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ARGONNE CODE CENTER:
COMPILATION OF PROGRAM ABSTRACTS

by

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<u>PAGES TO BE INSERTED</u>	<u>PAGES TO BE REMOVED</u>	<u>COMMENT</u>
1-21	1-21	Revised cover, title page, table of contents, and Sections I through IV
31-34	31-34	ACC Abstract 29 revised
57-60	57-60	ACC Abstract 51 revised
76.1-76.2	76.1-76.2	ACC Abstract R80 revised
125-128	125-128	ACC Abstract 136 revised
139-140	139-140	ACC Abstract 146 revised
187-190	187-190	ACC Abstract 168 revised
221-222.2	221-222.2	ACC Abstract 185 revised
285-286	285-286	ACC Abstract 216 revised
301-302	301-302	ACC Abstract 224 revised
349-352	349-352	ACC Abstract 249 revised
363-364	363-364	ACC Abstract 255 revised
383-384	383-384	ACC Abstract 265 revised
405-406.2	405-406.2	ACC Abstract R275 revised
419-420, 420.1-420.2	419-420	ACC Abstract R282 revised
439-442	439-442	ACC Abstract 292 revised
455-457.1, 457.2-458	455-458	ACC Abstract R299 revised
473-476	473-476	ACC Abstract 308 revised
541-542	541-542	ACC Abstract 340 revised
579-582	579-581.1, 581.2-582	ACC Abstract 358 revised
631-634	631-634	ACC Abstract 384 revised
639-640, 640.1-640.2, 641-642	639-642	ACC Abstracts 387 and 388 revised
691-692	691-692	ACC Abstract R412 revised
733-738	733-738	ACC Abstracts 432 and 433 revised
769-771.1, 771.2-772	769-772	ACC Abstract 450 revised
795-798	795-798	ACC Abstract R462 revised
803-808, 809-809.1, 809.2-810, 811-814	803-814	ACC Abstracts 465, 467, and 469 revised
825-828	825-828	ACC Abstract 475 revised
853-854	853-854	ACC Abstract 487 revised
877-878	877-878	ACC Abstract 498 revised
883-888	883-888	ACC Abstracts 501 and 502 revised
903-906	903-906	ACC Abstract 510 revised
933-934, 935-935.1, 935.2-936	933-936	ACC Abstract 523 revised
941-944	941-944	ACC Abstract 527 revised
965-1349	965-1038	ACC Abstracts 538 through 610 added; Section VI Library Pro- grams by Classification revised; Section VII KWIC Index revised; References replaced

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7	FIRN, 2-D FEW-GP S4 APPROXIMATION RZ GEOMETRY	LRL	709	F2	RS	C	23
9	FIRE5, 1-D AGE-DIFFUSION SLAB CYLINDER SPHERE	AEB	360	F4	RS L T	C	24
14	HAFFER, HAUSER-FESHBACH INELASTIC SCATTERING	CCC	1604	F63	RS P	A	26
18	2DXY, 2-D MULTI-GP SN APPROXIMATION XY GEOM	AGC	7090	FLCCC	RSBP	C	28
28	FOG, 1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE	AI	7090	F2	RS P T	C	30
28	FOG, 1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE	CCC	1604	F63	RS P T	C	30
28	FCG, 1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE	BC	625	F4	RS T	C	30
29	AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	AI	7090	F+FAP	RS PL T	C	32
29	AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	CCC	1604	F63	RS PL T	C	32
29	AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	OSUC	370	F4	RS PL CT	C	32
30	PERT, 1-D PERTURBATION FOR AIM AND FCG CODES	CCC	1604	F63	RS	C	34
30	PERT, 1-D PERTURBATION FOR AIM AND FCG CODES	BHSC	360	F4	RS F	C	34
30	PERT, 1-D PERTURBATION FOR AIM AND FCC CODES	AI	7090	F2	RS	C	34
32	WHIRLAWAY, 3-D 2-GROUP DIFFUSION XYZ GEOMETRY	CCC	1604	F63	RS P T	C	36
32	WHIRLAWAY, 3-D 2-GROUP DIFFUSION XYZ GEOMETRY	ORNL	7090	F2	RS P T	C	36
33	GAM1, FAST NEUTRON SPECTRUM X-SECTION CALC	CCC	1604	F63	RS PLX T	B	38
33	GAM1, FAST NEUTRON SPECTRUM X-SECTION CALC	ANL	3600	F63	RS LX T	B	38
33	GAM1, FAST NEUTRON SPECTRUM X-SECTION CALC	GGA	7090	F2	RS PLX T	B	38
39	EQUIPOISE3, 2-D 2-GROUP DIFFUSION SLAB CYL	CRNL	7090	F2	RS P T	C	40
40	ZOGRAND, 2-D FEW-GROUP DIFFUSION SLAB CYLINDER	CCC	1604	F63	RS P T	C	42
40	ZOGRAND, 2-D FEW-GROUP DIFFUSION SLAB CYLINDER	CRNL	7090	F2	RS P T	C	42
41	ZUT, RESOLVED REGION RESONANCE INTEGRAL CALC	GGA	7090	F+FAP	RSB T	A	44
42	TUZ, UNRESOLVED REGION RESONANCE INTEGRAL CALC	GGA	7090	F+FAP	RSB T	A	46
R 43	CURFIT, CURVE FITTING EXPERIMENTAL DATA POINTS	KAFI	6600	F+ASC	RS P T	P	47
45	GRACE1, GAMMA-RAY ATTENUATION SLAB GEOMETRY	CCC	1604	F63	RS P	J	48
45	GRACE1, GAMMA-RAY ATTENUATION SLAB GEOMETRY	AI	7090	F2	RS P	J	48
46	GRACE2, GAMMA-RAY ATTENUATION CYL SPHERE GEOM	CCC	1604	F63	RS P	J	50
46	GRACE2, GAMMA-RAY ATTENUATION CYL SPHERE GEOM	AI	7090	F2	RS F	J	50
47	CLOUD, GAMMA-RAY DOSE RATE FROM A CLOUD	CCC	1604	F63	RS P	G	52
47	CLOUD, GAMMA-RAY DOSE RATE FROM A CLOUD	DP	360	F4	RS P	G	52
47	CLOUD, GAMMA-RAY DOSE RATE FROM A CLOUD	AI	7090	F2	RS P	G	52
48	FUGUE, STEADY-STATE TEMPERATURE VOID FRACTION	AI	7090	F2	RS	I	54
50	TEMPEST2, THERMAL NEUTRON SPECTRUM X-SECTIONS	CCC	1604	F63	RS PL T	B	56
50	TEMPEST2, THERMAL NEUTRON SPECTRUM X-SECTIONS	BHSC	360	F4	RS PL T	B	56
50	TEMPEST2, THERMAL NEUTRON SPECTRUM X-SECTIONS	AI	7090	F+FAP	RS PL T	B	56
51	FORM, FAST NEUTRON SPECTRUM X-SECTION CALC	CCC	1604	F63	RS PL T	B	58
51	FORM, FAST NEUTRON SPECTRUM X-SECTION CALC	AI	7090	F2	RS PL T	B	58
51	FORM, FAST NEUTRON SPECTRUM X-SECTION CALC	CSLC	370	F4	RS PLXCT	B	58
52	SAIL, 1-D 1-GP SN APPROXIMATION SLAB GEOMETRY	AI	7090	F2	RS P	B	60
52	SAIL, 1-D 1-GP SN APPROXIMATION SLAB GEOMETRY	CCC	1604	F63	RS P	B	60
53	S4 CYL CELL CODE, 1-D 1-GP S4 APPROXIMATION	AI	7090	F2	RS	B	62
53	S4 CYL CELL CODE, 1-D 1-GP S4 APPROXIMATION	CCC	1604	F63	RS P	B	62
55	AIMFIKE, URANIUM FUEL CYCLE COST ANALYSIS	AI	7090	F2	RS P	D	64
56	SUMMIT, CRYSTALLINE SCATTERING KERNEL CALC	GGA	7090	F2	RS T	A	66
58	SIZZLE, 1-D MULTIGROUP DIFFUSION DEPLETION	AI	360	F4	RSBP X T	D	68
58	SIZZLE, 1-D MULTIGROUP DIFFUSION DEPLETION	AI	7090	F2	RS L T	C	68
58	SIZZLE, 1-D MULTIGROUP DIFFUSION DEPLETION	CCC	1604	F63	RS L T	D	68
59	MIST, 1-D FEW-GP SN DOUBLE SN APPROX SLAB GEOM	PFCC	7090	F2	RS P	C	70
62	LASL LEAST SQUARES, GENERAL CURVE FITTING	LASL	7094	F4	RS T	P	72
75	GE-HAPO-S13, 1-D MULTI-GP DOUBLE SN APPROX	BNW	7090	FLOCO	RSBP T	C	74
R 80	SOR3, STRESS ANALYSIS SHELLS OF REVOLUTION	KAPL	6600C	F4	RS P T	I	76
87	EQUIPOISE3A, 2-D 2-GP DIFFUSION CYLINDER SLAB	ORNL	7090	F2	RS P T	C	77

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87	EQUIPOISE3A, 2-D 2-GP DIFFUSION CYLINDER SLAB	CCC	1604	F63	RS P	T	C 77
89	ARES2, RESONANCE INTEGRAL X-SECTION CALC	AI	7090	F2	RS PL	T	A 79
89	ARES2, RESONANCE INTEGRAL X-SECTION CALC	CCC	1604	F63	RS PL	T	A 79
91	FARSE1A, DOSE RATE FROM SNAP SHIELD LEAKAGE	AI	7090	F2	RS		J 81
99	CCB, 2-D FEW-GP DIFFUSION BURNUP RZ GEOMETRY	GGA	7090	F+FAP	RSBP	T	D 83
102	AX1, COUPLED NEUTRONICS-HYDRODYNAMICS SPHERE	CCC	3600	F63	RSBP		F 85
103	CRAM, 1-D AND 2-D MULTI-GP DIFFUSION PROGRAM	LK-R	7090	F+FAP	RSBPL	T	C 87
103	CRAM, 1-D AND 2-D MULTI-GP DIFFUSION PROGRAM	AAEC	360	F+BAL	RS P	T	C 87
108	BAM, S4 CYL CELL CODE AND TEMPEST COMBINATION	AI	7090	F2	RS P		B 90
109	4RESTRAINT PIPE STRESS, MAXIMUM MOMENT CALC	AI	7090	F+FAP	RS	T	I 92
110	SCARF2, SCATTER FROM RADIATOR FINS SNAP GECM	AI	7090	F2	RS		J 93
111	SCAR1, SCATTER FROM A RING SNAP GEOMETRY	AI	7090	F2	RS		J 95
112	CROCK, SPACE POWER PLANT DESIGN OPTIMIZATION	AI	7090	F2	RS		I 97
113	Z01, GROUP-COLLAPSING CF MULTI-GP X-SECTIONS	LASL	7090	FLOCO	RS P		B 98
114	SHOCK, SPACE POWER PLANT DESIGN OPTIMIZATION	AI	7090	F2	RS		I 100
117	FEVER, 1-D FEW-GP DIFFUSION DEPLETION PROGRAM	GGA	7090	F2	RSB	T	C 101
118	ULCER, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	AI	7090	F+FAP	RS L	T	C 103
119	QUICKIE, INFINITE MEDIUM SPECTRUM X-SECTIONS	AI	7090	F+FAP	RS L	T	B 105
120	FAIM, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	AI	7090	F+FAP	RS L	T	C 107
120	FAIM, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	CCC	1604	F63	RS PLX	T	C 107
120	FAIMOS, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	EFSC	360	F4	RS P	T	C 107
121	AIREK3, SPACE-INDEPENDENT KINETICS W/FEEDBACK	AI	7090	F2	RS		E 110
121	AIREK3, SPACE-INDEPENDENT KINETICS W/FEEDBACK	AEB	360	F4	RS P		E 110
121	AIREK3, SPACE-INDEPENDENT KINETICS W/FEEDBACK	CCC	1604	F63	RS P		E 110
122	SNAPKINS/5A, 1-REGION KINETICS SNAP GEOMETRY	AI	7090	F2	RS		E 112
123	LIPRECAN1, MC NEUTRON PENETRATION CALCULATION	CAC	7090	F2	RSBP		J 114
129	CONEC, COUPLED NEUTRONICS-HYDRODYNAMICS SPHERE	LRL	7090	F2	RS P		F 116
132	W-DSN, 1-D MULTI-GP SN APPROX SLAB CYL SPHERE	UK-W	7090	F2	RS P	T	C 118
133	WED, W-DSN OUTPUT TAPE EDIT REACTION RATES	LK-W	7090	F2	RS		N 120
134	NUCY, SOLUTION OF NUCLEI CHAIN EQUATIONS	ORNL	7090	F2	RSBP		D 122
135	TRAFICCRPATION, TRANSFER FUNCTION SYNTHESIS	ANL	3600	F63	RSBP	T	E 124
136	HERESY3, 2-D HETEROGENEOUS REACTOR CALCULATION	DP	360B	F4	RSBP	CT	C 126
141	RATRAP, DOSE RATE CALCULATION SNAP GEOMETRY	AI	7090	F2	RS P		J 128
142	MORTIMER, DOSE RATE CALCULATION SNAP GEOMETRY	AI	7090	F2	RS		J 130
143	MAC, SHIELD DESIGN MULTIGROUP SLAB GEOMETRY	BNW	7090	F2	RSBPL	T	J 132
143	MAC, SHIELD DESIGN MULTIGROUP SLAB GEOMETRY	ANL	3600	F63	RSBPL	T	J 132
144	OTF, 1-D MULTIGROUP DISCRETE COORDINATE CALC	UNC	1604	F63	RS PL	T	C 135
145	WEAK EXFUSION, COUPLED NEUTRON-HYDRODYNAMICS	APDA	7094	F2	RS F		F 137
146	NPRFCCP, FUEL CYCLE COSTS PERFORMANCE DATA	KE	7090	F2	RSBP		D 139
146	NPRFCCP, FUEL CYCLE COSTS PERFORMANCE DATA	LEC	6600	F4	RS P		D 139
147	AILMOE, X-SECTION CALC ELASTIC SCAT RESONANCES	AI	7094	F+FAP	RS PL	T	B 141
147	AILMOE, X-SECTION CALC ELASTIC SCAT RESONANCES	AI	360	F4	RS PLX	T	B 141
148	TOPIC, 1-D FEW-GP SN APPROXIMATION CYLINDER	PPCO	7090	F2	RS P	T	C 144
148	TOPIC, 1-D FEW-GP SN APPROXIMATION CYLINDER	PPCO	7040	F4	RS P	T	C 144
149	TYCE3, MONTE CARLO SLOWING-DOWN DENSITY CALC	AI	7094	F+FAP	RS PL	T	B 146
150	DANCOFF JR, ACCELERATOR SPACE CHORD DIST FUNCT	AEG	7090	F2	RS		B 148
151	ANISN, 1-D MULTI-GP DISCRETE COORDINATE CALC	AI	360	F4	RSBPLX	T	C 150
151	CTF2, 1-D MULTI-GP DISCRETE COORDINATE CALC	AI	7090	F2	RS PLX	T	C 150
152	ARGUS, TRANSIENT TEMPERATURE CALC CYLINDER	ANL	3600	F63	RSBP	T	H 153
153	HATCHET, COUPLED NEUTRONICS-HYDRODYNAMICS CCCE	AGC	7090	F2	RSB		F 155
154	CAC90, ML-1 FLUID FLOW EXPERIMENT ANALYSIS	AGC	7090	F2	RS P		C 157
155	PTH1, BLOWDOWN PRESSURE TEMPERATURE HISTORY	KE	7094	F2	RSBP	T	H 159
156	EXTERMINATOR, 2-D MULTI-GP DIFFUSION PROGRAM	CRNL	7090	F+FAP	RS P	T	C 161
156	EXTERMINATOR2, 2-D MULTI-GP DIFFUSION PROGRAM	CRNL	360	F4	RS P	T	C 161
156	EXTERMINATOR2, 2-D MULTI-GP DIFFUSION PROGRAM	CE	6600	F4	RS P	T	C 161
156	EXTERMINATOR2, 2-D MULTI-GP DIFFUSION PROGRAM	BC	625	F4	RS	T	C 161
159	MOMUS, X-SECTION LIBRARY UTILITY PROGRAM	AI	7094	F+FAP	RS L	T	M 165
160	SOPHIST1/2/5, MULTI-GP TRANSFER COEFFICIENTS	LRL	7090	F+FAP	RS P	T	B 167
161	FERTRAN TDC, 2-D MULTI-GP SN APPROXIMATION RZ	PN	1604	F63	RS P	T	C 169
162	GRAVE, GROUP-AVERAGING X-SECTIONS PARAMETERS	AI	7094	F+FAP	RS PL	T	B 172
163	AIRCS, SPACE-INDEPENDENT KINETICS W/FEEDBACK	AI	7094	F+FAP	RS F	T	E 174
164	BURP1, DETECTOR EFFICIENCY POINT SOURCE	UM	7090	MAD	RSB		O 177
165	BURP2, DETECTOR EFFICIENCY DISK SOURCE	UM	7090	MAD	RSB		O 179
166	BURP3, DETECTOR EFFICIENCY POINT SOURCE	UM	7090	MAD	RSB		C 182
167	FLAKE, 3-D REACTIVITY AND POWER DISTRIBUTION	CCC	3600	F63	RSBP	T	C 185
167	FLARE, 3-D REACTIVITY AND POWER DISTRIBUTION	NED	635	F4	RS P	T	C 185
167	FLARE, 3-D REACTIVITY AND POWER DISTRIBUTION	MSS	360	F4	RS P	CT	C 185
168	R102, SPACE-INDEPENDENT INVERSE KINETICS CALC	WANL	7094	F4	RS		E 187
168	R102, SPACE-INDEPENDENT INVERSE KINETICS CALC	ANL	360	F4	RS P		E 187
168	R102, SPACE-INDEPENDENT INVERSE KINETICS CALC	ANL	3600	F63	RSBP		E 187
169	BURP4, GAMMA-RAY PHOTOFRACITION SOLID CRYSTAL	UM	7090	MAD	RSB		C 190
170	BURP5, GAMMA-RAY PHOTOFRACITION WELL CRYSTAL	UM	7090	MAD	RSB		C 192
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172	R153, PARAMETRIC SITE REQUIREMENT STUDY	ANL	3600	F63	RSBP	T	G 196
172	AISITE2, PARAMETRIC SITE REQUIREMENT STUDY	AI	360	F4	RS P	T	G 196
173	2DF, 2-D MULTI-GP DISCRETE ORDINATE CODE	GGA	1108	F5	RS P	T	C 198
173	2DF, 2-D MULTI-GP DISCRETE ORDINATE CODE	UNC	1604	F63	RS		C 198
174	FORE2, FAST REACTOR EXCURSION CALCULATIONS	NEC	635	F4	RS P X	T	F 200
174	FORE2, FAST REACTOR EXCURSION CALCULATIONS	ANL	360	F4	RS P X	T	F 200
174	FCRE, FAST REACTOR EXCURSION CALCULATIONS	NED	2000	F4	RS P	T	F 200
176	RAPTURE, RESONANCE INTEGRAL X-SECTION CALC	NEC	2000	F2	RS P		A 203
177	DOPIE, RESOLVED RESONANCE X-SECTION CALC	NEC	2000	F2	RS P		A 205
178	SPARTA, SPATIALLY-AVERAGED DOPPLER EFFECTS	NED	2000	F2	RS P		B 207
175	ISOTOPES, MAXIMUM YIELD FROM REACTION CR DECAY	CRNL	1604	F63	RS P		D 209
180	ISOCRUNCH, REACTION DECAY CHAIN ANALYSIS	CRNL	7090	F2	RSBP		C 211
180	ISCCRUNCH, REACTION DECAY CHAIN ANALYSIS	CRNL	1604	F63	RS P		D 211
181	XLBIT, X-SECTION LIBRARY UTILITY ROUTINE	ANL	3600	F63	RSBP	T	M 213
182	AXFLU, HEAT TRANSFER MOLTEN FUEL TUBE BUNDLES	LASL	7094	F2	RSBP		H 215
183	AXTHRM, HEAT TRANSFER SOLID FUEL TUBE BUNDLES	LASL	7094	F2	RSBP		H 217
184	BRT1, THERMAL SPECTRUM X-SECTION CALC	BNW	1108	F5	RS PLX	T	B 219
184	THERMGS(ANL), THERMAL SPECTRUM X-SECTION CALC	ANL	3600	F63	RSBP XCT	B	219
185	GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV	BC	625	F4	RS PLX	T	B 221
185	GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV	BNW	7090	F+FAP	RS PL	T	B 221
185	GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV	BNW	1107	F4	RS PL	T	B 221
185	GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV	UVA	6400	F4	RS PLX	T	B 221
186	LAG, ASSEMBLER FOR FLOCO2 INSTRUCTION SET	PW	1604	F+CDP	RS P	T	P 223
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188	CMXMAT, TRANSFER FUNCTION EVALUATION	PW	1604	F63	RS P		E 227
189	SNC, CALCULATION OF SN CONSTANTS FOR CSA TEC	PW	1604	F63	RS P		L 229
190	WOPEXPRT, REACTOR WEIGHT OPTIMIZATION STUDY	PW	1604	F63	RS		I 230
191	AX-TNT, COUPLED NEUTRONICS-HYDRODYNAMICS SPH	PW	1604	F63	RS P		F 232
192	2DXVL, 3-D MULTI-GP FLUX SYNTHESIS PROGRAM CYL	PW	1604	F63	RS	T	C 235
193	CSP2A, SN X-SECTION LIBRARY TAPE PREPARATION	PW	1604	F63	RS		L 237
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195	FMC-N, FMC-G, MC NEUTRON, GAMMA-RAY HISTORIES	PW	1604	F+CDP	RS P X	T	B 241
195	FMC-N, MONTE CARLO CALC NEUTRON HISTORIES	GGA	7044	F4	RS P	T	B 241
196	CURIE, DOSE, THUNDERHEAD, EXTERNAL+INTERNAL DOSE	AI	7094	F+FAP	RS PL	T	G 244
197	SFOE, S-FIELD WEIGHT OPTIMIZATION DOSE CALC	AI	7094	F+FAP	RS P		J 246
198	HEATING2, TRANSIENT STEADY-STATE HEAT TRANSFER	AI	7094	F+FAP	RS P	T	H 248
199	TDP, 2-D PERTURBATION TDC CR 2DXY FLUX INPUT	PW	1604	F63	RS		C 250
200	SATURATED BLOWDOWN2, BLOWDOWN ANALYSIS LOFT	KE	7094	F+MAP	RSBP	T	G 252
201	EPI THERMGS, SPECTRUM AND X-SECTION CALCULATION	NEC	7094	F+FAP	RS P	T	B 254
202	MCS, MONTE CARLO NEUTRON PENETRATION STUDY	LASL	7090	FLCCC	RS P		E 256
203	CCMBCO, COMBINED B-W MULTI-LEVEL CONVOLUTION	PPCO	7040	F+MAP	RS P		A 258
204	AGN-GAM, FAST SPECTRUM MULTI-GP CONSTANT CALC	AGC	7090	F+FAP	RSBP LX	T	B 260
205	BLOUST5, POINT-KINETICS WITH 2-D HEAT TRANSFER	GGA	7044	F+MAP	RS P	T	F 262
206	UNPACK, RETRIEVAL FROM SCISRS X-SECTION TAPE	GGA	7044	F+MAP	RSBP		M 264
207	CROSSPLOT, SC4C2C PLOTS FROM X-SECTION TAPES	GGA	7044	F+SPS	RSBP	T	N 266
208	TRIX1, RESONANCE INTEGRAL X-SECTION CALC	AI	7094	F+MAP	RS PLX	T	A 268
209	DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	BC	625	F+MAP	RS P	T	C 270
209	DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	ANL	360	F+BAL	RS P	T	C 270
209	DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	LASL	7030	F4	RS P	T	C 270
209	DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	LEF	7094	F4	RS P	T	C 270
209	DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	LASL	6600	F4	RS P	T	C 270
210	DTX, EFFECTIVE X-SECTION CALC FROM CSA CUTPUT	PW	1604	LAG1	RS P		N 273
211	MGCSN, 1-D MULTI-GP SN APPROX SLAB CYL SPHERE	PW	1604	LAG1	RS P		C 275
212	VARI-QUIR, TIME-DEP 2-D MULTI-GP DIFFUSION	WANL	6600	F4	RS P	T	C 277
212	VARI-QUIR, TIME-DEP 2-D MULTI-GP DIFFUSION	UMCC	360	F4	RS P	T	C 277
213	RIFF-RAFF, RESONANCE INTEGRAL CALC 2-REG CELL	ANL	3600	F36	RSBP X	T	E 279
214	MIST-MASH, RESONANCE INTEGRAL CALC HOMOGENEOUS	ANL	3600	F36	RSBP		A 281
215	CHAD, LEGENDRE COEF CALC FOR ANGULAR DIST DATA	AI	7094	F+MAP	RS P		A 283
216	FSDP3, POINTWISE XSECS. FROM B-W PARAMETERS	GGA	1108	F5	RS P	CT	A 285
217	LEGCECF3, LEGENDRE COEF CALC FOR ANGULAR DIST	GGA	7044	F4	RS P X		A 287
218	GAYER, ENERGY INTERVAL X-SECTION AVERAGING	GGA	7044	F4	RS P		L 289
219	GARCL, RESONANCE OVERLAP AND LATTICE EFFECTS	LER	7094	F+MAP	RS P	T	B 291
219	GAROL, RESONANCE OVERLAP AND LATTICE EFFECTS	GGA	7044	F+MAP	RS P	T	B 291
220	GASP2, 1-D FEW-GP DIFFUSION POWER DIST SEARCH	GGA	7044	F4	RS P	T	C 293
221	RELCAO-FEVER, 1-C FEW-GP DIFFUSION DEPLETION	GGA	7044	F4	RS P	T	D 295
222	GAMBLE5, 2-D MULTI-GP DIFFUSION XY RZ GEOMETRY	GGA	1108	F+BAL	RS P	T	C 297
222	GAMBLE4, 2-D MULTI-GP DIFFUSION XY RZ GEOMETRY	GGA	7044	F+MAP	RSBP	T	C 297
223	REVISED-GAC, FUEL CYCLE ANALYSIS W/REFUELING	GGA	7044	F4	RS P	T	D 299
224	WAMPUM, FUEL CYCLE COSTS PERFORMANCE STUDY	UEC	6600	F4	RS P		D 301
224	WAMPUM, FUEL CYCLE COSTS PERFORMANCE STUDY	GGA	7044	F4	RS P		D 301
225	TEMCO, 1-D FEW-GP DIFFUSION TEMP COEF CALC	CEA	7044	F4	RS P	T	C 303
226	OPUS, POWER PLANT PERFORMANCE AND PRICE STUDY	GGA	7044	F+MAP	RS P	T	C 305

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228	FRECCN, HTGR CONTAINMENT PRESSURE POST RUPTURE	GGA	7044	F4	RS X T	G	309
229	ELBOW, FUEL ELEMENT STRESS ANALYSIS STUDY	CGA	7044	F4	RS P T	G	311
231	RAC2, HTGR FISSION PRODUCT ACTIVITY DIST STUDY	GGA	7044	F4	RS P	C	315
232	GAZELLE5, GAS-COOLED CORE THERMAL DESIGN STUDY	GGA	7044	F4	RS P	I	317
233	CORE, CORE CONFIGURATION FUEL TEMPERATURE CODE	CGA	7044	F4	RS	I	319
234	CPC, DATA PREPARATION FOR 2-D DESIGN PROGRAMS	LASL	7090	F+FAP	RS P T	L	321
235	GAMMA-P, PRODUCTION X-SECTIONS FOR GAMMA-RAYS	CEC	7054	F4	KS P	B	323
236	DFSR, DATA FILE SERVICE ROUTINES ENDF TAPES	ENL	7090	F+FAP	RS P T	M	325
237	ECUNCE, FLUX DIST IN MULTI-PIN FUEL ELEMENT	AGC	7050	F2	RS P	P	327
238	EXT, X-SECTIONS FROM E-W RESONANCE PARAMETERS	WANL	7094	F2	KS P	A	329
239	CPS, SC4020 PLOTS FROM CIRS X-SECTION TAPES	WANL	7094	F+FAP	RSBP L	T N	331
240	ASSALT, 2-D MULTI-GP DIFFUSION DEPLETION CODE	CRNL	7050	F+FAP	RS P T	D	333
241	FFN, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	BNL	1107	F4	RS P T	C	336
242	RATH, 2- CR 3-D HEAT CONDUCTION LUMPED MASS	LASL	7030	F4	RS	T H	338
242	RATH, 2- CR 3-D HEAT CONDUCTION LUMPED MASS	LASL	7094	FAP	RS P T	F	338
243	AGA-SIGMA, CALC OF MULTI-GP TRANSFER MATRICES	AGC	7050	F2	RS P T	P	340
244	CYCLCPS1, THERMODYNAMIC CYCLE ANALYSIS	AI	7054	F2	RS PL T	I	342
246	FLOW-MODEL, MULTI-CHANNEL 2-D 2-PHASE FLOW	MSS	360	F4	RS P	F	344
246	FLOW-MODEL, MULTI-CHANNEL 2-D 2-PHASE FLOW	AI	7054	F2	RS P	H	344
247	FLANGE1, SCATTERING LAW X-SECTION CALCULATION	CGA	1108	F5	RS P	A	346
248	COINC, COINCIDENCE COUNTING DATA REDUCTION	ANL	3600	F63	RSBP	C	348
249	LASER, SPECTRUM CALC WITH BURNUP CYL LATTICE	TVA	360	F4	RSBP L X C T	E	350
249	LASER, SPECTRUM CALC WITH BURNUP CYL LATTICE	WAFD	7094	F+MAP	RS PL X T	B	350
250	SAFE-PCRS, STRESS ANALYSIS AXISYMMETRIC LOAD	GGA	7044	F4	RSBP CT	I	353
251	SAFE-AXISYM, STRESS ANALYSIS AXISYMMETRIC LOAD	CGA	7044	F4	RS P T	I	355
252	SAFE-PLANE, PLANE STRESS ANALYSIS, 2-D BODIES	CGA	1108	F4	RS P	I	357
252	SAFE-PLANE, PLANE STRESS ANALYSIS, 2-D BODIES	BNL	6600	F4	RS P T	I	357
253	SAFE-SHELL, STRESS ANALYSIS THIN SHELLS	CGA	1108	F4	RS P	I	359
254	ZPLUS, NON-SPHERICAL OPTICAL MODEL X-SECTIONS	AI	7094	F2	RS P T	A	361
254	ZPLUS, NON-SPHERICAL OPTICAL MODEL X-SECTIONS	ANL	3600	F63	RSBP T	A	361
255	RIC1, SPACE-INDEPENDENT KINETICS KEX OPTICS	WANL	7094	F4	RS P	E	363
255	RIC1, SPACE-INDEPENDENT KINETICS KEX OPTICS	ANL	3600	F63	RSBP	E	363
255	RIC1, SPACE-INDEPENDENT KINETICS KEX OPTICS	ANL	360	F4	RS P	E	363
256	MANTA, STEADY-STATE THERMAL-HYDRAULIC ANALYSIS	NEL	635	F4	RS P T	H	365
256	MANTA, STEADY-STATE THERMAL-HYDRAULIC ANALYSIS	WARD	6600	F4	RS P T	H	365
257	REAX, RESOLVED RESONANCE EPITHERMAL X-SECTIONS	NEC	635	F4	RS P T	B	367
258	EXPN, ANALYSIS OF PULSED NEUTRON SOURCE DATA	NEC	635	F4	RS P T	O	369
259	MUSCAT, VIEW FACTOR SHIELDING CODE CAVITY GEOM	GGA	1108	F4	RS P T	J	371
260	GARGCYL, FUEL CYCLE ANALYSIS PARTIAL REFUEL	GGA	7044	F4	RS P T	C	373
261	GADUSE, DOSET, HTGR ACCIDENT ANALYSIS CODE CALC	CGA	1108	F4	RS	T G	375
262	MACH1, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	PURD	6500	F4	RS PL X T	C	377
262	MACH1, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	ANL	3600	F36	RS P X T	C	377
263	GASKET, THERMAL SCATTERING LAW CALCULATION	GGA	1108	F4	RS P	A	379
264	VARI-QUIR3, 2-D MULTI-GP DIFFUSION XY RZ RTH	WANL	7054	F4	RS P X T	C	381
265	RSAC, RADIOLOGICAL SAFETY ANALYSIS PROGRAM	ANL	360	F4	RSBP CT	G	383
266	CYGR02, STRESS ANALYSIS CYL FUEL ELEMENT	EAPL	6600	F4	RS	T I	385
267	WATER, STEAM TABLES 14.5-14,500PSIA 32-472DEGF	BAPL	6600	F4	RS	T H	387
268	TRANS-FLGLE1, TRANSIENT FLOW AND HEAT TRANSFER	AI	7094	F2	RS P T	G	389
269	CTF-BURN, 1-D MULTI-GP CTF WITH DEPLETION	LASL	7030	F4	RS P T	D	391
270	CAESAR4, LITEST, 1-D MULTI-GP DIFFUSION + LIB	AI	360	F4	RSBP L X T	C	393
271	CLIP, FORM OR THREEDES LIBRARY UTILITY ROUTINE	AI	360	F4	RSBP L T	M	396
272	FIGRO, LOWER FUEL SWELLING TEMPERATURE STUDY	BAPL	6600	F4	RS P T	H	398
273	THREDES, 1-D FEW-GP DIFFUSION DESIGN SYSTEM	AI	360	F4	RSBP T	K	400
274	WIGL2, 1-D 2-GP SPACE-TIME DIFFUSION 3-GEOM	BAPL	6600	F4	RS P T	F	402
274	WIGL2, 1-D 2-GP SPACE-TIME DIFFUSION 3-GEOM	GGA	1108	F4	RS P T	F	402
275	PDQ7, 1,2 CR 3-D FEW-GP DIFFUSION DEPLETION	EW	6600B	F+ASC	RS P T	D	405
275	PDQ7, 1,2 CR 3-D FEW-GP DIFFUSION DEPLETION	BAFL	6600C	F+ASC	RS P T	C	405
275	PDQ7, 1,2 CR 3-D FEW-GP DIFFUSION DEPLETION	ANC	360E	F+BAL	RS P X T	D	405
275	PDQ7, 1,2 CR 3-D FEW-GP DIFFUSION DEPLETION	BCS	6600E	F+ASC	R B T	D	405
275	PDQ7, 1,2 CR 3-D FEW-GP DIFFUSION DEPLETION	BAPL	6600G	F+ASC	RS P T	D	405
276	AVOID, ANNULAR VOID X-SECTION CALCULATION	CEC	625	F4	RS P	B	407
277	HAMMER, LITHE, HELP, CRITICAL ANALYSIS SYSTEM	DP	360	F+BAL	RS P X T	E	409
278	WATER-MAPPER, LIQUID ELWCCLWA ANALYSIS LGFT	UGA	360	F4	RS P	G	411
278	WHAM, LIQUID-FILLED PIPING SYSTEM ANALYSIS	KE	3600E	F36	RSBP	G	411
279	LECPARC, SPECTRA CALCULATION WITH DEPLETION	JNC	1108	F5	RS LX T	B	413
279	LEOPARC, SPECTRA CALCULATION WITH DEPLETION	WAFD	360	F4	RS PL X T	B	413
280	MOB07, 2-D DIFFUSION ABSORPTION REMOVAL X-SECS	BAPL	6600	F4	RS	T B	415
281	RABBLE, NLIB, FLAT, RESONANCE ABSORPTION, CELL	ANL	3600	F36	RSBP X T	B	417
282	SEAL SHELL, SHELL STRESS ANALYSIS AXISYM LOAD	WTSC	6600B	F4	RS P T	I	419
282	SEAL SHELL2, SHELL STRESS ANALYSIS AXISYM LOAD	BAPL	6600	F4	RS P T	I	419
282	SEAL SHELL2, SHELL STRESS ANALYSIS AXISYM LOAD	SR	360	F4	RS P T	I	419
283	MO552, DYNAMIC ANALYSIS LINEAR ELASTIC SYSTEMS	BAPL	6600	F4	RS P T	I	421

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R285	RESG2,RESQ0,CBF1, RESONANCE INTEGRAL HEX CELL	BAPL	6600	F+ASC	RS P	X T	B 425
R286	HCT2, 2-D TRANSIENT HEAT CONDUCTION PROGRAM	BAPL	6600	F4	RS P	T	H 427
287	BISYN, 2-D MULTI-GP DIFFUSION SYNTHESIS CALC	NEC	635	F4	RS PL	T	C 429
287	BISYN, 2-D MULTI-GP DIFFUSION SYNTHESIS CALC	NED	1108	F4	RS P	T	C 429
288	SNARG-1D, 1-D MULTI-GP DISCRETE CURVATURE CALC	ANL	3600	F36	RS P	T	C 432
289	CAKER, INELASTIC SCAT X-SECTION CALC MODERATOR	GGA	1108	F4	RS P		A 434
290	GASA, STABILITY ANALYSIS REACTOR KINETICS EQNS	GGA	1108	F4	RS P		E 436
291	HEXSCAT, ELASTIC SCAT X-SECTIONS HEX LATTICE	GGA	1108	F4	RS		B 438
292	PSEUDO, STATISTICAL RESONANCE PARAMETER CALC	GGA	1108	F4	RS P		A 440
292	PSEUDO, STATISTICAL RESONANCE PARAMETER CALC	ENEA	360	F4	RS P		A 440
293	MARS, 2-D EXCURSION CALCULATION R-Z GEOMETRY	APDA	7094	F4	RS P		F 442
R294	MOB99,MOH, STEAM TABLES 14.5-2538 PSIA	BAPL	6600	F4	RS P	T	H 444
R294	MOB99,MOH, STEAM TABLES 14.5-2538 PSIA	ANL	1604	F63	RS P		H 444
R295	FLASH3, LOSS-OF-COOLANT ACCIDENT ANALYSIS	BAPL	6600	F4	RS P	T	G 446
296	GRDWRK, GRID GENERATION FOR SAFE PROGRAMS	GGA	1108	F4	RS P		L 448
298	GGC4, MULTI-GP X-SECTIONS FAST THERMAL SPECTRA	GGA	6600	F4	RS	L T	E 452
298	GGC4, MULTI-GP X-SECTIONS FAST THERMAL SPECTRA	GGA	1108	F4	RS PLX	T	E 452
R299	LION4, 3-D TEMPERATURE DISTRIBUTION PROGRAM	KAPL	6600	F+ASC	RS P	T	H 456
R299	LION4, 3-D TEMPERATURE DISTRIBUTION PROGRAM	CHI	1108	F4	RS P	T	H 456
300	SAFE-CREEP, VISCOELASTIC ANALYSIS CONCRETE	GGA	1108	F4	RS P		I 458
301	FREVAP6, HTGR METALLIC FISSION PRODUCT RELEASE	GGA	1108	F4	RS P		C 460
302	GAFFE, EQUILIBRIUM FUEL CYCLE CALCULATION	GGA	1108	F4	S	T	D 462
303	BLCCST6, COPEINEC KINETICS 2-C HEAT TRANSFER	GGA	1108	F+BAL	RS P	T	E 464
304	PERT4, 2-D PERTURBATION XY RZ RTHETA GEOMETRY	BNW	1108	F4	RS P		C 466
305	STRIP, RESOLVED RESONANCE INTEGRAL CALCULATION	BW	2000	F4	RS		A 468
306	FCC4, FUNDAMENTAL MODE FAST REACTOR X-SEC CALC	BNW	1108	F4	RS P	T	B 470
307	HWCCR-SAFE, 2-C MONTE CARLO CELL CALCULATION	AI	360	F+BAL	RS P	X T	E 472
308	JUPITOR1, COUPLED-CHANNEL X-SEC EVALUATION	CRNL	1604	F63	RS P	T	A 474
308	JUPITOR1, COUPLED CHANNEL X-SEC EVALUATION	ENEA	360	F4	RS P	CT	A 474
309	TSN, SPATIALLY-DEPENDENT REACTOR KINETICS	AI	360	F4	RS P	T	F 476
309	TSN, SPATIALLY-DEPENDENT REACTOR KINETICS	AI	7094	F+MAP	RS P	T	F 476
310	CAKIN, 1-D MULTIGROUP TIME-DEPENDENT DIFFUSION	GGA	1108	F4	RS P	T	F 478
311	BURNUP, HEAVY ELEMENT ISOTOPE BURNUP ANALYSIS	NED	635	F4	RS P	T	C 480
312	TOSN, 2-D MULTIGROUP DISCRETE CURVATURE PROGRAM	LER	7090	F+MAP	RS P	T	C 482
313	CINDER,MO102, POINT DEPLETION FISSION PRODUCT	DP	360	F+BAL	RS P	T	C 484
313	CINDER,MO102, POINT DEPLETION FISSION PRODUCT	BAPL	6600	F4	RS P		D 484
314	NAP, NEUTRON-INDUCED GAMMA-RAY RADIOACTIVITY	IIITR	7094	F4	RSBPLX	T	C 486
315	WIREX, COMPUTER-PRODUCED WIRING LISTS UTREX	LASL	7090	F+MAP	RS P		I 488
316	GAF,GAR, SPECTRA AND GROUP-AVERAGED X-SEC CALC	GGA	1108	F4	RS P	X T	B 490
317	GAPOTKIN, SPACE-INDEPENDENT REACTOR KINETICS	GGA	1108	F4	RS P		E 493
318	FEVER7, 1-C MULTIGROUP DIFFUSION AND DEPLETION	GGA	1108	F4	RS P	T	D 495
319	GASP7, 1-D BURNUP POWER DISTRIBUTION SEARCH	GGA	1108	F4	RS P	T	C 497
320	TEMCO7, TEMPERATURE COEFFICIENT CALCULATION	GGA	1108	F4	RS P	T	C 499
321	EXPALS, LEAST SQUARES EXPONENTIAL DECAY CURVES	LRL	7094	F2	RS P		P 501
322	ISOSEARCH, ISOTOPE PRODUCTION FLUX, X-SEC CALC	CRNL	1604	F63	RS P		D 503
322	ISOSEARCH, ISOTOPE PRODUCTION FLUX, X-SEC CALC	CRNL	360	F+BAL	RS P		D 503
323	MUFFLE, FISSION NUCLEIDE X-SECTION EVALUATION	CRNL	7090	F4	RSBP		A 505
324	FRANTIC, LEAST SQUARES FIT SUM OF EXPONENTIALS	MIT	7090	F2	RS P		P 507
325	ZDB, 2-D MULTIGROUP DIFFUSION AND DEPLETION	BNW	1108	F4	RS P	T	D 509
325	ZDB, 2-D MULTIGROUP DIFFUSION AND DEPLETION	LASL	6600	F4	RS P	T	D 509
325	ZDB, 2-C MULTIGROUP DIFFUSION AND DEPLETION	ANL	3600	F4	RSBP	T	D 509
326	AIRDS2A, SIMULATION OF REACTOR DYNAMICS	AI	360	F+BAL	RS P	T	E 511
R327	CAFT1, LEAST SQUARES FIT FISSION NUCLEIDE DATA	BAPL	6600	F4	RS P	T	P 514
328	NLRLOC-1.0, LOSS-OF-COOLANT THERMAL ANALYSIS	BCL	6400	F4	RS P	T	G 516
R329	MO457,PIPE, ELASTIC STRESS OF PIPING SYSTEM	BAPL	6600	F4	RS P	T	I 518
330	ECCSA4, LOSS-OF-COOLANT & EMERGENCY COOLING	BCL	6400	F4	RS P	T	C 520
R331	FLCT1,MO219, PWR FLCW TRANSIENT ANALYSIS	BAPL	6600	F4	RS P	T	H 522
332	SAFE-3D, 3-D COMPOSITE STRUCTURE STRESS STUDY	GGA	1108	F4	RS P	T	I 524
332	SAFE-3D, 3-D COMPOSITE STRUCTURE STRESS STUDY	CRNL	360	F+BAL	RS P	T	I 524
333	TGAD, PROCESSING OF ANALYZER GAMMA-RAY SPECTRA	GGA	1108	F+BAL	RS P	T	C 526
334	PEGGY, ELASTIC SCATTERING PHASE-SHIFT ANALYSIS	CRNL	1604	F63	RS P		A 528
335	RAMES, PARTICLE WAVE FUNCTION RADIAL INTEGRALS	CRNL	1604	F63	RS P		A 530
R336	PDG5, 2-C FEW-GROUP DIFFUSION AND DEPLETION	IBM	360A	F+BAL	RS P	T	D 531
R336	PDQ5, 2-D FEW-GROUP DIFFUSION AND DEPLETION	MIT	360B	F+BAL	RSBP	T	D 531
R337	STEM, MATRIX GENERATION FOR A SYSTEM OF BEAMS	KAPL	6600	F4	RS P		I 533
R338	THWIGGLE, 2-D 2-GP SPACE-TIME DIFFUSION	ANL	360	F4	RS P		F 535
R338	THWIGL, 2-D 2-GP SPACE-TIME DIFFUSION FEEDBACK	BAPL	6600	F4	RS P	T	F 535
339	GAUGE, 2-D FEW-GP HEX GEOM DIFFUSION DEPLETION	GGA	1108	F4	RS P	T	D 538
340	POWERCC, NUCLEAR STATION ELECTRICITY COSTS	UEC	6600	F4	RS P		D 541
340	POWERCC, NUCLEAR STATION ELECTRICITY COSTS	CRNL	1604	F63	RS P		D 541
341	GANDY, UNRESOLVED RESONANCE X-SECTION CALC	GGA	1108	F4	RS P		A 543
R342	MO648, 1-D SLAB TRANSPORT WITH SLOWING DOWN	BAPL	6600	F4	RS	T	C 546

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R344	GEM, EIGENVALUE PROBLEM FOR VIBRATING SYSTEMS	KAPL	6600	F+ASC	RS P T I		550
345	GAND, GAUGER X-SECTION LIBRARY PREPARATION	CGA	1108	F4	RS P X T L		552
346	TATE, 3-D TRANSIENT HEAT TRANSFER PROGRAM	GEC	635	F+GMP	RSBP T F		554
347	CCOILLI, LEAST SQUARES ANALYSIS RESONANCE DATA	UILL	360	F4	RS P A		556
R348	TOPS, TRANSIENT THERMODYNAMICS OF PRESSURIZERS	EAFI	6600	F4	RS P T H		558
349	TCODEE, 2-D TIME-DEPENDENT HEAT CONDUCTION	PPCO	7044	F+MAP	RS P T H		560
350	ETOE, ENDF/B TO MC**2 DATA CONVERSION	ANL	360	F4	RS P CT M		562
350	ETOE, ENDF/B TO MC**2 DATA CONVERSION	APDA	3600	ASAF4	RS P T M		562
351	ECSIL, EXPERIMENTAL NEUTRON DATA LIBRARY	LRL	7094	F+FAP	RS PL T M		564
R352	RAUMZEIT, 1-D TIME-DEPENDENT DIFFUSION CALC	KAFI	6600	F4	RS P F		567
353	SNELL2, FUEL ELEMENT LIFETIME ANALYSIS	ANL	3600	F36	RSBP I		569
354	CINCAS, NUCLEAR FUEL CYCLE COST AND ECONOMICS	WAPC	6600	F4	RS P T D		571
354	CINCAS, NUCLEAR FUEL CYCLE COST AND ECONOMICS	CWE	360	F4	RS P T C		571
355	MC**2, ENDF MULTIGROUP X-SECTION CALCULATION	ANL	360	F4	RS P CT B		573
355	MC**2, ENDF MULTIGROUP X-SECTION CALCULATION	ANL	3600	F36	RS P T B		573
356	ZPR-III ASSEMBLY 48 GAUGER ENDF/B DATA TAPES	GGA	1108	BIN	R L T Z		575
357	SUPCRAN, REACTOR CORE SUPPORT STRESS ANALYSIS	ANL	3600	F36	RS P T I		578
358	TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ RTHETA	LASL	7600B	F4	RS P T C		580
358	TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ RTHETA	LASL	360B	F4	RS P CT C		580
358	TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ RTHETA	LASL	6600B	F4	RS P T C		580
R359	PUN1, UNRESOLVED RESONANCE INTEGRALS X-SECS	BAPL	6600	F4	RS P T A		582
360	TOR, THERMAL SCATTERING CRYSTALLINE MATERIALS	LASL	6600	F4	RS P T A		584
361	GLEN, GROUP CONSTANT CALC FROM TCR CLIPLOT DATA	LASL	6600	F4	RS P T B		586
362	WELWINC, MATERIAL BUCKLING CYL FUEL ELEMENTS	AEB	360	F4	RS P B		588
363	BLAST, REACTOR KINETICS TEMPERATURE CIST STUDY	AEB	360	F4	RS P E		590
R364	SNEQ, NONLINEAR ALGEBRAIC EQN SOLN CURVE PLOT	KAPL	6600	F+ASC	RS P T P		592
365	ECW2, DEFLECTION CALCULATION PARALLEL BEAMS	ANL	3600	F36	SBP I		594
366	CHEMLOC2, CORE HEATING CLADDING-STEAM REACTION	ANL	3600	F36	RSBP G		596
367	ISGGEN, RADIATION GENERATION AND DECAY	BNL	1108	F5	RSBPL T C		598
368	FLANGE2(71-1), ENDF/B THERMAL SCATTERING DATA	DP	360	F4	RS P XCT A		600
369	RELAP3, REACTOR BLOWDOWN - EXCURSION ANALYSIS	ANC	1108	F4	RS P T G		602
369	RELAP3, REACTOR BLOWDOWN - EXCURSION ANALYSIS	ANC	6600	F4	RS P T G		602
369	RELAP3, REACTOR BLOWDOWN - EXCURSION ANALYSIS	ANC	360	F4	RSBP XCT G		602
370	GAKIT, 1-D MULTIGP KINETICS WITH TEMP FEEDBACK	GGA	1108	F4	RS P T F		604
R371	NCWIG, 1-C 2-GP KINETICS TEMPERATURE FEEDBACK	BAPL	6600	F4	RS P T F		607
372	RAPFU, FUEL CYCLE PARAMETERS FAST BREEDERS	NEC	635	F4	RS P D		609
R373	EL47, CRAFTING TOOL TO PLOT PLANE STRUCTURES	BAPL	6600	F4	RS P T L		611
374	IDX, 1-D DIFFUSION FAST X-SECTION GENERATION	BNW	1108	F4	RS P X T B		613
375	SCORE3, SCISRS ENDF/B GRAPHIC X-SEC EVALUATION	FI	360	F+BAL	RSBPL CT M		615
376	AVERAGE, UNRESOLVED REGION AVERAGE X-SEC CALC	BNL	7094	F4	RS P A		617
376	AVERAGE, UNRESOLVED REGION AVERAGE X-SEC CALC	BNL	6600	F4	RS P A		617
377	SIGPLOT, RESOLVED MULTILEVEL B-W X-SEC CALC	BNL	6600	F4	RS P A		619
R378	TUBE, U-TUBE HEAT EXCHANGER STRESS ANALYSIS	KAPL	6600	F4	RS P I		621
379	GATE-2D, PLANE & AXISYMMETRIC STRESS ANALYSIS	GGA	1108	F4	RS P I		623
380	GATT, 3-D FEW-CP DIFFUSION CALC HEX-Z MESH	GGA	1108	F4	RS P T C		625
381	LYNNE, WCCDS-SAXON POTENTIAL SHAPE CALCULATION	CRNL	7090	F2	RS A		627
R382	RAPP, HIGH-VELOCITY FLOW STUDY STEAM-WATER MIX	KAPL	6600	F4	RS P F		628
R383	MO266, LINEAR ELASTIC STRUCTURAL DYNAMICS	BAPL	6600	F4	RS P T I		630
384	CHECKER,CRECT,DAMPET,FLCTFB,... ENDF/B VI FRCC	ENL	6600B	F4	RS T M		632
385	COMBE, COHERENT INELASTIC SCATTERING LAW CALC	GGA	1108	F4	RS P X A		635
R386	DATATRAK, MODULAR PROGRAMMING AND DATA SYSTEM	KAPL	6600	F+COM	RSB T M		637
387	CITATION, 1,2,3-D DIFFUSION DEPLETION MULTIGP	ORNL	360G	F4	RS P T K		639
388	ETOX3, MULTI-GP CONSTANTS FROM ENDF/B FOR 1CX	FEEL	1108B	F4	RS P X T B		641
R389	STINT3, SINGLE-CHANNEL SPACE-TIME SYNTHESIS	KAPL	6600	F4	RS P F		644
390	CCRGAP, UNFOLDING OF COMPLEX GAMMA-RAY SPECTRA	KSUN	360	F4	RS P Q		646
R391	SORSOB, PRESSURE VESSEL STRESS AND FATIGUE	KAFI	6600	F4	RS I		648
392	RAFFLE, 1ST FLIGHT COLLISION PROBABILITIES MC	CRNL	360	F+BAL	RS P T B		650
392	RAFFLE, 1ST FLIGHT COLLISION PROBABILITIES MC	ORNL	7090	F+FAP	RS P T B		650
393	XSDRN, DISCRETE ORDINATE MULTIGROUP CONSTANTS	CRNL	360	F4	RS PLX T B		652
R394	JITER, FLUCTUATION EXPERIMENT ANALYSIS	BAPL	6600	F4	RS P T O		654
395	FLAC, STEADY-STATE FLOW, PRESSURE DISTRIBUTION	GGA	1108	F5	RS P F		656
R396	WASP, WATER AND STEAM THERMODYNAMIC PROPERTIES	BAPL	6600	F4	RS P T F		658
R397	GAPL3, INELASTIC LARGE DEFLECTION STRESS STUDY	BAPL	6600	F+COM	RS P T I		660
R398	BE21, FEW-GP DISCRETE ORDINATES SLAB GEOMETRY	EAPL	6600	F4	RS P T C		662
R399	SUMOR, S-WAVE NEUTRON X-SECTION CALCULATION	BAPL	6600	F4	RS P T A		664
400	SAS1A, FAST REACTOR POWER AND FLOW TRANSIENTS	ANL	360	F4	RS P T F		666
400	SAS1A, FAST REACTOR POWER AND FLOW TRANSIENTS	ANL	6600	F4	RS P T F		666
401	CAMTRI, 2-D MULTIGP DIFFUSION TRIANGULAR MESH	GGA	1108	F+BAL	RS P T C		668
R402	SABOR4, DISCRETE-ELEMENT ANALYSIS THIN SHELLS	PIT	360	F4	RS P T I		670
R403	TIGIR2, MODULAR DOCUMENT INFORMATION SYSTEM	KAPL	6600	F	R B T F		673
R404	FINEL, FINITE-ELEMENT STUDY 2,3-D STRUCTURES	KAPL	6600	F4	RS P X I		675
405	NOAF, 1-D ONE-GP SPACE-TIME DIFFUSION FEEDBACK	ENL	6600	F4	RS P T F		677

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R406	CATATRAN 2-C GEOMETRY INPUT, PREPARATION, EDIT	KAPL	6600	F+ASC	RS P T L		679
R407	CATATRAN UTILITY MODULES, 2-C + 3-C PLOTTING	KAPL	6600	F+ASC	RS P T P		681
408	TAC2D, STEADY-STATE AND TRANSIENT TEMP CALC	GGA	1108	F5	RS P T P		683
409	LARCA, FLUX-WEIGHTING OF CTF4 CROSS SECTIONS	LASL	6600	F4	RS P N		685
410	TACASI, ANALYSIS OF RESONANCE MEASUREMENTS	GGA	1108	F4	RS P T A		687
R411	MO661, MO657, MO626, POLYNOMIAL CURVE FITTING	BAFL	6600	F4	RS P T P		689
R412	MANE1, RECTANGULAR MAGNETIC NETWORK SOLUTION	BAFL	6600B	F4	RS P T I		691
413	ALPHA-M, RESOLUTION OF GAMMA RAY SPECTRA	CRNL	360	F4	RS P C		693
414	TAC3D, TRANSIENT 3-D HEAT TRANSFER PROGRAM	GGA	1108	F5	RS P T H		695
415	CXEXE, INCXEXE, 1-GP 3-D XYZ XENON OSCILLATION	CENC	360	F4	RS P X T F		697
416	PARTI, OPTIMAL GROUP OR MESH COLLAPSING	TRH	6500	F4	RS P B		699
417	ATHENA4, INELASTIC SCATTERING FORM FACTORS	CRNL	360	F4	RS P T A		701
418	CHAINS, ANALYSIS OF RADIOACTIVE DECAY CHAINS	GEC	635	F4	RSBP C		703
419	CASCADE, CLUSTER, RADIATION DAMAGE IN METALS	GEC	635	F+FAF	RSBP T C		705
420	GROUSE, SPACE-DEPENDENT X-SECTION GENERATION	GEC	635	F4	RSBP T B		707
421	MICROD, MICROHARDNESS MEASUREMENT ANALYSIS	GEC	635	F4	RSBP C		709
422	SPECTRA, MC CALCULATION IRRADIATED MATERIAL	GEC	7050	FAP	RSBP X T Q		711
423	DOS, NEUTRON FLUX-DOSIMETER ACTIVITY RELATION	GEC	635	F4	RSBP D		713
R424	GLUB1, WATER-LOGGED FUEL ELEMENT ANALYSIS	BAFL	6600	F4	RS P T H		715
R425	REDUX, REACTOR FLUCTUATION EXPERIMENT ANALYSIS	BAFL	6600	F4	RS P T O		717
R426	PAX03, HARMONY-PDQ X-SECTION GENERATION CODE	BAFL	6600	F+CCM	RS P X T E		719
427	FAREC, 1-C FAST REACTOR DESIGN & SURVEY STUDY	BW	6600	F+CCM	RS P X T C		721
R428	DOGGY, DESK CALCULATOR FORM SHEET DP PACKAGE	KAPL	6600	F+ASC	RS P T P		725
R429	ASPI5, GAMMA RAY SOURCE BUILDUP FACTOR CALC	BAFL	6600	F+ASC	RS P T J		727
430	GAZE2, 1-D MULTIGROUP DIFFUSION SLAB, SPH, CYL	GGA	1108	F+BAL	RS P T C		729
431	SUPERTOG, ENDF/B FINE-GP CONSTANTS GENERATION	CRNL	360	F4	RS P T B		731
432	COBRA3C, ROD BUNDLE THERMAL-HYDRAULIC ANALYSIS	BNW	3600	F4	RS P T H		733
432	COBRA3C, ROD BUNDLE THERMAL-HYDRAULIC ANALYSIS	BNW	6600C	F4	RS P T H		733
432	COBRA3C, ROD BUNDLE THERMAL-HYDRAULIC ANALYSIS	BNW	1108C	F4	RS P T F		733
433	CCNTEMP-LT/022, PRESSURE-TEMPERATURE RESPONSE	ANC	360	F+BAL	RSBP CT G		735
434	HEATMESH, GEOMETRICAL DATA HEAT TRANSFER STUDY	SLL	6600	F4	RS P N		738
435	BURST1, HYDRODYNAMIC ANALYSIS DURING BLOWDOWN	PFCO	360	F4	RS P X C		740
436	ETC01, ENDF/B FORMAT TC MUFT FORMAT X-SECTIONS	WAPD	6600	F4	RS P T B		742
437	ETG01, ENDF/B TO MUFT, GAM, ANIS X-SEC FORMAT	WAPC	6600	F4	RS PL T B		744
438	BUE2, 2-D MULTIGROUP DIFFUSION & BURNUP XY, RZ	GGA	1108	F+BAL	RS P T D		747
439	BUGTRI, 2-D MULTIGP DIFFUSION+BURNUP TRI-MESH	GGA	1108	F+BAL	RS P T D		749
440	CYNAM, DYNAMIC ANALYSIS BOILING FLOW STEAM	GGA	1108	F4	RS P T F		751
441	PWCOST, REACTOR FUEL CYCLE COST CALCULATION	GGA	1108	F4	RS P T D		753
R442	SIMPLE1, TIME-SHARING PROGRAMMING LANGUAGE	KAPL	6600	F+ASC	RS P		755
443	HAA3, COAGULATION OF HETEROGENEOUS AEROSOLS	AI	360	F4	RS P T C		757
R444	RCPE, FINDING ROOTS OF A POLYNOMIAL	KAPL	6600	F4	RS P P		759
R445	LIZARD, NONLINEAR DIFFERENTIAL EQNS. SOLUTION	KAPL	6600	F+ASC	RS P T P		761
R446	MCST, A MULTIDIMENSIONAL OPTIMIZATION SCHEME	KAPL	6600	F4	RS P P		763
447	ETG01 DATA LIBRARIES, MUFT4 CR 5, GAM1 CR 2	WAPC	6600	BCD	R L T Z		764
R448	FLASH4, FULLY-IMPLICIT TRANSIENT SIMULATION	BAFL	6600	F4	RS P T G		766
R449	CYGR03, OXIDE FUEL ROD STRESS & DEFORMATION	BAFL	6600	F4	RS P T I		768
450	KENC2, MONTE CARLO MULTIGROUP CRITICALITY CODE	RFD	6600	F+CCM	RS P T C		770
450	KENO, MONTE CARLO MULTIGROUP CRITICALITY CODE	CRNL	360	F+BAL	RSBP CT C		770
451	SAFE-CRACK, VISCOELASTIC ANALYSIS OF CONCRETE	GGA	1108	F5	RS P T I		772
452	SHELL5, THIN SHELL 3-C STRUCTURAL ANALYSIS	GGA	1108	F5	RS P T I		774
453	RICE, PRIMARY RECOIL ATOM SPECTRA ENDF/B DATA	CRNL	360	F4	RS P T B		776
454	PHENIX, 2D DIFFUSION BURNUP REFUELING HISTORY	LASL	6600	F4	RS P T D		778
455	DAC1, SN PERTURBATION CODE USING CTF4 FLUXES	LASL	6600	F4	RS P N		781
456	DBUFIT1, LEAST SQUARES TRANSMUTATION ANALYSIS	BNWL	1108	F5	RS P T C		783
457	GSSLRN18, LEAST SQUARES PHOTOPEAK SPECTRA CODE	BNWL	1108	F+BAL	RS P T C		785
458	VELVE12, TURBULENT FLOW IN LPFB ROD BUNDLE	NEC	635	F4	RS P T H		787
459	CT2C8, 2-D MULTIGROUP DIFFUSION & SN THEORY	NEC	635	F4	RS P T C		789
460	LIFE1, FAST REACTOR FUEL ELEMENT BEHAVIOR	ANL	360	F4	RS P T I		791
R461	EPOCH, NEUTRON AGE CALCULATION OF ENDF/B DATA	BAFL	6600	F4	RS P T B		793
R462	SPAN4, A POINT-KERNEL SHIELD EVALUATION CODE	BAFL	6600B	F+ASC	RS P T J		795
463	3DDT, 3-D MULTIGROUP DIFFUSION XYZ R-THETA-Z	LASL	6600	F4	RS P T C		799
R464	CYN01, PHOTOMULTIPLIER ELECTRON DISTRIBUTION	ANL	360	F4	RS P C		801
R464	DYNC1, PHOTOMULTIPLIER ELECTRON DISTRIBUTION	KAPL	6600	F4	RS P O		801
465	RESEND, ADLER, ENDF/B RESONANCE XSECTION CODES	ENL	6600B	F4	RS P T A		803
466	APRF1, 99-GP DLC-2B LIBRARY GROUP COLLAPSING	APRF	6600	F4	RS B		806
467	HRG3, SLOWING-DOWN SPECTRUM, MULTIGP CONSTANTS	TVA	360	F4	RS PLX T B		808
467	HRG3, SLOWING-DOWN SPECTRUM, MULTIGP CONSTANTS	BNW	1108	F4	RS PLX T B		808
R468	BUBL1, FUEL SWELLING & GAS RELEASE SIMULATION	BAFL	6600	F4	RS P T I		810
469	PMS1, FAST NEUTRON POLARIZATION EXPERIMENT	UCNC	360B	F+BAL	RS P O		812
R470	GRAMP, R-M PARAMETERS OF UNRESOLVED RESONANCES	BAFL	6600	F4	RS P A		814
471	GAPER2D, 2-D PERTURBATION CALC FROM 2CF OUTPUT	GGA	1108	F5	RS P T N		816
472	MERM2, MC**2 BINARY LIBRARY TAPE MAINTENANCE	ANL	360	F4	RS M		818
472	MERM2, MAGIC, MC**2 LIBRARY SERVICE ROUTINES	ANL	3600	36F	RSBP T M		818

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R473	CHIC-KIN, FAST + INTERMEDIATE POWER TRANSIENTS	BAPL	6600	F4	RS P T	H	820
474	QX1, QUASISTATIC SPATIAL REACTOR KINETICS CODE	ANL	360	F4	RS PL CT	F	822
474	QX1, QUASISTATIC SPATIAL REACTOR KINETICS CODE	ANL	3600	36F	RS PL CT	F	822
475	CRECT,CHECKER, ENDF/B V2 PROCESSING CODES	ANL	360	F4	RS P T	M	825
475	CRECT,CHECKER,RIGEL,PLOTFB,... ENDF/B V2 PROC	BNL	6600B	F4	RS T	M	825
476	CAGE,BIRD,SPEC, TIME-CF-FLIGHT DATA ANALYSIS	GEES	1108	F5	RS P T	O	829
R477	3CXT,DEP3, 3-D XENON TRANSIENT & DEPLETION	KAPL	6600	F4	RS P T	D	831
478	BETTIS ENVIRONMENTAL ROUTINES, SUBROUTINE LIB.	BNL	6600B	F+ASC	RS T	P	833
478	BETTIS ENVIRONMENTAL ROUTINES, SUBROUTINE LIB.	BAPL	6600A	F+ASC	RS T	P	833
478	MODEL, MODIFIED BETTIS ENVIRONMENTAL LIB SCOPE3.2	CDC	6600C	F+CCM	RS T	P	833
478	MODEL, MODIFIED BETTIS ENVIRONMENTAL LIB SCOPE3.3	CDC	6600D	F+COM	RS T	P	833
478	MODEL, MODIFIED BETTIS ENVIRONMENTAL LIB SCOPE2.0	CCC	7600	F4	RS T	P	833
479	FREACM1, FAST REACTOR CORE ACCIDENT ANALYSIS	NED	635	F4	RS P T	G	836
480	FUMBLE, FAST REACTOR FUEL BURNUP & MANAGEMENT	NEC	635	F4	RS P T	D	839
R481	BUSHL, CYL SHELL BUCKLING COLLAPSE ANALYSIS	BAPL	6600	F4	RS P T	I	841
482	CCMNUC,CASCADE, COMPLEX NUCLEUS REACTION	AI	360	F+BAL	RS P T	A	843
483	REPP, THERMAL-HYDRAULIC WATER REACTOR DESIGN	BNM	1108	F5	RS P T	H	845
484	FIGS, IBM360/225C FORTRAN GRAPHICS SUBROUTINES	AI	360	F+BAL	RS T	P	847
R485	GASPA, COMPLEX GAMMA-RAY SPECTRA ANALYSIS	KAPL	6600	F4	RS T	O	849
486	ANCON, SPACE-INDEPENDENT REACTOR KINETICS CODE	ANL	360	F4	RS P T	E	851
486	ANCON, SPACE-INDEPENDENT REACTOR KINETICS CODE	LASL	6600	F4	RS P T	E	851
487	STEAM-67, 1967 ASME STEAM AND WATER PROPERTIES	BG&E	360	F4	RS T	F	853
488	NOISY1, AUTO- AND CROSS-SPECTRAL DENSITIES	BNM	7090	F4	RS P T	F	855
488	ACISY1, ALTC- AND CROSS-SPECTRAL DENSITIES	BNM	1108	F5	RS P X T	F	855
489	TRIFIDO, PULSED NEUTRON SOURCE DATA ANALYSIS	CNEA	360	F4	RS P T	E	857
490	JCSHUA, DATA STORAGE, RETRIEVAL, AND DISPLAY	DP	360	F+BAL	S T	M	859
491	MCD5, STOCHASTIC MODEL OF NEUTRON SLOWING-DOWN	NPGS	360	F4	RS P X T	E	861
492	RAMP1, REICH-MOORE RESOLVED REGION X-SECTIONS	ENL	6600	F4	RS P T	A	864
493	TROUT, MUG MULTIGROUP XSEC LIBRARY MAINTENANCE	NED	1108	F5	RS P T	M	866
493	TROUT, MUG MULTIGROUP XSEC LIBRARY MAINTENANCE	NEC	635	F4	RS P T	M	866
494	ADEP, 1D AND 2D FEW-GROUP SPACE-TIME KINETICS	BCL	6400	F4	RS P T	F	868
495	SYN, 2D SYNTHESIS MULTIGP DIFF & 1GP DEPLETION	NED	635	F+GMP	RS P T	D	870
R496	KAPLPLOT, KAPL CALCMP PLOTTING ROUTINES	KAPL	6600	F+COM	RS T	P	873
R497	RELO1, RELIABILITY FOR A SINGLE FAILURE MODE	BAPL	6600	F4	RS P T	P	875
498	CONCEPT2, POWER PLANT CONCEPTUAL COST ESTIMATE	CRNL	360B	F4	RS P XCT	D	877
499	MIRAB,MIRAP, CONTAINMENT SYSTEM ICONE REMOVAL	BCL	6400	F4	RS P T	G	879
500	FRCL2, LCCA FISSION PRODUCT RELEASE ANALYSIS	BCL	6400	F4	RS P T	G	882
501	ENDRUN2, MULTIGROUP CONSTANTS FROM ENDF/B DATA	GESV	635	F+GMP	RS P XCT	B	884
502	EDITOR, ENDF/B TAPE PROCESSING AND EDITING	CRNL	6600	F4	RS P T	M	887
502	EDITOR, ENDF/B TAPE PROCESSING AND EDITING	CRNL	360B	F4	RS P T	M	887
R503	CU22, 2-D AXISYMMETRIC & PLANE ELASTIC-PLASTIC	BAPL	6600	F+CCM	RS P T	I	889
504	THRESH, STATISTICAL MODEL REACTION X-SECTIONS	BNL	6600	F4	RS P T	A	892
505	TDCWN, SPATIAL & COMPOSITION-DEPENDENT X-SECS	GESV	635	F+GMP	RS P XCT	L	894
R506	JPIXR, COUPLED-CHANNEL SCATTERING X-SEC CALC	KAPL	6600	F4	RS P T	A	896
R507	PHASER, PHASE SHIFT X-SEC & POLARIZATION CALC	KAPL	6600	F4	RS P T	A	898
508	MUCHA1,MUCHA2, MULTIPLE CHANNEL ANALYSIS ECC	BCL	6400	F4	RS P X T	G	900
509	ETOT2, THERMAL LIBRARIES FROM ENDF/B DATA	WAPC	7600	F4	RS P T	B	902
510	VIMIX, MONTE CARLO CRITICAL ASSEMBLY ANALYSIS	AI-A	360	F4	RSEPL CT	C	904
510	VIM1, MONTE CARLO CRITICAL ASSEMBLY ANALYSIS	AI	7600	F4	RS PLX T	C	904
511	VENUS, 2-D LMFBR POWER EXCLUSION DISASSEMBLY	ANL	360	F4	RS P XCT	F	907
512	THERM-B, FUEL ROD THERMAL RESPONSE LOCA	ANC	360	F4	RSBP X T	G	910
513	TESS, 1-D SLAB AND SPHERE GEOM SA TRANSPORT	ANL	3600	F36	RS P XCT	C	912
514	FORSIM, SOLUTION OF SYSTEM OF ORDINARY DIFF EQNS	CRNL	6600	F4	RS P T	P	914
515	GENED ENVIRONMENTAL ROUTINES, SUBROUTINE LIB.	NED	635	F+GMP	RS T	P	916
516	PTAC11, 2-PASS ASSEMBLER FOR THE PCP-11 ON 360	ANC	360	PL1	RS P T	P	920
517	HEATING3, 1,2, OR 3-D HEAT CONDUCTION PROGRAM	CRNL	360	F4	RS P T	H	922
518	ERREST, LCCA ROD BUNDLE CHF DATA ANALYSIS	ANC	360	F4	RS PL CT	M	924
519	NRTS-RJE, OS/360 MVT REMOTE JOB ENTRY SYSTEM	ANC	360	BAL	RSE T	P	926
520	PHROG, MULTI-GP CONSTANT & FAST SPECTRA CALC	ANC	360	F4	RS PLXCT	B	928
521	SOCOOL2, SODIUM-FUEL INTERACTION ANALYSIS	ANL	360	F4	RS P T	G	930
521	SOCOOL2, SODIUM-FUEL INTERACTION ANALYSIS	HEDL	1108	F4	RS P T	G	930
522	SOC-SYSTEM, SYSTEM SUBPROGRAMS AND MODULES	ANL	360	F+BAL	RS P CT	M	932
523	ESP, MONTE CARLO REACTOR ANALYSIS CALCULATION	CRNL	360	F+BAL	RSBP CT	C	934
524	BESFIT, DIFFRACTION MODEL ELASTIC SCAT X-SEC	BNL	6600	F4	RS P T	A	936
525	ORTHIS,CRTHAT, 2-DIMENSIONAL HEAT CONDUCTION	CRNL	360	F4	RS P X T	H	938
526	CLUP77, SQUARE CELL COLLISION PROBABILITY CALC	JAER	230	F4	RS P T	B	940
526	CLUP77, SQUARE CELL COLLISION PROBABILITY CALC	ANL	360	F4	RS P T	B	940
527	HERMES, REGIONAL RADIOLOGICAL EFFECTS ANALYSIS	FECL	1108	F+SL	RS P XCT	R	942
528	PREP,KITT, SYSTEM FAULT TREE EVALUATION CODES	ANC	360	F4	RSEP CT	K	944
528	PREP,KITT, SYSTEM FAULT TREE EVALUATION CODES	ANC	1108	F4	RS P T	K	944
529	ANVENT, LOCA ANALYSIS DUKE POWER MCGLIRE UNITS	DUCC	635	F4	RS T	G	946
530	GENRD, FREE-FORMAT CARD INPUT PROCESSOR	LASL	6600	F4	RS P T	L	948
530	GENRD, FREE-FORMAT CARD INPUT PROCESSOR	LASL	360	F4	RS P T	L	948

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R531	CLEM, ANGULAR DISTRIBUTION LEGENDRE FITTING	KAPL	6600	F4	RS P	A	950
532	LASL XSEC SETS, SN 18- 24- AND 25-GROUP SETS	LASL	6600	BCD	R LX T	Z	952
533	ARC-NU1002, BCD INPUT DATA PROCESSING PCDULE	ANL	360	F4	RSBP CT	L	954
534	EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE	ANL	6600	F4	RS X T P		956
534	EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE	ANL	635	F4	RS X T P		956
534	EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE	ANL	1108	F4	RS X T P		956
534	EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE	ANL	360	F4	RSB XCT P		956
R535	MULTI, MULTI-LEVEL RESONANCE THEORY XSEC CALC	KAPL	6600	F4	RS P	A	959
536	RAHAB, JCSPUA SYSTEM LATTICE PHYSICS MODULES	DP	360	F+BAL	S X T E		961
R537	RUGIT, DYNAMIC RESPONSE OF ELASTIC STRUCTURES	BAPL	6600	F4	RS P T I		963
538	ETOG3, ENDF/B TO MLFT, GAM, ANISN X-SEC FORMAT	WAPC	7600	F4	RS P T B		965
539	STRAP, STATIC & DYNAMIC STRUCTURAL ANALYSIS	ANC	360	F4	RSBP CT I		968
540	PACTOLUS, CLOTHC, NUCLEAR POWER PLANT COST CODE	FECL	1108	F5	RS P X T D		970
541	WSP-HASP/DOS, DOS-MFT REMOTE WORKSTATION PKG	ANL	360	F+ASP	RSB CT P		972
542	PSA2, STRESS ANALYSIS MULTIANCHOR PIPE SYSTEM	AI	360	F4	RS P CT I		974
543	THERMOS LIBRARY, 30-GF ENDF/B SCAT KERNELS	CP	360	BCD	R LX T Z		976
544	PLOT-3D, 3-D PLOTS ON IBM2280 OR CALCOMP780	ANL	360	F4	RS P T N		978
R545	BETTY, ENTFAINED PARTICLES SAMPLING STUDY	BAPL	6600	F4	RS P T O		980
546	EMERALD, PWR PLANT RADIATION RELEASE & DCSE	FGE	360	F4	RS P CT G		982
547	GAMBIT, X-SEC GENERATION FOR TRANSPORT CODES	WANL	6600	F4	RS L T B		984
548	CEBLG, STEAM GENERATOR SODIUM-WATER REACTION	CENC	7600	F4	RS P T G		987
549	RIGDEAL, SPENT YANKEE-FUEL TEMPERATURE CALC	ORNL	1604	F2	RS P T F		989
550	REXCC-H, 2-C HYDRODYNAMIC RESPONSE TO EXCURSION	ANL	360	F4	RS P CT F		991
551	MOXY, BWR FUEL ELEMENT HEAT TRANSFER CALC	ANC	360	F4	RSBP XCT F		993
551	MCXY, BWR FUEL ELEMENT HEAT TRANSFER CALC	ANC	1108	F4	RS P T F		993
552	PWR-PPM, BCRATICH-DILUTION TABLES FOR PWR CPN	DPPD	6400	F4	S P H		995
553	U3R, UNRESOL RESONANCE XSEC PROBABILITY TABLES	AI	360	F+BAL	RS P CT B		997
554	LISPER, AEROSOL PARTICLE TRANSPORT STUDY	RFD	3600	F36	RS P G		999
555	PARET, WATER-COOLED CORE TRANSIENT ANALYSIS	ANC	360	F+BAL	RSBPL CT G		1001
556	KEELE, LINEARLY-CONSTRAINED OPTIMIZATION	CRAL	360	F4	RS P P		1004
R557	SPLCG, DATA MANAGEMENT, EDITING, & ANALYSIS	BAPL	6600	F4	RS P T F		1006
558	TASK, 1-D MULTIGROUP REACTOR KINETICS PROGRAM	ORNL	360	F4	RS P XCT F		1008
559	SOFIRE2, SODIUM POOL FIRE 1- & 2-CELL ANALYSIS	AI	360	F4	RS P T G		1010
R560	HYMAS, HYDRODYNAMIC MASS MATRIX GENERATION	BAPL	6600	F+CCM	RS P F		1012
561	TOKMINA/TOKMINA2, TOKAMAK FUSION REACTOR STUDY	ANL	360	F4	RS P X		1014
562	AMOLIRAE, ARGONNE SUBROUTINE LIBRARY CAT. A-F	ANL	360	F+P+A	RS T P		1016
563	AMOLIRF, ARGONNE SUBROUTINE LIBRARY CAT. F	ANL	360	F+RAL	RS T F		1022
564	AMOLIBGZ, ARGONNE SUBROUTINE LIBRARY CAT. G-Z	ANL	360	F+P+A	RS T P		1028
565	INCITE, THERMAL SPECTRA & MULTI-GP CONSTANTS	ANC	360	F4	RS PL CT E		1031
566	RESPOND, DISSIMILAR MEDIA TDC CORRECTION CALC	AI	360	F4	RS P T C		1033
567	3DB, 3-D MULTIGROUP DIFFUSION BURNUP ANALYSIS	HEDL	1108	F4	RS P T C		1035
567	3DB, 3-D MULTIGROUP DIFFUSION BURNUP ANALYSIS	ANL	360	F4	RS P CT C		1035
R568	BEHAVF2, OXIDE FUEL PERFORMANCE FINITE-ELEMENT	GESV	635	F4	RS P CT I		1038
569	VIEWPIN, VIEW FACTOR CALC FOR CYLINDRICAL PINS	ANC	360	F4	RSBP CT J		1040
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571	RIGEL, ENDF/B V3 DATA PROCESSING CODE	ANL	360	F4	RS T M		1044
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574	MACS LATTICE VIBRATION NEUTRON SCATTERING CODES	ANC	360	F4	RS P CT W		1051
575	MSCAT, SLOW NEUTRON MULTIPLE SCATTERING CALC	ANL	360	F4	RS P CT W		1056
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579	DWARF, 1-D FEW-GP DIFFUSION DEPLETION PROGRAM	ANC	360	F4	RSPP CT C		1065
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583	STEFEG, ANALYSIS OF PWR & BWR GASEOUS RELEASE	ORNL	360	F4	RS P C G		1074
584	FPFM, STEADY-STATE FISSION PRODUCT FUEL MODEL	ANC	360	F4	RSBP CT I		1076
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586	PLENUM, FLOW DIST. IN CYL COOLANT INLET PLENUM	CP	360	F4	RS P F		1080
587	AEC-ALO FAU, RADIO FREQUENCY MANAGEMENT SYSTEM	ALOO	360	CORCL	RS P M		1082
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591	PLETHS, ISOPLETH-AREA CALC FROM SINGLE SOURCE	ANL	GETS	F	P F		1090
592	GEAR, ORDINARY DIFFERENTIAL EQN SYSTEM SOLVER	LLL	6600	F4	RS P P		1092
593	TSO-SPEAKEASY, LANGUAGE PROCESSOR UNDER TSO	ANL	360	F+RAL	R B L T F		1094
594	ARC-XSECL, MICROSCOPIC X-SECTION MANIPULATION	ANL	360	F4	RSBPL CT L		1096
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R598	PFLN, FUEL PELLET TEMPERATURE & DEFORMATION	BAPL	6600	F4	PS P T I	1107
599	TCPLYR2, POWER PLANT THERMAL DISCHARGE STUDY	HEDL	110R	F5	PS P T P	1109
600	EGAO, CALC OF EXTERNAL GAMMA DOSE INTEGRALS	CP	360	F4	PS P C	1111
601	ERF,ERFC, ERROR & COMPLEMENTARY ERROR FUNCTION	SLA	6600	F4	RS P P	1113
602	LENODES, NONLINEAR LEAST SQ LENS DESIGN SYSTEM	LASL	6600	F+COM	PS P T P	1115
G603	RALCRTPH, RESOURCE ALLOCATION PROJECT PLANNING	MLMD	360	F+C+R	RSBP T M	1117
R604	TCRQ1, CREEP-BUCKLING OF TUBES UNDER PRESSURE	BAPL	6600	F4	PS P I	1119
605	GAUSS5, ANALYSIS OF GAMMA-RAY SPECTRA GE(LI)	ANC	360	F4	RSBP XCT W	1121
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608	TRIPLET, 2-D TRIANGULAR MESH TRANSPORT PROGRAM	LASL	7600	F4	RS P T C	1127
608	TRIPLET, 2-D TRIANGULAR MESH TRANSPORT PROGRAM	LASL	360	F4	RSBP CT C	1127
608	TRIPLET, 2-D TRIANGULAR MESH TRANSPORT PROGRAM	LASL	6600	F4	PS P T C	1127
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ARGONNE CODE CENTER: COMPILATION OF PROGRAM ABSTRACTS

by

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L. Ranzini, and William J. Snow

PREFACE

This is the second complete revision of program abstracts undertaken by the Code Center since its inception in 1960. This revision has eliminated from our collection those programs for machines of the 704 era and earlier. With the assistance of installation representatives and authors, existing program abstracts have been revised and material added to the library to complete, whenever possible, the program package for each program in the Center's collection.

This is the first attempt at a formal publication. Previous abstracts have been processed by use of multilith masters from high-speed printers. Publishing this as an AEC document makes it more easily referenced and accessed. Additions and corrections will be published as previously, with provision for a complete revision in this form after another 3- to 5-year period.

The table of contents lists in order of accession, the KWIC title of each program, the originating installation, the machine, the programming language, the package symbols, and the category. This title information was then used to provide the index which follows the abstracts. The package symbols included are defined as follows:

R = reference report or document,
S = source deck or tape,
B = binary or run deck or tape,
P = sample problem data,
L = library information, e.g., cross-section library,
random-number library,
X = auxiliary routines or information,
C = control or operating system language statements,

and

T = magnetic tape(s) required for transmittal of card and/or tape material.

This collection includes programs in which the program number is preceded by the letter R or G. The letter R denotes restricted, and U.S. citizens are required to file a release form with the Center for use of the program on either official U.S. government or commercial (nonmilitary) applications at a U.S. installation. The letter G designates programs which are limited to use on U.S. government contracts only. In addition to the release form requirement, the contract identification, and the signature of the contracting officer must be furnished when requesting such programs. The Code Center is not authorized to distribute these programs outside the United States.

To best service the interests of AEC contractors, university nuclear engineering departments, and the nuclear industry, the Center will, upon request, supply to an installation, a copy of any of the material listed as available under Item 16 of the abstract. Should that installation modify the program, convert it to a usable form on another computer, uncover an error, or have difficulty in using the program, they are asked to notify the Center so that their efforts in turn might benefit other recipients. The Center maintains records of the recipients of all library material so that if a correction or new version is prepared, all previous recipients of the program are notified promptly.

Program abstracts for the OECD Nuclear Energy Agency Computer Program Library programs in the Argonne Code Center collection have not been included in this compilation. Separate compilations are distributed regularly to our contributing installations.

I. HISTORY AND ACKNOWLEDGMENTS

In 1956, at the Second Annual Meeting of the American Nuclear Society, the initial meeting of an informal group called the Nuclear Codes Group was held. This group was composed of "persons interested in the development and use of computer programs for reactor design." The group held regular meetings in conjunction with the semiannual ANS meetings and published and distributed a Newsletter containing code abstracts submitted by members. These abstracts followed the format of the Atomic Energy Commission document AECU-3078, "A Bibliography of Available Digital Computer Codes for Nuclear Reactor Problems."¹

From September 1956 to December 1959, ten Newsletters were published and distributed through the auspices of the AEC Computing Facility at New York University.² In 1959, Ward Sangren and personnel at General Atomics edited and published 300 abstracts collected from Group members.³ A supplementary list of 100 abstracts was published the following year.⁴

In 1959 also, the Nuclear Codes Group became the nucleus of the American Nuclear Society's Mathematics and Computation Division. With stature came a desire for a central facility for the computer program library

and the dissemination of information concerning programs written in the areas of nuclear physics, reactor design, and engineering. In 1960, a proposal was made whereby, with the cooperation of Division members and installation representatives, and the Atomic Energy Commission's approval, Argonne National Laboratory undertook to serve as this central agency and the Argonne Code Center was established.

Procedures were drafted defining the material to be collected--the abstract and the "package"--and the responsibilities of the Center and the Installation Representatives. The submission of the material is the responsibility of the authors either directly, or through their Installation Representative. The Center edits and publishes the abstracts, and collects, maintains, tests, and distributes the packages. The representatives at AEC laboratories, contracting establishments, and universities serve as a source of information to the Center concerning programs or requests emanating from their installation, and it is they, in collaboration with the personnel at the Argonne Center, who supply the answers to the questions and nonroutine inquiries received. They are responsible for library programs at their installations.

In 1965 the Argonne Center became a separately-budgeted operation of the Reactor Physics Branch of the USAEC Division of Reactor Development and Technology. In September of 1972 the Argonne Code Center was designated as the AEC-wide computer program exchange and information center responsible for the dissemination of unclassified computer programs developed with AEC funds. The Center is currently supported by the USAEC Reactor Research and Development and Military Application Divisions and the Office of Information Services. Acquisition of ADP services by AEC offices and contractors and program (code) exchange and dissemination services of the Center program are defined in Parts VII and VIII of AEC Manual Appendix 1801 Data Processing Equipment and Services.

From 1961 until issuance of this publication in January 1968, the Argonne Code Center published 12 distributions containing abstracts of approximately 265 programs.⁵ This collection represents a complete revision of those previously published abstracts and includes, in addition, abstracts prepared and revised from 1968 to date.

II. ABSTRACT FORMAT

The program abstract has been modified considerably over the years. Its evolution from the original AECU-3078 format is due primarily to our experience at the Center and cooperative efforts undertaken with the NEA library personnel and the American Nuclear Society's ANS-10 subcommittee membership.⁶

A. Name or Designation of Program

This is the name or designation given the program(s) by the author.

B. Computer for Which Program is Designed and Others upon Which It Is Operable

The computer hardware system for which the program or system was prepared is identified and names of other computers for which versions are available are listed.

C. Description of Problem or Function

A brief description of the problem being solved or a definition of the data processing activity being carried out is given.

D. Method of Solution

A short summary of the mathematical methods employed, numerical algorithms adopted, or procedures incorporated in the program should appear under this entry.

E. Restrictions on the Complexity of the Problem

This item includes restrictions implied by storage allocation, such as maximum number of energy groups and mesh points, as well as those due to approximations used, such as implied argument-range limitations, etc.

F. Typical Running Time

Information intended to enable the user to estimate machine time requirements is listed.

G. Unusual Features of the Program

Distinguishing features and special capabilities of the program are enumerated. Information given under this item should allow the user to select, from a number of similar programs, the one most suitable for his particular problem.

H. Related and Auxiliary Programs

If this program supersedes or is an extension of an earlier program, this is noted here. Programs used in conjunction with this program, especially those coupled through use of external data files should be mentioned.

I. Status

The Center lists here the initial date of publication of the abstract. Versions in the library are identified and the date they were submitted is given. Testing completed at the Center is noted.

J. References

Available publications pertinent to the program are cited.

K. Machine Requirements

This item lists the hardware components essential for full utilization of the program.

L. Programming Language(s) Used

The programming language or languages in which the program was written are identified with an indication of the percentage of each used. If certain routines are in assembly rather than compiler language, these should be identified.

M. Operating System or Monitor under Which Program Is Executed

This item identifies the operating system, associated subroutine or function library, and installation support software used by the program. The version used is identified and deviations or exceptions noted.

N. Any Other Programming or Operating Information or Restrictions

Additional information needed by the reader to implement the program or determine the extent of the necessary implementation effort is summarized.

O. Name and Establishment of Author

The names and addresses of the authors of the program and of other machine versions are listed. If the author is no longer responsible for the program, the person to be contacted should be listed, as well.

P. Material Available

This lists the material being distributed, i.e., the contents of the program package.

Q. Category

The problem classification assigned from the Center program or system classification guide.

Keywords

This is a listing of the keywords associated with the program, supplied by the program author and/or Center based on the Argonne Code Center thesaurus.

III. RECOMMENDED PROGRAM PACKAGE CONTENTS

The "program package" is defined as the collection of card decks, tapes, and documentation, associated with a computer program, necessary for its modification and effective use by an individual other than the author on a computer system different from that on which it was developed.

The material required may include all of the following:

1. Source Decks (S)

Compiler and assembly language program decks or card-image tape records.

2. Run Decks (B)

Language processor object decks, or load modules, prepared as required for program execution. If source decks cannot be distributed for proprietary or other reasons, run decks may be substituted. For certain system-dependent programs this may be the preferable form, and in interchange between users of like systems, it may be more cost-effective and provide redundancy when used in conjunction with the source material.

3. Sample Problems (P)

Test case input data decks or card-image tape records for use in checking out program implementation.

4. Data Libraries (L)

External data files required for program operation; e.g., cross-section libraries, steam table data. It is preferable that decimal form be used for numerical data files for exchange purposes.

5. Control Information (C)

Operating system control cards or control language decks required for compilation or assembly of the program and execution of the sample problem at the originating installation. This information includes device assignments, format information, storage allocation, overlay structure definitions, etc.

6. Auxiliary Routines and Information (X)

Program package items for subsidiary programs used in preparing input information, processing results, maintaining data libraries, etc., for the program. Computer-readable information provided as documentation for use with text-processing facilities.

7. Documentation (R)

The traditional documentation associated with the computer program and its application. This material may be compiled in a single comprehensive report or it may exist as several independent documents--published paper reprints, program reports, user's manuals, program maintenance manuals, installation memoranda, computer output listings, etc. It may, regardless of form, include all of the following:

a. Problem definition or function description--Information providing the *raison d'être* for the computer program or system, a description of the problem solved or of the processing performed. A description of the mathematical model used and the computational algorithms and techniques employed should be included.

b. Application information--Documentation directed to the program user; i.e., a *User's Manual*, if a separate publication. Operating instructions, program options, and a description of the input and output formats should be covered in sufficient detail to enable the user to specify his own problem and interpret the results correctly. An example is helpful; if the identical sample problem of item 3 is used the selected output for it can be shown in this document; otherwise, it is essential to include a copy of the computer output listing obtained from execution of the item 3 sample problem in the program package.

c. Programming information--A detailed description of the program addressed to the programmer responsible for maintenance or transfer of the program; i.e., a *Program Maintenance Manual*, if a separate publication. Material covered should include the overall program structure and logic, identification of subprograms and detailed information on their use, glossaries showing the relationship between problem variables and program symbols, definitions of external data files, system hardware and software requirements, shared storage assignments, overlay or segment structures, and system-dependent programming considerations.

d. Installation environment information--A description of the environment in which the program was developed and installation support facilities utilized such as installation-dependent library routines for mathematical functions, plotting, microfilm recording and the like. It is recommended that general Installation Environment Reports issued by individuals responsible for the computer environment at the program-originating installation be utilized for this part of the program documentation. Such documents can greatly simplify the preparation of portable program packages and facilitate effective program exchange.

Program package items 1 through 6 are most effectively maintained and transmitted in punched card or magnetic tape form; item 7 as printed material. If a substantial number of cards are involved, these should be recorded

on magnetic tape in card-image format. Data libraries (item 4) are often computer-generated and exist only on tape. Control information (item 5) may, alternatively, be supplied as a computer output listing since this information is rarely identical at different installations.

IV. PROGRAM CLASSIFICATION GUIDE AND THESAURUS

A program classification scheme is being initiated with this report. It is intended to serve as a guide to those library programs dealing with the solution of a specific physical problem or area of related problems. In addition, a thesaurus has been prepared as a basis for the assignment of keywords to the library programs. The category and keywords listed as Abstract Item 17 have been assigned by the Code Center staff, but it is hoped that in the future they will be selected from the guide and thesaurus by the author of the program and/or abstract. The thesaurus follows the concept and design of the EURATOM thesaurus⁷ insofar as practicable. Accepted keywords not included in the thesaurus include specific reactor and computer code names that are always followed by the word "reactors" or "codes," e.g., HTGR reactors, AITP3 codes. Other accepted keywords are the element names and combinations of an element name and a mass number, e.g., hydrogen, uranium-238.

Program Classification Guide

A. Cross-section and Resonance-integral Calculations

Computation of reaction cross sections from nuclear theory such as the optical or Hauser-Feshbach models, resonance cross sections by Breit-Wigner or multilevel theory, determination of differential scattering cross sections, cross-section evaluation, and compilation programs.

B. Spectrum Calculations, Generation of Group Constants, Lattice and Cell Problems

Determination of the slowing-down density or thermal spectrum, weighting and averaging of cross sections and related quantities for the production of group constants, and evaluation of design parameters by lattice and cell calculation.

C. Static Design Studies

Calculation of the reactivity and flux distribution of the reactor system, and adjustment of design parameters to prescribed specifications, i.e., criticality and power distribution search procedures.

D. Depletion, Fuel Management, Cost Analysis, and Reactor Economics

Includes burnup programs, isotope and fission-product buildup and decay computations, and optimization studies.

E. Space-independent Kinetics

Studies of the time-behavior of reactors, including delayed-neutron effects and feedback mechanisms, and transfer-function evaluation.

F. Space-Time Kinetics, Coupled Neutronics-Hydrodynamics-Thermodynamics and Excursion Simulations

Programs that consider spatial design characteristics and accompanying effects in studying the time behavior of the reactor.

G. Radiological Safety, Hazard and Accident Analysis

Calculation of internal and external dose rates, determination of reactor thermodynamic and hydrodynamic properties following an accident, e.g., release of radioactive materials, coolant system blowdown, steam generator rupture.

H. Heat Transfer and Fluid Flow

Steady-state and transient heat transfer computations, fluid-flow studies and calculations of thermodynamic properties.

I. Deformation and Stress Distribution Computations, Structural Analysis, and Engineering Design Studies

Includes fuel-element design evaluations, core-configuration studies, and composite structure analysis.

J. Gamma Heating and Shield Design

Gamma and photon transport calculations, computation of heat-generation rates, and penetration analysis and leakage calculations for shielding.

K. Reactor Systems Analysis

Combinations of programs, designed as systems, for solving correlated problems from several of the categories A through I.

L. Data Preparation

Generation of program parameters; checking, editing, and formatting of problem input information.

M. Data Management

Construction, maintenance, and retrieval of data files, e.g., cross-section libraries; management systems such as payroll, personnel and

financial systems, property and equipment systems, network-oriented project management and indexing and retrieval systems, etc.

N. Subsidiary Calculations

Plotting, editing, and display routines that process output data from other programs.

O. Experimental Data Processing

Programs designed to process data directly acquired from an experimental situation or to assist the experimenter in the design of the experiment.

P. General Mathematical and Computing System Routines

Calculation of mathematical functions, statistical analysis, special-language routines with general data-processing capabilities, and software systems.

Q. Materials

Measurements and computation of the physical and mechanical properties of materials, simulation of radiation damage processes, corrosion studies, and determination of crystallographic functions.

R. Environmental and Earth Sciences

Environmental impact studies, geology, seismology, geophysics calculations, hydrology and ground water studies, bioenvironmental systems analyses, meteorological calculations relating to the atmosphere and its phenomena, studies of airborne particulate matter, climatology, etc.

S. Space Sciences

Analysis of orbits and trajectories, astronomy and astrophysics computations, wave propagation studies, and the calculation of reentry parameters.

T. Electronics and Engineering Equipment

Automated design of electronic equipment, engineering computations for numerically controlled machine tools and process control programs.

U. Chemistry

Chemical analysis, mass spectroscopy, radiation chemistry, radiolysis studies, etc.

V. Particle Accelerators and High Voltage Machines

Programs relating to the design, development and operation of high-voltage machines and particle accelerators such as Van de Graaff generators, linear accelerators, cyclotrons, synchrotrons, etc.

W. Physics

Calculations relating to theory of atomic or molecular structure or properties, charged particle collision studies that involve phenomena such as charge exchange, excitation, ionization, dissociation, etc., elementary particle theories and models, scattering theory, quantum field theory and quantum electrodynamics studies, general relativity and gravitation theory computations.

X. Controlled Thermonuclear Research

Electric discharge phenomena and plasma physics computations, electrodynamics and magnetic hydrodynamics studies.

Y. Biology and Medicine

Biological, medical and radiological studies of the structure, functions, chemistry, biophysics, reproduction, and heredity of bacteria, plants, laboratory animals, and humans.

Z. Data

Data prepared in specified program formats for program testing and evaluation, benchmark studies, or library use.

Thesaurus

1-dimensional	blowdown	cross sections
1-group	Breit-Wigner formula	crystals
2-dimensional	breeding	currents
2-group	Brown-St John model	cylinders
3-dimensional	buckling	Dancoff correction
absorption	capture	data processing
accidents	cell calculation	decay
activation	cladding	deformation
aerosols	coefficients	depletion
age	Cohen equation	design
algorithm	coincidence methods	differential equations
alpha decay	communications	diffraction
angular distribution	compound nuclei	diffusion
anisotropic scattering	containment	disadvantage factors
annular space	contamination	distance
assembler	continuous release	distribution
atmosphere	control	Doppler broadening
averages	control rods	Doppler coefficient
B _L method	coolants	dose rates
background	correlation	dynamics
beams	criticality	economics

efficiency	Legendre coefficients	reactors
eigensystems	libraries	remote job entry
elastic	lifetime	resolved region
elasticity	light	resonance
electrons	linear equations	resonance escape probability
elementary functions	liquids	resonance integrals
ENDF/B	liquid metals	retrieval
enthalpy	magnetic	sampling
epithermal	magnetohydrodynamics	scattering
equations	maintenance	scattering law
equifield	mass matrices	scintillation counters
equipotentials	Maxwell distribution	searches
excursions	measurements	Selengut-Goertzel equation
expansion	minimization	shells
factor	moderators	shielding
failures	Monte Carlo method	slabs
fast	multidimensional	slowing down
feedback	multigroup	S_n method
few-group	multilevel	solids
finite-element	networks	solutions
fire	neutrons	space
fission	noise	space-independent
fission products	nonlinear	space-time
floating-point arithmetic	nonlinear least squares	special functions
fluid flow	numerical calculations	spectra
fluids	operating systems	spheres
flux	operation	spherical harmonics
Fourier transform	optical model	statistics
frequency	optimization	steam generators
fuel cycle	output data	stresses
fuel elements	parameters	structural analysis
fuels	particles	swelling
fusion reactors	performance	synthesis
gamma radiation	perturbation theory	temperature
gas coolants	photomultipliers	temperature coefficient
gases	photon	thermal
geometries	pipes	thermal utilization
graphs	P_L method	thermalization
group constants	plates	thermodynamics
Hauser-Feshbach theory	poison	time-sharing
heat conduction	polarization	Tokamak
heat transfer	pollution	transfer functions
heating	polynomials	transients
heavy	potentials	transport theory
helium	potential scattering	triangular
heterogeneous	power	tubes
hexagonal	power plants	unresolved region
homogeneous	predictor-corrector	utility routines
hydrodynamics	preparation	vapors
incoherent approximation	pressure	variations
inelastic	production	velocity
infinite media	programming languages	vibrations
input data	pumps	viscoelasticity
instantaneous release	quadrature	waste solutions
interpolation	r-theta	water
isotopes	r-theta-z	weight
isotropic scattering	r-z	Wigner-Wilkins model
kernels	radiation effects	Wilkins equation
kinetics	radioactivity	x-ray
Laplace equation	reaction rates	x-y
lattices	reactivity	x-y-z
leakage	reactor safety	xenon
least squares		

V. ABSTRACT COLLECTION

As programs are submitted to the Argonne Center, they are assigned accession numbers that are used to identify the program and its abstract. Whenever the abstract is modified, the month and year of the modification appear in the abstract heading in the format MM/YY. Since this collection represents a complete revision, all abstracts appearing herein will be dated October 1967 or later, and the date in the abstract heading will appear as 10/67, etc.

15. NAME AND ESTABLISHMENT OF AUTHORS -

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16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL

SOURCE DECKS (7090-2843 CARDS, 1604-2851 CARDS, 625-2861 CARDS)
SAMPLE PROBLEMS (7090-39 CARDS, 1604-66 CARDS)
REFERENCE REPORT AND NOTE

17. CATEGORY - C

KEYWORDS - DIFFUSION EQUATIONS, 1-DIMENSIONAL, FEW-GROUP, SLABS,
CYLINDERS, SPHERES, CRITICALITY SEARCHES, FLUX DISTRIBUTION

1. NAME OR DESIGNATION OF PROGRAM - AIM6
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM7090,370, CDC1604
3. DESCRIPTION OF PROBLEM OR FUNCTION - AIM6 SOLVES THE ONE-DIMENSIONAL MULTIGROUP DIFFUSION EQUATIONS UTILIZING A MICROSCOPIC CROSS SECTION LIBRARY. ANY OF THREE GEOMETRIES ARE AVAILABLE SLAB, CYLINDER OR SPHERE. CRITICALITY SEARCHES ARE PROVIDED INCLUDING A CONCENTRATION SEARCH ON ONE OR TWO ELEMENTS. HOMOGENEOUS AND INHOMOGENEOUS PROBLEMS MAY BE SOLVED WITH A VARIETY OF BOUNDARY CONDITION OPTIONS.
4. METHOD OF SOLUTION -
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
10 SPACE POINTS
18 ENERGY GROUPS
ONLY DOWNSCATTER IS PERMITTED, AND, IN THE CURRENT VERSION, NEUTRONS FROM A GIVEN GROUP ARE PERMITTED TO SCATTER ONLY TO A MAXIMUM OF 5 SUCCESSIVE LOWER GROUPS.
6. TYPICAL RUNNING TIME - FOR 16 GROUPS, 3 MINUTES WOULD BE A TYPICAL TIME FOR A SINGLE PROBLEM, ALTHOUGH TIMES MAY BE AS LOW AS 30 SECONDS. THE SAMPLE PROBLEM REQUIRES 2 MINUTES ON THE IBM370.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - FOG (ACC ABSTRACT 28)
9. STATUS - ABSTRACT FIRST DISTRIBUTED FEBRUARY 1962.
IBM7090 VERSION SUBMITTED JANUARY 1962.
CDC1604 VERSION SUBMITTED AUGUST 1963.
IBM370 VERSION SUBMITTED JULY 1972, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - H. P. FLATT AND D. C. BALLER, THE AIM-6 CODE, NAA PROGRAM DESCRIPTION, JANUARY 1961, ERRATA AND ADDENDA.
D. P. SATKUS, LIBRARY, A PROGRAM TO PUNCH MICROSCOPIC CROSS SECTION LIBRARY IN COLUMN BINARY FORM FOR A VARIABLE NUMBER OF GROUPS, NAA PROGRAM DESCRIPTION, APRIL 19, 1960.
D. P. SATKUS, LIST, A PROGRAM TO LIST LIBRARY FOR A VARIABLE NUMBER OF GROUPS, NAA PROGRAM DESCRIPTION, APRIL 19, 1960.
AIM-6, NOTES CONCERNING THE CONTROL DATA VERSION.
11. MACHINE REQUIREMENTS - 300K BYTES AND 1 SCRATCH UNIT ON THE IBM370
12. PROGRAMMING LANGUAGES USED - FORTRAN II AND FAP (IBM7090), FORTRAN 63 (CDC1604), FORTRAN IV (IBM370)

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13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
FORTRAN MONITOR SYSTEM (IBM7090), CCCP (CCC1604), CS/370 (IBM370).
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
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16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (7090-3849 CARDS, 1604-3285 CARDS, 370-3503 CARDS)
SAMPLE PROBLEMS (7090-36 CARDS, 1604-29 CARDS, 370-30 CARDS)
LIBRARIES (7090-1221 CARDS, 1604-3317 CARDS, 370-337 CARDS)
CENTROL INFORMATION (JCL 370-9 CARDS)
SAMPLE PROBLEM OUTPUT (370-17 PAGES)
REFERENCE REPORTS, ERRATA, ADDENDA, AND NOTES
17. CATEGORY - C
KEYWORDS - DIFFUSION EQUATIONS, 1-DIMENSIONAL, MULTIGROUP, SLABS,
CYLINDERS, SPHERES, CRITICALITY SEARCHES, FLUX DISTRIBUTION, FOG CODES

1. NAME OR DESIGNATION OF PROGRAM - PERT
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM7090,360, CDC1604
3. DESCRIPTION OF PROBLEM OR FUNCTION - PERT IS A PERTURBATION PROGRAM DESIGNED FOR USE WITH THE AIM6 AND FOG PROGRAMS. PUNCHED CARD OUTPUT FROM THESE CODES IS USED AS INPUT TO PERT. USING CROSS SECTION DATA, FLUXES, AND ADJOINT FLUXES, THE RELATIVE CHANGE IN K_{EFF} CAN BE CALCULATED. CROSS SECTIONS MAY BE WEIGHTED WITH THE ADJOINT FLUX AND/OR DIRECT FLUX. THE NEUTRON LIFETIME FOR THE DELAY GROUPS MAY ALSO BE DETERMINED.
4. METHOD OF SOLUTION - A LINEAR PERTURBATION THEORY IS USED FOR THE CALCULATIONS OF THE RELATIVE CHANGE IN K_{EFF}.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
6. TYPICAL RUNNING TIME - ABOUT 30 SECONDS ARE REQUIRED FOR A TYPICAL PROBLEM.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - AIM6 (ACC ABSTRACT 29) AND FOG (ACC ABSTRACT 28)
9. STATUS - ABSTRACT FIRST DISTRIBUTED FEBRUARY 1962.
IBM7090 VERSION SUBMITTED JANUARY 1962.
CDC1604 VERSION SUBMITTED MARCH 1964.
IBM360 VERSION SUBMITTED JUNE 1967.
10. REFERENCES - H. P. FLATT, PERT, NAA PROGRAM DESCRIPTION, FEBRUARY 1961.
PERT, NOTES CONCERNING THE CONTROL DATA VERSION.
11. MACHINE REQUIREMENTS -
12. PROGRAMMING LANGUAGES USED - FORTRAN II (7090), FORTRAN 63 (1604), AND FORTRAN IV (360)
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
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13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
IBSYS (7090) AND OS360 (360).
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
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16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (7090-2145 CARDS, 1604-1298 CARDS, AND 360-1280 CARDS)
SAMPLE PROBLEMS (7090-10 CARDS, 1604-11 CARDS, AND 360-21 CARDS)
LIBRARIES (7090-765 CARDS, 1604-741 CARDS, AND 360-764 CARDS)
SAMPLE PROBLEM OUTPUT (360-14 SELECTED PAGES)
REFERENCE REPORTS, NOTES
17. CATEGORY - B
KEYWORDS - THERMALIZATION, WIGNER-WILKINS MODEL LIGHT MODERATORS,
WILKINS EQUATION HEAVY MODERATORS, MAXWELL DISTRIBUTION, THERMAL SPECTRA

1. NAME OR DESIGNATION OF PROGRAM - FORM
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM7090,370, CDC1604
3. DESCRIPTION OF PROBLEM OR FUNCTION - THE FORM, OR FORTRAN-MUFT, PROGRAM IS A FOURIER TRANSFORM SLOWING-DOWN CODE. A LIBRARY TAPE CONTAINING 54-GROUP MICROSCOPIC CROSS SECTIONS, RESONANCE PARAMETERS, INELASTIC SCATTERING MATRICES, AND SOURCE SPECTRA IS USED TO GENERATE A 54-GROUP FLUX SPECTRUM AND FEW-GROUP CONSTANTS.
4. METHOD OF SOLUTION -
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
6. TYPICAL RUNNING TIME - ABOUT 5 TO 6 SECONDS ARE REQUIRED.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - MUFT, LIBRARY EDITING ROUTINES ARE INCLUDED AS AUXILIARY CODES. AITP1 PREPARES THE IBM370 VERSION BINARY LIBRARY TAPE.
9. STATUS - ABSTRACT FIRST DISTRIBUTED APRIL 1962.
IBM7090 VERSION SUBMITTED MARCH 1962.
CDC1604 VERSION SUBMITTED MARCH 1964.
IBM370 VERSION SUBMITTED JULY 1972, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - D. J. MCGOFF, FORM, A FOURIER TRANSFORM FAST SPECTRUM CODE FOR THE IBM709, NAA-SR-MEMO-5766, 1960.
FORM, NOTES CONCERNING THE CONTROL DATA VERSION.
ATOMICS INTERNATIONAL FORM CROSS-SECTION LIBRARY,
AI NOTE, NOVEMBER 1962.
P. KAZEMERSKY AND S. NAKAMURA, THE FORM CODE, OHIO
STATE MODIFICATIONS TO NAA-SR-MEMO-5766, 1972.
11. MACHINE REQUIREMENTS - 32K WITH 2 TAPE UNITS
12. PROGRAMMING LANGUAGES USED - FORTRAN II (IBM7090), FORTRAN 63 (CDC1604), FORTRAN IV (IBM370)
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - FORTRAN MONITOR SYSTEM (IBM7090), CCCP (CDC1604), OS/370 (IBM370).
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
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SOURCE DECKS (FORM 7090-1620 CARDS, 1604-1697 CARDS, 370-1141
CARDS, AITP1 370-227 CARDS)
SAMPLE PROBLEMS (7090-14 CARDS, 1604-14 CARDS, 370-34 CARDS)
LIBRARIES (7090-5847 CARDS, 1604-5847 CARDS, 370-8319 CARDS)
CONTROL INFORMATION (FORM JCL 370-9 CARDS, AITP1 JCL 370-8
CARDS)
REFERENCE REPORT, NOTES, AND MODIFICATIONS

17. CATEGORY - B
KEYWORDS - FOURIER TRANSFORM SLOWING DOWN, FAST SPECTRA, FEW-
GROUP GROUP CONSTANTS, AITP1 CODES

1. NAME OR DESIGNATION OF PROGRAM - SAIL
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM7090, CDC1604
3. DESCRIPTION OF PROBLEM OR FUNCTION - THE MONOENERGETIC NEUTRON TRANSPORT EQUATION IS SOLVED USING THE DISCRETE SN METHOD FOR A ONE-DIMENSIONAL PLANE CELL. CELL PROPERTIES ARE COMPUTED.
4. METHOD OF SOLUTION -
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
PLANE GEOMETRY
ORDER OF APPROXIMATION = 2, 4, 6, OR 8
1 ENERGY GROUP
MAXIMUM NUMBER OF REGIONS = 100
MAXIMUM NUMBER OF INTERVALS = 100
6. TYPICAL RUNNING TIME - THE RUNNING TIME IS GENERALLY LESS THAN ONE MINUTE. A SAMPLE S4 PROBLEM INVOLVING 7 MESH POINTS REQUIRED 21 SECONDS, INCLUDING LOADING THE PROGRAM INTO MEMORY.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED APRIL 1962.
IBM7090 VERSION SUBMITTED MARCH 1962.
CDC1604 VERSION SUBMITTED MARCH 1964.
10. REFERENCES - B. J. LEMKE, SAIL, NAA PROGRAM DESCRIPTION, FEBRUARY 1961, AI-64-MEMO-179 PUBLICATION, AUGUST 1964.
B. CARLSON, NUMERICAL SOLUTION OF TRANSIENT AND STEADY-STATE NEUTRON TRANSPORT PROBLEMS, LA-2260, 1960.
SAIL, NOTES CONCERNING THE CONTROL DATA VERSION.
11. MACHINE REQUIREMENTS -
12. PROGRAMMING LANGUAGES USED - FORTRAN II (IBM), FORTRAN 63 (CDC)
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
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1. NAME OR DESIGNATION OF PROGRAM - SOR3
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - SOR3 IS USED FOR THE ANALYSIS OF SYMMETRICALLY LOADED SHELLS OF REVOLUTION. THE PROGRAM COMPUTES STRESSES, STRAINS, FORCES AND DEFLECTIONS PRODUCED BY THERMAL AND MECHANICAL LOADS. NORMAL AND TRANSVERSE SHEAR STRESSES AND WALL THICKNESS CHANGES ARE TAKEN INTO ACCOUNT. THE PROGRAM IS BASED ON CONSTITUTIVE EQUATIONS WHICH RETAIN TERMS THROUGH THE SECOND ORDER IN THE RATIO OF THE THICKNESS TO THE LOCAL RADIUS OF CURVATURE. THESE FEATURES MAKE THE PROGRAM APPLICABLE TO SHELL STRUCTURES WITH MODERATELY LARGE THICKNESS TO RADIUS RATIOS.
4. METHOD OF SOLUTION - THE NUMERICAL INTEGRATION OF THE GOVERNING DIFFERENTIAL EQUATIONS IS PERFORMED BY A VARIABLE INTERVAL SIZE ADAMS-MOULTON METHOD. THE PROBLEM IS FIRST CONVERTED FROM A TWO-POINT BOUNDARY VALUE PROBLEM TO AN INITIAL-VALUE PROBLEM. FIVE SEPARATE INTEGRATIONS WITH DIFFERENT SETS OF INITIAL CONDITIONS ARE REQUIRED. EACH INTEGRATION PROCEEDS WITH AUTOMATIC ADJUSTMENT OF INTERVAL SIZE FOR MAXIMUM SPEED WITHIN THE LIMITATION OF PRESET BOUNDS ON THE ASSOCIATED TRUNCATION ERROR.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
30 SHELLS INTO WHICH THE STRUCTURE IS DIVIDED
30 INPUT POINTS FOR THE SHELL
10 POINTS AT WHICH DETAILED STRESS PRINTOUT IS TO BE PROVIDED FOR BRITTLE FRACTURE PURPOSES
6. TYPICAL RUNNING TIME - AN AVERAGE TIME OF 10 SECONDS PER CASE IS REQUIRED.
7. UNUSUAL FEATURES OF THE PROGRAM - SOR3 HAS A BRANCHED-SHELL OPTION WHICH AUTOMATICALLY PERFORMS THE CUT AND FIT OPERATIONS ASSOCIATED WITH THE ANALYSIS OF SUCH STRUCTURES AS A PRESSURE VESSEL CONNECTED TO A SUPPORT SKIRT. SPECIAL OUTPUT OPTIONS TAILORED TO THE NEEDS OF STRESS, FATIGUE AND BRITTLE FRACTURE DESIGN EVALUATIONS ARE AVAILABLE.
8. RELATED AND AUXILIARY PROGRAMS - SOR3 IS AN EXTENSION OF THE EARLIER SOR2 PROGRAM. ONE OF THE SOR3 OPTIONS PROVIDES FOR PUNCHED CARD OUTPUT WHICH CAN BE FED DIRECTLY TO SCR5DB (ACC ABSTRACT 391), A KAPL PROGRAM WRITTEN TO FACILITATE THE CHECKING OF A GIVEN DESIGN AGAINST STRUCTURAL DESIGN BASIS CRITERIA.
9. STATUS - ABSTRACT FIRST DISTRIBUTED JUNE 1968.
CDC6600 VERSION OF SOR2 SUBMITTED JUNE 1968, REPLACED BY
REVISED VERSION JULY 1969, REPLACED BY SOR3 FEBRUARY
1973.

10. REFERENCES - J. R. FITCH AND R. L. FAGAN, SOR-3, A PROGRAM FOR THE STRESS ANALYSIS OF SHELLS OF REVOLUTION, KAPL-M-7100(L), AUGUST 30, 1971.
J. A. MIRABAL AND D. G. DIGHT, SOR-II - A PROGRAM TO PERFORM STRESS ANALYSIS OF SHELLS OF REVOLUTION, KAPL-2292, SEPTEMBER 15, 1963.
F. C. CARLSON AND R. E. DEBSON, SORSDE, A COMPUTER PROGRAM FOR THE STRESS AND FATIGUE EVALUATION OF SHELLS OF REVOLUTION, KAPL-M-6729, APRIL 1969.
11. MACHINE REQUIREMENTS -
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 3.0.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
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16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (3232 CARDS)
SAMPLE PROBLEM (354 CARDS)
REFERENCE REPORT, KAPL-M-7100(L)
17. CATEGORY - I
KEYWORDS - STRESSES, SHELLS, SPHERES, CYLINDERS, TEMPERATURE DISTRIBUTION, SOR2 CODES, SORSDB CODES

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14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
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SOURCE DECK (2122 CARDS)
BINARY DECK (711 CARDS)
SAMPLE PROBLEM (23 CARDS)
REFERENCE REPORTS, ANL-6716, AMDPL 1520/RE277, R149
17. CATEGORY - E
KEYWORDS - TRANSFER FUNCTIONS, FREQUENCY MEASUREMENTS

1. NAME OR DESIGNATION OF PROGRAM - HERESY3
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - HERESY3 SOLVES THE TWO-DIMENSIONAL FEW-GROUP STATIC REACTOR EIGENVALUE PROBLEM USING THE HETEROGENECUS (SOURCE-SINK OR FEINBURG-GALANIN) FORMALISM. THE SOLUTION YIELDS THE REACTOR K EFFECTIVE AND ABSORPTION REACTION RATES FOR EACH ROD NORMALIZED TO THE MOST ABSORPTIVE ROD IN THE THERMAL LEVEL. EPITHERMAL FISSIONS ARE ALLOWED AT EACH RESONANCE LEVEL, AND LATTICE AVERAGED VALUES OF THERMAL UTILIZATION, RESONANCE ESCAPE PROBABILITY, THERMAL AND RESONANCE η VALUES, AND THE FAST FISSION FACTOR ARE CALCULATED. KERNELS IN THE CALCULATION ARE BASED ON AGE DIFFUSION THEORY. BOTH FINITE REACTOR LATTICES AND INFINITELY REPEATING REACTOR SUPERCELLS MAY BE CALCULATED. ROD PARAMETERS MAY BE CALCULATED BY SEVERAL INTERNAL OPTIONS, AND A DIRECT INTERFACE IS PROVIDED TO A HAMMER SYSTEM (ACC ABSTRACT 277) LATTICE LIBRARY TAPE TO OBTAIN CELL PARAMETERS. CRITICALITY SEARCHES ARE PROVIDED ON THERMAL UTILIZATION, THERMAL η , AND AXIAL LEAKAGE BUCKLING.
4. METHOD OF SOLUTION - DIRECT POWER ITERATION ON MATRIX FORM OF THE HETEROGENECUS CRITICAL EQUATION IS USED.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF-
50 FLUX/GEOMETRY SYMMETRY POSITIONS
20 PHYSICALLY DIFFERENT ASSEMBLIES
9 RESONANCE LEVELS
5000 ROD COORDINATE POSITIONS
6. TYPICAL RUNNING TIME - FINITE REACTOR LATTICE OF 50 RODS REQUIRES ABOUT 3 MINUTES, AN INFINITE SUPERCELL OF 15 RODS ABOUT 2 MINUTES, AND AN AXIAL BUCKLING CRITICALITY SEARCH ABOUT 5 MINUTES.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - HERESY3 IS INTERFACED TO ACCEPT CELL DATA FROM A HAMMER SYSTEM (ACC ABSTRACT 277) LATTICE LIBRARY TAPE AND CALCULATE HETEROGENECUS ROD PARAMETERS AND MODERATOR CONSTANTS DIRECTLY.
9. STATUS - ABSTRACT FIRST DISTRIBUTED MARCH 1964.
IBM7090 VERSION OF HERESY1/KERNEL SUBMITTED DECEMBER 1963, DELETED APRIL 1972.
IBM360 VERSION OF HERESY3 SUBMITTED APRIL 1972, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - D. R. FINCH, HERESY3 COMPUTER CODE, DP-1284, FEBRUARY 1972.
C. N. KLAHR, L. B. MENDELSOHN, AND J. HEITNER, HETEROGENEOUS REACTOR CALCULATION METHODS, FINAL REPORT, NYO-2680,

10. REFERENCES (CONTINUED)
JUNE 30, 1961.

C. N. KLAHR, L. E. MENDELSOHN, AND J. HEITNER,
HETEROGENECUS REACTOR CALCULATION METHODS, QUARTERLY PROGRESS RE-
PORT NO. 6, NYO-2678, SEPTEMBER 30, 1960.

11. MACHINE REQUIREMENTS - 45K SINGLE-PRECISION WORDS OF HIGH SPEED
CORE PLUS 50K SINGLE-PRECISION WORDS OF DISK (OR DRUM) STORAGE

12. PROGRAMMING LANGUAGES USED - FORTRAN IV AND BAL

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
OS/360.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -

D. R. FINCH
E. I. DU PONT DE NEMOURS
SAVANNAH RIVER LABORATORY
AIKEN, SOUTH CAROLINA 29801

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (5264 CARDS)
SAMPLE PROBLEM (60 CARDS)
CONTROL INFORMATION (JCL-16 CARDS)
REFERENCE REPORT, DP-1284

17. CATEGORY - C

KEYWORDS - REACTIVITY, THERMAL UTILIZATION, RESONANCE ESCAPE
PROBABILITY, 2-DIMENSIONAL, POWER DISTRIBUTION, LAT-
TICES, THERMAL FISSION, HETEROGENECUS REACTORS, FERESY1
CODES, HAMMER CODES

1. NAME OR DESIGNATION OF PROGRAM - PATRAP
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM7090
3. DESCRIPTION OF PROBLEM OR FUNCTION - THE RATRAP PROGRAM COMPUTES THE DOSE RATE AT SPECIFIED SPATIAL POINTS ABOUT A SYSTEM OF SNAP GEOMETRY.
4. METHOD OF SOLUTION - AN ATTENUATION MODEL BASED ON MEAN FREE PATHS TRAVERSED ALONG A STRAIGHT LINE TRAJECTORY IS USED.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
MAXIMUM NUMBER OF CORE-REFLECTOR SOURCE POINTS = 1000
MAXIMUM NUMBER OF DOSE POINTS = 50 (DIMENSIONS MAY BE ENTERED IN CENTIMETERS OR INCHES)
6. TYPICAL RUNNING TIME - ABOUT 100 POINTS PER SECOND CAN BE RUN ON THE IBM7094 WHERE NUMBER OF POINTS = (NUMBER OF SOURCE POINTS) * (NUMBER OF DOSE POINTS).
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - MORTIMER (ACC ABSTRACT 142)
9. STATUS - ABSTRACT FIRST DISTRIBUTED NOVEMBER 1964.
IBM7090 VERSION SUBMITTED FEBRUARY 1964.
10. REFERENCE - W. B. GREEN, THE RATRAP CODE - A MODIFICATION OF THE FARSE METHOD FOR SNAP SHIELD GEOMETRY, NAA@SR@MEMC@8968, SEPTEMBER 13, 1963.
11. MACHINE REQUIREMENTS -
12. PROGRAMMING LANGUAGE USED - FORTRAN II
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHOR -
R. A. BLAINE
SUPERVISOR, REACTOR COMPUTING SYSTEMS UNIT
MATHEMATICS AND COMPUTER SCIENCES
ATOMICS INTERNATIONAL
P. O. BOX 309
CANOGA PARK, CALIFORNIA
16. MATERIAL AVAILABLE -
SOURCE DECK (1322 CARDS)
SAMPLE PROBLEM (13 CARDS)
REFERENCE REPORT

1. NAME OR DESIGNATION OF PROGRAM - NPRFCCP
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM7090, CDC6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - NUCLEAR FUEL CYCLE COSTS IN DOLLARS PER YEAR (\$/YR), AND IN MILLS PER KILOWATT-HOUR (MILLS/KWHR) ARE COMPUTED AND TABULATED FOR EACH REGION OF A MULTIREGION REACTOR CORE, ON THE BASIS OF AEC-LEASED NUCLEAR FUEL MATERIAL AND OF PRIVATELY-OWNED NUCLEAR FUEL MATERIAL. FUEL CYCLE COSTS ARE COMPUTED SEPARATELY FOR EACH REGION OR ZONE, FOR CORE DESIGNS OF ANY CONFIGURATION OR COMBINATION OF MATERIAL DEPLETION OR ENRICHED URANIUM FUEL OR OTHER SPECIAL NUCLEAR MATERIAL. PRINTED OUTPUT OF THE PROGRAM INCLUDES (A) DETAILED FUEL CYCLE COSTS FOR EACH ZONE IN TABULAR FORM, FOR AEC-LEASED AND PRIVATELY-OWNED NUCLEAR FUEL MATERIAL, RESPECTIVELY, (B) A SUMMARY TABULATION OF NUCLEAR FUEL COSTS FOR ALL REGIONS OF THE COMPLETE CORE, INCLUDING FIXED CHARGES ON WORKING CAPITAL REQUIRED FOR CORE FABRICATION AND FOR NUCLEAR FUEL MATERIAL, (C) A SUMMARY TABULATION OF CERTAIN COMPUTED PERFORMANCE AND ECONOMIC DATA, VIZ., AVERAGE RESIDENCE TIME, ANNUAL FUEL THROUGHPUT, UNIT ELECTRICAL ENERGY YIELD, ANNUAL POWER GENERATION, AND CORE FABRICATION COSTS, AND (D) A TABULATION OF ALL INPUT DATA FOR ALL REGIONS. THE PRINTING OF DATA DESCRIBED IN (A) AND (D) ABOVE IS OPTIONAL WITH PROGRAM USE.
4. METHOD OF SOLUTION -
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
MAXIMUM NUMBER OF REGIONS OR ZONES = 10
6. TYPICAL RUNNING TIME - 1 TO 2 MINUTES ARE REQUIRED.
7. UNUSUAL FEATURES OF THE PROGRAM - CERTAIN OF THE OPERATING AND ECONOMIC PARAMETERS WILL GENERALLY REMAIN CONSTANT FOR A WIDE RANGE OF REACTOR CORE DESIGNS. THEREFORE, THE PROGRAM INCLUDES A SET OF STANDARD VALUES FOR THESE PARAMETERS SO THAT THE AMOUNT OF BASIC INPUT DATA REQUIRED IS MINIMAL. THE USE OF THESE SO-CALLED STANDARD VALUES IS OPTIONAL WITH THE PROGRAM USER, AND ANY COMBINATION OF OR ALL OF THESE STANDARD VALUES MAY BE MODIFIED AS DESIRED. FUEL PROCESSING COSTS MAY BE COMPUTED FOR SPENT-FUEL MANAGEMENT PROGRAMS WHICH PROVIDE FOR THE REPROCESSING, SEPARATELY OR IN ANY COMBINATION, OF SINGLE OR MULTIPLE SPENT-FUEL BATCHES FROM ONE OR MORE REGIONS HAVING THE SAME OR DIFFERENT FINAL ENRICHMENTS. THUS, THE LOWEST COST SPENT-FUEL MANAGEMENT PROGRAM CAN BE READILY DETERMINED.
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED NOVEMBER 1964.
IBM7090 VERSION SUBMITTED JUNE 1964.
CDC6600 VERSION SUBMITTED APRIL 1973.

10. REFERENCE - J. T. JACKMAN, GUIDE TO NUCLEAR POWER COST EVALUATION, TID-7025, APRIL 30, 1963.
11. MACHINE REQUIREMENTS -
12. PROGRAMMING LANGUAGES USED - FORTRAN II (IBM7090), FORTRAN IV (CDC6600)
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 3.3 (CDC6600).
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
 - 7090 J. T. JACKMAN
KAISER ENGINEERS
KAISER INDUSTRIES CORPORATION
KAISER CENTER
300 LAKESIDE DRIVE
OAKLAND, CALIFORNIA 94604
 - 6600 FRANK D. TYSON
TECHNICAL COMPUTER SERVICES
UNITED ENGINEERS AND CONSTRUCTORS, INC.
1401 ARCH STREET
PHILADELPHIA, PENNSYLVANIA 19105
16. MATERIAL AVAILABLE -
 - SOURCE DECKS (7090-1444 CARDS, 6600-1446 CARDS)
 - BINARY DECK (7090-367 CARDS)
 - SAMPLE PROBLEMS (7090-137 CARDS, 6600-136 CARDS)
 - REFERENCE REPORT, APPENDIX A
17. CATEGORY - D
KEYWORDS - FUEL CYCLE ECONOMICS, PERFORMANCE

1. NAME OR DESIGNATION OF PROGRAM - INVERSE KINETICS (R102)
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC3600, IBM7094,360
3. DESCRIPTION OF PROBLEM OR FUNCTION - GIVEN THE SPACE-INDEPENDENT, ONE ENERGY GROUP REACTOR KINETICS EQUATIONS AND THE INITIAL CONDITIONS, THIS PROGRAM DETERMINES THE TIME VARIATION OF REACTIVITY REQUIRED TO PRODUCE THE GIVEN INPUT OF FLUX-TIME DATA.
4. METHOD OF SOLUTION - TIME DERIVATIVES OF NEUTRON DENSITY ARE OBTAINED BY APPLICATION OF -
 - (1) FIVE-POINT QUARTIC,
 - (2) THREE-POINT PARABOLIC,
 - (3) FIVE-POINT LEAST-MEAN-SQUARE CUBIC,
 - (4) FIVE-POINT LEAST-MEAN-SQUARE PARABOLIC, OR
 - (5) FIVE-POINT LEAST-MEAN-SQUARE LINEARFORMULAE TO THE NEUTRON DENSITY OR TO THE NATURAL LOGARITHM OF THE NEUTRON DENSITY. BETWEEN EACH DATA POINT THE NEUTRON DENSITY IS ASSUMED TO BE -
 - (1) EXPONENTIAL*(THIRD ORDER POLYNOMIAL),
 - (2) EXPONENTIAL, OR
 - (3) LINEAR.CHANGES IN REACTIVITY BETWEEN DATA POINTS ARE OBTAINED ALGEBRAICALLY FROM THE KINETICS EQUATIONS, NEUTRON DENSITY DERIVATIVES, AND THE ALGEBRAIC REPRESENTATION OF NEUTRON DENSITY. FIRST AND SECOND TIME DERIVATIVES OF THE REACTIVITY ARE OBTAINED BY USE OF ANY OF THE FORMULAE APPLICABLE TO THE NEUTRON DENSITY.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
 - 50 DELAY GROUPS
 - 1000 DATA POINTS
 - 99 DATA BLOCKS(A DATA BLOCK IS A SEQUENCE OF INPUT POINTS CHARACTERIZED BY A FIXED TIME INTERVAL BETWEEN POINTS, A SMOOTHING OPTION AND A NUMBER OF REPETITIONS OF THE SMOOTHING OPTION).
6. TYPICAL RUNNING TIME - USING SIX DELAY GROUPS, THE PROGRAM COMPUTES AND OUTPUTS APPROXIMATELY 30 POINTS PER SECOND (3600).
7. UNUSUAL FEATURES OF THE PROGRAM - THIS PROGRAM HAS BEEN USED FOR THE DETERMINATION OF FEEDBACK PARAMETERS, CONTROL ROD DESIGN AND EVALUATION OF CONTROL ROD WORTH. VARIOUS MODES OF SOLUTION ALLOW HIGH PRECISION WITH ANALYTIC DATA OR THE ANALYSIS OF DIGITALIZED DATA FROM RECORDING EQUIPMENT. SMOOTHING OF INPUT DATA MAY BE OBTAINED BY SINGLE OR REPEATED APPLICATION OF -
 - (1) FIVE-POINT CUBIC,
 - (2) FIVE-POINT PARABOLIC,

7. UNUSUAL FEATURES OF THE PROGRAM (CONTINUED)
 - (3) THREE-POINT LINEAR, CR
 - (4) FIVE-POINT LINEARLEAST-MEAN-SQUARE SMOOTHING FORMULAS. TABULAR OUTPUT INCLUDES EXCESS REACTIVITY, ITS FIRST AND SECOND DERIVATIVES, INPUT AND SMOOTHED INPUT DATA, INTEGRAL OF NEUTRON DENSITY, AND INSTANTANEOUS PERIOD. PRECURSOR DATA MAY BE INPUT OR OBTAINED FROM THE PROGRAM LIBRARY. STEADY-STATE INITIAL CONDITIONS MAY BE SPECIFIED BY INPUT OF A CONSTANT REACTIVITY OR PERIOD. NON-STEADY-STATE CONDITIONS REQUIRE PRECURSOR DENSITY INFORMATION. DISCONTINUOUS CHANGES IN REACTIVITY MAY BE GIVEN AS INPUT OR CALCULATED BY THE PROGRAM. ANY NUMBER OF PERUNS WITH VARYING SOLUTION MODES AND SMOOTHING OPTIONS MAY BE SCHEDULED.
8. RELATED AND AUXILIARY PROGRAMS - THIS PROGRAM SUPERCEDES RE138 AND RE171, ANL IBM704 PROGRAMS.
9. STATUS - ABSTRACT FIRST DISTRIBUTED FEBRUARY 1966.
CDC3600 VERSION SUBMITTED DECEMBER 1965, SAMPLE PROBLEM EXECUTED BY ACC.
IBM7094 VERSION SUBMITTED DECEMBER 1965.
IBM360 VERSION SUBMITTED FEBRUARY 1973, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - PRECURSOR LIBRARY IN PROGRAM IS FROM ANL-5800, SECOND EDITION, REACTOR PHYSICS CONSTANTS, JULY 1963.
J. J. KAGANOVE, ANL-AMD PROGRAM LIBRARY REPORT R102, JUNE 1965.
W-ANL NOTE - CHANGES MADE TO CONVERT R102+ TO FORTRAN IV.
11. MACHINE REQUIREMENTS -
12. PROGRAMMING LANGUAGES USED - FORTRAN 63 (CDC3600), FORTRAN IV (IBM7094,360)
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE (3600), IBSYS VERSION 13 (7094), AND OS/360 (360).
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
 - 3600,360 J. J. KAGANOVE
APPLIED MATHEMATICS DIVISION
ARGONNE NATIONAL LABORATORY
9700 SOUTH CASS AVENUE
ARGONNE, ILLINOIS 60439
 - 7094 C. P. SAALBACH AND P. J. RICHARD
WESTINGHOUSE ELECTRIC CORPORATION
ASTRONUCLEAR LABORATORY
P. O. BOX 10864
PITTSBURGH, PENNSYLVANIA 15236

ACC ABSTRACT 168

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10/73

16. MATERIAL AVAILABLE -
SOURCE DECKS (360C-752 CARDS, 7094-814 CARDS, 360-825 CARDS)
BINARY DECK (3600-403 CARDS)
SAMPLE PROBLEMS (3600-525 CARDS, 360-525 CARDS)
SAMPLE PROBLEM OUTPUT (360-27 SELECTED PAGES)
REFERENCE REPORT AND NOTE
17. CATEGORY - E
KEYWORDS - SPACE-INDEPENDENT KINETICS, REACTIVITY

1. NAME OR DESIGNATION OF PROGRAM - BURP4
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM7090
3. DESCRIPTION OF PROBLEM OR FUNCTION - BURP4 CALCULATES THE PHOTO-FRACTION FOR MONOENERGETIC GAMMA RAYS INTERACTING IN SOLID CYLINDRICAL SCINTILLATION DETECTORS. PHOTO-FRACTION IS DEFINED AS THE FRACTION OF INTERACTING SOURCE GAMMAS THAT ARE TOTALLY ABSORBED (INCLUDING SECONDARIES) IN THE CRYSTAL. ISOTROPIC SOURCE GEOMETRIES ALLOWED ARE ISOTROPIC POINT (ON OR OFF-AXIS), DISKS, CYLINDRICAL VOLUMES. ALLOWED MONODIRECTIONAL SOURCES, NORMAL TO CRYSTAL FACE, ARE NARROW BEAM COLLIMATED TO CRYSTAL AXIS, BROAD BEAM ILLUMINATING ENTIRE CRYSTAL FACE, AND COLLIMATED BEAM OF ANY SPECIFIED DIAMETER.
4. METHOD OF SOLUTION - USES MONTE CARLO METHODS TO SIMULATE TRANSPORT OF GAMMAS, AND SECONDARIES (ELECTRONS AND BREMSSTRAHLUNG).
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - SOURCE ENERGY RANGE MUST BE 0.01-30 MEV. SOLID CYLINDRICAL CRYSTALS ONLY.
6. TYPICAL RUNNING TIME - 4 MEV SOURCE ENERGY (2000 PRIMARY INTERACTIONS) - APPROXIMATELY 3 MINUTES.
7. UNUSUAL FEATURES OF THE PROGRAM - ESCAPE OF ELECTRONS GENERATED BY PRIMARY GAMMA PROCESSES IS DETERMINED BY SAMPLING FROM TRANSMISSION DATA. BREMSSTRAHLUNG PHOTONS ARE GENERATED AND FOLLOWED THROUGH MEDIUM. ELECTRON TRANSMISSION DATA AND BREMSSTRAHLUNG SPECTRA DATA INCLUDED IN PROGRAM FOR NAI, AND ABOVE APPROXIMATELY 3 MEV, SOME ERROR IS INTRODUCED IF CALCULATION IS MADE FOR MATERIAL OTHER THAN NAI. GAMMA RAY CROSS SECTIONS FOR NAI ARE INCLUDED IN PROGRAM, BUT OTHER CROSS SECTION DATA MAY BE READ FOR DIFFERENT SCINTILLATION MATERIALS.
8. RELATED AND AUXILIARY PROGRAMS -
 - (A) FOR ABSOLUTE TOTAL EFFICIENCIES -
 - (1) BURP1 ISOTROPIC POINT SOURCE ON AXIS OF SYMMETRY.
 - (2) BURP2 SYMMETRICALLY LOCATED ISOTROPIC DISK AND HOMOGENEOUS CYLINDRICAL VOLUME SOURCES (CAN INCLUDE SOURCE ABSORPTION AND SCATTERING).
 - (3) BURP3 ISOTROPIC POINT SOURCE LOCATED OFF AXIS OF SYMMETRY.
 - (B) FOR PHOTO-FRACTIONS -
 - (1) BURP5 WELL CRYSTAL, ALL ISOTROPIC SOURCES AND COLLIMATED SOURCES.
9. STATUS - ABSTRACT FIRST DISTRIBUTED FEBRUARY 1966.
IBM7090 VERSION SUBMITTED DECEMBER 1965.

1. NAME OR DESIGNATION OF PROGRAM - GAMTEC2
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM7090, UNIVAC1107, GE625, CDC6400
3. DESCRIPTION OF PROBLEM OR FUNCTION - GAMTEC2 GENERATES MULTIGROUP CONSTANTS IN THE ENERGY RANGE FROM 0 TO 10 MEV FOR EITHER HOMOGENEOUS MIXTURES OR HETEROGENEOUS ARRAYS CONSISTING OF CYLINDERIZED LATTICE CELLS. THE THERMAL GROUP CONSTANTS ARE AVERAGED OVER EITHER (1) WIGNER-WILKINS LIGHT MODERATOR SPECTRUM, (2) WILKINS HEAVY MODERATOR SPECTRUM, OR (3) A MAXWELLIAN DISTRIBUTION. FOR HETEROGENEOUS ARRAYS THE SPATIAL THERMAL FLUX IS CALCULATED BY A MONOENERGETIC P3 APPROXIMATION. FOR EPITHERMAL ENERGIES, THE SLOWING-DOWN DISTRIBUTION IS DESCRIBED BY EITHER A B1 OR P1 APPROXIMATION TO THE BOLTZMANN EQUATION. RESONANCE ABSORPTION AND FISSION ARE TREATED BY THE ADLER-NORDHEIM METHOD. AN IMPROVED METHOD OVER THAT IN GAM-I FOR AVERAGING THE RESONANCE ABSORPTION CONTRIBUTION TO THE MULTIGROUP CONSTANTS IS INCLUDED. FUEL LUMPING EFFECTS ON THE FAST FISSION OF U238 AND TH232 ARE TREATED BY AN N-FLIGHT COLLISION PROBABILITY TECHNIQUE. GROUP CONSTANTS ARE PUNCHED ON CARDS IN HFN (DIFFUSION CODE) AND DTF (SN TRANSPORT CODE) FORMATS.
4. METHOD OF SOLUTION -
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE MAXIMUM NUMBER OF CONCENTRIC REGIONS IN THE UNIT LATTICE CELL IS SIXTEEN. EACH REGION MAY CONTAIN UP TO TEN ISOTOPES. GROUP CONSTANTS MAY BE COMPUTED FOR ONE THERMAL GROUP AND FROM 1 TO 34 EPITHERMAL GROUPS.
6. TYPICAL RUNNING TIME - A PROBLEM REQUIRES FROM ONE TO THREE MINUTES ON THE IBM7090, DEPENDING ON THE COMPLEXITY AND OPTIONS UTILIZED, AND 20 TO 25 SECONDS ON THE CDC6400.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - GAMTEC2 COMBINES THE ATOMICS INTERNATIONAL TEMPEST (ACC ABSTRACT 50) AND THE GENERAL ATOMIC GAM1 (ACC ABSTRACT 33) CODES TO COMPUTE MULTIGROUP CONSTANTS FOR BOTH THERMAL AND EPITHERMAL NEUTRONS IN ONE OPERATION. THE GAM1 CODE HAS BEEN EXTENDED TO TREAT RESONANCE FISSION BY THE ADLER-NORDHEIM METHOD. ALSO, AN IMPROVED METHOD WAS USED FOR AVERAGING THE RESONANCE ABSORPTION CONTRIBUTION TO THE MULTIGROUP CONSTANTS.
9. STATUS - ABSTRACT FIRST DISTRIBUTED FEBRUARY 1966.
IBM7090 VERSION SUBMITTED SEPTEMBER 1965.
UNIVAC1107 VERSION SUBMITTED FEBRUARY 1967.
GE625 VERSION SUBMITTED JULY 1968.
CDC6400 VERSION SUBMITTED JANUARY 1973.
10. REFERENCES - L. L. CARTER, C. P. RICHEY AND C. E. HUGHEY, GAMTEC-II - A CODE FOR GENERATING CONSISTENT MULTIGROUP CONSTANTS UTI-

10. REFERENCES (CONTINUED)
LIZED IN DIFFUSION AND TRANSPORT THEORY CALCULATIONS, BNWL-35,
MAY 1965, AND ERRATA.
C. R. RICHEY, NOTE TO USERS OF 7090 VERSION OF
GAMTEC-II, FEBRUARY 1967.
C. R. RICHEY, GAMTEC-II NOTE, FEBRUARY 1967.
R. L. BRUNNENMEYER AND R. A. MICKLE, GAMTEC-II GE-625
VERSION (NE572) USERS NOTES, BECHTEL NOTE, JULY 1968.
11. MACHINE REQUIREMENTS - THE CODE REQUIRES THE USE OF TWO TAPE UNITS
IN ADDITION TO THE USUAL INPUT AND OUTPUT UNITS UTILIZED IN THE
IBM FORTRAN-II MONITOR SYSTEM - ONE UNIT FOR THE SINGLE DATA
LIBRARY TAPE AND A SCRATCH TAPE IS MOUNTED ON THE OTHER. ALSO,
AN ON-LINE CARD PUNCH IS REQUIRED. THE CDC6400 VERSION USES DISK
AS SCRATCH STORAGE.
12. PROGRAMMING LANGUAGES USED - FORTRAN II AND FAP (7090) AND
FORTRAN IV (1107, 625, 6400)
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
FORTRAN II MONITOR SYSTEM (IBM7090), EXEC2 (UNIVAC1107), SCOPE 3.4
(CDC6400).
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
THE GE625 VERSION HAS BEEN MODIFIED TO INCORPORATE A SIMPLE ROU-
TINE FOR CALCULATING DANCOFF CORRECTION FACTORS AND TO PROVIDE
PUNCHED OUTPUT FOR FOG (ACC ABSTRACT 28). THE CDC6400 VERSION
REQUIRES THE RUN COMPILER.
15. NAME AND ESTABLISHMENT OF AUTHORS -
7090,1107 L. L. CARTER AND C. R. RICHEY
PACIFIC NORTHWEST LABORATORIES
BATTELLE
P. O. BOX 999
RICHLAND, WASHINGTON 99352

7090,1107 C. E. HUGHEY
GENERAL ELECTRIC COMPANY
RICHLAND, WASHINGTON 99352

625 R. L. BRUNNENMEYER AND R. A. MICKLE
BECHTEL CORPORATION
50 BEALE STREET
SAN FRANCISCO, CALIFORNIA 94119

6400 R. A. RYDIN
NUCLEAR ENGINEERING DEPARTMENT
REACTOR FACILITY
UNIVERSITY OF VIRGINIA
CHARLOTTESVILLE, VIRGINIA 22901
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (7090-8234 CARDS, 1107-9925 CARDS, 625-6140 CARDS,

16. MATERIAL AVAILABLE (CONTINUED)

6400-6347 CARDS)

SAMPLE PROBLEM (7090-18 CARDS, 1107-18 CARDS, 625-16 CARDS,
6400-19 CARDS)

AUXILIARY ROUTINES (625-757 CARDS, 6400-1062 CARDS)

BCD LIBRARY (12,398 CARDS)

BINARY LIBRARY (7090-FILES 3,4,5)

REFERENCE REPORT, ERRATA, AND NOTES

17. CATEGORY - B

KEYWORDS - MULTIGROUP GROUP CONSTANTS, SPECTRA, LATTICES, CYLIN-
DERS, WIGNER-WILKINS MODEL, LIGHT MODERATORS, WILKINS
EQUATION, HEAVY MODERATORS, MAXWELL DISTRIBUTION, PL
METHOD, BL METHOD, THERMAL, EPITHERMAL, DANCOFF CORREC-
TION

1. NAME OR DESIGNATION OF PROGRAM - FSDP3
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - UNIVAC1108
3. DESCRIPTION OF PROBLEM OR FUNCTION - FSDP3 COMPUTES POINTWISE CROSS SECTIONS FROM SINGLE-LEVEL BREIT-WIGNER RESONANCE PARAMETERS.
4. METHOD OF SOLUTION - THE CROSS SECTION AT EACH ENERGY IS COMPUTED FROM A SUMMATION OF CONTRIBUTIONS FROM A SPECIFIED NUMBER OF NEIGHBORING RESONANCES. THE CONTRIBUTION FROM EACH RESONANCE IS EXPRESSED IN TERMS OF CONVENTIONAL SYMMETRIC AND ASYMMETRIC DOPPLER LINE SHAPE FUNCTIONS WHICH ARE CALCULATED FROM CONVERGENT OR ASYMPTOTIC SERIES APPROXIMATIONS.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE MAXIMUM NUMBER OF NEUTRON ENERGIES IS 5000 WHEN THE ENDF/B FORMAT INPUT OPTION IS USED AND LIMITED ONLY BY COMPUTING TIME CONSIDERATIONS OTHERWISE. A MAXIMUM OF 3000 RESONANCES PER L-J STATE MAY BE USED WITH THE ENDF/B FORMAT INPUT OPTION AND 3000 S-WAVE RESONANCES WITH THE OLD INPUT FORMAT. THE NUMBER OF RESONANCES TO BE CONSIDERED ON EACH SIDE OF EACH NEUTRON ENERGY MAY BE THE SAME AS THE TOTAL NUMBER OF RESONANCES PER L-J STATE EXCEPT WHEN THE MULTILEVEL BREIT-WIGNER SCATTERING OPTION IS USED IN WHICH CASE A MAXIMUM OF 100 RESONANCES PER L-J STATE ON EACH SIDE IS ALLOWED. RELATIVE ORBITAL ANGULAR MOMENTUM VALUES L GREATER THAN 3 ARE NOT ALLOWED (L=0 IS AN S-WAVE INTERACTION). THE MATHEMATICAL ASSUMPTIONS NEEDED TO EXPRESS THE RESULTS IN TERMS OF THE CONVENTIONAL DOPPLER LINE SHAPE FUNCTIONS MAY BE INVALID AT VERY LOW NEUTRON ENERGIES. THE BASIC FORMULATION IS INCOMPLETE FOR THE VERY HIGH TEMPERATURES ATTAINABLE IN STARS OR IN NUCLEAR EXPLOSIONS.
6. TYPICAL RUNNING TIME - APPROXIMATELY 0.1 SECOND PER NEUTRON ENERGY IS REQUIRED.
7. UNUSUAL FEATURES OF THE PROGRAM - THE TRUE NEUTRON ENERGY DEPENDENCE OF THE TOTAL RESONANCE WIDTH IS USED. THE MULTI-LEVEL BREIT-WIGNER SCATTERING OPTION IS PROGRAMMED SO THAT NO ADDITIONAL DOPPLER LINE SHAPE FUNCTION EVALUATIONS ARE REQUIRED WHEN THIS OPTION IS USED.
8. RELATED AND AUXILIARY PROGRAMS - THE FSDP2 (UNDOCUMENTED) AND THE FASDOP CODES ARE EARLIER VERSIONS OF THE FSDP3 CODE.
9. STATUS - ABSTRACT FIRST DISTRIBUTED JULY 1966.
IBM7044 VERSION OF FASDOP SUBMITTED FEBRUARY 1966,
DELETED AUGUST 1972.
UNIVAC1108 VERSION OF FSDP3 SUBMITTED AUGUST 1972.
10. REFERENCES - D. R. MATHEWS, FSDP3, A COMPUTER PROGRAM FOR COMPUTING CROSS SECTIONS FROM RESONANCE PARAMETERS, GULF-GA-A12052,

10. REFERENCES (CONTINUED)
APRIL 5, 1972.
C. A. STEVENS, FASDOP, A FORTRAN IV COMPUTER PROGRAM FOR COMPUTING CROSS SECTIONS FROM RESONANCE PARAMETERS, GAMD-6562, AUGUST 9, 1965.
11. MACHINE REQUIREMENTS - 50,511 DECIMAL WORDS FOR DATA STORAGE PLUS 7995 WORDS FOR INSTRUCTIONS, A CROSS SECTION OUTPUT TAPE IS OPTIONAL, AND 2 SCRATCH FILES (TAPE OR DRUM) ARE REQUIRED.
12. PROGRAMMING LANGUAGE USED - FORTRAN V
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - EXEC-8.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - NO UNUSUAL PROGRAMMING TRICKS ARE USED. THE PROGRAM STRUCTURE CONSISTS OF A MAIN PROGRAM (FSDP3) AND FIVE SUBROUTINES (FSDP, UPDN, REVERS, QPUN, AND DELTM). ARRAY EQUIVALENCING IS USED ONLY FOR THE PUNCHED OUTPUT SUBROUTINE QPUN. SUBROUTINE DELTM CALLS A SYSTEM ROUTINE NAMED TICKER WHICH RETURNS THE TIME OF DAY IN UNITS OF 1/60 OF A SECOND. FOR A GIVEN ORBITAL ANGULAR MOMENTUM L, ONLY RESONANCES WITH THE SAME COMPOUND NUCLEUS SPIN J (AND HENCE THE SAME STATISTICAL FACTOR GJ) ARE ALLOWED TO INTERFERE. THIS MEANS THAT, IN CASES IN WHICH AN AVERAGE VALUE OF THE SPIN J HAS BEEN USED FOR CERTAIN RESONANCE LEVELS BECAUSE OF INSUFFICIENT EXPERIMENTAL DATA, ALL SUCH LEVELS WILL INTERFERE AMONG THEMSELVES WHEN THE MULTILEVEL BREIT-WIGNER SCATTERING OPTION IS USED.
15. NAME AND ESTABLISHMENT OF AUTHOR -
D. R. MATHEWS
GULF GENERAL ATOMIC COMPANY
P. O. BOX 608
SAN DIEGO, CALIFORNIA 92112
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (1063 CARDS)
SAMPLE PROBLEM (94 CARDS)
CONTROL INFORMATION (25 CARDS)
REFERENCE REPORT, GULF-GA-A12052
17. CATEGORY - A
KEYWORDS - RESONANCE CROSS SECTIONS, BREIT-WIGNER, MULTILEVEL, SCATTERING, FSDP2 CODES, FASDCP CODES

1. NAME OR DESIGNATION OF PROGRAM - WAMPUM
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM7044, CDC6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - THIS PROGRAM CALCULATES FUEL CYCLE COSTS ON A DETAILED BASIS, USING RESULTS OF NUCLEAR DEPLETION CALCULATIONS AND CERTAIN SPECIFIED ECONOMICS ASSUMPTIONS. THE PURPOSE IS TO PROVIDE A MEASURE OF PERFORMANCE FOR COMPARING OR OPTIMIZING FUEL CYCLES AND ASSOCIATED REACTOR CORE AND FUEL ELEMENT CHARACTERISTICS.
4. METHOD OF SOLUTION - WAMPUM FOLLOWS A PROCEDURE SIMILAR TO THAT OUTLINED IN GUIDE TO NUCLEAR POWER COST EVALUATION, TID-7025, VOLUME 4, WITH SOME MODIFICATION TO PROVIDE MORE GENERALITY IN APPLICATION.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
6. TYPICAL RUNNING TIME - LESS THAN 1 MINUTE IS REQUIRED.
7. UNUSUAL FEATURES OF THE PROGRAM -
 - (A) BOTH GOVERNMENT AND PRIVATE FUEL OWNERSHIP CONSIDERED.
 - (B) CAPITAL COSTS OF FUEL CYCLE OPERATIONS ARE EVALUATED DIRECTLY, BY APPLYING AN INTEREST RATE TO THE FABRICATION COST AND INVENTORY VALUE, AND IMPLICITLY, BY HOLDING CONSTANT THE PRESENT VALUE OF EACH COST ITEM OVER THE IRRADIATION PERIOD.
 - (C) PROVISION IS MADE FOR DISTINGUISHING BETWEEN FED AND BRED FUEL.
 - (D) TWO FUEL PARTICLE TYPES HAVING DIFFERENT ENRICHMENTS CAN BE ACCOMMODATED WHICH PERMITS CALCULATIONS INVOLVING SEGREGATED FUEL.
8. RELATED AND AUXILIARY PROGRAMS - REVISED GAD (ACC ABSTRACT 223)
9. STATUS - ABSTRACT FIRST DISTRIBUTED JULY 1966.
IBM7044 VERSION SUBMITTED FEBRUARY 1966.
CDC6600 VERSION SUBMITTED APRIL 1973.
10. REFERENCE - F. W. TODT AND J. R. TRIFLETT, A GENERAL FUEL CYCLE ECONOMICS CODE, GA-5316, OCTOBER 27, 1965.
11. MACHINE REQUIREMENTS - 32K IBM7044, 3 TAPES (INPUT, OUTPUT, SYSTEM)
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - IBM7040/7044 OPERATING SYSTEM (16/32K), VERSION 9, SCOPE 3.3 (CDC6600).

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
7044	F. W. TODD AND J. R. TRIPLETT
GULF GENERAL ATOMIC INCORPORATED
P. O. BOX 608
SAN DIEGO, CALIFORNIA 92112
6600	FRANK D. TYSON
TECHNICAL COMPUTER SERVICES
UNITED ENGINEERS AND CONSTRUCTORS, INC.
1401 ARCH STREET
PHILADELPHIA, PENNSYLVANIA 19105
16. MATERIAL AVAILABLE -
SOURCE DECKS (7044-1009 CARDS, 6600-1019 CARDS)
SAMPLE PROBLEMS (7044-62 CARDS, 6600-62 CARDS)
REFERENCE REPORT
17. CATEGORY - D
KEYWORDS - FUEL CYCLE ECONOMICS, DEPLETION, PERFORMANCE, FUEL
ELEMENTS, REVISED GAD CODES

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8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED APRIL 1967.
CDC3600 VERSION SUBMITTED JUNE 1966, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - A. DE VOLPI, K. G. PORGES AND G. JENSEN, COMPUTER CODE FOR REDUCTION OF COINCIDENCE COUNTING DATA, INTERNATIONAL JOURNAL OF APPLIED RADIATION AND ISOTOPES, VOL. 17, 1966.
G. JENSEN, COINC, FOR REDUCTION OF COINCIDENCE COUNTING DATA, ANL PROGRAM LIBRARY REPORT 1198/RP-258, JUNE 9, 1966.
11. MACHINE REQUIREMENTS -
12. PROGRAMMING LANGUAGE USED - FORTRAN 63
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
A. DE VOLPI, K. G. PORGES, AND G. JENSEN
ARGONNE NATIONAL LABORATORY
9700 SOUTH CASS AVENUE
ARGONNE, ILLINOIS 60439
16. MATERIAL AVAILABLE -
SOURCE DECK (3600-416 CARDS)
BINARY DECK (3600-217 CARDS)
SAMPLE PROBLEM (3600-31 CARDS)
REFERENCE REPORTS
17. CATEGORY - D
KEYWORDS - COINCIDENCE METHODS, STATISTICS, DECAY MEASUREMENTS,
DATA PROCESSING

1. NAME OR DESIGNATION OF PROGRAM - LASER
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM7094,36C/370
3. DESCRIPTION OF PROBLEM OR FUNCTION - LASER IS BASED ON MODIFIED VERSIONS OF THE SLOWING-DOWN PROGRAM MUFT AND THE THERMALIZATION TRANSPORT THEORY PROGRAM THERMOS, AND PERFORMS A CALCULATION OF THE NEUTRON SPECTRUM IN A UNIFORM LATTICE MADE UP OF CYLINDRICAL RODS, CLADDING, AND SURROUNDING MODERATOR. THE THERMAL CUTOFF IN LASER IS 1.855 EV. THE PROGRAM PERFORMS A BURNUP CALCULATION FOR THE LATTICE. THE SPATIAL DISTRIBUTION OF BURNUP WITHIN THE FUEL RODS IS EXPLICITLY CALCULATED. THE PROGRAM WILL, AT OPTION, ACCOUNT FOR ALL NON-LINEARITIES AND MUTUAL CONNECTIONS IN THE SYSTEM OF BURNUP EQUATIONS. THIS CALCULATION ACCOUNTS FOR THE VARIATION OF THE NEUTRON FLUX IN SPACE AND ENERGY DURING EACH TIME-STEP. A BUCKLING AND A BORON CONCENTRATION SEARCH (CRITICALITY SEARCH) ARE PROVIDED AS OPTIONS. OUTPUT INCLUDES EDITS IN THE ENERGY RANGE ZERO LESS THAN OR EQUAL TO E LESS THAN OR EQUAL TO 0.625 EV.
4. METHOD OF SOLUTION - THE METHODS USED IN SOLVING THE NEUTRON TRANSPORT EQUATION ARE ESSENTIALLY THOSE UTILIZED BY THE MUFT AND THERMOS PROGRAMS. THE NON-LINEAR EFFECTS IN THE BURNUP EQUATIONS ARE ACCOUNTED FOR BY COMPUTING THE RATE OF CHANGE OF THE NEUTRON FLUX WITH TIME AND BY USING THE RUNGE-KUTTA NUMERICAL PROCEDURE TO RECOVER THE FLUX AS A FUNCTION OF TIME. THE DEPLETION EQUATIONS ARE SOLVED BY ASSUMING A POLYNOMIAL EXPANSION FOR EXPONENTIAL FUNCTIONS. THE PRODUCTION AND LOSS OF CHAIN MEMBERS DURING IRRADIATION ARE EVALUATED BY SIMPLE MATRIX ALGEBRA. THE PROCEDURE ALLOWS FOR A TIME-DEPENDENT FLUX, IN THE FORM OF A POWER SERIES.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THIS VERSION OF LASER IS RESTRICTED TO ONE-DIMENSIONAL, CYLINDRICAL GEOMETRY. THE MAXIMUM NUMBER OF SPACE POINTS IS 14, WITH A MAXIMUM OF 5 SPACE POINTS IN THE FUEL REGION. THE CODE IS RESTRICTED TO 4 MIXTURES (FUEL, CLADDING, MODERATOR, AND NON-ABSORBING HEAVY SCATTERER). THE MODERATOR CAN BE EITHER LIGHT WATER (NELKIN OR FREE GAS SCATTERING KERNEL), OR HEAVY WATER (NELKIN SCATTERING KERNEL). THE CLADDING MATERIAL CAN BE STAINLESS STEEL, ALUMINUM OR ZIRCALLOY-2. THE FUEL CAN BE A METAL, OXIDE OR CERMET. THE EPITHERMAL AND FAST ENERGY RANGES INCLUDE 50 ENERGY GROUPS. THE THERMAL RANGE INCLUDES 35 ENERGY GROUPS. ONLY THE U235 CHAIN (THROUGH U236) AND THE U238 CHAIN (THROUGH PU242) ARE AVAILABLE IN THE CODE. THE FISSION PRODUCTS ARE SEPARATED INTO XE135, THE DIRECTLY PRODUCED SM149, AND ALL OTHER FISSION PRODUCTS LUMPED INTO ONE PSEUDO FISSION PRODUCT. THE CROSS SECTIONS FOR THE LUMPED FISSION PRODUCTS ARE REPRESENTED BY POLYNOMIALS IN THE BURNUP. THE SPATIAL DISTRIBUTION OF U238 RESONANCE CAPTURES WITHIN THE FUEL RODS IS INPUT.
6. TYPICAL RUNNING TIME - THE GREATER PART OF THE LASER EXECUTION TIME IS CONSUMED BY THE THERMOS CALCULATION. EXECUTION TIMES FOR

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6. TYPICAL RUNNING TIME (CONTINUED)
NO-BURNUP CASES ARE APPROXIMATELY 1-2 MINUTES WHEN THE MAXIMUM NUMBER OF SPACE POINTS IS SPECIFIED. FOR A BURNUP PROBLEM, EXECUTION TIME IS 1-2 MINUTES WHEN THE LINEAR APPROXIMATION IS CHOSEN, AND 4-6 MINUTES WHEN NON-LINEAR EFFECTS ARE INCLUDED.
7. UNUSUAL FEATURES OF THE PROGRAM - THE PROGRAM PROVIDES A COMPLETE EDIT FOR THE LATTICE IN THE ENERGY RANGE ZERO LESS THAN OR EQUAL TO 5 LESS THAN OR EQUAL TO TEN MEV, INCLUDING INTEGRAL QUANTITIES AND HOMOGENIZED FEW-GROUP CROSS SECTIONS. THE USER HAS A CHOICE OF THERMAL NEUTRON SCATTERING KERNELS, RESONANCE SELF-SHIELDING TREATMENTS, AND CELL CRITICALITY SEARCHES. A LINEAR AND A NON-LINEAR TREATMENT OF THE BURNUP EQUATIONS ARE PROVIDED. THE DETAILED SPATIAL BURNUP DISTRIBUTION WITHIN THE FUEL RODS IS TAKEN INTO ACCOUNT. A BURNUP PROBLEM CAN BE CONTINUED AFTER ANY TIME-STEP, BY USING A SPECIAL INPUT DECK PUNCHED AFTER EACH TIME-STEP.
8. RELATED AND AUXILIARY PROGRAMS - LIBP4 GENERATES THE THERMAL LIBRARY TAPE. SIG1 CONVERTS, BY INTERPOLATION, THE CROSS SECTION DATA CORRESPONDING TO A GIVEN ENERGY MESH TO CROSS SECTION DATA SUITABLE FOR INPUT TO THE LIBP4 PROGRAM.
9. STATUS - ABSTRACT FIRST DISTRIBUTED APRIL 1967.
IBM7094 VERSION SUBMITTED AUGUST 1966.
IBM360 VERSION SUBMITTED FEBRUARY 1973, REPLACED SEPTEMBER 1973, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - C. G. PONCELET, BURNUP PHYSICS OF HETEROGENEOUS REACTOR LATTICES, WCAP-6069, JUNE 1965.
C. G. PONCELET, LASER - A DEPLETION PROGRAM FOR LATTICE CALCULATIONS BASED ON MLFT AND THERMOS, WCAP-6073, APRIL 1966.
LASER, ACC NO. 249.360, ACC PROGRAMMING NOTE 74-7, OCTOBER 1973.
11. MACHINE REQUIREMENTS - 32K IBM7094, 7090, 7094-II WITH OVERLAY TAPE, LIBRARY TAPE, AND 3 SCRATCH TAPES. 15CK IBM360 WITH LIBRARY TAPE AND 2 SCRATCH UNITS.
12. PROGRAMMING LANGUAGES USED - FORTRAN IV (IBM7094, 360), LIBRARY (IBM7094) IN MAP
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - STANDARD IBM FORTRAN IV MONITOR (IBM7094), OS/360 (IBM360).
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
7094 C. G. PONCELET
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PWR PLANTS DIVISION
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P. O. BOX 355

15. NAME AND ESTABLISHMENT OF AUTHOR(S) (CONTINUED)
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CHATTANOOGA, TENNESSEE 37401

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (LASER 7094-5844 CARDS, 360-7762 CARDS, LIBP 7094-
422 CARDS, 360-385 CARDS, SIG1 7094-170 CARDS,
360-165 CARDS)
SAMPLE PROBLEMS (LASER 7094-17 CARDS, 360-15 CARDS, LIBP 7094-
1498 CARDS, 360-1496 CARDS)
LIBRARIES (LASER 7094-2664 CARDS, 360-140 BINARY RECORDS)
LOAD MODULE LASER.LOAD (360-320 BLOCKS)
CONTROL INFORMATION (JCL 360-24 CARDS)
REFERENCE REPORTS AND ACC NOTE

17. CATEGORY - B
KEYWORDS - SLOWING DOWN, THERMALIZATION, SPECTRA, LATTICES, DEPLE-
TION, 1-DIMENSIONAL, CYLINDERS, CRITICALITY SEARCHES,
LIBP4 CODES, SIG1 CODES

1. NAME OR DESIGNATION OF PROGRAM - R101
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC3600, IBM7094,360
3. DESCRIPTION OF PROBLEM OR FUNCTION - R101 SOLVES THE SPACE-INDEPENDENT, ONE-ENERGY GROUP REACTOR KINETICS EQUATIONS TO DETERMINE THE TIME VARIATION OF NEUTRON DENSITY GIVEN SPECIFIED INITIAL CONDITIONS. ANY OF FOUR PROGRAMMED REPRESENTATIONS OF EXCESS REACTIVITY CAN BE SELECTED.
4. METHOD OF SOLUTION - THE METHOD OF SOLUTION WAS ORIGINALLY DESCRIBED IN ANL-5577.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
MAXIMUM NUMBER OF DELAY GROUPS = 20
6. TYPICAL RUNNING TIME - APPROXIMATELY 360 CALCULATIONS PER SECOND CAN BE PERFORMED ON THE CDC3600.
7. UNUSUAL FEATURES OF THE PROGRAM - AN INTERRUPT FACILITY IS INCORPORATED WHICH PERMITS PARAMETER CHANGES AND EDIT OR TERMINATION WHEN A SPECIFIED VALUE OF A PARAMETER IS ATTAINED.
8. RELATED AND AUXILIARY PROGRAMS - R102 (ACC ABSTRACT 168) IS THE INVERSE PROGRAM.
9. STATUS - ABSTRACT FIRST DISTRIBUTED APRIL 1967.
CDC3600 VERSION SUBMITTED OCTOBER 1966, SAMPLE PROBLEM EXECUTED BY ACC.
IBM7094 VERSION SUBMITTED NOVEMBER 1966.
IBM360 VERSION SUBMITTED FEBRUARY 1973, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - J. J. KAGANOVE, REACTOR KINETICS, R101 AND PROGRAM LIBRARY REPORT, OCTOBER 7, 1964.
R. C. BRITTAN, SOME PROBLEMS IN THE SAFETY OF FAST REACTORS, ANL-5577, MAY 1956.
11. MACHINE REQUIREMENTS -
12. PROGRAMMING LANGUAGES USED - FORTRAN 63 (CDC3600) AND FORTRAN IV (IBM7094,360)
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE (CDC3600), IBSYS (IBM7094), OS/360 (IBM360).
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
3600,360 J. J. KAGANOVE
APPLIED MATHEMATICS DIVISION

15. NAME AND ESTABLISHMENT OF AUTHOR(S) (CONTINUED)

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7094

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PITTSBURGH, PENNSYLVANIA 15236

16. MATERIAL AVAILABLE -

SOURCE DECKS (3600-439 CARDS, 7094-392 CARDS, 360-450 CARDS)
BINARY DECK (3600-165 CARDS)
SAMPLE PROBLEMS (3600-36 CARDS, 7094-36 CARDS, 360-36 CARDS)
REFERENCE REPORT, AND PROGRAM LIBRARY REPORT

17. CATEGORY - E

KEYWORDS - SPACE-INDEPENDENT KINETICS, REACTIVITY

1. NAME OR DESIGNATION OF PROGRAM - RSAC
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - RSAC GENERATES A FISSION PRODUCT INVENTORY FROM A GIVEN SET OF REACTOR OPERATING CONDITIONS AND THEN COMPUTES THE EXTERNAL GAMMA DOSE, THE DEPOSITION GAMMA DOSE, AND/OR THE INHALATION-INGESTION DOSE TO CRITICAL BODY ORGANS AS A RESULT OF EXPOSURE TO THESE FISSION PRODUCTS. PROGRAM OUTPUT INCLUDES REACTOR OPERATING HISTORY, FISSION PRODUCT INVENTORY, DOSES, AND INGESTION PARAMETERS.
4. METHOD OF SOLUTION - THE FISSION PRODUCT INVENTORY GENERATED BY THE REACTOR OPERATING CONDITIONS AND THE INVENTORY REMAINING AT VARIOUS TIMES AFTER RELEASE ARE COMPUTED USING THE EQUATIONS OF W. RUBINSON IN JOURNAL OF CHEMICAL PHYSICS, VOL. 17, PAGES 542-547, JUNE 1949. THE EXTERNAL GAMMA DOSE AND THE DEPOSITION GAMMA DOSE ARE CALCULATED BY DETERMINING DISINTEGRATION RATES AS A FUNCTION OF SPACE AND TIME AND THEN INTEGRATING USING HERMITES NUMERICAL TECHNIQUES FOR THE SPATIAL DEPENDENCE. THE INHALATION-INGESTION DOSE IS DETERMINED BY THE TYPE AND QUANTITY OF ACTIVITY INHALED AND THE BIOLOGICAL RATE OF DECAY FOLLOWING INHALATION. THESE QUANTITIES ARE INTEGRATED WITH RESPECT TO TIME TO OBTAIN THE DOSE. THE INGESTION DOSE IS RELATED TO THE INHALATION DOSE BY AN INPUT CONSTANT.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
6. TYPICAL RUNNING TIME - ABOUT 6 MINUTES ARE REQUIRED TO RUN BOTH SAMPLE PROBLEMS.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED APRIL 1967.
IBM7040 (MAP) VERSION SUBMITTED JANUARY 1967, DELETED AUGUST 1968.
IBM7040 (FORTRAN) VERSION SUBMITTED AUGUST 1968, DELETED JULY 1972.
IBM360 VERSION SUBMITTED JULY 1972, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - R. L. COATES AND N. R. HERTON, RSAC - A RADIOLOGICAL SAFETY ANALYSIS COMPUTER PROGRAM, IDO-17151, MAY 1966.
L. C. RICHARDSON, USERS MANUAL FOR FORTRAN VERSION OF RSAC, A RADIOLOGICAL SAFETY ANALYSIS COMPUTER PROGRAM, IDO-17261, MAY 1968.
11. MACHINE REQUIREMENTS - 150K BYTES AND 1 TAPE DRIVE

12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHOR -
L. C. RICHARDSON
AEROJET NUCLEAR CORPORATION
P. O. BOX 1845
IDAHO FALLS, IDAHO 83401
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (2344 CARDS)
SAMPLE PROBLEM (965 CARDS)
CONTROL INFORMATION (JCL 63 CARDS)
LOAD MODULE (120 BLOCKS)
REFERENCE REPORTS
17. CATEGORY - G
KEYWORDS - RADIOACTIVITY, CONTINUOUS RELEASE, INSTANTANEOUS
RELEASE, FISSION PRODUCTS, ATMOSPHERE, DOSE RATES

1. NAME OR DESIGNATION OF PROGRAM - PDQ7
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600, IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - PDQ7 SOLVES FEW-GROUP NEUTRON DIFFUSION-DEPLETION PROBLEMS IN ONE, TWO, AND THREE DIMENSIONS. ADJOINT SOLUTIONS ARE ALSO AVAILABLE AND TWO OVERLAPPING THERMAL GROUPS MAY BE USED IN ONE AND TWO-DIMENSIONAL PROBLEMS. EITHER POINTWISE OR REGIONWISE DEPLETION MAY BE PERFORMED USING THE HARMONY DEPLETION SYSTEM. THE GEOMETRY MAY BE RECTANGULAR, CYLINDRICAL, OR SPHERICAL IN ONE DIMENSION, RECTANGULAR, CYLINDRICAL, OR HEXAGONAL IN TWO DIMENSIONS, AND RECTANGULAR OR HEXAGONAL IN THREE DIMENSIONS. ALL GEOMETRIES PROVIDE FOR VARIABLE MESH SPACING IN ALL DIMENSIONS. ZERO FLUX, ZERO CURRENT, AND ROTATIONAL SYMMETRY BOUNDARY CONDITIONS ARE AVAILABLE, AND BOUNDARY VALUE PROBLEMS MAY BE SOLVED BY SPECIFYING THE FLUX VALUES ON ONE OR MORE BOUNDARIES. THE BETTIS REVISED PDQ7 MAY BE USED TO ALSO SOLVE ADDITIVE FAST-SOURCE AND SIMPLIFIED PL PROBLEMS AS WELL AS THE THREE-DIMENSIONAL SYNTHESIS EIGENVALUE PROBLEM. CONTROL SEARCHES, THERMAL FEEDBACK, AND XENON FEEDBACK ARE OPTIONAL. THE IBM360 AND VERSION CAN BE USED TO SOLVE THREE-DIMENSIONAL SYNTHESIS PROBLEMS.
4. METHOD OF SOLUTION - DIFFERENCE EQUATIONS ARE OBTAINED AT EACH POINT BY INTEGRATING THE DIFFERENTIAL EQUATIONS OVER AN APPROPRIATE MESH ELEMENT. THE RESULTING EQUATIONS ARE THREE-POINT, FIVE-POINT, AND SEVEN-POINT IN ONE, TWO, AND THREE DIMENSIONS EXCEPT FOR HEXAGONAL GEOMETRY, WHERE THE NUMBER OF POINTS IS INCREASED BY TWO. THE GROUP EQUATIONS ARE SOLVED USING A SINGLE-LINE CYCLIC CHEBYSHEV SEMI-ITERATIVE TECHNIQUE AND THE SOURCE ITERATIONS ARE ACCELERATED BY A PROCEDURE BASED ON CHEBYSHEV POLYNOMIALS.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE TOTAL NUMBER OF GROUPS IS LIMITED TO 5. THE PRODUCT OF GROUPS AND POINTS CANNOT EXCEED 300,000 AND THE PLANE SIZE IN THREE-DIMENSIONAL PROBLEMS IS RESTRICTED TO 8000 POINTS. FOR THE BETTIS REVISED PDQ7 SIX EQUATIONS MAY BE SOLVED WHEN THE FAST GROUP TREATMENT IS SIMPLIFIED P3. THERE ARE VERY FEW FIXED CONSTRAINTS ON SPATIAL PROBLEM SIZES. THE BETTIS REVISED PDQ7 HAS SUCCESSFULLY RUN EXPLICIT THREE-DIMENSIONAL PROBLEMS UP TO ABOUT 800,000 GROUP POINTS. THREE-DIMENSIONAL SYNTHESIS PROBLEMS UP TO 15,000,000 GROUP POINTS HAVE ALSO BEEN EXECUTED SUCCESSFULLY.
6. TYPICAL RUNNING TIME - THE RUNNING TIME IN HOURS MAY BE ESTIMATED BY DIVIDING THE PRODUCT OF GROUPS AND POINTS BY 150000. THE ACTUAL TIME MAY VARY WIDELY FROM THIS ESTIMATE DUE EITHER TO SPECIAL CONVERGENCE DIFFICULTIES OR TO THE COMPLEXITY OF THE DEPLETION FORMULATION. SAMPLE PROBLEM RUNNING TIME ON THE 360/195 IS ABOUT 4 MINUTES.
7. UNUSUAL FEATURES OF THE PROGRAM -

8. RELATED AND AUXILIARY PROGRAMS - HARMONY TABLE SETS MAY BE INPUT ON CARDS OR MAY BE OBTAINED FROM A FILE GENERATED BY A CROSS SECTION PROGRAM. ON REQUEST, PDQ7 WILL PREPARE OUTPUT FILES CONTAINING FLUX, CONCENTRATION, POWER, INTEGRAL, GEOMETRY, AND SYNTHESIS INTEGRAL DATA, AND THESE FILES MAY BE FURTHER PROCESSED IN AUXILIARY PROGRAMS. THE BETTIS VERSION OF PDQ7 USES THE NEW BETTIS ENVIRONMENTAL ROUTINES, WHICH HAVE NOT YET BEEN RELEASED. THE B+W VERSION USES THE B+W VERSION OF THE BETTIS ENVIRONMENTAL ROUTINES (ACC ABSTRACT 478).
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1967.
 CDC6600 (BETTIS) VERSION SUBMITTED MAY 1967, REPLACED BY UPDATED VERSION JUNE 1971.
 IBM360 (IBM) VERSION SUBMITTED FEBRUARY 1969, DELETED NOVEMBER 1971.
 CDC6600 (BARCOCK AND WILCOX) VERSION SUBMITTED FEBRUARY 1970.
 IBM360 (AEROJET NUCLEAR) VERSION SUBMITTED APRIL 1970, REVISED APRIL 1971, REPLACED BY THIRD REVISION AUGUST 1972, REVISED MARCH 1973, SAMPLE PROBLEM EXECUTED BY ACC.
 CDC6600 KRCNCS (BOEING) VERSION SUBMITTED JULY 1973.
10. REFERENCES - W. R. CADWELL, PDQ-7 REFERENCE MANUAL, WAPD-TM-678, JANUARY 1967.
 R. J. BREEN, O. J. MARLOWE, AND C. J. PFEIFER, HARMONY - SYSTEM FOR NUCLEAR REACTOR DEPLETION COMPUTATION, WAPD-TM-478, JANUARY 1965.
 OUTPUT FOR THE BETTIS CDC-6600 REVISED VERSION OF PDQ7, 1971.
 C. J. PFEIFER, PDQ-7 REFERENCE MANUAL II, WAPC-TM-947(L), FEBRUARY 1971.
 C. J. PFEIFER, CDC-6600 FORTRAN PROGRAMMING - BETTIS ENVIRONMENTAL REPORT, WAPD-TM-668, JANUARY 1967.
 INSTALLATION OF PDQ-7 ON THE CDC 6600 IN CONJUNCTION WITH MODEL, CDC NOTE, 1971.
 A. W. BROWN, J. A. MCCLURE, AND R. J. WAGNER, SUMMARY OF PDQ-7 (IBM-360-370 VERSION) INPUT DATA REQUIREMENTS AND OPERATING PROCEDURES, ANCR-1061, MARCH 1972.
 PDQ-7 TRANSMITTAL TAPE (ACC NO. 275.36CD), ANC NOTE, 1972.
 R. J. WAGNER, OPERATIONAL NOTES FOR PDQ-7/14, ACC NO. 275.360D, ANC NOTE, 1972.
 UPD, A PROGRAM TO UPDATE SOURCE DECKS, ANC NOTE P01750.
 NRTS ENVIRONMENTAL SUBROUTINE MANUAL, ANC DOCUMENT, DECEMBER 1972.
 PDQ7, ACC NO. R275.6600D, ARGONNE CODE CENTER PROGRAMMING NOTE 74-16, DECEMBER 3, 1973.
11. MACHINE REQUIREMENTS - THE CENTRAL MEMORY SIZE FOR THE BETTIS VERSION MUST BE AT LEAST 64K AND THERE MUST BE FOUR NON-SYSTEM DISKS, EACH ON ITS OWN CHANNEL. THE 360 VERSION REQUIRES AT LEAST 400K BYTES OF CCRE AND MODEL 2314 OR 3330 DISK PACKS.

12. PROGRAMMING LANGUAGES USED - FORTRAN IV AND ASCENT (6600), FORTRAN IV(H) AND EAL (360)
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 3.0 (BETTIS REV.), SCOPE 3.1.6 (B+W 6600), OS/360(360), AND KRONOS 2.0 (BCS 6600).
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THE REQUIRED SOFTWARE ENVIRONMENT IS DESCRIBED IN REFERENCE 5. IT INCLUDES ROUTINES FOR PROGRAM LOADING, INPUT CONVERSION AND PROCESSING, STORAGE AND RETRIEVAL OF PERMANENT FILES, SCRATCH INPUT/OUTPUT, AND STORAGE ALLOCATION. CALL REMARK IN SUBROUTINE CASENN REFERS TO A 6600 SYSTEM ROUTINE FOR DISPLAY OF MESSAGES ON THE OPERATOR SCOPE. CALL TICK REFERS TO A 6600 SYSTEM ROUTINE FOR LOGGING JOB TIME USED. SUBSTITUTE ROUTINES WILL BE REQUIRED FOR USE OF THIS PROGRAM ON OTHER MACHINES.
15. NAME AND ESTABLISHMENT OF AUTHORS -

6600	W. R. CADWELL AND C. J. PFEIFER WESTINGHOUSE ELECTRIC CORPORATION BETTIS ATOMIC POWER LABORATORY P. O. BOX 79 WEST MIFFLIN, PENNSYLVANIA 15122
360	R. J. CREASY INTERNATIONAL BUSINESS MACHINES CORPORATION 2670 HANOVER STREET PALO ALTO, CALIFORNIA 94304
360	R. J. WAGNER, J. A. MCCLURE, AND A. W. BROWN COMPUTER SCIENCE BRANCH AEROJET NUCLEAR COMPANY P. O. BOX 1845 IDAHO FALLS, IDAHO 83401
6600 B+W	M. L. DECH AND R. W. MCCRANEY CENTRAL DATA CORPORATION G. R. POETSCHAT AND G. L. RUSSELL THE BABCOCK + WILCOX COMPANY POWER GENERATION DIVISION P. O. BOX 1260 LYNCHBURG, VIRGINIA 24505
6600 KRONOS	F. M. KNOX BOEING COMPUTER SERVICES, INC. P. O. BOX 24346 SEATTLE, WASHINGTON 98124
16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION

MAGNETIC TAPE TRANSMITTAL	(BETTIS 6600-3 TAPES, B+W 6600-2 TAPES, AEROJET 360-1 TAPE, BCS 6600-1 TAPE)
SOURCE DECKS	(BETTIS 6600-51,497 CARDS, B+W 6600-27,446 CARDS,

16. MATERIAL AVAILABLE (CONTINUED)

AEROJET 360-38,258 CARDS)
UPDATE FILES (BOEING UPDATE OLDPL CF PDQ7 6600-238 RECORDS,
UPDATE OLDPL OF BETTIS ENVIRONMENTAL ROUTINES
6600-130 RECORDS, MODIFY CPL OF PDQ,MFN,CATLIST
6600-20 RECORDS)
IBM 2314 LOAD MODULE (AEROJET PCS PDQTRNMT 360-1811 BLOCKS)
SAMPLE PROBLEMS (BETTIS 6600-80 CARDS, AEROJET 360-761 CARDS,
B+W 6600-69 CARDS)
AUXILIARY PROGRAMS (AEROJET BUFR 246 CARDS, PDQDI 41 CARDS,
PDQD 148 CARDS, PDQR 107 CARDS, PDQTL 53
CARDS, MISCELLANEOUS 3127 CARDS)
FLUX FILES (AEROJET 360-137 BLOCKS)
SAMPLE PROBLEM OUTPUT LISTINGS (BETTIS 6600-36 PAGES, AEROJET
360-89 PAGES)
REFERENCE REPORTS, WAPD-TM-678, WAPD-TM-668, WAPD-TM-947(L),
ANCR-1061, NRTS MANUAL, AND NOTES

17. CATEGORY - D

KEYWORDS - DEPLETION, DIFFUSION EQUATIONS, 1-DIMENSIONAL, SLABS,
CYLINDERS, SPHERES, 2-DIMENSIONAL, HEXAGONAL, X-Y, R-Z,
3-DIMENSIONAL, X-Y-Z, SYNTHESIS, FEW-GROUP, SEARCHES,
HARMONY CODES, UPD CODES, BUFR CODES, PDQDI CODES, PDQD
CODES, PDQR CODES, PDQTL CODES

1. NAME OR DESIGNATION OF PROGRAM - SEALSHELL2 (M0110)
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600, IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - THE SEALSHELL2 PROGRAM DETERMINES STRESSES, STRAINS, DEFLECTIONS, AND REACTIONS IN A THICK SHELL OF REVOLUTION WITH AXISYMMETRIC LOADING. THE LOADING CONSISTS OF A TEMPERATURE DISTRIBUTION, INSIDE AND OUTSIDE PRESSURE DISTRIBUTIONS, AND CIRCUMFERENTIAL FORCES AND MOMENTS APPLIED TO THE MIDDLE SURFACE. THE SHELL IS LINEAR-ELASTIC WITH TENSILE, BENDING, AND SHEAR STRAINS.
4. METHOD OF SOLUTION - THE SHELL IS DIVIDED INTO 2 TO 100 SEGMENTS. EACH SEGMENT IS SUBJECTED TO 11 DEFORMATION SHAPES, WHOSE MAGNITUDES ARE CALCULATED BY THE PRINCIPLE OF VIRTUAL WORK. THAT IS, FOR SMALL VIRTUAL CHANGES IN MAGNITUDE, THE CHANGES IN STRAIN ENERGY AND EXTERNAL WORK ARE DETERMINED. THEN EQUATING THE ENERGY TO THE WORK GIVES A SET OF SIMULTANEOUS EQUATIONS WHICH MAY BE SOLVED FOR THE MAGNITUDES.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
100 SEGMENTS
11 DEFORMATION SHAPES PER SEGMENT
6. TYPICAL RUNNING TIME - EXECUTION TIME ON AN IBM360/40 IS 0.7 MINUTES PER ELEMENT.
7. UNUSUAL FEATURES OF THE PROGRAM - THE PROGRAM WILL HANDLE THICK SHELLS OF REVOLUTION, AS WELL AS THE USUAL THIN SHELL STRUCTURES. AS DISCUSSED IN ADDENDUM I, AN OPTION ALLOWS THE REQUESTOR TO INPUT INFLUENCE COEFFICIENTS OF THE FLEXIBILITY MATRIX OF ANY SEGMENT. THE COEFFICIENTS MAY BE FOR ANY AXISYMMETRIC STRUCTURE, SUCH AS A TUBE SHEET IN A HEAT EXCHANGER. IN THIS WAY, DIFFERENT BRANCHES OF SHELLS MAY BE CONNECTED TOGETHER. ANOTHER APPLICATION IS TO CONDENSE A GROUP OF SEGMENTS INTO A SINGLE ELEMENT WHICH MAY BE USED IN A SERIES OF PROBLEMS AND SO CUT DOWN RUNNING TIME ON THE COMPUTER. ALSO, USING THE CONDENSED GROUPS OF SEGMENTS AS A SINGLE SEGMENT ALLOWS THE USER TO SPECIFY MORE ELEMENTS IN THE ANALYSIS OF A CRITICAL REGION IN THE SHELL.
8. RELATED AND AUXILIARY PROGRAMS - THE CDC6600 VERSION A USES THE BETTIS ENVIRONMENTAL ROUTINES (ACC ABSTRACT 478).
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1967.
CDC6600 VERSION A SUBMITTED AUGUST 1967, REVISED JULY 1969.
IBM360 VERSION SUBMITTED JANUARY 1972, SAMPLE PROBLEM EXECUTED BY ACC.
CDC6600 VERSION B SUBMITTED NOVEMBER 1972.

10. REFERENCES - C. M. FRIEDRICH, SEAL-SHELL-2, A COMPUTER PROGRAM FOR THE STRESS ANALYSIS OF A THICK SHELL OF REVOLUTION WITH AXISYMMETRIC PRESSURES, TEMPERATURES, AND DISTRIBUTED LOADS, WAPC-TM-398, DECEMBER 1963, ADDENDUM I, APRIL 1967, AND ADDENDUM II, JUNE 1969.
 C. J. PFEIFER, CDC-6600 FORTRAN PROGRAMMING - BETTIS ENVIRONMENTAL REPORT, WAPC-TM-668, JANUARY 1967.
 L. MCRAN, EXCERPT FROM WESTINGHOUSE TELE-COMPUTER CENTER STANDARDS AND FACILITIES REPORT, 1969.
 DOCUMENTATION DIFFERENCES PERTAINING TO WTSC VERSION OF SEAL-SHELL2, WTSC NCTE, NOVEMBER 1972.
11. MACHINE REQUIREMENTS - 32K MEMORY (CDC6600), 185K BYTES MEMORY (IBM360)
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 2.0 (CDC6600) AND CS/360 (IBM360).
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - AN OPTION IS INCLUDED TO PLOT THE SHELL GEOMETRY ON THE CDC280 MICROFILM RECORDER WITH THE 6600 VERSION A OR ON THE CALCOMP663 WITH THE 360 VERSION. THE 6600 VERSION B INCLUDES AN OPTION FOR A SHELL GEOMETRY PLOT AND A STRESS PLOT ON EITHER THE CALCOMP OR THE DATAGRAPHIX PLOTTER USING THE WTSC PLOT PACKAGE OF SUBROUTINES WHICH ARE IN THE WTSC LIBRARY AND ARE DESCRIBED IN REFERENCE 3, BUT ARE NOT INCLUDED IN THE SOURCE DECK. THESE SUBROUTINES INCLUDE PLOT1, PLOT2, PLOT3, LINE, RAISE, PRESET, WXACNV, WXLABEL, PSCHR, AND PDVICE. THE PROGRAM WILL RUN WITHOUT PLOTS IF THESE SUBROUTINES ARE DUMMIED OUT.
15. NAME AND ESTABLISHMENT OF AUTHORS -
 6600A C. M. FRIEDRICH
 BETTIS ATOMIC POWER LABORATORY
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 360 P. G. GARSIDE
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 P. O. BOX 5888
 DENVER, COLORADO 80217
 6600B W. P. KUNKEL
 MANAGER, APPLICATION SUPPORT
 WESTINGHOUSE TELE-COMPUTER SYSTEMS CORPORATION
 2040 ARDMORE BOULEVARD
 PITTSBURGH, PENNSYLVANIA 15221
16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
 MAGNETIC TAPE TRANSMITTAL

ACC ABSTRACT 282

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16. MATERIAL AVAILABLE (CONTINUED)

SOURCE DECKS (6600A-1999 CARDS, 360-2059 CARDS, 6600B-2202 CARDS)

SAMPLE PROBLEMS (6600A-31 CARDS, 360-31 CARDS, 6600B-31 CARDS)

SAMPLE PROBLEM OUTPUT (25 SELECTED PAGES)

REFERENCE REPORTS, WAPD-TM-398, ADDENDUM I, ADDENDUM II, EXCERPT, AND NOTE

17. CATEGORY - I

KEYWORDS - STRESSES, SHELLS, PRESSURE DISTRIBUTION, TEMPERATURE DISTRIBUTION, DEFORMATION, ELASTICITY

ACC ABSTRACT 291

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02/72

15. NAME AND ESTABLISHMENT OF AUTHOR -

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16. MATERIAL AVAILABLE -

SOURCE DECK (1108-358 CARDS)
REFERENCE REPORT

17. CATEGORY - B

KEYWORDS - ELASTIC SCATTERING CROSS SECTIONS, HEXAGONAL LATTICES,
ANISOTROPIC SCATTERING, AVERAGES

1. NAME OR DESIGNATION OF PROGRAM - PSEUCC
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - UNIVAC1108, IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - RESONANCE PARAMETERS ARE CONSTRUCTED FROM AVERAGE NUCLEAR PROPERTIES IN THE RESOLVED RESONANCE REGION.
4. METHOD OF SOLUTION - RANDOM SAMPLING TECHNIQUES ARE USED TO SELECT FROM ASSUMED DISTRIBUTION FUNCTIONS FOR LEVEL SPACINGS AND WIDTHS.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
500 LADDERS
4000 RESONANCES PER LADDER
6. TYPICAL RUNNING TIME - 9 SECONDS ARE REQUIRED FOR ONE LADDER OF 1248 RESONANCES.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - OUTPUT DATA MAY BE PREPARED FOR THE GAM2, GAROL (ACC ABSTRACT 219), OR GAP (ACC ABSTRACT 316) PROGRAMS.
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1967.
UNIVAC1108 VERSION SUBMITTED JULY 1967.
IBM360 VERSION SUBMITTED JUNE 1969, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCE - M. W. DYOS, CONSTRUCTION OF STATISTICAL RESONANCES IN THE UNRESOLVED RESONANCE REGION, THE PSEUDO CODE, GA-7136, MAY 26, 1966.
11. MACHINE REQUIREMENTS - 15K MEMORY
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - EXEC II (UNIVAC1108), OS/360 (IBM360).
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THE USER CAN CHOOSE EITHER TWO OR THREE DEGREES OF FREEDOM FOR THE DISTRIBUTION OF FISSION WIDTHS.
15. NAME AND ESTABLISHMENT OF AUTHORS -
1108 D. MATHEWS
GULF GENERAL ATOMIC INCORPORATED
P. O. BOX 608
SAN DIEGO, CALIFORNIA 92112

360 L. GARCIA DE VIECMA

ACC ABSTRACT 292

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15. NAME AND ESTABLISHMENT OF AUTHOR(S) (CONTINUED)
NEA COMPUTER PROGRAM LIBRARY
ISPRA, ITALY
16. MATERIAL AVAILABLE -
SOURCE DECKS (1108-326 CARDS, 360-318 CARDS)
SAMPLE PROBLEMS (1108-6 CARDS, 360-6 CARDS)
REFERENCE REPORT
17. CATEGORY - A
KEYWORDS - RESOLVED REGION, RESONANCE PARAMETERS, STATISTICS,
INPUT DATA PREPARATION

1. NAME OR DESIGNATION OF PROGRAM - MARS
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM7094
3. DESCRIPTION OF PROBLEM OR FUNCTION - MARS PERFORMS A COUPLED NEUTRONICS-HYDRODYNAMICS CALCULATION FOR A FINITE CYLINDER CORE WITH CONCENTRIC REGIONS OF DIFFERENT COMPOSITIONS AND CHARACTERISTICS TO OBTAIN THE TIME-DEPENDENT ENERGY RELEASE THAT RESULTS FROM THE INSERTION OF REACTIVITY ACCORDING TO A PRESCRIBED PROGRAM. THE BASIC USE FOR THIS PROGRAM IS FOUND IN ANALYSIS OF FAST REACTOR CORE COLLAPSE ACCIDENTS. THE REACTIVITY CHANGES DUE TO MATERIAL DISPLACEMENT IS DETERMINED BY THE USE OF PERTURBATION THEORY AND THE PRESSURE GENERATION FOR THE HYDRODYNAMICS CALCULATION IS DETERMINED BY THE THE USE OF AN EXPONENTIAL FORM FOR THE SATURATED VAPOR PRESSURE CURVE. THE DOPPLER EFFECT IS DETERMINED BY THE USE OF A FLEXIBLE $T^{*(-N)}$ FORM WHERE N IS A PARAMETER THAT IS SPECIFIED AT THE TIME OF EXECUTION. THE EXTERNAL REACTIVITY INSERTION CAN BE IN THE FORM OF A STEP, A LINEAR RAMP OR A PARABOLIC RAMP, WITH A LIMIT ON THE AMOUNT OF REACTIVITY WHICH CAN BE INSERTED BEING A DEFINABLE QUANTITY. TABULATED VALUES OF THE POWER AND MATERIAL WORTH DISTRIBUTIONS ARE ACCEPTED AS INPUT. THE CHARACTERISTICS OF EACH REGION (DENSITY, SPECIFIC HEAT, DOPPLER COEFFICIENT, EQUATION OF STATE, GEOMETRIC LIMITS) ARE SPECIFIED INDEPENDENTLY FOR EACH REGION TO PROVIDE FLEXIBILITY IN THE TREATMENT OF CORES OF UNUSUAL CONFIGURATION. THE NEUTRON KINETICS CALCULATIONS ARE DONE WITH A POINT REACTOR MODEL AND DELAYED NEUTRONS ARE USED.
4. METHOD OF SOLUTION - THE APPROXIMATE HYDRODYNAMICS EQUATIONS AND THE NEUTRON KINETICS EQUATIONS ARE SOLVED BY THE RUNGE-KUTTA METHOD. THE FEEDBACK REACTIVITY DUE TO MATERIAL MOTION IS CALCULATED BY SIMPLE NUMERICAL SUMMATIONS TO APPROXIMATE SURFACE AND VOLUME INTEGRALS.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
6 REGIONS
6 DELAYED NEUTRON GROUPS
6. TYPICAL RUNNING TIME - 5 MINUTES ARE REQUIRED WHEN 2 REGIONS ARE USED AND THE PROBLEM IS STARTED FROM DELAYED CRITICAL.
7. UNUSUAL FEATURES OF THE PROGRAM - MARS WILL SOLVE THE SEVERE EXCURSION PROBLEM IN AN R-Z GEOMETRY FOR A CYLINDRICAL CORE WITH AS MANY AS 6 REGIONS.
8. RELATED AND AUXILIARY PROGRAMS - THE RUNGE-KUTTA SUBROUTINE SPDEQ (GENERAL MOTORS) IS USED.
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1967.
IBM7094 VERSION SUBMITTED AUGUST 1967.

15. NAME AND ESTABLISHMENT OF AUTHOR(S) (CONTINUED)

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6600 AUTHOR

D. W. DRAWBAUGH
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16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL (4 TAPES)

SOURCE DECKS (GGC4 1108-11,567 CARDS, WTFG 1646 CARDS, MAKE
1033 CARDS, MST 463 CARDS, PRINT 769 CARDS, MIXER
500 CARDS, MGT3 251 CARDS, SPRINT 334 CARDS,
COMBIN 479 CARDS, DCP 927 CARDS, GGC4 6600-
11,504 CARDS)

SAMPLE PROBLEMS (GGC4 1108-38 CARDS, 6600-38 CARDS)

FAST DATA TAPE (60 NUCLIDES - TAPE 2 - 1108-2772 BINARY
RECORDS, 6600-1703 BINARY RECORDS)

FAST DATA TAPE (151 NUCLIDES - TAPE 3 - 1108-7362 BINARY
RECORDS, 6600-4436 BINARY RECORDS)

THERMAL DATA TAPE (222 NUCLIDES - TAPE 4 - 1108-2854 BINARY
RECORDS, 6600-1539 BINARY RECORDS)

REFERENCE REPORTS AND NOTES

17. CATEGORY - B

KEYWORDS - MULTIGROUP CROSS SECTIONS, AVERAGES, FAST, THERMAL,
SPECTRA, DOPPLER BROADENING, DANCOFF CORRECTION, ANGU-
LAR DISTRIBUTION, RESONANCE PARAMETERS, MAKE CODES,
MST CODES, PRINT CODES, MIXER CODES, WTFG CODES, MGT3
CODES, SPRINT CODES, COMBIN CODES, DOP CODES

1. NAME OR DESIGNATION OF PROGRAM - LION4
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600,7600, UNIVAC 1108
3. DESCRIPTION OF PROBLEM OR FUNCTION - LION4 IS A COMPUTER PROGRAM FOR CALCULATING ONE, TWO, OR THREE DIMENSIONAL TRANSIENT AND STEADY-STATE TEMPERATURE DISTRIBUTIONS IN REACTOR AND REACTOR PLANT COMPONENTS. IT IS USED PRIMARILY FOR THERMAL-STRUCTURAL ANALYSES. IT UTILIZES FINITE DIFFERENCE TECHNIQUES WITH FIRST-ORDER FORWARD DIFFERENCE INTEGRATION AND IS CAPABLE OF HANDLING A WIDE VARIETY OF BOUNDING CONDITIONS.
 HEAT TRANSFER SITUATIONS ACCOMMODATED INCLUDE FORCED AND FREE CONVECTION IN BOTH REDUCED AND FULLY-AUTOMATED TEMPERATURE DEPENDENT FORMS, COOLANT FLOW EFFECTS, A LIMITED THERMAL RADIATION CAPABILITY, A STATIONARY OR STAGNANT FLUID GAP, A DUAL DEPENDENCY (TEMPERATURE DIFFERENCE AND TEMPERATURE LEVEL) HEAT TRANSFER, AN ALTERNATIVE HEAT TRANSFER MODE COMPARISON AND SELECTION FACILITY COMBINED WITH HEAT FLUX DIRECTION SENSOR, AND ANY FORM OF TIME-DEPENDENT BOUNDARY TEMPERATURES. THE PROGRAM, WHICH HANDLES TIME AND SPACE DEPENDENT INTERNAL HEAT GENERATION, CAN ALSO PROVIDE TEMPERATURE DEPENDENT MATERIAL PROPERTIES WITH LIMITED NON-ISOTROPIC PROPERTIES. USER-ORIENTED CAPABILITIES AVAILABLE INCLUDE TEMPERATURE MEANS WITH VARIOUS WEIGHTINGS AND A COMPLETE HEAT FLOW RATE SURVEILLANCE SYSTEM.
4. METHOD OF SOLUTION - THE MODELING IS BASED ON THE CONCEPT OF NODAL POINTS CONNECTED BY ONE-DIMENSIONAL THERMAL CONDUCTANCE EQUATIONS IN AS MANY AS SIX DIRECTIONS SIMULTANEOUSLY. THE EXPLICIT, OR FIRST FORWARD DIFFERENCE METHOD, IS THEN USED TO OBTAIN THE SOLUTIONS TO THESE EQUATIONS FOR THE THREE-DIMENSIONAL FIELD. THE TEMPERATURE CHANGE FOR A SURFACE NODE IS CALCULATED BY APPLYING THE OHMS LAW ANALOGY FOR HEAT FLOW TO A NODE WITH NO CAPACITANCE.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - DYNAMIC ALLOCATION
 $11 * D1 + 26 * D2 + 20 * D3 + 3 * D4 + 17 * D5 + 3 * D6 + S1 + S2 + S3 + S4$
 LESS THAN OR EQUAL TO 24500
 VARIABLE NUMBER OF EXTERNAL CONNECTIONS (D1)
 VARIABLE NUMBER OF INTERNAL NODES (D2)
 VARIABLE NUMBER OF SURFACE NODES (D3)
 VARIABLE NUMBER OF BOUNDARY NODES (D4)
 VARIABLE NUMBER OF COOLANT NODES (D5)
 VARIABLE NUMBER OF INTERFACE NODES (D6)
 S1=STORAGE FOR TEMPERATURE MEANS AND DIFFERENCES
 S2=STORAGE FOR HEAT FLOW SUBROUTINE
 S3=STORAGE FOR CONVECTIVE HEAT TRANSFER CALCULATION
 S4=STORAGE FOR VARIABLE LIBRARIES
 USING INCREASED NODAL CAPABILITY FEATURE WITH ADMITTANCE MATRIX IN
 ECS THIS ALGORITHM BECOMES--
 $11 * D1 + 10 * D2 + 4 * D3 + 3 * D4 + 17 * D5 + 3 * D6 + S1 + S2 + S3 + S4$
 15 MATERIALS
 7 * D2 INTERNAL CONNECTIONS

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM (CONTINUED)
 - 12 COOLANT CHANNELS (EACH WITH 4 SIDES MAXIMUM)
 - 77 PRINTOUTS
 - 7 INTERNAL CONNECTIONS PER INTERNAL NODE
 - 6 SURFACE CONNECTIONS PER SURFACE NODE
 - 6 TYPES OF TEMPERATURE MEANS AND DIFFERENCES SETS
 - 10 GRAPHS (CDC6600, 7600 ONLY)
 - 12 CURVES PER GRAPH (CDC6600, 7600 ONLY)
 - 17 TYPES OF QUANTITIES GRAPHABLE (CDC6600, 7600 ONLY)
 - 4 SUB-COOLED NUCLEATE BOILING REGIONS
 - 5 TYPES OF HEAT FLOW RATE SETS
6. TYPICAL RUNNING TIME - THE RUNNING TIME ON THE CDC6600 IS STRONGLY DEPENDENT ON THE NUMBER OF NODES, THEIR RELATIVE AND ABSOLUTE SIZE, AND THE TIME RANGE CONSIDERED. THE SAMPLE PROBLEM EXECUTES IN ONLY A FEW SECONDS ON THE CDC6600. EXECUTION OF THE UNIVAC1108 SAMPLE PROBLEM REQUIRES 5 SECONDS.
7. UNUSUAL FEATURES OF THE PROGRAM - SUBCOOLED NUCLEATE BOILING MAY BE CONSIDERED. HOWEVER, THIS CONSIDERATION IS LIMITED TO WATER.
8. RELATED AND AUXILIARY PROGRAMS - SUPPORT PROGRAMS INCLUDE THE PLI SERIES OF PREPROCESSORS FOR SELECTED GEOMETRIES, THE GRAPL GRADIENT PLOTTER, HCAL2, WHICH EVALUATES HEAT TRANSFER COEFFICIENT EQUATIONS FOR SELECTED CONDITIONS, AND CONLI, WHICH RENUMBERS INPUT DATA AND INSERTS SPARE NODE NUMBERS OF 3 DIFFERENT KINDS TO PERMIT CONSOLIDATION OF GEOMETRY INPUT FOR ENTRY INTO A LARGE PROBLEM. LION SUPERCEDES EARLIER IBM704 AND PHILCC 2000 PROGRAMS CALLED TIGER.
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1967.
 CDC6600 VERSION SUBMITTED OCTOBER 1967, REPLACED BY FIRST REVISION AUGUST 1968, REPLACED BY SECOND REVISION JANUARY 1970, REPLACED BY THIRD REVISION JULY 1973.
 UNIVAC1108 VERSION SUBMITTED JUNE 1971.
10. REFERENCES - J. R. SCHMID, G. L. LECHLITER, AND W. W. FISCHER, LION TEMPERATURE DISTRIBUTIONS FOR ARBITRARY SHAPES AND COMPLICATED BOUNDARY CONDITIONS, KAPL-M-6532 (EC-57), JULY 27, 1966.
 W. W. FISCHER, LION TALKS A USERS MANUAL FOR THE LION THERMAL-STRUCTURAL EVALUATION CODE, KAPL-M-6533 (EC-58), JULY 31, 1967.
 R. J. CULLEN, 6600 CALCCMP PLOTTER ROUTINES, KAPL NOTE, JULY 25, 1966.
 E. J. BINNEY, ADDITIONS TO LION CODE, KAPL NOTE, SEPTEMBER 30, 1969.
 E. J. BINNEY, ADDITIONS TO LION CODE EFFECTIVE WITH SEPTEMBER 1970 VERSION, KAPL NOTE, SEPTEMBER 22, 1970.
 W. W. FISCHER AND M. N. GLODSMITH, GRAPL A GRADIENT PLOTTER FOR LION, KAPL-M-7164, OCTOBER 13, 1970.
 E. J. BINNEY, ADDITIONS TO LION CODE EFFECTIVE WITH THE DECEMBER 1970 VERSION, KAPL NOTE, DECEMBER 18, 1970.
 E. J. BINNEY, ADDITIONS TO THE LION CODE EFFECTIVE

10. REFERENCES (CONTINUED)

FEBRUARY 26, 1971, KAPL NOTE, FEBRUARY 26, 1971.

E. J. BINNEY, MODIFICATION TO THE LION CODE EFFECTIVE
MARCH 31, 1971, KAPL NOTE, APRIL 8, 1971.

E. J. BINNEY, HEAT BALANCE CAPABILITY IN LION, KAPL
NOTE, APRIL 30, 1971.

E. J. BINNEY, ADDITIONS TO THE LION CODE EFFECTIVE
FEBRUARY 29, 1972, KAPL NOTE, FEBRUARY 29, 1972.

E. J. BINNEY, LION NEWSLETTER NO. 1, KAPL NOTE,
JUNE 5, 1972.

E. J. BINNEY, LION4 NEWSLETTER NO. 2, KAPL NOTE,
OCTOBER 5, 1972.

M. N. GOLDSMITH AND W. W. FISCHER, THE PLI--SERIES OF
PREPROCESSORS FOR THE LION CODE, KAPL-M-7289, JULY 6, 1972.

JPARAM SYSTEMS PROGRAMMING INFORMAL PROGRAM DESCRIPTION,
EXCERPT FROM USERS GUIDE TO CDC SYSTEMS AT KAPL, JULY 27,
1972.

W. W. FISCHER, CONVECTIVE HEAT TRANSFER COEFFICIENT
CALCULATIONAL SYSTEM FOR LION, KAPL-M-7301(L), DECEMBER 18, 1972.

11. MACHINE REQUIREMENTS - THE PLOTTER ROUTINE APPLE IS USED TO PRODUCE THE INPUT REQUIRED BY THE ASSOCIATED CALCOMP PLOTTER FOR GRAPHICAL OUTPUT.

12. PROGRAMMING LANGUAGES USED - FORTRAN IV AND ASCENT (CDC6600,7600), FORTRAN IV (UNIVAC1108)

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCCPE (CDC6600,7600) AND EXEC9 (UNIVAC1108).

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - DATA SAVING ON TAPE AND OPTIONS TO PROVIDE PLOTTING OF A VARIETY OF PARAMETERS VERSUS TIME ARE INCLUDED IN LION4. BECAUSE OF THE LARGE SIZE OF LION4, IT WAS NECESSARY TO SEGMENT THE PROGRAM. THE UNIVAC1108 CON VERSION IS BASED ON THE JANUARY 1970 VERSION AND DOES NOT INCLUDE THE ADDED FEATURES OF THE RECENT KAPL EDITION NOR DOES IT INCLUDE A PLOTTING CAPABILITY.

15. NAME AND ESTABLISHMENT OF AUTHORS -

6600,7600 E. J. BINNEY
KNCLLS ATOMIC POWER LABORATORY
GENERAL ELECTRIC COMPANY
BOX 1072
SCHENECTADY, NEW YORK 12301

1108 DARRELL BARTKOWSKI
CHI CORPORATION
11000 CEDAR AVENUE
CLEVELAND, OHIO 44106

16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (6600-5470 CARDS, 1108-2447 CARDS)

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16. MATERIAL AVAILABLE (CONTINUED)
SAMPLE PROBLEMS (6600-161 CARDS, 1108-156 CARDS)
SAMPLE PROBLEM OUTPUT (6600-33 PAGES, 1108-22 PAGES)
REFERENCE REPORTS, NEWSLETTERS, AND NOTES
17. CATEGORY - H
KEYWORDS - TEMPERATURE DISTRIBUTION, FLUID FLOW, THERMAL, 3-DIMENSIONAL, HEAT TRANSFER, LIQUIDS, VAPORS, TIGER CODES

1. NAME OR DESIGNATION OF PROGRAM - SAFE-CREEP
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - UNIVAC1108
3. DESCRIPTION OF PROBLEM OR FUNCTION - SAFE-CREEP PERFORMS A VISCO-ELASTIC ANALYSIS OF PLANE OR AXISYMMETRIC COMPOSITE CONCRETE STRUCTURES WITH AGE- AND TEMPERATURE-DEPENDENT CREEP DATA.
4. METHOD OF SOLUTION - THE PROGRAM USES THE FINITE ELEMENT METHOD WHICH REDUCES THE PROBLEM TO THE SOLUTION OF A SYSTEM OF COUPLED INTEGRAL EQUATIONS. THE METHOD OF SOLUTION IS ITERATIVE ON THE SPACE VARIABLE AND UTILIZES THE TRAPEZOIDAL RULE INTEGRATION FOR THE TIME VARIABLE.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
350 NODES
750 ELEMENTS
60 TIME INCREMENTS
6. TYPICAL RUNNING TIME - 90 MINUTES ARE REQUIRED FOR A FULL-CAPACITY PROBLEM.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - GRDWRK (ACC ABSTRACT 296), SAFE-PCRS (ACC ABSTRACT 250), SAFE-PLANE (ACC ABSTRACT 252), SAFE-SHELL (ACC ABSTRACT 253)
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1967.
UNIVAC1108 VERSION SUBMITTED OCTOBER 1967.
10. REFERENCES - Y. RASHID AND W. ROCKENHAUSER, PRESSURE VESSEL ANALYSIS BY FINITE ELEMENT TECHNIQUE, GA-7810, 1967.
R. D. BROWN, PROPERTIES OF CONCRETE IN REACTOR VESSELS, PAPER NO. 13, CONFERENCE ON PRESTRESSED CONCRETE PRESSURE VESSELS, LONDON, MARCH 13-17, 1967.
F. J. DE ARRIAGA AND Y. R. RASHID, SAFE-CREEP, A COMPUTER PROGRAM FOR THE VISCOELASTIC ANALYSIS OF AXISYMMETRIC AND PLANE CONCRETE STRUCTURES, A USERS MANUAL, GA-8111, JULY 31, 1967.
11. MACHINE REQUIREMENTS - 65K MEMORY AND 13 TAPES
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - CALL TICKER REFERS TO AN 1108 SYSTEM ROUTINE FOR LOGGING JOB TIME USED. A SUBSTITUTE ROUTINE WILL BE REQUIRED FOR USE OF THIS PROGRAM ON ANOTHER MACHINE.

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8. RELATED AND AUXILIARY PROGRAMS (CONTINUED)
WRITTEN TO HANDLE IDENTICAL CYLINDRICAL RODS IN THREE-DIMENSIONAL
FINITE OR INFINITE ARRAYS.
9. STATUS - ABSTRACT FIRST DISTRIBUTED JUNE 1968.
IBM360 VERSION SUBMITTED OCTOBER 1967.
10. REFERENCES - L. B. LEVITT AND R. C. LEWIS, HWO CR-SAFE, A MONTE
CARLO REACTOR ANALYSIS CODE, AI-CE-MEMO-69, JUNE 30, 1967.
RELICS INPUT DESCRIPTION, AI NOTE.
INPUT DESCRIPTION FOR HWO CR-SAFE CROSS SECTION TAPE
MAKER, AI NOTE.
11. MACHINE REQUIREMENTS -
12. PROGRAMMING LANGUAGES USED - FORTRAN IV (H) AND BAL
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
OS/360.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
VARIATIONS OF THIS PROGRAM HAVE BEEN PREPARED FOR THE CDC6600 AND
IBM7094 COMPUTERS.
15. NAME AND ESTABLISHMENT OF AUTHORS -
L. B. LEVITT AND R. C. LEWIS
HWO CR PROGRAM OFFICE
P. O. BOX 309
CANDGA PARK, CALIFORNIA 91304
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (SAFE 2682 CARDS, RELICS 76 CARDS, TAPE-MAKER 262
CARDS)
SAMPLE PROBLEMS (SAFE 245 CARDS, RELICS 30 CARDS, TAPE-MAKER
1835 CARDS)
REFERENCE REPORT AND NOTES
17. CATEGORY - B
KEYWORDS - CELL CALCULATION, 2-DIMENSIONAL, MONTE CARLO METHOD,
HWO CR REACTORS, REACTIVITY, RELICS CODES, TAPE-MAKER
CODES

1. NAME OR DESIGNATION OF PROGRAM - JUPITER1(JP1)
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC1604, IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - JUPITER1 IS USED TO PERFORM COUPLED-CHANNEL CALCULATIONS TO EVALUATE THE CROSS SECTIONS FOR THE SCATTERING OF NUCLEAR PARTICLES BY VARIOUS COLLECTIVE NUCLEI.
4. METHOD OF SOLUTION - IN SOLVING THE COUPLED DIFFERENTIAL EQUATIONS THE PREDICTION-CORRECTION METHOD DUE TO STORMER IS USED.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - A MAXIMUM OF SIX STATES AND 30 PARTIAL WAVES CAN BE COUPLED AT ONE TIME. IF THE PROJECTILE ENERGY BECOMES NEGATIVE IN SOME EXCITED CHANNELS THIS MAXIMUM IS REDUCED TO 25 PARTIAL WAVES. THE MAXIMUM VALUE OF THE ORBITAL ANGULAR MOMENTUM IS 69. DIFFERENTIAL CROSS SECTIONS FOR UP TO 100 ANGLES FOR ANY NUMBER OF STATES CAN BE COMPUTED UNLESS A POLARIZED BEAM OR TARGET IS CONSIDERED, IN WHICH CASE THE MAXIMUM IS 35.
6. TYPICAL RUNNING TIME - THE SAMPLE PROBLEM REQUIRES ABOUT 2 MINUTES ON THE IBM360.
7. UNUSUAL FEATURES OF THE PROGRAM - SPIN OF THE PROJECTILE CAN BE 0, 1/2, OR 1 FOR NON-ADIABATIC CALCULATIONS, 0 OR 1/2 FOR ADIABATIC. TARGETS CAN BE EITHER VIBRATIONAL (SPHERICAL) OR ROTATIONAL (PERMANENTLY DEFORMED) AND OF EITHER EVEN OR ODD A. WHEN THE TARGET IS DEFORMED, EXCITATION OF STATES BELONGING TO HIGHER (VIBRATIONAL) BANDS CAN BE CONSIDERED. COLLECTIVE EXCITATION CAN BE INCLUDED, AND THE FORM FACTOR CAN BE EITHER REAL OR COMPLEX.
8. RELATED AND AUXILIARY PROGRAMS - JUPITER2 IS UNDER PREPARATION TO HANDLE SMALLER SETS OF EQUATIONS MORE EFFICIENTLY.
9. STATUS - ABSTRACT FIRST DISTRIBUTED JUNE 1968.
CDC1604 VERSION SUBMITTED NOVEMBER 1967.
IBM360 VERSION SUBMITTED DECEMBER 1970, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - T. TAMURA, COMPUTER PROGRAM JUPITER-1 FOR COUPLED-CHANNEL CALCULATIONS, ORNL-4152, AUGUST 1967, ADDENDUM I, AUGUST 14, 1967, ADDENDA/CORRIGENDA NO. 2, NOVEMBER 27, 1967.
T. TAMURA, REVS. MOD. PHYS., VOL. 37, P. 679, 1965.
11. MACHINE REQUIREMENTS - CDC1604 WITH 32K CORE MEMORY
12. PROGRAMMING LANGUAGES USED - FORTRAN 63 (CDC1604), FORTRAN IV (IBM360)
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - CS/360 (IBM360).

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14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
- 1604 TARO TAMURA
PHYSICS DIVISION
OAK RIDGE NATIONAL LABORATORY
P. O. BOX X
OAK RIDGE, TENNESSEE 37831
- 360 L. GARCIA DE VIEDMA
NEA COMPUTER PROGRAM LIBRARY
ISPRA, ITALY
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (1604-2954 CARDS, 360-4216 CARDS)
SAMPLE PROBLEMS (1604-92 CARDS, 360-18 CARDS)
CONTROL INFORMATION (JCL 360-37 CARDS)
PUNCHED OUTPUT (360-108 CARDS)
SAMPLE PROBLEM PRINTED OUTPUT (360-5 PAGES)
REFERENCE REPORT, ORNL-4152 AND ACCENCA
17. CATEGORY - A
KEYWORDS - SCATTERING, CROSS SECTIONS, COMPOUND NUCLEUS, ANGULAR
DISTRIBUTION

1. NAME OR DESIGNATION OF PROGRAM - TSN
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM7094,360
3. DESCRIPTION OF PROBLEM OR FUNCTION - THE TIME-DEPENDENT NEUTRON TRANSPORT EQUATION IS SOLVED. ENERGY DEPOSITION IS ALLOWED TO CAUSE VARIATION IN THE NEUTRON CROSS SECTIONS FOR THE CORE REGION, IN THE CORE DENSITY, AND IN CORE HEIGHT. THE RESULT IS A KINETICS CALCULATION INCLUDING SPATIAL DEPENDENCE BOTH IN FEEDBACK EFFECTS AND IN NEUTRON DENSITY. THE RESULTS ARE SUMMARIZED IN A MANNER SIMILAR TO POINT-KINETICS CODES, AND SPATIAL DISTRIBUTIONS ARE ALSO GIVEN. GRAPHICAL SUMMARIES OF THE SIGNIFICANT VARIABLES AND SPATIAL DISTRIBUTIONS ARE GIVEN. IN THE IBM360 VERSION, EITHER THE NEUTRON YIELD FROM FISSION OR THE THICKNESS OF A SPECIFIED ZONE CAN BE CHANGED AS AN INDEPENDENT FUNCTION OF TIME AS SPECIFIED BY THE USER. THIS PROVIDES TWO WAYS OF ALLOWING EXPLICIT REACTIVITY VARIATION WITH TIME.
4. METHOD OF SOLUTION - CARLSON'S SN METHOD IS USED TO SOLVE THE NEUTRON TRANSPORT EQUATION. ANALOGOUS FINITE-DIFFERENCE TECHNIQUES ARE USED TO SOLVE THE FEEDBACK EQUATIONS. THE VARIATIONS IN CROSS SECTIONS AND DENSITIES WITH ENERGY DEPOSITION ARE EVALUATED FROM POLYNOMIAL COEFFICIENTS SUPPLIED BY THE USER.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - 2 VELOCITY GROUPS, 100 SPATIAL INTERVALS, 1-DIMENSIONAL GEOMETRY S4 (CYLINDRICAL) OR S6 (PLANE OR SPHERE). IN THE IBM7094 VERSION, THE CORE MUST BE THE FIRST ZONE AND MUST BE HOMOGENEOUS. THE $1/V$ TERM IS NEGLECTED FOR THE FAST GROUP. THESE LAST RESTRICTIONS HAVE BEEN REMOVED IN THE IBM360 VERSION.
6. TYPICAL RUNNING TIME - A TYPICAL PROBLEM SUPPLIED WITH THE DOCUMENTATION RAN 5.2 MINUTES ON THE IBM7094 AND 18.1 MINUTES ON THE IBM360, MODEL 50. THE LATTER TIME CAN BE REDUCED BY APPLYING THE OPTIMIZATION FEATURE OF FORTRAN IV LEVEL H, WHERE AVAILABLE.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - TSN IS BASED ON AND USES PORTIONS OF ANISN (ACC ABSTRACT 151).
9. STATUS - ABSTRACT FIRST DISTRIBUTED JUNE 1968.
IBM7094 VERSION SUBMITTED NOVEMBER 1967.
IBM360 VERSION SUBMITTED NOVEMBER 1967.
10. REFERENCES - W. A. RHOADES AND J. G. MORGAN, THE TSN COMPUTER CODE FOR SPATIALLY DEPENDENT REACTOR KINETICS CALCULATIONS, NAA-SR-MEMO-12319, APRIL 18, 1967.
M. A. BOLING AND W. A. RHOADES, AICRT3-3, SPONTV, AND FLINGV, GENERAL PURPOSE SUBROUTINES FOR DISPLAY OF DIGITAL DATA, NAA-SR-TDR-11915, APRIL 1966.

1. NAME OR DESIGNATION OF PROGRAM - POWERCO
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC1604A,6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - POWERCO CALCULATES THE COST OF ELECTRICITY PRODUCED BY NUCLEAR POWER STATIONS, ASSUMING ALL CASH EXPENSES SUCH AS INVESTMENT AND FUEL COSTS, OPERATING EXPENSES, AND TAXES ARE KNOWN. THE POWER COST IS HELD CONSTANT THROUGHOUT THE PROJECT LIFE.
4. METHOD OF SOLUTION - THE COST CALCULATION IS BASED ON THE REQUIREMENT THAT INCOMES RECEIVED MUST PROVIDE FOR RECOVERY OF INVESTMENT, RETURN ON INVESTMENT, AND ALL OPERATING EXPENSES. EQUATIONS ARE DEVELOPED TO CALCULATE TRUE FIXED CHARGE RATES AND TRUE AVERAGE FUEL WORKING CAPITAL.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMUM OF - 180 TIME PERIODS
6. TYPICAL RUNNING TIME - ABOUT 1 MINUTE PER PROBLEM IS REQUIRED.
7. UNUSUAL FEATURES OF THE PROGRAM - POWERCO USES A PRESENT-WORTHED CASH FLOW PROCEDURE. FIXED CHARGE RATES AND FUEL WORKING CAPITAL ARE NOT REQUIRED. INCOME TAXES ARE CALCULATED INTERNALLY.
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED MARCH 1969.
CDC1604A VERSION SUBMITTED JUNE 1968.
CDC6600 VERSION SUBMITTED APRIL 1973.
10. REFERENCE - ROYES SALMON, A PROCEDURE AND A COMPUTER CODE (POWERCO) FOR CALCULATING THE COST OF ELECTRICITY PRODUCED BY NUCLEAR POWER STATIONS, ORNL-3944, JUNE 1966.
11. MACHINE REQUIREMENTS -
12. PROGRAMMING LANGUAGES USED - FORTRAN 63 (CDC1604A), FORTRAN IV (CDC6600)
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 3.3 (CDC6600).
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
1604A ROYES SALMON
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P. O. BOX X
OAK RIDGE, TENNESSEE 37830

15. NAME AND ESTABLISHMENT OF AUTHOR(S) (CONTINUED)
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TECHNICAL COMPUTER SERVICES
UNITED ENGINEERS AND CONSTRUCTORS, INC.
1401 ARCH STREET
PHILADELPHIA, PENNSYLVANIA 19105
16. MATERIAL AVAILABLE -
SOURCE DECKS (1604A-444 CARDS, 6600-442 CARDS)
SAMPLE PROBLEMS (1604A-36 CARDS, 6600-36 CARDS)
REFERENCE REPORT
17. CATEGORY - D
KEYWORDS - POWER PLANTS, ECONOMICS

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15. NAME AND ESTABLISHMENT OF AUTHOR -
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ARGONNE, ILLINOIS 60439
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (2230 CARDS)
SAMPLE PROBLEM (25 CARDS)
REFERENCE REPORT AND SUPPLEMENT
17. CATEGORY - I
KEYWORDS - STRUCTURAL ANALYSIS, STRESSES, DEFORMATION

1. NAME OR DESIGNATION OF PROGRAM - TWOTRAN2
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC7600,6600, IBM360/195
3. DESCRIPTION OF PROBLEM OR FUNCTION - TWOTRAN2 SOLVES THE TWO-DIMENSIONAL MULTIGROUP TRANSPORT EQUATION IN (X,Y), (R,THETA), AND (R,Z) GEOMETRIES. BOTH REGULAR AND ADJACENT, INHOMOGENEOUS AND HOMOGENEOUS (KEFF AND EIGENVALUE SEARCHES) PROBLEMS SUBJECT TO VACUUM, REFLECTIVE, PERIODIC, WHITE OR INPUT-SPECIFIED BOUNDARY FLUX CONDITIONS ARE SOLVED. GENERAL ANISOTROPIC SCATTERING IS ALLOWED AND ANISOTROPIC INHOMOGENEOUS SOURCES ARE PERMITTED.
4. METHOD OF SOLUTION - THE DISCRETE ORDINATES APPROXIMATION FOR THE ANGULAR VARIABLE IS USED IN FINITE DIFFERENCE FORM WHICH IS SOLVED WITH THE CENTRAL (DIAMOND) DIFFERENCE APPROXIMATION. NEGATIVE FLUXES ARE ELIMINATED BY A LOCAL SET-TO ZERO AND CORRECT ALGORITHM. STANDARD INNER (WITHIN-GROUP) AND OUTER ITERATIVE CYCLES ARE ACCELERATED BY A COARSE-MESH REBALANCING ON A COARSE MESH WHICH MAY BE INDEPENDENT OF THE MATERIAL MESH.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - VARIABLE DIMENSIONING IS USED SO THAT ANY COMBINATION OF PROBLEM PARAMETERS LEADING TO A CONTAINER ARRAY LESS THAN MAXLEN CAN BE ACCOMMODATED. ON IBM MACHINES, TWOTRAN2 WILL EXECUTE IN THE 4-BYTE MODE SO THAT ANY COMBINATION OF PROBLEM PARAMETERS LEADING TO A CONTAINER ARRAY LESS THAN MAXLEN CAN BE ACCOMMODATED. MAXLEN CAN BE SEVERAL HUNDRED THOUSAND AND MOST PROBLEMS CAN BE CORE-CONTAINED. ON THE CDC MACHINES MAXLEN CAN BE SLIGHTLY GREATER THAN 40,000 WORDS AND PERIPHERAL STORAGE IS USED FOR MOST GROUP-DEPENDENT DATA.
6. TYPICAL RUNNING TIME - A SIX-GROUP, S4, 42 X 42 MESH POINT, KEFF CALCULATION OF AN EBR-II MODEL REQUIRES ABOUT 3.9 MINUTES OF CDC7600 TIME. THE SAMPLE PROBLEMS REQUIRE 6 MINUTES ON THE IBM360.
7. UNUSUAL FEATURES OF THE PROGRAM - PROVISION IS MADE FOR CREATION OF STANDARD INTERFACE OUTPUT FILES FOR SN CONSTANTS, ANGLE-INTEGRATED FLUXES AND ANGULAR FLUXES. STANDARD INTERFACE INPUT FILES FOR SOURCES, FLUXES, CROSS SECTIONS AND SN CONSTANTS MAY BE READ. ALL BINARY OPERATIONS ARE LOCALIZED IN SUBROUTINES CALLED REED AND RITE. DETAILED EDIT OPTIONS, INCLUDING ANGULAR FLUXES, DUMPS AND RESTART CAPABILITY ARE PROVIDED. OPTIONAL USE OF AN ARBITRARY REBALANCE MESH INDEPENDENT OF THE MATERIAL MESH IS ALLOWED.
8. RELATED AND AUXILIARY PROGRAMS - TWOTRAN2 IS AN IMPROVED VERSION OF THE TWOTRAN PROGRAM. MANY COMMENT CARDS WERE ADDED AND MUCH SIMPLIFYING PROGRAMMING WAS PERFORMED TO MAKE TWOTRAN2 AS EASY TO UNDERSTAND AS POSSIBLE.

