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ARGONNE CODE CENTER:
COMPILATION OF PROGRAM ABSTRACTS

by

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161-164.2	161-164.2	ACC Abstract 156 revised
185-186	185-186	ACC Abstract 167 revised
197-200	197-200	ACC Abstract 173 revised
343-346	343-346	ACC Abstract 246 revised
405-406.2	405-406.2	ACC Abstract R275 revised
409-410	409-410	ACC Abstract 277 revised
419-420	419-420	ACC Abstract R282 revised
429-432	429-432	ACC Abstract 287 revised
449-452	449-452	ACC Abstract 297 deleted
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561-564	561-564	ACC Abstract 350 revised
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637-640	637-640	ACC Abstracts 386 and 387 revised
655-658	655-658	ACC Abstract 395 revised
679-682	679-682	ACC Abstracts 406 and 407 revised
719-720, 720.1-720.2	719-720	ACC Abstract R426 revised
767-770	767-770	ACC Abstract 449 revised
801-802	801-802	ACC Abstract 464 revised
821-830	821-830	ACC Abstracts 474, 475 and 476 revised
833-836	833-836	ACC Abstract R478 revised
879-1141	879-1038	ACC Abstracts 499 through R537 added; Section VI Library Programs by Classification revised; Section VII KWIC Index revised; References replaced

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NO.	KWIC TITLE	INSTALLATION	MACH	LANG	PACKAGE	CAT	
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	HAFAVER, HAUSER-FESHBACH INELASTIC SCATTERING	CDC	1604	F63	RS P	A	26
18	2DXY, 2-D MULTI-GP SN APPROXIMATION XY GEOM	AGC	7090	FLOCO	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	CDC	1604	F63	RS P T	C	30
28	FOG, 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	CDC	1604	F63	RS PL T	C	32
30	PERT, 1-D PERTURBATION FOR AIM AND FOG CODES	AI	7090	F2	RS	C	34
30	PERT, 1-D PERTURBATION FOR AIM AND FOG CODES	CDC	1604	F63	RS	C	34
30	PERT, 1-D PERTURBATION FOR AIM AND FOG CODES	BHSC	360	F4	RS P	C	34
32	WHIRLAWAY, 3-D 2-GROUP DIFFUSION XYZ GEOMETRY	ORNL	7090	F2	RS P T	C	36
32	WHIRLAWAY, 3-D 2-GROUP DIFFUSION XYZ GEOMETRY	CDC	1604	F63	RS P T	C	36
33	GAM1, FAST NEUTRON SPECTRUM X-SECTION CALC	GGA	7090	F2	RS PLX T	B	38
33	GAM1, FAST NEUTRON SPECTRUM X-SECTION CALC	CDC	1604	F63	RS PLX T	B	38
33	GAM1, FAST NEUTRON SPECTRUM X-SECTION CALC	ANL	3600	F63	RS LX T	B	38
39	EQUIPOISE3, 2-D 2-GROUP DIFFUSION SLAB CYL	ORNL	7090	F2	RS P T	C	40
40	20GRAND, 2-D FEW-GROUP DIFFUSION SLAB CYLINDER	ORNL	7090	F2	RS P T	C	42
40	20GRAND, 2-D FEW-GROUP DIFFUSION SLAB CYLINDER	CDC	1604	F63	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	KAPL	6600	F+ASC	RS P T	P	47.1
45	GRACE1, GAMMA-RAY ATTENUATION SLAB GEOMETRY	AI	7090	F2	RS P	J	48
45	GRACE1, GAMMA-RAY ATTENUATION SLAB GEOMETRY	CDC	1604	F63	RS P	J	48
46	GRACE2, GAMMA-RAY ATTENUATION CYL SPHERE GEOM	AI	7090	F2	RS P	J	50
46	GRACE2, GAMMA-RAY ATTENUATION CYL SPHERE GEOM	CDC	1604	F63	RS P	J	50
47	CLOUD, GAMMA-RAY DOSE RATE FROM A CLOUD	AI	7090	F2	RS P	G	52
47	CLOUD, GAMMA-RAY DOSE RATE FROM A CLOUD	CDC	1604	F63	RS P	G	52
47	CLOUD, GAMMA-RAY DOSE RATE FROM A CLOUD	DP	360	F4	RS P	G	52
48	FUGUE, STEADY-STATE TEMPERATURE VOID FRACTION	AI	7090	F2	RS	I	54
50	TEMPEST2, THERMAL NEUTRON SPECTRUM X-SECTIONS	AI	7090	F+FAP	RS PL T	B	56
50	TEMPEST2, THERMAL NEUTRON SPECTRUM X-SECTIONS	CDC	1604	F63	RS PL T	B	56
50	TEMPEST2, THERMAL NEUTRON SPECTRUM X-SECTIONS	BHSC	360	F4	RS PL T	B	56
51	FORM, FAST NEUTRON SPECTRUM X-SECTION CALC	AI	7090	F2	RS PL T	B	58
51	FORM, FAST NEUTRON SPECTRUM X-SECTION CALC	CDC	1604	F63	RS PL T	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	CDC	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	CDC	1604	F63	RS P	B	62
55	AIMFIRE, 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	7090	F2	RS L T	D	68
58	SIZZLE, 1-D MULTIGROUP DIFFUSION DEPLETION	CDC	1604	F63	RS L T	D	68
58	SIZZLE, 1-D MULTIGROUP DIFFUSION DEPLETION	AI	360	F4	RSBP X T	D	68

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59	MIST, 1-D FEW-GP SN DOUBLE SN APPROX SLAB GEOM	PPCO	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	SNR2, STRESS ANALYSIS SHELLS OF REVOLUTION	KAPL	6600	F4	RS P	T I	76.1
87	EQUIPOISE3A, 2-D 2-GP DIFFUSION CYLINDER SLAB	ORNL	7090	F2	RS P	T C	77
87	EQUIPOISE3A, 2-D 2-GP DIFFUSION CYLINDER SLAB	CDC	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	CDC	1604	F63	RS PL	T A	79
91	FARSE1A, DOSE RATE FROM SNAP SHIELD LEAKAGE	AI	7090	F2	RS	J	81
99	DOB, 2-D FEW-GP DIFFUSION BURNUP RZ GEOMETRY	GGA	7090	F+FAP	RSBP	T D	83
102	AX1, COUPLED NEUTRONICS-HYDRODYNAMICS SPHERE	CDC	3600	F63	RSBP	F	85
103	CRAM, 1-D AND 2-C MULTI-GP DIFFUSION PROGRAM	UK-R	7090	F+FAP	RSBPL	T C	87
103	CRAM, 1-D AND 2-C 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 GEOM	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	ZOT, GROUP-COLLAPSING OF 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 D	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	CDC	1604	F63	RS PLX	T C	107
120	FAIMOS, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	BHSC	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	CDC	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	DAC	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	UK-W	7090	F2	RS	N	120
134	NUCY, SOLUTION OF NUCLIDE CHAIN EQUATIONS	ORNL	7090	F2	RSBP	D	122
135	TRAFICORPORATION, TRANSFER FUNCTION SYNTHESIS	ANL	3600	F63	RSBP	T E	124
136	HERESY1, LATTICE PARAMETERS HETEROGENEOUS CALC	FMA	7090	F2	RSBP X	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	DTF, 1-D MULTIGROUP DISCRETE ORDINATE CALC	UNC	1604	F63	RS PL	T C	135
145	WEAK EXPLOSION, COUPLED NEUTRON-HYDRODYNAMICS	APDA	7094	F2	RS P	F	137
146	NPRFCCP, FUEL CYCLE COSTS PERFORMANCE DATA	KE	7090	F2	RSBP	D	139
147	ATLMOE, X-SECTION CALC ELASTIC SCAT RESONANCES	AI	360	F4	RS PLX	T B	141
147	ATLMOE, X-SECTION CALC ELASTIC SCAT RESONANCES	AI	7094	F+FAP	RS PL	T B	141
148	TOPIC, 1-D FEW-GP SN APPROXIMATION CYLINDER	PPCO	7040	F4	RS P	T C	144
148	TOPIC, 1-D FEW-GP SN APPROXIMATION CYLINDER	PPCO	7090	F2	RS P	T C	144
149	TYCHE3, MONTE CARLO SLOWING-DOWN DENSITY CALC	AI	7094	F+FAP	RS PL	T B	146
150	DANCOFF JR, MODERATOR SPACE CHORD DIST FUNCT	AEG	7090	F2	RS	B	148
151	DTF2, 1-D MULTI-GP DISCRETE ORDINATE CALC	AI	7090	F2	RS PLX	T C	150
151	ANISN, 1-D MULTI-GP DISCRETE ORDINATE CALC	AI	360	F4	RSBPLX	T C	150
152	ARGUS, TRANSIENT TEMPERATURE CALC CYLINDER	ANL	3600	F63	RSBP	T H	153
153	HATCHET, COUPLED NEUTRONICS-HYDRODYNAMICS CODE	AGC	7090	F2	RSB	F	155
154	CROC90, ML-1 FLUID FLOW EXPERIMENT ANALYSIS	AGC	7090	F2	RS P	O	157
155	PTH1, BLOWDOWN PRESSURE TEMPERATURE HISTORY	KE	7094	F2	RSBP	T H	159
156	EXTERMINATOR2, 2-D MULTI-GP DIFFUSION PROGRAM	BC	625	F4	RS	T C	161
156	EXTERMINATOR, 2-D MULTI-GP DIFFUSION PROGRAM	ORNL	7090	F+FAP	RS P	T C	161
156	EXTERMINATOR2, 2-D MULTI-GP DIFFUSION PROGRAM	ORNL	360	F4	RS P	T C	161
156	EXTERMINATOR2, 2-C MULTI-GP DIFFUSION PROGRAM	CE	6600	F4	RS P	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	FORTTRAN TDC, 2-D MULTI-GP SN APPROXIMATION RZ	PW	1604	F63	RS P	T C	169
162	GRAVE, GROUP-AVERAGING X-SECTIONS PARAMETERS	AI	7094	F+FAP	RS PL	T B	172
163	AIR0S, SPACE-INDEPENDENT KINETICS W/FEEDBACK	AI	7094	F+MAP	RS P	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	O	182
167	FLAPE, 3-D REACTIVITY AND POWER DISTRIBUTION	CDC	3600	F63	RSBP	T C	185
167	FLARE, 3-D REACTIVITY AND POWER DISTRIBUTION	NEO	635	F4	RS P	T C	185
167	FLARE, 3-D REACTIVITY AND POWER DISTRIBUTION	MSS	360	F4	RS P	T C	185
168	R102, SPACE-INDEPENDENT INVERSE KINETICS CALC	ANL	3600	F63	RSBP	E	187
168	R102, SPACE-INDEPENDENT INVERSE KINETICS CALC	WANL	7094	F4	RS	E	187
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171	NEAPREX, COMPOUND NUCLEUS X-SECTION CALC	ANL	3600	F63	RSBP	A	194
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
172	AISITE2, PARAMETRIC SITE REQUIREMENT STUDY	AI	7094	F+FAP	RS P	T G	196
173	2DF, 2-D MULTI-GP DISCRETE ORDINATE CODE	UNC	1604	F63	RS	C	198
173	2DF, 2-D MULTI-GP DISCRETE ORDINATE CODE	GGA	1108	F5	RS P	T C	198
174	FORE2, FAST REACTOR EXCURSION CALCULATIONS	ANL	360	F4	RS P X	T F	200
174	FORE, FAST REACTOR EXCURSION CALCULATIONS	NED	2000	F4	RS P	T F	200
174	FORE2, FAST REACTOR EXCURSION CALCULATIONS	NED	635	F4	RS P X	T F	200
176	RAPTURE, RESONANCE INTEGRAL X-SECTION CALC	NED	2000	F2	RS P	A	203
177	DOPIE, RESOLVED RESONANCE X-SECTION CALC	NED	2000	F2	RS P	A	205
178	SPARTA, SPATIALLY-AVERAGED DOPPLER EFFECTS	NED	2000	F2	RS P	B	207
179	ISOTOPES, MAXIMUM YIELD FROM REACTION OR DECAY	ORNL	1604	F63	RS P	D	209
180	ISOCRUNCH, REACTION DECAY CHAIN ANALYSIS	ORNL	1604	F63	RS P	D	211
180	ISOCRUNCH, REACTION DECAY CHAIN ANALYSIS	ORNL	7090	F2	RSBP	D	211
181	XLIBIT, 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	THERMOS(ANL), THERMAL SPECTRUM X-SECTION CALC	ANL	3600	F63	RSBP XCT	B	219
184	BRT1, THERMAL SPECTRUM X-SECTION CALC	BNW	1108	F5	RS PLX	T B	219
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	BC	625	F4	RS P X	T B	221
186	LAG, ASSEMBLER FOR FLOCO2 INSTRUCTION SET	PW	1604	F+CDP	RS P	T P	223
187	PIP, CENTRIFUGAL PUMP IMPELLER DESIGN STUDY	PW	1604	F63	RS P	T I	225
188	CMPMAT, TRANSFER FUNCTION EVALUATION	PW	1604	F63	RS P	E	227
189	SNC, CALCULATION OF SN CONSTANTS FOR DSN TDC	PW	1604	F63	RS P	L	229
190	WOPEXPT, 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	2DXYL, 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
194	CSP1, SN X-SECTION LIBRARY TAPE PREPARATION	PW	1604	F63	RS	L	239
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	SHOE, SHIELD 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 OR 2DXY FLUX INPUT	PW	1604	F63	RS	C	250
200	SATURATED BLOWDOWN2, BLOWDOWN ANALYSIS LOFT	KE	7094	F+MAP	RSBP	T G	252
201	EPIATHERMOS, SPECTRUM AND X-SECTION CALCULATION	NED	7094	F+FAP	RS P	T B	254
202	MCS, MONTE CARLO NEUTRON PENETRATION STUDY	LASL	7090	FLOCO	RS P	B	256
203	COMBCO, 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	T B	260
205	BLOST5, POINT-KINETICS WITH 2-D HEAT TRANSFER	GGA	7044	F+MAP	RS P	T H	262
206	UNPACK, RETRIEVAL FROM SCISRS X-SECTION TAPE	GGA	7044	F+MAP	RSBP	M	264
207	CROSSPLOT, SC4020 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	LER	7094	F4	RS P	T C	270
209	DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	LASL	6600	F4	RS P	T C	270
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
210	CTX, EFFECTIVE X-SECTION CALC FROM DSN OUTPUT	PW	1604	LAG1	RS P	N	273
211	MGDSN, 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 B	279
214	MISH-MASH, RESONANCE INTEGRAL CALC HOMOGENEOUS	ANL	3600	F36	RSBP	A	281
215	CHAC, LEGENDRE COEF CALC FOR ANGULAR DIST DATA	AI	7094	F+MAP	RS P	A	283
216	FASDOP, X-SECTIONS FROM B-W RESONANCE DATA	GGA	7044	F+MAP	RS P	A	285
217	LEGCOEF3, LEGENDRE COEF CALC FOR ANGULAR DIST	GGA	7044	F4	RS P X	A	287
218	GAVR, ENERGY INTERVAL X-SECTION AVERAGING	GGA	7044	F4	RS P	L	289
219	GARCL, RESONANCE OVERLAP AND LATTICE EFFECTS	GGA	7044	F+MAP	RS P	T B	291
219	GARCL, RESONANCE OVERLAP AND LATTICE EFFECTS	LER	7094	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	RELCD-FEVER, 1-D FEW-GP DIFFUSION DEPLETION	GGA	7044	F4	RS P	T C	295
222	GAMBLE4, 2-D MULTI-GP DIFFUSION XY RZ GEOMETRY	GGA	7044	F+MAP	RSBP	T C	297
222	GAMBLE5, 2-D MULTI-GP DIFFUSION XY RZ GEOMETRY	GGA	1108	F+BAL	RS P	T C	297
223	REVISFO-GAD, FUEL CYCLE ANALYSIS W/REFUELING	GGA	7044	F4	RS P	T D	299
224	WAMPUM, FUEL CYCLE COSTS PERFORMANCE STUDY	GGA	7044	F4	RS P	D	301
225	TEMCO, 1-D FEW-GP DIFFUSION TEMP COEF CALC	GGA	7044	F4	RS P	T C	303
226	OPUS, POWER PLANT PERFORMANCE AND PRICE STUDY	GGA	7044	F+MAP	RS P	T D	305

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227	STMGEN, STEAM GENERATOR DESIGN CRITERIA COSTS	GGA	7044	F4	RS P T D		307
228	PRECON, HTGR CONTAINMENT PRESSURE POST RUPTURE	GGA	7044	F4	RS X T G		309
229	ELBOW, FUEL ELEMENT STRESS ANALYSIS STUDY	GGA	7044	F4	RS P T G		311
231	RAD2, HTGR FISSION PRODUCT ACTIVITY DIST STUDY	GGA	7044	F4	RS P D		315
232	GAZELLE5, GAS-COOLED CORE THERMAL DESIGN STUDY	GGA	7044	F4	RS P I		317
233	CORE, CORE CONFIGURATION FUEL TEMPERATURE CODE	GGA	7044	F4	RS I		319
234	DPC, 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	GEC	7094	F4	RS P B		323
236	DFSR, DATA FILE SERVICE ROUTINES ENDF TAPES	BNL	7090	F+FAP	RS P T M		325
237	BOUNCE, FLUX DIST IN MULTI-PIN FUEL ELEMENT	AGC	7090	F2	RS P B		327
238	EXT, X-SECTIONS FROM B-W RESONANCE PARAMETERS	WANL	7094	F2	RS P A		329
239	CPS, SC4020 PLCTS FROM SCISRS X-SECTION TAPES	WANL	7094	F+FAP	RSBPL T N		331
240	ASSAULT, 2-D MULTI-GP DIFFUSION DEPLETION CODE	ORNL	7090	F+FAP	RS P T D		333
241	MFN, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	BNW	1107	F4	RS P T C		336
242	RATH, 2- OR 3-D HEAT CONDUCTION LUMPED MASS	LASL	7094	FAP	RS P T H		338
242	RATH, 2- OR 3-D HEAT CONDUCTION LUMPED MASS	LASL	7030	F4	RS T H		338
243	AGN-SIGMA, CALC OF MULTI-GP TRANSFER MATRICES	AGC	7090	F2	RS P T B		340
244	CYCLOPS1, THERMODYNAMIC CYCLE ANALYSIS	AI	7094	F2	RS PL T I		342
246	FLOW-MODEL, MULTI-CHANNEL 2-D 2-PHASE FLOW	AI	7094	F2	RS P H		344
246	FLOW-MODEL, MULTI-CHANNEL 2-D 2-PHASE FLOW	MSS	360	F4	RS P H		344
247	FLANGE1, SCATTERING LAW X-SECTION CALCULATION	GGA	1108	F5	RS P A		346
248	COINC, COINCIDENCE COUNTING DATA REDUCTION	ANL	3600	F63	RSBP O		348
249	LASER, SPECTRUM CALC WITH BURNUP CYL LATTICE	WAPD	7094	F+MAP	RS PLX T B		350
250	SAFE-PCRS, STRESS ANALYSIS AXISYMMETRIC LOAD	GGA	7044	F4	RS P T I		353
251	SAFE-AXISYM, STRESS ANALYSIS AXISYMMETRIC LOAD	GGA	7044	F4	RS P T I		355
252	SAFE-PLANE, PLANE STRESS ANALYSIS, 2-D BODIES	BNL	6600	F4	RS P T I		357
252	SAFE-PLANE, PLANE STRESS ANALYSIS, 2-D BODIES	GGA	1108	F4	RS P I		357
253	SAFE-SHELL, STRESS ANALYSIS THIN SHELLS	GGA	1108	F4	RS P I		359
254	2PLUS, NON-SPHERICAL OPTICAL MODEL X-SECTIONS	ANL	3600	F63	RSBP T A		361
254	2PLUS, NON-SPHERICAL OPTICAL MODEL X-SECTIONS	AI	7094	F2	RS P T A		361
255	R101, SPACE-INDEPENDENT KINETICS KEX OPTIONS	WANL	7094	F4	RS P E		363
255	R101, SPACE-INDEPENDENT KINETICS KEX OPTIONS	ANL	3600	F63	RSBP E		363
256	MANTA, STEADY-STATE THERMAL-HYDRAULIC ANALYSIS	WARD	6600	F4	RS P T H		365
256	MANTA, STEADY-STATE THERMAL-HYDRAULIC ANALYSIS	NED	635	F4	RS P T H		365
257	REAX, RESOLVED RESONANCE EPITHERMAL X-SECTIONS	NED	635	F4	RS P T B		367
258	EXPN, ANALYSIS OF PULSED NEUTRON SOURCE DATA	NED	635	F4	RS P T O		369
259	MUSCAT, VIEW FACTOR SHIELDING CODE CAVITY GEOM	GGA	1108	F4	RS P T J		371
260	GARGOYLE, FUEL CYCLE ANALYSIS PARTIAL REFUEL	GGA	7044	F4	RS P T D		373
261	GADCE,DOSET, HTGR ACCIDENT ANALYSIS DOSE CALC	GGA	1108	F4	RS T G		375
262	MACH1, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	ANL	3600	F36	RS P X T C		377
262	MACH1, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	PURD	6500	F4	RS PLX 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	7094	F4	RS P X T C		381
265	RSAC, RADIOLOGICAL SAFETY ANALYSIS PROGRAM	PPCO	7040	F+MAP	RS P T G		383
R266	CYGR02, STRESS ANALYSIS CYL FUEL ELEMENT	BAPL	6600	F4	RS T I		385
R267	WATER, STEAM TABLES 14.5-14,500PSIA 32-472DEGF	BAPL	6600	F4	RS T H		387
268	TRANS-FUGUE1, TRANSIENT FLW AND HEAT TRANSFER	AI	7094	F2	RS P T G		389
269	DTF-BURN, 1-D MULTI-GP DTF4 WITH DEPLETION	LASL	7030	F4	RS P T D		391
270	CAESAR4,LIBLST, 1-D MULTI-GP DIFFUSION + LIB	AI	360	F4	RSBPLX T C		393
271	CLIP, FORM OR THREDES LIBRARY UTILITY ROUTINE	AI	360	F4	RSB L T M		396
R272	FIGRO, LSBR 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
R274	WIGL2, 1-D 2-GP SPACE-TIME DIFFUSION 3-GEOM	BAPL	6600	F4	RS P T F		402
R274	WIGL2, 1-D 2-GP SPACE-TIME DIFFUSION 3-GEOM	GGA	1108	F4	RS P T F		402
R275	PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	BAPL	6600A	F+ASC	RS P T D		405
R275	PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	BW	6600B	F+ASC	RS P T D		405
R275	PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	BAPL	6600C	F+ASC	RS P T D		405
R275	PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	ANC	360D	F+BAL	RS P XCT D		405
276	AVOID, ANNULAR VOID X-SECTION CALCULATION	GEC	625	F4	RS P B		407
277	HAMMER,LITHE,HELP, CRITICAL ANALYSIS SYSTEM	DP	360	F+BAL	RS P XCT B		409
278	WATER-HAMMER, LIQUID BLOWDOWN ANALYSIS LOFT	UGA	360	F4	RS P G		411
278	WHAM, LIQUID-FILLED PIPING SYSTEM ANALYSIS	KE	3600B	F36	RSBP G		411
279	LEOPARD, SPECTRA CALCULATION WITH DEPLETION	JNC	1108	F5	RS LX T B		413
279	LEOPARD, SPECTRA CALCULATION WITH DEPLETION	WAPD	360	F4	RS PLX T B		413
R280	MOB07, 2-D DIFFUSION ABSORPTION REMOVAL X-SECS	BAPL	6600	F4	RS T B		415
281	RABBLE,WLIB,FLAT, RESONANCE ABSORPTION, CELL	ANL	3600	F36	RSBP X T B		417
R282	SEALSHLL2, SHELL STRESS ANALYSIS AXISYM LOAD	SR	360	F4	RS P T I		419
R282	SFALSHLL2, SHELL STRESS ANALYSIS AXISYM LOAD	BAPL	6600	F4	RS P T I		419
R283	MO552, DYNAMIC ANALYSIS LINEAR ELASTIC SYSTEMS	BAPL	6600	F4	RS P T I		421
R284	MO555,ACT1, LCSS-CF-COOLANT ACCIDENT ANALYSIS	BAPL	6600	F4	RS P T G		423
R285	RESQ2,RESQ0,DBF1, RESONANCE INTEGRAL HEX CELL	BAPL	6600	F+ASC	RS P X T B		425
R286	HOT2, 2-D TRANSIENT HEAT CONDUCTION PROGRAM	BAPL	6600	F4	RS P T H		427
287	BISYN, 2-D MULTI-GP DIFFUSION SYNTHESIS CALC	NED	635	F4	RS PL T C		429

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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 ORDINATE CALC	ANL	3600	F36	RS P	T C	432
289	GAKER, 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
293	MARS, 2-D EXCURSION CALCULATION R-Z GEOMETRY	APDA	7094	F4	RS P	F	442
R294	M0899,H0H, STEAM TABLES 14.5-2538 PSIA	ANL	1604	F63	RS P	H	444
R294	M0899,H0H, STEAM TABLES 14.5-2538 PSIA	BAPL	6600	F4	RS P	T H	444
R295	FLASH3, LOSS-CF-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	1108	F4	RS PLX	T B	452
298	GGC4, MULTI-GP X-SECTIONS FAST THERMAL SPECTRA	GGA	6600	F4	RS L	T B	452
R299	LION, 3-D TEMPERATURE DISTRIBUTION PROGRAM	CHI	1108	F4	RS P	T H	456
R299	LION, 3-D TEMPERATURE DISTRIBUTION PROGRAM	KAPL	6600	F+ASC	RS P	T H	456
300	SAFE-CREEP, VISCOPLASTIC ANALYSIS CONCRETE	GGA	1108	F4	RS P	I	458
301	FREAP6, HTGR METALLIC FISSION PRODUCT RELEASE	GGA	1108	F4	RS P	D	460
302	GAFFE, EQUILIBRIUM FUEL CYCLE CALCULATION	GGA	1108	F4	S	T D	462
303	BLOOST6, COMBINED KINETICS 2-D 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	HWOGR-SAFE, 2-D MONTE CARLO CELL CALCULATION	AI	360	F+BAL	RS P X	T B	472
308	JUPITOR1, COUPLED-CHANNEL X-SEC EVALUATION	ORNL	1604	F63	RS P	T 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	GAKIN, 1-D MULTIGROUP TIME-DEPENDENT DIFFUSION	GGA	1108	F4	RS P	T F	478
311	BURNUP, HEAVY ELEMENT ISOTOPIC BURNUP ANALYSIS	NED	635	F4	RS P	T D	480
312	TDSN, 2-D MULTIGROUP DISCRETE ORDINATE PROGRAM	LER	7090	F+MAP	RS P	T C	482
313	CINDER(M0102), POINT DEPLETION FISSION PRODUCT	DP	360	F+BAL	RS P	T D	484
313	CINDER,M0102, POINT DEPLETION FISSION PRODUCT	BAPL	6600	F4	RS P	D	484
314	NAP, NEUTRON-INDUCED GAMMA-RAY RADIOACTIVITY	IITR	7094	F4	RSBPLX	T D	486
315	WIREX, COMPUTER-PRODUCED WIRING LISTS UHTREX	LASL	7090	F+FAP	RS P	I	488
316	GAFGAR, 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-D 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	ORNL	1604	F63	RS P	D	503
322	ISOSEARCH, ISOTOPE PRODUCTION FLUX, X-SEC CALC	ORNL	360	F+BAL	RS P	D	503
323	MUFFLE, FISSION NUCLIDE X-SECTION EVALUATION	ORNL	7090	F4	RSBP	A	505
324	FRANTIC, LEAST SQUARES FIT SUM OF EXPONENTIALS	MIT	7090	F2	RS P	P	507
325	2DB, 2-D MULTIGROUP DIFFUSION AND DEPLETION	ANL	3600	F4	RSBP	T D	509
325	2DB, 2-D MULTIGROUP DIFFUSION AND DEPLETION	BNW	1108	F4	RS P	T D	509
325	2DB, 2-D MULTIGROUP DIFFUSION AND DEPLETION	LASL	6600	F4	RS P	T D	509
326	AIRDS2A, SIMULATION OF REACTOR DYNAMICS	AI	360	F+BAL	RS P	T E	511
R327	DAFT1, LEAST SQUARES FIT FISSION NUCLIDE DATA	BAPL	6600	F4	RS P	T P	514
328	NURLOC-1.0, LOSS-CF-COOLANT THERMAL ANALYSIS	BCL	6400	F4	RS P	T G	516
R329	M0457,PIPE, ELASTIC STRESS OF PIPING SYSTEM	BAPL	6600	F4	RS P	T I	518
330	ECCSA4, LOSS-CF-COOLANT & EMERGENCY COOLING	BCL	6400	F4	RS P	T G	520
R331	FLOT1,M0219, PWR FLOW TRANSIENT ANALYSIS	BAPL	6600	F4	RS P	T H	522
332	SAFE-3D, 3-D COMPOSITE STRUCTURE STRESS STUDY	ORNL	360	F+BAL	RS P	T I	524
332	SAFE-3D, 3-D COMPOSITE STRUCTURE STRESS STUDY	GGA	1108	F4	RS P	T I	524
333	TOAD, PROCESSING OF ANALYZER GAMMA-RAY SPECTRA	GGA	1108	F+BAL	RS P	T D	526
334	PEGGY, ELASTIC SCATTERING PHASE-SHIFT ANALYSIS	ORNL	1604	F63	RS P	A	528
335	RAMES, PARTICLE WAVE FUNCTION RADIAL INTEGRALS	ORNL	1604	F63	RS P	A	530
R336	PDQ5, 2-D FEW-GROUP DIFFUSION AND DEPLETION	MIT	360B	F+BAL	RSBP	T D	531
R336	PDQ5, 2-D FEW-GROUP DIFFUSION AND DEPLETION	IBM	360A	F+BAL	RS P	T D	531
R337	STEM, MATRIX GENERATION FOR A SYSTEM OF BEAMS	KAPL	6600	F4	RS P	I	533
R338	TWIGL, 2-D 2-GP SPACE-TIME DIFFUSION FEEDBACK	BAPL	6600	F4	RS P	T F	535
R338	TWIGGLE, 2-D 2-GP SPACE-TIME DIFFUSION	ANL	360	F4	RS P	F	535
339	GAUCE, 2-D FEW-GP HEX GEOM DIFFUSION DEPLETION	GGA	1108	F4	RS P	T D	538
340	POWERCO, NUCLEAR STATION ELECTRICITY COSTS	ORNL	1604	F63	RS P	D	541
341	GANDY, UNRESOLVED RESONANCE X-SECTION CALC	GGA	1108	F4	RS P	A	543
R342	M0648, 1-D SLAB TRANSPORT WITH SLOWING DOWN	BAPL	6600	F4	RS	T C	546
R343	M0756,LETO, 1-D SLAB GAMMA-RAY TRANSPORT	BAPL	6600	F4	RS P	T J	548
R344	GEM, EIGENVALUE PROBLEM FOR VIBRATING SYSTEMS	KAPL	6600	F+ASC	RS P	T I	550
345	GAND, GAFGAR X-SECTION LIBRARY PREPARATION	GGA	1108	F4	RS P X	T L	552
346	THTE, 3-D TRANSIENT HEAT TRANSFER PROGRAM	GEC	635	F+GMP	RSBP	T H	554
347	COILLI, LEAST SQUARES ANALYSIS RESONANCE DATA	UILL	360	F4	RS P	A	556
R348	TOPS, TRANSIENT THERMODYNAMICS OF PRESSURIZERS	BAPL	6600	F4	RS P	T H	558
349	TODDEE, 2-D TIME-DEPENDENT HEAT CONDUCTION	PPCO	7044	F+MAP	RS P	T H	560

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350	ETOE, ENDF/B TC MC**2 DATA CONVERSION	ANL	360	F4	RS P CT	M	562
350	ETOE, ENDF/B TC 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	KAPL	6600	F4	RS P	F	567
353	SWELL2, FUEL ELEMENT LIFETIME ANALYSIS	ANL	3600	F36	RSBP	I	569
354	CINCAS, NUCLEAR FUEL CYCLE COST AND ECONOMICS	WAPD	6600	F4	RS P T	D	571
354	CINCAS, NUCLEAR FUEL CYCLE COST AND ECONOMICS	CWE	360	F4	RS P T	D	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 GAFFAR ENDF/B DATA TAPES	GGA	1108	BIN	R L T	Z	575
357	SUPORAN, REACTOR CORE SUPPORT STRESS ANALYSIS	ANL	3600	F36	RS P T	I	578
358	TWOTRAN, 2-D MULTI-GP TRANSPORT CODE X-Y GEOM	ANL	360	F4	RS P T	C	580
358	TWOTRAN, 2-D MULTI-GP TRANSPORT CODE R-Z GEOM	LASL	1108B	F4	RS P T	C	580
358	TWOTRAN, 2-D MULTI-GP TRANSPORT CODE X-Y GEOM	LASL	1108A	F4	RS P T	C	580
358	TWOTRAN, 2-D MULTI-GP TRNSPT CODE XY RZ RTHETA	LASL	6600	F4	RS P T	C	580
R359	PUNI, 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 TOR OUTPUT DATA	LASL	6600	F4	RS P T	B	586
362	WELWING, MATERIAL BUCKLING CYL FUEL ELEMENTS	AEB	360	F4	RS P	B	588
363	BLAST, REACTOR KINETICS TEMPERATURE DIST 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	BOW2, DEFLECTION CALCULATION PARALLEL BEAMS	ANL	3600	F36	SBP	I	594
366	CHEMLDC2, CORE HEATING CLADDING-STEAM REACTION	ANL	3600	F36	RSBP		596
367	ISOGEN, RADIONUCLIDE GENERATION AND DECAY	BNW	1108	F5	RSBPL T	D	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	NOWIG, 1-D 2-GP KINETICS TEMPERATURE FEEDBACK	BAPL	6600	F4	RS P T	F	607
372	RAPFU, FUEL CYCLE PARAMETERS FAST BREEDERS	NED	635	F4	RS P	D	609
R373	BL47, DRAFTING TCCL 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	AI	360	F+BAL	RS L T	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 R-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	SAFE-2D, PLANE + AXISYMMETRIC STRESS ANALYSIS	GGA	1108	F4	RS P	I	623
380	GATT, 3-D FEW-GP DIFFUSION CALC HEX-Z MESH	GGA	1108	F4	RS P T	C	625
381	LYNNE, WOODS-SAXCN POTENTIAL SHAPE CALCULATION	ORNL	7090	F2	RS	A	627
R382	RAPP, HIGH-VFLCCITY FLOW STUDY STEAM-WATER MIX	KAPL	6600	F4	RS P	H	628
R383	MO266, LINEAR ELASTIC STRUCTURAL DYNAMICS	BAPL	6600	F4	RS P T	I	630
384	CHECKER, CRECT, DAMMET, PLOTFB, SLAV3, ENDF/B PROC	BNL	6600	F4	RS	T	632
385	COHBE, COHERENT INELASTIC SCATTERING LAW CALC	GGA	1108	F4	RS P X	A	635
R386	DATATRAN, MODULAR PROGRAMMING AND DATA SYSTEM	KAPL	6600	F+COM	RSB	T	637
387	CITATION, 1,2,3-D DIFFUSION DEPLETION MULTIGP	ORNL	360G	F4	RS P T	K	639
388	ETOX2, MULTIGP CONSTANTS FROM ENDF/B FOR IDX	HEDL	1108	F4	RS P X T	B	641
R389	STINT3, SINGLE-CHANNEL SPACE-TIME SYNTHESIS	KAPL	6600	F4	RS P	F	644
390	CORCAM, UNFOLDING OF COMPLEX GAMMA-RAY SPECTRA	KSUN	360	F4	RS P	O	646
R391	SORSDB, PRESSURE VESSEL STRESS AND FATIGUE	KAPL	6600	F4	RS	I	648
392	RAFFLE, 1ST FLIGHT COLLISION PROBABILITIES MC	ORNL	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	ORNL	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	H	656
R396	WASP, WATER AND STEAM THERMODYNAMIC PROPERTIES	BAPL	6600	F4	RS P T	H	658
R397	GAPL3, INELASTIC LARGE DEFLECTION STRESS STUDY	BAPL	6600	F+COM	RS P T	I	660
R398	BE21, FEW-GP DISCRETE ORDINATES SLAB GEOME RY	BAPL	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	GAMTRI, 2-D MULTIGP DIFFUSION TRIANGULAR MESH	GGA	1108	F+BAL	RS P T	C	668
R402	SABOR4, DISCRETE-ELEMENT ANALYSIS THIN SHELLS	MIT	360	F4	RS P T	I	670
R403	TIGIR2, MODULAR DOCUMENT INFORMATION SYSTEM	KAPL	6600	F	R B T	M	673
R404	FINEL, FINITE-ELEMENT STUDY 2,3-D STRUCTURES	KAPL	6600	F4	RS P X	I	675
405	NOAH, 1-D ONE-CP SPACE-TIME DIFFUSION FEEDBACK	BNL	6600	F4	RS P T	F	677
R406	DATATRAN 2-D GEOMETRY INPUT, PREPARATION, EDIT	KAPL	6600	F+ASC	RS P T	L	679
R407	DATATRAN UTILITY MODULES, 2-D + 3-D PLOTTING	KAPL	6600	F+ASC	RS P T	P	681
408	TAC2D, STEADY-STATE AND TRANSIENT TEMP CALC	GGA	1108	F5	RS P T	H	683
409	LARCA, FLUX-WEIGHTING OF DTF4 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	BAPL	6600	F4	RS P T	P	689

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R412	MANE1, RECTANGULAR MAGNETIC NETWORK SOLUTION	BAPL	6600	F4	RS P T I		691
413	ALPHA-M, RESOLUTION OF GAMMA RAY SPECTRA	ORNL	360	F4	RS P	O	693
414	TAC3D, TRANSIENT 3-D HEAT TRANSFER PROGRAM	GGA	1108	F5	RS P T H		695
415	CEXE,INCEXE, 1-GP 3-D XYZ XENON OSCILLATION	CEND	360	F4	RS P X T F		697
416	PARTI, OPTIMAL GRUP OR MESH COLLAPSING	TRW	6500	F4	RS P	B	699
417	ATHENA4, INELASTIC SCATTERING FORM FACTORS	ORNL	360	F4	RS P T A		701
418	CHAINS, ANALYSIS OF RADIOACTIVE DECAY CHAINS	GEC	635	F4	RSBP	D	703
419	CASCADE,CLUSTER, RADIATION DAMAGE IN METALS	GEC	635	F+FAP	RSBP T Q		705
420	GROUSE, SPACE-DEPENDENT X-SECTION GENERATION	GEC	635	F4	RSBP T B		707
421	MICHRD, MICROHARDNESS MEASUREMENT ANALYSIS	GEC	635	F4	RSBP	O	709
422	SPECTRA, MC CALCULATION IRRADIATED MATERIAL	GEC	7090	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	BAPL	6600	F4	RS P T H		715
R425	REDUX, REACTOR FLUCTUATION EXPERIMENT ANALYSIS	BAPL	6600	F4	RS P T O		717
R426	PAX03, HARMONY-PDQ X-SECTION GENERATION CODE	BAPL	6600	F+COM	RS P X T B		719
427	FAROD, 1-D FAST REACTOR DESIGN & SURVEY STUDY	BW	6600	F+COM	RS P X T D		721
R428	DOGGY, DESK CALCULATOR FORM SHEET DP PACKAGE	KAPL	6600	F+ASC	RS P T P		725
R429	ASPI3, GAMMA RAY SOURCE BUILDUP FACTOR CALC	BAPL	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	ORNL	360	F4	RS P T B		731
432	COBRA3, ROD BUNDLE THERMALHYDRAULIC ANALYSIS	BNW	1108	F4	RS P T H		733
432	COBRA3, ROD BUNDLE THERMALHYDRAULIC ANALYSIS	ANL	360	F4	RS P T H		733
433	CONTEMP-PS, PRESSURE-TEMPERATURE RESPONSE	ANC	360	F+BAL	RS P T G		735
434	HEATMESH, GEOMETRICAL DATA HEAT TRANSFER STUDY	SLL	6600	F4	RS P	N	738
435	BURST1, HYDRODYNAMIC ANALYSIS DURING BLOWDOWN	PPCO	360	F4	RS P X	G	740
436	ETOM1, ENDF/B FORMAT TO MUFT FORMAT X-SECTIONS	WAPD	6600	F4	RS P T B		742
437	ETOG1, ENDF/B TO MUFT, GAM, ANISN X-SEC FORMAT	WAPD	6600	F4	RS PL T B		744
438	BUG2, 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 O		749
440	DYNAM, DYNAMIC ANALYSIS BOILING FLOW STEAM	GGA	1108	F4	RS P T H		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 G		757
R444	ROPE, 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	MOST, A MULTIDIMENSIONAL OPTIMIZATION SCHEME	KAPL	6600	F4	RS P	P	763
447	ETOG1 DATA LIBRARIES, MUFT4 OR 5, GAM1 OR 2	WAPD	6600	BCD	R L T Z		764
R448	FLASH4, FULLY-IMPLICIT TRANSIENT SIMULATION	BAPL	6600	F4	RS P T G		766
R449	CYGR03, OXIDE FUEL ROD STRESS & DEFORMATION	BAPL	6600	F4	RS P T I		768
450	KENC, MONTE CARLO MULTIGROUP CRITICALITY CODE	ORNL	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 3D STRUCTURAL ANALYSIS	GGA	1108	F5	RS P T I		774
453	RICE, PRIMARY RECOIL ATOM SPECTRA ENDF/B DATA	ORNL	360	F4	RS P T B		776
454	PHENIX, 2D DIFFUSION BURNUP REFUELING HISTORY	LASL	6600	F4	RS P T D		778
455	DACL, SN PERTURBATION CODE USING DTF4 FLUXES	LASL	6600	F4	RS P T N		781
456	DBUFIT1, LEAST SQUARES TRANSMUTATION ANALYSIS	BNWL	1108	F5	RS P T D		783
457	GSSLRN18, LEAST SQUARES PHOTOPEAK SPECTRA CODE	BNWL	1108	F+BAL	RS P T O		785
458	VELVET2, TURBULENT FLOW IN LMFBR ROD BUNDLE	NED	635	F4	RS P T H		787
459	DOT208, 2D MULTIGROUP DIFFUSION + SN THEORY	NED	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	BAPL	6600	F4	RS P T B		793
R462	SPAN4, A POINT-KERNEL SHIELD EVALUATION CODE	BAPL	6600	F+ASC	RS P T J		795
463	3DDT, 3D MULTIGROUP DIFFUSION XYZ R-THETA-Z	LASL	6600	F4	RS P T C		799
R464	DYN01, PHOTOMULTIPLIER ELECTRON DISTRIBUTION	ANL	360	F4	RS P	O	801
R464	DYN01, PHOTOMULTIPLIER ELECTRON DISTRIBUTION	KAPL	6600	F4	RS P	O	801
465	AVRAGE3,4,SIGMA2,ADLER, ENDF/B RESONANCE XSECS	BNL	6600	F4	RS P T A		803
466	APRFX1, 99-GP DLC-28 LIBRARY GROUP COLLAPSING	APRF	6600	F4	RS	B	806
467	HRG3, SLOWING-DOWN SPECTRUM, MULTIGP CONSTANTS	BNW	1108	F4	RS PLX T B		808
R468	BUBL1, FUEL SWELLING + GAS RELEASE SIMULATION	BAPL	6600	F4	RS P T I		810
469	PMS1, FAST NEUTRON POLARIZATION EXPERIMENT	UCND	360	F+BAL	RS P	O	812
R470	GRAMP, R-M PARAMETERS OF UNRESOLVED RESONANCES	BAPL	6600	F4	RS P	A	814
471	GAPER20, 2D PERTURBATION CALC USING 2DF OUTPUT	GGA	1108	F5	RS P T N		816
472	MERMC2,MAGIC, MC**2 LIBRARY SERVICE ROUTINES	ANL	3600	36F	RSBP T M		818
472	MERMC2, MC**2 BINARY LIBRARY TAPE MAINTENANCE	ANL	360	F4	RS	M	818
R473	CHIC-KIN, FAST + INTERMEDIATE POWER TRANSIENTS	BAPL	6600	F4	RS P T H		820
474	QX1, QUASISTATIC SPATIAL REACTOR KINETICS CODE	ANL	3600	36F	RS PL CT F		822
474	QX1, QUASISTATIC SPATIAL REACTOR KINETICS CODE	ANL	360	F4	RS PL CT F		822
475	CRECT,CHECKER,RIGEL,PLOTFR,LISTFC,DICTION,ETC.	BNL	6600	F4	RS	T M	825
475	CRECT,CHECKER,RIGEL ENDF/B PROCESSING CODES	ANL	360	F4	RS P T M		825
476	CAGE,BIRD,SPEC, TIME-OF-FLIGHT DATA ANALYSIS	GEES	1108	F5	RS P T O		829
R477	3DXT,DEP3, 3-D XENON TRANSIENT + DEPLETION	KAPL	6600	F4	RS P T D		831
R478	MODEL, MODIFIED BETTIS ENVIRNMNTL LIB SCOPE3.3	CDC	66000	F+COM	RS	T P	833
R478	BETTIS ENVIRONMENTAL ROUTINES, SUBROUTINE LIB.	BAPL	6600A	F+ASC	RS	T P	833

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R478	MODEL, MODIFIED BETTIS ENVIRNMNTL LIB SCOPE2.0	CDC	7600	F4	RS	T	P 833
R478	BETTIS ENVIRONMENTAL ROUTINES, SUBROUTINE LIB.	BW	6600B	F+ASC	RS	T	P 833
R478	MODEL, MODIFIED BETTIS ENVIRNMNTL LIB SCOPE3.2	CDC	6600C	F+COM	RS	T	P 833
479	FREADM1, FAST REACTOR CORE ACCIDENT ANALYSIS	NED	635	F4	RS	P	T G 836
480	FUMBLE, FAST REACTOR FUEL BURNUP + MANAGEMENT	NED	635	F4	RS	P	T D 839
R481	BUSHL, CYL SHELL BUCKLING COLLAPSE ANALYSIS	BAPL	6600	F4	RS	P	T I 841
482	COMMUC, CASCADE, COMPOUND NUCLEUS REACTION	AI	360	F+BAL	RS	P	T A 843
483	REPP, THERMAL HYDRAULIC WATER-REACTOR DESIGN	BNW	1108	F5	RS	P	T H 845
484	FIGS, IBM360+2250 FORTRAN GRAPHICS SUBROUTINES	AI	360	F+BAL	RS	T	P 847
R485	GASPAR, COMPLEX GAMMA-RAY SPECTRA ANALYSIS	KAPL	6600	F4	RS	T	O 849
486	ANCON, SPACE-INDEPENDENT REACTOR KINFITICS CODE	LASL	6600	F4	RS	P	T E 851
486	ANCON, SPACE-INDEPENDENT REACTOR KINETICS CODE	ANL	360	F4	RS	P	T E 851
487	STEAM-67, 1967 ASME STEAM AND WATER PROPERTIES	BGGE	360	F4	RS	T	H 853
488	NOISY1, AUTO- AND CROSS-SPECTRAL DENSITIES	BNW	1108	F5	RS	P	X T F 855
488	NOISY1, AUTO- AND CROSS-SPECTRAL DENSITIES	BNW	7090	F4	RS	P	T F 855
489	TRIFIDO, PULSED NEUTRON SOURCE DATA ANALYSIS	CNEA	360	F4	RS	P	F 857
490	JOSHUA, DATA STORAGE, RETRIEVAL, AND DISPLAY	DP	360	F+BAL	S	T	M 859
491	MOD5, STOCHASTIC MODEL OF NEUTRON SLOWING-DOWN	NPGS	360	F4	RS	P	X T E 861
492	RAMPL, REICH-MORE RESOLVED REGION X-SECTIONS	BNL	6600	F4	RS	P	T A 864
493	TROUT, MUG MULTIGROUP XSEC LIBRARY MAINTENANCE	NED	635	F4	RS	P	T M 866
493	TROUT, MUG MULTIGROUP XSEC LIBRARY MAINTENANCE	NED	1108	F5	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	KAPLLOT, KAPL CALCOMP 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	CONCEPT, POWER PLANT CONCEPTUAL COST ESTIMATES	ORNL	360	F4	RS	P	T D 877
499	MIRAB, MIRAP, CONTAINMENT SYSTEM IODINE REMOVAL	BCL	6400	F4	RS	P	G 879
500	FRCL2, LOCA FISSION PRODUCT RELEASE ANALYSIS	BCL	6400	F4	RS	P	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	ORNL	360	F4	RS	P	T MING 887
R503	DUZ2, 2-D AXISYMMETRIC + PLANE ELASTIC-PLASTIC	BAPL	6600	F+COM	RS	P	T I 889
504	THRESH, STATISTICAL MODEL REACTION X-SECTIONS	BNL	6600	F4	RS	P	A 892
505	TDOWN, SPATIAL & COMPOSITION-DEPENDENT X-SECS	GESV	635	F+GMP	RS	P	XCT L 894
R506	JP1XR, 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	MUCHAL, MUCHA2, MULTIPLE CHANNEL ANALYSIS ECC	BCL	6400	F4	RS	P	X T G 900
509	ETCT2, THERMAL LIBRARIES FROM ENDF/B DATA	WAPD	7600	F4	RS	P	T B 902
510	VIM1, MONTE CARLO CRITICAL ASSEMBLY ANALYSIS	AI	7600	F4	RS	PLX	T C 904
510	VIM1, MONTE CARLO CRITICAL ASSEMBLY ANALYSIS	ANL	360	F4	RS	PLX	T C 904
511	VENUS, 2-D LMFR POWER EXCURSION DISASSEMBLY	ANL	360	F4	RS	P	XCT F 907
512	THETA1-B, FUEL ROD THERMAL RESPONSE LOCA	ANC	360	F4	RSBP	X	T G 910
513	TESS, 1-D SLAB AND SPHERE GEOM SN TRANSPORT	ANL	3600	F36	RS	P	XCT C 912
514	FORSIM, SOLN OF SYSTEM OF ORDINARY DIFF EQNS	CRNL	6600	F4	RS	P	P 914
515	GENED ENVIRONMENTAL ROUTINES, SUBROUTINE LIB.	NED	635	F+GMP	RS	T	P 916
516	PTAC11, 2-PASS ASSEMBLER FOR THE PDP-11 ON 360	ANC	360	PL1	RS	P	T P 920
517	HEATING3, 1,2, OR 3-D HEAT CONDUCTION PROGRAM	ORNL	360	F4	RS	P	T H 922
518	ERREST, LOCA RCD 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	RSB	T	P 926
520	PHRNG, MULTI-GP CONSTANT + FAST SPECTRA CALC	ANC	360	F4	RS	PLXCT	B 928
521	SOCOL2, SODIUM-FUEL INTERACTION ANALYSIS	ANL	360	F4	RS	P	G 930
521	SOCOL2, SODIUM-FUEL INTERACTION ANALYSIS	HEDL	1108	F4	RS	P	G 930
522	ARC-SYSTEM, SYSTEM SUBPROGRAMS AND MODULES	ANL	360	F+BAL	RS	P	CT M 932
523	ESP, MONTE CARLO REACTOR ANALYSIS CALCULATION	ORNL	360	F+BAL	RS	P	T C 934
524	RESFIT, DIFFRACTION MODEL ELASTIC SCAT X-SEC	BNL	6600	F4	RS	P	A 936
525	ORTHIS, ORTHAT, 2-DIMENSIONAL HEAT CONDUCTION	ORNL	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	HEDL	1108	F+SL	RS	T	K 942
528	PREP,KITT, SYSTEM FAULT TREE EVALUATION CODES	ANC	360	F4	RSBP	T	K 944
528	PREP,KITT, SYSTEM FAULT TREE EVALUATION CODES	ANC	1108	F4	RS	P	T K 944
529	ANVENT, LOCA ANALYSIS DUKE POWER MCGUIRE UNITS	DUCO	635	F4	RS		G 946
530	GENRD, FREE-FCRMT CARD INPUT PROCESSOR	LASL	6600	F4	RS	P	L 948
530	GENRD, FREE-FCRMT CARD INPUT PROCESSOR	LASL	360	F4	RS	P	L 948
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 MODULE	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, JOSHUA SYSTEM LATTICE PHYSICS MODULES	DP	360	F+BAL	S	X	T B 961
R537	FUGIT, DYNAMIC RESPONSE OF ELASTIC STRUCTURES	BAPL	6600	F4	RS	P	T I 963

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1. NAME OR DESIGNATION OF PROGRAM - EXTERMINATOR/EXTERMINATOR?
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM7090,360, GE625, CDC6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - THE MULTIGROUP, TWO-DIMENSIONAL NEUTRON DIFFUSION EQUATIONS ARE SOLVED IN X-Y, R-Z, OR R-THETA GEOMETRY.
4. METHOD OF SOLUTION - THE EQUIPOISE METHOD (REFERENCE 2) IS EMPLOYED TO SOLVE THE FINITE-DIFFERENCE ANALOGS OF THE MULTIGROUP NEUTRON DIFFUSION EQUATIONS.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - IN EXTERMINATOR -

LET IMAX = MAXIMUM NUMBER OF ROWS
 JMAX = MAXIMUM NUMBER OF COLUMNS
 KMAX = MAXIMUM NUMBER OF GROUPS
 MMAX = MAXIMUM NUMBER OF DIFFERENT COMPOSITIONS
 NMAX = MAXIMUM NUMBER OF NUCLIDES

THEN IMAX AND JMAX MUST BE BETWEEN 3 AND 250
 KMAX MUST BE BETWEEN 1 AND 50
 MMAX MUST BE BETWEEN 1 AND 400
 IMAX*JMAX MUST BE BETWEEN 9 AND 20000
 IMAX*KMAX MUST BE BETWEEN 3 AND 2000
 JMAX*(5+KMAX) MUST BE BETWEEN 18 AND 2000
 MMAX*NMAX MUST BE BETWEEN 0 AND 6300
 KMAX*MMAX MUST BE BETWEEN 1 AND 1000
 KMAX**2*MMAX MUST BE BETWEEN 1 AND 10000

SINCE FORTRAN IV VARIABLE DIMENSIONING TECHNIQUES WERE USED IN EXTERMINATOR2, THE ONLY RESTRICTION ON PROBLEM SIZE IS THE AVAILABLE CORE STORAGE. THE CODE EXAMINES THE PROBLEM SIZE AND STORES FLUXES AND EQUATION COEFFICIENTS (EXCEPT FOR SCATTERING MATRIX COEFFICIENTS WHICH ARE RECALCULATED AT EACH ITERATION) ACCORDING TO THE MACHINE CORE SIZE IN ONE OF FOUR WAYS -

- (1) ALL FLUXES AND EQUATION COEFFICIENTS ARE CONTAINED IN CORE AND NO I/O DEVICES ARE USED DURING THE ITERATIVE PART OF THE CALCULATION.
 - (2) ALL EQUATION COEFFICIENTS ARE CONTAINED IN CORE AND I/O DEVICES ARE USED TO STORE THE FLUXES.
 - (3) THE FLUXES ARE CONTAINED IN CORE AND I/O DEVICES ARE USED TO STORE THE EQUATION COEFFICIENTS.
 - (4) BOTH COEFFICIENTS AND FLUXES ARE USED FROM I/O DEVICES.
- FOR A PROBLEM WITH AN I*J MESH, K ENERGY GROUPS, M DIFFERENT MATERIALS, N NUCLIDES, AND L SETS OF SPECIFICATIONS OF COMPOSITION LOCATIONS, THE CORE STORAGE REQUIRED FOR VARIABLES, WHEN ALL FLUXES AND COEFFICIENTS ARE USED FROM I/O DEVICES, IS

$$4*I + 24*J + 16*K + 2*M + 6*N + (2*M + N + 1)*K**2 + 8*I*J + 14*J*K + 15*M*K + M*N + 4*N*K + 5*L + 8$$

WORDS. THE CORE STORAGE REQUIRED TO BE ABLE TO CONTAIN THE FLUXES AND COEFFICIENTS IN CORE IS

$$4*I + 24*J + 16*K + 2*M + 6*N + (2*M + N + 1)*K**2 + 8*I*J + 4*J*K + 15*M*K + M*N + 4*N*K + 5*L + 8*I*J*K + 10$$

IF ALL CROSS SECTIONS ARE MACROSCOPIC, N IS 1 ABOVE.

6. TYPICAL RUNNING TIME - THE RUNNING TIME OF A PROBLEM WILL DEPEND UPON THE SIZE OF THE PROBLEM, THE COMPUTER, THE COMPILER AND OPERATING SYSTEM BEING USED, AND THE AMOUNT OF I/O REQUIRED DURING THE ITERATIVE PART OF THE CALCULATION. THE FOLLOWING TABLE GIVES THE RUNNING TIMES AND RATES OF SOME TYPICAL PROBLEMS RUN ON THE IBM360/75 COMPUTER USING THE IBM FORTRAN IV COMPILER WITH LEVEL 2 OPTIMIZATION AND OPERATING SYSTEM/360. THE MACHINE HAS A 512K BYTE CORE MEMORY PLUS 1024K BYTES OF LARGE CAPACITY STORAGE.

MESH SIZE	GROUPS	2311 DISK	NO.ITER.	TIME(MIN)	RATE
31 X 31	3	NC	83	3	0.0007
42 X 25	9	NO	151	17	0.0007
31 X 81	9	NO	92	28	0.0008
51 X 51	25	YES	149	255	0.0016

IN EXTERMINATOR THE CALCULATION RATE VARIES FROM 0.0018 TO 0.0035 SECOND PER POINT PER ITERATION PER GROUP. THE RUNNING TIMES OF SOME TYPICAL PROBLEMS WERE -

POINTS	GROUPS	NO.ITER.	TIME(MIN)	RATE
2500	2	100	15	0.0018
2254	4	85	37	0.0029
2597	7	117	86	0.0024
1681	16	106	162	0.0034

7. UNUSUAL FEATURES OF THE PROGRAM -
EXTERMINATOR AND EXTERMINATOR2 -

- (A) THREE OUTER-BOUNDARY CONDITIONS MAY BE IMPOSED - ZERO FLUX, ZERO NORMAL DERIVATIVE, OR PERIODIC. THE LOGARITHMIC BOUNDARY CONDITION MAY ALSO BE SPECIFIED, EITHER ALONG BOUNDARIES OR INTERNAL TO THE MESH.
 - (B) NEUTRON SCATTERING IS ALLOWED FROM ANY GROUP TO ANY OTHER.
- EXTERMINATOR -
- (A) EIGENVALUE PROBLEMS, CONSTANT SOURCE PROBLEMS, OR POISON SEARCH PROBLEMS MAY BE SOLVED.
 - (B) INPUT CROSS SECTIONS MAY BE MACROSCOPIC, MICROSCOPIC, OR BOTH. MICROSCOPIC CROSS SECTIONS MAY BE USED FROM A PREVIOUSLY MADE TAPE, FROM CARDS, OR BOTH.
 - (C) EITHER POINT RELAXATION OR SINGLE-LINE RELAXATION MAY BE USED IN THE SOLUTION OF A PROBLEM. CONVERGENCE IS ACCELERATED BY MEANS OF THE EXTRAPOLATED LIEBMANN PROCESS IN WHICH THE EXTRAPOLATED LIEBMANN COEFFICIENT IS MADE TO VARY AS NECESSARY DURING THE COURSE OF A CALCULATION TO OBTAIN REASONABLE CONVERGENCE RATES. WHEN THE CONVERGENCE RATE DROPS BELOW A CERTAIN LEVEL, THE FLUXES ARE EXTRAPOLATED BY MEANS OF THE AITKEN DELTA-SQUARED PROCESS. IN CELL PROBLEMS AND IN PROBLEMS IN WHICH THE GROUPS ARE NOT WELL-COUPLED, A GROUP REBALANCING PROCEDURE IS USED TO ACCELERATE CONVERGENCE.
 - (D) THE LEVEL OF CONVERGENCE OF A PROBLEM IS INDICATED BY

7. UNUSUAL FEATURES OF THE PROGRAM (CONTINUED)

POINTWISE FLUX CONVERGENCE, EIGENVALUE CONVERGENCE, A POINTWISE FLUX CONVERGENCE CRITERION MODIFIED BY THE ESTIMATED RATE OF CONVERGENCE, AND NEUTRON BALANCES FOR EACH GROUP.

EXTERMINATOR2 -

- (A) EIGENVALUE PROBLEMS, CONSTANT SOURCE PROBLEMS, POISON SEARCH PROBLEMS, AND NUCLIDE DENSITY SEARCH PROBLEMS MAY BE SOLVED BY DIRECT ITERATION WITH THE UNKNOWN TREATED AS THE EIGENVALUE OF THE PROBLEM. INDIRECT SEARCH BY SOLUTION OF SUCCEEDING EIGENVALUE PROBLEMS IS ALSO INCLUDED. SPECIAL NEUTRON PROBLEMS CAN BE SOLVED IN WHICH SOME OF THE FLUXES ARE NEGATIVE.
- (B) THE EFFECT ON THE MULTIPLICATION FACTOR AND THE FLUXES DUE TO POINTWISE EQUILIBRIUM XENON CONCENTRATIONS MAY BE TAKEN INTO ACCOUNT.
- (C) THE CODE WILL CALCULATE ADJOINT FLUXES AND DO PERTURBATION CALCULATIONS.
- (D) FLUX-WEIGHTED BROAD-GROUP MICROSCOPIC CROSS SECTIONS MAY BE CALCULATED.
- (E) SUCCEEDING CASES REQUIRE ONLY THOSE INPUT DATA WHICH ARE DIFFERENT FROM THE INPUT FROM THE PRECEDING CASE.
- (F) OPTIONAL OUTPUT INCLUDES POINT-GROUP FLUXES AS NEUTRONS PER CM**2 -SECOND, POINT NEUTRON DENSITY AS NEUTRONS PER CM**3, POINT SOURCE DENSITY AS FISSIONS PER CM**3 -SECOND OR NEUTRON PRODUCTIONS PER CM**3 -SECOND, NUCLIDE REACTION RATES, TOTAL AND COMPOSITION NEUTRON BALANCES, AND CUMULATIVE HEATING ALONG DEFINED COOLANT CHANNELS.

8. RELATED AND AUXILIARY PROGRAMS - EXTERMINATOR IS EXPECTED TO REPLACE THE SLOWER FFW-GROUP DIFFUSION CODE, 20GRAND (ACC ABSTRACT 40). EXTERMINATOR2 IS A FORTRAN IV VERSION OF THE CODE EXTERMINATOR WITH MAJOR IMPROVEMENTS.

9. STATUS - ABSTRACT FIRST DISTRIBUTED APRIL 1965.

IBM7090 VERSION OF EXTERMINATOR SUBMITTED MARCH 1965.

IBM360 VERSION OF EXTERMINATOR2 SUBMITTED MAY 1967.

GE625 VERSION OF EXTERMINATOR2 SUBMITTED JULY 1968.

CDC6600 VERSION OF EXTERMINATOR2 SUBMITTED NOVEMBER 1970.

10. REFERENCES - T. B. FOWLER, M. L. TOBIAS AND D. R. VONDY, EXTERMINATOR-2 A FORTRAN IV CODE FOR SOLVING MULTIGROUP NEUTRON DIFFUSION EQUATIONS IN TWO DIMENSIONS, ORNL-4078, APRIL 1967.

M. L. TOBIAS AND T. B. FOWLER, THE EQUIPOISE METHOD - A SIMPLE PROCEDURE FOR GROUP-DIFFUSION CALCULATIONS IN TWO AND THREE DIMENSIONS, NUCLEAR SCIENCE AND ENGINEERING, VOL. 12, PP. 513-518, 1962.

T. B. FOWLER, M. L. TOBIAS, AND D. R. VONDY, EXTERMINATOR - A MULTIGROUP CODE FOR SOLVING NEUTRON DIFFUSION EQUATIONS IN ONE AND TWO DIMENSIONS, ORNL-TM-842, JULY 1966.

R. L. BRUNNENMEYER AND R. A. MICKLE, EXTERMINATOR-2 GE-625 VERSION (NE573) USERS NOTE, BECHTEL NOTE, JULY 1968.

11. MACHINE REQUIREMENTS - EXTERMINATOR - IBM7090 WITH 32K CORE, ON-LINE PRINTER, AND A MINIMUM OF 7 CHANNEL A TAPE UNITS (INCLUDING SYSTEM TAPE, INPUT TAPE AND OUTPUT TAPE), AND 5 CHANNEL B TAPE UNITS. AN ADDITIONAL CHANNEL B TAPE UNIT IS REQUIRED IF CROSS SECTIONS ARE IN MICROSCOPIC FORM. EXTERMINATOR2 - A MACHINE WITH A MINIMUM OF ABOUT 64K WORDS OF CORE STORAGE AND 5 I/O DEVICES FOR TEMPORARY STORAGE IN ADDITION TO THOSE FOR INPUT DATA AND PRINTED OUTPUT. SOME PROBLEMS MAY REQUIRE 4 ADDITIONAL I/O DEVICES.
12. PROGRAMMING LANGUAGES USED - FORTRAN II AND FAP (EXTERMINATOR) AND FORTRAN IV (EXTERMINATOR2)
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - FORTRAN II, VERSION 2 MONITOR SYSTEM DESIGNATED IBM-7090-062 (IBM7090), OS/360 (IBM360), GECOS (GE625), AND SCOPE (CDC6600).
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - EXTERMINATOR CONSISTS OF 6 CHAIN LINKS COMPRISING APPROXIMATELY 7000 STATEMENTS. EXTERMINATOR2 CAN BE MADE TO CONFORM TO MACHINES OF DIFFERENT CORE SIZES SIMPLY BY ADJUSTING THE FIXED DIMENSION OF ONLY ONE VARIABLE IN A SHORT MASTER PROGRAM. THE CODE COMPILED UNDER THE IBM FORTRAN IV COMPILER ON THE IBM360 COMPUTER IS ABOUT 35000 WORDS LONG BUT CAN BE SHORTENED BY AS MUCH AS ONE-HALF THIS LENGTH BY REMOVING SOME OF THE SUBROUTINES WHICH DO OPTIONAL CALCULATIONS. USING THE OVERLAY FEATURE OF THE IBM360 OPERATING SYSTEM, THE STORAGE REQUIREMENTS CAN BE REDUCED TO ABOUT 15000 WORDS. BECAUSE OF STORAGE LIMITATIONS THE GE625 VERSION WAS SHORTENED AND THE FOLLOWING FIVE SUBROUTINES WERE DELETED -
 - (1) GROUP REBALANCING SUBROUTINE,
 - (2) NEUTRON BALANCE AND REACTION RATE PRINT SUBROUTINE,
 - (3) NEUTRON ABSORPTION AND DENSITY CALCULATION SUBROUTINE,
 - (4) ADJLINT FLUX CALCULATION SUBROUTINE, AND
 - (5) CHANNEL HEATING CALCULATIONS SUBROUTINE.
15. NAME AND ESTABLISHMENT OF AUTHORS -

7090,360	T. B. FOWLER, M. L. TCBIAS, AND C. R. VONDY OAK RIDGE NATIONAL LABORATORY P. O. BOX X OAK RIDGE, TENNESSEE 37830
625	R. L. BRUNNENMEYER AND R. A. MICKLE BECHTEL CORPORATION 50 BEALF STREET SAN FRANCISCO, CALIFORNIA 94119
6600	SAM PACINO COMBUSTION ENGINEERING, INC. P. O. BOX 500 WINDSOR, CONNECTICUT 06095
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (7090-7581 CARDS, 360-6643 CARDS, 625-4882 CARDS, 6600-6964 CARDS)

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16. MATERIAL AVAILABLE (CONTINUED)
SAMPLE PROBLEMS (7090-56 CARDS, 360-67 CARDS, 6600-67 CARDS)
REFERENCE REPORTS, ORNL-4078 AND ORNL-TM-842, AND NOTE
17. CATEGORY - C
KEYWORDS - DIFFUSION EQUATIONS, 2-DIMENSIONAL, MULTIGROUP, X-Y,
R-Z, R-THETA, REACTIVITY, FLUX DISTRIBUTION

1. NAME OR DESIGNATION OF PROGRAM - FLARE
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - GE635, CDC3600, IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - 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.
4. METHOD OF SOLUTION - THE CALCULATIONS INCLUDE A REPRESENTATION OF THE COUPLED EFFECTS OF FLOW, POWER, VOIDS AND EACH CONTROL ROD INDEPENDENTLY.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - BECAUSE OF THE INDEPENDENT REPRESENTATION OF THE CONTROL RODS, A THREE-DIMENSIONAL CALCULATIONAL SCHEME WAS EMPLOYED. THIS THREE-DIMENSIONAL GEOMETRY COMBINED WITH COMPUTER SIZE LIMITATIONS RESTRICTED THE CALCULATIONS TO A RELATIVELY COARSE MESH. THE PRESENT VERSION OF THE CODE WILL HANDLE A MAXIMUM ARRAY OF 14 X 14 X 12 NODES WITH EITHER MIRROR OR DIAGONAL SYMMETRY.
6. TYPICAL RUNNING TIME - 5 MINUTES ARE REQUIRED TO RUN THE SAMPLE PROBLEM ON THE IBM360.
7. UNUSUAL FEATURES OF THE PROGRAM - A 3-DIMENSIONAL COARSE-MESH FLUX CALCULATION IS INCORPORATED.
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED APRIL 1965.
PHILCO 2000 VERSION SUBMITTED FEBRUARY 1965, DELETED OCTOBER 1967.
GE635 VERSION SUBMITTED NOVEMBER 1966.
CDC3600 VERSION SUBMITTED DECEMBER 1966, SAMPLE PROBLEM EXECUTED BY ACC.
IBM360 VERSION SUBMITTED JANUARY 1971, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - D. L. DELP, D. L. FISHER, J. M. HARRIMAN, AND M. J. STEDWELL, FLARE - A THREE-DIMENSIONAL BOILING WATER REACTOR SIMULATOR, GEAP-4598, JULY 16, 1964.
NELS J. ANDERSON, JR., IDFTAP, A FORTRAN IV FUNCTION SUBPROGRAM, S6T001, JANUARY 15, 1965.
11. MACHINE REQUIREMENTS - 39K AND 3 TAPES IN ADDITION TO SYSTEM USE ON THE GE635, 400K AND 5 TAPES OR DISKS ON THE IBM360

12. PROGRAMMING LANGUAGES USED - FORTRAN IV (GE635 AND IBM360) AND FORTRAN 63 (CDC3600)
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - GECOS (GE635), SCOPE (CDC3600), AND OS/360 (IBM360).
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - PROGRAM USES TWO INTERMEDIATE TAPES AND PRODUCES A TAPE FOR OFF-LINE PUNCHED CARDS.
15. NAME AND ESTABLISHMENT OF AUTHORS -
 - 635 D. L. DELP AND D. L. FISHER, PHYSICS
J. M. HARRIMAN AND M. J. STEDWELL, PROGRAMMING
GENERAL ELECTRIC COMPANY
175 CURTNER AVENUE
SAN JOSE, CALIFORNIA
 - 360 S. ELKIN
NUCLEAR APPLICATIONS COMPUTATION CENTER
CONTROL DATA CORPORATION
COMPUTER DIVISION
3145 PORTER DRIVE
P. O. BOX 10111
PALO ALTO, CALIFORNIA 94303
 - 360 GEORGE W. PERRY
MIDDLE SOUTH SERVICES, INC.
BOX 61000
NEW ORLEANS, LOUISIANA 70160
 - 360 DR. FREDERICK W. BUCKMAN
CONSUMERS POWER COMPANY
1945 PARNALL AVENUE
JACKSON, MICHIGAN 49201
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (635-3272 CARDS, 3600-2965 CARDS, 360-3442 CARDS)
BINARY DECK (3600-696 CARDS)
SAMPLE PROBLEMS (635-51 CARDS, 3600-42 CARDS, 360-42 CARDS)
CONTROL INFORMATION (JCL 360-16 CARDS)
SAMPLE PROBLEM OUTPUT (360-13 PAGES)
REFERENCE REPORTS
17. CATEGORY - C
KEYWORDS - REACTIVITY, POWER DISTRIBUTION, 3-DIMENSIONAL

10. REFERENCES (CONTINUED)
REPORT, MAY 1967.
D. H. LOVEGROVE, ANL-AMD PROGRAM LIBRARY REPORT R153,
OCTOBER 1965, AND MODIFICATIONS.
11. MACHINE REQUIREMENTS - 32K IBM7094 WITH SC-4020 GRAPHICAL DISPLAY
DEVICE, 256K BYTE IBM360
12. PROGRAMMING LANGUAGES USED - FORTRAN II AND FAP (IBM), FORTRAN 63
(CDC), FORTRAN IV (IBM360)
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
STANDARD IBM FORTRAN MONITOR (7090), SCOPE (3600), OS/360.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
IF AN SC-4020 GRAPHICAL DISPLAY DEVICE IS NOT AVAILABLE, DUMMY
ROUTINES CAN BE USED FOR SUBROUTINES GRAPH AND AICRT3, OR THESE
ROUTINES CAN BE REWRITTEN. THE NAA SC-4020 SUBROUTINE PACKAGE
IS AVAILABLE THROUGH -
LAIDE LIBRARIAN
C/O STROMBERG-CARLSON
P. O. BOX 2449
SAN DIEGO, CALIFORNIA
15. NAME AND ESTABLISHMENT OF AUTHORS -
7090,360 R. A. BLAINE
SUPERVISOR, REACTOR COMPUTING SYSTEMS UNIT
MATHEMATICS AND COMPUTER SCIENCES
ATOMICS INTERNATIONAL
P. O. BOX 309
CANCEGA PARK, CALIFORNIA

3600 D. LOVEGROVE
APPLIED MATHEMATICS DIVISION
ARGONNE NATIONAL LABORATORY
9700 SOUTH CASS AVENUE
ARGONNE, ILLINOIS 60439
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (7094-2413 CARDS, 3600-1781 CARDS, 360-2833 CARDS)
BINARY DECK (3600-181 CARDS)
SAMPLE PROBLEMS (7094-99 CARDS, 3600-100 CARDS, 360-99 CARDS)
REFERENCE REPORTS
17. CATEGORY - G
KEYWORDS - DOSE RATES, DISTANCE, CONTAINMENT, FISSION PRODUCTS

1. NAME OR DESIGNATION OF PROGRAM - 2DF
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC1604A, UNIVAC1108
3. DESCRIPTION OF PROBLEM OR FUNCTION - 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.
4. METHOD OF SOLUTION -
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - STORAGE RESTRICTIONS ARE SPECIFIED BY A COMPLICATED EQUATION INVOLVING S(N) ORDER, NUMBER OF MATERIALS, MESH INTERVALS, AND ENERGY GROUPS, AND SPECIFIED BOUNCARY CONDITIONS.
6. TYPICAL RUNNING TIME -
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - 2DF IS A TWO-DIMENSIONAL VERSION OF THE DTF PROGRAM (ACC ABSTRACT 144). THE 1108 VERSION OF 2DF IS USED TO PREPARE FLUX AND CURRENT DATA TAPES FOR USE BY GAPER2D (ACC ABSTRACT 471).
9. STATUS - ABSTRACT FIRST DISTRIBUTED FEBRUARY 1966.
CDC1604 VERSION SUBMITTED JANUARY 1966.
UNIVAC1108 VERSION SUBMITTED FEBRUARY 1972.
10. REFERENCES - UNITED NUCLEAR CORPORATION NOTES ON 2DF INPUT DATA DECK ARRANGEMENT, 2DF PROBLEM DECK ARRANGEMENT, OPERATING INSTRUCTIONS, 2DF INPUT FORMS.
2DF CROSS SECTION INPUT, PHYS/MATH MEMO 3816, OCTOBER 23, 1964.
MAXIMUM SIZE 2DF PROBLEM, PHYS/MATH MEMO 3703, SEPTEMBER 9, 1964.
11. MACHINE REQUIREMENTS -
12. PROGRAMMING LANGUAGES USED - FORTRAN 63 (CDC1604A) AND FORTRAN V (UNIVAC1108)
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - COOP MONITOR (CDC1604A) AND EXEC 8 (UNIVAC1108).

