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ARGONNE CODE CENTER:
COMPILATION OF PROGRAM ABSTRACTS

by

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<u>PAGES TO BE INSERTED</u>	<u>PAGES TO BE REMOVED</u>	<u>COMMENT</u>
1-8.2	1-8.2	Revised cover, title page and table of contents
345-348	345-348	Reactor Code Abstract 247 revised
379-380	379-380	Reactor Code Abstract 263 revised
451-458	451-458	Reactor Code Abstracts 298 and 299 revised
509-510.2	509-510	Reactor Code Abstract 325 revised
635-813	635-751	Reactor Code Abstracts 385 through 410 added; Section VI Library Programs by Classification revised; Section VII KWIC Index revised; References replaced

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<u>NO.</u>	<u>KWIC TITLE</u>	<u>INSTALLATION</u>	<u>MACH</u>	<u>LANG</u>	<u>PACKAGE</u>	<u>CAT</u>	
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	HAFEVER, 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	PLXT B	38
33	GAM1, FAST NEUTRON SPECTRUM X-SECTION CALC	CDC	1604	F63	RS	PLXT B	38
33	GAM1, FAST NEUTRON SPECTRUM X-SECTION CALC	ANL	3600	F63	RS	LXT B	38
39	EQUIPOISE3, 2-D 2-GROUP DIFFUSION SLAB CYL	ORNL	7090	F2	RS	P T C	40
40	ZOGRAND, 2-D FEW-GROUP DIFFUSION SLAB CYLINDER	ORNL	7090	F2	RS	P T C	42
40	ZOGRAND, 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

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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 XT	D	68
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	SOR2, 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	GRAM, 1-D AND 2-D MULTI-GP DIFFUSION PROGRAM	UK-R	7090	F+FAP	RSBPL	T C	87
103	GRAM, 1-D AND 2-D MULTI-GP DIFFUSION PROGRAM	AAEC	360	F+BAL	RS P	T C	87
108	BAM, S4 CYL CELL CODE AND TEMPEST COMBINATION	AI	7090	F2	RS P	B	90
109	4RESTRAINT PIPE STRESS, MAXIMUM MOMENT CALC	AI	7090	F+FAP	RS	T I	92
110	SCARF2, SCATTER FROM RADIATOR FINS SNAP 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 PLXT	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	SNAPKIN5/5A, 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, TRANSFERFUNCTION SYNTHESIS	ANL	3600	F63	RSBP	T E	124
136	HERESY1, LATTICE PARAMETERS HETEROGENEOUS CALC	FMA	7090	F2	RSBP	X C	126
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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	AILMOE, X-SECTION CALC ELASTIC SCAT RESONANCES	AI	360	F4	RS PLXT	B	141
147	AILMOE, 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 PLXT	C	150
151	ANISN, 1-D MULTI-GP DISCRETE ORDINATE CALC	AI	360	F4	RSBPLXT	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
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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

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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	AIROS, 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	FLARE, 3-D REACTIVITY AND POWER DISTRIBUTION	NED	635	F4	RS P T C		185
167	FLARE, 3-D REACTIVITY AND POWER DISTRIBUTION	CDC	3600	F63	RSBP 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
169	BURP4, GAMMA-RAY PHOTOFRACITION SOLID CRYSTAL	UM	7090	MAD	RSB O		190
170	BURP5, GAMMA-RAY PHOTOFRACITION WELL CRYSTAL	UM	7090	MAD	RSB O		192
171	NEARREX, 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	7094	F+FAP	RS P T G		196
172	AISITE2, PARAMETRIC SITE REQUIREMENT STUDY	AI	360	F4	RS P T G		196
173	2DF, 2-D MULTI-GP DISCRETE ORDINATE CODE	UNC-LASL	1604	F63	RS C		198
174	FORE2, FAST REACTOR EXCURSION CALCULATIONS	ANL	360	F4	RS P XT 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 XT 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
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180	ISOCRUNCH, REACTION DECAY CHAIN ANALYSIS	ORNL	1604	F63	RS P 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 XT B		219
185	GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV	BC	625	F4	RS P XT B		221
185	GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV	BNW	7090	F+FAP	RS PL T B		221
185	GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV	BNW	1107	F4	RS PL T B		221
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	CMPXMAT, TRANSFER FUNCTION EVALUATION	PW	1604	F63	RS P E		227
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190	WOPEXPRT, REACTOR WEIGHT OPTIMIZATION STUDY	PW	1604	F63	RS I		230
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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 XT 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	F2	RS P J		246
198	HEATING2, TRANSIENT STEADY-STATE HEAT TRANSFER	AI	7094	F2	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	EPITHERMOS, SPECTRUM AND X-SECTION CALCULATION	GEV	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	F4	RS P A		258
204	AGN-GAM, FAST SPECTRUM MULTI-GP CONSTANT CALC	AGC	7090	F2	RSBPXT B		260
205	BLOOST5, POINT-KINETICS WITH 2-D HEAT TRANSFER	GGA	7044	F4	RS T H		262
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207	CROSSPLOT, SC4020 PLOTS FROM X-SECTION TAPES	GGA	7044	F4	RSBP T N		266
208	TRIX1, RESONANCE INTEGRAL X-SECTION CALC	AI	7094	F+MAP	RS PLXT A		268
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	F4	RS P T C		270
209	DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	ANL	360	F4	RS P T C		270
209	DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	LASL	7030	F4	RS P T C		270
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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	XT B	279
214	MISH-MASH, RESONANCE INTEGRAL CALC HOMOGENEOUS	ANL	3600	F36	RSBP	A	281
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219	GAROL, RESONANCE OVERLAP AND LATTICE EFFECTS	GGA	7044	F+MAP	RS P	T B	291
219	GAROL, RESONANCE OVERLAP AND LATTICE EFFECTS	LER	7094	F4	RS P	T B	291
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221	RELOAD-FEVER, 1-D FEW-GP DIFFUSION DEPLETION	GGA	7044	F4	RS P	T D	295
222	GAMBLF4, 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	REVISED-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
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	XT 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	F2	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+MAP	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 PLOTS FROM SCISRS X-SECTION TAPES	WANL	7094	F2	RSB	T N	331
240	ASSAULT, 2-D MULTI-GP DIFFUSION DEPLETION CODE	ORNL	7090	F+MAP	RS P	T D	333
241	HFN, 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
247	FLANGE1, SCATTERING LAW X-SECTION CALCULATION	GGA	7044	F4	RS	A	346
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	PLXT 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	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	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	GADOSE,DOSET, HTGR ACCIDENT ANALYSIS DOSE CALC	GGA	1108	F4	RS	T G	375
262	MACH1, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	PURD	6500	F4	RS	PLXT C	377
262	MACH1, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	ANL	3600	F36	RS P	XT 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	XT C	381
265	RSAC, RADIOLOGICAL SAFETY ANALYSIS PROGRAM	PPCO	7040	F+MAP	RS P	T G	383
R266	CYGRO2, STRESS ANALYSIS CYL FUEL ELEMENT	BAPL	6600	F4	RS	XT I	385
R267	WATER, STEAM TABLES 14.5-14,500PSIA 32-472DEGF	BAPL	6600	F4	RS	XT H	387

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268	TRANS-FUGUE1, TRANSIENT FLOW 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,LIB1ST, 1-D MULTI-GP DIFFUSION + LIB	AI	360	F4	RSBPLXT 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 XT 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	GGA	1108	F4	RS P T F		402
R274	WIGL2, 1-D 2-GP SPACE-TIME DIFFUSION 3-GEOM	BAPL	6600	F4	RS P XT F		402
R275	PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	IRM	360	F4	RS P T D		405
R275	PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	BAPL	6600	F+ASC	RS P XT D		405
276	AVOID, ANNULAR VOID X-SECTION CALCULATION	GEC	625	F4	RS P B		407
277	HAMMER, CRITICAL EXPERIMENT ANALYSIS SYSTEM	BNL-DP	360	F4	RS PLXT B		409
277	HAMMER, CRITICAL EXPERIMENT ANALYSIS SYSTEM	BNL-DP	7090	F2	RS PLXT B		409
278	WATER-HAMMER, LIQUID BLOWDOWN ANALYSIS LOFT	UGA	360	F4	RS P G		411
278	WHAM, LIQUID-FILLED PIPING SYSTEM ANALYSIS	KE	3600	F36	RSBP G		411
279	LEOPARD, SPECTRA CALCULATION WITH DEPLETION	WAPD	360	F4	RS PLXT B		413
R280	MO807, 2-D DIFFUSION ABSORPTION REMOVAL X-SECS	BAPL	6600	F4	RS XT B		415
281	RABBLE,WLIB,FLAT, RESONANCE ABSORPTION, CELL	ANL	3600	F36	RSBP XT B		417
R282	SEALSHL2, SHELL STRESS ANALYSIS AXISYM LOAD	BAPL	6600	F4	RS P XT I		419
R283	MO552, DYNAMIC ANALYSIS LINEAR ELASTIC SYSTEMS	BAPL	6600	F4	RS P XT I		421
R284	MO555,ACT1, LOSS-OF-COOLANT ACCIDENT ANALYSIS	BAPL	6600	F4	RS P XT G		423
R285	RESQ2,RESQ0,DHF1, RESONANCE INTEGRAL HEX CELL	BAPL	6600	F4	RS P XT B		425
R286	HOT2, 2-D TRANSIENT HEAT CONDUCTION PROGRAM	BAPL	6600	F4	RS P XT H		427
287	BISYN, 2-D MULTI-GP DIFFUSION SYNTHESIS CALC	NED	635	F4	RS PL 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	MO899,HOH, STEAM TABLES 14.5-2538 PSIA	ANL	1604	F63	RS P H		444
R294	MO899,HOH, STEAM TABLES 14.5-2538 PSIA	BAPL	6600	F4	RS P XT H		444
R295	FLASH2, LOSS-OF-COOLANT ACCIDENT ANALYSIS	BAPL	6600	F4	RS P XT G		446
296	GRDWRK, GRID GENERATION FOR SAFE PROGRAMS	GGA	1108	F4	RS P L		448
297	CONTEMPT, LOSS-OF-COOLANT ACCIDENT ANALYSIS	PPCO	7040	F+MAP	RS P T G		450
298	GGC4, MULTI-GP X-SECTIONS FAST THERMAL SPECTRA	GGA	1108	F4	RS PLXT 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	KAPL	6600	F+ASC	RS P T H		456
300	SAFE-CREEP, VISCOELASTIC ANALYSIS CONCRETE	GGA	1108	F4	RS P I		458
301	FREVAP6, HTGR METALLIC FISSION PRODUCT RELEASE	GGA	1108	F4	RS P 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	F4	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	F4	RS P XT B		472
308	JUPITOR1, COUPLED-CHANNEL X-SEC EVALUATION	ORNL	1604	F63	RS P T A		474
309	TSN, SPATIALLY-DEPENDENT REACTOR KINETICS	AI	7094	F4	RS P T F		476
309	TSN, SPATIALLY-DEPENDENT REACTOR KINETICS	AI	360	F4	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	GEV	635	F4	RS P T O		480
312	TDSN, 2-D MULTIGROUP DISCRETE ORDINATE PROGRAM	LER	7090	F+MAP	RS P T C		482
313	CINDER,MO102, POINT DEPLETION FISSION PRODUCT	BAPL	6600	F4	RS P D		484
314	NAP, NEUTRON-INDUCED GAMMA-RAY RADIOACTIVITY	IITR	7094	F4	RSBPLXT D		486
315	WIREX, COMPUTER-PRODUCED WIRING LISTS UHTREX	LASL	7090	F2	RS P I		488
316	GAF,GAR, SPECTRA AND GROUP-AVERAGED X-SEC CALC	GGA	1108	F4	RS P XT 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	F4	RS P D		503
323	MUFFLE, FISSION NUCLEIDE X-SECTION EVALUATION	ORNL	7090	F4	RSBP A		505

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324	FRANTIC, LEAST SQUARES FIT SUM OF EXPONENTIALS	MIT	7090	F2	RS P	P	507
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
325	2DB, 2-D MULTIGROUP DIFFUSION AND DEPLETION	ANL	3600	F4	RSBP	T D	509
326	AIRUS2A, SIMULATION OF REACTOR DYNAMICS	AI	360	F+BAL	RS P	T E	511
R327	DAFT1, LEAST SQUARES FIT FISSILE NUCLIDE DATA	BAPL	6600	F4	RS P	XT P	514
328	NURLOC-1.0, LOSS-OF-COOLANT THERMAL ANALYSIS	BCL	6400	F4	RS P	T G	516
R329	M0457, PIPE, ELASTIC STRESS OF PIPING SYSTEM	BAPL	6600	F4	RS P	XT I	518
330	ECCSA1, LOSS-OF-COOLANT + EMERGENCY COOLING	BCL	6400	F4	RS P	T G	520
R331	FLOT1, M0219, PWR FLOW TRANSIENT ANALYSIS	BAPL	6600	F4	RS P	XT H	522
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	F4	RS P	T O	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	IBM	360	F+BAL	RS P	T D	531
R337	STEM, MATRIX GENERATION FOR A SYSTEM OF RFAMS	KAPL	6600	F4	PS P	I	532
R338	TWIGGLE, 2-D 2-GP SPACE-TIME DIFFUSION	ANL	360	F4	RS P	F	535
R338	TWIGL, 2-D 2-GP SPACE-TIME DIFFUSION FEEDBACK	BAPL	6600	F4	RS P	XT F	535
339	GAUGE, 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	XT C	546
R343	M0756, LETO, 1-D SLAB GAMMA-RAY TRANSPORT	BAPL	6600	F4	RS P	XT J	548
R344	GEM, FIGENVALUE PROBLEM FOR VIBRATING SYSTEMS	KAPL	6600	F4	RS P	T I	550
345	GAND, GAFGAR X-SECTION LIBRARY PREPARATION	GGA	1108	F4	RS P	T L	552
346	THTE, 3-D TRANSIENT HEAT TRANSFER PROGRAM	GEC	635	F+GMP	RSBP	T H	554
347	CODILLI, LEAST SQUARES ANALYSIS RESONANCE DATA	UILL	360	F4	RS P	A	556
R348	TOPS, TRANSIENT THERMODYNAMICS OF PRESSURIZERS	BAPL	6600	F4	RS P	XT H	558
349	TOODEE, 2-D TIME-DEPENDENT HEAT CONDUCTION	PPCO	7044	F+MAP	RS P	T H	560
350	ETOE, ENDF/B TO MC**2 DATA CONVERSION	APDA	3600	ASAF4	RS P	T M	562
351	ECSIL, EXPERIMENTAL NEUTRON DATA LIBRARY	LRL	7094	F2	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	COMM	360	F4	RS P	T D	571
355	MC**2, ENDF MULTIGROUP X-SECTION CALCULATION	ANL	3600	F36	RS P	T B	573
356	ZPR-III ASSEMBLY 48 GAFGAR 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 X-Y GEOM	LASL	1108	F4	RS P	T C	581
R359	PUN1, UNRESOLVED RESONANCE INTEGRALS X-SECS	BAPL	6600	F4	RS P	XT 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	S 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	CHEMLOC2, CORE HEATING CLADDING-STEAM REACTION	ANL	3600	F36	RSBP	G	596
367	ISOGEN, RADIONUCLIDE GENERATION AND DECAY	BNW	1108	F5	RSBP	T D	598
368	FLANGE2, ENDF/B THERMAL SCATTERING DATA PROC	DP	360	F4	RS P	T A	600
369	RELAP2, REACTOR BLOWDOWN - EXCURSION ANALYSIS	INC	7044	F4	RS P	T 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	XT F	607
372	RAPFU, FUEL CYCLE PARAMETERS FAST BREEDERS	APD	635	F4	RS P	D	609
R373	BL47, DRAFTING TOOL TO PLOT PLANE STRUCTURES	BAPL	6600	F4	RS P	XT L	611
374	IDX, 1-D DIFFUSION FAST X-SECTION GENERATION	BNW	1108	F4	RS P	XT B	613
375	SCORE2, 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	6600	F4	RS P	A	617
376	AVERAGE, UNRESOLVED REGION AVERAGE X-SEC CALC	BNL	7094	F4	RS P	A	617
377	SIGPLOT, RESOLVED MULTILEVEL B-W X-SEC CALC	BNL	6600	F4	RS P	A	619
377	SIGPLOT, RESOLVED MULTILEVEL B-W X-SEC CALC	BNL	7094	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-SAXON POTENTIAL SHAPE CALCULATION	ORNL	7090	F2	RS	A	627

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R383	MO266, LINEAR ELASTIC STRUCTURAL DYNAMICS	BAPL	6600	F4	RS P	XT I	630
384	CHECKER, CRECT, DAMMET, PLOT F8, SLAV3, ENDF/B PROC	NCSC	6600	F4	RS	T M	632
385	COHBE, COHERENT INELASTIC SCATTERING LAW CALC	GGA	1108	F4	RS P	X A	635
R386	DATATRA, MODULAR PROGRAMMING AND DATA SYSTEM	KAPL	6600	F+COM	RSB	T M	637
387	CITATION, 1,2,3-D DIFFUSION DEPLETION MULTIGP	ORNL	360	F4	RS P	XT K	639
388	ETOX, MULTIGROUP CONSTANTS FROM ENDF/B FOR 10X	BNWL	1108	F4	RS P	T B	642
R389	STINT3, SINGLE-CHANNEL SPACE-TIME SYNTHESIS	KAPL	6600	F4	RS P	F	644
390	CORGAM, 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	PLXT 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	XT H	658
R397	GAPL3, INELASTIC LARGE DEFLECTION STRESS STUDY	BAPL	6600	F+COM	RS P	XT I	660
R398	BE21, FEW-GP DISCRETE ORDINATES SLAB GEOMETRY	BAPL	6600	F4	RS P	XT C	662
R399	SUMOR, S-WAVE NEUTRON X-SECTION CALCULATION	BAPL	6600	F4	RS P	XT 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	FINEI, FINITE-ELEMENT STUDY 2,3-D STRUCTURES	KAPL	6600	F4	RS P	X I	675
405	NOAH, 1-D ONE-GP SPACE-TIME DIFFUSION FEEDBACK	BNL	6600	F4	RS P	T F	677
R406	DATATRA 2-D GEOMETRY INPUT, PREPARATION, EDIT	KAPL	6600	F+ASC	RS P	T L	679
R407	DATATRA 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	TACAS1, ANALYSIS OF RESONANCE MEASUREMENTS	GGA	1108	F4	RS P	T A	687

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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 SUB-
ROUTINE AND THE NAA-SC-4020 SUBROUTINE PACKAGE WHICH ARE AVAILABLE
THROUGH -

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16. MATERIAL AVAILABLE -

SOURCE DECK (366 CARDS)
SAMPLE PROBLEM (36 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. NATURE OF PHYSICAL PROBLEM SOLVED - 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 - EXEC II.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHOR -
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REACTOR CODE ABSTRACT 247

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05/70

16. MATERIAL AVAILABLE -
SOURCE DECK (869 CARDS)
SAMPLE PROBLEM (5 CARDS)
REFERENCE REPORTS
17. CATEGORY - A
KEYWORDS - SCATTERING LAW, CROSS SECTIONS, ANGULAR DISTRIBUTION

8. RELATED AND AUXILIARY PROGRAMS - AN AUXILIARY CODE, FLANGE (ACC ABSTRACT 247), IS USED TO GENERATE CROSS SECTION INFORMATION FROM THE SCATTERING LAW.
9. STATUS - ABSTRACT FIRST DISTRIBUTED APRIL 1967.
UNIVAC1108 VERSION SUBMITTED DECEMBER 1966, REPLACED BY
LATER VERSION SEPTEMBER 1969.

1. NAME OR DESIGNATION OF PROGRAM - COINC (COMPUTER CODE FOR REDUCTION OF COINCIDENCE COUNTING DATA)

380

10. REFERENCES - J. U. KOPPEL, J. R. TRIPLETT, AND Y. D. NALIBOFF, GASKET, A UNIFIED CODE FOR THERMAL NEUTRON SCATTERING, GA-7417 REVISED, MARCH 10, 1967.
GASKET UPDATE NOTE, GGA NOTE.
11. MACHINE REQUIREMENTS - 32K MACHINE WITH ABOUT 26K AVAILABLE FOR THE PROGRAM AND ONE SCRATCH UNIT (DRUM, DISK, OR TAPE)
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - EXEC II (UNIVAC1108) AND CHIPPEWA (CDC6600).
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
PROGRAM J. U. KOPPEL, J. R. TRIPLETT, AND Y. D. NALIBOFF

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16. MATERIAL AVAILABLE -
SOURCE DECK (1108-1385 CARDS)
SAMPLE PROBLEM (1108-61 CARDS)
REFERENCE REPORT AND NOTE
17. CATEGORY - A
KEYWORDS - SCATTERING LAW, INCOHERENT APPROXIMATION, MODERATORS

REACTOR CODE ABSTRACT 297

-2-

12/67

6. TYPICAL RUNNING TIME - ON THE IBM7040 APPROXIMATELY 0.32 SECOND PER TIME ADVANCEMENT IS REQUIRED FOR A PROBLEM USING 90 MESH POINTS FOR HEAT STRUCTURES.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1967.
IBM7040 VERSION SUBMITTED SEPTEMBER 1967.
10. REFERENCE - L. C. RICHARDSON, L. J. FINNEGAN, R. J. WAGNER, AND J. M. WAAGE, CONTEMP, A COMPUTER PROGRAM FOR PREDICTING THE CONTAINMENT PRESSURE-TEMPERATURE RESPONSE TO A LOSS-OF-COOLANT ACCIDENT, IDO-17220, JUNE 1967.
11. MACHINE REQUIREMENTS - 32K MEMORY
12. PROGRAMMING LANGUAGES USED - FORTRAN IV AND MAP (DECIMAL INPUT, DATE, AND CLOCKING ROUTINES)
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - IBSYS.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
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AND J. M. WAAGE
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PHILLIPS PETROLEUM COMPANY
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IDAHO FALLS, IDAHO 83401
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (7040-2154 CARDS)
SAMPLE PROBLEM (7040-58 CARDS)
REFERENCE REPORT
17. CATEGORY - G
KEYWORDS - ACCIDENTS, TEMPERATURE DISTRIBUTION, PRESSURE DISTRIBUTION, CONTAINMENT, COOLANTS, WATER, LIQUIDS, VAPORS, LEAKAGE, HEAT TRANSFER

1. NAME OR DESIGNATION OF PROGRAM - GGC4
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - UNIVAC1108, CDC6600
3. NATURE OF PHYSICAL PROBLEM SOLVED - 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-

4. METHOD OF SOLUTION (CONTINUED)

NANCE CALCULATIONS, DOPPLER BROADENED (AT AN INPUT TEMPERATURE) ABSORPTION AND SCATTERING CROSS SECTIONS ARE USED. THE RESONANCE TREATMENT ALLOWS UP TO TWO ADMIXED MODERATORS IN AN ABSORBER LUMP IMBEDDED IN A SURROUNDING MODERATOR. THE ABSORBER IN THE LUMP IS TREATED BY USING EITHER THE NARROW RESONANCE APPROXIMATION, THE NARROW RESONANCE INFINITE MASS APPROXIMATION, OR A SOLUTION OF THE SLOWING DOWN INTEGRAL EQUATIONS TO DETERMINE THE COLLISION DENSITY THROUGH THE RESONANCE. THE ADMIXED MODERATORS ARE TREATED BY USING EITHER AN ASYMPTOTIC FORM OF, OR AN INTEGRAL EQUATION SOLUTION FOR, THE COLLISION DENSITY. IN THE RESONANCE CALCULATION EITHER STANDARD GEOMETRY COLLISION PROBABILITIES ARE USED OR TABLES OF COLLISION PROBABILITIES ARE ENTERED. DANCORFF CORRECTIONS CAN ALSO BE MADE. IN THE REGION OF UNRESOLVED RESONANCES, RESONANCE ABSORPTION IS CALCULATED BY USING PORTER-THOMAS DISTRIBUTIONS, BUT ONLY S-WAVE NEUTRONS ARE CONSIDERED. IN THE THERMAL SECTION EITHER THE B0, B1, P0, OR P1 APPROXIMATION TO THE TRANSPORT EQUATION IS MADE, AND IN ALL OPTIONS LEGENDRE MOMENTS OF THE ANGULAR FLUX ARE COMPUTED. A TRAPEZOIDAL ENERGY INTEGRATION MESH IS USED, AND THE RESULTING EQUATIONS ARE SOLVED ITERATIVELY BY USING A SOURCE-NORMALIZED, OVER-RELAXED, GAUSSIAN TECHNIQUE. AVERAGES OVER BROAD GROUPS ARE PERFORMED BY SIMPLE NUMERICAL INTEGRATION. THE RESULTS OBTAINED IN THE FAST AND THERMAL SECTIONS ARE STORED ON SPECIAL TAPES. THESE TAPES MAY CONTAIN RESULTS FOR A NUMBER OF PROBLEMS, EACH PROBLEM INCLUDING FINE GROUP CROSS SECTION DATA FOR A NUMBER OF NUCLIDES. IF THE PROBLEM NUMBER IS SPECIFIED ON THESE TAPES, AND A DESIRED LIST OF NUCLIDES IS GIVEN, THE COMBINING CODE WILL PUNCH MICROSCOPIC CROSS SECTIONS FOR THE REQUESTED LIST OF NUCLIDES. THE PROGRAM ALSO TREATS MIXTURES. GIVEN THE ATOMIC DENSITIES OF THE NUCLIDES IN A MIXTURE, THE CODE WILL PUNCH MACROSCOPIC CROSS SECTIONS.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -

- 99 FAST GROUPS
- 101 THERMAL FINE GROUPS
- 99 FAST BROAD GROUPS
- 50 THERMAL BROAD GROUPS
- 50 BROAD GROUPS IN THE COMBINING SECTION
- 100 RESONANCES PER NUCLIDE
- 2 MODERATORS ADMIXED WITH A RESONANCE ABSORBER
- 305 ENTRIES IN THE ESCAPE PROBABILITY TABLE FOR CYLINDRICAL GEOMETRIES
- 505 ENTRIES IN THE ESCAPE PROBABILITY TABLE FOR SLAB GEOMETRIES

A SINGLE AND POSITIVE VALUE FOR THE BUCKLING (B^2) MUST BE SUPPLIED.

6. TYPICAL RUNNING TIME - A B1 CALCULATION IN THE FAST SECTION FOR 3 NUCLIDES AND 6 BROAD GROUPS TAKES APPROXIMATELY 4 MINUTES ON THE UNIVAC1108 IF A RESONANCE CALCULATION (1/2 MINUTE) IS PERFORMED FOR ONE NUCLIDE. THE THERMAL CALCULATION FOR 3 BROAD GROUPS REQUIRES APPROXIMATELY 2 MINUTES, WHICH INCLUDE ABOUT 7 SECONDS FOR THE ITERATIVE PROCEDURE. TO PUNCH STANDARD DIFFUSION AND STANDARD TRANSPORT CROSS SECTIONS FOR THIS PROBLEM REQUIRES 2 SECONDS.

7. UNUSUAL FEATURES OF THE PROGRAM - THERE IS AN OPTION IN GGC4 WHICH MAKES IT POSSIBLE TO SHORTEN THE PUNCHING PROCESS FOR LARGE TWO-DIMENSIONAL TRANSFER ARRAYS. THIS CAN BE DONE BY SPECIFYING A MAXIMUM NUMBER OF DESIRED UPSCATTERING AND DOWNSCATTERING TERMS.
8. RELATED AND AUXILIARY PROGRAMS - GGC4 IS A REVISION OF THE EARLIER PROGRAM, GGC3. TO PREPARE, HANDLE, AND UPDATE THE BASIC CROSS SECTION TAPES WHICH ARE USED AS INPUT FOR GGC4, THE FOLLOWING CODES ARE UTILIZED - MAKE, MST, PRINT, MIXER, WTEG, MGT3, SPRINT, COMBIN, AND DDP.
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1967.
UNIVAC1108 VERSION OF GGC3 SUBMITTED SEPTEMBER 1967,
DELETED JUNE 1968.
UNIVAC1108 VERSION OF GGC4 SUBMITTED JUNE 1968, REPLACED
BY LATER VERSION JULY 1969.
CDC6600 VERSION SUBMITTED OCTOBER 1969.
10. REFERENCES - J. ADIR AND K. D. LATHROP, THEORY OF METHODS USED IN GGC-4 MULTIGROUP CROSS SECTION CODE, GA-9021, OCTOBER 1, 1968.
J. ADIR, S. S. CLARK, R. FROELICH, AND L. J. TODT, USERS AND PROGRAMMERS MANUAL FOR GGC-3 MULTIGROUP CROSS SECTION CODE, PARTS 1 AND 2, GA-7157, JULY 1967.
M. K. DRAKE, DESCRIPTION OF AUXILIARY CODES USED IN THE PREPARATION OF DATA FOR THE GGC-3 CODE, GA-7158, AUGUST 1967.
BCDCON, GA NOTE.
MODIFICATIONS TO IMPLEMENT THE UNIVAC 1108 VERSION OF THE GGC-4 PROGRAM TO THE CDC 6600 COMPUTER, WANL NOTE.
11. MACHINE REQUIREMENTS - 64K MEMORY WITH 11 TAPE UNITS (SOME OF WHICH MAY BE DRUM AREAS) ON THE UNIVAC1108.
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - UNIVAC EXEC II, GAX29.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THERE IS NO RESTRICTION ON THE NUMBER OF PROBLEMS THAT CAN BE RUN CONSECUTIVELY IN EACH SECTION, NOR IS THERE A RESTRICTION ON THE NUMBER OF NUCLIDES PER PROBLEM. WITHOUT USING THE NEW OPTIONS, GGC4 CAN ALSO BE RUN WITH THE GGC3 INPUT INSTRUCTIONS. THE CDC6600 VERSION IS ORGANIZED INTO FOUR OVERLAYS. WITH THE BUFFER LENGTHS SET TO 1030 (OCTAL), THE LARGEST OVERLAY REQUIRES 165,000 (OCTAL) LOCATIONS. IT SHOULD BE POSSIBLE TO REDUCE THIS REQUIREMENT BY A MORE EFFICIENT USE OF THE COMMON AREA.
15. NAME AND ESTABLISHMENT OF AUTHORS -
1108 AUTHOR
J. ADIR

PRESENT CONTACT
D. R. MATHEWS

15. NAME AND ESTABLISHMENT OF AUTHOR(S) (CONTINUED)
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ASTRONUCLEAR LABORATORY
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16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL (4 TAPES)
SOURCE DECKS (GGC4 1108-11,567 CARDS, WTFG 1646 CARDS, MAKE
1033 CARDS, MST 463 CARDS, PRINT 769 CARDS, MIXER
500 CARDS, MGT3 251 CARDS, SPRINT 334 CARDS,
COMBIN 479 CARDS, DOP 927 CARDS, GGC4 6600-
11,504 CARDS)
SAMPLE PROBLEMS (GGC4 1108-38 CARDS, 6600-38 CARDS)
FAST DATA TAPE (60 NUCLIDES - TAPE 2 - 1108-2772 BINARY
RECORDS, 6600-1703 BINARY RECORDS)
FAST DATA TAPE (151 NUCLIDES - TAPE 3 - 1108-7362 BINARY
RECORDS, 6600-4436 BINARY RECORDS)
THERMAL DATA TAPE (222 NUCLIDES - TAPE 4 - 1108-2854 BINARY
RECORDS, 6600-1539 BINARY RECORDS)
REFERENCE REPORTS AND NOTES
17. CATEGORY - B
KEYWORDS - MULTIGROUP CROSS SECTIONS, AVERAGES, FAST, THERMAL,
SPECTRA, DOPPLER BROADENING, DANCOFF CORRECTION, ANGU-
LAR DISTRIBUTION, RESONANCE PARAMETERS, MAKE CODES,
MST CODES, PRINT CODES, MIXER CODES, WTFG CODES, MGT3
CODES, SPRINT CODES, COMBIN CODES, DOP CODES

1. NAME OR DESIGNATION OF PROGRAM - LION
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. NATURE OF PHYSICAL PROBLEM SOLVED - 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.
4. METHOD OF SOLUTION - THE MODELING IS BASED ON THE CONCEPT OF NODAL POINTS CONNECTED BY ONE-DIMENSIONAL THERMAL CONDUCTANCE EQUATIONS IN AS MANY AS SIX DIRECTIONS SIMULTANEOUSLY. THE EXPLICIT, OR FIRST FORWARD DIFFERENCE METHOD, IS THEN USED TO OBTAIN THE SOLUTIONS TO THESE EQUATIONS FOR THE THREE-DIMENSIONAL FIELD. THE TEMPERATURE CHANGE FOR A SURFACE NODE IS CALCULATED BY APPLYING THE OHMS LAW ANALOGY FOR HEAT FLOW TO A NODE WITH NO CAPACITANCE.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
11*D1 + 22*D2 + 20*D3 + 61*D4 + 15*D5 LESS THAN OR EQUAL TO 21000
VARIABLE NUMBER OF SURFACE CONNECTIONS (D1)
VARIABLE NUMBER OF INTERNAL NODES (D2)
VARIABLE NUMBER OF SURFACE NODES (D3)
VARIABLE NUMBER OF BOUNDARY NODES (D4)
VARIABLE NUMBER OF COOLANT NODES (D5)
15 MATERIALS
7*D2 INTERNAL CONNECTIONS
12 COOLANT CHANNELS (EACH WITH 4 SIDES MAXIMUM)
75 PRINTOUTS
7 INTERNAL CONNECTIONS PER INTERNAL NODE
6 SURFACE CONNECTIONS PER SURFACE NODE
30 MEANS AND DIFFERENCES SETS
100 NODES PER SET (WITHOUT EQUIVALENT LINEAR)
50 NODES PER SET (WITH EQUIVALENT LINEAR)
6 TYPES OF MEANS AND DIFFERENCES SETS
5 GRAPHS
6 CURVES PER GRAPH
13 TYPES OF QUANTITIES GRAPHABLE
4 SUB-COOLED NUCLEATE BOILING REGIONS
6. TYPICAL RUNNING TIME - THE APPROXIMATE RUNNING TIME ON THE CDC6600 IS 1 MINUTE PER 10 NODES FOR A STEADY-STATE PROBLEM AND 1.5 MINUTES PER 10 NODES FOR A TRANSIENT PROBLEM.

7. UNUSUAL FEATURES OF THE PROGRAM - SUBCOOLED NUCLEATE BOILING MAY BE CONSIDERED. HOWEVER, THIS CONSIDERATION IS LIMITED TO WATER.
8. RELATED AND AUXILIARY PROGRAMS - LION SUPERCEDES EARLIER IBM704 AND PHILCO 2000 PROGRAMS CALLED TIGER.
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1967.
CDC6600 VERSION SUBMITTED OCTOBER 1967, REPLACED BY MODIFIED VERSION AUGUST 1968, REPLACED BY MODIFIED VERSION JANUARY 1970.
10. REFERENCES - J. R. SCHMID, G. L. LECHLITER, AND W. W. FISCHER, LION TEMPERATURE DISTRIBUTIONS FOR ARBITRARY SHAPES AND COMPLI-CATED BOUNDARY CONDITIONS, KAPL-M-6532 (EC-57), JULY 27, 1966.
W. W. FISCHER, LION TALKS A USERS MANUAL FOR THE LION THERMAL-STRUCTURAL EVALUATION CODE, KAPL-M-6533 (EC-58), JULY 31, 1967.
E. J. BINNEY, ADDENDUM TO LION REPORT, KAPL-M-6532, JUNE 28, 1968.
R. J. CULLEN, 6600 CALCOMP PLOTTER ROUTINES, KAPL NOTE, JULY 25, 1966.
E. J. BINNEY, ADDITIONS TO LION CODE, KAPL NOTE, SEPTEMBER 30, 1969.
LION4 INPUT DESCRIPTION, SPECIAL NOTE, AND LIMITS, KAPL NOTE, DECEMBER 30, 1969.
ACC PROGRAMMING NOTE 70-27, MAY 1970.
11. MACHINE REQUIREMENTS - THE PLOTTER ROUTINE APPLE IS USED TO PRODUCE THE INPUT REQUIRED BY THE ASSOCIATED CALCOMP PLOTTER FOR GRAPHICAL OUTPUT.
12. PROGRAMMING LANGUAGES USED - FORTRAN IV AND ASCENT
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE (CDC6600).
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - BECAUSE OF THE LARGE SIZE OF THE LION PROGRAM IT WAS NECESSARY TO SEGMENT THE PROGRAM.
15. NAME AND ESTABLISHMENT OF AUTHOR -
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KNOLLS ATOMIC POWER LABORATORY
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16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (4064 CARDS)
SAMPLE PROBLEM (158 CARDS)
REFERENCE REPORTS, ADDENDUM, NOTES

17. CATEGORY - H
KEYWORDS - TEMPERATURE DISTRIBUTION, FLUID FLOW, THERMAL, 3-DIMENSIONAL, HEAT TRANSFER, LIQUIDS, VAPORS

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

1. NAME OR DESIGNATION OF PROGRAM - 2DB
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - UNIVAC1108, CDC6600,3600
3. NATURE OF PHYSICAL PROBLEM SOLVED - 2DB IS A FLEXIBLE, TWO-DIMENSIONAL (X-Y, R-Z, R-THETA, HEX GEOMETRY) DIFFUSION CODE FOR USE IN FAST REACTOR ANALYSES. THE CODE CAN BE USED TO -
  - (A) COMPUTE FUEL BURNUP USING A FLEXIBLE MATERIAL SHUFFLING SCHEME,
  - (B) PERFORM CRITICALITY SEARCHES ON TIME ABSORPTION (ALPHA), MATERIAL CONCENTRATIONS, AND REGION DIMENSIONS USING A REGULAR OR ADJOINT MODEL. CRITICALITY SEARCHES CAN BE PERFORMED DURING BURNUP TO COMPENSATE FOR FUEL DEPLETION,
  - (C) COMPUTE FLUX DISTRIBUTIONS FOR AN ARBITRARY EXTRANEEOUS SOURCE.
4. METHOD OF SOLUTION - STANDARD SOURCE-ITERATION TECHNIQUES ARE USED. GROUP REBALANCING AND SUCCESSIVE OVERRELAXATION WITH LINE INVERSION ARE USED TO ACCELERATE CONVERGENCE. MATERIAL BURNUP IS BY REACTOR ZONE. THE BURNUP RATE IS DETERMINED BY THE ZONE AND ENERGY (GROUP) AVERAGED CROSS SECTIONS WHICH ARE RECOMPUTED AFTER EACH TIME-STEP. THE ISOTOPIC CHAINS, WHICH CAN CONTAIN ANY NUMBER OF ISOTOPES, ARE FORMED BY THE USER. THE CODE DOES NOT CONTAIN BUILT-IN OR INTERNAL CHAINS.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - SINCE VARIABLE DIMENSIONING IS EMPLOYED, NO SIMPLE BOUNDS CAN BE STATED. THE CURRENT 1108 VERSION, HOWEVER, IS NOMINALLY RESTRICTED TO 50 ENERGY GROUPS IN A 65K MEMORY. IN THE 6600 VERSION THE POWER FRACTION, AVERAGE BURNUP RATE, AND BREEDING RATIO CALCULATIONS ARE LIMITED TO REACTORS WITH A MAXIMUM OF 50 ZONES.
6. TYPICAL RUNNING TIME - A KEFF CALCULATION WITH A 30 X 30 MESH AND FOUR ENERGY GROUPS REQUIRES APPROXIMATELY ONE MINUTE. A TYPICAL BURNUP CALCULATION REQUIRES ROUGHLY TWICE THE MACHINE TIME OF A KEFF CALCULATION. THE SAMPLE PROBLEM REQUIRES ABOUT 3 MINUTES ON THE CDC3600.
7. UNUSUAL FEATURES OF THE PROGRAM - THE INPUT DATA ARE ARRANGED SO THE CODE CAN BE EASILY USED FOR KEFF AND SEARCH CALCULATIONS WITHOUT BURDENING THE USER WITH BURNUP PARAMETERS.
8. RELATED AND AUXILIARY PROGRAMS - THE INPUT DATA (E.G., CROSS SECTIONS, FLUX DUMPS, GEOMETRY, AND COMPOSITION SPECIFICATIONS) ARE COMPATIBLE WITH THE LOS ALAMOS ONE- AND TWO-DIMENSIONAL TRANSPORT CODES, DTF4 (ACC ABSTRACT 209) AND 2DF, AND THE BATTELLE PERTURBATION CODE, PERT4 (ACC ABSTRACT 304). ALL FOUR CODES USE THE SAME INPUT MODULE. THE LOGICAL FLOW OF 2DB IS PATTERNED AFTER THE 2DF CODE.