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9. STATUS - ABSTRACT FIRST DISTRIBUTED SEPTEMBER 1969.
UNIVAC1108 X-Y VERSION SUBMITTED DECEMBER 1968, REPLACED
BY UPDATED VERSION JUNE 1970, DELETED JUNE 1973.
IBM360 X-Y VERSION SUBMITTED APRIL 1969, REPLACED BY
TWOTRAN2 JUNE 1973, SAMPLE PROBLEM EXECUTED BY ACC.
UNIVAC1108 R-Z VERSION SUBMITTED OCTOBER 1969, DELETED
JUNE 1973.
CDC6600 GENERAL GEOMETRY VERSION SUBMITTED JULY 1970,
REPLACED BY TWOTRAN2 JULY 1973.
CCC7600 VERSION OF TWOTRAN2 SUBMITTED JUNE 1973.
10. REFERENCES - K. D. LATHROP AND F. W. BRINKLEY, TWOTRAN-II, AN
INTERFACED, EXPORTABLE VERSION OF THE TWOTRAN CODE FOR TWO-DIMEN-
SIONAL TRANSPORT, LA-4848-MS, JULY 1973.
K. D. LATHROP AND F. W. BRINKLEY, THEORY AND USE OF
THE GENERAL-GEOMETRY TWOTRAN PROGRAM, LA-4432, APRIL 1970.
11. MACHINE REQUIREMENTS - FIVE OUTPUT UNITS, FIVE INTERFACE UNITS
(USE OF INTERFACE UNITS IS OPTIONAL) AND TWO SYSTEM INPUT/OUTPUT
UNITS ARE REQUIRED. A LARGE BULK MEMORY IS DESIRABLE, BUT IT CAN
BE REPLACED BY DISK, DRUM OR TAPE STORAGE.
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
K. D. LATHROP AND F. W. BRINKLEY
LCS ALAMOS SCIENTIFIC LABORATORY
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LOS ALAMOS, NEW MEXICO 87544
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (7600-7047 CARDS, 6600-7048 CARDS, 360-7429 CARDS)
SAMPLE PROBLEMS (7600-1985 CARDS, 6600-686 CARDS, 360-1984
CARDS)
CONTROL INFORMATION (JCL 360-32 CARDS)
REFERENCE REPORT, LA-4848-MS
17. CATEGORY - C
KEYWORDS - 2-DIMENSIONAL, TRANSPORT THEORY, SN METHOD, X-Y, R-Z,
R-THETA, CRITICALITY SEARCHES, FLUX DISTRIBUTION,
ANISOTROPIC SCATTERING, 2CF CODES, TWOTRAN CODES

1. NAME OR DESIGNATION OF PROGRAM - PUN1
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND CTHEPS UPON WHICH IT IS OPERABLE - CDC6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - PUN1 EVALUATES UNRESOLVED RADIATIVE CAPTURE INTEGRALS AND RELATED MULTIGROUP CROSS SECTIONS. THE UNRESOLVED DISTRIBUTIONS MAY HAVE VARIOUS ORBITAL ANGULAR MOMENTUM QUANTUM NUMBERS AND THE EFFECTS OF DOPPLER BROADENING AND SELF-SHIELDING ARE INCLUDED.
4. METHOD OF SOLUTION - THE $\Psi(\theta, x)$ FUNCTION IS EVALUATED ON THE INTERVAL $(0, 20/\theta)$ BY THE DFB ROUTINE DEVELOPED BY GELBARD (SEE REFERENCE 2). THE $J(\theta, \beta)$ FUNCTION IS OBTAINED FROM THE $\Psi(\theta, x)$ FUNCTION BY TWO TRAPEZOIDAL INTEGRATIONS, FOLLOWED BY RICHARDSON EXTRAPOLATION PLUS A WING CORRECTION FOR x GREATER THAN $20/\theta$. THE INTEGRAL INVOLVING CHI-SQUARE FLUCTUATION OF THE REDUCED NEUTRON WIDTH, $\gamma(n)$, IS EVALUATED BY GAUSSIAN QUADRATURE. THE INTEGRATION OVER THE NEUTRON WEIGHTING SPECTRUM IS APPROXIMATED BY GAUSS QUADRATURE FOR THE $1/E$ CASE AND TRAPEZOIDAL INTEGRATION FOR OTHER WEIGHTING SPECTRA.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - NO MORE THAN 20 SPIN STATES PER CASE AND 54 ENERGY GROUPS ARE ALLOWED. AN ARBITRARY ENERGY WEIGHTING SPECTRUM OF UP TO 498 POINTS MAY BE USED, BUT ALL POINTS MUST BE POSITIVE ($w(E)$ GREATER THAN 0).
6. TYPICAL RUNNING TIME - LESS THAN 1/4 SECOND PER SPIN STATE PER GROUP IS REQUIRED.
7. UNUSUAL FEATURES OF THE PROGRAM -
 - (A) ANGULAR MOMENTUM QUANTUM NUMBER $L = 0, 1, 2, 3, 4$ PERMITTED.
 - (B) $\gamma(n)$ PERMITTED TO FLUCTUATE WITH A CHI-SQUARE DISTRIBUTION OF UP TO 8 DEGREES OF FREEDOM FOR EACH SPIN STATE.
 - (C) EVALUATION OF THE INTEGRAL CONTRIBUTION FROM LEVELS WITH $\gamma(n)$ LESS THAN SOME FRACTION OF THE AVERAGE PERMITTED.
 - (D) AN ARBITRARY GROSS ENERGY WEIGHTING SPECTRUM PERMITTED.
 - (E) DANCUFF CORRECTION IS COMPUTED INTERNALLY FOR EITHER HEXAGONAL OR SQUARE LATTICE ARRAYS OF CYLINDRICAL CLAD FUEL RODS.
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED SEPTEMBER 1969.
CDC6600 VERSION SUBMITTED APRIL 1969.
10. REFERENCES - N. M. STEEN, PUN-1 - A FORTRAN-IV PROGRAM FOR THE EVALUATION OF UNRESOLVED RESONANCE INTEGRALS AND RELATED MULTIGROUP CROSS SECTIONS (LWBR DEVELOPMENT PROGRAM), WAPD-TM-768,

10. REFERENCES (CONTINUED)
CENTER, UTF4-01, AUGUST 2, 1961.
C. M. FRIEDRICH, STRUCTURE DESIGN NOTES - CALCULATION OF STRESSES, FORCES, AND DEFLECTIONS IN LINEAR-ELASTIC SKELETON STRUCTURES WITH TEMPERATURE, PRESSURES, APPLIED LOADS, AND REDUNDANT LOADS, WAPD-TM-417, APRIL 1964.
J. L. BITNER, DEVELOPING FLEXIBILITY MATRICES USING CTAC RULE, WAPD-TM-749, OCTOBER 1968.
11. MACHINE REQUIREMENTS - 105,000 OCTAL LOCATIONS, INPUT TAPE, OUTPUT TAPE, ONE SCRATCH TAPE, AND PRINTER
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 3.1.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHOR -
W. A. WENZEL
WESTINGHOUSE ELECTRIC CORPORATION
BETTIS ATOMIC POWER LABORATORY
P. O. BOX 79
WEST MIFFLIN, PENNSYLVANIA 15122
16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (946 CARDS)
SAMPLE PROBLEM (30 CARDS)
BETTIS ENVIRONMENTAL ROUTINES (21,123 CARDS)
REFERENCE REPORTS, WAPD-TM-739(L) AND WAPD-TM-668
17. CATEGORY - I
KEYWORDS - STRUCTURAL ANALYSIS, FREQUENCY, STRESSES, BEAMS, ELASTIC, DESIGN

1. NAME OR DESIGNATION OF PROGRAM - CHECKER/CRECT/DAMMET/PLOTFB/SLAVE3
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - THIS PACKAGE OF FIVE PROGRAMS IS DESIGNED FOR PROCESSING ENDF/B (EVALUATED NUCLEAR DATA FILE VERSION B) VERSION I TAPES.

CHECKER CHECKS THAT THE ENDF/B TAPES ARE IN PROPER FORMAT AND ALL FIELDS ARE WITHIN SPECIFIED LIMITS, RATHER THAN THE PHYSICS OF THE DATA LIBRARY. ANGULAR DISTRIBUTIONS RECONSTRUCTED FROM LEGENDRE COEFFICIENTS ARE EVERYWHERE POSITIVE.

CRECT, WHICH CAN PROCESS ENDF/B VERSION III DATA AS WELL AS EARLIER VERSIONS, PROVIDES A MEANS OF CORRECTING ASSEMBLED DATA ON A TAPE BY INSERTION AND DELETION OF DATA.

DAMMET SELECTIVELY MERGES DATA FROM ONE OR TWO ENDF/B LIBRARY TAPES ONTO A FINAL TAPE. THE MODE (BCD OR BINARY) AND ARRANGEMENT (STANDARD OR ALTERNATE) MAY BE CHANGED DURING THIS PROCESS.

PLOTFB PROCESSES ENDF/B LIBRARY TAPES WHICH CONTAIN DATA EMBEDDED WITHIN A NECESSARY LIBRARY STRUCTURE IN ORDER TO PRODUCE COMPREHENSIVE LISTINGS AND/OR PLOTS. THE LISTINGS AND/OR PLOTS CONTAIN AN EXTENSIVE AMOUNT OF INFORMATION RELATED TO THE DATA, SUCH AS TEMPERATURE DEPENDENCE, PHYSICAL UNITS OF THE DATA, INTERPOLATION LAWS FOR THE DATA, CRYPTIC TITLES DEFINING THE REACTION TYPE, ETC.

SLAVE3 PROVIDES MODULAR SUBROUTINES WHICH CAN BE ASSEMBLED TO RETRIEVE AND PROCESS ENDF/B DATA FOR A SPECIFIC PROBLEM.

4. METHOD OF SOLUTION - IN CHECKER MOST DATA ARE SUBMITTED TO RANGE LIMIT CHECKS TO ENSURE THE STRUCTURE AGREES WITH ENDF/B-DEFINED SPECIFICATIONS. THE DEVIANT POINT CHECK (DETECTION OF MISPUNCHED VALUES) IS ACCOMPLISHED BY SEQUENTIALLY CHECKING FIVE DATA POINTS, TWO POINTS ON EITHER SIDE OF THE POINT UNDER SCRUTINY, FORWARD EXTRAPOLATION ON THE FIRST TWO POINTS, REVERSE EXTRAPOLATION ON THE FOURTH AND FIFTH, AND INTERPOLATIONS BETWEEN THE SECOND AND FOURTH POINTS. IF THE THIRD POINT DOES NOT FALL WITHIN THE RANGE OF THE VALUES CALCULATED BY EXTRAPOLATIONS AND INTERPOLATION, THE VALUE IS LISTED AS DEVIANT. IN ESSENCE, THE ABOVE PROCEDURE MERELY SIMULATES A CHECKING OF GRAPHICAL DATA BY EYE. CHECKING OF LEGENDRE COEFFICIENTS FOR FEASIBILITY AND POSITIVITY IS ACCOMPLISHED BY CONVERTING THE COEFFICIENTS TO MOMENTS, CHECKING WHETHER MOMENTS ARE PHYSICALLY POSSIBLE AND TESTING WHETHER THE LEGENDRE EXPANSION IS NEGATIVE WITHIN THE INTERVAL -1 TO 1 BY THE STURM SEQUENCE METHOD. IF THE LEGENDRE EXPANSION IS NEGATIVE, IT IS DEFINED OVER THE NEGATIVE REGION(S) AND INTEGRATED, THUS DETERMINING THE TOTAL NEGATIVE PROBABILITY.

CRECT ACCEPTS A DATA TAPE TO BE CORRECTED AS INPUT AND LOCATES AREAS TO BE CORRECTED BY SEQUENCE AND MATERIAL NUMBERS. A CORRECTED TAPE IS THEN GENERATED REFLECTING THE INSERTIONS AND DELETIONS.

WHEN MERGING TWO TAPES AND CONVERTING TO A DATA FORMAT OTHER

4. METHOD OF SOLUTION (CONTINUED)

THAN THAT OF EITHER INPUT TAPE, DAMMET PERFORMS A TWO-PASS OPERATION. THE FIRST PASS CONSISTS OF SELECTING ONLY THE DATA REQUIRED AND CONVERTING IT TO THE FORMAT OF THE FINAL TAPE, WITH STORAGE OF THE DATA ON AN INTERMEDIATE TAPE. UPON COMPLETION OF THE FIRST PASS ON BOTH TAPES, RESULTING IN TWO INTERMEDIATE TAPES, THE SECOND PASS MERGES BOTH INTERMEDIATE TAPES TO THE FINAL DATA TAPE.

IN PLOTFB THE SPECIFIED STRUCTURE OF THE LIBRARY ALLOWS DATA TO BE SUBCLASSIFIED UNDER NUCLIDES, CLASSES OF DATA, AND REACTION TYPES. THE WELL-DEFINED STRUCTURE PERMITS THE ASSOCIATED INFORMATION TO BE ACCESSED BY CONVERTING MATERIAL NUMBERS TO HOLLERITH TITLES, ETC. PLOTS ARE GENERATED UTILIZING A PLOTTING PACKAGE WHICH INCLUDES SCALING, GRID, AND NORMALIZATION ROUTINES. PLOTS CAN BE GENERATED IN EITHER LINEAR-LOG AXIS OR A MIXTURE OF BOTH.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -

IN CHECKER CORRECT STRUCTURE OF THE DATA TAPE IS ASSUMED AND MINOR ANOMALIES ARE NOTED. COMMON AND MAJOR IRREGULARITIES CAUSE TERMINATION OF EXECUTION ACCOMPANIED BY A CORE DUMP.

IN CRECT CORRECT SEQUENCE AND MATERIAL FIELDS OF THE DATA TAPE ARE ASSUMED. IN BOTH CHECKER AND CRECT DATA MUST BE IN ENDF/B BCD STANDARD ARRANGEMENT CARD IMAGE FORMAT.

IN DAMMET A SPECIFIC REACTION CANNOT BE EXTRACTED FROM A TAPE UNLESS IT IS WITHIN A FILE OR MATERIAL SELECTED.

6. TYPICAL RUNNING TIME - .007 SECOND OF CPU TIME IS REQUIRED TO PROCESS ONE RECORD OF BCD INFORMATION IN CHECKER. TYPICAL CPU TO PP TIME RATIO FOR THE SHORT FORM OUTPUT IS 1 TO 4, FOR LONG FORM OUTPUT, 1 TO 6.

IN CRECT 2 SECONDS OF CPU TIME ARE REQUIRED. TYPICAL CPU TO PP TIME RATIO IS 1 TO 5.

IN DAMMET 3 TO 7 MINUTES OF CPU TIME ARE REQUIRED TO PROCESS 13 NUCLIDES. TYPICAL CPU TO PP TIME RATIO IS APPROXIMATELY 3 TO 1.

IN PLOTFB 4 MINUTES OF CPU TIME AND 10 MINUTES OF PP TIME ARE REQUIRED TO LIST AND PLOT 35 MATERIALS (APPROXIMATELY 3500 DATA CARDS).

IN SLAVE3 RUNNING TIME IS DEPENDENT ON THE SELECTION OF SUBROUTINES AND PROCESSING REQUIREMENTS. TYPICAL CPU TO PP TIME RATIO IS 1 TO 3, AND AN AVERAGE RUN IS 4 MINUTES.

7. UNUSUAL FEATURES OF THE PROGRAM - IN CHECKER THERE ARE TWO OUTPUT OPTIONS - (A) LONG FORM, WHICH LISTS EACH CARD IMAGE AS WELL AS THE ANOMALIES ENCOUNTERED, AND (B) SHORT FORM, WHICH LISTS ONLY THE ANOMALIES ENCOUNTERED BY THE PROGRAM (MINIMUM OUTPUT OPTION).

8. RELATED AND AUXILIARY PROGRAMS - ALL FIVE PROGRAMS PERFORM AN INDEPENDENT OPERATION ON ENDF/B DATA. CRECT MAY BE USED TO CORRECT ERRORS DETECTED BY CHECKER.

9. STATUS - ABSTRACT FIRST DISTRIBUTED SEPTEMBER 1969.

CDC6600 VERSION SUBMITTED APRIL 1969, CRECT REPLACED BY LATER VERSION AUGUST 1972.

10. REFERENCES - NATIONAL NEUTRON CROSS SECTION CENTER, DESCRIPTION OF THE ENDF/B PROCESSING CODES CHECKER, CRECT, DAMMET, PLOTFB, AND RETRIEVAL SUBROUTINES, ENDF-110, BNL-13582, SEPTEMBER 1967, REVISED APRIL 1969.
H. C. MCNECK, ENDF/B - SPECIFICATIONS FOR AN EVALUATED NUCLEAR DATA FILE FOR REACTOR APPLICATIONS, BNL-50066, MAY 1966, REVISED JULY 1967.
11. MACHINE REQUIREMENTS - FOR CHECKER 56,300 OCTAL (APPROXIMATELY 24,000 DECIMAL) WORDS OF CORE STORAGE AND ONE TAPE (OR DISC) UNIT (BESIDES INPUT AND OUTPUT UNITS).
FOR CRECT 13,000 OCTAL WORDS OF CORE STORAGE AND TWO DATA STORAGE UNITS.
FOR DAMMET 61,000 OCTAL (ABOUT 25,000 DECIMAL) WORDS OF CORE STORAGE AND A MAXIMUM OF FIVE TAPE (OR DISC) UNITS.
FOR PLOTFB 73,700 OCTAL (ABOUT 30,000 DECIMAL) WORDS OF CORE STORAGE AND THREE TAPE (OR DISC) UNITS.
FOR SLAVE3 40,000 OCTAL (APPROXIMATELY 18,000 DECIMAL) WORDS OF CORE STORAGE AND ONE OR TWO TAPE (OR DISC) UNITS WILL BE REQUIRED FOR A TYPICAL JOB.
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE3 (LOCALLY MODIFIED).
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - WHEN USING NCCN-CDC6600 VERSIONS OF FORTRAN IV THE IMPLEMENTATION OF AND/OR OPERATIONS AND EOF TESTING OPERATIONS SHOULD BE CHECKED.
15. NAME AND ESTABLISHMENT OF AUTHORS -
D. E. CULLEN, W. KRCPP, S. PEARLSTEIN,
AND C. OZER
NATIONAL NEUTRON CROSS SECTION CENTER
BROOKHAVEN NATIONAL LABORATORY
UPTON, LONG ISLAND, NEW YORK 11973
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (CHECKER 2355 CARDS, CRECT 259 CARDS, DAMMET 1867 CARDS, PLOTFB 4037 CARDS, SLAVE3 2245 CARDS)
REFERENCE REPORT, BNL-13582
17. CATEGORY - M
KEYWORDS - DATA PROCESSING, CROSS SECTIONS, GRAPHS, INPUT DATA, LIBRARIES, MAINTENANCE, RETRIEVAL

1. NAME OR DESIGNATION OF PROGRAM - CITATION
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - CITATION IS DESIGNED TO SOLVE PROBLEMS INVOLVING THE FINITE-DIFFERENCE REPRESENTATION OF DIFFUSION THEORY TREATING UP TO THREE SPACE DIMENSIONS WITH ARBITRARY GROUP-TO-GROUP SCATTERING. X-Y-Z, THETA-R-Z, HEXAGONAL-Z, AND TRIAGONAL-Z GEOMETRIES MAY BE TREATED. DEPLETION PROBLEMS MAY BE SOLVED AND FUEL MANAGED FOR MULTI-CYCLE ANALYSIS. EXTENSIVE FIRST-ORDER PERTURBATION RESULTS MAY BE OBTAINED, GIVEN MICROSCOPIC DATA AND NUCLIDE CONCENTRATIONS. STATICS PROBLEMS MAY BE SOLVED AND PERTURBATION RESULTS OBTAINED WITH MICROSCOPIC DATA.
4. METHOD OF SOLUTION - EXPLICIT, FINITE-DIFFERENCE APPROXIMATIONS IN SPACE AND TIME HAVE BEEN IMPLEMENTED. THE NEUTRON-FLUX-EIGENVALUE PROBLEMS ARE SOLVED BY DIRECT ITERATION TO DETERMINE THE MULTIPLICATION FACTOR OR THE NUCLIDE DENSITIES REQUIRED FOR A CRITICAL SYSTEM.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - CITATION HAS BEEN DESIGNED TO ATTACK PROBLEMS WHICH CAN BE RUN IN A REASONABLE AMOUNT OF TIME. STORAGE OF DATA IS ALLOCATED DYNAMICALLY TO GIVE THE USER FLEXIBILITY IN DIMENSIONING. TYPICALLY, A FINITE-DIFFERENCE DIFFUSION PROBLEM COULD HAVE 200 DEPLETING ZONES, 10,000 NUCLIDE DENSITIES AND 30,000 SPACE-ENERGY POINT FLUX VALUES.
6. TYPICAL RUNNING TIME - THE TWO-DIMENSIONAL FINITE-DIFFERENCE DIFFUSION THEORY EIGENVALUE PROBLEMS ITERATE AT A RATE OF ABOUT 0.1 MILLISECOND PER POINT PER ITERATION WITH ALTERNATING-DIRECTION LINE RELAXATION (TWO SWEEPS PER ITERATION) WITH 8-BYTE WORDS ON THE IBM360/91 (0.5 ON THE 360/75). SINCE ABOUT 30 ITERATIONS ARE REQUIRED FOR EACH SUCCEEDING EIGENVALUE PROBLEM, MACHINE TIME FOR A DEPLETION PROBLEM IS ABOUT .003 SECOND PER POINT PER TIME-STEP. MACHINE TIME FOR MOST AUXILIARY CALCULATIONS IS USUALLY INSIGNIFICANT. FOR A REPRESENTATIVE FAST BREEDER DEPLETION PROBLEM, 68 PERCENT OF THE MACHINE CPU TIME IS SPENT IN SOLVING EIGENVALUE PROBLEMS.
7. UNUSUAL FEATURES OF THE PROGRAM - CITATION IS CONSIDERED UNUSUAL IN THAT IT SHOULD BE RELATIVELY EASY TO MODIFY THE CONTENTS OR TO ADD ROUTINES. EFFECTIVE TECHNIQUES ARE INCORPORATED TO DETERMINE A CRITICAL SYSTEM. MORE THAN ONE SET OF MICROSCOPIC CROSS SECTIONS MAY BE USED IN A SYSTEM AND NUCLIDE BEHAVIOR CAN BE FOLLOWED ON A SUB-ZONE SCALE WITHIN DEPLETION REGIONS. THE USER HAS FLEXIBLE CONTROL OVER THE ROUTE OF A CALCULATION AS WELL AS OF THE EDIT OF RESULTS.
8. RELATED AND AUXILIARY PROGRAMS - THE MICROSCOPIC CROSS SECTION TAPE FOR THIS PROGRAM MAY BE GENERATED BY VARIOUS CODES, BUT XSDRA

8. RELATED AND AUXILIARY PROGRAMS (CONTINUED)
(ACC ABSTRACT 393) IS DESIGNED SPECIFICALLY FOR THIS PURPOSE. THE MICROSCOPIC CROSS SECTION ROUTINES, FORMERLY AN AUXILIARY PROGRAM, WERE INTEGRATED INTO THE CODE TO PERMIT SUCH DATA TO BE SUPPLIED FROM CARDS OR MODIFIED IN THE SAME RUN AS A PROBLEM IS SOLVED.
9. STATUS - ABSTRACT FIRST DISTRIBUTED MAY 1970.
IBM360 VERSION SUBMITTED JULY 1969, REVISED JANUARY 1970,
2ND REVISION APRIL 1970, 3RD REVISION NOVEMBER 1971,
4TH REVISION APRIL 1972, 5TH REVISION JUNE 1972,
6TH REVISION AUGUST 1972, 7TH REVISION NOVEMBER 1972.
10. REFERENCES - T. B. FOWLER, D. R. VONCY, AND G. W. CUNNINGHAM,
NUCLEAR REACTOR CORE ANALYSIS CODE CITATION, ORNL-TM-2496,
REVISION 2, JULY 1971, SUPPLEMENT 1, OCTOBER 1971, SUPPLEMENT 2,
MARCH 1972, SUPPLEMENT 3, JULY 1972.
N. M. GREENE AND C. W. CRAVEN, JR., XSDRN, A DISCRETE
ORDINATES SPECTRAL AVERAGING CODE, ORNL-TM-2500, JULY 1969.
D. R. VONCY AND T. B. FOWLER, JCB STREAM OF CASES
FOR THE COMPUTER CODE CITATION, ORNL-TM-3793, JULY 1972.
11. MACHINE REQUIREMENTS - IBM360/91 OR EQUIVALENT WITH AT LEAST
128,000 4-BYTE WORDS OF DIRECTLY-ADDRESSABLE CORE STORAGE, 7 TO 32
I/O DEVICES DEPENDING UPON THE CALCULATION, EXCLUDING INPUT AND
OUTPUT DEVICES AND SYSTEM REQUIREMENTS.
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
OS/360.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
NOW CITATION CONTAINS ABOUT 25,000 SOURCE STATEMENTS. WITHOUT
OVERLAY, STORAGE FOR THE CODE INSTRUCTIONS WOULD APPROACH 150,000
4-BYTE WORDS, BUT WITH OVERLAY THE STORAGE REQUIREMENT IS ABOUT
43,000 FOR THE PROGRAM AND FIXED STORAGE, INCLUDING 10,000 FOR
SYSTEM LIBRARY ROUTINES.
15. NAME AND ESTABLISHMENT OF AUTHORS -
T. B. FOWLER, D. R. VONCY, AND G. W. CUNNINGHAM
OAK RIDGE NATIONAL LABORATORY
P. O. BOX X
OAK RIDGE, TENNESSEE 37830
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (28,476 CARDS)
SAMPLE PROBLEM (850 CARDS)
REFERENCE REPORT, ORNL-TM-2496, REV.2, SUPPLEMENTS 1, 2, AND 3
REFERENCE REPORT, ORNL-TM-3793, AVAILABLE UPON REQUEST
17. CATEGORY - K
KEYWORDS - 1-DIMENSIONAL, 2-DIMENSIONAL, 3-DIMENSIONAL, MULTI-

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17. KEYWORDS (CONTINUED)

GROUP, DIFFUSION, CRITICALITY SEARCHES, BUCKLING,
X-Y-Z, R-THETA, HEXAGONAL, DEPLETION, FUEL MANAGEMENT

1. NAME OR DESIGNATION OF PROGRAM - ETCX3
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - UNIVAC1108
3. DESCRIPTION OF PROBLEM OR FUNCTION - ETOX3 (ENDF/B TO 1DX) CALCULATES MULTIGROUP CONSTANTS FOR NUCLEAR REACTOR CALCULATIONS USING DATA FROM THE EVALUATED NUCLEAR DATA FILE (ENDF/B) VERSION II OR VERSION III FORMAT. IT CAN ALSO PROCESS VERSION I MATERIALS THAT DO NOT CALL FOR PARTIAL ENERGY DISTRIBUTION LAWS 1, 2, 4, 6, OR 8 (SEE ENDF/B, FILE 5). THE CODE IS DESIGNED TO COMPUTE AND PUNCH -
 - (A) INFINITE DILUTE CROSS SECTIONS,
 - (B) TEMPERATURE DEPENDENT SELF-SHIELDING FACTORS FOR ARBITRARY VALUES OF MICROSCOPIC SIGMA0 (TOTAL CROSS SECTION PER ATOM) IN THE RUSSIAN (BCNDARENKO) FORMAT, AND
 - (C) INELASTIC SCATTERING PROBABILITY MATRICES.
4. METHOD OF SOLUTION - MICROSCOPIC CROSS SECTION VALUES ARE CONSTRUCTED AS SPECIFIED BY THE ENDF/B. GROUP CONSTANTS ARE OBTAINED BY INTEGRATING THE MICROSCOPIC DATA OVER GROUP INTERVALS USING THE FLUX WEIGHTING SCHEME--
 $\Phi(U)$ IS PROPORTIONAL TO $1/\Sigma_{\text{MAT}}(U)$, $\Sigma_{\text{MAT}}(U) = N(J) * \text{MICROSCOPIC } \Sigma_{\text{MAT}}(J) + N(J) * \text{MICROSCOPIC } \Sigma_{\text{MAT}}(U)$.
INTEGRATION METHODS USED INCLUDE ROMBERG, GAUSSIAN QUADRATURE, N-POINT, SIMPSON AND TRAPEZOIDAL. THE CODE ALLOWS AS INPUT ARBITRARY SETS OF VALUES OF GROUP ENERGIES, TEMPERATURES, AND MICROSCOPIC SIGMA0, SIGMA1.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
6. TYPICAL RUNNING TIME - 26-GROUP DATA FOR A REPRESENTATIVE SET OF 14 ISOTOPES REQUIRES ABOUT 28 MINUTES.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - WLIB IS A SHORT PROGRAM INCLUDED WITH ETOX3. IT CREATES A TABLE OF COMPLEX INTEGRALS USED BY ETOX3. ETCX3 REQUIRES THE ENDF/B TAPE IN STANDARD ARRANGEMENT BINARY MODE. SINCE THE ENDF/B TAPES DO NOT NORMALLY COME IN THIS MODE, THEY MUST BE PROCESSED BY THE CAMMET CODE (ACC ABSTRACTS 384 AND 475) PRIOR TO USING THEM WITH ETOX3. THE FORMAT OF THE ETCX3 OUTPUT IS COMPATIBLE FOR INPUT TO THE COMPUTER CODE 1DX (ACC ABSTRACT 374), A MULTIPURPOSE DIFFUSION CODE FOR GENERATING CROSS SECTIONS TO BE USED IN FAST REACTOR ANALYSIS.
9. STATUS - ABSTRACT FIRST DISTRIBUTED MAY 1970.
UNIVAC1108 VERSION OF ETOX SUBMITTED JULY 1969, REVISED APRIL 1970, REPLACED BY ETCX2 DECEMBER 1970, REPLACED BY ETOX3 JUNE 1973.

10. REFERENCES - R. E. SCHENTER, J. L. BAKER, AND R. B. KIDMAN, ETOX, A CODE TO CALCULATE GROUP CONSTANTS FOR NUCLEAR REACTOR CALCULATIONS, BNWL-1002, MAY 1969.
R. B. KIDMAN, ETOX-3 OPERATING INSTRUCTIONS, OVERLAY STRUCTURE, AND CARD INPUT INSTRUCTIONS, WADCO NOTE.
H. C. HONECK, ENDF/B, SPECIFICATION FOR AN EVALUATED NUCLEAR DATA FILE FOR REACTOR APPLICATIONS, BNL-50066, MAY 1966, REVISED JULY 1967.
R. W. HARDIE AND W. W. LITTLE, JR., 1DX, A ONE-DIMENSIONAL DIFFUSION CODE FOR GENERATING EFFECTIVE NUCLEAR CROSS SECTIONS, BNWL-954, MARCH 1969.
I. I. BONDARENKO (EDITOR), GROUP CONSTANTS FOR NUCLEAR REACTOR CALCULATIONS, CONSULTANTS BUREAU, NEW YORK, 1964.
W. ROMBERG, VEREINFACHTE NUMERISCHE INTEGRATION, DET. KONG. NORSKE VIDENSKABER SFLSKAB FORHANDLINGER, BAND 28, NR. 7, 1955.
M. ALBRAMOWITZ AND I. A. STEGUN (EDITORS), HANDBOOK OF MATHEMATICAL FUNCTIONS, DOVER PUBLICATIONS, INC., P. 916, 1965.
D. M. OSHEA, B. J. TOPPEL, AND A. L. RAGO, MC**2, A CODE TO CALCULATE MULTIGROUP CROSS SECTIONS, ANL-7318, JUNE 1967.
R. B. KIDMAN AND R. E. SCHENTER, GROUP CONSTANTS FOR FAST REACTOR CALCULATIONS, HEDL-TME-71-36, MARCH 1971.
11. MACHINE REQUIREMENTS - 65K MEMORY, 5 TAPE UNITS (3 OF WHICH ARE SCRATCH TAPES), AND RANDOM ACCESS CORE STORAGE
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - ETOX3 USES RANDOM DRUM STORAGE TO MAKE MAXIMUM USE OF CORE. THE TAPE OF COMPLEX INTEGRALS PREPARED BY WLIR SHOULD BE MOUNTED AS LOGICAL UNIT 9. THE ENDF/B TAPE IN STANDARD ARRANGEMENT BINARY MODE SHOULD BE MOUNTED AS LOGICAL UNIT 12.
15. NAME AND ESTABLISHMENT OF AUTHOR -
R. B. KIDMAN
HANFORD ENGINEERING DEVELOPMENT LABORATORY
WESTINGHOUSE HANFORD COMPANY
P. O. BOX 1970
RICHLAND, WASHINGTON 99352
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (ETOX3 4909 CARDS, WLIR 205 CARDS)
SAMPLE PROBLEM (ETOX3 11 CARDS)
PUNCHED OUTPUT (200 CARDS)
REFERENCE REPORT, BNWL-1002, AND WADCO NOTE
17. CATEGORY - B
KEYWORDS - GROUP CONSTANTS, INELASTIC SCATTERING, FAST REACTORS, TEMPERATURE, INPUT DATA, ENDF/B, 1DX CODES, WLIR CODES, CAMMET CODES

1. NAME OR DESIGNATION OF PROGRAM - MANE1
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - THE MANE1 PROGRAM FINDS THE MAGNETIC FLUX IN EACH BRANCH OF A MAGNETIC NETWORK CONSISTING OF A NUMBER OF BRANCHES OF IRON AND AIR. THE PROBLEM IS ONE STEP IN THE DESIGN OF SLOW SPEED RELUCTANCE MOTORS IN WHICH THE MAGNETIC FLUX IS DETERMINED IN ALL COMPONENT PARTS FOR A POSITION OF THE ROTOR WITH RESPECT TO THE STATOR.
4. METHOD OF SOLUTION - THE EQUATIONS TO BE SOLVED ARE OBTAINED BY APPLYING OHMS LAW AND KIRCHOFFS LAW TO THE MAGNETIC NETWORK. THE RESULTING NONLINEAR EQUATIONS ARE SOLVED BY THE NEWTON-RAPHSON METHOD OF ITERATION. THE LINEARIZED EQUATIONS ARE SOLVED BY USING KRON'S FUNDAMENTAL FORMULA FOR MESH ANALYSIS OF AN ELECTRICAL CIRCUIT.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE NETWORK CONSISTS OF A NUMBER OF MAJOR RECTANGLES OR LOOPS CONNECTED TO EACH OTHER IN A CYCLIC FASHION. EACH LARGE RECTANGLE IS SUBDIVIDED INTO A NUMBER OF SMALLER RECTANGLES. EACH SIDE (NETWORK BRANCH) HAS A RELUCTANCE BUT ONLY ONE BRANCH OF EACH MAJOR RECTANGLE HAS A DRIVING FORCE CORRESPONDING TO THE APPLIED AMPERE TURNS IN THE STATOR. IF THERE ARE L LOOPS AND R RECTANGLES PER LOOP, THEN LR LINEAR EQUATIONS MUST BE SOLVED. A RULE OF THUMB LIMITATION IS LR LESS THAN OR EQUAL TO 90, ALTHOUGH THE PROGRAM IS ACTUALLY LIMITED ONLY BY THE AMOUNT OF CORE STORAGE AND THE ADEQUACY OF GAUSS ELIMINATION WITH PIVOTAL CONDENSATION.
6. TYPICAL RUNNING TIME - FOR VALUES OF LR = 24 THE SOLUTION IS OBTAINED IN 5 TO 10 SECONDS.
7. UNUSUAL FEATURES OF THE PROGRAM - GIVEN THE MAGNETIZATION CHARACTERISTICS OF THE VARIOUS STEELS (REPRESENTED BY POINTS ON A TABLE), MANE1 FINDS A POINT ON EACH CURVE AND CALCULATES THE EQUATION OF A TANGENT TO THE CURVE INSTEAD OF A STRAIGHT LINE FROM THE CALCULATED POINT TO THE ORIGIN. REGARDLESS OF THE COMPLICATION OF THE NETWORK, THE PROGRAM SOLVES THE PROBLEM IN LESS THAN 10 ITERATIONS. THE PROGRAM ALSO CALCULATES THE TOTAL MAGNETIC ENERGY IN THE ENTIRE NETWORK.
8. RELATED AND AUXILIARY PROGRAMS - MANE1 IS AN IMPROVED VERSION OF MO565 AND USES THE BETTIS ENVIRONMENTAL ROUTINES (ACC ABSTRACT 478).
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1970.
CDC6600 VERSION SUBMITTED OCTOBER 1969, REPLACED BY
REVISED VERSION APRIL 1973.

10. REFERENCES - D. A. GUERDAN, C. J. MARLOWE, MANE1 - A DIGITAL COMPUTER PROGRAM TO SOLVE A RECTANGULAR MAGNETIC NETWORK, WAPD-TM-790, SEPTEMBER 1969.
D. A. GUERDAN, M0565, A PROGRAM TO SOLVE A RECTANGULAR MAGNETIC NETWORK FOR USE ON THE PHILCO-2000 COMPUTER, WAPD-TM-557, FEBRUARY 1966.
C. J. PFEIFER, CDC-6600 FORTRAN PROGRAMMING - BETTIS ENVIRONMENTAL REPORT, WAPD-TM-668, JANUARY 1967.
11. MACHINE REQUIREMENTS - FOR SMALL PROBLEMS, LR = 18, 35,000 (CCTAL) CORE LOCATIONS ARE REQUIRED. FOR LARGE PROBLEMS, LR = 80, 154,000 (CCTAL) CORE LOCATIONS ARE REQUIRED.
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 3.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - FORTRAN INTEGER AND REAL VARIABLES ARE EQUIVALENCED. IT IS ASSUMED THAT VARIABLES ARE ALLOCATED THE SAME NUMBER OF STORAGE BITS INDEPENDENTLY OF THIS TYPE DESIGNATION.
15. NAME AND ESTABLISHMENT OF AUTHORS -
D. A. GUERDAN AND C. J. MARLOWE
BETTIS ATOMIC POWER LABORATORY
WESTINGHOUSE ELECTRIC CORPORATION
P. O. BOX 79
WEST MIFFLIN, PENNSYLVANIA 15122
16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
SOURCE DECK (870 CARDS)
SAMPLE PROBLEM (14 CARDS)
SAMPLE PROBLEM OUTPUT (9 PAGES)
REFERENCE REPORTS, WAPD-TM-790 AND WAPD-TM-668
17. CATEGORY - I
KEYWORDS - DESIGN, MAGNETIC FLUX, M0565 CODES

1. NAME OR DESIGNATION OF PROGRAM - COBRA3C
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - UNIVAC1108, IBM370, CDC6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - COBRA3C CALCULATES THE STEADY-STATE AND TRANSIENT FLOW, ENTHALPY AND PRESSURE DROP IN THE SUBCHANNELS OF ROD BUNDLE NUCLEAR FUEL ELEMENTS DURING BOTH BOILING AND NONBOILING CONDITIONS. THE PROGRAM USES A MATHEMATICAL MODEL THAT INCLUDES THE EFFECTS OF TURBULENT AND DIVERSION CROSSFLOW MIXING BETWEEN THE SUBCHANNELS. A THERMAL MODEL OPTION IS INCLUDED TO CALCULATE RADIAL FUEL TEMPERATURE DISTRIBUTION AS A FUNCTION OF USER-SPECIFIED POWER GENERATION AND HEAT TRANSFER CORRELATIONS. CRITICAL HEAT FLUX CALCULATIONS CAN ALSO BE PERFORMED BY USER OPTION. FORCED CROSSFLOW MIXING DUE TO DIVERTER VANES OR WIRE WRAPS CAN BE CONSIDERED.
4. METHOD OF SOLUTION - THE EQUATIONS FOR THE FLUID FLOW AND HEAT TRANSFER MODEL ARE SOLVED AS A BOUNDARY-VALUE PROBLEM BY USING IMPLICIT FINITE DIFFERENCE EQUATIONS THAT ARE STABLE FOR ALL TIME-STEPS. THE BOUNDARY CONDITIONS FOR THE FLOW SOLUTION ARE THE INLET ENTHALPY, INLET FLOW, INLET CROSSFLOW AND EXIT PRESSURE. A COMBINATION OF GAUSS ELIMINATION AND ITERATION IS USED TO PERFORM THE SOLUTION. THE SOLUTION MUST RELY UPON INPUT CORRELATIONS TO SPECIFY THE TURBULENT CROSSFLOW MIXING, SUBCHANNEL PRESSURE GRADIENT, AND HEAT TRANSFER COEFFICIENTS DURING BOTH STEADY-STATE AND TRANSIENTS.
5. RESTRICTIONS UPON THE COMPLEXITY OF THE PROBLEM - ADJUSTABLE DIMENSIONS ARE INCLUDED TO ALLOW THE USER TO EXPAND OR CONTRACT THE SIZE OF THE PROGRAM TO ACCOMMODATE HIS COMPUTER STORAGE CAPABILITY. THE PROGRAM HAS PERFORMED SUCCESSFULLY WITH 36 SUBCHANNELS, 25 FUEL RODS AND 60 SUBCHANNEL CONNECTIONS.
6. TYPICAL RUNNING TIME - ABOUT 2 MINUTES OF UNIVAC1108 TIME ARE REQUIRED FOR 4 TIME-STEPS, 60 AXIAL NODES, 9 SUBCHANNELS, AND 7 RADIAL FUEL NODES. ABOUT 4 MINUTES ARE REQUIRED TO RUN THE SAMPLE PROBLEM ON THE IBM360.
7. UNUSUAL FEATURES OF THE PROGRAM - COBRA3C IS A RATHER GENERAL PROGRAM WHICH CAN BE USED FOR THERMAL-HYDRAULIC ANALYSIS OF ALMOST ANY ROD BUNDLE FUEL ELEMENT CONFIGURATION.
8. RELATED AND AUXILIARY PROGRAMS - THIS IS AN IMPROVED VERSION OF THE COBRA3 PROGRAM DESCRIBED IN REFERENCE 2.
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1970.
UNIVAC1108 VERSION OF COBRA2 SUBMITTED DECEMBER 1970,
REPLACED BY COBRA3 IN JUNE 1971, REPLACED BY COBRA3C
IN APRIL 1973.
IBM360 VERSION OF COBRA2 SUBMITTED FEBRUARY 1970,
REPLACED BY COBRA3 IN SEPTEMBER 1971, REPLACED BY

9. STATUS (CONTINUED)

COBRA3C IN APRIL 1973, SAMPLE PROBLEM EXECUTED BY
ACC.

CCC6600 VERSION OF COBRA3C SUBMITTED JUNE 1973.

10. REFERENCES - D. S. RCWE, COBRA-IIIC, A DIGITAL COMPUTER PROGRAM FOR STEADY-STATE AND TRANSIENT THERMAL-HYDRAULIC ANALYSIS OF ROD BUNDLE NUCLEAR FUEL ELEMENTS, BNWL-1695, MARCH 1973.
D. S. RCWE, COBRA-III, A DIGITAL COMPUTER PROGRAM FOR STEADY-STATE AND TRANSIENT THERMAL-HYDRAULIC SUBCHANNEL ANALYSIS OF ROD BUNDLE NUCLEAR FUEL ELEMENTS, BNWL-B-82, JULY 1971.
11. MACHINE REQUIREMENTS - 32K MEMORY
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - CSCX (UNIVAC1108), OS/370 (IBM370), SCCPF 4.3 (CCC6600 CYBER70).
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - COBRA3 IS STILL UNDER DEVELOPMENT. THIS INTERIM VERSION IS BEING MADE AVAILABLE TO EXPEDITE ITS USE BY THE NUCLEAR INDUSTRY. THE CODE SHOULD BE USED WITH DISCRETION AND WITH FULL UNDERSTANDING OF ITS PRESENT LIMITATIONS.
15. NAME AND ESTABLISHMENT OF AUTHORS -

1108,6600	D. S. RCWE PACIFIC NORTHWEST LABORATORIES BATTELLE P. O. BOX 999 RICHLAND, WASHINGTON 99352
370	R. L. CURTIS COMPUTER SCIENCE CENTER AEROCJET NUCLEAR COMPANY P. O. BOX 1845 IDAHO FALLS, IDAHO 83401
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
 SOURCE DECKS (1108-2563 CARDS, 6600-2973 CARDS, 370-2997 CARDS)
 SAMPLE PROBLEMS (1108-181 CARDS, 6600-179 CARDS, 370-181 CARDS)
 REFERENCE REPORT, BNWL-1695
17. CATEGORY - H
 KEYWORDS - THERMODYNAMICS, FLUID FLOW, FUEL ELEMENTS, LIQUIDS,
 VAPORS, ENTHALPY, PRESSURE, COBRA CODES

1. NAME OR DESIGNATION OF PROGRAM - CONTEMPT-LT/022
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - THE CONTEMPT-LT PROGRAM PREDICTS THE PRESSURE-TEMPERATURE RESPONSE OF A DRY WELL OR A DRY WELL WITH VENTS AND PRESSURE SUPPRESSION SYSTEM TO A LOSS-OF-COOLANT ACCIDENT. AN ADDITIONAL DUAL CONTAINMENT COMPARTMENT MAY ALSO BE MODELED IF DESIRED. THE DRY WELL IS SEPARATED INTO A LIQUID REGION AND A VAPOR REGION. EACH REGION IS ASSUMED TO HAVE A UNIFORM TEMPERATURE BUT THE TEMPERATURES OF THE TWO REGIONS MAY BE DIFFERENT. THE CONTAINMENT BUILDING IS REPRESENTED AS CONSISTING OF SEVERAL HEAT CONDUCTING STRUCTURES WHOSE THERMAL BEHAVIOR CAN BE DESCRIBED BY THE ONE-DIMENSIONAL MULTI-REGION HEAT CONDUCTION EQUATIONS. WATER AND ENERGY RATES FROM DISCHARGE OF COOLANT, BOILING OF RESIDUAL WATER BY REACTOR DECAY HEAT, SUPERHEATING OF STEAM PASSING THROUGH THE CORE, AND METAL-WATER REACTIONS ARE ASSUMED AVAILABLE FROM PREVIOUS CALCULATIONS AND ARE INPUT DATA TO THE PROGRAM. PROGRAM OUTPUT INCLUDES CONTAINMENT VOLUME PRESSURE AND TEMPERATURE, TEMPERATURES THROUGH THE BUILDING STRUCTURES, AND THE AMOUNT OF WATER, VAPOR, AND ENERGY IN THE CONTAINMENT VOLUMES. THE PRESSURE SUPPRESSION CALCULATIONS INCLUDE VENT CLEARING AND FLOW OF A TWO-COMPONENT TWO-PHASE WATER-AIR MIXTURE THROUGH THE VENTS, AND A MASS-ENERGY BALANCE IN THE WET WELL. THERE ARE PROVISIONS FOR NORMAL BUILDING LEAKAGE, LEAKAGE FROM PENETRATIONS, A FAN COOLER SYSTEM, AND DRY AND WET WELL SPRAY SYSTEMS.
4. METHOD OF SOLUTION - THE INITIAL CONDITIONS OF THE CONTAINMENT ATMOSPHERE ARE CALCULATED FROM INPUT VALUES, AND THE INITIAL TEMPERATURE DISTRIBUTIONS THROUGH THE CONTAINMENT STRUCTURES ARE DETERMINED FROM THE STEADY-STATE SOLUTION OF THE HEAT CONDUCTION EQUATIONS. A TIME ADVANCEMENT PROCEEDS AS FOLLOWS. THE INPUT WATER AND ENERGY RATES ARE EVALUATED AT THE MIDPOINT OF A TIME INTERVAL AND ADDED TO THE CONTAINMENT SYSTEM. PRESSURE SUPPRESSION, SPRAY SYSTEM EFFECTS, AND FAN COOLER EFFECTS ARE CALCULATED USING CONDITIONS AT THE BEGINNING OF A TIME-STEP. LEAKAGE AND HEAT LOSSES OR GAINS, EXTRAPOLATED FROM THE LAST TIME-STEP, ARE ADDED TO THE CONTAINMENT SYSTEM. CONTAINMENT VOLUME PRESSURE AND TEMPERATURES ARE ESTIMATED BY SOLVING THE MASS, VOLUME, AND ENERGY BALANCE EQUATIONS. USING THESE RESULTS AS BOUNDARY CONDITIONS, THE HEAT CONDUCTION EQUATIONS DESCRIBING STRUCTURE BEHAVIOR ARE ADVANCED USING AN IMPLICIT TECHNIQUE. THE RESULTING HEAT TRANSFER RATES ARE USED TO CORRECT THE PREVIOUS ESTIMATES OF THE WATER AND ENERGY STORAGE IN THE CONTAINMENT VOLUME, AND THE CONTAINMENT CONDITIONS ARE OBTAINED BY SOLVING FOR THE SECOND TIME THE CONTAINMENT BALANCE EQUATIONS. THE PRESSURE SUPPRESSION ROUTINES USE THE CONDITIONS AT THE BEGINNING OF A TIME-STEP TO CALCULATE BOTH THE INITIAL EXPULSION OF WATER FROM THE VENTS AND THE FLOW THROUGH THE VENTS. FROM THE CALCULATED FLOW RATES, MASS AND ENERGY ARE REMOVED FROM THE DRY WELL AND ADDED TO THE WET WELL.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
20 HEAT STRUCTURES
101 MESH POINTS PER STRUCTURE
SEVERAL METHODS FOR DESCRIBING NON-CONSTANT HEAT TRANSFER COEFFICIENTS ARE PROVIDED, BUT THE THERMAL CONDUCTIVITY AND HEAT CAPACITY ARE CONSTANT. WATER THERMODYNAMIC PROPERTIES ARE DETERMINED FROM TABLE LOOKUP AND INTERPOLATION PROCEDURES.
6. TYPICAL RUNNING TIME - ON THE IBM360/75, APPROXIMATELY .021 SECOND PER TIME ADVANCEMENT WITH 90 MESH POINTS FOR HEAT STRUCTURES WITHOUT PRESSURE SUPPRESSION IS REQUIRED. THE PRESSURE SUPPRESSION TIMING IS NOT EASILY PREDICTED BUT TWO SAMPLE PROBLEMS RANGED FROM .3 TO 2 SECONDS PER TIME ADVANCEMENT.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - CONTEMPT-LT REPLACES CONTEMPT (ACC ABSTRACT 297), CONTEMPT-CONPS, AND CONTEMPT-PS.
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1970.
IBM360 VERSION OF CONTEMPT-CONPS SUBMITTED FEBRUARY 1970, REPLACED BY CONTEMPT-PS APRIL 1971, REPLACED BY CONTEMPT-LT/020 AUGUST 1973, REPLACED BY CONTEMPT-LT/022 DECEMBER 1973, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - L. C. RICHARDSON, L. J. FINNEGAN, R. J. WAGNER, AND J. M. WAAGE, CONTEMPT, A COMPUTER PROGRAM FOR PREDICTING THE CONTAINMENT PRESSURE-TEMPERATURE RESPONSE TO A LOSS-OF-COOLANT ACCIDENT, IDO-17220, JUNE 1967.
C. F. CARMICHAEL AND S. A. MARKC, CONTEMPT-PS - A DIGITAL COMPUTER CODE FOR PREDICTING THE PRESSURE-TEMPERATURE HISTORY WITHIN A PRESSURE-SUPPRESSION CONTAINMENT VESSEL IN RESPONSE TO A LOSS-OF-COOLANT ACCIDENT, IDO-17252, APRIL 1969.
R. J. WAGNER, CONTEMPT MODIFICATIONS, PHILLIPS PETROLEUM MEMO WAG-24-68 AM, SEPTEMBER 23, 1968.
R. J. WAGNER, CONTEMPT-CONPS MODIFICATIONS, WAG-19-69A-M, MAY 14, 1969.
C. F. CARMICHAEL, MODIFICATIONS TO CONTEMPT/CONPS CODE, IDAHO NUCLEAR MEMO CARM-16-69, SEPTEMBER 17, 1969.
L. C. RICHARDSON, DATE SUBROUTINE S0000010, PHILLIPS PETROLEUM NOTE, NOVEMBER 1968.
R. J. WAGNER, CVI INPUT SUBROUTINE, IDAHO NUCLEAR NOTE, MAY 1969.
R. L. MUELLER, 360/75 INTERVAL TIMER ROUTINE S00030, PHILLIPS PETROLEUM NOTE, OCTOBER 10, 1968.
K. D. RICHERT, BUFIO, A SUBROUTINE TO PERMIT FORTRAN ACCESS TO IOOP, PHILLIPS PETROLEUM NOTE, FEBRUARY 1966.
A. J. SMITH, CALCOMP PLOTTER SUBROUTINES, PHILLIPS PETROLEUM DESCRIPTION, FEBRUARY 1969.
NRTS ENVIRONMENTAL SUBROUTINE MANUAL, ANC DOCUMENT, DECEMBER 1972.
R. J. WAGNER AND L. L. WHEAT, CONTEMPT-LT USERS

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10. REFERENCES (CONTINUED)
MANUAL, INTERIM REPORT I-214-74-12.1, AUGUST 1973.
L. L. WHEAT, CONTEMPT-LT/021 CONTAINMENT CODE - LLW-7-73, AEROJET NOTE, SEPTEMBER 6, 1973.
L. L. WHEAT, CONTEMPT-LT/022 PROGRAM AVAILABILITY - LLW-12-73, AEROJET NOTE, DECEMBER 17, 1973.
11. MACHINE REQUIREMENTS - 270K BYTES AND A CALCOMP PLOTTER USED FOR PLOTTING
12. PROGRAMMING LANGUAGES USED - FORTRAN IV AND PAL
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360 MVT.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
R. J. WAGNER AND L. L. WHEAT
AEROJET NUCLEAR COMPANY
550 SECOND STREET
IDAHO FALLS, IDAHO 83401
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (CONTEMPT 5182 CARDS, NRTS ENVIRONMENTAL SUBROUTINES 12,187 CARDS)
LOAD MODULE CONTEMPT (342 BLOCKS)
SAMPLE PROBLEM (60 CARDS)
CONTROL INFORMATION (JCL 53 CARDS)
REFERENCE REPORTS, PROGRAM MODIFICATION MEMORANDA, SUBROUTINE DESCRIPTIONS, INTERIM REPORT, AND AEROJET NOTES
17. CATEGORY - G
KEYWORDS - ACCIDENTS, TEMPERATURE DISTRIBUTION, PRESSURE DISTRIBUTION, CONTAINMENT, WATER, THERMODYNAMICS, LEAKAGE, HEAT TRANSFER, CONTEMPT CODES

1. NAME OR DESIGNATION OF PROGRAM - HEATMESH
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - HEATMESH IS USED TO GENERATE GEOMETRICAL DATA REQUIRED FOR STUDIES OF HEAT TRANSFER IN AXISYMMETRIC STRUCTURES REPRESENTED AS SURFACES OF REVOLUTION. THE PROGRAM CONSISTS OF TWO DISTINCT PHASES. THE FIRST SUBDIVIDES THE GIVEN PARTS INTO A NODAL NETWORK AND EVALUATES THE GEOMETRICAL PROPERTIES OF THE NODES. THE SECOND DETERMINES ADJACENT NODES AND EDITS GEOMETRICAL DATA FOR THE THERMAL MODEL.
4. METHOD OF SOLUTION - THE STRUCTURE TO BE STUDIED, REPRESENTED AS A BODY OF REVOLUTION, IS DIVIDED INTO PARTS HAVING COMMON MATERIAL PROPERTIES AND REPRESENTED AS BODIES OF REVOLUTION. EACH PART IS THEN DESCRIBED AS FOUR SURFACES OF REVOLUTION SUBDIVIDED INTO NODES WHICH FORM A MESH. DATA FOR EACH PART ARE COLLECTED, I.E. VOLUME, AREA, AND PART NUMBER OF EACH NODE, AND NODE SURFACES ON THE PART BOUNDARY AND INSIDE THE PART BOUNDARY. THE DISTANCE BETWEEN THE CENTER AND THE MIDPOINT OF EACH SURFACE OF THE NODE IS TABULATED ALSO.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
NUMBER OF SUBDIVISIONS BETWEEN 1 AND 50 FOR SIDES 1 AND 3
NUMBER OF SUBDIVISIONS BETWEEN 1 AND 12 FOR SIDES 2 AND 4
6. TYPICAL RUNNING TIME -
7. UNUSUAL FEATURES OF THE PROGRAM - THE INPUT DATA ARE CONSTRUCTED IN THE SAME MANNER AS USED IN THE APT PROGRAM. DATA GENERATED BY APT CAN BE USED IN HEATMESH WITH ONLY MINOR CHANGES.
8. RELATED AND AUXILIARY PROGRAMS - THE DATA GENERATED BY HEATMESH ARE USED IN THE DIFFERENCE EQUATIONS OF THE HEATFLOW PROGRAM WHICH SOLVES TRANSIENT HEAT TRANSFER PROBLEMS.
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1970.
CDC6600 VERSION SUBMITTED JANUARY 1970.
10. REFERENCES - V. K. GABRIELSON, HEATMESH, A COMPUTER CODE FOR GENERATING GEOMETRICAL DATA REQUIRED FOR STUDIES OF HEAT TRANSFER IN AXISYMMETRIC STRUCTURES, SCL-DR-67-30, SEPTEMBER 1967, AND ERRATA, 1970.
11. MACHINE REQUIREMENTS -
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE.

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11. MACHINE REQUIREMENTS - 140,000 OCTAL WORDS
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
SCOPE.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
CYGRO3 CALLS A SUBROUTINE TICK WHICH IS NOT INCLUDED WITH THE PRO-
GRAM NOR WITH THE BETTIS ENVIRONMENTAL ROUTINES. THEREFORE, THE
USER WILL HAVE TO PROVIDE HIS OWN SUBROUTINE TICK. CALL TICK(HRS)
IS USED TO OBTAIN ELAPSED TIME FOR THE CURRENT JOB. IT SETS HRS
(REAL) TO THE ELAPSED CHARGE TIME IN HOURS.
15. NAME AND ESTABLISHMENT OF AUTHORS -
E. DUNCOMBE AND C. M. FRIEDRICH
BETTIS ATOMIC POWER LABORATORY
WESTINGHOUSE ELECTRIC CORPORATION
P. O. BOX 79
WEST MIFFLIN, PENNSYLVANIA 15122
16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (5206 CARDS)
SAMPLE PROBLEM (95 CARDS)
SAMPLE PROBLEM OUTPUT (15 PAGES)
REFERENCE REPORTS
17. CATEGORY - I
KEYWORDS - STRESSES DISTRIBUTION, FUEL ELEMENTS, DEFORMATION,
TEMPERATURE, PRESSURE, CYGRO CODES

1. NAME OR DESIGNATION OF PROGRAM - KENO/KENO2
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360, CDC6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - KENO IS A MULTIGROUP MONTE CARLO CRITICALITY CODE CONTAINING A SPECIAL GEOMETRY PACKAGE WHICH ALLOWS EASY DESCRIPTION OF SYSTEMS COMPOSED OF CYLINDERS, SPHERES, AND CUBOIDS (RECTANGULAR PARALLELEPIPEDS) ARRANGED IN ANY ORDER WITH ONLY ONE RESTRICTION (EACH GEOMETRICAL REGION MUST BE DESCRIBED AS COMPLETELY ENCLOSED BY ALL REGIONS INTERIOR TO IT). FOR SYSTEMS NOT DESCRIBABLE USING THIS SPECIAL GEOMETRY PACKAGE, THE PROGRAM CAN USE THE GENERALIZED GEOMETRY PACKAGE (GEOM) DEVELOPED FOR THE OSR MONTE CARLO CODE. IT ALLOWS ANY SYSTEM THAT CAN BE DESCRIBED BY A COLLECTION OF PLANES AND/OR QUADRATIC SURFACES, ARBITRARILY ORIENTED AND INTERSECTING IN ARBITRARY FASHION. RECTANGULAR ARRAYS OF FISSIONABLE UNITS ARE ALLOWED WITH OR WITHOUT EXTERNAL REFLECTOR REGIONS. OUTPUT FROM KENO CONSISTS OF K_{EFF} FOR THE SYSTEM PLUS AN ESTIMATE OF ITS STANDARD DEVIATION AND THE LEAKAGE, ABSORPTION, AND FISSIONS FOR EACH ENERGY GROUP PLUS THE TOTALS FOR ALL GROUPS. FLUX AS A FUNCTION OF ENERGY GROUP AND REGION AND FISSION DENSITIES AS A FUNCTION OF REGION ARE OPTIONAL OUTPUT.
4. METHOD OF SOLUTION - THE SCATTERING TREATMENT USED IN KENO ASSUMES THAT THE DIFFERENTIAL NEUTRON SCATTERING CROSS SECTION CAN BE REPRESENTED BY A P₁ LEGENDRE POLYNOMIAL. ABSORPTION OF NEUTRONS IN KENO IS NOT ALLOWED. INSTEAD, AT EACH COLLISION POINT OF A NEUTRON TRACKING HISTORY THE WEIGHT OF THE NEUTRON IS REDUCED BY THE ABSORPTION PROBABILITY. WHEN THE NEUTRON WEIGHT HAS BEEN REDUCED BELOW A SPECIFIED POINT FOR THE REGION IN WHICH THE COLLISION OCCURS, RUSSIAN ROULETTE IS PLAYED TO DETERMINE IF THE NEUTRONS HISTORY IS TO BE TERMINATED AT THAT POINT OR IF THE NEUTRON IS TO SURVIVE WITH AN INCREASED WEIGHT. SPLITTING OF HIGH WEIGHT NEUTRONS IS ALLOWED IN ORDER TO MINIMIZE THE VARIANCE IN K_{EFF} FOR SYSTEMS WITH REGIONS OF WIDELY VARYING AVERAGE WEIGHTS.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
6. TYPICAL RUNNING TIME - THE FIRST SAMPLE PROBLEM REQUIRES JUST OVER 2 MINUTES OF EXECUTION TIME ON THE IBM360/91 AND 6 MINUTES ON THE IBM360/75. TYPICAL PROBLEMS RUN BETWEEN 2 AND 30 MINUTES ON THE CDC6600, DEPENDING ON THE NUMBER OF HISTORIES REQUESTED, THE STATISTICAL WEIGHTING USED, AND THE PRESENCE OR ABSENCE OF REFLECTORS.
7. UNUSUAL FEATURES OF THE PROGRAM - THE MIXED BOX FEATURE PERMITS THE CALCULATION OF MANY DIFFERENT TYPES OF UNITS. KENO2 INPUT IS EXTENSIVELY CHECKED FOR CONSISTENCY AND COMPLETENESS.
8. RELATED AND AUXILIARY PROGRAMS - ANISN (ACC ABSTRACT 151), DOT, GEOM, OSR

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9. STATUS - ABSTRACT FIRST DISTRIBUTED JANUARY 1972.
 IBM360 VERSION OF KEND SUBMITTED MAY 1970, REPLACED BY
 SECOND VERSION SEPTEMBER 1971, SAMPLE PROBLEM EXECUTED BY ACC.
 CDC6600 VERSION OF KENC2 SUBMITTED JULY 1973.
10. REFERENCES - G. E. WHITESIDES AND N. F. CROSS, KEND - A MULTIGROUP
 MONTE CARLO CRITICALITY PROGRAM, CTC-5, SEPTEMBER 10, 1969.
 KEND DATA GUIDE, CTC-5 ERRATA PP.21-32, SEPTEMBER
 1971.
 DESCRIPTION OF ALBEDO AND CROSS SECTION DATA, ORNL
 NOTE, SEPTEMBER 1971.
 ACC PROGRAMMING NOTE, KEND TAPE SETUP, JANUARY 1972.
 DEANNE DICKINSON, ROCKY FLATS KEND II MANUAL, APRIL
 1973.
 ACC 450 KENC2 CDC6600 PROGRAMMING NOTES, JULY 1973.
11. MACHINE REQUIREMENTS - CDC6600 PROGRAM REQUIRES 64K WORDS OF FAST
 CORE, A DISK FACILITY OR CNF OR MORE TAPE UNITS.
12. PROGRAMMING LANGUAGES USED - FORTRAN IV, EXCEPT FOR 3 MACHINE
 LANGUAGE SUBROUTINES (IBM360) AND FTN FORTRAN WITH COMPASS SUB-
 ROUTINES (CDC6600).
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
 OS/360 (IBM360) AND SCOPE 3.3 (CDC6600).
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
 IBM360 SAMPLE PROBLEM CAN BE EXECUTED BY MOUNTING THE DISTRIBUTION
 TAPE AND USING THE JCL CARDS FROM FILE 5 TO RETRIEVE THE OBJECT
 PROGRAM AND ANY NEEDED CROSS SECTION OR ALBEDO DATA. THE ENCLOSED
 CROSS SECTION AND ALBEDO DATA ARE INCLUDED FOR THE SOLE PURPOSE
 OF ALLOWING THE SAMPLE PROBLEMS TO BE RUN FOR INSTRUCTIONAL PURPOSES
 AND SHOULD NOT BE ASSUMED USEFUL FOR ANY OTHER PURPOSE WITHOUT
 CLOSE EXAMINATION AS TO THEIR APPLICABILITY.
 THE 3 MACHINE LANGUAGE SUBROUTINES MENTIONED IN ITEM 12 INCLUDE
 A RANDOM NUMBER PACKAGE RANDNUM (ENTRIES FLTRN, AZIRN, EXPEN, AND
 GTISC), A TIMING SUBROUTINE PULL (ENTRIES PULL AND ITIME), AND
 MODEL, A SUBROUTINE USED AT OAK RIDGE TO IDENTIFY THE MACHINE ON
 WHICH A PROBLEM IS BEING RUN.
15. NAME AND ESTABLISHMENT OF AUTHORS -

360	G. E. WHITESIDES AND N. F. CROSS MATHEMATICS DIVISION OAK RIDGE NATIONAL LABORATORY P. O. BOX X OAK RIDGE, TENNESSEE 37830
6600	DEANNE DICKINSON ROCKY FLATS DIVISION DOW CHEMICAL USA P. O. BOX 888 GOLDEN, COLORADO 80401

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL (360-6 FILES)
SOURCE DECK (360-FILE5 5230 CARDS, 6600-5109 CARDS)
OBJECT DECK (360-FILE3 3347 CARDS)
SAMPLE PROBLEMS (360-FILE6 1664 CARDS, 6600-369 CARDS)
LIBRARIES (360-CROSS SECTION FILE1 110 VARIABLE-SIZED BINARY
RECORDS AND ALBEDOS FILE2 39 VARIABLE-SIZED BINARY
RECORDS)
CONTROL INFORMATION (360-JCL FILE4 29 CARDS)
SAMPLE PROBLEM OUTPUT (360-110 SELECTED PAGES, 6600-58 PAGES)
REFERENCE REPORT, FREATA, MANUAL, AND NOTES
17. CATEGORY - C
KEYWORDS - MULTIGROUP, MONTE CARLO METHOD, CRITICALITY, LEAKAGE,
ABSORPTION, FISSION, STATISTICS, ANISOTROPY, DOT
CODES, GEOM CODES, QSR CODES

1. NAME OR DESIGNATION OF PROGRAM - SAFE-CRACK
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - UNIVAC1108
3. DESCRIPTION OF PROBLEM OR FUNCTION - SAFE-CRACK PERFORMS A VISCO-ELASTIC ANALYSIS OF PLANE AND AXISYMMETRIC COMPOSITE CONCRETE STRUCTURES SUBJECTED TO TRANSIENT TEMPERATURE AND MECHANICAL LOADINGS. THE SPECIFIC CREEP OF CONCRETE AS AN AGE AND TEMPERATURE DEPENDENT FUNCTION, AND CONCRETE FAILURE UNDER COMBINED STRESSES ARE CONSIDERED. PARTICULAR EMPHASIS IS PLACED ON THE CRACKING ANALYSIS IN CONCRETE STRUCTURES AND THE NONLINEAR DEPENDENCE OF CREEP PROPERTY ON TRANSIENT TEMPERATURE.
4. METHOD OF SOLUTION - THE PROGRAM USES THE FINITE-ELEMENT METHOD WHICH REDUCES THE PROBLEM TO THE SOLUTION OF A SYSTEM OF COUPLED INTEGRAL EQUATIONS. THE CHOLESKY METHOD IS USED TO SOLVE THE LINEAR SYSTEM OF EQUATIONS AND THE TRAPEZOIDAL RULE IS APPLIED FOR THE TIME INTEGRATION.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
300 NODES
675 ELEMENTS
70 TIME-STEPS
6. TYPICAL RUNNING TIME - 90 MINUTES ARE REQUIRED FOR A FULL-CAPACITY PROBLEM.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - SAFE-CREEP (ACC ABSTRACT 300)
9. STATUS - ABSTRACT FIRST DISTRIBUTED JANUARY 1972.
UNIVAC1108 VERSION SUBMITTED MAY 1970.
10. REFERENCES - Y. R. RASHID, NONLINEAR QUASI-STATIC ANALYSIS OF TWO-DIMENSIONAL CONCRETE STRUCTURES, PART I THEORY, PART II COMPUTER PROGRAM MANUAL, GA-9994, MARCH 23, 1970.
R. D. BROWNE, PROPERTIES OF CONCRETE IN REACTOR VESSELS, CONFERENCE ON PRESTRESSED CONCRETE PRESSURE VESSELS AT CHURCH HOUSE, WESTMINSTER, S.W. 1, 13-17 MARCH 1967, THE INSTITUTE OF CIVIL ENGINEERS, LONDON, 1968, PP. 131-151.
NTRAN, I/O ROUTINES FOR TAPE AND DRUM, EXCERPT FROM UNIVAC 1107 FORTRAN IV PROGRAMMERS REFERENCE MANUAL, UP-3569, REV. 1.
11. MACHINE REQUIREMENTS - 65K MEMORY AND 13 TAPES
12. PROGRAMMING LANGUAGE USED - FORTRAN V
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - EXEC II.

1. NAME OR DESIGNATION OF PROGRAM - SPAN4
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - SPAN4 CALCULATES THE FAST NEUTRON DOSE RATE, THERMAL NEUTRON FLUX, GAMMA-RAY FLUX, DOSE RATE, AND ENERGY-ABSORPTION RATE IN RECTANGULAR, CYLINDRICAL, AND SPHERICAL GEOMETRIES BY INTEGRATING APPROPRIATE EXPONENTIAL KERNELS OVER A SOURCE DISTRIBUTION. THE SHIELD CONFIGURATION IS FLEXIBLE - A FIRST-LEVEL SHIELD MESH, USING ANY ONE OF THE THREE GEOMETRIES, IS SPECIFIED. REGIONS OF THIS SAME GEOMETRY OR OF OTHER GEOMETRIES, HAVING THEIR OWN (FINER) MESHES, MAY THEN BE EMBEDDED BETWEEN THE FIRST-LEVEL MESH LINES, DEFINING SECOND-LEVEL SHIELD MESHES. THIS PROCESS IS TELESCOPIC - THIRD-LEVEL SHIELD MESHES MAY BE EMBEDDED BETWEEN SECOND-LEVEL MESH LINES IN TURN. ALL MESHES MAY HAVE VARIABLE SPACING. SOURCES AND DETECTORS MAY BE LOCATED ARBITRARILY WITH RESPECT TO ANY SHIELD MESH. THE SOURCE IS DEFINED BY THE FUNCTION -

$$S=S_0+S_1(A)*S_2(B)*S_3(C)+S_4(A,B)*S_3(C)+S_5(A,C)*S_2(B)+S_6(B,C)*S_1(A)+S_7(A,B,C)$$
 WHERE A, B, AND C REPRESENT COORDINATES. IF ANY FACTOR IS MISSING, THE CORRESPONDING TERMS ARE ZERO. CROSS SECTIONS, BUILDUP FACTORS, STANDARD COMPOSITIONS, ENERGY STRUCTURES, DOSE-CONVERSION FACTORS, INFINITE LINE AND INFINITE PLANE SOURCE KERNELS, AND QUADRATURES ARE CONTAINED IN A LIBRARY OF APPROXIMATELY 10,000 ITEMS.
4. METHOD OF SOLUTION - ALL KERNELS USED ASSUME EXPONENTIAL ATTENUATION. BY RAY TRACING, THE STRAIGHT-LINE DISTANCES BETWEEN POINTS IN THE SOURCE AND DOSE POINTS ARE FOUND, TO BE USED IN CALCULATING THE ATTENUATION. INTEGRALS ARE EVALUATED BY GAUSS-LEGENDRE, GAUSS-LAGUERRE, OR LOBATTO QUADRATURE. ACCURACY IS DEPENDENT ON THE ACCURACY OF THE LIBRARY DATA AND ON THE ORDERS OF QUADRATURE USED. IN THERMAL NEUTRON FLUX CALCULATIONS, THE DOSE POINTS MUST BE LOCATED WITHIN OR BEYOND HYDROGENOUS REGIONS, UNLESS THE REMOVAL CROSS SECTIONS FOR THE NON-HYDROGENOUS CASE ARE KNOWN.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - DYNAMIC STORAGE IS USED FOR LARGE BLOCKS OF DATA. HOWEVER, THE FOLLOWING LIMITS ARE TO BE OBSERVED - MAXIMA OF -
 - 75 SHIELD UNITS
 - 75 COMPOSITION MATRICES
 - 9 SOURCES AND DETECTORS
 - 9 FIELD-POINT LISTS
 - 450 DIFFERENT DYNAMICALLY-STORED ARRAYS. THE NUMBER OF SUCH ARRAYS IS $3*(\text{NUMBER OF SHIELD UNITS})+\text{NUMBER OF COMPOSITION MATRICES}+10*(\text{NUMBER OF SOURCES}+\text{NUMBER OF DETECTORS})+\text{NUMBER OF FIELD POINT LISTS}+1$.
 - 400 DIFFERENT COMPOSITION NUMBERS
 - 200 MESH LINES IN ANY DIRECTION IN ANY SHIELD UNIT
 - 33 EMBEDDED GEOMETRIES IN THE PATH OF ONE RAY

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM (CONTINUED)

9 COMBINED FIELD-POINT LISTS
33 INTEGRATIONS IN ONE CASE
15 DECAY-TIMES LISTS
2000 ITEMS IN ANY ONE DATA GROUP, EXCEPT SOURCE STRENGTHS
2000 PRODUCT OF THE ORDERS OF THE THREE QUADRATURE NUMBERS
MAXIMUM ADDITIONS TO THE LIBRARY -
1016 CROSS SECTION DATA ENTRIES OR 32 NEW ELEMENTS
1060 COMPOSITION DATA ENTRIES OR 279 COMPOSITIONS
190 ENERGY-STRUCTURE DATA ENTRIES OR 19 ENERGY STRUCTURES
350 BUILDUP-FACTOR DATA ENTRIES OR 3 NEW BUILDUP-FACTOR MATERIALS

6. TYPICAL RUNNING TIME - A CONSERVATIVE ESTIMATE OF THE COMPUTER TIME REQUIRED FOR A RUN IS GIVEN BY -

$$T(\text{SEC}) = 25 + (0.00042 * NG * NI + 0.1 * (E - 1) + 0.02 * NC) * NF$$

WHERE NG IS THE PRODUCT OF THE ORDERS OF THE QUADRATURES USED IN INTEGRATING OVER THE SOURCE VOLUME, NI IS THE NUMBER OF MESH LINES CROSSED IN RAY-TRACING FROM A TYPICAL GAUSS POINT TO A TYPICAL FIELD POINT, NF IS THE NUMBER OF FIELD POINTS IN THE RUN, E IS THE NUMBER OF ENERGY LEVELS IN THE ENERGY STRUCTURE, AND NC IS THE NUMBER OF DIFFERENT COMPOSITIONS.

7. UNUSUAL FEATURES OF THE PROGRAM - THE EXTREME FLEXIBILITY OF THE SHIELD GEOMETRY OPTIONS ALLOWS NEARLY EXACT REPRESENTATIONS OF VERY COMPLEX REACTORS, SHIELDS, AND REACTOR COMPARTMENT SITUATIONS. COMPLEX REACTORS AND OTHER DEVICES ARE REPRESENTED BY EMBEDDING PORTIONS OF ONE GEOMETRY IN ANOTHER AS FOLLOWS.

A BASIC GEOMETRY (RECTANGULAR, CYLINDRICAL, OR SPHERICAL) IS DEFINED FOR THE SHIELD CONFIGURATION, AND IS USED TO SPECIFY THE MESH LINES IN THE FIRST-LEVEL SHIELD UNIT. THE FIRST-LEVEL SHIELD USUALLY ENCOMPASSES ALL OF THE SHIELDS AND COMPONENTS WHICH ARE TO BE REPRESENTED IN THE PROBLEM. AFTER THE FIRST-LEVEL SHIELD UNIT HAS BEEN SPECIFIED, NEW SHIELD UNITS MAY BE DEFINED (USING A DIFFERENT GEOMETRY THAN THE FIRST-LEVEL SHIELD IF DESIRED), AND PORTIONS OF THESE NEW SHIELD UNITS MAY BE EMBEDDED BETWEEN THE MESH LINES OF THE FIRST-LEVEL SHIELD UNIT. THESE NEW SHIELD UNITS BECOME SECOND-LEVEL SHIELDS.

THE EMBEDDING PROCESS IS TELESCOPIC, SUCH THAT THIRD-LEVEL SHIELD UNITS MAY BE DEFINED AND EMBEDDED IN THE SECOND-LEVEL SHIELD UNITS, AND EACH NEW LEVEL OF SHIELD GEOMETRY IS EMBEDDED IN THE NEXT LOWER LEVEL. THE MESH LINES WHICH ARE SPECIFIED IN EACH SHIELD MAY HAVE VARIABLE SPACING.

EACH CELL FORMED BY THE MESH LINES OF EACH SHIELD UNIT MAY THEN BE SPECIFIED TO CONTAIN EITHER A COMPOSITION (THAT IS VOID, ELEMENT, COMPOUND, OR MIXTURE) OR A CELL-SHAPED PORTION OF A HIGHER-ORDER SHIELD UNIT. THE HIGHEST-ORDER SHIELD UNIT(S) IN A PROBLEM WILL THEREFORE HAVE A COMPOSITION IN EVERY CELL.

MULTIPLE SOURCES AND DETECTORS ARE ALLOWED, THUS SIMPLIFYING SOME TYPES OF STUDIES. NINE SOURCE AND DETECTOR GEOMETRIES MAY BE DEFINED IN A SPAN4 PROBLEM, AND AGAIN THE GEOMETRIES MAY BE RECTANGULAR, CYLINDRICAL, OR SPHERICAL. SOURCES AND DETECTORS MAY BE LOCATED ARBITRARILY WITH RESPECT TO ANY SHIELD UNIT, AND THE

7. UNUSUAL FEATURES OF THE PROGRAM (CONTINUED)
REGIONS OF INTEGRATION (OR DETECTORS) OVER WHICH THE FLUX, DOSE RATE, OR ENERGY-ABSORPTION RATE ARE CALCULATED MAY BE PARTS OF RECTANGULAR SOLIDS, PARTS OF CYLINDERS, OR PARTS OF SPHERES.
THE ENERGY OUTPUT OR PARTICLE EMISSION OF EACH SOURCE IS DESCRIBED BY A GENERAL THREE-DIMENSIONAL DISTRIBUTION FUNCTION. THE VARIATION OF THE SOURCE DISTRIBUTION FUNCTION BETWEEN MESH-LINES MAY BE LINEAR, SEMI-LOG, OR LOG-LOG. THE GENERALITY OF THE FUNCTION REQUIRES THAT THE INTEGRAL BE ESTIMATED BY MEANS OF GAUSS-LEGENDRE, GAUSS-LAGUERRE, OR LOBATTE QUADRATURES. A NUMBER OF AUXILIARY PROGRAMS WHICH PREPARE SPAN4 INPUT FILES AND PROCESS SPAN4 OUTPUT FILES EXIST. ISOTROPIC SOURCES ARE USUALLY ASSUMED. A COSINE SOURCE OPTION ALLOWS THE SIMULATION OF ANISOTROPIC SOURCES.
8. RELATED AND AUXILIARY PROGRAMS - SPAN4 IS AN EXTENSION OF, AND SUPERCEDES, SPAN3. SPAN4 USES THE BETTIS ENVIRONMENTAL ROUTINES (ACC ABSTRACT 478).
9. STATUS - ABSTRACT FIRST DISTRIBUTED JANUARY 1972.
CCC6600 VERSION A SUBMITTED SEPTEMBER 1970, REPLACED BY VERSION B FEBRUARY 1973.
10. REFERENCES - O. J. WALLACE, SPAN-4 - A POINT-KERNEL COMPUTER PROGRAM FOR SHIELDING, WAPD-TM-809(L)-ISSUE 2, VOLS. I AND II, OCTOBER 1972.
O. J. WALLACE, SPAN-4 - A POINT-KERNEL COMPUTER PROGRAM FOR SHIELDING, WAPD-TM-809, DECEMBER 1969.
C. J. PFEIFER, CCC-6600 FORTRAN PROGRAMMING - BETTIS ENVIRONMENTAL REPORT, WAPD-TM-668, JANUARY 1967.
W. H. GUILINGER, N. D. COOK, AND P. A. GILLIS, SPAN-3 A SHIELD DESIGN PROGRAM FOR THE PHILCC-2000 COMPUTER, WAPD-TM-235, FEBRUARY 1962.
CENTRAL DATA 6400/6500/6600 COMPUTER SYSTEMS SCOPE 2.1 REFERENCE MANUAL, PUBL. NO. 60189400A, FEBRUARY 1968.
11. MACHINE REQUIREMENTS - 64K CENTRAL MEMORY AND ONE SYSTEM DISK. MICROFILM IS REQUIRED IF THE PLCT OPTICS ARE TO BE USED.
12. PROGRAMMING LANGUAGES USED - FORTRAN IV AND ASCENT
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 3.1.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - SPAN4 IS STRUCTURED INTO DISTINCT PARTS WHICH ARE LOADED INTO CENTRAL MEMORY AS REQUIRED. THESE PARTS ARE REFERRED TO AS OVERLAYS AS DESCRIBED IN REFERENCE 5. ESSENTIALLY AN OVERLAY REPRESENTS THE AMOUNT OF PROGRAM TEXT IN CENTRAL MEMORY. WITH OVERLAY LOADING, THE MAIN OVERLAY IS ALWAYS IN MEMORY, AND, IN ADDITION, A PARTICULAR PRIMARY AND ONE SECONDARY OVERLAY MAY ALSO BE IN CENTRAL MEMORY. SPAN4 CONTAINS A MAIN OVERLAY, 7 PRIMARY OVERLAYS, AND 8 SECONDARY OVERLAYS. OVERALL PROGRAM CONTROL IS VESTED IN

14. ANY OTHER INFORMATION OR RESTRICTIONS (CONTINUED)
THE MAIN OVERLAY AND THE PRIMARY AND SECONDARY OVERLAYS ARE LOADED
AND EXECUTED THROUGH THE USE OF THE NEXT SUBROUTINE DESCRIBED IN
REFERENCE 3.
15. NAME AND ESTABLISHMENT OF AUTHOR -
O. J. WALLACE
PETTIS ATOMIC POWER LABORATORY
WESTINGHOUSE ELECTRIC CORPORATION
P. O. BOX 79
WEST MIFFLIN, PENNSYLVANIA 15122
16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
MAGNETIC TAPE TRANSMITTAL (2 TAPES)
SOURCE DECK (PART 1 11,080 CARDS, PART 2 11,553 CARDS)
SAMPLE PROBLEMS (466 CARDS)
REFERENCE REPORTS, WAPC-TM-809(L), VOLS. 1 AND 2
17. CATEGORY - J
KEYWORDS - DCSF RATES, SHIELDING DESIGN, GAMMA RADIATION, SPAN3
CODES

1. NAME OR DESIGNATION OF PROGRAM - RESEND/ADLER
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600, PDP10
3. DESCRIPTION OF PROBLEM OR FUNCTION - RESEND GENERATES INFINITELY DILUTE, UNBROADENED POINT CROSS SECTIONS IN THE ENDF FORMAT BY COMBINING ENDF FILE 3, BACKGROUND CROSS SECTIONS WITH POINTS CALCULATED FROM ENDF FILE 2, RESONANCE PARAMETER DATA.
ADLER CALCULATES TOTAL, CAPTURE AND FISSION CROSS SECTIONS FROM THE CORRESPONDING ADLER-ADLER PARAMETERS IN THE ENDF/E FILE 2 VERSION II DATA AND ALSO DOPPLER-BROADENS CROSS SECTIONS.
4. METHOD OF SOLUTION - RESEND CALCULATIONS ARE DONE IN TWO STEPS BY TWO SEPARATE SECTIONS OF THE PROGRAM. THE FIRST SECTION DOES THE RESONANCE CALCULATION AND STORES THE RESULTS ON A SCRATCH FILE. THE SECOND SECTION COMBINES THE DATA FROM THE SCRATCH FILE WITH BACKGROUND CROSS SECTIONS AND PRINTS THE RESULTS.
ADLER USES THE ADLER-ADLER FORMALISM.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - RESEND EXPECTS ITS INPUT TO BE A STANDARD MODE BCD ENDF FILE (VERSION II/III). SINCE THE OUTPUT IS ALSO A STANDARD MODE BCD ENDF FILE, THE PROGRAM IS LIMITED BY THE SIX SIGNIFICANT FIGURE ACCURACY INHERENT IN THE ENDF FORMATS. (IF THE CROSS SECTION HAS BEEN CALCULATED AT TWO POINTS SO CLOSE IN ENERGY THAT ONLY THEIR LEAST SIGNIFICANT FIGURES DIFFER, THAT INTERVAL IS ASSUMED TO HAVE CONVERGED, EVEN IF OTHER CONVERGENCE CRITERIA MAY NOT BE SATISFIED.) IN THE UNRESOLVED RANGE THE CROSS SECTIONS HAVE BEEN AVERAGED OVER A PORTER-THOMAS DISTRIBUTION. IN SOME REGIONS THE CALCULATED RESONANCE CROSS SECTIONS MAY BE NEGATIVE. IN SUCH CASES THE STANDARD CONVERGENCE CRITERION WOULD CAUSE AN UNNECESSARILY LARGE NUMBER OF POINTS TO BE PRODUCED IN THE REGION WHERE THE CROSS SECTION BECOMES ZERO. FOR THIS REASON AN ADDITIONAL INPUT CONVERGENCE CRITERION MAY BE USED (AVERR), BY MEANS OF WHICH IF THE ABSOLUTE VALUE OF THE CROSS SECTION AT BOTH ENDS OF AN INTERVAL IS LESS THAN AVERR THEN THE INTERVAL IS ASSUMED TO HAVE CONVERGED. THERE ARE NO LIMITATIONS ON THE TOTAL NUMBER OF POINTS GENERATED. THE PRESENT ENDF (VERSION II/III) FORMATS RESTRICT THE TOTAL NUMBER OF POINTS THAT CAN BE GIVEN FOR A REACTION TYPE TO 5000.
ADLER CAN HANDLE RESONANCE DATA UP TO A MAXIMUM OF 10 ISOTOPES WITH A TOTAL NUMBER OF 500 RESONANCES. THE CODE ASSUMES THAT THE RESOLVED RESONANCE PARAMETERS ARE GIVEN FOR ONE ENERGY RANGE WHICH IS THE SAME FOR ALL THE ISOTOPES OF AN ELEMENT. THE MESH POINTS AT WHICH THE CROSS SECTIONS ARE CALCULATED CAN BE VARIED. SINCE THE CALCULATED DATA ARE NOT STORED, AN INCREASE IN THE NUMBER OF MESH POINTS DOES NOT CONFLICT WITH ANY STORAGE REQUIREMENT.
6. TYPICAL RUNNING TIME - TO PRODUCE THE U238 (ENDF MAT = 1103) CROSS SECTIONS WITH A 1 PERCENT ACCURACY (ERR = 0.01) RESEND GENERATES ABOUT 12,000 RESONANCE POINTS AND REQUIRES ABOUT 1 HOUR ON THE PDP10. FOR LESS COMPLEX MATERIALS RUNNING TIME IS CONSIDERABLY

6. TYPICAL RUNNING TIME (CONTINUED)
SHORTER.
ADLER CALCULATIONS OF CROSS SECTIONS OF ONE ISOTOPE WITH 37 RESONANCES AND 20 MESH POINTS BETWEEN RESONANCES REQUIRES 21 SECONDS WITHOUT DOPPLER BROADENING AND 209 SECONDS WITH DOPPLER BROADENING.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - RESEND COMBINES THE FEATURES OF THE RESONANCE REGION CODES AVRAGE3, AVRAGE4, AND SIGMA2. ADDITIONAL SUBROUTINES UNDER DEVELOPMENT WILL FURTHER ENABLE IT TO REPLACE ADLER AND RAMPI (ACC ABSTRACT 492).
9. STATUS - ABSTRACT FIRST DISTRIBUTED JANUARY 1972.
CDC6600 VERSIONS OF AVRAGE3,4, SIGMA2, AND ADLER SUBMITTED OCTOBER 1970, REPLACED BY REVISED VERSION DECEMBER 1971. AVRAGE3,4, AND SIGMA2 REPLACED BY PDP10 VERSION OF RESFND AUGUST 1972.
10. REFERENCES - M. R. BHAT, ENDF/B PROCESSING CODES FOR THE RESONANCE REGION, BNL-50296 (ENDF-148), JUNE 1971.
M. K. DRAKE, ED., DATA FORMATS AND PROCEDURES FOR THE ENDF NEUTRON CROSS SECTION LIBRARY, BNL-50274(T-601) (ENDF-102), VOL. 1, OCTOBER 1970.
ODELLI OZER, PROGRAM RESEND, BNL-17134, JANUARY 1972.
D. B. ADLER AND F. T. ADLER, ANALYSIS OF NEUTRON RESONANCES IN FISSILE ELEMENTS, PROGRAMS CODILLI, CURVEPLOT AND SIGMA, COC-1546-3, SEPTEMBER 1966.
11. MACHINE REQUIREMENTS - RESEND REQUIRES 24K DECIMAL CORE WITH 2 SCRATCH UNITS, AN INPUT UNIT FOR THE ENDF DATA, AN OUTPUT UNIT, A UNIT FOR READING IN THE RUN PARAMETERS (TELETYPE OR SYSTEM INPUT) AND A UNIT FOR PRINTING OUT RUN ASSOCIATED MESSAGES (TELETYPE OR SYSTEM OUTPUT). ADLER REQUIRES 37K OCTAL MEMORY.
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 3.0.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
M. R. BHAT AND O. OZER
NATIONAL NEUTRON CROSS SECTION CENTER
BROOKHAVEN NATIONAL LABORATORY
UPTON, LONG ISLAND, NEW YORK 11973
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (RESEND 2321 CARDS, ADLER 892 CARDS)
SAMPLE PROBLEM (ADLER 157 CARDS)
REFERENCE REPORTS, BNL-50296 AND BNL-17134

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17. CATEGORY - A
KEYWORDS - AVERAGES, SCATTERING, CAPTURE, FISSION, CROSS SECTIONS,
ENDF/B, DOPPLER BROADENING, MULTILEVEL, BREIT-WIGNER
FORMULA, AVRAGE3 CODES, AVRAGE4 CODES, SIGMA2 CODES,
RAMPL CODES

1. NAME OR DESIGNATION OF PROGRAM - APRFX1
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - APRFX1 COLLAPSES AND COMBINES CROSS SECTION SETS FOR MULTIGROUP TRANSPORT CALCULATIONS. IT PERFORMS GROUP COLLAPING FOR AS MANY ISOTOPES, MIXTURES AND LEGENDRE EXPANSION SETS AS DESIRED FROM THE DLC-2B LIBRARY. THE DLC-2B LIBRARY STRUCTURE EMPLOYS TENTH LETHARGY UNIT INTERVALS FROM 15 MEV TO 111 KEV AND QUARTER LETHARGY INTERVALS DOWN TO 0.414 EV. A 100TH GROUP 0.0 TO 0.414 EV IS USED AS A SINK GROUP. THE CODE ALSO DETERMINES THE BROAD GROUP INPUT SOURCE AND GENERATES AVERAGED NEUTRON VELOCITIES FOR USE WITH TRANSPORT CALCULATIONS.
4. METHOD OF SOLUTION - THE FINE GROUP CROSS SECTIONS ARE COLLAPSED TO A BROAD GROUP STRUCTURE ACCORDING TO A FLUX SPECTRUM EITHER INPUT BY THE USER OR CALCULATED BY THE CODE. FINE GROUP CROSS SECTIONS ARE AVERAGED TO FORM EITHER MACROSCOPIC OR MICROSCOPIC ISOTOPE CROSS SECTIONS AND ANY COMBINATION OF MACROSCOPIC MIXTURES OF THESE CROSS SECTIONS.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THIS VERSION OF THE CODE USES THE DLC-2B LIBRARY IN ANISN-DOT FORMAT. UPSCATTERING IS NOT INCLUDED.
6. TYPICAL RUNNING TIME -
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - THE PROGRAM UTILIZES THE 99 GROUP DLC-2B NEUTRON CROSS SECTION LIBRARY. THIS LIBRARY IS DERIVED FROM THE ENDF/P DATA BY USE OF SUPERTOG (ACC ABSTRACT 431) AND IS IN THE ANISN-DOT FORMAT. THE CODE FUNCTIONS SIMILARLY TO ZOT (ACC ABSTRACT 113) WRITTEN AT LOS ALAMOS SCIENTIFIC LABORATORY.
9. STATUS - ABSTRACT FIRST DISTRIBUTED JANUARY 1972.
CDC6600 VERSION SUBMITTED OCTOBER 1970.
10. REFERENCES - PAUL S. PICKARD, NEUTRON CROSS SECTION COLLAPSING CODE APRFX1, AMXRD-BNL(12-70), JUNE 1, 1970.
PAUL S. PICKARD AND DONALD O. WILLIAMS, CALCULATED NEUTRON ENERGY SPECTRA FOR THE APRE REACTOR, AMXRD-BNL(9-70), APRIL 28, 1970.
11. MACHINE REQUIREMENTS -
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -

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14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -
AUTHOR

PAUL S. PICKARD

CONTACT

DR. A. H. KAZI
ARMY PULSE RADIATION FACILITY
U. S. DEPARTMENT OF THE ARMY
ABERDEEN RESEARCH AND DEVELOPMENT CENTER
ABERDEEN PROVING GROUND, MARYLAND 21005

16. MATERIAL AVAILABLE -
SOURCE DECK (646 CARDS)
REFERENCE REPORTS

17. CATEGORY - B
KEYWORDS - CROSS SECTIONS, MULTIGROUP, GROUP CONSTANTS, SUPER TIG
CODES, ANISN CODES, ZOT CODES, DOT CODES

1. NAME OR DESIGNATION OF PROGRAM - HRG3
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - UNIVAC1108, IBM360/370
3. DESCRIPTION OF PROBLEM OR FUNCTION - THE CODE COMPUTES THE SLOWING DOWN SPECTRUM OVER THE ENERGY RANGE 10 MEV TO .414 EV IN EITHER THE B1 OR P1 APPROXIMATION, USING 68 GROUPS OF NEUTRONS WITH A CONSTANT GROUP WIDTH OF $\Delta U = .25$. THE CALCULATED FLUX AND CURRENT SPECTRA ARE USED TO REDUCE THE ORIGINAL 68-GROUP CROSS SECTION DATA TO AVERAGE VALUES OVER AS MANY AS 33 BROAD GROUPS. OUTPUT IS PRINTED AND MAY ALSO BE PUNCHED IN FORMATS FOR INPUT TO ANY OF SEVERAL SPATIAL MULTIGROUP CODES.
4. METHOD OF SOLUTION - THE 68 FINE-GROUP FLUXES AND CURRENTS ARE CALCULATED BY ONE SWEEP THROUGH THE GROUP STRUCTURE, STARTING FROM A SPECIFIED SOURCE DISTRIBUTION. THE SOURCE MAY BE SELECTED FROM AMONG THE 8 AVAILABLE ON THE DATA TAPE OR MAY BE INPUT. THE MULTIGROUP MODEL USES A FULL DOWNSCATTERING MATRIX, WITH INELASTIC, N2N, AND P0 AND P1 COMPONENTS OF ELASTIC SCATTERING EXPLICITLY INCLUDED. MACROSCOPIC FINE-GROUP PARAMETERS ARE CONSTRUCTED FROM INPUT NUCLIDE CONCENTRATIONS AND MICROSCOPIC PARAMETERS, AVAILABLE ON THE DATA TAPE FOR MORE THAN 200 INDIVIDUAL NUCLIDES. THERE IS NO RESTRICTION, OTHER THAN AVAILABILITY, ON THE NUMBER OF NUCLIDES USABLE IN A CASE. A SPECIAL CALCULATION IS MADE IN THE RESONANCE RANGE FOR CERTAIN NUCLIDES, USING AN ADAPTATION OF THE ADLER, FINMAN, AND NOBDEHEIM METHOD TO OBTAIN AN INTERMEDIATE RESONANCE APPROXIMATION FOR BOTH THE ABSORBER NUCLIDE AND AN ADMIXED MODERATOR. THE RESONANCE CONTRIBUTION IS ALLOCATED TO THE FINE-GROUPS IN A CONSISTENT MANNER PROVIDING SELF-SHIELDING IN BOTH SPACE AND ENERGY. ADDITIONAL SELF-SHIELDING FACTORS MAY BE READ IN FOR ANY NUCLIDE, IF DESIRED. THE FINE-GROUP FLUXES AND CURRENTS ARE USED AS WEIGHTING FUNCTIONS IN AVERAGING MACROSCOPIC AND MICROSCOPIC PARAMETERS OVER THE SPECIFIED BROAD-GROUP STRUCTURE. AS AN OPTION, THE NEUTRON AGE IN AN INFINITE MEDIUM MAY BE CALCULATED BY THE MOMENTS METHOD.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE MAXIMUM NUMBER OF BROAD GROUPS IS 33. BROAD-GROUP BOUNDARIES ARE ADJUSTED INTERNALLY TO COINCIDE WITH ONE OF THE 68 FINE-GROUP BOUNDARIES.
6. TYPICAL RUNNING TIME - FOR 10 NUCLIDES, INCLUDING 4 WITH RESONANCE CALCULATION AND NO PUNCHED OUTPUT, 40 SECONDS ARE REQUIRED FOR THE FIRST CASE IN A RUN, AND 20 SECONDS FOR EACH SUCCEEDING CASE.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - NUTAPE2 UPDATES AND/OR PRINTS THE HRG3 DATA TAPE. BINHDT CONVERTS A BCC LIBRARY TO THE BINARY FORMAT USED BY HRG3.

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9. STATUS - ABSTRACT FIRST DISTRIBUTED JANUARY 1972.
UNIVAC1108 VERSION SUBMITTED OCTOBER 1970.
IBM360 VERSION SUBMITTED MARCH 1973, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - J. L. CARTER, HRG3 - A CODE FOR CALCULATING THE SLOWING-DOWN SPECTRUM IN THE P1 OR B1 APPROXIMATIONS, BNWL-1432, JUNE 1970.
HRG-3 CHANGES IN CONVERSION TO IBM 360/370, TVA NOTE, 1973.
11. MACHINE REQUIREMENTS - 64K MEMORY, NORMAL INPUT, OUTPUT, PROGRAM, AND PUNCH UNITS, 1 UNIT FOR LIBRARY, 1 TO 4 SCRATCH UNITS OR THEIR EQUIVALENT ON DRUM (UNIVAC1108), 200K MEMORY, STANDARD I/O UNITS, 1 UNIT FOR LIBRARY, AND 1 SCRATCH UNIT (IBM360)
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - CSCX (UNIVAC1108), OS/360 (IBM360).
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - A FEW SPECIAL FEATURES OF CSCX ARE USED BY THE UNIVAC1108. THEIR FUNCTIONS ARE DESCRIBED IN THE REFERENCE REPORT BNWL-1432.
15. NAME AND ESTABLISHMENT OF AUTHORS -

1108	J. L. CARTER REACTOR PHYSICS DEPARTMENT PACIFIC NORTHWEST LABORATORIES BATTELLE P. O. BOX 999 RICHLAND, WASHINGTON 99352
360	G. W. PERRY TENNESSEE VALLEY AUTHORITY 303 POWER BUILDING CHATTANOOGA, TENNESSEE 37401
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL (1 OR 3 TAPES)
SOURCE DECKS (HRG3 1108-2512 CARDS, 360-2116 CARDS, NLTape2 1108-815 CARDS, 360-858 CARDS, BINFDT 1108-278 CARDS, 360-286 CARDS)
SAMPLE PROBLEMS (HRG3 1108-48 CARDS, 360-21 CARDS, BINFDT 1108-26 CARDS, 360-1 CARD, NLTape2 360-3 CARDS)
LIBRARIES (1108-1417 BINARY RECORDS, 360 AND 1108 TAPE 2 17,635 CARDS, TAPE 3 19,530 CARDS)
CONTROL INFORMATION (HRG3 360-11 CARDS, BINFDT 360-16 CARDS, NLTape2 360-14 CARDS)
SAMPLE PROBLEM OUTPUT (BINFDT-11 PAGES)
REFERENCE REPORT AND TVA NOTE

17. CATEGORY - B

KEYWORDS - SLOWING DOWN, GROUP CONSTANTS, CROSS SECTIONS, ELASTIC
SCATTERING, INELASTIC SCATTERING, NUTAPE2 CODES,
BINHDT CCDES

1. NAME OR DESIGNATION OF PROGRAM - BUBL1
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - BUBL1 PREDICTS FUEL SWELLING AND FISSION GAS RELEASE FROM NUCLEAR FUELS, BASED ON MOVEMENT OF FISSION GAS BUBBLES IN SOLIDS BY A SURFACE DIFFUSION MECHANISM UNDER THE ACTION OF A THERMAL GRADIENT (SEE REFERENCE 3). INTERACTIONS OF THE BUBBLES WITH DISLOCATIONS AND GRAIN BOUNDARIES PROVIDE TEMPORARY TRAPPING SITES, PRIOR TO RELEASE.
4. METHOD OF SOLUTION - BUBL1 IS A COMPUTER SIMULATION OF A FUEL REGION. WITHIN THIS REGION, FISSION GAS EVENTS ARE FOLLOWED VIA A MONTE CARLO TECHNIQUE. INDIVIDUAL BUBBLES ARE FOLLOWED THROUGH THEIR TIME HISTORY FROM NUCLEATION TO RELEASE FROM THE FUEL, WITH INTERACTIONS AT DISLOCATIONS AND GRAIN BOUNDARIES. SPECIFIC BUBBLE SIZES ARE DETERMINED FROM EITHER THE IDEAL GAS LAW OR THE VAN DER WAALS EQUATION OF STATE AS MODIFIED BY A LOCAL HYDROSTATIC PRESSURE TERM.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE CURRENT VERSION OF BUBL1 IS RESTRICTED TO ISOTHERMAL PROBLEMS WITH NON-VARYING HYDROSTATIC PRESSURE AND THERMAL GRADIENT HISTORIES.
6. TYPICAL RUNNING TIME - ONE MINUTE PER CASE IS REQUIRED.
7. UNUSUAL FEATURES OF THE PROGRAM - BUBL1 IS A UNIQUE ANALYSIS TOOL IN THAT IT IS THE ONLY KNOWN PROGRAM WHICH EXPLICITLY DESCRIBES A FUEL REGION AND FOLLOWS FISSION GAS ATOMS FROM NUCLEATION UNTIL RELEASE FROM THE FUEL REGION OCCURS. IT IS THE ONLY MODEL AVAILABLE WHICH PREDICTS THE PHENOMENA OF SATURATION IN GASEOUS SWELLING AT HIGH TEMPERATURE AND A TEMPERATURE OF MAXIMUM SWELLING, BOTH HAVING BEEN OBSERVED EXPERIMENTALLY.
8. RELATED AND AUXILIARY PROGRAMS - THE LONG RANGE PLAN IS TO INTEGRATE THE BUBL SWELLING AND GAS RELEASE MODEL WITH CYGRO3 (ACC ABSTRACT 449). BUBL1 USES THE BETTIS ENVIRONMENTAL ROUTINES (ACC ABSTRACT 478).
9. STATUS - ABSTRACT FIRST DISTRIBUTED JANUARY 1972.
CDC6600 VERSION SUBMITTED OCTOBER 1970.
10. REFERENCES - H. R. WARNER, BUBL-1 - A STATISTICAL FUEL SWELLING AND FISSION GAS RELEASE MODEL, WAPD-TM-942, SEPTEMBER 1970.
C. J. PFEIFER, CDC-6600 FORTRAN PROGRAMMING - BETTIS ENVIRONMENTAL REPORT, WAPD-TM-668, JANUARY 1967.
F. A. NICHOLS, BEHAVIOR OF GASEOUS FISSION PRODUCTS IN OXIDE FUEL ELEMENTS, WAPD-TM-570, OCTOBER 1966.
E. DUNCOMBE AND C. M. FRIEDRICH, CYGRO-3 - A COMPUTER PROGRAM TO DETERMINE TEMPERATURES, STRESSES AND DEFORMATION IN OXIDE FUEL RODS, WAPD-TM-961, MARCH 1970.

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11. MACHINE REQUIREMENTS - 65K MEMORY, A PRINTER, AND A PLOTTER
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
SCOPE 3.1.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
BUBL1 USES PLOTTING ROUTINES DESCRIBED IN REFERENCE 2. FUNCTION
SUBROUTINE RANGEN IS ENTERED IN THE BUBL1 PROGRAM BY THE REAL
FUNCTION RANDOM(0), WHICH PRODUCES A REAL RANDOM NUMBER R SUCH
THAT 0.0 LESS THAN OR EQUAL R LESS THAN 1.0.
15. NAME AND ESTABLISHMENT OF AUTHOR -
H. R. WARNER
BETTIS ATOMIC POWER LABORATORY
WESTINGHOUSE ELECTRIC CORPORATION
P. O. BOX 79
WEST MIFFLIN, PENNSYLVANIA 15122
16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (1366 CARDS)
SAMPLE PROBLEM (12 CARDS)
REFERENCE REPORTS, WAPD-TM-942 AND WAPD-TM-668
17. CATEGORY - I
KEYWORDS - FUELS, SWELLING, FISSION GASES, SOLIDS, MONTE CARLO
METHOD, CYGRO3 CODES

1. NAME OR DESIGNATION OF PROGRAM - PMS1
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - PMS1 CORRECTS EXPERIMENTAL FAST NEUTRON POLARIZATION DATA FOR FINITE GEOMETRY AND MULTIPLE SCATTERING EFFECTS, WHEN LIQUID HELIUM IS THE POLARIZER ANALYZER.
4. METHOD OF SOLUTION - THE MONTE CARLO CODE SIMULATES THE ACTUAL GEOMETRY OF THE EXPERIMENT, TRACES SCATTERING HISTORIES TO ESTIMATE MULTIPLE-SCATTERING ASYMMETRY FOR AN INCIDENT NEUTRON BEAM OF ARBITRARY POLARIZATION. THE CODE USES PHASE SHIFTS TO CALCULATE THE NECESSARY PARAMETERS, THE ANGULAR DISTRIBUTIONS ($d\sigma/d\Omega$), THE POLARIZATION P AND THE SPIN ROTATION PARAMETER β NEEDED FOR CONSISTENT TRACKING OF POLARIZATION EFFECTS IN SUCCESSIVE SCATTERING. THE PHASE SHIFT DATA ARE TAKEN FROM THE FITTED DATA OF HOOP AND BARSCHALL ABOVE 1.5 MEV AND FROM MORGAN AND WALTER BELOW 1.5 MEV. THE CODE ADJUSTS THE INITIAL INPUT POLARIZATION NEEDED TO REPRODUCE THE MEASURED LEFT-RIGHT COUNT RATIO FOR THE TWO DETECTORS.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - NO MORE THAN FIVE COLLISIONS ARE ALLOWED AND LIQUID HELIUM MUST BE THE POLARIZER ANALYZER. THE TOTAL NUMBER OF ENERGY POINTS FOR WHICH PHASE SHIFTS ARE GIVEN MUST BE LESS THAN 100.
6. TYPICAL RUNNING TIME - ABOUT 3 MINUTES PER CASE ARE REQUIRED.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED JANUARY 1972.
IBM360 VERSION SUBMITTED OCTOBER 1970, REPLACED BY
UPDATED VERSION APRIL 1973, SAMPLE PROBLEM EXECUTED
BY ACC.
10. REFERENCES - G. W. MORRISON, T. G. MILLER, AND F. P. GIBSON,
PMS1 - A FORTRAN MONTE CARLO CODE FOR CORRECTING EXPERIMENTAL
FAST-NEUTRON POLARIZATION DATA, CTC-9, DECEMBER 1969.
B. HOOP AND H. H. BARSCHALL, SCATTERING OF NEUTRONS
BY ALPHA-PARTICLES, NUCLEAR PHYSICS, VOL. 83, P. 65, 1966.
11. MACHINE REQUIREMENTS - 32K MEMORY
12. PROGRAMMING LANGUAGES USED - FORTRAN IV(F) AND BAL
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
CS/360.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

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15. NAME AND ESTABLISHMENT OF AUTHCRS -

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F. P. GIBSON AND T. G. MILLER
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REDSTONE ARSENAL, ALABAMA 35808

16. MATERIAL AVAILABLE -

SOURCE DECK (1040 CARDS)
SAMPLE PROBLEM (31 CARDS)
SAMPLE PROBLEM OUTPUT (6 PAGES)
REFERENCE REPORT

17. CATEGORY - 0

KEYWORDS - MONTE CARLO METHOD, STATISTICS, ELASTIC SCATTERING,
POLARIZATION, HELIUM

1. NAME OR DESIGNATION OF PROGRAM - GRAMP
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - GRAMP RANDOMLY GENERATES REICH AND MOORE PARAMETERS FOR MULTILEVEL UNRESOLVED RESONANCES OF FISSILE ISOTOPES.
4. METHOD OF SOLUTION - PARAMETERS ARE SELECTED RANDOMLY FROM THE APPROPRIATE DISTRIBUTION FUNCTIONS. RESONANCE ENERGIES ARE CHOSEN FROM THE WIGNER DISTRIBUTION. PARTIAL FISSION WIDTHS AND THE REDUCED NEUTRON WIDTH ARE CHOSEN FROM THE PORTER-THOMAS DISTRIBUTION. THE FISSION WIDTH FOR A GIVEN RESONANCE IN THE REICH AND MOORE FORMALISM IS THE SUM OF A SET OF PARTIAL WIDTHS CORRESPONDING TO THE OPEN FISSION CHANNELS.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE MAXIMUM NUMBER OF RESONANCES PER SPIN STATE IS 100. TWO COMPOUND NUCLEUS SPIN STATES ARE ALLOWED AND EACH SPIN STATE MAY HAVE 2 OPEN FISSION CHANNELS.
6. TYPICAL RUNNING TIME - PARAMETERS FOR 1000 RESONANCES ARE GENERATED IN 6 SECONDS.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - GRAMP OUTPUT MAY BE PUNCHED ON CARDS WHICH SERVE AS INPUT TO RECAP-0.
9. STATUS - ABSTRACT FIRST DISTRIBUTED JANUARY 1972.
CDC6600 VERSION SUBMITTED NOVEMBER 1970.
10. REFERENCES - M. GOLDSMITH, GRAMP-A PROGRAM TO GENERATE REICH AND MOORE PARAMETERS FOR MULTILEVEL UNRESOLVED RESONANCES, WAPD-TM-939, MAY 1970.
11. MACHINE REQUIREMENTS -
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 3.1.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THIS PROGRAM USES THE BETTIS ENVIRONMENTAL ROUTINES INTTAP, OUTTAP AND FINISH (ACC ABSTRACT 478). SETRAN INITIALIZES THE RANDOM NUMBER SEQUENCE AND THE RANDOM(0) FUNCTION PROVIDES THE NEXT RANDOM NUMBER FROM THE RANGEN, RANDOM NUMBER GENERATING ROUTINE, WHICH PROVIDES REAL NUMBERS, R, RANDOMLY DISTRIBUTED IN THE RANGE 0 LESS THAN OR EQUAL R LESS THAN 1.

1. NAME OR DESIGNATION OF PROGRAM - CRECT/CHECKER/RIGEL/PLOTFB/LISTFC/DICTION/SLAVE3/DAMMET
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600, IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - THIS PACKAGE OF EIGHT PROGRAMS IS DESIGNED FOR PROCESSING ENDF/B II (EVALUATED NUCLEAR DATA FILE VERSION B FORMAT II) TAPES.

CRECT, WHICH PROCESSES VERSION III ENDF/B DATA AS WELL AS EARLIER VERSIONS, PROVIDES A MEANS OF CORRECTING ASSEMBLED DATA ON A TAPE BY INSERTION AND DELETION OF DATA.

CHECKER CHECKS THAT THE ENDF/B BCD CARD IMAGE FORMAT TAPES ARE IN PROPER FORMAT AND ALL FIELDS ARE WITHIN SPECIFIED LIMITS, RATHER THAN THE PHYSICS OF THE DATA LIBRARY. ANGULAR DISTRIBUTIONS RECONSTRUCTED FROM LEGENDRE COEFFICIENTS ARE CHECKED TO ENSURE THEY ARE EVERYWHERE POSITIVE.

RIGEL WILL PERFORM ANY OR ALL OF THE FOLLOWING OPERATIONS - SELECTIVELY RETRIEVE ENDF/B DATA ON FROM 1 TO 9 ENDF/B TAPES, MERGE RETRIEVED ENDF/B DATA ONTO FROM 1 TO 8 ENDF/B RESULT TAPES, CHANGE TAPE ARRANGEMENT (FROM STANDARD TO ALTERNATE OR VICE VERSA) AND CHANGE TAPE MODE.

LISTFC, WHICH PROCESSES VERSION III ENDF/B DATA AS WELL AS EARLIER VERSIONS, PRODUCES INTERPRETED LISTINGS OF INFORMATION FROM BCD STANDARD ARRANGEMENT ENDF/B TAPES.

DICTION CONSTRUCTS A NEW SECTION DICTIONARY (FILE 1, SECTION 451) FOR AN ENTIRE ENDF/B TAPE. IF A SECTION DICTIONARY IS ALREADY PRESENT IT IS REPLACED.

PLOTFB PROCESSES ENDF/B LIBRARY TAPES WHICH CONTAIN DATA EMBEDDED WITHIN A NECESSARY LIBRARY STRUCTURE IN ORDER TO PRODUCE COMPREHENSIVE LISTINGS AND/OR PLOTS. THE LISTINGS AND/OR PLOTS CONTAIN AN EXTENSIVE AMOUNT OF INFORMATION RELATED TO THE DATA, SUCH AS TEMPERATURE DEPENDENCE, PHYSICAL UNITS OF THE DATA, INTERPOLATION LAWS FOR THE DATA, CRYPTIC TITLES DEFINING THE REACTION TYPE, ETC.

SLAVE3 PROVIDES MODULAR SUBROUTINES WHICH CAN BE ASSEMBLED TO RETRIEVE AND PROCESS ENDF/B DATA FOR A SPECIFIC PROBLEM.

DAMMET SELECTIVELY MERGES DATA FROM ONE OR TWO ENDF/B LIBRARY TAPES ONTO A FINAL TAPE. THE MODE (BCD OR BINARY) AND ARRANGEMENT (STANDARD OR ALTERNATE) MAY BE CHANGED DURING THIS PROCESS.
4. METHOD OF SOLUTION - CRECT ACCEPTS A BCD TAPE IN ENDF/B FORMAT AS INPUT AND PRODUCES A CORRECTED ENDF/B TAPE AS OUTPUT. CORRECTIONS CONSIST OF INSERTIONS, DELETIONS AND CHANGES SPECIFIED ON INPUT CARDS.

CHECKER - MOST DATA ARE SUBMITTED TO RANGE LIMIT CHECKS. TABULATED DATA ARE CHECKED FOR SMOOTHNESS IN ORDER TO DETECT POSSIBLE MISPUNCHED VALUES. LEGENDRE COEFFICIENTS ARE CONVERTED TO MOMENTS AND MOMENTS ARE CHECKED TO DETERMINE IF THEY ARE PHYSICALLY POSSIBLE. THE LEGENDRE EXPANSION IS CHECKED FOR POSITIVITY IN THE INTERVAL $-1 \leq \cos \theta \leq 1$.

IN PLOTFB THE SPECIFIED STRUCTURE OF THE LIBRARY ALLOWS DATA TO

4. METHOD OF SOLUTION (CONTINUED)

BE SUBCLASSIFIED UNDER NUCLIDES, CLASSES OF DATA, AND REACTION TYPES. THE WELL-DEFINED STRUCTURE PERMITS THE ASSOCIATED INFORMATION TO BE ACCESSED BY CONVERTING MATERIAL NUMBERS TO HOLLERITH TITLES, ETC. PLOTS ARE GENERATED UTILIZING A PLOTTING PACKAGE WHICH INCLUDES SCALING, GRID, AND NORMALIZATION ROUTINES. PLOTS CAN BE GENERATED IN EITHER LINEAR-LOG AXIS OR A MIXTURE OF BOTH.

WHEN MERGING TWO TAPES AND CONVERTING TO A DATA FORMAT OTHER THAN THAT OF EITHER INPUT TAPE, DAMMET PERFORMS A TWO-PASS OPERATION. THE FIRST PASS CONSISTS OF SELECTING ONLY THE DATA REQUIRED AND CONVERTING IT TO THE FORMAT OF THE FINAL TAPE, WITH STORAGE OF THE DATA ON AN INTERMEDIATE TAPE. UPON COMPLETION OF THE FIRST PASS ON BOTH TAPES, RESULTING IN TWO INTERMEDIATE TAPES, THE SECOND PASS MERGES BOTH INTERMEDIATE TAPES TO THE FINAL DATA TAPE.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -

IN CRECT CORRECT SEQUENCE AND MATERIAL FIELDS OF THE DATA TAPE ARE ASSUMED. IN BOTH CHECKER AND CRECT DATA MUST BE IN ENDF/B BCD STANDARD ARRANGEMENT CARD IMAGE FORMAT.

IN CHECKER CORRECT STRUCTURE OF THE DATA TAPE IS ASSUMED AND MINOR ANOMALIES ARE NOTED. COMMON AND MAJOR IRREGULARITIES CAUSE TERMINATION OF EXECUTION ACCOMPANIED BY A CCRE DUMP.

DICTION CAN HANDLE ONLY ENDF/B BCD STANDARD ARRANGEMENT TAPES WITH 1000 OR FEWER SECTIONS.

IN PLOTFB DATA MUST BE IN EITHER THE ENDF/B BCD OR BINARY STANDARD ARRANGEMENT CARD IMAGE FORMAT. PLOTFB CAN EXTRACT DATA ONLY TO THE MATERIAL AND FILE LEVEL OF DATA WITHIN THE ENDF LIBRARY.

IN DAMMET A SPECIFIC REACTION CANNOT BE EXTRACTED FROM A TAPE UNLESS IT IS WITHIN A FILE OR MATERIAL SELECTED.

6. TYPICAL RUNNING TIME -

CDC 6600 -

.007 SECONDS OF CP TIME IS REQUIRED TO PROCESS ONE RECORD OF BCD INFORMATION IN CHECKER. TYPICAL CP TO PP TIME RATIO FOR THE SHORT FORM OUTPUT IS 1 TO 4, FOR LONG FORM OUTPUT, 1 TO 6.

IN CRECT 2 SECONDS OF CP TIME ARE REQUIRED. TYPICAL CP TO PP TIME RATIO IS 1 TO 5.

IN DAMMET 3 TO 7 MINUTES OF CP TIME ARE REQUIRED TO PROCESS 13 NUCLIDES. TYPICAL CP TO PP TIME RATIO IS APPROXIMATELY 3 TO 1.

IN PLOTFB 4 MINUTES OF CP TIME AND 10 MINUTES OF PP TIME ARE REQUIRED TO LIST AND PLOT 35 MATERIALS (APPROXIMATELY 3500 DATA CARDS).

IN SLAVE3 RUNNING TIME IS DEPENDENT ON THE SELECTION OF SUBROUTINES AND PROCESSING REQUIREMENTS. TYPICAL CP TO PP TIME RATIO IS 1 TO 3, AND AN AVERAGE RUN IS 4 MINUTES.

IBM360 -

CHECKER REQUIRES ABOUT 1 MINUTE FOR EACH 6000 CARD IMAGES ON THE INPUT TAPE.

CRECT REQUIRES ABOUT 1 MINUTE FOR EACH 5000 CARD IMAGES ON THE INPUT TAPE.

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7. UNUSUAL FEATURES OF THE PROGRAM - IN CHECKER THERE ARE TWO OUTPUT OPTIONS - (A) LONG FORM, WHICH LISTS EACH CARD IMAGE AS WELL AS THE ANOMALIES ENCOUNTERED, AND (B) SHORT FORM, WHICH LISTS ONLY THE ANOMALIES ENCOUNTERED BY THE PROGRAM (MINIMUM OUTPUT OPTION).
8. RELATED AND AUXILIARY PROGRAMS - ALL EIGHT PROGRAMS PERFORM AN INDEPENDENT OPERATION ON ENDF/B DATA. CRECT MAY BE USED TO CORRECT ERRORS DETECTED BY CHECKER.
9. STATUS - ABSTRACT FIRST DISTRIBUTED JANUARY 1972.
CDC6600 VERSIONS OF ALL 8 CODES SUBMITTED DECEMBER 1970, CRECT REPLACED BY LATER VERSION AUGUST 1972, LISTFC REPLACED BY LATER VERSION DECEMBER 1972.
IBM360 VERSIONS OF CHECKER AND CRECT SUBMITTED MARCH 1971, SAMPLE PROBLEM EXECUTED BY ACC MAY 1971.
10. REFERENCES - NATIONAL NEUTRON CROSS SECTION CENTER, DESCRIPTION OF THE ENDF/B PROCESSING CODES AND RETRIEVAL SUBROUTINES, BNL-50300 (ENDF-110), SEPTEMBER 1967, REVISED APRIL 1969, REVISED SEPTEMBER 1970, REVISED JUNE 1971.
H. C. HONECK, ENDF/B - SPECIFICATIONS FOR AN EVALUATED NUCLEAR DATA FILE FOR REACTOR APPLICATIONS, BNL-50066, MAY 1966, REVISED JULY 1967.
M. K. DRAKE, DATA FORMAT AND PROCEDURES FOR THE ENDF NEUTRON CROSS SECTION LIBRARY, BNL-50274, OCTOBER 1970.
11. MACHINE REQUIREMENTS -
CDC 6600 -
FOR CHECKER 56,300 OCTAL (APPROXIMATELY 24,000 DECIMAL) WORDS OF CORE STORAGE AND ONE TAPE (OR DISC) UNIT
FOR CRECT 13,000 OCTAL WORDS OF CORE STORAGE AND TWO DATA STORAGE UNITS.
FOR PLOTFB 73,700 OCTAL (ABOUT 30,000 DECIMAL) WORDS OF CORE STORAGE AND THREE TAPE (OR DISC) UNITS.
FOR SLAVE3 40,000 OCTAL (APPROXIMATELY 18,000 DECIMAL) WORDS OF CORE STORAGE AND ONE OR TWO TAPE (OR DISC) UNITS WILL BE REQUIRED FOR A TYPICAL JOB.
FOR DAMMET 61,000 OCTAL (ABOUT 25,000 DECIMAL) WORDS OF CORE STORAGE AND A MAXIMUM OF FIVE TAPE (OR DISC) UNITS.
IBM 360 -
CHECKER REQUIRES 300K BYTES FOR EXECUTION.
CRECT REQUIRES 150K BYTES FOR EXECUTION.
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE (CDC6600), OS/360 (IBM360).
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
6600 ODELLI OZER
NATIONAL NEUTRON CROSS SECTION CENTER

15. NAME AND ESTABLISHMENT OF AUTHOR(S) (CONTINUED)
BROOKHAVEN NATIONAL LABORATORY
UPTON, LONG ISLAND, NEW YORK 11973
- 360 E. M. PENNINGTON
APPLIED PHYSICS DIVISION
ARGONNE NATIONAL LABORATORY
ARGONNE, ILLINOIS 60439
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (CRECT 6600-259 CARDS, 360-274 CARDS, CHECKER
6600-3192 CARDS, 360-3199 CARDS, RIGEL 6600-2060,
LISTFC 6600-3172 CARDS, DICTION 6600-200 CARDS,
PLOTFB 6600-4015 CARDS, SLAVE3 6600-2240 CARDS,
DAMMET 6600-1957 CARDS)
SAMPLE PROBLEM (CHECKER 360-8 CARDS)
REFERENCE REPORT, BNL-50300
17. CATEGORY - M
KEYWORDS - DATA PROCESSING, CROSS SECTIONS, GRAPHS, INPUT DATA,
LIBRARIES, MAINTENANCE, RETRIEVAL

1. NAME OR DESIGNATION OF PROGRAM - STEAM-67
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - STEAM-67 IS A SET OF ROUTINES FOR CALCULATING THE PROPERTIES OF STEAM AND WATER ACCORDING TO THE ASME STEAM TABLES, 1967, WHICH HAVE BEEN MODIFIED IN ACCORDANCE WITH THE ASME PAPER (REFERENCE 3). MODIFICATIONS WERE MADE TO IMPROVE PROGRAM RUNNING TIME AS WELL AS TO CORRECT SOME EXISTING PROGRAM ERRORS. CORRECTIONS WERE ALSO MADE TO ROUTINES FOR THE LIQUID REGION TO IMPROVE ACCURACY ON THE IBM360 COMPUTER.
4. METHOD OF SOLUTION - FOR THE USUAL CASE, WHERE PRESSURE AND/OR TEMPERATURE ARE KNOWN, THE VISCOSITY, SPECIFIC VOLUME, ENTHALPY OR ENTROPY MAY BE CALCULATED IN EITHER THE LIQUID OR VAPOR REGIONS. IN THE VAPOR REGION, QUALITY MAY BE CALCULATED AS A FUNCTION OF PRESSURE AND ENTROPY OR ENTHALPY.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
6. TYPICAL RUNNING TIME -
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED JANUARY 1972.
IBM360 VERSION SUBMITTED JUNE 1970, REVISED SEPTEMBER 1973.
10. REFERENCES - R. J. SPITZNAS, STEAM-67 TABLES, BALTIMORE GAS AND ELECTRIC NOTE, MAY 18, 1970.
C. A. MEYER, ET AL., THERMODYNAMIC AND TRANSPORT PROPERTIES OF STEAM, COMPRISING TABLES AND CHARTS FOR STEAM AND WATER, NEW YORK, 1967.
R. B. MCCLINTOCK AND G. J. SILVESTRI, SOME IMPROVED STEAM PROPERTY CALCULATION PROCEDURES, TRANSACTIONS OF THE ASME, VOL.92, PP.123-134, APRIL 1970.
R. B. MCCLINTOCK AND G. J. SILVESTRI, FORMULATIONS AND ITERATIVE PROCEDURES FOR THE CALCULATION OF PROPERTIES OF STEAM, ASME PUBLICATION (H-17), 1968.
11. MACHINE REQUIREMENTS -
12. PROGRAMMING LANGUAGE USED - FORTRAN IV(G)
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - DUE TO PRECISION REQUIREMENTS, ALL SUBPROGRAMS ARE WRITTEN IN

14. ANY OTHER INFORMATION OR RESTRICTIONS (CONTINUED)
DOUBLE-PRECISION. HOWEVER, ARGUMENTS ARE TRANSMITTED TO AND FROM
CALLING PROGRAMS IN STANDARD PRECISION. BECAUSE OF THIS INTERFACE
BETWEEN STANDARD AND DOUBLE-PRECISION, THE USER IS CAUTIONED TO
ADHERE STRICTLY TO THE LISTED CALLS AND PARAMETERS AND NOT TO
USE ANY OTHER AVAILABLE ENTRY POINTS. AN ERROR-HANDLING ROUTINE
IS INCLUDED AS PART OF THE PACKAGE. IT WILL DOCUMENT NON-
CONVERGENCE OR ARGUMENTS OUT OF ACCEPTABLE RANGE, LISTING THE
CALLING ROUTINE AND ITS ARGUMENTS.
15. NAME AND ESTABLISHMENT OF AUTHOR -
RAYMOND J. SPITZNAS
BALTIMORE GAS AND ELECTRIC COMPANY
GAS AND ELECTRIC BUILDING
BALTIMORE, MARYLAND 21203
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (2408 CARDS)
REFERENCE NOTE, TABLES AND CHARTS, AND ASME TRANSACTIONS PRE-
PRINT
17. CATEGORY - H
KEYWORDS - THERMODYNAMICS, WATER, PRESSURE, TEMPERATURE, LIQUIDS,
VAPORS

1. NAME OR DESIGNATION OF PROGRAM - CCNCEPT2
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - CONCEPT2 GENERATES A CAPITAL COST ESTIMATE FOR A SELECTION OF PWR, BWR, COAL, AND OIL STEAM-ELECTRIC POWER PLANTS WITH RUN-OF-RIVER, MECHANICAL DRAFT, OR NATURAL DRAFT COOLING SYSTEMS OF SPECIFIED ELECTRICAL OUTPUT (IN THE RANGE OF 500 TO 2000 MW(E)) FOR ANY OF TWENTY U. S. CITIES, A HYPOTHETICAL MIDDLETOWN, AND TWO CANADIAN CITIES, AND PRINTS AS A RESULT A DETAILED COST BREAKDOWN.
4. METHOD OF SOLUTION - CONCEPT2 IS SUPPORTED BY TWO AUXILIARY-GENERATED LIBRARIES - (1) CONTAC WHICH GENERATES A COST MODEL TAPE WHERE THE MODEL IS EXTRAPOLATED BY CONCEPT TO OTHER SIZES BY INTERNAL SCALING EQUATIONS, AND (2) CONLAM WHICH GENERATES A TAPE CONTAINING HISTORICAL DATA FOR LABOR AND MATERIALS THAT ARE USED FOR ADJUSTING COSTS AT A BASE LOCATION AND TIME TO A SPECIFIED LOCATION AND TIME.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - POWER LEVELS OF 500 TO 2000 MW(E) ARE ACCEPTABLE. THE AUXILIARY PROGRAM CONLAM IS LIMITED TO 30 TIME PERIODS OF COST HISTORY FOR 23 LOCATIONS WITHOUT PROGRAM ALTERATIONS.
6. TYPICAL RUNNING TIME - A SINGLE COST ESTIMATE IS GENERATED IN LESS THAN ONE MINUTE ON THE MODEL 65.
7. UNUSUAL FEATURES OF THE PROGRAM - CONCEPT2 UTILIZES EXECUTION-TIME NAMELIST VARIATIONS OF STORED CONSTANTS, PRINTER PLOTTING CASH-FLOW CURVES, AND NUMEROUS OUTPUT AND SOLUTION OPTIONS.
8. RELATED AND AUXILIARY PROGRAMS - CONCEPT2 REQUIRES THE USE OF CONLAM TO GENERATE A USER FILE OF LABOR AND MATERIALS COST HISTORY AND CONTAC TO GENERATE A USER FILE OF COST MODELS TO SUPPORT CONCEPT2.
9. STATUS - ABSTRACT FIRST DISTRIBUTED JANUARY 1972.
IBM360 VERSION OF CONCEPT SUBMITTED SEPTEMBER 1971,
REPLACED BY CONCEPT2 MARCH 1973.
10. REFERENCE - H. I. BOWERS, R. C. DELCZIER, L. C. REYNOLDS, AND B. E. SRITE, CONCEPT - COMPUTERIZED CONCEPTUAL COST ESTIMATES FOR STEAM-ELECTRIC POWER PLANTS - PHASE II USERS MANUAL, ORNL-4809, APRIL 1973.
11. MACHINE REQUIREMENTS - 150K BYTES, ONE SCRATCH DISK OR TAPE, TWO SUPPORT TAPES, AND THE STANDARD I/C UNITS
12. PROGRAMMING LANGUAGE USED - FORTRAN IV(G)

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THE MAIN PROGRAM USES THE IBM FORTRAN EXTENDED ERROR FEATURE (ERRSET) TO PERMIT ZERO DIVISION AND EXPONENT OVERFLOW WHICH MAY REQUIRE LOCAL ALTERATIONS.
15. NAME AND ESTABLISHMENT OF AUTHORS -
AUTHORS
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16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (CONCEPT2 1545 CARDS, CONLAM 496 CARDS, CONTACT 644 CARDS)
SAMPLE PROBLEMS (CONCEPT2 79 CARDS, CONLAM 111 CARDS AND 2899 CARDS, CONTACT 12 FILES 737 CARDS EACH)
CONTROL INFORMATION (CONCEPT2 13 CARDS, CONLAM 20 CARDS, CONTACT 65 CARDS)
REFERENCE REPORT
17. CATEGORY - D
KEYWORDS - ECONOMICS, POWER PLANTS, PWR REACTORS, CONCEPT CODES, CONLAM CODES, CONTACT CODES

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13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
SCOPE 3.3.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
ROBERT L. RITZMAN
BATTELLE MEMORIAL INSTITUTE
COLUMBUS LABORATORIES
505 KING AVENUE
COLUMBUS, OHIO 43201
16. MATERIAL AVAILABLE -
SOURCE DECK (293 CARDS)
SAMPLE PROBLEM (58 CARDS)
REFERENCE REPORT
17. CATEGORY - G
KEYWORDS - FISSION PRODUCTS, FUEL ELEMENTS, ACCIDENTS

1. NAME OR DESIGNATION OF PROGRAM - ENDRUN2
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - GE635
3. DESCRIPTION OF PROBLEM OR FUNCTION - ENDRUN2 IS USED TO CALCULATE MULTIGROUP CONSTANTS FROM ENERGY-DEPENDENT, MICROSCOPIC CROSS SECTIONS, RESONANCE PARAMETERS, AND INELASTIC LEVEL DATA INPUT IN THE EVALUATED NUCLEAR DATA FILE (ENDF/B) FORMATS. DATA IS PROCESSED FOR ONE MATERIAL AT A TIME AND THE OUTPUT MULTIGROUP FILE INCLUDES BOTH INFINITELY-DILUTE GROUP CROSS SECTIONS AND SELF-SHIELDING, BONDARENKO-TYPE F-FACTORS SO THAT THE RESULTING GENERALIZED FILE IS INDEPENDENT OF REACTOR COMPOSITION. THE MULTIGROUP DATA MAY BE OUTPUT ON PUNCHED CARDS, A STANDARD LIBRARY TAPE, OR PLOTTED OVER ANY ENERGY RANGE.
4. METHOD OF SOLUTION - RESOLVED RESONANCE PARAMETERS ARE EVALUATED ACCORDING TO THE DOPPLER BROADENED BREIT-WIGNER, SINGLE-LEVEL LINE SHAPE EQUATIONS. RESONANCE CONTRIBUTIONS ARE AVERAGED OVER EACH FINE GROUP WITH AN EXTRAPOLATED ROMBERG INTEGRATION SCHEME. UNRESOLVED RESONANCE CALCULATIONS EMPLOY AN AVERAGING OVER THE CHI-SQUARED STATISTICAL DISTRIBUTION OF RESONANCE PARAMETERS. SELF-SHIELDING IS ACCOMPLISHED BY WEIGHTING WITH A $1/(\text{SIGMA}(T) + \text{SIGMA}(0))$ FLUX, WHERE $\text{SIGMA}(0)$ IS AN INPUT VALUE REPRESENTING THE TOTAL OTHER-MATERIAL CROSS SECTION. PROVISIONS ARE MADE FOR THE OVERLAP OF RESOLVED AND UNRESOLVED RESONANCE SEQUENCES AND SMOOTH DATA. SEPARATE INELASTIC, ELASTIC, AND $N,2N$ MATRICES ARE CALCULATED.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - ENDRUN MAY BE USED ON ANY ENDF/B MATERIAL WITH FEWER THAN 9 ISOTOPES. A CASE MAY INCLUDE UP TO 100 COARSE GROUPS AND 30 FINE GROUPS PER COARSE GROUP. MAXIMUM TRANSFER MATRIX SIZE IS 70 X 50. UP TO 5 $\text{SIGMA}(0)$ VALUES AND 3 TEMPERATURES MAY BE PROVIDED AS INPUT DATA FOR SELF-SHIELDING.
6. TYPICAL RUNNING TIME - A SIMPLE 29-GROUP CASE FOR ANY MATERIAL WITHOUT RESONANCE DATA IS PROCESSED IN ONLY A FEW SECONDS ON THE GE635. A SIMILAR CASE FOR U-238 WITH ALL SELF-SHIELDING OPTIONS MAY RUN OVER AN HOUR.
7. UNUSUAL FEATURES OF THE PROGRAM - ENDRUN IS DESIGNED TO ALLOW MAXIMUM USER FLEXIBILITY IN CREATING A MULTIGROUP FILE OR TESTING DATA, E.G. SEVERAL ENDF/B REACTIONS MAY BE COMBINED IN A SINGLE OUTPUT CROSS SECTION, ANY TYPE OF DATA OR SINGLE CROSS SECTION MAY BE PROCESSED SEPARATELY, INPUT MAY COME FROM CARDS, BCD OR BINARY TAPE, OR COMPRESSED BINARY TAPE, AND MATRICES MAY BE OUTPUT SEPARATELY OR COMBINED.
8. RELATED AND AUXILIARY PROGRAMS - ENDRUN2 IS A DESCENDANT OF THE ENDRUN1 CODE OF APRIL 1970 AND RETAINS MOST OF THE MAJOR SUB-ROUTINES FROM THE EARLIER CODE. IT USES SEVERAL OF THE ENDF/B

8. RELATED AND AUXILIARY PROGRAMS (CONTINUED)
RETRIEVAL SUBROUTINES IN PROCESSING THE ENDF/B DATA FILE AND ALSO THE QUICKW TABLE LOOK-UP ROUTINE FROM MC**2 (ACC ABSTRACT 355). A GENERALIZED DATA FILE TAPE (GMUG) MAY BE CREATED FOR DIRECT USE BY THE TDOWN CCDE (ACC ABSTRACT 505).
9. STATUS - ABSTRACT FIRST DISTRIBUTED OCTOBER 1972.
GE635 VERSION SUBMITTED OCTOBER 1971.
10. REFERENCES - B. A. HUTCHINS, C. L. COWAN, M. D. KELLEY, J. E. TURNER, ENCRUN-II, A COMPUTER CODE TO GENERATE A GENERALIZED MULTIGROUP DATA FILE FROM ENDF/B, GEAP-13704 (ENDF-145), MARCH 1971.
 - I. I. BOGDARENKO, GROUP CONSTANTS FOR NUCLEAR REACTOR CALCULATIONS, CONSULTANTS BUREAU, NEW YORK, 1964.
 - H. C. HONECK, ENDF/B SPECIFICATIONS FOR AN EVALUATED NUCLEAR DATA FILE FOR REACTOR APPLICATIONS, BNL-50066, MAY 1966, REVISED JULY 1967.
 - DRAW, GESV NOTE, JANUARY 15, 1968.
 - REREAD, CCNVRT SUBROUTINE DESCRIPTION, GESV NOTE, SEPTEMBER 11, 1967.
11. MACHINE REQUIREMENTS - THE CCDE REQUIRES 52K MEMORY, INCLUDING A 10K OVERLAP WITH LOADING ROUTINES. UP TO 5 TAPES AND 7 AUXILIARY UNITS (DISCS IN THE AUTHORS ENVIRONMENT) MAY BE REQUIRED, BUT THE NUMBER OF TAPES MAY BE REDUCED BY USE OF PERMANENT DISC FILES WITH THE CARD READER AS THE INPUT UNIT.
12. PROGRAMMING LANGUAGES USED - FORTRAN IV EXCEPT FOR USE OF RWSBT AND NPOST IN THE GE COMPRESSED BINARY INPUT AND OUTPUT ROUTINES. FORTRAN VERSIONS OF THESE ROUTINES ARE AVAILABLE, ALSO.
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - GECOS III.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - PRIMARY CHANGES TO CONVERT THIS PROGRAM TO ANOTHER MACHINE WOULD BE IN THE INPUT AND OUTPUT ROUTINES, AUXILIARY UNIT ASSIGNMENTS, AND THE PLOTTING ROUTINES WHICH ARE PARTICULARLY MACHINE DEPENDENT.
15. NAME AND ESTABLISHMENT OF AUTHORS -
 - B. A. HUTCHINS, C. L. COWAN, M. D. KELLEY,
AND J. E. TURNER
GENERAL ELECTRIC COMPANY
NUCLEAR ENERGY DIVISION
31 DEGUIGNE DRIVE
SUNNYVALE, CALIFORNIA 94086
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
 - SOURCE DECKS (ENCRUN2 12,142 CARDS, QUICKW 276 CARDS, AUXILIARY ROUTINES 503 CARDS)
 - SAMPLE PROBLEM (ENCRUN2 215 CARDS)

16. MATERIAL AVAILABLE (CONTINUED)
 CNTRCL CARDS (ENDRUN2 412 CARDS, QUICKW 26 CARDS)
 SAMPLE PROBLEM OUTPUT (38 PAGES)
 REFERENCE REPORT, GEAP-13704, AND NOTES
17. CATEGORY - B
 KEYWORDS - MULTIGROUP CROSS SECTIONS, BREIT-WIGNER FORMULA,
 DOPPLER BROADENING, ELASTIC SCATTERING, INELASTIC
 SCATTERING, ELASTIC REMOVAL, FISSION, CAPTURE, TDCWN
 CODES, ENDF/B, LMFR REACTORS

1. NAME OR DESIGNATION OF PROGRAM - EDITOR
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360, CDC6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - EDITOR PRODUCES READABLE LISTINGS OF THE CONTENTS OF ENDF/B NUCLEAR DATA CROSS SECTION TAPES. IT ALSO ALLOWS COPYING, ALTERING CODE, MERGING AND PUNCHING OF THE DATA ON ONE OR MORE ENDF/B TAPES.
4. METHOD OF SOLUTION - EDITOR PROCESSES MATERIALS, FILES (IN THE ENDF/B SENSE) OR SECTIONS (REACTION TYPES) ACCORDING TO INPUT INSTRUCTIONS.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - A MAXIMUM OF 50 MATERIALS MAY BE HANDLED IN ONE BATCH, WHERE A BATCH IS A GROUP OF ASSOCIATED INPUT INSTRUCTIONS. A MAXIMUM OF 5 FILES PER MATERIAL AND 15 SECTIONS PER FILE MAY BE REQUESTED IN EACH BATCH. FILES 1 TO 5, 7, 12 TO 15, AND 23 WILL BE PROCESSED BY THE PROGRAM. OTHER FILES WILL BE IGNORED.
6. TYPICAL RUNNING TIME - THE SAMPLE PROBLEM COMPILES AND EXECUTES ON THE IBM360 IN LESS THAN 3 MINUTES.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED OCTOBER 1972.
IBM360 VERSION A SUBMITTED SEPTEMBER 1971, REPLACED BY
VERSION B FEBRUARY 1973.
CDC6600 VERSION SUBMITTED FEBRUARY 1973.
10. REFERENCES - C. L. THOMPSON, J. R. STOCKTON, L. M. PETRIE, R. Q. WRIGHT, S. K. PENNY, EDITOR, A PROCESSING CODE FOR ENDF/B FORMAT DATA, ORNL-TM-3266 (ENDF-142), FEBRUARY 1971.
11. MACHINE REQUIREMENTS - APPROXIMATELY 300K BYTES OF CORE
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - CS/360 (IBM360), SCOPE (CDC6600).
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - EDITOR MAY BE USED TO APPEND MATERIALS TO AN EXISTING TAPE, IF THE ORIGINAL TAPE IS NOT BLOCKED.
15. NAME AND ESTABLISHMENT OF AUTHORS -
C. L. THOMPSON, J. R. STOCKTON, L. M. PETRIE,
R. Q. WRIGHT, AND S. K. PENNY
CAK RIDGE NATIONAL LABORATORY

15. NAME AND ESTABLISHMENT OF AUTHOR(S) (CONTINUED)

P. O. BOX X
CAK RIDGE, TENNESSEE 37830

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL

SOURCE DECKS (360-3044 CARDS, 6600-3057 CARDS)

SAMPLE PROBLEMS (360-4 CARDS, 6600-5 CARDS)

CONTROL INFORMATION (JCL 360-12 CARDS)

LIBRARIES (360-430 CARDS, 6600-430 CARDS)

SAMPLE PROBLEM OUTPUT (360-26 SELECTED PAGES, 6600-27 SELECTED
PAGES)

REFERENCE REPORT

17. CATEGORY - M

KEYWORDS - DATA PROCESSING, CROSS SECTIONS, LIBRARIES, ENDF/B,
MAINTENANCE, RETRIEVAL

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11. MACHINE REQUIREMENTS - THE CODE REQUIRES 50K (DECIMAL) MEMORY ON THE CDC7600, USES 1 SCRATCH TAPE, 1 LIBRARY TAPE, AND THE STANDARD INPUT/OUTPUT AND PUNCH UNITS.
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - CDC7600 SCOPE 1.7.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THE PROGRAM CONSISTS OF 6 OVERLAYS.
15. NAME AND ESTABLISHMENT OF AUTHORS -
C. L. BEARD AND R. A. DANIELS
WESTINGHOUSE ELECTRIC CORPORATION
NUCLEAR ENERGY SYSTEMS
BOX 355
PITTSBURGH, PENNSYLVANIA 15230
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (5714 CARDS)
SAMPLE PROBLEM (5 CARDS)
REFERENCE REPORT, WCAP-7363
17. CATEGORY - L
KEYWORDS - ENDF/B, CROSS SECTIONS, LIBRARIES, KATE CODES, THERMOS CODES, TEMPEST CODES, LASER CODES, ETOM1 CODES

1. NAME OR DESIGNATION OF PROGRAM - VIM1/VIM1X
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC7600, IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - VIM1 IS A MONTE CARLO CODE DESIGNED FOR THE ANALYSIS OF FAST CRITICAL EXPERIMENTS. IT HAS BEEN EXPRESSLY PREPARED FOR THE ANALYSIS OF FAST CRITICAL ASSEMBLIES OF THE PLATE-DRAWER TYPE SUCH AS ZPPP, ZPR-3, AND ZEPRA. THE LIBRARY USES POINT CROSS SECTION DATA, RATHER THAN MULTIGROUP CONSTANTS.
4. METHOD OF SOLUTION - THE MONTE CARLO METHOD IS USED WITH NEUTRONS STARTED FROM AN INITIAL SOURCE DISTRIBUTION IN SPACE, ANGLE, AND ENERGY WITH A STATISTICAL WEIGHT OF UNITY. THEY ARE FOLLOWED FROM COLLISION TO COLLISION UNTIL CAPTURE, ESCAPE FROM THE SYSTEM, OR FISSION OCCURS. THE SPATIAL COORDINATE WHERE FISSION OCCURS, ALONG WITH THE NUMBER OF NEUTRONS PRODUCED AT EACH POINT, PROVIDE THE BASIS FOR DETERMINING THE SOURCE DISTRIBUTION FOR THE NEXT GENERATION. VIM1 REGARDS THIS SET OF WEIGHTED SOURCE POINTS AS A DISTRIBUTION FUNCTION FROM WHICH THE SOURCE NEUTRON STARTING POINTS ARE SELECTED EACH WITH INITIAL STATISTICAL WEIGHT OF UNITY. THE INELASTIC SCATTERING MODEL INCLUDES BOTH THE EVAPORATION MODEL AND A DISCRETE EXCITATION LEVEL APPROACH. ABSORPTION WEIGHTING OF VARIABLE AMOUNT IS OPTIONALLY PERMITTED.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - VIM1 IS RESTRICTED TO CRITICAL ASSEMBLIES OF THE PLATE DRAWER TYPE, AND THE ENERGY RANGE MUST BE BETWEEN 10 MEV AND 10 EV.
 - 7600 MAXIMA -
 - 13 MATERIALS
 - 36 ROWS IN THE CRITICAL ASSEMBLY MATRIX
 - 36 COLUMNS IN THE CRITICAL ASSEMBLY MATRIX
 - 360 MAXIMA -
 - 250,000 HISTORIES PER PROBLEM
 - 1,000 HISTORIES PER BATCH
 - 6 DRAWER TYPES
 - 50 ROWS IN THE MATRIX
 - 51 COLUMNS
 - 13 ISOTOPES IN PROBLEM
 - 150 ZONES
 - 27 GROUPS FOR EDITS
 - 30 ENERGY BANDS FOR STRATIFIED SAMPLING OF SOURCE NEUTRON ENERGIES
 - 9 CENTRAL FISSION RATIOS COMPUTED
6. TYPICAL RUNNING TIME - APPROXIMATELY 1 SECOND PER 1200 COLLISIONS IS REQUIRED ON THE CDC7600. THE IBM360/75 EXECUTES THE SAMPLE PROBLEM IN 2 MINUTES.
7. UNUSUAL FEATURES OF THE PROGRAM -
 - USE OF CROSS SECTION PROBABILITY TABLES IN THE UNRESOLVED

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7. UNUSUAL FEATURES OF THE PROGRAM (CONTINUED)
RESONANCE RANGE,
USE OF POINT CROSS SECTION DATA IN LIEU OF MULTICROUP
CONSTANTS, AND
USE OF CUMULATIVE DISTRIBUTION FUNCTIONS OF THE CENTER-OF-MASS
SCATTERING ANGLE TO DESCRIBE ANGULAR DISTRIBUTIONS INSTEAD
OF LEGENDRE COEFFICIENTS.
8. RELATED AND AUXILIARY PROGRAMS - A CROSS SECTION LIBRARY TAPE
GENERATOR IS INCLUDED IN THE PROGRAM PACKAGE.
9. STATUS - ABSTRACT FIRST DISTRIBUTED OCTOBER 1972.
CDC7600 VERSION SUBMITTED NOVEMBER 1971.
IBM360 VERSION SUBMITTED JANUARY 1972, REVISED FEBRUARY
1973, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - L. B. LEVITT, R. C. LEWIS, VIM1, A NON-MULTICROUP
MONTE CARLO CODE FOR ANALYSIS OF FAST CRITICAL ASSEMBLIES,
AI-AFC-12951, MAY 15, 1970.
INPUT DESCRIPTION FOR VIM1 - 7600, ATOMIC
INTERNATIONAL MEMORANDUM, NOVEMBER 1971.
F. L. FILLMORE, USERS MANUAL FOR THE VIM-IX MONTE
CARLO CODE, ANL ZPR-TM-121, SEPTEMBER 20, 1972.
VIM1 360 VERSION TAPE CONTENTS DESCRIPTION, ACC PRO-
GRAMMING NOTE 73-19, MARCH 1973.
PARAMETER CARD FOR LIBREAD, ACC PROGRAMMING NOTE
73-20, APRIL 5, 1973.
11. MACHINE REQUIREMENTS - 65K (DECIMAL) FAST CENTRAL MEMORY, 80K ECS,
AND 1 MAGNETIC TAPE UNIT ARE REQUIRED ON THE CDC7600. 650K
BYTES AND 2 TAPE UNITS ARE REQUIRED ON THE IBM360.
12. PROGRAMMING LANGUAGES USED - FORTRAN IV (7600) AND FORTRAN IV AND
BAL (360)
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
SCOPE 1. (7600) AND OS/360 (360).
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
VIM PRESENTLY USES A CROSS SECTION LIBRARY BASED ON ENDF/B II DATA
INCLUDING CODING TO USE PROBABILITY TABLES IN THE UNRESOLVED
RESONANCE REGION. AN ENDF/B III LIBRARY FOR USE WITH VIM HAS BEEN
PREPARED AND VIM IS BEING UPDATED TO ACCOMMODATE IT.
THE 360 ROUTINE TLEFT IS PART OF THE ANL 360 ENVIRONMENT.
IT RETURNS TO A CALLING PROGRAM THE DIFFERENCE, IN HUNDRETHS OF A
SECOND, BETWEEN THE TIME ESTIMATE ON THE JOB CARD AND THE TOTAL
ELAPSED CPL + VOLUNTARY WAIT TIME. THE FUNCTION IS CALLED WITH
ONE DUMMY ARGUMENT. THE VALUE RETURNED IS IN SINGLE PRECISION,
FLOATING-POINT BINARY. THE VALUE OF THE DUMMY ARGUMENT REMAINS
UNCHANGED.
15. NAME AND ESTABLISHMENT OF AUTHORS -
L. B. LEVITT AND R. C. LEWIS

15. NAME AND ESTABLISHMENT OF AUTHOR(S) (CONTINUED)
ATOMICS INTERNATIONAL
P. O. BOX 309
CANCRA PARK, CALIFORNIA 91304
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (VIM1 7600-2025 CARDS, VIM1X 360-3111 CARDS,
LIBREAD 360-276 CARDS)
LOAD MODULE VIM.MOCLIB (360-188 BLOCKS)
SAMPLE PROBLEMS (7600-385 CARDS, 360-272 CARDS)
LIBRARIES (14 FILES)
CONTROL INFORMATION (JCL 360-32 CARDS)
SAMPLE PROBLEM OUTPUT (7600-24 PAGES)
REFERENCE REPORTS, INPUT DESCRIPTION MEMORANDUM, AND ACC PRO-
GRAMMING NOTES
17. CATEGORY - C
KEYWORDS - MONTE CARLO METHOD, FAST REACTORS, CRITICALITY, ZPR-3
REACTORS, ZPPR REACTORS, ZEBRA REACTORS

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11. MACHINE REQUIREMENTS - THE RESIDENT PORTION OF THE SYSTEM ITSELF REQUIRES ABOUT 15K BYTES. TO TEST THE SYSTEM REQUIRES ABOUT 220K BYTES PLUS ONE PERIPHERAL I/O DEVICE.
12. PROGRAMMING LANGUAGES USED - FORTRAN IV, ASSEMBLER LANGUAGE, AND MACRO DEFINITIONS
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360 RELEASE 19.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THE ASSEMBLER LANGUAGE ROUTINE IHCFIOSH (MACRO IHCFIOSM) IS A SLIGHTLY MODIFIED VERSION OF THE IBM ROUTINE FOR RELEASE 19 OF OS/360. SYSTEMS OPERATING UNDER EARLIER RELEASES SHOULD SIMILARLY MODIFY THIS ROUTINE AND RE-LINKEDIT THE MODULE ARCIBCOM.
15. NAME AND ESTABLISHMENT OF AUTHORS -
L. C. JUST, H. HENRYSON II, A. S. KENNEDY,
S. D. SPARCK, B. J. TOPPEL, AND P. M. WALKER

CONTACT B. J. TOPPEL
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9700 SOUTH CASS AVENUE
ARGONNE, ILLINOIS 60439
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (PDS ARC.SOURCE)
OBJECT MODULES (PDS ARC.SEGLIB)
LINKAGE EDITOR CONTROL STATEMENTS (PDS ARC.OVERLAY)
LOAD MODULES (PDS ARC.MODLIB)
MACRO DEFINITIONS (PDS ARC.MACLIB)
CONTROL INFORMATION (JCL-IEHMOVE DECK-16 CARDS)
SAMPLE PROBLEM (153 CARDS)
SAMPLE PROBLEM OUTPUT (IEHMOVE-3 PAGES, EXECUTION-8 PAGES)
REFERENCE REPORTS AND ACC NOTE
17. CATEGORY - M
KEYWORDS - MODULAR SYSTEM, DATA PROCESSING, ARC CODES

1. NAME OR DESIGNATION OF PROGRAM - ESP
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360/75,91
3. DESCRIPTION OF PROBLEM OR FUNCTION - ESP IS A GENERAL-PURPOSE MONTE CARLO REACTOR ANALYSIS CODE. IT COVERS THE COMPLETE ENERGY RANGE OF INTEREST IN REACTOR CALCULATIONS AND IS DESIGNED FOR BOTH EIGENVALUE AND FIXED SOURCE REACTOR AND REACTOR CELL CALCULATIONS. BASIC DATA ARE ACCEPTED ONLY IN THE VERSION I, II, AND III ENDF/B FORMAT. IN ADDITION TO SMOOTH DATA, THE CROSS SECTION PREPARATION INCLUDES A DETAILED TREATMENT OF RESOLVED AND UNRESOLVED RESONANCES AND THE FREE GAS AND S(ALPHA,BETA) THERMAL MODELS. THE COLLISION AND SOURCE ROUTINES UTILIZE THE ENDF/B NONELASTIC SECONDARY DISTRIBUTIONS, THE ANISOTROPIC SCATTERING DATA, AND THE FISSION SPECTRA. THE ENERGY RANGE MAY BE DIVIDED INTO AS MANY AS 25,000 INTERVALS, AND OVER EACH INTERVAL THE APPROPRIATELY AVERAGED CROSS SECTIONS ARE USED AS CONSTANT POINT-ENERGY VALUES. A GENERAL THREE-DIMENSIONAL GEOMETRY DESCRIPTION IS AVAILABLE, AS WELL AS SEVERAL SPECIALIZED GEOMETRIES. USE OF FIXED-SOURCE OPTIONS ALLOWS CALCULATIONS ON NON-MULTIPLYING SYSTEMS. A STEADY-STATE ANALYSIS OF NEUTRON HISTORIES IS PERFORMED IN COMPUTER CORE FOR SUCH QUANTITIES AS NEUTRON FLUXES, REACTION RATES, AND CROSS SECTIONS, AVERAGED OVER ARBITRARY ENERGY AND SPATIAL REGIONS.
4. METHOD OF SOLUTION - ESP UTILIZES STANDARD MONTE CARLO TECHNIQUES IN THE NEUTRON TRACKING AND COLLISION PROCESSES. ANALYSIS OF HISTORIES IS PERFORMED BY EITHER COLLISION DENSITY OR TRACK LENGTH ESTIMATION. THE NUCLIDES ARE ASSUMED TO BE AT REST EXCEPT IN THE THERMAL ENERGY RANGE. NON-ABSORPTION WEIGHTING, SPLITTING, AND RUSSIAN ROULETTE ARE USED AS VARIANCE REDUCTION METHODS. IN ORDER TO OBTAIN ESTIMATES OF THE STATISTICAL ERROR OF ESP CALCULATIONS, THE NEUTRON HISTORIES ARE PROCESSED IN BATCHES. THE FISSION NEUTRONS PRODUCED IN A BATCH MAY BE USED AS THE STARTING NEUTRONS FOR THE NEXT BATCH. ANISOTROPIC SCATTERING IS HANDLED BY THE CONVEYOR TECHNIQUE. THE RESONANCE CROSS SECTIONS ARE COMPILED USING THE DOPPLER BROADENING SINGLE-LEVEL BREIT-WIGNER MODEL. A DETAILED STATISTICAL TREATMENT IS APPLIED TO THIS MODEL IN THE UNRESOLVED RESONANCE ENERGY REGION.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE ENERGY RANGE IS RESTRICTED TO NEUTRON ENERGIES FOR WHICH DATA IS AVAILABLE IN THE ENDF/B FILES. EACH PHYSICAL BOUNDARY OF THE SYSTEM MUST BE DESCRIBABLE BY A GENERAL SECOND-ORDER ALGEBRAIC EQUATION. THERE MAY BE AS MANY AS 25 NUCLIDES IN AS MANY AS 16 DIFFERENT MIXTURES IN THE SYSTEM.
6. TYPICAL RUNNING TIME - RUNNING TIMES ARE HIGHLY PROBLEM DEPENDENT. LESS THAN 5 MINUTES ARE USED ON THE IBM360/91 FOR DATA PREPARATION, TRACKING, AND ANALYSIS OF 20,000 HISTORIES FOR GODIVA. A HETEROGENEOUS MOCKUP OF ZPR3 ASSEMBLY 48 TAKES 3 HOURS.

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7. UNUSUAL FEATURES OF THE PROGRAM - ESP MAY BE RUN IN ONE PROBLEM SETUP AND COMPUTER PASS. NO PERIPHERAL SUBROUTINE PREPARATION OR TAPE PROCESSING IS NECESSARY, ALTHOUGH SOME INFORMATION CONCERNING A CALCULATION MAY BE RETAINED ON TAPE FOR USE IN FUTURE CALCULATIONS. REALISTIC REACTOR SYSTEMS MAY BE CALCULATED IN COMPLETE GEOMETRIC DETAIL WITH A VERSION OF ESP WHICH UTILIZES A FICTITIOUS SCATTERING MODEL AND AN ARRAY VERSION OF GENERALIZED GEOMETRY.
8. RELATED AND AUXILIARY PROGRAMS - ESP IS ONE OF SEVERAL CODES RECENTLY DEVELOPED AT OAK RIDGE NATIONAL LABORATORY WHICH HAS THE OSR CODE AS ITS PREDECESSOR.
9. STATUS - ABSTRACT FIRST DISTRIBUTED OCTOBER 1972.
IBM360 VERSION SUBMITTED FEBRUARY 1972, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - S. N. CRAMER, R. S. CARLSMITH, G. W. MORRISON, G. W. PERRY, AND J. L. LUCIUS, ESP, A GENERAL MONTE CARLO REACTOR ANALYSIS CODE, ORNL-TM-3164, JANUARY 1972.
D. C. IRVING, R. M. FREESTONE, JR., AND F. B. K. KAM, OSR, A GENERAL-PURPOSE MONTE CARLO NEUTRON TRANSPORT CODE, ORNL-3422, FEBRUARY 1965.
S. N. CRAMER, MONTE CARLO ANALYSIS OF THE EXACT GEOMETRIC MOCKUP OF ZPR-III ASSEMBLY 48, ORNL-TM-3596, OCTOBER 1971.
ESP TAPE CONTENTS DESCRIPTION, ACC PROGRAMMING NOTE 73-18, MARCH 1973.
11. MACHINE REQUIREMENTS - AT LEAST 350K BYTES OF COMPUTER CORE
12. PROGRAMMING LANGUAGES USED - FORTRAN IV AND PAL
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
S. N. CRAMER, R. S. CARLSMITH, G. W. MORRISON,
G. W. PERRY, AND J. L. LUCIUS
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P. O. BOX X
OAK RIDGE, TENNESSEE 37830
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (PDS ESP, SOURCE LIB 1557 BLOCKS, ASSEMBLY LANGUAGE ROUTINES 266 CARDS)
OBJECT DECKS (ESP 16 BLOCKS, GENL. GEOM. 17 BLOCKS, RAFFLE GEOM. 26 BLOCKS, SPH. GEOM. 2 BLOCKS, CYL. GEOM. 7 BLOCKS, ESPGLTS 309 BLOCKS)
SAMPLE PROBLEM (29 CARDS)
LIBRARY (85 BLOCKS)
CONTROL INFORMATION (JCL 102 CARDS)
REFERENCE REPORT, ORNL-TM-3164, AND ACC PROGRAMMING NOTE 73-18

935.1

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02/74

17. CATEGORY - C
KEYWORDS - MONTE CARLO METHOD, CRITICALITY, CELL CALCULATION,
ENDF/B, CROSS SECTIONS, O5R CODES

1. NAME OR DESIGNATION OF PROGRAM - BESFIT
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - BESFIT CALCULATES DIFFERENTIAL ELASTIC SCATTERING CROSS SECTIONS USING A BESSEL FUNCTION EXPANSION, BASED ON A DIFFRACTION MODEL. CONSTANT TERMS MAY EITHER BE SUPPLIED AS INPUT DATA OR OBTAINED BY A LEAST SQUARES FITTING OF THE DATA.
4. METHOD OF SOLUTION - BESFIT USES THE DIFFRACTION MODEL TO SOLVE THE PROBLEM.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - A MAXIMUM OF 101 ANGULAR POINTS CAN BE USED.
6. TYPICAL RUNNING TIME - EACH CASE RUNS IN APPROXIMATELY 30 SECONDS.
7. UNUSUAL FEATURES OF THE PROGRAM - FIRST ORDER ESTIMATES OF THE DIFFERENTIAL ELASTIC SCATTERING CROSS SECTION ARE OBTAINED BY SPECIFYING ONLY THE INCIDENT NEUTRON ENERGY AND TARGET MASS.
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED OCTOBER 1972.
CDC6600 VERSION SUBMITTED MARCH 1972.
10. REFERENCES - S. PEARLSTEIN, PROGRAM BESFIT, FEBRUARY 1972.
S. PEARLSTEIN, NEUTRON ANGULAR DISTRIBUTION ANALYSIS USING CYLINDRICAL BESSEL FUNCTIONS, BNL-16530, FEBRUARY 1972.
11. MACHINE REQUIREMENTS -
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - STANDARD MONITOR.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
S. PEARLSTEIN
NATIONAL NEUTRON CROSS SECTION CENTER
BROOKHAVEN NATIONAL LABORATORY
UPTON, LONG ISLAND, NEW YORK 11973
16. MATERIAL AVAILABLE -
SOURCE DECK (657 CARDS)
SAMPLE PROBLEM (34 CARDS)
REFERENCE REPORT AND PROGRAM DESCRIPTION

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
SUBROUTINES PACK AND UNPACK CALL A ROUTINE WHICH FINDS THE
LOGICAL SUM OF TWO INTEGERS. THIS SUBROUTINE MUST BE USER-SUP-
PLIED.
15. NAME AND ESTABLISHMENT OF AUTHORS -
FACOM230-60 KEIICHIRO TSUCHIHASHI
JAPAN ATOMIC ENERGY RESEARCH INSTITUTE
TOKAI RESEARCH ESTABLISHMENT
TOKAI-MURA, NAKA-GUN, IBARAKI-KEN
JAPAN

IBM360 P. HENLINE
HIGH ENERGY PHYSICS DIVISION
ARGONNE NATIONAL LABORATORY
9700 S. CASS AVENUE
ARGONNE, ILLINOIS 60439
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (FACOM-2645 CARDS, 360-2677 CARDS)
SAMPLE PROBLEMS (FACOM-43 CARDS, 360-47 CARDS)
SAMPLE PROBLEM OUTPUT (33 SELECTED PAGES)
REFERENCE REPORT AND MEMORANDA
17. CATEGORY - B
KEYWORDS - FUEL ELEMENTS, CELL CALCULATIONS, POISON, FLUX
DISTRIBUTION

1. NAME OR DESIGNATION OF PROGRAM - HERMES
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - UNIVAC1108
3. DESCRIPTION OF PROBLEM OR FUNCTION - THE HERMES MODEL CALCULATES THE REGIONAL RADIONUCLIDE RELEASES AND RADIATION DOSE TO THE POPULACE IN A GIVEN YEAR ARISING FROM THE OPERATION OF NUCLEAR FACILITIES TO MEET ELECTRICAL GENERATION DEMANDS WITHIN A GIVEN STUDY REGION.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE FOLLOWING ARE ALL APPROXIMATE DIMENSION RESTRICTIONS -
 - 12 TIME PERIODS (MONTHS)
 - 50 RADIONUCLIDES
 - 200 RADIONUCLIDE SOURCES (NUCLEAR SITES)
 - 300 RECEPTOR LOCATIONS
6. TYPICAL RUNNING TIME - THE HERMES MODEL CONSISTS OF TEN SUBMODELS DESIGNED TO BE EXECUTED SEQUENTIALLY, BUT EACH OF THE SUBMODELS MAY BE USED INDIVIDUALLY TO STUDY A GIVEN ASPECT OF THE EVENTS LEADING TO DOSE. RUNNING TIME OF EACH SUBMODEL VARIES FROM ABOUT 1 MINUTE TO 1 HOUR DEPENDING ON THE SUBMODEL AND THE COMPLEXITY OF THE PROBLEM.
7. UNUSUAL FEATURES OF THE PROGRAM - THIS PROGRAM PROVIDES A REGIONAL ANALYSIS OF RADIATION DOSE FROM THE NUCLEAR POWER INDUSTRY, PERMITTING EVALUATION OF THE RESULTANT EFFECTS OF OPERATING LARGE NUMBERS OF NUCLEAR FACILITIES. OPTIONS IN COMPONENT CODES OF THE PROGRAM PERMIT CONSIDERATION OF A VARIETY OF RADIATION WASTE TREATMENT SYSTEMS. DOSE EVALUATIONS MAY BE OBTAINED IN VARYING DETAIL.
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED OCTOBER 1972.
UNIVAC1108 VERSION SUBMITTED MARCH 1972.
10. REFERENCES - J. F. FLETCHER AND W. L. DUTTON, HERMES - A DIGITAL COMPUTER CODE FOR ESTIMATING REGIONAL RADIOLOGICAL EFFECTS FROM THE NUCLEAR POWER INDUSTRY, HEDL-TME-71-168, DECEMBER 1971.
UNIVAC SYSTEM DESCRIPTIONS FOR NTRAN, ETIME, ETIMEF, AND DOY.
HERMES CONTROL CARDS, ACC PROGRAMMING NOTE 74-6, SEPTEMBER 7, 1973.
11. MACHINE REQUIREMENTS - 65K MEMORY AND A MAGNETIC DRUM OR ALTERNATIVE DEVICE FOR STORAGE OF LARGE AMOUNTS OF DATA.
12. PROGRAMMING LANGUAGES USED - FORTRAN IV AND SLEUTH

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
CSCX.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
MOST OF THE SUBMODELS OF HERMES WOULD REQUIRE VERY LITTLE
CONVERSION EFFORT TO EXECUTE ON OTHER COMPUTERS, ALTHOUGH THOSE
SUBMODELS REQUIRING DRUM DEVICES FOR STORAGE OF DATA WOULD
REQUIRE MORE EFFORT. ASSEMBLY LANGUAGE ROUTINES ARE USED FOR
TIMING INPUT-OUTPUT UNIT ASSIGNMENTS AND SIMILAR ACTIVITIES.
SEVERAL CALLS ARE MADE TO SUBROUTINE SETDAR. THIS SUBROUTINE
DYNAMICALLY ALLOCATES STORAGE FOR ARRAYS AND MUST BE SUPPLIED BY
THE USER. SAMPLE PROBLEM INPUT DECKS FOR RADREL, ARTRAN AND
WTRAN CONTAIN UNIVAC 1108 CONTROL STATEMENTS WHICH HAVE A MULTIPLE
7-8 PUNCH IN COLUMN 1. FOR DISTRIBUTION ON CODE CENTER EQUIPMENT
IT WAS NECESSARY TO MODIFY SUCH STATEMENTS; THE MULTIPLE 7-8 PUNCH
IN COLUMN 1 WAS REPLACED BY A MULTIPLE 12-1 PUNCH, A LETTER A.
15. NAME AND ESTABLISHMENT OF AUTHORS -
B. W. BENTLEY, W. E. BLACK, W. L. DOTSON,
J. F. FLETCHER, D. R. HAFNER, L. D. JACOBSON,
D. E. PETERSON AND K. R. WISE
HANFORD ENGINEERING DEVELOPMENT LABORATORY
WESTINGHOUSE HANFORD COMPANY
P. O. BOX 1970
RICHLAND, WASHINGTON 99352
J. K. SOLDAT
PACIFIC NORTHWEST LABORATORIES
BATTELLE
P. O. BOX 999
RICHLAND, WASHINGTON 99352
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (SITE 173 CARDS, MCPOSH 427 CARDS, RADREL 796
CARDS, DOSIS 1355 CARDS, REPAIR 1672 CARDS,
TRANS 259 CARDS, FIGURE 338 CARDS, ARTRAN 1763
CARDS, WTRAN 2716 CARDS, DOSE 3280 CARDS)
SAMPLE PROBLEMS (SITE 35 CARDS, MCPOSH 33 CARDS, RADREL 58
CARDS, DOSIS 5 CARDS, REPAIR 5 CARDS,
ARTRAN 152 CARDS, WTRAN 345 CARDS, DOSE 1315
CARDS)
SAMPLE PROBLEM OUTPUT (SITE 4 PAGES, MCPOSH 13 PAGES, RADREL 20
PAGES, DOSIS 6 PAGES, REPAIR 9 PAGES,
ARTRAN 16 PAGES, WTRAN 14 PAGES, DOSE 17
PAGES)
DOCUMENTATION (480 CARDS)
REFERENCE REPORT, SYSTEM DESCRIPTIONS, AND ACC NOTE
17. CATEGORY - R
KEYWORDS - RADIATION EFFECTS, REACTOR SAFETY, DOSE RATES,
POWER PLANTS

1. NAME OR DESIGNATION OF PROGRAM - PREP/KITT
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND CTHEPS UPON WHICH IT IS OPERABLE - IBM360, UNIVAC1108
3. DESCRIPTION OF PROBLEM OR FUNCTION - THE PREP/KITT COMPUTER PROGRAM PACKAGE OBTAINS SYSTEM RELIABILITY INFORMATION FROM A SYSTEM FAULT TREE. THE PREP PROGRAM FINDS THE MINIMAL CUT SETS AND/OR THE MINIMAL PATH SETS OF THE SYSTEM FAULT TREE. (A MINIMAL CUT SET IS A SMALLEST SET OF COMPONENTS SUCH THAT IF ALL THE COMPONENTS ARE SIMULTANEOUSLY FAILED THE SYSTEM IS FAILED. A MINIMAL PATH SET IS A SMALLEST SET OF COMPONENTS SUCH THAT IF ALL OF THE COMPONENTS ARE SIMULTANEOUSLY FUNCTIONING THE SYSTEM IS FUNCTIONING.) THE KITT PROGRAMS DETERMINE RELIABILITY INFORMATION FOR THE COMPONENTS OF EACH MINIMAL CUT OR PATH SET, FOR EACH MINIMAL CUT OR PATH SET, AND FOR THE SYSTEM. EXACT, TIME-DEPENDENT RELIABILITY INFORMATION IS DETERMINED FOR EACH COMPONENT AND FOR EACH MINIMAL CUT SET OR PATH SET. FOR THE SYSTEM, RELIABILITY RESULTS ARE OBTAINED BY UPPER BOUND APPROXIMATIONS OR BY A BRACKETING PROCEDURE IN WHICH VARIOUS UPPER AND LOWER BOUNDS MAY BE OBTAINED AS CLOSE TO ONE ANOTHER AS DESIRED. THE KITT PROGRAMS CAN HANDLE INDEPENDENT COMPONENTS WHICH ARE NONREPAIRABLE OR WHICH HAVE A CONSTANT REPAIR TIME. ANY ASSORTMENT OF NONREPAIRABLE COMPONENTS AND COMPONENTS HAVING CONSTANT REPAIR TIMES CAN BE CONSIDERED. ANY INHIBIT CONDITIONS HAVING CONSTANT PROBABILITIES OF OCCURRENCE CAN BE HANDLED. THE FAILURE INTENSITY OF EACH COMPONENT IS ASSUMED TO BE CONSTANT WITH RESPECT TO TIME. THE KITT2 PROGRAM CAN ALSO HANDLE COMPONENTS WHICH DURING DIFFERENT TIME INTERVALS, CALLED PHASES, MAY HAVE DIFFERENT RELIABILITY PROPERTIES.
4. METHOD OF SOLUTION - THE PREP PROGRAM OBTAINS MINIMAL CUT SETS BY EITHER DIRECT DETERMINISTIC TESTING OR BY AN EFFICIENT MONTE CARLO ALGORITHM. THE MINIMAL PATH SETS ARE OBTAINED USING THE MONTE CARLO ALGORITHM. THE RELIABILITY INFORMATION IS OBTAINED BY THE KITT PROGRAMS FROM NUMERICAL SOLUTION OF THE SIMPLE INTEGRAL BALANCE EQUATIONS OF KINETIC TREE THEORY.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE PREP PROGRAM WILL OBTAIN THE MINIMAL CUT AND/OR PATH SETS FOR ANY TREE WITH UP TO 2000 COMPONENTS AND 2000 LOGICAL GATES. ALL GATES OF THE FAULT TREE MUST BE AND AND OR GATES, AND NO GATE MAY HAVE MORE THAN 7 INPUTS CONSISTING OF BOTH COMPONENTS AND OTHER GATES. PREP CAN OBTAIN AT MOST 1000 MINIMAL CUT SETS WITH A MAXIMUM OF 19 COMPONENTS PER SET, AND CAN OBTAIN AT MOST 500 MINIMAL PATH SETS WITH A MAXIMUM OF 29 COMPONENTS PER SET. KITT1 WILL OBTAIN RELIABILITY INFORMATION FOR UP TO 500 MINIMAL CUT OR PATH SETS CONTAINING A TOTAL OF AT MOST 400 DISTINCT COMPONENTS AND INHIBIT CONDITIONS. KITT2 WILL OBTAIN RELIABILITY INFORMATION FOR UP TO 500 MINIMAL CUT OR PATH SETS CONTAINING A TOTAL OF AT MOST 350 DISTINCT COMPONENTS AND INHIBIT CONDITIONS. KITT2 CAN OBTAIN RELIABILITY INFORMATION FOR EACH OF 50 DIFFERENT PHASES PER COMPONENT.

1. NAME OR DESIGNATION OF PROGRAM - ETOG3
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC7600
3. DESCRIPTION OF PROBLEM OR FUNCTION - ETOG3 PROCESSES BASIC NUCLEAR INFORMATION GIVEN IN ENDF/B VERSION III FORMAT PRODUCING DATA DECKS FOR USE IN GENERATION OF MUFT4, MUFT5, GAM1, GAM2, AND ANISN LIBRARIES.
4. METHOD OF SOLUTION - ETOG3 PERFORMS A STRAIGHTFORWARD GROUP AVERAGE OF CROSS SECTIONS USING AN INPUT WEIGHTING FUNCTION AND THE MICROSCOPIC DATA FROM THE ENDF/B FILES. THE BREIT-WIGNER SINGLE-LEVEL AND MULTI-LEVEL FORMULAE ARE ASSUMED TO YIELD RESOLVED RESONANCE CROSS SECTIONS WITH REASONABLE ACCURACY. TREATMENT OF UNRESOLVED CROSS SECTIONS IS SIMILAR TO THAT OF MC**2 (ACC ABSTRACT 355).
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - IN ADDITION TO THE RESTRICTIONS ON THE ENDF/B DATA ITSELF, ETOG3 HAS THE FOLLOWING MAXIMA -
 - 99 MULTIGROUPS
 - 500 RESOLVED RESONANCES

6. TYPICAL RUNNING TIME -

LIBRARY	ENDF DATA HAS FEW RESONANCE PARAMETERS	ENDF DATA HAS NO RESONANCE PARAMETERS
MUFT, 54 GROUP	35 SECONDS*	6 SECONDS
GAM1, 68 GROUP	100 SECONDS**	48 SECONDS**
GAM2, 99 GROUP	180 SECONDS**	96 SECONDS**
ANISN, 99 GROUP	180 SECONDS**	96 SECONDS**
* EASILY GOES UP TO 450 SECONDS FOR 400 RESONANCES		
** ESTIMATE		

7. UNUSUAL FEATURES OF THE PROGRAM - IN THE ESTABLISHMENT OF TRANSFER MATRICES, ANALYTICAL RESULTS ARE EMPLOYED WHERE POSSIBLE IN THE NORMALIZATION OF OUTPUT DATA. FOR EXAMPLE, IN THE GENERATION OF THE ELASTIC SCATTERING MATRIX IN THE ENERGY RANGE IN WHICH THE SCATTER IS ISOTROPIC IN THE CENTER-OF-MASS SYSTEM, RESULTS OF THE NUMERICAL INTEGRATION PERFORMED ARE NORMALIZED TO VALUES DERIVED ANALYTICALLY.
8. RELATED AND AUXILIARY PROGRAMS - ETOG3 SUPERSEDES ETOG1 IN THAT (A) MORE ACCURATE DATA DECKS ARE PRODUCED FOR USE IN CREATING LIBRARIES, (B) ADDITIONAL DATA DECKS MAY BE GENERATED FOR USE IN CREATING LASER LIBRARIES, AND (C) VERSION-III ENDF/B FORMATS AND FORMULAE ARE DIGESTIBLE. IN THE PROGRAM, USE IS MADE OF THE GENERAL PURPOSE PROCESSOR AND RETRIEVAL SUBROUTINES WRITTEN AT BROOKHAVEN FOR HANDLING ENDF/B DATA FILES (ACC ABSTRACTS 384,465,475).

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
CDC7600 VERSION SUBMITTED SEPTEMBER 1973.
10. REFERENCES - M. RAYMUND, SUPPLEMENT TO WCAP-3845-1, ETOG-1, A FORTRAN IV PROGRAM TO PROCESS DATA FROM THE ENDF/B FILE TO THE MUFT, GAM AND ANISN FORMATS, WCAP-3845-1 (ENDF-114) SUPPLEMENT, AUGUST 1973.
D. E. KUSNER AND S. KELLMAN, ETOG-1, A FORTRAN IV PROGRAM TO PROCESS DATA FROM THE ENDF/B FILE TO THE MUFT, GAM AND ANISN FORMATS, WCAP-3845-1 (ENDF-114), DECEMBER 1969, AND ERRATA.
M. K. DRAKE, ED., DATA FORMATS AND PROCEDURES FOR THE ENDF NEUTRON CROSS SECTION LIBRARY, BNL-50274 (ENDF-102), VOL. 1, OCTOBER 1970.
C. G. POCELET, LASER - A DEPLETION PROGRAM FOR LATTICE CALCULATIONS BASED ON MUFT AND THERMOS, WCAP-6073, APRIL 1966.
G. CZER, DESCRIPTION OF THE ENDF/B PROCESSING CODES AND RETRIEVAL SUBROUTINES, ENDF/110, REVISED JUNE 1971.
H. BOHL, JR., E. M. GELBARD, AND G. H. RYAN, MUFT-4, FAST NEUTRON SPECTRUM CODE FOR THE IBM-704, WAPD-TM-72, JULY 1957.
H. BOHL, JR. AND A. P. HEMPHILL, MUFT-5 - A FAST NEUTRON SPECTRUM PROGRAM FOR THE PHILCO-2000, WAPD-TM-218, FEBRUARY 1961.
G. D. JOANOU AND J. S. DUDEK, GAM-I, A CONSISTENT P1 MULTIGROUP CODE FOR THE CALCULATION OF FAST NEUTRON SPECTRA AND MULTIGROUP CONSTANTS, GA-1850, MAY 1961.
G. D. JOANOU AND J. S. DUDEK, GAM-II, A B3 CODE FOR CALCULATION OF SLOWING DOWN SPECTRUM AND ASSOCIATED MULTIGROUP CONSTANTS, GA-4265, SEPTEMBER 16, 1963.
W. W. ENGLE, JR., A USERS MANUAL FOR ANISN, A ONE-DIMENSIONAL DISCRETE ORDINATES CODE WITH ANISOTROPIC SCATTERING, K-1693, MARCH 30, 1967.
D. M. OSHEA, R. J. TOPPEL AND A. L. RAGO, MC**2 - A CODE TO CALCULATE MULTIGROUP CROSS SECTIONS, ANL-7318, JUNE 1967.
11. MACHINE REQUIREMENTS - 42,000 DECIMAL LOCATIONS AND 4 SCRATCH AND PUNCH UNITS, 17,000 DECIMAL LOCATIONS OF EXTENDED CORE MEMORY
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 2.0.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THE PROGRAM CONSISTS OF 9 OVERLAYS.
15. NAME AND ESTABLISHMENT OF AUTHORS -
M. RAYMUND, D. E. KUSNER, R. A. DANNELS,
AND S. KELLMAN
WESTINGHOUSE ELECTRIC CORPORATION
NUCLEAR ENERGY SYSTEMS
P. O. BOX 355
PITTSBURGH, PENNSYLVANIA 15230

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16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (ETOG3 13,877 CARDS, UPDATE 13,947 CARDS, MODI-
FICATIONS 77 CARDS)
SAMPLE PROBLEM (2 CARDS)
REFERENCE REPORT, WCAP-3845-1, AND SUPPLEMENT 1
17. CATEGORY - B
KEYWORDS - CROSS SECTIONS, BREIT-WIGNER FORMULA, GROUP CONSTANTS,
AVERAGES, LIBRARIES, ETOM CODES, GAM CODES, ANISN
CODES, MUFT CODES

1. NAME OR DESIGNATION OF PROGRAM - STRAP
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - THE CODE STRAP (STRUCTURAL ANALYSIS PACKAGE) WAS DEVELOPED TO ANALYZE THE RESPONSE OF STRUCTURAL SYSTEMS TO STATIC AND DYNAMIC LOADING CONDITIONS. STRAP-S SOLVES FOR THE DISPLACEMENTS AND MEMBER FORCES OF STRUCTURAL SYSTEMS UNDER STATIC LOADS AND TEMPERATURE GRADIENTS. STRAP-D WILL SOLVE NUMERICALLY A GIVEN STRUCTURAL DYNAMICS PROBLEM.
4. METHOD OF SOLUTION - STRAP-S GENERATES THE STIFFNESS MATRIX OF A STRUCTURE BY THE FINITE ELEMENT METHOD AND SOLVES THE RESULTING EQUATIONS FOR STRUCTURAL DISPLACEMENTS AND MEMBER FORCES. STRAP-D GENERATES THE STIFFNESS MATRIX, SOLVES FOR EIGENVALUES AND EIGENVECTORS, UNCOUPLES AND SOLVES THE SERIES OF SECOND-ORDER ORDINARY DIFFERENTIAL EQUATIONS, AND THEN CALCULATES AND PLOTS THE REQUESTED MEMBER FORCES.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
 STRAP-S MAXIMA -
 250 DEGREES OF FREEDOM
 100 MEMBERS
 STRAP-D MAXIMA -
 100 DEGREES OF FREEDOM
 80 TIME-STEPS IN THE FORCING FUNCTION INPUT
6. TYPICAL RUNNING TIME - STRAP-S RUNNING TIME IS ABOUT 5 SECONDS FOR A 97 DEGREE OF FREEDOM PROBLEM. STRAP-D RUNNING TIME IS APPROXIMATELY 15 SECONDS FOR A PLANE FRAME, 6 DEGREES OF FREEDOM, 6 MODAL SHAPE (0 TO 1 SECOND) PROBLEM WITH 3 PLOTS, WHILE 1.5 MINUTES ARE REQUIRED FOR A VIBRATING BEAM, 41 DEGREE OF FREEDOM, 2 MODES (0 TO 1 SECOND) PROBLEM WITH 5 PLOTS.
7. UNUSUAL FEATURES OF THE PROGRAM - STRAP-D ALLOWS FORCING FUNCTIONS INPUT TO BE IN THE FORM OF PRESSURES, FORCES, OR GROUND ACCELERATIONS. INITIAL CONDITIONS (DISPLACEMENTS AND VELOCITIES) CAN BE SPECIFIED AS ZERO, OR DISPLACEMENTS CAN BE CALCULATED, OR DISPLACEMENTS AND VELOCITIES CAN BE READ FROM INPUT. MEMBER FORCES CAN BE CALCULATED AND PLOTTED BY STRAP-D.
8. RELATED AND AUXILIARY PROGRAMS - INTEGRAL PARTS OF STRAP-D INCLUDE AN EIGENVALUE-EIGENVECTOR ROUTINE (THJCOB) BY C. NOBLE, A STIFFNESS GENERATOR (STIFGN) BY J. A. DEARIEN, A RUNGE-KUTTA INTEGRATION TECHNIQUE (RKINTZ) BY R. D. PEAK, AND A MATRIX INVERSION ROUTINE (MAINV) BY D. H. GIPSON.
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
 IBM360 VERSION OF STRAP-S SUBMITTED APRIL 1972, SAMPLE PROBLEM EXECUTED BY ACC.
 IBM360 VERSION OF STRAP-D SUBMITTED APRIL 1972, SAMPLE PROBLEM EXECUTED BY ACC.

10. REFERENCES - J. A. DEARIEN, C. NOBLE, AND E. D. ULDRICH, STRAP, A COMPUTER CODE FOR STATIC AND DYNAMIC STRUCTURAL ANALYSIS AND STUDIES MADE USING THE CODE, IN-1362, JUNE 1970.
J. A. DEARIEN, STRAP-S, STRUCTURAL ANALYSIS PACKAGE-STATIC, AND PROGRAM WRITEUP, OCTOBER 1969.
L. J. SIEFKEN, STRAP-D, STRUCTURAL ANALYSIS PACKAGE-DYNAMIC, AND PROGRAM WRITEUP, OCTOBER 1971.
W. WEAVER, JR., COMPUTER PROGRAMS FOR STRUCTURAL ANALYSIS, D. VAN NOSTRAND CO., INC., PRINCETON, NEW JERSEY, 1967.
W. C. HURTY AND M. F. RUBINSTEIN, DYNAMICS OF STRUCTURES, PRENTICE-HALL, INC., ENGLEWOOD CLIFFS, NEW JERSEY, 1964.
S. L. ROGERS, DYNAMICS OF FRAMED STRUCTURES, JOHN WILEY + SONS, INC., NEW YORK, 1959.
J. B. SCARBOROUGH, NUMERICAL MATHEMATICAL ANALYSIS, THE JOHN HOPKINS PRESS, BALTIMORE, MARYLAND, 1955.
W. T. THOMSON, VIBRATION THEORY AND APPLICATIONS, PRENTICE-HALL, INC., ENGLEWOOD CLIFFS, NEW JERSEY, 1965.
N. WILLEMS AND W. M. LUCAS, MATRIX ANALYSIS FOR STRUCTURAL ENGINEERS, PRENTICE-HALL, INC., ENGLEWOOD CLIFFS, NEW JERSEY, 1968.
11. MACHINE REQUIREMENTS - 300K BYTES OF MEMORY FOR EACH PROGRAM PLUS 5 TO 7 DIRECT ACCESS STORAGE DEVICES BESIDES STANDARD I/O FOR STRAP-D
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - STRAP-D USES PLOTTING SUBROUTINES CURRENTLY IN THE NRTS OPERATING SYSTEM.
15. NAME AND ESTABLISHMENT OF AUTHORS -
J. A. DEARIEN AND E. D. ULDRICH
AEROCJET NUCLEAR COMPANY
P. O. BOX 1845
IDAHO FALLS, IDAHO 83401
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (STRAP-S 1209 CARDS, STRAP-D 5067 CARDS)
SAMPLE PROBLEMS (STRAP-S 34 CARDS, STRAP-D 138 CARDS)
CONTROL INFORMATION (JCL STRAP-S 18 CARDS, STRAP-D 61 CARDS)
LOAD MODULES (STRAP-S, STRAP-D STEP1, STRAP-D STEP2, AND STRAP-D STEP3)
SAMPLE PROBLEM OUTPUT (STRAP-S 7 PAGES, STRAP-D 31 SELECTED PAGES)
REFERENCE REPORT, IN-1362, AND PROGRAM WRITEUPS
17. CATEGORY - I
KEYWORDS - STRUCTURAL ANALYSIS, DIFFERENTIAL EQUATIONS, FINITE-ELEMENT, DYNAMICS, MASS MATRICES

1. NAME OR DESIGNATION OF PROGRAM - PACTCLUS/CLOTHC
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - UNIVAC1108
3. DESCRIPTION OF PROBLEM OR FUNCTION - PACTCLUS IS A CODE FOR COMPUTING NUCLEAR POWER COSTS USING THE DISCOUNTED CASH FLOW METHOD. THE CASH FLOWS ARE GENERATED FROM INPUT UNIT COSTS, TIME SCHEDULES AND BURNUP DATA. CLOTHC CALCULATES AND COMMUNICATES TO PACTCLUS MASS FLOW DATA TO MATCH A SPECIFIED LOAD FACTOR HISTORY.
4. METHOD OF SOLUTION - PLANT LIFETIME POWER COSTS ARE CALCULATED USING THE DISCOUNTED CASH FLOW METHOD.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
40 ANNUAL TIME PERIODS INTO WHICH ALL COSTS AND MASS FLOWS ARE ACCUMULATED
20 ISOTOPIC MASS FLOWS CHARGED INTO AND DISCHARGED FROM THE REACTOR MODEL
6. TYPICAL RUNNING TIME - FOR TYPICAL NUCLEAR PLANTS HAVING A LIFE-TIME OF 30 YEARS AND BETWEEN 50 AND 200 CHARGE-DISCHARGE FUELING EVENTS, A RUN TIME OF 10 TO 25 SECONDS CAN BE EXPECTED.
7. UNUSUAL FEATURES OF THE PROGRAM - ALTHOUGH THE PACTCLUS/CLOTHC CODE IS DESIGNED PRIMARILY FOR NUCLEAR POWER PLANT COST ANALYSIS, BY PROPER INPUT OF MASS FLOWS AND UNIT COSTS ANY SIMILAR PLANT SUCH AS A FOSSIL-FUELED POWER PLANT OR A HYDROELECTRIC PLANT CAN BE SIMULATED. AN OPTION OF PACTCLUS ALLOWS DIRECT READING OF MASS FLOWS OF LIGHT-WATER REACTORS FROM A BURNUP TAPE PROVIDED BY THE ALTHAEA BURNUP CODE DESCRIBED IN REFERENCE 4. ANY SIMILAR BURNUP TAPE COULD BE USED FOR ANY SPECIFIC REACTOR DESIGN, OR CARD INPUT CAN BE PROVIDED THROUGH CLOTHC.
8. RELATED AND AUXILIARY PROGRAMS - THE POWER COST CALCULATION IN PACTCLUS/CLOTHC IS A MODIFIED VERSION OF A TECHNIQUE DEVELOPED BY ROYCE SALMON OF OAK RIDGE NATIONAL LABORATORY AND DESCRIBED IN THE REPORT, A PROCEDURE AND A COMPUTER CODE (POWERCC) FOR CALCULATING THE COST OF ELECTRICITY PRODUCED BY NUCLEAR POWER STATIONS, ORNL-3944, JUNE 1966. SEE ACC ABSTRACT 340.
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
UNIVAC1108 VERSION SUBMITTED APRIL 1972.
10. REFERENCES - C. H. BLOOMSTER, J. H. NAIL, AND D. R. HAFNER, PACTCLUS, A CODE FOR COMPUTING NUCLEAR POWER COSTS, BNWL-1169, JANUARY 1970.
J. H. NAIL, PACTCLUS, A CODE FOR COMPUTING NUCLEAR POWER COSTS, PART 1, USERS MANUAL, BNWL-429, JUNE 1967.
J. H. NAIL, CLOTHC, A CODE FOR COMMUNICATING REACTOR MASS BALANCE DATA TO REACTOR ECONOMICS CODES, BNWL-770, JUNE 1968.
E. T. MERRILL, ALTHAEA PART 1, A ONE-DIMENSIONAL TWO-

10. REFERENCES (CONTINUED)
GROUP DIFFUSION CODE WITH AN EFFECTIVE FOUR-GROUP BURNUP,
BNWL-462, MAY 1971.
R. SALMON, EXCERPTED PAGES FROM CPNL-4116, AUGUST
1969.
D. R. HAFFNER, OPERATION OF THE PACTOLUS/CLOTHO CODE,
HECL MEMO, FEBRUARY 21, 1973.
SELECTED PAGES FROM CSCX RJE/CRJE REFERENCE, E00003-
02-00, VOL. 2.
NTRAN I/O ROUTINES DESCRIPTION, EXCERPT FROM UP-3569,
REV. 1.
11. MACHINE REQUIREMENTS - 65K MEMORY WITH DRUM STORAGE OF INPUT DATA
TO SPEED UP PROCESSING
12. PROGRAMMING LANGUAGE USED - FORTRAN V
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
CSCX.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHOR -
D. R. HAFFNER
HANFORD ENGINEERING DEVELOPMENT LABORATORY
WESTINGHOUSE HANFORD COMPANY
P. O. BOX 1970
RICHLAND, WASHINGTON 99352
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (PACTOLUS 4793 CARDS, PDCC 782 CARDS)
SAMPLE PROBLEMS (PACTOLUS 16 CARDS, PDCC 40 CARDS, CLOTHO 311
CARDS)
SAMPLE PROBLEM OUTPUT (PACTOLUS 20 PAGES, CLOTHO 2 PAGES)
REFERENCE REPORTS, BNWL-770 AND BNWL-1169, EXCERPTS, AND MEMO
17. CATEGORY - D
KEYWORDS - DEPLETION, FUEL MANAGEMENT, COST ANALYSIS, REACTOR
ECONOMICS, POWERCC CODES, ALTHAEA CODES

1. NAME OR DESIGNATION OF PROGRAM - WSP-HASP/DCS
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - THE WSP (WORK STATION PACKAGE) IS A MODIFICATION OF THE STANDARD HASP/RMT360 PACKAGE SUPPLIED BY IBM AND RUNS ON A MULTIPROGRAMMED DCS SYSTEM/360/30 USING MULTI-LEAVING AND BINARY SYNCHRONOUS COMMUNICATIONS TO COMMUNICATE WITH A SYSTEM/360/195/ASP CENTRAL CPU.
4. METHOD OF SOLUTION - WSP IS A MODIFICATION OF A COMPONENT OF THE HASP II (360D-05.1.014) VERSION 3, MODIFICATION LEVEL 1 IBM PROGRAM. WSP RUNS IN A FOREGROUND PARTITION OF A DCS MFT SYSTEM.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
6. TYPICAL RUNNING TIME - WSP NORMALLY RUNS CONTINUOUSLY IN THE FOREGROUND PARTITION.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - HASP/RMT360 PACKAGE.
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 DCS VERSION SUBMITTED SEPTEMBER 1973.
10. REFERENCES - ROBERT J. MCMAHON, THE ARGONNE HASP/DCS WORKSTATION PACKAGE (WSP), ARGONNE NATIONAL LABORATORY MEMORANDUM, SEPTEMBER, 1973.
11. MACHINE REQUIREMENTS - WSP HAS BEEN DESIGNED FOR A SYSTEM/360/30 WITH AN IBM 2540 READER-PUNCH, TWO IBM 1403 PRINTERS, AN IBM 1052 PRINTER KEYBOARD CONSOLE, AND AN IBM 2701 DATA ADAPTER UNIT.
12. PROGRAMMING LANGUAGE USED - DCS ASSEMBLER LANGUAGE
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - 360 DCS RELEASE 26.1. THE ANL SYSTEM/360/195 ASP CENTRAL CPU IS OPERATING WITH VERSION 2.6.5 OF ASP REQUIRING NO CHANGES.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THE PERSON RESPONSIBLE FOR WSP INSTALLATION AND OPERATION SHOULD BE WELL-VERSED IN HASP, DCS, AND ASP. DEVIATIONS FROM THE CONFIGURATION SPECIFIED IN 11, MAY REQUIRE ADDITIONAL PROGRAMMING.
15. NAME AND ESTABLISHMENT OF AUTHOR -
ROBERT J. MCMAHON
APPLIED MATHEMATICS DIVISION
ARGONNE NATIONAL LABORATORY
9700 S. CASS AVENUE
ARGONNE, ILLINOIS 60439

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16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
ARGonne MODIFICATIONS TO THE STANDARD HASP/RMT360 PACKAGE -
SOURCE (597 CARDS)
WSP DRIVER AND B-TRANSIENT PROGRAM PLUS DCS LINK-EDIT JOBS -
SOURCE (42 CARDS)
WSP OBJECT DECK (294 CARDS)
REFERENCE REPORT
17. CATEGORY - P
KEYWORDS - OPERATING SYSTEMS, DATA PROCESSING, REMOTE JOB PROCESS-
ING, COMPUTER NETWORKS

1. NAME OR DESIGNATION OF PROGRAM - PSA2
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360,370
3. DESCRIPTION OF PROBLEM OR FUNCTION - PSA2 COMPUTES THE REACTIONS AND STRESSES CAUSED BY THERMAL EXPANSION AND LOADS IN A MULTI-ANCHOR PIPING SYSTEM WHICH MAY CONTAIN LOOPS AND MAY BE PARTIALLY RESTRAINED AT ANY POINT IN ANY DIRECTION.
4. METHOD OF SOLUTION - THE LINEAR EQUATIONS FOR THE STATICALLY INDETERMINATE PIPE SYSTEM ARE SET UP BY A GENERALIZATION OF BROOKS MATRIX METHOD. BY A SYSTEMATIC USE OF LINEAR TRANSFORMS, THE MATRIX OF THE SYSTEM OF LINEAR EQUATIONS CAN BE OBTAINED BY INCIDENCE ALGEBRA IN THE FORM OF A SYMMETRIC BANDED MATRIX.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMUM OF - 36 SECTIONS
6. TYPICAL RUNNING TIME - 1 TO 3 MINUTES ARE REQUIRED ON A MODEL 50.
7. UNUSUAL FEATURES OF THE PROGRAM - PSA2 TAKES INTO ACCOUNT -
 - (A) ELASTICITY OF THE ATTACHMENT OF THE PIPE TO THE FOUNDATION,
 - (B) RESTRAINTS ON PIPE DISPLACEMENTS BY ANCHORS AND INTERMEDIATE PARTIAL CONSTRAINTS OF LINEAR TYPE,
 - (C) GIVEN CONSTANT FORCES AND MOMENTS ACTING UPON THE PIPE SYSTEM,
 - (D) THERMAL EXPANSION,
 - (E) ANY GEOMETRICAL STRUCTURE OF THE PIPE SYSTEM,
 - (F) SEVERAL CASES OF STRESSING PER PIPE SYSTEM, AND
 - (G) BOTH METRIC AND ENGLISH UNITS.
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 VERSION SUBMITTED MAY 1972, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCE - B. H. BOONSTRA, A. N. NICKOLS, W. J. HUGHES, AND W. D. GROSS, PIPE STRESS ANALYSIS CODE, PSA2, AI-64-MEMO-142, REVISION 1.
11. MACHINE REQUIREMENTS - 64K MEMORY
12. PROGRAMMING LANGUAGE USED - FORTRAN IV (F)
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - CS/360.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - FUNCTION LCC MUST BE USER-SUPPLIED. IT RETURNS THE ADDRESS OF ITS ARGUMENT AS AN INTEGER TO THE CALLING PROGRAM.

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15. NAME AND ESTABLISHMENT OF AUTHOR -
A. N. NICKOLS
CODES COORDINATOR
ATOMICS INTERNATIONAL
P. O. BOX 309
CANGA PARK, CALIFORNIA 91304
16. MATERIAL AVAILABLE -
SOURCE DECK (1356 CARDS)
SAMPLE PROBLEM (20 CARDS)
CONTROL INFORMATION (JCL 21 CARDS)
REFERENCE REPORT
17. CATEGORY - I
KEYWORDS - STRESSES, THERMAL EXPANSION, PIPES

1. NAME OR DESIGNATION OF PROGRAM - ENDF/B-THERMCS
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE -
3. DESCRIPTION OF PROBLEM OR FUNCTION - THESE DATA ARE 30-GROUP THERMOS THERMAL SCATTERING KERNELS FOR P0 TO P5 LEGENDRE ORDERS FOR EVERY TEMPERATURE OF EVERY MATERIAL FROM S(ALPHA,BETA) DATA STORED IN THE ENDF/B LIBRARY. THESE SCATTERING KERNELS WERE GENERATED USING THE FLANGE2 COMPUTER CODE (ACC ABSTRACT 368). TO TEST THE KERNELS, THE INTEGRAL PROPERTIES OF EACH SET OF KERNELS WERE DETERMINED BY A PRECISION INTEGRATION OF THE DIFFUSION LENGTH EQUATION AND COMPARED TO EXPERIMENTAL MEASUREMENTS OF THESE PROPERTIES. IN GENERAL, THE AGREEMENT WAS VERY GOOD. DETAILS OF THE METHODS USED AND RESULTS OBTAINED ARE CONTAINED IN THE REFERENCE. THE SCATTERING KERNELS ARE ORGANIZED INTO A TWO VOLUME MAGNETIC TAPE LIBRARY FROM WHICH THEY MAY BE RETRIEVED EASILY FOR USE IN ANY 30-GROUP THERMOS LIBRARY. THE CONTENTS OF THE TAPES ARE AS FOLLOWS -

VOLUME I		
MATERIAL	ZA	TEMPERATURES (DEGREES K)
MOLECULAR H ₂ O	100.0	296, 350, 400, 450, 500, 600, 800, 1000
MOLECULAR D ₂ O	101.0	296, 350, 400, 450, 500, 600, 800, 1000
GRAPHITE	6000.0	296, 400, 500, 600, 700, 800, 1000, 1200, 1600, 2000
POLYETHYLENE	205.0	296, 350
BENZENE	106.0	296, 350, 400, 450, 500, 600, 800, 1000
VOLUME II		
MATERIAL	ZA	TEMPERATURES (DEGREES K)
ZR BOUND IN ZRHX	203.0	296, 400, 500, 600, 700, 800, 1000, 1200
H BOUND IN ZRHX	230.0	296, 400, 500, 600, 700, 800, 1000, 1200
BERYLLIUM-9	4009.0	296, 400, 500, 600, 700, 800, 1000, 1200
BERYLLIUM OXIDE	200.0	296, 400, 500, 600, 700, 800, 1000, 1200
URANIUM DIOXIDE	207.0	296, 400, 500, 600, 700, 800, 1000, 1200

4. METHOD OF SOLUTION - KERNEL GENERATION IS PERFORMED BY DIRECT INTEGRATION OF THE THERMAL SCATTERING LAW DATA TO OBTAIN THE DIFFERENTIAL SCATTERING CROSS SECTIONS FOR EACH LEGENDRE ORDER. THE INTEGRAL PARAMETER CALCULATION IS DONE BY PRECISION INTEGRATION OF THE DIFFUSION LENGTH EQUATION FOR SEVERAL MODERATOR ABSORPTION CROSS SECTIONS FOLLOWED BY A LEAST SQUARES FIT TO OBTAIN THE FIRST THREE MOMENTS OF k^2/Σ_a AS A FUNCTION OF Σ_a . THE DIFFUSION PARAMETERS D_0 , C AND OTHER INTEGRAL PARAMETERS WERE THEN OBTAINED FROM THE FITTED MOMENTS.

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5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
6. TYPICAL RUNNING TIME -
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - A RETRIEVAL PROGRAM TO PRINT AND/OR PUNCH SCATTERING KERNELS FROM THE LIBRARIES IS INCLUDED. PART OF THE ROUTINE IS A GENERAL SUBROUTINE THAT WILL POSITION A LIBRARY IN FRONT OF A SPECIFIED KERNEL. THE SUBROUTINE MAY BE USED IN ANY USER PROGRAM.
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
THIS VERSION SUBMITTED APRIL 1972.
10. REFERENCE - F. J. MCCROSSON, D. R. FINCH, AND E. C. CLSEN, TESTING OF ENDF/B - THERMOS CROSS SECTIONS FOR H₂O, D₂O, C, ZRH₂, (C₂H₄)X, BE, BEO, C₆H₆, AND UO₂, CP-1276 (ENDF-158), OCTOBER 1971.
11. MACHINE REQUIREMENTS - THE RETRIEVAL PROGRAM REQUIRES 1 TAPE DRIVE AND A SMALL AMOUNT OF HIGH-SPEED CORE.
12. PROGRAMMING LANGUAGE USED - AUXILIARY PROGRAM WRITTEN IN FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
F. J. MCCROSSON AND D. R. FINCH
SAVANNAH RIVER LABORATORY
E. I. DU PONT DE NEMOURS AND COMPANY
AIKEN, SOUTH CAROLINA 29801
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL (3 TAPES)
LIBRARY (TAPE 1 22,787 CARDS, TAPE 2 24,875 CARDS)
AUXILIARY PROGRAM (203 CARDS)
REFERENCE REPORT
17. CATEGORY - Z
KEYWORDS - SCATTERING KERNELS, ENDF/B, DATA PROCESSING, THERMOS CODES, FLANGE2 CODES

1. NAME OR DESIGNATION OF PROGRAM - PLOT-3D
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360/75 WITH AN IBM2280 FILM RECORDER OR A CALCOMP 780 PLOTTER
3. DESCRIPTION OF PROBLEM OR FUNCTION - PLOT-3D IS A PACKAGE OF SUB-PROGRAMS DESIGNED TO DRAW THREE-DIMENSIONAL SURFACES FROM ARRAYS OF POINTS (X,Y,Z). THE SURFACES CAN BE DRAWN AFTER ARBITRARY ROTATIONS ABOUT THE THREE COORDINATE AXES.
4. METHOD OF SOLUTION - PLOT-3D IS A COMPUTER PROGRAM TO PLOT ANY SURFACE FOR WHICH EACH COORDINATE PAIR (X,Y) IS ASSOCIATED WITH A UNIQUE Z IN THE SET OF POINTS (X,Y,Z). IT USES MATRIX TRANSFORMATION OF THE POINTS TO GENERATE DIFFERENT VIEWS OF THE SURFACE AFTER ARBITRARY ROTATIONS ABOUT THE THREE COORDINATE AXES. FOUR VERSIONS OF PLOT-3D ARE AVAILABLE. OUTPUT OF VERSION 1 AND 3 IS BY FILM RECORDER. OUTPUT OF VERSION 2 AND 4 IS BY CALCOMP PLOTTER. VERSIONS 3 AND 4 DO NOT DRAW LINES WHICH WOULD BE INVISIBLE TO A VIEWER LOOKING AT AN OPAQUE SURFACE, WHEREAS VERSIONS 1 AND 2 DRAW EVERY LINE ON THE SURFACE.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - VERSIONS 3 AND 4 LIMIT NUMBER OF ROWS IN ARRAYS (X,Y,Z) TO 100 AND ALSO NUMBER OF COLUMNS IN ARRAYS (X,Y,Z) TO 100.
6. TYPICAL RUNNING TIME - USING A 20 X 10 GRID AND PRODUCING SIX 3-D PICTURES REQUIRES 15 SECONDS WITH VERSION 1, 20 SECONDS WITH VERSION 2, 4 MINUTES AND 30 SECONDS WITH VERSION 3, AND 3 MINUTES AND 28 SECONDS WITH VERSION 4.
7. UNUSUAL FEATURES OF THE PROGRAM - THE PLOT-3D PACKAGE IS READILY ADAPTABLE TO OTHER HARDWARE. IT IS INTENDED FOR GRAPHICAL REPRESENTATION OF SURFACES DETERMINED BY SINGLE-VALUED FUNCTIONS OF TWO INDEPENDENT VARIABLES.
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 VERSION SUBMITTED MAY 1972, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - D. BASINGER AND J. GVILDYS, THREE-DIMENSIONAL GRAPHICAL REPRESENTATION OF SURFACES BY COMPUTER (FAST REACTOR CONTAINMENT PROGRAM), ANL-7633, NOVEMBER 1971.
R. BRUCE CANWRIGHT, JR. AND PAUL SWIGERT, PLOT 3-D - A PACKAGE OF FORTRAN SUBPROGRAMS TO DRAW THREE-DIMENSIONAL SURFACES, NASA TM-X-1598, JUNE 1968.
RUTH A. NEISS, BE VISION, A PACKAGE OF IBM 7090 FORTRAN PROGRAMS TO DRAW CRYPTOGRAPHIC VIEWS OF COMBINATIONS OF PLANE AND QUATRIC SURFACES, JOURNAL OF THE ASSOCIATION OF COMPUTER MACHINERY, PP. 194-204, APRIL 1966.

10. REFERENCES (CONTINUED)

HENRY MARGENAU AND GEORGE M. MURPHY, THE MATHEMATICS OF PHYSICS AND CHEMISTRY, SECOND EDITION, D. VAN NOSTRAND CO., INC., PP. 565-570, 1956.

D. CARSON, A FILM-PLOTTING SUBROUTINE PACKAGE (FSP) FOR THE IBM 2280 FILM RECORDER, ANL-AMD TECHNICAL MEMORANDUM NO. 167, JUNE 17, 1968.

RONALD F. KRUPP, S/360 PROGRAMMING TECHNIQUES FOR THE CALCOMP 78C, ANL-AMD TECHNICAL MEMORANDUM NO. 130, REVISED JUNE 13, 1972.

11. MACHINE REQUIREMENTS - VERSIONS 1 AND 3, FOR THE IBM 2280 FILM RECORDER, REQUIRE 7810 AND 58,285 BYTES OF CORE STORAGE, EXCLUSIVE OF FILM RECORDER SUBROUTINES AND ARRAYS. VERSIONS 2 AND 4, FOR THE CALCOMP PLOTTER, REQUIRE 6670 AND 62,435 BYTES OF CORE STORAGE, EXCLUSIVE OF CALCOMP PLOTTER SUBROUTINES AND ARRAYS.

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360 ASP.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -

D. BASINGER AND J. GVILDYS
REACTOR ANALYSIS AND SAFETY DIVISION
ARGONNE NATIONAL LABORATORY
9700 SOUTH CASS AVENUE
ARGONNE, ILLINOIS 60439

16. MATERIAL AVAILABLE -

SOURCE DECKS (VERSION 1 251 CARDS, VERSION 2 245 CARDS, VERSION 3 557 CARDS, VERSION 4 558 CARDS)
SAMPLE PROBLEM OUTPUT (12 PAGES)
REFERENCE REPORT, ANL-7633

17. CATEGORY - N

KEYWORDS - 3-DIMENSIONAL, X-Y-Z, GRAPHS

1. NAME OR DESIGNATION OF PROGRAM - BETTY
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - BETTY DESCRIBES SPATIAL AND TEMPORAL CONCENTRATION BEHAVIOR OF A SUSPENSION IN A PIPE, AS A RESULT OF DEPOSITION AND EROSION OF THE PARTICLES.
4. METHOD OF SOLUTION - THE PARTIAL DIFFERENTIAL EQUATIONS DESCRIBING THE CONCENTRATION BEHAVIOR ARE SOLVED BY A COMBINATION OF ANALYTICAL AND NUMERICAL INTEGRATION USING A SIMPLE FORWARD DIFFERENCING TECHNIQUE.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - NO MORE THAN 900 AXIAL INCREMENTS MAY BE USED.
6. TYPICAL RUNNING TIME - A PROBLEM WITH 100 AXIAL INCREMENTS REQUIRES ABOUT TWO SECONDS.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - BETTY USES SEVERAL ROUTINES FROM THE BETTIS ENVIRONMENTAL PACKAGE (ACC ABSTRACT 478) AND SUBROUTINE HCH (ACC ABSTRACT 294) TO CALCULATE WATER AND STEAM PROPERTIES.
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
CDC6600 VERSION SUBMITTED JUNE 1972.
10. REFERENCES - S. K. BEAL, THE ROLE OF EROSION AND DEPOSITION IN SAMPLING ENTRAINED PARTICLES, WAPD-TM-1014, APRIL 1972.
C. J. PFEIFER, CDC-6600 FORTRAN PROGRAMMING - BETTIS ENVIRONMENTAL REPORT, WAPD-TM-668, JANUARY 1967.
L. L. LYNN, A DIGITAL COMPUTER PROGRAM FOR NUCLEAR DESIGN WATER PROPERTIES, WAPD-TM-680, JULY 1967.
11. MACHINE REQUIREMENTS - 63K 60-BIT WORDS OF CORE STORAGE
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCCPE 3.2.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHOR -
S. K. BEAL
BETTIS ATOMIC POWER LABORATORY
WESTINGHOUSE ELECTRIC CORPORATION
P. O. BOX 79
WEST MIFFLIN, PENNSYLVANIA 15122

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16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
SOURCE DECK (599 CARDS)
SAMPLE PROBLEM (22 CARDS)
SAMPLE PROBLEM OUTPUT (13 PAGES)
REFERENCE REPORT, WAPD-TM-1014
17. CATEGORY - H
KEYWORDS - PIPES, PARTICLES, SAMPLING

1. NAME OR DESIGNATION OF PROGRAM - EMERALD
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360/85
3. DESCRIPTION OF PROBLEM OR FUNCTION - THE EMERALD PROGRAM IS DESIGNED FOR THE CALCULATION OF RADIATION RELEASES AND EXPOSURES RESULTING FROM NORMAL AND ABNORMAL OPERATION OF A LARGE PRESSURIZED WATER REACTOR. THE APPROACH USED IN EMERALD IS SIMILAR TO AN ANALOG SIMULATION OF A REAL SYSTEM. EACH COMPONENT OR VOLUME IN THE PLANT WHICH CONTAINS A RADIOACTIVE MATERIAL IS REPRESENTED BY A SUBROUTINE, WHICH KEEPS TRACK OF THE PRODUCTION, TRANSFER, DECAY AND ABSORPTION OF RADIOACTIVITY IN THAT VOLUME. DURING THE COURSE OF THE ANALYSIS OF AN ACCIDENT, ACTIVITY IS TRANSFERRED FROM SUBROUTINE TO SUBROUTINE IN THE PROGRAM AS IT WOULD BE TRANSFERRED FROM PLACE TO PLACE IN THE PLANT. FOR EXAMPLE, IN THE CALCULATION OF THE DOSES RESULTING FROM A LOSS-OF-COOLANT ACCIDENT THE PROGRAM FIRST CALCULATES THE ACTIVITY BUILT UP IN THE FUEL BEFORE THE ACCIDENT, THEN RELEASES SOME OF THIS ACTIVITY TO THE CONTAINMENT VOLUME. SOME OF THIS ACTIVITY IS THEN RELEASED TO THE ATMOSPHERE. THE RATES OF TRANSFER, LEAKAGE, PRODUCTION, CLEANUP, DECAY, AND RELEASE ARE READ IN AS INPUT TO THE PROGRAM. SUBROUTINES ARE ALSO INCLUDED WHICH CALCULATE THE ON-SITE AND OFF-SITE RADIATION EXPOSURES AT VARIOUS DISTANCES, FOR INDIVIDUAL ISOTOPES AND SUMS OF ISOTOPES. THE PROGRAM CONTAINS A LIBRARY OF PHYSICAL DATA FOR THE TWENTY-FIVE ISOTOPES OF MOST INTEREST IN LICENSING CALCULATIONS, AND OTHER ISOTOPES CAN BE ADDED OR SUBSTITUTED. BECAUSE OF THE FLEXIBLE NATURE OF THE SIMULATION APPROACH, THE EMERALD PROGRAM CAN BE USED FOR MOST CALCULATIONS INVOLVING THE PRODUCTION AND RELEASE OF RADIOACTIVE MATERIALS, INCLUDING DESIGN, OPERATIONAL AND LICENSING STUDIES.
4. METHOD OF SOLUTION - EXPLICIT SOLUTIONS OF FIRST-ORDER LINEAR DIFFERENTIAL EQUATIONS ARE INCLUDED. IN ADDITION, A SUBROUTINE IS PROVIDED WHICH SOLVES A SET OF SIMULTANEOUS LINEAR ALGEBRAIC EQUATIONS.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
25 ISOTOPES
7 TIME PERIODS
15 VOLUMES OR COMPONENTS
10 DISTANCES
6. TYPICAL RUNNING TIME - LESS THAN A MINUTE IS REQUIRED TO RUN THE SAMPLE PROBLEM.
7. UNUSUAL FEATURES OF THE PROGRAM - THE USE OF FORTRAN IV LANGUAGE, MODULAR DESIGN, GENERIC VARIABLE NAMES, AND EXTENSIVE INTERNAL COMMENTS MAKES EMERALD EASILY ADAPTED TO THE USER'S PARTICULAR MODELS AND PROBLEMS.

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8. RELATED AND AUXILIARY PROGRAMS - SUBROUTINE SIMQ, WHICH IS DOCUMENTED IN IBM SYSTEM 360 SCIENTIFIC SUBROUTINE PACKAGE (360A-CM-30X), VERSION III, PROGRAM MANUAL H2C-0205-3, IS INCLUDED.
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 VERSION SUBMITTED MAY 1972, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - W. K. BRUNOT, EMERALD - A PROGRAM FOR THE CALCULATION OF ACTIVITY RELEASES AND POTENTIAL DOSES FROM A PRESSURIZED WATER REACTOR PLANT, PACIFIC GAS AND ELECTRIC COMPANY, OCTOBER 1971, AND ERRATA AND ADDITIONS, MAY 31, 1972, AND DECEMBER 12, 1972.
EMERALD - A PROGRAM FOR THE CALCULATION OF PWR RADIATION DOSES, TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY, JUNE 1972.
11. MACHINE REQUIREMENTS - 520K BYTES ON THE IBM 360/85
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHOR -
W. K. BRUNOT
MECHANICAL AND NUCLEAR ENGINEERING DEPARTMENT
PACIFIC GAS AND ELECTRIC COMPANY
77 BEALE STREET
SAN FRANCISCO, CALIFORNIA 94106
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (3985 CARDS)
SAMPLE PROBLEMS (1337 CARDS)
CONTROL INFORMATION (JCL 8 CARDS)
REFERENCE REPORT WITH ERRATA AND ADDITIONS
17. CATEGORY - G
KEYWORDS - DOSE RATES, ACCIDENTS, FISSION PRODUCTS, GAMMA RADIATION, POWER PLANTS, RADIOACTIVITY, PWR REACTORS

1. NAME OR DESIGNATION OF PROGRAM - GAMBIT
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - GAMBIT IS A PROGRAM THAT WAS DESIGNED TO CALCULATE MULTIGROUP NEUTRON CROSS SECTIONS IN THE HIGH ENERGY AND THE THERMAL ENERGY RANGES. IT WAS CREATED BY JOINING GAM, WHICH DOES THE HIGH ENERGY CALCULATION, AND BIT, WHICH DOES THE THERMAL CALCULATION.
4. METHOD OF SOLUTION - GAMBIT PROVIDES BROAD-GROUP FLUX AND CURRENT-AVERAGED NEUTRON CROSS SECTIONS. THEY ARE BASED ON A THERMAL CROSS SECTION LIBRARY CONSISTING OF 99 FINE GROUPS (0-2.38 EV), AND A FAST NEUTRON LIBRARY CONSISTING OF 68 FINE GROUPS (0.414 EV - 10 MEV, 1/4 LETHARGY INTERVALS). THE FLUXES AND CURRENTS REQUIRED TO OBTAIN THE BROAD-GROUP CROSS SECTIONS MAY BE CALCULATED WITH GAMBIT OR MAY BE ENTERED INTO THE PROGRAM. IN ADDITION, A MAXWELLIAN SPECTRUM MAY BE USED IN THE THERMAL RANGE. IF THE FLUX IS CALCULATED, EITHER THE B1 OR P1 METHODS OF SOLVING THE TRANSPORT EQUATION MAY BE USED. IN EFFECT, THE STEADY-STATE TRANSPORT EQUATION IS SOLVED FOR AN INFINITE MEDIUM PROBLEM. THE PROGRAM PROVIDES CROSS SECTIONS FOR A FULL P1 TRANSPORT CALCULATION. CARDS ARE PUNCHED OUT IN A FORMAT SUITABLE FOR INPUT TO THE ANISN AND DOT DISCRETE-ORDINATES TRANSPORT CODES.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
20 NUCLIDES PER PROBLEM
32 GAM (FAST) BROAD ENERGY GROUPS
48 BIT (THERMAL) BROAD ENERGY GROUPS
6. TYPICAL RUNNING TIME - 5 MINUTES ARE REQUIRED FOR A TYPICAL PROBLEM.
7. UNUSUAL FEATURES OF THE PROGRAM - BIT SOLVES EQUATIONS IN THE THERMAL ENERGY RANGE (0 LESS THAN OR EQUAL TO LESS THAN OR EQUAL 2.38 EV) THAT ARE CONSISTENT WITH THE EQUATIONS SOLVED WITHIN THE GAM PROGRAM AND COMPATIBLE TO THOSE SOLVED WITH THE GATHER PROGRAM. BIT PROVIDES FLUXES AND CURRENTS AND INCLUDES BOTH P0 AND P1 SCATTERING MATRICES IN ITS CROSS SECTION LIBRARY. INITIAL FINE ENERGY GROUP FLUXES AND CURRENTS MAY BE OBTAINED FROM GAMBIT WHICH CAN BE USED IN OBTAINING BROAD-GROUP CROSS SECTIONS. SUBSEQUENTLY FINE-GROUP FLUXES AND CURRENTS OBTAINED FROM A TRANSPORT THEORY CALCULATION MAY BE INPUT TO GAMBIT TO OBTAIN IMPROVED BROAD-GROUP CROSS SECTIONS.
8. RELATED AND AUXILIARY PROGRAMS - GAM (ACC ABSTRACT 33), GATHER, AND QUERY
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
CDC6600 VERSION SUBMITTED MAY 1972.

10. REFERENCES - G. COLLIER, G. GIBSON, L. L. MORAN, R. K. DISNEY, AND R. S. KAISER, SECOND VERSION OF THE GAMBIT CODE, WANL-TME-1969, NOVEMBER 1969.
 W. H. GRAY AND G. COLLIER, GAMBIT USERS MANUAL, WANL-TME-1751, FEBRUARY 1968.
 G. COLLIER AND G. GIBSON, GAMBIT PROGRAM, WANL-TME-1752, APRIL 1968.
 L. L. MCRAN, G. COLLIER, A. S. JOHNSTON, AND G. GIBSON, THERMAL RANGE LIBRARY FOR GAMBIT PROGRAM, WANL-TME-1830, JULY 1968.
 G. COLLIER AND L. L. MCRAN, UTILITY PROGRAMS FOR GAMBIT THERMAL RANGE LIBRARY, WANL-TME-1970, OCTOBER 1969.
 G. COLLIER, S. A. FODY, G. GIBSON, AND L. L. MORAN, NEW CROSS SECTIONS FOR THE GAMBIT LIBRARY, TAPES FSGAM24 AND CGBIT11, WANL-TME-1965, OCTOBER 1965.
 S. A. FODY, G. GIBSON, N. A. NICE, AND J. L. WYTIAZ, NEW CROSS SECTIONS FOR THE GAMBIT LIBRARY, TAPES FSGAM29 AND CGBIT15, WANL-TME-269C, APRIL 1970.
11. MACHINE REQUIREMENTS - 64K MEMORY AND 8 TAPES
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCCPE 3.0.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
 OPTIONS INCLUDED IN THE SECOND VERSION OF GAMBIT ARE -
 (A) THE FLUX AND CURRENT SPECTRUM CALCULATED IN A PRECEDING PROBLEM MAY BE REUSED IN A SUBSEQUENT STACKED PROBLEM WITHOUT RECALCULATION,
 (B) CROSS SECTION DATA IN THE EXTERMINATOR2 (ACC ABSTRACT 156) TWO-DIMENSIONAL DIFFUSION THEORY CODE FORMAT CAN BE PRODUCED,
 (C) THE TOTAL ELASTIC SCATTERING CROSS SECTION INCLUDING THE ANISOTROPIC SCATTERING EFFECT IN THE CENTER-OF-MASS SYSTEM IS CALCULATED IN THE APPROPCS DATA PREPARATION CODE FORMAT, AND
 (D) ALL OUTPUT MAY BE PRODUCED ON EITHER CARDS OR MAGNETIC TAPE OR BOTH. ALL CROSS SECTION SETS THAT ARE PUNCHED AND/OR PUT ON TAPE ARE PRINTED.
 GAMBIT IS OF LIMITED USE TO OTHER THAN CDC6600 INSTALLATIONS BECAUSE THE LIBRARY TAPES ARE IN CDC6600 BINARY FORMAT NOT READILY ADAPTED TO OTHER MACHINES.
15. NAME AND ESTABLISHMENT OF AUTHORS -
 G. GIBSON
 WESTINGHOUSE ELECTRIC CORPORATION
 ADVANCED REACTOR DIVISION
 WALTZ MILL SITE
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 MADISON, PENNSYLVANIA 15663
 G. COLLIER

15. NAME AND ESTABLISHMENT OF AUTHOR(S) (CONTINUED)
WESTINGHOUSE ELECTRIC CORPORATION
NUCLEAR ENERGY SYSTEMS
P. C. BOX 355
PITTSBURGH, PENNSYLVANIA 15230
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL (5 TAPES)
SOURCE DECK (4992 CARDS)
SAMPLE PROBLEM (28 CARDS)
CONTROL INFORMATICA (15 CARDS)
LIBRARIES (TAPE 2 - GAM LIBRARY 752 BINARY RECORDS, TAPE 3 -
BIT LIBRARY 2761 BINARY RECORDS, TAPE 4 - QUERY
LIBRARY 27 BINARY RECORDS, TAPES 5 - GAS LIBRARY 1754
BINARY RECORDS)
REFERENCE REPORTS, ALL EXCEPT WANL-TME-1751 WHICH IS AVAILABLE
ONLY ON MICROFICHE
17. CATEGORY - B
KEYWORDS - MULTIGROUP CROSS SECTIONS, FAST SPECTRA, THERMAL
SPECTRA, GAM CODES, BIT CODES, GATHER CODES, QUERY
CODES, ANISN CODES, DOT CODES, EXTERMINATOR2 CODES,
APPROPOS CODES

1. NAME OR DESIGNATION OF PROGRAM - CEBLG
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6400,6600,7600
3. DESCRIPTION OF PROBLEM OR FUNCTION - THE TRANSIENT HYDRAULIC BEHAVIOR OF THE SODIUM IN A SODIUM-HEATED STEAM GENERATOR IN WHICH A SODIUM-WATER REACTION OCCURS DUE TO A LARGE WATER LEAK IS CALCULATED FOR FLOWS IN UP TO THREE DIMENSIONS.
4. METHOD OF SOLUTION - THE METHOD OF FINITE ELEMENTS IS USED TO CALCULATE THE PRESSURES IN THE MULTI-DIMENSIONAL BUBBLE GROWTH REGION.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
 - 140 ELEMENTS IN 3-D REGION (INCLUDING TRANSITION ELEMENTS)
 - 30 CHANNELS
 - 30 CHANNEL NODES
 - 5 TRANSITION ELEMENTS
 - 1 COVER GAS SPACE
 - 29 CONNECTIONS TO FINITE ELEMENTS FOR EACH TRANSITION ELEMENT
 - 4 CONNECTIONS TO CHANNELS FOR EACH TRANSITION ELEMENT
 - 200 TIME-STEPS SAVED IN PLOT OUTPUT ARRAYIN GENERAL, THE FOLLOWING ASSUMPTIONS ALSO APPLY -
 - A SINGLE WATER LEAK OCCURS INSTANTANEOUSLY.
 - THE CHEMICAL REACTION IS INSTANTANEOUS.
 - ALL WATER REACTS TO FORM Na_2O AND H_2 AT 1800 DEGREES F.
 - THE HYDROGEN BUBBLE EXPANDS ISOTHERMALLY.
 - THE SODIUM IS INCOMPRESSIBLE.
 - THE STEAM GENERATOR DOES NOT DEFORM.
 - THE ANALYSIS STOPS WHEN THE HYDROGEN BUBBLE REACHES A COVER GAS SPACE OR COMPLETELY FILLS A FLOW CHANNEL.
6. TYPICAL RUNNING TIME - THIS IS HIGHLY PROBLEM DEPENDENT. THE SAMPLE PROBLEM WITH 130 FINITE ELEMENTS, 1 TRANSITION ELEMENT, AND 1 CHANNEL IS USED AS AN EXAMPLE. THIS WAS A 5-TUBE LEAK WHICH TOOK 0.39 SECONDS FOR THE HYDROGEN BUBBLE TO REACH THE TRANSITION ELEMENT.