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14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
1604A	MARTIN SHAPIRO
UNITED NUCLEAR CORPORATION
WHITE PLAINS, NEW YORK
1108	R. J. ARCHIBALD
GULF GENERAL ATOMIC COMPANY
P. O. BOX 608
SAN DIEGO, CALIFORNIA 92112
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (1604A-2585 CARDS, 1108-3711 CARDS)
SAMPLE PROBLEMS (1604A-83 CARDS, 1108-882 CARDS)
REFERENCE NOTES AND INTER-OFFICE MEMORANDA
17. CATEGORY - C
KEYWORDS - SN METHOD, 2-DIMENSIONAL, MULTIGROUP, X-Y, R-Z, R-
THETA, CRITICALITY SEARCHES, ANISOTROPIC SCATTERING,
DTF CODES, GAPER2D CODES

1. NAME OR DESIGNATION OF PROGRAM - FORE/FORE2
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - PHILCC-2000, GE635, IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - 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.
4. METHOD OF SOLUTION - FORE2 INPUT CONSISTS OF PROPERTY DATA, GEOMETRY, POWER AND FLOW DISTRIBUTION FACTORS, EXTERNAL TIME VARYING FUNCTIONS, EXPERIMENTAL COEFFICIENTS, AND TERMINATION DATA. THE DIFFERENTIAL EQUATIONS FOR FLUID FLOW, HEAT TRANSFER, AND POINT NEUTRONICS ARE SOLVED BY EXPLICIT FINITE-DIFFERENCE PROCEDURES.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - REACTOR EXCURSIONS WHICH CAN BE CALCULATED ARE RESTRICTED TO THOSE TRANSIENTS IN WHICH THE REACTOR IS NOT SUBSTANTIALLY DESTROYED. AS A GENERAL RULE, CHANGES IN REACTOR GEOMETRY AND COMPOSITION DURING AN EXCURSION ARE LIMITED TO THOSE CASES IN WHICH THE REACTIVITY EFFECTS OF THE CHANGES MAY BE CONSIDERED AS SMALL PERTURBATIONS OF THE INITIAL SYSTEM. THUS, ACCIDENTS INVOLVING LARGE-SCALE DISASSEMBLY AND BULK MELTDOWN OF A CORE ARE NOT COVERED BY FORE OR FORE2. UP TO SIX DELAYED NEUTRON GROUPS MAY BE USED IN FORE. FORE2 IS VALID ONLY WHILE THE CORE RETAINS ITS INITIAL GEOMETRY.
6. TYPICAL RUNNING TIME - RUNNING TIME OF FORE IS PROPORTIONAL TO THE NUMBER OF TIME-STEPS, GENERALLY 2 TO 26 MINUTES. ON A 10 MICRO-SECOND COMPUTER FORE2 RUNNING TIME IS ON THE ORDER OF 3.5 SECONDS PER STEP, FOR A 1 MICROSECOND COMPUTER 0.5 SECOND PER STEP.

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
IBM FORTRAN II MONITOR.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHOR -
J. A. HESSLER
MATHEMATICAL AND COMPUTING SCIENCES GROUP
ATOMICS INTERNATIONAL
P. O. BOX 309
CANOGA PARK, CALIFORNIA 91304
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (2931 CARDS)
SAMPLE PROBLEM (535 CARDS)
STEAM TABLES (156 CARDS)
REFERENCE REPORT
17. CATEGORY - I
KEYWORDS - THERMODYNAMICS, DESIGN, PUMPS, WATER, NITROGEN

1. NAME OR DESIGNATION OF PROGRAM - FLOW-MODEL
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM7094,360
3. DESCRIPTION OF PROBLEM OR FUNCTION - 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.
4. METHOD OF SOLUTION - THE DISCONTINUOUS NODAL FLOW MODEL APPROXIMATION LEADS TO A SYSTEM OF SIMULTANEOUS NONLINEAR EQUATIONS WHICH ARE SOLVED BY ITERATION.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
20 CHANNELS
100 AXIAL NODES
100 AXIAL POINTS
6. TYPICAL RUNNING TIME - ON THE IBM7094 ONE CASE WITH 3 CHANNELS AND 40 NODES REQUIRES ABOUT 20 SECONDS FOR BOTH PRINTED AND GRAPHICAL OUTPUT. ON THE IBM360 THE SAME PROBLEM REQUIRES 1 MINUTE.
7. UNUSUAL FEATURES OF THE PROGRAM - THE PROGRAM CAN USE AN SC-4020 GRAPHICAL DISPLAY DEVICE FOR PLOTTING RESULTS.
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED JULY 1966.
IBM7094 VERSION SUBMITTED MAY 1966.
IBM360 VERSION SUBMITTED JANUARY 1971, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - D. E. SCHRAMM AND R. F. BERLAND, A MULTI-CHANNEL TWO-DIMENSIONAL, TWO-PHASE FLOW MODEL AND IBM7090 CODE, NAA-SR-MEMO-9444, DECEMBER 31, 1963.
M. HOFFMAN AND W. A. RHCADDES, AICRT3, A GENERAL CODE FOR DISPLAY OF DIGITAL DATA, NAA-SR-MEMO-9069, OCTOBER 1963.
11. MACHINE REQUIREMENTS - 32K IBM7094 AND 240K BYTE IBM360
12. PROGRAMMING LANGUAGES USED - FORTRAN II (IBM7094) AND FORTRAN IV (IBM360)
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - STANDARD IBM FORTRAN MONITOR (IBM7094) AND OS/360 (IBM360).
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - IF AN SC-4020 GRAPHICAL DISPLAY DEVICE IS AVAILABLE, THE DUMMY SUBROUTINE AICRT3 SHOULD BE REPLACED BY THE FORTRAN II AICRT3 SUBROUTINE (IBM7094) OR THE FORTRAN IV AICRT4 SUBROUTINE (IBM360) AND

14. ANY OTHER INFORMATION OR RESTRICTIONS (CONTINUED)
THE NAA-SC-4020 SUBROUTINE PACKAGE WHICH ARE AVAILABLE THROUGH -
UAIDE LIBRARIAN
C/O STROMBERG-CARLSON
P. O. BOX 2449
SAN DIEGO, CALIFORNIA
15. NAME AND ESTABLISHMENT OF AUTHORS -
7094 R. F. BERLAND
MATHEMATICAL AND COMPUTING SCIENCES GROUP
ATOMICS INTERNATIONAL
P. O. BOX 309
CANCRA PARK, CALIFORNIA 91304
- 360 GEORGE W. PERRY
MIDDLE SOUTH SERVICES, INC.
BOX 61007
NEW ORLEANS, LOUISIANA 70160
16. MATERIAL AVAILABLE -
SOURCE DECKS (7094-366 CARDS, 360-370 CARDS)
SAMPLE PROBLEMS (7094-36 CARDS, 360-35 CARDS)
REFERENCE REPORTS
17. CATEGORY - H
KEYWORDS - 2-DIMENSIONAL, FLUID FLOW, COOLANTS DISTRIBUTIONS,
GRAPHS

1. NAME OR DESIGNATION OF PROGRAM - FLANGE1
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - UNIVAC1108
3. DESCRIPTION OF PROBLEM OR FUNCTION - FLANGE1 COMPUTES NEUTRON SCATTERING KERNELS FOR A LARGE CLASS OF MODERATORS. NEUTRON SCATTERING KERNELS ARE OBTAINED FROM THE SCATTERING LAW COMPUTED BY THE CODE GASKET. FLANGE1 ALLOWS THE CALCULATION OF DOUBLE DIFFERENTIAL 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.
4. METHOD OF SOLUTION -
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
6. TYPICAL RUNNING TIME - 3 MINUTES ARE REQUIRED ON THE UNIVAC1108.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - GASKET (ACC ABSTRACT 263)
9. STATUS - ABSTRACT FIRST DISTRIBUTED APRIL 1967.
IBM7044 VERSION SUBMITTED JUNE 1966, DELETED SEPTEMBER 1969.
UNIVAC1108 VERSION SUBMITTED SEPTEMBER 1969.
10. REFERENCES - H. C. HONECK AND Y. D. NALIBOFF, APPENDIX E INTEGRAL NEUTRON THERMALIZATION ANNUAL SUMMARY REPORT OCTOBER 1964 THROUGH SEPTEMBER 1965, GA-6824, MARCH 1966.
G. M. BORGONOV, NEUTRON SCATTERING KERNELS CALCULATIONS AT EPITHERMAL ENERGIES, GA-9950, MARCH 17, 1970.
11. MACHINE REQUIREMENTS - 32K MEMORY, 2 MAGNETIC TAPES, ONE SCRATCH UNIT
12. PROGRAMMING LANGUAGE USED - FORTRAN V
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - EXFC II.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHOR -
G. M. BORGONOV
GULF GENERAL ATOMIC INCORPORATED
P. O. BOX 608
SAN DIEGO, CALIFORNIA 92112

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 ANC 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 900,000 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 (BABCOCK AND WILCOX) VERSION SUBMITTED FEBRUARY 1970.
IBM360 (AEROJET NUCLEAR) VERSION SUBMITTED APRIL 1970, REVISED APRIL 1971, REPLACED BY THIRD REVISION AUGUST 1972, SAMPLE PROBLEM EXECUTED BY ACC.
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, WAPD-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. 275.360D), 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 PO1750.
NRTS ENVIRONMENTAL SUBROUTINE MANUAL, ANC DOCUMENT, DECEMBER 1972.
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 CORE AND MODEL 2314 OR 3330 DISK PACKS.
12. PROGRAMMING LANGUAGES USED - FORTRAN IV AND ASCENT (6600), FORTRAN IV(H) AND BAL (360)

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
SCOPE 3.0 (BETTIS REV.), SCOPE 3.1.6 (B+W 6600), AND JS/360 (360).
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
THE REQUIRED SOFTWARE ENVIRONMENT IS DESCRIBED IN REFERENCE 3.
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
6600	M. L. DECH AND R. W. MCCRANEY
CONTROL DATA CORPORATION
G. R. POETSCHAT AND G. L. RUSSELL
THE BABCOCK + WILCOX COMPANY
POWER GENERATION DIVISION
P. O. BOX 1260
LYNCHBURG, VIRGINIA 24505
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
16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
- MAGNETIC TAPE TRANSMITTAL (BETTIS 6600-3 TAPES, B+W
6600-2 TAPES, AEROJET 360-1
TAPE)
- SOURCE DECKS (BETTIS 6600-51,497 CARDS, B+W 6600-27,446 CARDS,
AEROJET 360-38,258 CARDS)
- LCAD MODULE (AEROJET PDS PCQTRNMT 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, PCQTL 53
CARDS, MISCELLANEOUS 3127 CARDS)
- FLUX FILES (AEROJET 360-137 BLOCKS)
- SAMPLE PROBLEM OUTPUT LISTINGS (BETTIS 6600-36 PAGES, AEROJET

16. MATERIAL AVAILABLE (CONTINUED)

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 CCDES, PDQD
CCDES, PCQR CCDES, PCQTL CODES

1. NAME OR DESIGNATION OF PROGRAM - HAMMER/LITHE/HELP
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - HAMMER PERFORMS INFINITE LATTICE, ONE-DIMENSIONAL CELL MULTIGROUP CALCULATIONS, FOLLOWED (OPTIONALLY) BY ONE-DIMENSIONAL, FEW-GROUP, MULTIREGION REACTOR CALCULATIONS WITH NEUTRON BALANCE EDITS.
4. METHOD OF SOLUTION - INFINITE LATTICE PARAMETERS ARE CALCULATED BY MEANS OF MULTIGROUP TRANSPORT THEORY, COMPOSITE REACTOR PARAMETERS BY FEW-GROUP DIFFUSION THEORY.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
 - CELL CALCULATIONS - MAXIMA OF
 - 30 THERMAL GROUPS
 - 54 EPITHERMAL GROUPS
 - 20 SPACE POINTS
 - 20 REGIONS
 - 18 ISOTOPES
 - 10 MIXTURES
 - 3 THERMAL UPSCATTERING MIXTURES
 - 200 RESONANCES PER GROUP
 - NO OVERLAP OR INTERFERENCE
 - SINGLE LEVEL ONLY
 - REACTOR CALCULATIONS - MAXIMA OF
 - 40 REGIONS
 - 40 MIXTURES
 - 250 SPACE POINTS
 - 4 GROUPS
6. TYPICAL RUNNING TIME - LITHE REQUIRES 1 MINUTE, HELP 9 MINUTES, AND HAMMER 2 MINUTES ON THE IBM360/65.
7. UNUSUAL FEATURES OF THE PROGRAM - HAMMER COMBINES THERMOS (ACC ABSTRACT 184), MUFT, ZUT (ACC ABSTRACT 41), TUZ (ACC ABSTRACT 42), FCG (ACC ABSTRACT 28), PLUS THERMAL FOURIER TRANSFORM, EPITHERMAL INTEGRAL TRANSPORT SPACE-DEPENDENT GROUP FLUXES, AND NEUTRON BALANCE EDITS FROM A SINGLE SET OF INPUT DATA AS WELL AS A LIBRARY OF CELL RESULTS, COMPATIBLE REACTOR/EXPONENTIAL ASSEMBLY CRITICALITY SEARCHES FROM THE LIBRARY.
8. RELATED AND AUXILIARY PROGRAMS - LITHE PREPARES A THERMAL LIBRARY FOR THE HAMMER VERSION OF THERMOS AND INCLUDES EPITHERMAL SCATTERING SOURCES. HELP PREPARES AN EPITHERMAL LIBRARY FOR THE HAMMER VERSIONS OF MUFT, ZUT, TUZ, AND CELL SPACE-DEPENDENT CALCULATIONS. IT ACCEPTS SLIGHTLY MODIFIED MUFT LIBRARIES PLUS RESONANCE PARAMETERS, EITHER PROBABILITY MATRIX OR INELASTIC CROSS SECTIONS.
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1967.
IBM7090 VERSION SUBMITTED JULY 1967, DELETED MARCH 1971.

9. STATUS (CONTINUED)
TRM360 VERSION SUBMITTED JULY 1967, REPLACED BY SECOND
VERSION MARCH 1971, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - J. E. SUICH AND F. C. HONECK, THE HAMMER SYSTEM,
DP-1064, JANUARY 1967.
C. E. BAILEY, HAMMER/LITHE/HELP NOTES, DP NOTE,
MARCH 8, 1971.
11. MACHINE REQUIREMENTS - 512K BYTES AND 10 SEQUENTIAL DATA SETS
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 AUTHOR -
H. C. HONECK
E. I. DUPONT DE NEMOURS AND CO., INC.
SAVANNAH RIVER LABORATORY
AIKEN, SOUTH CAROLINA 29801
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (HAMMER 13,157 CARDS, LITHE 440 CARDS, HELP 628
CARDS)
SAMPLE PROBLEMS (HAMMER 9 CARDS, LITHE 3911 CARDS, HELP 6182
CARDS)
CONTROL INFORMATION (JCL HAMMER 214 CARDS, LITHE 21 CARDS,
HELP 22 CARDS)
SAMPLE PROBLEM OUTPUT (HAMMER 33 SELECTED PAGES, LITHE 21
SELECTED PAGES, HELP 47 SELECTED PAGES)
REFERENCE REPORT AND NOTE
17. CATEGORY - B
KEYWORDS - CELL CALCULATION, 1-DIMENSIONAL, THERMAL, EPITHERMAL,
GROUP CONSTANTS, FLUX DISTRIBUTION, LITHE CODES, HELP
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 USES THE BETTIS ENVIRONMENTAL ROUTINES (ACC ABSTRACT 478).
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1967.
CDC6600 VERSION SUBMITTED AUGUST 1967, REVISED JULY 1969.
IBM360 VERSION SUBMITTED JANUARY 1972, SAMPLE PROBLEM EXECUTED BY ACC.
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, WAPD-TM-

10. REFERENCES (CONTINUED)
398, DECEMBER 1963, ADDENDUM I, APRIL 1967, AND ADDENDUM II,
JUNE 1969.
C. J. PFEIFER, CDC-6600 FORTRAN PROGRAMMING - BETTIS
ENVIRONMENTAL REPORT, WAPD-TM-668, JANUARY 1967.
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 OS/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 ON THE 6600 OR ON THE CALCOMP663 ON THE 360.
15. NAME AND ESTABLISHMENT OF AUTHORS -
6600 C. M. FRIEDRICH
WESTINGHOUSE ELECTRIC CORPORATION
BETTIS ATOMIC POWER LABORATORY
P. O. BOX 79
WEST MIFFLIN, PENNSYLVANIA 15122

360 P. G. GARSICE
STEARNS-ROGER INCORPORATED
700 SOUTH ASH
P. O. BOX 5888
DENVER, COLORADO 80217
16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (6600-1999 CARDS, 360-2059 CARDS)
SAMPLE PROBLEMS (6600-31 CARDS, 360-31 CARDS)
SAMPLE PROBLEM OUTPUT (25 SELECTED PAGES)
REFERENCE REPORTS, WAPD-TM-398, ADDENDUM I, AND ADDENDUM II
17. CATEGORY - I
KEYWORDS - STRESSES, SHELLS, PRESSURE DISTRIBUTION, TEMPERATURE
DISTRIBUTION, DEFORMATION, ELASTICITY

1. NAME OR DESIGNATION OF PROGRAM - BISYN
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - GE635, UNIVAC1108
3. DESCRIPTION OF PROBLEM OR FUNCTION - 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.
4. METHOD OF SOLUTION - ONE OR TWO INITIAL ONE-DIMENSIONAL FLUX SOLUTIONS ARE RUN IN THE DIRECTION SPECIFIED BY THE USER. FROM THE INITIAL SOLUTION(S), GROUP AND REGION DEPENDENT BUCKLINGS ARE CALCULATED FOR UP TO 5 ONE-DIMENSIONAL FLUX AND ADJOINT SOLUTIONS IN THE ORTHOGONAL DIRECTION. THESE SOLUTIONS ARE NORMALIZED TO BECOME SHAPE FUNCTIONS. EACH SHAPE FUNCTION IS THEN USED TO CALCULATE FLUX AND ADJOINT WEIGHTED CROSS SECTIONS AVERAGED OVER THE FULL SPAN OF THAT SHAPE FUNCTION. THUS, REGION-DEPENDENT CROSS SECTIONS ARE OBTAINED WHICH VARY ONLY IN THE DIRECTION SELECTED FOR THE INITIAL SOLUTION(S). A FINAL SOLUTION IS NOW PERFORMED IN THIS DIRECTION TO GENERATE AN EIGENVALUE AND A MESH-DEPENDENT FLUX WHICH REPRESENTS THE VOLUME INTEGRATED FLUXES OVER THE ORTHOGONAL DIRECTION. THE SHAPE FUNCTIONS ARE THEN COMBINED WITH THE FINAL SOLUTION TO SYNTHESIZE A TWO-DIMENSIONAL SET OF FLUXES AND ADJOINTS. EXTENSIVE EDIT ROUTINES ARE AVAILABLE TO CALCULATE POWER DISTRIBUTION, NEUTRON BALANCE, ETC.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
MAXIMUM NUMBER OF REGIONS IN EACH DIMENSION = 8
MAXIMUM NUMBER OF MESH POINTS IN EACH DIMENSION = 75
MAXIMUM NUMBER OF ENERGY GROUPS = 16
MAXIMUM DOWNSCATTER = 8
6. TYPICAL RUNNING TIME - AN AVERAGE 16-GROUP PROBLEM TAKES ABOUT 3 MINUTES OF PROCESSOR TIME.
7. UNUSUAL FEATURES OF THE PROGRAM - SHAPE FUNCTIONS IN NON-MULTIPLYING REGIONS (BLANKETS, REFLECTORS) MAY BE CALCULATED USING A LEAKAGE SOURCE FROM THE SHAPE FUNCTION OF AN ADJACENT REGION, OR MAY BE SET UP SIMPLY BY COPYING A PREVIOUS SHAPE FUNCTION WITH THE FLUXES IN LETHARGY GROUPS $X+1$ TO $IMAX$ SET EQUAL TO THE FLUX IN GROUP X . BISYN CHECKS FOR NEGATIVE FLUX VALUES AND PRINTS OUT THE GROUP AND REGION WHERE THEY OCCUR. THE USER MAY SPECIFY THAT, IF NEGATIVE FLUXES OCCUR IN ANY SOLUTION, (A) THE PROGRAM TERMINATE, (B) SET THOSE BUCKLING VALUES TO ZERO WHICH ORIGINALLY GAVE A NEGATIVE TOTAL REMOVAL CROSS SECTION, OR (C) SET THOSE TOTAL REMOVAL CROSS SECTIONS TO ZERO WHICH WERE ORIGINALLY NEGATIVE, AND RE-RUN THAT SOLUTION.

8. RELATED AND AUXILIARY PROGRAMS - BISYN USES EITHER THE FORTRAN OR THE MACHINE LANGUAGE VERSION OF THE NPOST-RWSBT INPUT/OUTPUT ROUTINES.
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1967.
GE635 VERSION SUBMITTED JUNE 1967.
UNIVAC1108 VERSION SUBMITTED AUGUST 1969.
10. REFERENCES - P. GREEBLER, M. D. KELLEY, R. A. DAVIS, C. A. KECK, W. A. DUNCAN, BISYN - A TWO DIMENSIONAL SYNTHESIS PROGRAM, GEAP-4922, JULY 15, 1965, AND SUPPLEMENT, 1969.
MUG FILE TAPE DESCRIPTION, GE NOTE.
BISYN SUBROUTINE DESCRIPTIONS INCLUDING -
J. E. VAN ETEN, JR., ISUP, SEPTEMBER 1, 1966.
J. E. VAN ETEN, JR., FSUP, SEPTEMBER 1, 1966.
J. E. VAN ETEN, JR., GE-635 NPOST SPECIFICATION, APRIL 14, 1966.
FLEXO, J3T001, JANUARY 21, 1965.
NELS J. ANDERSON, JR., IDFTAP, A FORTRAN IV FUNCTION SUBPROGRAM, S6T001, JANUARY 15, 1965.
NELS J. ANDERSON, JR., RESTRT, Q3T001, AUGUST 1965.
SORT, L6T002.
NELS J. ANDERSON, JR., WRAPUP, A FORTRAN IV SUBROUTINE, Q3T001, AUGUST 1965.
BITA, L5T001, DECEMBER 3, 1964.
NELS J. ANDERSON, JR., FORTRAN IV SUBROUTINE ERRSYS, S4T001, JANUARY 15, 1965.
A. E. SCADDEN, ZERC, DIVISION OVERFLOW MODIFIER, Q4T001.
11. MACHINE REQUIREMENTS - 47,000 WORDS OF MEMORY, DISC, DRUM, AND 2 TAPES FOR THE GE635, 54K OF FAST MEMORY, 2 TAPE DRIVES, 510,000 WORDS OF PERIPHERAL STORAGE AND THE ABILITY TO SEGMENT FOR THE UNIVAC1108
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - GECOS III, SOL1 (GE635) AND EXEC II (UNIVAC1108).
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - AN INPUT LIBRARY IS REQUIRED FOR THE 635 VERSION. THE LIBRARY PROGRAM IS NOT INCLUDED. THE 1108 VERSION REQUIRES THAT THE COMPUTER HAS THE ABILITY TO USE READ AFTER WRITE INSTRUCTIONS.
15. NAME AND ESTABLISHMENT OF AUTHORS -
P. GREEBLER, M. D. KELLEY, R. A. DAVIS,
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GENERAL ELECTRIC COMPANY
NUCLEAR ENERGY DIVISION
ADVANCED PRODUCTS OPERATION
SUNNYVALE, CALIFORNIA 94086

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16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (635-20,995 CARDS, 1108-22,257 CARDS)
SAMPLE PROBLEMS (635-122 CARDS, 1108-94 CARDS)
LIBRARY (635-415 CARDS)
REFERENCE REPORT, NOTE, AND BISYN SUBROUTINE DESCRIPTIONS
17. CATEGORY - C
KEYWORDS - 2-DIMENSIONAL, MULTIGROUP, DIFFUSION EQUATIONS, X-Y,
R-Z, FLUX SYNTHESIS, FLUX DISTRIBUTION, AVERAGES

1. NAME OR DESIGNATION OF PROGRAM - SNARG-1D
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC3600
3. DESCRIPTION OF PROBLEM OR FUNCTION - 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 K_{EFF} OR ALPHA, INVERSE PERIOD, VALUE MAY BE SPECIFIED RATHER THAN THE CRITICALITY VALUE, $K_{\text{EFF}} = 1$. 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.
4. METHOD OF SOLUTION - SNARG-1D IS BASED ON THE SN DISCRETE-ORDINATE METHOD AS DEVELOPED BY CARLSON. THE BOUNDARY CONDITIONS PROVIDED INCLUDE THE FREE, PERIODIC, REFLECTIVE, OR WHITE BOUNDARY. TO MAKE THE COMPUTATION OF ANGULAR FLUX STABLE WITH RESPECT TO ROUND-OFF ERRORS AND SPEED CONVERGENCE, THE DIRECTIONAL-EVALUATION RULE AND A SCALED ITERATION PROCEDURE ARE USED. IF THE USER IS NOT CONCERNED WITH ANGULAR FLUX VARIATION, A DIFFUSION THEORY OPTION IS INCLUDED IN THE CODE.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
6. TYPICAL RUNNING TIME - PROBLEM EXECUTION TIME VARIES FROM FIVE MINUTES TO SEVERAL HOURS DEPENDING ON THE PROBLEM SPECIFICATION.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - CROSS SECTION DATA ARE OBTAINED FROM TAPES GENERATED BY THE ANL CROSS SECTION LIBRARY PROGRAM, XLIBIT (ACC ABSTRACT 181).
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1967.
CDC3600 VERSION SUBMITTED MARCH 1968.
10. REFERENCES - G. J. DUFFY, H. GREENSPAN, S. D. SPARCK, J. V. ZAPATKA AND M. K. BUTLER, SNARG-1D, A ONE-DIMENSIONAL, DISCRETE-ORDINATE, TRANSPORT-THEORY PROGRAM FOR THE CDC-3600, ANL-7221, JUNE 1966.
S. D. SPARCK, XLIBIT ANL CROSS-SECTION LIBRARY CODE, ANL-7112, FEBRUARY 1966.
M. K. BUTLER AND H. GREENSPAN, GENERAL INPUT SPECIFICATIONS FOR ANL REACTOR PROGRAMS, ANL-7194, APRIL 1966.

10. REFERENCES (CONTINUED)
CONCRETE STRUCTURES, A USERS MANUAL, GA-7854, JULY 31, 1967.
Y. RASHID, D. C. CERNELL, AND K. B. JADHAV, SAFE-3D,
A COMPUTER PROGRAM FOR THE THREE-DIMENSIONAL STRESS ANALYSIS OF
COMPOSITE STRUCTURES - A USERS MANUAL, SEPTEMBER 1, 1967.
11. MACHINE REQUIREMENTS - 20,100 WORDS PLUS OPERATING SYSTEM
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
UNIVAC EXEC II, GAX23B THROUGH GAX27.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
THE PROGRAM IS OPERABLE ON ANY COMPUTER WITH FORTRAN IV AND 25K
CORE.
15. NAME AND ESTABLISHMENT OF AUTHOR -
D. A. DOERING
GULF GENERAL ATOMIC INCORPORATED
P. O. BOX 608
SAN DIEGO, CALIFORNIA 92112
16. MATERIAL AVAILABLE -
SOURCE DECK (1339 CARDS)
SAMPLE PROBLEM (73 CARDS)
REFERENCE REPORT, GA-7856
17. CATEGORY - L
KEYWORDS - INPUT DATA PREPARATION, 2-DIMENSIONAL GEOMETRIES, PARA-
METERS, SAFE CODES, STRESSES

1. NAME OR DESIGNATION OF PROGRAM - GGC4
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - UNIVAC110R, CDC6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - 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.
4. METHOD OF SOLUTION - IN THE FAST SECTION EITHER THE P1 OR THE B1, B2, OR B3 APPROXIMATION IS MADE TO THE TRANSPORT EQUATION USING THE POSITIVE, ENERGY-INDEPENDENT BUCKLING. IN EACH APPROXIMATION LEGENDRE MOMENTS OF THE ANGULAR FLUX ARE COMPUTED BY DIRECT NUMERICAL INTEGRATION OF THE SLOWING DOWN EQUATIONS. IN THE RESO-

1. NAME OR DESIGNATION OF PROGRAM - STEM
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - STEM CALCULATES AND PUNCHES OUT PARTIALLY-COUPLED MASS, STIFFNESS AND INTERNAL LOAD FUNCTION MATRICES FOR A STRUCTURAL SYSTEM OF BEAMS HAVING PRISMATIC SEGMENTS. SHEAR DEFORMATION AND ROTATIONAL INERTIA ARE INCLUDED IN THE CALCULATIONS.
4. METHOD OF SOLUTION - STEM USES THE CONSISTENT MASS MATRIX WHICH IS DERIVED BY USING THE DEFORMATION FUNCTION ARISING IN THE FORMULATION OF THE STIFFNESS MATRIX AND INCLUDES THE EFFECTS OF SHEAR DEFORMATION AND ROTARY INERTIA.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE PROGRAM IS LIMITED TO A SYSTEM OF 14 BEAMS. THE MAXIMUM MATRIX SIZE IS 120 BY 120. THE NUMBER OF BEAMS PLUS THE NUMBER OF SEGMENTS IN ONE CASE CANNOT EXCEED 60.
6. TYPICAL RUNNING TIME - 5 SECONDS ARE REQUIRED TO COMPILE AND EXECUTE ONE CASE WITH 120 DEGREES OF FREEDOM.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - THE PUNCHED OUTPUT CONTAINING THE STIFFNESS AND INTERNAL LOAD FUNCTION MATRICES CAN BE USED DIRECTLY AS INPUT TO A GEM PROGRAM (ACC ABSTRACT 344) CALCULATION IN THE DYNAMIC DESIGN ANALYSIS METHOD OF SHOCK ANALYSIS. THE INPUT PREPARATION FOR STEM MAY BE FACILITATED BY USE OF THE PAM2 PROGRAM TO CALCULATE THE CROSS SECTIONAL AREA, INERTIA AND SHEAR FORM FACTOR.
9. STATUS - ABSTRACT FIRST DISTRIBUTED MARCH 1969.
CDC6600 VERSION SUBMITTED JULY 1968, REPLACED BY SECOND VERSION MAY 1972.
10. REFERENCES - F. C. CARLSON AND P. E. DUFFY, STEM, A COMPUTER PROGRAM TO GENERATE A CONSISTENT MASS AND STIFFNESS MATRIX FOR A SYSTEM OF UNIFORM BEAM SEGMENTS, KAPL-M-6933, FEBRUARY 1971.
R. B. MCCALLEY, MASS MATRIX FOR A PRISMATIC BEAM SEGMENT, KAPL-M-6913, MARCH 1968.
11. MACHINE REQUIREMENTS - FIELD LENGTH OF 50,000 OCTAL
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 3.2
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -
P. E. DUFFY AND F. C. CARLSON
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GENERAL ELECTRIC COMPANY
BOX 1072
SCHENECTADY, NEW YORK 12301
16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
SOURCE DECK (229 CARDS)
SAMPLE PROBLEM (7 CARDS)
REFERENCE REPORT
17. CATEGORY - I
KEYWORDS - MASS MATRICES, BEAMS, STRUCTURAL ANALYSIS, VIBRATIONS,
GEM CODES, PAM2 CODES

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15. NAME AND ESTABLISHMENT OF AUTHOR -
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IDAHO FALLS, IDAHO 83401
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (5019 CARDS)
SAMPLE PROBLEM (187 CARDS)
REFERENCE REPORT AND REVISIONS
17. CATEGORY - H
KEYWORDS - 2-DIMENSIONAL, X-Y, R-Z, R-THETA, GEOMETRIES, HEAT CON-
DUCTION, SPACE-TIME, TEMPERATURE DISTRIBUTION, FUEL
ELEMENTS

1. NAME OR DESIGNATION OF PROGRAM - ETOE
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC3600, IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - 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 CODE WRITTEN BY ARGONNE NATIONAL LABORATORY. THE ETOE PROGRAM PROCESSES FORMATS I, II, AND III ENDF/B DATA TAPES.
4. METHOD OF SOLUTION -
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE RESTRICTIONS AS TO STORAGE LIMITATIONS AND OPTIONS ARE BASICALLY THOSE IMPOSED BY THE 1966 ENDF/B RESTRICTIONS AND THE MC**2 PROGRAM (ACC ABSTRACT 355).
6. TYPICAL RUNNING TIME - THE AVERAGE RUNNING TIME VARIES FROM 3 TO 6 MINUTES ON THE CDC3600 PER MATERIAL PROCESSED DEPENDENT ON RESONANCE SCATTERING CALCULATIONS AND LEGENDRE POLYNOMIAL CALCULATIONS.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - ETOE PREPARES INPUT TO THE MC**2 PROGRAM (SEE REFERENCE 2) USING A MODE 2 ENDF/B TAPE. THE DAMMET PROGRAM (ACC ABSTRACT 384) MAY BE USED TO CREATE THE MODE 2 BINARY TAPE FOR ENDF/B FORMAT I DATA. THE DAMMET AND RIGEL PROGRAMS (ACC ABSTRACT 475) MAY BE USED TO CREATE THE MODE 2 BINARY TAPE FOR ENDF/B FORMAT II DATA AND RIGEL MAY BE USED TO CREATE THE MODE 2 BINARY TAPE FOR ENDF/B FORMAT III DATA.
9. STATUS - ABSTRACT FIRST DISTRIBUTED MARCH 1969.
CDC3600 VERSION SUBMITTED SEPTEMBER 1968.
IBM360 VERSION 1 SUBMITTED APRIL 1971, SAMPLE PROBLEM EXECUTED BY ACC.
IBM360 VERSION 2 REPLACING VERSION 1 SUBMITTED JUNE 1972, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - D. M. GREEN AND T. A. PITZERLE, ETOE, A PROGRAM FOR ENDF/B TO MC**2 DATA CONVERSION, APDA-219 (ENDF/B-120), JUNE 1968.
B. J. TOPPEL, A. L. RAGO, AND D. M. OSHEA, MC**2, A CODE TO CALCULATE MULTIGROUP CROSS SECTIONS, ANL-7318, JUNE 1967.
H. C. HONECK, ENDF/B SPECIFICATIONS FOR AN EVALUATED NUCLEAR DATA FILE FOR REACTOR APPLICATIONS, BNL-50066 (T-467), ENDF-102, MAY 1966, REVISED JULY 1967.
H. C. HONECK AND J. FELBERBAUM, DAMMET, A PROGRAM TO DELETE, ALTER MODE AND MERGE ENDF/B TAPES, ENDF-110, 1967.

11. MACHINE REQUIREMENTS - 65K MEMORY AND 7 MAGNETIC TAPES - STANDARD INPUT, STANDARD OUTPUT, ENDF/B, MC**2, 2 SCRATCH TAPES, AND AN OVERLAY TAPE ARE REQUIRED FOR THE CDC3600. THE IBM360 VERSION REQUIRES 600K BYTES OF MEMCRY.
12. PROGRAMMING LANGUAGE USED - FORTRAN IV (ASA STANDARD FORTRAN INsofar AS POSSIBLE)
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCCPE 6.2B (CDC3600), CS/360 (IBM360).
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THE CDC3600 VERSION OF ETOE IS MADE UP OF SIX OVERLAYS. OVERLAYS 1-5 PROCESS THE ENDF/B TAPE DATA. OVERLAY 6 REARRANGES THE LEGENDRE POLYNOMIAL EXPANSION DATA TO THE MC**2 FORMAT. AN INITIAL (ADDITIONAL) INPUT CARD (FCRMT 6 I6) IS REQUIRED FOR THE IBM360 VERSION, ASSIGNING THE LOGICAL UNIT NUMBERS REQUIRED. FIELD 1 (COLS. 1-6) IDENTIFIES THE CARD INPUT UNIT, FIELD 2 (COLS. 7-12) THE ENDF/B DATA TAPE UNIT, FIELD 3 (COLS. 13-18) THE MC**2 TAPE UNIT, FIELD 4 (COLS. 19-24) THE ELASTIC AND INELASTIC SCATTERING CROSS SECTION SCRATCH UNIT, FIELD 5 (COLS. 25-30) THE LEGENDRE COEFFICIENT SCRATCH UNIT, AND FIELD 6 (COLS. 31-36) THE W TABLE UNIT.
15. NAME AND ESTABLISHMENT OF AUTHCRS -
3600 D. M. GREEN AND T. A. PITTLERLE
ATOMIC POWER DEVELOPMENT ASSOCIATES, INC.

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ARGONNE NATIONAL LABORATORY
9700 SOUTH CASS AVENUE
ARGONNE, ILLINOIS 60439
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (3600-3743 CARDS, 360-4444 CARDS)
SAMPLE PROBLEMS (3600-282 CARDS, 360-283 CARDS)
CONTROL INFORMATION (JCL 360-73 CARDS)
SAMPLE PROBLEM OUTPUT (3600-44 PAGES, 360-45 PAGES)
REFERENCE REPORT, APDA-219
17. CATEGORY - M
KEYWORDS - CROSS SECTIONS, LIBRARIES, PREPARATION, RETRIEVAL,
MC**2 CODES, DAMMET CODES, RIGEL CODES

1. NAME OR DESIGNATION OF PROGRAM - ECSIL
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM7094
3. DESCRIPTION OF PROBLEM OR FUNCTION - 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 FISSION CROSS SECTION, AN ANGULAR DISTRIBUTION FOR EMERGENT NON-ELASTIC 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.
4. METHOD OF SOLUTION -
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE NUMBER OF EDITING OPERATIONS THAT MAY BE PERFORMED DURING A SINGLE UPDATE RUN IS 100.
6. TYPICAL RUNNING TIME -
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - THE PROGRAM ECSCHK IS USED TO CHECK THE INPUT TAPE FOR STANDARD TYPE ERRORS WHICH MIGHT HAVE BEEN MISSED DURING THE HAND-CHECKING PROCEDURES. THE ECSUPD PROGRAM UPDATES THE EXPERIMENTAL DATA TAPE(S). ECSDIX IS USED TO PRODUCE INDEXES TO THE EXPERIMENTAL DATA FILE. ECSRET IS USED TO RETRIEVE DATA FROM THE TAPE LIBRARY, EASILY AND EFFICIENTLY, ACCORDING TO SPECIFICATION OF THE REQUESTER. THE PROGRAM ECSRPT PRODUCES A PRINTED DISPLAY OF THE DATA FROM THE BINARY TAPE LIBRARY. THE OUTPUT FROM ECSRPT IS A DOCUMENT CONTAINING EXPERIMENTAL DATA ON ANY DESIRED NUMBER OF ISOTOPES IN A READILY USABLE FORM. ECSPLT PRODUCES CALCOMP PLOT OUTPUT OF INTEGRATED CROSS SECTION DATA FROM THE EXPERIMENTAL CROSS SECTION LIBRARY. ECSAPL

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13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
EXFC II.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
A CALL TO SETEOF IS COMPLETELY UNNECESSARY BUT ELIMINATES AN UN-
NECESSARY DIAGNOSTIC ON THE 1108.
15. NAME AND ESTABLISHMENT OF AUTHOR -
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BATTELLE-NORTHWEST LABORATORY
P. O. BOX 999
RICHLAND, PENNSYLVANIA 99352
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (1175 CARDS)
BINARY DECK (505 CARDS)
SAMPLE PROBLEM (71 CARDS)
LIBRARY (1512 CARDS)
REFERENCE REPORT AND NOTE
17. CATEGORY - D
KEYWORDS - 2-GROUP, ISOTOPES, PRODUCTION, DECAY, FISSION PRODUCTS,
REACTION RATES

1. NAME OR DESIGNATION OF PROGRAM - FLANGE2(71-1)
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - 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.
4. METHOD OF SOLUTION - DIRECT INTEGRATION OF THE SCATTERING LAW IS USED TO OBTAIN LEGENDRE MOMENTS.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
MAXIMUM ENERGY GROUPS = 200
MAXIMUM LEGENDRE ORDER = 5
6. TYPICAL RUNNING TIME - A SMOOTH CROSS SECTION CALCULATION REQUIRES APPROXIMATELY 1 MINUTE, WHILE A FULL SCATTERING MATRIX PROBLEM (L=5) FOR 30 ENERGY GROUPS TAKES ABOUT 12 MINUTES ON THE IBM360/65.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - KERINT(71-1) GENERATES SCATTERING MATRICES AT TEMPERATURES INTERMEDIATE BETWEEN MATRICES GENERATED BY FLANGE2.
9. STATUS - ABSTRACT FIRST DISTRIBUTED SEPTEMBER 1969.
IBM360 VERSION OF FLANGE2 SUBMITTED JANUARY 1969,
REPLACED BY FLANGE2(71-1) MARCH 1972, SAMPLE PROBLEM EXECUTED BY ACC.
UNIVAC1108 VERSION OF FLANGE2 SUBMITTED MAY 1970, DELETED MARCH 1972.
UNIVAC1108 VERSION OF FLANGE2/SC SUBMITTED DECEMBER 1970, DELETED MARCH 1972.
10. REFERENCES - H. C. HONECK AND D. R. FINCH, FLANGE-II (VERSION 71-1), A CODE TO PROCESS THERMAL NEUTRON DATA FROM AN ENDF/B TAPE, DP-1278 (ENDF-152), OCTOBER 1971, AND CORRECTION NOTICE.
11. MACHINE REQUIREMENTS - 40K SINGLE-PRECISION WORDS OF HIGH-SPEED CORE PLUS 3 TAPE (OR DISK) UNITS
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360 (IBM360).
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - FLANGE2 REQUIRES FOR INPUT THE ENDF/B LIBRARY WHICH IS AVAILABLE FROM THE NATIONAL NEUTRON CROSS SECTION CENTER AT BROOKHAVEN NATIONAL LABORATORY.

15. NAME AND ESTABLISHMENT OF AUTHORS -
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SAVANNAH RIVER LABORATORY
E. I. DUPONT DE NEMOURS AND CO., INC.
AIKEN, SOUTH CAROLINA 29801
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (FLANGE2 3247 CARDS, KERINT 351 CARDS)
SAMPLE PROBLEMS (FLANGE2 23 CARDS, KERINT 75 CARDS)
CONTROL INFORMATION (JCL FLANGE2 78 CARDS, KERINT 21 CARDS)
REFERENCE REPORT AND CORRECTION NOTICE
17. CATEGORY - B
KEYWORDS - THERMAL MULTIGROUP CROSS SECTIONS, SCATTERING LAW,
ANGULAR DISTRIBUTION, RESONANCE PARAMETERS, KERINT
CODES

1. NAME OR DESIGNATION OF PROGRAM - RELAP3
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360, CDC6600, UNIVAC1108
3. DESCRIPTION OF PROBLEM OR FUNCTION - 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.
4. METHOD OF SOLUTION - FROM A MASS AND ENERGY INVENTORY, COOLANT CONDITIONS ARE OBTAINED IN THE CONTROL VOLUMES BY INTERPOLATION OF A STEAM TABLE WHOSE ENTRIES ARE BASED ON THE 1967 ASME FORMULAE. THE INTERVOLUME FLOWS ARE THEN CALCULATED FROM THE CONTROL VOLUME PRESSURES AND QUALITIES AND THE JUNCTION DESCRIPTIONS. THE COOLANT TEMPERATURE AND DENSITY AND THE METAL TEMPERATURE IN EACH CORE REGION CAN BE USED TO GENERATE A REACTIVITY FOR THE REACTOR KINETICS EQUATIONS. HEAT TRANSFER IS THEN CALCULATED IN THE CORE REGIONS AND HEAT EXCHANGERS TO OBTAIN NEW ENERGY INVENTORIES, FLOWS ARE USED TO OBTAIN NEW MASS-ENERGY INVENTORIES, AND A NEW ADVANCEMENT IS STARTED.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
200 VOLUMES
250 JUNCTIONS
TIME-STEP SEQUENCE IS DETERMINED BY THE USER.
6. TYPICAL RUNNING TIME - FOR A TYPICAL PROBLEM ON AN IBM360/75 1 MILLISECOND PER VOLUME PER STEP IS REQUIRED, ON A CDC6600 10 MILLISECONDS PER VOLUME PER STEP, AND ON A UNIVAC1108 15 MILLISECONDS PER VOLUME PER STEP.
7. UNUSUAL FEATURES OF THE PROGRAM -
 - (A) GENERALIZED GEOMETRY AND PLANT CONTROL FUNCTIONS ARE USED.
 - (B) EXTENSIVE INPUT CHECKING IS PERFORMED.
 - (C) A DATA TAPE CAN BE CREATED.
 - (D) RESTARTING PROCEDURES ARE INCLUDED.
8. RELATED AND AUXILIARY PROGRAMS - RELAP3 SUPERSEDES RELAPSE AND RELAP2. INCLUDED IN THE PROGRAM PACKAGE ARE VDRELAP3, WHICH CAN BE USED TO REDIMENSION THE RELAP3 SOURCE DECK TO REDUCE THE COM-

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8. RELATED AND AUXILIARY PROGRAMS (CONTINUED)
PUTER STORAGE REQUIREMENTS, AND PLOTR3, WHICH IS OPERABLE ONLY ON THE NRTS IBM360/75 SYSTEM WITHOUT CHANGES.
9. STATUS - ABSTRACT FIRST DISTRIBUTED SEPTEMBER 1969.
IBM7044 VERSION OF RELAP2 SUBMITTED FEBRUARY 1969,
DELETED DECEMBER 1971.
IBM360 VERSION OF RELAP3 SUBMITTED DECEMBER 1971, SAMPLE
PROBLEM EXECUTED BY ACC.
CDC6600 VERSION OF RELAP3 SUBMITTED JANUARY 1972.
UNIVAC1108 VERSION OF RELAP3 SUBMITTED JANUARY 1972.
10. REFERENCES - W. H. RETTIG, G. A. JAYNE, K. V. MOORE, C. S. SLATER,
AND M. L. UPTMOR, RELAP3 - A COMPUTER PROGRAM FOR REACTOR BLOWDOWN
ANALYSIS, IN-1321, JUNE 1970, REVISED MAY 1971, AND ERRATA, AUGUST
18, 1971.
DEVELOPMENT OF THE OPTIONAL TWO-PHASE FRICTIONAL
PRESSURE DROP CORRELATION FOR USE IN RELAP3, ANC NOTE, AUGUST 18,
1971.
M. A. LINTNER, PLOTR3, A PLOTTING ROUTINE FOR RELAP
DATA TAPES, ANC NOTE, JANUARY 1970.
WALTER H. RETTIG, VDRELAP3 - A PROGRAM TO REDIMENSION
RELAP3, ANC NOTE.
11. MACHINE REQUIREMENTS - ON AN IBM360 WITH OVERLAY 375K BYTE REGION
SIZE IS REQUIRED FOR EXECUTION (UNDER 180K BYTES WITH REDIMENSION-
ING), 2 SCRATCH TAPES ARE DESIRABLE, AND A CLOCK IS OPTIONAL.
12. PROGRAMMING LANGUAGES USED - FORTRAN IV (CDC6600 AND UNIVAC1108),
FORTRAN IV AND BAL (IBM360)
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
CS/360 (IBM360), EXEC II (UNIVAC1108), CHIPPEWA (CDC6600).
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
W. H. RETTIG, G. A. JAYNE, K. V. MOORE,
C. S. SLATER, AND M. L. UPTMOR
AERCJET NUCLEAR COMPANY
P. O. BOX 1845
IDAHO FALLS, IDAHO 83401
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (RELAP3 360-13,633 CARDS, 6600-13,454 CARDS,
1108-13,450 CARDS, VDRELAP3 360-693 CARDS,
6600-694 CARDS, 1108-693 CARDS, PLOTR3 360-1177
CARDS, 6600-1177 CARDS, 1108-1177 CARDS)
SAMPLE PROBLEMS (RELAP3 360-76 CARDS, 6600-76 CARDS, 1108-76
CARDS)
CONTROL INFORMATICA (JCL 360-34 CARDS)
REFERENCE REPORT, ERRATA, AND NOTES

17. CATEGORY - G
KEYWORDS - FLUID FLOW, TEMPERATURE DISTRIBUTION, PRESSURE DISTRIBUTION, WATER REACTORS, BLOWDOWN, REACTIVITY EXCURSIONS, RELAP CODES, RELAPSE CODES, FLASH CODES, VDRELAP3 CODES, PLCTR3 CODES

1. NAME OR DESIGNATION OF PROGRAM - GAKIT
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - UNIVAC1108
3. DESCRIPTION OF PROBLEM OR FUNCTION - 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 PRE-DETERMINED 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.
4. METHOD OF SOLUTION - THE MULTIGROUP, ONE-DIMENSIONAL, TIME-DEPENDENT DIFFUSION THEORY KINETICS EQUATIONS ARE SOLVED BY A SEMI-IMPLICIT TIME INTEGRATION METHOD (SEE REFERENCES 1, 2, AND 3). THE HEAT TRANSFER EQUATIONS ARE SOLVED BY A QUASI TWO-DIMENSIONAL METHOD, ASSUMING THE AXIAL HEAT CONDUCTION IS NEGLIGIBLE COMPARED WITH THE HEAT TRANSPORT DUE TO COOLANT FLOW. FOR THE NUMERICAL SOLUTION OF THE KINETICS EQUATIONS AND ALSO FOR THE SOLUTION OF THE HEAT TRANSFER EQUATIONS FINITE DIFFERENCE METHODS IN SPACE AND TIME ARE EMPLOYED. THE MATERIAL PROPERTIES ARE ASSUMED TO BE REGIONWISE CONSTANT AND THE TIME-STEP SIZE IS HELD CONSTANT IN EACH TIME ZONE.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
 - ONE-DIMENSIONAL KINETICS CALCULATION - MAXIMA OF -
 - 10 PROMPT NEUTRON ENERGY GROUPS
 - 6 DELAYED NEUTRON GROUPS
 - 10 HOMOGENEOUS REGIONS (CHANNELS)
 - 100 MESH POINTS
 - FUEL ELEMENT GEOMETRY FOR HEAT TRANSFER CALCULATION - IN THE AXIAL DIRECTION THE FUEL ELEMENT MAY CONSIST OF A BOTTOM REFLECTOR, A CORE SECTION, AND A TOP REFLECTOR. THE BOTTOM AND TOP REFLECTORS MUST HAVE UNIFORM DENSITIES AND UNIFORM THERMAL PROPERTIES, WHILE WITHIN THE CORE SECTION OF THE FUEL ELEMENT UP TO 5 RADIAL REGIONS MAY BE USED. MAXIMA OF -
 - 15 RADIAL MESH POINTS
 - 20 AXIAL MESH POINTS

1. NAME OR DESIGNATION OF PROGRAM - DATATRAN
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - DATATRAN SUPPLIES A LINKAGE SYSTEM FOR MODULARIZED PROGRAMS, ENABLES A HIERARCHICAL NAMING TECHNIQUE, AND SIMPLIFIES HANDLING OF STRUCTURED DATA LISTS.
4. METHOD OF SOLUTION - A PRECOMPILER SCANS THE DATATRAN JOB DECK, REPLACING DATATRAN STATEMENTS WITH FORTRAN SUBROUTINE CALLS. A SET OF SUBROUTINES TO INTERPRET THESE CALLS IS THEN LOADED WITH THE JOB AS PART OF THE BASE OVERLAY.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MODULES ARE LIMITED TO 50K OCTAL WORDS. DATA LISTS ARE LIMITED ONLY BY DISK CAPACITY, BUT DATATRAN OPERATIONS MAY BECOME INEFFICIENT WHEN DEALING WITH MORE THAN SEVERAL HUNDRED THOUSAND WORDS OF DATA.
6. TYPICAL RUNNING TIME - 30 SECONDS ARE REQUIRED FOR THE PRECOMPILER AND SETTING UP TO RUN THE FIRST MODULE.
7. UNUSUAL FEATURES OF THE PROGRAM - DATATRAN ALLOWS ANY PATH THROUGH A SERIES OF PROGRAMS (BY SIMPLE CALL STATEMENTS), TRANSFERS BLOCKS OF DATA FROM PROGRAM TO PROGRAM SIMPLY BY NAME ASSIGNMENT, ALLOWS A HIERARCHICAL STRUCTURE TO BLOCKS OF DATA WHEREBY THE NAME ALONE CAN BE USED TO MANIPULATE ALL OR ONLY A SELECTED PORTION OF THE DATA, ALLOWS EASE IN SAVING AND RETRIEVING BLOCKS OF DATA, IN PARTICULAR, RETRIEVAL SEARCHING AT LOW FIELD LENGTH. DATATRAN MOST BENEFITS THAT CLASS OF PROBLEMS WHERE INTERFACING IS IMPORTANT AMONG MANY COMPUTER PROGRAMS IN A COMPLEX DESIGN PROCESS. DATATRAN ALLOWS VERY GENERAL AND FLEXIBLE WAYS OF PREPARING INPUT.
8. RELATED AND AUXILIARY PROGRAMS - DATATRAN USES THE KAPL DATAPOOL DISK FILE SYSTEM AND ITS RELATED PP PROGRAMS. DATATRAN INCLUDES A NUMBER OF UTILITY ROUTINES.
9. STATUS - ABSTRACT FIRST DISTRIBUTED MAY 1970.
CDC6600 VERSION SUBMITTED JULY 1969.
10. REFERENCES - W. E. SCHILLING AND H. J. KOPP, DATATRAN MODULAR PROGRAMMING SYSTEM FOR A DIGITAL COMPUTER, KAPL-M-6997L, JULY 1, 1968.
J. D. MORRIS AND H. J. KOPP, DESCRIPTION OF THE FORTRAN PROGRAM DTSCAN, KAPL-M-7036L, DECEMBER 16, 1968.
W. E. SCHILLING, DATATRAN SYSTEM NOTICE, SUGGESTED LOADING AND TESTING PROCEDURES, AND EXPLANATORY NOTES APPLICABLE TO INCORPORATION OF DATATRAN SYSTEM, APRIL 30, 1969.
E. E. KAZMIERCZAK, DATAPOOL A DATA STORAGE AND RETRIEVAL SUBROUTINE, JANUARY 23, 1969.
H. J. KOPP, DATATRAN PRIMER, KAPL-M-7176, MAY 1971.

11. MACHINE REQUIREMENTS - MINIMUM REQUIREMENTS ARE A 65,536 CENTRAL MEMORY AND AT LEAST HALF OF ONE CDC6638 DISK WHICH CAN BE DEDICATED TO DATATRAN.
12. PROGRAMMING LANGUAGES USED - FORTRAN IV AND COMPASS
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - DATATRAN OPERATES UNDER SCOPE 3.1.X. THE OPERATING SYSTEM MUST ALLOW AT LEAST 144,000 OCTAL FIELD LENGTH FOR A DATATRAN JOB.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THE PRESENT VERSION OF DATATRAN REQUIRES SOME MODIFICATION TO THE SCOPE OPERATING SYSTEM. DATATRAN MAKES USE OF THE KAPL DATAPOL. THIS IN TURN REQUIRES DEDICATED DISKS (OR PORTIONS OF A DISK UNIT). MODIFICATION OF THE STACK PROCESSOR AND/OR MONITOR PROGRAMS IS THUS REQUIRED. A VERSION OF DATATRAN IS AVAILABLE WITHOUT THESE RESTRICTIONS BUT IT REQUIRES THAT A LARGE AMOUNT OF ECS BE MADE AVAILABLE TO IT. THE SIZE OF PROBLEMS THAT CAN BE RUN WITH THIS VERSION OF DATATRAN IS CONSIDERABLY SMALLER THAN WITH THE DISK VERSION.
15. NAME AND ESTABLISHMENT OF AUTHORS -
W. E. SCHILLING, H. J. KOPP, M. A. KETCHUM,
AND J. D. MORRIS
KNOLLS ATOMIC POWER LABORATORY
GENERAL ELECTRIC COMPANY
BOX 1072
SCHENECTADY, NEW YORK 12301
16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
MAGNETIC TAPE TRANSMITTAL
FILE 1 DATATRAN FCITSYM FORMAT (213 BINARY RECORDS)
FILE 2 MODIFICATIONS TO DATATRAN (276 CARDS)
REFERENCE REPORTS AND NOTES
17. CATEGORY - M
KEYWORDS - PROGRAMMING LANGUAGES, DATA PROCESSING

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 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.
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, 69 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 XSDRN

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 AND D. R. VONDY, 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. GREFNE AND C. W. CRAVEN, JR., XSDRN, A DISCRETE ORDINATES SPECTRAL AVERAGING CODE, ORNL-TM-2500, JULY 1969.
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 - CS/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. VONDY, AND G. W. CUNNINGHAM
OAK RIDGE NATIONAL LABORATORY
P. O. BOX Y
OAK RIDGE, TENNESSEE 37830
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (28,476 CARDS)
SAMPLE PROBLEM (849 CARDS)
REFERENCE REPORT, ORNL-TM-2496, REV.2, SUPPLEMENTS 1, 2, AND 3
17. CATEGORY - K
KEYWORDS - 1-DIMENSIONAL, 2-DIMENSIONAL, 3-DIMENSIONAL, MULTI-GROUP, DIFFUSION, CRITICALITY SEARCHES, BUCKLING, X-Y-Z, R-THETA, HEXAGONAL, XSDRN CODES

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15. NAME AND ESTABLISHMENT OF AUTHOR(S) (CONTINUED)
WESTINGHOUSE ELECTRIC CORPORATION
P. O. BOX 79
WEST MIFFLIN, PENNSYLVANIA 15122
16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (435 CARDS)
SAMPLE PROBLEM (961 CARDS)
BETTIS ENVIRONMENTAL ROUTINES (21,123 CARDS)
REFERENCE REPORTS
17. CATEGORY - 0
KEYWORDS - POWER SPECTRA, DATA PROCESSING, CORRELATION COEFFI-
CIENTS, STATISTICS, 1-DIMENSIONAL, KINETICS

1. NAME OR DESIGNATION OF PROGRAM - FLAC
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - UNIVAC1108
3. DESCRIPTION OF PROBLEM OR FUNCTION - 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.
4. METHOD OF SOLUTION - THE EQUATIONS THAT ARE SOLVED ARE THE ONE-DIMENSIONAL MOMENTUM EQUATION FOR INCOMPRESSIBLE FLOW IN A DUCT AND THE CONSERVATION EQUATIONS FOR FLOW AND ENERGY AT EACH NODE. DENSITY CHANGES DUE TO HEAT ADDITION ARE INCLUDED ACCORDING TO THE PERFECT GAS LAW. THE METHOD FOR SOLVING THE SET OF ALGEBRAIC EQUATIONS IS A VARIATION OF THE POINT RELAXATION TECHNIQUE.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE FLAC PROGRAM DOES NOT CONSIDER TWO-PHASE FLOW OR OPEN-CHANNEL FLOW, AS IN HYDRAULICS.
6. TYPICAL RUNNING TIME - APPROXIMATELY 30 SECONDS ARE REQUIRED FOR A PROBLEM CONSISTING OF 100 BRANCHES.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED MAY 1970.
UNIVAC1108 VERSION SUBMITTED AUGUST 1969.
10. REFERENCE - G. J. MALEK, DEVELOPMENT OF THE FLOW ANALYSIS CODE FLAC, GA-9482, JUNE 1969.
11. MACHINE REQUIREMENTS - THE COMPUTER STORAGE REQUIREMENTS FOR FLAC ARE FLEXIBLE, AND THE SIZE OF THE VARIOUS ARRAYS CAN BE ADJUSTED TO SUIT ANY PROBLEM. WITH ALL ARRAYS SET TO THEIR MAXIMUM, A PROBLEM CONSISTING OF 1500 BRANCHES AND 700 NODES REQUIRES APPROXIMATELY 50,000 STORAGE LOCATIONS.
12. PROGRAMMING LANGUAGE USED - FORTRAN V
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - EXEC II.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - FOR LARGE PROBLEMS, AUXILIARY DATA TAPES CAN BE USED TO STORE INPUT INFORMATION AND RESULTS FROM THE LAST ITERATION. THESE DATA TAPES CAN BE USED TO RESTART THE PROBLEM IN CASE OF NON-CONVERGENCE. THE GULF SYSTEM ROUTINE WARN PERMITS THE USER TO PRESCRIBE AT RUN TIME A TIME INTERVAL PARAMETER WHICH IS USED AS A WARNING PERIOD PRIOR TO JOB TERMINATION ON THE ELAPSED TIME JOB

14. ANY OTHER INFORMATION OR RESTRICTIONS (CONTINUED)
LIMIT. USE OF THE STATEMENT CALL WARN (IWARN) RETURNS A NEGATIVE
VALUE OF IWARN UNTIL THE JOB ENTERS THE SPECIFIED WARNING TIME IN-
TERVAL AFTER WHICH A POSITIVE VALUE IS ASSIGNED. THIS ROUTINE IS
USED TO INITIATE WRITING TO TAPE OF RESTART DATA FOR SUBSEQUENT
RUNS.
15. NAME AND ESTABLISHMENT OF AUTHOR -
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GULF GENERAL ATOMIC INCORPORATED
P. O. BOX 608
SAN DIEGO, CALIFORNIA 92112
16. MATERIAL AVAILABLE -
SOURCE DECK (1210 CARDS)
SAMPLE PROBLEM (90 CARDS)
REFERENCE REPORT
17. CATEGORY - H
KEYWORDS - FLUID FLOW, TEMPERATURE DISTRIBUTION, PRESSURE DISTRI-
BUTION, GASES, HEAT CONDUCTION, HTGR REACTORS

1. NAME OR DESIGNATION OF PROGRAM - WASP
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - WASP USES A UNIQUE METHOD TO QUICKLY CALCULATE VARIOUS WATER AND STEAM PHYSICAL PROPERTIES OVER AN EXTREMELY WIDE RANGE.
4. METHOD OF SOLUTION - WASP STORES SATURATION LINE PROPERTIES AND DERIVATIVES OF INTERNAL ENERGY, ENTHALPY, AND TEMPERATURE WITH RESPECT TO PRESSURE ALONG CONSTANT DENSITY LINES IN THE SINGLE-PHASE REGIONS, AND USES LINEAR INTERPOLATION TO LOCATE EQUILIBRIUM THERMODYNAMIC POINTS.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - WASP WILL TREAT ANY POSITIVE PRESSURE, ENERGY, ENTHALPY, OR TEMPERATURE, AND ANY DENSITY LESS THAN 71.0 POUNDS PER CUBIC FOOT.
6. TYPICAL RUNNING TIME - 0.3 TO 0.4 MILLISECCNDS PER CALL ARE REQUIRED.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - THE NUMERICAL METHODS USED WERE ORIGINALLY DEVELOPED FOR USE IN THE FLASH2 (ACC ABSTRACT 295) COMPUTER PROGRAM.
9. STATUS - ABSTRACT FIRST DISTRIBUTED MAY 1970.
CDC6600 VERSION SUBMITTED AUGUST 1969.
10. REFERENCES - J. H. MURPHY AND J. A. REDFIELD, WASP - A PROGRAM TO GENERATE WATER AND STEAM THERMODYNAMIC PROPERTIES, WAPD-TM-839, OCTOBER 1968.
J. A. REDFIELD, J. H. MURPHY, AND V. C. DAVIS, FLASH-2, A FORTRAN-IV PROGRAM FOR THE DIGITAL SIMULATION OF A MULTINODE REACTOR PLANT DURING LOSS OF COOLANT, WAPD-TM-666, APRIL 1967.
11. MACHINE REQUIREMENTS - LESS THAN 1000 (DECIMAL) CENTRAL MEMORY LOCATIONS
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 -
J. H. MURPHY AND J. A. REDFIELD
BETTIS ATOMIC POWER LABORATORY
WESTINGHOUSE ELECTRIC CORPORATION

1. NAME OR DESIGNATION OF PROGRAM - DATATRAN 2-D GEOMETRY INPUT
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - 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.
4. METHOD OF SOLUTION - THE MODULES CONSTRUCTED FOR THIS PURPOSE AND THEIR INDIVIDUAL FUNCTIONS ARE
GEO2 - TO PROCESS THE SPECIFICATION OF THE GEOMETRY AS OBTAINED FROM THE ENGINEERING DRAWINGS IN UNITS OF INCHES OR CENTIMETERS AND DEFINE AND LABEL REGIONS.
PLOT20, PLOT21 - TO DRAW PLANE GEOMETRY PICTURES OF ALL REGIONS DEFINED IN THE GEOMETRY CONSTRUCTION USING MICROFILM, CALCOMP PLOTTER, GERBER DRAFTING MACHINE, OR PRINTER.
MGEN - TO GENERATE THE 2-DIMENSIONAL 90 DEGREE MESH DESCRIPTIONS REQUIRED BY NOVA DIFFUSION THEORY CALCULATIONS.
MAP120 - TO GENERATE A 2-DIMENSIONAL UNIFORMLY SPACED 120 DEGREE MESH DESCRIPTION FROM REGION DEFINITIONS. BOUNDARIES ARE MAPPED TO THE NEAREST MESH LINE.
PLOT - TO GENERATE CONTOUR LINES FROM REGION DEFINITIONS.
DUMPIT - TO EDIT THE OUTPUT OF GEO2 FOR CHECKING.
ORDELM - TO REORDER DATA FOR PLOT.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
GEO2 - LIMITED TO PLANAR FIGURES COMPOSED OF STRAIGHT-LINE SEGMENTS.
PLOT20,21, MGEN, PLOT - MAXIMUM OF 490 VERTICES FOR ANY REGION
MAP120 - MAXIMUM OF 95 VERTICES FOR ANY REGION
6. TYPICAL RUNNING TIME -
GEO2 - 15 SECONDS FOR A 325-REGION PROBLEM
PLOT20 - 20 SECONDS FOR A CALCOMP PLOT OF A 325-REGION PROBLEM
10 SECONDS FOR FILM PLOT OF A 325-REGION PROBLEM
MGEN - 30 SECONDS FOR A 300-REGION PROBLEM
PLOT - 5 SECONDS FOR A 325-REGION PROBLEM
GEO2 AND MAP120 - 37 SECONDS FOR A 100-REGION PROBLEM
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - PLOT, PLOT20, PLOT21, DUMPIT, MGEN, MAP120, AND PLOT120 MAY BE RUN FOLLOWING GEO2 TO PREPARE AND CHECK 2-DIMENSIONAL INPUT. PLOT20 AND PLOT21 USE THE PLOTTING SUBROUTINES.
9. STATUS - ABSTRACT FIRST DISTRIBUTED MAY 1970.
CDC6600 VERSION SUBMITTED JULY 1969.

10. REFERENCES - R. H. BEAM AND H. J. KOPP, TWO-DIMENSIONAL GEOMETRY INPUT PROCESSING, KAPL-M-7040L, MAY 15, 1969.
W. E. SCHILLING AND H. J. KOPP, DATATRAN MODULAR PROGRAMMING SYSTEM, KAPL-M-6997L, JULY 1, 1968.
ARGONNE CODE CENTER PROGRAMMING NOTE 70-23, JANUARY 22, 1970.
R. H. BEAM, JR. AND H. J. KOPP, TWO-DIMENSIONAL MESH PROCESSING, KAPL-M-7191L, MAY 1971.
R. H. BEAM, JR. AND H. J. KOPP, BASIC TWO-DIMENSIONAL GEOMETRY MODULES, KAPL-M-7183L, MARCH 1971.
11. MACHINE REQUIREMENTS - 51,200 WORDS OF HIGH-SPEED MEMORY
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 - THESE PROGRAMS OPERATE UNDER THE KAPL DATATRAN MODULAR PROGRAMMING SYSTEM (ACC ABSTRACT 386).
15. NAME AND ESTABLISHMENT OF AUTHORS -
R. H. BEAM AND H. J. KOPP
KNOLLS ATOMIC POWER LABORATORY
GENERAL ELECTRIC COMPANY
BOX 1072
SCHENECTADY, NEW YORK 12301
16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
MAGNETIC TAPE TRANSMITTAL
SOURCE DECK WITH SAMPLE PROBLEMS (9992 CARDS)
REFERENCE REPORTS AND NOTE
FLOW CHARTS (MICROFICHE COPIES AVAILABLE UPON REQUEST)
17. CATEGORY - L
KEYWORDS - INPUT DATA, DATA PROCESSING, GEOMETRIES, 2-DIMENSIONAL

1. NAME OR DESIGNATION OF PROGRAM - DATATRAM UTILITY MODULES
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - 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.
4. METHOD OF SOLUTION - PLOT3 IS AN ADAPTATION OF M0883 DESCRIBED IN THE REFERENCE REPORT, WAPD-TM-611.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
PLOT2 - A MAXIMUM OF 15 CURVES OR ORDINATE SCALES ALLOWED PER PLOT
PLOT3 - A MAXIMUM OF 9000 POINTS PERMITTED
6. TYPICAL RUNNING TIME -
PLOT2 - FOR TWO 135-POINT CURVES 5 SECONDS ARE REQUIRED TO GENERATE A MICROFILM FIGURE AND 8 SECONDS TO PREPARE CALCOMP DATA. FOR TWO FIGURES EACH WITH THREE 1024-POINT CURVES 60 SECONDS WERE USED TO PREPARE CALCOMP DATA.
PLOT3 - 13 SECONDS WERE REQUIRED TO GENERATE A 300-POINT CALCOMP PLOT. FILM IS SEVERAL TIMES FASTER.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - PLOT3 IS AN ADAPTATION OF THE BETTIS PROGRAM M0883.
9. STATUS - ABSTRACT FIRST DISTRIBUTED MAY 1970.
CDC6600 VERSION SUBMITTED JULY 1969.
10. REFERENCES - H. J. KOPP AND B. L. HENNIG, UTILITY PLOTTING MODULES FOR USE IN THE DATATRAM MODULAR SYSTEM, KAPL-M-7047L, MAY 1, 1969.
W. E. SCHILLING AND H. J. KOPP, DATATRAM MODULAR PROGRAMMING SYSTEM, KAPL-M-6997L, JULY 1, 1968.
C. DILEONARDO, THE GRAPHICAL DISPLAY OF NUMERICAL DATA, WAPD-TM-611, APRIL 1966.
ARGONNE CODE CENTER PROGRAMMING NOTE 70-23, JANUARY 22, 1970.
R. H. BEAM, JR. AND H. J. KOPP, TWO-DIMENSIONAL MESH PROCESSING, KAPL-M-7191L, MAY 1971.
R. H. BEAM, JR. AND H. J. KOPP, BASIC TWO-DIMENSIONAL GEOMETRY MODULES, KAPL-M-7183L, MARCH 1971.
11. MACHINE REQUIREMENTS - 51,200 WORDS OF HIGH-SPEED MEMORY
12. PROGRAMMING LANGUAGES USED - FORTRAN IV AND ASCENT

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
SCOPE 3.1, SCOPE 3.2.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
THESE PROGRAMS OPERATE UNDER THE KAPL DATATRAN MODULAR PROGRAMMING
SYSTEM (ACC ABSTRACT 386).
15. NAME AND ESTABLISHMENT OF AUTHORS -
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GENERAL ELECTRIC COMPANY
BOX 1072
SCHENECTADY, NEW YORK 12301
16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
MAGNETIC TAPE TRANSMITTAL
SOURCE DECK WITH SAMPLE PROBLEMS (2810 CARDS)
REFERENCE REPORTS, KAPL-M-6997L, KAPL-M-7047L, KAPL-M-7191L,
KAPL-M-7183L, AND NOTE
17. CATEGORY - P
KEYWORDS - GRAPHS, DATA PROCESSING, 2-DIMENSIONAL, 3-DIMENSIONAL

1. NAME OR DESIGNATION OF PROGRAM - PAX03
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - 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.
4. METHOD OF SOLUTION - INVENTORIES OF CELLS ARE INPUT IN THE FORM OF NUCLIDE CONCENTRATIONS IN BASIC NUCLEAR MATERIALS AND THEIR GEOMETRIC ARRANGEMENTS AND SIZES. INDIVIDUAL MODULES OF THE PROGRAM CALCULATE SPECIFIC PROPERTIES OF THE CELL WHICH ARE ENTERED INTO A GENERAL FILE ALONG WITH OTHER RESULTS FOR FURTHER EDITING. ACCORDING TO PRESCRIBED PROCEDURES, THE HARMONY FILE REQUIRED BY PDQ7 IS GENERATED FROM THIS GENERAL FILE. THE PARAMETERS REQUIRED FOR THE P7MG EQUATIONS ARE ALSO TAKEN FROM THE GENERAL FILE WHILE THE RESULTS ARE ENTERED INTO A SEPARATE FILE FOR EDITING. IN CYLINDRICAL AND SPHERICAL GEOMETRY THE P3, P5, AND P7 FAST AND DOUBLE-P1 THERMAL SPECTRA ARE SIMPLIFIED APPROXIMATIONS.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
 - 30 CELLS CALCULATED IN ONE PROBLEM
 - 30 NUCLIDES REPRESENTED IN THE FAST ENERGY SPECTRUM
 - 50 NUCLIDES USED IN OTHER PARTS OF THE PROGRAM
 - 4 FAST GROUPS WITH 1 THERMAL GROUP OR 3 FAST GROUPS WITH 2 OVERLAPPING THERMAL GROUPS
 - 3 PERTURBED PARAMETERS IN THE TEMPERATURE FEEDBACK CALCULATIONS
 - UNLIMITED NUMBER OF DEPLETION TIMES
6. TYPICAL RUNNING TIME - ABOUT 15 SECONDS PER CELL PER DEPLETION STEP ARE REQUIRED EXCEPT FOR FINE DETAIL PLATE GEOMETRY PROBLEMS WHICH REQUIRE 90 SECONDS.
7. UNUSUAL FEATURES OF THE PROGRAM -
 - (A) THE CELLS CAN BE DESCRIBED BY CONCENTRATIONS AND BASIC DIMENSIONS.
 - (B) HETEROGENEOUS RESONANCE INTEGRALS MAY BE CALCULATED FROM INPUT L-FACTORS FOR ROD GEOMETRY AND FROM FINE-DETAILED MULTIGROUP CALCULATIONS FOR PLATE GEOMETRY.
 - (C) FAST CROSS SECTIONS ARE OBTAINED FROM A 57-GROUP XAP LIBRARY. BOTH 54- AND 57-GROUP PROBLEMS CAN BE SOLVED.