9. STATUS - ABSTRACT FIRST DISTRIBUTED JUNE 1968.
UNIVAC1108 VERSION SUBMITTED FEBRUARY 1968, REVISED APRIL 1969.
CDC6600 VERSION SUBMITTED FEBRUARY 1969.
CDC3600 VERSION SUBMITTED FEBRUARY 1970.
10. REFERENCES - W. W. LITTLE, JR. AND R. W. HARDIE, 2DB, A TWO-DIMENSIONAL DIFFUSION-BURNUP CODE FOR FAST REACTOR ANALYSIS, BNWL-640, JANUARY 1968, ADDENDUM AND ERRATA, APRIL 12, 1968.
W. W. LITTLE, JR. AND R. W. HARDIE, 2DB USERS MANUAL - REVISION 1, BNWL-831, REV. 1, FEBRUARY 1969.
T. J. HIRONS AND R. D. ODELL, CDC-6600 VERSION OF 2DB, A TWO-DIMENSIONAL DIFFUSION-BURNUP CODE FOR FAST REACTOR ANALYSES, LASL NOTE K-1-L-776, FEBRUARY 5, 1969.
K. D. LATHROP, DTF-IV, A FORTRAN-IV PROGRAM FOR SOLVING THE MULTIGROUP TRANSPORT EQUATION WITH ANISOTROPIC SCATTERING, LA-3373, JULY 15, 1965.
2DF, A TWO-DIMENSIONAL TRANSPORT CODE FROM THE LOS ALAMOS SCIENTIFIC LABORATORY (UNPUBLISHED).
R. W. HARDIE AND W. W. LITTLE, JR., PERT-IV, A TWO-DIMENSIONAL PERTURBATION CODE IN FORTRAN-IV, BNWL-409, APRIL 1967.
11. MACHINE REQUIREMENTS - 65K MEMORY AND THREE PERIPHERAL STORAGE DEVICES
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 -
1108	W. W. LITTLE, JR. AND R. W. HARDIE BATTELLE-NORTHWEST LABORATORY P. O. BOX 999 RICHLAND, WASHINGTON 99352
6600	T. J. HIRONS AND R. D. ODELL UNIVERSITY OF CALIFORNIA LOS ALAMOS SCIENTIFIC LABORATORY P. O. BOX 1663 LOS ALAMOS, NEW MEXICO 87544
3600	M. LEGAN ARGONNE CODE CENTER ARGONNE NATIONAL LABORATORY 9700 SOUTH CASS AVENUE ARGONNE, ILLINOIS 60439
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (1108-2425 CARDS, 6600-3110 CARDS, 3600-3074 CARDS)
BINARY DECK (3600-1496 CARDS)

REACTOR CODE ABSTRACT 325

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16. MATERIAL AVAILABLE (CONTINUED)
SAMPLE PROBLEMS (1108-63 CARDS, 6600-169 CARDS, 3600-63 CARDS)
REFERENCE REPORTS, BNWL-640 AND BNWL-831, AND LASL NOTE
17. CATEGORY - D
KEYWORDS - 2-DIMENSIONAL, MULTIGROUP, REACTIVITY, CRITICALITY
SEARCHES, DEPLETION, DIFFUSION EQUATIONS, X-Y, R-Z,
R-THETA GEOMETRIES, DTF4 CODES, PERT4 CODES

1. NAME OR DESIGNATION OF PROGRAM - COHBE/PREP
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - UNIVAC1108
3. NATURE OF PHYSICAL PROBLEM SOLVED - 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.
4. METHOD OF SOLUTION - THE FREQUENCIES AND THE POLARIZATION VECTORS FOR AN IRREDUCIBLE BRILLOUIN ZONE ARE OBTAINED USING THE SLUTSKY AND GARLAND FORM OF THE DYNAMICAL MATRIX WITH FORCE CONSTANTS DETERMINED BY SCHUNK, ET AL. THESE VALUES FOR A COARSE MESH ARE WRITTEN ON MAGNETIC TAPE. THE CODE THEN COMPUTES THE SCATTERING LAW BY SUMMING OVER RECIPROCAL LATTICE VECTORS, THE NUMBER OF WHICH DEPENDS ON α MAX. FOR EACH RECIPROCAL LATTICE VECTOR THE STRUCTURE FACTORS ARE COMPUTED FOR ALL POINTS OF THE COARSE MESH, AND THE CONTRIBUTION TO THE SCATTERING LAW IS CALCULATED FOR EACH POINT ON A FINE MESH BY LINEAR INTERPOLATION OF THE STRUCTURE FACTORS. THE CONTRIBUTIONS ARE STORED IN A REGION $\Delta\alpha$, $\Delta\beta$ AROUND THE APPROPRIATE α , β TO GIVE THE SCATTERING LAW $S(\alpha, \beta)$ AS A DOUBLE HISTOGRAM.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
90 α GROUPS
40 β GROUPS
6. TYPICAL RUNNING TIME - THE MAXIMUM VALUE OF α AT WHICH THE SCATTERING LAW IS COMPUTED DETERMINES COMPUTATION TIME, WHICH INCREASES APPROXIMATELY AS α TO THE $3/2$ POWER. A TYPICAL PROBLEM MAY REQUIRE 30 MINUTES.
7. UNUSUAL FEATURES OF THE PROGRAM - COHBE REDUCES MESH SIZE DEPENDENCE OF RESULTS, ASSOCIATED WITH COHERENT SCATTERING LAW CALCULATIONS.
8. RELATED AND AUXILIARY PROGRAMS - PREP PREPARES THE MAGNETIC TAPE WITH THE FREQUENCIES AND POLARIZATION VECTORS FOR BERYLLIUM. COHBE WRITES THE SCATTERING LAW ON A MAGNETIC TAPE SUITABLE FOR INPUT TO THE FLANGE CODE (ACC ABSTRACT 247).
9. STATUS - ABSTRACT FIRST DISTRIBUTED MAY 1970.
UNIVAC1108 VERSION SUBMITTED AUGUST 1969.
10. REFERENCE - G. M. BORGONOV, COHERENT SCATTERING LAW FOR POLYCRYSTALLINE BERYLLIUM, GA-9364, MAY 16, 1969.
11. MACHINE REQUIREMENTS - 45K MEMORY AND 2 MAGNETIC TAPES

12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - EXEC 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
16. MATERIAL AVAILABLE -
SOURCE DECKS (COHBE 1108-230 CARDS, PREP 1108-319 CARDS)
SAMPLE PROBLEMS (COHBE 1108-37 CARDS, PREP 1108-3 CARDS)
REFERENCE REPORT
17. CATEGORY - A
KEYWORDS - INELASTIC SCATTERING, CRYSTALS, BE, SCATTERING LAW,
CROSS SECTIONS

1. NAME OR DESIGNATION OF PROGRAM - DATATRAN
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. NATURE OF PHYSICAL PROBLEM SOLVED - 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 DATAPOL 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.
F. E. KAZMIERCZAK, DATAPOL A DATA STORAGE AND RETRIEVAL SUBROUTINE, JANUARY 23, 1969.

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 - MAGNETIC TAPE TRANSMITTAL
FILE 1 DATATRAN FDITSYM 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. NATURE OF PHYSICAL PROBLEM SOLVED - CITATION IS DESIGNED TO ATTACK THE REACTOR CORE DEPLETION AND DYNAMICS PROBLEMS IN A GENERAL SENSE. A VARIETY OF MATHEMATICAL FORMULATIONS IS AVAILABLE TO CHOOSE FROM - FOR EXAMPLE, THE GENERAL NEUTRON-FLUX-EIGENVALUE PROBLEM MAY BE SOLVED IN ONE-, TWO- OR THREE-DIMENSIONAL GEOMETRY WITH ARBITRARY SCATTERING IN THE DISCRETE-ENERGY, FINITE-DIFFERENCE DIFFUSION-THEORY FORMULATION. CERTAIN OTHER FORMULATIONS ARE BEING ADDED AND STILL OTHERS WILL BE INCORPORATED. NOW THE PROGRAM WILL SOLVE EIGENVALUE PROBLEMS WITHIN A FINITE-DIFFERENCE REPRESENTATION OF THE DIFFUSION THEORY APPROXIMATION TO NEUTRON TRANSPORT IN MULTIGROUP FORM WITH ARBITRARY SCATTERING. THE EIGENVALUE PROBLEM MAY INVOLVE THE DETERMINATION OF THE EFFECTIVE MULTIPLICATION FACTOR, OR BE A DIRECT CRITICALITY SEARCH ON BUCKLING, ON $1/V$ ABSORBER, OR ON THE CONCENTRATIONS OF SPECIFIED NUCLIDES WHICH MAY INCLUDE FUEL. THE ADJOINT PROBLEM MAY BE SOLVED AND PERTURBATION CALCULATIONS PERFORMED. UP TO THREE GEOMETRIC DIMENSIONS MAY BE CONSIDERED INCLUDING X-Y-Z, R-THETA-Z, AND HEXAGONAL-Z COORDINATE SYSTEMS.
4. METHOD OF SOLUTION - EXPLICIT, FINITE-DIFFERENCE APPROXIMATIONS IN SPACE AND TIME HAVE BEEN GIVEN PREFERENCE ALTHOUGH CERTAIN OTHER TECHNIQUES ARE BEING INCORPORATED. 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 WITH ALL EQUATION CONSTANTS FOR THE ITERATIVE EIGENVALUE PROBLEM AVAILABLE IN STORAGE, OR 60,000 SPACE-ENERGY POINT FLUX VALUES WITH I/O.
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 OR DYNAMICS PROBLEM IS ABOUT .003 SECOND PER POINT PER TIME-STEP. THIS TIME SHOULD BE MULTIPLIED BY THE NUMBER OF TIMES EACH STEP IS TO BE REPEATED (BY THE NUMBER OF TIMES EIGENVALUE PROBLEMS ARE REPEATED). MACHINE TIME FOR MOST AUXILIARY CALCULATIONS IS USUALLY INSIGNIFICANT. FOR A REPRESENTATIVE FAST

6. TYPICAL RUNNING TIME (CONTINUED)
BREEDER DEPLETION PROBLEM, 68 PERCENT OF THE MACHINE CPU TIME WAS 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 DATA REQUIRED FOR NUCLIDE CHAIN RELATIONSHIPS, FOR DELAYED NEUTRONS AND FOR CALCULATING THE CAPTURE GAMMA SOURCE CAN BE SUPPLIED ON THE MICROSCOPIC CROSS SECTION TAPE ALLOWING AUTOMATION OF MANY TYPES OF CALCULATIONS. 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 (ACC ABSTRACT 393) IS DESIGNED SPECIFICALLY FOR THIS PURPOSE.
9. STATUS - ABSTRACT FIRST DISTRIBUTED MAY 1970.
IBM360 VERSION SUBMITTED JULY 1969, REVISED JANUARY 1970,
REVISED APRIL 1970.
10. REFERENCES - T. B. FOWLER AND D. R. VONDY, NUCLEAR REACTOR CORE ANALYSIS CODE CITATION, ORNL-TM-2496, JULY 1969.
N. M. GREENE AND C. W. CRAVEN, JR., XSDRN, A DISCRETE COORDINATES 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, 8 I/O DEVICES, EXCLUDING INPUT AND OUTPUT DEVICES AND SYSTEM REQUIREMENTS.
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - NOW CITATION CONTAINS ABOUT 15,000 SOURCE STATEMENTS, AND WITHOUT OVERLAY, STORAGE FOR THE CODE INSTRUCTIONS WOULD APPROACH 100,000 4-BYTE WORDS.
15. NAME AND ESTABLISHMENT OF AUTHORS -
T. B. FOWLER AND D. R. VONDY
OAK RIDGE NATIONAL LABORATORY
P. O. BOX Y
OAK RIDGE, TENNESSE 37830
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (CITATION 14,902 CARDS, CROSS-SECTION WRITER 1891 CARDS)

REACTOR CODE ABSTRACT 387

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16. MATERIAL AVAILABLE (CONTINUED)
SAMPLE PROBLEMS (CITATION 111 CARDS, CROSS-SECTION WRITER
344 CARDS)
REFERENCE REPORT, ORNL-TM-2496
17. CATEGORY - K
KEYWORDS - 1-DIMENSIONAL, 2-DIMENSIONAL, 3-DIMENSIONAL, MULTI-
GROUP, DIFFUSION, CRITICALITY SEARCHES, BUCKLING,
X-Y-Z, R-THETA, HEXAGONAL, XSORN CODES

1. NAME OR DESIGNATION OF PROGRAM - ETOX
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - UNIVAC1108
3. NATURE OF PHYSICAL PROBLEM SOLVED - ETOX (ENDF/B TO 1DX) CALCULATES MULTIGROUP CONSTANTS FOR NUCLEAR REACTOR CALCULATIONS USING DATA FROM THE EVALUATED NUCLEAR DATA FILE (ENDF/B). THE CODE IS DESIGNED TO COMPUTE AND PUNCH -
  - (A) INFINITE DILUTE CROSS SECTIONS,
  - (B) TEMPERATURE DEPENDENT SELF-SHIELDING FACTORS FOR ARBITRARY VALUES OF MICROSCOPIC SIGMAO (TOTAL CROSS SECTION PER ATOM) IN THE RUSSIAN (BONDARENKO) FORMAT, AND
  - (C) INELASTIC SCATTERING PROBABILITY MATRICES.
4. METHOD OF SOLUTION - MICROSCOPIC CROSS SECTION VALUES ARE CONSTRUCTED AS SPECIFIED BY THE ENDF/B. GROUP CONSTANTS ARE OBTAINED BY INTEGRATING THE MICROSCOPIC DATA OVER GROUP INTERVALS USING THE FLUX WEIGHTING SCHEME
PHI(U) IS PROPORTIONAL TO 1/SIGMAT(U), SIGMAT(U)=N(J)*MICROSCOPIC SIGMAT(J)+N(J)*MICROSCOPIC SIGMAO.
INTEGRATION METHODS USED INCLUDE ROMBERG, GAUSSIAN QUADRATURE, N-POINT, SIMPSON AND TRAPEZOIDAL. THE CODE ALLOWS AS INPUT ARBITRARY SETS OF VALUES OF GROUP ENERGIES, TEMPERATURES, AND MICROSCOPIC SIGMAO,S.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
6. TYPICAL RUNNING TIME - 26-GROUP DATA FOR A REPRESENTATIVE SET OF 14 ISOTOPES REQUIRES ABOUT 28 MINUTES.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - THE FORMAT OF THE INPUT DATA IS COMPATIBLE WITH THE ENDF/B DATA TAPE. THE FORMAT OF THE OUTPUT IS COMPATIBLE FOR INPUT TO THE COMPUTER CODE 1DX (ACC ABSTRACT 374), A MULTIPURPOSE DIFFUSION CODE FOR GENERATING CROSS SECTIONS TO BE USED IN FAST REACTOR ANALYSIS.
9. STATUS - ABSTRACT FIRST DISTRIBUTED MAY 1970.
UNIVAC1108 VERSION SUBMITTED JULY 1969, REVISED APRIL 1970.
10. REFERENCES - R. E. SCHENTER, J. L. BAKER, AND R. B. KIDMAN, ETOX, A CODE TO CALCULATE GROUP CONSTANTS FOR NUCLEAR REACTOR CALCULATIONS, BNWL-1002, MAY 1969.
CARD INPUT INSTRUCTIONS AND OPERATING INSTRUCTIONS, BNWL NOTE.
H. C. HONECK, ENDF/B, SPECIFICATION FOR AN EVALUATED NUCLEAR DATA FILE FOR REACTOR APPLICATIONS, BNL-50066 (T-46), MAY 1966, REVISED JULY 1967.
R. W. HARDIE AND W. W. LITTLE, JR., 1DX, A ONE-

10. REFERENCES (CONTINUED)
DIMENSIONAL DIFFUSION CODE FOR GENERATING EFFECTIVE NUCLEAR CROSS SECTIONS, BNWL-954, MARCH 1969.
I. I. BONDARENKO (EDITOR), GROUP CONSTANTS FOR NUCLEAR REACTOR CALCULATIONS, CONSULTANTS BUREAU, NEW YORK, 1964.
W. ROMPERG, VEREINFACHTE NUMERISCHE INTEGRATION, DET. KONG. NORSKE VIDENSKABER SELSKAB FORHANDLINGER, BAND 28, NR. 7, 1955.
M. ALBRAMOWITZ AND I. A. STEGUN (EDITORS), HANDBOOK OF MATHEMATICAL FUNCTIONS, DOVER PUBLICATIONS, INC., P. 916, 1965.
D. M. O'SHEA, B. J. TOPPEL, AND A. L. RAGO, MC**2, A CODE TO CALCULATE MULTIGROUP CROSS SECTIONS, ANL-7318, JUNE 1967.
11. MACHINE REQUIREMENTS - 65K MEMORY, 3 TAPE UNITS, AND RANDOM ACCESS DRUM STORAGE
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - ETOX USES RANDOM DRUM STORAGE TO MAKE MAXIMUM USE OF CORE.
15. NAME AND ESTABLISHMENT OF AUTHORS -
R. E. SCHENTER AND J. L. BAKER
PHYSICS AND ENGINEERING DIVISION
R. B. KIDMAN
FFTF REACTOR PHYSICS AND OPERATIONS
BATTELLE MEMORIAL INSTITUTE
PACIFIC NORTHWEST LABORATORY
RICHLAND, WASHINGTON 99352
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (5139 CARDS)
SAMPLE PROBLEM (72 CARDS)
REFERENCE REPORT, BNWL-1002, AND BNWL NOTE
17. CATEGORY - B
KEYWORDS - GROUP CONSTANTS, INELASTIC SCATTERING, FAST REACTORS, TEMPERATURE, INPUT DATA, ENDF/B, 10X CODES

1. NAME OR DESIGNATION OF PROGRAM - STINT3
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. NATURE OF PHYSICAL PROBLEM SOLVED - STINT3 SOLVES STATIC (EIGEN-VALUE) 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.
4. METHOD OF SOLUTION - THE SYSTEM OF DIFFERENCE EQUATIONS IS SOLVED BY THE FORWARD-ELIMINATION, BACKWARD-SUBSTITUTION METHOD.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
6 EQUATIONS (GROUPS * MODES)
50 AXIAL MESH INTERVALS
6 DELAYED NEUTRON GROUPS
40 CONTROL ROD AND TEMPERATURE FEEDBACK CHANNELS
6. TYPICAL RUNNING TIME - 3 SECONDS PER TIME-STEP ARE REQUIRED FOR THE LARGEST POSSIBLE PROBLEM.
7. UNUSUAL FEATURES OF THE PROGRAM -
  - (A) EVERY TRANSIENT CALCULATION IS AUTOMATICALLY PRECEDED BY AN EIGENVALUE PROBLEM TO ESTABLISH CRITICAL INITIAL CONDITIONS. THE CRITICAL POWER DISTRIBUTION IS USED TO CALCULATE AN INITIAL TEMPERATURE DISTRIBUTION.
  - (B) THE CODE CALCULATES THERMAL FEEDBACK USING A SIMPLE OPEN-LOOP THERMALHYDRAULIC MODEL.
  - (C) STINT3 CAN ALSO BE USED FOR ONE-DIMENSIONAL, FEW-GROUP TRANSIENT CALCULATIONS.
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED MAY 1970.
CDC6600 VERSION SUBMITTED JULY 1969.
10. REFERENCE - C. H. ADAMS, R. A. RYDIN, AND W. M. STACEY, JR., STINT - SINGLE-CHANNEL, SPACE-TIME SYNTHESIS CODES FOR MULTIDIMENSIONAL NEUTRON DIFFUSION PROBLEMS, KAPL-3449, MAY 1969.
11. MACHINE REQUIREMENTS - 64K MEMORY
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 3.1.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - STINT3 SOLVES THE SYNTHESIS EQUATIONS ONLY. THE TASK OF GENERATING THE SYNTHESIS EXPANSION FUNCTIONS AND PERFORMING THE REQUIRED

14. ANY OTHER INFORMATION OR RESTRICTIONS (CONTINUED)
INTEGRALS MUST BE DONE ELSEWHERE. THE SOLE FUNCTION OF ONE OF THE SUBROUTINES, INVERT, IS TO INVERT A MATRIX. IN THE PROCESS IT CALLS A SYSTEM INVERSION SUBROUTINE, F4MAIN, WHICH IS NOT GENERALLY AVAILABLE OUTSIDE OF KAPL. THE USER WILL HAVE TO SUPPLY AN EQUIVALENT INVERSION ROUTINE.
15. NAME AND ESTABLISHMENT OF AUTHORS -
C. H. ADAMS, R. A. RYDIN, AND W. M. STACEY, JR.
KNOLLS ATOMIC POWER LABORATORY
GENERAL ELECTRIC COMPANY
BOX 1072
SCHENECTADY, NEW YORK 12301
16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
SOURCE DECK (1296 CARDS)
SAMPLE PROBLEM (299 CARDS)
REFERENCE REPORT
17. CATEGORY - F
KEYWORDS - KINETICS, SYNTHESIS, SPACE-TIME, DIFFUSION EQUATIONS, FEEDBACK, CONTROL RODS, TEMPERATURE DISTRIBUTION, 1-DIMENSIONAL, 3-DIMENSIONAL

1. NAME OR DESIGNATION OF PROGRAM - CORGAM
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IRM360/50
3. NATURE OF PHYSICAL PROBLEM SOLVED - 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.
4. METHOD OF SOLUTION - A BACKWARD ELIMINATION LEAST-SQUARES METHOD IS EMPLOYED. THE ELIMINATION CRITERION IS ONE IN WHICH THE STUDENTS T VALUE OF EACH INTENSITY IS COMPARED TO A T VALUE AT A PRESCRIBED LEVEL OF SIGNIFICANCE. THE CALCULATION OF THE STANDARD DEVIATION FOR EACH INTENSITY COEFFICIENT ACCOUNTS FOR RANDOMNESS IN BOTH THE COMPLEX AND REFERENCE GAMMA-RAY SPECTRA.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - CURRENTLY THE PROGRAM IS RESTRICTED TO A PROBLEM OF 400 CHANNELS AND 15 REFERENCE SPECTRA. THERE WOULD BE NO DIFFICULTY IN EXPANDING THIS TO AS MANY AS 4096 CHANNELS. HOWEVER, THE NUMBER OF REFERENCE SPECTRA IS LIMITED BY THE ACCURACY DESIRED IN THE INVERSION PROCEDURE. THE INVERSION PROGRAM CURRENTLY BEING USED WOULD SUFFER (FROM THE ACCURACY STANDPOINT) IF THE NUMBER OF REFERENCE SPECTRA WERE GREATER THAN 25.
6. TYPICAL RUNNING TIME - A TYPICAL ANALYSIS, INVOLVING 256 CHANNELS AND 14 REFERENCE SPECTRA AND USING REFERENCE SPECTRA WHICH WERE SUITABLY ALIGNED, REQUIRES LESS THAN 1 MINUTE OF EXECUTION TIME.
7. UNUSUAL FEATURES OF THE PROGRAM - CORGAM IS A NOVEL METHOD OF UNFOLDING COMPLEX GAMMA-RAY SPECTRA BECAUSE THE VARIANCE CALCULATIONS INCLUDE CONTRIBUTIONS FROM BOTH THE COMPLEX AND REFERENCE SPECTRA. ALSO, ONLY REFERENCE SPECTRA THAT HAVE INTENSITY COEFFICIENTS WHICH ARE SIGNIFICANT AT A PRESELECTED LEVEL ARE RETAINED IN THE FINAL SOLUTION. THE INTERMEDIATE RESULTS CAN BE PRINTED, AND THE LEVEL OF SIGNIFICANCE OF EACH OF THE INTENSITY COEFFICIENTS CAN BE OBSERVED.

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8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED MAY 1970.
IBM360 VERSION SUBMITTED JULY 1969.
10. REFERENCES - N. D. ECKHOFF, OPTIMAL NEUTRON ACTIVATION ANALYSIS, TID-24581, 1968.
N. D. ECKHOFF, CORGAM - AN OPERATORS MANUAL, KSU REPORT, JULY 7, 1969.
N. R. DRAPER AND H. SMITH, APPLIED REGRESSION ANALYSIS, JOHN WILEY AND SONS, INC., 1966.
M. H. YOUNG AND N. S. SINGHAL, GAMMA-RAY SPECTRAL UNFOLDING BY THE STEPWISE STATISTICAL METHOD, NUCLEAR INSTRUMENTS AND METHODS, VOL. 45, P. 287, 1966.
J. I. TROMBKA AND R. L. SCHMADEBECK, A METHOD FOR THE ANALYSIS OF PULSE-HEIGHT SPECTRA CONTAINING GAIN SHIFT AND ZERO-DRIFT COMPENSATION, TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY, VOL. 10, P. 33, JUNE 1967.
R. M. PARR AND H. F. LUCAS, JR., A RIGOROUS LEAST-SQUARES ANALYSIS OF COMPLEX GAMMA-RAY SPECTRA WITH PARTIAL COMPENSATION FOR INSTRUMENTAL INSTABILITY, IEEE TRANSACTIONS NUCLEAR SCIENCE, NS-11, P. 349, JUNE 1964.
G. D. OKELLEY, ED., APPLICATIONS OF COMPUTERS TO NUCLEAR AND RADIOCHEMISTRY, GATLINBURG CONFERENCE, NAS-NS-3107, 1963.
11. MACHINE REQUIREMENTS -
12. PROGRAMMING LANGUAGE USED - FORTRAN IV LEVEL G
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - DISK STORAGE IS REQUIRED.
15. NAME AND ESTABLISHMENT OF AUTHOR -
N. D. ECKHOFF
DEPARTMENT OF NUCLEAR ENGINEERING
KANSAS STATE UNIVERSITY
MANHATTAN, KANSAS 66502
16. MATERIAL AVAILABLE -
SOURCE DECK (1303 CARDS)
SAMPLE PROBLEM (558 CARDS)
REFERENCE REPORT, KSU REPORT
17. CATEGORY - 0
KEYWORDS - ACTIVATION, DATA PROCESSING, LEAST SQUARES, GAMMA RADIATION SPECTRA

1. NAME OR DESIGNATION OF PROGRAM - SORSDB
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. NATURE OF PHYSICAL PROBLEM SOLVED - 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.
4. METHOD OF SOLUTION - THE PROCEDURES OF PARAGRAPHS N414 AND N415.2 OF THE ASME CODE ARE USED TO CALCULATE PRIMARY AND SECONDARY STRESSES, STRESS DIFFERENCES AND STRESS INTENSITIES FOR COMPARISON WITH ALLOWED VALUES. CALCULATIONS ARE BASED ON A SET OF UNIT LOAD INPUT CASES FOR A FIXED GEOMETRY.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - AS MANY AS 100 POINTS ON THE VESSEL MAY BE EVALUATED FOR A MAXIMUM OF 15 OPERATING CONDITIONS AND 50 FATIGUE CYCLES.
6. TYPICAL RUNNING TIME - 10 SECONDS TO 1 MINUTE ARE REQUIRED, DEPENDING ON PROBLEM SIZE.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - SOR2
9. STATUS - ABSTRACT FIRST DISTRIBUTED MAY 1970.
CDC6600 VERSION SUBMITTED JULY 1969.
10. REFERENCES - F. C. CARLSON AND R. E. DOBSON, SORSDB, A COMPUTER PROGRAM FOR THE STRESS AND FATIGUE EVALUATION OF SHELLS OF REVOLUTION, KAPL-M-6729, APRIL 1969.
J. A. MIRABAL AND D. G. DIGHT, SOR-II - A PROGRAM TO PERFORM STRESS ANALYSIS OF SHELLS OF REVOLUTION, KAPL-M-2292, SEPTEMBER 15, 1963.
R. L. FAGAN, PUNCHED CARD FROM SOR-2 FOR SORSDB, KE-ZAP-2393, JUNE 20, 1969.
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 AUTHORS -
F. C. CARLSON AND R. E. DOBSON

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15. NAME AND ESTABLISHMENT OF AUTHOR(S) (CONTINUED)
KNOLLS ATOMIC POWER LABORATORY
GENERAL ELECTRIC COMPANY
BOX 1072
SCHENECTADY, NEW YORK 12301
16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
SOURCE DECK (609 CARDS)
REFERENCE REPORT, KAPL-M-6729
17. CATEGORY - 1
KEYWORDS - STRESSES, SHELLS, STRUCTURAL ANALYSIS, SOR CODES,
FATIGUE ANALYSIS

1. NAME OR DESIGNATION OF PROGRAM - RAFFLE
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM7090,360/75
3. NATURE OF PHYSICAL PROBLEM SOLVED - 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.
4. METHOD OF SOLUTION - EACH AXIAL SUBDIVISION OF EACH REGION AND ROD IS CHARACTERIZED BY A NUMBER WHICH DESIGNATES ITS MATERIAL, AND THEREBY THE NUCLEAR TOTAL CROSS SECTION. THE MONTE CARLO METHOD IS USED, IN WHICH NEUTRON HISTORIES ARE STARTED AT RANDOM WITHIN MATERIAL NUMBER 1 AND CONTINUED UNTIL A COLLISION OR ESCAPE OCCURS. IF DESIRED, SUCCESSIVE CASES MAY BE RUN IN WHICH THE HISTORIES ARE STARTED IN ANY MATERIAL OF THE CELL MERELY BY RENUMBERING THE MATERIALS.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
  - 20 REGIONS
  - 10 DIFFERENT TYPES OF RODS (DIFFERING IN EITHER GEOMETRY OR MATERIALS)
  - 50 RODS PER REGION
  - 20 SUBREGIONS PER ROD
  - 12 REGIONS WITH RODS (ONLY THE FIRST 12 REGIONS COUNTING FROM THE CELL CENTER)
  - 8 MATERIALS
6. TYPICAL RUNNING TIME - SIMPLE GEOMETRIES MAY REQUIRE 10 MINUTES FOR A CASE CONSISTING OF 25,000 HISTORIES ON THE IBM7090 OR 2 MINUTES FOR THE SAME CASE ON THE IBM360. PROBLEMS IN WHICH THE SOURCE REGION IS A SMALL FRACTION OF THE TOTAL OR THE MEAN FREE PATHS ARE LONG COMPARED TO THE DIMENSIONS OF THE REGIONS MAY TAKE SEVERAL TIMES AS LONG.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - MUCH OF THE BASIC INFORMATION AND SOME PARTS OF THE CODE ITSELF ARE TAKEN FROM THE MORE GENERAL MONTE CARLO CODE, 05R.
9. STATUS - ABSTRACT FIRST DISTRIBUTED MAY 1970.
  - IBM7090 VERSION SUBMITTED OCTOBER 1969.
  - IBM360 VERSION SUBMITTED OCTOBER 1969.
10. REFERENCES - O. W. HERMANN AND R. S. CARLSMITH, RAFFLE, A MONTE CARLO CODE FOR CALCULATION OF FIRST FLIGHT COLLISION PROBABILITIES, ORNL-TM-1699, DECEMBER 1966.
  - D. C. IRVING, R. M. FREESTONE, JR., AND F. B. K. KAM, 05R, A GENERAL-PURPOSE MONTE CARLO NEUTRON TRANSPORT CODE, ORNL-3622, FEBRUARY 1965.

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11. MACHINE REQUIREMENTS -
12. PROGRAMMING LANGUAGES USED - (IBM7090) FORTRAN II (95 PERCENT) AND FAP (5 PERCENT), (IBM360) FORTRAN IV (97 PERCENT) AND BAL (3 PERCENT)
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - ASSEMBLY LANGUAGE IS USED FOR THE RANDOM NUMBER GENERATION ROUTINES.
15. NAME AND ESTABLISHMENT OF AUTHORS -
O. W. HERMANN AND R. S. CARLSMITH
OAK RIDGE NATIONAL LABORATORY
OAK RIDGE, TENNESSEE 37830
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (7090-3384 CARDS, 360-3294 CARDS)
SAMPLE PROBLEMS (7090-28 CARDS, 360-31 CARDS)
REFERENCE REPORT, ORNL-TM-1699
17. CATEGORY - R
KEYWORDS - CELL CALCULATION, LEAKAGE, MONTE CARLO METHOD, LATTICES, O5R CODES

1. NAME OR DESIGNATION OF PROGRAM - XSDRN
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360/65 OR HIGHER
3. NATURE OF PHYSICAL PROBLEM SOLVED - 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.
4. METHOD OF SOLUTION - THE PRINCIPAL CALCULATIONS PERFORMED BY XSDRN (RESONANCE CALCULATION AND FLUX CALCULATION) BOTH EMPLOY NUMERICAL FINITE-DIFFERENCE TECHNIQUES. FOR THE RESONANCE CALCULATION, THIS INVOLVES A SIMPSONS INTEGRATION TO SOLVE FOR THE COLLISION DENSITY IN THE RESONANCE RANGE. THE FLUX CALCULATIONS EMPLOY A MULTIGROUP ENERGY STRUCTURE, AN ARBITRARY SPATIAL STRUCTURE AND A MECHANICAL ANGULAR QUADRATURE, ALL OF WHICH MUST BE USED IN THE VARIOUS INTEGRATION AND DIFFERENCING SCHEMES IN THE CODE.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE PRINCIPAL RESTRICTION IS THE AVAILABILITY OF ADEQUATE CORE STORAGE TO BUILD REQUIRED ARRAYS. THE CODE IS FLEXIBLY DIMENSIONED WHICH MEANS THAT ARRAY SIZES ARE SET FOR THE PARTICULAR PROBLEM AT EXECUTION TIME. (PROVISIONS ARE ALSO AVAILABLE FOR STORING CERTAIN LARGE DATA ARRAYS OUT OF CORE, IF NEED BE.)
6. TYPICAL RUNNING TIME - TYPICAL RESONANCE CALCULATIONS HAVE BEEN RUN ON THE IBM360/75 IN FROM ONE-HALF TO ONE MINUTE PER NUCLIDE. A TYPICAL FLUX CALCULATION (S4 P3, 25 SPACE POINTS, 123 ENERGY GROUPS, CYLINDER, K-CALCULATION, REDUCE CROSS SECTIONS, 4 RESONANCE NUCLIDES) GENERALLY RUNS IN 10 TO 12 MINUTES. A FIXED SOURCE CALCULATION FOR THE SAME SYSTEM WOULD TAKE APPROXIMATELY THE SAME TIME.
7. UNUSUAL FEATURES OF THE PROGRAM - THE FLEXIBLE DIMENSIONING SCHEME EMPLOYED BY XSDRN ALLOWS ONE TO MAKE OPTIMAL USE OF CORE STORAGE. A UNIQUE METHOD OF STORING CROSS SECTIONS IS EMPLOYED TO ELIMINATE INPUT OF UNNECESSARY TRANSFER CROSS SECTIONS.
8. RELATED AND AUXILIARY PROGRAMS - THE MASTER LIBRARY TAPE FOR XSDRN IS PRODUCED BY XLACS. CROSS SECTION TAPES CAN BE GENERATED FOR ANISN (ACC ABSTRACT 151), DOT, CITATION (ACC ABSTRACT 387), ROD, OR THE EXTERMINATOR2 (ACC ABSTRACT 156) CODES.

9. STATUS - ABSTRACT FIRST DISTRIBUTED MAY 1970.
IBM360 VERSION SUBMITTED NOVEMBER 1969.
10. REFERENCES - N. M. GREENE AND C. W. CRAVEN, JR., XSDRN, A DISCRETE ORDINATES SPECTRAL AVERAGING CODE, ORNL-TM-2500, JULY 1969, AND ERRATA.
N. M. GREENE, XLACS, CROSS SECTION PRODUCTION PACKAGE FOR XSDRN, CTC REPORT (TO BE PUBLISHED).
DESCRIPTION OF XSDRN TAPE CONTENTS, ACC NOTE, MAY 1970.
11. MACHINE REQUIREMENTS - ON THE IBM360/65 APPROXIMATELY 90K WORDS OF DIRECTLY ADDRESSABLE CORE STORAGE MUST BE AVAILABLE FOR THE PROGRAM. THE VARIOUS CALCULATIONAL OPTIONS REQUIRE FROM 4 TO 13 INPUT/OUTPUT DEVICES, DEPENDING ON THE PROBLEM. AT LEAST ONE DIRECT-ACCESS DEVICE IS 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 - XSDRN IS PRESENTLY USED IN A FOUR-LEVEL OVERLAY STRUCTURE CONSISTING OF 14 SEPARATE LINKS. SUBROUTINE DA MUST BE COMPILED WITH THE FORTRAN G COMPILER.
15. NAME AND ESTABLISHMENT OF AUTHORS -
N. M. GREENE
COMPUTING TECHNOLOGY CENTER
P. O. BOX P
OAK RIDGE, TENNESSEE 37830
C. W. CRAVEN, JR.
OAK RIDGE NATIONAL LABORATORY
P. O. BOX Y
OAK RIDGE, TENNESSEE 37830
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL (2 TAPES)
SOURCE DECKS
SAMPLE PROBLEM
MASTER CROSS SECTION LIBRARY (TAPE 2)
REFERENCE REPORT, ORNL-TM-2500, ERRATA, AND NOTE
17. CATEGORY - B
KEYWORDS - GROUP CONSTANTS, CELL CALCULATION, TRANSPORT THEORY, MULTIGROUP, 1-DIMENSIONAL, SN METHOD, RESONANCE, SLABS, CYLINDERS, SPHERES, FLUX DISTRIBUTION, ANGULAR DISTRIBUTION, XLACS CODES, ANISN CODES, DOT CODES, CITATION CODES, RCD CODES, EXTERMINATOR2 CODES

1. NAME OR DESIGNATION OF PROGRAM - JITER
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. NATURE OF PHYSICAL PROBLEM SOLVED - 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.
4. METHOD OF SOLUTION - THE COMPUTATION IS DONE AS AN EXPANSION IN TERMS OF THE DECAYING MODES OF A ONE-DIMENSIONAL, FEW-GROUP KINETICS MODEL.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE KINETICS MODEL MAY HAVE AS MANY AS 4 ENERGY GROUPS AND UP TO 6 GROUPS OF DELAYED NEUTRONS. HALF THE REACTOR CORE CAN BE DESCRIBED WITH UP TO 300 SPATIAL MESH POINTS AND AS MANY AS 5 DIFFERENT MATERIALS DISTRIBUTED IN AT MOST 50 SPATIAL REGIONS. A TOTAL OF 10 MODES CAN BE USED IN THE EXPANSIONS.
6. TYPICAL RUNNING TIME - 30 SECONDS ARE REQUIRED WITH 8 MODES.
7. UNUSUAL FEATURES OF THE PROGRAM - ANY ORDER SPHERICAL HARMONICS TRANSPORT APPROXIMATION CAN BE USED FOR THE MODES SO LONG AS TIME DERIVATIVES ARE IGNORED IN ALL BUT ONE PO EQUATION.
8. RELATED AND AUXILIARY PROGRAMS - MODES CAN BE PRODUCED WITH BE21 (ACC ABSTRACT 398) OR MULE.
9. STATUS - ABSTRACT FIRST DISTRIBUTED MAY 1970.
CDC6600 VERSION SUBMITTED AUGUST 1969.
10. REFERENCES - M. NATELSON AND D. R. HARRIS, JITER, A FORTRAN IV PROGRAM FOR THE COMPUTATION, FROM ONE-DIMENSIONAL MODAL KINETICS MODELS, OF STATISTICAL PARAMETERS MEASURED IN REACTOR FLUCTUATION EXPERIMENTS, WAPD-TM-877, JUNE 1969.
C. J. PFEIFER, CDC-6600 FORTRAN PROGRAMMING - BETTIS ENVIRONMENTAL REPORT, WAPD-TM-668, JANUARY 1967.
11. MACHINE REQUIREMENTS - 120,000 (OCTAL) 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 -
M. NATELSON AND D. R. HARRIS
BETTIS ATOMIC POWER LABORATORY

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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. NATURE OF PHYSICAL PROBLEM SOLVED - 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 NO CONVERGENCE.

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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
SAMPLE PROBLEM
REFERENCE REPORT

17. CATEGORY - H

KEYWORDS - FLUID FLOW, TEMPERATURE DISTRIBUTION, PRESSURE DISTRIBUTION, 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. NATURE OF PHYSICAL PROBLEM SOLVED - 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 MILLISECONDS 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

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15. NAME AND ESTABLISHMENT OF AUTHOR(S) (CONTINUED)
P. O. BOX 79
WEST MIFFLIN, PENNSYLVANIA 15122
16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
SOURCE DECK (446 CARDS)
SAMPLE PROBLEM (15 CARDS)
REFERENCE REPORT, WAPD-TM-839
17. CATEGORY - H
KEYWORDS - THERMODYNAMICS, WATER, PRESSURE, TEMPERATURE, LIQUIDS,
VAPORS

1. NAME OR DESIGNATION OF PROGRAM - GAPL3
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. NATURE OF PHYSICAL PROBLEM SOLVED - GAPL3 DETERMINES THE INELASTIC, LARGE-DEFLECTION BEHAVIOR OF THIN PLATES OR AXIALLY SYMMETRIC SHELLS WITH PRESSURE LOADING AND DEFLECTION RESTRAINTS.
4. METHOD OF SOLUTION - THE DEFORMATION OF THE BODY IS DESCRIBED BY A SET OF PARAMETERS $ZETA(I)$. THE STRAINS ARE FOUND IN TERMS OF THE $ZETA(I)$ BY GEOMETRIC RELATIONS, AND THE STRESSES ARE FOUND IN TERMS OF THE STRAINS BY MATERIAL PROPERTY RELATIONS. THE PRINCIPLE OF VIRTUAL WORK IS USED TO SET UP SIMULTANEOUS EQUATIONS WHICH MAY BE SOLVED FOR THE $ZETA(I)$. THE SOLUTION IS ITERATED UNTIL THE STRESSES AND STRAINS DO NOT CHANGE APPRECIABLY.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE THICKNESS OF THE PLATE OR SHELL SHOULD FALL WITHIN THE LIMITS OF THIN SHELL THEORY.
6. TYPICAL RUNNING TIME - A SMALL ELASTIC PROBLEM WILL TAKE LESS THAN A MINUTE. A LARGE PLASTIC ONE CAN REQUIRE OVER 10 MINUTES.
7. UNUSUAL FEATURES OF THE PROGRAM - GAPL3 IS QUITE VERSATILE AND MAY BE APPLIED TO MOST THIN PLATE OR AXIALLY SYMMETRIC SHELL PROBLEMS. IT IS PARTICULARLY APPROPRIATE WHEN NONLINEAR MATERIAL OR GEOMETRIC EFFECTS ARE IMPORTANT. AMONG ITS DISTINGUISHING FEATURES ARE -
  - (1) LARGE-DEFLECTION THEORY IS USED,
  - (2) EITHER DEFORMATION THEORY OR INCREMENTAL THEORY MAY BE SPECIFIED,
  - (3) ELASTIC-PLASTIC MATERIAL PROPERTIES ARE USED,
  - (4) ALMOST ANY BOUNDARY CONDITIONS MAY BE CONSIDERED,
  - (5) THE RIGID DEFLECTION RESTRAINT MAY TAKE ANY SHAPE AND ORIENTATION, AND
  - (6) BODIES HAVING A VARIABLE THICKNESS MAY BE ANALYZED.
8. RELATED AND AUXILIARY PROGRAMS - GAPL3 IS AN EXTENSIVE MODIFICATION OF GAPL1 AND GAPL2 TO PERMIT THE SOLUTION OF A BROAD CLASS OF PROBLEMS.
9. STATUS - ABSTRACT FIRST DISTRIBUTED MAY 1970.
CDC6600 VERSION SUBMITTED AUGUST 1969.
10. REFERENCES - A. L. THURMAN, GAPL-3, A COMPUTER PROGRAM FOR THE INELASTIC LARGE-DEFLECTION STRESS ANALYSIS OF A THIN PLATE OR AXIALLY SYMMETRIC SHELL WITH PRESSURE LOADING AND DEFLECTION RESTRAINTS, WAPD-TM-791, JUNE 1969.
C. M. FRIEDRICH, W. H. GUILINGER, A. E. SUMNER, JR., GAPL-1, A COMPUTER PROGRAM FOR THE PLASTIC STRESS ANALYSIS OF A HORIZONTAL PLATE WITH PRESSURE LOADING ABOVE AND DEFLECTION

10. REFERENCES (CONTINUED)
RESTRAINTS BELOW, WAPD-TM-731, (TO BE ISSUED).
C. J. PFEIFFER, CDC-6600 FORTRAN PROGRAMMING - BETTIS
ENVIRONMENTAL REPORT, WAPD-TM-668, DECEMBER 1966.
11. MACHINE REQUIREMENTS - MINIMUM CORE STORAGE OF 100,000 (OCTAL)
WORDS, A PRINTER, AN ON-LINE PUNCH, AND A PLOTTER
12. PROGRAMMING LANGUAGES USED - FORTRAN IV AND ASSEMBLY LANGUAGE
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
SCOPE.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHOR -
A. L. THURMAN
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 (3416 CARDS)
SAMPLE PROBLEM (28 CARDS)
BETTIS ENVIRONMENTAL ROUTINES (21,123 CARDS)
REFERENCE REPORTS, WAPD-TM-791 AND WAPD-TM-668
17. CATEGORY - I
KEYWORDS - STRUCTURAL ANALYSIS, STRESSES, PLATES, SHELLS, PRESSURE

1. NAME OR DESIGNATION OF PROGRAM - BE21
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. NATURE OF PHYSICAL PROBLEM SOLVED - BE21 SOLVES THE FEW-GROUP DISCRETE ORDINATES EQUATIONS IN SLAB GEOMETRY. EITHER HOMOGENEOUS OR INHOMOGENEOUS PROBLEMS CAN BE SOLVED.
4. METHOD OF SOLUTION - AUXILIARY VARIABLES ARE INTRODUCED THAT PERMIT THE INHOMOGENEOUS EQUATIONS TO BE SOLVED BY DIRECT INVERSION. THE METHOD IS STABLE WITH RESPECT TO ROUND-OFF ERRORS. HOMOGENEOUS PROBLEMS ARE SOLVED BY USING THE SAME INVERSION METHOD TO EVALUATE THE CRITICAL DETERMINANT. CRITICALITY IS OBTAINED BY SEARCHING FOR SUITABLE ROOTS OF THE CRITICAL DETERMINANT WITH INVERSE INTERPOLATION. AN EXACT SPATIAL DIFFERENCING SCHEME IS INCLUDED.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE MAXIMUM NUMBER OF ORDINATES IS 60 WHICH MAY BE DIVIDED ARBITRARILY AMONG THE GROUPS SUBJECT TO THE RESTRICTION THAT THE ORDINATE SCHEMES BE SYMMETRIC ABOUT, BUT NOT INCLUDE, $\mu=0$ IN EACH GROUP. THE CORRESPONDING GROUP NUMBER LIMIT IS 30 WITH TWO ORDINATES PER GROUP. OTHER LIMITATIONS INCLUDE -
  - 20 COMPOSITIONS
  - 50 REGIONS
  - 50 SOURCE REGIONS
6. TYPICAL RUNNING TIME - LESS THAN ONE MINUTE IS REQUIRED FOR A 10 ORDINATE EIGENVALUE PROBLEM.
7. UNUSUAL FEATURES OF THE PROGRAM - BE21 HAS AN INTERNAL LIBRARY OF GAUSS-LEGENDRE ORDINATE SCHEMES THAT PERMIT EITHER PN OR DPN APPROXIMATION. THE HOMOGENEOUS SOLUTION WILL FIND ANY EIGENFUNCTION OF THE SYSTEM WITH EQUAL FACILITY.
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED MAY 1970.
CDC6600 VERSION SUBMITTED AUGUST 1969.
10. REFERENCES - E. SCHMIDT, BE21 - A FEW-GROUP TRANSPORT PROGRAM IN FORTRAN IV, WAPD-TM-781, MAY 1968.
C. J. PFFIFER, CDC-6600 FORTRAN PROGRAMMING - BETTIS ENVIRONMENTAL REPORT, WAPD-TM-668, JANUARY 1967.
11. MACHINE REQUIREMENTS - 140,000 (OCTAL) LOCATIONS OF FAST MEMORY AND 2 SCRATCH TAPES
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 3.1.