COMPUTER	CPU TIME
6400	435 SECONDS
6600	188 SECONDS
7600	20 SECONDS
7. UNUSUAL FEATURES OF THE PROGRAM -
 - (A) LEAK RATE - USER SPECIFICATION OF WATER LEAK RATE ALLOWS ANY DESIRED SITUATION TO BE MODELED (ALL LEAKS MUST BE IN ONE FINITE ELEMENT). ANY AXIAL AND RADIAL LOCATION OF THE LEAK IS POSSIBLE. BACK PRESSURE EFFECTS ON THE LEAK RATE ARE CALCULATED AUTOMATICALLY.
 - (B) MODEL - UP TO 3 DIMENSIONS MAY BE MODELED IN THE FINITE ELEMENT REGION. ONE-DIMENSIONAL LUMPED-PARAMETER CHANNELS MAY BE USED TO MODEL REMAINDER OF SYSTEM. A COVER GAS MAY

7. UNUSUAL FEATURES OF THE PROGRAM (CONTINUED)
BE MODELED. FORM, FRICTIONAL, AND INERTIAL FLOW RESISTANCES MAY BE USED.
 - (C) PRESSURE RELIEF SYSTEM - TRIGGERED BY PRESSURE ABOVE USER-SET THRESHOLD. TWO-COMPONENT COMPRESSIBLE FLOW IS MODELED.
 - (D) GENERAL - ANY L/D STEAM GENERATOR MAY BE MODELED. BUBBLE PRESSURE, SODIUM PRESSURE AND SODIUM FLOW THROUGHOUT THE SYSTEM ARE CALCULATED. RELIEF SYSTEM FLOW AND MATERIAL INVENTORY ARE CALCULATED. SELECTED PRESSURES AND FLOWS ARE RETAINED FOR AN AUTOMATED PLOTTING PACKAGE.
8. RELATED AND AUXILIARY PROGRAMS - THIS PROGRAM IS A MAJOR EXTENSION OF THE APDA PROGRAM BUG3. A PLOTTING PACKAGE SPECIFIC TO C-E IS CALLED BY CEBUG. A DUMMY SUBROUTINE, GRAPH, IS PROVIDED IN PLACE OF IT AND CAN BE REPLACED BY A LOCAL EQUIVALENT WITH APPROPRIATE CALLS.
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
CDC7600 VERSION SUBMITTED JUNE 1973.
10. REFERENCES - P. K. DOHERTY AND D. W. STUTEVILLE, CEBUG - A CODE FOR STEAM GENERATOR SODIUM-WATER REACTION ANALYSIS, CEND-368, DECEMBER 21, 1972.
P. K. DOHERTY, DOUBLE PRECISION VERSION OF CEBUG, CEND NOTE, MAY 17, 1973.
11. MACHINE REQUIREMENTS - 21,000 WORD MEMORY (CDC6400,6600), 17,000 WORD MEMORY (CDC7600)
12. PROGRAMMING LANGUAGE USED - ANSI FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 3.3 (CDC6400,6600), SCOPE 2.0 (CDC7600).
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - FOR COMPUTERS WITH WORD LENGTH LESS THAN 60 BITS, DOUBLE PRECISION MAY BE NECESSARY. SEE REFERENCE ON DOUBLE PRECISION USE WITH CEBUG.
15. NAME AND ESTABLISHMENT OF AUTHORS -
P. K. DOHERTY AND D. W. STUTEVILLE
COMBUSTION ENGINEERING, INC.
1000 PROSPECT HILL ROAD
WINDSOR, CONNECTICUT 06095
16. MATERIAL AVAILABLE -
SOURCE DECK (1299 CARDS)
SAMPLE PROBLEM (146 CARDS)
REFERENCE REPORT AND NOTE
17. CATEGORY - G
KEYWORDS - FINITE ELEMENT, STEAM GENERATOR, LEAKAGE, WATER, SODIUM, SODIUM-WATER REACTION

1. NAME OR DESIGNATION OF PROGRAM - BIGDEAL
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC1604
3. DESCRIPTION OF PROBLEM OR FUNCTION - BIGDEAL IS USED TO (1) CALCULATE THE MAXIMUM TEMPERATURES OF A SPENT YANKEE ATOMIC TYPE POWER REACTOR FUEL ASSEMBLY (36 0.305-IN. -OD BY 102-IN. - LONG STAINLESS STEEL FUEL RODS ON 0.422-IN. CENTERS) DURING SHEAR-LEACH PROCESSING, AND (2) CALCULATE PRESSURE BUILDUP WITHIN A BATCH DISSOLVER AS THE HOT FUEL IS QUENCHED BY COLD NITRIC ACID IN PREPARATION FOR AQUEOUS PROCESSING. THE FOLLOWING FIVE CASES, RELATED TO THE UNIT OPERATIONS OF SHEAR-LEACH, MAY BE INVESTIGATED - (1) FUEL SUBASSEMBLY SUSPENDED VERTICALLY IN WATER, (2) SUBASSEMBLY SUSPENDED HORIZONTALLY IN AIR, (3) SUBASSEMBLY CONTAINED WITHIN THE SHEAR FEED ENVELOPE, (4) 16 5-, 7-3/4-, OR 10-IN. ID BASKETS OF SHEARED FUEL STORED IN A 4 X 4 ARRAY ON 12-IN. CENTERS, AND (5) LEACHING OF 6 BASKETS IN A BATCH DISSOLVER.
4. METHOD OF SOLUTION -
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - TEMPERATURES ARE CALCULATED OVER A RANGE OF BURNUPS FROM 8000 TO 50,000 MWD/METRIC TON (U), SPECIFIC POWER FROM 10 TO 70 WATTS PER GRAM OF URANIUM, AND DECAY TIMES FROM 180 TO 1080 DAYS.
6. TYPICAL RUNNING TIME -
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
CDC1604 VERSION SUBMITTED JUNE 1972.
10. REFERENCES - G. E. ABRAHAM II AND B. C. FINNEY, CALCULATED MAXIMUM TEMPERATURES OF SPENT YANKEE ATOMIC TYPE POWER REACTOR FUEL DURING SHEAR-LEACH PROCESSING, CRNL-3948, NOVEMBER 1966.
11. MACHINE REQUIREMENTS -
12. PROGRAMMING LANGUAGE USED - FORTRAN 63
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
G. E. ABRAHAM II AND B. C. FINNEY
CHEMICAL TECHNOLOGY DIVISION
OAK RIDGE NATIONAL LABORATORY
P. O. BOX X
OAK RIDGE, TENNESSEE 37830

16. MATERIAL AVAILABLE -
 SCURCE DECK (652 CARDS)
 SAMPLE PROBLEM (122 CARDS)
 SAMPLE PROBLEM OUTPUT (1 PAGE)
 REFERENCE REPCRT
17. CATEGORY - D
 KEYWORDS - FUEL ELEMENTS, TEMPERATURES, PCWER REACTORS

1. NAME OR DESIGNATION OF PROGRAM - REXCO-H (RELEASE 1)
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360/195
3. DESCRIPTION OF PROBLEM OR FUNCTION - REXCO-H CALCULATES THE TWO-DIMENSIONAL HYDRODYNAMIC RESPONSE OF PRIMARY REACTOR CONTAINMENT TO A HIGH-ENERGY EXCURSION.
4. METHOD OF SOLUTION - EQUATION OF HYDRODYNAMICS AND EQUATION OF STATE OF REACTOR MATERIALS ARE EXPRESSED IN LAGRANGIAN FORM AND SET INTO FINITE-DIFFERENCE EQUATIONS. SHOCK DISCONTINUITIES ARE ELIMINATED BY THE USE OF THE VON NEUMANN-RICHTMYER PSEUDOVISCOSITY FACTOR, Q. PROPAGATION OF SHOCK WAVES, LOADS IMPOSED ON DIFFERENT PARTS OF THE REACTOR COMPONENTS, AND THE RESULTING DAMAGE ARE DETERMINED AT EVERY TIME-STEP, UNTIL THE VESSEL RUPTURES OR THE FORCE ACTING ON THE SHIELD PLUG EXCEEDS THE STRENGTH OF THE PLUG FOLDDOWN DEVICE. CALCULATED DISPLACEMENTS AND PRESSURES AT ALL SPATIAL POINTS AT ANY INSTANT OF TIME ALSO ARE GIVEN IN PICTORIAL FORM.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
 - 3000 GRID ZONES
 - 1000 CYCLES PER RUN, IF CALCOMP DISPLAY IS REQUIRED
 - 20 MATERIALS
 - 20 SECTIONS
 - 10 REACTOR VESSELS
 - 50 POINTS FOR STRESS-STRAIN TABLE FOR REACTOR MATERIAL
6. TYPICAL RUNNING TIME - THE SAMPLE PROBLEM REQUIRES ABOUT 1.5 MINUTES FOR 100 CYCLES.
7. UNUSUAL FEATURES OF THE PROGRAM - THE REACTOR VESSELS IN THIS PROGRAM ARE TREATED AS THIN SHELL STRUCTURES.
8. RELATED AND AUXILIARY PROGRAMS - PLCT3D (ACC ABSTRACT 544)
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
 - IBM360 VERSION SUBMITTED OCTOBER 1973, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - Y. W. CHANG, J. GVILDYS, AND S. F. FISTEDIS, TWO-DIMENSIONAL HYDRODYNAMICS ANALYSIS FOR PRIMARY CONTAINMENT, ANL-7498, NOVEMBER 1969.
 - Y. W. CHANG, J. GVILDYS AND S. F. FISTEDIS, HYDRODYNAMIC RESPONSE OF PRIMARY REACTOR CONTAINMENT TO HIGH-ENERGY EXCURSION, NUCL. ENG. DESIGN VOL. 12, PP. 344-360 (1970).
 - Y. W. CHANG AND J. GVILDYS, DYNAMIC RESPONSE OF REACTOR CONTAINMENT TO HIGH-ENERGY EXCURSION, PRCC. THE 1ST INTL. CONF. ON STRUCTURAL MECHANICS IN REACTOR TECHNOLOGY, BERLIN, GERMANY (1971).
 - J. VON NEUMANN AND R. D. RICHTMYER, A METHOD OF THE

10. REFERENCES (CONTINUED)
NUMERICAL CALCULATION OF HYDRODYNAMIC SHOCKS, J. APP. PHYSICS, VOL. 21(3), PP. 232-237 (1950).
J. E. ASH AND R. T. JULKE, COMPARISON OF A TWO-DIMENSIONAL HYDRODYNAMICS CODE (REXCC) TO EXCURSION REACTOR CONTAINMENT, ANL-7911, JANUARY 1972.
J. E. ASH, Y. W. CHANG, AND R. T. JULKE, COMPARISON OF A TWO-DIMENSIONAL HYDRODYNAMIC CODE (REXCC) TO EXCURSION EXPERIMENTS FOR FAST REACTOR CONTAINMENT, ANL-7911, SUPPL. 1, JULY 1972.
11. MACHINE REQUIREMENTS - 500K BYTES OF CORE, TWO 9-TRACK TAPE UNITS, ONE 7-TRACK TAPE UNIT, IBM 2280 FILM RECORDER, CALCOMP 780 PLOTTER.
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - TO EXECUTE THE PICTORIAL DISPLAY, THE PROGRAM USES THE ANL SYSTEM INSTALLATION SUBROUTINES DESCRIBED IN ANL-AMD TECHNICAL MEMORANDUM NO. 167, A FILM-PLOTTING SUBROUTINE PACKAGE (FSP) FOR THE 2280 FILM RECORDER, BY D. CARSON, JUNE 17, 1968, AND TO EXECUTE THE CALCOMP PLOTS, THE PROGRAM USES THE SUBROUTINES DESCRIBED IN ANL-AMD TECHNICAL MEMORANDUM NO. 130, S/360 PROGRAMMING TECHNIQUES FOR THE CALCOMP 780, BY R. F. KRUPP, JANUARY 6, 1967.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
Y. W. CHANG, J. GVILCYS, AND S. H. FISTEDIS
REACTOR ANALYSIS AND SAFETY DIVISION
ARGONNE NATIONAL LABORATORY
9700 S. CASS AVENUE
ARGONNE, ILLINOIS 60439
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (2440 CARDS)
SAMPLE PROBLEM (300 CARDS)
CONTROL INFORMATION (JCL 18 CARDS)
SAMPLE PROBLEM OUTPUT (59 SELECTED PAGES)
REFERENCE REPORT, ANL-7498
17. CATEGORY - F
KEYWORDS - 2-DIMENSIONAL, CONTAINMENT, EXCURSIONS, HYDRODYNAMICS, REACTOR SAFETY, FAST REACTORS, FLUCTUATING CODES

1. NAME OR DESIGNATION OF PROGRAM - MOXY/MCD1
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360, UNIVAC1108
3. DESCRIPTION OF PROBLEM OR FUNCTION - MOXY COMPUTES HEAT TRANSFER IN A BOILING WATER REACTOR FUEL ELEMENT. CONDUCTION, CONVECTION, AND RADIATION MODES OF HEAT TRANSFER ARE CONSIDERED, AS WELL AS HEAT ADDITION BY METAL-WATER REACTION. CONVECTION HEAT TRANSFER COEFFICIENTS ARE INPUT AS TABULAR FUNCTIONS OF TIME.
4. METHOD OF SOLUTION - AN IMPLICIT NUMERICAL SOLUTION OF THE ONE-DIMENSIONAL FOURIER HEAT CONDUCTION EQUATION IS USED.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
6. TYPICAL RUNNING TIME - APPROXIMATELY 4 MINUTES PER 700-SECOND TRANSIENT ARE REQUIRED ON THE IBM360.
7. UNUSUAL FEATURES OF THE PROGRAM - MOXY ALLOWS THE USE OF FAIRLY LARGE TIME-STEPS (GREATER THAN 1 SECOND).
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 VERSION SUBMITTED JUNE 1972, SAMPLE PROBLEM EXECUTED BY ACC.
UNIVAC1108 VERSION SUBMITTED JUNE 1972.
10. REFERENCES - D. R. EVANS, MOXY, A DIGITAL COMPUTER CODE FOR CORE HEAT TRANSFER ANALYSIS, IN-1392, AUGUST 1970.
MOXY/MCD001*01/04/71*PRE CODE DESCRIPTION, AERJET NOTE, 1972.
11. MACHINE REQUIREMENTS - 125K BYTES OF CORE
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360 (IBM360).
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - MOXY READS THE RADIATION MATRIX FROM A DIRECT ACCESS STORAGE DEVICE.
15. NAME AND ESTABLISHMENT OF AUTHOR -
D. R. EVANS
AERJET NUCLEAR COMPANY
P. O. BOX 1845
IDAHO FALLS, IDAHO 83401

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (MOXY 360-900 CARDS, 1108-1412 CARDS, BLOCK DATA
PROGRAM 360-697 CARDS)
SAMPLE PROBLEMS (360-45 CARDS, 1108-46 CARDS)
CONTROL INFORMATION (JCL 360-39 CARDS)
LOAD MODULE L.ELSMOXY (360-93 BLOCKS)
SAMPLE PROBLEM OUTPUT (30 SELECTED PAGES)
REFERENCE REPORT AND NOTE
17. CATEGORY - H
KEYWORDS - HEAT TRANSFER, BWR REACTORS, FUEL ELEMENTS, ZIRCONIUM

1. NAME OR DESIGNATION OF PROGRAM - PWR-PPM
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6000 SERIES
3. DESCRIPTION OF PROBLEM OR FUNCTION - PWR-PPM GENERATES BORATION-DILUTION TABLES USED BY THE REACTOR OPERATOR OF A PWR. THE COMPUTER PRINTED TABLES PLCT INITIAL AND FINAL REACTOR COOLANT SYSTEM BORON CONCENTRATION IN UNITS OF PPM BORON AGAINST THE GALLONS OF MAKEUP WATER AND BORIC ACID SOLUTION REQUIRED TO OBTAIN THE DESIRED PPM CHANGE. THESE TABLES REPLACE ACOMGRAPHS NORMALLY REQUIRED FOR BORATION AND DILUTION OPERATIONS.
4. METHOD OF SOLUTION - PWR-PPM UTILIZES THE EXPLICIT SOLUTION OF THE SINGLE SYSTEM DILUTION AND BORATION EQUATIONS AND LINEAR INTERPOLATION OF THE COMPRESSED LIQUID TABLES.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE TEMPERATURE BETWEEN AND INCLUDING 100 DEGREES F. TO 600 DEGREES F. AND THE PRESSURE BETWEEN AND INCLUDING 200 PSIG TO 6000 PSIG.
6. TYPICAL RUNNING TIME - RUNNING TIME USUALLY DOES NOT EXCEED 5 SECONDS.
7. UNUSUAL FEATURES OF THE PROGRAM - ONLY FIVE INPUT PARAMETERS ARE REQUIRED -
 - (1) WEIGHT PER CENT OF BORIC SOLUTION IN MAKE-UP STEAM,
 - (2) VOLUME OF THE REACTOR COOLANT SYSTEM,
 - (3) TEMPERATURE OF THE REACTOR COOLANT SYSTEM,
 - (4) PRESSURE OF THE REACTOR COOLANT SYSTEM, AND
 - (5) TITLE CARD.
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
CDC6400 VERSION SUBMITTED JUNE 1972.
10. REFERENCE - J. H. KEENAN AND F. G. KEYES, THERMODYNAMIC PROPERTIES OF STEAM, WILEY AND SONS, INC., NEW YORK, 1967.
11. MACHINE REQUIREMENTS -
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - KPCNCS SCOPE 3.3.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THE PROGRAM WILL COMPUTE A SET OF BORATION-DETECTION TABLES FOR EACH SET OF PRESSURE AND TEMPERATURE DATA INPUT.

15. NAME AND ESTABLISHMENT OF AUTHORS -
R. L. JAWORSKI AND V. I. SWISHER
FCRT CALHCUN NUCLEAR STATION
OMAHA PUBLIC POWER DISTRICT
1623 HARNEY STREET
OMAHA, NEBRASKA 68102
16. MATERIAL AVAILABLE -
SOURCE DECK (250 CARDS)
SAMPLE PROBLEM (5 CARDS)
SAMPLE PROBLEM OUTPUT (2 SELECTED PAGES)
17. CATEGORY - H
KEYWORDS - OPERATION, PWR REACTORS, COOLANTS, BORON

1. NAME OR DESIGNATION OF PROGRAM - U3R
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360,370
3. DESCRIPTION OF PROBLEM OR FUNCTION - U3R NUMERICALLY CONSTRUCTS A TABLE OF THE CUMULATIVE PROBABILITY DISTRIBUTION FUNCTIONS OF UNRESOLVED RESONANCE CROSS SECTIONS IN A NARROW ENERGY RANGE.
4. METHOD OF SOLUTION - THE PROCEDURE IS:
 - A) TO GENERATE A LADDER OF RESOLVED RESONANCES OVER THE ENERGY RANGE USING PRESCRIBED AVERAGE VALUES AND DISTRIBUTION FUNCTIONS OF RESONANCE PARAMETERS;
 - B) TO CALCULATE DOPLER-BROADENED POINT CROSS SECTIONS FOR THE LADDER;
 - C) TO DISTRIBUTE THE POINT CROSS SECTIONS WITH THEIR PROBABILITIES (FRACTIONAL ENERGY INCREMENTS) INTO A TABLE. ADDITIONAL LADDERS ARE ACCUMULATED INTO THE TABLE UNTIL THE DESIRED ACCURACY OF TABLE ENTRIES IS OBTAINED. THUS, POINTWISE CROSS SECTION DATA WHICH ARE PROPERTIES OF THE INDIVIDUAL ISOTOPES, RATHER THAN GROUP AVERAGE SETS ARE OBTAINED.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
 - 20 UNRESOLVED RESONANCE (L,J) SERIES
 - 4 TEMPERATURES
 - 100 LADDERS
 - UNLIMITED ENERGIES
 - 99 AS THE TABLE LENGTH
6. TYPICAL RUNNING TIME - 1 MINUTE PER ENERGY POINT IS REQUIRED FOR A NON-FISSILE PROBLEM AND 5 MINUTES PER ENERGY POINT FOR A FISSILE PROBLEM.
7. UNUSUAL FEATURES OF THE PROGRAM - U3R PROVIDES POINTWISE UNRESOLVED RESONANCE CROSS SECTION DATA IN A HIGHLY COMPACT FORM.
8. RELATED AND AUXILIARY PROGRAMS - A SINGLE-PRECISION VERSION OF THE CODE WAS PRODUCED FOR THE CDC6600.
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 VERSION SUBMITTED JUNE 1972, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - J. M. OTTER, R. C. LEWIS, AND L. B. LEVITT, U3R, A CODE TO CALCULATE UNRESOLVED RESONANCE CROSS SECTION PROBABILITY TABLES, AI-AEC-13024, JULY 31, 1972.
INTERNAL SORT, NORTH AMERICAN ROCKWELL CORPORATION AEROSPACE AND SYSTEMS GROUP ENGINEER'S COMPUTING MANUAL EXCERPT, DECEMBER 8, 1969.
11. MACHINE REQUIREMENTS - 470K MEMORY (DOUBLE PRECISION)

12. PROGRAMMING LANGUAGES USED - FORTRAN IV, ASSEMBLY LANGUAGE RANDOM NUMBER GENERATOR
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
J. M. OTTER, R. C. LEWIS, AND L. B. LEVITT
APPLIED PHYSICS UNIT
NUCLEAR ENGINEERING REPORT UNIT
ATOMICS INTERNATIONAL
P. O. BOX 309
CANOGA PARK, CALIFORNIA 91304
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (2148 CARDS)
SAMPLE PROBLEM (12 CARDS)
CONTROL INFORMATION (JCL 14 CARDS)
REFERENCE REPORT AND MANUAL EXCERPT
17. CATEGORY - A
KEYWORDS - PROBABILITY TABLES, UNRESOLVED RESONANCE CROSS SECTIONS, INPUT DATA, ENDF/B, U238, U235, PU239

1. NAME OR DESIGNATION OF PROGRAM - DISPER
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC3600,3800
3. DESCRIPTION OF PROBLEM OR FUNCTION - DISPER DETERMINES THE AEROSOL PARTICLE SOURCE STRENGTH OUTSIDE AN ENCLOSURE DUE TO A RELEASE OF AEROSOL PARTICLES WITHIN THE ENCLOSURE. THE RELEASE IS ASSUMED TO PRESSURIZE THE ENCLOSURE AND THE AIRBORNE PARTICLES ARE CARRIED BY THE ESCAPING GAS INTO LEAK PATHS IN THE ENCLOSURE WALLS. HERE, THEY MAY BE DEPOSITED ON THE LEAK PATH WALLS OR REMAIN ENTRAINED AND ESCAPE FROM THE ENCLOSURE.
4. METHOD OF SOLUTION - THE CODE OPERATES IN TWO MODES - (1) PRESSURE DEPENDENT, AND (2) PRESSURE INDEPENDENT. IN THE PRESSURE DEPENDENT MODE, THE NUMBER AND RADIUS OF THE LEAK PATHS ARE COMPUTED BY THE CODE BASED ON AN ENCLOSURE LEAKAGE RATE AT A GIVEN OVERPRESSURE AND A PAIR OF PRESSURE RESPONSE PARAMETERS. IN THE PRESSURE INDEPENDENT MODE, THE COMPLETE DESCRIPTION OF THE LEAK PATHS IS CODE INPUT. IN BOTH MODES, THE AEROSOL PARTICLE SOURCE STRENGTH AND SIZE DISTRIBUTION IS INPUT ALONG WITH PARAMETERS WHICH DETERMINE THE PROBABILITY OF PARTICLES (1) ENTERING LEAK PATHS, AND (2) BEING DEPOSITED IN THE LEAK PATHS. THE PARTICLE SOURCE STRENGTH, ALONG WITH THERMAL INPUT CONSTANTS SPECIFYING THE THERMAL EQUILIBRIUM IN THE ENCLOSURE, DETERMINE THE ENCLOSURE OVERPRESSURE AND RESULTANT LEAKAGE PATH GAS FLOW VELOCITY.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMUM OF - 20 LEAKAGE PATH SETS
6. TYPICAL RUNNING TIME - 8 SECONDS ARE REQUIRED FOR EACH SOURCE STRENGTH VALUE COMPUTED IN THE PRESSURE DEPENDENT MODE AND 5 SECONDS IN THE PRESSURE INDEPENDENT MODE.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
CDC3600 VERSION SUBMITTED JULY 1972.
10. REFERENCES - D. C. HUNT, DISPER - AN AEROSOL PARTICLE TRANSPORT CODE, RFP-1855, SEPTEMBER 1972.
D. C. HUNT, THE PROBABILITY OF HAZARDOUS ENVIRONMENTAL PLUTONIUM RELEASES, RFP-1543, APRIL 14, 1971.
11. MACHINE REQUIREMENTS - 13,000 48-BIT WORDS, NC TAPES, ALL CARD INPUT
12. PROGRAMMING LANGUAGE USED - 3600 FORTRAN

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
DRUMSCOPE.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHOR -
D. C. HUNT
DOW CHEMICAL COMPANY
ROCKY FLATS DIVISION
P. O. BOX 888
GOLDEN, COLORADO 80401
16. MATERIAL AVAILABLE -
SOURCE DECK (347 CARDS)
SAMPLE PROBLEM (50 CARDS)
SAMPLE PROBLEM OUTPUT (18 SELECTED PAGES)
REFERENCE REPORTS
17. CATEGORY - G
KEYWORDS - PARTICLES, AEROSOLS, LEAKAGE

1. NAME OR DESIGNATION OF PROGRAM - PARET
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - THIS PROGRAM IS DESIGNED FOR USE IN PREDICTING THE COURSE AND CONSEQUENCES OF NONDESTRUCTIVE REACTIVITY ACCIDENTS IN SMALL REACTOR CORES.
4. METHOD OF SOLUTION - THE ANALYSIS IS BASED ON COUPLED THERMAL, HYDRODYNAMIC, AND NUCLEAR EFFECTS IN THE CORE. THE MODEL CONSISTS OF A WATER-COOLED CORE WITH A MAXIMUM OF FOUR FUEL ELEMENTS. THUS THE CORE CAN BE DIVIDED INTO FOUR OR FEWER REGIONS, EACH HAVING DIFFERENT POWER GENERATION, COOLANT MASS FLOW RATE, HYDRAULIC PARAMETERS, AND OTHER ASSOCIATED CONDITIONS, WITH EACH REGION REPRESENTED BY A SINGLE FUEL PIN OR PLATE PLUS ITS ASSOCIATED COOLANT CHANNEL. A TRANSIENT PROBLEM IS FORCED THROUGH SPECIFICATION OF EXTERNALLY INSERTED REACTIVITY VERSUS TIME, OR AVERAGE CORE POWER VERSUS TIME. THE PROGRAM EMBODIES HEAT TRANSFER CALCULATIONS, CONTINUOUS REACTIVITY FEEDBACK, AND HYDRODYNAMIC CALCULATIONS ALLOWING FOR COOLANT FLOW REVERSAL.
HEAT TRANSFER IN EACH FUEL ELEMENT IS COMPUTED ON THE BASIS OF A ONE-DIMENSIONAL CONDUCTION SOLUTION IN EACH OF UP TO A MAXIMUM OF 20 AXIAL SECTIONS. LOCAL HEAT GENERATION IS DETERMINED FROM THE CALCULATED OR SPECIFIED CORE AVERAGE POWER LEVEL AND SPATIAL WEIGHTING FACTORS. PARET EMPLOYS EMPIRICAL CONVECTIVE HEAT TRANSFER CORRELATIONS IN ESTIMATING THE RATE OF HEAT TRANSFER AT THE CLAD-COOLANT INTERFACE.
THE HYDRODYNAMICS CALCULATIONS ARE BASED ON A ONE-DIMENSIONAL MODIFIED MOMENTUM INTEGRAL MODEL IN WHICH EQUATIONS REPRESENTING CONSERVATION LAWS ARE SOLVED IN EACH COOLANT CHANNEL AT EACH TIME NODE. THE SOLUTIONS TO THESE EQUATIONS YIELD THE PRESSURE DROP ACROSS THE CORE, AND THE POINT-WISE FLUID ENTHALPIES, PRESSURES, AND MASS FLOW RATES ALONG EACH CHANNEL. THE COOLANT IS ALLOWED TO RANGE FROM SUBCOOLED LIQUID, THROUGH THE TWO-PHASE REGION, UP TO AND INCLUDING SUPERHEATED STEAM.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
THE PARET MODEL IS SUBJECT TO SEVERAL RECOGNIZED LIMITATIONS WHICH MAY LIMIT THE APPLICABILITY IN ANY SPECIFIC SITUATION, DEPENDING ON THE NATURE OF THE TRANSIENT UNDER CONSIDERATION. THE CODE EMPLOYS STEADY-STATE HEAT TRANSFER CORRELATIONS THROUGHOUT, POSSIBLY BEING UNREALISTIC IN CERTAIN TRANSIENT SITUATIONS. ANY COMPLETE DESCRIPTION OF A SEVERE TRANSIENT MUST INCLUDE PROVISION FOR SOME SORT OF THERMAL OR HYDRAULIC CRISIS. PARET IS LIMITED IN PREDICTING A THERMAL CRISIS BY THE FACT THAT IT EMPLOYS A STEADY-STATE DNB CORRELATION, SINCE NO TRANSIENT CORRELATION WITH DEMONSTRATED RELIABILITY WAS DEVELOPED. ACCURATE DESCRIPTION OF HYDRAULIC INSTABILITY DEPENDS UPON ACCURATE CALCULATION OF TRANSIENT PRESSURE AND FLOW FLUCTUATIONS. PARET IS LIMITED IN THIS RESPECT BECAUSE IT EMPLOYS AN INCOMPRESSIBLE MODEL AND A SIMPLIFIED VOID VOLUME GENERATION EQUATION. ALSO, THE MAGNITUDE OF

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM (CONTINUED)
LOCAL PRESSURES PREDICTED TO ACCOMPANY COOLANT EXPULSION IS STRONGLY AFFECTED BY THE NUMBER OF AXIAL SECTIONS CHOSEN IN THE COMPUTATIONS. AS A RESULT, THE HYDRODYNAMIC OUTPUT SHOULD BE INTERPRETED AS A QUALITATIVE INDICATION OF A POSSIBLE CRISIS RATHER THAN A RELIABLE QUANTITATIVE PREDICTION.
THE PRINCIPAL UNCERTAINTIES IN THE CODE LIE IN THE REALM OF BOILING. THESE UNCERTAINTIES, COUPLED WITH THE FACT THAT APPLICATION OF THE CODE TO BOILING SITUATIONS HAS NOT BEEN FULLY VERIFIED, MAKE IT IMPERATIVE TO CONSIDER THE BOILING MODEL TO BE IN THE DEVELOPMENT STAGE.
PARET IS NOT APPLICABLE TO EITHER DESTRUCTIVE EXCURSIONS OR SITUATIONS IN WHICH THERE IS A SPACE-TIME EFFECT IN NEUTRON FLUX.
6. TYPICAL RUNNING TIME - THE SAMPLE PROBLEM REQUIRES LESS THAN 22 SECONDS OF CPU TIME TO PROCESS 65 TIME-STEPS ON 4 CHANNELS.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - THIS CODE IS AN EXTENSION OF THE CHIC-KIN CODE (ACC ABSTRACT R473).
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 VERSION SUBMITTED AUGUST 1972, REPLACED BY REVISED VERSION MAY 1973, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - C. F. OBENCHAIN, PARET, A PROGRAM FOR THE ANALYSIS OF REACTOR TRANSIENTS, IDO-17282, JANUARY 1969.
J. A. REDFIELD, CHIC-KIN, A FORTRAN PROGRAM FOR INTERMEDIATE AND FAST TRANSIENTS IN A WATER-MODERATED REACTOR, WAPD-TM-479, JANUARY 1965.
CHANGE TO PARET PROGRAM, AERJET NOTE, 1972.
EXCERPTS FROM NRTS ENVIRONMENTAL SUPERCUTLINE MANUAL, DECEMBER 1972.
C. J. SMITH AND W. A. COOY, ANL DATE ROUTINE, ANL SUBROUTINE DESCRIPTION Q054S, FEBRUARY 1968.
11. MACHINE REQUIREMENTS - 240K BYTES PLUS ONE MAGNETIC TAPE
12. PROGRAMMING LANGUAGES USED - FORTRAN IV AND BAL
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
SUBROUTINE INLK WAS COMPILED WITH THE FORTH450 COMPILER WITH 640K. THE NORMAL COMPILER COULD NOT PROCESS CPT=2 BECAUSE THIS ROUTINE IS TOO LONG.
15. NAME AND ESTABLISHMENT OF AUTHOR -
P. D. ADOLF
AEROJET NUCLEAR COMPANY
P. O. BOX 1845
IDAHO FALLS, IDAHO 83401

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16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (6771 CARDS)
OBJECT DECKS (2692 CARDS)
SAMPLE PROBLEM (103 CARDS)
CONTROL INFORMATION (JCL 20 CARDS)
LIBRARY (62 BLOCKS OF VARIABLE-SIZED BINARY RECORDS)
SAMPLE PROBLEM OUTPUT (38 SELECTED PAGES)
REFERENCE REPORT, ICD-17282, AND NOTES
17. CATEGORY - G
KEYWORDS - REACTIVITY ACCIDENTS, HEAT TRANSFER, HYDRODYNAMICS,
FEEDBACK, CHIC-KIN CODES

1. NAME OR DESIGNATION OF PROGRAM - KEELE
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - KEELE IS A LINEARLY CONSTRAINED NONLINEAR PROGRAMMING ALGORITHM FOR LOCATING A LOCAL MINIMUM OF A FUNCTION OF N VARIABLES WITH THE VARIABLES SUBJECT TO LINEAR EQUALITY AND/OR INEQUALITY CONSTRAINTS.
4. METHOD OF SOLUTION - A VARIABLE METRIC PROCEDURE IS USED WHERE THE DIRECTION OF SEARCH AT EACH ITERATION IS OBTAINED BY MULTIPLYING THE NEGATIVE OF THE GRADIENT VECTOR BY A POSITIVE DEFINITE MATRIX WHICH APPROXIMATES THE INVERSE OF THE MATRIX OF SECOND PARTIAL DERIVATIVES ASSOCIATED WITH THE FUNCTION.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - ARRAY DIMENSIONS LIMIT THE NUMBER OF VARIABLES TO 20 AND THE NUMBER OF CONSTRAINTS TO 50. THESE CAN BE CHANGED BY THE USER.
6. TYPICAL RUNNING TIME - TOTAL EXECUTION TIME FOR THE FOUR EXAMPLES IN THE REPORT IS APPROXIMATELY 10 SECONDS.
7. UNUSUAL FEATURES OF THE PROGRAM - ALL INPUT IS THROUGH THE ARGUMENT LIST AND/OR THE COMMON BLOCK /PAMRWF/.
8. RELATED AND AUXILIARY PROGRAMS - THIS PROGRAM IS A MODIFICATION OF THE CORRESPONDING PROGRAM DESCRIBED IN REFERENCE 2.
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 VERSION SUBMITTED AUGUST 1972, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - G. W. WESTLEY, A LINEARLY CONSTRAINED NONLINEAR PROGRAMMING ALGORITHM, ORNL-4644, JANUARY 1971.
G. W. WESTLEY AND J. A. WATTS, THE COMPUTING TECHNOLOGY CENTER NUMERICAL ANALYSIS LIBRARY, CTC-39, 1970.
11. MACHINE REQUIREMENTS - 31K BYTES
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THREE SUBROUTINES MUST BE USER-SUPPLIED. GRADNT DEFINES THE GRADIENT OF THE RESPONSE SURFACE, CONSTR DEFINES THE CONSTRAINTS ON THE VARIABLES, AND EVAL DEFINES THE RESPONSE SURFACE.
15. NAME AND ESTABLISHMENT OF AUTHOR -
G. W. WESTLEY

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15. NAME AND ESTABLISHMENT OF AUTHOR(S) (CONTINUED)
MATHEMATICS DIVISION
OAK RIDGE NATIONAL LABORATORY
P. O. BOX X
OAK RIDGE, TENNESSEE 37830
16. MATERIAL AVAILABLE -
SOURCE DECK (1019 CARDS)
SAMPLE PROBLEMS (117 CARDS)
SAMPLE PROBLEM OUTPUT (9 PAGES)
REFERENCE REPORT, ORNL-4644
17. CATEGORY - P
KEYWORDS - MINIMIZATION ALGORITHM, NONLINEAR

1. NAME OR DESIGNATION OF PROGRAM - SHLOG
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - SHLOG PROVIDES GENERAL-PURPOSE DATA MANIPULATION FUNCTIONS FOR DATA ANALYSIS. THESE FUNCTIONS INCLUDE CREATING, MAINTAINING, AND STORING FILES, DISPLAYING THE CONTENTS OF A FILE VIA EITHER THE LINE PRINTER OR AN ON-LINE PLOTTER, SEARCHING FOR DATA POINTS BY COMPARING VALUES WITH SPECIFIED CRITERIA, AND PERFORMING CERTAIN STATISTICAL OPERATIONS ON THE DATA POINTS.
4. METHOD OF SOLUTION -
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
6. TYPICAL RUNNING TIME -
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - SHLOG USES THE BETTIS ENVIRONMENTAL ROUTINES (ACC ABSTRACT 478).
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
CDC6600 VERSION SUBMITTED AUGUST 1972.
10. REFERENCES - H. BACH, JR., SHLOG, A FORTRAN PROGRAM TO PROVIDE GENERAL TECHNICAL DATA FUNCTIONS, WAPD-TM-963, JANUARY 1972.
C. J. PFEIFFER, CDC-6600 FORTRAN PROGRAMMING - BETTIS ENVIRONMENTAL REPORT, WAPD-TM-668, JANUARY 1967.
H. BACH, JR. AND C. J. MARLOWE, THE FINK/PANTRY STORAGE AND RETRIEVAL SYSTEM FOR A COMPUTER, WAPD-TM-710, REV., JULY 1969.
11. MACHINE REQUIREMENTS - 100,000 (OCTAL) CENTRAL MEMORY, INPUT/OUTPUT VIA MAGNETIC TAPE OR DISK, MAP OUTPUT ON LINE PRINTER OR MICROFILM DEVICE, GRAPHS ON MICROFILM DEVICE
12. PROGRAMMING LANGUAGES USED - FORTRAN IV AND COMPASS
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 3.1.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHOR -
H. BACH, JR.
BETTIS ATOMIC POWER LABORATORY
WESTINGHOUSE ELECTRIC CORPORATION
P. O. BOX 79
WEST MIFFLIN, PENNSYLVANIA 15122

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16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (10,686 CARDS)
SAMPLE PROBLEM (302 CARDS)
REFERENCE REPORT, WAPD-TM-963
17. CATEGORY - M
KEYWORDS - DATA PROCESSING, LIBRARIES, MAINTENANCE, STATISTICS,
GRAPHS, CLTPUT DATA, UTILITY RCUTINES

1. NAME OR DESIGNATION OF PROGRAM - TASK
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - TASK SOLVES THE ONE-DIMENSIONAL MULTIGROUP FORM OF THE REACTOR KINETICS EQUATIONS, USING EITHER TRANSPORT OR DIFFUSION THEORY AND ALLOWING AN ARBITRARY NUMBER OF DELAYED NEUTRON GROUPS. THE PROGRAM CAN ALSO BE USED TO SOLVE STANDARD STATIC PROBLEMS EFFICIENTLY SUCH AS EIGENVALUE PROBLEMS, DISTRIBUTED SOURCE PROBLEMS, AND BOUNDARY SOURCE PROBLEMS. CONVERGENCE PROBLEMS ASSOCIATED WITH SOURCES IN HIGHLY MULTIPLICATIVE MEDIA ARE CIRCUMVENTED, AND SUCH PROBLEMS ARE READILY CALCULABLE.
4. METHOD OF SOLUTION - TASK EMPLOYS A COMBINATION SCATTERING AND TRANSFER MATRIX METHOD TO ELIMINATE CERTAIN DIFFICULTIES THAT ARISE IN CLASSICAL FINITE DIFFERENCE APPROXIMATIONS. AS SUCH, WITHIN-GROUP (INNER) ITERATIONS ARE ELIMINATED AND SOLUTION CONVERGENCE IS INDEPENDENT OF SPATIAL MESH SIZE. THE TIME VARIABLE IS REMOVED BY LAPLACE TRANSFORMATION. (A LATER VERSION WILL PERMIT DIRECT TIME SOLUTIONS.) THE CODE CAN BE RUN EITHER IN AN OUTER ITERATION MODE OR IN CLOSED (NONITERATIVE) FORM. THE RUNNING MODE IS DICTATED BY THE NUMBER OF GROUPS TIMES THE NUMBER OF ANGLES, CONSISTENT WITH AVAILABLE STORAGE.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE PRINCIPAL RESTRICTIONS ARE AVAILABLE STORAGE AND COMPUTATION TIME. SINCE THE CODE IS FLEXIBLY DIMENSIONED AND HAS AN OUTER ITERATION OPTION THERE ARE NO INTERNAL RESTRICTIONS ON GROUP STRUCTURE, QUADRATURE, AND NUMBER OF ORDINATES. THE FLEXIBLE-DIMENSIONING SCHEME ALLOWS OPTIONAL USE OF CORE STORAGE. THE GENERALIZED CYLINDRICAL GEOMETRY OPTION IS NOT COMPLETE IN VERSION I OF THE CODE. THE FEED-BACK OPTICS AND CMGA-MODE SEARCH OPTIONS ARE NOT INCLUDED IN VERSION I.
6. TYPICAL RUNNING TIME - A TYPICAL 13-REGION, 5-GROUP, S4, FAST REACTOR STATIC PROBLEM REQUIRES ABOUT 0.5 MINUTES ON THE IBM360/91, WHEREAS THE ENTIRE KINETIC RESPONSE CAN BE COMPUTED IN 8 TO 10 MINUTES. A 16-GROUP, S16, STATIC, 125-CM FE SLAB SHIELDING PROBLEM REQUIRES ABOUT 4 MINUTES.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - TWO AUXILIARY PROGRAMS ARE INCLUDED WITH TASK. PROGRAM ACPSC READS THE FLUX TAPE(S) WRITTEN (OPTIONALLY) BY TASK AND COMPUTES AN ARBITRARY NUMBER OF DETECTOR RESPONSES, USING DETECTOR ENERGY RESPONSES AS PROVIDED BY THE USER AND THE GROUP FLUXES AT SPACE POINTS SELECTED BY THE USER. THE PROGRAM ALSO CALCULATES THE CROSS-POWER SPECTRAL DENSITY (CPSD) AND AUTO-POWER SPECTRAL DENSITY (APSD) FOR SELECTED PAIRS OF DETECTORS. PROGRAM FITSPEC FITS THE POINT REACTOR MODEL TO THE

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8. RELATED AND AUXILIARY PROGRAMS (CONTINUED)
REAL PART OF THE CROSS-POWER SPECTRAL DENSITIES AND TO THE AUTO-
POWER SPECTRAL DENSITIES GENERATED BY PROGRAM ACPSD.
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 VERSION SUBMITTED AUGUST 1972, REPLACED BY REVISED
VERSION I JANUARY 1973, SAMPLE PROBLEM EXECUTED BY
ACC.
10. REFERENCE - A. R. BUHL, R. A. LILLIE, F. L. DODDS, JR., O. W.
HERMANN, J. C. ROBINSON, AND R. J. HINTON, A USERS MANUAL FOR
TASK, A GENERALIZED ONE-DIMENSIONAL TRANSPORT AND DIFFUSION KINE-
TICS CODE, CRNL-TM-3811, DECEMBER 1972.
11. MACHINE REQUIREMENTS - TASK REQUIRES 154K BYTES OF STORAGE PLUS
DATA BLOCK STORAGE AND 1 TAPE IF USING THE FLUX TAPE OPTION.
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
OS/360.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
A. R. BUHL
NEUTRON PHYSICS DIVISION
C. W. HERMANN AND R. J. HINTON
MATHEMATICS DIVISION
OAK RIDGE NATIONAL LABORATORY
OAK RIDGE, TENNESSEE 37830
F. L. DODDS, JR.
SAVANNAH RIVER LABORATORY
E. I. DUPONT DE NEMOURS AND COMPANY, INC.
AIKEN, SOUTH CAROLINA 29801
J. C. ROBINSON AND R. A. LILLIE
THE UNIVERSITY OF TENNESSEE
KNOXVILLE, TENNESSEE 37901
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (TASK 3617 CARDS, ACPSD 362 CARDS, FITSPEC 270
CARDS)
SAMPLE PROBLEMS (TASK 984 CARDS, ACPSD 6 CARDS, FITSPEC 261
CARDS)
CONTROL INFORMATION (JCL TASK 13 CARDS, ACPSD 12 CARDS, FITSPEC
9 CARDS)
PUNCHED OUTPUT (ACPSD 30 CARDS)
SAMPLE PROBLEM PRINTED OUTPUT, AVAILABLE UPON REQUEST (TASK 391
BLOCKS, ACPSD 16 BLOCKS, FITSPEC 36 BLOCKS)
REFERENCE REPORT
17. CATEGORY - E
KEYWORDS - 1-DIMENSIONAL, MULTIGROUP, REACTOR KINETICS, ACPSD
CODES, FITSPEC CODES

1. NAME OR DESIGNATION OF PROGRAM - SCFIRE2 1- AND 2-CELL
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - SCFIRE2 ONE CELL, CALCULATES THE CONSEQUENCES OF A SODIUM POOL FIRE IN A CLOSED VAULT. GAS PRESSURE IN THE VAULT IS CALCULATED FROM THE GAS DENSITY AND TEMPERATURE. SCFIRE2 TWO CELL, CALCULATES THE CONSEQUENCES OF A SODIUM POOL FIRE IN A VAULT CONNECTED TO A CONTAINMENT STRUCTURE THROUGH A RESTRICTED OPENING. COLD GAS FLOWS FROM THE CONTAINMENT TO THE VAULT DUE TO MASS DIFFERENCES WHILE HOT GAS FLOWS FROM THE VAULT TO THE CONTAINMENT TO EQUILIBRATE PRESSURES. PRESSURE IN THE CONTAINMENT IS CALCULATED FROM THE GAS DENSITY AND TEMPERATURE. IN BOTH PROGRAMS THE SODIUM BURNING RATE IS GOVERNED BY THE RATE OF OXYGEN DIFFUSION TO THE SODIUM SURFACE.
4. METHOD OF SOLUTION - BOTH PROGRAMS USE THE FINITE DIFFERENCE METHOD TO CALCULATE TRANSIENT TEMPERATURES IN A NODAL NETWORK DESIGNED TO SIMULATE A PHYSICAL SYSTEM (ONE CELL PROGRAM) OR THE TWO CELL GEOMETRY (TWO CELL PROGRAM).
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE ONE CELL PROGRAM HAS A TOTAL OF 12 NODES AVAILABLE FOR SYSTEM COMPONENTS, WHILE THE TWO CELL PROGRAM HAS A TOTAL OF 16 NODES.
6. TYPICAL RUNNING TIME - THE ONE CELL PROGRAM REQUIRES 1 MINUTE FOR A 12 HOUR REAL TIME PROBLEM, WHILE THE TWO CELL PROGRAM REQUIRES 12 SECONDS FOR A 24 HOUR REAL TIME PROBLEM.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 VERSION OF BOTH PROGRAMS SUBMITTED AUGUST 1972,
SAMPLE PROBLEMS EXECUTED BY ACC.
10. REFERENCE - P. BEIRIGER, J. HOPFENFELD, M. SILBERBERG, R. P. JOHNSON, L. BAURMASH, AND R. L. KCCNTZ, SCFIRE II USER REPORT, AI-AEC-13055, MARCH 30, 1973.
11. MACHINE REQUIREMENTS - 134K BYTES (ONE CELL PROGRAM), 148K BYTES (TWO CELL PROGRAM)
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - IF AN SC-4020 GRAPHICAL DISPLAY DEVICE IS NOT AVAILABLE, A DUMMY ROUTINE CAN BE USED FOR SUBROUTINE AICRT3, OR THE ROUTINE MAY BE REWRITTEN. THE NAA SC-4020 SUBROUTINE PACKAGE IS AVAILABLE THROUGH -

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14. ANY OTHER INFORMATION OR RESTRICTIONS (CONTINUED)

LAIDE LIBRARIAN
C/O STROMBERG-CARLSON
P. O. BOX 2449
SAN DIEGO, CALIFORNIA

15. NAME AND ESTABLISHMENT OF AUTHOR -

MELVIN SILBERBERG
ATOMICS INTERNATIONAL
P. O. BOX 309
CANOGA PARK, CALIFORNIA 91304

16. MATERIAL AVAILABLE -

SOURCE DECKS (1-CELL 489 CARDS, 2-CELL 570 CARDS)
SAMPLE PROBLEMS (1-CELL 37 CARDS, 2-CELL 49 CARDS)
REFERENCE REPORT

17. CATEGORY - G

KEYWORDS - CONTAINMENT, SODIUM, FIRE, LEAKAGE, REACTOR SAFETY,
ACCIDENTS

1. NAME OR DESIGNATION OF PROGRAM - HYMAS
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - HYMAS GENERATES THE HYDRODYNAMIC MASS MATRIX PER UNIT DEPTH ASSOCIATED WITH A MULTI-MASS SYSTEM IMMERSED IN A LIQUID ENVIRONMENT. IT IS ASSUMED THAT THE LIQUID ENVIRONMENT MAY BE REPRESENTED BY A SERIES OF FLOW-CHANNELS AND ACCES. FLOW-CHANNELS ARE INTRODUCED IN THE REGION BETWEEN SURFACES OF NEIGHBORING SOLIDS, AND ACCES ARE USED TO CONNECT TWO OR MORE FLOW-CHANNELS. ALSO, IT IS ASSUMED THAT THE SOLID BODIES UNDERGO UNIDIRECTIONAL MOTION, THAT POTENTIAL FLOW THEORY IS APPLICABLE, THAT THE WIDTH OF A FLOW-CHANNEL IS SMALL COMPARED WITH THE LENGTH SO THERE IS NO PRESSURE DROP ACROSS THE FLOW-CHANNEL, AND THAT NODAL VOLUME IS SMALL COMPARED WITH FLOW-CHANNEL VOLUME.
4. METHOD OF SOLUTION - FORMULATION OF THE GENERAL MATRIX EQUATION FOR HYDRODYNAMIC MASS WAS ACCOMPLISHED BY FIRST DEVELOPING THE GOVERNING EQUATION FOR FLUID FLOW IN A CHANNEL OF UNIT DEPTH BOUNDED BY TWO PARALLEL SURFACES WHICH MAY MOVE IN TRANSLATION BOTH PERPENDICULAR AND PARALLEL TO THE DIRECTION OF FLOW. THIS RESULT WAS THEN UTILIZED TO OBTAIN THE EQUATION FOR A VARIABLE AREA FLOW-CHANNEL. NEXT, THE CONTINUITY EQUATION FOR AN ARBITRARY NODE WAS WRITTEN. THE GENERAL MATRIX EQUATION FOR COMPUTING HYDRODYNAMIC MASS WAS THEN OBTAINED BY APPLYING THE DEVELOPED EQUATIONS TO A PARTICULAR PROBLEM. THE PROGRAM HYMAS IS IN ESSENCE THIS GENERAL MATRIX EQUATION.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE NUMBER OF SUBDIVISIONS IN A FLOW-CHANNEL IS LIMITED TO 50.
6. TYPICAL RUNNING TIME - LESS THAN 30 SECONDS ARE REQUIRED FOR A TYPICAL PROBLEM.
7. UNUSUAL FEATURES OF THE PROGRAM - HYMAS COMPUTES THE HYDRODYNAMIC MASS MATRIX FOR A LUMPED-PARAMETER SYSTEM.
8. RELATED AND AUXILIARY PROGRAMS - THE OUTPUT OF HYMAS MAY BECOME PART OF THE MASS MATRIX INPUT TO ANY LUMPED-PARAMETER DYNAMIC ANALYSIS PROGRAM. HYMAS USES SUBROUTINES INTTAP, CLTTAP, FINISH, SUBERR, AND JOBCRD FROM THE BETTIS ENVIRONMENTAL ROUTINES (ACC ABSTRACT 478).
9. STATUS - ABSTRACT FIRST DISTRIBUTED JANUARY 1974.
CDC6600 VERSION SUBMITTED DECEMBER 1973.
10. REFERENCES - G. R. SHARP AND W. A. WENZEL, HYDRODYNAMIC MASS MATRIX FOR A MULTIBODIED SYSTEM, WAPD-TM-1087, SEPTEMBER 1973.
C. J. PFEIFER, CDC-6600 FORTRAN PROGRAMMING - BETTIS ENVIRONMENTAL REPORT, WAPD-TM-668, JANUARY 1967.

ACC ABSTRACT 560

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11. MACHINE REQUIREMENTS - 30000 (OCTAL) OF FAST MEMORY, PLUS EXTENDED CORE STORAGE
12. PROGRAMMING LANGUAGES USED - FORTRAN IV AND COMPASS
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCCPF 3.1.5.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
G. R. SHARP AND W. A. WENZEL
BETTIS ATOMIC POWER LABORATORY
WESTINGHOUSE ELECTRIC CORPORATION
P. O. BOX 79
WEST MIFFLIN, PENNSYLVANIA 15122
16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
SOURCE DECK (806 CARDS)
SAMPLE PROBLEM (14 CARDS)
REFERENCE REPORT, WAPC-TM-1087
17. CATEGORY - H
KEYWORDS - FLUID FLOW, HYDRODYNAMICS, MASS MATRICES, LUMPED-
PARAMETER SYSTEMS

1. NAME OR DESIGNATION OF PROGRAM - TOKMINA/TOKMINA2
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - TOKMINA FINDS THE MINIMUM MAGNETIC FIELD, B_M , REQUIRED AT THE TOROIDAL COIL OF A TOKAMAK TYPE FUSION REACTOR WHEN THE INPUT IS BETA(RATIO OF PLASMA PRESSURE TO MAGNETIC PRESSURE), Q (KRUSKAL-SHAFRANOV PLASMA STABILITY FACTOR), AND Y (RATIO OF PLASMA RADIUS TO VACUUM WALL RADIUS: R_P/R_W) AND ARRAYS OF P_T (TOTAL THERMAL POWER FROM BOTH D-T AND TRITIUM BREEDING REACTIONS), P_W (WALL LOADING OR POWER FLUX) AND T_B (THICKNESS OF BLANKET), FOLLOWING THE METHOD OF GOLDOVIN, ET AL. TOKMINA2 FINDS THE TOTAL POWER, P_T , OF SUCH A FUSION REACTOR, GIVEN A SPECIFIED MAGNETIC FIELD, B_M , AT THE TOROIDAL COIL.
4. METHOD OF SOLUTION - TOKMINA: THE ASPECT RATIO(A) IS MINIMIZED, GIVING A MINIMUM VALUE FOR B_M .
TOKMINA2: A SEARCH IS MADE FOR P_T ; THE VALUE OF P_T WHICH MINIMIZES B_M TO THE REQUIRED VALUE WITHIN 50 GAUSS IS CHOSEN.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - INPUT ARRAYS PRESENTLY ARE DIMENSIONED AT 20. THIS RESTRICTION CAN BE OVERCOME BY CHANGING A DIMENSION CARD.
6. TYPICAL RUNNING TIME - TOKMINA: APPROXIMATELY 30 SECONDS FOR 100 SETS OF INPUT VALUES.
TOKMINA2: APPROXIMATELY 1 MINUTE FOR 700 SETS OF INPUT VALUES.
7. UNUSUAL FEATURES OF THE PROGRAM - OUTPUT FOR EACH SET OF INPUT VALUES ARE T_B , B_T (TOROIDAL MAGNETIC FIELD ON THE MINOR AXIS), R (MAJOR RADIUS OF THE TOROID), R_P , R_M (DISTANCE BETWEEN THE MAJOR AXIS AND THE BLANKET IN THE MIDPLANE), N (DENSITY OF THE PLASMA) AND I (PLASMA CURRENT). THESE VALUES, AS WELL AS B_M AND P_T MAY BE STUDIED AS A FUNCTION OF BLANKET THICKNESS.
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 VERSION SUBMITTED AUGUST 1972, SAMPLE PROBLEMS EXECUTED BY ACC.
10. REFERENCES - I. N. GOLDOVIN, YU. A. DNEVSTROVSKY AND D. P. KOSTOMAROV, TOKAMAK AS A POSSIBLE FUSION REACTOR - COMPARISON WITH OTHER C. T. R. DEVICES, BNES NUCLEAR FUSION REACTOR CONFERENCE AT CULHAM LABORATORY, SEPTEMBER 1969.
A. J. HATCH AND J. ETZWEILER, A SIMPLIFIED PARAMETRIC STUDY OF TOKAMAK FUSION REACTORS, PROCEEDINGS OF THE TEXAS SYMPOSIUM ON FUSION REACTORS, NOVEMBER 22-23, 1972, CGNF-721111.

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11. MACHINE REQUIREMENTS - 160K BYTES OF CORE
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
A. J. HATCH
PHYSICS DIVISION
ARGONNE NATIONAL LABORATORY
9700 SOUTH CASS AVENUE
ARGONNE, ILLINOIS 60439
16. MATERIAL AVAILABLE -
SOURCE DECKS (TOKMINA-153 CARDS, TOKMINA2-198 CARDS)
SAMPLE PROBLEMS (TOKMINA-4 CARDS, TOKMINA2-5 CARDS)
SAMPLE PROBLEM OUTPUT (TOKMINA-2 PAGES, TOKMINA2-28 PAGES)
REFERENCE REPRINT, CONF-721111
17. CATEGORY - X
KEYWORDS - FUSION REACTORS, TOKAMAK, MAGNETOHYDRODYNAMICS

1. NAME OR DESIGNATION OF PROGRAM - AMDLIBAE
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360/75
3. DESCRIPTION OF PROBLEM OR FUNCTION - AMDLIBAE IS A SUBSET OF THE IBM 360 SUBROUTINE LIBRARY AT THE APPLIED MATHEMATICS DIVISION AT ARGONNE NATIONAL LABORATORY. THIS SUBSET INCLUDES LIBRARY CATEGORIES A-E:

IDENTIFICATION	DESCRIPTION
A152S A MPA	MULT. PREC. FLOATING POINT ARITH. PACKAGE
B156S A ARSIN	ARCSINE, ARCCOSINE
B157S A SIN/COS	SINE, COSINE
B158S A DSIN/DCOS	DP SINE, COSINE
B159S A DTAN/DCOT	DP TANGENT, COTANGENT
B252S A SINH/COSH	HYPERBOLIC SINE, COSINE
B353S A ALCG	SP LOGARITHM
B354S A DEXP	DP EXPONENTIAL
B355S A DLG	DP LOGARITHM
B456S A DCUBRT	DP CUBE ROOT
B457S A ARGPOWER	X**Y
B458S A ARGFDXPD	DP X**Y
C150S F DQD	Q. D. ALGORITHM APPLIED TO A POWER SERIES
C151S F DCONF1	EVAL. CONT. FRACT. Q. D. OF POWER SERIES
C250S F CUBIC	ROOTS OF CUBIC POLYNOMIAL EQUATION
C251S F QUARTIC	ROOTS OF QUARTIC POLYNOMIAL EQUATION
C252S F RSSR	ALL ROOTS OF POLY EQS. WITH REAL COEF.
C253S F PCLDRV	DRIVER FOR C254S
C254S F CPOLY	ROOTS ARB. POLY. JENKINS-TRAUB ALGORITHM
C353S F1	ANG. MOM. COEF.- CLEBSCH, RACAH, WIGNER
C354S A ELLIPK	SP COMPLETE ELLIPTIC INTEGRAL K
C355S A ELLIPE	SP COMPLETE ELLIPTIC INTEGRAL E
C365S A ALGAMA	LOGARITHM OF THE GAMMA FUNCTION
C366S A DGAMMA/DLGAMA	DP GAMMA AND LOG(GAMMA) FUNCTIONS
C367S A GAMMA/ALGAMA	GAMMA AND LOG(GAMMA) FUNCTIONS
C368S F ECNE	EXPONENTIAL INTEGRAL E1
C369S F DEONE	DP EXPONENTIAL INTEGRAL E1
C370S F RESJY	BESSEL FUNCTIONS J AND Y
C371S F RESIK	BESSEL FUNCTIONS I AND K
C372S F CHIPRB	CHI-SQUARE INTEGRAL
C373S A DELIPK	DP COMPLETE ELLIPTIC INTEGRAL K
C374S A DELIPE	DP COMPLETE ELLIPTIC INTEGRAL E
C375S F1 DEI	EXPONENTIAL INTEGRALS IN LONG PRECISION
C377S F1 DCAW	DAWSON'S INTEGRAL IN DOUBLE PRECISION
C380S F DRZETA	LONG PRECISION ZETA, ZETA-1 FUNCTIONS
C382S F DCGAM	LONG PRECISION COMPLEX GAMMA
C383S A DERF/DERFC	DP ERROR FUNCTION
C384S F BFJ1	BESSEL FUNCTION J1
C385S F CCULMB	REGULAR COULOMB WAVE FUNCTIONS
C386S F1 DSGMAL	COULOMB PHASE SHIFT
C387S F BFJYR	BESSEL FUNCTIONS Y0, Y1
C388S F IRCCUL	LP IRREGULAR COULOMB WAVE FUNCTIONS

3. DESCRIPTION OF PROBLEM OR FUNCTION (CONTINUED)

C389S F	GAMIN	INCOMPLETE GAMMA FUNCTION
C390S F	LC	ASSOC. LEGENDRE FUNCTIONS OF 2ND. KIND
C393S F	CDEONE	MODIFIED COMPLEX EXPONENTIAL INTEGRAL
D150S F	HAVIE	QUADRATURE BY HAVIE'S ALGORITHM
D150S P	HAVIEP	QUADRATURE BY HAVIE'S ALGORITHM
D151S F	ROMBRG	ROMBERG QUADRATURE
D151S P	ROMBRG	ROMBERG QUADRATURE
D152S F1	CHEB	CLENSHAW-CURTIS QUADRATURE
D153S F	DROMB	TWO-DIMENSIONAL ROMBERG QUADRATURE
D153S P	DROMBP	TWO-DIMENSIONAL ROMBERG QUADRATURE
D154S F	CMQUAD	MODIFIED CLENSHAW-CURTIS QUADRATURE
D155S F	SIMP	ADAPTIVE SIMPSON QUADRATURE
D157S F	ASIMP	IMPROVED ADAPTIVE SIMPSON QUADRATURE
D157S P	ASIMPP	IMPROVED ADAPTIVE SIMPSON QUADRATURE
D158S F	ANC4	ADAP. QUAD. USING 4-TH ORDER NEWTON-COTES
D158S P	ANC4P	ADAP. QUAD. USING 4-TH ORDER NEWTON-COTES
D161S F	GAUSS	ARBITRARY GAUSSIAN WEIGHTS AND NODES
D162S F	SQUANK	SIMPSON'S QUAD. USED ADAPTIVELY
D252S F	DDFSUB	DP NEVILLE CR STER SOL. LIN. DIF. EQNS.
D253S F	DDFSYS	DRIVER FOR D252S
D254S F	DEGEAR	GEAR'S SOL. OF DIF. EQS.
D255S F	DFBND	STER SOL. DIF. EQS. WITH ERROR BOUNDS
D256S F	DFBCRV	DRIVER FOR D256
E206S F	LSQPCL	LEAST SQUARES WEIGHTED POLYNOMIAL FIT
E208S F1		ARBITRARY FUNCTION FIT, LEAST SQUARES
E209S F	CALLSQ	DRIVER FOR E206S
E212S F		GENERAL LEAST SQUARES FIT + FUNCTION EVAL.
E250S F	VA02A	LEAST SQUARES FUNCT. MIN. W/C DERIVATIVES
E252S F	MINMAX	CHEPYSHEV LINE FIT
E253S F		ARBITRARY FUNCTIONAL FIT II
E256S F	BGPOL	LEAST SQUARES FIT WITH POLYNOMIALS
E257S F	BGLSSQ	LEAST SQUARES FIT WITH ARBITRARY FUNCTION
E350S F	SMOOTH	SMOOTHING BY CUBIC SPLINES

4. METHOD OF SOLUTION -

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -

6. TYPICAL RUNNING TIME -

7. UNUSUAL FEATURES OF THE PROGRAM -

8. RELATED AND AUXILIARY PROGRAMS - AMDLIBF (ACC ABSTRACT 563) AND
AMDLIBGZ (ACC ABSTRACT 564)9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 VERSION SUBMITTED SEPTEMBER 1972.10. REFERENCES - B. T. SMITH, THE ANL-AMD SUBROUTINE LIBRARY (ACC 562,
563, AND 564), ACC PROGRAMMING NOTE 73-5, SEPTEMBER 1, 1972.

ANL-AMD SYSTEM/360 LIBRARY SUBROUTINE DESCRIPTIONS:

K. E. HILLSTROM, MPA, MULTIPLE-PRECISION FLOATING-

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 W. J. CODY AND K. PACIOREK, ARGARSIN, OS/360 FORTRAN IV SYSTEMS SUBROUTINE FOR ARCSINE, ARCCOSINE FUNCTION (SINGLE PRECISION), B156S, FEBRUARY 1969.
 K. HILLSTROM AND K. PACIOREK, SIN/CCS, CS/360 FORTRAN IV ROUTINE FOR THE SINE AND COSINE, B157S, FEBRUARY 1969.
 K. HILLSTROM, CSIN/DCOS, OS/360 FORTRAN IV COMPATIBLE ROUTINE FOR THE SINE AND COSINE FUNCTION, B158S, OCTOBER 1969.
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 NANCY CLARK, DEXP, OS/360 FORTRAN IV SYSTEMS ROUTINE FOR DOUBLE-PRECISION E^{**X} , B354S, FEBRUARY 1969.
 NANCY W. CLARK, DLOG, FORTRAN IV SYSTEMS ROUTINE FOR NATURAL OR BASE 10 DP LOGARITHMS, B355S, FEBRUARY 1969.
 KATHLEEN A. PACIOREK, DCUBRT, SYSTEM/360 ASSEMBLY LANGUAGE SUBROUTINE WHICH COMPUTES THE DP CUBE ROOT OF A NORMALIZED DP FLOATING POINT ARGUMENT, B456S, OCTOBER 1967.
 DONALD F. JORDAN, ARGPCWER, IBM S/360 FORTRAN IV SINGLE-PRECISION POWER FUNCTION, B457S, FEBRUARY 1969.
 N. A. CLARK, W. J. CODY, AND K. A. PACIOREK, ARGEXPD, IBM S/360 FORTRAN IV DP POWER FUNCTION, B458S, MAY 1969.
 H. C. THACHER, JR. AND KATHLEEN A. PACIOREK, DQD, DP FORTRAN IV QUOTIENT-DIFFERENCE ALGORITHM, C150S, JULY 1969.
 H. C. THACHER, JR. AND KATHLEEN A. PACIOREK, DCCNF1, DP FORTRAN IV ROUTINE TO EVALUATE AN S-FRACTION, C151S, JULY 1969.
 BURTON S. GARBOW, CUBIC, ROOTS OF CUBIC POLYNOMIAL EQUATIONS, C250S, DECEMBER 1967.
 BURTON S. GARBOW, QUARTI, ROOTS OF QUARTIC POLYNOMIAL EQUATIONS, C251S, DECEMBER 1967.
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 K. PACIOREK, POLDRV, FORTRAN IV DOUBLE-PRECISION DRIVER FOR ANL C254S, C253S, APRIL 1969.
 KATHLEEN PACIOREK, CPCLY, RPCLY, BNCZRO, A FORTRAN IV DOUBLE-PRECISION POLYNOMIAL ROOTFINDER PACKAGE, C254S, APRIL 1969.
 DONALD F. JORDAN AND KENNETH HILLSTROM, PACKAGE FOR COMPUTATION OF ANGULAR MOMENTUM COEFFICIENTS, C353S-1, AUG. 1971.
 KATHLEEN A. PACIOREK, ELLIPK, EVALUATION OF THE SP COMPLETE ELLIPTIC INTEGRAL $K(K^{**2})$, C354S, FEBRUARY 1969.
 KATHLEEN A. PACIOREK, ELLIPE, EVALUATION OF THE SP COMPLETE ELLIPTIC INTEGRAL $E(K^{**2})$, C355S, FEBRUARY 1969.
 K. HILLSTROM, ALGAMA, FORTRAN IV COMPATIBLE ROUTINE FOR THE NATURAL LOG OF THE REAL GAMMA FUNCTION, C365S, MARCH 1967.
 K. HILLSTROM, DGAMMA/DLGAMA, OS/360 FORTRAN IV COMPATIBLE ROUTINE FOR THE GAMMA FUNCTION AND THE NATURAL LOG OF THE GAMMA FUNCTION, C366S, MAY 1969.
 K. HILLSTROM, GAMMA/ALGAMA, CS/360 FORTRAN IV COMPA-

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KATHLEEN PACIOREK, CHIPRB, FORTRAN IV DOUBLE-PRECISION SUBROUTINE WHICH FINDS THE PROBABILITY THAT X^2 FOR N DEGREES OF FREEDOM EXCEEDS X , C372S, JANUARY 1968.

KATHLEEN A. PACIOREK, DELIPK, EVALUATION OF THE COMPLETE ELLIPTIC INTEGRAL $K(K^2)$, C373S, FEBRUARY 1969.

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K. PACIOREK AND W. CODY, DEI, A FORTRAN IV FUNCTION SUBROUTINE TO CALCULATE EXPONENTIAL INTEGRALS $E-SUB-I(X)$, $E-SUB-1(X)$, OR $EXP(-X)*E-SUB-I(X)$ FOR A LONG PRECISION ARGUMENT X , C375S-1, JUNE 1971.

KATHLEEN A. PACIOREK AND W. J. CODY, CDW, FORTRAN IV FUNCTION WHICH CALCULATES DAWSON'S INTEGRAL, C377S-1, JULY 1970.

K. HILLSTROM, PRZETA, FORTRAN IV (H) ROUTINE FOR THE RIEMANN ZETA FUNCTION $ZETA(S)$ OR $ZETA(S)-1$, C380S, OCTOBER 1970.

K. HILLSTROM AND H. KUKI, DCGAM/DCLGAM/CDGAMA/CDLGAM, OS/360 FORTRAN IV (H) ROUTINE FOR THE DOUBLE-PRECISION COMPLEX GAMMA AND LOG GAMMA FUNCTIONS, C382S-1, NOVEMBER 1970.

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K. HILLSTROM, DSGMAL, OS/360 FORTRAN IV (H) ROUTINE FOR THE COULOMB PHASE SHIFT $SIGMAL(N)$, ($L=0,1,2,\dots,N$), C386S-1, JULY 1970.

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A. STRECK, GAMIN, OS/360 FORTRAN IV (H) DP ROUTINE FOR THE INCOMPLETE GAMMA FUNCTION, C389S, JANUARY 1971.

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A. STRECK, CDEONE, MODIFIED COMPLEX EXPONENTIAL INTEGRAL, C393S, MAY 1972.

K. HILLSTROM, HAVIE, OS/360 FORTRAN IV ROUTINE FOR HAVIE QUADRATURE, D150S, NOVEMBER 1968.

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K. HILLSTROM, CHEB, OS/360 FORTRAN IV ROUTINE FOR CHEBYSHEV QUADRATURE, D152S-1, AUGUST 1970.

K. HILLSTROM, DRCMB, OS/360 FORTRAN IV ROUTINE FOR TWO-DIMENSIONAL ROMBERG QUADRATURE, D153S, NOVEMBER 1968.

K. HILLSTROM, DROMBP, OS/360 PL/I ROUTINE FOR TWO-DIMENSIONAL ROMBERG QUADRATURE, D153S-P, JULY 1970.

K. HILLSTROM, CMQUAD, OS/360 FORTRAN IV ROUTINE FOR MODIFIED CHEBYSHEV QUADRATURE, D154S, NOVEMBER 1968.

K. HILLSTROM, SIMP, OS/360 FORTRAN IV ROUTINE FOR ADAPTIVE SIMPSON RULE QUADRATURE, D155S, NOVEMBER 1968.

ADAPTIVE SIMPSON RULE QUADRATURE, D155S, NOVEMBER 1968.

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K. HILLSTROM, ASIMPP, OS/360 PL/I ROUTINE FOR ADAPTIVE SIMPSON RULE QUADRATURE, D157S-P, JULY 1970.

K. HILLSTROM, ANC4, OS/360 FORTRAN IV ROUTINE FOR ADAPTIVE QUADRATURE USING THE 4TH NEWTON-COTES FORMULA, D158S, NOVEMBER 1968.

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KATHLEEN PACIOREK, DCFSUB, FORTRAN IV SUBROUTINE WHICH PERFORMS ONE DP INTEGRATION STEP FOR A SYSTEM OF FIRST-ORDER ORDINARY DIFFERENTIAL EQUATIONS, D252S, SEPTEMBER 1968.

KATHLEEN PACIOREK, DDFSYS, FORTRAN IV DP ROUTINE WHICH PROVIDES INPUT/OUTPUT AND CONTROL FOR USE WITH THE DP ROUTINE AND D252S - DCFSUB TO INTEGRATE A SYSTEM OF FIRST-ORDER ORDINARY DIFFERENTIAL EQUATIONS, D253S, MAY 1967.

C. W. GEAR, CEGEAR, OS/360 FORTRAN IV PROGRAM FOR THE NUMERICAL INTEGRATION OF ORDINARY DIFFERENTIAL EQUATIONS WITH INITIAL VALUE BOUNDARY CONDITIONS, D254S, DECEMBER 1967.

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KATHLEEN A. PACIOREK, DFBDRV, FORTRAN IV DP ROUTINE WHICH PROVIDES INPUT/OUTPUT AND CONTROL FOR USE WITH THE DP ROUTINES AND D255S DFBND-CIFI TO INTEGRATE A SYSTEM OF FIRST-ORDER ORDINARY DIFFERENTIAL EQUATIONS, D256S, OCTOBER 1969.

KATHLEEN PACIOREK, ISQPCL, LEAST SQUARE POLYNOMIAL FIT, E206S, SEPTEMBER 1967.

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11. MACHINE REQUIREMENTS -

12. PROGRAMMING LANGUAGE USED - ASSEMBLY LANGUAGE, FORTRAN IV, AND PL/I EACH INDICATED BY A, F OR P IN THE IDENTIFICATION GIVEN IN ITEM 3 ABOVE.

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360 RELEASE 19.6.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -

CONTACT B. T. SMITH, PROGRAM LIBRARIAN
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ARGONNE NATIONAL LABORATORY
9700 SOUTH CASS AVENUE
ARGONNE, ILLINOIS 60439

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (19,180 CARDS)
ACC NOTE AND SUBROUTINE DESCRIPTIONS

17. CATEGORY - P

KEYWORDS - FLOATING-POINT ARITHMETIC, ELEMENTARY FUNCTIONS, POLYNOMIALS, DIFFERENTIAL EQUATIONS, QUADRATURE, INTERPOLATION, SPECIAL FUNCTIONS

1. NAME OR DESIGNATION OF PROGRAM - AMDLIBF
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360/75
3. DESCRIPTION OF PROBLEM OR FUNCTION - AMDLIBF IS A SUBSET OF THE IBM 360 SUBROUTINE LIBRARY AT THE APPLIED MATHEMATICS DIVISION AT ARGONNE. THIS SUBSET INCLUDES LIBRARY CATEGORY F:

IDENTIFICATION	DESCRIPTION
F105S F MATEQ,UNIQUE	GENERALIZED MAT. INV. AND SOL. LIN. EQS.
F150S F HERM	EIGENSYSTEMS OF HERMITIAN MATRICES
F152S F SYMINV	INVERT SYM. MATRICES, SOLVE LIN. SYSTEMS
F154S A DCTP	DOUBLE PLUS PRECISION ACCUM. INNER PROD.
F155S F HESSFN	RED. COMPLEX NON-HERM. MAT. TO UP. HESS.
F156S F RAYCOR	RAYLEIGH CORRECTIONS FOR EIGENVALUES
F157S F SINGLVL	SINGULAR VALUE DECOMP. OF REAL MATRIX
F161S F XTRADP	A FAST EXTENDED PRECISION INNER PRODUCT
F202S F1 EIGEN	EIGENSYSTEM FOR REAL SYMMETRIC MATRIX
F203S F	DRIVER FOR F202S
F220S F ELTRAN	ACCUM. TRANSFORMATIONS FROM ELMHES (FQR2)
F221S F ORTRAN	ACCUM. TRANSFORMATIONS FROM CRTHES (FQR2)
F222S F FIGI2	REDUCE NONSYM. TO SYM. TRIDIAG. (TQL2)
F223S F1 TINVT	FIND SOME EIGENVEC. OF SYM. TRIDIAG. MAT.
F224S F REDUC	REDUCE GEN. SYM. EIGENPROB. AX-L*BX
F225S F REBAK	BACKTRANSFORM VECTORS REDUC FORMED MATRIX
F226S F BANDP	REDUCE BAND SYM. MATRIX TO SYM. TRIDIAG.
F227S F BANDV	FIND EIGENVECTORS OF BAND SYM. MATRIX
F228S F TRED3	REDUCE PACKED SYM. MAT. TO SYM. TRIDIAG.
F229S F TRBAK3	BACKTRANSFORM VECTORS TRED3 FORMED MATRIX
F250S F FRANCI	EIGENVALUES OF A REAL MATRIX
F251S F FRANCC	EIGENVALUES OF COMPLEX MATRICES
F252S F GEIGEN	GENERALIZED SYMMETRIC EIGENPROBLEM
F255S F SPIAG	EIGENSYSTEM OF REAL SYM. DP MATRICES
F257S F TSTMTZ	GENERATES TEST MATRICES
F258S F LPCHZ	FIG. VALS. REAL SYM. MAT. VIA LR-CHOLEQ.
F259S F BYSFCT	EIGENVALUES OF TRIDIAG. MAT. BY BISECTION
F260S F JACOBI	EIGENSYSTEM OF REAL MATRICES
F261S F EIGINV	INVERSE EIGENVALUE PROBLEM
F262S F VEC5	EIGENVECTORS OF PENTADIAG. SYM. MATRICES
F263S F BANDRD	REDUCE SYM. BAND MATRIX TO TRIDIAG. FORM
F264S F BANDVC	ORTHONORM. EIGENVEC. OF SYM. BAND MAT.
F265S F EIGENP	EIGENSYSTEM OF REAL GENERAL MATRIX
F269S F1 BALANC	BALANCE A REAL GENERAL MATRIX
F270S F1 BALBAK	BACKTRANSFORM VECTORS BALANCE FORMED MAT.
F271S F1 CBAL	BALANCE A COMPLEX GENERAL MATRIX
F272S F1 CBABK2	BACKTRANSFORM VECTORS CBAL FORMED MATRIX
F273S F1 ELMHES	REDUCE REAL MATRIX TO REAL HESS. (ELEM.)
F274S F1 ELMBAK	BACKTRANSFORM VECTORS ELMHES FORMED MAT.
F275S F1 ORTHES	REDUCE REAL MAT. TO REAL HESS. (ORTHOG.)
F276S F1 ORTBAK	BACKTRANSFORM VECTORS ORTHES FORMED MAT.
F277S F1 TRED1	REDUCE SYM. MATRIX TO SYM. TRIDIAG.
F278S F1 TRED2	REDUCE SYM. MAT. TO SYM. TRIDIAG. (TQL2)

3. DESCRIPTION OF PROBLEM OR FUNCTION (CONTINUED)

F279S F1 TRBAK1	BACKTRANSFORM VECTORS TREC1 FORMED MATRIX
F280S F1 FIGI	REDUCE NCNSYM. TO SYM. TRIDIAG. MATRIX
F281S F1 EAKVEC	BACKTRANSFORM VECTORS FIGI FORMED MATRIX
F282S F1 CCMHES	REDUCE COMPLEX MATRIX TO COMPLEX HESS.
F283S F1 COMBAK	BACKTRANSFORM VECTORS CCMHES FORMED MAT.
F284S F1 HTRIDI	REDUCE HERMITIAN MATRIX TO SYM. TRIDIAG.
F285S F1 HTRIBK	BACKTRANSFORM VECTORS HTRIDI FORMED MAT.
F286S F1 HCR	FIND ALL VALUES OF REAL HESS. MATRIX
F287S F1 HCR2	FIND ALL VALUES/VECTORS REAL HESS. MAT.
F288S F1 INVIT	FIND SOME VECTORS OF REAL HESS. MATRIX
F289S F2 TCL1	FIND ALL VALUES OF SYM. TRIDIAG. MATRIX
F290S F2 TQL2	ALL VALUES/VECTORS SYM. TRIDIAG. MAT.
F291S F1 IMTQL1	FIND ALL VALUES OF SYM. TRIDIAG. MATRIX
F292S F1 IMTQL2	ALL VALUES/VECTORS SYM. TRIDIAG. MAT.
F293S F1 TSTURM	SOME VALUES/VECTORS SYM. TRIDIAG. MAT.
F294S F2 BISECT	FIND SOME VALUES OF SYM. TRIDIAG. MATRIX
F295S F1 CCMLR	FIND ALL VALUES OF COMPLEX HESS. MATRIX
F296S F1 CCMLR2	ALL VALUES/VECTORS COMPLEX HESS. MAT.
F297S F1 CINVT	FIND SOME VECTORS OF COMPLEX HESS. MATRIX
F298S F1 RATOR	FIND EXTREME VALUES OF SYM. TRIDIAG. MAT.
F299S FA1EISPAC	CONTROL PROGRAM F220S-F223S + F269S-F298S
F402S F MATINV	MATRIX INVERSION AND SOL. OF LINEAR EQNS.
F403S F	DRIVER FOR F402S
F452S F CHCLLU,CHOLEC	SYM. DECOMP. OF POS. DEF. BAND MATRICES
F453S F MATINC	INVERSION OF COMPLEX MATRICES
F454S F CROUT	SOLUTION OF SIMULTANEOUS LINEAR EQUATIONS
F455S F CROUTC	SOL. OF SIMULTANEOUS COMPLEX LINEAR EQNS.
F456S F1 DIAG	INTEGER PRESERVING GAUSSIAN ELIMINATION

4. METHOD OF SOLUTION -

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -

6. TYPICAL RUNNING TIME -

7. UNUSUAL FEATURES OF THE PROGRAM -

8. RELATED AND AUXILIARY PROGRAMS - AMDLIBAE (ACC ABSTRACT 562) AND
AMDLIBGZ (ACC ABSTRACT 564)9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 VERSION SUBMITTED SEPTEMBER 1972.10. REFERENCES - B. T. SMITH, THE ANL-AMD SUBROUTINE LIBRARY (ACC 562,
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11. MACHINE REQUIREMENTS -

12. PROGRAMMING LANGUAGES USED - ASSEMBLY LANGUAGE AND FORTRAN IV EACH INDICATED BY A OR F IN THE IDENTIFICATION GIVEN IN ITEM 3.

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360 RELEASE 19.6.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -

CONTACT B. T. SMITH, PROGRAM LIBRARIAN
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9700 SOUTH CASS AVENUE
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16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (13,629 CARDS)
ACC NOTE AND SUBROUTINE DESCRIPTIONS

17. CATEGORY - P

KEYWORDS - MATRICES, SIMULTANEOUS LINEAR EQUATIONS, EIGENSYSTEMS

1. NAME OR DESIGNATION OF PROGRAM - AMDLIBGZ
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360/75
3. DESCRIPTION OF PROBLEM OR FUNCTION - AMDLIBGZ IS A SUBSET OF THE IBM 360 SUBROUTINE LIBRARY AT THE APPLIED MATHEMATICS DIVISION AT ARGONNE NATIONAL LABORATORY. THIS SUBSET INCLUDES LIBRARY CATEGORIES G-Z:

IDENTIFICATION	DESCRIPTION
G552S F RANF	RANDCM NUMBER GENERATOR
J552S F1 PLOTSFLM	CALCOMP PLOTS TO IBM 2280
J952S F YCLYPLCT	CALCCMP PLCTS
J955S P GRAF	PRINTS A GRAPH OF POINTS ON LINE PRINTER
K250S A1	CORE TO CORE CONVERSION
K251S A HEXINP	HEXADECIMAL INPUT FOR PL/I PROGRAMS
K252S A HEXOUT	HEXADECIMAL OUTPUT CONV. PL/I PROGRAMS
M101S F SCRT	ALGEBRAIC SCRT
M150S F CSOPT	ALCEBRAIC SCRT
M151S P2 ANLKWIC	KWIC SORT
M250S A SMALLIST	SQUEEZES ASSEMBLER LISTING TO 8X11
N251S A ABEND	CALLS ABEND DUMP
Q052S A CLCCK	TIME
Q053S A CCOPYAGO	COPY LOAD MODULE FROM TAPE TO DISK
Q054S A DATE	CURRENT DATE IN FORM MM/DD/YY
Q055S A TIME	TIME (24 HOUR CLOCK) IN EBCDIC HH.MM.SS
Z013S F	VARIABLE METRIC MINIMIZATION
Z057S A LCCF	LOCATE MACHINE ADDRESSES OF VARIABLES
Z071S A ALLCC	ALLCCATE LCS FOR FORTRAN PROGRAMS
Z073S A LCSGET	ALLCCATE LCS FOR PL/I PROGRAMS
Z074S A ANLMNP	EXPONENT + MANTISSA MANIPULATIVE FUNCTS.
4. METHOD OF SOLUTION -
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
6. TYPICAL RUNNING TIME -
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - AMCLIBAE (ACC ABSTRACT 562) AND AMDLIBF (ACC ABSTRACT 563)
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 VERSION SUBMITTED SEPTEMBER 1972.
10. REFERENCES - B. T. SMITH, THE ANL-AMD SUBROUTINE LIBRARY (ACC 562, 563, AND 564), ACC PROGRAMMING NOTE 73-5, SEPTEMBER 1, 1972.
ANL-AMD SYSTEM/360 LIBRARY SUBROUTINE DESCRIPTIONS:
NANCY W. CLARK, RANF, CS/360 FORTRAN IV ROUTINE TO PRODUCE A SERIES OF RANDCM NUMBERS, G552S, JULY 1967.
NANCY CLARK, PLCTSFLM, OS/360 FORTRAN IV ROUTINE TO

10. REFERENCES (CONTINUED)

PROVIDE 35MM FILM OUTPUT ON THE IBM 2280 USING CALCOMP CALLING SEQUENCES, J552S-1, DECEMBER 1970.

CYNTHIA CHAMOT, YOLYPLOT, J952S, DECEMBER 1966.

GEORGE M. HAUSER, GRAF, A PL/I PROCEDURE TO PLOT POINTS ON A LINE PRINTER, J955S, OCTOBER 1971.

DANIEL CARSON, CORE TO CORE CONVERSION, K250S-1, FEBRUARY 1970.

ANTHONY J. STRECK, HEXINP, HEXADECIMAL CONVERSION FOR PL/I, K251S, APRIL 1970.

ANTHONY J. STRECK, HEXCUT, HEXADECIMAL OUTPUT FOR PL/I, K252S, APRIL 1970.

KATHLEEN A. PACIOREK, SCRT, M101S, OCTOBER 1968.

KATHLEEN A. PACIOREK, CSORT, M150S, OCTOBER 1968.

DONALD F. JORDAN, K. CRITZ, W. J. CODY, AND

K. HILLSTROM, ANL KWIC KEY WORD IN CONTEXT, M151S-2, MAY 1971.

ROBERT P. TANNURA, SMALLIST, M250S, DECEMBER 1967.

G. DUFFY, ABEND, ABNORMAL TERMINATION DUMP CALL FROM FORTRAN IV, N251S, APRIL 19, 1967.

G. DUFFY, CLCCK, VALUE OF CLOCK UPON CALL FROM FORTRAN IV, Q052S, APRIL 19, 1967.

G. DUFFY, COPYACC, COPY A LOAD MODULE FROM TAPE TO DISK AND EXECUTE IT, Q053S, APRIL 19, 1967.

C. J. SMITH AND W. J. CODY, DATE, CURRENT DATE IN GREGORIAN CALENDAR, FORTRAN IV CALLABLE, Q054S, FEBRUARY 1968.

K. HILLSTROM, TIME, 24 HOUR CLOCK, FORTRAN IV CALLABLE, Q055S, FEBRUARY 1970.

JANET HERMAN, VARIABLE METRIC MINIMIZATION, Z013S, APRIL 1967.

JOHN A. OHDE, LCCF, Z057S, OCTOBER 1968.

JOHN A. OHDE, ALLOC, Z071S, OCTOBER 1968.

JOHN A. OHDE, PLILCS, Z073S, OCTOBER 1968.

K. E. HILLSTROM, ANLMNP, EXPONENT AND MANTISSA MANIPULATION FUNCTIONS, Z074S, JULY 1971.

11. MACHINE REQUIREMENTS -

12. PROGRAMMING LANGUAGES USED - ASSEMBLY LANGUAGE, FORTRAN IV, AND PL/I EACH INDICATED BY A, F OR P IN THE IDENTIFICATION GIVEN IN ITEM 3 ABOVE.

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360 RELEASE 19.6.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -

CONTACT

B. T. SMITH, PROGRAM LIBRARIAN
APPLIED MATHEMATICS DIVISION
ARGONNE NATIONAL LABORATORY
9700 SOUTH CASS AVENUE
ARGONNE, ILLINOIS 60439

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (2866 CARDS)
ACC NOTE AND SUBROUTINE DESCRIPTIONS
17. CATEGORY - P
KEYWORDS - GRAPHS, INPUT DATA, OUTPUT DATA, UTILITY ROUTINES

1. NAME OR DESIGNATION OF PROGRAM - INCITE
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - INCITE GENERATES ENERGY-DEPENDENT THERMAL NEUTRON SPECTRA AND APPROPRIATE AVERAGE MULTI-GROUP CROSS SECTIONS USING ARBITRARY SCATTERING KERNELS. THE PHYSICAL MODEL IS A HOMOGENEOUS, CRITICAL, ONE-DIMENSIONAL BASE SLAB CORE.
4. METHOD OF SOLUTION - THE PROGRAM EMPLOYS A NORMALIZED GAUSS-SEIDEL ITERATION TECHNIQUE TO SOLVE THE ENERGY-DEPENDENT INTEGRAL FORM OF THE B-1 APPROXIMATION TO THE BOLTZMANN TRANSPORT EQUATION.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - A MAXIMUM OF 101 FINE ENERGY POINTS AND 50 BROAD GROUPS IS PERMITTED. A LIBRARY TAPE CONTAINING THE APPROPRIATE ABSORPTION AND SCATTERING CROSS SECTIONS AT THESE ENERGY POINTS IS REQUIRED.
6. TYPICAL RUNNING TIME - THE RUNNING TIME FOR A TYPICAL PROBLEM ON THE IBM360 IS NORMALLY LESS THAN 15 SECONDS.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - LIBMOD, AN AUXILIARY PROGRAM FOR MODIFICATION OR CREATION OF INCITE CROSS SECTION DATA LIBRARIES. THE CURRENT MASTER LIBRARY IS FOR THE ENERGY RANGE 0.0 TO 2.38 EV.
9. STATUS - ABSTRACT FIRST DISTRIBUTED JANUARY 1974.
IBM360 VERSION SUBMITTED JANUARY 1973, SAMPLE PROBLEM EXECUTED BY ACC FEBRUARY 1974.
10. REFERENCES - R. L. CURTIS AND R. A. GRIMSEY, INCITE - A FORTRAN-IV PROGRAM TO GENERATE THERMAL NEUTRON SPECTRA AND MULTI-GROUP CONSTANTS USING ARBITRARY SCATTERING KERNELS, IN-1062, NOVEMBER 1967.
11. MACHINE REQUIREMENTS - APPROXIMATELY 300K BYTES OF CORE MEMORY, ONE CROSS SECTION LIBRARY TAPE, AND THREE I/O SCRATCH UNITS ARE REQUIRED FOR EXECUTION.
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
R. L. CURTIS AND R. A. GRIMSEY
AFROJET NUCLEAR COMPANY

15. NAME AND ESTABLISHMENT OF AUTHOR(S) (CONTINUED)
P. O. BOX 1845
IDAHO FALLS, IDAHO 83401
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (2022 CARDS)
SAMPLE PROBLEM (26 CARDS)
CONTROL INFORMATION (JCL 29 CARDS)
LIBRARY (569 BLOCKS OF VARIABLE-SIZED BINARY RECORDS)
SAMPLE PROBLEM OUTPUT (37 PAGES)
REFERENCE REPORT
17. CATEGORY - B
KEYWORDS - THERMAL SPECTRA, MULTIGROUP CROSS SECTIONS, LIBRARIES,
INELASTIC SCATTERING KERNELS, THERMALIZATION

1. NAME OR DESIGNATION OF PROGRAM - RESPOND
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360/370
3. DESCRIPTION OF PROBLEM OR FUNCTION - RESPOND CALCULATES THE RELATIVE ENERGY ABSORPTION OF A SMALL REGION OF ONE MATERIAL IN A LARGE BODY OF ANOTHER MATERIAL EXPOSED TO GAMMA- OR X-RADIATION.
4. METHOD OF SOLUTION - THE RELATIVE ENERGY ABSORBED BY THE SMALL REGION FROM ENERGETIC ELECTRONS PRODUCED IN THE SURROUNDING MEDIUM AND THE RELATIVE ENERGY ABSORBED FROM THE ELECTRONS PRODUCED WITHIN THE REGION ARE CALCULATED AS A FUNCTION OF PHOTON ENERGY AND COMBINED BY THE METHOD OF T. E. BURLIN. THIS ENERGY-DEPENDENT RESPONSE FUNCTION IS AVERAGED OVER AN INPUT PHOTON SPECTRUM.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE ENERGY DIVISION IS INTO 100 EQUAL INTERVALS. ONLY 2 REGIONS MAY BE SPECIFIED.
6. TYPICAL RUNNING TIME - 14 SECONDS PER CASE ARE REQUIRED.
7. UNUSUAL FEATURES OF THE PROGRAM - RESPOND IS SPECIFICALLY INTENDED FOR CALCULATING THE CORRECTION FACTOR FOR THERMOLUMINESCENT DOSIMETERS (TLD) IN DISSIMILAR MEDIUM.
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 VERSION SUBMITTED SEPTEMBER 1972, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - R. J. TUTTLE, MEASUREMENTS OF GAMMA-RAY HEATING BY THERMOLUMINESCENT DOSIMETERS, TI-707-140-022, MAY 1972.
T. E. BURLIN, RADIATION DOSIMETRY, VOL. I, P. 331, FRANK H. ATTIX AND WILLIAM C. ROESCH, EDITORS, ACADEMIC PRESS, NEW YORK, 1968.
11. MACHINE REQUIREMENTS - 84K MEMORY
12. PROGRAMMING LANGUAGE USED - FORTRAN IV (H)
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHOR -
R. J. TUTTLE
ATOMICS INTERNATIONAL
P. O. BOX 209
CANCER PARK, CALIFORNIA 91304

16. MATERIAL AVAILABLE -
SOURCE DECK (266 CARDS)
SAMPLE PROBLEM (207 CARDS)
SAMPLE PROBLEM OUTPUT (10 PAGES)
REFERENCE REPORT, TI-707-140-022
17. CATEGORY - Q
KEYWORDS - DOSE RATES, GAMMA RADIATION, HEATING

1. NAME OR DESIGNATION OF PROGRAM - 3CB
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - UNIVAC1108, IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - 3DB IS A THREE-DIMENSIONAL (X-Y-Z, R-THETA-Z, TRIANGULAR-Z) MULTIGROUP DIFFUSION CODE FOR USE IN DETAILED FAST-REACTOR CRITICALITY AND BURNUP ANALYSIS. THE CODE CAN BE USED TO -
 - (A) COMPUTE K_{EFF} AND PERFORM CRITICALITY SEARCHES ON TIME ABSORPTION, REACTOR COMPOSITION, AND REACTOR DIMENSIONS BY MEANS OF EITHER A FLUX OR AN ADJOINT MODEL,
 - (B) COMPUTE MATERIAL BURNUP USING A FLEXIBLE MATERIAL SHUFFLING SCHEME, AND
 - (C) COMPUTE FLUX DISTRIBUTIONS FOR AN ARBITRARY EXTRANEEOUS SOURCE.
4. METHOD OF SOLUTION - EIGENVALUES ARE COMPUTED BY STANDARD SOURCE-ITERATION TECHNIQUES. GROUP REBALANCING AND SUCCESSIVE OVERRELAXATION WITH LINE INVERSION ARE USED TO ACCELERATE CONVERGENCE. ADJOINT SOLUTIONS ARE OBTAINED BY INVERTING THE INPUT DATA AND REDEFINING THE SOURCE TERMS. MATERIAL BURNUP IS BY REACTOR ZONE. THE BURNUP RATE IS DETERMINED BY THE ZONE AND ENERGY-AVERAGED CROSS SECTIONS WHICH ARE RECOMPUTED AFTER EACH TIME-STEP. THE ISOTOPIC CHAINS, WHICH CAN CONTAIN ANY NUMBER OF ISOTOPES ARE FORMED BY THE USER. THE CODE DOES NOT CONTAIN BUILT-IN OR INTERNAL CHAINS.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - SINCE VARIABLE DIMENSIONING IS EMPLOYED, NO SIMPLE BOUNDS CAN BE STATED.
6. TYPICAL RUNNING TIME - A K_{EFF} CALCULATION WITH A 20 X 20 X 20 MESH USING 2 ENERGY GROUPS REQUIRES APPROXIMATELY 30 MINUTES ON A UNIVAC1108. EACH SUCCESSIVE BURNUP TIME-STEP TAKES ABOUT A QUARTER OF THE ABOVE TIME. ON AN IBM360/195 COMPILATION AND LINK EDIT REQUIRE ABOUT 1 MINUTE AND EXECUTION ABOUT 7 MINUTES FOR THE SAMPLE PROBLEM WITH 10 X 10 X 10 MESH USING 2 ZONES AND 2 ENERGY GROUPS.
7. UNUSUAL FEATURES OF THE PROGRAM - THE INPUT DATA ARE ARRANGED SO THE CODE CAN BE USED EASILY FOR K_{EFF} AND SEARCH CALCULATIONS WITHOUT BURDENING THE USER WITH BURNUP PARAMETERS.
8. RELATED AND AUXILIARY PROGRAMS - THE FORMAT OF THE INPUT DATA (E. G. CROSS SECTIONS, GEOMETRY, AND COMPOSITION SPECIFICATIONS) IS COMPATIBLE WITH THE ONE- AND TWO-DIMENSIONAL TRANSPORT CODES DTF4 (ACC ABSTRACT 209) AND 2DF (ACC ABSTRACT 173), THE PERTURBATION CODE PERT5, THE ONE-DIMENSIONAL CROSS SECTION GENERATING CODE ICX (ACC ABSTRACT 374), AND THE TWO-DIMENSIONAL DIFFUSION BURNUP CODE 2DB (ACC ABSTRACT 325). ALL SIX CODES USE THE SAME INPUT MODULE.

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
UNIVAC1108 VERSION SUBMITTED OCTOBER 1972.
IBM360 VERSION SUBMITTED JULY 1973, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - R. W. HARDIE AND W. W. LITTLE, JR., 3DB, A THREE-DIMENSIONAL DIFFUSION THEORY BURNUP CODE, BNWL-1264, MARCH 1970.
K. D. LATHROP, DTF-IV, A FORTRAN-IV PROGRAM FOR SOLVING THE MULTIGROUP TRANSPORT EQUATION WITH ANISOTROPIC SCATTERING, LA-3373, JULY 15, 1965.
2DF, A TWO-DIMENSIONAL TRANSPORT CODE, DEVELOPED AT THE LOS ALAMOS SCIENTIFIC LABORATORY, (UNPUBLISHED).
R. W. HARDIE AND W. W. LITTLE, JR., PERT-V, A TWO-DIMENSIONAL PERTURBATION CODE FOR FAST REACTOR ANALYSIS, BNWL-1162, SEPTEMBER 1969.
R. W. HARDIE AND W. W. LITTLE, JR., 1CX, A ONE-DIMENSIONAL DIFFUSION CODE FOR GENERATING EFFECTIVE NUCLEAR CROSS SECTIONS, BNWL-954, MARCH 1969.
W. W. LITTLE, JR. AND R. W. HARDIE, 2DB USERS MANUAL REVISION 1, BNWL-831, REV. 1, FEBRUARY 1969.
NTRAN DESCRIPTION, EXCERPT FROM UNIVAC1107 FORTRAN IV MANUAL, UP-3569, REV. 1.
ETIME,ETIMEF,SETR DESCRIPTIONS, EXCERPT FROM CSCXRJE/CRJE REFERENCE, VOL. 2, LIBRARY ELEMENTS, F00003-02-00, APRIL 1971.
11. MACHINE REQUIREMENTS - 65K WORD MEMORY AND 11 PERIPHERAL STORAGE DEVICES (UNIVAC1108), 500K BYTES AND SAME NUMBER OF MASS STORAGE UNITS (IBM360)
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - EXEC-8 (UNIVAC1108), CS/360 (IBM360).
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - DUE TO DIFFERENCES IN WORD SIZE, THE IBM VERSION USES DOUBLE PRECISION. IN ADDITION, CERTAIN I/O ROUTINES FROM THE UNIVAC LIBRARY HAD TO BE WRITTEN IN FORTRAN FOR THE IBM VERSION.
15. NAME AND ESTABLISHMENT OF AUTHORS -
1108 R. W. HARDIE AND W. W. LITTLE, JR.
HANFORD ENGINEERING DEVELOPMENT LABORATORY
WESTINGHOUSE HANFORD COMPANY
P. O. BOX 1970
RICHLAND, WASHINGTON 99352

360 W. MROZ
APPLIED MATHEMATICS DIVISION
ARGONNE NATIONAL LABORATORY
9700 SOUTH CASS AVENUE
ARGONNE, ILLINOIS 60439

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16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (1108-2971 CARDS, 360-3804 CARDS)
SAMPLE PROBLEMS (1108-76 CARDS, 360-76 CARDS)
CONTROL INFORMATION (JCL 360-30 CARDS)
REFERENCE REPORT, BNWL-1264, AND EXCERPTS
17. CATEGORY - D
KEYWORDS - 3-DIMENSIONAL, X-Y-Z, R-THETA-Z, TRIANGULAR-Z, MULTI-
GROUP DIFFUSION, FAST REACTORS, CRITICALITY, BURNUP,
DTF4 CODES, 2DF CODES, PERT5 CODES, 1DX CODES, 2DB
CODES

1. NAME OR DESIGNATION OF PROGRAM - BEHAVE2
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - GE635
3. DESCRIPTION OF PROBLEM OR FUNCTION - BEHAVE2 CALCULATES THE POSITION IN SPACE OF CLADDING, FUEL, AND VOIDAGE IN AN OPERATING OXIDE FUEL PIN WITH UNFAILED CLADDING. AXIAL SYMMETRY IS ASSUMED THROUGHOUT THE PROGRAM. ALSO CALCULATED ARE STRESS, STRAIN, DISPLACEMENT, AND TEMPERATURE FIELDS. INFLUENTIAL PROCESSES SIMULATED INCLUDE CRACKING OF FUEL, DILATATION OF FUEL AND CLADDING DUE TO IRRADIATION EFFECTS AND THERMAL EXPANSION, FUEL DENSIFICATION BY BOTH STRESS- AND DIFFUSION-CONTROLLED PROCESSES, AXIAL SLIPPAGE OR LOCKING AT THE FUEL-CLADDING INTERFACE AND AXIAL FLOW OF FUEL.
4. METHOD OF SOLUTION - THE FINITE-ELEMENT METHOD IS USED IN THE CLADDING AND OUTER FUEL ZONES. DISPLACEMENT COMPATIBILITY IS MAINTAINED AXIALLY AS WELL AS RADIALLY BETWEEN ADJACENT ELEMENTS. CIRCULAR CYLINDRICAL RING ELEMENTS WITH THREE DEGREES OF FREEDOM ARE USED IN THE FUEL AND CLADDING. NO RELATIVE SHEAR DEFORMATION IS PERMITTED BETWEEN RING ELEMENTS, BUT A SPECIAL SHEAR ELEMENT AT THE FUEL-CLADDING INTERFACE PERMITS RELATIVE SLIPPAGE OR PRODUCES FRICTION-INDUCED FUEL PELLET LOCKING. AN INTERIOR INVISCID FUEL ZONE INTERACTS WITH THE OUTER, STRUCTURAL FUEL ZONE AS A CONSTANT PRESSURE BOUNDARY CONDITION. WITHIN THE INVISCID ZONE, AXIAL TRANSFER OF FUEL BY A FLOW PROCESS OCCURS UNDER CERTAIN CONDITIONS. SWELLING OF FUEL AND CLADDING AND FISSION GAS RELEASES ARE REPRESENTED BY EMPIRICALLY DERIVED MODELS.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE PROGRAM IS DIMENSIONED FOR A MAXIMUM GRID STRUCTURE AS DEFINED BELOW -
CLADDING DIVIDED RADIALLY INTO 10 RINGS,
OUTER (STRUCTURAL) FUEL ZONE DIVIDED RADIALLY INTO 10 RINGS,
MIDDLE (NONTRANSPORT) FUEL REGION DIVIDED RADIALLY INTO 10 RINGS,
INNER (TRANSPORT) FUEL REGION DIVIDED RADIALLY INTO 10 RINGS,
FUEL AND CLADDING DIVIDED AXIALLY INTO 5 SECTIONS.
6. TYPICAL RUNNING TIME - A PROBLEM EMPLOYING THE MAXIMUM GRID STRUCTURE IN THE FUEL, 2 RINGS IN THE CLADDING, AND 37 TIME-STEPS REQUIRES ABOUT 13 MINUTES OF GE635 PROCESSOR TIME.
7. UNUSUAL FEATURES OF THE PROGRAM -
 - (A) AXIALLY INTERACTIVE EFFECTS ARE CALCULATED.
 - (B) CRACKS ARE REPRESENTED AS A CONTINUUM, PRODUCING ZERO STRESS NORMAL TO THE CRACK PLANE. CRACKING OCCURS UNDER ANY POSITIVE STRESS NORMAL TO TWO POSSIBLE DIRECTIONS OF CRACKING, (R, THETA) AND (R, Z) PLANES.
 - (C) RAPID CLOSURE OF THE FUEL-CLADDING GAP IS ASSUMED, PERMITTED BY IMMEDIATE CRACKING OF THE FUEL AT THE FIRST APPLICATION OF POWER.

7. UNUSUAL FEATURES OF THE PROGRAM (CONTINUED)
 - (D) FUEL IS DIVIDED INTO TWO PHENOMENOLOGICAL ZONES, THE INNER ZONE BEING MADE UP OF TWO REGIONS. BOUNDARIES BETWEEN THE ZONES AND REGIONS ARE DEFINED BY TIME-TEMPERATURE RELATIONS AND MOVE IN SPACE AS A FUNCTION OF TIME. CRACK CLOSURE IS ASSUMED IN THE INNER ZONE.
 - (E) THE NODAL GRID IS REDEFINED IN THE RADIAL DIRECTION EVERY TIME-STEP BY AVERAGING CONDITIONS FROM THE OLD GRID. A FINE GRID IS IMPOSED IN REGIONS OF RAPIDLY CHANGING PROPERTIES.
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
GE635 VERSION SUBMITTED OCTOBER 1972.
10. REFERENCES - S. OLDBERG, JR., BEHAVE-2, OXIDE FUEL PERFORMANCE CODE IN TWO SPATIAL DIMENSIONS AND TIME, GEAP-13788, FEBRUARY 1972.
LINK DESCRIPTION, GE NOTE, BN90, PPS. 3-18, 7-1 THROUGH 7-5, 1972.
11. MACHINE REQUIREMENTS - 41K FAST MEMORY
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - GECOS III, SAL-3.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHOR -
S. OLDBERG, JR.
BREEDER REACTOR DEPARTMENT
GENERAL ELECTRIC COMPANY
310 DEGUIGNE DRIVE
SUNNYVALE, CALIFORNIA 94086
16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (6268 CARDS)
SAMPLE PROBLEM (37 CARDS)
CONTROL INFORMATION (129 CARDS)
SAMPLE PROBLEM OUTPUT (36 SELECTED PAGES)
REFERENCE REPORT AND GE NOTE
17. CATEGORY - I
KEYWORDS - FUEL ELEMENTS, STRESSES, CLADDING, THERMAL EXPANSION, FINITE-ELEMENT

1. NAME OR DESIGNATION OF PROGRAM - VIEWPIN
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - THE PROGRAM CALCULATES VIEW FACTORS FOR CYLINDRICAL PINS WHENEVER THE PROBLEM CAN BE REPRESENTED TWO-DimensionALLY.
4. METHOD OF SOLUTION - THE PROGRAM USES A MAXIMUM OF TWO SHADOWING PINS AND PERFORMS A SINGLE INTEGRATION.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE LENGTH OF THE CYLINDRICAL PINS OF THE PHYSICAL PROBLEM MUST BE MUCH GREATER THAN THE DIAMETER OF ANY OF THE PINS.
6. TYPICAL RUNNING TIME - THE CODE WILL CALCULATE FOUR VIEW FACTORS PER SECOND WITH AN ACCURACY EXCEEDING 0.01%, ON THE IBM 360/75.
7. UNUSUAL FEATURES OF THE PROGRAM - A RENORMALIZATION PROCEDURE IS PROVIDED BY THE CODE.
8. RELATED AND AUXILIARY PROGRAMS - RADHT, A ROUTINE FOR COMPUTING RADIATION HEAT TRANSFER IN THE BWR-FLECHT ROD BUNDLE
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 VERSION SUBMITTED OCTOBER 1972, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCE - G. L. SINGER, VIEWPIN, A FORTRAN PROGRAM TO CALCULATE VIEW FACTORS FOR CYLINDRICAL PINS, ANCR-1054, MARCH 1972.
11. MACHINE REQUIREMENTS - 50K BYTES
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - CS/360.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHOR -
G. L. SINGER
AEROJET NUCLEAR COMPANY
P. O. BOX 1845
IDAHO FALLS, IDAHO 83401
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (550 CARDS)
SAMPLE PROBLEM (106 CARDS)
CONTROL INFORMATION (JCL 9 CARDS)
LOAD MODULE PROLIBC (35 BLOCKS)
REFERENCE REPORT

ACC ABSTRACT 569

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11/73

17. CATEGORY - J

KEYWORDS - FUEL ELEMENTS, CYLINDERS, RADIATION EFFECTS, 2-DIMEN-
SIGNAL, RADHT CODES

1. NAME OR DESIGNATION OF PROGRAM - STRIPE(M0650)
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - STRIPE EXAMINES THE DEFORMATIONS IMPOSED ON THE CLADDING OF CYLINDRICAL FUEL ELEMENTS DUE TO DIFFERENTIAL THERMAL EXPANSIONS DURING ABRUPT POWER INCREASES. THE TITLE IS TAKEN FROM STRESSES AND CRACKING IN PELLETS. THE CALCULATIONAL MODEL INCLUDES EFFECTS OF PELLET CRACKING, THE CONSTRAINT OF SYSTEM PRESSURE AND CLADDING, COMPRESSIVE PLASTIC FLOW IN THE FUEL AND THE TEMPERATURE DEPENDENCE OF MATERIAL PROPERTIES.
4. METHOD OF SOLUTION - THICK-WALLED INTEGRAL SOLUTIONS ARE USED FOR VARIOUS REGIONS OF THE FUEL PELLETS AND CLADDING. TRAPEZOIDAL INTEGRATION IS USED IN FINITE-DIFFERENCE EQUATIONS TO APPROXIMATE THESE INTEGRALS THAT RESULT IN DESCRIBING DIFFERENTIAL THERMAL EXPANSION. THE METHOD OF BISECTION ITERATION SCHEME IS USED TO SOLVE A PAIR OF NONLINEAR ALGEBRAIC-INTEGRAL EQUATIONS TO DETERMINE THE DEPTH OF CRACKING.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
100 RADIAL SECTIONS IN THE FUEL FOR THE COMPUTING GRID
50 RADIAL SECTIONS IN THE CLAD FOR THE COMPUTING GRID
PLASTIC-PERFECTLY PLASTIC PROPERTIES ARE USED FOR BOTH THE PELLET AND CLAD.
6. TYPICAL RUNNING TIME - RUNNING TIME IS TYPICALLY ABOUT 5 SECONDS PER CASE. IF PLASTIC FLOW OR CLAD YIELDING CALCULATIONS ARE REQUIRED, THE COMPUTER TIME INCREASES TO ABOUT 30 SECONDS PER CASE.
7. UNUSUAL FEATURES OF THE PROGRAM - STRIPE DETERMINES THE DEPTH OF RADIAL CRACKING AND ITS EFFECTS ON PELLET EXPANSION. IT ACCOUNTS FOR A PLASTIC INNER ZONE IN THE FUEL PELLET AS WELL AS YIELDING OF THE CLADDING. SEVERAL AXIAL RESTRAINT OPTIONS SUCH AS PLANE STRAIN OR PLANE STRESS ARE AVAILABLE.
8. RELATED AND AUXILIARY PROGRAMS - ESSENTIAL TEMPERATURE PROFILES MAY BE OBTAINED FROM OUTPUT OF THE PROGRAM FIGRO (ACC ABSTRACT 272), WHICH SOLVES THE RADIAL HEAT CONDUCTION PROBLEM FOR CYLINDRICAL FUEL ELEMENTS, USING A TEMPERATURE VARYING THERMAL CONDUCTIVITY FOR OXIDE FUELS. STRIPE USES THE BETTIS ENVIRONMENTAL ROUTINES (ACC ABSTRACT 478).
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
CDC6600 VERSION SUBMITTED NOVEMBER 1972.
10. REFERENCES - W. J. O'DONNELL, W. G. CLARKE, AND W. R. CAMPBELL, AN ANALYSIS OF TRANSIENT CLAD STRAINS IN CYLINDRICAL FUEL ELEMENTS INCLUDING THE EFFECTS OF OXIDE PELLET CRACKING (STRIPE), WAPD-TM-652, FEBRUARY 1970.

ACC ABSTRACT 570

-2-

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10. REFERENCES (CONTINUED)

C. J. PFEIFER, CCC-6600 FORTRAN PROGRAMMING - BETTIS ENVIRONMENTAL REPORT, WAPD-TM-668, JANUARY 1967.

11. MACHINE REQUIREMENTS - 45,000 OCTAL LOCATIONS OF CENTRAL MEMORY

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCCPE 3.1.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -

W. J. O'DONNELL
O'DONNELL AND ASSOCIATES, INC.
5100 CENTRE AVENUE
PITTSBURGH, PENNSYLVANIA 15232
W. G. CLARKE AND W. R. CAMPBELL
BETTIS ATOMIC POWER LABORATORY
WESTINGHOUSE ELECTRIC CORPORATION
P. O. BOX 79
WEST MIFFLIN, PENNSYLVANIA 15122

16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION

SOURCE DECK (987 CARDS)

SAMPLE PROBLEM (114 CARDS)

REFERENCE REPORT, WAPD-TM-652

17. CATEGORY - I

KEYWORDS - DEFORMATION, CYLINDERS, FUEL ELEMENTS, CLADDING, THERMAL EXPANSION, STRESSES

1. NAME OR DESIGNATION OF PROGRAM - CHECK3/RIGEL3
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600, IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - THESE PROGRAMS ARE USED TO PROCESS ENDF/B VERSION III DATA. IN ADDITION, THE CDC6600 PROGRAMS WILL PROCESS ENDF/B VERSION IV DATA. CHECK3 CHECKS THAT THE ENDF/B TAPES ARE IN PROPER FORMAT AND ALL FIELDS ARE WITHIN SPECIFIED LIMITS, RATHER THAN THE PHYSICS OF THE DATA LIBRARY. ANGULAR DISTRIBUTIONS RECONSTRUCTED FROM LEGENDRE COEFFICIENTS ARE EVERYWHERE POSITIVE. RIGEL3 WILL PERFORM ANY OR ALL OF THE FOLLOWING OPERATIONS - SELECTIVELY RETRIEVE ENDF/B DATA ON FROM 1 TO 9 ENDF/B TAPES, MERGE RETRIEVED ENDF/B DATA ONTO FROM 1 TO 8 ENDF/B RESULT TAPES, CHANGE TAPE ARRANGEMENT (FROM STANDARD TO ALTERNATE OR VICE-VERSA) AND CHANGE TAPE MODE.
4. METHOD OF SOLUTION - IN CHECK3 MOST DATA ARE SUBMITTED TO RANGE LIMIT CHECKS TO INSURE THE STRUCTURE AGREES WITH ENDF/B-DEFINED SPECIFICATIONS. THE DEVIANT POINT CHECK (DETECTION OF MISPUNCHED VALUES) IS ACCOMPLISHED BY SEQUENTIALLY CHECKING FIVE DATA POINTS, TWO POINTS ON EITHER SIDE OF THE POINT UNDER SCRUTINY, FORWARD EXTRAPOLATION ON THE FIRST TWO POINTS, REVERSE EXTRAPOLATION ON THE FOURTH AND FIFTH, AND INTERPOLATIONS BETWEEN THE SECOND AND FOURTH POINTS. IF THE THIRD POINT DOES NOT FALL WITHIN THE RANGE OF THE VALUES CALCULATED BY EXTRAPOLATIONS AND INTERPOLATION, THE VALUE IS LISTED AS DEVIANT. IN ESSENCE, THE ABOVE PROCEDURE MERELY SIMULATES A CHECKING OF GRAPHICAL DATA BY EYE. CHECKING OF LEGENDRE COEFFICIENTS FOR FEASIBILITY AND POSITIVITY IS ACCOMPLISHED BY CONVERTING THE COEFFICIENTS TO MOMENTS, CHECKING WHETHER MOMENTS ARE PHYSICALLY POSSIBLE AND TESTING WHETHER THE LEGENDRE EXPANSION IS NEGATIVE WITHIN THE INTERVAL -1 TO 1 BY THE STURM SEQUENCE METHOD. IF THE LEGENDRE EXPANSION IS NEGATIVE, IT IS DEFINED OVER THE NEGATIVE REGION(S) AND INTEGRATED, THUS DETERMINING THE TOTAL NEGATIVE PROBABILITY.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - IN CHECK3 CORRECT STRUCTURE OF THE DATA TAPE IS ASSUMED AND MINOR ANOMALIES ARE NOTED. COMMON AND MAJOR IRREGULARITIES CAUSE TERMINATION OF EXECUTION ACCOMPANIED BY A CORE DUMP.
6. TYPICAL RUNNING TIME -
7. UNUSUAL FEATURES OF THE PROGRAM - IN CHECK3 THERE ARE TWO OUTPUT OPTIONS - (A) LONG FORM, WHICH LISTS EACH CARD IMAGE AS WELL AS THE ANOMALIES ENCOUNTERED, AND (B) SHORT FORM, WHICH LISTS ONLY THE ANOMALIES ENCOUNTERED BY THE PROGRAM (MINIMUM OUTPUT OPTION).
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
CDC6600 VERSIONS OF CHECK3 AND RIGEL3 SUBMITTED AUGUST

ACC ABSTRACT 571

-2-

01/74

9. STATUS (CONTINUED)
1972.
IBM360 VERSION OF RIGEL3 SUBMITTED JUNE 1972.
10. REFERENCE - NATIONAL NEUTRON CROSS SECTION CENTER, DESCRIPTION OF THE ENDF/B PROCESSING CODES AND RETRIEVAL SUBROUTINES, BNL-50300 (ENDF-110), SEPTEMBER 1967, REVISED APRIL 1969, REVISED SEPTEMBER 1970, REVISED JUNE 1971.
11. MACHINE REQUIREMENTS - FOR CHECK3 2 SCRATCH DEVICES
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE (CDC6600), OS/360 (IBM360).
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
6600 COELLI OZER
NATIONAL NEUTRON CROSS SECTION CENTER
BROOKHAVEN NATIONAL LABORATORY
UPTON, LONG ISLAND, NEW YORK 11973

360 E. M. PENNINGTON
APPLIED PHYSICS DIVISION
ARGONNE NATIONAL LABORATORY
9700 SOUTH CASS AVENUE
ARGONNE, ILLINOIS 60439
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (CHECK3 6600-3455 CARDS, RIGEL3 6600-2125 CARDS,
360-2123 CARDS)
REFERENCE REPORT
17. CATEGORY - M
KEYWORDS - DATA PROCESSING, CROSS SECTIONS, GRAPHS, INPUT DATA,
ENDF/B, LIBRARIES, MAINTENANCE, RETRIEVAL

1. NAME OR DESIGNATION OF PROGRAM - XLACS
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - XLACS CALCULATES FINE-GROUP AVERAGED NEUTRON CROSS SECTIONS FROM ENDF/B DATA. ITS PRIMARY PURPOSE IS TO PRODUCE FULL RANGE MULTIGROUP LIBRARIES FOR THE XSDRN PROGRAM (ACC ABSTRACT 493). PROVISIONS ARE INCLUDED FOR TREATING FAST, RESONANCE, AND THERMAL ENDF/B DATA. FINE-GROUP ENERGY STRUCTURES AND EXPANSION ORDERS USED TO REPRESENT DIFFERENTIAL CROSS SECTIONS FOR XSDRN CAN BE ARBITRARILY SET BY THE USER. CROSS SECTIONS CAN BE AVERAGED OVER AN ARBITRARY INPUT WEIGHTING FUNCTION OR BY ANY OF SEVERAL BUILT-IN FUNCTIONS.
4. METHOD OF SOLUTION - IN THE RESOLVED RESONANCE RANGE XLACS ACCEPTS EITHER SINGLE OR MULTI-LEVEL BREIT-WIGNER PARAMETERS AND CALCULATES INFINITE DILUTION AND BACKGROUND CROSS SECTIONS CONSISTENT WITH THE NORDHEIM INTEGRAL TREATMENT USED IN XSDRN. DOPPLER BROADENING IS PROVIDED THROUGH THE USE OF PSI AND CHI ROUTINES. THE UNRESOLVED TREATMENT STEMS FROM MC**2 (ACC ABSTRACT 355) BUT HAS BEEN MODIFIED TO TREAT THE OVERLAP OF UNRESOLVED RESONANCE SEQUENCES. UNRESOLVED CROSS SECTIONS INCLUDE SOME SHIELDING EFFECTS THROUGH A (1/SIGMA_T) WEIGHTING AND CAN INCLUDE DOPPLER BROADENING. SMOOTH CROSS SECTIONS ARE CALCULATED BY AVERAGING THE ENDF/B POINT DATA OVER EITHER A USER-SUPPLIED INPUT SPECTRUM OR BUILT-IN SPECTRA. ELASTIC SCATTERING MATRICES ARE COMPUTED FROM THE SCATTERING ANGULAR DISTRIBUTION DATA SPECIFIED AS LEGENDRE EXPANSION COEFFICIENTS. AN INELASTIC SCATTERING TREATMENT IS PROVIDED FOR ALL PRESENT FORMS OF ENDF/B FILE 5 DATA USING EITHER A DISCRETE LEVEL OR AN EVAPORATION MODEL. THERMAL CROSS SECTION MATRICES ARE CALCULATED THROUGH THE USE OF PROCEDURES TAKEN FROM THE FLANGE2 CODE (ACC ABSTRACT 368).
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE PRINCIPAL RESTRICTION IS THE AVAILABILITY OF ADEQUATE CORE STORAGE TO ASSIMILATE REQUIRED ARRAYS. THE CODE IS FLEXIBLY-DIMENSIONED WHICH MEANS THAT ARRAY SIZES ARE SET FOR THE PARTICULAR PROBLEM AT EXECUTION TIME. CORE STORAGE REQUIREMENTS ARE NOT AFFECTED BY THE NUMBER OF NUCLIDES IN A CASE.
6. TYPICAL RUNNING TIME - RUNNING TIME IS A FUNCTION OF NUMBER OF RESONANCES, NUMBER OF GROUPS, DOPPLER BROADENING, AND NUMBER OF THERMAL SCATTERING KERNELS BEING CALCULATED. A U238 CALCULATION WITH 68 GROUPS, NO THERMAL CALCULATION, AND NO DOPPLER BROADENING REQUIRES 1.65 MINUTES. A PU239 CALCULATION WITH 123 GROUPS (30 THERMAL), ONE THERMAL KERNEL, AND DOPPLER BROADENING TAKES 6.72 MINUTES. THE CALCULATION OF BOTH FE AND H2O WITH 123 GROUPS (30 THERMAL), AND ONE THERMAL KERNEL REQUIRES 4.74 MINUTES.
7. UNUSUAL FEATURES OF THE PROGRAM - IN CONTRAST WITH MCST ENDF/B PROCESSING PROGRAMS, THE VARIABLE DIMENSIONING TECHNIQUE EMPLOYED

7. UNUSUAL FEATURES OF THE PROGRAM (CONTINUED)
BY XLACS PERMITS OPTIMAL USE OF AVAILABLE CORE STORAGE. THE PROGRAM TREATS BOTH FAST AND THERMAL ENDF/B DATA IN A SINGLE CALCULATION. MIXED ENDF/B TAPE MODES (BCD AND BINARY) ARE PERMITTED. FOR CONVENIENCE, EDITING, UPDATING, AND PLOTTING CAPABILITIES ARE PROVIDED.
8. RELATED AND AUXILIARY PROGRAMS - WHEN ANGULAR DISTRIBUTIONS OF SECONDARY NEUTRONS ARE SPECIFIED AS TABULAR FUNCTIONS THE SAD PROGRAM MUST BE USED PRIOR TO RUNNING XLACS TO CONVERT THE DATA TO LEGENDRE EXPANSION COEFFICIENTS. THE XSDRN PROGRAM USES THE CROSS SECTIONS GENERATED BY XLACS. HOWEVER, THE XSDRN TAPE FORMAT PRODUCED BY XLACS IS SOMEWHAT MORE GENERAL THAN THE TAPE FORMAT USED BY PRESENT XSDRN CODES. AN AUXILIARY PROGRAM, CCNVERT, IS AVAILABLE TO CONVERT TO THE USABLE FORMAT.
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 VERSION SUBMITTED NOVEMBER 1972, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - N. M. GREENE, J. L. LUCIUS, J. E. WHITE, R. Q. WRIGHT, C. W. CRAVEN, JR., AND M. L. TOBIAS, XLACS, A PROGRAM TO PRODUCE FINE GROUP AVERAGED NEUTRON CROSS SECTIONS FROM ENDF/B, ORNL-TM-3646, APRIL 3, 1972.
M. K. DRAKE, EDITOR, DATA FORMATS AND PROCEDURES FOR THE ENDF NEUTRON CROSS SECTION LIBRARY, BNL-50279, OCTOBER 1970.
N. M. GREENE AND C. W. CRAVEN, JR., XSDRN, A DISCRETE ORDINATES SPECTRAL AVERAGING CODE, ORNL-TM-2500, JULY 1969.
L. W. NORDHEIM, THE THEORY OF RESONANCE ABSORPTION, SYMPOSIUM ON APPLIED MATHEMATICS, VOL. 11, 1961.
D. M. O'SHEA, B. J. TOPPEL, AND A. L. RAGO, MC**2 - A CODE TO CALCULATE MULTIGROUP CROSS SECTIONS, ANL-7318, JUNE 1967.
H. C. HONECK AND D. R. FINCH, FLANGE-II, A CODE TO PROCESS THERMAL NEUTRON DATA FROM AN ENDF/B TAPE, DP-1278, OCTOBER 1971.
11. MACHINE REQUIREMENTS - 330K BYTES OF CORE STORAGE AND EXTERNAL STORAGE DEVICES SUCH AS MAGNETIC TAPES OR DISKS
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - CS/360.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THE PROGRAM IS PRESENTLY USED IN A 3-LEVEL OVERLAY STRUCTURE CONSISTING OF 19 SEPARATE SEGMENTS. TWO FUNCTIONS, MCDEL AND ICLOCK, ARE NOT INCLUDED WITH THE PROGRAM AND SHOULD BE DUMMIED OUT.
15. NAME AND ESTABLISHMENT OF AUTHORS -
N. M. GREENE, J. L. LUCIUS, J. E. WHITE,
R. Q. WRIGHT, C. W. CRAVEN, JR., AND M. L. TOBIAS

15. NAME AND ESTABLISHMENT OF AUTHOR(S) (CONTINUED)
OAK RIDGE NATIONAL LABORATORY
P. O. BOX X
OAK RIDGE, TENNESSEE 37830
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (XLACS 12,973 CARDS, CONVERT 593 CARDS)
SAMPLE PROBLEMS (XLACS 47 CARDS)
CONTROL INFORMATION (XLACS 80 CARDS)
LOAD MODULE XLAC (567 BLOCKS)
SAMPLE PROBLEM OUTPUT ON TAPE (PROBLEM1 99 BLOCKS, PROBLEM2
89 BLOCKS)
SAMPLE PROBLEM OUTPUT (42 SELECTED PAGES)
REFERENCE REPORT, ORNL-TM-3646
17. CATEGORY - B
KEYWORDS - NEUTRON CROSS SECTIONS, MULTIGROUP LIBRARIES, ENDF/B,
XSDB CODES, SAD CODES, MC**2 CODES, FLANGE2 CODES

1. NAME OR DESIGNATION OF PROGRAM - TWOTRAN-PNVW
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600/7600
3. DESCRIPTION OF PROBLEM OR FUNCTION - TWOTRAN-PNVW SOLVES TWO-DIMENSIONAL PARTICLE TRANSPORT PROBLEMS FOR X-Y, R-Z, AND R-THETA GEOMETRIES. BOTH DIRECT AND ADJOINT, HOMOGENEOUS (KEFF OR PARAMETRIC EIGENVALUE SEARCHES) OR INHOMOGENEOUS TIME-INDEPENDENT PROBLEMS ARE SOLVED SUBJECT TO VACUUM, REFLECTIVE, PERIODIC OR INPUT SPECIFICATION OF BOUNDARY FLUX CONDITIONS. BOTH ANISOTROPIC INHOMOGENEOUS PROBLEMS AND GENERAL ANISOTROPIC SCATTERING PROBLEMS ARE TREATED.
4. METHOD OF SOLUTION - TWOTRAN-PNVW IS DESIGNED TO SOLVE DISCRETE ORDINATES EQUATIONS THAT HAVE BEEN CONVERTED TO EQUATIONS LIKE SPHERICAL HARMONICS EQUATIONS TO ELIMINATE RAY EFFECTS. THE CONVERSION IS ACCOMPLISHED BY USING A SPECIALLY CONSTRUCTED SOURCE. CONSTRUCTION OF THE SPECIAL SOURCE IS OPTIONAL SO THAT NORMAL DISCRETE ORDINATES EQUATION SOLUTIONS ARE ALSO POSSIBLE. SPACE DEPENDENCE IS APPROXIMATED USING A VARIABLE-WEIGHTED DIAMOND-DIFFERENCE SCHEME FOR CALCULATING SPATIAL DERIVATIVES. ENERGY DEPENDENCE IS TREATED BY THE MULTIGROUP APPROXIMATION. ANISOTROPIC SCATTERING AND ANISOTROPIC INHOMOGENEOUS SOURCES ARE REPRESENTED BY FINITE SPHERICAL HARMONICS EXPANSIONS. WITHIN GROUP ITERATIONS, KEFF ITERATIONS AND EIGENVALUE SEARCH ITERATIONS ARE ACCELERATED BY A COARSE MESH PARTICLE REBALANCING ALGORITHM.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE VARIABLE-DIMENSIONING CAPABILITY OF FORTRAN IV IS USED SO THAT ANY COMBINATION OF PROBLEM PARAMETERS LEADING TO A COMMON VECTOR LENGTH LESS THAN MAXLEN CAN BE USED. MAXLEN IS SLIGHTLY GREATER THAN 40,000 WORDS FOR THE CDC7600. WITH A FEW EXCEPTIONS ONLY WITHIN-GROUP PROBLEM DATA ARE STORED IN FAST MEMORY. DATA FOR ALL OTHER GROUPS ARE STORED IN AUXILIARY STORAGE. ARBITRARY NUMBERS OF GROUPS OF UP OR DOWN SCATTERING ARE ALLOWED.
6. TYPICAL RUNNING TIME - A ONE-GROUP, S8 CONVERTED TO P5, ISOTROPIC PROBLEM WITH MESH SIZE 20 X 20 REQUIRES 12 SECONDS ON THE CDC7600.
7. UNUSUAL FEATURES OF THE PROGRAM - UNUSUAL FEATURES INCLUDE OPTIONAL SPHERICAL HARMONIC OR DISCRETE ORDINATE SOLUTION, COARSE MESH CONVERGENCE ACCELERATION, COARSE MESH SPATIAL AND ANGULAR ORGANIZATION TO PERMIT LARGER PROBLEMS, GENERAL ANISOTROPIC SCATTERING AND INHOMOGENEOUS SOURCE OPTION, INPUT SPECIFICATION OF TOP, BOTTOM OR RIGHT BOUNDARY FLUXES, BUILT-IN DISCRETE ORDINATES CONSTANTS (S2, S4, ...S16) AND FIDC CROSS SECTION INPUT OPTION.
8. RELATED AND AUXILIARY PROGRAMS - TWOTRAN GENERAL-GEOMETRY (ACC ABSTRACT 358)

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
CDC7600 VERSION SUBMITTED NOVEMBER 1972.
10. REFERENCES - K. D. LATHROP, F. W. BRINKLEY, AND P. ROOD, THEORY AND USE OF THE SPHERICAL HARMONICS, FIRST COLLISION SOURCE, AND VARIABLE WEIGHT VERSIONS OF THE TWOTRAN PROGRAM, LA-4600, MARCH 1972.
K. D. LATHROP AND F. W. BRINKLEY, THEORY AND USE OF THE GENERAL-GEOMETRY TWOTRAN PROGRAM, LA-4432, MAY 1970.
RAY DAVENPORT (ED.), ELEMENTARY GUIDE TO THE CONTROL DATA 7600, UNIVERSITY OF CALIFORNIA, LOS ALAMOS SCIENTIFIC LABORATORY, PROGRAMMERS INFORMATION MANUAL, VOL. 5A, 1972.
11. MACHINE REQUIREMENTS - 5 OUTPUT UNITS (DISK, DRUMS OR TAPES) IN ADDITION TO 2 SYSTEM INPUT/OUTPUT UNITS, A CDC EXTENDED CORE STORAGE UNIT OR A LARGE BULK MEMORY (DISK, DRUMS OR TAPES CAN BE SUBSTITUTED FOR THIS REQUIREMENT)
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - COS.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
K. D. LATHROP AND F. W. BRINKLEY
LOS ALAMOS SCIENTIFIC LABORATORY
P. O. BOX 1663
LOS ALAMOS, NEW MEXICO 87544
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (6394 CARDS)
SAMPLE PROBLEM (86 CARDS)
SAMPLE PROBLEM OUTPUT (30 PAGES)
REFERENCE REPORT, LA-4600
17. CATEGORY - C
KEYWORDS - 2-DIMENSIONAL, X-Y, R-Z, R-THETA, TRANSPORT THEORY, SPHERICAL HARMONICS, TWOTRAN GENERAL GEOMETRY CODES

1. NAME OR DESIGNATION OF PROGRAM - MACS LATTICE VIBRATION CODES
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - THIS PACKAGE OF SEVEN RELATED CODES IS BASICALLY AIMED AT GIVING MAXIMUM CAPABILITY FOR CALCULATING SLOW-NEUTRON SCATTERING BY MODERATORS.

MACS-C COMPUTES CRYSTAL VIBRATIONS WHEN THE POTENTIAL ENERGY IS A SUM OF PARTS ARISING FROM SHORT-RANGE FORCES AND LONG-RANGE COULOMB INTERACTIONS. IT ALSO OBTAINS JACOBIAN MATRICES FOR DETERMINING ADJUSTMENTS IN FORCE CONSTANTS AND IONIC CHARGE WHICH CAN LEAD TO IMPROVED AGREEMENT WITH DATA. STRUCTURE FACTORS FOR NEUTRON INELASTIC SCATTERING CAN ALSO BE CALCULATED.

MACS-J COMPUTES THE DYNAMICAL MATRIX FOR THE HARMONIC OSCILLATIONS OF A CRYSTAL, ITS EIGENVALUES AND EIGENVECTORS, THE CORRESPONDING STRUCTURE FACTORS FOR COHERENT SINGLE-PHONON SCATTERING OF NEUTRONS, AND JACOBIAN MATRICES FOR USE IN ADJUSTING FORCE CONSTANTS TO FIT CALCULATED TO OBSERVED DISPERSION CURVES.

REVISED-D CALCULATES VALANCE COORDINATES IN TERMS OF MASS ADJUSTED ATOM DISPLACEMENTS, TOGETHER WITH COORDINATES WHICH DEFINE RIGID GROUP ROTATIONS.

REVISED-MVFC CONSTRUCTS FORCE CONSTANT MATRICES FOR USE IN VALANCE FORCE POTENTIAL FUNCTIONS WHICH ARE USED IN OTHER PROGRAMS DEALING WITH MOLECULAR AND CRYSTAL VIBRATIONS.

ADJUSTER IS A FORCE ADJUSTER PROGRAM TO OBTAIN A LEAST SQUARES FIT TO OBSERVED FREQUENCIES OF MOLECULES AND CRYSTALS.

DIPOLE-SUM CALCULATES DIPOLE SUMS FOR AN ARBITRARY CRYSTAL.

MODEL-PI CALCULATES CRYSTAL VIBRATIONS WHEN THE POTENTIAL ENERGY IS A SUM OF SHORT-RANGE AND LONG- OR INTERMEDIATE-RANGE TERMS IN THE DIPOLE COORDINATE APPROXIMATION. IT ALSO OBTAINS JACOBIAN MATRICES FOR USE IN ADJUSTING INPUT PARAMETERS.
4. METHOD OF SOLUTION -

IN MACS-C, ADJUSTER, AND REVISED-D, MATRIX MANIPULATIONS ARE APPLIED TO MATRICES WHICH DESCRIBE PHYSICAL CONDITIONS.

IN MACS-J, FIRST-ORDER DIFFERENCE EQUATIONS ARE SUBSTITUTED FOR PARTIAL DIFFERENTIAL EQUATIONS FOR JACOBIAN ELEMENTS.

IN MVFC THE USER EMPLOYS A SET OF CRITERIA FOR DEFINING DIFFERENT TYPES OF INTERACTIONS TO PREPARE BY HAND THE INPUT TO THE PROGRAM. FOR EXAMPLE, IF TWO-ANGLE COORDINATES WHICH HAVE A COMMON ATOM AT THE END OF A LEG OF EACH ANGLE INTERACT, THE USER MUST SPECIFY THE ASSOCIATED CRITERIA WHICH INCLUDE THE DISTANCE BETWEEN THE TWO APEX ATOMS AND BETWEEN THE FARTHEST SEPARATED LEG ATOMS. THE REVISED-MVFC CODE USES THE POSITIONS IN THE PRIMITIVE CELL AND SEARCHES FOR ALL COORDINATE INTERACTIONS WHICH SATISFY EACH OF THE CRITERIA STIPULATED IN MVFC. THE USER IS SPARED THE TEDIOUS TASK OF CALCULATING ANGLES BETWEEN BONDS, DISTANCES BETWEEN ATOMS, ETC.

IN DIPOLE-SUM, THE PROCEDURE OF KAPLAN AND SULLIVAN IS APPLIED.

IN MODEL-PI, THE EIGENVALUES AND EIGENVECTORS OF A COMPLEX HERMITIAN MATRIX ARE USED.

5. RESTRICTIONS UPON THE COMPLEXITY OF THE PROBLEM -

FOR ALL CODES WHICH PRODUCE EIGENVECTORS, NEARLY EQUAL EIGENVALUES CAN BE ENCOUNTERED, IN WHICH CASE THE BASIS VECTORS FOR THE CORRESPONDING VECTOR SUBSPACE ARE NOT UNIQUELY DETERMINED.

IN MACS-C, THE LARGEST JACOBIAN MATRIX WHICH CAN BE COMPUTED IS 40 X 15. THE LARGEST FORCE CONSTANT VECTOR APPLIED IS OF DIMENSION 15. THE LARGEST REAL OR COMPLEX MATRICES ARE 40 X 40.

IN MACS-J, THE LARGEST REAL AND COMPLEX MATRICES ARE 32 X 32. THE LARGEST FORCE CONSTANT VECTOR IS OF DIMENSION 50.

IN REVISED-D, THE LARGEST NUMBER OF ELEMENTS IN 3-DIMENSIONAL ARRAYS IS 2400. THE MAXIMUM NUMBER OF GROUPS IS 20. THE MAXIMUM NUMBER OF ATOMS PER GROUP IS 50. THE LARGEST FORCE CONSTANT VECTOR IS OF DIMENSION 30.

IN REVISED-MVFC, THE LARGEST INDICES OF 3-DIMENSIONAL VARIABLES ARE (20,8,8). THE LARGEST MATRICES ARE 150 X 150. THE DIMENSION OF THE LARGEST FORCE CONSTANT VECTOR IS 60.

IN ADJUSTER, THE LARGEST MATRICES ARE 32 X 32.

IN DIPOLE-SUM, THE LARGEST NUMBER OF ALPHA-BETA PAIRS IS 15. THE LARGEST NUMBER OF K-KPRIME PAIRS IS 15.

IN MODEL-PI, THERE CANNOT BE MORE THAN 4 DIPOLES PER PRIMITIVE CELL. THE LARGEST MATRICES ARE 32 X 32. THE DIMENSION OF THE LARGEST FORCE CONSTANT VECTOR IS 50.

6. TYPICAL RUNNING TIME -

A MACS-C SAMPLE PROBLEM DEALING WITH 6 MATRICES OF SIZE 16 X 6 REQUIRES LESS THAN 3 SECONDS WITH COMPILE-RUN-WAIT TIME LESS THAN 42 SECONDS.

A MACS-J SAMPLE PROBLEM DEALING WITH 6 MATRICES OF SIZE 16 X 6 AND 7 DIMENSIONAL FORCE CONSTANT VECTORS REQUIRES LESS THAN 50 SECONDS WITH COMPILE-RUN-WAIT TIME LESS THAN 74 SECONDS.

A REVISED-D SAMPLE PROBLEM DEALING WITH 6 ATOM GROUPS CONTAINING (4,4,2,2,2,2) ATOMS REQUIRES LESS THAN 4 SECONDS WITH COMPILE-RUN-WAIT TIME LESS THAN 26 SECONDS.

A REVISED-MVFC SAMPLE PROBLEM WHICH DEFINES 21 ELEMENTS IN F, USING 8 ATOMS IN EACH OF 2 GROUPS REQUIRES LESS THAN 10 SECONDS WITH COMPILE-RUN-WAIT TIME LESS THAN 47 SECONDS.

AN ADJUSTER SAMPLE PROBLEM DEALING WITH A 13 X 6 MATRIX REQUIRES LESS THAN 7 SECONDS WITH COMPILE-RUN-WAIT TIME LESS THAN 25 SECONDS.

A DIPOLE-SUM SAMPLE PROBLEM WITH 4 ATOM POSITIONS REQUIRES LESS THAN 10 SECONDS WITH COMPILE-RUN-WAIT TIME LESS THAN 27 SECONDS.

A MODEL-PI SAMPLE PROBLEM DEALING WITH FIVE 32 X 12 MATRICES REQUIRES LESS THAN 92 SECONDS WITH COMPILE-RUN-WAIT TIME LESS THAN 140 SECONDS.

7. UNUSUAL FEATURES OF THE PROGRAM - VALENCE FORCE POTENTIAL FUNCTIONS FOR CRYSTALS MAY BE USED AS WELL AS CONVENTIONAL INTERACTIONS BETWEEN ATOM PAIRS.

8. RELATED AND AUXILIARY PROGRAMS -

MACS-C IS A REVISION OF AT LEAST TWO PREDECESSOR CODES. THE IMPROVEMENTS AND REASONS FOR THE CHANGES ARE DESCRIBED IN DETAIL IN REFERENCE REPORT IN-1280.

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 VERSIONS SUBMITTED NOVEMBER 1972, SAMPLE PROBLEMS EXECUTED BY ACC.
10. REFERENCES - J. K. BOYTER, H. L. MCMURRY, A. W. SOLBRIG, JR., AND R. M. MARTIN, MACS C, A COMPUTING PROGRAM FOR CRYSTAL VIBRATIONS WHICH INCLUDES LONG-RANGE COULOMB INTERACTIONS, IN-1280, MARCH 1969.
J. K. BOYTER AND A. W. SOLBRIG, JR., MACS J, A PROGRAM FOR COMPUTING CRYSTAL PHONON DISPERSION RELATIONS, STRUCTURE FACTORS FOR NEUTRON INELASTIC SCATTERING, AND JACOBIAN MATRICES, IN-1147, JANUARY 1968.
J. K. BOYTER AND H. L. MCMURRY, REVISED C, A COMPUTER PROGRAM FOR CALCULATING VALENCE COORDINATES IN TERMS OF MASS ADJUSTED ATOM DISPLACEMENTS, TOGETHER WITH COORDINATES DEFINING RIGID GROUP ROTATIONS, AND NOTE P00441 (PPCO 40*1176), JANUARY 1969.
J. K. BOYTER AND H. L. MCMURRY, REVISED MVFC, A COMPUTER PROGRAM FOR CONSTRUCTING FORCE CONSTANT MATRICES FOR USE IN VALENCE FORCE POTENTIAL FUNCTIONS IN MOLECULES AND CRYSTALS, AND NOTE P00311, AUGUST 1969.
J. K. BOYTER AND H. L. MCMURRY, MVFC, A COMPUTER PROGRAM FOR CONSTRUCTING FORCE CONSTANT MATRICES FOR USE IN VALENCE FORCE POTENTIAL FUNCTIONS IN MOLECULES AND CRYSTALS, IN-1282, APRIL 1969.
J. K. BOYTER AND H. L. MCMURRY, ADJUSTER, A FORCE CONSTANT ADJUSTER PROGRAM TO OBTAIN LEAST SQUARES FIT TO OBSERVED FREQUENCIES OF MOLECULES AND CRYSTALS, IN-1148, DECEMBER 1967.
J. K. BOYTER AND T. G. WORTON, DIPOLE SUM, A COMPUTER PROGRAM FOR CALCULATING DIPOLE SUMS FOR AN ARBITRARY CRYSTAL, IN-1226, OCTOBER 1968.
W. J. SUITT AND A. W. SOLBRIG, JR., MODEL PI, AND NOTE P01800, JULY 1970.
H. KAPLAN AND J. J. SULLIVAN, PHYSICAL REVIEW, VOL. 130, P. 120, 1963.
11. MACHINE REQUIREMENTS - 650K BYTES OF CORE ARE REQUIRED FOR EACH OF THE PROGRAMS.
IN ADDITION TO STANDARD INPUT/OUTPUT, MACS-C USES SCRATCH UNITS 1, 2, 3, 4, 8, 9, AND 10. 162K OF LCS WAS INDICATED AFTER COMPILING.
IN ADDITION TO STANDARD INPUT/OUTPUT, MACS-J USES SCRATCH UNITS 1, 2, 3, 4, 8, 9, AND 10. 158K OF LCS WAS INDICATED AFTER COMPILING.
144K OF LCS WAS INDICATED AFTER COMPILING REVISED-C.
356K OF LCS WAS INDICATED AFTER COMPILING REVISED-MVFC.
100K OF LCS WAS INDICATED AFTER COMPILING ADJUSTER.
50K OF LCS WAS INDICATED AFTER COMPILING DIPOLE-SUM.
IN ADDITION TO STANDARD INPUT/OUTPUT, MODEL-PI USES SCRATCH UNITS 2, 3, 4, 8, 9, 11, 12, 13, 14, 15, 16, AND 17. 330K OF LCS WAS INDICATED AFTER COMPILING.
12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THE SOURCE PROGRAMS REQUIRE THE FCRT-450 COMPILER USING 650K. MACS-J RESULTS CAN BE AFFECTED BY CROSS-OVER ERRORS IN CERTAIN PARTS OF JACOBIAN RESULTS. SEE PAGE 10 OF REFERENCE IN-1147. THE SAMPLE PROBLEM RESULTS CONTAINED NEARLY EQUAL EIGENVALUES, AS DID SAMPLE PROBLEMS FOR MACS-C AND MODEL PI.
REVISED-D RESULTS FOR RIGID GROUP CALCULATIONS MAY BE IN ERROR AND SHOULD BE CAREFULLY EXAMINED. SEE PAGE 2, REFERENCE P00441.
REVISED-MVFC INSERTS $7.7777E-07$ INTO THE CALCULATIONS WHEN THE NUMBER OF UNIQUE INTERACTIONS FOR TWO SETS OF COORDINATES OF A PARTICULAR INTERACTION TYPE EXCEEDS TWENTY.
15. NAME AND ESTABLISHMENT OF AUTHORS -
H. L. MCMURRY AND W. J. SLITT
AERCJET NUCLEAR COMPANY
P. O. BOX 1845
IDAHO FALLS, IDAHO 83401
T. G. WERTON
SOLID STATE SCIENCE DIVISION
ARGONNE NATIONAL LABORATORY
9700 SOUTH CASS AVENUE
ARGONNE, ILLINOIS 60439
R. M. MARTIN
XEROX CORPORATION
XEROX PARK
3180 PORTER DRIVE
PALO ALTO, CALIFORNIA 94304
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (MACS-C 1259 CARDS, MACS-J 1208 CARDS, REVISED-D 947 CARDS, REVISED-MVFC 1518 CARDS, ADJUSTER 195 CARDS, DIPOLE-SUM 212 CARDS, MODEL-PI 1919 CARDS)
SAMPLE PROBLEMS (MACS-C 190 CARDS, MACS-J 274 CARDS, REVISED-D 56 CARDS, REVISED-MVFC 145 CARDS, ADJUSTER 20 CARDS, DIPOLE-SUM 18 CARDS, MODEL-PI 234 CARDS)
CONTROL INFORMATION (MACS-C 14 CARDS, MACS-J 14 CARDS, REVISED-D 6 CARDS, REVISED-MVFC 6 CARDS, ADJUSTER 6 CARDS, DIPOLE-SUM 6 CARDS, MODEL-PI 30 CARDS)
SAMPLE PROBLEM OUTPUT (MACS-C 3 PAGES, MACS-J 26 SELECTED PAGES, REVISED-D 11 PAGES, REVISED-MVFC 41 SELECTED PAGES, DIPOLE-SUM 3 PAGES, MODEL-PI 35 SELECTED PAGES)
REFERENCE REPORTS AND NOTES

ACC ABSTRACT 574

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12/73

17. CATEGORY - W
KEYWORDS - CRYSTAL VIBRATIONS, NEUTRON INELASTIC SCATTERING,
EIGENSYSTEMS, MODERATORS

1. NAME OR DESIGNATION OF PROGRAM - MSCAT
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - IN A THERMAL NEUTRON SCATTERING EXPERIMENT, THE MEASURED CROSS SECTION INCLUDES BOTH SINGLE AND MULTIPLE SCATTERING EVENTS. IN ORDER TO EXTRACT THE SINGLE SCATTERING CROSS SECTION, THE CROSS SECTION FOR MULTIPLE SCATTERING MUST BE KNOWN. SINCE THIS CONTRIBUTION IS GENERALLY A SMOOTHER FUNCTION OF ANGLE AND SCATTERED ENERGY THAN THE SINGLE SCATTERING, IT IS LESS SENSITIVE TO DETAILS OF THE SINGLE SCATTERING CROSS SECTION. IT IS THEREFORE FEASIBLE TO CALCULATE THE MULTIPLE SCATTERING USING AN APPROXIMATE SCATTERING FUNCTION, AND TO SUBTRACT IT FROM THE MEASUREMENTS IN ORDER TO OBTAIN THE SINGLE SCATTERING. MSCAT CALCULATES THE SINGLE AND MULTIPLE SCATTERING CROSS SECTIONS, FOR A SPECIFIED EXPERIMENTAL SITUATION, GIVEN A SINGLE SCATTERING FUNCTION AS INPUT.
4. METHOD OF SOLUTION - MSCAT IS ADAPTED FROM A PROGRAM WRITTEN BY BISCHOFF (SEE REFERENCE 2). THE BASIC STRUCTURE IS UNCHANGED, BUT MANY MODIFICATIONS HAVE BEEN INCORPORATED IN ORDER TO TREAT A WIDER VARIETY OF PROBLEMS. GIVEN A SCATTERING FUNCTION, THE PROGRAM TRACKS SUCCESSIVE NEUTRONS WITHIN THE SAMPLE AND/OR SAMPLE CONTAINER IN A MONTE CARLO FASHION. AT EACH SCATTERING POINT, THE RESPONSE, WITHIN EACH TIME CHANNEL AND FOR EACH DETECTOR, IS CALCULATED. A CUTOFF IS IMPOSED TO AVOID TRACKING NEUTRONS INDEFINITELY. SINGLE AND MULTIPLE SCATTERING CONTRIBUTIONS FOR EACH TIME CHANNEL AND FOR EACH ANGLE ARE SEPARATELY ACCUMULATED.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - APART FROM SPACE AND TIME LIMITATIONS, THE PROGRAM IS LIMITED TO THREE TARGET GEOMETRIES, AND TO NO MORE THAN 8 SCATTERING ANGLES. THESE AND OTHER LESS SIGNIFICANT RESTRICTIONS MAY BE REMOVED BY SUITABLY MODIFYING THE PROGRAM. THE SAMPLE (AND SAMPLE CONTAINER) MUST BE ISOTROPIC MATERIALS.
6. TYPICAL RUNNING TIME - ONCE THE SCATTERING FUNCTION HAS BEEN SET UP, THE MONTE CARLO LOOP TAKES 0.2 TO 0.5 MILLISECONDS PER COLLISION, PER ANGLE, PER TIME CHANNEL. TYPICAL RUNNING TIMES FOR A COMPLETE PROBLEM ARE OF ORDER 1 TO 10 MINUTES ON THE IBM360/195. IF ELASTIC COHERENT SCATTERING IS TO BE CALCULATED, THE PROGRAM MAY TAKE CONSIDERABLY LONGER TO OBTAIN ADEQUATE STATISTICS.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - MSCAT REPRESENTS A MODIFIED, EXTENDED, AND LARGELY REWRITTEN, VERSION OF THE PROGRAM DESCRIBED BY BISCHOFF.
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 VERSION SUBMITTED AUGUST 1973, SAMPLE PROBLEM EXECUTED BY ACC.

10. REFERENCES - J. R. D. COPLEY, MONTE CARLO CALCULATION OF MULTIPLE SCATTERING EFFECTS IN THERMAL NEUTRON SCATTERING EXPERIMENTS, COMPUTER PHYSICS COMMUNICATIONS PREPRINT, 1973.
F. G. BISCHOFF, M. L. YEATER, AND W. E. MOORE, MONTE CARLO EVALUATION OF MULTIPLE SCATTERING AND RESOLUTION EFFECTS IN DOUBLE-DIFFERENTIAL NEUTRON SCATTERING CROSS-SECTION MEASUREMENTS, NUCLEAR SCIENCE AND ENGINEERING, VOL. 48, PP. 266-80, 1972.
F. G. BISCHOFF, GENERALIZED MONTE CARLO METHODS FOR MULTIPLE SCATTERING PROBLEMS IN NEUTRON AND REACTOR PHYSICS, PH.D. THESIS, RENSSELAER POLYTECHNIC INSTITUTE, UNIVERSITY MICROFILMS 70-19931, 1970.
J. R. D. COPLEY, MONTE CARLO CALCULATION OF MULTIPLE SCATTERING EFFECTS IN THERMAL NEUTRON SCATTERING EXPERIMENTS, MODIFICATION TO HORIZONTAL CYLINDER GEOMETRY, COMPUTER PHYSICS COMMUNICATIONS PREPRINT, 1973.
J. R. D. COPLEY, MONTE CARLO CALCULATION OF MULTIPLE SCATTERING EFFECTS IN THERMAL NEUTRON SCATTERING EXPERIMENTS, MODIFICATION TO SLAB GEOMETRY, COMPUTER PHYSICS COMMUNICATIONS PREPRINT, 1973.
11. MACHINE REQUIREMENTS - NORMAL I/O DEVICES PLUS A HIGH SPEED DISK TO STORE UP TO 3 FILES WRITTEN BY THE PROGRAM AND A CORE REQUIREMENT OF 46,000 WORDS
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - CS/360, RELEASE 20.1.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - IF INELASTIC SCATTERING IS INCLUDED, FURTHER HIGH SPEED STORAGE IS REQUIRED. THE AMOUNT OF EXTRA STORAGE IS AT THE DISCRETION OF THE USER, DEPENDING ON HOW ACCURATELY HE WISHES TO DEFINE THE INELASTIC SCATTERING FUNCTIONS. IN THE PRESENT CASE AN EXTRA 26,000 WORDS ARE USED TO STORE THESE FUNCTIONS. MSCAT IS WRITTEN FOR VERTICAL CYLINDER GEOMETRY, WITH SOURCE DECKS INCLUDED IN THE PACKAGE ENABLING THE USER TO MODIFY MSCAT FOR EITHER SLAB OR HORIZONTAL CYLINDER GEOMETRY.
15. NAME AND ESTABLISHMENT OF AUTHOR -
J. R. D. COPLEY
INSTITUT LAUE-LANGEVIN
B.P. 156 CENTRE DE TRI
38 GRENOBLE, FRANCE
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (MSCAT-5472 CARDS, TARGET SLAB-392 CARDS, TARGET CYL-298 CARDS)
SAMPLE PROBLEM (37 CARDS)
CONTROL INFORMATION (JCL-10 CARDS)
SAMPLE PROBLEM OUTPUT (MSCAT, MSLAB, MCYL 16 PAGES EACH)
REFERENCE PREPRINTS AS SUBMITTED BY AUTHOR

17. CATEGORY - W
KEYWORDS - THERMAL NEUTRON SCATTERING, ELASTIC SCATTERING, IN-
ELASTIC SCATTERING, MONTE CARLO METHOD

1. NAME OR DESIGNATION OF PROGRAM - GEM
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - GEM IS USED TO PREDICT FUEL CYCLE COSTS FOR ANY TYPE NUCLEAR SYSTEM (I.E., BWR, HTGR, PWR, LMFBR, GCFR, . . .). THE CURRENT VERSION IS LIMITED TO THERMAL REACTORS. GEM IS DESIGNED FOR PRODUCTION USE BY LARGE UTILITIES WHICH HAVE SEVERAL REACTOR TYPES ON THEIR SYSTEM. GEM HAS BEEN WRITTEN SO AS TO ACCOMMODATE ALL MAJOR FUEL MANAGEMENT ACTIVITIES UNDERTAKEN BY A UTILITY -
 - (1) FUEL BID ANALYSIS,
 - (2) EVALUATION OF ACTUAL DAY TO DAY OPERATION, AND
 - (3) SYSTEM SIMULATION AND OPTIMIZATION STUDIES.
4. METHOD OF SOLUTION - COSTS ARE CALCULATED USING PRESENT-WORTH TECHNIQUES AND CONTINUOUS COMPOUNDING. THE EQUATIONS ARE BASED ON AN INVESTOR-OWNED UTILITY CAPITALIZATION STRUCTURE WHICH EASILY COVERS THE RANGE OF INDUSTRIAL, PRIVATE, AND PUBLIC (GOVERNMENT) OWNED UTILITIES. THREE DISTINCT TYPES OF ANALYSIS (CASHFLOW, ALLOCATED COSTS, YEARLY CASHFLOW) ARE PERFORMED, EACH YIELDING IDENTICAL RESULTS. USING THESE AS A BASIS MANY OTHER ANALYSES ARE UNDERTAKEN.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - DIMENSIONS OF ALL ARRAYS ARE CARRIED AS VARIABLES THROUGHOUT THE ANALYSIS. THE MAXIMUM SIZE OF EACH ARRAY IS SET BY THE USER IN PROGRAM MAIN. CURRENT VALUES ARE SET SO THAT MAXIMA ARE -
 - 50 BATCHES PER CASE STUDY
 - 20 YEAR BATCH LIFE
 - 30 YEAR CASE STUDY
 - 120 BATCH BURN TIME-STEPS
 - 20 INDIVIDUAL PAYMENTS (SALES) ASSOCIATED WITH EACH COST COMPONENT
6. TYPICAL RUNNING TIME - 1/3 SECOND PER BATCH IS REQUIRED.
7. UNUSUAL FEATURES OF THE PROGRAM - GEM
 - (1) IS BROKEN INTO THREE MAJOR SECTIONS - INPUT, GENERAL ECONOMIC ANALYSIS, AND OUTPUT. THE LAST TWO SECTIONS ARE ABLE TO PERFORM AN ECONOMIC ANALYSIS OF ANY TYPE REACTOR SYSTEM TO ANY DESIRED DEGREE OF PRECISION. THE INPUT SECTION CONVERTS DATA SPECIFIC TO A REACTOR TYPE INTO A GENERAL FORM ACCEPTABLE TO THE LAST TWO SECTIONS. THE CURRENT INPUT SECTIONS AVAILABLE HANDLE BWR, PWR, AND HTGR.
 - (2) USES CONTINUOUS COMPOUNDING.
 - (3) CONTAINS THREE DISTINCT TYPES OF ECONOMIC ANALYSIS - CASHFLOW, ALLOCATED COST, AND YEARLY CASHFLOW.
 - (4) CALCULATES FUEL CYCLE COST ON A BATCH, YEAR, CASE, CUMULATIVE BATCHWISE, AND CUMULATIVE YEARWISE BASIS.

7. UNUSUAL FEATURES OF THE PROGRAM (CONTINUED)
 - (5) HAS SEPARATE ESCALATION ROUTINES AVAILABLE FOR EACH TYPE OF COST COMPONENT.
 - (6) ACCEPTS PU AND U RECYCLE BIDS.
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 VERSION SUBMITTED OCTOBER 1973, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - J. A. HUGHES AND D. F. HANG, PROGRAM GEM, GENERAL ECONOMIC MODEL TO ANALYZE NUCLEAR FUEL CYCLE COSTS, UNIVERSITY OF ILLINOIS NUCLEAR ENGINEERING PROGRAM REPORT, SEPTEMBER 1973.
D. F. HANG, FUEL CYCLE ECONOMICS, EDUCATION AND RESEARCH IN THE NUCLEAR FUEL CYCLE, PP. 67-83, 1972.
J. A. HUGHES AND D. F. HANG, DEVELOPMENT OF ENGINEERING ECONOMIC BASIS TO ANALYZE NUCLEAR FUEL CYCLE COSTS, TRANSACTIONS OF AMERICAN NUCLEAR SOCIETY ANNUAL MEETING, PP. 48-50, JUNE 1972.
11. MACHINE REQUIREMENTS - 274K BYTES (202K WITH OVERLAY STRUCTURE) AND ONE NON-SYSTEM DISK (OR TAPE)
12. PROGRAMMING LANGUAGES USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
J. A. HUGHES AND D. F. HANG
UNIVERSITY OF ILLINOIS
217 NUCLEAR ENGINEERING LABORATORY
URBANA, ILLINOIS 61801
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (4479 CARDS)
SAMPLE PROBLEM (431 CARDS)
CONTROL INFORMATION (JCL 10 CARDS)
REFERENCE REPORT
17. CATEGORY - D
KEYWORDS - FUEL CYCLE, ECONOMICS, POWER PLANTS, PRODUCTION, REACTORS, OPERATION

1. NAME OR DESIGNATION OF PROGRAM - FFEARS
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - FFEARS IS GENERALLY APPLICABLE FOR THE SOLUTION OF BOUNDARY VALUE PROBLEMS INVOLVING THE LAPLACE EQUATION USING DIFFERENCE EQUATIONS IN AXISYMMETRIC OR RECTANGULAR COORDINATES. IT WILL HANDLE VIRTUALLY ANY CONFIGURATION OF DIELECTRICS AND FLOATING ELECTRODES, PRODUCING BOTH EQUIPOTENTIAL AND EQUIFIELD PLOTS, IF DESIRED.
4. METHOD OF SOLUTION - BASIC RELAXATION TECHNIQUES ARE USED. THE DIFFERENCE EQUATIONS EMPLOYED ARE DERIVED FROM LAPLACE'S EQUATION FOR ISOTROPIC DIELECTRICS. THESE ARE SOLVED ITERATIVELY AT ALL POINTS WITHIN THE ELECTRODE CONFIGURATION EXCEPT ON THE INTERFACES BETWEEN MATERIALS OF DIFFERENT DIELECTRIC CONSTANT. DIELECTRIC INTERFACES ARE SOLVED BY A TECHNIQUE DEVELOPED BY C. N. CORNY (LETTERS, PRCC, IEEE, VOL. 57, PP. 856-858). FLOATING ELECTRODES ARE TREATED AS SPECIAL DIELECTRICS.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE PROGRAM TREATS ANY RECTANGULAR OR AXISYMMETRIC CONFIGURATION OF DIELECTRICS AND SMALL FLOATING ELECTRODES THAT CAN BE DESCRIBED BY A MATRIX OF UP TO 201 X 201 POINTS. ALL ELECTRODE AND DIELECTRIC SURFACES MUST LIE ON MATRIX POINTS.
6. TYPICAL RUNNING TIME - SOLUTIONS WITH ERRORS OF LESS THAN FIVE PERCENT ARE OBTAINED IN LESS THAN TEN MINUTES.
7. UNUSUAL FEATURES OF THE PROGRAM - A BLOWUP ROUTINE PERMITS THE EXPANSION AND RECOMPUTATION OF SECTIONS OF THE PLOT TO PERMIT GREATER RESOLUTION.
8. RELATED AND AUXILIARY PROGRAMS - THIS PACKAGE IS A MODIFICATION OF ALO-00262, TRANSFERRED FROM THE ALO-COSMIC COLLECTION.
9. STATUS - ABSTRACT FIRST DISTRIBUTED JANUARY 1974.
CDC6600 VERSION SUBMITTED MAY 1973.
10. REFERENCES - J. E. BOERS, FFEARS, A DIGITAL COMPUTER PROGRAM FOR THE SIMULATION OF LAPLACE EQUATION INCLUDING DIELECTRIC INTERFACES AND SMALL UNGROUNDED ELECTRODES, SC-RR-71 0377, JULY 1971.
ENVIRONMENTAL SUBROUTINES REQUIRED BY FFEARS,
ARGONNE CODE CENTER PROGRAMMING NOTE 74-21, JANUARY 1974.
11. MACHINE REQUIREMENTS - 1735CC (OCTAL) OF CORE STORAGE, AND 14 FILES ON DISK STORAGE.
12. PROGRAMMING LANGUAGE USED - FORTRAN IV, COMPILED UNDER FORTRAN EXTENDED OPT2.

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
SCOPE 3.3.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
SEVERAL SUBROUTINES AND FUNCTIONS NECESSARY TO THE OPERATION OF
THE PLOTTING PORTION OF THE PROGRAM ARE NOT INCLUDED IN THE SOURCE
DECK. THEY ARE A PART OF THE STANDARD SCCRS PLOTTER PACKAGE FOR
THE SC-4020 PLOTTER, AND MUST BE FURNISHED BY THE USER OR REPLACED
BY EQUIVALENT LOCALLY-AVAILABLE SUBROUTINES.
15. NAME AND ESTABLISHMENT OF AUTHOR -
J. E. BCERS
SANDIA LABORATORIES
P. O. BOX 5800
ALBUQUERQUE, NEW MEXICO 87115
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (1396 CARDS)
SAMPLE PROBLEM (258 CARDS)
SAMPLE PROBLEM OUTPUT (70 PAGES, PLOTTER OUTPUT-7 PAGES)
REFERENCE REPORT AND ACC PROGRAMMING NOTE 74-21
17. CATEGORY - V
KEYWORDS - POTENTIALS, EQUIPOTENTIALS, EQUIFIELD, LAPLACE EQUATION

1. NAME OR DESIGNATION OF PROGRAM - PLOTR
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - PLCTR AND THE AUXILIARY ROUTINE XYGRD CONTOUR A FUNCTION DEFINED OVER A TWO-DIMENSIONAL GRID AND COMPUTE THE AREA WITHIN THE CONTOURS.
4. METHOD OF SOLUTION - PLOTR AND XYGRD UTILIZE A SO-CALLED FOUR-POINT CELL METHOD. THE FUNCTION TO BE CONTOURED MUST BE TABULATED IN A TWO-DIMENSIONAL ARRAY WHERE THE POSITION OF EACH ELEMENT $F(I,J)$ IS SPECIFIED BY THE COORDINATES $X(I)$ AND $Y(J)$. THESE COORDINATES MAY BE IN EITHER CARTESIAN OR POLAR FORM.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE MAXIMUM ALLOWABLE RANGE BETWEEN MINIMUM AND MAXIMUM ANGLES IS 180 DEGREES.
6. TYPICAL RUNNING TIME -
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - PLCTR UTILIZES THE SCORS PLOTTING ROUTINES (REFERENCE 2) TO PRODUCE AN OUTPUT FILE FOR THE SC-4020 MICROFILM PLOTTER.
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
CDC6600 VERSION SUBMITTED JANUARY 1970.
10. REFERENCES - SUSAN M. MILLY, PLOTR, A TWO-DIMENSIONAL CONTOURING AND AREA-CALCULATING ROUTINE, SC-RR-69-685, OCTOBER 1969.
DIVISION 9424, SC-4020 USAGE WITH IBM-7090/7094, CDC-3600, UNIVAC-1107/1108, CDC-6600, SANDIA LABORATORIES, ALBUQUERQUE, NEW MEXICO, MAY 1969.
PLOTTING ROUTINES REQUIRED BY PLOTR, ACC NO. 578, ACC PROGRAMMING NOTE 74-24, FEBRUARY 1974.
11. MACHINE REQUIREMENTS -
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THE REFERENCE SC-RR-69-685 DOES NOT CORRESPOND EXACTLY TO THE LATEST VERSION. IN THE CURRENT VERSION OF PLOTR, THE PARAMETER F HAS BEEN DROPPED FROM THE CALL LIST. THE PARAMETER ANS SHOULD NOW CONTAIN THE ARRAY OF FUNCTION VALUES TO BE CONTOURED ON INPUT.
15. NAME AND ESTABLISHMENT OF AUTHOR -
SUSAN MILLY DAVENPORT
SANDIA LABORATORIES

15. NAME AND ESTABLISHMENT OF AUTHOR(S) (CONTINUED)
P. O. BOX 5800
ALBUQUERQUE, NEW MEXICO 87115
16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
SOURCE DECK (714 CARDS)
SAMPLE PROBLEM (114 CARDS)
REFERENCE REPORT, SC-RR-69-685, AND ACC NOTE
17. CATEGORY - P
KEYWORDS - CONTOUR, 2-DIMENSIONAL, CARTESIAN, POLAR, COORDINATES

1. NAME OR DESIGNATION OF PROGRAM - DWARF
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - DWARF ALLOWS ONE-DIMENSIONAL SIMULATION OF REACTOR BURNUP AND XENON OSCILLATION PROBLEMS IN SLAB, CYLINDRICAL, OR SPHERICAL GEOMETRY USING A FEW-GROUP DIFFUSION THEORY MODEL.
4. METHOD OF SOLUTION - THE FEW-GROUP, NEUTRON DIFFUSION THEORY EQUATIONS ARE REDUCED TO A SYSTEM OF FINITE DIFFERENCE EQUATIONS THAT ARE SOLVED FOR EACH GROUP BY THE GAUSS METHOD AT EACH TIME POINT. FISSION NEUTRON SOURCE ITERATION CAN BE ACCELERATED WITH CHEBYSHEV EXTRAPOLATION. A THERMAL FEEDBACK ITERATIVE LOOP IS USED TO OBTAIN CONSISTENT SOLUTIONS FOR THE DISTRIBUTIONS OF REACTOR POWER, NEUTRON FLUX, AND FUEL AND COOLANT PROPERTIES WITH THE NEUTRON GROUP CONSTANTS FUNCTIONS OF THE LATTER. SOLUTIONS FOR THE NEW NUCLIDE CONCENTRATIONS OF A TIME POINT ARE MADE WITH THE FLUX ASSUMED CONSTANT IN THE TIME INTERVAL.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
 - 4 GROUPS
 - 40 REGIONS
 - 50 MACROSCOPIC MATERIALS*
 - 50 NUCLIDES PER REGION
 - 250 MESH POINTS* ONLY 10 ARE FUNCTIONS OF THE FEEDBACK VARIABLES.
6. TYPICAL RUNNING TIME - PRIMARILY A FUNCTION OF THE NUMBER OF FEEDBACK ITERATIONS REQUIRED, RUNNING TIME RANGES FROM LESS THAN A SECOND TO SEVERAL SECONDS PER TIME-STEP.
7. UNUSUAL FEATURES OF THE PROGRAM - THE NEUTRON GROUP CONSTANTS FOR THE MACROSCOPIC MATERIALS CAN BE USER-SPECIFIED FUNCTIONS OF THE FEEDBACK VARIABLES AND THE GROUP CONSTANTS CAN BE A MIXTURE OF THE NONDEPLETION MACROSCOPIC AND DEPLETING MICROSCOPIC MATERIAL DATA IN A REGION. AUTOMATIC SEARCHES ON BUCKLING, POISON, REGION DIMENSIONS, A REGION INTERFACE POSITION, OR TOTAL POWER CAN BE DONE AT EACH TIME POINT. BASIC INPUT DATA AND MATERIAL CONSTANTS CAN BE CHANGED FREELY AT ANY TIME DURING PROBLEM EXECUTION. THE SOLUTIONS FOR THE COOLANT THERMAL PROPERTIES COVER THE ENTIRE RANGE FROM THE SUBCOOLED THROUGH THE SUPERHEATED VAPOR REGIMES WITH CONSTANT PRESSURE AND MASS FLOW RATE ASSUMED. A PLOTTED OUTPUT ROUTINE CAN PLOT UP TO THREE DISTRIBUTIONS (OR FLUX, POWER, TEMPERATURES, DENSITIES, ETC.) PER FRAME VERSUS THE ONE-DIMENSIONAL SPACE VARIABLE.
8. RELATED AND AUXILIARY PROGRAMS - CORA, A FEW-GROUP, ONE-DIMENSIONAL DIFFUSION PROGRAM AND SINBAD, A NUCLIDE DEPLETION PROGRAM.

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 VERSION SUBMITTED JUNE 1973, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - E. C. ANDERSON AND G. E. PUTNAM, DWARF, A FEW CRUP, ONE-DIMENSIONAL DIFFUSION THEORY PROGRAM FOR REACTOR DEPLETION WITH ADJUSTABLE REACTIVITY FEEDBACK, ANCR-1083, NOVEMBER 1972.
11. MACHINE REQUIREMENTS - 330K BYTES OF CORE STORAGE PLUS 8 FORTRAN LOGICAL UNITS, INCLUDING UNITS FOR CARD INPUT, PRINTED OUTPUT, AND PLOTTED OUTPUT
12. PROGRAMMING LANGUAGE USED - FORTRAN IV (F)
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THE PROGRAM COMPILES WITH THE FORTRAN F COMPILER, OPTIMIZATION LEVEL 2. IT CONSISTS OF A RCCT MAIN SEGMENT THAT CALLS 5 OVERLAYS SERIALLY. THE CLOCK AND PLOTTED OUTPUT ROUTINES ARE INSTALLATION DEPENDENT.
15. NAME AND ESTABLISHMENT OF AUTHORS -
E. C. ANDERSON AND G. E. PUTNAM
AEROJET NUCLEAR COMPANY
P. O. BOX 1845
IDAHO FALLS, IDAHO 83401
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (8278 CARDS)
SAMPLE PROBLEM (149 CARDS)
CONTROL INFORMATICA (JCL 66 CARDS)
LCAD MODULE DWARF (289 BLOCKS)
SAMPLE PROBLEM OUTPUT (26 PAGES)
REFERENCE REPORT
17. CATEGORY - D
KEYWORDS - FEW-GROUP, ONE-DIMENSIONAL, DIFFUSION, SLABS, CYLINDERS, SPHERES, REACTIVITY FEEDBACK, CORA CODES, SINBAD CODES

1. NAME OR DESIGNATION OF PROGRAM - ASTEM
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - ASTEM IS A MODULAR SET OF FORTRAN IV SUBROUTINES TO EVALUATE THE GIBBS, HELMHOLTZ, AND SATURATION LINE FUNCTIONS AS PUBLISHED BY THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS (1967). ANY THERMODYNAMIC QUANTITY INCLUDING DERIVATIVE PROPERTIES CAN BE OBTAINED FROM THESE ROUTINES BY A USER-SUPPLIED MAIN PROGRAM.
4. METHOD OF SOLUTION -
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - UNLESS REDIMENSIONED BY THE USER, THE HIGHEST DERIVATIVE ALLOWED IS ORDER 9. ALL ARRAYS WITHIN ASTEM ARE ONE-DIMENSIONAL TO SAVE STORAGE AREA.
6. TYPICAL RUNNING TIME - THE SAMPLE PROBLEM REQUIRES LESS THAN A MINUTE.
7. UNUSUAL FEATURES OF THE PROGRAM - THE MAIN PROGRAM IS THE SAMPLE PROBLEM.
8. RELATED AND AUXILIARY PROGRAMS - STEAM-67 (ACC ABSTRACT 487)
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 VERSION SUBMITTED JUNE 1973, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - K. V. MOORE, ASTEM - A COLLECTION OF FORTRAN SUBROUTINES TO EVALUATE THE 1967 ASME EQUATIONS OF STATE FOR WATER/STEAM AND DERIVATIVES OF THESE EQUATIONS, ANCR-1026, OCTOBER 1971.
C. A. MEYER, R. B. MCCLINTOCK, G. J. SILVESTRI, AND R. C. SPENCER, JR., 1967 ASME STEAM TABLES - THERMODYNAMIC AND TRANSPORT PROPERTIES OF STEAM, NEW YORK, THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS, 1967.
P. W. BRIDGMAN, THE THERMODYNAMICS OF ELECTRICAL PHENOMENA IN METALS AND A CONDENSED COLLECTION OF THERMODYNAMIC FORMULAS, NEW YORK, COVER PUBLICATIONS, INC., 1961.
11. MACHINE REQUIREMENTS - 68K BYTES
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - CS/360.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHOR -
K. V. MOORE

15. NAME AND ESTABLISHMENT OF AUTHCR(S) (CONTINUED)
AEROJET NUCLEAR COMPANY
P. O. BOX 1845
IDAHO FALLS, IDAHO 83401
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (1551 CARDS)
SAMPLE PROBLEM (83 CARDS)
REFERENCE REPORT, ANCR-1026
17. CATEGORY - F
KEYWORDS - THERMODYNAMICS, WATER, PRESSURE, TEMPERATURE, LIQUIDS,
VAPORS, STEAM-67 CODES

1. NAME OR DESIGNATION OF PROGRAM - SLADE-D
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - SLADE-D ANALYZES THE TRANSIENT DYNAMIC RESPONSE OF ELASTIC SHELLS.
4. METHOD OF SOLUTION - SLADE-D USES THE FINITE ELEMENT METHOD IN SPACE AND CENTRAL DIFFERENCE SCHEME IN TIME.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
650 ELEMENTS
700 NODAL POINTS
6. TYPICAL RUNNING TIME - RUNNING TIME IS CONTROLLED BY THE SIZE OF THE MESH AND THE LENGTH IN TIME FOR WHICH THE RESPONSE IS SOUGHT.
7. UNUSUAL FEATURES OF THE PROGRAM - SLADE-D IS DESIGNED FOR THE DYNAMIC ANALYSIS OF THIN SHELLS. A DOUBLY CURVED, ARBITRARY QUADRILATERAL ELEMENT IS UTILIZED. THE ELEMENT IS BASED ON A MINIMUM POTENTIAL ENERGY PRINCIPLE FOR THIN SHELLS. A SIMPLE CENTRAL DIFFERENCE TIME INTEGRATION SCHEME TOGETHER WITH A DIAGONAL MASS MATRIX IS USED TO COMPUTE THE TRANSIENT DYNAMIC RESPONSE. SINCE THE MAJORITY OF AEROSPACE STRUCTURES ARE BASED ON SHELLS OF REVOLUTION, THE PROGRAM IS DESIGNED SPECIFICALLY FOR A SHELL THE REFERENCE SURFACE OF WHICH IS A PORTION OF AN AXISYMMETRIC SURFACE. THE PROGRAM ALLOWS UP TO FIVE SEPARATE LAYERS AND UP TO FIVE SEPARATE ELASTIC ANISOTROPIC MATERIALS WITH TEMPERATURE-DEPENDENT PROPERTIES. SLADE-D HANDLES VARIABLE THICKNESS SHELLS AND ALLOWS THICKNESS DISCONTINUITIES ALONG ELEMENT BOUNDARIES. IT PROVIDES FOR BOTH NORMAL AND TANGENTIAL SURFACE LOADS AND FOR TEMPERATURE CHANGES THROUGH THE THICKNESS AS WELL AS VARYING TEMPERATURES OVER THE REFERENCE SURFACE. OVER ANY PORTION OF THE BOUNDARY, A CHOICE OF THIRTEEN SEPARATE BOUNDARY CONDITIONS IS AVAILABLE. TO EASE DATA PREPARATION, SIMPLE BUT EFFECTIVE GENERATION SCHEMES ARE BUILT INTO THE PROGRAM. SLADE-D COMPUTES DYNAMIC DEFORMATIONS, VELOCITIES, STRESSES, AND STRESS RESULTANTS OCCURRING IN THE SHELL. SINCE IT IS DESIGNED FOR USE BY A LARGE NUMBER OF PEOPLE, IT CONTAINS ERROR CHECKS WHEREVER POSSIBLE AND, EXCEPT WHERE NEEDED FOR EFFICIENCY, VERY STRAIGHTFORWARD LOGIC. SLADE-D USES A SINGLE-DIMENSIONED STORAGE ARRAY FOR THE TOTAL STIFFNESS MATRIX, MASS MATRIX, AND LOAD VECTOR. IF A GIVEN PROBLEM FITS WITHIN THE LIMITS OF THIS STORAGE ARRAY, THE PROGRAM FUNCTIONS AS AN IN-CORE PROGRAM. IF ADDITIONAL STORAGE IS REQUIRED, THE PROGRAM SEEKS ON-LINE AUXILIARY STORAGE WHICH MUST BE RANDOMLY ACCESSIBLE.
8. RELATED AND AUXILIARY PROGRAMS - SLADE-D IS AN OUTGROWTH OF AN EARLIER STATIC SHELL PROGRAM, SLADE.

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
CDC6600 VERSION SUBMITTED SEPTEMBER 1973.
10. REFERENCES - SAMUEL W. KEY AND ZELMA E. BEISINGER, SLADE D, A COMPUTER PROGRAM FOR THE DYNAMIC ANALYSIS OF THIN SHELLS, SLA-73-CC79, JANUARY 1973.
S. W. KEY AND Z. E. BEISINGER, SLADE, A COMPUTER PROGRAM FOR THE STATIC ANALYSIS OF THIN SHELLS, SC-RR-69-369, NOVEMBER 1970.
11. MACHINE REQUIREMENTS - 79,000 DECIMAL WORD CORE, EXTENDED CORE STORAGE, AND MASS STORAGE DISK FILES
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCCPE 3.2.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THE STIFFNESS MATRIX, MASS MATRIX, AND LOAD VECTOR GENERATED ARE STORED IN A, A ONE-DIMENSIONAL ARRAY OF 6056 LOCATIONS. IF THE MATRICES AND VECTOR GENERATED REQUIRE MORE THAN 6056 CORE LOCATIONS, EITHER RANDOM ACCESS EXTENDED CORE STORAGE, RANDOM ACCESS MASS STORAGE DISK FILES, OR THE EQUIVALENT IS REQUIRED. AS THE PROGRAM IS CURRENTLY WRITTEN, THE MASS STORAGE CALLS WRITEC AND READC ARE USED IN CONJUNCTION WITH A CDC 6635 EXTENDED CORE STORAGE UNIT, AND THE MASS STORAGE CALLS OPENMS, WRITMS, AND READMS ARE USED IN CONJUNCTION WITH THE SYSTEM DISK FILES.
THE REQUIRED NUMBER OF BLOCKS NEEDED TO STORE THE STIFFNESS MATRIX, MASS MATRIX AND LOAD VECTOR IS SET UP AS ONE FILE OF INFORMATION IN EXTENDED CORE STORAGE OR IN DISK FILE STORAGE. EXTENDED CORE STORAGE IS SOUGHT FIRST, AND, IF THE FILE LENGTH EXCEEDS THE SPACE AVAILABLE, THE FILE IS PLACED IN DISK STORAGE. EACH BLOCK COMPRISES 6056 CORE LOCATIONS, LOCATED IN THE ARRAY A WHEN IN THE CORE OF THE COMPUTER. THE MASS STORAGE CALLS ALLOW ANY NUMBER OF WORDS TO BE TRANSFERRED TO OR FROM THE FILE STARTING AT ANY POINT IN THE FILE. THE RESULT IS A RANDOMLY ACCESSIBLE FILE. ANY BLOCK IS ACCESSIBLE AT ANY TIME. THE RANDOM ACCESS FEATURE IS REQUIRED IN THE ASSEMBLY OF THE STIFFNESS MATRIX, MASS MATRIX, AND LOAD VECTOR IN MERGEX. THE TIME INTEGRATION IN INTEGX USES THE FILE SEQUENTIALLY.
15. NAME AND ESTABLISHMENT OF AUTHORS -
S. W. KEY AND Z. E. BEISINGER
DIVISION 1541
SANDIA LABORATORIES
P. O. BOX 5800
ALBUQUERQUE, NEW MEXICO 87115
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (3409 CARDS)
SAMPLE PROBLEM (61 CARDS)
REFERENCE REPORT, SLA-73-0079

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17. CATEGORY - I

KEYWORDS - SHELLS, FINITE ELEMENT, DYNAMICS, STRUCTURAL ANALYSIS,
DEFORMATION, STRESSES, MASS MATRICES, SLACE CCDES

1. NAME OR DESIGNATION OF PROGRAM - MONA
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - MONA SOLVES THE MULTIGROUP, ONE-DIMENSIONAL NEUTRON DIFFUSION EQUATIONS IN SLAB, CYLINDRICAL, OR SPHERICAL GEOMETRY FOR EITHER THE DIRECT OR ADJOINT FLUX. BOUNDARY SOURCES AND SPATIALLY DEPENDENT VOLUME SOURCES CAN BE GROUP DEPENDENT. MULTIPLE THERMAL GROUPS ARE ALLOWED.
4. METHOD OF SOLUTION - THE SYSTEM OF FINITE DIFFERENCE EQUATIONS OF A GROUP ARE SOLVED BY THE GAUSS METHOD. OUTER ITERATIONS ON THE NEUTRON FISSION SOURCE CAN BE ACCELERATED WITH THREE-POINT CHEBYSHEV EXTRAPOLATION, AND INNER ITERATIONS ON MULTIPLE THERMAL GROUPS CAN BE ACCELERATED WITH TWO-POINT EXTRAPOLATION OR GROUP SCALING.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
 - 50 GROUPS
 - 50 REGIONS
 - 20 MACROSCOPIC MATERIALS
 - 999 LIBRARY MATERIALS
 - 500 MESH POINTS
6. TYPICAL RUNNING TIME - A SAMPLE PROBLEM WITH 22 GROUPS, 41 MESH POINTS AND NO UPSCATTER REQUIRES 0.35 SECONDS OF CPU TIME PER OUTER ITERATION.
7. UNUSUAL FEATURES OF THE PROGRAM - FLUX-VOLUME WEIGHTED FEW-GROUP CONSTANTS CAN BE GENERATED. PARAMETER SEARCHES THAT CONVERGE TO USER-SPECIFIED EIGENVALUES INCLUDE BUCKLING, POISSON, DIMENSION, BOUNDARY, AND CONCENTRATION SEARCHES. OUTPUT EDITS INCLUDE ARBITRARILY NORMALIZED FLUX, SOURCE, AND POWER DISTRIBUTIONS; FLUX SPECTRA; MEDIAN AND AVERAGE ENERGY DISTRIBUTIONS FOR VARIOUS REACTION RATES; DETAILED NEUTRON BALANCE DATA; ACTIVATION TRAVERSES; AND DISTRIBUTIONS OF RATIOS OF ARBITRARY REACTION RATES.
8. RELATED AND AUXILIARY PROGRAMS - MANY OF THE DETAILED ALGORITHMS AND GENERAL METHODS OF THE MONA CODE WERE TAKEN DIRECTLY FROM THE FEW-GROUP, ONE-DIMENSIONAL DIFFUSION CODE CORA.
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
 - IBM360 VERSION SUBMITTED NOVEMBER 1972, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - G. E. PUTNAM, MONA, A MULTIGROUP ONE-DIMENSIONAL NEUTRONICS ANALYSIS CODE, ANCR-1051, MARCH 1972.
 - R. L. MUELLER, 360/75 INTERVAL TIMER ROUTINE, EXCERPT FROM NRTS ENVIRONMENTAL SUBROUTINE MANUAL, OCTOBER 1968.

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11. MACHINE REQUIREMENTS - 300K BYTES OF CORE STORAGE, 5 FORTRAN LOGICAL UNITS FOR PROGRAM-REQUIRED DATA SETS, 3 FORTRAN LOGICAL UNITS FOR CARD INPUT, PRINTED OUTPUT, AND PUNCHED CARD OUTPUT
12. PROGRAMMING LANGUAGE USED - FORTRAN IV (H)
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THE PROGRAM COMPILES WITH THE FORTRAN H COMPILER, OPTIMIZATION LEVEL 2. IT CONSISTS OF A ROOT MAIN SEGMENT THAT CALLS 8 OVERLAYS SERIALY. MONA CALLS 3 INSTALLATION-DEPENDENT ROUTINES--TIMSET, TIMER, AND TIMJ. THE FIRST TWO ARE DESCRIBED IN REFERENCE 2. TIMJ IS A SMALL CLOCK (ELAPSED CPU TIME) ROUTINE THAT CAN BE EASILY REPLACED OR DUMMIED. AN IBM360 SYSTEM ROUTINE ERRSET, DESCRIBED IN GC28-6817-2, IBM SYSTEM/360 OPERATING SYSTEM, FORTRAN IV (G AND H) PROGRAMMERS GUIDE, IS ALSO CALLED AND MAY BE DUMMIED.
15. NAME AND ESTABLISHMENT OF AUTHOR -
G. E. PUTNAM
AEROJET NUCLEAR COMPANY
P. O. BOX 1845
IDAHO FALLS, IDAHO 83401
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (9282 CARDS)
LOAD MODULE MONA (250 BLOCKS)
SAMPLE PROBLEM (223 CARDS)
CONTROL INFORMATION (JCL 35 CARDS)
REFERENCE REPORT AND EXCERPT
17. CATEGORY - C
KEYWORDS - MULTIGROUP, 1-DIMENSIONAL, DIFFUSION, CRITICALITY
SEARCHES, SLABS, CYLINDERS, SPHERES, CORA CODES

1. NAME OR DESIGNATION OF PROGRAM - STEFEG
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - STEFEG CALCULATES GASEOUS SOURCE TERMS. IT COMPUTES THE GASEOUS RELEASES THROUGH VARIOUS PATHS FROM BOILING WATER REACTORS AND/OR PRESSURIZED WATER REACTORS.
4. METHOD OF SOLUTION -
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - 20 ISOTOPES, AND 6 REPORTS EACH FOR PRESSURIZED WATER REACTOR AND BOILING WATER REACTOR.
6. TYPICAL RUNNING TIME - 12 REPORTS REQUIRE ABOUT 14 SECONDS.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 VERSION SUBMITTED DECEMBER 1972, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - F. T. BINFORD, T. P. HAMRICK, G. W. PARKER, AND T. H. ROW, ANALYSIS OF POWER REACTOR GASEOUS WASTE SYSTEMS, 12TH AEC AIR CLEANING CONFERENCE, AND ERRATA.
11. MACHINE REQUIREMENTS -
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
F. T. BINFORD, T. P. HAMRICK,
G. W. PARKER, AND T. H. ROW
OAK RIDGE NATIONAL LABORATORY
P. O. BOX X
OAK RIDGE, TENNESSEE 37830
16. MATERIAL AVAILABLE -
SOURCE DECK (652 CARDS)
SAMPLE PROBLEM (63 CARDS)
CONTROL INFORMATION (JCL 9 CARDS)
REFERENCE REPORT AND ERRATA

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17. CATEGORY - G

KEYWORDS - POWER REACTORS, GASES, RADICACTIVITY, WASTE SOLUTIONS

1. NAME OR DESIGNATION OF PROGRAM - FPFM
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - FPFM IS USED IN RADIOLOGICAL SAFETY ANALYSES OF LINE REACTORS (BWR'S AND PWR'S ONLY) TO CALCULATE: (1) MAXIMUM NOBLE GAS RELEASE TO THE FUEL CLADDING GAP FOR TOTAL CORE DURING STEADY-STATE OPERATION, (2) NOBLE GAS RELEASED TO THE REACTOR PRIMARY SYSTEM FOR SELECTED PIN PERFORATIONS, AND (3) INTERNAL PIN PRESSURE (OPTIONAL).
4. METHOD OF SOLUTION - AN ANALYTICAL METHOD IS USED BASED ON A STEADY-STATE RELEASE MODEL. THIS METHOD WHICH EMPLOYS FISSION GAS CAPSULE DATA AND CONSERVATIVE ASSUMPTIONS HAS PROVIDED GOOD CORRELATIONS OF CAPSULE RELEASE DATA AND DESCRIBED FISSION PRODUCT DISTRIBUTION IN URANIUM OXIDE FUELS. THE ASSUMPTIONS USED ARE THAT THE RELEASE OF IODINE-131 IS EQUAL TO THE FRACTIONAL RELEASE OBSERVED FOR XENON-131, AND THAT ALL THE FUEL PINS HAVE A LOW FUEL-TO-SHEATH HEAT TRANSFER COEFFICIENT AND, THEREFORE, A HIGH FUEL SURFACE TEMPERATURE WHICH INCREASES RELEASE FOR ALL CORRESPONDING HEAT RATINGS.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - FPFM APPLIES ONLY TO WATER-COOLED REACTORS.
6. TYPICAL RUNNING TIME - LESS THAN 1 MINUTE IS REQUIRED FOR A TYPICAL PROBLEM.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 VERSION SUBMITTED JANUARY 1973, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - V. F. BASTON, J. H. MCFADDEN, W. A. YUILL, AN ANALYTICAL METHOD FOR CALCULATING STEADY-STATE FISSION GAS RELEASE--FISSION PRODUCT FUEL MODE (FPFM) CODE, ANCR-1010, SEPTEMBER 1971.
11. MACHINE REQUIREMENTS - 7CK STORAGE SINGLE-PRECISION
12. PROGRAMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - SOURCE CODE DECK IS MODIFIED TO CALL LATER VERSION OF THE CALCCMP PLOTTING PACKAGE.

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15. NAME AND ESTABLISHMENT OF AUTHOR -
V. F. BASTON
AERCJET NUCLEAR COMPANY
P. O. BOX 1845
IDAHO FALLS, IDAHO 83401
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (131 CARDS)
SAMPLE PROBLEM (18 CARDS)
CONTROL INFORMATION (8 CARDS)
LOAD MODULE (PROLIBC-69 BLOCKS)
REFERENCE REPORT
17. CATEGORY - G
KEYWORDS - GASES, FISSION PRODUCTS, RADIOACTIVITY, CLADDING,
WATER COOLANTS, POWER REACTORS, OPERATION

1. NAME OR DESIGNATION OF PROGRAM - TRIAL
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - H6000
3. DESCRIPTION OF PROBLEM OR FUNCTION - TRIAL CARRIES OUT A SIMPLE LINKING OF SEVERAL TWO-DIMENSIONAL, MULTIGROUP NEUTRON (DIRECT OR ADJOINT) FLUX SETS TO GIVE A THREE-DIMENSIONAL REPRESENTATION.
4. METHOD OF SOLUTION - THE FLUX LINKING APPROACH ASSUMES THAT THE REACTOR SYSTEM CAN BE WELL REPRESENTED IN CYLINDRICAL GEOMETRY AND REQUIRES INPUT OF ONE (R,Z) MULTIGROUP FLUX SET AND ONE OR MORE (X,Y) MULTIGROUP FLUX SETS FOR SELECTED PLANES PERPENDICULAR TO THE Z-AXIS. POINTS OF INTERSECTION BETWEEN THE TRANSVERSE PLANES AND SELECTED AXIAL LINE SHAPE FUNCTIONS ARE USED TO ESTABLISH FUNCTIONAL DISTRIBUTIONS WHICH DEPEND ON THE SPECTRA (E.G., THE PU239 FISSION RATE, B10 ABSORPTION RATE, ETC.). FOR EACH TRANSVERSE PLANE, A WEIGHTED FUNCTIONAL IS DETERMINED BY AVERAGING THE POINTWISE FUNCTIONALS OVER ALL THE INTERSECTING NODES OF THE AXIAL LINES AND THAT PLANE. THE WEIGHTED FUNCTIONS ARE THEN USED AS NORMALIZATION CONSTANTS IN A SIMPLE INTERPOLATION (OR EXTRAPOLATION) ROUTINE FOR COMPUTING THE THREE-DIMENSIONAL FLUX REPRESENTATION.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - A MAXIMUM OF 25 TWO-DIMENSIONAL FLUX SETS MAY BE INPUT TO TRIAL. OTHERWISE, VARIABLE-DIMENSIONED ARRAYS ARE USED EXCLUSIVELY WITHIN THE PROGRAM AND PROBLEM SIZE LIMITATIONS WILL BE DICTATED BY THE AMOUNT OF AVAILABLE COMPUTER MEMORY.
6. TYPICAL RUNNING TIME - A PROBLEM CONSISTING OF A 20 X 20 X 31 MESH ARRAY, 7 INPUT (X,Y) FLUX SETS AND 3 AXIAL LINE SHAPE FUNCTIONS REQUIRES APPROXIMATELY 3 MINUTES.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - TRIAL USES THE GENED ENVIRONMENTAL SUBROUTINE PACKAGE (ACC ABSTRACT 515).
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
H6000 VERSION SUBMITTED FEBRUARY 1973.
10. REFERENCES - C. L. COWAN, P. GREEBLER, B. A. HUTCHINS, M. D. KELLEY, AND R. PROTSIK, A DESCRIPTION AND EVALUATION OF THE FLUX LINKING APPROACH FOR COMPUTING THREE-DIMENSIONAL FLUXES - THE COMPUTER CODE TRIAL, GEAP-13931, MARCH 1973.
B. M. CARMICHAEL, D. A. MENELEY, AND C. R. VONDY, REPORT ON THE SUBCOMMITTEE ON STANDARD INTERFACE FILES, PREPARED FOR THE COMMITTEE ON COMPUTER CODE COORDINATION, SEPTEMBER 1, 1971.

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11. MACHINE REQUIREMENTS - 32K MEMORY, A MINIMUM OF 4 LOGICAL UNITS FOR THE PERIPHERAL STORAGE OF INPUT, WORKING, AND OUTPUT FLUX SETS, PLUS AN ADDITIONAL LOGICAL UNIT FOR EACH ADDITIONAL INPUT (X,Y) FLUX SET GREATER THAN ONE
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - GCOS6000.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATICS OR RESTRICTIONS - ALL INPUT FLUX SETS AND THE OUTPUT 3-D FLUX SET ARE PRESCRIBED IN THE FORMAT OF THE STANDARD INTERFACE FILE, AS RECOMMENDED BY THE STANDARD INTERFACE FILE SUBCOMMITTEE OF THE COMPUTER CODE COORDINATION COMMITTEE (SEE REFERENCE 2).
15. NAME AND ESTABLISHMENT OF AUTHOR -
C. L. CCHAN
BREEDER REACTOR DEPARTMENT
GENERAL ELECTRIC COMPANY
310 DEGUIGNE DRIVE
SUNNYVALE, CALIFORNIA 94086
16. MATERIAL AVAILABLE -
SOURCE DECK (971 CARDS)
SAMPLE PROBLEM (23 CARDS)
CONTROL INFORMATION (96 CARDS)
REFERENCE REPORT, GEAP-13931
17. CATEGORY - C
KEYWORDS - 3-DIMENSIONAL, REACTION RATES, POWER DISTRIBUTIONS,
LMFBR REACTORS

1. NAME OR DESIGNATION OF PROGRAM - PLENUM
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - BULK FLOW DISTRIBUTION IN A CYLINDRICAL REACTOR COOLANT INLET PLENUM IS CALCULATED USING POTENTIAL FLOW THEORY.
4. METHOD OF SOLUTION - THE LAPLACE EQUATION FOR THE VELOCITY POTENTIAL IS SOLVED FOR GENERAL, SYMMETRIC BOUNDARY CONDITIONS AND ONE INLET NOZZLE BY GAUSS-SEIDEL RELAXATION (PART 1). NONSYMMETRIC, DIMENSIONAL SOLUTIONS ARE THEN FORMED BY SUPERPOSITION OF THE GENERAL SOLUTION (PART 2).
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE CODE IS DIMENSIONED FOR 8000 MESH POINTS IN AN (R,THETA,Z) ARRAY. DIMENSIONS CAN BE EXPANDED AT THE EXPENSE OF RUN TIME AND CORE SIZE.
6. TYPICAL RUNNING TIME - RUN TIME FOR PART 1 IS PROPORTIONAL TO N^2 , WHERE N IS THE NUMBER OF MESH POINTS. WITH 2299 MESH POINTS CPU TIME IS 42 SECONDS ON A 360/195. RUN TIME FOR PART 2 IS 1 SECOND PER PROBLEM. SAMPLE PROBLEM RUNNING TIME IS 2 MINUTES FOR PART 1 AND 1 MINUTE FOR PART 2.
7. UNUSUAL FEATURES OF THE PROGRAM - THE CODE APPROXIMATES BULK FLUID MOTION THROUGH LARGE CYLINDRICAL HEADERS IN CIRCUMSTANCES WHERE DETAILS OF THE FLOW, SUCH AS BOUNDARY LAYER EFFECTS, MAY BE NEGLECTED. THREE-DIMENSIONAL EFFECTS ARE CALCULATED, SO THAT ASYMMETRIC FLUID INPUT AND OUTPUT PROBLEMS MAY BE CALCULATED. USE OF A LINEAR FIELD EQUATION PERMITS RAPID SOLUTION BY SUPERPOSITION OF MANY COMBINATIONS OF INPUT AND OUTPUT BOUNDARY CONDITIONS. FIRST ORDER EFFECTS OF FRICTION MAY BE INCLUDED BY ADDITION OF CONSTANT COEFFICIENTS IN THE FINITE DIFFERENCE FORMULATIONS.
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 VERSION SUBMITTED JUNE 1973, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCE - S. D. HARRIS AND J. W. REECE, APPLICATION OF POTENTIAL FLOW THEORY TO REACTOR COOLANT CIRCULATION, PROCEEDINGS OF THE EIGHTH SOUTHEASTERN SEMINAR ON THERMAL SCIENCES, CP-MS-71-13, MARCH 23-24, 1972.
11. MACHINE REQUIREMENTS - 240K BYTES OF STORAGE AND AN ON-LINE PUNCH AND PRINTER
12. PROGRAMMING LANGUAGE USED - FORTRAN IV

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13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - PLENUM IS WRITTEN AS TWO SEPARATE PROGRAMS. PART 1 PROVIDES A GENERAL DIMENSIONLESS SOLUTION TO THE FIELD EQUATION. FOR A GIVEN HEADER THIS CODE NEED ONLY BE EXECUTED ONCE. PART 2 USES PUNCHED OUTPUT FROM PART 1 TO DETERMINE SOLUTIONS FOR A VARIETY OF USER-SPECIFIED BOUNDARY CONDITIONS BY DIMENSIONALIZATION AND SUPERPOSITION.
15. NAME AND ESTABLISHMENT OF AUTHOR -
S. D. HARRIS
SAVANNAH RIVER LABORATORY
E. I. DU PONT DE NEMOURS
AIKEN, SOUTH CAROLINA 29801
16. MATERIAL AVAILABLE -
SOURCE DECKS (PART1 312 CARDS, PART2 220 CARDS)
SAMPLE PROBLEMS (PART1 3 CARDS, PART2 16 CARDS)
PUNCHED OUTPUT (PART1 419 CARDS)
SAMPLE PROBLEM OUTPUT (PART1 31 PAGES, PART2 11 PAGES)
REFERENCE REPORT
17. CATEGORY - H
KEYWORDS - CYLINDERS, REACTOR COOLANTS, FLUID FLOW, R-THETA-Z

1. NAME OR DESIGNATION OF PROGRAM - AEC-ALO FAU
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360/50
3. DESCRIPTION OF PROBLEM OR FUNCTION - THE AEC-ALO RADIO FREQUENCY ASSIGNMENTS AND USES PROGRAM (FAU) PROVIDES FOR MAINTAINING RADIO FREQUENCY ASSIGNMENT AND TRANSACTION RECORDS. IT LISTS ALL RADIO FREQUENCY ASSIGNMENTS AND USES FROM INITIAL APPLICATION (AEC-310) THROUGH AUTHORIZATIONS (IRAC DOCKET). THE PROGRAM ALLOWS FOR SORTING BY OFFICE, SYSTEM NUMBER, LOCATION, FREQUENCY, EXPIRATION DATE, ALO OR AEC SERIAL NUMBER, AND IRAC DOCKET NUMBER.
4. METHOD OF SOLUTION -
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - A GENERAL FAMILIARITY WITH AEC APPENDIX 0270, PART IV AND THE OTP MANUAL IS ASSUMED.
6. TYPICAL RUNNING TIME - 5 MINUTES ARE REQUIRED FOR SEVEN REPORTS, 1000 RECORDS.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - AN EARLIER VERSION OF THIS PROGRAM WAS WRITTEN FOR THE BURROUGHS B-5500. THIS IS A MODIFIED COBOL VERSION OF A USAEC NUO FORTRAN PROGRAM.
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 VERSION SUBMITTED FEBRUARY 1973, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - AEC-ALO MEMORANDUM, AEC-ALO RADIO FREQUENCY ASSIGNMENTS AND USES (FAU), (1973).
AEC-ALO MEMORANDUM, DESCRIPTION OF RADIO FREQUENCY BOOKKEEPING PROGRAM, (1973).
11. MACHINE REQUIREMENTS - THIS SYSTEM REQUIRES DISK-SORT OF INPUT DATA AND THE MASTER TAPE RECORDS. PERIPHERAL EQUIPMENT REQUIRED IS CARD READER, LINE PRINTER (132 CHARACTER/LINE), AND TWO MAGNETIC TAPE UNITS.
12. PROGRAMMING LANGUAGES USED - COBOL
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THE SYSTEM CONSISTS OF TWO PROGRAMS, M2501 THE TAPE UPDATE PROGRAM, AND M2502 THE REPORT PREPARATION PROGRAM.

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15. NAME AND ESTABLISHMENT OF AUTHORS -

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16. MATERIAL AVAILABLE -

SOURCE DECKS (M2501-485 CARDS, M2502-374 CARDS)
SAMPLE PROBLEMS (M2501-43 CARDS, M2502-1 CARD)
SAMPLE PROBLEM OUTPUT (M2501-11 PAGES, M2502-10 PAGES)
REFERENCE MEMORANDA

17. CATEGORY - M

KEYWORDS - DATA PROCESSING, MAINTENANCE, SEARCHES, RETRIEVAL

1. NAME OR DESIGNATION OF PROGRAM - ORCOST
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - ORCOST ESTIMATES DIRECT AND INDIRECT CAPITAL COSTS OF NUCLEAR AND FOSSIL-FUELED STEAM-ELECTRIC POWER PLANTS. THE COSTS ARE CALCULATED USING BASE COST MODELS WHICH ARE INCLUDED IN THE PROGRAM FOR EACH OF THE FOLLOWING TYPES OF PLANTS - PWR, BWR, COAL, GAS, AND OIL.
4. METHOD OF SOLUTION - THE CODE FOLLOWS THE GUIDELINES OF AEC REPORT NUS-531. A BASE PLANT COST MODEL IS SELECTED AND ADJUSTED FOR DESIRED SIZE, LOCATION, DATE, ETC. CONTINGENCY, SPARE PARTS, OVERTIME, INDIRECTS, INTEREST AND ESCALATION ARE THEN INCLUDED BEFORE PRINTING A REPORT OF COST.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
6. TYPICAL RUNNING TIME - EXECUTION TIME FOR A SINGLE CASE IS APPROXIMATELY ONE SECOND.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - COST MODELS WERE DEVELOPED FROM THE CONCEPT CODE (ACC ABSTRACT 498).
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 VERSION SUBMITTED MARCH 1973, REPLACED BY REVISED
VERSION JULY 1973, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - L. C. FULLER, C. A. SWEET, F. I. BOWERS, ORCOST- A COMPUTER CODE FOR SUMMARY CAPITAL COST ESTIMATES OF STEAM-ELECTRIC POWER PLANTS, USER'S MANUAL, ORNL-TM-3743, SEPTEMBER 1972.
11. MACHINE REQUIREMENTS - 56K BYTES
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
F. I. BOWERS, L. C. FULLER, AND C. A. SWEET
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P. O. BOX X
OAK RIDGE, TENNESSEE 37830
16. MATERIAL AVAILABLE -
SOURCE DECK (1005 CARDS)

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16. MATERIAL AVAILABLE (CONTINUED)
SAMPLE PROBLEM (5 CARCS)
REFERENCE REPORT
17. CATEGORY - D
KEYWORDS - REACTOR ECONOMICS, POWER PLANTS, PWR REACTORS, BWR
REACTORS, CONCEPT CODES

1. NAME OR DESIGNATION OF PROGRAM - BECCM
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360/50, UNIVAC1108
3. DESCRIPTION OF PROBLEM OR FUNCTION - AEC REGULATIONS REQUIRE THAT A PURCHASE VS. LEASE ANALYSIS BE MADE ON EACH PIECE OF DATA PROCESSING EQUIPMENT AS PART OF THE STUDY PRECEDING THE LEASE OR PURCHASE OF SUCH EQUIPMENT. IN ADDITION, IT IS REQUIRED THAT A PURCHASE VS. LEASE ANALYSIS BE PREPARED ANNUALLY FOR EACH ITEM OF DATA PROCESSING EQUIPMENT LEASED WITH AEC FUNDS. BECOM WAS DEVELOPED TO FACILITATE THE RAPID AND ACCURATE PREPARATION OF AN AEC PURCHASE VS. LEASE SCHEDULE FOR AN ITEM OF DATA PROCESSING EQUIPMENT.
4. METHOD OF SOLUTION -
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - BECOM IS RESTRICTED TO A 6 YEARS' STUDY.
6. TYPICAL RUNNING TIME - ON THE UNIVAC1108 50 STUDIES CAN BE DONE IN LESS THAN A MINUTE. ON THE IBM360 THE SAMPLE PROBLEM REQUIRES ABOUT 30 SECONDS.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - THIS PROGRAM IS A MODIFICATION OF ALO-178 AND ALO-251 TRANSFERRED FROM THE ALO-COSMIC COLLECTION.
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 VERSION SUBMITTED JANUARY 1973, SAMPLE PROBLEM EXECUTED BY ACC.
UNIVAC1108 VERSION SUBMITTED JANUARY 1973.
10. REFERENCES - BRUNO D. NAVALES, BECCM, A COMPUTER PROGRAM TO CALCULATE BREAK-EVEN POINT OF PURCHASE VS. LEASE FOR COMPUTING EQUIPMENT IN THE AEC, SANDIA LABORATORIES MANUAL.
BRUNO D. NAVALES, BECOM, A COMPUTER PROGRAM TO CALCULATE BREAK-EVEN POINT OF PURCHASE VS. LEASE FOR COMPUTING EQUIPMENT IN THE AEC, SANDIA LABORATORIES MANUAL, MODIFIED FEBRUARY 1971.
BRUNO NAVALES, PURCHASE VS. LEASE PROGRAM LISTING (BECOM) FOR IBM360/50, SANDIA LABORATORIES REPORT, JANUARY 24, 1973.
BRUNO NAVALES, PURCHASE VS. LEASE PROGRAM LISTING (BECOM) FOR UNIVAC 1108 EXEC-8, SANDIA LABORATORIES REPORT, JANUARY 23, 1973.
11. MACHINE REQUIREMENTS - 300K BYTES OF STORAGE (IBM360)
12. PROGRAMMING LANGUAGE USED - COBOL

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13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
OS/360 (IBM360), EXEC8 (UNIVAC1108).
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHOR -
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SANDIA LABORATORIES
P. O. BOX 5800
ALBUQUERQUE, NEW MEXICO 87115
16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (360-1423 CARDS, 1108-960 CARDS)
SAMPLE PROBLEMS (360-97 CARDS, 1108-97 CARDS)
CONTROL INFORMATION (360-9 CARDS)
LCAD MODULE BECOM (42 BLOCKS)
REFERENCE REPORTS
17. CATEGORY - M
KEYWORDS - DATA PROCESSING, ECONOMICS

1. NAME OR DESIGNATION OF PROGRAM - INTEG/INSPEC
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - THESE PROGRAMS ANALYZE THE CHARACTERISTICS OF A GENERAL MODEL DEVELOPED TO REPRESENT THE SAFETY ASPECTS OF AN OPERATING NUCLEAR REACTOR. THESE CHARACTERISTICS ARE THE FREQUENCIES OF INCIDENTS THAT ARE DEPARTURES FROM THE EXPECTED BEHAVIOR OF THE REACTOR. EACH INCIDENT IS ASSUMED TO BE PRECEDED BY A SEQUENCE OF EVENTS STARTING AT SOME INITIATING EVENT. AT EACH MEMBER IN THIS SEQUENCE THERE MAY BE FUNCTIONS SUCH AS SAFETY CIRCUITS, AND PERSONNEL OPERATIONS THAT STOP THE SEQUENCE AT THAT MEMBER. WHEN MECHANICAL DEVICES FAIL THEY ARE ASSUMED TO REMAIN INOPERATIVE UNTIL REPAIRED. THE MODEL ACCOUNTS FOR SCHEDULED INSPECTION AND MAINTENANCE OF ALL EQUIPMENT IN THE SYSTEM.
4. METHOD OF SOLUTION - IN INTEG, THE DISCONTINUOUS DENSITY FUNCTION IS INTEGRATED BY THE TRAPEZOIDAL RULE FROM TIME EQUALS ZERO TO TIME EQUALS T. INSPEC IS BASED ON THE SIMULATION OF REACTOR OPERATION AS A MARKOV PROCESS. A VECTOR OF PROBABILITIES IS SUCCESSIVELY MULTIPLIED BY A TRANSITION MATRIX.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - INSPEC IS LIMITED TO SUBSYSTEMS WITH NO MORE THAN 7 SAFETY CIRCUITS. THE TRANSITION MATRIX CAN BE MADE UP AS DESIRED SO THAT ANY INTERCORRELATIONS BETWEEN FAILURES OF CIRCUITS CAN BE ACCOMMODATED. IN INTEG, FAILURE RATES OF SAFETY CIRCUITS ARE RESTRICTED TO INDEPENDENCE.
6. TYPICAL RUNNING TIME - THE INTEG SAMPLE PROBLEM CONTAINING FIVE PROBLEMS, EACH WITH 3,000 STEPS OF TRAPEZOIDAL INTEGRATION AND WITH AN AVERAGE OF 4.6 SAFETY CIRCUITS, REQUIRES A TOTAL CPU TIME OF 2 SECONDS ON AN IBM360/195, WHILE THE INSPEC SAMPLE PROBLEM WITH THREE SAFETY CIRCUITS RUNS FOR 500 TRANSITIONS WITH AN INDICATED CPU TIME LESS THAN 2 SECONDS.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 VERSION SUBMITTED MARCH 1973, SAMPLE PROBLEMS EXECUTED BY ACC.
10. REFERENCE - L. M. ARNETT, QUANTITATIVE ANALYSIS OF REACTOR SAFETY, DP-1168, NOVEMBER 1968.
11. MACHINE REQUIREMENTS -
12. PROGRAMMING LANGUAGE USED - FORTRAN IV

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13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
OS/360.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHOR -
L. M. ARNETT
SAVANNAH RIVER LABORATORY
E. I. DU PONT DE NEMOURS
AIKEN, SOUTH CAROLINA 29801
16. MATERIAL AVAILABLE -
SOURCE DECKS (INTEG 143 CARDS, INSPEC 159 CARDS)
SAMPLE PROBLEMS (INTEG 28 CARDS, INSPEC 10 CARDS)
SAMPLE PROBLEM OUTPUT (INTEG 13 PAGES, INSPEC 2 PAGES)
REFERENCE REPORT
17. CATEGORY - G
KEYWORDS - REACTOR SAFETY, OPERATION

1. NAME OR DESIGNATION OF PROGRAM - PLETHS
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - GE-400 TIME-SHARING
3. DESCRIPTION OF PROBLEM OR FUNCTION - PLETHS IS A TIME-SHARING ISOPLETH-AREA PROGRAM FOR DETERMINING GROUND-LEVEL AREAS OF HIGH POLLUTANT CONCENTRATION DOWNWIND OF A SINGLE SOURCE OF EMISSION. THESE ELLIPTICAL AREAS ARE ENCLOSED BY ISOPLETHS OF CONSTANT CONCENTRATION PRODUCED BY CONTINUOUS POLLUTANT EMISSIONS FROM ONE SMOKE STACK OR GROUND SOURCE, OR FROM A CLOSELY ASSOCIATED GROUP OF SINGLE SOURCES. STACK HEIGHT, WEATHER CONDITIONS, AND SOURCE EMISSION RATE ARE TYPED IN AND THE PROGRAM CALCULATES AND DESCRIBES THE HIGH POLLUTION AREAS ENCLOSED BY ISOPLETHS.
4. METHOD OF SOLUTION - CONCENTRATIONS FOR EACH POINT OF A SQUARE GRID ARE CALCULATED BY MEANS OF THE PLUME MODEL FOR ATMOSPHERIC DISPERSION OR (FOR LOW WIND SPEEDS) THE PUFF MODEL.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - CALCULATIONS CAN BE PERFORMED FOR ANY (NONREACTING) GAS OR PARTICULATE MATTER. THE RESULTING CONCENTRATIONS AND ISOPLETHS ARE IN PARTS PER MILLION (FOR GASES OF GIVEN MOLECULAR WEIGHT) OR IN MICROGRAMS PER CUBIC METER (FOR ANY POLLUTANT).
6. TYPICAL RUNNING TIME - LESS THAN A MINUTE IS REQUIRED WITH AVERAGE CONNECT TIME ABOUT 15 TO 20 MINUTES.
7. UNUSUAL FEATURES OF THE PROGRAM - THE PARTICULAR ADVANTAGE OF THE TIME-SHARING PROGRAM IS THAT ISOPLETHS CAN BE CALCULATED FOR ANY COMBINATION OF SOURCE STRENGTH AND ISOPLETH LEVEL, AS WELL AS ANY COMBINATION OF WIND SPEED, STABILITY, AND OTHER METEOROLOGICAL CONDITIONS. ANY BOOK OF TABLES IS NECESSARILY LIMITED BY SIZE TO A SMALL SET OF CASES.
8. RELATED AND AUXILIARY PROGRAMS - THE TIME-SHARING PROGRAM IS BASED ON THE ISOPLETH-AREA CODE DESCRIBED IN REFERENCE 1. THIS CODE ALSO FORMED THE NUCLEUS OF THE PUFF CODE ASSOCIATED WITH THE APICS SYSTEM, REFERENCE 2.
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
GE-400 TIME-SHARING PROGRAM RECEIVED MAY 1973.
10. REFERENCES - L. A. CONLEY, E. J. CROKE, A. S. KENNEDY, R. F. KING, J. E. NORCO, J. J. ROBERTS, A. D. ROSSIN, AND T. D. WOLSKO, ISOPLETH-AREA TABLES, ANL/ES-8, OCTOBER 1971.
J. J. ROBERTS, EDITOR, CHICAGO AIR POLLUTION SYSTEMS ANALYSIS PROGRAM: FINAL REPORT, ANL/ES-CC-009, FEBRUARY 1971.
RICHARD F. KING, TIME-SHARING ISOPLETH-AREA PROGRAM, ANL/ES-13, SEPTEMBER 1972.

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11. MACHINE REQUIREMENTS - CODE LENGTHS ARE: SOURCE, ABOUT 22,500 BYTES, OBJECT, ABOUT 13,000 BYTES, 3-BYTES PER 24-BIT WORD.
12. PROGRAMMING LANGUAGES USED - GE-400 TIME-SHARING FORTRAN
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - GSA TIME-SHARING SYSTEM.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHOR -
RICHARD F. KING
ENERGY AND ENVIRONMENTAL SYSTEMS DIVISION
ARGONNE NATIONAL LABORATORY
9700 SOUTH CASS AVENUE
ARGONNE, ILLINOIS 60439
16. MATERIAL AVAILABLE -
REFERENCE REPORT, ANL/ES-13, CONTAINING SOURCE LISTING, SAMPLE
PROBLEM INPUT AND OUTPUT INFORMATION
17. CATEGORY - R
KEYWORDS - TIME-SHARING, POLLUTANTS CONCENTRATION, PARTICLES,
ATMOSPHERE

1. NAME OR DESIGNATION OF PROGRAM - GEAR
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS LPCN WHICH IT IS OPERABLE - CDC6600,7600
3. DESCRIPTION OF PROBLEM OR FUNCTION - GEAR IS A PACKAGE OF SUBROUTINES FOR THE NUMERICAL SOLUTION OF SYSTEMS OF ORDINARY DIFFERENTIAL EQUATIONS, GIVEN THE INITIAL VALUES. IT IS PARTICULARLY WELL-SUITED FOR STIFF SYSTEMS, BUT CAN BE USED GENERALLY.
4. METHOD OF SOLUTION - THE BASIC METHODS USED ARE OF THE LINEAR MULTISTEP PREDICTOR-CORRECTOR TYPE. GEAR CONTAINS BOTH THE IMPLICIT ADAMS METHODS AND THE LINEAR MULTISTEP METHODS OF C. W. GEAR AS OPTIONS, AND IS BASED ON A PROGRAM WRITTEN BY GEAR.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - CHOICE OF EITHER IMPLICIT ADAMS METHODS TO ORDER 12, OR GEAR METHODS TO ORDER 5 IS ALLOWED.
6. TYPICAL RUNNING TIME - THIS IS PROBLEM- AND MACHINE-DEPENDENT.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
CDC6600-7600 VERSION SUBMITTED JULY 1973.
10. REFERENCES - C. W. GEAR, NUMERICAL INITIAL VALUE PROBLEMS IN ORDINARY DIFFERENTIAL EQUATIONS, PRENTICE-HALL, 1971.
A. C. HINDMARSH, LINEAR MULTISTEP METHODS FOR ORDINARY DIFFERENTIAL EQUATIONS: METHOD FORMULATIONS, STABILITY, AND THE METHODS OF NORDSIECK AND GEAR, UCRL-51186, MARCH 1972.
A. C. HINDMARSH, THE CONTROL OF ERRORS IN THE GEAR PACKAGE FOR ORDINARY DIFFERENTIAL EQUATIONS, IN CONSTRUCTION OF MATHEMATICAL SOFTWARE, F. N. FRITSCH, ED., UCID-30050 PART 3, AUGUST 7, 1972.
A. C. HINDMARSH, GEAR: ORDINARY DIFFERENTIAL EQUATION SYSTEM SOLVER, UCID-30001 REV. 2, AUGUST 20, 1972.
11. MACHINE REQUIREMENTS - UNDER ORDER OR WHAT THE SPACE REQUIRED FOR THE ENTIRE PACKAGE, INCLUDING DRIVES, BUT EXCLUDING THE COMMON BLOCKS AND THE Y ARRAY IS 1837 DECIMAL.
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - PROGRAM RUNS UNDER ORDER AND WHAT SYSTEMS ON THE CDC6600 AND CDC7600, AND WITH MINOR CHANGES UNDER CHIP ON THE CDC6600. FOR OTHER SYSTEMS, ONLY MINOR MODIFICATIONS SHOULD BE NECESSARY.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
THE SUBROUTINES IN THE GEAR PACKAGE--DRIVES, STIFF, COSET, DECOMP,
AND SOLVE--ARE HEAVILY AUGMENTED WITH COMMENT CARDS. IF STIFF IS
USED ON MACHINES OTHER THAN THE CDC6600,7600, THE CONSTANT NOISE
SET IN A DATA STATEMENT MUST BE SET TO THE APPROXIMATE MACHINE
NOISE LEVEL. THE PACKAGE CAN BE USED IN ONE OF TWO MODES. THE
USER CAN CALL SUBROUTINE STIFF FROM HIS OWN PROGRAM FOR EACH STEP
OF THE INTEGRATION OR ALTERNATIVELY, THE USER CAN MAKE A SINGLE
CALL TO THE DRIVES SUBROUTINE WHICH CONTAINS THE LOOPING AND
ERROR-TREATMENT CODING NECESSARY TO COMPLETE THE PROBLEM.
15. NAME AND ESTABLISHMENT OF AUTHOR -
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NUMERICAL MATHEMATICS GROUP, L-310
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LIVERMORE, CALIFORNIA 94550
16. MATERIAL AVAILABLE -
SOURCE DECKS (982 CARDS)
SAMPLE PROBLEM (82 CARDS)
SAMPLE PROBLEM OUTPUT (3 PAGES)
REFERENCE REPORT, UCID-30001 REV. 2
17. CATEGORY - P
KEYWORDS - DIFFERENTIAL EQUATIONS, NUMERICAL CALCULATIONS,
PREDICTOR-CORRECTOR

1. NAME OR DESIGNATION OF PROGRAM - TSC-SPEAKEASY
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360,370
3. DESCRIPTION OF PROBLEM OR FUNCTION - SPEAKEASY IS A GENERAL-PURPOSE LANGUAGE PROCESSOR OPERATING AS A SUPER DESK CALCULATOR UNDER TSO.
4. METHOD OF SOLUTION - THE LANGUAGE SYNTAX CLOSELY RESEMBLES THAT OF MATHEMATICS. USER-DEFINED VARIABLES ARE CLASSIFIED AS SCALARS, ARRAYS, VECTORS, OR MATRICES. CLASS-DIRECTED OPERATORS SIMPLIFY THE LANGUAGE.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE MAJOR VERSIONS DEVELOPED WERE (1) AN IBM360/370 STANDARD JOB BATCH VERSION, (2) AN INTERACTIVE VERSION WHICH USED THE IBM2250 DISPLAY CONSOLE OFFERING GRAPHIC CAPABILITIES, AND (3) AN INTERACTIVE VERSION THAT RUNS UNDER TSO.
6. TYPICAL RUNNING TIME -
7. UNUSUAL FEATURES OF THE PROGRAM - SPEAKEASY IS AN EXTENSIBLE LIBRARY-DIRECTED PROCESSOR. AVAILABLE FACILITIES INCLUDE ARRAY ALGEBRA, COMPLETE MATRIX ALGEBRA, STATISTICAL PACKAGES, GRAPHICAL PACKAGES, AND ASSORTED SPECIAL FUNCTIONS. AN ACTIVE USER COMMUNITY EXISTS.
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 IOTA VERSION 3F SUBMITTED NOVEMBER 1973.
THIS VERSION IS VALID ONLY THROUGH DECEMBER 1974.
10. REFERENCES - S. COHEN, THE SPEAKEASY-3 REFERENCE MANUAL, ANL-8000, MAY 1973.
S. COHEN, SPEAKEASY: "RAKUGO", FIRST USA-JAPAN COMPUTER CONFERENCE PROCEEDINGS REPRINT, OCTOBER 3-5, 1972.
S. COHEN, TSC-SPEAKEASY NEWSLETTERS, NO. 1 (AUG. 7, 1972), NO. 2 (SEPT. 5, 1972), NO. 3 (DEC. 13, 1972), NO. 4 (MAR. 28, 1973), NO. 5 (MAY 23, 1973), NO. 6 (JULY 24, 1973), NO. 7 (OCT. 1, 1973).
11. MACHINE REQUIREMENTS - A 130K OR LARGER TSC REGION IS REQUIRED FOR THIS TSO VERSION.
12. PROGRAMMING LANGUAGE USED - FORTRAN IV AND ASSEMBLER LANGUAGE
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360, RELEASE 21.6, VS1, AND VS2.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHOR -

S. COHEN
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ARGONNE, ILLINOIS 60439

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL

SPEAK.ICTA LOAD MODULE (286 BLOCKS)
SPEAK.EMESS ERROR MESSAGES (66 BLOCKS)
SPEAK.LINKULES SYSTEM LINKULE LIBRARY (1227 BLOCKS)
SPEAK.HELP CURRENT HELP LIBRARY (276 BLOCKS)
SPEAK.PROCLIB TUTORIAL AND TAILORING INFORMATION (109 BLOCKS)
REFERENCE REPORTS, REPRINT, NEWSLETTERS, AND INSTALLATION
INSTRUCTIONS

17. CATEGORY - P

KEYWORDS - PROGRAMMING LANGUAGES, NUMERICAL CALCULATIONS,
LIBRARIES

1. NAME OR DESIGNATION OF PROGRAM - ARC-XSEC1
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - ARC-XSEC1 PROVIDES THE CAPABILITY OF MANIPULATING MULTIGROUP MICROSCOPIC CROSS SECTION DATA IN THE XS.ISO FORMAT TO AFFECT MODIFICATIONS OF THE ISOTOPIC CROSS SECTION COMPONENTS, TO COLLAPSE THE ENERGY GROUP STRUCTURE TO FEWER GROUPS, AND TO HOMOGENIZE MIXTURES INTO MATERIAL AND COMPOSITION LEVEL DATA FOR USE BY THE NEUTRONICS MODULES OF THE ARGONNE REACTOR COMPLETION (ARC) SYSTEM.
4. METHOD OF SOLUTION - ARC-XSEC1 CONSISTS OF FOUR RELATED MODULES - AJC007, NUI006, NUI001, AND NUC001. THE MODULE AJC007 PROVIDES A GROUP COLLAPSE OF THE MULTIGROUP XS.ISO DATA INTO A USER-SPECIFIED GROUP STRUCTURE AND WRITES THE BINARY INTERFACE DATA SET XS.ISO2. NUI006 PRODUCES RUN-TIME MODIFICATIONS OF ISOTOPIC CROSS SECTION COMPONENTS OF THE CARD IMAGE DATA SET A.NIP. THE MODULE NUI001 PROCESSES THE MATERIAL AND COMPOSITION LEVEL MIXING DATA SPECIFIED IN A.NIP AND PRODUCES MIX TABLES AS THE BINARY INTERFACE DATA SET B.HOMOG. NUC001 USES THE MIX TABLES OF B.HOMOG TO PRODUCE HOMOGENIZED MATERIAL AND COMPOSITION LEVEL CROSS SECTION DATA SETS IN THE BINARY INTERFACE DATA SET FORMATS XS.M.MIN, XS.M.ANI, XS.M.AUX, XS.C.MIN, XS.C.ANI, XS.C.AUX, RESPECTIVELY.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
6. TYPICAL RUNNING TIME - THE SAMPLE PROBLEM PROVIDED WHICH CONSISTS OF MULTIPLE OPERATIONS, REQUIRES ABOUT 71 SECONDS ON AN IBM360/195.
7. UNUSUAL FEATURES OF THE PROGRAM - THE MODULAR DESIGN ALLOWS THE USE OF ANY OR ALL OF THE MODULES IN THIS PACKAGE WITH OTHER DESIRED MODULES. THE HOMOGENIZATION CAPABILITY, NUI001 AND NUC001, IS USED TO PROVIDE CROSS SECTION DATA FOR EACH OF THE NEUTRONICS MODULES WITH COMMUNICATION VIA INTERFACE DATA SETS.
8. RELATED AND AUXILIARY PROGRAMS - THE NEUTRONICS PATHS OF THE ARC SYSTEM UTILIZE THE CAPABILITIES PROVIDED BY THESE MODULES. THE ARC SYSTEM ENVIRONMENT IS PROVIDED BY ARC-SYSTEM (ACC ABSTRACT 522). THE BCD INPUT PROCESSOR MODULE FOR THE ARC-SYSTEM IS ARC-NUI002 (ACC ABSTRACT 533).
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 VERSION SUBMITTED APRIL 1973, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - E. A. KOVALSKY, J. ZAPATKA, H. HENRYSON, II, J. HOOVER, AND P. M. WALKER, THE ARC SYSTEM CROSS SECTION HOMOGENIZATION AND MODIFICATION CAPABILITIES, ANL-7714, JUNE 1971.
L. C. JUST, H. HENRYSON, II, A. S. KENNEDY, S. D.