7. UNUSUAL FEATURES OF THE PROGRAM (CONTINUED)
 - (D) THERMAL CROSS SECTIONS AND THERMAL SCATTERING KERNELS ARE OBTAINED FROM A 25-, 36-, OR 50-GROUP XAP LIBRARY.
 - (E) THERMAL SHIELDING FACTORS ARE OBTAINED WITH A DOUBLE-P APPROXIMATION FOR PLATES OR FROM A CORRELATION FOR RODS AND PLATES.
 - (F) P1, P2, AND P3 OR DOUBLE-P1 SPECTRA ARE COMPUTED THERMALLY AND CROSS SECTION AVERAGES ARE OBTAINED FOR ONE-GROUP DIFFUSION, TWO-OVERLAPPING-GROUPS DIFFUSION, P1, DOUBLE-P1 AND P3 MODELS. THE AVERAGES MAY BE USED IN HARMONY TABLESETS OR IN P7MG.
 - (G) IN SLAB GEOMETRY, P1, P3, P5, AND P7 APPROXIMATIONS ARE AVAILABLE IN THE FAST MULTIGROUPS OF A P7MG CALCULATION. ONE-GROUP DIFFUSION, P1, DOUBLE-P1, AND TWO-OVERLAPPING-GROUPS APPROXIMATIONS ARE AVAILABLE FOR THE THERMAL GROUPS.
8. RELATED AND AUXILIARY PROGRAMS - THE FAST AND THERMAL CROSS SECTION DATA ARE CREATED BY THE XAP PROGRAM. THE FINK/PANTRY DATA STORAGE AND RETRIEVAL SYSTEM IS USED BY PAX03 AS ARE THE BETTIS ENVIRONMENTAL ROUTINES (ACC ABSTRACT 478). HARMONY TABLESETS, CREATED BY PAX03, ARE INPUT TO PDQ7 (ACC ABSTRACT 275).
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1970.
CDC6600 VERSION OF PAX02 SUBMITTED JANUARY 1970, REPLACED BY CDC6600 VERSION OF PAX03 IN JUNE 1972.
10. REFERENCES - S. M. NIKOLICH, S. H. WEISS, O. J. MARLOWE, R. D. GREENBERG, AND S. E. KOVSCEK, PAX03, A COMPREHENSIVE CDC-6600 PROGRAM TO COMPUTE INFINITE MEDIUM MULTIGROUP SPECTRA, HARMONY INPUT, AND ONE-DIMENSIONAL P7 MULTIGROUP SOLUTIONS, WAPD-TM-888(L), VOLS. I AND II, FEBRUARY 1971.
B. L. ANDERSON AND L. A. ONDIS, XAP - A MULTIGROUP CROSS SECTION LIBRARY SYSTEM, WAPD-TM-823(L), FEBRUARY 1971.
C. J. PFEIFER, CDC-6600 FORTRAN PROGRAMMING - BETTIS ENVIRONMENTAL REPORT, WAPD-TM-668, JANUARY 1967.
H. BACH, JR. AND O. J. MARLOWE, THE FINK/PANTRY DATA STORAGE AND RETRIEVAL SYSTEM FOR A COMPUTER, WAPD-TM-710, REVISED, JULY 1969.
11. MACHINE REQUIREMENTS - SYSTEM DISK, DEDICATED DISK AREA FOR BETTIS FILE MANAGER, EXTENDED CORE STORAGE (ECS) FOR AUXILIARY STORAGE
12. PROGRAMMING LANGUAGES USED - FORTRAN IV AND COMPASS
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 3.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
S. M. NIKOLICH, S. H. WEISS, O. J. MARLOWE,
R. D. GREENBERG, AND S. E. KOVSCEK

15. NAME AND ESTABLISHMENT OF AUTHOR(S) (CONTINUED)
BETTIS 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 DECKS (PAX03 TAPE1-19,064 CARDS, TAPE 2-13,691 CARDS,
FINK/PANTRY 3224 CARDS, XAP 853 CARDS)
SAMPLE PROBLEM (PAX03 151 CARDS)
REFERENCE REPORTS
17. CATEGORY - B
KEYWORDS - CROSS SECTIONS, FFV-GROUP, THERMAL SPECTRA, RESONANCE
INTEGRALS, FISSION PRODUCTS, HARMONY CODES, XAP CODES,
PDQ7 CODES, FINK/PANTRY CODES, PAX02 CODES

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 -
T. A. PORSCHING, J. H. MURPHY, J. A. REDFIELD,
AND V. C. DAVIS
BETTIS 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 (11,598 CARDS)
SAMPLE PROBLEM (24 CARDS)
BETTIS ENVIRONMENTAL ROUTINES (21,123 CARDS)
REFERENCE REPORTS, WAPD-TM-840, WAPD-TM-666, AND WAPD-TM-668
17. CATEGORY - G
KEYWORDS - REACTORS, TRANSIENTS, ACCIDENT, CONTAINMENT, FUELS,
FLUID FLOW, PRESSURE DISTRIBUTION, COOLANTS, BLOWDOWN,
REACTOR SAFETY, FLASH CODES

1. NAME OR DESIGNATION OF PROGRAM - CYGRO3
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - CYGRO3 IS AN EXTENSIVE MODIFICATION OF CYGRO1 AND CYGRO2 (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. FUEL GROWTH AND MIGRATION ARE INCLUDED. THE MAIN CHANGES FROM CYGRO1 AND CYGRO2 ARE IN THE AREA OF VOID MIGRATION, FUEL CRACKING, CLAD COLLAPSE, REPRESENTATION OF IN-PILE CREEP AND CLAD ANISOTROPY.
4. METHOD OF SOLUTION - THE FUEL AND CLAD ARE DIVIDED INTO A NUMBER OF CONCENTRIC RINGS. EQUATIONS FOR BALANCE OF FORCES AND DISPLACEMENTS BETWEEN THE RINGS ARE USED TO ESTABLISH EQUILIBRIUM. PLASTIC FLOW (CREEP) IS TREATED ON AN INCREMENTAL BASIS. THE REQUIRED SIZES OF TIME-STEPS ARE CALCULATED INTERNALLY ON THE BASIS OF ALLOWED STRESS AND STRAIN INCREMENTS.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMUM OF - 30 RINGS (FUEL PLUS CLAD)
6. TYPICAL RUNNING TIME - EACH BASIC TIME-STEP TAKES ABOUT 0.01 SECOND PER FUEL RING (I.E. 0.3 SECOND FOR 30 RINGS). THE NUMBER OF TIME-STEPS PER HISTORY INPUT STEP VARIES BETWEEN 50 AND 500.
7. UNUSUAL FEATURES OF THE PROGRAM - BENDING MOMENTS TO HOLD THE FUEL ROD STRAIGHT WHEN SITUATED IN A POWER GRADIENT ARE CALCULATED BY A PERTURBATION ANALYSIS. CORRESPONDING DEFLECTIONS IF ALLOWED TO GO FREE ARE ALSO DETERMINED. AXIAL FORCES PRODUCED BY SUPPORTS CAN BE FACTORED INTO THE CALCULATIONS. THE EFFECT OF A CENTRAL HEAT PRODUCING PLUG INSIDE THE FUEL CAN BE CALCULATED. CLAD COLLAPSE PRESSURES CAN BE SPECIFIED AS A FUNCTION OF TIME.
8. RELATED AND AUXILIARY PROGRAMS - CYGRO1 AND CYGRO2. CYGRO3 USES THE BETTIS ENVIRONMENTAL ROUTINES (ACC ABSTRACT 478).
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1970.
CDC6600 VERSION SUBMITTED JULY 1970, REPLACED
BY CORRECTED VERSION AUGUST 1971.
10. REFERENCES - F. DUNCOMBE AND C. M. FRIEDRICH, CYGRO-3 - A COMPUTER PROGRAM TO DETERMINE TEMPERATURES, STRESSES AND DEFORMATIONS IN OXIDE FUEL RODS (LWBR DEVELOPMENT PROGRAM), WAPD-TM-961, MARCH 1970.
C. J. PFEIFER, CDC-6600 FORTRAN PROGRAMMING - BETTIS ENVIRONMENTAL REPORT, WAPD-TM-668, JANUARY 1967.
ACC PROGRAMMING NOTE 73-4, AUGUST 28, 1972.

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 PROGRAM NCR 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
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360/65,75,91
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 O5R 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 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.
4. METHOD OF SOLUTION - THE SCATTERING TREATMENT USED IN KENO ASSUMES THAT THE DIFFERENTIAL NEUTRON SCATTERING CROSS SECTION CAN BE REPRESENTED BY A P_L 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 NEUTRON'S 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 KEFF 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.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - ANISN (ACC ABSTRACT 151), DOT, GEOM, O5R
9. STATUS - ABSTRACT FIRST DISTRIBUTED JANUARY 1972.
IBM360 VERSION SUBMITTED MAY 1970, REPLACED BY SECOND VERSION SEPTEMBER 1971, SAMPLE PROBLEM EXECUTED BY ACC.

1. NAME OR DESIGNATION OF PROGRAM - DYN01
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600, IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - DYN01 CALCULATES THE DISTRIBUTION OF ELECTRONS THAT ARE EMITTED FROM A PHOTOMULTIPLIER COMPOSED OF A SERIES OF DYNODES.
4. METHOD OF SOLUTION - ONE ELECTRON IMPINGING UPON A PHOTOMULTIPLIER PRODUCES AN OUTPUT OF MANY ELECTRONS. THIS OUTPUT CAN BE DESCRIBED STATISTICALLY BY USE OF GENERATING FUNCTIONS. THE OUTPUT FROM EACH DYNODE IS ASSUMED TO HAVE A POLYA DISTRIBUTION. THE PROCEDURE FOLLOWED IS THE SAME AS THAT FIRST DESCRIBED FOR UNIFORM DYNODES BY J. R. PRESCOTT OF THE UNIVERSITY OF ALBERTA (REFERENCE 2), EMPLOYING A RECURSION RELATIONSHIP FOR THE PROBABILITY DISTRIBUTIONS.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
4 STAGES
10,000 ELECTRONS FOR WHICH PROBABILITIES WILL BE CALCULATED
6. TYPICAL RUNNING TIME - RUNNING TIME IS HIGHLY DEPENDENT ON THE NUMBER OF ELECTRON CALCULATIONS DESIRED AND THE CONVERGENCE CRITERION SPECIFIED. A 4-STAGE, 5000 ELECTRON PROBLEM WITH A CONVERGENCE CRITERION OF $1.E-9$ REQUIRES ABOUT 10 SECONDS. MOST CASES SHOULD RUN IN LESS THAN 1 MINUTE.
7. UNUSUAL FEATURES OF THE PROGRAM - APPLICATION OF PRESCOTTS FORMULA TO A SERIES OF NON-UNIFORM DYNODES.
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED JANUARY 1972.
CDC6600 VERSION SUBMITTED OCTOBER 1970.
IBM360 VERSION SUBMITTED NOVEMBER 1971, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - J. E. EDWARDS AND J. F. MCCARTHY, DYN01 A PROGRAM TO COMPUTE THE DISTRIBUTION OF SECONDARY ELECTRONS IN PHOTOMULTIPLIERS, KAPL-M-6575, SEPTEMBER 21, 1966.
J. R. PRESCOTT, A STATISTICAL MODEL FOR PHOTOMULTIPLIER SINGLE-ELECTRON STATISTICS, NUCLEAR INSTRUMENTS AND METHODS, VOL. 39, PP. 173-179, 1966.
L. A. DIETZ, GENERAL METHOD FOR COMPUTING THE STATISTICS OF CHARGE AMPLIFICATION AND PHOTON DETECTORS USED FOR PULSE COUNTING, INT. J. MASS SPECTROM. ION PHYSICS, VOL. 5, PP. 11-19, 1970.
11. MACHINE REQUIREMENTS - ABOUT 45,000 WORDS OF MEMORY
12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
SCOPE (CDC6600) AND OS/360 (IBM360).
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
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HIGH ENERGY PHYSICS
ARGONNE NATIONAL LABORATORY
ARGONNE, ILLINOIS 60439
16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
SOURCE DECKS (6600-157 CARDS, 360-161 CARDS)
SAMPLE PROBLEMS (6600-5 CARDS, 360-7 CARDS)
REFERENCE REPORT, KAPL-M-6575
17. CATEGORY - D
KEYWORDS - STATISTICS, PHOTOMULTIPLIERS, ELECTRONS

10. REFERENCES - J. A. REDFIELD, CHIC-KIN - A FORTRAN PROGRAM FOR INTERMEDIATE AND FAST TRANSIENTS IN A WATER MODERATED REACTOR, WAPD-TM-479, JANUARY 1965.
C. J. PFEIFFER, CDC-6600 FORTRAN PROGRAMMING - BETTIS ENVIRONMENTAL REPORT, WAPD-TM-668, JANUARY 1967.
11. MACHINE REQUIREMENTS -
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCCPF 3.1.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHOR -
J. A. REDFIELD
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WEST MIFFLIN, PENNSYLVANIA 15122
16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (5054 CARDS)
SAMPLE PROBLEM (35 CARDS)
SAMPLE PROBLEM OUTPUT (20 SELECTED PAGES)
REFERENCE REPORTS
17. CATEGORY - H
KEYWORDS - REACTIVITY TRANSIENTS, WATER COOLANTS, HEAT TRANSFER, KINETICS, CHIC3 CODES, SPERT1 REACTORS

1. NAME OR DESIGNATION OF PROGRAM - QX1
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC3600, IBM360/75
3. DESCRIPTION OF PROBLEM OR FUNCTION - 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.
4. METHOD OF SOLUTION - THE IMPROVED QUASISTATIC METHOD DESCRIBED IN REFERENCE 1 IS USED TO SOLVE THE TIME-DEPENDENT PROBLEM. THE METHOD CONSISTS OF FACTORING THE TOTAL FLUX INTO THE PRODUCT OF A SPACE-ENERGY-TIME DEPENDENT SHAPE FUNCTION AND A PURELY TIME-DEPENDENT AMPLITUDE FUNCTION, NORMALIZED SO THAT THE MOST RAPIDLY VARYING PART OF THE TOTAL FLUX IS INCLUDED IN THE AMPLITUDE FUNCTION. THE TWO COUPLED SETS OF EQUATIONS WHICH RESULT ARE SOLVED ITERATIVELY. THE FUEL TEMPERATURE CHANGES ARE CALCULATED BY A REGIONWISE ADIABATIC MODEL WITH THE ASSUMPTION THAT ALL POWER IS PRODUCED IN THE FUEL. THE METHOD WAS DEVELOPED SPECIFICALLY FOR FAST REACTOR SAFETY ANALYSIS. THE ADVANTAGES OF FACTORIZATION ARE GREATEST FOR SUCH SYSTEMS, THOUGH THE CODE HAS BEEN SHOWN TO PERFORM ADEQUATELY ON THERMAL REACTOR PROBLEMS.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMUM OF
 - 30 ENERGY GROUPS
 - 15 DOWNSCATTER GROUPS
 - 6 DELAYED NEUTRON FAMILIES
 - 20 SPATIAL REGIONS
 - 16 MATERIAL MIXTURES PER REGION
 - 150 MESH POINTS
6. TYPICAL RUNNING TIME - A 29-GROUP, 15 DOWNSCATTER, 51 MESH POINT ROD-DROP PROBLEM RUN TO 30 REACTOR SECONDS EXECUTES IN 29 MINUTES ON THE CDC3600 AND 10 MINUTES ON THE IBM360/75. A 10-GROUP, 6 DOWNSCATTER, 53 POINT PULSED REACTOR PROBLEM RUN TO 1 MSEC. REACTOR TIME EXECUTES IN 10 MINUTES ON THE IBM360/75. RUNNING TIME ESTIMATES CANNOT BE GENERALIZED BECAUSE OF THE HIGH DEGREE OF DEPENDENCE ON THE REQUIRED ACCURACY OF SOLUTION, TYPE OF PERTURBATION, AND THE EIGENVALUE SEPARATION OF THE SPACE-ENERGY EQUATION.
7. UNUSUAL FEATURES OF THE PROGRAM - THE RUNNING TIME CAN BE REDUCED GREATLY FOR PROBLEMS REQUIRING RELATIVELY LOW ACCURACY, AND THE CODE HAS BEEN SHOWN TO REPRODUCE THE RESULTS OF DIRECT

7. UNUSUAL FEATURES OF THE PROGRAM (CONTINUED)
FINITE-DIFFERENCE CODES WHEN CONVERGENCE IS TIGHTENED. AN AUTOMATIC TIME-STEP SELECTOR IS PROVIDED TO OPTIMIZE THE TIME DISTRIBUTION OF SHAPE FUNCTION RECALCULATIONS DURING THE TRANSIENT. A TRUE POINT KINETICS PROBLEM CAN BE RUN USING ONLY THE INITIAL SHAPE FUNCTION. A COMPACT PROBLEM EDIT IS GIVEN IN TERMS OF THE FAMILIAR INTEGRAL QUANTITIES OF REACTIVITY, EFFECTIVE DELAYED-NEUTRON FRACTION, GENERATION TIME, ETC. VERY GENERAL PROBLEM DRIVING FUNCTIONS AND TIME-STEP CONTROLS MAY BE USED. A GROUP-COLLAPSING SYSTEM IS BUILT INTO THE PROBLEM PREPARATION MODULE OF THE CODE.
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED JANUARY 1972.
CDC3600 VERSION SUBMITTED JANUARY 1971, REVISED APRIL 1972.
IBM360/75 VERSION SUBMITTED JANUARY 1971, SAMPLE PROBLEM EXECUTED BY ACC.
IBM360/75 VERSION REPLACED BY EDITION 6 OF CODE APRIL 1972, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - K. C. OTT AND D. A. MENELEY, ACCURACY OF THE QUASISTATIC TREATMENT OF SPATIAL REACTOR KINETICS, NUCL. SCI. + ENG., 36, PP. 402 (1969).
D. A. MENELEY, K. C. OTT, AND E. S. WIENER, FAST REACTOR KINETICS - THE QX1 CODE, ANL-7769, MARCH 1971.
D. A. MENELEY, ANL INTRA-LABORATORY MEMORANDUM, MARCH 1972.
11. MACHINE REQUIREMENTS - FOR THE CDC3600, 64K MEMORY, INPUT, OUTPUT, AND PUNCH TAPES, A MAXIMUM OF 2 CROSS SECTION TAPES, AND A MAXIMUM OF 6 SCRATCH TAPES. ON THE IBM360/75, 450K BYTE MEMORY, INPUT, OUTPUT, AND PUNCH DATASETS, A MAXIMUM OF 2 CROSS SECTION DATASETS, AND A MAXIMUM OF 6 SCRATCH DATASETS.
12. PROGRAMMING LANGUAGES USED - FORTRAN IV (IBM360) AND 3600 FORTRAN (CDC3600). EACH VERSION HAS BEEN MADE INDEPENDENT OF THE PECuliarITIES OF LOCAL LANGUAGE TO THE MAXIMUM EXTENT POSSIBLE. VARIANCES ARE DOCUMENTED ON COMMENT CARDS WITHIN THE CODE. THE CDC3600 VERSION HAS BEEN ADAPTED TO THE CDC6000-SERIES LANGUAGE THROUGH INTERACTION WITH WORK CARRIED OUT ON A CDC6500 MACHINE.
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCCPE 6.2 (CDC3600) AND OS/360 (IBM360).
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THE CDC3600 VERSION CONSISTS OF A MAIN PROGRAM AND 3 OVERLAY MODULES. THE IBM360/75 VERSION IS ALSO OVERLAYED. EDITION 6 OF QX1 INCLUDES A STEADY-STATE RESTART CAPABILITY, A MORE SATISFACTORY ITERATION PROCEDURE FOR FEEDBACK PROBLEMS, AND A SIMPLIFIED DUMP FILE FACILITY.

15. NAME AND ESTABLISHMENT OF AUTHOR -
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16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (3600-6501 CARDS, 360-6633 CARDS)
SAMPLE PROBLEMS (3600-205 CARDS, 360-192 CARDS)
LIBRARIES (3600-5609 CARDS, 360-5609 CARDS)
CONTROL INFORMATION (BINARY CONTROL CARDS 3600-21 CARDS,
JCL 360-152 CARDS)
SAMPLE PROBLEM OUTPUT (37 SELECTED PAGES)
REFERENCE REPORT, ANL-7769, AND ANL MEMORANDUM
17. CATEGORY - F
KEYWORDS - 1-DIMENSIONAL, MULTIGROUP, DIFFUSION, FAST REACTORS,
KINETICS, SPACE-TIME

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. THE IBM360 VERSION OF RIGEL IS DESIGNED TO PROCESS ENDF/B III TAPES ONLY.

CRECT 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 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 BE SUBCLASSIFIED UNDER NUCLIDES, CLASSES OF DATA, AND REACTION

4. METHOD OF SOLUTION (CONTINUED)

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 CORE 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 -

CCC 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.

7. UNUSUAL FEATURES OF THE PROGRAM - IN CHECKER THERE ARE TWO OUTPUT OPTIONS - (A) LONG FORM, WHICH LISTS EACH CARD IMAGE AS WELL AS

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7. UNUSUAL FEATURES OF THE PROGRAM (CONTINUED)
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.
IBM360 VERSIONS OF CHECKER AND CRECT SUBMITTED MARCH 1971.
IBM360 VERSION OF RIGEL SUBMITTED JUNE 1972.
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 JCB.
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 (CCC6600), OS/360 (IRM360).
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
6600 ODELLI OZER
NATIONAL NEUTRON CROSS SECTION CENTER
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15. NAME AND ESTABLISHMENT OF AUTHOR(S) (CONTINUED)

36C

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16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL

SOURCE DECKS (RECT 6600-258 CARDS, 360-274 CARDS, CHECKER
6600-3192 CARDS, 360-3199 CARDS, RIGEL 6600-2060,
360-2123 CARDS, LISTFC 6600-2687 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 - CAGE/BIRD/SPEC
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - UNIVAC1108
3. DESCRIPTION OF PROBLEM OR FUNCTION - 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.
4. METHOD OF SOLUTION - CAGE COMPUTES THE TIME-ENERGY NEUTRON SPECTRUM IN A ZERO-DIMENSION, MULTIGROUP ONE- OR TWO-POINT MODEL ACCORDING TO A FREQUENCY COLLISION METHOD. CAGE IS ALSO EMBEDDED IN BIRD. BIRD CALCULATES THE TIME-OF-FLIGHT DEPENDENT CORRECTION FACTOR TO BE APPLIED TO NEUTRON TIME-OF-FLIGHT SPECTRA IN ORDER TO CORRECT THEM FOR NEUTRON EMISSION TIME EFFECTS AND DETECTOR EFFICIENCY. THIS IS DONE BY COMPUTING THE NEUTRON TIME-OF-FLIGHT SPECTRUM WITH AND WITHOUT THE DISTORTION DUE TO NEUTRON EMISSION, DETECTOR EFFICIENCY, ETC., AND COMPUTING THE RATIO OF THE TWO SPECTRA FOR EACH TIME CHANNEL. SPEC PERFORMS THE ACTUAL DATA PROCESSING JOB - BACKGROUND EVALUATION AND SUBTRACTION, ELECTRONIC DEADTIME CORRECTION, USE OF THE CORRECTION FACTOR COMPUTED BY BIRD TO CONVERT THE DATA FROM COUNTS PER UNIT OF TIME TO NEUTRONS PER UNIT OF LETHARGY, STATISTICAL ERROR ANALYSIS, GROUPING AND EDITING.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - A MAXIMUM OF 35 GROUPS FOR THE MULTIGROUP CALCULATION FOR CAGE AND BIRD. DEADTIME CORRECTION ROUTINES OF SPEC ARE DESIGNED FOR TMC 201, 211, AND 212 1024-CHANNEL ANALYZERS AND FOR AN ON-LINE CDC1700.
OTHER MAXIMA INCLUDE -
 - 2000 NEUTRON GENERATIONS (CAGE)
 - 1100 NEUTRON GENERATIONS (BIRD)
 - 150 POINTS IN THE REFERENCE FINE GROUP SPECTRUM
 - 150 POINTS IN THE DETECTOR EFFICIENCY TABLE
 - 100 POINTS IN THE FLIGHT PATH TRANSMISSION TABLE
 - 2000 TIME CHANNELS FOR THE CORRECTION FACTOR COMPUTATION
6. TYPICAL RUNNING TIME - CAGE REQUIRES 3 MINUTES, BIRD 4 MINUTES, AND SPEC 1 MINUTE FOR A TYPICAL CASE.
7. UNUSUAL FEATURES OF THE PROGRAM - SPEC READS TIME-OF-FLIGHT DATA FROM CARDS OR TAPES AND WRITES THE PROCESSED DATA ONTO TAPES.
8. RELATED AND AUXILIARY PROGRAMS - CAGE AND BIRD ACCEPT THE INPUT CROSS SECTIONS IN THE GGC FORMAT (ACC ABSTRACT 298).
9. STATUS - ABSTRACT FIRST DISTRIBUTED JANUARY 1972.
UNIVAC1108 VERSION SUBMITTED FEBRUARY 1971, ADDITIONAL MATERIAL RECEIVED JUNE 1972.

10. REFERENCES - P. DOULTREMONT, D. HOUSTON, AND J. C. YOUNG, CAGE-BIRD-SPEC, A PACKAGE FORTRAN-V SYSTEM FOR THE REDUCTION AND ANALYSIS OF NEUTRON TIME-OF-FLIGHT SPECTRA, GULF-RT-10195, NOVEMBER 18, 1970.
- P. DOULTREMONT, TIME-DEPENDENT ANALYSIS OF SUBCRITICAL OR NON-MULTIPLYING SYSTEMS, NUCLEAR SCIENCE AND ENGINEERING, VOL. 37, PP.104-110, 1969.
- P. DOULTREMONT, AND J. C. YOUNG, A MULTIGROUP TWO-POINT KINETIC MODEL FOR THE TIME-DEPENDENT ANALYSIS OF TWO-ZONE FAST NEUTRON SYSTEMS, NUCLEAR SCIENCE AND ENGINEERING, VOL.40, PP. 339-342, 1970.
- J. ADIR AND K. C. LATHROP, THEORY AND METHOD USED IN THE GGC-4 MULTIGROUP CROSS SECTION CODE, GA-9021, OCTOBER 1968.
11. MACHINE REQUIREMENTS - 64K MEMORY AND ONE FAST DRUM AREA OF 100K FOR CAGE AND BIRD. 50K MEMORY, 2 SCRATCH FILES AND, ON OPTION, SEVERAL INPUT/OUTPUT FILES FOR SPEC.
12. PROGRAMMING LANGUAGE USED - FORTRAN V
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - EXEC8.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
- P. DOULTREMONT, D. H. HOUSTON, AND J. C. YOUNG
GULF RADIATION TECHNOLOGY
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P. O. BOX 608
SAN DIEGO, CALIFORNIA 92112
16. MATERIAL AVAILABLE -
- SOURCE DECKS (CAGE 370 CARDS, BIRD 505 CARDS, SPEC 727 CARDS)
SAMPLE PROBLEM INPUT (CAGE 310 CARDS, BIRD 386 CARDS, SPEC 504 CARDS)
SAMPLE PROBLEM PUNCHED OUTPUT (BIRD 116 CARDS, SPEC 79 CARDS)
SAMPLE PROBLEM OUTPUT (CAGE 25 PAGES, BIRD 6 PAGES, SPEC 4 PAGES)
REFERENCE REPORT, GULF-RT-10195
17. CATEGORY - 0
- KEYWORDS - SPECTRA, DATA PROCESSING, NEUTRONS, BACKGROUND, STATISTICS

1. NAME OR DESIGNATION OF PROGRAM - BETTIS ENVIRONMENTAL ROUTINES/
MODEL6/3.2/MODEL6/3.3/MODEL7/2.0
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH
IT IS OPERABLE - CDC6600,7600
3. DESCRIPTION OF PROBLEM OR FUNCTION - 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.
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 - THE BETTIS ENVIRONMENTAL ROUTINES AND MODEL ARE USED BY MOST OF THE BETTIS PROGRAMS. HOWEVER, MODEL INCLUDES ONLY FILE HANDLING AND STORAGE ALLOCATION FACILITIES.
9. STATUS - ABSTRACT FIRST DISTRIBUTED JANUARY 1972.
CDC6600 BETTIS SCOPE 2 VERSION SUBMITTED JANUARY 1967.
CDC6600 BABCOCK + WILCOX SCOPE 3.1 VERSION SUBMITTED FEBRUARY 1970, WITH UPDATED SCOPE 3.3 SUBROUTINES ADDED OCTOBER 1971.
CDC6600 MODEL SCOPE 3.1 VERSION SUBMITTED JUNE 1970, REPLACED BY SCOPE 3.2 VERSION NOVEMBER 1971.
CDC6600 MODEL SCOPE 3.3 VERSION SUBMITTED DECEMBER 1971.
CDC7600 MODEL SCOPE 2.0 VERSION SUBMITTED MAY 1972.
10. REFERENCES - C. J. PFEIFER, CDC-6600 FORTRAN PROGRAMMING - BETTIS ENVIRONMENTAL REPORT, WAPD-TM-668, JANUARY 1967.
R. S. HORECK, L. A. BOELTER, AND R. W. MORSTAD, MODEL - MODIFIED ENVIRONMENTAL LIBRARY, CDC-6600 FORTRAN PROGRAMMING GUIDE, CDC REPORT, SEPTEMBER 1971.
B. W. YEATTS, R. S. HORECK, L. A. BOELTER, AND R. W. MORSTAD, MODEL - MODIFIED ENVIRONMENTAL LIBRARY, VERSION 6/3.2 INSTALLATION GUIDE, CDC REPORT, NOVEMBER 1971.
B. W. YEATTS AND L. A. BOELTER, MODEL - MODIFIED ENVIRONMENTAL LIBRARY, VERSION 6/3.3 INSTALLATION GUIDE, CDC REPORT, DECEMBER 1971.
L. A. BOELTER, MODEL - MODIFIED ENVIRONMENTAL

10. REFERENCES (CONTINUED)

LIBRARY, CDC-7600 FORTRAN PROGRAMMING GUIDE, CDC REPORT, MAY 1972.

L. A. BOELTER, MODEL - MODIFIED ENVIRONMENTAL
LIBRARY, VERSION 7/2.0 INSTALLATION GUIDE, CDC REPORT, MAY 1972.

11. MACHINE REQUIREMENTS - FOR THE BETTIS VERSION 65,356 WORDS OF 60-BIT CORE STORAGE (MORE OR LESS CAN BE USED), A SYSTEM (6603) DISK, AT LEAST 2 MAGNETIC TAPES, AT LEAST 4 NON-SYSTEM DISKS, EACH ON ITS OWN CHANNEL, AND CDC-280 PLOTTING HARDWARE.

FOR THE MODEL VERSIONS 65,356 WORDS OF 60-BIT CORE STORAGE (MORE CAN BE USED), 2 MAGNETIC TAPES, AND 4 MASS STORAGE DEVICES, EACH ON ITS OWN CHANNEL.

12. PROGRAMMING LANGUAGES USED - FORTRAN IV AND ASCENT (BETTIS AND BABCOCK+WILCOX), FORTRAN IV AND COMPASS (MODEL 6/3.2 AND 3.3), FORTRAN IV (MODEL 7/2.0)

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 2.0 (BETTIS), SCOPE 3.1 (BABCOCK + WILCOX), SCOPE 3.2 (MODEL), SCOPE 3.3 (MODEL), SCOPE 2.0 (MODEL 7/2.0).

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THE OPERATING SYSTEMS TO BE ENHANCED BY MODEL 6/3.2, MODEL 6/3.3, AND MODEL 7/2.0 ARE CDC6600 SCOPE3.2 AND SCOPE 3.3 AND CDC7600 SCOPE 2.0, RESPECTIVELY. THE USER MUST PROVIDE A SITE-CONFIGURED SCOPE 3.2, SCOPE 3.3, OR SCOPE 2.0 SOURCE CODE FILE, IN UPDATE PROGRAM LIBRARY FORMAT. UPDATE IS THE SCOPE SOURCE LANGUAGE LIBRARY MAINTENANCE PROGRAM, AS DOCUMENTED IN THE SCOPE REFERENCE MANUAL. AS A RESULT OF THE INSTALLATION PROCEDURE, A SCOPE 3.2, SCOPE 3.3, OR SCOPE 2.0 DEADSTART TAPE WITH MODEL ROUTINES AND A CORRESPONDING SOURCE CODE FILE WILL BE PRODUCED. THE MODEL 6/3.2 AND 3.3 FORTRAN-CODED ROUTINES MUST BE COMPILED USING THE RUN COMPILER OR VARIATIONS THEREOF (E.G., FUN-53), WHILE THE MODEL 7/2.0 FORTRAN-CODED ROUTINES USE THE FTN COMPILER. THE COMPASS-CODED ROUTINES MUST BE ASSEMBLED USING THE COMPASS 2.0 ASSEMBLER.

15. NAME AND ESTABLISHMENT OF AUTHORS -

BETTIS

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BETTIS ATOMIC POWER LABORATORY
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P. O. BOX 79
WEST MIFFLIN, PENNSYLVANIA 15122

B+W

M. L. DECH AND R. W. MCCRANEY
CONTROL DATA CORPORATION
G. R. POETSCHAT AND G. L. RUSSELL
THE BABCOCK + WILCOX COMPANY
POWER GENERATION DIVISION
P. O. BOX 1260
LYNCHBURG, VIRGINIA 24505

MODEL

B. W. YEATTS, R. S. HORECK, L. A. BOELTER,
AND R. W. MCRSTAD

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15. NAME AND ESTABLISHMENT OF AUTHOR(S) (CONTINUED)
CONTROL DATA CORPORATION
MINNEAPOLIS, MINNESOTA 55440
16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (BETTIS 21,123 CARDS, B+W 21,258 CARDS, B+W SCOPE
3.3 ROUTINES 444 CARDS, MODEL 6/3.2 1054 BCD
RECORDS, MODEL 6/3.3 1022 BCD RECORDS,
MODEL 7/2.0 882 BCD RECORDS)
REFERENCE REPORTS
17. CATEGORY - P
KEYWORDS - DATA PROCESSING OPERATION, LIBRARIES, MAINTENANCE

1. NAME OR DESIGNATION OF PROGRAM - FREADM1
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - GE635
3. DESCRIPTION OF PROBLEM OR FUNCTION - 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.
4. METHOD OF SOLUTION - TIME INTEGRATION OF THE EQUATIONS FOR THE DYNAMICS OF NUCLEAR KINETICS, HEAT TRANSFER AND PRIMARY LOOP COOLANT FLOW MAY BE PERFORMED IN A COUPLED MODE, OR INDEPENDENTLY. TRANSIENT TEMPERATURE CONDITIONS COMPUTED FOR SINGLE PINS, REPRESENTATIVE OF A NUMBER OF BUNDLE TYPES, MAY BE USED TO INITIATE PRESCRIBED ACCIDENT INITIATING AND/OR PROPAGATING ACTIVITIES. THE USER SUPPLIES CRITERIA FOR INITIATING THESE ACTIVITIES. REACTIVITY FEEDBACK FROM THE VARIOUS ACTIVITIES MAY BE COMPUTED USING MODELS IN THE CODE, OR INPUT FROM TABLES.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - FREADM1 IS RESTRICTED TO ACCIDENTS WHICH INITIATE AND PROPAGATE UNIFORMLY WITHIN ANNULAR OR CYLINDRICAL COAXIAL CORE REGIONS.
HEAT TRANSFER CALCULATIONS FOR UP TO 12 RADIAL CORE REGIONS MAY BE PERFORMED SIMULTANEOUSLY WITH UP TO 12 SEPARATE BUNDLE TYPES SUBDIVIDED INTO 9 OR LESS AXIAL SECTIONS. RADIAL HEAT TRANSFER CALCULATIONS ARE DONE USING UP TO 10 RADIAL FUEL NODES, A CLAD NODE AND A COOLANT NODE FOR EACH AXIAL SECTION. LOOP FLOW MAY BE TREATED USING A MAXIMUM OF 2 INDEPENDENT PRIMARY COOLANT LOOPS (LOOPS MAY BE OF DIFFERENT SIZES TO SIMULATE MORE THAN 2 LCCPS). POINT KINETICS WITH UP TO 6 DELAYED NEUTRON PRECURSOR GROUPS IS USED TO COMPUTE THE TRANSIENT POWER LEVEL OF THE CORE.
6. TYPICAL RUNNING TIME - RUNNING TIME FOR FREADM1 IS STRONGLY DEPENDENT ON THE OPTIONS UTILIZED AND VALUES SUPPLIED FOR TIME-STEP CONTROL. 200 KINETICS TIME-STEPS WITH DOPPLER FEEDBACK FOR 12 BUNDLE TYPES, 9 AXIAL SECTIONS REQUIRE ABOUT .9 MINUTES OF GE635 PROCESSOR TIME. 87 COUPLED KINETICS AND HEAT TRANSFER TIME-STEPS USING 12 BUNDLE TYPES AND 9 AXIAL SECTIONS REQUIRE ABOUT 4.4 MINUTES OF GE635 PROCESSOR TIME. 32 COUPLED LOOP FLOW, KINETICS AND HEAT TRANSFER TIME-STEPS USING 12 BUNDLE TYPES AND 9 AXIAL SECTIONS REQUIRE ABOUT 5 MINUTES OF GE635 PROCESSOR TIME. COMPUTATION TIME PER TIME-STEP FOR HEAT TRANSFER CALCULATIONS IS PROPORTIONAL TO $NBT * NAX$ WHERE NBT = NUMBER OF BUNDLE TYPES AND NAX = NUMBER OF AXIAL SECTIONS. COMPUTATION TIME PER TIME-STEP FOR AN INDEPENDENT LOOP FLOW AND VOIDING CALCULATIONS IS ABOUT 15 SECONDS OF GE635 PROCESSOR TIME.

1. NAME OR DESIGNATION OF PROGRAM - MIRAB/MIRAP
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6400
3. DESCRIPTION OF PROBLEM OR FUNCTION - 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.
4. METHOD OF SOLUTION - A SYSTEM OF FIRST-ORDER DIFFERENTIAL EQUATIONS HAVING NONCONSTANT COEFFICIENTS WERE SET UP FROM THE VARIOUS MASS FLUX AND MASS BALANCE DEFINITIONS WHICH WERE WRITTEN FOR THE SYSTEM. THE NUMEROUS RATE COEFFICIENT VALUES NEEDED FOR EACH TERM IN THESE EQUATIONS ARE COMPUTED IN VARIOUS SUBROUTINES OF THE MAIN PROGRAM. THOSE COEFFICIENTS WHICH DEPEND ONLY ON TEMPERATURE ARE COMPUTED IN ONE SET OF SUBROUTINES WHILE THOSE WHICH DEPEND ON BOTH TEMPERATURE AND IODINE CONCENTRATION ARE COMPUTED IN ANOTHER SUBROUTINE. PHYSICAL PROPERTY DATA REQUIRED IN THESE COMPUTATIONS ARE CALCULATED IN YET ANOTHER SUBROUTINE. THE METHOD IS DESIGNED TO USE CONTAINMENT TEMPERATURE DATA GENERATED FROM A SEPARATE THERMAL ANALYSIS OF THE SYSTEM. THE RATE AND DURATION OF IODINE INJECTION TO THE VESSEL AND THE RELATIVE PROPORTIONS OF EACH FORM ARE PRESELECTED BY THE USER. THE RATE IS RESTRICTED TO A LINEAR FUNCTION OF TIME. THE PROGRAM SPECIFICALLY MODELS THREE VOLUMES WHICH ARE EQUIVALENT TO A BWR DRYWELL, WETWELL, AND REFUELING BUILDING. NATURAL DEPOSITION OF IODINE IS ASSUMED TO OCCUR BY A NATURAL CONVECTION MECHANISM, AND DEPOSITION ON BOTH DRY AND CONDENSING SURFACES IS CONSIDERED. IODINE REMOVAL BY SPRAYS INCORPORATES HYDROLYSIS EFFECTS AND ALSO TAKES INTO ACCOUNT THE INFLUENCE OF A DISTRIBUTION OF DROP SIZES, DROP COALESCENCE, LIQUID PHASE MASS TRANSFER RESISTANCE, AND RECYCLING OF USED LIQUID. REMOVAL OF PARTICULATE IODINE CONSIDERS THE MECHANISMS OF GRAVITATIONAL SETTLING, DIFFUSIOPHORESIS, AND IMPACTION OR INTERCEPTION BY SPRAY DROPS. SEPARATE EFFICIENCIES ARE USED FOR THE REMOVAL OF THE DIFFERENT IODINE FORMS BY FILTER UNITS BUT THESE EFFICIENCIES MUST BE SUPPLIED BY THE USER. WELL-MIXED CONDITIONS ARE ASSUMED TO PREVAIL IN THE LARGE GAS AND LIQUID VOLUMES IN THE SYSTEM. FOR BWR REACTORS ALL LEAKAGE FROM DRYWELL AND WETWELL REGIONS IS ASSUMED TO ENTER THE REFUELING BUILDING, AND ESCAPE FROM THIS BUILDING OCCURS VIA A FILTERED EXHAUST SYSTEM.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MIRAB WILL ONLY ACCEPT TEMPERATURE DATA FROM CARDS AND IS LIMITED TO THE THREE IODINE FORMS NOTED ABOVE. MIRAP IS RESTRICTED TO A SINGLE VOLUME CONTAINMENT VESSEL AND TO THE THREE IODINE FORMS NOTED ABOVE.
6. TYPICAL RUNNING TIME - MIRAB REQUIRES APPROXIMATELY 30 SECONDS PER 100 TIME-STEPS CALCULATED. MIRAP REQUIRES APPROXIMATELY 15 SECONDS PER 100 TIME-STEPS CALCULATED.
7. UNUSUAL FEATURES OF THE PROGRAM - BOTH CODES USE A GENERALIZED APPROACH TO THE IODINE REMOVAL PROBLEM - I.E., THEY TREAT SEVERAL PROCESSES OCCURRING SIMULTANEOUSLY INSTEAD OF EACH ONE INDIVIDUALLY.
8. RELATED AND AUXILIARY PROGRAMS - MIRAB NEEDS TEMPERATURE DATA GENERATED FROM A SEPARATE THERMAL ANALYSIS PROGRAM. MIRAP IS DESIGNED TO ACCEPT THERMAL DATA AS GENERATED BY THE CONTEMP-PS COMPUTER PROGRAM (ACC ABSTRACT 433).
9. STATUS - ABSTRACT FIRST DISTRIBUTED OCTOBER 1972.
CDC6400 VERSIONS SUBMITTED NOVEMBER 1971.
10. REFERENCES - R. L. RITZMAN, MIRA-METHODS FOR IODINE-REMOVAL ANALYSIS IN REACTOR CONTAINMENT SYSTEMS, BMI-1915, AUGUST 1971.
11. MACHINE REQUIREMENTS - EACH CODE USES 42K MEMORY, CARD READER, LINE PRINTER, AND ONE TAPE.
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 3.3.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THE IRKG SUBROUTINE IS AN INITIALIZATION ROUTINE WHICH COMPUTES INITIAL DERIVATIVES AND SUPPLIES STARTING DATA TO RKG. RKG IS THE INTEGRATION ROUTINE WHICH UTILIZES THE FOURTH-ORDER RUNGE-KUTTA-GILL METHOD TO SUPPLY THE MAIN PROGRAM WITH THE CONCENTRATIONS AND THEIR DERIVATIVES AT ALL SUBSEQUENT TIME INCREMENTS. BILINI IS A SUBROUTINE FOR LINEAR INTERPOLATION FROM A TABLE OF SPRAY DROP UNSATURATION FRACTIONS AS A FUNCTION OF THEIR SHERWOOD NUMBER AND THE DIMENSIONLESS TIME.
15. NAME AND ESTABLISHMENT OF AUTHOR -
ROBERT L. RITZMAN
BATTELLE MEMORIAL INSTITUTE
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COLUMBUS, OHIO 43201
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (MIRAB 1025 CARDS, MIRAP 992 CARDS)

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16. MATERIAL AVAILABLE (CONTINUED)

SAMPLE PROBLEMS (MIRAB 149 CARDS, MIRAP 591 CARDS)
REFERENCE REPORT

17. CATEGORY - G

KEYWORDS - FISSION PRODUCTS, IODINE, METHYL IODINE, CONTAINMENT,
ACCIDENTS, REACTOR SAFETY, PWR REACTORS, BWR REACTORS

1. NAME OR DESIGNATION OF PROGRAM - FRCRL2
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6400
3. DESCRIPTION OF PROBLEM OR FUNCTION - THE CODE CALCULATES THE CUMULATIVE FRACTIONAL RELEASE OF FISSION PRODUCTS FROM NUCLEAR REACTOR FUEL UNDER POSTULATED LOSS-OF-COOLANT ACCIDENT CONDITIONS. THE MATHEMATICAL MODEL FOR RELEASE IS BASED ON SIMPLE VOLUME DIFFUSION 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.
4. METHOD OF SOLUTION - ANALYTICAL SOLUTIONS TO THE CONVENTIONAL PROBLEM OF ONE-DIMENSIONAL DIFFUSION FROM A SPHERE ARE USED. FOR THE PREACCIDENT RELEASE COMPONENT UNIFORM CONDITIONS ARE ASSUMED OVER THE PERIOD OF REACTOR OPERATION. PARABOLIC RADIAL TEMPERATURE PROFILES FOR THE FUEL PELLETS ARE COMPUTED AND USED TO DEFINE FIVE RADIAL TEMPERATURE ZONES FOR EACH CORE SEGMENT. FROM THIS THE CORRESPONDING SET OF DIMENSIONLESS RELEASE PARAMETERS ARE CALCULATED FOR INSERTION IN THE ANALYTICAL SOLUTION. FOR THE ACCIDENT RELEASE COMPONENT THE CHANGE IN TEMPERATURE VERSUS TIME IS CONSIDERED BY INCREMENTALLY MODIFYING THE DIMENSIONLESS RELEASE PARAMETERS FOR EACH OF THE CORE SEGMENTS.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE CALCULATION IS LIMITED TO MAXIMA OF 12 FISSION PRODUCT SPECIES, 10 RADIAL CORE REGIONS, AND 11 AXIAL CORE REGIONS. ALSO, FOUR SEPARATE SETS OF FISSION PRODUCT DIFFUSION PARAMETER VALUES MUST BE SUPPLIED FOR DIFFERENT TEMPERATURE RANGES OR ASSUMED ATMOSPHERIC CONDITIONS.
6. TYPICAL RUNNING TIME - APPROXIMATELY 2 SECONDS PER FISSION PRODUCT SPECIES PER ACCIDENT TIME-STEP ARE REQUIRED.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED OCTOBER 1972.
CDC6400 VERSION SUBMITTED NOVEMBER 1971.
10. REFERENCES - P. L. RITZMAN AND D. L. MERRISON, FRCRL2-A COMPUTER CODE FOR CALCULATING FISSION-PRODUCT RELEASE IN REACTOR ACCIDENT ANALYSES, BMI-1913, AUGUST 1971.
11. MACHINE REQUIREMENTS - 62K OCTAL MEMORY, CARD READER, LINE PRINTER
12. PROGRAMMING LANGUAGE USED - FORTRAN IV

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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 $1/(\Sigma(T) + \Sigma(0))$ FLUX, WHERE $\Sigma(C)$ 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 $\Sigma(0)$ 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 CODE (ACC ABSTRACT 505).
10. REFERENCES - B. A. HUTCHINS, C. L. COWAN, M. D. KELLEY, J. E. TURNER, ENDRUN-II, A COMPUTER CODE TO GENERATE A GENERALIZED MULTIGROUP DATA FILE FROM ENDF/B, GEAP-13704 (ENDF-145), MARCH 1971.
I. I. BONDARENKO, 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, CONVRT SUBROUTINE DESCRIPTION, GESV NOTE, SEPTEMBER 11, 1967.
11. MACHINE REQUIREMENTS - THE CODE 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 - GECCS 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 (ENDRUN2 12,142 CARDS, QUICKW 276 CARDS, AUXILIARY ROUTINES 503 CARDS)
SAMPLE PROBLEM (ENDRUN2 215 CARDS)
CONTROL CARDS (ENDRUN2 412 CARDS, QUICKW 26 CARDS)
SAMPLE PROBLEM OUTPUT (38 PAGES)
REFERENCE REPORT, GEAP-13704, AND NOTES

17. CATEGCRY - B
KEYWORDS - MULTIGROUP CROSS SECTIONS, BREIT-WIGNER FORMULA,
DOPPLER BROADENING, ELASTIC SCATTERING, INELASTIC
SCATTERING, ELASTIC REMOVAL, FISSION, CAPTURE, TDOWN
CODES, ENDF/B, LMFBR REACTORS

1. NAME OR DESIGNATION OF PROGRAM - EDITOR
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
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 MODE, 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 IN LESS THAN 8 MINUTES.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED OCTOBER 1972.
IBM360 VERSION SUBMITTED SEPTEMBER 1971, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - C. L. THOMPSON, J. R. STOCKTON, L. M. PETRIE, R. C. 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 SPACE ARE REQUIRED.
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 - 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
OAK RIDGE NATIONAL LABORATORY

15. NAME AND ESTABLISHMENT OF AUTHOR(S) (CONTINUED)
P. C. BCX X
OAK RIDGE, TENNESSEE 37830
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (2910 CARDS)
SAMPLE PROBLEM (8 CARDS)
ENDF/B LIBRARY FOR SAMPLE PROBLEM (430 CARDS)
SAMPLE PROBLEM OUTPUT (25 PAGES)
REFERENCE REPORT
17. CATEGORY - M
KEYWORDS - DATA PROCESSING, CROSS SECTIONS, LIBRARIES, ENDF/B,
MAINTENANCE, RETRIEVAL

1. NAME OR DESIGNATION OF PROGRAM - DUZZ
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - DUZZ 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.
4. METHOD OF SOLUTION - A CYCLIC CHEBYSHEV SEMI-ITERATIVE METHOD IS USED. A SYMMETRIC NONNEGATIVE DEFINITE MATRIX WHICH RELATES DISPLACEMENT COMPONENTS IS DERIVED BY THE FINITE ELEMENT METHOD. THE ELASTIC DISPLACEMENT SOLUTION IS OBTAINED USING CYCLIC CHEBYSHEV WITH SIMULTANEOUS ITERATIONS. PLASTIC PROBLEMS ARE SOLVED BY THE INITIAL STRAIN METHOD, WHEREBY PLASTIC STRAINS ARE TREATED AS THERMAL STRAINS IN AN OUTER ITERATION, AND THE ELASTIC SOLUTION CONSTITUTES AN INNER ITERATION. STRESSES AND OTHER EDIT QUANTITIES ARE THEN CALCULATED FROM ELASTIC DISPLACEMENTS AND PLASTIC STRAINS.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE PROGRAM PROVIDES FOR UP TO 99 REGIONS, TO DESCRIBE MATERIAL PROPERTIES AND BOUNDARY CONDITIONS. THERE MAY BE UP TO 5000 POINTS IN A RECTANGULAR ARRAY, WITH AT MOST 250 MESH ROWS OR COLUMNS. BECAUSE OF THE INITIAL STRAIN METHOD, PLASTIC STRAINS SHOULD NOT BE SIGNIFICANTLY LARGER THAN ELASTIC STRAINS.
6. TYPICAL RUNNING TIME - OVER A 2-MONTH PERIOD, SUCCESSFUL USER RUNS WERE OBSERVED TO AVERAGE 282 SECONDS, RANGING FROM 37 TO 1796 SECONDS. MOST LONG JOBS ARE NOT RUN ALL AT ONCE, BUT IN 500-SECOND SHOTS WITH FORCE-OFFS AND RESTARTS.
7. UNUSUAL FEATURES OF THE PROGRAM - THE PROGRAM TREATS NONHOMOGENEOUS MATERIAL PROPERTIES WHICH ARE TEMPERATURE DEPENDENT. TEMPERATURE PROFILES MAY BE OBTAINED FROM HCT2 WHICH USES AN IDENTICAL RECTANGULAR MESH POINT GRID AND REGION OVERLAY. BOUNDARY DISPLACEMENTS AND STRESSES MAY BE LINEAR FUNCTIONS OF R AND Z. INELASTIC STRESS-STRAIN RELATIONS MAY BE INPUT AS PIECEWISE LINEAR CURVES OR POWER FITS. SEVERAL EDIT QUANTITIES INCLUDING STRESS INTENSITY, GENERALIZED STRESS, AND PRINCIPAL STRESSES, CAN BE PLOTTED IN CONTOUR OR PERSPECTIVE, OR PRINTED.
8. RELATED AND AUXILIARY PROGRAMS - TEMPERATURE FILES FROM HOT2 (ACC ABSTRACT 296) CAN BE READ. DISPLACEMENT FILES CAN BE REQUESTED FOR RESTARTING DUZZ OR FOR USE WITH OTHER PROGRAMS. A FILE OF STRESSES AND STRAINS CAN ALSO BE REQUESTED FOR USE WITH OTHER PROGRAMS. DUZZ USES THE BETTIS ENVIRONMENTAL ROUTINES (ACC ABSTRACT 478).

9. STATUS - ABSTRACT FIRST DISTRIBUTED OCTOBER 1972.
CDC6600 VERSION SUBMITTED OCTOBER 1971.
10. REFERENCES - C. M. FRIEDRICH, W. H. GUILINGER, L. A. HAGEMAN, C. JEFFREY, W. D. PETERSON, DUZ-2 A PROGRAM FOR SOLVING AXISYMMETRIC AND PLANE ELASTIC-PLASTIC PROBLEMS ON THE CDC-6600, WAPD-TM-926, SEPTEMBER 1970.
C. J. PFEIFFER, CDC-6600 FORTRAN PROGRAMMING - BETTIS ENVIRONMENTAL REPORT, WAPD-TM-668, JANUARY 1967.
W. D. PETERSON AND J. SPANIER, POT2 - A TWO-DIMENSIONAL TRANSIENT HEAT CONDUCTION PROGRAM FOR THE CDC-6600, WAPD-TM-669, JUNE 1967.
11. MACHINE REQUIREMENTS - THE PROGRAM WAS WRITTEN FOR A CDC6600 WITH A CENTRAL MEMORY SIZE OF AT LEAST 64K, READER, PRINTER, A SYSTEM DISK AND 4 NON-SYSTEM DISKS EACH ON ITS OWN CHANNEL. THE PROGRAM MAKES OPTIONAL USE OF EXTENDED CORE STORAGE AND CDC-290 MICROFILM OUTPUT.
12. PROGRAMMING LANGUAGES USED - ALTHOUGH THE PROGRAM IS WRITTEN PRIMARILY IN FORTRAN IV, CERTAIN INNER LOOP ROUTINES WERE OPTIMIZED USING COMPASS. ALSO, THE PROGRAM CALLS ON COMPASS ROUTINES WHICH ARE A PART OF THE BETTIS COMPUTING ENVIRONMENT.
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 3.1.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THE PROGRAM IS ORGANIZED FOR OVERLAY LOADING UNDER THE SCOPE 3.1 SYSTEM. THERE IS A MAIN OVERLAY, OR ROOT, WHICH RESIDES IN CENTRAL MEMORY AT ALL TIMES, AND FOURTEEN PRIMARY OVERLAYS AND THREE SECONDARY OVERLAYS. THE ROOT CONTAINS MANY OF THE FCIP ROUTINES, INCLUDING NEXT, WHICH LOADS EACH OVERLAY AS NEEDED. THE TWO SECONDARIES CONTAIN MUTUALLY EXCLUSIVE ROUTINES FOR THE INPUT PRIMARY-INPF FOR CARD INPUT AND IFM FOR FILE INPUT. THE ROOT DECLARES A BLANK COMMON ARRAY OF LENGTH ONE. IF THERE ARE M WORDS FROM THE START OF BLANK COMMON TO THE FIELD LENGTH, AND N WORDS OF TEXT IN WHATEVER PRIMARY AND SECONDARY ARE EXECUTING, THE STORAGE SPACE ACTUALLY AVAILABLE TOTALS M-N WORDS. THE ROOT CONTAINS THESE PARAMETERS IN THE LABELED COMMON BLOCK /SIZE/M,N. ALL AVAILABLE BLANK COMMON SPACE IS ALLOCATED BY FTB, WHICH ALSO HANDLES ALL TEMPORARY DISK OR EXTENDED CORE FILES. EIGHT SUBROUTINES ARE MISSING AND MAY BE HANDLED IN THE FOLLOWING WAYS. CALLS TO SUBROUTINES PEEP, UNPEEP, MESSAGE, AND NEXTIN ARE NOT NECESSARY AND MAY BE ELIMINATED. SUBROUTINE REMARK WRITES A MESSAGE IN THE DAY FILE OR ON THE OPERATOR CONSOLE. THIS SUBROUTINE CAN BE REPLACED WITH A DUMMY SUBROUTINE. SUBROUTINE SHIFT IS DESCRIBED IN WAPD-TM-668 ON PAGE 68. SUBROUTINES WRITEC AND READC WILL NOT BE CALLED IF SUFFICIENT STORAGE AND DISK SPACE IS PROVIDED AND THEY MAY REMAIN AS UNSATISFIED EXTERNALS.
15. NAME AND ESTABLISHMENT OF AUTHORS -
W. D. PETERSON AND C. JEFFREY

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15. NAME AND ESTABLISHMENT OF AUTHOR(S) (CONTINUED)
BETTIS ATOMIC POWER LABORATORY
WESTINGHOUSE ELECTRIC CORPORATION
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WEST MIFFLIN, PENNSYLVANIA 15122
16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
MAGNETIC TAPE TRANSMITTAL (2 TAPES)
DUZ2 SOURCE DECK PART 1 (12808 CARDS)
DUZ2 SOURCE DECK PART 2 (12823 CARDS)
SAMPLE PROBLEM (72 CARDS)
REFERENCE REPORT, WAPD-TM-926
17. CATEGORY - I
KEYWORDS - INELASTIC STRESSES, 2-DIMENSIONAL, FINITE-ELEMENT,
DEFORMATION, HOT2 CODES, BETTIS ENVIRONMENTAL CODES

1. NAME OR DESIGNATION OF PROGRAM - THRESH
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - 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, ALPHA, NP, ND, NT, NHE-3, N-ALPHA, PN, 2P, P-ALPHA, ALPHA-N, ALPHA-P, AND DN.
4. METHOD OF SOLUTION - A STATISTICAL MODEL WITH EMPIRICALLY DETERMINED PARAMETERS IS EMPLOYED. BINDING ENERGIES, IF CALCULATED BY THE PROGRAM, ARE CALCULATED FROM AN EMPIRICAL MASS FORMULA DUE TO HILLMAN (BNL-846). SINCE DIRECT REACTION EFFECTS CAN BE IMPORTANT THE CALCULATIONS ARE NORMALIZED TO COMPENSATE PARTLY FOR DEFICIENCIES IN THE MODEL. THE EMPIRICAL MODEL IS SIMILAR TO PREVIOUS (N,2N) WORK BUT IS EXTENDED TO INCLUDE CHARGED PARTICLE EMISSION.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
50 ENERGY POINTS
19 REACTION TYPES
6. TYPICAL RUNNING TIME - APPROXIMATELY 30 SECONDS PER NUCLIDE ARE REQUIRED FOR THE CALCULATION OF 19 REACTIONS IN THE ENERGY RANGE 0 TO 20 MEV IN 0.5 MEV STEPS. APPROXIMATELY 1 MINUTE PER NUCLIDE IS REQUIRED FOR FISSION SPECTRUM AVERAGES OF THE 19 REACTION CROSS SECTIONS.
7. UNUSUAL FEATURES OF THE PROGRAM - FITTING PARAMETERS AND BINDING ENERGIES ARE SUPPLIED BY THE PROGRAM BUT MAY OPTIONALLY BE DEFINED BY THE USER.
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED OCTOBER 1972.
CDC6600 VERSION SUBMITTED OCTOBER 1971.
10. REFERENCES - S. PEARLSTEIN, NEUTRON-INDUCED REACTIONS IN MEDIUM MASS NUCLEI, BNL-16271, TO BE PUBLISHED.
S. PEARLSTEIN, ANALYSIS OF (N,2N) CROSS SECTIONS FOR MEDIUM AND HEAVY MASS NUCLEI, NUCL. SCI. + ENG., 23, PP. 238-250 (1965).
S. PEARLSTEIN, PROGRAM THRESH, NCSC REPORT, SEPTEMBER 1971.
11. MACHINE REQUIREMENTS - THE PROGRAM USES 9.5K (DECIMAL) ON THE CDC6600.
12. PROGRAMMING LANGUAGE USED - FORTRAN IV

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13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
SCOPE.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
A PDP10 VERSION OF THRESH HAS BEEN PREPARED AND USED AT BNL ALSO.
15. NAME AND ESTABLISHMENT OF AUTHOR -
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NATIONAL NEUTRON CROSS SECTION CENTER
BROOKHAVEN NATIONAL LABORATORY
UPTON, LONG ISLAND, NEW YORK 11973
16. MATERIAL AVAILABLE -
SOURCE DECK (907 CARDS)
SAMPLE PROBLEM (2 CARDS)
REFERENCE REPORTS, BNL-16271 AND NCSC REPORT
17. CATEGORY - A
KEYWORDS - CROSS SECTIONS, FISSION SPECTRA, NEUTRONS

1. NAME OR DESIGNATION OF PROGRAM - TDOWN
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - GE635
3. DESCRIPTION OF PROBLEM OR FUNCTION - TDOWN GENERATES SPATIAL AND COMPOSITION DEPENDENT CROSS SECTION SETS FROM A BUNDARENKO 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.
4. METHOD OF SOLUTION - TDOWN USES THE RAPID CROSS SECTION ADJUSTMENT PROCEDURE AND A GENERALIZED FILE. FOR EACH MATERIAL, THE FILE CONTAINS THE GROUPWISE VALUES OF INFINITELY-DILUTE CROSS SECTIONS, RESONANCE SELF-SHIELDING FACTORS WHICH ARE TABULATED FOR TEMPERATURES AND A RANGE OF $\Sigma(0)$ - THE MATERIAL COMPOSITION PARAMETER, AND SCATTERING MATRICES. SELF-SHIELDING OF A CROSS SECTION IS ACCOMPLISHED BY COMPUTING $\Sigma(0)$ AND USING INTERPOLATION ROUTINES TO DETERMINE THE SELF-SHIELDING FACTOR FOR THE $\Sigma(0)$ AND INPUT TEMPERATURE. SELF-SHIELDING IS AN ITERATIVE PROCEDURE WITH THE CONVERGENCE CRITERIA SPECIFIED IN THE INPUT. SPECTRAL ADJUSTMENTS TO THE ELASTIC REMOVAL ARE CARRIED OUT DIRECTLY IF THE FLUX SETS ARE INPUT. 0- OR 1-DIMENSIONAL FLUX SOLUTIONS MAY BE SPECIFIED TO GENERATE THE FLUX SETS. THE FLUX SOLUTIONS ARE ITERATED UNTIL SPECTRAL ADJUSTMENTS CONVERGE TO THE CRITERIA SPECIFIED BY THE USER.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MOST OF THE RESTRICTIONS ON TDOWN ARE DUE TO THE LIMITATIONS OF THE LINKED CCDFS. SOME OF THESE LIMITATIONS INCLUDE - A GENERALIZED FILE HAS A MAXIMUM OF 100 ENERGY GROUPS, AND UP TO 120 MATERIAL CROSS SECTION SETS MAY BE GENERATED.
6. TYPICAL RUNNING TIME - PROBLEMS WITH ALL THE FLUX SPECTRA INPUT USE A MAXIMUM OF A FEW MINUTES ON THE GE635. A 29 ENERGY GROUP PROBLEM GENERATING 100 MATERIALS IN 15 COMPOSITIONS WITH THE FLUX SPECTRA COMPUTED BY TWO 1-DIMENSIONAL FLUX SOLUTIONS, 9 ITERATIONS EACH, REQUIRED 18 MINUTES OF PROCESSOR TIME.
7. UNUSUAL FEATURES OF THE PROGRAM - TDOWN GIVES THE USER FLEXIBILITY IN DETERMINING THE DETAIL A PARTICULAR OUTPUT CROSS SECTION FILE WILL HAVE WITH RESPECT TO COMPOSITION AND SPATIAL EFFECTS. OUTPUT CROSS SECTIONS SETS FROM THE COMPOSITIONS ARE NOT AUTOMATIC. EACH SET IS SELECTED FROM PARTICULAR COMPOSITIONS AND THEN THE USER CAN APPLY ANY SPECTRAL SET TO CORRECT THE ELASTIC REMOVAL. IF THE PROBLEM REQUIRES FLUX SOLUTIONS AND CONSEQUENTLY REGIONAL DESCRIPTIONS, COMPOSITIONS MAY BE DEFINED OUTSIDE OF THE REGIONS.

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8. RELATED AND AUXILIARY PROGRAMS - DATA FOR THE GENERALIZED FILE GMUG ARE GENERATED BY THE ENDRUN2 PROGRAM (ACC ABSTRACT 501).
9. STATUS - ABSTRACT FIRST DISTRIBUTED OCTOBER 1972.
GE635 VERSION SUBMITTED OCTOBER 1971.
10. REFERENCES - C. L. COWAN, B. A. HUTCHINS, J. E. TURNER, TDOWN - A CODE TO GENERATE COMPOSITION AND SPATIALLY DEPENDENT CROSS SECTIONS, GEAP-13740, AUGUST 1971.
I. I. BENDARENKO, GROUP CONSTANTS FOR NUCLEAR REACTOR CALCULATIONS, CONSULTANTS BUREAU, NEW YORK, 1964.
B. A. HUTCHINS, C. L. COWAN, M. D. KELLEY, AND J. E. TURNER, ENDRUN-II, A COMPUTER CODE TO GENERATE A GENERALIZED MULTIGROUP DATA FILE FROM ENDF/B, GEAP-13704, MARCH 1971.
C. T. FHLERS, CASERR, A FORTRAN COMPATIBLE SUBROUTINE, GESV NOTE, NOVEMBER 28, 1967.
EXOPT SUBROUTINE DESCRIPTION, GESV NOTE.
11. MACHINE REQUIREMENTS - THE CODE REQUIRES 32K MEMORY ON A GE635, INCLUDING A 10K OVERLAP WITH THE LOADING ROUTINES. IN ADDITION TO THE USUAL INPUT/OUTPUT UNITS, 3 TAPE HANDLERS AND 6 FILES ON A PERIPHERAL DEVICE (DISC AT THE AUTHORS INSTALLATION) ARE USED.
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - GECCS III.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - PRIMARY CHANGES TO CONVERT THIS PROGRAM TO ANOTHER MACHINE WOULD BE THE INPUT/OUTPUT ROUTINES AND PERIPHERAL UNIT ASSIGNMENTS.
15. NAME AND ESTABLISHMENT OF AUTHORS -
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16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (TDOWN 10,751 CARDS, PUNT 1704 CARDS, AUXILIARY ROUTINES 693 CARDS)
SAMPLE PROBLEMS (TDOWN 19 CARDS, PUNT 11 CARDS)
CONTROL CARDS (TDOWN 405 CARDS, PUNT 119 CARDS)
SAMPLE PROBLEM OUTPUT (21 PAGES)
REFERENCE REPORT, GEAP-13740, AND NOTES
17. CATEGORY - B
KEYWORDS - MULTIGROUP CROSS SECTIONS, FLUX SPECTRA, ELASTIC SCATTERING, ENDRUN CODES

1. NAME OR DESIGNATION OF PROGRAM - JP1XR
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. NATURE OF PHYSICAL PROBLEM SOLVED - JP1XR COMPUTES SCATTERING CROSS SECTIONS AND RELATED QUANTITIES FOR THE SCATTERING OF NUCLEONS OR COMPOSITE PARTICLES FROM ANY COLLECTIVE NUCLEUS, EVEN CR CDD A, VIBRATIONAL OR ROTATIONAL. THE PROJECTILE CAN BE CHARGED OR UNCHARGED AND CAN HAVE SPIN 0, 1/2, OR 1.
4. METHOD OF SOLUTION - THE PROGRAM IS BASED ON THE COUPLED-CHANNELS FORMALISM OF TAMURA AND THE COLLECTIVE MODEL OF THE NUCLEUS. THE INTERACTION TO WHICH THE INCIDENT PARTICLE IS SUBJECTED IS DESCRIBED BY THE GENERALIZED OPTICAL MODEL POTENTIAL WHICH INCLUDES SPIN-ORBIT AND COULOMB INTERACTIONS AND HAS A SAXON-WOODS RADIAL DEPENDENCE.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMUM OF -
100 ANGLES FOR WHICH THE DIFFERENTIAL QUANTITIES (CROSS SECTION AND POLARIZATION) ARE TO BE COMPUTED
6. TYPICAL RUNNING TIME -
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - JP1XR IS BASED ON THE PROGRAM JUPITOR1 (ACC ABSTRACT 308).
9. STATUS - ABSTRACT FIRST DISTRIBUTED OCTOBER 1972.
CDC6600 VERSION SUBMITTED OCTOBER 1971.
10. REFERENCES - C. J. SLAVIK, JP1XR, A COMPUTER PROGRAM FOR NUCLEAR COUPLED-CHANNEL CALCULATIONS, KAPL-M-7079(L), FEBRUARY 1971.
T. TAMURA, COMPUTER PROGRAM JUPITOR-1 FOR COUPLED-CHANNEL CALCULATIONS, ORNL-4152, AUGUST 1967.
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 -
15. NAME AND ESTABLISHMENT OF AUTHOR -
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16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION

MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (3159 CARDS)
SAMPLE PROBLEM (59 CARDS)
REFERENCE REPORT, KAPL-M-7079(L)

17. CATEGORY - A

KEYWORDS - SCATTERING CROSS SECTIONS, OPTICAL MODEL, JUPITORI
CODES

1. NAME OR DESIGNATION OF PROGRAM - PHASER
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. NATURE OF PHYSICAL PROBLEM SOLVED - PHASER 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.
4. METHOD OF SOLUTION - THESE QUANTITIES ARE COMPUTED FROM THE NEUTRON SCATTERING PHASE SHIFTS. PHASER CAN ALSO COMPUTE THESE QUANTITIES FROM THE COMPLEX ELEMENTS OF THE SCATTERING MATRIX. THE PHASE SHIFTS MAY BE COMPLEX TO ALLOW FOR OPEN INELASTIC SCATTERING CHANNELS. HAUSER-FESHBACH THEORY IS USED TO COMPUTE THE COMPOUND NUCLEAR CROSS SECTIONS AND MOMENTS.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMUM OF -
15 STATES TO BE CONSIDERED IN THE HAUSER-FESHBACH CALCULATION
6. TYPICAL RUNNING TIME -
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED OCTOBER 1972.
CDC6600 VERSION SUBMITTED OCTOBER 1971.
10. REFERENCE - C. J. SLAVIK, PHASER, A FORTRAN PROGRAM TO COMPUTE NEUTRON CROSS SECTIONS, POLARIZATIONS, AND LEGENDRE MOMENTS FROM PHASE SHIFTS, ADA-TP-12(L), MARCH 30, 1971.
11. MACHINE REQUIREMENTS -
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
SCCPE.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHOR -
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ACC ABSTRACT 507

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16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
SOURCE DECK (505 CARDS)
SAMPLE PROBLEM (4 CARDS)
REFERENCE REPORT
17. CATEGORY - A
KEYWORDS - ELASTIC SCATTERING, INELASTIC SCATTERING, CROSS
SECTIONS, HAUSER-FESHBACH THEORY

1. NAME OR DESIGNATION OF PROGRAM - MUCHA1/MUCHA2
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6400
3. DESCRIPTION OF PROBLEM OR FUNCTION - MUCHA1 PREDICTS THE THERMAL AND HYDRAULIC BEHAVIOR OF ANY TWO REACTOR FUEL RODS AND THEIR ASSOCIATED PARALLEL FLOW CHANNELS DURING A LOSS-OF-COOLANT ACCIDENT USING AS BOUNDARY CONDITIONS PLENUM FLUID CONDITIONS DETERMINED 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.
4. METHOD OF SOLUTION - IN MUCHA1 AN EXPLICIT, FINITE-DIFFERENCE TECHNIQUE IS USED TO SOLVE THE CONSERVATION EQUATIONS DESCRIBING THE FLUID BEHAVIOR IN THE PARALLEL CORE CHANNELS. FLUID THERMODYNAMIC PROPERTIES ARE DETERMINED FROM PROPERTY TABLES USING AN EXPLICIT, FINITE-DIFFERENCE TECHNIQUE. IN MUCHA2 AN EXPLICIT FINITE-DIFFERENCE TECHNIQUE IS USED TO SOLVE THE CONSERVATION EQUATIONS DESCRIBING THE FLUID BEHAVIOR IN PARALLEL CORE CHANNELS AND PLENA. FLUID THERMODYNAMIC PROPERTIES ARE DETERMINED FROM PROPERTY TABLES INCORPORATED IN THE CODE. HEAT CONDUCTION IN THE FUEL ROD IS DETERMINED USING AN EXPLICIT, FINITE-DIFFERENCE TECHNIQUE.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - IN MUCHA1 THE TWO FUEL RODS CAN BE REPRESENTED BY UP TO A TOTAL OF 15 RADIAL NODES. EACH FUEL ROD AND ITS ASSOCIATED FLOW CHANNEL MAY BE REPRESENTED BY UP TO 12 AXIAL SEGMENTS. MUCHA2 APPLIES THE SAME RESTRICTIONS TO EACH PAIR OF EQUIVALENT FUEL RODS.
6. TYPICAL RUNNING TIME - MUCHA1 RUNNING TIME VARIES BETWEEN 200 TO 300 TIMES REAL TIME, USING 2-FOOT AXIAL SEGMENTS IN EACH FLOW CHANNEL. DOUBLING THE NUMBER OF AXIAL SEGMENTS WILL INCREASE THE RUNNING TIME BY APPROXIMATELY A FACTOR OF 4. MUCHA2 RUNNING TIME VARIES BETWEEN 200 TO 400 TIMES REAL TIME, USING 2-FOOT AXIAL SEGMENTS IN EACH FLOW CHANNEL. DOUBLING THE NUMBER OF AXIAL SEGMENTS WILL INCREASE THE RUNNING TIME BY APPROXIMATELY A FACTOR OF 4.
7. UNUSUAL FEATURES OF THE PROGRAM - WITH MUCHA1 THE THERMAL AND HYDRAULIC BEHAVIOR OF ANY TWO FUEL RODS AND THEIR ASSOCIATED FLOW CHANNELS CAN BE PREDICTED DURING ALL PHASES OF A LOSS-OF-COOLANT ACCIDENT. MUCHA2 PROVIDES A DETAILED DESCRIPTION OF THE CORE AND PLENUM THERMAL-HYDRAULIC BEHAVIOR DURING ALL PHASES OF A LOSS-OF-COOLANT ACCIDENT, INCLUDING THE EMERGENCY CORE COOLANT INJECTION PHASE.

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8. RELATED AND AUXILIARY PROGRAMS - MUCHA1 REQUIRES AS INPUT TIME-DEPENDENT PLENUM FLUID CONDITIONS DETERMINED BY MUCHA2 OR A SYSTEM-ORIENTED CODE.
9. STATUS - ABSTRACT FIRST DISTRIBUTED OCTOBER 1972.
CDC6400 VERSION SUBMITTED NOVEMBER 1971.
10. REFERENCES - R. A. CUDNIK, ECCSA AND MUCHA - COMPUTER CODES FOR THE ANALYSIS OF EMERGENCY CORE COOLING SYSTEMS, BMI-1916, SEPTEMBER 1971.
BATTELLE 6400 PROGRAMMING BULLETIN, NO. 11, UNILIN, MARCH 21, 1967.
BATTELLE 6400 PROGRAMMING BULLETIN, NO. 12, BILIN1, MARCH 24, 1967.
11. MACHINE REQUIREMENTS - MUCHA1 REQUIRES 120K OCTAL MEMORY AND ONE TAPE FOR RESTART CAPABILITY. MUCHA2 REQUIRES 120K OCTAL MEMORY, ONE TAPE FOR RESTART CAPABILITY, AND ONE TAPE FOR STORING PLENUM BOUNDARY CONDITIONS.
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 3.3.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - MUCHA1 AND MUCHA2 REQUIRE THE USE OF CDC6400 FORTRAN FUNCTION SUBPROGRAMS UNILIN AND BILIN1. UNILIN PERFORMS LINEAR INTERPOLATION FROM A TABLE OF VALUES OF Y VERSUS X. BILIN1 PERFORMS LINEAR INTERPOLATION FROM A TABLE OF VALUES OF Z VERSUS X AND Y. MUCHA1 CALLS UNILIN FROM HTCHG AND MUCHA2 CALLS IT FROM HTCHG, FLUID, AND PLENA. MUCHA1 CALLS BILIN1 FROM PHISQ AND MUCHA2 ALSO CALLS IT FROM PHISQ.
15. NAME AND ESTABLISHMENT OF AUTHORS -
RONALD A. CUDNIK
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505 KING AVENUE
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16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (MUCHA1-1722 CARDS, MUCHA2-3067 CARDS)
SAMPLE PROBLEMS (MUCHA1-436 CARDS, MUCHA2-69 CARDS)
BLOCK DATA AND AUXILIARY ROUTINES (2111 CARDS)
REFERENCE REPORT AND BULLETINS
17. CATEGORY - G
KEYWORDS - REACTOR SAFETY, HEAT TRANSFER, ACCIDENTS, COOLANTS, THERMODYNAMICS, WATER

1. NAME OR DESIGNATION OF PROGRAM - ETOT2
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC7600
3. DESCRIPTION OF PROBLEM OR FUNCTION - ETOT2 PROCESSES BASIC NUCLEAR INFORMATION GIVEN IN THE ENDF/B LIBRARY TAPE FORMATS I AND II AND PRODUCES DATA CHECKS FOR USE IN THE GENERATION OF KATE, THERMOS (ACC ABSTRACT 184), TEMPEST (ACC ABSTRACT 50), AND LASER (ACC ABSTRACT 249) LIBRARIES.
4. METHOD OF SOLUTION - ETOT2 PERFORMS A STRAIGHT-FORWARD GROUP AVERAGE USING AN INPUT WEIGHTING FUNCTION OR TAKES POINT VALUES OF THE MICROSCOPIC DATA FROM THE ENDF/B FILES. THE BREIT-WIGNER SINGLE LEVEL FORMULA IS ASSUMED TO YIELD RESOLVED RESONANCE CROSS SECTIONS WITH REASONABLE ACCURACY.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - IN ADDITION TO THE RESTRICTIONS ON THE ENDF/B DATA ITSELF, ETOT2 HAS THE FOLLOWING RESTRICTIONS -
 - MAXIMUM NUMBER OF GROUPS OR POINTS - 309
 - MAXIMUM NUMBER OF RESOLVED RESONANCES - 500A CHANGE IS NOTED IN THE PROGRAM TO PROVIDE FOR CORRECT PROCESSING OF ENDF/B FORMAT III DATA.
6. TYPICAL RUNNING TIME - ABOUT 5 SECONDS PER ISOTOPE IS REQUIRED ON THE CDC7600. THE TIME IS DEPENDENT ON THE NUMBER OF RESONANCE PARAMETERS.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - THE PROGRAM USES THE GENERAL PURPOSE PROCESSOR AND RETRIEVAL SUBROUTINES WRITTEN AT NNCSC, BROOKHAVEN FOR HANDLING ENDF/B DATA FILES (REFERENCE 4). THE PROGRAM IS RELATED TO ETOM1 (ACC ABSTRACT 436) WHICH GENERATES EPITHERMAL CROSS SECTIONS.
9. STATUS - ABSTRACT FIRST DISTRIBUTED OCTOBER 1972.
CDC7600 VERSION RECEIVED JANUARY 1972.
10. REFERENCES - CHARLES L. BEARD AND ROBERT A. DANIELS, ETOT, A FORTRAN IV PROGRAM TO PROCESS DATA FROM THE ENDF/B FILE TO THERMAL LIBRARY FORMAT, WCAP-7363 (ENDF-146), MARCH 1971.
 - HENRY C. HONECK, ENDF/B SPECIFICATIONS FOR AN EVALUATED NUCLEAR DATA FILE FOR REACTOR APPLICATIONS, BNL-50066 (ENDF-102), MAY 1966, REVISED BY S. PEARLSTEIN JULY 1967.
 - M. K. DRAKE, DATA FORMATS AND PROCEDURES FOR THE ENDF NEUTRON CROSS SECTION LIBRARY, BNL-50274 (ENDF-102 VOL. 1), OCTOBER 1970.
 - ODELLI OZER, DESCRIPTION OF THE ENDF/B PROCESSING CODES AND RETRIEVAL SUBROUTINES, BNL-50300 (ENDF-110), SEPTEMBER 1967, REVISED APRIL 1969, SEPTEMBER 1970, AND JUNE 1971.