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14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHOR -
E. SCHMIDT
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 (2185 CARDS)
SAMPLE PROBLEM (11 CARDS)
BETTIS ENVIRONMENTAL ROUTINES (21,123 CARDS)
REFERENCE REPORTS
17. CATEGORY - C
KEYWORDS - FEW-GROUP, TRANSPORT THEORY, SLAB GEOMETRY, PL METHOD

1. NAME OR DESIGNATION OF PROGRAM - SUMOR(M0271)
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. NATURE OF PHYSICAL PROBLEM SOLVED - 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.
4. METHOD OF SOLUTION - DOPPLER BROADENING IS CARRIED OUT BY A TRAPEZOIDAL INTEGRATION OVER NEIGHBORING CROSS SECTIONS WEIGHTED BY THE SOLBRIG KERNEL.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - LEVEL-LEVEL INTERFERENCE IS NOT PERMITTED IN FISSION CHANNELS. SUMOR TREATS S-WAVE CHANNELS ONLY, AND POTENTIAL CROSS SECTION IS APPROXIMATED AS INDEPENDENT OF ENERGY.
6. TYPICAL RUNNING TIME - A PROBLEM WHICH CALCULATES ABSORPTION, FISSION, SCATTERING, AND TOTAL CROSS SECTIONS FROM 5 RESONANCE ENERGIES AT 50 ENERGIES RUNS APPROXIMATELY 10 SECONDS.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED MAY 1970.
CDC6600 VERSION SUBMITTED AUGUST 1969.
10. REFERENCES - D. R. HARRIS AND C. B. NOLL, SUMOR (M0271), A FORTRAN IV PROGRAM FOR THE CDC-6600 FOR NEUTRON RESONANCE CROSS SECTIONS INCLUDING LEVEL-LEVEL INTERFERENCE AND EXACT DOPPLER BROADENING, WAPD-TM-810, JULY 1969.
D. R. HARRIS AND C. B. NOLL, SUMOR, A FORTRAN-IV PROGRAM FOR THE PHILCO-2000 FOR NEUTRON RESONANCE CROSS SECTIONS INCLUDING LEVEL-LEVEL INTERFERENCE AND EXACT DOPPLER BROADENING, WAPD-TM-518, NOVEMBER 1967.
C. J. PFEIFER, CDC-6600 FORTRAN PROGRAMMING - BETTIS ENVIRONMENTAL REPORT, WAPD-TM-668, JANUARY 1967.
11. MACHINE REQUIREMENTS - SUMOR REQUIRES APPROXIMATELY 135,000 (OCTAL) CENTRAL MEMORY LOCATIONS. THE NUMBER OF CENTRAL MEMORY WORDS COULD BE DECREASED BY DECREASING THE DIMENSIONS OF THE OUTPUT CROSS SECTIONS. ALSO, ONE INPUT AND AT LEAST THREE OUTPUT DEVICES ARE REQUIRED.

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12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
SCOPE 3.1.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
D. R. HARRIS AND C. R. NOLL
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WESTINGHOUSE ELECTRIC CORPORATION
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WEST MIFFLIN, PENNSYLVANIA 15122
16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (1540 CARDS)
SAMPLE PROBLEM (21 CARDS)
BETTS ENVIRONMENTAL ROUTINES (21,123 CARDS)
REFERENCE REPORTS
17. CATEGORY - A
KEYWORDS - CROSS SECTIONS, DOPPLER BROADENING, MULTILEVEL, ELASTIC
SCATTERING, CAPTURE, FISSION

1. NAME OR DESIGNATION OF PROGRAM - SASIA
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600, IBM360/75
3. NATURE OF PHYSICAL PROBLEM SOLVED - 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.
4. METHOD OF SOLUTION -
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
20 AXIAL HEAT TRANSFER NODES IN A FUEL PIN, IN THE UPPER BLANKET, AND IN THE LOWER BLANKET
6 DELAY GROUPS
60 REGIONS USED TO DESCRIBE THE CORE
200 AXIAL SEGMENTS IN THE COOLANT CHANNEL
15 RADIAL TEMPERATURES IN THE FUEL
6. TYPICAL RUNNING TIME - 5 MINUTES ARE REQUIRED ON THE IBM360/75.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - THE BASIC METHOD OF ANALYSIS USED IN THE WEAK EXPLOSION MODULE IS A MODIFIED VERSION OF THE MARS CODE (ACC ABSTRACT 293).
9. STATUS - ABSTRACT FIRST DISTRIBUTED MAY 1970.
CDC6600 VERSION SUBMITTED SEPTEMBER 1969.
IBM360 VERSION SUBMITTED SEPTEMBER 1969.
10. REFERENCES - A. K. AGRAWAL, J. C. CARTER, G. J. FISCHER, T. J. HEAMES, D. R. MACFARLANE, N. A. MCNEAL, W. T. SHA, C. K. SANATHANAN, AND C. K. YOUNGDAHL, SASIA, A COMPUTER CODE FOR THE ANALYSIS OF FAST REACTOR POWER AND FLOW TRANSIENTS, ANL-7607, AUGUST 1969.
SASIA DICTIONARY.
11. MACHINE REQUIREMENTS - 410K BYTES ON THE IBM360/75 (WITHOUT OVERLAYS) AND APPROXIMATELY 300K BYTES ON THE IBM360/75 (WITH OVERLAYS)
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 -
PREA IS A FUNCTION SUBPROGRAM WHICH GIVES EITHER THE REACTIVITY OR
POWER VERSUS TIME INPUT (DEPENDING ON THE OPTION CHOSEN) FOR A
POWER TRANSIENT. THIS IS AN ARBITRARY FUNCTION WHICH MUST BE SPE-
CIFIED BY THE USER.
15. NAME AND ESTABLISHMENT OF AUTHOR -
T. J. HEAMES
APPLIED PHYSICS DIVISON
ARGONNE NATIONAL LABORATORY
9700 SOUTH CASS AVENUE
ARGONNE, ILLINOIS 60439
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (6600-8568 CARDS, 360-8590 CARDS)
SAMPLE PROBLEMS (6600-198 CARDS, 360-198 CARDS)
REFERENCE REPORT AND DICTIONARY
17. CATEGORY - F
KEYWORDS - FAST REACTORS, POWER TRANSIENTS, EXCURSIONS, HEAT
TRANSFER, REACTIVITY, MARS CODES

1. NAME OR DESIGNATION OF PROGRAM - GAMTRI
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - UNIVAC1108
3. NATURE OF PHYSICAL PROBLEM SOLVED - 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.
4. METHOD OF SOLUTION - THE MULTIGROUP DIFFUSION THEORY EQUATIONS ARE APPROXIMATED BY 7-POINT DIFFERENCE EQUATIONS FOR THE UNIFORM TRIANGULAR MESH GRID. THE SYSTEM OF DIFFERENCE EQUATIONS IS SOLVED BY AN EXTENSION OF THE POWER METHOD TO FIND THE EIGENVECTOR (NEUTRON FLUX) AND THE EIGENVALUE (K-EFFECTIVE). SUCCESSIVE LINE OVERRELAXATION IS APPLIED IN A SPECIAL FORM (EXPONENTIAL OVERRELAXATION) THAT GUARANTEES THE NON-NEGATIVITY OF THE NEUTRON FLUX. COARSE MESH REBALANCING IS USED TO IMPROVE THE PREASYMPTOTIC CONVERGENCE BEHAVIOR. A VARIATION OF AITKENS METHOD IMPROVES THE ASYMPTOTIC BEHAVIOR, ASSUMING ONLY ONE ERROR MODE.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
10 ENERGY GROUPS
20,000 SPACE MESH POINTS
255 DIFFERENT MATERIAL REGIONS
6. TYPICAL RUNNING TIME - 5 TO 60 MINUTES ARE REQUIRED.
7. UNUSUAL FEATURES OF THE PROGRAM -
  - (A) THE COARSE MESH REBALANCING SCHEME INCREASES THE EFFECTIVE SOLUTION RANGE.
  - (B) SIMULTANEOUS PERFORMANCE OF COMPUTATION AND DATA TRANSFER PROVIDE ITERATIONS WITH VIRTUALLY NO DELAY CAUSED BY THE USE OF DRUM STORAGE.
  - (C) EFFICIENT RESTART ABILITY AND ABILITY TO ACCEPT A TAPE FLUX GUESS.
8. RELATED AND AUXILIARY PROGRAMS - GAMTRI IS A MAJOR REVISION OF GAMBLE5 (ACC ABSTRACT 222).
9. STATUS - ABSTRACT FIRST DISTRIBUTED MAY 1970.
UNIVAC1108 VERSION SUBMITTED SEPTEMBER 1969.
10. REFERENCES - J. P. DORSEY AND R. FROELICH, GAMTRI, A PROGRAM FOR THE SOLUTION OF THE MULTIGROUP NEUTRON-DIFFUSION EQUATIONS IN TRIANGULAR GEOMETRY WITH ARBITRARY GROUP SCATTERING, FOR THE UNIVAC-1108 COMPUTER, GA-9201, MAY 12, 1969, AND ERRATA.

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11. MACHINE REQUIREMENTS - 65,536 WORDS OF CORE STORAGE, 3 TAPE UNITS ON 1 DATA CHANNEL, 1,572,864 WORDS OF DRUM STORAGE FROM 1 DATA CHANNEL, AND A PERIPHERAL PRINTER-PUNCH.
12. PROGRAMMING LANGUAGES USED - FORTRAN IV (90 PERCENT) AND ASSEMBLY LANGUAGE (10 PERCENT)
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - EXEC II, GENERAL ATOMIC VERSION GAX 23.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - CTT5 IS THE ASSEMBLY LANGUAGE ROUTINE USED FOR THE COMPREHENSIVE CHECKING AND TRANSMITTING OF DATA INTO AND OUT OF CORE STORAGE.
15. NAME AND ESTABLISHMENT OF AUTHORS -
J. P. DORSEY AND R. FROELICH
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16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (16,639 CARDS)
SAMPLE PROBLEM (150 CARDS)
REFERENCE REPORT AND ERRATA
17. CATEGORY - C
KEYWORDS - MULTIGROUP, DIFFUSION EQUATIONS, 2-DIMENSIONAL, TRIANGULAR GEOMETRIES, FLUX DISTRIBUTION, GAMBLE5 CODES

1. NAME OR DESIGNATION OF PROGRAM - SABOR4
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
3. NATURE OF PHYSICAL PROBLEM SOLVED - 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.
4. METHOD OF SOLUTION - IT IS ASSUMED THAT THE STRUCTURE IS A SHELL OF REVOLUTION WITH AXISYMMETRIC DISTRIBUTIONS OF THICKNESS AND MATERIAL PROPERTIES SO THAT WHEN THE STRUCTURAL DEFORMATIONS ARE REPRESENTED AS SUMS OF FOURIER CIRCUMFERENTIAL HARMONICS IN THETA, THE LOAD DEFLECTION EQUATIONS OF EQUILIBRIUM SEPARATE INTO INDIVIDUAL HARMONICS. THEN THE PROBLEM MAY BE SOLVED FOR EACH LOADING HARMONIC SEPARATELY AND THE RESULTS SUMMED TO OBTAIN THE COMPLETE SOLUTION.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
  - HAL4 MAXIMA -
    - 150 ELEMENTS
    - 100 TABULATED F(THETA) POINTS
    - 20 DIFFERENT HARMONICS ALLOWED FOR THE COMPLETE STRUCTURE
  - MELT4 MAXIMA -
    - 150 ELEMENTS
    - 72 THETA VALUES
    - 25 THICKNESS STATIONS
    - 19 HARMONICS IF THE DELTA-T(S,ZETA,THETA) OPTION IS BEING USED
    - 26 HARMONICS IF THE DELTA-T(S,ZETA) OPTION IS BEING USED
  - LANCE4 MAXIMA -
    - 150 ELEMENTS
    - 29 S STATIONS FOR SIMPSON INTEGRATION ACROSS AN ELEMENT (THIS MUST BE AN ODD NUMBER)
  - MAINS4 MAXIMA -
    - 150 ELEMENTS
    - 151 NODES
    - 29 POINTS FOR THE SIMPSONS RULE INTEGRATION ACROSS AN ELEMENT
    - 0 RADIUS AT ONLY ONE END OF AN ELEMENT
  - MAINS4 MINIMA -

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM (CONTINUED)
  - 2 ELEMENTS PER BRANCH
  - SUMPLOT4 MAXIMA -
    - 150 ELEMENTS
    - 37 THETA VALUES
    - 11 THICKNESS STATIONS
    - 175 ELEMENTS + NUMBER OF POLES
    - 49 BRANCHES
    - 175 POINTS TO BE PLOTTED FOR A PARTICULAR FUNCTION AT ONE THETA-VALUE
    - 175 NODES + BRANCHES + INTERNAL DISCONTINUITIES
  - SUMPLOT4 MINIMA -
    - 2 ELEMENTS PER BRANCH OR MAIN SHELL
6. TYPICAL RUNNING TIME -
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED MAY 1970.
IBM360 VERSION SUBMITTED AUGUST 1969.
10. REFERENCES - E. A. WITMER, E. W. MACK, T. H. H. PIAN, AND B. A. BERG, AN IMPROVED DISCRETE-ELEMENT ANALYSIS AND PROGRAM FOR THE LINEAR-ELASTIC STATIC ANALYSIS OF MERIDIONALLY-CURVED, VARIABLE-THICKNESS, BRANCHED THIN SHELLS OF REVOLUTION SUBJECTED TO GENERAL EXTERNAL MECHANICAL AND THERMAL LOADS, PART 1, ANALYSIS AND EVALUATION, SAMSO TR 68-310, PART 1, MARCH 1968.
E. W. MACK, B. A. BERG, AND E. A. WITMER, AN IMPROVED DISCRETE-ELEMENT ANALYSIS AND PROGRAM FOR THE LINEAR-ELASTIC STATIC ANALYSIS OF MERIDIONALLY-CURVED, VARIABLE-THICKNESS, BRANCHED THIN SHELLS OF REVOLUTION SUBJECTED TO GENERAL EXTERNAL MECHANICAL AND THERMAL LOADS, PART 2, THE SABOR 4 PROGRAM, SAMSO TR 68-310, PART 2, MARCH 1968.
11. MACHINE REQUIREMENTS -
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
  - E. A. WITMER, E. W. MACK, T. H. H. PIAN, AND B. A. BERG
  - AEROELASTIC AND STRUCTURES RESEARCH LABORATORY
  - DEPARTMENT OF AERONAUTICS AND ASTRONAUTICS
  - MASSACHUSETTS INSTITUTE OF TECHNOLOGY
  - CAMBRIDGE, MASSACHUSETTS 02139

16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION

MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (5635 CARDS)
SAMPLE PROBLEM (619 CARDS)
REFERENCE REPORTS (MICROFICHE ONLY)

17. CATEGORY - I

KEYWORDS - FINITE-ELEMENT, MASS MATRICES, STRUCTURAL ANALYSIS,
SHELLS

1. NAME OR DESIGNATION OF PROGRAM - TIGIR2
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. NATURE OF PHYSICAL PROBLEM SOLVED - 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.
4. METHOD OF SOLUTION - INFORMATION IS RETRIEVED ON A SELECTIVE BASIS. THE SELECTION PROCESS EMPLOYED IS ONE WHICH DETERMINES THE TRUTH VALUE OF A REQUEST FOR ANY GIVEN UNIT RECORD, WHERE A UNIT RECORD IS THE INFORMATION FILED FOR A DOCUMENT, AND THE REQUEST IS A BOOLEAN-LIKE EXPRESSION WRITTEN IN THE LANGUAGE USED TO DESCRIBE THE DOCUMENT.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
6. TYPICAL RUNNING TIME - ONE MINUTE OF CENTRAL PROCESSOR TIME IS REQUIRED TO SEARCH ABOUT 6000 DOCUMENT RECORDS ON TAPE.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - TIGIR2 PRESENTLY IS MADE UP OF THE FOLLOWING OVERLAY PROGRAMS - TIGIR, TIGIR1, LIBGEN, COMPILE, SEARCH, TIGEDIT, AND NOTIFY.
9. STATUS - ABSTRACT FIRST DISTRIBUTED MAY 1970.
CDC6600 VERSION SUBMITTED SEPTEMBER 1969.
10. REFERENCES - J. L. COPELAND, R. J. CULLEN, C. H. HUNTER, AND A. E. ZACKRISON, TIGIR, A DOCUMENT RETRIEVAL PROGRAM FOR THE CDC 6600 - USERS REFERENCE MANUAL, KAPL-M-6749, JULY 28, 1969.
B. A. BROWN, TIGIR, A DOCUMENT RETRIEVAL PROGRAM FOR THE CDC 6600 AND TIGSORT, ANOTHER TIGIR MODULE TO PROVIDE SORT CAPABILITY, KAPL-M-6749 ADDENDUM NO. 1, OCTOBER 1969.
11. MACHINE REQUIREMENTS -
12. PROGRAMMING LANGUAGE USED - FORTRAN
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - SOME NON-STANDARD OPERATIONS SUCH AS BUFFER ASSIGNMENT AT EXECUTE TIME, RANDOM FILE GENERATION AND USE, AND SHIFTING, HAVE MADE MACHINE LANGUAGE SUBPROGRAMS NECESSARY. THE TIGIR2 PROGRAM TAPE CONTAINS SEVEN BINARY FILES, EACH BEING AN ABSOLUTE OVERLAY. THE

14. ANY OTHER INFORMATION OR RESTRICTIONS (CONTINUED)
OVERLAY SCHEME REQUIRES THAT THESE EXIST ON DISK WITH THE SPECIFIC
INDIVIDUAL NAMES IN ORDER - TIGIR, TIGIR 1, TIGIR 2, TIGIR 3,
TIGIR 4, TIGIR 5, TIGIR 6. THE SETUP DECK SETS UP THE DISK FILE
AND LOADS THE BASE OVERLAY.
15. NAME AND ESTABLISHMENT OF AUTHORS -
J. L. COPELAND, R. J. CULLEN, C. H. HUNTER,
AND A. E. ZACKRISON
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GENERAL ELECTRIC COMPANY
BOX 1072
SCHENECTADY, NEW YORK 12301
16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
MAGNETIC TAPE TRANSMITTAL
TIGIR2 PROGRAM TAPE (BINARY)
FILE 1 - TIGIR
FILE 2 - TIGIR 1
FILE 3 - TIGIR 2 (LIBGEN)
FILE 4 - TIGIR 3 (COMPILE)
FILE 5 - TIGIR 4 (SEARCH)
FILE 6 - TIGIR 5 (TIGEDIT)
FILE 7 - TIGIR 6 (NOTIFY)
SETUP DECK (31 CARDS)
REFERENCE REPORT AND ADDENDUM
17. CATEGORY - M
KEYWORDS - LIBRARIES, MAINTENANCE, RETRIEVAL, DATA PROCESSING

1. NAME OR DESIGNATION OF PROGRAM - FINEL
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. NATURE OF PHYSICAL PROBLEM SOLVED - FINEL IS A COLLECTION OF THREE 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.
4. METHOD OF SOLUTION - THE CALCULATION IS BASED ON THE FINITE ELEMENT APPROACH.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
  - FINEL2 MAXIMA -
    - 2000 NODES
    - 1000 ELEMENTS
    - 4 TYPES OF MATERIALS
    - 10 DIFFERENT MATERIALS OF EACH TYPE
    - 100 GROUPS
    - 500 FORCES OF ANY ONE TYPE (X, Y, OR SLANT)
    - 500 BOUNDARY CONDITIONS OF ANY ONE TYPE
  - FINEL3 MAXIMA -
    - 30 NODES PER GROUP IF THE NUMBER OF DIMENSIONS IS 2
    - 20 NODES PER GROUP IF THE NUMBER OF DIMENSIONS IS 3
    - 100 GROUPS
    - 1000 ELEMENTS
6. TYPICAL RUNNING TIME - ON THE CDC6600 WITH THE CHIPPEWA OPERATING SYSTEM, FINEL2 PLASTIC CALCULATIONS TAKE BETWEEN 1.2 AND 1.5 MINUTES PER 100 NODES.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - FINPUT IS AN AID FOR THE PREPARATION OF INPUT TO THE FINELS.
9. STATUS - ABSTRACT FIRST DISTRIBUTED MAY 1970.
CDC6600 VERSION SUBMITTED SEPTEMBER 1969.
10. REFERENCES - W. B. JORDAN, FINEL, A PROGRAM TO SOLVE ELASTIC STRUCTURES BY THE USE OF FINITE ELEMENTS, KAPL-M-6582, DECEMBER 1, 1966.
  - L. A. GRIEB, FINEL-2 INPUT PREPARATION AND ERROR CHECKS, KAPL NOTE, MARCH 13, 1967.
  - L. A. GRIEB, FINEL INPUT DESCRIPTION ATTACHMENT, KAPL NOTE, APRIL 28, 1967.
11. MACHINE REQUIREMENTS -

12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - CHIPPEWA.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
W. B. JORDAN AND L. A. GRIEB
KNOLLS ATOMIC POWER LABORATORY
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SCHENECTADY, NEW YORK 12301
16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
SOURCE DECKS (FINEL 957 CARDS, FINPUT 211 CARDS)
SAMPLE PROBLEM (FINEL 34 CARDS)
REFERENCE REPORT AND NOTES
17. CATEGORY - I
KEYWORDS - 2-DIMENSIONAL, 3-DIMENSIONAL, PLATFS, STRUCTURAL
ANALYSIS, STRESSES, FINITE-ELEMENT, FINPUT CODES

1. NAME OR DESIGNATION OF PROGRAM - NOAH
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. NATURE OF PHYSICAL PROBLEM SOLVED - 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.
4. METHOD OF SOLUTION - THE EQUILIBRIUM STATE IS DETERMINED ITERATIVELY BY AN IMPLICIT TWO PASS TECHNIQUE. THREE ACCELERATION METHODS ARE AVAILABLE - FIRST AND SECOND ORDER EXTRAPOLATION OF THE SOURCE AND A JUMP EXTRAPOLATION EVERY 13 ITERATIONS. POINTWISE FLUX CONVERGENCE IS REQUIRED. THE TRANSIENT IS SOLVED BY BACKWARDS DIFFERENCING OF TIME DERIVATIVES, AND COEFFICIENTS ARE EVALUATED AT THE PRECEDING TIME-STEP. ALL DEPENDENT VARIABLES (INCLUDING TEMPERATURES AND XENON) ARE EVALUATED ON THE SAME SPATIAL MESH. FIVE OUTPUT PROCEDURES ARE POSSIBLE.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
6 GROUPS OF DELAYED NEUTRONS
10 REGIONS
500 SPACE POINTS
A NEW REGION IS REQUIRED WHEN THE FEEDBACK FREE VALUE OF ANY OF THE PARAMETERS IS CHANGED FROM THE PRECEDING REGION VALUE.
6. TYPICAL RUNNING TIME - IF NS IS THE NUMBER OF SPACE POINTS AND NT THE NUMBER OF TIME-STEPS (ONE STEADY-STATE ITERATION IS EQUIVALENT TO ONE TIME-STEP), THEN THE RUNNING TIME IS $T = NS*NT/1500$ SECONDS. FOR POINTWISE CONVERGENCE TO 10^{*-6} THE EQUILIBRIUM STATE IS TYPICALLY OBTAINED IN 20 TO 80 ITERATIONS DEPENDING ON THE CHOICE OF ACCELERATION PARAMETERS.
7. UNUSUAL FEATURES OF THE PROGRAM - THE EQUILIBRIUM IS SOLVED BY ADDING A PSEUDO TIME DERIVATIVE WITH A RELATIVELY SMALL TIME CONSTANT. THE APPROACH TO EQUILIBRIUM IS RAPID BECAUSE THE PSEUDO TIME EIGENVALUE IS LARGE. THE JUMP EXTRAPOLATION TECHNIQUE TENDS TO FURTHER INCREASE THE RATE OF APPROACH TO EQUILIBRIUM. PROVISION FOR READING IN AN ALREADY CALCULATED EQUILIBRIUM STATE (OR AN ARBITRARY INITIAL FLUX AND TEMPERATURE DISTRIBUTION) IS INCLUDED. RESTART IS POSSIBLE. PROVISION IS MADE FOR ADDITIONS TO THE PROGRAM BY THE USER (BY THIS WE MEAN A NUMBER OF INPUT LOCATIONS ARE NOT USED IN THE CURRENT CONFIGURATION BUT ARE ADDRESSABLE, HENCE, MAY BE USED IN USER-INITIATED SUBROUTINES WITHOUT CHANGING THE DIMENSION STATEMENTS).

8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED MAY 1970.
CDC6600 VERSION SUBMITTED SEPTEMBER 1969.
10. REFERENCE REPORT - G. S. LELLOUCHE, NOAH, A CODE FOR SOLVING THE ONE DIMENSIONAL SPACE-TIME DIFFUSION EQUATION ACCOUNTING FOR THE EFFECTS OF TEMPERATURE AND XENON FEEDBACK, BNL-50157 (T-153), JANUARY 1969.
11. MACHINE REQUIREMENTS - 27K MEMORY
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 2 OR 3.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THE SOURCE DECK INCLUDES THE MAIN PROGRAM AND 20 SUBROUTINES. THERE ARE TWO VERSION OF TEMPSS AND TEMPTR - TSS1 AND TTR1 FOR A FUEL-CLAD-COOLANT MODEL AND TSS2 AND TTR2 FOR A FUEL-COOLANT-SOLID MODERATOR MODEL. THERE ARE TWO VERSION OF STABLE - STB1 DOES NOT PERFORM ANY STABILIZATION WHILE STB2 DOES. THERE ARE EIGHT VERSIONS OF THE PERTURBATION SUBROUTINE, PERT - PRT1 FOR A TEST OF STABILITY UNDER A TEMPERATURE IMPULSE, PRT2 FOR OSCILLATION OF INLET VALUE OF COOLANT TEMPERATURE, PRT3 FOR A STEP CHANGE IN INLET COOLANT TEMPERATURE, PRT4 FOR A RAMP CHANGE IN INLET COOLANT TEMPERATURE, PRT5 FOR SIMULATION OF AXIAL ROD BANK MOTION, PRT6 FOR A STEP CHANGE IN COOLANT VELOCITY, PRT7 FOR A RAMP CHANGE IN COOLANT VELOCITY, AND PRT8 FOR ALTERATION OF THE ABSORPTION CROSS SECTION BETWEEN ANY TWO POINTS.
15. NAME AND ESTABLISHMENT OF AUTHOR -
G. S. LELLOUCHE
BROOKHAVEN NATIONAL LABORATORY
UPTON, LONG ISLAND, NEW YORK 11973
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (2599 CARDS)
SAMPLE PROBLEM (75 CARDS)
REFERENCE REPORT
17. CATEGORY - F
KEYWORDS - ONE-GROUP, ONE-DIMENSIONAL, SPACE-TIME, DIFFUSION EQUATIONS, TEMPERATURE FEEDBACK, XENON FEEDBACK

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. NATURE OF PHYSICAL PROBLEM SOLVED - 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, DATATRAM MODULAR PROGRAMMING SYSTEM, KAPL-M-6997L, JULY 1, 1968.
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 DATATRAM MODULAR PROGRAMMING SYSTEM (ACC ABSTRACT 386).
15. NAME AND ESTABLISHMENT OF AUTHORS -
R. H. BEAM AND H. J. KOPP
KNOLLS ATOMIC POWER LABORATORY
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SCHENECTADY, NEW YORK 12301
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK WITH SAMPLE PROBLEMS (9992 CARDS)
REFERENCE REPORTS
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. NATURE OF PHYSICAL PROBLEM SOLVED - 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.
    D. DILEONARDO, THE GRAPHICAL DISPLAY OF NUMERICAL DATA, WAPD-TM-611, APRIL 1966.
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 DATATRAM MODULAR PROGRAMMING SYSTEM (ACC ABSTRACT 386).

15. NAME AND ESTABLISHMENT OF AUTHORS -
B. L. HENNIG AND H. J. KOPP
KNOLLS ATOMIC POWER LABORATORY
GENERAL ELECTRIC COMPANY
BOX 1072
SCHENECTADY, NEW YORK 12301
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK WITH SAMPLE PROBLEMS (2810 CARDS)
REFERENCE REPORTS, KAPL-M-7047L AND KAPL-M-6997L
17. CATEGORY - P
KEYWORDS - GRAPHS, DATA PROCESSING, 2-DIMENSIONAL, 3-DIMENSIONAL

1. NAME OR DESIGNATION OF PROGRAM - TAC2D
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - UNIVAC1108
3. NATURE OF PHYSICAL PROBLEM SOLVED - TAC2D IS DESIGNED TO TREAT TRANSIENT, TWO-DIMENSIONAL HEAT TRANSFER PROBLEMS. STEADY-STATE PROBLEMS ARE TREATED BY CONSIDERING THE PROBLEM TO BE A TRANSIENT, STARTING WITH AN ASSUMED TEMPERATURE DISTRIBUTION AND RUNNING UNTIL EQUILIBRIUM CONDITIONS ARE ESTABLISHED. GEOMETRICALLY, RECTANGULAR (X-Y), CYLINDRICAL (R,Z), OR CIRCULAR (R,THETA) COORDINATES MAY BE USED.
4. METHOD OF SOLUTION - THE HEAT CONDUCTION EQUATION IS REPLACED BY AN EQUIVALENT SET OF LINEAR FINITE DIFFERENCE EQUATIONS. THIS SET OF EQUATIONS IS THEN SOLVED BY THE PEACEMAN-RACHFORD IMPLICIT ALTERNATING DIRECTION METHOD.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
  - (A) THE GRID LINE SYSTEM MUST BE ORTHOGONAL IN THE RECTANGULAR, CYLINDRICAL, OR CIRCULAR COORDINATE SYSTEM. THEREFORE, THE SIDES OF THE NODAL ELEMENTS MUST BE ORTHOGONAL. THE ENTIRE PROBLEM MUST BE BOUNDED BY FOUR GRID LINES IN ONE OF THE COORDINATE SYSTEMS. DIFFICULTIES IN TREATING IRREGULAR BOUNDARIES CAN BE OVERCOME TO SOME EXTENT THROUGH THE USE OF MATERIALS HAVING SPECIALLY CHOSEN PROPERTIES.
  - (B) ALL RADIATION IS TREATED ONE-DimensionALLY.
  - (C) THERE ARE NO PROVISIONS FOR THERMAL EXPANSION OR CHANGE OF PHASE. SUCH SPECIAL HEAT TRANSFER SITUATIONS COULD BE INCLUDED BY EXTENSIONS OF THE EXISTING PROGRAMMING.
6. TYPICAL RUNNING TIME -
7. UNUSUAL FEATURES OF THE PROGRAM -
  - (A) THE GEOMETRICAL INPUT IS SIMPLE.
  - (B) THE INPUT OF THERMAL PARAMETERS IS BY FORTRAN V ARITHMETIC STATEMENT FUNCTIONS. MANY OF THE CALCULATION VARIABLES (TIME, LOCAL TEMPERATURE, LOCAL POSITION) ARE AVAILABLE FOR USE IN THESE FUNCTIONS.
  - (C) INTERNAL AND EXTERNAL FLOWING COOLANTS MAY BE USED.
  - (D) THERE MAY BE INTERNAL AND EXTERNAL THERMAL RADIATION.
  - (E) THERE IS A WIDE SELECTION OF OPTIONAL OUTPUT.
  - (G) THERE IS A SPECIAL OPTION WHICH MAY BE USED FOR OBTAINING STEADY-STATE RESULTS EFFICIENTLY.
8. RELATED AND AUXILIARY PROGRAMS - TAC3D, WHICH IS THREE-DIMENSIONAL AND HAS ALL THE FEATURES OF TAC2D DESCRIBED IN THIS ABSTRACT.
9. STATUS - ABSTRACT FIRST DISTRIBUTED MAY 1970.
UNIVAC1108 VERSION SUBMITTED OCTOBER 1969.

10. REFERENCES - J. F. PETERSEN, TAC2D, A GENERAL PURPOSE TWO-DIMENSIONAL HEAT TRANSFER COMPUTER CODE - USERS MANUAL, GA-8868, SEPTEMBER 6, 1969
S. S. CLARK AND J. F. PETERSEN, TAC2D, A GENERAL PURPOSE TWO-DIMENSIONAL HEAT TRANSFER COMPUTER CODE - MATHEMATICAL FORMULATIONS AND PROGRAMMERS GUIDE, GA-9262, SEPTEMBER 1969.
D. W. PEACEMAN AND H. H. RACHFORD, THE NUMERICAL SOLUTION OF PARABOLIC AND ELLIPTIC DIFFERENTIAL EQUATIONS, I. SOC. INDUST. APPL. MATH., VOL.3, PP. 28-41, MARCH 1955.
J. F. PETERSEN, TAC3D, A GENERAL PURPOSE THREE-DIMENSIONAL HEAT TRANSFER COMPUTER CODE - USERS MANUAL, GA-9263, SEPTEMBER 1969.
S. S. CLARK, J. V. DEL BENNE, AND J. F. PETERSEN, TAC3D, A GENERAL PURPOSE THREE-DIMENSIONAL HEAT TRANSFER COMPUTER CODE - MATHEMATICAL FORMULATIONS AND PROGRAMMERS GUIDE, GA-9264, SEPTEMBER 1969.
11. MACHINE REQUIREMENTS - 65K UNIVAC1108 OR EQUIVALENT. IN ADDITION TO INPUT/OUTPUT, A MAXIMUM OF FOUR AND A MINIMUM OF NO TAPES ARE REQUIRED DEPENDING UPON THE CODE OPTIONS BEING USED.
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 - IN SUBROUTINES ERROR 2 AND STEADY, THE CALLS TO MERR CAUSE TERMINATION OF THE PROBLEM WITH ERROR FLAG SETTING. ANY METHOD OF TERMINATING WHICH IS APPLICABLE TO THE SYSTEM BEING USED COULD BE SUBSTITUTED FOR THESE TWO CALL MERR STATEMENTS.
15. NAME AND ESTABLISHMENT OF AUTHORS -
J. F. PETERSEN AND S. S. CLARK
GULF GENERAL ATOMIC INCORPORATED
P. O. BOX 608
SAN DIEGO, CALIFORNIA 92112
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (6511 CARDS)
SAMPLE PROBLEM (288 CARDS)
REFERENCE REPORTS, GA-8868 AND GA-9262
17. CATEGORY - H
KEYWORDS - HEAT TRANSFER, 2-DIMENSIONAL, COOLANTS, TEMPERATURE DISTRIBUTION

1. NAME OR DESIGNATION OF PROGRAM - LARCA
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. NATURE OF PHYSICAL PROBLEM SOLVED - MULTIGROUP CROSS SECTIONS ARE WEIGHTED BY THE FLUX IN THE APPROPRIATE GROUPS AND REGIONS, AND CROSS SECTIONS FOR THE ASSEMBLY ARE COMPUTED AND PUNCHED IN DTF4 FORMAT. THE PROGRAM ALSO COMPUTES THE INFINITE MEDIUM FLUX, REACTION RATES, AND THE INFINITE MULTIPLICATION FACTOR AND MATERIAL BUCKLING.
4. METHOD OF SOLUTION -
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
25 GROUPS
13 REACTIONS PER GROUP
20 ZONES
36 MATERIALS
6. TYPICAL RUNNING TIME - 10 SECONDS ARE REQUIRED.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - INPUT AND OUTPUT CROSS SECTIONS ARE IN DTF4 (ACC ABSTRACT 209) FORMAT. INPUT FLUXES ARE IN THE FORMAT OF 70NF FLUXES PUNCHED BY DTF4.
9. STATUS - ABSTRACT FIRST DISTRIBUTED MAY 1970.
CDC6600 VERSION SUBMITTED OCTOBER 1969.
10. REFERENCES - R. C. ANDERSON, LARCA, A FORTRAN IV CDC-6600 PROGRAM FOR CALCULATING FLUX-WEIGHTED CROSS SECTIONS, LA-8373-MS, MARCH 29, 1968, AND ADDENDUM, OCTOBER 1, 1969.
11. MACHINE REQUIREMENTS - 63,000 (OCTAL) STORAGE
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHOR -
R. C. ANDERSON
LOS ALAMOS SCIENTIFIC LABORATORY
P. O. BOX 1663
LOS ALAMOS, NEW MEXICO 87544
16. MATERIAL AVAILABLE -
SOURCE DECK

16. MATERIAL AVAILABLE (CONTINUED)
SAMPLE PROBLEMS
REFERENCE REPORT

17. CATEGORY - N
KEYWORDS - CROSS SECTIONS, AVERAGES, DATA PROCESSING, DTF4 CODES

1. NAME OR DESIGNATION OF PROGRAM - TACASI
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - UNIVAC1108
3. NATURE OF PHYSICAL PROBLEM SOLVED - 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.
4. METHOD OF SOLUTION - LEAST-SQUARES TECHNIQUES ARE USED. THE SOLUTION IS BY ITERATION STARTING WITH GUESSED VALUES OF THE NEUTRON AND RADIATION WIDTHS. THE MULTIPLE SCATTERING CALCULATION EMPLOYS EITHER INFINITE SLAB OR RIGHT CIRCULAR CYLINDER GEOMETRY WITH THE BEAM NORMAL TO THE FACE OF THE CYLINDER. IT IS ALSO POSSIBLE TO SELECT STATIONARY NUCLEUS (DOPPLER BROADENED) OR MOVING NUCLEUS (UNBROADENED) MODE IN THE MULTIPLE SCATTERING CALCULATION. RUSSIAN ROULETTE AND IMPORTANCE SAMPLING TECHNIQUES ARE EMPLOYED TO REDUCE COMPUTATION TIME.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - AS MANY AS 16 OBSERVED QUANTITIES MAY BE INPUT AND AS MANY AS 24 SUBRESONANCES MAY BE INCLUDED.
6. TYPICAL RUNNING TIME - A TYPICAL PROBLEM INVOLVING 3 OR 4 OBSERVED QUANTITIES IN THE STATIONARY TARGET MODE CAN BE SOLVED IN ABOUT 1 MINUTE OF COMPUTING TIME IF THE GUESSES ARE REASONABLY ACCURATE.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - SIGMA AND FLUSH ARE AUXILIARY CODES USED TO PREPARE TACASI INPUT. IF SIGMA AND FLUSH ARE NOT USED, IT WILL BE NECESSARY TO CONVERT CAPTURE AND SELF-INDICATION AREA DATA INTO CAPTURE PROBABILITIES AS A FUNCTION OF TIME-OF-FLIGHT. THE CODE P IS USED TO OBTAIN A PRINTER PLOT OF THE EXPERIMENTAL DATA. HOWEVER, THE PLOT OF THE CALCULATED TIME HISTORY CAN STILL BE OBTAINED. IF IT IS DESIRED TO PROCESS LARGE QUANTITIES OF DATA THROUGH TACASI, CONTACT THE AUTHOR DIRECTLY ABOUT OBTAINING THESE AUXILIARY CODES.
9. STATUS - ABSTRACT FIRST DISTRIBUTED MAY 1970.
UNIVAC1108 VERSION SUBMITTED OCTOBER 1969.
10. REFERENCE - F. H. FROHNER, TACASI - A FORTRAN IV CODE FOR LEAST SQUARES AREA ANALYSIS OF NEUTRON RESONANCE DATA, GA-6906, AUGUST 4, 1966.
TACASI VERSION 3, GGA NOTE.
S. FRIESENHAHN, TACASI OPTIONS, GGA NOTE, FEBRUARY 7, 1969.
S. FRIESENHAHN, CCDE CHANGE, GGA NOTE, FEBRUARY

10. REFERENCES (CONTINUED)
25, 1969.

P CODE DESCRIPTION, GGA NOTE.