10. REFERENCES (CONTINUED)
SPARCK, B. J. TOPPEL, AND P. M. WALKER, THE SYSTEM ASPECTS AND
INTERFACE DATA SETS OF THE ARGONNE REACTOR COMPUTATION (ARC) SYS-
TEM, ANL-7711, APRIL 1971.
B. J. TOPPEL, SUPPLEMENTAL INFORMATION, ANL MEMO,
1973.
11. MACHINE REQUIREMENTS - 300K BYTES WITH A 10,000 DOUBLEWORD CON-
TAINER (DEFAULT) AND 2 PERIPHERAL I/O DEVICES
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
OS/360.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
AUTHORS E. A. KOVALSKY, J. ZAPATKA, F. FERRYSON, II,
J. HOOVER, AND P. M. WALKER

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ARGONNE, ILLINOIS 60439
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (PDS ARC.XSOURCE)
OBJECT MODULES (PDS ARC.XSEGLIB)
LINKAGE EDITOR CONTROL STATEMENTS (PDS ARC.XOVERLAY)
LOAD MODULES (PDS ARC.XMCCLIB)
CONTROL INFORMATION (JCL IEHMOVE DECK)
SAMPLE PROBLEM (425 CARDS)
LIBRARIES (XS.ISO.F1 AND XS.ISC.F2)
SAMPLE PROBLEM OUTPUT (98 PAGES)
REFERENCE REPORTS
17. CATEGORY - L
KEYWORDS - MODULAR SYSTEM, MULTIGROUP CROSS SECTIONS, INPUT DATA,
GROUP CONSTANTS, ARC CCDES

1. NAME OR DESIGNATION OF PROGRAM - MAPPER
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - GE MARK III TIME-SHARING
3. DESCRIPTION OF PROBLEM OR FUNCTION - MAPPER IS A COMPUTER PROGRAM FOR PREDICTING EQUIPMENT REQUIREMENTS. IT WAS DESIGNED AS AN AID TO MANAGEMENT AND CAN INTERPRET COMPONENT PRODUCTION REQUIREMENTS BACKWARD FROM SHIPPING SCHEDULES TO THE PROCESS OF INTEREST, CALCULATE EQUIPMENT CAPACITY, DISPLAY SIX MONTHS PRIOR EQUIPMENT UTILIZATION AND PROCESS YIELD DATA.
4. METHOD OF SOLUTION -
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
6. TYPICAL RUNNING TIME - 1 TO 2 SECONDS ARE REQUIRED FOR A TYPICAL PROBLEM.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
GE MARK III TIME-SHARING PROGRAM LISTING SUBMITTED
AUGUST 1973.
10. REFERENCES - R. J. DI PRIMA, MANUFACTURING PROGRAM FOR PREDICTING EQUIPMENT REQUIREMENT (MAPPER), GEPP-103, 1973.
11. MACHINE REQUIREMENTS -
12. PROGRAMMING LANGUAGES USED - BASIC
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - GE MARK III TIME-SHARING OPERATION.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THE PROGRAM USES THE MARK III SYSTEM PLOTTING ROUTINE EZGRAF.
15. NAME AND ESTABLISHMENT OF AUTHOR -
R. J. DI PRIMA
NEUTRON DEVICES DEPARTMENT
GENERAL ELECTRIC COMPANY
P. O. BOX 11508
ST. PETERSBURG, FLORIDA 33733
16. MATERIAL AVAILABLE -
REFERENCE REPORT CONTAINING SOURCE LISTING, SAMPLE PROBLEM
INPUT AND OUTPUT INFORMATION
SOURCE PROGRAM ON PAPER TAPE (AVAILABLE UPON REQUEST)

ACC ABSTRACT 595

-2-

02/74

17. CATEGORY - M

KEYWORDS - MANAGEMENT AID, EQUIPMENT REQUIREMENTS, MANUFACTURING

1. NAME OR DESIGNATION OF PROGRAM - ENDFB2/GAND2/GFE2
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - UNIVAC1108
3. DESCRIPTION OF PROBLEM OR FUNCTION - ENDFB2 CONVERTS ENDF/B CROSS SECTION DATA FROM A CARD-IMAGE TO A BINARY TAPE FOR USE BY THE GAND2 AND/OR GFE2 CODES.

GAND2 PREPARES THE CROSS SECTIONS NEEDED FOR DETAILED COMPUTATIONS OF NEUTRON ENERGY SPECTRA IN REACTORS FROM A FILE OF BASIC NUCLEAR DATA IN THE ENDF/B VERSION II OR III FORMATS (ALSO RETAINS THE ENDF/B VERSION I CAPABILITY OF GAND).

GFE2 PREPARES 1/E OR FISSION-SPECTRUM WEIGHTED, ZERO TEMPERATURE, INFINITE DILUTION GROUP-AVERAGED CROSS SECTIONS AND SCATTERING TRANSFER ARRAYS FOR USE IN THE FAST SECTIONS OF THE GGC AND MICROX CODES FROM A FILE OF BASIC NUCLEAR DATA IN THE ENDF/B VERSION II OR III FORMATS (THE ENDF/B VERSION I FORMAT CAPABILITY OF THE ORIGINAL GFE CODE IS ALSO RETAINED).
4. METHOD OF SOLUTION - GAND2 PREPARES FINE GROUP CROSS SECTIONS AND SCATTERING TRANSFER ARRAY COEFFICIENT ARRAYS FOR USE IN THE GAF CODE USING MODIFIED VERSIONS OF THE ROUTINES USED TO PREPARE GGC4 (ACC ABSTRACT 298) DATA TAPES AS WELL AS THE GANDY CODE (ACC ABSTRACT 341) FOR UNRESOLVED RESONANCE REGION CROSS SECTION GENERATION. POINTWISE RESOLVED RESONANCE REGION CROSS SECTIONS FOR USE IN THE GAR AND MICROX CODES AS WELL AS THE GAROL OPTION (ACC ABSTRACT 219) OF THE GGC5 CODE ARE PREPARED USING THE PSEUDO CODE (ACC ABSTRACT 292) TO GENERATE STATISTICAL RESONANCES IN THE UNRESOLVED RESONANCE REGION AND THE FSDP3 CODE (ACC ABSTRACT 216) TO GENERATE THE CROSS SECTIONS FROM BOTH THE STATISTICAL RESONANCES AND THE RESOLVED RESONANCE PARAMETERS. CROSS SECTION VALUES IN THE THERMAL NEUTRON ENERGY RANGE MAY BE PREPARED FOR NON-MODERATOR NUCLIDES (THOSE NUCLIDES FOR WHICH NO DETAILED SCATTERING LAW DATA ARE GIVEN IN FILE 7) USING EITHER A STRICTLY POINTWISE CALCULATION OR AN ULTRA-FINE MESH AVERAGING PROCEDURE USING A NEUTRON ENERGY SPECTRUM OBTAINED BY INTERPOLATION FROM AN INPUT SPECTRUM.

GFE2 IS AN EXTENDED SPECIAL-PURPOSE VERSION OF THE GAF CROSS SECTION PREPARATION SECTION OF THE GAND2 CODE. THE EXTENSIONS INCLUDE THE COMPUTATION OF P3 INSTEAD OF P1 SCATTERING TRANSFER ARRAYS AND A HIGH-SPEED, ZERO TEMPERATURE, INFINITE DILUTION RESOLVED RESONANCE CALCULATION VIA THE INDER CODE (GA-7158).
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - ENDFB2 PROCESSES FILES 1 THROUGH 7 OF THE CURRENT ENDF/B FORMAT.

GAND2 MAXIMA INCLUDE -

 - 20 ENDF/B MATERIALS PROCESSED IN A SINGLE PROBLEM
 - 35 RESONANCE LEVELS ON EITHER SIDE OF THE INCIDENT NEUTRON ENERGY
 - 1000 RESOLVED RESONANCES PER ISOTOPE (375 PER L-STATE PER ISOTOPE IN GFE2 VERSION)
 - 500 ENERGIES PER L-STATE PER ISOTOPE FOR ENERGY-DEPENDENT UNRESOLVED RESONANCE PARAMETERS (LRU=2, LRF=1 OR 2)

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM (CONTINUED)

1740 GROUPS FOR GAF

5000 WORDS PER RECORD ON GAF DATA TAPES

2000 WORDS PER RECORD ON GAR DATA TAPES

10 TEMPERATURES PER GAR PROBLEM

10 ISOTOPES PER GAR PROBLEM

800 ENERGIES (GROUPS) IN THE THERMAL NEUTRON CROSS SECTION PREPARATION SECTION

GFE2 MAXIMA INCLUDE -

20 ENDF/B MATERIALS PER PROBLEM

375 RESOLVED RESONANCES PER L-STATE (ANGULAR MOMENTUM STATE) PER ISOTOPE

375 ENERGIES PER L-STATE PER ISOTOPE FOR ENERGY-DEPENDENT UNRESOLVED RESONANCE PARAMETERS (LRU=2, LRF=1 OR 2)

99 GROUPS (LIMITED BY SUBROUTINE INDER AND BY TRANSFER ARRAY ACCUMULATION IN SUBROUTINE GACJ)

LF=1 OR 5 SECONDARY ENERGY DISTRIBUTION LAWS IN FILE 5 CANNOT BE PROCESSED IN THE PRESENT VERSION OF GAND2 AND GFE2. INELASTIC SCATTERING IS ASSUMED TO BE ISOTROPIC IN THE CENTER-OF-MASS SYSTEM.

6. TYPICAL RUNNING TIME - ENDFB2 PROCESSING ONE MATERIAL TAKES LESS THAN A MINUTE. TOTAL TIME IS DETERMINED BY THE POSITION OF THE MATERIAL ON THE CARD-IMAGE TAPE. A FULL CARD-IMAGE TAPE (CONTAINING APPROXIMATELY 23,000 RECORDS) TAKES ABOUT 9 MINUTES TO READ.

GAND2 REQUIRES 15 MINUTES OR LESS FOR A TYPICAL GAF OR GAR PROBLEM, 1 MINUTE FOR THE THERMAL NEUTRON CROSS SECTION OPTION. 5 MINUTES ARE REQUIRED FOR A TYPICAL GFE2 PROBLEM.

7. UNUSUAL FEATURES OF THE PROGRAM - ENDFB2 WRITES THE BINARY OUTPUT TAPE USING THE UNIVAC SPECIAL I/O ROUTINE NTPAN. IF THE NUMBER OF TABULAR POINTS FOR A GIVEN ENDF/B FILE 3 REACTION TYPE EXCEEDS 2000, THE REACTION DATA IS BLOCKED INTO MULTIPLE RECORDS. REDUNDANT INELASTIC SCATTERING DATA IS ALSO ELIMINATED.

THE RESOLVED AND UNRESOLVED RESONANCE CALCULATIONS IN GAND2 CAN TREAT PROCESSES INVOLVING NEUTRONS OF ORBITAL ANGULAR MOMENTA ZERO THROUGH THREE (S-, P-, D-, AND F-WAVE INTERACTIONS). THE VERSION OF THE PSEUDO CODE USED IN THIS PROGRAM HAS BEEN MODIFIED TO ALLOW 1 TO 4 DEGREES OF FREEDOM FOR THE DISTRIBUTION OF FISSION WIDTHS AND HAS BEEN MODIFIED IN GAND2 TO OPERATE FROM HIGHER TO LOWER ENERGIES FOR MUCH GREATER SPEED IN PREPARING 14,500 POINT GAR DATA FOR NUCLIDES SUCH AS U235. A VIRTUALLY UNLIMITED (OVER 2 MILLION) NUMBER OF TABULAR ENERGIES MAY BE USED IN THE ENDF/B FORMAT FILE 3 DATA. THIS IS ACHIEVED BY BREAKING THE ENDF/B FILE 3 DATA UP INTO 2000 WORD BLOCKS. A SIMILAR SCHEME IS USED TO PROCESS THE ANGULAR DISTRIBUTION DATA FROM AN ENDF/B FORMAT FILE 4 WITHOUT SIGNIFICANT RESTRICTIONS ON THE AMOUNT OF INPUT DATA.

THE RESOLVED AND UNRESOLVED RESONANCE CALCULATIONS IN GFE2 CAN TREAT PROCESSES INVOLVING NEUTRONS OF ORBITAL ANGULAR MOMENTA ZERO THROUGH THREE (S-, P-, D-, AND F-WAVE INTERACTIONS). A VIRTUALLY UNLIMITED (OVER 2 MILLION) NUMBER OF TABULAR ENERGIES MAY BE USED IN THE ENDF/B FORMAT FILE 3 DATA. THIS IS ACHIEVED BY BREAKING THE ENDF/B FILE 3 DATA UP INTO 2000 WORD BLOCKS. A SIMILAR SCHEME

7. UNUSUAL FEATURES OF THE PROGRAM (CONTINUED)
IS USED TO PROCESS THE ANGULAR DISTRIBUTION DATA FROM AN ENDF/B FORMAT FILE 4 WITHOUT SIGNIFICANT RESTRICTIONS ON THE AMOUNT OF INPUT DATA.
8. RELATED AND AUXILIARY PROGRAMS - THE BINARY ENDF/B FORMAT NUCLEAR DATA TAPES REQUIRED BY THE GAND2 AND GFE2 CODES ARE PREPARED FROM CARDS OR ENDF/B CARD-IMAGE TAPES BY THE ENDFR2 CODE, WHICH IS SIMILAR TO THE DAMMET CODE (ACC ABSTRACT 384). OUTPUT FROM THE GAND2 CODE IS INTENDED FOR USE IN THE GAFGAR CODE (ACC ABSTRACT 316), THE GAROL OPTION OF THE GGC5 CODE, AND MICROX CODE, AND THE WTFG CODE. OUTPUT OF THE GFE2 CODE IS INTENDED FOR USE AS INPUT TO THE MAKE CODE WHICH PREPARES DATA TAPES (GAM TYPE) FOR USE IN THE FAST SECTIONS OF THE GGC4 AND GGC5 CODES. THESE GAM-TYPE DATA TAPES ARE ALSO USED TO PREPARE DATA TAPES FOR USE IN THE MICROX CODE.
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
UNIVAC1108 VERSION SUBMITTED JULY 1973.
10. REFERENCES - R. J. ARCHIBALD AND D. R. MATHEWS, THE GAF/GAR/GAND FAST REACTOR CROSS SECTION PREPARATION SYSTEM, GAFGAR - A PROGRAM FOR THE CALCULATION OF NEUTRON SPECTRA AND GROUP-AVERAGED CROSS SECTIONS, GA-7542, VOL. I, 1968, AND ERRATA, MAY 1968.
R. J. ARCHIBALD AND D. R. MATHEWS, THE GAF/GAR/GAND FAST REACTOR CROSS SECTION PREPARATION SYSTEM, GAND2 AND GFE2 - COMPUTER PROGRAMS FOR PREPARING INPUT DATA FOR THE GAFGAR, GGC AND MICROX CODES FROM AN ENDF/B FORMAT NUCLEAR DATA FILE, GA-7542, VOL. II, MARCH 1973, AND ERRATA, FEBRUARY 18, 1974.
M. K. DRAKE (ED.), DATA FORMATS AND PROCEDURES FOR THE ENDF/B NEUTRON CROSS SECTION LIBRARY, BNL-50274, OCTOBER 1970.
M. K. DRAKE, C. V. SMITH, AND L. J. TCDT, DESCRIPTION OF AUXILIARY CODES USED IN THE PREPARATION OF DATA FOR THE GGC-3 CODE, GA-7158, AUGUST 1971.
S. C. COHEN AND P. K. KOCH, GANDY - A COMPUTER PROGRAM FOR THE EVALUATION OF EFFECTIVE CROSS SECTIONS IN THE UNRESOLVED RESONANCE REGION, GA-8003, MAY 1967.
M. W. DYOS, CONSTRUCTION OF STATISTICAL RESONANCES IN THE UNRESOLVED RESONANCE REGION - THE PSEUDC CODE, GA-7136, MAY 26, 1966.
D. R. MATHEWS, FSDP3, A COMPUTER PROGRAM FOR COMPUTING CROSS SECTIONS FROM RESONANCE PARAMETERS, GULF-GA-A12052, APRIL 5, 1972.
D. MATHEWS, ET AL., GGC-5, A COMPUTER PROGRAM FOR CALCULATION OF NEUTRON SPECTRA AND GROUP CONSTANTS, GA-8871, SEPTEMBER 27, 1971.
J. ADIR AND K. D. LATHROP, THEORY OF METHODS USED IN THE GGC-4 MULTIGROUP CROSS SECTION CODE, GA-5021, OCTOBER 1968.
P. WALT AND P. KOCH, MICROX - A TWO-REGION FLUX SPECTRUM CODE FOR THE EFFICIENT CALCULATION OF GROUP CROSS SECTIONS, GULF-GA-A10827, APRIL 14, 1972.

11. MACHINE REQUIREMENTS - 11,000 WORDS FOR ENDFB2 PROGRAM AND DATA AND A MAXIMUM OF 4 MAGNETIC TAPE UNITS, 65K WORD AVAILABLE FAST MEMORY AND 4 TO 8 MAGNETIC TAPE UNITS PLUS 5 SCRATCH FILES TOTAL-ING ABOUT 1310K WORDS IN CAPACITY FOR GAND2, 65K WORD AVAILABLE FAST MEMORY AND 2 MAGNETIC TAPE UNITS PLUS 7 SCRATCH FILES TOTAL-ING ABOUT 1310K WORDS IN CAPACITY FOR GFE2
12. PROGRAMMING LANGUAGE USED - FORTRAN V (1108)
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - EXEC-8 (1108).
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THE UNIVAC1108 VERSION OF THESE PROGRAMS USES THE UNIVAC NTRAN I/O ROUTINES, UNIVAC FORTRAN V PROCEDURE ELEMENTS, AS WELL AS THE INCLUDE AND PARAMETER STATEMENTS.
15. NAME AND ESTABLISHMENT OF AUTHORS -
1108 D. R. MATHEWS AND R. J. ARCHIBALD
GULF GENERAL ATCMIC
P. O. BOX 608
SAN DIEGO, CALIFORNIA 92112
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (ENDFB2 1108-790 CARDS, GAND2 1108-9217 CARDS,
GFE2 1108-6228 CARDS)
SAMPLE PROBLEMS (ENDFB2 1108-13 CARDS, GAND2 1108-53 CARDS,
GFE2 1108-32 CARDS)
REFERENCE REPORT, GA-7542, VOL. II
17. CATEGCRY - B
KEYWORDS - CROSS SECTIONS, DATA PREPARATION, ENDF/B, GGC4 CODES,
GANDY CODES, GAROL CODES, GGC5 CODES, PSEUDO CODES,
FSDP3 CODES, GAFGAR CODES, MICRCX CODES, WTFG CODES,
MAKE CODES, DAMMET CODES

1. NAME OR DESIGNATION OF PROGRAM - MATLS
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600,7600
3. DESCRIPTION OF PROBLEM OR FUNCTION - MATLS PERFORMS SMALL-STRAIN ELASTIC ANALYSIS OF THREE-DIMENSIONAL SOLIDS.
4. METHOD OF SOLUTION - THE FINITE-ELEMENT METHOD IS USED, WITH EIGHT-NODE TRILINEAR ISOPARAMETRIC ELEMENTS. THE PRINCIPLE OF VIRTUAL WORK IS USED TO DEVELOP THE STIFFNESS EQUATIONS. THE STIFFNESS EQUATIONS ARE SOLVED BY A DIRECT METHOD (CROUTS METHOD) WHICH TAKES ADVANTAGE OF THE SYMMETRY, BANDEDNESS, AND SPARSENESS OF THE STIFFNESS MATRIX.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - PROBLEMS WITH UP TO ABOUT 3200 NODES CAN BE SOLVED (WITH A CENTRAL MEMORY FIELD LENGTH OF 170,000 OCTAL). LARGE BANDWIDTHS CAN CAUSE OVERFLOW OF DATA FROM EXTENDED CORE STORAGE TO LOWER SPEED DISK STORAGE WHICH CAN GREATLY INCREASE THE RUNNING TIME OF A PROBLEM.
6. TYPICAL RUNNING TIME - RUNNING TIME DEPENDS ON THE PROBLEM SIZE AND THE COMPUTER. THE PROGRAM RUNS ABOUT FIVE TIMES FASTER ON THE CDC7600 THAN ON THE CDC6600. THE FORWARD ELIMINATION (FACTORIZATION) PHASE OF THE DIRECT SOLUTION PROCESS IS THE MOST TIME CONSUMING PHASE OF A TIME-STEP. THIS FORWARD ELIMINATION TIME (CP PLUS I/O TIME) CAN BE ESTIMATED FROM THE FORWARD ELIMINATION TIME (IN SECONDS) APPROXIMATELY EQUAL TO $1/C$ TIMES THE SUMMATION FROM 1 TO N OF $(BW(SUB\ N))^2$ WHERE $BW(SUB\ N)$ IS THE BANDWIDTH OF ROW N OF THE STIFFNESS MATRIX AND N IS THE NUMBER OF NODES. THE CONSTANT C EQUALS 2000 IF THE CDC6600 IS USED OR EQUALS 10,000 IF THE CDC7600 IS USED. IF THE MAXIMUM BANDWIDTH IS GREATER THAN THE NUMBER OF ROWS OF THE STIFFNESS MATRIX THAT WILL FIT IN EXTENDED CORE STORAGE (ECS), THE RUNNING TIME WILL GREATLY EXCEED THE ESTIMATE GIVEN ABOVE. WITH AN ECS FIELD LENGTH OF 1,200,000 OCTAL, PROBLEMS WITH BANDWIDTHS UP TO ABOUT 162 CAN BE SOLVED WITHOUT CAUSING OVERFLOW FROM ECS TO DISK.
7. UNUSUAL FEATURES OF THE PROGRAM - THE PROGRAM HAS A TEMPERATURE-DEPENDENT MATERIAL PROPERTY CAPABILITY. SOME CRITICAL LOOPS IN THE FORWARD ELIMINATION (FACTORIZATION) PART OF THE DIRECT SOLUTION ALGORITHM HAVE BEEN PROGRAMMED IN COMPASS ASSEMBLY LANGUAGE IN ORDER TO SPEED UP THE SOLUTION PROCESS. A RESTART OPTION ALLOWS THE USER TO SAVE THE FACTORED STIFFNESS MATRIX AND TO RETRIEVE IT IN A LATER JOB IN WHICH THE SAME PROBLEM IS SUBMITTED WITH DIFFERENT LOADING CONDITIONS. THE USE OF THIS OPTION RESULTS IN A CONSIDERABLE (80-95 PERCENT) SAVINGS IN RUN TIME, SINCE IT ELIMINATES THE NECESSITY TO RE-GENERATE THE FACTORED STIFFNESS MATRIX.
8. RELATED AND AUXILIARY PROGRAMS - PEDCOM (REF. 1) READS, PROCESSES, AND CHECKS THE INPUT DATA FOR MATLS. MESH3D (REF. 3) CAN BE USED

8. RELATED AND AUXILIARY PROGRAMS (CONTINUED)
TO AUTOMATICALLY GENERATE A FINITE-ELEMENT MESH FOR MATUS. APACHE (REF. 2) CAN BE USED TO GENERATE THE TEMPERATURE DISTRIBUTIONS AND, ALSO, TO CALCULATE NODAL POINT VALUES OF STRESS AND STRAIN. PLOTZ (APPENDIX D OF REF. 1) CAN BE USED TO GENERATE DEFORMED GEOMETRY PLOTS AND TEMPERATURE, STRESS, AND STRAIN CONTOUR PLOTS. PRINS (APPENDIX E OF REF. 1) CAN BE USED TO COMPUTE PRINCIPAL STRESSES AND STRAINS AT THE CENTERS OF THE MATUS ELEMENTS.
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
CDC6600,7600 VERSIONS SUBMITTED MAY 1973.
10. REFERENCES - D. N. HUTULA AND B. E. WIANCKO, MATUS, A THREE-DIMENSIONAL FINITE ELEMENT PROGRAM FOR SMALL-STRAIN ELASTIC ANALYSIS, WAPD-TM-1081, MARCH 1973.
D. N. HUTULA, B. E. WIANCKO, AND S. M. ZEILER, APACHE, A THREE-DIMENSIONAL FINITE ELEMENT PROGRAM FOR STEADY-STATE OR TRANSIENT HEAT CONDUCTION ANALYSIS, WAPD-TM-1080, MARCH 1973.
D. N. HUTULA AND S. M. ZEILER, MESH3D, A THREE-DIMENSIONAL FINITE ELEMENT MESH GENERATOR PROGRAM FOR EIGHT-NODE ISOPARAMETRIC ELEMENTS, WAPD-TM-1079, MARCH 1973.
C. J. PFEIFER, CDC-6600 FORTRAN PROGRAMMING - BETTIS ENVIRONMENTAL REPORT, WAPD-TM-668, JANUARY 1967.
ACC NO. R597 MATUS, ARGONNE CODE CENTER PROGRAMMING NOTE 74-1, JULY 1973.
ACC NO. R597 MATUS, ARGONNE CODE CENTER PROGRAMMING NOTE 74-10, NOVEMBER 1973.
11. MACHINE REQUIREMENTS - THE PROGRAM WAS WRITTEN FOR A CDC6600 OR A CDC7600 WITH A CENTRAL MEMORY SIZE OF 64K AND AN EXTENDED CORE SIZE OF 512K. THE ACTUAL AMOUNT OF CENTRAL MEMORY AND EXTENDED CORE USED BY THE PROGRAM DEPENDS ON THE PROBLEM SIZE. THE PROGRAM REQUIRES A CARD READER, A LINE PRINTER, A SYSTEM DISK, AND 2 SCRATCH DISKS. ALSO, A DRIVER THAT ALLOWS WRITING-IN-PLACE IS REQUIRED FOR THE 2 SCRATCH DISKS.
12. PROGRAMMING LANGUAGES USED - FORTRAN IV AND COMPASS
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - A DESCRIPTION OF THE SOFTWARE ENVIRONMENT AND THE HARDWARE USAGE ASSUMED BY THE PROGRAM IS CONTAINED IN REFERENCE 4. IN PARTICULAR, THE PROGRAM IS DESIGNED TO RUN UNDER THE SCCPE 3.1.5 OPERATING SYSTEM ON THE CDC6600 AND UNDER SCCPE 1.1 OPERATING SYSTEM ON THE CDC7600.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - MATUS IS ORGANIZED FOR OVERLAY LOADING, WHEREBY CENTRAL MEMORY IS OCCUPIED AT ANY GIVEN TIME BY THE MAIN OVERLAY (ROOT) AND A SINGLE PRIMARY OVERLAY. THERE ARE FIVE PRIMARY OVERLAYS. THE ROOT CONTAINS MANY OF THE FCHIP ROUTINES (REF. 4), INCLUDING NEXT, WHICH LOADS EACH OVERLAY AS NEEDED. THE ROOT DECLARES A BLANK COMMON ARRAY OF LENGTH ONE. IF THERE ARE M WORDS FROM THE START OF

14. ANY OTHER INFORMATION OR RESTRICTIONS (CONTINUED)
BLANK COMMON TO THE FIELD LENGTH AND N WORDS OF TEXT IN THE LONGEST OVERLAY, THE STORAGE SPACE ACTUALLY AVAILABLE FOR PROBLEM DATA IS M-N WORDS. THESE M-N WORDS OF BLANK COMMON ARE DYNAMICALLY ALLOCATED TO ACCOMMODATE THE ARRAYS NEEDED FOR A PARTICULAR PROBLEM. EXTENDED CORE STORAGE, ALSO DYNAMICALLY ALLOCATED, IS USED TO STORE MATERIAL PROPERTY TABLES, SOME LARGE ARRAYS, AND, MOST IMPORTANTLY, AS MUCH OF THE STIFFNESS MATRIX AS IS POSSIBLE. APACHE AND MESH3D ARE SIMILARLY ORGANIZED.
IN APACHE THE TRIO ROUTINES (A SCRATCH I/C SYSTEM) CONTAIN CALLS TO MLCAD, WHICH CALLS A PP SUBROUTINE, DD7. THESE ARE CALLS TO A DISK DRIVER, WHICH COULD NOT BE INCLUDED WITH THIS TRANSMISSION.
IN MATUS THERE WILL BE AN UNSATISFIED EXTERNAL CALLED STPLAN. THIS IS NOT USED, AND ALL CALLS ON THIS ROUTINE MAY BE DELETED.
15. NAME AND ESTABLISHMENT OF AUTHORS -
D. N. HUTULA AND B. E. WIANCKE
BETTIS ATOMIC POWER LABORATORY
WESTINGHOUSE ELECTRIC CORPORATION
P. O. BOX 79
PITTSBURGH, PENNSYLVANIA 15122
16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
MAGNETIC TAPE TRANSMITTAL (2 TAPES)
SOURCE DECKS (MATUS 10,918 CARDS, MESH3D 6778 CARDS, APACHE 8309 CARDS, PEDCOM 3356 CARDS, PLCTZ 2328 CARDS, PRINS 876 CARDS, 7600 ECSRW ROUTINE 274 CARDS, 6600 TRIO ROUTINES 1438 CARDS)
SAMPLE PROBLEMS (MESH3D AND APACHE 685 CARDS, PEDCCM 204 CARDS)
REFERENCE REPORTS AND ACC NOTES
17. CATEGORY - I
KEYWORDS - ELASTIC ANALYSIS, 3-DIMENSIONAL, FINITE-ELEMENT, HEAT CONDUCTION, PEDCOM CODES, MESH3D CODES, APACHE CODES, PLCTZ CODES, PRINS CODES

1. NAME OR DESIGNATION OF PROGRAM - PELEN
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - PELEN SOLVES A TWO-DIMENSIONAL, AXISYMMETRICAL MODEL OF A FUEL PELLET AND CLAD ELEMENT FOR THE TEMPERATURE, STRESS, AND DEFORMATION THROUGHOUT A TIME HISTORY. IN A GENERAL TIME INCREMENT, THE COMPUTATIONAL SEQUENCE IS - (1) A HEAT CONDUCTION ANALYSIS OF BOTH FUEL AND CLAD TO DETERMINE THE CURRENT TEMPERATURE FIELD WHICH IS DEPENDENT ON THE POWER RATE, THE MATERIAL PROPERTIES, AND THE GEOMETRICAL CONFIGURATION, (2) AN INCREMENTAL STRESS ANALYSIS OF BOTH FUEL AND CLAD TO DETERMINE THE CURRENT STRESS AND DEFORMATION FIELDS WHICH ARE DEPENDENT ON THE INELASTIC STRAIN INCREMENTS (TEMPERATURE, CREEP, VOLUME EXPANSION, ETC.), THE MATERIAL PROPERTIES, AND THE GEOMETRICAL CONFIGURATION, AND (3) A CONTACT ANALYSIS OF BOTH FUEL AND CLAD TO DETERMINE THE CORRECTED CURRENT STRESS AND DEFORMATION FIELDS WHICH ARE DEPENDENT ON THE EXTENT OF CONTACT BETWEEN ADJACENT FUEL PELLETS AND/OR THE FUEL AND CLAD.
4. METHOD OF SOLUTION - FOR THE MATHEMATICAL MODEL, THE HISTORY IS SUBDIVIDED INTO A SET OF TIME INCREMENTS AND THE GEOMETRY IS SUBDIVIDED INTO AN ASSEMBLAGE OF FINITE ELEMENTS SUCH THAT EACH ELEMENT IS A RING WITH A TRIANGULAR CROSS SECTION. EACH FINITE ELEMENT HAS AT MOST A LINEAR DISTRIBUTION OF TEMPERATURE AND DISPLACEMENT SPECIFIED BY THE NODAL VALUES. THE FIELD EQUATIONS WITH THE NODAL VALUES AS UNKNOWN ARE DERIVED BY VARIATIONAL PRINCIPLES FOR HEAT CONDUCTION AND STRESS ANALYSES. THE SOLUTION IS OBTAINED BY MATRIX INVERSION TECHNIQUES.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
25 HISTORY INTERVALS AS INPUT, WHERE EACH INTERVAL CAN HAVE
AN ARBITRARY NUMBER OF SUBDIVISIONS
200 FINITE ELEMENTS
6. TYPICAL RUNNING TIME - RUNNING TIME DEPENDS ON THE COMPLEXITIES OF THE HISTORY INPUT AND NUMBER OF FINITE ELEMENTS. APPROXIMATELY 2.5 SECONDS OF COMPUTATION TIME PER TIME INCREMENT ARE REQUIRED FOR 18 FINITE ELEMENTS.
7. UNUSUAL FEATURES OF THE PROGRAM - PELEN HAS A MINIMUM OF GEOMETRY INPUT DATA TO GENERATE THE FINITE ELEMENTS. IT INTERNALLY UPDATES THE GEOMETRICAL CONFIGURATION TO INCLUDE DIMENSIONAL CHANGES FROM THE REFERENCE CONFIGURATIONS.
8. RELATED AND AUXILIARY PROGRAMS - INPF, THE BETTIS INPUT DATA PACKAGE IS PART OF THE BETTIS ENVIRONMENTAL ROUTINES (ACC ABSTRACT 478). ECSFIL, THE BETTIS EXTENDED CORE STORAGE FILE PACKAGE IS DESCRIBED IN REFERENCE 2.

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
CDC6600 VERSION SUBMITTED SEPTEMBER 1973.
10. REFERENCES - R. B. STOUT, E. DUNCOMBE, AND J. K. FISCHER, PELEN -
A COMPUTER PROGRAM TO ANALYZE AXIAL AND RADIAL VARIATIONS OF TEM-
PERATURE AND DEFORMATION IN ZIRCALOY-CLAD OXIDE FUEL RODS,
WAPD-TM-1001(L), DECEMBER 1971.
C. J. PFEIFER, CDC-6600 FORTRAN PROGRAMMING - BETTIS
ENVIRONMENTAL REPORT, WAPD-TM-668, JANUARY 1967.
J. J. URBANIAK, ARF DESCRIPTION, SEPTEMBER 1969.
11. MACHINE REQUIREMENTS - 140,000 OCTAL WORDS OF CORE STORAGE, A
PRINTER, AND EXTENDED CORE STORAGE UNITS
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
R. B. STOUT, E. DUNCOMBE, AND J. K. FISCHER
BETTIS ATOMIC POWER LABORATORY
WESTINGHOUSE ELECTRIC CORPORATION
P. O. BOX 79
WEST MIFFLIN, PENNSYLVANIA 15122
16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (6086 CARDS)
SAMPLE PROBLEM (45 CARDS)
REFERENCE REPORT, WAPD-TM-1001(L), AND ARF DESCRIPTION
17. CATEGORY - I
KEYWORDS - 2-DIMENSIONAL, TEMPERATURE, STRESSES, DEFORMATION, HEAT
CONDUCTION, FINITE-ELEMENT

1. NAME OR DESIGNATION OF PROGRAM - TCPLYR2
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - UNIVAC1108
3. DESCRIPTION OF PROBLEM OR FUNCTION - TCPLYR2 APPLIES THE FIRST LAW OF THERMODYNAMICS TO COMPUTE THE TEMPERATURE OF A WATER MASS FLOWING IN AN OPEN CHANNEL. THE PROGRAM IS DESIGNED TO ACCOMMODATE VARIABLE DEPTH, VELOCITY, AND CROSS SECTION. THE SOURCE OF ENERGY (LOCATION OF THE DISCHARGE) IS ASSUMED TO BE SUFFICIENTLY DISTANT FROM THE RIVER SEGMENT UNDER EXAMINATION THAT THE MOMENTUM ASSOCIATED WITH THE DISCHARGE IS INSIGNIFICANT. VELOCITY DISTRIBUTION AT BOTH THE INLET AND OUTLET OF THE REACH AS WELL AS THE TEMPERATURE DISTRIBUTION AT THE INLET AS A FUNCTION OF TIME AND AT THE OUTLET INITIALLY ARE SPECIFIED. EDDY DIFFUSIVITIES, AMBIENT METEOROLOGICAL CONDITIONS, AND GEOMETRY ARE ALSO SUPPLIED TO THE CODE. ALTHOUGH THE LATERAL EDDY DIFFUSIVITY IS ALLOWED TO VARY SPATIALLY, THE EFFECT OF DENSITY DISPARITY IS NOT TREATED EXPLICITLY BY THE CODE. TEMPORAL BEHAVIOR INDUCED BY VARIATIONS IN THE AMBIENT METEOROLOGICAL AND BOUNDARY CONDITIONS ARE COMPUTED.
4. METHOD OF SOLUTION - TCPLYR2 DIVIDES THE WATER MASS INTO AN ARRAY OF RECTANGULAR PRISMS OF NON-UNIFORM DEPTH WHERE VERTICALLY AVERAGED QUANTITIES ARE EMPLOYED. THE MATHEMATICAL MODEL EMPLOYS AN ENERGY BALANCE OF TEMPERAL, CONVECTIVE, DIFFUSIONAL AND SOURCE TERMS AND A MASS BALANCE. THE EQUATIONS ARE TRANSFORMED TO A SECOND-ORDER FINITE-DIFFERENCE FORM AND AN ALTERNATING DIRECTION IMPLICIT SCHEME IS USED TO COMPUTE THE TEMPERATURE FIELD. THE TWO-DIMENSIONAL TRIDIAGONAL ARRAYS PRODUCED BY THE ADI METHOD ARE SOLVED BY GUASSIAN ELIMINATION. PROVISIONS HAVE BEEN INCLUDED IN THE PROGRAM TO ACCOMMODATE NON-UNIFORM DIFFUSIVITY. THE ENERGY SOURCE RESULTS FROM WEATHER CONDITIONS AND NEWTON'S COOLING LAW BOUNDARY CONDITIONS.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - SUBSCRIPTED VARIABLES ARE DIMENSIONED AT COMPILATION TIME USING THE UNIVAC1108 PROCEDURE DEFINITION PROCESSOR. CODE INSTRUCTIONS REQUIRE RELATIVELY LITTLE STORAGE. A TYPICAL RIVER SIMULATION PROBLEM WITH ADEQUATE GEOMETRIC-TIME MESH INVOLVES ABOUT 10000 DECIMAL WORDS OF STORAGE (INSTRUCTIONS, BLANK COMMON AND DATA).
6. TYPICAL RUNNING TIME - FOR A TYPICAL 17 X 10 NODE SPATIAL GRID AND 200 TIME-STEPS, 1 TO 3 MINUTES ARE REQUIRED DEPENDING UPON PROBLEM COMPLEXITY.
7. UNUSUAL FEATURES OF THE PROGRAM - TO ELIMINATE THE POSSIBILITY OF ANY NON-PHYSICALLY PLAUSIBLE TEMPERATURE FORM ENTERING INTO THE ANALYSIS A SCHEME PROPOSED BY HAINS IS EMPLOYED. THE USE OF THE HAINS PRINCIPLE ASSURES THAT THE SECOND LAW OF THERMODYNAMICS IS NOT VIOLATED. A DEFAULT ALGORITHM ASSIGNS A UNIFORM DIFFUSION COEFFICIENT TO THE FLOW FIELD. LOCAL DEPTH AND VELOCITY ARE AVAILABLE FOR THE USER TO CONSTRUCT A NON-UNIFORM DIFFUSION COEFFICIENT

7. UNUSUAL FEATURES OF THE PROGRAM (CONTINUED)
MATRIX. CURRENTLY, AN ALGORITHM BASED ON ONE-DIMENSIONAL FRICTIONAL FLOW IS PROVIDED.
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
UNIVAC1108 VERSION SUBMITTED JUNE 1973.
10. REFERENCES - D. C. KOLESAR, J. C. SONNICHSEN, TOPLYR2 - A TWO-DIMENSIONAL THERMAL-ENERGY TRANSPORT CODE, HECL-TME-72-46, MARCH 1972.
D. C. KOLESAR, MATHEMATICAL MODELING OF THERMAL PLUME DISPERSION IN A RECEIVING WATER BODY, PRESENTED AT THE SECOND ANNUAL THERMAL POWER CONFERENCE, WASHINGTON STATE UNIVERSITY, PULLMAN, WASHINGTON, OCTOBER 1971.
A. J. POLICASTRO, J. V. TUCKER, HEATED-EFFLUENT DISPERSION IN LARGE LAKES, STATE-OF-THE-ART OF ANALYTICAL MODELING ANL/ES-11 (1972) PART 1, CRITIQUE OF MODEL FORMULATIONS, 1972.
TOPLYR2, ACC NO. 559, HEDL NOTE, 1973.
11. MACHINE REQUIREMENTS -
12. PROGRAMMING LANGUAGE USED - FORTRAN V
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - EXEC2 OR CSCX.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - TWO VERSIONS OF TOPLYR2 ARE AVAILABLE - ONE EMPLOYS A CONSTANT DIFFUSIVITY AND THE OTHER A LOCAL DEPTH AND VELOCITY DEPENDENT DIFFUSIVITY. THE LATTER VERSION IMPLEMENTS THE EMPIRICAL CORRELATION.
15. NAME AND ESTABLISHMENT OF AUTHORS -
D. C. KOLESAR AND J. C. SONNICHSEN
HANFORD ENGINEERING DEVELOPMENT LABORATORY
WESTINGHOUSE HANFORD COMPANY
P. O. BOX 1970
RICHLAND, WASHINGTON 99352
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (1996 CARDS)
SAMPLE PROBLEM (61 CARDS)
REFERENCE REPORT, HECL-TME-72-46, AND HEDL NOTE
17. CATEGORY - R
KEYWORDS - THERMODYNAMICS, WATER, VELOCITY DISTRIBUTION, TEMPERATURE DISTRIBUTION

1. NAME OR DESIGNATION OF PROGRAM - EGAD
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360/195
3. DESCRIPTION OF PROBLEM OR FUNCTION - EGAD CALCULATES GAMMA DOSE INTEGRALS TO A GROUND LEVEL RECEPTOR, FOR INCREMENTAL VALUES OF THE VERTICAL DISPERSION PARAMETER ΣZ , AS A FUNCTION OF GAMMA ENERGY AND SPATIAL DISTRIBUTION OF THE RADIOACTIVE MATERIAL. THE DOSE INTEGRALS ARE REPRESENTATIVE OF SECTOR AVERAGES SINCE THE DISTRIBUTION OF MATERIAL IS ASSUMED TO BE GAUSSIAN IN THE VERTICAL, HOMOGENEOUS IN THE HORIZONTAL, AND BOUNDED BETWEEN GROUND LEVEL AND AN INVERSION LID. CALCULATED DOSE INTEGRALS ARE INDEPENDENT OF RADIOACTIVE DECAY, TRANSPORT VELOCITY, DOWNWIND DISTANCE, AND SECTOR WIDTH. SPACE ATTENUATION AND BUILDUP ARE TAKEN INTO ACCOUNT.
4. METHOD OF SOLUTION - THE PLUME OF RADIOACTIVE MATERIAL IS ASSUMED TO REMAIN CONSTANT IN SHAPE AND SIZE DURING PASSAGE OVER A RECEPTOR POINT. THE SPACE DISTRIBUTION OF MATERIAL IS THEN REPRESENTED AS PARALLEL LINE SOURCES. THE LINE CONTRIBUTIONS ARE INTEGRATED ANALYTICALLY BY TRANSFORMING TO BESSEL AND RELATED FUNCTIONS, REDUCING THE SPATIAL DISTRIBUTION TO A VERTICAL PLANE AT THE RECEPTOR POINT. PLANE INTEGRATIONS ARE THEN PERFORMED BY GAUSSIAN QUADRATURES.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
6. TYPICAL RUNNING TIME - RUNNING TIME TO EVALUATE INTEGRALS IS TYPICALLY LESS THAN 30 MSEC FOR EACH ENERGY AND RECEPTOR POINT.
7. UNUSUAL FEATURES OF THE PROGRAM - EGAD PROVIDES AN EFFICIENT MEANS OF COMPILING TABULAR DATA OF DOSE INTEGRALS AS A FUNCTION OF INCREMENTAL VALUES OF ENERGY AND THE VERTICAL DISPERSION PARAMETER. THESE DATA MAY THEN BE INTERPOLATED FOR SPECIFIC VALUES OF THE VARIABLES RESULTING IN LARGE COMPUTATIONAL SAVINGS IF LARGE AMOUNTS OF METEOROLOGY DATA ARE TO BE PROCESSED.
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 VERSION SUBMITTED MAY 1973, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCE - R. E. CCCPER, A COMPUTER PROGRAM TO COMPUTE DOSE INTEGRALS FROM EXTERNAL GAMMA EMITTERS, DP-1304, SEPTEMBER 1972.
11. MACHINE REQUIREMENTS - 40K BYTES OF CORE STORAGE
12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
OS/360.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHOR -
R. E. COOPER
SAVANNAH RIVER LABORATORY
E. I. DU PONT DE NEMOURS
AIKEN, SOUTH CAROLINA 29801
16. MATERIAL AVAILABLE -
SOURCE DECK (222 CARDS)
SAMPLE PROBLEM (6 CARDS)
SAMPLE PROBLEM OUTPUT (1 PAGE)
REFERENCE REPORT
17. CATEGORY - G
KEYWORDS - DCSE RATES, GAMMA RADIATION, RADIOACTIVITY

1. NAME OR DESIGNATION OF PROGRAM - ERF,ERFC
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - ERF AND ERFC ARE USED TO COMPUTE VALUES OF THE ERROR FUNCTION AND COMPLEMENTARY ERROR FUNCTION FOR ANY REAL NUMBER. THEY MAY BE USED TO COMPUTE OTHER RELATED FUNCTIONS SUCH AS THE NORMAL PROBABILITY INTEGRALS.
4. METHOD OF SOLUTION - THE ERROR FUNCTION AND COMPLEMENTARY ERROR FUNCTION ARE APPROXIMATED BY RATIONAL FUNCTIONS. THREE SUCH RATIONAL APPROXIMATIONS ARE USED DEPENDING ON WHETHER -
 $|x| < 0.46875$,
 $0.46875 < |x| < 4.0$, OR
 $|x| > 4.0$.
 IN THE FIRST REGION THE ERROR FUNCTION IS COMPUTED DIRECTLY AND THE COMPLEMENTARY ERROR FUNCTION IS COMPUTED VIA THE IDENTITY $ERFC(x) = 1 - ERF(x)$. IN THE OTHER TWO REGIONS THE COMPLEMENTARY ERROR FUNCTION IS COMPUTED DIRECTLY AND THE ERROR FUNCTION IS COMPUTED FROM THE IDENTITY $ERF(x) = 1.0 - ERFC(x)$. THE ERROR FUNCTION AND COMPLEMENTARY ERROR FUNCTION ARE REAL-VALUED FUNCTIONS OF ANY REAL ARGUMENT. THE RANGE OF THE ERROR FUNCTION IS $(-1,1)$. THE RANGE OF THE COMPLEMENTARY ERROR FUNCTION IS $(0,2)$.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE USER IS CAUTIONED AGAINST USING ERF TO COMPUTE THE COMPLEMENTARY ERROR FUNCTION BY USING THE IDENTITY $ERFC(x)=1.0-ERF(x)$. THIS SUBTRACTION MAY CAUSE PARTIAL OR TOTAL LOSS OF SIGNIFICANCE FOR CERTAIN VALUES OF x .
6. TYPICAL RUNNING TIME - RUNNING TIME DEPENDS ON THE ARGUMENT VALUE AND WILL VARY BETWEEN 70 AND 110 MICROSECONDS.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - THIS PACKAGE IS A MODIFICATION OF ALO-00241 TRANSFERRED FROM THE ALO-COSMIC COLLECTION.
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
 CDC6600 VERSION SUBMITTED MAY 1973.
10. REFERENCE - J. E. VOGEL, ERF AND ERFC: MATHEMATICAL ROUTINES FOR COMPUTING THE ERROR FUNCTION AND COMPLEMENTARY ERROR FUNCTION, SC-M-70-275, MAY 1970.
11. MACHINE REQUIREMENTS - ERF AND ERFC EACH REQUIRE ABOUT 260 (OCTAL) LOCATIONS.
12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
SCOPE.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHOR -
J. E. VOGEL
SANDIA LABORATORIES
P. O. BOX 5800
ALBUQUERQUE, NEW MEXICO 87115
16. MATERIAL AVAILABLE -
SOURCE DECK (129 CARDS)
SAMPLE PROBLEM (48 CARDS)
SAMPLE PROBLEM OUTPUT (1 PAGE)
REFERENCE REPORT
17. CATEGORY - P
KEYWORDS - DATA PROCESSING, ERROR FUNCTION, COMPLEMENTARY ERROR
FUNCTION

1. NAME OR DESIGNATION OF PROGRAM - LENSDES
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC7600,6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - LENSDES ANALYZES THE PERFORMANCE OF OPTICAL LENSES BY COMPUTING THE IMAGE ERRORS FOUND WHEN BUNDLES OF SKEW RAYS ARE TRACED FROM OBJECT POINTS TO THE IMAGE SURFACE. LENS PERFORMANCE IS OPTIMIZED BY VARYING SELECTED LENS PARAMETERS UNDER DIRECTION OF THE NONLINEAR LEAST SQUARES PROGRAM, OPTIMIZ.
4. METHOD OF SOLUTION - LENS DESIGN IS TREATED AS AN APPLICATION OF NONLINEAR LEAST SQUARES OPTIMIZATION OF A CONTINUOUS N-PARAMETER SYSTEM.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - ALL OPTICAL SURFACES MUST BE CENTERED.
6. TYPICAL RUNNING TIME - ONE MINUTE IS REQUIRED ON THE CDC7600.
7. UNUSUAL FEATURES OF THE PROGRAM - RAPIDLY AND STEADILY DECREASING ERROR FUNCTION.
8. RELATED AND AUXILIARY PROGRAMS - THIS PROGRAM IS A LATER VERSION OF ALO-00010, AN IBM7090 PROGRAM IN THE ALC-CCSMIC COLLECTION. LASL-1962 AND JPL FOLDP-1967 LENS DESIGN CODES ARE EARLIER VERSIONS DEVELOPED AT LASL.
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
CDC7600 VERSION SUBMITTED MAY 1973.
10. REFERENCES - T.C. DOYLE, NONLINEAR LEAST SQUARES OPTIMIZATION OF A CONTINUOUS N-PARAMETER SYSTEM, LA-DC-72-1018, 1972.
T. C. DOYLE, AUTOMATIC LENS DESIGN BY NONLINEAR LEAST SQUARES OPTIMIZATION OF A CONTINUOUS N-PARAMETER SYSTEM, LA-UR-73-518, 1973.
B. BRIXNER, FASTER LASL LENS DESIGN PROGRAM, APPLIED OPTICS REPRINT, VOL. 12, PP. 2703-2708 (1973).
LASL SPECIAL SYSTEM SUBROUTINES USED TO ACCESS EXTENDED CORE STORAGE, LASL NOTE, 1973.
THOMAS C. DOYLE, AUTOMATIC LENS DESIGN BY NONLINEAR LEAST SQUARES OPTIMIZATION OF A CONTINUOUS N-PARAMETER SYSTEM, LASL MEMO T4AB, APRIL 1, 1973.
THOMAS C. DOYLE, NONLINEAR LEAST SQUARES OPTIMIZATION OF A CONTINUOUS N-PARAMETER SYSTEM, LASL MEMO E4AA, APRIL 1, 1973.
11. MACHINE REQUIREMENTS - 32K WORDS OF MEMORY, BUT VERY LARGE PROBLEMS MAY REQUIRE EXTENDED CORE STORAGE (ECS) ON THE CDC6600 OR LARGE CORE MEMORY (LCM) ON THE CDC7600.
12. PROGRAMMING LANGUAGES USED - FORTRAN IV AND COMPASS

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
OPERABLE UNDER CDC SCOPE 3.1 ON CDC6600 OR UNDER THE LASL-
DEVELOPED CRCS SYSTEM ON THE CDC7600.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
BERLYN BRIXNER AND THOMAS C. DOYLE
LCS ALAMOS SCIENTIFIC LABORATORY
P. O. BOX 1663
LOS ALAMOS, NEW MEXICO 87544
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (3768 CARDS)
SAMPLE PROBLEMS (335 CARDS)
SAMPLE PROBLEM OUTPUT (PHIGRAD(V) 35 SELECTED PAGES, PHIGRAD(U)
38 SELECTED PAGES)
REFERENCE REPORTS, REPRINT, NOTE, AND MEMORANDA
17. CATEGORY - P
KEYWORDS - NONLINEAR LEAST SQUARES, OPTIMIZATION

1. NAME OR DESIGNATION OF PROGRAM - RALCRTPH
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - RALCRTPH IS A RESOURCE ALLOCATION SYSTEM USED TO PROVIDE THE PROJECT PLANNER WITH A TOOL TO HELP HIM SCHEDULE RESOURCES INVOLVED IN A PROJECT. INFORMATION ON WHICH JOBS ARE CRITICAL AND THE RESOURCES AVAILABLE IS NECESSARY FOR PROJECT SCHEDULING. THIS SYSTEM IS ORIENTED TOWARD THE USER WHO IS PLANNING A PLANT SHUTDOWN. HOWEVER, IT ALSO HAS APPLICATIONS IN OTHER AREAS.
4. METHOD OF SOLUTION - THE RESOURCE ALLOCATION SYSTEM PERFORMS TWO BASIC FUNCTIONS -
 - (1) CALCULATES THE CRITICAL PATH, AND
 - (2) LEVELS RESOURCES AND SCHEDULES ACTIVITIES.IF ONLY A CRITICAL PATH REPORT IS REQUIRED, THE SYSTEM EDITS THE INPUT DATA FOR LOOPING AND SYNTACTICAL ERRORS AND PRINTS THE CRITICAL PATH REPORT. THE SYSTEM CAN THEN PROCEED TO SCHEDULE A PROJECT WITHIN USER-SPECIFIED RESOURCE LIMITATIONS. AFTER SCHEDULING A PROJECT A SERIES OF REPORTS CAN BE PRINTED. THIS SERIES INCLUDES THE RESOURCE UTILIZATION SUMMARY, ACTIVITY LISTING FOR ALL RESOURCES, ACTIVITY LISTING FOR SPECIFIED RESOURCES, ACTIVITY BAR GRAPH FOR ALL RESOURCES, ACTIVITY BAR GRAPH FOR SPECIFIED RESOURCES, A WORK SCHEDULE FOR ALL RESOURCES, AND A WORK SCHEDULE FOR SPECIFIED RESOURCES.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE SIZE OF THE ARROW DIAGRAM THAT CAN BE READ INTO THE EDIT AND CRITICAL PATH PROGRAMS IN THE FORM OF ACTIVITY CARDS IS DETERMINED BY THE MEMORY AVAILABLE IN THE COMPUTER. THE PRESENT LIMITATION IS 3000. THE LIMITATIONS ON NODE NUMBERS ARE ALSO CONTROLLED IN THE CRITICAL PATH PROGRAM. THE PRESENT RANGE OF ACCEPTABLE NUMBERS IS 1 TO 3000. THE UPPER LIMIT MAY BE INCREASED. HOWEVER, 0 OR NEGATIVE NODE NUMBERS ARE UNACCEPTABLE. THE PRESENT QUEUE SIZES IN THE RESOURCE ALLOCATION PROGRAM ARE 300 EACH FOR THE PROCESS AND THE WAIT QUEUES. THE LIMITATIONS ON RESOURCES PER ACTIVITY (4) AND THE TOTAL NUMBER OF RESOURCES (51) ARE ALSO CONTROLLED BY THE RESOURCE ALLOCATION PROGRAM.
6. TYPICAL RUNNING TIME -
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED JANUARY 1974.
IBM360 VERSION SUBMITTED AUGUST 1973, SAMPLE PROBLEM EXECUTED BY ACC.

10. REFERENCE - C. T. SIGLER, RESOURCE ALLOCATION USERS GUIDE, MONSANTO MANAGEMENT INFORMATION AND SYSTEMS DEPARTMENT FINAL REPORT, SEPTEMBER 1, 1967.
11. MACHINE REQUIREMENTS - 128K BYTES OF MEMORY, CARD READER, PRINTER, 3 TAPES OR DISK DRIVES
12. PROGRAMMING LANGUAGES USED - FORTRAN IV(H), COBOL, AND RPG
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS II, LEVEL 8.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHOR -
C. T. SIGLER
MONSANTO CORPORATION
TEXAS CITY, TEXAS 77590
16. MATERIAL AVAILABLE - RESTRICTED TO USE ON GOVERNMENT CONTRACTS
MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (FORTRAN 5089 CARDS, COBOL 1202 CARDS, RPG 58 CARDS)
SAMPLE PROBLEMS (542 CARDS)
LOAD MODULE RALLIB (487 BLOCKS)
SAMPLE PROBLEM OUTPUT (PART1 41 PAGES, PART2 46 PAGES)
REFERENCE REPORT
17. CATEGORY - M
KEYWORDS - CRITICAL PATH CALCULATION, RESOURCE ALLOCATION, SCHEDULING

1. NAME OR DESIGNATION OF PROGRAM - TCB01
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - A TUBE UNDER EXTERNAL PRESSURE, AT ELEVATED TEMPERATURE, AND INITIALLY OUT-OF-ROUND WILL CREEP, BECOMING MORE OUT-OF-ROUND AND EVENTUALLY WILL COLLAPSE. TCB01 ATTEMPTS TO PREDICT THE TIME OF COLLAPSE.
4. METHOD OF SOLUTION - USING THE SOLUTION AT THE PREVIOUS TIME POINT AND THE TIME INCREMENT, STRESS AND STRAINS ARE CALCULATED AT RADIAL STATIONS WHICH LIE ON THE RADIUS THROUGH THE POINT OF MINIMUM RADIUS OF CURVATURE. WHEN THE CHANGE IN EXTERNAL MOMENT CALCULATED FROM THE CHANGE IN STRAIN CANNOT BE BALANCED BY THE CHANGE IN INTERNAL MOMENT DUE TO STRESS, THE TUBE HAS COLLAPSED. THE STRAIN HARDENING RULE MAY BE USED WITH EITHER THE TRESCA OR VON MISES CRITERION. THE TEMPERATURE MAY VARY WITH TIME.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - IT IS ASSUMED THAT PLANE SECTIONS REMAIN PLANE, THE RADIAL STRESS IS ZERO, THE TEMPERATURE ACROSS THE THICKNESS IS CONSTANT, THE INITIAL OUT-OF-ROUNDNESS FOLLOWS A COSINE LAW, AND THE TUBE IS FIXED AXIALLY. THE PROGRAM ANALYZES A SIMPLE TUBE OF A SINGLE MATERIAL. AT THE PRESENT TIME ZIRCALOY IS THE ONLY MATERIAL AVAILABLE.
6. TYPICAL RUNNING TIME - THE SAMPLE PROBLEM REQUIRES LESS THAN A MINUTE.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED JANUARY 1974.
CDC6600 VERSION SUBMITTED NOVEMBER 1973.
10. REFERENCE - W. K. WILSON, A METHOD OF ANALYSIS FOR THE CREEP-BUCKLING OF TUBES UNDER EXTERNAL PRESSURE, WAPD-TM-956, SEPTEMBER 1970.
11. MACHINE REQUIREMENTS -
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 3.1.5.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHOR -
W. K. WILSON
BETTIS ATOMIC POWER LABORATORY

15. NAME AND ESTABLISHMENT OF AUTHOR(S) (CONTINUED)
WESTINGHOUSE ELECTRIC CORPORATION
P. O. BOX 79
WEST MIFFLIN, PENNSYLVANIA 15122
16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
SOURCE DECK (873 CARDS)
SAMPLE PROBLEM (10 CARDS)
REFERENCE REPORT
17. CATEGORY - I
KEYWORDS - BUCKLING, TUBES, PRESSURE, LWBR REACTORS

1. NAME OR DESIGNATION OF PROGRAM - GAUSS5
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360/75
3. DESCRIPTION OF PROBLEM OR FUNCTION - GAUSS5 IS USED TO DETERMINE GAMMA-RAY ENERGIES AND INTENSITIES FROM SPECTRA OBTAINED WITH A GE(LI) DETECTOR AND A MULTICHANNEL PULSE-HEIGHT ANALYSIS SYSTEM.
4. METHOD OF SOLUTION - THE SPECTRUM ANALYSIS IS GENERALLY CARRIED OUT IN THE FOLLOWING STEPS -
 - (A) THE PEAKS ARE LOCATED AUTOMATICALLY BY MEANS OF AN AUTO-CORRELATION ROUTINE. MANUAL PEAK SELECTION IS ALSO AVAILABLE.
 - (B) EACH PEAK IS FITTED WITH A GAUSSIAN FUNCTION PLUS A LINEAR FUNCTION REPRESENTING THE SPECTRAL BACKGROUND. NORMALLY, ONLY THE THREE GAUSSIAN PARAMETERS (HEIGHT, WIDTH AND POSITION) ARE ALLOWED TO VARY. ALSO, THE PROGRAM USES ONLY THE DATA POINTS ABOVE ABOUT THE HALF-HEIGHT IN THE FIT, UNLESS THE USER SPECIFIES OTHER LIMITS.
 - (C) IF THE USER SUPPLIES THE GAMMA-RAY ENERGIES OF SOME CALIBRATION LINES, A LINEAR AND/OR QUADRATIC ENERGY VS. CHANNEL FUNCTION IS DETERMINED. THIS CALCULATION INCLUDES CORRECTIONS FOR THE PREVIOUSLY MEASURED NONLINEARITY OF THE ELECTRONIC SYSTEM. THE ENERGIES OF ALL LINES ARE THEN COMPUTED ALONG WITH THE UNCERTAINTIES.
 - (D) IF A DETECTOR EFFICIENCY TABLE IS AVAILABLE, THE GAMMA-RAY INTENSITIES ARE COMPUTED.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - GAUSS5 WILL HANDLE SPECTRA OF UP TO 4096 CHANNELS WITH UP TO 300 PEAKS AND 50 ENERGY CALIBRATION LINES.
6. TYPICAL RUNNING TIME - TYPICAL SPECTRA CAN BE ANALYZED AT A RATE OF ABOUT 5 PER MINUTE.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - GAUSS5 SUPERSEDES GAUSS3 WHICH HAS BEEN DESCRIBED IN NUCLEAR INSTRUMENTS AND METHODS 57, 46 (1967). THE PROGRAM LCTAPE IS USED TO TRANSFER THE NONLINEARITY CORRECTION AND EFFICIENCY TABLES TO DISK.
9. STATUS - ABSTRACT FIRST DISTRIBUTED JANUARY 1974.
IBM360 VERSION SUBMITTED SEPTEMBER 1973, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCE - R. G. HELMER AND M. H. PUTNAM, GAUSS V, A COMPUTER PROGRAM FOR THE ANALYSIS OF GAMMA-RAY SPECTRA FROM GE(LI) SPECTROMETERS, ANCR-1043, JANUARY 1972.

11. MACHINE REQUIREMENTS - ONE 9-TRACK TAPE FOR SPECTRAL LIBRARY AND FOUR DISKS, A PRINTER AND CARD PUNCH
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360 MVT.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
R. G. HELMER AND M. F. PUTNAM
AERCJET NUCLEAR COMPANY
550 SECOND STREET
IDAHO FALLS, IDAHO 83401
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (GAUSS5 3639 CARDS, LCTAPE 164 CARDS)
SAMPLE PROBLEMS (GAUSS5 424 CARDS, LCTAPE 24 CARDS)
CONTROL INFORMATION (GAUSS5 25 CARDS, LCTAPE 10 CARDS)
LOAD MODULE GSS5 (133 BLOCKS)
PUNCHED OUTPUT (GAUSS5 104 CARDS)
SAMPLE PROBLEM OUTPUT (GAUSS5 15 PAGES, LCTAPE 3 PAGES)
REFERENCE REPORT
17. CATEGORY - B
KEYWORDS - GAMMA-RAY SPECTRA, GE(LI) SPECTROMETERS, GAUSS FUNCTION, LCTAPE CODES, GAUSS3 CODES

1. NAME OR DESIGNATION OF PROGRAM - GAPER1D
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - UNIVAC1108
3. DESCRIPTION OF PROBLEM OR FUNCTION - REACTIVITY COEFFICIENTS ARE COMPUTED USING FIRST-ORDER TRANSPORT PERTURBATION THEORY FOR ONE-DIMENSIONAL MULTI-REGION REACTOR ASSEMBLIES. THE NUMBER OF SPATIAL MESH POINTS AND ENERGY GROUPS IS ARBITRARY. AN ELEMENTARY SYNTHESIS SCHEME IS EMPLOYED FOR TREATMENT OF TWO- AND THREE-DIMENSIONAL PROBLEMS. THE CONTRIBUTIONS TO THE CHANGE IN INVERSE MULTIPLICATION FACTOR, $\Delta(1/K)$, FROM PERTURBATIONS IN THE INDIVIDUAL CAPTURE, NET FISSION, TOTAL SCATTERING, $(N,2N)$, INELASTIC SCATTERING, AND LEAKAGE CROSS SECTIONS ARE COMPUTED. A MULTI-DIMENSIONAL PROMPT NEUTRON LIFETIME CALCULATION IS ALSO AVAILABLE.
4. METHOD OF SOLUTION - BROAD GROUP CROSS SECTIONS FOR THE CORE AND PERTURBING OR SAMPLE MATERIALS ARE REQUIRED AS INPUT. SCALAR NEUTRON FLUXES AND CURRENTS, AS COMPUTED BY SN TRANSPORT CALCULATIONS, ARE THEN UTILIZED TO SOLVE THE FIRST-ORDER TRANSPORT PERTURBATION THEORY EQUATIONS. A SYNTHESIS SCHEME IS USED, ALONG WITH INDEPENDENT SN CALCULATIONS IN TWO OR THREE DIMENSIONS, TO TREAT A MULTI-DIMENSIONAL ASSEMBLY. SPHERICAL HARMONICS EXPANSIONS OF THE ANGULAR FLUXES AND SCATTERING SOURCE TERMS ARE USED WITH LEAKAGE AND ANISOTROPIC SCATTERING TREATED IN A P1 APPROXIMATION. THE ANGULAR INTEGRATIONS IN THE PERTURBATION THEORY EQUATIONS ARE PERFORMED ANALYTICALLY. VARIOUS REACTIVITY COEFFICIENTS AND MATERIAL WORTHS ARE THEN EASILY COMPUTED AT SPECIFIED POSITIONS IN THE ASSEMBLY.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE FORMULATION OF THE SYNTHESIS SCHEME USED FOR TWO- AND THREE-DIMENSIONAL PROBLEMS ASSUMES THAT THE FLUXES AND CURRENTS WERE COMPUTED BY THE DTF4 CODE (ACC ABSTRACT 209). THEREFORE, FLUXES AND CURRENTS FROM TWO- OR THREE-DIMENSIONAL TRANSPORT OR DIFFUSION THEORY CODES CANNOT BE USED.
6. TYPICAL RUNNING TIME - A THREE-DIMENSIONAL, 11-GROUP SERIES OF EIGHT PROBLEMS WITH EIGHT REGIONS DEFINED FOR A 9X9X9-INTERVAL MESH REQUIRES 12 SECONDS. A ONE-DIMENSIONAL, 20 GROUP SERIES OF 6 PROBLEMS WITH 5 REGIONS DEFINED FOR A 50-INTERVAL MESH REQUIRES 22 SECONDS.
7. UNUSUAL FEATURES OF THE CODE - PROBLEMS INVOLVING CALCULATIONS FOR DIFFERENT ASSEMBLIES CAN BE RUN CONSECUTIVELY IF DESIRED.
8. RELATED AND AUXILIARY CODES - GAPER AND GAPER2D (ACC ABSTRACT 471). GAPER1D IS AN UPDATED VERSION OF THE GAPER CODE.
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
UNIVAC1108 VERSION SUBMITTED JULY 1973.

10. REFERENCES - D. A. SARGIS, GAPER - A TRANSPORT PERTURBATION THEORY PROGRAM, GA-8667, APRIL 26, 1968.
K. LATHROP, DTF-IV, A FORTRAN IV PROGRAM FOR SOLVING THE MULTIGROUP TRANSPORT EQUATION WITH ANISOTROPIC SCATTERING, LA-3373, JULY 15, 1965.
R. J. ARCHIBALD AND D. A. SARGIS, GAPER-2D, A TWO-DIMENSIONAL TRANSPORT PERTURBATION THEORY PROGRAM, GA-10103, APRIL 29, 1970.
GAPER-1D SAMPLE PROBLEM DESCRIPTION, GULF NCTE, 1973.
P. KOCH, GAPER-1D DESCRIPTION, GULF INTERNAL MEMORANDUM, JULY 11, 1973.
11. MACHINE REQUIREMENTS - ONE I/O DEVICE FOR READING INPUT AND PRINTING RESULTS AND ONE TAPE DRIVE TO READ THE CODE FROM TAPE. CORE STORAGE REQUIREMENTS ARE VARIABLE.
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - EXEC8.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - GAPER1D IS CORE-CONTAINED. PARAMETER STATEMENTS ARE USED TO SET DIMENSION LIMITS ON THE ARRAYS.
15. NAME AND ESTABLISHMENT OF AUTHOR -
P. K. KOCH
GULF GENERAL ATOMIC COMPANY
P. O. BOX 81608
SAN DIEGO, CALIFORNIA 92138
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (GAPER1D 2038 CARDS, DTF4 MODIFICATIONS 46 CARDS)
SAMPLE PROBLEM (642 CARDS)
CONTROL INFORMATION (11 CARDS)
SAMPLE PROBLEM OUTPUT (40 PAGES)
REFERENCE REPORT, GA-8667, GULF NCTE, AND INTERNAL MEMORANDUM
17. CATEGORY - A
KEYWORDS - REACTIVITY, PERTURBATION THEORY, 1-DIMENSIONAL, SN METHOD, DTF4 CODES, GAPER CODES

1. NAME OR DESIGNATION OF PROGRAM - SPIRAL
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - UNIVAC1108
3. DESCRIPTION OF PROBLEM OR FUNCTION - THE GENERAL ABILITY OF SPIRAL IS BUILDING, PERHAPS GRADUALLY, A MACHINE-READABLE ENCYCLOPEDIA OF INFORMATION ITEMS THAT ARE OR MAY BECOME IMPORTANT TO A PARTICULAR PROJECT, AND THEN LATER, RECALLING BITS OF INFORMATION AS REQUIRED. THE INFORMATION CONTENT OF A COLLECTION CAN RANGE FROM CRYPTIC COMMENTS (AS OCCUR IN SOME TEST AND INSPECTION RECORDS) TO MORE LENGTHY ENTRIES (SUCH AS TECHNICAL ABSTRACTS AND MANAGEMENT BRIEFS) AS WELL AS FULL TEXT OF DOCUMENTS.
4. METHOD OF SOLUTION - THE INDEXING PHASE INCLUDES ELIMINATION OF EXCLUSION WORDS, SUFFIX TRUNCATION, AND HAS CODING OF WORDS. THE RESULTING CODES ARE INSERTED INTO A MULTILEVEL INDEX FILE STRUCTURE. USING THIS STRUCTURE, THE RETRIEVAL SYSTEM APPLIES A COMBINATION OF BINARY AND SEQUENTIAL SEARCH OPERATIONS TO FIND DOCUMENTS AND PARAGRAPHS WITHIN DOCUMENTS THAT ARE PERTINENT TO AN INQUIRY.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - INPUT DOCUMENTS MUST CONTAIN LESS THAN 4096 PARAGRAPHS, AND PARAGRAPHS MUST CONTAIN LESS THAN 4096 WORDS. FOR PROCESSING EFFICIENCY, A GIVEN ACCUMULATION OF DOCUMENTS SHOULD NOT EXCEED APPROXIMATELY 1000 DOCUMENTS OR APPROXIMATELY A MILLION WORDS. OTHERWISE, A GIVEN COLLECTION IS LIMITED TO AVAILABLE ON-LINE STORAGE FOR CONTAINING THE DATA BASE. THE RETRIEVAL SYSTEM IS LIMITED TO PROCESSING NO MORE THAN 100 INQUIRIES SIMULTANEOUSLY.
6. TYPICAL RUNNING TIME - THE INDEXING AND STORAGE SYSTEM OPERATES AT BETWEEN 5000 AND 20,000 WORDS PER MINUTE. PRIMARILY, THE VARIATION IS DUE TO THE LENGTH OF DOCUMENTS, THE LENGTH OF PARAGRAPHS, AND THE NUMBER OF DOCUMENTS BEING INPUT DURING A GIVEN PROCESSING CYCLE. IN THE RETRIEVAL PROCESS, RUN TIME PER INQUIRY IS GOVERNED BY THE COMPLEXITY OF INQUIRIES, THE NUMBER OF INQUIRIES BEING PROCESSED SIMULTANEOUSLY, AND THE AMOUNT OF RELEVANT INFORMATION CONTAINED IN THE DATA BASE. BECAUSE OF THESE FACTORS, RUN TIME PER INQUIRY MAY VARY FROM A FEW SECONDS TO A FEW MINUTES.
7. UNUSUAL FEATURES OF THE PROGRAM - AMONG THE PERHAPS NOVEL FEATURES OF THE SYSTEM ARE -
 - (A) THE METHOD OF DATA COMPRESSION (HASH CODING) USED IN BUILDING THE CORPUS INDEX AND IN CONSTRUCTING INQUIRIES,
 - (B) THE METHOD OF MACHINE-COMPILING THE INQUIRIES SUCH THAT MANY CAN BE PROCESSED SIMULTANEOUSLY,
 - (C) THE METHOD FOR CODING AND COMPARISON OF PHRASES, AND
 - (D) A METHOD TO DETECT VOCABULARY SIMILARITY BETWEEN PARAGRAPHS.
8. RELATED AND AUXILIARY PROGRAMS -

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
UNIVAC1108 VERSION SUBMITTED SEPTEMBER 1973.
10. REFERENCES - L. E. WEST, SPIRAL REVISITED, SC-M-72 0175, MARCH 1972.
LESLIE E. WEST, SPIRAL (SANDIA'S PROGRAM FOR INFORMATION RETRIEVAL AND LISTING), PROCEEDINGS OF THE AMERICAN SOCIETY FOR INFORMATION SCIENCE, ANNUAL MEETING, 1969.
11. MACHINE REQUIREMENTS - UNIVAC1108 FASTRAND II DRUM, FM-432 DRUM, CARD READER, PRINTER, AND TAPE DRIVE
12. PROGRAMMING LANGUAGES USED - FORTRAN V AND ASSEMBLY LANGUAGE
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - EXEC 8.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - SPIRAL USES THE UNIVAC1108 SORT/MERGE AND NTRAN I/O PACKAGES. USER PROGRAMMING MAY BE REQUIRED TO REFORMAT EXISTING MACHINE-READABLE TEXT TO SPIRAL'S TEXT INPUT FORMAT.
15. NAME AND ESTABLISHMENT OF AUTHOR -
L. E. WEST
DIVISION 2644
SANDIA LABORATORIES
P. O. BOX 5800
ALBUQUERQUE, NEW MEXICO 87115
16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (8636 CARDS)
SAMPLE PROBLEM (1037 CARDS)
ELEMENT FILE (980 VARIABLE-LENGTH BINARY RECORDS)
REFERENCE REPORT, SC-M-72 0175, AND PROCEEDINGS REPRINT
17. CATEGORY - M
KEYWORDS - RETRIEVAL, DATA PROCESSING, SEARCHES

1. NAME OR DESIGNATION OF PROGRAM - TRIPLET
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC7600,6600, IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - TRIPLET SOLVES THE TWO-DIMENSIONAL MULTIGROUP TRANSPORT EQUATION IN PLANAR GEOMETRIES USING A REGULAR TRIANGULAR MESH. REGULAR AND ADJACENT, INHOMOGENEOUS AND HOMOGENEOUS (KEFF AND EIGENVALUE SEARCHES) PROBLEMS SUBJECT TO VACUUM, REFLECTIVE OR SOURCE BOUNDARY CONDITIONS ARE SOLVED. GENERAL ANISOTROPIC SCATTERING IS ALLOWED AND ANISOTROPIC DISTRIBUTED SOURCES ARE PERMITTED.
4. METHOD OF SOLUTION - THE DISCRETE ORDINATES APPROXIMATION IS USED FOR THE ANGULAR VARIABLES. A FINITE ELEMENT METHOD IN WHICH THE ANGULAR FLUX IS ASSUMED TO BE GIVEN BY A LOW-ORDER POLYNOMIAL IN EACH TRIANGLE IS USED TO SOLVE THE DISCRETE ORDINATES EQUATIONS. ANGULAR FLUXES ARE ALLOWED TO BE DISCONTINUOUS ACROSS TRIANGLE BOUNDARIES, AND THE ORDER OF THE POLYNOMIAL IS INPUT DATA TO THE CODE. BOTH INNER (WITHIN-GROUP) AND OUTER ITERATION CYCLES ARE ACCELERATED BY EITHER SYSTEM OR FINE MESH REBALANCE.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - VARIABLE DIMENSIONING IS USED SO THAT ANY COMBINATION OF PROBLEM PARAMETERS LEADING TO A CONTAINER ARRAY LESS THAN MAXLEN CAN BE ACCOMMODATED. ON CDC MACHINES MAXLEN CAN BE ABOUT 40,000 WORDS AND PERIPHERAL STORAGE IS USED FOR MOST GROUP-DEPENDENT DATA. ON IBM MACHINES TRIPLET WILL EXECUTE IN SINGLE-PRECISION (4 BYTES PER WORD) SO THAT MAXLEN CAN BE SEVERAL HUNDRED THOUSAND AND MOST PROBLEMS CAN BE CORE-CONTAINED.
6. TYPICAL RUNNING TIME - A SIX-GROUP, S₂, 1700 TRIANGLE, KEFF CALCULATION OF AN EBR-II CORE REQUIRES ABOUT 4.4 MINUTES OF CDC7600 TIME. RUNNING TIMES VARY ALMOST LINEARLY WITH THE TOTAL NUMBER OF UNKNOWN.
7. UNUSUAL FEATURES OF THE PROGRAM - SOURCES, FLUXES, SN CONSTANTS, AND CROSS SECTIONS MAY BE INPUT FROM STANDARD INTERFACE FILES. CREATION OF STANDARD INTERFACE OUTPUT FILES FOR SN CONSTANTS AND SCALAR AND ANGULAR FLUXES IS OPTIONAL. ALL BINARY DATA TRANSFERS ARE LOCALIZED IN SUBROUTINES CALLED REED AND RITE. FLEXIBLE EDIT OPTIONS, INCLUDING DUMPS AND RESTART CAPABILITY, ARE PROVIDED.
8. RELATED AND AUXILIARY PROGRAMS - TRIPLET IS BASED IN LARGE PART ON THE TWO-DIMENSIONAL ORTHOGONAL MESH CODE TWOTRAN2 (ACC ABSTRACT 358), WHICH IS AN IMPROVED VERSION OF THE TWOTRAN PROGRAM.
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
CDC7600 VERSION SUBMITTED AUGUST 1973.
CDC6600 VERSION SUBMITTED AUGUST 1973.
IBM360 VERSION SUBMITTED AUGUST 1973, SAMPLE PROBLEM EXECUTED BY ACC.

10. REFERENCES - WM. H. REED, T. R. HILL, F. W. BRINKLEY, AND K. D. LATHROP, TRIPLET: A TWO-DIMENSIONAL, MULTIGROUP, TRIANGULAR MESH, PLANAR GEOMETRY, EXPLICIT TRANSPORT CODE, LA-5428-MS, OCTOBER 1973.
11. MACHINE REQUIREMENTS - SIX OUTPUT (SCRATCH) UNITS AND TWO SYSTEM I/O UNITS ARE REQUIRED. USE OF FIVE INTERFACE UNITS IS OPTIONAL. ON THE CDC MACHINES A LARGE BULK MEMORY IS REQUIRED.
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THE CODE IS WRITTEN TO READ THE CASE INPUT DATA FROM FSET10 (7600) OR TAPE10 (6600) AND TO WRITE THE OUTPUT INFORMATION ON FSET9 (7600) OR TAPE9 (6600), WHICH ARE NOT EQUIVALENT TO THE SYSTEM INPUT AND OUTPUT UNITS.
15. NAME AND ESTABLISHMENT OF AUTHOR -
T. R. HILL
LOS ALAMOS SCIENTIFIC LABORATORY
P. O. BOX 1663
LOS ALAMOS, NEW MEXICO 87544
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (7600-8253 CARDS, 6600-8254 CARDS, 360-8639 CARDS)
SAMPLE PROBLEMS (7600-661 CARDS, 6600-661 CARDS, 360-661 CARDS)
CONTROL INFORMATION (JCL 360-31 CARDS)
IBM 2314 LOAD MODULE (360-TRIPLET 306 BLOCKS)
SAMPLE PROBLEM OUTPUT (7600, 6600-50 SELECTED PAGES, 360-45
SELECTED PAGES)
REFERENCE REPORT
17. CATEGORY - C
KEYWORDS - 2-DIMENSIONAL, MULTIGROUP, TRANSPORT THEORY, TRIANGULAR MESH, ANISOTROPIC SCATTERING, FINITE-ELEMENT, TWOTRAN2 CODES

1. NAME OR DESIGNATION OF PROGRAM - INDX
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - INDX PROVIDES A MEANS FOR RAPIDLY DEFINING AND TESTING TRIAL UNIT CELLS AS AN AID TO INDEXING POWDER PATTERNS OF CRYSTAL STRUCTURES OF UNKNOWN SYMMETRY.
4. METHOD OF SOLUTION - INDX ATTEMPTS TO INDEX X-RAY DIFFRACTION POWDER PATTERNS BY FINDING A REDUCED TRICLINIC CELL WHOSE CALCULATED Q VALUES ($Q=1/(D^2)$) MATCH A DESIRED PERCENTAGE OF THE OBSERVED Q VALUES WITHIN A GIVEN LIMIT OF ERROR. IF A REDUCED TRICLINIC CELL IS FOUND, THE CELL CONSTANTS MAY BE USED TO FORM A RECTANGULAR ARRAY (I.E., A NIGGLI MATRIX). REFERENCE TO PUBLISHED TABLES OF GENERAL AND SPECIAL NIGGLI MATRICES REVEALS WHETHER OR NOT THE SPECIFIC TRICLINIC CELL MAY BE TRANSFORMED TO A CELL OF HIGHER SYMMETRY. THE RESULTS OF THIS PROGRAM ARE THE REAL SPACE CELL CONSTANTS OF EACH INDIVIDUAL TRIAL CELL AND THE POSITION OF THE CELL IN THE POSSIBLE CELLS LIST.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE NUMBER OF OBSERVED Q VALUES CANNOT EXCEED 100. THE MAXIMUM VALUE OF $Q=2.0$.
6. TYPICAL RUNNING TIME -
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - THIS PROGRAM IS THE ALO-00154 PROGRAM TRANSFERRED FROM THE ALC-CCSMIC COLLECTION.
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
CCC6600 VERSION SUBMITTED JULY 1973.
10. REFERENCES - R. B. ROOF, JR., INDX, A COMPUTER PROGRAM TO AID IN THE INDEXING OF X-RAY POWDER PATTERNS OF CRYSTAL STRUCTURES OF UNKNOWN SYMMETRY, LA-3920, JULY 1968.
11. MACHINE REQUIREMENTS -
12. PROGRAMMING LANGUAGE USED - FORTRAN IV AND COMPASS
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 3 (CDC6600).
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHOR -
R. B. ROOF, JR.
LCS ALAMOS SCIENTIFIC LABORATORY
P. O. BOX 1663
LCS ALAMOS, NEW MEXICO 87544

16. MATERIAL AVAILABLE -
 SOURCE DECK (746 CARDS)
 SAMPLE PROBLEM (63 CARDS)
 REFERENCE REPORT
17. CATEGORY - Q
 KEYWORDS - X-RAY DIFFRACTION, CRYSTALS

1. NAME OR DESIGNATION OF PROGRAM - FUNPACK
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360, CDC6600,7600, UNIVAC1108
3. DESCRIPTION OF PROBLEM OR FUNCTION - FUNPACK IS A COLLECTION OF FORTRAN SUBROUTINES TO EVALUATE CERTAIN SPECIAL FUNCTIONS. THE INDIVIDUAL SUBROUTINES ARE -

IDENTIFICATION	DESCRIPTION
DEI	FIEI EXPONENTIAL INTEGRALS
DELIPK	FIEK COMPLETE ELLIPTIC INTEGRAL OF THE FIRST KIND
DELIPE	FIEE COMPLETE ELLIPTIC INTEGRAL OF THE SECOND KIND
DAW	FIDW DAWSON'S INTEGRAL
BESKO	FIKO BESSEL FUNCTION K-SUB-0
BESK1	FIK1 BESSEL FUNCTION K-SUB-1
MONERR	FIMO ERROR MONITORING PACKAGE
4. METHOD OF SOLUTION - FUNPACK USES EVALUATION OF MINIMAX APPROXIMATIONS.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE IBM DISTRIBUTION INCLUDES ALL PROGRAMS LISTED UNDER ITEM 3. OTHER MACHINE VERSIONS DO NOT INCLUDE BESKO FIKO AND BESK1 FIK1.
6. TYPICAL RUNNING TIME -
7. UNUSUAL FEATURES OF THE PROGRAM - THESE ROUTINES HAVE BEEN CERTIFIED UNDER THE NATS PROJECT FOR THE MACHINES AND OPERATING SYSTEMS INDICATED IN ITEM 13 AND FOR THE COMPILERS INDICATED IN ITEM 12. EXTENSIVE TESTING ON THESE MACHINES HAS SHOWN NO EVIDENCE OF PERFORMANCE DIFFICULTIES. EXCEPTIONS, IF ANY, FOLLOW -

CDC VERSIONS OF THESE SUBROUTINES ARE TUNED TO PERFORM BEST USING THE ROUNDED ARITHMETIC OPTION ON CDC COMPILERS.

THE ACCURACY OF THE SUBROUTINES FOR THE ELEMENTARY FUNCTIONS (EXP, ALOG, ETC.) CAN AFFECT THE ACCURACY OF FUNPACK SUBROUTINES.

THE IBM VERSION OF THIS PACKAGE ASSUMES THE IBM-SUPPLIED TRACEBACK SUBROUTINE ERRTRA IS AVAILABLE.

THE NATS PROJECT FULLY SUPPORTS CERTIFIED ROUTINES IN THE SENSE THAT DETAILED INFORMATION ON THE TESTING PROCEDURES IS AVAILABLE AND REPORTS OF THE POOR OR INCORRECT PERFORMANCE ON AT LEAST THE MACHINES AND OPERATING SYSTEMS LISTED WILL GAIN IMMEDIATE ATTENTION FROM THE DEVELOPERS.
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.

IBM360,370 VERSION SUBMITTED AUGUST 1973, SAMPLE PROBLEMS EXECUTED BY ACC SEPTEMBER 1973.

CDC6600,7600 VERSION SUBMITTED AUGUST 1973.

UNIVAC1108 VERSION SUBMITTED AUGUST 1973.

10. REFERENCES - J. M. BLAIR AND A. E. RUSSON, RATIONAL MINIMAX APPROXIMATIONS FOR THE BESSEL FUNCTIONS $K_0(X)$ AND $K_1(X)$, AECL-3461, 1969.
 W. J. CODY, CHEBYSHEV APPROXIMATIONS FOR THE COMPLETE ELLIPTIC INTEGRALS K AND E , MATH. COMP. 19, 105-112, 1965.
 W. J. CODY, K. A. PACIOREK, AND H. C. THACHER, JR., CHEBYSHEV APPROXIMATIONS FOR DAWSON'S INTEGRAL, MATH. COMP. 24, 171-178, 1970.
 W. J. CODY AND HENRY C. THACHER, JR., RATIONAL CHEBYSHEV APPROXIMATIONS FOR THE EXPONENTIAL INTEGRAL $E_1(X)$, MATH. COMP. 22, 641-649, 1968.
 CHEBYSHEV APPROXIMATIONS FOR THE EXPONENTIAL INTEGRAL $E_1(X)$, MATH. COMP. 23, 289-303, 1969.
11. MACHINE REQUIREMENTS -
12. PROGRAMMING LANGUAGES USED - FORTRAN IV(G) (IBM360/75,195, AND 370/165), FORTRAN IV(G1) (IBM360/75,195), FORTRAN IV(H) (IBM360/65,67,75,195), FORTRAN IV(H EXTENDED) (IBM360/195), WATFIV (IBM360/67), FORTRAN RUN, FTN, AND FUN (CDC6600,7600), AND FORTRAN V (UNIVAC1108)
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360 (IBM360/75,65,195, AND 370/165), MTS (IBM360/67), STAN (IBM360/67), PURD (CDC6500), LLL (CDC6600,7600), UTEX (CDC6600,6400), NCAR (CDC6600,7600), SCOPE 3.3 (CDC6400), LBL (CDC6600,7600), AND EXEC 8 (UNIVAC1108).
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
 LOCATIONS AND MACHINES USED FOR FUNPACK TESTING WERE -
MACHINE	TEST SITE
IBM360/75,195	ARGONNE NATIONAL LABORATORY
IBM360/65	THE UNIVERSITY OF CHICAGO
IBM360/67	THE UNIVERSITY OF MICHIGAN
IBM360/65	AMES LABORATORY, IOWA STATE UNIVERSITY
IBM360/67	STANFORD UNIVERSITY (STAN)
IBM360/67	THE UNIVERSITY OF NEW MEXICO
IBM370/165	THE UNIVERSITY OF TORONTO
CDC6600,7600	LAWRENCE BERKELEY LABORATORY (LBL)
CDC6600,7600	LAWRENCE LIVERMORE LABORATORY (LLL)
CDC6600/6400	THE UNIVERSITY OF TEXAS AT AUSTIN (UTEX)
CDC6600,7600	NATIONAL CENTER FOR ATMOSPHERIC RESEARCH (NCAR)
CDC6400	NORTHWESTERN UNIVERSITY
CDC6500	PURDUE UNIVERSITY
UNIVAC1108	ILLINOIS INSTITUTE OF TECHNOLOGY
UNIVAC1108	UNIVERSITY OF WISCONSIN
15. NAME AND ESTABLISHMENT OF AUTHOR -
 CONTACT BURTON S. GARBOW

15. NAME AND ESTABLISHMENT OF AUTHOR(S) (CONTINUED)
APPLIED MATHEMATICS DIVISION
ARGONNE NATIONAL LABORATORY
9700 SOUTH CASS AVENUE
ARGONNE, ILLINOIS 60439
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (IBM360,370 1831 CARDS, CDC6600,7600 1374 CARDS,
UNIVAC1108 1377 CARDS)
DEMONSTRATION PROGRAM SOURCE DECKS (IBM360,370 987 CARDS,
CDC6600,7600 632 CARDS, UNIVAC1108 652 CARDS)
MACHINE READABLE DOCUMENTATION (IBM360,370 ABOUT 2137 CARDS,
OTHER MACHINES ABOUT 1573 CARDS)
17. CATEGORY - P
KEYWORDS - SPECIAL FUNCTIONS, EXPONENTIAL INTEGRALS, COMPLETE
ELLIPTIC INTEGRALS, DAWSON'S INTEGRAL, BESSEL FUNCTIONS

VI. LIBRARY PROGRAMS BY PROBLEM CLASSIFICATION

A. CROSS SECTION AND RESONANCE INTEGRAL CALCULATIONS

3/74

14 HAFEVER HAFEVER CALCULATES THE ENERGY EXCHANGE INELASTIC SCATTERING CROSS SECTION ACCORDING TO THE HAUSER-FESHBACH THEORY MODIFIED TO INCLUDE THE EFFECT OF SPIN-ORBIT COUPLING. THE CROSS SECTION IS INTEGRATED OVER ANGLE.

41 ZUT ZUT COMPUTES RESONANCE INTEGRALS FROM RESONANCE PARAMETERS FOR A WIDE VARIETY OF TEMPERATURES, COMPOSITIONS, AND GEOMETRIES FOR THE RESOLVED RESONANCES.

42 TUZ TUZ COMPUTES RESONANCE INTEGRALS FOR A WIDE VARIETY OF TEMPERATURES, COMPOSITIONS, AND GEOMETRIES FOR THE UNRESOLVED RESONANCES.

56 SUMMIT SUMMIT EVALUATES THE DIFFERENTIAL ENERGY-TRANSFER CROSS SECTION FOR SCATTERING BY A CRYSTALLINE MODERATOR, UTILIZING THE SO-CALLED PHONON EXPANSION. THE SCATTERING KERNEL FOR A 1-PHONON CHANGE IN ENERGY IS ADDED TO THAT FOR A 2-PHONON ENERGY EXCHANGE, AND SO ON. THIS PROGRAM HAS BEEN USED TO DETERMINE SCATTERING MATRICES FOR BERYLLIUM, GRAPHITE, AND OXYGEN.

$$\text{SIGMA}(E(0) \text{ TO } E)/\text{SIGMA}(0) = (((M+1)/M)**2) * \text{SQRT}(E/E(0)) * 1/2$$

 THE INTEGRAL FROM -1 TO 1 OF $\text{SIGMA}(E(0) \text{ TO } E, \cos(\theta))$
 $\text{D}(\cos(\theta))$

WHERE $E(0)$ AND E ARE THE INITIAL AND FINAL ENERGIES, θ IS THE ANGLE OF SCATTERING, $\text{SIGMA}(0)$ THE FREE-ATOM CROSS SECTION, AND M THE RATIO OF THE MASS OF THE SCATTERING NUCLEUS TO THAT OF THE NEUTRON.

89 ARES2 ARES2 IS USED TO CALCULATE EFFECTIVE RESONANCE INTEGRALS AND MULTIGROUP CROSS SECTIONS FOR LUMPS AND MIXTURES USING RESONANCE PARAMETERS. IT COMBINES IN A SINGLE CODE, THE RESOLVED, UNRESOLVED, AND $1/V$ PARTS OF THE CALCULATION WHICH WERE PREVIOUSLY IN SEPARATE CODES. THE MULTIGROUP CROSS SECTIONS ARE PRINTED IN A FORM FOR USE IN MULTIGROUP REACTOR CALCULATIONS. FOR EXAMPLE, THEY CAN BE INSERTED INTO THE AIM6 (ACC ABSTRACT 29) OR FAIM (ACC ABSTRACT 120) LIBRARIES. THE ENERGY BREAKPOINTS ARE INPUT DATA AND A RESONANCE PARAMETER LIBRARY IS INCLUDED.

171 NEARREX NEARREX COMPUTES NEUTRON-INDUCED, AVERAGE FLUCTUATION (OR COMPOUND NUCLEUS) CROSS SECTIONS. PROVISION IS MADE FOR THE COMPUTATION OF COMPOUND ELASTIC AND INELASTIC NEUTRON CROSS SECTIONS, RADIATIVE CAPTURE AND FISSION CROSS SECTIONS, AS WELL AS OTHER PROCESSES, SUCH AS PROTON EMISSION. IT CAN ALSO BE USED TO COMPUTE PROTON-INDUCED AVERAGE CROSS SECTIONS.

A. CROSS SECTION AND RESONANCE INTEGRAL CALCULATIONS

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176 RAPTURE **THIS CODE COMPUTES**
RESONANCE INTEGRALS, AVERAGES THEM OVER RESONANCE PARAMETRIC
DISTRIBUTIONS, AND COMPUTES FISSION AND CAPTURE CROSS SECTIONS
AS A FUNCTION OF FUEL TEMPERATURE AND OF POTENTIAL SCATTERING
CROSS SECTION PER ABSORBER ISOTOPE.

177 DOPIE
THE EFFECTS OF - DOPIE WAS DEVELOPED TO STUDY

- (1) OVERLAP OF RESONANCES OF UNLIKE FUEL ISOTOPES SUCH AS U238 AND THE PLUTONIUM ISOTOPES, AND
- (2) THE TEMPERATURE DEPENDENCE OF THE AVERAGE FLUX OVER AN ENERGY INTERVAL CONTAINING RESONANCES IN THE CALCULATION OF THE DOPPLER COEFFICIENT.

DCPIE COMPUTES FLUX-AVERAGED CROSS SECTIONS OVER A GIVEN ENRGY RANGE UNDER THE FOLLOWING ASSUMPTION

- (1) INTERFERENCE SCATTERING CORRECTIONS WILL BE SMALL AND CAN BE IGNORED.
- (2) SCATTERED NEUTRONS ARE DISTRIBUTED UNIFORMLY OVER THE RANGE OF ENERGY DEGRADATION CONSTANT FOR EACH MATERIAL.
- (3) ALL RESONANCES ARE RESOLVED OR CAN BE TREATED AS RESOLVED.
- (4) LEAKAGE IS INSIGNIFICANT, MAKING $\Sigma R(J) = \text{POTENTIAL SCATTERING}$.

203 COMBCD (40.0279) THE PROGRAM PERMITS COMPUTING
AND CONVOLUTING A COMBINATION CROSS SECTION CURVE COMPOSED OF THE
CROSS SECTION CURVES OF A SAMPLE AND UP TO FOUR CONTAMINANTS.

208 TRIX1 TRIX1 CALCULATES MULTI-GROUP, DOPPLER-BROADENED EFFECTIVE RESONANCE INTEGRALS AND CROSS SECTIONS AND THEIR TEMPERATURE COEFFICIENTS FOR A HETEROGENEOUS RESONANCE ABSORBER. USING BASIC RESONANCE PARAMETERS, GEOMETRY AND CONCENTRATIONS, THE CODE COMBINES RESOLVED RESONANCE, UNRESOLVED RESONANCE, AND $1/V$ AND NEGATIVE ENERGY RESONANCE CALCULATIONS. FISSILE ISOTOPE CALCULATION IS AVAILABLE. $L=1$ UNRESOLVED RESONANCE CALCULATIONS ARE AVAILABLE FOR ISOTOPES OF ALL SPINS. EQUIVALENCE RELATIONSHIPS ARE CODED FOR CYLINDERS, SPHERES, AND PLANES. INTERFERENCE BETWEEN RESONANCE AND POTENTIAL SCATTERING AND ITS TEMPERATURE DEPENDENCE ARE AVAILABLE. THE NARROW-RESONANCE, INFINITE-MASS, AND INTERMEDIATE REPRESENTATIONS OF SCATTERINGS WITH ABSORBER ATOMS ARE ALL AVAILABLE. THE ISOLATED SINGLE-LEVEL BREIT-WIGNER LINE SHAPE IS USED.

A. CROSS SECTION AND RESONANCE INTEGRAL CALCULATIONS

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214 MISH MASH THE PROGRAM COMPUTES RESONANCE INTEGRALS FOR INFINITE HOMOGENEOUS MIXTURES FOR ABOVE THERMAL ENERGIES. THE MAJOR PHYSICAL APPROXIMATION IS THAT RESONANCES ARE REPRESENTED BY THE SINGLE-LEVEL BREIT-WIGNER FORMULATION. IT IS ALSO ASSUMED THAT SCATTERING IS ELASTIC AND THAT A NONRESONANT MATERIAL HAS A CONSTANT SCATTERING CROSS SECTION.

215 CHAD CHAD IS DESIGNED TO FACILITATE ANALYSIS AND HANDLING OF DIFFERENTIAL NEUTRON SCATTERING DATA. IT PRODUCES LEGENDRE SCATTERING COEFFICIENTS FROM ANGULAR DISTRIBUTION DATA TABULATED IN MANY DIFFERENT FORMATS. IT CAN TRANSFORM ANGULAR DATA INTO LEGENDRE SCATTERING COEFFICIENTS IN EITHER THE LABORATORY OR THE CENTER-OF-MASS FRAME OF REFERENCE. IT CALCULATES THE AVERAGE COSINE OF THE SCATTERING ANGLE IN THE LABORATORY SYSTEM AND THE AVERAGE LOGARITHMIC ENERGY DECREMENT PER ELASTIC COLLISION.

216 FSDP3 FSDP3 COMPUTES POINTWISE CROSS SECTIONS FROM SINGLE-LEVEL BREIT-WIGNER RESONANCE PARAMETERS.

217 LEGCOEF3/GEORGE CALCULATES LEGENDRE EXPANSION COEFFICIENTS FOR THE ANGULAR DISTRIBUTION OF ELASTICALLY SCATTERED NEUTRONS.

238 EXT/XO GIVEN A SET OF BREIT-WIGNER RESONANCE PARAMETERS (ZERO TEMPERATURE) EXT CALCULATES THE EFFECTIVE DOPPLER-BROADENED CROSS SECTIONS FOR ANY TEMPERATURE. THE EFFECTIVE CROSS SECTION WHEN MULTIPLIED BY THE TARGET DENSITY AND THE NEUTRON VELOCITY (v) GIVES THE REACTION RATE PER INCIDENT NEUTRON. A MAXWELLIAN VELOCITY DISTRIBUTION IS ASSUMED FOR THE TARGET NUCLEI. THE ANALYSIS IS CARRIED OUT FOR SUFFICIENTLY LOW ENERGIES SO THAT ONLY ZERO NEUTRON ANGULAR MOMENTA ($L = 0$) INTERACTIONS ARE IMPORTANT. INTERFERENCE BETWEEN LEVELS IS NEGLECTED, HOWEVER, INTERFERENCE BETWEEN RESONANCE SCATTERING AND POTENTIAL SCATTERING IS INCLUDED. THERE ARE PROVISIONS FOR ADDING A CORRECTION CROSS SECTION OF THE FORM $1.0/\sqrt{E}$ FOR LEVELS NOT EXPLICITLY CONSIDERED. ALSO THE CROSS SECTION IN THE WINGS OF A NEGATIVE ENERGY RESONANCE, $CONSTANT/(\sqrt{E})(E-E_0)^2$ MAY BE ADDED.

A. CROSS SECTION AND RESONANCE INTEGRAL CALCULATIONS

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247 FLANGE1 FLANGE1 COMPUTES NEUTRON
SCATTERING KERNELS FOR A LARGE CLASS OF MODERATORS. NEUTRON SCAT-
TERING KERNELS ARE OBTAINED FROM THE SCATTERING LAW COMPUTED BY
THE CODE GASKET. FLANGE1 ALLOWS THE CALCULATION OF DOUBLE DIF-
FERENTIAL CROSS SECTIONS, ANGULAR CROSS SECTIONS, TOTAL CROSS
SECTIONS, AND LEGENDRE MOMENTS OF THE SCATTERING KERNEL. THE
SHORT COLLISION TIME APPROXIMATION IS USED FOR ENERGY TRANSFERS
LARGER THAN THE MAXIMUM PROVIDED BY GASKET.

254 2PLUS THE 2PLUS CODE SOLVES THE PROBLEM OF THE SCATTERING OF CHARGED OR UNCHARGED NUCLEONS BY A NUCLEUS REPRESENTED BY A DEFORMED NUCLEAR POTENTIAL. THE MODEL ASSUMES THAT THE TARGET NUCLEUS HAS A 0+ GROUND STATE AND A 2+ FIRST EXCITED LEVEL, AND THE INTERACTION POTENTIAL HAS A QUADRUPOLE DEFORMATION. A HAUSER-FESHBACH COMPOUND NUCLEUS CALCULATION HAS BEEN INCLUDED. THE OUTPUT CONTAINS TOTAL, POTENTIAL ELASTIC, POTENTIAL INELASTIC (2+), REACTION, AND COMPOUND NUCLEUS CROSS SECTIONS AS WELL AS ELASTIC AND INELASTIC ANGULAR DISTRIBUTIONS.

263 GASKET GASKET CALCULATES THE THERMAL NEUTRON SCATTERING LAW, $S(\alpha, \beta)$, FOR A LARGE CLASS OF MODERATORS. PROVISION HAS BEEN MADE IN GASKET FOR THE FOLLOWING DYNAMICAL MODES OF THE SCATTERER -

- (1) FREE TRANSLATION (GAS).
- (2) DIFFUSIVE OR BROWNIAN MOTION.
- (3) HARMONIC ISOTROPIC VIBRATIONS WITH CONTINUOUS FREQUENCY SPECTRUM.
- (4) HARMONIC ANISOTROPIC VIBRATIONS WITH CONTINUOUS FREQUENCY SPECTRUM (AS APPLIED FOR INSTANCE TO GRAPHITE).
- (5) HARMONIC ISOTROPIC VIBRATIONS WITH DISCRETE FREQUENCY SPECTRUM.

289 GAKER THE GAKER CODE EVALUATES THE INELASTIC DOUBLE-DIFFERENTIAL NEUTRON SCATTERING CROSS SECTIONS FOR MODERATORS WITH PHONON SPECTRA WHICH CAN BE REPRESENTED AS SUMS OF DELTA-FUNCTIONS. IT IS BASED ON THE ORIGINAL MODEL FOR LIGHT WATER BY NELKIN, WHICH CONSISTED OF A TRANSLATOR, A HINDERED ROTATOR (TREATED AS AN ISOTROPIC OSCILLATOR), AND SEVERAL VIBRATIONAL OSCILLATORS. THE CODE HAS BEEN MODIFIED SEVERAL TIMES TO INCLUDE MORE OSCILLATORS AND TO TREAT ANISOTROPIC EFFECTS. FINAL ENERGY-INTEGRATED CROSS SECTIONS ARE ALSO CALCULATED.

292 PSEUDO RESONANCE PARAMETERS ARE CON-
STRUCTED FROM AVERAGE NUCLEAR PROPERTIES IN THE RESOLVED RESONANCE
REGION.

A. CROSS SECTION AND RESONANCE INTEGRAL CALCULATIONS

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305 STRIP CAPTURE AND FISSION RESONANCE
INTEGRALS ARE CALCULATED BY A FAST METHOD IN THE RESOLVED RESO-
NANCE RANGE, TAKING EXPLICIT ACCOUNT OF OVERLAP AND INTERFERENCE
BETWEEN RESONANCES IN A MIXTURE OF RESONANCE ABSORBERS. THE
RESONANCE INTEGRALS ARE CALCULATED OVER ARBITRARY ENERGY BANDS.
OPTIONALLY, THE NEUTRON FLUX AS A FUNCTION OF ENERGY IN ONE OR TWO
REGIONS MAY BE PRINTED OUT.

308 JUPITOR1(JP1) JUPITOR1 IS USED TO PERFORM
COUPLED-CHANNEL CALCULATIONS TO EVALUATE THE CROSS SECTIONS FOR
THE SCATTERING OF NUCLEAR PARTICLES BY VARIOUS COLLECTIVE NUCLEI.

323 MUFFLE THIS PROGRAM COMPUTES THE NEUTRON CROSS SECTIONS FOR A FISSILE NUCLIDE IN WHICH ONE TO THREE REACTION CHANNELS ARE OPEN FOR THE FISSION PROCESS. PROVISION IS MADE FOR TWO INDEPENDENT SPIN STATES WITH INTERFERING LEVELS AS WELL AS A SET OF NON-INTERFERING LEVELS. THE CROSS SECTIONS ARE INTEGRATED OVER A SPECIFIED GROUP STRUCTURE TO YIELD RESONANCE INTEGRALS.

334 PEGGY PEGGY IS A LEAST SQUARES SEARCH PROGRAM WHICH ANALYZES, IN TERMS OF PHASE SHIFTS, THE ELASTIC SCATTERING OF SPIN ZERO AND SPIN ONE-HALF PARTICLES BY SPIN ZERO NUCLEI. REAL OR COMPLEX PHASE SHIFTS MAY BE USED WITH OR WITHOUT SPIN-ORBIT COUPLING. DIFFERENTIAL CROSS SECTION AND POLARIZATION ANGULAR DISTRIBUTIONS MAY BE ANALYZED EITHER SEPARATELY OR SIMULTANEOUSLY.

335 RAMES RAMES COMPUTES BOTH LOCAL AND
NONLOCAL RADIAL INTEGRALS OF A VARIETY OF RADIAL OPERATORS USING
SINGLE-PARTICLE WAVE FUNCTIONS WHICH ARE EIGENSTATES OF MOTION IN
A WOODS-SAXON POTENTIAL WELL. THE OPERATORS CURRENTLY AVAILABLE
ARE R**N, N=0,1,2,3,4,5 AND THE DERIVATIVE WITH RESPECT TO X OF
1/(EXP(X)+1) WHERE X=(R-R(0))/A(0).

341 GANDY THE GANDY CODE EVALUATES TEMPERATURE-DEPENDENT EFFECTIVE NEUTRON CAPTURE, FISSION, AND SCATTERING CROSS SECTIONS IN THE UNRESOLVED RESONANCE REGION FROM AVERAGE RESONANCE PARAMETERS.

A. CROSS SECTION AND RESONANCE INTEGRAL CALCULATIONS

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347 CODILLI A LEAST SQUARES ANALYSIS OF NEUTRON RESONANCE DATA IS PERFORMED USING THE MULTI-LEVEL EXPANSION. THE PROGRAM CAN HANDLE ONLY ONE SET OF CROSS SECTIONS AT A TIME. OPTIONS ARE PROVIDED FOR THE ANALYSIS OF REACTION OR TOTAL CROSS SECTION DATA, AND FOR THE DIRECT HANDLING OF TRANSMISSION DATA. BY OPTION, ONE CAN INCLUDE THE MULTI-LEVEL INTERFERENCE OR PERFORM THE FIT IN TERMS OF SUPERIMPOSED SYMMETRIC BREIT-WIGNER LINES, WHILE THE POTENTIAL SCATTERING INTERFERENCE IS ALWAYS INCLUDED IN THE TRIAL FUNCTION FOR THE TOTAL CROSS SECTION. PROVISIONS ARE GIVEN FOR GAUSSIAN AND NON-GAUSSIAN RESOLUTION FUNCTIONS. IN THE LATTER CASE, MODIFICATION OF ONE SUBROUTINE ALLOWS FOR ADAPTATION TO ANY KIND OF EXPERIMENTAL CONDITIONS. THE RELEVANT CONVOLUTION INTEGRALS INVOLVING THE TRIAL FUNCTION ARE EVALUATED BY SIMPSON INTEGRATION WITH AN OPTIONAL NUMBER OF INTEGRATION STEPS. BESIDES THE RESONANCES TO BE FITTED, THE TRIAL FUNCTION CONTAINS AN OPTIONAL NUMBER OF RESONANCES HAVING KNOWN PARAMETERS, WHICH MAY REPRESENT RESONANCES EXTERNAL TO THE REGION BEING FITTED AS WELL AS RESONANCES WITHIN THE ENERGY INTERVAL OF INTEREST, THUS PERMITTING IMPURITY EFFECTS TO BE DESCRIBED, OR, IF NEEDED, SPIN STATES SEPARATED.

359 PUN1 PUN1 EVALUATES UNRESOLVED RADIATIVE CAPTURE INTEGRALS AND RELATED MULTIGROUP CROSS SECTIONS. THE UNRESOLVED DISTRIBUTIONS MAY HAVE VARIOUS ORBITAL ANGULAR MOMENTUM QUANTUM NUMBERS AND THE EFFECTS OF DOPPLER BROADENING AND SELF-SHIELDING ARE INCLUDED.

360 TOR THE TOR PROGRAM CALCULATES THE SCATTERING LAW FOR A CRYSTALLINE MATERIAL IN THE INCOHERENT APPROXIMATION, FROM THE PHONON FREQUENCY DISTRIBUTION AND A SPECIFIED TEMPERATURE. A PROPORTIONAL QUANTITY IS PUNCHED IN THE FORM OF A TABLE FOR INTERPOLATION OF THE DOUBLE DIFFERENTIAL CROSS SECTION. AS AN ALTERNATIVE, THE PROGRAM OBTAINS THE ANALOGOUS QUANTITIES FOR A MONATOMIC GAS.

376 AVERAGE AVERAGE CALCULATES AVERAGE SCATTERING, CAPTURE, AND FISSION CROSS SECTIONS FROM S- AND P-WAVE DATA OF THE UNRESOLVED PARAMETERS OF FILE 2 OF ENDF/B.

377 SIGPLOT SIGPLOT CALCULATES THE SCATTERING, CAPTURE, FISSION, AND TOTAL CROSS SECTIONS FROM RESONANCE PARAMETERS OF VERSION 1 DATA FROM FILE 2 OF ENDF/B. SCATTERING CROSS SECTIONS MAY BE CALCULATED WITH OR WITHOUT LEVEL-LEVEL INTERFERENCE. PROVISION IS ALSO MADE TO NUMERICALLY DOPPLER-BROADEN ANY OF THE CROSS SECTIONS.

A. CROSS SECTION AND RESONANCE INTEGRAL CALCULATIONS

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381 LYNNNE LYNN PERFORMS A MULTIPOLAR EXPANSION OF THE WOODS-SAXON POTENTIAL. THE NUMBERS GENERATED ARE SUITABLE FOR MICROSCOPIC CALCULATIONS OF INELASTIC SCATTERING FROM NUCLEI WHICH USE A WOODS-SAXON INTERACTION BETWEEN THE PROJECTILE AND THE TARGET NUCLEONS.

385 COHBE/PREP THE PROGRAMS, PREP AND COHBE CALCULATE THE COHERENT ONE-PHONON SCATTERING LAW FOR POLYCRYSTALLINE BERYLLIUM, USING AN ISOTROPIC DEBYE-WALLER FACTOR AS AN APPROXIMATION FOR BERYLLIUM. THE DEBYE-WALLER FACTOR W IS CONSISTENT WITH THE DEFINITION $\exp(-2W\alpha)$ IN THE SCATTERING LAW.

399 SUMOR(M0271) SUMOR CALCULATES S-WAVE NEUTRON CROSS SECTIONS AT SELECTED ENERGIES. THE CROSS SECTIONS ARE CALCULATED IN THREE APPROXIMATIONS TO R-MATRIX THEORY - THE REICH AND MCORE APPROXIMATION, THE FESHBACH, PORTER, AND WEISSKOPF APPROXIMATION, AND THE SUMS OF SINGLE-LEVEL FORMULAE APPROXIMATION. THESE CALCULATED CROSS SECTIONS OR, ALTERNATIVELY, INPUT LISTS OF CROSS SECTIONS, ARE DOPPLER BROADENED USING EXACT CALCULATION FOR TARGET NUCLEI IN MAXWELLIAN MOTION. CALCULATED CROSS SECTIONS OR CROSS SECTIONS DIVIDED BY NEUTRON ENERGY CAN BE INTEGRATED BETWEEN ARBITRARY ENERGY LIMITS.

410 TACASI TACASI IS USED TO DETERMINE THE PARAMETERS OF A SINGLE NEUTRON RESONANCE. THE CODE ACCEPTS MEASURED VALUES OF CAPTURE AREAS, SELF-INDICATION AREAS, SELF-INDICATION RATIOS AND TRANSMISSION AREAS AND THEIR ASSOCIATED UNCERTAINTIES IN ANY COMBINATION AND DETERMINES BEST ESTIMATES OF THE NEUTRON AND RADIATION WIDTHS AND THEIR STANDARD DEVIATIONS.

417 ATHENA4 ATHENA4 COMPUTES FORM FACTORS FOR INELASTIC SCATTERING CALCULATIONS, USING SINGLE-PARTICLE WAVE FUNCTIONS THAT ARE EIGENSTATES OF MOTION IN EITHER A WOODS-SAXON POTENTIAL WELL OR A HARMONIC OSCILLATOR WELL. TWO-BODY FORCES OF GAUSS, COULOMB, YUKAWA, AND A SUM OF CUT-OFF YUKAWA RADIAL DEPENDENCES ARE AVAILABLE.

465 RESEND/ADLER RESEND GENERATES INFINITELY DILUTE, UNBROADENED POINT CROSS SECTIONS IN THE ENDF FORMAT BY COMBINING ENDF FILE 3, BACKGROUND CROSS SECTIONS WITH POINTS CALCULATED FROM ENDF FILE 2, RESONANCE PARAMETER DATA.

ADLER CALCULATES TOTAL, CAPTURE AND FISSION CROSS SECTIONS FROM THE CORRESPONDING ADLER-ADLER PARAMETERS IN THE ENDF/B FILE 2 VERSION II DATA AND ALSO DOPPLER-BROADENS CROSS SECTIONS.

A. CROSS SECTION AND RESONANCE INTEGRAL CALCULATIONS

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470 GRAMP GRAMP RANDOMLY GENERATES REICH AND MOORE PARAMETERS FOR MULTILEVEL UNRESOLVED RESONANCES OF FISSION ISOTOPES.

482 COMNUC/CASCADE COMNUC CALCULATES NEUTRON REACTION CROSS SECTIONS USING A STATISTICAL MODEL FOR DECAY OF THE COMPOUND NUCLEUS. COMPETING REACTION TYPES PERMITTED ARE ELASTIC, DISCRETE AND CONTINUUM INELASTIC, GAMMA RAY EMISSION, CAPTURE, FISSION, AND $n, 2n$.

CASCADE SOLVES THE INTRANUCLEAR GAMMA RAY CASCADE EQUATION TO DETERMINE SECONDARY PARTICLE EMISSION PROBABILITIES. COMPETING PROCESSES CONSIDERED ARE GAMMA RAY EMISSION, NEUTRON EMISSION AND FISSION.

492 RAMP1 RAMP1 CALCULATES SCATTERING, CAPTURE, FISSION AND TOTAL CROSS SECTIONS FROM REICH-MOORE RESOLVED RESONANCE PARAMETERS. THE RESONANCE PARAMETERS ARE ASSUMED TO BE IN ENDF/B VERSION II DATA FORMAT. CROSS SECTIONS MAY BE DOPPLER BROADENED IF SO DESIRED.

504 THRESH THRESH CALCULATES NEUTRON-INDUCED REACTION CROSS SECTIONS FROM 0 TO 20 MEV AND FISSION SPECTRUM AVERAGES FOR NUCLIDES HAVING 21 TO 50 PROTONS. REACTION PRODUCTS CONSIDERED ARE $2n$, $3n$, p , d , t , $He-3$, α , np , nd , nt , $nHe-3$, $n-\alpha$, pn , $2p$, $p-\alpha$, $\alpha-n$, $\alpha-p$, AND dn .

506 JPIXR PIXR COMPUTES SCATTERING CROSS SECTIONS AND RELATED QUANTITIES FOR THE SCATTERING OF NUCLEONS OR COMPOSITE PARTICLES FROM ANY COLLECTIVE NUCLEUS, EVEN OR ODD A , VIBRATIONAL OR ROTATIONAL. THE PROJECTILE CAN BE CHARGED OR UNCHARGED AND CAN HAVE SPIN 0, $1/2$, OR 1.

507 PHASER HASER COMPUTES THE FOLLOWING QUANTITIES FOR THE SCATTERING OF NEUTRONS FROM NUCLEI - TOTAL, ELASTIC, AND REACTION CROSS SECTIONS, DIFFERENTIAL SHAPE AND COMPOUND ELASTIC CROSS SECTIONS, DIFFERENTIAL POLARIZATIONS, DIFFERENTIAL AND INTEGRATED COMPOUND LEVEL INELASTIC CROSS SECTIONS, COMPOUND AND SHAPE ELASTIC LEGENDRE MOMENTS IN THE CENTER-OF-MASS SYSTEM.

524 BESFIT BESFIT CALCULATES DIFFERENTIAL ELASTIC SCATTERING CROSS SECTIONS USING A BESSEL FUNCTION EXPANSION, BASED ON A DIFFRACTION MODEL. CONSTANT TERMS MAY EITHER BE SUPPLIED AS INPUT DATA OR OBTAINED BY A LEAST SQUARES FITTING OF THE DATA.

A. CROSS SECTION AND RESONANCE INTEGRAL CALCULATIONS

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531 CLEM CLEM GENERATES CONSTRAINED
LEGENDRE MOMENTS FOR NEUTRON SCATTERING ANGULAR DISTRIBUTIONS.
THE CONSTRAINT IS THAT THE ANGULAR DISTRIBUTION ITSELF SHOULD BE
NON-NEGATIVE.

535 MULTI MULTI COMPUTES SCATTERING
CROSS SECTIONS.

553 U3R U3R NUMERICALLY CONSTRUCTS A
TABLE OF THE CUMULATIVE PROBABILITY DISTRIBUTION FUNCTIONS OF
UNRESOLVED RESONANCE CROSS SECTIONS IN A NARROW ENERGY RANGE.

B. SPECTRUM CALCULATIONS, GENERATION OF GROUP CONSTANTS,
LATTICE AND CELL PROBLEMS

3/74

162 GRAVE GRAVE IS THE PROGRAM TO FORM GROUP-AVERAGED CROSS SECTIONS USING THE NEUTRON CROSS SECTION MASTER TAPE DEVELOPED UNDER THE ATOMICS INTERNATIONAL AUTOMATED CROSS SECTION PROGRAM. NINETEEN GROUP-AVERAGED PARAMETERS ARE OBTAINABLE AS FOLLOWS - SIGMA T, SIGMA EL, SIGMA N, SIGMA F, NUBAR, MUBAR, XIBAR, SIGMA IN, SIGMA N-ALPHA, SIGMA N-P, SIGMA N-2N, SIGMA A, SIGMA TR, SIGMA NON-EL, ALPHABAR, XI*SIGMA EL, NU*SIGMA F, MUBAR*SIGMA EL, AND SIGMA R. THE SPECTRUM IS CONSTRUCTED FROM A COMBINATION OF FISSION, E**N, POWER SERIES, MAXWELLIAN OR INPUT SPECTRA.

178 SPARTA SPARTA COMPUTES SPATIALLY-AVERAGED DOPPLER COEFFICIENTS AND SPATIALLY-AVERAGED DOPPLER REACTIVITY CHANGES.

184 ANL THERMOS/BRT1 ANL THERMOS AND BRT1, LIKE THE ORIGINAL THERMOS CODE DEVELOPED BY H. HONECK OF BROOKHAVEN NATIONAL LABORATORY, COMPUTE THE SCALAR THERMAL NEUTRON SPECTRUM AS A FUNCTION OF POSITION IN A LATTICE BY SOLVING THE INTEGRAL TRANSPORT EQUATION WITH ISOTROPIC SCATTERING. ONE-DIMENSIONAL SLAB OR CYLINDRICAL GEOMETRY MAY BE USED. AS OUTPUT THE CODE SUPPLIES FLUX-AVERAGED VALUES OF SIGMA A, SIGMA F, NU SIGMA F, SIGMA S, AND D FOR THE CELL COMPOSITION AND THE VALUES OF SIGMA A, SIGMA F, NU SIGMA F, SIGMA S, AND SIGMA TR FOR THE ISOTOPIC CONSTITUENTS.

185 GAMTEC2 GAMTEC2 GENERATES MULTIGROUP CONSTANTS IN THE ENERGY RANGE FROM 0 TO 10 MEV FOR EITHER HOMOGENEOUS MIXTURES OR HETEROGENEOUS ARRAYS CONSISTING OF CYLINDERIZED LATTICE CELLS. THE THERMAL GROUP CONSTANTS ARE AVERAGED OVER EITHER (1) WIGNER-WILKINS LIGHT MODERATOR SPECTRUM, (2) WILKINS HEAVY MODERATOR SPECTRUM, OR (3) A MAXWELLIAN DISTRIBUTION. FOR HETEROGENEOUS ARRAYS THE SPATIAL THERMAL FLUX IS CALCULATED BY A MONOENERGETIC P3 APPROXIMATION. FOR EPITHERMAL ENERGIES, THE SLOWING-DOWN DISTRIBUTION IS DESCRIBED BY EITHER A B1 OR P1 APPROXIMATION TO THE BOLTZMANN EQUATION. RESONANCE ABSORPTION AND FISSION ARE TREATED BY THE ADLER-NORDHEIM METHOD. AN IMPROVED METHOD OVER THAT IN GAM-I FOR AVERAGING THE RESONANCE ABSORPTION CONTRIBUTION TO THE MULTIGROUP CONSTANTS IS INCLUDED. FUEL LUMPING EFFECTS ON THE FAST FISSION OF U238 AND TH232 ARE TREATED BY AN N-FLIGHT COLLISION PROBABILITY TECHNIQUE. GROUP CONSTANTS ARE PUNCHED ON CARDS IN HFN (DIFFUSION CODE) AND DTF (SN TRANSPORT CODE) FORMATS.

B. SPECTRUM CALCULATIONS, GENERATION OF GROUP CONSTANTS,
LATTICE AND CELL PROBLEMS

3/74

195 FORTRAN FMC-N/FMC-G THE FLEXIBLE MONTE CARLO PROGRAMS FMC-N AND FMC-G WERE ORIGINALLY WRITTEN IN ASSEMBLY LANGUAGE FOR THE IBM704 BY GE-ANP. THESE PROGRAMS HAVE BEEN CONVERTED TO FORTRAN FOR THE CDC1604B BY PRATT AND WHITNEY. THE PROGRAMS APPLY MONTE CARLO METHODS TO SIMULATE NEUTRON AND GAMMA RAY LIFE HISTORIES, RESPECTIVELY, IN A SOURCE-SHIELD CONFIGURATION. AS THE NAMES IMPLY, THE CODES ARE DESIGNED FOR FLEXIBILITY IN THE GEOMETRICAL, MATERIAL, NUCLEAR, AND SOURCE DESCRIPTIONS OF SOURCE-SHIELD CONFIGURATIONS AND VARIANCE REDUCTION TECHNIQUES.

201 EPITHERMOS THE EPITHERMOS CODE IS A MODIFICATION OF THE THERMOS THERMAL TRANSPORT THEORY CODE OF HONECK. THE ESSENTIAL DIFFERENCE BETWEEN THE CODES IS IN THE LIBRARY PREPARATION SUBROUTINE BASK. THE EPITHERMOS CODE IS DESIGNED TO COMPUTE THE NEUTRON DENSITY ABOVE 0.7849 EV, THE MAXIMUM ENERGY OF THE USUAL THERMOS CALCULATION. EPITHERMOS COMPUTES THE SCALAR NEUTRON DENSITY AS A FUNCTION OF POSITION AND SPEED IN A ONE-DIMENSIONAL SLAB OR CYLINDRICAL SYSTEM. THE SCATTERING MODEL IS ARBITRARY IN THE THERMAL RANGE AND THE BUILT-IN FREE GAS MODEL IS USED IN THE EPITHERMAL RANGE.

202 MCS THE MCS CODE DETERMINES THE SPATIAL DISTRIBUTION OF SOME NUCLEAR REACTION FOR A GIVEN NEUTRON SOURCE IN A GIVEN CONFIGURATION OF MATERIALS. THE MONTE CARLO ESTIMATE OF THE SOLUTION CONSISTS OF PICKING A SAMPLE OF NEUTRONS FROM THE GIVEN SOURCE AND FOLLOWING EACH NEUTRON THROUGH A SEQUENCE OF SURFACE CROSSINGS AND COLLISIONS UNTIL THE NEUTRON EITHER ESCAPES OR IS NO LONGER OF INTEREST TO THE SOLUTION. THE DESIRED FLUX OR COLLISION DENSITY IS ACCUMULATED FOR EVERY NEUTRON OF THE SAMPLE, AND THE SAMPLE SIZE INCREASED UNTIL RESULTS OF SUFFICIENT STATISTICAL SIGNIFICANCE ARE OBTAINED.

B. SPECTRUM CALCULATIONS, GENERATION OF GROUP CONSTANTS, LATTICE AND CELL PROBLEMS

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204 AGN-GAM AGN-GAM CALCULATES THE SUBGROUP FLUXES AND CURRENT TERMS FROM A SOLUTION OF THE P1 OR B1 EQUATIONS. THE P1 EQUATIONS INCORPORATE BOTH VOLUME AND SURFACE SOURCES, ALLOWING SPECTRAL CALCULATIONS IN REFLECTOR REGIONS. OTHER SPECTRAL OPTIONS ARE FLUX KNOWN, CURRENT TERM CALCULATED AND BOTH FLUX AND CURRENT TERMS KNOWN. THE AGE FOR THE MATERIAL IS OBTAINED FROM A SECOND MOMENTS CALCULATION. THE 75 SUBGROUPS USED IN THE CALCULATIONS ARE ESTABLISHED AS QUARTER LETHARGY GROUPS FROM 10 MEV TO 0.07EV. ELASTIC SCATTERING MATRICES MAINTAIN THE ENERGY-ANGLE CORRELATION BY INCLUDING BOTH P0 AND P1 TERMS. ISOTROPIC SCATTERING MATRICES ARE INCLUDED FOR INELASTIC AND (N,2N) PROCESSES. THE METHOD OF ADLER, HINMAN AND NORDHEIM IS USED TO CALCULATE RESONANCE ABSORPTION AND FISSION CROSS SECTIONS. MULTIGROUP CONSTANTS ARE GENERATED BY SPECTRAL AVERAGING OVER THE SUBGROUPS.

213 RIFF RAFF RIFF RAFF COMPUTES RESONANCE INTEGRALS FOR ABSORBERS IN A ROD IN A TWO-REGION CIRCULARIZED CELL FOR ABOVE THERMAL ENERGIES. THE FLUX DISTRIBUTION IN THE CELL IS ALSO COMPUTED AND CAN BE PRINTED. THE METHOD OF SOLUTION IS BASED UPON THE FOLLOWING ASSUMPTIONS - ISOTROPIC SCATTERING IN THE LABORATORY SYSTEM, CONSTANT TOTAL CROSS SECTION IN THE MODERATOR AND ISOTROPIC NEUTRON FLUXES ENTERING AND LEAVING THE ROD.

219 GAROL GAROL COMPUTES EFFECTIVE GROUP CROSS SECTIONS FOR THE RESOLVED RESONANCES OF A MIXTURE OF ISOTOPES IN A TWO-REGION CELL. BASIC CROSS SECTIONS INCLUDE TEMPERATURE DEPENDENCE. THE PROGRAM ALLOWS A CHOICE OF GEOMETRIES AND CAN ACCEPT AN ARBITRARY TABLE OF ESCAPE PROBABILITIES. A DANCORFF CORRECTION MAY BE USED TO ACCOUNT FOR SHADOWING EFFECTS IN A TIGHT LATTICE, AND CROSS SECTIONS MAY BE $1/V$, CONSTANT, COMPUTED FROM BREIT-WIGNER RESONANCE PARAMETERS, OR GIVEN IN TABULAR FORM. THE MESH MAY BE CHOSEN AT EQUAL ENERGY OR LETHARGY INTERVALS, PROPORTIONAL TO THE NEUTRON VELOCITY, OR AS AN ARBITRARY TABLE OF VALUES.

235 GAMMA-P (NMP468) CROSS SECTIONS FOR THE PRODUCTION OF GAMMA RAYS BY NEUTRON RADIATIVE CAPTURE, BY NEUTRON INELASTIC SCATTERING, AND BY NEUTRON-INDUCED FISSIONING ARE COMPUTED AS A FUNCTION OF NEUTRON LETHARGY GROUPS AND PHOTON ENERGY GROUPS.

8. SPECTRUM CALCULATIONS, GENERATION OF GROUP CONSTANTS, LATTICE AND CELL PROBLEMS

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237 BOUNCE BOUNCE DETERMINES THE ONE-GROUP THERMAL NEUTRON FLUX DISTRIBUTION WITHIN THE PIN BUNDLE OF A MULTIPLE-PIN FUEL ELEMENT. ALL SCATTERING WITHIN THE PINS IS CONSIDERED TO BE ISOTROPIC. ELEMENTS WITH 6, 7, 12, 13, 18, AND 19 FUEL PINS, WHERE EACH PIN IS COMPOSED OF A CENTRAL FUEL PELLET SURROUNDED BY A CLADDING MATERIAL, MAY BE TREATED. THE COOLANT REGION AROUND THE PINS IS ASSUMED TO CONTAIN A VOID.

243 AGN-SIGMA AGN-SIGMA CALCULATES THE LEGENDRE COMPONENTS OF THE MULTIGROUP TRANSFER MATRICES $\Sigma(L, G \text{ TO } G+N)$ FOR FAST NEUTRONS. REACTIONS CONSIDERED ARE ELASTIC SCATTERING, INELASTIC SCATTERING (LEVEL EXCITATION AND THE EVAPORATION MODEL), AND THE FOLLOWING FIVE DECAY MODES FOR THE $(N, 2N)$ REACTION -- $A(N, N1)A*(N2)(A-1)*$, 3- AND 4- BODY PHASE SPACE MODEL, EVAPORATION MODEL, AND THE CLUSTER MODEL, WHERE $A*$ IS THE RECOIL NUCLEUS. ALL NUCLEAR LEVELS INVOLVED IN THE TRANSITIONS ARE DISCRETE. THE CODE MAY ALSO BE USED TO CALCULATE GROUP AVERAGED CROSS SECTIONS AS WELL AS TO MANIPULATE, E.G., ADD, MULTIPLY, ETC., THE OUTPUT MATRICES. THE NEUTRON SPECTRUM MAY BE A COMBINATION OF FISSION AND 1/E OR ARBITRARY INPUT DATA.

249 LASER LASER IS BASED ON MODIFIED VERSIONS OF THE SLOWING-DOWN PROGRAM MUFT AND THE THERMALIZATION TRANSPORT THEORY PROGRAM THERMOS, AND PERFORMS A CALCULATION OF THE NEUTRON SPECTRUM IN A UNIFORM LATTICE MADE UP OF CYLINDRICAL RODS, CLADDING, AND SURROUNDING MODERATOR. THE THERMAL CUTOFF IN LASER IS 1.855 EV. THE PROGRAM PERFORMS A BURNUP CALCULATION FOR THE LATTICE. THE SPATIAL DISTRIBUTION OF BURNUP WITHIN THE FUEL RODS IS EXPLICITLY CALCULATED. THE PROGRAM WILL, AT OPTION, ACCOUNT FOR ALL NON-LINEARITIES AND MUTUAL CONNECTIONS IN THE SYSTEM OF BURNUP EQUATIONS. THIS CALCULATION ACCOUNTS FOR THE VARIATION OF THE NEUTRON FLUX IN SPACE AND ENERGY DURING EACH TIME-STEP. A BUCKLING AND A BORON POISON SEARCH (CRITICALITY SEARCH) ARE PROVIDED AS OPTIONS. OUTPUT INCLUDES EDITS IN THE ENERGY RANGE ZERO LESS THAN OR EQUAL TO E LESS THAN OR EQUAL TO 0.625 EV.

257 REAX REAX CALCULATES EPITHERMAL FLUX, ACTIVITIES AND CROSS SECTIONS AS A FUNCTION OF RADIUS AND ENERGY FOR A CONSTANT TEMPERATURE FUEL ROD IMMERSSED IN A HOMOGENEOUS MEDIUM.

276 AVOID AVOID COMPUTES THE EQUIVALENT DIFFUSION COEFFICIENT AND LOSS CROSS SECTION OF AN ANNULAR VOID IN A CYLINDRICAL REACTOR AND THE RADIAL FLUX DISTRIBUTION IN THE VOID.

B. SPECTRUM CALCULATIONS, GENERATION OF GROUP CONSTANTS,
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277 HAMMER/LITHE/HELP HAMMER PERFORMS INFINITE LATTICE, ONE-DIMENSIONAL CELL MULTIGROUP CALCULATIONS, FOLLOWED (OPTIONALLY) BY ONE-DIMENSIONAL, FEW-GROUP, MULTIREGION REACTOR CALCULATIONS WITH NEUTRON BALANCE EDITS.

279 LEOPARD/SPOTS LEOPARD IS A UNIT CELL HOMOGENIZATION AND SPECTRUM GENERATION (MUFT-SOFOCCATE) PROGRAM WITH A FUEL DEPLETION OPTION.

280 M0807 M0807 SOLVES THE TWO-DIMENSIONAL FIXED-SOURCE DIFFUSION EQUATION FOR THE ABSORPTION AND REMOVAL MACROSCOPIC CROSS SECTIONS REQUIRED TO YIELD A SPECIFIED REACTION RATE DISTRIBUTION.

281 RABBLE/WLIB/FLAT RABBLE COMPUTES EFFECTIVE CROSS SECTIONS FOR ABOVE THERMAL ENERGIES BASED ON RESOLVED SINGLE-LEVEL RESONANCE PARAMETERS FOR INFINITE HOMOGENEOUS OR HETEROGENEOUS SYSTEMS.

285 RESQ2/RESQ0/DBF1 RESQ2 CALCULATES THE RESONANCE INTEGRAL IN A TWO-DIMENSIONAL, HEXAGONAL SYSTEM CONSISTING OF FUEL, CLAD AND WATER WITH A REFLECTING BOUNDARY CONDITION.

291 HEXSCAT HEXSCAT CALCULATES P0 THROUGH P3 COMPONENTS OF THE POLYCRYSTALLINE COHERENT ELASTIC NEUTRON SCATTERING CROSS SECTION PER NUCLEUS FOR A HEXAGONAL LATTICE. THE CODE AVERAGES POINT VALUES OVER INPUT GROUP BOUNDARIES TO GIVE SMOOTHED GROUP CROSS SECTIONS.

B. SPECTRUM CALCULATIONS, GENERATION OF GROUP CONSTANTS, LATTICE AND CELL PROBLEMS

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298 GGC4 THE GGC4 PROGRAM SOLVES THE MULTIGROUP SPECTRUM EQUATIONS WITH SPATIAL DEPENDENCE REPRESENTED BY A SINGLE POSITIVE INPUT BUCKLING. BROAD GROUP CROSS SECTIONS (SHIELDED OR UNSHIELDED) ARE PREPARED FOR DIFFUSION AND TRANSPORT CODES BY AVERAGING WITH THE CALCULATED SPECTRA OVER INPUT-DESIGNATED ENERGY LIMITS. THE CODE IS DIVIDED INTO THREE MAIN PARTS. A FAST (GAM) SECTION WHICH COVERS THE ENERGY RANGE FROM 14.9 MEV TO 0.414 EV, A THERMAL (GATHER) SECTION WHICH COVERS THE ENERGY RANGE FROM 0 TO 2.38 EV, AND A COMBINING (COMBO) SECTION WHICH COMBINES FAST AND THERMAL CROSS SECTIONS INTO SINGLE SETS. BASIC NUCLEAR DATA FOR THE FAST SECTION WHICH CONSISTS OF FINE GROUP-AVERAGED CROSS SECTIONS AND RESONANCE PARAMETERS IS READ OFF A DATA TAPE. THE FINE GROUP ABSORPTION AND FISSION CROSS SECTIONS MAY BE ADJUSTED BY PERFORMING A RESONANCE INTEGRAL CALCULATION. UTILIZING A FISSION SOURCE AND AN INPUT BUCKLING, THE CODE SOLVES THE P₁, B₁, B₂, OR B₃ APPROXIMATION TO OBTAIN THE ENERGY-DEPENDENT FAST SPECTRUM. TWO OR SIX SPATIAL MOMENTS OF THE SPECTRUM (DUE TO A PLANE SOURCE) MAY ALSO BE EVALUATED. INSTEAD OF PERFORMING A SPECTRUM CALCULATION, THE USER MAY ENTER THE LEGENDRE COMPONENTS OF THE ANGULAR FLUX DIRECTLY. FOR AS MANY INPUT-DESIGNATED BROAD GROUP STRUCTURES AS DESIRED, THE CODE CALCULATES AND SAVES (FOR THE COMBINING SECTION) SPECTRUM-WEIGHTED AVERAGES OF MICROSCOPIC AND MACROSCOPIC CROSS SECTIONS AND TRANSFER ARRAYS. SLOWING DOWN SOURCES ARE CALCULATED AND SAVED FOR USE IN THE LOWER ENERGY RANGE. GIVEN BASIC NUCLEAR DATA, THE THERMAL SECTION OF GGC4 DETERMINES A THERMAL SPECTRUM BY EITHER READING IT AS INPUT, BY CALCULATING A MAXWELLIAN SPECTRUM FOR A GIVEN TEMPERATURE, OR BY AN ITERATIVE SOLUTION OF THE P₃, B₀, P₁, OR B₁ EQUATIONS FOR AN INPUT BUCKLING. TIME MOMENTS OF THE TIME AND ENERGY-DEPENDENT DIFFUSION EQUATIONS ARE CALCULATED (AS AN OPTION) USING THE INPUT BUCKLING TO REPRESENT LEAKAGE. BROAD GROUP CROSS SECTIONS ARE PREPARED BY AVERAGING FINE GROUP CROSS SECTIONS OVER THE CALCULATED SPECTRA. BROAD GROUP STRUCTURES ARE READ AS INPUT. THE COMBINING SECTION OF GGC4 TAKES THE BROAD GROUP-AVERAGED CROSS SECTIONS FROM THE FAST AND THERMAL PORTIONS OF GGC4 AND FORMS MULTIGROUP CROSS SECTION TABLES. THESE TABLES ARE PREPARED IN STANDARD FORMATS FOR TRANSPORT OR DIFFUSION THEORY CALCULATIONS. IN ADDITION, IT IS POSSIBLE TO USE THE COMBINING SECTION TO PRODUCE MIXTURES NOT USED IN THE SPECTRUM CALCULATION OR TO COMBINE THE RESULTS OF DIFFERENT FAST AND THERMAL SECTION CALCULATIONS AND SO ON. THESE OPTIONS ARE DESCRIBED IN REFERENCE 2.

306 FCC4 FCC4 IS A MULTIPURPOSE DATA MANIPULATION CODE FOR USE IN FAST REACTOR ANALYSIS. THE CODE CAN BE USED TO - (A) COMPUTE RESONANCE-SHIELDED CROSS SECTIONS USING DATA IN THE RUSSIAN FORMAT (SHIELDING FACTORS AND INFINITE-DILUTION CROSS SECTIONS), (B) COMPUTE MULTIGROUP FUNDAMENTAL-MODE FLUX AND ADJOINT FLUX, (C) COMPUTE AND PUNCH GROUP-COLLAPSED MICROSCOPIC OR MACROSCOPIC CROSS SECTIONS IN THE DTF FORMAT, (D) COMPUTE FUEL BURNUP AT CONSTANT FLUX OR POWER DENSITY.

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307 HWOGR-SAFE HWOGR-SAFE IS A MONTE CARLO THERMAL REACTOR ANALYSIS PROGRAM DESIGNED FOR USE WITH PROPOSED HWOGR LATTICE CONFIGURATIONS. IT IS A BENCHMARK TOOL TO CHECK MULTIGROUP DIFFUSION AND TRANSPORT CALCULATIONS AND TO EVALUATE THE EFFECT OF THEIR USE OF GEOMETRIC APPROXIMATIONS.

316 GAFGAR/P3T/PROC/TAPCOP THE PROBLEM IS TO OBTAIN VERY DETAILED NEUTRON FLUX AND CURRENT DISTRIBUTIONS AS FUNCTIONS OF ENERGY CONSIDERING EXPLICITLY THE POSSIBLE OVERLAP EFFECTS BETWEEN RESONANCES OF A RESONANCE ABSORBER AND OF MIXTURES OF RESONANCE ABSORBERS AND TO USE THESE DISTRIBUTIONS TO PREPARE GROUP-AVERAGED CROSS SECTIONS AND TRANSFER ARRAYS FOR USE IN FAST REACTOR ANALYSES.

355 MC**2 MC**2 IS USED TO CALCULATE MULTIGROUP CROSS SECTIONS USING AN EVALUATED NUCLEAR DATA FILE (ENDF) AND THESE CROSS SECTIONS ARE SUITABLE FOR DIRECT USE BY NEUTRONICS CODES WITHOUT PERFORMING ANCILLARY CALCULATIONS.

361 GLEN THE GLEN PROGRAM INTERPOLATES VALUES OF A FACTOR PROPORTIONAL TO THE SCATTERING LAW FROM THE PUNCHED OUTPUT OF THE TOR CODE (ACC ABSTRACT 360). THE DIFFERENTIAL CROSS SECTION DETERMINED FROM THESE IS INTEGRATED OVER THE SCATTERING ANGLE TO OBTAIN COEFFICIENTS OF AN EXPANSION IN LEGENDRE POLYNOMIALS OF THIS ANGLE FOR $L = 0, 1, 2, 3$. INTEGRATION OVER FINAL ENERGIES YIELDS VALUES OF THE TOTAL SCATTERING CROSS SECTION AND TRANSPORT CROSS SECTION. FOR EACH OF A SERIES OF ISOTOPIC COMPOSITIONS (UP TO 10 COMPOSITIONS) THE GLEN CODE CALCULATES THE DIFFUSION LENGTH AND VALUES OF THE FLUX-WEIGHTED GROUP AVERAGE MACROSCOPIC SCATTERING, ABSORPTION, FISSION, AND TRANSFER CROSS SECTIONS.

362 WELWING WELWING WAS DEVELOPED TO CALCULATE THE MATERIAL BUCKLING OF REACTOR SYSTEMS CONSISTING OF ANNULAR FUEL ELEMENTS IN HEAVY WATER AS MODERATOR FOR VARIOUS MODERATOR TO FUEL RATIOS. THE MODERATOR TO FUEL RATIO FOR THE MAXIMUM MATERIAL BUCKLING FOR THE PARTICULAR SYSTEM IS SELECTED AUTOMATICALLY AND THE CORRESPONDING MATERIAL BUCKLING IS CALCULATED.

368 FLANGE2(71-1) FLANGE2 TAKES CROSS SECTIONS, ANGULAR DISTRIBUTION, RESONANCE PARAMETER, AND THERMAL SCATTERING LAW DATA FROM ENDF/B FORMAT II OR III DATA TAPES AND PREPARES THERMAL MULTIGROUP CROSS SECTIONS AND SCATTERING MATRICES.

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374 1DX 1DX IS A MULTIPURPOSE, ONE-DIMENSIONAL DIFFUSION CODE FOR GENERATING CROSS SECTIONS TO BE USED IN FAST REACTOR ANALYSES. THE CODE IS DESIGNED TO -

- (A) COMPUTE AND PUNCH RESONANCE SHIELDED CROSS SECTIONS USING DATA IN THE RUSSIAN (SEE REFERENCE 2) FORMAT,
- (B) COMPUTE AND PUNCH GROUP-COLLAPSED MICROSCOPIC AND/OR MACROSCOPIC CROSS SECTIONS AVERAGED OVER THE SPECTRUM IN ANY SPECIFIED ZONE, AND
- (C) COMPUTE KEFF AND PERFORM CRITICALITY SEARCHES ON TIME ABSORPTION, MATERIAL CONCENTRATIONS, ZONE DIMENSIONS, AND BUCKLING USING EITHER A FLUX OR AN ADJOINT MODEL.

388 ETOX3 ETOX3 (ENDF/B TO 1DX) CALCULATES MULTIGROUP CONSTANTS FOR NUCLEAR REACTOR CALCULATIONS USING DATA FROM THE EVALUATED NUCLEAR DATA FILE (ENDF/B) VERSION II OR VERSION III FORMAT. IT CAN ALSO PROCESS VERSION I MATERIALS THAT DO NOT CALL FOR PARTIAL ENERGY DISTRIBUTION LAWS 1, 2, 4, 6, OR 8 (SEE ENDF, FILE 5). THE CODE IS DESIGNED TO COMPUTE AND PUNCH -

- (A) INFINITE DILUTE CROSS SECTIONS,
- (B) TEMPERATURE DEPENDENT SELF-SHIELDING FACTORS FOR ARBITRARY VALUES OF MICROSCOPIC SIGMAC (TOTAL CROSS SECTION PER ATOM) IN THE RUSSIAN (BONDARENKO) FORMAT, AND
- (C) INELASTIC SCATTERING PROBABILITY MATRICES.

392 RAFFLE RAFFLE CALCULATES NEUTRON FIRST FLIGHT COLLISION PROBABILITIES FOR A WIDE VARIETY OF THREE-DIMENSIONAL CELL GEOMETRY CONFIGURATIONS. THE OUTER BOUNDARIES OF THE CELL CROSS SECTION MAY BE CIRCULAR, SQUARE, OR HEXAGONAL. THE CELL MAY CONTAIN ANNULAR REGIONS AND/OR CLUSTERS OF RODS.

393 XSDRN XSDRN USES THE NORDHEIM INTEGRAL TREATMENT, NARROW RESONANCE, OR INFINITE MASS APPROXIMATION TO PROCESS RESONANCE DATA ON A MASTER CROSS SECTION LIBRARY AND THUS OBTAIN MICROSCOPIC FINE-GROUP CROSS SECTIONS FOR A LARGE NUMBER OF NUCLIDES. THE CODE WILL THEN USE THESE CROSS SECTIONS IN AN INDEPENDENT CALCULATION TO SOLVE FOR FLUXES, EIGENVALUES, CRITICAL DIMENSIONS, ETC., USING DISCRETE ORDINATES, DIFFUSION, OR AN INFINITE MEDIUM THEORY CALCULATION. THE FINE-GROUP FLUXES THUS OBTAINED CAN THEN BE USED TO COLLAPSE THE FINE-GROUP CROSS SECTION DATA TO A MORE TENABLE BROAD-GROUP STRUCTURE FOR USE IN SEVERAL INDEPENDENT COMPUTER CODES.

416 PARTI PARTI IS A GROUP COLLAPSING CODE WHICH DETERMINES THE OPTIMUM DISCRETE REPRESENTATION OF A VARIABLE FOR SUBSEQUENT REPETITIVE CALCULATIONS.

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420 GROUSE GROUSE COMPUTES EFFECTIVE
MULTIGROUP CROSS SECTIONS AS A FUNCTION OF POSITION IN THE CORE
OF A REACTOR OR THE ABSORBER REGION OF A FUEL OR CONTROL ELEMENT.
THE FLUX WEIGHTING USES SYNTHESIZED FLUXES GENERATED IN FINE EN-
ERGY DETAIL FROM PARAMETRIC FLUX TRAVERSES SUPPLIED AS INPUT AS A
FUNCTION OF THE CORE ABSORPTION AND SCATTER CROSS SECTIONS.

426 PAX03 PAX03 PERFORMS INFINITE MEDIUM, TIME-DEPENDENT CALCULATIONS OF NEUTRON FLUX SPECTRA IN HOMOGENEOUS, HYDROGENOUS MEDIA. A HARMONY FILE CONTAINING FEW-GROUP MICROSCOPIC AND/OR MACROSCOPIC CROSS SECTIONS FOR PDQ7 PROBLEMS MAY BE GENERATED. THE ONE-DIMENSIONAL MULTIGROUP TRANSPORT EQUATION MAY BE SOLVED USING A P1 TO P7 APPROXIMATION IN RECTANGULAR, CYLINDRICAL, OR SPHERICAL GEOMETRY. HETEROGENEOUS RESONANCE INTEGRALS AND THERMAL SHIELDING FACTORS ARE CALCULATED FOR EITHER PLATE OR ROD GEOMETRY. BLACKNESS PARAMETERS ARE CALCULATED AND COEFFICIENTS FOR TEMPERATURE FEEDBACK CALCULATIONS ARE OBTAINED. FEW-GROUP CONSTANTS ARE AVAILABLE IN BOTH THE FAST AND THERMAL ENERGY RANGES.

431 SUPERTOG SUPERTOG ACCEPTS NUCLEAR DATA IN EITHER A POINT BY POINT OR PARAMETRIC REPRESENTATION AS SPECIFIED BY ENDF/B. THIS DATA IS AVERAGED OVER EACH SPECIFIED GROUP WIDTH. THE EXPLICIT ASSUMPTION IS MADE THAT THE FLUX PER UNIT LETHARGY IS CONSTANT OR THAT A SUITABLE WEIGHT FUNCTION WILL BE SUPPLIED BY THE USER. WHEN RESONANCE DATA IS AVAILABLE, RESOLVED AND UNRESOLVED RESONANCE CONTRIBUTIONS ARE CALCULATED AND USED AS SPECIFIED BY INPUT OPTIONS. FINE GROUP CONSTANTS SUCH AS ONE-DIMENSIONAL REACTION ARRAYS (ABSORPTION, FISSION, ETC.), PN ELASTIC SCATTERING MATRICES, AND INELASTIC AND (N,2N) SCATTERING MATRICES ARE GENERATED AND PLACED ON TAPES IN FORMATS SUITABLE FOR USE BY THE GAM1 (ACC ABSTRACT 33), GAM2, ANISN, OR DOT PROGRAMS.

436 ETOM1 ETOM1 PROCESSES BASIC NUCLEAR
INFORMATION GIVEN IN THE ENDF/B FORMAT AND PRODUCES DATA DECKS FOR
USE IN GENERATION OF MUFT4 AND MUFT5 LIBRARIES.

437 ETOG1 TOG1 PROCESSES BASIC NUCLEAR
INFORMATION GIVEN IN THE ENDF/B FORMAT AND PRODUCES DATA DECKS FOR
USE IN GENERATION OF MUFT4, MUFT5, GAM1, GAM2, AND ANISN LIBRAR-
IES.

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453 RICE THE PROGRAM CALCULATES AN ENERGY EXCHANGE MATRIX WHICH DESCRIBES THE PROBABILITY THAT A NEUTRON WITH ENERGY E WILL PRODUCE A RECOIL ATOM WITH ENERGY T IN A GIVEN MATERIAL. IN ADDITION, THE PROGRAM CAN CALCULATE THE PRIMARY RECOIL ATOM ENERGY SPECTRUM FOR A GIVEN NEUTRON SPECTRUM, THE DAMAGE CROSS SECTION FOR THE MATERIAL, AND AN OPTIMUM LOWER ENERGY LIMIT FOR USE IN COMPARING THE RELATIVE DAMAGE IN DIFFERENT REACTOR SPECTRA. THE PROGRAM ACCEPTS NEUTRON SCATTERING DATA DIRECTLY FROM THE ENDF/B LIBRARY TAPES AND, IN THE CASE OF A RESONANCE NUCLIDE, FROM A TAPE GENERATED BY THE PROGRAM SUPERTOG (ACC ABSTRACT 431).

461 EPOCH EPOCH SOLVES FOR FINE DETAIL P-1 FLUX SPECTRA IN SIMPLY BUCKLED MEDIA AND IS ABLE TO CALCULATE NEUTRON AGES FROM THE SPECTRA. IT OBTAINS NUCLEAR CROSS SECTIONS FROM THE ENDF/B LIBRARY IGNORING RESONANCE FILES AND IS MOST USEFUL FOR HIGHER ENERGIES WHERE RESONANT REACTIONS ARE WEAK OR ABSENT. THE PRESENT VERSION READS ONLY VERSION 1 ENDF/B TAPES.

466 APRFX1 APRFX1 COLLAPSES AND COMBINES CROSS SECTION SETS FOR MULTIGROUP TRANSPORT CALCULATIONS. IT PERFORMS GROUP COLLAPING FOR AS MANY ISOTOPES, MIXTURES AND LEGENDRE EXPANSION SETS AS DESIRED FROM THE DLC-2B LIBRARY. THE DLC-2B LIBRARY STRUCTURE EMPLOYS TENTH LETHARGY UNIT INTERVALS FROM 15 MEV TO 111 KEV AND QUARTER LETHARGY INTERVALS DOWN TO 0.414 EV. A 100TH GROUP 0.0 TO 0.414 EV IS USED AS A SINK GROUP. THE CODE ALSO DETERMINES THE BROAD GROUP INPUT SOURCE AND GENERATES AVERAGED NEUTRON VELOCITIES FOR USE WITH TRANSPORT CALCULATIONS.

467 HRG3 THE CODE COMPUTES THE SLOWING DOWN SPECTRUM OVER THE ENERGY RANGE 10 MEV TO .414 EV IN EITHER THE B1 OR P1 APPROXIMATION, USING 68 GROUPS OF NEUTRONS WITH A CONSTANT GROUP WIDTH OF $\Delta U = .25$. THE CALCULATED FLUX AND CURRENT SPECTRA ARE USED TO REDUCE THE ORIGINAL 68-GROUP CROSS SECTION DATA TO AVERAGE VALUES OVER AS MANY AS 33 BROAD GROUPS. OUTPUT IS PRINTED AND MAY ALSO BE PUNCHED IN FORMATS FOR INPUT TO ANY OF SEVERAL SPATIAL MULTIGROUP CODES.

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501 ENDRUN2 ENDRUN2 IS USED TO CALCULATE MULTIGROUP CONSTANTS FROM ENERGY-DEPENDENT, MICROSCOPIC CROSS SECTIONS, RESONANCE PARAMETERS, AND INELASTIC LEVEL DATA INPUT IN THE EVALUATED NUCLEAR DATA FILE (ENDF/B) FORMATS. DATA IS PROCESSED FOR ONE MATERIAL AT A TIME AND THE OUTPUT MULTIGROUP FILE INCLUDES BOTH INFINITELY-DILUTE GROUP CROSS SECTIONS AND SELF-SHIELDING, BONDARENKO-TYPE F-FACTORS SO THAT THE RESULTING GENERALIZED FILE IS INDEPENDENT OF REACTOR COMPOSITION. THE MULTIGROUP DATA MAY BE OUTPUT ON PUNCHED CARDS, A STANDARD LIBRARY TAPE, OR PLOTTED OVER ANY ENERGY RANGE.

505 TDOWN TDOWN GENERATES SPATIAL AND COMPOSITION DEPENDENT CROSS SECTION SETS FROM A BONDARENKO TYPE, GENERALIZED CROSS SECTION FILE CALLED GMUG. A TDOWN PROBLEM CAN BE A SIMPLE DESCRIPTION OF MATERIAL COMPOSITIONS WITH AN INPUT FLUX SPECTRA OR A PROBLEM CAN CONSIST OF A MULTI-REGIONAL TWO-DIMENSIONAL REACTOR DESCRIPTION WITH SEVERAL 0- OR 1-DIMENSIONAL FLUX SOLUTIONS TO PROVIDE THE FLUX FOR SPECTRAL ADJUSTMENTS OF THE CROSS SECTION SETS.

520 PHROG PHROG GENERATES ENERGY
DEPENDENT FAST NEUTRON SPECTRA AND ASSOCIATED MULTIGROUP CROSS
SECTION DATA SUITABLE FOR USE IN DIFFUSION AND TRANSPORT THEORY
REACTOR DESIGN ANALYSIS. THE SOLUTION UTILIZES 68 EQUAL LETHARGY
GROUPS OF CROSS SECTION, SOURCE, AND LEAKAGE DATA OVER AN ENERGY
RANGE EXTENDING FROM 10 MEV TO .414 EV. THESE DATA ARE THEN
COALESCED INTO BROAD GROUP FORM USING THE FLUXES AND CURRENTS AS
WEIGHTING FUNCTIONS.

521 SOCOOL2 SOCOOL2 CALCULATES THE
TRANSIENT TEMPERATURES, PRESSURES, AND MECHANICAL WORK ENERGY
WHEN A MOLTEN MATERIAL IS INSTANTANEOUSLY AND UNIFORMLY DISPERSED
IN LIQUID SODIUM WHICH IS INITIALLY UNDER ACCUSTIC CONSTRAINT.

526 CLUP77 CLUP77 COMPUTES THE COLLISION
PROBABILITIES IN A MULTI-REGION SQUARE ASSEMBLY OF CLUSTERED FUEL
RODS. THE ASSEMBLY CAN BE MADE UP OF RODS OF INFINITE HEIGHT AND
DIVIDED INTO RECTANGULAR PILLARS CONTAINING A NEST OF CONCENTRIC
ANNULI OF DIFFERENT MATERIALS. THE OUTER BOUNDARY OF THE ASSEMBLY
MAY BE TREATED AS REFLECTIVE OR A VACUUM.

B. SPECTRUM CALCULATIONS, GENERATION OF GROUP CONSTANTS,
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536 RAHAB LATTICE PHYSICS MODULES RAHAB IS A TWO-DIMENSIONAL, MULTIGROUP, NEUTRON INTEGRAL TRANSPORT CODE. ITS CAPABILITY INCLUDES FULL OR SUBDIVIDED ANNULAR, SQUARE AND HEXAGON REGIONS, CLUSTERS AND MULTICELL (MIXED LATTICES). THE MULTIGROUP STRUCTURE CAN INCLUDE THERMAL, EPITHERMAL, AND FAST ENERGY REGIONS. THE NUMBER OF ENERGY GROUPS IS VARIABLE FROM 1 TO 100. BUCKLING AND TIME EIGENVALUE SEARCHES ARE ALLOWED OPTIONS.

538 ETOG3 ETOG3 PROCESSES BASIC NUCLEAR INFORMATION GIVEN IN ENDF/B VERSION III FORMAT PRODUCING DATA DECKS FOR USE IN GENERATION OF MUFT4, MUFT5, GAM1, GAM2, AND ANISN LIBRARIES.

547 GAMBIT GAMBIT IS A PROGRAM THAT WAS DESIGNED TO CALCULATE MULTIGROUP NEUTRON CROSS SECTIONS IN THE HIGH ENERGY AND THE THERMAL ENERGY RANGES. IT WAS CREATED BY JOINING GAM, WHICH DOES THE HIGH ENERGY CALCULATION, AND BIT, WHICH DOES THE THERMAL CALCULATION.

565 INCITE INCITE GENERATES ENERGY-DEPENDENT THERMAL NEUTRON SPECTRA AND APPROPRIATE AVERAGE MULTIGROUP CROSS SECTIONS USING ARBITRARY SCATTERING KERNELS. THE PHYSICAL MODEL IS A HOMOGENEOUS, CRITICAL, ONE-DIMENSIONAL BASE SLAB CORE.

572 XLACS XLACS CALCULATES FINE-GROUP AVERAGED NEUTRON CROSS SECTIONS FROM ENDF/B DATA. ITS PRIMARY PURPOSE IS TO PRODUCE FULL RANGE MULTIGROUP LIBRARIES FOR THE XSDRN PROGRAM (ACC ABSTRACT 493). PROVISIONS ARE INCLUDED FOR TREATING FAST, RESONANCE, AND THERMAL ENDF/B DATA. FINE-GROUP ENERGY STRUCTURES AND EXPANSION ORDERS USED TO REPRESENT DIFFERENTIAL CROSS SECTIONS FOR XSDRN CAN BE ARBITRARILY SET BY THE USER. CROSS SECTIONS CAN BE AVERAGED OVER AN ARBITRARY INPUT WEIGHTING FUNCTION OR BY ANY OF SEVERAL BUILT-IN FUNCTIONS.

B. SPECTRUM CALCULATIONS, GENERATION OF GROUP CONSTANTS,
LATTICE AND CELL PROBLEMS

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596 ENDFB2/GAND2/GFE2 ENDFB2 CONVERTS ENDF/B CROSS
SECTION DATA FROM A CARD-IMAGE TO A BINARY TAPE FOR USE BY THE
GAND2 AND/OR GFE2 CODES.

GAND2 PREPARES THE CROSS SECTIONS NEEDED FOR DETAILED COMPUTA-
TIONS OF NEUTRON ENERGY SPECTRA IN REACTORS FROM A FILE OF BASIC
NUCLEAR DATA IN THE ENDF/B VERSION II OR III FORMATS (ALSO RETAINS
THE ENDF/B VERSION I CAPABILITY OF GAND).

GFE2 PREPARES 1/E OR FISSION-SPECTRUM WEIGHTED, ZERO TEMPERA-
TURE, INFINITE DILUTION GROUP-AVERAGED CROSS SECTIONS AND SCATTER-
ING TRANSFER ARRAYS FOR USE IN THE FAST SECTIONS OF THE GGC AND
MICROX CODES FROM A FILE OF BASIC NUCLEAR DATA IN THE ENDF/B VER-
SION II OR III FORMATS (THE ENDF/B VERSION I FORMAT CAPABILITY OF
THE ORIGINAL GFE CODE IS ALSO RETAINED).

605 GAUSS5 GAUSS5 IS USED TO DETERMINE
GAMMA-RAY ENERGIES AND INTENSITIES FROM SPECTRA OBTAINED WITH A
GE(LI) DETECTOR AND A MULTICHANNEL PULSE-HEIGHT ANALYSIS SYSTEM.

C. STATIC DESIGN STUDIES

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7 FIRM FIRM SOLVES THE TWO-DIMENSIONAL SN APPROXIMATION IN FINITE CYLINDRICAL GEOMETRY. IT IS A FORTRAN ADAPTATION OF THE LOS ALAMOS TOC PROGRAM WRITTEN BY BENGT CARLSON AND CLARENCE LEE. FIRM IS LIMITED TO A MAXIMUM OF SIX GROUPS AND THE S2, S4 OR S6 APPROXIMATION.

9 FIRES FIRES SOLVES THE ONE-DIMENSIONAL MULTIGROUP AGE-DIFFUSION EQUATIONS FOR SLAB (SYMMETRIC AND ASYMMETRIC), CYLINDER, AND SPHERE GEOMETRIES. AN EXTENSION OF THE ORIGINAL LOS ALAMOS FIRE PROGRAM WRITTEN BY F. W. BRINKLEY AND C. B. MILLS, IT CONTAINS A 34-GROUP LIBRARY OF 10 ELEMENTS. FIRES CAN BE USED FOR CELL CALCULATIONS WITH THE BOUNDARY CONDITION THAT THE CURRENT BE ZERO ON THE OUTER BOUNDARY. THE EFFECTIVE CROSS SECTIONS AND DIFFUSION COEFFICIENTS FOR A HOMOGENEOUS REGION CONSISTING OF ANY NUMBER OF NEIGHBORING REGIONS CAN ALSO BE OBTAINED, BUT ONLY FOR CYLINDRICAL GEOMETRY. FIRES ALSO COMPUTES THE MACROSCOPIC FLUX-WEIGHTED CROSS SECTIONS FOR COLLAPSED GROUPS IN EACH REGION.

18 2DXY THE 2DXY PROGRAM SOLVES THE HOMOGENEOUS OR INHOMOGENEOUS MULTIGROUP EQUATIONS IN X-Y GEOMETRY, USING THE SN TRANSPORT EQUATION APPROXIMATION. VACUUM, SURFACE SOURCE, OR REFLECTING BOUNDARY CONDITIONS ARE AVAILABLE AS OPTIONS. IN THE HOMOGENEOUS CASE THE USER MAY REQUEST THE COMPUTATION OF REACTIVITY, REACTOR PERIOD, CRITICAL CONCENTRATIONS OF SOME COMPOSITION, OR THE CRITICAL THICKNESS OF A ZONE.

28 FOG THE FOG PROGRAM SOLVES THE ONE-DIMENSIONAL FEW-GROUP DIFFUSION EQUATIONS IN ANY OF THREE GEOMETRIES SLAB, CYLINDER, OR SPHERE. PROVISIONS ARE MADE FOR CALCULATING THE FLUX, THE ADJOINT FLUX, AND VARIOUS CRITICALITY SEARCHES AS WELL AS A BUCKLING ITERATION AND AUTOMATIC TSCHEBYSCHIEFF POLYNOMIAL COMPUTATION OF SOURCE EXTRAPOLATION FACTORS.

29 AIM6 AIM6 SOLVES THE ONE-DIMENSIONAL MULTIGROUP DIFFUSION EQUATIONS UTILIZING A MICROSCOPIC CROSS SECTION LIBRARY. ANY OF THREE GEOMETRIES ARE AVAILABLE SLAB, CYLINDER OR SPHERE. CRITICALITY SEARCHES ARE PROVIDED INCLUDING A CONCENTRATION SEARCH ON ONE OR TWO ELEMENTS. HOMOGENEOUS AND INHOMOGENEOUS PROBLEMS MAY BE SOLVED WITH A VARIETY OF BOUNDARY CONDITION OPTIONS.

C. STATIC DESIGN STUDIES

3/74

30 PERT PERT IS A PERTURBATION PROGRAM DESIGNED FOR USE WITH THE AIM6 AND FOG PROGRAMS. PUNCHED CARD OUTPUT FROM THESE CODES IS USED AS INPUT TO PERT. USING CROSS SECTION DATA, FLUXES, AND ADJOINT FLUXES, THE RELATIVE CHANGE IN KEFF CAN BE CALCULATED. CROSS SECTIONS MAY BE WEIGHTED WITH THE ADJOINT FLUX AND/OR DIRECT FLUX. THE NEUTRON LIFETIME FOR THE DELAY GROUPS MAY ALSO BE DETERMINED.

32 WHIRLAWAY WHIRLAWAY SOLVES THE TWO-GROUP, THREE-DIMENSIONAL, NEUTRON DIFFUSION EQUATIONS IN X-Y-Z GEOMETRY.

39 EQUIPOISE3 EQUIPOISE3 SOLVES THE TWO-GROUP, TWO-DIMENSIONAL, NEUTRON DIFFUSION EQUATIONS IN CYLINDRICAL OR SLAB GEOMETRY.

40 ZOGRAND ZOGRAND SOLVES THE FEW-GROUP, TWO-DIMENSIONAL, NEUTRON DIFFUSION EQUATIONS IN CYLINDRICAL OR SLAB GEOMETRY.

59 MIST MIST OBTAINS THE SOLUTION TO THE ONE-DIMENSIONAL BOLTZMANN EQUATION IN SLAB GEOMETRY. THE NUMERICAL APPROXIMATION USED IS A LINEAR ONE WHICH CAN BE DESCRIBED AS AN EXTENSION AND GENERALIZATION OF THE SN APPROXIMATION. THE EQUATIONS ARE FORMULATED IN TERMS OF A DOUBLE SN APPROXIMATION. THE BOUNDARY CONDITIONS FOR EACH GROUP MAY BE INDEPENDENTLY SPECIFIED AND PERMIT VERY GENERAL SPECIFICATIONS WITH RESPECT TO -

- (A) PERFECT MIRROR REFLECTION OR SYMMETRY, BY INPUT OF MIRROR ALBEDOS,
- (B) ANISOTROPIC DIFFUSE SOURCES, BY INPUT OF LEGENDRE POLYNOMIAL COEFFICIENTS UP TO $\lambda = 9$, OR A SHORT TABLE DESCRIBING A KNOWN ANGULAR DISTRIBUTION OF THE FLUX,
- (C) ISOTROPIC (LAMBERT SURFACE) REFLECTION.

ISOTROPIC VOLUME SOURCES IN EACH GROUP MAY ALSO BE INDEPENDENTLY SPECIFIED. THE SCATTERING FROM ONE GROUP TO ANOTHER IS ASSUMED TO BE ISOTROPIC BUT THE SCATTERING FUNCTION WITHIN EACH GROUP CAN BE A SECOND-ORDER LEGENDRE POLYNOMIAL SERIES.

75 GE-HAPO-S13 PROGRAM S CONSTRUCTS BILINEARLY COUPLED TIME-VARIANT MULTIENERGY NEUTRON-AND-PHOTON TRANSPORT AND NUCLIDE-TRANSMUTATION FIELDS HAVING SLAB, CYLINDRICAL, OR SPHERICAL SYMMETRY. ASSURANCE OF UNBIASED CONVERGENCE IS PROVIDED BY USE OF A DUAL ADJOINT-AND-FLUX LOOP CONSTRUCTED IN PRECISE CORRESPONDENCE WITH THE PHYSICS OF SUCCESSIVE FREE FLIGHTS.

C. STATIC DESIGN STUDIES

3/74

87 EQUIPOISE-3A EQUIPOISE-3A SOLVES THE TWO-DIMENSIONAL TWO-GROUP DIFFUSION EQUATIONS IN CYLINDRICAL OR SLAB GEOMETRY. IT IS A SLIGHTLY REVISED VERSION OF EQUIPOISE3 (ACC ABSTRACT 39). IN ADDITION TO THE STANDARD OUTPUT, A PICTURE IS PRINTED OF THE MATERIAL ARRANGEMENT IN THE REACTOR. IF THE ADJOINT FLUX OPTION IS USED, THE PROMPT NEUTRON LIFETIME IS CALCULATED AND PRINTED, WITH THE REACTIVITY PER UNIT CHANGE IN EACH GROUP CONSTANT IN EACH REGION OF THE REACTOR.

103 CRAM CRAM IS USED TO SOLVE THE MULTIGROUP DIFFUSION EQUATIONS IN TWO-DIMENSIONS (R-Z, X-Y, OR R-THETA GEOMETRY), OR IN ONE-DIMENSION (SLAB, CYLINDRICAL, OR SPHERICAL GEOMETRY). NEUTRONS MAY SCATTER FROM ANY GROUP TO ANY OTHER. REAL, ADJOINT, AND SOURCE-TYPE PROBLEMS ARE ALL SOLVABLE. THE PROGRAM WILL COMPUTE THE K-EFFECTIVE OF THE SYSTEM OR ALTERNATIVELY SEARCH FOR CRITICALITY BY MOVING SPATIAL BOUNDARIES, VARYING MATERIAL COMPOSITIONS, OR VARYING TRANSVERSE BUCKLING.

118 ULCER ULCER IS A MULTIGROUP, ONE-DIMENSIONAL DIFFUSION EQUATION CODE WITH UPSCATTER BASED ON FAIM (ACC ABSTRACT 120). ULCER DIFFERS FROM FAIM IN THAT -

- (A) UPSCATTERING IS INCLUDED,
- (B) DOWNSCATTER TO ALL LOWER GROUPS,
- (C) MICROSCOPIC CROSS SECTIONS ARE ON TAPE,
- (D) PROVISION FOR MULTIPLE FISSION SPECTRA,
- (E) RESTART DUMP,
- (F) FEW-GROUP REDUCTION, AND
- (G) SPECTRUM COMPUTATION AND GRAPHICAL DISPLAY.

C. STATIC DESIGN STUDIES

3/74

120 FAIM/FAIMOS FAIM IS A MULTIGROUP, ONE-DIMENSIONAL DIFFUSION EQUATION PROGRAM BASED ON AIM6 (ACC ABSTRACT 29). THE PRINCIPAL FEATURES ARE -

- (A) THREE GEOMETRIES,
- (B) CALCULATION OF FLUXES AND MULTIPLICATION FACTOR,
- (C) ONE-ITERATION PROBLEMS,
- (D) CHOICE OF ONE OF FIVE SETS OF BOUNDARY CONDITIONS AT BOTH BOUNDARIES,
- (E) CRITICALITY SEARCHES ON TRANSVERSE BUCKLING, HOMOGENEOUS POISON, CRITICAL RADIUS, ONE, TWO, OR THREE ELEMENT CONCENTRATION, LOCATION OF POISON REGION BOUNDARY, LOCATION OF A FUEL REGION BOUNDARY,
- (F) ADJOINT FLUX CALCULATION, AND
- (G) EXTENSIVE DATA EDIT.

FAIMOS IS A MODIFIED VERSION OF FAIM. THREE GENERAL MODIFICATIONS WERE MADE -

- (A) THE MICROSCOPIC CROSS SECTION LIBRARY AND ITS ASSOCIATED SUBROUTINES WERE REMOVED. AS A RESULT, OPTIONS REQUIRING THE USE OF MICROSCOPIC CROSS SECTIONS ARE NOT AVAILABLE.
- (B) FAIM RAN AS A CHAIN JOB. OVERLAYS ARE NOT USED BY FAIMOS.
- (C) THE PROGRAM LANGUAGE WAS CONVERTED FROM FORTRAN II TO FORTRAN IV(H). THIS MODIFICATION MADE NECESSARY A MINOR CHANGE IN THE DATA INPUT FORMAT.

132 W-DSN W-DSN SOLVES THE DISCRETE SN EQUATIONS IN CYLINDRICAL GEOMETRY. THE EIGENVALUE OPTION IS REACTIVITY (KEFF) ONLY. VOLUME DISTRIBUTED SOURCES ARE ALLOWED, BUT NO SURFACE SOURCES.

136 HERESY3 HERESY3 SOLVES THE TWO-DIMENSIONAL FEW-GROUP STATIC REACTOR EIGENVALUE PROBLEM USING THE HETEROGENEOUS (SOURCE-SINK OR FEINBURG-GALANIN) FORMALISM. THE SOLUTION YIELDS THE REACTOR K EFFECTIVE AND ABSORPTION REACTION RATES FOR EACH ROD NORMALIZED TO THE MOST ABSORPTIVE ROD IN THE THERMAL LEVEL. EPITHERMAL FISSIONS ARE ALLOWED AT EACH RESONANCE LEVEL, AND LATTICE AVERAGED VALUES OF THERMAL UTILIZATION, RESONANCE ESCAPE PROBABILITY, THERMAL AND RESONANCE η VALUES, AND THE FAST FISSION FACTOR ARE CALCULATED. KERNELS IN THE CALCULATION ARE BASED ON AGE DIFFUSION THEORY. BOTH FINITE REACTOR LATTICES AND INFINITELY REPEATING REACTOR SUPERCELLS MAY BE CALCULATED. ROD PARAMETERS MAY BE CALCULATED BY SEVERAL INTERNAL OPTIONS, AND A DIRECT INTERFACE IS PROVIDED TO A HAMMER SYSTEM (ACC ABSTRACT 277) LATTICE LIBRARY TAPE TO OBTAIN CELL PARAMETERS. CRITICALITY SEARCHES ARE PROVIDED ON THERMAL UTILIZATION, THERMAL η , AND AXIAL LEAKAGE BUCKLING.

C. STATIC DESIGN STUDIES

3/74

144 DTF THE DTF PROGRAM IS A ONE-DIMENSIONAL MULTIGROUP PROGRAM FOR SOLVING THE NEUTRON TRANSPORT EQUATION. THE PROGRAM CAN DETERMINE THE REGULAR OR ADJOINT SOLUTION FOR SLAB, CYLINDRICAL, OR SPHERICAL GEOMETRY. ISOTROPIC OR A FORM OF LINEAR ANISOTROPIC SCATTERING MAY BE CONSIDERED. VARIOUS BOUNDARY CONDITIONS ARE ALLOWED SO THAT CELLS OR TIME-DEPENDENT SOLUTIONS MAY BE OBTAINED USING FINITE AS WELL AS INFINITE CONFIGURATIONS IN THE CASE OF SLABS OR CYLINDERS. THE PROGRAM ALSO CONTAINS A NUMBER OF SEARCH OPTIONS WHEREBY ONE CAN VARY DIMENSIONS OR CONCENTRATIONS TO ARRIVE AT A PREDETERMINED EIGENVALUE. DISTRIBUTED OR SHELL SOURCES MAY BE SPECIFIED AT ANY POSITION WITHIN THE CONFIGURATION. AS OUTPUT THE PROGRAM SUPPLIES THE EIGENVALUE, ANGULAR FLUXES, TOTAL FLUXES, FISSION DISTRIBUTIONS, AND OTHER QUANTITIES. A LIBRARY OF CROSS SECTIONS IS AVAILABLE ON MAGNETIC TAPE. CROSS SECTIONS MAY BE READ FROM THIS LIBRARY TAPE AND/OR FROM CARDS.

148 TOPIC TOPIC SOLVES THE ONE-DIMENSIONAL BOLTZMANN EQUATION IN CYLINDRICAL GEOMETRY WITH UP TO SIX ENERGY GROUPS, 240 SPACE POINTS, 40 REGIONS, AND ANISOTROPIC (P1) SCATTERING.

THE BOUNDARY CONDITIONS FOR EACH GROUP CAN BE INDEPENDENTLY SPECIFIED AND THE FLEXIBILITY OF THE SPECIFICATIONS PERMIT A

- (A) PERFECT MIRROR REFLECTION OR SYMMETRY,
- (B) ISOTROPIC REFLECTION (LAMBERT SURFACE REFLECTION), AND
- (C) ANISOTROPIC DIFFUSE SOURCES BY MEANS OF EITHER
A P1 LEGENDRE SERIES OR A SHORT TABLE OF POINT VALUES FOR
THE ANGULAR FLUX.

INDEPENDENT SPECIFICATION OF ISOTROPIC FIXED VOLUME SOURCES FOR EACH GROUP IS ALSO ALLOWED.

AS IMPLIED, BOTH HOMOGENEOUS AND INHOMOGENEOUS PROBLEMS ARE SOLVED, AND FISSIONS CAN OCCUR IN EITHER TYPE OF PROBLEM.

151 DTF2/ANISN THE MULTIGROUP, ONE-SPACE DIMENSION NEUTRON TRANSPORT EQUATION IS SOLVED. ISOTROPIC OR LINEAR ANISOTROPIC SCATTERING IS PERMITTED BETWEEN ALL GROUPS AND A DIFFUSION SOLUTION MAY BE OBTAINED FOR ANY OR ALL GROUPS. HIGH-ORDER ANISOTROPIC SCATTERING PROBLEMS (PL) CAN BE RUN USING ANISN, THE 360 VERSION OF DTF2. WHITE/GREY BOUNDARY CONDITIONS ARE AVAILABLE, AND AN ALBEDO CAN BE SPECIFIED FOR EACH GROUP. A VOID STREAMING CORRECTION IS INCLUDED. A COMPLETE SHELL SOURCE DESCRIPTION BY GROUP, POSITION, AND ANGLE IS AVAILABLE. GRAPHICAL DISPLAY (CRT) FEATURES ARE AVAILABLE WITH ANISN.

156 EXTERMINATOR/EXTERMINATOR2 THE MULTIGROUP, TWO-DIMENSIONAL NEUTRON DIFFUSION EQUATIONS ARE SOLVED IN X-Y, R-Z, OR R-THETA GEOMETRY.

C. STATIC DESIGN STUDIES

3/74

161 FORTRAN TDC TDC SOLVES THE BOLTZMANN EQUATION IN MULTIGROUP FORM FOR THE TRANSPORT OF NEUTRONS OR THE ADJOINT EQUATION IN FINITE (R,Z) CYLINDRICAL GEOMETRY BY THE DISCRETE SN METHOD. THE PROBLEM MAY BE HOMOGENEOUS (NO SOURCES INDEPENDENT OF FLUXES) OR INHOMOGENEOUS, BUT ALL SOURCES MUST BE ISOTROPIC. NEUTRON SCATTERING MUST ALSO BE ISOTROPIC. A HOMOGENEOUS PROBLEM MAY BE SOLVED FOR THE EIGENVALUE K-EFF OR THE EIGENVALUE ALPHA (TIME CONSTANT). ALTERNATIVELY, THE HOMOGENEOUS PROBLEM MAY BE SOLVED FOR THE SIZE (RADIUS, HEIGHT OR BOTH) OF THE SYSTEM CORRESPONDING TO A SPECIFIED K-EFF OR FOR THE ATOM CONCENTRATION OF SOME MATERIAL CORRESPONDING TO A SPECIFIED EIGENVALUE K-EFF OR ALPHA. FOR INHOMOGENEOUS PROBLEMS, THE IMPOSED SOURCE MAY BE AN ISOTROPIC VOLUME-DISTRIBUTED SOURCE OR AN ISOTROPIC SHELL SOURCE ON THE OUTER BOUNDARY.

167 FLARE FLARE IS AN INEXPENSIVE CALCULATIONAL METHOD TO DETERMINE CORE REACTIVITY AND CORE POWER DISTRIBUTION. A SCOPING CALCULATION OF THIS TYPE IS VALUABLE IN APPRAISING THE PHYSICS CHARACTERISTICS OF PLANNED TEST MODES OF OPERATION SO THAT DETAILED ANALYSIS CAN BE RESERVED FOR THOSE CORE CALCULATIONS OF GREATER INTEREST FROM EITHER A TECHNICIAN OR SAFETY STANDPOINT.

173 2DF 2DF IS A TWO-DIMENSIONAL MULTIGROUP PROGRAM WRITTEN IN FORTRAN FOR SOLVING THE NEUTRON TRANSPORT EQUATION USING THE SN METHOD. THE PROGRAM CAN DETERMINE THE REAL OR ADJOINT SOLUTION FOR X-Y, R-Z, OR R-THETA GEOMETRY. ISOTROPIC OR A FORM OF LINEAR ANISOTROPIC SCATTERING MAY BE CONSIDERED. VARIOUS BOUNDARY CONDITIONS ARE ALLOWED. THE PROGRAM ALSO CONTAINS A NUMBER OF SEARCH OPTIONS WHEREBY ONE CAN VARY DIMENSIONS OR CONCENTRATIONS TO ARRIVE AT A PREDETERMINED EIGENVALUE. A DISTRIBUTED SOURCE MAY BE SPECIFIED. A LIBRARY OF CROSS SECTIONS IS AVAILABLE ON MAGNETIC TAPE. CROSS SECTIONS MAY BE READ FROM THE LIBRARY TAPE AND/OR FROM CARDS.

192 2DXYL THE 2DXY PROGRAM (ACC ABSTRACT 18) HAS BEEN CONVERTED FROM FLOCO TO FORTRAN 63 FOR USE ON THE CDC1604 WITH CHANGES TO PERMIT THE INCLUSION OF FIXED SOURCE TERMS FROM TDC - TERMS REPRESENTING THE EFFECTIVE NET LOSS PER UNIT VOLUME DUE TO AXIAL LEAKAGE. IN THIS MANNER, A THREE-DIMENSIONAL FLUX SYNTHESIS CODE IS ACHIEVED.

199 TDP TDP IS A TWO-DIMENSIONAL LINEAR PERTURBATION THEORY CODE WHICH CALCULATES REACTIVITY COEFFICIENTS, PROMPT NEUTRON LIFETIMES, AND EFFECTIVE DELAYED FRACTIONS USING FLUXES FROM TDC CYLINDRICAL (R-Z) OR RECTANGULAR (X-Y) GEOMETRY.

C. STATIC DESIGN STUDIES

3/74

209 DTF4 THE LINEAR, TIME-INDEPENDENT, BOLTZMANN EQUATION FOR PARTICLE TRANSPORT IS SOLVED FOR THE ENERGY SPACE, AND ANGULAR DEPENDENCE OF THE PARTICLE DISTRIBUTION IN ONE-DIMENSIONAL SLABS, CYLINDERS, AND SPHERES. INDEPENDENT SOURCE OR EIGENVALUE (MULTIPLICATION, TIME-ABSORPTION, ELEMENT CONCENTRATION, ZONE THICKNESS OR SYSTEM DIMENSION) PROBLEMS ARE SOLVED SUBJECT TO VACUUM, REFLECTIVE, OR PERIODIC BOUNDARY CONDITIONS. A COMPLETE ENERGY-TRANSFER SCATTERING MATRIX IS ALLOWED FOR EACH LEGENDRE COMPONENT OF THE SCATTERING CROSS SECTION MATRICES.

211 MGDSN, MANY GROUP DSN MGDSN IS A MODIFICATION OF DSN, THE ONE-DIMENSIONAL THEORY CODE DESIGNED TO ACCOMMODATE 100 GROUP ISOTROPIC MATERIAL CROSS SECTION DATA TAPES PREPARED BY CSP1 AND CSP2A.

212 VARI-QUIR THE TIME-DEPENDENT, MULTI-GROUP, TWO-DIMENSIONAL NEUTRON DIFFUSION EQUATIONS ARE SOLVED IN X-Y OR R-Z GEOMETRY.

220 GASP2 GASP2 CALCULATES THE ONE-DIMENSIONAL DISTRIBUTION OF FISSILE AND FERTILE MATERIALS IN A NUCLEAR REACTOR WHICH WILL YIELD ANY DESIRED POWER DISTRIBUTION AND APPROXIMATELY RETAIN THIS DESIRED POWER DISTRIBUTION DURING THE BURNUP HISTORY OF THE REACTOR CORE. A POISON AND POISON DISTRIBUTION SEARCH FOR A DESIRED MULTIPLICATION AND MINIMUM POWER DISTRIBUTION PERTURBATION CAN ALSO BE PERFORMED.

222 GAMBLE4/GAMBLE5 THE HOMOGENEOUS 2-DIMENSIONAL MULTIGROUP DIFFUSION THEORY EQUATIONS WITH ARBITRARY GROUP-TO-GROUP SCATTERING AND ARBITRARY FISSION TRANSFER ARE SOLVED FOR HETEROGENEOUS ASSEMBLIES IN X-Y AND R-Z GEOMETRY. HOMOGENEOUS LOGARITHMIC BOUNDARY CONDITIONS ARE USED AT THE OUTER SURFACE OF THE ASSEMBLY AND AT THE SURFACE OF NON-DIFFUSION REGIONS. THE RESULTS INCLUDE THE GROUP AND POINT DEPENDENT NEUTRON FLUXES, THE POWER DISTRIBUTION, THE NEUTRON MULTIPLICATION FACTOR (K-EFFECTIVE), AND A DETAILED NEUTRON BALANCE.

225 TEMCO TEMCO COMPUTES REACTOR TEMPERATURE COEFFICIENTS.

C. STATIC DESIGN STUDIES

3/74

241 HFN HFN SOLVES THE HOMOGENEOUS OR INHOMOGENEOUS ONE-DIMENSIONAL MULTIGROUP DIFFUSION EQUATION FOR IT LOWEST EIGENVALUE AND THE CORRESPONDING DIRECT AND/OR ADJOINT EIGENVECTORS. INHOMOGENEOUS BOUNDARY CONDITIONS AND A FLEXIBLE SCATTER-TRANSFER MATRIX STRUCTURE ARE INCLUDED. OPTIONAL CALCULATIONS INCLUDE CRITICALITY SEARCHES, DETECTOR ACTIVATION TRAVERSES, AND INTEGRALS FOR PERTURBATION THEORY ANALYSIS.

262 MACH1 MACH1 PERFORMS ONE-DIMENSIONAL MULTIGROUP DIFFUSION SOLUTIONS AND ASSOCIATED CALCULATIONS, INCLUDING CRITICALITY SEARCHES, PERTURBATION, REACTION SUMMARY, BETA EFFECTIVE, GROUP COLLAPSING, AND POINTWISE REACTION RATES AND RATIOS. SEVERAL CARD DUMPS OF COMPUTED DATA ARE AVAILABLE ON OPTION.

264 VARI-QUIR3 THE STEADY-STATE, MULTIGROUP, TWO-DIMENSIONAL NEUTRON DIFFUSION EQUATIONS ARE SOLVED IN X-Y, R-Z, AND R-THETA GEOMETRY.

270 CAESAR4/LIBLST CAESAR4 SOLVES THE CNF-DIMENSIONAL, MULTIGROUP DIFFUSION EQUATIONS IN ANY OF THREE GEOMETRIES AND PROVIDES A WIDE CHOICE OF BOUNDARY CONDITIONS, CRITICALITY SEARCHES, EDITS AND OTHER AUXILIARY COMPUTATIONS.

287 BISYN BISYN SOLVES THE TWO-DIMENSIONAL MULTIGROUP NEUTRON DIFFUSION EQUATIONS IN X-Y OR R-Z GEOMETRY USING A NONITERATIVE SYNTHESIS METHOD. THIS APPROACH IS DESIGNED TO GREATLY REDUCE THE COMPUTER COST OF RUNNING TWO-DIMENSIONAL MULTIGROUP PROBLEMS AT THE RISK OF SOME LOSS IN ACCURACY OF THE DETAILED FLUX DISTRIBUTION.

288 SNARG-1D THE PROGRAM IS DESIGNED TO SOLVE THE ONE-DIMENSIONAL NEUTRON TRANSPORT EQUATIONS. SNARG-1D IS WRITTEN FOR THE SOLUTION OF ONE-DIMENSIONAL PROBLEMS USING THE ORDER $N = 2, 4, 6, 8, 12, 16, \text{ OR } 32$, AND APPLICABLE TO PLANE, CYLINDRICAL AND SPHERICAL GEOMETRIES. THE REAL OR ADJOINT SOLUTION MAY BE CALCULATED AND HOMOGENEOUS OR INHOMOGENEOUS PROBLEMS MAY BE SOLVED. FOUR CRITICALITY SEARCH OPTIONS ARE PROVIDED FOR WHICH A FIXED $KEFF$ OR ALPHA, INVERSE PERIOD, VALUE MAY BE SPECIFIED RATHER THAN THE CRITICALITY VALUE, $KEFF = 1$. EITHER OF TWO INHOMOGENEOUS SOLUTIONS MAY BE OBTAINED (SHELL OR DISTRIBUTED SOURCE CALCULATIONS). LINEAR ANISOTROPIC COMPONENTS OF BOTH THE SHELL SOURCE AND THE SCATTERING CROSS SECTIONS MAY BE INCLUDED. FISSION SPECTRUM MATRICES ARE ALLOWED AS BOTH MATERIAL-DEPENDENT AND INCIDENT NEUTRON ENERGY-DEPENDENT FUNCTIONS.

358 TWOTRAN2 TWOTRAN2 SOLVES THE TWO-DIMENSIONAL MULTIGROUP TRANSPORT EQUATION IN (X,Y), (R,THETA), AND (R,Z) GEOMETRIES. BOTH REGULAR AND ADJOINT, INHOMOGENEOUS AND HOMOGENEOUS (KEFF AND EIGENVALUE SEARCHES) PROBLEMS SUBJECT TO VACUUM, REFLECTIVE, PERIODIC, WHITE OR INPUT-SPECIFIED BOUNDARY FLUX CONDITIONS ARE SOLVED. GENERAL ANISOTROPIC SCATTERING IS ALLOWED AND ANISOTROPIC INHOMOGENEOUS SOURCES ARE PERMITTED.

C. STATIC DESIGN STUDIES

3/74

380 GATT GATT IS A THREE-DIMENSIONAL FEW-GROUP NEUTRON DIFFUSION THEORY PROGRAM FOR CALCULATING THE DETAILED SPATIAL FLUX AND POWER DISTRIBUTION FOR REACTORS WITH HEXAGONAL CORE CONFIGURATION. THE PROGRAM USES A UNIFORM TRIANGULAR MESH IN THE HORIZONTAL MESH PLANES AND ASSUMES A RELATIVELY SIMPLE REGION STRUCTURE IN THE AXIAL DIRECTION. IT WAS DESIGNED TO REPRESENT THE SPECIAL PATCH-TYPE CORE STRUCTURE OF THE HTGR REACTOR AS CLOSELY AS POSSIBLE.

398 BE21 BE21 SOLVES THE FEW-GROUP DISCRETE ORDINATES EQUATIONS IN SLAB GEOMETRY. EITHER HOMOGENEOUS OR INHOMOGENEOUS PROBLEMS CAN BE SOLVED.

401 GAMTRI THE HOMOGENEOUS TWO-DIMENSIONAL MULTIGROUP DIFFUSION THEORY EQUATIONS WITH ARBITRARY GROUP-TO-GROUP SCATTERING AND ARBITRARY FISSION TRANSFER ARE SOLVED FOR HETEROGENEOUS ASSEMBLIES IN (UNIFORM MESH) TRIANGULAR GEOMETRY. HOMOGENEOUS LOGARITHMIC BOUNDARY CONDITIONS ARE USED AT THE OUTER SURFACE OF NON-DIFFUSION REGIONS. THE RESULTS INCLUDE THE GROUP AND POINT-DEPENDENT NEUTRON FLUXES, THE POWER DISTRIBUTION, THE NEUTRON MULTIPLICATION FACTOR, AND A DETAILED NEUTRON BALANCE.

430 GAZE2 GAZE2 IS A ONE-DIMENSIONAL, MULTIGROUP, NEUTRON DIFFUSION THEORY PROGRAM. IT INCLUDES ALL FOUR OF THE STANDARD ONE-DIMENSIONAL GEOMETRIES - SLAB, SPHERE, RADIAL CYLINDER, AND AXIAL CYLINDER, THE LAST OF WHICH IS IDENTICAL TO SLAB GEOMETRY EXCEPT WHEN THE ZOOM ALBEDO-TYPE TRANSVERSE BOUNDARY CONDITION IS USED.

450 KEND/KENO2 KEND IS A MULTIGROUP MONTE CARLO CRITICALITY CODE CONTAINING A SPECIAL GEOMETRY PACKAGE WHICH ALLOWS EASY DESCRIPTION OF SYSTEMS COMPOSED OF CYLINDERS, SPHERES, AND CUBOIDS (RECTANGULAR PARALLELEPIPEDS) ARRANGED IN ANY ORDER WITH ONLY ONE RESTRICTION (EACH GEOMETRICAL REGION MUST BE DESCRIBED AS COMPLETELY ENCLOSING ALL REGIONS INTERIOR TO IT). FOR SYSTEMS NOT DESCRIBABLE USING THIS SPECIAL GEOMETRY PACKAGE, THE PROGRAM CAN USE THE GENERALIZED GEOMETRY PACKAGE (GEOM) DEVELOPED FOR THE OSR MONTE CARLO CCCE. IT ALLOWS ANY SYSTEM THAT CAN BE DESCRIBED BY A COLLECTION OF PLANES AND/OR QUADRATIC SURFACES, ARBITRARILY ORIENTED AND INTERSECTING IN ARBITRARY FASHION. RECTANGULAR ARRAYS OF FISSION UNITS ARE ALLOWED WITH OR WITHOUT EXTERNAL REFLECTOR REGIONS. OUTPUT FROM KEND CONSISTS OF KEFF FOR THE SYSTEM PLUS AN ESTIMATE OF ITS STANDARD DEVIATION AND THE LEAKAGE, ABSORPTION, AND FISSIONS FOR EACH ENERGY GROUP PLUS THE TOTALS FOR ALL GROUPS. FLUX AS A FUNCTION OF ENERGY GROUP AND REGION AND FISSION DENSITIES AS A FUNCTION OF REGION ARE OPTIONAL OUTPUT.

C. STATIC DESIGN STUDIES

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459 DOT2DB DOT2DB SOLVES BOTH THE MULTI-GROUP DISCRETE ORDINATES TRANSPORT THEORY AND THE MULTIGROUP DIFFUSION THEORY EQUATIONS IN TWO DIMENSIONS. ANISOTROPIC SCATTERING OF ANY ORDER LEGENDRE EXPANSION IS ALLOWED IN THE TRANSPORT THEORY OPTION. ANISOTROPIC SCATTERING IN THE DIFFUSION THEORY OPTION IS TREATED WITH THE TRANSPORT APPROXIMATION, USING THE P1 SCATTERING MATRIX, WHEN PROVIDED, TO CALCULATE THE TRANSPORT CROSS SECTION. OPTIONS INCLUDE SOLUTIONS IN (X,Y), (R,Z), (R,THETA), AND, IN THE DIFFUSION THEORY OPTION, TRIANGULAR GEOMETRIES. BOTH DIRECT AND ADJOINT FLUXES MAY BE COMPUTED FOR FIXED VOLUME-DISTRIBUTED SOURCE, MULTIPLICATION CONSTANT ITERATION, TIME ABSORPTION ITERATION, CONCENTRATION SEARCH, ZONE THICKNESS SEARCH, AND FIXED BOUNDARY SOURCE PROBLEMS. IN ADDITION TO THE FIXED BOUNDARY SOURCE PROBLEM, OPTIONS INCLUDE VACUUM, REFLECTION, PERIODIC AND WHITE BOUNDARY CONDITIONS. CROSS SECTIONS MAY BE ENTERED FROM CARDS OR FROM TAPE IN THE DTF FORMAT. ACTIVITIES FOR ANY MATERIAL IN THE SYSTEM MAY BE OUTPUT BY INTERVAL (OPTIONAL) AND ZONE. OTHER OUTPUT INCLUDES THE INTERVAL FLUXES AND SOURCES AND A REACTION SUMMARY TABLE FOR EACH ZONE AND FOR THE SYSTEM.

510 VIM1/VIM1X VIM1 IS A MONTE CARLO CODE DESIGNED FOR THE ANALYSIS OF FAST CRITICAL EXPERIMENTS. IT HAS BEEN EXPRESSLY PREPARED FOR THE ANALYSIS OF FAST CRITICAL ASSEMBLIES OF THE PLATE-DRAWER TYPE SUCH AS ZPPR, ZPR-3, AND ZEBRA. THE LIBRARY USES POINT CROSS SECTION DATA, RATHER THAN MULTIGROUP CONSTANTS.

513 TESS TESS SOLVES THE TRANSPORT EQUATION IN SLAB AND SPHERICAL GEOMETRY USING THE DOUBLE-SN APPROXIMATION FOR SLAB GEOMETRY.

C. STATIC DESIGN STUDIES

3/74

523 ESP ESP IS A GENERAL-PURPOSE MONTE CARLO REACTOR ANALYSIS CODE. IT COVERS THE COMPLETE ENERGY RANGE OF INTEREST IN REACTOR CALCULATIONS AND IS DESIGNED FOR BOTH EIGENVALUE AND FIXED SOURCE REACTOR AND REACTOR CELL CALCULATIONS. BASIC DATA ARE ACCEPTED ONLY IN THE VERSION I, II, AND III ENDF/B FORMAT. IN ADDITION TO SMOOTH DATA, THE CROSS SECTION PREPARATION INCLUDES A DETAILED TREATMENT OF RESOLVED AND UNRESOLVED RESONANCES AND THE FREE GAS AND S(ALPHA,BETA) THERMAL MODELS. THE COLLISION AND SOURCE ROUTINES UTILIZE THE ENDF/B NONELASTIC SECONDARY DISTRIBUTIONS, THE ANISOTROPIC SCATTERING DATA, AND THE FISSION SPECTRA. THE ENERGY RANGE MAY BE DIVIDED INTO AS MANY AS 25,000 INTERVALS, AND OVER EACH INTERVAL THE APPROPRIATELY AVERAGED CROSS SECTIONS ARE USED AS CONSTANT POINT-ENERGY VALUES. A GENERAL THREE-DIMENSIONAL GEOMETRY DESCRIPTION IS AVAILABLE, AS WELL AS SEVERAL SPECIALIZED GEOMETRIES. USE OF FIXED-SOURCE OPTIONS ALLOWS CALCULATIONS ON NON-MULTIPLYING SYSTEMS. A STEADY-STATE ANALYSIS OF NEUTRON HISTORIES IS PERFORMED IN COMPUTER CORE FOR SUCH QUANTITIES AS NEUTRON FLUXES, REACTION RATES, AND CROSS SECTIONS, AVERAGED OVER ARBITRARY ENERGY AND SPATIAL REGIONS.

573 TWOTRAN-PNVW TWOTRAN-PNVW SOLVES TWO-DIMENSIONAL PARTICLE TRANSPORT PROBLEMS FOR X-Y, R-Z, AND R-THETA GEOMETRIES. BOTH DIRECT AND ADJOINT, HOMOGENEOUS (KEFF OR PARAMETRIC EIGENVALUE SEARCHES) OR INHOMOGENEOUS TIME-INDEPENDENT PROBLEMS ARE SOLVED SUBJECT TO VACUUM, REFLECTIVE, PERIODIC OR INPUT SPECIFICATION OF BOUNDARY FLUX CONDITIONS. BOTH ANISOTROPIC INHOMOGENEOUS PROBLEMS AND GENERAL ANISOTROPIC SCATTERING PROBLEMS ARE TREATED.

582 MONA MONA SOLVES THE MULTIGROUP, ONE-DIMENSIONAL NEUTRON DIFFUSION EQUATIONS IN SLAB, CYLINDRICAL, OR SPHERICAL GEOMETRY FOR EITHER THE DIRECT OR ADJOINT FLUX. BOUNDARY SOURCES AND SPATIALLY DEPENDENT VOLUME SOURCES CAN BE GROUP DEPENDENT. MULTIPLE THERMAL GROUPS ARE ALLOWED.

585 TRIAL TRIAL CARRIES OUT A SIMPLE LINKING OF SEVERAL TWO-DIMENSIONAL, MULTIGROUP NEUTRON (DIRECT OR ADJOINT) FLUX SETS TO GIVE A THREE-DIMENSIONAL REPRESENTATION.

608 TRIPLET TRIPLET SOLVES THE TWO-DIMENSIONAL MULTIGROUP TRANSPORT EQUATION IN PLANAR GEOMETRIES USING A REGULAR TRIANGULAR MESH. REGULAR AND ADJOINT, INHOMOGENEOUS AND HOMOGENEOUS (KEFF AND EIGENVALUE SEARCHES) PROBLEMS SUBJECT TO VACUUM, REFLECTIVE OR SOURCE BOUNDARY CONDITIONS ARE SOLVED. GENERAL ANISOTROPIC SCATTERING IS ALLOWED AND ANISOTROPIC DISTRIBUTED SOURCES ARE PERMITTED.

55 AIMFIRE THIS PROGRAM WAS DESIGNED TO
COMPARE THE COSTS OF VARIOUS FUEL CYCLES. THE PROGRAM CONTAINS
A LIBRARY OF FAST AND THERMAL MICROSCOPIC CROSS SECTIONS, DECAY
CONSTANTS, AND FISSION YIELDS FOR 50 ISOTOPES. THE PRESENT
VERSION IS USED TO INVESTIGATE THE ECONOMICS OF URANIUM FUEL SYS-
TEMS.

58 SIZZLE SIZZLE SOLVES THE ONE-DIMENSIONAL, OR MULTIGROUP BURNUP PROBLEM IN THE DIFFUSION THEORY APPROXIMATION FOR FAST INTERMEDIATE REACTORS. AFTER THE INITIAL CALCULATION AT T=0, AVERAGE CROSS SECTIONS ARE COMPUTED FOR FURTHER CALCULATIONS USING ONE TO SIX ENERGY GROUPS. CRITICALITY MAY BE MAINTAINED BY USE OF A CONCENTRATION SEARCH. THE CONCENTRATION OF THE VARIOUS ISOTOPES IS PERMITTED TO VARY ONLY FROM REGION-TO-REGION. CHAINS INCLUDED ARE TH232, U238, AND A FISSION PRODUCT POISON CHAIN.

99 DUO DIMENSIONAL BURNOUT (DOB) THE FIVE-GROUP, TWO-DIMENSIONAL, NEUTRON DIFFUSION EQUATIONS IN CYLINDRICAL GEOMETRY ARE SOLVED WITH BURNOUT OPTIONS AND CONTROL ROD SEARCH OPTIONS.

117 FEVER FEVER PERFORMS ONE-DIMENSIONAL FEW-GROUP DEPLETION CALCULATIONS. OPTIONS ARE AVAILABLE TO ADJUST CONTROL POISONS IN VARIOUS REGIONS OF THE REACTOR, SELF-SHIELDING OF LUMPED POISONS, AND TO CALCULATE HOT MAXIMUM AND COLD SHUT-DOWN MULTIPLICATION.

134 NUCY THE CALCULATION OF NUCLIDE
CONCENTRATIONS AT A POINT IN A REACTOR AT SUCCESSIVE TIME INTER-
VALS, WITH EXPOSURE TO A TWO-GROUP NEUTRON FLUX. INFINITE SYSTEM
CRITICALITY IS CALCULATED.

D. DEPLETION, FUEL MANAGEMENT, COST ANALYSIS, AND REACTOR ECONOMICS

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146 NPFCCP NUCLEAR FUEL CYCLE COSTS IN DOLLARS PER YEAR (\$/YR), AND IN MILLS PER KILOWATT-HOUR (MILLS/KWHR) ARE COMPUTED AND TABULATED FOR EACH REGION OF A MULTIREGION REACTOR CORE, ON THE BASIS OF AEC-LEASED NUCLEAR FUEL MATERIAL AND OF PRIVATELY-OWNED NUCLEAR FUEL MATERIAL. FUEL CYCLE COSTS ARE COMPUTED SEPARATELY FOR EACH REGION OR ZONE, FOR CORE DESIGNS OF ANY CONFIGURATION OR COMBINATION OF MATERIAL DEPLETION OR ENRICHED URANIUM FUEL OR OTHER SPECIAL NUCLEAR MATERIAL. PRINTED OUTPUT OF THE PROGRAM INCLUDES (A) DETAILED FUEL CYCLE COSTS FOR EACH ZONE IN TABULAR FORM, FOR AEC-LEASED AND PRIVATELY-OWNED NUCLEAR FUEL MATERIAL, RESPECTIVELY, (B) A SUMMARY TABULATION OF NUCLEAR FUEL COSTS FOR ALL REGIONS OF THE COMPLETE CORE, INCLUDING FIXED CHARGES ON WORKING CAPITAL REQUIRED FOR CORE FABRICATION AND FOR NUCLEAR FUEL MATERIAL, (C) A SUMMARY TABULATION OF CERTAIN COMPUTED PERFORMANCE AND ECONOMIC DATA, VIZ., AVERAGE RESIDENCE TIME, ANNUAL FUEL THROUGHPUT, UNIT ELECTRICAL ENERGY YIELD, ANNUAL POWER GENERATION, AND CORE FABRICATION COSTS, AND (D) A TABULATION OF ALL INPUT DATA FOR ALL REGIONS. THE PRINTING OF DATA DESCRIBED IN (A) AND (D) ABOVE IS OPTIONAL WITH PROGRAM USE.

179 ISOTOPES **THIS PROGRAM CAN BE USED TO**
CALCULATE FOR ANY NEUTRON FLUX THE OPTIMUM TIME OF IRRADIATION
FOR MAXIMUM YIELD, THE SPECIFIC ACTIVITY OF THE PRODUCT ISOTOPE
IN CURIES PER GRAM OF TARGET MATERIAL, AND THE COMBINED SPECIFIC
ACTIVITY OF THE TARGET AND PRODUCT ISOTOPES. THE PRODUCT ISOTOPE
MAY BE PRODUCED BY ANY SIMPLE REACTION SUCH AS (N,GAMMA), (N,P),
(N,2N), ETC., OR IT MAY BE PRODUCED BY DECAY OF A PARENT ISOTOPE.

180 ISOCRUNCH ISOCRUNCH CAN BE USED TO COMPUTE THE AMOUNT OF EACH ISOTOPE IN A REACTION AND DECAY CHAIN FOR ANY SPECIFIED NEUTRON FLUX AND TIME, TO SUM THE CONTRIBUTIONS OF VARIOUS CHAINS TO THE SAME ISOTOPE, TO GRAPH ON AN ASSOCIATED ELECTROPLOTTER OR CALCOMP THE YIELD OF AN ISOTOPE VS. TIME FOR A GIVEN FLUX, AND TO FIND THE OPTIMUM TIME FOR MAXIMUM YIELD OF AN ISOTOPE IN A CHAIN. THE PROGRAM DOES NOT TAKE INTO ACCOUNT THE SELF-SHIELDING OF A TARGET IN A REACTOR OR THE DEPENDENCE OF REACTION CROSS SECTIONS ON NEUTRON ENERGY WHICH CAN BE HANDLED BY ADJUSTING THE INPUT DATA.

221 RELOAD FEVER A FEW-GROUP, 1-D DEPLETION
CALCULATION WHICH ALLOWS FUEL IN VARIOUS STAGES OF IRRADIATION TO
BE HOMOGENIZED INTO THE SAME REGION FOR PURPOSES OF THE DIFFUSION
CALCULATION BUT FOLLOWS THE DEPLETION OF EACH OF THE SUB-REGIONS
SEPARATELY. THE CALCULATION MAY BE INTERRUPTED PERIODICALLY FOR
REFUELING ONE OR MORE REGIONS. RECYCLING IS OPTIONAL AND THERE IS
NO LIMIT TO THE NUMBER OF REFUELINGS WHICH MAY BE PERFORMED. A
CONTROL POISON SEARCH IS AVAILABLE AND CONCENTRATION DEPENDENT
SELF-SHIELDING FACTORS MAY BE APPLIED TO ONE LUMPED POISON.

224 WAMPUM THIS PROGRAM CALCULATES FUEL
CYCLE COSTS ON A DETAILED BASIS, USING RESULTS OF NUCLEAR
DEPLETION CALCULATIONS AND CERTAIN SPECIFIED ECONOMICS
ASSUMPTIONS. THE PURPOSE IS TO PROVIDE A MEASURE OF PERFORMANCE
FOR COMPARING OR OPTIMIZING FUEL CYCLES AND ASSOCIATED REACTOR
CORE AND FUEL ELEMENT CHARACTERISTICS.

226 OPUS THE CCDE GENERATES A FLOW NETWORK EQUIVALENT TO A GAS-COOLED NUCLEAR POWER PLANT OF SPECIFIED ELECTRICAL OUTPUT (IN THE RANGE OF 100 TO 1000 MW) ACCORDING TO INPUT DATA AND PROGRAMMED RULES, PROCEEDS TO EVALUATE THE PLANT PERFORMANCE AND PRICE OF THE TURBOGENERATOR SET (ACCORDING TO GENERAL ELECTRIC PRICE DATA), AND PRINTS AS A RESULT A CODED LIST OF ALL PLANT COMPONENTS AND A DETAILED PERFORMANCE MAP.

227 STMGEN STMGEN CAN BE USED IN A PLANT OPTIMIZATION PROGRAM. THIS CODE DETERMINES THE AREA OF EACH SECTION OF A STEAM GENERATOR REQUIRED TO SATISFY THE DESIGN CONDITIONS OF HEAT TRANSFER, PRESSURE DROP AND MAXIMUM TUBE TEMPERATURE CONSTRAINTS. THE COST OF THE GENERATOR IS COMPUTED AS A FUNCTION OF THE TOTAL HEAT TRANSFER AREA, THE NON-PRODUCTIVE TUBE LENGTH REQUIRED TO CONNECT THE HEADERS, PLUS THE COST OF THE HEADERS.

231 RAD2 THIS PROGRAM CALCULATES
THE FISSION PRODUCT ACTIVITY DISTRIBUTIONS IN A HIGH TEMPERATURE
GAS-COOLED REACTOR SYSTEM.

240 ASSAULT **MULTIGROUP, TWO-DIMENSIONAL**
REACTOR DEPLETION. GIVEN NUCLIDE CONCENTRATIONS AND MICROSCOPIC
 CROSS SECTIONS, THE STEADY-STATE MULTIREGION, MULTIGROUP
 DIFFUSION EQUATIONS ARE SOLVED IN ONE OR TWO DIMENSIONS OVER A
 FINITE-DIFFERENCE SYSTEM OF MESH POINTS. THE CALCULATED NEUTRON
 FLUXES ARE THEN USED TO DETERMINE NUCLIDE CONCENTRATIONS AFTER A
 SPECIFIED PERIOD OF EXPOSURE. THESE CALCULATIONS ARE REPEATED
 FOR A SPECIFIED NUMBER OF TIME-STEPS.

C. DEPLETION, FUEL MANAGEMENT, COST ANALYSIS, AND
REACTOR ECONOMICS

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260 GARGOYLE GARGOYLE IS AN INFINITE-MEDIUM DEPLETION CODE FOR FUEL CYCLE CALCULATIONS ON REACTORS EMPLOYING PARTIAL REFUELING. THE BURNUP OF UP TO 12 DISCRETE FUEL COMPOSITIONS (REGIONS OR STAGES OF IRRADIATION) MAY BE FOLLOWED SIMULTANEOUSLY. THE BURNUP CALCULATION MAY BE INTERRUPTED PERIODICALLY TO REMOVE THE CONTENTS OF AND TO REFUEL ONE OR MORE REGIONS. FUEL MAY BE COMPLETELY OR PARTIALLY RECYCLED. A CONTROL POISON SEARCH MAY BE PERFORMED AT EACH TIME-STEP. FEED FUEL SEARCHES ARE PERMITTED AT THE END OF EACH BURNUP CYCLE BEFORE REFUELING. CONCENTRATION DEPENDENT SELF-SHIELDING FACTORS MAY BE APPLIED TO ANY NUCLIDE EXCEPT MODERATORS. THE NUCLIDE SCHEME EMPLOYED, ALTHOUGH NOT COMPLETELY GENERAL, IS FLEXIBLE.

269 DTF-BURN DTF-BURN IS A ONE-DIMENSIONAL, MULTIGROUP BURNUP CODE BASED ON TRANSPORT THEORY. A DIFFERENT TYPE OF EIGENVALUE CALCULATION (MULTIPLICATION, PERIOD, NUCLIDE CONCENTRATION, ZONE THICKNESS, OR SYSTEM DIMENSION) CAN BE PERFORMED AT THE BEGINNING OF EACH OF A SPECIFIED SET OF TIME-STEPS. THIS FEATURE PERMITS THE SIMULATION, IN A SINGLE PROBLEM RUN, OF A SYSTEM IN WHICH VARIOUS CONTROL METHODS ARE USED AS A FUNCTION OF TIME. THE CONCENTRATION OF THE VARIOUS NUCLIDES IS PERMITTED TO VARY FROM REGION-TO-REGION OR POINT-BY-POINT. NUCLIDES CONSIDERED ARE U235, U236, U238, NP239, PU239, PU240, PU241, PU242, AND FP, A PSEUDO FISSION PRODUCT PAIR.

275 PDQ7 PDQ7 SOLVES FEW-GROUP NEUTRON DIFFUSION-DEPLETION PROBLEMS IN ONE, TWO, AND THREE DIMENSIONS. ADJOINT SOLUTIONS ARE ALSO AVAILABLE AND TWO OVERLAPPING THERMAL GROUPS MAY BE USED IN ONE AND TWO-DIMENSIONAL PROBLEMS. EITHER POINTWISE OR REGIONWISE DEPLETION MAY BE PERFORMED USING THE HARMONY DEPLETION SYSTEM. THE GEOMETRY MAY BE RECTANGULAR, CYLINDRICAL, OR SPHERICAL IN ONE DIMENSION, RECTANGULAR, CYLINDRICAL, OR HEXAGONAL IN TWO DIMENSIONS, AND RECTANGULAR OR HEXAGONAL IN THREE DIMENSIONS. ALL GEOMETRIES PROVIDE FOR VARIABLE MESH SPACING IN ALL DIMENSIONS. ZERO FLUX, ZERO CURRENT, AND ROTATIONAL SYMMETRY BOUNDARY CONDITIONS ARE AVAILABLE, AND BOUNDARY VALUE PROBLEMS MAY BE SOLVED BY SPECIFYING THE FLUX VALUES ON ONE OR MORE BOUNDARIES. THE BETTIS REVISED PDQ7 MAY BE USED TO ALSO SOLVE ADDITIVE FAST-SOURCE AND SIMPLIFIED PL PROBLEMS AS WELL AS THE THREE-DIMENSIONAL SYNTHESIS EIGENVALUE PROBLEM. CONTROL SEARCHES, THERMAL FEEDBACK, AND XENON FEEDBACK ARE OPTIONAL. THE IBM360 ANC VERSION CAN BE USED TO SOLVE THREE-DIMENSIONAL SYNTHESIS PROBLEMS.

D. DEPLETION, FUEL MANAGEMENT, COST ANALYSIS, AND
REACTOR ECONOMICS

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301 FREVAP6 THE FREVAP TYPE OF CODE FOR ESTIMATING THE RELEASE OF LONGER-LIVED METALLIC FISSION PRODUCTS FROM HTGR FUEL ELEMENTS HAS BEEN DEVELOPED TO TAKE INTO ACCOUNT THE COMBINED EFFECTS OF THE RETENTION OF METALLIC FISSION PRODUCTS BY FUEL PARTICLES AND THE RATHER STRONG ABSORPTION OF THESE FISSION PRODUCTS BY THE GRAPHITE OF THE FUEL ELEMENTS. RELEASE CALCULATIONS ARE MADE ON THE BASIS THAT THE LOSS OF FISSION PRODUCT NUCLIDES SUCH AS OF STRONTIUM, CESIUM, AND BARIUM IS DETERMINED BY THEIR EVAPORATION FROM THE GRAPHITE SURFACES AND THEIR TRANSPIRATION INDUCED BY THE FLOWING HELIUM COOLANT. THE CODE IS DEvised SO THAT CHANGES OF FISSION RATE (FUEL ELEMENT POWER), FUEL TEMPERATURE, AND GRAPHITE TEMPERATURE MAY BE INCORPORATED INTO THE CALCULATION. TEMPERATURE IS QUITE IMPORTANT IN DETERMINING RELEASE BECAUSE, IN GENERAL, BOTH RELEASE FROM FUEL PARTICLES AND LOSS BY EVAPORATION (TRANSPIRATION) VARY EXPONENTIALLY WITH THE RECIPROCAL OF THE ABSOLUTE TEMPERATURE.

302 GAFFE A ZERO-DIMENSIONAL CALCULATION OF FEED FUEL REQUIREMENTS IS PERFORMED TO PRODUCE A SPECIFIED END OF CYCLE MULTIPLICATION FACTOR FOR THE EQUILIBRIUM FUEL CYCLE, GIVEN FEED COMPOSITION, LENGTH OF CYCLE AND REACTOR POWER. IT IS ALTERNATELY POSSIBLE TO COMPUTE CYCLE LENGTH OR FEED ENRICHMENT. THE CODE IS A SURVEY TOOL WHICH ASSUMES PERIODIC REFUELING AND PERMITS COMPLETE OR PARTIAL RECYCLING OF MATERIALS. THE SEGREGATED FUEL CONCEPT CAN BE HANDLED WITHIN THE FRAMEWORK OF THE CALCULATION.

313 CINDER(M0102) CINDER IS A FOUR-GROUP, ONE-POINT DEPLETION AND FISSION PRODUCT PROGRAM BASED ON THE EVALUATION OF A GENERAL ANALYTICAL SOLUTION OF NUCLIDES COUPLED IN ANY LINEAR SEQUENCE OF RADIOACTIVE DECAYS AND NEUTRON ABSORPTIONS IN A SPECIFIED NEUTRON FLUX SPECTRUM. THE DESIRED DEPLETION AND FISSION PRODUCT CHAINS AND ALL PHYSICAL DATA ARE SPECIFIED BY THE PROBLEM ORIGINATOR. THE PROGRAM COMPUTES INDIVIDUAL NUCLIDE NUMBER DENSITIES, ACTIVITIES, NINE ENERGY-GROUP DISINTEGRATION RATES, AND MACROSCOPIC AND BARNs/FISSION POISONS AT EACH TIME-STEP AS WELL AS SELECTED SUMMARIES OF THESE DATA.

314 NAP NAP CALCULATES THE SPECTRUM AND SPATIAL DISTRIBUTION IN ONE DIMENSION OF ACTIVATION GAMMA RAYS FOLLOWING NEUTRON IRRADIATION.

D. DEPLETION, FUEL MANAGEMENT, COST ANALYSIS, AND
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318 FEVER7 FEVER7 PERFORMS A MULTIGROUP, 1-DIMENSIONAL DEPLETION CALCULATION WHICH ALLOWS FUEL IN VARIOUS STAGES OF IRRADIATION TO BE HOMOGENIZED INTO THE SAME REGION FOR PURPOSES OF THE DIFFUSION CALCULATION BUT FOLLOWS THE DEPLETION OF EACH OF THE SUBREGIONS SEPARATELY. THE CALCULATION MAY BE INTERRUPTED PERIODICALLY FOR REFUELING ONE OR MORE REGIONS. RECYCLING IS OPTIONAL AND THERE IS NO LIMIT TO THE NUMBER OF REFUELINGS WHICH MAY BE PERFORMED. A CONTROL POISON SEARCH IS AVAILABLE AND CONCENTRATION DEPENDENT SELF-SHIELDING FACTORS MAY BE APPLIED TO A NUMBER OF LUMPED POISONS.

322 ISOSEARCH THE PROGRAM WAS DEVELOPED TO CALCULATE THE UNKNOWN REACTION CROSS SECTION, FLUX VALUE, OR PRODUCT ACTIVITY IN AN ISOTOPE-PRODUCTION SCHEME CONSISTING OF TWO OR THREE NUCLIDES.

325 2DB 2DB IS A FLEXIBLE, TWO-DIMENSIONAL (X-Y, R-Z, R-THETA, HEX GEOMETRY) DIFFUSION CODE FOR USE IN FAST REACTOR ANALYSES. THE CODE CAN BE USED TO -

- (A) COMPUTE FUEL BURNUP USING A FLEXIBLE MATERIAL SHUFFLING SCHEME,
- (B) PERFORM CRITICALITY SEARCHES ON TIME ABSORPTION (ALPHA), MATERIAL CONCENTRATIONS, AND REGION DIMENSIONS USING A REGULAR OR ADJOINT MODEL. CRITICALITY SEARCHES CAN BE PERFORMED DURING BURNUP TO COMPENSATE FOR FUEL DEPLETION,
- (C) COMPUTE FLUX DISTRIBUTIONS FOR AN ARBITRARY EXTRANEOUS SOURCE.

336 PDQ5 THE FEW-GROUP TWO-DIMENSIONAL NEUTRON DIFFUSION EQUATIONS ARE SOLVED. UP TO FIVE GROUPS MAY BE USED WITH SCATTERING ALLOWED BETWEEN ADJACENT GROUPS. IN ADDITION, DEPLETION PROBLEMS MAY BE SOLVED WITH PDQ5.

339 GAUGE THE TWO-DIMENSIONAL FEW-GROUP NEUTRON DIFFUSION THEORY EQUATIONS FOR A UNIFORM TRIANGULAR MESH ARE SOLVED TO OBTAIN THE MULTIPLICATION FACTOR AND THE SPATIAL FLUX AND POWER DISTRIBUTION OF REACTORS WITH HEXAGONAL CORE CONFIGURATION. COMPLETE REACTOR LIFE HISTORIES WITH PARTIAL REFUELING AT A NUMBER OF RELOAD TIME POINTS CAN BE CALCULATED. AT EACH DISCRETE TIME POINT A CONTROL ROD SEARCH MAY BE PERFORMED TO MAINTAIN CRITICALITY AT ALL TIMES. THE DEPLETION SCHEME OF ALL BURNABLE NUCLIDES IS SPECIFIED BY THE USER AT EXECUTION TIME. THREE MODES OF OPERATION ARE POSSIBLE - (1) STRAIGHT BURNUP CALCULATION, (2) CONTROL ROD CRITICALITY SEARCH, ALLOWING THE ADJUSTMENT OF A NUMBER OF CONTROL ROD BANKS ACCORDING TO A PRESCRIBED ROD SEQUENCING SCHEME, AND (3) A SERIES OF STATIC CALCULATIONS WITH INSERTION OF RODS INTO FIXED PRESCRIBED POSITIONS.

C. DEPLETION, FUEL MANAGEMENT, COST ANALYSIS, AND
REACTOR ECONOMICS

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340 POWERCO POWERCO CALCULATES THE COST OF ELECTRICITY PRODUCED BY NUCLEAR POWER STATIONS, ASSUMING ALL CASH EXPENSES SUCH AS INVESTMENT AND FUEL COSTS, OPERATING EXPENSES, AND TAXES ARE KNOWN. THE POWER COST IS HELD CONSTANT THROUGHOUT THE PROJECT LIFE.

354 CINCAS CINCAS IS A NUCLEAR FUEL CYCLE COST CODE WHICH MAY BE USED FOR EITHER ENGINEERING ECONOMY PREDICTIONS OF FUEL CYCLE COSTS OR FOR ACCOUNTING FORECASTING OF SUCH COSTS. FEATURES OF CINCAS INCLUDE -

- (1) MONTHLY CALCULATION OF DOLLAR COSTS AND MASS INVENTORY ON A BATCH AND CASE BASIS FOR EACH MONTH OF A PERIOD WHICH IS USUALLY DEFINED AS (BUT NOT RESTRICTED TO) BEGINNING WITH THE DELIVERY OF FUEL TO THE REACTOR SITE AND ENDING WITH THE WITHDRAWAL OF FUEL FROM THE REACTOR.
- (2) A GENERAL FORMULA FOR THE UNIT PRICE OF ENRICHED URANIUM WHICH ALLOWS FOR VARIABLE FEED AND TAILS ENRICHMENTS, COSTS OF FEED, CHEMICAL CONVERSION, SEPARATIVE WORK, AND LOSSES IN CONVERSION AND FABRICATION.

367 ISOGEN ISOGEN CALCULATES RADICISO-
TOPE GENERATION AND DECAY, USING TWO-GROUP NEUTRON CROSS SECTIONS.

372 RAPFU RAPFU CALCULATES EQUILIBRIUM FUEL CYCLE ISOTOPICS IN FAST BREEDER REACTORS. THE RECYCLED PLUTONIUM IS PERMITTED TO HAVE DIFFERENT ISOTOPIC COMPOSITIONS IN TWO DIFFERENT CORE ZONES, AND SEVERAL RECYCLE SCHEMES ARE AVAILABLE AS OPTIONS. OUTPUT DATA INCLUDES THE INITIAL, AVERAGE, AND DISCHARGED FUEL ISOTOPIC CONCENTRATIONS FOR EACH REGION OF THE CORE ZONES AND THE BLANKETS, BREEDING RATIO, DOUBLING TIME, AND (OPTIONALLY) FUEL COSTS CALCULATED USING SIMPLIFIED RELATIONSHIPS.

418 CHAINS CHAINS COMPUTES THE ATOM DENSITY OF MEMBERS OF A SINGLE RADIOACTIVE DECAY CHAIN. THE LINEARITY OF THE BATEMAN EQUATIONS ALLOWS TRACING OF INTERCONNECTING CHAINS BY MANUALLY ACCUMULATING RESULTS FROM SEPARATE CALCULATIONS OF SINGLE CHAINS. RE-ENTRANT LOOPS CAN BE TREATED AS EXTENSIONS OF A SINGLE CHAIN. LOSSES FROM THE CHAIN ARE ALSO TALLIED.

423 DOS DOS COMPUTES THE LOCAL NEUTRON FLUX PER REFERENCE REACTOR POWER LEVEL WHICH WILL PRODUCE THE MEASURED ACTIVITY OF A DOSIMETER. ALTERNATIVELY, IF THE FLUX VALUE IS SUPPLIED, THE CORRESPONDING DOSIMETER ACTIVITY WILL BE CALCULATED.