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 ZPPR, ZPR-3, AND ZEBRA. 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 -
7600 VERSION
RESTRICTED TO CRITICAL ASSEMBLIES OF PLATE DRAWER TYPE
RESTRICTED TO MAXIMA OF -
13 MATERIALS
36 ROWS IN THE CRITICAL ASSEMBLY MATRIX
36 COLUMNS IN THE CRITICAL ASSEMBLY MATRIX
ENERGY RANGE MUST BE 10 MEV TO 10 EV
360 VERSION
RESTRICTED TO CRITICAL ASSEMBLIES OF PLATE DRAWER TYPE
RESTRICTED TO MAXIMA OF -
13 MATERIALS
51 ROWS IN THE CRITICAL ASSEMBLY MATRIX
51 COLUMNS IN THE CRITICAL ASSEMBLY MATRIX
ENERGY RANGE MUST BE 10 MEV TO 10 EV
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 RESONANCE RANGE,
USE OF POINT CROSS SECTION DATA IN LIEU OF MULTIGROUP CONSTANTS, AND
USE OF CUMULATIVE DISTRIBUTION FUNCTIONS OF THE CENTER-OF-MASS

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7. UNUSUAL FEATURES OF THE PROGRAM (CONTINUED)
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, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - L. B. LEVITT, R. C. LEWIS, VIM1, A NON-MULTIGROUP MONTE CARLO CODE FOR ANALYSIS OF FAST CRITICAL ASSEMBLIES, AI-AEC-12951, MAY 15, 1970.
INPUT DESCRIPTION FOR VIM1 - 7600, ATOMICS INTERNATIONAL MEMORANDUM, NOVEMBER 1971.
INPUT DESCRIPTION FOR VIM1 - 360, ATOMICS INTERNATIONAL AND ARGONNE NATIONAL LABORATORY MEMORANDUM, NOVEMBER 1971.
L. B. LEVITT, THE PROBABILITY TABLE METHOD FOR TREATING UNRESOLVED RESONANCES IN MONTE CARLO CRITICALITY CALCULATIONS, ANS TRANSACTIONS, OCTOBER 1971.
ACC PROGRAMMING NOTE 72-17, VIM1 360 VERSION TRANSMITTAL TAPE, FEBRUARY 1972.
11. MACHINE REQUIREMENTS - 65K (DECIMAL) FAST CENTRAL MEMORY, 80K ECS, AND 1 MAGNETIC TAPE UNIT ARE REQUIRED ON THE CDC7600. 600K BYTES AND 1 TAPE UNIT ARE USED 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 HUNDREDTHS OF A SECOND, BETWEEN THE TIME ESTIMATE ON THE JOB CARD AND THE TOTAL ELAPSED CPU + 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
ATOMICS INTERNATIONAL
P. O. BOX 309
CANOGA PARK, CALIFORNIA 91304

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (7600-2025 CARDS, 360-2323 CARDS)
SAMPLE PROBLEMS (7600-385 CARDS, 360-676 CARDS)
AUXILIARY ROUTINES (TAPE GENERATOR AND SAMPLE PROBLEM 7600-199
CARDS, 360-240 CARDS)
BINARY LIBRARY (7600-14 FILES, 360-14 FILES)
CONTROL INFORMATION (JCL 360-52 CARDS)
SAMPLE PROBLEM OUTPUT (7600-24 PAGES, 360-29 PAGES)
REFERENCE REPORT, AI-AEC-12951, INPUT DESCRIPTION MEMORANDA,
AND ACC PROGRAMMING NOTE 72-17
17. CATEGORY - C
KEYWORDS - MONTE CARLO METHOD, FAST REACTORS, CRITICALITY, ZPR-3
REACTORS, ZPPR REACTORS, ZEBRA REACTORS

1. NAME OR DESIGNATION OF PROGRAM - VENUS
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360/75
3. DESCRIPTION OF PROBLEM OR FUNCTION - VENUS COMPUTES THE POWER, ENERGY RELEASE AND SPACE-TIME (R-Z GEOMETRY) HISTORY OF THE TEMPERATURE, 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.
4. METHOD OF SOLUTION - THE POWER AND ENERGY RELEASE ARE CALCULATED USING THE POINT KINETICS FORMULATION OF KAGANOV WITH UP TO SIX DELAYED NEUTRON GROUPS (SEE REFERENCE 2). THE REACTIVITY IS A COMBINATION OF AN INPUT DRIVING FUNCTION AND FEEDBACK EFFECTS DUE TO DOPPLER BROADENING AND MATERIAL MOTION. AN ADIABATIC MODEL IS USED TO CALCULATE THE TEMPERATURE INCREASE THROUGHOUT THE REACTOR, BASED ON AN INITIAL TEMPERATURE DISTRIBUTION AND POWER PROFILE PROVIDED AS INPUT. THESE TEMPERATURES ARE, IN TURN, CONVERTED TO FUEL PRESSURES VIA AN ENERGY DEPENDENT OR ENERGY-DENSITY DEPENDENT EQUATION OF STATE (EOS). IN NON-FUELED REGIONS, PRESSURES ARE CALCULATED BY A SIMPLE COMPRESSION MODEL. THE CODE IS STRUCTURED SUCH THAT THE USER CAN READILY ADD A NEW EOS, IF THE EOS IN THE PROGRAM IS NOT APPLICABLE OR SUITABLE TO THE USER'S REQUIREMENTS. THE MATERIAL MOTION THAT RESULTS FROM THE PRESSURE BUILDUP IS CALCULATED BY A DIRECT FINITE-DIFFERENCE SOLUTION OF A SET OF TWO-DIMENSIONAL (R-Z) HYDRODYNAMICS EQUATIONS. THIS IS DONE IN LAGRANGIAN COORDINATES USING A MODIFIED VERSION OF KOLSKY'S METHOD. THE REACTIVITY CHANGE ASSOCIATED WITH THIS MOTION IS CALCULATED BY FIRST-ORDER PERTURBATION THEORY. THE DISPLACEMENTS ARE ALSO USED TO ADJUST THE FUEL DENSITIES AS REQUIRED FOR THE DENSITY DEPENDENT EQUATION OF STATE. AN AUTOMATIC TIME-STEP-SIZE SELECTION SCHEME IS PROVIDED TO CONTROL THE NUMERICAL ACCURACY OF THE CALCULATIONS.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - VENUS IS WRITTEN SO THAT THE DIMENSIONS OF THE STORAGE ARRAYS CAN BE READILY CHANGED TO ACCOMMODATE A BROAD RANGE OF PROBLEM SIZES. IN THE BASIC VERSION, THE TOTAL NUMBER OF MESH POINTS IS RESTRICTED SUCH THAT $(NR+3)*(NZ+3)$ IS LESS THAN 700, WHERE NR AND NZ ARE THE TOTAL NUMBER OF MESH INTERVALS IN THE R AND Z DIRECTIONS, RESPECTIVELY. THE TOTAL NUMBER OF SPATIAL REGIONS USED IN THE MOCKUP MUST BE NO GREATER THAN 20. THE PROGRAM REQUIRES ABOUT 375K BYTES OF CORE STORAGE WITH THESE RESTRICTIONS. IF THE AVAILABLE STORAGE IS INCREASED THESE RESTRICTIONS CAN BE RELAXED ACCORDINGLY.
6. TYPICAL RUNNING TIME - TYPICAL PROBLEMS REQUIRE FROM 3 TO 15 MINUTES OF IBM360/75 CPU TIME, WITH SOME CASES TAKING UP TO 30 MINUTES. RATHER MILD EXCURSIONS IN REACTORS THAT HAVE LITTLE INITIAL VOID SPACE USUALLY REQUIRE THE LONGER RUNNING TIMES.

7. UNUSUAL FEATURES OF THE PROGRAM - VENUS HAS THE FOLLOWING TWO DISTINCT ADVANTAGES OVER BETHE-TAIT TYPE ANALYSES -
 - (A) BECAUSE CONSERVATION OF MASS AND MOMENTUM ARE EXPLICITLY TAKEN INTO ACCOUNT IN THE VENUS PROGRAM THE ASSUMPTION THAT THE PRESSURE CAN BE CALCULATED BY IGNORING ANY CHANGE IN DENSITY DURING AN EXCURSION USED IN BETHE-TAIT TYPE ANALYSES IS NO LONGER NEEDED. SINCE THE DENSITY IS COMPUTED EXPLICITLY AS A FUNCTION OF TIME, AN ENERGY-DENSITY-DEPENDENT EQUATION-OF-STATE CAN BE EMPLOYED READILY.
 - (B) THE USE OF LAGRANGIAN COORDINATES IN THE VENUS PROGRAM PROVIDES DETAILED INFORMATION ON THE MOTION OF THE REACTOR MATERIAL DURING AN EXCURSION. THIS INFORMATION IS ESSENTIAL TO THE BASIC UNDERSTANDING OF THE MECHANISM OF AN ACCIDENT AND TO THE ASSESSMENT OF POSSIBLE DAMAGE TO THE SURROUNDING STRUCTURES.
8. RELATED AND AUXILIARY PROGRAMS - TWO AUXILIARY GRAPHICAL OUTPUT PROGRAMS ARE INCLUDED WITH THE PROGRAM. ONE IS DESIGNED FOR USE WITH THE IBM2280, WHILE THE OTHER IS FOR THE SC4060.
9. STATUS - ABSTRACT FIRST DISTRIBUTED OCTOBER 1972.
IBM360 VERSION SUBMITTED NOVEMBER 1971.
10. REFERENCES - W. T. SHA AND T. H. HUGHES, VENUS--A TWO-DIMENSIONAL COUPLED NEUTRONICS-HYDRODYNAMICS COMPUTER PROGRAM FOR FAST REACTOR POWER EXCURSIONS, ANL-7701, OCTOBER 1970.
 - J. J. KACANOVE, NUMERICAL SOLUTION OF THE ONE-GROUP SPACE-INDEPENDENT REACTOR KINETICS EQUATION FOR NEUTRON DENSITY GIVEN THE EXCESS REACTIVITY, ANL-6132, 1960.
 - H. G. KOLSKY, A METHOD FOR THE NUMERICAL SOLUTION OF TRANSIENT HYDRODYNAMICS SHOCK PROBLEMS IN TWO SPACE DIMENSIONS, LA-1867, 1955.
 - J. F. JACKSON, R. B. NICHOLSON, AND W. T. SHA, NUMERICAL STABILITY PROBLEMS IN THE VENUS DISASSEMBLY CODE, PROCEEDINGS OF THE ANS TOPICAL MEETING ON NEW DEVELOPMENTS IN REACTOR MATHEMATICS AND APPLICATIONS, MARCH 29-31, 1971.
 - H. A. BETHE AND J. H. TAIT, AN ESTIMATE OF THE ORDER OF MAGNITUDE OF THE EXPLOSION WHEN THE CORE OF A FAST REACTOR COLLAPSES, RHM, VOL.56, P.113, ATOMIC ENERGY RESEARCH ESTABLISHMENT, 1956.
 - N. HIRAKAWA, MARS, TWO-DIMENSIONAL EXCURSION CODE, APDA-198, 1962.
 - R. B. NICHOLSON, METHODS FOR DETERMINING THE ENERGY RELEASE IN HYPOTHETICAL REACTOR MELTDOWN ACCIDENTS, APDA-150, 1962.
 - E. P. HICKS AND D. C. MENZIES, A COMPUTER CODE FOR CALCULATION OF FAST REACTOR MAXIMUM ACCIDENT, TRG REPORT 1268(D), 1968.
 - GRAPHIC PROGRAMMING SERVICES FOR IBM 2280 AND 2282 FILM UNITS, FILE NO. 5360-30, IBM FORM C27-6927-1, FEBRUARY 1967.
 - G. D. BROWN, C. H. BUSH AND R. A. BERMAN, THE INTEGRATED GRAPHICS SYSTEM FOR THE S-C 4060, I. USERS MANUAL, RM-5560-PR, 1968.

11. MACHINE REQUIREMENTS - 400K BYTES WHEN STORING THE DATA IN DOUBLE PRECISION. IF THE CODE WAS CONVERTED FOR USE ON A COMPUTER WITH A LONGER WORD SIZE THAN THE IBM360, IT SHOULD BE POSSIBLE TO USE SINGLE PRECISION STORAGE. ONE PERIPHERAL STORAGE DEVICE IS NEEDED IF THE GRAPHICAL OUTPUT OPTION IS USED.
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 AUTHORS -
W. T. SPA
MATERIALS SCIENCE DIVISION
ARGONNE NATIONAL LABORATORY
9700 SOUTH CASS AVENUE
ARGONNE, ILLINOIS 60439
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (VENUS 3107 CARDS, PLOTTING 192 CARDS, MICROFILM 416 CARDS)
SAMPLE PROBLEM (VENUS 228 CARDS)
CONTROL INFORMATION (JCL 19 CARDS)
REFERENCE REPORT, ANL-7701
17. CATEGORY - F
KEYWORDS - FAST REACTORS, REACTIVITY FEEDBACK, 2-DIMENSIONAL, R-Z, HYDRODYNAMICS, POWER EXCURSIONS

1. NAME OR DESIGNATION OF PROGRAM - THETA1B
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360/75
3. DESCRIPTION OF PROBLEM OR FUNCTION - THETA1B COMPUTES THE THERMAL RESPONSE CHARACTERISTICS OF A NUCLEAR FUEL ROD SUBJECTED TO A LCSS-CF-COOLANT ACCIDENT ENVIRONMENT.
4. METHOD OF SOLUTION - THETA1B SOLVES THE TWO-DIMENSIONAL DIFFUSION EQUATION FOR A SINGLE FUEL ROD AND THE ONE-DIMENSIONAL CONSERVATION OF ENERGY EQUATION FOR THE ASSOCIATED FLUID CHANNEL. THE TWO SOLUTIONS ARE LINKED AT THE FUEL ROD-FLUID INTERFACE BY THE BOUNDARY CONDITIONS OF SURFACE TEMPERATURE AND HEAT FLUX. THE ENERGY EQUATIONS IN THE FUEL ROD AND FLUID CHANNEL ARE SOLVED BY SEVERAL NUMERICAL DIFFERENCING TECHNIQUES. NORMALLY THE FUEL ROD EQUATION IS SOLVED EXPLICITLY AND THE FLUID EQUATION IS SOLVED BY THE METHOD OF CHARACTERISTICS. THE HEAT TRANSFER MODEL CONSIDERS FORCED CONVECTION IN SUBCOOLED LIQUID AND SUPERHEATED VAPOR, NUCLEATE BOILING, FORCED CONVECTION VAPORIZATION, TRANSITION BOILING, AND STABLE FILM BOILING.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - SMALL TIME-STEPS ARE USED RESULTING IN LONG RUNNING TIMES.
6. TYPICAL RUNNING TIME - APPROXIMATELY 30 MINUTES ARE REQUIRED FOR A 30 SECOND TRANSIENT.
7. UNUSUAL FEATURES OF THE PROGRAM - VARIOUS OPTIONS ARE AVAILABLE FOR HEAT TRANSFER CORRELATIONS IN THE DIFFERENT HEAT TRANSFER REGIONS. THE CODE MAY ALSO BE USED TO MODEL ELECTRICALLY HEATED TEST ELEMENTS USED IN CUT-OF-PILE DECOMPRESSION EXPERIMENTS.
8. RELATED AND AUXILIARY PROGRAMS - CINDA3G (REFERENCE 2) IS USED TO SOLVE THE CONDUCTION EQUATION.
9. STATUS - ABSTRACT FIRST DISTRIBUTED OCTOBER 1972.
IBM360 VERSION SUBMITTED DECEMBER 1971, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - C. J. HOCEVAR AND T. W. WINEINGER, THETA1B, A COMPUTER CODE FOR NUCLEAR REACTOR CORE THERMAL ANALYSIS, IN-1445, FEBRUARY 1971.
J. D. GASKI, CHRYSLER IMPROVED NUMERICAL DIFFERENCING ANALYZER FOR THIRD GENERATION COMPUTERS, CHRYSLER CORPORATION TECHNICAL NOTE TN-AP-67-287, OCTOBER 1967.
ACC PROGRAMMING NOTE 72-23, THETA1B TRANSMITTAL TAPE, APRIL 1972.
11. MACHINE REQUIREMENTS - 400K BYTES OF CORE MEMORY ARE REQUIRED.
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 AUTHORS -
C. J. HOCEVAR AND T. W. WINEINGER
AEROJET NUCLEAR COMPANY
P. O. BOX 1845
IDAHO FALLS, IDAHO 83401
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (THETA-3325 CARDS, CINDA1-9741 CARDS, CINDA2-7307
CARDS)
SAMPLE PROBLEM (700 CARDS)
LOAD MODULES (THETA-1887 RECORDS, CINDA1-1221 RECORDS, CINDA2-
4261 RECORDS)
SAMPLE PROBLEM OUTPUT (24 PAGES)
REFERENCE REPORT, IN-1445, AND ACC NOTE 72-23
17. CATEGORY - G
KEYWORDS - THERMAL REACTORS, COOLANTS, ACCIDENTS, FLUID FLOW,
HEAT CONDUCTION, FUEL ELEMENTS, LOCA, WATER REACTORS,
LCFT

1. NAME OR DESIGNATION OF PROGRAM - TESS
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC3600
3. DESCRIPTION OF PROBLEM OR FUNCTION - TESS SOLVES THE TRANSPORT EQUATION IN SLAB AND SPHERICAL GEOMETRY USING THE DOUBLE-SN APPROXIMATION FOR SLAB GEOMETRY.
4. METHOD OF SOLUTION - TESS CALCULATES THE ANGULAR FLUXES FOR A GROUP IN EACH CUTER ITERATION BY A DIRECT SOLUTION OF THE MATRIX PROBLEM.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - TESS PERMITS A MAXIMUM OF -
 - 150 MESH POINTS
 - 26 GROUPS
 - 20 ANGULAR INTERVALS
 - 12 ISOTROPIC DOWNSCATTER GROUPS
 - 1 P1 DOWNSCATTER GROUP
 - 40 REGIONS
 - 25 MATERIALSTHERE IS NO RESTRICTION ON ANGLES EXCEPT THAT THEY BE SYMMETRIC ABOUT $\pi/2$ ($\mu=0$). NO UPSCATTER IS ALLOWED.
6. TYPICAL RUNNING TIME - APPROXIMATELY .5 MILLISECOND IS REQUIRED (POINT-GROUP-ANGULAR ORDER SQUARED) PER ITERATION.
7. UNUSUAL FEATURES OF THE PROGRAM - TESS AUTOMATICALLY COMPUTES BOTH REAL AND ADJOINT FLUXES AND PERFORMS THE INTEGRATIONS NEEDED FOR PERTURBATION ANALYSIS. BILINEAR AS WELL AS REAL FLUX WEIGHTED CROSS SECTION HOMOGENIZATION OVER BOTH SPACE AND ENERGY IS PERFORMED. REACTION RATES AS A FUNCTION OF SPACE FOR SPECIFIED ISOTOPES ARE COMPUTED.
8. RELATED AND AUXILIARY PROGRAMS - TESS IS AN EXTENSION AND MODIFICATION OF THE MIST CODE (ACC ABSTRACT 59). ONE OF THE MAIN MODIFICATIONS IN TESS IS THE CONVERSION OF THE COEFFICIENT MATRICES FROM THREE-DIMENSIONAL TO ONE-DIMENSIONAL VECTORS TO INCREASE BOTH THE MAXIMUM PERMISSIBLE PROBLEM SIZE AND THE SPEED OF THE CODE. OTHER MODIFICATIONS HAVE BEEN MADE TO THE ADJOINT CALCULATION, THE LIFETIME CALCULATION, THE CALCULATION OF FLUX AND ADJOINT INTEGRALS FOR PERTURBATION ANALYSIS, THE CROSS SECTION HOMOGENIZATION ROUTINE, AND THE ADDITION OF THE SPHERICAL SOLUTION.
9. STATUS - ABSTRACT FIRST DISTRIBUTED OCTOBER 1972.
CDC3600 VERSION SUBMITTED JANUARY 1972.
10. REFERENCES - G. E. PUTNAM AND D. M. SHAPIRO, MIST (MULTIGROUP INTERNUCLEAR SLAB TRANSPORT), IDO-16856, MAY 1963.
RONALD W. GCIN AND J. P. PLUMMER, TESS, A ONE-

10. REFERENCES (CONTINUED)
DIMENSIONAL SN TRANSPORT-THEORY CODE FOR THE CDC-3600, ANL-7406,
DECEMBER 1971.
11. MACHINE REQUIREMENTS - TESS USES 50K OF CORE STORAGE, 10 TAPE
UNITS, INCLUDING I/O BUT NOT INCLUDING MONITOR.
12. PROGRAMMING LANGUAGE USED - 3600 FORTRAN
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
SCOPE 6.2114.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
THE BUFFERIN AND BUFFEROUT STATEMENTS HAVE BEEN USED AND WOULD
HAVE TO BE CHANGED TO BE COMPATIBLE WITH FORTRAN IV. THE TIME
REMAINING AT ANY STAGE OF THE COMPUTATION IS DETERMINED BY AN A =
TIMELEFT(A) STATEMENT. THE PROGRAM IS MADE UP OF FIVE OVERLAYS,
ONE OF WHICH CONTAINS THREE SEGMENTS.
15. NAME AND ESTABLISHMENT OF AUTHORS -
RONALD W. GOIN AND J. P. PLUMMER
APPLIED PHYSICS DIVISION
ARGONNE NATIONAL LABORATORY
IDAHO FALLS, IDAHO 83401
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (4944 CARDS)
SAMPLE PROBLEM (27 CARDS)
CONTROL INFORMATION (39 CARDS)
SAMPLE PROBLEM OUTPUT (26 PAGES)
REFERENCE REPORT, ANL-7406
17. CATEGORY - C
KEYWORDS - 1-DIMENSIONAL, TRANSPORT THEORY, CRITICALITY SEARCHES,
REACTION RATES, MULTIGROUP, PERTURBATION THEORY, MIST
CODES

1. NAME OR DESIGNATION OF PROGRAM - FORSIM
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - 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.
4. METHOD OF SOLUTION - THE EQUATIONS ARE INTEGRATED BY A COMBINATION OF FOURTH-ORDER RUNGE-KUTTA AND STRATIFIED ROMBERG INTEGRATION WITH VARIABLE STEP-SIZE. A FIXED STEP METHOD MAY ALSO BE USED ON REQUEST.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - FORSIM HANDLES ONLY ORDINARY DIFFERENTIAL EQUATIONS - PARTIALS MUST BE DISCRETIZED. THE MAXIMUM NUMBER OF SIMULTANEOUS EQUATIONS IS CURRENTLY 100.
6. TYPICAL RUNNING TIME - THE TIME REQUIRED DEPENDS ON THE EQUATION SYSTEM BEING SOLVED.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - THE PROGRAM IS SIMILAR IN CONCEPT TO ITS LOCAL PREDECESSORS, MIMIC AND CSMP, BUT THE USER WRITES IN FORTRAN AND HAS FULL COMMAND OF ALL FORTRAN FACILITIES. DERIVATIVES MAY BE CALCULATED IN SUBROUTINES AND INDEXED IN ARRAYS.
9. STATUS - ABSTRACT FIRST DISTRIBUTED OCTOBER 1972.
CDC6600 VERSION SUBMITTED JANUARY 1972.
10. REFERENCES - M. B. CARVER AND S. L. LIKENESS, FORSIM, A FORTRAN ORIENTED SIMULATION PROGRAM FOR THE CONTINUOUS TRANSIENT SOLUTION OF SYSTEMS OF ORDINARY DIFFERENTIAL EQUATIONS, AECL-3902, MAY 1971.
11. MACHINE REQUIREMENTS - 35K MEMORY AND 6 DISK FILES, INCLUDING INPLT AND OUTPUT.
12. PROGRAMMING LANGUAGE USED - FORTRAN EXTENDED
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - CDC6600 SCOPE 3.2
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -

M. B. CARVER
MATHEMATICS AND COMPUTATION BRANCH
CHALK RIVER NUCLEAR LABORATORIES
ATOMIC ENERGY OF CANADA LIMITED
CHALK RIVER, ONTARIO, CANADA

16. MATERIAL AVAILABLE -

SOURCE DECK (907 CARDS)
SAMPLE PROBLEM (31 CARDS)
SAMPLE PROBLEM OUTPUT (14 PAGES)
REFERENCE REPORT

17. CATEGORY - P

KEYWORDS - RUNGE-KUTTA, DIFFERENTIAL EQUATIONS

1. NAME OR DESIGNATION OF PROGRAM - GENED ENVIRONMENTAL ROUTINES
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - GE635
3. DESCRIPTION OF PROBLEM OR FUNCTION - 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.
 - FLFXD 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.
 - FSNCW 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

3. DESCRIPTION OF PROBLEM OR FUNCTION (CONTINUED)
(RUNNING TIME EXCEEDED) OCCURS, ALLOWING THE PROGRAM AN ADDITIONAL 5 MINUTES OF PROCESSOR TIME.

LISTFCRM CONSISTS OF TWO SUBPROGRAMS, JGEGEN 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.

LCCF4 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 INCORPORATING THE FUNCTIONS OF VTAB, REWIND, POSWDS, POSLIN, POSTMW, POSASN, POSPOS, PRID, PWID, POSTSF, PCSTSB, PCSTRB, 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.

PLCTRC PROVIDES A SERIES OF CALCOMP PLOTTER ROUTINES. THESE INCLUDE PENSET, PSCALE, SPLOT, IPLOT, IDPLOT, XCPlot, YCPlot, 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 FORMAT CONTROL. CONVRT PERMITS CHARACTER MANIPULATION AND CONVERSION OF ANY DATUM/DATA IN MEMORY.

RWSBT MANIPULATES INFORMATION IN BINARY FORM ON TAPE, DISC, OR DRUM PHYSICAL DEVICES. IT INCLUDES BLKSIZ, ROBT, WTBT, 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.

FDUMP 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.

FLGECF WHICH IS USED TO PROCESS END-OF-FILE CONDITIONS.

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 -
9. STATUS ABSTRACT FIRST DISTRIBUTED DECEMBER 1972.
 GE635 VERSION SUBMITTED NOVEMBER 1972.
10. REFERENCES - BITA (A FORTRAN-COMPATIBLE SUBROUTINE), GESJ NOTE.
 CASE (A FORTRAN-COMPATIBLE SUBROUTINE), GESJ NOTE,
 NOVEMBER 17, 1971.
 CASERR (A FORTRAN-COMPATIBLE SUBROUTINE), GESJ NOTE,
 NOVEMBER 28, 1967.
 DRAW, GESJ NOTE, NOVEMBER 10, 1971.
 ERRSYS (FORTRAN-COMPATIBLE SUBROUTINE), GESJ NOTE.
 F4TRBK, F4TRAC, F4TRID, GESJ NOTE.
 FLEXO, CONSOLE TYPEWRITER OUTPUT SUBROUTINE, GESJ
 NOTE.
 A. F. SCADDEN, FLTBCD (A FORTRAN-COMPATIBLE SUBROU-
 TINE), GESJ NOTE, FEBRUARY 19, 1969.
 NELS J. ANDERSON, JR., IDFTAP FUNCTION SUBPROGRAM
 WRITE-UP, GESJ NOTE.
 ISERVE, GE-635 COMPUTER SERVICE FUNCTION, GESJ NOTE.
 ISUP AND ISUPC, GESJ NOTE.
 W. CATTANEO, LIMRTN, GESJ NOTE, JANUARY 19, 1968.
 NELS J. ANDERSON, JR., LISTFORM, GESJ NOTE S6T002,
 SEPTEMBER 15, 1967.
 LOC4, GESJ NOTE.
 NBCDFX (A FORTRAN-COMPATIBLE FUNCTION), GESJ NOTE.
 NFXBCD (A FORTRAN-COMPATIBLE FUNCTION), GESJ NOTE.
 M. A. GUMUCIO, NIPS, ALPHANUMERIC INPUT PROCESSING
 SUBROUTINE, GESJ NOTE.
 L. M. CIOLLI, GE-635 NPOST, GESJ NOTE, JULY 13, 1967.
 R. E. WARF, NSORT, SORT ROUTINE FOR FORTRAN PROGRAMS,
 GESJ NOTE, JULY 1967.
 PLOTRC, GESJ NOTE, NOVEMBER 29, 1971.
 PRNTHD (A FORTRAN-COMPATIBLE SUBROUTINE), GESJ NOTE,
 OCTOBER 6, 1967.
 REREAD, CONVRT, GESJ NOTE, SEPTEMBER 11, 1967.
 NELS J. ANDERSON, JR., RWSBT - BINARY FILE INPUT-
 OUTPUT SUBROUTINE, GESJ NOTE.
 VAMPIR, GESJ NOTE, NOVEMBER 29, 1971.
 ZERO (A FORTRAN-COMPATIBLE SUBROUTINE), GESJ NOTE,
 FEBRUARY 16, 1971.
 EXCERPTS FROM GE-600 LINE FORTRAN IV REFERENCE
 MANUAL, CPB-1006G, SEPTEMBER 1964, REV. MARCH 1969, REV. JULY
 1969.
11. MACHINE REQUIREMENTS -
12. PROGRAMMING LANGUAGES USED - FORTRAN IV AND GMAP
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
 GECOS.

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14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHOR -
CONTACT F. A. WASSEM
GENERAL ELECTRIC COMPANY
NUCLEAR ENERGY DIVISION
175 CURTNER AVENUE
SAN JOSE, CALIFORNIA 95114
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (1407 CARDS)
REFERENCE NOTES AND EXCERPTS
17. CATEGORY - P
KEYWORDS - GRAPHS, DATA PROCESSING, OPERATING SYSTEMS, LIBRARIES

1. NAME OR DESIGNATION OF PROGRAM - PTAC11
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360/75
3. DESCRIPTION OF PROBLEM OR FUNCTION - 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.
4. METHOD OF SOLUTION - PTAC11 IS A TWO PASS ASSEMBLER. A USER DEFINED SYMBOL TABLE IS CREATED DURING PASS ONE. THE BINARY CODE AND LISTING IS PRODUCED DURING PASS TWO.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE NUMBER OF USER DEFINED SYMBOLS IS LIMITED TO 800. THE STANDARD DEC MNEMONICS ARE USED WITH TWO EXCEPTIONS. THE ALTERNATE MNEMONICS FOR BCC (BRANCH IF CARRY CLEAR) AND BCS (BRANCH IF CARRY SET) ARE NOT USED. THE MNEMONIC FOR BREAK TRAP IS CALLED BPT.
6. TYPICAL RUNNING TIME - LESS THAN 2 MINUTES IS REQUIRED FOR 4096 PDP-11 SOURCE STATEMENTS.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED OCTOBER 1972.
IBM360 VERSION SUBMITTED JANUARY 1972, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - E. W. KILLIAN, A PROGRAM TO ASSEMBLE CODE FOR THE PDP-11 (PTAC-11), P02050, JANUARY 1972.
C. W. RICHARDSON AND E. W. KILLIAN, TECHNIQUES OF PROGRAM PREPARATION FOR SMALL COMPUTERS, DECUS FALL MEETING, 1969.
11. MACHINE REQUIREMENTS - 100K BYTES MEMORY, USUAL I/O UNITS AND ONE TAPE UNIT
12. PROGRAMMING LANGUAGE USED - PL/I
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - PTAC11 SUPPLIES THE USER WITH FOUR DIFFERENT FORMS OF OUTPUT - A PRINTED LISTING, A PRINTED SYMBOL TABLE, A PRINTED CROSS REFERENCE LISTING, AND A BINARY TAPE IN THE FORMAT READ BY THE PDP-11 ABSOLUTE LOADER.

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15. NAME AND ESTABLISHMENT OF AUTHOR -
E. W. KILLIAN
AEROJET NUCLEAR COMPANY
P. O. BOX 1845
IDAHO FALLS, IDAHO 83401
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (1817 CARDS)
SAMPLE PROBLEM (14 CARDS)
REFERENCE DOCUMENT, P02050
17. CATEGORY - P
KEYWORDS - PDP-11, PROGRAMMING LANGUAGES, ASSEMBLER

1. NAME OR DESIGNATION OF PROGRAM - HEATING3
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - 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.
4. METHOD OF SOLUTION - THE EXTRAPOLATED LIEBMANN METHOD AND A MODIFICATION OF THE AITKEN DELTA**2 EXTRAPOLATION PROCESS ARE USED TO SOLVE THE FINITE DIFFERENCE EQUATIONS WHICH APPROXIMATE THE PARTIAL DIFFERENTIAL EQUATIONS FOR A STEADY-STATE PROBLEM. THE DIFFERENCE EQUATIONS FOR A TRANSIENT PROBLEM INVOLVE THE FIRST FORWARD TIME DIFFERENCE, AND THUS, THE SOLUTION IS EXPRESSED EXPLICITLY IN TERMS OF THE TEMPERATURES AT THE PREVIOUS TIME LEVEL. FOR TRANSIENT CALCULATIONS, A MODIFIED EXPLICIT METHOD IS INCORPORATED INTO THE PROGRAM AS AN OPTION WHICH ALLOWS THE USE OF AN ARBITRARY TIME INCREMENT WHILE MAINTAINING STABILITY.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
 - 1750 LATTICE POINTS
 - 100 REGIONS
 - 50 MATERIALS
 - 50 BOUNDARY CONDITIONS
 - 100 FINE LATTICE LINES ALONG ANY AXIS
 - 50 GROSS LATTICE LINES ALONG ANY AXIS
 - 20 HEAT GENERATION FUNCTIONS
 - 25 INITIAL TEMPERATURE FUNCTIONS
 - 25 POINTS PER TEMPERATURE-DEPENDENT CONDUCTIVITY FUNCTION
 - 25 POINTS PER TEMPERATURE-DEPENDENT DENSITY FUNCTION
 - 25 POINTS PER TEMPERATURE-DEPENDENT SPECIFIC HEAT FUNCTION
 - 25 POINTS PER TIME-DEPENDENT FUNCTION
 - 50 POSITION-DEPENDENT FUNCTIONS
 - 100 PRINTOUT TIMES
 - 500 SURFACE-TO-SURFACE CONNECTORS
 - 20 TIME-DEPENDENT FUNCTIONS
6. TYPICAL RUNNING TIME - IBM360/91 RUNNING TIME IS APPROXIMATELY $(5.0E-5) * (NO. OF NODES) * (NO. OF TIME-STEPS)$ SECONDS FOR TRANSIENT CALCULATIONS AND $(1.0E-4) * (NO. OF NODES) * (NO. OF ITERATIONS)$ FOR STEADY-STATE PROBLEMS. TEMPERATURE-DEPENDENT THERMAL PROPERTIES OR BOUNDARY CONDITIONS WILL INCREASE THIS BY A FACTOR OF 5 TO 10.

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7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - HEATING3 IS A MODIFIED VERSION OF THE GENERALIZED HEAT CONDUCTION CODE HEATING.
9. STATUS - ABSTRACT FIRST DISTRIBUTED OCTOBER 1972.
IBM360 VERSION SUBMITTED JANUARY 1972, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - W. D. TURNER AND M. SIMAN-TOV, HEATING3 - AN IBM 360 HEAT CONDUCTION PROGRAM, ORNL-TM-3208, FEBRUARY 1971.
W. D. TURNER AND J. S. CROWELL, NOTES ON HEATING - AN IBM 360 HEAT CONDUCTION PROGRAM, CTC-INF-980, 1969.
S. LEVY, USE OF EXPLICIT METHOD IN HEAT TRANSFER CALCULATION WITH AN ARBITRARY TIME STEP, GE-98-C-282, 1968.
T. B. FOWLER AND E. R. VOLK, GENERALIZED HEAT CONDUCTION CODE FOR THE IBM-704 COMPUTER, ORNL-2734, OCTOBER 1959.
11. MACHINE REQUIREMENTS - LARGEST INTEGER IN $(178+0.156*N)$ KBYTES OF MEMORY ARE REQUIRED WHERE $N=NO.$ OF NODES.
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 1750 LATTICE POINT RESTRICTION CAN BE MODIFIED EASILY BY CHANGING TWO CARDS IN THE MAIN ROUTINE.
15. NAME AND ESTABLISHMENT OF AUTHORS -
W. D. TURNER AND M. SIMAN-TOV
OAK RIDGE NATIONAL LABORATORY
P. O. BOX X
OAK RIDGE, TENNESSEE 37830
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (2561 CARDS)
SAMPLE PROBLEM (59 CARDS)
REFERENCE REPORTS, ORNL-TM-3208 AND CTC-INF-980
17. CATEGORY - F
KEYWORDS - HEAT CONDUCTION, 1-DIMENSIONAL, 2-DIMENSIONAL, 3-DIMENSIONAL, HEATING CODES

1. NAME OR DESIGNATION OF PROGRAM - ERREST
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - ERREST SORTS THE ROD BUNDLE LIBRARY OF CRITICAL HEAT FLUX DATA AND PERFORMS ERROR CALCULATIONS ON SORTED SUBSETS.
4. METHOD OF SOLUTION - ERROR CALCULATIONS ARE PERFORMED BY USER SUPPLIED SUBROUTINES.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
6. TYPICAL RUNNING TIME - 1 TO 5 MINUTES ARE REQUIRED.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED OCTOBER 1972.
IBM360 VERSION SUBMITTED FEBRUARY 1972, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - E. D. HUGHES, A CORRELATION OF ROD BUNDLE CRITICAL HEAT FLUX FOR WATER IN THE PRESSURE RANGE 150 TO 725 PSIA, IN-1412, JULY 1970.
IDAHO NUCLEAR CORPORATION, QUARTERLY TECHNICAL REPORT NUCLEAR SAFETY PROGRAM DIVISION, JULY 1 - SEPTEMBER 30, 1969, IN-1319, MAY 1970.
MICHAEL A. LINTNER, LEAST-SQUARES ESTIMATION OF NONLINEAR PARAMETERS, PO0950, JUNE 1969.
M. A. LINTNER, ERREST, A PROGRAM TO EDIT DATA, PERFORM ERROR CALCULATIONS, AND DO NON-LINEAR LEAST SQUARE PARAMETER ESTIMATIONS, IDAHC NUCLEAR CORPORATION, IDAHO FALLS, IDAHO, JUNE 1970.
11. MACHINE REQUIREMENTS - 460K 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 AUTHOR -
M. A. LINTNER
AEROJET NUCLEAR COMPANY
P. O. BOX 1845
IDAHO FALLS, IDAHO 83401

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16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (1483 CARDS)
SAMPLE PROBLEM WITH LIBRARY (9426 CARDS)
CONTROL INFORMATION (31 CARDS)
SAMPLE PROBLEM OUTPUT (25 SELECTED PAGES)
REFERENCE REPORTS, IN-1412, ERREST PROGRAM DESCRIPTION, AND
P00950
17. CATEGORY - P
KEYWORDS - NONLINEAR LEAST SQUARES

1. NAME OR DESIGNATION OF PROGRAM - NRTS OS/360 REMOTE JOB ENTRY
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360/75
3. DESCRIPTION OF PROBLEM OR FUNCTION - 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.
4. METHOD OF SOLUTION - CONVERSATIONAL MODE OPERATION OF COMMUNICATION LINES IS USED TO ALLOW CONCURRENT INPUT AND OUTPUT OPERATION OF MULTIPLE INPUT/OUTPUT DEVICES. WITH THE EXCEPTION OF INTERACTIVE GRAPHICS, DATA SETS CREATED BY THE JOB ARE HANDLED BY OS DATA MANAGEMENT ROUTINES. INTERACTIVE GRAPHIC DATA SETS DIRECTED TO AN IBM2250 AT A REMOTE STATION ARE HANDLED BY A COMBINATION OF SVC'S AND THE RJE SYSTEM. OUTPUT DATA SETS CREATED BY REMOTELY SUBMITTED JOBS AND THOSE DIRECTED TO A REMOTE STATION BY A CENTRAL INSTALLATION USER ARE PLACED IN SPECIAL OUTPUT CLASSES AND RETURNED TO THE REMOTE USER UNDER DIRECTION OF THE RJE PROGRAM.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
6. TYPICAL RUNNING TIME -
7. UNUSUAL FEATURES OF THE PROGRAM - NRTS RJE SUPPORTS INTERACTIVE COMMUNICATION BETWEEN A REMOTE IBM2250 SCOPE AND AN EXECUTING PROGRAM. THE REMOTE WORK STATION PROGRAM HAS BEEN COMPLETELY REDESIGNED.
8. RELATED AND AUXILIARY PROGRAMS - NRTS REQUIRES THE INCORPORATION OF TWO TYPE ONE SVC'S FOR OPERATION.
9. STATUS - ABSTRACT FIRST DISTRIBUTED OCTOBER 1972.
IBM360 VERSION SUBMITTED FEBRUARY 1972.
10. REFERENCES - NRTS OS/360 REMOTE JOB ENTRY SYSTEM, IDAHO NUCLEAR CORPORATION MANUAL.
NRTS OS/360 REMOTE JOB ENTRY SYSTEM, INTERNAL DESCRIPTION, AEROCJET NUCLEAR COMPANY MANUAL.
1130 RJE (I. F. VERSION) INTERNAL DOCUMENTATION, AEROJET NUCLEAR COMPANY MANUAL.
11. MACHINE REQUIREMENTS - IBM360 WITH MINIMUM OF 512K BYTES STORAGE, USING OS/360 MVT AND AN IBM2701 DATA ADAPTER UNIT WITH SYNCHRONOUS DATA ADAPTER TYPEII WITH THE BINARY SYNCHRONOUS FEATURES, EQUIPPED FOR EBCDIC CODE AND FULL TRANSPARENCY OPERATION. DUAL INTERFACE FEATURE IS REQUIRED IF LINE IS TO BE SWITCHED BETWEEN SLOW AND HIGH-SPEED OPERATION. DIRECT ACCESS STORAGE FOR RJE

11. MACHINE REQUIREMENTS (CONTINUED)
TABLES IS TYPICALLY LESS THAN 1-2311 DASD OR 1-2314 DISK PACK.
SYSIN DATA REQUIREMENTS ARE INSTALLATION DEPENDENT.
IBM1130 WORK STATION REQUIREMENTS INCLUDE A
SINGLE DISK STORAGE DRIVE, 8K WORDS OF CORE STORAGE, 1442-7 CARD
READ/PUNCH, 1403-2 WITH RPQ F20724 OR 1403-6 PRINTER, BINARY SYN-
CHRONOUS COMMUNICATIONS ADAPTERS. OPTIONALLY, A 1627-1 PLOTTER,
2415 MAGNETIC TAPE, 1134 PAPER TAPE READER, 1055 PAPER TAPE PUNCH,
2501 CARD READER, AND 2250-4 SCOPE ARE SUPPORTED.
12. PROGRAMMING LANGUAGE USED - ASSEMBLER
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
OS/360 MVT RELEASE 19.6.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
SUPPORT FOR THE IBM 2770/2780 TERMINALS IS BEING INCORPORATED IN
THE SYSTEM FOR LATER RELEASE.
15. NAME AND ESTABLISHMENT OF AUTHOR -
LYNN C. RICHARDSON
AEROJET NUCLEAR COMPANY
P. O. BOX 1845
IDAHO FALLS, IDAHO 83401
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (PDS SYS1.RJESRC 1134 BLOCKS)
MACRO DEFINITIONS (PDS SYS1.RJEMAC 793 BLOCKS)
OBJECT MODULES (PDS SYS1.RJE OBJ 96 BLOCKS)
ASSEMBLY LISTINGS (PDS SYS1.RJELST 4990 BLOCKS)
REFERENCE REPORTS
17. CATEGORY - P
KEYWORDS - DATA PROCESSING, INPUT DATA, OUTPUT DATA

1. NAME OR DESIGNATION OF PROGRAM - PHRCG
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - 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.
4. METHOD OF SOLUTION - THE CODE RECURSIVELY SOLVES EITHER A B-1 OR P-1 APPROXIMATION TO THE ENERGY DEPENDENT TRANSPORT EQUATION UTILIZING CROSS SECTION DATA OBTAINED FROM A LIBRARY. LOGIC IS INCORPORATED TO CALCULATE BOTH RESOLVED AND UNRESOLVED RESONANCE DATA TO COMPLEMENT THE LIBRARY ABSORPTION AND FISSION DATA WHERE NECESSARY. AN OPTION IS AVAILABLE TO CALCULATE A DANCOFF-GINSBURG CORRECTION FACTOR TO ACCOUNT FOR PIN SHADOWING.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE CODE IS RESTRICTED TO A 68 GROUP STRUCTURE FOR INPUT.
6. TYPICAL RUNNING TIME - A TYPICAL PROBLEM GENERALLY REQUIRES LESS THAN ONE MINUTE OF CPU TIME ON THE IBM360/75.
7. UNUSUAL FEATURES OF THE PROGRAM - THE LIBRARY IS DERIVED MAINLY FROM ENDF/B DATA.
8. RELATED AND AUXILIARY PROGRAMS - ETOP IS THE PROCESSING CODE WHICH CALCULATES THE ELASTIC CROSS SECTION OF INFINITE DILUTION AND PREPARES THE ELASTIC SCATTERING MATRICES FOR PHROG.
9. STATUS - ABSTRACT FIRST DISTRIBUTED OCTOBER 1972.
IBM360 VERSION SUBMITTED FEBRUARY 1972, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - R. L. CURTIS, G. L. SINGER, F. J. WHEELER, R. A. GRIMESEY, PHROG--A FORTRAN IV PROGRAM TO GENERATE FAST NEUTRON SPECTRA AND AVERAGE MULTIGROUP CONSTANTS, IN-1435, APRIL 1971, WITH CHANGES PER AEROCJET NUCLEAR COMPANY NOTE, G. L. SINGER, DECEMBER 1971.
11. MACHINE REQUIREMENTS - 200K BYTES MEMORY AND SIX I/O DEVICES INCLUDING CARD READER, PRINTER, CARD PUNCH, TAPE UNIT FOR CROSS SECTION LIBRARY, AND 2 SCRATCH UNITS
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 AUTHORS -
R. L. CURTIS, G. L. SINGER, F. J. WHEELER AND
R. A. GRIMSEY
AEROJET NUCLEAR COMPANY
P. O. BOX 1845
IDAHO FALLS, IDAHO 83401
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (7209 CARDS)
SAMPLE PROBLEM (17 CARDS)
LIBRARY (EBCDIC 473 BLOCKS,
DCB=(RECFM=VBS,LRECL=216,BLKSIZE=4324))
LIBRARY PROCESSING ROUTINE (104 CARDS)
CONTROL INFORMATION (JCL 51 CARDS)
SAMPLE PROBLEM OUTPUT (43 PAGES)
REFERENCE REPORT IN-1435 AND NOTE
17. CATEGORY - B
KEYWORDS - MULTIGROUP CROSS SECTIONS, FAST SPECTRA, DANCORRECTION, GROUP CONSTANTS, RESOLVED REGION RESONANCE, UNRESOLVED REGION RESONANCE, ETOP CODES

1. NAME OR DESIGNATION OF PROGRAM - SOCCOL2
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360, UNIVAC1108
3. DESCRIPTION OF PROBLEM OR FUNCTION - 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 ACOUSTIC CONSTRAINT.
4. METHOD OF SOLUTION - A UNIT CELL CONSISTING OF A SINGLE SPHERICAL PARTICLE OF MOLTEN MATERIAL SURROUNDED CONCENTRICALLY BY SODIUM IS USED AS THE BASIS FOR THE CALCULATION. HEAT TRANSFER FROM THE MOLTEN PARTICLE TO THE SODIUM IS CALCULATED BY AN IMPLICIT NUMERICAL TECHNIQUE ASSUMING NEGLIGIBLE CONTACT RESISTANCE AT THE INTERFACE OF THE PARTICLE. THE EXPANSION OF THE HEATED SODIUM IS CALCULATED BY THE ONE-DIMENSIONAL ACOUSTIC EQUATION UNTIL VAPORIZATION CONDITIONS ARE ATTAINED. UPON VAPORIZATION, IT IS ASSUMED THAT THE PARTICLE BECOMES VAPOR-BLANKETED AND THAT NO FURTHER HEAT TRANSFER TO OR FROM THE SODIUM OCCURS. THE HEATED SODIUM IS THEN EXPANDED TO THE SPECIFIC FINAL PRESSURE IN AN ISENTROPIC EXPANSION PROCESS.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE PRESENCE OF AN INITIAL AMOUNT OF SODIUM VAPOR OR NONCONDENSIBLE GAS CANNOT BE TAKEN INTO ACCOUNT. TIME DELAYS IN THE PROCESS OF FRAGMENTATION AND MIXING OF THE MOLTEN MATERIAL INTO THE SODIUM CANNOT BE CONSIDERED. HEAT TRANSFER DURING THE TWO-PHASE EXPANSION OF SODIUM IS NEGLECTED.
6. TYPICAL RUNNING TIME - THE SAMPLE PROBLEM EXECUTED ON THE UNIVAC1108 IN 10 SECONDS, ON THE IBM360/75 IN 15 SECONDS.
7. UNUSUAL FEATURES OF THE PROGRAM - THE PROGRAM HAS BUILT-IN THERMOPHYSICAL PROPERTIES WHEN THE MOLTEN MATERIAL IS 25 PERCENT PUO2 - 75 PERCENT UO2 AND THE USER HAS THE OPTION OF CALCULATING THE SODIUM PROPERTIES ACCORDING TO THREE DIFFERENT METHODS.
8. RELATED AND AUXILIARY PROGRAMS - SOCOOL2 IS A CONTINUATION IN AN ANALYSIS PROGRAM TO PREDICT THE MECHANICAL WORK ENERGY FOR HYPOTHETICAL LMFBR MAXIMUM ACCIDENTS. SOCOOL1 WAS A COMPLETELY THERMODYNAMIC MODEL WHEREAS SOCOOL2 TAKES INTO ACCOUNT THE FINITE RATE OF HEAT TRANSFER.
9. STATUS - ABSTRACT FIRST DISTRIBUTED OCTOBER 1972.
UNIVAC1108 VERSION SUBMITTED FEBRUARY 1972.
IBM360 VERSION SUBMITTED FEBRUARY 1972, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - A. PADILLA, JR., MECHANICAL WORK ENERGY FOR SODIUM FUEL INTERACTION, HECL-TME-71-94, JUNE 1971.

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11. MACHINE REQUIREMENTS - UNIVAC1108 - 19K WORDS OF MEMORY, IBM360 - 115K BYTES OF MEMORY
12. PROGRAMMING LANGUAGES USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - UNIVAC1108 CSCX, IBM360 OS/360
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
A. PADILLA, JR.
REACTOR ANALYSIS AND SAFETY DIVISION
ARGONNE NATIONAL LABORATORY
9700 S. CASS AVENUE
ARGONNE, ILLINOIS 60439
16. MATERIAL AVAILABLE -
SOURCE DECK (1108-923 CARDS, 360-937 CARDS)
SAMPLE PROBLEM (1108-5 CARDS, 360-7 CARDS)
SAMPLE PROBLEM OUTPUT (2 PAGES)
REFERENCE REPORT
17. CATEGORY - B
KEYWORDS - LMFBR REACTORS, REACTOR SAFETY, ACCIDENTS,
CONTAINMENT, FUELS, VAPORS, EXCURSIONS, SOCOCCL1 CODES

1. NAME OR DESIGNATION OF PROGRAM - ARC-SYSTEM
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360/50 AND LARGER MODELS
3. DESCRIPTION OF PROBLEM OR FUNCTION - ARC-SYSTEM IS THE COLLECTION OF SYSTEMS SUBPROGRAMS AND MODULES WHICH PROVIDE THE SOFTWARE ENVIRONMENT NECESSARY TO EXECUTE THE MODULAR COMPUTATIONAL CAPABILITIES OF THE ARGONNE REACTOR COMPUTATION (ARC) SYSTEM ON IBM360 SYSTEMS.
4. METHOD OF SOLUTION - ARC-SYSTEM MODULES INITIALIZE THE SYSTEM, PROCESS THE EBCDIC INPUT DATA INTO ARC SYSTEM DATA SETS (DS/360 DATA SETS) FOR USE BY THE MODULES IN A COMPUTATIONAL PATH, AND PROVIDE COMMUNICATION LINKAGE BETWEEN ARC SYSTEM INTERFACE DATA SETS (BINARY AND EBCDIC) AND DS/360 LOGICAL UNITS.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - BCD INPUT DATA RESTRICTIONS ARE SET AT 100 ARC SYSTEM DATA BLOCKS AND 2000 EBCDIC DATA CARDS. AN ARC SYSTEM DATA BLOCK IS A NAMED SET OF DATA CONTAINING NAMED SUBBLOCKS OF DATA WHICH ARE PROCESSED INTO DATA SETS BY A CALL TO THE SYSTEM ROUTINE BCDD.
6. TYPICAL RUNNING TIME - THE PROCESSING OF THE DATA FOR THE SAMPLE PROBLEM REQUIRES ABOUT 10 SECONDS ON AN IBM360/75.
7. UNUSUAL FEATURES OF THE PROGRAM - ARC-SYSTEM SUPPORTS THE EXECUTION OF COMPUTATIONAL PATHS CONSISTING OF DYNAMICALLY-LOADED MODULES WHICH COMMUNICATE DATA BY MEANS OF BINARY AND BCD INTERFACE DATA SETS. ONE I/O PACKAGE IS UTILIZED BY ALL OF THE MODULES EXECUTED WITH I/O ACTIVITY AND IS LOADED BY THE FIRST SUCH MODULE. SUBPROGRAMS ARE PROVIDED WHICH FACILITATE DYNAMIC LOADING OF MODULES, DATA PROCESSING AND MANAGEMENT, AND I/O OPERATIONS.
8. RELATED AND AUXILIARY PROGRAMS - ALL COMPUTATIONAL PATHS AND MODULES OF THE ARC SYSTEM ARE RELATED. SOME OF THE IBM UTILITY PROGRAMS ARE USEFUL IN UPDATING AND MAINTAINING THE LIBRARIES OF THE ARC SYSTEM.
9. STATUS - ABSTRACT FIRST DISTRIBUTED OCTOBER 1972.
IBM360 VERSION SUBMITTED FEBRUARY 1972, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - L. C. JUST, H. FENRYSON II, A. S. KENNEDY, S. D. SPARCK, B. J. TOPPEL, AND P. M. WALKER, THE SYSTEMS ASPECTS AND INTERFACE DATA SETS OF THE ARGONNE REACTOR COMPUTATION (ARC) SYSTEM, ANL-7711, APRIL 1971.
B. J. TOPPEL, EDITOR, THE ARGONNE REACTOR COMPUTATION (ARC) SYSTEM, ANL-7332, NOVEMBER 1967.
ARC-SYSTEM - CONTENTS OF PARTITIONED DATA SET LIBRARIES, ACC NOTE, FEBRUARY 29, 1972.

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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 IHCFIUSM) 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-LINKED IT 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
APPLIED PHYSICS DIVISION
ARGONNE NATIONAL LABORATORY
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-3 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(α , β) 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 COVEYOU 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 GCDIVA. A HETEROGENEOUS MOCKUP OF ZPR3 ASSEMBLY 48 TAKES 3 HOURS.

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 O5R CODE AS ITS PREDECESSOR.
9. STATUS - ABSTRACT FIRST DISTRIBUTED OCTOBER 1972.
IBM360 VERSION SUBMITTED FEBRUARY 1972.
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, O5R, A GENERAL-PURPOSE MONTE CARLO NEUTRON TRANSPORT CODE, ORNL-3622, FEBRUARY 1965.
S. N. CRAMER, MONTE CARLO ANALYSIS OF THE EXACT GEOMETRIC MOCKUP OF ZPR-III ASSEMBLY 48, ORNL-TM-3596, OCTOBER 1971.
11. MACHINE REQUIREMENTS - AT LEAST 350K BYTES OF COMPUTER CORE
12. PROGRAMMING LANGUAGES USED - FORTRAN IV AND BAL
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
OAK RIDGE NATIONAL LABORATORY
P. O. BOX X
OAK RIDGE, TENNESSEE 37830
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK
SAMPLE PROBLEM
CONTROL INFORMATION (JCL
REFERENCE REPORT, ORNL-TM-3164
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

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17. CATEGORY - A
KEYWORDS - ELASTIC SCATTERING CROSS SECTIONS, ANGULAR
DISTRIBUTION, DIFFRACTION MODEL

1. NAME OR DESIGNATION OF PROGRAM - ORTHIS/ORTHAT
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - ORTHIS AND ORTHAT 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.
4. METHOD OF SOLUTION - ORTHIS USES THE ITERATIVE METHOD OF SUCCESSIVE OVERRELAXATION TO SOLVE THE STEADY-STATE PROBLEM. IN ADDITION TO OVERRELAXATION IT ALSO USES A DOMINANT-ERROR-MODE EXTRAPOLATION PROCEDURE TO INCREASE THE RATE OF CONVERGENCE. ORTHAT USES A MODIFIED ALTERNATING-DIRECTION IMPLICIT METHOD TO SOLVE THE TRANSIENT PROBLEM. THE INPUT FOR BOTH PROGRAMS HAS BEEN DESIGNED IN AN EASILY USABLE FREE-FORM STYLE.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
 - 1000 VERTICAL NODES
 - 1000 HORIZONTAL NODES
 - 10000 TOTAL NODES (ROWS*COLUMNS)
 - 50 VERTICAL REGIONS
 - 50 HORIZONTAL REGIONS
 - 2500 TOTAL REGIONS (ROWS*COLUMNS)
 - 300 MATERIALS
 - 1500 STEADY-STATE ITERATIONS
 - 5000 TRANSIENT TIME-STEPS
6. TYPICAL RUNNING TIME - BOTH PROGRAMS EXECUTE IN 2 TO 3 MINUTES.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED OCTOBER 1972.
IBM360 VERSION SUBMITTED MARCH 1972, ORTHIS SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - R. C. DUFFEE AND C. W. NESTOR, JR., ORTHIS, ORTHAT - TWO COMPUTER PROGRAMS FOR SOLVING TWO-DIMENSIONAL STEADY-STATE AND TRANSIENT HEAT CONDUCTION PROBLEMS, ORNL-TM-3324, JULY 1971.
ACC PROGRAMMING NOTE 73-3, JULY 31, 1972.
11. MACHINE REQUIREMENTS - ORTHIS REQUIRES 700K, ORTHAT REQUIRES 1024K BYTES.
12. PROGRAMMING LANGUAGES USED - FORTRAN IV AND BAL

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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 - PROBLEMS MAY BE PARTIALLY RUN AND THEN RESTARTED. THE PRINTOUT IS MADE AS READABLE AS POSSIBLE AND INCLUDES A PICTURE OF THE MESH ASSEMBLY AND TEMPERATURE DISTRIBUTIONS AND PROFILES.
15. NAME AND ESTABLISHMENT OF AUTHORS -
R. C. DURFEE AND C. W. NESTOR, JR.
OAK RIDGE NATIONAL LABORATORY
P. O. BOX X
OAK RIDGE, TENNESSEE 37830
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (ORTHIS 6944 CARDS, ORTHAT 7200 CARDS)
AUXILIARY SOURCE DECKS (960 CARDS)
SAMPLE PROBLEMS (ORTHIS 36 CARDS, ORTHAT 57 CARDS)
SAMPLE PROBLEM OUTPUT (ORTHIS 12 PAGES, ORTHAT 23 PAGES)
REFERENCE REPORT AND ACC NOTE
17. CATEGORY - H
KEYWORDS - 2-DIMENSIONAL GEOMETRIES, HEAT CONDUCTION, FUEL
ELEMENTS

1. NAME OR DESIGNATION OR PROGRAM - CLUP77
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - FACOM 230-60, IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - 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.
4. METHOD OF SOLUTION - THE COLLISION PROBABILITIES ARE COMPUTED BY A NUMERICAL DOUBLE INTEGRATION. AN ARRAY OF FUEL RODS, A CRUCIFORM CONTROL ROD AND A POISON CURTAIN IN THE ASSEMBLY ARE TREATED WITHOUT SMEARING. WHEN A ONE-GROUP CALCULATION WITH A FIXED SOURCE IS REQUIRED, THE FLUX DISTRIBUTION IS CALCULATED ITERATIVELY.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - A MAXIMUM OF 120 ASSEMBLIES ARE ALLOWED AND ALL ASSEMBLIES MUST BE SYMMETRIC BOTH BILATERALLY AND DIAGONALLY.
6. TYPICAL RUNNING TIME - 3 1/2 MINUTES EXECUTION TIME IS REQUIRED FOR THE SAMPLE PROBLEM ON THE FACOM 230-60, 2 1/2 MINUTES IS REQUIRED ON THE IBM360/75.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED OCTOBER 1972.
FACOM VERSION SUBMITTED MARCH 1972.
IBM360 VERSION SUBMITTED MAY 1972, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - KEIICHIRO TSUCHIHASHI, CLUP77 - A FORTRAN PROGRAM OF COLLISION PROBABILITIES FOR SQUARE CLUSTERED ASSEMBLY, JAERI-1196, JANUARY 1971.
KIYOSHI ASAI, FREE FORMAT, JAERI MEMO 4458, MAY 1971.
REMARKS TO USERS, JAERI MEMORANDUM.
INPUT DATA REQUIREMENTS OF CLUP-77, JAERI MEMORANDUM.
11. MACHINE REQUIREMENTS - 57K (CCTAL) WORDS ON THE FACOM, 250K BYTES ON THE IBM360
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - FACOM OPERATING SYSTEM, CS/360.

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. FENLINE
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. DOTSON, 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.
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.
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 LABORATORY
BATTELLE MEMORIAL INSTITUTE
P. O. BOX 999
RICHLAND, WASHINGTON 99352
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (SUBMODEL 1-173 CARDS, 2-427 CARDS, 3-796 CARDS,
4-1355 CARDS, 5-1672 CARDS, 6-259 CARDS, 7-338
CARDS, 8-1763 CARDS, 9-2716 CARDS, 10-3280 CARDS)
DOCUMENTATION (480 CARDS)
REFERENCE REPORT AND SYSTEM DESCRIPTIONS
17. CATEGORY - K
KEYWORDS - RADIATION EFFECTS, REACTOR SAFETY, DOSE RATES,
POWER PLANTS

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1. NAME OR DESIGNATION OF PROGRAM - PREP/KITT
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS 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 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.

6. TYPICAL RUNNING TIME - ON THE IBM360/75 RUNNING TIME IS ABOUT .06 SECOND FOR A TEN-COMPONENT TREE WITHOUT REPAIR.
7. UNUSUAL FEATURES OF THE PROGRAM - THE KITT PROGRAMS OBTAIN EXACT RELIABILITY QUANTITIES AS FUNCTIONS OF TIME RATHER THAN THE SINGLE-POINT OBTAINED BY MOST OTHER PROGRAMS.
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED OCTOBER 1972.
IBM360 VERSION SUBMITTED FEBRUARY 1972.
UNIVAC1108 VERSION SUBMITTED FEBRUARY 1972.
10. REFERENCES - W. F. VESELY, ANALYSIS OF FAULT TREES BY KINETIC TREE THEORY, IN-1330, OCTOBER 1969.
W. F. VESELY AND R. E. NARUM, THE USERS MANUAL FOR THE PREP AND KITT CODES, IN-1349, AUGUST 1970.
W. E. VESELY, SINGLE PRECISION MODIFICATIONS TO THE KITT-1 AND KITT-2 FAULT TREE CODES, IDAHO NUCLEAR CORPORATION MEMORANDUM, WEV-54-70, DECEMBER 9, 1970.
11. MACHINE REQUIREMENTS - 350K BYTES ON THE IBM360.
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360 MVT (IBM360).
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
W. E. VESELY AND R. E. NARUM
AFROJET NUCLEAR COMPANY
P. O. BOX 1845
IDAHO FALLS, IDAHO 83401
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (PREP 360-925 CARDS, 1108-785 CARDS, MINSET 360-654 CARDS, 1108-617 CARDS, RAND 360-75 CARDS, KITT1 360-915 CARDS, 1108-870 CARDS, KITT2 360-1049 CARDS, 1108-1049 CARDS)
SAMPLE PROBLEMS (PREP 360-35 CARDS, 1108-35 CARDS, KITT1 360-17 CARDS, 1108-17 CARDS, KITT2 360-44 CARDS, 1108-44 CARDS)
LOAD MODULES (360 PREP.TREEIL, KITT.KITT1, KITT.KITT2)
OBJECT MODULES (360 PREP.MINSET)
CONTROL INFORMATION (JCL 360-56 CARDS)
SAMPLE PROBLEM OUTPUT (8 REPLACEMENT PAGES)
REFERENCE REPORT, IN-1349, AND MEMORANDUM
17. CATEGORY - G
KEYWORDS - RELIABILITY, FAULT TREE, PROBABILITY, SAFETY ANALYSIS, ACCIDENTS, FAILURE

1. NAME OR DESIGNATION OF PROGRAM - ANVENT
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - GE635 MARK2 TIME-SHARING SYSTEM
3. DESCRIPTION OF PROBLEM OR FUNCTION - 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 COMPANY'S 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.
4. METHOD OF SOLUTION - THE SYSTEM IS DIVIDED INTO THREE REGIONS - AN UPPER REGION, A LOWER REGION, AND THE MIDDLE, OR ICE CONDENSER REGION. FINITE DIFFERENCE EQUATIONS ARE SOLVED TO DETERMINE THE TEMPERATURES AT VARIOUS NODES FOR BOTH THE STEADY-STATE AND TRANSIENT CONDITION.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE MODEL IS ONE-DIMENSIONAL WITH HEAT TRANSFER OCCURRING ONLY IN THE RADIAL DIRECTION. ALL PHYSICAL PROPERTIES ARE INDEPENDENT OF TEMPERATURE EXCEPT THE DENSITY OF THE ANNULUS AIR WHICH BEHAVES AS AN IDEAL GAS AND EXISTS UNIFORMLY AT ITS MEAN MIXED TEMPERATURE. THE AIR IN THE ANNULUS HAS A TRANSMISSIVITY OF 1. RADIATIVE HEAT TRANSFER OCCURS BETWEEN THE CONCRETE REACTOR BUILDING AND THE STEEL CONTAINMENT BUILDING. CIRCULATION OF REFRIGERATING AIR IN THE ICE-CONDENSER AIR DUCTS CEASES AT THE INITIATION OF THE LOCA. LEAKAGE OF AIR ACROSS THE CONCRETE REACTOR BUILDING OR THE STEEL CONTAINMENT SHELL IS NEGLIGIBLE. THERMAL CONTACT RESISTANCES ARE NEGLECTED.
6. TYPICAL RUNNING TIME -
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED OCTOBER 1972.
GE635 VERSION SUBMITTED FEBRUARY 1972.
10. REFERENCE - R. S. KRELL AND J. L. KELLY, ANVENT ANNULUS VENTILATION PROGRAM FOR WESTINGHOUSE ICE-CONDENSER NUCLEAR UNIT, DUKE POWER COMPANY PROGRAM DESCRIPTION, DECEMBER 3, 1971.
11. MACHINE REQUIREMENTS -

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12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
GE635 MARK 2 TIME-SHARING SYSTEM.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
J. L. KELLY AND R. S. KRELL
DUKE POWER COMPANY
422 SOUTH CHURCH STREET
CHARLOTTE, NORTH CAROLINA 28201
16. MATERIAL AVAILABLE -
SOURCE DECK (432 CARDS)
REFERENCE PROGRAM DESCRIPTION
17. CATEGORY - G
KEYWORDS - ACCIDENTS, HEAT CONDUCTION, REACTOR SAFETY, COOLANTS

1. NAME OR DESIGNATION OF PROGRAM - GENRD
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600, IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - GENRD WILL READ AND PROCESS FREE-FORMAT NUMERIC AND HOLLERITH INPUT DATA FROM CARDS.
4. METHOD OF SOLUTION - GENRD READS INPUT DATA AS A CARD IMAGE, DECODES THE RESULTING CHARACTER STRING TO FORM A SET OF INTEGERS, REAL CONSTANTS, OR HOLLERITH WORDS, AND STORES THE SET INTO A CONTAINER ARRAY SPECIFIED IN THE PARAMETER LIST.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THERE IS NO PROVISION FOR TYPING DOUBLE PRECISION, COMPLEX, OR LOGICAL INPUT. GENRD CANNOT RECOGNIZE CCTL OR OTHER NON-STANDARD INPUT FORMS. HOLLERITH INFORMATION CANNOT BE CONTINUED FROM ONE CARD TO THE NEXT NOR CAN IT BE CONTAINED WITHIN A REPEAT SPECIFICATION. SUGGESTIONS ARE INCLUDED IN THE REPORT FOR WAYS TO OVERCOME SOME OF THESE DIFFICULTIES. THERE IS NO PROVISION FOR LIMITING THE LENGTH OF A DIGIT STRING SINCE THE MAXIMUM NUMBER OF DIGITS WHICH CAN BE USED TO REPRESENT AN INTEGER IS MACHINE DEPENDENT.
6. TYPICAL RUNNING TIME - AN INPUT DECK OF MIXED NUMERIC AND HOLLERITH DATA CAN BE PROCESSED AT THE RATE OF 70 CARDS PER SECOND.
7. UNUSUAL FEATURES OF THE PROGRAM - GENRD HAS BEEN WRITTEN ENTIRELY IN STANDARD FORTRAN IV LANGUAGE TO MAKE IT EASILY AVAILABLE ON A VARIETY OF COMPUTERS. IN ADDITION TO STORING ISOLATED DATA AS IT IS ENCOUNTERED ON THE CARDS IT CAN MANIPULATE DATA ACCORDING TO THE INTERPOLATE (I), REPEAT (R), OR SKIP WORDS (S) SPECIFICATIONS. THUS, IT CAN GENERATE AND INSERT A SPECIFIED NUMBER OF EQUALLY SPACED INTERPOLATES BETWEEN TWO CONSTANTS, IT CAN REPEAT THE STORAGE OF A SET OF CONSTANTS A SPECIFIED NUMBER OF TIMES, AND IT CAN PASS OVER A SPECIFIED NUMBER OF WORDS IN THE CONTAINER ARRAY WHEN STORING PROCESSED INPUT. A NUMERIC ENTITY, SUCH AS A LONG R SPECIFICATION, MAY BE CONTINUED FROM ONE CARD TO THE NEXT.
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED OCTOBER 1972.
CDC6600 VERSION SUBMITTED APRIL 1972.
IBM360 VERSION SUBMITTED APRIL 1972, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - CLARICE W. COX, GENRD - A FREE-FORMAT CARD INPUT PROCESSOR, LA-4793, JANUARY, 1972.
CLARICE W. COX, NOTES ON GENRD PACKAGE, IBM-360 VERSION, LASL MEMORANDUM.
CLARICE W. COX, NOTES ON GENRD PACKAGE, CDC-6600 VERSION, LASL MEMORANDUM.

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11. MACHINE REQUIREMENTS - 3000 DECIMAL WORDS OF CORE, USUAL I/O, AND ONE TAPE OR DISK UNIT.
12. PROGRAMMING LANGUAGE USED - ANSI STANDARD FORTRAN
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - CDC6600 SCOPE 3 AND IBM360 DDS.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHOR -
CLARICE W. CCX
LOS ALAMOS SCIENTIFIC LABORATORY
UNIVERSITY OF CALIFORNIA
LOS ALAMOS, NEW MEXICO 87544
16. MATERIAL AVAILABLE -
SOURCE DECKS (360-696 CARDS, 6600-695 CARDS)
SAMPLE PROBLEM (360-18 CARDS, 6600-18 CARDS)
SAMPLE PROBLEM OUTPUT (360-4 PAGES, 6600-3 PAGES)
REFERENCE REPORT AND MEMORANDA
17. CATEGORY - L
KEYWORDS - INPUT DATA, DATA PROCESSING, FREE-FORMAT

1. NAME OR DESIGNATION OF PROGRAM - CLEM
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - CLEM GENERATES CONSTRAINED LEGENDRE MOMENTS FOR NEUTRON SCATTERING ANGULAR DISTRIBUTIONS. THE CONSTRAINT IS THAT THE ANGULAR DISTRIBUTION ITSELF SHOULD BE NON-NEGATIVE.
4. METHOD OF SOLUTION - THE ANGULAR DISTRIBUTIONS ARE EXPANDED IN TERMS OF LEGENDRE POLYNOMIALS AND A NON-NEGATIVE CONSTRAINT IS APPLIED.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
6. TYPICAL RUNNING TIME - THE PROGRAM WILL COMPILE AND EXECUTE THE SAMPLE PROBLEM USING 33 SECONDS CP TIME, 41 SECONDS PP TIME.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - CLEM CALLS SUBROUTINES GRLIN, SPLCT, PMARK, AND PENEND. THESE ROUTINES ARE INCLUDED IN KAPLPLOT (ACC ABSTRACT 496).
9. STATUS - ABSTRACT FIRST DISTRIBUTED OCTOBER 1972.
CDC6600 VERSION SUBMITTED MARCH 1972.
10. REFERENCES - C. J. SLAVIK, C. R. LUBITZ, J. T. REYNOLDS, CLEM - A LEGENDRE POLYNOMIAL FITTING PROGRAM WITH A NON-NEGATIVITY CONSTRAINT, KAPL-M-6923, MAY 22, 1968.
11. MACHINE REQUIREMENTS - 300K, USUAL I/O, AND ONE TAPE UNIT
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 AUTHORS -
C. J. SLAVIK, C. R. LUBITZ, J. T. REYNOLDS
GENERAL ELECTRIC COMPANY
KNOLLS ATOMIC POWER LABORATORY
P. O. BOX 1072
SCHENECTADY, NEW YORK 12301
16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (979 CARDS)
SAMPLE PROBLEM (116 CARDS)

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16. MATERIAL AVAILABLE (CONTINUED)
SAMPLE PROBLEM OUTPUT (16 SELECTED PAGES)
REFERENCE REPORT
17. CATEGORY - A
KEYWORDS - NEUTRON SCATTERING, LEGENDRE COEFFICIENTS, KAPLPLOT
CODES

1. NAME OR DESIGNATION OF PROGRAM - LOS ALAMOS GROUP-AVERAGED CROSS SECTIONS
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - GROUP CONSTANTS AND COMPUTED NEUTRON CROSS SECTIONS ARE TABULATED FOR A VARIETY OF MATERIALS INCLUDING - AL, B, BF, C, CD, CL, D, GA, FI94, FE, H, K, LI6, MO, NA, NI, O, PU232, 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.
4. METHOD OF SOLUTION - THE TABLES ARE ARRANGED IN INCREASING NUCLIDE NUMBER IN THE FORMAT USED BY THE LASL TRANSPORT THEORY PROGRAMS. WITH A FEW EXCEPTIONS, ELEMENTS ARE GIVEN IN ALPHABETICAL ORDER. ALL CROSS SECTIONS ARE IN BARNS.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
6. TYPICAL RUNNING TIME -
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - ROTAX, A PROGRAM USED AT LASL TO PREPARE A BINARY LIBRARY TAPE FOR USE WITH DTF FROM THE RCD DATA TAPE HAS BEEN INCLUDED IN THIS PACKAGE.
9. STATUS - ABSTRACT FIRST DISTRIBUTED OCTOBER 1972.
CDC6600 VERSION SUBMITTED OCTOBER 1967.
10. REFERENCES - G. I. BELL, J. J. DEVANEY, G. E. HANSEN, C. B. MILLS, AND W. H. ROACH, LOS ALAMOS GROUP-AVERAGED CROSS SECTIONS, LAMS-2941, SEPTEMBER 1963.
F. BRINKLEY, LASL MEMORANDUM (ROUGH DRAFT), OCTOBER 10, 1967.
11. MACHINE REQUIREMENTS -
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - CDC6600 SCOPE.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHOR -
C. B. MILLS
LOS ALAMOS SCIENTIFIC LABORATORY
P. O. BOX 1663
LOS ALAMOS, NEW MEXICO 87544

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16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (RDTAX 62 CARDS)
18-GROUP CROSS SECTIONS (4522 CARDS)
24-GROUP CROSS SECTIONS (3111 CARDS)
25-GROUP CROSS SECTIONS (15,313 CARDS)
REFERENCE REPORT AND MEMORANDUM
17. CATEGORY - Z
KEYWORDS - CROSS SECTIONS, INPUT DATA, LIBRARIES, DTF CODES, RDTAX
CODES

1. NAME OR DESIGNATION OF PROGRAM - ARC(NUI002) BCD INPUT PROCESSOR
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360/50 AND LARGER MODELS
3. NATURE OF PHYSICAL PROBLEM SOLVED - 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.
4. METHOD OF SOLUTION - THIS MODULE READS AND ANALYZES THE CARD IMAGE DATA IN THE DATA SET A.NIP. THESE DATA DEFINE REACTOR GEOMETRY, MESH STRUCTURE, REGION AND COMPOSITION ASSIGNMENTS, BOUNDARY CONDITIONS, PROBLEM TYPE, CRITICALITY SEARCH SPECIFICATIONS, AND EXTERNAL SOURCE DATA. INSUFFICIENT OR INCONSISTENT DATA ARE NOTED WITH ERROR MESSAGES, AND PROCESSING CONTINUES. BINARY INTERFACE DATA SETS ARE WRITTEN FOR USE BY OTHER MODULES. ON OPTION EDITS OF THE DATA SETS PRODUCED ARE PROVIDED INCLUDING A REGION-COMPOSITION-MESH MAP OF THE REACTOR CORE.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
6. TYPICAL RUNNING TIME - THE SAMPLE PROBLEM PROVIDED REQUIRES ABOUT 3 SECONDS ON AN IBM360/75.
7. UNUSUAL FEATURES OF THE PROGRAM - THE MODULAR DESIGN ALLOWS THE USE OF THE SAME INPUT PROCESSOR, ARC(NUI002), FOR EACH OF THE NEUTRONICS COMPUTATIONAL MODULES WITH COMMUNICATION VIA INTERFACE DATA SETS.
8. RELATED AND AUXILIARY PROGRAMS - ALL NEUTRONICS PATHS OF THE ARC SYSTEM UTILIZE THIS MODULE. THE ARC SYSTEM ENVIRONMENT IS PROVIDED BY ARC-SYSTEM (ACC ABSTRACT 522).
9. STATUS - ABSTRACT FIRST DISTRIBUTED OCTOBER 1972.
IBM360 VERSION SUBMITTED APRIL 1972, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - E. A. KOVALSKY AND D. E. NEAL, THE ARC SYSTEM NEUTRONICS INPUT PROCESSOR, ANL-7713, JANUARY 1971.
L. C. JUST, H. HENRYSON II, A. S. KENNEDY, S. D. SPARCK, R. J. TOPPEL, AND P. M. WALKER, THE SYSTEM ASPECTS AND INTERFACE DATA SETS OF THE ARGONNE REACTOR COMPUTATION (ARC) SYSTEM, ANL-7711, APRIL 1971.
ARC(NUI002) SUPPLEMENTAL INFORMATION, 1972.
11. MACHINE REQUIREMENTS - ABOUT 255K BYTES ARE REQUIRED WITH A 10,000 DOUBLE WORD CONTAINER (DEFAULT). ONE PERIPHERAL I/O DEVICE IS REQUIRED.
12. PROGRAMMING LANGUAGE USED - FORTRAN IV

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13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
OS/360 MVT.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
THIS MODULE IS EXECUTED IN AN ARC SYSTEM ENVIRONMENT (ACC ABSTRACT
522).
15. NAME AND ESTABLISHMENT OF AUTHORS -
E. A. KOVALSKY
APPLIED MATHEMATICS DIVISION
ARGONNE NATIONAL LABORATORY
9700 SOUTH CASS AVENUE
ARGONNE, ILLINOIS 60439

CONTACT B. J. TOPPFL
APPLIED PHYSICS DIVISION
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (PDS NUI002.SOURCE)
OBJECT MODULES (PDS NUI002.SGLIB)
LINKAGE EDITOR CONTROL STATEMENTS (PDS NUI002.OVERLAY)
LOAD MODULES (PDS NUI002.MODLIB)
CONTROL INFORMATION (JCL IEHMOVE 20 CARDS)
SAMPLE PROBLEM (263 CARDS)
SAMPLE PROBLEM OUTPUT (IEHMOVE 2 PAGES, EXECUTION 16 PAGES)
REFERENCE REPORTS AND SUPPLEMENTAL INFORMATION
17. CATEGORY - L
KEYWORDS - MODULAR SYSTEM, INPUT DATA, ARC CODES

1. NAME OR DESIGNATION OF PROGRAM - EISPACK
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360, CDC6000-7000, UNIVAC1108, PDP10 AND H635
3. DESCRIPTION OF PROBLEM OR FUNCTION - 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
BALPAK 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)
CRTBAK 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.
COMPAK 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
RATOR E2F298	FIND EXTREME VALUES OF SYM. TRIDIAG. MATRIX
FLTRAN E2F220	ACCUMULATE TRANSFORMATIONS FROM ELMHES (FOR HQR2)
CRTRAN E2F221	ACCUMULATE TRANSFORMATIONS FROM ORTHES (FOR HQR2)
FIGI2 E2F222	REDUCE NONSYM. TRIDIAG. MATRIX TO SYM. TRIDIAG.
TINVIT E2F223	FIND SOME VECTORS OF SYM. TRIDIAG. MATRIX
EISPAK E2F299	CONTROL PROGRAM FOR EISPACK
4. METHOD OF SOLUTION - QR, LP, QL, RATIONAL QR, BISECTION, AND INVERSE ITERATION METHODS ARE USED.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -

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 -

FIELD TESTING OF THE CURRENT VERSIONS OF BISECT E2F294 AND TINVIT E2F223 IS NOT YET COMPLETE.