11. MACHINE REQUIREMENTS - 65K MEMORY

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
EXEC II.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHOR -
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16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK
SAMPLE PROBLEM
REFERENCE REPORT

17. CATEGORY - A
KEYWORDS - LEAST SQUARES, RESONANCE PARAMETERS, BREIT-WIGNER
FORMULA

VI. LIBRARY PROGRAMS BY CLASSIFICATION

A. CROSS SECTION AND RESONANCE INTEGRAL CALCULATIONS

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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 THE PROGRAM 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.

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

177 DOPIE DOPIE WAS DEVELOPED TO STUDY
THE EFFECTS OF -

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

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

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

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

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

A. CROSS SECTION AND RESONANCE INTEGRAL CALCULATIONS

5/70

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 FASDOP FASDOP EVALUATES POINTWISE, TEMPERATURE-DEPENDENT CROSS SECTIONS FROM SINGLE-LEVEL BREIT-WIGNER RESONANCE PARAMETERS.

217 LFGCOEF3/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 $1.0/\sqrt{E}$ FOR LEVELS NOT EXPLICITLY CONSIDERED. ALSO THE CROSS SECTION IN THE WINGS OF A NEGATIVE ENERGY RESONANCE, $CONSTANT/(\sqrt{E}*(E-E_0)**2)$ MAY BE ADDED.

A. CROSS SECTION AND RESONANCE INTEGRAL CALCULATIONS

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247 FLANGE1 FLANGE1 COMPUTES NEUTRON SCATTERING KERNELS FOR A LARGE CLASS OF MODERATORS. NEUTRON 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 PSEUDO RESONANCE PARAMETERS ARE CONSTRUCTED FROM AVERAGE NUCLEAR PROPERTIES IN THE RESOLVED RESONANCE REGION.

A. CROSS SECTION AND RESONANCE INTEGRAL CALCULATIONS

5/70

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

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

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

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

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

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

5/70

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.

A. CROSS SECTION AND RESONANCE INTEGRAL CALCULATIONS

5/70

377 SIGPLOT SIGPLOT CALCULATES THE SCATTERING, CAPTURE, FISSION, AND TOTAL CROSS SECTIONS FROM RESOLVED RESONANCE PARAMETER 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.

381 LYNNE LYNNE 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.

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

5/70

33 GAML/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 $\Delta U=0.25$. 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 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.

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

5/70

119 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.

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

5/70

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 TP, 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 THERMOS (ANL VERSION) THIS ARGONNE-REVISED VERSION LIKE THE ORIGINAL THERMOS CODE DEVELOPED BY H. HONECK OF BROOKHAVEN NATIONAL LABORATORY COMPUTES 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 P1 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.

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

5/70

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 TASK. 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.

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

219 GAROL   GAROL COMPUTES EFFECTIVE GROUP
CROSS SECTIONS FOR THE RESOLVED RESONANCES OF A MIXTURE OF
ISOTOPES IN A TWO-REGION CELL. BASIC CROSS SECTIONS INCLUDE
TEMPERATURE DEPENDENCE. THE PROGRAM ALLOWS A CHOICE OF GEOMETRIES
AND CAN ACCEPT AN ARBITRARY TABLE OF ESCAPE PROBABILITIES. A
DANCOFF 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 LEHARGY 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.

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

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

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

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

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

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

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

5/70

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

279 LEOPARD/SPOTS LEOPARD IS A UNIT CELL HOMOGENIZATION AND SPECTRUM GENERATION (MUFT-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/DRF1 RESQ2 CALCULATES THE RESONANCE INTEGRAL IN A TWO-DIMENSIONAL, HEXAGONAL SYSTEM CONSISTING OF FUEL, CLAD AND WATER WITH A REFLECTING BOUNDARY CONDITION.

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

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

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

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

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

5/70

307 HWOCR-SAFE HWOCR-SAFE IS A MONTE CARLO THERMAL REACTOR ANALYSIS PROGRAM DESIGNED FOR USE WITH PROPOSED HWOCR 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 ANALYSFS.

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

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

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

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

5/70

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 PUSSIAN (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 K_{EFF} AND PERFORM CRITICALITY SEARCHES ON TIME
ABSORPTION, MATERIAL CONCENTRATIONS, ZONE DIMENSIONS, AND
BUCKLING USING EITHER A FLUX OR AN ADJOINT MODEL.

C. STATIC DESIGN STUDIES

5/70

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 FIRE5 FIRE5 SOLVES THE ONE-DIMENSIONAL MULTIGROUP AGE-DIFFUSION EQUATIONS FOR SLAB (SYMMETRIC AND ASYMMETRIC), CYLINDER, AND SPHERE GEOMETRIES. AN EXTENSION OF THE ORIGINAL LOS ALAMOS FIRE PROGRAM WRITTEN BY F. W. BRINKLEY AND C. B. MILLS, IT CONTAINS A 34-GROUP LIBRARY OF 10 ELEMENTS. FIRE5 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. FIRE5 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, PFACTOR 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 TSCHERYSCHIEFF 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

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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-TRANSUTATION FIELDS HAVING SLAB, CYLINDRICAL, OR SPHERICAL SYMMETRY. ASSURANCE OF UNBIASED CONVERGENCE IS PROVIDED BY USE OF A DUAL ADJOINT-AND-FLUX LOOP CONSTRUCTED IN PRECISE CORRESPONDENCE WITH THE PHYSICS OF SUCCESSIVE FREE FLIGHTS.

C. STATIC DESIGN STUDIES

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 GRAM GRAM IS A PROGRAM 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

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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.

C. STATIC DESIGN STUDIES

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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.

161 FORTRAN TDC

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

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

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

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

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

C. STATIC DESIGN STUDIES

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

225 TEMCO TEMCO COMPUTES REACTOR TEMPERATURE COEFFICIENTS.

C. STATIC DESIGN STUDIES

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241 HFN HFN SOLVES THE HOMOGENEOUS OR INHOMOGENEOUS ONE-DIMENSIONAL MULTIGROUP DIFFUSION EQUATION FOR ITS 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 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.

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 MC648 MC648 SOLVES THE ONE-DIMENSIONAL SLAB TRANSPORT PROBLEM WITH SLOWING DOWN FOR AN ARBITRARY SPATIAL EXTERNAL SOURCE AND ARBITRARY SCATTERING.

353 TWOTRAN TWOTRAN SOLVES TWO-DIMENSIONAL PARTICLE TRANSPORT PROBLEMS IN X-Y GEOMETRY. 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.

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

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

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

99 DUO DIMENSIONAL BURNOUT (DDR) 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.

179 ISOTOPES THIS PROGRAM CAN BE USED TO CALCULATE FOR ANY NEUTRON FLUX THE OPTIMUM TIME OF IRRADIATION FOR MAXIMUM YIELD, THE SPECIFIC ACTIVITY OF THE PRODUCT ISOTOPE IN CURIES PER GRAM OF TARGET MATERIAL, AND THE COMBINED SPECIFIC ACTIVITY OF THE TARGET AND PRODUCT ISOTOPES. THE PRODUCT ISOTOPE MAY BE PRODUCED BY ANY SIMPLE REACTION SUCH AS (N,GAMMA), (N,P), (N,2N), ETC., OR IT MAY BE PRODUCED BY DECAY OF A PARENT ISOTOPE.

180 ISOCRUNCH ISOCRUNCH CAN BE USED TO COMPUTE THE AMOUNT OF EACH ISOTOPE IN A REACTION AND DECAY CHAIN FOR ANY SPECIFIED NEUTRON FLUX AND TIME, TO SUM THE CONTRIBUTIONS OF VARIOUS CHAINS TO THE SAME ISOTOPE, TO GRAPH ON AN ASSOCIATED ELECTROPLOTTER OR CALCOMP THE YIELD OF AN ISOTOPE VS. TIME FOR A GIVEN FLUX, AND TO FIND THE OPTIMUM TIME FOR MAXIMUM YIELD OF AN ISOTOPE IN A CHAIN. THE PROGRAM DOES NOT TAKE INTO ACCOUNT THE SELF-SHIELDING OF A TARGET IN A REACTOR OR THE DEPENDENCE OF REACTION CROSS SECTIONS ON NEUTRON ENERGY WHICH CAN BE HANDLED BY ADJUSTING THE INPUT DATA.

221 RELOAD FEVER   A FEW-GROUP, 1-D DEPLETION
CALCULATION WHICH ALLOWS FUEL IN VARIOUS STAGES OF IRRADIATION TO
BE HOMOGENIZED INTO THE SAME REGION FOR PURPOSES OF THE DIFFUSION
CALCULATION BUT FOLLOWS THE DEPLETION OF EACH OF THE SUB-REGIONS
SEPARATELY. THE CALCULATION MAY BE INTERRUPTED PERIODICALLY FOR
REFUELING ONE OR MORE REGIONS. RECYCLING IS OPTIONAL AND THERE IS
NO LIMIT TO THE NUMBER OF REFUELINGS WHICH MAY BE PERFORMED. A
CONTROL POISON SEARCH IS AVAILABLE AND CONCENTRATION DEPENDENT
SELF-SHIELDING FACTORS MAY BE APPLIED TO ONE LUMPED POISON.

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

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223 REVISED GAD 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 STMGFN STMGFN WILL 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.

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

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260 GARGOYLE GARGOYLE IS AN INFINITE MEDIUM DEPLETION CODE FOR FUEL CYCLE CALCULATIONS ON REACTORS EMPLOYING PARTIAL REFUELING. THE BURNUP OF UP TO 12 DISCRETE FUEL COMPOSITIONS (REGIONS OR STAGES OF IRRADIATION) MAY BE FOLLOWED SIMULTANEOUSLY. THE BURNUP CALCULATION MAY BE INTERRUPTED PERIODICALLY TO REMOVE THE CONTENTS OF AND TO REFUEL ONE OR MORE REGIONS. FUEL MAY BE COMPLETELY OR PARTIALLY RECYCLED. A CONTROL POISON SEARCH MAY BE PERFORMED AT EACH TIME-STEP. FEED FUEL SEARCHES ARE PERMITTED AT THE END OF EACH BURNUP CYCLE BEFORE REFUELING. CONCENTRATION DEPENDENT SELF-SHIELDING FACTORS MAY BE APPLIED TO ANY NUCLIDE EXCEPT MODERATORS. THE NUCLIDE SCHEME EMPLOYED, ALTHOUGH NOT COMPLETELY GENERAL, IS FLEXIBLE.

269 DTF-BURN DTF-BURN IS A ONE-DIMENSIONAL, MULTIGROUP BURNUP CODE BASED ON TRANSPORT THEORY. A DIFFERENT TYPE OF EIGENVALUE CALCULATION (MULTIPLICATION, PERIOD, NUCLIDE CONCENTRATION, ZONE THICKNESS, OR SYSTEM DIMENSION) CAN BE PERFORMED AT THE BEGINNING OF EACH OF A SPECIFIED SET OF TIME-STEPS. THIS FEATURE PERMITS THE SIMULATION, IN A SINGLE PROBLEM RUN, OF A SYSTEM IN WHICH VARIOUS CONTROL METHODS ARE USED AS A FUNCTION OF TIME. THE CONCENTRATION OF THE VARIOUS NUCLIDES IS PERMITTED TO VARY FROM REGION-TO-REGION OR POINT-BY-POINT. NUCLIDES CONSIDERED ARE U235, U236, U238, NP239, PU239, PU240, PU241, PU242, AND FP, A PSEUDO FISSION PRODUCT PAIR.

275 PDQ7 PDQ7 SOLVES FEW-GROUP NEUTRON DIFFUSION-DEPLETION PROBLEMS IN ONE, TWO, AND THREE DIMENSIONS. ADJOINT SOLUTIONS ARE ALSO AVAILABLE AND TWO OVERLAPPING THERMAL GROUPS MAY BE USED IN ONE AND TWO-DIMENSIONAL PROBLEMS. EITHER POINTWISE OR REGIONWISE DEPLETION MAY BE PERFORMED USING THE HARMONY DEPLETION SYSTEM. THE GEOMETRY MAY BE RECTANGULAR, CYLINDRICAL, OR SPHERICAL IN ONE DIMENSION, RECTANGULAR, CYLINDRICAL, OR HEXAGONAL IN TWO DIMENSIONS, AND RECTANGULAR OR HEXAGONAL IN THREE DIMENSIONS. ALL GEOMETRIES PROVIDE FOR VARIABLE MESH SPACING IN ALL DIMENSIONS. ZERO FLUX, ZERO CURRENT, AND ROTATIONAL SYMMETRY BOUNDARY CONDITIONS ARE AVAILABLE, AND BOUNDARY VALUE PROBLEMS MAY BE SOLVED BY SPECIFYING THE FLUX VALUES ON ONE OR MORE BOUNDARIES.

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

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301 FREVAP6 THE FREVAP TYPE OF CODE FOR ESTIMATING THE RELEASE OF LONGER-LIVED METALLIC FISSION PRODUCTS FROM HTGR FUEL ELEMENTS HAS BEEN DEVELOPED TO TAKE INTO ACCOUNT THE COMBINED EFFECTS OF THE RETENTION OF METALLIC FISSION PRODUCTS BY FUEL PARTICLES AND THE RATHER STRONG ABSORPTION OF THESE FISSION PRODUCTS BY THE GRAPHITE OF THE FUEL ELEMENTS. RELEASE CALCULATIONS ARE MADE ON THE BASIS THAT THE LOSS OF FISSION PRODUCT NUCLIDES SUCH AS OF STRONTIUM, CESIUM, AND BARIUM IS DETERMINED BY THEIR EVAPORATION FROM THE GRAPHITE SURFACES AND THEIR TRANSPIRATION INDUCED BY THE FLOWING HELIUM COOLANT. THE CODE IS 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 FEED FUEL REQUIREMENTS IS PERFORMED TO PRODUCE A SPECIFIED END OF CYCLE MULTIPLICATION FACTOR FOR THE EQUILIBRIUM FUEL CYCLE, GIVEN FEED COMPOSITION, LENGTH OF CYCLE AND REACTOR POWER. IT IS ALTERNATELY POSSIBLE TO COMPUTE CYCLE LENGTH OR FEED ENRICHMENT. THE CODE IS A SURVEY TOOL WHICH ASSUMES PERIODIC REFUELING AND PERMITS COMPLETE OR PARTIAL RECYCLING OF MATERIALS. THE SEGREGATED FUEL CONCEPT CAN BE HANDLED WITHIN THE FRAMEWORK OF THE CALCULATION.

313 CINDER(MG102) 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 FISSION POISONS AT EACH TIME-STEP AS WELL AS SELECTED SUMMARIES OF THESE DATA.

314 NAP NAP CALCULATES THE SPECTRUM AND SPATIAL DISTRIBUTION IN ONE DIMENSION OF ACTIVATION GAMMA RAYS FOLLOWING NEUTRON IRRADIATION.

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

5/70

318 FEVER7 FEVER7 PERFORMS A MULTIGROUP, 1-DIMENSIONAL DEPLETION CALCULATION WHICH ALLOWS FUEL IN VARIOUS STAGES OF IRRADIATION TO BE HOMOGENIZED INTO THE SAME REGION FOR PURPOSES OF THE DIFFUSION CALCULATION BUT FOLLOWS THE DEPLETION OF EACH OF THE SUBREGIONS SEPARATELY. THE CALCULATION MAY BE INTERRUPTED PERIODICALLY FOR REFUELING ONE OR MORE REGIONS. RECYCLING IS OPTIONAL AND THERE IS NO LIMIT TO THE NUMBER OF REFUELINGS WHICH MAY BE PERFORMED. A CONTROL POISON SEARCH IS AVAILABLE AND CONCENTRATION DEPENDENT SELF-SHIELDING FACTORS MAY BE APPLIED TO A NUMBER OF LUMPED POISONS.

322 ISOSEARCH THE PROGRAM WAS DEVELOPED TO CALCULATE THE UNKNOWN REACTION CROSS SECTION, FLUX VALUE, OR PRODUCT ACTIVITY IN AN ISOTOPE-PRODUCTION SCHEME CONSISTING OF TWO OR THREE NUCLIDES.

325 2DB 2DB IS A FLEXIBLE, TWO-DIMENSIONAL (X-Y, R-Z, R-THETA, HEX GEOMETRY) DIFFUSION CODE FOR USE IN FAST REACTOR ANALYSES. THE CODE CAN BE USED TO -

- (A) COMPUTE FUEL BURNUP USING A FLEXIBLE MATERIAL SHUFFLING SCHEME,
- (B) PERFORM CRITICALITY SEARCHES ON TIME ABSORPTION (ALPHA), MATERIAL CONCENTRATIONS, AND REGION DIMENSIONS USING A REGULAR OR ADJOINT MODEL. CRITICALITY SEARCHES CAN BE PERFORMED DURING BURNUP TO COMPENSATE FOR FUEL DEPLETION,
- (C) COMPUTE FLUX DISTRIBUTIONS FOR AN ARBITRARY EXTRANEEOUS 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.

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

5/70

340 POWERCO POWERCO CALCULATES THE COST OF ELECTRICITY PRODUCED BY NUCLEAR POWER STATIONS, ASSUMING ALL CASH EXPENSES SUCH AS INVESTMENT AND FUEL COSTS, OPERATING EXPENSES, AND TAXES ARE KNOWN. THE POWER COST IS HELD CONSTANT THROUGHOUT THE PROJECT LIFE.

354 CINCAS CINCAS IS A NUCLEAR FUEL CYCLE COST CODE WHICH MAY BE USED FOR EITHER ENGINEERING ECONOMY PREDICTIONS OF FUEL CYCLE COSTS OR FOR ACCOUNTING FORECASTING OF SUCH COSTS. FEATURES OF CINCAS INCLUDE -

- (1) MONTHLY CALCULATION OF DOLLAR COSTS AND MASS INVENTORY ON A BATCH AND CASE BASIS FOR EACH MONTH OF A PERIOD WHICH IS USUALLY DEFINED AS (BUT NOT RESTRICTED TO) BEGINNING WITH THE DELIVERY OF FUEL TO THE REACTOR SITE AND ENDING WITH THE WITHDRAWAL OF FUEL FROM THE REACTOR.
- (2) A GENERAL FORMULA FOR THE UNIT PRICE OF ENRICHED URANIUM WHICH ALLOWS FOR VARIABLE FEED AND TAILS ENRICHMENTS, COSTS OF FEED, CHEMICAL CONVERSION, SEPARATIVE WORK, AND LOSSES IN CONVERSION AND FABRICATION.

367 ISOGEN ISOGEN CALCULATES 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.

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. P. COHEN. INPUT AND OUTPUT ARE SIMPLIFIED AND THE POWER, INVERSE PERIOD, FEEDBACKS, AND PRE-CURSORS 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 TPA 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 AIPOS AIPOS 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

5/70

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 STABILIT GASA DETERMINES THE STABILITY OF ANY PHYSICAL SYSTEM WHOSE MOTION IS DESCRIBABLE BY A SET OF FIRST-ORDER LINEAR DIFFERENTIAL EQUATIONS. IN PARTICULAR GASA EVALUATES THE STABILITY OF A REACTOR DESCRIBED BY THE LINEAR REACTOR KINETICS EQUATIONS WITH TEMPERATURE FEEDBACK, AGAINST PERTURBATIONS ABOUT ANY OPERATING POWER LEVEL. THE PROGRAM WILL ALSO CALCULATE AND PLOT THE TRANSFER FUNCTION BETWEEN ANY STATE VARIABLE OF THE SYSTEM AND A GIVEN EXTERNAL FORCING FUNCTION (SUCH AS AN EXTERNAL REACTIVITY PERTURBATION) OR ANOTHER STATE VARIABLE OF THE SYSTEM.

303 BLOOST6 BLOOST6 COMBINES A REACTOR SPACE-INDEPENDENT KINETICS CODE WITH A TWO-DIMENSIONAL HEAT TRANSFER CODE, AND A TIME-DEPENDENT SPHERICAL GEOMETRY HEAT TRANSFER ROUTINE FOR FUEL PARTICLES. THE CODE IS APPLICABLE TO PROBLEMS FOR WHICH THE SPACE-INDEPENDENT FORM OF THE REACTOR KINETICS EQUATION IS APPLICABLE.

317 GAPOTKIN GAPOTKIN IS A POINT KINETICS CODE THAT SOLVES THE SPACE-INDEPENDENT KINETICS EQUATIONS FOR A VERY GENERAL FORM OF THE REACTIVITY FUNCTION.

E. SPACE-INDEPENDENT KINETICS

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326 AIROS2A AIROS2A SOLVES THE SPACE-INDEPENDENT REACTOR KINETICS EQUATIONS AND PROVIDES FOR THE DETERMINATION OF REACTIVITY BY SOLVING IN ADDITION THE DISCRETIZED EQUATIONS THAT REPRESENT THE SPATIAL HEAT AND MASS TRANSFER MODEL FOR SEVERAL FUEL CHANNELS. IN ADDITION, VARIATION OF THE FILM COEFFICIENT WITH FLOW IS ACCOUNTED FOR ALONG WITH THE PROVISION FOR FLOW DECAY AND AFTERGLOW HEATING. SCRAMS CAN BE INITIATED BY DELAYED SIGNALS FROM INSTRUMENTS THAT SENSE ANY QUANTITY CALCULATED, F.G., POWER, INVERSE PERIOD OR TEMPERATURE. GENERALIZED FEEDBACK EQUATIONS ARE USED TO PROVIDE FLEXIBILITY IN THE MODELS THAT REPRESENT MULTICHANNEL HEAT TRANSFER INCLUDING CONDUCTION AND CONVECTION, ENERGY, PRESSURE AND OTHER PHENOMENON SUCH AS FUEL MELTING, COOLANT BOILING AND VOIDING RUN-OUT. THE REACTIVITY EQUATION IS ALSO GENERALIZED. THE REACTIVITY FEEDBACK COEFFICIENTS CAN BE CONSTANT OR VARY AS THE SQUARE ROOT OR RECIPROCAL OF TEMPERATURE. FURTHERMORE, ANY FEEDBACK VARIABLE CAN BE USED TO INITIATE A REACTIVITY SCRAM, EACH WITH A UNIQUE DELAY TIME. AN INPUT GENERATOR COMPUTES THE CONDUCTION AND CONVECTION COEFFICIENTS FOR AN $N \times M$ NODAL, MULTICHANNEL SYSTEM USING BUILT-IN TABLES OF SPECIFIC HEAT, DENSITY, CONDUCTIVITY AND VISCOSITY FOR THE COMMON FUEL, STRUCTURE AND COOLANT MATERIALS, AND PERFORMS AN INITIAL TEMPERATURE CALCULATION. THE FILM COEFFICIENTS MAY BE SPECIFIED OR CALCULATED USING LYONS EQUATION OR THE DITTUS-BOELTER EQUATION.

363 BLAST BLAST HAS BEEN DEVELOPED TO STUDY ACCIDENT CONDITIONS IN CRITICAL AND SUBCRITICAL THERMAL MULTIPLYING SYSTEMS. THE PROGRAMME COMPUTES THE TIME BEHAVIOUR OF THE THERMAL NEUTRON DENSITY AND THE SYSTEM TEMPERATURE FOLLOWING A STEP CHANGE IN REACTIVITY. THE INTEGRATED THERMAL NEUTRON DENSITY IS ALSO COMPUTED, FROM WHICH THE TOTAL NUMBER OF FISSIONS DURING AN EXCURSION MAY BE OBTAINED.

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153 HATCHET HATCHET IS A MAJOR MODIFICATION OF THE AX1 CODE DESIGNED TO STUDY BURST CHARACTERISTICS OF A SUPERPROMPT CRITICAL, CONCENTRIC SHELL, PULSED REACTOR. IT COMPUTES SPECIFIC ENERGY, TEMPERATURE, PRESSURE, DENSITY AND VELOCITY VARIATIONS AS A FUNCTION OF TIME AND SPACE. THE CODE ALSO COMPUTES REACTIVITY AS A FUNCTION OF INVERSE REACTOR PERIOD, POWER, THE TOTAL AND KINETIC ENERGIES, AND THE POSITION OF THE SHELLS WHICH COMPRISE THE SYSTEM.

F. SPACE-TIME KINETICS, COUPLED NEUTRONICS-HYDRODYNAMICS-
THERMODYNAMICS, AND EXCURSION SIMULATIONS

5/70

174 FORE/FORE2 FORE CALCULATES REACTOR POWER AND TEMPERATURES OF FUEL, COOLANT, CLAD, AND STRUCTURE AS FUNCTIONS OF TIME IN RESPONSE TO A PROGRAMMED REACTIVITY INSERTION SPECIFIED AS A SERIES OF RAMPS. TEMPERATURE PROFILES ARE COMPUTED AT SPECIFIED AXIAL POSITIONS FOR AN AVERAGE CHANNEL AND FOR THE PEAK POWER (CENTRAL) CHANNEL. THE HEAT OF FUSION ACCOMPANYING FUEL MELTING IS TAKEN INTO ACCOUNT. FEEDBACK REACTIVITY MECHANISMS THAT RESPOND TO CHANGES OF TEMPERATURES INCLUDE THE FUEL DOPPLER EFFECT AND THERMAL EXPANSION OF THE CORE (AND AXIAL BLANKET OR REFLECTOR) MATERIALS. FORE2 IS A COUPLED THERMAL HYDRAULICS-POINT KINETICS DIGITAL COMPUTER CODE DESIGNED TO CALCULATE SIGNIFICANT REACTOR PARAMETERS UNDER STEADY-STATE CONDITIONS, OR AS FUNCTIONS OF TIME DURING TRANSIENTS. THE TRANSIENTS MAY RESULT FROM A PROGRAMMED REACTIVITY INSERTION OR A POWER CHANGE. VARIABLE INLET COOLANT FLOW RATE AND TEMPERATURE ARE CONSIDERED. THE CODE CALCULATES THE REACTOR POWER, THE INDIVIDUAL REACTIVITY FEEDBACKS, AND THE TEMPERATURE OF COOLANT, CLADDING, FUEL, STRUCTURE, AND ADDITIONAL MATERIAL FOR UP TO SEVEN AXIAL POSITIONS IN THREE CHANNEL TYPES WHICH REPRESENT RADIAL ZONES OF THE REACTOR. THE HEAT OF FUSION ACCOMPANYING FUEL MELTING, THE LIQUID METAL VOIDING REACTIVITY, AND THE SPATIAL AND THE TIME VARIATION OF THE FUEL CLADDING GAP COEFFICIENT DUE TO CHANGES IN GAP SIZE ARE CONSIDERED.

- 191 AX-TNT AX-TNT SOLVES
- (A) THE COUPLED HYDRODYNAMIC, THERMODYNAMIC AND NEUTRONIC EQUATIONS WHICH DESCRIBE A SPHERICAL, SUPER-PROMPT CRITICAL REACTOR SYSTEM DURING AN EXCURSION,
  - (B) THE COUPLED EQUATIONS OF MOTION, AND IDEAL GAS EQUATION OF STATE FOR THE DETONATION OF A SPHERICAL CHARGE IN A GAS.

274 WIGL2 WIGL2 IS A ONE-DIMENSIONAL TWO-GROUP SPACE-TIME DIFFUSION THEORY PROGRAM WITH ZERO, ONE, OR SIX DELAYED NEUTRON GROUPS. THE PROGRAM WILL TREAT SLAB, CYLINDRICAL, AND SPHERICAL GEOMETRIES AND INCLUDES NON-BOILING HEAT TRANSFER. IT ACCOUNTS FOR XENON FEEDBACK AND FEEDBACK EFFECTS DUE TO FUEL AND COOLANT TEMPERATURE. CONTROL ROD MOTION AND CONTROL SYSTEM FEEDBACK BASED ON TOTAL CORE POWER OR OUTLET COOLANT TEMPERATURE CAN BE SIMULATED. TRANSIENTS MAY BE EXCITED BY PRESCRIBED CHANGES IN INLET COOLANT TEMPERATURE, COOLANT FLOW RATE, OR ROD POSITION.

F. SPACE-TIME KINETICS, COUPLED NEUTRONICS-HYDRODYNAMICS-THERMODYNAMICS, AND EXCURSION SIMULATIONS

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293 MARS MARS PERFORMS A COUPLED NEUTRONICS-HYDRODYNAMICS CALCULATION FOR A FINITE CYLINDER CORE WITH CONCENTRIC REGIONS OF DIFFERENT COMPOSITIONS AND CHARACTERISTICS TO OBTAIN THE TIME-DEPENDENT ENERGY RELEASE THAT RESULTS FROM THE INSERTION OF REACTIVITY ACCORDING TO A PRESCRIBED PROGRAM. THE BASIC USE FOR THIS PROGRAM IS FOUND IN ANALYSIS OF FAST REACTOR CORE COLLAPSE ACCIDENTS. THE REACTIVITY CHANGES DUE TO MATERIAL DISPLACEMENT IS DETERMINED BY THE USE OF PERTURBATION THEORY AND THE PRESSURE GENERATION FOR THE HYDRODYNAMICS CALCULATION IS DETERMINED BY THE THE USE OF AN EXPONENTIAL FORM FOR THE SATURATED VAPOR PRESSURE CURVE. THE DOPPLER EFFECT IS DETERMINED BY THE USE OF A FLEXIBLE $T^{*(-N)}$ FORM WHERE N IS A PARAMETER THAT IS SPECIFIED AT THE TIME OF EXECUTION. THE EXTERNAL REACTIVITY INSERTION CAN BE IN THE FORM OF A STEP, A LINEAR RAMP OR A PARABOLIC RAMP, WITH A LIMIT ON THE AMOUNT OF REACTIVITY WHICH CAN BE INSERTED BEING A DEFINABLE QUANTITY. TABULATED VALUES OF THE POWER AND MATERIAL WORTH DISTRIBUTIONS ARE ACCEPTED AS INPUT. THE CHARACTERISTICS OF EACH REGION (DENSITY, SPECIFIC HEAT, DOPPLER COEFFICIENT, EQUATION OF STATE, GEOMETRIC LIMITS) ARE SPECIFIED INDEPENDENTLY FOR EACH REGION TO PROVIDE FLEXIBILITY IN THE TREATMENT OF CORES OF UNUSUAL CONFIGURATION. THE NEUTRON KINETICS CALCULATIONS ARE DONE WITH A POINT REACTOR MODEL AND DELAYED NEUTRONS ARE USED.

309 TSN THE TIME-DEPENDENT NEUTRON TRANSPORT EQUATION IS SOLVED. ENERGY DEPOSITION IS ALLOWED TO CAUSE VARIATION IN THE NEUTRON CROSS SECTIONS FOR THE CORE REGION, IN THE CORE DENSITY, AND IN CORE HEIGHT. THE RESULT IS A KINETICS CALCULATION INCLUDING SPATIAL DEPENDENCE BOTH IN FEEDBACK EFFECTS AND IN NEUTRON DENSITY. THE RESULTS ARE SUMMARIZED IN A MANNER SIMILAR TO POINT-KINETICS CODES, AND SPATIAL DISTRIBUTIONS ARE ALSO GIVEN. GRAPHICAL SUMMARIES OF THE SIGNIFICANT VARIABLES AND SPATIAL DISTRIBUTIONS ARE GIVEN. IN THE IBM360 VERSION, EITHER THE NEUTRON YIELD FROM FISSION OR THE THICKNESS OF A SPECIFIED ZONE CAN BE CHANGED AS AN INDEPENDENT FUNCTION OF TIME AS SPECIFIED BY THE USER. THIS PROVIDES TWO WAYS OF ALLOWING EXPLICIT REACTIVITY VARIATION WITH TIME.

310 GAKIN THE MULTIGROUP, 1-DIMENSIONAL, TIME-DEPENDENT DIFFUSION THEORY EQUATIONS ARE SOLVED IN SLAB, CYLINDRICAL OR SPHERICAL GEOMETRY WITH DELAYED NEUTRONS TAKEN INTO ACCOUNT. AN ARBITRARY SCATTERING MATRIX IS ALLOWED, TOGETHER WITH A PIECE-WISE, LINEAR, TIME-DEPENDENT, INHOMOGENEOUS SOURCE TERM. FEEDBACK IS AVAILABLE FROM TIME-DEPENDENT CROSS SECTION CHANGES AND BUILDUP IN XENON. THE TIME INTEGRATION IS DIVIDED INTO TIME ZONES WITH UNIQUE FEEDBACK AND SOURCE DATA FOR EACH ZONE.

F. SPACE-TIME KINETICS, COUPLED NEUTRONICS-HYDRODYNAMICS-
THERMODYNAMICS, AND EXCURSION SIMULATIONS

5/70

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 A PROGRAM FOR SOLVING 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.

G. RADIOLOGICAL SAFETY, HAZARD AND ACCIDENT ANALYSIS

5/70

47 CLOUD THE CLOUD PROGRAM CALCULATES THE EXTERNAL GAMMA-RAY DOSE RATE AND TOTAL INTEGRATED DOSE RESULTING FROM THE CONTINUOUS RELEASE OF RADIOACTIVE MATERIALS TO THE ATMOSPHERE.

172 AISITE2/R153 AISITE2 IS LARGELY BASED ON METHODS PROPOSED BY THE AEC IN TID-14844 BUT DIFFERS IN CERTAIN OF THE ASSUMPTIONS AND MODELS. THE CODE AUTOMATICALLY VARIES ANY ONE OF 46 PARAMETERS SUCH AS REACTOR POWER, BUILDING LEAK RATE, IODINE CLEAN-UP RATE, AND HALOGEN FILTER EFFICIENCY, COMPUTING THE EXCLUSION AREA, AND LOW POPULATION BOUNDARY ZONES AS FUNCTIONS OF THAT PARAMETER. THE EDIT INCLUDES DOSE VS. DISTANCE DATA, FRACTIONAL CONTRIBUTION BY ISOTOPE GROUP TO THE INHALATION DOSE, AND CRITICAL DISTANCES PROVIDING BOTH PRINTED AND GRAPHICAL DATA. THREE MODELS ARE AVAILABLE FOR FISSION PRODUCT RELEASE WITH UP TO 4 LEVELS OF CONTAINMENT.

196 CURIE/DOSE/THUNDERHEAD CURIE CALCULATES THE FISSION PRODUCT INVENTORY PRODUCED IN A REACTOR DURING CONSTANT POWER OPERATION AND RELEASES DIFFERENT PERCENTAGES OF THE NOBLE GASES, HALOGENS, AND PARTICULATES TO THE ATMOSPHERE AT REACTOR SHUTDOWN. DOSE CALCULATES THE TOTAL DOSE TO 13 INTERNAL BODY ORGANS RESULTING FROM INHALATION OF THE PASSING RADIOACTIVE CLOUD. THUNDERHEAD CALCULATES THE EXTERNAL CLOUD GAMMA EXPOSURE DOSE FROM THE RELEASED FISSION PRODUCTS.

200 SATURATED BLOWDOWN2 CALCULATION OF LOCAL PRESSURES, MASS FLOW RATES, FLUID QUALITIES, SPECIFIC VOLUMES, TEMPERATURES AND LOCAL HEAT TRANSFER COEFFICIENTS AT WETTED WALLS, DURING BLOWDOWN OF THE REACTOR PRIMARY COOLANT LOOP.

228 PRECON THE PURPOSE OF THE PROGRAM IS TO DETERMINE, FOR A GAS-COOLED REACTOR, THE CONTAINMENT PRESSURE AS A FUNCTION OF TIME, AFTER RUPTURES HAVE BEEN ASSUMED TO OCCUR IN THE PRIMARY SYSTEM OF 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.

265 RSAC RSAC GENERATES A FISSION PRO-
DUCT 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 FLASH2 FLASH2 DETERMINES THE TRANSIENT RESPONSE OF A WATER REACTOR TO A LOSS-OF-COOLANT ACCIDENT OR SEVERE VARIABLE PRESSURE OPERATION.

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 ECCSA1 ECCSA1 PREDICTS THE THERMAL AND HYDRAULIC PERFORMANCE OF REACTOR CORE CHANNELS DURING A LOSS-OF-COOLANT ACCIDENT AND SUBSEQUENT EMERGENCY CORE COOLING INJECTION.

366 CHEMLOC2 CHEMLOC2 IS USED TO COMPUTE THE EXTENT OF CORE HEATING AND METAL-STEAM REACTION FOLLOWING A HYPOTHETICAL LOSS-OF-COOLANT ACCIDENT, INCLUDING EMERGENCY CORE-COOLING FAILURE, IN A WATER-COOLED REACTOR. THE PROGRAM INCLUDES THE EFFECTS OF HEAT PRODUCTION BY DECAY HEATING IN THE FUEL AS WELL AS BY STEAM-METAL CHEMICAL REACTION, HEAT TRANSFER FROM THE CORE TO THE BOTTOM AND TOP GRID-SUPPORT PLATES AND TO THE WALL SURROUNDING THE CORE, AND METHODS OF CALCULATING THE EFFECTS OF CORE MOVEMENT AND MATERIAL TRANSFER ON REACHING SLUMPING TEMPERATURE.

G. RADIOLOGICAL SAFETY, HAZARD AND ACCIDENT ANALYSIS

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369 RELAP2 RELAP2 CALCULATES FLOW, MASS INVENTORIES, TEMPERATURES, PRESSURES, REACTIVITIES, AND TRANSIENT POWER FOR THE PRIMARY SYSTEM OF A WATER REACTOR DURING A REACTIVITY OR A LOSS-OF-COOLANT ACCIDENT. ALTHOUGH RETAINING THE SIMPLIFIED GEOMETRY (THREE VOLUMES PLUS A CORE REGION) OF THE PREVIOUS RELAP PROGRAM, MANY IMPROVEMENTS AND EXTENSIONS HAVE BEEN MADE. THE GEOMETRY CAN BE MADE TO APPROXIMATE EITHER A PRESSURIZED OR A BOILING WATER REACTOR SYSTEM. THE CORE IS TREATED AS A TWO-POINT MODEL FOR POWER GENERATION, HEAT TRANSFER, AND REACTIVITY FEEDBACKS AND AS A ONE-POINT MODEL FOR THE REACTOR KINETICS, PRESSURE BALANCES, AND FLOW BALANCES. ALSO, RELAP2 CAN BE USED FOR REACTOR SYSTEM SAFETY STUDIES INCLUDING LARGE REACTIVITY EXCURSIONS AS WELL AS THE LOSS-OF-COOLANT AND PUMP-FAILURE ACCIDENTS.

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 OF 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 CALCULATION, 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.

267 WATER WATER IS A SUBROUTINE USED TO EXTRACT THERMODYNAMIC AND TRANSPORT PROPERTIES OF LIQUID, VAPOR, AND SUPERCRITICAL WATER BY TABULAR INTERPOLATION OVER THE RANGE OF STATES - 14.5 TO 14,500 PSIA AND 32 TO 1472 DEGREES F. THESE PROPERTIES ARE SPECIFIC VOLUME, SPECIFIC ENTHALPY, DYNAMIC VISCOSITY, AND THERMAL CONDUCTIVITY, TABULATED FOR PRESSURE AND TEMPERATURE CONDITIONS.

272 FIGRO FIGRO CALCULATES THE ONE-DIMENSIONAL STEADY-STATE TEMPERATURE DISTRIBUTION AND TOTAL FUEL SWELLING FOR METAL-CLAD, AXISYMMETRIC, BULK-OXIDE CYLINDRICAL FUEL ELEMENTS. THE FUEL PELLETT 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 FISSIIONING RATE. 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.

286 HOT2 HOT2 IS A DIGITAL COMPUTER PROGRAM TO SOLVE TWO-DIMENSIONAL PLANE AND AXIALLY SYMMETRIC STEADY-STATE AND TRANSIENT HEAT CONDUCTION PROBLEMS WITH DIAGONAL BOUNDARIES AND INTERFACES. MESH SPACING (AT MOST 5000 POINTS) IS COMPLETELY VARIABLE. AS MANY AS 99 REGIONS ARE PERMITTED IN ORDER TO DESCRIBE SPATIAL VARIATIONS IN MATERIAL PROPERTIES, HEAT GENERATION RATES, AND BOUNDARY CONDITIONS. THE HEAT GENERATION RATE AND BOUNDARY CONDITIONS MAY VARY WITH TIME.

294 M0899/HOH BY MAKING CALLS ON A SUBROUTINE CALLED HOH, M0899 EDITS THERMODYNAMIC AND TRANSPORT PROPERTIES OF WATER OVER THE RANGE 14.5 TO 2538 PSIA AND UP TO 608 DEGREES FAHRENHEIT BELOW SATURATION AND 932 DEGREES FAHRENHEIT ABOVE SATURATION.

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 MC219(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.

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 DES THIS SYSTEM HAS BEEN DEVELOPED FOR THE DESIGN AND DEVELOPMENT OF HIGH SPEED TURBO-MACHINERY FOR PUMPING HIGH TEMPERATURE LIQUID METALS. AFTER INITIALIZING THE ANALYSIS AND DESIGN EFFORT BY ESTABLISHING THE PUMP CONDITIONS OF SERVICE THE CODES ARE USED TO DEFINE THE PUMP IMPELLER DESIGN. IN ALL PROGRAMS, REAL FLUID EFFECTS ARE NOT CONSIDERED. THE MACHINING CODE PRODUCES A PAPER TAPE FOR USE IN THE ACTUAL FABRICATION OF THE IMPELLER.