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427 FARED FARED CONTAINS AN INTERNAL CROSS SECTION AVERAGING ROUTINE WHICH IS RESPONSIBLE FOR PREPARING BROAD GROUP CROSS SECTION SETS FOR VARIOUS MATERIAL REGIONS OF THE REACTOR. THE CROSS SECTION AVERAGING IS PERFORMED IN PROGRAM REGA, WHICH COMPUTES A B1 FLUX AND CURRENT IN UP TO 20 REACTOR BLOCK COMPOSITIONS FOR USE AS WEIGHTING FUNCTIONS IN THE CROSS SECTION COLLAPSING CALCULATION. A HOMOGENEOUS OR HETEROGENEOUS RESOLVED AND UNRESOLVED RESONANCE TREATMENT IS PROVIDED TO COMPUTE EFFECTIVE MICROGROUP RESONANCE CROSS SECTIONS FOR THE BLOCK MIXTURE OR UP TO 2 CELL TYPES PER BLOCK. REAL AND ADJOINT FLUX DISTRIBUTIONS ARE CALCULATED FOR ONE-DIMENSIONAL SLAB, CYLINDRICAL, OR SPHERICAL GEOMETRIES. THE REAL FLUXES ARE NORMALIZED TO YIELD DESIRED TOTAL REACTOR POWER. CRITICALITY SEARCHES MAY BE PERFORMED ON THE REACTOR DIMENSION, TRANSVERSE BUCKLING OR ZONE COMPOSITIONS. ENRICHMENT SEARCHES MAY BE PERFORMED TO YIELD DESIRED RATIOS OF MAXIMUM (OR AVERAGE) POWER DENSITIES IN SEVERAL ZONES. ZONWISE DEPLETION IS CALCULATED EITHER FOR A GIVEN TIME PERIOD OR UNTIL SPECIFIED CRITICALITY, BURNUP OR NUCLIDE CONCENTRATIONS ARE SATISFIED. FLEXIBLE FUEL MANAGEMENT IS AVAILABLE PERMITTING SPECIFIED MATERIAL UNITS TO BE MOVED INTO, CUT OF OR SHUFFLED WITHIN THE REACTOR. A WIDE VARIETY OF EDITS MAY BE PERFORMED, INCLUDING PERTURBATION AND KINETIC PARAMETERS CALCULATIONS.

438 BUG2 THE 2-DIMENSIONAL MULTIGROUP NEUTRON DIFFUSION THEORY EQUATIONS FOR X-Y OR R-Z GEOMETRY ARE SOLVED TO OBTAIN THE MULTIPLICATION FACTOR AND THE SPATIAL FLUX AND POWER DISTRIBUTIONS. COMPLETE REACTOR LIFE HISTORIES WITH PARTIAL REFUELING AT A NUMBER OF RELOAD POINTS CAN BE CALCULATED. THE DEPLETION SCHEME OF ALL BURNABLE NUCLIDES IS SPECIFIED BY THE USER AT EXECUTION TIME. A REGIONWISE DEPLETION SCHEME IS USED. CONCENTRATION DEPENDENT SELF-SHIELDING FACTORS MAY BE APPLIED TO ANY NUCLIDE.

439 BUGTRI THE 2-DIMENSIONAL MULTIGROUP NEUTRON DIFFUSION THEORY EQUATIONS FOR TRIANGULAR GEOMETRY ARE SOLVED TO OBTAIN THE MULTIPLICATION FACTOR AND THE SPATIAL FLUX AND POWER DISTRIBUTIONS. COMPLETE REACTOR LIFE HISTORIES WITH PARTIAL REFUELING AT A NUMBER OF RELOAD TIME POINTS CAN BE CALCULATED. THE DEPLETION SCHEME OF ALL BURNABLE NUCLIDES IS SPECIFIED BY THE USER AT EXECUTION TIME. A REGIONWISE DEPLETION SCHEME IS USED. CONCENTRATION DEPENDENT SELF-SHIELDING FACTORS MAY BE APPLIED TO ANY NUCLIDE.

441 PW COST PW COST IS USED TO CALCULATE NUCLEAR REACTOR FUEL CYCLE COSTS. INPUT FOR ALL COMPONENTS OF THE FUEL CYCLE ARE TIME-DEPENDENT. WORKING CAPITAL CHARGE RATES MAY BE SPECIFIED SEPARATELY FOR IN-CORE AND OUT-OF-CORE TIME PERIODS.

D. DEPLETION, FUEL MANAGEMENT, COST ANALYSIS, AND
REACTOR ECONOMICS

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454 PHENIX PHENIX IS A TWO-DIMENSIONAL, MULTIGROUP, DIFFUSION-BURNUP-REFUELING CODE FOR USE WITH FAST REACTORS. THE CODE IS DESIGNED PRIMARILY FOR FUEL-CYCLE ANALYSIS OF FAST REACTORS AND CAN BE USED TO CALCULATE THE DETAILED BURNUP AND REFUELING HISTORY OF FAST BREEDER REACTOR CONCEPTS HAVING ANY GENERALIZED FRACTIONAL BATCH RELOADING SCHEME. EITHER ORDINARY KEFF CALCULATIONS OR SEARCHES ON MATERIAL CONCENTRATION OR REGION DIMENSIONS CAN BE PERFORMED AT ANY TIME DURING THE BURNUP HISTORY. THE COMPLETE FUEL CYCLE HISTORY CAN BE CALCULATED IN ONE RUN, OR THE INDIVIDUAL BURNUP INTERVALS CAN BE TREATED SEPARATELY. THE REFUELING OPTION OF THE CODE ACCOUNTS FOR THE SPATIAL FLUX SHIFTS OVER THE REACTOR LIFETIME IN THE CALCULATION OF FUEL DISCHARGE.

456 DBUFIT1 DBUFIT1 IS DESIGNED TO EXTRACT INTEGRAL CROSS SECTION INFORMATION FROM ISOTOPIC BURNUP DATA. THIS INFORMATION IS OBTAINED BY FITTING BURNUP EQUATIONS TO THE ISOTOPIC DATA USING LEAST SQUARES FITTING TECHNIQUES. BURNUP EQUATIONS FOR THE FOLLOWING TRANSMUTATION CHAINS HAVE BEEN PROGRAMMED - PU239 TO PU242, U238 TO PU242, PU242 TO CM244 AND U235 TO PU238.

463 3DDT 3DDT IS A THREE-DIMENSIONAL (X-Y-Z OR R-THETA-Z) MULTIGROUP DIFFUSION THEORY CODE FOR USE IN FAST REACTOR ANALYSIS. THE CODE CAN BE USED TO COMPUTE KEFF OR TO PERFORM CRITICALITY SEARCHES ON REACTOR COMPOSITION, TIME ABSORPTION, AND REACTOR DIMENSIONS BY EITHER THE REGULAR OR THE ADJOINT FLUX EQUATIONS. MATERIAL BURNUP AND FISSION PRODUCT BUILDUP CAN BE COMPUTED FOR SPECIFIED TIME INTERVALS, AND CRITICALITY SEARCHES CAN BE PERFORMED DURING BURNUP TO COMPENSATE FOR FUEL DEPLETION AND FISSION PRODUCT GROWTH.

477 3DXT/DEP3 THESE TWO CODES WERE DEVELOPED FOR USE WITH DETAILED REACTOR PHYSICS CALCULATIONS TO OBTAIN 3-DIMENSIONAL XENON TRANSIENT (3DXT) AND DEPLETION (DEP3) CALCULATIONS. THEY ARE WELL SUITED FOR SURVEY STUDIES AND BECAUSE THEY INCORPORATE THREE-DIMENSIONAL EFFECTS WITH THERMAL FEEDBACK AND ROD SEARCH CAPABILITIES, ARE USEFUL FOR ASSESSING SITUATIONS SUCH AS ROD MISALIGNMENTS OR FUEL LOADING AND COOLANT FLOW ASYMMETRIES WHICH ARE TIME-CONSUMING AND OFTEN IMPOSSIBLE TO DETECT WITH DETAILED 1- OR 2-DIMENSIONAL CODES.

D. DEPLETION, FUEL MANAGEMENT, COST ANALYSIS, AND
REACTOR ECONOMICS

3/74

480 FUMBLE FUMBLE COMPUTES THE FUEL BURNUP IN REACTOR OPERATIONS. THIS INCLUDES THE EVALUATION OF REACTIVITY EFFECTS, BREEDING (OR DEPLETION) AND INVENTORIES OF FUEL, AND FUEL COSTS FOR CHANGING ECONOMIC CONDITIONS AND SUPPLIED FUEL COMPOSITIONS THROUGHOUT THE REACTOR LIFETIME (OR FOR AS MANY REFUELING OPERATING INTERVALS AS DESIRED). CONSIDERABLE FLEXIBILITY IS ALLOWED IN THE SPECIFICATIONS OF REACTOR REFUELING, INCLUDING FUEL COMPOSITIONS FOR THE STARTUP REACTOR, RECYCLE SCHEMES AND FISSILE MAKEUP COMPOSITIONS FOR SUBSEQUENT CORE LOADINGS, AMOUNTS OF FUEL TO BE REPLACED IN DIFFERENT POSITIONS OF THE REACTOR AT ANY REFUELING, AND SHUFFLING OF FUEL FROM ONE PART OF THE REACTOR TO ANOTHER OR TEMPORARILY STORING FUEL DISCHARGED FROM THE REACTOR FOR LATER ADDITIONAL BURNUP. THE REFUELING SPECIFICATIONS MAY BE CHANGED FROM ONE REFUELING OPERATING INTERVAL TO ANOTHER, AS WELL AS OPERATING INTERVAL TIME, POWER RATING, AND LOAD FACTOR. FUEL COSTS MAY BE EVALUATED FOR SEVERAL DIFFERENT SETS OF COST INPUT DATA (DIFFERENT ECONOMIC ASSUMPTIONS) AND MAY BE BASED ON NET COSTS ACCRUED AND ENERGY PRODUCED BY SPENT FUEL BATCHES AND/OR ON NET COSTS INCURRED FOR ALL FUEL HELD AND ENERGY PRODUCED BY THE ENTIRE REACTOR FOR EACH OPERATING INTERVAL.

495 SYN SYN CONTAINS TWO MAJOR SEGMENTS, BISYN AND BICYCL. THE BISYN SEGMENT SOLVES THE TWO-DIMENSIONAL MULTIGROUP NEUTRON DIFFUSION THEORY EQUATIONS IN R,Z OR X,Y GEOMETRY USING A NONITERATIVE SYNTHESIS METHOD. THIS APPROACH IS DESIGNED TO GREATLY REDUCE THE COMPUTER COST OF RUNNING TWO-DIMENSIONAL MULTIGROUP PROBLEMS AT THE RISK OF SOME LOSS IN ACCURACY OF THE DETAILED FLUX DISTRIBUTION. THIS SEGMENT ALSO CONTAINS A PERTURBATION AND EFFECTIVE DELAYED NEUTRON FRACTION CALCULATION.

THE BICYCL SEGMENT USES OUTPUT FROM BISYN TO SOLVE THE ONE-GROUP NEUTRON DEPLETION EQUATIONS. BICYCL ALLOWS THE USER TO SEARCH ON MAKEUP OR RECYCLE ISOTOPIC COMPOSITIONS FOR A FIRST CYCLE OF A FIRST CORE OR FOR EQUILIBRIUM CONCENTRATIONS. IT ALSO HAS PROVISIONS FOR FUEL SHUFFLING AND THE OPTION TO CYCLE BACK TO BISYN IN ORDER TO UPDATE THE FLUXES, ONE-GROUP CROSS SECTIONS, ETC.

498 CONCEPT2 CONCEPT2 GENERATES A CAPITAL COST ESTIMATE FOR A SELECTION OF PWR, BWR, CCAL, AND CIL STEAM-ELECTRIC POWER PLANTS WITH RUN-OF-RIVER, MECHANICAL DRAFT, OR NATURAL DRAFT COOLING SYSTEMS OF SPECIFIED ELECTRICAL OUTPUT (IN THE RANGE OF 500 TO 2000 MW(E)) FOR ANY OF TWENTY U. S. CITIES, A HYPOTHETICAL MIDDLETOWN, AND TWO CANADIAN CITIES, AND PRINTS AS A RESULT A DETAILED COST BREAKDOWN.

D. DEPLETION, FUEL MANAGEMENT, COST ANALYSIS, AND REACTOR ECONOMICS

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540 PACTOLUS/CLOTHO PACTOLUS IS A CODE FOR COMPUTING NUCLEAR POWER COSTS USING THE DISCOUNTED CASH FLOW METHOD. THE CASH FLOWS ARE GENERATED FROM INPUT UNIT COSTS, TIME SCHEDULES AND BURNUP DATA. CLOTHO CALCULATES AND COMMUNICATES TO PACTOLUS MASS FLOW DATA TO MATCH A SPECIFIED LOAD FACTOR HISTORY.

549 BIGDEAL BIGDEAL IS USED TO (1) CALCULATE THE MAXIMUM TEMPERATURES OF A SPENT YANKEE ATOMIC TYPE POWER REACTOR FUEL ASSEMBLY (36 0.305-IN. -OD BY 102-IN. - LONG STAINLESS STEEL FUEL RODS ON 0.422-IN. CENTERS) DURING SHEAR-LEACH PROCESSING, AND (2) CALCULATE PRESSURE BUILDUP WITHIN A BATCH DISSOLVER AS THE HOT FUEL IS QUENCHED BY COLD NITRIC ACID IN PREPARATION FOR AQUEOUS PROCESSING. THE FOLLOWING FIVE CASES, RELATED TO THE UNIT OPERATIONS OF SHEAR-LEACH, MAY BE INVESTIGATED - (1) FUEL SUBASSEMBLY SUSPENDED VERTICALLY IN WATER, (2) SUBASSEMBLY SUSPENDED HORIZONTALLY IN AIR, (3) SUBASSEMBLY CONTAINED WITHIN THE SHEAR FEED ENVELOPE, (4) 16 5-, 7-3/4-, OR 10-IN. ID BASKETS OF SHEARED FUEL STORED IN A 4 X 4 ARRAY ON 12-IN. CENTERS, AND (5) LEACHING OF 6 BASKETS IN A BATCH DISSOLVER.

567 3DB 3DB IS A THREE-DIMENSIONAL (X-Y-Z, R-THETA-Z, TRIANGULAR-Z) MULTIGROUP DIFFUSION CODE FOR USE IN DETAILED FAST-REACTOR CRITICALITY AND BURNUP ANALYSIS. THE CODE CAN BE USED TO -

- (A) COMPUTE KEFF AND PERFORM CRITICALITY SEARCHES ON TIME ABSORPTION, REACTOR COMPOSITION, AND REACTOR DIMENSIONS BY MEANS OF EITHER A FLUX OR AN ADJOINT MODEL,
- (B) COMPUTE MATERIAL BURNUP USING A FLEXIBLE MATERIAL SHUFFLING SCHEME, AND
- (C) COMPUTE FLUX DISTRIBUTIONS FOR AN ARBITRARY EXTRANEEOUS SOURCE.

576 GEM GEM IS USED TO PREDICT FUEL CYCLE COSTS FOR ANY TYPE NUCLEAR SYSTEM (I.E., BWR, HTGR, PWR, LMFBR, GCFR, . . .). THE CURRENT VERSION IS LIMITED TO THERMAL REACTORS. GEM IS DESIGNED FOR PRODUCTION USE BY LARGE UTILITIES WHICH HAVE SEVERAL REACTOR TYPES ON THEIR SYSTEM. GEM HAS BEEN WRITTEN SO AS TO ACCOMMODATE ALL MAJOR FUEL MANAGEMENT ACTIVITIES UNDERTAKEN BY A UTILITY -

- (1) FUEL BID ANALYSIS,
- (2) EVALUATION OF ACTUAL DAY TO DAY OPERATION, AND
- (3) SYSTEM SIMULATION AND OPTIMIZATION STUDIES.

579 DWARF DWARF ALLOWS ONE-DIMENSIONAL SIMULATION OF REACTOR BURNUP AND XENON OSCILLATION PROBLEMS IN SLAB, CYLINDRICAL, OR SPHERICAL GEOMETRY USING A FEW-GROUP DIFFUSION THEORY MODEL.

D. DEPLETION, FUEL MANAGEMENT, COST ANALYSIS, AND
REACTOR ECONOMICS

3/74

588 ORCOST ORCOST ESTIMATES DIRECT AND
INDIRECT CAPITAL COSTS OF NUCLEAR AND FOSSIL-FUELED STEAM-ELECTRIC
POWER PLANTS. THE COSTS ARE CALCULATED USING BASE COST MODELS
WHICH ARE INCLUDED IN THE PROGRAM FOR EACH OF THE FOLLOWING TYPES
OF PLANTS - PWR, BWR, COAL, GAS, AND OIL.

E. SPACE-INDEPENDENT KINETICS

3/74

121 AIREK3 AIREK3 FINDS THE NUMERICAL SOLUTION TO THE SPACE INDEPENDENT REACTOR KINETICS EQUATIONS BASED ON THE METHOD DEVELOPED BY E. R. COHEN. INPUT AND OUTPUT ARE SIMPLIFIED AND THE POWER, INVERSE PERIOD, FEEDBACKS, AND PRE-CURSOR ARE DISPLAYED GRAPHICALLY.

122 SNAPKIN5/SNAPKIN-5A SNAPKIN5 PROVIDES A ONE-REGION TIME-DEPENDENT CALCULATION OF POWER, ENERGY, TEMPERATURE, REACTIVITY, INVERSE PERIOD, AND HYDROGEN LOSS IN A SNAP REACTOR AFTER A PERTURBATION FROM GIVEN INITIAL CONDITIONS. SNAPKIN-5A, IN ADDITION, WEIGHS POWER, HEAT CAPACITY, AND REACTIVITY IMPORTANCE FOR TWENTY-FIVE OR FEWER REGIONS.

135 TRAFICORPORATION, COMPLEX TRAN EXPERIMENTAL FREQUENCY RESPONSE DATA OBTAINED FROM A LINEAR DYNAMIC SYSTEM IS PROCESSED TO OBTAIN THE TRANSFER FUNCTION AS A RATIO OF TWO FREQUENCY-DEPENDENT POLYNOMIALS. THE TRANSFER FUNCTION MAY HAVE NON-MINIMUM PHASE.

163 AIROS AIRCS SOLVES THE SPACE-INDEPENDENT REACTOR KINETICS EQUATIONS AND PROVIDES FOR THE DETERMINATION OF REACTIVITY BY SOLVING IN ADDITION THE DISCRETIZED EQUATIONS WHICH REPRESENT THE SPATIAL HEAT AND MASS TRANSFER MODEL FOR SEVERAL FUEL CHANNELS. IN ADDITION, VARIATION OF THE FILM COEFFICIENT WITH FLOW IS ACCOUNTED FOR AS WELL AS THE PROVISION FOR FLOW DECAY AND AFTERGLOW HEATING. SCRAMS CAN BE INITIATED BY DELAYED SIGNALS FROM INSTRUMENTS WHICH SENSE ANY QUANTITY CALCULATED, E.G., POWER, INVERSE PERIOD OR TEMPERATURE. GENERALIZED FEEDBACK EQUATIONS ARE USED TO PROVIDE FLEXIBILITY IN THE MODELS THAT REPRESENT MULTICHANNEL HEAT TRANSFER INCLUDING CONDUCTION AND CONVECTION, ENERGY, PRESSURE AND OTHER PHENOMENON. THE REACTIVITY EQUATION IS ALSO GENERALIZED. THE REACTIVITY FEEDBACK COEFFICIENTS CAN BE CONSTANT OR VARY AS THE SQUARE ROOT OR RECIPROCAL OF TEMPERATURE. FURTHERMORE ANY FEEDBACK VARIABLE CAN BE USED TO INITIATE A REACTIVITY SCRAM, EACH WITH A UNIQUE DELAY TIME.

168 INVERSE KINETICS (RI02) GIVEN THE SPACE-INDEPENDENT, ONE ENERGY GROUP REACTOR KINETICS EQUATIONS AND THE INITIAL CONDITIONS, THIS PROGRAM DETERMINES THE TIME VARIATION OF REACTIVITY REQUIRED TO PRODUCE THE GIVEN INPUT OF FLUX-TIME DATA.

188 CMPXMAT A SYSTEM OF N LINEAR EQUATIONS DERIVED FROM THE LAPLACE TRANSFORM OF A SET OF LINEARIZED DIFFERENTIAL EQUATIONS IS SOLVED FOR AMPLITUDE AND PHASE ANGLE AS A FUNCTION OF FREQUENCY.

E. SPACE-INDEPENDENT KINETICS

3/74

255 R101 R101 SOLVES THE SPACE-INDEPENDENT, ONE-ENERGY GROUP REACTOR KINETICS EQUATIONS TO DETERMINE THE TIME VARIATION OF NEUTRON DENSITY GIVEN SPECIFIED INITIAL CONDITIONS. ANY OF FOUR PROGRAMMED REPRESENTATIONS OF EXCESS REACTIVITY CAN BE SELECTED.

290 GASA (GENERAL ATOMIC STABILITY GASA DETERMINES THE STABILITY OF ANY PHYSICAL SYSTEM WHOSE MOTION IS DESCRIBABLE BY A SET OF FIRST-ORDER LINEAR DIFFERENTIAL EQUATIONS. IN PARTICULAR GASA EVALUATES THE STABILITY OF A REACTOR DESCRIBED BY THE LINEAR REACTOR KINETICS EQUATIONS WITH TEMPERATURE FEEDBACK, AGAINST PERTURBATIONS ABOUT ANY OPERATING POWER LEVEL. THE PROGRAM WILL ALSO CALCULATE AND PLOT THE TRANSFER FUNCTION BETWEEN ANY STATE VARIABLE OF THE SYSTEM AND A GIVEN EXTERNAL FORCING FUNCTION (SUCH AS AN EXTERNAL REACTIVITY PERTURBATION) OR ANOTHER STATE VARIABLE OF THE SYSTEM.

303 BLOOST6 BLOOST6 COMBINES A REACTOR SPACE-INDEPENDENT KINETICS CODE WITH A TWO-DIMENSIONAL HEAT TRANSFER CODE, AND A TIME-DEPENDENT SPHERICAL GEOMETRY HEAT TRANSFER ROUTINE FOR FUEL PARTICLES. THE CODE IS APPLICABLE TO PROBLEMS FOR WHICH THE SPACE-INDEPENDENT FORM OF THE REACTOR KINETICS EQUATION IS APPLICABLE.

317 GAPOTKIN GAPOTKIN IS A POINT KINETICS CODE THAT SOLVES THE SPACE-INDEPENDENT KINETICS EQUATIONS FOR A VERY GENERAL FORM OF THE REACTIVITY FUNCTION.

E. SPACE-INDEPENDENT KINETICS

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326 AIROS2A AIROS2A SOLVES THE SPACE-INDEPENDENT REACTOR KINETICS EQUATIONS AND PROVIDES FOR THE DETERMINATION OF REACTIVITY BY SOLVING IN ADDITION THE DISCRETIZED EQUATIONS THAT REPRESENT THE SPATIAL HEAT AND MASS TRANSFER MODEL FOR SEVERAL FUEL CHANNELS. IN ADDITION, VARIATION OF THE FILM COEFFICIENT WITH FLOW IS ACCOUNTED FOR ALONG WITH THE PROVISION FOR FLOW DECAY AND AFTERGLOW HEATING. SCRAMS CAN BE INITIATED BY DELAYED SIGNALS FROM INSTRUMENTS THAT SENSE ANY QUANTITY CALCULATED, E.G., POWER, INVERSE PERIOD OR TEMPERATURE. GENERALIZED FEEDBACK EQUATIONS ARE USED TO PROVIDE FLEXIBILITY IN THE MODELS THAT REPRESENT MULTICHANNEL HEAT TRANSFER INCLUDING CONDUCTION AND CONVECTION, ENERGY, PRESSURE AND OTHER PHENOMENON SUCH AS FUEL MELTING, COOLANT BOILING AND VOIDING BURN-OUT. THE REACTIVITY EQUATION IS ALSO GENERALIZED. THE REACTIVITY FEEDBACK COEFFICIENTS CAN BE CONSTANT OR VARY AS THE SQUARE ROOT OR RECIPROCAL OF TEMPERATURE. FURTHERMORE, ANY FEEDBACK VARIABLE CAN BE USED TO INITIATE A REACTIVITY SCRAM, EACH WITH A UNIQUE DELAY TIME. AN INPUT GENERATOR COMPUTES THE CONDUCTION AND CONVECTION COEFFICIENTS FOR AN $N \times M$ NODAL, MULTICHANNEL SYSTEM USING BUILT-IN TABLES OF SPECIFIC HEAT, DENSITY, CONDUCTIVITY AND VISCOSITY FOR THE COMMON FUEL, STRUCTURE AND COOLANT MATERIALS, AND PERFORMS AN INITIAL TEMPERATURE CALCULATION. THE FILM COEFFICIENTS MAY BE SPECIFIED OR CALCULATED USING LYONS EQUATION OR THE DITTUS-BOELTER EQUATION.

363 BLAST BLAST HAS BEEN DEVELOPED TO STUDY ACCIDENT CONDITIONS IN CRITICAL AND SUBCRITICAL THERMAL MULTIPLYING SYSTEMS. THE PROGRAMME COMPUTES THE TIME BEHAVIOUR OF THE THERMAL NEUTRON DENSITY AND THE SYSTEM TEMPERATURE FOLLOWING A STEP CHANGE IN REACTIVITY. THE INTEGRATED THERMAL NEUTRON DENSITY IS ALSO COMPUTED, FROM WHICH THE TOTAL NUMBER OF FISSIONS DURING AN EXCURSION MAY BE OBTAINED.

486 ANCON ANCON SOLVES THE POINT-REACTOR KINETIC EQUATIONS INCLUDING THERMAL FEEDBACK. LUMP-TYPE HEAT BALANCE EQUATIONS ARE USED TO REPRESENT THE THERMODYNAMICS, AND THE HEAT CAPACITY OF EACH LUMP CAN VARY WITH TEMPERATURE. THERMAL FEEDBACK CAN BE EITHER A LINEAR OR A NON-LINEAR FUNCTION OF LUMP TEMPERATURE, AND THE IMPRESSED REACTIVITY CAN BE EITHER A POLYNOMIAL OR SINUSOIDAL FUNCTION.

489 TRIFIDO THE CODE CALCULATES THE DECAY CONSTANT AND THE POPULATION OF THE FUNDAMENTAL PROMPT NEUTRON MODE EXTRAPOLATED TO INITIAL TIME, USING PULSED NEUTRON EXPERIMENTAL DATA. THESE DATA ARE THE RESULTING TIME PROFILE OF THE NEUTRON DENSITY OF A SUBCRITICAL MULTIPLICATIVE ASSEMBLY WHICH IS REPETITIVELY PULSED WITH SHORT BURSTS OF NEUTRONS. THE TIME PROFILE IS MEASURED WITH AN APPROPRIATE DETECTOR AND RECORDED WITH A TIME ANALYSER. WITH THE CALCULATED PARAMETERS THE CODE DETERMINES THE VALUES OF $(k*\beta)/\lambda$ AND REACTIVITY BY MEANS OF THE GARELIS-RUSSELL METHOD, AND REACTIVITIES USING THE GOZANI AND SJOSTRAND METHODS.

491 MOD5 MOD5 CALCULATES THE TIME- AND ENERGY-DEPENDENT EVOLUTION OF THE NEUTRON DENSITY IN HOMOGENEOUS MEDIA FOLLOWING INITIATION OF A) A MONOENERGETIC SOURCE DISTRIBUTED OVER A FINITE TIME INTERVAL, OR B) A SOURCE OF ARBITRARY SPECTRUM WITH A DELTA-FUNCTION DISTRIBUTION IN TIME. EFFECTIVELY THE CODE PRODUCES GREENS FUNCTION SOLUTIONS TO THE SLOWING-DOWN EQUATION IN DISCRETE NUMERICAL FORM. LEAKAGE IS TREATED IN THE DIFFUSION APPROXIMATION. THE PROGRAM A) CALCULATES SPECTRA AND ENERGY MOMENTS AT SELECTED TIMES FOLLOWING THE BURST OF SOURCE NEUTRONS, B) EVALUATES THE TIME-DEPENDENT NEUTRON DENSITY AND SLOWING-DOWN DENSITY AT SELECTED ENERGIES AND COMPUTES MOMENTS OF THESE DENSITIES, C) CALCULATES TIME-DEPENDENT DISTRIBUTIONS OF CAPTURE, LEAKAGE AND FIRST FISSION, AND MOMENTS OF THESE DISTRIBUTIONS, D) CALCULATES STEADY-STATE CENTRAL CORE NEUTRON FLUX AND LEAKAGE FLUX IN DETAIL AND IN GROUP-AVERAGED FORM, AND E) CALCULATES PARAMETERS SUCH AS k_{eff} .

558 TASK TASK SOLVES THE ONE-DIMENSIONAL MULTIGROUP FORM OF THE REACTOR KINETICS EQUATIONS, USING EITHER TRANSPORT OR DIFFUSION THEORY AND ALLOWING AN ARBITRARY NUMBER OF DELAYED NEUTRON GROUPS. THE PROGRAM CAN ALSO BE USED TO SOLVE STANDARD STATIC PROBLEMS EFFICIENTLY SUCH AS EIGENVALUE PROBLEMS, DISTRIBUTED SOURCE PROBLEMS, AND BOUNDARY SOURCE PROBLEMS. CONVERGENCE PROBLEMS ASSOCIATED WITH SOURCES IN HIGHLY MULTIPLICATIVE MEDIA ARE CIRCUMVENTED, AND SUCH PROBLEMS ARE READILY CALCULABLE.

F. SPACE-TIME KINETICS, COUPLED NEUTRONICS-HYDRODYNAMICS-THERMODYNAMICS AND EXCURSION SIMULATIONS

102 AX1 AX1 PERFORMS A COUPLED NEU-
TRONICS-HYDRODYNAMICS CALCULATION. GIVEN A SPHERICALLY SYMMETRIC,
SUPERPROMPT CRITICAL SYSTEM, THE PROGRAM COMPUTES THE VARIATION IN
TIME AND SPACE OF THE SPECIFIC ENERGY, TEMPERATURE, PRESSURE,
DENSITY AND VELOCITY.

129 CONEC CONEC IS A COUPLED NEUTRONIC-ELASTICITY CODE DESIGNED FOR APPLICATION TO PULSED FAST REACTOR SYSTEMS. IT IS A ONE-DIMENSIONAL CALCULATION, CAPABLE OF DEALING WITH SOLID SPHERES OR SPHERICAL SHELLS. SPECIFICALLY, CONEC CALCULATES THE ALPHA OF A SYSTEM, THE TEMPERATURE DISTRIBUTION, THE RADIAL AND TANGENTIAL STRESS DISTRIBUTIONS, AND FROM THESE THE ACCELERATIONS, VELOCITIES, AND DISPLACEMENTS THROUGHOUT THE SYSTEM.

145 WEAK EXPLOSION PROGRAM THIS PROGRAM PERFORMS A COUPLED NEUTRONICS-HYDRODYNAMICS CALCULATION FOR A SPHERICALLY SYMMETRIC REACTOR CORE WITH A GIVEN COMPOSITION TO OBTAIN THE TIME-DEPENDENT ENERGY RELEASE THAT RESULTS FROM THE INSERTION OF REACTIVITY AT A GIVEN RATE. THE BASIC USE FOR THIS PROGRAM IS FOUND IN ANALYSIS OF FAST REACTOR CORE COLLAPSE ACCIDENTS.

153 HATCHET HATCHET IS A MAJOR MODIFICATION OF THE AX1 CODE DESIGNED TO STUDY BURST CHARACTERISTICS OF A SUPERPROMPT CRITICAL, CONCENTRIC SHELL, PULSED REACTOR. IT COMPUTES SPECIFIC ENERGY, TEMPERATURE, PRESSURE, DENSITY AND VELOCITY VARIATIONS AS A FUNCTION OF TIME AND SPACE. THE CODE ALSO COMPUTES REACTIVITY AS A FUNCTION OF INVERSE REACTOR PERIOD, POWER, THE TOTAL AND KINETIC ENERGIES, AND THE POSITION OF THE SHELLS WHICH COMPRISE THE SYSTEM.

F. SPACE-TIME KINETICS, COUPLED NEUTRONICS-HYDRODYNAMICS-
THERMODYNAMICS AND EXCURSION SIMULATIONS

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174 FORE/FORE2 FORE CALCULATES REACTOR POWER AND TEMPERATURES OF FUEL, COOLANT, CLAD, AND STRUCTURE AS FUNCTIONS OF TIME IN RESPONSE TO A PROGRAMMED REACTIVITY INSERTION SPECIFIED AS A SERIES OF RAMPS. TEMPERATURE PROFILES ARE COMPUTED AT SPECIFIED AXIAL POSITIONS FOR AN AVERAGE CHANNEL AND FOR THE PEAK POWER (CENTRAL) CHANNEL. THE HEAT OF FUSION ACCOMPANYING FUEL MELTING IS TAKEN INTO ACCOUNT. FEEDBACK REACTIVITY MECHANISMS THAT RESPOND TO CHANGES OF TEMPERATURES INCLUDE THE FUEL DOPPLER EFFECT AND THERMAL EXPANSION OF THE CORE (AND AXIAL BLANKET OR REFLECTOR) MATERIALS. FORE2 IS A COUPLED THERMAL HYDRAULICS-POINT KINETICS DIGITAL COMPUTER CODE DESIGNED TO CALCULATE SIGNIFICANT REACTOR PARAMETERS UNDER STEADY-STATE CONDITIONS, OR AS FUNCTIONS OF TIME DURING TRANSIENTS. THE TRANSIENTS MAY RESULT FROM A PROGRAMMED REACTIVITY INSERTION OR A POWER CHANGE. VARIABLE INLET COOLANT FLOW RATE AND TEMPERATURE ARE CONSIDERED. THE CODE CALCULATES THE REACTOR POWER, THE INDIVIDUAL REACTIVITY FEEDBACKS, AND THE TEMPERATURE OF COOLANT, CLADDING, FUEL, STRUCTURE, AND ADDITIONAL MATERIAL FOR UP TO SEVEN AXIAL POSITIONS IN THREE CHANNEL TYPES WHICH REPRESENT RADIAL ZONES OF THE REACTOR. THE HEAT OF FUSION ACCOMPANYING FUEL MELTING, THE LIQUID METAL VOIDING REACTIVITY, AND THE SPATIAL AND THE TIME VARIATION OF THE FUEL CLADDING GAP COEFFICIENT DUE TO CHANGES IN GAP SIZE ARE CONSIDERED.

- 191 AX-TNT AX-TNT SOLVES
- (A) THE COUPLED HYDRODYNAMIC, THERMODYNAMIC AND NEUTRONIC EQUATIONS WHICH DESCRIBE A SPHERICAL, SUPER-PROMPT CRITICAL REACTOR SYSTEM DURING AN EXCURSION,
 - (B) THE COUPLED EQUATIONS OF MOTION, AND IDEAL GAS EQUATION OF STATE FOR THE DETONATION OF A SPHERICAL CHARGE IN A GAS.

274 WIGL2 WIGL2 IS A ONE-DIMENSIONAL TWO-GROUP SPACE-TIME DIFFUSION THEORY PROGRAM WITH ZERO, ONE, OR SIX DELAYED NEUTRON GROUPS. THE PROGRAM WILL TREAT SLAB, CYLINDRICAL, AND SPHERICAL GEOMETRIES AND INCLUDES NON-BOILING HEAT TRANSFER. IT ACCOUNTS FOR XENON FEEDBACK AND FEEDBACK EFFECTS DUE TO FUEL AND COOLANT TEMPERATURE. CONTROL ROD MOTION AND CONTROL SYSTEM FEEDBACK BASED ON TOTAL CORE POWER OR OUTLET COOLANT TEMPERATURE CAN BE SIMULATED. TRANSIENTS MAY BE EXCITED BY PRESCRIBED CHANGES IN INLET COOLANT TEMPERATURE, COOLANT FLOW RATE, OR ROD POSITION.

F. SPACE-TIME KINETICS, COUPLED NEUTRONICS-HYDRODYNAMICS-THERMODYNAMICS AND EXCURSION SIMULATIONS

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293 MARS MARS PERFORMS A COUPLED NEUTRONICS-HYDRODYNAMICS CALCULATION FOR A FINITE CYLINDER CORE WITH CONCENTRIC REGIONS OF DIFFERENT COMPOSITIONS AND CHARACTERISTICS TO OBTAIN THE TIME-DEPENDENT ENERGY RELEASE THAT RESULTS FROM THE INSERTION OF REACTIVITY ACCORDING TO A PRESCRIBED PROGRAM. THE BASIC USE FOR THIS PROGRAM IS FOUND IN ANALYSIS OF FAST REACTOR CORE COLLAPSE ACCIDENTS. THE REACTIVITY CHANGES DUE TO MATERIAL DISPLACEMENT IS DETERMINED BY THE USE OF PERTURBATION THEORY AND THE PRESSURE GENERATION FOR THE HYDRODYNAMICS CALCULATION IS DETERMINED BY THE THE USE OF AN EXPONENTIAL FORM FOR THE SATURATED VAPOR PRESSURE CURVE. THE DOPPLER EFFECT IS DETERMINED BY THE USE OF A FLEXIBLE $T^{*}(-N)$ FORM WHERE N IS A PARAMETER THAT IS SPECIFIED AT THE TIME OF EXECUTION. THE EXTERNAL REACTIVITY INSERTION CAN BE IN THE FORM OF A STEP, A LINEAR RAMP OR A PARABOLIC RAMP, WITH A LIMIT ON THE AMOUNT OF REACTIVITY WHICH CAN BE INSERTED BEING A DEFINABLE QUANTITY. TABULATED VALUES OF THE POWER AND MATERIAL WORTH DISTRIBUTIONS ARE ACCEPTED AS INPUT. THE CHARACTERISTICS OF EACH REGION (DENSITY, SPECIFIC HEAT, DOPPLER COEFFICIENT, EQUATION OF STATE, GEOMETRIC LIMITS) ARE SPECIFIED INDEPENDENTLY FOR EACH REGION TO PROVIDE FLEXIBILITY IN THE TREATMENT OF CORES OF UNUSUAL CONFIGURATION. THE NEUTRON KINETICS CALCULATIONS ARE DONE WITH A POINT REACTOR MODEL AND DELAYED NEUTRONS ARE USED.

309 TSN THE TIME-DEPENDENT NEUTRON TRANSPORT EQUATION IS SOLVED. ENERGY DEPOSITION IS ALLOWED TO CAUSE VARIATION IN THE NEUTRON CROSS SECTIONS FOR THE CORE REGION, IN THE CORE DENSITY, AND IN CORE HEIGHT. THE RESULT IS A KINETICS CALCULATION INCLUDING SPATIAL DEPENDENCE BOTH IN FEEDBACK EFFECTS AND IN NEUTRON DENSITY. THE RESULTS ARE SUMMARIZED IN A MANNER SIMILAR TO POINT-KINETICS CODES, AND SPATIAL DISTRIBUTIONS ARE ALSO GIVEN. GRAPHICAL SUMMARIES OF THE SIGNIFICANT VARIABLES AND SPATIAL DISTRIBUTIONS ARE GIVEN. IN THE IBM360 VERSION, EITHER THE NEUTRON YIELD FROM FISSION OR THE THICKNESS OF A SPECIFIED ZONE CAN BE CHANGED AS AN INDEPENDENT FUNCTION OF TIME AS SPECIFIED BY THE USER. THIS PROVIDES TWO WAYS OF ALLOWING EXPLICIT REACTIVITY VARIATION WITH TIME.

310 GAKIN THE MULTIGROUP, 1-DIMENSIONAL TIME-DEPENDENT DIFFUSION THEORY EQUATIONS ARE SOLVED IN SLAB, CYLINDRICAL OR SPHERICAL GEOMETRY WITH DELAYED NEUTRONS TAKEN INTO ACCOUNT. AN ARBITRARY SCATTERING MATRIX IS ALLOWED, TOGETHER WITH A PIECE-WISE, LINEAR, TIME-DEPENDENT, INHOMOGENEOUS SOURCE TERM. FEEDBACK IS AVAILABLE FROM TIME-DEPENDENT CROSS SECTION CHANGES AND BUILDUP IN XENON. THE TIME INTEGRATION IS DIVIDED INTO TIME ZONES WITH UNIQUE FEEDBACK AND SOURCE DATA FOR EACH ZONE.

F. SPACE-TIME KINETICS, COUPLED NEUTRONICS-HYDRODYNAMICS-
THERMODYNAMICS AND EXCURSION SIMULATIONS

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338 TWIGL/TWIGGLE TWIGL SOLVES THE TWO-DIMENSIONAL, TWO-GROUP, SPACE-TIME NEUTRON DIFFUSION EQUATIONS IN RECTANGULAR OR CYLINDRICAL GEOMETRY IN THE PRESENCE OF TEMPERATURE FEEDBACK. THE NEUTRON DIFFUSION AND DELAYED PRECURSOR EQUATIONS ARE DIFFERENCED IN BOTH SPACE AND TIME. THE THERMAL-HYDRAULIC DESCRIPTION IS BASED ON A NO-BOILING, ONE-PASS MODEL FORMULATED IN TERMS OF REGIONWISE-AVERAGED COOLANT AND FUEL METAL TEMPERATURES.

352 RAUMZEIT RAUMZEIT SOLVES SYSTEMS OF ONE-DIMENSIONAL, TIME-DEPENDENT, MULTIGROUP DIFFUSION-TYPE EQUATIONS USING EITHER OF TWO TREATMENTS OF THE TIME DEPENDENCE, FINITE DIFFERENCING OR THE TIME-INTEGRATED APPROACH (SEE REFERENCE 2).

370 GAKIT GAKIT SOLVES THE MULTIGROUP, ONE-DIMENSIONAL, TIME-DEPENDENT DIFFUSION THEORY KINETICS EQUATIONS INCLUDING DELAYED NEUTRON EFFECTS AND TEMPERATURE FEEDBACK BASED ON TWO-DIMENSIONAL HEAT TRANSFER CALCULATIONS. FOR THE ONE-DIMENSIONAL MULTIGROUP KINETICS EQUATIONS AN ARBITRARY SCATTERING MATRIX AND ARBITRARY FISSION TRANSFER ARE ALLOWED, AND PLANE, CYLINDRICAL, OR SPHERICAL GEOMETRY MIGHT BE USED. A PIECEWISE LINEAR TIME-DEPENDENT INHOMOGENEOUS SOURCE CAN BE SPECIFIED. FEEDBACK IS AVAILABLE FROM XENON BUILDUP AND TEMPERATURE DEPENDENCE OF CROSS SECTIONS. THE HEAT TRANSFER CALCULATION IS PERFORMED FOR TWO-DIMENSIONAL R-Z FUEL ELEMENT MODELS ASSUMING PREDETERMINED AXIAL POWER SHAPE FUNCTIONS AND TIME-DEPENDENT POWER AMPLITUDES OBTAINED FROM THE ONE-DIMENSIONAL KINETICS CALCULATIONS. FOR THE FUEL ELEMENTS AVERAGE FUEL AND MODERATOR TEMPERATURES ARE CALCULATED WHICH DETERMINE, BASED ON TABLES, THE TEMPERATURE-DEPENDENT CROSS SECTIONS. TRANSIENTS MAY BE INTRODUCED BY STEP CHANGES OF CROSS SECTIONS, BY PIECEWISE LINEAR TIME-DEPENDENT CROSS SECTIONS (ROD WITHDRAWAL ACCIDENTS), BY STEP CHANGES OF THE FLOW RATES OR BY STEP CHANGES OF THE COOLANT INLET TEMPERATURES.

371 NOWIG NOWIG IS USED TO SOLVE THE ONE-DIMENSIONAL TWO-GROUP NEUTRON DIFFUSION AND DELAYED PRECURSOR EQUATIONS USING A SHAPE-SPECIFIED POINT KINETICS APPROXIMATION. FEEDBACK DUE TO CHANGES IN THE FUEL METAL TEMPERATURE AND COOLANT DENSITY IS ACCOUNTED FOR BY USING A MODEL WHICH IS IDENTICAL WITH THAT USED IN THE WIGL2 (ACC ABSTRACT 274) PROGRAM.

389 STINT3 STINT3 SOLVES STATIC (EIGENVALUE) AND TIME-DEPENDENT SYSTEMS OF COUPLED, ONE-DIMENSIONAL, DIFFUSION TYPE EQUATIONS IN SLAB GEOMETRY AND IS PRIMARILY INTENDED FOR SOLVING SINGLE-CHANNEL, FLUX-SYNTHESIS EQUATIONS. THE CODE PROVIDES FOR CONTROL ROD ACTION AND TEMPERATURE FEEDBACK.

F. SPACE-TIME KINETICS, COUPLED NEUTRONICS-HYDRODYNAMICS-THERMODYNAMICS AND EXCURSION SIMULATIONS

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400 SASIA SASIA IS USED FOR THE ANALYSIS OF FAST REACTOR POWER AND FLOW TRANSIENTS. THE PROGRAM CONSISTS OF FOUR DRIVER PROGRAMS EACH CALLED BY THE MAIN PROGRAM. THESE DRIVERS HANDLE THE AREAS OF (1) INPUT/OUTPUT, WITH DIAGNOSTICS, (2) STEADY-STATE INITIALIZATION, TO DEFINE THE CORE OPERATING CONDITIONS BEFORE THE INITIATION OF THE TRANSIENT, (3) THE TRANSIENT PORTION, AND (4) THE DISASSEMBLY (WFAK EXPLOSION) ANALYSIS.

405 NOAH NOAH SOLVES THE ONE-DIMENSIONAL, ONE-GROUP SPACE-TIME DIFFUSION EQUATION ACCOUNTING FOR THE EFFECTS OF FUEL, CLAD, AND COOLANT TEMPERATURES (OR BY CHANGING SUBROUTINES FUEL, COOLANT, AND SOLID MODERATOR TEMPERATURES) ON FISSION AND ABSORPTION CROSS SECTIONS, AND ON THE DIFFUSION COEFFICIENT AND THE TRANSVERSE BUCKLING. IT CAN ACCOUNT FOR THE EFFECTS OF XENON-IODINE FEEDBACK. IF DESIRED, IT WILL DETERMINE LONG-TIME XENON-FLUX BEHAVIOR ASSUMING THE TEMPERATURES TO BE IN QUASI-STATIC EQUILIBRIUM. NUMEROUS METHODS OF PERTURBATION ARE ALLOWED AND CONTROL OF THE TRANSIENT IS ALSO PROVIDED.

415 CEXE/INCEXE CEXE SOLVES THE THREE-DIMENSIONAL XYZ TIME-DEPENDENT XENON SPATIAL OSCILLATION PROBLEM USING A MODIFIED ONE ENERGY GROUP THEORY AND A NOCAL REPRESENTATION.

474 QX1 QX1 SOLVES THE MULTIGROUP, ONE-DIMENSIONAL, TIME-DEPENDENT DIFFUSION EQUATIONS. PROBLEM GEOMETRY MAY BE PLANE, CYLINDRICAL, OR SPHERICAL. STEADY-STATE INITIAL CONDITIONS MAY BE ESTABLISHED EITHER FOR A SOURCE-FREE SYSTEM OR FOR A SYSTEM WITH AN EXTERNAL NEUTRON SOURCE. THE REACTOR MAY BE PERTURBED BY CHANGING MATERIAL VOLUME FRACTIONS AND/OR TEMPERATURES OR BY CHANGING THE NEUTRON SOURCE LEVEL. A FIRST-COLLISION PULSED SOURCE DISTRIBUTION MAY BE SPECIFIED. RESONANCE ABSORPTION FEEDBACK IS CALCULATED BY GROUPWISE INTERPOLATION IN A CROSS-SECTION VERSUS TEMPERATURE TABLE. A HIGHLY SIMPLIFIED FUEL TEMPERATURE MODEL IS INCLUDED.

488 NOISY1 AUTO- AND CROSS-SPECTRAL DENSITY FUNCTIONS ARE CALCULATED FOR NEUTRON FLUCTUATIONS IN NUCLEAR REACTORS. THE CALCULATIONS ARE POINT-WISE, SPACE-DEPENDENT IN CUBICAL REACTORS WHICH ARE HOMOGENEOUS AND BARE. EITHER NEUTRON FLUCTUATIONS OR THE FLUCTUATIONS SEEN BY A NEUTRON DETECTOR CAN BE SPECIFIED. FLUCTUATIONS BETWEEN EITHER TWO POINTS OR BETWEEN TWO FINITE REGIONS CAN BE CONSIDERED. THE FINITE REGIONS OR SIMULATED DETECTORS MUST EITHER FULLY OVERLAP OR NOT OVERLAP AND ARE RESTRICTED IN SHAPE TO RECTANGULAR PARALLELEPIPEDS.

F. SPACE-TIME KINETICS, COUPLED NEUTRONICS-HYDRODYNAMICS-
THERMODYNAMICS AND EXCURSION SIMULATIONS

3/74

494 ADEP THE TIME-DEPENDENT FEW-GROUP
NEUTRON DIFFUSION EQUATIONS ARE SOLVED IN ONE OR TWO DIMENSIONS.
LUMPED PARAMETER THERMAL-HYDRAULIC EQUATIONS ARE USED TO CALCULATE
FEEDBACK.

511 VENUS VENUS COMPUTES THE POWER,
ENERGY RELEASE AND SPACE-TIME (R-Z GEOMETRY) HISTORY OF THE TEMP-
ERATURE, PRESSURE, DENSITY AND MATERIAL MOTION OF AN LMFBR DURING
A DISASSEMBLY EXCURSION. REACTIVITY FEEDBACK DUE TO DOPPLER
BROADENING AND MOTION OF THE REACTOR MATERIAL IS TAKEN INTO
ACCOUNT.

550 REXCO-H (RELEASE 1) REXCO-H CALCULATES THE TWO-
DIMENSIONAL HYDRODYNAMIC RESPONSE OF PRIMARY REACTOR CONTAINMENT
TO A HIGH-ENERGY EXCURSION.

G. RADIOLOGICAL SAFETY, HAZARD AND ACCIDENT ANALYSIS

3/74

47 CLOUD THE CLOUD PROGRAM CALCULATES THE EXTERNAL GAMMA-RAY DOSE RATE AND TOTAL INTEGRATED DOSE RESULTING FROM THE CONTINUOUS RELEASE OF RADIOACTIVE MATERIALS TO THE ATMOSPHERE.

172 AISITE2/R153 AISITE2 IS LARGELY BASED ON METHODS PROPOSED BY THE AEC IN TID-14844 BUT DIFFERS IN CERTAIN OF THE ASSUMPTIONS AND MODELS. THE CODE AUTOMATICALLY VARIES ANY ONE OF 46 PARAMETERS SUCH AS REACTOR POWER, BUILDING LEAK RATE, IODINE CLEAN-UP RATE, AND HALOGEN FILTER EFFICIENCY, COMPUTING THE EXCLUSION AREA, AND LOW POPULATION BOUNDARY ZONES AS FUNCTIONS OF THAT PARAMETER. THE EDIT INCLUDES DOSE VS. DISTANCE DATA, FRACTIONAL CONTRIBUTION BY ISOTOPE GROUP TO THE INHALATION DOSE, AND CRITICAL DISTANCES PROVIDING BOTH PRINTED AND GRAPHICAL DATA. THREE MODELS ARE AVAILABLE FOR FISSION PRODUCT RELEASE WITH UP TO 4 LEVELS OF CONTAINMENT.

196 CURIE/DOSE/THUNDERHEAD CURIE CALCULATES THE FISSION PRODUCT INVENTORY PRODUCED IN A REACTOR DURING CONSTANT POWER OPERATION AND RELEASES DIFFERENT PERCENTAGES OF THE NOBLE GASES, HALOGENS, AND PARTICULATES TO THE ATMOSPHERE AT REACTOR SHUTDOWN. DOSE CALCULATES THE TOTAL DOSE TO 13 INTERNAL BODY ORGANS RESULTING FROM INHALATION OF THE PASSING RADIOACTIVE CLOUD. THUNDERHEAD CALCULATES THE EXTERNAL CLOUD GAMMA EXPOSURE DOSE FROM THE RELEASED FISSION PRODUCTS.

200 SATURATED BLOWDOWN2 CALCULATION OF LOCAL PRESSURES, MASS FLOW RATES, FLUID QUALITIES, SPECIFIC VOLUMES, TEMPERATURES AND LOCAL HEAT TRANSFER COEFFICIENTS AT WETTED WALLS, DURING BLOWDOWN OF THE REACTOR PRIMARY COOLANT LOOP.

228 PRECON THE PURPOSE OF THE PROGRAM IS TO DETERMINE, FOR A GAS-COOLED REACTOR, THE CONTAINMENT PRESSURE AS A FUNCTION OF TIME, AFTER RUPTURES HAVE BEEN ASSUMED TO OCCUR IN THE PRIMARY SYSTEM OR IN CONJUNCTION WITH STEAM GENERATOR RUPTURES.

229 ELBOW DEFLECTIONS, RESTRAINT FORCES AND STRESSES ARE DETERMINED IN A FUEL ELEMENT SUBJECTED TO ASYMMETRIC POWER GENERATION, CIRCUMFERENTIALLY NON-UNIFORM COOLANT TEMPERATURE DISTRIBUTION, AND ASYMMETRIC FAST NEUTRON FLUX DAMAGE.

G. RADIOLOGICAL SAFETY, HAZARD AND ACCIDENT ANALYSIS

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261 GADOSE/DOSET THE GADOSE PROGRAM CALCULATES RADIOACTIVITY AND DOSES RESULTING FROM INSTANTANEOUS ACCIDENTAL RELEASE OF ACTIVITY WHILE THE COMPANION PROGRAM DOSET INCLUDES THE EFFECTS OF A TIME-DEPENDENT ACCIDENTAL FISSION PRODUCT RELEASE FOR THE HTGR TYPE OF PLANT. GIVEN AN INITIAL FISSION PRODUCT INVENTORY RELEASED INTO A REACTOR VESSEL OR CONTAINMENT VOLUME, THE QUANTITY OF EACH ISOTOPE IS CALCULATED AT A NUMBER OF TIMES AT A NUMBER OF LOCATIONS (IN THE CONTAINMENT, CONTAINMENT RECIRCULATING CLEANUP FILTERS, LEAK COLLECTOR, PLANT EXHAUST FILTERS AND IN THE ATMOSPHERE AT A NUMBER OF DISTANCES FROM THE PLANT). EACH DECAY CHAIN IS CALCULATED SEPARATELY CONSIDERING BUILDUP AND DECAY OF EACH ISOTOPE. RADIOLOGICAL DOSES ARE CALCULATED FOR ANY THREE BODY ORGANS AND THE WHOLE BODY BASED ON METEOROLOGICAL AND PHYSIOLOGICAL INPUT PARAMETERS. FALLOUT AND RAINCUT ARE INCLUDED.

265 RSAC RSAC GENERATES A FISSION PRODUCT INVENTORY FROM A GIVEN SET OF REACTOR OPERATING CONDITIONS AND THEN COMPUTES THE EXTERNAL GAMMA DOSE, THE DEPOSITION GAMMA DOSE, AND/OR THE INHALATION-INGESTION DOSE TO CRITICAL BODY ORGANS AS A RESULT OF EXPOSURE TO THESE FISSION PRODUCTS. PROGRAM OUTPUT INCLUDES REACTOR OPERATING HISTORY, FISSION PRODUCT INVENTORY, DOSAGES, AND INGESTION PARAMETERS.

268 TRANS-FUGUE1 TRANS-FUGUE1 IS A TRANSIENT SINGLE CHANNEL, TWO-PHASE FLOW, AND HEAT TRANSFER CODE FOR ANALYSIS OF POSTULATED REACTOR INCIDENTS INVOLVING BOILING. THE CODE IS BASED ON A HOMOGENEOUS HYDRODYNAMIC MODEL WHICH ASSUMES EQUAL PHASE TEMPERATURES AND VELOCITIES. IT ASSUMES VAPOR GENERATION TO BE HEAT TRANSFER LIMITED ONLY, AND CALCULATES AXIAL DISTRIBUTION OF VELOCITY, VOID FRACTION, PRESSURE, COOLANT TEMPERATURE, AND FUEL TEMPERATURE. TRANSIENTS SIMULATING POWER EXCURSIONS, LOSS OF FLOW, LOSS OF PRESSURE AND CHANNEL PLUGGING CAN BE STUDIED.

G. RADIOLOGICAL SAFETY, HAZARD AND ACCIDENT ANALYSIS

3/74

278 WHAM/WATER-HAMMER WHAM IS USED TO CALCULATE PRESSURE, VELOCITY, AND FORCE TRANSIENTS IN THE LIQUID FILLED PIPING NETWORKS. IT CAN BE APPLIED TO MULTI-LOOP, COMPLEX PIPING NETWORKS CONSISTING OF ANY NUMBER OF DEAD ENDS, ELBOWS, ORIFICES, MULTIPLE BRANCH TEES, CHANGES OF FLOW PASSAGE CROSS SECTIONS, CHECK VALVES, PUMPS, PRESSURIZERS OR TANKS, AND EXIT VALVES. HYDRAULIC LOSSES ARE CONSIDERED. TRANSIENTS CAN BE INITIATED EITHER, BY CLOSURE OR BY OPENING OF ONE OR MORE EXIT VALVES (OR BY THE SYSTEM RUPTURE AT ONE OR MORE PLACES), OR BY A PRESCRIBED CHANGE IN THE TANK (OR PRESSURIZER) PRESSURE, OR BY THE PUMP POWER FAILURE. WHAM IS AN EXTENSION OF THE PROGRAM WATER-HAMMER. WATER-HAMMER ANALYZES HYDRAULIC TRANSIENTS IMPOSED BY THE SUDDEN DISCHARGE OF LIQUID FROM THE PRIMARY COOLANT LOOP, BEFORE ANY GENERATION OF VAPOR HAS TAKEN PLACE. EFFECTS OF HYDRAULIC LOSSES ARE NEGLECTED, THE LOOP PRESSURIZER IS ASSUMED TO REMAIN CONSTANT AT INITIAL PRESSURE AND THE PRESENCE OF A PUMP IS IGNORED. IT WAS DESIGNED FOR THE EARLY BLOWDOWN ANALYSIS FOR LOFT.

284 M0555(ACT1) THIS PROGRAM WILL PREDICT THE PRESSURE TRANSIENT IN THE CONTAINMENT VESSEL AS A FUNCTION OF TIME AS A RESULT OF A MAJOR RUPTURE IN THE PRIMARY SYSTEM OF A PRESSURIZED WATER REACTOR. MEANS ARE AVAILABLE FOR INTRODUCING WATER AND HEAT INTO THE CONTAINMENT VESSEL. THERE ARE ALSO PROVISIONS FOR SPECIFYING VARIOUS TYPES OF HEAT SINKS FOR ENERGY ABSORPTION. THE TEMPERATURE DISTRIBUTION IN THESE HEAT SINKS IS CALCULATED AS A FUNCTION OF TIME. DISCHARGE RATES OF THE CONTAINMENT MAY ALSO BE DETERMINED AS A FUNCTION OF BOTH TIME AND THE INTERNAL PRESSURE.

295 FLASH3 FLASH3 DETERMINES THE TRANSIENT RESPONSE OF A WATER-COOLED REACTOR TO A LOSS-OF-COOLANT ACCIDENT OR SEVERE VARIABLE PRESSURE OPERATION.

G. RADIOLOGICAL SAFETY, HAZARD AND ACCIDENT ANALYSIS

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297 CONTEMPT THE CONTEMPT COMPUTER PROGRAM PREDICTS THE PRESSURE-TEMPERATURE RESPONSE OF A DRY WELL CONTAINMENT BUILDING TO A LOSS-OF-COOLANT ACCIDENT. THE CONTAINMENT VOLUME IS SEPARATED INTO A LIQUID REGION AND A VAPOR REGION. EACH REGION IS ASSUMED TO HAVE A UNIFORM TEMPERATURE BUT THE TEMPERATURE OF THE TWO REGIONS MAY BE DIFFERENT. THE CONTAINMENT BUILDING IS REPRESENTED AS CONSISTING OF SEVERAL HEAT CONDUCTING STRUCTURES WHOSE THERMAL BEHAVIOR CAN BE DESCRIBED BY THE ONE-DIMENSIONAL MULTIREGION HEAT CONDUCTION EQUATION. WATER AND ENERGY RATES FROM DISCHARGE OF COOLANT, THE BOILING OF RESIDUAL WATER BY REACTOR DECAY HEAT, THE SUPERHEATING OF STEAM PASSING THROUGH THE CORE, AND METAL-WATER REACTIONS ARE ASSUMED AVAILABLE FROM PREVIOUS CALCULATIONS AND ARE INPUT DATA TO CONTEMPT. PROGRAM OUTPUT INCLUDES CONTAINMENT VOLUME PRESSURE AND TEMPERATURES, TEMPERATURE THROUGH BUILDING STRUCTURES, AND THE AMOUNT OF WATER, VAPOR, AND ENERGY IN THE CONTAINMENT VOLUMES. THE PROGRAM ALSO CALCULATES BUILDING LEAKAGE AND THE EFFECTS OF ENGINEERED SAFEGUARD DEVICES SUCH AS WATER SPRAY AND FAN COOLER SYSTEMS.

328 NURLOC-1.0 NURLOC-1.0 PERFORMS CORE / PRESSURE VESSEL THERMAL ANALYSIS FOR A NUCLEAR REACTOR LOSS-OF-COOLANT ACCIDENT.

330 ECCSA4 ECCSA4 PREDICTS THE THERMAL AND HYDRAULIC BEHAVIOR OF A SINGLE FUEL ROD AND ITS ASSOCIATED CORE FLOW CHANNEL DURING A LOSS-OF-COOLANT ACCIDENT AND SUBSEQUENT EMERGENCY CORE COOLING INJECTION.

366 CHEMLOC2 CHEMLOC2 IS USED TO COMPUTE THE EXTENT OF CORE HEATING AND METAL-STEAM REACTION FOLLOWING A HYPOTHETICAL LOSS-OF-COOLANT ACCIDENT, INCLUDING EMERGENCY CORE-COOLING FAILURE, IN A WATER-COOLED REACTOR. THE PROGRAM INCLUDES THE EFFECTS OF HEAT PRODUCTION BY DECAY HEATING IN THE FUEL AS WELL AS BY STEAM-METAL CHEMICAL REACTION, HEAT TRANSFER FROM THE CORE TO THE BOTTOM AND TOP GRID-SUPPORT PLATES AND TO THE WALL SURROUNDING THE CORE, AND METHODS OF CALCULATING THE EFFECTS OF CORE MOVEMENT AND MATERIAL TRANSFER ON REACHING SLUMPING TEMPERATURE.

G. RADIOLOGICAL SAFETY, HAZARD AND ACCIDENT ANALYSIS

3/74

369 RELAP3 RELAP3 IS USED TO CALCULATE FLOWS, MASS INVENTORIES, PRESSURES, TEMPERATURES, REACTIVITIES, AND REACTOR POWER FOR THE PRIMARY SYSTEM OF A WATER REACTOR DURING SEVERE TRANSIENTS OR ACCIDENTS. THE SPECIFIC ACCIDENT FOR WHICH THE PROGRAM WAS WRITTEN IS THE LOSS-OF-COOLANT BUT OTHERS, SUCH AS LOSS-OF-PUMPING-POWER OR INSERTION-OF-REACTIVITY, CAN ALSO BE HANDLED. THE REACTOR PRIMARY SYSTEM CAN BE APPROXIMATED BY AN ARBITRARY NUMBER OF CONTROL VOLUMES, INTERCONNECTED IN AN ARBITRARY MANNER BY JUNCTIONS. ANY NUMBER OF VOLUMES CAN BE CHOSEN TO CONTAIN ENERGY SOURCES (CORE REGIONS) OR ENERGY SINKS (HEAT EXCHANGERS). ANY NUMBER OF JUNCTIONS CAN BE SELECTED TO REPRESENT COOLANT SINKS (LEAKS), COOLANT SOURCES (FILL SYSTEMS), OR NORMAL JUNCTIONS (CONNECTIONS BETWEEN CONTROL VOLUMES). PROVISIONS ARE MADE FOR THE USE OF PUMPS, CHECK VALVES, CONTROL ROD INSERTION, AND OTHER FEATURES OF WATER-COOLED REACTORS.

433 CONTEMPT-LT/022 THE CONTEMPT-LT PROGRAM PREDICTS THE PRESSURE-TEMPERATURE RESPONSE OF A DRY WELL OR A DRY WELL WITH VENTS AND PRESSURE SUPPRESSION SYSTEM TO A LOSS-OF-COOLANT ACCIDENT. AN ADDITIONAL DUAL CONTAINMENT COMPARTMENT MAY ALSO BE MODELED IF DESIRED. THE DRY WELL IS SEPARATED INTO A LIQUID REGION AND A VAPOR REGION. EACH REGION IS ASSUMED TO HAVE A UNIFORM TEMPERATURE BUT THE TEMPERATURES OF THE TWO REGIONS MAY BE DIFFERENT. THE CONTAINMENT BUILDING IS REPRESENTED AS CONSISTING OF SEVERAL HEAT CONDUCTING STRUCTURES WHOSE THERMAL BEHAVIOR CAN BE DESCRIBED BY THE ONE-DIMENSIONAL MULTI-REGION HEAT CONDUCTION EQUATIONS. WATER AND ENERGY RATES FROM DISCHARGE OF COOLANT, BOILING OF RESIDUAL WATER BY REACTOR DECAY HEAT, SUPERHEATING OF STEAM PASSING THROUGH THE CORE, AND METAL-WATER REACTIONS ARE ASSUMED AVAILABLE FROM PREVIOUS CALCULATIONS AND ARE INPUT DATA TO THE PROGRAM. PROGRAM OUTPUT INCLUDES CONTAINMENT VOLUME PRESSURE AND TEMPERATURE, TEMPERATURES THROUGH THE BUILDING STRUCTURES, AND THE AMOUNT OF WATER, VAPOR, AND ENERGY IN THE CONTAINMENT VOLUMES. THE PRESSURE SUPPRESSION CALCULATIONS INCLUDE VENT CLEARING AND FLOW OF A TWO-COMPONENT TWO-PHASE WATER-AIR MIXTURE THROUGH THE VENTS, AND A MASS-ENERGY BALANCE IN THE WET WELL. THERE ARE PROVISIONS FOR NORMAL BUILDING LEAKAGE, LEAKAGE FROM PENETRATIONS, A FAN COOLER SYSTEM, AND DRY AND WET WELL SPRAY SYSTEMS.

435 BURST1 BURST1 PROVIDES FOR THE STUDY OF PRESSURIZED LIQUID IN A CYLINDRICAL SYSTEM IMMEDIATELY AFTER A RUPTURE OCCURS AT ONE OR BOTH ENDS OF THE SYSTEM. PRESSURE, MASS VELOCITY, AND ENTHALPY ARE CALCULATED AT EQUALLY-SPACED MESH POINTS ALONG THE LENGTH OF THE SYSTEM. THIS IS A ONE-DIMENSIONAL REPRESENTATION, ASSUMING UNIFORM CONDITIONS THROUGHOUT ANY GIVEN CROSS-SECTIONAL AREA. FORCES ON DESIGNATED SECTIONS OF THE SYSTEM CAN ALSO BE COMPUTED, WITH PROVISION FOR DIRECTIONAL CHANGES.

G. RADIOLOGICAL SAFETY, HAZARD AND ACCIDENT ANALYSIS

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443 HAA3 HAA3 EVALUATES AN APPROXIMATION TO THE GENERAL INTEGRO-DIFFERENTIAL EQUATION WHICH DESCRIBES AEROSOL BEHAVIOR. THE PHYSICAL MODEL INCLUDES PARTICLE GENERATION, BROWNIAN AND GRAVITATIONAL AGGLOMERATION, SETTLING, PLATING, AND LEAKAGE FOR SPHERICAL PARTICLES. THE APPROXIMATION IS THE REQUIREMENT THAT THE SIZE DISTRIBUTION FUNCTION BE LOG-NORMAL. THE TIME-DEPENDENT PHYSICAL QUANTITIES COMPUTED ARE (1) PLATED, SETTLED, SUSPENDED, AND LEAKED VOLUME FRACTIONS, (2) GEOMETRIC MEAN DEVIATION, NUMBER CONCENTRATION, AND GEOMETRIC MEAN RADIUS FOR THE LOG-NORMAL DISTRIBUTION OF THE SUSPENDED MATERIAL, (3) THE 50 PERCENT RADIUS (BY MASS) FOR THE SUSPENDED MATERIAL, (4) THE NUMBER AND VOLUME DISTRIBUTIONS (FUNCTIONS OF RADIUS) FOR THE SETTLED, PLATED, AND LEAKED MATERIAL, (5) THE EFFECTIVE RADII FOR THE SUSPENDED, SETTLED, AND PLATED MATERIAL.

448 FLASH4 FLASH4 IS USED TO DETERMINE THE TRANSIENT RESPONSE OF A WATER-COOLED REACTOR OR HYDRAULIC SYSTEM TO SEVERE VARIABLE PRESSURE OPERATION.

479 FREADM1 FREADM1 IS A FAST REACTOR MULTICHANNEL ACCIDENT ANALYSIS PROGRAM DESIGNED TO EFFICIENTLY SIMULATE A REACTOR TRANSIENT FROM INITIATION TO THE POINT OF CORE DISASSEMBLY. MODELS ARE INCLUDED FOR NUCLEAR KINETICS (POINT MODEL), CORE THERMO-HYDRAULICS, VOIDING, FUEL REDISTRIBUTION, FAILURE PROPAGATION, PROGRAMMED REACTIVITY INSERTION, AND THE DYNAMICS OF PRIMARY SYSTEM COOLANT FLOW. A BROAD RANGE OF ASSUMED ACCIDENT INITIATING AND PROPAGATING ACTIVITIES MAY BE SIMULATED USING TRIGGERING LOGIC INCLUDED IN THE CODE.

499 MIRAB/MIRAP THE CODE MIRAB IS USED FOR BWR REACTORS AND MIRAP IS FOR PWR REACTORS. THE CODES CALCULATE THE REMOVAL OF FISSION PRODUCT IODINE FROM A DRY-TYPE BWR/PWR CONTAINMENT SYSTEM ATMOSPHERE UNDER REACTOR ACCIDENT CONDITIONS. THE METHOD CONSIDERS THE SIMULTANEOUS REMOVAL BY NATURAL DEPOSITION ON SURFACES OR ABSORPTION IN WATER, BY ENGINEERED SPRAY SYSTEM OPERATION, BY ADSORPTION ON FILTERS, AND BY LEAKAGE FROM THE CONTAINMENT. IN ADDITION, THE SIMULTANEOUS BEHAVIOR OF THREE IODINE FORMS IS MODELED - SPECIFICALLY ELEMENTAL IODINE, METHYL IODINE, AND PARTICULATE IODINE. THE PROGRAMS GENERATE IODINE CONCENTRATIONS AND ACCUMULATIONS THROUGHOUT THE CONTAINMENT SYSTEM AS A FUNCTION OF TIME AFTER START OF THE ACCIDENT.

G. RADIOLOGICAL SAFETY, HAZARD AND ACCIDENT ANALYSIS

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500 FRCRL2 THE CODE CALCULATES THE CUM-
ULATIVE FRACTIONAL RELEASE OF FISSION PRODUCTS FROM NUCLEAR RE-
ACTOR FUEL UNDER POSTULATED LOSS-OF-COOLANT ACCIDENT CONDITIONS.
THE MATHEMATICAL MODEL FOR RELEASE IS BASED ON SIMPLE VOLUME DIF-
FUSION THEORY AND THE EQUIVALENT-SPHERE APPROXIMATION OF FUEL
POROSITY. BOTH THE OPERATIONAL PREACCIDENT RELEASE COMPONENT AND
THE ACCIDENT CORE THERMAL TRANSIENT-INDUCED RELEASE COMPONENT ARE
CALCULATED. DETAILED CORE TEMPERATURE DATA ARE NEEDED TO MAKE
THE LATTER SET OF COMPUTATIONS. IN ADDITION, SPECIFIC CORE POWER
DISTRIBUTION FACTORS AND FISSION PRODUCT DIFFUSION PARAMETERS
MUST BE SUPPLIED.

508 MUCHA1/MUCHA2 MUCHA1 PREDICTS THE THERMAL
AND HYDRAULIC BEHAVIOR OF ANY TWO REACTOR FUEL RODS AND THEIR
ASSOCIATED PARALLEL FLOW CHANNELS DURING A LOSS-OF-COOLANT ACCI-
DENT USING AS BOUNDARY CONDITIONS PLENUM FLUID CONDITIONS DETER-
MINED BY MUCHA2 OR A SYSTEM-ORIENTED CODE. MUCHA2 PREDICTS THE
THERMAL AND HYDRAULIC BEHAVIOR OF THE PRIMARY COOLANT WITHIN
THE REACTOR PRESSURE VESSEL DURING A LOSS-OF-COOLANT ACCIDENT.
THE HEATED CORE IS REPRESENTED BY TWO EQUIVALENT FUEL RODS AND
THEIR ASSOCIATED PARALLEL FLOW CHANNELS. A PLENUM MODEL HAS BEEN
DEVELOPED TO PREDICT THE UPPER AND LOWER PLENUM FLUID CONDITIONS
THROUGHOUT THE ACCIDENT SEQUENCE FOR USE AS BOUNDARY CONDITIONS
FOR THE PARALLEL CORE CHANNELS.

512 THETA1B THETA1B COMPUTES THE THERMAL
RESPONSE CHARACTERISTICS OF A NUCLEAR FUEL ROD SUBJECTED TO A
LOSS-OF-COOLANT ACCIDENT ENVIRONMENT.

G. RADIOLOGICAL SAFETY, HAZARD AND ACCIDENT ANALYSIS

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528 PREP/KITT THE PREP/KITT COMPUTER PROGRAM PACKAGE OBTAINS SYSTEM RELIABILITY INFORMATION FROM A SYSTEM FAULT TREE. THE PREP PROGRAM FINDS THE MINIMAL CUT SETS AND/OR THE MINIMAL PATH SETS OF THE SYSTEM FAULT TREE. (A MINIMAL CUT SET IS A SMALLEST SET OF COMPONENTS SUCH THAT IF ALL THE COMPONENTS ARE SIMULTANEOUSLY FAILED THE SYSTEM IS FAILED. A MINIMAL PATH SET IS A SMALLEST SET OF COMPONENTS SUCH THAT IF ALL OF THE COMPONENTS ARE SIMULTANEOUSLY FUNCTIONING THE SYSTEM IS FUNCTIONING.) THE KITT PROGRAMS DETERMINE RELIABILITY INFORMATION FOR THE COMPONENTS OF EACH MINIMAL CUT OR PATH SET, FOR EACH MINIMAL CUT OR PATH SET, AND FOR THE SYSTEM. EXACT, TIME-DEPENDENT RELIABILITY INFORMATION IS DETERMINED FOR EACH COMPONENT AND FOR EACH MINIMAL CUT SET OR PATH SET. FOR THE SYSTEM, RELIABILITY RESULTS ARE OBTAINED BY UPPER BOUND APPROXIMATIONS OR BY A BRACKETING PROCEDURE IN WHICH VARIOUS UPPER AND LOWER BOUNDS MAY BE OBTAINED AS CLOSE TO ONE ANOTHER AS DESIRED. THE KITT PROGRAMS CAN HANDLE INDEPENDENT COMPONENTS WHICH ARE NONREPAIRABLE OR WHICH HAVE A CONSTANT REPAIR TIME. ANY ASSORTMENT OF NONREPAIRABLE COMPONENTS AND COMPONENTS HAVING CONSTANT REPAIR TIMES CAN BE CONSIDERED. ANY INHIBIT CONDITIONS HAVING CONSTANT PROBABILITIES OF OCCURRENCE CAN BE HANDLED. THE FAILURE INTENSITY OF EACH COMPONENT IS ASSUMED TO BE CONSTANT WITH RESPECT TO TIME. THE KITT2 PROGRAM CAN ALSO HANDLE COMPONENTS WHICH DURING DIFFERENT TIME INTERVALS, CALLED PHASES, MAY HAVE DIFFERENT RELIABILITY PROPERTIES.

529 ANVENT THE ANVENT PROGRAM WAS DEVELOPED TO ANALYZE THERMAL EFFECTS OF A LOSS-OF-COOLANT ACCIDENT (LOCA) IN A WESTINGHOUSE ICE CONDENSER NUCLEAR UNIT, SIMILAR TO THE DUKE POWER COMPANYS MCGUIRE UNITS. THE PROGRAM IS CAPABLE OF EVALUATING (1) STEADY-STATE RADIAL TEMPERATURE DISTRIBUTIONS CORRESPONDING TO FIXED INSIDE AND OUTSIDE TEMPERATURES, (2) RADIAL TEMPERATURE DISTRIBUTIONS IN THE STEEL CONTAINMENT SHELL AND THE CONCRETE REACTOR (SHIELD) BUILDING DURING THE POST-LOCA TRANSIENT, (3) TEMPERATURE AND PRESSURE IN THE ANNULUS BETWEEN THE CONTAINMENT SHELL AND REACTOR BUILDING DURING THE POST-LOCA TRANSIENT, AND (4) CAPABILITY OF THE ANNULUS VENTILATION FAN TO QUICKLY ATTAIN AND MAINTAIN A VACUUM IN THE ANNULUS AFTER A LOCA OCCURS.

G. RADIOLOGICAL SAFETY, HAZARD AND ACCIDENT ANALYSIS

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546 EMERALD THE EMERALD PROGRAM IS DESIGNED FOR THE CALCULATION OF RADIATION RELEASES AND EXPOSURES RESULTING FROM NORMAL AND ABNORMAL OPERATION OF A LARGE PRESSURIZED WATER REACTOR. THE APPROACH USED IN EMERALD IS SIMILAR TO AN ANALOG SIMULATION OF A REAL SYSTEM. EACH COMPONENT OR VOLUME IN THE PLANT WHICH CONTAINS A RADIOACTIVE MATERIAL IS REPRESENTED BY A SUBROUTINE, WHICH KEEPS TRACK OF THE PRODUCTION, TRANSFER, DECAY AND ABSORPTION OF RADIOACTIVITY IN THAT VOLUME. DURING THE COURSE OF THE ANALYSIS OF AN ACCIDENT, ACTIVITY IS TRANSFERRED FROM SUBROUTINE TO SUBROUTINE IN THE PROGRAM AS IT WOULD BE TRANSFERRED FROM PLACE TO PLACE IN THE PLANT. FOR EXAMPLE, IN THE CALCULATION OF THE DOSES RESULTING FROM A LOSS-OF-COOLANT ACCIDENT THE PROGRAM FIRST CALCULATES THE ACTIVITY BUILT UP IN THE FUEL BEFORE THE ACCIDENT, THEN RELEASES SOME OF THIS ACTIVITY TO THE CONTAINMENT VOLUME. SOME OF THIS ACTIVITY IS THEN RELEASED TO THE ATMOSPHERE. THE RATES OF TRANSFER, LEAKAGE, PRODUCTION, CLEANUP, DECAY, AND RELEASE ARE READ IN AS INPUT TO THE PROGRAM. SUBROUTINES ARE ALSO INCLUDED WHICH CALCULATE THE ON-SITE AND OFF-SITE RADIATION EXPOSURES AT VARIOUS DISTANCES, FOR INDIVIDUAL ISOTOPES AND SUMS OF ISOTOPES. THE PROGRAM CONTAINS A LIBRARY OF PHYSICAL DATA FOR THE TWENTY-FIVE ISOTOPES OF MOST INTEREST IN LICENSING CALCULATIONS, AND OTHER ISOTOPES CAN BE ADDED OR SUBSTITUTED. BECAUSE OF THE FLEXIBLE NATURE OF THE SIMULATION APPROACH, THE EMERALD PROGRAM CAN BE USED FOR MOST CALCULATIONS INVOLVING THE PRODUCTION AND RELEASE OF RADIOACTIVE MATERIALS, INCLUDING DESIGN, OPERATIONAL AND LICENSING STUDIES.

548 CEBUG THE TRANSIENT HYDRAULIC BEHAVIOR OF THE SODIUM IN A SODIUM-HEATED STEAM GENERATOR IN WHICH A SODIUM-WATER REACTION OCCURS DUE TO A LARGE WATER LEAK IS CALCULATED FOR FLOWS IN UP TO THREE DIMENSIONS.

554 DISPER DISPER DETERMINES THE AEROSOL PARTICLE SOURCE STRENGTH OUTSIDE AN ENCLOSURE DUE TO A RELEASE OF AEROSOL PARTICLES WITHIN THE ENCLOSURE. THE RELEASE IS ASSUMED TO PRESSURIZE THE ENCLOSURE AND THE AIRBORNE PARTICLES ARE CARRIED BY THE ESCAPING GAS INTO LEAK PATHS IN THE ENCLOSURE WALLS. HERE, THEY MAY BE DEPOSITED ON THE LEAK PATH WALLS OR REMAIN ENTRAINED AND ESCAPE FROM THE ENCLOSURE.

555 PARET THIS PROGRAM IS DESIGNED FOR USE IN PREDICTING THE COURSE AND CONSEQUENCES OF NONDESTRUCTIVE REACTIVITY ACCIDENTS IN SMALL REACTOR CORES.

G. RADIOLOGICAL SAFETY, HAZARD AND ACCIDENT ANALYSIS

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559 SOFIRE2 1- AND 2-CELL SOFIRE2 ONE CELL, CALCULATES THE CONSEQUENCES OF A SODIUM POOL FIRE IN A CLOSED VAULT. GAS PRESSURE IN THE VAULT IS CALCULATED FROM THE GAS DENSITY AND TEMPERATURE. SOFIRE2 TWO CELL, CALCULATES THE CONSEQUENCES OF A SODIUM POOL FIRE IN A VAULT CONNECTED TO A CONTAINMENT STRUCTURE THROUGH A RESTRICTED OPENING. COLD GAS FLOWS FROM THE CONTAINMENT TO THE VAULT DUE TO MASS DIFFERENCES WHILE HOT GAS FLOWS FROM THE VAULT TO THE CONTAINMENT TO EQUILIBRATE PRESSURES. PRESSURE IN THE CONTAINMENT IS CALCULATED FROM THE GAS DENSITY AND TEMPERATURE. IN BOTH PROGRAMS THE SODIUM BURNING RATE IS GOVERNED BY THE RATE OF OXYGEN DIFFUSION TO THE SODIUM SURFACE.

583 STEFEG STEFEG CALCULATES GASEOUS SOURCE TERMS. IT COMPUTES THE GASEOUS RELEASES THROUGH VARIOUS PATHS FROM BOILING WATER REACTORS AND/OR PRESSURIZED WATER REACTORS.

584 FPFM FPFM IS USED IN RADIOLOGICAL SAFETY ANALYSES OF LINE REACTORS (BWR'S AND PWR'S ONLY) TO CALCULATE: (1) MAXIMUM NOBLE GAS RELEASE TO THE FUEL CLADDING GAP FOR TOTAL CORE DURING STEADY-STATE OPERATION, (2) NOBLE GAS RELEASED TO THE REACTOR PRIMARY SYSTEM FOR SELECTED PIN PERFORATIONS, AND (3) INTERNAL PIN PRESSURE (OPTIONAL).

590 INTEG/INSPEC THESE PROGRAMS ANALYZE THE CHARACTERISTICS OF A GENERAL MODEL DEVELOPED TO REPRESENT THE SAFETY ASPECTS OF AN OPERATING NUCLEAR REACTOR. THESE CHARACTERISTICS ARE THE FREQUENCIES OF INCIDENTS THAT ARE DEPARTURES FROM THE EXPECTED BEHAVIOR OF THE REACTOR. EACH INCIDENT IS ASSUMED TO BE PRECEDED BY A SEQUENCE OF EVENTS STARTING AT SOME INITIATING EVENT. AT EACH MEMBER IN THIS SEQUENCE THERE MAY BE FUNCTIONS SUCH AS SAFETY CIRCUITS, AND PERSONNEL OPERATIONS THAT STOP THE SEQUENCE AT THAT MEMBER. WHEN MECHANICAL DEVICES FAIL THEY ARE ASSUMED TO REMAIN INOPERATIVE UNTIL REPAIRED. THE MODEL ACCOUNTS FOR SCHEDULED INSPECTION AND MAINTENANCE OF ALL EQUIPMENT IN THE SYSTEM.

G. RADIOLOGICAL SAFETY, HAZARD AND ACCIDENT ANALYSIS

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600 EGAD EGAD CALCULATES GAMMA DOSE INTEGRALS TO A GROUND LEVEL RECEPTOR, FOR INCREMENTAL VALUES OF THE VERTICAL DISPERSION PARAMETER SIGMA-Z, AS A FUNCTION OF GAMMA ENERGY AND SPATIAL DISTRIBUTION OF THE RADIOACTIVE MATERIAL. THE DOSE INTEGRALS ARE REPRESENTATIVE OF SECTOR AVERAGES SINCE THE DISTRIBUTION OF MATERIAL IS ASSUMED TO BE GAUSSIAN IN THE VERTICAL, HOMOGENEOUS IN THE HORIZONTAL, AND BOUNDED BETWEEN GROUND LEVEL AND AN INVERSION LID. CALCULATED DOSE INTEGRALS ARE INDEPENDENT OF RADIOACTIVE DECAY, TRANSPORT VELOCITY, DOWNWIND DISTANCE, AND SECTOR WIDTH. SPACE ATTENUATION AND BUILDUP ARE TAKEN INTO ACCOUNT.

H. HEAT TRANSFER AND FLUID FLOW

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152 ARGUS (RE248) THIS PROGRAM CALCULATES TRANSIENT TEMPERATURES IN A CONCENTRIC, CYLINDRICAL CONFIGURATION. UP TO 25 CONCENTRIC REGIONS ARE ALLOWED, EACH CONTAINING EITHER A STATIONARY (SOLID OR NON-FLOWING LIQUID) OR TURBULENTLY FLOWING (LIQUID OR GAS) MATERIAL. ANY STATIONARY REGION CAN HAVE SPATIAL- AND TIME-DEPENDENT HEAT GENERATION. TEMPERATURES ARE CALCULATED AT NODE POINTS EQUALLY-SPACED WITHIN A REGION. FILM COEFFICIENTS ON FLOWING REGION BOUNDARIES ARE CALCULATED BY THE PROGRAM. TIME-DEPENDENT COOLANT VELOCITIES ARE PERMITTED. THE HEAT SOURCE IS ASSUMED TO BE ANGULAR INDEPENDENT. AXIAL HEAT CONDUCTION IS NEGLECTED, BUT AXIAL HEAT TRANSPORT DUE TO MATERIAL MOTION IS CONSIDERED IN THE FLOWING REGIONS.

155 PTH1 THIS PROGRAM CALCULATES CONTAINMENT SHELL PRESSURE-TEMPERATURE HISTORY RESULTING FROM AQUEOUS COOLANT SYSTEM BLOWDOWN.

182 AXFLU AXFLU CALCULATES HEAT TRANSFER FROM A LATTICE OF FLUID CYLINDRICAL FUEL PINS TO COOLANT IN EITHER SLUG OR FULLY-DEVELOPED LAMINAR FLOW. SOLUTION IS ANALYTIC AND CLOSED, EXCEPT FOR SATISFYING BOUNDARY CONDITIONS AT A FINITE, (BUT ARBITRARY), NUMBER OF BOUNDARY POINTS.

183 AXTHRM AXTHRM CALCULATES HEAT TRANSFER FROM A TRIANGULAR LATTICE OF CLAD SOLID CYLINDRICAL FUEL PIN TO COOLANT IN EITHER SLUG OR FULLY-DEVELOPED LAMINAR FLOW. SOLUTION IS ANALYTIC AND CLOSED, EXCEPT FOR SATISFYING BOUNDARY CONDITIONS AT A FINITE, (BUT ARBITRARY), NUMBER OF BOUNDARY POINTS.

198 HEATING2 HEATING2 IS A GENERALIZED HEAT TRANSFER CODE CAPABLE OF SOLVING TRANSIENT AND/OR STEADY-STATE COORDINATE SYSTEMS. THE SIMPLIFIED INPUT MAKES IT A VERY USEFUL CODE FOR THOSE PROBLEMS HAVING GEOMETRICAL CONFIGURATIONS WHICH CAN BE DESCRIBED BY PARALLEL AND PERPENDICULAR LINES OR PLANES, OR CONCENTRIC CIRCLES. THESE FIGURES CAN BE BROKEN UP INTO A MAXIMUM OF 100 ONE-MATERIAL REGIONS WITH POSITION AND TIME-DEPENDENT VOLUMETRIC HEAT GENERATION RATES. UP TO 40 MATERIALS WITH CONSTANT PROPERTIES CAN BE DESCRIBED, AND THE INITIAL TEMPERATURES OF THESE REGIONS ARE POSITION-DEPENDENT. THE BOUNDARIES OF THESE REGIONS CAN BE CONTACT, INSULATED, TIME-DEPENDENT TEMPERATURE CONTROLLED, OR FORCED CONVECTION WITH A TIME-DEPENDENT SINK TEMPERATURE. ALSO A RADIATION BOUNDARY WITH A TIME-DEPENDENT SINK TEMPERATURE IS INCLUDED.

H. HEAT TRANSFER AND FLUID FLOW

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205 BLOOST5 BLOOST5 COMBINES A REACTOR KINETICS CODE WITH A TWO-DIMENSIONAL HEAT TRANSFER CODE, AND IS APPLICABLE TO PROBLEMS FOR WHICH THE SPACE-INDEPENDENT FORM OF THE REACTOR KINETICS EQUATION IS APPLICABLE.

242 RATH MESHER/RATH WANTON THESE CODES SOLVE THE TWO- AND THREE-DIMENSIONAL HEAT CONDUCTION PROBLEM IN GENERAL GEOMETRIES. TIME, TEMPERATURE, AND POSITION-DEPENDENT PHYSICAL PROPERTIES CAN BE USED.

246 FLOW-MODEL A MULTI-CHANNEL, TWO-DIMENSIONAL, TWO-PHASE FLOW MODEL, DESIGNED TO COMPUTE THE AXIAL AND RADIAL COOLANT DENSITY AND QUALITY PROFILES, THE AXIAL PRESSURE PROFILE AND THE WEIGHT FLOW DISTRIBUTION FOR AN OPEN MATRIX FLOW, BOILING WATER REACTOR.

256 MANTA MANTA IS A PROGRAM WHICH PROVIDES A THERMAL-HYDRAULIC NODAL ANALYSIS IN THE STEADY STATE. IT WAS DESIGNED TO ANALYZE FUEL ELEMENT CONFIGURATION IN THE SUPER-HEAT DEVELOPMENT PROGRAM. MANTA ANALYZES MIXING BETWEEN COOLANT CHANNELS, ALLOWS FOR TEMPERATURE VARIANT CONDUCTIVITY IN ADMITTANCE CALCULATIONS, AND MULTIPLE STACKED SEGMENTS THROUGH THE FUEL REGION FOR A 7 ELEMENT CLUSTER ANALYSIS OVER A LENGTH OF UP TO 8 FEET. MANTA IS DESIGNED FOR SINGLE-PASS STEAM FLOW. THE FLOW DIRECTION IN THE COOLANT CHANNELS MAY BE EITHER UP OR DOWN, THEREBY PERMITTING THE ANALYSIS OF TWO-PASS AS WELL AS SINGLE-PASS FUEL ELEMENTS. MANTA ACCOUNTS FOR THE HEAT TRANSFER AND PRESSURE DROP THAT MAY OCCUR BETWEEN COOLANT CHANNELS DUE TO MIXING AS WELL AS TO THE CONVENTIONAL HEAT TRANSFER AND PRESSURE DROP RELATIONSHIPS DUE TO FRICTION, DISCONTINUITIES, ACCELERATION, CONVECTION, CONDUCTION, AND RADIATION. MANTA ALLOWS FOR THE CALCULATION AT EACH NODE OF THE MATERIAL PROPERTIES VISCOSITY, SPECIFIC HEAT, CONDUCTIVITY, AND SPECIFIC VOLUME TO CORRESPOND TO THE ACTUAL NODE TEMPERATURE BEING SOLVED FOR. THE CDC6600 VERSION USES SODIUM FOR THE WORKING FLUID RATHER THAN STEAM.

267 WATER WATER IS A SUBROUTINE USED TO EXTRACT THERMODYNAMIC AND TRANSPORT PROPERTIES OF LIQUID, VAPOR, AND SUPERCRITICAL WATER BY TABULAR INTERPOLATION OVER THE RANGE OF STATES - 14.5 TO 14,500 PSIA AND 32 TO 1472 DEGREES F. THESE PROPERTIES ARE SPECIFIC VOLUME, SPECIFIC ENTHALPY, DYNAMIC VISCOSITY, AND THERMAL CONDUCTIVITY, TABULATED FOR PRESSURE AND TEMPERATURE CONDITIONS.

272 FIGRO
FIGRO CALCULATES THE ONE-DIMENSIONAL STEADY-STATE TEMPERATURE DISTRIBUTION AND TOTAL FUEL SWELLING FOR METAL-CLAD, AXISYMMETRIC, BULK-OXIDE CYLINDRICAL FUEL ELEMENTS. THE FUEL PELLET MAY BE SOLID, ANNULAR, OR CONTAIN TWO RADIAL ZONES. OXIDE FUEL THERMAL CONDUCTIVITY IS A FUNCTION OF TEMPERATURE, DEPLETION, AND POROSITY. FUEL SWELLING IS A FUNCTION OF TEMPERATURE, DEPLETION, INTERNAL HYDROSTATIC PRESSURE, AND FISSI- SIONING RATE. FUEL-CLAD GAP CONDUCTANCE IS A FUNCTION OF GAS COM- POSITION, TEMPERATURE, AND GAP THICKNESS AT OPERATING CONDITIONS. EITHER THE CLAD SURFACE FLUX OR THE TEMPERATURE AT THE INSIDE RADIUS OF THE FUEL MAY BE SPECIFIED AS A BOUNDARY CONDITION FOR THE HEAT CONDUCTION EQUATION. THERMAL EXPANSION OF THE FUEL AND CLADDING IS ACCOUNTED FOR. TRANSIENT TEMPERATURE CALCULATIONS CAN THEN BE PERFORMED STARTING FROM THE STEADY-STATE SOLUTION WITH USER-SPECIFIED HEAT GENERATION AND WATER TEMPERATURE TABLES.

286 HOT2
HOT2 IS A DIGITAL COMPUTER PROGRAM TO SOLVE TWO-DIMENSIONAL PLANE AND AXIALLY SYMMETRIC STEADY-STATE AND TRANSIENT HEAT CONDUCTION PROBLEMS WITH DIAGONAL BOUNDARIES AND INTERFACES. MESH SPACING (AT MOST 5000 POINTS) IS COMPLETELY VARIABLE. AS MANY AS 99 REGIONS ARE PERMITTED IN ORDER TO DESCRIBE SPATIAL VARIATIONS IN MATERIAL PROPERTIES, HEAT GENERATION RATES, AND BOUNDARY CONDITIONS. THE HEAT GENERATION RATE AND BOUNDARY CONDITIONS MAY VARY WITH TIME.

294 M0899/HOH
BY MAKING CALLS ON A SUBROUTINE CALLED HOH, M0899 EDITS THERMODYNAMIC AND TRANSPORT PROPERTIES OF WATER OVER THE RANGE 14.5 TO 2538 PSIA AND UP TO 608 DEGREES FAHRENHEIT BELOW SATURATION AND 932 DEGREES FAHRENHEIT ABOVE SATURATION.

H. HEAT TRANSFER AND FLUID FLOW

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299 LION4 LION4 IS A COMPUTER PROGRAM FOR CALCULATING ONE, TWO, OR THREE DIMENSIONAL TRANSIENT AND STEADY-STATE TEMPERATURE DISTRIBUTIONS IN REACTOR AND REACTOR PLANT COMPONENTS. IT IS USED PRIMARILY FOR THERMAL-STRUCTURAL ANALYSES. IT UTILIZES FINITE DIFFERENCE TECHNIQUES WITH FIRST-ORDER FORWARD DIFFERENCE INTEGRATION AND IS CAPABLE OF HANDLING A WIDE VARIETY OF BOUNDING CONDITIONS.

HEAT TRANSFER SITUATIONS ACCOMMODATED INCLUDE FORCED AND FREE CONVECTION IN BOTH REDUCED AND FULLY-AUTOMATED TEMPERATURE DEPENDENT FORMS, COOLANT FLOW EFFECTS, A LIMITED THERMAL RADIATION CAPABILITY, A STATIONARY OR STAGNANT FLUID GAP, A DUAL DEPENDENCY (TEMPERATURE DIFFERENCE AND TEMPERATURE LEVEL) HEAT TRANSFER, AN ALTERNATIVE HEAT TRANSFER MODE COMPARISON AND SELECTION FACILITY COMBINED WITH HEAT FLUX DIRECTION SENSOR, AND ANY FORM OF TIME-DEPENDENT BOUNDARY TEMPERATURES. THE PROGRAM, WHICH HANDLES TIME AND SPACE DEPENDENT INTERNAL HEAT GENERATION, CAN ALSO PROVIDE TEMPERATURE DEPENDENT MATERIAL PROPERTIES WITH LIMITED NON-ISOTROPIC PROPERTIES. USER-ORIENTED CAPABILITIES AVAILABLE INCLUDE TEMPERATURE MEANS WITH VARIOUS WEIGHTINGS AND A COMPLETE HEAT FLOW RATE SURVEILLANCE SYSTEM.

331 M0219(FLOT1) FLCT1 WILL PREDICT THE STEADY-STATE FLOW AND THE FLOW TRANSIENT DUE TO THE SUBSEQUENT LOSS OF POWER TO ALL PUMPS AND TERMINATE THE TRANSIENT AT A SPECIFIED TIME OR IT WILL PREDICT THE FLOW TRANSIENT IN WHICH ONLY SOME OF THE PUMPS ARE LOST. THIS LATTER TRANSIENT MAY BE TERMINATED BY A MAXIMUM TRANSIENT TIME OR BY CHECK VALVE CLOSURES IN ALL LOOPS IN WHICH PUMPING POWER IS LOST. IN THE LATTER EVENT, THE PROGRAM WILL PREDICT THE SUBSEQUENT STEADY-STATE FLOW DISTRIBUTION.

346 THTE THTE (TRANSIENT HEAT TRANSFER VERSION E) PROVIDES A SOLUTION CAPABILITY FOR LARGE COMPLEX, THREE-DIMENSIONAL TRANSIENT AND STEADY-STATE HEAT TRANSFER PROBLEMS WHICH CAN INCLUDE CONDUCTION, CONVECTION, AND RADIATION WITH THE OPTION TO COMPUTE FLUID FLOW RATES ON A ONE-DIMENSIONAL BASIS.

348 TOPS THE TOPS PROGRAM IS A DIGITAL SIMULATION OF PRESSURIZER DYNAMICS BASED ON A RIGOROUS APPLICATION OF THE FIRST LAW OF THERMODYNAMICS AND PHENOMENOLOGICAL HEAT AND MASS TRANSFER LAWS WITH EMPIRICALLY DETERMINED COEFFICIENTS. THE PROGRAM IS USEFUL IN STUDYING THE THERMODYNAMIC PATHS OF PRESSURIZER TRANSIENTS AND IS CONVENIENT TO USE AS A DESIGN TOOL.

H. HEAT TRANSFER AND FLUID FLOW

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349 TOODEE THE TOODEE PROGRAM CALCULATES TEMPERATURES AT THE CENTER POINTS OF A TWO-DIMENSIONAL ARRAY IN X-Y, R-Z, OR R-THETA GEOMETRY. THE MESH IN THIS ARRAY MAY BE VARIABLY-SPACED. AVERAGED MATERIAL CONSTANTS ARE USED WHICH MAY BE SPATIAL AND TEMPERATURE DEPENDENT. PROVISION IS MADE IN THE PROGRAM FOR MATERIAL PHASE CHANGES. CHANNELS FOR FORCED FLOW COOLANT MAY BE INCLUDED AT EXTERIOR BOUNDARIES. IN ADDITION TO THE TEMPERATURE ARRAY, PROGRAM OUTPUT INCLUDES SURFACE TEMPERATURES AND HEAT FLUXES.

382 RAPP RAPP COMPUTES THE RELATIONSHIP AMONG MASS FLOW, PRESSURE, AND PIPING RESISTANCE (K-FACTOR) FOR HIGH VELOCITY FLOW OF A TWO-PHASE MIXTURE OF STEAM AND WATER. THE SOURCE FLUID MAY BE SUBCOOLED OR SATURATED WATER, SATURATED STEAM, OR A MIXTURE OF STEAM AND WATER. THE DOWNSTREAM PRESSURE MUST BE BELOW THE SATURATION PRESSURE OF THE SOURCE FLUID. SPECIFIC APPLICATIONS INCLUDE PRESSURIZER SURGE LINE PRESSURE DROP AND PRESSURE DISTRIBUTION DOWNSTREAM OF A RELIEF VALVE.

395 FLAC THE FLOW ANALYSIS CODE FLAC CALCULATES THE STEADY-STATE FLOW AND PRESSURE DISTRIBUTION IN AN ARBITRARY NETWORK. THE PROGRAM INCLUDES THE POSSIBILITY OF HEAT ADDITION AND MASS ADDITION IN ANY PORTION OF THE NETWORK.

396 WASP WASP USES A UNIQUE METHOD TO QUICKLY CALCULATE VARIOUS WATER AND STEAM PHYSICAL PROPERTIES OVER AN EXTREMELY WIDE RANGE.

408 TAC2D TAC2D IS DESIGNED TO TREAT TRANSIENT, TWO-DIMENSIONAL HEAT TRANSFER PROBLEMS. STEADY-STATE PROBLEMS ARE TREATED BY CONSIDERING THE PROBLEM TO BE A TRANSIENT, STARTING WITH AN ASSUMED TEMPERATURE DISTRIBUTION AND RUNNING UNTIL EQUILIBRIUM CONDITIONS ARE ESTABLISHED. GEOMETRICALLY, RECTANGULAR (X-Y), CYLINDRICAL (R,Z), OR CIRCULAR (R,THETA) COORDINATES MAY BE USED.

414 TAC3D TAC3D IS DESIGNED TO TREAT TRANSIENT, THREE-DIMENSIONAL HEAT TRANSFER PROBLEMS. STEADY-STATE PROBLEMS ARE TREATED BY CONSIDERING THE PROBLEM TO BE A TRANSIENT, STARTING WITH AN ASSUMED TEMPERATURE DISTRIBUTION AND RUNNING UNTIL EQUILIBRIUM CONDITIONS ARE ESTABLISHED. GEOMETRICALLY, THE PROBLEM MAY BE DEFINED BY EITHER RECTANGULAR (X,Y,Z) OR CYLINDRICAL (R,Z,THETA) COORDINATES.

H. HEAT TRANSFER AND FLUID FLOW

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424 GLUB1 GLUB1 SOLVES THE WATERLOGGING TRANSIENT CAUSED BY THE EXISTENCE OF A FUEL ELEMENT CLADDING DEFECT DURING AN INCREASE IN POWER. THE POWER IS EITHER - CASE 1, PUT IN AS AN ARBITRARY FUNCTION OF TIME, OR CASE 2, ASSUMED TO BE A SERIES OF LINEAR RAMPS TO A NEW STEADY-STATE WITH STEEPER AND STEEPER SLOPES. ALL THE GEOMETRY AND METAL PROPERTIES ARE INPUT QUANTITIES. WATER PROPERTIES ARE OBTAINED FROM INTERNAL TABLES. CLAD AND FUEL THERMAL, STRESS, AND STRAIN COMPUTATIONS ARE PERFORMED. THE OUTPUT CONSISTS OF INTERNAL PRESSURE AND DEFECT FLOW. FOR CASE 1, THE CLAD STRESS VERSUS TIME IS OUTPUT, AND FOR CASE 2, THE NEW STEADY-STATE POWER WHICH JUST CAUSES CLAD FAILURE IS OUTPUT.

432 COBRA3C COBRA3C CALCULATES THE STEADY-STATE AND TRANSIENT FLOW, ENTHALPY AND PRESSURE DROP IN THE SUBCHANNELS OF ROD BUNDLE NUCLEAR FUEL ELEMENTS DURING BOTH BOILING AND NONBOILING CONDITIONS. THE PROGRAM USES A MATHEMATICAL MODEL THAT INCLUDES THE EFFECTS OF TURBULENT AND CONVECTION CROSSFLOW MIXING BETWEEN THE SUBCHANNELS. A THERMAL MODEL OPTION IS INCLUDED TO CALCULATE RADIAL FUEL TEMPERATURE DISTRIBUTION AS A FUNCTION OF USER-SPECIFIED POWER GENERATION AND HEAT TRANSFER CORRELATIONS. CRITICAL HEAT FLUX CALCULATIONS CAN ALSO BE PERFORMED BY USER OPTION. FORCED CROSSFLOW MIXING DUE TO DIVERTER VANES OR WIRE WRAPS CAN BE CONSIDERED.

440 DYNAM DYNAM PERFORMS A DYNAMIC ANALYSIS OF ONCE-THROUGH BOILING FLOW OSCILLATIONS WITH STEAM SUPERHEAT. THE MODEL DESCRIBING THE SUPERHEAT REGIME (SINGLE-PHASE, VARIABLE DENSITY FLUID) FOR SUBCRITICAL PRESSURE OPERATION IS ALSO APPLICABLE TO THE STUDY OF ONCE-THROUGH OPERATION USING SUPERCRITICAL PRESSURE WATER.

458 VELVET2 VELVET2 SOLVES THE COUPLED HEAT TRANSFER EQUATIONS IN THE FUEL, GAP, CLADDING, AND COOLANT FOR A TRIANGULAR-SPACED, CLOSE-PACKED FUEL ROD BUNDLE WITH LIQUID METAL COOLANT. THE MODEL INCLUDES TEMPERATURE-DEPENDENT MATERIAL PROPERTIES, TURBULENT VELOCITY DISTRIBUTION IN THE COOLANT, AND CONTRIBUTIONS TO COOLANT HEAT TRANSFER BY TURBULENT MIXING.

473 CHIC-KIN CHIC-KIN TREATS FAST AND INTERMEDIATE REACTIVITY TRANSIENTS IN A WATER-COOLED HETEROGENEOUS NUCLEAR REACTOR. THE PROGRAM CALCULATES THE POWER, TEMPERATURES, AND INTERNAL PRESSURE SURGES WHEN CONTROL ROD MOTION, INLET TEMPERATURE, INLET FLOW, AND SYSTEM PRESSURE ARE KNOWN FUNCTIONS OF TIME. THE REACTOR MODEL CONSIDERED IS A SINGLE PASS WATER-COOLED CORE REPRESENTED BY A SINGLE FUEL ELEMENT-COOLANT PASSAGE SYSTEM WITH REACTIVITY FEEDBACK TO THE KINETICS EQUATIONS.

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483 REPP THE REPP COMPUTER CODE PROVIDES A METHOD FOR (1) EVALUATING FUEL TEMPERATURES AND CRITICAL HEAT FLUX MARGINS FOR A FIXED REACTOR CORE AND FUEL DESIGN, (2) DETERMINING THE NUMBER OF FUEL PINS REQUIRED TO MAINTAIN SPECIFIED HEAT FLUX MARGINS FROM BURNOUT AT A GIVEN REACTOR POWER LEVEL, (3) DETERMINING THE DIAMETER OF A FUEL PIN TO DESIGN WITHIN FUEL CENTERLINE TEMPERATURE LIMITS AT A SPECIFIED REACTOR POWER LEVEL, (4) EVALUATING THE SINTERING EFFECT ON FUEL TEMPERATURE, (5) CALCULATING PRESSURE DROP AND COOLANT PROPERTIES FOR SINGLE-PHASE AND TWO-PHASE FLOW FOR FUEL OPERATING AT AVERAGE REACTOR CONDITIONS AND A THEORETICAL HOT PIN HOT CHANNEL CONDITION, AND (6) CALCULATING PRESSURE DROP ACROSS SEVERAL TYPES OF FUEL PIN SPACERS.

487 STEAM-67 STEAM-67 IS A SET OF ROUTINES FOR CALCULATING THE PROPERTIES OF STEAM AND WATER ACCORDING TO THE ASME STEAM TABLES, 1967, WHICH HAVE BEEN MODIFIED IN ACCORDANCE WITH THE ASME PAPER (REFERENCE 3). MODIFICATIONS WERE MADE TO IMPROVE PROGRAM RUNNING TIME AS WELL AS TO CORRECT SOME EXISTING PROGRAM ERRORS. CORRECTIONS WERE ALSO MADE TO ROUTINES FOR THE LIQUID REGION TO IMPROVE ACCURACY ON THE IBM360 COMPUTER.

517 HEATING3 HEATING3 IS DESIGNED TO SOLVE STEADY-STATE AND/OR TRANSIENT HEAT CONDUCTION PROBLEMS IN ONE-, TWO-, OR THREE-DIMENSIONAL CARTESIAN OR CYLINDRICAL COORDINATES. THERMAL CONDUCTIVITY, DENSITY, AND SPECIFIC HEAT MAY BE DEPENDENT ON TEMPERATURE. HEAT GENERATION RATES MAY BE DEPENDENT ON POSITION AND TIME, AND THE BOUNDARY TEMPERATURES MAY BE TIME-DEPENDENT. THE BOUNDARY CONDITIONS MAY BE FIXED TEMPERATURES OR ANY COMBINATION OF CONSTANT HEAT FLUX, FORCED CONVECTION, NATURAL CONVECTION, AND RADIATION. THEY CAN BE FROM SURFACE-TO-BOUNDARY, SURFACE-TO-SURFACE, OR SURFACE-TO-SURFACE PLUS CONDUCTION. THE MESH SPACING CAN BE VARIABLE ALONG EACH AXIS.

525 ORTHIS/ORTHAT CRTHIS AND CRTHAT ARE DESIGNED TO SOLVE STEADY-STATE AND TRANSIENT HEAT CONDUCTION PROBLEMS, RESPECTIVELY, IN TWO-DIMENSIONAL GEOMETRIES. EITHER CARTESIAN (X-Y) OR CYLINDRICAL (R-Z, R-THETA) COORDINATE SYSTEMS MAY BE USED. THERMAL PROPERTIES, HEAT GENERATION RATES, AND BOUNDARY CONDITIONS MAY BE FUNCTIONS OF POSITION, TIME, OR TEMPERATURE.

545 BETTY BETTY DESCRIBES SPATIAL AND TEMPORAL CONCENTRATION BEHAVIOR OF A SUSPENSION IN A PIPE, AS A RESULT OF DEPOSITION AND EROSION OF THE PARTICLES.

H. HEAT TRANSFER AND FLUID FLOW

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551 MCXY/MOXL MOXY COMPUTES HEAT TRANSFER IN A BOILING WATER REACTOR FUEL ELEMENT. CONDUCTION, CONVECTION, AND RADIATION MODES OF HEAT TRANSFER ARE CONSIDERED, AS WELL AS HEAT ADDITION BY METAL-WATER REACTION. CONVECTION HEAT TRANSFER COEFFICIENTS ARE INPUT AS TABULAR FUNCTIONS OF TIME.

552 PWR-PPM PWR-PPM GENERATES BORATION-DILUTION TABLES USED BY THE REACTOR OPERATOR OF A PWR. THE COMPUTER PRINTED TABLES PLOT INITIAL AND FINAL REACTOR COOLANT SYSTEM BORON CONCENTRATION IN UNITS OF PPM BORON AGAINST THE GALLONS OF MAKEUP WATER AND BORIC ACID SOLUTION REQUIRED TO OBTAIN THE DESIRED PPM CHANGE. THESE TABLES REPLACE NOMOGRAPHS NORMALLY REQUIRED FOR BORATION AND DILUTION OPERATIONS.

560 HYMAS HYMAS GENERATES THE HYDRODYNAMIC MASS MATRIX PER UNIT DEPTH ASSOCIATED WITH A MULTI-MASS SYSTEM IMMERSED IN A LIQUID ENVIRONMENT. IT IS ASSUMED THAT THE LIQUID ENVIRONMENT MAY BE REPRESENTED BY A SERIES OF FLOW-CHANNELS AND NODES. FLOW-CHANNELS ARE INTRODUCED IN THE REGION BETWEEN SURFACES OF NEIGHBORING SOLIDS, AND NODES ARE USED TO CONNECT TWO OR MORE FLOW-CHANNELS. ALSO, IT IS ASSUMED THAT THE SOLID BODIES UNDERGO UNIDIRECTIONAL MOTION, THAT POTENTIAL FLOW THEORY IS APPLICABLE, THAT THE WIDTH OF A FLOW-CHANNEL IS SMALL COMPARED WITH THE LENGTH SO THERE IS NO PRESSURE DROP ACROSS THE FLOW-CHANNEL, AND THAT NODAL VOLUME IS SMALL COMPARED WITH FLOW-CHANNEL VOLUME.

580 ASTEM ASTEM IS A MODULAR SET OF FORTRAN IV SUBROUTINES TO EVALUATE THE GIBBS, HELMHOLTZ, AND SATURATION LINE FUNCTIONS AS PUBLISHED BY THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS (1967). ANY THERMODYNAMIC QUANTITY INCLUDING DERIVATIVE PROPERTIES CAN BE OBTAINED FROM THESE ROUTINES BY A USER-SUPPLIED MAIN PROGRAM.

586 PLENUM BULK FLOW DISTRIBUTION IN A CYLINDRICAL REACTOR COOLANT INLET PLENUM IS CALCULATED USING POTENTIAL FLOW THEORY.

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48 FUGUE THE FUGUE PROGRAM COMPUTES STEADY-STATE WALL AND BULK FLUID TEMPERATURE, VOID FRACTION, AND LOCAL PRESSURE IN LIQUID-COOLED CLOSED CHANNELS IN WHICH THE HEATING RATE IS SPECIFIED. THE REQUIRED RELATIONSHIPS ARE EXPRESSED IN GENERAL, NON-DIMENSIONAL FORM AND COMBINED IN AN INTERNALLY CONSISTENT MANNER TO ALLOW PREDICTIONS FOR A VARIETY OF COOLANTS AND SPECIFIED OPERATING CONDITIONS.

80 SCR3 SOR3 IS USED FOR THE ANALYSIS OF SYMMETRICALLY LOADED SHELLS OF REVOLUTION. THE PROGRAM COMPUTES STRESSES, STRAINS, FORCES AND DEFLECTIONS PRODUCED BY THERMAL AND MECHANICAL LOADS. NORMAL AND TRANSVERSE SHEAR STRESSES AND WALL THICKNESS CHANGES ARE TAKEN INTO ACCOUNT. THE PROGRAM IS BASED ON CONSTITUTIVE EQUATIONS WHICH RETAIN TERMS THROUGH THE SECOND ORDER IN THE RATIO OF THE THICKNESS TO THE LOCAL RADIUS OF CURVATURE. THESE FEATURES MAKE THE PROGRAM APPLICABLE TO SHELL STRUCTURES WITH MODERATELY LARGE THICKNESS TO RADIUS RATIOS.

109 4RESTRAINT PIPE STRESS CODE THIS PROGRAM EVALUATES A FOUR RESTRAINT PIPING SYSTEM DESIGNED FOR HIGH TEMPERATURE OPERATION.

112 CROCK CROCK SELECTS THE MINIMUM WEIGHT DESIGN FOR A SPACE POWER PLANT IN WHICH THE WASTE CYCLE HEAT IS RADIATED DIRECTLY TO SPACE FROM THE CONDENSER. IT ACCOUNTS FOR HEAT TRANSFER, FLUID FLOW, METEORIC PROTECTION, AND THE GEOMETRIC PROPERTIES OF A RADIATOR-CONDENSER.

114 SHOCK SHOCK SELECTS THE MINIMUM WEIGHT DESIGN FOR A HEAT-REJECTION SYSTEM FOR A SPACE POWER PLANT IN WHICH THE SENSIBLE HEAT LOST FROM A SINGLE-PHASE FLUID IS RADIATED TO SPACE. IT ACCOUNTS FOR HEAT TRANSFER, FLUID FLOW, METEORIC PROTECTION AND RADIATOR GEOMETRY.

187 CENTRIFUGAL PUMP IMPELLER DESI THIS SYSTEM HAS BEEN DEVELOPED FOR THE DESIGN AND DEVELOPMENT OF HIGH SPEED TURBO-MACHINERY FOR PUMPING HIGH TEMPERATURE LIQUID METALS. AFTER INITIALIZING THE ANALYSIS AND DESIGN EFFORT BY ESTABLISHING THE PUMP CONDITIONS OF SERVICE THE CODES ARE USED TO DEFINE THE PUMP IMPELLER DESIGN. IN ALL PROGRAMS, REAL FLUID EFFECTS ARE NOT CONSIDERED. THE MACHINING CODE PRODUCES A PAPER TAPE FOR USE IN THE ACTUAL FABRICATION OF THE IMPELLER.

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190 WOPEXPRT, WEIGHT OPTIMIZATION THE PURPOSE OF THE CODE IS TO CHOOSE THE LIGHTEST REACTOR RESULTING FROM ALL POSSIBLE COMBINATIONS OVER THE RANGE OF REACTOR INDEPENDENT VARIABLES SPECIFIED. THE ENGINEERING CALCULATIONS FOR EACH REACTOR DESIGN ARE BASED ON A LIQUID-COOLED CYLINDRICAL REACTOR HAVING PIN-TYPE FUEL ELEMENTS. REACTOR CONTROL IS ASSUMED TO BE EFFECTED BY MOVABLE SIDE REFLECTORS SURROUNDING THE CORE. NECESSARY PHYSICS DATA IS INPUT IN THE FORM OF SECOND-DEGREE EQUATIONS AS A FUNCTION OF THE INDEPENDENT VARIABLES.

232 GAZELLES DETERMINATION OF GAS-COOLED FAST REACTOR CORE PROPORTIONS REQUIRED TO SATISFY SPECIFIED DESIGN CONSTRAINTS AND COMPUTATION OF RESULTING PERFORMANCE CHARACTERISTICS.

233 CORE THE REACTOR CORE CONFIGURATION DESIGNED BY THE CORE PROGRAM CONSISTS OF CYLINDRICAL FUEL ELEMENTS ARRANGED ON AN EQUILATERAL PITCH SPACING WITH INTERNAL AND EXTERNAL COOLING. THE FUEL ELEMENT IS COMPOSED OF THREE CONCENTRIC GRAPHITE RINGS, AN INTERNAL COOLANT CHANNEL, AND A SPINE. THE COOLANT CHANNEL IS FORMED BY THE SPINE AND INNER GRAPHITE RING. THE FUEL IS CONTAINED IN THE MIDDLE GRAPHITE RING. CORE WILL DETERMINE THE NUMBER OF FUEL ELEMENTS OF A SPECIFIED DIAMETER AND LENGTH REQUIRED TO SATISFY A GIVEN CENTRAL FUEL TEMPERATURE. IT ALSO ADJUSTS THE PITCH SPACING REQUIRED TO PRODUCE A DESIRED PRESSURE DROP AS WELL AS PROVIDING A SPECIFIED INTERNAL COOLING RATE.

244 CYCLOPS1 CYCLOPS1 IS A PROGRAM FOR THE ANALYSIS OF THERMODYNAMIC SYSTEMS. IT IS A GENERAL PURPOSE PROGRAM THAT PERFORMS A HEAT AND MASS BALANCE FOR THERMODYNAMIC SYSTEMS COMPOSED OF PUMPS, TURBINES, SEPARATORS, HEAT EXCHANGERS, COMPRESSORS AND FLOW THROTTLING DEVICES. THESE COMPONENTS MAY BE CONNECTED IN ANY DESIRED WAY. THE THERMODYNAMIC FLUIDS THAT MAY BE USED ARE WATER, AIR, NITROGEN, AND PARA-HYDROGEN.

250 SAFE-PCRS SAFE-PCRS NUMERICALLY DETERMINES THE STRESS AND STRAIN DISTRIBUTION WITHIN EITHER HOMOGENEOUS OR HETEROGENEOUS THICK-WALLED BODIES OF REVOLUTION. IT IS DESIGNED FOR THE ANALYSIS OF MULTI-MATERIAL AXISYMMETRIC COMPOSITE STRUCTURES SUCH AS REINFORCED AND/OR PRESTRESSED CONCRETE VESSELS. DEFORMATIONS MUST BE WITHIN THE ELASTIC LIMIT OF THE MATERIALS CONSIDERED AND ONLY BODIES OF REVOLUTION SUBJECTED TO AXISYMMETRIC LOADING CAN BE TREATED.

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251 SAFE-AXISYM SAFE-AXISYM IS A PROGRAM FOR THE ANALYSIS OF MULTI-MATERIAL AXISYMMETRIC COMPOSITE STRUCTURES. IT IS DESIGNED FOR THE ANALYSIS OF HETEROGENEOUS STRUCTURES SUCH AS REINFORCED AND/OR PRESTRESSED CONCRETE VESSELS. THE STRUCTURE IS ASSUMED TO BE LINEARLY ELASTIC, AND ONLY BODIES OF REVOLUTION SUBJECTED TO AXISYMMETRIC LOADING CAN BE TREATED.

252 SAFE-PLANE SAFE-PLANE IS APPLIED TO TWO-DIMENSIONAL STRUCTURES OF ARBITRARY GEOMETRY UNDER IN-PLANE LOADS. EITHER PLANE STRESS OR PLANE STRAIN CONDITIONS MAY BE IMPOSED. MECHANICAL AND/OR THERMAL LOADS ARE PERMITTED.

253 SAFE-SHELL SAFE-SHELL IS USED TO DESIGN AND ANALYZE AXISYMMETRIC THIN SHELL STRUCTURES OF ARBITRARY GENERATRICES UNDER AXISYMMETRIC MECHANICAL AND/OR THERMAL LOADING CONDITIONS. THE INTERSECTION OF TWO OR MORE SHELLS CAN BE TREATED.

266 CYGRO2 CYGRO2 IS USED TO DETERMINE STRESSES AND STRAINS DURING STEADY-STATE AND TRANSIENT POWER OPERATION OF AN OXIDE-FUELED, METAL CLAD RCC-TYPE FUEL ELEMENT IN A PRESSURIZED ENVIRONMENT. MAJOR LOADING CONDITIONS INCLUDE FUEL SWELLING, FISSION GAS AND COOLANT PRESSURE, CLAD GROWTH AND DIFFERENTIAL THERMAL EXPANSION. THE APPLICATION FOR WHICH THE PROGRAM HAS BEEN DEVELOPED IS ZIRCALOY TUBES CONTAINING BULK OXIDE FUEL. AXIAL AND AZIMUTHAL SYMMETRY OF TEMPERATURE AND STRESSES IS ASSUMED.

282 SEALSHELL2 (M0110) THE SEALSHELL2 PROGRAM DETERMINES STRESSES, STRAINS, DEFLECTIONS, AND REACTIONS IN A THICK SHELL OF REVOLUTION WITH AXISYMMETRIC LOADING. THE LOADING CONSISTS OF A TEMPERATURE DISTRIBUTION, INSIDE AND OUTSIDE PRESSURE DISTRIBUTIONS, AND CIRCUMFERENTIAL FORCES AND MOMENTS APPLIED TO THE MIDDLE SURFACE. THE SHELL IS LINEAR-ELASTIC WITH TENSILE, BENDING, AND SHEAR STRAINS.

283 M0552 M0552 SOLVES THE TRANSIENT RESPONSE PROBLEM OF LINEAR ELASTIC, LUMPED-MASS SYSTEMS SUBJECTED TO A UNIDIRECTIONAL FOUNDATION TRANSIENT THAT CAN BE EITHER A VELOCITY OR ACCELERATION TRANSIENT. NORMAL MODE THEORY IS USED AND THE INPUT TO THE PROGRAM CONSISTS OF THE MODE SHAPES, FREQUENCIES, AND FOUNDATION TRANSIENT. ELEMENT EFFECTS ARE ALSO EVALUATED AS A FUNCTION OF TIME. MODAL DAMPING COEFFICIENTS MAY BE SPECIFIED.

300 SAFE-CREEP SAFE-CREEP PERFORMS A VISCO-ELASTIC ANALYSIS OF PLANE OR AXISYMMETRIC COMPOSITE CONCRETE STRUCTURES WITH AGE- AND TEMPERATURE-DEPENDENT CREEP DATA.

329 M0457(PIPE) PIPE PERFORMS AN ELASTIC STRESS ANALYSIS OF A 3-DIMENSIONAL PIPING STRUCTURE WITH THERMAL STRESSES, REDUNDANT LOOPS, AND CONCENTRATED LOADS.

337 STEM STEM CALCULATES AND PUNCHES
OUT PARTIALLY-COUPLED MASS, STIFFNESS AND INTERNAL LOAD FUNCTION
MATRICES FOR A STRUCTURAL SYSTEM OF BEAMS HAVING PRISMATIC SEG-
MENTS. SHEAR DEFORMATION AND ROTATIONAL INERTIA ARE INCLUDED IN
THE CALCULATIONS.

344 GEM GEM IS INTENDED PRIMARILY TO PERFORM VIBRATION STUDIES WITH THE CAPABILITY OF GENERATING INPUT FOR THE VEP (VIBRATION EIGENVALUE PROBLEM) ROUTINE AND PERFORMING ADDITIONAL OPERATIONS ON THE OUTPUT FROM THE SHC (SHOCK) SEGMENT. GIVEN A SYSTEM OF MASSES AND SPRINGS, THE VEP ROUTINE COMPUTES THE NATURAL FREQUENCIES OF THE VIBRATING SYSTEM AS WELL AS THE MODE SHAPES FOR EACH FREQUENCY. GIVEN THE MODE SHAPES, FREQUENCIES, AND MASSES OF A VIBRATING SYSTEM, THE SHC ROUTINE WILL COMPUTE THE DEFLECTIONS AND FORCES AT THE MASS POINTS.

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353 SWELL2 SWELL2 WAS DEVELOPED TO PROVIDE THE FUEL-ELEMENT LIFETIME DATA REQUIRED FOR POWER PLANT OPTIMIZATION STUDIES. THE PROGRAM COMMENCES BY CALCULATING RADIAL AND AXIAL TEMPERATURES IN A FUEL ELEMENT. THE FUEL WHICH IS HOTTER THAN THE EFFECTIVE-FISSION-GAS-RELEASE-TEMPERATURE IS CONSIDERED TO RELEASE ITS FISSION GAS IMMEDIATELY TO A PLENUM, AND THE PRESSURE OF ALL PLENUM GAS IS CALCULATED. THE PRESSURE OF THE GAS RETAINED FOR A WHILE IN THE COLDER FUEL IS ALSO CALCULATED. AT EACH AXIAL POSITION THE PLENUM PRESSURE IS COMPARED WITH THE PRESSURE EXERTED BY RETAINED FISSION GAS, AND THE LARGER OF THE TWO PRESSURES IS CONSIDERED TO BE THE EFFECTIVE PRESSURE AS FAR AS CLADDING DAMAGE IS CONCERNED. THE CLADDING IS ASSUMED TO FAIL WHEN ITS CUMULATIVE DAMAGE EQUALS UNITY AT ANY AXIAL POSITION. DAMAGE COMPONENTS ARE PRIMARY CREEP, SECONDARY CREEP, RATCHETING GROWTH DUE TO THERMAL CYCLING, FATIGUE DUE TO THERMAL CYCLING, AND STRAIN DUE TO INEXORABLE FUEL SWELLING. AT EACH STEP OF THE CALCULATIONS THE FUEL ELEMENT IS SUBJECTED TO SEVERAL CONDITIONS OF ABNORMAL OPERATION (OVERPOWER, FLOW CCASTDOWN, ETC.) TO ENSURE THEY COULD NOT PRODUCE ENOUGH ADDITIONAL DAMAGE TO CAUSE FAILURE AT THAT TIME.

357 SUPORAN SUPORAN SOLVES FOR STEADY-STATE DEFORMATION AND STRENGTH CHARACTERISTICS OF A NUCLEAR REACTOR CORE SUPPORT STRUCTURE. THIS STRUCTURE IS ASSUMED TO BE MADE OF TWO CIRCULAR PLATES WHICH ARE LOCATED ABOVE EACH OTHER AND ARE INTERCONNECTED PERPENDICULARLY WITH CONCENTRIC ROWS OF TUBULAR MEMBERS. THE GEOMETRY OF THE STRUCTURE AND ITS LOADING (TRANSVERSE PRESSURE AND INTERNAL TEMPERATURE GRADIENTS) ARE ALL OF AXISYMMETRICAL NATURE.

365 BOW2 BOW2 IS USED TO CALCULATE DEFLECTIONS OF CLOSELY-SPACED PARALLEL BEAMS, EACH WITH LIMITED-PIVOT SUPPORT AT ONE END, POSSIBLE BEAM INTERACTIONS AT THE OTHER END AND AT ONE INTERMEDIATE POSITION, ASSUMING AN ARBITRARY TEMPERATURE DISTRIBUTION.

378 TUBE TUBE SOLVES FOR THE STRESSES DUE TO PRESSURE AND TEMPERATURE IN A U-TUBE TYPE HEAT EXCHANGER. SPECIFICALLY, IT HANDLES A CONFIGURATION CONSISTING OF A SPHERICAL HEAD, PRIMARY TRANSITION CYLINDER, AND SECONDARY CYLINDER. THE TRANSITION CYLINDERS MAY BE CONICAL AND TAPERED IN THICKNESS, BUT THE REMAINING SHELLS ARE OF UNIFORM THICKNESS. THE SPHERICAL HEAD AND THE TRANSITION CYLINDERS MAY BE OMITTED FROM A PROBLEM.

379 SAFE-2D SAFE-2D PERFORMS THE ELASTIC STRESS ANALYSIS OF GENERAL AXISYMMETRIC, PLANE, AND COMBINED AXISYMMETRIC AND PLANE COMPOSITE STRUCTURES.

I. DEFORMATION AND STRESS DISTRIBUTION COMPUTATIONS, STRUCTURAL ANALYSIS, AND ENGINEERING DESIGN STUDIES

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383 M0266 M0266 COMPUTES THE DYNAMIC SHOCK FORCES AND MODAL FREQUENCIES ACTING ON A LUMPED MASS, LINEAR ELASTIC MODEL OF A STRUCTURE SUBJECTED TO SHOCK SPECTRUM INPUTS. THE MODEL EMPLOYED IS A COLLECTION OF LUMPED MASSES CONNECTED BY WEIGHTLESS FLEXIBLE ELEMENTS. IF THE ORIGINAL STRUCTURE IS NOT STATICALLY DETERMINATE, REDUNDANT FORCES MUST BE INTRODUCED TO ENSURE A PRIMARY STRUCTURE THAT IS.

391 SORSDB SORSDB WAS WRITTEN TO CALCULATE THE STRESS INTENSITIES AND FATIGUE USAGE FACTORS FOR PRESSURE VESSELS (STRUCTURAL MEMBERS) IN ACCORDANCE WITH THE ASME CODE, NUCLEAR VESSELS, SECTION 3. THE INPUT REQUIRES THE BASIC MEMBRANE AND BENDING STRESSES GENERATED BY THE SCR2 CODE (ACC ABSTRACT 80) OR ANY ADAPTABLE SHELL PROGRAM. THE OUTPUT INCLUDES STRESS DIFFERENCES, STRESS INTENSITIES, AND FATIGUE USAGE FACTORS.

402 SABOR4 SABOR4 IS A DISCRETE ELEMENT DISPLACEMENT PROGRAM FOR THE LINEAR-ELASTIC, STATIC, LOAD-DEFLECTION ANALYSIS OF MERIDIONALLY-CURVED, VARIABLE-THICKNESS, BRANCHED, THIN SHELLS OF REVOLUTION WHICH MAY BE SUBJECTED TO CONCENTRATED OR DISTRIBUTED EXTERNAL LOADING AND TO ISOTHERMAL OR NONUNIFORM TEMPERATURE CONDITIONS. THE PROGRAM CONSISTS OF FIVE PRIMARY SUBPROGRAMS - HAL4, MELT4, LANCE4, MAINS4, AND SUMPLOT4. THREE OF THESE (HAL4, MELT4, AND LANCE4) PROCESS EXTERNAL-MECHANICAL-LOAD OR THERMAL-LOAD DATA TO DETERMINE THE GENERALIZED NODAL FORCES FOR EACH DISCRETE ELEMENT. MAINS4 COMPUTES THE DISCRETE-ELEMENT STIFFNESS AND MASS MATRICES AND FORMS THESE MATRICES FOR THE ASSEMBLED STRUCTURE. SUMPLOT4 CALCULATES THE OTHER QUANTITIES OF INTEREST, SUMS CONTRIBUTIONS FROM VARIOUS LOADING HARMONICS, AND PREPARES RESULTS FOR CALCOMP PLOTTING.

404 FINEL FINEL IS A COLLECTION OF 3 PROGRAMS FOR THE CALCULATION OF THE ELASTIC AND PLASTIC BEHAVIOR OF STRUCTURES. THE STRUCTURES ARE BUILT UP FROM PLATES AND BARS, WHICH CAN BE ARRANGED IN EITHER 2-DIMENSIONAL OR 3-DIMENSIONAL ASSEMBLIES. THE PLATES CAN BE IN PLANE STRESS OR PLANE STRAIN. FINEL2 HANDLES 2-D STRUCTURES ONLY. FINEL3 CAN HANDLE BOTH 2- AND 3-D STRUCTURES, BUT IS SLOW.

412 MANE1 THE MANE1 PROGRAM FINDS THE MAGNETIC FLUX IN EACH BRANCH OF A MAGNETIC NETWORK CONSISTING OF A NUMBER OF BRANCHES OF IRON AND AIR. THE PROBLEM IS ONE STEP IN THE DESIGN OF SLOW SPEED RELUCTANCE MOTORS IN WHICH THE MAGNETIC FLUX IS DETERMINED IN ALL COMPONENT PARTS FOR A POSITION OF THE ROTOR WITH RESPECT TO THE STATOR.

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449 CYGR03 CYGR03 IS AN EXTENSIVE MODIFICATION OF CYGR01 AND CYGR02 (ACC ABSTRACT 266). BASICALLY THE PROGRAM CALCULATES TEMPERATURES, DEFORMATION, AND STRESSES IN CLADDED FUEL RODS AS A FUNCTION OF A HISTORY OF POWER AND COOLANT CONDITIONS. AXIAL AND CIRCUMFERENTIAL UNIFORMITY ARE ASSUMED. BUBBLE GROWTH AND MIGRATION ARE INCLUDED. THE MAIN CHANGES FROM CYGR01 AND CYGR02 ARE IN THE AREA OF VOID MIGRATION, FUEL CRACKING, CLAD COLLAPSE, REPRESENTATION OF IN-PILE CREEP AND CLAD ANISOTROPY.

451 SAFE-CRACK SAFE-CRACK PERFORMS A VISCO-ELASTIC ANALYSIS OF PLANE AND AXISYMMETRIC COMPOSITE CONCRETE STRUCTURES SUBJECTED TO TRANSIENT TEMPERATURE AND MECHANICAL LOADINGS. THE SPECIFIC CREEP OF CONCRETE AS AN AGE AND TEMPERATURE DEPENDENT FUNCTION, AND CONCRETE FAILURE UNDER COMBINED STRESSES ARE CONSIDERED. PARTICULAR EMPHASIS IS PLACED ON THE CRACKING ANALYSIS IN CONCRETE STRUCTURES AND THE NONLINEAR DEPENDENCE OF CREEP PROPERTY ON TRANSIENT TEMPERATURE.

452 SHELL5 SHELL5 PERFORMS AN ELASTIC STRESS ANALYSIS OF SMOOTHLY CURVED, ARBITRARILY SHAPED, THREE-DIMENSIONAL THIN SHELLS WITH ANY DESIRED DISTRIBUTIONS OF MATERIAL PROPERTIES, BOUNDARY CONSTRAINTS, AND MECHANICAL, THERMAL, AND DISPLACEMENT LOADING CONDITIONS.

460 LIFE1 LIFE1 IS DESIGNED TO PREDICT THE IN-PILE BEHAVIOR OF CYLINDRICAL FAST REACTOR FUEL ELEMENTS. ASSUMING AXIAL SYMMETRY, THE GENERALIZED PLANE-STRAIN ANALYSIS COMBINES MODELS FOR FUEL RESTRUCTURING, MIGRATION OF FUEL CONSTITUENTS, FUEL SWELLING DUE TO ACCUMULATION OF FISSION PRODUCTS, FISSION GAS RELEASE, HOT PRESSING OF THE FUEL, AND CLAD SWELLING DUE TO VOID NUCLEATION AND GROWTH. AN ITERATIVE PROCEDURE ALLOWS THE CODE TO COMPUTE THE DETAILED THERMAL AND MECHANICAL RESPONSE OF THE FUEL ELEMENT DURING ANY SPECIFIED HISTORY OF NORMAL REACTOR POWER CYCLING. UP TO 10 AXIAL SECTIONS ARE ALLOWED TO ACCOUNT FOR VARIATIONS IN POWER AND COOLANT TEMPERATURE, AND AN OPTION IS INCLUDED FOR TREATMENT OF ENCAPSULATED ELEMENTS.

468 BUBL1 BUBL1 PREDICTS FUEL SWELLING AND FISSION GAS RELEASE FROM NUCLEAR FUELS, BASED ON MOVEMENT OF FISSION GAS BUBBLES IN SOLIDS BY A SURFACE DIFFUSION MECHANISM UNDER THE ACTION OF A THERMAL GRADIENT (SEE REFERENCE 3). INTERACTIONS OF THE BUBBLES WITH DISLOCATIONS AND GRAIN BOUNDARIES PROVIDE TEMPORARY TRAPPING SITES, PRIOR TO RELEASE.

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481 BUSHL BUSHL DETERMINES THE LOAD AT WHICH A FINITE LENGTH SHELL OF REVOLUTION WILL BUCKLE WHEN SUBJECTED TO HYDROSTATIC PRESSURE, AXIAL COMPRESSION, OR A COMBINATION OF THE TWO. ELASTIC-PLASTIC MATERIAL PROPERTIES ARE USED WITH DEFORMATION THEORY AND THIN SHELL THEORY TO ANALYZE THE SHELL. BUSHL WAS DEVELOPED PRIMARILY FOR THE BUCKLING COLLAPSE ANALYSIS OF ZIRCALOY-CLAD OXIDE FUEL RODS.

503 DUZ2 DUZ2 PERFORMS TWO-DIMENSIONAL ELASTIC-PLASTIC STRESS CALCULATIONS. THE PROGRAM TREATS AXIALLY SYMMETRIC BODIES OR PLANE REGIONS (PLANE STRESS OR PLANE STRAIN) ASSUMING DEFORMATION THEORY. LOADING CONDITIONS MAY BE A NON-UNIFORM TEMPERATURE DISTRIBUTION, BODY FORCES, AND BOUNDARY DISPLACEMENTS OR STRESSES.

537 M0678(FUGIT1) FUGIT1 PERFORMS A TRANSIENT STEP ANALYSIS OF AN ELASTIC STRUCTURE MOUNTED ON A RIGID BASE WHICH HAS A GIVEN SHOCK HISTORY OF MOTION. THE STRUCTURE MAY HAVE NONLINEAR CONSTRAINTS AND DAMPING.

539 STRAP THE CODE STRAP (STRUCTURAL ANALYSIS PACKAGE) WAS DEVELOPED TO ANALYZE THE RESPONSE OF STRUCTURAL SYSTEMS TO STATIC AND DYNAMIC LOADING CONDITIONS. STRAP-SOLVES FOR THE DISPLACEMENTS AND MEMBER FORCES OF STRUCTURAL SYSTEMS UNDER STATIC LOADS AND TEMPERATURE GRADIENTS. STRAP-D WILL SOLVE NUMERICALLY A GIVEN STRUCTURAL DYNAMICS PROBLEM.

542 PSA2 PSA2 COMPUTES THE REACTIONS AND STRESSES CAUSED BY THERMAL EXPANSION AND LOADS IN A MULTI-ANCHOR PIPING SYSTEM WHICH MAY CONTAIN LOOPS AND MAY BE PARTIALLY RESTRAINED AT ANY POINT IN ANY DIRECTION.

568 BEHAVE2 BEHAVE2 CALCULATES THE POSITION IN SPACE OF CLADDING, FUEL, AND VOIDAGE IN AN OPERATING OXIDE FUEL PIN WITH UNFAILED CLADDING. AXIAL SYMMETRY IS ASSUMED THROUGHOUT THE PROGRAM. ALSO CALCULATED ARE STRESS, STRAIN, DISPLACEMENT, AND TEMPERATURE FIELDS. INFLUENTIAL PROCESSES SIMULATED INCLUDE CRACKING OF FUEL, DILATATION OF FUEL AND CLADDING DUE TO IRRADIATION EFFECTS AND THERMAL EXPANSION, FUEL DENSIFICATION BY BOTH STRESS- AND DIFFUSION-CONTROLLED PROCESSES, AXIAL SLIPPAGE OR LOCKING AT THE FUEL-CLADDING INTERFACE AND AXIAL FLOW OF FUEL.

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570 STRIPE(M0650) STRIPE EXAMINES THE DEFORMATIONS IMPOSED ON THE CLADDING OF CYLINDRICAL FUEL ELEMENTS DUE TO DIFFERENTIAL THERMAL EXPANSIONS DURING ABRUPT POWER INCREASES. THE TITLE IS TAKEN FROM STRESSES AND CRACKING IN PELLETS. THE CALCULATIONAL MODEL INCLUDES EFFECTS OF PELLET CRACKING, THE CONSTRAINT OF SYSTEM PRESSURE AND CLADDING, COMPRESSIVE PLASTIC FLOW IN THE FUEL AND THE TEMPERATURE DEPENDENCE OF MATERIAL PROPERTIES.

581 SLADE-D SLADE-D ANALYZES THE TRANSIENT DYNAMIC RESPONSE OF ELASTIC SHELLS.

597 MATUS MATUS PERFORMS SMALL-STRAIN ELASTIC ANALYSIS OF THREE-DIMENSIONAL SOLIDS.

598 PELEN PELEN SOLVES A TWO-DIMENSIONAL, AXISYMMETRICAL MODEL OF A FUEL PELLET AND CLAD ELEMENT FOR THE TEMPERATURE, STRESS, AND DEFORMATION THROUGHOUT A TIME HISTORY. IN A GENERAL TIME INCREMENT, THE COMPUTATIONAL SEQUENCE IS - (1) A HEAT CONDUCTION ANALYSIS OF BOTH FUEL AND CLAD TO DETERMINE THE CURRENT TEMPERATURE FIELD WHICH IS DEPENDENT ON THE POWER RATE, THE MATERIAL PROPERTIES, AND THE GEOMETRICAL CONFIGURATION, (2) AN INCREMENTAL STRESS ANALYSIS OF BOTH FUEL AND CLAD TO DETERMINE THE CURRENT STRESS AND DEFORMATION FIELDS WHICH ARE DEPENDENT ON THE INELASTIC STRAIN INCREMENTS (TEMPERATURE, CREEP, VOLUME EXPANSION, ETC.), THE MATERIAL PROPERTIES, AND THE GEOMETRICAL CONFIGURATION, AND (3) A CONTACT ANALYSIS OF BOTH FUEL AND CLAD TO DETERMINE THE CORRECTED CURRENT STRESS AND DEFORMATION FIELDS WHICH ARE DEPENDENT ON THE EXTENT OF CONTACT BETWEEN ADJACENT FUEL PELLETS AND/OR THE FUEL AND CLAD.

604 TCB01 A TUBE UNDER EXTERNAL PRESSURE, AT ELEVATED TEMPERATURE, AND INITIALLY CUT-OFF-ROUND WILL CREEP, BECOMING MORE CUT-OFF-ROUND AND EVENTUALLY WILL COLLAPSE. TCB01 ATTEMPTS TO PREDICT THE TIME OF COLLAPSE.

J. GAMMA HEATING AND SHIELD DESIGN

3/74

45 GRACE1 GRACE1 IS A MULTIGROUP, MULTIREGION, GAMMA-RAY ATTENUATION PROGRAM DESIGNED PRIMARILY FOR COMPUTING GAMMA-RAY HEATING AND GAMMA-RAY DOSE RATES IN MULTIREGION FINITE OR SEMI-INFINITE SLAB SHIELDS. A DIFFERENT BUILDUP FACTOR MAY BE SPECIFIED FOR EACH SOURCE REGION CONSIDERED.

46 GRACE2 GRACE2 IS A MULTIGROUP, MULTIREGION, GAMMA-RAY ATTENUATION PROGRAM TO COMPUTE THE TOTAL DOSE RATE OR HEAT GENERATION RATE FROM EITHER A SPHERICAL OR A CYLINDRICAL SOURCE. THE SOURCE, WHICH MAY BE LOCATED IN EITHER THE CENTRAL REGION OF THE SYSTEM OR IN A CONCENTRIC SHELL REGION SURROUNDING IT, MAY BE UNIFORM, EXPONENTIAL, OR HAVE A POLYNOMIAL VARIATION IN THE RADIAL DIRECTION. IN THE CASE OF CYLINDRICAL GEOMETRY, IT MAY ALSO HAVE A POLYNOMIAL VARIATION IN THE AXIAL DIRECTION.

91 FARSE-1A THE PROGRAM COMPUTES THE NEUTRON LEAKAGE FROM A SHIELD ANNULUS. THE REMOVAL CROSS SECTIONS INCORPORATE MULTISCATTERING EFFECTS. DOSE DEPOSIT AT THE TARGET MESH IS THEN DETERMINED FROM THE ANGULAR DISTRIBUTION OF THE LEAKAGE NEUTRONS, INTEGRATED OVER THE SHIELD SURFACE.

110 SCARF2 SCARF2 EVALUATES THE FIRST-ORDER APPROXIMATION OF THE FAST NEUTRON CURRENT AT THE PAY LOAD SURFACE DUE TO NEUTRONS WHICH SCATTER FROM THE RADIATOR FINS. IT USES SNAP GEOMETRY AND IS A COMPLEMENTARY PROGRAM TO FARSE.

111 SCAR1 SCAR1 PERFORMS SINGLE SCATTER RAY TRACING AND EVALUATES SCATTERING FROM A RING. IT IS COMPLEMENTARY TO FARSE.

J. GAMMA HEATING AND SHIELD DESIGN

3/74

123 LIPRECAN1 LIPRECAN1 IS A TWO-DIMENSIONAL MONTE CARLO PROGRAM TO COMPUTE THE PENETRATION AND ENERGY DEPOSITION OF NEUTRONS IN PURE HYDROGENOUS MEDIA. THE CODE OFFERS THREE POSSIBLE GEOMETRIES, I. E., CONICAL, CYLINDRICAL AND ONE-DIMENSIONAL INFINITE SLAB GEOMETRY (THIS LATTER OPTION TO THE EXTENT THAT AN INFINITE SLAB MAY BE APPROXIMATED BY A CYLINDER OF LARGE RADIUS). THE CODE MAY BE USED WITH A MONO-DIRECTIONAL POINT OR BEAM SOURCE AND IS MODIFIED EASILY TO HANDLE ANGULAR DISTRIBUTIONS. ISOTROPIC SCATTERING IN THE CENTER OF MASS SYSTEM IS ASSUMED. THE FOLLOWING RESULTS ARE TABULATED WITH EACH SUMMARY -

- (A) ENERGY DEPOSITION DISTRIBUTION,
- (B) PARTICLE DEPOSITION DISTRIBUTION,
- (C) PARTICLE LEAKAGE FRACTION,
- (D) PARTICLE ABSORPTION FRACTION,
- (E) THE FRACTION OF PARTICLES REACHING THE CUTOFF ENERGY WHICH HAVE NEITHER LEAKED NOR HAVE BEEN ABSORBED,
- (F) THE AVERAGE ENERGY PER PARTICLE LEAKING FROM THE SYSTEM,
- (G) THE AVERAGE ENERGY PER PARTICLE REMAINING IN THE SYSTEM AS HEAT GENERATION,
- (H) THE AVERAGE NUMBER OF COLLISIONS PER HISTORY,
- (I) THE TOTAL NUMBER OF HISTORIES CURRENTLY BEING SUMMARIZED,
- (J) THE AVERAGE ENERGY DEPOSIT PER HISTORY THROUGH ABSORPTION,
- (K) THE AVERAGE ENERGY OF PARTICLES ABSORBED.

141 RATRAP THE RATRAP PROGRAM COMPUTES THE DOSE RATE AT SPECIFIED SPATIAL POINTS ABOUT A SYSTEM OF SNAP GEOMETRY.

142 MORTIMER MORTIMER COMPUTES THE DOSE RATE AT SPECIFIED SPATIAL POINTS ABOUT A SYSTEM OF SNAP GEOMETRY.

143 MAC MAC PERFORMS SLAB GEOMETRY, MULTIGROUP NEUTRON AND GAMMA RAY PENETRATION ANALYSIS FOR A MULTI-REGION REACTOR SHIELD. THE CODE CALCULATES THE FOLLOWING INFORMATION AS A FUNCTION OF DISTANCE THROUGH A REACTOR SHIELD ASSEMBLY -

- NEUTRON FLUXES FOR UP TO 35 ENERGY GROUPS,
- NEUTRON DOSE RATES,
- THE APPROXIMATE NEUTRON SPECTRUM,
- GAMMA RAY FLUXES FOR 7 ENERGY GROUPS,
- TOTAL GAMMA DOSE RATE, WITH A BREAKDOWN OF THE CONTRIBUTION FROM SOURCES IN EACH REACTOR AND SHIELD REGION,
- THE APPROXIMATE GAMMA RAY SPECTRUM.

J. GAMMA HEATING AND SHIELD DESIGN

3/74

197 SHOE THE SHOE CODE MAKES USE OF THE METHOD OF STEEPEST DESCENT TO FIND THE DIMENSIONS OF A MINIMUM-WEIGHT, THREE-LAYER SHIELD IN SPHERICAL GEOMETRY. THE WEIGHT MINIMIZATION IS CARRIED OUT SUBJECT TO THE CONSTRAINING CONDITION OF A CONSTANT DOSE RATE AT SOME SELECTED POINT OUTSIDE THE SHIELD.

259 MUSCAT MUSCAT COMPUTES THE INCIDENT SCATTERED NEUTRON CURRENTS AS A FUNCTION OF POSITION WITHIN (1) THE CAVITY FORMED BY TWO TRUNCATED CONCENTRIC SPHERES, (2) THE CAVITY BETWEEN TWO CONCENTRIC CIRCULAR CYLINDERS, OR (3) A CYLINDRICAL CAVITY.

343 MO756 (LETO) LETO WILL SOLVE THE GAMMA RAY TRANSPORT AND ENERGY DEPOSITION PROBLEM IN ONE-DIMENSIONAL LAMINAR SLAB GEOMETRY. THE ENERGY GROUP SCHEME IS EMPLOYED TO ACCOUNT FOR PHOTON ENERGY DEGRADATION. AN ARBITRARY EXTERNAL SPATIAL ISOTROPIC SOURCE MAY BE SPECIFIED WITH AN ARBITRARY ENERGY SPECTRUM. THE BOUNDARY CONDITIONS MAY BE (A) FREE BOUNDARIES WITH ARBITRARY INCIDENT, (B) SYMMETRY ON THE LEFT ARBITRARY INCIDENT ON THE RIGHT, AND (C) SYMMETRY ON BOTH ENDS.

429 ASPIS ASPIS COMPUTES THE ENERGY, DOSE AND ENERGY DEPOSITION BUILDUP FACTORS FOR MONOENERGETIC GAMMA RAYS FOR A PLANE ISOTROPIC, PLANE MONODIRECTIONAL, OR PLANE SLANT SOURCE, IN AN ARBITRARY LAMINAR ARRAY.

J. GAMMA HEATING AND SHIELD DESIGN

3/74

462 SPAN4

SPAN4 CALCULATES THE FAST NEUTRON DOSE RATE, THERMAL NEUTRON FLUX, GAMMA-RAY FLUX, DOSE RATE, AND ENERGY-ABSORPTION RATE IN RECTANGULAR, CYLINDRICAL, AND SPHERICAL GEOMETRIES BY INTEGRATING APPROPRIATE EXPONENTIAL KERNELS OVER A SOURCE DISTRIBUTION. THE SHIELD CONFIGURATION IS FLEXIBLE - A FIRST-LEVEL SHIELD MESH, USING ANY ONE OF THE THREE GEOMETRIES, IS SPECIFIED. REGIONS OF THIS SAME GEOMETRY OR OF OTHER GEOMETRIES, HAVING THEIR OWN (FINER) MESHES, MAY THEN BE EMBEDDED BETWEEN THE FIRST-LEVEL MESH LINES, DEFINING SECOND-LEVEL SHIELD MESHES. THIS PROCESS IS TELESCOPIC - THIRD-LEVEL SHIELD MESHES MAY BE EMBEDDED BETWEEN SECOND-LEVEL MESH LINES IN TURN. ALL MESHES MAY HAVE VARIABLE SPACING. SOURCES AND DETECTORS MAY BE LOCATED ARBITRARILY WITH RESPECT TO ANY SHIELD MESH. THE SOURCE IS DEFINED BY THE FUNCTION -

$$S = S_0 + S_1(A) * S_2(B) * S_3(C) + S_4(A, B) * S_3(C) + S_5(A, C) * S_2(B) + S_6(B, C) * S_1(A) + S_7(A, B, C)$$

WHERE A, B, AND C REPRESENT COORDINATES. IF ANY FACTOR IS MISSING, THE CORRESPONDING TERMS ARE ZERO. CROSS SECTIONS, BUILDUP FACTORS, STANDARD COMPOSITIONS, ENERGY STRUCTURES, DOSE-CONVERSION FACTORS, INFINITE LINE AND INFINITE PLANE SOURCE KERNELS, AND QUADRATURES ARE CONTAINED IN A LIBRARY OF APPROXIMATELY 10,000 ITEMS.

569 VIEWPIN

THE PROGRAM CALCULATES VIEW FACTORS FOR CYLINDRICAL PINS WHENEVER THE PROBLEM CAN BE REPRESENTED TWO-DimensionALLY.

K. REACTOR SYSTEMS ANALYSIS

3/74

273 THREDES THREDES IS A SCIENTIFIC APPLICATIONS PROGRAMMING SYSTEM. INCORPORATED IN THIS SYSTEM ARE THE NECESSARY MODULES TO PERFORM PARAMETRIC DESIGN STUDIES OF THERMAL REACTORS INCLUDING THE THERMAL CELL HOMOGENIZATION (BAM - ACC ABSTRACT 108), THE FAST SPECTRUM CALCULATION (FORM - ACC ABSTRACT 51), REACTOR DIFFUSION THEORY (FOG - ACC ABSTRACT 28), AND ZERO-DIMENSIONAL BURNUP (KINDLE) CALCULATIONS. THESE MODULES CAN BE USED IN CONJUNCTION WITH ONE ANOTHER OR INDIVIDUALLY.

387 CITATION CITATION IS DESIGNED TO SOLVE PROBLEMS INVOLVING THE FINITE-DIFFERENCE REPRESENTATION OF DIFFUSION THEORY TREATING UP TO THREE SPACE DIMENSIONS WITH ARBITRARY GROUP-TO-GROUP SCATTERING. X-Y-Z, THETA-R-Z, HEXAGONAL-Z, AND TRIANGULAR-Z GEOMETRIES MAY BE TREATED. DEPLETION PROBLEMS MAY BE SOLVED AND FUEL MANAGED FOR MULTI-CYCLE ANALYSIS. EXTENSIVE FIRST-ORDER PERTURBATION RESULTS MAY BE OBTAINED, GIVEN MICROSCOPIC DATA AND NUCLIDE CONCENTRATIONS. STATICS PROBLEMS MAY BE SOLVED AND PERTURBATION RESULTS OBTAINED WITH MICROSCOPIC DATA.

L. DATA PREPARATION

3/74

189 SNC
FOR DSN AND TDC.

CALCULATION OF SN CONSTANTS

193 CSP2A THIS CODE PREPARES 100 GROUP FORWARD AND ADJOINT MACROSCOPIC MIXTURE CROSS SECTIONS FOR SN TYPE CODES. THE 100 GROUP MICROSCOPIC CROSS SECTIONS ARE TAKEN FROM THE CROSS SECTION TAPE WRITTEN BY THE CODE CSP1. THE OUTPUT OF CSP2A IS IN THE FORM OF TWO TAPES, ONE CONTAINING THE FORWARD AND THE OTHER THE ADJOINT MACROSCOPIC CROSS SECTIONS. THE CROSS SECTIONS ARE ALSO PRINTED, IF DESIRED.

194 CSP1 THIS CODE PREPARES 100 GROUP MICROSCOPIC CROSS SECTIONS FOR SN TYPE REACTOR CODES, USING THE GAM2 NUCLEAR DATA TAPE FOR THE CROSS SECTION DATA FOR THE FIRST 99 GROUPS. THE DATA FOR GROUP 100 IS PART OF THE PUNCHED CARD INPUT. THE 100 GROUP SN CROSS SECTIONS, PREPARED BY THE CODE, ARE WRITTEN ON TAPE AND PRINTED, IF DESIRED. THE CROSS SECTIONS ARE FOR THE ISOTROPIC OPTION OF THE SN CODES. THE DIAGONAL TRANSPORT APPROXIMATION HAS BEEN USED IN CALCULATING THE TRANSPORT AND IN-GROUP SCATTERING CROSS SECTIONS. THE CORRECTION TERM USED TO CALCULATE THESE TWO CROSS SECTIONS IS SIMPLY 1/3 OF THE P1 SCATTERING CROSS SECTION. THE NUMBER OF OUT-OF-GROUP SCATTERING TERMS IS OPTIONAL. WHEN LESS THAN THE NUMBER APPEARING ON THE GAM2 TAPE ARE REQUESTED, THE REMAINING TERMS, FOR A GIVEN SOURCE GROUP, ARE SUMMED AND ADDED TO THE LAST DOWN-SCATTERING TERM SAVED. WHEN CROSS SECTIONS ARE LISTED IN THE SN FORMAT, IT IS POSSIBLE THAT ONE OR MORE INTERMEDIATE DOWN-SCATTERING TERMS WILL BE ZERO. WHEN THIS SITUATION ARISES, THE CODE WILL REPLACE THESE INTERMEDIATE ZEROS WITH THE QUANTITY $1.0 \times 10^{**(-20)}$.

218 GAVER GAVER CALCULATES GROUP AVERAGED CROSS SECTIONS FROM POINTWISE CROSS SECTION DATA FOR THE GAM2 99 FINE-GROUP LIBRARY. THE INPUT DATA ARE USED TO OBTAIN A SET OF INTERPOLATED CROSS SECTIONS, WHERE 20 INTERPOLATED CROSS SECTIONS ARE OBTAINED FOR EACH FINE GROUP. WHERE INPUT DATA DO NOT COVER THE FULL RANGE OF A FINE GROUP, THE GROUP-AVERAGED CROSS SECTION IS SET TO ZERO.

234 DPC DPC PREPARES INPUT DATA FOR TWO-DIMENSIONAL NEUTRONIC CALCULATIONS FROM ENGINEERING DATA. A GENERAL DESCRIPTION OF REGIONS, IN TERMS OF MULTIPLE SUBREGIONS, ALLOWS FOR EXPLICIT CONSIDERATION OF DETAILED STRUCTURAL FORMS. DURING THE TRANSFORMATION OF DATA, GENERAL THERMAL EXPANSIONS ARE INCLUDED. ALSO, CONSIDERABLE DATA CHECKING AND EVALUATION ARE PERFORMED. COMBINED WITH THE FLEXIBLE NARRATIVE INPUT, THESE FEATURES MAKE THE CODE USEFUL IN THE PREPARATION OF ERROR-FREE INPUT FOR COMPLEX PROBLEMS.

L. DATA PREPARATION

3/74

296 GRDWRK GRDWRK GENERATES AS PUNCHED OUTPUT THE BASIC FINITE ELEMENT REFERENCE GRID WORK FOR THE SAFE CODES. THIS GENERATED GRID CONSISTS OF TRIANGULAR ELEMENTS AND NODES, UNIAXIAL ELEMENTS, SUCH AS REINFORCEMENT BARS, TENDONS, AND ANCHORS, AND BIAXIAL MEMBRANES, SUCH AS ANY THIN SHELL OR LINER. THE PUNCHED OUTPUT SERVE AS DIRECT INPUT DATA TO THE SAFE CODES.

345 GAND GAND PREPARES THE CROSS SECTIONS NEEDED FOR DETAILED COMPUTATIONS OF NEUTRON ENERGY SPECTRA IN FAST REACTORS FROM A FILE OF BASIC NUCLEAR DATA IN THE ENDF/B FORMAT.

373 BL47 BL47 IS A PLOTTING ROUTINE DESIGNED FOR PLANE STRUCTURES THAT ARE TO UNDERGO STRESS ANALYSIS. POINTS AND LINES ARE INPUT IN VARIOUS PARAMETRIC FORMS, AND CURVED SEGMENTS ARE DRAWN BETWEEN GIVEN POINTS ALONG THE GIVEN LINES. THE PROGRAM MAY BE USED AS A DRAFTING TOOL TO CONSTRUCT ENGINEERING DRAWINGS. BL47 USES THREE POINTS ON A STRAIGHT LINE SEGMENT TO OBTAIN DIMENSIONS FOR SEALHELL2 (ACC ABSTRACT 282) INPUT DATA.

406 DATATRAN 2-D GEOMETRY INPUT THIS SERIES OF DATATRAN MODULES IS DESIGNED TO FACILITATE THE PREPARATION OF GEOMETRIC INPUT TO 2-DIMENSIONAL FINITE DIFFERENCE PROGRAMS FROM DATA READILY TRANSCRIBED FROM ENGINEERING DRAWINGS AND TO CHECK AND EDIT THE INPUT DATA GENERATED.

509 ETOT2 ETCT2 PROCESSES BASIC NUCLEAR INFORMATION GIVEN IN THE ENDF/B LIBRARY TAPE FORMATS I AND II AND PRODUCES DATA DECKS FOR USE IN THE GENERATION OF KATE, THERMOS (ACC ABSTRACT 184), TEMPEST (ACC ABSTRACT 50), AND LASER (ACC ABSTRACT 249) LIBRARIES.

530 GENRD GENRD WILL READ AND PROCESS FREE-FORMAT NUMERIC AND HOLLERITH INPUT DATA FROM CARDS.

533 ARC(NUI002) BCD INPUT PROCESSOR THE MODULE ARC(NUI002) PROCESSES GENERAL NEUTRONICS INPUT DATA SETS FOR SUBSEQUENT USE BY THE NEUTRONICS-COMPUTATIONAL MODULES OF THE ARGONNE REACTOR COMPUTATION (ARC) SYSTEM.

L. DATA PREPARATION

3/74

594 ARC-XSEC1 ARC-XSEC1 PROVIDES THE CAPABILITY OF MANIPULATING MULTIGROUP MICROSCOPIC CROSS SECTION DATA IN THE XS.ISO FORMAT TO AFFECT MODIFICATIONS OF THE ISOTOPIC CROSS SECTION COMPONENTS, TO COLLAPSE THE ENERGY GROUP STRUCTURE TO FEWER GROUPS, AND TO HOMOGENIZE MIXTURES INTO MATERIAL AND COMPOSITION LEVEL DATA FOR USE BY THE NEUTRONICS MODULES OF THE ARGONNE REACTOR COMPUTATION (ARC) SYSTEM.

M. DATA MANAGEMENT

3/74

159 MOMUS MOMUS IS THE PROGRAM USED TO CONSTRUCT AND MAINTAIN THE NEUTRON CROSS SECTION MASTER TAPE DEVELOPED UNDER THE ATOMICS INTERNATIONAL AUTOMATED CROSS SECTION PROGRAM. THE LIBRARY CONTAINS 21 ELEMENTS WITH DATA FOR 11 PARAMETERS IN THE RANGE 0.001 EV TO 10 MEV. MOMUS WILL PERFORM THE FOLLOWING TASKS -

- (A) MAKE THE BINARY MASTER TAPE FROM CARDS,
- (B) LIST SELECTED ELEMENTS,
- (C) UPDATE - ADD, CORRECT AND REPLACE ANY DATA,
- (D) MAKE A SHORT TAPE CONTAINING SELECTED ELEMENTS,
- (E) PROVIDE GRAPHICAL DISPLAY OF SELECTED DATA, AND
- (F) PUNCH MICROSCOPIC DATA.

181 XLBIT USING THE ANL STANDARD CROSS SECTION DATA CARDS AS INPUT, THE PROGRAM CAN PERFORM THE FOLLOWING OPERATIONS -

- (A) PREPARE A LIBRARY TAPE CONSISTING OF THE CROSS SECTION DATA FOR SETS OF MATERIALS, INCLUDING A DIRECTORY GIVING THE SETS ON THE TAPE AND THE MATERIALS IN EACH SET,
- (B) GIVEN AN EXISTING LIBRARY TAPE, THE PROGRAM CAN PREPARE A DUPLICATE TAPE OR A MODIFIED TAPE, THE MODIFICATIONS CONSISTING OF THE ADDITION AND DELETION OF SETS, THE ADDITION AND DELETION OF MATERIALS WITHIN A SET, AND THE RE-ORDERING OF THE SETS ON THE TAPE,
- (C) ANY OF THE DATA ON A LIBRARY TAPE MAY BE PRINTED, AND THE PROGRAM WILL PUNCH THE CROSS SECTION DATA CARDS THAT WERE USED TO PLACE ANY OF THE MATERIALS OR SETS ON THE TAPE WITH ALTERED SET AND MATERIAL NAMES IF DESIRED.

206 UNPACK UNPACK RETRIEVES NEUTRON CROSS SECTION DATA AND RELATED INFORMATION FROM A SCISRS (BROOKHAVEN NATIONAL LABORATORY) DATA TAPE. THE FORMAT AND STRUCTURE OF THE SCISRS TAPE IS DESCRIBED IN BNL-883 BY FRIEDMAN AND PLATT, JULY 1964.

236 DFSR DATA FILE SERVICE ROUTINES (DFSR) ARE USED TO STORE, DISTRIBUTE, AND CHECK THE DATA ON THE EVALUATED NUCLEAR DATA FILE (ENDF). THERE ARE 6 ROUTINES -

- DFSR1 - STORES DATA ON MASTER LIBRARY TAPES.
- DFSR2 - PROCESSES REQUESTS FOR DATA BY FINDING THE APPROPRIATE DATA ON THE MASTER TAPES AND COPYING THEM ONTO THE REQUESTORS TAPE.
- DFSR3 - CORRECTS DATA ON THE MASTER TAPES.
- DFSR4 - COPIES/PRINTS/PUNCHES SELECTED DATA FROM THE MASTER TAPES.
- DFSR5 - PRINTS LIST OF DATA RECENTLY ADDED TO MASTER TAPES AND PREPARES A CROSS-REFERENCE LIST OF ALL DATA ON THE MASTER TAPES.
- DFSR6 - MAKES COPIES AND CHECKS THE MASTER TAPES.

M. DATA MANAGEMENT

3/74

271 CLIP CLIP IS THE CROSS SECTION LIBRARY PREPARATION AND MAINTENANCE PROGRAM FOR FORM AND THREDES.

350 ETOE ETOE (ENDF/B TO MC**2 DATA CONVERSION) ACCEPTS CROSS SECTION DATA FROM A MODE 2 ENDF/B TAPE (SEE REFERENCE 3) AND PREPARES THE BINARY CROSS SECTION AND LEGENDRE POLYNOMIAL TAPE FOR THE MC**2 CCDE WRITTEN BY ARGONNE NATIONAL LABORATORY. THE ETOE PROGRAM PROCESSES FORMATS I, II, AND III ENDF/B DATA TAPES.

351 ECSIL ECSIL (EXPERIMENTAL CROSS SECTION INFORMATION LIBRARY) IS A SYSTEM FOR THE STORAGE, RETRIEVAL, AND DISPLAY OF EXPERIMENTAL NEUTRON DATA. THE HEART OF THE ENTIRE SYSTEM IS THE COLLECTION OF DESIGNATORS USED TO IDENTIFY THE TYPE OF NEUTRON DATA, E.G., WHETHER THE MEASUREMENT IS A FISSILE CROSS SECTION, AN ANGULAR DISTRIBUTION FOR EMERGENT NON-FLASTIC NEUTRONS BETWEEN TWO NEUTRON ENERGIES, ETC. THERE ARE THREE DICTIONARIES USED FOR INPUT TO THE DATA FILE - ONE FOR THE REACTION-TYPE DESIGNATOR, ONE FOR THE STATUS OF THE DATA, AND ONE TO FLAG THE PROGRAM TO PERFORM CERTAIN CONVERSIONS. EXPERIMENTAL NEUTRON DATA ARE, IN GENERAL, COMPOSED OF TWO INTERDEPENDENT, BUT LOGICALLY SEPARABLE PARTS, THE BIBLIOGRAPHIC INFORMATION AND THE ACTUAL EXPERIMENTAL VALUES. THE REFERENCE ACCESSION NUMBER, WHICH IS ASSIGNED TO A REFERENCE AND ITS ASSOCIATED SET OF DATA AS THEY ARE ACQUIRED, SERVES AS A LINK BETWEEN THE BIBLIOGRAPHIC AND THE EXPERIMENTAL DATA FILES. AFTER A REFERENCE ACCESSION NUMBER IS ASSIGNED TO A NEW REFERENCE, THE FOLLOWING INFORMATION IS ENTERED INTO THE BIBLIOGRAPHIC FILE - THE COMPLETE BIBLIOGRAPHIC CITATION, THE LABORATORY WHERE THE MEASUREMENT WAS PERFORMED, A BRIEF DESCRIPTION OF THE EXPERIMENTAL TECHNIQUE, CORRECTIONS THAT HAVE BEEN MADE TO THE RESULTS, AND NORMALIZATIONS, IF ANY. IN ADDITION, ANY CHANGES MADE TO THE DATA (RENORMALIZATIONS TO BETTER STANDARDS, CORRECTIONS, ETC.) ARE RECORDED HERE. SUPPLEMENTARY REFERENCES ARE CARRIED ALONG AS SEE ALSOS.

375 SCORE3 SCORE IS AN INTERACTIVE NEUTRON CROSS SECTION EVALUATION SYSTEM.

M. DATA MANAGEMENT

3/74

384 CHECKER/CRECT/DAMMET/PLOTFB/ THIS PACKAGE OF FIVE PROGRAMS IS DESIGNED FOR PROCESSING ENDF/B (EVALUATED NUCLEAR DATA FILE VERSION B) VERSION I TAPES.

CHECKER CHECKS THAT THE ENDF/B TAPES ARE IN PROPER FORMAT AND ALL FIELDS ARE WITHIN SPECIFIED LIMITS, RATHER THAN THE PHYSICS OF THE DATA LIBRARY. ANGULAR DISTRIBUTIONS RECONSTRUCTED FROM LEGENDRE COEFFICIENTS ARE EVERYWHERE POSITIVE.

CRECT, WHICH CAN PROCESS ENDF/B VERSION III DATA AS WELL AS EARLIER VERSIONS, PROVIDES A MEANS OF CORRECTING ASSEMBLED DATA ON A TAPE BY INSERTION AND DELETION OF DATA.

DAMMET SELECTIVELY MERGES DATA FROM ONE OR TWO ENDF/B LIBRARY TAPES ONTO A FINAL TAPE. THE MODE (BCD OR BINARY) AND ARRANGEMENT (STANDARD OR ALTERNATE) MAY BE CHANGED DURING THIS PROCESS.

PLOTFB PROCESSES ENDF/B LIBRARY TAPES WHICH CONTAIN DATA EMBEDDED WITHIN A NECESSARY LIBRARY STRUCTURE IN ORDER TO PRODUCE COMPREHENSIVE LISTINGS AND/OR PLOTS. THE LISTINGS AND/OR PLOTS CONTAIN AN EXTENSIVE AMOUNT OF INFORMATION RELATED TO THE DATA, SUCH AS TEMPERATURE DEPENDENCE, PHYSICAL UNITS OF THE DATA, INTERPOLATION LAWS FOR THE DATA, CRYPTIC TITLES DEFINING THE REACTION TYPE, ETC.

SLAVE3 PROVIDES MODULAR SUBROUTINES WHICH CAN BE ASSEMBLED TO RETRIEVE AND PROCESS ENDF/B DATA FOR A SPECIFIC PROBLEM.

386 DATATRAN DATATRAN SUPPLIES A LINKAGE SYSTEM FOR MODULARIZED PROGRAMS, ENABLES A HIERARCHICAL NAMING TECHNIQUE, AND SIMPLIFIES HANDLING OF STRUCTURED DATA LISTS.

403 TIGIR2 TIGIR IS A MODULAR PROGRAM DESIGNED TO GENERATE AND MAINTAIN LIBRARIES OF DOCUMENT INFORMATION (ABSTRACTS, BIBLIOGRAPHIC INFORMATION, INDEX TERMS, AND OTHER SIGNIFICANT INFORMATION), TO RETRIEVE THE INFORMATION SELECTIVELY, TO PRINT THE RETRIEVED INFORMATION IN VARIOUS OUTPUT FORMATS, AND TO GENERATE STATISTICS OF THE INFORMATION FILES.

472 MERMC2/MAGIC THE PROGRAMS MERMC2 AND MAGIC ARE SERVICE ROUTINES FOR USE WITH THE BINARY CROSS-SECTION LIBRARY TAPES OF THE MC**2 MULTIGROUP CROSS-SECTION PROGRAM.

MERMC2 TAKES AS INPUT TWO MC**2 LIBRARY TAPES AND PRODUCES A NEW MC**2 LIBRARY TAPE CONTAINING DATA FROM BOTH INPUT TAPES WITH DELETION OF PARTICULAR MATERIALS AS DESIRED, OR MERMC2 MAY BE USED TO CREATE A NEW LIBRARY TAPE FROM A SINGLE INPUT TAPE BY SIMPLY DELETING SELECTED MATERIALS.

MAGIC PRODUCES LIBRARY TAPE LISTINGS AND TAPES FOR OFF-LINE CALCCMP PLOTTING OF SELECTED DATA FROM AN MC**2 LIBRARY TAPE.

475 CRECT/CHECKER/RIGEL/PLOTFB/ THIS PACKAGE OF EIGHT PROGRAMS IS DESIGNED FOR PROCESSING ENDF/B II (EVALUATED NUCLEAR DATA FILE VERSION B FORMAT II) TAPES.

CRECT, WHICH PROCESSES VERSION III ENDF/B DATA AS WELL AS EARLIER VERSIONS, PROVIDES A MEANS OF CORRECTING ASSEMBLED DATA ON A TAPE BY INSERTION AND DELETION OF DATA.

CHECKER CHECKS THAT THE ENDF/B BCD CARD IMAGE FORMAT TAPES ARE IN PROPER FORMAT AND ALL FIELDS ARE WITHIN SPECIFIED LIMITS, RATHER THAN THE PHYSICS OF THE DATA LIBRARY. ANGULAR DISTRIBUTIONS RECONSTRUCTED FROM LEGENDRE COEFFICIENTS ARE CHECKED TO ENSURE THEY ARE EVERYWHERE POSITIVE.

RIGEL WILL PERFORM ANY OR ALL OF THE FOLLOWING OPERATIONS - SELECTIVELY RETRIEVE ENDF/B DATA ON FROM 1 TO 9 ENDF/B TAPES, MERGE RETRIEVED ENDF/B DATA ONTO FROM 1 TO 8 ENDF/B RESULT TAPES, CHANGE TAPE ARRANGEMENT (FROM STANDARD TO ALTERNATE OR VICE VERSA) AND CHANGE TAPE MODE.

LISTFC, WHICH PROCESSES VERSION III ENDF/B DATA AS WELL AS EARLIER VERSIONS, PRODUCES INTERPRETED LISTINGS OF INFORMATION FROM BCD STANDARD ARRANGEMENT ENDF/B TAPES.

DICTION CONSTRUCTS A NEW SECTION DICTIONARY (FILE 1, SECTION 451) FOR AN ENTIRE ENDF/B TAPE. IF A SECTION DICTIONARY IS ALREADY PRESENT IT IS REPLACED.

PLOTFB PROCESSES ENDF/B LIBRARY TAPES WHICH CONTAIN DATA EMBEDDED WITHIN A NECESSARY LIBRARY STRUCTURE IN ORDER TO PRODUCE COMPREHENSIVE LISTINGS AND/OR PLOTS. THE LISTINGS AND/OR PLOTS CONTAIN AN EXTENSIVE AMOUNT OF INFORMATION RELATED TO THE DATA, SUCH AS TEMPERATURE DEPENDENCE, PHYSICAL UNITS OF THE DATA, INTERPOLATION LAWS FOR THE DATA, CRYPTIC TITLES DEFINING THE REACTION TYPE, ETC.

SLAVE3 PROVIDES MODULAR SUBROUTINES WHICH CAN BE ASSEMBLED TO RETRIEVE AND PROCESS ENDF/B DATA FOR A SPECIFIC PROBLEM.

DAMMET SELECTIVELY MERGES DATA FROM ONE OR TWO ENDF/B LIBRARY TAPES ONTO A FINAL TAPE. THE MODE (BCD OR BINARY) AND ARRANGEMENT (STANDARD OR ALTERNATE) MAY BE CHANGED DURING THIS PROCESS.

490 JOSHUA OPERATING SYSTEM JOSHUA IS A SYSTEM WHICH EFFECTIVELY STORES LARGE VOLUMES OF DATA AND RETRIEVES IT FOR DISPLAY AND COMPUTATION.

493 TROUT TROUT IS A FILE MAINTENANCE PROGRAM WHICH ALLOWS THE USER TO ALTER, MERGE, DELETE, OVERLAY OR CREATE MULTIGROUP CROSS SECTION FILES IN MUG FORMAT.

502 EDITOR EDITOR PRODUCES READABLE LISTINGS OF THE CONTENTS OF ENDF/B NUCLEAR DATA CROSS SECTION TAPES. IT ALSO ALLOWS COPYING, ALTERING MODE, MERGING AND PUNCHING OF THE DATA ON ONE OR MORE ENDF/B TAPES.

557 SHLOG SHLOG PROVIDES GENERAL-PURPOSE DATA MANIPULATION FUNCTIONS FOR DATA ANALYSIS. THESE FUNCTIONS INCLUDE CREATING, MAINTAINING, AND STORING FILES, DISPLAYING THE CONTENTS OF A FILE VIA EITHER THE LINE PRINTER OR AN ON-LINE PLOTTER, SEARCHING FOR DATA POINTS BY COMPARING VALUES WITH SPECIFIED CRITERIA, AND PERFORMING CERTAIN STATISTICAL OPERATIONS ON THE DATA POINTS.

571 CHECK3/RIGEL3 THESE PROGRAMS ARE USED TO
PROCESS ENDF/B VERSION III DATA. IN ADDITION, THE CDC6600 PRO-
GRAMS WILL PROCESS ENDF/B VERSION IV DATA. CHECK3 CHECKS THAT THE
ENDF/B TAPES ARE IN PROPER FORMAT AND ALL FIELDS ARE WITHIN SPECI-
FIED LIMITS, RATHER THAN THE PHYSICS OF THE DATA LIBRARY. ANGULAR
DISTRIBUTIONS RECONSTRUCTED FROM LEGENDRE COEFFICIENTS ARE EVERY-
WHERE POSITIVE. RIGEL3 WILL PERFORM ANY OR ALL OF THE FOLLOWING
OPERATIONS - SELECTIVELY RETRIEVE ENDF/B DATA ON FROM 1 TO 9
ENDF/B TAPES, MERGE RETRIEVED ENDF/B DATA ONTO FROM 1 TO 8 ENDF/B
RESULT TAPES, CHANGE TAPE ARRANGEMENT (FROM STANDARD TO ALTERNATE
OR VICE-VERSA) AND CHANGE TAPE MODE.

587 AEC-ALO FAU THE AEC-ALO RADIO FREQUENCY
ASSIGNMENTS AND USES PROGRAM (FAU) PROVIDES FOR MAINTAINING RADIO
FREQUENCY ASSIGNMENT AND TRANSACTION RECORDS. IT LISTS ALL RADIO
FREQUENCY ASSIGNMENTS AND USES FROM INITIAL APPLICATION (AEC-310)
THROUGH AUTHORIZATIONS (IRAC DOCKET). THE PROGRAM ALLOWS FOR
SORTING BY OFFICE, SYSTEM NUMBER, LOCATION, FREQUENCY, EXPIRATION
DATE, ALO OR AEC SERIAL NUMBER, AND IRAC DOCKET NUMBER.

589 BECOM AEC REGULATIONS REQUIRE THAT A PURCHASE VS. LEASE ANALYSIS BE MADE ON EACH PIECE OF DATA PROCESSING EQUIPMENT AS PART OF THE STUDY PRECEDING THE LEASE OR PURCHASE OF SUCH EQUIPMENT. IN ADDITION, IT IS REQUIRED THAT A PURCHASE VS. LEASE ANALYSIS BE PREPARED ANNUALLY FOR EACH ITEM OF DATA PROCESSING EQUIPMENT LEASED WITH AEC FUNDS. BECOM WAS DEVELOPED TO FACILITATE THE RAPID AND ACCURATE PREPARATION OF AN AEC PURCHASE VS. LEASE SCHEDULE FOR AN ITEM OF DATA PROCESSING EQUIPMENT.

595 MAPPER MAPPER IS A COMPUTER PROGRAM FOR PREDICTING EQUIPMENT REQUIREMENTS. IT WAS DESIGNED AS AN AID TO MANAGEMENT AND CAN INTERPRET COMPONENT PRODUCTION REQUIREMENTS BACKWARD FROM SHIPPING SCHEDULES TO THE PROCESS OF INTEREST, CALCULATE EQUIPMENT CAPACITY, DISPLAY SIX MONTHS PRIOR EQUIPMENT UTILIZATION AND PROCFSS YIELD DATA.

603 RALCRTPH RALCRTPH IS A RESOURCE ALLOCATION SYSTEM USED TO PROVIDE THE PROJECT PLANNER WITH A TOOL TO HELP HIM SCHEDULE RESOURCES INVOLVED IN A PROJECT. INFORMATION ON WHICH JOBS ARE CRITICAL AND THE RESOURCES AVAILABLE IS NECESSARY FOR PROJECT SCHEDULING. THIS SYSTEM IS ORIENTED TOWARD THE USER WHO IS PLANNING A PLANT SHUTDOWN. HOWEVER, IT ALSO HAS APPLICATIONS IN OTHER AREAS.

607 SPIRAL THE GENERAL ABILITY OF SPIRAL IS BUILDING, PERHAPS GRADUALLY, A MACHINE-READABLE ENCYCLOPEDIA OF INFORMATION ITEMS THAT ARE OR MAY BECOME IMPORTANT TO A PARTICULAR PROJECT, AND THEN LATER, RECALLING BITS OF INFORMATION AS REQUIRED. THE INFORMATION CONTENT OF A COLLECTION CAN RANGE FROM CRYPTIC COMMENTS (AS OCCUR IN SCME TEST AND INSPECTION RECORDS) TO MORE LENGTHY ENTRIES (SUCH AS TECHNICAL ABSTRACTS AND MANAGEMENT BRIEFS) AS WELL AS FULL TEXT OF DOCUMENTS.

N. SUBSIDIARY CALCULATIONS

3/74

133 WED THIS PROGRAM EDITS THE MAGNETIC TAPE PRODUCED BY W-DSN CALCULATING REACTION RATES BY ENERGY AND BY VOLUME WITH TOTALS. IT CAN ALSO PRODUCE REACTION RATES FOR FED-IN CROSS SECTIONS.

207 CROSSPLOT/CROSSPLOT DATA TAPE AUTOMATIC PLOTS ARE GENERATED FROM NEUTRON CROSS SECTION DATA.

210 DTX THE DTX CODE CALCULATES EFFECTIVE MACROSCOPIC, HOMOGENEOUS, GROUP CROSS SECTIONS WHICH ARE SPACE-AVERAGED OVER THE FLUXES AND CURRENTS PRE-CALCULATED IN A ONE-DIMENSIONAL NEUTRON TRANSPORT CODE SUCH AS DTK OR DSN. ISOTROPIC AND ANISOTROPIC CROSS SECTIONS MAY BE INCLUDED.

239 CPS CPS PROVIDES A GRAPHICAL MEANS OF COMPARING EXPERIMENTAL CROSS SECTION VALUES OBTAINED FROM THE SCISRS LIBRARY TAPE WITH AN OPTION TO INCLUDE READING IN NEW EXPERIMENTAL OR CALCULATED VALUES.

409 LARCA MULTIGROUP CROSS SECTIONS ARE WEIGHTED BY THE FLUX IN THE APPROPRIATE GROUPS AND REGIONS, AND CROSS SECTIONS FOR THE ASSEMBLY ARE COMPUTED AND PUNCHED IN DTF4 FORMAT. THE PROGRAM ALSO COMPUTES THE INFINITE MEDIUM FLUX, REACTION RATES, AND THE INFINITE MULTIPLICATION FACTOR AND MATERIAL BUCKLING.

434 HEATMESH HEATMESH IS USED TO GENERATE GEOMETRICAL DATA REQUIRED FOR STUDIES OF HEAT TRANSFER IN AXISYMMETRIC STRUCTURES REPRESENTED AS SURFACES OF REVOLUTION. THE PROGRAM CONSISTS OF TWO DISTINCT PHASES. THE FIRST SUBDIVIDES THE GIVEN PARTS INTO A NODAL NETWORK AND EVALUATES THE GEOMETRICAL PROPERTIES OF THE NODES. THE SECOND DETERMINES ADJACENT NODES AND EDITS GEOMETRICAL DATA FOR THE THERMAL MODEL.

455 DAC1 DAC1 USES ANGULAR FLUXES FROM THE DTF4 SN CODE TO CALCULATE REACTIVITY PERTURBATIONS, EFFECTIVE DELAYED NEUTRON FRACTIONS, AND GENERATION TIMES IN REACTORS. THE REFERENCE REACTOR SPECIFICATIONS ARE INPUT TO DAC1 BY A DIRECT READING OF THE DTF4 INPUT DECK. CONSEQUENTLY, THE ONLY ADDITIONAL INPUT NEEDED ARE THE PERTURBATION SPECIFICATIONS.

N. SUBSIDIARY CALCULATIONS

3/74

471 GAPER2D GAPER2D IS A TWO-DIMENSIONAL
TRANSPORT PERTURBATION THEORY PROGRAM USING THE REAL AND ADJOINT
FLUXES AND CURRENTS FROM 2DF (ACC ABSTRACT 173) PROBLEM RESULTS TO
COMPUTE REACTIVITY CHANGES DUE TO SMALL PERTURBATIONS IN REFLECTED
MULTIREGION SYSTEMS.

544 PLOT-3D PLOT-3D IS A PACKAGE OF SUB-PROGRAMS DESIGNED TO DRAW THREE-DIMENSIONAL SURFACES FROM ARRAYS OF POINTS (X,Y,Z). THE SURFACES CAN BE DRAWN AFTER ARBITRARY ROTATIONS ABOUT THE THREE COORDINATE AXES.

606 GAPER1D REACTIVITY COEFFICIENTS ARE COMPUTED USING FIRST-ORDER TRANSPORT PERTURBATION THEORY FOR ONE-DIMENSIONAL MULTI-REGION REACTOR ASSEMBLIES. THE NUMBER OF SPATIAL MESH POINTS AND ENERGY GROUPS IS ARBITRARY. AN ELEMENTARY SYNTHESIS SCHEME IS EMPLOYED FOR TREATMENT OF TWO- AND THREE-DIMENSIONAL PROBLEMS. THE CONTRIBUTIONS TO THE CHANGE IN INVERSE MULTIPLICATION FACTOR, $\Delta(1/k)$, FROM PERTURBATIONS IN THE INDIVIDUAL CAPTURE, NET FISSION, TOTAL SCATTERING, $(N,2N)$, INELASTIC SCATTERING, AND LEAKAGE CROSS SECTIONS ARE COMPUTED. A MULTI-DIMENSIONAL PROMPT NEUTRON LIFETIME CALCULATION IS ALSO AVAILABLE.

O. EXPERIMENTAL DATA PROCESSING

3/74

154 CROC90 THE CROC90 CODE WAS DEVELOPED FOR USE IN THE DATA REDUCTION OF OUT-OF-PILE FLUID FLOW EXPERIMENTS ON THE ML-1 FUEL ELEMENTS. THE CODE IS SPECIFICALLY DESIGNED TO EVALUATE FRICTION FACTORS, ENTRANCE AND EXIT COEFFICIENTS, AND ORIFICE CALIBRATIONS FROM HYDRODYNAMIC DATA OBTAINED FROM SINGLE PHASE EXPERIMENTAL FLUID FLOW TESTS IN AXIAL FLOW DUCTS.

164 BURP1 THE PROGRAM CALCULATES ABSOLUTE TOTAL EFFICIENCY FOR MONOENERGETIC GAMMA RAY INTERACTIONS IN CYLINDRICAL SCINTILLATION DETECTORS. THE ABSOLUTE TOTAL EFFICIENCY IS DEFINED AS THE FRACTION OF SOURCE GAMMAS WHICH INTERACT AT LEAST ONCE WITH THE CRYSTAL DETECTOR. CALCULATIONS ARE MADE FOR THE POINT ISOTROPIC SOURCE LOCATED ALONG THE AXIS OF SYMMETRY FOR SOLID CYLINDRICAL CRYSTALS, WITH OR WITHOUT A COAXIAL CYLINDRICAL WELL.

165 BURP2 THE PROGRAM CALCULATES THE ABSOLUTE TOTAL EFFICIENCY FOR MONOENERGETIC GAMMA RAYS INTERACTING IN CYLINDRICAL SCINTILLATION DETECTORS. THE ABSOLUTE TOTAL EFFICIENCY IS DEFINED AS THE FRACTION OF SOURCE GAMMAS WHICH INTERACT AT LEAST ONCE WITH THE CRYSTAL DETECTOR. CALCULATIONS ARE MADE FOR HOMOGENEOUS, ISOTROPIC CIRCULAR DISK OR CYLINDRICAL VOLUME SOURCES. SOURCES MUST BE SYMMETRICAL WITH THE AXIS OF SYMMETRY FOR SOLID CYLINDRICAL CRYSTALS, WITH OR WITHOUT A COAXIAL CYLINDRICAL WELL. SOURCE ABSORPTION AND SCATTERING MAY BE INCLUDED FOR VOLUME SOURCES.

166 BURP3 THE PROGRAM CALCULATES ABSOLUTE TOTAL EFFICIENCY FOR MONOENERGETIC GAMMA RAY INTERACTIONS IN CYLINDRICAL SCINTILLATION DETECTORS. THE ABSOLUTE TOTAL EFFICIENCY IS DEFINED AS THE FRACTION OF SOURCE GAMMAS WHICH INTERACT AT LEAST ONCE WITH THE CRYSTAL DETECTOR. CALCULATIONS ARE MADE FOR POINT ISOTROPIC SOURCES LOCATED BOTH ON AND OFF THE AXIS OF SYMMETRY FOR SOLID CYLINDRICAL CRYSTALS, WITH OR WITHOUT A COAXIAL CYLINDRICAL WELL. THE EFFICIENCIES FOR POINTS LOCATED AT SPECIFIED RADIAL OFF-AXIS POSITIONS, FOR A SINGLE AXIAL SOURCE-CRYSTAL DISTANCE, ARE NORMALIZED TO THE ON-AXIS EFFICIENCY FOR THE SAME AXIAL DISTANCE. THE ABSOLUTE EFFICIENCY FOR THE ON-AXIS POINT IS GIVEN.

O. EXPERIMENTAL DATA PROCESSING

3/74

394 JITER JITER COMPUTES THE FOLLOWING QUANTITIES MEASURED IN REACTOR FLUCTUATION EXPERIMENTS - THE DISPERSION PARAMETER γ , THE MODIFIED COEFFICIENT OF CORRELATION MCC, THE FREQUENCY DEPENDENT PART OF THE POWER SPECTRAL DENSITY PSD, AND THE CROSS POWER SPECTRAL DENSITY CPSD.

413 ALPHA-M ALPHA-M IS USED FOR DETERMINING RADIOISOTOPES BY LEAST SQUARES RESOLUTION OF THE GAMMA RAY SPECTRA. IT CAN HANDLE A VERY LARGE LIBRARY OF GAMMA RAY SPECTRA AND TAKES INTO ACCOUNT CORRECTIONS SUCH AS BACKGROUND SUBTRACTION, COUNTING TIME, DECAY TIME, DEAD TIME, AUTOMATIC COMPENSATION FOR GAIN AND THRESHOLD SHIFTS, SIZE OF THE ALIQUOT, VOLUME REDUCTION PRIOR TO COUNTING, AND SO ON.

421 MICHROD THE VICKERS PYRAMID NUMBER AND THE MICROHARDNESS INCREMENT FRACTION ARE COMPUTED FROM FILAR MICROMETER EYEPIECE READINGS. THESE READINGS ARE MADE ON INDENTS, WHICH HAVE BEEN MADE BY AN INDENTER, IN THE MATERIAL BEING TESTED.

425 REDUX REDUX IS USED FOR THE REDUCTION OF DATA FROM REACTOR FLUCTUATION EXPERIMENTS. FROM INPUT COUNT SAMPLES RECORDED BY ONE OR TWO COUNTING CHANNELS, THE PROGRAM COMPUTES UNBIASED SAMPLE ESTIMATES OF MOMENTS AND FUNCTIONS OF MOMENTS OF THE COUNT DISTRIBUTIONS, INCLUDING THE DISPERSION PARAMETER γ AND THE MODIFIED COEFFICIENT OF CORRELATION MCC. STANDARD ERROR ESTIMATES ARE COMPUTED FOR γ AND MCC.

457 GSSLRN1B GSSLRN1B IS UTILIZED FOR EVALUATIONS AND STATISTICAL DETERMINATION OF PHOTOPEAKS IN PHOTON SPECTRA. THE CODE PERFORMS EVALUATIONS OF PHOTOPEAK SPECTRA USING AS INPUT THE DIGITIZED PULSE HEIGHT DISTRIBUTION WHICH IS OUTPUT FROM A LARGE MULTICHANNEL ANALYZER. PHOTOPEAKS ARE LOCATED, FUNCTIONS FIT TO EACH REAL PEAK, AND THE RELATIVE INTENSITY OF EACH FITTED PEAK ABOVE THE BACKGROUND CONTINUUM IS CALCULATED. THE CODE IS EASILY ADAPTABLE FOR ANALYSIS OF ANY SPECTRA WHICH CAN BE ADEQUATELY DEFINED BY PEAKS REPRESENTED IN ANALYTIC FORM.

464 DYN01 DYN01 CALCULATES THE DISTRIBUTION OF ELECTRONS THAT ARE EMITTED FROM A PHOTOMULTIPLIER COMPOSED OF A SERIES OF DYNODES.

469 PMS1 PMS1 CORRECTS EXPERIMENTAL FAST NEUTRON POLARIZATION DATA FOR FINITE GEOMETRY AND MULTIPLE SCATTERING EFFECTS, WHEN LIQUID HELIUM IS THE POLARIZER ANALYZER.

O. EXPERIMENTAL DATA PROCESSING

3/74

476 CAGE/BIRD/SPEC CAGE/BIRD/SPEC IS A PACKAGE OF THREE INDEPENDENT CODES DESIGNED FOR THE REDUCTION AND PROCESSING OF NEUTRON TIME-OF-FLIGHT SPECTRA IN PULSED MULTIPLYING OR NON-MULTIPLYING ASSEMBLIES.

485 GASPAN GASPAN ANALYZES OUTPUT PULSES FROM A LITHIUM-DRIFTED GERMANIUM SEMICONDUCTOR DETECTOR TO DEFINE COMPLEX GAMMA-RAY SPECTRA OF ROUTINE CRUD AND FILTRATE SAMPLES.

43 CURFIT CURFIT IS A COMPOSITE PROGRAM FOR FITTING EXPERIMENTAL DATA POINTS WITH DIFFERENT TYPES OF COMMON ANALYTIC CURVES. THERE ARE AT PRESENT FIVE FITS AVAILABLE -

- (1) POLYNOMIAL $Y = \text{SUMMATION OVER } I \text{ OF } A(I) * (X^{**}(I))$
- (2) EXPONENTIAL $Y = A * \text{EXP}(BX)$
- (3) COSINE $Y = A * \text{COS}(B(X+C))$
- (4) SERIES OF CUBICS $Y = A(J) + B(J) * X + C(J) * (X^{**}2) + D(J) * (X^{**}3)$
- (5) FOURIER SERIES

62 LOS ALAMOS LEAST SQUARES THIS PROGRAM PERFORMS LEAST SQUARES FITTING OF LINEAR OR NONLINEAR FUNCTIONS IN SEVERAL INDEPENDENT VARIABLES. THE PROGRAM WILL DETERMINE AN ESTIMATE OF A IN THE FUNCTION $Y=F(X,A)$ BY MINIMIZING THE SUM OF SQUARES. IN THE FUNCTION, X IS A VECTOR OF OBSERVED VARIABLES AND A IS A VECTOR OF PARAMETERS TO BE DETERMINED. IN THIS CONTEXT, A LINEAR FUNCTION IS ONE WHOSE PARTIAL DERIVATIVES WITH RESPECT TO THE ELEMENTS OF A ARE ALL INDEPENDENT OF A. A NONLINEAR FUNCTION HAS AT LEAST ONE OF THE ELEMENTS OF A APPEARING IN AT LEAST ONE OF THESE PARTIAL DERIVATIVES.

186 LAG1/LAG2 LAG IS A SINGLE PASS LOAD AND GO ASSEMBLER DESIGNED TO ACCEPT IBM7090 FLOCO II INSTRUCTIONS.

321 EXPALS THIS PROGRAM FITS BY LEAST SQUARES A FUNCTION WHICH IS A LINEAR COMBINATION OF REAL EXPONENTIAL DECAY FUNCTIONS. THE FUNCTION IS

$$Y(K) = \text{SUMMATION OVER } J \text{ OF } A(J) * \text{EXP}(-\text{LAMBDA}(J) * K).$$

VALUES OF THE INDEPENDENT VARIABLE (K) AND THE DEPENDENT VARIABLE Y(K) ARE SPECIFIED AS INPUT DATA. WEIGHTS MAY BE SPECIFIED AS INPUT INFORMATION OR SET BY THE PROGRAM ($W(K) = 1/Y(K)$).

324 FRANTIC FRANTIC IS DESIGNED TO PROCESS RAW COUNTING DATA AND TO FIT IN THE LEAST SQUARES SENSE THESE DATA TO THE MULTIPLE EXPONENTIAL GROWTH AND DECAY EQUATIONS. THE PROGRAM CAN BE USED FOR SUMS OF EXPONENTIALS WITH POSITIVE, NEGATIVE, OR ZERO EXPONENTS AND POSITIVE OR NEGATIVE COEFFICIENTS.

327 DAFT1 DAFT1 IS A PROGRAM FOR WEIGHTED LEAST SQUARES FITTING OF 0.0253 EV NEUTRON DATA FOR FISSILE NUCLIDES. THE PROGRAM ALSO CARRIES OUT COMPUTATIONS RELEVANT TO DISCERNING OVERALL GOODNESS OF FIT, PARTICULARLY DEVIANT DATA, AND DATA WHOSE IMPROVEMENT WOULD LEAD TO LARGE REDUCTIONS IN ERROR OF EACH FITTED PARAMETER.

P. GENERAL MATHEMATICAL AND COMPUTING SYSTEM ROUTINES

3/74

364 SNEQ SNEQ CONSISTS OF THE TWO CODES, SNAP AND EQPLT, WHICH HAVE BEEN MERGED DUE TO THEIR COMMON USE OF THE SLIP COMPILER. SNAP INTERPRETS AND SOLVES PSEUDO-FORTRAN INPUT EQUATIONS REPRESENTING NONLINEAR ALGEBRAIC SYSTEMS. EQPLT INTERPRETS PSEUDO-FORTRAN INPUT EQUATIONS AND CALCULATES AND PLOTS MULTIPLE CURVES ON A SINGLE GRAPH. EQPLT IS USEFUL FOR PARAMETER STUDIES.

407 DATATRAN UTILITY MODULES PLOT2 WAS DESIGNED TO PROVIDE ROUTINE X-Y PLOTS USING THE CALCOMP PLOTTER, MICROFILM UNIT, OR PRINTER AS THE OUTPUT DEVICE. PLOT3 WAS DESIGNED TO PREPARE CONTOUR, PERSPECTIVE, AND STEREOGRAPHIC PLOTS FOR THE CALCOMP PLOTTER OR MICROFILM UNIT OF FUNCTIONS OF TWO VARIABLES.

411 M0661, M0657, M0626 M0661, M0657, AND M0626 PERFORM STATISTICAL ANALYSES OF DATA BASED ON A LEAST SQUARES POLYNOMIAL FIT.

428 DOGGY DOGGY CAN PERFORM MOST ROUTINE FORM SHEET CALCULATIONS. THE PROGRAM CAN HANDLE COMMON ARITHMETIC MANIPULATIONS ON COLUMNS OF INPUT SUCH AS ADDITION, SUBTRACTION, MULTIPLICATION, AND DIVISION. IT ALSO HAS PROVISIONS FOR THE USE OF SPECIAL FUNCTIONS SUCH AS LOGARITHMIC, TRIGONOMETRIC, ARC TRIGONOMETRIC, HYPERBOLIC, EXPONENTIAL, SQUARE ROOT, MAXIMA, MINIMA, AND RAISING A NUMBER TO ANY POWER. DOGGY ALSO CALCULATES WATER PROPERTIES SUCH AS THERMAL CONDUCTIVITY, VISCOSITY, AND PRANDTL NUMBER OVER A WIDE RANGE OF TEMPERATURE AND PRESSURE.

442 SIMPLE1 SIMPLE1 COMPILES AND EXECUTES MULTISTatement CALCULATIONS TYPED IN A FAMILIAR ALGEBRAIC NOTATION AT A TIME-SHARED TERMINAL, IMMEDIATELY RETURNING REQUESTED RESULTS TO THE TERMINAL AND PERMITTING AD LIB CONTINUATION OF A CALCULATION. THE USER MAY USE THE SYSTEM AS AN EXTENDED AND POWERFUL ELECTRONIC CALCULATOR OR AS A CALCULATOR OF SMALL LOAD-AND-GO RUNS. ERRORS ARE DETECTED AND CORRECTED ON AN AS-YOU-GO BASIS. CALCULATIONS MAY INCLUDE INTERACTIVE INPUT/OUTPUT, FUNCTIONS, AND LOOPS.

444 ROPE ROPE IS USED TO CALCULATE ROOTS OF POLYNOMIALS.

445 LIZARD4 LIZARD4 IS USED TO SOLVE NON-LINEAR, ORDINARY DIFFERENTIAL EQUATIONS AS A ONE-SHOT EFFORT. IT WAS WRITTEN TO SOLVE INITIAL VALUE EQUATIONS, THAT IS, THE VALUES OF THE DEPENDENT VARIABLES MUST BE SPECIFIED AT SOME INITIAL VALUE OF THE INDEPENDENT VARIABLE. ONE-DIMENSIONAL STEADY-STATE BOUNDARY VALUE PROBLEMS CAN BE SOLVED WITH LIZARD4, PROVIDING AN ITERATIVE METHOD IS EMPLOYED BY THE USER WHERE ONE OF THE BOUNDARY CONDITIONS IS SPECIFIED AND INTEGRATION PROCEEDS UNTIL THE ALTERNATE BOUNDARY CONDITION IS MET.

446 MOST MOST IS DESIGNED TO VARY A SET OF COORDINATES $(x_1, x_2, \dots, x_n)$ REPRESENTING THE VECTOR x IN SUCH A WAY THAT A SPECIFIED FUNCTION $y(x)$, $y(x)$ GREATER THAN OR EQUAL TO 0, IS MINIMIZED.

478 BETTIS ENVIRONMENTAL ROUTINES/ THE BETTIS ENVIRONMENTAL ROUTINES EXTEND THE FORTRAN LANGUAGE BY MODIFYING SOME OF THE STANDARD CDC6600 LIBRARY ROUTINES AND BY ADDING ROUTINES TO THE LIBRARY TO FACILITATE DECIMAL INPUT AND OUTPUT, FILE MAINTENANCE, SCRATCH I/O, STORAGE ALLOCATION, UTILITY FUNCTIONS, OPERATING SYSTEM INTERFACING, AND OPERATOR COMMUNICATION.

MODEL (MODIFIED ENVIRONMENTAL LIBRARY) DIFFERS FROM THE ORIGINAL BETTIS VERSION IN THAT IT ALLOWS THE OPERATING SYSTEM, RATHER THAN THE ENVIRONMENTAL PACKAGE, TO CONTROL THE OPERATING ENVIRONMENT.

484 FIGS FIGS IS A FORTRAN CALLABLE SUBROUTINE PACKAGE FOR THE SUPPORT OF INTERACTIVE COMPUTING PROGRAMS UTILIZING AN IBM SYSTEM/360 COMPUTER AND AN IBM2250 DISPLAY UNIT.

P. GENERAL MATHEMATICAL AND COMPUTING SYSTEM ROUTINES

3/74

496 KAPLPLOT KAPLPLOT IS THE SET OF STANDARD CALCOMP SUBROUTINES WRITTEN AT KNOLLS ATOMIC POWER LABORATORY TO PROVIDE GRAPHIC OUTPUT.

GRLIN IS USED TO DRAW AN AXIS SYSTEM, ESTABLISH SCALING FACTORS, AND ENABLE THE USER TO DRAW LINEAR GRAPHS.

GRLOG IS USED TO DRAW AN AXIS SYSTEM, ESTABLISH SCALING FACTORS, AND PERMIT USERS TO DRAW FULL LOGARITHMIC GRAPHS.

LINLG PROVIDES THE CAPABILITY OF DRAWING SEMI-LOGARITHMIC GRAPHS WITH LINEARLY SCALED ABSCISSAS WHILE LOGLN PROVIDES THE SAME CAPABILITY WITH LINEARLY SCALED ORDINATES.

PENSET INITIALIZES THE PLOTTING SUBROUTINES AND DRAWS THE JOB IDENTIFICATION, TIME, DATE, AND CHARGE NUMBER.

PENEND MOVES THE PEN OFF A COMPLETED PLOT AND PREVENTS SUBSEQUENT PLOTS FROM OVERWRITING THE COMPLETED PLOTS.

IPLOT MOVES THE PLOTTER PEN FROM ITS CURRENT POSITION TO A NEW POSITION.

IDPLOT MOVES THE PEN A SPECIFIED INCREMENTAL DISTANCE IN INCHES FROM ITS PRESENT POSITION.

PSCALE ESTABLISHES THE VALUE OF FACTORS TO BE USED BY THE SPLOT SUBROUTINE IN SCALING USER DATA TO FIT ON PLOTTER COORDINATES.

SPLOT CAUSES THE PEN TO MOVE TO COORDINATES WHICH ARE OBTAINED BY APPLYING PSCALE SCALE FACTORS TO USER DATA.

XCPlot AND YCPlot CAUSE ALPHABETIC INFORMATION TO BE WRITTEN PARALLEL TO THE DIRECTION OF THE ABSCISSA AXIS, XCPlot, OR THE ORDINATE AXIS, YCPlot.

PMARK CAUSES A DISTINCTIVE SYMBOL TO BE PLOTTED AT THE CURRENT POSITION OF THE PEN.

PLTsize CONVEYS TO THE PLOTTING SYSTEM INFORMATION WHICH WILL ENABLE THE PLOTTING SYSTEM TO PLACE THE MAXIMUM NUMBER OF PLOTS IN A MINIMUM LENGTH OF PAPER.

497 REL01 REL01 COMPUTES THE FAILURE PROBABILITY FOR A SINGLE FAILURE MODE. TWO OPTIONS ARE AVAILABLE - OPTION 1 CALCULATES THE INTERACTION OF TWO NORMALLY DISTRIBUTED VARIATES AND OPTION 2 CALCULATES THE INTERACTION OF TWO TRUNCATED NORMALLY DISTRIBUTED VARIATES.

514 FORSIM FORSIM IS A FORTRAN ORIENTED SIMULATION PROGRAM FOR THE CONTINUOUS TRANSIENT SOLUTION OF SYSTEMS OF ORDINARY DIFFERENTIAL EQUATIONS. THE USER WRITES HIS EQUATIONS IN A FORTRAN SUBROUTINE, FOLLOWING PRESCRIBED RULES, AND LOADS THIS ROUTINE ALONG WITH THE EXECUTIVE ROUTINES. THE EXECUTIVE ROUTINES THEN READ IN INITIAL DATA SUPPLIED BY THE USER AND PROCEED WITH THE INTEGRATION.

515 GENED ENVIRONMENTAL ROUTINES THE GENED ENVIRONMENTAL ROUTINES CONSIST OF A SET OF STANDARD ROUTINES WRITTEN AT THE GENERAL ELECTRIC NUCLEAR ENERGY DIVISION AND A SET OF STANDARD GE635 SYSTEM ROUTINES. THE FIRST SET INCLUDES THE FOLLOWING -

BITA MOVES BITS FROM ONE WORD TO ANOTHER WITHOUT ALTERING THOSE BITS OUTSIDE THE RANGE OF THE CALL.

CASE POSITIONS AN INPUT FILE SO THAT THE INPUT DATA FOLLOWING A CASE CARD CAN BE READ.

CASERR ASSUMES THAT AN ERROR WAS DETECTED IN THE LAST DATA CASE AND FORCES THE CASE SUBROUTINE TO ADVANCE THE DATA INPUT FILE TO THE NEXT INDEPENDENT CASE CARD OR TO THE END OF THE INPUT DATA, WHICHEVER OCCURS FIRST.

DRAW IS A GENERAL-PURPOSE PLOTTING ROUTINE USED TO (A) DRAW A GRID NETWORK, (B) LABEL THE GRID NETWORK, (C) DRAW CURVES WITHIN THE GRID NETWORK, (D) ALLOW TWO DIFFERENT Y-AXIS VALUES, AND (E) PRODUCE A BAR OR HISTOGRAM PLOT.

ERRSYS IS A GENERAL ERROR INDICATING ROUTINE THAT SETS UP DIAGNOSTIC INFORMATION FOR USE IN ERROR RECOVERY WITHIN PROGRAM SYSTEMS.

F4TRBK PROVIDES A TRACE OF CALLING PROGRAMS FROM LEVEL TO LEVEL UP TO THE ORIGINAL CALLING LEVEL. F4TRAC PRINTS OUT A TRACE AND THEN RETURNS TO THE STATEMENT AFTER THE CALL TO F4TRAC. F4TRID PROVIDES THE NAME OF THE PROGRAM WHICH CALLED ERRSYS.

FLEXO WRITES A MESSAGE ON THE ON-LINE TYPEWRITER DURING PROGRAM EXECUTION TO SERVE AS A GUIDE TO THE OPERATOR OR USER.

FLTBCD CONVERTS A FORTRAN FLOATING-POINT NUMBER TO A BCD NUMBER IN EITHER F OR E FORMAT.

FSNOW IS A SPECIAL SUBROUTINE TO SAVE A FILE CODE IN THE CELL .SPFC.

FSUP PERMITS THE USER TO SUPPRESS A FLOATING-POINT NUMBER OR BINARY CONFIGURATION WHEN PRINTING OR PUNCHING WITH FORTRAN I/O.

FSUPC IS CALLED TO DISABLE THE SUPPRESS FUNCTION PERFORMED BY FSUP AND RETURN TO NORMAL FORTRAN I/O PROCESSING.

HELP IS USED TO SUPPLY A USER WITH THE TYPE OF DEVICE (TAPE/ DISC/DRUM) AND THE NUMBER OF LINKS USED IF THE DEVICE IS A DISC OR DRUM UNIT.

IDFTAP CREATES A LOGICAL UNIT DESIGNATOR (REFERRED TO AS A LUD), FROM THE INFORMATION GIVEN TO THE IDFTAP FUNCTION BY THE USER, AND RETURNS THE LUD TO THE USER.

ISERVE IS A FUNCTION WITH VARIOUS OPTIONS TO PICK UP AND/OR CONVERT ONE OF THE FOLLOWING - DATE, CLOCK TIME, CASE NUMBER, USER IDENTIFICATION, AND COMPUTER PROCESSOR TIME.

ISUP PERMITS THE USER TO SUPPRESS A FIXED-POINT NUMBER OR BINARY CONFIGURATION WHEN PRINTING OR PUNCHING WITH FORTRAN I/O.

ISUPC IS CALLED TO DISABLE THE SUPPRESS FUNCTION PERFORMED BY ISUP AND RETURN TO NORMAL FORTRAN I/O PROCESSING.

LIMRTN PERMITS THE USER TO REGAIN CONTROL AFTER AN I8 ABORT (RUNNING TIME EXCEEDED) OCCURS, ALLOWING THE PROGRAM AN ADDITIONAL 5 MINUTES OF PROCESSOR TIME.

LISTFORM CONSISTS OF TWO SUBPROGRAMS, JGEEN AND JGEOUT, AND ENABLES THE FORTRAN USER TO WRITE OUTPUT TAPES (FOR PRINTING OR PUNCHING) IN A MORE EFFICIENT AND FASTER MANNER THAN IS POSSIBLE WITH A FORTRAN WRITE (I,N) LIST STATEMENT, WHICH MUST SCAN THE FORMAT STATEMENT EACH TIME OUTPUT IS INITIATED.

LOCF4 IS A FUNCTION USED TO CONVERT THE ADDRESS OF A VARIABLE

OR AN ARRAY INTO A FORTRAN INTEGER.

NBCDFX CONVERTS A BCD NUMBER, INCLUDING THE SIGN, TO A FORTRAN INTEGER.

NFXBCD CONVERTS A FORTRAN INTEGER TO A BCD NUMBER.

NIPS INTERPRETS AN ARRAY OF BCD CHARACTERS IN INTEGER, REAL, OR HOLLERITH FORMAT.

NPOST IS A MULTIPLE ENTRY SUBROUTINE INCCRPORATING THE FUNCTIONS OF VTAB, REWIND, POSWDS, POSLIN, POSTMW, POSASN, POSPOS, PRID, PWID, POSTSF, POSTSB, POSTRB, AND POSTWB. IT SERVES AS A DRIVER TO RWSBT FOR GROUPS OF DATA WHICH ARE UNIQUELY DEFINED ON A PHYSICAL DEVICE CALLED A LINE (A DISK, DRUM, OR TAPE FILE).

NSORT PROVIDES A FLEXIBLE ASCENDING-ORDER SORTING CAPABILITY TO A FORTRAN PROGRAM THAT REQUIRES A TAPE OR DISC SORT.

PLOTRC PROVIDES A SERIES OF CALCCMP PLOTTER ROUTINES. THESE INCLUDE PENSET, PSCALE, SPLOT, IPLOT, IDPLOT, XCPLT, YCPLT, PMARK, AND PENEND.

PRNTHD CAUSES A PRINTER OUTPUT HEADING TO BE WRITTEN AT THE TOP OF A NEW PAGE.

REREAD ALLOWS THE USER TO RE-READ (RE-FORMAT) THE LAST BCD RECORD READ IN, UNDER A DIFFERENT FCRMAT CONTROL. CONVRT PERMITS CHARACTER MANIPULATION AND CONVERSION OF ANY DATUM/DATA IN MEMORY.

RWSBT MANIPULATES INFORMATION IN BINARY FCRM ON TAPE, DISC, OR DRUM PHYSICAL DEVICES. IT INCLUDES BLKSIZ, RDBT, WBT, SBITF, SBITB, RWD, RWDLO, AND MOVEBT.

VAMPIR PROVIDES THE COMPLETE SETUP OF LINEAR GRAPHS TO BE PRODUCED ON A DIGITAL PLOTTER.

ZERO CAUSES DIVISION BY ZERO TO YIELD A FIXED OR FLOATING POINT ZERO AS THE DIVIDEND INSTEAD OF THE MACHINES MAXIMUM. IT ALSO SUPPRESSES THE ASSOCIATED DIVIDE CHECK AND ERROR MESSAGES.

THE SET OF STANDARD GE635 SYSTEM ROUTINES INCLUDE -

DUMP WHICH DUMPS THE INDICATED LIMITS OF CORE STORAGE AND TERMINATES EXECUTION BY RETURNING CONTROL TO THE OPERATING SYSTEM.

PDUMP WHICH DUMPS THE INDICATED LIMITS OF CORE STORAGE AND THEN CONTINUES EXECUTION.

LINK WHICH ENABLES THE PROGRAMMER TO CALL PROGRAM OVERLAYS AND LLINK WHICH LOADS A LINK AND THEN RETURNS TO THE NEXT SEQUENTIAL STATEMENT OF THE CALLING ROUTINE.

FLGEOF WHICH IS USED TO PROCESS END-OF-FILE CONDITIONS.

P. GENERAL MATHEMATICAL AND COMPUTING SYSTEM ROUTINES

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516 PTAC11 PTAC11 ALLOWS A PROGRAMMER TO ASSEMBLE BINARY CODE FOR THE DIGITAL EQUIPMENT CORPORATION PDP-11 COMPUTER ON THE IBM360/75, TAKING ADVANTAGE OF THE FACILITIES AND SPEED OF THE LARGER MACHINE.

518 ERREST ERREST SORTS THE ROD BUNDLE LIBRARY OF CRITICAL HEAT FLUX DATA AND PERFORMS ERROR CALCULATIONS ON SORTED SUBSETS.

519 NRTS OS/360 REMOTE JOB ENTRY NRTS ALLOWS USERS AT REMOTE LOCATIONS TO SUBMIT JOBS OVER SLOW OR HIGH SPEED COMMUNICATION LINES TO AN IBM SYSTEM 360/75 USING THE OPERATING SYSTEM THAT PROVIDES MULTIPROGRAMMING WITH A VARIABLE NUMBER OF TASKS. THIS PROGRAM IS AN EXTENSION OF THE STANDARD RJE PROGRAM. ONCE A JOB HAS BEEN ENTERED EXECUTION PROCEEDS UNDER OS JOB MANAGEMENT ROUTINES.

P. GENERAL MATHEMATICAL AND COMPUTING SYSTEM ROUTINES

3/74

534 EISPACK EISPACK IS A COLLECTION OF FORTRAN SUBROUTINES TO SOLVE THE STANDARD EIGENPROBLEM FOR ANY ONE OF THE FOLLOWING CLASSES OF MATRICES - REAL GENERAL, CERTAIN REAL TRIDIAGONAL, REAL SYMMETRIC, REAL TRIDIAGONAL SYMMETRIC, COMPLEX GENERAL AND COMPLEX HERMITIAN MATRICES. THE INDIVIDUAL SUBROUTINES ARE -

IDENTIFICATION	DESCRIPTION
BALANC E2F269	BALANCE A REAL GENERAL MATRIX
BALBAK E2F270	BACK TRANSFORM VECTORS OF MATRIX FORMED BY BALANC
CBAL E2F271	BALANCE A COMPLEX GENERAL MATRIX
CBABK2 E2F272	BACK TRANSFORM VECTORS OF MATRIX FORMED BY CBAL
ELMHES E2F273	REDUCE REAL MATRIX TO REAL HESS. (ELEMENTARY)
ELMBAK E2F274	BACK TRANSFORM VECTORS OF MATRIX FORMED BY ELMHES
ORTHES E2F275	REDUCE REAL MATRIX TO REAL HESS. (ORTHOGONAL)
ORTBAK E2F276	BACK TRANSFORM VECTORS OF MATRIX FORMED BY ORTHES
TRED1 E2F277	REDUCE SYM. MATRIX TO SYM. TRIDIAG.
TRED2 E2F278	REDUCE SYM. MATRIX TO SYM. TRIDIAG.
TRBAK1 E2F279	BACK TRANSFORM VECTORS OF MATRIX FORMED BY TRED1
FIG1 E2F280	REDUCE NONSYM. TRIDIAG. MATRIX TO SYM. TRIDIAG.
BAKVEC E2F281	BACK TRANSFORM VECTORS OF MATRIX FORMED BY FIG1
COMHES E2F282	REDUCE COMPLEX MATRIX TO COMPLEX HESS.
COMBAK E2F283	BACK TRANSFORM VECTORS OF MATRIX FORMED BY COMHES
HTRIDI E2F284	REDUCE HERMITIAN MATRIX TO SYM. TRIDIAG.
HTRIBK E2F285	BACK TRANSFORM VECTORS OF MATRIX FORMED BY HTRIDI
HQR E2F286	FIND ALL VALUES OF REAL HESS. MATRIX
HQR2 E2F287	FIND ALL VALUES/VECTORS OF REAL HESS. MATRIX
INVIT E2F288	FIND SOME VECTORS OF REAL HESS. MATRIX
TQL1 E2F289	FIND ALL VALUES OF SYM. TRIDIAG. MATRIX
TQL2 E2F290	FIND ALL VALUES/VECTORS OF SYM. TRIDIAG. MATRIX
IMTQL1 E2F291	FIND ALL VALUES OF SYM. TRIDIAG. MATRIX
IMTQL2 E2F292	FIND ALL VALUES/VECTORS OF SYM. TRIDIAG. MATRIX
TSTURM E2F293	FIND SOME VALUES/VECTORS OF SYM. TRIDIAG. MATRIX
BISECT E2F294	FIND SOME VALUES OF SYM. TRIDIAG. MATRIX
COMLR E2F295	FIND ALL VALUES OF COMPLEX HESS. MATRIX
COMLR2 E2F296	FIND ALL VALUES/VECTORS OF COMPLEX HESS. MATRIX
CINVIT E2F297	FIND SOME VECTORS OF COMPLEX HESS. MATRIX
RATQR E2F298	FIND EXTREME VALUES OF SYM. TRIDIAG. MATRIX
ELTRAN E2F220	ACCUMULATE TRANSFORMATIONS FROM ELMHES (FOR HQR2)
ORTRAN E2F221	ACCUMULATE TRANSFORMATIONS FROM ORTHES (FOR HQR2)
FIG12 E2F222	REDUCE NONSYM. TRIDIAG. MATRIX TO SYM. TRIDIAG.
TINVIT E2F223	FIND SOME VECTORS OF SYM. TRIDIAG. MATRIX
EISPAC E2F299	CONTROL PROGRAM FOR EISPACK

541 WSP-HASP/DOS THE WSP (WORK STATION PACKAGE) IS A MODIFICATION OF THE STANDARD HASP/RMT360 PACKAGE SUPPLIED BY IBM AND RUNS ON A MULTIPROGRAMMED DOS SYSTEM/360/30 USING MULTI-LEAVING AND BINARY SYNCHRONOUS COMMUNICATIONS TO COMMUNICATE WITH A SYSTEM/360/195/ASP CENTRAL CPU.

P. GENERAL MATHEMATICAL AND COMPUTING SYSTEM ROUTINES

3/74

556 KEELE KEELE IS A LINEARLY CON-
STRAINED NONLINEAR PROGRAMMING ALGORITHM FOR LOCATING A LOCAL
MINIMUM OF A FUNCTION OF N VARIABLES WITH THE VARIABLES SUBJECT TO
LINEAR EQUALITY AND/OR INEQUALITY CCNSTRAINTS.

P. GENERAL MATHEMATICAL AND COMPUTING SYSTEM ROUTINES

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562 AMDLIBAE AMDLIBAE IS A SUBSET OF THE
 IBM 360 SUBROUTINE LIBRARY AT THE APPLIED MATHEMATICS DIVISION AT
 ARGONNE NATIONAL LABORATORY. THIS SUBSET INCLUDES LIBRARY CATE-
 GORIES A-E:

IDENTIFICATION	DESCRIPTION
A152S A MPA	MULT. PREC. FLOATING POINT ARITH. PACKAGE
B156S A ARSIN	ARCSINE, ARCCOSINE
B157S A SIN/COS	SINE, COSINE
B158S A DSIN/DCOS	DP SINE, CCSINE
B159S A DTAN/DCOT	DP TANGENT, COTANGENT
B252S A SINH/COSH	HYPERBOLIC SINE, COSINE
B353S A ALOG	SP LOGARITHM
B354S A DEXP	DP EXPONENTIAL
B355S A DLOG	DP LOGARITHM
B456S A DCUBRT	DP CUBE ROOT
B457S A ARGPOWER	X**Y
B458S A ARGFDXPD	DP X**Y
C150S F DQD	Q. D. ALGORITHM APPLIED TO A POWER SERIES
C151S F DCONF1	EVAL. CONT. FRACT. Q. D. OF POWER SERIES
C250S F CUBIC	ROOTS OF CUBIC POLYNOMIAL EQUATION
C251S F QUARTIC	ROOTS OF QUARTIC POLYNOMIAL EQUATION
C252S F RSSR	ALL ROOTS OF POLY EQS. WITH REAL COEF.
C253S F POLDRV	DRIVER FOR C254S
C254S F CPOLY	ROOTS ARB. POLY. JENKINS-TRAUB ALGORITHM
C353S F1	ANG. MOM. CCEF.- CLEBSCH, RACAH, WIGNER
C354S A ELLIPK	SP COMPLETE ELLIPTIC INTEGRAL K
C355S A ELLIPE	SP COMPLETE ELLIPTIC INTEGRAL E
C365S A ALGAMA	LOGARITHM OF THE GAMMA FUNCTION
C366S A DGAMMA/DLGAMA	DP GAMMA AND LOG(GAMMA) FUNCTIONS
C367S A GAMMA/ALGAMA	GAMMA AND LOG(GAMMA) FUNCTIONS
C368S F EONE	EXPONENTIAL INTEGRAL E1
C369S F DEONE	DP EXPONENTIAL INTEGRAL E1
C370S F BESJY	BESSEL FUNCTIONS J AND Y
C371S F BESIK	BESSEL FUNCTIONS I AND K
C372S F CHIPRB	CHI-SQUARE INTEGRAL
C373S A DELIPK	DP COMPLETE ELLIPTIC INTEGRAL K
C374S A DELIPE	DP COMPLETE ELLIPTIC INTEGRAL E
C375S F1 DEI	EXPONENTIAL INTEGRALS IN LONG PRECISION
C377S F1 DDAW	DAWSON'S INTEGRAL IN DOUBLE PRECISION
C380S F DRZETA	LONG PRECISION ZETA, ZETA-1 FUNCTIONS
C382S F DCGAM	LONG PRECISION COMPLEX GAMMA
C383S A DERF/DERFC	DP ERROR FUNCTION
C384S F BFJ1	BESSEL FUNCTION J1
C385S F COULMB	REGULAR COULOMB WAVE FUNCTIONS
C386S F1 DSGMAL	COULOMB PHASE SHIFT
C387S F BFJYR	BESSEL FUNCTIONS J0, J1, Y0, Y1
C388S F IRCOUL	LP IRREGULAR COULOMB WAVE FUNCTIONS
C389S F GAMIN	INCOMPLETE GAMMA FUNCTION
C390S F LQ	ASSOC. LEGENDRE FUNCTIONS OF 2ND. KIND
C393S F CODEONE	MODIFIED COMPLEX EXPONENTIAL INTEGRAL
D150S F HAVIE	QUADRATURE BY HAVIE'S ALGORITHM
D150S P HAVIEP	QUADRATURE BY HAVIE'S ALGORITHM
D151S F ROMBRG	ROMBERG QUADRATURE
D151S P ROMBRG	ROMBERG QUADRATURE
D152S F1 CHEB	CLENSHAW-CURTIS QUADRATURE

D153S F DROMB
 D153S P DROMBP
 D154S F CMQUAD
 D155S F SIMP
 D157S F ASIMP
 D157S P ASIMPP
 D158S F ANC4
 D158S P ANC4P
 D161S F GAUSS
 D162S F SQUANK
 D252S F DDFSUB
 D253S F DDFSYS
 D254S F DEGEAR
 D255S F DFBND
 D256S F DFBDRV
 E206S F LSQPOL
 E208S F1
 E209S F CALLSQ
 E212S F
 E250S F VA02A
 E252S F MINMAX
 E253S F
 E256S F BGPOL
 E257S F BGLSSQ
 E350S F SMOOTH

TWO-DIMENSIONAL ROMBERG QUADRATURE
 TWO-DIMENSIONAL ROMBERG QUADRATURE
 MODIFIED CLENSHAW-CURTIS QUADRATURE
 ADAPTIVE SIMPSON QUADRATURE
 IMPROVED ADAPTIVE SIMPSON QUADRATURE
 IMPROVED ADAPTIVE SIMPSON QUADRATURE
 ADAP. QUAD. USING 4-TH ORDER NEWTON-COTES
 ADAP. QUAD. USING 4-TH ORDER NEWTON-COTES
 ARBITRARY GAUSSIAN WEIGHTS AND NODES
 SIMPSON'S QUAD. USED ADAPTIVELY
 DP NEVILLE OR STOER SOL. LIN. DIF. EQNS.
 DRIVER FOR D252S
 GEAR'S SOL. OF DIF. EQS.
 STOER SOL. DIF. EQS. WITH ERROR BOUNDS
 DRIVER FOR D256
 LEAST SQUARES WEIGHTED POLYNOMIAL FIT
 ARBITRARY FUNCTION FIT, LEAST SQUARES
 DRIVER FOR E206S
 GENERAL LEAST SQUARES FIT + FNCTION EVAL.
 LEAST SQUARES FUNCT. MIN. W/O DERIVATIVES
 CHEBYSHEV LINE FIT
 ARBITRARY FUNCTIONAL FIT II
 LEAST SQUARES FIT WITH POLYNOMIALS
 LEAST SQUARES FIT WITH ARBITRARY FUNCTION
 SMOOTHING BY CUBIC SPLINES

P. GENERAL MATHEMATICAL AND COMPUTING SYSTEM ROUTINES

3/74

563 AMDLIBF AMDLIBF IS A SUBSET OF THE
 IBM 360 SUBROUTINE LIBRARY AT THE APPLIED MATHEMATICS DIVISION AT
 ARGONNE. THIS SUBSET INCLUDES LIBRARY CATEGORY F:

IDENTIFICATION	DESCRIPTION
F105S F MATEQ,UNIQUE	GENERALIZED MAT. INV. AND SOL. LIN. EQS.
F150S F HERM	EIGENSYSTEMS OF HERMITIAN MATRICES
F152S F SYMINV	INVERT SYM. MATRICES, SOLVE LIN. SYSTEMS
F154S A DOTP	DOUBLE PLUS PRECISION ACCUM. INNER PROD.
F155S F HESSEN	RED. COMPLEX NON-HERM. MAT. TO UP. HESS.
F156S F RAYCOR	RAYLEIGH CORRECTIONS FOR EIGENVALUES
F157S F SINGLVL	SINGULAR VALUE DECOMP. OF REAL MATRIX
F161S F XTRADP	A FAST EXTENDED PRECISION INNER PRODUCT
F202S F1 EIGEN	EIGENSYSTEM FOR REAL SYMMETRIC MATRIX
F203S F	DRIVER FOR F202S
F220S F ELTRAN	ACCUM. TRANSFORMATIONS FROM ELMHES (HQR2)
F221S F ORTRAN	ACCUM. TRANSFORMATIONS FROM ORTHES (HQR2)
F222S F FIGI2	REDUCE NONSYM. TO SYM. TRIDIAG. (TQL2)
F223S F1 TINVIT	FIND SOME EIGENVEC. OF SYM. TRIDIAG. MAT.
F224S F REDUC	REDUCE GEN. SYM. EIGENPROB. AX-L*BX
F225S F REBAK	BACKTRANSFORM VECTORS REDUC FORMED MATRIX
F226S F BANDR	REDUCE BAND SYM. MATRIX TO SYM. TRIDIAG.
F227S F BANDV	FIND EIGENVECTORS OF BAND SYM. MATRIX
F228S F TRED3	REDUCE PACKED SYM. MAT. TO SYM. TRIDIAG.
F229S F TRBAK3	BACKTRANSFORM VECTORS TRED3 FORMED MATRIX
F250S F FRANCI	EIGENVALUES OF A REAL MATRIX
F251S F FRANCC	EIGENVALUES OF COMPLEX MATRICES
F252S F GEIGEN	GENERALIZED SYMMETRIC EIGENPROBLEM
F255S F SDIAG	EIGENSYSTEM OF REAL SYM. DP MATRICES
F257S F TSTMTZ	GENERATES TEST MATRICES
F258S F LRCHZ	EIG. VALS. REAL SYM. MAT. VIA LR-CHOLEQ.
F259S F BYSECT	EIGENVALUES OF TRIDIAG. MAT. BY BISECTION
F260S F JACOBI	EIGENSYSTEM OF REAL MATRICES
F261S F EIGINV	INVERSE EIGENVALUE PROBLEM
F262S F VEC5	EIGENVECTORS OF PENTADIAG. SYM. MATRICES
F263S F BANDRD	REDUCE SYM. BAND MATRIX TO TRIDIAG. FORM
F264S F BANDVC	ORTHONORM. EIGENVEC. OF SYM. BAND MAT.
F265S F EIGENP	EIGENSYSTEM OF REAL GENERAL MATRIX
F269S F1 BALANC	BALANCE A REAL GENERAL MATRIX
F270S F1 BALBAK	BACKTRANSFORM VECTORS BALANCE FORMED MAT.
F271S F1 CBAL	BALANCE A COMPLEX GENERAL MATRIX
F272S F1 CBABK2	BACKTRANSFORM VECTORS CBAL FORMED MATRIX
F273S F1 ELMHES	REDUCE REAL MATRIX TO REAL HESS. (ELEM.)
F274S F1 ELMBAK	BACKTRANSFORM VECTORS ELMHES FORMED MAT.
F275S F1 ORTHES	REDUCE REAL MAT. TO REAL HESS. (ORTHOG.)
F276S F1 ORTBAK	BACKTRANSFORM VECTORS ORTHES FORMED MAT.
F277S F1 TRED1	REDUCE SYM. MATRIX TO SYM. TRIDIAG.
F278S F1 TRED2	REDUCE SYM. MAT. TO SYM. TRIDIAG. (TQL2)
F279S F1 TRBAK1	BACKTRANSFORM VECTORS TRED1 FORMED MATRIX
F280S F1 FIGI	REDUCE NONSYM. TO SYM. TRIDIAG. MATRIX
F281S F1 BAKVEC	BACKTRANSFORM VECTORS FIGI FORMED MATRIX
F282S F1 COMHES	REDUCE COMPLEX MATRIX TO COMPLEX HESS.
F283S F1 COMBAK	BACKTRANSFORM VECTORS COMHES FORMED MAT.
F284S F1 HTRIDI	REDUCE HERMITIAN MATRIX TO SYM. TRIDIAG.
F285S F1 HTRIBK	BACKTRANSFORM VECTORS HTRIDI FORMED MAT.
F286S F1 HQR	FIND ALL VALUES OF REAL HESS. MATRIX

F287S F1 HQR2	FIND ALL VALUES/VECTORS REAL HESS. MAT.
F288S F1 INVIT	FIND SOME VECTORS OF REAL HESS. MATRIX
F289S F2 TQL1	FIND ALL VALUES OF SYM. TRIDIAG. MATRIX
F290S F2 TQL2	ALL VALUES/VECTORS SYM. TRIDIAG. MAT.
F291S F1 IMTQL1	FIND ALL VALUES OF SYM. TRIDIAG. MATRIX
F292S F1 IMTQL2	ALL VALUES/VECTORS SYM. TRIDIAG. MAT.
F293S F1 TSTURM	SOME VALUES/VECTORS SYM. TRIDIAG. MAT.
F294S F2 BISECT	FIND SOME VALUES OF SYM. TRIDIAG. MATRIX
F295S F1 COMLR	FIND ALL VALUES OF COMPLEX HESS. MATRIX
F296S F1 COMLR2	ALL VALUES/VECTORS COMPLEX HESS. MAT.
F297S F1 CINVIT	FIND SOME VECTORS OF COMPLEX HESS. MATRIX
F298S F1 RATQR	FIND EXTREME VALUES OF SYM. TRIDIAG. MAT.
F299S FAL EISPAC	CONTROL PROGRAM F220S-F223S + F269S-F298S
F402S F MATINV	MATRIX INVERSION AND SOL. OF LINEAR EQNS.
F403S F	DRIVER FOR F402S
F452S F CHOLLU,CHOLEQ	SYM. DECOMP. OF POS. DEF. BAND MATRICES
F453S F MATINC	INVERSION OF COMPLEX MATRICES
F454S F CROUT	SOLUTION OF SIMULTANEOUS LINEAR EQUATIONS
F455S F CROUTC	SOL. OF SIMULTANEOUS COMPLEX LINEAR EQNS.
F456S F1 DIAG	INTEGER PRESERVING GAUSSIAN ELIMINATION

P. GENERAL MATHEMATICAL AND COMPUTING SYSTEM ROUTINES

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564 AMDLIBGZ AMDLIBGZ IS A SUBSET OF THE IBM 360 SUBROUTINE LIBRARY AT THE APPLIED MATHEMATICS DIVISION AT ARGONNE NATIONAL LABORATORY. THIS SUBSET INCLUDES LIBRARY CATEGORIES G-Z:

IDENTIFICATION	DESCRIPTION
G552S F RANF	RANDOM NUMBER GENERATOR
J552S F1 PLOTSFLM	CALCOMP PLOTS TO IBM 2280
J952S F YOLYPLOT	CALCCMP PLCTS
J955S P GRAF	PRINTS A GRAPH OF POINTS ON LINE PRINTER
K250S A1	CORE TO CORE CONVERSION
K251S A HEXINP	HEXADECIMAL INPUT FOR PL/I PROGRAMS
K252S A HEXOUT	HEXADECIMAL OUTPUT CONV. PL/I PROGRAMS
M101S F SORT	ALGEBRAIC SORT
M150S F CSORT	ALGEBRAIC SCRT
M151S P2 ANLKWIC	KWIC SORT
M250S A SMALLIST	SQUEEZES ASSEMBLER LISTING TO 8X11
N251S A ABEND	CALLS ABEND DUMP
Q052S A CLOCK	TIME
Q053S A COPYAGO	COPY LOAD MODULE FROM TAPE TO DISK
Q054S A DATE	CURRENT DATE IN FORM MM/DD/YY
Q055S A TIME	TIME (24 HOUR CLOCK) IN EBCDIC HH.MM.SS
Z013S F	VARIABLE METRIC MINIMIZATION
Z057S A LOCF	LOCATE MACHINE ADDRESSES OF VARIABLES
Z071S A ALLOC	ALLOCATE LCS FOR FORTRAN PROGRAMS
Z073S A LCSGET	ALLOCATE LCS FOR PL/I PROGRAMS
Z074S A ANLMNP	EXPONENT + MANTISSA MANIPULATIVE FUNCTS.