THE NATS PROJECT FULLY SUPPORTS CERTIFIED ROUTINES IN THE SENSE THAT DETAILED INFORMATION ON THE TESTING PROCEDURES IS AVAILABLE AND REPORTS OF 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 OCTOBER 1972.
 IBM360 VERSION SUBMITTED MAY 1972.
 CDC6000-7000 VERSION SUBMITTED MAY 1972.
 UNIVAC1108 VERSION SUBMITTED MAY 1972.
 PDP10 AND H635 VERSION SUBMITTED MAY 1972.

10. REFERENCES - J. H. WILKINSON AND C. REINSCH, HANDBOOK FOR AUTOMATIC COMPUTATION, VOLUME II, LINEAR ALGEBRA, SPRINGER-VERLAG, NEW YORK, HEIDELBERG, BERLIN, 1971.

11. MACHINE REQUIREMENTS -

12. PROGRAMMING LANGUAGES USED - FORTRAN IV(G) AND (H) (IBM360/75 AND 370/165), FORTRAN IV(F) (IBM360/65,67), WATFIV (IBM360/67), FORTRAN RUN,FTN, AND FLN (CDC6000-7000), FORTRAN IV (H635), AND FORTRAN V (UNIVAC1108)

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - CS/360 (IBM360/75,65 AND IBM370/165), MTS (IBM360/67), STAN (IBM360/67), PURD (CDC6500), LLL (CDC6600,7600), UTEX (CDC6600/6400), NCAR (CDC6600,7600), SCOPE 3.3 (CDC6400), GECOS III (H635), 503 MONITOR (PDP10), AND EXEC 8 (UNIVAC1108).

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THE IBM DISTRIBUTION INCLUDES ALL PROGRAMS LISTED UNDER ITEM 3. OTHER MACHINE VERSIONS DO NOT INCLUDE EISPAK E2F299.

LOCATIONS AND MACHINES USED FOR EISPAK TESTING WERE -

MACHINE	TEST SITE
IBM360/75	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)
IBM370/165	THE UNIVERSITY OF TORONTO
CDC6600,7600	LAWRENCE LIVERMORE LABORATORY (LLL)

14. ANY OTHER INFORMATION OR RESTRICTIONS (CONTINUED)

CDC6600/6400	THE UNIVERSITY OF TEXAS AT AUSTIN (UTEX)
CDC6600,7600	NATIONAL CENTER FOR ATMOSPHERIC RESEARCH (NCAR)
CDC6400	NORTHWESTERN UNIVERSITY
CDC6500	PURDUE UNIVERSITY (PURD)
PDP-10	YALE UNIVERSITY
HONEYWELL (GF) 635	UNIVERSITY OF KANSAS
UNIVAC 1108	UNIVERSITY OF WISCONSIN

ADDITIONAL TESTING WAS CARRIED OUT BY OAK RIDGE NATIONAL LABORATORY AND THE NOTTINGHAM ALGORITHMS GROUP.

15. NAME AND ESTABLISHMENT OF AUTHOR -

CONTACT BURTON S. GARBOW
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ARGONNE NATIONAL LABORATORY
9700 S. CASS AVENUE
ARGONNE, ILLINOIS 60439

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL

SOURCE DECKS (360 8100 CARDS, 6000-7000 5632 CARDS, 1103 5632
CARDS, PDP-HONEYWELL 5632 CARDS)
OBJECT DECKS (360 38 CARDS)
CONTROL INFORMATION (JCL 360-475 CARDS)
TAPE DOCUMENTATION (360 11,509 CARDS, OTHER MACHINE VERSIONS
10,349 CARDS)

17. CATEGORY - P

KEYWORDS - EIGENVALUE, EIGENVECTOR, MATRICES, NUMERICAL CALCULATION

1. NAME OR DESIGNATION OF PROGRAM - MULTI
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - MULTI COMPUTES SCATTERING CROSS SECTIONS.
4. METHOD OF SOLUTION - THE MULTI-LEVEL RESONANCE FORMULA OF F. A. BETHE IS USED TO COMPUTE THE SCATTERING CROSS SECTIONS.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - ONLY S-WAVE INCIDENT NEUTRONS ARE ALLOWED.
6. TYPICAL RUNNING TIME - COMPILATION AND EXECUTION OF SAMPLE PROBLEM REQUIRES 10 SECONDS CPU TIME AND 22 SECONDS PP TIME.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - MULTI CALLS THE PLOTTING SUBROUTINES PLTSIZE, LINLG, SPLOT AND PENEND WHICH ARE INCLUDED IN THE PROGRAM PACKAGE KAPLPLOT (ACC ABSTRACT 496).
9. STATUS - ABSTRACT FIRST DISTRIBUTED OCTOBER 1972.
CDC6600 VERSION SUBMITTED APRIL 1972.
10. REFERENCES - C. J. SLAVIK, MULTI, A MULTI-LEVEL RESONANCE THEORY PROGRAM, ADA-TP-15, MAY 1971.
H. A. BETHE, REV. MOD. PHYS., 9, 69 (1937).
H. FESHBACH, NUCLEAR SPECTROSCOPY PART B, F. AJZENBERG-SELGVE, ED., ACADEMIC PRESS, 1960.
11. MACHINE REQUIREMENTS - INPUT, OUTPUT, AND TWO TAPE UNITS.
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - CDC6600 SCOPE.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - TO AVOID CALLING THE PLOTTING ROUTINES, SUBROUTINE PLT CAN BE REMOVED AND THE SINGLE CALL PLT IN SUBROUTINE FUNK SHOULD BE DELETED.
15. NAME AND ESTABLISHMENT OF AUTHOR -
C. J. SLAVIK
GENERAL ELECTRIC COMPANY
KNOLLS ATOMIC POWER LABORATORY
P. O. BOX 1072
SCHENECTADY, NEW YORK 12301

16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
SOURCE DECK (371 CARDS)
SAMPLE PROBLEM (61 CARDS)
SAMPLE PROBLEM OUTPUT (16 PAGES AND 5 GRAPHS)
REFERENCE REPORT, ADA-TP-15
17. CATEGORY - A
KEYWORDS - SCATTERING CROSS SECTION, RESONANCE, KAPLPLCT CODES

1. NAME OR DESIGNATION OF PROGRAM - RAHAB LATTICE PHYSICS MODULES
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - 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.
4. METHOD OF SOLUTION - AN ITERATIVE TECHNIQUE IS USED TO SOLVE THE INTEGRAL TRANSPORT EQUATIONS. AN INNER ITERATION IS USED TO COMPUTE THE SPATIAL SHAPE FOR ONE ENERGY GROUP WITH SOURCE TERMS FROM OTHER ENERGY GROUPS HELD CONSTANT. AN OUTER ITERATION SETTLES THE THERMAL FLUX ENERGY DISTRIBUTION AND FISSION SOURCE SHAPE.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE CODE IS RESTRICTED TO 150 MESH POINTS, 100 ENERGY GROUPS AND 50 DIFFERENT ISOTOPES.
6. TYPICAL RUNNING TIME - A PROBLEM CONTAINING 100 MESH POINTS, 37 ENERGY GROUPS, USUALLY REQUIRES ABOUT 1 MINUTE CPU TIME ON AN IBM360/195.
8. RELATED AND AUXILIARY PROGRAMS - JOSHUA OPERATING SYSTEM (ACC ABSTRACT 490).
9. STATUS - ABSTRACT FIRST DISTRIBUTED OCTOBER 1972.
IBM360 VERSION SUBMITTED APRIL 1972.
10. REFERENCES - THE JOSHUA SYSTEM, DPSTM-500
VOL. 1 GENERAL NOVEMBER 1969
VOL. 2 USER'S GUIDE OCTOBER 1970
VOL. 3 DATA SET SPECS DECEMBER 1969, REV. 5/71
VOL. 4 LATTICE PHYSICS JUNE 1970
11. MACHINE REQUIREMENTS - 260K BYTES
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - CS/360 AND HASP.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHOR -
F. C. HONECK
SAVANNAH RIVER LABORATORY

15. NAME AND ESTABLISHMENT OF AUTHOR(S) (CONTINUED)
E. I. DUPONT DE NEMOURS AND COMPANY, INC.
AIKEN, SOUTH CAROLINA 29801
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (22,729 CARDS)
AUXILIARY ROUTINES (280 CARDS)
17. CATEGORY - B
KEYWORDS - 2-DIMENSIONAL, MULTIGROUP, LATTICES, TRANSPORT THEORY,
MODULAR SYSTEM, JCSHUA CODES

1. NAME OR DESIGNATION OF PROGRAM - M0678 (FUGIT1)
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - 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.
4. METHOD OF SOLUTION - THE F4ICE ROUTINE IS USED TO SOLVE FIRST-ORDER TRANSIENT EQUATIONS OF MOTION BY MODIFIED EULER METHOD OF INTEGRATION.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
1 TO 6 DEGREES OF FREEDOM IN THE BASE MOTION
1 TO 30 ROWS AND COLUMNS IN THE FLEXIBILITY MATRIX
0 TO 3 TYPES OF DAMPING
6. TYPICAL RUNNING TIME - 5 MINUTES ARE REQUIRED FOR A TYPICAL PROBLEM.
7. UNUSUAL FEATURES OF THE PROGRAM - EITHER THE FLEXIBILITY OR STIFFNESS MATRICES MAY BE INPUT. NONLINEAR CONSTRAINTS AND DAMPING MAY BE USED. FREQUENCY ANALYSES OF OUTPUT MAY BE PLOTTED.
8. RELATED AND AUXILIARY PROGRAMS - M0397 DETERMINES THE FLEXIBILITY OR STIFFNESS MATRIX OF AN ELASTIC STRUCTURE. FUGIT1 USES THE BETTIS ENVIRONMENTAL ROUTINES (ACC ABSTRACT 478).
9. STATUS - ABSTRACT FIRST DISTRIBUTED OCTOBER 1972.
10. REFERENCES - C. M. FRIEDRICH, FUGIT-1, A COMPUTER PROGRAM FOR THE DYNAMIC RESPONSE OF ELASTIC STRUCTURES WITH NONLINEAR CONSTRAINTS AND DAMPING, WAPD-TM-650, OCTOBER 1969.
C. J. PFEIFER, CDC-6600 FORTRAN PROGRAMMING - BETTIS ENVIRONMENTAL REPORT, WAPD-TM-668, JANUARY 1967.
11. MACHINE REQUIREMENTS - INPUT TAPE, OUTPUT TAPE, 150,000 (OCTAL) CENTRAL MEMORY, PLOT ROUTINES
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCCPE.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHOR -
C. M. FRIEDRICH
BETTIS ATOMIC POWER LABORATORY
WESTINGHOUSE ELECTRIC CORPORATION

15. NAME AND ESTABLISHMENT OF AUTHOR(S) (CONTINUED)
P. O. BOX 79
WEST MIFFLIN, PENNSYLVANIA 15122
16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (1340 CARDS)
SAMPLE PROBLEM (26 CARDS)
SAMPLE PROBLEM OUTPUT (25 PAGES)
REFERENCE REPORT, WAPD-TM-650
17. CATEGORY - I
KEYWORDS - ELASTIC STRUCTURES, STRUCTURAL ANALYSIS, NON-LINEAR
CONSTRAINTS, M0397 CODES

VI. LIBRARY PROGRAMS BY PROBLEM CLASSIFICATION

A. CROSS SECTION AND RESONANCE INTEGRAL CALCULATIONS

1/73

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 $\text{SIGMA}(E(0) \text{ TO } E, \cos(\theta))$
 $D(\cos(\theta))$

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.

173

177 DCPIE DOPIE WAS DEVELOPED TO STUDY
THE EFFECTS OF -

- DOPIE COMPUTES FLUX-AVERAGED CROSS SECTIONS OVER A GIVEN ENERGY RANGE UNDER THE FOLLOWING ASSUMPTION

- 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 FASDCP FASDCP EVALUATES POINTWISE, TEMPERATURE-DEPENDENT 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 (LAB) 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 $1.0/\text{SQRT}(E)$ FOR LEVELS NOT EXPLICITLY CONSIDERED. ALSO THE CROSS SECTION IN THE WINGS OF A NEGATIVE ENERGY RESONANCE, $\text{CONSTANT}/(\text{SQRT}(E)*(E-E_0)**2)$ 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 SCATTERING KERNELS ARE OBTAINED FROM THE SCATTERING LAW COMPUTED BY THE CODE GASKET. FLANGE1 ALLOWS THE CALCULATION OF DOUBLE DIFFERENTIAL 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 PSEUDC RESONANCE PARAMETERS ARE CONSTRUCTED FROM AVERAGE NUCLEAR PROPERTIES IN THE RESOLVED RESONANCE REGION.

1/73

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.

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381 LYNN LYNN PERFORMS A MULTIPOLE 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 MOORE 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.

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465 AVRA3/AVRA4/SIGMA2/ADLER AVRA3 CALCULATES AVERAGE DATA OF THE UNRESOLVED PARAMETERS OF FILE 2 OF ENDF/B VERSION II DATA.

AVRA4 CALCULATES AVERAGE SCATTERING, CAPTURE, AND FISSION CROSS SECTIONS FROM S-, P-, AND D-WAVE DATA OF THE UNRESOLVED PARAMETERS OF FILE 2 OF ENDF/B VERSION II DATA.

SIGMA2 CALCULATES THE SCATTERING, CAPTURE, FISSION, AND TOTAL CROSS SECTIONS FROM RESOLVED RESONANCE PARAMETER DATA OF FILE 2 OF ENDF/B VERSION II DATA. 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.

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.

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, ALPHA, NP, ND, NT, NHE-3, N-ALPHA, PN, 2F, P-ALPHA, ALPHA-N, ALPHA-P, AND DN.

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33 GAM1/REP/UPDATE THIS PROGRAM COMPUTES THE SLOWING-DOWN SPECTRUM IN EITHER THE P1 OR THE B1 APPROXIMATION USING 68 GROUPS OF NEUTRONS WITH A CONSTANT GROUP WIDTH $CU=0.25$, MULTIGROUP CONSTANTS ARE CALCULATED FOR UP TO 32 FAST GROUPS.

50 TEMPEST2 TEMPEST2 IS A NEUTRON THERMALIZATION PROGRAM BASED UPON THE WIGNER-WILKINS APPROXIMATION FOR LIGHT MODERATORS AND THE WILKINS APPROXIMATION FOR HEAVY MODERATORS. A MAXWELLIAN DISTRIBUTION MAY ALSO BE USED. THE MODEL USED MAY BE SELECTED AS A FUNCTION OF ENERGY. THE SECOND-ORDER DIFFERENTIAL EQUATIONS ARE INTEGRATED DIRECTLY RATHER THAN TRANSFORMED TO THE RICCATI EQUATION. THE PROGRAM PROVIDES MICROSCOPIC AND MACROSCOPIC CROSS SECTION AVERAGES OVER THE THERMAL NEUTRON SPECTRUM.

51 FORM 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.

52 SAIL THE MONOENERGETIC NEUTRON TRANSPORT EQUATION IS SOLVED USING THE DISCRETE SN METHOD FOR A ONE-DIMENSIONAL PLANE CELL. CELL PROPERTIES ARE COMPUTED.

53 S4 CYLINDRICAL GEOMETRY CELL C THIS PROGRAM SOLVES THE ONE-DIMENSIONAL MONOENERGETIC BOLTZMANN EQUATION IN CYLINDRICAL GEOMETRY, USING THE S4 APPROXIMATION. IN ADDITION TO THE FLUX DISTRIBUTION, CELL-AVERAGED PARAMETERS ARE COMPUTED.

108 BAM BAM COMPUTES THERMAL CONSTANTS, SPATIAL AND ENERGY DISTRIBUTIONS IN HETEROGENEOUS CYLINDRICAL CELLS BY ASSUMING SEPARABILITY OF SPACE AND ENERGY IN THE BOLTZMANN EQUATION.

113 ZOT ZOT TAKES MULTIGROUP NEUTRON CROSS SECTION SETS IN THE SN FORMAT (SNG, DSN, ETC.) AND REDUCES THE NUMBER OF GROUPS (COLLAPSES) ACCORDING TO A GIVEN OR COMPUTED MULTIGROUP FLUX SPECTRUM. AVERAGE VELOCITIES FOR THE FEW-GROUP SET MAY BE GENERATED ON THE BASIS OF THE FLUXES AND VOLUMES FOR A GIVEN REACTOR CONFIGURATION.

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139 QUICKIE QUICKIE SOLVES THE NEUTRON SLOWING DOWN AND THERMALIZATION PROBLEM IN INFINITE MEDIA BY INVERTING A SET OF SIMULTANEOUS MULTIGROUP EQUATIONS. THE CODE USES THE ULCER (ACC ABSTRACT 118) LIBRARY TAPE AND IS IN EXCELLENT AGREEMENT WITH ULCER FOR THOSE CASES WHERE BUCKLING IS KNOWN.

147 AILMOE AILMOE IS A MODIFIED FORM OF THE ANL ELMOE PROGRAM. THE FOURIER TRANSFORM OF THE FAST NEUTRON FLUX IS FOUND FOR A MIXTURE OF MODERATORS HEAVIER THAN HYDROGEN WITH THE MODERATOR SCATTERING LAW RIGOROUSLY ACCOUNTED FOR.

149 TYCHE3 TYCHE3 IS A MONTE CARLO CODE DESIGNED TO FIND THE SECOND, FOURTH AND SIXTH MOMENTS OF THE NEUTRON SLOWING DOWN DENSITY DISTRIBUTION IN AN INFINITE HOMOGENEOUS MEDIUM. NEUTRON WEIGHTS ARE USED TO AVOID THE TERMINATION OF A HISTORY BY ABSORPTION AND MINIMIZE THE RUNNING TIME. PROVISIONS ARE MADE FOR RESTART OF NON-CONVERGED PROBLEMS, GRAPHICAL DISPLAYS OF THE MOMENTS AND AVERAGE FISSION ENERGY AS A FUNCTION OF THE NUMBER OF SETS OF HISTORIES AND CALCULATION OF THE CORRECTION TO FLUX MOMENTS.

150 DANCOFF JR. THIS CODE EVALUATES MODERATOR SPACE CHORD DISTRIBUTION FUNCTIONS OF ZEROth AND FIRST ORDER, PLUS THEIR LINEAR, SQUARE, LOGARITHMIC AND EXPONENTIAL MOMENTS, FOR REGULAR AND IRREGULAR LATTICES OF CYLINDRICAL FUEL RODS CLAD WITH MATERIAL OF NEGLIGIBLE TOTAL CROSS SECTION. OF PARTICULAR SIGNIFICANCE FOR REACTOR DESIGN CALCULATIONS IS THE EXPONENTIAL MOMENT, OR DANCOFF CORRECTION, WHICH CAN BE CALCULATED EXACTLY IN INFINITE SQUARE AND HEXAGONAL LATTICES, IN CLUMPED SQUARE LATTICES WITH STRAIGHT OR CRUCIFORM WATER GAPS, OR IN CLUSTERS OF TWO, THREE, SEVEN, AND NINETEEN FUEL RODS.

160 SOPHIST SOPHIST1 CALCULATES TEMPERATURE-DEPENDENT MULTIGROUP ENERGY TRANSFER COEFFICIENTS FOR A MAXWELL GAS MODERATOR WITH ELASTIC, ISOTROPIC SCATTERING IN THE CENTER OF MASS SYSTEM. SOPHIST2 CALCULATES TEMPERATURE-DEPENDENT MULTIGROUP CROSS SECTIONS FOR A MAXWELL GAS. SOPHIST5 CALCULATES MULTIGROUP ENERGY TRANSFER MATRICES FOR ANISOTROPIC ELASTIC SCATTERING.

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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-1 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.

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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,
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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 GARCL GARCL 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.

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237 BOUNCE BOUNCE DETERMINES THE CNE-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- BCDY 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.

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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/SPOT6 LEOPARD IS A UNIT CELL HOMOGENIZATION AND SPECTRUM GENERATION (MUFT-SOFOCATE) 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 PO 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.

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

1/73

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 TCR 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.

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

1/73

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 ETOX2 ETOX2 (ENDF/B TO 1DX) CALCULATES MULTIGROUP CONSTANTS FOR NUCLEAR REACTOR CALCULATIONS USING DATA FROM THE EVALUATED NUCLEAR DATA FILE (ENDF/B) VERSION II 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 (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.

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

1/73

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 ENERGY 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 ETOG1 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 LIBRARIES.

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

1/73

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.

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

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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 ACOUSTIC 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,
LATTICE AND CELL PROBLEMS

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536 RAHAB LATTICE PHYSICS MODULES RAHAB IS A TWO-DIMENSIONAL, MULTIGROUP, NEUTRON INTEGRAL TRANSPORT CODE. ITS CAPABILITY INCLUDES FULL OR SUBCIVIDEC 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.

1/73

C. STATIC DESIGN STUDIES

7 FIRM FIRM SOLVES THE TWO-DIMENSIONAL SN APPROXIMATION IN FINITE CYLINDRICAL GEOMETRY. IT IS A FORTRAN ADAPTATION OF THE LOS ALAMOS TDC 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 FIRES5 FIRES5 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. P. MILLS, IT CONTAINS A 34-GROUP LIBRARY OF 10 ELEMENTS. FIRES5 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 HOMOGENISED REGION CONSISTING OF ANY NUMBER OF NEIGHBORING REGIONS CAN ALSO BE OBTAINED, BUT ONLY FOR CYLINDRICAL GEOMETRY. FIRES5 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

1/73

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.

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

1/73

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 HERESY1/KERNEL HERESY1 CALCULATES THE REACTIVITY, THERMAL UTILIZATION, RESONANCE ESCAPE PROBABILITY, RELATIVE ROD ABSORPTIONS AND POWER DISTRIBUTION IN HETEROGENEOUS REACTORS HAVING TWO SPATIAL DIMENSIONS. HERESY1 CAN BE USED FOR NON-UNIFORM LATTICES, LATTICES WITH MANY TYPES OF FUEL AND CONTROL RODS, AND SPIKED AND SEEDED REACTORS. FISSIONS ARE ASSUMED TO OCCUR ONLY AT THERMAL ENERGY. RESONANCE ABSORPTIONS ARE LUMPED INTO ONE EQUIVALENT RESONANCE. THE MODERATOR IS ASSUMED TO BE INFINITE IN THE RADIAL DIRECTION, AND RODS ARE TREATED AS LINE SOURCES AND SINKS. THE ROD PARAMETERS ARE INDEPENDENT OF THE INTER-ROD SEPARATION DISTANCES. SLOWING-DOWN KERNEL FUNCTIONS MAY BE OF ANY TYPE - AGE THEORY, TRANSPORT THEORY, OR EMPIRICAL. A SELF-CONSISTENT PROCEDURE CAN BE USED WHICH EFFECTIVELY CANCELS OUT ANY ERRORS IN THE KERNEL FUNCTIONS.

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) 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.

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

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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 TEMPERATURE COEFFICIENTS.

TEMCO COMPUTES REACTOR

C. STATIC DESIGN STUDIES

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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 ONE-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.

C. STATIC DESIGN STUDIES

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304 PERT4 PERT4 COMPUTES REACTIVITY COEFFICIENT TRAVERSES IN X-Y, R-Z, OR R-THETA GEOMETRY USING THE FIRST-ORDER PERTURBATION EQUATIONS IN THE DIFFUSION APPROXIMATION. FLUX AND ADJOINT INPUT CAN BE TAKEN DIRECTLY FROM 2-D CALCULATIONS OR SYNTHESIZED FROM RADIAL AND AXIAL 1-D CALCULATIONS. THE CODE CAN ALSO BE USED TO COMPUTE ACTIVITY TRAVERSES FOR ANY CROSS SECTION OF ANY MATERIAL, THE NEUTRON GENERATION TIME, AND THE EFFECTIVE DELAYED NEUTRON FRACTION.

312 TDSN THE LINEAR, TIME-INDEPENDENT, BOLTZMANN EQUATION IS SOLVED FOR THE ENERGY, SPACE, AND ANGULAR DEPENDENCE OF THE NEUTRON DISTRIBUTION IN ONE-DIMENSIONAL SLABS, CYLINDERS OR SPHERES OR IN TWO-DIMENSIONAL X-Y OR R-Z GEOMETRY. FIXED SOURCE OR MULTIPLICATION FACTOR (ADJOINT OR FLUX) PROBLEMS ARE SOLVED SUBJECT TO VACUUM, PLANE REFLECTIVE, ISOTROPIC REFLECTIVE OR 180 DEGREE ROTATIONALLY SYMMETRIC BOUNDARY CONDITIONS. A COMPLETE ENERGY TRANSFER SCATTERING MATRIX IS ALLOWED FOR EACH LEGENDRE COMPONENT OF SCATTERING CROSS SECTION MATRICES THROUGH P1.

319 GASP7 GASP7 CALCULATES THE ONE DIMENSIONAL DISTRIBUTION OF FISSILE AND FERTILE MATERIALS IN A NUCLEAR REACTOR WHICH WILL YIELD ANY 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.

320 TEMCO7 TEMCO7 COMPUTES REACTOR TEMPERATURE COEFFICIENTS.

342 M0648 M0648 SOLVES THE ONE-DIMENSIONAL SLAB TRANSPORT PROBLEM WITH SLOWING DOWN FOR AN ARBITRARY SPATIAL EXTERNAL SOURCE AND ARBITRARY SCATTERING.

358 TWOTRAN TWOTRAN SOLVES 2-DIMENSIONAL PARTICLE TRANSPORT PROBLEMS. SEPARATE VERSIONS ARE AVAILABLE IN X-Y AND R-Z GEOMETRIES AS WELL AS A GENERAL GEOMETRY VERSION IN 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, OR INPUT SPECIFICATION OF BOUNDARY FLUX CONDITIONS. BOTH ANISOTROPIC INHOMOGENEOUS PROBLEMS AND GENERAL ANISOTROPIC SCATTERING PROBLEMS ARE TREATED.

C. STATIC DESIGN STUDIES

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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 KENO 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 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 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 FISSION UNITS ARE ALLOWED WITH OR WITHOUT EXTERNAL REFLECTOR REGIONS. OUTPUT FROM KENO 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

1/73

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, OPTICNS 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-CRAWER 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.

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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.

55 AIRFIRE 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 DUC DIMENSIONAL BURNOUT (DCB) 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.

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

2173

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 ISCTCPES 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 ISOTCPES. 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 CALCCMP 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.

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

2/73

223 REVISED GAC THIS INFINITE-MEDIUM DEPLETION PROGRAM PERFORMS FUEL CYCLE CALCULATIONS ON REACTORS EMPLOYING PARTIAL REFUELING. THE BURN-UP OF UP TO 12 DISCRETE FUEL COMPOSITIONS (REGIONS OR STAGES OF IRRADIATION) MAY BE FOLLOWED SIMULTANEOUSLY. THE BURN-UP CALCULATION MAY BE INTERRUPTED PERIODICALLY TO REMOVE THE CONTENTS AND TO REFUEL ONE OR MORE REGIONS. FUEL MAY BE PARTIALLY OR COMPLETELY RECYCLED.

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 CODE 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.

265 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 AND VERSION CAN BE USED TO SOLVE THREE-DIMENSIONAL SYNTHESIS PROBLEMS.

D. DEPLETION, FUEL MANAGEMENT, COST ANALYSIS, AND
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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 DESIGNED 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 FUEL REQUIREMENTS IS PERFORMED TO PRODUCE A SPECIFIED END OF CYCLE MULTIPLICATION FACTOR FOR THE EQUILIBRIUM FUEL CYCLE, GIVEN FUEL COMPOSITION, LENGTH OF CYCLE AND REACTOR POWER. IT IS ALTERNATELY POSSIBLE TO COMPUTE CYCLE LENGTH OR FUEL 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 MICROSCOPIC 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.

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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 ADJACENT MODEL. CRITICALITY SEARCHES CAN BE PERFORMED DURING BURNUP TO COMPENSATE FOR FUEL DEPLETION,
- (C) COMPUTE FLUX DISTRIBUTIONS FOR AN ARBITRARY EXTRANUCLEAR 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.

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340 POWERCO POWERCO CALCULATES THE COST OF ELECTRICITY PRODUCED BY NUCLEAR POWER STATIONS, ASSUMING ALL CAPITAL 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 ISCGEN ISCGEN CALCULATES RADIOISOTOPE 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 LCCPS 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 FAREC FAREC 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. ZONEWISE 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, OUT 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.

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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 DBUFT11 DBUFT11 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 ABSCRIPTION, 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.

C. DEPLETION, FUEL MANAGEMENT, COST ANALYSIS, AND
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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 CONCEPT THE CODE GENERATES A CAPITAL COST ESTIMATE FOR A PWR NUCLEAR POWER PLANT OF SPECIFIED ELECTRICAL OUTPUT (IN THE RANGE OF 300 TO 2000 MWE) FOR ANY OF TWENTY U.S. CITIES AND PRINTS AS A RESULT A DETAILED COST BREAKDOWN ACCORDING TO THE CODE OF ACCOUNTS SUGGESTED IN USAEC REPORT NLS-531.

E. SPACE-INDEPENDENT KINETICS

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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 AIROS 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

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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.

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.

E. SPACE-INDEPENDENT KINETICS

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489 TRIFIDC 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 $(K \cdot \beta)/L$ 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 CCR NEUTRON FLUX AND LEAKAGE FLUX IN DETAIL AND IN GROUP-AVERAGED FORM, AND E) CALCULATES PARAMETERS SUCH AS K_{eff} .

153 HATCHET HATCHET IS A MAJOR MODIFICATION OF THE AXI 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-
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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 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 PRE-DETERMINED 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 MOTION 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 (WEAK 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 NODAL 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-
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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.

G. RADIOLOGICAL SAFETY, HAZARD AND ACCIDENT ANALYSIS IS

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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 LCW 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 RAINOUT 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

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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

1/73

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.

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-PS THE CONTEMPT-PS PROGRAM PREDICTS THE PRESSURE-TEMPERATURE RESPONSE OF A DRY WELL FOR A LOSS-OF-COOLANT ACCIDENT. 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 MULTIREGION HEAT CONDUCTION EQUATIONS. WATER AND ENERGY ADDITION RATES FROM DISCHARGE OF COOLANT, BOILING OF RESIDUAL WATER BY REACTION 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 HOMOGENEOUS FLOW OF A TWO-COMPONENT TWO-PHASE WATER-AIR MIXTURE THROUGH THE VENTS, AND A MASS-ENERGY BALANCE IN THE WET WELL IN WHICH THE LIQUID AND VAPOR REGIONS ARE ASSUMED TO HAVE THE SAME TEMPERATURE. 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 RADIUS 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 CUMULATIVE FRACTIONAL RELEASE OF FISSION PRODUCTS FROM NUCLEAR REACTOR FUEL UNDER POSTULATED LOSS-OF-COOLANT ACCIDENT CONDITIONS. THE MATHEMATICAL MODEL FOR RELEASE IS BASED ON SIMPLE VOLUME DIFFUSION 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 ACCIDENT USING AS BOUNDARY CONDITIONS PLENUM FLUID CONDITIONS DETERMINED 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.

H. STEADY-STATE AND TRANSIENT HEAT TRANSFER

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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 NONFLOWING 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. STEADY-STATE AND TRANSIENT HEAT TRANSFER

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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.

H. STEADY-STATE AND TRANSIENT HEAT TRANSFER

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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-ONING 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/HOF
BY MAKING CALLS ON A SUBROUTINE CALLED HOF, 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.

299 LION
LION IS A DIGITAL COMPUTER PROGRAM WHICH WILL SOLVE THREE-DIMENSIONAL TRANSIENT AND STEADY-STATE TEMPERATURE DISTRIBUTION PROBLEMS. THE INPUT CONSISTS OF GEOMETRY, PHYSICAL PROPERTIES, BOUNDARY CONDITIONS, INTERNAL HEAT GENERATION RATES, AND COOLANT FLOW RATES AS A FUNCTION OF TIME. IN ADDITION TO SOLVING PROBLEMS OF HEAT CONDUCTION IN A STRUCTURE, LION CAN HANDLE FORCED CONVECTION, FREE CONVECTION, AND RADIATION OR A COMBINATION OF THESE AT THE SURFACE OF THE STRUCTURE. THE OUTPUT CONSISTS OF COMPLETE NODAL TEMPERATURE DISTRIBUTIONS ALONG WITH SURFACE FLUXES AND HEAT TRANSFER COEFFICIENTS. AN OPTION IS INCLUDED IN THE PROGRAM FOR DETERMINING THE MEAN TEMPERATURE IN ANY SPECIFIED SECTION OF THE STRUCTURE.

H. STEADY-STATE AND TRANSIENT HEAT TRANSFER

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331 M0219(FLOT1) FLOT1 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 PHENOMOLOGICAL 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.

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.

1/73

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.

H. STEADY-STATE AND TRANSIENT HEAT TRANSFER

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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.

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.

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.

H. STEADY-STATE AND TRANSIENT HEAT TRANSFER

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525 ORTHIS/ORTHAT ORTHIS AND ORTHAT 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.

I. DEFORMATION AND STRESS DISTRIBUTION COMPUTATIONS, STRUCTURAL ANALYSIS, AND ENGINEERING DESIGN STUDIES

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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 SOR2 SOR2 SOLVES FOR THE FORCES, STRESSES, DEFLECTIONS, AND STRAINS IN THIN SHELLS OF REVOLUTION. THE SHELLS MAY BE GENERAL SURFACES OF REVOLUTION WITH VARIABLE THICKNESSES AND ELASTIC MODULI. THIS INCLUDES THE MORE FAMILIAR FORMS - THE CIRCULAR FLAT PLATE, CONE, CYLINDER, SPHERE, ELLIPSE, AND TORII WITH CIRCULAR OR ELLIPTICAL CROSS SECTIONS, FOR WHICH A SIMPLIFIED INPUT IS USED. THE AXISYMMETRIC LOADINGS CONSIDERED INCLUDE ARBITRARY DISTRIBUTIONS OF NORMAL, TANGENTIAL AND MOMENT SURFACE LOADINGS, AS WELL AS EDGE FORCES AND DEFLECTIONS. THE EFFECTS OF RADIAL AND AXIAL TEMPERATURE DISTRIBUTIONS, CENTRIFUGAL LOADING DUE TO ROTATION ABOUT THE AXIS AND VIBRATION ARE INCLUDED. THE ADDITIONAL EFFECTS OF MISALIGNMENT, LINE LOADS, AND ELASTIC SUPPORTS AT THE SHELL INTERSECTIONS ARE CONSIDERED.

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, METEOROID 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, METEOROID 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 INITIALING 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 FABRICATON OF THE IMPELLER.

I. DEFORMATION AND STRESS DISTRIBUTION COMPUTATIONS,
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190 WOPEXPT, WEIGHT OPTIMIZATION THE PURPOSE OF THE CCDE 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 ROD-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 SEALSHL2 (M0110) THE SEALSHL2 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.

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315 WIREX WIREX PRODUCES WIRING LISTS CONTAINING ALL THE INFORMATION NORMALLY FOUND ON DETAILED WIRING DRAWINGS. THESE LISTS ARE PRESENTED TO THE ELECTRICIANS AS A JOB BOOK CONTAINING INFORMATION IN THE ORDER IN WHICH IT IS REQUIRED FOR LOGICAL PROCEDURE THROUGH A WIRING JOB. WIREX LISTS WERE USED EXTENSIVELY DURING INSTALLATION FOR THE UHTREX PROJECT.

332 SAFE-3D

SAFE-3D IS A FINITE-ELEMENT PROGRAM FOR THE THREE-DIMENSIONAL ELASTIC ANALYSIS OF HETEROGENEOUS COMPOSITE STRUCTURES. THE PROGRAM USES THE FOLLOWING TYPES OF FINITE ELEMENTS - (1) TETRAHEDRAL ELEMENTS TO REPRESENT THE CONTINUUM, (2) TRIANGULAR PLANE STRESS MEMBRANE ELEMENTS TO REPRESENT INNER LINER OR OUTER CASE, AND (3) UNIAXIAL TENSION-COMPRESSION ELEMENTS TO REPRESENT INTERNAL REINFORCEMENT. THE STRUCTURE CAN BE OF ARBITRARY GEOMETRY AND HAVE ANY DISTRIBUTION OF MATERIAL PROPERTIES, TEMPERATURES, SURFACE LOADINGS, AND BOUNDARY CONDITIONS.

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 SHO (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 SHO 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 COASTDOWN, 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.

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383 MO266 MO266 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 SOR2 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 SLOWER.

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 CYGRO3 CYGRO3 IS AN EXTENSIVE MODIFICATION OF CYGRO1 AND CYGRO2 (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 CYGRO1 AND CYGRO2 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, THREEDIMENSIONAL 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 MO678 (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.

J. GAMMA HEATING AND SHIELD DESIGN PROBLEMS

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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.

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 PROBLEMS

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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 M0756(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.

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, AND INFINITE LINE SOURCE KERNELS ARE CONTAINED IN A LIBRARY.

K. TOTAL SYSTEMS ANALYSIS

1/73

273 THREDES

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

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 PERTUREATION RESULTS OBTAINED WITH MICROSCOPIC DATA.

527 HERMES

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.

CALCULATION OF SN CONSTANTS

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

1/73

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 SEALSHL2 (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 ETOT2 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) PCC 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.

M. DATA MANAGEMENT

1/73

159 MOMUS MOMUS IS THE PROGRAM USED TO CONSTRUCT AND MAINTAIN THE NEUTRON CROSS SECTION MASTER TAPE DEVELOPED UNDER THE ATOMIC'S 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 XLIBIT 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

1/73

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 LEGEN-
DRE POLYNOMIAL TAPE FOR THE MC**2 CODE 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, RETRIEV-
AL, 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 FIS-
SION CROSS SECTION, AN ANGULAR DISTRIBUTION FOR EMERGENT NON-ELAS-
TIC NEUTRONS BETWEEN TWO NEUTRON ENERGIES, ETC. THERE ARE THREE
DICTIONARIES USED FOR INPUT TO THE DATA FILE - ONE FOR THE REAC-
TION-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 ADDI-
TION, 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 NEU-
TRON CROSS SECTION EVALUATION SYSTEM.

M. DATA MANAGEMENT

1/73

384 CHECKER/CRECT/DAMMET/PLOTFB/ THIS PACKAGE OF FIVE PROGRAMS IS DESIGNED FOR PROCESSING ENDF/B (EVALUATED NUCLEAR DATA FILE VERSION B) 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 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 CALCOMP PLOTTING OF SELECTED DATA FROM AN MC**2 LIBRARY TAPE.

475 CRECT/CHECKER/RIGEL/PLCTFB/ THIS PACKAGE OF EIGHT PROGRAMS IS DESIGNED FOR PROCESSING ENDF/B II (EVALUATED NUCLEAR DATA FILE VERSION B FORMAT II) TAPES. THE IBM360 VERSION OF RIGEL IS DESIGNED TO PROCESS ENDF/B III TAPES ONLY.

CRECT 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 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.

M. DATA MANAGEMENT

173

522 ARC-SYSTEM ARC-SYSTEM IS THE COLLECTION
OF SYSTEMS SUBPROGRAMS AND MODULES WHICH PROVIDE THE SOFTWARE
ENVIRONMENT NECESSARY TO EXECUTE THE MODULAR COMPUTATIONAL CAPA-
BILITIES OF THE ARGONNE REACTOR COMPUTATION (ARC) SYSTEM ON IBM360
SYSTEMS.

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

173

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.

C. EXPERIMENTAL DATA PROCESSING

1/73

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.

C. EXPERIMENTAL DATA PROCESSING

1 / 73

169 BURP4 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 POINTS (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.

170 BURP5 BURP5 CALCULATES THE PHOTO-FRACTION FOR MONOENERGETIC GAMMA RAYS INTERACTING IN WELL-TYPE 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 POINTS (ON OR OFF-AXIS), DISKS, CYLINDRICAL VOLUMES. ALSO ALLOWS NARROW MONODIRECTIONAL BEAM COLLIMATED TO CRYSTAL AXIS, INCIDENT NORMAL TO WELL BOTTOM.

248 COINC (COMPUTER CODE FOR REDUC COINCIDENCE COUNTING DATA ARE TREATED TO OBTAIN SPECIFIC DISINTEGRATION RATES, CHANNEL EFFICIENCIES AND COUNT RATES, WEIGHTED MEANS, AND ALL ASSOCIATED STANDARD ERRORS. CORRECTIONS ARE MADE FOR UNEQUAL DEADTIME LOSS IN EACH CHANNEL, COINCIDENCE RESOLVING TIME LOSSES, DECAY DURING COUNTING, DECAY FROM A REFERENCE TIME, AND BACKGROUND IN EACH OF THE THREE CHANNELS. INPUT VARIABLES INCLUDE SAMPLE IDENTIFICATION, START TIME FOR COUNTING, SAMPLE REFERENCE TIME, COUNTING INTERVAL, TOTAL NUMBER OF COUNTS IN TWO SINGLE CHANNELS AND ONE COINCIDENCE CHANNEL, AND NORMALIZING SAMPLE VOLUME. INPUT PARAMETERS CONSIST OF DEADTIMES OF EACH SINGLE CHANNEL, COINCIDENCE RESOLVING TIME FOR ALL THREE CHANNELS, DECAY CONSTANT, BACKGROUND COUNT RATE FOR ALL THREE CHANNELS, AND STANDARD ERRORS FOR EACH OF THE ABOVE PARAMETERS. OPTIONAL INPUT ALLOWS DATE, GROUP CLASSIFICATION, AND A 3-DIGIT USER CODE. OUTPUT CONTAINS CORRECTED SINGLE CHANNEL, COINCIDENCE, AND DISINTEGRATION RATES REFERRED TO START OF COUNT, SPECIFIC DISINTEGRATION RATE (COUNTS/SECOND/UNIT VOLUME OR WEIGHT) REFERRED TO REFERENCE TIME, WEIGHTED MEAN AND ERROR OF ANY NUMBER OF PROBLEMS IN A GROUP, EFFICIENCIES OF THE TWO INDEPENDENT DETECTOR CHANNELS, DATE, SUMMARY OF BACKGROUND VALUES USED, IDENTIFICATION NUMBER, COUNT START TIME, AND UPPER AND LOWER LIMIT (ONE STANDARD DEVIATION) OF EACH OF THE COMPUTED QUANTITIES.

C. EXPERIMENTAL DATA PROCESSING

1/73

258 EXPN EXPN ANALYZES PULSED NEUTRON DATA USING THE GARELIS-RUSSEL TECHNIQUE (REFERENCE 1). BASICALLY THE CODE COMPUTES THE PROMPT DECAY CONSTANT, ALPHA, AND THE PARAMETER ($K \cdot \text{BETA}/L$) FROM EXPERIMENTAL DATA, WHICH IS DIRECTLY EXTRACTED FROM A TIME ANALYZER STORAGE MEMORY AND READ ONTO A PUNCHED PAPER TAPE. THE ALPHA-DETERMINATION PART OF THE CODE WAS ORIGINALLY OBTAINED UNDER THE NAME EXPLICIT FROM KNOLLS ATOMIC POWER LABORATORY BUT HAS SINCE BEEN MODIFIED. THE CODE PROVIDES OPTIONS FOR A PRE-BURST OR A POST-BURST BACKGROUND ANALYSIS. THAT IS, THE PARAMETERS ALPHA AND ($K \cdot \text{BETA}/L$) ARE OBTAINED USING A BACKGROUND MEASURED PRIOR TO THE BURST OR MEASURED AFTER THE BURST.

311 BURNUP. BURNUP CORRELATES HEAVY ELEMENT ISOTOPIC ANALYSIS WITH FISSION PRODUCT NEODYMIUM, URANIUM, AND PLUTONIUM CONCENTRATIONS IN AN IRRADIATED URANIUM FUEL FOR CALCULATION OF BURNUP (ATOM PER CENT FISSION AND MWD/MT). REACTOR PARAMETERS, INCLUDING EFFECTIVE NEUTRON ABSORPTION CROSS SECTIONS FOR ALL URANIUM AND PLUTONIUM ISOTOPES, CAPTURE-TO-FISSION RATIOS FOR U235, PU239, AND PU241, A TWO-GROUP DESCRIPTION OF THE NEUTRON SPECTRUM, THE AVERAGE NEUTRON TEMPERATURE, THE REACTOR FAST FISSION FACTOR, AND THE DISTRIBUTION OF THE SOURCES OF FISSION AMONG THE FISSIONABLE NUCLIDES ARE COMPUTED FROM THE EXPERIMENTAL DATA OBTAINED FROM THE MASS SPECTROMETRIC ANALYSIS OF URANIUM, PLUTONIUM, AND NEODYMIUM.

333 TOAD TOAD IS USED TO PROCESS AND ANALYZE GAMMA RAY SPECTRA.

390 CORGAM A CORRELATION ALGORITHM IS CODED TO ALLOW THE UNFOLDING OF COMPLEX GAMMA-RAY SPECTRA TYPICALLY COLLECTED IN A NEUTRON ACTIVATION ANALYSIS PROCEDURE. CORGAM (1) WILL COMPENSATE FOR ELECTRONIC SHIFTS IN THE DATA, (2) WILL CORRECT FOR BACKGROUND, (3) WILL NORMALIZE THE DATA TO A FIXED NEUTRON FLUX LEVEL, (4) ALLOWS A CHOICE OF WEIGHTING FACTORS, AND (5) ALLOWS A CHOICE OF METHODS FOR CALCULATION OF STANDARD DEVIATIONS. THE CODE REQUIRES A MATRIX OF REFERENCE GAMMA-RAY SPECTRA. THESE SPECTRA CAN BE IN A RAW-DATA FORM. ALL OF THE MODIFICATIONS AVAILABLE TO THE COMPLEX GAMMA-RAY SPECTRA ARE AVAILABLE TO THE REFERENCE GAMMA-RAY SPECTRA. IN ADDITION, A DECAY CORRECTION IS AVAILABLE FOR THE REFERENCE GAMMA-RAY SPECTRA. ONLY THE REFERENCE GAMMA-RAY SPECTRA THAT HAVE INTENSITY COEFFICIENTS WHICH ARE SIGNIFICANT AT A PRESCRIBED LEVEL OF SIGNIFICANCE ARE RETAINED IN THE FINAL SOLUTION. THE INTERMEDIATE SOLUTIONS, I.E., THOSE SOLUTIONS THAT CONTAIN REFERENCE GAMMA-RAY SPECTRA WHICH HAVE NONSIGNIFICANT INTENSITY COEFFICIENTS AT THE PRESCRIBED LEVEL, ARE PRINTED OUT. THEREFORE, SEVERAL SOLUTIONS ARE IMBEDDED IN THE FINAL SOLUTION.

D. EXPERIMENTAL DATA PROCESSING

1/73

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 SCORING.

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.

C. EXPERIMENTAL DATA PROCESSING

1/73

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-DRIIFTED GERMANIUM SEMICONDUCTOR DETECTOR TO DEFINE COMPLEX GAMMA-RAY SPECTRA OF ROUTINE CRUD AND FILTRATE SAMPLES.

P. GENERAL MATHEMATICAL AND COMPUTING SYSTEM ROUTINES

1/73

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 GC 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 FIS-SILE 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.

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.

P. GENERAL MATHEMATICAL AND COMPUTING SYSTEM ROUTINES

1/73

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.

496 KAPLPLOT KAPLPLOT IS THE SET OF STANDARD CALCOMP SUBROUTINES WRITTEN AT KNULLS 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.

IDPLCT 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.

XCPLCT AND YCPLCT CAUSE ALPHABETIC INFORMATION TO BE WRITTEN PARALLEL TO THE DIRECTION OF THE ABSCISSA AXIS, XCPLCT, OR THE ORDINATE AXIS, YCPLCT.

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 RELO1 RELO1 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.

P. GENERAL MATHEMATICAL AND COMPUTING SYSTEM ROUTINES

1/73

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, JGEGEN AND JGECUT, 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 INCORPORATING 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.

PLOTFC PROVIDES A SERIES OF CALCOMP PLOTTER ROUTINES. THESE INCLUDE PENSET, PSCALE, SPLOT, IPLOT, IDPLOT, XCPLLOT, YCPLLOT, 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 FORMAT CONTROL. CONVRT PERMITS CHARACTER MANIPULATION AND CONVERSION OF ANY DATUM/DATA IN MEMORY.

RWSBT MANIPULATES INFORMATION IN BINARY FORM ON TAPE, DISC, OR DRUM PHYSICAL DEVICES. IT INCLUDES BLKSIZ, RDBT, WTBT, SBITF, SBITB, RWD, RWDLO, AND MOVEBT.

VAMPIR PROVIDES THE COMPLETE SETUP OF LINEAR GRAPHS TO BE PRODUCED ON A DIGITAL PLOTTER.

ZERC 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.

F. GENERAL MATHEMATICAL AND COMPUTING SYSTEM ROUTINES

1/73

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 RCD 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.

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
CCMHES 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
CCMLR 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
RATOR E2F298	FIND EXTREME VALUES OF SYM. TRIDIAG. MATRIX
ELTRAN E2F220	ACCUMULATE TRANSFORMATIONS FROM ELMHES (FOR HQR2)
ORTTRAN E2F221	ACCUMULATE TRANSFORMATIONS FROM ORTHES (FOR HQR2)
FIGI2 E2F222	REDUCE NONSYM. TRIDIAG. MATRIX TO SYM. TRIDIAG.
TINVIT E2F223	FIND SOME VECTORS OF SYM. TRIDIAG. MATRIX
EISPAC E2F299	CONTROL PROGRAM FOR EISPACK

Q. RADIATION EFFECTS

1/73

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.

Z. DATA

2/73

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 CROSS 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.

VII. KWIC INDEX

AAEC

AI

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	
ABSCRPTION, 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	\$	DOS, 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 XSECS	BNL	6600	F4	RS	P	T	A	\$	AVRAGE3,4,SIGMA2,	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			
AEG	7090	F2	RS	B	\$	DANCOFF JR, MODERATOR SPACE CHORD DIST FUNCT	150				
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	B	\$	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	L	T	M	\$	SCORE3, SCISRS ENDF/B GRAPHIC X-SEC EVALUATION	375		
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	X	T	B	\$	HWOCR-SAFE, 2-D MONTE CARLO CELL CALCULATION	307	
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	PLX	T	B	\$	AILMOE, X-SECTION CALC ELASTIC SCAT RESONANCES	147		
AI	360	F4	RSB	L	T	M	\$	CLIP, FORM OR 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	\$	CRCK, 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	7090	F2	RS	J	\$	FARSE1A, DOSE 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 CODE 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 DOSE RATE FROM A CLOUD	47			

AI

ANL

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	\$ SHCE, 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	\$ FLCW-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							
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 FCC CODES							AI	7090	F2	RS	C	\$ PERT, 1-D PERTURBATION FOR	30	
AIM AND FCC CODES							BHSC	360	F4	RS	P	C	\$ PERT, 1-D PERTURBATION FOR	30
AIM AND FCC 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
AIREK3, SPACE-INDEPENDENT KINETICS W/FEEDBACK							AEB	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		
ALPHA-M, PFSOLUTION OF GAMMA RAY SPECTRA							ORNL	360	F4	RS	P	O	\$	413
ANALYZER GAMMA-RAY SPECTRA GGA							1108	F+BAL	RS	P	T O	\$ TOAD, PROCESSING OF	333	
ANC	360	BAL	RSB	T	P	\$ NRTS-RJE, OS/360 MVT REMOTE JOB ENTRY SYSTEM	519							
ANC	360	F+BAL	RS	P	T G	\$ CONTEMPT-PS, PRESSURE-TEMPERATURE RESPONSE	433							
ANC	360	F4	RS	PL	CT M	\$ ERREST, LOCA ROD BUNDLE CHF DATA ANALYSIS	518							
ANC	360	F4	RS	PLX	T B	\$ PHROG, MULTI-GP CONSTANT + FAST SPECTRA CALC	520							
ANC	360	F4	RSBP	T	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	PL1	RS	P	T P	\$ PTAC11, 2-PASS ASSEMBLER FOR THE PDP-11 ON 360	516							
ANC	360D	F+BAL	RS	P	XCT	D	\$ PDQ7, 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 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
ANCON, SPACE-INDEPENDENT REACTOR KINETICS CODE							LASL	6600	F4	RS	P	T E	\$	486
ANGULAR DIST GGA							7044	F4	RS	P	X	A	\$ LEGCOEF3, LEGENDRE COEF CALC FOR	217
ANGULAR DIST 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,	531
ANISN X-SEC FORMAT WAPD							6600	F4	RS	PL	T B	\$ ETOG1, ENDF/B TO MUFT, GAM,	437	
ANISN, 1-D MULTI-GP DISCRETE ORDINATE CALC							AI	360	F4	RSBPLX	T C	\$	151	
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	F4	RS		M	\$ MERMC2, MC**2 BINARY LIBRARY TAPE MAINTENANCE	472							

ANL

ASME

ANL	360	F4	RS P	F \$	TWIGGLE, 2-D 2-GP SPACE-TIME DIFFUSION	338
ANL	360	F4	RS P	G \$	SOCOOL2, SODIUM-FUEL INTERACTION ANALYSIS	521
ANL	360	F4	RS P	O \$	DYND1, PHOTOMULTIPLIER ELECTRON DISTRIBUTION	464
ANL	360	F4	RS P	T B \$	CLUP77, SQUARE CELL COLLISION PROBABILITY CALC	526
ANL	360	F4	RS P	T C \$	TWOTRAN, 2-D MULTI-GP TRANSPORT CODE X-Y GEOM	358
ANL	360	F4	RS P	T E \$	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 H \$	COBRA3, ROD BUNDLE THERMALHYDRAULIC ANALYSIS	432
ANL	360	F4	RS P	T I \$	LIFE1, FAST REACTOR FUEL ELEMENT BEHAVIOR	460
ANL	360	F4	RS P	T M \$	CRECT,CHECKER,RIGEL ENDF/B PROCESSING CODES	475
ANL	360	F4	RS P	CT B \$	MC**2, ENDF MULTIGROUP X-SECTION CALCULATION	355
ANL	360	F4	RS P	CT M \$	ETOE, ENDF/B TO MC**2 DATA CONVERSION	350
ANL	360	F4	RS P	X T F \$	FORE2, FAST REACTOR EXCURSION CALCULATIONS	174
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	RS PL	X T C \$	VIM1, MONTE CARLO CRITICAL ASSEMBLY ANALYSIS	510
ANL	360	F4	RSB	XCT P \$	EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE	534
ANL	360	F4	RSBP	CT L \$	ARC-NUI002, BCD INPUT DATA PROCESSING MODULE	533
ANL	635	F4	RS	X T P \$	EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE	534
ANL	1108	F4	RS	X T P \$	EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE	534
ANL	1604	F63	RS P	H \$	MO899,HOH, STEAM TABLES 14.5-2538 PSIA	294
ANL	3600	F36	SBP	I \$	BOW2, DEFLECTION CALCULATION PARALLEL BEAMS	365
ANL	3600	F36	RS P	T B \$	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 HOMOGENEOUS	214
ANL	3600	F36	RSBP	G \$	CHEMLOC2, CORE HEATING CLADDING-STEAM REACTION	366
ANL	3600	F36	RSBP	I \$	SWELL2, FUEL ELEMENT LIFETIME ANALYSIS	353
ANL	3600	F36	RSBP	X T B \$	RABBLE,WLIB,FLAT, RESONANCE ABSORPTION, CELL	281
ANL	3600	F36	RSBP	X T B \$	RIFF-RAFF, RESONANCE INTEGRAL CALC 2-REG CELL	213
ANL	3600	F4	RSBP	T D \$	2DB, 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	E \$	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	RSBP	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 \$	MERMC2,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 \$	SAS1A, FAST REACTOR POWER AND FLOW TRANSIENTS	400
ANL), THERMAL SPECTRUM X-SECTION CALC						ANL 3600 F63
ANNULAR VOID X-SECTION CALCULATION						RSBP XCT B \$ THERMOS(
ANVENT, LCCA ANALYSIS DUKE POWER MCGUIRE UNITS DUCO						635 F4 RS
APDA 3600 ASAF4						RS G \$
APDA 7094 F2						RS P T M \$ ETOE, ENDF/B TO MC**2 DATA CONVERSION
APDA 7094 F4						RS P F \$ WEAK EXPLOSION, COUPLED NEUTRON-HYDRODYNAMICS
APRF 6600 F4						RS F \$ MARS, 2-D EXCURSION CALCULATION R-Z GEOMETRY
APRF 6600 F4						RS B \$ APRFX1, 99-GP DLC-2B LIBRARY GROUP COLLAPSING
APRFX1, 99-GP DLC-2B LIBRARY GROUP COLLAPSING						APRF 6600 F4 RS
ARC-NUI002, BCD INPUT DATA PROCESSING MODULE						ANL 360 F4
ARC-SYSTEM, SYSTEM SUBPROGRAMS AND MODULES						ANL 360 F+BAL
ARES2, RESONANCE INTEGRAL X-SECTION CALC						AI 7090 F2
ARES2, RESONANCE INTEGRAL X-SECTION CALC						CDC 1604 F63
ARGUS, TRANSIENT TEMPERATURE CALC CYLINDER						ANL 3600 F63
ASAF4 RS P						T M \$ ETOE, ENDF/B TO MC**2 DATA CONVERSION
ASME STEAM AND WATER PROPERTIES BG&E						360 F4 RS
ASME STEAM AND WATER PROPERTIES BG&E						360 F4 RS T H \$ STEAM-67, 1967

ASPI5

BAPL

ASPI5, GAMMA RAY SOURCE BUILDUP FACTOR CALC	BAPL 6600	F+ASC	RS P	T J \$	429
ASSAULT, 2-D MULTI-GP DIFFUSION DEPLETION CODE	ORNL 7090	F+FAP	RS P	T D \$	240
ASSEMBLER FOR FLOCC2 INSTRUCTION SET	PW 1604	F+CDP	RS P	T P \$	186
ASSEMBLER FOR THE PDP-11 ON 360 ANC	360 PL1	RS P	T P \$	PTAC11, 2-PASS	516
ASSEMBLY ANALYSIS AI 7600 F4	RS PLX T C \$	VIM1, MONTE CARLO CRITICAL			510
ASSEMBLY ANALYSIS ANL 360 F4	RS PLX T C \$	VIM1, MONTE CARLO CRITICAL			510
ASSEMBLY 48 GAFGAR ENDF/B DATA TAPES	GGA 1108	BIN R L T Z \$	ZPR-III		356
ATHENA4, INELASTIC SCATTERING FORM FACTORS	ORNL 360 F4	RS P	T A \$		417
ATCM SPECTRA ENDF/B DATA ORNL 360 F4	RS P	T B \$	RICE, PRIMARY RECOIL		453
ATTENUATION CYL SPHERE GEOM AI 7090 F2	RS P	J \$	GRACE2, GAMMA-RAY		46
ATTENUATION CYL SPHERE GEOM CDC 1604 F63	RS P	J \$	GRACE2, GAMMA-RAY		46
ATTENUATION SLAB GEOMETRY AI 7090 F2	RS P	J \$	GRACE1, GAMMA-RAY		45
ATTENUATION SLAB GEOMETRY CDC 1604 F63	RS P	J \$	GRACE1, GAMMA-RAY		45
AUTO- 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
AVRAGE3,4,SIGMA2,ADLER, ENDF/B RESONANCE XSECS	BNL 6600 F4	RS P	T A \$		465
AX-TNT, COUPLED NEUTRONICS-HYDRODYNAMICS SPH	PW 1604 F63	RS P	F \$		191
AXFLU, HEAT TRANSFER MCLTEN FUEL TUBE BUNDLES	LASL 7094 F2	RSBP	H \$		182
AXISYM LOAD BAPL 6600 F4	RS P	T I \$	SEALSHL2, SHELL STRESS ANALYSIS		282
AXISYM LOAD SR 360 F4	RS P	T I \$	SEALSHL2, SHELL STRESS ANALYSIS		282
AXISYMMETRIC + PLANE ELASTIC-PLASTIC	BAPL 6600	F+COM	RS P	T I \$	DUZ2, 2-D
AXISYMMETRIC LOAD GGA 7044 F4	RS P	T 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
AXTRM, 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 POCO 7040	F+MAP	RS P	A \$	COMBCO, COMBINED	203
B-W RESONANCE DATA GGA 7044	F+MAP	RS P	A \$	FASDOP, X-SECTIONS 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 RSR 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	T J \$	SPAN4, A POINT-KERNEL SHIELD EVALUATION CODE		462
BAPL 6600 F+ASC	RS P X T B \$	RESQ2, RESQ0, DBF1, RESONANCE INTEGRAL HEX CELL			285
BAPL 6600 F+CCM	RS P	T I \$	DUZ2, 2-D AXISYMMETRIC + PLANE ELASTIC-PLASTIC		503
BAPL 6600 F+CCM	RS P	T I \$	GAPL3, INELASTIC LARGE DEFLECTION STRESS STUDY		397
BAPL 6600 F+COM	PS P X T B \$	PAX03, HARMONY-PDQ X-SECTION GENERATION CODE			426
BAPL 6600 F4	RS	T B \$	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	P \$	RELO1, 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 GEOME RY		398
BAPL 6600 F4	RS P	T F \$	NOWIG, 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-OF-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, LSBR FUEL SWELLING TEMPERATURE STUDY		272
BAPL 6600 F4	RS P	T H \$	FLCT1, M0219, PWR FLOW TRANSIENT ANALYSIS		331

BAPL

BLOWDOWN

BAPL 6600	F4	RS P	T H \$	GLUB1, 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	396
BAPL 6600	F4	RS P	T I \$	BUBL1, FUEL SWELLING + GAS RELEASE SIMULATION	468
BAPL 6600	F4	RS P	T I \$	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 \$	MANE1, RECTANGULAR MAGNETIC NETWORK SOLUTION	412
BAPL 6600	F4	RS P	T I \$	M0266, LINEAR ELASTIC STRUCTURAL DYNAMICS	383
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 \$	SEALSHL2, 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 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 6600C	F+ASC	RS P	T D \$	PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	275
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 P X	T B \$	GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV	185
BCD R	L T Z	\$	ETOG1 DATA LIBRARIES, MUFT4 OR 5, GAM1 OR 2	WAPD 6600	447
BCD R	LX T Z	\$	LASL XSEC SETS, SN 18- 24- AND 25-GROUP SETS	LASL 6600	532
BCD INPUT DATA	PROCESSING	MODULE	ANL 360 F4	RSBP CT L \$ ARC-NU1002,	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 \$	NURLOC-1.0, LOSS-OF-COOLANT THERMAL ANALYSIS	328
BCL 6400	F4	RS P X	T G \$	MUCHA1, MUCHA2, MULTIPLE CHANNEL ANALYSIS ECC	508
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
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
BE21, FEW-GP DISCRETE ORDINATES	SLAB GEOME RY	BAPL 6600	F4	RS P T C \$	398
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
BIN R	L T 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, SPFC, 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
BLAST, REACTOR KINETICS TEMPERATURE DIST STUDY	AEB 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	RSBP XCT	G \$ RELAP3, REACTOR	369
BLOWDOWN - EXCURSION ANALYSIS	ANC 1108	F4	RS P	T G \$ RELAP3, REACTOR	369
BLOWDOWN - EXCURSION ANALYSIS	ANC 6600	F4	RS P	T G \$ RELAP3, REACTOR	369
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

BLOWDCWN

BURP4

BLCWDOWN PRESSURE TEMPERATURE HISTORY	KE	7094	F2	RSBP	T H \$ PTH1,	155
BLOWDOWN2, BLOWDCWN ANALYSIS LOFT	KE	7094	F+MAP	RSBP	T G \$ SATURATED	200
BL47, DRAFTING TOOL TO PLCT PLANE STRUCTURES	BAPL	6600	F4	RS P	T L \$	373
BNL 6600 F4 RS	T M \$	CHECKER,CRECT,DAMMET,PLOTFB,SLAV3, ENDF/B PROC				384
BNL 6600 F4 RS	T M \$	CRECT,CHECKER,RIGEL,PLOTFB,LISTFC,DICTION,ETC.				475
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 \$	RAMP1, 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 A \$	AVRAGE3,4,SIGMA2,ADLER, ENDF/B RESONANCE XSECS				465
BNL 6600 F4 RS P	T F \$	NOAH, 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 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 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	T H \$	COBRA3, ROD BUNDLE THERMALHYDRAULIC ANALYSIS				432
BNW 1108 F4 RS P X	T B \$	IDX, 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 PS PLX	T B \$	BRT1, THERMAL SPECTRUM X-SECTION CALC				184
BNW 1108 F5 RSBPL	T D \$	ISOGEN, RADIONUCLIDE GENERATION AND DECAY				367
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 O \$	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
BOUNCE, FLUX DIST IN MULTI-PIN FUEL ELEMENT	AGC	7090 F2 RS P	B \$			237
BOW2, 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
BUBL1, 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 ROD		518
BUNDLE THERMALHYDRAULIC ANALYSIS	ANL	360 F4 RS P	T H \$	COBRA3, ROD		432
BUNDLE THERMALHYDRAULIC ANALYSIS	BNW	1108 F4 RS P	T H \$	COBRA3, 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	NED	635 F4 RS P	T O \$	BURNUP, HEAVY ELEMENT ISOTOPIC		311
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 \$	DD8, 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	NED	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

CHF

BURP5, GAMMA-RAY PHOTOFRACTION 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 C	\$	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
CAESAR4, LIBLST, 1-D MULTI-GP DIFFUSION + LIB	AI	360	F4	RSBPLX	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
CARD INPUT PROCESSOR	LASL	360	F4	RS P	L	\$	GENRD, FREE-FORMAT
CARD INPUT PROCESSOR	LASL	6600	F4	RS P	L	\$	GENRD, FREE-FORMAT
CASCADE, COMPOUND NUCLEUS REACTION	AI	360	F+BAL RS P	T A	\$	COMNUC,	482
CASCADE, CLUSTER, RADIATION DAMAGE IN METALS	GEC	635	F+FAP RSBP	T Q	\$		419
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, HAUSER-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-D 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 DOSE 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-D 2-GROUP DIFFUSION XYZ GEOMETRY					32
CDC 1604 F63 RS P T C	\$	20GRAND, 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 ENVIRNMNTL LIB SCOPE3.2				478
CDC 6600D F+COM RS	T P	\$	MODEL, MODIFIED BETTIS ENVIRNMNTL LIB SCOPE3.3				478
CDC 7600 F4 RS	T P	\$	MODEL, MODIFIED BETTIS ENVIRNMNTL LIB SCOPE2.0				478
CE 6600 F4 RS P	T C	\$	EXTERMINATOR2, 2-D MULTI-GP DIFFUSION PROGRAM				156
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, RESQ0, DBF1, RESONANCE INTEGRAL HEX					285
CELL CALCULATION AI	360	F+BAL RS P X T B	\$	HWOCR-SAFE, 2-D MONTE CARLO			307
CELL CODE AND TEMPEST COMBINATION AI	7090	F2	RS P	B	\$	BAM, S4 CYL	108
CELL CODE, 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	\$	CExE, INCExE, 1-GP 3-D XYZ XENON OSCILLATION					415
CENTRIFUGAL PUMP IMPELLER DESIGN STUDY PW	1604	F63	RS P	T I	\$	PIP,	187
CExE, INCExE, 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	\$	ISCCRUNCH, REACTION DECAY				180
CHAIN ANALYSIS ORNL 7090 F2 RSBP	D	\$	ISCCRUNCH, REACTION DECAY				180
CHAIN EQUATIONS ORNL 7090 F2 RSBP	D	\$	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
CHECKER, CRECT, DAMMET, PLOTFB, SLAV3, ENDF/B PROC BNL	6600	F4	RS	T M	\$		384
CHECKER, RIGEL ENDF/B PROCESSING CODES ANL	360	F4	RS P	T M	\$	CRECT,	475
CHECKER, RIGEL, PLOTFB, LISTFC, DICTION, ETC. BNL	6600	F4	RS	T M	\$	CRECT,	475
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

CONFIGURATION

CHI 1108 F4	RS P	T H \$	LICN, 3-D TEMPERATURE DISTRIBUTION PROGRAM	299	
CHIC-KIN, FAST + INTERMEDIATE POWER TRANSIENTS	BAPL 6600 F4	RS P	T H \$	473	
CHCRD DIST FUNCT AEG 7090 F2	RS	B \$	DANCOFF JR, MODERATOR SPACE	150	
CINCAS, NUCLEAR FUEL CYCLE COST AND ECONOMICS	CWE 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	DP 360 F+BAL	RS P	T D \$	313	
CINDER,M0102, POINT DEPLETION FISSION PRODUCT	BAPL 6600 F4	RS P	D \$	313	
CITATION, 1,2,3-D DIFFUSION DEPLETION MULTIGP	ORNL 360G F4	RS P	T K \$	387	
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	
CLCUD AI 7090 F2	RS P	G \$	CLOUD, GAMMA-RAY DOSE RATE FROM A	47	
CLOUD CDC 1604 F63	RS P	G \$	CLOUD, GAMMA-RAY DOSE RATE FROM A	47	
CLCUD 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	
CLCUD, 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+FAP	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	
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COBRA3, ROD BUNDLE THERMALHYDRAULIC ANALYSIS	BNW 1108 F4	RS P	T H \$	432	
CODILLI, LEAST SQUARES ANALYSIS RESONANCE DATA	UILL 360 F4	RS P	A \$	347	
COEF 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+FAP	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	
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COINCIDENCE COUNTING DATA REDUCTION	ANL 3600 F63	RSBP	O \$	COINC, 248	
CCLLAPSE ANALYSIS BAPL 6600 F4	RS P	T I \$	BUSHL, CYL SHELL BUCKLING	481	
COLLAPSING TRW 6500 F4	RS P	B \$	PARTI, OPTIMAL GROUP OR MESH	416	
CCLLAPSING 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	
COMBCO, COMBINED B-W MULTI-LEVEL CONVOLUTION	PPCO 7040	F+MAP	RS P	A \$ 203	
COMNUC,CASCADE, COMPCUND NUCLEUS REACTION	AI 360	F+BAL	RS P	T A \$ 482	
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	
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CONCEPTUAL COST ESTIMATES ORNL 360 F4	RS P	T D \$	CONCEPT, POWER PLANT	498	
CONCRETE GGA 1108 F4	RS P	I \$	SAFE-CREEP, VISCOELASTIC ANALYSIS	300	
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CONDUCTION ORNL 360 F4	RS P	X T H \$	ORTHIS, ORTHAT, 2-DIMENSIONAL HEAT	525	
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CONSTANT

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CONSTANT + FAST SPECTRA CALC ANC 360 F4 RS PLXCT B \$ PHROG, MULTI-GP 520
 CONSTANT CALC AGC 7090 F+FAP RSBPLX T B \$ AGN-GAM, FAST SPECTRUM MULTI-GP 204
 CONSTANT CALC FROM TCR CUTPUT DATA LASL 6600 F4 RS P T B \$ GLEN, GROUP 361
 CONSTANT CALC 0 TO 10 MEV BC 625 F4 RS P X 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
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 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 FCR 10X HEDL 1108 F4 RS P X T B \$ ETOX2, MULTIGP 388
 CONSTANTS GENERATION CRNL 360 F4 RS P T B \$ SUPERTOG, ENDF/B FINE-GP 431
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 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
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 CORE THERMAL DESIGN STUDY GGA 7044 F4 RS P I \$ GAZELLE5, GAS-COOLED 232
 CORE, CORE CONFIGURATION FUEL TEMPERATURE CODE GGA 7044 F4 RS I \$ 233
 CORGAM, UNFOLDING OF CCMPLEX GAMMA-RAY SPECTRA KSUN 360 F4 RS P O \$ 390
 COST ANALYSIS AI 7090 F2 RS P D \$ AIMFIRE, URANIUM FUEL CYCLE 55
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 COST AND ECONOMICS WAPD 6600 F4 RS P T D \$ CINCAS, NUCLEAR FUEL CYCLE 354
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 CRAM, 1-D AND 2-D MULTI-GP DIFFUSION PROGRAM UK-R 7090 F+FAP RSBPL T C \$ 103
 CRECT,CHECKER,RIGEL ENDF/B PROCESSING CODES ANL 360 F4 RS P T M \$ 475
 CRECT,CHECKER,RIGEL,PLCTFB,LISTFC,DICTION,ETC. BNL 6600 F4 RS T M \$ 475
 CRECT,DAMMET,PLOTFB,SLAV3, ENDF/B PROC BNL 6600 F4 RS T M \$ CHECKER, 384
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 CRITICAL ASSEMBLY ANALYSIS ANL 360 F4 RS PLX T C \$ VIM1, MONTE CARLO 510
 CRITICALITY CODE ORNL 360 F+BAL RSBPL CT C \$ KENO, MONTE CARLO MULTIGROUP 450
 CRNL 6600 F4 RS P P \$ FORSIM, SOLN OF SYSTEM OF ORDINARY DIFF EQNS 514
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 CROSSPLOT, SC4020 PLCTS FROM X-SECTION TAPES GGA 7044 F+SPS RSBP T N \$ 207
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CRYSTALLINE