I. DEFORMATION AND STRESS DISTRIBUTION COMPUTATIONS,
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190 WOPEXPRT, WEIGHT OPTIMIZATION THE PURPOSE OF THE CODE IS TO CHOOSE THE LIGHTEST REACTOR RESULTING FROM ALL POSSIBLE COMBINATIONS OVER THE RANGE OF REACTOR INDEPENDENT VARIABLES SPECIFIED. THE ENGINEERING CALCULATIONS FOR EACH REACTOR DESIGN ARE BASED ON A LIQUID-COOLED CYLINDRICAL REACTOR HAVING PIN-TYPE FUEL ELEMENTS. REACTOR CONTROL IS ASSUMED TO BE EFFECTED BY MOVABLE SIDE REFLECTORS SURROUNDING THE CORE. NECESSARY PHYSICS DATA IS INPUT IN THE FORM OF SECOND-DEGREE EQUATIONS AS A FUNCTION OF THE INDEPENDENT VARIABLES.

232 GAZELLES DETERMINATION OF GAS-COOLED FAST REACTOR CORE PROPORTIONS REQUIRED TO SATISFY SPECIFIED DESIGN CONSTRAINTS AND COMPUTATION OF RESULTING PERFORMANCE CHARACTERISTICS.

233 CORE THE REACTOR CORE CONFIGURATION DESIGNED BY THE CORE PROGRAM CONSISTS OF CYLINDRICAL FUEL ELEMENTS ARRANGED ON AN EQUILATERAL PITCH SPACING WITH INTERNAL AND EXTERNAL COOLING. THE FUEL ELEMENT IS COMPOSED OF THREE CONCENTRIC GRAPHITE RINGS, AN INTERNAL COOLANT CHANNEL, AND A SPINE. THE COOLANT CHANNEL IS FORMED BY THE SPINE AND INNER GRAPHITE RING. THE FUEL IS CONTAINED IN THE MIDDLE GRAPHITE RING. CORE WILL DETERMINE THE NUMBER OF FUEL ELEMENTS OF A SPECIFIED DIAMETER AND LENGTH REQUIRED TO SATISFY A GIVEN CENTRAL FUEL TEMPERATURE. IT ALSO ADJUSTS THE PITCH SPACING REQUIRED TO PRODUCE A DESIRED PRESSURE DROP AS WELL AS PROVIDING A SPECIFIED INTERNAL COOLING RATE.

244 CYCLOPS1 CYCLOPS1 IS A PROGRAM FOR THE ANALYSIS OF THERMODYNAMIC SYSTEMS. IT IS A GENERAL PURPOSE PROGRAM THAT PERFORMS A HEAT AND MASS BALANCE FOR THERMODYNAMIC SYSTEMS COMPOSED OF PUMPS, TURBINES, SEPARATORS, HEAT EXCHANGERS, COMPRESSORS AND FLOW THROTTLING DEVICES. THESE COMPONENTS MAY BE CONNECTED IN ANY DESIRED WAY. THE THERMODYNAMIC FLUIDS THAT MAY BE USED ARE WATER, AIR, NITROGEN, AND PARA-HYDROGEN.

250 SAFE-PCRS SAFE-PCRS NUMERICALLY DETERMINES THE STRESS AND STRAIN DISTRIBUTION WITHIN EITHER HOMOGENEOUS OR HETEROGENEOUS THICK-WALLED BODIES OF REVOLUTION. IT IS DESIGNED FOR THE ANALYSIS OF MULTI-MATERIAL AXISYMMETRIC COMPOSITE STRUCTURES SUCH AS REINFORCED AND/OR PRESTRESSED CONCRETE VESSELS. DEFORMATIONS MUST BE WITHIN THE ELASTIC LIMIT OF THE MATERIALS CONSIDERED AND ONLY BODIES OF REVOLUTION SUBJECTED TO AXISYMMETRIC LOADING CAN BE TREATED.

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

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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 SEALSHLL2 (M0110)   THE SEALSHLL2 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.

I. DEFORMATION AND STRESS DISTRIBUTION COMPUTATIONS,
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300 SAFE-CREEP   SAFE-CREEP PERFORMS A VISCO-ELASTIC ANALYSIS OF PLANE OR AXISYMMETRIC COMPOSITE CONCRETE STRUCTURES WITH AGE- AND TEMPERATURE-DEPENDENT CREEP DATA.

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.

329 MC457(PIPE)   PIPE PERFORMS AN ELASTIC STRESS ANALYSIS OF A 3-DIMENSIONAL PIPING STRUCTURE WITH THERMAL STRESSES, REDUNDANT LOOPS, AND CONCENTRATED LOADS.

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.

337 STEM   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.

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.

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

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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.

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

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383 M0266 M0266 COMPUTES THE DYNAMIC SHOCK FORCES AND MODAL FREQUENCIES ACTING ON A LUMPED MASS, LINEAR ELASTIC MODEL OF A STRUCTURE SUBJECTED TO SHOCK SPECTRUM INPUTS. THE MODEL EMPLOYED IS A COLLECTION OF LUMPED MASSES CONNECTED BY WEIGHTLESS FLEXIBLE ELEMENTS. IF THE ORIGINAL STRUCTURE IS NOT STATICALLY DETERMINATE, REDUNDANT FORCES MUST BE INTRODUCED TO ENSURE A PRIMARY STRUCTURE THAT IS.

45 GRACE1 GRACE1 IS A MULTIGROUP, MULTI-REGION, 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 LIPRECANI LIPRECANI 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.

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.

K. TOTAL SYSTEMS ANALYSIS

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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.

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

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 SEALSHELL2 (ACC ABSTRACT 282) INPUT DATA.

159 MOMUS MOMUS IS THE PROGRAM USED TO CONSTRUCT AND MAINTAIN THE NEUTRON CROSS SECTION MASTER TAPE DEVELOPED UNDER THE ATOMICS INTERNATIONAL AUTOMATED CROSS SECTION PROGRAM. THE LIBRARY CONTAINS 21 ELEMENTS WITH DATA FOR 11 PARAMETERS IN THE RANGE 0.001 EV TO 10 MEV. MOMUS WILL PERFORM THE FOLLOWING TASKS -

- (A) MAKE THE BINARY MASTER TAPE FROM CARDS,
- (B) LIST SELECTED ELEMENTS,
- (C) UPDATE - ADD, CORRECT AND REPLACE ANY DATA,
- (D) MAKE A SHORT TAPE CONTAINING SELECTED ELEMENTS,
- (E) PROVIDE GRAPHICAL DISPLAY OF SELECTED DATA, AND
- (F) PUNCH MICROSCOPIC DATA.

181 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

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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.

351 ECSIL ECSIL (EXPERIMENTAL CROSS SEC-
TION 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 DESIG-
NATOR, 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 BIB-
LIOGRAPHIC FILE - THE COMPLETE BIBLIOGRAPHIC CITATION, THE LABORA-
TORY 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, CORREC-
TIONS, ETC.) ARE RECORDED HERE. SUPPLEMENTARY REFERENCES ARE
CARRIED ALONG AS SEE ALSOS.

375 SCORE2 SCORE IS AN INTERACTIVE NEU-
TRON CROSS SECTION EVALUATION SYSTEM.

M. DATA MANAGEMENT

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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.

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207 CROSSPLOT/CROSSPLOT DATA TAPE AUTOMATIC PLOTS ARE GENERATED
FROM NEUTRON CROSS SECTION DATA.

239 CPS CPS PROVIDES A GRAPHICAL
MEANS OF COMPARING EXPERIMENTAL CROSS SECTION VALUES OBTAINED
FROM THE SCISRS LIBRARY TAPE WITH AN OPTION TO INCLUDE READING IN
NEW EXPERIMENTAL OR CALCULATED VALUES.

D. EXPERIMENTAL DATA PROCESSING

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154 CROC90 THE CROC90 CODE WAS DEVELOPED FOR USE IN THE DATA REDUCTION OF OUT-OF-PILE FLUID FLOW EXPERIMENTS ON THE ML-1 FUEL ELEMENTS. THE CODE IS SPECIFICALLY DESIGNED TO EVALUATE FRICTION FACTORS, ENTRANCE AND EXIT COEFFICIENTS, AND ORIFICE CALIBRATIONS FROM HYDRODYNAMIC DATA OBTAINED FROM SINGLE PHASE EXPERIMENTAL FLUID FLOW TESTS IN AXIAL FLOW DUCTS.

164 BURP1 THE PROGRAM CALCULATES ABSOLUTE TOTAL EFFICIENCY FOR MONOENERGETIC GAMMA RAY INTERACTIONS IN CYLINDRICAL SCINTILLATION DETECTORS. THE ABSOLUTE TOTAL EFFICIENCY IS DEFINED AS THE FRACTION OF SOURCE GAMMAS WHICH INTERACT AT LEAST ONCE WITH THE CRYSTAL DETECTOR. CALCULATIONS ARE MADE FOR THE POINT ISOTROPIC SOURCE LOCATED ALONG THE AXIS OF SYMMETRY FOR SOLID CYLINDRICAL CRYSTALS, WITH OR WITHOUT A COAXIAL CYLINDRICAL WELL.

165 BURP2 THE PROGRAM CALCULATES THE ABSOLUTE TOTAL EFFICIENCY FOR MONOENERGETIC GAMMA RAYS INTERACTING IN CYLINDRICAL SCINTILLATION DETECTORS. THE ABSOLUTE TOTAL EFFICIENCY IS DEFINED AS THE FRACTION OF SOURCE GAMMAS WHICH INTERACT AT LEAST ONCE WITH THE CRYSTAL DETECTOR. CALCULATIONS ARE MADE FOR HOMOGENEOUS, ISOTROPIC CIRCULAR DISK OR CYLINDRICAL VOLUME SOURCES. SOURCES MUST BE SYMMETRICAL WITH THE AXIS OF SYMMETRY FOR SOLID CYLINDRICAL CRYSTALS, WITH OR WITHOUT A COAXIAL CYLINDRICAL WELL. SOURCE ABSORPTION AND SCATTERING MAY BE INCLUDED FOR VOLUME SOURCES.

166 BURP3 THE PROGRAM CALCULATES ABSOLUTE TOTAL EFFICIENCY FOR MONOENERGETIC GAMMA RAY INTERACTIONS IN CYLINDRICAL SCINTILLATION DETECTORS. THE ABSOLUTE TOTAL EFFICIENCY IS DEFINED AS THE FRACTION OF SOURCE GAMMAS WHICH INTERACT AT LEAST ONCE WITH THE CRYSTAL DETECTOR. CALCULATIONS ARE MADE FOR POINT ISOTROPIC SOURCES LOCATED BOTH ON AND OFF THE AXIS OF SYMMETRY FOR SOLID CYLINDRICAL CRYSTALS, WITH OR WITHOUT A COAXIAL CYLINDRICAL WELL. THE EFFICIENCIES FOR POINTS LOCATED AT SPECIFIED RADIAL OFF-AXIS POSITIONS, FOR A SINGLE AXIAL SOURCE-CRYSTAL DISTANCE, ARE NORMALIZED TO THE ON-AXIS EFFICIENCY FOR THE SAME AXIAL DISTANCE. THE ABSOLUTE EFFICIENCY FOR THE ON-AXIS POINT IS GIVEN.

O. EXPERIMENTAL DATA PROCESSING

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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 REDU 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.

D. EXPERIMENTAL DATA PROCESSING

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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
ANALYZE GAMMA RAY SPECTRA.

TOAD IS USED TO PROCESS AND

43 CURFIT CURFIT IS A COMPOSITE PROGRAM FOR FITTING EXPERIMENTAL DATA POINTS WITH DIFFERENT TYPES OF COMMON ANALYTIC CURVES. THERE ARE AT PRESENT FIVE FITS AVAILABLE -

- (1) POLYNOMIAL $Y = \text{SUMMATION OVER } I \text{ OF } A(I) * (X^{**}(I))$
- (2) EXPONENTIAL $Y = A * \text{EXP}(BX)$
- (3) COSINE $Y = A * \text{COS}(B(X+C))$
- (4) SERIES OF CUBICS $Y = A(J) + B(J) * X + C(J) * (X^{**}2) + D(J) * (X^{**}3)$
- (5) FOURIER SERIES

62 LOS ALAMOS LEAST SQUARES THIS PROGRAM PERFORMS LEAST SQUARES FITTING OF LINEAR OR NONLINEAR FUNCTIONS IN SEVERAL INDEPENDENT VARIABLES. THE PROGRAM WILL DETERMINE AN ESTIMATE OF A IN THE FUNCTION $Y=F(X,A)$ BY MINIMIZING THE SUM OF SQUARES. IN THE FUNCTION, X IS A VECTOR OF OBSERVED VARIABLES AND A IS A VECTOR OF PARAMETERS TO BE DETERMINED. IN THIS CONTEXT, A LINEAR FUNCTION IS ONE WHOSE PARTIAL DERIVATIVES WITH RESPECT TO THE ELEMENTS OF A ARE ALL INDEPENDENT OF A. A NONLINEAR FUNCTION HAS AT LEAST ONE OF THE ELEMENTS OF A APPEARING IN AT LEAST ONE OF THESE PARTIAL DERIVATIVES.

186 LAG1/LAG2 LAG IS A SINGLE PASS LOAD AND GO ASSEMBLER DESIGNED TO ACCEPT IBM7090 FLOCO II INSTRUCTIONS.

321 EXPALS THIS PROGRAM FITS BY LEAST SQUARES A FUNCTION WHICH IS A LINEAR COMBINATION OF REAL EXPONENTIAL DECAY FUNCTIONS. THE FUNCTION IS

$$Y(K) = \text{SUMMATION OVER } J \text{ OF } A(J) * \text{EXP}(-\text{LAMBDA}(J) * K).$$

VALUES OF THE INDEPENDENT VARIABLE (K) AND THE DEPENDENT VARIABLE Y(K) ARE SPECIFIED AS INPUT DATA. WEIGHTS MAY BE SPECIFIED AS INPUT INFORMATION OR SET BY THE PROGRAM ($W(K) = 1/Y(K)$).

324 FRANTIC FRANTIC IS DESIGNED TO PROCESS RAW COUNTING DATA AND TO FIT IN THE LEAST SQUARES SENSE THESE DATA TO THE MULTIPLE EXPONENTIAL GROWTH AND DECAY EQUATIONS. THE PROGRAM CAN BE USED FOR SUMS OF EXPONENTIALS WITH POSITIVE, NEGATIVE, OR ZERO EXPONENTS AND POSITIVE OR NEGATIVE COEFFICIENTS.

327 DAFT1 DAFT1 IS A PROGRAM FOR WEIGHTED LEAST SQUARES FITTING OF 0.0253 EV NEUTRON DATA FOR 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.

P. GENERAL MATHEMATICAL AND COMPUTING SYSTEM ROUTINES

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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.

Z. NUCLEAR DATA

5/70

356 GAF/GAR DATA TAPES USED IN GG 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.

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AILMOE, X-SECTION CALC ELASTIC SCAT RESONANCES	AI	7094	F+FAP	RS	PL	T B \$		147
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AIM AND FOG CODES	BHSC	360	F4	RS	P	C\$	PERT, 1-D PERTURBATION FOR	30
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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	XT	C\$	MACH1, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	262
ANL	3600	F36	RSBP			A\$	MISH-MASH, RESONANCE INTEGRAL CALC HOMOGENEOUS	214
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BAPL 6600 F+COM	RS P XT I\$ GAPL3, INELASTIC LARGE DEFLECTION STRESS STUDY	R397
BAPL 6600 F4	RS XT B\$ M0807, 2-D DIFFUSION ABSORPTION REMOVAL X-SECS	R280
BAPL 6600 F4	RS XT C\$ M0648, 1-D SLAB TRANSPORT WITH SLOWING DOWN	R342
BAPL 6600 F4	RS XT H\$ WATER, STEAM TABLES 14.5-14,500PSIA 32-472DEGF	R267
BAPL 6600 F4	RS XT I\$ CYGRO2, STRESS ANALYSIS CYL FUEL ELEMENT	R266
BAPL 6600 F4	RS P D\$ CINDER, M0102, POINT DEPLETION FISSION PRODUCT	313
BAPL 6600 F4	RS P T D\$ JITER, FLUCTUATION EXPERIMENT ANALYSIS	R394
BAPL 6600 F4	RS P XT A\$ PUN1, UNRESOLVED RESONANCE INTEGRALS X-SECS	R359
BAPL 6600 F4	RS P XT A\$ SUMOR, S-WAVE NEUTRON X-SECTION CALCULATION	R399
BAPL 6600 F4	RS P XT B\$ RESQ2, RESQ0, DBF1, RESONANCE INTEGRAL HEX CELL	R285
BAPL 6600 F4	RS P XT C\$ RE21, FEW-GP DISCRETE ORDINATES SLAB GEOMETRY	R398
BAPL 6600 F4	RS P XT F\$ NOWIG, 1-D 2-GP KINETICS TEMPERATURE FEEDBACK	R371
BAPL 6600 F4	RS P XT F\$ TWIGL, 2-D 2-GP SPACE-TIME DIFFUSION FEEDBACK	R338
BAPL 6600 F4	RS P XT F\$ WIGL2, 1-D 2-GP SPACE-TIME DIFFUSION 3-GEOM	R274
BAPL 6600 F4	RS P XT G\$ FLASH2, LOSS-OF-COOLANT ACCIDENT ANALYSIS	R295
BAPL 6600 F4	RS P XT G\$ M0555, ACT1, LOSS-OF-COOLANT ACCIDENT ANALYSIS	R284
BAPL 6600 F4	RS P XT H\$ FIGRO, LSBR FUEL SWELLING TEMPERATURE STUDY	R272
BAPL 6600 F4	RS P XT H\$ FLOT1, M0219, PWR FLOW TRANSIENT ANALYSIS	R331
BAPL 6600 F4	RS P XT H\$ HOT2, 2-D TRANSIENT HEAT CONDUCTION PROGRAM	R286
BAPL 6600 F4	RS P XT H\$ M0899, HOH, STEAM TABLES 14.5-2538 PSIA	R294
BAPL 6600 F4	RS P XT H\$ TOPS, TRANSIENT THERMODYNAMICS OF PRESSURIZERS	R348
BAPL 6600 F4	RS P XT H\$ WASP, WATER AND STEAM THERMODYNAMIC PROPERTIES	R396
BAPL 6600 F4	RS P XT I\$ M0266, LINEAR ELASTIC STRUCTURAL DYNAMICS	R383
BAPL 6600 F4	RS P XT I\$ M0457, PIPE, ELASTIC STRESS OF PIPING SYSTEM	R329
BAPL 6600 F4	RS P XT I\$ M0552, DYNAMIC ANALYSIS LINEAR ELASTIC SYSTEMS	R283

BAPL 6600 F4	RS P XT I\$	SEALSHL2, SHELL STRESS ANALYSIS AXISYM LOAD	R282
BAPL 6600 F4	RS P XT J\$	M0756,LETO, 1-D SLAB GAMMA-RAY TRANSPORT	R343
BAPL 6600 F4	RS P XT L\$	BL47, DRAFTING TOOL TO PLOT PLANE STRUCTURES	R373
BAPL 6600 F4	RS P XT P\$	DAFT1, LEAST SQUARES FIT FISSILE NUCLIDE DATA	R327
BC 625 F4	RS T C\$	EXTERMINATOP2, 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 T C\$	DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	209
BC 625 F4	RS P XT R\$	GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV	185
BCL 6400 F4	RS P T G\$	ECCSA1, LOSS-OF-COOLANT + EMERGENCY COOLING	330
BCL 6400 F4	RS P T G\$	NURLOC-1.0, LOSS-OF-COOLANT THERMAL ANALYSIS	328
BEAMS ANL 3600 F36	SRP I\$	BOW2, DEFLECTION CALCULATION PARALLEL	365
BEAMS KAPL 6600 F4	RS P I\$	STEM, MATRIX GENERATION FOR A SYSTEM OF	R337
BE21, FEW-GP DISCRETE ORDINATES SLAB GEOMETRY	BAPL 6600 F4	RS P XT C \$	R398
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 GAFGAR ENDF/B DATA TAPES	GGA 1108	356
BISYN, 2-D MULTI-GP DIFFUSION SYNTHESIS CALC	NED 635 F4	RS PL T C \$	287
BLAST, REACTOR KINETICS TEMPERATURE DIST STUDY	AER 360 F4	RS P F \$	363
BLOOST5, POINT-KINETICS WITH 2-D HEAT TRANSFER	GGA 7044 F4	RS T H \$	205
BLOOST6, COMBINED KINETICS 2-D HEAT TRANSFER	GGA 1108 F4	RS P T F \$	303
BLOWDOWN - EXCURSION ANALYSIS INC 7044 F4	RS P T G\$	RELAP2, 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
BLOWDOWN PRESSURE TEMPERATURE HISTORY KE 7094 F2	RSBP T H\$	PTH1,	155
BLOWDOWN2, BLOWDOWN ANALYSIS LOFT KE 7094 F+MAP	RSBP T G\$	SATURATED	200
BL47, DRAFTING TOOL TO PLOT PLANE STRUCTURES	BAPL 6600 F4	RS P XT L \$	R373
BNL 6600 F4	RS P A\$	AVERAGE, UNRESOLVED REGION AVERAGE X-SEC CALC	376
BNL 6600 F4	RS P A\$	SIGPLOT, RESOLVED MULTILEVEL B-W X-SEC CALC	377
BNL 6600 F4	RS P T F\$	NOAH, 1-D ONE-GP SPACE-TIME DIFFUSION FEEDBACK	405
BNL 7090 F+MAP	RS P T M\$	DESR, DATA FILE SERVICE ROUTINES ENDF TAPES	236
BNL 7094 F4	RS P A\$	AVERAGE, UNRESOLVED REGION AVERAGE X-SEC CALC	376
BNL 7094 F4	RS P A\$	SIGPLOT, RESOLVED MULTILEVEL B-W X-SEC CALC	377
BNL-DP 360 F4	RS PLXT B\$	HAMMER, CRITICAL EXPERIMENT ANALYSIS SYSTEM	277
BNL-DP 7090 F2	RS PLXT B\$	HAMMER, CRITICAL EXPERIMENT ANALYSIS SYSTEM	277
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 XT R\$	IDX, 1-D DIFFUSION FAST X-SECTION GENERATION	374
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
BNWL 1108 F4	RS P T B\$	ETOX, MULTIGROUP CONSTANTS FROM ENDF/B FOR IDX	388
BODIES GGA 1108 F4	RS P I\$	SAFE-PLANE, PLANE STRESS ANALYSIS, 2-D	252
BOUNCF, FLUX DIST IN MULTI-PIN FUEL ELEMENT	AGC 7090 F2	RS P B \$	237
BOW2, DEFLECTION CALCULATION PARALLEL BEAMS	ANL 3600 F36	SRP I \$	365
BREEDERS APD 635 F4	RS P D\$	RAPFU, FUEL CYCLE PARAMETERS FAST	372
BUCKLING CYL FUEL ELEMENTS AER 360 F4	S P B\$	WFLWING, MATERIAL	362
BUNDLES LASL 7094 F2	RSPP H\$	AXFLU, HEAT TRANSFER MOLTEN FUEL TUBE	182
BUNDLES LASL 7094 F2	RSRP H\$	AXTHM, HEAT TRANSFER SOLID FUEL TUBE	183
BURNUP ANALYSIS GEV 635 F4	RS P T D\$	BURNUP, HEAVY ELEMENT ISOTOPIC	311
BURNUP CYL LATTICE WAPD 7094 F+MAP	RS PLXT B\$	LASER, SPECTRUM CALC WITH	249
BURNUP POWER DISTRIBUTION SEARCH GGA 1108 F4	RS P T C\$	GASP7, 1-D	319
BURNUP RZ GEOMETRY GGA 7090 F+MAP	RSBP T D\$	DOB, 2-D FEW-GP DIFFUSION	99
BURNUP, HEAVY ELEMENT ISOTOPIC BURNUP ANALYSIS GEV 635 F4	RS P T D \$		311
BURP1, DETECTOR EFFICIENCY POINT SOURCE	UM 7090 MAD	RSB 0 \$	164
BURP2, DETECTOR EFFICIENCY DISK SOURCE	UM 7090 MAD	RSB 0 \$	165
BURP3, DETECTOR EFFICIENCY POINT SOURCE	UM 7090 MAD	RSB 0 \$	166
BURP4, GAMMA-RAY PHOTOFRACITION SOLID CRYSTAL	UM 7090 MAD	RSB 0 \$	169
BURP5, GAMMA-RAY PHOTOFRACITION WELL CRYSTAL	UM 7090 MAD	RSB 0 \$	170
BW 2000 F4	RS A\$	STRIP, RESOLVED RESONANCE INTEGRAL CALCULATION	305

CAESAR4, LIRLST, 1-D MULTI-GP DIFFUSION + LIB	AI	360 F4	RSBPLXT C	\$	270
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 FNG 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	F\$ 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\$ FNG, 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 PLXT	B\$ GAM1, FAST NEUTRON SPECTRUM X-SECTION CALC		33
CDC	1604 F63	RS PLXT	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
CELL	ANL 3600 F36	RSBP	XT B\$ RABBLE, WLIB, FLAT, RESONANCE ABSORPTION,		281
CELL	ANL 3600 F36	RSBP	XT B\$ RIFF-RAFF, RESONANCE INTEGRAL CALC 2-REG		213
CELL	RAPL 6600 F4	RS P	XT B\$ RESQ2, RESQ0, DBF1, RESONANCE INTEGRAL HEX	R	285
CELL CALCULATION	AI	360 F4	RS P	XT B\$ HWOCR-SAFF, 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
CENTRIFUGAL PUMP IMPELLER DESIGN STUDY	PW	1604 F63	RS P	T I\$ PIP,	187
CHAD, LEGENDRE COEF CALC FOR ANGULAR DIST DATA	AI	7094 F+MAP	RS P	A \$	215
CHAIN ANALYSIS	ORNL 1604 F63	RS P	D\$ ISOCRUNCH, REACTION DECAY		180
CHAIN ANALYSIS	ORNL 7090 F2	RS P	D\$ ISOCRUNCH, REACTION DECAY		180
CHAIN EQUATIONS	ORNL 7090 F2	RSBP	D\$ NUCY, SOLUTION OF NUCLIDE		134
CHECKER, CRECT, DAMMET, PLOTFB, SLAV3, ENDF/B PROC	NCSC 6600 F4	RS	T M \$		384
CHEMLOC2, CORE HEATING CLADDING-STEAM REACTION	ANL 3600 F36	RSBP	G \$		366
CHORD DIST FUNCT	AEG 7090 F2	RS	B\$ DANCORFF JR, MODERATOR SPACE		150
CINCAS, NUCLEAR FUEL CYCLE COST AND ECONOMICS	COMM 360 F4	RS P	T D \$		354
CINDER, MO102, POINT DEPLETION FISSION PRODUCT	BAPL 6600 F4	RS P	D \$		313
CITATION, 1,2,3-D DIFFUSION DEPLETION MULTIGP	ORNL 360 F4	RS P	XT K \$		387
CLADDING-STEAM REACTION	ANL 3600 F36	RSBP	G\$ CHEMLOC2, CORE HEATING		366
CLIP, FORM OR THREDES LIBRARY UTILITY ROUTINE	AI	360 F4	RSB L T M \$		271
CLOUD	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
CLOUD	DP	360 F4	RS P	G\$ CLOUD, GAMMA-RAY DOSE RATE FROM A	47
CLOUD, GAMMA-RAY DOSE RATE FROM A CLOUD	AI	7090 F2	RS P	G \$	47
CLOUD, GAMMA-RAY DOSE RATE FROM A CLOUD	CDC	1604 F63	RS P	G \$	47
CLOUD, GAMMA-RAY DOSE RATE FROM A CLOUD	DP	360 F4	RS P	G \$	47
CMPXMAT, TRANSFER FUNCTION EVALUATION	PW	1604 F63	RS P	E \$	188
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+MAP	RS P	T B\$ SOPHIST1/2/5, MULTI-GP TRANSFER		160
COHBE, COHERENT INELASTIC SCATTERING LAW CALC	GGA 1108 F4	RS P	X A\$ COHBE,		385
COHERENT INELASTIC SCATTERING LAW CALC	GGA 1108 F4	RS P	X A\$ COHBE,		385
COINC, COINCIDENCE COUNTING DATA REDUCTION	ANL 3600 F63	RSBP	D \$		248
COINCIDENCE COUNTING DATA REDUCTION	ANL 3600 F63	RSBP	D\$ COINC,		248
COLLISION PROBABILITIES	MC ORNL 360 F+BAL	RS P	T B\$ RAFFLE, 1ST FLIGHT		392
COLLISION PROBABILITIES	MC ORNL 7090 F+MAP	RS P	T B\$ RAFFLE, 1ST FLIGHT		392
COMBCO, COMBINED B-W MULTI-LEVEL CONVOLUTION	PPCO 7040 F4	RS P	A \$		203
COMM	360 F4	RS P	T D\$ CINCAS, NUCLEAR FUEL CYCLE COST AND ECONOMICS		354

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
COMPOUND NUCLEUS X-SECTION CALC	ANL 3600 F63	RSBP	A\$ NEARREX,	171
COMPUTER-PRODUCED WIRING LISTS UHTREX	LASL 7090 F2	RS P	I\$ WIREX,	315
CONCRETE	GGA 1108 F4	RS P	I\$ SAFE-CREEP, VISCOELASTIC ANALYSIS	300
CONDUCTION	PPCO 7044 F+MAP	RS P	T H\$ TOODEE, 2-D TIME-DEPENDENT HEAT	349
CONDUCTION LUMPED MASS	LASL 7030 F4	RS	T H\$ RATH, 2- OR 3-D HEAT	242
CONDUCTION LUMPED MASS	LASL 7094 FAP	RS P	T H\$ RATH, 2- OR 3-D HEAT	242
CONDUCTION PROGRAM	BAPL 6600 F4	RS P	XT H\$ HOT2, 2-D TRANSIENT HEAT	R286
CONEC, COUPLED NEUTRONICS-HYDRODYNAMICS SPHERE	LRL 7090 F2	RS P	F \$	129
CONFIGURATION FUEL TEMPERATURE CODE	GGA 7044 F4	RS	I\$ CORE, CORE	233
CONSTANT CALC	AGC 7090 F2	RSBP	L\$ AGN-GAM, FAST SPECTRUM MULTI-GP	204
CONSTANT CALC FROM TOR OUTPUT DATA	LASL 6600 F4	RS P	T R\$ GLEN, GROUP	361
CONSTANT CALC 0 TO 10 MEV	BC 625 F4	RS P	XT R\$ GAMTEC2, MULTI-GP	185
CONSTANT CALC 0 TO 10 MEV	BNW 1107 F4	RS PL	T R\$ GAMTEC2, MULTI-GP	185
CONSTANT CALC 0 TO 10 MEV	PNW 7090 F+MAP	RS PL	T R\$ GAMTEC2, MULTI-GP	185
CONSTANTS	ORNL 360 F4	RS PL	XT B\$ XSDRN, DISCRETE ORDINATE MULTIGROUP	393
CONSTANTS FOR DSN TDC	PW 1604 F63	RS P	L\$ SNC, CALCULATION OF SN	189
CONSTANTS FROM ENDF/B FOR 1DX BNWL	1108 F4	RS P	T B\$ ETOX, MULTIGROUP	388
CONTAINMENT PRESSURE POST RUPTURE	GGA 7044 F4	RS	XT G\$ PRECON, HTGR	228
CONTEMPT, LOSS-OF-COOLANT ACCIDENT ANALYSIS	PPCO 7040 F+MAP	RS P	T G \$	297
CONVERSION	APDA 3600 ASAF4	RS P	T M\$ ETOE, ENDF/B TO MC**2 DATA	350
CONVOLUTION	PPCO 7040 F4	RS P	A\$ COMBCO, COMBINED B-W MULTI-LEVEL	203
COOLING	BCL 6400 F4	RS P	T G\$ ECCSA1, LOSS-OF-COOLANT + EMERGENCY	330
CORE CONFIGURATION FUEL TEMPERATURE CODE	GGA 7044 F4	RS	I\$ CORE,	233
CORE HEATING CLADDING-STEAM REACTION	ANL 3600 F36	RSBP	G\$ CHEMLOC2,	366
CORE SUPPORT STRESS ANALYSIS	ANL 3600 F36	RS P	T I\$ SUPORAN, REACTOR	357
CORE THERMAL DESIGN STUDY	GGA 7044 F4	RS P	I\$ GAZELLE5, GAS-COOLED	232
CORE, CORE CONFIGURATION FUEL TEMPERATURE CODE	GGA 7044 F4	RS	I \$	233
CORGAM, UNFOLDING OF COMPLEX GAMMA-RAY SPECTRA KSUN	360 F4	RS P	O \$	390
COST ANALYSIS	AI 7090 F2	RS P	D\$ AIMFIRE, URANIUM FUEL CYCLE	55
COST AND ECONOMICS	COMM 360 F4	RS P	T D\$ CINCAS, NUCLEAR FUEL CYCLE	354
COSTS	ORNL 1604 F63	RS P	D\$ POWERCO, NUCLEAR STATION ELECTRICITY	340
COSTS	GGA 7044 F4	RS P	T D\$ STMGFN, STEAM GENERATOR DESIGN CRITERIA	227
COSTS PERFORMANCE DATA	KE 7090 F2	RSBP	D\$ NPRFCCP, FUEL CYCLE	146
COSTS PERFORMANCE STUDY	GGA 7044 F4	RS P	D\$ WAMPUM, FUEL CYCLE	224
COUNTING DATA REDUCTION	ANL 3600 F63	RSBP	O\$ COINC, COINCIDENCE	248
COUPLED NEUTRON-HYDRODYNAMICS	APDA 7094 F2	RS P	F\$ WEAK EXPLOSION,	145
COUPLED NEUTRONICS-HYDRODYNAMICS CODE	AGC 7090 F2	RSB	F\$ HATCHET,	153
COUPLED NEUTRONICS-HYDRODYNAMICS SPH	PW 1604 F63	RS P	F\$ AX-TNT,	191
COUPLED NEUTRONICS-HYDRODYNAMICS SPHERE	CDC 3600 F63	RSBP	F\$ AX1,	102
COUPLED NEUTRONICS-HYDRODYNAMICS SPHERE	LRL 7090 F2	RS P	F\$ CONEC,	129
COUPLED-CHANNEL X-SEC EVALUATION	ORNL 1604 F63	RS P	T A\$ JUPITOR1,	308
CPS, SC4020 PLOTS FROM SCISRS X-SECTION TAPES	WANL 7094 F2	RSB	T N \$	239
CRAM, 1-D AND 2-D MULTI-GP DIFFUSION PROGRAM	AAEC 360 F+BAL	RS P	T C \$	103
CRAM, 1-D AND 2-D MULTI-GP DIFFUSION PROGRAM	UK-R 7090 F+MAP	RSBP	T C \$	103
CRECT, DAMMET, PLOTFR, SLAV3, ENDF/B PROC NCSC	6600 F4	RS	T M\$ CHECKFR,	384
CRITERIA COSTS	GGA 7044 F4	RS P	T D\$ STMGFN, STEAM GENERATOR DESIGN	227
CRITICAL EXPERIMENT ANALYSIS SYSTEM	BNL-DP 360 F4	RS PL	XT B\$ HAMMER,	277
CRITICAL EXPERIMENT ANALYSIS SYSTEM	BNL-DP 7090 F2	RS PL	XT B\$ HAMMER,	277
CROCK, SPACE POWER PLANT DESIGN OPTIMIZATION	AI 7090 F2	RS	I \$	112
CROC90, ML-1 FLUID FLOW EXPERIMENT ANALYSIS	AGC 7090 F2	RS P	O \$	154
CROSS SECTIONS	LASL 6600 F4	RS P	N\$ LARCA, FLUX-WEIGHTING OF DTF4	409
CROSSPLOT, SC4020 PLOTS FROM X-SECTION TAPES	GGA 7044 F4	RSBP	T N \$	207
CRYSTAL	UM 7090 MAD	RSB	O\$ BURP5, GAMMA-RAY PHOTOFRACATION WELL	170
CRYSTAL	UM 7090 MAD	RSB	O\$ BURP4, GAMMA-RAY PHOTOFRACATION SOLID	169
CRYSTALLINE MATERIALS	LASL 6600 F4	RS P	T A\$ TOR, THERMAL SCATTERING	360
CRYSTALLINE SCATTERING KERNEL CALC	GGA 7090 F2	RS	T A\$ SUMMIT,	56
CSP1, SN X-SECTION LIBRARY TAPE PREPARATION	PW 1604 F63	RS	L \$	194
CSP2A, SN X-SECTION LIBRARY TAPE PREPARATION	PW 1604 F63	RS	L \$	193
CURFIT, CURVE FITTING EXPERIMENTAL DATA POINTS	KAPL 6600 F+ASC	RS P	T P \$ R	43
CURIE, DOSE, THUNDERHEAD, EXTERNAL+INTERNAL DOSE	AI 7094 F+MAP	RS PL	T G \$	196
CURVE FITTING	LASL 7094 F4	RS	T P\$ LASL LEAST SQUARES, GENERAL	62
CURVE FITTING EXPERIMENTAL DATA POINTS	KAPL 6600 F+ASC	RS P	T P\$ CURFIT,	R 43

CURVE PLOT KAPL 6600 F+ASC RS P T P\$ SNEQ, NONLINEAR ALGEBRAIC EQN SOLN R364
 CURVES LRL 7094 F2 RS P P\$ EXPALS, LEAST SQUARES EXPONENTIAL DECAY 321
 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 COMM 360 F4 RS P T D\$ CINCAS, NUCLEAR FUEL 354
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EDIT KAPL 6600 F+ASC	RS P	T L\$ DATATRAN 2-D GEOMETRY INPUT, PREPARATION,	R406		
EDIT REACTION RATES	UK-W	7090 F2	RS	N\$ WED, W-DSN OUTPUT TAPE	133
EFFECTIVE X-SECTION CALC FROM DSN OUTPUT	PW	1604 LAG1	PS 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 PROBLEM FOR VIBRATING SYSTEMS	KAPL	6600 F4	RS P	T I\$ GEM,	R344
ELASTIC SCAT RESONANCES	AI	360 F4	RS PLXT	B\$ AILMOE, X-SECTION CALC	147
ELASTIC SCAT RESONANCES	AI	7094 F+FAP	RS PL T	B\$ AILMOE, X-SECTION CALC	147
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	XT I\$ M0457, PIPE,	R329
ELASTIC STRUCTURAL DYNAMICS	BAPL	6600 F4	RS P	XT I\$ M0266, LINEAR	R383
ELASTIC SYSTEMS	BAPL	6600 F4	RS P	XT I\$ M0552, DYNAMIC ANALYSIS LINEAR	R283
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
EMERGENCY COOLING	BCL	6400 F4	RS P	T G\$ ECCSA1, LOSS-OF-COOLANT +	330
ENDF MULTIGROUP X-SECTION CALCULATION	ANL	3600 F36	RS P	T B\$ MC**2,	355
ENDF TAPES	BNL	7090 F+FAP	RS P	T M\$ DFSR, DATA FILE SERVICE ROUTINES	236
ENDF/B DATA TAPES	GGA	1108 BIN	R	L T Z\$ ZPR-III ASSEMBLY 48 GAFGAR	356
ENDF/B FOR 1DX BNWL	1108 F4	RS P	T B\$ ETOX, MULTIGROUP CONSTANTS FROM	388	
ENDF/B GRAPHIC X-SEC EVALUATION	AI	360 F+BAL	RS	L T M\$ SCORE2, SCISRS	375
ENDF/B PROC NCSC	6600 F4	RS	T M\$ CHECKER, CPECT, DAMMET, PLOTFB, SLAV3,	384	
ENDF/B THERMAL SCATTERING DATA PROC	DP	360 F4	RS P	T A\$ FLANGE2,	368
ENDF/B TO MC**2 DATA CONVERSION	APDA	3600 ASAF4	RS P	T M\$ ETOE,	350
ENERGY INTERVAL X-SECTION AVERAGING	GGA	7044 F4	RS P	L\$ GAVER,	218
EPITHERMAL X-SECTIONS NED	635 F4	RS P	T B\$ REAX, RESOLVED RESONANCE	257	
EPITHERMOS, SPECTRUM AND X-SECTION CALCULATION	GEV	7094 F+FAP	RS P	T B \$	201
EQN SOLN CURVE PLOT	KAPL	6600 F+ASC	RS P	T P\$ SNEQ, NONLINEAR ALGEBRAIC	R364
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
EQUIPOISEF3A, 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
ETOF, ENDF/B TO MC**2 DATA CONVERSION	APDA 3600 ASAF4	RS P T M \$	350
ETOX, MULTIGROUP CONSTANTS FROM ENDF/B FOR 1DX BNWL 1108 F4	RS P T B \$		388
EXCHANGER STRESS ANALYSIS KAPL 6600 F4	RS P I\$ TURF, U-TUBE HEAT		R378
EXCURSION ANALYSIS INC 7044 F4	RS P T G\$ RFLAP2, 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 XT F\$ FORE2, FAST REACTOR		174
EXCURSION CALCULATIONS NED 635 F4	RS P XT F\$ FORE2, FAST REACTOR		174
EXPALS, LEAST SQUARES EXPONENTIAL DECAY CURVES	LRL 7094 F2	RS P P \$	321
EXPERIMENT ANALYSIS BAPL 6600 F4	RS P T O\$ JITER, FLUCTUATION		R394
EXPERIMENT ANALYSIS AGC 7090 F2	RS P O\$ CROC90, ML-1 FLUID FLOW		154
EXPERIMENT ANALYSIS SYSTEM BNL-DP 360 F4	RS PLXT B\$ HAMMER, CRITICAL		277
EXPERIMENT ANALYSIS SYSTEM BNL-DP 7090 F2	RS PLXT B\$ HAMMER, CRITICAL		277
EXPERIMENTAL DATA POINTS KAPL 6600 F+ASC	RS P T P\$ CURFIT, CURVE FITTING		R 43
EXPERIMENTAL NEUTRON DATA LIBRARY	LRL 7094 F2	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	ORNL 360 F4	RS P T C \$	156
EXTERNAL+INTERNAL DOSE AT 7094 F+FAP	RS PL T G\$ CURIE, DOSE, THUNDERHEAD,		196
F+ASC RS P T H\$ LION, 3-D TEMPERATURE DISTRIBUTION PROGRAM	KAPL 6600		R299
F+ASC RS P T L\$ DATATRAN 2-D GEOMETRY INPUT, PREPARATION, EDIT	KAPL 6600		R406
F+ASC RS P T P\$ CURFIT, CURVE FITTING EXPERIMENTAL DATA POINTS	KAPL 6600		R 43
F+ASC RS P T P\$ DATATRAN UTILITY MODULES, 2-D + 3-D PLOTTING	KAPL 6600		R407
F+ASC RS P T P\$ SNEQ, NONLINEAR ALGEBRAIC EQN SOLN CURVE PLOT	KAPL 6600		R364
F+ASC RS P XT D\$ PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	BAPL 6600		R275
F+BAL RS L T M\$ SCORE2, SCISRS ENDF/B GRAPHIC X-SEC EVALUATION	AI 360		375
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	AAFC 360		103
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 D\$ PDQ5, 2-D FEW-GROUP DIFFUSION AND DEPLETION	IBM 360		R336
F+BAL RS P T E\$ AIROS2A, SIMULATION OF REACTOR DYNAMICS	AI 360		326
F+CDP RS P T P\$ LAG, ASSEMBLER FOR FLOC2 INSTRUCTION SET	PW 1604		186
F+CDP RS P XT B\$ FMC-N, FMC-G, MC NEUTRON, GAMMA-RAY HISTORIES	PW 1604		195
F+COM RS P XT I\$ GAPL3, INELASTIC LARGE DEFLECTION STRESS STUDY	BAPL 6600		R397
F+COM RSB T M\$ DATATRAN, MODULAR PROGRAMMING AND DATA SYSTEM	KAPL 6600		R386
F+FAP RS T I\$ 4RESTRAINT PIPE STRESS, MAXIMUM MOMENT CALC	AI 7090		109
F+FAP RS L T B\$ QUICKIE, INFINITE MEDIUM SPECTRUM X-SECTIONS	AI 7090		119
F+FAP RS L T C\$ FAIM, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	AI 7090		120
F+FAP RS L T C\$ ULCER, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	AI 7090		118
F+FAP RS L T M\$ MOMUS, X-SECTION LIBRARY UTILITY PROGRAM	AI 7094		159
F+FAP RS P T B\$ EPITHERMOS, SPECTRUM AND X-SECTION CALCULATION	GEV 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 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 RSB T A\$ TUZ, UNRESOLVED REGION RESONANCE INTEGRAL CALC	GGA 7090		42
F+FAP RSB T A\$ ZUT, RESOLVED REGION RESONANCE INTEGRAL CALC	GGA 7090		41
F+FAP RSBP T D\$ DDB, 2-D FEW-GP DIFFUSION BURNUP RZ GEOMETRY	GGA 7090		99