578 PLOTR PLOTR AND THE AUXILIARY ROUTINE XYGRD CONTOUR A FUNCTION DEFINED OVER A TWO-DIMENSIONAL GRID AND COMPUTE THE AREA WITHIN THE CONTOURS.

592 GEAR GEAR IS A PACKAGE OF SUBROUTINES FOR THE NUMERICAL SOLUTION OF SYSTEMS OF ORDINARY DIFFERENTIAL EQUATIONS, GIVEN THE INITIAL VALUES. IT IS PARTICULARLY WELL-SUITED FOR STIFF SYSTEMS, BUT CAN BE USED GENERALLY.

593 TSO-SPEAKEASY SPEAKEASY IS A GENERAL-PURPOSE LANGUAGE PROCESSOR OPERATING AS A SUPER DESK CALCULATOR UNDER TSO.

601 ERF,ERFC ERF AND ERFC ARE USED TO COMPUTE VALUES OF THE ERROR FUNCTION AND COMPLEMENTARY ERROR FUNCTION FOR ANY REAL NUMBER. THEY MAY BE USED TO COMPUTE OTHER RELATED FUNCTIONS SUCH AS THE NORMAL PROBABILITY INTEGRALS.

P. GENERAL MATHEMATICAL AND COMPUTING SYSTEM ROUTINES

3/74

602 LENSDES

602 LENSDES LENSDES ANALYZES THE PERFORMANCE OF OPTICAL LENSES BY COMPUTING THE IMAGE ERRORS FOUND WHEN BUNDLES OF SKEW RAYS ARE TRACED FROM OBJECT POINTS TO THE IMAGE SURFACE. LENS PERFORMANCE IS OPTIMIZED BY VARYING SELECTED LENS PARAMETERS UNDER DIRECTION OF THE NONLINEAR LEAST SQUARES PROGRAM, OPTIMIZ.

610 FUNPACK

IDENTIFICATION	DESCRIPTION
610 FUNPACK	FUNPACK IS A COLLECTION OF FORTRAN SUBROUTINES TO EVALUATE CERTAIN SPECIAL FUNCTIONS.

IDENTIFICATION	DESCRIPTION
DEI	F1EI EXPONENTIAL INTEGRALS
DELIPK	F1EK COMPLETE ELLIPTIC INTEGRAL OF THE FIRST KIND
DELIPE	F1EE COMPLETE ELLIPTIC INTEGRAL OF THE SECOND KIND
DAW	F1DW DAWSON'S INTEGRAL
BESK0	F1K0 BESSEL FUNCTION K-SUB-0
BESK1	F1K1 BESSEL FUNCTION K-SUB-1
MONERR	F1MO ERROR MONITORING PACKAGE

Q. MATERIALS

3/74

419 CASCADE/CLUSTER CASCADE IS A SIMULATION OF THE COLLISION CASCADE RESULTING FROM THE DISPLACEMENT OF A PRIMARY KNOCK-ON ATOM BY AN ENERGETIC NEUTRON IN A BODY-CENTERED-CUBIC OR FACE-CENTERED-CUBIC CRYSTAL STRUCTURE. CLUSTER ANALYZES THE SPATIAL DISTRIBUTION OF THE RESULTING RADIATION DAMAGE IN TERMS OF VACANCY AND INTERSTITIAL CLUSTERS, TAKING INTO ACCOUNT THE EXACT CRYSTAL STRUCTURE.

422 SPECTRA SPECTRA COMPUTES THE NUMBER AND SPECTRUM OF PRIMARY KNOCK-ON ATOMS RESULTING FROM NEUTRON COLLISION SEQUENCES IN A MATERIAL UNDER IRRADIATION.

566 RESPOND RESPOND CALCULATES THE RELATIVE ENERGY ABSORPTION OF A SMALL REGION OF ONE MATERIAL IN A LARGE BODY OF ANOTHER MATERIAL EXPOSED TO GAMMA- OR X-RADIATION.

609 INDX INDX PROVIDES A MEANS FOR RAPIDLY DEFINING AND TESTING TRIAL UNIT CELLS AS AN AID TO INDEXING POWDER PATTERNS OF CRYSTAL STRUCTURES OF UNKNOWN SYMMETRY.

527 HERMES THE HERMES MODEL CALCULATES THE REGIONAL RADIONUCLIDE RELEASES AND RADIATION DOSE TO THE POPULACE IN A GIVEN YEAR ARISING FROM THE OPERATION OF NUCLEAR FACILITIES TO MEET ELECTRICAL GENERATION DEMANDS WITHIN A GIVEN STUDY REGION.

591 PLETHS PLETHS IS A TIME-SHARING ISOPLETH-AREA PROGRAM FOR DETERMINING GROUND-LEVEL AREAS OF HIGH POLLUTANT CONCENTRATION DOWNWIND OF A SINGLE SOURCE OF EMISSION. THESE ELLIPTICAL AREAS ARE ENCLOSED BY ISOPLETHS OF CONSTANT CONCENTRATION PRODUCED BY CONTINUOUS POLLUTANT EMISSIONS FROM ONE SMOKE STACK OR GROUND SOURCE, OR FROM A CLOSELY ASSOCIATED GROUP OF SINGLE SOURCES. STACK HEIGHT, WEATHER CONDITIONS, AND SOURCE EMISSION RATE ARE TYPED IN AND THE PROGRAM CALCULATES AND DESCRIBES THE HIGH POLLUTION AREAS ENCLOSED BY ISOPLETHS.

599 TOPLYR2 TOPLYR2 APPLIES THE FIRST LAW OF THERMODYNAMICS TO COMPUTE THE TEMPERATURE OF A WATER MASS FLOWING IN AN OPEN CHANNEL. THE PROGRAM IS DESIGNED TO ACCOMMODATE VARIABLE DEPTH, VELOCITY, AND CROSS SECTION. THE SOURCE OF ENERGY (LOCATION OF THE DISCHARGE) IS ASSUMED TO BE SUFFICIENTLY DISTANT FROM THE RIVER SEGMENT UNDER EXAMINATION THAT THE MOMENTUM ASSOCIATED WITH THE DISCHARGE IS INSIGNIFICANT. VELOCITY DISTRIBUTION AT BOTH THE INLET AND OUTLET OF THE REACH AS WELL AS THE TEMPERATURE DISTRIBUTION AT THE INLET AS A FUNCTION OF TIME AND AT THE OUTLET INITIALLY ARE SPECIFIED. EDDY DIFFUSIVITIES, AMBIENT METEOROLOGICAL CONDITIONS, AND GEOMETRY ARE ALSO SUPPLIED TO THE CODE. ALTHOUGH THE LATERAL EDDY DIFFUSIVITY IS ALLOWED TO VARY SPATIALLY, THE EFFECT OF DENSITY DISPARITY IS NOT TREATED EXPLICITLY BY THE CODE. TEMPORAL BEHAVIOR INDUCED BY VARIATIONS IN THE AMBIENT METEOROLOGICAL AND BOUNDARY CONDITIONS ARE COMPUTED.

V. PARTICLE ACCELERATORS AND HIGH VOLTAGE MACHINES

3/74

577 FFEARS FFEARS IS GENERALLY APPLICABLE FOR THE SOLUTION OF BOUNDARY VALUE PROBLEMS INVOLVING THE LAPLACE EQUATION USING DIFFERENCE EQUATIONS IN AXISYMMETRIC OR RECTANGULAR COORDINATES. IT WILL HANDLE VIRTUALLY ANY CONFIGURATION OF DIELECTRICS AND FLOATING ELECTRODES, PRODUCING BOTH EQUIPOTENTIAL AND EQUIFIELD PLOTS, IF DESIRED.

574 MACS LATTICE VIBRATION CODES THIS PACKAGE OF SEVEN RELATED CODES IS BASICALLY AIMED AT GIVING MAXIMUM CAPABILITY FOR CALCULATING SLOW-NEUTRON SCATTERING BY MODERATORS.

MACS-C COMPUTES CRYSTAL VIBRATIONS WHEN THE POTENTIAL ENERGY IS A SUM OF PARTS ARISING FROM SHORT-RANGE FORCES AND LONG-RANGE COULOMB INTERACTIONS. IT ALSO OBTAINS JACOBIAN MATRICES FOR DETERMINING ADJUSTMENTS IN FORCE CONSTANTS AND IONIC CHARGE WHICH CAN LEAD TO IMPROVED AGREEMENT WITH DATA. STRUCTURE FACTORS FOR NEUTRON INELASTIC SCATTERING CAN ALSO BE CALCULATED.

MACS-J COMPUTES THE DYNAMICAL MATRIX FOR THE HARMONIC OSCILLATIONS OF A CRYSTAL, ITS EIGENVALUES AND EIGENVECTORS, THE CORRESPONDING STRUCTURE FACTORS FOR COHERENT SINGLE-PHONON SCATTERING OF NEUTRONS, AND JACOBIAN MATRICES FOR USE IN ADJUSTING FORCE CONSTANTS TO FIT CALCULATED TO OBSERVED DISPERSION CURVES.

REVISED-D CALCULATES VALANCE COORDINATES IN TERMS OF MASS ADJUSTED ATOM DISPLACEMENTS, TOGETHER WITH COORDINATES WHICH DEFINE RIGID GROUP ROTATIONS.

REVISED-MVFC CONSTRUCTS FORCE CONSTANT MATRICES FOR USE IN VALANCE FORCE POTENTIAL FUNCTIONS WHICH ARE USED IN OTHER PROGRAMS DEALING WITH MOLECULAR AND CRYSTAL VIBRATIONS.

ADJUSTER IS A FORCE ADJUSTER PROGRAM TO OBTAIN A LEAST SQUARES FIT TO OBSERVED FREQUENCIES OF MOLECULES AND CRYSTALS.

DIPOLE-SUM CALCULATES DIPOLE SUMS FOR AN ARBITRARY CRYSTAL.

MODEL-PI CALCULATES CRYSTAL VIBRATIONS WHEN THE POTENTIAL ENERGY IS A SUM OF SHORT-RANGE AND LONG- OR INTERMEDIATE-RANGE TERMS IN THE DIPOLE COORDINATE APPROXIMATION. IT ALSO OBTAINS JACOBIAN MATRICES FOR USE IN ADJUSTING INPUT PARAMETERS.

575 MSCAT IN A THERMAL NEUTRON SCATTERING EXPERIMENT, THE MEASURED CROSS SECTION INCLUDES BOTH SINGLE AND MULTIPLE SCATTERING EVENTS. IN ORDER TO EXTRACT THE SINGLE SCATTERING CROSS SECTION, THE CROSS SECTION FOR MULTIPLE SCATTERING MUST BE KNOWN. SINCE THIS CONTRIBUTION IS GENERALLY A SMOOTHER FUNCTION OF ANGLE AND SCATTERED ENERGY THAN THE SINGLE SCATTERING, IT IS LESS SENSITIVE TO DETAILS OF THE SINGLE SCATTERING CROSS SECTION. IT IS THEREFORE FEASIBLE TO CALCULATE THE MULTIPLE SCATTERING USING AN APPROXIMATE SCATTERING FUNCTION, AND TO SUBTRACT IT FROM THE MEASUREMENTS IN ORDER TO OBTAIN THE SINGLE SCATTERING. MSCAT CALCULATES THE SINGLE AND MULTIPLE SCATTERING CROSS SECTIONS, FOR A SPECIFIED EXPERIMENTAL SITUATION, GIVEN A SINGLE SCATTERING FUNCTION AS INPUT.

X. CONTROLLED THERMONUCLEAR RESEARCH

3/74

561 TOKMINA/TOKMINA2 TOKMINA FINDS THE MINIMUM MAGNETIC FIELD, B_M , REQUIRED AT THE TOROIDAL COIL OF A TOKAMAK TYPE FUSION REACTOR WHEN THE INPUT IS BETA (RATIO OF PLASMA PRESSURE TO MAGNETIC PRESSURE), Q (KRUSKAL-SHAFRANOV PLASMA STABILITY FACTOR), AND Y (RATIO OF PLASMA RADIUS TO VACUUM WALL RADIUS: R_P/R_W) AND ARRAYS OF P_T (TOTAL THERMAL POWER FROM BOTH D-T AND TRITIUM BREEDING REACTIONS), P_W (WALL LOADING OR POWER FLUX) AND T_B (THICKNESS OF BLANKET), FOLLOWING THE METHOD OF GOLOVIN, ET AL. TOKMINA2 FINDS THE TOTAL POWER, P_T , OF SUCH A FUSION REACTOR, GIVEN A SPECIFIED MAGNETIC FIELD, B_M , AT THE TOROIDAL COIL.

356 GAF/GAR DATA TAPES USED IN GGA A BENCHMARK STUDY OF ZPR-III ASSEMBLY 48 USING ENDF/B CROSS SECTIONS WAS UNDERTAKEN TO IDENTIFY POSSIBLE CROSS SECTION DISCREPANCIES IN THE MICROSCOPIC ENDF/B DATA. THIS WORK WAS DONE FOR THE CSEWG TESTING SUBCOMMITTEE AS PART OF THEIR PHASE I DATA TESTING. THIS PACKAGE CONTAINS THE CROSS SECTION DATA GENERATED FOR THIS STUDY IN THE FORM OF THE ULTRA-FINE GROUP CROSS SECTIONS OF THE MATERIALS OF ZPR-III ASSEMBLY 48 IN THE FORMAT OF THE GGA GAF/GAR PROGRAM DATA TAPES.

447 ETOG1 DATA FOR MUFT AND GAM THE DATA REQUIRED FOR THE CREATION OF MUFT4, MUFT5, GAM1 AND GAM2 LIBRARIES WERE GENERATED FROM THE BROOKHAVEN NATIONAL NEUTRON CROSS SECTION CENTER ENDF/B TAPES 114 THROUGH 117 BY THE ETOG1 PROGRAM (ACC ABSTRACT 437).

532 LOS ALAMOS GROUP-AVERAGED CRCS GROUP CONSTANTS AND COMPUTED NEUTRON CROSS SECTIONS ARE TABULATED FOR A VARIETY OF MATERIALS INCLUDING - AL, B, BE, C, CD, CL, D, GA, F194, FE, H, K, LI6, MO, NA, NI, O, PU239, PU240, PU249, TH, U233, U235, U238, AND ZR. THESE ARE PRESENTED AS 18-, 24-, AND 25-GROUP CALCULATIONS FOR REACTORS WITH NEUTRON ENERGIES RANGING FROM FAST TO THERMAL.

Z. DATA

3/74

543 ENDF/B-THERMOS THESE DATA ARE 30-GROUP THERMOS THERMAL SCATTERING KERNELS FOR P0 TO P5 LEGENDRE ORDERS FOR EVERY TEMPERATURE OF EVERY MATERIAL FROM S(ALPHA,BETA) DATA STORED IN THE ENDF/B LIBRARY. THESE SCATTERING KERNELS WERE GENERATED USING THE FLANGE2 COMPUTER CODE (ACC ABSTRACT 368). TO TEST THE KERNELS, THE INTEGRAL PROPERTIES OF EACH SET OF KERNELS WERE DETERMINED BY A PRECISION INTEGRATION OF THE DIFFUSION LENGTH EQUATION AND COMPARED TO EXPERIMENTAL MEASUREMENTS OF THESE PROPERTIES. IN GENERAL, THE AGREEMENT WAS VERY GOOD. DETAILS OF THE METHODS USED AND RESULTS OBTAINED ARE CONTAINED IN THE REFERENCE. THE SCATTERING KERNELS ARE ORGANIZED INTO A TWO VOLUME MAGNETIC TAPE LIBRARY FROM WHICH THEY MAY BE RETRIEVED EASILY FOR USE IN ANY 30-GROUP THERMOS LIBRARY. THE CONTENTS OF THE TAPES ARE AS FOLLOWS -

VOLUME I		
MATERIAL	ZA	TEMPERATURES (DEGREES K)
MOLECULAR H2O	100.0	296, 350, 400, 450, 500, 600, 800, 1000
MOLECULAR D2O	101.0	296, 350, 400, 450, 500, 600, 800, 1000
GRAPHITE	6000.0	296, 400, 500, 600, 700, 800, 1000, 1200, 1600, 2000
POLYETHYLENE	205.0	296, 350
BENZENE	106.0	296, 350, 400, 450, 500, 600, 800, 1000
VOLUME II		
MATERIAL	ZA	TEMPERATURES (DEGREES K)
ZR BOUND IN ZRHX	203.0	296, 400, 500, 600, 700, 800, 1000, 1200
H BOUND IN ZRHX	230.0	296, 400, 500, 600, 700, 800, 1000, 1200
BERYLLIUM-9	4009.0	296, 400, 500, 600, 700, 800, 1000, 1200
BERYLLIUM OXIDE	200.0	296, 400, 500, 600, 700, 800, 1000, 1200
URANIUM DIOXIDE	207.0	296, 400, 500, 600, 700, 800, 1000, 1200

VII. KWIC INDEX

A-E

AI

A-E	ANL	360	F+P+A	RS	T P	\$ AMDLIBAE, ARGONNE SUBROUTINE LIBRARY CAT.	562			
AAEC	360	F+BAL	RS	P	T C	\$ CRAM, 1-D AND 2-D MULTI-GP DIFFUSION PROGRAM	103			
ABSORPTION	REMOVAL	X-SECS	BAPL	6600	F4	RS T B \$ M0807, 2-D DIFFUSION	280			
ABSORPTION,	CELL	ANL	3600	F36	RSBP X T B	\$ RABBLE,WLIB,FLAT, RESONANCE	281			
ACCIDENT	ANALYSIS		BAPL	6600	F4	RS P T G \$ FLASH3, LOSS-OF-COOLANT	295			
ACCIDENT	ANALYSIS	NED	635	F4	RS P T G	\$ FREADM1, FAST REACTOR CORE	479			
ACCIDENT	ANALYSIS	BAPL	6600	F4	RS P T G	\$ M0555,ACT1, LOSS-OF-COOLANT	284			
ACCIDENT	ANALYSIS	DOSE CALC	GGA	1108	F4	RS T G \$ GADOSE,DOSET, HTGR	261			
ACTIVITY	DIST STUDY	GGA	7044	F4	RS P	D \$ RAD2, HTGR FISSION PRODUCT	231			
ACTIVITY	RELATION	GEC	635	F4	RSBP	D \$ COS, NEUTRON FLUX-DOSIMETER	423			
ACT1,	LOSS-OF-COOLANT	ACCIDENT	ANALYSIS	BAPL	6600	F4	RS P T G \$ M0555,	284		
ADEP,	1D AND 2D FEW-GROUP	SPACE-TIME	KINETICS	BCL	6400	F4	RS P T F \$	494		
ADLER,	ENDF/B	RESONANCE	XSECTION	CCDES	BNL	6600B	F4	RS P T A \$ RESEND,	465	
AEB	360	F4	RS	L	T C	\$ FIRE5, 1-D AGE-DIFFUSION SLAB CYLINDER SPHERE	9			
AEB	360	F4	RS	P		B \$ WELWING, MATERIAL BUCKLING CYL FUEL ELEMENTS	362			
AEB	360	F4	RS	P		E \$ AIREK3, SPACE-INDEPENDENT KINETICS W/FEEDBACK	121			
AEB	360	F4	RS	P		E \$ BLAST, REACTOR KINETICS TEMPERATURE DIST STUDY	363			
AEC	DP PURCHASE	VERSUS LEASE	ANALYSIS	SLA	360	COBOL	RSBP CT M \$ BECOM,	589		
AEC	DP PURCHASE	VERSUS LEASE	ANALYSIS	SLA	1108	COBOL	RS P M \$ BECOM,	589		
AEC-ALO	FAU,	RADIO FREQUENCY	MANAGEMENT	SYSTEM	ALOO	360	COBOL	RS P M \$	587	
AEG	7090	F2	RS			R \$ CANCOFF JR, MCDERATOR SPACE CHORD DIST FUNCT	150			
AEROSOL	PARTICLE	TRANSPORT	STUDY		RFD	3600	F36	RS P G \$ DISPER,	554	
AEROSOLS	AI	360	F4	RS	P T G	\$ HAA3, COAGULATION OF HETEROGENEOUS	443			
AGC	7090	F+FAP	RSBPLX	T B	\$	AGN-GAM, FAST SPECTRUM MULTI-GP CONSTANT CALC	204			
AGC	7090	FLOCO	RSBP		C \$	2DXY, 2-D MULTI-GP SN APPROXIMATION XY GEOM	18			
AGC	7090	F2	RS	P		B \$ BOUNCE, FLUX DIST IN MULTI-PIN FUEL ELEMENT	237			
AGC	7090	F2	RS	P		O \$ CROC90, ML-1 FLUID FLOW EXPERIMENT ANALYSIS	154			
AGC	7090	F2	RS	P T B	\$	AGN-SIGMA, CALC OF MULTI-GP TRANSFER MATRICES	243			
AGC	7090	F2	RSB		F \$	HATCHET, COUPLED NEUTRONICS-HYDRODYNAMICS CODE	153			
AGE	CALCULATION	OF	ENDF/B	DATA	BAPL	6600	F4	RS P T R \$ EPOCH, NEUTRON	461	
AGE-DIFFUSION	SLAB CYLINDER	SPHERE	AEB	360	F4	RS L T C	\$ FIRE5, 1-D	9		
AGN-GAM,	FAST SPECTRUM	MULTI-GP	CONSTANT	CALC	AGC	7090	F+FAP	RSBPLX T B \$	204	
AGN-SIGMA,	CALC	OF	MULTI-GP	TRANSFER	MATRICES	AGC	7090	F2	RS P T B \$	243
AI	360	F+BAL	RS		T P	\$ FIGS, IBM360&2250 FORTRAN GRAPHICS SUBROUTINES	484			
AI	360	F+BAL	RS	P	T A	\$ COMNUC,CASCADE, COMPOUND NUCLEUS REACTION	482			
AI	360	F+BAL	RS	P	T E	\$ AIROS2A, SIMULATION OF REACTOR DYNAMICS	326			
AI	360	F+BAL	RS	P	CT B	\$ U3R, UNRESOL RESONANCE XSEC PROBABILITY TABLES	553			
AI	360	F+BAL	RS	P X T B	\$	FWOCR-SAFE, 2-D MONTE CARLO CELL CALCULATION	307			
AI	360	F+BAL	RSB	L	CT M	\$ SCORE3, SCISRS ENDF/B GRAPHIC X-SEC EVALUATION	375			
AI	360	F4	RS	P	T F	\$ TSN, SPATIALLY-DEPENDENT REACTOR KINETICS	309			
AI	360	F4	RS	P	T G	\$ AISITE2, PARAMETRIC SITE REQUIREMENT STUDY	172			
AI	360	F4	RS	P	T G	\$ HAA3, COAGULATION OF HETEROGENEOUS AEROSOLS	443			
AI	360	F4	RS	P	T G	\$ SOFIRE2, SODIUM POOL FIRE 1- & 2-CELL ANALYSIS	559			
AI	360	F4	RS	P	T Q	\$ RESPOND, DISSIMILAR MEDIA TLD CORRECTION CALC	566			
AI	360	F4	RS	P	CT I	\$ PSA2, STRESS ANALYSIS MULTIANCHOR PIPE SYSTEM	542			
AI	360	F4	RS	PLX	T B	\$ AILMOE, X-SECTION CALC ELASTIC SCAT RESONANCES	147			
AI	360	F4	RSB	L	T M	\$ CLIP, FORM CR THREDES LIBRARY UTILITY ROUTINE	271			
AI	360	F4	RSBP		T K	\$ THREDES, 1-D FEW-GP DIFFUSION DESIGN SYSTEM	273			
AI	360	F4	RSBP	X	T D	\$ SIZZLE, 1-D MULTIGROUP DIFFUSION DEPLETION	58			
AI	360	F4	RSBPLX		T C	\$ ANISN, 1-D MULTI-GP DISCRETE ORDINATE CALC	151			
AI	360	F4	RSBPLX		T C	\$ CAESAR4,LIBLST, 1-D MULTI-GP DIFFUSION + LIB	270			
AI	7090	F+FAP	RS		T I	\$ 4RESTRAINT PIPE STRESS, MAXIMUM MOMENT CALC	109			
AI	7090	F+FAP	RS	L	T B	\$ QUICKIE, INFINITE MEDIUM SPECTRUM X-SECTIONS	119			
AI	7090	F+FAP	RS	L	T C	\$ FAIM, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	120			
AI	7090	F+FAP	RS	L	T C	\$ ULCER, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	118			
AI	7090	F+FAP	RS	PL	T B	\$ TEMPEST2, THERMAL NEUTRON SPECTRUM X-SECTIONS	50			
AI	7090	F+FAP	RS	PL	T C	\$ AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	29			
AI	7090	F2	RS		B \$	S4 CYL CELL CODE, 1-D 1-GP S4 APPROXIMATION	53			
AI	7090	F2	RS		C \$	PERT, 1-D PERTURBATION FOR AIM AND FOG CODES	30			
AI	7090	F2	RS		E \$	AIREK3, SPACE-INDEPENDENT KINETICS W/FEEDBACK	121			
AI	7090	F2	RS		E \$	SNAPKIN5/5A, 1-REGION KINETICS SNAP GEOMETRY	122			
AI	7090	F2	RS		I \$	CPOCK, SPACE POWER PLANT DESIGN OPTIMIZATION	112			
AI	7090	F2	RS		I \$	FUGUE, STEADY-STATE TEMPERATURE VOID FRACTION	48			
AI	7090	F2	RS		I \$	SHOCK, SPACE POWER PLANT DESIGN OPTIMIZATION	114			

AI

ANC

AI	7090	F2	RS	J	\$ FARSE1A, DCSE RATE FROM SNAP SHIELD LEAKAGE	91
AI	7090	F2	RS	J	\$ MORTIMER, DOSE RATE CALCULATION SNAP GEOMETRY	142
AI	7090	F2	RS	J	\$ SCARF2, SCATTER FROM RADIATOR FINS SNAP GEOM	110
AI	7090	F2	RS	J	\$ SCAR1, SCATTER FROM A RING SNAP GEOMETRY	111
AI	7090	F2	RS L T	D	\$ SIZZLE, 1-D MULTIGROUP DIFFUSION DEPLETION	58
AI	7090	F2	RS P	B	\$ BAM, S4 CYL CELL CCDE AND TEMPEST COMBINATION	108
AI	7090	F2	RS P	B	\$ SAIL, 1-D 1-GP SN APPROXIMATION SLAB GEOMETRY	52
AI	7090	F2	RS P	D	\$ AIMFIRE, URANIUM FUEL CYCLE COST ANALYSIS	55
AI	7090	F2	RS P	G	\$ CLOUD, GAMMA-RAY DCSE RATE FROM A CLOUD	47
AI	7090	F2	RS P	J	\$ GRACE1, GAMMA-RAY ATTENUATION SLAB GEOMETRY	45
AI	7090	F2	RS P	J	\$ GRACE2, GAMMA-RAY ATTENUATION CYL SPHERE GEOM	46
AI	7090	F2	RS P	J	\$ RATRAP, DOSE RATE CALCULATION SNAP GEOMETRY	141
AI	7090	F2	RS P T C	\$	FOG, 1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE	28
AI	7090	F2	RS PL T A	\$	ARES2, RESONANCE INTEGRAL X-SECTION CALC	89
AI	7090	F2	RS PL T B	\$	FORM, FAST NEUTRON SPECTRUM X-SECTION CALC	51
AI	7090	F2	RS PLX T C	\$	DTF2, 1-D MULTI-GP DISCRETE ORDINATE CALC	151
AI	7094	F+FAP	RS L T M	\$	MOMUS, X-SECTION LIBRARY UTILITY PROGRAM	159
AI	7094	F+FAP	RS P	J	\$ SHOE, SHIELD WEIGHT OPTIMIZATION DOSE CALC	197
AI	7094	F+FAP	RS P T G	\$	AISITE2, PARAMETRIC SITE REQUIREMENT STUDY	172
AI	7094	F+FAP	RS P T H	\$	HEATING2, TRANSIENT STEADY-STATE HEAT TRANSFER	198
AI	7094	F+FAP	RS PL T B	\$	AILMOE, X-SECTION CALC ELASTIC SCAT RESONANCES	147
AI	7094	F+FAP	RS PL T B	\$	GRAVE, GROUP-AVERAGING X-SECTIONS PARAMETERS	162
AI	7094	F+FAP	RS PL T B	\$	TYCHE3, MONTE CARLO SLOWING-DOWN DENSITY CALC	149
AI	7094	F+FAP	RS PL T G	\$	CURIE, DOSE, THUNDERHEAD, EXTERNAL+INTERNAL DOSE	196
AI	7094	F+MAP	RS P	A	\$ CHAD, LEGENDRE COEF CALC FOR ANGULAR DIST DATA	215
AI	7094	F+MAP	RS P T E	\$	AIROS, SPACE-INDEPENDENT KINETICS W/FEEDBACK	163
AI	7094	F+MAP	RS P T F	\$	TSN, SPATIALLY-DEPENDENT REACTOR KINETICS	309
AI	7094	F+MAP	RS PLX T A	\$	TRIX1, RESONANCE INTEGRAL X-SECTION CALC	208
AI	7094	F2	RS P H	\$	FLOW-MODEL, MULTI-CHANNEL 2-D 2-PHASE FLOW	246
AI	7094	F2	RS P T A	\$	2PLUS, NON-SPHERICAL OPTICAL MODEL X-SECTIONS	254
AI	7094	F2	RS P T G	\$	TRANS-FUGUE1, TRANSIENT FLOW AND HEAT TRANSFER	268
AI	7094	F2	RS PL T I	\$	CYCLOPS1, THERMODYNAMIC CYCLE ANALYSIS	244
AI	7600	F4	RS PLX T C	\$	VIM1, MONTE CARLO CRITICAL ASSEMBLY ANALYSIS	510
AI-A	360	F4	RSBPL CT C	\$	VIMIX, MONTE CARLO CRITICAL ASSEMBLY ANALYSIS	510
AILMOE, X-SECTION CALC ELASTIC SCAT RESONANCES AI 360 F4 RS PLX T B \$						147
AILMOE, X-SECTION CALC ELASTIC SCAT RESONANCES AI 7094 F+FAP RS PL T B \$						147
AIM AND FOG CODES AI 7090 F2 RS C \$ PERT, 1-D PERTURBATION FOR						30
AIM AND FOG CODES BHSC 360 F4 RS P C \$ PERT, 1-D PERTURBATION FOR						30
AIM AND FOG CODES CDC 1604 F63 RS C \$ PERT, 1-D PERTURBATION FOR						30
AIMFIRE, URANIUM FUEL CYCLE COST ANALYSIS AI 7090 F2 RS P D \$						55
AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE AI 7090 F+FAP RS PL T C \$						29
AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE CDC 1604 F63 RS PL T C \$						29
AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE OSUC 370 F4 RS PL CT C \$						29
AIREK3, SPACE-INDEPENDENT KINETICS W/FEEDBACK AEP 360 F4 RS P E \$						121
AIREK3, SPACE-INDEPENDENT KINETICS W/FEEDBACK AI 7090 F2 RS E \$						121
AIREK3, SPACE-INDEPENDENT KINETICS W/FEEDBACK CDC 1604 F63 RS P E \$						121
AIROS, SPACE-INDEPENDENT KINETICS W/FEEDBACK AI 7094 F+MAP RS P T E \$						163
AIROS2A, SIMULATION OF REACTOR DYNAMICS AI 360 F+BAL RS P T E \$						326
AISITE2, PARAMETRIC SITE REQUIREMENT STUDY AI 360 F4 RS P T G \$						172
AISITE2, PARAMETRIC SITE REQUIREMENT STUDY AI 7094 F+FAP RS P T G \$						172
ALGEBRAIC EQN SOLN CURVE PLOT KAPL 6600 F+ASC RS P T P \$ SNEQ, NONLINEAR						364
ALLOCATION PROJECT PLANNING MLMC 360 F+C+R RSBP T M \$ RALCRTPH, RESOURCE						603
ALOO 360 COBOL RS P M \$ AEC-ALO FAU, RADIO FREQUENCY MANAGEMENT SYSTEM						587
ALPHA-M, RESOLUTION OF GAMMA RAY SPECTRA ORNL 360 F4 RS P O \$						413
AMDLIBAE, ARGONNE SUBROUTINE LIBRARY CAT. A-E ANL 360 F+P+A RS T P \$						562
AMDLIBF, ARGONNE SUBROUTINE LIBRARY CAT. F ANL 360 F+BAL RS T P \$						563
AMDLIBGZ, ARGONNE SUBROUTINE LIBRARY CAT. G-Z ANL 360 F+P+A RS T P \$						564
ANALYZER GAMMA-RAY SPECTRA GGA 1108 F+BAL RS P T O \$ TOAC, PROCESSING OF						333
ANC 360 BAL RSB T P \$ NRTS-RJE, OS/360 MVT REMOTE JOB ENTRY SYSTEM						519
ANC 360 F+BAL RSBP CT G \$ CONTEMP-LT/022, PRESSURE-TEMPERATURE RESPONSE						433
ANC 360 F+BAL RSBPL CT G \$ PARFT, WATER-COOLED CORE TRANSIENT ANALYSIS						555
ANC 360 F4 RS P T H \$ ASTEM, THERMODYNAMIC PROPERTIES WATER & STEAM						580
ANC 360 F4 RS P CT W \$ MACS LATTICE VIBRATION NEUTRON SCATTERING CODES						574
ANC 360 F4 RS PL CT B \$ INCITE, THERMAL SPECTRA & MULTI-GP CONSTANTS						565

ANC

ANL

ANC	360	F4	RS PL CT M	\$ ERREST, LCCA ROD BUNDLE CHF DATA ANALYSIS	518		
ANC	360	F4	RS PLXCT B	\$ PHROG, MULTI-GP CONSTANT & FAST SPECTRA CALC	520		
ANC	360	F4	RSBP CT C	\$ MCNA, 1-D MULTIGROUP DIFFUSION SLAB, CYL, SPH	582		
ANC	360	F4	RSBP CT D	\$ DWARF, 1-D FEW-GP DIFFUSION DEPLETION PROGRAM	579		
ANC	360	F4	RSBP CT G	\$ RSAC, RADIOLOGICAL SAFETY ANALYSIS PROGRAM	265		
ANC	360	F4	RSBP CT I	\$ PPFM, STEADY-STATE FISSION PRODUCT FUEL MODEL	584		
ANC	360	F4	RSBP CT I	\$ STRAP, STATIC & DYNAMIC STRUCTURAL ANALYSIS	539		
ANC	360	F4	RSBP CT J	\$ VIEWPIN, VIEW FACTOR CALC FOR CYLINDRICAL PINS	569		
ANC	360	F4	RSBP CT K	\$ PREP,KITT, SYSTEM FAULT TREE EVALUATION CODES	528		
ANC	360	F4	RSBP X T G	\$ THETA1-B, FUEL ROD THERMAL RESPONSE LOCA	512		
ANC	360	F4	RSBP XCT G	\$ RELAP3, REACTOR BLOWDOWN - EXCURSION ANALYSIS	369		
ANC	360	F4	RSBP XCT H	\$ MOXY, BWR FUEL ELEMENT HEAT TRANSFER CALC	551		
ANC	360	F4	RSBP XCT W	\$ GAUSS5, ANALYSIS OF GAMMA-RAY SPECTRA GF(LI)	605		
ANC	360	PL1	RS P T P	\$ PTAC11, 2-PASS ASSEMBLER FOR THE PDP-11 ON 360	516		
ANC	360E	F+BAL	RS P XCT D	\$ PDD7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	275		
ANC	1108	F4	RS P T G	\$ RELAP3, REACTOR BLOWDOWN - EXCURSION ANALYSIS	369		
ANC	1108	F4	RS P T H	\$ MOXY, BWR FUEL ELEMENT HEAT TRANSFER CALC	551		
ANC	1108	F4	RS P T K	\$ PREP,KITT, SYSTEM FAULT TREE EVALUATION CODES	528		
ANC	6600	F4	RS P T G	\$ RELAP3, REACTOR BLOWDOWN - EXCURSION ANALYSIS	369		
ANCON,	SPACE-INDEPENDENT REACTOR KINETICS CODE	ANL	360	F4	RS P T E	\$	486
ANCCN,	SPACE-INDEPENDENT REACTOR KINETICS CODE	LASL	6600	F4	RS P T E	\$	486
ANGULAR DIST	GGA	7044	F4	RS P X A	\$ LEGCCEF3, LEGENDRE COEF CALC FOR		217
ANGULAR CIST DATA	AI	7094	F+MAP	RS P A	\$ CHAD, LEGENDRE COEF CALC FOR		215
ANGULAR DISTRIBUTION	LEGENDRE FITTING	KAPL	6600	F4	RS P A	\$ CLEM,	521
ANISN X-SEC FORMAT	WAPD	6600	F4	RS PL T B	\$ ETOG1, ENDF/B TO MUFT, GAM,		437
ANISN X-SEC FORMAT	WAPD	7600	F4	RS P T B	\$ ETOG3, ENDF/B TO MUFT, GAM,		538
ANISN,	1-D MULTI-GP DISCRETE ORDINATE CALC	AI	360	F4	RSBPLX T C	\$	151
ANL	360	F+ASM	RSB CT P	\$ WSP-HASP/DOS, DOS-MFT REMOTE WORKSTATION PKG			541
ANL	360	F+BAL	R B L T P	\$ TSO-SPEAKEASY, LANGUAGE PROCESSOR UNDER TSO			593
ANL	360	F+BAL	RS T P	\$ AMDLIBF, ARGONNE SUBROUTINE LIBRARY CAT. F			563
ANL	360	F+BAL	RS P T C	\$ DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM			209
ANL	360	F+BAL	RS P CT M	\$ ARC-SYSTEM, SYSTEM SUBPROGRAMS AND MODULES			522
ANL	360	F+P+A	RS T P	\$ AMDLIBAF, ARGONNE SUBROUTINE LIBRARY CAT. A-E			562
ANL	360	F+P+A	RS T P	\$ AMCLIBGZ, ARGONNE SUBROUTINE LIBRARY CAT. G-Z			564
ANL	360	F4	RS M	\$ MERMC2, MC**2 BINARY LIBRARY TAPE MAINTENANCE			472
ANL	360	F4	RS T M	\$ RIGEL, ENDF/B V3 DATA PROCESSING CODE			571
ANL	360	F4	RS P E	\$ R101, SPACE-INDEPENDENT KINETICS KEX OPTIONS			255
ANL	360	F4	RS P E	\$ R102, SPACE-INDEPENDENT INVERSE KINETICS CALC			168
ANL	360	F4	RS P F	\$ TWIGGLE, 2-D 2-GP SPACE-TIME DIFFUSION			338
ANL	360	F4	RS P G	\$ SOCOCL2, SODIUM-FUEL INTERACTION ANALYSIS			521
ANL	360	F4	RS P O	\$ DYN01, PHOTOMULTIPLIER ELECTRON DISTRIBUTION			464
ANL	360	F4	RS P X	\$ TOKMINA/TOKMINA2, TOKAMAK FUSION REACTOR STUDY			561
ANL	360	F4	RS P T B	\$ CLUP77, SQUARE CELL COLLISION PROBABILITY CALC			526
ANL	360	F4	RS P T F	\$ ANCON, SPACE-INDEPENDENT REACTOR KINETICS CODE			486
ANL	360	F4	RS P T F	\$ SAS1A, FAST REACTOR POWER AND FLOW TRANSIENTS			400
ANL	360	F4	RS P T I	\$ LIFE1, FAST REACTOR FUEL ELEMENT BEHAVIOR			460
ANL	360	F4	RS P T M	\$ CRECT,CHECKER, ENDF/B V2 PROCESSING CODES			475
ANL	360	F4	RS P T N	\$ PLOT-3D, 3-D PLOTS ON IBM2280 OR CALCCMP780			544
ANL	360	F4	RS P CT B	\$ MC**2, ENDF MULTIGROUP X-SECTION CALCULATION			355
ANL	360	F4	RS P CT D	\$ 3DB, 3-D MULTIGROUP DIFFUSION BURNUP ANALYSIS			567
ANL	360	F4	RS P CT F	\$ REXCO-H, 2-D HYDRODYNAM RESPONSE TO EXCURSION			550
ANL	360	F4	RS P CT M	\$ ETOE, ENDF/B TO MC**2 DATA CONVERSION			350
ANL	360	F4	RS P CT W	\$ MSCAT, SLOW NEUTRON MULTIPLE SCATTERING CALC			575
ANL	360	F4	RS P X T F	\$ FORE2, FAST REACTOR EXCURSION CALCULATIONS			174
ANL	360	F4	RS P X T P	\$ FUNPACK, SPECIAL FUNCTION ROUTINES-EI,K,E,....			610
ANL	360	F4	RS P XCT F	\$ VENUS, 2-D LMFBR POWER EXCURSION DISASSEMBLY			511
ANL	360	F4	RS PL CT F	\$ QX1, QUASISTATIC SPATIAL REACTOR KINETICS CODE			474
ANL	360	F4	RSB XCT P	\$ EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE			534
ANL	360	F4	RSBP CT L	\$ ARC-NU1002, BCD INPUT DATA PROCESSING MODULE			533
ANL	360	F4	RSBPL CT L	\$ ARC-XSECI, MICROSCOPIC X-SECTION MANIPULATION			554
ANL	635	F4	RS X T P	\$ EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE			534
ANL	GETS	F	R R	\$ PLETHS, ISOPLETH-AREA CALC FROM SINGLE SOURCE			591
ANL	1108	F4	RS X T P	\$ EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE			534
ANL	1108	F5	RS P X T P	\$ FUNPACK, SPECIAL FUNCTION ROUTINES-EI,K,E,....			610

ANL

ATTENUATION

ANL 1604 F63	RS P	H \$	M0899, HOH, STEAM TABLES 14.5-2538 PSIA	294
ANL 3600 F36	SBP	I \$	BOW2, DEFLECTION CALCULATION PARALLEL BFAMS	365
ANL 3600 F36	RS P	T R \$	MC**2, ENDF MULTIGROUP X-SECTION CALCULATION	355
ANL 3600 F36	RS P	T C \$	SNARG-1D, 1-D MULTI-GP DISCRETE ORDINATE CALC	288
ANL 3600 F36	RS P	T I \$	SUPORAN, REACTOR CORE SUPPORT STRESS ANALYSIS	357
ANL 3600 F36	RS P	X T C \$	MACH1, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	262
ANL 3600 F36	RS P	XCT C \$	TESS, 1-D SLAB AND SPHERE GEOM SN TRANSPORT	513
ANL 3600 F36	RSBP	A \$	MISH-MASH, RESONANCE INTEGRAL CALC HOMOGENECUS	214
ANL 3600 F36	RSBP	G \$	CHEMLCC2, CORE HEATING CLADDING-STEAM REACTION	366
ANL 3600 F36	RSBP	I \$	SWELL2, FUEL ELEMENT LIFETIME ANALYSIS	353
ANL 3600 F36	RSBP	X T R \$	RAPBLE, WLIR, FLAT, RESONANCE ABSORPTION, CELL	281
ANL 3600 F36	RSBP	X T R \$	RIFF-RAFF, RESONANCE INTEGRAL CALC 2-REG CELL	213
ANL 3600 F4	RSBP	T D \$	2DR, 2-D MULTIGROUP DIFFUSION AND DEPLETION	325
ANL 3600 F63	RS	LX T B \$	GAM1, FAST NEUTRON SPECTRUM X-SECTION CALC	33
ANL 3600 F63	RSBP	A \$	NEARREX, COMPOUND NUCLEUS X-SECTION CALC	171
ANL 3600 F63	RSBP	E \$	R101, SPACE-INDEPENDENT KINETICS KEX OPTIONS	255
ANL 3600 F63	RSBP	F \$	R102, SPACE-INDEPENDENT INVERSE KINETICS CALC	168
ANL 3600 F63	RSBP	O \$	COINC, COINCIDENCE COUNTING DATA REDUCTION	248
ANL 3600 F63	RSBP	T A \$	2PLUS, NON-SPHERICAL OPTICAL MODEL X-SECTIONS	254
ANL 3600 F63	RSBP	T E \$	TRAFICORPORATION, TRANSFER FUNCTION SYNTHESIS	135
ANL 3600 F63	RSBP	T G \$	R153, PARAMETRIC SITE REQUIREMENT STUDY	172
ANL 3600 F63	RSBP	T H \$	ARGUS, TRANSIENT TEMPERATURE CALC CYLINDER	152
ANL 3600 F63	RSBP	T M \$	XLBIT, X-SECTION LIBRARY UTILITY ROUTINE	181
ANL 3600 F63	RSBP	XCT B \$	THERMOS(ANL), THERMAL SPECTRUM X-SECTION CALC	184
ANL 3600 F63	RSBPL	T J \$	MAC, SHIELD DESIGN MULTIGROUP SLAB GEOMETRY	143
ANL 3600 36F	RS	PL CT F \$	QX1, QUASISTATIC SPATIAL REACTOR KINETICS CODE	474
ANL 3600 36F	RSBP	T M \$	MERM2, MAGIC, MC**2 LIBRARY SERVICE ROUTINES	472
ANL 6600 F4	RS	X T P \$	EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE	534
ANL 6600 F4	RS	P T F \$	SASIA, FAST REACTOR POWER AND FLOW TRANSIENTS	400
ANL 6600 F4	RS	P X T P \$	FUNPACK, SPECIAL FUNCTION ROUTINES-EI, K, E,	610
ANL), THERMAL SPECTRUM X-SECTION CALC				ANL 3600 F63
ANNULAR VOID X-SECTION CALCULATION				GEC 625 F4
ANVENT, LOCA ANALYSIS DUKE POWER MCGUIPE UNITS DUCC				635 F4
APDA 3600 ASAF4				RS P
APDA 7094 F2				RS P
APDA 7094 F4				RS P
APRF 6600 F4				RS
APRFX1, 99-GP DLC-2B LIBRARY GROUP COLLAPSING				APRF 6600 F4
ARC-NU1002, BCD INPUT DATA PROCESSING MODULE				ANL 360 F4
ARC-SYSTEM, SYSTEM SUBPROGRAMS AND MODULES				ANL 360 F+BAL
ARC-XSEC1, MICROSCOPIC X-SECTION MANIPULATION				ANL 360 F4
AREA CALCULATION				SLA 6600 F4
ARES2, RESONANCE INTEGRAL X-SECTION CALC				AI 7090 F2
ARES2, RESONANCE INTEGRAL X-SECTION CALC				CDC 1604 F63
ARGCNE SUBROUTINE LIBRARY CAT. A-E				ANL 360 F+P+A
ARGCNE SUBROUTINE LIBRARY CAT. F				ANL 360 F+BAL
ARGCNE SUBROUTINE LIBRARY CAT. G-Z				ANL 360 F+P+A
ARGUS, TRANSIENT TEMPERATURE CALC CYLINDER				ANL 3600 F63
ASAF4 RS P				T M \$
ASME STEAM AND WATER PROPERTIES BG&E				360 F4
ASPI, GAMMA RAY SOURCE BUILDUP FACTOR CALC				BAPL 6600 F+ASC
ASSAULT, 2-D MULTI-GP DIFFUSION DEPLETION CODE				ORNL 7090 F+FAF
ASSEMBLER FOR FLOCO2 INSTRUCTION SET				PW 1604 F+CDP
ASSEMBLER FOR THE PDP-11 ON 360 ANC				360 PL1
ASSEMBLY ANALYSIS				AI 7600 F4
ASSEMBLY ANALYSIS				AI-A 360 F4
ASSEMBLY 48 GAFGAR ENDF/B DATA TAPES				GGA 1108 BIN
ASTEM, THERMODYNAMIC PROPERTIES WATER & STEAM				ANC 360 F4
ATHENA4, INELASTIC SCATTERING FORM FACTORS				ORNL 360 F4
ATCM SPECTRA ENDF/B DATA				ORNL 360 F4
ATTENUATION CYL SPHERE GECM				AI 7090 F2
ATTENUATION CYL SPHERE GEOM				CDC 1604 F63
ATTENUATION SLAB GEOMETRY				AI 7090 F2
ATTENUATION SLAB GEOMETRY				CDC 1604 F63

AUTO-

BAPL

AUTC- AND CROSS-SPECTRAL DENSITIES	BNW	1108	F5	RS P	X T F \$	NOISY1,	488
AUTO- AND CROSS-SPECTRAL DENSITIES	BNW	7090	F4	RS P	T F \$	NOISY1,	488
AVERAGE X-SEC CALC	BNL	6600	F4	RS P	A \$	AVERAGE, UNRESOLVED REGION	376
AVERAGE X-SEC CALC	BNL	7094	F4	RS P	A \$	AVERAGE, UNRESOLVED REGION	376
AVERAGE, UNRESOLVED REGION AVERAGE X-SEC CALC	BNL	6600	F4	RS P	A \$		376
AVERAGE, UNRESOLVED REGION AVERAGE X-SEC CALC	BNL	7094	F4	RS P	A \$		376
AVERAGING	GGA	7044	F4	RS P	L \$	GAVER, ENERGY INTERVAL X-SECTION	218
AVOID, ANNULAR VOID X-SECTION CALCULATION	GEC	625	F4	RS P	B \$		276
AX-TNT, COUPLED NEUTRONICS-HYDRODYNAMICS SPH	PW	1604	F63	RS P	F \$		191
AXFLU, HEAT TRANSFER MOLTEN FUEL TUBE BUNDLES	LASL	7094	F2	RSBP	H \$		182
AXISYM LOAD	BAPL	6600	F4	RS P	T I \$	SEAL SHELL2, SHELL STRESS ANALYSIS	282
AXISYM LOAD	SR	360	F4	RS P	T I \$	SEAL SHELL2, SHELL STRESS ANALYSIS	282
AXISYM LOAD	WTSC	6600B	F4	RS P	T I \$	SEAL SHELL, SHELL STRESS ANALYSIS	282
AXISYMMETRIC & PLANE ELASTIC-PLASTIC	BAPL	6600	F+COM	RS P	T I \$	DUZ2, 2-D	503
AXISYMMETRIC LOAD	GGA	7044	F4	RSBP	CT I \$	SAFE-PCRS, STRESS ANALYSIS	250
AXISYMMETRIC LOAD	GGA	7044	F4	RS P	T I \$	SAFE-AXISYM, STRESS ANALYSIS	251
AXISYMMETRIC STRESS ANALYSIS	GGA	1108	F4	RS P	I \$	SAFE-2D, PLANE &	379
AXTHRM, HEAT TRANSFER SOLID FUEL TUBE BUNDLES	LASL	7094	F2	RSBP	H \$		183
AX1, COUPLED NEUTRONICS-HYDRODYNAMICS SPHERE	CDC	3600	F63	RSBP	F \$		102
B-W MULTI-LEVEL CONVOLUTION	PPCC	7040	F+MAP	RS P	A \$	COMBCC, COMBINED	203
B-W PARAMETERS	GGA	1108	F5	RS P	CT A \$	FSDP3, POINTWISE XSECS. FROM	216
B-W RESONANCE PARAMETERS	WANL	7094	F2	RS P	A \$	EXT, X-SECTIONS FROM	238
B-W X-SEC CALC	BNL	6600	F4	RS P	A \$	SIGPLOT, RESOLVED MULTILEVEL	377
BAL	RSB	T P	\$	NRTS-RJE, OS/360 MVT REMOTE JOB ENTRY SYSTEM	ANC	360	519
BAM, S4 CYL CELL CODE AND TEMPEST COMBINATION	AI	7090	F2	RS P	B \$		108
BAPL 6600	F+ASC	RS P	T J \$	ASPI5, GAMMA RAY SOURCE BUILDUP FACTOR CALC			429
BAPL 6600	F+ASC	RS P	X T R \$	RESQ2, RESQ0, DBF1, RESONANCE INTEGRAL HEX CELL			285
BAPL 6600	F+COM	RS P	H \$	HYMAS, HYDRODYNAMIC MASS MATRIX GENERATION			560
BAPL 6600	F+COM	RS P	T I \$	DUZ2, 2-D AXISYMMETRIC & PLANE ELASTIC-PLASTIC			503
BAPL 6600	F+COM	RS P	T I \$	GAPL3, INELASTIC LARGE DEFLECTION STRESS STUDY			397
BAPL 6600	F+COM	RS P	X T R \$	PAX03, HARMONY-PDQ X-SECTION GENERATION CODE			426
BAPL 6600	F+COM	RS P	X T I \$	MATUS, 3-D FINITE ELEMENT ELASTIC ANALYSIS			597
BAPL 6600	F4	RS	T R \$	M0807, 2-D DIFFUSION ABSORPTION REMOVAL X-SECS			280
BAPL 6600	F4	RS	T C \$	M0648, 1-D SLAB TRANSPORT WITH SLOWING DOWN			342
BAPL 6600	F4	RS	T H \$	WATER, STEAM TABLES 14.5-14,500PSIA 32-472DEGF			267
BAPL 6600	F4	RS	T I \$	CYGR02, STRESS ANALYSIS CYL FUEL ELEMENT			266
BAPL 6600	F4	RS P	A \$	GRAMP, R-M PARAMETERS OF UNRESOLVED RESONANCES			470
BAPL 6600	F4	RS P	D \$	CINDER, M0102, POINT DEPLETION FISSION PRODUCT			313
BAPL 6600	F4	RS P	I \$	STRIPE, FUEL ROD CLAD STRAIN & PELLET CRACKING			570
BAPL 6600	F4	RS P	I \$	TCB01, CREEP-BUCKLING OF TUBES UNDER PRESSURE			604
BAPL 6600	F4	RS P	P \$	RFL01, RELIABILITY FOR A SINGLE FAILURE MODE			497
BAPL 6600	F4	RS P	T A \$	PUN1, UNRESOLVED RESONANCE INTEGRALS X-SECS			359
BAPL 6600	F4	RS P	T A \$	SUMOR, S-WAVE NEUTRON X-SECTION CALCULATION			399
BAPL 6600	F4	RS P	T B \$	EPOCH, NEUTRON AGE CALCULATION OF ENDF/B DATA			461
BAPL 6600	F4	RS P	T C \$	BE21, FEW-GP DISCRETE ORDINATES SLAB GEOMETRY			398
BAPL 6600	F4	RS P	T F \$	NCWIG, 1-D 2-GP KINETICS TEMPERATURE FEEDBACK			371
BAPL 6600	F4	RS P	T F \$	TWIGL, 2-D 2-GP SPACE-TIME DIFFUSION FEEDBACK			338
BAPL 6600	F4	RS P	T F \$	WIGL2, 1-D 2-GP SPACE-TIME DIFFUSION 3-GEOM			274
BAPL 6600	F4	RS P	T G \$	FLASH3, LOSS-CF-COOLANT ACCIDENT ANALYSIS			295
BAPL 6600	F4	RS P	T G \$	FLASH4, FULLY-IMPLICIT TRANSIENT SIMULATION			448
BAPL 6600	F4	RS P	T G \$	M0555, ACT1, LOSS-OF-COOLANT ACCIDENT ANALYSIS			284
BAPL 6600	F4	RS P	T H \$	CHIC-KIN, FAST + INTERMEDIATE POWER TRANSIENTS			473
BAPL 6600	F4	RS P	T H \$	FIGRO, LWBR FUEL SWELLING TEMPERATURE STUDY			272
BAPL 6600	F4	RS P	T H \$	FLOT1, M0219, PWR FLOW TRANSIENT ANALYSIS			331
BAPL 6600	F4	RS P	T H \$	GLUR1, WATER-LOGGED FUEL ELEMENT ANALYSIS			424
BAPL 6600	F4	RS P	T H \$	HOT2, 2-D TRANSIENT HEAT CONDUCTION PROGRAM			286
BAPL 6600	F4	RS P	T H \$	M0899, HOH, STEAM TABLES 14.5-2538 PSIA			294
BAPL 6600	F4	RS P	T H \$	TOPS, TRANSIENT THERMODYNAMICS OF PRESSURIZERS			348
BAPL 6600	F4	RS P	T H \$	WASP, WATER AND STEAM THERMODYNAMIC PROPERTIES			356
BAPL 6600	F4	RS P	T I \$	BUBL1, FUEL SWELLING & GAS RELEASE SIMULATION			468
BAPL 6600	F4	RS P	T J \$	BUSHL, CYL SHELL BUCKLING COLLAPSE ANALYSIS			481
BAPL 6600	F4	RS P	T I \$	CYGR03, OXIDE FUEL ROD STRESS & DEFORMATION			449
BAPL 6600	F4	RS P	T I \$	FUGIT, DYNAMIC RESPONSE OF ELASTIC STRUCTURES			537
BAPL 6600	F4	RS P	T I \$	M0266, LINEAR ELASTIC STRUCTURAL DYNAMICS			383

BAPL

BLOWDOWN

BAPL 6600	F4	RS P	T I	\$ M0457, PIPE, ELASTIC STRESS OF PIPING SYSTEM	329
BAPL 6600	F4	RS P	T I	\$ M0552, DYNAMIC ANALYSIS LINEAR ELASTIC SYSTEMS	283
BAPL 6600	F4	RS P	T I	\$ PELEN, FUEL PELLET TEMPERATURE & DEFORMATION	598
BAPL 6600	F4	RS P	T I	\$ SEALSHELL2, SHELL STRESS ANALYSIS AXISYM LOAD	282
BAPL 6600	F4	RS P	T J	\$ M0756, LETO, 1-D SLAB GAMMA-RAY TRANSPORT	343
BAPL 6600	F4	RS P	T L	\$ BL47, DRAFTING TOOL TO PLOT PLANE STRUCTURES	373
BAPL 6600	F4	RS P	T M	\$ SHLOG, DATA MANAGEMENT, EDITING, & ANALYSIS	557
BAPL 6600	F4	RS P	T O	\$ BETTY, ENTRAINED PARTICLES SAMPLING STUDY	545
BAPL 6600	F4	RS P	T O	\$ JITER, FLUCTUATION EXPERIMENT ANALYSIS	394
BAPL 6600	F4	RS P	T O	\$ REDUX, REACTOR FLUCTUATION EXPERIMENT ANALYSIS	425
BAPL 6600	F4	RS P	T P	\$ DAFT1, LEAST SQUARES FIT FISSILE NUCLIDE DATA	327
BAPL 6600	F4	RS P	T P	\$ M0661, M0657, M0626, POLYNOMIAL CURVE FITTING	411
BAPL 6600A	F+ASC	RS	T P	\$ BETTIS ENVIRONMENTAL ROUTINES, SUBROUTINE LIB.	478
BAPL 6600A	F+ASC	RS P	T D	\$ PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	275
BAPL 6600B	F+ASC	RS P	T J	\$ SPAN4, A PCINT-KERNEL SHIELD EVALUATION CODE	462
BAPL 6600B	F4	RS P	T I	\$ MANE1, RECTANGULAR MAGNETIC NETWORK SOLUTION	412
BAPL 6600C	F+ASC	RS P	T D	\$ PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	275
BASIC R	M	\$	M	MAPPER, PREDICTING MANUFACTURING REQUIREMENTS GEPI GETS	595
BC 625	F+MAP	RS P	T C	\$ DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	209
BC 625	F4	RS	T C	\$ EXTERMINATOR2, 2-D MULTI-GP DIFFUSION PROGRAM	156
BC 625	F4	RS	T C	\$ FOG, 1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE	28
BC 625	F4	RS PLX	T B	\$ GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV	185
BCD R	L T Z	\$	E	ETOGL DATA LIBRARIES, MUFT4 OR 5, GAM1 OR 2 WAPD 6600	447
BCD R	LX T Z	\$	L	LASL XSEC SETS, SN 18- 24- AND 25-GROUP SETS LASL 6600	532
BCD R	LX T Z	\$	T	THERMOS LIBRARY, 30-GP ENDF/B SCAT KERNELS DP 360	543
BCD INPUT DATA PROCESSING MODULE	ANL 360	F4	RSBP	CT L \$ ARC-NUID02,	533
BCL 6400	F4	RS P	G	\$ FRCRL2, LOCA FISSION PRODUCT RELEASE ANALYSIS	500
BCL 6400	F4	RS P	G	\$ MIRAB, MIRAP, CONTAINMENT SYSTEM IODINE REMOVAL	499
BCL 6400	F4	RS P	T F	\$ ADEP, 1D AND 2D FEW-GROUP SPACE-TIME KINETICS	494
BCL 6400	F4	RS P	T G	\$ ECCSA4, LOSS-OF-COOLANT & EMERGENCY COOLING	330
BCL 6400	F4	RS P	T G	\$ NURLCC-1.0, LOSS-OF-COOLANT THERMAL ANALYSIS	328
BCL 6400	F4	RS P X	T G	\$ MUCHA1, MUCHA2, MULTIPLE CHANNEL ANALYSIS ECC	508
BCS 6600D	F+ASC R B	T D	\$	PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	275
BEAMS ANL 3600	F36	SBP	I	\$ BOW2, DEFLECTION CALCULATION PARALLEL	365
BEAMS KAPL 6600	F4	RS P	I	\$ STEM, MATRIX GENERATION FOR A SYSTEM OF	337
BECOM, AEC DP PURCHASE VERSUS LEASE ANALYSIS	SLA 360	COBOL	RSBP	CT M \$	589
BECOM, AEC DP PURCHASE VERSUS LEASE ANALYSIS	SLA 1108	COBOL	RS P	M \$	589
BEHAVE2, OXIDE FUEL PERFORMANCE FINITE-ELEMENT GESV	635	F4	RS P	CT I \$	568
BEHAVIOR ANL 360	F4	RS P	T I	\$ LIFE1, FAST REACTOR FUEL ELEMENT	460
BESFIT, DIFFRACTION MODEL ELASTIC SCAT X-SEC	BNL 6600	F4	RS P	A \$	524
BETTIS ENVIRNMNTL LIB SCOPE2.0 CDC	7600	F4	RS	T P \$ MODEL, MODIFIED	478
BETTIS ENVIRNMNTL LIB SCOPE3.2 CDC	6600C	F+COM	RS	T P \$ MODEL, MODIFIED	478
BETTIS ENVIRNMNTL LIB SCOPE3.3 CDC	6600D	F+COM	RS	T P \$ MODEL, MODIFIED	478
BETTIS ENVIRONMENTAL ROUTINES, SUBROUTINE LIB.	BAPL 6600A	F+ASC	RS	T P \$	478
BETTIS ENVIRONMENTAL ROUTINES, SUBROUTINE LIB.	BW 6600B	F+ASC	RS	T P \$	478
BETTY, ENTRAINED PARTICLES SAMPLING STUDY	BAPL 6600	F4	RS P	T O \$	545
BE21, FEW-GP DISCRETE ORDINATES SLAB GEOMETRY	BAPL 6600	F4	RS P	T C \$	358
BG&E 360	F4	RS	T H	\$ STEAM-67, 1967 ASME STEAM AND WATER PROPERTIES	487
BHSC 360	F4	RS P	C	\$ PERT, 1-D PERTURBATION FOR AIM AND FOG CODES	30
BHSC 360	F4	RS P	T C	\$ FAIMOS, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	120
BHSC 360	F4	RS PL	T B	\$ TEMPEST2, THERMAL NEUTRON SPECTRUM X-SECTIONS	50
RIGDEAL, SPENT YANKEE-FUEL TEMPERATURE CALC	CRNL 1604	F2	RS P	H \$	549
BIN R	L T Z	\$	Z	ZPR-III ASSEMBLY 48 GAFFAR ENDF/B DATA TAPES GGA 1108	356
BINARY LIBRARY TAPE MAINTENANCE	ANL 360	F4	RS	M \$ MERMC2, MC**2	472
BIRD, SPEC, TIME-OF-FLIGHT DATA ANALYSIS	GEES 1108	F5	RS P	T O \$ CAGE,	476
BISYN, 2-D MULTI-GP DIFFUSION SYNTHESIS CALC	NED 635	F4	RS PL	T C \$	287
BISYN, 2-D MULTI-GP DIFFUSION SYNTHESIS CALC	NED 1108	F4	RS P	T C \$	287
ELAST, REACTOR KINETICS TEMPERATURE DIST STUDY	AFB 360	F4	RS P	E \$	363
BLOCST5, PCINT-KINETICS WITH 2-D HEAT TRANSFER	GGA 7044	F+MAP	RS P	T H \$	205
BLOOST6, COMBINED KINETICS 2-D HEAT TRANSFER	GGA 1108	F+BAL	RS P	T E \$	303
BLOWDOWN PPCO 360	F4	RS P X	G	\$ BURST1, HYDRODYNAMIC ANALYSIS DURING	435
BLOWDOWN - EXCURSION ANALYSIS	ANC 360	F4	RSPP	XCT G \$ RELAP3, REACTOR	369
BLOWDOWN - EXCURSION ANALYSIS	ANC 1108	F4	RS P	T G \$ RELAP3, REACTOR	369
PLCWDOWN - EXCURSION ANALYSIS	ANC 6600	F4	RS P	T G \$ RELAP3, REACTOR	369

BLOWDOWN

BURNUP

BLOWDOWN ANALYSIS LOFT	KE	7094	F+MAP	RSBP	T G	\$ SATURATED BLOWDOWN2,	200
BLOWDOWN ANALYSIS LOFT	UGA	360	F4	RS P	G	\$ WATER-HAMMER, LIQUID	278
BLOWDOWN PRESSURE TEMPERATURE HISTORY	KE	7094	F2	RSBP	T H	\$ PTH1,	155
BLOWDOWN2, BLOWDOWN ANALYSIS LOFT	KE	7094	F+MAP	RSBP	T G	\$ SATURATED	200
BL47, DRAFTING TOOL TO PLOT PLANE STRUCTURES	BAPL	6600	F4	RS P	T L	\$	373
BNL 6600 F4 RS	T M	\$ CHECK3, RIGEL3, ENDF/B V3, V4 PROCESSING CODES	571				
BNL 6600 F4 RS P	A	\$ AVERAGE, UNRESOLVED REGION AVERAGE X-SEC CALC	376				
BNL 6600 F4 RS P	A	\$ BESFIT, DIFFRACTION MODEL ELASTIC SCAT X-SEC	524				
BNL 6600 F4 RS P	A	\$ RAMPL, REICH-MOORE RESOLVED REGION X-SECTIONS	492				
BNL 6600 F4 RS P	A	\$ SIGPLOT, RESOLVED MULTILEVEL B-W X-SEC CALC	377				
BNL 6600 F4 RS P	A	\$ THRESH, STATISTICAL MODEL REACTION X-SECTIONS	504				
BNL 6600 F4 RS P	T F	\$ NOAA, 1-D ONE-GP SPACE-TIME DIFFUSION FEEDBACK	405				
BNL 6600 F4 RS P	T I	\$ SAFE-PLANE, PLANE STRESS ANALYSIS, 2-D BODIES	252				
BNL 6600B F4 RS	T M	\$ CHECKER, CRECT, DAMMET, PLOTFB, ... ENDF/B V1 PROC	384				
BNL 6600B F4 RS	T M	\$ CRECT, CHECKER, RIGEL, PLOTFB, ... ENDF/B V2 PROC	475				
BNL 6600B F4 RS P	T A	\$ RESEND, ADLER, ENDF/B RESONANCE XSECTION CODES	465				
BNL 7090 F+MAP RS P	T M	\$ DFSR, DATA FILE SERVICE ROUTINES ENDF TAPES	236				
BNL 7094 F4 RS P	A	\$ AVERAGE, UNRESOLVED REGION AVERAGE X-SEC CALC	376				
BNW 360C F4 RS P	T H	\$ COBRA3C, ROD BUNDLE THERMAL-HYDRAULIC ANALYSIS	432				
BNW 1107 F4 RS P	T C	\$ HFN, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	241				
BNW 1107 F4 RS PL	T B	\$ GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV	185				
BNW 1108 F4 RS P	C	\$ PERT4, 2-D PERTURBATION XY RZ RTHETA GEOMETRY	304				
BNW 1108 F4 RS P	T B	\$ FCC4, FUNDAMENTAL MODE FAST REACTOR X-SEC CALC	306				
BNW 1108 F4 RS P	T D	\$ 2DB, 2-D MULTIGROUP DIFFUSION AND DEPLETION	325				
BNW 1108 F4 RS P X T B	\$	1DX, 1-D DIFFUSION FAST X-SECTION GENERATION	374				
BNW 1108 F4 RS PLX T B	\$	HRG3, SLOWING-DOWN SPECTRUM, MULTIGP CONSTANTS	467				
BNW 1108 F5 RS P	T H	\$ REPP, THERMAL-HYDRAULIC WATER REACTOR DESIGN	483				
BNW 1108 F5 RS P X T F	\$	NOISY1, AUTO- AND CROSS-SPECTRAL DENSITIES	488				
BNW 1108 F5 RS PLX T B	\$	BRT1, THERMAL SPECTRUM X-SECTION CALC	184				
BNW 1108 F5 RSBPL	T D	\$ ISOGEN, RADIONUCLIDE GENERATION AND DECAY	367				
BNW 1108C F4 RS P	T H	\$ COBRA3C, ROD BUNDLE THERMAL-HYDRAULIC ANALYSIS	432				
BNW 6600C F4 RS P	T H	\$ COBRA3C, ROD BUNDLE THERMAL-HYDRAULIC ANALYSIS	432				
BNW 7090 F+MAP RS PL	T B	\$ GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV	185				
BNW 7090 FLOCO RSBP	T C	\$ GE-HAPO-S13, 1-D MULTI-GP DOUBLE SN APPROX	75				
BNW 7090 F2 RSBPL	T J	\$ MAC, SHIELD DESIGN MULTIGROUP SLAB GEOMETRY	143				
BNW 7090 F4 RS P	T F	\$ NOISY1, AUTO- AND CROSS-SPECTRAL DENSITIES	488				
BNWL 1108 F+BAL RS P	T D	\$ GSSLRN1B, LEAST SQUARES PHOTOPEAK SPECTRA CODE	457				
BNWL 1108 F5 RS P	T D	\$ DBUFIT1, LEAST SQUARES TRANSMUTATION ANALYSIS	456				
BODIES BNL 6600 F4 RS P	T I	\$ SAFE-PLANE, PLANE STRESS ANALYSIS, 2-D	252				
BODIES GGA 1108 F4 RS P	I	\$ SAFE-PLANE, PLANE STRESS ANALYSIS, 2-D	252				
BOILING FLOW STEAM	GGA	1108 F4 RS P	T H	\$ DYNAM, DYNAMIC ANALYSIS	440		
BORATION-DILUTION TABLES FOR PWR CPN	CPPD	6400 F4 S P	H	\$ PWR-PPM,	552		
BOUNCE, FLUX DIST IN MULTI-PIN FUEL ELEMENT	AGC	7090 F2 RS P	B	\$	237		
BCW2, DEFLECTION CALCULATION PARALLEL BEAMS	ANL	3600 F36 SBP	I	\$	365		
BREEDERS	NED	635 F4 RS P	D	\$ RAPFU, FUEL CYCLE PARAMETERS FAST	372		
BRT1, THERMAL SPECTRUM X-SECTION CALC	BNW	1108 F5 RS PLX T B	\$		184		
BUBBL1, FUEL SWELLING & GAS RELEASE SIMULATION	BAPL	6600 F4 RS P	T I	\$	468		
BUCKLING COLLAPSE ANALYSIS	BAPL	6600 F4 RS P	T I	\$ BUSHL, CYL SHELL	481		
BUCKLING CYL FUEL ELEMENTS	AEB	360 F4 RS P	B	\$ WELWING, MATERIAL	362		
BUGTRI, 2-D MULTIGP DIFFUSION+BURNUP TRI-MESH	GGA	1108 F+BAL RS P	T D	\$	439		
BUG2, 2-D MULTIGROUP DIFFUSION & BURNUP XY, RZ	GGA	1108 F+BAL RS P	T D	\$	438		
BUILDUP FACTOR CALC	BAPL	6600 F+ASC RS P	T J	\$ ASPIS, GAMMA RAY SOURCE	429		
BUNDLE	NED	635 F4 RS P	T H	\$ VELVET2, TURBULENT FLOW IN LMFBR ROD	458		
BUNDLE CHF DATA ANALYSIS	ANC	360 F4 RS PL CT M	\$ ERREST, LOCA RCD	518			
BUNDLE THERMAL-HYDRAULIC ANALYSIS	BNW	360C F4 RS P	T H	\$ COBRA3C, ROD	432		
BUNDLE THERMAL-HYDRAULIC ANALYSIS	BNW	1108C F4 RS P	T H	\$ COBRA3C, ROD	432		
BUNDLE THERMAL-HYDRAULIC ANALYSIS	BNW	6600C F4 RS P	T H	\$ COBRA3C, ROD	432		
BUNDLES LASL 7094 F2 RSBP	H	\$ AXFLU, HEAT TRANSFER MOLTEN FUEL TUBE	182				
BUNDLES LASL 7094 F2 RSBP	H	\$ AXTHRM, HEAT TRANSFER SOLID FUEL TUBE	183				
BURNUP & MANAGEMENT	NED	635 F4 RS P	T D	\$ FUMBLE, FAST REACTOR FUEL	480		
BURNUP ANALYSIS	ANL	360 F4 RS P	CT D	\$ 3DB, 3-D MULTIGROUP DIFFUSION	567		
BURNUP ANALYSIS	HEDL	1108 F4 RS P	T D	\$ 3DB, 3-D MULTIGROUP DIFFUSION	567		
BURNUP ANALYSIS	NED	635 F4 RS P	T C	\$ BURNUP, HEAVY ELEMENT ISOTOPIC	311		
BURNUP CYL LATTICE	TVA	360 F4 RSBPLXCT B	\$ LASER, SPECTRUM CALC WITH	249			

BURNUP

CELL

BURNUP CYL LATTICE	WAPD 7094	F+MAP RS	PLX T B	\$ LASER, SPECTRUM CALC WITH	249
BURNUP POWER DISTRIBUTION SEARCH	GGA 1108	F4	RS P T C	\$ GASP7, 1-D	319
BURNUP REFUELING HISTORY	LASL 6600	F4	RS P T D	\$ PHENIX, 2D DIFFUSION	454
BURNUP RZ GEOMETRY	GGA 7090	F+MAP RSBP	T D	\$ DDB, 2-D FEW-GP DIFFUSION	99
BURNUP XY, RZ	GGA 1108	F+BAL RS P	T D	\$ BUG2, 2-D MULTIGROUP DIFFUSION &	438
BURNUP, HEAVY ELEMENT ISOTOPIC BURNUP ANALYSIS	NEC 635	F4	RS P T O	\$	311
BURP1, DETECTOR EFFICIENCY POINT SOURCE		UM 7090	MAD RSB	O \$	164
BURP2, DETECTOR EFFICIENCY DISK SOURCE		UM 7090	MAD RSB	O \$	165
BURP3, DETECTOR EFFICIENCY POINT SOURCE		UM 7090	MAD RSB	O \$	166
BURP4, GAMMA-RAY PHOTOFRACITION SOLID CRYSTAL		UM 7090	MAD RSB	O \$	169
BURP5, GAMMA-RAY PHOTOFRACITION WELL CRYSTAL		UM 7090	MAD RSB	O \$	170
BURST1, HYDRODYNAMIC ANALYSIS DURING BLOWDOWN	PPCO 360	F4	RS P X G	\$	435
BUSHL, CYL SHELL BUCKLING COLLAPSE ANALYSIS	BAPL 6600	F4	RS P T I	\$	481
BW 2000 F4 RS	A \$	STRIP, RESOLVED RESONANCE INTEGRAL CALCULATION			305
BW 6600 F+COM RS P X T D	\$	FARED, 1-D FAST REACTOR DESIGN & SURVEY STUDY			427
BW 6600B F+ASC RS	T P	\$ BETTIS ENVIRONMENTAL ROUTINES, SUBROUTINE LIB.			478
BW 6600B F+ASC RS P	T D	\$ PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION			275
BWR FUEL ELEMENT HEAT TRANSFER CALC	ANC 360	F4	RSBP XCT H	\$ MOXY,	551
BWR FUEL ELEMENT HEAT TRANSFER CALC	ANC 1108	F4	RS P T H	\$ MOXY,	551
BWR GASEOUS RELEASE	ORNL 360	F4	RS P C G	\$ STEFEG, ANALYSIS OF PWR &	583
CAESAR4, LIB1ST, 1-D MULTI-GP DIFFUSION + LIB	AI 360	F4	RSBP LX T C	\$	270
CAGE, BIRD, SPEC, TIME-OF-FLIGHT DATA ANALYSIS	GEES 1108	F5	RS P T O	\$	476
CALCOMP PLOTTING ROUTINES	KAPL 6600	F+COM RS	T P	\$ KAPLPLOT, KAPL	496
CALCOMP780	ANL 360	F4	RS P T N	\$ PLOT-3D, 3-D PLOTS ON IBM2280 OR	544
CAPITAL COST ESTIMATING	ORNL 360	F4	RS P T D	\$ ORCOST, POWER PLANT	588
CARD INPUT PROCESSOR	LASL 360	F4	RS P	L \$ GENRD, FREE-FORMAT	530
CARD INPUT PROCESSOR	LASL 6600	F4	RS P	L \$ GENRD, FREE-FORMAT	530
CASCADE, COMPOUND NUCLEUS REACTION	AI 360	F+BAL RS P	T A	\$ COMNUC,	482
CASCADE, CLUSTER, RADIATION DAMAGE IN METALS	GEC 635	F+MAP RSBP	T Q	\$	419
CAT. A-E	ANL 360	F+P+A RS	T P	\$ AMDLIBAE, ARGONNE SUBROUTINE LIBRARY	562
CAT. F	ANL 360	F+BAL RS	T P	\$ AMDLIBF, ARGONNE SUBROUTINE LIBRARY	563
CAT. G-Z	ANL 360	F+P+A RS	T P	\$ AMCLIBGZ, ARGONNE SUBROUTINE LIBRARY	564
CAVITY GEOM	GGA 1108	F4	RS P T J	\$ MUSCAT, VIEW FACTOR SHIELDING CODE	259
CDC 1604 F63 RS	C \$	PERT, 1-D PERTURBATION FOR AIM AND FOG CODES			30
CDC 1604 F63 RS L T D	\$	SIZZLE, 1-D MULTIGROUP DIFFUSION DEPLETION			58
CDC 1604 F63 RS P	A \$	HAFEVER, HALSER-FESHBACH INELASTIC SCATTERING			14
CDC 1604 F63 RS P	B \$	SAIL, 1-D 1-GP SN APPROXIMATION SLAB GEOMETRY			52
CDC 1604 F63 RS P	B \$	S4 CYL CELL CODE, 1-C 1-GP S4 APPROXIMATION			53
CDC 1604 F63 RS P	E \$	AIREK3, SPACE-INDEPENDENT KINETICS W/FEEDBACK			121
CDC 1604 F63 RS P	G \$	CLOUD, GAMMA-RAY DCSE RATE FROM A CLOUD			47
CDC 1604 F63 RS P	J \$	GRACE1, GAMMA-RAY ATTENUATION SLAB GEOMETRY			45
CDC 1604 F63 RS P	J \$	GRACE2, GAMMA-RAY ATTENUATION CYL SPHERE GEOM			46
CDC 1604 F63 RS P T C	\$	EQUIPOISE3A, 2-D 2-GP DIFFUSION CYLINDER SLAB			87
CDC 1604 F63 RS P T C	\$	FOG, 1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE			28
CDC 1604 F63 RS P T C	\$	WHIRLAWAY, 3-C 2-GROUP DIFFUSION XYZ GEOMETRY			32
CDC 1604 F63 RS P T C	\$	ZOGRAND, 2-D FEW-GROUP DIFFUSION SLAB CYLINDER			40
CDC 1604 F63 RS PL T A	\$	ARES2, RESONANCE INTEGRAL X-SECTION CALC			89
CDC 1604 F63 RS PL T B	\$	FORM, FAST NEUTRON SPECTRUM X-SECTION CALC			51
CDC 1604 F63 RS PL T B	\$	TEMPEST2, THERMAL NEUTRON SPECTRUM X-SECTIONS			50
CDC 1604 F63 RS PL T C	\$	AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE			29
CDC 1604 F63 RS PLX T B	\$	GAM1, FAST NEUTRON SPECTRUM X-SECTION CALC			33
CDC 1604 F63 RS PLX T C	\$	FAIM, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE			120
CDC 3600 F63 RSBP	F \$	AX1, COUPLED NEUTRONICS-HYDRODYNAMICS SPHERE			102
CDC 3600 F63 RSBP	T C	\$ FLARE, 3-D REACTIVITY AND POWER DISTRIBUTION			167
CDC 6600C F+COM RS	T P	\$ MODEL, MODIFIED BETTIS ENVIRONMENTAL LIB SCOPE3.2			478
CDC 6600D F+COM RS	T P	\$ MODEL, MODIFIED BETTIS ENVIRONMENTAL LIB SCOPE3.3			478
CDC 7600 F4 RS	T P	\$ MODEL, MODIFIED BETTIS ENVIRONMENTAL LIB SCOPE2.0			478
CE 6600 F4 RS P	T C	\$ EXTERMINATOR2, 2-D MULTI-GP DIFFUSION PROGRAM			156
CEBUG, STEAM GENERATOR SODIUM-WATER REACTION	CEND 7600	F4	RS P T G	\$	548
CELL	ANL 3600	F36	RSBP X T B	\$ RABBLE, WLIB, FLAT, RESONANCE ABSORPTION,	281
CELL	ANL 3600	F36	RSBP X T B	\$ RIFF-RAFF, RESONANCE INTEGRAL CALC 2-REG	213
CELL	BAPL 6600	F+ASC RS P X T B	\$	RESQ2, RESQ, DBF1, RESONANCE INTEGRAL HEX	285
CELL CALCULATION	AI 360	F+BAL RS P X T B	\$	HWOGR-SAFE, 2-D MONTE CARLO	307
CELL CODE AND TEMPEST COMBINATION	AI 7090	F2	RS P	B \$ BAM, S4 CYL	108

CELL

COLLAPSE

CELL CCDE, 1-D 1-GP S4 APPROXIMATION	AI	7090	F2	RS	B \$ S4 CYL	53
CELL CODE, 1-D 1-GP S4 APPROXIMATION	CDC	1604	F63	RS P	B \$ S4 CYL	53
CELL COLLISION PROBABILITY CALC ANL	360	F4	RS P	T B \$ CLUP77, SQUARE		526
CELL COLLISION PROBABILITY CALC JAER	230	F4	RS P	T B \$ CLUP77, SQUARE		526
CEND 360 F4 RS P X T F \$ CESE,INCESE, 1-GP 3-D XYZ XENON OSCILLATION						415
CEND 7600 F4 RS P T G \$ CEBUG, STEAM GENERATOR SODIUM-WATER REACTION						548
CENTRIFUGAL PUMP IMPELLER DESIGN STUDY	PW	1604	F63	RS P	T I \$ PIP,	187
CESE,INCESE, 1-GP 3-D XYZ XENON OSCILLATION	CEND	360	F4	RS P X T F \$		415
CHAD, LEGENDRE COEF CALC FOR ANGULAR DIST DATA	AI	7094	F+MAP	RS P	A \$	215
CHAIN ANALYSIS	ORNL	1604	F63	RS P	D \$ ISOCRUNCH, REACTION DECAY	180
CHAIN ANALYSIS	ORNL	7090	F2	RSBP	D \$ ISOCRUNCH, REACTION DECAY	180
CHAIN EQUATIONS	ORNL	7090	F2	RSBP	C \$ NUCY, SOLUTION OF NUCLIDE	134
CHAINS GEC 635 F4 RSBP				D \$ CHAINS, ANALYSIS OF RADIOACTIVE DECAY		418
CHAINS, ANALYSIS OF RADIOACTIVE DECAY CHAINS	GEC	635	F4	RSBP	D \$	418
CHANNEL ANALYSIS ECC BCL 6400 F4			RS P X T G \$ MUCHA1,MUCHA2, MULTIPLE			508
CHANNEL X-SEC EVALUATION	ENEA	360	F4	RS P	CT A \$ JUPITOR1, COUPLED	308
CHECKER, ENDF/B V2 PROCESSING CODES	ANL	360	F4	RS P	T M \$ CRECT,	475
CHECKER,CRECT,DAMMET,PLOTFB,... ENDF/B V1 PROC	BNL	6600B	F4	RS	T M \$	384
CHECKER,RIGEL,PLOTFB,... ENDF/B V2 PROC	BNL	6600B	F4	RS	T M \$ CRECT,	475
CHEK3,RIGEL3, ENDF/B V3,V4 PROCESSING CODES	BNL	6600	F4	RS	T M \$	571
CHEMLOC2, CORE HEATING CLADDING-STEAM REACTION	ANL	3600	F36	RSBP	G \$	366
CHF DATA ANALYSIS	ANC	360	F4	RS PL	CT M \$ ERREST, LOCA ROD BUNDLE	518
CHI 1108 F4 RS P T H \$ LION4, 3-D TEMPERATURE DISTRIBUTION PROGRAM						299
CHIC-KIN, FAST + INTERMEDIATE POWER TRANSIENTS	BAPL	6600	F4	RS P	T H \$	473
CHORD DIST FUNCT AEG 7090 F2 RS			B \$ CANCOFF JR, MODERATOR SPACE			150
CINCAS, NUCLEAR FUEL CYCLE COST AND ECONOMICS	CWF	360	F4	RS P	T D \$	354
CINCAS, NUCLEAR FUEL CYCLE COST AND ECONOMICS	WAPD	6600	F4	RS P	T D \$	354
CINDER,M0102, POINT DEPLETION FISSION PRODUCT	BAPL	6600	F4	RS P	D \$	313
CINDER,M0102, POINT DEPLETION FISSION PRODUCT	DP	360	F+BAL	RS P	T D \$	313
CITATION, 1,2,3-D DIFFUSION DEPLETION MULTIGP	ORNL	360G	F4	RS P	T K \$	387
CLAD STRAIN & PELLET CRACKING	BAPL	6600	F4	RS P	I \$ STRIPE, FUEL ROD	570
CLADDING-STEAM REACTION	ANL	3600	F36	RSBP	G \$ CHEMLOC2, CORE HEATING	366
CLEM, ANGULAR DISTRIBUTION LEGENDRE FITTING	KAPL	6600	F4	RS P	A \$	531
CLIP, FORM OR THREDES LIBRARY UTILITY ROUTINE	AI	360	F4	RSB L	T M \$	271
CLOTHO, NUCLEAR POWER PLANT COST CODE	HECL	1108	F5	RS P X T D \$ PACTOLUS,		540
CLOUD	AI	7090	F2	RS P	G \$ CLCUD, GAMMA-RAY DOSE RATE FROM A	47
CLOUD	CDC	1604	F63	RS P	G \$ CLOUD, GAMMA-RAY DOSE RATE FROM A	47
CLOUD	DP	360	F4	RS P	G \$ CLOUD, GAMMA-RAY DOSE RATE FROM A	47
CLOUD, GAMMA-RAY DOSE RATE FROM A CLOUD	AI	7090	F2	RS P	G \$	47
CLOUD, GAMMA-RAY DOSE RATE FROM A CLOUD	CDC	1604	F63	RS P	G \$	47
CLOUD, GAMMA-RAY DOSE RATE FROM A CLOUD	DP	360	F4	RS P	G \$	47
CLUP77, SQUARE CELL COLLISION PROBABILITY CALC	ANL	360	F4	RS P	T B \$	526
CLUP77, SQUARE CELL COLLISION PROBABILITY CALC	JAER	230	F4	RS P	T B \$	526
CLUSTER, RADIATION DAMAGE IN METALS	GEC	635	F+MAP	RSBP	T Q \$ CASCADE,	419
CMPXMAT, TRANSFER FUNCTION EVALUATION	PW	1604	F63	RS P	E \$	188
CNEA 360 F4 RS P			E \$ TRIFIDO, PULSED NEUTRON SOURCE DATA ANALYSIS			489
COAGULATION OF HETEROGENEOUS AEROSOLS	AI	360	F4	RS P	T G \$ HAA3,	443
COBCL RS P	M \$ AEC-ALC FAU, RADIO FREQUENCY MANAGEMENT SYSTEM	ALCO	360			587
COBOL RS P	M \$ BECOM, AFC DP PURCHASE VERSUS LEASE ANALYSIS	SLA	1108			589
COBCL RSBP	CT M \$ BECOM, AFC DP PURCHASE VERSUS LEASE ANALYSIS	SLA	360			589
COBRA3C, ROD BUNDLE THERMAL-HYDRAULIC ANALYSIS	BNW	360C	F4	RS P	T H \$	432
COBRA3C, ROD BUNDLE THERMAL-HYDRAULIC ANALYSIS	BNW	1108C	F4	RS P	T H \$	432
COBRA3C, ROD BUNDLE THERMAL-HYDRAULIC ANALYSIS	BNW	6600C	F4	RS P	T H \$	432
CODILLI, LEAST SQUARES ANALYSIS RESONANCE DATA	UILL	360	F4	RS P	A \$	347
COFF CALC	GGA	7044	F4	RS P	T C \$ TEMCO, 1-D FEW-GP DIFFUSION TEMP	225
COEF CALC FOR ANGULAR DIST	GGA	7044	F4	RS P X	A \$ LEGCOEF3, LEGENDRE	217
COEF CALC FOR ANGULAR DIST DATA	AI	7094	F+MAP	RS P	A \$ CHAD, LEGENDRE	215
COEFFICIENT CALCULATION	GGA	1108	F4	RS P	T C \$ TEMCO7, TEMPERATURE	320
COEFFICIENTS	LRL	7090	F+MAP	RS P	T B \$ SOPHIST1/2/5, MULTI-GP TRANSFER	160
COHBE, COHERENT INELASTIC SCATTERING LAW CALC	GGA	1108	F4	RS P X	A \$	385
COHERENT INELASTIC SCATTERING LAW CALC	GGA	1108	F4	RS P X	A \$ COHBE,	385
COINC, COINCIDENCE COUNTING DATA REDUCTION	ANL	3600	F63	RSBP	O \$	248
COINCIDENCE COUNTING DATA REDUCTION	ANL	3600	F63	RSBP	O \$ COINC,	248
COLLAPSE ANALYSIS	BAPL	6600	F4	RS P	T I \$ RUSHL, CYL SHELL BUCKLING	481

COLLAPSING

COST

COLLAPSING	TRW	6500	F4	RS P	B \$ PARTI, OPTIMAL GROUP OR MESH	416
COLLAPSING	APRF	6600	F4	RS	B \$ APRFX1, 99-GP DLC-2B LIBRARY GROUP	466
COLLISION PROBABILITIES	MC	ORNL	360	F+BAL RS P	T B \$ RAFFLE, 1ST FLIGHT	392
COLLISION PROBABILITIES	MC	ORNL	7090	F+FAP RS P	T B \$ RAFFLE, 1ST FLIGHT	392
COLLISION PROBABILITY CALC	ANL	360	F4	RS P	T B \$ CLUP77, SQUARE CELL	526
COLLISION PROBABILITY CALC	JAER	230	F4	RS P	T B \$ CLUP77, SQUARE CELL	526
COMBCC, COMBINED B-W MULTI-LEVEL CONVOLUTION	PPCO	7040	F+MAP RS P	A \$		203
COMNUC, CASCADE, COMPOUND NUCLEUS REACTION	AI	360	F+BAL RS P	T A \$		482
COMPLEMENTARY ERROR FUNCTION	SLA	6600	F4	RS P	P \$ ERF,ERFC, ERROR &	601
COMPLEX GAMMA-RAY SPECTRA ANALYSIS	KAPL	6600	F4	RS	T O \$ GASPAN,	485
COMPLEX GAMMA-RAY SPECTRA	KSUN	360	F4	RS P	O \$ CORGAM, UNFOLDING OF	390
COMPOSITE STRUCTURE STRESS STUDY	GGA	1108	F4	RS P	T I \$ SAFE-3D, 3-D	332
COMPOSITE STRUCTURE STRESS STUDY	ORNL	360	F+BAL RS P	T I \$ SAFE-3D, 3-D		332
COMPOSITION-DEPENDENT X-SECS	GESV	635	F+GMP RS P	XCT L \$ TDOWN, SPATIAL &		505
COMPOUND NUCLEUS REACTION	AI	360	F+BAL RS P	T A \$ COMNUC, CASCADE,		482
COMPOUND NUCLEUS X-SECTION CALC	ANL	3600	F63	RSBP	A \$ NEARREX,	171
COMPUTER-PRODUCED WIRING LISTS	UHTREX	LASL	7090	F+FAP RS P	I \$ WIREX,	315
CONCEPTUAL COST ESTIMATE	ORNL	360B	F4	RS P	XCT D \$ CONCEPT2, POWER PLANT	498
CONCEPT2, POWER PLANT CONCEPTUAL COST ESTIMATE	ORNL	360B	F4	RS P	XCT D \$	498
CONCRETE	GGA	1108	F4	RS P	I \$ SAFE-CREEP, VISCOELASTIC ANALYSIS	300
CONCRETE	GGA	1108	F5	RS P	T I \$ SAFE-CRACK, VISCOELASTIC ANALYSIS OF	451
CONDUCTION	PPCO	7044	F+MAP RS P	T H \$ TOODEE, 2-D TIME-DEPENDENT HEAT		349
CONDUCTION	ORNL	360	F4	RS P	X T H \$ ORTHIS, ORTHAT, 2-DIMENSIONAL HEAT	525
CONDUCTION LUMPED MASS	LASL	7030	F4	RS	T H \$ RATH, 2- OR 3-D HEAT	242
CONDUCTION LUMPED MASS	LASL	7094	FAP	RS P	T H \$ RATH, 2- OR 3-D HEAT	242
CONDUCTION PROGRAM	BAPL	6600	F4	RS P	T H \$ HOT2, 2-D TRANSIENT HEAT	286
CONDUCTION PROGRAM	ORNL	360	F4	RS P	T H \$ HEATING3, 1,2, OR 3-D HEAT	517
CONEC, COUPLED NEUTRONICS-HYDRODYNAMICS SPHERE	LRL	7090	F2	RS P	F \$	129
CONFIGURATION FUEL TEMPERATURE CODE	GGA	7044	F4	RS	I \$ CORE, CORE	233
CONSTANT & FAST SPECTRA CALC	ANC	360	F4	RS	PLXCT B \$ PHROG, MULTI-GP	520
CONSTANT CALC	AGC	7090	F+FAP	RSPLX T B \$ AGN-GAM, FAST SPECTRUM MULTI-GP		204
CONSTANT CALC FROM TOR OUTPUT DATA	LASL	6600	F4	RS P	T B \$ GLEN, GROUP	361
CONSTANT CALC 0 TO 10 MEV	BC	625	F4	RS	PLX T B \$ GAMTEC2, MULTI-GP	185
CONSTANT CALC 0 TO 10 MEV	BNW	1107	F4	RS	PL T B \$ GAMTEC2, MULTI-GP	185
CONSTANT CALC 0 TO 10 MEV	BNW	7090	F+FAP	RS PL T B \$ GAMTEC2, MULTI-GP		185
CONSTANT CALC 0 TO 10 MEV	UVA	6400	F4	RS	PLX T B \$ GAMTEC2, MULTI-GP	185
CONSTANTS	ANC	360	F4	RS	PL CT B \$ INCITE, THERMAL SPECTRA & MULTI-GP	565
CONSTANTS	ORNL	360	F4	RS	PLX T B \$ XSDRN, DISCRETE ORDINATE MULTIGROUP	393
CONSTANTS	BNW	1108	F4	RS	PLX T B \$ HRG3, SLOWING-DOWN SPECTRUM, MULTIGP	467
CONSTANTS FOR DSN TDC	PW	1604	F63	RS P	L \$ SNC, CALCULATION OF SN	189
CONSTANTS FROM ENDF/B DATA	GESV	635	F+GMP RS P	XCT B \$ ENDRUN2, MULTIGROUP		501
CONSTANTS FROM ENDF/B FOR IDX	HEDL	1108B	F4	RS P	X T B \$ ETOX3, MULTI-GP	388
CONSTANTS GENERATION	ORNL	360	F4	RS P	T B \$ SUPERTOG, ENDF/B FINE-GP	431
CONSTANTS TVA	360	F4	RS	PLX T R \$ HRG3, SLOWING-DOWN SPECTRUM, MULTIGP		467
CONTAINMENT PRESSURE POST RUPTURE	GGA	7044	F4	RS	X T G \$ PRECON, HTGR	228
CONTAINMENT SYSTEM IODINE REMOVAL	RCL	6400	F4	RS P	G \$ MIRAB, MIRAP,	499
CONTEMP-LT/022, PRESSURE-TEMPERATURE RESPONSE	ANC	360	F+BAL	RSBP	CT G \$	433
CONTOUR PLOTS & AREA CALCULATION	SLA	6600	F4	RS P	P \$ PLOTR, 2D	578
CONVERSION	ANL	360	F4	RS P	CT M \$ ETOE, ENDF/B TO MC**2 DATA	350
CONVERSION	APDA	3600	ASAF	RS P	T M \$ ETOE, ENDF/B TO MC**2 DATA	350
CONVOLUTION	PPCO	7040	F+MAP RS P	A \$ COMBCC, COMBINED B-W MULTI-LEVEL		203
COOLANT INLET PLENUM DP	360	F4	RS P	H \$ PLENUM, FLOW DIST. IN CYL		586
COOLING	RCL	6400	F4	RS P	T G \$ ECCSA4, LOSS-OF-COOLANT & EMERGENCY	330
CORE ACCIDENT ANALYSIS	NED	635	F4	RS P	T G \$ FREADM1, FAST REACTOR	479
CORE CONFIGURATION FUEL TEMPERATURE CODE	GGA	7044	F4	RS	I \$ CORE,	233
CORE HEATING CLADDING-STEAM REACTION	ANL	3600	F36	RSBP	G \$ CHEMLOC2,	366
CORE SUPPORT STRESS ANALYSIS	ANL	3600	F36	RS P	T I \$ SUPORAN, REACTOR	357
CORE THERMAL DESIGN STUDY	GGA	7044	F4	RS P	I \$ GAZELLES, GAS-COOLED	232
CORE TRANSIENT ANALYSIS	ANC	360	F+BAL	RSBP	CT G \$ PARET, WATER-COOLED	555
CORE, CORE CONFIGURATION FUEL TEMPERATURE CODE	GGA	7044	F4	RS	I \$	233
CORGAM, UNFOLDING OF COMPLEX GAMMA-RAY SPECTRA	KSUN	360	F4	RS P	O \$	390
CORRECTION CALC	AI	360	F4	RS P	T Q \$ RESPOND, DISSIMILAR MEDIA TLD	566
COST ANALYSIS	AI	7090	F2	RS P	D \$ AIMFIRE, URANIUM FUEL CYCLE	55
COST AND ECONOMICS	CWE	360	F4	RS P	T D \$ CINCAS, NUCLEAR FUEL CYCLE	354

CCST

CYCLE

CCST AND ECONOMICS	WAPD	6600	F4	RS P	T D \$	CINCAS, NUCLEAR FUEL CYCLE	354	
COST CALCULATION	GGA	1108	F4	RS P	T D \$	PWCOST, REACTOR FUEL CYCLE	441	
COST CODE HEDL	1108	F5	RS P	X T D \$	PACTCLUS,CLOTHC, NUCLEAR POWER PLANT		540	
COST ESTIMATE ORNL	360B	F4	RS P	XCT D \$	CONCEPT2, POWER PLANT CONCEPTUAL		498	
COST ESTIMATING	ORNL	360	F4	RS P	T D \$	ORCOST, POWER PLANT CAPITAL	588	
COSTS	ORNL	1604	F63	RS P	D \$	POWERCO, NUCLEAR STATION ELECTRICITY	340	
COSTS	UEC	6600	F4	RS P	D \$	POWERCO, NUCLEAR STATION ELECTRICITY	340	
COSTS	GGA	7044	F4	RS P	T D \$	STMGEN, STEAM GENERATOR DESIGN CRITERIA	227	
COSTS PERFORMANCE DATA	KE	7090	F2	RSBP	D \$	NPRFCCP, FUEL CYCLE	146	
COSTS PERFORMANCE DATA	UEC	6600	F4	RS P	D \$	NPRFCCP, FUEL CYCLE	146	
COSTS PERFORMANCE STUDY	GGA	7044	F4	RS P	D \$	WAMPUM, FUEL CYCLE	224	
COSTS PERFORMANCE STUDY	UEC	6600	F4	RS P	D \$	WAMPUM, FUEL CYCLE	224	
COUNTING DATA REDUCTION	ANL	3600	F63	RSBP	O \$	COINC, COINCIDENCE	248	
COUPLED CHANNEL X-SEC EVALUATION	ENEA	360	F4	RS P	CT A \$	JUPITOR1,	308	
COUPLED NEUTRON-HYDRODYNAMICS	APDA	7094	F2	RS P	F \$	WEAK EXPLOSION,	145	
COUPLED NEUTRONICS-HYDRODYNAMICS	CODE AGC	7090	F2	RSB	F \$	HATCHET,	153	
COUPLED NEUTRONICS-HYDRODYNAMICS	SPH	PW	1604	F63	RS P	F \$	AX-TNT,	191
COUPLED NEUTRONICS-HYDRODYNAMICS	SPHERE	CDC	3600	F63	RSBP	F \$	AX1,	102
COUPLED NEUTRONICS-HYDRODYNAMICS	SPHERE	LRL	7090	F2	RS P	F \$	CONEC,	129
COUPLED-CHANNEL SCATTERING X-SEC CALC	KAPL	6600	F4	RS P	T A \$	JPIXR,	506	
COUPLED-CHANNEL X-SEC EVALUATION	CRNL	1604	F63	RS P	T A \$	JUPITOR1,	308	
CPS, SC4020 PLOTS FROM SCISRS X-SECTION TAPES	WANL	7094	F+FBAL	RSBP	T N \$		239	
CRACKING BAPL	6600	F4	RS P	I \$	STRIPE, FUEL ROC CLAD STRAIN & PELLET		570	
CRAM, 1-D AND 2-D MULTI-GP DIFFUSION PROGRAM	AAEC	360	F+FBAL	RS P	T C \$		103	
CRAM, 1-D AND 2-D MULTI-GP DIFFUSION PROGRAM	UK-R	7090	F+FBAL	RSBP	T C \$		103	
CRECT,CHECKER, ENDF/B V2 PROCESSING CODES	ANL	360	F4	RS P	T M \$		475	
CRECT,CHECKER,RIGEL,PLOTFB,... ENDF/B V2 PROC	BNL	6600B	F4	RS	T M \$		475	
CRECT,DAMMET,PLOTFB,... ENDF/B V1 PROC	BNL	6600B	F4	RS	T M \$	CHECKER,	384	
CREEP-BUCKLING OF TUBES UNDER PRESSURE	BAPL	6600	F4	RS P	I \$	TCB01,	604	
CRITERIA COSTS	GGA	7044	F4	RS P	T D \$	STMGEN, STEAM GENERATOR DESIGN	227	
CRITICAL ANALYSIS SYSTEM	DP	360	F+FBAL	RS P	XCT B \$	HAMMER,LITHE,HELP,	277	
CRITICAL ASSEMBLY ANALYSIS	AI	7600	F4	RS	PLX T C \$	VIM1, MONTE CARLO	510	
CRITICAL ASSEMBLY ANALYSIS	AI-A	360	F4	RSBP	CT C \$	VIMIX, MONTE CARLO	510	
CRITICALITY CODE	ORNL	360	F+FBAL	RSBP	CT C \$	KENC, MONTE CARLO MULTIGROUP	450	
CRITICALITY CODE	RFD	6600	F+COM	RS P	T C \$	KENC2, MONTE CARLO MULTIGROUP	450	
CRNL 6600	F4	RS P	P \$	FORSIM, SOLN OF SYSTEM OF ORDINARY DIFF EQNS			514	
CROCK, SPACE POWER PLANT DESIGN OPTIMIZATION	AI	7090	F2	RS	I \$		112	
CROC90, ML-1 FLUID FLOW EXPERIMENT ANALYSIS	AGC	7090	F2	RS P	O \$		154	
CROSS SECTIONS	LASL	6600	F4	RS P	N \$	LARCA, FLUX-WEIGHTING OF DTF4	409	
CROSS-SPECTRAL DENSITIES	BNW	1108	F5	RS P	X T F \$	NOISY1, AUTO- AND	488	
CROSS-SPECTRAL DENSITIES	BNW	7090	F4	RS P	T F \$	NOISY1, AUTO- AND	488	
CROSSPLOT, SC4020 PLOTS FROM X-SECTION TAPES	GGA	7044	F+SPS	RSBP	T N \$		207	
CRYSTAL	UM	7090	MAD	RSB	O \$	BURP5, GAMMA-RAY PHOTOFRACTION WELL	170	
CRYSTAL	UM	7090	MAD	RSB	O \$	BURP4, GAMMA-RAY PHOTOFRACTION SOLID	169	
CRYSTALLINE MATERIALS	LASL	6600	F4	RS P	T A \$	TOR, THERMAL SCATTERING	360	
CRYSTALLINE SCATTERING KERNEL CALC	GGA	7090	F2	RS	T A \$	SUMMIT,	56	
CSP1, SN X-SECTION LIBRARY TAPE PREPARATION	PW	1604	F63	RS	L \$		194	
CSP2A, SN X-SECTION LIBRARY TAPE PREPARATION	PW	1604	F63	RS	L \$		193	
CURFIT, CURVE FITTING EXPERIMENTAL DATA POINTS	KAPL	6600	F+ASC	RS P	T P \$		43	
CURIE,DOSE,THUNDERHEAD, EXTERNAL+INTERNAL DOSE	AI	7094	F+FBAL	RS PL	T G \$		196	
CURVE FITTING	LASL	7094	F4	RS	T P \$	LASL LEAST SQUARES, GENERAL	62	
CURVE FITTING	BAPL	6600	F4	RS P	T P \$	M0661,M0657,M0626, POLYNOMIAL	411	
CURVE FITTING EXPERIMENTAL DATA POINTS	KAPL	6600	F+ASC	RS P	T P \$	CURFIT,	43	
CURVE PLCT	KAPL	6600	F+ASC	RS P	T P \$	SNEQ, NONLINEAR ALGEBRAIC EQN SOLN	364	
CURVES	LRL	7094	F2	RS P	P \$	EXPALS, LEAST SQUARES EXPONENTIAL DECAY	321	
CWE	360	F4	RS P	T D \$	CINCAS, NUCLEAR FUEL CYCLE COST AND ECONOMICS		354	
CYCLE ANALYSIS	AI	7094	F2	RS PL	T I \$	CYCLOPS1, THERMODYNAMIC	244	
CYCLE ANALYSIS PARTIAL REFUEL	GGA	7044	F4	RS P	T D \$	GARGOYLE, FUEL	260	
CYCLE ANALYSIS W/REFUELING	GGA	7044	F4	RS P	T D \$	REVISED-GAD, FUEL	223	
CYCLE CALCULATION	GGA	1108	F4	S	T D \$	GAFFE, EQUILIBRIUM FUEL	302	
CYCLE COST ANALYSIS	AI	7090	F2	RS P	D \$	AIMFIRE, URANIUM FUEL	55	
CYCLE COST AND ECONOMICS	CWE	360	F4	RS P	T D \$	CINCAS, NUCLEAR FUEL	354	
CYCLE COST AND ECONOMICS	WAPD	6600	F4	RS P	T D \$	CINCAS, NUCLEAR FUEL	354	
CYCLE CCST CALCULATION	GGA	1108	F4	RS P	T D \$	PWCOST, REACTOR FUEL	441	

CYCLE

DATA

CYCLE COSTS PERFORMANCE DATA	KE	7090	F2	PSBP	C \$ NPRFCCP, FUEL	146
CYCLE COSTS PERFORMANCE DATA	UEC	6600	F4	RS P	D \$ NPRFCCP, FUEL	146
CYCLE COSTS PERFORMANCE STUDY	GGA	7044	F4	RS P	D \$ WAMPUM, FUEL	224
CYCLE COSTS PERFORMANCE STUDY	UFC	6600	F4	RS P	D \$ WAMPUM, FUEL	224
CYCLE ECONMICS UICS 360 F4	RS P	CT D	\$ GEM, ANALYSIS OF NUCLEAR FUEL			576
CYCLE PARAMETERS FAST BREEDERS	NED	635	F4	RS P	D \$ RAPFU, FUEL	372
CYCLOPS1, THERMODYNAMIC CYCLE ANALYSIS	AI	7094	F2	RS PL	T I \$	244
CYGR02, STRESS ANALYSIS CYL FUEL ELEMENT	BAPL	6600	F4	RS	T I \$	266
CYGR03, OXIDE FUEL ROD STRESS & DEFORMATION	BAPL	6600	F4	RS P	T I \$	449
CYL CRNL 7090 F2	RS P	T C \$ EQUIPOISE3, 2-D 2-GROUP DIFFUSION SLAB				39
CYL CELL CODE AND TEMPEST COMBINATION	AI	7090	F2	RS P	B \$ BAM, S4	108
CYL CELL CODE, 1-D 1-GP S4 APPROXIMATION	AI	7090	F2	RS	B \$ S4	53
CYL CELL CODE, 1-D 1-GP S4 APPROXIMATION	CDC	1604	F63	RS P	B \$ S4	53
CYL COOLANT INLET PLENUM DP 360 F4	RS P	H \$ PLENUM, FLOW DIST. IN				586
CYL FUEL ELEMENT	BAPL	6600	F4	RS	T I \$ CYGR02, STRESS ANALYSIS	266
CYL FUEL ELEMENTS	AEB	360	F4	RS P	B \$ WELWING, MATERIAL BUCKLING	362
CYL GGA 1108 F+BAL	RS P	T C \$ GAZE2, 1-D MULTIGROUP DIFFUSION SLAB, SPH,				430
CYL LATTICE TVA 360 F4	RSBPLXCT	B \$ LASER, SPECTRUM CALC WITH BURNUP				249
CYL LATTICE WAPD 7094 F+MAP	RS PLX	T B \$ LASER, SPECTRUM CALC WITH BURNUP				249
CYL PW 1604 F63	RS	T C \$ 2DXYL, 3-D MULTI-GP FLUX SYNTHESIS PROGRAM				192
CYL SELL BUCKLING COLLAPSE ANALYSIS	BAPL	6600	F4	RS P	T I \$ BUSHL,	481
CYL SPHERE BNW 1107 F4	RS P	T C \$ HFN, 1-D MULTI-GP DIFFUSION SLAB				241
CYL SPHERE AI 7090 F+FAP	RS L	T C \$ FAIM, 1-D MULTI-GP DIFFUSION SLAB				120
CYL SPHERE AI 7090 F+FAP	RS PL	T C \$ AIM6, 1-D MULTI-GP DIFFUSION SLAB				29
CYL SPHERE CDC 1604 F63	RS PL	T C \$ AIM6, 1-D MULTI-GP DIFFUSION SLAB				29
CYL SPHERE CDC 1604 F63	RS PLX	T C \$ FAIM, 1-D MULTI-GP DIFFUSION SLAB				120
CYL SPHERE OSUC 370 F4	RS PL	CT C \$ AIM6, 1-D MULTI-GP DIFFUSION SLAB				29
CYL SPHERE AI 7090 F+FAP	RS L	T C \$ ULCER, 1-D MULTI-GP DIFFUSION SLAB				118
CYL SPHERE ANL 3600 F36	RS P	X T C \$ MACH1, 1-D MULTI-GP DIFFUSION SLAB				262
CYL SPHERE PURD 6500 F4	RS PLX	T C \$ MACH1, 1-D MULTI-GP DIFFUSION SLAB				262
CYL SPHERE PW 1604 LAG1	RS P	C \$ WGSN, 1-D MULTI-GP SN APPROX SLAB				211
CYL SPHERE UK-W 7090 F2	RS P	T C \$ W-DSN, 1-D MULTI-GP SN APPROX SLAB				132
CYL SPHERE BHSC 360 F4	RS P	T C \$ FAIMOS, 1-D MULTI-GP DIFFUSION SLAB				120
CYL SPHERE GEOM AI 7090 F2	RS P	J \$ GRACE2, GAMMA-RAY ATTENUATION				46
CYL SPHERE GEOM CDC 1604 F63	RS P	J \$ GRACE2, GAMMA-RAY ATTENUATION				46
CYL, SPH ANC 360 F4	RSBP	CT C \$ MCNA, 1-D MULTIGROUP DIFFUSION SLAB,				582
CYLINDER ANL 3600 F63	RSBP	T H \$ ARGUS, TRANSIENT TEMPERATURE CALC				152
CYLINDER PPCD 7040 F4	RS P	T C \$ TOPIC, 1-D FEW-GP SN APPROXIMATION				148
CYLINDER PPCD 7090 F2	RS P	T C \$ TOPIC, 1-D FEW-GP SN APPROXIMATION				148
CYLINDER CDC 1604 F63	RS P	T C \$ 20GRAND, 2-D FEW-GROUP DIFFUSION SLAB				40
CYLINDER ORNL 7090 F2	RS P	T C \$ 20GRAND, 2-D FEW-GROUP DIFFUSION SLAB				40
CYLINDER SLAB CDC 1604 F63	RS P	T C \$ EQUIPOISE3A, 2-D 2-GP DIFFUSION				87
CYLINDER SLAB ORNL 7090 F2	RS P	T C \$ EQUIPOISE3A, 2-D 2-GP DIFFUSION				87
CYLINDER SPHERE AEB 360 F4	RS L	T C \$ FIRE5, 1-D AGE-DIFFUSION SLAB				9
CYLINDER SPHERE AI 7090 F2	RS P	T C \$ FOG, 1-D FEW-GP DIFFUSION SLAB				28
CYLINDER SPHERE BC 625 F4	RS	T C \$ FOG, 1-D FEW-GP DIFFUSION SLAB				28
CYLINDER SPHERE CDC 1604 F63	RS P	T C \$ FOG, 1-D FEW-GP DIFFUSION SLAB				28
CYLINDRICAL PINS ANC 360 F4	RSBP	CT J \$ VIEWPIN, VIEW FACTOR CALC FOR				569
CAC 7090 F2	RSBP	J \$ LIPRECAN1, MC NEUTRON PENETRATION CALCULATION				123
CAC1, SN PERTURBATION CODE USING DTF4 FLUXES	LASL	6600	F4	RS P	N \$	455
DAFT1, LEAST SQUARES FIT FISSILE NUCLIDE DATA	BAPL	6600	F4	RS P	T P \$	327
DAMAGE IN METALS GEC 635 F+FAP	RSBP	T Q \$ CASCADE, CLUSTER, RADIATION				419
DAMMET, PLOTB, ... ENDF/B VI PRCC	BNL	6600B	F4	RS	T M \$ CHECKER, CRECT,	384
DANCOFF JR, MODERATOR SPACE CHORD DIST FUNCT	AEG	7090	F2	RS	B \$	150
DATA WAPD 7600 F4	RS P	T B \$ ETOT2, THERMAL LIBRARIES FROM ENDF/B				509
DATA KE 7090 F2	RSBP	D \$ NPRFCCP, FUEL CYCLE COSTS PERFORMANCE				146
DATA UEC 6600 F4	RS P	D \$ NPRFCCP, FUEL CYCLE COSTS PERFORMANCE				146
DATA NED 635 F4	RS P	T D \$ EXPN, ANALYSIS OF PULSED NEUTRON SOURCE				258
DATA BAPL 6600 F4	RS P	T B \$ EPOCH, NEUTRON AGE CALCULATION OF ENDF/B				461
DATA BAPL 6600 F4	RS P	T P \$ DAFT1, LEAST SQUARES FIT FISSILE NUCLIDE				327
DATA DP 360 F4	RS P	XCT A \$ FLANGE2(71-1), ENDF/B THERMAL SCATTERING				368
DATA ORNL 360 F4	RS P	T B \$ RICE, PRIMARY RECOIL ATOM SPECTRA ENDF/B				453
DATA AI 7094 F+MAP	RS P	A \$ CHAD, LEGENDRE COEF CALC FOR ANGULAR DIST				215
DATA ANALYSIS ANC 360 F4	RS PL	CT M \$ ERREST, LOCA ROD BUNDLE CHF				518

DATA

DEPLETION

DATA ANALYSIS	CNEA	360	F4	RS P	E \$ TRIFIDO, PULSED NEUTRON SOURCE	489	
DATA ANALYSIS	GEES	1108	F5	RS P	T D \$ CAGE, BIRD, SPEC, TIME-OF-FLIGHT	476	
DATA CCNVERSION		ANL	360	F4	RS P CT M \$ ETOE, ENDF/B TO MC**2	350	
DATA CCNVERSION		APDA	3600	ASAF4	RS P T M \$ ETOE, ENDF/B TO MC**2	350	
DATA FILE SERVICE ROUTINES	ENDF TAPES	BNL	7090	F+FAP	RS P T M \$ DFSR,	236	
DATA GESV	635	F+GMP	RS P	XCT B \$ ENDRUN2, MULTIGROUP CONSTANTS FROM ENDF/B		501	
DATA HEAT TRANSFER STUDY	SLL	6600	F4	RS P	N \$ HEATMESH, GEOMETRICAL	434	
DATA LASL	6600	F4	RS P	T B \$ GLEN, GROUP CONSTANT CALC FROM TCR OUTPUT		361	
DATA LIBRARIES, MUFT4 OR 5, GAM1 OR 2	WAPD	6600	BCD	R	L T Z \$ ETOG1	447	
DATA LIBRARY	LRL	7094	F+FAP	RS PL	T M \$ ECSIL, EXPERIMENTAL NEUTRON	351	
DATA MANAGEMENT, EDITING, & ANALYSIS	BAPL	6600	F4	RS P	T M \$ SHLOG,	557	
DATA POINTS KAPL	6600	F+ASC	RS P	T P \$ CURFIT, CURVE FITTING EXPERIMENTAL		43	
DATA PREPARATION FOR 2-D DESIGN PROGRAMS	LASL	7090	F+FAP	RS P	T L \$ CPC,	234	
DATA PROCESSING CODE	ANL	360	F4	RS	T M \$ RIGEL, ENDF/B V3	571	
DATA PROCESSING MODULE	ANL	360	F4	RSBP	CT L \$ ARC-NU1002, BCD INPUT	533	
DATA REDUCTION	ANL	3600	F63	RSBP	O \$ CCINC, COINCIDENCE COUNTING	248	
DATA STORAGE, RETRIEVAL, AND DISPLAY	DP	360	F+BAL	S	T M \$ JOSHUA,	490	
DATA SYSTEM KAPL	6600	F+COM	RSB	T M \$ DATATRAN, MODULAR PROGRAMMING AND		386	
DATA TAPES	GGA	1108	RIN	R	L T Z \$ ZPR-III ASSEMBLY 48 GAFFAR ENDF/B	356	
DATA UILL	360	F4	RS P	A \$ CODILLI, LEAST SQUARES ANALYSIS RESONANCE		347	
DATATRAN UTILITY MODULES, 2-D + 3-D PLOTTING	KAPL	6600	F+ASC	RS P	T P \$	407	
DATATRAN 2-D GEOMETRY INPUT, PREPARATION, EDIT	KAPL	6600	F+ASC	RS P	T L \$	406	
DATATRAN, MODULAR PROGRAMMING AND DATA SYSTEM	KAPL	6600	F+COM	RSB	T M \$	386	
DBF1, RESONANCE INTEGRAL HEX CELL	BAPL	6600	F+ASC	RS P	X T B \$ RESQ2, RESQ0,	285	
DBUFIT1, LEAST SQUARES TRANSMUTATION ANALYSIS	BNWL	1108	F5	RS P	T D \$	456	
DOB, 2-D FEW-GP DIFFUSION BURNUP RZ GEOMETRY	GGA	7090	F+FAP	RSBP	T D \$	99	
DECAY	BNW	1108	F5	RSBP	T D \$ ISOGEN, RADIONUCLIDE GENERATION AND	367	
DECAY CHAIN ANALYSIS	ORNL	1604	F63	RS P	D \$ ISOCRUNCH, REACTION	180	
DECAY CHAIN ANALYSIS	ORNL	7090	F2	RSBP	D \$ ISCCRUNCH, REACTION	180	
DECAY CHAINS	GEC	635	F4	RSBP	D \$ CHAINS, ANALYSIS OF RADIOACTIVE	418	
DECAY CURVES	LRL	7094	F2	RS P	P \$ EXPALS, LEAST SQUARES EXPONENTIAL	321	
DECAY ORNL	1604	F63	RS P	D \$ ISOTOPES, MAXIMUM YIELD FROM REACTION OR		179	
DEFLECTION CALCULATION PARALLEL BEAMS	ANL	3600	F36	SBP	I \$ ROW2,	365	
DEFLECTION STRESS STUDY	BAPL	6600	F+COM	RS P	T I \$ GAPL3, INFLASTIC LARGE	397	
DEFORMATION	BAPL	6600	F4	RS P	T I \$ CYGPO3, OXIDE FUEL ROD STRESS &	449	
DEFORMATION	BAPL	6600	F4	RS P	T I \$ PELEN, FUEL PELLET TEMPERATURE &	598	
DENSITIES	BNW	1108	F5	RS P	X T F \$ NOISY1, AUTO- AND CROSS-SPECTRAL	488	
DENSITIES	BNW	7090	F4	RS P	T F \$ NCISY1, AUTO- AND CROSS-SPECTRAL	488	
DENSITY CALC	AI	7094	F+FAP	RS PL	T B \$ TYCHE3, MONTE CARLO SLOWING-DOWN	149	
DEPLETION	AI	360	F4	RSBP	X T D \$ SIZZLE, 1-D MULTIGROUP DIFFUSION	58	
DEPLETION	AI	7090	F2	RS	L T D \$ SIZZLE, 1-D MULTIGROUP DIFFUSION	58	
DEPLETION	CDC	1604	F63	RS	L T D \$ SIZZLE, 1-D MULTIGROUP DIFFUSION	58	
DEPLETION	KAPL	6600	F4	RS P	T D \$ 3DXT, DEP3, 3-D XENON TRANSIENT &	477	
DEPLETION	LASL	7030	F4	RS P	T D \$ DTF-BURN, 1-D MULTI-GP DTF4 WITH	269	
DEPLETION	ANC	360E	F+BAL	RS P	XCT D \$ PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION	275	
DEPLETION	ANL	3600	F4	RSBP	T D \$ 2DB, 2-D MULTIGROUP DIFFUSION AND	325	
DEPLETION	BAPL	6600A	F+ASC	RS P	T D \$ PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION	275	
DEPLETION	BAPL	6600C	F+ASC	RS P	T D \$ PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION	275	
DEPLETION	BCS	6600D	F+ASC	R B	T D \$ PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION	275	
DEPLETION	BNW	1108	F4	RS P	T D \$ 2DB, 2-D MULTIGROUP DIFFUSION AND	325	
DEPLETION	BW	6600B	F+ASC	RS P	T D \$ PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION	275	
DEPLETION	IBM	360A	F+BAL	RS P	T D \$ PDQ5, 2-D FEW-GROUP DIFFUSION AND	336	
DEPLETION	JNC	1108	F5	RS	LX T B \$ LEOPARD, SPECTRA CALCULATION WITH	279	
DEPLETION	LASL	6600	F4	RS P	T D \$ 2DB, 2-D MULTIGROUP DIFFUSION AND	325	
DEPLETION	MIT	360B	F+BAL	RSBP	T D \$ PDQ5, 2-D FEW-GROUP DIFFUSION AND	336	
DEPLETION	WAPD	360	F4	RS	PLX T B \$ LEOPARD, SPECTRA CALCULATION WITH	279	
DEPLETION	GGA	7044	F4	RS P	T D \$ RELCAD-FEVER, 1-D FEW-GP DIFFUSION	221	
DEPLETION	CCDE	ORNL	7090	F+FAP	RS P T D \$ ASSAULT, 2-D MULTI-GP DIFFUSION	240	
DEPLETION	FISSION PRODUCT	BAPL	6600	F4	RS P	D \$ CINDER, MO102, POINT	313
DEPLETION	FISSION PRODUCT	DP	360	F+BAL	RS P	T D \$ CINDER, MO102, POINT	313
DEPLETION	GGA	1108	F4	RS P	T D \$ FEVER7, 1-D MULTIGROUP DIFFUSION AND	318	
DEPLETION	GGA	1108	F4	RS P	T D \$ GAUGE, 2-D FEW-GP HEX GEOM DIFFUSION	339	
DEPLETION	MULTIGP	ORNL	360G	F4	RS P	T K \$ CITATION, 1,2,3-D DIFFUSION	387
DEPLETION	NFD	635	F+GMP	RS P	T D \$ SYN, 2D SYNTHESIS MULTIGP DIFF & IGP	455	

DEPLETION

DIFFUSION

DEPLETION PROGRAM	ANC	360	F4	RSBP	CT D \$ DWARF, 1-D FEW-GP	DIFFUSION	579
DEPLETION PROGRAM	GGA	7090	F2	RSB	T D \$ FEVER, 1-D FEW-GP	DIFFUSION	117
DEP3, 3-D XENON TRANSIENT & DEPLETION				KAPL 6600	F4 RS P T D \$ 3DXT,		477
DESIGN	BNW	1108	F5	RS P	T H \$ REPP, THERMAL-HYDRAULIC WATER REACTOR		483
DESIGN & SURVEY STUDY	BW	6600	F+COM	RS P X T D \$	FARED, 1-D FAST REACTOR		427
DESIGN CRITERIA COSTS	GGA	7044	F4	RS P	T D \$ STMG, STEAM GENERATOR		227
DESIGN MULTIGROUP SLAB GEOMETRY	ANL	3600	F63	RSBPL	T J \$ MAC, SHIELD		143
DESIGN MULTIGROUP SLAB GEOMETRY	BNW	7050	F2	RSBPL	T J \$ MAC, SHIELD		143
DESIGN OPTIMIZATION	AI	7090	F2	RS	I \$ CROCK, SPACE POWER PLANT		112
DESIGN OPTIMIZATION	AI	7090	F2	RS	I \$ SHOCK, SPACE POWER PLANT		114
DESIGN PROGRAMS	LASL	7090	F+FAP	RS P	T L \$ DPC, DATA PREPARATION FOR 2-D		234
DESIGN STUDY	PW	1604	F63	RS P	T I \$ PIP, CENTRIFUGAL PUMP IMPELLER		187
DESIGN STUDY GGA	7044	F4	RS P	I \$	GAZELLES, GAS-COOLED CORE THERMAL		232
DESIGN SYSTEM	AI	360	F4	RSBP	T K \$ THREDES, 1-D FEW-GP	DIFFUSION	273
DESIGN SYSTEM	LASL	6600	F+CCM	RS P	T P \$ LENSES, NONLINEAR LEAST SQ LENS		602
DESK CALCULATOR FORM SHEET DP PACKAGE				KAPL 6600	F+ASC RS P T P \$	DOGGY,	428
DETECTOR EFFICIENCY DISK SOURCE				UM	7090 MAD RSB	O \$ BURP2,	165
DETECTOR EFFICIENCY POINT SOURCE				UM	7090 MAD RSB	O \$ BURP1,	164
DETECTOR EFFICIENCY POINT SOURCE				UM	7090 MAD RSB	O \$ BURP3,	166
DFSR, DATA FILE SERVICE ROUTINES ENDF TAPES				BNL	7090 F+FAP RS P T M \$		236
DIELECTRICS SLA	6600	F4	RS P	V \$	FFEAR, LAPLACE EQUATION ISOTROPIC		577
DIFF & 1GP DEPLETION	NED	635	F+GMP	RS P	T D \$ SYN, 2D SYNTHESIS MULTIGP		495
DIFF EQNS	CRNL	6600	F4	RS P	P \$ FORSIM, SOLN OF SYSTEM OF ORDINARY		514
DIFFERENTIAL EQN SYSTEM SOLVER	LLL	6600	F4	RS P	P \$ GEAR, ORDINARY		592
DIFFERENTIAL EQNS. SOLUTION	KAPL	6600	F+ASC	RS P	T P \$ LIZARD, NONLINEAR		445
DIFFRACTION MODEL ELASTIC SCAT X-SEC	BNL	6600	F4	RS P	A \$ BESFIT,		524
DIFFRACTION POWDER PATTERN INDEXING	LASL	6600	F+COM	RS P	T Q \$ IND, XRAY		609
DIFFUSION	ANL	360	F4	RS P	F \$ TWIGGLE, 2-D 2-GP SPACE-TIME		338
DIFFUSION	UMCC	360	F4	RS P	T C \$ VARI-QUIR, TIME-DEP 2-D MULTI-GP		212
DIFFUSION	WANL	6600	F4	RS P	T C \$ VARI-QUIR, TIME-DEP 2-D MULTI-GP		212
DIFFUSION + LIB	AI	360	F4	RSBPLX	T C \$ CAESAR4, LIBLST, 1-D MULTI-GP		270
DIFFUSION & BURNUP XY, RZ	GGA	1108	F+BAL	RS P	T D \$ BUG2, 2-D MULTIGROUP		438
DIFFUSION & SN THEORY	NED	635	F4	RS P	T C \$ DOT2DB, 2-D MULTIGROUP		459
DIFFUSION ABSORPTION REMOVAL X-SECS	BAPL	6600	F4	RS	T B \$ M0807, 2-D		280
DIFFUSION AND DEPLETION	ANL	3600	F4	RSBP	T D \$ 2DB, 2-D MULTIGROUP		325
DIFFUSION AND DEPLETION	BNW	1108	F4	RS P	T D \$ 2CB, 2-D MULTIGROUP		325
DIFFUSION AND DEPLETION	IBM	360A	F+BAL	RS P	T D \$ PDQ5, 2-C FEW-GROUP		336
DIFFUSION AND DEPLETION	LASL	6600	F4	RS P	T D \$ 2DB, 2-D MULTIGROUP		325
DIFFUSION AND DEPLETION	MIT	360B	F+BAL	RSBP	T D \$ PDQ5, 2-C FEW-GROUP		336
DIFFUSION AND DEPLETION	GGA	1108	F4	RS P	T D \$ FEVER7, 1-D MULTIGROUP		318
DIFFUSION BURNUP ANALYSIS	ANL	360	F4	RS P	CT D \$ 3CB, 3-D MULTIGROUP		567
DIFFUSION BURNUP ANALYSIS	HEDL	1108	F4	RS P	T D \$ 3DB, 3-D MULTIGROUP		567
DIFFUSION BURNUP REFUELING HISTORY	LASL	6600	F4	RS P	T D \$ PHENIX, 2D		454
DIFFUSION BURNUP RZ GEOMETRY	GGA	7090	F+FAP	RSBP	T D \$ DCR, 2-D FEW-GP		59
DIFFUSION CALC	KAPL	6600	F4	RS P	F \$ RAUMZEIT, 1-D TIME-DEPENDENT		352
DIFFUSION CALC HEX-Z MESH	GGA	1108	F4	RS P	T C \$ GATT, 3-D FEW-GP		380
DIFFUSION CYLINDER SLAB	CDC	1604	F63	RS P	T C \$ EQUIPOISE3A, 2-D 2-GP		87
DIFFUSION CYLINDER SLAB	ORNL	7090	F2	RS P	T C \$ EQUIPOISE3A, 2-D 2-GP		87
DIFFUSION DEPLETION	AI	360	F4	RSBP	X T D \$ SIZZLE, 1-D MULTIGROUP		58
DIFFUSION DEPLETION	AI	7090	F2	RS	L T D \$ SIZZLE, 1-D MULTIGROUP		58
DIFFUSION DEPLETION	CDC	1604	F63	RS	L T D \$ SIZZLE, 1-D MULTIGROUP		58
DIFFUSION DEPLETION	ANC	360E	F+BAL	RS P	XCT D \$ PDQ7, 1,2 OR 3-D FEW-GP		275
DIFFUSION DEPLETION	BAPL	6600A	F+ASC	RS P	T C \$ PDQ7, 1,2 OR 3-D FEW-GP		275
DIFFUSION DEPLETION	BAPL	6600C	F+ASC	RS P	T C \$ PDQ7, 1,2 OR 3-D FEW-GP		275
DIFFUSION DEPLETION	BCS	6600D	F+ASC	R B	T D \$ PDQ7, 1,2 OR 3-D FEW-GP		275
DIFFUSION DEPLETION	BW	6600R	F+ASC	RS P	T D \$ PDQ7, 1,2 OR 3-D FEW-GP		275
DIFFUSION DEPLETION	GGA	7044	F4	RS P	T D \$ RELCAD-FEVER, 1-D FEW-GP		221
DIFFUSION DEPLETION CODE	ORNL	7090	F+FAP	RS P	T D \$ ASSAULT, 2-D MULTI-GP		240
DIFFUSION DEPLETION	GGA	1108	F4	RS P	T D \$ GAUGE, 2-D FEW-GP HEX GEOM		339
DIFFUSION DEPLETION MULTIGP	ORNL	360G	F4	RS P	T K \$ CITATION, 1,2,3-D		387
DIFFUSION DEPLETION PROGRAM	ANC	360	F4	RSBP	CT D \$ DWARF, 1-D FEW-GP		579
DIFFUSION DEPLETION PROGRAM	GGA	7090	F2	RSB	T C \$ FEVER, 1-D FEW-GP		117
DIFFUSION DESIGN SYSTEM	AI	360	F4	RSBP	T K \$ THREDES, 1-D FEW-GP		273
DIFFUSION FAST X-SECTION GENERATION	BNW	1108	F4	RS P	X T B \$ 1DX, 1-D		374

DIFFUSION

DOCUMENT

DIFFUSION	FEEDBACK	BAPL	6600	F4	RS P	T F \$ TWIGL, 2-D 2-GP SPACE-TIME	338
DIFFUSION	FEEDBACK	BNL	6600	F4	RS P	T F \$ NOAH, 1-D ONE-GP SPACE-TIME	405
DIFFUSION	GGA	1108	F4	RS P	T F \$ GAKIN, 1-D MULTIGROUP TIME-DEPENDENT	310	
DIFFUSION	POWER DIST SEARCH	GGA	7044	F4	RS P	T C \$ GASP2, 1-D FEW-GP	220
DIFFUSION	PROGRAM	AAEC	360	F+BAL	RS P	T C \$ CRAM, 1-D AND 2-D MULTI-GP	103
DIFFUSION	PROGRAM	ORNL	7090	F+MAP	RS P	T C \$ EXTERMINATOR, 2-D MULTI-GP	156
DIFFUSION	PROGRAM	UK-R	7090	F+MAP	RSBPL	T C \$ CRAM, 1-D AND 2-D MULTI-GP	103
DIFFUSION	PROGRAM	BC	625	F4	RS	T C \$ EXTERMINATOR2, 2-D MULTI-GP	156
DIFFUSION	PROGRAM	CE	6600	F4	RS P	T C \$ EXTERMINATOR2, 2-D MULTI-GP	156
DIFFUSION	PROGRAM	ORNL	360	F4	RS P	T C \$ EXTERMINATOR2, 2-D MULTI-GP	156
DIFFUSION	SLAB CYL	ORNL	7090	F2	RS P	T C \$ EQUIPCISE3, 2-D 2-GROUP	39
DIFFUSION	SLAB CYL SPHERE	BNW	1107	F4	RS P	T C \$ HFN, 1-D MULTI-GP	241
DIFFUSION	SLAB CYL SPHERE	AI	7090	F+MAP	RS	L T C \$ FAIM, 1-D MULTI-GP	120
DIFFUSION	SLAB CYL SPHERE	AI	7090	F+MAP	RS PL	T C \$ AIM6, 1-D MULTI-GP	29
DIFFUSION	SLAB CYL SPHERE	CDC	1604	F63	RS PL	T C \$ AIM6, 1-D MULTI-GP	29
DIFFUSION	SLAB CYL SPHERE	CDC	1604	F63	RS PLX	T C \$ FAIM, 1-D MULTI-GP	120
DIFFUSION	SLAB CYL SPHERE	OSUC	370	F4	RS PL	CT C \$ AIM6, 1-D MULTI-GP	29
DIFFUSION	SLAB CYL SPHERE	AI	7090	F+MAP	RS	L T C \$ ULCER, 1-D MULTI-GP	118
DIFFUSION	SLAB CYL SPHERE	ANL	3600	F36	RS P	X T C \$ MACH1, 1-D MULTI-GP	262
DIFFUSION	SLAB CYL SPHERE	PURD	6500	F4	RS PLX	T C \$ MACH1, 1-D MULTI-GP	262
DIFFUSION	SLAB CYL SPHERE	BHSC	360	F4	RS P	T C \$ FAIMOS, 1-D MULTI-GP	120
DIFFUSION	SLAB CYLINDER	CDC	1604	F63	RS P	T C \$ 20GRAND, 2-D FEW-GROUP	40
DIFFUSION	SLAB CYLINDER	CRNL	7090	F2	RS P	T C \$ 20GRAND, 2-D FEW-GROUP	40
DIFFUSION	SLAB CYLINDER SPHERE	AI	7090	F2	RS P	T C \$ FCG, 1-D FEW-GP	28
DIFFUSION	SLAB CYLINDER SPHERE	BC	625	F4	RS	T C \$ FOG, 1-D FEW-GP	28
DIFFUSION	SLAB CYLINDER SPHERE	CDC	1604	F63	RS P	T C \$ FOG, 1-D FEW-GP	28
DIFFUSION	SLAB, CYL, SPH	ANC	360	F4	RSBP	CT C \$ MONA, 1-D MULTIGROUP	582
DIFFUSION	SLAB, SPH, CYL	GGA	1108	F+BAL	RS P	T C \$ GAZE2, 1-D MULTIGROUP	430
DIFFUSION	SYNTHESIS CALC	NED	635	F4	RS PL	T C \$ BISYN, 2-D MULTI-GP	287
DIFFUSION	SYNTHESIS CALC	NED	1108	F4	RS P	T C \$ BISYN, 2-D MULTI-GP	287
DIFFUSION	TEMP COEF CALC	GGA	7044	F4	RS P	T C \$ TEMCO, 1-D FEW-GP	225
DIFFUSION	TRIANGULAR MESH	GGA	1108	F+BAL	RS P	T C \$ GAMTRI, 2-D MULTIGP	401
DIFFUSION	XY RZ GEOMETRY	GGA	1108	F+BAL	RS P	T C \$ GAMBLE5, 2-D MULTI-GP	222
DIFFUSION	XY RZ GEOMETRY	GGA	7044	F+MAP	RSBP	T C \$ GAMBLE4, 2-D MULTI-GP	222
DIFFUSION	XY RZ RTH	WANL	7094	F4	RS P	X T C \$ VARI-QUIR3, 2-D MULTI-GP	264
DIFFUSION	XYZ GEOMETRY	CDC	1604	F63	RS P	T C \$ WHIRLAWAY, 3-D 2-GROUP	32
DIFFUSION	XYZ GEOMETRY	ORNL	7090	F2	RS P	T C \$ WHIRLAWAY, 3-D 2-GROUP	32
DIFFUSION	XYZ R-THETA-Z	LASL	6600	F4	RS P	T C \$ 3DDT, 3-D MULTIGROUP	463
DIFFUSION	3-GEOM	BAPL	6600	F4	RS P	T F \$ WIGL2, 1-D 2-GP SPACE-TIME	274
DIFFUSION	3-GEOM	GGA	1108	F4	RS P	T F \$ WIGL2, 1-D 2-GP SPACE-TIME	274
DIFFUSION+BURNUP	TRI-MESH	GGA	1108	F+BAL	RS P	T D \$ BUGTRI, 2-D MULTIGP	439
DISASSEMBLY	ANL	360	F4	PS P	XCT F \$ VENUS, 2-D LMFBR POWER EXCURSION	511	
DISCHARGE STUDY	HEDL	1108	F5	RS P	T R \$ TCPLYR2, POWER PLANT THERMAL	599	
DISCRETE ORDINATE CALC		AI	7090	F2	RS PLX	T C \$ DTF2, 1-D MULTI-GP	151
DISCRETE ORDINATE CALC		AI	360	F4	RSBPLX	T C \$ ANISN, 1-D MULTI-GP	151
DISCRETE ORDINATE CALC		UNC	1604	F63	RS PL	T C \$ DTF, 1-D MULTIGROUP	144
DISCRETE ORDINATE CALC	ANL	3600	F36	RS P	T C \$ SNARG-1D, 1-D MULTI-GP	288	
DISCRETE ORDINATE CODE		GGA	1108	F5	RS P	T C \$ 2DF, 2-D MULTI-GP	173
DISCRETE ORDINATE CODE		UNC	1604	F63	RS	C \$ 2DF, 2-D MULTI-GP	173
DISCRETE ORDINATE MULTIGROUP	CONSTANTS	CRNL	360	F4	RS PLX	T B \$ XSDRN,	393
DISCRETE ORDINATE PROGRAM		ANL	360	F+BAL	RS P	T C \$ DTF4, 1-D MULTI-GP	209
DISCRETE ORDINATE PROGRAM		BC	625	F+MAP	RS P	T C \$ DTF4, 1-D MULTI-GP	209
DISCRETE ORDINATE PROGRAM		LASL	6600	F4	RS P	T C \$ DTF4, 1-D MULTI-GP	209
DISCRETE ORDINATE PROGRAM		LASL	7030	F4	RS P	T C \$ DTF4, 1-D MULTI-GP	209
DISCRETE ORDINATE PROGRAM		LER	7094	F4	RS P	T C \$ DTF4, 1-D MULTI-GP	209
DISCRETE ORDINATE PROGRAM		LER	7090	F+MAP	RS P	T C \$ TDSN, 2-D MULTIGROUP	312
DISCRETE ORDINATES SLAB GEOMETRY		BAPL	6600	F4	RS P	T C \$ BE21, FEW-GP	398
DISCRETE-ELEMENT ANALYSIS THIN SHELLS		MIT	360	F4	RS P	T I \$ SABOR4,	402
DISK SOURCE	UM	7090	MAD	RSB		O \$ BURP2, DETECTOR EFFICIENCY	165
DISPER, AEROSOL PARTICLE TRANSPORT STUDY					RFD	3600 F36 RS P G \$	554
DISPLAY	DP	360	F+BAL	S	T M \$ JOSHUA, DATA STORAGE, RETRIEVAL, AND		490
DISSIMILAR MEDIA TLD CORRECTION CALC		AI	360	F4	RS P	T Q \$ RESPOND,	566
DLC-2B LIBRARY GROUP COLLAPSING		APRF	6600	F4	RS	B \$ APRFX1, 99-GP	466
DOCUMENT INFORMATION SYSTEM		KAPL	6600	F	R B	T M \$ TIGIR2, MODULAR	403

DOGGY

DYNCL

DOGGY, DESK CALCULATOR FORM SHEET DP PACKAGE	KAPL 6600	F+ASC RS P	T P \$	428
COPIE, RESOLVED RESONANCE X-SECTION CALC	NED 2000	F2 RS P	A \$	177
DOPPLER EFFECTS	NED 2000	F2 RS P	B \$ SPARTA, SPATIALLY-AVRAGED	178
DOS-MFT REMOTE WORKSTATION PKG	ANL 360	F+ASM RSB	CT P \$ WSP-HASP/DOS,	541
DOS, NEUTRON FLUX-DOSIMETER ACTIVITY RELATION	GEC 635	F4 RSBP	D \$	423
DOSE PGE 360 F4 RS P CT G \$ FEMERALD, PWR PLANT RADIATION RELEASE &				546
DOSE AI 7094 F+FAP RS PL T G \$ CURIE, DOSE, THUNDERHEAD, EXTERNAL+INTERNAL				196
DOSE CALC AI 7094 F+FAP RS P J \$ SHOE, SHIELD WEIGHT OPTIMIZATION				197
DOSE CALC GGA 1108 F4 RS T G \$ GADOSE, DOSET, HTGR ACCIDENT ANALYSIS				261
DOSE INTEGRALS DP 360 F4 RS P G \$ EGAD, CALC OF EXTERNAL GAMMA				600
DOSE RATE CALCULATION SNAP GEOMETRY AI 7090 F2 RS P J \$ RATRAP,				141
DOSE RATE CALCULATION SNAP GEOMETRY AI 7090 F2 RS J \$ MORTIMER,				142
DOSE RATE FROM A CLOUD AI 7090 F2 RS P G \$ CLOUD, GAMMA-RAY				47
DOSE RATE FROM A CLOUD CDC 1604 F63 RS P G \$ CLOUD, GAMMA-RAY				47
DOSE RATE FROM A CLOUD CP 360 F4 RS P G \$ CLOUD, GAMMA-RAY				47
DOSE RATE FROM SNAP SHIELD LEAKAGE AI 7090 F2 RS J \$ FARSEIA,				91
DOSE, THUNDERHEAD, EXTERNAL+INTERNAL DOSE AI 7094 F+FAP RS PL T G \$ CURIE,				196
DOSET, HTGR ACCIDENT ANALYSIS DOSE CALC GGA 1108 F4 RS T G \$ GADOSE,				261
DOT2DB, 2-D MULTIGROUP DIFFUSION & SN THEORY	NED 635	F4 RS P	T C \$	459
DOUBLE SN APPROX BNW 7090 FLOCO RSBP T C \$ GE-HAPO-S13, 1-D MULTI-GP				75
DOUBLE SN APPROX SLAB GEOM PPCC 7090 F2 RS P C \$ MIST, 1-D FEW-GP SN				59
CP 360 BCD R LX T Z \$ THERMOS LIBRARY, 30-GP ENDF/B SCAT KERNELS				543
CP 360 F+BAL S T M \$ JOSHUA, DATA STORAGE, RETRIEVAL, AND DISPLAY				490
CP 360 F+BAL S X T B \$ RAHAB, JCSHUA SYSTEM LATTICE PHYSICS MODULES				536
CP 360 F+BAL RS P T D \$ CINDER, MO102, POINT DEPLETION FISSION PRODUCT				313
CP 360 F+BAL RS P XCT R \$ HAMMER, LITHE, HELP, CRITICAL ANALYSIS SYSTEM				277
CP 360 F4 RS P G \$ CLOUD, GAMMA-RAY DOSE RATE FROM A CLOUD				47
CP 360 F4 RS P G \$ EGAD, CALC OF EXTERNAL GAMMA DOSE INTEGRALS				600
CP 360 F4 RS P G \$ INTEG, INSPEC, MARKCV SIMULATION OF REACTOR OPN				590
CP 360 F4 RS P H \$ PLENUM, FLOW DIST. IN CYL COOLANT INLET PLENUM				586
CP 360 F4 RS P XCT A \$ FLANGE2(71-1), ENDF/B THERMAL SCATTERING DATA				368
CP 360 F4 RSBP CT C \$ HERFSY3, 2-D HETEROGENEOUS REACTOR CALCULATION				136
CP PACKAGE KAPL 6600 F+ASC RS P T P \$ DOGGY, DESK CALCULATOR FORM SHEET				428
DP PURCHASE VERSUS LEASE ANALYSIS SLA 360 CBCL RSBP CT M \$ BECOM, AEC				589
DP PURCHASE VERSUS LEASE ANALYSIS SLA 1108 CBCL RS P M \$ BECOM, AEC				589
CPC, DATA PREPARATION FOR 2-D DESIGN PROGRAMS LASL 7090 F+FAP RS P T L \$				234
DRAFTING TOOL TO PLOT PLANE STRUCTURES EAPL 6600 F4 RS P T L \$ BL47,				373
DSN OUTPUT PW 1604 LAG1 RS P N \$ DTX, EFFECTIVE X-SECTION CALC FROM				210
DSN TDC PW 1604 F63 RS P L \$ SAC, CALCULATION OF SN CONSTANTS FOR				189
DTF-BURN, 1-D MULTI-GP DTF4 WITH DEPLETION LASL 7030 F4 RS P T D \$				269
DTF, 1-D MULTIGROUP DISCRETE ORDINATE CALC UNC 1604 F63 RS PL T C \$				144
DTF2, 1-D MULTI-GP DISCRETE ORDINATE CALC AI 7090 F2 RS PLX T C \$				151
DTF4 CROSS SECTIONS LASL 6600 F4 RS P N \$ LARCA, FLUX-WEIGHTING OF				409
DTF4 FLUXES LASL 6600 F4 RS P N \$ DAC1, SN PERTURBATION CODE USING				455
DTF4 WITH DEPLETION LASL 7030 F4 RS P T D \$ DTF-BURN, 1-D MULTI-GP				269
DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM ANL 360 F+BAL RS P T C \$				209
DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM BC 625 F+MAP RS P T C \$				209
DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM LASL 6600 F4 RS P T C \$				209
DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM LASL 7030 F4 RS P T C \$				209
DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM LER 7094 F4 RS P T C \$				209
DTX, EFFECTIVE X-SECTION CALC FROM DSN OUTPUT PW 1604 LAG1 RS P N \$				210
DUCC 635 F4 RS G \$ ANVENT, LOCA ANALYSIS DUKE POWER MCGUIRE UNITS				529
DUKE POWER MCGUIRE UNITS DUCC 635 F4 RS G \$ ANVENT, LOCA ANALYSIS				529
CUZ2, 2-D AXISYMMETRIC & PLANE ELASTIC-PLASTIC BAPL 6600 F+COM RS P T I \$				503
DWARF, 1-D FEW-GP DIFFUSION DEPLETION PROGRAM ANC 360 F4 RSBP CT D \$				579
DYNAM, DYNAMIC ANALYSIS BOILING FLOW STEAM GGA 1108 F4 RS P T H \$				440
DYNAMIC ANALYSIS BOILING FLOW STEAM GGA 1108 F4 RS P T H \$ DYNAM,				440
DYNAMIC ANALYSIS LINEAR ELASTIC SYSTEMS BAPL 6600 F4 RS P T I \$ M0552,				283
DYNAMIC ANALYSIS OF THIN SHELLS SLA 6600 F4 RS P T I \$ SLADE-D,				581
DYNAMIC RESPONSE OF ELASTIC STRUCTURES BAPL 6600 F4 RS P T I \$ FUGIT,				537
DYNAMIC STRUCTURAL ANALYSIS ANC 360 F4 RSBP CT I \$ STRAP, STATIC &				539
DYNAMICS AI 360 F+BAL RS P T E \$ AIROS2A, SIMULATION OF REACTOR				326
DYNAMICS BAPL 6600 F4 RS P T I \$ M0266, LINEAR ELASTIC STRUCTURAL				383
DYNCL, PHOTOMULTIPLIER ELECTRON DISTRIBUTION ANL 360 F4 RS P O \$				464

DYN01

ENDF/B

DYN01, PHOTOMULTIPLIER ELECTRON DISTRIBUTION	KAPL 6600 F4	RS P	O \$	464
ECC BCL 6400 F4	RS P X T G \$	MUCHA1, MUCHA2, MULTIPLE CHANNEL ANALYSIS		508
ECCSA4, LOSS-OF-COOLANT & EMERGENCY COOLING	BCL 6400 F4	RS P	T G \$	330
ECONOMICS CWE 360 F4	RS P	T D \$	CINCAS, NUCLEAR FUEL CYCLE COST AND	354
ECONOMICS UICS 360 F4	RS P	CT D \$	GEM, ANALYSIS OF NUCLEAR FUEL CYCLE	576
ECONOMICS WAPD 6600 F4	RS P	T D \$	CINCAS, NUCLEAR FUEL CYCLE COST AND	354
ECSIL, EXPERIMENTAL NEUTRON DATA LIBRARY	LRL 7094 F+FAP	RS PL	T M \$	351
EDIT KAPL 6600 F+ASC	RS P	T L \$	DATATRAN 2-D GEOMETRY INPUT, PREPARATION,	406
EDIT REACTION RATES	UK-W 7090 F2	RS	N \$	WEC, W-DSN OUTPUT TAPE
EDITING	ORNL 360B F4	RS P	T M \$	EDITOR, ENDF/B TAPE PROCESSING AND
EDITING	ORNL 6600 F4	RS P	T M \$	EDITOR, ENDF/B TAPE PROCESSING AND
EDITING, & ANALYSIS	BAPL 6600 F4	RS P	T M \$	SHLOG, DATA MANAGEMENT,
EDITOR, ENDF/B TAPE PROCESSING AND EDITING	ORNL 360B F4	RS P	T M \$	
EDITOR, ENDF/B TAPE PROCESSING AND EDITING	ORNL 6600 F4	RS P	T M \$	
EFFECTIVE X-SECTION CALC FROM DSN OUTPUT	PW 1604	LAG1	RS P	N \$
EFFICIENCY DISK SOURCE	UM 7090	MAD	RSB	O \$
EFFICIENCY POINT SOURCE	UM 7090	MAD	RSB	O \$
EFFICIENCY POINT SOURCE	UM 7090	MAD	RSB	O \$
EGAD, CALC OF EXTERNAL GAMMA DCSE INTEGRALS	DP 360 F4	RS P	G \$	
EIGENVALUE EIGENVECTOR PACKAGE ANL 360 F4	RSB	XCT P \$	EISPACK, MATRIX	
EIGENVALUE EIGENVECTOR PACKAGE ANL 635 F4	RS	X T P \$	EISPACK, MATRIX	
EIGENVALUE EIGENVECTOR PACKAGE ANL 1108 F4	RS	X T P \$	EISPACK, MATRIX	
EIGENVALUE EIGENVECTOR PACKAGE ANL 6600 F4	RS	X T P \$	EISPACK, MATRIX	
EIGENVALUE PROBLEM FOR VIBRATING SYSTEMS	KAPL 6600 F+ASC	RS P	T I \$	GEM,
EIGENVECTOR PACKAGE ANL 360 F4	RSB	XCT P \$	EISPACK, MATRIX	EIGENVALUE
EIGENVECTOR PACKAGE ANL 635 F4	RS	X T P \$	EISPACK, MATRIX	EIGENVALUE
EIGENVECTOR PACKAGE ANL 1108 F4	RS	X T P \$	EISPACK, MATRIX	EIGENVALUE
EIGENVECTOR PACKAGE ANL 6600 F4	RS	X T P \$	EISPACK, MATRIX	EIGENVALUE
EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE ANL 360 F4	RSB	XCT P \$		
EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE ANL 635 F4	RS	X T P \$		
EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE ANL 1108 F4	RS	X T P \$		
EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE ANL 6600 F4	RS	X T P \$		
ELASTIC ANALYSIS	BAPL 6600 F+COM	RS P	X T I \$	MATUS, 3-D FINITE ELEMENT
ELASTIC SCAT RESONANCES AI 360 F4	RS	PLX T B \$	AILMOE, X-SECTION CALC	
ELASTIC SCAT RESONANCES AI 7094 F+FAP	RS PL	T B \$	AILMOE, X-SECTION CALC	
ELASTIC SCAT X-SEC BNL 6600 F4	RS P	A \$	BESFIT, DIFFRACTION MODEL	
ELASTIC SCAT X-SECTIONS HEX LATTICE	GGA 1108 F4	RS	B \$	HEXSCAT,
ELASTIC SCATTERING PHASE-SHIFT ANALYSIS	ORNL 1604 F63	RS P	A \$	PEGGY,
ELASTIC STRESS OF PIPING SYSTEM	BAPL 6600 F4	RS P	T I \$	M0457, PIPE,
ELASTIC STRUCTURAL DYNAMICS	BAPL 6600 F4	RS P	T I \$	M0266, LINEAR
ELASTIC STRUCTURES	BAPL 6600 F4	RS P	T I \$	FUGIT, DYNAMIC RESPONSE OF
ELASTIC SYSTEMS	BAPL 6600 F4	RS P	T I \$	M0552, DYNAMIC ANALYSIS LINEAR
ELASTIC-PLASTIC	BAPL 6600 F+COM	RS P	T I \$	DUZ2, 2-D AXISYMMETRIC & PLANE
ELBCW, FUEL ELEMENT STRESS ANALYSIS STUDY	GGA 7044 F4	RS P	T G \$	
ELECTRICITY COSTS	ORNL 1604 F63	RS P	D \$	POWERCO, NUCLEAR STATION
ELECTRICITY COSTS	UEC 6600 F4	RS P	D \$	POWERCO, NUCLEAR STATION
ELECTRON DISTRIBUTION	ANL 360 F4	RS P	O \$	DYN01, PHOTOMULTIPLIER
ELECTRON DISTRIBUTION	KAPL 6600 F4	RS P	C \$	DYN01, PHOTOMULTIPLIER
EMERALD, PWR PLANT RADIATION RELEASE & DOSE	PGE 360 F4	RS P	CT G \$	
EMERGENCY COOLING	BCL 6400 F4	RS P	T G \$	ECCSA4, LOSS-OF-COOLANT &
ENDF MULTIGROUP X-SECTION CALCULATION	ANL 360 F4	RS P	CT B \$	MC**2,
ENDF MULTIGROUP X-SECTION CALCULATION	ANL 3600 F36	RS P	T B \$	MC**2,
ENDF TAPES	BNL 7090 F+FAP	RS P	T M \$	DFSR, DATA FILE SERVICE ROUTINES
ENDF/B	ORNL 360 F4	RSBP	XCT B \$	XLACS, XSDRN MULTIGROUP LIBRARIES FROM
ENDF/B DATA	WAPD 7600 F4	RS P	T B \$	ETOT2, THERMAL LIBRARIES FROM
ENDF/B DATA	BAPL 6600 F4	RS P	T B \$	EPOCH, NEUTRON AGE CALCULATION OF
ENDF/B DATA	ORNL 360 F4	RS P	T B \$	RICE, PRIMARY RECOIL ATOM SPECTRA
ENDF/B DATA	GESV 635 F+GMP	RS P	XCT B \$	ENDRUN2, MULTIGROUP CONSTANTS FROM
ENDF/B DATA TAPES	GGA 1108 BIN	R	L T Z \$	ZPR-III ASSEMBLY 48 GAFFAR
ENDF/B FINE-GP CONSTANTS GENERATION	ORNL 360 F4	RS P	T B \$	SUPERTOQ,
ENDF/B FOR IDX	HEOL 1108B F4	RS P	X T B \$	ETCX3, MULTI-GP CONSTANTS FROM
ENDF/B FORMAT TO MUFT FORMAT X-SECTIONS	WAPD 6600 F4	RS P	T B \$	ETOM1,
ENDF/B GRAPHIC X-SEC EVALUATION	AI 360 F+BAL	RSB	L CT M \$	SCORE3, SCISRS
ENDF/B RESONANCE XSECTION CODES	BNL 6600B F4	RS P	T A \$	RESEND, ADLER,

ENDF/B

EXPERIMENT

ENDF/B SCAT KERNELS	DP	360	BCD	R	LX T Z	\$ THERMOS LIBRARY, 30-GP	543
ENDF/B TAPE PROCESSING AND EDITING		ORNL	360B	F4	RS P	T M \$ EDITOR,	502
ENDF/B TAPE PROCESSING AND EDITING		ORNL	6600	F4	RS P	T M \$ EDITOR,	502
ENDF/B THERMAL SCATTERING DATA	DP	360	F4		RS P	XCT A \$ FLANGE2(71-1),	368
ENDF/B TO GAFGAR X-SECTIONS GGA	1108	F5		RS P	T B \$ ENDFB2,GAND2,GFE2,		596
ENDF/B TO MC**2 DATA CONVERSION		ANL	360	F4	RS P	CT M \$ ETOE,	350
ENDF/B TO MC**2 DATA CONVERSION		APDA	3600	ASAF4	RS P	T M \$ ETOE,	350
ENDF/B TO MUFT, GAM, ANISN X-SEC FORMAT	WAPD	6600	F4		RS PL	T B \$ ETOG1,	437
ENDF/B TO MUFT, GAM, ANISN X-SEC FORMAT	WAPD	7600	F4		RS P	T B \$ ETOG3,	538
ENDF/B V1 PROC BNL	6600B	F4	RS		T M \$ CHECKER,CRECT,DAMMET,PLOTFB,...		384
ENDF/B V2 PROC BNL	6600B	F4	RS		T M \$ CRECT,CHECKER,RIGEL,PLOTFB,...		475
ENDF/B V2 PROCESSING CODES		ANL	360	F4	RS P	T M \$ CRECT,CHECKER,	475
ENDF/B V3 DATA PROCESSING CODE		ANL	360	F4	RS	T M \$ RIGEL,	571
ENDF/B V3,V4 PROCESSING CODES	BNL	6600	F4	RS		T M \$ CHECK3,RIGEL3,	571
ENDFB2,GAND2,GFE2, ENDF/B TO GAFGAR X-SECTIONS GGA	1108	F5		RS P	T B \$		596
ENDRUN2, MULTIGROUP CONSTANTS FROM ENDF/B DATA GESV	635	F+GMP	RS P	XCT B \$			501
ENEA 360 F4	RS P	A \$	PSEUDO, STATISTICAL RESONANCE PARAMETER CALC				292
ENEA 360 F4	RS P	CT A \$	JUPITOR1, COUPLED CHANNEL X-SEC EVALUATION				308
ENERGY INTERVAL X-SECTION AVERAGING	GGA	7044	F4	RS P	L \$	GAVER,	218
ENTRAINED PARTICLES SAMPLING STUDY	BAPL	6600	F4	RS P	T O \$	BETTY,	545
ENTRY SYSTEM	ANC	360	BAL	RSB	T P \$	NRTS-RJE, OS/360 MVT REMOTE JOB	519
ENVIRNMNTL LIB SCOPE2.0 CDC	7600	F4	RS		T P \$	MODEL, MODIFIED BETTIS	478
ENVIRNMNTL LIB SCOPE3.2 CDC	6600C	F+COM	RS		T P \$	MODEL, MODIFIED BETTIS	478
ENVIRNMNTL LIB SCOPE3.3 CDC	6600D	F+COM	RS		T P \$	MODEL, MODIFIED BETTIS	478
ENVIRONMENTAL ROUTINES, SUBROUTINE LIB.	NED	635	F+GMP	RS		T P \$ GENED	515
ENVIRONMENTAL ROUTINES, SUBROUTINE LIB.	BAPL	6600A	F+ASC	RS		T P \$ BETTIS	478
ENVIRONMENTAL ROUTINES, SUBROUTINE LIB.	BW	6600B	F+ASC	RS		T P \$ BETTIS	478
EPITHERMAL X-SECTIONS NED	635	F4	RS P		T B \$	REAX, RESOLVED RESONANCE	257
EPITHERMOS, SPECTRUM AND X-SECTION CALCULATION NED	7094	F+GMP	PS P	T B \$			201
EPOCH, NEUTRON AGE CALCULATION OF ENDF/B DATA	BAPL	6600	F4	RS P	T B \$		461
EQN SOLN CURVE PLOT	KAPL	6600	F+ASC	RS P	T P \$	SNEQ, NONLINEAR ALGEBRAIC	364
EQN SYSTEM SOLVER LLL	6600	F4	RS P		P \$	GEAR, ORDINARY DIFFERENTIAL	592
EQUILIBRIUM FUEL CYCLE CALCULATION	GGA	1108	F4	S		T D \$ GAFFE,	302
EQUIPOISE3, 2-D 2-GROUP DIFFUSION SLAB CYL	CRNL	7090	F2	RS P	T C \$		39
EQUIPOISE3A, 2-D 2-GP DIFFUSION CYLINDER SLAB	CCC	1604	F63	RS P	T C \$		87
EQUIPOISE3A, 2-D 2-GP DIFFUSION CYLINDER SLAB	CRNL	7090	F2	RS P	T C \$		87
ERF,ERFC, ERROR & COMPLEMENTARY ERROR FUNCTION	SLA	6600	F4	RS P		P \$	601
ERFC, ERROR & COMPLEMENTARY ERROR FUNCTION	SLA	6600	F4	RS P		P \$ ERF,	601
ERREST, LOCA ROD BUNDLE CHF DATA ANALYSIS	ANC	360	F4	RS PL	CT M \$		518
ERROR & COMPLEMENTARY ERROR FUNCTION	SLA	6600	F4	RS P		P \$ ERF,ERFC,	601
ERROR FUNCTION	SLA	6600	F4	RS P		P \$ ERF,ERFC, ERROR & COMPLEMENTARY	601
ESP, MONTE CARLO REACTOR ANALYSIS CALCULATION	OPNL	360	F+GMP	RSRPL	CT C \$		523
ESTIMATE	ORNL	360B	F4	RS P	XCT D \$	CONCEPT2, POWER PLANT CONCEPTUAL COST	458
ESTIMATING	ORNL	360	F4	RS P	T D \$	ORCOST, POWER PLANT CAPITAL COST	588
ETOE, ENDF/B TO MC**2 DATA CONVERSION		ANL	360	F4	RS P	CT M \$	350
ETOE, ENDF/B TO MC**2 DATA CONVERSION		APDA	3600	ASAF4	RS P	T M \$	350
ETOG1 DATA LIBRARIES, MUFT4 OR 5, GAM1 OR 2	WAPD	6600	BCD	R	L T Z \$		447
ETOG1, ENDF/B TO MUFT, GAM, ANISN X-SEC FORMAT	WAPD	6600	F4	RS PL	T B \$		437
ETOG3, ENDF/B TO MUFT, GAM, ANISN X-SEC FORMAT	WAPD	7600	F4	RS P	T B \$		538
ETOM1, ENDF/B FORMAT TO MUFT FORMAT X-SECTIONS	WAPD	6600	F4	RS P	T B \$		436
ETOT2, THERMAL LIBRARIES FROM ENDF/B DATA		WAPD	7600	F4	RS P	T B \$	509
ETOX3, MULTI-GP CONSTANTS FROM ENDF/B FOR 1DX	HEDL	1108B	F4	RS P	X T B \$		388
EXCHANGER STRESS ANALYSIS	KAPL	6600	F4	RS P	I \$	TUBE, U-TUBE HEAT	378
EXCURSION	ANL	360	F4	RS P	CT F \$	REXCC-H, 2-D HYDRODYNAM RESPONSE TO	550
EXCURSION ANALYSIS	ANC	360	F4	RSRPL	XCT G \$	RELAP3, REACTOR BLOWDOWN -	369
EXCURSION ANALYSIS	ANC	1108	F4	RS P	T G \$	RELAP3, REACTOR BLOWDOWN -	369
EXCURSION ANALYSIS	ANC	6600	F4	RS P	T G \$	RELAP3, REACTOR BLOWDOWN -	369
EXCURSION CALCULATION R-Z GEOMETRY	APDA	7094	F4	RS P	F \$	MARS, 2-D	253
EXCURSION CALCULATIONS	NED	2000	F4	RS P	T F \$	FORE, FAST REACTOR	174
EXCURSION CALCULATIONS	ANL	360	F4	RS P	X T F \$	FORE2, FAST REACTOR	174
EXCURSION CALCULATIONS	NED	635	F4	RS P	X T F \$	FORE2, FAST REACTOR	174
EXCURSION DISASSEMBLY	ANL	360	F4	RS P	XCT F \$	VENUS, 2-D LMFBR POWER	511
EXPALS, LEAST SQUARES EXPONENTIAL DECAY CURVES	LPL	7094	F2	RS P		P \$	321
EXPERIMENT	UCND	360B	F+GMP	RS P	C \$	PMS1, FAST NEUTRON POLARIZATION	469

EXPERIMENT

F+BAL

EXPERIMENT ANALYSIS	RAPL 6600 F4	RS P	T O \$ JITER, FLUCTUATION	394
EXPERIMENT ANALYSIS	AGC 7090 F2	RS P	O \$ CROC90, ML-1 FLUID FLOW	154
EXPERIMENT ANALYSIS	BAPL 6600 F4	RS P	T O \$ REDUX, REACTOR FLUCTUATION	425
EXPERIMENTAL DATA POINTS	KAPL 6600	F+ASC RS P	T P \$ CUPFIT, CURVE FITTING	43
EXPERIMENTAL NEUTRON DATA LIBRARY	LRL 7094	F+FAP RS PL	T M \$ ECSIL,	351
EXPLOSION, COUPLED NEUTRON-HYDRODYNAMICS	APDA 7054 F2	RS P	F \$ WEAK	145
EXPN, ANALYSIS OF PULSED NEUTRON SOURCE DATA	NEC 635 F4	RS P	T O \$	258
EXPONENTIAL DECAY CURVES	LRL 7054 F2	RS P	P \$ EXPALS, LEAST SQUARES	321
EXPONENTIALS MIT 7090 F2	RS P	P \$ FRANTIC, LEAST SQUARES FIT SUM OF		324
EXT, X-SECTIONS FROM B-W RESONANCE PARAMETERS	WANL 7094 F2	RS P	A \$	238
EXTERMINATOR, 2-D MULTI-GP DIFFUSION PROGRAM	ORNL 7090	F+FAP RS P	T C \$	156
EXTERMINATOR2, 2-D MULTI-GP DIFFUSION PROGRAM	BC 625 F4	RS	T C \$	156
EXTERMINATOR2, 2-D MULTI-GP DIFFUSION PROGRAM	CE 6600 F4	RS P	T C \$	156
EXTERMINATOR2, 2-D MULTI-GP DIFFUSION PROGRAM	ORNL 360 F4	RS P	T C \$	156
EXTERNAL GAMMA DOSE INTEGRALS	CP 360 F4	PS P	G \$ EGAD, CALC OF	600
EXTERNAL+INTERNAL DOSE AI 7054	F+FAP RS PL	T G \$ CURIE,DOSE,THUNDERHEAD,		196
F+ASC R B	T D \$ PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	BCS 6600D		275
F+ASC RS	P \$ SIMPLE1, TIME-SHARING PROGRAMMING LANGUAGE	KAPL 6600		442
F+ASC RS	T P \$ BETTIS ENVIRONMENTAL ROUTINES, SUBROUTINE LIB.	RAPL 6600A		478
F+ASC RS	T P \$ BETTIS ENVIRONMENTAL ROUTINES, SUBROUTINE LIB.	BW 6600B		478
F+ASC RS P	T D \$ PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	BAPL 6600A		275
F+ASC RS P	T D \$ PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	BAPL 6600C		275
F+ASC RS P	T D \$ PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	BW 6600B		275
F+ASC RS P	T H \$ LION4, 3-D TEMPERATURE DISTRIBUTION PROGRAM	KAPL 6600		299
F+ASC RS P	T I \$ GEM, EIGENVALUE PROBLEM FOR VIBRATING SYSTEMS	KAPL 6600		344
F+ASC RS P	T J \$ ASPIS, GAMMA RAY SOURCE BUILDUP FACTOR CALC	BAPL 6600		429
F+ASC RS P	T J \$ SPAN4, A POINT-KERNEL SHIELD EVALUATION CODE	RAPL 6600B		462
F+ASC RS P	T L \$ DATATRAN 2-D GEOMETRY INPUT, PREPARATION, EDIT	KAPL 6600		406
F+ASC RS P	T P \$ CURFIT, CURVE FITTING EXPERIMENTAL DATA POINTS	KAPL 6600		43
F+ASC RS P	T P \$ DATATRAN UTILITY MODULES, 2-D + 3-D PLOTTING	KAPL 6600		407
F+ASC RS P	T P \$ DOGGY, DESK CALCULATOR FORM SHEET DP PACKAGE	KAPL 6600		428
F+ASC RS P	T P \$ LIZARD, NONLINEAR DIFFERENTIAL EQNS. SOLUTION	KAPL 6600		445
F+ASC RS P	T P \$ SNEQ, NONLINEAR ALGEBRAIC EQN SOLN CURVE PLOT	KAPL 6600		364
F+ASC RS P X T B	\$ RESQ2,RESQ0,DBF1, RESONANCE INTEGRAL HEX CELL	BAPL 6600		285
F+ASC RSB	CT P \$ WSP-HASP/DOS, DOS-MFT REMOTE WORKSTATION PKG	ANL 360		541
F+BAL S	T M \$ JOSHUA, DATA STORAGE, RETRIEVAL, AND DISPLAY	DP 360		490
F+BAL S	X T B \$ RAHAB, JOSHUA SYSTEM LATTICE PHYSICS MODULES	DP 360		536
F+BAL R B L	T P \$ TSO-SPEAKEASY, LANGUAGE PROCESSOR UNDER TSO	ANL 360		593
F+BAL RS	T P \$ AMDLIBF, ARGONNE SUBROUTINE LIBRARY CAT. F	ANL 360		563
F+BAL RS	T P \$ FIGS, IBM360&2250 FORTRAN GRAPHICS SUBROUTINES	AI 360		484
F+BAL RS P	D \$ ISOSEARCH, ISOTOPE PRODUCTION FLUX, X-SEC CALC	ORNL 360		322
F+BAL RS P	O \$ PMS1, FAST NEUTRON POLARIZATION EXPERIMENT	UCND 360B		469
F+BAL RS P	T A \$ COMNUC,CASCADE, COMPOUND NUCLEUS REACTION	AI 360		482
F+BAL RS P	T B \$ RAFFLE, 1ST FLIGHT COLLISION PROBABILITIES MC	ORNL 360		392
F+BAL RS P	T C \$ CRAM, 1-D AND 2-D MULTI-GP DIFFUSION PROGRAM	AAEC 360		103
F+BAL RS P	T C \$ DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	ANL 360		209
F+BAL RS P	T C \$ GAMBLE5, 2-D MULTI-GP DIFFUSION XY RZ GEOMETRY	GGA 1108		222
F+BAL RS P	T C \$ GAMTRI, 2-D MULTIGP DIFFUSION TRIANGULAR MESH	GGA 1108		401
F+BAL RS P	T C \$ GAZE2, 1-D MULTIGROUP DIFFUSION SLAB, SPH, CYL	GGA 1108		430
F+BAL RS P	T D \$ BUGTRI, 2-D MULTIGP DIFFUSION+BURNUP TRI-MESH	GGA 1108		439
F+BAL RS P	T D \$ BUG2, 2-D MULTIGROUP DIFFUSION & BURNUP XY, RZ	GGA 1108		438
F+BAL RS P	T D \$ CINDER,M0102, POINT DEPLETION FISSION PRODUCT	DP 360		313
F+BAL RS P	T D \$ PDQ5, 2-D FEW-GROUP DIFFUSION AND DEPLETION	IBM 360A		336
F+BAL RS P	T E \$ AIROS2A, SIMULATION OF REACTOR DYNAMICS	AI 360		326
F+BAL RS P	T E \$ BLOOST6, COMBINED KINETICS 2-D HEAT TRANSFER	GGA 1108		303
F+BAL RS P	T I \$ SAFE-3D, 3-D COMPOSITE STRUCTURE STRESS STUDY	ORNL 360		332
F+BAL RS P	T O \$ GSSLRN1B, LEAST SQUARES PHOTOPeAK SPECTRA CODE	BNWL 1108		457
F+BAL RS P	T O \$ TOAD, PROCESSING OF ANALYZER GAMMA-RAY SPECTRA	GGA 1108		333
F+BAL RS P CT B	\$ U3R, UNRESOL RESONANCE XSEC PROBABILITY TABLES	AI 360		553
F+BAL RS P CT M	\$ ARC-SYSTEM, SYSTEM SUBPROGRAMS AND MODULES	ANL 360		522
F+BAL RS P X T B	\$ HWOCR-SAFE, 2-D MONTE CARLO CELL CALCULATION	AI 360		307
F+BAL RS P XCT B	\$ HAMMER,LITHE,HELP, CRITICAL ANALYSIS SYSTEM	DP 360		277
F+BAL RS P XCT D	\$ PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	ANC 360E		275
F+BAL RSB L CT M	\$ SCORE3, SCISRS ENDF/B GRAPHIC X-SEC EVALUATION	AI 360		375

F+BAL			F+MAP		
F+BAL	RSBP	T D \$ PDQ5, 2-D FEW-GROUP DIFFUSION AND DEPLETION	MIT	3608	336
F+BAL	RSBP	T M \$ SPIRAL, FULL-TEXT STORAGE, SEARCH & RETRIEVAL	SLA	1108	607
F+BAL	RSBP	CT G \$ CONTEMPT-LT/022, PRESSURE-TEMPERATURE RESPONSE	ANC	360	433
F+BAL	RSBPL	CT C \$ ESP, MONTE CARLO REACTOR ANALYSIS CALCULATION	ORNL	360	523
F+BAL	RSBPL	CT C \$ KENC, MONTE CARLO MULTIGROUP CRITICALITY CODE	ORNL	360	450
F+BAL	RSBPL	CT G \$ PARET, WATER-COOLED CORE TRANSIENT ANALYSIS	ANC	360	555
F+C+R	RSBP	T M \$ RALCRTPH, RESOURCE ALLOCATION PROJECT PLANNING	MLMD	360	603
F+CDP	RS P	T P \$ LAG, ASSEMBLER FOR FLOCC2 INSTRUCTION SET	PW	1604	186
F+CDP	RS P	X T B \$ FMC-N, FMC-G, MC NEUTRON, GAMMA-RAY HISTORIES	PW	1604	195
F+COM	RS	T P \$ KAPLPLCT, KAPL CALCOMP PLOTTING ROUTINES	KAPL	6600	456
F+COM	RS	T P \$ MODEL, MODIFIED BETTIS ENVIRNMNTL LIB SCOPE3.2	CDC	6600C	478
F+COM	RS	T P \$ MODEL, MODIFIED BETTIS ENVIRNMNTL LIB SCOPE3.3	CDC	6600D	478
F+COM	RS P	H \$ HYMAS, HYDRODYNAMIC MASS MATRIX GENERATION	BAPL	6600	560
F+COM	RS P	T C \$ KENO2, MONTE CARLO MULTIGROUP CRITICALITY CODE	RFD	6600	450
F+COM	RS P	T I \$ DUZ2, 2-D AXISYMMETRIC & PLANE ELASTIC-PLASTIC	BAPL	6600	503
F+COM	RS P	T I \$ GAPL3, INELASTIC LARGE DEFLECTION STRESS STUDY	BAPL	6600	397
F+COM	RS P	T P \$ LENSDES, NONLINEAR LEAST SQ LENS DESIGN SYSTEM	LASL	6600	602
F+COM	RS P	T Q \$ INDXX, XRAY DIFFRACTION POWDER PATTERN INDEXING	LASL	6600	609
F+COM	RS P	X T B \$ PAX03, HARMONY-PDQ X-SECTION GENERATION CODE	BAPL	6600	426
F+COM	RS P	X T D \$ FARED, 1-D FAST REACTOR DESIGN & SURVEY STUDY	BW	6600	427
F+COM	RS P	X T I \$ MATUS, 3-D FINITE ELEMENT ELASTIC ANALYSIS	BAPL	6600	597
F+COM	RSB	T M \$ DATATRAN, MODULAR PROGRAMMING AND DATA SYSTEM	KAPL	6600	386
F+FAP	RS	T I \$ 4RESTRAINT PIPE STRESS, MAXIMUM MOMENT CALC	AI	7090	109
F+FAP	RS	L T B \$ QUICKIE, INFINITE MEDIUM SPECTRUM X-SECTIONS	AI	7090	119
F+FAP	RS	L T C \$ FAIM, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	AI	7090	120
F+FAP	RS	L T C \$ ULCER, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	AI	7090	118
F+FAP	RS	L T M \$ MOMUS, X-SECTION LIBRARY UTILITY PROGRAM	AI	7094	159
F+FAP	RS P	J \$ WIREX, COMPUTER-PRODUCED WIRING LISTS UHTREX	LASL	7090	315
F+FAP	RS P	I \$ SHOE, SHIELD WEIGHT OPTIMIZATION DOSE CALC	AI	7094	197
F+FAP	RS P	T B \$ EPITHERMOS, SPECTRUM AND X-SECTION CALCULATION	NED	7094	201
F+FAP	RS P	T B \$ RAFFLE, 1ST FLIGHT COLLISION PROBABILITIES MC	ORNL	7090	392
F+FAP	RS P	T B \$ SOPHIST1/2/5, MULTI-GP TRANSFER COEFFICIENTS	LRL	7090	160
F+FAP	RS P	T C \$ EXTERMINATOR, 2-D MULTI-GP DIFFUSION PROGRAM	ORNL	7090	156
F+FAP	RS P	T D \$ ASSAULT, 2-D MULTI-GP DIFFUSION DEPLETION CODE	ORNL	7090	240
F+FAP	RS P	T G \$ AISITE2, PARAMETRIC SITE REQUIREMENT STUDY	AI	7094	172
F+FAP	RS P	T H \$ HEATING2, TRANSIENT STEADY-STATE HEAT TRANSFER	AI	7094	158
F+FAP	RS P	T L \$ DPC, DATA PREPARATION FOR 2-D DESIGN PROGRAMS	LASL	7090	234
F+FAP	RS P	T M \$ DFRS, DATA FILE SERVICE ROUTINES ENDF TAPES	BNL	7090	236
F+FAP	RS PL	T B \$ AILMOE, X-SECTION CALC ELASTIC SCAT RESONANCES	AI	7094	147
F+FAP	RS PL	T B \$ GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV	BNW	7090	185
F+FAP	RS PL	T B \$ GRAVE, GROUP-AVERAGING X-SECTIONS PARAMETERS	AI	7094	162
F+FAP	RS PL	T B \$ TEMPEST2, THERMAL NEUTRON SPECTRUM X-SECTIONS	AI	7090	50
F+FAP	RS PL	T B \$ TYCHE3, MONTE CARLO SLOWING-DOWN DENSITY CALC	AI	7094	149
F+FAP	RS PL	T C \$ AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	AI	7090	29
F+FAP	RS PL	T C \$ CURIE, DOSE, THUNDERHEAD, EXTERNAL+INTERNAL DOSE	AI	7094	196
F+FAP	RS PL	T M \$ ECSIL, EXPERIMENTAL NEUTRON DATA LIBRARY	LRL	7094	351
F+FAP	RSB	T A \$ TUZ, UNRESOLVED REGION RESONANCE INTEGRAL CALC	GGA	7090	42
F+FAP	RSB	T A \$ ZUT, RESOLVED REGION RESONANCE INTEGRAL CALC	GGA	7090	41
F+FAP	RSBP	T D \$ DOB, 2-D FEW-GP DIFFUSION BURNUP RZ GEOMETRY	GGA	7090	99
F+FAP	RSBP	T Q \$ CASCADE, CLUSTER, RADIATION DAMAGE IN METALS	GEC	635	419
F+FAP	RSBPL	T C \$ CRAM, 1-D AND 2-D MULTI-GP DIFFUSION PROGRAM	UK-R	7090	103
F+FAP	RSBPL	T N \$ CPS, SC4020 PLOTS FROM SCISRS X-SECTION TAPES	WANL	7094	239
F+FAP	RSBPLX	T B \$ AGN-GAM, FAST SPECTRUM MULTI-GP CONSTANT CALC	AGC	7090	204
F+GMP	RS	T P \$ GENED ENVIRONMENTAL ROUTINES, SUBROUTINE LIB.	NED	635	515
F+GMP	RS P	T D \$ SYN, 2D SYNTHESIS MULTIGP DIFF & 1GP DEPLETION	NED	635	495
F+GMP	RS P	XCT B \$ ENDRUN2, MULTIGROUP CONSTANTS FROM ENDF/B DATA	GESV	635	501
F+GMP	RS P	XCT L \$ TDOWN, SPATIAL & COMPOSITION-DEPENDENT X-SECS	GESV	635	505
F+GMP	RSBP	T H \$ THTE, 3-D TRANSIENT HEAT TRANSFER PROGRAM	GEC	635	346
F+MAP	RS P	A \$ CHAD, LEGENDRE COEF CALC FOR ANGULAR DIST DATA	AI	7094	215
F+MAP	RS P	A \$ COMBCO, COMBINED B-W MULTI-LEVEL CONVOLUTION	PPCO	7040	203
F+MAP	RS P	T B \$ GAROL, RESONANCE OVERLAP AND LATTICE EFFECTS	GGA	7044	219
F+MAP	RS P	T B \$ GAROL, RESONANCE OVERLAP AND LATTICE EFFECTS	LER	7094	219
F+MAP	RS P	T C \$ DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	BC	625	209
F+MAP	RS P	T C \$ TDSN, 2-D MULTIGROUP DISCRETE ORDINATE PROGRAM	LER	7090	312

F+MAP

FEW-GP

F+MAP RS P	T D	\$ OPUS, POWER PLANT PERFORMANCE AND PRICE STUDY	GGA	7044	226			
F+MAP RS P	T E	\$ AIROS, SPACE-INDEPENDENT KINETICS W/FEEDBACK	AI	7094	163			
F+MAP RS P	T F	\$ TSN, SPATIALLY-DEPENDENT REACTOR KINETICS	AI	7094	309			
F+MAP RS P	T H	\$ BLOOST5, POINT-KINETICS WITH 2-D HEAT TRANSFER	GGA	7044	205			
F+MAP RS P	T H	\$ TOODEE, 2-D TIME-DEPENDENT HEAT CONDUCTION	PPCC	7044	349			
F+MAP RS PLX	T A	\$ TRIX1, RESONANCE INTEGRAL X-SECTION CALC	AI	7094	208			
F+MAP RS PLX	T B	\$ LASER, SPECTRUM CALC WITH BURNUP CYL LATTICE	WAPD	7094	249			
F+MAP RSBP	M	\$ UNPACK, RETRIEVAL FROM SCISRS X-SECTION TAPE	GGA	7044	206			
F+MAP RSBP	T C	\$ GAMBLE4, 2-D MULTI-GP DIFFUSION XY RZ GEOMETRY	GGA	7044	222			
F+MAP RSBP	T G	\$ SATURATED BLOWDOWN2, BLOWDOWN ANALYSIS LOFT	KE	7094	200			
F+P+A RS	T P	\$ AMDLIBAE, ARGONNE SUBROUTINE LIBRARY CAT. A-E	ANL	360	562			
F+P+A RS	T P	\$ AMDLIBGZ, ARGONNE SUBROUTINE LIBRARY CAT. G-Z	ANL	360	564			
F+SL RS P	XCT R	\$ HERMES, REGIONAL RADIOLOGICAL EFFECTS ANALYSIS	HEDL	1108	527			
F+SPS RSBP	T N	\$ CROSSPLOT, SC4020 PLOTS FROM X-SECTION TAPES	GGA	7044	207			
FACTOR CALC	BAPL 6600	F+ASC RS P	T J	\$ ASPIS, GAMMA RAY SOURCE BUILDUP	429			
FACTOR CALC FOR CYLINDRICAL PINS	ANC	360 F4	RSBP	CT J	\$ VIEWPIN, VIEW	569		
FACTOR SHIELDING CODE	CAVITY GEOM	GGA 1108	F4	RS P	T J	\$ MUSCAT, VIEW	259	
FACTORS	CRNL 360	F4	RS P	T A	\$ ATHENA4, INELASTIC SCATTERING FORM	417		
FAILURE MODE	BAPL 6600	F4	RS P	P	\$ RFL01, RELIABILITY FOR A SINGLE	457		
FAIM, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	AI	7090	F+FAP RS	L	T C	\$	120	
FAIM, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	CDC	1604	F63	PS	PLX	T C	\$	120
FAIMOS, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE BHSC	360 F4	RS P	T C	\$				120
FAP RS P	T H	\$ RATH, 2- OR 3-D HEAT CONDUCTION LUMPED MASS	LASL	7094	242			
FAP RSBP	X T Q	\$ SPECTRA, MC CALCULATION IRRADIATED MATERIAL	GFC	7090	422			
FARED, 1-D FAST REACTOR DESIGN & SURVEY STUDY	BW	6600	F+CCM RS	P X	T D	\$	427	
FARSEIA, DCSE RATE FROM SNAP SHIELD LEAKAGE	AI	7090	F2	RS	J	\$	91	
FAST + INTERMEDIATE POWER TRANSIENTS	BAPL 6600	F4	RS P	T H	\$ CHIC-KIN,	473		
FAST BREEDERS	NED	635 F4	RS P	D	\$ RAFP, FUEL CYCLE PARAMETERS	372		
FAST NEUTRON POLARIZATION EXPERIMENT	UCND	360P	F+BAL RS	P	O	\$ PMS1,	469	
FAST NEUTRON SPECTRUM X-SECTION CALC	AI	7090	F2	RS	PL	T R	\$ FORM,	51
FAST NEUTRON SPECTRUM X-SECTION CALC	ANL	3600	F63	RS	LX	T R	\$ GAM1,	33
FAST NEUTRON SPECTRUM X-SECTION CALC	CDC	1604	F63	RS	PL	T B	\$ FORM,	51
FAST NEUTRON SPECTRUM X-SECTION CALC	CDC	1604	F63	PS	PLX	T B	\$ GAM1,	33
FAST NEUTRON SPECTRUM X-SECTION CALC	GGA	7090	F2	PS	PLX	T B	\$ GAM1,	33
FAST NEUTRON SPECTRUM X-SECTION CALC	OSUC	370	F4	RS	PLXCT	R	\$ FORM,	51
FAST REACTOR CORE ACCIDENT ANALYSIS	NED	635 F4	RS P	T G	\$ FFEADM1,	479		
FAST REACTOR DESIGN & SURVEY STUDY	BW	6600	F+CCM RS	P X	T D	\$ FARED, 1-D	427	
FAST REACTOR EXCURSION CALCULATIONS	NED	2000	F4	FS	P	T F	\$ FORE,	174
FAST REACTOR EXCURSION CALCULATIONS	ANL	360	F4	RS	P X	T F	\$ FORE2,	174
FAST REACTOR EXCURSION CALCULATIONS	NED	635 F4	RS	P X	T F	\$ FORE2,	174	
FAST REACTOR FUEL BURNUP & MANAGEMENT	NED	635 F4	RS P	T D	\$ FUMBLE,	480		
FAST REACTOR FUEL ELEMENT BEHAVIOR	ANL	360	F4	RS	P	T I	\$ LIFE1,	460
FAST REACTOR POWER AND FLOW TRANSIENTS	ANL	360	F4	RS	P	T F	\$ SAS1A,	400
FAST REACTOR POWER AND FLOW TRANSIENTS	ANL	6600	F4	PS	P	T F	\$ SAS1A,	400
FAST REACTOR X-SEC CALC BNW	1108 F4	RS P	T R	\$ FCC4, FUNDAMENTAL MODE	306			
FAST SPECTRA CALC	ANC	360 F4	RS	PLXCT	B	\$ PHROG, MULTI-GP CONSTANT &	520	
FAST SPECTRUM MULTI-GP CONSTANT CALC	AGC	7090	F+FAP RSBPLX	T R	\$ AGN-GAM,	204		
FAST THERMAL SPECTRA	GGA	1108 F4	RS	PLX	T B	\$ GGC4, MULTI-GP X-SECTIONS	298	
FAST THERMAL SPECTRA	GGA	6600 F4	RS	L	T B	\$ GGC4, MULTI-GP X-SECTIONS	298	
FAST X-SECTION GENERATION	BNW	1108 F4	RS	P X	T R	\$ 1DX, 1-D DIFFUSION	374	
FATIGUE	KAPL 6600	F4	RS	I	\$ SORSDB, PRESSURE VESSEL STRESS AND	391		
FAU, RADIO FREQUENCY MANAGEMENT SYSTEM	ALDO	360	COBOL	RS P	M	\$ AFC-ALO	587	
FAULT TREE EVALUATION CODES	ANC	360 F4	RSBP	CT K	\$ PPEP,KITT, SYSTEM	528		
FAULT TREE EVALUATION CODES	ANC	1108 F4	RS P	T K	\$ PREP,KITT, SYSTEM	528		
FCC4, FUNDAMENTAL MODE FAST REACTOR X-SEC CALC	BNW	1108 F4	RS P	T B	\$	306		
FEEDBACK	BAPL 6600	F4	RS P	T F	\$ NCWIG, 1-D 2-GP KINETICS TEMPERATURE	371		
FEEDBACK	BAPL 6600	F4	RS P	T F	\$ TWIGL, 2-D 2-GP SPACE-TIME DIFFUSION	338		
FEEDBACK	BNL	6600 F4	RS P	T F	\$ NOAA, 1-D ONE-GP SPACE-TIME DIFFUSION	405		
FEEDBACK	GGA	1108 F4	RS P	T F	\$ GAKIT, 1-D MULTIGP KINETICS WITH TEMP	370		
FEVER, 1-D FEW-GP DIFFUSION DEPLETION PROGRAM	GGA	7090	F2	RSB	T D	\$	117	
FEVER7, 1-D MULTIGROUP DIFFUSION AND DEPLETION	GGA	1108 F4	RS P	T D	\$	318		
FEW-GP DIFFUSION BURNUP RZ GEOMETRY	GGA	7090	F+FAP RSBP	T D	\$ DOB, 2-D	99		
FEW-GP DIFFUSION CALC HEX-Z MESH	GGA	1108 F4	RS P	T C	\$ GATT, 3-D	380		
FEW-GP DIFFUSION DEPLETION	ANC	360F	F+BAL RS	P	XCT D	\$ PDQ7, 1,2 CR 3-D	275	

FEW-GP

FLOCO

FEW-GP	DIFFUSION	DEPLETION	BAPL	6600A	F+ASC	RS	P	T	D	\$	PDQ7, 1,2 OR 3-D	275		
FEW-GP	DIFFUSION	DEPLETION	BAPL	6600C	F+ASC	RS	P	T	D	\$	PDQ7, 1,2 OR 3-D	275		
FEW-GP	DIFFUSION	DEPLETION	BCS	6600D	F+ASC	R	B	T	D	\$	PDQ7, 1,2 OR 3-D	275		
FEW-GP	DIFFUSION	DEPLETION	BW	6600B	F+ASC	RS	P	T	D	\$	PDQ7, 1,2 OR 3-D	275		
FEW-GP	DIFFUSION	DEPLETION	GGA	7044	F4	RS	P	T	D	\$	RELCAD-FEVER, 1-D	221		
FEW-GP	DIFFUSION	DEPLETION	PROGRAM	ANC	360	F4	RSBP	CT	C	\$	DWARF, 1-D	579		
FEW-GP	DIFFUSION	DEPLETION	PROGRAM	GGA	7090	F2	RSB	T	D	\$	FEVER, 1-D	117		
FEW-GP	DIFFUSION	DESIGN	SYSTEM	AI	360	F4	RSBP	T	K	\$	THREDES, 1-D	273		
FEW-GP	DIFFUSION	POWER	DIST SEARCH	GGA	7044	F4	RS	P	T	C	\$	GASP2, 1-D	220	
FEW-GP	DIFFUSION	SLAB	CYLINDER SPHERE	AI	7090	F2	RS	P	T	C	\$	FCG, 1-D	28	
FEW-GP	DIFFUSION	SLAB	CYLINDER SPHERE	BC	625	F4	RS	T	C	\$	FOG, 1-D	28		
FEW-GP	DIFFUSION	SLAB	CYLINDER SPHERE	CDC	1604	F63	RS	P	T	C	\$	FOG, 1-D	28	
FEW-GP	DIFFUSION	TEMP	COEF CALC	GGA	7044	F4	RS	P	T	C	\$	TEMCO, 1-D	225	
FEW-GP	DISCRETE	ORDINATES	SLAB	GEOMETRY	EAPL	6600	F4	RS	P	T	C	\$	BE21, 358	
FEW-GP	HEX	GEOM	DIFFUSION	DEPLETION	GGA	1108	F4	RS	P	T	C	\$	GAUGE, 2-D	339
FEW-GP	SN	APPROXIMATION	CYLINDER	PPCO	7040	F4	RS	P	T	C	\$	TOPIC, 1-D	148	
FEW-GP	SN	APPROXIMATION	CYLINDER	PPCC	7090	F2	RS	P	T	C	\$	TOPIC, 1-D	148	
FEW-GP	SN	DOUBLE	SN APPROX	SLAB	GEOM	PPCO	7090	F2	RS	P	C	\$	MIST, 1-D	59
FEW-GP	S4	APPROXIMATION	RZ	GEOMETRY	LRL	709	F2	RS	C	\$	FIRN, 2-D	7		
FEW-GROUP	DIFFUSION	AND	DEPLETION	IBM	360A	F+BAL	RS	P	T	D	\$	PDQ5, 2-D	336	
FEW-GROUP	DIFFUSION	AND	DEPLETION	MIT	360B	F+BAL	RSBP	T	D	\$	PDQ5, 2-D	336		
FEW-GROUP	DIFFUSION	SLAB	CYLINDER	CDC	1604	F63	RS	P	T	C	\$	20GRAND, 2-D	40	
FEW-GROUP	DIFFUSION	SLAB	CYLINDER	ORNL	7090	F2	RS	P	T	C	\$	20GRAND, 2-D	40	
FEW-GROUP	SPACE-TIME	KINETICS	BCL	6400	F4	RS	P	T	F	\$	ADEP, 1D AND 2D	494		
FFEARs,	LAPLACE	EQUATION	ISOTROPIC	DIELECTRICS	SLA	6600	F4	RS	P	V	\$	577		
FIGRO,	LWBR	FUEL	SWELLING	TEMPERATURE	STUDY	BAPL	6600	F4	RS	P	T	H	\$	272
FIGS,	IBM360&2250	FORTTRAN	GRAPHICS	SUBROUTINES	AI	360	F+BAL	RS	T	P	\$	484		
FILE	SERVICE	ROUTINES	ENDF	TAPES	BNL	7090	F+FAP	RS	P	T	M	\$	DFSR, DATA	236
FINDING	RCCTS	OF	A	POLYNOMIAL	KAPL	6600	F4	RS	P	P	\$	ROPE, 444		
FINE-GP	CONSTANTS	GENERATION	ORNL	360	F4	RS	P	T	B	\$	SUPERTO, ENDF/B	431		
FINEL,	FINITE-ELEMENT	STUDY	2,3-D	STRUCTURES	KAPL	6600	F4	RS	P	X	I	\$	404	
FINITE	ELEMENT	ELASTIC	ANALYSIS	BAPL	6600	F+CCM	RS	P	X	T	I	\$	MATUS, 3-D	557
FINITE-ELEMENT	GESV	635	F4	RS	P	CT	I	\$	BEHAVE2, CXIDE	FUEL	PERFORMANCE	568		
FINITE-ELEMENT	STUDY	2,3-D	STRUCTURES	KAPL	6600	F4	RS	P	X	I	\$	FINEL, 404		
FINS	SNAP	GEOM	AI	7090	F2	RS	J	\$	SCARF2, SCATTER	FROM	RADIATOR	110		
FIRE	1- & 2-CELL	ANALYSIS	AI	360	F4	RS	P	T	G	\$	SOFIRE2, SODIUM	POOL	559	
FIRE5,	1-D	AGE-DIFFUSION	SLAB	CYLINDER SPHERE	AFB	360	F4	RS	L	T	C	\$	9	
FIRN,	2-D	FEW-GP	S4	APPROXIMATION	PZ	GEOMETRY	LRL	709	F2	RS	C	\$	7	
FISSILE	NUCLIDE	DATA	BAPL	6600	F4	RS	P	T	P	\$	DAFT1, LEAST	SQUARES	327	
FISSILE	NUCLIDE	X-SECTION	EVALUATION	ORNL	7090	F4	RSBP	A	\$	MUFFLE, 323				
FISSION	PRODUCT	BAPL	6600	F4	RS	P	D	\$	CINDER, M0102, PCINT	DEPLETION	313			
FISSION	PRODUCT	DP	360	F+BAL	RS	P	T	D	\$	CINDER, M0102, POINT	DEPLETION	313		
FISSION	PRODUCT	ACTIVITY	DIST	STUDY	GGA	7044	F4	RS	P	C	\$	RAD2, HTGR	231	
FISSION	PRODUCT	FUEL	MODEL	ANC	360	F4	RSBP	CT	I	\$	FPFM, STEADY-STATE	584		
FISSION	PRODUCT	RELEASE	ANALYSIS	BCL	6400	F4	RS	P	G	\$	FRCRL2, LOCA	500		
FISSION	PRODUCT	RELEASE	GGA	1108	F4	RS	P	D	\$	FREVAP6, HTGR	METALLIC	301		
FIT	FISSILE	NUCLIDE	DATA	BAPL	6600	F4	RS	P	T	P	\$	DAFT1, LEAST	SQUARES	327
FIT	SUM	OF	EXPONENTIALS	MIT	7090	F2	RS	P	P	\$	FRANTIC, LEAST	SQUARES	324	
FITTING	LASL	7094	F4	RS	T	P	\$	LASL	LEAST	SQUARES, GENERAL	CURVE	62		
FITTING	BAPL	6600	F4	RS	P	T	P	\$	M0661, M0657, M0626, POLYNOMIAL	CURVE	411			
FITTING	KAPL	6600	F4	RS	P	A	\$	CLEM, ANGULAR	DISTRIBUTION	LEGENDRE	531			
FITTING	EXPERIMENTAL	DATA	POINTS	KAPL	6600	F+ASC	RS	P	T	P	\$	CURFIT, CURVE	43	
FLAC,	STEADY-STATE	FLOW,	PRESSURE	DISTRIBUTION	GGA	1108	F5	RS	P	H	\$	355		
FLANGE1,	SCATTERING	LAW	X-SECTION	CALCULATION	GGA	1108	F5	RS	P	A	\$	247		
FLANGE2(71-1),	ENDF/B	THERMAL	SCATTERING	DATA	DP	360	F4	RS	P	XCT	A	\$	368	
FLARE,	3-D	REACTIVITY	AND	POWER	DISTRIBUTION	CDC	3600	F63	RSBP	T	C	\$	167	
FLARE,	3-D	REACTIVITY	AND	POWER	DISTRIBUTION	MSS	360	F4	RS	P	CT	C	\$	167
FLARE,	3-D	REACTIVITY	AND	POWER	DISTRIBUTION	NED	635	F4	RS	P	T	C	\$	167
FLASH3,	LOSS-OF-COOLANT	ACCIDENT	ANALYSIS	BAPL	6600	F4	RS	P	T	G	\$	295		
FLASH4,	FULLY-IMPLICIT	TRANSIENT	SIMULATION	BAPL	6600	F4	RS	P	T	G	\$	448		
FLAT,	RESONANCE	ABSORPTION,	CELL	ANL	3600	F36	RSBP	X	T	B	\$	RABBLE, WLIB,	281	
FLIGHT	COLLISION	PROBABILITIES	MC	ORNL	360	F+BAL	RS	P	T	B	\$	RAFFLE, 1ST	392	
FLIGHT	COLLISION	PROBABILITIES	MC	CPNL	7090	F+FAP	RS	P	T	B	\$	RAFFLE, 1ST	392	
FLOCO	RS	P	B	\$	MCS, MONTE	CARLO	NEUTRON	PENETRATION	STUDY	LASL	7090	202		

FLOCT

FREVP6

FLOCC RS P	B \$ ZOT, GROUP-COLLAPSING OF MULTI-GP X-SECTIONS	LASL 7090	113
FLOCD RSBP	C \$ 2DXY, 2-D MULTI-GP SN APPROXIMATION XY GEOM	AGC 7090	18
FLOCC RSBP	T C \$ GE-HAPO-S13, 1-D MULTI-GP DOUBLE SN APPROX	BNW 7090	75
FLOCC2 INSTRUCTION SET	PW 1604 F+CDP RS P T P \$ LAG, ASSEMBLER FOR		186
FLOT1,MO219, PWR FLOW TRANSIENT ANALYSIS	BAPL 6600 F4 RS P T H \$		331
FLCW AI 7094 F2 RS P H \$ FLOW-MODEL, MULTI-CHANNEL 2-D 2-PHASE			246
FLOW MSS 360 F4 RS P H \$ FLOW-MODEL, MULTI-CHANNEL 2-D 2-PHASE			246
FLOW AND HEAT TRANSFER AI 7094 F2 RS P T G \$ TRANS-FLGLE1, TRANSIENT			268
FLOW DIST. IN CYL COOLANT INLET PLENUM DP 360 F4 RS P H \$ PLENUM,			586
FLOW EXPERIMENT ANALYSIS AGC 7090 F2 RS P C \$ CROC90, ML-1 FLUID			154
FLOW IN LMFBR ROD BUNDLE NED 635 F4 RS P T H \$ VELVET2, TURBULENT			458
FLOW STEAM GGA 1108 F4 RS P T F \$ DYNAM, DYNAMIC ANALYSIS BOILING			440
FLOW STUDY STEAM-WATER MIX KAPL 6600 F4 RS P H \$ RAPP, HIGH-VFLOCITY			382
FLOW TRANSIENT ANALYSIS BAPL 6600 F4 RS P T H \$ FLOT1,MO219, PWR			331
FLOW TRANSIENTS ANL 360 F4 RS P T F \$ SASIA, FAST REACTOR POWER AND			400
FLOW TRANSIENTS ANL 6600 F4 RS P T F \$ SASIA, FAST REACTOR POWER AND			400
FLOW-MODEL, MULTI-CHANNEL 2-D 2-PHASE FLCW AI 7094 F2 RS P H \$			246
FLOW-MODEL, MULTI-CHANNEL 2-D 2-PHASE FLOW MSS 360 F4 RS P H \$			246
FLCW, PRESSURE DISTRIBUTION GGA 1108 F5 RS P H \$ FLAC, STEADY-STATE			395
FLUCTUATION EXPERIMENT ANALYSIS BAPL 6600 F4 RS P T D \$ JITER,			394
FLUCTUATION EXPERIMENT ANALYSIS BAPL 6600 F4 RS P T C \$ REDUX, REACTOR			425
FLUID FLOW EXPERIMENT ANALYSIS AGC 7090 F2 RS P D \$ CROC90, ML-1			154
FLUX DIST IN MULTI-PIN FUEL ELEMENT AGC 7090 F2 RS P B \$ POUNCE,			237
FLUX INPUT PW 1604 F63 RS C \$ TDP, 2-D PERTURBATION TDC CR 2DXY			199
FLUX SETS GESV H600 F4 RS P CT C \$ TRIAL, 3-D REACTION RATES FROM 2-D			585
FLUX SYNTHESIS PROGRAM CYL PW 1604 F63 RS T C \$ 2DXYL, 3-D MULTI-GP			192
FLUX-DESMETER ACTIVITY RELATION GEC 635 F4 RSBP D \$ DOS, NEUTRON			423
FLUX-WEIGHTING OF DTF4 CROSS SECTIONS LASL 6600 F4 RS P N \$ LARCA,			409
FLUX, X-SEC CALC ORNL 360 F+BAL RS P D \$ ISOSEARCH, ISOTOPE PRODUCTION			322
FLUX, X-SEC CALC ORNL 1604 F63 RS P D \$ ISOSEARCH, ISOTOPE PRODUCTION			322
FLUXES LASL 6600 F4 RS P N \$ DAC1, SN PERTURBATION CODE USING DTF4			455
FMC-G, MC NEUTRON, GAMMA-RAY HISTORIES PW 1604 F+CDP RS P X T B \$ FMC-N,			195
FMC-N, MONTE CARLO CALC NEUTRON HISTORIES GGA 7044 F4 RS P T B \$			195
FMC-N,FMC-G, MC NEUTRON, GAMMA-RAY HISTORIES PW 1604 F+CDP RS P X T B \$			195
FOG CODES AI 7090 F2 RS C \$ PERT, 1-D PERTURBATION FOR AIM AND			30
FOG CODES BHSC 360 F4 RS P C \$ PERT, 1-D PERTURBATION FOR AIM AND			30
FOG CODES CDC 1604 F63 RS C \$ PERT, 1-D PERTURBATION FOR AIM AND			30
FOG, 1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE AI 7090 F2 RS P T C \$			28
FOG, 1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE BC 625 F4 RS T C \$			28
FOG, 1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE CDC 1604 F63 RS P T C \$			28
FORE, FAST REACTOR EXCURSION CALCULATIONS NED 2000 F4 RS P T F \$			174
FORE2, FAST REACTOR EXCURSION CALCULATIONS ANL 360 F4 RS P X T F \$			174
FORE2, FAST REACTOR EXCURSION CALCULATIONS NED 635 F4 RS P X T F \$			174
FORM FACTORS ORNL 360 F4 RS P T A \$ ATHENA4, INELASTIC SCATTERING			417
FORM CR THREDES LIBRARY UTILITY ROUTINE AI 360 F4 RSB L T M \$ CLIP,			271
FORM SHEET DP PACKAGE KAPL 6600 F+ASC RS P T P \$ DOGGY, DESK CALCULATOR			428
FORM, FAST NEUTRON SPECTRUM X-SECTION CALC AI 7090 F2 RS PL T B \$			51
FORM, FAST NEUTRON SPECTRUM X-SECTION CALC CDC 1604 F63 RS PL T B \$			51
FORM, FAST NEUTRON SPECTRUM X-SECTION CALC QSUC 370 F4 RS PLXCT B \$			51
FORMAT TO MUFT FORMAT X-SECTIONS WAPD 6600 F4 RS P T B \$ ETOM1, ENDF/B			436
FORMAT WAPD 6600 F4 RS PL T B \$ ETOG1, ENDF/B TO MUFT, GAM, ANISN X-SEC			437
FORMAT WAPD 7600 F4 RS P T B \$ ETOG3, ENDF/B TO MUFT, GAM, ANISN X-SEC			538
FORMAT X-SECTIONS WAPD 6600 F4 RS P T B \$ ETOM1, ENDF/B FORMAT TO MUFT			436
FORSIM, SOLN OF SYSTEM OF ORDINARY DIFF ECNS CRNL 6600 F4 RS P P \$			514
FORTRAN GRAPHICS SUBROUTINES AI 360 F+BAL RS T P \$ FIGS, IBM360&2250			484
FORTRAN TDC, 2-D MULTI-GP SN APPROXIMATION RZ PW 1604 F63 RS P T C \$			161
FPFM, STEADY-STATE FISSION PRODUCT FUEL MODEL ANC 360 F4 RSBP CT I \$			584
FRANTIC, LEAST SQUARES FIT SUM OF EXPONENTIALS MIT 7090 F2 RS P P \$			324
FRCL2, LOCA FISSION PRODUCT RELEASE ANALYSIS BCL 6400 F4 RS P G \$			500
FREADM1, FAST REACTOR CORE ACCIDENT ANALYSIS NED 635 F4 RS P T G \$			479
FREE-FORMAT CARD INPUT PROCESSOR LASL 360 F4 RS P L \$ GENRD,			530
FREE-FORMAT CARD INPUT PROCESSOR LASL 6600 F4 RS P L \$ GENRD,			530
FREQUENCY MANAGEMENT SYSTEM ALOO 360 COBOL RS P M \$ AEC-ALO FAU, RADIO			587
FREVAP6, HTGR METALLIC FISSION PRODUCT RELEASE GGA 1108 F4 RS P D \$			301

FSDP3

F2

FSDP3, POINTWISE XSECS. FROM B-W PARAMETERS	GGA	1108	F5	RS P	CT A	\$	216
FUEL BURNUP & MANAGEMENT NED	635	F4	RS P	T D	\$ FUMBLE, FAST REACTOR		480
FUEL CYCLE ANALYSIS PARTIAL REFUEL	GGA	7044	F4	RS P	T D	\$ GARGOYLE,	260
FUEL CYCLE ANALYSIS W/REFUELING	GGA	7044	F4	RS P	T D	\$ REVISED-GAD,	223
FUEL CYCLE CALCULATION	GGA	1108	F4	S	T D	\$ GAFFE, EQUILIBRIUM	302
FUEL CYCLE COST ANALYSIS	AI	7090	F2	RS P	D	\$ AIMFIRE, URANIUM	55
FUEL CYCLE COST AND ECONOMICS CWF	360	F4	RS P	T D	\$ CINCAS, NUCLEAR		354
FUEL CYCLE COST AND ECONOMICS WAPD	6600	F4	PS P	T D	\$ CINCAS, NUCLEAR		354
FUEL CYCLE COST CALCULATION	GGA	1108	F4	RS P	T D	\$ PW COST, REACTOR	441
FUEL CYCLE COSTS PERFORMANCE DATA	KE	7090	F2	RSBP	D	\$ NPRFCCP,	146
FUEL CYCLE COSTS PERFORMANCE DATA	UEC	6600	F4	RS P	D	\$ NPRFCCP,	146
FUEL CYCLE COSTS PERFORMANCE STUDY	GGA	7044	F4	RS P	D	\$ WAMPUM,	224
FUEL CYCLE COSTS PERFORMANCE STUDY	UEC	6600	F4	RS P	D	\$ WAMPUM,	224
FUEL CYCLE ECONOMICS UICS	360	F4	RS P	CT D	\$ GFM, ANALYSIS OF NUCLEAR		576
FUEL CYCLE PARAMETERS FAST BREEDERS	NED	635	F4	RS P	D	\$ RAPFU,	372
FUEL ELEMENT	BAPL	6600	F4	RS	T I	\$ CYGRO2, STRESS ANALYSIS CYL	266
FUEL ELEMENT	AGC	7090	F2	RS P	B	\$ BOUNCE, FLUX DIST IN MULTI-PIN	237
FUEL ELEMENT ANALYSIS	BAPL	6600	F4	RS P	T H	\$ GLUB1, WATER-LOGGED	424
FUEL ELEMENT BEHAVIOR	ANL	360	F4	RS P	T I	\$ LIFE1, FAST REACTOR	460
FUEL ELEMENT HEAT TRANSFER CALC	ANC	360	F4	RSBP	XCT H	\$ MOXY, BWR	551
FUEL ELEMENT HEAT TRANSFER CALC	ANC	1108	F4	RS P	T H	\$ MCXY, BWR	551
FUEL ELEMENT LIFETIME ANALYSIS	ANL	3600	F36	RSBP	I	\$ SWELL2,	353
FUEL ELEMENT STRESS ANALYSIS STUDY	GGA	7044	F4	RS P	T G	\$ ELBOW,	229
FUEL ELEMENTS AEB	360	F4	RS P	B	\$ WELWING, MATERIAL BUCKLING CYL		362
FUEL MODEL ANC	360	F4	RSBP	CT I	\$ FPFM, STEADY-STATE FISSION PRODUCT		584
FUEL PELLETT TEMPERATURE & DEFORMATION	BAPL	6600	F4	RS P	T I	\$ PELEN,	598
FUEL PERFORMANCE FINITE-ELEMENT GFSV	635	F4	RS P	CT I	\$ BFHAVE2, CXIDE		568
FUEL ROD CLAD STRAIN & PELLETT CRACKING	BAPL	6600	F4	RS P	I	\$ STRIPE,	570
FUEL ROD STRESS & DEFORMATION	BAPL	6600	F4	RS P	T I	\$ CYGRO3, CXIDE	449
FUEL ROD THERMAL RESPONSE LOCA	ANC	360	F4	RSBP	X T G	\$ THETA1-B,	512
FUEL SWELLING & GAS RELEASE SIMULATION	BAPL	6600	F4	RS P	T I	\$ RUBL1,	468
FUEL SWELLING TEMPERATURE STUDY	BAPL	6600	F4	RS P	T H	\$ FIGRO, LWBR	272
FUEL TEMPERATURE CODE	GGA	7044	F4	RS	I	\$ CORE, CORE CONFIGURATION	233
FUEL TUBE BUNDLES LASL	7094	F2	RSBP	H	\$ AXFLU, HEAT TRANSFER MOLTEN		182
FUEL TUBE BUNDLES LASL	7094	F2	RSBP	H	\$ AXTHRM, HEAT TRANSFER SOLID		183
FUGIT, DYNAMIC RESPONSE OF ELASTIC STRUCTURES	BAPL	6600	F4	PS P	T I	\$	537
FUGUE, STEADY-STATE TEMPERATURE VOID FRACTION	AI	7090	F2	RS	I	\$	48
FULL-TEXT STORAGE, SEARCH & RETRIEVAL	SLA	1108	F+BAL	RSBP	T M	\$ SPIRAL,	607
FULLY-IMPLICIT TRANSIENT SIMULATION	BAPL	6600	F4	RS P	T G	\$ FLASH4,	448
FUMBLE, FAST REACTOR FUEL BURNUP & MANAGEMENT	NED	635	F4	RS P	T D	\$	480
FUNDAMENTAL MODE FAST REACTOR X-SEC CALC	BNW	1108	F4	RS P	T B	\$ FCC4,	306
FUNPACK, SPECIAL FUNCTION ROUTINES-EI,K,E,....	ANL	360	F4	RS P	X T P	\$	610
FUNPACK, SPECIAL FUNCTION ROUTINES-EI,K,E,....	ANL	1108	F5	RS P	X T P	\$	610
FUNPACK, SPECIAL FUNCTION ROUTINES-EI,K,E,....	ANL	6600	F4	RS P	X T P	\$	610
FUSION REACTOR STUDY	ANL	360	F4	RS P	X	\$ TOKMINA/TOKMINA2, TOKAMAK	561
F2 RS	A	\$ LYNNE, WOODS-SAXON POTENTIAL SHAPE CALCULATION	ORNL	7090			381
F2 RS	B	\$ DANCOFF JR, MODERATOR SPACE CHORD DIST FUNCT	AEG	7090			150
F2 RS	B	\$ S4 CYL CELL CODE, 1-D 1-GP S4 APPROXIMATION	AI	7090			53
F2 RS	C	\$ FIRN, 2-D FEW-GP S4 APPROXIMATION RZ GEOMETRY	LRL	709			7
F2 RS	C	\$ PERT, 1-D PERTURBATION FOR AIM AND FOG CODES	AI	7090			30
F2 RS	E	\$ AIREK3, SPACE-INDEPENDENT KINETICS W/FEEDBACK	AI	7090			121
F2 RS	E	\$ SNAPKIN5/5A, 1-REGION KINETICS SNAP GEOMETRY	AI	7090			122
F2 RS	I	\$ CROCK, SPACE POWER PLANT DESIGN OPTIMIZATION	AI	7090			112
F2 RS	I	\$ FUGUE, STEADY-STATE TEMPERATURE VOID FRACTION	AI	7090			48
F2 RS	I	\$ SHOCK, SPACE POWER PLANT DESIGN OPTIMIZATION	AI	7090			114
F2 RS	J	\$ FARSE1A, DOSE RATE FROM SNAP SHIELD LEAKAGE	AI	7090			91
F2 RS	J	\$ MORTIMER, DOSE RATE CALCULATION SNAP GEOMETRY	AI	7090			142
F2 RS	J	\$ SCARF2, SCATTER FROM RADIATOR FINS SNAP GEOM	AI	7090			110
F2 RS	J	\$ SCAR1, SCATTER FROM A RING SNAP GEOMETRY	AI	7090			111
F2 RS	N	\$ WED, W-DSN OUTPUT TAPE EDIT REACTION RATES	UK-W	7090			133
F2 RS	T	\$ SUMMIT, CRYSTALLINE SCATTERING KERNEL CALC	GGA	7090			56
F2 RS L	T	\$ SIZZLE, 1-D MULTIGROUP DIFFUSION DEPLETION	AI	7090			58
F2 RS P	A	\$ DOPIE, RESOLVED RESONANCE X-SECTION CALC	NED	2000			177
F2 RS P	A	\$ EXT, X-SECTIONS FROM B-W RESONANCE PARAMETERS	WANL	7094			238

F2

F4

F2	RS P	A	\$ RAPTURE, RESONANCE INTEGRAL X-SECTION CALC	NEC	2000	176
F2	RS P	B	\$ BAM, S4 CYL CELL CODE AND TEMPEST COMBINATION	AI	7090	108
F2	RS P	B	\$ BOUNCE, FLUX DIST IN MULTI-PIN FUEL ELEMENT	ACC	7090	237
F2	RS P	B	\$ SAIL, 1-D 1-GP SN APPROXIMATION SLAB GEOMETRY	AI	7090	52
F2	RS P	B	\$ SPARTA, SPATIALLY-AVERAGED DOPPLER EFFECTS	NED	2000	178
F2	RS P	C	\$ MIST, 1-D FEW-GP SN DOUBLE SN APPROX SLAB GEOM	PPCO	7090	59
F2	RS P	D	\$ AIMFIRE, URANIUM FUEL CYCLE COST ANALYSIS	AI	7090	55
F2	RS P	F	\$ CONEC, COUPLED NEUTRONICS-HYDRODYNAMICS SPHERE	LRL	7090	129
F2	RS P	F	\$ WEAK EXPLOSION, COUPLED NEUTRON-HYDRODYNAMICS	APDA	7094	145
F2	RS P	G	\$ CLOUD, GAMMA-RAY DOSE RATE FROM A CLOUD	AI	7090	47
F2	RS P	H	\$ BIGDEAL, SPENT YANKEE-FUEL TEMPERATURE CALC	ORNL	1604	549
F2	RS P	H	\$ FLOW-MODEL, MULTI-CHANNEL 2-D 2-PHASE FLOW	AI	7094	246
F2	RS P	J	\$ GRACE1, GAMMA-RAY ATTENUATION SLAB GEOMETRY	AI	7090	45
F2	RS P	J	\$ GRACE2, GAMMA-RAY ATTENUATION CYL SPHERE GEOM	AI	7090	46
F2	RS P	J	\$ RATRAP, DOSE RATE CALCULATION SNAP GEOMETRY	AI	7090	141
F2	RS P	O	\$ CROC90, ML-1 FLUID FLOW EXPERIMENT ANALYSIS	AGC	7090	154
F2	RS P	P	\$ EXPALS, LEAST SQUARES EXPONENTIAL DECAY CURVES	LRL	7094	321
F2	RS P	P	\$ FRANTIC, LEAST SQUARES FIT SUM OF EXPONENTIALS	MIT	7090	324
F2	RS P	T A	\$ 2PLUS, NON-SPHERICAL OPTICAL MODEL X-SECTIONS	AI	7094	254
F2	RS P	T B	\$ AGN-SIGMA, CALC OF MULTI-GP TRANSFER MATRICES	ACC	7090	243
F2	RS P	T C	\$ EQUIPOISE3, 2-D 2-GROUP DIFFUSION SLAB CYL	ORNL	7090	39
F2	RS P	T C	\$ EQUIPOISE3A, 2-D 2-GP DIFFUSION CYLINDER SLAB	ORNL	7090	87
F2	RS P	T C	\$ FOG, 1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE	AI	7090	28
F2	RS P	T C	\$ TOPIC, 1-D FEW-GP SN APPROXIMATION CYLINDER	PPCO	7090	148
F2	RS P	T C	\$ W-DSN, 1-D MULTI-GP SN APPROX SLAB CYL SPHERE	UK-W	7090	132
F2	RS P	T C	\$ WHIRLAWAY, 3-D 2-GROUP DIFFUSION XYZ GEOMETRY	ORNL	7090	32
F2	RS P	T C	\$ 20GRAND, 2-D FEW-GROUP DIFFUSION SLAB CYLINDER	ORNL	7090	40
F2	RS P	T G	\$ TRANS-FUGUE1, TRANSIENT FLOW AND HEAT TRANSFER	AI	7094	268
F2	RS PL	T A	\$ ARES2, RESONANCE INTEGRAL X-SECTION CALC	AI	7090	89
F2	RS PL	T B	\$ FORM, FAST NEUTRON SPECTRUM X-SECTION CALC	AI	7090	51
F2	RS PL	T I	\$ CYCLOPS1, THERMODYNAMIC CYCLE ANALYSIS	AI	7094	244
F2	RS PLX	T B	\$ GAM1, FAST NEUTRON SPECTRUM X-SECTION CALC	GCA	7090	33
F2	RS PLX	T C	\$ DTF2, 1-D MULTI-GP DISCRETE ORDINATE CALC	AI	7090	151
F2	RSB		\$ HATCHET, COUPLED NEUTRONICS-HYDRODYNAMICS CODE	AGC	7090	153
F2	RSB	T D	\$ FEVER, 1-D FEW-GP DIFFUSION DEPLETION PROGRAM	GGA	7090	117
F2	RSBP		\$ ISOCRUNCH, REACTION DECAY CHAIN ANALYSIS	ORNL	7090	180
F2	RSBP		\$ NPRECCP, FUEL CYCLE COSTS PERFORMANCE DATA	KE	7090	146
F2	RSBP		\$ NUCY, SOLUTION OF NUCLIDE CHAIN EQUATIONS	ORNL	7090	134
F2	RSBP	H	\$ AXFLU, HEAT TRANSFER MELTEN FUEL TUBE BUNDLES	LASI	7094	182
F2	RSBP	H	\$ AXTHRM, HEAT TRANSFER SOLID FUEL TUBE BUNDLES	LASI	7094	183
F2	RSBP	J	\$ LIPRECAN1, MC NEUTRON PENETRATION CALCULATION	DAC	7090	123
F2	RSBP	T H	\$ PTH1, BLOWDOWN PRESSURE TEMPERATURE HISTORY	KF	7094	155
F2	RSBPL	T J	\$ MAC, SHIELD DESIGN MULTIGROUP SLAB GEOMETRY	BW	7090	143
F36	SBP	I	\$ BOW2, DEFLECTION CALCULATION PARALLEL BEAMS	ANL	3600	365
F36	RS P	G	\$ DISPER, AEROSOL PARTICLE TRANSPORT STUDY	RFD	3600	554
F36	RS P	T B	\$ MC*2, ENDF MULTIGROUP X-SECTION CALCULATION	ANL	3600	355
F36	RS P	T C	\$ SNAKG-1D, 1-D MULTI-GP DISCRETE ORDINATE CALC	ANL	3600	288
F36	RS P	T I	\$ SUPORAN, REACTOR CORE SUPPORT STRESS ANALYSIS	ANL	3600	357
F36	RS P	X T C	\$ MACH1, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	ANL	3600	262
F36	RS P	XCT C	\$ TESS, 1-D SLAB AND SPHERE GEOM SN TRANSPORT	ANL	3600	513
F36	RSBP	A	\$ MISH-MASH, RESONANCE INTEGRAL CALC HOMOGENEOUS	ANL	3600	214
F36	RSBP	G	\$ CHEMLC2, CORE HEATING CLADDING-STEAM REACTION	ANL	3600	366
F36	RSBP	J	\$ WHAM, LIQUID-FILLED PIPING SYSTEM ANALYSIS	KF	3600B	278
F36	RSBP	I	\$ SWELL2, FUEL ELEMENT LIFETIME ANALYSIS	ANL	3600	353
F36	RSBP	X T B	\$ RAPBLE, WUP, FLAT, RESONANCE ABSORPTION, CELL	ANL	3600	281
F36	RSBP	X T B	\$ RIFF-RAFF, RESONANCE INTEGRAL CALC 2-REG CELL	ANL	3600	213
F4	S	T D	\$ GAFFE, EQUILIBRIUM FUEL CYCLE CALCULATION	GGA	1108	302
F4	S P	H	\$ PWR-PPM, BORATION-DILUTION TABLES FOR PWR OPN	ORPD	6400	552
F4	RS	A	\$ STRIP, RESOLVED RESONANCE INTEGRAL CALCULATION	BW	2000	305
F4	RS	R	\$ APREX1, 99-CP DFC-2P LIBRARY GROUP COLLAPSING	APPE	6600	466
F4	RS	E	\$ HEXSCAT, ELASTIC SCAT X-SECTIONS HEX LATTICE	GCA	1108	291
F4	RS	B	\$ R102, SPACE-INDEPENDENT INVERSE KINETICS CALC	WNL	7094	168
F4	RS	G	\$ ANVENT, LOCA ANALYSIS DUKE POWER MCGUIRE UNITS	DUCO	635	529
F4	RS	I	\$ CORE, CORE CONFIGURATION FUEL TEMPERATURE CODE	GCA	7044	233