DAMMET, PLOTFB, SLAV3

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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+FAP	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
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CURVE PLOT	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 COST CALCULATION	GGA	1108	F4	RS P	T D \$	PWCOST, REACTOR FUEL	441
CYCLE COSTS PERFORMANCE DATA	KE	7090	F2	RSBP	D \$	NPRFCCP, FUEL	146
CYCLE COSTS PERFORMANCE STUDY	GGA	7044	F4	RS P	D \$	WAMPUM, FUEL	224
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 FUEL ELEMENT	BAPL	6600	F4	RS	T I \$	CYGR02, STRESS ANALYSIS	266
CYL FUEL ELEMENTS	AER	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	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
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CYL SPHERE	BNW	1107	F4	RS P	T C \$	IFN, 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	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 \$	MGDSN, 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
CYLINDER	ANL	3600	F63	RSBP	T H \$	ARGUS, TRANSIENT TEMPERATURE CALC	152
CYLINDER	PPCO	7040	F4	RS P	T C \$	TOPIC, 1-D FEW-GP SN APPROXIMATION	148
CYLINDER	PPCO	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	CRNL	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	DPNL	7090	F2	RS P	T C \$	EQUIPOISE3A, 2-D 2-GP DIFFUSION	87
CYLINDER SPHERE	AFR	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
DAC	7090	F2	RSBP	J \$	LIPRECAN1, MC NEUTRON PENETRATION CALCULATION		123
DAC1, 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,PLCTFB,SLAV3, ENDF/B PROC BNL	6600	F4	RS	T M \$	CHECKER,CRECT,		384

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DEPLETION

DANCOFF JR, MODERATOR SPACE CHORD DIST FUNCT	AEG 7090 F2 RS	B \$	150
DATA WAPD 7600 F4 RS P T B \$ ETCT2, THERMAL LIBRARIES FROM ENDF/B			509
DATA GGA 7044 F+MAP RS P A \$ FASDOP, X-SECTIONS FROM B-W RESONANCE			216
DATA KE 7090 F2 RSBP D \$ NPRFCPP, 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 E \$ 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 ANALYSIS CNEA 360 F4 RS P E \$ TRIFIDO, PULSED NEUTRON SOURCE			489
DATA ANALYSIS GEES 1108 F5 RS P T O \$ CAGE,BIRD,SPEC, TIME-OF-FLIGHT			476
DATA CONVERSION ANL 360 F4 RS P CT M \$ ETOE, ENDF/B TO MC**2			350
DATA CONVERSION APDA 3600 ASAF4 RS P T M \$ ETOE, ENDF/B TO MC**2			350
DATA FILE SERVICE ROUTINES ENDF TAPES BNL 7090 F+MAP 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 TOR OUTPUT			361
DATA LIBRARIES, MUFT4 CR 5, GAM1 OR 2 WAPD 6600 BCD R L T Z \$ ETOG1			447
DATA LIBRARY LRL 7094 F+MAP RS PL T M \$ ECSIL, EXPERIMENTAL NEUTRON			351
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+MAP RS P T L \$ DPC,			234
DATA PROCESSING MODULE ANL 360 F4 RSBP CT L \$ ARC-NUI002, BCD INPUT			533
DATA REDUCTION ANL 3600 F63 RSBP O \$ COINC, 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 BIN R L T Z \$ ZPR-III ASSEMBLY 48 GAFGAR 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,RESQ,			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+MAP RSBP T D \$			99
DECAY BNW 1108 F5 RSBPL 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 \$ ISOCRUNCH, 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 \$ BOW2,			365
DEFLECTION STRESS STUDY BAPL 6600 F+COM RS P T I \$ GAPL3, INELASTIC LARGE			397
DEFORMATION BAPL 6600 F4 RS P T I \$ CYGR03, OXIDE FUEL ROD STRESS &			449
DENSITIES BNW 1108 F5 RS P X T F \$ NOISY1, AUTO- AND CROSS-SPECTRAL			488
DENSITIES BNW 7090 F4 RS P T F \$ NOISY1, AUTO- AND CROSS-SPECTRAL			488
DENSITY CALC AI 7094 F+MAP 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 3600 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 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 \$ RELOAD-FEVER, 1-D FEW-GP DIFFUSION			221

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DEPLETION CODE 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,M0102, POINT	313
DEPLETION FISSION PRCCUCT DP 360 F+BAL RS P T D \$ CINDER(M0102), 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 NED 635 F+GMP RS P T D \$ SYN, 2D SYNTHESIS MULTIGP DIFF + 1GP	495
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 \$ STMGEN, STEAM GENERATOR	227
DESIGN MULTIGROUP SLAB GEOMETRY ANL 3600 F63 RSBPL T J \$ MAC, SHIELD	143
DESIGN MULTIGROUP SLAB GEOMETRY BNW 7090 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 \$ GAZELLE5, GAS-COOLED CORE THERMAL	232
DESIGN SYSTEM AI 360 F4 RSBP T K \$ THREDES, 1-D FEW-GP DIFFUSION	273
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 PCINT SOURCE UM 7090 MAD RSB O \$ BURP1,	164
DETECTOR EFFICIENCY PCINT SOURCE UM 7090 MAD RSB O \$ BURP3,	166
DFSR, DATA FILE SERVICE ROUTINES ENDF TAPES BNL 7090 F+FAP RS P T M \$	236
DICTION,ETC. BNL 6600 F4 RS T M \$ CRECT,CHECKER,RIGEL,PLOTFB,LISTFC,	475
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 EQNS. SCLUTION 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
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 + BURNUP XY, RZ GGA 1108 F+BAL RS P T D \$ BUG2, 2-D MULTIGROUP	438
DIFFUSION + LIB AI 360 F4 RSBPLX T C \$ CAESAR4,LIBLST, 1-D MULTI-GP	270
DIFFUSION + SN THEORY NED 635 F4 RS P T C \$ DOT2DB, 2D 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 \$ 2DB, 2-D MULTIGROUP	325
DIFFUSION AND DEPLETION IBM 360A F+BAL RS P T D \$ PDQ5, 2-D 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-D FEW-GROUP	336
DIFFUSION AND DEPLETION GGA 1108 F4 RS P T D \$ FEVER7, 1-D MULTIGROUP	318
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 \$ DDB, 2-D FEW-GP	99
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 CRNL 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 360D F+BAL RS P XCT D \$ PDQ7, 1,2 OR 3-D FEW-GP	275
DIFFUSION DEPLETION BAPL 6600A F+ASC RS P T D \$ PDQ7, 1,2 OR 3-D FEW-GP	275
DIFFUSION DEPLETION BAPL 6600C F+ASC RS P T D \$ PDQ7, 1,2 OR 3-D FEW-GP	275
DIFFUSION DEPLETION BW 6600B F+ASC RS P T D \$ PDQ7, 1,2 OR 3-D FEW-GP	275
DIFFUSION DEPLETION GGA 7044 F4 RS P T D \$ RELOAD-FEVER, 1-D FEW-GP	221
DIFFUSION DEPLETION CCDE 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 GGA 7090 F2 RSB T D \$ 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 \$ IDX, 1-D	374
DIFFUSION FEEDBACK BAPL 6600 F4 RS P T F \$ TWIGL, 2-D 2-GP SPACE-TIME	338

DIFFUSION

DOSE

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 CRNL	7090	F+AP	RS P	T C	\$ EXTERMINATOR, 2-D MULTI-GP	156
DIFFUSION PROGRAM UK-R	7090	F+AP	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	\$ EQUIPOISE3, 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+AP	RS	L T C	\$ FAIM, 1-D MULTI-GP	120
DIFFUSION SLAB CYL SPHERE	AI 7090	F+AP	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	AI 7090	F+AP	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 ORNL	7090	F2	RS P	T C	\$ 20GRAND, 2-D FEW-GROUP	40
DIFFUSION SLAB CYLINDER SPHERE	AI 7090	F2	RS P	T C	\$ FOG, 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, 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, 3D 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	RS P XCT	F \$	VENUS, 2-D LMFBR POWER EXCURSION	511
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	ORNL 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 GEOME	RY 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
DISPLAY DP	360	F+BAL	S	T M	\$ JOSHUA, DATA STORAGE, RETRIEVAL, AND	490
DLC-28 LIBRARY GROUP CCLLAPSING	APRF 6600	F4	RS	B	\$ APRFX1, 99-GP	466
DOCUMENT INFORMATION SYSTEM	KAPL 6600	F	R B	T M	\$ TIGR2, MODULAR	403
DOGGY, DESK CALCULATOR FORM SHEET DP PACKAGE	KAPL 6600	F+ASC	RS P	T P	\$	428
DOPIE, RESOLVED RESONANCE X-SECTION CALC	NED 2000	F2	RS P	A	\$	177
DOPPLER EFFECTS	NED 2000	F2	RS P	B	\$ SPARTA, SPATIALLY-AVERAGED	178
DOS, NEUTRON FLUX-DOSIMETER ACTIVITY RELATION	GEC 635	F4	RSBP	O	\$	423
DOSE AI	7094	F+AP	RS PL	T G	\$ CURIE, DOSE, THUNDERHEAD, EXTERNAL+INTERNAL	196
DOSE CALC	AI 7094	F+AP	RS P	J	\$ SHOE, SHIELD WEIGHT OPTIMIZATION	197

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DOSE CALC GGA 1108 F4 RS T G \$ GADOSE,DOSET, HTGR ACCIDENT ANALYSIS	261
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 DP 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, 2D 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 PPCO 7090 F2 RS P C \$ MIST, 1-D FEW-GP SN	59
DP 360 F+BAL S T M \$ JOSHUA, DATA STORAGE, RETRIEVAL, AND DISPLAY	490
DP 360 F+BAL S X T B \$ RAHAB, JOSHUA SYSTEM LATTICE PHYSICS MODULES	536
DP 360 F+BAL RS P T D \$ CINDER(MO102), POINT DEPLETION FISSION PRODUCT	313
DP 360 F+BAL RS P XCT B \$ HAMMER,LITHE,HELP, CRITICAL ANALYSIS SYSTEM	277
DP 360 F4 RS P G \$ CLCUD, GAMMA-RAY DOSE RATE FROM A CLOUD	47
DP 360 F4 RS P XCT A \$ FLANGE2(71-1), ENDF/B THERMAL SCATTERING DATA	368
DP PACKAGE KAPL 6600 F+ASC RS P T P \$ DOGGY, DESK CALCULATOR FORM SHEET	428
DPC, DATA PREPARATION FOR 2-D DESIGN PROGRAMS LASL 7090 F+FAP RS P T L \$	234
DRAFTING TCCL TO PLOT PLANE STRUCTURES BAPL 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 \$ SNC, 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
DUZ2, 2-D AXISYMMETRIC + PLANE ELASTIC-PLASTIC BAPL 6600 F+COM RS P T I \$	503
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 \$ MO552,	283
DYNAMIC RESPONSE OF ELASTIC STRUCTURES BAPL 6600 F4 RS P T I \$ FUGIT,	537
DYNAMICS AI 360 F+BAL RS P T E \$ AIROS2A, SIMULATION OF REACTOR	326
DYNAMICS BAPL 6600 F4 RS P T I \$ MO266, LINEAR ELASTIC STRUCTURAL	383
DYNCL, PHOTOMULTIPLIER ELECTRON DISTRIBUTION ANL 360 F4 RS P O \$	464
DYNCL, PHOTOMULTIPLIER ELECTRON DISTRIBUTION KAPL 6600 F4 RS P O \$	464
FCC BCL 6400 F4 RS P X T G \$ MUCHA1,MUCHA2, MULTIPLE CHANNEL ANALYSIS	508
ECCSA4, LCSS-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 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 \$ WED, W-DSN OUTPUT TAPE	133
EDITING ORNL 360 F4 RS P T M \$ EDITOR, ENDF/B TAPE PROCESSING AND	502
EDITOR, ENDF/B TAPE PROCESSING AND EDITING ORNL 360 F4 RS P T M \$	502
EFFECTIVE X-SECTION CALC FROM DSN OUTPUT PW 1604 LAG1 RS P N \$ DTX,	210
EFFICIENCY DISK SOURCE UM 7090 MAD RSB O \$ BURP2, DETECTOR	165
EFFICIENCY POINT SOURCE UM 7090 MAD RSB O \$ BURP1, DETECTOR	164
EFFICIENCY POINT SOURCE UM 7090 MAD RSB O \$ BURP3, DETECTOR	166
EIGENVALUE EIGENVECTOR PACKAGE ANL 360 F4 RSB XCT P \$ EISPACK, MATRIX	534
EIGENVALUE EIGENVECTOR PACKAGE ANL 635 F4 RS X T P \$ EISPACK, MATRIX	534
EIGENVALUE EIGENVECTOR PACKAGE ANL 1108 F4 RS X T P \$ EISPACK, MATRIX	534
EIGENVALUE EIGENVECTOR PACKAGE ANL 6600 F4 RS X T P \$ EISPACK, MATRIX	534
EIGENVALUE PROBLEM FOR VIBRATING SYSTEMS KAPL 6600 F+ASC RS P T I \$ GEM,	344

EIGENVECTOR

ETC.

EIGENVECTOR PACKAGE ANL	360	F4	RSB	XCT P \$	EISPACK, MATRIX EIGENVALUE	534
EIGENVECTOR PACKAGE ANL	635	F4	RS	X T P \$	EISPACK, MATRIX EIGENVALUE	534
EIGENVECTOR PACKAGE ANL	1108	F4	RS	X T P \$	EISPACK, MATRIX EIGENVALUE	534
EIGENVECTOR PACKAGE ANL	6600	F4	RS	X T P \$	EISPACK, MATRIX EIGENVALUE	534
EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE ANL	360	F4	RSB	XCT P \$		534
EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE ANL	635	F4	RS	X T P \$		534
EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE ANL	1108	F4	RS	X T P \$		534
EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE ANL	6600	F4	RS	X T P \$		534
ELASTIC SCAT RESONANCES AI	360	F4	RS	PLX T B \$	AILMOE, X-SECTION CALC	147
ELASTIC SCAT RESONANCES AI	7094	F4	F+FAP RS PL	T B \$	AILMOE, X-SECTION CALC	147
ELASTIC SCAT X-SEC BNL	6600	F4	RS P	A \$	BESFIT, DIFFRACTION MODEL	524
ELASTIC SCAT X-SECTIONS HEX LATTICE GGA	1108	F4	RS	B \$	HEXSCAT,	291
ELASTIC SCATTERING PHASE-SHIFT ANALYSIS ORNL	1604	F63	RS P	A \$	PEGGY,	334
ELASTIC STRESS OF PIPING SYSTEM BAPL	6600	F4	RS P	T I \$	M0457, PIPE,	329
ELASTIC STRUCTURAL DYNAMICS BAPL	6600	F4	RS P	T I \$	M0266, LINEAR	383
ELASTIC STRUCTURES BAPL	6600	F4	RS P	T I \$	FUGIT, DYNAMIC RESPONSE OF	537
ELASTIC SYSTEMS BAPL	6600	F4	RS P	T I \$	M0552, DYNAMIC ANALYSIS LINEAR	283
ELASTIC-PLASTIC BAPL	6600	F4	F+COM RS P	T I \$	DUZ2, 2-D AXISYMMETRIC + PLANE	503
ELBOW, FUEL ELEMENT STRESS ANALYSIS STUDY GGA	7044	F4	RS P	T G \$		229
ELECTRICITY COSTS ORNL	1604	F63	RS P	D \$	POWERCO, NUCLEAR STATION	340
ELECTRON DISTRIBUTION ANL	360	F4	RS P	O \$	DYN01, PHOTOMULTIPLIER	464
ELECTRON DISTRIBUTION KAPL	6600	F4	RS P	O \$	DYN01, PHOTOMULTIPLIER	464
EMERGENCY COOLING BCL	6400	F4	RS P	T G \$	ECCSA4, LOSS-OF-COOLANT &	330
ENDF MULTIGROUP X-SECTION CALCULATION ANL	360	F4	RS P	CT B \$	MC**2,	355
ENDF MULTIGROUP X-SECTION CALCULATION ANL	3600	F36	RS P	T B \$	MC**2,	355
ENDF TAPES BNL	7090	F4	F+FAP RS P	T M \$	DFSR, DATA FILE SERVICE ROUTINES	236
ENDF/B DATA WAPD	7600	F4	RS P	T B \$	ETOT2, THERMAL LIBRARIES FROM	509
ENDF/B DATA BAPL	6600	F4	RS P	T B \$	EPOCH, NEUTRON AGE CALCULATION OF	461
ENDF/B DATA ORNL	360	F4	RS P	T B \$	RICE, PRIMARY RECDIL ATOM SPECTRA	453
ENDF/B DATA GESV	635	F4	F+GMP RS P	XCT B \$	ENDRUN2, MULTIGROUP CONSTANTS FROM	501
ENDF/B DATA TAPES GGA	1108	F4	RS	L T Z \$	ZPR-III ASSEMBLY 48 GAFFAR	356
ENDF/B FINE-GP CONSTANTS GENERATION ORNL	360	F4	RS P	T B \$	SUPERTO, G	431
ENDF/B FOR 1DX HEDL	1108	F4	RS P	X T B \$	ETOX2, MULTIGP CONSTANTS FROM	388
ENDF/B FORMAT TO MUFT FORMAT X-SECTIONS WAPD	6600	F4	RS P	T B \$	ETOM1,	436
ENDF/B GRAPHIC X-SEC EVALUATION AT	360	F4	F+BAL RS	L T M \$	SCORE3, SCISRS	375
ENDF/B PROC BNL	6600	F4	RS	T M \$	CHECKER, CRECT, DAMMET, PLOTFB, SLAV3,	384
ENDF/B PROCESSING CODES ANL	360	F4	RS P	T M \$	CRECT, CHECKER, RIGEL	475
ENDF/B RESONANCE XSECS BNL	6600	F4	RS P	T A \$	AVRAGE3, 4, SIGMA2, ADLER,	465
ENDF/B TAPE PROCESSING AND EDITING ORNL	360	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 MC**2 DATA CONVERSION ANL	360	F4	RS P	CT M \$	ETOE,	350
ENDF/B TO MC**2 DATA CONVERSION APDA	3600	F4	ASAF4 RS P	T M \$	ETOE,	350
ENDF/B TC MUFT, GAM, ANISN X-SEC FORMAT WAPD	6600	F4	RS PL	T B \$	ETOG1,	437
ENDRUN2, MULTIGROUP CONSTANTS FROM ENDF/B DATA GESV	635	F4	F+GMP RS P	XCT B \$		501
ENERGY INTERVAL X-SECTION AVERAGING GGA	7044	F4	RS P	L \$	GAVER,	218
ENTRY SYSTEM ANC	360	F4	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	6600	F4	F+COM RS	T P \$	MODEL, MODIFIED BETTIS	478
ENVIRNMNTL LIB SCOPE3.3 CDC	6600	F4	F+COM RS	T P \$	MODEL, MODIFIED BETTIS	478
ENVIRONMENTAL ROUTINES, SUBROUTINE LIB. NED	635	F4	F+GMP RS	T P \$	GENED	515
ENVIRONMENTAL ROUTINES, SUBROUTINE LIB. BAPL	6600A	F4	F+ASC RS	T P \$	BETTIS	478
ENVIRONMENTAL ROUTINES, SUBROUTINE LIB. BW	6600B	F4	F+ASC RS	T P \$	BETTIS	478
EPITHERMAL X-SECTIONS NED	635	F4	RS P	T B \$	REAX, RESOLVED RESONANCE	257
EPITHERMAL X-SECTIONS NED	7094	F4	F+FAP RS 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	F4	F+ASC RS P	T P \$	SNEQ, NONLINEAR ALGEBRAIC	364
EQUILIBRIUM FUEL CYCLE CALCULATION GGA	1108	F4	S	T D \$	GAFFE,	302
EQUIPOISE3, 2-D 2-GROUP DIFFUSION SLAB CYL ORNL	7090	F2	RS P	T C \$		39
EQUIPOISE3A, 2-D 2-GP DIFFUSION CYLINDER SLAB CDC	1604	F63	RS P	T C \$		87
EQUIPOISE3A, 2-D 2-GP DIFFUSION CYLINDER SLAB ORNL	7090	F2	RS P	T C \$		87
ERREST, LCCA ROD BUNDLE CHF DATA ANALYSIS ANC	360	F4	RS PL	CT M \$		518
ESP, MONTE CARLO REACTOR ANALYSIS CALCULATION ORNL	360	F4	F+BAL RS P	T C \$		523
ESTIMATES ORNL	360	F4	RS P	T D \$	CONCEPT, POWER PLANT CONCEPTUAL COST	498
ETC. BNL	6600	F4	RS	T M \$	CRECT, CHECKER, RIGEL, PLOTFB, LISTFC, DICTION,	475

ETOE

F+BAL

FTOE, 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, ANISX X-SEC FORMAT	WAPD	6600	F4	RS PL	T B \$	437
ETCM1, ENDF/B FORMAT TO MUFT FORMAT X-SECTIONS	WAPD	6600	F4	RS P	T B \$	436
ETCT2, THERMAL LIBRARIES FROM ENDF/B DATA	WAPD	7600	F4	RS P	T B \$	509
ETOX2, MULTIGP CONSTANTS FROM ENDF/B FOR 1DX	HEDL	1106	F4	RS P	X T B \$	388
EXCHANGER STRESS ANALYSIS	KAPL	6600	F4	RS P	I \$ TUBE, U-TUBE HEAT	378
EXCURSION ANALYSIS	ANC	360	F4	RSBP	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	293
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	LRL	7094	F2	RS P	P \$	321
EXPERIMENT	UCND	360	F+BAL	RS P	O \$ PMS1, FAST NEUTRON POLARIZATION	469
EXPERIMENT ANALYSIS	BAPL	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 \$ CURFIT, CURVE FITTING	43
EXPERIMENTAL NEUTRON DATA LIBRARY	LRL	7094	F+FAP	RS PL	T M \$ ECSIL,	351
EXPLOSION, COUPLED NEUTRON-HYDRODYNAMICS	APDA	7094	F2	RS P	F \$ WEAK	145
EXPN, ANALYSIS OF PULSED NEUTRON SOURCE DATA	NED	635	F4	RS P	T O \$	258
EXPONENTIAL DECAY CURVES	LRL	7094	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+INTERNAL DOSE	AI	7094	F+FAP	RS PL	T G \$ CURIE,DOSE,THUNDERHEAD,	196
F+ASC RS	P	\$ SIMPLE1, TIME-SHARING PROGRAMMING LANGUAGE	KAPL	6600		442
F+ASC RS	T	P \$ BETTIS ENVIRONMENTAL ROUTINES, SUBROUTINE LIB.	BAPL	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 \$ LION, 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	BAPL	6600		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 \$ SNFQ, 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+BAL S	T	M \$ JCASHUA, 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 RS	T	P \$ FIGS, IBM360+2250 FORTRAN GRAPHICS SUBROUTINES	AI	360		484
F+BAL RS	L	T M \$ SCORF3, SCISRS ENDF/B GRAPHIC X-SEC EVALUATION	AI	360		375
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	360		469
F+BAL RS P	T	A \$ CCMNUC,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 \$ ESP, MONTE CARLO REACTOR ANALYSIS CALCULATION	ORNL	360		523
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

F+MAP

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	\$	PCQ5, 2-D FEW-GROUP DIFFUSION AND DEPLETION	IBM	360A	336	
F+BAL	RS	P	T	E	\$	AIRCS2A, 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	G	\$	CONTEMPT-PS, PRESSURE-TEMPERATURE RESPONSE	ANC	360	433	
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	M	\$	ARC-SYSTEM, SYSTEM SUBPROGRAMS AND MODULES	ANL	360	522	
F+BAL	RS	P	X	T	B	\$	HWOCS-SAFE, 2-D MONTE CARLO CELL CALCULATION	AI	360	307
F+BAL	RS	P	X	T	B	\$	HAMMER,LITHE,HELP, CRITICAL ANALYSIS SYSTEM	DP	360	277
F+BAL	RS	P	X	T	D	\$	PCQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	ANC	360D	275
F+BAL	RSBP		T	D	\$	PCQ5, 2-D FEW-GROUP DIFFUSION AND DEPLETION	MIT	360B	336	
F+BAL	RSBPL		CT	C	\$	KENC, MONTE CARLO MULTIGROUP CRITICALITY CODE	ORNL	360	450	
F+CDP	RS	P	T	P	\$	LAG, ASSEMBLER FOR FLOCO2 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	\$	KAPLPLOT, KAPL CALCOMP PLOTTING ROUTINES	KAPL	6600	496	
F+COM	RS		T	P	\$	MCDEL, MODIFIED BETTIS ENVIRNMNTL LIB SCOPE3.2	CDC	6600C	478	
F+COM	RS		T	P	\$	MCDEL, MODIFIED BETTIS ENVIRNMNTL LIB SCOPE3.3	CDC	6600D	478	
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	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	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	\$	MCMUS, X-SECTION LIBRARY UTILITY PROGRAM	AI	7094	159	
F+FAP	RS	P		I	\$	WIREX, COMPUTER-PRODUCED WIRING LISTS UHTREX	LASL	7090	315	
F+FAP	RS	P		J	\$	SFOE, 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	198	
F+FAP	RS	P	T	L	\$	DPC, DATA PREPARATION FOR 2-D DESIGN PROGRAMS	LASL	7090	234	
F+FAP	RS	P	T	M	\$	DFSR, 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	G	\$	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	\$	TLZ, 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	\$	DCR, 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	X	T	B	\$	ENDRUN2, MULTIGROUP CONSTANTS FROM ENCF/B DATA	GESV	635	501
F+GMP	RS	P	X	T	L	\$	TDCWN, SPATIAL & COMPOSITION-DEPENDENT X-SECS	GESV	635	505
F+GMP	RSEP		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 CONVCLUTION	PPCO	7040	203	

F+MAP

FEW-GP

F+MAP RS P	A	\$ FASDOP, X-SECTIONS FROM B-W RESONANCE DATA	GGA	7044	216
F+MAP RS P	T B	\$ GARCL, RESONANCE OVERLAP AND LATTICE EFFECTS	GGA	7044	219
F+MAP RS P	T B	\$ GARCL, 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 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 G	\$ RSAC, RADIOLOGICAL SAFETY ANALYSIS PROGRAM	PPCO	7040	265
F+MAP RS P	T H	\$ BLOCST5, POINT-KINETICS WITH 2-D HEAT TRANSFER	GGA	7044	205
F+MAP RS P	T H	\$ TOODEF, 2-D TIME-DEPENDENT HEAT CONDUCTION	PPCO	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+SL RS	T K	\$ 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 SHIELDING CODE CAVITY GEOM	GGA 1108 F4	RS P T J \$ MUSCAT, VIEW			259
FACTORS	ORNL 360 F4	RS P T A \$ ATHENA4, INELASTIC SCATTERING FORM			417
FAILURE MODE	BAPL 6600 F4	RS P P \$ REL01, RELIABILITY FOR A SINGLE			497
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	RS 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	GEC 7090			422
FARED, 1-D FAST REACTOR DESIGN & SURVEY STUDY	BW 6600	F+COM RS P X T D \$			427
FARSEIA, DCFE RATE FROM SNAP SHIELD LEAKAGE	AI 7090 F2	RS J \$			91
FASDOP, X-SECTIONS FROM B-W RESONANCE DATA	GGA 7044	F+MAP RS P A \$			216
FAST + INTERMEDIATE POWER TRANSIENTS	BAPL 6600 F4	RS P T H \$ CHIC-KIN,			473
FAST BREEDERS	NED 635 F4	RS P D \$ RAPFU, FUEL CYCLE PARAMETERS			372
FAST NEUTRON POLARIZATION EXPERIMENT	UCND 360	F+BAL RS P O \$ PMS1,			469
FAST NEUTRON SPECTRUM X-SECTION CALC	AI 7090 F2	RS PL T B \$ FORM,			51
FAST NEUTRON SPECTRUM X-SECTION CALC	ANL 3600 F63	RS LX T B \$ 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	RS PLX T B \$ GAM1,			33
FAST NEUTRON SPECTRUM X-SECTION CALC	GGA 7090 F2	RS PLX T B \$ GAM1,			33
FAST REACTOR CORE ACCIDENT ANALYSIS	NED 635 F4	RS P T G \$ FREADM1,			479
FAST REACTOR DESIGN & SURVEY STUDY	BW 6600	F+COM RS P X T D \$ FARED, 1-D			427
FAST REACTOR EXCURSION CALCULATIONS	NED 2000 F4	RS 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	RS P T F \$ SAS1A,			400
FAST REACTOR X-SEC CALC BNW	1108 F4	RS P T B \$ 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 B \$ 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 B \$ IDX, 1-D DIFFUSION			374
FATIGUE	KAPL 6600 F4	RS I \$ SORSDB, PRESSURE VESSEL STRESS AND			391
FAULT TREE EVALUATION CCDES	ANC 360 F4	RSBP T K \$ PREP,KITT, SYSTEM			528
FAULT TREE EVALUATION CCDES	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 \$ NOWIG, 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 \$ NOAH, 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 GEOMFTRY	GGA 7090	F+FAP RSBP T D \$ DDB, 2-D			99

FEW-GP

FLOT1,M0219

FEW-GP DIFFUSION CALC HEX-Z MESH	GGA	1108	F4	RS P	T C \$ GATT, 3-D	380	
FEW-GP DIFFUSION DEPLETION	ANC	360D	F+BAL	RS P	XCT D \$ PDQ7, 1,2 OR 3-D	275	
FEW-GP DIFFUSION DEPLETION	BAPL	6600A	F+ASC	RS P	T C \$ 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	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 \$ RELOAD-FEVER, 1-D	221	
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 \$ FOG, 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 GEOME	RY	BAPL	6600	F4	RS P T C \$ BE21,	398	
FEW-GP HEX GEOM DIFFUSION DEPLETION	GGA	1108	F4	RS P	T D \$ 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	PPCO	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	
FIGRO, LSRR FUEL SWELLING TEMPERATURE STUDY	BAPL	6600	F4	RS P	T H \$	272	
FIGS, IBM360+2250 FORTRAN GRAPHICS SUBROUTINES	AI	360	F+BAL	RS	T P \$	484	
FILE SERVICE ROUTINES ENDF TAPES	BNL	7090	F+AP	RS P	T M \$ DFSR, DATA	236	
FINDING ROOTS OF A POLYNOMIAL	KAPL	6600	F4	RS P	P \$ ROPE,	444	
FINE-GP CONSTANTS GENERATION	ORNL	360	F4	RS P	T B \$ SUPERTUG, ENDF/B	431	
FINEL, FINITE-ELEMENT STUDY 2,3-D STRUCTURES	KAPL	6600	F4	RS P	X I \$	404	
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	
FIRE5, 1-D AGE-DIFFUSION SLAB CYLINDER SPHERE	AEB	360	F4	RS	L T C \$	9	
FIRN, 2-D FEW-GP S4 APPROXIMATION RZ GEOMETRY	LRL	709	F2	RS	C \$	7	
FISSILE NUCLIDE DATA	BAPL	6600	F4	RS P	T P \$ DAFT1, LEAST SQUARES FIT	327	
FISSILE NUCLIDE X-SECTION EVALUATION	ORNL	7090	F4	RSBP	A \$ MUFFLE,	323	
FISSION PRODUCT	BAPL	6600	F4	RS P	D \$ CINDER,M0102, POINT DEPLETION	313	
FISSION PRODUCT ACTIVITY DIST STUDY	GGA	7044	F4	RS P	D \$ RAD2, HTGR	231	
FISSION PRODUCT DP	360	F+BAL	RS P	T D \$ CINDER(M0102), POINT DEPLETION	313		
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 \$	395	
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	T C \$	167	
FLARE, 3-D REACTIVITY AND POWER DISTRIBUTION	NED	635	F4	RS P	T C \$	167	
FLASH3, LCSS-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	ORNL	7090	F+AP	RS P	T B \$ RAFFLE, 1ST	392
FLCCO RS P	B	\$ MCS, MONTE CARLO NEUTRON PENETRATION STUDY	LASL	7090		202	
FLOCO RS P	B	\$ ZOT, GROUP-COLLAPSING OF MULTI-GP X-SECTIONS	LASL	7090		113	
FLOCO RSBP	C	\$ 2DCY, 2-D MULTI-GP SN APPROXIMATION XY GEOM	AGC	7090		18	
FLOCO RSBP	T C	\$ GE-HAPO-S13, 1-D MULTI-GP DOUBLE SN APPROX	BNW	7090		75	
FLOCO2 INSTRUCTION SET	PW	1604	F+CDP	RS P	T P \$ LAG, ASSEMBLER FOR	186	
FLOT1,M0219, PWR FLCH TRANSIENT ANALYSIS	BAPL	6600	F4	RS P	T H \$	331	

FLOW

FUEL

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
FLCW AND HEAT TRANSFER	AI	7094	F2	RS P	T G \$	TRANS-FUGUE1, TRANSIENT	268
FLOW EXPERIMENT ANALYSIS	AGC	7090	F2	RS P	O \$	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 H \$	DYNAM, DYNAMIC ANALYSIS BOILING	440
FLOW STUDY STEAM-WATER MIX	KAPL	6600	F4	RS P	H \$	RAPP, HIGH-VELOCITY	382
FLCW TRANSIENT ANALYSIS	BAPL	6600	F4	RS P	T H \$	FLOT1, MO219, PWR	331
FLCW TRANSIENTS	ANL	360	F4	RS P	T F \$	SAS1A, FAST REACTOR POWER AND	400
FLCW TRANSIENTS	ANL	6600	F4	RS P	T F \$	SAS1A, FAST REACTOR POWER AND	400
FLCW-MODEL, MULTI-CHANNEL 2-D 2-PHASE FLOW	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 O \$	JITER, REACTOR	394
FLUCTUATION EXPERIMENT ANALYSIS	BAPL	6600	F4	RS P	T O \$	REDUX, REACTOR	425
FLUID FLCW EXPERIMENT ANALYSIS	AGC	7090	F2	RS P	O \$	CROC90, ML-1	154
FLUX DIST IN MULTI-PIN FUEL ELEMENT	AGC	7090	F2	RS P	B \$	BOUNCE,	237
FLUX INPUT	PW	1604	F63	RS	C \$	TCP, 2-D PERTURBATION TDC OR 2DXY	199
FLUX SYNTHESIS PROGRAM	CYL PW	1604	F63	RS	T C \$	2DXYL, 3-D MULTI-GP	192
FLUX-DOSIMETER 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
FMA	7090	F2	RSBP	X C \$	HERESY1, LATTICE PARAMETERS HETEROGENEOUS CALC		136
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 OR THREEDES 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
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 X-SECTIONS	WAPD	6600	F4	RS P	T B \$	ETOM1, ENDF/B FORMAT TO MUFT	436
FORSIM, SCRN OF SYSTEM CF ORDINARY DIFF EQNS	CRNL	6600	F4	RS P	P \$		514
FORTAN GRAPHICS SUBROUTINES	AI	360	F+BAL	RS	T P \$	FIGS, IBM360+2250	484
FORTAN TDC, 2-D MULTI-GP SN APPROXIMATION	RZ PW	1604	F63	RS P	T C \$		161
FRANTIC, LEAST SQUARES FIT SUM OF EXPONENTIALS	MIT	7090	F2	RS P	P \$		324
FRCL2, LCCA 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
FREVAP6, HTGR METALLIC FISSION PRODUCT RELEASE	GGA	1108	F4	RS P	D \$		301
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	CWE	360	F4	RS P	T D \$	CINCAS, NUCLEAR	354
FUEL CYCLE COST AND ECONOMICS	WAPD	6600	F4	RS P	T D \$	CINCAS, NUCLEAR	354
FUEL CYCLE COST CALCULATION	GGA	1108	F4	RS P	T D \$	PWCOST, REACTOR	441
FUEL CYCLE COSTS PERFORMANCE DATA	KE	7090	F2	RSBP	D \$	NPRFCCP,	146
FUEL CYCLE COSTS PERFORMANCE STUDY	GGA	7044	F4	RS P	D \$	WAMPUM,	224

FUEL

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FUEL CYCLE PARAMETERS FAST BREEDERS	NED	635	F4	RS P	D \$ RAPFU,	372
FUEL ELEMENT BAPL 6600 F4 RS	T I \$ CYGR02, 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 BEHAVICR ANL 360 F4 RS P	T I \$ LIFE1, FAST REACTOR					460
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 ROD STRESS & DEFORMATION BAPL 6600 F4 RS P	T I \$ CYGR03, OXIDE					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 \$ BUBL1,					468
FUEL SWELLING TEMPERATURE STUDY BAPL 6600 F4 RS P	T H \$ FIGRO, LSBR					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 RESPNSE OF ELASTIC STRUCTURES BAPL 6600 F4 RS P	T I \$					537
FUGUE, STEADY-STATE TEMPERATURE VOID FRACTION AI 7090 F2 RS	I \$					48
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
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 CCDE, 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 A \$ SUMMIT, CRYSTALLINE SCATTERING KERNEL CALC GGA 7090						56
F2 RS L T D \$ SIZZLE, 1-D MULTIGROUP DIFFUSION DEPLETION AI 7090						58
F2 RS P A \$ COPIE, RESOLVED RESONANCE X-SECTION CALC NED 2000						177
F2 RS P A \$ EXT, X-SECTIONS FROM B-W RESONANCE PARAMETERS WANL 7094						238
F2 RS P A \$ RAPTURE, RESONANCE INTEGRAL X-SECTION CALC NED 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 AGC 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 \$ CONFC, 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 \$ 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 AGC 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 \$ FCG, 1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE AI 7090						28
F2 RS P T C \$ TPCIC, 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

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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	\$	FCRM, 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	GGA	7090	33	
F2	RS	PLX	T	C	\$	DTE2, 1-D MULTI-GP DISCRETE ORDINATE CALC	AI	7090	151	
F2	RSB			F	\$	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			D	\$	ISOCRUNCH, REACTION DECAY CHAIN ANALYSIS	ORNL	7090	180	
F2	RSBP			D	\$	NPRECCP, FUEL CYCLE COSTS PERFORMANCE DATA	KE	7090	146	
F2	RSBP			D	\$	NUCY, SOLUTION OF NUCLIDE CHAIN EQUATIONS	ORNL	7090	134	
F2	RSBP			H	\$	AXFLU, HEAT TRANSFER MOLTEN FUEL TUBE BUNDLES	LASL	7094	182	
F2	RSBP			H	\$	AXTHRM, HEAT TRANSFER SOLID FUEL TUBE BUNDLES	LASL	7094	183	
F2	RSBP			J	\$	LIPRECAN1, MC NEUTRON PENETRATION CALCULATION	DAC	7090	123	
F2	RSBP		T	H	\$	PTH1, BLOWDOWN PRESSURE TEMPERATURE HISTORY	KE	7094	155	
F2	RSBP	X		C	\$	HERESY1, LATTICE PARAMETERS HETEROGENEOUS CALC	FMA	7090	136	
F2	RSBPL		T	J	\$	MAC, SHIELD DESIGN MULTIGROUP SLAB GEOMETRY	BNW	7090	143	
F36	SBP			I	\$	BOW2, DEFLECTION CALCULATION PARALLEL BEAMS	ANL	3600	365	
F36	RS	P	T	B	\$	MC**2, ENDF MULTIGROUP X-SECTION CALCULATION	ANL	3600	355	
F36	RS	P	T	C	\$	SNARG-ID, 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	X	T	C	\$	TFSS, 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	\$	CHEMLOC2, CORE HEATING CLADDING-STEAM REACTION	ANL	3600	366	
F36	RSBP			G	\$	WHAM, LIQUID-FILLED PIPING SYSTEM ANALYSIS	KE	3600B	278	
F36	RSBP			I	\$	SWFLL2, FUEL ELEMENT LIFETIME ANALYSIS	ANL	3600	353	
F36	RSBP	X	T	B	\$	RABBLE,WLIB,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	RS			A	\$	STRIP, RESOLVED RESONANCE INTEGRAL CALCULATION	BW	2000	305	
F4	RS			B	\$	APRFX1, 99-GP DLC-2B LIBRARY GROUP COLLAPSING	APRF	6600	466	
F4	RS			B	\$	HFXSCAT, ELASTIC SCAT X-SECTIONS HEX LATTICE	GGA	1108	291	
F4	RS			E	\$	R102, SPACE-INDEPENDENT INVERSE KINETICS CALC	WANL	7094	168	
F4	RS			G	\$	ANVENT, LOCA ANALYSIS DUKE POWER MCGUIRE UNITS	DUCO	635	529	
F4	RS			I	\$	CORE, CORE CONFIGURATION FUEL TEMPERATURE CODE	GGA	7044	233	
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	\$	M0807, 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	\$	FCG, 1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE	BC	625	28	
F4	RS		T	C	\$	M0648, 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	\$	CYGRO2, STRESS ANALYSIS CYL FUEL ELEMENT	BAPL	6600	266	
F4	RS		T	M	\$	CHECKER,CRECT,DAMMET,PLOTFB,SLAV3, ENDF/B PROC	BNL	6600	384	
F4	RS		T	M	\$	CRECT,CHECKER,RIGEL,PLOTFB,LISTFC,DICTION,ETC.	BNL	6600	475	
F4	PS		T	D	\$	GASPAN, 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	\$	M0DFL, MODIFIED BETTIS ENVIRNMNTL 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	PS	L	T	B	\$	G0C4, MULTI-GP X-SECTIONS FAST THERMAL SPECTRA	GGA	6600	298	
F4	RS	L	T	C	\$	FIRE5, 1-D AGE-DIFFUSION SLAB CYLINDER SPHERE	AEB	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	\$	CCDILLI, LEAST SQUARES ANALYSIS RESONANCE DATA	UILL	360	347	

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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 \$ GPAMP, 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	GGA 1108	292
F4	RS P	A \$ RAMP1, REICH-MOORE RESOLVED REGION X-SECTIONS	BNL 6600	492
F4	RS P	A \$ SIGPLOT, RESOLVED MULTILEVEL B-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	TRW 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 FOG CODES	BHSC 360	30
F4	RS P	C \$ PERT4, 2-D PERTURBATION XY RZ RTHETA GEOMETRY	BNW 1108	304
F4	RS P	D \$ CINDER, MO102, POINT DEPLETION FISSION PRODUCT	BAPL 6600	313
F4	RS P	D \$ FREVAP6, HTGR METALLIC FISSION PRODUCT RELEASE	GGA 1108	301
F4	RS P	D \$ RAD2, HTGR FISSION PRODUCT ACTIVITY DIST STUDY	GGA 7044	231
F4	RS P	D \$ RAPFC, FUEL CYCLE PARAMETERS FAST BREEDERS	NED 635	372
F4	RS P	D \$ WAMPUM, FUEL CYCLE COSTS PERFORMANCE STUDY	GGA 7044	224
F4	RS P	E \$ AIREK3, SPACE-INDEPENDENT KINETICS W/FEEDBACK	AEB 360	121
F4	RS P	E \$ BLAST, REACTOR KINETICS TEMPERATURE DIST STUDY	AEB 360	363
F4	RS P	E \$ GAPOTKIN, 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	WANL 7094	255
F4	RS P	E \$ TRIFIDO, PULSED NEUTRON SOURCE DATA ANALYSIS	CNEA 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
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 \$ FRCRL2, LOCA FISSION PRODUCT RELEASE ANALYSIS	BCL 6400	500
F4	RS P	G \$ MIRAB, MIRAP, CONTAINMENT SYSTEM IODINE REMOVAL	BCL 6400	499
F4	RS P	G \$ SOCOOL2, SODIUM-FUEL INTERACTION ANALYSIS	ANL 360	521
F4	RS P	G \$ SOCOOL2, SODIUM-FUEL INTERACTION ANALYSIS	HEDL 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 \$ RAPP, HIGH-VELOCITY FLOW STUDY STEAM-WATER MIX	KAPL 6600	382
F4	RS P	I \$ GAZELLE5, GAS-COOLED CORE THERMAL DESIGN STUDY	GGA 7044	232
F4	RS P	I \$ SAFE-CREEP, VISCOELASTIC ANALYSIS CONCRETE	GGA 1108	300
F4	RS P	I \$ SAFE-PLANE, PLANE STRESS ANALYSIS, 2-C BODIES	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 \$ 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-FCRMT CARD INPUT PROCESSOR	LASL 360	530
F4	RS P	L \$ GENRD, FREE-FCRMT 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 \$ CCRGAM, UNFOLDING OF COMPLEX GAMMA-RAY SPECTRA	KSUN 360	390
F4	RS P	O \$ DYNC1, PHOTOMULTIPLIER ELECTRON DISTRIBUTION	ANL 360	464
F4	RS P	O \$ DYNC1, PHOTOMULTIPLIER ELECTRON DISTRIBUTION	KAPL 6600	464
F4	RS P	P \$ FORSIM, SOLN OF SYSTEM OF ORDINARY DIFF EQNS	CRNL 6600	514
F4	RS P	P \$ MCST, A MULTIDIMENSIONAL OPTIMIZATION SCHEME	KAPL 6600	446
F4	RS P	P \$ REL01, RELIABILITY FOR A SINGLE FAILURE MODE	BAPL 6600	497
F4	RS P	P \$ ROPE, FINDING ROOTS OF A POLYNOMIAL	KAPL 6600	444
F4	RS P	T A \$ ATHENA4, INELASTIC SCATTERING FORM FACTORS	ORNL 360	417
F4	RS P	T A \$ AVRAGE3,4,SIGMA2,ADLER, ENDF/B RESONANCE XSECS	BNL 6600	465
F4	RS P	T A \$ JP1XR, COUPLED-CHANNEL SCATTERING X-SEC CALC	KAPL 6600	506
F4	RS P	T A \$ PHASER, PHASE SHIFT X-SEC + POLARIZATION CALC	KAPL 6600	507

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F4	RS	P	T	A	\$	PUN1, UNRESOLVED RESONANCE INTEGRALS X-SECS	BAPL	6600	359
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	\$	TCR, 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	JAER	230	526
F4	RS	P	T	B	\$	EPOCH, NEUTRON AGE CALCULATION OF ENDF/B DATA	BAPL	6600	461
F4	RS	P	T	B	\$	ETCM1, 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	ORNL	360	431
F4	RS	P	T	C	\$	BE21, FEW-GP DISCRETE ORDINATES SLAB GEOME RY	BAPL	6600	398
F4	RS	P	T	C	\$	BISYN, 2-D MULTI-GP DIFFUSION SYNTHESIS CALC	NED	1108	287
F4	RS	P	T	C	\$	DCT2DB, 2D 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	CE	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	BHSC	360	120
F4	RS	P	T	C	\$	FLARE, 3-D REACTIVITY AND POWER DISTRIBUTION	MSS	360	167
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 SLAB CYL SPHERE	BNW	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	\$	TWOTRAN, 2-D MULTI-GP TRANSPORT CODE R-Z GEOM	LASL	1108B	358
F4	RS	P	T	C	\$	TWOTRAN, 2-D MULTI-GP TRANSPORT CODE X-Y GEOM	ANL	360	358
F4	RS	P	T	C	\$	TWOTRAN, 2-D MULTI-GP TRANSPORT CODE X-Y GEOM	LASL	1108A	358
F4	RS	P	T	C	\$	TWOTRAN, 2-D MULTI-GP TRNSPT CODE XY RZ RTHETA	LASL	6600	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, 3D 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	\$	CONCEPT, POWER PLANT CONCEPTUAL COST ESTIMATES	ORNL	360	498
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 GEOM DIFFUSION DEPLETION	GGA	1108	339
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	BNW	1108	325
F4	RS	P	T	D	\$	2DB, 2-D MULTIGROUP DIFFUSION AND DEPLETION	LASL	6600	325
F4	RS	P	T	D	\$	3DXT,DEP3, 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	\$	FORE, 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	BNL	6600	405
F4	RS	P	T	F	\$	NCISY1, AUTO- AND CROSS-SPECTRAL DENSITIES	BNW	7090	488

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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	\$	ECCSA4, LOSS-CF-COOLANT & EMERGENCY COOLING	BCL	6400	330
F4	RS	P	T	G	\$	ELBOW, FUEL ELEMENT STRESS ANALYSIS STUDY	GGA	7044	229
F4	RS	P	T	G	\$	FLASH3, LOSS-CF-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
F4	RS	P	T	G	\$	MO555,ACT1, LOSS-OF-COOLANT ACCIDENT ANALYSIS	BAPL	6600	284
F4	RS	P	T	G	\$	NURL0C-1.0, LCSS-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	H	\$	CHIC-KIN, FAST + INTERMEDIATE POWER TRANSIENTS	BAPL	6600	473
F4	RS	P	T	H	\$	CCBRA3, ROD BUNDLE THERMALHYDRAULIC ANALYSIS	ANL	360	432
F4	RS	P	T	H	\$	COBRA3, ROD BUNDLE THERMALHYDRAULIC ANALYSIS	BNW	1108	432
F4	RS	P	T	H	\$	DYNAM, DYNAMIC ANALYSIS BOILING FLOW STEAM	GGA	1108	440
F4	RS	P	T	H	\$	FIGRO, LSBR FUEL SWELLING TEMPERATURE STUDY	BAPL	6600	272
F4	RS	P	T	H	\$	FL0T1,MO219, PWR FLOW TRANSIENT ANALYSIS	BAPL	6600	331
F4	RS	P	T	H	\$	GLUR1, 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	\$	HCT2, 2-D TRANSIENT HEAT CONDUCTION PROGRAM	BAPL	6600	286
F4	RS	P	T	H	\$	LION, 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	\$	MO899,H0H, STFAM TABLES 14.5-2538 PSIA	BAPL	6600	294
F4	RS	P	T	H	\$	TCPS, 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	\$	FLGIT, 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	6600	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	\$	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-PCRS, STRESS ANALYSIS AXISYMMETRIC LOAD	GGA	7044	250
F4	RS	P	T	I	\$	SAFE-PLANE, PLANE STRESS ANALYSIS, 2-C BODIES	BNL	6600	252
F4	RS	P	T	I	\$	SAFE-3D, 3-D COMPOSITE STRUCTURE STRESS STUDY	GGA	1108	332
F4	RS	P	T	I	\$	SEALSHLL2, SHELL STRESS ANALYSIS AXISYM LOAD	BAPL	6600	282
F4	RS	P	T	I	\$	SEALSHLL2, SHELL STRESS ANALYSIS AXISYM LOAD	SR	360	282
F4	RS	P	T	I	\$	SOR2, STRESS ANALYSIS SHELLS OF REVOLUTION	KAPL	6600	80
F4	RS	P	T	J	\$	MUSCAT, VIEW FACTOR SHIELDING CODE CAVITY GEOM	GGA	1108	259
F4	RS	P	T	J	\$	MO756,LETO, 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,RIGEL ENDF/B PROCESSING CODES	ANL	360	475
F4	RS	P	T	M	\$	EDITOR, ENDF/B TAPE PROCESSING AND EDITING	ORNL	360	502
F4	RS	P	T	M	\$	TROUT, MUG MULTIGROUP XSEC LIBRARY MAINTENANCE	NED	635	493
F4	RS	P	T	O	\$	BURNUP, HEAVY ELEMENT ISOTOPIC BURNUP ANALYSIS	NED	635	311
F4	RS	P	T	O	\$	FXPN, ANALYSIS OF PULSED NEUTRON SOURCE DATA	NED	635	258
F4	RS	P	T	O	\$	JITER, FLUCTUATION EXPERIMENT ANALYSIS	BAPL	6600	394
F4	RS	P	T	O	\$	RFOUX, REACTOR FLUCTUATION EXPERIMENT ANALYSIS	BAPL	6600	425
F4	RS	P	T	P	\$	DAFT1, LEAST SQUARES FIT FISSILE NUCLIDE DATA	BAPL	6600	327

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F4	RS P T P	\$ M0661,M0657,M0626, POLYNOMIAL CURVE FITTING	BAPL 6600	411
F4	RS P CT B	\$ MC**2, ENDF MULTIGROUP X-SECTION CALCULATION	ANL 360	355
F4	RS P CT M	\$ ETOE, ENDF/B TO MC**2 DATA CONVERSION	ANL 360	350
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	\$ FINFL, FINITE-ELEMENT STUDY 2,3-D STRUCTURES	KAPL 6600	404
F4	RS P X T B	\$ ETOX2, MULTIGP CONSTANTS FROM ENDF/B FOR 1DX	HEDL 1108	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	\$ GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV	BC 625	185
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	\$ MCD5, STOCHASTIC MODEL OF NEUTRON SLOWING-DOWN	NPGS 360	491
F4	RS P X T F	\$ CEXE,INCEXE, 1-GP 3-D XYZ XENON OSCILLATION	CEND 360	415
F4	RS P X T F	\$ FCRE2, FAST REACTOR EXCURSION CALCULATIONS	ANL 360	174
F4	RS P X T F	\$ FCRE2, FAST REACTOR EXCURSION CALCULATIONS	NED 635	174
F4	RS P X T G	\$ MUCHA1,MUCHA2, MULTIPLE CHANNEL ANALYSIS ECC	BCL 6400	508
F4	RS P X T H	\$ CTHIS,ORTHAT, 2-DIMENSIONAL HEAT CONDUCTION	ORNL 360	525
F4	RS P X T L	\$ GAND, GAFGAR X-SECTION LIBRARY PREPARATION	GGA 1108	345
F4	RS P XCT A	\$ FLANGE2(71-1), ENDF/B THERMAL SCATTERING DATA	DP 360	368
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	WAPD 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	NED 635	287
F4	RS PL CT F	\$ QX1, QUASISTATIC SPATIAL REACTOR KINETICS CODE	ANL 360	474
F4	RS PL CT M	\$ ERREST, LOCA ROD BUNDLE CHF DATA ANALYSIS	ANC 360	518
F4	RS PLX T B	\$ AILMCE, X-SECTION CALC ELASTIC SCAT RESONANCES	AI 360	147
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	\$ LEOPARD, SPECTRA CALCULATION WITH DEPLETION	WAPD 360	279
F4	RS PLX T B	\$ XSDRN, DISCRETE ORDINATE MULTIGROUP CONSTANTS	ORNL 360	393
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 PLX T C	\$ VIM1, MONTE CARLO CRITICAL ASSEMBLY ANALYSIS	ANL 360	510
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	GEC 635	418
F4	RSBP D	\$ DCS, NEUTRON FLUX-DOSIMETER ACTIVITY RELATION	GEC 635	423
F4	RSBP O	\$ MICHRD, MICROHARDNESS MEASUREMENT ANALYSIS	GEC 635	421
F4	RSBP T B	\$ GROUSE, SPACE-DEPENDENT X-SECTION GENERATION	GEC 635	420
F4	RSBP T D	\$ 2CB, 2-D MULTIGROUP DIFFUSION AND DEPLETION	ANL 3600	325
F4	RSBP T K	\$ PREP,KITT, SYSTEM FAULT TREE EVALUATION CODES	ANC 360	528
F4	RSBP T K	\$ THREDES, 1-D FEW-GP DIFFUSION DESIGN SYSTEM	AI 360	273
F4	RSBP CT L	\$ APC-NU1002, BCD INPUT DATA PROCESSING MODULE	ANL 360	533
F4	RSBP X T D	\$ SIZZLE, 1-D MULTIGROUP DIFFUSION DEPLETION	AI 360	58
F4	RSBP X T G	\$ THETA1-B, FUEL ROD THERMAL RESPONSE LOCA	ANC 360	512
F4	RSBP XCT G	\$ RFLAP3, REACTOR BLOWDOWN - EXCURSION ANALYSIS	ANC 360	369
F4	RSBP LX T C	\$ ANISN, 1-D MULTI-GP DISCRETE ORDINATE CALC	AI 360	151
F4	RSBP LX T C	\$ CAFESAR4,LIBLST, 1-D MULTI-GP DIFFUSION + LIB	AI 360	270
F4	RSBP LX T D	\$ NAP, NEUTRON-INDUCED GAMMA-RAY RADIOACTIVITY	IITR 7094	314
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 C	\$ 2DF, 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 3D STRUCTURAL ANALYSIS	GGA 1108	452
F5	RS P T M	\$ TROUT, MUG MULTIGROUP XSEC LIBRARY MAINTENANCE	NED 1108	493

F5

GAKER

F5	RS	P	T	N	\$	GAPER2D, 2D PERTURBATION CALC USING 2DF OUTPUT	GGA	1108	471			
F5	RS	P	T	O	\$	CAGE,BIRD,SPEC, TIME-OF-FLIGHT DATA ANALYSIS	GEES	1108	476			
F5	RS	P	X	T	F	\$	NCISY1, AUTO- AND CROSS-SPECTRAL DENSITIES	BNW	1108	488		
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				\$	PERT, 1-D PERTURBATION FOR AIM AND FOG CODES	CDC	1604	30			
F63	RS				\$	TDP, 2-D PERTURBATION TDC OR 2DXY FLUX INPUT	PW	1604	199			
F63	RS				\$	2DF, 2-D MULTI-GP DISCRETE ORDINATE CODE	UNC	1604	173			
F63	RS				\$	WCPEXPRT, REACTOR WEIGHT OPTIMIZATION STUDY	PW	1604	190			
F63	RS				\$	CSP1, SN X-SECTION LIBRARY TAPE PREPARATION	PW	1604	194			
F63	RS				\$	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			\$	HAFAVER, HAUSER-FESHBACH INELASTIC SCATTERING	CDC	1604	14			
F63	RS	P			\$	PEGGY, ELASTIC SCATTERING PHASE-SHIFT ANALYSIS	ORNL	1604	334			
F63	RS	P			\$	RAMES, PARTICLE WAVE FUNCTION RADIAL INTEGRALS	ORNL	1604	335			
F63	RS	P			\$	SAIL, 1-D 1-GP SN APPROXIMATION SLAB GEOMETRY	CDC	1604	52			
F63	RS	P			\$	S4 CYL CELL CODE, 1-D 1-GP S4 APPROXIMATION	CDC	1604	53			
F63	RS	P			\$	ISOCRUNCH, REACTION DECAY CHAIN ANALYSIS	ORNL	1604	180			
F63	RS	P			\$	ISOSEARCH, ISOTOPE PRODUCTION FLUX, X-SEC CALC	ORNL	1604	322			
F63	RS	P			\$	ISOTOPE, MAXIMUM YIELD FROM REACTION OR DECAY	ORNL	1604	179			
F63	RS	P			\$	POWERCO, NUCLEAR STATION ELECTRICITY COSTS	ORNL	1604	340			
F63	RS	P			\$	AIREK3, SPACE-INDEPENDENT KINETICS W/FEEDBACK	CDC	1604	121			
F63	RS	P			\$	CMPXMAT, TRANSFER FUNCTION EVALUATION	PW	1604	188			
F63	RS	P			\$	AX-TNT, COUPLED NEUTRONICS-HYDRODYNAMICS SPH	PW	1604	191			
F63	RS	P			\$	CLOUD, GAMMA-RAY DOSE RATE FROM A CLOUD	CDC	1604	47			
F63	RS	P			\$	MC899,HOH, STEAM TABLES 14.5-2538 PSIA	ANL	1604	294			
F63	RS	P			\$	GRACE1, GAMMA-RAY ATTENUATION SLAB GEOMETRY	CDC	1604	45			
F63	RS	P			\$	GRACE2, GAMMA-RAY ATTENUATION CYL SPHERE GEOM	CDC	1604	46			
F63	RS	P			\$	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	\$	EQUIPOISE3A, 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-C MULTI-GP DIFFUSION SLAB CYL SPHERE	CDC	1604	120			
F63	RSBP				\$	NEARREX, COMPOUND NUCLEUS X-SECTION CALC	ANL	3600	171			
F63	RSBP				\$	R101, SPACE-INDEPENDENT KINETICS KEX OPTIONS	ANL	3600	255			
F63	RSBP				\$	R102, SPACE-INDEPENDENT INVERSE KINETICS CALC	ANL	3600	168			
F63	RSBP				\$	AX1, COUPLED NEUTRONICS-HYDRODYNAMICS SPHERE	CDC	3600	102			
F63	RSBP				\$	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	RSBPL	T	J	\$		MAC, SHIELD DESIGN MULTIGROUP SLAB GEOMETRY	ANL	3600	143			
GADOSE,DCSET, 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	BIN	R	L	T	Z	\$	ZPR-III ASSEMBLY	48	356
GAFGAR X-SECTION	LIBRARY PREPARATION	GGA	1108	F4	RS	P	X	T	L	\$	GAND,	345
GAKER, INELASTIC	SCAT X-SECTION CALC MODERATOR	GGA	1108	F4	RS	P	A	\$	289			

GAKIN

GEES

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, ANIS X-SEC FORMAT WAPD 6600	F4	RS PL	T B \$	ETOG1, ENDF/B TO MUFT,		437
GAMBLE4, 2-D MULTI-GP DIFFUSION XY RZ GEOMETRY	GGA	7044	F+MAP	RSBP	T C \$	222
GAMBLE5, 2-D MULTI-GP DIFFUSION XY RZ GEOMETRY	GGA	1108	F+BAL	RS P	T C \$	222
GAMMA RAY SOURCE BUILDUP FACTOR CALC	BAPL	6600	F+ASC	RS P	T J \$	ASPIS,
GAMMA RAY SPECTRA	ORNL	360	F4	RS P	O \$	ALPHA-M, RESOLUTION OF
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,
GAMMA-RAY ATTENUATION CYL SPHERE GFOM	CDC	1604	F63	RS P	J \$	GRACE2,
GAMMA-RAY ATTENUATION SLAB GEOMETRY	AI	7090	F2	RS P	J \$	GRACE1,
GAMMA-RAY ATTENUATION SLAB GEOMETRY	CDC	1604	F63	RS P	J \$	GRACE1,
GAMMA-RAY DOSE RATE FROM A CLOUD	AI	7090	F2	RS P	G \$	CLOUD,
GAMMA-RAY DOSE RATE FROM A CLOUD	CDC	1604	F63	RS P	G \$	CLOUD,
GAMMA-RAY DOSE RATE FROM A CLOUD	DP	360	F4	RS P	G \$	CLOUD,
GAMMA-RAY HISTORIES	PW	1604	F+CDP	RS P	X T B \$	FMC-N, FMC-G, MC NEUTRON,
GAMMA-RAY PHOTOFRACITION SOLID CRYSTAL	UM	7090	MAD	RSB	O \$	BURP4,
GAMMA-RAY PHOTOFRACITION WELL CRYSTAL	UM	7090	MAD	RSB	O \$	BURP5,
GAMMA-RAY RADIOACTIVITY	IITR	7094	F4	RSBPLX	T D \$	NAP, NEUTRON-INDUCED
GAMMA-RAY SPECTRA ANALYSIS	KAPL	6600	F4	RS	T O \$	GASPAR, COMPLEX
GAMMA-RAY SPECTRA GGA	1108	F+BAL	RS P	T O \$	TOAD, 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 \$	M0756, LETO, 1-D SLAB
GAMMA-RAYS	GEC	7094	F4	RS P	B \$	GAMMA-P, PRODUCTION X-SECTIONS FOR
GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV	BC	625	F4	RS P	X T B \$	185
GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV	BNW	1107	F4	RS PL	T B \$	185
GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV	BNW	7090	F+MAP	RS PL	T B \$	185
GAMTRI, 2-D MULTIGP DIFFUSION TRIANGULAR MESH	GGA	1108	F+BAL	RS P	T C \$	401
GAM1 OR 2	WAPD	6600	BCD	R	L T Z \$	ETOG1 DATA LIBRARIES, MUFT4 OR 5,
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	GGA	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
GAPER2D, 2D PERTURBATION CALC USING 2DF OUTPUT	GGA	1108	F5	RS P	T N \$	471
GAPL3, INELASTIC LARGE DEFLECTION STRESS STUDY	BAPL	6600	F+COM	RS P	T I \$	397
GAPOTKIN, 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,
GARGOYLE, 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
GARCL, 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 +
GAS-COOLED CORE THERMAL DESIGN STUDY	GGA	7044	F4	RS P	I \$	GAZELLE5,
GASA, STABILITY ANALYSIS REACTOR KINETICS EQNS	GGA	1108	F4	RS P	E \$	290
GASKET, THERMAL SCATTERING LAW CALCULATION	GGA	1108	F4	RS P	A \$	263
GASPAR, 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	RS 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
GAYER, ENERGY INTERVAL X-SECTION AVERAGING	GGA	7044	F4	RS P	L \$	218
GAZELLE5, 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-HAPO-S13, 1-D MULTI-GP DOUBLE SN APPROX	BNW	7090	FLOCO	RSBP	T C \$	75
GEC	625	F4	RS P	B \$	AVOID, ANNULAR VOID X-SECTION CALCULATION	276
GEC	635	F+MAP	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
GEC	635	F4	RSBP	D \$	CHAINS, ANALYSIS OF RADIOACTIVE DECAY CHAINS	418
GEC	635	F4	RSBP	D \$	DO'S, NEUTRON FLUX-DOSIMETER ACTIVITY RELATION	423
GEC	635	F4	RSBP	O \$	MICHRD, MICROHARDNESS MEASUREMENT ANALYSIS	421
GEC	635	F4	RSBP	T B \$	GROUSE, SPACE-DEPENDENT X-SECTION GENERATION	420
GEC	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, BIRD, SPEC, TIME-OF-FLIGHT DATA ANALYSIS	476

GEM

GGA

GEM, 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	GGA 7044	F4	RS P	T D	\$	227	
GENRD, FREE-FORMAT CARD INPUT PRCESSOR	LASL 360	F4	RS P	L	\$	530	
GENRD, FREE-FORMAT CARD INPUT PRCESSOR	LASL 6600	F4	RS P	L	\$	530	
GEOME RY EAPL 6600	F4	RS P	T C	\$	BE21, FEW-GP DISCRETE ORDINATES SLAB	398	
GEOMETRICAL DATA HEAT TRANSFER STUDY	SLL 6600	F4	RS P	N	\$	434	
GESV 635	F+GMP	RS P	XCT B	\$	ENDRUN2, MULTIGROUP CONSTANTS FROM ENDF/B DATA	501	
GESV 635	F+GMP	RS P	XCT L	\$	TDOWN, SPATIAL & COMPOSITION-DEPENDENT X-SECS	505	
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 O	\$	TOAD, 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,DOSET, 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	\$	FREVP6, 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 BODIES	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	\$	PWCOST, 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	\$	COMBE, COHERENT INELASTIC SCATTERING LAW CALC	385	
GGA 1108	F4	RS P X	T B	\$	GAF,GAR, 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 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 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 3D STRUCTURAL ANALYSIS	452	
GGA 1108	F5	RS P	T N	\$	GAPER2D, 2D PERTURBATION CALC USING 2DF OUTPUT	471	
GGA 6600	F4	RS L	T B	\$	GGC4, MULTI-GP X-SECTIONS FAST THERMAL SPECTRA	298	
GGA 7044	F+MAP	RS P	A	\$	FASDOP, X-SECTIONS FROM B-W RESONANCE DATA	216	
GGA 7044	F+MAP	RS P	T B	\$	GAROL, RESONANCE OVERLAP AND LATTICE EFFECTS	219	
GGA 7044	F+MAP	RS P	T D	\$	OPUS, POWER PLANT PERFORMANCE AND PRICE STUDY	226	
GGA 7044	F+MAP	RS P	T H	\$	BLCOST5, 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	\$	GAMBLE4, 2-D MULTI-GP DIFFUSION XY RZ GEOMETRY	222	

GGA

HEAT

GGA	7044	F+SPS	RSBP	T N	\$	CRCSPLT, 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	\$	PRECON, HTGR CONTAINMENT PRESSURE POST RUPTURE	228	
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	\$	RELOAD-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 D	\$	STMGEN, STEAM GENERATOR DESIGN CRITERIA COSTS	227	
GGA	7044	F4	RS P	T G	\$	ELBOW, FUEL ELEMENT STRESS ANALYSIS STUDY	229	
GGA	7044	F4	RS P	T I	\$	SAFE-AXISYM, STRESS ANALYSIS AXISYMMETRIC LOAD	251	
GGA	7044	F4	RS P	T I	\$	SAFE-PCRS, STRESS ANALYSIS AXISYMMETRIC LOAD	250	
GGA	7044	F4	RS P X	A	\$	LEGCOEF3, LEGENDRE COEF CALC FOR ANGULAR DIST	217	
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	\$	DOB, 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 B	\$	GAM1, 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,	GRUP 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	RS 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	RS L T M	\$	SCORE3, SCISRS ENDF/B	375	
GRAPHICS	SUBROUTINES AI	360	F+BAL	RS T P	\$	FIGS, IBM360+2250 FORTRAN	484	
GRAVE,	GRUP-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	
GROUP CONSTANT CALC	FROM TOR OUTPUT DATA	LASL	6600	F4	RS P T B \$	GLEN,	361	
GROUP OR MESH COLLAPSING	TRW 6500 F4	RS P	B	\$	PARTI, OPTIMAL		416	
GRUP-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	PPCC 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	\$	HOT2, 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	\$	BLOOST6, 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	GGA 7044 F+MAP	RS P T H	\$	BLOOST5, POINT-KINETICS WITH 2-D		205		
HEAT TRANSFER	MCLTEN FUEL TUBE BUNDLES	LASL	7094	F2	RSBP H \$	AXFLU,	182	

HEAT

INVERSE

HEAT TRANSFER PROGRAM	GEC	635	F+GMP	RSBP	T H \$	THTE, 3-D TRANSIENT	346
HEAT TRANSFER PROGRAM	GGA	1108	F5	RS P	T H \$	TAC3D, TRANSIENT 3-D	414
HEAT TRANSFER SOLID FUEL TUBE BUNDLES	LASL	7094	F2	RSBP	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 \$	CHEMLOC2, 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	ORNL	360	F4	RS P	T H \$		517
HEATMESH, GEOMETRICAL DATA HEAT TRANSFER STUDY	SLL	6600	F4	RS P	N \$		434
HEAVY ELEMENT ISCTOPIC BURNUP ANALYSIS	NED	635	F4	RS P	T O \$	BURNUP,	311
HEDL 1108 F+SL RS	T K \$	HERMES, REGIONAL RADIOLOGICAL EFFECTS ANALYSIS					527
HEDL 1108 F4 RS P	G \$	SOCOOL2, SODIUM-FUEL INTERACTION ANALYSIS					521
HEDL 1108 F4 RS P X T B \$	ETCX2, MULTIGP CONSTANTS FROM ENDF/B FOR 1DX						388
HELP, CRITICAL ANALYSIS SYSTEM	DP	360	F+BAL	RS P	XCT B \$	HAMMER,LITHE,	277
HERESY1, LATTICE PARAMETERS HETEROGENEOUS CALC	FMA	7090	F2	RSBP	X C \$		136
HERMES, REGIONAL RADIOLOGICAL EFFECTS ANALYSIS	HEDL	1108	F+SL	RS	T K \$		527
HETEROGENEOUS AEROSOLS	AI	360	F4	RS P	T G \$	HAA3, COAGULATION OF	443
HETEROGENEOUS CALC FMA	7090	F2	RSBP	X C \$	HERESY1, LATTICE PARAMETERS		136
HEX CELL	BAPL	6600	F+ASC	RS P	X T B \$	RESQ2,RESQ0,DBF1, RESONANCE INTEGRAL	285
HEX GEOM DIFFUSION DEPLETION	GGA	1108	F4	RS P	T D \$	GAUGE, 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 \$	RAPP,	382
HISTORIES	GGA	7044	F4	RS P	T B \$	FMC-N, 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
HTGR ACCIDENT ANALYSIS DOSE CALC	GGA	1108	F4	RS	T G \$	GADOSE,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 \$	RAD2,	231
HTGR METALLIC FISSION PRODUCT RELEASE	GGA	1108	F4	RS P	D \$	FREVAP6,	301
HWOCR-SAFE, 2-D MONTE CARLO CELL CALCULATION	AI	360	F+BAL	RS P	X T B \$		307
HYDRAULIC WATER-REACTOR DESIGN	BNW	1108	F5	RS P	T H \$	REPP, THERMAL	483
HYDRODYNAMIC ANALYSIS DURING BLOWDOWN	PPCO	360	F4	RS P	X G \$	BURST1,	435
IBM 360A F+BAL RS P	T D \$	PDQ5, 2-D FEW-GROUP DIFFUSION AND DEPLETION					336
IBM360+2250 FORTRAN GRAPHICS SUBROUTINES	AI	360	F+BAL	RS	T P \$	FIGS,	484
IITR 7094 F4	RSBPLX	T D \$	NAP, NEUTRON-INDUCED GAMMA-RAY RADIOACTIVITY				314
IMPELLER DESIGN STUDY	PW	1604	F63	RS P	T I \$	PIP, CENTRIFUGAL PUMP	187
INCEXE, 1-GP 3-D XYZ XENON OSCILLATION	CEND	360	F4	RS P	X T F \$	CEXE,	415
INELASTIC LARGE DEFLECTION STRESS STUDY	BAPL	6600	F+COM	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 \$	HAFAEVER, 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 \$	TIGIR2, MODULAR DOCUMENT	403
INPUT	PW	1604	F63	RS	C \$	TDP, 2-D PERTURBATION TDC OR 2DXY FLUX	199
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 \$	DATATN 2-D GEOMETRY	406
INSTRUCTION SET	PW	1604	F+CDP	RS P	T P \$	LAG, ASSEMBLER FOR FLOCO2	186
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	3600	F63	RSBP	E \$	R102, SPACE-INDEPENDENT	168
INVERSE KINETICS CALC	WANL	7094	F4	RS	E \$	R102, SPACE-INDEPENDENT	168

IODINE

KINETICS

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		ORNL 1604	F63	RS P D \$	180
ISOCRUNCH, REACTION DECAY CHAIN ANALYSIS		ORNL 7090	F2	RSBP D \$	180
ISCGEN, RADIONUCLIDE GENERATION AND DECAY		BNW 1108	F5	RSBPL T D \$	367
ISOSEARCH, ISOTOPE PRODUCTION FLUX, X-SEC CALC		ORNL 360	F+BAL	RS P D \$	322
ISOSEARCH, ISOTOPE PRODUCTION FLUX, X-SEC CALC		ORNL 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		ORNL 1604	F63	RS P D \$ ISOSEARCH,	322
ISOTOPES, MAXIMUM YIELD FROM REACTION OR DECAY		ORNL 1604	F63	RS P D \$	179
ISOTOPIC BURNUP ANALYSIS NED	635	F4	RS P	T O \$ BURNUP, HEAVY ELEMENT	311
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 \$ LECPARD, SPECTRA CALCULATION WITH DEPLETION			279
JOB ENTRY SYSTEM	ANC	360	BAL	RSB T P \$ NRTS-RJE, OS/360 MVT REMOTE	519
JOSHUA SYSTEM LATTICE PHYSICS MODULES	DP	360	F+BAL	S X T B \$ RAHAB,	536
JOSHUA, DATA STORAGE, RETRIEVAL, AND DISPLAY	DP	360	F+BAL	S T M \$	490
JP1XR, COUPLED-CHANNEL SCATTERING X-SEC CALC		KAPL 6600	F4	RS P T A \$	506
JUPITORI, 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 \$ LICN, 3-D TEMPERATURE DISTRIBUTION PROGRAM			299
KAPL 6600 F+ASC	RS P	T I \$ GEM, EIGENVALUE PROBLEM FOR VIBRATING SYSTEMS			344
KAPL 6600 F+ASC	RS P	T L \$ DATATRAN 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 \$ DATATRAN 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+CCM	RS	T P \$ KAPLPLOT, KAPL CALCOMP PLOTTING ROUTINES			496
KAPL 6600 F+COM	RSB	T M \$ DATATRAN, MODULAR PROGRAMMING AND DATA SYSTEM			386
KAPL 6600 F4	RS	I \$ SORSDB, PRESSURE VESSEL STRESS AND FATIGUE			391
KAPL 6600 F4	RS	T O \$ GASPAN, 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 \$ TUBE, 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 PCLYNOMIAL			444
KAPL 6600 F4	RS P	T A \$ JP1XR, 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 6600 F4	RS P	T I \$ SOR2, STRESS ANALYSIS SHELLS OF REVOLUTION			80
KAPL 6600 F4	RS P X	I \$ FINEL, FINITE-ELEMENT STUDY 2,3-D STRUCTURES			404
KAPLPLOT, KAPL CALCCMP 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
KENC, MONTE CARLO MULTIGROUP CRITICALITY CODE		ORNL 360	F+BAL	RSBPL CT C \$	450
KERNEL CALC	GGA	7090	F2	RS T A \$ SUMMIT, CRYSTALLINE SCATTERING	56
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	3600	F63	RSBP E \$ R102, SPACE-INDEPENDENT INVERSE	168
KINETICS CALC	WANL	7094	F4	RS E \$ R102, SPACE-INDEPENDENT INVERSE	168