F+FAP RSBPL T C\$	CRAM, 1-D AND 2-D MULTI-GP DIFFUSION PROGRAM	UK-R 7090	103
F+GMP RSBP T H\$	THTE, 3-D TRANSIENT HEAT TRANSFER PROGRAM	GEC 635	346
F+MAP RS P A\$	CHAD, LEGENDRE COFF CALC FOR ANGULAR DIST DATA	AI 7094	215
F+MAP RS P T B\$	GAROL, RESONANCE OVERLAP AND LATTICE EFFECTS	GGA 7044	219
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 G\$	CONTEMPT, LOSS-OF-COOLANT ACCIDENT ANALYSIS	PPCO 7040	297
F+MAP RS P T G\$	RSAC, RADIOLOGICAL SAFETY ANALYSIS PROGRAM	PPCO 7040	265
F+MAP RS P T H\$	TODDFE, 2-D TIME-DEPENDENT HEAT CONDUCTION	PPCO 7044	349
F+MAP RS PLXT A\$	TRIXI, RESONANCE INTEGRAL X-SECTION CALC	AI 7094	208
F+MAP RS PLXT 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 BLOWDOWN?, BLOWDOWN ANALYSIS LOFT	KE 7094	200
FACTOR SHIELDING CODE	CAVITY GEOM GGA 1108 F4 RS P T J\$ MUSCAT, VIEW		259
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 PLXT 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
FARSEIA, DOSE RATE FROM SNAP	SHIELD LEAKAGE AI 7090 F2 RS J \$		91
FASDOP, X-SECTIONS FROM B-W	RESONANCE DATA GGA 7044 F4 RS P A \$		216
FAST BREEDERS APO 635 F4	RS P D\$ RAPFU, FUEL CYCLE PARAMETERS		372
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 LXT 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 PLXT B\$ GAM1,		33
FAST NEUTRON SPECTRUM X-SECTION	CALC GGA 7090 F2 RS PLXT B\$ GAM1,		33
FAST REACTOR EXCURSION CALCULATIONS	NED 2000 F4 RS P T F\$ FORE,		174
FAST REACTOR EXCURSION CALCULATIONS	ANL 360 F4 RS P XT F\$ FORE2,		174
FAST REACTOR EXCURSION CALCULATIONS	NED 635 F4 RS P XT F\$ FORE2,		174
FAST REACTOR POWER AND FLOW TRANSIENTS	ANL 360 F4 RS P T F\$ SASIA,		400
FAST REACTOR POWER AND FLOW TRANSIENTS	ANL 6600 F4 RS P T F\$ SASIA,		400
FAST REACTOR X-SEC CALC BNW 1108 F4	RS P T B\$ FCC4, FUNDAMENTAL MODE		306
FAST SPECTRUM MULTI-GP CONSTANT CALC	AGC 7090 F2 RSBPLXT B\$ AGN-GAM,		204
FAST THERMAL SPECTRA GGA 1108 F4	RS PLXT 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 XT B\$ 1DX, 1-D DIFFUSION		374
FATIGUE KAPL 6600 F4 RS	I\$ SORSDB, PRESSURE VESSEL STRESS AND		R391
FCC4, FUNDAMENTAL MODE FAST REACTOR	X-SEC CALC BNW 1108 F4 RS P T B \$		306
FEEDBACK BAPL 6600 F4 RS P XT F\$	NOWIG, 1-D 2-GP KINETICS TEMPERATURE		R371
FEEDBACK BAPL 6600 F4 RS P XT F\$	TWIGL, 2-D 2-GP SPACE-TIME DIFFUSION		R338
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 GEOMETRY	GGA 7090 F+FAP RSBP T D\$ DDB, 2-D		99
FEW-GP DIFFUSION CALC HEX-Z MESH	GGA 1108 F4 RS P T C\$ GATT, 3-D		380
FEW-GP DIFFUSION DEPLETION BAPL 6600	F+ASC RS P XT D\$ PDQ7, 1,2 OR 3-D		R275
FEW-GP DIFFUSION DEPLETION IBM 360 F4	RS P T D\$ PDQ7, 1,2 OR 3-D		R275
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 GEOMETRY	BAPL 6600 F4 RS P XT C\$ BE21,		R398
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

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FEW-GROUP DIFFUSION AND DEPLETION      IRM   360 F+BAL RS P   T D$ PDQ5, 2-D   R336
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
FIGRO, LSRR FUEL SWELLING TEMPERATURE STUDY  BAPL 6600 F4     RS P XT H $ R272
FILE SERVICE ROUTINES ENDF TAPES      BNL   7090 F+FAP RS P   T M$ DFSR, DATA  236
FINEL, FINITE-ELEMENT STUDY 2,3-D STRUCTURES  KAPL 6600 F4     RS P X I $ R404
FINITE-ELEMENT STUDY 2,3-D STRUCTURES  KAPL 6600 F4     RS P X I $ FINEL,  R404
FINS SNAP GEOM   AI   7090 F2     RS       J$ SCARF2, SCATTER FROM RADIATOR  110
FIRES, 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 XT P$ DAFT1, LEAST SQUARES FIT  R327
FISSILE NUCLIDE X-SECTION EVALUATION  ORNL 7090 F4     RSBP   A$ MUFFLF,  323
FISSION PRODUCT  BAPL 6600 F4     RS P       D$ CINDER,MO102, POINT DEPLETION  313
FISSION PRODUCT ACTIVITY DIST STUDY GGA   7044 F4     RS P       D$ RAD2, HTGR  231
FISSION PRODUCT RELEASE GGA   1108 F4     RS P       D$ FREVAP6, HTGR METALLIC  301
FIT FISSILE NUCLIDE DATA  BAPL 6600 F4     RS P XT P$ DAFT1, LEAST SQUARES  R327
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 EXPERIMENTAL DATA POINTS KAPL 6600 F+ASC RS P   T P$ CURFIT, CURVE  R 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
FLANGE1, SCATTERING LAW X-SECTION CALCULATION GGA   7044 F4     RS       A $   247
FLANGE2, ENDF/B THERMAL SCATTERING DATA PROC  DP    360 F4     RS P   T A $   368
FLARE, 3-D REACTIVITY AND POWER DISTRIBUTION  CDC   3600 F63   RSBP   T C $   167
FLARE, 3-D REACTIVITY AND POWER DISTRIBUTION  NED    635 F4     RS P   T C $   167
FLASH2, LOSS-OF-COOLANT ACCIDENT ANALYSIS  BAPL 6600 F4     RS P XT G $ R295
FLAT, RESONANCE ABSORPTION, CELL  ANL   3600 F36   RSBP XT 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+FAP RS P   T B$ RAFFLE, 1ST   392
FLOCO 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$ 2DXY, 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,MO219, PWR FLOW TRANSIENT ANALYSIS  BAPL 6600 F4     RS P XT H $ R331
FLOW      AI   7094 F2     RS P   H$ FLOW-MODEL, MULTI-CHANNEL 2-D 2-PHASE  246
FLOW 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 STUDY STEAM-WATER MIX KAPL 6600 F4     RS P       H$ RAPP, HIGH-VELOCITY  R382
FLOW TRANSIENT ANALYSIS  BAPL 6600 F4     RS P XT H$ FLOT1,MO219, PWR  R331
FLOW TRANSIENTS  ANL    360 F4     RS P   T F$ SAS1A, FAST REACTOR POWER AND  400
FLOW TRANSIENTS  ANL   6600 F4     RS P   T F$ SAS1A, FAST REACTOR POWER AND  400
FLOW-MODEL, MULTI-CHANNEL 2-D 2-PHASE FLOW  AI   7094 F2     RS P       H $   246
FLOW, PRESSURE DISTRIBUTION GGA   1108 F5     RS P       H$ FLAC, STEADY-STATE  395
FLUCTUATION EXPERIMENT ANALYSIS  BAPL 6600 F4     RS P   T O$ JITER,  R394
FLUID FLOW 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$ TDP, 2-D PERTURBATION TDC OR 2DXY  199
FLUX SYNTHESIS PROGRAM CYL PW   1604 F63   RS       T C$ 2DXYL, 3-D MULTI-GP  192
FLUX-WEIGHTING OF DTF4 CROSS SECTIONS  LASL 6600 F4     RS P       N$ LARCA,  409
FLUX, X-SEC CALC ORNL   360 F4     RS P       D$ ISOSEARCH, ISOTOPE PRODUCTION  322
FLUX, X-SEC CALC ORNL  1604 F63   RS P       D$ ISOSEARCH, ISOTOPE PRODUCTION  322
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 XT B$ FMC-N,  195
FMC-N, MONTE CARLO CALC NEUTRON HISTORIES  GGA   7044 F4     RS P   T R $   195
FMC-N,FMC-G, MC NEUTRON, GAMMA-RAY HISTORIES  PW   1604 F+CDP RS P XT R $   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 XT F $   174

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FORE2, FAST REACTOR EXCURSION CALCULATIONS	NED	635 F4	RS P XT F \$	174
FORM OR THREDES LIBRARY UTILITY ROUTINE AI	360 F4	RSB L T M\$ CLIP,		271
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 R \$	51
FORTTRAN 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 \$	374
FREVAP6, HTGR METALLIC FISSION PRODUCT RELEASE	GGA	1108 F4	RS P D \$	301
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\$ GAFF, EQUILIBRIUM	302
FUEL CYCLE COST ANALYSIS	AI	7090 F2	RS P D\$ AIMFIRE, URANIUM	55
FUEL CYCLE COST AND ECONOMICS	COMM	360 F4	RS P T D\$ CINCAS, NUCLEAR	354
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 CYCLE PARAMETERS FAST BREEDERS	APD	635 F4	RS P D\$ RAPFU,	372
FUEL ELEMENT	BAPL	6600 F4	RS XT I\$ CYGRO2, STRESS ANALYSIS CYL	R266
FUEL ELEMENT	AGC	7090 F2	RS P B\$ BOUNCE, FLUX DIST IN MULTI-PIN	237
FUEL ELEMENT LIFETIME ANALYSIS	ANL	3600 F36	RSBP I\$ SWELL?,	353
FUEL ELEMENT STRESS ANALYSIS STUDY	GGA	7044 F4	RS P T G\$ ELBOW,	229
FUEL ELEMENTS	AEB	360 F4	S P B\$ WELWING, MATERIAL BUCKLING CYL	362
FUEL SWELLING TEMPERATURE STUDY	BAPL	6600 F4	RS P XT H\$ FIGRO, LSBR	R272
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
FUGUE, STEADY-STATE TEMPERATURE VOID FRACTION	AI	7090 F2	RS I \$	48
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 CODE, 1-D 1-GP S4 APPROXIMATION	AI	7090		53
F2 RS C\$ FIPN, 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 PS E\$ AIREK3, SPACE-INDEPENDENT KINETICS W/FEEDBACK	AI	7090		121
F2 RS E\$ SNAPKIN5/5A, 1-REGION KINETICS SNAP GEOMETRY	AI	7090		122
F2 PS 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\$ DOPIE, RESOLVED RESONANCE X-SECTION CALC	NED	2000		177
F2 RS P A\$ EXT, X-SECTIONS FROM B-W RESONANCE PARAMETERS	WANL	7094		238
F2 RS P A\$ RAPTURE, RESONANCE INTEGRAL X-SECTION CALC	NED	2000		176
F2 RS P B\$ RAM, 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 D\$ ISOCRUNCH, REACTION DECAY CHAIN ANALYSIS	ORNL	7090		180
F2 RS P F\$ CONEC, COUPLED NEUTRONICS-HYDRODYNAMICS SPHERE	LRL	7090		129
F2 RS P F\$ WEAK EXPLOSION, COUPLED NEUTRON-HYDRODYNAMICS	APDA	7094		145
F2 RS P G\$ CLOUD, GAMMA-RAY DOSE RATE FROM A CLOUD	AI	7090		47
F2 RS P H\$ FLOW-MODEL, MULTI-CHANNEL 2-D 2-PHASE FLOW	AI	7094		246
F2 RS P I\$ WIREX, COMPUTER-PRODUCED WIRING LISTS UHTREX	LASL	7090		315
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 J\$ SHOE, SHIELD WEIGHT OPTIMIZATION DOSE CALC	AI	7094		197
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\$	FOG, 1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE	AI	7090	28
F2	RS P	T C\$	TOPIC, 1-D FEW-GP SN APPROXIMATION CYLINDER	PPCO	7090	148
F2	RS P	T C\$	W-DSN, 1-D MULTI-GP SN APPROX SLAB CYL SPHERE	UK-W	7090	132
F2	RS P	T C\$	WHIRLAWAY, 3-D 2-GROUP DIFFUSION XYZ GEOMETRY	ORNL	7090	32
F2	RS P	T C\$	20GRAND, 2-D FEW-GROUP DIFFUSION SLAB CYLINDER	ORNL	7090	40
F2	RS P	T G\$	TRANS-FUGUE1, TRANSIENT FLOW AND HEAT TRANSFER	AI	7094	268
F2	RS P	T H\$	HEATING2, TRANSIENT STEADY-STATE HEAT TRANSFER	AI	7094	198
F2	RS P	T L\$	DPC, DATA PREPARATION FOR 2-D DESIGN PROGRAMS	LASL	7090	234
F2	RS PL T	A\$	ARES2, RESONANCE INTEGRAL X-SECTION CALC	AI	7090	89
F2	RS PL T	B\$	FORM, FAST NEUTRON SPECTRUM X-SECTION CALC	AI	7090	51
F2	RS PL T	I\$	CYCLOPS1, THERMODYNAMIC CYCLE ANALYSIS	AI	7094	244
F2	RS PL T	M\$	ECSIL, EXPERIMENTAL NEUTRON DATA LIBRARY	LRL	7094	351
F2	RS PLXT	B\$	GAM1, FAST NEUTRON SPECTRUM X-SECTION CALC	GGA	7090	33
F2	RS PLXT	B\$	HAMMER, CRITICAL EXPERIMENT ANALYSIS SYSTEM	BNL-DP	7090	277
F2	RS PLXT	C\$	DTF2, 1-D MULTI-GP DISCRETE ORDINATE CALC	AI	7090	151
F2	RSR	F\$	HATCHFT, COUPLED NEUTRONICS-HYDRODYNAMICS CODE	AGC	7090	153
F2	RSR	T D\$	FEVER, 1-D FEW-GP DIFFUSION DEPLETION PROGRAM	GGA	7090	117
F2	RSR	T N\$	CPS, SC4020 PLOTS FROM SCISRS X-SECTION TAPES	WANL	7094	239
F2	RSBP	D\$	NPRFCCP, FUEL CYCLE COSTS PERFORMANCE DATA	KF	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	RSRPL T	J\$	MAC, SHIELD DESIGN MULTIGROUP SLAB GEOMETRY	BNW	7090	143
F2	RSRPLXT	B\$	AGN-GAM, FAST SPECTRUM MULTI-GP CONSTANT CALC	AGC	7090	204
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-1D, 1-D MULTI-GP DISCRETE ORDINATE CALC	ANL	3600	288
F36	RS P	T I\$	SUPORAN, REACTOR COPE SUPPORT STRESS ANALYSIS	ANL	3600	357
F36	RS P XT	C\$	MACH1, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	ANL	3600	262
F36	RSBP	A\$	MISH-MASH, RESONANCE INTEGRAL CALC HOMOGENEOUS	ANL	3600	214
F36	RSBP	G\$	CHEMLQC2, CORE HEATING CLADDING-STEAM REACTION	ANL	3600	366
F36	RSBP	G\$	WHAM, LIQUID-FILLED PIPING SYSTEM ANALYSIS	KE	3600	278
F36	RSBP	I\$	SWELL2, FUEL ELEMENT LIFETIME ANALYSIS	ANL	3600	353
F36	RSBP XT	B\$	PARBLE, WLIF, FLAT, RESONANCE ABSORPTION, CELL	ANL	3600	281
F36	RSBP XT	B\$	PIFF-PAFF, RESONANCE INTEGRAL CALC 2-REG CELL	ANL	3600	213
F4	S	T D\$	GAFF, EQUILIBRIUM FUEL CYCLE CALCULATION	GGA	1108	302
F4	S P	B\$	WELWING, MATERIAL BUCKLING CYL FUEL ELEMENTS	AEB	360	362
F4	RS	A\$	FLANGF1, SCATTERING LAW X-SECTION CALCULATION	GGA	7044	247
F4	RS	A\$	STRIP, RESOLVED RESONANCE INTEGRAL CALCULATION	BW	2000	305
F4	RS	B\$	HEXSCAT, ELASTIC SCAT X-SECTIONS HEX LATTICE	GGA	1108	291
F4	RS	E\$	R102, SPACE-INDEPENDENT INVERSE KINETICS CALC	WANL	7094	168
F4	RS	I\$	CORE, CORE CONFIGURATION FUEL TEMPERATURE CODE	GGA	7044	233
F4	RS	I\$	SORSDB, PRESSURE VESSEL STRESS AND FATIGUE	KAPL	6600	R391
F4	RS	T C\$	EXTERMINATOR2, 2-D MULTI-GP DIFFUSION PROGRAM	BC	625	156
F4	RS	T C\$	FOG, 1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE	BC	625	28
F4	RS	T G\$	GADOSE, DOSE, HTGR ACCIDENT ANALYSIS DOSE CALC	GGA	1108	261
F4	RS	T H\$	BL00ST5, POINT-KINETICS WITH 2-D HEAT TRANSFER	GGA	7044	205
F4	RS	T H\$	RATH, 2- OR 3-D HEAT CONDUCTION LUMPED MASS	LASL	7030	242
F4	RS	T M\$	CHECKER, CRECT, DAMMET, PLOTFB, SLAV3, ENDF/B PROC	NCSC	6600	384
F4	RS	T P\$	LASL LEAST SQUARES, GENERAL CURVE FITTING	LASL	7094	62
F4	RS	XT B\$	M0807, 2-D DIFFUSION ABSORPTION REMOVAL X-SECS	BAPL	6600	R280
F4	RS	XT C\$	M0648, 1-D SLAB TRANSPORT WITH SLOWING DOWN	BAPL	6600	R342
F4	RS	XT G\$	PRECON, HTGR CONTAINMENT PRESSURE POST RUPTURE	GGA	7044	228
F4	RS	XT H\$	WATER, STEAM TABLES 14.5-14,500PSIA 32-472DEGF	BAPL	6600	R267
F4	RS	XT I\$	CYGR02, STRESS ANALYSIS CYL FUEL ELEMENT	BAPL	6600	R266
F4	RS	L T B\$	GGC4, MULTI-GP X-SECTIONS FAST THERMAL SPECTRA	GGA	6600	298

F4	RS	L T C\$	FIRE5, 1-D AGE-DIFFUSION SLAB CYLINDER SPHERE	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\$ CODILLI, LEAST SQUARES ANALYSIS RESONANCE DATA	UILL	360	347
F4	RS	P	A\$ COMBCO, COMBINED B-W MULTI-LEVEL CONVOLUTION	PPCO	7040	203
F4	RS	P	A\$ FASDDP, X-SECTIONS FROM B-W RESONANCE DATA	GGA	7044	216
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\$ PSEUDO, STATISTICAL RESONANCE PARAMETER CALC	GGA	1108	292
F4	RS	P	A\$ SIGPLOT, RESOLVED MULTILEVEL R-W X-SEC CALC	BNL	6600	377
F4	RS	P	A\$ SIGPLOT, RESOLVED MULTILEVEL B-W X-SEC CALC	BNL	7094	377
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	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\$ ISOSEARCH, ISOTOPE PRODUCTION FLUX, X-SEC CALC	ORNL	360	322
F4	RS	P	D\$ RAD2, HTGR FISSION PRODUCT ACTIVITY DIST STUDY	GGA	7044	231
F4	RS	P	D\$ RAPFU, FUEL CYCLE PARAMETERS FAST BREEDERS	APD	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\$ PLAST, 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	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	R352
F4	RS	P	F\$ STINT3, SINGLE-CHANNEL SPACE-TIME SYNTHESIS	KAPL	6600	R389
F4	RS	P	F\$ TWIGGLE, 2-D 2-GP SPACE-TIME DIFFUSION	ANL	360	R338
F4	RS	P	G\$ CLOUD, GAMMA-RAY DOSE RATE FROM A CLOUD	DP	360	47
F4	RS	P	G\$ WATER-HAMMER, LIQUID BLOWDOWN ANALYSIS LOFT	UGA	360	278
F4	RS	P	H\$ RAPP, HIGH-VELOCITY FLOW STUDY STEAM-WATER MIX	KAPL	6600	R382
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-D 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	R337
F4	RS	P	I\$ TUBE, U-TUBE HEAT EXCHANGER STRESS ANALYSIS	KAPL	6600	R378
F4	RS	P	L\$ GAVR, ENERGY INTERVAL X-SECTION AVERAGING	GGA	7044	218
F4	RS	P	L\$ GRDWRK, GRID GENERATION FOR SAFE PROGRAMS	GGA	1108	296
F4	RS	P	N\$ LARCA, FLUX-WEIGHTING OF DTF4 CROSS SECTIONS	LASL	6600	409
F4	RS	P	O\$ CORGAM, UNFOLDING OF COMPLEX GAMMA-RAY SPECTRA	KSUN	360	390
F4	RS	P T	A\$ FLANGE2, ENDF/B THERMAL SCATTERING DATA PROC	DP	360	368
F4	RS	P T	A\$ TACASI, ANALYSIS OF RESONANCE MEASUREMENTS	GGA	1108	410
F4	RS	P T	A\$ TOR, THERMAL SCATTERING CRYSTALLINE MATERIALS	LASL	6600	360
F4	RS	P T	B\$ ETOX, MULTIGROUP CONSTANTS FROM ENDF/B FOR 1DX	BNWL	1108	388
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\$ GAROL, RESONANCE OVERLAP AND LATTICE EFFECTS	LER	7094	219
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	C\$ DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	ANL	360	209
F4	RS	P T	C\$ DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	BC	625	209
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	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	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	PPCD	7040	148
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	1108	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	D\$	CINCAS, NUCLEAR FUEL CYCLE COST AND ECONOMICS	COMM	360	354
F4	RS	P	T	D\$	DTF-BURN, 1-D MULTI-GP DTF4 WITH DEPLETION	LASL	7030	269
F4	RS	P	T	D\$	FEVER7, 1-D MULTIGROUP DIFFUSION AND DEPLETION	GGA	1108	318
F4	RS	P	T	D\$	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\$	PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	IBM	360	R275
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	E\$	BLOOST6, COMBINED KINETICS 2-D HEAT TRANSFER	GGA	1108	303
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\$	SASIA, FAST REACTOR POWER AND FLOW TRANSIENTS	ANL	360	400
F4	RS	P	T	F\$	SASIA, 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\$	TSN, SPATIALLY-DEPENDENT REACTOR KINETICS	AI	7094	309
F4	RS	P	T	F\$	WIGL2, 1-D 2-GP SPACE-TIME DIFFUSION 3-GEOM	GGA	1108	R274
F4	RS	P	T	G\$	AISITE2, PARAMETRIC SITE REQUIREMENT STUDY	AI	360	172
F4	RS	P	T	G\$	ECCSA1, LOSS-OF-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\$	NURLOC-1.0, LOSS-OF-COOLANT THERMAL ANALYSIS	BCL	6400	328
F4	RS	P	T	G\$	RELAP2, REACTOR BLOWDOWN - EXCURSION ANALYSIS	INC	7044	369
F4	RS	P	T	H\$	MANTA, STEADY-STATE THERMAL-HYDRAULIC ANALYSIS	NED	635	256
F4	RS	P	T	I\$	GEM, EIGENVALUE PROBLEM FOR VIBRATING SYSTEMS	KAPL	6600	R344
F4	RS	P	T	I\$	SABOR4, DISCRETE-ELEMENT ANALYSIS THIN SHELLS	MIT	360	R402
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-3D, 3-D COMPOSITE STRUCTURE STRESS STUDY	GGA	1108	332
F4	RS	P	T	I\$	SOR2, STRESS ANALYSIS SHELLS OF REVOLUTION	KAPL	6600	R 80
F4	RS	P	T	J\$	MUSCAT, VIEW FACTOR SHIELDING CODE CAVITY GEOM	GGA	1108	259
F4	RS	P	T	L\$	GAND, GAFGAR X-SECTION LIBRARY PREPARATION	GGA	1108	345
F4	RS	P	T	O\$	BURNUP, HEAVY ELEMENT ISOTOPIC BURNUP ANALYSIS	GEV	635	311
F4	RS	P	T	O\$	EXPN, ANALYSIS OF PULSED NEUTRON SOURCE DATA	NED	635	258
F4	RS	P	T	O\$	JITER, FLUCTUATION EXPERIMENT ANALYSIS	BAPL	6600	R394
F4	RS	P	T	O\$	TOAD, PROCESSING OF ANALYZER GAMMA-RAY SPECTRA	GGA	1108	333
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	I\$	FINEF, FINITE-ELEMENT STUDY 2,3-D STRUCTURES	KAPL	6600	R404
F4	RS	P	XT	A\$	PUN1, UNRESOLVED RESONANCE INTEGRALS X-SECS	BAPL	6600	R359
F4	RS	P	XT	A\$	SUMOR, S-WAVE NEUTRON X-SECTION CALCULATION	BAPL	6600	R399
F4	RS	P	XT	B\$	GAFGAR, SPECTRA AND GROUP-AVERAGED X-SEC CALC	GGA	1108	316
F4	RS	P	XT	B\$	GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV	BC	625	185
F4	RS	P	XT	B\$	HWOGR-SAFE, 2-D MONTE CARLO CELL CALCULATION	AI	360	307
F4	RS	P	XT	B\$	RESQ2, RESQ0, DBF1, RESONANCE INTEGRAL HEX CELL	BAPL	6600	R285
F4	RS	P	XT	B\$	1DX, 1-D DIFFUSION FAST X-SECTION GENERATION	BNW	1108	374
F4	RS	P	XT	C\$	BE21, FFW-GP DISCRETE ORDINATES SLAB GEOMETRY	BAPL	6600	R398
F4	RS	P	XT	C\$	VARI-QUIR3, 2-D MULTI-GP DIFFUSION XY RZ RTH	WANL	7094	264
F4	RS	P	XT	F\$	FORE2, FAST REACTOR EXCURSION CALCULATIONS	ANL	360	174
F4	RS	P	XT	F\$	FORE2, FAST REACTOR EXCURSION CALCULATIONS	NED	635	174
F4	RS	P	XT	F\$	NOWIG, 1-D 2-GP KINETICS TEMPERATURE FEEDBACK	BAPL	6600	R371
F4	RS	P	XT	F\$	TWIGL, 2-D 2-GP SPACE-TIME DIFFUSION FEEDBACK	BAPL	6600	R338

F4	RS P XT F\$	WIGL2, 1-D 2-GP SPACE-TIME DIFFUSION 3-GEOM	BAPL	6600	R274
F4	RS P XT G\$	FLASH2, LOSS-OF-COOLANT ACCIDENT ANALYSIS	BAPL	6600	R295
F4	RS P XT G\$	M0555,ACT1, LOSS-OF-COOLANT ACCIDENT ANALYSIS	BAPL	6600	R284
F4	RS P XT H\$	FIGRO, LSRB FUFL SWELLING TEMPERATURE STUDY	BAPL	6600	R272
F4	RS P XT H\$	FLOT1,M0219, PWR FLOW TRANSIENT ANALYSIS	BAPL	6600	R331
F4	RS P XT H\$	HOT2, 2-D TRANSIENT HEAT CONDUCTION PROGRAM	BAPL	6600	R286
F4	RS P XT H\$	M0899,H0H, STEAM TABLES 14.5-2538 PSIA	BAPL	6600	R294
F4	RS P XT H\$	TOPS, TRANSIENT THERMODYNAMICS OF PRESSURIZERS	BAPL	6600	R348
F4	RS P XT H\$	WASP, WATER AND STEAM THERMODYNAMIC PROPERTIES	BAPL	6600	R396
F4	RS P XT I\$	M0266, LINEAR ELASTIC STRUCTURAL DYNAMICS	BAPL	6600	R383
F4	RS P XT I\$	M0457,PIPE, ELASTIC STRESS OF PIPING SYSTEM	BAPL	6600	R329
F4	RS P XT I\$	M0552, DYNAMIC ANALYSIS LINEAR ELASTIC SYSTEMS	BAPL	6600	R283
F4	RS P XT I\$	SEALSHELL2, SHELL STRESS ANALYSIS AXISYM LOAD	BAPL	6600	R282
F4	RS P XT J\$	M0756,LETO, 1-D SLAB GAMMA-RAY TRANSPORT	BAPL	6600	R343
F4	RS P XT K\$	CITATION, 1,2,3-D DIFFUSION DEPLETION MULTIGP	ORNL	360	387
F4	RS P XT L\$	BL47, DRAFTING TOOL TO PLOT PLANE STRUCTURES	BAPL	6600	R373
F4	RS P XT P\$	DAFT1, LEAST SQUARES FIT FISSILE NUCLIDE DATA	BAPL	6600	R327
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 PLXT B\$	AILMOF, X-SECTION CALC ELASTIC SCAT RESONANCES	AI	360	147
F4	RS PLXT B\$	GGC4, MULTI-GP X-SECTIONS FAST THERMAL SPECTRA	GGA	1108	298
F4	RS PLXT B\$	HAMMER, CRITICAL EXPERIMENT ANALYSIS SYSTEM	BNL-DP	360	277
F4	RS PLXT B\$	LEOPARD, SPECTRA CALCULATION WITH DEPLETION	WAPD	360	279
F4	RS PLXT B\$	XSDRN, DISCRETE ORDINATE MULTIGROUP CONSTANTS	ORNL	360	393
F4	RS PLXT C\$	MACH1, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	PURD	6500	262
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 T D\$	2DR, 2-D MULTIGROUP DIFFUSION AND DEPLETION	ANL	3600	325
F4	RSBP T K\$	THREDES, 1-D FEW-GP DIFFUSION DESIGN SYSTEM	AI	360	273
F4	RSBP T N\$	CROSSPLOT, SC4020 PLOTS FROM X-SECTION TAPES	GGA	7044	207
F4	RSBP XT D\$	SIZZLE, 1-D MULTIGROUP DIFFUSION DEPLETION	AI	360	58
F4	RSBPLXT C\$	ANISN, 1-D MULTI-GP DISCRETE ORDINATE CALC	AI	360	151
F4	RSBPLXT C\$	CAESAR4,LIBLST, 1-D MULTI-GP DIFFUSION + LIB	AI	360	270
F4	RSBPLXT D\$	NAP, NEUTRON-INDUCED GAMMA-RAY RADIOACTIVITY	IITR	7094	314
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 H\$	TAC2D, STEADY-STATE AND TRANSIENT TEMP CALC	GGA	1108	408
F5	RSBPL T D\$	ISOGEN, RADIONUCLIDE GENERATION AND DECAY	BNW	1108	367
F63	RS C\$	PERT, 1-D PERTURBATION FOR AIM AND FOG CODES	CDC	1604	30
F63	RS ; C\$	TDP, 2-D PERTURBATION TDC OR 2DXY FLUX INPUT	PW	1604	199
F63	RS C\$	2DF, 2-D MULTI-GP DISCRETE ORDINATE CODE	UNC-LASL	1604	173
F63	RS I\$	WOPEXPRT, REACTOR WEIGHT OPTIMIZATION STUDY	PW	1604	190
F63	RS L\$	CSP1, SN X-SECTION LIBRARY TAPE PREPARATION	PW	1604	194
F63	RS L\$	CSP2A, SN X-SECTION LIBRARY TAPE PREPARATION	PW	1604	193
F63	RS T C\$	2DXYL, 3-D MULTI-GP FLUX SYNTHESIS PROGRAM CYL	PW	1604	192
F63	RS L T D\$	SIZZLE, 1-D MULTIGROUP DIFFUSION DEPLETION	CDC	1604	58
F63	RS LXT B\$	GAM1, FAST NEUTRON SPECTRUM X-SECTION CALC	ANL	3600	33
F63	RS P A\$	HAFFEVER, HAUSER-FESHBACH INELASTIC SCATTERING	CDC	1604	14
F63	RS P A\$	PEGGY, ELASTIC SCATTERING PHASE-SHIFT ANALYSIS	ORNL	1604	334
F63	RS P A\$	RAMFS, PARTICLE WAVE FUNCTION RADIAL INTEGRALS	ORNL	1604	335
F63	RS P B\$	SAIL, 1-D 1-GP SN APPROXIMATION SLAB GEOMETRY	CDC	1604	52
F63	RS P B\$	S4 CYL CELL CODE, 1-D 1-GP S4 APPROXIMATION	CDC	1604	53
F63	RS P D\$	ISOCRUNCH, REACTION DECAY CHAIN ANALYSIS	ORNL	1604	180
F63	RS P D\$	ISOSFARCH, ISOTOPE PRODUCTION FLUX, X-SEC CALC	ORNL	1604	322
F63	RS P D\$	ISOTOPES, MAXIMUM YIELD FROM REACTION OR DECAY	ORNL	1604	179
F63	RS P D\$	POWERCO, NUCLEAR STATION ELECTRICITY COSTS	ORNL	1604	340
F63	RS P E\$	AIREK3, SPACE-INDEPENDENT KINETICS W/FEEDBACK	CDC	1604	121
F63	RS P E\$	CMXMAT, TRANSFER FUNCTION EVALUATION	PW	1604	188
F63	RS P F\$	AX-TNT, COUPLED NEUTRONICS-HYDRODYNAMICS SPH	PW	1604	191
F63	RS P G\$	CLOUD, GAMMA-RAY DOSE RATE FROM A CLOUD	CDC	1604	47
F63	RS P H\$	M0899,H0H, STEAM TABLES 14.5-2538 PSIA	ANL	1604	R294
F63	RS P J\$	GRACE1, GAMMA-RAY ATTENUATION SLAB GEOMETRY	CDC	1604	45
F63	RS P J\$	GRACE2, GAMMA-RAY ATTENUATION CYL SPHERE GEOM	CDC	1604	46

F63	RS	P	L\$	SNC, CALCULATION OF SN CONSTANTS FOR DSN TDC	PW	1604	189
F63	RS	P	T A\$	JUPITOR1, COUPLED-CHANNEL X-SFC 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\$	FDG, 1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE	CDC	1604	28
F63	RS	P	T C\$	FORTTRAN 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\$	AREF2, 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	PLXT	B\$	GAM1, FAST NEUTRON SPECTRUM X-SECTION CALC	CDC	1604	33
F63	RS	PLXT	C\$	FAIM, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	CDC	1604	120
F63	RSBP		A\$	NEARREF, COMPOUND NUCLEUS X-SECTION CALC	ANL	3600	171
F63	RSBP		E\$	R101, SPACE-INDEPENDENT KINETICS KEX OPTIONS	ANL	3600	255
F63	RSBP		E\$	R102, SPACE-INDEPENDENT INVERSE KINETICS CALC	ANL	3600	168
F63	RSBP		F\$	AX1, COUPLED NEUTRONICS-HYDRODYNAMICS SPHERE	CDC	3600	102
F63	RSBP		O\$	COINC, COINCIDENCE COUNTING DATA REDUCTION	ANL	3600	248
F63	RSBP	T	A\$	2PLUS, NON-SPHERICAL OPTICAL MODEL X-SECTIONS	ANL	3600	254
F63	RSBP	T	C\$	FLARE, 3-D REACTIVITY AND POWER DISTRIBUTION	CDC	3600	167
F63	RSBP	T	E\$	TRAFICORPORATION, TRANSFER FUNCTION SYNTHESIS	ANL	3600	135
F63	RSBP	T	G\$	R153, PARAMETRIC SITE REQUIREMENT STUDY	ANL	3600	172
F63	RSBP	T	H\$	ARGUS, TRANSIENT TEMPERATURE CALC CYLINDER	ANL	3600	152
F63	RSBP	T	M\$	XLIRIT, X-SECTION LIBRARY UTILITY ROUTINE	ANL	3600	181
F63	RSBP	XT	B\$	THERMOS(ANL), THERMAL SPECTRUM X-SECTION CALC	ANL	3600	184
F63	RSBP	PL	T J\$	MAC, SHIELD DESIGN MULTIGROUP SLAB GEOMETRY	ANL	3600	143
GADOSE,DOSET, HTGR ACCIDENT ANALYSIS DOSE CALC	GGA	1108	F4	RS	T	G\$	261
GAF,GAR, SPECTRA AND GROUP-AVERAGED X-SFC CALC	GGA	1108	F4	RS	P	XT	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	T	L\$ GAND, 345
GAKER, INELASTIC SCAT X-SECTION CALC MODERATOR	GGA	1108	F4	RS	P		A\$ 289
GAKIN, 1-D MULTIGROUP TIME-DEPENDENT DIFFUSION	GGA	1108	F4	RS	P	T	F\$ 310
GAKIT, 1-D MULTIGP KINETICS WITH TEMP FEEDBACK	GGA	1108	F4	RS	P	T	F\$ 370
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-P, PRODUCTION X-SECTIONS FOR GAMMA-PAYS	GEC	7094	F4	RS	P		R\$ 235
GAMMA-RAY ATTENUATION CYL SPHERE GEOM	AI	7090	F2	RS	P	J\$	GRACE2, 46
GAMMA-PAY ATTENUATION CYL SPHERE GEOM	CDC	1604	F63	RS	P	J\$	GRACE2, 46
GAMMA-PAY ATTENUATION SLAB GEOMETRY	AI	7090	F2	RS	P	J\$	GRACE1, 45
GAMMA-RAY ATTENUATION SLAB GEOMETRY	CDC	1604	F63	RS	P	J\$	GRACE1, 45
GAMMA-RAY DOSE RATE FROM A CLOUD	AI	7090	F2	RS	P	G\$	CLOUD, 47
GAMMA-RAY DOSE RATE FROM A CLOUD	CDC	1604	F63	RS	P	G\$	CLOUD, 47
GAMMA-RAY DOSE RATE FROM A CLOUD	DP	360	F4	RS	P	G\$	CLOUD, 47
GAMMA-RAY HISTORIES	PW	1604	F+CDP	RS	P	XT	R\$ FMC-N,FMC-G, MC NEUTRON, 195
GAMMA-RAY PHOTOFRACITION SOLID CRYSTAL	UM	7090	MAD	RSB		O\$	BURP4, 169
GAMMA-RAY PHOTOFRACITION WELL CRYSTAL	UM	7090	MAD	RSB		O\$	BURP5, 170
GAMMA-RAY RADIOACTIVITY	IITR	7094	F4	RSBP	PLXT	D\$	NAP, NEUTRON-INDUCED 314
GAMMA-RAY SPECTRA	GGA	1108	F4	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	XT	J\$ M0756,LETO, 1-D SLAB R343
GAMMA-RAYS	GEC	7094	F4	RS	P	R\$	GAMMA-P, PRODUCTION X-SECTIONS FOR 235
GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV	BC	625	F4	RS	P	XT	R\$ 185
GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV	BNW	1107	F4	RS	PL	T	R\$ 185
GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV	BNW	7090	F+MAP	RS	PL	T	R\$ 185
GAMTRI, 2-D MULTIGP DIFFUSION TRIANGULAR MESH	GGA	1108	F+BAL	RS	P	T	C\$ 401
GAM1, FAST NEUTRON SPECTRUM X-SECTION CALC	ANL	3600	F63	RS	LXT	R\$	33
GAM1, FAST NEUTRON SPECTRUM X-SECTION CALC	CDC	1604	F63	RS	PLXT	B\$	33
GAM1, FAST NEUTRON SPECTRUM X-SECTION CALC	GGA	7090	F2	RS	PLXT	B\$	33
GAND, GAFGAR X-SECTION LIBRARY PREPARATION	GGA	1108	F4	RS	P	T	L\$ 345
GANDY, UNRESOLVED RESONANCE X-SECTION CALC	GGA	1108	F4	RS	P		A\$ 341
GAPL3, INELASTIC LARGE DEFLECTION STRESS STUDY	BAPL	6600	F+COM	RS	P	XT	I\$ R397