F4

F4

F4	RS	I	\$	SORSDB, PRESSURE VESSEL STRESS AND FATIGUE	KAPL	6600	391		
F4	RS	M	\$	MERMC2, MC**2 BINARY LIBRARY TAPE MAINTENANCE	ANL	360	472		
F4	RS	T	B	\$	MO807, 2-D DIFFUSION ABSORPTION REMOVAL X-SECS	BAPL	6600	280	
F4	RS	T	C	\$	EXTERMINATOR2, 2-D MULTI-GP DIFFUSION PROGRAM	BC	625	156	
F4	RS	T	C	\$	F0G, 1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE	BC	625	28	
F4	RS	T	C	\$	MO648, 1-D SLAB TRANSPORT WITH SLOWING DOWN	BAPL	6600	342	
F4	RS	T	G	\$	GADOSE,DOSET, HTGR ACCIDENT ANALYSIS DOSE CALC	GGA	1108	261	
F4	RS	T	H	\$	RATH, 2- OR 3-D HEAT CONDUCTION LUMPED MASS	LASL	7030	242	
F4	RS	T	H	\$	STEAM-67, 1967 ASME STEAM AND WATER PROPERTIES	BG&E	360	487	
F4	RS	T	H	\$	WATER, STEAM TABLES 14.5-14,500PSIA 32-472DEGF	BAPL	6600	267	
F4	RS	T	I	\$	CYGR02, STRESS ANALYSIS CYL FUEL ELEMENT	BAPL	6600	266	
F4	RS	T	M	\$	CHECKER,CRECT,CAMMET,PLCTFB,... ENDF/B V1 PROC	BNL	6600B	384	
F4	RS	T	M	\$	CHECK3,RIGEL3, ENDF/B V3,V4 PROCESSING CODES	BNL	6600	571	
F4	RS	T	M	\$	CRECT,CHECKER,RIGEL,PLCTFB,... ENDF/B V2 PROC	BNL	6600B	475	
F4	RS	T	M	\$	RIGEL, ENDF/R V3 DATA PROCESSING CODE	ANL	360	571	
F4	RS	T	O	\$	GASPAR, COMPLEX GAMMA-RAY SPECTRA ANALYSIS	KAPL	6600	485	
F4	RS	T	P	\$	LASL LEAST SQUARES, GENERAL CURVE FITTING	LASL	7094	62	
F4	RS	T	P	\$	MODEL, MODIFIED BETTIS ENVIRONMENTAL LIB SCOPE2.0	CDC	7600	478	
F4	RS	X	T	G	\$	PRECON, HTGR CONTAINMENT PRESSURE POST RUPTURE	GGA	7044	228
F4	RS	X	T	P	\$	EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE	ANL	635	534
F4	RS	X	T	P	\$	EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE	ANL	1108	534
F4	RS	X	T	P	\$	EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE	ANL	6600	534
F4	RS	L	T	B	\$	GAMBIT, X-SEC GENERATION FOR TRANSPORT CODES	WANL	6600	547
F4	RS	L	T	B	\$	GGC4, MULTI-GP X-SECTIONS FAST THERMAL SPECTRA	GGA	6600	298
F4	RS	L	T	C	\$	FIRE5, 1-D AGE-DIFFUSION SLAB CYLINDER SPHERE	AFB	360	9
F4	RS	P	A	\$	AVERAGE, UNRESOLVED REGION AVERAGE X-SEC CALC	BNL	6600	376	
F4	RS	P	A	\$	AVERAGE, UNRESOLVED REGION AVERAGE X-SEC CALC	BNL	7094	376	
F4	RS	P	A	\$	BESFIT, DIFFRACTION MODEL ELASTIC SCAT X-SEC	BNL	6600	524	
F4	RS	P	A	\$	CLEM, ANGULAR DISTRIBUTION LEGENDRE FITTING	KAPL	6600	531	
F4	RS	P	A	\$	CODILLI, LEAST SQUARES ANALYSIS RESONANCE DATA	UILL	360	347	
F4	RS	P	A	\$	GAKER, INELASTIC SCAT X-SECTION CALC MODERATOR	GGA	1108	289	
F4	RS	P	A	\$	GANDY, UNRESOLVED RESONANCE X-SECTION CALC	GGA	1108	341	
F4	RS	P	A	\$	GASKET, THERMAL SCATTERING LAW CALCULATION	GGA	1108	263	
F4	RS	P	A	\$	GRAMP, R-M PARAMETERS OF UNRESOLVED RESONANCES	BAPL	6600	470	
F4	RS	P	A	\$	MULTI, MULTI-LEVEL RESONANCE THEORY XSEC CALC	KAPL	6600	535	
F4	RS	P	A	\$	PSEUDO, STATISTICAL RESONANCE PARAMETER CALC	ENEA	360	292	
F4	RS	P	A	\$	PSEUDO, STATISTICAL RESONANCE PARAMETER CALC	GGA	1108	292	
F4	RS	P	A	\$	RAMP1, REICH-MOORE RESOLVED REGION X-SECTIONS	BNL	6600	492	
F4	RS	P	A	\$	SIGPLOT, RESOLVED MULTILEVEL R-W X-SEC CALC	BNL	6600	377	
F4	RS	P	A	\$	THRESH, STATISTICAL MODEL REACTION X-SECTIONS	BNL	6600	504	
F4	RS	P	B	\$	AVOID, ANNULAR VOID X-SECTION CALCULATION	GEC	625	276	
F4	RS	P	B	\$	GAMMA-P, PRODUCTION X-SECTIONS FOR GAMMA-RAYS	GEC	7094	235	
F4	RS	P	B	\$	PARTI, OPTIMAL GROUP OR MESH COLLAPSING	TPW	6500	416	
F4	RS	P	B	\$	WELWING, MATERIAL BUCKLING CYL FUEL ELEMENTS	AFB	360	362	
F4	RS	P	C	\$	PERT, 1-D PERTURBATION FOR AIM AND F0G CODES	BHSC	360	30	
F4	RS	P	C	\$	PERT4, 2-D PERTURBATION XY RZ RTHETA GEOMETRY	PAW	1108	304	
F4	RS	P	D	\$	CINDER,M0102, POINT DEPLETION FISSION PRODUCT	BAPL	6600	313	
F4	RS	P	J	\$	FREVAP6, HTGR METALLIC FISSION PRODUCT RELEASE	GGA	1108	301	
F4	RS	P	D	\$	NPRFCCP, FUEL CYCLE COSTS PERFORMANCE DATA	UEC	6600	146	
F4	RS	P	J	\$	POWERCO, NUCLEAR STATION ELECTRICITY COSTS	UEC	6600	340	
F4	RS	P	D	\$	RAD2, HTGR FISSION PRODUCT ACTIVITY DIST STUDY	GGA	7044	231	
F4	RS	P	D	\$	RAPFU, FUEL CYCLE PARAMETERS FAST BREEDERS	NED	635	372	
F4	RS	P	J	\$	WAMPUM, FUEL CYCLE COSTS PERFORMANCE STUDY	GGA	7044	224	
F4	RS	P	J	\$	WAMPUM, FUEL CYCLE COSTS PERFORMANCE STUDY	UEC	6600	224	
F4	RS	P	E	\$	AIREK3, SPACE-INDEPENDENT KINETICS W/FEEEDBACK	AFB	360	121	
F4	RS	P	E	\$	BLAST, REACTOR KINETICS TEMPERATURE DIST STUDY	AFB	360	363	
F4	RS	P	E	\$	GAPUTKIN, SPACE-INDEPENDENT REACTOR KINETICS	GGA	1108	317	
F4	RS	P	E	\$	GASA, STABILITY ANALYSIS REACTOR KINETICS EQNS	GGA	1108	290	
F4	RS	P	E	\$	R101, SPACE-INDEPENDENT KINETICS KEX OPTIONS	ANL	360	255	
F4	RS	P	E	\$	R101, SPACE-INDEPENDENT KINETICS KEX OPTIONS	WANL	7094	255	
F4	RS	P	E	\$	R102, SPACE-INDEPENDENT INVERSE KINETICS CALC	ANL	360	168	
F4	RS	P	E	\$	TRIFIDO, PULSED NEUTRON SOURCE DATA ANALYSIS	CAEA	360	489	
F4	RS	P	F	\$	MARS, 2-D EXCURSION CALCULATION R-Z GEOMETRY	APDA	7094	293	
F4	RS	P	F	\$	RAUMZEIT, 1-D TIME-DEPENDENT DIFFUSION CALC	KAPL	6600	352	

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F4	RS P	F \$ STINT3, SINGLE-CHANNEL SPACE-TIME SYNTHESIS	KAPL 6600	389
F4	RS P	F \$ TWIGGLE, 2-D 2-GP SPACE-TIME DIFFUSION	ANL 360	338
F4	RS P	G \$ CLOUD, GAMMA-RAY DOSE RATE FROM A CLOUD	DP 360	47
F4	RS P	G \$ EGAD, CALC OF EXTERNAL GAMMA DOSE INTEGRALS	DP 360	600
F4	RS P	G \$ FRCRL2, LOCA FISSION PRODUCT RELEASE ANALYSIS	BCL 6400	500
F4	RS P	G \$ INTEG, INSPEC, MARKOV SIMULATION OF REACTOR OPN	DP 360	590
F4	RS P	G \$ MIRAB, MIRAP, CONTAINMENT SYSTEM IODINE REMOVAL	BCL 6400	459
F4	RS P	G \$ SOCOOL2, SODIUM-FUEL INTERACTION ANALYSIS	ANL 360	521
F4	RS P	G \$ SOCOOL2, SODIUM-FUEL INTERACTION ANALYSIS	HFDI 1108	521
F4	RS P	G \$ WATER-HAMMER, LIQUID BLOWDOWN ANALYSIS LOFT	UGA 360	278
F4	RS P	H \$ FLOW-MODEL, MULTI-CHANNEL 2-D 2-PHASE FLOW	MSS 360	246
F4	RS P	H \$ PLENUM, FLOW DIST. IN CYL COOLANT INLET PLENUM	DP 360	586
F4	RS P	H \$ RAPP, HIGH-VELOCITY FLOW STUDY STEAM-WATER MIX	KAPL 6600	382
F4	RS P	I \$ GAZELLE5, GAS-COOLED CORE THERMAL DESIGN STUDY	GGA 7044	237
F4	RS P	I \$ SAFE-CREEP, VISCOELASTIC ANALYSIS CONCRETE	GGA 1108	300
F4	RS P	I \$ SAFE-PLANE, PLANE STRESS ANALYSIS, 2-D RODS	GGA 1108	252
F4	RS P	I \$ SAFE-SHELL, STRESS ANALYSIS THIN SHELLS	GGA 1108	253
F4	RS P	I \$ SAFE-2D, PLANE & AXISYMMETRIC STRESS ANALYSIS	GGA 1108	379
F4	RS P	I \$ STEM, MATRIX GENERATION FOR A SYSTEM OF BEAMS	KAPL 6600	337
F4	RS P	I \$ STRIPE, FUEL ROD CLAD STRAIN & PELLET CRACKING	BAPL 6600	570
F4	RS P	I \$ TCR01, CREEP-BUCKLING OF TUBES UNDER PRESSURE	BAPL 6600	604
F4	RS P	I \$ TUBE, U-TUBE HEAT EXCHANGER STRESS ANALYSIS	KAPL 6600	378
F4	RS P	L \$ GAVER, ENERGY INTERVAL X-SECTION AVERAGING	GGA 7044	218
F4	RS P	L \$ GENRD, FREE-FORMAT CARD INPUT PROCESSOR	LASL 360	530
F4	RS P	L \$ GENRD, FREE-FORMAT CARD INPUT PROCESSOR	LASL 6600	530
F4	RS P	L \$ GRDWRK, GRID GENERATION FOR SAFE PROGRAMS	GGA 1108	296
F4	RS P	N \$ DAC1, SN PERTURBATION CODE USING DTF4 FLUXES	LASL 6600	455
F4	RS P	N \$ HEATMESH, GEOMETRICAL DATA HEAT TRANSFER STUDY	SLL 6600	434
F4	RS P	N \$ LARCA, FLUX-WEIGHTING OF DTF4 CROSS SECTIONS	LASL 6600	409
F4	RS P	O \$ ALPHA-M, RESOLUTION OF GAMMA RAY SPECTRA	ORNL 360	413
F4	RS P	O \$ COKGAM, UNFOLDING OF COMPLEX GAMMA-RAY SPECTRA	KSUN 360	390
F4	RS P	O \$ DYN01, PHOTOMULTIPLIER ELECTRON DISTRIBUTION	ANL 360	464
F4	RS P	O \$ DYN01, PHOTOMULTIPLIER ELECTRON DISTRIBUTION	KAPL 6600	464
F4	RS P	P \$ ERF,EREC, ERROR & COMPLEMENTARY ERROR FUNCTION	SLA 6600	601
F4	RS P	P \$ FORSIM, SOLN OF SYSTEM OF ORDINARY DIFF EQNS	CRNL 6600	514
F4	RS P	P \$ GEAK, ORDINARY DIFFERENTIAL EQN SYSTEM SOLVER	LLL 6600	592
F4	RS P	P \$ KEELE, LINEARLY-CONSTRAINED OPTIMIZATION	ORNL 360	556
F4	RS P	P \$ MOST, A MULTIDIMENSIONAL OPTIMIZATION SCHEME	KAPL 6600	446
F4	RS P	P \$ PLOTR, 2D CONTOUR PLOTS & AREA CALCULATION	SLA 6600	578
F4	RS P	P \$ RELO1, RELIABILITY FOR A SINGLE FAILURE MODE	BAPL 6600	457
F4	RS P	P \$ ROPE, FINDING ROOTS OF A POLYNOMIAL	KAPL 6600	444
F4	RS P	V \$ FEARS, LAPLACE EQUATION ISOTROPIC DIELECTRICS	SLA 6600	577
F4	RS P	X \$ TOKMINA/TOKMINA2, TOKAMAK FUSION REACTOR STUDY	ANL 360	561
F4	RS P	T A \$ ATHENA4, INELASTIC SCATTERING FORM FACTORS	ORNL 360	417
F4	RS P	T A \$ JP1XR, COUPLED-CHANNEL SCATTERING X-SEC CALC	KAPL 6600	506
F4	RS P	T A \$ PHASEP, PHASE SHIFT X-SEC & POLARIZATION CALC	KAPL 6600	507
F4	RS P	T A \$ PUN1, UNRESOLVED RESONANCE INTEGRALS X-SECS	BAPL 6600	359
F4	RS P	T A \$ RESEND,ADLER, ENDF/B RESONANCE XSECTION CODES	BAL 6600B	465
F4	RS P	T A \$ SUMOR, S-WAVE NEUTRON X-SECTION CALCULATION	BAPL 6600	399
F4	RS P	T A \$ TACASI, ANALYSIS OF RESONANCE MEASUREMENTS	GGA 1108	410
F4	RS P	T A \$ TOR, THERMAL SCATTERING CRYSTALLINE MATERIALS	LASL 6600	360
F4	RS P	T B \$ CLUP77, SQUARE CELL COLLISION PROBABILITY CALC	ANL 360	526
F4	RS P	T B \$ CLUP77, SQUARE CELL COLLISION PROBABILITY CALC	JAIFR 230	526
F4	RS P	T B \$ EPOCH, NEUTRON AGE CALCULATION OF ENDF/B DATA	BAPL 6600	461
F4	RS P	T B \$ ET0G3, ENDF/B TO MUFT, GAM, ANIS X-SEC FORMAT	WAPF 7600	538
F4	RS P	T B \$ ETOM1, ENDF/B FORMAT TO MUFT FORMAT X-SECTIONS	WAPD 6600	436
F4	RS P	T B \$ ETOT2, THERMAL LIBRARIES FROM ENDF/B DATA	WAPD 7600	509
F4	RS P	T B \$ FCC4, FUNDAMENTAL MODE FAST REACTOR X-SEC CALC	BNW 1108	306
F4	RS P	T B \$ FMC-N, MONTE CARLO CALC NEUTRON HISTORIES	GGA 7044	195
F4	RS P	T B \$ GLEN, GROUP CONSTANT CALC FROM TOR OUTPUT DATA	LASL 6600	361
F4	RS P	T B \$ REAX, RESOLVED RESONANCE EPITHERMAL X-SECTIONS	NED 635	257
F4	RS P	T B \$ RICE, PRIMARY RECOIL ATOM SPECTRA ENDF/B DATA	ORNL 360	453
F4	RS P	T B \$ SUPERTOG, ENDF/B FINE-GP CONSTANTS GENERATION	CRNL 360	431
F4	RS P	T C \$ BE21, FEW-GP DISCRETE ORDINATES SLAB GEOMETRY	BAPL 6600	398

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F4	RS	P	T	C	\$	BISYN, 2-D MULTI-GP DIFFUSION SYNTHESIS CALC	NED	1108	287
F4	RS	P	T	C	\$	OUT2DB, 2-D MULTIGROUP DIFFUSION & SN THEORY	NED	635	459
F4	RS	P	T	C	\$	DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	LASL	6600	209
F4	RS	P	T	C	\$	DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	LASL	7030	209
F4	RS	P	T	C	\$	DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	LER	7094	209
F4	RS	P	T	C	\$	EXTERMINATOR2, 2-D MULTI-GP DIFFUSION PROGRAM	CF	6600	156
F4	RS	P	T	C	\$	EXTERMINATOR2, 2-D MULTI-GP DIFFUSION PROGRAM	ORNL	360	156
F4	RS	P	T	C	\$	FAIMOS, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	RHSC	360	120
F4	RS	P	T	C	\$	FLARE, 3-D REACTIVITY AND POWER DISTRIBUTION	NED	635	167
F4	RS	P	T	C	\$	GASP2, 1-D FEW-GP DIFFUSION POWER DIST SEARCH	GGA	7044	220
F4	RS	P	T	C	\$	GASP7, 1-D BURNUP POWER DISTRIBUTION SEARCH	GGA	1108	319
F4	RS	P	T	C	\$	GATT, 3-D FEW-GP DIFFUSION CALC HEX-Z MESH	GGA	1108	380
F4	RS	P	T	C	\$	HFN, 1-D MULTI-GP DIFFUSION SLAP CYL SPHERE	RNW	1107	241
F4	RS	P	T	C	\$	TEMCO, 1-D FEW-GP DIFFUSION TEMP COEF CALC	GGA	7044	225
F4	RS	P	T	C	\$	TEMCO7, TEMPERATURE COEFFICIENT CALCULATION	GGA	1108	320
F4	RS	P	T	C	\$	TOPIC, 1-D FEW-GP SN APPROXIMATION CYLINDER	PPCO	7040	148
F4	RS	P	T	C	\$	TRIPLET, 2-D TRIANGULAR MESH TRANSPORT PROGRAM	LASL	6600	608
F4	RS	P	T	C	\$	TRIPLET, 2-D TRIANGULAR MESH TRANSPORT PROGRAM	LASL	7600	608
F4	RS	P	T	C	\$	TWOTRAN-PNVH, 2-D PARTICLE TRANSPORT XY RZ RTH	LASL	7600	573
F4	RS	P	T	C	\$	TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ RTHETA	LASL	6600B	358
F4	RS	P	T	C	\$	TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ RTHETA	LASL	7600R	358
F4	RS	P	T	C	\$	VARI-QUIR, TIME-DEP 2-D MULTI-GP DIFFUSION	UMCC	360	212
F4	RS	P	T	C	\$	VARI-QUIR, TIME-DEP 2-D MULTI-GP DIFFUSION	WANL	6600	212
F4	RS	P	T	C	\$	3DDT, 3-D MULTIGROUP DIFFUSION XYZ R-THETA-Z	LASL	6600	463
F4	RS	P	T	D	\$	CINCAS, NUCLEAR FUEL CYCLE COST AND ECONOMICS	CWE	360	354
F4	RS	P	T	D	\$	CINCAS, NUCLEAR FUEL CYCLE COST AND ECONOMICS	WAPD	6600	354
F4	RS	P	T	D	\$	DTF-BURN, 1-D MULTI-GP DTF4 WITH DEPLETION	LASL	7030	269
F4	RS	P	T	D	\$	FEVER7, 1-D MULTIGROUP DIFFUSION AND DEPLETION	GGA	1108	318
F4	RS	P	T	D	\$	FUMBLE, FAST REACTOR FUEL BURNUP & MANAGEMENT	NED	635	480
F4	RS	P	T	D	\$	GARGOYLE, FUEL CYCLE ANALYSIS PARTIAL REFUEL	GGA	7044	260
F4	RS	P	T	D	\$	GAUGE, 2-D FEW-GP HEX CECM DIFFUSION DEPLETION	GGA	1108	339
F4	RS	P	T	D	\$	ORCOST, POWER PLANT CAPITAL COST ESTIMATING	ORNL	360	588
F4	RS	P	T	D	\$	PHENIX, 2D DIFFUSION BURNUP REFUELING HISTORY	LASL	6600	454
F4	RS	P	T	D	\$	PWCOST, REACTOR FUEL CYCLE COST CALCULATION	GGA	1108	441
F4	RS	P	T	D	\$	RELOAD-FEVER, 1-D FEW-GP DIFFUSION DEPLETION	GGA	7044	221
F4	RS	P	T	D	\$	REVISED-GAD, FUEL CYCLE ANALYSIS W/REFUELING	GGA	7044	223
F4	RS	P	T	D	\$	STMGEN, STEAM GENERATOR DESIGN CRITERIA COSTS	GGA	7044	227
F4	RS	P	T	D	\$	2DB, 2-D MULTIGROUP DIFFUSION AND DEPLETION	RNW	1108	325
F4	RS	P	T	D	\$	2DB, 2-D MULTIGROUP DIFFUSION AND DEPLETION	LASL	6600	325
F4	RS	P	T	D	\$	3DB, 3-D MULTIGROUP DIFFUSION BURNUP ANALYSIS	HEOL	1108	567
F4	RS	P	T	D	\$	3DXT,DFP3, 3-D XENON TRANSIENT & DEPLETION	KAPL	6600	477
F4	RS	P	T	E	\$	ANCON, SPACE-INDEPENDENT REACTOR KINETICS CODE	ANL	360	486
F4	RS	P	T	E	\$	ANCON, SPACE-INDEPENDENT REACTOR KINETICS CODE	LASL	6600	486
F4	RS	P	T	F	\$	ADEP, 1D AND 2D FEW-GROUP SPACE-TIME KINETICS	BCL	6400	494
F4	RS	P	T	F	\$	EQRE, FAST REACTOR EXCURSION CALCULATIONS	NED	2000	174
F4	RS	P	T	F	\$	GAKIN, 1-D MULTIGROUP TIME-DEPENDENT DIFFUSION	GGA	1108	310
F4	RS	P	T	F	\$	GAKIT, 1-D MULTIGP KINETICS WITH TEMP FEEDBACK	GGA	1108	370
F4	RS	P	T	F	\$	NOAH, 1-D ONE-GP SPACE-TIME DIFFUSION FEEDBACK	RNL	6600	405
F4	RS	P	T	F	\$	NOISY1, AUTO- AND CROSS-SPECTRAL DENSITIES	BNW	7090	488
F4	RS	P	T	F	\$	NOWIG, 1-D 2-GP KINETICS TEMPERATURE FEEDBACK	BAPL	6600	371
F4	RS	P	T	F	\$	SAS1A, FAST REACTOR POWER AND FLOW TRANSIENTS	ANL	360	400
F4	RS	P	T	F	\$	SAS1A, FAST REACTOR POWER AND FLOW TRANSIENTS	ANL	6600	400
F4	RS	P	T	F	\$	TSN, SPATIALLY-DEPENDENT REACTOR KINETICS	AI	360	309
F4	RS	P	T	F	\$	TWIGL, 2-D 2-GP SPACE-TIME DIFFUSION FEEDBACK	BAPL	6600	338
F4	RS	P	T	F	\$	WIGL2, 1-D 2-GP SPACE-TIME DIFFUSION 3-GEOM	BAPL	6600	274
F4	RS	P	T	F	\$	WIGL2, 1-D 2-GP SPACE-TIME DIFFUSION 3-GEOM	GGA	1108	274
F4	RS	P	T	G	\$	AISITE2, PARAMETRIC SITE REQUIREMENT STUDY	AI	360	172
F4	RS	P	T	G	\$	CEBUG, STEAM GENERATOR SODIUM-WATER REACTION	CEND	7600	548
F4	RS	P	T	G	\$	ECCSA4, LOSS-OF-COOLANT & EMERGENCY COOLING	BCL	6400	330
F4	RS	P	T	G	\$	ELBCW, FUEL ELEMENT STRESS ANALYSIS STUDY	GGA	7044	229
F4	RS	P	T	G	\$	FLASH3, LOSS-OF-COOLANT ACCIDENT ANALYSIS	BAPL	6600	295
F4	RS	P	T	G	\$	FLASH4, FULLY-IMPLICIT TRANSIENT SIMULATION	BAPL	6600	448
F4	RS	P	T	G	\$	FREADM1, FAST REACTOR CORE ACCIDENT ANALYSIS	NED	635	479
F4	RS	P	T	G	\$	HAA3, COAGULATION OF HETEROGENEOUS AEROSOLS	AI	360	443

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F4	RS	P	T	G	\$	MO555,ACT1, LOSS-OF-COOLANT ACCIDENT ANALYSIS	BAPL	6600	284
F4	RS	P	T	G	\$	NURLOC-1.0, LOSS-OF-COOLANT THERMAL ANALYSIS	BCL	6400	328
F4	RS	P	T	G	\$	RELAP3, REACTOR BLOWDOWN - EXCURSION ANALYSIS	ANC	1108	369
F4	RS	P	T	G	\$	RELAP3, REACTOR BLOWDOWN - EXCURSION ANALYSIS	ANC	6600	369
F4	RS	P	T	G	\$	SOFIRE2, SODIUM POOL FIRE 1- & 2-CELL ANALYSIS	AI	360	559
F4	RS	P	T	H	\$	ASTEM, THERMODYNAMIC PROPERTIES WATER & STEAM	ANC	360	580
F4	RS	P	T	H	\$	CHIC-KIN, FAST + INTERMEDIATE POWER TRANSIENTS	BAPL	6600	473
F4	RS	P	T	H	\$	COBRA3C, ROD BUNDLE THERMAL-HYDRAULIC ANALYSIS	BNW	360C	432
F4	RS	P	T	H	\$	COBRA3C, ROD BUNDLE THERMAL-HYDRAULIC ANALYSIS	BNW	1108C	432
F4	RS	P	T	H	\$	COBRA3C, ROD BUNDLE THERMAL-HYDRAULIC ANALYSIS	BNW	6600C	432
F4	RS	P	T	H	\$	DYNAM, DYNAMIC ANALYSIS BOILING FLOW STEAM	GGA	1108	440
F4	RS	P	T	H	\$	FIGRO, LWR FUEL SWELLING TEMPERATURE STUDY	BAPL	6600	272
F4	RS	P	T	H	\$	FLOT1,MO219, PWR FLOW TRANSIENT ANALYSIS	BAPL	6600	331
F4	RS	P	T	H	\$	GLUB1, WATER-LOGGED FUEL ELEMENT ANALYSIS	BAPL	6600	424
F4	RS	P	T	H	\$	HEATING3, 1,2, OR 3-D HEAT CONDUCTION PROGRAM	ORNL	360	517
F4	RS	P	T	H	\$	HOT2, 2-D TRANSIENT HEAT CONDUCTION PROGRAM	BAPL	6600	286
F4	RS	P	T	H	\$	LION4, 3-D TEMPERATURE DISTRIBUTION PROGRAM	CHI	1108	299
F4	RS	P	T	H	\$	MANTA, STEADY-STATE THERMAL-HYDRAULIC ANALYSIS	NED	635	256
F4	RS	P	T	H	\$	MANTA, STEADY-STATE THERMAL-HYDRAULIC ANALYSIS	WARD	6600	256
F4	RS	P	T	H	\$	MOXY, BWR FUEL ELEMENT HEAT TRANSFER CALC	ANC	1108	551
F4	RS	P	T	H	\$	MO899,HOH, STEAM TABLES 14.5-2538 PSIA	BAPL	6600	294
F4	RS	P	T	H	\$	TOPS, TRANSIENT THERMODYNAMICS OF PRESSURIZERS	BAPL	6600	348
F4	RS	P	T	H	\$	VELVET2, TURBULENT FLOW IN LMFBR ROD BUNDLE	NED	635	458
F4	RS	P	T	H	\$	WASP, WATER AND STEAM THERMODYNAMIC PROPERTIES	BAPL	6600	396
F4	RS	P	T	I	\$	BUBL1, FUEL SWELLING & GAS RELEASE SIMULATION	BAPL	6600	468
F4	RS	P	T	I	\$	BUSHL, CYL SHELL BUCKLING COLLAPSE ANALYSIS	BAPL	6600	481
F4	RS	P	T	I	\$	CYGR03, OXIDE FUEL ROD STRESS & DEFORMATION	BAPL	6600	449
F4	RS	P	T	I	\$	FUGIT, DYNAMIC RESPONSE OF ELASTIC STRUCTURES	BAPL	6600	537
F4	RS	P	T	I	\$	LIFE1, FAST REACTOR FUEL ELEMENT BEHAVIOR	ANL	360	460
F4	RS	P	T	I	\$	MANE1, RECTANGULAR MAGNETIC NETWORK SOLUTION	BAPL	6600B	412
F4	RS	P	T	I	\$	MO266, LINEAR ELASTIC STRUCTURAL DYNAMICS	BAPL	6600	383
F4	RS	P	T	I	\$	MO457,PIPE, ELASTIC STRESS OF PIPING SYSTEM	BAPL	6600	329
F4	RS	P	T	I	\$	MO552, DYNAMIC ANALYSIS LINEAR ELASTIC SYSTEMS	BAPL	6600	283
F4	RS	P	T	I	\$	PELEN, FUEL PELLET TEMPERATURE & DEFORMATION	BAPL	6600	598
F4	RS	P	T	I	\$	SABOR4, DISCRETE-ELEMENT ANALYSIS THIN SHELLS	MIT	360	402
F4	RS	P	T	I	\$	SAFE-AXISYM, STRESS ANALYSIS AXISYMMETRIC LOAD	GGA	7044	251
F4	RS	P	T	I	\$	SAFE-PLANE, PLANE STRESS ANALYSIS, 2-D BODIES	RNL	6600	252
F4	RS	P	T	I	\$	SAFE-3D, 3-D COMPOSITE STRUCTURE STRESS STUDY	GGA	1108	332
F4	RS	P	T	I	\$	SEAL SHELL, SHELL STRESS ANALYSIS AXISYM LOAD	WTSC	6600B	282
F4	RS	P	T	I	\$	SEALSHELL2, SHELL STRESS ANALYSIS AXISYM LOAD	BAPL	6600	282
F4	RS	P	T	I	\$	SEALSHELL2, SHELL STRESS ANALYSIS AXISYM LOAD	SR	360	282
F4	RS	P	T	I	\$	SLADE-D, DYNAMIC ANALYSIS OF THIN SHELLS	SLA	6600	581
F4	RS	P	T	I	\$	SOR3, STRESS ANALYSIS SHELLS OF REVOLUTION	KAPL	6600C	80
F4	RS	P	T	J	\$	MUSCAT, VIEW FACTOR SHIELDING CODE CAVITY GEOM	GGA	1108	259
F4	RS	P	T	J	\$	MO756,LETC, 1-D SLAB GAMMA-RAY TRANSPORT	BAPL	6600	343
F4	RS	P	T	K	\$	CITATION, 1,2,3-D DIFFUSION DEPLETION MULTIGP	ORNL	360G	387
F4	RS	P	T	K	\$	PREP,KITT, SYSTEM FAULT TREE EVALUATION CODES	ANC	1108	528
F4	RS	P	T	L	\$	BL47, DRAFTING TOOL TO PLOT PLANE STRUCTURES	BAPL	6600	373
F4	RS	P	T	M	\$	CRECT,CHECKER, ENDF/B V2 PROCESSING CODES	ANL	360	475
F4	RS	P	T	M	\$	EDITOR, ENDF/B TAPE PROCESSING AND EDITING	ORNL	360B	502
F4	RS	P	T	M	\$	EDITOR, ENDF/B TAPE PROCESSING AND EDITING	ORNL	6600	502
F4	RS	P	T	M	\$	SHLOG, DATA MANAGEMENT, EDITING, & ANALYSIS	BAPL	6600	557
F4	RS	P	T	M	\$	TROUT, MUG MULTIGROUP XSFC LIBRARY MAINTENANCE	NED	635	493
F4	RS	P	T	N	\$	PLOT-3D, 3-D PLOTS ON IBM2280 OR CALCOMP780	ANL	360	544
F4	RS	P	T	O	\$	BETTY, ENTRAINED PARTICLES SAMPLING STUDY	BAPL	6600	545
F4	RS	P	T	O	\$	BURNUP, HEAVY ELEMENT ISOTOPIIC BURNUP ANALYSIS	NED	635	311
F4	RS	P	T	O	\$	EXPN, ANALYSIS OF PULSED NEUTRON SOURCE DATA	NED	635	258
F4	RS	P	T	U	\$	JITER, FLUCTUATION EXPERIMENT ANALYSIS	BAPL	6600	394
F4	RS	P	T	O	\$	REDUX, REACTOR FLUCTUATION EXPERIMENT ANALYSIS	BAPL	6600	425
F4	RS	P	T	P	\$	DAFT1, LEAST SQUARES FIT FISSION NUCLIDE DATA	BAPL	6600	327
F4	RS	P	T	P	\$	MO661,MO657,MO626, POLYNOMIAL CURVE FITTING	BAPL	6600	411
F4	RS	P	T	Q	\$	RESPND, DISSIMILAR MEDIA TLD CORRECTION CALC	AT	360	566
F4	RS	P	C	G	\$	STEFEG, ANALYSIS OF PWR & BWR GASEOUS RELEASE	ORNL	360	583
F4	RS	P	C	T	A	JUPITOR1, COUPLED CHANNEL X-SEC EVALUATION	ENEA	360	308

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F4	RS P CT B	\$ MC**2, ENDF MULTIGROUP X-SECTION CALCULATION	ANL	360	355
F4	RS P CT C	\$ FLARE, 3-D REACTIVITY AND POWER DISTRIBUTION	MSS	360	167
F4	RS P CT C	\$ TRIAL, 3-D REACTION RATES FROM 2-D FLUX SETS	GESV	H600	585
F4	RS P CT C	\$ TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ RTHETA	LASL	360B	358
F4	RS P CT D	\$ GEM, ANALYSIS OF NUCLEAR FUEL CYCLE ECONOMICS	UICS	360	576
F4	RS P CT D	\$ 3DB, 3-D MULTIGROUP DIFFUSION BURNUP ANALYSIS	ANL	360	567
F4	RS P CT F	\$ REXCO-H, 2-D HYDRODYNAM RESPONSE TO EXCURSION	ANL	360	550
F4	RS P CT G	\$ EMERALD, PWR PLANT RADIATION RELEASE & DCSE	PGE	360	546
F4	RS P CT I	\$ BEHAVE2, OXIDE FUEL PERFORMANCE FINITE-ELEMENT	GESV	635	568
F4	RS P CT I	\$ PSA2, STRESS ANALYSIS MULTIANCHOR PIPE SYSTEM	AI	360	542
F4	RS P CT M	\$ ETOE, ENDF/B TO MC**2 DATA CONVERSION	ANL	360	350
F4	RS P CT W	\$ MACS LATTICE VIBRATION NEUTRON SCATTERING CODES	ANC	360	574
F4	RS P CT W	\$ MSCAT, SLOW NEUTRON MULTIPLE SCATTERING CALC	ANL	360	575
F4	RS P X A	\$ COHBE, COHERENT INELASTIC SCATTERING LAW CALC	GGA	1108	385
F4	RS P X A	\$ LEGCOEF3, LEGENDRE COEF CALC FOR ANGULAR DIST	GGA	7044	217
F4	RS P X G	\$ BURST1, HYDRODYNAMIC ANALYSIS DURING BLOWDOWN	PPCO	360	435
F4	RS P X I	\$ FINEL, FINITE-ELEMENT STUDY 2,3-D STRUCTURES	KAPL	6600	404
F4	RS P X T B	\$ ETOX3, MULTI-GP CONSTANTS FROM ENDF/B FOR 1DX	HFDL	1108B	388
F4	RS P X T B	\$ GAF,GAR, SPECTRA AND GROUP-AVERAGED X-SEC CALC	GGA	1108	316
F4	RS P X T B	\$ 1DX, 1-D DIFFUSION FAST X-SECTION GENERATION	BNW	1108	374
F4	RS P X T C	\$ VARI-QUIR3, 2-D MULTI-GP DIFFUSION XY RZ RTH	WANL	7094	264
F4	RS P X T E	\$ MOD5, STOCHASTIC MODEL OF NEUTRON SLOWING-DOWN	NPGS	360	491
F4	RS P X T F	\$ CEXE,INCEXE, 1-GP 3-D XYZ XFNCN OSCILLATION	CENF	360	415
F4	RS P X T F	\$ FORE2, FAST REACTOR EXCURSION CALCULATIONS	ANL	360	174
F4	RS P X T F	\$ FORE2, FAST REACTOR EXCURSION CALCULATIONS	NFD	635	174
F4	RS P X T G	\$ MUCHA1,MUCHA2, MULTIPLE CHANNEL ANALYSIS ECC	BCL	6400	508
F4	RS P X T H	\$ ORTHIS,ORTHAT, 2-DIMENSIONAL HEAT CONDUCTION	ORNL	360	525
F4	RS P X T L	\$ GAND, GAFGAR X-SECTION LIBRARY PREPARATION	GCA	1108	345
F4	RS P X T P	\$ FUNPACK, SPECIAL FUNCTION ROUTINES-EI,K,E,....	ANL	360	610
F4	RS P X T P	\$ FUNPACK, SPECIAL FUNCTION ROUTINES-EI,K,F,....	ANL	6600	610
F4	RS P XCT A	\$ FLANGE2(71-1), ENDF/B THERMAL SCATTERING DATA	DP	360	368
F4	RS P XCT C	\$ GAPER1C, 1-D TRANSPORT PERTURBATION THEORY	GGA	1108	606
F4	RS P XCT D	\$ CONCEPT2, POWER PLANT CONCEPTUAL COST ESTIMATE	ORNL	360B	458
F4	RS P XCT F	\$ TASK, 1-D MULTIGROUP REACTOR KINETICS PROGRAM	ORNL	360	558
F4	RS P XCT F	\$ VENUS, 2-D LMFBR POWER EXCURSION DISASSEMBLY	ANL	360	511
F4	RS PL T B	\$ ETOG1, ENDF/B TO MUFT, GAM, ANISN X-SEC FORMAT	WAPC	6600	437
F4	RS PL T B	\$ GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV	BNW	1107	185
F4	RS PL T B	\$ TEMPEST2, THERMAL NEUTRON SPECTRUM X-SECTIONS	BHSC	360	50
F4	RS PL T C	\$ BISYN, 2-D MULTI-GP DIFFUSION SYNTHESIS CALC	NFD	635	287
F4	RS PL CT B	\$ INCITE, THERMAL SPECTRA & MULTI-GP CONSTANTS	ANC	360	565
F4	RS PL CT C	\$ AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	OSUC	370	29
F4	RS PL CT F	\$ QX1, QUASISTATIC SPATIAL REACTOR KINETICS COEF	ANL	360	474
F4	RS PL CT M	\$ ERREST, LOCA RCD BUNDLE CHF DATA ANALYSIS	ANC	360	518
F4	RS PLX T B	\$ AILMOE, X-SECTION CALC ELASTIC SCAT RESONANCES	AI	360	147
F4	RS PLX T B	\$ GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV	RC	625	185
F4	RS PLX T B	\$ GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV	UVA	6400	185
F4	RS PLX T B	\$ GGC4, MULTI-GP X-SECTIONS FAST THERMAL SPECTRA	GGA	1108	298
F4	RS PLX T B	\$ HRG3, SLOWING-DOWN SPECTRUM, MULTIGP CONSTANTS	BNW	1108	467
F4	RS PLX T B	\$ HRG3, SLOWING-DOWN SPECTRUM, MULTIGP CONSTANTS	TVA	360	467
F4	RS PLX T B	\$ LEOPARD, SPECTRA CALCULATION WITH DEPLETION	WAPC	360	279
F4	RS PLX T B	\$ XSDRN, DISCRETE ORDINATE MULTIGROUP CONSTANTS	ORNL	360	353
F4	RS PLX T C	\$ MACH1, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	PURD	6500	262
F4	RS PLX T C	\$ VIM1, MONTE CARLO CRITICAL ASSEMBLY ANALYSIS	AI	7600	510
F4	RS PLXCT B	\$ FORM, FAST NEUTRON SPECTRUM X-SECTION CALC	OSUC	370	51
F4	RS PLXCT B	\$ PHROG, MULTI-GP CONSTANT & FAST SPECTRA CALC	ANC	360	520
F4	RSB XCT P	\$ EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE	ANL	360	534
F4	RSB L T M	\$ CLIP, FORM OR THREDES LIBRARY UTILITY ROUTINE	AI	360	271
F4	RSBP A	\$ MUFFLE, FISSILE NUCLIDE X-SECTION EVALUATION	ORNL	7090	323
F4	RSBP D	\$ CHAINS, ANALYSIS OF RADIOACTIVE DECAY CHAINS	GFC	635	418
F4	RSBP D	\$ DOS, NEUTRON FLUX-DOSIMETER ACTIVITY RELATION	GFC	635	423
F4	RSBP D	\$ MICHRO, MICROHARDNESS MEASUREMENT ANALYSIS	GFC	635	421
F4	RSBP T B	\$ GROUSE, SPACE-DEPENDENT X-SECTION GENERATION	GFC	635	420
F4	RSBP T D	\$ 2DB, 2-D MULTIGROUP DIFFUSION AND DEPLETION	ANL	3600	325
F4	RSBP T K	\$ THREDES, 1-D FEW-GP DIFFUSION DESIGN SYSTEM	AI	360	273

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F4	RSBP	CT C	\$ HERESY3, 2-D HETEROGENEOUS REACTOR CALCULATION	DP	360B	136
F4	RSBP	CT C	\$ MONA, 1-D MULTIGROUP DIFFUSION SLAB, CYL, SPH	ANC	360	582
F4	RSBP	CT C	\$ TRIPLET, 2-D TRIANGULAR MESH TRANSPORT PROGRAM	LASL	360	608
F4	RSBP	CT D	\$ DWARF, 1-D FEW-GP DIFFUSION DEPLETION PROGRAM	ANC	360	579
F4	RSBP	CT G	\$ RSAC, RADIOLOGICAL SAFETY ANALYSIS PROGRAM	ANC	360	265
F4	RSBP	CT I	\$ FPFM, STEADY-STATE FISSION PRODUCT FUEL MODEL	ANC	360	584
F4	RSBP	CT I	\$ SAFE-PCRS, STRESS ANALYSIS AXISYMMETRIC LOAD	GGA	7044	250
F4	RSBP	CT I	\$ STRAP, STATIC & DYNAMIC STRUCTURAL ANALYSIS	ANC	360	539
F4	RSBP	CT J	\$ VIEWPIN, VIEW FACTOR CALC FOR CYLINDRICAL PINS	ANC	360	569
F4	RSBP	CT K	\$ PREP,KITT, SYSTEM FAULT TREE EVALUATION CODES	ANC	360	528
F4	RSBP	CT L	\$ ARC-NU1002, BCD INPUT DATA PROCESSING MODULE	ANL	360	533
F4	RSBP	X T D	\$ SIZZLE, 1-D MULTIGROUP DIFFUSION DEPLETION	AT	360	58
F4	RSBP	X T G	\$ THETA1-B, FUEL ROD THERMAL RESPONSE LOCA	ANC	360	512
F4	RSBP	XCT B	\$ XLACS, XSDRN MULTIGROUP LIBRARIES FROM ENDF/B	CRNL	360	572
F4	RSBP	XCT G	\$ RELAP3, REACTOR BLOWDOWN - EXCURSION ANALYSIS	ANC	360	369
F4	RSBP	XCT H	\$ MOXY, RWP FUEL ELEMENT HEAT TRANSFER CALC	ANC	360	551
F4	RSBP	XCT W	\$ GAUSS5, ANALYSIS OF GAMMA-RAY SPECTRA GF(LI)	ANC	360	605
F4	RSBPL	CT C	\$ VMIX, MONTI CARLO CRITICAL ASSEMBLY ANALYSIS	AI-A	360	510
F4	RSBPL	CT L	\$ ARC-XSEC1, MICROSCOPIC X-SECTION MANIPULATION	ANL	360	594
F4	RSBPLX	T C	\$ ANISN, 1-D MULTI-GP DISCRETE ORDINATE CALC	AI	360	151
F4	RSBPLX	T C	\$ CAESAR4,LIBLST, 1-D MULTI-GP DIFFUSION + LIP	AI	360	270
F4	RSBPLX	T D	\$ N4P, NEUTRON-INDUCED GAMMA-RAY RADIOACTIVITY	IITR	7094	314
F4	RSBPLXCT	B	\$ LASER, SPECTRUM CALC WITH BURNUP CYL LATTICE	TVA	360	249
F5	RS	LX T B	\$ LEOPARD, SPECTRA CALCULATION WITH DEPLETION	JNC	1108	279
F5	RS	P A	\$ FLANGE1, SCATTERING LAW X-SECTION CALCULATION	GGA	1108	247
F5	RS	P H	\$ FLAC, STEADY-STATE FLOW, PRESSURE DISTRIBUTION	GGA	1108	395
F5	RS	P T B	\$ ENDFB2,GAND2,GFE2, ENDF/B TO GAFFAR X-SECTIONS	GGA	1108	596
F5	RS	P T C	\$ ZDF, 2-D MULTI-GP DISCRETE ORDINATE CODE	GGA	1108	173
F5	RS	P T D	\$ DBUFIT1, LEAST SQUARES TRANSMUTATION ANALYSIS	BNWL	1108	456
F5	RS	P T H	\$ REPP, THERMAL-HYDRAULIC WATER REACTOR DESIGN	BNW	1108	483
F5	RS	P T H	\$ TAC2D, STEADY-STATE AND TRANSIENT TEMP CALC	GGA	1108	408
F5	RS	P T H	\$ TAC3D, TRANSIENT 3-D HEAT TRANSFER PROGRAM	GGA	1108	414
F5	RS	P T I	\$ SAFE-CRACK, VISCOELASTIC ANALYSIS OF CONCRETE	GGA	1108	451
F5	RS	P T I	\$ SHELL5, THIN SHELL 3-D STRUCTURAL ANALYSIS	GGA	1108	452
F5	RS	P T M	\$ TROUT, MUG MULTIGROUP XSEC LIBRARY MAINTENANCE	NED	1108	493
F5	RS	P T N	\$ GAPER2D, 2-D PERTURBATION CALC FROM 2DF OUTPUT	GGA	1108	471
F5	RS	P T O	\$ CAGE,BIRD,SPFC, TIME-OF-FLIGHT DATA ANALYSIS	GEES	1108	476
F5	RS	P T R	\$ TOPLYR2, POWER PLANT THERMAL DISCHARGE STUDY	HFOL	1108	599
F5	RS	P CT A	\$ FSDP3, POINTWISE XSECS. FROM P-W PARAMETERS	GGA	1108	216
F5	RS	P X T D	\$ PACTOLUS,CLOTHD, NUCLEAR POWER PLANT COST CODE	HEDL	1108	540
F5	RS	P X T F	\$ NDISY1, AUTC- AND CROSS-SPECTRAL DENSITIES	BNW	1108	488
F5	RS	P X T P	\$ FUNPACK, SPECIAL FUNCTION ROUTINES-EI,K,E,....	ANL	1108	610
F5	RS	PLX T B	\$ BRT1, THERMAL SPECTRUM X-SECTION CALC	BNW	1108	184
F5	RSBPL	T D	\$ ISOGEN, RADIONUCLIDE GENERATION AND DECAY	BNW	1108	367
F63	RS	C	\$ PERT, 1-D PERTURBATION FOR AIM AND FOG CODES	CCC	1604	30
F63	RS	C	\$ TOP, 2-D PERTURBATION TDC OR 2DXY FLUX INPUT	PW	1604	199
F63	RS	C	\$ ZDF, 2-D MULTI-GP DISCRETE ORDINATE CODE	UNC	1604	173
F63	RS	I	\$ WOPEXPRT, REACTOR WEIGHT OPTIMIZATION STUDY	PW	1604	190
F63	RS	L	\$ CSP1, SN X-SECTION LIBRARY TAPE PREPARATION	PW	1604	194
F63	RS	L	\$ CSP2A, SN X-SECTION LIBRARY TAPE PREPARATION	PW	1604	193
F63	RS	T C	\$ 2DXYL, 3-D MULTI-GP FLUX SYNTHESIS PROGRAM CYL	PW	1604	192
F63	RS	L T D	\$ SIZZLE, 1-D MULTIGROUP DIFFUSION DEPLETION	CDC	1604	58
F63	RS	LX T B	\$ GAM1, FAST NEUTRON SPECTRUM X-SECTION CALC	ANL	3600	33
F63	RS	P A	\$ HAFEVER, HAUSER-FESHBACH INELASTIC SCATTERING	CDC	1604	14
F63	RS	P A	\$ PEGGY, ELASTIC SCATTERING PHASE-SHIFT ANALYSIS	ORNL	1604	334
F63	RS	P A	\$ RAMES, PARTICLE WAVE FUNCTION RADIAL INTEGRALS	ORNL	1604	335
F63	RS	P B	\$ SAIL, 1-D 1-GP SN APPROXIMATION SLAB GEOMETRY	CDC	1604	52
F63	RS	P B	\$ S4 CYL CFLL CODE, 1-D 1-GP S4 APPROXIMATION	CDC	1604	53
F63	RS	P D	\$ ISOCRUNCH, REACTION DECAY CHAIN ANALYSIS	ORNL	1604	180
F63	RS	P D	\$ ISOSEARCH, ISOTOPE PRODUCTION FLUX, X-SEC CALC	ORNL	1604	322
F63	RS	P D	\$ ISOTOPES, MAXIMUM YIELD FROM REACTION OR DECAY	ORNL	1604	179
F63	RS	P D	\$ POWERCO, NUCLEAR STATION ELECTRICITY COSTS	ORNL	1604	340
F63	RS	P E	\$ AIREK3, SPACE-INDEPENDENT KINETICS W/FEEDBACK	CDC	1604	121
F63	RS	P E	\$ CMPXMAT, TRANSFER FUNCTION EVALUATION	PW	1604	188

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GAMMA-RAY

F63	RS P	F \$	AX-TNT, COUPLED NEUTRONICS-HYDRODYNAMICS SPH	PW	1604	191
F63	RS P	G \$	CLOUD, GAMMA-RAY DOSE RATE FROM A CLOUD	CDC	1604	47
F63	RS P	H \$	MO899,HCH, STEAM TABLES 14.5-2538 PSIA	ANL	1604	294
F63	RS P	J \$	GRACE1, GAMMA-RAY ATTENUATION SLAB GEOMETRY	CDC	1604	45
F63	RS P	J \$	GRACE2, GAMMA-RAY ATTENUATION CYL SPHERE GEOM	CDC	1604	46
F63	RS P	L \$	SNC, CALCULATION OF SN CONSTANTS FOR DSN TDC	PW	1604	189
F63	RS P	T A \$	JUPITOR1, COUPLED-CHANNEL X-SEC EVALUATION	ORNL	1604	308
F63	RS P	T C \$	EQUIPCISE3A, 2-D 2-GP DIFFUSION CYLINDER SLAB	CDC	1604	87
F63	RS P	T C \$	FOG, 1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE	CDC	1604	28
F63	RS P	T C \$	FORTAN TDC, 2-D MULTI-GP SN APPROXIMATION RZ	PW	1604	161
F63	RS P	T C \$	WHIRLAWAY, 3-D 2-GROUP DIFFUSION XYZ GEOMETRY	CDC	1604	32
F63	RS P	T C \$	20GRAND, 2-D FEW-GROUP DIFFUSION SLAB CYLINDER	CDC	1604	40
F63	RS P	T I \$	PIP, CENTRIFUGAL PUMP IMPELLER DESIGN STUDY	PW	1604	187
F63	RS PL	T A \$	ARES2, RESONANCE INTEGRAL X-SECTION CALC	CDC	1604	89
F63	RS PL	T B \$	FORM, FAST NEUTRON SPECTRUM X-SECTION CALC	CDC	1604	51
F63	RS PL	T B \$	TEMPEST2, THERMAL NEUTRON SPECTRUM X-SECTIONS	CDC	1604	50
F63	RS PL	T C \$	AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	CDC	1604	29
F63	RS PL	T C \$	DTF, 1-D MULTIGROUP DISCRETE ORDINATE CALC	UNC	1604	144
F63	RS PLX	T B \$	GAM1, FAST NEUTRON SPECTRUM X-SECTION CALC	CDC	1604	33
F63	RS PLX	T C \$	FAIM, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	CDC	1604	120
F63	RSBP	A \$	NEARREX, COMPOUND NUCLEUS X-SECTION CALC	ANL	3600	171
F63	RSBP	E \$	R101, SPACE-INDEPENDENT KINETICS KEX OPTICS	ANL	3600	255
F63	RSBP	E \$	R102, SPACE-INDEPENDENT INVERSE KINETICS CALC	ANL	3600	168
F63	RSBP	F \$	AX1, COUPLED NEUTRONICS-HYDRODYNAMICS SPHERE	CDC	3600	102
F63	RSBP	O \$	COINC, COINCIDENCE COUNTING DATA REDUCTION	ANL	3600	248
F63	RSBP	T A \$	2PLUS, NON-SPHERICAL OPTICAL MODEL X-SECTIONS	ANL	3600	254
F63	RSBP	T C \$	FLARE, 3-D REACTIVITY AND POWER DISTRIBUTION	CDC	3600	167
F63	RSBP	T E \$	TRAFICORPORATION, TRANSFER FUNCTION SYNTHESIS	ANL	3600	135
F63	RSBP	T G \$	R153, PARAMETRIC SITE REQUIREMENT STUDY	ANL	3600	172
F63	RSBP	T H \$	ARGUS, TRANSIENT TEMPERATURE CALC CYLINDER	ANL	3600	152
F63	RSBP	T M \$	XLBIT, X-SECTION LIBRARY UTILITY ROUTINE	ANL	3600	181
F63	RSBP	XCT B \$	THERMOS(ANL), THERMAL SPECTRUM X-SECTION CALC	ANL	3600	184
F63	RSBP	T J \$	MAC, SHIELD DESIGN MULTIGROUP SLAB GEOMETRY	ANL	3600	143
G-Z	ANL	360	F+P+A RS T P \$ AMCLIRZ, ARGONNE SUBROUTINE LIBRARY CAT.			564
GADSE,DOSET, HTGR ACCIDENT ANALYSIS DOSE CALC	GGA	1108	F4 RS T G \$			261
GAF,GAR, SPECTRA AND GROUP-AVERAGED X-SEC CALC	GGA	1108	F4 RS P X T B \$			316
GAFFE, EQUILIBRIUM FUEL CYCLE CALCULATION	GGA	1108	F4 S T D \$			302
GAFGAR ENDF/B DATA TAPES	GGA	1108	RIN R L T Z \$ ZPR-III ASSEMBLY 48			356
GAFGAR X-SECTION LIBRARY PREPARATION	GGA	1108	F4 RS P X T L \$ GAND,			345
GAFGAR X-SECTIONS	GGA	1108	F5 RS P T B \$ ENDFB2,GAND2,GFE2, ENDF/B TO			596
GAKER, INELASTIC SCAT X-SECTION CALC MODERATOR	GGA	1108	F4 RS P A \$			289
GAKIN, 1-D MULTIGROUP TIME-DEPENDENT DIFFUSION	GGA	1108	F4 RS P T F \$			310
GAKIT, 1-D MULTIGP KINETICS WITH TEMP FEEDBACK	GGA	1108	F4 RS P T F \$			370
GAM, ANISN X-SEC FORMAT WAPD 6600	F4	RS PL	T P \$ ETOG1, ENDF/B TO MUFT,			437
GAM, ANISN X-SEC FORMAT WAPD 7600	F4	RS P	T B \$ ETOG3, ENDF/B TO MUFT,			538
GAMBLE4, 2-D MULTI-GP DIFFUSION XY RZ GEOMETRY	GGA	7044	F+MAP RSRP T C \$			222
GAMBLE5, 2-D MULTI-GP DIFFUSION XY RZ GEOMETRY	GGA	1108	F+BAL RS P T C \$			222
GAMBIT, X-SEC GENERATION FOR TRANSPORT CODES	WANL	6600	F4 RS L T B \$			547
GAMMA DOSE INTEGRALS	DP	360	F4 RS P G \$ EGAD, CALC OF EXTERNAL			600
GAMMA RAY SOURCE BUILDUP FACTOR CALC	BAPL	6600	F+ASC RS P T J \$ ASPIS,			429
GAMMA RAY SPECTRA	ORNL	360	F4 RS P O \$ ALPHA-M, RESOLUTION CF			413
GAMMA-P, PRODUCTION X-SECTIONS FOR GAMMA-RAYS	GEC	7094	F4 RS P B \$			235
GAMMA-RAY ATTENUATION CYL SPHERE GEOM	AI	7090	F2 RS P J \$ GRACE2,			46
GAMMA-RAY ATTENUATION CYL SPHERE GEOM	CDC	1604	F63 RS P J \$ GRACE2,			46
GAMMA-RAY ATTENUATION SLAB GEOMETRY	AI	7090	F2 RS P J \$ GRACE1,			45
GAMMA-RAY ATTENUATION SLAB GEOMETRY	CDC	1604	F63 RS P J \$ GRACE1,			45
GAMMA-RAY DOSE RATE FROM A CLOUD	AI	7090	F2 RS P G \$ CLOUD,			47
GAMMA-RAY DOSE RATE FROM A CLOUD	CDC	1604	F63 RS P G \$ CLOUD,			47
GAMMA-RAY DOSE RATE FROM A CLOUD	DP	360	F4 RS P G \$ CLOUD,			47
GAMMA-RAY HISTORIES	PW	1604	F+CDP RS P X T B \$ FMC-N,FMC-G, MC NEUTRON,			195
GAMMA-RAY PHOTOFRACTION SOLID CRYSTAL	UM	7090	MAD RSB O \$ BURP4,			169
GAMMA-RAY PHOTOFRACTION WELL CRYSTAL	UM	7090	MAD RSB O \$ BURP5,			170
GAMMA-RAY RADIOACTIVITY	IITR	7094	F4 RSBPLX T D \$ NAP, NEUTRON-INDUCED			314
GAMMA-RAY SPECTRA ANALYSIS	KAPL	6600	F4 RS T O \$ GASPAN, COMPLEX			485

GAMMA-RAY

GESV

GAMMA-RAY SPECTRA GE(LI)	ANC	360	F4	RSBP	XCT	W	\$	GAUSS5, ANALYSIS OF	605				
GAMMA-RAY SPECTRA GGA	1108	F+BAL	RS	P	T	O	\$	TCAD, PROCESSING OF ANALYZER	333				
GAMMA-RAY SPECTRA KSUN	360	F4	RS	P	O	\$	CORGAM, UNFOLDING OF COMPLEX	390					
GAMMA-RAY TRANSPORT	BAPL	6600	F4	RS	P	T	J	\$	MO756,LETO, 1-D SLAB	343			
GAMMA-RAYS GEC	7094	F4	RS	P	B	\$	GAMMA-P, PRODUCTION X-SECTIONS FOR	235					
GAMTEC2, MULTI-GP CONSTANT CALC	O	TO	10	MEV	BC	625	F4	RS	PLX	T	B	\$	185
GAMTEC2, MULTI-GP CONSTANT CALC	O	TO	10	MEV	BNW	1107	F4	RS	PL	T	B	\$	185
GAMTEC2, MULTI-GP CONSTANT CALC	O	TO	10	MEV	BNW	7090	F+FAP	RS	PL	T	B	\$	185
GAMTEC2, MULTI-GP CONSTANT CALC	O	TO	10	MEV	UVA	6400	F4	RS	PLX	T	B	\$	185
GAMTRI, 2-D MULTIGP DIFFUSION TRIANGULAR MESH	GGA	1108	F+BAL	RS	P	T	C	\$	401				
GAM1 CR 2	WAPD	6600	BCD	R	L	T	Z	\$	ETOG1 DATA LIBRARIES, MUFT4 OR 5,	447			
GAM1, FAST NEUTRON SPECTRUM X-SECTION CALC	ANL	3600	F63	RS	LX	T	B	\$	33				
GAM1, FAST NEUTRON SPECTRUM X-SECTION CALC	CDC	1604	F63	RS	PLX	T	B	\$	33				
GAM1, FAST NEUTRON SPECTRUM X-SECTION CALC	GCA	7090	F2	RS	PLX	T	B	\$	33				
GAND, GAFGAR X-SECTION LIBRARY PREPARATION	GGA	1108	F4	RS	P	X	T	L	\$	345			
GANDY, UNRESOLVED RESONANCE X-SECTION CALC	GGA	1108	F4	RS	P	A	\$	341					
GAND2,GFE2, ENDF/B TO GAFGAR X-SECTIONS GCA	1108	F5	RS	P	T	B	\$	ENDFB2,	596				
GAPER1D, 1-D TRANSPORT PERTURBATION THEORY	GGA	1108	F4	RS	P	XCT	C	\$	606				
GAPER2D, 2-D PERTURBATION CALC FROM 2DF CUTPUT	GGA	1108	F5	RS	P	T	N	\$	471				
GAPL3, INELASTIC LARGE DEFLECTION STRESS STUDY	BAPL	6600	F+CCM	RS	P	T	I	\$	397				
GAPCTKIN, SPACE-INDEPENDENT REACTOR KINETICS	GGA	1108	F4	RS	P	E	\$	317					
GAR, SPECTRA AND GROUP-AVERAGED X-SEC CALC GGA	1108	F4	RS	P	X	T	B	\$	GAF,	316			
GARGCYLE, FUEL CYCLE ANALYSIS PARTIAL REFUEL	GGA	7044	F4	RS	P	T	D	\$	260				
GARCL, RESONANCE OVERLAP AND LATTICE EFFECTS	GGA	7044	F+MAP	RS	P	T	B	\$	219				
GAROL, RESONANCE OVERLAP AND LATTICE EFFECTS	LER	7094	F+MAP	RS	P	T	B	\$	219				
GAS RELEASE SIMULATION BAPL 6600 F4 RS P	T	I	\$	BUBL1, FUEL SWELLING &	468								
GAS-COOLED CORE THERMAL DESIGN STUDY GGA	7044	F4	RS	P	I	\$	GAZFLE5,	232					
GASA, STABILITY ANALYSIS REACTOR KINETICS EQNS	GGA	1108	F4	RS	P	E	\$	290					
GASECUS RELEASE ORNL 360 F4 PS P C G \$	STEFEG, ANALYSIS OF PWR & BWR	583											
GASKET, THERMAL SCATTERING LAW CALCULATION	GCA	1108	F4	RS	P	A	\$	263					
CASPAN, COMPLEX GAMMA-RAY SPECTRA ANALYSIS	KAPL	6600	F4	RS	T	O	\$	485					
GASP2, 1-D FEW-GP DIFFUSION POWER DIST SEARCH	GGA	7044	F4	RS	P	T	C	\$	220				
GASP7, 1-D BURNUP POWER DISTRIBUTION SEARCH	GGA	1108	F4	PS	P	T	C	\$	319				
GATT, 3-D FEW-GP DIFFUSION CALC HEX-Z MESH	GGA	1108	F4	RS	P	T	C	\$	380				
GAUGE, 2-D FEW-GP HEX GEOM DIFFUSION DEPLETION	GGA	1108	F4	RS	P	T	D	\$	339				
GAUSS5, ANALYSIS OF GAMMA-RAY SPECTRA GE(LI)	ANC	360	F4	RSBP	XCT	W	\$	605					
GAVER, ENRGY INTERVAL X-SECTION AVERAGING	GCA	7044	F4	RS	P	L	\$	218					
GAZE1E5, GAS-COOLED CORE THERMAL DESIGN STUDY	GGA	7044	F4	RS	P	I	\$	232					
GAZE2, 1-D MULTIGROUP DIFFUSION SLAB, SPH, CYL	GGA	1108	F+BAL	RS	P	T	C	\$	430				
GE(LI) ANC 360 F4 RSBP XCT W \$ GAUSS5, ANALYSIS OF GAMMA-RAY SPECTRA	605												
GE-HAPQ-S13, 1-D MULTI-GP DOUBLE SN APPROX	BNW	7090	FLCCC	RSBP	T	C	\$	75					
GEAR, ORDINARY DIFFERENTIAL EQN SYSTEM SOLVER	LLL	6600	F4	RS	P	P	\$	592					
GFC 625 F4 RS P B \$	AVOID, ANNULAR VOID X-SECTION CALCULATION	276											
GEC 635 F+FAP RSBP T Q \$	CASCADE,CLUSTER, RADIATION DAMAGE IN METALS	419											
GEC 635 F+GMP RSBP T H \$	THTE, 3-D TRANSIENT HEAT TRANSFER PROGRAM	346											
GFC 635 F4 RSBP D \$	CHAINS, ANALYSIS OF RADIOACTIVE DECAY CHAINS	418											
GFC 635 F4 RSBP D \$	COS, NEUTRON FLUX-DOSIMETER ACTIVITY RELATION	423											
GFC 635 F4 RSBP O \$	MICHRD, MICRCHARDNESS MEASUREMENT ANALYSIS	421											
GEC 635 F4 RSBP T B \$	GROUSE, SPACE-DEPENDENT X-SECTION GENERATION	420											
GFC 7090 FAP RSBP X T Q \$	SPECTRA, MC CALCULATION IRRADIATED MATERIAL	422											
GEC 7094 F4 RS P B \$	GAMMA-P, PRODUCTION X-SECTIONS FOR GAMMA-RAYS	235											
GEES 1108 F5 RS P T O \$	CAGE,BIRC,SPEC, TIME-OF-FLIGHT DATA ANALYSIS	476											
GEM, ANALYSIS OF NUCLEAR FUEL CYCLE ECONOMICS	UICS 360 F4 RS P CT D \$	576											
CEM, EIGENVALUE PROBLEM FOR VIBRATING SYSTEMS	KAPL 6600 F+ASC RS P T I \$	344											
GENED ENVIRONMENTAL ROUTINES, SUBROUTINE LIB.	NED 635 F+GMP RS T P \$	515											
GENERATOR DESIGN CRITERIA COSTS GCA 7044 F4	RS P T D \$	STMGEN, STEAM	227										
GENERATOR SODIUM-WATER REACTION CEND 7600 F4	RS P T G \$	CERUG, STEAM	548										
GENRD, FREE-FORMAT CARD INPUT PROCESSOR	LASL 360 F4 RS P L \$	530											
GENRD, FREE-FORMAT CARD INPUT PROCESSOR	LASL 6600 F4 RS P L \$	530											
GEOMETRICAL DATA HEAT TRANSFER STUDY SLL 6600 F4	RS P N \$	HEATMESH,	434										
GEPI GETS BASIC R M \$	MAPPER, PREDICTING MANUFACTURING REQUIREMENTS	595											
GESV 635 F+GMP RS P XCT B \$	ENDRUN2, MULTIGROUP CONSTANTS FROM ENDF/B DATA	501											
GESV 635 F+GMP RS P XCT L \$	TDGWA, SPATIAL & COMPOSITION-DEPENDENT X-SECS	505											
GESV 635 F4 RS P CT I \$	REHAVE2, OXIDE FUEL PERFORMANCE FINITE-ELEMENT	568											

GESV

GGA

GESV	H600	F4	RS	P	CT	C	\$ TRIAL, 3-D REACTION RATES FROM 2-D FLUX SETS	585					
GETS	BASIC	R			M	\$ MAPPER, PREDICTING MANUFACTURING REQUIREMENTS	GEPI	595					
GETS	F	R			R	\$ PLETHS, ISOPLETH-AREA CALC FROM SINGLE SOURCE	ANL	591					
GFE2,	ENDF/B	TO	GAFGAR	X-SECTIONS	GGA	1108	F5	RS	P	T	B	\$ ENDFB2,GAND2,	596
GGA	1108	BIN	R	L	T	Z	\$ ZPR-III ASSEMBLY 48 GAFGAR ENDF/B DATA TAPES	356					
GGA	1108	F+BAL	RS	P	T	C	\$ GAMBLE5, 2-D MULTI-GP DIFFUSION XY RZ GEOMETRY	222					
GGA	1108	F+BAL	RS	P	T	C	\$ GAMTRI, 2-D MULTIGP DIFFUSION TRIANGULAR MESH	401					
GGA	1108	F+BAL	RS	P	T	C	\$ GAZE2, 1-D MULTIGROUP DIFFUSION SLAB, SPH, CYL	430					
GGA	1108	F+BAL	RS	P	T	D	\$ BUGTRI, 2-D MULTIGP DIFFUSION+BURNUP TRI-MESH	439					
GGA	1108	F+BAL	RS	P	T	D	\$ BUG2, 2-D MULTIGROUP DIFFUSION & BURNUP XY, RZ	438					
GGA	1108	F+BAL	RS	P	T	E	\$ BLOOST6, COMBINED KINETICS 2-D HEAT TRANSFER	303					
GGA	1108	F+BAL	RS	P	T	C	\$ TLOAD, PROCESSING OF ANALYZER GAMMA-RAY SPECTRA	333					
GGA	1108	F4		S	T	D	\$ GAFFE, EQUILIBRIUM FUEL CYCLE CALCULATION	302					
GGA	1108	F4	RS		B	\$ HEXSCAT, ELASTIC SCAT X-SECTIONS HEX LATTICE	291						
GGA	1108	F4	RS		T	G	\$ GADOSE,DCSET, HTGR ACCIDENT ANALYSIS DOSE CALC	261					
GGA	1108	F4	RS	P	A	\$ GAKER, INELASTIC SCAT X-SECTION CALC MODERATOR	289						
GGA	1108	F4	RS	P	A	\$ GANDY, UNRESOLVED RESONANCE X-SECTION CALC	341						
GGA	1108	F4	RS	P	A	\$ GASKET, THERMAL SCATTERING LAW CALCULATION	263						
GGA	1108	F4	RS	P	A	\$ PSEUDO, STATISTICAL RESONANCE PARAMETER CALC	292						
GGA	1108	F4	RS	P	D	\$ FREVAP6, HTGR METALLIC FISSION PRODUCT RELEASE	301						
GGA	1108	F4	RS	P	E	\$ GAPOTKIN, SPACE-INDEPENDENT REACTOR KINETICS	317						
GGA	1108	F4	RS	P	E	\$ GASA, STABILITY ANALYSIS REACTOR KINETICS EQNS	290						
GGA	1108	F4	RS	P	I	\$ SAFE-CREEP, VISCOELASTIC ANALYSIS CONCRETE	300						
GGA	1108	F4	RS	P	I	\$ SAFE-PLANE, PLANE STRESS ANALYSIS, 2-D RODIES	252						
GGA	1108	F4	RS	P	I	\$ SAFE-SHELL, STRESS ANALYSIS THIN SHELLS	253						
GGA	1108	F4	RS	P	I	\$ SAFE-2D, PLANE & AXISYMMETRIC STRESS ANALYSIS	379						
GGA	1108	F4	RS	P	L	\$ GRDWRK, GRID GENERATION FOR SAFE PROGRAMS	296						
GGA	1108	F4	RS	P	T	A	\$ TACASI, ANALYSIS OF RESONANCE MEASUREMENTS	410					
GGA	1108	F4	RS	P	T	C	\$ GASP7, 1-D BURNUP POWER DISTRIBUTION SEARCH	319					
GGA	1108	F4	RS	P	T	C	\$ GATT, 3-D FEW-GP DIFFUSION CALC HEX-Z MESH	380					
GGA	1108	F4	RS	P	T	C	\$ TEMCO7, TEMPERATURE COEFFICIENT CALCULATION	320					
GGA	1108	F4	RS	P	T	D	\$ FEVER7, 1-D MULTIGROUP DIFFUSION AND DEPLETION	318					
GGA	1108	F4	RS	P	T	D	\$ GAUGE, 2-D FEW-GP HEX GEOM DIFFUSION DEPLETION	339					
GGA	1108	F4	RS	P	T	D	\$ PWOCST, REACTOR FUEL CYCLE COST CALCULATION	441					
GGA	1108	F4	RS	P	T	F	\$ GAKIN, 1-D MULTIGROUP TIME-DEPENDENT DIFFUSION	310					
GGA	1108	F4	RS	P	T	F	\$ GAKIT, 1-D MULTIGP KINETICS WITH TEMP FEEDBACK	370					
GGA	1108	F4	RS	P	T	F	\$ WIGL2, 1-D 2-GP SPACE-TIME DIFFUSION 3-GEOM	274					
GGA	1108	F4	RS	P	T	H	\$ DYNAM, DYNAMIC ANALYSIS BOILING FLOW STEAM	440					
GGA	1108	F4	RS	P	T	I	\$ SAFE-3D, 3-D COMPOSITE STRUCTURE STRESS STUDY	332					
GGA	1108	F4	RS	P	T	J	\$ MUSCAT, VIEW FACTOR SHIELDING CODE CAVITY GEOM	259					
GGA	1108	F4	RS	P	X	A	\$ COHBE, COHERENT INELASTIC SCATTERING LAW CALC	385					
GGA	1108	F4	RS	P	X	T	B	\$ GAFGAR, SPECTRA AND GROUP-AVERAGED X-SEC CALC	316				
GGA	1108	F4	RS	P	X	T	L	\$ GAND, GAFGAR X-SECTION LIBRARY PREPARATION	345				
GGA	1108	F4	RS	P	X	T	C	\$ GAPER1D, 1-D TRANSPORT PERTURBATION THEORY	606				
GGA	1108	F4	RS	PLX	T	B	\$ GGC4, MULTI-GP X-SECTIONS FAST THERMAL SPECTRA	298					
GGA	1108	F5	RS	P	A	\$ FLANGE1, SCATTERING LAW X-SECTION CALCULATION	247						
GGA	1108	F5	RS	P	H	\$ FLAC, STEADY-STATE FLOW, PRESSURE DISTRIBUTION	395						
GGA	1108	F5	RS	P	T	P	\$ ENDFB2,GAND2,GFE2, ENDF/B TO GAFGAR X-SECTIONS	596					
GGA	1108	F5	RS	P	T	C	\$ 2DF, 2-D MULTI-GP DISCRETE ORDINATE CODE	173					
GGA	1108	F5	RS	P	T	H	\$ TAC2D, STEADY-STATE AND TRANSIENT TEMP CALC	408					
GGA	1108	F5	RS	P	T	H	\$ TAC3D, TRANSIENT 3-D HEAT TRANSFER PROGRAM	414					
GGA	1108	F5	RS	P	T	I	\$ SAFE-CRACK, VISCOELASTIC ANALYSIS OF CONCRETE	451					
GGA	1108	F5	RS	P	T	I	\$ SHELL5, THIN SHELL 3-D STRUCTURAL ANALYSIS	452					
GGA	1108	F5	RS	P	T	N	\$ GAPER2D, 2-D PERTURBATION CALC FROM 2DF OUTPUT	471					
GGA	1108	F5	RS	P	CT	A	\$ FSOP3, POINTWISE XSECS. FROM R-W PARAMETERS	216					
GGA	6600	F4	RS	L	T	R	\$ GGC4, MULTI-GP X-SECTIONS FAST THERMAL SPECTRA	298					
GGA	7044	F+MAP	RS	P	T	R	\$ GAROL, RESONANCE OVERLAP AND LATTICE EFFECTS	219					
GGA	7044	F+MAP	RS	P	T	C	\$ QPUS, POWER PLANT PERFORMANCE AND PRICE STUDY	226					
GGA	7044	F+MAP	RS	P	T	H	\$ RLOCST5, POINT-KINETICS WITH 2-D HEAT TRANSFER	205					
GGA	7044	F+MAP	RSBP		M	\$ UNPACK, RETRIEVAL FROM SCISRS X-SECTION TAPE	206						
GGA	7044	F+MAP	RSBP		T	C	\$ CAMBLE4, 2-D MULTI-GP DIFFUSION XY RZ GEOMETRY	222					
GGA	7044	F+SPS	RSBP		T	N	\$ CROSSPLOT, SC4020 PLOTS FROM X-SECTION TAPES	207					
GGA	7044	F4	RS		I	\$ CORE, CORE CONFIGURATION FUEL TEMPERATURE CODE	233						
GGA	7044	F4	RS	X	T	G	\$ PRECCN, HTGR CONTAINMENT PRESSURE POST RUPTURE	228					

GGA

HEAT

GGA	7044	F4	RS	P	D	\$	RAD2, HTGR FISSION PRODUCT ACTIVITY DIST STUDY	231								
GGA	7044	F4	RS	P	D	\$	WAMPUM, FUEL CYCLE COSTS PERFORMANCE STUDY	224								
GGA	7044	F4	RS	P	I	\$	GAZELLE5, GAS-COOLED CORE THERMAL DESIGN STUDY	232								
GGA	7044	F4	RS	P	L	\$	GAVER, ENERGY INTERVAL X-SECTION AVERAGING	218								
GGA	7044	F4	RS	P	T	B	\$	FMC-N, MONTE CARLO CALC NEUTRON HISTORIES	195							
GGA	7044	F4	RS	P	T	C	\$	GASP2, 1-D FEW-GP DIFFUSION POWER DIST SEARCH	220							
GGA	7044	F4	RS	P	T	C	\$	TEMCO, 1-D FEW-GP DIFFUSION TEMP COEF CALC	225							
GGA	7044	F4	RS	P	T	D	\$	GARGOYLE, FUEL CYCLE ANALYSIS PARTIAL REFUEL	260							
GGA	7044	F4	RS	P	T	D	\$	RFLDAD-FEVER, 1-D FEW-GP DIFFUSION DEPLETION	221							
GGA	7044	F4	RS	P	T	D	\$	REVISED-GAD, FUEL CYCLE ANALYSIS W/REFUELING	223							
GGA	7044	F4	RS	P	T	G	\$	STMGEN, STEAM GENERATOR DESIGN CRITERIA COSTS	227							
GGA	7044	F4	RS	P	T	I	\$	SAFF-AXISYM, STRESS ANALYSIS AXISYMMETRIC LOAD	251							
GGA	7044	F4	RS	P	X	A	\$	LEGOFF3, LEGENDRE COEF CALC FOR ANGULAR DIST	217							
GGA	7044	F4	RSBP	CT	I	\$	SAFF-PCRS, STRESS ANALYSIS AXISYMMETRIC LOAD	250								
GGA	7090	F+FAP	RSB	T	A	\$	TUZ, UNRESOLVED REGION RESONANCE INTEGRAL CALC	42								
GGA	7090	F+FAP	RSB	T	A	\$	ZUT, RESOLVED REGION RESONANCE INTEGRAL CALC	41								
GGA	7090	F+FAP	RSBP	T	D	\$	DDR, 2-D FEW-GP DIFFUSION BURNUP RZ GEOMETRY	99								
GGA	7090	F2	RS	T	A	\$	SUMMIT, CRYSTALLINE SCATTERING KERNEL CALC	56								
GGA	7090	F2	RS	PLX	T	P	\$	CAM1, FAST NEUTRON SPECTRUM X-SECTION CALC	33							
GGA	7090	F2	RSB	T	D	\$	FEVER, 1-D FEW-GP DIFFUSION DEPLETION PROGRAM	117								
GGC4,	MULTI-GP	X-SECTIONS	FAST	THERMAL	SPECTRA	GGA	1108	F4	RS	PLX	T	B	\$	298		
GGC4,	MULTI-GP	X-SECTIONS	FAST	THERMAL	SPECTRA	GGA	6600	F4	RS	L	T	B	\$	298		
GLEN,	GROUP	CONSTANT	CALC	FROM	TOR	OUTPUT	DATA	LASL	6600	F4	RS	P	T	B	\$	361
GLUB1,	WATER-LOGGED	FUEL	ELEMENT	ANALYSIS		BAPL	6600	F4	RS	P	T	H	\$	424		
GRACE1,	GAMMA-RAY	ATTENUATION	SLAB	GEOMETRY		AI	7090	F2	RS	P	J	\$	45			
GRACE1,	GAMMA-RAY	ATTENUATION	SLAB	GEOMETRY		CDC	1604	F63	PS	P	J	\$	45			
GRACE2,	GAMMA-RAY	ATTENUATION	CYL	SPHERE	GEOM	AI	7090	F2	RS	P	J	\$	46			
GRACE2,	GAMMA-RAY	ATTENUATION	CYL	SPHERE	GEOM	CDC	1604	F63	RS	P	J	\$	46			
GRAMP,	R-M	PARAMETERS	OF	UNRESOLVED	RESONANCES	BAPL	6600	F4	RS	P	A	\$	470			
GRAPHIC	X-SEC	EVALUATION	AI	360	F+BAL	RSB	L	CT	M	\$	SCORE3, SCISRS	ENDF/B	375			
GRAPHICS	SUBROUTINES	AI	360	F+BAL	RS	T	P	\$	FIGS, IPM360&2250	FORTRAN	484					
GRAVE,	GROUP-AVERAGING	X-SECTIONS	PARAMETERS	AI	7094	F+FAP	RS	PL	T	B	\$	162				
GRDWRK,	GRID	GENERATION	FOR	SAFE	PROGRAMS	GGA	1108	F4	RS	P	L	\$	296			
GRID	GENERATION	FOR	SAFE	PROGRAMS	GGA	1108	F4	RS	P	L	\$	GRDWRK,	296			
GROUP	COLLAPSING	APRF	6600	F4	RS	B	\$	APRFX1, 99-GP	DLC-2B	LIBRARY	466					
GRUP	CONSTANT	CALC	FROM	TOR	OUTPUT	DATA	LASL	6600	F4	PS	P	T	B	\$	GLEN,	361
GRUP	OR	MESH	COLLAPSING	TRW	6500	F4	RS	P	B	\$	PARTI, OPTIMAL	416				
GROUP-AVERAGED	X-SEC	CALC	GGA	1108	F4	RS	P	X	T	B	\$	GAF,GAR, SPECTRA AND	316			
GROUP-AVERAGING	X-SECTIONS	PARAMETERS	AI	7094	F+FAP	RS	PL	T	B	\$	GRAVE,	162				
GROUP-COLLAPSING	OF	MULTI-GP	X-SECTIONS	LASL	7090	FLOCO	RS	P	B	\$	ZOT,	113				
GROUSE,	SPACE-DEPENDENT	X-SECTION	GENERATION	GEC	635	F4	RSBP	T	B	\$	420					
GSSLRN1B,	LEAST	SQUARES	PHOTOPEAK	SPECTRA	CODE	BNWL	1108	F+BAL	RS	P	T	O	\$	457		
HAA3,	COAGULATION	OF	HETEROGENEOUS	AEROSOLS	AI	360	F4	RS	P	T	G	\$	443			
HAFEVER,	HAUSER-FESHBACH	INELASTIC	SCATTERING	CDC	1604	F63	RS	P	A	\$	14					
HAMMER,LITHE,HELP,	CRITICAL	ANALYSIS	SYSTEM	DP	360	F+BAL	RS	P	XCT	B	\$	277				
HARMONY-PDQ	X-SECTION	GENERATION	CODE	BAPL	6600	F+COM	RS	P	X	T	B	\$	PAX03,	426		
HATCHET,	COUPLED	NEUTRONICS-HYDRODYNAMICS	CODE	AGC	7090	F2	RSB	F	\$	153						
HAUSER-FESHBACH	INELASTIC	SCATTERING	CDC	1604	F63	RS	P	A	\$	HAFEVER,	14					
HEAT	CONDUCTION	PPCD	7044	F+MAP	RS	P	T	H	\$	TOODEE, 2-D	TIME-DEPENDENT	349				
HEAT	CONDUCTION	ORNL	360	F4	RS	P	X	T	H	\$	ORTHIS,ORTHAT, 2-DIMENSIONAL	525				
HEAT	CONDUCTION	LUMPED	MASS	LASL	7030	F4	RS	T	H	\$	RATH, 2- OR 3-D	242				
HEAT	CONDUCTION	LUMPED	MASS	LASL	7094	FAP	RS	P	T	H	\$	RATH, 2- OR 3-D	242			
HEAT	CONDUCTION	PROGRAM	BAPL	6600	F4	RS	P	T	H	\$	MOT2, 2-D	TRANSIENT	286			
HEAT	CONDUCTION	PROGRAM	ORNL	360	F4	RS	P	T	H	\$	HEATING3, 1,2, OR 3-D	517				
HEAT	EXCHANGER	STRESS	ANALYSIS	KAPL	6600	F4	RS	P	I	\$	TUBE, U-TUBE	378				
HEAT	TRANSFER	GGA	1108	F+BAL	RS	P	T	E	\$	BLOCST6, COMBINED	KINETICS	2-D	303			
HEAT	TRANSFER	AI	7094	F+FAP	RS	P	T	H	\$	HEATING2, TRANSIENT	STEADY-STATE	198				
HEAT	TRANSFER	AI	7094	F2	RS	P	T	G	\$	TRANS-FUGUE1, TRANSIENT	FLOW AND	268				
HEAT	TRANSFER	CALC	ANC	360	F4	RSBP	XCT	H	\$	MOXY, BWR	FUEL	ELEMENT	551			
HEAT	TRANSFER	CALC	ANC	1108	F4	RS	P	T	H	\$	MOXY, BWR	FUEL	ELEMENT	551		
HEAT	TRANSFER	GGA	7044	F+MAP	RS	P	T	H	\$	BLOCST5, POINT-KINETICS	WITH	2-D	205			
HEAT	TRANSFER	MOLTEN	FUEL	TUBE	BUNDLES	LASL	7094	F2	RSBP	H	\$	AXFLU,	182			
HEAT	TRANSFER	PROGRAM	GEC	635	F+GMP	RSBP	T	H	\$	THTE, 3-D	TRANSIENT	346				

HEAT

INPUT

HEAT TRANSFER PROGRAM	GGA 1108 F5	RS P	T H \$	TAC3D, TRANSIENT 3-D	414
HEAT TRANSFER SOLID FUEL TUFF BUNDLES	LASL 7094 F2	RSPP	H \$	AXTHRM,	183
HEAT TRANSFER STUDY SLL 6600 F4	RS P	N \$	HEATMESH, GEOMETRICAL DATA	434	
HEATING CLADDING-STEAM REACTION ANL 3600 F36	RSBP	G \$	CHEMLCC2, CORE	366	
HEATING2, TRANSIENT STEADY-STATE HEAT TRANSFER AI 7094	F+FAP RS P	T H \$		198	
HEATING3, 1,2, OR 3-D HEAT CONDUCTION PROGRAM CENL 360 F4	RS P	T H \$		517	
HEATMESH, GEOMETRICAL DATA HEAT TRANSFER STUDY SLL 6600 F4	RS P	N \$		434	
HEAVY ELEMENT ISOTOPIC BURNUP ANALYSIS NEC 635 F4	RS P	T Q \$	BURNUP,	311	
HEDL 1108 F+SL RS P XCT R \$	HERMES, REGIONAL RADIOLOGICAL EFFECTS ANALYSIS			527	
HEDL 1108 F4 RS P	G \$	SODCC2, SODIUM-FUEL INTERACTION ANALYSIS		521	
HEDL 1108 F4 RS P	T D \$	3DR, 3-D MULTIGROUP DIFFUSION BURNUP ANALYSIS		567	
HEDL 1108 F5 RS P	T R \$	TOPLR2, POWER PLANT THERMAL DISCHARGE STUDY		599	
HEDL 1108 F5 RS P X T D \$	PACTOLUS, CLCTHO, NUCLEAR POWER PLANT COST CODE			540	
HEDL 1108 F4 RS P X T B \$	ETCX3, MULTI-GP CONSTANTS FROM ENDF/B FOR 1DX			388	
HELP, CRITICAL ANALYSIS SYSTEM	CP 360 F+BAL RS P XCT B \$	HAMMER, LITHE,		277	
HERESY3, 2-D HETEROGENEOUS REACTOR CALCULATION DP 360B F4	RSBP	CT C \$		136	
HERMES, REGIONAL RADIOLOGICAL EFFECTS ANALYSIS HEDL 1108 F+SL RS P XCT R \$				527	
HETEROGENEOUS AEROSOLS AI 360 F4 RS P	T G \$	HAA3, COAGULATION OF		443	
HETEROGENEOUS REACTOR CALCULATION DP 360B F4	RSBP	CT C \$	HERESY3, 2-D	136	
HEX CELL BAPL 6600 F+ASC RS P X T B \$	RESQ2, RESQO, DRF1, RESONANCE INTEGRAL			285	
HEX GEOM DIFFUSION DEPLETION GGA 1108 F4 RS P	T C \$	GAUCE, 2-D FEW-GP		339	
HEX LATTICE GGA 1108 F4 RS	B \$	HEXSCAT, ELASTIC SCAT X-SECTIONS		291	
HEX-Z MESH GGA 1108 F4 RS P	T C \$	GATT, 3-D FEW-GP DIFFUSION CALC		380	
HEXSCAT, ELASTIC SCAT X-SECTIONS HEX LATTICE GGA 1108 F4 RS	B \$			291	
HFN, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE BNW 1107 F4 RS P	T C \$			241	
HIGH-VELOCITY FLOW STUDY STEAM-WATER MIX KAPL 6600 F4 RS P	H \$	PAPP,		382	
HISTORIES GGA 7044 F4 PS P	T B \$	FMC-A, MONTE CARLO CALC NEUTRON		195	
HISTORIES PW 1604 F+CDP RS P X T B \$	FMC-N, FMC-G, MC NEUTRON, GAMMA-RAY			195	
HISTORY KE 7094 F2 RSBP	T H \$	PTH1, BLOWDOWN PRESSURE TEMPERATURE		155	
HISTORY LASL 6600 F4 RS P	T D \$	PHENIX, 2D DIFFUSION BURNUP REFUELING		454	
HOH, STEAM TABLES 14.5-2538 PSIA	ANL 1604 F63 RS P	H \$	M0899,	294	
HOH, STEAM TABLES 14.5-2538 PSIA	BAPL 6600 F4 RS P	T H \$	M0899,	294	
HOMOGENEOUS ANL 3600 F36 RSBP	A \$	MISH-MASH, RESONANCE INTEGRAL CALC		214	
HOT2, 2-D TRANSIENT HEAT CONDUCTION PROGRAM BAPL 6600 F4 RS P	T H \$			286	
HRG3, SLOWING-DOWN SPECTRUM, MULTIGP CONSTANTS BNW 1108 F4 RS	PLX T B \$			467	
HRG3, SLOWING-DOWN SPECTRUM, MULTIGP CONSTANTS TVA 360 F4 RS	PLX T B \$			467	
HTGR ACCIDENT ANALYSIS DOSE CALC GGA 1108 F4 RS	T G \$	GADDOSE, DOSET,		261	
HTGR CONTAINMENT PRESSURE POST RUPTURE GGA 7044 F4 RS	X T G \$	PRECON,		228	
HTGR FISSION PRODUCT ACTIVITY DIST STUDY GGA 7044 F4 RS P	D \$	PAD2,		231	
HTGR METALLIC FISSION PRODUCT RELEASE GGA 1108 F4 RS P	D \$	FREVAP6,		301	
HWOGR-SAFE, 2-D MONTE CARLO CELL CALCULATION AI 360 F+BAL RS P X T B \$				307	
HYDRODYNAM RESPONSE TO EXCURSION ANL 360 F4 RS P	CT F \$	REXCO-H, 2-D		550	
HYDRODYNAMIC ANALYSIS DURING BLOWDOWN PPCO 360 F4 RS P X	G \$	BURST1,		435	
HYDRODYNAMIC MASS MATRIX GENERATION BAPL 6600 F+COM RS P	H \$	HYMAS,		560	
HYMAS, HYDRODYNAMIC MASS MATRIX GENERATION BAPL 6600 F+COM RS P	H \$			560	
H600 F4 RS P	CT C \$	TRIAL, 3-D PFACION RATES FROM 2-D FLUX SETS	GESV	585	
IBM 360A F+BAL RS P	T D \$	PCQ5, 2-D FEW-GROUP DIFFUSION AND DEPLETION		336	
IBM2280 7R CALCOMP780 ANL 360 F4 RS P	T N \$	PLOT-3D, 3-D PLCTS ON		544	
IBM360&2250 FORTRAN GRAPHICS SUBROUTINES AI 360 F+BAL RS	T P \$	FIGS,		484	
IITR 7094 F4 RSBP	PLX T D \$	NAP, NEUTRON-INDUCED GAMMA-RAY RADIOACTIVITY		314	
IMPELLER DESIGN STUDY PW 1604 F63 RS P	T I \$	PIP, CENTRIFUGAL PUMP		187	
INCXE, 1-GP 3-D XYZ XENON OSCILLATION CENC 360 F4 RS P X T F \$	CEXE,			415	
INCITE, THERMAL SPECTRA & MULTI-GP CONSTANTS ANC 360 F4 RS	PL CT B \$			565	
INDEXING LASL 6600 F+COM RS P	T Q \$	INDX, XRAY DIFFRACTION POWDER PATTERN		609	
INDX, XRAY DIFFRACTION POWDER PATTERN INDEXING LASL 6600 F+COM RS P	T Q \$			609	
INELASTIC LARGE DEFLECTION STRESS STUDY BAPL 6600 F+CCM RS P	T I \$	GAPL3,		397	
INELASTIC SCAT X-SECTION CALC MODERATOR GGA 1108 F4 RS P	A \$	GAKER,		289	
INELASTIC SCATTERING CDC 1604 F63 RS P	A \$	HAFEVER, HAUSER-FESHBACH		14	
INELASTIC SCATTERING FORM FACTORS ORNL 360 F4 RS P	T A \$	ATHENA4,		417	
INELASTIC SCATTERING LAW CALC GGA 1108 F4 RS P X	A \$	COHBE, COHERENT		385	
INFINITE MEDIUM SPECTRUM X-SECTIONS AI 7090 F+FAP RS	L T B \$	QUICKIE,		119	
INFORMATION SYSTEM KAPL 6600 F	R B	T M \$	TIGR2, MODULAR DOCUMENT	403	
INLET PLENUM DP 360 F4 RS P	H \$	PLENUM, FLOW DIST. IN CYL COOLANT		586	
INPUT PW 1604 F63 RS	C \$	TDP, 2-D PERTURBATION TDC OR 2DXY FLUX		199	

INPUT

KAPL

INPUT DATA PROCESSING MODULE	ANL	360	F4	RSBP	CT L \$ ARC-NUI002, BCD	533	
INPUT PROCESSOR	LASL	360	F4	RS P	L \$ GENRD, FREE-FORMAT CARD	530	
INPUT PROCESSOR	LASL	6600	F4	RS P	L \$ GENRD, FREE-FORMAT CARD	530	
INPUT, PREPARATION, EDIT	KAPL	6600	F+ASC	RS P	T L \$ DATATRA 2-D GEOMETRY	406	
INSPEC, MARKOV SIMULATION OF REACTOR OPN DP		360	F4	RS P	G \$ INTEG,	590	
INSTRUCTION SET	PW	1604	F+CDP	RS P	T P \$ LAG, ASSEMBLER FOR FLOCO2	186	
INTEG, INSPEC, MARKOV SIMULATION OF REACTOR CPN DP		360	F4	RS P	G \$	590	
INTERACTION ANALYSIS	ANL	360	F4	RS P	G \$ SOCOOL2, SODIUM-FUEL	521	
INTERACTION ANALYSIS	HEDL	1108	F4	RS P	G \$ SOCOOL2, SODIUM-FUEL	521	
INTERMEDIATE POWER TRANSIENTS	BAPL	6600	F4	RS P	T H \$ CHIC-KIN, FAST +	473	
INTERVAL X-SECTION AVERAGING	GGA	7044	F4	RS P	L \$ GAVER, ENERGY	218	
INVERSE KINETICS CALC	ANL	360	F4	RS P	E \$ R102, SPACE-INDEPENDENT	168	
INVERSE KINETICS CALC	ANL	3600	F63	RSBP	E \$ R102, SPACE-INDEPENDENT	168	
INVERSE KINETICS CALC	WANL	7094	F4	RS	E \$ R102, SPACE-INDEPENDENT	168	
IODINE REMOVAL BCL	6400	F4	RS P	G \$	MIRAB, MIRAP, CONTAINMENT SYSTEM	499	
IRRADIATED MATERIAL	GEC	7090	FAP	RSBP	X T Q \$ SPECTRA, MC CALCULATION	422	
ISOCRUNCH, REACTION DECAY CHAIN ANALYSIS		CRNL	1604	F63	RS P	D \$	180
ISOCRUNCH, REACTION DECAY CHAIN ANALYSIS		CRNL	7090	F2	RSBP	D \$	180
ISOGEN, RADIONUCLIDE GENERATION AND DECAY		BNW	1108	F5	RSBP	T D \$	367
ISOPLET-H AREA CALC FROM SINGLE SOURCE	ANL	GETS	F	R	R \$ PLETHS,	591	
ISOSEARCH, ISOTOPE PRODUCTION FLUX, X-SEC CALC	ORNL	360	F+BAL	RS P	D \$	322	
ISOSEARCH, ISOTOPE PRODUCTION FLUX, X-SEC CALC	CRNL	1604	F63	RS P	D \$	322	
ISOTOPE PRODUCTION FLUX, X-SEC CALC	ORNL	360	F+BAL	RS P	D \$	ISOSEARCH,	322
ISOTOPE PRODUCTION FLUX, X-SEC CALC	CRNL	1604	F63	RS P	D \$	ISOSEARCH,	322
ISOTOPES, MAXIMUM YIELD FROM REACTION OR DECAY	CRNL	1604	F63	RS P	D \$	179	
ISOTOPIC BURNUP ANALYSIS	NED	635	F4	RS P	T O \$ BURNUP, HEAVY ELEMENT	311	
ISOTROPIC DIELECTRICS	SLA	6600	F4	RS P	V \$ FFEARS, LAPLACE EQUATION	577	
JAER	230	F4	RS P	T B \$	CLUP77, SQUARE CELL COLLISION PROBABILITY CALC	526	
JITER, FLUCTUATION EXPERIMENT ANALYSIS		BAPL	6600	F4	RS P	T O \$	394
JNC	1108	F5	RS	LX T B \$	LEOPARD, SPECTRA CALCULATION WITH DEPLETION	279	
JOB ENTRY SYSTEM	ANC	360	BAL	RSB	T P \$ ARTS-RJE, OS/360 MVT REMOTE	519	
JOSHUA SYSTEM LATTICE PHYSICS MODULES	CP	360	F+BAL	S	X T B \$ RAHAB,	536	
JOSHUA, DATA STORAGE, RETRIEVAL, AND DISPLAY	DP	360	F+BAL	S	T M \$	490	
JPIXR, COUPLED-CHANNEL SCATTERING X-SEC CALC	KAPL	6600	F4	RS P	T A \$	506	
JUPITOR1, COUPLED CHANNEL X-SEC EVALUATION	ENEA	360	F4	RS P	CT A \$	308	
JUPITOR1, COUPLED-CHANNEL X-SEC EVALUATION	ORNL	1604	F63	RS P	T A \$	308	
KAPL CALCCMP PLOTTING ROUTINES	KAPL	6600	F+COM	RS	T P \$ KAPLPLOT,	496	
KAPL 6600	F	R B	T M \$	TIGIR2, MODULAR DOCUMENT INFORMATION SYSTEM	403		
KAPL 6600	F+ASC	RS	P \$	SIMPLE1, TIME-SHARING PROGRAMMING LANGUAGE	442		
KAPL 6600	F+ASC	RS P	T H \$	LICN4, 3-D TEMPERATURE DISTRIBUTION PROGRAM	259		
KAPL 6600	F+ASC	RS P	T I \$	GEM, EIGENVALUE PROBLEM FOR VIBRATING SYSTEMS	344		
KAPL 6600	F+ASC	RS P	T L \$	DATATRA 2-D GEOMETRY INPUT, PREPARATION, EDIT	406		
KAPL 6600	F+ASC	RS P	T P \$	CURFIT, CURVE FITTING EXPERIMENTAL DATA POINTS	43		
KAPL 6600	F+ASC	RS P	T P \$	DATATRA UTILITY MODULES, 2-D + 3-D PLOTTING	407		
KAPL 6600	F+ASC	RS P	T P \$	DOGGY, DESK CALCULATOR FORM SHEET DP PACKAGE	428		
KAPL 6600	F+ASC	RS P	T P \$	LIZARD, NONLINEAR DIFFERENTIAL EQNS. SOLUTION	445		
KAPL 6600	F+ASC	RS P	T P \$	SNEQ, NONLINEAR ALGEBRAIC EQN SOLN CURVE PLOT	364		
KAPL 6600	F+COM	RS	T P \$	KAPLPLOT, KAPL CALCCMP PLOTTING ROUTINES	496		
KAPL 6600	F+COM	RSB	T M \$	DATATRA, MODULAR PROGRAMMING AND DATA SYSTEM	386		
KAPL 6600	F4	RS	I \$	SCRSDR, PRESSURE VESSEL STRESS AND FATIGUE	391		
KAPL 6600	F4	RS	T O \$	GASPAR, COMPLEX GAMMA-RAY SPECTRA ANALYSIS	485		
KAPL 6600	F4	RS P	A \$	CLEM, ANGULAR DISTRIBUTION LEGENDRE FITTING	531		
KAPL 6600	F4	RS P	A \$	MULTI, MULTI-LEVEL RESONANCE THEORY XSEC CALC	535		
KAPL 6600	F4	RS P	F \$	RAUMZEIT, 1-D TIME-DEPENDENT DIFFUSION CALC	352		
KAPL 6600	F4	RS P	F \$	STINT3, SINGLE-CHANNEL SPACE-TIME SYNTHESIS	389		
KAPL 6600	F4	RS P	H \$	RAPP, HIGH-VELOCITY FLOW STUDY STEAM-WATER MIX	382		
KAPL 6600	F4	RS P	I \$	STEM, MATRIX GENERATION FOR A SYSTEM OF BEAMS	337		
KAPL 6600	F4	RS P	I \$	TURF, U-TUBE HEAT EXCHANGER STRESS ANALYSIS	378		
KAPL 6600	F4	RS P	O \$	DYN01, PHOTOMULTIPLIER ELECTRON DISTRIBUTION	464		
KAPL 6600	F4	RS P	P \$	MOST, A MULTIDIMENSIONAL OPTIMIZATION SCHEME	446		
KAPL 6600	F4	RS P	P \$	ROPE, FINDING ROOTS OF A POLYNOMIAL	444		
KAPL 6600	F4	RS P	T A \$	JPIXR, COUPLED-CHANNEL SCATTERING X-SEC CALC	506		
KAPL 6600	F4	RS P	T A \$	PHASER, PHASE SHIFT X-SEC & POLARIZATION CALC	507		
KAPL 6600	F4	RS P	T D \$	3DXT, DEP3, 3-D XENON TRANSIENT & DEPLETION	477		

KAPL

LASL

KAPL 6600 F4	RS P X	I \$	FINEL, FINITE-ELEMENT STUDY 2,3-D STRUCTURES	404
KAPL 6600C F4	RS P	T I \$	SOR3, STRESS ANALYSIS SHELLS OF REVCLUTION	80
KAPLPLOT, KAPL CALCOMP	PLOTTING ROUTINES		KAPL 6600 F+COM RS	T P \$ 496
KE 3600B F36	RSBP	G \$	WHAM, LIQUID-FILLED PIPING SYSTEM ANALYSIS	278
KE 7090 F2	RSBP	D \$	NPRFCCP, FUEL CYCLE COSTS PERFORMANCE DATA	146
KE 7094 F+MAP	RSBP	T G \$	SATURATED BLOWDOWN2, BLOWDOWN ANALYSIS LOFT	200
KE 7094 F2	RSBP	T H \$	PTH1, BLOWDOWN PRESSURE TEMPERATURE HISTORY	155
KEELE, LINEARLY-CONSTRAINED OPTIMIZATION		ORNL 360 F4	RS P	P \$ 556
KENO, MONTE CARLO MULTIGROUP CRITICALITY CCDE		ORNL 360 F+BAL	RSBP L CT C \$	450
KENO2, MONTE CARLO MULTIGROUP CRITICALITY CODE	RFC	6600 F+COM	RS P	T C \$ 450
KERNEL CALC	GGA 7090 F2	RS	T A \$	SUMMIT, CRYSTALLINE SCATTERING 56
KERNELS	DP 360 BCD	R LX T Z \$	THERMOS LIBRARY, 30-GP ENDF/B SCAT	543
KEX OPTIONS	ANL 360 F4	RS P	E \$	R101, SPACE-INDEPENDENT KINETICS 255
KEX OPTIONS	ANL 3600 F63	RSBP	E \$	R101, SPACE-INDEPENDENT KINETICS 255
KEX OPTIONS	WANL 7094 F4	RS P	E \$	R101, SPACE-INDEPENDENT KINETICS 255
KINETICS	AI 360 F4	RS P	T F \$	TSN, SPATIALLY-DEPENDENT REACTOR 309
KINETICS	AI 7094 F+MAP	RS P	T F \$	TSN, SPATIALLY-DEPENDENT REACTOR 309
KINETICS	GGA 1108 F4	RS P	E \$	GAPOTKIN, SPACE-INDEPENDENT REACTOR 317
KINETICS	BCL 6400 F4	RS P	T F \$	ADEP, 1D AND 2D FEW-GROUP SPACE-TIME 494
KINETICS CALC	ANL 360 F4	RS P	E \$	R102, SPACE-INDEPENDENT INVERSE 168
KINETICS CALC	ANL 3600 F63	RSBP	E \$	R102, SPACE-INDEPENDENT INVERSE 168
KINETICS CALC	WANL 7094 F4	RS	E \$	R102, SPACE-INDEPENDENT INVERSE 168
KINETICS CODE	ANL 360 F4	RS P	T E \$	ANCON, SPACE-INDEPENDENT REACTOR 486
KINETICS CCDE	ANL 360 F4	RS PL CT F	\$	QX1, QUASISTATIC SPATIAL REACTOR 474
KINETICS CODE	ANL 3600 36F	RS PL CT F	\$	QX1, QUASISTATIC SPATIAL REACTOR 474
KINETICS CODE	LASL 6600 F4	RS P	T E \$	ANCON, SPACE-INDEPENDENT REACTOR 486
KINETICS EQNS	GGA 1108 F4	RS P	E \$	GASA, STABILITY ANALYSIS REACTOR 290
KINETICS KEX OPTIONS	ANL 360 F4	RS P	E \$	R101, SPACE-INDEPENDENT 255
KINETICS KEX OPTIONS	ANL 3600 F63	RSBP	E \$	R101, SPACE-INDEPENDENT 255
KINETICS KEX OPTIONS	WANL 7094 F4	RS P	E \$	R101, SPACE-INDEPENDENT 255
KINETICS PROGRAM	ORNL 360 F4	RS P	XCT F \$	TASK, 1-D MULTIGROUP REACTOR 558
KINETICS SNAP GEOMETRY	AI 7090 F2	RS	E \$	SNAPKIN5/5A, 1-REGION 122
KINETICS TEMPERATURE DIST STUDY	AEB 360 F4	RS P	E \$	BLAST, REACTOR 363
KINETICS TEMPERATURE FEEDBACK	BAPL 6600 F4	RS P	T F \$	NOWIG, 1-D 2-GP 371
KINETICS W/FEEDBACK	AI 7094 F+MAP	RS P	T F \$	AIROS, SPACE-INDEPENDENT 163
KINETICS W/FEEDBACK	AEB 360 F4	RS P	E \$	AIREK3, SPACE-INDEPENDENT 121
KINETICS W/FEEDBACK	AI 7090 F2	RS	E \$	AIREK3, SPACE-INDEPENDENT 121
KINETICS W/FEEDBACK	CDC 1604 F63	RS P	E \$	AIREK3, SPACE-INDEPENDENT 121
KINETICS WITH TEMP FEEDBACK	GGA 1108 F4	RS P	T F \$	GAKIT, 1-D MULTIGP 370
KINETICS 2-D HEAT TRANSFER	GGA 1108 F+BAL	RS P	T E \$	BLOOST6, COMBINED 303
KITT, SYSTEM FAULT TREE EVALUATION CODES	ANC 360 F4	RSBP	CT K \$	PREP, 528
KITT, SYSTEM FAULT TREE EVALUATION CODES	ANC 1108 F4	RS P	T K \$	PREP, 528
KSUN 360 F4	RS P	O \$	CORGAM, UNFOLDING OF COMPLEX GAMMA-RAY SPECTRA	390
LAG, ASSEMBLER FOR FLOCO2 INSTRUCTION SET		PW 1604 F+COM	RS P	T P \$ 186
LAG1 RS P	C \$	MGDSN, 1-D MULTI-GP SN APPROX SLAB CYL SPHERE	PW 1604	211
LAG1 RS P	N \$	DTX, EFFECTIVE X-SECTION CALC FROM DSN OUTPUT	PW 1604	210
LANGUAGE	KAPL 6600 F+ASC	RS	P \$	SIMPLF1, TIME-SHARING PROGRAMMING 442
LANGUAGE PROCESSOR UNDER TSO	ANL 360 F+BAL	R B L	T P \$	TSO-SPEAKEASY, 593
LAPLACE EQUATION ISOTROPIC DIELECTRICS	SLA 6600 F4	RS P	V \$	FFEARS, 577
LARCA, FLUX-WEIGHTING OF DTF4 CROSS SECTIONS		LASL 6600 F4	RS P	N \$ 409
LARGE DEFLECTION STRESS STUDY	BAPL 6600 F+COM	RS P	T I \$	GAPL3, INFLASTIC 397
LASER, SPECTRUM CALC WITH BURNUP CYL LATTICE		TVA 360 F4	RSBP L XCT B \$	249
LASER, SPECTRUM CALC WITH BURNUP CYL LATTICE		WAPD 7094 F+MAP	RS PLX T B \$	249
LASL 360 F4	RS P	L \$	GENRD, FREE-FORMAT CARD INPUT PROCESSOR	530
LASL 360 F4	RSBP	CT C \$	TRIPLET, 2-D TRIANGULAR MESH TRANSPORT PROGRAM	608
LASL 360B F4	RS P	CT C \$	TWCTAN2, 2-D MULTI-GP TRANSPORT XY RZ RTHETA	358
LASL LEAST SQUARES, GENERAL CURVE FITTING		LASL 7094 F4	RS	T P \$ 62
LASL XSEC SETS, SN 18-24- AND 25-GROUP SETS		LASL 6600 BCD	R LX T Z \$	532
LASL 6600 BCD	R LX T Z \$	LASL XSEC SETS, SN 18-24- AND 25-GROUP SETS		532
LASL 6600 F+COM	RS P	T P \$	LENSEDES, NONLINEAR LEAST SQ LENS DESIGN SYSTEM	602
LASL 6600 F+COM	RS P	T Q \$	INDX, XRAY DIFFRACTION POWDER PATTERN INDEXING	609
LASL 6600 F4	RS P	L \$	GENRD, FREE-FORMAT CARD INPUT PROCESSOR	530
LASL 6600 F4	RS P	N \$	PAC1, SN PERTURBATION CODE USING DTF4 FLUXES	455
LASL 6600 F4	RS P	N \$	LARCA, FLUX-WEIGHTING OF DTF4 CROSS SECTIONS	409

LASL

LIBRARIES

LASL 6600	F4	RS P	T A	\$ TOR, THERMAL SCATTERING CRYSTALLINE MATERIALS	360
LASL 6600	F4	RS P	T B	\$ GLEN, GROUP CONSTANT CALC FROM TOR OUTPUT DATA	361
LASL 6600	F4	RS P	T C	\$ DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	209
LASL 6600	F4	RS P	T C	\$ TRIPLET, 2-D TRIANGULAR MESH TRANSPORT PROGRAM	608
LASL 6600	F4	RS P	T C	\$ 3DDT, 3-D MULTIGROUP DIFFUSION XYZ R-THETA-Z	463
LASL 6600	F4	RS P	T D	\$ PHENIX, 2D DIFFUSION BURNUP REFUELING HISTORY	454
LASL 6600	F4	RS P	T D	\$ 2DR, 2-D MULTIGROUP DIFFUSION AND DEPLETION	325
LASL 6600	F4	RS P	T E	\$ ANCON, SPACE-INDEPENDENT REACTOR KINETICS CODE	486
LASL 6600B	F4	RS P	T C	\$ TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ RTHETA	358
LASL 7030	F4	RS	T H	\$ RATH, 2- OR 3-D HEAT CONDUCTION LUMPED MASS	242
LASL 7030	F4	RS P	T C	\$ DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	209
LASL 7030	F4	RS P	T D	\$ DTF-BURN, 1-D MULTI-GP DTF4 WITH DEPLETION	265
LASL 7090	F+FAP	RS P	I	\$ WIRFX, COMPUTER-PRODUCED WIRING LISTS UHTREX	315
LASL 7090	F+FAP	RS P	T L	\$ OPC, DATA PREPARATION FOR 2-D DESIGN PROGRAMS	234
LASL 7090	FLOCO	RS P	B	\$ MCS, MONTE CARLO NEUTRON PENETRATION STUDY	202
LASL 7090	FLOCO	RS P	R	\$ ZOT, GROUP-COLLAPSING OF MULTI-GP X-SECTIONS	113
LASL 7094	FAP	RS P	T H	\$ RATH, 2- OR 3-D HEAT CONDUCTION LUMPED MASS	242
LASL 7094	F2	RSBP	H	\$ AXFLU, HEAT TRANSFER MOLTEN FUEL TUBE BUNDLES	182
LASL 7094	F2	RSBP	H	\$ AXTHRM, HEAT TRANSFER SOLID FUEL TUBE BUNDLES	183
LASL 7094	F4	RS	T P	\$ LASL LEAST SQUARES, GENERAL CURVE FITTING	62
LASL 7600	F4	RS P	T C	\$ TRIPLET, 2-D TRIANGULAR MESH TRANSPORT PROGRAM	608
LASL 7600	F4	RS P	T C	\$ TWOTRAN-PNVW, 2-D PARTICLE TRANSPORT XY RZ RTH	573
LASL 7600B	F4	RS P	T C	\$ TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ RTHETA	358
LATTICE	GGA 1108	F4	RS	B \$ HEXSCAT, ELASTIC SCAT X-SECTIONS HEX	291
LATTICE	TVA 360	F4	RSBP	PLXCT B \$ LASER, SPECTRUM CALC WITH BURNUP CYL	249
LATTICE	WAPD 7094	F+MAP	RS	PLX T B \$ LASER, SPECTRUM CALC WITH BURNUP CYL	249
LATTICE EFFECTS	GGA 7044	F+MAP	RS P	T B \$ GAROL, RESONANCE OVERLAP AND	219
LATTICE EFFECTS	LER 7094	F+MAP	RS P	T B \$ GAROL, RESONANCE OVERLAP AND	219
LATTICE PHYSICS MODULES	DP 360	F+BAL	S	X T B \$ RAHAB, JCShUA SYSTEM	536
LATTICE VIBRATION NEUTRON SCATTERING CODES	ANC 360	F4	RS P	CT W \$ MACS	574
LEAKAGE	AI 7090	F2	RS	J \$ FARSEIA, DCSE RATE FROM SNAP SHIELD	91
LEASE ANALYSIS	SLA 360	COBOL	RSBP	CT M \$ BECOM, AEC DP PURCHASE VERSUS	589
LEASE ANALYSIS	SLA 1108	COBOL	RS P	M \$ BECOM, AEC DP PURCHASE VERSUS	589
LEAST SQ LENS DESIGN SYSTEM	LASL 6600	F+CCM	RS P	T P \$ LENSDES, NONLINEAR	602
LEAST SQUARES ANALYSIS	RESONANCE DATA	UILL 360	F4	RS P A \$ CODILLI,	347
LEAST SQUARES EXPONENTIAL DECAY CURVES	LRL 7094	F2	RS P	P \$ EXPALS,	321
LEAST SQUARES FIT FISSILE NUCLIDE DATA	BAPL 6600	F4	RS P	T P \$ DAFT1,	327
LEAST SQUARES FIT SUM OF EXPONENTIALS	MIT 7090	F2	RS P	P \$ FRANTIC,	324
LEAST SQUARES PHOTOPEAK SPECTRA CODE	BNWL 1108	F+BAL	RS P	T O \$ GSSLRN1B,	457
LEAST SQUARES TRANSMUTATION ANALYSIS	BNWL 1108	F5	RS P	T D \$ DRUFIT1,	456
LEAST SQUARES, GENERAL CURVE FITTING	LASL 7094	F4	RS	T P \$ LASL	62
LEGCOEF3, LEGENDRE COEF CALC FOR ANGULAR DIST	GGA 7044	F4	RS P	X A \$ LEGCOEF3,	217
LEGENDRE COEF CALC FOR ANGULAR DIST	GGA 7044	F4	RS P	X A \$ LEGCOEF3,	217
LEGENDRE COEF CALC FOR ANGULAR DIST DATA	AI 7094	F+MAP	RS P	A \$ CHAD,	215
LEGENDRE FITTING	KAPL 6600	F4	RS P	A \$ CLEM, ANGULAR DISTRIBUTION	531
LENS DESIGN SYSTEM	LASL 6600	F+CCM	RS P	T P \$ LENSDES, NONLINEAR LEAST SQ	602
LENSDES, NONLINEAR LEAST SQ LENS DESIGN SYSTEM	LASL 6600	F+CCM	RS P	T P \$	602
LEOPARD, SPECTRA CALCULATION WITH DEPLETION	JNC 1108	F5	RS	LX T B \$	279
LEOPARD, SPECTRA CALCULATION WITH DEPLETION	WAPD 360	F4	RS	PLX T B \$	279
LER 7090	F+MAP	RS P	T C	\$ TDSN, 2-D MULTIGROUP DISCRETE ORDINATE PROGRAM	312
LER 7094	F+MAP	RS P	T B	\$ GARCL, RESONANCE OVERLAP AND LATTICE EFFECTS	219
LER 7094	F4	RS P	T C	\$ DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	209
LETC, 1-D SLAB GAMMA-RAY TRANSPORT	BAPL 6600	F4	RS P	T J \$ M0756,	343
LI) ANC 360	F4	RSBP	XCT W	\$ GAUSS5, ANALYSIS OF GAMMA-RAY SPECTRA GEI	605
LIB AI 360	F4	RSBP	PLX T C	\$ CAESAR4, LIBLST, 1-D MULTI-GP DIFFUSION +	270
LIB SCOPE2.0 CDC 7600	F4	RS	T P	\$ MODEL, MODIFIED BETTIS ENVIRNMNTL	478
LIB SCOPE3.2 CDC 6600C	F+COM	RS	T P	\$ MODEL, MODIFIED BETTIS ENVIRNMNTL	478
LIB SCOPE3.3 CDC 6600D	F+COM	RS	T P	\$ MODEL, MODIFIED BETTIS ENVIRNMNTL	478
LIB. NED 635	F+GMP	RS	T P	\$ GENED ENVIRONMENTAL ROUTINES, SUBROUTINE	515
LIB. BAPL 6600A	F+ASC	RS	T P	\$ BETTIS ENVIRONMENTAL ROUTINES, SUBROUTINE	478
LIB. BW 6600B	F+ASC	RS	T P	\$ BETTIS ENVIRONMENTAL ROUTINES, SUBROUTINE	478
LIBLST, 1-D MULTI-GP DIFFUSION + LIB AI 360	F4	RSBP	PLX T C	\$ CAESAR4,	270
LIBRARIES FROM ENDF/B ORNL 360	F4	RSBP	XCT B	\$ XLACS, XSDRN MULTIGROUP	572
LIBRARIES FROM ENDF/B DATA	WAPD 7600	F4	RS P	T B \$ ETOT2, THERMAL	509

LIBRARIES

MAD

LIBRARIES, MUFT4 OR 5, GAM1 OR 2	WAPD 6600	BCD	R	L	T	Z	\$	FTCG1 DATA	447	
LIBRARY	LRL 7094	F+FAP	RS	PL	T	M	\$	ECSIL, EXPERIMENTAL NEUTRON DATA	351	
LIBRARY CAT. A-E	ANL 360	F+P+A	RS		T	P	\$	AMPLIBAE, ARGONNE SUBROUTINE	562	
LIBRARY CAT. F	ANL 360	F+RAL	RS		T	P	\$	AMDLIBF, ARGONNE SUBROUTINE	563	
LIBRARY CAT. G-Z	ANL 360	F+P+A	RS		T	P	\$	AMCLIBGZ, ARGONNE SUBROUTINE	564	
LIBRARY GROUP COLLAPSING	APRF 6600	F4	RS		B	\$	APRFX1, 99-GP DLC-2B	466		
LIBRARY MAINTENANCE NED	635	F4	RS	P	T	M	\$	TROUT, MUG MULTIGROUP XSEC	493	
LIBRARY MAINTENANCE NED	1108	F5	RS	P	T	M	\$	TROUT, MUG MULTIGROUP XSEC	493	
LIBRARY PREPARATION	GGA 1108	F4	RS	P	X	T	L	\$	GAND, GAEGAR X-SECTION	345
LIBRARY SERVICE ROUTINES	ANL 3600	36F	RSBP		T	M	\$	MERMC2, MAGIC, MC**2	472	
LIBRARY TAPE MAINTENANCE	ANL 360	F4	RS		M	\$	MERMC2, MC**2 BINARY	472		
LIBRARY TAPE PREPARATION	PW 1604	F63	RS		L	\$	CSP1, SN X-SECTION	194		
LIBRARY TAPE PREPARATION	PW 1604	F63	RS		L	\$	CSP2A, SN X-SECTION	193		
LIBRARY UTILITY PROGRAM	AI 7094	F+FAP	RS	L	T	M	\$	MCUS, X-SECTION	159	
LIBRARY UTILITY ROUTINE	ANL 3600	F63	RSBP		T	M	\$	XLIBIT, X-SECTION	181	
LIBRARY UTILITY ROUTINE	AI 360	F4	RSB	L	T	M	\$	CLIP, FORM OR THREDES	271	
LIBRARY, 30-GP ENDF/B SCAT KERNELS	DP 360	BCD	R	L	X	T	Z	\$	THERMOS	543
LIFETIME ANALYSIS	ANL 3600	F36	RSBP		I	\$	SWELL2, FUEL ELEMENT	353		
LIFE1, FAST REACTOR FUEL ELEMENT BEHAVIOR	ANL 360	F4	RS	P	T	I	\$		460	
LINEAR ELASTIC STRUCTURAL DYNAMICS	BAPL 6600	F4	RS	P	T	I	\$	M0266,	383	
LINEAR ELASTIC SYSTEMS	BAPL 6600	F4	RS	P	T	I	\$	M0552, DYNAMIC ANALYSIS	283	
LINEARLY-CONSTRAINED OPTIMIZATION	ORNL 360	F4	RS	P	P	\$	KEELF,	556		
LION4, 3-D TEMPERATURE DISTRIBUTION PROGRAM	CHI 1108	F4	RS	P	T	H	\$		299	
LION4, 3-D TEMPERATURE DISTRIBUTION PROGRAM	KAPL 6600	F+ASC	RS	P	T	H	\$		299	
LIPRECAN1, MC NEUTRON PENETRATION CALCULATION	DAC 7090	F2	RSBP		J	\$			123	
LIQUID BLOWDOWN ANALYSIS	LCFT UGA 360	F4	RS	P	G	\$	WATER-HAMMER,	278		
LIQUID-FILLED PIPING SYSTEM ANALYSIS	KE 3600R	F36	RSBP		G	\$	WHAM,	278		
LISTS UHTREX	LASL 7090	F+FAP	RS	P	I	\$	WIREX, COMPUTER-PRODUCED WIRING	315		
LITHE,HELP, CRITICAL ANALYSIS SYSTEM	DP 360	F+RAL	RS	P	X	T	B	\$	HAMMER,	277
LIZARD, NONLINEAR DIFFERENTIAL EQNS. SOLUTION	KAPL 6600	F+ASC	RS	P	T	P	\$		445	
LLL 6600 F4	RS	P	\$	GEAR, ORDINARY DIFFERENTIAL EQN SYSTEM SOLVER					592	
LMFBR POWER EXCURSION DISASSEMBLY	ANL 360	F4	RS	P	X	T	F	\$	VENUS, 2-D	511
LMFBR ROD BUNDLE	NED 635	F4	RS	P	T	H	\$	VELVET2, TURBULENT FLOW IN	458	
LOAD	GGA 7044	F4	RSBP	CT	I	\$	SAFE-PCRS, STRESS ANALYSIS AXISYMMETRIC	250		
LOAD	BAPL 6600	F4	RS	P	T	I	\$	SEALSHL2, SHELL STRESS ANALYSIS AXISYM	282	
LOAD	SR 360	F4	RS	P	T	I	\$	SEALSHL2, SHELL STRESS ANALYSIS AXISYM	282	
LOAD	WTSC 6600B	F4	RS	P	T	I	\$	SEAL SHELL, SHELL STRESS ANALYSIS AXISYM	282	
LCAD	GGA 7044	F4	RS	P	T	I	\$	SAFE-AXISYM, STRESS ANALYSIS AXISYMMETRIC	251	
LOCA	ANC 360	F4	RSPP	X	T	G	\$	THETA1-B, FUEL ROD THERMAL RESPONSE	512	
LOCA ANALYSIS DUKE POWER MCGUIRE UNITS	DUCE 635	F4	RS		G	\$	ANVENT,	529		
LCCA FISSION PRODUCT RELEASE ANALYSIS	BCL 6400	F4	RS	P	G	\$	FRCRL2,	500		
LOCA ROD BUNDLE CHF DATA ANALYSIS	ANC 360	F4	RS	PL	CT	M	\$	ERREST,	518	
LOFT	KE 7094	F+MAP	RSBP	T	G	\$	SATURATED BLOWDOWN2, BLOWDOWN ANALYSIS	200		
LCFT	UGA 360	*F4	RS	P	G	\$	WATER-HAMMER, LIQUID BLOWDOWN ANALYSIS	278		
LOSS-OF-COOLANT & EMERGENCY COOLING	BCL 6400	F4	RS	P	T	G	\$	ECCSA4,	330	
LCSS-OF-COOLANT ACCIDENT ANALYSIS	BAPL 6600	F4	RS	P	T	G	\$	FLASH3,	295	
LOSS-OF-COOLANT ACCIDENT ANALYSIS	BAPL 6600	F4	RS	P	T	G	\$	M0555,ACT1,	284	
LOSS-OF-COOLANT THERMAL ANALYSIS	BCL 6400	F4	RS	P	T	G	\$	NURLOC-1.0,	328	
LRL 709	F2	RS	C	\$	FIRN, 2-D FEW-GP S4 APPROXIMATION RZ GEOMETRY				7	
LRL 7090	F+FAP	RS	P	T	B	\$	SOPHIST1/2/5, MULTI-GP TRANSFER COEFFICIENTS	160		
LRL 7090	F2	RS	P	F	\$	CONEC, COUPLED NEUTRONICS-HYDRODYNAMICS SPHERE			129	
LRL 7094	F+FAP	RS	PL	T	M	\$	ECSIL, EXPERIMENTAL NEUTRON DATA LIBRARY	351		
LRL 7094	F2	RS	P	P	\$	EXPALS, LEAST SQUARES EXPONENTIAL DECAY CURVES			321	
LUMPED MASS	LASL 7030	F4	RS	T	F	\$	RATH, 2- OR 3-D HEAT CONDUCTION	242		
LUMPED MASS	LASL 7094	FAP	RS	P	T	H	\$	RATH, 2- OR 3-D HEAT CONDUCTION	242	
LWBR FUEL SWELLING TEMPERATURE STUDY	BAPL 6600	F4	RS	P	T	H	\$	FIGRO,	272	
LYNNE, WOODS-SAXON POTENTIAL SHAPE CALCULATION	ORNL 7090	F2	RS	A	\$				381	
MAC, SHIELD DESIGN MULTIGROUP SLAB GEOMETRY	ANL 3600	F63	RSBPL	T	J	\$			143	
MAC, SHIELD DESIGN MULTIGROUP SLAB GEOMETRY	BNW 7090	F2	RSBPL	T	J	\$			143	
MACH1, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	ANL 3600	F36	RS	P	X	T	C	\$	262	
MACH1, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	PURD 6500	F4	RS	PLX	T	C	\$		262	
MACS LATTICE VIBRATION NEUTRON SCATTERING CODES	ANC 360	F4	RS	P	CT	W	\$		574	
MAD	RSB	O	\$	BURP1, DETECTOR EFFICIENCY POINT SOURCE		UM	7090		164	
MAD	RSB	O	\$	BURP2, DETECTOR EFFICIENCY DISK SOURCE		UM	7090		165	

MAC

MICHRO

MAD	RSB	O \$ BURP3, DETECTOR EFFICIENCY PCINT SOURCE	UM	7090	166
MAD	RSB	O \$ BURP4, GAMMA-RAY PHOTOFRACITION SOLID CRYSTAL	UM	7090	169
MAD	RSB	O \$ BURP5, GAMMA-RAY PHCTCFRACTION WELL CRYSTAL	UM	7090	170
MAGIC, MC**2	LIBRARY SERVICE ROUTINES	ANL 3600 36F RSBP T M \$ MERMC2,			472
MAGNETIC NETWORK SOLUTION	BAPL 6600B F4 RS P T I \$ MANE1, RECTANGULAR				412
MAINTENANCE	ANL 360 F4 RS M \$ MERMC2, MC**2 BINARY LIBRARY TAPE				472
MAINTENANCE NED	635 F4 RS P T M \$ TROUT, MUG MULTIGROUP XSEC LIBRARY				493
MAINTENANCE NED	1108 F5 RS P T M \$ TROUT, MUG MULTIGROUP XSEC LIBRARY				493
MANAGEMENT NED	635 F4 RS P T D \$ FUMBLE, FAST REACTOR FUEL BURNUP &				480
MANAGEMENT SYSTEM ALOO	360 COBOL RS P M \$ AEC-ALO FAU, RADIO FREQUENCY				587
MANAGEMENT, EDITING, & ANALYSIS	BAPL 6600 F4 RS P T M \$ SHLOG, DATA				557
MANE1, RECTANGULAR MAGNETIC NETWORK SOLUTION	BAPL 6600B F4 RS P T I \$				412
MANIPULATION	ANL 360 F4 RSBPL CT L \$ ARC-XSEC1, MICROSCOPIC X-SECTION				594
MANTA, STEADY-STATE THERMAL-HYDRAULIC ANALYSIS	NEC 635 F4 RS P T H \$				256
MANTA, STEADY-STATE THERMAL-HYDRAULIC ANALYSIS	WARD 6600 F4 RS P T H \$				256
MANUFACTURING REQUIREMENTS GEPI GETS BASIC R	M \$ MAPPER, PREDICTING				595
MAPPER, PREDICTING MANUFACTURING RQUIREMENTS	GEPI GETS BASIC R M \$				595
MARKCV SIMULATION OF REACTOR OPN DP	360 F4 RS P G \$ INTEG,INSPEC,				590
MARS, 2-D EXCURSION CALCULATION R-Z GEOMETRY	APDA 7094 F4 RS P F \$				293
MASS LASL 7030 F4 RS T H \$ RATH, 2- OR 3-D HEAT CONDUCTION LUMPED					242
MASS LASL 7094 FAP RS P T H \$ RATH, 2- OR 3-D HEAT CONDUCTION LUMPED					242
MASS MATRIX GENERATION	BAPL 6600 F+CCM RS P H \$ HYMAS, HYDRODYNAMIC				560
MATERIAL GEC 7090 FAP RSBP X T Q \$ SPECTRA, MC CALCULATION IRRADIATED					422
MATERIAL BUCKLING CYL FUEL ELEMENTS	AEB 360 F4 RS P B \$ WELWING,				362
MATERIALS LASL 6600 F4 RS P T A \$ TOR, THERMAL SCATTERING CRYSTALLINE					360
MATRICES AGC 7090 F2 RS P T B \$ AGN-SIGMA, CALC OF MULTI-GP TRANSFER					243
MATRIX EIGENVALUE EIGENVECTOR PACKAGE	ANL 360 F4 RSB XCT P \$ EISPACK,				534
MATRIX EIGENVALUE EIGENVECTOR PACKAGE	ANL 635 F4 RS X T P \$ EISPACK,				534
MATRIX EIGENVALUE EIGENVECTOR PACKAGE	ANL 1108 F4 RS X T P \$ EISPACK,				534
MATRIX EIGENVALUE EIGENVECTOR PACKAGE	ANL 6600 F4 RS X T P \$ EISPACK,				534
MATRIX GENERATION	BAPL 6600 F+COM RS P H \$ HYMAS, HYDRODYNAMIC MASS				560
MATRIX GENERATION FOR A SYSTEM OF BEAMS	KAPL 6600 F4 RS P I \$ STEM,				337
MATUS, 3-D FINITE ELEMENT ELASTIC ANALYSIS	BAPL 6600 F+CCM RS P X T I \$				597
MAXIMUM MOMENT CALC	AI 7090 F+FAP RS T I \$ 4RESTRAINT PIPE STRESS,				109
MAXIMUM YIELD FROM REACTION OR DECAY ORNL 1604 F63 RS P D \$ ISOTOPES,					179
MC ORNL 360 F+BAL RS P T B \$ RAFFLE, 1ST FLIGHT COLLISION PROBABILITIES					392
MC ORNL 7090 F+FAP RS P T B \$ RAFFLE, 1ST FLIGHT COLLISION PROBABILITIES					392
MC CALCULATION IRRADIATED MATERIAL	GEC 7090 FAP RSBP X T Q \$ SPECTRA,				422
MC NEUTRON PENETRATION CALCULATION	DAC 7090 F2 RSBP J \$ LIPRECAN1,				123
MC NEUTRON, GAMMA-RAY HISTORIES	PW 1604 F+CDP RS P X T B \$ FMC-N, FMC-G,				195
MC**2 BINARY LIBRARY TAPE MAINTENANCE	ANL 360 F4 RS M \$ MERMC2,				472
MC**2 DATA CONVERSION	ANL 360 F4 PS P CT M \$ ETOE, ENDF/B TO				350
MC**2 DATA CONVERSION	APDA 3600 ASAF4 RS P T M \$ ETOE, ENDF/B TO				350
MC**2 LIBRARY SERVICE ROUTINES	ANL 3600 36F RSBP T M \$ MERMC2, MAGIC,				472
MC**2, ENDF MULTIGROUP X-SECTION CALCULATION	ANL 360 F4 RS P CT B \$				355
MC**2, ENDF MULTIGROUP X-SECTION CALCULATION	ANL 3600 F36 RS P T B \$				355
MCGUIRE UNITS DUO 635 F4 RS G \$ ANVENT, LOCA ANALYSIS DUKE POWER					529
MCS, MONTE CARLO NEUTRON PENETRATION STUDY	LASL 7090 FLOCC RS P B \$				202
MEASUREMENT ANALYSIS	GEC 635 F4 RSBP O \$ MICHRO, MICROHARDNESS				421
MEASUREMENTS	GGA 1108 F4 RS P T A \$ TACASI, ANALYSIS OF RESONANCE				410
MEDIA TLD CORRECTION CALC	AI 360 F4 RS P T Q \$ RESPOND, DISSIMILAR				566
MEDIUM SPECTRUM X-SECTIONS	AI 7090 F+FAP RS L T B \$ QUICKIE, INFINITE				119
MERMC2, MC**2 BINARY LIBRARY TAPE MAINTENANCE	ANL 360 F4 RS M \$				472
MERMC2, MAGIC, MC**2 LIBRARY SERVICE ROUTINES	ANL 3600 36F RSBP T M \$				472
MESH GGA 1108 F4 RS P T C \$ GATT, 3-D FEW-GP DIFFUSION CALC HEX-Z					380
MESH GGA 1108 F+BAL RS P T C \$ GAMTRI, 2-D MULTIGP DIFFUSION TRIANGULAR					401
MESH COLLAPSING	TRW 6500 F4 RS P R \$ PARTI, OPTIMAL GROUP OR				416
MESH TRANSPORT PROGRAM	LASL 360 F4 RSBP CT C \$ TRIPLET, 2-D TRIANGULAR				608
MESH TRANSPORT PROGRAM	LASL 6600 F4 RS P T C \$ TRIPLET, 2-D TRIANGULAR				608
MESH TRANSPORT PROGRAM	LASL 7600 F4 RS P T C \$ TRIPLET, 2-D TRIANGULAR				608
METALLIC FISSION PRODUCT RELEASE	GGA 1108 F4 RS P C \$ FREVAP6, HTGR				301
METALS	GEC 635 F+FAP RSBP T Q \$ CASCADE, CLUSTER, RADIATION DAMAGE IN				419
MGDSN, 1-D MULTI-GP SN APPROX SLAB CYL SPHERE	PW 1604 LAG1 RS P C \$				211
MICHRO, MICROHARDNESS MEASUREMENT ANALYSIS	GEC 635 F4 RSBP O \$				421

MICROHARDNESS

MULTI-GP

MICROHARDNESS MEASUREMENT ANALYSIS	GEC	635	F4	RSBP	O \$	MICHRD,	421	
MICROSCOPIC X-SECTION MANIPULATION	ANL	360	F4	RSBPL CT L	\$	ARC-XSEC1,	594	
MIRAB, MIRAP, CONTAINMENT SYSTEM IODINE REMOVAL	BCL	6400	F4	RS P	G \$		499	
MIRAP, CONTAINMENT SYSTEM IODINE REMOVAL	BCL	6400	F4	RS P	G \$	MIRAB,	499	
MISH-MASH, RESONANCE INTEGRAL CALC HOMOGENEOUS	ANL	3600	F36	RSBP	A \$		214	
MIST, 1-D FEW-GP SN DOUBLE SN APPRXX SLAB GEOM	PPCO	7090	F2	RS P	C \$		59	
MIT 360 F4 RS P T I \$	SABOR4,					DISCRETE-ELEMENT ANALYSIS THIN SHELLS	402	
MIT 360B F+BAL RSBP T D \$	PDQ5,					2-D FEW-GROUP DIFFUSION AND DEPLETION	336	
MIT 7090 F2 RS P P \$	FRANTIC,					LEAST SQUARES FIT SUM OF EXPONENTIALS	324	
MIX KAPL 6600 F4 RS P H \$	RAPP,					HIGH-VELOCITY FLOW STUDY STEAM-WATER	382	
ML-1 FLUID FLOW EXPERIMENT ANALYSIS	AGC	7090	F2	RS P	O \$	CRCC90,	154	
MLMO 360 F+C+R RSBP T M \$	RALCRTPH,					RESOURCE ALLOCATION PROJECT PLANNING	603	
MCDE BAPL 6600 F4 RS P P \$	RELO1,					RELIABILITY FOR A SINGLE FAILURE	497	
MODE FAST REACTOR X-SEC CALC BNW	1108	F4	RS P	T B \$	FCC4,	FUNDAMENTAL	306	
MODERATOR GGA 1108 F4 RS P A \$	GAKER,					INFLASTIC SCAT X-SECTION CALC	289	
MODERATOR SPACE CHORD DIST FUNCT	AEG	7090	F2	RS	B \$	DANCOFF JR,	150	
MODIFIED BETTIS ENVIRNMNTL LIB SCOPE2.0 CDC	7600	F4	RS	T P \$	MODEL,		478	
MODIFIED BETTIS ENVIRNMNTL LIB SCOPE3.2 CDC	6600C	F+CCM	RS	T P \$	MODEL,		478	
MODIFIED BETTIS ENVIRNMNTL LIB SCOPE3.3 CDC	6600D	F+COM	RS	T P \$	MODEL,		478	
MODULAR DOCUMENT INFORMATION SYSTEM	KAPL	6600	F	R B	T M \$	TIGIR2,	403	
MODULAR PROGRAMMING AND DATA SYSTEM	KAPL	6600	F+COM	RSB	T M \$	DATATRAN,	386	
MODULE ANL 360 F4 RSBP CT L \$	ARC-NUI002,					BCD INPUT DATA PROCESSING	533	
MODULES ANL 360 F+BAL RS P CT M \$	ARC-SYSTEM,					SYSTEM SUBPROGRAMS AND	522	
MODULES DP 360 F+BAL S X T R \$	RAHAB,					JOSHUA SYSTEM LATTICE PHYSICS	536	
MODULES, 2-D + 3-D PLOTTING	KAPL	6600	F+ASC	RS P	T P \$	DATATRAN UTILITY	407	
MOD5, STOCHASTIC MODEL OF NEUTRON SLOWING-DOWN	NPGS	360	F4	RS P	X T F \$		491	
MCLTEN FUEL TUBE BUNDLES LASL	7094	F2	RSBP	H \$	AXFLU,	HEAT TRANSFER	182	
MOMENT CALC AI 7090 F+FAP RS T I \$	4RESTRAINT					PIPE STRESS, MAXIMUM	109	
MOMUS, X-SECTION LIBRARY UTILITY PROGRAM	AI	7094	F+FAP	RS L	T M \$		159	
MONA, 1-D MULTIGROUP DIFFUSION SLAB, CYL, SPH	ANC	360	F4	RSBP	CT C \$		582	
MONTE CARLO CALC NEUTRON HISTORIES	GGA	7044	F4	RS P	T R \$	FMC-N,	195	
MONTE CARLO CELL CALCULATION AI 360 F+BAL RS P X T R \$	HWOCR-SAFE,					2-D	307	
MONTE CARLO CRITICAL ASSEMBLY ANALYSIS	AI	7600	F4	RS PLX	T C \$	VIM1,	510	
MONTE CARLO CRITICAL ASSEMBLY ANALYSIS	AI-A	360	F4	RSBPL	CT C \$	VIMIX,	510	
MONTE CARLO MULTIGROUP CRITICALITY CODE	CRNL	360	F+BAL	RSBPL	CT C \$	KENC,	450	
MONTE CARLO MULTIGROUP CRITICALITY CODE	RFD	6600	F+COM	RS P	T C \$	KENO2,	450	
MONTE CARLO NEUTRON PENETRATION STUDY	LASL	7090	FLOCO	RS P	B \$	MCS,	202	
MONTE CARLO REACTOR ANALYSIS CALCULATION	CRNL	360	F+BAL	RSBPL	CT C \$	ESP,	523	
MONTE CARLO SLOWING-DOWN DENSITY CALC	AI	7094	F+FAP	RS PL	T R \$	TYCHE3,	149	
MORTIMER, DCSE RATE CALCULATION SNAP GEOMETRY	AI	7090	F2	RS	J \$		142	
MOST, A MULTIDIMENSIONAL OPTIMIZATION SCHEME	KAPL	6600	F4	RS P	P \$		446	
MOXY, BWR FUEL ELEMENT HEAT TRANSFER CALC	ANC	360	F4	RSBP	XCT H \$		551	
MOXY, BWR FUEL ELEMENT HEAT TRANSFER CALC	ANC	1108	F4	RS P	TH \$		551	
MSCAT, SLOW NEUTRON MULTIPLE SCATTERING CALC	ANL	360	F4	RS P	CT W \$		575	
MSS 360 F4 RS P H \$	FLOW-MODEL,					MULTI-CHANNEL 2-D 2-PHASE FLOW	246	
MSS 360 F4 RS P CT C \$	FLARE,					3-D REACTIVITY AND POWER DISTRIBUTION	167	
MUCHA1, MUCHA2, MULTIPLE CHANNEL ANALYSIS	ECC	BCL	6400	F4	RS P X T G \$		508	
MUCHA2, MULTIPLE CHANNEL ANALYSIS	ECC	BCL	6400	F4	RS P X T G \$	MUCHA1,	508	
MUFFLE, FISSILE NUCLIDE X-SECTION EVALUATION	CRNL	7090	F4	RSBP	A \$		323	
MUFT FORMAT X-SECTIONS WAPD	6600	F4	RS P	T B \$	ETOM1,	ENDF/B FORMAT TO	436	
MUFT, GAM, ANISN X-SEC FORMAT WAPD	6600	F4	RS PL	T B \$	ETCG1,	ENDF/B TO	437	
MUFT, GAM, ANISN X-SEC FORMAT WAPD	7600	F4	RS P	T B \$	ETOG3,	ENDF/B TO	538	
MUFT4 OR 5, GAM1 OR 2 WAPD	6600	BCD	R	L T Z \$	ETOG1	DATA LIBRARIES,	447	
MUG MULTIGROUP XSEC LIBRARY MAINTENANCE	NED	635	F4	RS P	T M \$	TROUT,	493	
MUG MULTIGROUP XSEC LIBRARY MAINTENANCE	NED	1108	F5	RS P	T M \$	TROUT,	493	
MULTI-CHANNEL 2-D 2-PHASE FLOW	AI	7094	F2	RS P	H \$	FLOW-MODEL,	246	
MULTI-CHANNEL 2-D 2-PHASE FLOW	MSS	360	F4	RS P	H \$	FLCW-MODEL,	246	
MULTI-GP CONSTANT & FAST SPECTRA CALC	ANC	360	F4	RS PLXCT	R \$	PHROG,	520	
MULTI-GP CONSTANT CALC	AGC	7090	F+FAP	RSBPLX	T B \$	AGN-GAM,	FAST SPECTRUM	204
MULTI-GP CONSTANT CALC 0 TO 10 MEV	BC	625	F4	RS PLX	T R \$	GAMTEC2,	185	
MULTI-GP CONSTANT CALC 0 TO 10 MEV	BNW	1107	F4	RS PL	T R \$	GAMTEC2,	185	
MULTI-GP CONSTANT CALC 0 TO 10 MEV	RNW	7090	F+FAP	RS PL	T B \$	GAMTEC2,	185	
MULTI-GP CONSTANT CALC 0 TO 10 MEV	UVA	6400	F4	RS PLX	T R \$	GAMTEC2,	185	
MULTI-GP CONSTANTS	ANC	360	F4	RS PL	CT B \$	INCITE,	THERMAL SPECTRA &	565

MULTI-GP

MULTIGP

MULTI-GP	CONSTANTS	FROM ENDF/P	FOR IDX	FEDL	1108B	F4	RS	P	X	T	B	\$	ETOX3,	388	
MULTI-GP	DIFFUSION	UMCC	360	F4	RS	P	T	C	\$	VARI-QUIR,	TIME-DEP	2-D	212		
MULTI-GP	DIFFUSION	WANL	6600	F4	RS	P	T	C	\$	VARI-QUIR,	TIME-DEP	2-D	212		
MULTI-GP	DIFFUSION	+ LIB	AI	360	F4	RSRPLX	T	C	\$	CAESAR4,	LIRLST,	1-D	270		
MULTI-GP	DIFFUSION	DEPLETION	CODE	CRNL	7090	F+FAP	RS	P	T	C	\$	ASSAULT,	2-D	240	
MULTI-GP	DIFFUSION	PROGRAM	AAEC	360	F+BAL	RS	P	T	C	\$	CRAM,	1-D AND 2-D	103		
MULTI-GP	DIFFUSION	PROGRAM	CRNL	7090	F+FAP	RS	P	T	C	\$	EXTERMINATOR,	2-D	156		
MULTI-GP	DIFFUSION	PROGRAM	UK-R	7090	F+FAP	RSBPL	T	C	\$	CRAM,	1-D AND 2-D	103			
MULTI-GP	DIFFUSION	PROGRAM	BC	625	F4	RS	T	C	\$	EXTERMINATOR2,	2-D	156			
MULTI-GP	DIFFUSION	PROGRAM	CF	6600	F4	RS	P	T	C	\$	EXTERMINATOR2,	2-D	156		
MULTI-GP	DIFFUSION	PROGRAM	CRNL	360	F4	RS	P	T	C	\$	EXTERMINATOR2,	2-D	156		
MULTI-GP	DIFFUSION	SLAB CYL	SPHERE	BNW	1107	F4	RS	P	T	C	\$	HFN,	1-D	241	
MULTI-GP	DIFFUSION	SLAB CYL	SPHERE	AI	7090	F+FAP	RS	L	T	C	\$	FAIM,	1-D	120	
MULTI-GP	DIFFUSION	SLAB CYL	SPHERE	AI	7090	F+FAP	RS	PL	T	C	\$	AIM6,	1-D	29	
MULTI-GP	DIFFUSION	SLAB CYL	SPHERE	CDC	1604	F63	RS	PL	T	C	\$	AIM6,	1-D	229	
MULTI-GP	DIFFUSION	SLAB CYL	SPHERE	CDC	1604	F63	RS	PLX	T	C	\$	FAIM,	1-D	120	
MULTI-GP	DIFFUSION	SLAB CYL	SPHERE	OSUC	370	F4	RS	PL	CT	C	\$	AIM6,	1-D	29	
MULTI-GP	DIFFUSION	SLAB CYL	SPHERE	AI	7090	F+FAP	RS	L	T	C	\$	ULCER,	1-D	118	
MULTI-GP	DIFFUSION	SLAB CYL	SPHERE	ANL	3600	F36	RS	P	X	T	C	\$	MACH1,	1-D	262
MULTI-GP	DIFFUSION	SLAB CYL	SPHERE	PURD	6500	F4	RS	PLX	T	C	\$	MACH1,	1-D	262	
MULTI-GP	DIFFUSION	SLAB CYL	SPHERE	BHSC	360	F4	RS	P	T	C	\$	FAIMCS,	1-D	120	
MULTI-GP	DIFFUSION	SYNTHESIS	CALC	NED	635	F4	RS	PL	T	C	\$	BISYN,	2-D	287	
MULTI-GP	DIFFUSION	SYNTHESIS	CALC	NED	1108	F4	RS	P	T	C	\$	AISYN,	2-D	287	
MULTI-GP	DIFFUSION	XY RZ	GEOMETRY	GGA	1108	F+BAL	RS	P	T	C	\$	GAMBLEF5,	2-D	222	
MULTI-GP	DIFFUSION	XY RZ	GEOMETRY	GGA	7044	F+MAP	RSBP	T	C	\$	GAMBLE4,	2-D	222		
MULTI-GP	DIFFUSION	XY RZ	RTH	WANL	7094	F4	RS	P	X	T	C	\$	VARI-QUIR3,	2-D	264
MULTI-GP	DISCRETE	ORDINATE	CALC	AI	7090	F2	RS	PLX	T	C	\$	DTF2,	1-D	151	
MULTI-GP	DISCRETE	ORDINATE	CALC	AI	360	F4	RSBPLX	T	C	\$	ANISN,	1-D	151		
MULTI-GP	DISCRETE	ORDINATE	CALC	ANL	3600	F36	RS	P	T	C	\$	SNARG-1D,	1-D	288	
MULTI-GP	DISCRETE	ORDINATE	CODE	GGA	1108	F5	RS	P	T	C	\$	2DF,	2-D	173	
MULTI-GP	DISCRETE	ORDINATE	CODE	UNC	1604	F63	RS	C	\$	2DF,	2-D	173			
MULTI-GP	DISCRETE	ORDINATE	PROGRAM	ANL	360	F+BAL	RS	P	T	C	\$	DTF4,	1-D	209	
MULTI-GP	DISCRETE	ORDINATE	PROGRAM	BC	625	F+MAP	RS	P	T	C	\$	DTF4,	1-D	209	
MULTI-GP	DISCRETE	ORDINATE	PROGRAM	LASL	6600	F4	RS	P	T	C	\$	DTF4,	1-D	209	
MULTI-GP	DISCRETE	ORDINATE	PROGRAM	LASL	7030	F4	RS	P	T	C	\$	DTF4,	1-D	209	
MULTI-GP	DISCRETE	ORDINATE	PROGRAM	LER	7094	F4	RS	P	T	C	\$	DTF4,	1-D	209	
MULTI-GP	DOUBLE	SN APPROX	BNW	7090	FLOCO	RSBP	T	C	\$	GE-HAPO-S13,	1-D	75			
MULTI-GP	DTF4	WITH DEPLETION	LASL	7030	F4	RS	P	T	D	\$	DTF-BURN,	1-D	269		
MULTI-GP	FLUX	SYNTHESIS	PROGRAM	CYL	PW	1604	F63	RS	T	C	\$	2DXYL,	3-D	192	
MULTI-GP	SN APPROX	SLAB CYL	SPHERE	PW	1604	LAG1	RS	P	C	\$	MGDSN,	1-D	211		
MULTI-GP	SN APPROX	SLAB CYL	SPHERE	UK-W	7090	F2	RS	P	T	C	\$	W-DSN,	1-D	132	
MULTI-GP	SN APPROXIMATION	RZ	PW	1604	F63	RS	P	T	C	\$	FCRTRAN	TDC,	2-D	161	
MULTI-GP	SN APPROXIMATION	XY GEOM	AGC	7090	FLOCO	RSBP	C	\$	2DXY,	2-D	18				
MULTI-GP	TRANSFER	COEFFICIENTS	LRL	7090	F+FAP	RS	P	T	B	\$	SOPHIST1/2/5,	160			
MULTI-GP	TRANSFER	MATRICES	AGC	7090	F2	RS	P	T	B	\$	AGN-SIGMA,	CALC OF	243		
MULTI-GP	TRANSPORT	XY RZ	RTHETA	LASL	360B	F4	RS	P	CT	C	\$	TWOTRAN2,	2-D	358	
MULTI-GP	TRANSPORT	XY RZ	RTHETA	LASL	660CB	F4	RS	P	T	C	\$	TWOTRAN2,	2-D	358	
MULTI-GP	TRANSPORT	XY RZ	RTHETA	LASL	7600B	F4	RS	P	T	C	\$	TWOTRAN2,	2-D	358	
MULTI-GP	X-SECTIONS	LASL	7090	FLOCO	RS	P	B	\$	ZOT,	GROUP-COLLAPSING	OF	113			
MULTI-GP	X-SECTIONS	FAST THERMAL	SPECTRA	GGA	1108	F4	RS	PLX	T	B	\$	GGC4,	298		
MULTI-GP	X-SECTIONS	FAST THERMAL	SPECTRA	GGA	6600	F4	RS	L	T	B	\$	GGC4,	298		
MULTI-LEVEL	CONVOLUTION	PPCO	7040	F+MAP	RS	P	A	\$	COMBCC,	COMBINED	B-W	203			
MULTI-LEVEL	RESONANCE	THEORY	XSEC	CALC	KAPL	6600	F4	RS	P	A	\$	MULTI,	535		
MULTI-PIN	FUEL ELEMENT	AGC	7090	F2	RS	P	B	\$	BOUNCE,	FLUX	DIST	IN	237		
MULTI,	MULTI-LEVEL	RESONANCE	THEORY	XSEC	CALC	KAPL	6600	F4	RS	P	A	\$	535		
MULTIANCHOR	PIPE SYSTEM	AI	360	F4	RS	P	CT	I	\$	PSA2,	STRESS	ANALYSIS	542		
MULTIDIMENSIONAL	OPTIMIZATION	SCHEME	KAPL	6600	F4	RS	P	P	\$	MOST,	A	446			
MULTIGP	CRNL	360G	F4	RS	P	T	K	\$	CITATION,	1,2,3-D	DIFFUSION	DEPLETION	387		
MULTIGP	CONSTANTS	BNW	1108	F4	RS	PLX	T	B	\$	HRG3,	SLOWING-DOWN	SPECTRUM,	467		
MULTIGP	CONSTANTS	TVA	360	F4	RS	PLX	T	B	\$	HRG3,	SLOWING-DOWN	SPECTRUM,	467		
MULTIGP	DIFF & 1GP	DEPLETION	NED	635	F+GMP	RS	P	T	D	\$	SYN,	2D	SYNTHESIS	495	
MULTIGP	DIFFUSION	TRIANGULAR	MESH	GGA	1108	F+BAL	RS	P	T	C	\$	GAMTRI,	2-D	401	
MULTIGP	DIFFUSION+BURNUP	TRI-MESH	GGA	1108	F+BAL	RS	P	T	D	\$	BUGTRI,	2-D	439		
MULTIGP	KINETICS	WITH TEMP	FEEDBACK	GGA	1108	F4	RS	P	T	F	\$	GAKIT,	1-D	370	

MULTIGROUP

NED

MULTIGROUP	CONSTANTS	ORNL	360	F4	RS PLX T B \$ XSDRN, DISCRETE ORDINATE	393
MULTIGROUP	CONSTANTS FROM ENDF/B DATA	GFSV	635	F+GMP RS P	XCT B \$ ENDRUN2,	501
MULTIGROUP	CRITICALITY CODE	ORNL	360	F+BAL RSRPL CT C \$	KENC, MONTE CARLO	450
MULTIGROUP	CRITICALITY CODE	RFC	6600	F+COM RS P	T C \$ KENO2, MONTE CARLO	450
MULTIGROUP	DIFFUSION & BURNUP	XY, RZ GGA	1108	F+BAL RS P	T D \$ BUG2, 2-D	438
MULTIGROUP	DIFFUSION & SN THEORY	NED	635	F4	RS P T C \$ DOT2DB, 2-D	459
MULTIGROUP	DIFFUSION AND DEPLETION	ANL	3600	F4	RSBP T D \$ 2DB, 2-D	325
MULTIGROUP	DIFFUSION AND DEPLETION	BNW	1108	F4	RS P T D \$ 2DB, 2-D	325
MULTIGROUP	DIFFUSION AND DEPLETION	LASL	6600	F4	RS P T D \$ 2DB, 2-D	325
MULTIGROUP	DIFFUSION AND DEPLETION	GGA	1108	F4	RS P T D \$ FEVER7, 1-D	318
MULTIGROUP	DIFFUSION BURNUP ANALYSIS	ANL	360	F4	RS P CT D \$ 3DB, 3-D	567
MULTIGROUP	DIFFUSION BURNUP ANALYSIS	HEDL	1108	F4	RS P T D \$ 3DB, 3-D	567
MULTIGROUP	DIFFUSION DEPLETION	AI	360	F4	RSBP X T D \$ SIZZLE, 1-D	58
MULTIGROUP	DIFFUSION DEPLETION	AI	7090	F2	RS L T D \$ SIZZLE, 1-D	58
MULTIGROUP	DIFFUSION DEPLETION	CDC	1604	F63	RS L T D \$ SIZZLE, 1-D	58
MULTIGROUP	DIFFUSION SLAB, CYL, SPH	ANC	360	F4	RSBP CT C \$ MCNA, 1-D	582
MULTIGROUP	DIFFUSION SLAB, SPH, CYL	GGA	1108	F+BAL RS P	T C \$ GAZE2, 1-D	430
MULTIGROUP	DIFFUSION XYZ R-THETA-Z	LASL	6600	F4	RS P T C \$ 3DCT, 3-D	463
MULTIGROUP	DISCRETE ORDINATE CALC	UNC	1604	F63	RS PL T C \$ DTF, 1-D	144
MULTIGROUP	DISCRETE ORDINATE PROGRAM	LER	7090	F+MAP RS P	T C \$ TDSN, 2-D	312
MULTIGROUP	LIBRARIES FROM ENDF/B	CRNL	360	F4	RSBP XCT B \$ XLACS, XSDRN	572
MULTIGROUP	REACTOR KINETICS PROGRAM	ORNL	360	F4	RS P XCT F \$ TASK, 1-D	558
MULTIGROUP	SLAB GEOMETRY	ANL	3600	F63	RSBPL T J \$ MAC, SHIELD DESIGN	143
MULTIGROUP	SLAB GEOMETRY	RNW	7090	F2	RSBPL T J \$ MAC, SHIELD DESIGN	143
MULTIGROUP	TIME-DEPENDENT DIFFUSION	GGA	1108	F4	RS P T F \$ GAKIN, 1-D	310
MULTIGROUP	X-SECTION CALCULATION	ANL	360	F4	RS P CT B \$ MC**2, ENDF	355
MULTIGROUP	X-SECTION CALCULATION	ANL	3600	F36	RS P T B \$ MC**2, ENDF	355
MULTIGROUP	XSEC LIBRARY MAINTENANCE	NED	635	F4	RS P T M \$ TROUT, MUG	493
MULTIGROUP	XSEC LIBRARY MAINTENANCE	NED	1108	F5	RS P T M \$ TROUT, MUG	493
MULTILEVEL	B-W X-SEC CALC	RNL	6600	F4	RS P A \$ SIGPLOT, RESOLVED	377
MULTIPLE CHANNEL ANALYSIS	ECC	BCL	6400	F4	RS P X T G \$ MUCHA1, MUCHA2,	508
MULTIPLE SCATTERING CALC	ANL	360	F4	RS P CT W \$ MSCAT, SLOW NEUTRON	575	
MUSCAT, VIEW FACTOR SHIELDING CODE	CAVITY GEOM	GGA	1108	F4	RS P T J \$	259
MVT REMOTE JOB ENTRY SYSTEM	ANC	360	BAL	RSB	T P \$ NRTS-RJE, OS/360	519
M0102, POINT DEPLETION FISSION PRODUCT	BAPL	6600	F4	RS P	D \$ CINDER,	313
M0102, POINT DEPLETION FISSION PRODUCT	CP	360	F+BAL	RS P	T D \$ CINDER,	313
M0219, PWR FLOW TRANSIENT ANALYSIS	BAPL	6600	F4	RS P	T F \$ FLOT1,	331
M0266, LINEAR ELASTIC STRUCTURAL DYNAMICS	BAPL	6600	F4	RS P	T I \$	383
M0457, PIPE, ELASTIC STRESS OF PIPING SYSTEM	BAPL	6600	F4	RS P	T I \$	329
M0552, DYNAMIC ANALYSIS LINEAR ELASTIC SYSTEMS	BAPL	6600	F4	RS P	T I \$	283
M0555, ACT1, LOSS-OF-COOLANT ACCIDENT ANALYSIS	BAPL	6600	F4	RS P	T G \$	284
M0626, POLYNOMIAL CURVE FITTING	BAPL	6600	F4	RS P	T P \$ M0661, M0657,	411
M0648, 1-D SLAB TRANSPORT WITH SLOWING DOWN	BAPL	6600	F4	RS	T C \$	342
M0657, M0626, POLYNOMIAL CURVE FITTING	BAPL	6600	F4	RS P	T P \$ M0661,	411
M0661, M0657, M0626, POLYNOMIAL CURVE FITTING	BAPL	6600	F4	RS P	T P \$	411
M0756, LETC, 1-D SLAB GAMMA-RAY TRANSPORT	BAPL	6600	F4	RS P	T J \$	343
M0807, 2-D DIFFUSION ABSORPTION REMOVAL X-SECS	BAPL	6600	F4	RS	T B \$	280
M0899, HOH, STEAM TABLES 14.5-2538 PSIA	ANL	1604	F63	RS P	H \$	294
M0899, HCH, STEAM TABLES 14.5-2538 PSIA	BAPL	6600	F4	RS P	T H \$	294
NAP, NEUTRON-INDUCED GAMMA-RAY RADIOACTIVITY	IITR	7094	F4	RSBPLX	T D \$	314
NEARREX, COMPOUND NUCLEUS X-SECTION CALC	ANL	3600	F63	RSBP	A \$	171
NED	635	F+GMP RS	T P	\$ GENED ENVIRONMENTAL ROUTINES, SUBROUTINE LIB.	515	
NEC	635	F+GMP RS P	T D	\$ SYN, 2D SYNTHESIS MULTIGP DIFF & IGP DEPLETION	495	
NED	635	F4	RS P	D \$ RAPFU, FUEL CYCLE PARAMETERS FAST BREEDERS	372	
NEC	635	F4	RS P	T B \$ RFAX, RESOLVED RESONANCE EPITHERMAL X-SECTIONS	257	
NED	635	F4	RS P	T C \$ DOT2DB, 2-D MULTIGROUP DIFFUSION & SN THEORY	459	
NED	635	F4	RS P	T C \$ FLARE, 3-D REACTIVITY AND POWER DISTRIBUTION	167	
NED	635	F4	RS P	T D \$ FUMBLE, FAST REACTOR FUEL BURNUP & MANAGEMENT	480	
NED	635	F4	RS P	T G \$ FREADM1, FAST REACTOR CORE ACCIDENT ANALYSIS	479	
NED	635	F4	RS P	T H \$ MANTA, STEADY-STATE THERMAL-HYDRAULIC ANALYSIS	256	
NED	635	F4	RS P	T H \$ VELVET2, TURBULENT FLOW IN LMFBR ROD BUNDLE	458	
NED	635	F4	RS P	T M \$ TROUT, MUG MULTIGROUP XSEC LIBRARY MAINTENANCE	493	
NED	635	F4	RS P	T O \$ BURNUP, HEAVY ELEMENT ISOTOPIC BURNUP ANALYSIS	311	
NED	635	F4	RS P	T O \$ EXPN, ANALYSIS OF PULSED NEUTRON SOURCE DATA	258	

NED

NUCY

NED	635	F4	RS P X T F	\$ FORE2, FAST REACTOR EXCURSION CALCULATIONS	174
NED	635	F4	RS PL T C	\$ BISYN, 2-D MULTI-GP DIFFUSION SYNTHESIS CALC	287
NED	1108	F4	RS P T C	\$ BISYN, 2-D MULTI-GP DIFFUSION SYNTHESIS CALC	287
NED	1108	F5	RS P T M	\$ TROUT, MUG MULTIGROUP XSEC LIBRARY MAINTENANCE	493
NED	2000	F2	RS P A	\$ COPIE, RESOLVED RESONANCE X-SECTION CALC	177
NED	2000	F2	RS P A	\$ RAPTURE, RESONANCE INTEGRAL X-SECTION CALC	176
NED	2000	F2	RS P B	\$ SPARTA, SPATIALLY-AVERAGED DOPPLER EFFECTS	178
NED	2000	F4	RS P T F	\$ FORE, FAST REACTOR EXCURSION CALCULATIONS	174
NED	7094	F+FAP	RS P T B	\$ EPITHERMOS, SPECTRUM AND X-SECTION CALCULATION	201
NETWORK SOLUTION	BAPL 6600B	F4	RS P T I	\$ MANE1, RECTANGULAR MAGNETIC	412
NEUTRON AGE CALCULATION OF ENDF/B DATA	BAPL 6600	F4	RS P T B	\$ EPOCH, NEUTRON DATA LIBRARY	461
NEUTRON FLUX-DOSIMETER ACTIVITY RELATION	GEC 635	F4	RSBP D	\$ DOS, NEUTRON HISTORIES	423
NEUTRON HISTORIES	GGA 7044	F4	RS P T B	\$ FMC-N, MONTE CARLO CALC	195
NEUTRON MULTIPLE SCATTERING CALC	ANL 360	F4	RS P CT W	\$ MSCAT, SLCW	575
NEUTRON PENETRATION CALCULATION	DAC 7090	F2	RSBP J	\$ LIPREFCAN1, MC	123
NEUTRON PENETRATION STUDY	LASL 7050	FLOCC	RS P B	\$ MCS, MONTE CARLO	202
NEUTRON POLARIZATION EXPERIMENT	UCND 360B	F+FAL	RS P D	\$ PMS1, FAST	469
NEUTRON SCATTERING CODES AND	360	F4	RS P CT W	\$ MACS LATTICE VIBRATION	574
NEUTRON SLOWING-DOWN NPGS	360	F4	RS P X T E	\$ MOD5, STOCHASTIC MODEL CF	491
NEUTRON SOURCE DATA	NED 635	F4	RS P T D	\$ EXPN, ANALYSIS OF PULSED	258
NEUTRON SOURCE DATA ANALYSIS	CNEA 360	F4	RS P E	\$ TRIFIDC, PULSED	489
NEUTRON SPECTRUM X-SECTION CALC	AI 7090	F2	RS PL T B	\$ FORM, FAST	51
NEUTRON SPECTRUM X-SECTION CALC	ANL 3600	F63	RS LX T B	\$ GAM1, FAST	33
NEUTRON SPECTRUM X-SECTION CALC	CDC 1604	F63	RS PL T B	\$ FORM, FAST	51
NEUTRON SPECTRUM X-SECTION CALC	CCC 1604	F63	RS PLX T B	\$ GAM1, FAST	33
NEUTRON SPECTRUM X-SECTION CALC	GGA 7050	F2	RS PLX T B	\$ GAM1, FAST	33
NEUTRON SPECTRUM X-SECTION CALC	OSUC 370	F4	RS PLXCT B	\$ FORM, FAST	51
NEUTRON SPECTRUM X-SECTIONS	AI 7090	F+FAP	RS PL T B	\$ TEMPEST2, THERMAL	50
NEUTRON SPECTRUM X-SECTIONS	RHSC 360	F4	RS PL T B	\$ TEMPEST2, THERMAL	50
NEUTRON SPECTRUM X-SECTIONS	CCC 1604	F63	RS PL T B	\$ TEMPEST2, THERMAL	50
NEUTRON X-SECTION CALCULATION	BAPL 6600	F4	RS P T A	\$ SUMCR, S-WAVE	399
NEUTRON-HYDRODYNAMICS	APPA 7094	F2	RS P F	\$ WEAK EXPLOSION, COUPLED	145
NEUTRON-INDUCED GAMMA-RAY RADIOACTIVITY	IITR 7094	F4	RSBP LX T D	\$ NAP, NEUTRON, GAMMA-RAY HISTORIES	314
NEUTRON, GAMMA-RAY HISTORIES	PW 1604	F+CDP	RS P X T B	\$ FMC-N, FMC-G, MC	195
NEUTRONICS-HYDRODYNAMICS CODE ACC	7090	F2	RSBP F	\$ HATCHET, COUPLED	153
NEUTRONICS-HYDRODYNAMICS SPH	PW 1604	F63	RS P F	\$ AX-TNT, COUPLED	191
NEUTRONICS-HYDRODYNAMICS SPHERE	CDC 3600	F63	RSBP F	\$ AX1, COUPLED	102
NEUTRONICS-HYDRODYNAMICS SPHERE	LRL 7090	F2	RS P F	\$ CONEC, COUPLED	129
NOAH, 1-D ONE-GP SPACE-TIME DIFFUSION FEEDBACK	BAL 6600	F4	RS P T F	\$ NOISY1, AUTO- AND CROSS-SPECTRAL DENSITIES	405
NOISY1, AUTO- AND CROSS-SPECTRAL DENSITIES	BNW 1108	F5	RS P X T F	\$ NOISY1, AUTO- AND CROSS-SPECTRAL DENSITIES	488
NOISY1, AUTO- AND CROSS-SPECTRAL DENSITIES	BNW 7090	F4	RS P T F	\$ NON-SPHERICAL OPTICAL MODEL X-SECTIONS	488
NON-SPHERICAL OPTICAL MODEL X-SECTIONS	AI 7094	F2	RS P T A	\$ 2PLUS, NON-SPHERICAL OPTICAL MODEL X-SECTIONS	254
NON-SPHERICAL OPTICAL MODEL X-SECTIONS	ANL 3600	F63	RSBP T A	\$ 2PLUS, NONLINEAR ALGEBRAIC EQN SOLN CURVE PLOT	254
NONLINEAR ALGEBRAIC EQN SOLN CURVE PLOT	KAPL 6600	F+ASC	RS P T P	\$ SNEQ, NONLINEAR DIFFERENTIAL EQNS. SOLUTION	364
NONLINEAR DIFFERENTIAL EQNS. SOLUTION	KAPL 6600	F+ASC	RS P T P	\$ LIZARD, NONLINEAR LEAST SQ LENS DESIGN SYSTEM	445
NONLINEAR LEAST SQ LENS DESIGN SYSTEM	LASL 6600	F+COM	RS P T P	\$ LENSEDES, NOWIG, 1-D 2-GP KINETICS TEMPERATURE FEEDBACK	602
NOWIG, 1-D 2-GP KINETICS TEMPERATURE FEEDBACK	BAPL 6600	F4	RS P T F	\$ NPGS 360 F4 RS P X T F \$ MOD5, STOCHASTIC MODEL OF NEUTRON SLOWING-DOWN	371
NPGS 360 F4 RS P X T F \$ MOD5, STOCHASTIC MODEL OF NEUTRON SLOWING-DOWN					491
NPRECCP, FUEL CYCLE COSTS PERFORMANCE DATA	KE 7090	F2	RSBP D	\$ NPRECCP, FUEL CYCLE COSTS PERFORMANCE DATA	146
NPRECCP, FUEL CYCLE COSTS PERFORMANCE DATA	UEC 6600	F4	RS P D	\$ ARTS-RJE, CS/360 MVT REMOTE JOB ENTRY SYSTEM	146
ARTS-RJE, CS/360 MVT REMOTE JOB ENTRY SYSTEM	ANC 360	RAL	RSBP T P	\$ NUCLEAR FUEL CYCLE COST AND ECONOMICS	519
NUCLEAR FUEL CYCLE COST AND ECONOMICS	CWE 360	F4	RS P T D	\$ CINCAS, NUCLEAR FUEL CYCLE COST AND ECONOMICS	354
NUCLEAR FUEL CYCLE COST AND ECONOMICS	WAPD 6600	F4	RS P T D	\$ CINCAS, NUCLEAR FUEL CYCLE ECONOMICS	354
NUCLEAR FUEL CYCLE ECONOMICS	UICS 360	F4	RS P CT D	\$ GEM, ANALYSIS OF NUCLEAR POWER PLANT COST CODE	576
NUCLEAR POWER PLANT COST CODE	HEPL 1108	F5	RS P X T D	\$ PACTOLUS, CLCTHC, NUCLEAR STATION ELECTRICITY COSTS	540
NUCLEAR STATION ELECTRICITY COSTS	CRNL 1604	F63	RS P D	\$ POWERCO, NUCLEAR STATION ELECTRICITY COSTS	340
NUCLEAR STATION ELECTRICITY COSTS	UEC 6600	F4	RS P D	\$ POWERCO, NUCLEUS REACTION	340
NUCLEUS REACTION	AI 360	F+BAL	RS P T A	\$ COMNUC, CASCADE, COMPOUND	482
NUCLEUS X-SECTION CALC	ANL 3600	F63	RSBP A	\$ NEAPREX, COMPOUND	171
NUCLIDE CHAIN EQUATIONS	ORNL 7090	F2	RSPP D	\$ NUCY, SOLUTION OF NUCLIDE DATA	134
NUCLIDE DATA	BAPL 6600	F4	RS P T P	\$ DAFT1, LEAST SQUARES FIT FISSION	327
NUCLIDE X-SECTION EVALUATION	OPNL 7090	F4	RSBP A	\$ MUFFLE, FISSION	323
NUCY, SOLUTION OF NUCLIDE CHAIN EQUATIONS	OPNL 7090	F2	RSBP D	\$	134

NURLOC-1.0

CRNL

NURLOC-1.0, LOSS-OF-COOLANT THERMAL ANALYSIS	BCL	6400	F4	RS P	T G \$	328
CNE-GP SPACE-TIME DIFFUSION FEEDBACK	BNL	6600	F4	RS P	T F \$ NOAH, 1-D	405
OPN OPPD 6400 F4	S P			H \$ PWR-PPM, BORATION-DILUTION TABLES FOR PWR		552
OPN DP 360 F4	RS P			G \$ INTEG, INSPEC, MARKOV SIMULATION OF REACTOR		590
OPPD 6400 F4	S P			H \$ PWR-PPM, BORATION-DILUTION TABLES FOR PWR CPN		552
OPTICAL MODEL X-SECTIONS	AI	7094	F2	RS P	T A \$ 2PLUS, NON-SPHERICAL	254
OPTICAL MODEL X-SECTIONS	ANL	3600	F63	RSBP	T A \$ 2PLUS, NCA-SPHERICAL	254
OPTIMAL GRUP OR MESH COLLAPSING				TRW 6500 F4	RS P B \$ PARTI,	416
OPTIMIZATION	ORNL	360	F4	RS P	P \$ KEELE, LINEARLY-CONSTRAINED	556
OPTIMIZATION	AI	7090	F2	RS	I \$ CROCK, SPACE POWER PLANT DESIGN	112
OPTIMIZATION	AI	7090	F2	RS	I \$ SHOCK, SPACE POWER PLANT DESIGN	114
OPTIMIZATION DOSE CALC	AI	7094	F+FAP	RS P	J \$ SHOE, SHIELD WEIGHT	197
OPTIMIZATION SCHEME	KAPL	6600	F4	RS P	P \$ MOST, A MULTIDIMENSIONAL	446
OPTIMIZATION STUDY	PW	1604	F63	RS	I \$ WOEXPRT, REACTOR WEIGHT	190
CPUS, POWER PLANT PERFORMANCE AND PRICE STUDY	GGA	7044	F+MAP	RS P	T D \$	226
ORCOST, POWER PLANT CAPITAL COST ESTIMATING	ORNL	360	F4	RS P	T D \$	588
ORDINARY DIFF EQNS	CRNL	6600	F4	RS P	P \$ FORSIM, SOLN OF SYSTEM OF	514
ORDINARY DIFFERENTIAL EQN SYSTEM SOLVER	LLL	6600	F4	RS P	P \$ GEAR,	592
ORDINATE CALC	AI	7090	F2	RS PLX	T C \$ CTF2, 1-D MULTI-GP DISCRETE	151
ORDINATE CALC	AI	360	F4	RSBPLX	T C \$ ANISN, 1-D MULTI-GP DISCRETE	151
ORDINATE CALC	UNC	1604	F63	RS PL	T C \$ CTF, 1-D MULTIGROUP DISCRETE	144
ORDINATE CALC	ANL	3600	F36	RS P	T C \$ SNARG-1D, 1-D MULTI-GP DISCRETE	288
ORDINATE CODE	GGA	1108	F5	RS P	T C \$ 2DF, 2-D MULTI-GP DISCRETE	173
ORDINATE CODE	UNC	1604	F63	RS	C \$ 2CF, 2-D MULTI-GP DISCRETE	173
ORDINATE MULTIGROUP CONSTANTS	ORNL	360	F4	RS PLX	T B \$ XSDRN, DISCRETE	393
ORDINATE PROGRAM	ANL	360	F+BAL	RS P	T C \$ CTF4, 1-D MULTI-GP DISCRETE	209
ORDINATE PROGRAM	BC	625	F+MAP	RS P	T C \$ CTF4, 1-D MULTI-GP DISCRETE	209
ORDINATE PROGRAM	LASL	6600	F4	RS P	T C \$ CTF4, 1-D MULTI-GP DISCRETE	209
ORDINATE PROGRAM	LASL	7030	F4	RS P	T C \$ CTF4, 1-D MULTI-GP DISCRETE	209
ORDINATE PROGRAM	LER	7094	F4	RS P	T C \$ CTF4, 1-D MULTI-GP DISCRETE	209
ORDINATE PROGRAM	LER	7090	F+MAP	RS P	T C \$ TDSN, 2-D MULTIGROUP DISCRETE	312
ORDINATES SLAB GEOMETRY	BAPL	6600	F4	RS P	T C \$ BE21, FEW-GP DISCRETE	358
ORNL 360	F+BAL	RS P		D \$ ISOSEARCH, ISOTOPE PRODUCTION FLUX, X-SEC CALC		322
CRNL 360	F+BAL	RS P	T R	\$ RAFFLE, 1ST FLIGHT COLLISION PROBABILITIES MC		392
ORNL 360	F+BAL	RS P	T J	\$ SAFE-3D, 3-D COMPOSITE STRUCTURE STRESS STUDY		332
CRNL 360	F+BAL	RSBPL	CT C	\$ ESP, MONTE CARLO REACTOR ANALYSIS CALCULATION		523
CRNL 360	F+BAL	RSBPL	CT C	\$ KENO, MONTE CARLO MULTIGROUP CRITICALITY CODE		450
ORNL 360	F4	RS P	O	\$ ALPHA-M, RESOLUTION OF GAMMA RAY SPECTRA		413
CRNL 360	F4	RS P	P	\$ KEELE, LINEARLY-CONSTRAINED OPTIMIZATION		556
ORNL 360	F4	RS P	T A	\$ ATHENA4, INELASTIC SCATTERING FORM FACTORS		417
CRNL 360	F4	RS P	T R	\$ RICE, PRIMARY RECOIL ATOM SPECTRA ENDF/B DATA		453
CRNL 360	F4	RS P	T R	\$ SUPERTOG, ENDF/B FINE-GP CONSTANTS GENERATION		431
ORNL 360	F4	RS P	T C	\$ EXTERMINATOR2, 2-D MULTI-GP DIFFUSION PROGRAM		156
CRNL 360	F4	RS P	T D	\$ ORCOST, POWER PLANT CAPITAL COST ESTIMATING		588
ORNL 360	F4	RS P	T H	\$ HEATING3, 1,2, OR 3-C HEAT CONDUCTION PROGRAM		517
ORNL 360	F4	RS P	C G	\$ STEFEG, ANALYSIS OF PWR & BWP GASEOUS RELEASE		583
ORNL 360	F4	RS P	X T H	\$ OPTHIS, ORTHAT, 2-DIMENSIONAL HEAT CONDUCTION		525
ORNL 360	F4	RS P	XCT F	\$ TASK, 1-D MULTIGROUP REACTOR KINETICS PROGRAM		558
CRNL 360	F4	RS PLX	T R	\$ XSDRN, DISCRETE ORDINATE MULTIGROUP CONSTANTS		393
ORNL 360	F4	RSBP	XCT R	\$ XLACS, XSDRN MULTIGROUP LIBRARIES FROM ENDF/B		572
ORNL 360B	F4	RS P	T M	\$ EDITOR, ENDF/B TAPE PROCESSING AND EDITING		502
CRNL 360B	F4	RS P	XCT D	\$ CONCEPT2, POWER PLANT CONCEPTUAL COST ESTIMATE		458
ORNL 360G	F4	RS P	T K	\$ CITATION, 1,2,3-D DIFFUSION DEPLETION MULTIGP		387
CRNL 1604	F2	RS P	H	\$ RIGDEAL, SPENT YANKEE-FUEL TEMPERATURE CALC		549
CRNL 1604	F63	RS P	A	\$ PEGGY, ELASTIC SCATTERING PHASE-SHIFT ANALYSIS		334
ORNL 1604	F63	RS P	A	\$ RAMES, PARTICLE WAVE FUNCTION RACIAL INTEGRALS		335
CRNL 1604	F63	RS P	D	\$ ISCCRUNCH, REACTION DECAY CHAIN ANALYSIS		180
ORNL 1604	F63	RS P	D	\$ ISOSFARCH, ISOTOPE PRODUCTION FLUX, X-SEC CALC		322
ORNL 1604	F63	RS P	D	\$ ISOTOPE5, MAXIMUM YIELD FROM REACTION OR DECAY		179
CRNL 1604	F63	RS P	D	\$ POWERCO, NUCLEAR STATION ELECTRICITY COSTS		340
ORNL 1604	F63	RS P	T A	\$ JUPITER1, COUPLED-CHANNEL X-SEC EVALUATION		308
CRNL 6600	F4	RS P	T M	\$ EDITOR, ENDF/B TAPE PROCESSING AND EDITING		502
ORNL 7090	F+FAP	RS P	T R	\$ RAFFLE, 1ST FLIGHT COLLISION PROBABILITIES MC		352
CRNL 7090	F+FAP	RS P	T C	\$ EXTERMINATOR, 2-D MULTI-GP DIFFUSION PROGRAM		156

ORNL

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CRNL 7090	F+FAP	RS P	T D	\$ ASSAULT, 2-D MULTI-GP DIFFUSION DEPLETION CODE	240
ORNL 7090	F2	RS	A	\$ LYNNE, WOODS-SAXON POTENTIAL SHAPE CALCULATION	381
CRNL 7090	F2	RS P	T C	\$ EQUIPOISE3, 2-D 2-GROUP DIFFUSION SLAB CYL	39
ORNL 7090	F2	RS P	T C	\$ EQUIPOISE3A, 2-D 2-GP DIFFUSION CYLINDER SLAB	87
ORNL 7090	F2	RS P	T C	\$ WHIRLAWAY, 3-D 2-GROUP DIFFUSION XYZ GEOMETRY	32
CRNL 7090	F2	RS P	T C	\$ ZOGGRAND, 2-D FEW-GROUP DIFFUSION SLAB CYLINDER	40
ORNL 7090	F2	RSBP	D	\$ ISOCRUNCH, REACTION DECAY CHAIN ANALYSIS	180
CRNL 7090	F2	RSBP	D	\$ NUCY, SOLUTION OF NUCLIDE CHAIN EQUATIONS	134
ORNL 7090	F4	RSBP	A	\$ MUFFLE, FISSILE NUCLIDE X-SECTION EVALUATION	323
ORTHAT, 2-DIMENSIONAL HEAT CONDUCTION	ORNL 360	F4	RS P	X T H \$ ORTHIS,	525
ORTHAT, 2-DIMENSIONAL HEAT CONDUCTION	ORNL 360	F4	RS P	X T H \$	525
OS/360 MVT REMOTE JOB ENTRY SYSTEM	ANC 360	PAL	RSB	T P \$ NRTS-RJE,	519
CSCILLATION	CEND 360	F4	RS P	X T F \$ CEXF, INCXE, 1-GP 3-D XYZ XENON	415
CSUC 370	F4	RS PL	CT C	\$ AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	29
OSUC 370	F4	RS PL	CT B	\$ FORM, FAST NEUTRON SPECTRUM X-SECTION CALC	51
OUTPUT PW 1604	LAG1	RS P	N	\$ DTX, EFFECTIVE X-SECTION CALC FROM DSN	210
OUTPUT DATA LASL 6600	F4	RS P	T B	\$ GLEN, GROUP CONSTANT CALC FROM TOR	361
OUTPUT GGA 1108	F5	RS P	T N	\$ GAPER2D, 2-D PERTURBATION CALC FROM 2DF	471
OUTPUT TAPE EDIT REACTION RATES	UK-W 7090	F2	RS	N \$ WED, W-DSA	133
OVERLAP AND LATTICE EFFECTS	GGA 7044	F+MAP	RS P	T B \$ GAROL, RESONANCE	219
OVERLAP AND LATTICE EFFECTS	LEF 7094	F+MAP	RS P	T B \$ GAROL, RESONANCE	219
OXIDE FUEL PERFORMANCE FINITE-ELEMENT	GESV 635	F4	RS P	CT I \$ BEHAVE2,	568
OXIDE FUEL ROD STRESS & DEFORMATION	BAPL 6600	F4	RS P	T I \$ CYGR03,	449
PACTCLUS, CLOTHO, NUCLEAR POWER PLANT COST CODE	HEDL 1108	F5	RS P	X T D \$	540
PARALLEL BEAMS	ANL 3600	F36	SRP	I \$ PCW2, DEFLECTION CALCULATION	365
PARET, WATER-COOLED CORE TRANSIENT ANALYSIS	ANC 360	F+BAL	RSBP	CT G \$	555
PARTI, OPTIMAL GROUP OR MESH COLLAPSING	TPW 6500	F4	RS P	B \$	416
PARTIAL REFUEL	GGA 7044	F4	RS P	T D \$ GARGOYLE, FUEL CYCLE ANALYSIS	260
PARTICLE TRANSPORT STUDY	RFD 3600	F36	RS P	G \$ DISPER, AEROSOL	554
PARTICLE TRANSPORT XY RZ RTH	LASL 7600	F4	RS P	T C \$ TWOTRAN-PNVW, 2-D	573
PARTICLE WAVE FUNCTION RADIAL INTEGRALS	ORNL 1604	F63	RS P	A \$ RAMES,	335
PARTICLES SAMPLING STUDY	BAPL 6600	F4	RS P	T D \$ BETTY, ENTRAINED	545
PATTERN INDEXING	LASL 6600	F+COM	RS P	T Q \$ INDX, XRAY DIFFRACTION POWDER	609
PAX03, HARMONY-PDQ X-SECTION GENERATION CODE	BAPL 6600	F+COM	RS P	X T B \$	426
PDP-11 ON 360	ANC 360	PL1	RS P	T P \$ PTAC11, 2-PASS ASSEMBLER FOR THE	516
PDQ5, 2-D FEW-GROUP DIFFUSION AND DEPLETION	IBM 360A	F+BAL	RS P	T D \$	336
PDQ5, 2-D FEW-GROUP DIFFUSION AND DEPLETION	MIT 360B	F+BAL	RSBP	T D \$	336
PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	ANC 360E	F+BAL	RS P	XCT D \$	275
PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	BAPL 6600A	F+ASC	RS P	T D \$	275
PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	BAPL 6600C	F+ASC	RS P	T D \$	275
PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	BCS 6600D	F+ASC	R B	T D \$	275
PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	BW 6600B	F+ASC	RS P	T D \$	275
PEGGY, ELASTIC SCATTERING PHASE-SHIFT ANALYSIS	ORNL 1604	F63	RS P	A \$	334
PELEN, FUEL PELLET TEMPERATURE & DEFORMATION	BAPL 6600	F4	RS P	T I \$	598
PELLET CRACKING	BAPL 6600	F4	RS P	I \$ STRIPE, FUEL ROD CLAD STRAIN &	570
PELLET TEMPERATURE & DEFORMATION	BAPL 6600	F4	RS P	T I \$ PELEN, FUEL	598
PENETRATION CALCULATION	DAC 7090	F2	RSBP	J \$ LIPRECANI, MC NEUTRON	123
PENETRATION STUDY	LASL 7090	FLCCC	RS P	B \$ MCS, MONTE CARLO NEUTRON	202
PERFORMANCE AND PRICE STUDY	GGA 7044	F+MAP	RS P	T D \$ OPUS, POWER PLANT	226
PERFORMANCE DATA	KE 7090	F2	RSBP	D \$ NPRFCCP, FUEL CYCLE COSTS	146
PERFORMANCE DATA	UEC 6600	F4	RS P	D \$ NPRFCCP, FUEL CYCLE COSTS	146
PERFORMANCE FINITE-ELEMENT	GESV 635	F4	RS P	CT I \$ BEHAVE2, OXIDE FUEL	568
PERFORMANCE STUDY	GGA 7044	F4	RS P	D \$ WAMPUM, FUEL CYCLE COSTS	224
PERFORMANCE STUDY	UEC 6600	F4	RS P	D \$ WAMPUM, FUEL CYCLE COSTS	224
PERT, 1-D PERTURBATION FOR AIM AND FOG CODES	AI 7090	F2	RS	C \$	30
PERT, 1-D PERTURBATION FOR AIM AND FOG CODES	BHSC 360	F4	RS P	C \$	30
PERT, 1-D PERTURBATION FOR AIM AND FOG CODES	CDC 1604	F63	RS	C \$	30
PERTURBATION CALC FROM 2DF OUTPUT	GGA 1108	F5	RS P	T N \$ GAPER2D, 2-D	471
PERTURBATION CODE USING DTF4 FLUXES	LASL 6600	F4	RS P	N \$ DAC1, SN	455
PERTURBATION FOR AIM AND FOG CODES	AI 7090	F2	RS	C \$ PERT, 1-D	30
PERTURBATION FOR AIM AND FOG CODES	BHSC 360	F4	RS P	C \$ PERT, 1-D	30
PERTURBATION FOR AIM AND FOG CODES	CDC 1604	F63	RS	C \$ PERT, 1-D	30
PERTURBATION TDC OR 2DX FLUX INPUT	PW 1604	F63	RS	C \$ TDP, 2-D	159
PERTURBATION THEORY	GGA 1108	F4	RS P	XCT C \$ GAPER1D, 1-D TRANSPORT	606

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POLYNOMIAL

PERTURBATION XY RZ RTHETA GEOMETRY BNW 1108 F4 RS P C \$ PERT4, 2-D	304
PERT4, 2-D PERTURBATION XY RZ RTHETA GEOMETRY BNW 1108 F4 RS P C \$	304
PGE 360 F4 RS P CT G \$ EMERALD, PWR PLANT RADIATION RELEASE & DOSE	546
PHASE SHIFT X-SEC & POLARIZATION CALC KAPL 6600 F4 RS P T A \$ PHASER,	507
PHASE-SHIFT ANALYSIS ORNL 1604 F63 RS P A \$ PEGGY, ELASTIC SCATTERING	334
PHASER, PHASE SHIFT X-SEC & POLARIZATION CALC KAPL 6600 F4 RS P T A \$	507
PHENIX, 2D DIFFUSION BURNUP REFUELING HISTORY LASL 6600 F4 RS P T D \$	454
PHOTOFRACTION SOLID CRYSTAL UM 7090 MAD RSP O \$ BURP4, GAMMA-RAY	169
PHOTOFRACTION WELL CRYSTAL UM 7090 MAD RSP O \$ BURP5, GAMMA-RAY	170
PHOTOMULTIPLIER ELECTRON DISTRIBUTION ANL 360 F4 RS P O \$ DYN01,	464
PHOTOMULTIPLIER ELECTRON DISTRIBUTION KAPL 6600 F4 RS P O \$ DYN01,	464
PHOTPEAK SPECTRA CODE BNWL 1108 F+BAL RS P T C \$ GSSLRN1B, LEAST SQUARES	457
PHROG, MULTI-GP CONSTANT & FAST SPECTRA CALC ANC 360 F4 RS PLXCT B \$	520
PHYSICS MODULES DP 360 F+BAL S X T B \$ RAHAB, JOSHUA SYSTEM LATTICE	536
PINS ANC 360 F4 RSBP CT J \$ VIEWPIN, VIEW FACTOR CALC FOR CYLINDRICAL	569
PIP, CENTRIFUGAL PUMP IMPELLER DESIGN STUDY PW 1604 F63 RS P T I \$	187
PIPE STRESS, MAXIMUM MOMENT CALC AI 7090 F+AP RS T I \$ 4RESTRAINT	109
PIPE SYSTEM AI 360 F4 RS P CT I \$ PSA2, STRESS ANALYSIS MULTIANCHOP	542
PIPE, ELASTIC STRESS OF PIPING SYSTEM BAPL 6600 F4 RS P T I \$ M0457	329
PIPING SYSTEM BAPL 6600 F4 RS P T I \$ M0457, PIPE, ELASTIC STRESS OF	329
PIPING SYSTEM ANALYSIS KF 3600B F36 RSBP G \$ WHAM, LIQUID-FILLED	278
PKG ANL 360 F+ASM RSB CT P \$ WSP-HASP/DOO, DOO-MET REMOTE WORKSTATION	541
PLANE & AXISYMMETRIC STRESS ANALYSIS GGA 1108 F4 RS P I \$ SAFE-2D,	379
PLANE ELASTIC-PLASTIC BAPL 6600 F+COM RS P T I \$ DUZ2, 2-D AXISYMMETRIC &	503
PLANE STRESS ANALYSIS, 2-D BODIES BNL 6600 F4 RS P T I \$ SAFE-PLANE,	252
PLANE STRESS ANALYSIS, 2-D BODIES GGA 1108 F4 RS P I \$ SAFE-PLANE,	252
PLANE STRUCTURES BAPL 6600 F4 RS P T L \$ PL47, DRAFTING TOOL TO PLCT	373
PLANNING MLMD 360 F+C+R RSPP T M \$ RALCRTPH, RESOURCE ALLOCATION PROJECT	603
PLANT CAPITAL COST ESTIMATING ORNL 360 F4 RS P T D \$ CRCOST, POWER	588
PLANT CONCEPTUAL COST ESTIMATE ORNL 360B F4 RS P XCT D \$ CONCEPT2, POWER	498
PLANT COST CODE HEDL 1108 F5 RS P X T D \$ PACTCLUS, CLOTHC, NUCLEAR POWER	540
PLANT DESIGN OPTIMIZATION AI 7090 F2 RS I \$ CROCK, SPACE POWER	112
PLANT DESIGN OPTIMIZATION AI 7090 F2 RS I \$ SHOCK, SPACE POWER	114
PLANT PERFORMANCE AND PRICE STUDY GGA 7044 F+MAP RS P T D \$ CPUS, POWER	226
PLANT RADIATION RELEASE & DOSE PGE 360 F4 RS P CT G \$ EMERALD, PWR	546
PLANT THERMAL DISCHARGE STUDY HEDL 1108 F5 RS P T F \$ TOPLYR2, POWER	599
PLENUM DP 360 F4 RS P H \$ PLENUM, FLOW DIST. IN CYL COOLANT INLET	586
PLENUM, FLOW DIST. IN CYL COOLANT INLET PLENUM DP 360 F4 RS P H \$	586
PLETHS, ISOPLETH-AREA CALC FROM SINGLE SOURCE ANL GETS F P R \$	591
PLOT KAPL 6600 F+ASC RS P T P \$ SNEQ, NONLINEAR ALGEBRAIC EQN SOLN CURVE	364
PLOT PLANE STRUCTURES BAPL 6600 F4 RS P T L \$ BL47, DRAFTING TOOL TO	373
PLOT-3D, 3-D PLOTS ON IBM2280 OR CALCOMP780 ANL 360 F4 RS P T N \$	544
PLCTFB,... ENDF/B V1 PROC BNL 6600B F4 RS T M \$ CHECKER, CRECT, DAMMET,	384
PLCTFB,... ENDF/B V2 PROC BNL 6600B F4 RS T M \$ CRECT, CHECKER, RIGEL,	475
PLCTR, 2D CONTOUR PLOTS & AREA CALCULATION SLA 6600 F4 RS P P \$	578
PLOTS & AREA CALCULATION SLA 6600 F4 RS P P \$ PLOTR, 2D CONTOUR	578
PLOTS FROM SCISRS X-SECTION TAPES WANL 7054 F+AP RSBPL T N \$ CPS, SC4020	239
PLCTS FROM X-SECTION TAPES GGA 7044 F+SPS RSBP T N \$ CROSSPLOT, SC4020	207
PLOTS ON IBM2280 OR CALCOMP780 ANL 360 F4 RS P T N \$ PLOT-3D, 3-D	544
PLOTTING KAPL 6600 F+ASC RS P T P \$ DATATRAN UTILITY MODULES, 2-D + 3-D	407
PLOTTING ROUTINES KAPL 6600 F+CCM RS T P \$ KAPLPLOT, KAPL CALCOMP	496
PL1 RS P T P \$ PTAC11, 2-PASS ASSEMBLER FOR THE PDP-11 ON 360 ANC 360	516
PMS1, FAST NEUTRON POLARIZATION EXPERIMENT UCND 360B F+BAL RS P O \$	469
POINT DEPLETION FISSION PRODUCT BAPL 6600 F4 RS P D \$ CINDER, M0102,	313
POINT DEPLETION FISSION PRODUCT DP 360 F+BAL RS P T D \$ CINDER, M0102,	313
POINT SOURCE UM 7090 MAD RSB O \$ BURP1, DETECTOR EFFICIENCY	164
POINT SOURCE UM 7090 MAD RSB C \$ BURP3, DETECTOR EFFICIENCY	166
POINT-KERNEL SHIELD EVALUATION CODE BAPL 6600B F+ASC RS P T J \$ SPAN4, A	462
POINT-KINETICS WITH 2-D HEAT TRANSFER GGA 7044 F+MAP RS P T H \$ BLOOST5,	205
POINTS KAPL 6600 F+ASC RS P T P \$ CURFIT, CURVE FITTING EXPERIMENTAL DATA	43
POINTWISE XSECS. FROM B-W PARAMETERS GGA 1108 F5 RS P CT A \$ FSDP3,	216
POLARIZATION CALC KAPL 6600 F4 RS P T A \$ PHASER, PHASE SHIFT X-SEC &	507
POLARIZATION EXPERIMENT UCND 360B F+BAL RS P O \$ PMS1, FAST NEUTRON	469
POLYNOMIAL KAPL 6600 F4 RS P P \$ ROPE, FINDING ROOTS OF A	444

POLYNOMIAL

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POLYNOMIAL CURVE FITTING	BAPL 6600 F4	RS P	T P \$	M0661,M0657,M0626,	411
POOL FIRE 1- & 2-CELL ANALYSIS	AI 360 F4	RS P	T G \$	SOFIRE2, SODIUM	559
POST RUPTURE GGA 7044 F4	RS	X T G \$	PRECCN,	HTGR CONTAINMENT PRESSURE	228
POTENTIAL SHAPE CALCULATION	ORNL 7090 F2	RS	A \$	LYNNE, WOODS-SAXON	381
POWDER PATTERN INDEXING	LASL 6600 F+CCM	RS P	T Q \$	INDX, XRAY DIFFRACTION	609
POWER AND FLOW TRANSIENTS	ANL 360 F4	RS P	T F \$	SAS1A, FAST REACTOR	400
POWER AND FLOW TRANSIENTS	ANL 6600 F4	RS P	T F \$	SAS1A, FAST REACTOR	400
POWER DIST SEARCH	GGA 7044 F4	RS P	T C \$	GASP2, 1-D FEW-GP DIFFUSION	220
POWER DISTRIBUTION	CDC 3600 F63	RSBP	T C \$	FLARE, 3-D REACTIVITY AND	167
POWER DISTRIBUTION	MSS 360 F4	RS P	CT C \$	FLARE, 3-D REACTIVITY AND	167
POWER DISTRIBUTION	NED 635 F4	RS P	T C \$	FLARE, 3-D REACTIVITY AND	167
POWER DISTRIBUTION SEARCH	GGA 1108 F4	RS P	T C \$	GASP7, 1-D BURNUP	319
POWER EXCURSION DISASSEMBLY	ANL 360 F4	RS P	XCT F \$	VENUS, 2-D LMFBR	511
POWER MCQUIRE UNITS	DUCC 635 F4	RS	G \$	ANVENT, LCCA ANALYSIS DUKE	529
POWER PLANT CAPITAL COST ESTIMATING	ORNL 360 F4	RS P	T D \$	ORCOST,	588
POWER PLANT CONCEPTUAL COST ESTIMATE	ORNL 3608 F4	RS P	XCT D \$	CONCEPT2,	498
POWER PLANT COST CODE	HEDL 1108 F5	RS P	X T D \$	PACTOLUS,CLOTHO, NUCLEAR	540
POWER PLANT DESIGN OPTIMIZATION	AI 7090 F2	RS	I \$	CROCK, SPACE	112
POWER PLANT DESIGN OPTIMIZATION	AI 7090 F2	RS	I \$	SHOCK, SPACE	114
POWER PLANT PERFORMANCE AND PRICE STUDY	GGA 7044 F+MAP	RS P	T D \$	OPUS,	226
POWER PLANT THERMAL DISCHARGE STUDY	HEDL 1108 F5	RS P	T R \$	TOPLYR2,	599
POWER TRANSIENTS	BAPL 6600 F4	RS P	T H \$	CHIC-KIN, FAST + INTERMEDIATE	473
POWERCO, NUCLEAR STATION ELECTRICITY COSTS	ORNL 1604 F63	RS P	D \$		340
POWERCO, NUCLEAR STATION ELECTRICITY COSTS	UEC 6600 F4	RS P	D \$		340
PPCC 7040 F+MAP	RS P	A \$	COMBCC, COMBINED R-W MULTI-LEVEL CONVOLUTION		203
PPCC 7040 F4	RS P	T C \$	TOPIC, 1-D FEW-GP SN APPROXIMATION CYLINDER		148
PPCC 7044 F+MAP	RS P	T H \$	TOODEE, 2-D TIME-DEPENDENT HEAT CONDUCTION		349
PPCC 7090 F2	RS P	C \$	MIST, 1-D FEW-GP SN DOUBLE SN APPROX SLAB GEOM		59
PPCC 7090 F2	RS P	T C \$	TOPIC, 1-D FEW-GP SN APPROXIMATION CYLINDER		148
PPCC 360 F4	RS P	X	G \$	BURST1, HYDRODYNAMIC ANALYSIS DURING BLOWDOWN	435
PRECCN, HTGR CONTAINMENT PRESSURE	POST RUPTURE GGA 7044 F4	RS	X T G \$		228
PREDICTING MANUFACTURING REQUIREMENTS	GFPI GETS	PASIC R	M \$	MAPPER,	595
PREP,KITT, SYSTEM FAULT TREE EVALUATION	CCCES ANC 360 F4	RSBP	CT K \$		528
PREP,KITT, SYSTEM FAULT TREE EVALUATION	CCCES ANC 1108 F4	PS P	T K \$		528
PREPARATION	GGA 1108 F4	RS P	X T L \$	GAND, GAFGAR X-SECTION LIBRARY	345
PREPARATION	PW 1604 F63	RS	L \$	CSP1, SN X-SECTION LIBRARY TAPE	194
PREPARATION	PW 1604 F63	RS	L \$	CSP2A, SN X-SECTION LIBRARY TAPE	193
PREPARATION FOR 2-D DESIGN PROGRAMS	LASL 7090 F+MAP	RS P	T L \$	DPC, DATA	234
PREPARATION, EDIT KAPL 6600 F+ASC	RS P	T L \$	DATATRA 2-D GEOMETRY INPUT,		406
PRESSURE	BAPL 6600 F4	RS P	I \$	TCB01, CREEP-BUCKLING OF TUBES UNDER	604
PRESSURE DISTRIBUTION	GGA 1108 F5	RS P	H \$	FIAC, STEADY-STATE FLOW,	395
PRESSURE POST RUPTURE	GGA 7044 F4	RS	X T G \$	PRECCN, HTGR CONTAINMENT	228
PRESSURE TEMPERATURE HISTORY	KF 7094 F2	RSBP	T H \$	PTH1, BLOWDOWN	155
PRESSURE VESSEL STRESS AND FATIGUE	KAPL 6600 F4	RS	I \$	SORSDB,	351
PRESSURE-TEMPERATURE RESPONSE	ANC 360 F+BAL	RSBP	CT G \$	CONTEMPT-LT/022,	433
PRESSURIZERS	BAPL 6600 F4	RS P	T H \$	TOPS, TRANSIENT THERMODYNAMICS OF	348
PRICE STUDY	GGA 7044 F+MAP	RS P	T D \$	CPUS, POWER PLANT PERFORMANCE AND	226
PRIMARY RECOIL ATOM SPECTRA ENDF/B DATA	ORNL 360 F4	RS P	T R \$	RICE,	453
PROBABILITIES MC	ORNL 360 F+PAL	RS P	T B \$	RAFFLE, 1ST FLIGHT COLLISION	392
PROBABILITIES MC	ORNL 7090 F+MAP	RS P	T B \$	RAFFLE, 1ST FLIGHT COLLISION	392
PROBABILITY CALC	ANL 360 F4	RS P	T B \$	CLUP77, SQUARE CELL COLLISION	526
PROBABILITY CALC	JAFR 230 F4	RS P	T B \$	CLUP77, SQUARE CELL COLLISION	526
PROBABILITY TABLES	AI 360 F+PAL	RS P	CT B \$	L3R, UNRESOL RESONANCE XSEC	553
PRCC BNL 66008 F4	RS	T M \$	CPECT,CHECKER,RIGEL,PLCTFB,...	ENDF/B V2	475
PRCC BNL 66008 F4	RS	T M \$	CHECKER,CRECT,CAMMET,PLCTFB,...	ENDF/B V1	384
PROCESSING AND EDITING	ORNL 3608 F4	RS P	T M \$	EDITOR, ENDF/B TAPE	502
PROCESSING AND EDITING	ORNL 6600 F4	RS P	T M \$	EDITOR, ENDF/B TAPE	502
PROCESSING CODE	ANL 360 F4	RS	T M \$	RIGEL, ENDF/B V3 DATA	571
PROCESSING CODES	ANL 360 F4	RS P	T M \$	CRECT,CHECKER, ENDF/B V2	475
PROCESSING CODES	BNL 6600 F4	PS	T M \$	CHECK3,PIGEL3, ENDF/B V3,V4	571
PROCESSING MODULE	ANL 360 F4	RSBP	CT L \$	ARC-NUI002, BCD INPUT DATA	533
PROCESSING OF ANALYZER GAMMA-RAY SPECTRA	CCA 1108 F+PAL	RS P	T D \$	TOAC,	333
PROCESSOR	LASL 360 F4	RS P	L \$	GENRD, FREE-FORMAT CARD INPUT	530
PROCESSOR	LASL 6600 F4	RS P	L \$	GENRD, FREE-FORMAT CARD INPUT	530

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PROCESSOR UNDER TSO	ANL	360	F+BAL R B L	T P \$	TSC-SPEAKEASY, LANGUAGE	593
PROGRAMMING AND DATA SYSTEM	KAPL	6600	F+COM RSB	T M \$	DATATRAK, MODULAR	386
PROGRAMMING LANGUAGE	KAPL	6600	F+ASC RS	P \$	SIMPLE1, TIME-SHARING	442
PROJECT PLANNING MLMD	360	F+C+R RSBP	T M \$	RALCRTPH, RESOURC	ALLOCATION	603
PROPERTIES BAPL	6600	F4	RS P	T H \$	WASP, WATER AND STEAM THERMODYNAMIC	396
PROPERTIES RG&E	360	F4	RS	T H \$	STEAM-67, 1967 ASME STEAM AND WATER	487
PROPERTIES WATER & STEAM	ANC	360	F4	RS P	T H \$	ASTEM, THERMODYNAMIC
PSA2, STRESS ANALYSIS MULTIANCHOR PIPE SYSTEM	AI	360	F4	RS P	CT I \$	542
PSEUDO, STATISTICAL RESONANCE PARAMETER CALC	ENEA	360	F4	RS P	A \$	292
PSEUDC, STATISTICAL RESONANCE PARAMETER CALC	GGA	1108	F4	RS P	A \$	252
PTAC11, 2-PASS ASSEMBLER FOR THE PDP-11 ON	360	ANC	360	PL1	RS P	T P \$
PTH1, BLOWDOWN PRESSURE TEMPERATURE HISTORY	KE	7094	F2	RSBP	T H \$	155
PULSED NEUTRON SOURCE DATA	NEP	635	F4	RS P	T O \$	EXPAN, ANALYSIS OF
PULSED NEUTRON SOURCE DATA ANALYSIS	CNEA	360	F4	RS P	F \$	TRIFIDO,
PUMP IMPELLER DESIGN STUDY	PW	1604	F63	RS P	T I \$	PIP, CENTRIFUGAL
PUN1, UNRESOLVED RESONANCE INTEGRALS X-SECS	BAPL	6600	F4	RS P	T A \$	359
PURCHASE VERSUS LEASE ANALYSIS	SLA	360	COBQL RSBP	CT M \$	BECOM, AEC DP	589
PURCHASE VERSUS LEASE ANALYSIS	SLA	1108	COBQL RS P	M \$	BECOM, AEC DP	589
PURD	6500	F4	RS PLX	T C \$	MACH1, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	262
PW	1604	F+CDP	RS P	T P \$	LAG, ASSEMBLER FOR FLOCO2 INSTRUCTION SFT	186
PW	1604	F+CDP	RS P	X T B \$	FMC-N, FMC-G, MC NEUTRON, GAMMA-RAY HISTORIES	155
PW	1604	F63	RS	C \$	TOP, 2-D PERTURBATION TDC OR 2DXY FLUX INPUT	199
PW	1604	F63	RS	I \$	WOPEXPT, REACTOR WEIGHT OPTIMIZATION STUDY	150
PW	1604	F63	RS	L \$	CSP1, SN X-SECTION LIBRARY TAPE PREPARATION	194
PW	1604	F63	RS	L \$	CSP2A, SN X-SECTION LIBRARY TAPE PREPARATION	193
PW	1604	F63	RS	T C \$	2DXYL, 3-D MULTI-GP FLUX SYNTHESIS PROGRAM CYL	192
PW	1604	F63	RS P	E \$	CMPTMAT, TRANSFER FUNCTION EVALUATION	188
PW	1604	F63	RS P	F \$	AX-TNT, COUPLED NEUTRONICS-HYDRODYNAMICS SPH	191
PW	1604	F63	RS P	L \$	SNC, CALCULATION OF SN CONSTANTS FOR DSN TDC	189
PW	1604	F63	RS P	T C \$	FORTAN TDC, 2-D MULTI-GP SN APPROXIMATION RZ	161
PW	1604	F63	RS P	T I \$	PIP, CENTRIFUGAL PUMP IMPELLER DESIGN STUDY	187
PW	1604	LAG1	RS P	C \$	MGDSN, 1-D MULTI-GP SN APPROX SLAB CYL SPHERE	211
PW	1604	LAG1	RS P	N \$	DTX, EFFECTIVE X-SECTION CALC FROM DSN OUTPUT	210
PWCOST, REACTOR FUEL CYCLE COST CALCULATION	GGA	1108	F4	RS P	T D \$	441
PWR & BWR GASEOUS RELEASE	ORNL	360	F4	RS P	C G \$	STEFEG, ANALYSIS OF
PWR FLOW TRANSIENT ANALYSIS	BAPL	6600	F4	RS P	T H \$	FLOTL, M0219,
PWR OPN	OPPD	6400	F4	S P	H \$	PWR-PPM, BORATION-DILUTION TABLES FOR
PWR PLANT RADIATION RELEASE & DOSE	PGE	360	F4	RS P	CT G \$	EMERALD,
PWR-PPM, BORATION-DILUTION TABLES FOR PWR CPN	OPPD	6400	F4	S P	H \$	552
QUASISTATIC SPATIAL REACTOR KINETICS CODE	ANL	360	F4	RS PL	CT F \$	QX1,
QUASISTATIC SPATIAL REACTOR KINETICS CODE	ANL	3600	36F	PS PL	CT F \$	QX1,
QUICKIE, INFINITE MEDIUM SPECTRUM X-SECTIONS	AI	7090	F+FAP	RS	L T B \$	119
QX1, QUASISTATIC SPATIAL REACTOR KINETICS CODE	ANL	360	F4	RS PL	CT F \$	474
QX1, QUASISTATIC SPATIAL REACTOR KINETICS CODE	ANL	3600	36F	RS PL	CT F \$	474
R-M PARAMETERS OF UNRESOLVED RESONANCES	BAPL	6600	F4	RS P	A \$	GRAMP,
R-THETA-Z	LASL	6600	F4	RS P	T C \$	3DDT, 3-D MULTIGROUP DIFFUSION XYZ
R-Z GEOMETRY	APDA	7094	F4	RS P	F \$	MARS, 2-D EXCURSION CALCULATION
RABBLE, WLIR, FLAT, RESONANCE ABSORPTION, CELL	ANL	3600	F36	RSRP	X T B \$	281
RADIAL INTEGRALS	ORNL	1604	F63	RS P	A \$	RAMES, PARTICLE WAVE FUNCTION
RADIATION DAMAGE IN METALS	GEC	635	F+FAP	RSPP	T Q \$	CASCADE, CLUSTER,
RADIATION RELEASE & DOSE	PGE	360	F4	RS P	CT G \$	EMERALD, PWR PLANT
RADIATOR FINS SNAP GEOM	AI	7090	F2	RS	J \$	SCARF2, SCATTER FROM
RADIO FREQUENCY MANAGEMENT SYSTEM	ALOP	360	COBQL	RS P	M \$	AEC-ALC FAU,
RADIOACTIVE DECAY CHAINS	GEC	635	F4	RSRP	D \$	CHAINS, ANALYSIS OF
RADIOACTIVITY	IITR	7094	F4	RSRPLX	T C \$	NAP, NEUTRON-INDUCED GAMMA-RAY
RADIOLOGICAL EFFECTS ANALYSIS	HEDL	1108	F+SL	RS P	XCT R \$	HERMES, REGIONAL
RADIOLOGICAL SAFETY ANALYSIS PROGRAM	ANC	360	F4	RSBP	CT G \$	RSAC,
RADIONUCLIDE GENERATION AND DECAY	BNW	1108	F5	RSRPL	T D \$	ISOGEN,
RAD2, HTGR FISSION PRODUCT ACTIVITY DIST STUDY	GGA	7044	F4	RS P	D \$	231
RAFFLE, 1ST FLIGHT COLLISION PROBABILITIES MC	CRNL	360	F+BAL	RS P	T B \$	352
RAFFLE, 1ST FLIGHT COLLISION PROBABILITIES MC	CRNL	7090	F+FAP	RS P	T B \$	392
RAHAB, JCSHUA SYSTEM LATTICE PHYSICS MODULES	DP	360	F+BAL	S	X T B \$	536
RALCRTPH, RESOURCE ALLOCATION PROJECT PLANNING	MLMD	360	F+C+R	RSBP	T M \$	603
RAMES, PARTICLE WAVE FUNCTION RADIAL INTEGRALS	OPNL	1604	F63	RS P	A \$	335

RAMPL

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RAMPL, REICH-MOORE RESOLVED REGION X-SECTIONS	BNL 6600 F4	RS P	A \$	492
RAPFU, FUEL CYCLE PARAMETERS FAST BREEDERS	NED 635 F4	RS P	D \$	372
RAPP, HIGH-VELOCITY FLOW STUDY STEAM-WATER MIX	KAPL 6600 F4	RS P	H \$	382
RAPTURE, RESONANCE INTEGRAL X-SECTION CALC	NEC 2000 F2	RS P	A \$	176
RATES UK-W 7090 F2 RS N \$ WED, W-DSN OUTPUT TAPE EDIT REACTION				133
RATES FROM 2-D FLUX SETS GFSV H600 F4 RS P CT C \$ TRIAL, 3-D REACTION				585
RATH, 2- OR 3-D HEAT CONDUCTION LUMPED MASS	LASL 7030 F4	PS	T H \$	242
RATH, 2- OR 3-D HEAT CONDUCTION LUMPED MASS	LASL 7094 F4P	RS P	T H \$	242
RATRAP, DOSE RATE CALCULATION SNAP GEOMETRY	AI 7090 F2	RS P	J \$	141
RAUMZEIT, 1-D TIME-DEPENDENT DIFFUSION CALC	KAPL 6600 F4	RS P	F \$	352
RAY SOURCE BUILDUP FACTOR CALC	PAPL 6600 F+ASC	RS P	T J \$ ASPIS, GAMMA	429
RAY SPECTRA ORNL 360 F4 RS P D \$ ALPHA-M, RESOLUTION OF GAMMA				413
REACTION AI 360 F+PAL RS P T A \$ COMNUC, CASCADE, COMPOUND NUCLEUS				482
REACTION CEND 7600 F4 RS P T G \$ CEBUG, STEAM GENERATOR SODIUM-WATER				548
REACTION ANL 3600 F36 RSBP G \$ CHEMLOC2, CORE HEATING CLADDING-STEAM				366
REACTION DECAY CHAIN ANALYSIS CRNL 1604 F63 RS P D \$ ISOCRUNCH,				180
REACTION DECAY CHAIN ANALYSIS CRNL 7090 F2 PSBP D \$ ISOCRUNCH,				180
REACTION OR DECAY ORNL 1604 F63 RS P D \$ ISOTOPES, MAXIMUM YIELD FROM				179
REACTION RATES UK-W 7090 F2 RS N \$ WED, W-DSN OUTPUT TAPE EDIT				133
REACTION RATES FROM 2-D FLUX SETS GFSV H600 F4 RS P CT C \$ TRIAL, 3-D				585
REACTION X-SECTIONS BNL 6600 F4 RS P A \$ THRESH, STATISTICAL MODEL				504
REACTIVITY AND POWER DISTRIBUTION CDC 3600 F63 RSBP T C \$ FLARE, 3-D				167
REACTIVITY AND POWER DISTRIBUTION MSS 360 F4 RS P CT C \$ FLARE, 3-D				167
REACTIVITY AND POWER DISTRIBUTION NEC 635 F4 RS P T C \$ FLARE, 3-D				167
REAX, RESOLVED RESONANCE EPITHERMAL X-SECTIONS	NED 635 F4	RS P	T B \$	257
RECCIL ATOM SPECTRA ENDF/B DATA ORNL 360 F4 RS P T P \$ RICE, PRIMARY				453
RECTANGULAR MAGNETIC NETWORK SOLUTION BAPL 6600B F4 PS P T I \$ MANE1,				412
REDUCTION ANL 3600 F63 RSBP D \$ COINC, COINCIDENCE COUNTING DATA				248
REDUX, REACTOR FLUCTUATION EXPERIMENT ANALYSIS BAPL 6600 F4 RS P T O \$				425
REFUEL GGA 7044 F4 RS P T D \$ GARGCYCLE, FUEL CYCLE ANALYSIS PARTIAL				260
REFUELING HISTORY LASL 6600 F4 RS P T D \$ PHENIX, 2D DIFFUSION BURNUP				454
REGIONAL RADIOLOGICAL EFFECTS ANALYSIS HECL 1108 F+SL RS P XCT R \$ HERMES,				527
REICH-MOORE RESOLVED REGION X-SECTIONS BNL 6600 F4 RS P A \$ RAMPL,				492
RFLAP3, REACTOR BLOWDOWN - EXCURSION ANALYSIS ANC 360 F4 RSBP XCT G \$				369
RELAP3, REACTOR BLOWDOWN - EXCURSION ANALYSIS ANC 1108 F4 RS P T G \$				369
RELAP3, REACTOR BLOWDOWN - EXCURSION ANALYSIS ANC 6600 F4 RS P T G \$				369
RELATION GEC 635 F4 RSBP D \$ DCS, NEUTRON FLUX-DOSIMETER ACTIVITY				423
RELEASE ORNL 360 F4 RS P C G \$ STEFEG, ANALYSIS OF PWR & BWR GASEOUS				583
RELEASE & DOSE PGE 360 F4 RS P CT G \$ EMERALD, PWR PLANT RADIATION				546
RELEASE ANALYSIS BCL 6400 F4 RS P G \$ FRCRL2, LOCA FISSION PRODUCT				500
RELEASE GGA 1108 F4 RS P D \$ FREVAP6, HTGR METALLIC FISSION PRODUCT				301
RELEASE SIMULATION BAPL 6600 F4 RS P T I \$ RUBLI, FUEL SWELLING & GAS				468
RELIABILITY FOR A SINGLE FAILURE MODE BAPL 6600 F4 RS P P \$ REL01,				497
RELOCAD-FEVER, 1-D FEW-GP DIFFUSION DEPLETION GGA 7044 F4 RS P T D \$				221
REL01, RELIABILITY FOR A SINGLE FAILURE MODE BAPL 6600 F4 PS P P \$				457
REMOTE JOB ENTRY SYSTEM ANC 360 BAL RSB T P \$ NRTS-RJE, CS/360 MVT				519
REMOTE WORKSTATION PKG ANL 360 F+ASM RSB CT P \$ WSP-HASP/DOE, DOS-MFT				541
REMOVAL BCL 6400 F4 RS P G \$ MIPAB, MIRAP, CONTAINMENT SYSTEM IODINE				499
REMOVAL X-SECS BAPL 6600 F4 RS T B \$ M0807, 2-D DIFFUSION ABSORPTION				280
REPP, THERMAL-HYDRAULIC WATER REACTOR DESIGN BNW 1108 F5 RS P T H \$				483
RESEND, ADLER, ENDF/B RESONANCE XSECTION CODES BNL 6600B F4 RS P T A \$				465
RESOLUTION OF GAMMA RAY SPECTRA ORNL 360 F4 RS P D \$ ALPHA-M,				413
RESOLVED MULTILEVEL B-W X-SEC CALC BNL 6600 F4 RS P A \$ SIGPLOT,				377
RESOLVED REGION RESONANCE INTEGRAL CALC GGA 7090 F+FAP RSB T A \$ ZUT,				41
RESOLVED REGION X-SECTIONS BNL 6600 F4 RS P A \$ RAMPL, REICH-MOORE				492
RESOLVED RESONANCE EPITHERMAL X-SECTIONS NED 635 F4 RS P T P \$ REAX,				257
RESOLVED RESONANCE INTEGRAL CALCULATION BW 2000 F4 RS A \$ STRIP,				305
RESOLVED RESONANCE X-SECTION CALC NEC 2000 F2 RS P A \$ COPIE,				177
RESONANCE ABSORPTION, CELL ANL 3600 F36 RSBP X T B \$ RABBLE, WL1B, FLAT,				281
RESONANCE DATA UILL 360 F4 RS P A \$ CODILLI, LEAST SQUARES ANALYSIS				347
RESONANCE EPITHERMAL X-SECTIONS NED 635 F4 RS P T P \$ REAX, RESOLVED				257
RESONANCE INTEGRAL CALC GGA 7090 F+FAP RSB T A \$ ZUT, RESOLVED REGION				41
RESONANCE INTEGRAL CALC GGA 7090 F+FAP RSB T A \$ TUZ, UNRESOLVED REGION				42
RESONANCE INTEGRAL CALC HOMOGENEOUS ANL 3600 F36 RSBP A \$ MISH-MASH,				214

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RESONANCE INTEGRAL CALC 2-REG CELL	ANL	3600	F36	RSBP	X T B \$ RIFF-RAFF,	213
RESONANCE INTEGRAL CALCULATION RW	2000	F4	RS	A \$ STRIP, RESOLVED		305
RESONANCE INTEGRAL HEX CELL	BAPL	6600	F+ASC	RS P X T B \$ RESQ2, RESQ0, DBF1,		285
RESONANCE INTEGRAL X-SECTION CALC	AI	7090	F2	RS PL T A \$ ARES2,		89
RESONANCE INTEGRAL X-SECTION CALC	AI	7094	F+MAP	RS PLX T A \$ TRIX1,		208
RESONANCE INTEGRAL X-SECTION CALC	CFG	1604	F63	RS PL T A \$ ARES2,		89
RESONANCE INTEGRAL X-SECTION CALC	NED	2000	F2	RS P A \$ RAPTURE,		176
RESONANCE INTEGRALS X-SECS	BAPL	6600	F4	RS P T A \$ PUN1, UNRESOLVED		359
RESONANCE MEASUREMENTS	GGA	1108	F4	RS P T A \$ TACASI, ANALYSIS OF		410
RESONANCE OVERLAP AND LATTICE EFFECTS	GGA	7044	F+MAP	RS P T B \$ GARCL,		219
RESONANCE OVERLAP AND LATTICE EFFECTS	LER	7094	F+MAP	RS P T B \$ GAROL,		219
RESONANCE PARAMETER CALC	FMFA	360	F4	RS P A \$ PSEUDO, STATISTICAL		292
RESONANCE PARAMETER CALC	GGA	1108	F4	RS P A \$ PSEUDO, STATISTICAL		292
RESONANCE PARAMETERS	WANL	7094	F2	RS P A \$ FXT, X-SECTIONS FROM B-W		238
RESONANCE THEORY XSEC CALC	KAPL	6600	F4	RS P A \$ MULTI, MULTI-LEVEL		535
RESONANCE X-SECTION CALC	NED	2000	F2	RS P A \$ DOPIE, RESOLVED		177
RESONANCE X-SECTION CALC	GGA	1108	F4	RS P A \$ GANCY, UNRESOLVED		341
RESONANCE XSEC PROBABILITY TABLES	AI	360	F+BAL	RS P CT B \$ U3R, UNRESOL		553
RESONANCE XSECTION CODES	RNL	6600	F4	RS P T A \$ RESEND, ADIFR, ENDF/B		465
RESONANCES	AI	360	F4	RS PLX T B \$ AILMCF, X-SECTION CALC ELASTIC SCAT		147
RESONANCES	AI	7094	F+MAP	RS PL T B \$ AILMOF, X-SECTION CALC ELASTIC SCAT		147
RESONANCES	BAPL	6600	F4	RS P A \$ CRAMP, R-M PARAMETERS OF UNRESOLVED		470
RESOURCE ALLOCATION PROJECT PLANNING	MLMD	360	F+C+R	RSBP T M \$ RALCRTPH,		603
RESPOND, DISSIMILAR MEDIA TLD CORRECTION CALC	AI	360	F4	PS P T D \$		566
RESPONSE ANC	360	F+BAL	RSBP	CT G \$ CONTEMPT-LT/022, PRESSURE-TEMPERATURE		433
RESPONSE LOCA	ANC	360	F4	RSBP X T G \$ THETA1-R, FUEL ROD THERMAL		512
RESPONSE OF ELASTIC STRUCTURES	BAPL	6600	F4	RS P T I \$ FUGIT, DYNAMIC		537
RESPONSE TO EXCURSION	ANL	360	F4	RS P CT F \$ REXCO-H, 2-D HYDRODYNAM		550
RESQ0, DBF1, RESONANCE INTEGRAL HEX CELL	BAPL	6600	F+ASC	RS P X T B \$ RESQ2,		285
RESQ2, RESQ0, DBF1, RESONANCE INTEGRAL HEX CELL	BAPL	6600	F+ASC	RS P X T B \$		285
RETRIEVAL	SLA	1108	F+BAL	RSBP T M \$ SPIRAL, FULL-TEXT STORAGE, SEARCH &		607
RETRIEVAL FROM SCISRS X-SECTION TAPE	GGA	7044	F+MAP	RSBP M \$ UNPACK,		206
RETRIEVAL, AND DISPLAY	DP	360	F+BAL	S T M \$ JOSHUA, DATA STORAGE,		490
REVISED-GAC, FUEL CYCLE ANALYSIS W/REFUELING	GGA	7044	F4	RS P T D \$		223
REVOLUTION	KAPL	6600	F4	RS P T I \$ SOR3, STRESS ANALYSIS SHELLS OF		80
REXCO-H, 2-D HYDRODYNAM RESPONSE TO EXCURSION	ANL	360	F4	RS P CT F \$		550
RFD	3600	F36	RS P	G \$ CISPER, AEOSOL PARTICLE TRANSPORT STUDY		554
RFD	6600	F+COM	RS P	T C \$ KENO2, MCNTE CARLC MULTIGROUP CRITICALITY CODE		450
RICE, PRIMARY RECOIL ATOM SPECTRA ENDF/B DATA	OPNL	360	F4	RS P T B \$		453
RIFF-RAFF, RESONANCE INTEGRAL CALC 2-REG CELL	ANL	3600	F36	RSBP X T B \$		213
RIGEL, ENDF/B V3 DATA PROCESSING CODE	ANL	360	F4	PS T M \$		571
RIGEL, PLCTFR, ... ENDF/B V2 PROC	RNL	6600	F4	PS T M \$ CRECT, CHECKER,		475
RIGEL3, ENDF/B V3, V4 PROCESSING CODES	RNL	6600	F4	RS T M \$ CHECK3,		571
RINC SNAP GEOMETRY	AI	7090	F2	RS J \$ SCAR1, SCATTER FROM A		111
ROD BUNDLE	NED	635	F4	RS P T H \$ VELVET2, TURBULENT FLOW IN LMFBR		458
ROD BUNDLE CHF DATA ANALYSIS	ANC	360	F4	RS PL CT M \$ ERREST, LOCA		518
ROD BUNDLE THERMAL-HYDRAULIC ANALYSIS	BNW	3600	F4	RS P T H \$ COBRA3C,		432
ROD BUNDLE THERMAL-HYDRAULIC ANALYSIS	BNW	1108	F4	RS P T H \$ COBRA3C,		432
ROD BUNDLE THERMAL-HYDRAULIC ANALYSIS	BNW	6600	F4	RS P T H \$ COBRA3C,		432
ROD CLAD STRAIN & PELLET CRACKING	BAPL	6600	F4	RS P I \$ STRIPE, FUEL		570
ROD STRESS & DEFORMATION	BAPL	6600	F4	RS P T I \$ CYGRO3, OXIDE FUEL		449
ROD THERMAL RESPONSE LOCA	ANC	360	F4	RSBP X T G \$ THETA1-R, FUEL		512
ROOTS OF A POLYNOMIAL	KAPL	6600	F4	RS P P \$ ROPE, FINDING		444
ROPE, FINDING ROOTS OF A POLYNOMIAL	KAPL	6600	F4	RS P P \$		444
RSAC, RADIOLOGICAL SAFETY ANALYSIS PROGRAM	ANC	360	F4	RSBP CT G \$		265
RTH	WANL	7094	F4	RS P X T C \$ VARI-CUIR3, 2-D MULTI-GP DIFFUSION XY RZ		264
RTH	LASL	7600	F4	RS P T C \$ TWOTRAN-PNVH, 2-D PARTICLE TRANSPORT XY RZ		573
RTHETA	LASL	3608	F4	RS P CT C \$ TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ		358
RTHETA	LASL	6600	F4	RS P T C \$ TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ		358
RTHETA	LASL	7600	F4	RS P T C \$ TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ		358
RTHETA GEOMETRY	BNW	1108	F4	RS P C \$ PERT4, 2-D PERTURBATION XY RZ		304
RUPTURE	GGA	7044	F4	RS X T G \$ PRECON, HTGR CONTAINMENT PRESSURE POST		228
RZ	PW	1604	F63	RS P T C \$ FORTRAN TDC, 2-D MULTI-GP SN APPROXIMATION		161
RZ GEOMETRY	GGA	7090	F+MAP	RSBP T D \$ DDB, 2-D FEW-GP DIFFUSION BURNUP		99