KINETICS

LEAST

KINETICS CODE ANL 360 F4 RS P T E \$ ANCON, SPACE-INDEPENDENT REACTOR	486
KINETICS CODE 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 3600 F63 RSBP E \$ R101, SPACE-INDEPENDENT	255
KINETICS KEX OPTIONS WANL 7094 F4 RS P E \$ R101, SPACE-INDEPENDENT	255
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 E \$ 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 T 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+CDP 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 \$ SIMPLE1, TIME-SHARING PROGRAMMING	442
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, INELASTIC	397
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 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 1108A F4 RS P T C \$ TWOTRAN, 2-D MULTI-GP TRANSPORT CODE X-Y GEOM	358
LASL 1108B F4 RS P T C \$ TWOTRAN, 2-D MULTI-GP TRANSPORT CODE R-Z GEOM	358
LASL 6600 BCD R LX T Z \$ LASL XSEC SETS, SN 18- 24- AND 25-GROUP SETS	532
LASL 6600 F4 RS P L \$ GENRD, FREE-FORMAT CARD INPUT PROCESSOR	530
LASL 6600 F4 RS P N \$ DAC1, SN PERTURBATION CODE USING DTF4 FLUXES	455
LASL 6600 F4 RS P N \$ LARCA, FLUX-WEIGHTING OF DTF4 CROSS SECTIONS	409
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 \$ TWOTRAN, 2-D MULTI-GP TRNSPT CODE XY RZ RTHETA	358
LASL 6600 F4 RS P T C \$ 3DDT, 3D 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 \$ 2DB, 2-D MULTIGROUP DIFFUSION AND DEPLETION	325
LASL 6600 F4 RS P T E \$ ANCON, SPACE-INDEPENDENT REACTOR KINETICS CODE	486
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	269
LASL 7090 F+MAP RS P I \$ WIREX, COMPUTER-PRODUCED WIRING LISTS UHTREX	315
LASL 7090 F+MAP 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 B \$ 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
LATTICE GGA 1108 F4 RS B \$ HEXSCAT, ELASTIC SCAT X-SECTIONS HEX	291
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 PARAMETERS HETEROGENEOUS CALC FMA 7090 F2 RSBP X C \$ HERESY1,	136
LATTICE PHYSICS MODULES DP 360 F+BAL S X T B \$ RAHAB, JOSHUA SYSTEM	536
LEAKAGE AI 7090 F2 RS J \$ FARSE1A, DOSE RATE FROM SNAP SHIELD	91
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

LOSS-OF-COOLANT

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 D \$ GSSLRN1B,	457	
LEAST SQUARES TRANSUTATION ANALYSIS BNWL	1108	F5	RS P	T D \$ DBUFIT1,	456	
LEAST SQUARES, GENERAL CURVE FITTING	LASL	7094	F4	RS	T P \$ LASL	62
LEGCOEF3, LEGENDRE CCEF CALC FOR ANGULAR DIST	GGA	7044	F4	RS P X	A \$	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	
LEOPARD, SPECTRA CALCULATION WITH DEPLETION	JNC	1108	F5	RS	LX T B \$	279
LECPARD, 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 \$ GAROL, RESONANCE OVERLAP AND LATTICE EFFECTS					219
LER 7094 F4	RS P	T C \$ DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM				209
LETO, 1-D SLAB GAMMA-RAY TRANSPORT	BAPL	6600	F4	RS P	T J \$ M0756,	343
LIB AI	360	F4	RSBPLX	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	6600C	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	RSBPLX	T C \$ CAESAR4,	270
LIBRARIES FROM ENDF/P DATA	WAPD	7600	F4	RS P	T B \$ ETOT2, THERMAL	509
LIBRARIES, MUFT4 OR 5, GAM1 OR 2	WAPD	6600	BCD	R	L T Z \$ ETOG1 DATA	447
LIBRARY	LRL	7094	F+FAP	RS PL	T M \$ ECSIL, EXPERIMENTAL NEUTRON DATA	351
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, GAFGAR 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 \$ MOMUS, 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
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
LION, 3-D TEMPERATURE DISTRIBUTION PROGRAM	CHI	1108	F4	RS P	T H \$	299
LION, 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 LOFT	UGA	360	F4	RS P	G \$ WATER-HAMMER,	278
LIQUID-FILLED PIPING SYSTEM ANALYSIS	KE	3600B	F36	RSBP	G \$ WHAM,	278
LISTFC, DICTION, ETC. RNL	6600	F4	RS	T M \$ CRECT, CHECKER, RIGEL, PLOTFB,		475
LISTS UHTREX	LASL	7090	F+FAP	RS P	I \$ WIREX, COMPUTER-PRODUCED WIRING	315
LITHE, HELP, CRITICAL ANALYSIS SYSTEM	DP	360	F+BAL	RS P	XCT B \$ HAMMER,	277
LIZARD, NONLINEAR DIFFERENTIAL EQNS. SOLUTION	KAPL	6600	F+ASC	RS P	T P \$	445
LMFBR POWER EXCURSION DISASSEMBLY	ANL	360	F4	RS P	XCT F \$ VENUS, 2-D	511
LMFBR ROD BUNDLE	NED	635	F4	RS P	T H \$ VELVET2, TURBULENT FLOW IN	458
LOAD GGA	7044	F4	RS P	T I \$ SAFE-PCRS, STRESS ANALYSIS AXISYMMETRIC		250
LOAD BAPL	6600	F4	RS P	T I \$ SEALSHLL2, SHELL STRESS ANALYSIS AXISYM		282
LOAD SR	360	F4	RS P	T I \$ SEALSHLL2, SHELL STRESS ANALYSIS AXISYM		282
LOAD GGA	7044	F4	RS P	T I \$ SAFE-AXISYM, STRESS ANALYSIS AXISYMMETRIC		251
LCCA	ANC	360	F4	RSBP X T G \$ THETA1-B, FUEL ROD THERMAL RESPONSE		512
LCCA ANALYSIS DUKE POWER MCGUIRE UNITS DUCO	635	F4	RS	G \$ ANVENT,		529
LCCA FISSION PRODUCT RELEASE ANALYSIS	BCL	6400	F4	RS P	G \$ FRCRL2,	500
LCCA 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
LOFT	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
LOSS-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

LCSS-CF-COOLANT

METALLIC

LCSS-OF-CCOLANT 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				
LSBR FUEL SWELLING TEMPERATURE STUDY	BAPL	6600 F4 RS P	T H \$	FIGRO,	272		
LUMPED MASS LASL 7030 F4 RS	T H \$	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				
LYNNE, WOODS-SAXCN PCTENTIAL 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			
MAD RSB	O \$	BURP1, DETECTOR EFFICIENCY POINT SOURCE	UM	7090	164		
MAD RSB	O \$	BURP2, DETECTOR EFFICIENCY DISK SOURCE	UM	7090	165		
MAD RSB	O \$	BURP3, DETECTOR EFFICIENCY POINT SOURCE	UM	7090	166		
MAD RSB	O \$	BURP4, GAMMA-RAY PHOTOFRACTION SOLID CRYSTAL	UM	7090	169		
MAD PSB	O \$	BURP5, GAMMA-RAY PHOTOFRACTION WELL CRYSTAL	UM	7090	170		
MAGIC, MC**2 LIBRARY SERVICE ROUTINES	ANL	3600 36F RSBP	T M \$	MERMC2,	472		
MAGNETIC NETWORK SOLUTION	BAPL	6600 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			
MANE1, RECTANGULAR MAGNETIC NETWORK SOLUTION	BAPL	6600 F4 RS P	T I \$	412			
MANTA, STEADY-STATE THERMAL-HYDRAULIC ANALYSIS	NED	635 F4 RS P	T H \$	256			
MANTA, STEADY-STATE THERMAL-HYDRAULIC ANALYSIS	WARD	6600 F4 RS P	T H \$	256			
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				
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 FOR A SYSTEM OF BEAMS	KAPL	6600 F4 RS P	I \$	STEM,	337		
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 RS 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 FLOCO RS P	B \$	202			
MEASUREMENT ANALYSIS	GEC	635 F4 RSBP	O \$	MICHRD, MICROHARDNESS	421		
MEASUREMENTS	GGA	1108 F4 RS P	T A \$	TACASI, ANALYSIS OF RESONANCE	410		
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	B \$	PARTI, OPTIMAL GROUP OR	416		
METALLIC FISSION PRODUCT RELEASE	GGA	1108 F4 RS P	D \$	FREVAP6, HTGR	301		

METALS

MULTI-GP

METALS	GEC	635	F+FAP	RSBP	T Q	\$ CASCADE, CLUSTER, RADIATION DAMAGE IN	419
MGCSN, 1-D MULTI-GP SN APPROX SLAB CYL SPHERE	PW	1604	LAG1	RS P	C	\$	211
MICHRD, MICROHARDNESS MEASUREMENT ANALYSIS	GEC	635	F4	RSBP	O	\$	421
MICROHARDNESS MEASUREMENT ANALYSIS	GEC	635	F4	RSBP	O	\$ MICHRD,	421
MIRAB, MIRAP, CONTAINMENT SYSTEM IODINE REMOVAL	BCL	6400	F4	RS P	G	\$	499
MIRAP, CCNTAINMENT 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 APPROX 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	\$ CROC90,	154
MODE 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, INELASTIC SCAT X-SECTION CALC		289
MODERATOR SPACE CHORD DIST FUNCT	AEG	7090	F2	RS	B	\$ DANCOFF JR,	150
MODIFIED PETTIS ENVIRNMNTL LIB SCOPE2.0 CDC	7600	F4	RS	T P	\$ MODEL,		478
MODIFIED PETTIS ENVIRNMNTL LIB SCOPE3.2 CDC	6600C	F+COM	RS	T P	\$ MODEL,		478
MODIFIED PETTIS 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 B \$ 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 E	\$		491
MOLTEN 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
MONTE CARLO CALC NEUTRON HISTORIES	GGA	7044	F4	RS P	T B	\$ FMC-N,	195
MONTE CARLO CELL CALCULATION AI 360 F+BAL RS P X T B \$ HWOCR-SAFE, 2-D							307
MONTE CARLO CRITICAL ASSEMBLY ANALYSIS AI 7600 F4 RS PLX T C \$ VIM1,							510
MONTE CARLO CRITICAL ASSEMBLY ANALYSIS ANL 360 F4 RS PLX T C \$ VIM1,							510
MONTE CARLO MULTIGROUP CRITICALITY CODE ORNL 360 F+BAL RSBPL CT C \$ KENO,							450
MONTE CARLO NEUTRON PENETRATION STUDY LASL 7090 FLOCO RS P B \$ MCS,							202
MONTE CARLO REACTOR ANALYSIS CALCULATION ORNL 360 F+BAL RS P T C \$ ESP,							523
MONTE CARLO SLOWING-DOWN DENSITY CALC AI 7094 F+FAP RS PL T B \$ TYCHE3,							149
MCRTIMER, DOSE RATE CALCULATION SNAP GEOMETRY AI 7090 F2 RS J \$							142
MOST, A MULTIDIMENSIONAL OPTIMIZATION SCHEME KAPL 6600 F4 RS P P \$							446
MSS 360 F4 RS P H \$ FLOW-MODEL, MULTI-CHANNEL 2-D 2-PHASE FLOW							246
MSS 360 F4 RS P T 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 ORNL 7090 F4 RSBP A \$							323
MUFT FORMAT X-SECTIONS WAPD 6600 F4 RS P T B \$ ETOG1, ENDF/B FORMAT TO							436
MUFT, GAM, ANISN X-SEC FORMAT WAPD 6600 F4 RS PL T B \$ ETOG1, ENDF/B TO							437
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 \$ FLOW-MODEL,							246
MULTI-GP CONSTANT + FAST SPECTRA CALC ANC 360 F4 RS PLXCT B \$ 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 P X T B \$ GAMTEC2,							185
MULTI-GP CONSTANT CALC 0 TO 10 MEV BNW 1107 F4 RS PL T B \$ GAMTEC2,							185
MULTI-GP CONSTANT CALC 0 TO 10 MEV BNW 7090 F+FAP RS PL T B \$ GAMTEC2,							185
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 RSBPLX T C \$ CAESAR4, LIBLST, 1-D							270
MULTI-GP DIFFUSION DEPLETION CODE ORNL 7090 F+FAP RS P T D \$ 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 ORNL 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

MULTIGROUP

MULTI-GP	DIFFUSION	PROGRAM	BC	625	F4	RS	T C	\$ EXTERMINATOR2,	2-D	156
MULTI-GP	DIFFUSION	PROGRAM	CE	6600	F4	RS P	T C	\$ EXTERMINATOR2,	2-D	156
MULTI-GP	DIFFUSION	PROGRAM	ORNL	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	29
MULTI-GP	DIFFUSION	SLAB CYL SPHERE	CDC	1604	F63	RS PLX	T C	\$ FAIM,	1-D	120
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	\$ FAIMOS,	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	\$ BISYN,	2-D	287
MULTI-GP	DIFFUSION	XY RZ GEOMETRY	GGA	1108	F+BAL	RS P	T C	\$ GAMBLE5,	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	\$ FORTRAN	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	\$ SUPHIST1/2/5,	160		
MULTI-GP	TRANSFER MATRICES	AGC	7090	F2	RS P	T B	\$ AGN-SIGMA, CALC OF	243		
MULTI-GP	TRANSPORT CCDE R-Z GEOM	LASL	1108B	F4	RS P	T C	\$ TWOTRAN,	2-D	358	
MULTI-GP	TRANSPORT CCDE X-Y GEOM	ANL	360	F4	RS P	T C	\$ TWOTRAN,	2-D	358	
MULTI-GP	TRANSPORT CCDE X-Y GEOM	LASL	1108A	F4	RS P	T C	\$ TWOTRAN,	2-D	358	
MULTI-GP	TRNSPT CCDE XY RZ RTHETA	LASL	6600	F4	RS P	T C	\$ TWOTRAN,	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	\$ COMBCO, 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	
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	FROM ENDF/B FOR	IDX	HEDL	1108	F4	RS P X	T B	\$ ETOX2,	388
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	CONSTANTS	CRNL 360	F4	RS PLX	T B	\$ XSDRN, DISCRETE ORDINATE	393			
MULTIGROUP	CONSTANTS	FROM ENDF/B DATA	GESV 635	F+GMP	RS P X	T B	\$ ENDRUN2,	501		
MULTIGROUP	CRITICALITY CODE	ORNL 360	F+BAL	RSBP	CT C	\$ KENDU, 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,	2D	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

NEUTRON

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, 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 \$ 3DDT, 3D	463
MULTIGROUP DISCRETE ORDINATE CALC	UNC	1604	F63	RS PL T C \$ OTF, 1-D	144
MULTIGROUP DISCRETE ORDINATE PROGRAM LER	7090	F+MAP	RS P	T C \$ TDSN, 2-D	312
MULTIGROUP SLAB GEOMETRY	ANL	3600	F63	RSBPL T J \$ MAC, SHIELD DESIGN	143
MULTIGROUP SLAB GEOMETRY	BNW	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	BNL	6600	F4	RS P A \$ SIGPLOT, RESOLVED	377
MULTIPLE CHANNEL ANALYSIS ECC	BCL	6400	F4	RS P X T G \$ MUCHAL, MUCHA2,	508
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
MO102), POINT DEPLETION FISSION PRODUCT DP	360	F+BAL	RS P	T D \$ CINDER(	313
MO102, POINT DEPLETION FISSION PRODUCT	BAPL	6600	F4	RS P D \$ CINDER,	313
MO219, PWR FLOW TRANSIENT ANALYSIS	BAPL	6600	F4	RS P T H \$ FLOT1,	331
MO266, LINEAR ELASTIC STRUCTURAL DYNAMICS	BAPL	6600	F4	RS P T I \$	383
MO457, PIPE, ELASTIC STRESS OF PIPING SYSTEM	BAPL	6600	F4	RS P T I \$	329
MO552, DYNAMIC ANALYSIS LINEAR ELASTIC SYSTEMS	BAPL	6600	F4	RS P T I \$	283
MO555, ACT1, LOSS-OF-COOLANT ACCIDENT ANALYSIS	BAPL	6600	F4	RS P T G \$	284
MO626, POLYNOMIAL CURVE FITTING	BAPL	6600	F4	RS P T P \$ MO661, MO657,	411
MO648, 1-D SLAB TRANSPORT WITH SLOWING DOWN	BAPL	6600	F4	RS T C \$	342
MO657, MO626, POLYNOMIAL CURVE FITTING	BAPL	6600	F4	RS P T P \$ MO661,	411
MO661, MO657, MO626, POLYNOMIAL CURVE FITTING	BAPL	6600	F4	RS P T P \$	411
MO756, LETO, 1-D SLAB GAMMA-RAY TRANSPORT	BAPL	6600	F4	RS P T J \$	343
MO807, 2-D DIFFUSION ABSORPTION REMOVAL X-SECS	BAPL	6600	F4	RS T B \$	280
MO899, HOH, STEAM TABLES 14.5-2538 PSIA	ANL	1604	F63	RS P H \$	294
MO899, HOH, 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		
NFD 635 F+GMP RS P	T D \$	SYN, 2D SYNTHESIS MULTIGP DIFF + 1GP DEPLETION	495		
NFD 635 F4	RS P	D \$ RAPFU, FUEL CYCLE PARAMETERS FAST BREEDERS	372		
NED 635 F4	RS P	T B \$ REAX, RESOLVED RESONANCE EPITHERMAL X-SECTIONS	257		
NED 635 F4	RS P	T C \$ DOT2DB, 2D MULTIGROUP DIFFUSION + SN THEORY	459		
NED 635 F4	RS P	T C \$ FLARE, 3-D REACTIVITY AND POWER DISTRIBUTION	167		
NFD 635 F4	RS P	T D \$ FUMBLE, FAST REACTOR FUEL BURNUP + MANAGEMENT	480		
NED 635 F4	RS P	T G \$ FRADMI, 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		
NFD 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		
NFD 1108 F5	RS P	T M \$ TROUT, MUG MULTIGROUP XSEC LIBRARY MAINTENANCE	493		
NED 2000 F2	RS P	A \$ DOPIE, RESOLVED RESONANCE X-SECTION CALC	177		
NED 2000 F2	RS P	A \$ RAPTURE, RESONANCE INTEGRAL X-SECTION CALC	176		
NFD 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+GMP RS P	T B \$	EPITHERMOS, SPECTRUM AND X-SECTION CALCULATION	201		
NETWORK SOLUTION	BAPL	6600	F4	RS P T I \$ MANE1, RECTANGULAR MAGNETIC	412
NEUTRON AGE CALCULATION OF ENDF/P DATA	BAPL	6600	F4	RS P T B \$ EPOCH,	461
NEUTRON DATA LIBRARY	LRL	7094	F+GMP	RS PL T M \$ ECSIL, EXPERIMENTAL	351
NEUTRON FLUX-DOSIMETER ACTIVITY RELATION	GEC	635	F4	RSBP D \$ DOS,	423
NEUTRON HISTORIES	GGA	7044	F4	RS P T B \$ FMC-N, MONTE CARLO CALC	195
NEUTRON PENETRATION CALCULATION	DAC	7090	F2	RSBP J \$ LIPRECANI, MC	123
NEUTRON PENETRATION STUDY	LASL	7090	FLOCO	RS P B \$ MCS, MONTE CARLO	202

NEUTRON

ORDINATE

NEUTRON POLARIZATION EXPERIMENT	UCND	360	F+BAL	RS P	O \$ PMS1, FAST	469
NEUTRON SLOWING-DOWN NPGS	360	F4	RS P X T E \$	MOD5, STOCHASTIC MODEL OF	491	
NEUTRON SOURCE DATA	KED	635	F4	RS P T O \$	EXPN, ANALYSIS OF PULSED	258
NEUTRON SOURCE DATA ANALYSIS	CNEA	360	F4	RS P	E \$ TRIFIDO, 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	CDC	1604	F63	RS PLX T B \$	GAM1, FAST	33
NEUTRON SPECTRUM X-SECTION CALC	GGA	7090	F2	RS PLX T B \$	GAM1, FAST	33
NEUTRON SPECTRUM X-SECTIONS	AI	7090	F+MAP	RS PL T B \$	TEMPEST2, THERMAL	50
NEUTRON SPECTRUM X-SECTIONS	BHSC	360	F4	RS PL T B \$	TEMPEST2, THERMAL	50
NEUTRON SPECTRUM X-SECTIONS	CDC	1604	F63	RS PL T B \$	TEMPEST2, THERMAL	50
NEUTRON X-SECTION CALCULATION	BAPL	6600	F4	RS P T A \$	SUMOR, S-WAVE	399
NEUTRON-HYDRODYNAMICS	APDA	7094	F2	RS P	F \$ WEAK EXPLOSION, COUPLED	145
NEUTRON-INDUCED GAMMA-RAY RADIOACTIVITY	IITR	7094	F4	RSBPLX T D \$	NAP,	314
NEUTRON, GAMMA-RAY HISTORIES	PW	1604	F+CDP	RS P X T B \$	FMC-N, FMC-G, MC	195
NEUTRONICS-HYDRODYNAMICS CODE	AGC	7090	F2	RSB	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	BNL	6600	F4	RS P T F \$		405
NOISY1, AUTO- AND CROSS-SPECTRAL DENSITIES	BNW	1108	F5	RS P X T F \$		488
NOISY1, AUTO- AND CROSS-SPECTRAL DENSITIES	BNW	7090	F4	RS P T F \$		488
NON-SPHERICAL OPTICAL MODEL X-SECTIONS	AI	7094	F2	RS P T A \$	2PLUS,	254
NON-SPHERICAL OPTICAL MODEL X-SECTIONS	ANL	3600	F63	RSBP T A \$	2PLUS,	254
NONLINEAR ALGEBRAIC EQN SOLN CURVE PLOT	KAPL	6600	F+ASC	RS P T P \$	SNEQ,	364
NONLINEAR DIFFERENTIAL EQNS. SOLUTION	KAPL	6600	F+ASC	RS P T P \$	LIZARD,	445
NOWIG, 1-D 2-GP KINETICS TEMPERATURE FEEDBACK	BAPL	6600	F4	RS P T F \$		371
NPGS	360	F4	RS P X T E \$	MOD5, STOCHASTIC MODEL OF NEUTRON SLOWING-DOWN	491	
NPRFCCP, FUEL CYCLE COSTS PERFORMANCE DATA	KE	7090	F2	RSBP	D \$	146
NRTS-RJE, GS/360 MVT REMOTE JOB ENTRY SYSTEM	ANC	360	BAL	RSB	T P \$	519
NUCLEAR FUEL CYCLE COST AND ECONOMICS	CWE	360	F4	RS P T D \$	CINCAS,	354
NUCLEAR FUEL CYCLE COST AND ECONOMICS	WAPD	6600	F4	RS P T D \$	CINCAS,	354
NUCLEAR STATION ELECTRICITY COSTS	ORNL	1604	F63	RS P	D \$ POWERCO,	340
NUCLEUS REACTION	AI	360	F+BAL	RS P T A \$	COMNUC, CASCADE, COMPOUND	482
NUCLEUS X-SECTION CALC	ANL	3600	F63	RSBP	A \$ NEARREX, COMPOUND	171
NUCLIDE CHAIN EQUATIONS	ORNL	7090	F2	RSBP	D \$ NUCY, SOLUTION OF	134
NUCLIDE DATA	BAPL	6600	F4	RS P T P \$	DAFT1, LEAST SQUARES FIT FISSILE	327
NUCLIDE X-SECTION EVALUATION	ORNL	7090	F4	RSBP	A \$ MUFFLE, FISSILE	323
NUCY, SOLUTION OF NUCLIDE CHAIN EQUATIONS	ORNL	7090	F2	RSBP	D \$	134
NURLOC-1.0, LOSS-OF-COOLANT THERMAL ANALYSIS	BCL	6400	F4	RS P T G \$		328
ONE-GP SPACE-TIME DIFFUSION FEEDBACK	BNL	6600	F4	RS P T F \$	NOAH, 1-D	405
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, NON-SPHERICAL	254
OPTIMAL GROUP OR MESH COLLAPSING	TRW	6500	F4	RS P	B \$ PARTI,	416
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+MAP	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 \$ WOEXPT, REACTOR WEIGHT	190
OPUS, POWER PLANT PERFORMANCE AND PRICE STUDY	GGA	7044	F+MAP	RS P T D \$		226
ORDINARY DIFF EQNS	CRNL	6600	F4	RS P	P \$ FORSIM, SOLN OF SYSTEM OF	514
ORDINATE CALC	AI	7090	F2	RS PLX T C \$	DTF2, 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 \$	DTF, 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 \$ 2DF, 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 \$	DTF4, 1-D MULTI-GP DISCRETE	209
ORDINATE PROGRAM	BC	625	F+MAP	RS P T C \$	DTF4, 1-D MULTI-GP DISCRETE	209
ORDINATE PROGRAM	LASL	6600	F4	RS P T C \$	DTF4, 1-D MULTI-GP DISCRETE	209
ORDINATE PROGRAM	LASL	7030	F4	RS P T C \$	DTF4, 1-D MULTI-GP DISCRETE	209
ORDINATE PROGRAM	LER	7094	F4	RS P T C \$	DTF4, 1-D MULTI-GP DISCRETE	209

ORDINATE

PERFORMANCE

ORDINATE	PROGRAM	LER	7090	F+MAP	RS	P	T	C	\$	TDSN, 2-D MULTIGROUP DISCRETE	312										
ORDINATES	SLAB	GEOME	RY	BAPL	6600	F4	RS	P	T	C	\$	BE21, FEW-GP DISCRETE	398								
ORNL	360	F+BAL	RS	P	D	\$	ISCSEARCH, ISOTOPE PRODUCTION FLUX, X-SEC CALC						322								
ORNL	360	F+BAL	RS	P	T	B	\$	RAFFLE, 1ST FLIGHT COLLISION PROBABILITIES MC					392								
ORNL	360	F+BAL	RS	P	T	C	\$	ESP, MONTE CARLO REACTOR ANALYSIS CALCULATION					523								
ORNL	360	F+BAL	RS	P	T	I	\$	SAFE-3D, 3-D COMPOSITE STRUCTURE STRESS STUDY					332								
ORNL	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								
ORNL	360	F4	RS	P	T	A	\$	ATHENA4, INELASTIC SCATTERING FORM FACTORS					417								
ORNL	360	F4	RS	P	T	B	\$	RICE, PRIMARY RECOIL ATOM SPECTRA ENDF/B DATA					453								
ORNL	360	F4	RS	P	T	B	\$	SUPERTOG, ENDF/B FINE-GP CONSTANTS GENERATION					431								
ORNL	360	F4	RS	P	T	C	\$	EXTERMINATOR2, 2-D MULTI-GP DIFFUSION PROGRAM					156								
ORNL	360	F4	RS	P	T	C	\$	CONCEPT, POWER PLANT CONCEPTUAL COST ESTIMATES					498								
ORNL	360	F4	RS	P	T	H	\$	HEATING3, 1,2, OR 3-D HEAT CONDUCTION PROGRAM					517								
ORNL	360	F4	RS	P	T	M	\$	EDITOR, ENDF/B TAPE PROCESSING AND EDITING					502								
ORNL	360	F4	RS	P	X	T	H	\$	ORTHIS, ORTHAT, 2-DIMENSIONAL HEAT CONDUCTION				525								
ORNL	360	F4	RS	PLX	T	B	\$	XSDRN, DISCRETE ORDINATE MULTIGROUP CONSTANTS					393								
ORNL	360G	F4	RS	P	T	K	\$	CITATION, 1,2,3-D DIFFUSION DEPLETION MULTIGP					387								
ORNL	1604	F63	RS	P	A	\$	PEGGY, ELASTIC SCATTERING PHASE-SHIFT ANALYSIS						334								
ORNL	1604	F63	RS	P	A	\$	RAMES, PARTICLE WAVE FUNCTION RADIAL INTEGRALS						335								
ORNL	1604	F63	RS	P	D	\$	ISCCRUNCH, REACTION DECAY CHAIN ANALYSIS						180								
ORNL	1604	F63	RS	P	D	\$	ISCSEARCH, ISOTOPE PRODUCTION FLUX, X-SEC CALC						322								
ORNL	1604	F63	RS	P	D	\$	ISOTOPES, MAXIMUM YIELD FROM REACTION OR DECAY						179								
ORNL	1604	F63	RS	P	D	\$	POWERCO, NUCLEAR STATION ELECTRICITY COSTS						340								
ORNL	1604	F63	RS	P	T	A	\$	JUPITOR1, COUPLED-CHANNEL X-SEC EVALUATION					308								
ORNL	7090	F+MAP	RS	P	T	B	\$	RAFFLE, 1ST FLIGHT COLLISION PROBABILITIES MC					392								
ORNL	7090	F+MAP	RS	P	T	C	\$	EXTERMINATOR, 2-D MULTI-GP DIFFUSION PROGRAM					156								
ORNL	7090	F+MAP	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								
ORNL	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								
ORNL	7090	F2	RS	P	T	C	\$	20GRAND, 2-D FEW-GROUP DIFFUSION SLAB CYLINDER					40								
ORNL	7090	F2	RSBP		D	\$	ISCCRUNCH, REACTION DECAY CHAIN ANALYSIS						180								
ORNL	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
ORTHIS, ORTHAT, 2-DIMENSIONAL HEAT CONDUCTION											ORNL	360	F4	RS	P	X	T	H	\$		525
OS/360 MVT REMOTE JOB ENTRY SYSTEM											ANC	360	BAL	RSB	T	P	\$	NRTS-RJE,		519	
OSCILLATION											CEND	360	F4	RS	P	X	T	F	\$	CEXE, INCXE, 1-GP 3-D XYZ XENON	415
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, 2D PERTURBATION CALC USING 2DF	471		
OUTPUT TAPE EDIT REACTION RATES											UK-W	7090	F2	RS	N	\$	WED, W-DSN	133			
OVERLAP AND LATTICE EFFECTS											GGA	7044	F+MAP	RS	P	T	B	\$	GAROL, RESONANCE	219	
OVERLAP AND LATTICE EFFECTS											LER	7094	F+MAP	RS	P	T	B	\$	GAROL, RESONANCE	219	
OXIDE FUEL ROD STRESS & DEFORMATION											BAPL	6600	F4	RS	P	T	I	\$	CYGR03,	449	
PARALLEL BEAMS											ANL	3600	F36	SBP	I	\$	BOW2, DEFLECTION CALCULATION	365			
PARTI, OPTIMAL GROUP OR MESH COLLAPSING											TRW	6500	F4	RS	P	B	\$		416		
PARTIAL REFUEL											GGA	7044	F4	RS	P	T	D	\$	GARGOYLE, FUEL CYCLE ANALYSIS	260	
PARTICLE WAVE FUNCTION RADIAL INTEGRALS											ORNL	1604	F63	RS	P	A	\$	RAMES,	335		
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	360D	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											BW	6600B	F+ASC	RS	P	T	D	\$	275		
PEGGY, ELASTIC SCATTERING PHASE-SHIFT ANALYSIS											ORNL	1604	F63	RS	P	A	\$	334			
PENETRACON CALCULATION											DAC	7090	F2	RSBP	J	\$	LIPRECAN1, MC NEUTRON	123			
PENETRATION STUDY											LASL	7090	FLOCO	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

POWER

PERFORMANCE STUDY	GGA	7044	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-C 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 USING 2DF OUTPUT	GGA	1108	F5	RS P	T N \$ GAPER2D, 2D	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 2DXY FLUX INPUT	PW	1604	F63	RS	C \$ TDP, 2-D	199
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
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	RSB	O \$ BURP4, GAMMA-RAY	169
PHOTOFRACTION WELL CRYSTAL	UM	7090	MAD	RSB	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
PHOTOPEAK SPECTRA CODE BNWL	1108	F+BAL	RS P	T O \$ GSSLRN18, 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	
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, ELASTIC STRESS OF PIPING SYSTEM	BAPL	6600	F4	RS P	T I \$ MO457,	329
PIPING SYSTEM	BAPL	6600	F4	RS P	T I \$ MO457, PIPE, ELASTIC STRESS OF	329
PIPING SYSTEM ANALYSIS	KE	36008	F36	RSBP	G \$ WHAM, LIQUID-FILLED	278
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 \$ BL47, DRAFTING TOOL TO PLOT	373
PLANT CONCEPTUAL COST ESTIMATES	CRNL	360	F4	RS P	T D \$ CONCEPT, POWER	498
PLANT DESIGN OPTIMIZATION	AI	7090	F2	RS	I \$ CROCK, SPACE POWER	112
PLANT DESIGN OPTIMIZATION	AI	7090	F2	RS	I \$ SHUCK, SPACE POWER	114
PLANT PERFORMANCE AND PRICE STUDY	GGA	7044	F+MAP	RS P	T D \$ OPUS, POWER	226
PLCT	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
PLCTFB, LISTFC, DICTION, ETC.	BNL	6600	F4	RS	T M \$ CRECT, CHECKER, RIGEL,	475
PLOTFB, SLAV3, ENDF/B PROC	BNL	6600	F4	RS	T M \$ CHECKER, CRECT, DAMMET,	384
PLOTS FROM SCISRS X-SECTION TAPES	WANL	7094	F+MAP	RSBP	T N \$ CPS, SC4020	239
PLCTS FROM X-SECTION TAPES	GGA	7044	F+SPS	RSBP	T N \$ CROSSPLOT, SC4020	207
PLOTTING	KAPL	6600	F+ASC	RS P	T P \$ DATATRAN UTILITY MODULES, 2-D + 3-D	407
PLOTTING ROUTINES	KAPL	6600	F+COM	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	360	F+BAL	RS P	O \$	469
POINT DEPLETION FISSION PRODUCT	BAPL	6600	F4	RS P	D \$ CINDER, MO102,	313
POINT DEPLETION FISSION PRODUCT	DP	360	F+BAL	RS P	T D \$ CINDER(MO102),	313
POINT SOURCE	UM	7090	MAD	RSB	O \$ BURP1, DETECTOR EFFICIENCY	164
POINT SOURCE	UM	7090	MAD	RSB	O \$ BURP3, DETECTOR EFFICIENCY	166
POINT-KERNEL SHIELD EVALUATION CODE	BAPL	6600	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
POLARIZATION CALC	KAPL	6600	F4	RS P	T A \$ PHASER, PHASE SHIFT X-SEC +	507
POLARIZATION EXPERIMENT	UCND	360	F+BAL	RS P	O \$ PMS1, FAST NEUTRON	469
POLYNOMIAL	KAPL	6600	F4	RS P	P \$ ROPE, FINDING ROOTS OF A	444
POLYNOMIAL CURVE FITTING	BAPL	6600	F4	RS P	T P \$ MO661, MO657, MO626,	411
POST RUPTURE	GGA	7044	F4	RS	X T G \$ PRECON, HTGR CONTAINMENT PRESSURE	228
POTENTIAL SHAPE CALCULATION	ORNL	7090	F2	RS	A \$ LYNNE, WOODS-SAXON	381
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

PW

POWER DISTRIBUTION	MSS	360	F4	RS P	T 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 MCGUIRE UNITS DUCO	635	F4	RS	G \$ ANVENT, LOCA ANALYSIS DUKE	529	
POWER PLANT CONCEPTUAL COST ESTIMATES	ORNL	360	F4	RS P	T D \$ CONCEPT,	498
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 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
PPCO 7040	F+MAP	RS P	A \$ COMBCO, COMBINED B-W MULTI-LEVEL CONVOLUTION	203		
PPCO 7040	F+MAP	RS P	T G \$ RSAC, RADIOLOGICAL SAFETY ANALYSIS PROGRAM	265		
PPCO 7040	F4	RS P	T C \$ TOPIC, 1-D FFW-GP SN APPROXIMATION CYLINDER	148		
PPCO 7044	F+MAP	RS P	T H \$ TOCDEE, 2-D TIME-DEPENDENT HEAT CONDUCTION	349		
PPCO 7090	F2	RS P	C \$ MIST, 1-D FEW-GP SN DOUBLE SN APPROX SLAB GEOM	59		
PPCO 7090	F2	RS P	T C \$ TOPIC, 1-D FEW-GP SN APPROXIMATION CYLINDER	148		
PPCO 360	F4	RS P	X G \$ BURST1, HYDRODYNAMIC ANALYSIS DURING BLOWDOWN	435		
PRECON, HTGR CONTAINMENT PRESSURE POST RUPTURE	GGA	7044	F4	RS	X T G \$	228
PREP,KITT, SYSTEM FAULT TREE EVALUATION CODES	ANC	360	F4	RSBP	T K \$	528
PREP,KITT, SYSTEM FAULT TREE EVALUATION CODES	ANC	1108	F4	RS 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 \$ DATATRAN 2-D GEOMETRY INPUT,	406		
PRESSURE DISTRIBUTION	GGA	1108	F5	RS P	H \$ FLAC, STEADY-STATE FLOW,	395
PRESSURE POST RUPTURE	GGA	7044	F4	RS	X T G \$ PRECON, HTGR CONTAINMENT	228
PRESSURE TEMPERATURE HISTORY	KE	7094	F2	RSBP	T H \$ PTH1, BLOWDOWN	155
PRESSURE VESSEL STRESS AND FATIGUE	KAPL	6600	F4	RS	I \$ SORSDB,	391
PRESSURE-TEMPERATURE RESPONSE	ANC	360	F+BAL	RS P	T G \$ CONTEMPT-PS,	433
PRESSURIZERS BAPL 6600	F4	RS P	T H \$ TOPS, TRANSIENT THERMODYNAMICS OF	348		
PRICE STUDY	GGA	7044	F+MAP	RS P	T D \$ OPUS, POWER PLANT PERFORMANCE AND	226
PRIMARY RECOIL ATOM SPECTRA ENDF/B DATA	ORNL	360	F4	RS P	T B \$ RICE,	453
PROBABILITIES MC	ORNL	360	F+BAL	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	JAF	230	F4	RS P	T B \$ CLUP77, SQUARE CELL COLLISION	526
PROC PNL 6600	F4	RS	T M \$ CHECKER, CRECT, DAMMET, PLOTFB, SLAV3, ENDF/B	384		
PROCESSING AND EDITING	ORNL	360	F4	RS P	T M \$ EDITOR, ENDF/B TAPE	502
PROCESSING CODES	ANL	360	F4	RS P	T M \$ CRECT, CHECKER, RIGEL ENDF/B	475
PROCESSING MODULE	ANL	360	F4	RSBP	CT L \$ ARC-NUI002, BCD INPUT DATA	533
PROCESSING OF ANALYZER GAMMA-RAY SPECTRA	GGA	1108	F+BAL	RS P	T O \$ TOAD,	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
PROGRAMMING AND DATA SYSTEM	KAPL	6600	F+COM	RSB	T M \$ DATATRAN, MODULAR	386
PROGRAMMING LANGUAGE	KAPL	6600	F+ASC	RS	P \$ SIMPLE1, TIME-SHARING	442
PROPERTIES BAPL 6600	F4	RS P	T H \$ WASP, WATER AND STEAM THERMODYNAMIC	396		
PROPERTIES BG&F	360	F4	RS	T H \$ STEAM-67, 1967 ASME STEAM AND WATER	487	
PSEUDO, STATISTICAL RESONANCE PARAMETER CALC	GGA	1108	F4	RS P	A \$	292
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	NED	635	F4	RS P	T O \$ EXPN, ANALYSIS OF	258
PULSED NEUTRON SOURCE DATA ANALYSIS	CNEA	360	F4	RS P	E \$ TRIFIDO,	489
PUMP IMPELLER DESIGN STUDY	PW	1604	F63	RS P	T I \$ PIP, CENTRIFUGAL	187
PUN1, UNRESOLVED RESONANCE INTEGRALS X-SECS	BAPL	6600	F4	RS P	T A \$	359
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 FLOC02 INSTRUCTION SET	186		
PW 1604	F+CDP	RS P	X T B \$ FMC-N, FMC-G, MC NEUTRON, GAMMA-RAY HISTORIES	195		
PW 1604	F63	RS	C \$ TDP, 2-D PERTURBATION TDC OR 2DXY FLUX INPUT	199		
PW 1604	F63	RS	I \$ WOPEXPRT, REACTOR WEIGHT OPTIMIZATION STUDY	190		
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

RELAP3

PW	1604	F63	RS P	E \$	CMXMAT, 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,	RFAC	TO	R	R	REACTOR FUEL CYCLE COST CALCULATION	GGA 1108 F4 RS P T D \$ 441
PWR	FLCW	TRANS	ANAL	YSIS	TRANSIENT ANALYSIS	BAPL 6600 F4 RS P T H \$ FLOT1,M0219, 331
QUAS	IS	STAT	IC	SP	ATIAL REACTOR KINETICS CODE ANL 360 F4 RS PL CT F \$ QX1, 474	
QUAS	IS	STAT	IC	SP	ATIAL REACTOR KINETICS CODE ANL 3600 36F RS PL CT F \$ QX1, 474	
QUICK	IE,	IN	FIN	ITE	MEDIUM SPECTRUM X-SECTIONS	AI 7090 F+FAP RS L T B \$ 119
QX1,	QUAS	IS	STAT	IC	SP	ATIAL REACTOR KINETICS CODE ANL 360 F4 RS PL CT F \$ 474
QX1,	QUAS	IS	STAT	IC	SP	ATIAL REACTOR KINETICS CODE ANL 3600 36F RS PL CT F \$ 474
R-M	PARA	METERS	OF	UN	RESOLVED RESONANCES	BAPL 6600 F4 RS P A \$ GRAMP, 470
R-THETA-Z	LASL	6600	F4	RS	P T C \$ 3CDT, 3D MULTIGROUP DIFFUSION XYZ	463
R-Z	GEOM	LASL	1108R	F4	RS P T C \$ TWOTRAN, 2-D MULTI-GP TRANSPORT CODE	358
R-Z	GEOM	ETRY	APDA	7094	F4 RS P F \$ MARS, 2-D EXCURSION CALCULATION	293
RABBLE,WLIB,FLAT,	RESONANCE	ABSORPTION,	CELL	ANL	3600 F36 RSBP X T B \$	281
RADIAL	INTEGRALS	ORNL	1604	F63	RS P A \$ RAMES, PARTICLE WAVE FUNCTION	335
RADIATION	DAMAGE	IN	METALS	GEC	635 F+FAP RSBP T Q \$ CASCADE,CLUSTER,	419
RADIATOR	FINS	SNAP	GEOM	AI	7090 F2 RS J \$ SCARF2, SCATTER FROM	110
RADIOACTIVE	DECAY	CHAINS	GEC	635	F4 RSBP D \$ CHAINS, ANALYSIS OF	418
RADIOACTIVITY	IITR	7094	F4	RSBPLX	T D \$ NAP, NEUTRON-INDUCED GAMMA-RAY	314
RADIOLOGICAL	EFFECTS	ANALYSIS	HEDL	1108	F+SL RS T K \$ HERMES, REGIONAL	527
RADIOLOGICAL	SAFETY	ANALYSIS	PROGRAM	PPCO	7040 F+MAP RS P T G \$ RSAC,	265
RADIONUCLIDE	GENERATION	AND	DECAY	BNW	1108 F5 RSBPL T D \$ ISOGEN,	367
RAD2,	HTGR	FISSION	PRODUCT	ACTIVITY	DIST STUDY	GGA 7044 F4 RS P D \$ 231
RAFFLE,	1ST	FLIGHT	COLLISION	PROBABILITIES	MC ORNL 360 F+BAL RS P T B \$	392
RAFFLE,	1ST	FLIGHT	COLLISION	PROBABILITIES	MC ORNL 7090 F+FAP RS P T B \$	392
RAHAB,	JOSHUA	SYSTEM	LATTICE	PHYSICS	MODULES	DP 360 F+BAL S X T B \$ 536
RAMES,	PARTICLE	WAVE	FUNCTION	RADIAL	INTEGRALS	ORNL 1604 F63 RS P A \$ 335
RAMP1,	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	NED 2000 F2 RS P A \$	176
RATES	UK-W	7090	F2	RS	N \$ WED, W-DSN OUTPUT TAPE EDIT REACTION	133
RATH, 2- OR 3-D	HEAT	CONDUCTION	LUMPED	MASS	LASL 7030 F4 RS T H \$	242
RATH, 2- OR 3-D	HEAT	CONDUCTION	LUMPED	MASS	LASL 7094 FAP RS P T H \$	242
RATRAP,	DCSE	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	BAPL 6600 F+ASC RS P T J \$ ASPIS, GAMMA	429
RAY	SPECTRA	ORNL	360	F4	RS P O \$ ALPHA-M, RESOLUTION OF GAMMA	413
REACTION	AI	360	F+BAL	RS P	T A \$ COMNUC,CASCADE, COMPOUND NUCLEUS	482
REACTION	ANL	3600	F36	RSBP	G \$ CHEMLOC2, CORE HEATING CLADDING-STEAM	366
REACTION	DECAY	CHAIN	ANALYSIS	ORNL	1604 F63 RS P D \$ ISOCRUNCH,	180
REACTION	DECAY	CHAIN	ANALYSIS	ORNL	7090 F2 RSBP 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	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 T C \$ FLARE, 3-D	167
REACTIVITY	AND	POWER	DISTRIBUTION	NED	635 F4 RS P T C \$ FLARE, 3-D	167
REAX,	RESOLVED	RESONANCE	EPITHERMAL	X-SECTIONS	NED 635 F4 RS P T B \$	257
RECOIL	ATCM	SPECTRA	ENDF/B	DATA	ORNL 360 F4 RS P T B \$ RICE, PRIMARY	453
RECTANGULAR	MAGNETIC	NETWORK	SOLUTION	BAPL	6600 F4 RS P T I \$ MANE1,	412
REDUCTION	ANL	3600	F63	RSBP	O \$ 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 \$ GARGOYLE, FUEL CYCLE ANALYSIS PARTIAL	260
REFUELING	HISTORY	LASL	6600	F4	RS P T D \$ PHENIX, 2D DIFFUSION BURNUP	454
REGIONAL	RADIOLOGICAL	EFFECTS	ANALYSIS	HEDL	1108 F+SL RS T K \$ HERMES,	527
REICH-MOORE	RESOLVED	REGION	X-SECTIONS	BNL	6600 F4 RS P A \$ RAMP1,	492
RELAP3,	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

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RELAP3, REACTOR BLOWDOWN - EXCURSION ANALYSIS ANC 6600 F4 RS P T G \$ 369
 RELATION GEC 635 F4 RSBP D \$ DOS, NEUTRON FLUX-DOSIMETER ACTIVITY 423
 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 \$ BUBLI, FUEL SWELLING + GAS 468
 RELIABILITY FOR A SINGLE FAILURE MODE BAPL 6600 F4 RS P P \$ REL01, 497
 RELOAD-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 RS P P \$ 497
 REMOTE JOP ENTRY SYSTEM ANC 360 BAL RSB T P \$ NRTS-RJE, OS/360 MVT 519
 REMOVAL BCL 6400 F4 RS P G \$ MIRAB, 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
 RESOLUTION OF GAMMA PAY SPECTRA ORNL 360 F4 RS P O \$ 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 \$ RAMP1, REICH-MOORE 492
 RESOLVED RESONANCE EPITHERMAL X-SECTIONS NED 635 F4 RS P T B \$ REAX, 257
 RESOLVED RESONANCE INTEGRAL CALCULATION BW 2000 F4 RS A \$ STRIP, 305
 RESOLVED RESONANCE X-SECTION CALC NED 2000 F2 RS P A \$ DOPIE, 177
 RESONANCE ABSORPTION, CELL ANL 3600 F36 RSBP X T B \$ RABBLE, WL1B, FLAT, 281
 RESONANCE DATA GGA 7044 F+MAP RS P A \$ FASDOP, X-SECTIONS FROM B-W 216
 RESONANCE DATA UILL 360 F4 RS P A \$ CODILLI, LEAST SQUARES ANALYSIS 347
 RESONANCE EPITHERMAL X-SECTIONS NED 635 F4 RS P T B \$ 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
 RESONANCE INTEGRAL CALC 2-REG CELL ANL 3600 F36 RSBP X T B \$ RIFF-RAFF, 213
 RESONANCE INTEGRAL CALCULATION BW 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 CDC 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 \$ GAROL, 219
 RESONANCE OVERLAP AND LATTICE EFFECTS LER 7094 F+MAP RS P T B \$ GAROL, 219
 RESONANCE PARAMETER CALC GGA 1108 F4 RS P A \$ PSEUDO, STATISTICAL 292
 RESONANCE PARAMETERS WANL 7094 F2 RS P A \$ EXT, 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 \$ GANDY, UNRESOLVED 341
 RESONANCE XSECS BNL 6600 F4 RS P T A \$ AVRA3,4, SIGMA2, ADLER, ENDF/B 465
 RESONANCES AI 360 F4 RS PLX T B \$ AILMOE, X-SECTION CALC ELASTIC SCAT 147
 RESONANCES AI 7094 F+FAP RS PL T B \$ AILMOE, X-SECTION CALC ELASTIC SCAT 147
 RESONANCES BAPL 6600 F4 RS P A \$ GRAMP, R-M PARAMETERS OF UNRESOLVED 470
 RESPONSE ANC 360 F+BAL RS P T G \$ CONTEMPT-PS, PRESSURE-TEMPERATURE 433
 RESPONSE LOCA ANC 360 F4 RSBP X T G \$ THETA1-B, FUEL ROD THERMAL 512
 RESPONSE OF ELASTIC STRUCTURES BAPL 6600 F4 RS P T I \$ FUGIT, DYNAMIC 537
 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 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-GAD, FUEL CYCLE ANALYSIS W/REFUELING GGA 7044 F4 RS P T D \$ 223
 REVOLUTION KAPL 6600 F4 RS P T I \$ SOR2, STRESS ANALYSIS SHELLS OF 80
 RICE, PRIMARY RECOIL ATOM SPECTRA ENDF/B DATA ORNL 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 PROCESSING CODES ANL 360 F4 RS P T M \$ CRECT, CHECKER, 475
 RIGEL, PLOTFB, LISTFC, DICTION, ETC. BNL 6600 F4 RS T M \$ CRECT, CHECKER, 475
 RING 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 THERMALHYDRAULIC ANALYSIS ANL 360 F4 RS P T H \$ COBRA3, 432
 ROD BUNDLE THERMALHYDRAULIC ANALYSIS BNW 1108 F4 RS P T H \$ COBRA3, 432

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ROD STRESS & DEFORMATION	BAPL 6600 F4	RS P	T I	\$ CYGR03, OXIDE FUEL	449	
ROD THERMAL RESPONSE LOCA	ANC 360 F4	RSBP X T G	\$ THETA1-B, 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	PPCO 7040 F+MAP	RS P	T G	\$	265	
RTH WANL 7094 F4	RS P X T C	\$ VARI-QUIR3, 2-D MULTI-GP DIFFUSION	XY RZ		264	
RTHETA GEOMETRY BNW 1108 F4	RS P	C	\$ PERT4, 2-D PERTURBATION	XY RZ	304	
RTHETA LASL 6600 F4	RS P	T C	\$ TWOTRAN, 2-D MULTI-GP TRNSPT	CODE XY RZ	358	
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 GEOMETRY LRL 709 F2	RS	C	\$ FIRN, 2-D FEW-GP S4 APPROXIMATION		7	
RZ GEOMETRY GGA 1108 F+BAL	RS P	T C	\$ GAMBLE5, 2-D MULTI-GP DIFFUSION	XY	222	
RZ GEOMETRY GGA 7044 F+MAP	RSBP	T C	\$ GAMBLE4, 2-D MULTI-GP DIFFUSION	XY	222	
RZ GGA 1108 F+BAL	RS P	T D	\$ BUG2, 2-D MULTIGROUP DIFFUSION + BURNUP	XY,	438	
RZ RTH WANL 7094 F4	RS P X T C	\$ VARI-QUIR3, 2-D MULTI-GP DIFFUSION	XY		264	
RZ RTHETA GEOMETRY BNW 1108 F4	RS P	C	\$ PERT4, 2-D PERTURBATION	XY	304	
RZ RTHETA LASL 6600 F4	RS P	T C	\$ TWOTRAN, 2-D MULTI-GP TRNSPT	CODE XY	358	
R101, SPACE-INDEPENDENT KINETICS KEX OPTIONS	ANL 3600 F63	RSBP	E	\$	255	
R101, SPACE-INDEPENDENT KINETICS KEX OPTIONS	WANL 7094 F4	RS P	E	\$	255	
R102, SPACE-INDEPENDENT INVERSE KINETICS CALC	ANL 3600 F63	RSBP	E	\$	168	
R102, SPACE-INDEPENDENT INVERSE KINETICS CALC	WANL 7094 F4	RS	E	\$	168	
R153, PARAMETRIC SITE REQUIREMENT STUDY	ANL 3600 F63	RSBP	T G	\$	172	
S-WAVE NEUTRON X-SECTION CALCULATION	BAPL 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	\$ GRDWRK, GRID GENERATION	FOR	296
SAFE-AXISYM, STRESS ANALYSIS AXISYMMETRIC LOAD	GGA 7044 F4	RS P	T I	\$	251	
SAFE-CRACK, VISCOELASTIC ANALYSIS OF CONCRETE	GGA 1108 F5	RS P	T I	\$	451	
SAFE-CREEP, VISCOELASTIC ANALYSIS CONCRETE	GGA 1108 F4	RS P	I	\$	300	
SAFE-PCRS, STRESS ANALYSIS AXISYMMETRIC LOAD	GGA 7044 F4	RS P	T 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+BAL	RS P	T I	\$	332	
SAFETY ANALYSIS PROGRAM	PPCO 7040 F+MAP	RS P	T G	\$ RSAC, RADIOLOGICAL	265	
SAIL, 1-D 1-GP SN APPROXIMATION SLAB GEOMETRY	AI 7090 F2	RS P	B	\$	52	
SAIL, 1-D 1-GP SN APPROXIMATION SLAB GEOMETRY	CDC 1604 F63	RS P	B	\$	52	
SASIA, FAST REACTOR POWER AND FLCW 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 LOFT	KE 7094 F+MAP	RSBP	T G	\$	200	
SCARF2, SCATTER FROM RADIATOR FINS SNAP GEOM	AI 7090 F2	RS	J	\$	110	
SCAR1, SCATTER FROM A RING SNAP GEOMETRY	AI 7090 F2	RS	J	\$	111	
SCAT RESONANCES AI 360 F4	RS PLX T B	\$ AILMOE, X-SECTION CALC ELASTIC			147	
SCAT RESONANCES AI 7094 F+MAP	RS PL T B	\$ AILMOE, X-SECTION CALC ELASTIC			147	
SCAT X-SEC BNL 6600 F4	RS P	A	\$ BESFIT, 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 RING 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	\$ HAFEVER, HAUSER-FESHBACH INELASTIC		14	
SCATTERING CRYSTALLINE MATERIALS	LASL 6600 F4	RS P	T A	\$ TOR, THERMAL	360	
SCATTERING DATA DP 360 F4	RS P XCT A	\$ FLANGE2(71-1), ENDF/B 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	\$ COHBE, COHERENT INELASTIC	385	
SCATTERING LAW CALCULATION	GGA 1108 F4	RS 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	
SCHEME	KAPL 6600 F4	RS P	P	\$ MOST, A MULTIDIMENSIONAL OPTIMIZATION	446	
SCISRS ENDF/B GRAPHIC X-SEC EVALUATION	AI 360 F+BAL	RS L	T M	\$ SCORE3,	375	
SCISRS X-SECTION TAPE	GGA 7044 F+MAP	RSBP	M	\$ UNPACK, RETRIEVAL FROM	206	

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SLAB

SCISRS X-SECTION TAPES	WANL 7094	F+FAP	RSBPL	T N	\$ CPS, SC4020 PLOTS FROM	239
SCOPE2.0 CDC	7600	F4	RS	T P	\$ MODEL, MODIFIED BETTIS ENVIRNMNTL LIB	478
SCOPE3.2 CDC	6600C	F+COM	RS	T P	\$ MODEL, MODIFIED BETTIS ENVIRNMNTL LIB	478
SCOPE3.3 CDC	6600D	F+COM	RS	T P	\$ MODEL, MODIFIED BETTIS ENVIRNMNTL LIB	478
SCORE3, SCISRS ENDF/P GRAPHIC X-SEC EVALUATION	AI	360	F+BAL	RS	L T M \$	375
SC4020 PLOTS FROM SCISRS X-SECTION TAPES	WANL 7094	F+FAP	RSBPL	T N	\$ CPS,	239
SC4020 PLOTS FROM X-SECTION TAPES	GGA 7044	F+SPS	RSBP	T N	\$ CROSSPLOT,	207
SEALSHLL2, SHLL STRESS ANALYSIS	AXISYM	LOAD	BAPL 6600	F4	RS P T I \$	282
SEALSHLL2, SHELL STRESS ANALYSIS	AXISYM	LOAD	SR	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
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	BNL 7090	F+FAP	RS P	T M	\$ DFSR, DATA FILE	236
SETS	LASL 6600	BCD	R	LX T Z	\$ LASL XSEC SETS, SN 18- 24- AND 25-GROUP	532
SETS, SN 18- 24- AND 25-GROUP SETS	LASL 6600	BCD	R	LX T Z	\$ LASL XSEC	532
SHAPE CALCULATION	ORNL 7090	F2	RS	A	\$ LYNNE, WOODS-SAXON POTENTIAL	381
SHEET DP PACKAGE	KAPL 6600	F+ASC	RS P	T P	\$ DOGGY, 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 \$ SEALSHLL2,	282
SHELL STRESS ANALYSIS	AXISYM	LOAD	SR	360	F4 RS P T I \$ SEALSHLL2,	282
SHELL 3D STRUCTURAL ANALYSIS	GGA 1108	F5	RS P	T I	\$ SHLL5, THIN	452
SHELLS	GGA 1108	F4	RS P	I	\$ SAFE-SHELL, STRESS ANALYSIS THIN	253
SHLLS	MIT 360	F4	RS P	T I	\$ SABOR4, DISCRETE-ELEMENT ANALYSIS THIN	402
SHELLS OF REVOLUTION	KAPL 6600	F4	RS P	T I	\$ SOR2, STRESS ANALYSIS	80
SHLL5, THIN SHELL 3D STRUCTURAL ANALYSIS	GGA 1108	F5	RS P	T I	\$	452
SHIELD DESIGN MULTIGROUP SLAB GEOMETRY	ANL 3600	F63	RSBPL	T J	\$ MAC,	143
SHIELD DESIGN MULTIGROUP SLAB GEOMETRY	BNW 7090	F2	RSBPL	T J	\$ MAC,	143
SHIELD EVALUATION CODE	BAPL 6600	F+ASC	RS P	T J	\$ SPAN4, A POINT-KERNEL	462
SHIELD LEAKAGE	AI 7090	F2	RS	J	\$ FARSE1A, DOSE RATE FROM SNAP	91
SHIELD WEIGHT OPTIMIZATION DOSE CALC	AI 7094	F+FAP	RS P	J	\$ SHOE,	197
SHIELDING CODE CAVITY CEOM	GGA 1108	F4	RS P	T J	\$ MUSCAT, VIEW FACTOR	259
SHIFT X-SEC + POLARIZATION CALC	KAPL 6600	F4	RS P	T A	\$ PHASER, PHASE	507
SHOCK, SPACE POWER PLANT DESIGN OPTIMIZATION	AI 7090	F2	RS	I	\$	114
SHOE, SHIELD WEIGHT OPTIMIZATION DOSE CALC	AI 7094	F+FAP	RS P	J	\$	197
SIGMA2, ADLER, ENDF/B RESONANCE XSECS	BNL 6600	F4	RS P	T A	\$ AVRAGE3,4,	465
SIGPLOT, RESOLVED MULTILEVEL B-W X-SEC CALC	BNL 6600	F4	RS P	A	\$	377
SIMPLF1, TIME-SHARING PROGRAMMING LANGUAGE	KAPL 6600	F+ASC	RS	P	\$	442
SIMULATION	BAPL 6600	F4	RS P	T G	\$ FLASH4, FULLY-IMPLICIT TRANSIENT	448
SIMULATION	BAPL 6600	F4	RS P	T I	\$ RUBLI, FUEL SWELLING + GAS RELEASE	468
SIMULATION OF REACTOR DYNAMICS	AI 360	F+BAL	RS P	T E	\$ AIROS2A,	326
SINGLE FAILURE MODE	BAPL 6600	F4	RS P	P	\$ RELO1, RELIABILITY FOR A	497
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	RS	L T D	\$	58
SIZZLF, 1-D MULTIGROUP DIFFUSION DEPLETION	CDC 1604	F63	RS	L T D	\$	58
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 AND SPHERE GEOM SN TRANSPORT	ANL 3600	F36	RS P	XCT C	\$ TESS, 1-D	513
SLAB CYL	ORNL 7090	F2	RS P	T C	\$ EQUIPOISE3, 2-D 2-GROUP DIFFUSION	39
SLAB CYL SPHERE	BNW 1107	F4	RS P	T C	\$ HFN, 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	AI 7090	F+FAP	RS	L T C	\$ ULCER, 1-D MULTI-GP DIFFUSION	118
SLAB CYL SPHERE	ANL 3600	F36	RS	P X T C	\$ MACH1, 1-D MULTI-GP DIFFUSION	262
SLAB CYL SPHERE	PURD 6500	F4	RS	PLX T C	\$ MACH1, 1-D MULTI-GP DIFFUSION	262
SLAB CYL SPHERE	PW 1604	LAG1	RS	P	C \$ MGDSN, 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	RS	P T C	\$ FAIMOS, 1-D MULTI-GP DIFFUSION	120

SLAB

SOURCE

SLAB CYLINDER CDC 1604 F63	RS P	T C \$ 20GRAND, 2-D FEW-GROUP DIFFUSION	40
SLAB CYLINDER ORNL 7090 F2	RS P	T C \$ 20GRAND, 2-D FEW-GROUP DIFFUSION	40
SLAB CYLINDER SPHERE AEB 360 F4	RS L	T C \$ FIRE5, 1-D AGE-DIFFUSION	9
SLAB CYLINDER SPHERE AI 7090 F2	RS P	T C \$ FOG, 1-D FEW-GP DIFFUSION	28
SLAB CYLINDER SPHERE BC 625 F4	RS	T C \$ FOG, 1-D FEW-GP DIFFUSION	28
SLAB CYLINDER SPHERE CDC 1604 F63	RS P	T C \$ FOG, 1-D FEW-GP DIFFUSION	28
SLAB GAMMA-RAY TRANSPORT	BAPL 6600 F4	RS P T J \$ M0756, LETO, 1-D	343
SLAB GEOM PPCO 7090 F2	RS P	C \$ MIST, 1-D FEW-GP SN DOUBLE SN APPROX	59
SLAB GEOME RY BAPL 6600 F4	RS P	T C \$ BF21, FEW-GP DISCRETE ORDINATES	398
SLAB GEOMETRY AI 7090 F2	RS P	J \$ GRACE1, GAMMA-RAY ATTENUATION	45
SLAB GEOMETRY ANL 3600 F63	RSBPL	T J \$ MAC, SHIELD DESIGN MULTIGROUP	143
SLAB GEOMETRY BNW 7090 F2	RSBPL	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	RS P	B \$ SAIL, 1-D 1-GP SN APPROXIMATION	52
SLAB GEOMETRY CDC 1604 F63	RS P	B \$ SAIL, 1-D 1-GP SN APPROXIMATION	52
SLAB TRANSPORT WITH SLOWING DOWN	BAPL 6600 F4	RS T C \$ M0648, 1-D	342
SLAB, SPH, CYL GGA 1108 F+BAL	RS P	T C \$ GAZE2, 1-D MULTIGROUP DIFFUSION	430
SLAV3, ENDF/B PROC PNL 6600 F4	RS	T M \$ CHECKER, CRECT, DAMMET, PLOTFB,	384
SLL 6600 F4	RS P	N \$ HEATMESH, GEOMETRICAL DATA HEAT TRANSFER STUDY	434
SLOWING DOWN	BAPL 6600 F4	RS T C \$ M0648, 1-D SLAB TRANSPORT WITH	342
SLOWING-DOWN DENSITY CALC AI 7094	F+AP	RS PL T B \$ TYCHE3, MONTE CARLO	149
SLOWING-DOWN NPGS 360 F4	RS P	X T E \$ MCD5, STOCHASTIC MODEL OF NEUTRON	491
SLOWING-DOWN SPECTRUM, MULTIGP CONSTANTS BNW 1108	F4	RS PLX T B \$ HRG3,	467
SN APPROX BNW 7090 FLOCO RSBP	T C \$ GE-HAPO-S13, 1-D MULTI-GP DOUBLE		75
SN APPROX SLAB CYL SPHERE PW 1604	LAG1	RS P C \$ MGDSN, 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	RS 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 PPCC 7090 F2	RS P	T C \$ TOPIC, 1-D FEW-GP	148
SN APPROXIMATION RZ PW 1604 F63	RS P	T C \$ FORTRAN TDC, 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 FLOCO RSBP	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	N \$ DAC1,	455
SN THEORY NED 635 F4	RS P	T C \$ DOT2DB, 2D MULTIGROUP DIFFUSION +	459
SN TRANSPORT ANL 3600 F36	RS 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-GRUP SETS LASL 6600 BCD	R	LX T Z \$ LASL XSEC SETS,	532
SNAP GEOM AI 7090 F2	RS	J \$ SCARF2, SCATTER FROM RADIATOR FINS	110
SNAP GEOMETRY AI 7090 F2	RS	J \$ SCAR1, SCATTER FROM A RING	111
SNAP GEOMETRY AI 7090 F2	RS P	J \$ RATRAP, DOSE RATE CALCULATION	141
SNAP GEOMETRY AI 7090 F2	RS	E \$ SNAPKIN5/5A, 1-REGION KINETICS	122
SNAP GEOMETRY AI 7090 F2	RS	J \$ MORTIMER, DOSE RATE CALCULATION	142
SNAP SHIELD LEAKAGE AI 7090 F2	RS	J \$ FARSE1A, DOSE RATE FROM	91
SNAPKIN5/5A, 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 TDC PW 1604 F63	RS P	L \$	189
SNEQ, NONLINEAR ALGEBRAIC EQN SOLN CURVE PLOT KAPL 6600 F+ASC	RS P	T P \$	364
SOCOOL2, SODIUM-FUEL INTERACTION ANALYSIS ANL 360 F4	RS P	G \$	521
SOCOOL2, SODIUM-FUEL INTERACTION ANALYSIS HEDL 1108 F4	RS P	G \$	521
SODIUM-FUEL INTERACTION ANALYSIS ANL 360 F4	RS P	G \$ SOCOOL2,	521
SODIUM-FUEL INTERACTION ANALYSIS HEDL 1108 F4	RS P	G \$ SOCOOL2,	521
SOLID CRYSTAL UM 7090 MAD	RSB	O \$ BURP4, GAMMA-RAY PHOTOFRACTION	169
SOLID FUEL TUBE BUNDLES LASL 7094 F2	RSB	H \$ AXTHRM, HEAT TRANSFER	183
SOPHIST1/2/5, MULTI-GP TRANSFER COEFFICIENTS LRL 7090 F+AP	RS P	T B \$	160
SORSDB, PRESSURE VESSEL STRESS AND FATIGUE KAPL 6600 F4	RS	I \$	391
SOR2, STRESS ANALYSIS SHELLS OF REVOLUTION KAPL 6600 F4	RS P	T I \$	80
SOURCE UM 7090 MAD	RSB	O \$ BURP2, DETECTOR EFFICIENCY DISK	165
SOURCE UM 7090 MAD	RSB	O \$ BURP1, DETECTOR EFFICIENCY POINT	164
SOURCE UM 7090 MAD	RSB	O \$ BURP3, DETECTOR EFFICIENCY POINT	166
SOURCE BUILDUP FACTOR CALC BAPL 6600 F+ASC	RS P	T J \$ ASPIS, GAMMA RAY	429

SOURCE

SPHERE

SOURCE DATA	NED	635	F4	RS P	T O \$	EXPN, ANALYSIS OF PULSED NEUTRON	258
SOURCE DATA ANALYSIS	CNFA	360	F4	RS P	E \$	TRIFIDO, PULSED NEUTRON	489
SPACE CHORD DIST FUNCT	AFG	7090	F2	RS	B \$	DANCOFF 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	GEC	635	F4	RSBP	T B \$	GROUSE,	420
SPACE-INDEPENDENT INVERSE KINETICS CALC	ANL	3600	F63	RSBP	E \$	R102,	168
SPACE-INDEPENDENT INVERSE KINETICS CALC	WANL	7094	F4	RS	E \$	R102,	168
SPACE-INDEPENDENT KINETICS KEX OPTIONS	ANL	3600	F63	RSBP	E \$	R101,	255
SPACE-INDEPENDENT KINETICS KEX OPTIONS	WANL	7094	F4	RS P	E \$	R101,	255
SPACE-INDEPENDENT KINETICS W/FEEDBACK	AI	7094	F+MAP	RS P	T E \$	AIROS,	163
SPACE-INDEPENDENT KINETICS W/FEEDBACK	AEB	360	F4	RS P	E \$	AIREK3,	121
SPACE-INDEPENDENT KINETICS W/FEEDBACK	AI	7090	F2	RS	E \$	AIREK3,	121
SPACE-INDEPENDENT KINETICS W/FEEDBACK	CDC	1604	F63	RS P	E \$	AIREK3,	121
SPACE-INDEPENDENT REACTOR KINETICS	GGA	1108	F4	RS P	E \$	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 E \$	ANCON,	486
SPACE-TIME DIFFUSION	ANL	360	F4	RS P	F \$	TWIGGLE, 2-D 2-GP	338
SPACE-TIME DIFFUSION FFEEDBACK	BAPL	6600	F4	RS P	T F \$	TWIGL, 2-D 2-GP	338
SPACE-TIME DIFFUSION FFEEDBACK	BNL	6600	F4	RS P	T F \$	NOAH, 1-D ONE-GP	405
SPACE-TIME DIFFUSION 3-GEOM	BAPL	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	RCL	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	6600	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	XCT L \$	TDOWN,	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	B \$	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
SPECTRA	ORNL	360	F4	RS P	O \$	ALPHA-M, RESOLUTION OF GAMMA RAY	413
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,GAR,	316
SPECTRA CALC	ANC	360	F4	RS	PLXT B \$	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 O \$	GSSLRN1B, LEAST SQUARES PHOTOPEAK			457
SPECTRA ENDF/B DATA	ORNL	360	F4	RS P	T B \$	RICE, PRIMARY RECOIL ATOM	453
SPECTRA GGA 1108	F+BAL	RS P	T O \$	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 B \$	GGC4, MULTI-GP X-SECTIONS FAST THERMAL			298
SPECTRA KSUN 360	F4	RS P	O \$	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	WAPD	7094	F+MAP	RS	PLX T B \$	LASER,	249
SPECTRUM MULTI-GP CONSTANT CALC	AGC	7090	F+FAP	RSBP	PLX T B \$	AGN-GAM, FAST	204
SPECTRUM X-SECTION CALC	BNW	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	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	BNW	1108	F4	RS	PLX T B \$	HRG3, SLOWING-DOWN	467
SPH PW 1604	F63	RS P	F \$	AX-TNT, COUPLED NEUTRONICS-HYDRODYNAMICS			191
SPH, CYL GGA 1108	F+BAL	RS P	T C \$	GAZE2, 1-D MULTIGROUP DIFFUSION SLAB,			430
SPHERE	BNW	1107	F4	RS P	T C \$	HFN, 1-D MULTI-GP DIFFUSION SLAB CYL	241

SPHERE

STRESS

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	AEB	360	F4	RS	L	T	C	\$	FIRE5, 1-D AGE-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	PURD	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	\$ CONEC, COUPLED NEUTRONICS-HYDRODYNAMICS	129	
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	\$ SEALSHELL2, SHELL STRESS ANALYSIS AXISYM LOAD	282	
STABILITY ANALYSIS	REACTOR KINETICS EQNS	GGA	1108	F4		RS	P		E \$ GASA,	290	
STATION	ELECTRICITY COSTS	ORNL	1604	F63		RS	P		D \$ POWERCO, NUCLEAR	340	
STATISTICAL MODEL	REACTION X-SECTIONS	BNL	6600	F4		RS	P		A \$ THRESH,	504	
STATISTICAL RESONANCE	PARAMETER CALC	GGA	1108	F4		RS	P		A \$ PSEUDO,	292	
STEADY-STATE AND TRANSIENT	TEMP CALC	GGA	1108	F5		RS	P		T H \$ TAC2D,	408	
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 BOILING FLOW	440	
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 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,HOH,	294	
STEAM TABLES 14.5-2538 PSIA		BAPL	6600	F4		RS	P		T H \$ M0899,HOH,	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	BG&E	360	F4		RS			T H \$	487	
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	NPGS	360	F4		RS	P	X	T E \$ MOD5,	491	
STORAGE, RETRIEVAL, AND	DISPLAY	DP	360	F+BAL	S			T	M \$ JOSHUA, DATA	490	
STRESS & DEFORMATION	BAPL	6600	F4		RS	P		T	I \$ CYGR03, 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 \$ SEALSHELL2, SHELL	282	
STRESS ANALYSIS	AXISYM LOAD	SR	360	F4		RS	P		T I \$ SEALSHELL2, SHELL	282	
STRESS ANALYSIS	AXISYMMETRIC LOAD	GGA	7044	F4		RS	P		T 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 \$ CYGR02,	266	
STRESS ANALYSIS	SHELLS OF REVOLUTION	KAPL	6600	F4		RS	P		T I \$ SOR2,	80	
STRESS ANALYSIS	STUDY	GGA	7044	F4		RS	P		T G \$ ELBOW, 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	GGA	1108	F4		RS	P		I \$ SAFE-PLANE, PLANE	252	
STRESS AND FATIGUE	KAPL	6600	F4		RS			I	\$ SORSDB, PRESSURE VESSEL	391	
STRESS OF PIPING SYSTEM	BAPL	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+BAL	RS	P			T	I \$ SAFE-3D, 3-D COMPOSITE STRUCTURE	332	

STRESS

TEMPERATURE

STRESS STUDY BAPL 6600 F+COM RS P	T I \$ GAPL3, INELASTIC LARGE DEFLECTION	397
STRESS, MAXIMUM MOMENT CALC AI 7090 F+FAP RS	T I \$ 4RESTRAINT PIPE	109
STRIP, RESOLVED RESONANCE INTEGRAL CALCULATION BW 2000 F4 RS	A \$	305
STRUCTURAL ANALYSIS GGA 1108 F5 RS P	T I \$ SHELL5, THIN SHELL 3D	452
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+BAL RS P	T I \$ SAFE-3D, 3-D COMPOSITE	332
STRUCTURES BAPL 6600 F4 RS P	T L \$ BL47, DRAFTING TOOL TO PLOT PLANE	373
STRUCTURES KAPL 6600 F4 RS P X	I \$ FINEL, 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 LIB. BW 6600B F+ASC RS	T P \$ BETTIS ENVIRONMENTAL ROUTINES,	478
SUBROUTINES AI 360 F+BAL RS	T P \$ FIGS, IBM360+2250 FORTRAN GRAPHICS	484
SUM OF EXPONENTIALS MIT 7090 F2 RS P	P \$ FRANTIC, LEAST SQUARES FIT	324
SUMMIT, CRYSTALLINE SCATTERING KERNEL CALC GGA 7090 F2 RS	T A \$	56
SUMOR, 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+COM RS P X T D	\$ FARED, 1-D FAST REACTOR DESIGN &	427
SWELLING + GAS RELEASE SIMULATION BAPL 6600 F4 RS P	T I \$ BUBL1, FUEL	468
SWELLING TEMPERATURE STUDY BAPL 6600 F4 RS P	T H \$ FIGRO, LSBR FUEL	272
SWELL2, FUEL ELEMENT LIFETIME ANALYSIS ANL 3600 F36 RSBP	I \$	353
SYN, 2D SYNTHESIS MULTIGP DIFF + 1GP DEPLETION NED 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 RSBP	T E \$ TRAFICORPORATION, TRANSFER FUNCTION	135
SYNTHESIS CALC NED 635 F4 RS PL	T C \$ BISYN, 2-D MULTI-GP DIFFUSION	287
SYNTHESIS CALC NED 1108 F4 RS P	T C \$ BISYN, 2-D MULTI-GP DIFFUSION	287
SYNTHESIS MULTIGP DIFF + 1GP DEPLETION NED 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 \$ BAM,	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
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TABLES 14.5-2538 PSIA ANL 1604 F63 RS P	H \$ M0899,HOH, STEAM	294
TABLES 14.5-2538 PSIA BAPL 6600 F4 RS P	T H \$ M0899,HOH, STEAM	294
TACASI, 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 GGA 1108 F5 RS P	T H \$	414
TAPE GGA 7044 F+MAP RSBP	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 CRNL 360 F4 RS P	T M \$ EDITOR, ENDF/B	502
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 \$ TDP, 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 INPUT 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 COEF CALC GGA 7044 F4 RS P	T C \$	225
TEMCO7, 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 CALC CYLINDER ANL 3600 F63 RSBP	T H \$ ARGUS, TRANSIENT	152
TEMPERATURE CODE GGA 7044 F4 RS	I \$ CORE, CORE CONFIGURATION FUEL	233
TEMPERATURE COEFFICIENT CALCULATION GGA 1108 F4 RS P	T C \$ TEMCO7,	320