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	XT	B\$ GAF,	316
GARGOYLE, FUEL CYCLE ANALYSIS PARTIAL REFUEL	GGA	7044	F4	RS	P	T	D \$	260
GAROL, RESONANCE OVERLAP AND LATTICE EFFECTS	GGA	7044	F+MAP	RS	P	T	B \$	219
GAROL, RESONANCE OVERLAP AND LATTICE EFFECTS	LER	7094	F4	RS	P	T	R \$	219
GAS-COOLED CORE THERMAL DESIGN STUDY	GGA	7044	F4	RS	P	I\$	GAZELLE5,	232
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
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
GAVER, 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
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+GMP RSBP T H\$ THTE, 3-D TRANSIENT HEAT TRANSFER PROGRAM								346
GEC 7094 F4 RS P B\$ GAMMA-P, PRODUCTION X-SECTIONS FOR GAMMA-RAYS								235
GEM, EIGENVALUE PROBLEM FOR VIBRATING SYSTEMS	KAPL	6600	F4	RS	P	T	I \$	R344
GENERATOR DESIGN CRITERIA CPSTS	GGA	7044	F4	RS	P	T	D\$ STMGEN, STEAM	227
GEV 635 F4 RS P T O\$ BURNUP, HEAVY ELEMENT ISOTOPIC BURNUP ANALYSIS								311
GEV 7094 F+MAP RS P T B\$ EPITHERMOS, SPECTRUM AND X-SECTION CALCULATION								201
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 F4 S T D\$ GAFF, 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, DOSFT, HTGR ACCIDENT ANALYSIS DOSE CALC								261
GGA 1108 F4 RS P A\$ GAKER, INELASTIC SCAT X-SECTION CALC MODERATOR								289
GGA 1108 F4 RS P A\$ GANDY, UNRESOLVED RESONANCE X-SECTION CALC								341
GGA 1108 F4 RS P A\$ GASKET, THERMAL SCATTERING LAW CALCULATION								263
GGA 1108 F4 RS P A\$ PSEUDO, STATISTICAL RESONANCE PARAMETER CALC								292
GGA 1108 F4 RS P D\$ FREVAP6, HTGP METALLIC FISSION PRODUCT RELEASE								301
GGA 1108 F4 RS P F\$ GAPOTKIN, SPACE-INDEPENDENT REACTOR KINETICS								317
GGA 1108 F4 RS P F\$ GASA, STABILITY ANALYSIS REACTOR KINETICS EQNS								290
GGA 1108 F4 RS P I\$ SAFE-CREEP, VISCOPLASTIC ANALYSIS CONCRETE								300
GGA 1108 F4 RS P I\$ SAFE-PLANE, PLANE STRESS ANALYSIS, 2-D RODIES								252
GGA 1108 F4 RS P I\$ SAFE-SHELL, STRESS ANALYSIS THIN SHELLS								253
GGA 1108 F4 RS P I\$ SAFE-2D, PLANE + AXISYMMETRIC STRESS ANALYSIS								379
GGA 1108 F4 RS P L\$ GPDWRK, 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 F\$ BLOOST6, COMBINED KINETICS 2-D HEAT TRANSFER								303
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							R274	
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 T L\$ GAND, GAFGAR X-SECTION LIBRARY PREPARATION								345
GGA 1108 F4 RS P T O\$ TOAD, PROCESSING OF ANALYZER GAMMA-RAY SPECTRA								333
GGA 1108 F4 RS P X A\$ COHBE, COHERENT INELASTIC SCATTERING LAW CALC								385
GGA 1108 F4 RS P XT B\$ GAF, GAR, SPECTRA AND GROUP-AVERAGED X-SEC CALC								316
GGA 1108 F4 RS PLXT 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 H\$ TAC2D, STEADY-STATE AND TRANSIENT TEMP CALC								408
GGA 6600 F4 RS L T B\$ GGC4, MULTI-GP X-SECTIONS FAST THERMAL SPECTRA								298
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 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	7044	F4	RS		A\$	FLANGE1, SCATTERING LAW X-SECTION CALCULATION	247		
GGA	7044	F4	RS		I\$	CORE, CORE CONFIGURATION FUEL TEMPERATURE CODE	233		
GGA	7044	F4	RS	T	H\$	BLOOST5, POINT-KINETICS WITH 2-D HEAT TRANSFER	205		
GGA	7044	F4	RS	XT	G\$	PRECON, HTGR CONTAINMENT PRESSURE POST RUPTURE	278		
GGA	7044	F4	RS	P	A\$	FASDOP, X-SECTIONS FROM B-W RESONANCE DATA	216		
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 COFF CALC	225	
GGA	7044	F4	RS	P	T	D\$	GARGOYLE, FUEL CYCLE ANALYSIS PARTIAL REFUEL	260	
GGA	7044	F4	RS	P	T	D\$	RELOAD-FFEVER, 1-D FEW-GP DIFFUSION DEPLETION	221	
GGA	7044	F4	RS	P	T	D\$	FFVISED-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\$	FLBOW, 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	7044	F4	RSBP	T	N\$	CROSSPLOT, SC4020 PLOTS FROM X-SECTION TAPES	207		
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\$	DDB, 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	PLXT	B\$	CAM1, FAST NEUTRON SPECTRUM X-SECTION CALC	33		
GGA	7090	F2	RSB	T	D\$	FEVER, 1-D FEW-GP DIFFUSION DEPLETION PROGRAM	117		
GGC4, MULTI-GP X-SECTIONS FAST THERMAL SPECTRA	GGA	1108	F4	RS	PLXT	P	\$	298	
GGC4, MULTI-GP X-SECTIONS FAST THERMAL SPECTRA	GGA	6600	F4	RS	L	T	B	\$	298
GLEN, GROUP CONSTANT CALC FROM TOR OUTPUT DATA	LASL	6600	F4	RS	P	T	B	\$	361
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	
GRAPHIC X-SEC EVALUATION	AI	360	F+BAL	RS	L	T	M\$	SCORE2, SCISRS ENDF/B	375
GRAVE, GROUP-AVERAGING X-SECTIONS PARAMETERS	AI	7094	F+FAP	RS	PL	T	B	\$	162
GRDWRK, GRID GENERATION FOR SAFE PROGRAMS	GGA	1108	F4	RS	P	L	\$	296	
GRID GENERATION FOR SAFE PROGRAMS	GGA	1108	F4	RS	P	L\$	GRDWRK,	296	
GROUP CONSTANT CALC FROM TOR OUTPUT DATA	LASL	6600	F4	RS	P	T	B\$	GLEN,	361
GROUP-AVERAGED X-SEC CALC	GGA	1108	F4	RS	P	XT	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	R\$	ZOT,	113	
HAFFEVER, HAUSER-FFSHRACH INELASTIC SCATTERING	CDC	1604	F63	RS	P	A	\$	14	
HAMMER, CRITICAL EXPERIMENT ANALYSIS SYSTEM	BNL-DP	360	F4	RS	PLXT	B	\$	277	
HAMMER, CRITICAL EXPERIMENT ANALYSIS SYSTEM	BNL-DP	7090	F2	RS	PLXT	B	\$	277	
HATCHET, COUPLED NEUTRONICS-HYDRODYNAMICS CODE	AGC	7090	F2	RSB	F	\$	153		
HAUSER-FFSHRACH INELASTIC SCATTERING	CDC	1604	F63	RS	P	A\$	HAFFEVER,	14	
HEAT CONDUCTION	PDCO	7044	F+MAP	RS	P	T	H\$	TOODEF, 2-D TIME-DEPENDENT	349
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	RAPL	6600	F4	RS	P	XT	H\$	HOT2, 2-D TRANSIENT	R286
HEAT EXCHANGER STRESS ANALYSIS	KAPL	6600	F4	RS	P	I\$	TUBE, U-TUBE	R378	
HEAT TRANSFER	GGA	1108	F4	RS	P	T	F\$	BLOOST6, COMBINED KINETICS 2-D	303
HEAT TRANSFER	AI	7094	F2	RS	P	T	G\$	TRANS-FUGUE1, TRANSIENT FLOW AND	268
HEAT TRANSFER	AI	7094	F2	RS	P	T	H\$	HEATING2, TRANSIENT STEADY-STATE	198
HEAT TRANSFER	GGA	7044	F4	RS	T	H\$	BLOOST5, POINT-KINETICS WITH 2-D	205	
HEAT TRANSFER MOLTEN FUEL TUBE BUNDLES	LASL	7094	F2	RSBP	H\$	AXFLU,	182		
HEAT TRANSFER PROGRAM	GFC	635	F+GMP	RSBP	T	H\$	THTE, 3-D TRANSIENT	346	
HEAT TRANSFER SOLID FUEL TUBE BUNDLES	LASL	7094	F2	RSBP	H\$	AXTHRM,	183		
HEATING CLADDING-STEAM REACTION ANL	3600	F36	RSBP	G\$	CHEMLOC2, CORE	366			
HEATING2, TRANSIENT STEADY-STATE HEAT TRANSFER	AI	7094	F2	RS	P	T	H	\$	198
HEAVY ELEMENT ISOTOPIIC BURNUP ANALYSIS	GFV	635	F4	RS	P	T	D\$	BURNUP,	311
HERESY1, LATTICE PARAMETERS HETEROGENEOUS CALC	FMA	7090	F2	RSBP	X	C	\$	136	

HETEROGENEOUS CALC FMA	7090 F2	RSBP X C\$ HERESY1, LATTICE PARAMETERS	136
HEX CELL BAPL	6600 F4	RS P XT B\$ RFSQ2, RFSQ0, DBF1, RESONANCE INTEGRAL	R285
HEX GEOM DIFFUSION DEPLETION GGA	1108 F4	RS P T D\$ GAUGE, 2-D FEW-GP	339
HEX LATTICE GGA	1108 F4	PS 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 SPHERF	BNW 1107 F4	RS P T C \$	241
HIGH-VELOCITY FLOW STUDY STEAM-WATER MIX KAPL	6600 F4	RS P H\$ RAPP,	R382
HISTORIES GGA	7044 F4	RS P T B\$ FMC-N, MONTE CARLO CALC NEUTRON	195
HISTORIES PW	1604 F+CDP RS P XT B\$ FMC-N, FMC-G, MC NEUTRON, GAMMA-RAY		195
HISTORY KE	7094 F2	RSBP T H\$ PTH1, BLOWDOWN PRESSURE TEMPERATURE	155
HOH, STEAM TABLES 14.5-2538 PSIA	ANL 1604 F63	RS P H\$ MO899,	R294
HOH, STEAM TABLES 14.5-2538 PSIA	BAPL 6600 F4	RS P XT H\$ MO899,	R294
HOMOGENEOUS ANL	3600 F36	RSBP A\$ MISH-MASH, RESONANCE INTEGRAL CALC	214
HOT2, 2-D TRANSIENT HEAT CONDUCTION PROGRAM	BAPL 6600 F4	RS P XT H \$	R286
HTGR ACCIDENT ANALYSIS DOSE CALC GGA	1108 F4	RS T G\$ GADOSE, DOSFT,	261
HTGR CONTAINMENT PRESSURE POST RUPTURE GGA	7044 F4	RS XT 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
HMOCR-SAFE, 2-D MONTE CARLO CELL CALCULATION	AI 360 F4	RS P XT B \$	307
IBM 360 F+BAL	RS P T D\$ PDQ5, 2-D FEW-GROUP DIFFUSION AND DEPLETION		R336
IBM 360 F4	RS P T D\$ PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION		R275
IITR 7094 F4	RSBP LXT D\$ NAP, NEUTRON-INDUCED GAMMA-RAY RADIOACTIVITY		314
IMPELLER DESIGN STUDY	PW 1604 F63	RS P T I\$ PIP, CENTRIFUGAL PUMP	187
INC 7044 F4	RS P T G\$ RELAP2, REACTOR BLOWDOWN - EXCURSION ANALYSIS		369
INELASTIC LARGE DEFLECTION STRESS STUDY BAPL	6600 F+COM RS P XT I\$ GAPL3,		R397
INELASTIC SCAT X-SECTION CALC MODERATOR GGA	1108 F4	RS P A\$ GAKER,	289
INELASTIC SCATTERING CDC	1604 F63	RS P A\$ HAFEVER, HAUSER-FESHBACH	14
INELASTIC SCATTERING 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	R403
INPUT PW	1604 F63	RS C\$ TDP, 2-D PERTURBATION TDC OR 2DXY FLUX	199
INPUT, PREPARATION, EDIT	KAPL 6600 F+ASC	RS P T L\$ DATATRAN 2-D GEOMETRY	R406
INSTRUCTION SET	PW 1604 F+CDP	RS P T P\$ LAG, ASSEMBLER FOR FLOCO2	186
INTERVAL X-SECTION AVERAGING	GGA 7044 F4	RS P L\$ GAVER, ENERGY	218
INVERSE KINETICS CALC	ANL 3600 F63	RSBP F\$ R102, SPACE-INDEPENDENT	168
INVERSE KINETICS CALC	WANL 7094 F4	RS F\$ R102, SPACE-INDEPENDENT	168
ISOCRUNCH, REACTION DECAY CHAIN ANALYSIS	ORNL 1604 F63	RS P D \$	180
ISOCRUNCH, REACTION DECAY CHAIN ANALYSIS	ORNL 7090 F2	RS P D \$	180
ISOGEN, RADIONUCLIDE GENERATION AND DECAY	BNW 1108 F5	RSBP L T D \$	367
ISOSEARCH, ISOTOPE PRODUCTION FLUX, X-SEC CALC	ORNL 360 F4	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 F4	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	GEV 635 F4	RS P T O\$ BURNUP, HEAVY ELEMENT	311
JITER, FLUCTUATION EXPERIMENT ANALYSIS	BAPL 6600 F4	RS P T O \$	R394
JUPITOR1, COUPLED-CHANNEL X-SEC EVALUATION	ORNL 1604 F63	RS P T A \$	308
KAPL 6600 F	R B T M\$ TIGIR2, MODULAR DOCUMENT INFORMATION SYSTEM		R403
KAPL 6600 F+ASC	RS P T H\$ LION, 3-D TEMPERATURE DISTRIBUTION PROGRAM		R299
KAPL 6600 F+ASC	RS P T L\$ DATATRAN 2-D GEOMETRY INPUT, PREPARATION, EDIT		R406
KAPL 6600 F+ASC	RS P T P\$ CURFIT, CURVE FITTING EXPERIMENTAL DATA POINTS		R 43
KAPL 6600 F+ASC	RS P T P\$ DATATRAN UTILITY MODULES, 2-D + 3-D PLOTTING		R407
KAPL 6600 F+ASC	RS P T P\$ SNEQ, NONLINEAR ALGEBRAIC EQN SOLN CURVE PLOT		R364
KAPL 6600 F+COM	RSB T M\$ DATATRAN, MODULAR PROGRAMMING AND DATA SYSTEM		R386
KAPL 6600 F4	RS I\$ SORSDB, PRESSURE VESSEL STRESS AND FATIGUE		R391
KAPL 6600 F4	RS P F\$ RAUMZEIT, 1-D TIME-DEPENDENT DIFFUSION CALC		R352
KAPL 6600 F4	RS P F\$ STINT3, SINGLE-CHANNEL SPACE-TIME SYNTHESIS		R389
KAPL 6600 F4	RS P H\$ RAPP, HIGH-VELOCITY FLOW STUDY STEAM-WATER MIX		R382
KAPL 6600 F4	RS P I\$ STEM, MATRIX GENERATION FOR A SYSTEM OF BEAMS		R337
KAPL 6600 F4	RS P I\$ TUBE, U-TUBE HEAT EXCHANGER STRESS ANALYSIS		R378
KAPL 6600 F4	RS P T I\$ GEM, EIGENVALUE PROBLEM FOR VIBRATING SYSTEMS		R344
KAPL 6600 F4	RS P T I\$ SOR2, STRESS ANALYSIS SHELLS OF REVOLUTION		R 80
KAPL 6600 F4	RS P X I\$ FINEL, FINITE-ELEMENT STUDY 2,3-D STRUCTURES		R404

KE	3600 F36	RSBP	G\$ WHAM, LIQUID-FILLED PIPING SYSTEM ANALYSIS	278
KE	7090 F2	RSBP	D\$ NPRFCOP, 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
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 F\$ R101, SPACE-INDEPENDENT KINETICS	255
KINETICS	AI	360 F4	RS P T F\$ TSN, SPATIALLY-DEPENDENT REACTOR	309
KINETICS	AI	7094 F4	RS P T F\$ TSN, SPATIALLY-DEPENDENT REACTOR	309
KINETICS	GGA	1108 F4	RS P E\$ GAPOTKIN, SPACE-INDEPENDENT REACTOR	317
KINETICS CALC	ANL	3600 F63	RSBP F\$ R102, SPACE-INDEPENDENT INVERSE	168
KINETICS CALC	WANL	7094 F4	RS E\$ R102, SPACE-INDEPENDENT INVERSE	168
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 F\$ 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 XT F\$ NOWIG, 1-D 2-GP	R371
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 F4	RSP T E\$ BLOOST6, COMBINED	303
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
LARCA, FLUX-WEIGHTING OF DTF4 CROSS SECTIONS	LASL	6600 F4	RS P N \$	409
LARGE DEFLECTION STRESS STUDY	BAPL	6600 F+COM	RS P XT I\$ GAPL3, INELASTIC	R397
LASER, SPECTRUM CALC WITH BURNUP CYL LATTICE	WAPD	7094 F+MAP	RS PLXT B \$	249
LASL LEAST SQUARES, GENERAL CURVE FITTING	LASL	7094 F4	RS T P \$	62
LASL 1108 F4	RS P	T C\$ TWOTRAN, 2-D MULTI-GP TRANSPORT CODE X-Y GEOM		358
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 D\$ 2DB, 2-D MULTIGROUP DIFFUSION AND DEPLETION		325
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 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 7090 F2	RS P	I\$ WIREX, COMPUTER-PRODUCED WIRING LISTS UHTREX		315
LASL 7090 F2	RS P	T L\$ DPC, DATA PREPARATION FOR 2-D DESIGN PROGRAMS		234
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 PLXT B\$ LASFR, SPECTRUM CALC WITH BURNUP CYL	249
LATTICE EFFECTS	GGA	7044 F+MAP	RS P T B\$ GAROL, RESONANCE OVERLAP AND	219
LATTICE EFFECTS	LEP	7094 F4	RS P T B\$ GAROL, RESONANCE OVERLAP AND	219
LATTICE PARAMETERS HETEROGENEOUS CALC	FMA	7090 F2	RSBP X C\$ HERESY1,	136
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 XT P\$ DAFT1,	R327
LEAST SQUARES FIT SUM OF EXPONENTIALS	MIT	7090 F2	RS P P\$ FRANTIC,	324
LEAST SQUARES, GENERAL CURVE FITTING	LASL	7094 F4	RS T P\$ LASL	62
LEGCOEF3, LEGENDRE COEF CALC FOR ANGULAR DIST	GGA	7044 F4	RS P X A \$	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
LEOPARD, SPECTRA CALCULATION WITH DEPLETION	WAPD	360 F4	RS PLXT R \$	279

LER	7090 F+MAP	RS P	T C\$ TDSN, 2-D MULTIGROUP DISCRETE ORDINATE PROGRAM	312
LER	7094 F4	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 XT J\$ M0756,	R343
LIB	AI 360 F4	RSBPLXT C\$ CAESAR4, LIBLST, 1-D MULTI-GP DIFFUSION +		270
LIBLST,	1-D MULTI-GP DIFFUSION + LIB	AI 360 F4	RSBPLXT C\$ CAESAR4,	270
LIBRARY	LRL 7094 F2	RS PL T M\$ ECSIL, EXPERIMENTAL NEUTRON DATA		351
LIBRARY PREPARATION	GGA 1108 F4	RS P T L\$ GAND, GAFGAR X-SECTION		345
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+MAP	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 OF THREDES		271
LIFETIME ANALYSIS	ANL 3600 F36	RSBP I\$ SWELL2, FUEL ELEMENT		353
LINEAR ELASTIC STRUCTURAL DYNAMICS	BAPL 6600 F4	RS P XT I\$ M0266,		R383
LINEAR ELASTIC SYSTEMS	BAPL 6600 F4	RS P XT I\$ M0552, DYNAMIC ANALYSIS		R283
LION, 3-D TEMPERATURE DISTRIBUTION PROGRAM	KAPL 6600 F+ASC	RS P T H \$		R299
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 3600 F36	RSBP G\$ WHAM,		278
LISTS UHTRFX	LASL 7090 F2	RS P I\$ WIRFX, COMPUTER-PRODUCED WIRING		315
LOAD	GGA 7044 F4	RS P T I\$ SAFE-PCRS, STRESS ANALYSIS AXISYMMETRIC		250
LOAD	BAPL 6600 F4	RS P XT I\$ SEALSHL2, SHFL STRESS ANALYSIS AXISYM		R282
LOAD	GGA 7044 F4	RS P T I\$ SAFE-AXISYM, STRESS ANALYSIS AXISYMMETRIC		251
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\$ ECCSA1,		330
LOSS-OF-COOLANT ACCIDENT ANALYSIS	BAPL 6600 F4	RS P XT G\$ FLASH2,		R295
LOSS-OF-COOLANT ACCIDENT ANALYSIS	PPCO 7040 F+MAP	RS P T G\$ CONTEMPT,		297
LOSS-OF-COOLANT ACCIDENT ANALYSIS	BAPL 6600 F4	RS P XT G\$ M0555, ACT1,		R284
LOSS-OF-COOLANT THERMAL ANALYSIS	BCL 6400 F4	RS P T G\$ NURLOC-1.0,		328
LRL 709 F2	RS C\$ FIRN, 2-D FEW-GP S4 APPROXIMATION RZ GEOMETRY			7
LRL 7090 F+MAP	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 F2	RS P P\$ EXPALS, LEAST SQUARES EXPONENTIAL DECAY CURVES			321
LRL 7094 F2	RS PL T M\$ ECSIL, EXPERIMENTAL NEUTRON DATA LIBRARY			351
LSBR FUEL SWELLING TEMPERATURE STUDY	BAPL 6600 F4	RS P XT H\$ FIGRO,		R272
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-SAXON POTENTIAL SHAPE CALCULATION	ORNL 7090 F2	RS A \$		381
MAC, SHIELD DESIGN MULTIGROUP SLAB GEOMETRY	ANL 3600 F63	RSBPL T J \$		143
MAC, SHIELD DESIGN MULTIGROUP SLAB GEOMETRY	BNW 7090 F2	RSBPL T J \$		143
MACH1, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	ANL 3600 F36	RS P XT C \$		262
MACH1, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	PURD 6500 F4	RS PLXT 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 RSB	O\$ BURP5, GAMMA-RAY PHOTOFRACTION WELL CRYSTAL	UM 7090		170
MANTA, STEADY-STATE THERMAL-HYDRAULIC ANALYSIS	NED 635 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 RUCKLING CYL FUEL ELEMENTS	AEB 360 F4	S P B\$ WFLWING,		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 GENERATION FOR A SYSTEM OF BEAMS	KAPL 6600 F4	RS P I\$ STEM,		R337
MAXIMUM MOMENT CALC	AI 7090 F+MAP	RS T I\$ 4RESTRAINT PIPE STRESS,		109
MAXIMUM YIELD FROM REACTION OR DECAY	ORNL 1604 F63	RS P O\$ ISOTOPES,		179
MC ORNL 360 F+BAL	RS P T B\$ RAFFLE, 1ST FLIGHT COLLISION PROBABILITIES			392
MC ORNL 7090 F+MAP	RS P T B\$ RAFFLE, 1ST FLIGHT COLLISION PROBABILITIES			392
MC NEUTRON PENETRATION CALCULATION	DAC 7090 F2	RSBP J\$ LIPRECAN1,		123
MC NEUTRON, GAMMA-RAY HISTORIES	PW 1604 F+CDP	RS P XT R\$ FMC-N, FMC-G,		195
MC**2 DATA CONVERSION	APDA 3600 ASAF4	RS P T M\$ ETOE, ENDF/B TO		350

MC**2, ENDF MULTIGROUP X-SECTION CALCULATION ANL 3600 F36 RS P T B \$ 355
 MCS, MONTE CARLO NEUTRON PENETRATION STUDY LASL 7090 FLOCO RS P B \$ 202
 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
 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
 METALLIC FISSION PRODUCT RELEASE GGA 1108 F4 RS P D\$ FREVAP6, HTGR 301
 MGDSN, 1-D MULTI-GP SN APPROX SLAB CYL SPHERE PW 1604 LAG1 RS P C \$ 211
 MISH-MASH, RESONANCE INTEGRAL CALC HOMOGENFOUS 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-FLEMENT ANALYSIS THIN SHELLS R402
 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 R382
 ML-1 FLUID FLOW EXPERIMENT ANALYSIS AGC 7090 F2 RS P O\$ CROC90, 154
 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
 MODULAR DOCUMENT INFORMATION SYSTEM KAPL 6600 F R B T M\$ TIGIR2, R403
 MODULAR PROGRAMMING AND DATA SYSTEM KAPL 6600 F+COM RSB T M\$ DATATRAN, R386
 MODULES, 2-D + 3-D PLOTTING KAPL 6600 F+ASC RS P T P\$ DATATRAN UTILITY R407
 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 F4 RS P XT B\$ HWOCR-SAFE, 2-D 307
 MONTE CARLO NEUTRON PENETRATION STUDY LASL 7090 FLOCO RS P B\$ MCS, 202
 MONTE CARLO SLOWING-DOWN DENSITY CALC AI 7094 F+FAP RS PL T B\$ TYCHE3, 149
 MORTIMER, DOSE RATE CALCULATION SNAP GEOMETRY AI 7090 F2 RS J \$ 142
 MUFFLE, FISSION NUCLIDE X-SECTION EVALUATION ORNL 7090 F4 RSBP A \$ 323
 MULTI-CHANNEL 2-D 2-PHASE FLOW AI 7094 F2 RS P H\$ FLOW-MODEL, 246
 MULTI-GP CONSTANT CALC AGC 7090 F2 RSRPLXT B\$ AGN-GAM, FAST SPECTRUM 204
 MULTI-GP CONSTANT CALC 0 TO 10 MEV BC 625 F4 RS P XT 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 RSRPLXT 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 DIFFUSION PROGRAM BC 625 F4 RS 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 PLXT 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 XT C\$ MACH1, 1-D 262
 MULTI-GP DIFFUSION SLAB CYL SPHERE PURD 6500 F4 RS PLXT 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 XY PZ 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 PTH WANL 7094 F4 RS P XT C\$ VARI-QUIR3, 2-D 264
 MULTI-GP DISCRETE ORDINATE CALC AI 7090 F2 RS PLXT C\$ DTF2, 1-D 151
 MULTI-GP DISCRETE ORDINATE CALC AI 360 F4 RSRPLXT 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 UNC-LASL 1604 F63 RS C\$ 2DF, 2-D 173
 MULTI-GP DISCRETE ORDINATE PROGRAM ANL 360 F4 RS P T C\$ DTF4, 1-D 209
 MULTI-GP DISCRETE ORDINATE PROGRAM BC 625 F4 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 TDC, 2-D		161
MULTI-GP SN APPROXIMATION XY GEOM	AGC	7090 FLOCO RSBP	C\$ 2DXY, 2-D				18
MULTI-GP TRANSFER COEFFICIENTS	LRL	7090 F+FAP	RS	P	T	R\$ SOPHIST1/2/5,	160
MULTI-GP TRANSFER MATRICES	AGC	7090 F2	RS	P	T	B\$ AGN-SIGMA, CALC OF	243
MULTI-GP TRANSPORT CODE X-Y GEOM	ANL	360 F4	RS	P	T	C\$ TWOTRAN, 2-D	358
MULTI-GP TRANSPORT CODE X-Y GEOM	LASL	1108 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	PLXT	R\$ GGC4,		298
MULTI-GP X-SECTIONS FAST THERMAL SPECTRA	GGA	6600 F4	RS	L	T	R\$ GGC4,	298
MULTI-LEVEL CONVOLUTION	PPCO	7040 F4	RS	P	A\$ COMBCO, COMBINED B-W		203
MULTI-PIN FUEL ELEMENT	AGC	7090 F2	RS	P	B\$ BOUNCE, FLUX DIST IN		237
MULTIGP ORNL 360 F4	RS	P	XT	K\$ CITATION, 1,2,3-D	DIFFUSION DEPLETION		387
MULTIGP DIFFUSION TRIANGULAR MESH	GGA	1108 F+FAL	RS	P	T	C\$ GAMTRI, 2-D	401
MULTIGP KINETICS WITH TEMP FEEDBACK	GGA	1108 F4	RS	P	T	F\$ GAKIT, 1-D	370
MULTIGROUP CONSTANTS	ORNL	360 F4	RS	PLXT	R\$ XSDRN, DISCRETE ORDINATE		393
MULTIGROUP CONSTANTS FROM ENDF/B FOR 1DX BNWL	1108 F4	RS	P	T	R\$ ETOX,		388
MULTIGROUP DIFFUSION AND DEPLETION	ANL	3600 F4	RSBP	T	D\$ 2DB, 2-D		325
MULTIGROUP DIFFUSION AND DEPLETION	BNW	1108 F4	RS	P	T	D\$ 2DB, 2-D	325
MULTIGROUP DIFFUSION AND DEPLETION	LASL	6600 F4	RS	P	T	D\$ 2DB, 2-D	325
MULTIGROUP DIFFUSION AND DEPLETION	GGA	1108 F4	RS	P	T	D\$ FEVER7, 1-D	318
MULTIGROUP DIFFUSION DEPLETION	AI	360 F4	RSBP	XT	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 DISCRETE ORDINATE CALC	UNC	1604 F63	RS	PL	T	C\$ DTF, 1-D	144
MULTIGROUP DISCRETE ORDINATE PROGRAM	LER	7090 F+MAP	RS	P	T	C\$ TDSN, 2-D	312
MULTIGROUP 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	3600 F36	RS	P	T	R\$ MC**2, ENDF	355
MULTILEVEL B-W X-SEC CALC	BNL	6600 F4	RS	P	A\$ SIGPLOT, RESOLVED		377
MULTILEVEL B-W X-SEC CALC	BNL	7094 F4	RS	P	A\$ SIGPLOT, RESOLVED		377
MUSCAT, VIEW FACTOR SHIELDING CODE CAVITY GEOM	GGA	1108 F4	RS	P	T	J \$	259
MO102, POINT DEPLETION FISSION PRODUCT	BAPL	6600 F4	RS	P	D\$ CINDER,		313
MO219, PWR FLOW TRANSIENT ANALYSIS	BAPL	6600 F4	RS	P	XT	H\$ FLOT1,	R331
MO266, LINEAR ELASTIC STRUCTURAL DYNAMICS	BAPL	6600 F4	RS	P	XT	I \$	R383
MO457, PIPE, ELASTIC STRESS OF PIPING SYSTEM	BAPL	6600 F4	RS	P	XT	I \$	R329
MO552, DYNAMIC ANALYSIS LINEAR ELASTIC SYSTEMS	BAPL	6600 F4	RS	P	XT	I \$	R283
MO555, ACT1, LOSS-OF-COOLANT ACCIDENT ANALYSIS	BAPL	6600 F4	RS	P	XT	G \$	R284
MO648, 1-D SLAB TRANSPORT WITH SLOWING DOWN	BAPL	6600 F4	RS	XT	C \$		R342
MO756, LETO, 1-D SLAB GAMMA-RAY TRANSPORT	BAPL	6600 F4	RS	P	XT	J \$	R343
MO807, 2-D DIFFUSION ABSORPTION REMOVAL X-SECS	BAPL	6600 F4	RS	XT	B \$		R280
MO899, HOH, STEAM TABLES 14.5-2538 PSIA	ANL	1604 F63	RS	P	H \$		R294
MO899, HOH, STEAM TABLES 14.5-2538 PSIA	BAPL	6600 F4	RS	P	XT	H \$	R294
NAP, NEUTRON-INDUCED GAMMA-RAY RADIOACTIVITY	IITR	7094 F4	RSBPL	XT	D \$		314
NCSC 6600 F4	RS	T	M\$ CHECKER, CRECT, DAMMET, PLOTFB, SLAV3, ENDF/B PROC				384
NEARREX, COMPOUND NUCLEUS X-SECTION CALC	ANL	3600 F63	RSBP	A \$			171
NED 635 F4	RS	P	T	R\$ RFAX, RESOLVED RESONANCE EPITHERMAL X-SECTIONS			257
NED 635 F4	RS	P	T	C\$ FLARE, 3-D REACTIVITY AND POWER DISTRIBUTION			167
NED 635 F4	RS	P	T	H\$ MANTA, STEADY-STATE THERMAL-HYDRAULIC ANALYSIS			256
NED 635 F4	RS	P	T	O\$ EXPN, ANALYSIS OF PULSED NEUTRON SOURCE DATA			258
NED 635 F4	RS	P	XT	F\$ FORE2, FAST REACTOR EXCURSION CALCULATIONS			174
NED 635 F4	RS	PL	T	C\$ RISYN, 2-D MULTI-GP DIFFUSION SYNTHESIS CALC			287
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
NED 2000 F2	RS	P	B\$ SPARTA, SPATIALLY-AVERAGED DOPPLER EFFECTS				178
NED 2000 F4	RS	P	T	F\$ FORE, FAST REACTOR EXCURSION CALCULATIONS			174
NEUTRON DATA LIBRARY	LRL	7094 F2	RS	PL	T	M\$ ECSIL, EXPERIMENTAL	351
NEUTRON HISTORIES	GGA	7044 F4	RS	P	T	B\$ FMC-N, MONTE CARLO CALC	195

NEUTRON PENETRATION CALCULATION	DAC	7090 F2	RSBP	J\$ LIPRECAN1, MC	123
NEUTRON PENETRATION STUDY	LASL	7090 F4	RS P	B\$ MCS, MONTE CARLO	202
NEUTRON SOURCE DATA	NED	635 F4	RS P	T O\$ EXPN, ANALYSIS OF PULSED	258
NEUTRON SPECTRUM X-SECTION CALC	AI	7090 F2	RS PL T	B\$ FORM, FAST	51
NEUTRON SPECTRUM X-SECTION CALC	ANL	3600 F63	RS	LXT 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 PLXT	B\$ GAM1, FAST	33
NEUTRON SPECTRUM X-SECTION CALC	GGA	7090 F2	RS PLXT	B\$ GAM1, FAST	33
NEUTRON SPECTRUM X-SECTIONS	AI	7090 F+FAP	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 XT	A\$ SUMOR, S-WAVE	R399
NEUTRON-HYDRODYNAMICS	APDA	7094 F2	RS P	F\$ WEAK EXPLOSION, COUPLED	145
NEUTRON-INDUCED GAMMA-RAY RADIOACTIVITY	IITR	7094 F4	RSBPLXT	D\$ NAP,	314
NEUTRON, GAMMA-RAY HISTORIES	PW	1604 F+CDP	RS P XT	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
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,	R364
NOWIG, 1-D 2-GP KINETICS TEMPERATURE FEEDBACK	BAPL	6600 F4	RS P XT	F \$	R371
NPRFCCP, FUEL CYCLE COSTS PERFORMANCE DATA	KE	7090 F2	RSBP	D \$	146
NUCLEAR FUEL CYCLE COST AND ECONOMICS	COMM	360 F4	RS P	T D\$ CINCAS,	354
NUCLEAR STATION ELECTRICITY COSTS	ORNL	1604 F63	RS P	D\$ POWERCO,	340
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 XT	P\$ DAFT1, LEAST SQUARES FIT FISSILE	R327
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
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 F2	RS P	J\$ SHOE, SHIELD WEIGHT	197
OPTIMIZATION STUDY	PW	1604 F63	RS	I\$ WOPEXPRT, REACTOR WEIGHT	190
OPUS, POWER PLANT PERFORMANCE AND PRICE STUDY	GGA	7044 F+MAP	RS P	T D \$	226
ORDINATE CALC	AI	7090 F2	RS PLXT	C\$ DTF2, 1-D MULTI-GP DISCRETE	151
ORDINATE CALC	AI	360 F4	RSBPLXT	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	UNC-LASL	1604 F63	RS	C\$ 2DF, 2-D MULTI-GP DISCRETE	173
ORDINATE MULTIGROUP CONSTANTS	ORNL	360 F4	RS PLXT	B\$ XSDRN, DISCRETE	393
ORDINATE PROGRAM	ANL	360 F4	RS P	T C\$ DTF4, 1-D MULTI-GP DISCRETE	209
ORDINATE PROGRAM	BC	625 F4	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	703C 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 PROGRAM	LER	7094 F4	RS P	T C\$ TDSN, 2-D MULTIGROUP DISCRETE	312
ORDINATES SLAB GEOMETRY	BAPL	6600 F4	RS P XT	C\$ BE21, FEW-GP DISCRETE	R398
ORNL 360 F+BAL	RS P	T B\$ RAFFLE, 1ST FLIGHT COLLISION PROBABILITIES	MC		392
ORNL 360 F4	RS P	D\$ ISOSEARCH, ISOTOPE PRODUCTION FLUX, X-SEC CALC			322
ORNL 360 F4	RS P	T C\$ EXTERMINATOR2, 2-D MULTI-GP DIFFUSION PROGRAM			156
ORNL 360 F4	RS P XT	K\$ CITATION, 1,2,3-D DIFFUSION DEPLETION MULTIGP			387
ORNL 360 F4	RS PLXT	B\$ XSDRN, DISCRETE ORDINATE MULTIGROUP CONSTANTS			393
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ORNL 1604 F63	RS P	A\$ RAMES, PARTICLE WAVE FUNCTION RADIAL INTEGRALS			335
ORNL 1604 F63	RS P	D\$ ISOCRUNCH, REACTION DECAY CHAIN ANALYSIS			180
ORNL 1604 F63	RS P	D\$ ISOSEARCH, 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-SFC EVALUATION	308
ORNL 7090 F+FAP	RS P	T B\$ RAFFLE, 1ST FLIGHT COLLISION PROBABILITIES MC	392
ORNL 7090 F+FAP	RS P	T C\$ EXTERMINATOR, 2-D MULTI-GP DIFFUSION PROGRAM	156
ORNL 7090 F+FAP	RS P	T D\$ ASSAULT, 2-D MULTI-GP DIFFUSION DEPLETION CODE	240
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OVERLAP AND LATTICE EFFECTS	LER 7094 F4	RS P	T B\$ GAROL, RESONANCE
PARALLEL BFAMS	ANL 3600 F36	SBP	I\$ BOW2, DEFLECTION CALCULATION
PARTIAL RFUEL	GGA 7044 F4	RS P	T D\$ GARGOYLE, FUEL CYCLE ANALYSIS
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PDQ5, 2-D FEW-GROUP DIFFUSION AND DEPLETION	IBM 360 F+BAL	RS P	T D\$ R336
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PENETRATION STUDY	LASL 7090 FLOCO	RS P	B\$ MCS, MONTE CARLO NEUTRON
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PERFORMANCE DATA	KE 7090 F2	RSBP	D\$ NPRCCP, FUEL CYCLE COSTS
PERFORMANCE STUDY	GGA 7044 F4	RS P	D\$ WAMPUM, FUEL CYCLE COSTS
PERT, 1-D PERTURBATION FOR AIM AND FOG CODES	AI 7090 F2	RS	C\$ 30
PERT, 1-D PERTURBATION FOR AIM AND FOG CODES	BHSC 360 F4	RS P	C\$ 30
PERT, 1-D PERTURBATION FOR AIM AND FOG CODES	CDC 1604 F63	RS	C\$ 30
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PERTURBATION FOR AIM AND FOG CODES	BHSC 360 F4	RS P	C\$ PERT, 1-D
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RESQ2, RESQ0, DBF1, RESONANCE INTEGRAL HEX CELL	BAPL 6600 F4	RS P XT B \$	R285
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RIFF-RAFF, RESONANCE INTEGRAL CALC 2-REG CELL ANL 3600 F36 RSBP XT B \$ 213
 RING SNAP GEOMETRY AI 7090 F2 RS JS SCAR1, SCATTER FROM A 111
 RSAC, RADIOLOGICAL SAFETY ANALYSIS PROGRAM PPCO 7040 F+MAP RS P T G \$ 265
 RTH WANL 7094 F4 RS P XT 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
 RUPTURE GGA 7044 F4 RS XT 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+FAP RSBP T D\$ ODB, 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+RAL 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
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 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
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 SAFE-PCRS, STRESS ANALYSIS AXISYMMETRIC LOAD GGA 7044 F4 RS P T I \$ 250
 SAFE-PLANF, 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
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 SAIL, 1-D 1-GP SN APPROXIMATION SLAB GEOMETRY CDC 1604 F63 RS P B \$ 52
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 SASIA, FAST REACTOR POWER AND FLOW TRANSIENTS ANL 6600 F4 RS P T F \$ 400
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SHIELD LEAKAGE	AI	7090 F2	RS	J\$ FARSE1A, DOSE RATE FROM SNAP	91
SHIELD WEIGHT OPTIMIZATION DOSE CALC	AI	7094 F2	RS P	J\$ SHOE,	197
SHIELDING CODE CAVITY GEOM	GGA	1108 F4	RS P	T J\$ MUSCAT, VIEW FACTOR	259
SHOCK, SPACE POWER PLANT DESIGN OPTIMIZATION	AI	7090 F2	RS	I \$	114
SHOE, SHIELD WEIGHT OPTIMIZATION DOSE CALC	AI	7094 F2	RS P	J \$	197
SIGPLOT, RESOLVED MULTILEVEL B-W X-SEC CALC	BNL	6600 F4	RS P	A \$	377
SIGPLOT, RESOLVED MULTILEVEL B-W X-SEC CALC	BNL	7094 F4	RS P	A \$	377
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SITE REQUIREMENT STUDY	AI	7094 F+PAP	RS P	T G\$ AISITE2, PARAMETRIC	172
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SIZZLE, 1-D MULTIGROUP DIFFUSION DEPLETION	AI	7090 F2	RS	L T D \$	58
SIZZLE, 1-D MULTIGROUP DIFFUSION DEPLETION	CDC	1604 F63	RS	L T D \$	58
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SLAB ORNL	7090 F2	RS P	T C\$ EQUIPOISE3A, 2-D 2-GP DIFFUSION CYLINDER	87	
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SLAB CYL SPHERE	AI	7090 F+PAP	RS	L T C\$ FAIM, 1-D MULTI-GP DIFFUSION	120
SLAB CYL SPHERE	AI	7090 F+PAP	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	PLXT C\$ FAIM, 1-D MULTI-GP DIFFUSION	120
SLAB CYL SPHERE	AI	7090 F+PAP	RS	L T C\$ ULCER, 1-D MULTI-GP DIFFUSION	118
SLAB CYL SPHERE	ANL	3600 F36	RS	P XT C\$ MACH1, 1-D MULTI-GP DIFFUSION	262
SLAB CYL SPHERE	PURD	6500 F4	RS	PLXT 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
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SLAB CYL SPHERE	BHSC	360 F4	RS	P T C\$ FAIMOS, 1-D MULTI-GP DIFFUSION	120
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
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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	BAPL	6600 F4	RS	P XT C\$ RE21, FEW-GP DISCRETE ORDINATES	R398
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	XT C\$ M0648, 1-D	R342
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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	PPCO	7090 F2	RS	P T C\$ TOPIC, 1-D FEW-GP	148
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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
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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
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SPACE-INDEPENDENT KINETICS W/FEEDBACK CDC 1604 F63 RS P E\$ AIREK3,			121
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SPECTRA GGA 1108 F4 RS P T O\$ TOAD, PROCESSING OF ANALYZER GAMMA-RAY			333
SPECTRA GGA 1108 F4 RS PLXT 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
SPECTRUM AND X-SECTION CALCULATION GEV 7094 F+FAP RS P T B\$ EPITHERMOS,			201
SPECTRUM CALC WITH BURNUP CYL LATTICE WAPD 7094 F+MAP RS PLXT B\$ LASER,			249
SPECTRUM MULTI-GP CONSTANT CALC AGC 7090 F2 RSRPLXT B\$ AGN-GAM, FAST			204
SPECTRUM X-SECTION CALC AI 7090 F2 RS PL T B\$ FORM, FAST NEUTRON			51
SPECTRUM X-SECTION CALC ANL 3600 F63 RS LXT B\$ GAM1, FAST NEUTRON			33
SPECTRUM X-SECTION CALC CDC 1604 F63 RS PL T B\$ FORM, FAST NEUTRON			51
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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
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SPHERE	BNW	1107 F4	RS P	T C\$ HFN, 1-D MULTI-GP DIFFUSION SLAB CYL	241
SPHERE	AI	7090 F+FAP	RS L T C\$ FAIM, 1-D MULTI-GP DIFFUSION SLAB CYL		120
SPHERE	AI	7090 F+FAP	RS PL T C\$ AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL		29
SPHERE	CDC	1604 F63	RS PL T C\$ AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL		29
SPHERE	CDC	1604 F63	RS PLXT 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 XT C\$ MACH1, 1-D MULTI-GP DIFFUSION SLAB CYL		262
SPHERE	PURD	6500 F4	RS PLXT 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	LRL	7090 F2	RS P F\$ CONEC, COUPLED NEUTRONICS-HYDRODYNAMICS		129
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STATISTICAL	RESONANCE PARAMETER CALC	GGA 1108 F4	RS P A\$ PSEUDO,		292
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STEADY-STATE	FLOW, PRESSURE DISTRIBUTION	GGA 1108 F5	RS P H\$ FLAC,		395
STEADY-STATE	HEAT TRANSFER	AI 7094 F2	RS P T H\$ HEATING2, TRANSIENT		198
STEADY-STATE	TEMPERATURE VOID FRACTION	AI 7090 F2	RS I\$ FUGUE,		48
STEADY-STATE	THERMAL-HYDRAULIC ANALYSIS	NEO 635 F4	RS P T H\$ MANTA,		256
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 XT H\$ WATER,		R267
STEAM	TABLES 14.5-2538 PSIA	ANL 1604 F63	RS P H\$ M0899,HOH,		R294
STEAM	TABLES 14.5-2538 PSIA	BAPL 6600 F4	RS P XT H\$ M0899,HOH,		R294
STEAM	THERMODYNAMIC PROPERTIES	BAPL 6600 F4	RS P XT H\$ WASP, WATER AND		R396
STEAM-WATER	MIX	KAPL 6600 F4	RS P H\$ RAPP, HIGH-VELOCITY FLOW STUDY		R382
STEM,	MATRIX GENERATION FOR A SYSTEM OF BEAMS	KAPL 6600 F4	RS P I \$		R337
STINT3,	SINGLE-CHANNEL SPACE-TIME SYNTHESIS	KAPL 6600 F4	RS P F \$		R389
STMGEN,	STEAM GENERATOR DESIGN CRITERIA COSTS	GGA 7044 F4	RS P T D \$		227
STRESS	ANALYSIS	KAPL 6600 F4	RS P I\$ TUBE, U-TURE HEAT EXCHANGER		R378
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 XT I\$ SEALSHELL2, SHELL		R282
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 XT I\$ CYGR02,		R266
STRESS	ANALYSIS	SHELLS OF REVOLUTION	KAPL 6600 F4 RS P T I\$ SOR2,		R 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	GGA 1108 F4 RS P I\$ SAFE-PLANE, PLANE		257
STRESS	AND FATIGUE	KAPL 6600 F4	RS I\$ SORSDB, PRESSURE VESSEL		R391
STRESS	OF PIPING SYSTEM	BAPL 6600 F4	RS P XT I\$ M0457,PIPE, ELASTIC		R329
STRESS	STUDY	GGA 1108 F4	RS P T I\$ SAFE-3D, 3-D COMPOSITE STRUCTURE		332
STRESS	STUDY	BAPL 6600 F+COM	RS P XT I\$ GAPL3, INELASTIC LARGE DEFLECTION		R397
STRESS,	MAXIMUM MOMENT CALC	AI 7090 F+FAP	RS T I\$ 4RESTRAINT PIPE		109
STRIP,	RESOLVED RESONANCE INTEGRAL CALCULATION	RW 2000 F4	RS A \$		305
STRUCTURAL	DYNAMICS	BAPL 6600 F4	RS P XT I\$ M0266, LINEAR ELASTIC		R383
STRUCTURE	STRESS STUDY	GGA 1108 F4	RS P T I\$ SAFE-3D, 3-D COMPOSITE		332
STRUCTURES	BAPL 6600 F4	RS P XT L\$ BL47, DRAFTING TOOL TO PLOT PLANE			R373
STRUCTURES	KAPL 6600 F4	RS P X I\$ FINEL, FINITE-ELEMENT STUDY 2,3-D			R404
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 XT A \$		R399
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
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SWELL2,	FUEL ELEMENT LIFETIME ANALYSIS	ANL 3600 F36	RSBP I \$		353