RZ

SCOPE2.0

RZ GEOMETRY LRL 709 F2 RS C \$ FIRN, 2-D FEW-GP S4 APPROXIMATION	7
RZ GEOMETRY GGA 1108 F+RAL PS P T C \$ GAMBLE5, 2-D MULTI-GP DIFFUSION XY	222
RZ GEOMETRY GGA 7044 F+MAP RSP P T C \$ GAMBLE4, 2-D MULTI-GP DIFFUSION XY	222
RZ GGA 1108 F+RAL PS P T D \$ RUG2, 2-D MULTIGROUP DIFFUSION & BURNUP XY,	438
RZ RTH WANL 7094 F4 RS P X T C \$ VARI-QUIR3, 2-D MULTI-CP DIFFUSION XY	264
RZ RTH LASL 7600 F4 RS P T C \$ TWOTRAN-PNVW, 2-D PARTICLE TRANSPORT XY	573
RZ RTHETA LASL 3608 F4 RS P CT C \$ TWOTRAN2, 2-D MULTI-GP TRANSPORT XY	358
RZ RTHETA LASL 6600B F4 RS P T C \$ TWOTRAN2, 2-D MULTI-GP TRANSPORT XY	358
RZ RTHETA LASL 7600B F4 RS P T C \$ TWOTRAN2, 2-D MULTI-GP TRANSPORT XY	358
RZ RTHETA GEOMFTRY BNW 1108 F4 RS P C \$ PERT4, 2-D PERTURBATION XY	304
R101, SPACE-INDEPENDENT KINETICS KEX OPTIONS ANL 360 F4 RS P E \$	255
R101, SPACE-INDEPENDENT KINETICS KEX OPTIONS ANL 3600 F63 RSRP E \$	255
R101, SPACE-INDEPENDENT KINETICS KEX OPTIONS WANL 7094 F4 RS P E \$	255
R102, SPACE-INDEPENDENT INVERSE KINETICS CALC ANL 360 F4 RS P F \$	168
R102, SPACE-INDEPENDENT INVERSE KINETICS CALC ANL 3600 F63 RSRP E \$	168
R102, SPACE-INDEPENDENT INVERSE KINETICS CALC WANL 7094 F4 RS E \$	168
R153, PARAMETRIC SITE REQUIREMENT STUDY ANL 3600 F63 RSRP T G \$	172
S-WAVE NEUTRON X-SECTION CALCULATION RAPL 6600 F4 RS P T A \$ SUMOR,	399
SABOR4, DISCRETE-ELEMENT ANALYSIS THIN SHELLS MIT 360 F4 RS P T I \$	402
SAFE PROGRAMS GGA 1108 F4 RS P L \$ CROWPK, GFIC GENERATION FOR	256
SAFE-AXISYM, STRESS ANALYSIS AXISYMMETRIC LOAD GGA 7044 F4 RS P T I \$	251
SAFE-CRACK, VISCOELASTIC ANALYSIS OF CONCRETE GGA 1108 F5 PS P T I \$	451
SAFE-CREEP, VISCOELASTIC ANALYSIS OF CONCRETE GGA 1108 F4 PS P I \$	300
SAFE-PCRS, STRESS ANALYSIS AXISYMMETRIC LOAD GGA 7044 F4 RSRP CT I \$	250
SAFE-PLANE, PLANE STRESS ANALYSIS, 2-D BODIES BNL 6600 F4 RS P T I \$	252
SAFE-PLANE, PLANE STRESS ANALYSIS, 2-D BODIES GGA 1108 F4 RS P I \$	252
SAFE-SHELL, STRESS ANALYSIS THIN SHELLS GGA 1108 F4 RS P I \$	253
SAFE-2D, PLANE & AXISYMMETRIC STRESS ANALYSIS GGA 1108 F4 RS P I \$	379
SAFE-3D, 3-D COMPOSITE STRUCTURE STRESS STUDY GGA 1108 F4 RS P T I \$	332
SAFE-3D, 3-D COMPOSITE STRUCTURE STRESS STUDY ORNL 360 F+RAL RS P T I \$	332
SAFETY ANALYSIS PROGRAM ANL 360 F4 RSRP CT C \$ RSAC, RADIOLOGICAL	265
SAIL, 1-D 1-GP SN APPROXIMATION SLAR GEOMETRY AI 7090 F2 PS P B \$	52
SAIL, 1-D 1-GP SN APPROXIMATION SLAR GEOMETRY CDC 1604 F63 PS P B \$	52
SAMPLING STUDY BAPL 6600 F4 RS P T O \$ BETTY, ENTRAINED PARTICLES	545
SASIA, FAST REACTOR POWER AND FLOW TRANSIENTS ANL 360 F4 RS P T F \$	400
SASIA, FAST REACTOR POWER AND FLOW TRANSIENTS ANL 6600 F4 RS P T F \$	400
SATURATED BLOWDOWN2, BLOWDOWN ANALYSIS LEFT KE 7094 F+MAP RSRP T G \$	200
SCARF2, SCATTER FROM RADIATOR FINS SNAP GEOM AI 7090 F2 RS J \$	110
SCAR1, SCATTER FROM A PING SNAP GEOMETRY AI 7090 F2 RS J \$	111
SCAT KERNELS DP 360 RCP F LX T Z \$ THERMOS LIBRARY, 30-GP ENDF/B	543
SCAT RESONANCES AI 360 F4 RS PLX T P \$ AILMCE, X-SECTION CALC ELASTIC	147
SCAT RESONANCES AI 7094 F+MAP RS PL T B \$ AILMCE, X-SECTION CALC ELASTIC	147
SCAT X-SEC BNL 6600 F4 PS P A \$ RESFIT, DIFFRACTION MODEL ELASTIC	524
SCAT X-SECTION CALC MODERATOR GGA 1108 F4 RS P A \$ GAKER, INELASTIC	289
SCAT X-SECTIONS HEX LATTICE GGA 1108 F4 RS B \$ HEXSCAT, ELASTIC	291
SCATTER FROM A KING SNAP GEOMETRY AI 7090 F2 RS J \$ SCAR1,	111
SCATTER FROM RADIATOR FINS SNAP GEOM AI 7090 F2 RS J \$ SCARF2,	110
SCATTERING CDC 1604 F63 RS P A \$ HAEFVER, HAUSER-FESHBACH INELASTIC	14
SCATTERING CALC ANL 360 F4 RS P CT W \$ MSCAT, SLOW NEUTRON MULTIPLE	575
SCATTERING CRYSTALLINE MATERIALS LASL 6600 F4 RS P T A \$ TCR, THERMAL	360
SCATTERING DATA DP 360 F4 RS P XCT A \$ FLANGE2(71-1), ENDF/P THERMAL	368
SCATTERING FORM FACTORS ORNL 360 F4 RS P T A \$ ATHENA4, INELASTIC	417
SCATTERING KERNEL CALC GGA 7090 F2 RS T A \$ SUMMIT, CRYSTALLINE	56
SCATTERING LAW CALC GGA 1108 F4 RS P X A \$ COMBE, COHERENT INELASTIC	385
SCATTERING LAW CALCULATION GGA 1108 F4 PS P A \$ GASKET, THERMAL	263
SCATTERING LAW X-SECTION CALCULATION GGA 1108 F5 RS P A \$ FLANGE1,	247
SCATTERING PHASE-SHIFT ANALYSIS ORNL 1604 F63 RS P A \$ PEGGY, ELASTIC	334
SCATTERING X-SEC CALC KAPL 6600 F4 RS P T A \$ JP1XR, COUPLED-CHANNEL	506
SCATTRIN, CODES AND 360 F4 RS P CT W \$ MACS LATTICE VIBRATION NEUTRON	574
SCHEME KAPL 6600 F4 RS P P \$ MOST, A MULTIDIMENSIONAL OPTIMIZATION	446
SCISRS ENDF/B GRAPHIC X-SEC EVALUATION AI 360 F+RAL RSR L CT M \$ SCORE3,	375
SCISRS X-SECTION TAPL GGA 7044 F+MAP RSRP M \$ UNPACK, RETRIEVAL FROM	206
SCISRS X-SECTION TAP-S WANL 7094 F+MAP RSRPL T A \$ CPS, SC4020 PLOTS FROM	239
SCOPE2.0 CDC 7600 F4 RS T P \$ MODEL, MODIFIED BETTIS ENVIRONMENTAL LIB	479

SCCPE3.2

SLAB

SCOPE3.2 CDC 6600C F+CJM RS	T P \$ MODEL, MODIFIED BETTIS ENVIRNMNTL LIB	478
SCOPE3.3 CDC 6600D F+CJM RS	T P \$ MODEL, MODIFIED BETTIS ENVIRNMNTL LIB	478
SCORE3, SCISRS ENDF/B GRAPHIC X-SEC EVALUATION AI	360 F+BAL RSBP I CT M \$	375
SC4020 PLOTS FROM SCISRS X-SECTION TAPES WANL	7094 F+FAP RSBPL T N \$ CPS,	239
SC4020 PLOTS FROM X-SECTION TAPES GCA	7044 F+SPS RSBP T N \$ CROSSPLOT,	207
SEAL SHELL, SHELL STRESS ANALYSIS AXISYM LOAD	WTSC 6600B F4 RS P T I \$	282
SEALSHELL2, SHELL STRESS ANALYSIS AXISYM LOAD	BAPL 6600 F4 RS P T I \$	282
SEALSHELL2, SHELL STRESS ANALYSIS AXISYM LOAD	SP 360 F4 RS P T I \$	282
SEARCH GGA 1108 F4	RS P T C \$ GASP7, 1-D BURNUP POWER DISTRIBUTION	319
SEARCH GGA 7044 F4	RS P T C \$ GASP2, 1-D FEW-GP DIFFUSION POWER DIST	220
SEARCH & RETRIEVAL SLA 1108 F+BAL RSBP	T M \$ SPIRAL, FULL-TEXT STORAGE,	607
SECTIONS LASL 6600 F4	RS P N \$ LARCA, FLUX-WEIGHTING OF DTF4 CROSS	409
SERVICE ROUTINES ANL 3600 36F	RSBP T M \$ MERMC2, MAGIC, MC**2 LIBRARY	472
SERVICE ROUTINES ENDF TAPES ANL	7090 F+FAP RS P T M \$ OFSR, DATA FILE	236
SFTS GESV H600 F4	RS P CT C \$ TRIAL, 3-D REACTION RATES FROM 2-D FLUX	585
SFTS LASL 6600 BCD R	LX T Z \$ LASL XSEC SFTS, SN 18- 24- AND 25-GROUP	532
SFTS, SN 18- 24- AND 25-GROUP SFTS	LASL 6600 BCD R LX T Z \$ LASL XSEC	532
SHAPE CALCULATION ORNL 7090 F2	RS A \$ LYANNE, WCCFS-SAXON POTENTIAL	381
SHEET DP PACKAGE KAPL 6600 F+ASC	RS P T P \$ PCGGY, DESK CALCULATOR FORM	428
SHELL BUCKLING COLLAPSE ANALYSIS	BAPL 6600 F4 RS P T I \$ BUSHL, CYL	481
SHELL STRESS ANALYSIS AXISYM LOAD	BAPL 6600 F4 RS P T I \$ SEALSHELL2,	282
SHELL STRESS ANALYSIS AXISYM LOAD	SP 360 F4 RS P T I \$ SEALSHELL2,	282
SHELL STRESS ANALYSIS AXISYM LOAD	WTSC 6600B F4 RS P T I \$ SEAL SHELL,	282
SHELL 3-D STRUCTURAL ANALYSIS	GGA 1108 F5 RS P T I \$ SHELL5, THIN	452
SHELL, SHELL STRESS ANALYSIS AXISYM LOAD	WTSC 6600B F4 RS P T I \$ SEAL	282
SHELLS GGA 1108 F4	RS P I \$ SAFE-SHELL, STRESS ANALYSIS THIN	253
SHELLS SLA 6600 F4	RS P T I \$ SLADE-D, DYNAMIC ANALYSIS OF THIN	581
SHELLS MIT 360 F4	RS P T I \$ SAPCR4, DISCRETE-ELEMENT ANALYSIS THIN	402
SHELLS OF REVOLUTION KAPL 6600C F4	RS P T I \$ SOR3, STRESS ANALYSIS	80
SHELL5, THIN SHELL 3-D STRUCTURAL ANALYSIS	GCA 1108 F5 RS P T I \$	452
SHIELD DESIGN MULTIGROUP SLAB GEOMETRY	ANL 3600 F63 RSBP T J \$ MAC,	143
SHIELD DESIGN MULTIGROUP SLAB GEOMETRY	BNW 7090 F2 RSBPL T J \$ MAC,	143
SHIELD EVALUATION CODE	BAPL 6600P F+ASC RS P T J \$ SPAN4, A POINT-KERNEL	462
SHIELD LEAKAGE AI 7090 F2	RS J \$ FARSEIA, PCSE RATE FROM SNAP	91
SHIELD WEIGHT OPTIMIZATION DOSE CALC	AI 7094 F+FAP RS P J \$ SHCF,	197
SHIELDING CODE CAVITY GEOM CCA 1108 F4	RS P T J \$ MISCAT, VIEW FACTOR	259
SHIFT X-SEC & POLARIZATION CALC	KAPL 6600 F4 RS P T A \$ PHASER, PHASE	507
SHLGG, DATA MANAGEMENT, EDITING, & ANALYSIS	BAPL 6600 F4 RS P T M \$	557
SHOCK, SPACE POWER PLANT DESIGN OPTIMIZATION	AI 7090 F2 RS I \$	114
SHCF, SHIELD WEIGHT OPTIMIZATION DOSE CALC	AI 7094 F+FAP RS P J \$	197
SIGPLOT, RESOLVED MULTILEVEL R-W X-SEC CALC	BNL 6600 F4 RS P A \$	377
SIMPLE1, TIME-SHARING PROGRAMMING LANGUAGE	KAPL 6600 F+ASC PS P \$	442
SIMULATION BAPL 6600 F4	RS P T G \$ FLASH4, FULLY-IMPLICIT TRANSIENT	448
SIMULATION BAPL 6600 F4	RS P T I \$ PURL1, FUEL SWELLING & GAS RELEASE	468
SIMULATION OF REACTOR DYNAMICS	AI 360 F+BAL RS P T F \$ ATRCS2A,	326
SIMULATION OF REACTOR DYNAMICS	360 F4 RS P G \$ INTEG, INSPEC, MARKOV	550
SINGLE FAILURE MODE BAPL 6600 F4	RS P F \$ RFL01, RELIABILITY FOR A	497
SINGLE SOURCE ANL GETS F	P R \$ PLETHS, ISOPLETH-AREA CALC FROM	591
SINGLE-CHANNEL SPACE-TIME SYNTHESIS	KAPL 6600 F4 RS P F \$ STINT3,	389
SITE REQUIREMENT STUDY	ANL 3600 F63 RSBP T G \$ R153, PARAMETRIC	172
SITE REQUIREMENT STUDY	AI 360 F4 RS P T G \$ AISITE2, PARAMETRIC	172
SITE REQUIREMENT STUDY	AI 7094 F+FAP RS P T G \$ AISITE2, PARAMETRIC	172
SIZZLE, 1-D MULTIGROUP DIFFUSION DEPLETION	AI 360 F4 RSBP X T D \$	58
SIZZLE, 1-D MULTIGROUP DIFFUSION DEPLETION	AI 7090 F2 PS L T D \$	58
SIZZLE, 1-D MULTIGROUP DIFFUSION DEPLETION	CDC 1604 F63 PS L T D \$	58
SLA 360 COROL RSBP	CT M \$ BECOM, AEC DP PURCHASE VERSUS LEASE ANALYSIS	589
SLA 1108 COROL RS P	M \$ BECOM, AEC DP PURCHASE VERSUS LEASE ANALYSIS	589
SLA 1108 F+BAL RSBP	T M \$ SPIRAL, FULL-TEXT STORAGE, SEARCH & RETRIEVAL	607
SLA 6600 F4	RS P P \$ FPE, FRC, ERROR & COMPLEMENTARY ERROR FUNCTION	601
SLA 6600 F4	RS P P \$ PLOT, 2-D CONTOUR PLOTS & AREA CALCULATION	578
SLA 6600 F4	RS P V \$ EFFARS, LAPLACE EQUATION ISOTROPIC DIELECTRICS	577
SLA 6600 F4	RS P T I \$ SLADE-D, DYNAMIC ANALYSIS OF THIN SHELLS	581
SLAB CDC 1604 F63	RS P T C \$ EQUIPOISE3A, 2-D 2-GP DIFFUSION CYLINDER	87
SLAB ORNL 7090 F2	RS P T C \$ EQUIPOISE3A, 2-D 2-GP DIFFUSION CYLINDER	87

SLAB

SNAP

SLAB AND SPHERE	GFJ4	SN	TRANSPORT	ANL	3600	F36	RS P	XCT C	\$ TESS, 1-D	513
SLAB CYL	UKNL	7090	F2	RS P	T C	\$ EQUIPCISE3, 2-D 2-GROUP	DIFFUSION			39
SLAB CYL SPHERE	BNW	1107	F4	RS P	T C	\$ FEN, 1-D MULTI-GP	DIFFUSION			241
SLAB CYL SPHERE	AI	7090	F+FAP	RS L	T C	\$ FAIM, 1-D MULTI-GP	DIFFUSION			120
SLAB CYL SPHERE	AI	7090	F+FAP	RS PL	T C	\$ AIM6, 1-D MULTI-GP	DIFFUSION			29
SLAB CYL SPHERE	CDC	1604	F63	RS PL	T C	\$ AIM6, 1-D MULTI-GP	DIFFUSION			29
SLAB CYL SPHERE	CDC	1604	F63	RS PLX	T C	\$ FAIM, 1-D MULTI-GP	DIFFUSION			120
SLAB CYL SPHERE	DSJC	370	F4	RS PL	CT C	\$ AIM6, 1-D MULTI-GP	DIFFUSION			29
SLAB CYL SPHERE	AI	7090	F+FAP	RS L	T C	\$ ULCER, 1-D MULTI-GP	DIFFUSION			118
SLAB CYL SPHERE	ANL	3600	F36	PS P	X T C	\$ MACH1, 1-D MULTI-GP	DIFFUSION			262
SLAB CYL SPHERE	PURJ	6500	F4	RS PLX	T C	\$ MACH1, 1-D MULTI-GP	DIFFUSION			262
SLAB CYL SPHERE	PW	1604	LAG1	RS P	C	\$ MGDEN, 1-D MULTI-GP	SN APPROX			211
SLAB CYL SPHERE	UK-W	7090	F2	PS P	T C	\$ W-DSN, 1-D MULTI-GP	SN APPROX			132
SLAB CYL SPHERE	BHSC	360	F4	PS P	T C	\$ FAIMCS, 1-D MULTI-GP	DIFFUSION			120
SLAB CYLINDER	CDC	1604	F63	PS P	T C	\$ 20GRAND, 2-D FEW-GROUP	DIFFUSION			40
SLAB CYLINDER	UKNL	7090	F2	PS P	T C	\$ 20GRAND, 2-D FEW-GROUP	DIFFUSION			40
SLAB CYLINDER SPHERE	AER	360	F4	RS L	T C	\$ FIRE5, 1-D AGE-DIFFUSION				9
SLAB CYLINDER SPHERE	AI	7090	F2	PS P	T C	\$ FCG, 1-D FEW-GP	DIFFUSION			28
SLAB CYLINDER SPHERE	BC	625	F4	RS	T C	\$ FCG, 1-D FEW-GP	DIFFUSION			28
SLAB CYLINDER SPHERE	CDC	1604	F63	RS P	T C	\$ FCG, 1-D FEW-GP	DIFFUSION			28
SLAB GAMMA-RAY TRANSPORT				RAPL	6600	F4	RS P	T J	\$ M0756, LETO, 1-D	343
SLAB GEOM PPCO	7090	F2	PS P	C	\$ MIST, 1-D FEW-GP	SN DOUBLE	SN APPROX			59
SLAB GEOMETRY	AI	7090	F2	RS P	J	\$ GRACE1, GAMMA-RAY	ATTENUATION			45
SLAB GEOMETRY	ANL	3600	F63	RSPPL	T J	\$ MAC, SHIELD DESIGN	MULTIGROUP			143
SLAB GEOMETRY	BNW	7090	F2	RSPPL	T J	\$ MAC, SHIELD DESIGN	MULTIGROUP			143
SLAB GEOMETRY	CDC	1604	F63	RS P	J	\$ GRACE1, GAMMA-RAY	ATTENUATION			45
SLAB GEOMETRY	AI	7090	F2	PS P	B	\$ SAIL, 1-D 1-GP	SN APPROXIMATION			52
SLAB GEOMETRY	RAPL	6600	F4	RS P	T C	\$ PE21, FEW-GP DISCRETE	ORDINATES			358
SLAB GEOMETRY	CDC	1604	F63	RS P	P	\$ SAIL, 1-D 1-GP	SN APPROXIMATION			52
SLAB TRANSPORT WITH SLOWING DOWN				RAPL	6600	F4	RS	T C	\$ M0648, 1-D	342
SLAB, CYL, SPH	ANC	360	F4	RSPPL	CT C	\$ MONA, 1-D MULTIGROUP	DIFFUSION			582
SLAB, SPH, CYL	GGA	1108	F+RAL	RS P	T C	\$ GAZE2, 1-D MULTIGROUP	DIFFUSION			430
SLAB-D, DYNAMIC ANALYSIS OF THIN SHELLS				SLA	6600	F4	RS P	T I	\$	581
SLL	6600	F4	RS P	N	\$ HEATMESH, GEOMETRICAL DATA	HEAT TRANSFER STUDY				434
SLOW NEUTRON MULTIPLE SCATTERING CALC				ANL	3600	F4	RS P	CT W	\$ MSCAT,	575
SLOWING DOWN	BAPL	6600	F4	RS	T C	\$ M0648, 1-D SLAB TRANSPORT WITH				342
SLOWING-DOWN DENSITY CALC	AI	7094	F+FAP	RS PL	T P	\$ TYCHE3, MONTE CARLO				149
SLOWING-DOWN NPGS	360	F4	RS P	X T F	\$ MOD5, STOCHASTIC MODEL OF NEUTRON					491
SLOWING-DOWN SPECTRUM, MULTIGP CONSTANTS	PW	1108	F4	RS PLX	T R	\$ HPG3,				467
SLOWING-DOWN SPECTRUM, MULTIGP CONSTANTS	IVA	360	F4	RS PLX	T R	\$ HPG3,				467
SN APPROX	BNW	7090	FLECC	RSP	T C	\$ GF-HAPC-S13, 1-D MULTI-GP	DOUBLE			75
SN APPROX SLAB CYL SPHERE	PW	1604	LAC1	RS P	C	\$ MGDEN, 1-D MULTI-GP				211
SN APPROX SLAB CYL SPHERE	UK-W	7090	F2	RS P	T C	\$ W-DSN, 1-D MULTI-GP				132
SN APPROX SLAB GEOM PPCO	7090	F2	PS P	C	\$ MIST, 1-D FEW-GP	SN DOUBLE				59
SN APPROXIMATION CYLINDER	PPCO	7040	F4	RS P	T C	\$ TOPIC, 1-D FEW-GP				148
SN APPROXIMATION CYLINDER	PPCO	7090	F2	RS P	T C	\$ TOPIC, 1-D FEW-GP				148
SN APPROXIMATION RZ	PW	1604	F63	RS P	T C	\$ FORTRAN TCC, 2-D MULTI-GP				161
SN APPROXIMATION SLAB GEOMETRY	AI	7090	F2	RS P	B	\$ SAIL, 1-D 1-GP				52
SN APPROXIMATION SLAB GEOMETRY	CDC	1604	F63	RS P	B	\$ SAIL, 1-D 1-GP				52
SN APPROXIMATION XY GEOM	AGC	7090	FLECC	RSP	C	\$ 2DXY, 2-D MULTI-GP				18
SN CONSTANTS FOR DSN TDC	PW	1604	F63	RS P	L	\$ SNC, CALCULATION OF				189
SN DOUBLE SN APPROX SLAB GEOM PPCO	7090	F2	RS P	C	\$ MIST, 1-D FEW-GP					59
SN PERTURBATION CODE USING DTF4 FLUXES	LASL	6600	F4	RS P	A	\$ DAC1,				455
SN THEORY	NEL	635	F4	RS P	T C	\$ DOT208, 2-D MULTIGROUP	DIFFUSION			459
SN TRANSPORT	ANL	3600	F36	PS P	XCT C	\$ TESS, 1-D SLAB AND SPHERE	GEOM			513
SN X-SECTION LIBRARY TAPE PREPARATION	PW	1604	F63	RS	L	\$ CSP1,				194
SN X-SECTION LIBRARY TAPE PREPARATION	PW	1604	F63	RS	L	\$ CSP2A,				193
SN 18- 24- AND 25-GROUP SFTS	LASL	6600	RCD	R	LX T Z	\$ LASL XSFC SFTS,				532
SNAP GEOM	AI	7090	F2	RS	J	\$ SCARF2, SCATTER FROM RADIATOR	FINS			110
SNAP GEOMETRY	AI	7090	F2	RS	J	\$ SCAP1, SCATTER FROM A RING				111
SNAP GEOMETRY	AI	7090	F2	RS P	J	\$ RATEAP, DCSE RATE CALCULATION				141
SNAP GEOMETRY	AI	7090	F2	RS	E	\$ SNAPKIN5/5A, 1-REGION KINETICS				122
SNAP GEOMETRY	AI	7090	F2	RS	J	\$ MCRTIMER, DCSE RATE CALCULATION				142
SNAP SHIELD LEAKAGE	AI	7090	F2	RS	J	\$ FARSEIA, DCSE RATE FROM				91

SNAPKINS/5A

SPECTRA

SNAPKINS/5A, 1-REGION KINETICS SNAP GEOMETRY	AI	7090	F2	RS	E	\$	122			
SNARG-1D, 1-D MULTI-GP DISCRETE ORDINATE CALC	ANL	3600	F36	RS P	T	C	\$	288		
SNC, CALCULATION OF SN CONSTANTS FOR DSN TCC	PW	1604	F63	RS P	L	\$	189			
SNEQ, NONLINEAR ALGEBRAIC EQN SOLN CURVE PLOT	KAPL	6600	F+ASC	RS P	T	P	\$	364		
SODCCCL2, SODIUM-FUEL INTERACTION ANALYSIS	ANL	360	F4	RS P	G	\$	521			
SODCCCL2, SODIUM-FUEL INTERACTION ANALYSIS	HEBL	1108	F4	RS P	G	\$	521			
SODIUM POOL FIRE 1- & 2-CELL ANALYSIS	AI	360	F4	RS P	T	G	\$	SCFIRE2,	559	
SODIUM-FUEL INTERACTION ANALYSIS	ANL	360	F4	RS P	G	\$	SODCCCL2,	521		
SODIUM-FUEL INTERACTION ANALYSIS	HEBL	1108	F4	RS P	G	\$	SODCCCL2,	521		
SODIUM-WATER REACTION CEND 7600 F4	RS P	T	G	\$	CEBUC, STEAM GENERATOR		548			
SCFIRE2, SODIUM POOL FIRE 1- & 2-CELL ANALYSIS	AI	360	F4	PS P	T	G	\$	559		
SOLID CRYSTAL UM 7090 MAD RSR	C	\$	BURF4, GAMMA-RAY PHOTOREACTION				169			
SOLID FUEL TUBE BUNDLES LASL 7094 F2	RSBP	H	\$	AXTRM, HEAT TRANSFER			183			
SOLVER LLL 6600 F4	RS P	P	\$	GEAR, ORDINARY DIFFERENTIAL EQN SYSTEM			592			
SOPHIST1/2/5, MULTI-GP TRANSFER COEFFICIENTS	LRL	7090	F+EPAP	RS P	T	B	\$	160		
SORSOB, PRESSURE VESSEL STRESS AND FATIGUE	KAPL	6600	F4	PS	I	\$	391			
SOR3, STRESS ANALYSIS SHELLS OF REVOLUTION	KAPL	6600C	F4	RS P	T	I	\$	80		
SOURCE UM 7090 MAD RSP	O	\$	BURP2, DETECTOR EFFICIENCY DISK				165			
SOURCE UM 7090 MAD RSP	C	\$	BURP1, DETECTOR EFFICIENCY POINT				164			
SOURCE UM 7090 MAD RSR	O	\$	BURP3, DETECTOR EFFICIENCY POINT				166			
SOURCE ANL GETS F P	P	\$	PLETHS, ISOPLETH-AREA CALC FROM SINGLE				591			
SOURCE BUILDUP FACTOR CALC	BAPL	6600	F+ASC	RS P	T	J	\$	ASPIS, GAMMA RAY	429	
SOURCE DATA NED 635 F4	RS P	T	O	\$	EXPN, ANALYSIS OF PULSED NEUTRON		258			
SOURCE DATA ANALYSIS CNFA 360 F4	RS P	E	\$	TRIFID, PULSED NEUTRON			489			
SPACE CHORD DIST FUNCT AFG 7090 F2	PS	B	\$	DANCEFF JR, MODERATOR			150			
SPACE POWER PLANT DESIGN OPTIMIZATION	AI	7090	F2	RS	I	\$	CROCK,	112		
SPACE POWER PLANT DESIGN OPTIMIZATION	AI	7090	F2	RS	I	\$	SHOCK,	114		
SPACE-DEPENDENT X-SECTION GENERATION	GFC	635	F4	RSP	T	R	\$	GROUSE,	420	
SPACE-INDEPENDENT INVERSE KINETICS CALC	ANL	360	F4	FS P	E	\$	R102,	168		
SPACE-INDEPENDENT INVERSE KINETICS CALC	ANL	3600	F63	FSBP	E	\$	R102,	168		
SPACE-INDEPENDENT INVERSE KINETICS CALC	WANL	7094	F4	PS	E	\$	R102,	168		
SPACE-INDEPENDENT KINETICS KEX OPTIONS	ANL	360	F4	FS P	E	\$	R101,	255		
SPACE-INDEPENDENT KINETICS KEX OPTIONS	ANL	3600	F63	RSBP	E	\$	R101,	255		
SPACE-INDEPENDENT KINETICS KEX OPTIONS	WANL	7094	F4	PS P	E	\$	R101,	255		
SPACE-INDEPENDENT KINETICS W/FEEDBACK	AI	7094	F+MAP	RS P	T	E	\$	AIRS,	163	
SPACE-INDEPENDENT KINETICS W/FEEDBACK	AFB	360	F4	RS P	E	\$	AIREK3,	121		
SPACE-INDEPENDENT KINETICS W/FEEDBACK	AI	7090	F2	RS	E	\$	AIREK3,	121		
SPACE-INDEPENDENT KINETICS W/FEEDBACK	GGC	1604	F63	RS P	E	\$	AIREK3,	121		
SPACE-INDEPENDENT REACTOR KINETICS	GGA	1108	F4	RS P	F	\$	GAPOTKIN,	317		
SPACE-INDEPENDENT REACTOR KINETICS CODE	ANL	360	F4	RS P	T	E	\$	ANCON,	486	
SPACE-INDEPENDENT REACTOR KINETICS CODE	LASL	6600	F4	RS P	T	F	\$	ANCON,	486	
SPACE-TIME DIFFUSION	ANL	360	F4	RS P	F	\$	TWIGGLE, 2-D 2-GP	338		
SPACE-TIME DIFFUSION FEEDBACK	BAPL	6600	F4	PS P	T	F	\$	TWIGL, 2-D 2-GP	338	
SPACE-TIME DIFFUSION FEEDBACK	BNL	6600	F4	RS P	T	F	\$	NOAH, 1-D ONE-GP	405	
SPACE-TIME DIFFUSION 3-GEOM	PAPL	6600	F4	RS P	T	F	\$	WIGL2, 1-D 2-GP	274	
SPACE-TIME DIFFUSION 3-GEOM	GGA	1108	F4	RS P	T	F	\$	WIGL2, 1-D 2-GP	274	
SPACE-TIME KINETICS	BCL	6400	F4	RS P	T	F	\$	ADEP, 1D AND 2D FEW-GROUP	494	
SPACE-TIME SYNTHESIS	KAPL	6600	F4	RS P	F	\$	STINT3, SINGLE-CHANNEL	389		
SPAN4, A POINT-KERNEL SHIELD EVALUATION CODE	BAPL	6600B	F+ASC	RS P	T	J	\$	462		
SPARTA, SPATIALLY-AVERAGED DOPPLER EFFECTS	NED	2000	F2	RS P	B	\$	178			
SPATIAL & COMPOSITION-DEPENDENT X-SECS	GESV	635	F+GMP	RS P	X	T	L	\$	TDCWN,	505
SPATIAL REACTOR KINETICS CODE	ANL	360	F4	RS PL	CT	F	\$	QX1, QUASISTATIC	474	
SPATIAL REACTOR KINETICS CODE	ANL	3600	36F	RS PL	CT	F	\$	QX1, QUASISTATIC	474	
SPATIALLY-AVERAGED DOPPLER EFFECTS	NED	2000	F2	RS P	R	\$	SPARTA,	178		
SPATIALLY-DEPENDENT REACTOR KINETICS	AI	360	F4	RS P	T	F	\$	TSN,	309	
SPATIALLY-DEPENDENT REACTOR KINETICS	AI	7094	F+MAP	RS P	T	F	\$	TSN,	309	
SPEC, TIME-OF-FLIGHT DATA ANALYSIS	GEES	1108	F5	RS P	T	O	\$	CAGE,BIRD,	476	
SPECIAL FUNCTION ROUTINES-FI,K,E,....	ANL	360	F4	RS P	X	T	P	\$	FUNPACK,	610
SPECIAL FUNCTION ROUTINES-FI,K,F,....	ANL	1108	F5	RS P	X	T	P	\$	FUNPACK,	610
SPECIAL FUNCTION ROUTINES-FI,K,E,....	ANL	6600	F4	RS P	X	T	P	\$	FUNPACK,	610
SPECTRA ORNL 360 F4	RS P	C	\$	ALPHA-M, RESOLUTION OF GAMMA RAY			413			
SPECTRA & MULTI-GP CONSTANTS	ANC	360	F4	RS PL	CT	B	\$	INCITE, THERMAL	565	
SPECTRA ANALYSIS	KAPL	6600	F4	RS	T	O	\$	GASPAR, COMPLEX GAMMA-RAY	485	
SPECTRA AND GROUP-AVERAGED X-SEC CALC	GGA	1108	F4	RS P	X	T	B	\$	GAF,GAF,	316

SPECTRA

STATISTICAL

SPECTRA CALC	ANC	360	F4	RS PLXCT R	\$ PHROG, MULTI-GP CONSTANT & FAST	520	
SPECTRA CALCULATION WITH DEPLETION	JNC	1108	F5	RS LX T B	\$ LEOPARD,	279	
SPECTRA CALCULATION WITH DEPLETION	WAPD	360	F4	RS PLX T B	\$ LEOPARD,	279	
SPECTRA CODE BNWL	1108	F+BAL	RS P	T C	\$ GSSLRN1P, LEAST SQUARES PHOTOPEAK	457	
SPECTRA ENDF/B DATA	ORNL	360	F4	RS P	T B \$ RICE, PRIMARY RECOIL ATOM	453	
SPECTRA GE(LI)	ANC	360	F4	RSBP XCT W	\$ GAUSS5, ANALYSIS OF GAMMA-RAY	605	
SPECTRA GGA	1108	F+BAL	RS P	T C	\$ TOAD, PROCESSING OF ANALYZER GAMMA-RAY	333	
SPECTRA GGA	1108	F4	RS PLX T B	\$ GGC4, MULTI-GP X-SECTIONS FAST THERMAL	298		
SPECTRA GGA	6600	F4	RS L	T R \$ GGC4, MULTI-GP X-SECTIONS FAST THERMAL	298		
SPECTRA KSUN	360	F4	RS P	Q	\$ CORGAM, UNFOLDING OF COMPLEX GAMMA-RAY	390	
SPECTRA, MC CALCULATION IRRADIATED MATERIAL	GEC	7090	FAP	RSBP X T Q	\$	422	
SPECTRUM AND X-SECTION CALCULATION NED	7094	F+FAP	RS P	T B	\$ EPITHERMOS,	201	
SPECTRUM CALC WITH BURNUP CYL LATTICE	TVA	360	F4	RSBP LXCT B	\$ LASER,	249	
SPECTRUM CALC WITH BURNUP CYL LATTICE	WAPD	7094	F+MAP	RS PLX T B	\$ LASER,	249	
SPECTRUM MULTI-GP CONSTANT CALC	AGC	7090	F+FAP	RSBP LX T B	\$ AGN-GAM, FAST	204	
SPECTRUM X-SECTION CALC	RNW	1108	F5	RS PLX T B	\$ BRT1, THERMAL	184	
SPECTRUM X-SECTION CALC	AI	7090	F2	RS PL	T B \$ FORM, FAST NEUTRON	51	
SPECTRUM X-SECTION CALC	ANL	3600	F63	RS LX T B	\$ GAM1, FAST NEUTRON	33	
SPECTRUM X-SECTION CALC	CDC	1604	F63	RS PL	T B \$ FORM, FAST NEUTRON	51	
SPECTRUM X-SECTION CALC	CDC	1604	F63	RS PLX T B	\$ GAM1, FAST NEUTRON	33	
SPECTRUM X-SECTION CALC	GGA	7090	F2	RS PLX T B	\$ GAM1, FAST NEUTRON	33	
SPECTRUM X-SECTION CALC	CSUC	370	F4	RS PLXCT B	\$ FORM, FAST NEUTRON	51	
SPECTRUM X-SECTION CALC	ANL	3600	F63	RSBP XCT B	\$ THERMOS(ANL), THERMAL	184	
SPECTRUM X-SECTIONS	AI	7090	F+FAP	RS L	T B \$ QUICKIE, INFINITE MEDIUM	119	
SPECTRUM X-SECTIONS	AI	7090	F+FAP	RS PL	T B \$ TEMPEST2, THERMAL NEUTRON	50	
SPECTRUM X-SECTIONS	BHSC	360	F4	RS PL	T B \$ TEMPEST2, THERMAL NEUTRON	50	
SPECTRUM X-SECTIONS	CDC	1604	F63	RS PL	T B \$ TEMPEST2, THERMAL NEUTRON	50	
SPECTRUM, MULTIGP CONSTANTS	RNW	1108	F4	RS PLX T B	\$ HFG3, SLOWING-DOWN	467	
SPECTRUM, MULTIGP CONSTANTS	TVA	360	F4	RS PLX T B	\$ HFG3, SLOWING-DOWN	467	
SPENT YANKEE-FUEL TEMPERATURE CALC	ORNL	1604	F2	RS P	H \$ RIGDEAL,	549	
SPH PW	1604	F63	RS P	F	\$ AX-TNT, COUPLED NEUTRONICS-HYDRODYNAMICS	191	
SPH ANC	360	F4	RSPP	CT C	\$ MONA, 1-D MULTIGROUP DIFFUSION SLAB, CYL	582	
SPH, CYL	GGA	1108	F+BAL	RS P	T C \$ GAZE2, 1-D MULTIGROUP DIFFUSION SLAB,	430	
SPHERE	RNW	1107	F4	RS P	T C \$ FEN, 1-D MULTI-GP DIFFUSION SLAB CYL	241	
SPHERE	AI	7090	F+FAP	RS L	T C \$ FAIM, 1-D MULTI-GP DIFFUSION SLAB CYL	120	
SPHERE	AI	7090	F+FAP	RS PL	T C \$ AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL	29	
SPHERE	CDC	1604	F63	RS PL	T C \$ AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL	29	
SPHERE	CDC	1604	F63	RS PLX T C	\$ FAIM, 1-D MULTI-GP DIFFUSION SLAB CYL	120	
SPHERE	CDC	3600	F63	RSBP	F \$ AX1, COUPLED NEUTRONICS-HYDRODYNAMICS	102	
SPHERE	CSUC	370	F4	RS PL CT C	\$ AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL	29	
SPHERE	AFB	360	F4	RS L	T C \$ FIRE5, 1-D ACF-DIFFUSION SLAB CYLINDER	9	
SPHERE	AI	7090	F+FAP	RS L	T C \$ ULCER, 1-D MULTI-GP DIFFUSION SLAB CYL	118	
SPHERE	ANL	3600	F36	RS P X T C	\$ MACH1, 1-D MULTI-GP DIFFUSION SLAB CYL	262	
SPHERE	PIRD	6500	F4	RS PLX T C	\$ MACH1, 1-D MULTI-GP DIFFUSION SLAB CYL	262	
SPHERE	PW	1604	LAG1	RS P	C \$ MGDSN, 1-D MULTI-GP SN APPROX SLAB CYL	211	
SPHERE	UK-W	7090	F2	RS P	T C \$ W-DSN, 1-D MULTI-GP SN APPROX SLAB CYL	132	
SPHERE	AI	7090	F2	RS P	T C \$ FOG, 1-D FEW-GP DIFFUSION SLAB CYLINDER	28	
SPHERE	BC	625	F4	RS	T C \$ FOG, 1-D FEW-GP DIFFUSION SLAB CYLINDER	28	
SPHERE	BHSC	360	F4	RS P	T C \$ FAIMOS, 1-D MULTI-GP DIFFUSION SLAB CYL	120	
SPHERE	CDC	1604	F63	RS P	T C \$ FOG, 1-D FEW-GP DIFFUSION SLAB CYLINDER	28	
SPHERE	GEOM	AI	7090	F2	RS P	J \$ GRACE2, GAMMA-RAY ATTENUATION CYL	46
SPHERE	GEOM	CDC	1604	F63	RS P	J \$ GRACE2, GAMMA-RAY ATTENUATION CYL	46
SPHERE	GEOM SN TRANSPORT	ANL	3600	F36	RS P XCT C	\$ TESS, 1-D SLAB AND	513
SPHERE	LRL	7090	F2	RS P	F \$ CONFC, COUPLED NEUTRONICS-HYDRODYNAMICS	129	
SPIRAL, FULL-TEXT STORAGE, SEARCH & RETRIEVAL	SLA	1108	F+BAL	RSBP	T M \$	607	
SQ LENS DESIGN SYSTEM LASL	6600	F+CCM	RS P	T P	\$ LENSSES, NONLINEAR LEAST	602	
SQUARE CELL COLLISION PROBABILITY CALC	ANL	360	F4	RS P	T B \$ CLUP77,	526	
SQUARE CELL COLLISION PROBABILITY CALC	JAER	230	F4	RS P	T B \$ CLUP77,	526	
SR	360	F4	RS P	T I	\$ SEALSHLL2, SHELL STRESS ANALYSIS AXISYM LOAD	282	
STABILITY ANALYSIS REACTOR KINETICS EQNS	GGA	1108	F4	RS P	F \$ GASA,	290	
STATIC & DYNAMIC STRUCTURAL ANALYSIS	ANC	360	F4	RSBP	CT I \$ STRAP,	539	
STATION ELECTRICITY COSTS	ORNL	1604	F63	RS P	D \$ POWERCO, NUCLEAR	340	
STATION ELECTRICITY COSTS	UFC	6600	F4	RS P	D \$ POWERCO, NUCLEAR	340	
STATISTICAL MODEL REACTION X-SECTIONS	RNL	6600	F4	RS P	A \$ THRESH,	504	

STATISTICAL

SUBROUTINE

STATISTICAL RESONANCE PARAMETER CALC	ENEA	360	F4	RS P	A \$ PSEUDO,	292	
STATISTICAL RESONANCE PARAMETER CALC	GGA	1108	F4	RS P	A \$ PSFUDO,	292	
STEADY-STATE AND TRANSIENT TEMP CALC	GGA	1108	F5	RS P	T H \$ TAC2D,	408	
STEADY-STATE FISSION PRODUCT FUEL MODEL	ANC	360	F4	RSBP	CT I \$ FPFM,	584	
STEADY-STATE FLOW, PRESSURE DISTRIBUTION	GGA	1108	F5	RS P	H \$ FLAC,	395	
STEADY-STATE HEAT TRANSFER AI	7094	F+FAP	RS P	T H \$	HEATING2, TRANSIENT	198	
STEADY-STATE TEMPERATURE VOID FRACTION	AI	7090	F2	RS	I \$ FUGUE,	48	
STEADY-STATE THERMAL-HYDRAULIC ANALYSIS	NED	635	F4	RS P	T H \$ MANTA,	256	
STEADY-STATE THERMAL-HYDRAULIC ANALYSIS	WARD	6600	F4	RS P	T H \$ MANTA,	256	
STEAM	GGA	1108	F4	RS P	T H \$ DYNAM, DYNAMIC ANALYSIS	440	
STEAM	ANC	360	F4	RS P	T H \$ ASTEM, THERMODYNAMIC PROPERTIES	580	
STEAM AND WATER PROPERTIES BG&E	360	F4	RS	T H \$	STEAM-67, 1967 ASME	487	
STEAM GENERATOR DESIGN CRITERIA COSTS	GGA	7044	F4	RS P	T D \$ STMGEN,	227	
STEAM GENERATOR SODIUM-WATER REACTION	CEND	7600	F4	RS P	T G \$ CEBUG,	548	
STEAM TABLES 14.5-14,500PSIA	32-472DEGF	BAPL	6600	F4	RS	T H \$ WATER,	267
STEAM TABLES 14.5-2538 PSIA	ANL	1604	F63	RS P	H \$ M0899,HCH,	294	
STEAM TABLES 14.5-2538 PSIA	BAPL	6600	F4	RS P	T H \$ M0899,HCH,	294	
STEAM THERMODYNAMIC PROPERTIES	BAPL	6600	F4	RS P	T H \$ WASP, WATER AND	396	
STEAM-WATER MIX	KAPL	6600	F4	RS P	H \$ RAPP, HIGH-VELOCITY FLOW STUDY	382	
STEAM-67, 1967 ASME STEAM AND WATER PROPERTIES	BC&F	360	F4	RS	T H \$	487	
STEFEG, ANALYSIS OF PWR & BWR GASEOUS RELEASE	GRNL	360	F4	RS P	C G \$	583	
STEM, MATRIX GENERATION FOR A SYSTEM OF BEAMS	KAPL	6600	F4	RS P	I \$	337	
STINT3, SINGLE-CHANNEL SPACE-TIME SYNTHESIS	KAPL	6600	F4	RS P	F \$	389	
STMGEN, STEAM GENERATOR DESIGN CRITERIA COSTS	GGA	7044	F4	RS P	T D \$	227	
STOCHASTIC MODEL OF NEUTRON SLOWING-DOWN	APGS	360	F4	RS P	X T F \$ MOD5,	451	
STORAGE, RETRIEVAL, AND DISPLAY	DP	360	F+BAL	S	T M \$ JCISHUA, DATA	490	
STORAGE, SEARCH & RETRIEVAL	SLA	1108	F+BAL	RSBP	T M \$ SPIRAL, FULL-TEXT	607	
STRAIN & PELLET CRACKING	BAPL	6600	F4	RS P	I \$ STRIPE, FUEL ROD CLAD	570	
STRAP, STATIC & DYNAMIC STRUCTURAL ANALYSIS	ANC	360	F4	RSBP	CT I \$	539	
STRESS & DEFORMATION	BAPL	6600	F4	RS P	T I \$ CYGRO3, OXIDE FUEL ROD	449	
STRESS ANALYSIS	KAPL	6600	F4	RS P	I \$ TUBE, U-TUBE HEAT EXCHANGER	378	
STRESS ANALYSIS	ANL	3600	F36	RS P	T I \$ SUPORAN, REACTOR CORE SUPPORT	357	
STRESS ANALYSIS	GGA	1108	F4	RS P	I \$ SAFE-2D, PLANE & AXISYMMETRIC	379	
STRESS ANALYSIS AXISYM LOAD	BAPL	6600	F4	RS P	T I \$ SFALSHLL2, SHELL	282	
STRESS ANALYSIS AXISYM LOAD	SR	360	F4	RS P	T I \$ SEALSHLL2, SHELL	282	
STRESS ANALYSIS AXISYM LOAD	WTSC	6600B	F4	RS P	T I \$ SFAL SHELL, SHELL	282	
STRESS ANALYSIS AXISYMMETRIC LOAD	GGA	7044	F4	RSBP	CT I \$ SAFE-PCRS,	250	
STRESS ANALYSIS AXISYMMETRIC LOAD	GGA	7044	F4	RS P	T I \$ SAFE-AXISYM,	251	
STRESS ANALYSIS CYL FUEL ELEMENT	BAPL	6600	F4	RS	T I \$ CYGRO2,	266	
STRESS ANALYSIS MULTIANCHOR PIPE SYSTEM	AI	360	F4	RS P	CT I \$ PSA2,	542	
STRESS ANALYSIS SHELLS OF REVOLUTION	KAPL	6600C	F4	RS P	T I \$ SOR3,	80	
STRESS ANALYSIS STUDY	GGA	7044	F4	RS P	T G \$ FLBW, FUEL ELEMENT	229	
STRESS ANALYSIS THIN SHELLS	GGA	1108	F4	RS P	I \$ SAFE-SHELL,	253	
STRESS ANALYSIS, 2-D BODIES	BNL	6600	F4	RS P	T I \$ SAFE-PLANE, PLANE	252	
STRESS ANALYSIS, 2-D BODIES	CCA	1108	F4	RS P	I \$ SAFE-PLANE, PLANE	252	
STRESS AND FATIGUE	KAPL	6600	F4	RS	I \$ SCRSOP, PRESSURE VESSEL	351	
STRESS OF PIPING SYSTEM	PAPL	6600	F4	RS P	T I \$ M0457, PIPE, ELASTIC	329	
STRESS STUDY	GGA	1108	F4	RS P	T I \$ SAFE-3D, 3-D COMPOSITE STRUCTURE	332	
STRESS STUDY	ORNL	360	F+RAL	RS P	T I \$ SAFE-3D, 3-D COMPOSITE STRUCTURE	332	
STRESS STUDY	BAPL	6600	F+COM	RS P	T I \$ GAPL3, INELASTIC LARGE DEFLECTION	357	
STRESS, MAXIMUM MOMENT CALC	AI	7090	F+FAP	RS	T I \$ 4PSTRAINT PIPE	109	
STRIP, RESOLVED RESONANCE INTEGRAL CALCULATION	RW	2000	F4	RS	A \$	305	
STRIPE, FUEL ROD CLAD STRAIN & PELLET CRACKING	BAPL	6600	F4	RS P	I \$	570	
STRUCTURAL ANALYSIS	GGA	1108	F5	RS P	T I \$ SHELL5, THIN SHELL 3-D	452	
STRUCTURAL ANALYSIS	ANC	360	F4	RSBP	CT I \$ STRAP, STATIC & DYNAMIC	539	
STRUCTURAL DYNAMICS	BAPL	6600	F4	RS P	T I \$ M0266, LINEAR ELASTIC	383	
STRUCTURE STRESS STUDY	GGA	1108	F4	RS P	T I \$ SAFE-3D, 3-D COMPOSITE	332	
STRUCTURE STRESS STUDY	ORNL	360	F+RAL	RS P	T I \$ SAFE-3D, 3-D COMPOSITE	332	
STRUCTURES	BAPL	6600	F4	RS P	T L \$ RL47, CRAFTING TOOL TO PLOT PLANE	373	
STRUCTURES	KAPL	6600	F4	RS P	X I \$ FINFL, FINITE-ELEMENT STUDY 2,3-D	404	
STRUCTURES	BAPL	6600	F4	RS P	T I \$ FUGIT, DYNAMIC RESPONSE OF ELASTIC	537	
SUBPROGRAMS AND MODULES	ANL	360	F+BAL	RS P	CT M \$ ARC-SYSTEM, SYSTEM	522	
SUBROUTINE LIB.	NED	635	F+GMP	RS	T P \$ GENED ENVIRONMENTAL ROUTINES,	515	
SUBROUTINE LIB.	BAPL	6600A	F+ASC	RS	T P \$ BETTIS ENVIRONMENTAL ROUTINES,	478	

SUBROUTINE

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SUBROUTINE LIB. BW	6600P	F+ASC	RS	T P	\$ BETTIS ENVIRONMENTAL ROUTINES,	478	
SUBROUTINE LIBRARY CAT. A-E	ANL	360	F+P+A	RS	T P \$ AMOLIRAE, ARGONNE	562	
SUBROUTINE LIBRARY CAT. F	ANL	360	F+BAL	RS	T P \$ AMCLIRE, ARGONNE	563	
SUBROUTINE LIBRARY CAT. G-Z	ANL	360	F+P+A	RS	T P \$ AMOLIRG7, ARGONNE	564	
SUBROUTINES AI	360	F+BAL	RS	T P	\$ FIGS, IPM36082250 FORTRAN GRAPHICS	484	
SUM OF EXPONENTIALS MIT	7090	F2	RS	P	\$ FRANTIC, LEAST SQUARES FIT	324	
SUMMIT, CRYSTALLINE SCATTERING KERNEL CALC	GGA	7090	F2	RS	T A \$	56	
SUMOP, S-WAVE NEUTRON X-SECTION CALCULATION	BAPL	6600	F4	RS	P T A \$	399	
SUPERTOG, ENDF/B FINE-GP CONSTANTS GENERATION	ORNL	360	F4	RS	P T B \$	431	
SUPORAN, REACTOR CORE SUPPORT STRESS ANALYSIS	ANL	3600	F36	RS	P T I \$	357	
SUPPORT STRESS ANALYSIS	ANL	3600	F36	RS	P T I \$ SUPORAN, REACTOR CORE	357	
SURVEY STUDY BW	6600	F+CCM	RS	P X T	C \$ FARED, 1-D FAST REACTOR DESIGN &	427	
SWELLING & GAS RELEASE SIMULATION	BAPL	6600	F4	RS	P T I \$ RUHL1, FUEL	468	
SWELLING TEMPERATURE STUDY	BAPL	6600	F4	RS	P T H \$ FIGRO, LWPR FUEL	272	
SWELL2, FUEL ELEMENT LIFETIME ANALYSIS	ANL	3600	F36	RS	P I \$	353	
SYN, 2D SYNTHESIS MULTIGP DIFF & 1GP DEPLETION	NEC	635	F+GMP	RS	P T D \$	495	
SYNTHESIS	KAPL	6600	F4	RS	P F \$ STINT3, SINGLE-CHANNEL SPACE-TIME	389	
SYNTHESIS	ANL	3600	F63	RS	P T E \$ TRAFICORPORATION, TRANSFER FUNCTION	135	
SYNTHESIS CALC	NEC	635	F4	RS	PL T C \$ BISYN, 2-D MULTI-GP DIFFUSION	287	
SYNTHESIS CALC	NEC	1108	F4	RS	P T C \$ BISYN, 2-D MULTI-GP DIFFUSION	287	
SYNTHESIS MULTIGP DIFF & 1GP DEPLETION	NEC	635	F+GMP	RS	P T D \$ SYN, 2D	495	
SYNTHESIS PROGRAM CYL PW	1604	F63	RS	T C	\$ 2DXYL, 3-D MULTI-GP FLUX	192	
S4 APPROXIMATION	AI	7090	F2	RS	B \$ S4 CYL CELL CODE, 1-D 1-GP	53	
S4 APPROXIMATION	CDC	1604	F63	RS	P B \$ S4 CYL CELL CODE, 1-D 1-GP	53	
S4 APPROXIMATION RZ GEOMETRY	LRL	709	F2	RS	C \$ FIRN, 2-D FEW-GP	7	
S4 CYL CELL CODE AND TEMPEST COMBINATION	AI	7090	F2	RS	P B \$ RAM,	108	
S4 CYL CELL CODE, 1-D 1-GP S4 APPROXIMATION	AI	7090	F2	RS	B \$	53	
S4 CYL CELL CODE, 1-D 1-GP S4 APPROXIMATION	CDC	1604	F63	RS	P B \$	53	
TABLES AI	360	F+3AL	RS	P CT	R \$ U3R, UNRESOLVED RESONANCE XSEC PROBABILITY	553	
TABLES FOR PWR OPN	OPPD	6400	F4	S	P H \$ PWR-PPM, BORATION-DILUTION	552	
TABLES 14.5-14,500PSIA	32-472	DFGF	BAPL	6600	F4 RS T H \$ WATER, STEAM	267	
TABLES 14.5-2538 PSIA	ANL	1604	F63	RS	P H \$ M0899,HCH, STEAM	294	
TABLES 14.5-2538 PSIA	BAPL	6600	F4	RS	P T H \$ M0899,HCH, STEAM	294	
TACAS1, ANALYSIS OF RESONANCE MEASUREMENTS	GGA	1108	F4	RS	P T A \$	410	
TAC2D, STEADY-STATE AND TRANSIENT TEMP CALC	GGA	1108	F5	RS	P T H \$	408	
TAC3D, TRANSIENT 3-D HEAT TRANSFER PROGRAM	CGA	1108	F5	RS	P T H \$	414	
TAPE	GGA	7044	F+MAP	RS	P M \$ UNPACK, RETRIEVAL FROM SCISRS X-SECTION	206	
TAPE EDIT REACTION RATES	UK-W	7090	F2	RS	N \$ WED, W-DSN OUTPUT	133	
TAPE MAINTENANCE	ANL	360	F4	RS	M \$ MERMC2, MC**2 BINARY LIBRARY	472	
TAPE PREPARATION	PW	1604	F63	RS	L \$ CSP1, SN X-SECTION LIBRARY	194	
TAPE PREPARATION	PW	1604	F63	RS	L \$ CSP2A, SN X-SECTION LIBRARY	193	
TAPE PROCESSING AND EDITING	ORNL	360P	F4	RS	P T M \$ EDITOR, ENDF/B	502	
TAPE PROCESSING AND EDITING	ORNL	6600	F4	RS	P T M \$ EDITOR, ENDF/B	502	
TASK, 1-D MULTIGROUP REACTOR KINETICS PROGRAM	ORNL	360	F4	RS	P XCT	F \$	558
TCB01, CREEP-BUCKLING OF TUBES UNDER PRESSURE	BAPL	6600	F4	RS	P I \$	604	
TDC	PW	1604	F63	RS	P L \$ SNC, CALCULATION OF SN CONSTANTS FOR DSN	189	
TDC OR 2DXY FLUX INPUT	PW	1604	F63	RS	C \$ TDC, 2-D PERTURBATION	199	
TDC, 2-D MULTI-GP SN APPROXIMATION RZ	PW	1604	F63	RS	P T C \$ FORTRAN	161	
TDOWN, SPATIAL & COMPOSITION-DEPENDENT X-SECS	GESV	635	F+GMP	RS	P XCT	L \$	505
TDP, 2-D PERTURBATION TDC OR 2DXY FLUX INPLT	PW	1604	F63	RS	C \$	199	
TDSN, 2-D MULTIGROUP DISCRETE ORDINATE PROGRAM	LER	7090	F+MAP	RS	P T C \$	312	
TEMCO, 1-D FEW-GP DIFFUSION TEMP COEFF CALC	GGA	7044	F4	RS	P T C \$	225	
TEMCC7, TEMPERATURE COEFFICIENT CALCULATION	GGA	1108	F4	RS	P T C \$	320	
TEMP CALC	GGA	1108	F5	RS	P T H \$ TAC2D, STEADY-STATE AND TRANSIENT	408	
TEMP COEF CALC	GGA	7044	F4	RS	P T C \$ TEMCO, 1-D FEW-GP DIFFUSION	225	
TEMP FEEDBACK	GGA	1108	F4	RS	P T F \$ GAKIT, 1-D MULTIGP KINETICS WITH	370	
TEMPERATURE & DEFORMATION	BAPL	6600	F4	RS	P T I \$ PELEN, FUEL PELLETT	598	
TEMPERATURE CALC	ORNL	1604	F2	RS	P H \$ BIGDEAL, SPENT YANKEE-FUEL	549	
TEMPERATURE CALC CYLINDER	ANL	3600	F63	RS	P T H \$ ARGUS, TRANSIENT	152	
TEMPERATURE CODE	GGA	7044	F4	RS	I \$ CCORE, CORE CONFIGURATION FUEL	233	
TEMPERATURE COEFFICIENT CALCULATION	GGA	1108	F4	RS	P T C \$ TEMCO7,	320	
TEMPERATURE DIST STUDY AEB	360	F4	RS	P E \$ BLAST, REACTOR KINETICS	363		
TEMPERATURE DISTRIBUTION PROGRAM	CHI	1108	F4	RS	P T H \$ LION4, 3-D	299	
TEMPERATURE DISTRIBUTION PROGRAM	KAPL	6600	F+ASC	RS	P T H \$ LION4, 3-D	299	

TEMPERATURE

TCCL

TEMPERATURE FEEDBACK	BAPL 6600 F4	RS P	T F \$	NCWIC, 1-D 2-CP KINETICS	371
TEMPERATURE HISTORY	KF 7094 F2	RSBP	T H \$	PTH1, PLOWDOWN PRESSURE	155
TEMPERATURE STUDY	BAPL 6600 F4	RS P	T H \$	FIGPO, LWBR FUEL SWELLING	272
TEMPERATURE VOID FRACTION	AI 7090 F2	RS	I \$	FUGUE, STEADY-STATE	48
TEMPEST COMBINATION	AI 7090 F2	RS P	B \$	RAM, S4 CYL CELL CODE AND	108
TEMPEST2, THERMAL NEUTRON SPECTRUM X-SECTIONS	AI 7090 F4	FAP	RS PL T B \$		50
TEMPEST2, THERMAL NEUTRON SPECTRUM X-SECTIONS	BHSC 360 F4	RS PL T B \$			50
TEMPEST2, THERMAL NEUTRON SPECTRUM X-SECTIONS	CDC 1604 F63	RS PL T R \$			50
TESS, 1-D SLAB AND SPHERE GFM SN TRANSPORT	ANL 3600 F36	RS P XCT C \$			513
THEORY	GGA 1108 F4	RS P XCT C \$		GAPER10, 1-D TRANSPORT PERTURBATION	606
THEORY	NED 635 F4	RS P T C \$		DCT2DB, 2-D MULTIGROUP DIFFUSION & SN	459
THEORY XSEC CALC	KAPL 6600 F4	RS P A \$		MULTI, MULTI-LEVEL RESONANCE	535
THERMAL ANALYSIS	BCL 6400 F4	RS P T G \$		MURLOC-1.0, LOSS-OF-COOLANT	328
THERMAL DESIGN STUDY	GGA 7044 F4	RS P I \$		GAZELLE5, GAS-COOLED CORE	232
THERMAL DISCHARGE STUDY	HECL 1108 F5	RS P T R \$		TOPLYP2, POWER PLANT	599
THERMAL LIBRARIES FROM ENDF/B DATA	WAPC 7600 F4	RS P T P \$		FTOT2,	509
THERMAL NEUTRON SPECTRUM X-SECTIONS	AI 7090 F4	FAP	RS PL T R \$	TEMPEST2,	50
THERMAL NEUTRON SPECTRUM X-SECTIONS	BHSC 360 F4	RS PL T R \$		TEMPEST2,	50
THERMAL NEUTRON SPECTRUM X-SECTIONS	CDC 1604 F63	RS PL T R \$		TEMPEST2,	50
THERMAL RESPONSE LOCA	ANC 360 F4	RSBP X T G \$		THETA1-B, FUEL ROD	512
THERMAL SCATTERING CRYSTALLINE MATERIALS	LASL 6600 F4	RS P T A \$		TOR,	360
THERMAL SCATTERING DATA	DP 360 F4	RS P XCT A \$		FLANGF2(71-1), ENDF/B	368
THERMAL SCATTERING LAW CALCULATION	GGA 1108 F4	RS P A \$		GASKET,	263
THERMAL SPECTRA & MULTI-GP CONSTANTS	ANC 360 F4	RS PL CT B \$		INCITE,	565
THERMAL SPECTRA	GGA 1108 F4	RS PLX T B \$		GGC4, MULTI-GP X-SECTIONS FAST	298
THERMAL SPECTRA	GGA 6600 F4	RS L T P \$		GGC4, MULTI-GP X-SECTIONS FAST	298
THERMAL SPECTRUM X-SECTION CALC	BNW 110P F5	RS PLX T P \$		BRT1,	184
THERMAL SPECTRUM X-SECTION CALC	ANL 3600 F63	RSBP XCT B \$		THERMOS(ANL),	184
THERMAL-HYDRAULIC ANALYSIS	BNW 3600 F4	RS P T H \$		COBRA3C, ROD BUNDLE	432
THERMAL-HYDRAULIC ANALYSIS	BNW 1108C F4	RS P T H \$		COBRA3C, ROD BUNDLE	432
THERMAL-HYDRAULIC ANALYSIS	BNW 6600C F4	RS P T H \$		COBRA3C, ROD BUNDLE	432
THERMAL-HYDRAULIC ANALYSIS	NED 635 F4	RS P T H \$		MANTA, STEADY-STATE	256
THERMAL-HYDRAULIC ANALYSIS	WARD 6600 F4	RS P T H \$		MANTA, STEADY-STATE	256
THERMAL-HYDRAULIC WATER REACTOR DESIGN	BNW 1108 F5	RS P T H \$		REPP,	483
THERMODYNAMIC CYCLE ANALYSIS	AI 7094 F2	RS PL T I \$		CYCLOPS1,	244
THERMODYNAMIC PROPERTIES	BAPL 6600 F4	RS P T H \$		WASP, WATER AND STEAM	396
THERMODYNAMIC PROPERTIES WATER & STEAM	ANC 360 F4	RS P T H \$		ASTEM,	580
THERMODYNAMICS OF PRESSURIZERS	BAPL 6600 F4	RS P T H \$		TCPS, TRANSIENT	348
THERMOS LIBRARY, 30-GP ENDF/B SCAT KERNELS	DP 360 FCD	R LX T Z \$			543
THERMOS(ANL), THERMAL SPECTRUM X-SECTION CALC	ANL 3600 F63	RSBP XCT B \$			184
THETA1-B, FUEL ROD THERMAL RESPONSE LOCA	ANC 360 F4	RSBP X T G \$			512
THIN SHELL 3-D STRUCTURAL ANALYSIS	GGA 1108 F5	RS P T I \$		SHELL5,	452
THIN SHELLS	GGA 1108 F4	RS P I \$		SAFE-SHELL, STRESS ANALYSIS	253
THIN SHELLS	SLA 6600 F4	RS P T I \$		SLADE-D, DYNAMIC ANALYSIS OF	581
THIN SHELLS	MIT 360 F4	RS P T I \$		SARCR4, DISCRETE-ELEMENT ANALYSIS	402
THREDES LIBRARY UTILITY ROUTINE	AI 360 F4	RSB L T M \$		CLIP, FORM CR	271
THREDES, 1-D FEW-GP DIFFUSION DESIGN SYSTEM	AI 360 F4	RSBP T K \$			273
THRESH, STATISTICAL MODEL REACTION X-SECTIONS	BNL 6600 F4	RS P A \$			504
THTE, 3-D TRANSIENT HEAT TRANSFER PROGRAM	GEC 635 F+GMP	RSBP T H \$			346
THUNDERHEAD, EXTERNAL+INTERNAL DOSE	AI 7094 F4	FAP	RS PL T G \$	CURIE, DOSE,	196
TIGIR2, MODULAR DOCUMENT INFORMATION SYSTEM	KAPL 6600 F	R R T M \$			403
TIME-DEP 2-D MULTI-GP DIFFUSION	UMCC 360 F4	RS P T C \$		VARI-QUIR,	212
TIME-DEP 2-D MULTI-GP DIFFUSION	WANL 6600 F4	RS P T C \$		VARI-QUIR,	212
TIME-DEPENDENT DIFFUSION CALC	KAPL 6600 F4	RS P F \$		RAUMZEIT, 1-D	352
TIME-DEPENDENT DIFFUSION	GGA 1108 F4	RS P T F \$		GAKIN, 1-D MULTIGROUP	310
TIME-DEPENDENT HEAT CONDUCTION	PPCO 7C44 F4	FMAP	RS P T H \$	TOODEE, 2-D	349
TIME-OF-FLIGHT DATA ANALYSIS	GEES 1108 F5	RS P T O \$		CAGE, BIRD, SPEC,	476
TIME-SHARING PROGRAMMING LANGUAGE	KAPL 6600 F4	ASC	RS P \$	SIMPLE1,	442
TLC CORRECTION CALC	AI 360 F4	RS P T Q \$		RESPOND, DISSIMILAR MEDIA	566
TCAD, PROCESSING OF ANALYZER GAMMA-RAY SPECTRA	GGA 1108 F4	BAL	RS P T O \$		333
TOKAMAK FUSION REACTOR STUDY	ANL 360 F4	RS P X \$		TOKMINA/TOKMINA2,	561
TOKMINA/TOKMINA2, TOKAMAK FUSION REACTOR STUDY	ANL 360 F4	RS P X \$			561
TOODEE, 2-D TIME-DEPENDENT HEAT CONDUCTION	PPCC 7044 F4	FMAP	RS P T H \$		349
TCCL TO PLOT PLANE STRUCTURES	BAPL 6600 F4	RS P T L \$		BL47, DRAFTING	373

TOPIC

TRIPLET

TOPIC, 1-D FEW-GP SN APPROXIMATION CYLINDER	PPCC 7040	F4	RS P	T C \$	148	
TOPIC, 1-D FEW-GP SN APPROXIMATION CYLINDER	PPCC 7090	F2	RS P	T C \$	148	
TCPLYR2, POWER PLANT THERMAL DISCHARGE STUDY	HECL 1108	F5	RS P	T R \$	599	
TOPS, TRANSIENT THERMODYNAMICS OF PRESSURIZERS	BAPL 6600	F4	RS P	T H \$	348	
TOR OUTPUT DATA LASL 6600	F4	RS P	T B \$	GLEN, GPCUP CONSTANT CALC FROM	361	
TOR, THERMAL SCATTERING CRYSTALLINE MATERIALS	LASL 6600	F4	RS P	T A \$	360	
TRAFICORPORATION, TRANSFER FUNCTION SYNTHESIS	ANL 3600	F63	RSBP	T E \$	135	
TRANS-FUGUE1, TRANSIENT FLOW AND HEAT TRANSFER	AI 7094	F2	RS P	T G \$	268	
TRANSFER GGA 1108	F+RAL	RS P	T E \$	PLCOST6, COMBINED KINETICS 2-D HEAT	303	
TRANSFER AI 7094	F+FAP	RS P	T H \$	HEATING2, TRANSIENT STEADY-STATE HEAT	198	
TRANSFER AI 7094	F2	PS P	T G \$	TRANS-FUGUE1, TRANSIENT FLOW AND HEAT	268	
TRANSFER CALC	ANC 360	F4	RSBP	XCT H \$	MCXY, BWR FUEL ELEMENT HEAT	551
TRANSFER CALC	ANC 1108	F4	RS P	T H \$	MOXY, BWR FUEL ELEMENT HEAT	551
TRANSFER COEFFICIENTS	LRL 7090	F+FAP	RS P	T B \$	SOPHIST1/2/5, MULTI-GP	160
TRANSFER FUNCTION EVALUATION	PW 1604	F63	RS P	F \$	CMPXMAT,	188
TRANSFER FUNCTION SYNTHESIS	ANL 3600	F63	RSBP	T E \$	TRAFICORPORATION,	135
TRANSFER GGA 7044	F+MAP	PS P	T H \$	BLCCST5, POINT-KINETICS WITH 2-D HEAT	205	
TRANSFER MATRICES	AGC 7090	F2	RS P	T B \$	AGN-SIGMA, CALC OF MULTI-GP	243
TRANSFER MOLTEN FUEL TUBE BUNDLES	LASL 7094	F2	RSBP	H \$	AXFLU, HEAT	182
TRANSFER PROGRAM	GEC 635	F+GMP	RSBP	T H \$	THE, 3-D TRANSIENT HEAT	346
TRANSFER PROGRAM	GGA 1108	F5	RS P	T H \$	TAC3D, TRANSIENT 3-D HEAT	414
TRANSFER SOLID FUEL TUBE BUNDLES	LASL 7094	F2	RSBP	H \$	AXTHRM, HEAT	183
TRANSFER STUDY SLL 6600	F4	RS P	N \$	HEATMESH, GEOMETRICAL DATA HEAT	434	
TRANSIENT & DEPLETION	KAPL 6600	F4	RS P	T C \$	3DXT, DEP3, 3-D XFENON	477
TRANSIENT ANALYSIS	BAPL 6600	F4	RS P	T H \$	FLOT1, MO219, PWR FLOW	331
TRANSIENT ANALYSIS	ANC 360	F+BAL	RSBP	CT G \$	PARET, WATER-COOLED CORE	555
TRANSIENT FLOW AND HEAT TRANSFER	AI 7094	F2	PS P	T G \$	TRANS-FUGUE1,	268
TRANSIENT HEAT CONDUCTION PROGRAM	BAPL 6600	F4	RS P	T H \$	HOT2, 2-D	286
TRANSIENT HEAT TRANSFER PROGRAM	GEC 635	F+GMP	RSBP	T H \$	THE, 3-D	346
TRANSIENT SIMULATION	BAPL 6600	F4	RS P	T G \$	FLASH4, FULLY-IMPLICIT	448
TRANSIENT STEADY-STATE HEAT TRANSFER	AI 7094	F+FAP	RS P	T H \$	HEATING2,	198
TRANSIENT TEMP CALC	GGA 1108	F5	RS P	T H \$	TAC2D, STEADY-STATE AND	408
TRANSIENT TEMPERATURE CALC CYLINDER	ANL 3600	F63	RSBP	T H \$	ARGUS,	152
TRANSIENT THERMODYNAMICS OF PRESSURIZERS	BAPL 6600	F4	PS P	T H \$	TOPS,	348
TRANSIENT 3-D HEAT TRANSFER PROGRAM	GGA 1108	F5	RS P	T H \$	TAC3D,	414
TRANSIENTS	ANL 360	F4	RS P	T F \$	SASIA, FAST REACTOR POWER AND FLOW	400
TRANSIENTS	ANL 6600	F4	RS P	T F \$	SASIA, FAST REACTOR POWER AND FLOW	400
TRANSIENTS	BAPL 6600	F4	RS P	T H \$	CHIC-KIN, FAST + INTERMEDIATE POWER	473
TRANSMUTATION ANALYSIS	BNWL 1108	F5	RS P	T D \$	DRUFIT1, LEAST SQUARES	456
TRANSPORT	BAPL 6600	F4	RS P	T J \$	MO756, LETO, 1-D SLAB GAMMA-RAY	343
TRANSPORT	ANL 3600	F36	RS P	XCT C \$	TESS, 1-D SLAB AND SPHERE FROM SN	513
TRANSPORT CODES	WANL 6600	F4	RS L	T B \$	GAMBIT, X-SEC GENERATION FOR	547
TRANSPORT PERTURBATION THEORY	GGA 1108	F4	RS P	XCT C \$	GAPER1D, 1-D	606
TRANSPORT PROGRAM	LASL 360	F4	RSBP	CT C \$	TRIPLET, 2-D TRIANGULAR MESH	608
TRANSPORT PROGRAM	LASL 6600	F4	RS P	T C \$	TRIPLET, 2-D TRIANGULAR MESH	608
TRANSPORT PROGRAM	LASL 7600	F4	RS P	T C \$	TRIPLET, 2-D TRIANGULAR MESH	608
TRANSPORT STUDY	RFD 3600	F36	RS P	G \$	DISPER, AEROSOL PARTICLE	554
TRANSPORT WITH SLOWING DOWN	BAPL 6600	F4	RS	T C \$	MO648, 1-D SLAB	342
TRANSPORT XY RZ RTH	LASL 7600	F4	RS P	T C \$	TWOTRAN-PNVW, 2-D PARTICLE	573
TRANSPORT XY RZ RTHETA	LASL 3600	F4	RS P	CT C \$	TWOTRAN2, 2-D MULTI-GP	358
TRANSPORT XY RZ RTHETA	LASL 6600	F4	RS P	T C \$	TWOTRAN2, 2-D MULTI-GP	358
TRANSPORT XY RZ RTHETA	LASL 7600	F4	RS P	T C \$	TWOTRAN2, 2-D MULTI-GP	358
TRFE EVALUATION CODES	ANC 360	F4	RSBP	CT K \$	PREP,KITT, SYSTEM FAULT	528
TRFE EVALUATION CODES	ANC 1108	F4	RS P	T K \$	PREP,KITT, SYSTEM FAULT	528
TRI-MESH	GGA 1108	F+BAL	RS P	T D \$	BUGTRI, 2-D MULTIGP DIFFUSION+BURNUP	439
TRIAL, 3-D REACTION RATES FROM 2-D FLUX SETS	GFSV H600	F4	RS P	CT C \$		585
TRIANGULAR MESH	GGA 1108	F+RAL	PS P	T C \$	GAMTRI, 2-D MULTIGP DIFFUSION	401
TRIANGULAR MESH TRANSPORT PROGRAM	LASL 360	F4	RSBP	CT C \$	TRIPLET, 2-D	608
TRIANGULAR MESH TRANSPORT PROGRAM	LASL 6600	F4	RS P	T C \$	TRIPLET, 2-D	608
TRIANGULAR MESH TRANSPORT PROGRAM	LASL 7600	F4	RS P	T C \$	TRIPLET, 2-D	608
TRIFID2, PULSED NEUTRON SOURCE DATA ANALYSIS	CNEA 360	F4	RS P	F \$		489
TRIPLET, 2-D TRIANGULAR MESH TRANSPORT PROGRAM	LASL 360	F4	RSBP	CT C \$		608
TRIPLET, 2-D TRIANGULAR MESH TRANSPORT PROGRAM	LASL 6600	F4	RS P	T C \$		608
TRIPLET, 2-D TRIANGULAR MESH TRANSPORT PROGRAM	LASL 7600	F4	RS P	T C \$		608

TRIX1

U3R

TRIX1, RESONANCE INTEGRAL X-SECTION CALC	AI	7094	F+MAP	RS	PLX	T	A	\$	431
TROUT, MUG MULTIGROUP XSEC LIBRARY MAINTENANCE	NED	635	F4	RS	P	T	M	\$	493
TRCUT, MUG MULTIGROUP XSEC LIBRARY MAINTENANCE	NED	1108	F5	RS	P	T	M	\$	493
TRW 6500 F4 RS P R \$ PARTI, OPTIMAL GROUP OR MESH COLLAPSING									416
TSN, SPATIALLY-DEPENDENT REACTOR KINETICS	AI	360	F4	RS	P	T	F	\$	309
TSN, SPATIALLY-DEPENDENT REACTOR KINETICS	AI	7094	F+MAP	RS	P	T	F	\$	309
TSD ANL 360 F+BAL R R L T P \$ TSD-SPEAKEASY, LANGUAGE PROCESSOR UNDER									593
TSD-SPEAKEASY, LANGUAGE PROCESSOR UNDER TSD ANL 360 F+BAL R R L T P \$									593
TUBE BUNDLES LASL 7094 F2 RSBP H \$ AXFLU, HEAT TRANSFER MOLTEN FUEL									182
TUBE BUNDLES LASL 7094 F2 RSBP H \$ AXTHRM, HEAT TRANSFER SOLID FUEL									183
TUBE, U-TUBE HEAT EXCHANGER STRESS ANALYSIS KAPL 6600 F4 RS P I \$									378
TUBES UNDER PRESSURE BAPL 6600 F4 RS P I \$ TCB01, CREEP-BUCKLING OF									604
TURBULENT FLOW IN LMFBR ROD BUNDLE NED 635 F4 RS P T H \$ VFLVET2,									458
TUZ, UNRESOLVED REGION RESONANCE INTEGRAL CALC GGA 7090 F+MAP RSB T A \$									42
TVA 360 F4 RS PLX T B \$ HRG3, SLOWING-DOWN SPECTRUM, MULTIGP CONSTANTS									467
TVA 360 F4 RSBPLXCT B \$ LASER, SPECTRUM CALC WITH BURNUP CYL LATTICE									249
TWIGGLE, 2-D 2-GP SPACE-TIME DIFFUSION ANL 360 F4 RS P F \$									338
TWIGL, 2-D 2-GP SPACE-TIME DIFFUSION FEEDBACK BAPL 6600 F4 RS P T F \$									338
TWOTRAN-PNVW, 2-D PARTICLE TRANSPORT XY RZ RT+ LASL 7600 F4 RS P T C \$									573
TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ RT+ETA LASL 360B F4 RS P CT C \$									358
TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ RTHETA LASL 6600B F4 RS P T C \$									358
TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ RT+ETA LASL 7600B F4 RS P T C \$									358
TYCHE3, MONTE CARLO SLOWING-DOWN DENSITY CALC AI 7094 F+MAP RS PL T B \$									149
U-TUBE HEAT EXCHANGER STRESS ANALYSIS KAPL 6600 F4 RS P I \$ TUBE,									378
LCND 360B F+BAL RS P C \$ PMS1, FAST NEUTRON POLARIZATION EXPERIMENT									469
UEC 6600 F4 RS P D \$ NPRFCCP, FUEL CYCLE COSTS PERFORMANCE DATA									146
UEC 6600 F4 RS P D \$ POWERCO, NUCLEAR STATION ELECTRICITY COSTS									340
UEC 6600 F4 RS P D \$ WAMPUM, FUEL CYCLE COSTS PERFORMANCE STUDY									224
UGA 360 F4 RS P G \$ WATER-HAMMER, LIQUID BLOWDOWN ANALYSIS LOFT									278
UHTREX LASL 7090 F+MAP RS P I \$ WIREX, COMPUTER-PRODUCED WIRING LISTS									315
UICS 360 F4 RS P CT D \$ GFM, ANALYSIS OF NUCLEAR FUEL CYCLE ECONOMICS									576
UILL 360 F4 RS P A \$ CODILLI, LEAST SQUARES ANALYSIS RESONANCE DATA									347
UK-R 7090 F+MAP RSBPL T C \$ CPAM, 1-D AND 2-D MULTI-GP DIFFUSION PROGRAM									103
UK-W 7090 F2 RS N \$ WED, W-DSN OUTPUT TAPE EDIT REACTION RATES									133
UK-W 7090 F2 RS P T C \$ W-DSN, 1-D MULTI-GP SN APPROX SLAB CYL SPHERE									132
ULCER, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE AI 7090 F+MAP RS L T C \$									118
UM 7090 MAD RSB D \$ BURP1, DETECTOR EFFICIENCY POINT SOURCE									164
UM 7090 MAD RSB D \$ BURP2, DETECTOR EFFICIENCY DISK SOURCE									165
UM 7090 MAD RSB D \$ BURP3, DETECTOR EFFICIENCY POINT SOURCE									166
UM 7090 MAD RSB D \$ BURP4, GAMMA-RAY PHOTOFRACITION SOLID CRYSTAL									169
UM 7090 MAD RSB D \$ BURP5, GAMMA-RAY PHOTOFRACITION WELL CRYSTAL									170
UMCC 360 F4 RS P T C \$ VARI-QUIT, TIME-DEP 2-D MULTI-GP DIFFUSION									212
UNC 1604 F63 RS C \$ 2DF, 2-D MULTI-GP DISCRETE ORDINATE CODE									173
UNC 1604 F63 RS PL T C \$ DTF, 1-D MULTIGROUP DISCRETE ORDINATE CALC									144
UNDER PRESSURE BAPL 6600 F4 RS P I \$ TCB01, CREEP-BUCKLING OF TUBES									604
UNDER TSD ANL 360 F+BAL R R L T P \$ TSD-SPEAKEASY, LANGUAGE PROCESSOR									593
UNFOLDING OF COMPLEX GAMMA-RAY SPECTRA KSLN 360 F4 RS P C \$ CORGM,									390
UNITS DUCC 635 F4 RS C \$ ANVENT, LCCA ANALYSIS DUKE POWER MCGUIRE									529
UNPACK, RETRIEVAL FROM SCISRS X-SECTION TAPE GGA 7044 F+MAP RSBP M \$									206
UNRESOL RESONANCE XSEC PROBABILITY TABLES AI 360 F+BAL RS P CT B \$ U3R,									553
UNRESOLVED REGION AVERAGE X-SFC CALC BNL 6600 F4 RS P A \$ AVERAGE,									376
UNRESOLVED REGION AVERAGE X-SFC CALC BNL 7094 F4 RS P A \$ AVERAGE,				</					

VARI-QUIR

WHIRLAWAY

VARI-QUIR, TIME-DEP 2-D MULTI-GP DIFFUSION	UMCC	360	F4	RS P	T C \$	212
VARI-QUIR, TIME-DEP 2-D MULTI-GP DIFFUSION	WANL	6600	F4	RS P	T C \$	212
VARI-QUIR3, 2-D MULTI-GP DIFFUSION XY RZ RTH	WANL	7094	F4	RS P X T C \$		264
VELVFT2, TURBULENT FLOW IN LMFBR ROD BUNDLE	NED	635	F4	RS P	T H \$	458
VENUS, 2-D LMFBR POWER EXCURSION DISASSEMBLY	ANL	360	F4	RS P	XCT F \$	511
VERSUS LEASE ANALYSIS SLA 360 COROL RSRP	CT M \$	BECOM, AEC DP PURCHASE				589
VERSUS LEASE ANALYSIS SLA 1108 CORCL RS P	M \$	BECOM, AEC DP PURCHASE				589
VESSEL STRESS AND FATIGUE KAPL 6600 F4	RS	I \$	SCRSOP, PRESSURE			391
VIBRATING SYSTEMS KAPL 6600 F+ASC RS P	T I \$	GFM, EIGENVALUE PROBLEM FOR				344
VIBRATION NEUTRON SCATTERING CODES ANC 360 F4	RS P	CT W \$	MACS LATTICE			574
VIEW FACTOR CALC FOR CYLINDRICAL PINS ANC 360 F4	RSRP	CT J \$	VIEWPIN,			569
VIEW FACTOR SHIELDING CODE CAVITY GEOM GGA 1108 F4	RS P	T J \$	MUSCAT,			259
VIEWPIN, VIEW FACTOR CALC FOR CYLINDRICAL PINS ANC 360 F4	RSBP	CT J \$				569
VIMI, MONTE CARLO CRITICAL ASSEMBLY ANALYSIS AI 7600 F4	RS	PLX T C \$				510
VIMIX, MONTE CARLO CRITICAL ASSEMBLY ANALYSIS AI-A 360 F4	RSBP	CT C \$				510
VISCOELASTIC ANALYSIS CONCRETE GGA 1108 F4	RS P	I \$	SAFE-CREEP,			300
VISCOELASTIC ANALYSIS OF CONCRETE GGA 1108 F5	RS P	T I \$	SAFE-CRACK,			451
VOID FRACTION AI 7090 F2	RS	I \$	FUGUE, STEADY-STATE TEMPERATURE			48
VOID X-SECTION CALCULATION GFC 625 F4	RS P	R \$	AVOID, ANNULAR			276
V1 PROC BNL 6600B F4	RS	T M \$	CHECKER, CRECT, DAMMET, PLOTFR, ...	ENDF/B		384
V2 PROC BNL 6600B F4	RS	T M \$	CRECT, CHECKER, RIGEL, PLOTFR, ...	ENDF/B		475
V2 PROCESSING CODES ANL 360 F4	RS P	T M \$	CRECT, CHECKER, ENDF/B			475
V3 DATA PROCESSING CODE ANL 360 F4	RS	T M \$	RIGEL, ENDF/B			571
V3,V4 PROCESSING CODES BNL 6600 F4	RS	T M \$	CHECK3, RIGEL3, ENDF/B			571
V4 PROCESSING CODES BNL 6600 F4	RS	T M \$	CHECK3, RIGEL3, ENDF/B	V3,		571
W-DSN OUTPUT TAPE EDIT REACTION RATES UK-W 7090 F2	RS	N \$	WED,			133
W-DSN, 1-D MULTI-GP SN APPROX SLAB CYL SPHERE UK-W 7090 F2	RS P	T C \$				132
WAMPUM, FUEL CYCLE COSTS PERFORMANCE STUDY GGA 7044 F4	RS P	D \$				224
WAMPUM, FUEL CYCLE COSTS PERFORMANCE STUDY UFC 6600 F4	RS P	D \$				224
WANL 6600 F4	RS	L T R \$	CAMBIT, X-SEC GENERATION FOR TRANSPORT CODES			547
WANL 6600 F4	RS P	T C \$	VARI-QUIR, TIME-DEP 2-D MULTI-GP DIFFUSION			212
WANL 7094 F+PAP RSBPL T N \$	CPS, SC4020 PLOTS FROM SCISRS X-SECTION TAPES					239
WANL 7094 F2	RS P	A \$	EXT, X-SECTIONS FROM B-W RESONANCE PARAMETERS			238
WANL 7094 F4	RS	F \$	R102, SPACE-INDEPENDENT INVERSE KINETICS CALC			168
WANL 7094 F4	RS P	F \$	R101, SPACE-INDEPENDENT KINETICS KFX OPTIONS			255
WANL 7094 F4	RS P X T C \$		VARI-QUIR3, 2-D MULTI-GP DIFFUSION XY RZ RTH			264
WAPD 360 F4	RS	PLX T R \$	LEOPARD, SPECTRA CALCULATION WITH DEPLETION			279
WAPD 6600 PCD	R L T Z \$	ETOG1 DATA LIBRARIES, MUFT4 OR 5, GAM1 OR 2				447
WAPD 6600 F4	RS P	T R \$	ETOM1, ENDF/B FORMAT TO MUFT FORMAT X-SECTIONS			436
WAPC 6600 F4	RS P	T D \$	CINCAS, NUCLEAR FUEL CYCLE COST AND ECONOMICS			354
WAPD 6600 F4	RS	PL T R \$	ETOG1, ENDF/B TO MUFT, GAM, ANISN X-SEC FORMAT			437
WAPD 7094 F+PAP	RS	PLX T R \$	LASER, SPECTRUM CALC WITH BURNUP CYL LATTICE			249
WAPC 7600 F4	RS P	T R \$	ETOG3, ENDF/B TO MUFT, GAM, ANISN X-SEC FORMAT			538
WAPD 7600 F4	RS P	T R \$	ETOT2, THERMAL LIBRARIES FROM ENDF/B DATA			509
WARD 6600 F4	RS P	T H \$	MANTA, STEADY-STATE THERMAL-HYDRAULIC ANALYSIS			256
WASP, WATER AND STEAM THERMODYNAMIC PROPERTIES BAPL 6600 F4	RS P	T H \$				356
WATER & STEAM ANC 360 F4	RS P	T H \$	ASTEM, THERMODYNAMIC PROPERTIES			580
WATER AND STEAM THERMODYNAMIC PROPERTIES BAPL 6600 F4	RS P	T H \$	WASP,			356
WATER PROPERTIES BG&E 360 F4	RS	T H \$	STEAM-67, 1967 ASME STEAM AND			487
WATER REACTOR DESIGN BNW 1108 F5	RS P	T H \$	REPP, THERMAL-HYDRAULIC			483
WATER-COOLED CORE TRANSIENT ANALYSIS ANC 360 F+BAL RSBPL	CT G \$	PARET,				555
WATER-HAMMER, LIQUID BLOWDOWN ANALYSIS LCFT UGA 360 F4	RS P	G \$				278
WATER-LOGGED FUEL ELEMENT ANALYSIS BAPL 6600 F4	RS P	T H \$	GLUB1,			424
WATER, STEAM TABLES 14.5-14,500PSIA 32-472CEGF BAPL 6600 F4	RS	T H \$				267
WAVE FUNCTION RADIAL INTEGRALS ORNL 1604 F63	RS P	A \$	RAMES, PARTICLE			335
WEAK EXPLCSION, COUPLED NEUTRON-HYDRODYNAMICS APDA 7094 F2	RS P	F \$				145
WED, W-DSN OUTPUT TAPE EDIT REACTION RATES UK-W 7090 F2	RS	N \$				133
WEIGHT OPTIMIZATION DOSE CALC AI 7094 F+PAP PS P	J \$	SHOE, SHIELD				197
WEIGHT OPTIMIZATION STUDY PW 1604 F63	RS	I \$	WOPEXPRT, REACTOR			190
WELL CRYSTAL UM 7090 MAD RSB	C \$	BURP5, GAMMA-RAY PHOTOFRACTION				170
WELWING, MATERIAL BUCKLING CYL FUEL ELEMENTS AER 360 F4	RS P	B \$				362
WHAM, LIQUID-FILLED PIPING SYSTEM ANALYSIS KE 3600B F36	RSBP	G \$				278
WHIRLAWAY, 3-D 2-GROUP DIFFUSION XYZ GEOMETRY CDC 1604 F63	RS P	T C \$				32
WHIRLAWAY, 3-D 2-GROUP DIFFUSION XYZ GEOMETRY ORNL 7090 F2	RS P	T C \$				32

WIGL2

X-SECTION

WIGL2, 1-D 2-GP SPACE-TIME DIFFUSION 3-GEOM	BAPL 6600 F4	PS P	T F \$	274
WIGL2, 1-D 2-GP SPACE-TIME DIFFUSION 3-GEOM	GGA 1108 F4	PS P	T F \$	274
WIREX, COMPUTER-PRODUCED WIRING LISTS UHTREX	LASL 7090 F+FAP	PS P	I \$	315
WIRING LISTS UHTREX	LASL 7090 F+FAP	RS P	I \$ WIREX, COMPUTER-PRODUCED	315
WLIB, FLAT, RESONANCE ABSORPTION, CELL	ANL 3600 F36	RSBP	X T B \$ RARBLE,	281
WOODS-SAXON POTENTIAL SHAPE CALCULATION CRNL	7090 F2	RS	A \$ LYNNE,	381
WCPEXPRT, REACTOR WEIGHT OPTIMIZATION STUDY	PW 1604 F63	PS	I \$	190
WORKSTATION PKG	ANL 360 F+ASM	PSB	CT P \$ WSP-HASP/DOS, DOS-MET REMOTE	541
WSP-HASP/DOS, DOS-MET REMOTE WORKSTATION PKG	ANL 360 F+ASM	PSB	CT P \$	541
WTSC 6600R F4	RS P	T I \$	SEAL SHELL, SHELL STRESS ANALYSIS AXISYM LOAD	282
X-SEC	BNL 6600 F4	RS P	A \$ BESFIT, DIFFRACTION MODEL ELASTIC SCAT	524
X-SEC & POLARIZATION CALC	KAPL 6600 F4	RS P	T A \$ PHASER, PHASE SHIFT	507
X-SEC CALC	BNL 6600 F4	RS P	A \$ SIGPLCT, RESOLVED MULTILEVEL R-W	377
X-SEC CALC	KAPL 6600 F4	RS P	T A \$ JPIXR, COUPLED-CHANNEL SCATTERING	506
X-SEC CALC	BNL 6600 F4	RS P	A \$ AVERAGE, UNRESOLVED REGION AVERAGE	376
X-SEC CALC	BNL 7094 F4	RS P	A \$ AVERAGE, UNRESOLVED REGION AVERAGE	376
X-SFC CALC	BNW 1108 F4	RS P	T B \$ FCC4, FUNDAMENTAL MODE FAST REACTOR	306
X-SEC CALC	GGA 1108 F4	PS P	X T B \$ CAF, GAR, SPECTRA AND GROUP-AVERAGED	316
X-SEC CALC	ORNL 360 F+PAL	RS P	D \$ ISCSEARCH, ISCTCPF PRODUCTION FLUX,	322
X-SEC CALC	ORNL 1604 F63	RS P	D \$ ISOSEARCH, ISOTOPE PRODUCTION FLUX,	322
X-SEC EVALUATION	ENEA 360 F4	RS P	CT A \$ JUPITOR1, COUPLED CHANNEL	308
X-SEC EVALUATION	ORNL 1604 F63	RS P	T A \$ JUPITOR1, COUPLED-CHANNEL	308
X-SEC EVALUATION	AI 360 F+PAL	RSB	L CT M \$ SCORE3, SCISPS ENDF/R GRAPHIC	375
X-SFC FORMAT	WAPD 6600 F4	RS PL	T B \$ ETCG1, ENDF/B TO MUFT, GAM, ANISN	437
X-SEC FORMAT	WAPD 7600 F4	RS P	T B \$ ETOG3, ENDF/B TO MUFT, GAM, ANISN	538
X-SEC GENERATION FOR TRANSPORT CODES	WANL 6600 F4	RS	L T B \$ GAMBIT,	547
X-SECS	BAPL 6600 F4	PS P	T A \$ PLN1, UNRESOLVED RESONANCE INTEGRALS	359
X-SECS	GFSV 635 F+GMP	RS P	XCT L \$ TDCWN, SPATIAL & COMPOSITION-DEPENDENT	505
X-SECS	BAPL 6600 F4	RS	T B \$ M0807, 2-D DIFFUSION ABSORPTION REMOVAL	280
X-SECTION AVERAGING	GGA 7044 F4	RS P	L \$ GAVEF, ENERGY INTERVAL	218
X-SECTION CALC	BNW 1108 F5	RS	PLX T P \$ BRT1, THERMAL SPECTRUM	184
X-SECTION CALC	AI 7090 F2	RS PL	T A \$ ARES2, RESONANCE INTEGRAL	89
X-SECTION CALC	AI 7094 F+MAP	RS PLX	T A \$ TRIX1, RESONANCE INTEGRAL	208
X-SECTION CALC	ANL 3600 F63	RSBP	A \$ NEARREX, COMPOUND NUCLEUS	171
X-SECTION CALC	CDC 1604 F63	RS PL	T A \$ ARES2, RESONANCE INTEGRAL	89
X-SECTION CALC	NED 2000 F2	RS P	A \$ COPIE, RESOLVED RESONANCE	177
X-SECTION CALC	AI 7090 F2	RS PL	T B \$ FORM, FAST NEUTRON SPECTRUM	51
X-SECTION CALC	ANL 3600 F63	RS	LX T B \$ GAM1, FAST NEUTRON SPECTRUM	33
X-SECTION CALC	CDC 1604 F63	RS PL	T B \$ FORM, FAST NEUTRON SPECTRUM	51
X-SECTION CALC	CDC 1604 F63	RS PLX	T B \$ GAM1, FAST NEUTRON SPECTRUM	33
X-SECTION CALC	GGA 1108 F4	RS P	A \$ GANDY, UNRESOLVED RESONANCE	341
X-SECTION CALC	GGA 7090 F2	RS PLX	T B \$ GAM1, FAST NEUTRON SPECTRUM	33
X-SECTION CALC	NED 2000 F2	RS P	A \$ RAPTURE, RESONANCE INTEGRAL	176
X-SECTION CALC	OSUC 370 F4	RS PLXCT	B \$ FORM, FAST NEUTRON SPECTRUM	51
X-SECTION CALC	ANL 3600 F63	RSBP	XCT B \$ THERMOS(ANL), THERMAL SPECTRUM	184
X-SECTION CALC ELASTIC SCAT RESONANCES	AI 360 F4	RS PLX	T B \$ AILMOE,	147
X-SECTION CALC ELASTIC SCAT RESONANCES	AI 7094 F+FAP	RS PL	T B \$ AILMOE,	147
X-SECTION CALC FROM DSX OUTPUT	PW 1604 LAG1	RS P	N \$ DTX, EFFECTIVE	210
X-SECTION CALC MODERATOR	GGA 1108 F4	RS P	A \$ GAKER, INELASTIC SCAT	289
X-SECTION CALCULATION	GEC 625 F4	RS P	R \$ AVOID, ANNULAR VOID	276
X-SECTION CALCULATION	BAPL 6600 F4	RS P	T A \$ SUMOR, S-WAVE NEUTRON	399
X-SECTION CALCULATION	ANL 360 F4	RS P	CT B \$ MC**2, ENDF MULTIGROUP	355
X-SECTION CALCULATION	ANL 3600 F36	RS P	T B \$ MC**2, ENDF MULTIGROUP	355
X-SECTION CALCULATION	GGA 1108 F5	RS P	A \$ FLANGE1, SCATTERING LAW	247
X-SECTION CALCULATION	NED 7094 F+FAP	RS P	T B \$ EPITHERMOS, SPECTRUM AND	201
X-SECTION EVALUATION	ORNL 7090 F4	RSBP	A \$ MUFFLE, FISSILE NUCLIDE	323
X-SECTION GENERATION	BNW 1108 F4	RS P	X T B \$ 1CX, 1-D DIFFUSION FAST	374
X-SECTION GENERATION	GEC 635 F4	RSBP	T B \$ GROUSE, SPACE-DEPENDENT	420
X-SECTION GENERATION CODE	BAPL 6600 F+COM	RS P	X T B \$ PAX03, HARMONY-PDQ	426
X-SECTION LIBRARY PREPARATION	GGA 1108 F4	RS P	X T L \$ GAND, GAFGAR	345
X-SECTION LIBRARY TAPE PREPARATION	PW 1604 F63	RS	L \$ CSP1, SN	194
X-SECTION LIBRARY TAPE PREPARATION	PW 1604 F63	RS	L \$ CSP2A, SN	193
X-SECTION LIBRARY UTILITY PROGRAM	AI 7094 F+FAP	RS	L T M \$ MOMUS,	159
X-SECTION LIBRARY UTILITY ROUTINE	ANL 3600 F63	RSBP	T M \$ XLIBIT,	181

X-SECTION

1-D

X-SECTION MANIPULATION	ANL	360	F4	RSBPL CT L \$ ARC-XSEC1, MICROSCOPIC	594
X-SECTION TAPE	GGA	7044	F+MAP RSBP	M \$ UNPACK, RETRIEVAL FROM SCISRS	206
X-SECTION TAPES	GGA	7044	F+SPS RSBP	T N \$ CROSSPLOT, SC4020 PLOTS FROM	207
X-SECTION TAPES	WANL	7094	F+FAP RSBPL	T N \$ CPS, SC4020 PLOTS FROM SCISRS	239
X-SECTIONS	AI	7090	F+FAP RS L T B	\$ QUICKIF, INFINITE MEDIUM SPECTRUM	119
X-SECTIONS	LASL	7090	FLOCC RS P	B \$ ZOT, GROUP-COLLAPSING OF MULTI-GP	113
X-SECTIONS	AI	7090	F+FAP RS PL T B	\$ TEMPEST2, THERMAL NEUTRON SPECTRUM	50
X-SECTIONS	AI	7094	F2 RS P T A	\$ 2PLUS, NON-SPHERICAL OPTICAL MODEL	254
X-SECTIONS	ANL	3600	F63 RSBP T A	\$ 2PLUS, NON-SPHERICAL OPTICAL MODEL	254
X-SECTIONS	BHSC	360	F4 RS PL T B	\$ TEMPEST2, THERMAL NEUTRON SPECTRUM	50
X-SECTIONS	BNL	6600	F4 RS P A	\$ RAMPI, REICH-MOOPE RESOLVED REGION	492
X-SECTIONS	BNL	6600	F4 RS P A	\$ THRESH, STATISTICAL MODEL REACTION	504
X-SECTIONS	CDC	1604	F63 RS PL T B	\$ TEMPEST2, THERMAL NEUTRON SPECTRUM	50
X-SECTIONS	FAST THERMAL SPECTRA	GGA	1108 F4 RS PLX T B	\$ GGC4, MULTI-GP	298
X-SECTIONS	FAST THERMAL SPECTRA	GGA	6600 F4 RS L T B	\$ GGC4, MULTI-GP	298
X-SECTIONS	FOR GAMMA-RAYS	GEC	7094 F4 RS P B	\$ GAMMA-P, PRODUCTION	235
X-SECTIONS	FROM B-W RESONANCE PARAMETERS	WANL	7094 F2 RS P A	\$ EXT,	238
X-SECTIONS	GGA	1108 F5 RS P T B	\$ ENDFB2, GAND2, GFE2, ENDF/B TO GAFGAR		596
X-SECTIONS	HEX LATTICE	GGA	1108 F4 RS B	\$ HEXSCAT, ELASTIC SCAT	291
X-SECTIONS	NED	635 F4 RS P T B	\$ RFAX, RESOLVED RESONANCE EPITHERMAL		257
X-SECTIONS	PARAMETERS	AI	7094 F+FAP RS PL T B	\$ GRAVE, GROUP-AVERAGING	162
X-SECTIONS	WAPD	6600 F4 RS P T B	\$ ETCM1, ENDF/B FORMAT TO MUFT FORMAT		436
XENON OSCILLATION	CEND	360 F4 RS P X T F	\$ CEXE, INCXE, 1-GP 3-D XYZ		415
XENON TRANSIENT & DEPLETION	KAPL	6600 F4 RS P T D	\$ 3DXT, DFP3, 3-D		477
XLACS, XSDRN MULTIGROUP LIBRARIES FROM ENDF/B	ORNL	360 F4 RSBP XCT B	\$		572
XLIBIT, X-SECTION LIBRARY UTILITY ROUTINE	ANL	3600 F63 RSBP T M	\$		181
XRAY DIFFRACTION POWDER PATTERN INDEXING	LASL	6600 F+COM RS P T Q	\$ INDX,		609
XSDRN MULTIGROUP LIBRARIES FROM ENDF/B	ORNL	360 F4 RSBP XCT B	\$ XLACS,		572
XSDRN, DISCRETE ORDINATE MULTIGROUP CONSTANTS	ORNL	360 F4 RS PLX T B	\$		393
XSEC CALC	KAPL	6600 F4 RS P A	\$ MULTI, MULTI-LEVEL RESONANCE THEORY		535
XSEC LIBRARY MAINTENANCE	NED	635 F4 RS P T M	\$ TROUT, MUG MULTIGROUP		493
XSEC LIBRARY MAINTENANCE	NED	1108 F5 RS P T M	\$ TROUT, MUG MULTIGROUP		493
XSEC PROBABILITY TABLES	AI	360 F+BAL RS P CT P	\$ U3R, UNRESOL RESONANCE		553
XSEC SETS, SN 18- 24- AND 25-GROUP SETS	LASL	6600 BCD R LX T Z	\$ LASL		532
XSECS, FROM B-W PARAMETERS	GGA	1108 F5 RS P CT A	\$ FSDP3, POINTWISE		216
XSECTION CODES	BNL	6600 F4 RS P T A	\$ RESEND, ADLER, ENDF/B RESONANCE		465
XY GEOM	AGC	7090 FLOCC RSBP C	\$ 2EXY, 2-D MULTI-GP SN APPROXIMATION		18
XY RZ GEOMETRY	GGA	1108 F+BAL RS P T C	\$ GAMBLF5, 2-D MULTI-GP DIFFUSION		222
XY RZ GEOMETRY	GGA	7044 F+MAP RSBP T C	\$ GAMBLF4, 2-D MULTI-GP DIFFUSION		222
XY RZ RTH	WANL	7094 F4 RS P X T C	\$ VARI-QUIP3, 2-D MULTI-GP DIFFUSION		264
XY RZ RTH	LASL	7600 F4 RS P T C	\$ TWOTRAN-PNVW, 2-D PARTICLE TRANSPORT		573
XY RZ RTHETA	LASL	3600 F4 RS P CT C	\$ TWOTRAN2, 2-D MULTI-GP TRANSPORT		358
XY RZ RTHETA	LASL	6600 F4 RS P T C	\$ TWOTRAN2, 2-D MULTI-GP TRANSPORT		358
XY RZ RTHETA	LASL	7600 F4 RS P T C	\$ TWOTRAN2, 2-D MULTI-GP TRANSPORT		358
XY RZ RTHETA GEOMETRY	BNW	1108 F4 RS P C	\$ PERT4, 2-D PERTURBATION		304
XY, RZ GGA	1108 F+BAL RS P T D	\$ BUG2, 2-D MULTIGROUP DIFFUSION & BURNUP			438
XYZ GEOMETRY	CDC	1604 F63 RS P T C	\$ WHIRLAWAY, 3-D 2-GROUP DIFFUSION		32
XYZ GEOMETRY	ORNL	7090 F2 RS P T C	\$ WHIRLAWAY, 3-D 2-GROUP DIFFUSION		32
XYZ R-THETA-Z	LASL	6600 F4 RS P T C	\$ 3DPT, 3-D MULTIGROUP DIFFUSION		463
XYZ XENON OSCILLATION	CEND	360 F4 RS P X T F	\$ CEXE, INCXE, 1-GP 3-D		415
YANKEE-FUEL TEMPERATURE CALC	ORNL	1604 F2 RS P H	\$ BIGDEAL, SPENT		549
YIELD FROM REACTION OR DECAY	ORNL	1604 F63 RS P D	\$ ISOTOPES, MAXIMUM		179
ZOT, GROUP-COLLAPSING OF MULTI-GP X-SECTIONS	LASL	7090 FLOCC RS P B	\$		113
ZPR-III ASSEMBLY 48 GAFGAR ENDF/B DATA TAPES	GGA	1108 BIN R L T Z	\$		356
ZUT, RESOLVED REGION RESONANCE INTEGRAL CALC	GGA	7090 F+FAP RSB T A	\$		41
1- & 2-CELL ANALYSIS	AI	360 F4 RS P T G	\$ SOFIRE2, SODIUM POOL FIRE		559
1-D AGE-DIFFUSION SLAB CYLINDER SPHERE	AEB	360 F4 RS L T C	\$ FIRE5,		9
1-D AND 2-D MULTI-GP DIFFUSION PROGRAM	AAEC	360 F+BAL RS P T C	\$ CRAM,		103
1-D AND 2-D MULTI-GP DIFFUSION PROGRAM	UK-R	7090 F+FAP RSBPL T C	\$ CRAM,		103
1-D BURNUP POWER DISTRIBUTION SEARCH	GGA	1108 F4 RS P T C	\$ GASP7,		319
1-D DIFFUSION FAST X-SECTION GENERATION	BNW	1108 F4 RS P X T B	\$ IDX,		374
1-D FAST REACTOR DESIGN & SURVEY STUDY	BNW	6600 F+COM RS P X T D	\$ FARED,		427
1-D FEW-GP DIFFUSION DEPLETION	GGA	7044 F4 RS P T D	\$ RELOAD-FEVEP,		221
1-D FEW-GP DIFFUSION DEPLETION PROGRAM	ANC	360 F4 RSBP CT D	\$ DWARF,		579

1-D

1-GP

1-D FEW-GP DIFFUSION DEPLETION PROGRAM	GGA	7090	F2	RSB	T D	\$ FEVER,	117
1-D FEW-GP DIFFUSION DESIGN SYSTEM	AI	360	F4	RSBP	T K	\$ THREDES,	273
1-D FEW-GP DIFFUSION POWER DIST SEARCH	GGA	7044	F4	RS P	T C	\$ GASP2,	220
1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE	AI	7090	F2	RS P	T C	\$ FOG,	28
1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE	BC	625	F4	RS	T C	\$ FOG,	28
1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE	CDC	1604	F63	RS P	T C	\$ FOG,	28
1-D FEW-GP DIFFUSION TEMP COEF CALC	GGA	7044	F4	RS P	T C	\$ TEMCO,	225
1-D FEW-GP SN APPROXIMATION CYLINDER	PPCO	7040	F4	RS P	T C	\$ TOPIC,	148
1-D FEW-GP SN APPROXIMATION CYLINDER	PPCO	7090	F2	RS P	T C	\$ TOPIC,	148
1-D FEW-GP SN DOUBLE SN APPROX SLAR GEOM	PPCO	7090	F2	RS P		\$ MIST,	59
1-D MULTI-GP DIFFUSION + LTB	AI	360	F4	RSBPLX	T C	\$ CAESAR4,LIBLST,	270
1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	BNW	1107	F4	RS P	T C	\$ HFN,	241
1-C MULTI-GP DIFFUSION SLAR CYL SPHERE	AI	7090	F+FAP	RS L	T C	\$ FAIM,	120
1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	AI	7090	F+FAP	RS PL	T C	\$ AIM6,	29
1-C MULTI-GP DIFFUSION SLAB CYL SPHERE	CDC	1604	F63	RS PL	T C	\$ AIM6,	29
1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	CDC	1604	F63	RS PLX	T C	\$ FAIM,	120
1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	CSUC	370	F4	RS PL	CT C	\$ AIM6,	29
1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	AI	7090	F+FAP	RS L	T C	\$ ULCER,	118
1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	ANL	3600	F36	RS P	X T C	\$ MACH1,	262
1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	PURD	6500	F4	RS PLX	T C	\$ MACH1,	262
1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	BHSC	360	F4	RS P	T C	\$ FAIMOS,	120
1-D MULTI-GP DISCRETE ORDINATE CALC	AI	7090	F2	RS PLX	T C	\$ DTF2,	151
1-D MULTI-GP DISCRETE ORDINATE CALC	AI	360	F4	RSBPLX	T C	\$ ANISN,	151
1-D MULTI-GP DISCRETE ORDINATE CALC	ANL	3600	F36	RS P	T C	\$ SNARG-1D,	288
1-C MULTI-GP DISCRETE ORDINATE PROGRAM	ANL	360	F+BAL	RS P	T C	\$ DTF4,	209
1-D MULTI-GP DISCRETE ORDINATE PROGRAM	BC	625	F+MAP	RS P	T C	\$ DTF4,	209
1-D MULTI-GP DISCRETE ORDINATE PROGRAM	LASL	6600	F4	RS P	T C	\$ DTF4,	209
1-C MULTI-GP DISCRETE ORDINATE PROGRAM	LASL	7030	F4	RS P	T C	\$ DTF4,	209
1-D MULTI-GP DISCRETE ORDINATE PROGRAM	LER	7094	F4	RS P	T C	\$ DTF4,	209
1-C MULTI-GP DOUBLE SN APPROX	BNW	7090	FLCC	RSBP	T C	\$ GE-HAPQ-S13,	75
1-C MULTI-GP DTF4 WITH DEPLETION	LASL	7030	F4	RS P	T D	\$ DTF-BURN,	269
1-D MULTI-GP SN APPROX SLAR CYL SPHERE	PW	1604	LAG1	RS P		\$ MGDSN,	211
1-D MULTI-GP SN APPROX SLAR CYL SPHERE	UK-W	7090	F2	RS P	T C	\$ W-OSN,	132
1-C MULTIGP KINETICS WITH TEMP FEEDBACK	GGA	1108	F4	RS P	T F	\$ GAKIT,	370
1-D MULTIGROUP DIFFUSION AND DEPLETION	GGA	1108	F4	RS P	T D	\$ FEVER7,	318
1-D MULTIGROUP DIFFUSION DEPLETION	AI	360	F4	RSBP	X T C	\$ SIZZLE,	58
1-D MULTIGROUP DIFFUSION DEPLETION	AI	7090	F2	RS L	T D	\$ SIZZLE,	58
1-D MULTIGROUP DIFFUSION DEPLETION	CDC	1604	F63	RS L	T D	\$ SIZZLE,	58
1-D MULTIGROUP DIFFUSION SLAB, CYL, SPH	ANC	360	F4	RSBP	CT C	\$ MCNA,	582
1-D MULTIGROUP DIFFUSION SLAB, SPH, CYL	GGA	1108	F+BAL	RS P	T C	\$ GAZE2,	430
1-D MULTIGROUP DISCRETE ORDINATE CALC	UNC	1604	F63	RS PL	T C	\$ DTF,	144
1-D MULTIGROUP REACTOR KINETICS PROGRAM	CRNL	360	F4	RS P	XCT F	\$ TASK,	558
1-D MULTIGROUP TIME-DEPENDENT DIFFUSION	GGA	1108	F4	RS P	T F	\$ GAKIN,	310
1-C ONE-GP SPACE-TIME DIFFUSION FEEDBACK	RNL	6600	F4	PS P	T F	\$ NOAH,	405
1-D PERTURBATION FOR AIM AND FCG CODES	AI	7090	F2	RS		\$ PERT,	30
1-D PERTURBATION FOR AIM AND FCG CODES	RHSC	360	F4	PS P		\$ PERT,	30
1-D PERTURBATION FOR AIM AND FCG CODES	CDC	1604	F63	RS		\$ PERT,	30
1-D SLAB AND SPHERE GEOM SN TRANSPORT	ANL	3600	F36	RS P	XCT C	\$ TESS,	513
1-D SLAB GAMMA-RAY TRANSPORT	BAPL	6600	F4	RS P	T J	\$ M0756,LETO,	343
1-D SLAB TRANSPORT WITH SLOWING DOWN	BAPL	6600	F4	RS		\$ M0648,	342
1-D TIME-DEPENDENT DIFFUSION CALC	KAPL	6600	F4	RS P	F	\$ RAUMZFIT,	352
1-C TRANSPORT PERTURBATION THEORY	GGA	1108	F4	RS P	XCT C	\$ GAPER1D,	606
1-D 1-GP SN APPROXIMATION SLAR GEOMETRY	AI	7090	F2	PS P		\$ SAIL,	52
1-D 1-GP SN APPROXIMATION SLAR GEOMETRY	CDC	1604	F63	RS P		\$ SAIL,	52
1-D 1-GP S4 APPROXIMATION	AI	7090	F2	RS	B	\$ S4 CYL CFL CODE,	53
1-D 1-GP S4 APPROXIMATION	CDC	1604	F63	RS P	B	\$ S4 CYL CFL CODE,	53
1-C 2-GP KINETICS TEMPERATURE FEEDBACK	BAPL	6600	F4	RS P	T F	\$ NOWIG,	371
1-D 2-GP SPACE-TIME DIFFUSION 3-GEOM	BAPL	6600	F4	RS P	T F	\$ WIGL2,	274
1-D 2-GP SPACE-TIME DIFFUSION 3-GEOM	GGA	1108	F4	RS P	T F	\$ WIGL2,	274
1-GP SN APPROXIMATION SLAR GEOMETRY	AI	7090	F2	RS P		\$ SAIL, 1-D	52
1-GP SN APPROXIMATION SLAR GEOMETRY	CDC	1604	F63	RS P		\$ SAIL, 1-D	52
1-GP S4 APPROXIMATION	AI	7090	F2	RS	B	\$ S4 CYL CFL CODE, 1-D	53
1-GP S4 APPROXIMATION	CDC	1604	F63	RS P	B	\$ S4 CYL CFL CODE, 1-D	53
1-GP 3-D XYZ XENON OSCILLATION	CEND	360	F4	RS P	X T F	\$ CFXE,INCEX,	415

1-REGION

1108

1-REGION KINETICS SNAP GEOMETRY	AI	7090	F2	RS	E \$ SNAPKIN5/5A,	122
1D AND 2D FEW-GROUP SPACE-TIME KINETICS	BCL	6400	F4	RS P	T F \$ ADEP,	494
1CX FEEL 1108B F4	PS P	X T B \$	ETOX3, MULTI-GP	CONSTANTS FROM	FACE/B FOR	388
1DX, 1-D DIFFUSION FAST X-SECTION GENERATION	BNW	1108	F4	PS P	X T B \$	374
1GP DEPLETION NED	635	F+GMP	RS P	T D \$	SYN, 2D SYNTHESIS	MULTIGP DIFF &
1ST FLIGHT COLLISION PROBABILITIES MC	ORNL	360	F+BAL	RS P	T B \$	RAFFLE,
1ST FLIGHT COLLISION PROBABILITIES MC	ORNL	7090	F+AP	RS P	T B \$	RAFFLE,
10 MEV	PC	625	F4	PS PLX	T B \$	GAMTEC2, MULTI-GP
10 MEV	BNW	1107	F4	RS PL	T B \$	GAMTEC2, MULTI-GP
10 MEV	BNW	7090	F+AP	RS PL	T B \$	GAMTEC2, MULTI-GP
10 MEV	UVA	6400	F4	RS PLX	T B \$	GAMTEC2, MULTI-GP
1107 F4	RS P	T C \$	HFN, 1-D MULTI-GP	DIFFUSION SLAB	CYL SPHERE	BNW
1107 F4	RS PL	T B \$	GAMTEC2, MULTI-GP	CONSTANT CALC	O TO 10 MEV	BNW
1108 BIN	R	L	T Z \$	ZPR-III ASSEMBLY	48 GAFFAP	ENDF/B DATA TAPES
1108 COROL	RS P	M \$	BFCOM, AFC DP	PURCHASE VERSUS	LEASE ANALYSIS	SLA
1108 F+3AL	RS P	T C \$	GAMBLES, 2-D MULTI-GP	DIFFUSION XY RZ	GEOMETRY	GGA
1108 F+3AL	RS P	T C \$	GAMTRI, 2-D MULTIGP	DIFFUSION TRIANGULAR	MESH	GGA
1108 F+3AL	RS P	T C \$	GAZE2, 1-D MULTIGROUP	DIFFUSION SLAB, SPH,	CYL	GGA
1108 F+3AL	RS P	T D \$	BUCTPI, 2-D MULTIGP	DIFFUSION+BURNUP	TRI-MESH	GGA
1108 F+3AL	RS P	T D \$	BUG2, 2-D MULTIGROUP	DIFFUSION & BURNUP	XY, RZ	GGA
1108 F+3AL	RS P	T E \$	BLOOST6, COMBINED	KINETICS 2-D HEAT	TRANSFER	GGA
1108 F+3AL	RS P	T D \$	GSSLPN18, LEAST	SQUARES PHOTOPEAK	SPECTRA CODE	BNWL
1108 F+3AL	RS P	T D \$	TOAD, PROCESSING	OF ANALYZER GAMMA-RAY	SPECTRA	GGA
1108 F+3AL	RSBP	T M \$	SPIRAL, FULL-TEXT	STORAGE, SEARCH &	RETRIEVAL	SLA
1108 F+SL	RS P	XCT R \$	HEPMES, REGIONAL	RADIOLOGICAL EFFECTS	ANALYSIS	HEDL
1108 F4	S	T D \$	GAFFE, EQUILIBRIUM	FUEL CYCLE CALCULATION		GGA
1108 F4	RS	B \$	HEXSCAT, ELASTIC	SCAT X-SECTIONS	HEX LATTICE	GGA
1108 F4	RS	T G \$	GADOSE,DOSET, HTR	ACCIDENT ANALYSIS	DOSE CALC	GGA
1108 F4	RS	X T P \$	FISPACK, MATRIX	EIGENVALUE EIGENVECTOR	PACKAGE	ANL
1108 F4	RS P	A \$	GAKER, INFLASTIC	SCAT X-SECTION	CALC MODERATOR	GGA
1108 F4	RS P	A \$	GANDY, UNRESOLVED	RESONANCE X-SECTION	CALC	GGA
1108 F4	RS P	A \$	GASKET, THERMAL	SCATTERING LAW	CALCULATION	GGA
1108 F4	RS P	A \$	PSEUDO, STATISTICAL	RESONANCE PARAMETER	CALC	GGA
1108 F4	RS P	C \$	PERT4, 2-D PERTURBATION	XY RZ RTHETA	GEOMETRY	BNW
1108 F4	RS P	D \$	FREVAP6, HTR	METALLIC FISSION	PRODUCT RELEASE	GGA
1108 F4	RS P	E \$	GAPOTKIN, SPACE-IND	DEPENDENT REACTOR	KINETICS	GGA
1108 F4	RS P	E \$	GASA, STABILITY	ANALYSIS REACTOR	KINETICS EQNS	GGA
1108 F4	RS P	G \$	SODCOL2, SODIUM-FUEL	INTERACTION ANALYSIS		HEDL
1108 F4	RS P	I \$	SAFE-CREEP, VISCOELASTIC	ANALYSIS CONCRETE		GGA
1108 F4	RS P	I \$	SAFE-PLANE, PLANE	STRESS ANALYSIS, 2-D	BODIES	GGA
1108 F4	RS P	I \$	SAFE-SHELL, STRESS	ANALYSIS THIN SHELLS		GGA
1108 F4	RS P	I \$	SAFE-2D, PLANE &	AXISYMMETRIC STRESS	ANALYSIS	GGA
1108 F4	RS P	L \$	GRDWRK, GRID	GENERATION FOR	SAFE PROGRAMS	GGA
1108 F4	RS P	T A \$	TACASI, ANALYSIS	OF RESONANCE	MEASUREMENTS	GGA
1108 F4	RS P	T B \$	FCC4, FUNDAMENTAL	MODE FAST REACTOR	X-SEC CALC	BNW
1108 F4	RS P	T C \$	BISYN, 2-D MULTI-GP	DIFFUSION SYNTHESIS	CALC	NED
1108 F4	RS P	T C \$	GASP7, 1-D BURNUP	POWER DISTRIBUTION	SEARCH	GGA
1108 F4	RS P	T C \$	GATT, 3-D FEW-GP	DIFFUSION CALC	HEX-Z MESH	GGA
1108 F4	RS P	T C \$	TEMC07, TEMPERATURE	COEFFICIENT CALCULATION		GGA
1108 F4	RS P	T D \$	FEVER7, 1-D MULTIGROUP	DIFFUSION AND	DEPLETION	GGA
1108 F4	RS P	T D \$	GAUGE, 2-D FEW-GP	HEX GEOM	DIFFUSION DEPLETION	GGA
1108 F4	RS P	T D \$	PWCOST, REACTOR	FUEL CYCLE COST	CALCULATION	GGA
1108 F4	RS P	T D \$	ZDB, 2-D MULTIGROUP	DIFFUSION AND	DEPLETION	BNW
1108 F4	RS P	T D \$	3DR, 3-D MULTIGROUP	DIFFUSION BURNUP	ANALYSIS	HEDL
1108 F4	RS P	T F \$	GAKIN, 1-D MULTIGROUP	TIME-DEPENDENT	DIFFUSION	GGA
1108 F4	RS P	T F \$	GAKIT, 1-D MULTIGP	KINETICS WITH	TEMP FEEDBACK	GGA
1108 F4	RS P	T F \$	WIGL2, 1-D 2-GP	SPACE-TIME	DIFFUSION 3-GEOM	GGA
1108 F4	RS P	T G \$	RELAP3, REACTOR	BLOWDOWN -	EXCURSION ANALYSIS	ANC
1108 F4	RS P	T H \$	DYNAM, DYNAMIC	ANALYSIS	BOILING FLOW	STEAM
1108 F4	RS P	T H \$	LION4, 3-D	TEMPERATURE	DISTRIBUTION	PROGRAM
1108 F4	RS P	T H \$	MOXY, BWR	FUEL ELEMENT	HEAT TRANSFER	CALC
1108 F4	RS P	T I \$	SAFE-3D, 3-D	COMPOSITE	STRUCTURE	STRESS STUDY
1108 F4	RS P	T J \$	MUSCAT, VIEW	FACTOR	SHIELDING	CODE CAVITY GEOM
1108 F4	RS P	T K \$	PREP,KITT, SYSTEM	FAULT TREE	EVALUATION	CODES

1108		1604	
1108	F4	RS P X A \$	COHRE, COHERENT INELASTIC SCATTERING LAW CALC GGA 385
1108	F4	RS P X T B \$	GAF, GAR, SPECTRA AND GROUP-AVERAGED X-SEC CALC GGA 316
1108	F4	RS P X T B \$	1DX, 1-D DIFFUSION FAST X-SECTION GENERATION BNW 374
1108	F4	RS P X T L \$	GAND, GAFGAR X-SECTION LIBRARY PREPARATION GGA 345
1108	F4	RS P XCT C \$	GAPER1D, 1-D TRANSPORT PERTURBATION THEORY GGA 606
1108	F4	RS PLX T B \$	GGC4, MULTI-GP X-SECTIONS FAST THERMAL SPECTRA GGA 298
1108	F4	RS PLX T B \$	PRG3, SLOWING-DOWN SPECTRUM, MULTIGP CONSTANTS BNW 467
1108	F5	RS LX T B \$	LEOPARD, SPECTRA CALCULATION WITH DEPLETION JNC 279
1108	F5	RS P A \$	FLANGF1, SCATTERING LAW X-SECTION CALCULATION GGA 247
1108	F5	RS P H \$	FLAC, STEADY-STATE FLOW, PRESSURE DISTRIBUTION GGA 355
1108	F5	RS P T B \$	ENDFB2, GAND2, GFF2, ENDF/B TO GAFGAR X-SECTIONS GGA 556
1108	F5	RS P T C \$	2DF, 2-D MULTI-GP DISCRETE ORDINATE CONF GGA 173
1108	F5	RS P T D \$	DRUFIT1, LEAST SQUARES TRANSMUTATION ANALYSIS BNWL 456
1108	F5	RS P T H \$	REPP, THERMAL-HYDRAULIC WATER REACTOR DESIGN BNW 483
1108	F5	RS P T H \$	TAC2D, STEADY-STATE AND TRANSIENT TEMP CALC GGA 408
1108	F5	RS P T H \$	TAC3D, TRANSIENT 3-D HEAT TRANSFER PROGRAM GGA 414
1108	F5	RS P T I \$	SAFE-CRACK, VISCOELASTIC ANALYSIS OF CONCRETE GGA 451
1108	F5	RS P T I \$	SHELL5, THIN SHELL 3-D STRUCTURAL ANALYSIS GGA 452
1108	F5	RS P T M \$	TROUT, MUG MULTIGROUP XSEC LIBRARY MAINTENANCE NEC 493
1108	F5	RS P T N \$	GAPER2D, 2-D PERTURBATION CALC FROM 2DF OUTPUT GGA 471
1108	F5	RS P T O \$	CAGE, BIRD, SPEC, TIME-OF-FLIGHT DATA ANALYSIS CEES 476
1108	F5	RS P T R \$	TOPLYR2, POWER PLANT THERMAL DISCHARGE STUDY HEDL 599
1108	F5	RS P CT A \$	FSDP3, POINTWISE XSECS. FROM E-W PARAMETERS GGA 216
1108	F5	RS P X T D \$	PACTOLUS, CLOTHC, NUCLEAR POWER PLANT COST CODE HEDL 540
1108	F5	RS P X T F \$	NOISY1, AUTO- AND CROSS-SPECTRAL DENSITIES BNW 488
1108	F5	RS P X T P \$	FUNPACK, SPECIAL FUNCTION ROUTINES-EI, K, E, ANL 610
1108	F5	RS PLX T B \$	RPT1, THERMAL SPECTRUM X-SECTION CALC BNW 184
1108	F5	RSRPL T D \$	ISCGEN, RADIONUCLIDE GENERATION AND DECAY BNW 367
1108	F4	RS P X T B \$	FTOX3, MULTI-GP CONSTANTS FROM ENDF/B FOR 1DX HEDL 388
1108	F4	RS P T H \$	COPRAC3, ROD BUNDLE THERMAL-HYDRAULIC ANALYSIS BNW 432
14.5-14,500	PSIA	32-472	DEGF BAPL 6600 F4 RS T H \$ WATER, STEAM TABLES 267
14.5-2538	PSIA		ANL 1604 F63 RS P H \$ M0899, HCH, STEAM TABLES 294
14.5-2539	PSIA		BAPL 6600 F4 RS P T H \$ M0899, HCH, STEAM TABLES 294
1604	F+CDP	RS P T P \$	LAG, ASSEMBLER FOR FLOCC2 INSTRUCTION SET PW 186
1604	F+CDP	RS P X T B \$	FMC-N, FMC-G, MC NEUTRON, GAMMA-RAY HISTORIES PW 195
1604	F2	RS P H \$	BIGDEAL, SPENT YANKEE-FUEL TEMPERATURE CALC ORNL 549
1604	F63	RS C \$	PERT, 1-D PERTURBATION FOR AIM AND FCG CODES CDC 30
1604	F63	RS C \$	TDP, 2-D PERTURBATION TDC OR 2DXY FLUX INPUT PW 159
1604	F63	RS C \$	2DF, 2-D MULTI-GP DISCRETE ORDINATE CODE UNC 173
1604	F63	RS I \$	WOPXPRT, REACTOR WEIGHT OPTIMIZATION STUDY PW 190
1604	F63	RS L \$	CSP1, SN X-SECTION LIBRARY TAPE PREPARATION PW 194
1604	F63	RS L \$	CSP2A, SN X-SECTION LIBRARY TAPE PREPARATION PW 193
1604	F63	RS T C \$	2DXYL, 3-D MULTI-GP FLUX SYNTHESIS PROGRAM CYL PW 192
1604	F63	RS L T D \$	SIZZLE, 1-D MULTIGROUP DIFFUSION DEPLETION CDC 58
1604	F63	RS P A \$	HAFEVER, HAUSER-FESHBACH INELASTIC SCATTERING CDC 14
1604	F63	RS P A \$	PEGGY, ELASTIC SCATTERING PHASE-SHIFT ANALYSIS ORNL 334
1604	F63	RS P A \$	RAMES, PARTICLE WAVE FUNCTION RADIAL INTEGRALS ORNL 335
1604	F63	RS P B \$	SAIL, 1-D 1-GP SN APPROXIMATION SLAB GEOMETRY CDC 52
1604	F63	RS P B \$	S4 CYL CELL CODE, 1-D 1-GP S4 APPROXIMATION CDC 53
1604	F63	RS P D \$	ISOCRUNCH, REACTION DECAY CHAIN ANALYSIS ORNL 180
1604	F63	RS P D \$	ISOSEARCH, ISOTOPE PRODUCTION FLUX, X-SEC CALC ORNL 322
1604	F63	RS P D \$	ISOTOPES, MAXIMUM YIELD FROM REACTION OR DECAY ORNL 179
1604	F63	RS P D \$	POWERCO, NUCLEAR STATION ELECTRICITY COSTS ORNL 340
1604	F63	RS P E \$	AIREK3, SPACE-INDEPENDENT KINETICS W/FEEEDBACK CDC 121
1604	F63	RS P E \$	CMPTMAT, TRANSFER FUNCTION EVALUATION PW 188
1604	F63	RS P F \$	AX-TNT, COUPLED NEUTRONICS-HYDRODYNAMICS SPH PW 191
1604	F63	RS P G \$	CLOUD, GAMMA-RAY DOSE RATE FROM A CLOUD CDC 47
1604	F63	RS P H \$	M0899, HCH, STEAM TABLES 14.5-2538 PSIA ANL 294
1604	F63	RS P J \$	GRACE1, GAMMA-RAY ATTENUATION SLAB GEOMETRY CDC 45
1604	F63	RS P J \$	GRACE2, GAMMA-RAY ATTENUATION CYL SPHERE GEOM CDC 46
1604	F63	RS P L \$	SNC, CALCULATION OF SN CONSTANTS FOR DSN TDC PW 189
1604	F63	RS P T A \$	JUPITER1, COUPLED-CHANNEL X-SEC EVALUATION ORNL 308
1604	F63	RS P T C \$	EQUIPOISE3A, 2-D 2-GP DIFFUSION CYLINDER SLAB CDC 87
1604	F63	RS P T C \$	FOG, 1-D FFW-GP DIFFUSION SLAB CYLINDER SPHERE CDC 28

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1604	F63	RS P	T C	\$	FORTTRAN TDC, 2-D MULTI-GP SN APPROXIMATION RZ	PW	161
1604	F63	RS P	T C	\$	WHIRLAWAY, 3-D 2-GROUP DIFFUSION XYZ GEOMETRY	CDC	32
1604	F63	RS P	T C	\$	20GRAND, 2-D FEW-GROUP DIFFUSION SLAB CYLINDER	CDC	40
1604	F63	RS P	T I	\$	PIP, CENTRIFUGAL PUMP IMPELLER DESIGN STUDY	PW	187
1604	F63	RS PL	T A	\$	ARES2, RESONANCE INTEGRAL X-SECTION CALC	CDC	89
1604	F63	RS PL	T B	\$	FORM, FAST NEUTRON SPECTRUM X-SECTION CALC	CDC	51
1604	F63	RS PL	T B	\$	TEMPEST2, THERMAL NEUTRON SPECTRUM X-SECTIONS	CDC	50
1604	F63	RS PL	T C	\$	AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	CDC	29
1604	F63	RS PL	T C	\$	DTF, 1-D MULTIGROUP DISCRETE ORDINATE CALC	UNC	144
1604	F63	RS PLX	T B	\$	GAM1, FAST NEUTRON SPECTRUM X-SECTION CALC	CDC	33
1604	F63	RS PLX	T C	\$	FAIM, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	CDC	120
1604	LAG1	RS P		C	MGDSN, 1-D MULTI-GP SN APPROX SLAB CYL SPHERE	PW	211
1604	LAG1	RS P		N	CTX, EFFECTIVE X-SECTION CALC FROM DSN OUTPUT	PW	210
18-	24-	AND	25-	GROUP	SETS LASL 6600 BCD R LX T Z \$ LASL XSEC SETS, SN		532
1967	ASME	STEAM	AND	WATER	PROPERTIES BG&E 360 F4 RS T H \$ STEAM-67,		487
2-	OR	3-D	HEAT	CONDUCTION	LUMPED MASS LASL 7030 F4 PS T H \$ RATH,		242
2-	OR	3-D	HEAT	CONDUCTION	LUMPED MASS LASL 7094 FAP RS P T H \$ RATH,		242
2-CELL	ANALYSIS	AI	360	F4	RS P T G \$ SOFIPE2, SODIUM POOL FIRE 1- &		559
2-D	+	3-D	PLOTTING	KAPL 6600 F+ASC RS P T P \$ DATATRAV UTILITY MODULES,			407
2-C	AXISYMMETRIC	&	PLANE	ELASTIC-PLASTIC	BAPL 6600 F+COM RS P T I \$ OZZ2,		503
2-D	BODIES	BNL	6600	F4	RS P T I \$ SAFE-PLANE, PLANE STRESS ANALYSIS,		252
2-C	BODIES	GGA	1108	F4	RS P I \$ SAFE-PLANE, PLANE STRESS ANALYSIS,		252
2-D	DESIGN	PROGRAMS	LASL 7090	F+FAP RS P T L \$ OPC, DATA PREPARATION FOR			234
2-D	DIFFUSION	ABSORPTION	REMOVAL	X-SECS	BAPL 6600 F4 RS T R \$ M0807,		280
2-D	EXCURSION	CALCULATION	P-Z	GEOMETRY	APDA 7094 F4 RS P F \$ MARS,		293
2-D	FEW-GP	DIFFUSION	BURNUP	RZ	GEOMETRY GGA 7090 F+FAP RSBP T D \$ DDB,		99
2-D	FEW-GP	HEX	GEOM	DIFFUSION	DEPLETION GGA 1108 F4 RS P T D \$ GAUGE,		339
2-D	FEW-GP	S4	APPROXIMATION	RZ	GEOMETRY LRL 709 F2 PS C \$ FIRN,		7
2-D	FEW-GROUP	DIFFUSION	AND	DEPLETION	IBM 360A F+BAL PS P T D \$ PDQ5,		336
2-D	FEW-GROUP	DIFFUSION	AND	DEPLETION	MIT 360P F+BAL RSBP T D \$ PDQ5,		336
2-D	FEW-GROUP	DIFFUSION	SLAB	CYLINDER	CDC 1604 F63 RS P T C \$ 20GRAND,		40
2-D	FEW-GROUP	DIFFUSION	SLAB	CYLINDER	CRNL 7090 F2 RS P T C \$ 20GRAND,		40
2-D	FLUX	SETS	GESV H600	F4	RS P CT C \$ TRIAL, 3-D REACTION RATES FROM		585
2-D	GEOMETRY	INPUT,	PREPARATION,	EDIT	KAPL 6600 F+ASC RS P T L \$ DATATRAV		406
2-D	HEAT	TRANSFER	GGA 1108	F+RAL PS P T F \$ BLOOST6, COMBINED KINETICS			303
2-D	HEAT	TRANSFER	GGA 7044	F+MAP RS P T H \$ BLOOST5, POINT-KINETICS WITH			205
2-D	HETEROGENEOUS	REACTOR	CALCULATION	DP	360B F4 RSBP CT C \$ HERESY3,		136
2-D	HYDRODYNAMIC	RESPONSE	TO	EXCURSION	ANL 360 F4 RS P CT F \$ RFXCO-H,		550
2-D	LMFBR	POWER	EXCURSION	DISASSEMBLY	ANL 360 F4 RS P XCT F \$ VENUS,		511
2-D	MONTI	CARLO	CELL	CALCULATION	AI 360 F+RAL RS P X T B \$ HWCCR-SAFE,		307
2-D	MULTI-GP	DIFFUSION	UMCC 360	F4	RS P T C \$ VARI-QUIR, TIME-DEP		212
2-D	MULTI-GP	DIFFUSION	WANL 6600	F4	RS P T C \$ VARI-QUIR, TIME-DEP		212
2-D	MULTI-GP	DIFFUSION	DEPLETION	CODE	CRNL 7090 F+FAP RS P T D \$ ASSAULT,		240
2-D	MULTI-GP	DIFFUSION	PROGRAM	AAEC 360	F+RAL PS P T C \$ CPAM, 1-D AND		103
2-D	MULTI-GP	DIFFUSION	PROGRAM	CRNL 7090	F+FAP PS P T C \$ EXTERMINATOR,		156
2-D	MULTI-GP	DIFFUSION	PROGRAM	UK-R 7090	F+FAP RSBP T C \$ CRAM, 1-D AND		103
2-D	MULTI-GP	DIFFUSION	PROGRAM	RC 625	F4 RS T C \$ EXTERMINATOR2,		156
2-D	MULTI-GP	DIFFUSION	PROGRAM	CE 6600	F4 RS P T C \$ EXTERMINATOR2,		156
2-D	MULTI-GP	DIFFUSION	PROGRAM	CRNL 360	F4 RS P T C \$ EXTERMINATOR2,		156
2-D	MULTI-GP	DIFFUSION	SYNTHESIS	CALC	NED 635 F4 RS PL T C \$ BISYN,		287
2-D	MULTI-GP	DIFFUSION	SYNTHESIS	CALC	NED 1108 F4 RS P T C \$ BISYN,		287
2-D	MULTI-GP	DIFFUSION	XY RZ	GEOMETRY	GGA 1108 F+RAL RS P T C \$ GAMBLE5,		222
2-D	MULTI-GP	DIFFUSION	XY RZ	GEOMETRY	GGA 7044 F+MAP RSBP T C \$ GAMBLE4,		222
2-D	MULTI-GP	DIFFUSION	XY RZ	RTH	WANL 7094 F4 RS P X T C \$ VARI-QUIR3,		264
2-D	MULTI-GP	DISCRETE	ORDINATE	CODE	GGA 1108 F5 RS P T C \$ 2DF,		173
2-D	MULTI-GP	DISCRETE	ORDINATE	CODE	UNC 1604 F63 RS C \$ 2DF,		173
2-D	MULTI-GP	SN	APPROXIMATION	RZ	PW 1604 F63 RS P T C \$ FORTTRAN TDC,		161
2-D	MULTI-GP	SN	APPROXIMATION	XY	GEOM AGC 7090 FLCCO RSBP C \$ 2DXY,		18
2-D	MULTI-GP	TRANSPORT	XY RZ	RTHETA	LASL 360B F4 RS P CT C \$ TWOTRAN2,		358
2-D	MULTI-GP	TRANSPORT	XY RZ	RTHETA	LASL 6600B F4 RS P T C \$ TWOTRAN2,		358
2-D	MULTI-GP	TRANSPORT	XY RZ	RTHETA	LASL 7600B F4 RS P T C \$ TWOTRAN2,		358
2-D	MULTIGP	DIFFUSION	TRIANGULAR	MESH	GGA 1108 F+RAL RS P T C \$ GAMTRI,		401
2-D	MULTIGP	DIFFUSION	+BURNUP	TRI-MESH	GGA 1108 F+BAL RS P T D \$ BUGTRI,		439
2-D	MULTIGROUP	DIFFUSION	&	BURNUP	XY, RZ GGA 1108 F+BAL RS P T D \$ BUG2,		438

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2-D MULTIGROUP DIFFUSION & SN THEORY	NFC	635	F4	RS P	T C	\$	COT2DB,	459
2-D MULTIGROUP DIFFUSION AND DEPLETION	ANL	3600	F4	RSBP	T D	\$	2DB,	325
2-D MULTIGROUP DIFFUSION AND DEPLETION	BNW	1108	F4	RS P	T D	\$	2DB,	325
2-D MULTIGROUP DIFFUSION AND DEPLETION	LASL	6600	F4	RS P	T D	\$	2DB,	325
2-D MULTIGROUP DISCRETE ORDINATE PROGRAM	LER	7090	F+MAP	RS P	T C	\$	TDSN,	312
2-D PARTICLE TRANSPORT XY RZ RTH LASL 7600	F4		RS P	T C	\$	TWOTRAN-PNVW,	573	
2-D PERTURBATION CALC FROM 2DF OUTPUT GGA	1108	F5	RS P	T N	\$	GAPER2D,	471	
2-D PERTURBATION TDC OR 2DXY FLUX INPUT	PW	1604	F63	RS	C	\$	TDP,	199
2-D PERTURBATION XY RZ RTHETA GFCMETRY	BNW	1108	F4	RS P	C	\$	PERT4,	304
2-D TIME-DEPENDENT HEAT CONDUCTION	PPCO	7044	F+MAP	RS P	T H	\$	TCDDEE,	349
2-D TRANSIENT HEAT CONDUCTION PROGRAM	RAPL	6600	F4	RS P	T H	\$	HOT2,	286
2-D TRIANGULAR MESH TRANSPORT PROGRAM	LASL	360	F4	RSBP	CT C	\$	TRIPLET,	608
2-D TRIANGULAR MESH TRANSPORT PROGRAM	LASL	6600	F4	RS P	T C	\$	TRIPLET,	608
2-D TRIANGULAR MESH TRANSPORT PROGRAM	LASL	7600	F4	RS P	T C	\$	TRIPLET,	608
2-D 2-GP DIFFUSION CYLINDER SLAB CDC	1604	F63	RS P	T C	\$	EQUIPOISE3A,	87	
2-D 2-GP DIFFUSION CYLINDER SLAB CRNL	7090	F2	RS P	T C	\$	EQUIPOISE3A,	87	
2-D 2-GP SPACE-TIME DIFFUSION	ANL	360	F4	RS P	F	\$	TWIGGLE,	338
2-D 2-GP SPACE-TIME DIFFUSION FEEDBACK	BAPL	6600	F4	RS P	T F	\$	TWIGL,	338
2-D 2-GROUP DIFFUSION SLAB CYL	CRNL	7090	F2	RS P	T C	\$	EQUIPOISE3,	39
2-D 2-PHASE FLOW	AI	7094	F2	RS P	H	\$	FLOW-MODEL, MULTI-CHANNEL	246
2-D 2-PHASE FLOW	MSS	360	F4	RS P	H	\$	FLOW-MODEL, MULTI-CHANNEL	246
2-DIMENSIONAL HEAT CONDUCTION	CRNL	360	F4	RS P	X T F	\$	ORTHIS, ORTHAT,	525
2-GP DIFFUSION CYLINDER SLAB CDC	1604	F63	RS P	T C	\$	EQUIPOISE3A, 2-D	87	
2-GP DIFFUSION CYLINDER SLAB CRNL	7090	F2	RS P	T C	\$	EQUIPOISE3A, 2-D	87	
2-GP KINETICS TEMPERATURE FEEDBACK	BAPL	6600	F4	RS P	T F	\$	NCWIG, 1-D	371
2-GP SPACE-TIME DIFFUSION	ANL	360	F4	RS P	F	\$	TWIGGLE, 2-D	338
2-GP SPACE-TIME DIFFUSION FEEDBACK	BAPL	6600	F4	RS P	T F	\$	TWIGL, 2-D	338
2-GP SPACE-TIME DIFFUSION 3-GFCM	BAPL	6600	F4	RS P	T F	\$	WIGL2, 1-D	274
2-GP SPACE-TIME DIFFUSION 3-CFCM	GGA	1108	F4	RS P	T F	\$	WIGL2, 1-D	274
2-GROUP DIFFUSION SLAB CYL	CRNL	7090	F2	RS P	T C	\$	EQUIPOISE3, 2-D	39
2-GROUP DIFFUSION XYZ GEOMETRY CDC	1604	F63	RS P	T C	\$	WHIRLAWAY, 3-D	32	
2-GROUP DIFFUSION XYZ GEOMETRY CRNL	7090	F2	RS P	T C	\$	WHIRLAWAY, 3-D	32	
2-PASS ASSEMBLER FOR THE PDP-11 ON 360 ANC	360	PL1	RS P	T P	\$	PTAC11,	516	
2-PHASE FLOW	AI	7094	F2	RS P	H	\$	FLOW-MODEL, MULTI-CHANNEL 2-D	246
2-PHASE FLOW	MSS	360	F4	RS P	H	\$	FLOW-MODEL, MULTI-CHANNEL 2-D	246
2-REF CELL	ANL	3600	F36	RSBP	X T R	\$	RIFF-RAFF, RESONANCE INTEGRAL CALC	213
2D CONTCUR PLOTS & AREA CALCULATION	SLA	6600	F4	RS P	P	\$	PLOTR,	578
2D DIFFUSION BURNUP REFUELING HISTORY	LASL	6600	F4	RS P	T D	\$	PHENIX,	454
2D FEW-GROUP SPACE-TIME KINETICS	BCL	6400	F4	RS P	T F	\$	ADEP, 1D AND	494
2D SYNTHESIS MULTIGP DIFF & 1GP DEPLETION	NFC	635	F+GMP	RS P	T D	\$	SYN,	455
2DB, 2-D MULTIGROUP DIFFUSION AND DEPLETION	ANL	3600	F4	RSBP	T D	\$		325
2DB, 2-D MULTIGROUP DIFFUSION AND DEPLETION	BNW	1108	F4	RS P	T D	\$		325
2DB, 2-D MULTIGROUP DIFFUSION AND DEPLETION	LASL	6600	F4	RS P	T D	\$		325
2DF OUTPJT GGA	1108	F5	RS P	T N	\$	CAPER2D, 2-D PERTURBATION CALC FROM	471	
2DF, 2-D MULTI-GP DISCRETE ORDINATE CODE	GCA	1108	F5	RS P	T C	\$		173
2DF, 2-D MULTI-GP DISCRETE ORDINATE CODE	UNC	1604	F63	RS	C	\$		173
2DXY FLUX INPUT	PW	1604	F63	RS	C	\$	TDP, 2-D PERTURBATION TDC OR	199
2DXY, 2-D MULTI-GP SN APPROXIMATION XY GFCM	ACC	7090	FLECC	RSBP	C	\$		18
2DXYL, 3-D MULTI-GP FLUX SYNTHESIS PROGRAM CYL	PW	1604	F63	RS	T C	\$		192
2PLUS, NON-SPHERICAL OPTICAL MODEL X-SECTIONS	AI	7094	F2	RS P	T A	\$		254
2PLUS, NON-SPHERICAL OPTICAL MODEL X-SECTIONS	ANL	3600	F63	RSPP	T A	\$		254
2OGRAND, 2-D FEW-GROUP DIFFUSION SLAB CYLINDER CDC	1604	F63	RS P	T C	\$		40	
2OGRAND, 2-D FEW-GROUP DIFFUSION SLAB CYLINDER CRNL	7090	F2	RS P	T C	\$		40	
2000 F2	RS P	A	\$	DOPIE, RESOLVED RESONANCE X-SECTION CALC	NED		177	
2000 F2	RS P	A	\$	RAPTURE, RESONANCE INTEGRAL X-SECTION CALC	NED		176	
2000 F2	RS P	B	\$	SPARTA, SPATIALLY-AVERAGED DOPPLER EFFECTS	NED		178	
2000 F4	RS	A	\$	STRIP, RESOLVED RESONANCE INTEGRAL CALCULATION	RW		305	
2000 F4	RS P	T F	\$	FORF, FAST REACTOR EXCURSION CALCULATIONS	NED		174	
230 F4	RS P	T	\$	CLUP77, SQUARE CELL COLLISION PROBABILITY CALC	JAER		526	
24- AND 25-GROUP SETS	LASL	6600	RCD	R	LX T Z	\$	LASL XSEC SETS, SN 18-	532
25-GROUP SETS	LASL	6600	RCD	R	LX T Z	\$	LASL XSEC SETS, SN 18- 24- AND	532
3-D COMPOSITE STRUCTURE STRESS STUDY	GGA	1108	F4	RS P	T I	\$	SAFE-3D,	332
3-D COMPOSITE STRUCTURE STRESS STUDY	CRNL	360	F+RAL	RS P	T I	\$	SAFE-3D,	332
3-D DIFFUSION DEPLETION MULTIGP	CRNL	3600	F4	RS P	T K	\$	CITATION, 1,2,	387

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3-D FEW-GP DIFFUSION CALC HEX-Z MESH	CGA	1108	F4	RS P	T C	\$ GATT,	380
3-D FEW-GP DIFFUSION DEPLETION	ANC	360F	F+BAL	RS P	XCT D	\$ PDQ7, 1,2 CR	275
3-D FEW-GP DIFFUSION DEPLETION	RAPL	660CA	F+ASC	RS P	T D	\$ PDQ7, 1,2 CR	275
3-D FEW-GP DIFFUSION DEPLETION	RAPL	6600C	F+ASC	RS P	T C	\$ PDQ7, 1,2 CR	275
3-D FEW-GP DIFFUSION DEPLETION	RCS	6600D	F+ASC	R B	T C	\$ PDQ7, 1,2 CR	275
3-D FEW-GP DIFFUSION DEPLETION	PW	6600R	F+ASC	RS P	T D	\$ PDQ7, 1,2 CR	275
3-D FINITE ELEMENT ELASTIC ANALYSIS	BAPL	6600	F+CCM	RS P	X T I	\$ MATUS,	557
3-D HEAT CONDUCTION LUMPED MASS	LASL	7030	F4	PS	T H	\$ RATH, 2- CR	242
3-D HEAT CONDUCTION LUMPED MASS	LASL	7094	FAP	RS P	T H	\$ RATH, 2- CR	242
3-D HEAT CONDUCTION PROGRAM	ORNL	360	F4	RS P	T H	\$ HEATING3, 1,2, CR	517
3-D HEAT TRANSFER PROGRAM	GGA	1108	F5	RS P	T H	\$ TACAD, TRANSIENT	414
3-D MULTI-GP FLUX SYNTHESIS PROGRAM	CYL PW	1604	F63	PS	T C	\$ 2DXYL,	192
3-D MULTIGROUP DIFFUSION BURNUP ANALYSIS	ANL	360	F4	RS P	CT D	\$ 3DB,	567
3-D MULTIGROUP DIFFUSION BURNUP ANALYSIS	HEPL	1108	F4	RS P	T D	\$ 3DB,	567
3-D MULTIGROUP DIFFUSION XYZ R-THETA-Z	LASL	6600	F4	RS P	T C	\$ 3DDT,	463
3-D PLOTS ON IBM2280 OR CALCOMP780	ANL	360	F4	RS P	T N	\$ PICT-3D,	544
3-D PLOTTING	KAPL	6600	F+ASC	RS P	T P	\$ DATATRAV UTILITY MODULES, 2-D +	407
3-D REACTION RATES FROM 2-D FLUX SETS	GESV	H600	F4	RS P	CT C	\$ TRIAL,	585
3-D REACTIVITY AND POWER DISTRIBUTION	CCC	3600	F63	RSEP	T C	\$ FLARE,	167
3-D REACTIVITY AND POWER DISTRIBUTION	MSS	360	F4	RS P	CT C	\$ FLARE,	167
3-D REACTIVITY AND POWER DISTRIBUTION	NEP	635	F4	RS P	T C	\$ FLARE,	167
3-D STRUCTURAL ANALYSIS	GGA	1108	F5	RS P	T I	\$ SHELL5, THIN SHELL	452
3-D STRUCTURES	KAPL	6600	F4	RS P	X	I \$ FINEL, FINITE-ELEMENT STUDY 2,	404
3-D TEMPERATURE DISTRIBUTION PROGRAM	CHI	1108	F4	RS P	T H	\$ LION4,	299
3-D TEMPERATURE DISTRIBUTION PROGRAM	KAPL	6600	F+ASC	RS P	T H	\$ LION4,	299
3-D TRANSIENT HEAT TRANSFER PROGRAM	GEC	635	F+GMP	RSEP	T H	\$ THTE,	346
3-D XENON TRANSIENT & DEPLETION	KAPL	6600	F4	PS P	T D	\$ 3DXT,DEP3,	477
3-D XYZ XENON OSCILLATION	CEND	360	F4	RS P	X T F	\$ CEXE,INCEXE, 1-GP	415
3-D 2-GROUP DIFFUSION XYZ GEOMETRY	CCC	1604	F63	RS P	T C	\$ WHIRLAWAY,	32
3-D 2-GROUP DIFFUSION XYZ GEOMETRY	ORNL	7090	F2	RS P	T C	\$ WHIRLAWAY,	32
3-GEOM	BAPL	6600	F4	RS P	T F	\$ WIGL2, 1-D 2-GP SPACE-TIME DIFFUSION	274
3-GFCM	GGA	1108	F4	RS P	T F	\$ WIGL2, 1-D 2-GP SPACE-TIME DIFFUSION	274
3DB, 3-D MULTIGROUP DIFFUSION BURNUP ANALYSIS	ANL	360	F4	RS P	CT D	\$	567
3DB, 3-D MULTIGROUP DIFFUSION BURNUP ANALYSIS	HEPL	1108	F4	RS P	T D	\$	567
3DDT, 3-D MULTIGROUP DIFFUSION XYZ R-THETA-Z	LASL	6600	F4	RS P	T C	\$	463
3DXT,DEP3, 3-D XENON TRANSIENT & DEPLETION	KAPL	6600	F4	RS P	T D	\$	477
30-GP ENDF/B SCAT KERNELS	DP	360	BCD	R	LX T Z	\$ THERMOS LIBRARY,	543
32-472DEGF	BAPL	6600	F4	RS	T H	\$ WATER, STEAM TABLES 14.5-14,500PSIA	267
36F	RS PL	CT F	\$	QX1, QUASISTATIC SPATIAL REACTOR KINETICS CODE	ANL	3600	474
36F	RSEP	T M	\$	MERMC2,MAGIC, MC**2 LIBRARY SERVICE ROUTINES	ANL	3600	472
360	BAL	RSB	T P	\$	NRTS-PJE, CS/360 MVT REMOTE JOB ENTRY SYSTEM	ANC	519
360	BCD	R	LX T Z	\$	THERMOS LIBRARY, 30-GP ENDF/B SCAT KERNELS	DP	543
360	COROL	RS P	M	\$	AFC-ALC FAU, RADIC FREQUENCY MANAGEMENT SYSTEM	ALOC	587
360	COROL	RSEP	CT M	\$	BECON, AEC DP PURCHASE VERSUS LEASE ANALYSIS	SLA	589
360	F+ASM	RSB	CT P	\$	WSP-HASP/COS, DOS-MFT REMOTE WORKSTATION PKG	ANL	541
360	F+BAL	S	T M	\$	JOSHUA, DATA STORAGE, RETRIEVAL, AND DISPLAY	DP	490
360	F+PAL	S	X T B	\$	RAHA9, JOSHUA SYSTEM LATTICE PHYSICS MODULES	DP	536
360	F+PAL	R B L	T P	\$	TSC-SPEAKEASY, LANGUAGE PROCESSOR UNDER TSO	ANL	553
360	F+PAL	RS	T P	\$	AMPLIB, ARGONNE SUBROUTINE LIBRARY CAT. F	ANL	563
360	F+PAL	PS	T P	\$	FIGS, IBM360&2250 FORTRAN GRAPHICS SUBROUTINES	AI	484
360	F+BAL	RS P	D	\$	ISCSEARCH, ISOTOPE PRODUCTION FLUX, X-SEC CALC	ORNL	322
360	F+BAL	RS P	T A	\$	COMNUC,CASCADE, COMPOUND NUCLEUS REACTION	AI	482
360	F+BAL	RS P	T B	\$	RAFFLE, 1ST FLIGHT COLLISION PROBABILITIES MC	ORNL	392
360	F+BAL	RS P	T C	\$	GRAM, 1-D AND 2-D MULTI-GP DIFFUSION PROGRAM	AAEC	103
360	F+BAL	RS P	T C	\$	DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	ANL	209
360	F+BAL	RS P	T D	\$	CINDER,M0102, PCINT DEPLETION FISSION PRODUCT	CP	313
360	F+BAL	RS P	T E	\$	AIROS2A, SIMULATION OF REACTOR DYNAMICS	AI	326
360	F+BAL	RS P	T I	\$	SAFE-3C, 3-D COMPOSITE STRUCTURE STRESS STUDY	ORNL	332
360	F+BAL	RS P	CT B	\$	U3R, UNRESOL RESONANCE XSEC PROBABILITY TABLES	AI	553
360	F+BAL	RS P	CT M	\$	ARC-SYSTEM, SYSTEM SUBPROGRAMS AND MODULES	ANL	522
360	F+PAL	RS P	X T B	\$	HWOCR-SAFF, 2-D MONTE CARLO CELL CALCULATION	AI	307
360	F+PAL	RS P	XCT B	\$	HAMMER,LITHE,HELP, CRITICAL ANALYSIS SYSTEM	CP	277
360	F+PAL	RSB	L CT M	\$	SCORE3, SCISRS ENDF/B GRAPHIC X-SEC EVALUATION	AI	375
360	F+PAL	RSEP	CT G	\$	CONTEMP-LT/022, PRESSURE-TEMPERATURE RESPONSE	ANC	433

360	F+PAL	RSBPL	CT	C	\$	FSP, MONTE CARLO REACTOR ANALYSIS CALCULATION	CRNL	523	
360	F+BAI	RSBPL	CT	C	\$	KFNC, MONTE CARLO MULTIGROUP CRITICALITY CODE	CRNL	450	
360	F+RAL	RSJPL	CT	G	\$	PARET, WATER-COOLED CORE TRANSIENT ANALYSIS	ANC	555	
360	F+C+P	RSBP	T	M	\$	RALCRTPH, RESOURCE ALLOCATION PROJECT PLANNING	MLMO	603	
360	F+P+A	RS	T	P	\$	AMDLIRAF, ARGONNE SUBROUTINE LIBRARY CAT. A-F	ANL	562	
360	F+P+A	RS	T	P	\$	AMDLIBGZ, ARGONNE SUBROUTINE LIBRARY CAT. G-Z	ANL	564	
360	F4	RS		M	\$	MEPMC2, MC**2 BINARY LIBRARY TAPE MAINTENANCE	ANL	472	
360	F4	RS		T	H	\$	STEAM-67, 1967 ASME STEAM AND WATER PROPERTIES	RG&E	487
360	F4	RS		T	M	\$	RIGFL, ENDF/B V3 DATA PROCESSING CODE	ANL	571
360	F4	RS	L	T	C	\$	FIFP5, 1-D AGE-DIFFUSION SLAB CYLINDER SPHERE	AER	9
360	F4	RS	P		A	\$	COILLI, LEAST SQUARES ANALYSIS RESONANCE DATA	JILL	347
360	F4	RS	P		A	\$	PSFUCO, STATISTICAL RESONANCE PARAMETER CALC	ENEA	292
360	F4	RS	P		B	\$	WELWING, MATERIAL BUCKLING CYL FUEL ELEMENTS	AEB	362
360	F4	RS	P		C	\$	PERT, 1-D PERTURBATION FOR AIM AND FOG CODES	BHSC	30
360	F4	RS	P		E	\$	AIRFK3, SPACE-INDEPENDENT KINETICS W/FEEDBACK	AEB	121
360	F4	RS	P		E	\$	BLAST, REACTOR KINETICS TEMPERATURE DIST STUDY	AFR	363
360	F4	RS	P		E	\$	R101, SPACE-INDEPENDENT KINETICS KFX OPTIONS	ANL	255
360	F4	RS	P		E	\$	R102, SPACE-INDEPENDENT INVERSE KINETICS CALC	ANL	168
360	F4	RS	P		E	\$	TRIFIDO, PULSED NEUTRON SOURCE DATA ANALYSIS	CRFA	489
360	F4	RS	P		F	\$	TWIGGLE, 2-D 2-GP SPACE-TIME DIFFUSION	ANL	338
360	F4	RS	P		G	\$	CLOUD, GAMMA-RAY DOSE RATE FROM A CLOUD	DP	47
360	F4	RS	P		G	\$	EGAD, CALC OF EXTERNAL GAMMA DOSE INTEGRALS	DP	600
360	F4	RS	P		G	\$	INTEG,INSPEC, MARKIV SIMULATION OF REACTOR CPM	DP	590
360	F4	RS	P		G	\$	SODCOL2, SODIUM-FUEL INTERACTION ANALYSIS	ANL	521
360	F4	RS	P		G	\$	WATER-HAMMER, LIQUID BLOWDOWN ANALYSIS LOFT	UGA	278
360	F4	RS	P		H	\$	FLOW-MODEL, MULTI-CHANNEL 2-D 2-PHASE FLOW	MSS	246
360	F4	PS	P		H	\$	PLENUM, FLOW DIST. IN CYL COOLANT INLET PLENUM	DP	586
360	F4	RS	P		L	\$	GEARD, FREE-FORMAT CARD INPUT PROCESSOR	LASL	530
360	F4	RS	P		O	\$	ALPHA-M, RESOLUTION OF GAMMA RAY SPECTRA	CRNL	413
360	F4	RS	P		O	\$	CORGAM, UNFOLDING OF COMPLEX GAMMA-RAY SPECTRA	KSUN	350
360	F4	RS	P		O	\$	DYN01, PHOTOMULTIPLIER ELECTRON DISTRIBUTION	ANL	464
360	F4	RS	P		P	\$	KEOLF, LINEARLY-CONSTRAINED OPTIMIZATION	CRNL	556
360	F4	RS	P		X	\$	TOKMINA/TOKMINA2, TOKAMAK FUSION REACTOR STUDY	ANL	561
360	F4	RS	P	T	A	\$	ATHENA4, INELASTIC SCATTERING FORM FACTORS	CRNL	417
360	F4	PS	P	T	B	\$	CLUP77, SQUARE CELL COLLISION PROBABILITY CALC	ANL	526
360	F4	RS	P	T	B	\$	RICE, PRIMARY RECCIL ATOM SPECTRA ENDF/B DATA	CRNL	453
360	F4	RS	P	T	B	\$	SUPRT0G, ENDF/B FINE-GP CONSTANTS GENERATION	CRNL	431
360	F4	RS	P	T	C	\$	EXTERMINATOR2, 2-D MULTI-GP DIFFUSION PROGRAM	CRNL	156
360	F4	RS	P	T	C	\$	FAIMOS, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	BHSC	120
360	F4	RS	P	T	C	\$	VARI-QUIR, TIME-DEP 2-D MULTI-GP DIFFUSION	UMCC	212
360	F4	RS	P	T	D	\$	CINCAS, NUCLEAR FUEL CYCLE COST AND ECONOMICS	CWE	354
360	F4	PS	P	T	D	\$	OPCCST, POWER PLANT CAPITAL COST ESTIMATING	CRNL	588
360	F4	RS	P	T	E	\$	ANCON, SPACE-INDEPENDENT REACTOR KINETICS CODE	ANL	486
360	F4	RS	P	T	F	\$	SASIA, FAST REACTOR POWER AND FLOW TRANSIENTS	ANL	400
360	F4	RS	P	T	F	\$	TSN, SPATIALLY-DEPENDENT REACTOR KINETICS	AI	309
360	F4	RS	P	T	G	\$	AISITE2, PARAMETRIC SITE REQUIREMENT STUDY	AI	172
360	F4	RS	P	T	G	\$	HAA3, COAGULATION OF HETEROGENEOUS AEROSOLS	AI	443
360	F4	RS	P	T	G	\$	SOFIRE2, SODIUM POOL FIRE 1- & 2-CELL ANALYSIS	AI	559
360	F4	RS	P	T	H	\$	ASTEM, THERMODYNAMIC PROPERTIES WATER & STEAM	ANC	580
360	F4	RS	P	T	H	\$	HEATING3, 1,2, OR 3-D HEAT CONDUCTION PROGRAM	CRNL	517
360	F4	RS	P	T	I	\$	LIFE1, FAST REACTOR FUEL ELEMENT BEHAVIOR	ANL	460
360	F4	RS	P	T	I	\$	SAROR4, DISCRETE-ELEMENT ANALYSIS THIN SHELLS	MIT	402
360	F4	RS	P	T	I	\$	SEALSHL2, SHELL STRESS ANALYSIS AXISYM LOAD	SR	282
360	F4	RS	P	T	M	\$	CRECT,CHECKER, ENDF/B V2 PROCESSING CODES	ANL	475
360	F4	RS	P	T	N	\$	PLOT-3D, 3-D PLOTS ON IBM2280 OR CALCOMP780	ANL	544
360	F4	RS	P	T	Q	\$	RESPOND, DISSIMILAR MEDIA TLD CORRECTION CALC	AI	566
360	F4	RS	P	C	G	\$	STEFEG, ANALYSIS OF PWR & BWR GASEOUS RELEASE	CRNL	583
360	F4	RS	P	CT	A	\$	JUPITOR1, COUPLED CHANNEL X-SEC EVALUATION	ENEA	308
360	F4	RS	P	CT	B	\$	MC**2, ENDF MULTIGROUP X-SECTION CALCULATION	ANL	355
360	F4	RS	P	CT	C	\$	FLARF, 3-D REACTIVITY AND POWER DISTRIBUTION	MSS	167
360	F4	RS	P	CT	D	\$	GEM, ANALYSIS OF NUCLEAR FUEL CYCLE ECONOMICS	UICS	576
360	F4	RS	P	CT	D	\$	3DB, 3-D MULTIGROUP DIFFUSION BURNUP ANALYSIS	ANL	567
360	F4	RS	P	CT	F	\$	REXCO-H, 2-D HYDRODYNAM RESPONSE TO EXCURSION	ANL	550
360	F4	RS	P	CT	G	\$	EMERALD, PWR PLANT RADIATION RELEASE & DOSE	PGE	546

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360	F4	RS P	CT I	\$	PSA2, STRESS ANALYSIS MULTIANCHOR PIPE SYSTEM	AI	542
360	F4	RS P	CT M	\$	FTOE, ENDF/B TO MC**2 DATA CONVERSION	ANL	350
360	F4	RS P	CT W	\$	MACS LATTICE VIBRATION NEUTRON SCATTERING CODES	ANC	574
360	F4	RS P	CT W	\$	MSCAT, SLOW NEUTRON MULTIPLE SCATTERING CALC	ANL	575
360	F4	RS P	X G	\$	PURST1, HYDRODYNAMIC ANALYSIS DURING BLOWDOWN	PPCO	435
360	F4	RS P	X T E	\$	MON5, STOCHASTIC MODEL OF NEUTRON SLOWING-DOWN	NPGS	491
360	F4	RS P	X T F	\$	CEXE, INCEXF, 1-GP 3-D XYZ XENON OSCILLATION	CEND	415
360	F4	RS P	X T F	\$	FCRE2, FAST REACTOR EXCURSION CALCULATIONS	ANL	174
360	F4	RS P	X T H	\$	ORTHIS, ORTHAT, 2-DIMENSIONAL HEAT CONDUCTION	CRNL	525
360	F4	RS P	X T P	\$	FUNPACK, SPECIAL FUNCTION ROUTINES-FI, K, F,	ANL	610
360	F4	RS P	XCT A	\$	FLANGE2(71-1), ENDF/B THERMAL SCATTERING DATA	DP	368
360	F4	RS P	XCT F	\$	TASK, 1-D MULTIGROUP REACTOR KINETICS PROGRAM	CRNL	558
360	F4	RS P	XCT F	\$	VENUS, 2-D LMFBR POWER EXCURSION DISASSEMBLY	ANL	511
360	F4	RS PL	T B	\$	TEMPEST2, THERMAL NEUTRON SPECTRUM X-SECTIONS	BHSC	50
360	F4	RS PL	CT B	\$	INCITE, THERMAL SPECTRA & MULTI-GP CONSTANTS	ANC	565
360	F4	RS PL	CT F	\$	QX1, QUASISTATIC SPATIAL REACTOR KINETICS CODE	ANL	474
360	F4	RS PL	CT M	\$	ERREST, LOCA ROD BUNDLE CHF DATA ANALYSIS	ANC	518
360	F4	RS PLX	T B	\$	AILMOE, X-SECTION CALC ELASTIC SCAT RESONANCES	AI	147
360	F4	RS PLX	T B	\$	HRC3, SLOWING-DOWN SPECTRUM, MULTIGP CONSTANTS	TVA	467
360	F4	RS PLX	T B	\$	LEOPARD, SPECTRA CALCULATION WITH DEPLETION	WAPC	279
360	F4	RS PLX	T B	\$	XSDRN, DISCRETE ORDINATE MULTIGROUP CONSTANTS	CRNL	353
360	F4	RS PLXCT	B	\$	PHROG, MULTI-GP CONSTANT & FAST SPECTRA CALC	ANC	520
360	F4	RSB	XCT P	\$	EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE	ANL	534
360	F4	RSB	L T M	\$	CLIP, ECPM OP THREDES LIBRARY UTILITY ROUTINE	AI	271
360	F4	RSBP	T K	\$	THREDES, 1-D FEW-GP DIFFUSION DESIGN SYSTEM	AI	273
360	F4	RSBP	CT C	\$	MONA, 1-D MULTIGROUP DIFFUSION SLAR, CYL, SPH	ANC	582
360	F4	RSBP	CT C	\$	TRIPLT, 2-D TRIANGULAR MESH TRANSPORT PROGRAM	LASL	608
360	F4	RSBP	CT D	\$	DWARF, 1-D FEW-GP DIFFUSION DEPLETION PROGRAM	ANC	579
360	F4	RSBP	CT G	\$	RSAC, RADIOLOGICAL SAFETY ANALYSIS PROGRAM	ANC	265
360	F4	RSBP	CT I	\$	FPEM, STEADY-STATE FISSION PRODUCT FUEL MODEL	ANC	584
360	F4	RSBP	CT I	\$	STRAP, STATIC & DYNAMIC STRUCTURAL ANALYSIS	ANC	539
360	F4	RSBP	CT J	\$	VIEWPIN, VIEW FACTOR CALC FOR CYLINDRICAL PINS	ANC	569
360	F4	RSBP	CT K	\$	PREP, KITT, SYSTEM FAULT TREE EVALUATION CODES	ANC	528
360	F4	RSBP	CT L	\$	ARC-MU1002, RCP INPUT DATA PROCESSING MODULE	ANL	533
360	F4	RSBP	X T D	\$	SIZZLE, 1-D MULTIGROUP DIFFUSION DEPLETION	AI	58
360	F4	RSBP	X T G	\$	THETA1-P, FUEL ROD THERMAL RESPONSE LOCA	ANC	512
360	F4	RSBP	XCT B	\$	XLACS, XSDRN MULTIGROUP LIBRARIES FROM ENDF/B	CRNL	572
360	F4	RSBP	XCT G	\$	RELAP3, REACTOR BLOWDOWN - EXCURSION ANALYSIS	ANC	369
360	F4	RSBP	XCT H	\$	MOXY, BWR FUEL ELEMENT HEAT TRANSFER CALC	ANC	551
360	F4	RSBP	XCT W	\$	GAUSS5, ANALYSIS OF GAMMA-RAY SPECTRA GF(LI)	ANC	605
360	F4	RSBPL	CT C	\$	VIMIX, MONTE CARLO CRITICAL ASSEMBLY ANALYSIS	AI-A	510
360	F4	RSBPL	CT L	\$	ARC-XSEC1, MICROSCOPIC X-SECTION MANIPULATION	ANL	554
360	F4	RSBPLX	T C	\$	ANISA, 1-D MULTI-GP DISCRETE ORDINATE CALC	AI	151
360	F4	RSBPLX	T C	\$	CAESAR4, LIPLST, 1-D MULTI-GP DIFFUSION + LIB	AI	270
360	F4	RSBPLXCT	R	\$	LASEP, SPECTRUM CALC WITH PURNUP CYL LATTICE	TVA	249
360	PL1	RS P	T P	\$	PTAC11, 2-PASS ASSEMBLER FOR THE PDP-11 ON 360	ANC	516
360	ANC	360	PL1	RS P	T P \$ PTAC11, 2-PASS ASSEMBLER FOR THE PDP-11 ON		516
360A	F+RAL	RS P	T D	\$	PDQ5, 2-D FEW-GROUP DIFFUSION AND DEPLETION	IBM	336
360B	F+RAL	RS P	J	\$	PMS1, FAST NEUTRON POLARIZATION EXPERIMENT	UCND	469
360B	F+RAL	RSBP	T D	\$	PDQ5, 2-D FEW-GROUP DIFFUSION AND DEPLETION	MIT	336
360B	F4	RS P	T A	\$	EDITOR, ENDF/B TAPE PROCESSING AND EDITING	CRNL	502
360B	F4	RS P	CT C	\$	TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ RTHETA	LASL	358
360B	F4	RS P	XCT D	\$	CONCEPT2, POWER PLANT CONCEPTUAL COST ESTIMATE	CRNL	498
360B	F4	RSBP	CT C	\$	HERESY3, 2-D HETEROGENEOUS REACTOR CALCULATION	DP	136
360C	F4	RS P	T H	\$	CCPRA3C, RCP BUNDLE THERMAL-HYDRAULIC ANALYSIS	RNW	432
360E	F+RAL	RS P	XCT D	\$	PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	ANC	275
360G	F4	RS P	T K	\$	CITATION, 1,2,3-D DIFFUSION DEPLETION MULTIGP	CRNL	387
3600	ASAF4	RS P	T M	\$	FTOE, ENDF/B TO MC**2 DATA CONVERSION	APFA	350
3600	F36	S3P	I	\$	BOV2, REFLECTION CALCULATION PARALLEL BEAMS	ANL	365
360C	F36	PS P	G	\$	DISPER, AEROSOL PARTICLE TRANSPORT STUDY	RFD	554
3600	F36	PS P	T B	\$	MC**2, ENDF MULTIGROUP X-SECTION CALCULATION	ANL	355
360C	F36	RS P	T C	\$	SNARG-1D, 1-D MULTI-GP DISCRETE ORDINATE CALC	ANI	288
3600	F36	RS P	T I	\$	SUPORAN, REACTOR CORE SUPPORT STRESS ANALYSIS	ANL	357
3600	F36	RS P	X T C	\$	MACH1, 1-D MULTI-GP DIFFUSION SLAR CYL SPHERE	ANL	262

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3600	F36	RS P	XCT C	\$	TFSS, 1-D SLAB AND SPHERE GEOM SN TRANSPORT	ANL	513
3600	F36	RSBP	A	\$	MISH-MASH, RESONANCE INTEGRAL CALC HCMCGENFOCUS	ANL	214
3600	F36	RSBP	G	\$	CHEMLCC2, CORE HEATING CLADDING-STEAM REACTION	ANL	366
3600	F36	RSBP	I	\$	SWELL2, FUEL ELEMENT LIFETIME ANALYSIS	ANL	353
3600	F36	RSBP X T	B	\$	RABBLE,WLIR,FLAT, RESONANCE ABSORPTION, CELL	ANL	281
3600	F36	RSBP X T	B	\$	RJFF-RAFF, RESONANCE INTEGRAL CALC 2-RFG CFLI	ANL	213
3600	F4	RSBP	T D	\$	2DB, 2-D MULTIGROUP DIFFUSION AND DEPLETION	ANL	325
3600	F63	RS LX T	B	\$	GAM1, FAST NEUTRON SPECTRUM X-SECTION CALC	ANL	33
3600	F63	RSBP	A	\$	NFARREX, COMPOUND NUCLEUS X-SECTION CALC	ANL	171
3600	F63	RSBP	E	\$	R101, SPACE-INDEPENDENT KINETICS KFX OPTICS	ANL	255
3600	F63	RSBP	E	\$	R102, SPACE-INDEPENDENT INVERSE KINETICS CALC	ANL	168
3600	F63	RSBP	F	\$	AX1, COUPLED NEUTRONICS-HYDRODYNAMICS SPHERE	CDC	102
3600	F63	RSBP	D	\$	COINC, COINCIDENCE COUNTING DATA REDUCTION	ANL	248
3600	F63	RSBP	T A	\$	2PLUS, NON-SPHERICAL OPTICAL MODEL X-SECTIONS	ANL	254
3600	F63	RSBP	T C	\$	FLAPE, 3-D REACTIVITY AND POWER DISTRIBUTION	CDC	167
3600	F63	RSBP	T E	\$	TRAFICORPORATION, TRANSFER FUNCTION SYNTHESIS	ANL	135
3600	F63	RSBP	T G	\$	R153, PARAMETRIC SITE REQUIREMENT STUDY	ANL	172
3600	F63	RSBP	T H	\$	ARGUS, TRANSIENT TEMPERATURE CALC CYLINDER	ANL	152
3600	F63	RSBP	T M	\$	XLIMIT, X-SECTION LIBRARY UTILITY ROUTINE	ANL	181
3600	F63	RSBP XLT	B	\$	THERMOS(ANL), THERMAL SPECTRUM X-SECTION CALC	ANL	184
3600	F63	RSBPL	T J	\$	MAC, SHIELD DESIGN MULTIGROUP SLAB GEOMETRY	ANL	143
3600	36F	RS PL CT	F	\$	QX1, QUASISTATIC SPATIAL REACTOR KINETICS CODE	ANL	474
3600	36F	RSBP	T M	\$	MFRMC2,MAGIC, MC**2 LIBRARY SERVICE ROUTINES	ANL	472
3600R	F36	RSBP	G	\$	WHAM, LIQUID-FILLED PIPING SYSTEM ANALYSIS	KE	278
370	F4	RS PL CT	C	\$	ATME, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	CSUC	29
370	F4	RS PLXCT	B	\$	FORM, FAST NEUTRON SPECTRUM X-SECTION CALC	CSUC	51
4	RESTRAINT	PIPE	STRESS,		MAXIMUM MOMENT CALC	AI	7090 F+FAF RS
						T I	\$
48	CAFGAR	ENDF/3	DATA	TAPES	GGA	1108	BIN R L T Z \$ ZPR-III ASSEMBLY
500	PSIA	32-472	DFGE	BAPL	6600	F4	PS T H \$ WATER, STEAM TABLES 14.5-14,
625	F+MAP	PS P	T C	\$	DTF4, 1-D MULTI-GP DISCRETE CPCINATE PROGRAM	BC	209
625	F4	PS	T C	\$	EXTERMINATOR2, 2-D MULTI-GP DIFFUSION PROGRAM	BC	156
625	F4	RS	T C	\$	FCG, 1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE	BC	28
625	F4	RS P	R	\$	AVOID, ANNULAR VOID X-SECTION CALCULATION	GEC	276
625	F4	RS PLX	T B	\$	GAMFC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV	BC	185
635	F+FAF	RSBP	T Q	\$	CASCADE,CLUSTER, RADIATION DAMAGE IN METALS	GFC	419
635	F+GMP	RS	T P	\$	GENED ENVIRONMENTAL ROUTINES, SUBROUTINE LIB.	NED	515
635	F+GMP	RS P	T J	\$	SYN, 2D SYNTHESIS MULTIGP DIFF & ICP DEPLETION	NED	455
635	F+GMP	RS P XLT	B	\$	ENDPUN2, MULTIGROUP CONSTANTS FROM ENDF/P DATA	GFSV	501
635	F+GMP	RS P	XCT L	\$	TDOWN, SPATIAL & COMPOSITION-DEPENDENT X-SECS	GFSV	505
635	F+GMP	RSBP	T H	\$	THTE, 3-D TRANSIENT HEAT TRANSFER PROGRAM	GEC	346
635	F4	PS	J	\$	ANVENT, LOCA ANALYSIS DUKE POWER MCGUIRE UNITS	DUCC	529
635	F4	PS	X T P	\$	FISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE	ANL	534
635	F4	RS P	D	\$	RAPPL, FUEL CYCLE PARAMETERS FAST REEEDERS	NED	372
635	F4	RS P	T J	\$	REAX, RESOLVED RESONANCE EPITHERMAL X-SECTIONS	NED	257
635	F4	PS F	T C	\$	POT2DB, 2-D MULTIGROUP DIFFUSION & SN THEORY	NED	459
635	F4	PS P	T C	\$	FLAPE, 3-D REACTIVITY AND POWER DISTRIBUTION	NED	167
635	F4	PS P	T J	\$	FUMBLE, FAST REACTOR FUEL BURNUP & MANAGEMENT	NED	480
635	F4	RS P	T G	\$	FREADM1, FAST REACTOR CORE ACCIDENT ANALYSIS	NED	479
635	F4	RS P	T H	\$	MANTA, STEADY-STATE THERMAL-HYDRAULIC ANALYSIS	NED	256
635	F4	PS P	T H	\$	VELVET2, TURBULENT FLOW IN LMFBR ROD BUNDLE	NED	458
635	F4	RS P	T M	\$	TROUT, MUG MULTIGROUP XSEC LIBRARY MAINTENANCE	NED	493
635	F4	RS P	T D	\$	BURNUP, HEAVY ELEMENT ISOTOPIC BURNUP ANALYSIS	NED	311
635	F4	RS P	T J	\$	EXPN, ANALYSIS OF PULSED NEUTRON SOURCE DATA	NED	258
635	F4	RS P	CT I	\$	BEHAVE2, OXIDE FUEL PERFORMANCE FINITE-ELEMENT	GFSV	568
635	F4	RS P X T	F	\$	FORP2, FAST REACTOR EXCURSION CALCULATIONS	NED	174
635	F4	RS PL	T C	\$	RISYN, 2-D MULTI-GP DIFFUSION SYNTHESIS CALC	NED	287
635	F4	RSRP	D	\$	CHAINS, ANALYSIS OF RADIOACTIVE DECAY CHAINS	GFC	418
635	F4	RSBP	D	\$	DCS, NEUTRON FLUX-COSMETER ACTIVITY RELATION	GFC	423
635	F4	RSBP	J	\$	MICHPD, MICRONARDNESS MEASUREMENT ANALYSIS	GFC	421
635	F4	RSBP	T B	\$	GROUSE, SPACE-DEPENDENT X-SECTION GENERATION	GFC	420
6400	F4	S P	H	\$	PWP-PPM, REACTION-DILUTION TABLES FOR PWP OPN	OPED	552
6400	F4	RS P	J	\$	FCRL2, LOCA FISSION PRODUCT RELEASE ANALYSIS	BCL	500
6400	F4	RS P	J	\$	MIFAB,MIXAP, CONTAINMENT SYSTEM IODINE REMOVAL	BCL	499
6400	F4	RS P	T F	\$	ADFP, 1D AND 2D FEW-GROUP SPACE-TIME KINETICS	BCL	494

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6400	F4	RS	P	T	G	\$	ECCSA4, LOSS-OF-COOLANT & EMERGENCY COOLING	BCL	330	
6400	F4	RS	P	T	G	\$	NUFLOC-1.0, LOSS-OF-COOLANT THERMAL ANALYSIS	BCL	328	
6400	F4	RS	P	X	T	G	\$	MUCHA1,MUCHA2, MULTIPLE CHANNEL ANALYSIS ECC	BCL	508
6400	F4	RS	PLX	T	B	\$	GAMTEC2, MULTI-CP CONSTANT CALC 0 TO 10 MEV	UVA	185	
6500	F4	RS	P	B	\$	PART1, OPTIMAL GROUP CR MESH COLLAPSING	TRW	416		
6500	F4	RS	PLX	T	C	\$	MACH1, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	PUPD	262	
6600	PCD	R	L	T	Z	\$	ETOC1 DATA LIBRARIES, MUFT4 OR 5, GAM1 OR 2	WAPD	447	
6600	PCD	R	LX	T	Z	\$	LASL XSEC SFTS, SN 19- 24- AND 25-GROUP SFTS	LASL	532	
6600	F	R	B	T	M	\$	TIGIR2, MODULAR DOCUMENT INFORMATION SYSTEM	KAPL	403	
6600	F+ASC	RS		P	\$	SIMPLE1, TIME-SHARING PROGRAMMING LANGUAGE	KAPL	442		
6600	F+ASC	RS	P	T	H	\$	LION4, 3-D TEMPERATURE DISTRIBUTION PROGRAM	KAPL	299	
6600	F+ASC	RS	P	T	I	\$	GEN, EIGENVALUE PROBLEM FOR VIBRATING SYSTEMS	KAPL	344	
6600	F+ASC	KS	P	T	J	\$	ASPI3, GAMMA RAY SOURCE BUILDUP FACTOR CALC	BAPL	429	
6600	F+ASC	RS	P	T	L	\$	DATATRAN 2-D GEOMETRY INPUT, PREPARATION, EDIT	KAPL	406	
6600	F+ASC	RS	P	T	P	\$	CURFIT, CURVE FITTING EXPERIMENTAL DATA POINTS	KAPL	43	
6600	F+ASC	KS	P	T	P	\$	DATATRAN UTILITY MODULES, 2-D + 3-D PLOTTING	KAPL	407	
6600	F+ASC	RS	P	T	P	\$	DOGGY, DESK CALCULATOR FORM SHEET CP PACKAGE	KAPL	428	
6600	F+ASC	RS	P	T	P	\$	LIZARD, NONLINEAR DIFFERENTIAL EQNS. SOLUTION	KAPL	445	
6600	F+ASC	RS	P	T	P	\$	SNEQ, NONLINEAR ALGEBRAIC EQN SOLN CURVE PLOT	KAPL	364	
6600	F+ASC	RS	P	X	T	B	\$	RESQ2, RESQO, DBF1, RESONANCE INTEGRAL HEX CELL	BAPL	285
6600	F+CCM	RS		T	P	\$	KAPLPLOT, KAPL CALCOMP PLOTTING ROUTINES	KAPL	496	
6600	F+CCM	RS	P		H	\$	HYMAS, HYDRODYNAMIC MASS MATRIX GENERATION	BAPL	560	
6600	F+CCM	RS	P	T	C	\$	KENC2, MONTE CARLO MULTIGROUP CRITICALITY CODE	REF	450	
6600	F+CCM	RS	P	T	I	\$	DUZ2, 2-D AXISYMMETRIC & PLANE ELASTIC-PLASTIC	BAPL	503	
6600	F+CCM	RS	P	T	I	\$	GAPL3, INELASTIC LARGE DEFLECTION STRESS STUDY	BAPL	357	
6600	F+CCM	RS	P	T	P	\$	LENSEDS, NONLINEAR LEAST SQ LENS DESIGN SYSTEM	LASL	602	
6600	F+CCM	RS	P	T	Q	\$	INX, XRAY DIFFRACTION POWDER PATTERN INDEXING	LASL	609	
6600	F+CCM	RS	P	X	T	B	\$	PAXO3, HARMONY-PCQ X-SECTION GENERATION CODE	BAPL	426
6600	F+CCM	RS	P	X	T	D	\$	FAPED, 1-D FAST REACTOR DESIGN & SURVEY STUDY	BW	427
6600	F+CCM	RS	P	X	T	I	\$	MATUS, 3-D FINITE ELEMENT ELASTIC ANALYSIS	BAPL	557
6600	F+CCM	RSB		T	M	\$	DATATRAN, MODULAR PROGRAMMING AND DATA SYSTEM	KAPL	386	
6600	F4	RS		B	\$	APPEX1, 99-GP DLC-2B LIBRARY GROUP COLLAPSING	APRF	466		
6600	F4	RS		I	\$	SCRSDB, PRESSURE VESSEL STRESS AND FATIGUE	KAPL	351		
6600	F4	RS		T	B	\$	MOR07, 2-D DIFFUSION ABSORPTION REMOVAL X-SFCS	BAPL	280	
6600	F4	RS		T	C	\$	MO648, 1-D SLAB TRANSPORT WITH SLOWING DOWN	BAPL	342	
6600	F4	RS		T	H	\$	WATER, STEAM TABLES 14.5-14,500PSIA 32-472DECF	BAPL	267	
6600	F4	RS		T	I	\$	CYGR02, STRESS ANALYSIS CYL FUEL ELEMENT	BAPL	266	
6600	F4	RS		T	M	\$	CHECK3, RIGEL3, ENDF/B V3,V4 PROCESSING CODES	BNL	571	
6600	F4	RS		T	U	\$	GASPAR, COMPLEX GAMMA-RAY SPECTRA ANALYSIS	KAPL	485	
6600	F4	RS	X	T	P	\$	EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE	ANL	534	
6600	F4	RS	L	T	B	\$	GAMBIT, X-SEC GENERATION FOR TRANSPORT CODES	WANL	547	
6600	F4	RS	L	T	B	\$	GGC4, MULTI-GP X-SECTIONS FAST THERMAL SPECTRA	GGA	298	
6600	F4	RS	P	A	\$	AVERAGE, UNRESOLVED REGION AVERAGE X-SEC CALC	BNL	376		
6600	F4	RS	P	A	\$	BESFIT, DIFFRACTION MODEL ELASTIC SCAT X-SEC	BNL	524		
6600	F4	RS	P	A	\$	CLEM, ANGULAR DISTRIBUTION LEGENDRE FITTING	KAPL	531		
6600	F4	RS	P	A	\$	GRAMP, R-M PARAMETERS OF UNRESOLVED RESONANCES	BAPL	470		
6600	F4	RS	P	A	\$	MULTI, MULTI-LEVEL RESONANCE THEORY XSEC CALC	KAPL	535		
6600	F4	RS	P	A	\$	RAMP1, REICH-MOORE RESOLVED REGION X-SECTIONS	BNL	452		
6600	F4	RS	P	A	\$	SIGPLOT, RESOLVED MULTILEVEL B-W X-SEC CALC	BNL	377		
6600	F4	RS	P	A	\$	THRESH, STATISTICAL MODEL REACTION X-SECTIONS	BNL	504		
6600	F4	RS	P	D	\$	CINDER,M0102, PCINT DEPLETION FISSION PRODUCT	BAPL	313		
6600	F4	RS	P	D	\$	NPRECCP, FUEL CYCLE COSTS PERFORMANCE DATA	UEC	146		
6600	F4	RS	P	D	\$	POWERCO, NUCLEAR STATION ELECTRICITY COSTS	UEC	340		
6600	F4	RS	P	D	\$	WAMPUM, FUEL CYCLE COSTS PERFORMANCE STUDY	UEC	224		
6600	F4	RS	P	F	\$	RAUMZEIT, 1-D TIME-DEPENDENT DIFFUSION CALC	KAPL	352		
6600	F4	RS	P	F	\$	STINT3, SINGLE-CHANNEL SPACE-TIME SYNTHESIS	KAPL	389		
6600	F4	RS	P	H	\$	RAPP, HIGH-VELOCITY FLOW STUDY STEAM-WATER MIX	KAPL	382		
6600	F4	RS	P	I	\$	STEM, MATRIX GENERATION FOR A SYSTEM OF BEAMS	KAPL	337		
6600	F4	RS	P	I	\$	STRIPE, FUEL ROD CLAD STRAIN & PELLET CRACKING	BAPL	570		
6600	F4	RS	P	I	\$	TCR01, CREEP-BUCKLING OF TUBES UNDER PRESSURE	BAPL	604		
6600	F4	RS	P	I	\$	TUBE, U-TUBE HEAT EXCHANGER STRESS ANALYSIS	KAPL	378		
6600	F4	RS	P	L	\$	GENRD, FREE-FORMAT CARD INPUT PROCESSOR	LASL	530		
6600	F4	RS	P	N	\$	DAC1, SN PERTURBATION CODE USING DTF4 FLUXES	LASL	455		
6600	F4	RS	P	N	\$	HEATMESH, GEOMETRICAL DATA HEAT TRANSFER STUDY	SLL	434		

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6600	F4	RS	P	N	\$	LARCA, FLUX-WEIGHTING OF DTF4 CROSS SECTIONS	LASL	409	
6600	F4	RS	P	D	\$	DYND1, PHOTOMULTIPLIER ELECTRON DISTRIBUTION	KAPL	464	
6600	F4	RS	P	P	\$	ERF,EREC, ERROR & COMPLEMENTARY ERROR FUNCTION	SLA	601	
6600	F4	RS	P	P	\$	FORSIM, SOLN OF SYSTEM OF ORDINARY DIFF EQNS	CRNL	514	
6600	F4	RS	P	P	\$	GFAR, ORDINARY DIFFERENTIAL EQN SYSTEM SOLVER	LLI	552	
6600	F4	KS	P	P	\$	MOST, A MULTIDIMENSIONAL OPTIMIZATION SCHEME	KAPL	446	
6600	F4	RS	P	P	\$	PLOT9, 2D CONTOUR PLOTS & AREA CALCULATION	SLA	578	
6600	F4	RS	P	P	\$	RFLO1, RELIABILITY FOR A SINGLE FAILURE MODE	BAPL	497	
6600	F4	RS	P	P	\$	ROPF, FINDING ROOTS OF A POLYNOMIAL	KAPL	444	
6600	F4	RS	P	V	\$	FFEARS, LAPLACE EQUATION ISOTROPIC DIELECTRICS	SLA	577	
6600	F4	RS	P	T	A	\$	JP1XR, COUPLED-CHANNEL SCATTERING X-SEC CALC	KAPL	506
6600	F4	RS	P	T	A	\$	PHASER, PHASE SHIFT X-SEC & POLARIZATION CALC	KAPL	507
6600	F4	KS	P	T	A	\$	PUN1, UNRESOLVED RESONANCE INTEGRALS X-SECS	BAPL	359
6600	F4	RS	P	T	A	\$	SUMOR, S-WAVE NEUTRON X-SECTION CALCULATION	BAPL	399
6600	F4	RS	P	T	A	\$	TCR, THERMAL SCATTERING CRYSTALLINE MATERIALS	LASL	360
6600	F4	RS	P	T	B	\$	EPOCH, NEUTRON AGE CALCULATION OF ENDF/B DATA	BAPL	461
6600	F4	RS	P	T	B	\$	ETCM1, ENDF/B FORMAT TO MUFT FORMAT X-SECTIONS	WAPC	436
6600	F4	RS	P	T	B	\$	GLEN, GROUP CONSTANT CALC FROM TOF OUTPUT DATA	LASL	361
6600	F4	RS	P	T	C	\$	RF21, FEW-GP DISCRETE ORDINATES SLAB GEOMETRY	BAPL	398
6600	F4	RS	P	T	C	\$	DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	LASL	209
6600	F4	RS	P	T	C	\$	EXTERMINATOR2, 2-D MULTI-GP DIFFUSION PROGRAM	CE	156
6600	F4	RS	P	T	C	\$	TRIPLT, 2-D TRIANGULAR MESH TRANSPORT PROGRAM	LASL	608
6600	F4	RS	P	T	C	\$	VARI-QUIR, TIME-CEP 2-D MULTI-GP DIFFUSION	WAPL	212
6600	F4	RS	P	T	C	\$	3DDT, 3-D MULTIGROUP DIFFUSION XYZ R-THETA-Z	LASL	463
6600	F4	PS	P	T	D	\$	CINCAS, NUCLEAR FUEL CYCLE COST AND ECONOMICS	WARD	354
6600	F4	RS	P	T	D	\$	PHENIX, 2D DIFFUSION BURNUP REFUELING HISTORY	LASL	454
6600	F4	RS	P	T	D	\$	2DR, 2-D MULTIGROUP DIFFUSION AND DEPLETION	LASL	325
6600	F4	RS	P	T	D	\$	3DXT,CEP3, 3-D XENON TRANSIENT & DEPLETION	KAPL	477
6600	F4	RS	P	T	E	\$	ANCON, SPACE-INDEPENDENT REACTOR KINETICS CODE	LASL	486
6600	F4	RS	P	T	F	\$	NOAH, 1-D ONE-GP SPACE-TIME DIFFUSION FEEDBACK	RNL	405
6600	F4	RS	P	T	F	\$	NOWIG, 1-D 2-GP KINETICS TEMPERATURE FEEDBACK	BAPL	371
6600	F4	RS	P	T	F	\$	SAS1A, FAST REACTOR POWER AND FLOW TRANSIENTS	ANL	400
6600	F4	RS	P	T	F	\$	TWIGL, 2-D 2-GP SPACE-TIME DIFFUSION FEEDBACK	BAPL	338
6600	F4	RS	P	T	F	\$	WIGL2, 1-D 2-GP SPACE-TIME DIFFUSION 3-GFOM	BAPL	274
6600	F4	RS	P	T	G	\$	FLASH3, LOSS-OF-COOLANT ACCIDENT ANALYSIS	BAPL	295
6600	F4	RS	P	T	G	\$	FLASH4, FULLY-IMPLICIT TRANSIENT SIMULATION	BAPL	448
6600	F4	RS	P	T	G	\$	M0555,ACT1, LOSS-OF-COOLANT ACCIDENT ANALYSIS	BAPL	284
6600	F4	RS	P	T	G	\$	RELAP3, REACTOR BLOWDOWN - EXCURSION ANALYSIS	ANC	369
6600	F4	RS	P	T	H	\$	CHIC-KIN, FAST + INTERMEDIATE POWER TRANSIENTS	BAPL	473
6600	F4	RS	P	T	H	\$	FIGRO, LWBR FUEL SWELLING TEMPERATURE STUDY	BAPL	272
6600	F4	RS	P	T	H	\$	FLCT1,M0219, PWR FLOW TRANSIENT ANALYSIS	BAPL	321
6600	F4	RS	P	T	H	\$	GLUB1, WATER-LOGGED FUEL ELEMENT ANALYSIS	BAPL	424
6600	F4	RS	P	T	H	\$	HOT2, 2-D TRANSIENT HEAT CONDUCTION PROGRAM	BAPL	286
6600	F4	RS	P	T	H	\$	MANTA, STEADY-STATE THERMAL-HYDRAULIC ANALYSIS	WARD	256
6600	F4	RS	P	T	H	\$	M0899,H0H, STEAM TABLES 14.5-2538 PSIA	BAPL	294
6600	F4	RS	P	T	H	\$	TOPS, TRANSIENT THERMODYNAMICS OF PRESSURIZERS	BAPL	348
6600	F4	RS	P	T	H	\$	WASP, WATER AND STEAM THERMODYNAMIC PROPERTIES	BAPL	396
6600	F4	RS	P	T	I	\$	BURL1, FUEL SWELLING & GAS RELEASE SIMULATION	BAPL	468
6600	F4	RS	P	T	I	\$	RUSHL, CYL SHELL BUCKLING COLLAPSE ANALYSIS	BAPL	481
6600	F4	RS	P	T	I	\$	CYGR03, OXIDE FUEL ROD STRESS & DEFORMATION	BAPL	449
6600	F4	RS	P	T	I	\$	FUGIT, DYNAMIC RESPONSE OF ELASTIC STRUCTURES	BAPL	537
6600	F4	RS	P	T	I	\$	M0266, LINEAR ELASTIC STRUCTURAL DYNAMICS	BAPL	383
6600	F4	RS	P	T	I	\$	M0457,PIPE, ELASTIC STRESS OF PIPING SYSTEM	BAPL	329
6600	F4	RS	P	T	I	\$	M0552, DYNAMIC ANALYSIS LINEAR ELASTIC SYSTEMS	BAPL	283
6600	F4	RS	P	T	I	\$	PELEN, FUEL PELLET TEMPERATURE & REFORMATION	BAPL	598
6600	F4	RS	P	T	I	\$	SAFE-PLANE, PLANE STRESS ANALYSIS, 2-D RODS	RNL	252
6600	F4	RS	P	T	I	\$	SEALSHLL2, SHELL STRESS ANALYSIS AXISYM LOAD	BAPL	282
6600	F4	RS	P	T	I	\$	SLADE-D, DYNAMIC ANALYSIS OF THIN SHELLS	SLA	581
6600	F4	RS	P	T	J	\$	M0756,LETC, 1-D SLAB GAMMA-RAY TRANSPORT	BAPL	343
6600	F4	RS	P	T	L	\$	BL47, DRAFTING TCCL TC PLCT PLANE STRUCTURES	BAPL	373
6600	F4	RS	P	T	M	\$	EDITOR, ENDF/B TAPE PROCESSING AND EDITING	CRNL	502
6600	F4	RS	P	T	M	\$	SHLCG, DATA MANAGEMENT, EDITING, & ANALYSIS	BAPL	557
6600	F4	RS	P	T	O	\$	BFTTY, ENTRAINED PARTICLES SAMPLING STUDY	BAPL	545
6600	F4	RS	P	T	O	\$	JITER, FLUCTUATION EXPERIMENT ANALYSIS	BAPL	394

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6600	F4	RS	P	T	D	\$	REDUX, REACTOR FLUCTUATION EXPERIMENT ANALYSIS	BAPL	425	
6600	F4	RS	P	T	P	\$	DAFT1, LEAST SQUARES FIT FISSILE NUCLIDE DATA	BAPL	327	
6600	F4	RS	P	T	P	\$	M0661,M0657,M0626, POLYNOMIAL CURVE FITTING	BAPL	411	
6600	F4	RS	P	X	I	\$	FINE1, FINITE-ELEMENT STUDY 2,3-D STRUCTURES	KAPL	404	
6600	F4	RS	P	X	T	P	\$	FUNPACK, SPECIAL FUNCTION ROUTINES-EI,K,F,....	ANL	610
6600	F4	RS	PL	T	B	\$	ETOG1, ENDF/B TO MUFT, GAM, ANISN X-SEC FORMAT	WAPD	437	
6600A	F+ASC	RS		T	P	\$	BETTIS ENVIRONMENTAL ROUTINES, SUBROUTINE LIB.	BAPL	478	
6600A	F+ASC	RS	P	T	D	\$	PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	BAPL	275	
6600B	F+ASC	RS		T	P	\$	BETTIS ENVIRONMENTAL ROUTINES, SUBROUTINE LIB.	BW	478	
6600B	F+ASC	RS	P	T	D	\$	PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	BW	275	
6600B	F+ASC	RS	P	T	J	\$	SPAN4, A POINT-KERNEL SHIELD EVALUATION CODE	BAPL	462	
6600B	F4	RS		T	M	\$	CHECKER,CPECT,DAMMET,PLOTEB,... ENDF/B V1 PROC	BNL	384	
6600B	F4	RS		T	M	\$	CRECT,CHECKER,RIGEL,PLOTEP,... ENDF/B V2 PROC	BNL	475	
6600B	F4	RS	P	T	A	\$	RESEND,ADLER, ENDF/B RESONANCE XSECTION CODES	BNL	465	
6600P	F4	RS	P	T	C	\$	TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ RTHETA	LASL	358	
6600B	F4	RS	P	T	I	\$	MANE1, RECTANGULAR MAGNETIC NETWORK SOLUTION	BAPL	412	
6600P	F4	RS	P	T	I	\$	SEAL SHELL, SHELL STRESS ANALYSIS AXISYM LOAD	WTSC	282	
6600C	F+ASC	RS	P	T	D	\$	PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	BAPL	275	
6600C	F+CCM	RS		T	P	\$	MODEL, MODIFIED BETTIS ENVIRNMNTL LIB SCOPE3.2	CDC	478	
6600C	F4	RS	P	T	H	\$	CORRA3C, ROD BUNDLE THERMAL-HYDRAULIC ANALYSIS	BNW	432	
6600C	F4	RS	P	T	I	\$	SOR3, STRESS ANALYSIS SHELLS OF REVOLUTION	KAPL	80	
6600D	F+ASC	R	B	T	D	\$	PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	RCS	275	
6600D	F+CCM	RS		T	P	\$	MODEL, MODIFIED BETTIS ENVIRNMNTL LIB SCOPE3.3	CDC	478	
7030	F4	RS		T	H	\$	RATH, 2- OR 3-D HEAT CONDUCTION LUMPED MASS	LASL	242	
7030	F4	RS	P	T	C	\$	DTE4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	LASL	209	
7030	F4	RS	P	T	D	\$	DTE-BURN, 1-D MULTI-GP DTE4 WITH DEPLETION	LASL	269	
7040	F+MAP	RS	P		A	\$	COMBOD, COMBINED B-W MULTI-LEVEL CONVOLUTION	PPCO	203	
7040	F4	RS	P	T	C	\$	TOPIC, 1-D FEW-GP SN APPROXIMATION CYLINDER	PPCC	148	
7044	F+MAP	RS	P	T	B	\$	GARCL, RESONANCE OVERLAP AND LATTICE EFFECTS	GGA	215	
7044	F+MAP	RS	P	T	D	\$	OPUS, POWER PLANT PERFORMANCE AND PRICE STUDY	GGA	226	
7044	F+MAP	RS	P	T	H	\$	BLOOST5, POINT-KINETICS WITH 2-D HEAT TRANSFER	GGA	205	
7044	F+MAP	RS	P	T	H	\$	TOODIE, 2-D TIME-DEPENDENT HEAT CONDUCTION	PPCO	349	
7044	F+MAP	RS	B	P	M	\$	UNPACK, RETRIEVAL FROM SCISRS X-SECTION TAPE	GGA	206	
7044	F+MAP	RS	B	P	T	C	\$	GAMBLE4, 2-D MULTI-GP DIFFUSION XY RZ GEOMETRY	GGA	222
7044	F+SPS	RS	B	P	T	N	\$	CROSSPLOT, SC4020 PLOTS FROM X-SECTION TAPES	GGA	207
7044	F4	RS			I	\$	CORE, CORE CONFIGURATION FUEL TEMPERATURE CODE	GGA	233	
7044	F4	RS		X	T	\$	PFECON, HTGR CONTAINMENT PRESSURE POST RUPTURE	GGA	228	
7044	F4	RS	P		D	\$	RAD2, HTGR FISSION PRODUCT ACTIVITY DIST STUDY	GGA	231	
7044	F4	RS	P		D	\$	WAMPUM, FUEL CYCLE COSTS PERFORMANCE STUDY	GGA	224	
7044	F4	RS	P		I	\$	GAZE11E5, GAS-COOLED CORE THERMAL DESIGN STUDY	GGA	232	
7044	F4	RS	P		L	\$	GAYER, ENERGY INTERVAL X-SECTION AVEPAGING	GGA	218	
7044	F4	RS	P	T	B	\$	FMC-N, MONTE CARLO CALC NEUTRON HISTORIES	GGA	195	
7044	F4	RS	P	T	C	\$	GASP2, 1-D FEW-GP DIFFUSION POWER DIST SEARCH	GGA	220	
7044	F4	RS	P	T	C	\$	TEMCO, 1-D FEW-GP DIFFUSION TEMP COEF CALC	GGA	225	
7044	F4	RS	P	T	D	\$	GARGOYLE, FUEL CYCLE ANALYSIS PARTIAL REFUEL	GGA	260	
7044	F4	RS	P	T	D	\$	RELOAD-FEVER, 1-D FEW-GP DIFFUSION DEPLETION	GGA	221	
7044	F4	RS	P	T	D	\$	REVISED-GAC, FUEL CYCLE ANALYSIS W/REFUELING	GGA	223	
7044	F4	RS	P	T	D	\$	STMGEN, STEAM GENERATOR DESIGN CRITERIA COSTS	GGA	227	
7044	F4	RS	P	T	G	\$	ELROW, FUEL ELEMENT STRESS ANALYSIS STUDY	GGA	229	
7044	F4	RS	P	T	I	\$	SAFE-AXISYM, STRESS ANALYSIS AXISYMMETRIC LOAD	GGA	251	
7044	F4	RS	P	X	A	\$	LEGCOEF3, LEGENDRE COEF CALC FOR ANGULAR DIST	GGA	217	
7044	F4	RS	B	P	CT	I	\$	SAFE-PCPS, STRESS ANALYSIS AXISYMMETRIC LOAD	GGA	250
709	F2	RS			C	\$	FIRN, 2-D FEW-GP S4 APPROXIMATION RZ GEOMETRY	LRL	7	
7090	F+MAP	RS		T	I	\$	4PSTRAINT PIPE STRESS, MAXIMUM MOMENT CALC	AI	109	
7090	F+MAP	RS	L	T	B	\$	QUICKIE, INFINITE MEDIUM SPECTRUM X-SECTIONS	AI	115	
7090	F+MAP	RS	L	T	C	\$	FAIM, 1-D MULTI-GP DIFFUSION SLAR CYL SPHERE	AI	120	
7090	F+MAP	RS	L	T	C	\$	ULCER, 1-D MULTI-GP DIFFUSION SLAR CYL SPHERE	AI	118	
7090	F+MAP	RS	P		I	\$	WIREX, COMPUTER-PRODUCED WIRING LISTS WHTREX	LASL	315	
7090	F+MAP	RS	P	T	R	\$	RAFFLE, 1ST FLIGHT COLLISION PROBABILITIES MC	CRNL	392	
7090	F+MAP	RS	P	T	B	\$	SOPHIST1/2/5, MULTI-GP TRANSFER COEFFICIENTS	LRL	160	
7090	F+MAP	RS	P	T	C	\$	EXTERMINATOR, 2-D MULTI-GP DIFFUSION PROGRAM	CRNL	156	
7090	F+MAP	RS	P	T	D	\$	ASSAULT, 2-D MULTI-GP DIFFUSION DEPLETION CODE	CRNL	240	
7090	F+MAP	RS	P	T	L	\$	DPC, DATA PREPARATION FOR 2-D DESIGN PROGRAMS	LASL	234	
7090	F+MAP	RS	P	T	M	\$	DESP, DATA FILE SERVICE ROUTINES ENDF TAPES	BNL	236	

7090				7090			
7090	F+FAP	RS PL	T B \$	GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV	BNW	185	
7090	F+FAP	RS PL	T B \$	TEMPEST2, THERMAL NEUTRON SPECTRUM X-SECTIONS	AI	50	
7090	F+FAP	RS PL	T C \$	AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	AI	29	
7090	F+FAP	RSB	T A \$	TUZ, UNRESOLVED REGION RESONANCE INTEGRAL CALC	GGA	42	
7090	F+FAP	RSB	T A \$	ZUT, RESOLVED REGION RESONANCE INTEGRAL CALC	GGA	41	
7090	F+FAP	RSBP	T D \$	DOB, 2-D FEW-GP DIFFUSION BURNUP FZ GEOMETRY	GGA	99	
7090	F+FAP	RSBPL	T C \$	CRAM, 1-D AND 2-D MULTI-GP DIFFUSION PROGRAM	UK-R	103	
7090	F+FAP	RSBPLX	T B \$	AGN-GAM, FAST SPECTRUM MULTI-GP CONSTANT CALC	AGC	204	
7090	F+FAP	RS P	T C \$	TDSN, 2-D MULTIGROUP DISCRETE ORDINATE PROGRAM	LER	312	
7090	FAP	RSBP X	T Q \$	SPECTRA, MC CALCULATION IRRADIATED MATERIAL	GEC	422	
7090	FLCCC	RS P	B \$	MCS, MONTE CARLO NEUTRON PENETRATION STUDY	LASL	202	
7090	FLOCD	RS P	B \$	ZOT, GROUP-COLLAPSING CF MULTI-GP X-SECTIONS	LASL	113	
7090	FLCCC	RSBP	C \$	2CXY, 2-D MULTI-GP SN APPROXIMATION XY GEOM	AGC	18	
7090	FLOCD	RSBP	T C \$	GF-HAPC-S13, 1-D MULTI-GP DOUBLE SN APPROX	BNW	75	
7090	F2	RS	A \$	LYNNE, WOODS-SAXON POTENTIAL SHAPE CALCULATION	CRNL	381	
7090	F2	RS	B \$	CANCOFF JR, MODERATOR SPACE CHORD DIST FUNCT	AEG	150	
7090	F2	RS	B \$	S4 CYL CELL CODE, 1-D 1-GP S4 APPROXIMATION	AI	53	
7090	F2	RS	C \$	PERT, 1-D PERTURBATION FOR AIM AND FOG CODES	AI	30	
7090	F2	RS	E \$	AIRES3, SPACE-INDEPENDENT KINETICS W/FEEDBACK	AI	121	
7090	F2	RS	E \$	SNAPKINS/5A, 1-REGION KINETICS SNAP GEOMETRY	AI	122	
7090	F2	RS	I \$	CROCK, SPACE POWER PLANT DESIGN OPTIMIZATION	AI	112	
7090	F2	RS	I \$	FUGUE, STEADY-STATE TEMPERATURE VOID FRACTION	AI	48	
7090	F2	RS	I \$	SHOCK, SPACE POWER PLANT DESIGN OPTIMIZATION	AI	114	
7090	F2	RS	J \$	FARSEIA, DOSE RATE FROM SNAP SHIELD LEAKAGE	AI	91	
7090	F2	RS	J \$	MORTIMER, DOSE RATE CALCULATION SNAP GEOMETRY	AI	142	
7090	F2	RS	J \$	SCARF2, SCATTER FROM RADIATOR FINS SNAP GEOM	AI	110	
7090	F2	RS	J \$	SCAP1, SCATTER FROM A RING SNAP GEOMETRY	AI	111	
7090	F2	RS	N \$	WFD, W-DSN OUTPUT TAPE EDIT REACTION RATES	UK-W	133	
7090	F2	RS	T A \$	SUMMIT, CRYSTALLINE SCATTERING KERNEL CALC	GGA	56	
7090	F2	RS L	T D \$	SIZZLE, 1-D MULTIGROUP DIFFUSION DEPLETION	AI	58	
7090	F2	RS P	B \$	BAM, S4 CYL CELL CODE AND TEMPEST COMBINATION	AI	108	
7090	F2	RS P	B \$	BOUNCE, FLUX DIST IN MULTI-PIN FUEL ELEMENT	AGC	237	
7090	F2	RS P	B \$	SAIL, 1-D 1-GP SN APPROXIMATION SLAB GEOMETRY	AI	52	
7090	F2	RS P	C \$	MIST, 1-D FEW-GP SN DOUBLE SN APPROX SLAB GEOM	PPCC	59	
7090	F2	RS P	D \$	AIMFIRE, URANIUM FUEL CYCLE COST ANALYSIS	AI	55	
7090	F2	RS P	F \$	CONFC, COUPLED NEUTRONICS-HYDRODYNAMICS SPHERE	LRL	129	
7090	F2	RS P	G \$	CLOUD, GAMMA-RAY DOSE RATE FROM A CLOUD	AI	47	
7090	F2	RS P	J \$	GRACE1, GAMMA-RAY ATTENUATION SLAB GEOMETRY	AI	45	
7090	F2	RS P	J \$	GRACE2, GAMMA-RAY ATTENUATION CYL SPHERE GEOM	AI	46	
7090	F2	RS P	J \$	RATRAP, DOSE RATE CALCULATION SNAP GEOMETRY	AI	141	
7090	F2	RS P	D \$	CROCEO, ML-1 FLUID FLOW EXPERIMENT ANALYSIS	AGC	154	
7090	F2	RS P	P \$	FRANTIC, LEAST SQUARES FIT SUM OF EXPONENTIALS	MIT	324	
7090	F2	RS P	T B \$	AGN-SIGMA, CALC OF MULTI-GP TRANSFER MATRICES	AGC	243	
7090	F2	RS P	T C \$	EQUIPOISE3, 2-D 2-GROUP DIFFUSION SLAB CYL	CRNL	39	
7090	F2	RS P	T C \$	EQUIPOISE3A, 2-D 2-GP DIFFUSION CYLINDER SLAB	ORNL	87	
7090	F2	RS P	T C \$	FOG, 1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE	AI	28	
7090	F2	RS P	T C \$	TOPIC, 1-D FEW-GP SN APPROXIMATION CYLINDER	PPCC	148	
7090	F2	RS P	T C \$	W-DSN, 1-D MULTI-GP SN APPROX SLAB CYL SPHERE	UK-W	132	
7090	F2	RS P	T C \$	WHIRLAWAY, 3-D 2-GROUP DIFFUSION XYZ GEOMETRY	CRNL	32	
7090	F2	RS P	T C \$	ZOGRAND, 2-D FEW-GROUP DIFFUSION SLAB CYLINDER	ORNL	40	
7090	F2	RS PL	T A \$	APES2, RESONANCE INTEGRAL X-SECTION CALC	AI	89	
7090	F2	RS PL	T B \$	FOFM, FAST NEUTRON SPECTRUM X-SECTION CALC	AI	51	
7090	F2	RS PLX	T B \$	GAM1, FAST NEUTRON SPECTRUM X-SECTION CALC	GGA	33	
7090	F2	RS PLX	T C \$	DTF2, 1-D MULTI-GP DISCRETE ORDINATE CALC	AI	151	
7090	F2	RSB	F \$	HATCHET, COUPLED NEUTRONICS-HYDRODYNAMICS CODE	AGC	153	
7090	F2	RSB	T D \$	FEVER, 1-D FEW-GP DIFFUSION DEPLETION PROGRAM	GGA	117	
7090	F2	RSBP	D \$	ISOCRUNCH, REACTION DECAY CHAIN ANALYSIS	CRNL	180	
7090	F2	RSBP	D \$	NPRFCCP, FUEL CYCLE COSTS PERFORMANCE DATA	KE	146	
7090	F2	RSBP	D \$	NUCY, SOLUTION OF NUCLIDE CHAIN EQUATIONS	ORNL	134	
7090	F2	RSBP	J \$	LIPREFCAN1, MC NEUTRON PENETRATION CALCULATION	DAC	123	
7090	F2	RSBPL	T J \$	MAC, SHIELD DESIGN MULTIGROUP SLAB GEOMETRY	BNW	143	
7090	F4	RS P	T F \$	NOISY1, AUTO- AND CROSS-SPECTRAL DENSITIES	BNW	488	
7090	F4	RSBP	A \$	MUFFLE, FISSION NUCLIDE X-SECTION EVALUATION	ORNL	323	
7090	MAO	RSB	D \$	BURP1, DETECTOR EFFICIENCY POINT SOURCE	UM	164	

7090

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7090	MAC	RSB	D	\$	BURP2, DETECTOR EFFICIENCY DISK SOURCE	UM	165								
7090	MAC	RSB	D	\$	BURP3, DETECTOR EFFICIENCY POINT SOURCE	UM	166								
7090	MAC	RSB	D	\$	BURP4, GAMMA-RAY PHOTOFRACITION SOLID CRYSTAL	UM	169								
7090	MAC	RSB	D	\$	BURP5, GAMMA-RAY PHOTOFRACITION WELL CRYSTAL	UM	170								
7094	F+FAP	RS	L	T	M	\$	MOMUS, X-SECTION LIBRARY UTILITY PROGRAM	AI	159						
7094	F+FAP	RS	P		J	\$	SHOE, SHIELD WEIGHT OPTIMIZATION DOSE CALC	AI	197						
7094	F+FAP	RS	P	T	B	\$	EPITHERMOS, SPECTRUM AND X-SECTION CALCULATION	NEC	201						
7094	F+FAP	RS	P	T	G	\$	AISITE2, PARAMETRIC SITE REQUIREMENT STUDY	AI	172						
7094	F+FAP	RS	P	T	H	\$	HEATING2, TRANSIENT STEADY-STATE HEAT TRANSFER	AI	198						
7094	F+FAP	RS	PL	T	B	\$	AILMOE, X-SECTION CALC ELASTIC SCAT RESONANCES	AI	147						
7094	F+FAP	RS	PL	T	B	\$	GRAVE, GROUP-AVERAGING X-SECTIONS PARAMETERS	AI	162						
7094	F+FAP	RS	PL	T	B	\$	TYCHE3, MONTE CARLO SLOWING-DOWN DENSITY CALC	AI	149						
7094	F+FAP	RS	PL	T	G	\$	CURIE,DOSE,THUNDERHEAD, EXTERNAL+INTERNAL DOSE	AI	196						
7094	F+FAP	RS	PL	T	M	\$	ECSIL, EXPERIMENTAL NEUTRON DATA LIBRARY	LRL	351						
7094	F+FA2	RSBPL	T	N	\$	CPS, SC4020 PLOTS FROM SCISRS X-SECTION TAPES	WANL	239							
7094	F+MAP	RS	P		A	\$	CHAD, LEGENDRE COEF CALC FOR ANGULAR DIST DATA	AI	215						
7094	F+MAP	RS	P	T	B	\$	GAROL, RESONANCE OVERLAP AND LATTICE EFFECTS	LER	219						
7094	F+MAP	RS	P	T	E	\$	AIPDS, SPACE-INDEPENDENT KINETICS W/FEEDBACK	AI	163						
7094	F+MAP	RS	P	T	F	\$	TSN, SPATIALLY-DEPENDENT REACTOR KINETICS	AI	309						
7094	F+MAP	RS	PLX	T	A	\$	TRIX1, RESONANCE INTEGRAL X-SECTION CALC	AI	208						
7094	F+MAP	RS	PLX	T	B	\$	LASER, SPECTRUM CALC WITH BURNUP CYL LATTICE	WAPD	249						
7094	F+MAP	RSBP	T	G	\$	SATURATED BLOWDOWN2, BLOWDOWN ANALYSIS LOFT	KE	200							
7094	FAP	RS	P	T	H	\$	RATH, 2- OR 3-D HEAT CONDUCTION LUMPED MASS	LASL	242						
7094	F2	RS	P		A	\$	FXT, X-SECTIONS FROM B-W RESONANCE PARAMETERS	WANL	238						
7094	F2	RS	P		F	\$	WEAK EXPLOSION, COUPLED NEUTRON-HYDRODYNAMICS	APDA	145						
7094	F2	RS	P		H	\$	FLOW-MODEL, MULTI-CHANNEL 2-D 2-PHASE FLOW	AI	246						
7094	F2	RS	P		P	\$	EXPALS, LEAST SQUARES EXPONENTIAL DECAY CURVES	LRL	321						
7094	F2	RS	P	T	A	\$	2PLUS, NON-SPHERICAL OPTICAL MODEL X-SECTIONS	AI	254						
7094	F2	RS	P	T	G	\$	TRANS-FUGUE1, TRANSIENT FLOW AND HEAT TRANSFER	AI	268						
7094	F2	RS	PL	T	I	\$	CYCLOPS1, THERMODYNAMIC CYCLE ANALYSIS	AI	244						
7094	F2	RSBP		H	\$	AXFLU, HEAT TRANSFER MOLTEN FUEL TUBE BUNDLES	LASL	182							
7094	F2	RSBP		H	\$	AXTHRM, HEAT TRANSFER SOLID FUEL TUBE BUNDLES	LASL	183							
7094	F2	PSBP	T	H	\$	PTH1, BLOWDOWN PRESSURE TEMPERATURE HISTORY	KE	155							
7094	F4	RS		E	\$	R102, SPACE-INDEPENDENT INVERSE KINETICS CALC	WANL	168							
7094	F4	RS		T	P	\$	LASL LEAST SQUARES, GENERAL CURVE FITTING	LASL	62						
7094	F4	RS	P		A	\$	AVERAGE, UNRESOLVED REGION AVERAGE X-SEC CALC	BNL	376						
7094	F4	RS	P		F	\$	MARS, 2-D EXCURSION CALCULATION R-Z GEOMETRY	APDA	293						
7094	F4	RS	P	X	T	C	\$	VARI-QUIR3, 2-D MULTI-GP DIFFUSION XY RZ RTH	WANL	264					
71-1),	FNDF/B	THERMAL	SCATTERING	DATA	DP	360	F4	RS	P	X	T	A	\$	FLANGE21	368
7600	F4	RS		T	P	\$	MODEL, MODIFIED BETTIS ENVIRNMNTL LIB SCOPF2.0 CDC		478						
7600	F4	RS	P	T	B	\$	ETOG3, ENDF/B TO MUFT, GAM, ANISN X-SEC FORMAT	WAPD	538						
7600	F4	RS	P	T	B	\$	ETOT2, THERMAL LIBRARIES FROM ENDF/B DATA	WAPD	509						
7600	F4	RS	P	T	C	\$	TEIPLET, 2-D TRIANGULAR MESH TRANSPORT PROGRAM	LASL	608						
7600	F4	RS	P	T	G	\$	CERUG, STEAM GENERATOR SODIUM-WATER REACTION	CEND	548						
7600	F4	RS	PLX	T	C	\$	VIM1, MONTE CARLO CRITICAL ASSEMBLY ANALYSIS	AI	510						
7600B	F4	RS	P	T	C	\$	TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ RTHETA	LASL	358						
99-GP	DIC-2B	LIBRARY	GROUP	COLLAPSING	APRF	6600	F4	RS		B	\$	APRFX1,	466		

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