TEMPERATURE

TRANS-FUGUE1

TEMPERATURE DIST STUDY AEB	360	F4	RS P	E \$ BLAST, REACTOR KINETICS	363
TEMPERATURE DISTRIBUTION PROGRAM	CHI	1108	F4	RS P T H \$ LION, 3-D	299
TEMPERATURE DISTRIBUTION PROGRAM	KAPL	6600	F+ASC	RS P T H \$ LION, 3-D	299
TEMPERATURE FEEDBACK BAPL	6600	F4	RS P	T F \$ NOWIG, 1-D 2-GP KINETICS	371
TEMPERATURE HISTORY KE	7094	F2	RSBP	T H \$ PTH1, BLOWDOWN PRESSURE	155
TEMPERATURE STUDY BAPL	6600	F4	RS P	T H \$ FIGRO, LSBR FUEL SWELLING	272
TEMPERATURE VOID FRACTION AI	7090	F2	RS	I \$ FUGUE, STEADY-STATE	48
TEMPEST COMBINATION AI	7090	F2	RS P	B \$ BAM, S4 CYL CELL CODE AND	108
TEMPEST2, THERMAL NEUTRON SPECTRUM X-SECTIONS	AI	7090	F+AP	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 B \$	50
TESS, 1-D SLAB AND SPHERE GEOM SN TRANSPORT	ANL	3600	F36	RS P XCT C \$	513
THEORY NED	635	F4	RS P	T C \$ DOT2DB, 2D 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 \$ NURLOC-1.0, LOSS-OF-COOLANT	328
THERMAL DESIGN STUDY GGA	7044	F4	RS P	I \$ GAZELLE5, GAS-COOLED CORE	232
THERMAL HYDRAULIC WATER-REACTOR DESIGN	BNW	1108	F5	RS P T H \$ REPP,	483
THERMAL LIBRARIES FROM ENDF/B DATA	WAPD	7600	F4	RS P T B \$ ETOT2,	509
THERMAL NEUTRON SPECTRUM X-SECTIONS	AI	7090	F+AP	RS PL T B \$ TEMPEST2,	50
THERMAL NEUTRON SPECTRUM X-SECTIONS	BHSC	360	F4	RS PL T B \$ TEMPEST2,	50
THERMAL NEUTRON SPECTRUM X-SECTIONS	CDC	1604	F63	RS PL T B \$ 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 \$ FLANGE2(71-1), ENDF/B	368
THERMAL SCATTERING LAW CALCULATION	GGA	1108	F4	RS P A \$ GASKET,	263
THERMAL SPECTRA GGA	1108	F4	RS PLX	T B \$ GGC4, MULTI-GP X-SECTIONS FAST	298
THERMAL SPECTRA GGA	6600	F4	RS L	T B \$ GGC4, MULTI-GP X-SECTIONS FAST	298
THERMAL SPECTRUM X-SECTION CALC	BNW	1108	F5	RS PLX T B \$ BRT1,	184
THERMAL SPECTRUM X-SECTION CALC	ANL	3600	F63	RSBP XCT B \$ THERMOS(ANL),	184
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
THERMALHYDRAULIC ANALYSIS	ANL	360	F4	RS P T H \$ COBRA3, ROD BUNDLE	432
THERMALHYDRAULIC ANALYSIS	BNW	1108	F4	RS P T H \$ COBRA3, ROD BUNDLE	432
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
THERMODYNAMICS OF PRESSURIZERS BAPL	6600	F4	RS P	T H \$ TOPS, TRANSIENT	348
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 3D 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 MIT	360	F4	RS P	T I \$ SABOR4, DISCRETE-ELEMENT ANALYSIS	402
THREDES LIBRARY UTILITY ROUTINE	AI	360	F4	RSB L T M \$ CLIP, FORM OR	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	F+AP	RS PL T G \$ CURIE,DOSE,	196
TIGIR2, MODULAR DOCUMENT INFORMATION SYSTEM	KAPL	6600	F	R B 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	7044	F+MAP	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	F+ASC	RS P \$ SIMPLE1,	442
TOAD, PROCESSING OF ANALYZER GAMMA-RAY SPECTRA	GGA	1108	F+BAL	RS P T O \$	333
TOODEE, 2-D TIME-DEPENDENT HEAT CONDUCTION	PPCO	7044	F+MAP	RS P T H \$	349
TOCL TO PLOT PLANE STRUCTURES	BAPL	6600	F4	RS P T L \$ BL47, DRAFTING	373
TOPIC, 1-D FEW-GP SN APPROXIMATION CYLINDER	PPCO	7040	F4	RS P T C \$	148
TOPIC, 1-D FEW-GP SN APPROXIMATION CYLINDER	PPCO	7090	F2	RS P T C \$	148
TOPS, TRANSIENT THERMODYNAMICS OF PRESSURIZERS	BAPL	6600	F4	RS P T H \$	348
TOR OUTPUT DATA LASL	6600	F4	RS P	T B \$ GLEN, GROUP 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

UK-R

TRANSFER	GGA	1108	F+BAL	RS P	T E \$ BLOOST6, 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	RS P	T G \$ TRANS-FUGUE1, TRANSIENT FLOW AND HEAT	268	
TRANSFER	COEFFICIENTS	LRL	7090	F+FAP	RS P	T B \$ SOPHIST1/2/5, MULTI-GP	160
TRANSFER	FUNCTION EVALUATION			PW	1604 F63	RS P E \$ CMPXMAT,	188
TRANSFER	FUNCTION SYNTHESIS	ANL	3600	F63	RSBP	T E \$ TRAFICORPORATION,	135
TRANSFER	GGA	7044	F+MAP	RS P	T H \$ BLOOST5, POINT-KINETICS WITH 2-D HEAT	205	
TRANSFER	MATRICES	ACC	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 \$ THTE, 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 D \$ 3DXT, DEP3, 3-D XENON	477	
TRANSIENT ANALYSIS	BAPL	6600	F4	RS P	T H \$ FLOT1, M0219, PWR FLOW	331	
TRANSIENT FLOW AND HEAT TRANSFER	AI	7094	F2	RS 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 \$ THTE, 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	RS 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 \$ DBUFIT1, LEAST SQUARES	456	
TRANSPORT	BAPL	6600	F4	RS P	T J \$ M0756, LETO, 1-D SLAB GAMMA-RAY	343	
TRANSPORT	ANL	3600	F36	RS P	XCT C \$ TESS, 1-D SLAB AND SPHERE GEOM SN	513	
TRANSPORT CODE R-Z GEOM	LASL	1108B	F4	RS P	T C \$ TWOTRAN, 2-D MULTI-GP	358	
TRANSPORT CODE X-Y GEOM	ANL	360	F4	RS P	T C \$ TWOTRAN, 2-D MULTI-GP	358	
TRANSPORT CODE X-Y GEOM	LASL	1108A	F4	RS P	T C \$ TWOTRAN, 2-D MULTI-GP	358	
TRANSPORT WITH SLOWING DOWN	BAPL	6600	F4	RS	T C \$ M0648, 1-D SLAB	342	
TREE EVALUATION CODES	ANC	360	F4	RSBP	T K \$ PREP, KITT, SYSTEM FAULT	528	
TREE 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	
TRIANGULAR MESH	GGA	1108	F+BAL	RS P	T C \$ GAMTRI, 2-D MULTIGP DIFFUSION	401	
TRIFICO, PULSED NEUTRON SOURCE DATA ANALYSIS	CNEA	360	F4	RS P	E \$	489	
TRIX1, RESONANCE INTEGRAL X-SECTION CALC	AI	7094	F+MAP	RS PLX	T A \$	208	
TRNSPT CODE XY RZ RTHETA	LASL	6600	F4	RS P	T C \$ TWOTRAN, 2-D MULTI-GP	358	
TROUT, MUG MULTIGROUP XSEC LIBRARY MAINTENANCE	NED	635	F4	RS P	T M \$	493	
TROUT, MUG MULTIGROUP XSEC LIBRARY MAINTENANCE	NED	1108	F5	RS P	T M \$	493	
TRW	6500	F4	RS P	B \$ 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	
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	
TURBULENT FLOW IN LMFBR ROD BUNDLE	NED	635	F4	RS P	T H \$ VELVET2,	458	
TUZ, UNRESOLVED REGION RESONANCE INTEGRAL CALC	GGA	7090	F+FAP	RSB	T A \$	42	
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, 2-D MULTI-GP TRANSPORT CODE R-Z GEOM	LASL	1108B	F4	RS P	T C \$	358	
TWOTRAN, 2-D MULTI-GP TRANSPORT CODE X-Y GEOM	ANL	360	F4	RS P	T C \$	358	
TWOTRAN, 2-D MULTI-GP TRANSPORT CODE X-Y GEOM	LASL	1108A	F4	RS P	T C \$	358	
TWOTRAN, 2-D MULTI-GP TRNSPT CODE XY RZ RTHETA	LASL	6600	F4	RS P	T C \$	358	
TYCHE3, MONTE CARLO SLOWING-DOWN DENSITY CALC	AI	7094	F+FAP	RS PL	T B \$	149	
U-TUBE HEAT EXCHANGER STRESS ANALYSIS	KAPL	6600	F4	RS P	I \$ TUBE,	378	
UCND	360	F+BAL	RS P	O \$ PMS1, FAST NEUTRON POLARIZATION EXPERIMENT		469	
UGA	360	F4	RS P	G \$ WATER-HAMMER, LIQUID BLOWDOWN ANALYSIS LOFT		278	
UHTREX	LASL	7090	F+FAP	RS P	I \$ WIREX, COMPUTER-PRODUCED WIRING LISTS	315	
UILL	360	F4	RS P	A \$ CODILLI, LEAST SQUARES ANALYSIS RESONANCE DATA		347	
UK-R	7090	F+FAP	RSBPL	T C \$ CRAM, 1-D AND 2-D MULTI-GP DIFFUSION PROGRAM		103	

UK-W

WATER-REACTOR

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+FAP RS L T C \$	118
UM 7090	MAD	RSB	O \$ BURP1, DETECTOR EFFICIENCY POINT SOURCE	164
UM 7090	MAD	RSB	O \$ BURP2, DETECTOR EFFICIENCY DISK SOURCE	165
UM 7090	MAD	RSB	O \$ BURP3, DETECTOR EFFICIENCY POINT SOURCE	166
UM 7090	MAD	RSB	O \$ BURP4, GAMMA-RAY PHOTOFRACITION SOLID CRYSTAL	169
UM 7090	MAD	RSB	O \$ BURP5, GAMMA-RAY PHOTOFRACITION WELL CRYSTAL	170
UMCC 360	F4	RS P T C \$	VARI-QUIR, 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
UNFOLDING OF COMPLEX GAMMA-RAY SPECTRA	KSUN 360	F4 RS P	O \$ CORGAM,	390
UNITS DUCC 635	F4	RS	G \$ ANVENT, LOCA ANALYSIS DUKE POWER MCGUIRE	529
UNPACK, RETRIEVAL FROM SCISRS X-SECTION TAPE	GGA 7044	F+MAP RSBP	M \$	206
UNRESOLVED REGION AVERAGE X-SEC CALC	BNL 6600	F4 RS P	A \$ AVERAGE,	376
UNRESOLVED REGION AVERAGE X-SEC CALC	BNL 7094	F4 RS P	A \$ AVERAGE,	376
UNRESOLVED REGION RESONANCE INTEGRAL CALC	GGA 7090	F+MAP RSB	T A \$ TUZ,	42
UNRESOLVED RESONANCE INTEGRALS X-SECS	BAPL 6600	F4 RS P	T A \$ PUN1,	359
UNRESOLVED RESONANCE X-SECTION CALC	GGA 1108	F4 RS P	A \$ GANDY,	341
UNRESOLVED RESONANCES BAPL 6600	F4 RS P	A \$ GRAMP, R-M PARAMETERS OF		470
URANIUM FUEL CYCLE CCST ANALYSIS	AI 7090	F2 RS P	D \$ AIMFIRE,	55
USING DTF4 FLUXES	LASL 6600	F4 RS P	N \$ DAC1, SN PERTURBATION CODE	455
USING 2DF OUTPUT	GGA 1108	F5 RS P T N \$	GAPER2D, 2D PERTURBATION CALC	471
UTILITY MODULES, 2-D + 3-D PLOTTING	KAPL 6600	F+ASC RS P T P \$	DATATRN	407
UTILITY PROGRAM	AI 7094	F+MAP RS L T M \$	MOMUS, X-SECTION LIBRARY	159
UTILITY ROUTINE	ANL 3600	F63 RSBP	T M \$ XLIBIT, X-SECTION LIBRARY	181
UTILITY ROUTINE	AI 360	F4 RSB L T M \$	CLIP, FORM OR THREDES LIBRARY	271
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
VELVET2, 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
VESSEL STRESS AND FATIGUE	KAPL 6600	F4 RS	I \$ SORSDB, PRESSURE	391
VIBRATING SYSTEMS	KAPL 6600	F+ASC RS P T I \$	GEM, EIGENVALUE PROBLEM FOR	344
VIEW FACTOR SHIELDING CODE CAVITY GEOM	GGA 1108	F4 RS P T J \$	MUSCAT,	259
VIM1, MONTE CARLO CRITICAL ASSEMBLY ANALYSIS	AI 7600	F4 RS PLX T C \$		510
VIM1, MONTE CARLO CRITICAL ASSEMBLY ANALYSIS	ANL 360	F4 RS PLX T 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	GEC 625	F4 RS P	B \$ AVOID, ANNULAR	276
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 CCSTS PERFORMANCE STUDY	GGA 7044	F4 RS P	D \$	224
WANL 6600	F4 RS P T C \$	VARI-QUIR, TIME-DEP 2-D MULTI-GP DIFFUSION		212
WANL 7094	F+MAP 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	E \$ R102, SPACE-INDEPENDENT INVERSE KINETICS CALC		168
WANL 7094	F4 RS P	E \$ R101, SPACE-INDEPENDENT KINETICS KEX 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 B \$	LEOPARD, SPECTRA CALCULATION WITH DEPLETION		279
WAPD 6600	BCD R L T Z \$	ETCG1 DATA LIBRARIES, MUFT4 OR 5, GAM1 OR 2		447
WAPD 6600	F4 RS P T B \$	ETCM1, ENDF/B FORMAT TO MUFT FORMAT X-SECTIONS		436
WAPD 6600	F4 RS P T D \$	CINCAS, NUCLEAR FUEL CYCLE COST AND ECONOMICS		354
WAPD 6600	F4 RS PL T B \$	ETOG1, ENDF/B TO MUFT, GAM, ANISN X-SEC FORMAT		437
WAPD 7094	F+MAP RS PLX T B \$	LASER, SPECTRUM CALC WITH BURNUP CYL LATTICE		249
WAPD 7600	F4 RS P T B \$	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 \$		396
WATER AND STEAM THERMODYNAMIC PROPERTIES	BAPL 6600	F4 RS P T H \$	WASP,	396
WATER PROPERTIES BG&E 360	F4 RS	T H \$ STEAM-67, 1967 ASME STEAM AND		487
WATER-HAMMER, LIQUID BLOWDOWN ANALYSIS	LOFT UGA 360	F4 RS P	G \$	278
WATER-LOGGED FUEL ELEMENT ANALYSIS	BAPL 6600	F4 RS P T H \$	GLUB1,	424
WATER-REACTOR DESIGN	BNW 1108	F5 RS P T H \$	REPP, THERMAL HYDRAULIC	483

WATER

X-SECTION

WATER, STEAM TABLES 14.5-14,500PSIA 32-472DEGF 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 COSE CALC AI 7094 F+FAP RS P J \$ SHOE, SHIELD	197
WEIGHT OPTIMIZATION STUDY PW 1604 F63 RS I \$ WOPEXPRT, REACTOR	190
WELL CRYSTAL UM 7090 MAD RSB O \$ BURP5, GAMMA-RAY PHOTOFRACITION	170
WELWING, MATERIAL BUCKLING CYL FUEL ELEMENTS AEB 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, 1-D 2-GP SPACE-TIME DIFFUSION 3-GEOM BAPL 6600 F4 RS P T F \$	274
WIGL2, 1-C 2-GP SPACE-TIME DIFFUSION 3-GEOM GGA 1108 F4 RS P T F \$	274
WIRFX, COMPUTER-PRODUCED WIRING LISTS UHTREX LASL 7090 F+FAP RS 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 \$ RABBLE,	281
WOODS-SAXCN POTENTIAL SHAPE CALCULATION ORNL 7090 F2 RS A \$ LYNNE,	381
WOPEXPRT, REACTOR WEIGHT OPTIMIZATION STUDY PW 1604 F63 RS I \$	190
X-SEC BNL 6600 F4 RS P A \$ BESFIT, DIFFRACTION MODEL ELASTIC SCAT	524
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X-SEC CALC BNL 6600 F4 RS P A \$ SIGPLOT, RESOLVED MULTILEVEL B-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-SEC CALC BNW 1108 F4 RS P T B \$ FCC4, FUNDAMENTAL MODE FAST REACTOR	306
X-SEC CALC GGA 1108 F4 RS P X T B \$ GAF, GAR, SPECTRA AND GROUP-AVERAGED	316
X-SEC CALC ORNL 360 F+BAL RS P D \$ ISOSEARCH, ISOTOPE PRODUCTION FLUX,	322
X-SEC CALC ORNL 1604 F63 RS P D \$ ISOSEARCH, ISOTOPE PRODUCTION FLUX,	322
X-SEC EVALUATION ORNL 1604 F63 RS P T A \$ JUPITOR1, COUPLED-CHANNEL	308
X-SEC EVALUATION AI 360 F+BAL RS L T M \$ SCORE3, SCISRS ENDF/B GRAPHIC	375
X-SEC FORMAT WAPC 6600 F4 RS PL T B \$ ETOL1, ENDF/B TO MUFT, GAM, ANISN	437
X-SECS BAPL 6600 F4 RS P T A \$ PUN1, UNRESOLVED RESONANCE INTEGRALS	359
X-SECS GESV 635 F+GMP RS P XCT L \$ TDOWN, 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 \$ GAVER, ENERGY INTERVAL	218
X-SECTION CALC BNW 1108 F5 RS PLX T B \$ 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 \$ DOPIE, 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 GCA 1108 F4 RS P A \$ GANDY, UNRESOLVED RESONANCE	341
X-SECTION CALC GCA 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 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 DSN OUTPUT PW 1604 LAG1 RS P N \$ DTX, EFFECTIVE	210
X-SECTION CALC MODFRATER GGA 1108 F4 RS P A \$ GAKER, INELASTIC SCAT	289
X-SECTION CALCULATION GEC 625 F4 RS P B \$ 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 \$ IDX, 1-D DIFFUSION FAST	374
X-SECTION GENERATION GEC 635 F4 RSBP T B \$ GROUSE, SPACE-DEPENDENT	420
X-SECTION GENERATION COSE 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 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	RSBP	T N	\$ CPS, SC4020 PLOTS FROM SCISRS	239
X-SECTIONS	AI	7090	F+FAP	RS	L	T B \$ QUICKIE, INFINITE MEDIUM SPECTRUM	119
X-SECTIONS	LASL	7090	FLOCO	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 MOOFL	254
X-SECTIONS	BHSC	360	F4	RS	PL	T B \$ TEMPEST2, THERMAL NEUTRON SPECTRUM	50
X-SECTIONS	BNL	6600	F4	RS	P	A \$ RAMP1, REICH-MCCRE 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 DATA	GGA	7044	F+MAP	RS	P	A \$ FASDOP,	216
X-SECTIONS FROM B-W RESONANCE PARAMETERS	WANL	7094	F2	RS	P	A \$ EXT,	238
X-SECTIONS HEX LATTICE	GGA	1108	F4	RS		B \$ HEXSCAT, ELASTIC SCAT	291
X-SECTIONS NED	635	F4	RS	P	T B	\$ REAX, 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	\$ ETOM1, ENDF/B FORMAT TO MUFT FORMAT	436
X-Y GEOM	ANL	360	F4	RS	P	T C \$ TWOTRAN, 2-D MULTI-GP TRANSPORT CODE	358
X-Y GEOM	LASL	1108A	F4	RS	P	T C \$ TWOTRAN, 2-D MULTI-GP TRANSPORT CODE	358
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, DEP3, 3-D	477
XLIBIT, X-SECTION LIBRARY UTILITY ROUTINE	ANL	3600	F63	RSBP		T M \$	181
XSORN, 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 SETS, SN 18- 24- AND 25-GROUP SETS	LASL	6600	BCD	R	LX	T Z \$ LASL	532
XSECS	BNL	6600	F4	RS	P	T A \$ AVRA3,4, SIGMA2, ADLER, ENDF/B RESONANCE	465
XY GEOM	AGC	7090	FLOCO	RSBP		C \$ 2DXY, 2-D MULTI-GP SN APPROXIMATION	18
XY RZ GEOMETRY	GGA	1108	F+BAL	RS	P	T C \$ GAMBLE5, 2-D MULTI-GP DIFFUSION	222
XY RZ GEOMETRY	GGA	7044	F+MAP	RSBP		T C \$ GAMBLE4, 2-D MULTI-GP DIFFUSION	222
XY RZ RTH	WANL	7094	F4	RS	P	X T C \$ VARI-QUIR3, 2-D MULTI-GP DIFFUSION	264
XY RZ RTHETA GEOMETRY	BNW	1108	F4	RS	P	C \$ PERT4, 2-D PERTURBATION	304
XY RZ RTHETA	LASL	6600	F4	RS	P	T C \$ TWOTRAN, 2-D MULTI-GP TRNSPT CODE	358
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 \$ 3DDT, 3D MULTIGROUP DIFFUSION	463
XYZ XENON OSCILLATION	CEND	360	F4	RS	P	X T F \$ CFXE, INCXE, 1-GP 3-D	415
YIELD FROM REACTION OR DECAY	ORNL	1604	F63	RS	P	D \$ ISOTOPES, MAXIMUM	179
ZOT, GROUP-COLLAPSING CF MULTI-GP X-SECTIONS	LASL	7090	FLOCO	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-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	RSBP		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	BW	6600	F+COM	RS	P	X T D \$ FARED,	427
1-D FEW-GP DIFFUSION DEPLETION	GGA	7044	F4	RS	P	T D \$ RELOAD-FEVER,	221
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 SLAB GEOM	PPCO	7090	F2	RS P		C \$ MIST,	59
1-D MULTI-GP DIFFUSION + LIB	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-D MULTI-GP DIFFUSION SLAB 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-D 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	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-D 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-D MULTI-GP DISCRETE ORDINATE PROGRAM	LASL	7030	F4	RS P	T C	\$ DTF4,	209
1-D MULTI-GP DISCRETE ORDINATE PROGRAM	LFR	7094	F4	RS P	T C	\$ DTF4,	209
1-D MULTI-GP DOUBLE SN APPROX	BNW	7090	FLOCO	RSBP	T C	\$ GE-HAPO-S13,	75
1-D MULTI-GP DTF4 WITH DEPLETION	LASL	7030	F4	RS P	T D	\$ DTF-BURN,	269
1-D MULTI-GP SN APPROX SLAB CYL SPHERE	PW	1604	LAG1	RS P		C \$ MGDSN,	211
1-D MULTI-GP SN APPROX SLAB CYL SPHERE	UK-W	7090	F2	RS P	T C	\$ W-DSN,	132
1-D 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 D	\$ 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, 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 TIME-DEPENDENT DIFFUSION	GGA	1108	F4	RS P	T F	\$ GAKIN,	310
1-D ONE-GP SPACE-TIME DIFFUSION FEEDBACK	BNL	6600	F4	RS P	T F	\$ NOAH,	405
1-D PERTURBATION FOR AIM AND FOG CODES	AI	7090	F2	RS		C \$ PERT,	30
1-D PERTURBATION FOR AIM AND FOG CODES	BHSC	360	F4	RS P		C \$ PERT,	30
1-D PERTURBATION FOR AIM AND FOG CODES	CDC	1604	F63	RS		C \$ PERT,	30
1-D SLAB AND SPHERE GFCM 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	T C	\$ M0648,	342
1-D TIME-DEPENDENT DIFFUSION CALC	KAPL	6600	F4	RS P	F	\$ RAUMZEIT,	352
1-D 1-GP SN APPROXIMATION SLAB GEOMETRY	AI	7090	F2	RS P		B \$ SAIL,	52
1-D 1-GP SN APPROXIMATION SLAB GEOMETRY	CDC	1604	F63	RS P		B \$ SAIL,	52
1-D 1-GP S4 APPROXIMATION	AI	7090	F2	RS		B \$ S4 CYL CELL CODE,	53
1-D 1-GP S4 APPROXIMATION	CDC	1604	F63	RS P		B \$ S4 CYL CELL CODE,	53
1-D 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 SLAB GEOMETRY	AI	7090	F2	RS P		B \$ SAIL, 1-D	52
1-GP SN APPROXIMATION SLAB GEOMETRY	CDC	1604	F63	RS P		B \$ SAIL, 1-D	52
1-GP S4 APPROXIMATION	AI	7090	F2	RS		B \$ S4 CYL CELL CODE, 1-D	53
1-GP S4 APPROXIMATION	CDC	1604	F63	RS P		B \$ S4 CYL CELL CODE, 1-D	53
1-GP 3-D XYZ XENON OSCILLATION	CEND	360	F4	RS P X	T F	\$ CEXE,INCXE,	415
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
1DX HEDL	1108	F4	RS P X	T B	\$ ETOX2, MULTIGP CONSTANTS FROM ENDF/B FOR	388	
1DX, 1-D DIFFUSION FAST X-SECTION GENERATION	BNW	1108	F4	RS P X	T B	\$	374
1GP DEPLETION NED	635	F+GMP	RS P	T D	\$ SYN, 2D SYNTHESIS MULTIGP DIFF +	495	
1ST FLIGHT COLLISION PROBABILITIES MC	ORNL	360	F+BAL	RS P	T B	\$ RAFFLE,	392
1ST FLIGHT COLLISION PROBABILITIES MC	ORNL	7090	F+FAP	RS P	T B	\$ RAFFLE,	392
10 MEV	BC	625	F4	RS P X	T B	\$ GAMTEC2, MULTI-GP CONSTANT CALC 0 TO	185
10 MEV	BNW	1107	F4	RS PL	T B	\$ GAMTEC2, MULTI-GP CONSTANT CALC 0 TO	185
10 MEV	BNW	7090	F+FAP	RS PL	T B	\$ GAMTEC2, MULTI-GP CONSTANT CALC 0 TO	185

1107

1108

1107	F4	RS	P	T	C	\$	HFN, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	BNW	241	
1107	F4	RS	PL	T	B	\$	GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV	BNW	185	
1108	BIN	R	L	T	Z	\$	ZPR-III ASSEMBLY 48 GAFGAR ENDF/B DATA TAPES	GGA	356	
1108	F+BAL	RS	P	T	C	\$	GAMBLES, 2-D MULTI-GP DIFFUSION XY RZ GEOMETRY	GGA	222	
1108	F+BAL	RS	P	T	C	\$	GAMTRI, 2-D MULTIGP DIFFUSION TRIANGULAR MESH	GGA	401	
1108	F+BAL	RS	P	T	C	\$	GAZE2, 1-D MULTIGROUP DIFFUSION SLAB, SPH, CYL	GGA	430	
1108	F+BAL	RS	P	T	D	\$	BUGTRI, 2-D MULTIGP DIFFUSION+BURNUP TRI-MESH	GGA	439	
1108	F+BAL	RS	P	T	D	\$	BUG2, 2-D MULTIGROUP DIFFUSION + BURNUP XY, RZ	GGA	438	
1108	F+BAL	RS	P	T	E	\$	BLOOST6, COMBINED KINETICS 2-D HEAT TRANSFER	GGA	303	
1108	F+BAL	RS	P	T	O	\$	GSSLRN1B, LEAST SQUARES PHOTOPEAK SPECTRA CODE	BNWL	457	
1108	F+BAL	RS	P	T	O	\$	TOAD, PROCESSING OF ANALYZER GAMMA-RAY SPECTRA	GGA	333	
1108	F+SL	RS		T	K	\$	HERMES, REGIONAL RADIOLOGICAL EFFECTS ANALYSIS	HEDL	527	
1108	F4	S		T	D	\$	GAFFE, EQUILIBRIUM FUEL CYCLE CALCULATION	GGA	302	
1108	F4	RS		B	\$	HEXSCAT, ELASTIC SCAT X-SECTIONS HEX LATTICE	GGA	291		
1108	F4	RS		T	G	\$	GADOSE,DOSET, HTGR ACCIDENT ANALYSIS DOSE CALC	GGA	261	
1108	F4	RS	P	X	T	P	\$	EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE	ANL	534
1108	F4	RS	P		A	\$	GAKER, INELASTIC SCAT X-SECTION CALC MODERATOR	GGA	289	
1108	F4	RS	P		A	\$	GANDY, UNRESOLVED RESONANCE X-SECTION CALC	GGA	341	
1108	F4	RS	P		A	\$	GASKET, THERMAL SCATTERING LAW CALCULATION	GGA	263	
1108	F4	RS	P		A	\$	PSEUDO, STATISTICAL RESONANCE PARAMETER CALC	GGA	292	
1108	F4	RS	P		C	\$	PERT4, 2-D PERTURBATION XY RZ RTHETA GEOMETRY	BNW	304	
1108	F4	RS	P		D	\$	FREVAP6, HTGR METALLIC FISSION PRODUCT RELEASE	GGA	301	
1108	F4	RS	P		E	\$	GAPOTKIN, SPACE-INDEPENDENT REACTOR KINETICS	GGA	317	
1108	F4	RS	P		E	\$	GASA, STABILITY ANALYSIS REACTOR KINETICS EQNS	GGA	290	
1108	F4	RS	P		G	\$	SOCOOL2, SODIUM-FUEL INTERACTION ANALYSIS	HEDL	521	
1108	F4	RS	P		I	\$	SAFE-CREEP, VISCOELASTIC ANALYSIS CONCRETE	GGA	300	
1108	F4	RS	P		I	\$	SAFE-PLANE, PLANE STRESS ANALYSIS, 2-D BODIES	GGA	252	
1108	F4	RS	P		I	\$	SAFE-SHELL, STRESS ANALYSIS THIN SHELLS	GGA	253	
1108	F4	RS	P		I	\$	SAFE-2D, PLANE + AXISYMMETRIC STRESS ANALYSIS	GGA	379	
1108	F4	RS	P		L	\$	GRDWRK, GRID GENERATION FOR SAFE PROGRAMS	GGA	296	
1108	F4	RS	P		T	A	\$	TACASI, ANALYSIS OF RESONANCE MEASUREMENTS	GGA	410
1108	F4	RS	P		T	B	\$	FCC4, FUNDAMENTAL MODE FAST REACTOR X-SEC CALC	BNW	306
1108	F4	RS	P		T	C	\$	BISYN, 2-D MULTI-GP DIFFUSION SYNTHESIS CALC	NED	287
1108	F4	RS	P		T	C	\$	GASP7, 1-D BURNUP POWER DISTRIBUTION SEARCH	GGA	319
1108	F4	RS	P		T	C	\$	GATT, 3-D FEW-GP DIFFUSION CALC HEX-Z MESH	GGA	380
1108	F4	RS	P		T	C	\$	TEMCO7, TEMPERATURE COEFFICIENT CALCULATION	GGA	320
1108	F4	RS	P		T	D	\$	FEVER7, 1-D MULTIGROUP DIFFUSION AND DEPLETION	GGA	318
1108	F4	RS	P		T	D	\$	GAUGE, 2-D FEW-GP HEX GEOM DIFFUSION DEPLETION	GGA	339
1108	F4	RS	P		T	D	\$	PWCOST, REACTOR FUEL CYCLE COST CALCULATION	GGA	441
1108	F4	RS	P		T	D	\$	2DR, 2-D MULTIGROUP DIFFUSION AND DEPLETION	BNW	325
1108	F4	RS	P		T	F	\$	GAKIN, 1-D MULTIGROUP TIME-DEPENDENT DIFFUSION	GGA	310
1108	F4	RS	P		T	F	\$	GAKIT, 1-D MULTIGP KINETICS WITH TEMP FEEDBACK	GGA	370
1108	F4	RS	P		T	F	\$	WIGL2, 1-D 2-GP SPACE-TIME DIFFUSION 3-GEOM	GGA	274
1108	F4	RS	P		T	G	\$	RELAP3, REACTOR BLOWDOWN - EXCURSION ANALYSIS	ANC	369
1108	F4	RS	P		T	H	\$	CORRA3, ROD BUNDLE THERMALHYDRAULIC ANALYSIS	BNW	432
1108	F4	RS	P		T	H	\$	DYNAM, DYNAMIC ANALYSIS BOILING FLOW STEAM	GGA	440
1108	F4	RS	P		T	H	\$	LION, 3-D TEMPERATURE DISTRIBUTION PROGRAM	CHI	299
1108	F4	RS	P		T	I	\$	SAFE-3D, 3-D COMPOSITE STRUCTURE STRESS STUDY	GGA	332
1108	F4	RS	P		T	J	\$	MUSCAT, VIEW FACTOR SHIELDING CODE CAVITY GEOM	GGA	259
1108	F4	RS	P		T	K	\$	PREP,KITT, SYSTEM FAULT TREE EVALUATION CODES	ANC	528
1108	F4	RS	P	X	A	\$	COHBE, COHERENT INELASTIC SCATTERING LAW CALC	GGA	385	
1108	F4	RS	P	X	T	B	\$	ETOX2, MULTIGP CONSTANTS FROM ENDF/B FOR 1DX	HEDL	388
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	PLX	T	B	\$	GGC4, MULTI-GP X-SECTIONS FAST THERMAL SPECTRA	GGA	298	
1108	F4	RS	PLX	T	B	\$	HRG3, SLOWING-DOWN SPECTRUM, MULTIGP CONSTANTS	BNW	467	
1108	F5	RS	LX	T	B	\$	LECPARD, SPECTRA CALCULATION WITH DEPLETION	JNC	279	
1108	F5	RS	P		A	\$	FLANGE1, SCATTERING LAW X-SECTION CALCULATION	GGA	247	
1108	F5	RS	P		H	\$	FLAC, STEADY-STATE FLOW, PRESSURE DISTRIBUTION	GGA	395	
1108	F5	RS	P		T	C	\$	2DF, 2-D MULTI-GP DISCRETE ORDINATE CODE	GGA	173
1108	F5	RS	P		T	D	\$	DBUFIT1, 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

2-D

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 3D STRUCTURAL ANALYSIS	GGA	452
1108	F5	RS P	T M	\$ TROUT, MUG MULTIGROUP XSEC LIBRARY MAINTENANCE	NED	493
1108	F5	RS P	T N	\$ GAPER2D, 2D PERTURBATION CALC USING 2DF OUTPUT	GGA	471
1108	F5	RS P	T O	\$ CAGE,BIRD,SPEC, TIME-OF-FLIGHT DATA ANALYSIS	GEES	476
1108	F5	RS P	X T F	\$ NOISY1, AUTO- AND CROSS-SPECTRAL DENSITIES	BNW	488
1108	F5	RS	PLX T B	\$ BRT1, THERMAL SPECTRUM X-SECTION CALC	BNW	184
1108	F5	RSBPL	T D	\$ ISOGEN, RADIONUCLIDE GENERATION AND DECAY	BNW	367
1108A	F4	RS P	T C	\$ TWOTRAN, 2-D MULTI-GP TRANSPORT CODE X-Y GEOM	LASL	358
1108B	F4	RS P	T C	\$ TWOTRAN, 2-D MULTI-GP TRANSPORT CODE R-Z GEOM	LASL	358
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,H0H, STEAM TABLES		294
14.5-2538	PSIA		BAPL 6600 F4	RS P T H \$ M0899,H0H, STEAM TABLES		294
1604	F+CDP	RS P	T P	\$ LAG, ASSEMBLER FOR FLOCO2 INSTRUCTION SET	PW	186
1604	F+CDP	RS P	X T B	\$ FMC-N,FMC-G, MC NEUTRON, GAMMA-RAY HISTORIES	PW	195
1604	F63	RS	C	\$ PERT, 1-D PERTURBATION FOR AIM AND FOG CODES	CDC	30
1604	F63	RS	C	\$ TDP, 2-D PERTURBATION TDC OR 2DXY FLUX INPUT	PW	199
1604	F63	RS	C	\$ 2DF, 2-D MULTI-GP DISCRETE ORDINATE CODE	UNC	173
1604	F63	RS	I	\$ WOPEXPRT, 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/FEEDBACK	CDC	121
1604	F63	RS P	E	\$ CMPXMAT, 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	\$ JUPITOR1, 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 FEW-GP DIFFUSION SLAB CYLINDER SPHERE	CDC	28
1604	F63	RS P	T C	\$ FORTRAN 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, CFNTRIFUGAL 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 R	\$ 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 R	\$ 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	\$ DTX, EFFECTIVE X-SECTION CALC FROM DSN OUTPUT	PW	210
18- 24- AND 25-GROUP	SFTS		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	RS T H \$ RATH,		242
2- OR 3-D HEAT CONDUCTION LUMPED MASS		LASL 7094	FAP	RS P T H \$ RATH,		242
2-D + 3-D PLOTTING	KAPL 6600	F+ASC	RS P	T P \$ DATATRAN UTILITY MODULES,		407
2-D AXISYMMETRIC + PLANE ELASTIC-PLASTIC	BAPL 6600	F+COM	RS P	T I \$ DUZZ2,		503
2-D BODIES	BNL 6600	F4	RS P	T I \$ SAFE-PLANE, PLANE STRESS ANALYSIS,		252

2-D

2-GP

2-D BODIFS	GGA	1108	F4	RS P	I \$ SAFE-PLANE, PLANE STRESS ANALYSIS,	252
2-D DESIGN PROGRAMS	LASL	7090	F+FAP	RS P	T L \$ DPC, DATA PREPARATION FOR	234
2-D DIFFUSION ABSORPTION REMOVAL X-SECS	BAPL	6600	F4	RS	T B \$ M0807,	280
2-D EXCURSION CALCULATION R-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 GFCM DIFFUSION DEPLETION	GGA	1108	F4	RS P	T D \$ GAUGF,	339
2-D FEW-GP S4 APPROXIMATION RZ GEOMETRY	LRL	709	F2	RS	C \$ FIRN,	7
2-D FEW-GROUP DIFFUSION AND DEPLETION	IBM	360A	F+BAL	RS P	T D \$ PQQ5,	336
2-D FEW-GROUP DIFFUSION AND DEPLETION	MIT	360B	F+BAL	RSBP	T D \$ PQQ5,	336
2-D FEW-GROUP DIFFUSION SLAB CYLINDER	CDC	1604	F63	RS P	T C \$ 20GRAND,	40
2-D FEW-GROUP DIFFUSION SLAB CYLINDER	ORNL	7090	F2	RS P	T C \$ 20GRAND,	40
2-D GEOMETRY INPUT, PREPARATION, EDIT	KAPL	6600	F+ASC	RS P	T L \$ DATATRAN	406
2-D HEAT TRANSFER	GGA	1108	F+BAL	RS P	T E \$ BLOCST6, COMBINED KINETICS	303
2-D HEAT TRANSFER	GGA	7044	F+MAP	RS P	T H \$ BLOOST5, POINT-KINETICS WITH	205
2-D LMFBR POWER EXCURSION DISASSEMBLY	ANL	360	F4	RS P	XCT F \$ VENUS,	511
2-D MONTE CARLO CELL CALCULATION	AI	360	F+BAL	RS P	X T B \$ HWOCR-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	ORNL	7090	F+FAP	RS P	T D \$ ASSAULT,	240
2-D MULTI-GP DIFFUSION PROGRAM	AAEC	360	F+BAL	RS P	T C \$ CRAM, 1-D AND	103
2-D MULTI-GP DIFFUSION PROGRAM	ORNL	7090	F+FAP	RS 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	BC	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	ORNL	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+BAL	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 \$ FORTRAN TDC,	161	
2-D MULTI-GP SN APPROXIMATION XY GEOM	AGC	7090	FLOCC	RSBP	C \$ 2DXY,	18
2-D MULTI-GP TRANSPORT CODE R-Z GEOM	LASL	1108B	F4	RS P	T C \$ TWOTRAN,	358
2-D MULTI-GP TRANSPORT CODE X-Y GEOM	ANL	360	F4	RS P	T C \$ TWOTRAN,	358
2-D MULTI-GP TRANSPORT CODE X-Y GEOM	LASL	1108A	F4	RS P	T C \$ TWOTRAN,	358
2-D MULTI-GP TRNSPT CODE XY RZ RTHETA	LASL	6600	F4	RS P	T C \$ TWOTRAN,	358
2-D MULTIGP DIFFUSION TRIANGULAR MESH	GGA	1108	F+BAL	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
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 PERTURBATION TDC OR 2DXY FLUX INPUT	PW	1604	F63	RS	C \$ TDP,	199
2-D PERTURBATION XY RZ RTHETA GEOMETRY	BNW	1108	F4	RS P	C \$ PERT4,	304
2-D TIME-DEPENDENT HEAT CONDUCTION	PPCO	7044	F+MAP	RS P	T H \$ TOODEE,	349
2-D TRANSIENT HEAT CONDUCTION PROGRAM	BAPL	6600	F4	RS P	T H \$ HOT2,	286
2-D 2-GP DIFFUSION CYLINDER SLAB	CDC	1604	F63	RS P	T C \$ EQUIPOISE3A,	87
2-D 2-GP DIFFUSION CYLINDER SLAB	ORNL	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	ORNL	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	ORNL	360	F4	RS P	X T H \$ ORTHIS, ORTHAT,	525
2-GP DIFFUSION CYLINDER SLAB	CDC	1604	F63	RS P	T C \$ EQUIPOISE3A, 2-D	87
2-GP DIFFUSION CYLINDER SLAB	ORNL	7090	F2	RS P	T C \$ EQUIPOISE3A, 2-D	87
2-GP KINETICS TEMPERATURE FEEDBACK	BAPL	6600	F4	RS P	T F \$ NOWIG, 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-GEOM	BAPL	6600	F4	RS P	T F \$ WIGL2, 1-D	274
2-GP SPACE-TIME DIFFUSION 3-GEOM	GGA	1108	F4	RS P	T F \$ WIGL2, 1-D	274

2-GROUP

3DXT,DEP3

2-GROUP DIFFUSION SLAB CYL	ORNL 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	ORNL 7090 F2	RS P	T C \$ WHIRLAWAY, 3-D	32
2-PASS ASSEMBLER FOR THE PDP-11	CN 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-REG CELL	ANL 360C F36	RSBP X T B	\$ RIFF-RAFF, RESONANCE INTEGRAL CALC	213
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 MULTIGROUP DIFFUSION + SN THEORY	NED 635 F4	RS P	T C \$ DOT2DB,	459
2D PERTURBATION CALC USING 2DF OUTPUT	GGA 1108 F5	RS P	T N \$ GAPER2D,	471
2D SYNTHESIS MULTIGP DIFF + 1GP DEPLETION	NED 635 F+GMP	RS P	T D \$ SYN,	495
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 OUTPUT GGA	1108 F5	RS P	T N \$ GAPER2D, 2D PERTURBATION CALC USING	471
2DF, 2-D MULTI-GP DISCRETE ORDINATE CODE	GGA 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 GEOM	AGC 7090	FLOCO	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	RSBP	T A \$	254
20GRAND, 2-D FEW-GROUP DIFFUSION SLAB CYLINDER	CDC 1604 F63	RS P	T C \$	40
20GRAND, 2-D FEW-GROUP DIFFUSION SLAB CYLINDER	ORNL 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	BW	305
2000 F4	RS P	T F \$ FORE, FAST REACTOR EXCURSION CALCULATIONS	NED	174
230 F4	RS P	T B \$ CLUP77, SQUARE CELL COLLISION PROBABILITY CALC	JAER	526
24- AND 25-GROUP SETS	LASL 6600 BCD	R	LX T Z \$ LASL XSEC SETS, SN 18-	532
25-GROUP SETS	LASL 6600 BCD	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	ORNL 360 F+BAL	RS P	T I \$ SAFE-3D,	332
3-D DIFFUSION DEPLETION MULTIGP	ORNL 360G F4	RS P	T K \$ CITATION, 1,2,	387
3-D FEW-GP DIFFUSION CALC HEX-Z MESH	GGA 1108 F4	RS P	T C \$ GATT,	380
3-D FEW-GP DIFFUSION DEPLETION	ANC 360D F+BAL	RS P	XCT D \$ PDQ7, 1,2 OR	275
3-D FEW-GP DIFFUSION DEPLETION	BAPL 6600A F+ASC	RS P	T D \$ PDQ7, 1,2 OR	275
3-D FEW-GP DIFFUSION DEPLETION	BAPL 6600C F+ASC	RS P	T D \$ PDQ7, 1,2 OR	275
3-D FEW-GP DIFFUSION DEPLETION	BW 6600B F+ASC	RS P	T D \$ PDQ7, 1,2 OR	275
3-D HEAT CONDUCTION LUMPED MASS	LASL 7030 F4	RS	T H \$ RATH, 2- OR	242
3-D HEAT CONDUCTION LUMPED MASS	LASL 7094 FAP	RS P	T H \$ RATH, 2- OR	242
3-D HEAT CONDUCTION PROGRAM	ORNL 360 F4	RS P	T H \$ HEATING3, 1,2, OR	517
3-D HEAT TRANSFER PROGRAM	GGA 1108 F5	RS P	T H \$ TAC3D, TRANSIENT	414
3-D MULTI-GP FLUX SYNTHESIS PROGRAM	CYL PW 1604 F63	RS	T C \$ 2DXYL,	192
3-D PLOTTING	KAPL 6600 F+ASC	RS P	T P \$ DATATRAN UTILITY MODULES, 2-D +	407
3-D REACTIVITY AND POWER DISTRIBUTION	CDC 3600 F63	RSBP	T C \$ FLARE,	167
3-D REACTIVITY AND POWER DISTRIBUTION	MSS 360 F4	RS P	T C \$ FLARE,	167
3-D REACTIVITY AND POWER DISTRIBUTION	NED 635 F4	RS P	T C \$ FLARE,	167
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 \$ LION,	299
3-D TEMPERATURE DISTRIBUTION PROGRAM	KAPL 6600 F+ASC	RS P	T H \$ LION,	299
3-D TRANSIENT HEAT TRANSFER PROGRAM	GEC 635 F+GMP	RSBP	T H \$ THTE,	346
3-D XENON TRANSIENT + DEPLETION	KAPL 6600 F4	RS P	T D \$ 3DXT,DEP3,	477
3-D XYZ XENON OSCILLATION	CEND 360 F4	RS P	X T F \$ CESE, INCSE, 1-GP	415
3-D 2-GROUP DIFFUSION XYZ GEOMETRY	CDC 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-GEOM	GGA 1108 F4	RS P	T F \$ WIGL2, 1-D 2-GP SPACE-TIME DIFFUSION	274
3D MULTIGROUP DIFFUSION XYZ R-THETA-Z	LASL 6600 F4	RS P	T C \$ 3DDT,	463
3D STRUCTURAL ANALYSIS	GGA 1108 F5	RS P	T I \$ SHELL5, THIN SHELL	452
3DDT, 3D 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

32-472DEGF

360

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	RSBP	T M \$ MERMC2,MAGIC, MC**2 LIBRARY SERVICE RCUTINES	ANL	3600	472	
360	BAL	RSB	T P	\$ NRTS-RJE, CS/360 MVT REMOTE JCB ENTRY SYSTEM	ANC	519
360	F+BAL	S	T M	\$ JOSHUA, DATA STORAGE, RETRIEVAL, AND DISPLAY	DP	490
360	F+BAL	S	X T B	\$ RAHAB, JOSHUA SYSTEM LATTICE PHYSICS MODULES	DP	536
360	F+BAL	RS	T P	\$ FIGS, IBM360+2250 FORTRAN GRAPHICS SUBROUTINES	AI	484
360	F+BAL	RS	L T M	\$ SCORE3, SCISRS ENDF/B GRAPHIC X-SEC EVALUATION	AI	375
360	F+BAL	RS	P	C \$ ISOSEARCH, ISOTOPE PRODUCTION FLUX, X-SEC CALC	ORNL	322
360	F+BAL	RS	P	C \$ PMS1, FAST NEUTRON POLARIZATION EXPERIMENT	UCND	469
360	F+BAL	RS	P	T A \$ COMNUC,CASCADE, COMPCUND 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 \$ CRAM, 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 C \$ ESP, MONTE CARLO REACTOR ANALYSIS CALCULATION	ORNL	523
360	F+BAL	RS	P	T C \$ CINDER(MO102), POINT DEPLETION FISSION PRODUCT	DP	313
360	F+BAL	RS	P	T E \$ AIROS2A, SIMULATION OF REACTOR DYNAMICS	AI	326
360	F+BAL	RS	P	T G \$ CONTEMPT-PS, PRESSURE-TEMPERATURE RESPONSE	ANC	433
360	F+BAL	RS	P	T I \$ SAFE-3D, 3-D COMPOSITE STRUCTURE STRESS STUDY	ORNL	332
360	F+BAL	RS	P	CT M \$ ARC-SYSTEM, SYSTEM SUBPROGRAMS AND MODULES	ANL	522
360	F+BAL	RS	P	X T B \$ HWOCR-SAFE, 2-D MONTE CARLO CELL CALCULATION	AI	307
360	F+BAL	RS	P	XCT B \$ HAMMER,LITHE,HELP, CRITICAL ANALYSIS SYSTEM	DP	277
360	F+BAL	RSBPL	CT C	\$ KENO, MONTE CARLO MULTIGROUP CRITICALITY CODE	ORNL	450
360	F4	RS	M	\$ MERMC2, MC**2 BINARY LIBRARY TAPE MAINTENANCE	ANL	472
360	F4	RS	T H	\$ STEAM-67, 1967 ASME STEAM AND WATER PROPERTIES	BG&E	487
360	F4	RS	L T C	\$ FIRES5, 1-D AGE-DIFFUSION SLAB CYLINDER SPHERE	AEB	9
360	F4	RS	P	A \$ CODILLI, LEAST SQUARES ANALYSIS RESONANCE DATA	UILL	347
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 \$ AIREK3, SPACE-INDEPENDENT KINETICS W/FEEDBACK	AEB	121
360	F4	RS	P	E \$ BLAST, REACTOR KINETICS TEMPERATURE DIST STUDY	AEB	363
360	F4	RS	P	E \$ TRIFIDO, PULSED NEUTRON SOURCE DATA ANALYSIS	CNEA	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 \$ SOCOOL2, 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	RS	P	L \$ GENRD, FREE-FORMAT CARD INPUT PROCESSOR	LASL	530
360	F4	RS	P	C \$ ALPHA-M, RESOLUTION CF GAMMA RAY SPECTRA	ORNL	413
360	F4	RS	P	C \$ CORGAM, UNFOLDING OF COMPLEX GAMMA-RAY SPECTRA	KSUN	390
360	F4	RS	P	C \$ DYN01, PHOTOMULTIPLIER ELECTRON DISTRIBUTION	ANL	464
360	F4	RS	P	T A \$ ATHENA4, INELASTIC SCATTERING FORM FACTORS	ORNL	417
360	F4	RS	P	T B \$ CLUP77, SQUARE CELL COLLISION PROBABILITY CALC	ANL	526
360	F4	RS	P	T B \$ RICE, PRIMARY RECOIL ATOM SPECTRA ENDF/B DATA	ORNL	453
360	F4	RS	P	T B \$ SUPERTOG, ENDF/B FINE-GP CONSTANTS GENERATION	ORNL	431
360	F4	RS	P	T C \$ EXTERMINATOR2, 2-D MULTI-GP DIFFUSION PROGRAM	ORNL	156
360	F4	RS	P	T C \$ FAIMOS, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	BHSC	120
360	F4	RS	P	T C \$ FLARE, 3-D REACTIVITY AND POWER DISTRIBUTION	MSS	167
360	F4	RS	P	T C \$ TWOTRAN, 2-D MULTI-GP TRANSPORT CODE X-Y GEOM	ANL	358
360	F4	RS	P	T C \$ VARI-QUIR, TIME-DEP 2-D MULTI-GP DIFFUSION	UMCC	212
360	F4	RS	P	T C \$ CINCAS, NUCLEAR FUEL CYCLE COST AND ECONOMICS	CWE	354
360	F4	RS	P	T C \$ CONCEPT, POWER PLANT CONCEPTUAL COST ESTIMATES	ORNL	498
360	F4	RS	P	T F \$ ANCON, SPACE-INDEPENDENT REACTOR KINETICS CODE	ANL	486
360	F4	RS	P	T F \$ SAS1A, 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 H \$ COBRA3, ROD BUNDLE THERMALHYDRAULIC ANALYSIS	ANL	432
360	F4	RS	P	T H \$ HEATING3, 1,2, OR 3-D HEAT CONDUCTION PROGRAM	ORNL	517
360	F4	RS	P	T I \$ LIFE1, FAST REACTOR FUEL ELEMENT BEHAVIOR	ANL	460
360	F4	RS	P	T I \$ SABOR4, DISCRETE-ELEMENT ANALYSIS THIN SHELLS	MIT	402
360	F4	RS	P	T I \$ SEALSHELL2, SHELL STRESS ANALYSIS AXISYM LOAD	SR	282
360	F4	RS	P	T M \$ CRECT,CHECKER,RIGEL ENDF/B PROCESSING CODES	ANL	475
360	F4	RS	P	T M \$ EDITOR, ENDF/B TAPE PROCESSING AND EDITING	ORNL	502

360

4RESTRAINT

360	F4	RS P	CT B	\$ MC**2, ENDF MULTIGROUP X-SECTION CALCULATION	ANL	355	
360	F4	RS P	CT M	\$ ETOE, ENDF/B TO MC**2 DATA CONVERSION	ANL	350	
360	F4	RS P	X G	\$ BURST1, HYDRODYNAMIC ANALYSIS DURING BLOWDOWN	PPCO	435	
360	F4	RS P	X T E	\$ MOD5, STOCHASTIC MODEL OF NEUTRON SLOWING-DOWN	NPGS	491	
360	F4	RS P	X T F	\$ CEXE, INCXE, 1-GP 3-D XYZ XENON OSCILLATION	CEND	415	
360	F4	RS P	X T F	\$ FORE2, FAST REACTOR EXCURSION CALCULATIONS	ANL	174	
360	F4	RS P	X T F	\$ ORTHIS, ORTHAT, 2-DIMENSIONAL HEAT CONDUCTION	ORNL	525	
360	F4	RS P	XCT A	\$ FLANGE2(71-1), ENDF/B THERMAL SCATTERING DATA	DP	368	
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 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	\$ LEOPARD, SPECTRA CALCULATION WITH DEPLETION	WAPD	279	
360	F4	RS PLX	T B	\$ XSDRN, DISCRETE ORDINATE MULTIGROUP CONSTANTS	ORNL	393	
360	F4	RS PLX	T C	\$ VIM1, MONTE CARLO CRITICAL ASSEMBLY ANALYSIS	ANL	510	
360	F4	RS PLXCT	P	\$ 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, FORM OR THREDES LIBRARY UTILITY ROUTINE	AI	271	
360	F4	RSBP	T K	\$ PREP, KITT, SYSTEM FAULT TREE EVALUATION CODES	ANC	528	
360	F4	RSBP	T K	\$ THREDES, 1-D FEW-GP DIFFUSION DESIGN SYSTEM	AI	273	
360	F4	RSBP	CT L	\$ ARC-NUI002, BCD INPUT DATA PROCESSING MODULE	ANL	533	
360	F4	RSBP	X T F	\$ SIZZLE, 1-D MULTIGROUP DIFFUSION DEPLETION	AI	58	
360	F4	RSBP	X T G	\$ THETA1-B, FUEL ROD THERMAL RESPONSE LOCA	ANC	512	
360	F4	RSBP	XCT G	\$ RELAP3, REACTOR BLOWDOWN - EXCURSION ANALYSIS	ANC	369	
360	F4	RSBPLX	T C	\$ ANISN, 1-D MULTI-GP DISCRETE ORDINATE CALC	AI	151	
360	F4	RSBPLX	T C	\$ CAESAR4, LIBLST, 1-D MULTI-GP DIFFUSION + LIB	AI	270	
360	PL1	RS P	T F	\$ 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+BAL	PS P	T C	\$ PDQ5, 2-D FEW-GROUP DIFFUSION AND DEPLETION	IBM	336	
360B	F+BAL	RSBP	T C	\$ PDQ5, 2-D FEW-GROUP DIFFUSION AND DEPLETION	MIT	336	
360C	F+BAL	RS P	XCT C	\$ 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	ORNL	387	
3600	ASAF4	RS P	T M	\$ ETOE, ENDF/B TO MC**2 DATA CONVERSION	APDA	350	
3600	F36	SBP	I	\$ BOW2, DEFLECTION CALCULATION PARALLEL BEAMS	ANL	365	
3600	F36	RS P	T B	\$ MC**2, ENDF MULTIGROUP X-SECTION CALCULATION	ANL	355	
3600	F36	RS P	T C	\$ SNARG-1D, 1-D MULTI-GP DISCRETE ORDINATE CALC	ANL	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 SLAB CYL SPHERE	ANL	262	
3600	F36	RS P	XCT C	\$ TESS, 1-D SLAB AND SPHERE GEOM SN TRANSPORT	ANL	513	
3600	F36	PSBP	A	\$ MISH-MASH, RESONANCE INTEGRAL CALC HOMOGENEOUS	ANL	214	
3600	F36	RSBP	G	\$ CHEMLC2, 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, WLIB, FLAT, RESONANCE ABSORPTION, CELL	ANL	281	
3600	F36	RSBP	X T B	\$ RIFF-RAFF, RESONANCE INTEGRAL CALC 2-REG CELL	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	\$ NEARPEX, COMPOUND NUCLEUS X-SECTION CALC	ANL	171	
3600	F63	RSBP	E	\$ R101, SPACE-INDEPENDENT KINETICS KEX OPTIONS	ANL	255	
3600	F63	RSBP	F	\$ R102, SPACE-INDEPENDENT INVERSE KINETICS CALC	ANL	168	
3600	F63	RSBP	F	\$ AX1, COUPLED NEUTRONICS-HYDRODYNAMICS SPHERE	CDC	102	
3600	F63	RSBP	O	\$ 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	\$ FLARE, 3-D REACTIVITY AND POWER DISTRIBUTION	CDC	167	
3600	F63	RSBP	T F	\$ TRAFICOPPORATION, 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	\$ XLIBIT, X-SECTION LIBRARY UTILITY ROUTINE	ANL	181	
3600	F63	PSBP	XCT B	\$ THERMOS(ANL), THERMAL SPECTRUM X-SECTION CALC	ANL	184	
3600	F63	RSBPL	T J	\$ MAC, SHIFLD 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	\$ MERMC2, MAGIC, MC**2 LIBRARY SERVICE ROUTINES	ANL	472	
3600B	F36	RSBP	G	\$ WHAM, LIQUID-FILLED PIPING SYSTEM ANALYSIS	KE	278	
4RESTRAINT	PIPE STRESS, MAXIMUM MOMENT CALC	AI	7090	F+FAP RS	T I	\$ 109	

48	GAFGAR	ENDF/B	DATA	TAPES	GGA	1108	BIN	R	L	T	Z	\$	ZPR-III	ASSEMBLY	356
500	PSIA	32-472	DEGF	BAPL	6600	F4	RS	T	H	\$	WATER, STEAM	TABLES	14.5-14,	267	
625	F+MAP	RS	P	T	C	\$	DTF4, 1-D	MULTI-GP	DISCRETE	ORDINATE	PROGRAM	BC		209	
625	F4	RS		T	C	\$	EXTERMINATOR2, 2-D	MULTI-GP	DIFFUSION	PROGRAM	BC			156	
625	F4	RS		T	C	\$	FOG, 1-D	FEW-GP	DIFFUSION	SLAB	CYLINDER	SPHERE	BC	28	
625	F4	RS	P		P	\$	AVOID, ANNULAR	VOID	X-SECTION	CALCULATION	GEC			276	
625	F4	RS	P	X	T	B	\$	GAMTEC2, MULTI-GP	CONSTANT	CALC	0 TO 10	MEV	BC	185	
635	F+FAP	RSBP		T	Q	\$	CASCADE, CLUSTER, RADIATION	DAMAGE	IN	MTALS	GEC			419	
635	F+GMP	RS		T	P	\$	GENED ENVIRONMENTAL	ROUTINES, SUBROUTINE	LIB.	NED				515	
635	F+GMP	RS	P		T	C	\$	SYN, 2D	SYNTHESIS	MULTIGP	DIFF + 1GP	DEPLETION	NED	495	
635	F+GMP	RS	P	X	T	E	\$	ENDRUN2, MULTIGROUP	CONSTANTS	FROM	ENDF/B	DATA	CESV	501	
635	F+GMP	RS	P	X	T	L	\$	TDOWN, SPATIAL & COMPOSITION	-DEPENDENT	X-SECS	GESV			505	
635	F+GMP	RSBP		T	H	\$	THTE, 3-D	TRANSIENT	HEAT	TRANSFER	PROGRAM	GEC		346	
635	F4	RS			G	\$	ANVENT, LOCA	ANALYSIS	DUKE	POWER	MCGUIRE	UNITS	DUCCO	529	
635	F4	RS	X	T	P	\$	EISPACK, MATRIX	EIGENVALUE	EIGENVECTOR	PACKAGE	ANL			534	
635	F4	RS	P		P	\$	RAPFU, FUEL	CYCLE	PARAMETERS	FAST	BREEDERS	NED		372	
635	F4	RS	P		T	B	\$	REAX, RESOLVED	RESONANCE	EPITHERMAL	X-SECTIONS	NED		257	
635	F4	RS	P		T	C	\$	DOT2DB, 2D	MULTIGROUP	DIFFUSION + SN	THEORY	NED		459	
635	F4	RS	P		T	C	\$	FLARE, 3-D	REACTIVITY	AND	POWER	DISTRIBUTION	NED	167	
635	F4	RS	P		T	C	\$	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	RS	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	C	\$	BURNUP, HEAVY	ELEMENT	ISOTOPIC	BURNUP	ANALYSIS	NED	311	
635	F4	RS	P		T	C	\$	EXPN, ANALYSIS	OF	PULSED	NEUTRON	SOURCE	DATA	NED	258
635	F4	RS	P	X	T	F	\$	FORE2, FAST	REACTOR	EXCURSION	CALCULATIONS	NED		174	
635	F4	RS	PL		T	C	\$	BISYN, 2-D	MULTI-GP	DIFFUSION	SYNTHESIS	CALC	NED	287	
635	F4	RSBP			C	\$	CHAINS, ANALYSIS	OF	RADIOACTIVE	DECAY	CHAINS	GEC		418	
635	F4	RSBP			C	\$	DOS, NEUTRON	FLUX-DOSIMETER	ACTIVITY	RELATION	GEC			423	
635	F4	RSBP			C	\$	MICHRD, MICROHARDNESS	MEASUREMENT	ANALYSIS	GEC				421	
635	F4	RSBP		T	P	\$	GROUSE, SPACE-DEPENDENT	X-SECTION	GENERATION	GEC				420	
6400	F4	RS	P		G	\$	FRCRL2, LOCA	FISSION	PRODUCT	RELEASE	ANALYSIS	BCL		500	
6400	F4	RS	P		G	\$	MIRAB, MIRAP, CONTAINMENT	SYSTEM	IODINE	REMOVAL	BCL			499	
6400	F4	RS	P	T	F	\$	ADEP, 1D AND 2D	FEW-GROUP	SPACE-TIME	KINETICS	BCL			494	
6400	F4	RS	P		T	G	\$	ECCSA4, LOSS-OF-COOLANT	& EMERGENCY	COOLING	BCL			330	
6400	F4	RS	P		T	G	\$	NURLOC-1.0, LOSS-OF-COOLANT	THERMAL	ANALYSIS	BCL			328	
6400	F4	RS	P	X	T	G	\$	MUCHA1, MUCHA2, MULTIPLE	CHANNEL	ANALYSIS	ECC	BCL		508	
6500	F4	RS	P		B	\$	PARTI, OPTIMAL	GROUP	OR	MESH	COLLAPSING	TRW		416	
6500	F4	RS	PLX		T	C	\$	MACH1, 1-D	MULTI-GP	DIFFUSION	SLAB	CYL	SPHERE	PURD	262
6600	BCD	R	L	T	Z	\$	ETOG1	DATA	LIBRARIES, MUFT4	OR 5, GAM1	OR 2	WAPD		447	
6600	BCD	R	LX	T	Z	\$	LASL	XSEC	SETS, SN 18- 24- AND 25-GROUP	SETS	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	\$	LION, 3-D	TEMPERATURE	DISTRIBUTION	PROGRAM	KAPL		299	
6600	F+ASC	RS	P		T	I	\$	GEM, EIGENVALUE	PROBLEM	FOR	VIBRATING	SYSTEMS	KAPL	344	
6600	F+ASC	RS	P		T	J	\$	ASPI, GAMMA	RAY	SOURCE	BUILDUP	FACTOR	CALC	BAPL	429
6600	F+ASC	RS	P		T	J	\$	SPAN4, A	POINT-KERNEL	SHIELD	EVALUATION	CODE	BAPL	462	
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	RS	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	DP	PACKAGE	KAPL	428
6600	F+ASC	PS	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, RESQ0, 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		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	397	
6600	F+CCM	RS	P	X	T	B	\$	PAX03, HARMONY-PDQ	X-SECTION	GENERATION	CODE	BAPL		426	
6600	F+CCM	RS	P	X	T	D	\$	FARED, 1-D	FAST	REACTOR	DESIGN & SURVEY	STUDY	BW	427	
6600	F+CCM	RSB			T	M	\$	DATATRAN, MODULAR	PROGRAMMING	AND	DATA	SYSTEM	KAPL	386	
6600	F4	RS			B	\$	APRFX1, 99-GP	DLC-28	LIBRARY	GROUP	COLLAPSING	APRF		466	
6600	F4	RS			I	\$	SCRSD, PRESSURE	VESSEL	STRESS	AND	FATIGUE	KAPL		391	
6600	F4	RS			T	B	\$	MO807, 2-D	DIFFUSION	ABSORPTION	REMOVAL	X-SECS	BAPL	280	

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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 32-472DEGF	BAPL	267
6600	F4	RS	T I	\$	CYGRO2, STRESS ANALYSIS CYL FUEL ELEMENT	BAPL	266
6600	F4	RS	T M	\$	CHECKER,CRECT,DAMMET,PLOTFB,SLAV3, ENDF/B PROC	BNL	384
6600	F4	RS	T M	\$	CRECT,CHECKER,RIGEL,PLOTFB,LISTFC,DICTION,ETC.	BNL	475
6600	F4	RS	T O	\$	GASPAR, COMPLEX GAMMA-RAY SPECTRA ANALYSIS	KAPL	485
6600	F4	RS	X T P	\$	FISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE	ANL	534
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	492
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, POINT DEPLETION FISSION PRODUCT	BAPL	313
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	\$	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
6600	F4	RS	P N	\$	LARCA, FLUX-WEIGHTING OF DTF4 CROSS SECTIONS	LASL	409
6600	F4	RS	P C	\$	DYN01, PHOTOMULTIPLIER ELECTRON DISTRIBUTION	KAPL	464
6600	F4	RS	P P	\$	FORSIM, SOLN OF SYSTEM OF ORDINARY DIFF EQNS	CRNL	514
6600	F4	RS	P P	\$	MOST, A MULTIDIMENSIONAL OPTIMIZATION SCHEME	KAPL	446
6600	F4	RS	P P	\$	RELO1, RELIABILITY FOR A SINGLE FAILURE MODE	BAPL	497
6600	F4	RS	P P	\$	ROPE, FINDING ROOTS OF A POLYNOMIAL	KAPL	444
6600	F4	RS	P T A	\$	AVRAGE3,4,SIGMA2,ADLER, ENDF/B RESONANCE XSECS	BNL	465
6600	F4	RS	P T A	\$	JPIXR, 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	RS	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	\$	TOR, THERMAL SCATTERING CRYSTALLINE MATERIALS	LASL	360
6600	F4	RS	P T B	\$	FPOCH, NEUTRON AGE CALCULATION OF ENDF/B DATA	BAPL	461
6600	F4	RS	P T B	\$	ETGM1, ENDF/B FORMAT TO MUFT FORMAT X-SECTIONS	WAPD	436
6600	F4	RS	P T B	\$	GLEN, GROUP CONSTANT CALC FROM TOR OUTPUT DATA	LASL	361
6600	F4	RS	P T C	\$	BE21, FEW-GP DISCRETE ORDINATES SLAB GEOME RY	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	\$	TWOTRAN, 2-D MULTI-GP TRNSPT CODE XY RZ RTHETA	LASL	358
6600	F4	RS	P T C	\$	VARI-QUIR, TIME-DEP 2-D MULTI-GP DIFFUSION	WANL	212
6600	F4	RS	P T C	\$	3DDT, 3D MULTIGROUP DIFFUSION XYZ R-THETA-Z	LASL	463
6600	F4	RS	P T D	\$	CINCAS, NUCLEAR FUEL CYCLE COST AND ECONOMICS	WAPD	354
6600	F4	RS	P T D	\$	PHENIX, 2D DIFFUSION BURNUP REFUELING HISTORY	LASL	454
6600	F4	RS	P T D	\$	2DB, 2-D MULTIGROUP DIFFUSION AND DEPLETION	LASL	325
6600	F4	RS	P T D	\$	3DXT,DEP3, 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	BNL	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-GEOM	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	\$	MO555,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, LSBR FUEL SWELLING TEMPERATURE STUDY	BAPL	272
6600	F4	RS	P T H	\$	FLOT1,M0219, PWR FLOW TRANSIENT ANALYSIS	BAPL	331
6600	F4	RS	P T H	\$	GLUB1, WATER-LOGGED FUEL ELEMENT ANALYSIS	BAPL	424

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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,HCH, STEAM TABLES 14.5-2538 PSIA	BAPL	294
6600	F4	RS	P	T	H	\$	TOPS, TRANSIENT THERMODYNAMICS CF 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	\$	BUSHL, 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	\$	MANE1, RECTANGULAR MAGNETIC NETWORK SOLUTION	BAPL	412
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	\$	SAFE-PLANE, PLANE STRESS ANALYSIS, 2-D BODIES	BNL	252
6600	F4	RS	P	T	I	\$	SEALSHELL2, SHELL STRESS ANALYSIS AXISYM LOAD	BAPL	282
6600	F4	RS	P	T	I	\$	SOR2, STRESS ANALYSIS SHELLS OF REVOLUTION	KAPL	80
6600	F4	RS	P	T	J	\$	M0756,LFTO, 1-D SLAB GAMMA-RAY TRANSPORT	BAPL	343
6600	F4	RS	P	T	L	\$	BL47, DRAFTING TOOL TO PLOT PLANE STRUCTURES	BAPL	373
6600	F4	RS	P	T	O	\$	JITER, FLUCTUATION EXPERIMENT ANALYSIS	BAPL	394
6600	F4	RS	P	T	O	\$	REDUX, REACTOR FLUCTUATION EXPERIMENT ANALYSIS	BAPL	425
6600	F4	RS	P	T	P	\$	DAFT1, LEAST SQUARES FIT FISSION NUCLEI DATA	BAPL	327
6600	F4	RS	P	T	P	\$	M0661,M0657,M0626, POLYNOMIAL CURVE FITTING	BAPL	411
6600	F4	RS	P	X	I	\$	FINEL, FINITE-ELEMENT STUDY 2,3-D STRUCTURES	KAPL	404
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
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 ENVIRONMENTAL LIB SCOPE3.2	CDC	478
6600D	F+CCM	RS		T	P	\$	MODEL, MODIFIED BETTIS ENVIRONMENTAL 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	\$	DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	LASL	209
7030	F4	RS	P	T	D	\$	DTF-BURN, 1-D MULTI-GP DTF4 WITH DEPLETION	LASL	269
7040	F+MAP	RS	P	A	\$	COMBCC, COMBINED B-W MULTI-LEVEL CONVOLUTION	PPCO	203	
7040	F+MAP	RS	P	T	G	\$	RSAC, RADIOLOGICAL SAFETY ANALYSIS PROGRAM	PPCO	265
7040	F4	RS	P	T	C	\$	TOPIC, 1-D FEW-GP SN APPROXIMATION CYLINDER	PPCO	148
7044	F+MAP	RS	P	A	\$	FASDOP, X-SECTIONS FROM B-W RESONANCE DATA	GGA	216	
7044	F+MAP	RS	P	T	B	\$	GAROL, RESONANCE OVERLAP AND LATTICE EFFECTS	GGA	219
7044	F+MAP	RS	P	T	C	\$	CPUS, 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	\$	TOODEE, 2-D TIME-DEPENDENT HEAT CONDUCTION	PPCO	349
7044	F+MAP	RSBP		M	\$	UNPACK, RETRIEVAL FROM SCISRS X-SECTION TAPE	GGA	206	
7044	F+MAP	RSBP		T	C	\$	GAMBLE4, 2-D MULTI-GP DIFFUSION XY RZ GEOMETRY	GGA	222
7044	F+SPS	RSRP		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	G	\$	PRECON, 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	\$	GAZELLE5, GAS-COOLED CORE THERMAL DESIGN STUDY	GGA	232	
7044	F4	RS	P	L	\$	GAVER, ENERGY INTERVAL X-SECTION AVERAGING	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-GAD, 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	\$	FLBOW, 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	T	I	\$	SAFE-PCRS, STRESS ANALYSIS AXISYMMETRIC LOAD	GGA	250
7044	F4	RS	P	X	A	\$	LFGCOFF3, LEGENDRE COEF CALC FOR ANGULAR DIST	GGA	217
709	F2	RS		C	\$	FIRN, 2-D FEW-GP S4 APPROXIMATION RZ GEOMETRY	LRL	7	
7090	F+MAP	RS		T	I	\$	4RESTRAINT PIPE STRESS, MAXIMUM MOMENT CALC	AI	109

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7090	F+FAP	RS	L	T	B	\$	QUICKIE, INFINITE MEDIUM SPECTRUM X-SECTIONS	AI	119
7090	F+FAP	RS	L	T	C	\$	FAIM, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	AI	120
7090	F+FAP	RS	L	T	C	\$	ULCER, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	AI	118
7090	F+FAP	RS	P		I	\$	WIREX, COMPUTER-PRODUCED WIRING LISTS UHTREX	LASL	315
7090	F+FAP	RS	P	T	R	\$	RAFFLE, 1ST FLIGHT COLLISION PROBABILITIES MC	ORNL	392
7090	F+FAP	RS	P	T	B	\$	SOPHIST1/2/5, MULTI-GP TRANSFER COEFFICIENTS	LRL	160
7090	F+FAP	RS	P	T	C	\$	EXTERMINATOR, 2-D MULTI-GP DIFFUSION PROGRAM	ORNL	156
7090	F+FAP	RS	P	T	D	\$	ASSAULT, 2-D MULTI-GP DIFFUSION DEPLETION CODE	CRNL	240
7090	F+FAP	RS	P	T	L	\$	DPC, DATA PREPARATION FOR 2-D DESIGN PROGRAMS	LASL	234
7090	F+FAP	RS	P	T	M	\$	DFSR, DATA FILE SERVICE ROUTINES ENDF TAPES	BNL	236
7090	F+FAP	RS	PL	T	R	\$	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	\$	DCB, 2-D FEW-GP DIFFUSION BURNUP RZ 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+MAP	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	FLCCO	RS	P		B	\$	MCS, MONTE CARLO NEUTRON PENETRATION STUDY	LASL	202
7090	FLCCO	RS	P		B	\$	ZOT, GROUP-COLLAPSING OF MULTI-GP X-SECTIONS	LASL	113
7090	FLCCO	RSBP			C	\$	2DXY, 2-D MULTI-GP SN APPROXIMATION XY GEOM	AGC	18
7090	FLCCO	RSBP		T	C	\$	GE-HAPO-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			P	\$	DANCOFF 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	\$	AIPEK3, SPACE-INDEPENDENT KINETICS W/FEEDBACK	AI	121
7090	F2	RS			E	\$	SNAPKIN5/5A, 1-REGION KINETICS SNAP GEOMETRY	AI	122
7090	F2	RS			I	\$	CRCK, SPACE POWER PLANT DESIGN OPTIMIZATION	AI	112
7090	F2	RS			I	\$	FUGUF, STEADY-STATE TEMPERATURE VOID FRACTION	AI	48
7090	F2	RS			I	\$	SHOCK, SPACE POWER PLANT DESIGN OPTIMIZATION	AI	114
7090	F2	RS			J	\$	FARSE1A, 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	\$	SCAR1, SCATTER FROM A RING SNAP GEOMETRY	AI	111
7090	F2	RS			N	\$	WED, 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	C	\$	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		R	\$	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	PPCO	59
7090	F2	RS	P		D	\$	AIMFIRF, URANIUM FUEL CYCLE COST ANALYSIS	AI	55
7090	F2	RS	P		F	\$	CONEC, 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		C	\$	CROC90, 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	R	\$	AGN-SIGMA, CALC OF MULTI-GP TRANSFER MATRICES	AGC	243
7090	F2	RS	P	T	C	\$	EQUIPOISE3, 2-D 2-GROUP DIFFUSION SLAB CYL	ORNL	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	PPCO	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	ORNL	32
7090	F2	RS	P	T	C	\$	20GRAND, 2-D FEW-GROUP DIFFUSION SLAB CYLINDER	ORNL	40
7090	F2	RS	PL	T	A	\$	ARES2, RESONANCE INTEGRAL X-SECTION CALC	AI	89
7090	F2	RS	PL	T	B	\$	FORM, 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

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