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 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
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 TABLES 14.5-2538 PSIA ANL 1604 F63 RS P H\$ M0899, HOH, STEAM R294
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 TEMP CALC GGA 1108 F5 RS P T H\$ TAC2D, STEADY-STATE AND TRANSIENT 408
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 TEMPERATURE DISTRIBUTION PROGRAM KAPL 6600 F+ASC RS P T H\$ LION, 3-D R299
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 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
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 THREDES, 1-D FEW-GP DIFFUSION DESIGN SYSTEM AI 360 F4 RSBP T K \$ 273
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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	\$	TOODFF, 2-D 349
TOAD, PROCESSING OF ANALYZER GAMMA-RAY SPECTRA	GGA 1108 F4	RS P	T O	\$	333
TOODEE, 2-D TIME-DEPENDENT HEAT CONDUCTION	PPCO 7044 F+MAP	RS P	T H	\$	349
TOOL TO PLOT PLANE STRUCTURES	BAPL 6600 F4	RS P	XT L	\$	BL47, DRAFTING R373
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	XT H	\$	R348
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 GGA	1108 F4	RS P	T E	\$	BLOOST6, COMBINED KINETICS 2-D HEAT 303
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TRANSFER AI	7094 F2	RS P	T H	\$	HEATING2, TRANSIENT STEADY-STATE HEAT 198
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TRANSFER FUNCTION EVALUATION	PW 1604 F63	RS P	E	\$	CMXMAT, 188
TRANSFER FUNCTION SYNTHESIS	ANL 3600 F63	RSBP	T E	\$	TRAFICORPORATION, 135
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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 SOLID FUEL TUBE BUNDLES	LASL 7094 F2	RSBP	H	\$	AXTHRM, HEAT 183
TRANSIENT ANALYSIS	BAPL 6600 F4	RS P	XT H	\$	FLOT1, MO219, PWR FLOW R331
TRANSIENT FLOW AND HEAT TRANSFER	AI 7094 F2	RS P	T G	\$	TRANS-FUGUE1, 268
TRANSIENT HEAT CONDUCTION PROGRAM	BAPL 6600 F4	RS P	XT H	\$	HOT2, 2-D R286
TRANSIENT HEAT TRANSFER PROGRAM	GEC 635 F+GMP	RSBP	T H	\$	THTE, 3-D 346
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TRANSIENT TEMP CALC	GGA 1108 F5	RS P	T H	\$	TAC2D, STEADY-STATE AND 408
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TRANSIENTS	ANL 6600 F4	RS P	T F	\$	SASIA, FAST REACTOR POWER AND FLOW 400
TRANSPORT	BAPL 6600 F4	RS P	XT J	\$	MO756, LETO, 1-D SLAB GAMMA-RAY R343
TRANSPORT CODE X-Y GEOM	ANL 360 F4	RS P	T C	\$	TWOTRAN, 2-D MULTI-GP 358
TRANSPORT CODE X-Y GEOM	LASL 1108 F4	RS P	T C	\$	TWOTRAN, 2-D MULTI-GP 358
TRANSPORT WITH SLOWING DOWN	BAPL 6600 F4	RS	XT C	\$	MO648, 1-D SLAB R342
TRIANGULAR MESH	GGA 1108 F+BAL	RS P	T C	\$	GAMTRI, 2-D MULTIGP DIFFUSION 401
TRIX1, RESONANCE INTEGRAL X-SECTION CALC	AI 7094 F+MAP	RS	PLXT A	\$	208
TSN, SPATIALLY-DEPENDENT REACTOR KINETICS	AI 360 F4	RS P	T F	\$	309
TSN, SPATIALLY-DEPENDENT REACTOR KINETICS	AI 7094 F4	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	\$	R378
TUZ, UNRESOLVED REGION RESONANCE INTEGRAL CALC	GGA 7090 F+MAP	RSB	T A	\$	42
TWIGGLE, 2-D 2-GP SPACE-TIME DIFFUSION	ANL 360 F4	RS P	F	\$	R338
TWIGL, 2-D 2-GP SPACE-TIME DIFFUSION FEEDBACK	BAPL 6600 F4	RS P	XT F	\$	R338
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 1108 F4	RS P	T C	\$	358
TYCHE3, MONTE CARLO SLOWING-DOWN DENSITY CALC	AI 7094 F+MAP	RS	PL T B	\$	149
U-TUBE HEAT EXCHANGER STRESS ANALYSIS	KAPL 6600 F4	RS P	I	\$	TUBE, R378
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ULCER, 1-D MULTI-GP DIFFUSION SLAB CYL SPHRE	AI 7090 F+MAP	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

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UM	7090	MAD	RSB	O\$ BURP5, GAMMA-RAY PHOTOFRACTION WELL CRYSTAL	170
UMCC	360	F4	RS P T C\$	VARI-QUIR, TIME-DEP 2-D MULTI-GP DIFFUSION	212
UNC	1604	F63	RS PL T C\$	DTF, 1-D MULTIGROUP DISCRETE ORDINATE CALC	144
UNC-LASL	1604	F63	RS	C\$ 2DF, 2-D MULTI-GP DISCRETE ORDINATE CODE	173
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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-SFC CALC	BNL	7094	F4 RS P	A\$ AVERAGE,	376
UNRESOLVED REGION RESONANCE INTEGRAL CALC	GGA	7090	F+FAP	RSB T A\$ TUZ,	42
UNRESOLVED RESONANCE INTEGRALS X-SECS	BAPL	6600	F4 RS P	XT A\$ PUN1,	R359
UNRESOLVED RESONANCE X-SECTION CALC	GGA	1108	F4 RS P	A\$ GANDY,	341
URANIUM FUEL CYCLE COST ANALYSIS	AI	7090	F2 RS P	D\$ AIMFIRE,	55
UTILITY MODULES, 2-D + 3-D PLOTTING	KAPL	6600	F+ASC	RS P T P\$ DATATRAN	R407
UTILITY PROGRAM	AI	7094	F+FAP	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 XT C \$		264
VESSEL STRESS AND FATIGUE	KAPL	6600	F4 RS	I\$ SORSDB, PRESSURE	R391
VIBRATING SYSTEMS	KAPL	6600	F4 RS P T I\$	GEM, EIGENVALUE PROBLEM FOR	R344
VIEW FACTOR SHIELDING CODE CAVITY GEOM	GGA	1108	F4 RS P T J\$	MUSCAT,	259
VISCOELASTIC ANALYSIS CONCRETE	GGA	1108	F4 RS P	I\$ SAFE-CREFP,	300
VOID FRACTION	AI	7090	F2 RS	I\$ FUGUF, 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 COSTS PERFORMANCE STUDY	GGA	7044	F4 RS P	D \$	224
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WANL 7094 F4	RS P E\$	R101, SPACE-INDEPENDENT KINETICS KEX OPTIONS			255
WANL 7094 F4	RS P XT C\$	VARI-QUIR3, 2-D MULTI-GP DIFFUSION XY RZ RTH			264
WAPD 360 F4	RS PLXT B\$	LEOPARD, SPECTRA CALCULATION WITH DEPLETION			279
WAPD 7094 F+MAP	RS PLXT B\$	LASER, SPECTRUM CALC WITH BURNUP CYL LATTICE			249
WASP, WATER AND STEAM THERMODYNAMIC PROPERTIES	RAPL	6600	F4 RS P XT H \$		R396
WATER AND STEAM THERMODYNAMIC PROPERTIES	BAPL	6600	F4 RS P XT H\$	WASP,	R396
WATER-HAMMER, LIQUID BLOWDOWN ANALYSIS LOFT	UGA	360	F4 RS P	G \$	278
WATER, STEAM TABLES 14.5-14,500PSIA 32-472DEGF	BAPL	6600	F4 RS	XT H \$	R267
WAVE FUNCTION RADIAL INTEGRALS ORNL 1604 F63	RS P A\$	RAMES, PARTICLE			335
WEAK EXPLOSION, COUPLED NEUTRON-HYDRODYNAMICS	APDA	7094	F2 RS P	F \$	145
WED, W-DSN OUTPUT TAPE EDIT REACTION RATES	UK-W	7090	F2 RS	N \$	133
WEIGHT OPTIMIZATION DOSE CALC	AI	7094	F2 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 PHOTOFRACTION	170
WELWING, MATERIAL BUCKLING CYL FUEL ELEMENTS	AEB	360	F4 S P	R \$	362
WHAM, LIQUID-FILLED PIPING SYSTEM ANALYSIS	KE	3600	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 XT F \$		R274
WIGL2, 1-D 2-GP SPACE-TIME DIFFUSION 3-GEOM	GGA	1108	F4 RS P T F \$		R274
WIREX, COMPUTER-PRODUCED WIRING LISTS UHTREX	LASL	7090	F2 RS P	I \$	315
WIRING LISTS UHTREX	LASL	7090	F2 RS P	I\$ WIREX, COMPUTER-PRODUCED	315
WLIB, FLAT, RESONANCE ABSORPTION, CELL	ANL	3600	F36 RSBP XT B\$	RABBLE,	281
WOODS-SAXON POTENTIAL SHAPE CALCULATION ORNL 7090 F2	RS	A\$	LYNNE,		381
WOPEXPRT, REACTOR WEIGHT OPTIMIZATION STUDY	PW	1604	F63 RS	I \$	190
X-SEC CALC	BNL	6600	F4 RS P	A\$ SIGPLOT, RESOLVED MULTILEVEL B-W	377
X-SEC CALC	BNL	7094	F4 RS P	A\$ SIGPLOT, RESOLVED MULTILEVEL B-W	377
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	PS P XT B\$ GAF, GAR, SPECTRA AND GROUP-AVERAGED	316
X-SEC CALC ORNL 360 F4	RS P D\$ ISOSEARCH, ISOTOPE PRODUCTION FLUX,	322
X-SEC CALC ORNL 1604 F63	PS 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\$ SCORE2, SCISRS ENDF/B GRAPHIC	375
X-SECS BAPL 6600 F4	RS P XT A\$ PUN1, UNRESOLVED RESONANCE INTEGRALS	R359
X-SECS BAPL 6600 F4	RS XT B\$ M0807, 2-D DIFFUSION ABSORPTION REMOVAL	R280
X-SECTION AVERAGING GGA 7044 F4	RS P L\$ GAVER, ENERGY INTERVAL	218
X-SECTION CALC AI 7090 F2	RS PL T A\$ ARES2, RESONANCE INTEGRAL	89
X-SECTION CALC AI 7094 F+MAP RS	PLXT 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 LXT 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 PLXT B\$ GAM1, FAST NEUTRON SPECTRUM	33
X-SECTION CALC GGA 1108 F4	RS P A\$ GANDY, UNRESOLVED RESONANCE	341
X-SECTION CALC GGA 7090 F2	RS PLXT 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 XT B\$ THERMOS(ANL), THERMAL SPECTRUM	184
X-SECTION CALC ELASTIC SCAT RESONANCES AI 360 F4	RS PLXT B\$ AILMOE,	147
X-SECTION CALC ELASTIC SCAT RESONANCES AI 7094 F+MAP RS	PL T B\$ AILMOF,	147
X-SECTION CALC FROM DSN OUTPUT PW 1604 LAG1 RS	P N\$ DTX, EFFECTIVE	210
X-SECTION CALC MODERATOR GGA 1108 F4	RS P A\$ GAKER, INELASTIC SCAT	289
X-SECTION CALCULATION GEC 625 F4	RS P B\$ AVOID, ANNULAR VOID	276
X-SECTION CALCULATION BAPL 6600 F4	RS P XT A\$ SUMOR, S-WAVE NEUTRON	R399
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 GGA 7044 F4	RS A\$ FLANGE1, SCATTERING LAW	247
X-SECTION CALCULATION GEV 7094 F+MAP RS	P T B\$ EPITHERMOS, SPECTRUM AND	201
X-SECTION EVALUATION ORNL 7090 F4	RSBP A\$ MUFFLE, FISSION NUCLEIDE	323
X-SECTION GENERATION BNW 1108 F4	RS P XT B\$ 1DX, 1-D DIFFUSION FAST	374
X-SECTION LIBRARY PREPARATION GGA 1108 F4	RS P T L\$ GAND, GAEGAR	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+MAP 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 F4	RSBP T N\$ CROSSPLOT, SC4020 PLOTS FROM	207
X-SECTION TAPES WANL 7094 F2	RSBP T N\$ CPS, SC4020 PLOTS FROM SCISRS	239
X-SECTIONS AI 7090 F+MAP 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+MAP RS	PL T B\$ TEMPEST2, THERMAL NEUTRON SPECTRUM	50
X-SECTIONS AI 7094 F2	RS P T A\$ 2PLUS, NON-SPHERICAL OPTICAL MODEL	254
X-SECTIONS ANL 3600 F63	RSBP T A\$ 2PLUS, NON-SPHERICAL OPTICAL MODEL	254
X-SECTIONS BHSC 360 F4	RS PL T B\$ TEMPEST2, THERMAL NEUTRON SPECTRUM	50
X-SECTIONS CDC 1604 F63	RS PL T B\$ TEMPEST2, THERMAL NEUTRON SPECTRUM	50
X-SECTIONS FAST THERMAL SPECTRA GGA 1108 F4	RS PLXT 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 F4	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+MAP RS	PL T B\$ GRAVE, GROUP-AVERAGING	162
X-Y GEOM ANL 360 F4	RS P T C\$ TWOTRAN, 2-D MULTI-GP TRANSPORT CODE	358
X-Y GEOM LASL 1108 F4	RS P T C\$ TWOTRAN, 2-D MULTI-GP TRANSPORT CODE	358
XLIBIT, X-SECTION LIBRARY UTILITY ROUTINE ANL 3600 F63	RSBP T M\$	181
XSDRN, DISCRETE ORDINATE MULTIGROUP CONSTANTS ORNL 360 F4	RS PLXT B\$	393
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\$ GAMBLEF4, 2-D MULTI-GP DIFFUSION	222
XY RZ RTH WANL 7094 F4	RS P XT C\$ VARI-QUIR3, 2-D MULTI-GP DIFFUSION	264

XY RZ RTHETA GEOMETRY BNW 1108 F4	RS P	C\$ PERT4, 2-D PERTURBATION	304
XYZ GEOMFTRY 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
YIELD FROM REACTION OR DECAY ORNL 1604 F63	RS P D\$ ISOTOPES, MAXIMUM		179
ZOT, GROUP-COLLAPSING OF 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 RSBPL T C\$ CRAM,		103
1-D BURNUP POWER DISTRIBUTION SEARCH	GGA 1108 F4 RS P T C\$ GASP7,		319
1-D DIFFUSION FAST X-SECTION GENERATION	BNW 1108 F4 RS P XT B\$ IDX,		374
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 RSBPLXT 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 PLXT 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 XT C\$ MACH1,		262
1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	PURD 6500 F4 RS PLXT 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 PLXT C\$ DTF2,		151
1-D MULTI-GP DISCRETE ORDINATE CALC	AI 360 F4 RSBPLXT 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 F4 RS P T C\$ DTF4,		209
1-D MULTI-GP DISCRETE ORDINATE PROGRAM	BC 625 F4 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	LER 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 XT 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 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 GAMMA-RAY TRANSPORT	BAPL 6600 F4 RS P XT J\$ M0756,LETO,		R343
1-D SLAB TRANSPORT WITH SLOWING DOWN	BAPL 6600 F4 RS XT C\$ M0648,		R342
1-D TIME-DEPENDENT DIFFUSION CALC	KAPL 6600 F4 RS P F\$ RAUMZEIT,		R352
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 CFLL 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 XT F\$ NOWIG,		R371

1-D 2-GP SPACE-TIME DIFFUSION 3-GEOM	BAPL 6600 F4	RS P XT F\$ WIGL2,	R274
1-D 2-GP SPACE-TIME DIFFUSION 3-GEOM	GGA 1108 F4	RS P T F\$ WIGL2,	R274
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-REGION KINETICS SNAP GEOMETRY AI	7090 F2	RS F\$ SNAPKIN5/5A,	122
1DX BNWL 1108 F4	RS P T B\$ ETOX, MULTIGROUP CONSTANTS FROM ENDF/B FOR		388
1DX, 1-D DIFFUSION FAST X-SECTION GENERATION	BNW 1108 F4	RS P XT R \$	374
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 RC	625 F4	RS P XT 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 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 GAEGAR ENDF/B DATA TAPES	GGA	356
1108 F+BAL	RS P T C\$ GAMBLE5, 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 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 A\$ GAKFR, INELASTIC SCAT X-SECTION CALC MODFRATOR	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 FONS	GGA	290
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	PS 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\$ ETOX, MULTIGROUP CONSTANTS FROM ENDF/B FOR 1DX	BNWL	388
1108 F4	RS P T B\$ FCC4, FUNDAMENTAL MODE FAST REACTOR X-SFC CALC	BNW	306
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 C\$ TWOTRAN, 2-D MULTI-GP TRANSPORT CODE X-Y GEOM	LASL	358
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\$ 2DB, 2-D MULTIGROUP DIFFUSION AND DEPLETION	BNW	325
1108 F4	RS P T E\$ BLOOST6, COMBINED KINETICS 2-D HEAT TRANSFER	GGA	303
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 TFMP FEEDBACK	GGA	370
1108 F4	RS P T F\$ WIGL2, 1-D 2-GP SPACE-TIME DIFFUSION 3-GEOM	GGA	R274
1108 F4	RS P T I\$ SAFF-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 L\$ GAND, GAEGAR X-SECTION LIBRARY PREPARATION	GGA	345
1108 F4	RS P T O\$ TOAD, PROCESSING OF ANALYZER GAMMA-RAY SPECTRA	GGA	333
1108 F4	RS P X A\$ COHRE, COHERENT INELASTIC SCATTERING LAW CALC	GGA	385
1108 F4	RS P XT B\$ GAF,GAR, SPECTRA AND GROUP-AVERAGED X-SFC CALC	GGA	316
1108 F4	RS P XT B\$ 1DX, 1-D DIFFUSION FAST X-SECTION GENERATION	BNW	374
1108 F4	RS PLXT B\$ GGC4, MULTI-GP X-SECTIONS FAST THERMAL SPECTRA	GGA	298
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 H\$ TAC2D, STEADY-STATE AND TRANSIENT TEMP CALC	GGA	408
1108 F5	PSBPL T D\$ ISOGEN, RADIONUCLIDE GENERATION AND DECAY	BNW	367
14.5-14,500PSIA	32-472DEGF BAPL 6600 F4	RS XT H\$ WATER, STEAM TABLES	R267
14.5-2538 PSIA	ANL 1604 F63	RS P H\$ M0899,H0H, STEAM TABLES	R294
14.5-2538 PSIA	BAPL 6600 F4	RS P XT H\$ M0899,H0H, STEAM TABLES	R294

1604	F+CDP	RS	P	T	P\$	LAG, ASSEMBLER FOR FLOCO2 INSTRUCTION SET	PW	186			
1604	F+CDP	RS	P	XT	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-LASL	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 CFLL 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\$	MO899, HOH, STEAM TABLES 14.5-2538 PSIA	ANL	R294			
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\$	FORTTRAN TDC, 2-D MULTI-GP SN APPROXIMATION RZ	PW	161			
1604	F63	RS	P	T	C\$	WHIRLAWAY, 3-D 2-GROUP DIFFUSION XYZ GEOMETRY	CDC	32			
1604	F63	RS	P	T	C\$	2OGRAND, 2-D FEW-GROUP DIFFUSION SLAB CYLINDER	CDC	40			
1604	F63	RS	P	T	I\$	PIP, CENTRIFUGAL PUMP IMPELLER DESIGN STUDY	PW	187			
1604	F63	RS	PL	T	A\$	ARES2, RESONANCE INTEGRAL X-SECTION CALC	CDC	89			
1604	F63	RS	PL	T	B\$	FORM, FAST NEUTRON SPECTRUM X-SECTION CALC	CDC	51			
1604	F63	RS	PL	T	B\$	TEMPEST2, THERMAL NEUTRON SPECTRUM X-SECTIONS	CDC	50			
1604	F63	RS	PL	T	C\$	AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	CDC	29			
1604	F63	RS	PL	T	C\$	DTF, 1-D MULTIGROUP DISCRETE ORDINATE CALC	UNC	144			
1604	F63	RS	PLXT	B\$	GAM1, FAST NEUTRON SPECTRUM X-SECTION CALC	CDC	33				
1604	F63	RS	PLXT	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			
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,	R407
2-D	BODIES	GGA	1108	F4	RS	P		I\$	SAFE-PLANE, PLANE STRESS ANALYSIS,	252	
2-D	DESIGN PROGRAMS	LASL	7090	F2	RS	P	T	L\$	DPC, DATA PREPARATION FOR	234	
2-D	DIFFUSION ABSORPTION REMOVAL X-SECS	BAPL	6600	F4	RS	XT	B\$	MO807,	R280		
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+AP	RSBP	T	D\$	DDR,	99		
2-D	FEW-GP HEX GEOM DIFFUSION DEPLETION	GGA	1108	F4	RS	P	T	D\$	GAUGE,	339	
2-D	FEW-GP S4 APPROXIMATION RZ*GEOMETRY	LRL	709	F2	RS		C\$	FIRN,	7		
2-D	FEW-GROUP DIFFUSION AND DEPLETION	IBM	360	F+BAL	RS	P	T	D\$	PDQ5,	R336	
2-D	FEW-GROUP DIFFUSION SLAP CYLINDER	CDC	1604	F63	RS	P	T	C\$	2OGRAND,	40	
2-D	FEW-GROUP DIFFUSION SLAB CYLINDER	ORNL	7090	F2	RS	P	T	C\$	2OGRAND,	40	
2-D	GEOMETRY INPUT, PREPARATION, EDIT	KAPL	6600	F+ASC	RS	P	T	L\$	DATATRAN	R406	
2-D	HEAT TRANSFER	GGA	1108	F4	RS	P	T	E\$	BLOOST6, COMBINED KINETICS	303	
2-D	HEAT TRANSFER	GGA	7044	F4	RS		T	H\$	BLOOST5, POINT-KINETICS WITH	205	
2-D	MONTE CARLO CELL CALCULATION	AI	360	F4	RS	P	XT	B\$	HWOGR-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+AP	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	RSBPL	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	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 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	XT C\$	VARI-QUIR3,	264
2-D MULTI-GP DISCRETE ORDINATE CODE	UNC-LASL	1604	F63	RS	C\$	2DF,	173
2-D MULTI-GP SN APPROXIMATION RZ	PW	1604	F63	RS P	T C\$	FORTTRAN TDC,	161
2-D MULTI-GP SN APPROXIMATION XY GEOM	AGC	7090	FLOCO	RSBP	C\$	2DXY,	18
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	1108	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 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	XT H\$	HOT2,	R286
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,	R338
2-D 2-GP SPACE-TIME DIFFUSION FEEDBACK	BAPL	6600	F4	RS P	XT F\$	TWIGL,	R338
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-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	XT F\$	NOWIG, 1-D	R371
2-GP SPACE-TIME DIFFUSION	ANL	360	F4	RS P	F\$	TWIGGLE, 2-D	R338
2-GP SPACE-TIME DIFFUSION FEEDBACK	BAPL	6600	F4	RS P	XT F\$	TWIGL, 2-D	R338
2-GP SPACE-TIME DIFFUSION 3-GEOM	BAPL	6600	F4	RS P	XT F\$	WIGL2, 1-D	R274
2-GP SPACE-TIME DIFFUSION 3-GEOM	GGA	1108	F4	RS P	T F\$	WIGL2, 1-D	R274
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-PHASE FLOW	AI	7094	F2	RS P	H\$	FLOW-MODEL, MULTI-CHANNEL 2-D	246
2-REG CELL	ANL	3600	F36	RSBP	XT B\$	RIFF-RAFF, RESONANCE INTEGRAL CALC	213
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, 2-D MULTI-GP DISCRETE ORDINATE CODE	UNC-LASL	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	BN			305
2000 F4	RS P	T F\$	FORE, FAST REACTOR EXCURSION CALCULATIONS	NED			174
3-D COMPOSITE STRUCTURE STRESS STUDY	GGA	1108	F4	RS P	T I\$	SAFE-3D,	332
3-D DIFFUSION DEPLETION MULTIGP	ORNL	360	F4	RS P	XT 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	BAPL	6600	F+ASC	RS P	XT D\$	PDQ7, 1,2 OR	R275
3-D FEW-GP DIFFUSION DEPLETION	IBM	360	F4	RS P	T D\$	PDQ7, 1,2 OR	R275
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 MULTI-GP FLUX SYNTHESIS PROGRAM	CYL PW	1604	F63	RS	T C\$	2DXYL,	192

3-D PLOTTING	KAPL 6600 F+ASC PS P	T P\$ DATATRAN UTILITY MODULES, 2-D +	R407
3-D REACTIVITY AND POWER DISTRIBUTION	CDC 3600 F63	RSBP 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,	R404
3-D TEMPERATURE DISTRIBUTION PROGRAM	KAPL 6600 F+ASC RS P	T H\$ LION,	R299
3-D TRANSIENT HEAT TRANSFER PROGRAM	GFC 635 F+GMP	RSBP T H\$ THTE,	346
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 XT F\$ WIGL2, 1-D 2-GP SPACE-TIME DIFFUSION	R274
3-GEOM	GGA 1108 F4	RS P T F\$ WIGL2, 1-D 2-GP SPACE-TIME DIFFUSION	R274
32-472DEGF	BAPL 6600 F4	PS XT H\$ WATER, STEAM TABLES 14.5-14,500PSIA	R267
360 F+BAL	RS L T M\$ SCORE2, SCISRS ENDF/B GRAPHIC X-SFC EVALUATION	AI	375
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 D\$ PDQ5, 2-D FEW-GROUP DIFFUSION AND DEPLETION	IBM	R336
360 F+BAL	RS P T E\$ AIROS2A, SIMULATION OF REACTOR DYNAMICS	AI	326
360 F4	S P B\$ WELWING, MATERIAL BUCKLING CYL FUEL ELEMENTS	AEB	362
360 F4	RS L T C\$ FIRES, 1-D AGE-DIFFUSION SLAB CYLINDER SPHERE	AFB	9
360 F4	RS P A\$ CODILLI, LEAST SQUARES ANALYSIS RESONANCE DATA	UILL	347
360 F4	RS P C\$ PERT, 1-D PERTURBATION FOR AIM AND FOG CODES	BHSC	30
360 F4	RS P D\$ ISOSEARCH, ISOTOPE PRODUCTION FLUX, X-SFC CALC	ORNL	322
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 F\$ TWIGGLE, 2-D 2-GP SPACE-TIME DIFFUSION	ANL	R338
360 F4	RS P G\$ CLOUD, GAMMA-RAY DOSE RATE FROM A CLOUD	DP	47
360 F4	RS P G\$ WATER-HAMMER, LIQUID BLOWDOWN ANALYSIS LOFT	UGA	278
360 F4	RS P G\$ COPGAM, UNFOLDING OF COMPLEX GAMMA-RAY SPECTRA	KSUN	390
360 F4	RS P T A\$ FLANGE2, ENDF/B THERMAL SCATTERING DATA PROC	DP	368
360 F4	RS P T C\$ DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	ANL	209
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\$ TWOTRAN, 2-D MULTI-GP TRANSPORT CODE X-Y GEOM	ANL	358
360 F4	RS P T C\$ VAPI-QUIR, TIME-DEP 2-D MULTI-GP DIFFUSION	UMCC	212
360 F4	RS P T D\$ CINCAS, NUCLEAR FUEL CYCLE COST AND ECONOMICS	COMM	354
360 F4	RS P T D\$ PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	IBM	R275
360 F4	RS P T F\$ SASIA, FAST REACTOR POWER AND FLOW TRANSIENTS	ANL	400
360 F4	RS P T F\$ TSN, SPATIALLY-DEPENDENT REACTOR KINETICS	AI	309
360 F4	RS P T G\$ AISITE2, PARAMETRIC SITE REQUIREMENT STUDY	AI	172
360 F4	RS P T I\$ SABOR4, DISCRETE-ELEMENT ANALYSIS THIN SHELLS	MIT	R402
360 F4	RS P XT B\$ HWOCR-SAFF, 2-D MONTE CARLO CELL CALCULATION	AI	307
360 F4	RS P XT F\$ FORE2, FAST REACTOR EXCURSION CALCULATIONS	ANL	174
360 F4	RS P XT K\$ CITATION, 1,2,3-D DIFFUSION DEPLETION MULTIGP	ORNL	387
360 F4	RS PL T B\$ TEMPEST2, THERMAL NEUTRON SPECTRUM X-SECTIONS	BHSC	50
360 F4	RS PLXT B\$ AILMOE, X-SECTION CALC ELASTIC SCAT RESONANCES	AI	147
360 F4	RS PLXT B\$ HAMMER, CRITICAL EXPERIMENT ANALYSIS SYSTEM	BNL-DP	277
360 F4	RS PLXT B\$ LEOPARD, SPECTRA CALCULATION WITH DEPLETION	WAPD	279
360 F4	RS PLXT B\$ XSDRN, DISCRETE ORDINATE MULTIGROUP CONSTANTS	ORNL	393
360 F4	RSB L T M\$ CLIP, FORM OR THREDES LIBRARY UTILITY ROUTINE	AI	271
360 F4	RSBP T K\$ THREDES, 1-D FEW-GP DIFFUSION DESIGN SYSTEM	AI	273
360 F4	RSBP XT D\$ SIZZLE, 1-D MULTIGROUP DIFFUSION DEPLETION	AI	58
360 F4	RSBPLXT C\$ ANISN, 1-D MULTI-GP DISCRETE ORDINATE CALC	AI	151
360 F4	RSBPLXT C\$ CAESAR4, LIBLST, 1-D MULTI-GP DIFFUSION + LIB	AI	270
3600 ASAF4	RS P T M\$ ETOE, ENDF/B TO MC**2 DATA CONVERSION	APDA	350
3600 F36	SBP I\$ BOW2, DEFLECTION CALCULATION PARALLEL BFAMS	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\$ SUPOPAN, REACTOR CORE SUPPORT STRESS ANALYSIS	ANL	357
3600 F36	RS P XT C\$ MACH1, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	ANL	262
3600 F36	RSBP A\$ MISH-MASH, RESONANCE INTEGRAL CALC HOMOGENEOUS	ANL	214
3600 F36	RSBP G\$ CHEMLOC2, CORE HEATING CLADDING-STEAM REACTION	ANL	366
3600 F36	RSBP G\$ WHAM, LIQUID-FILLED PIPING SYSTEM ANALYSIS	KE	278
3600 F36	RSBP I\$ SWELL2, FUEL ELEMENT LIFETIME ANALYSIS	ANL	353
3600 F36	RSBP XT B\$ RABBLE, WLIB, FLAT, RESONANCE ABSORPTION, CELL	ANL	281
3600 F36	RSBP XT B\$ RIFF-PAFF, RESONANCE INTEGRAL CALC 2-REG CELL	ANL	213

3600 F4	RSBP	T D\$	208, 2-D MULTIGROUP DIFFUSION AND DEPLETION	ANL	325
3600 F63	RS	LXT B\$	GAM1, FAST NEUTRON SPECTRUM X-SECTION CALC	ANL	33
3600 F63	RSBP	A\$	NEARREX, COMPOUND NUCLEUS X-SECTION CALC	ANL	171
3600 F63	RSBP	E\$	R101, SPACE-INDEPENDENT KINETICS KEX OPTIONS	ANL	255
3600 F63	RSBP	E\$	R102, SPACE-INDEPENDENT INVERSE KINETICS CALC	ANL	168
3600 F63	RSBP	F\$	AX1, COUPLED NEUTRONICS-HYDRODYNAMICS SPHERE	CDC	102
3600 F63	RSBP	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 E\$	TRAFICORPORATION, TRANSFER FUNCTION SYNTHESIS	ANL	135
3600 F63	RSBP	T G\$	R153, PARAMETRIC SITE REQUIREMENT STUDY	ANL	172
3600 F63	RSBP	T H\$	ARGUS, TRANSIENT TEMPERATURE CALC CYLINDER	ANL	152
3600 F63	RSBP	T M\$	XLIBIT, X-SECTION LIBRARY UTILITY ROUTINE	ANL	181
3600 F63	RSBP	XT B\$	THERMOS(ANL), THERMAL SPECTRUM X-SECTION CALC	ANL	184
3600 F63	RSBPL	T J\$	MAC, SHIELD DESIGN MULTIGROUP SLAB GEOMETRY	ANL	143
4RE	RESTRAINT		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
500PSIA	32-472DEGF	BAPL	6600 F4	RS	XT H\$ WATER, STEAM TABLES 14.5-14, R267
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	B\$	AVOID, ANNULAR VOID X-SECTION CALCULATION	GEC	276
625 F4	RS P	T C\$	DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	BC	209
625 F4	RS P	XT B\$	GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV	BC	185
635 F+GMP	RSBP	T H\$	THTE, 3-D TRANSIENT HEAT TRANSFER PROGRAM	GEC	346
635 F4	RS P	D\$	RAPFU, FUEL CYCLE PARAMETERS FAST BREEDERS	APQ	372
635 F4	RS P	T B\$	REAX, RESOLVED RESONANCE EPITHERMAL X-SECTIONS	NED	257
635 F4	RS P	T C\$	FLARE, 3-D REACTIVITY AND POWER DISTRIBUTION	NED	167
635 F4	RS P	T H\$	MANTA, STEADY-STATE THERMAL-HYDRAULIC ANALYSIS	NED	256
635 F4	RS P	T O\$	BURNUP, HEAVY ELEMENT ISOTOPIC BURNUP ANALYSIS	GEV	311
635 F4	RS P	T O\$	EXPN, ANALYSIS OF PULSED NEUTRON SOURCE DATA	NED	258
635 F4	RS P	XT F\$	FORE2, FAST REACTOR EXCURSION CALCULATIONS	NED	174
635 F4	RS PL	T C\$	BISYN, 2-D MULTI-GP DIFFUSION SYNTHESIS CALC	NED	287
6400 F4	RS P	T G\$	ECCSA1, LOSS-OF-COOLANT + EMERGENCY COOLING	BCL	330
6400 F4	RS P	T G\$	NURLOC-1.0, LOSS-OF-COOLANT THERMAL ANALYSIS	BCL	328
6500 F4	RS PLXT	C\$	MACH1, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	PURD	262
6600 F	R B	T M\$	TIGIR2, MODULAR DOCUMENT INFORMATION SYSTEM	KAPL	R403
6600 F+ASC	RS P	T H\$	LION, 3-D TEMPERATURE DISTRIBUTION PROGRAM	KAPL	R299
6600 F+ASC	RS P	T L\$	DATATRAN 2-D GEOMETRY INPUT, PREPARATION, EDIT	KAPL	R406
6600 F+ASC	RS P	T P\$	CURFIT, CURVE FITTING EXPERIMENTAL DATA POINTS	KAPL	R 43
6600 F+ASC	RS P	T P\$	DATATRAN UTILITY MODULES, 2-D + 3-D PLOTTING	KAPL	R407
6600 F+ASC	RS P	T P\$	SNEQ, NONLINEAR ALGEBRAIC EQN SOLN CURVE PLOT	KAPL	R364
6600 F+ASC	RS P	XT D\$	PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	BAPL	R275
6600 F+COM	RS P	XT I\$	GAPL3, INELASTIC LARGE DEFLECTION STRESS STUDY	BAPL	R397
6600 F+COM	RSB	T M\$	DATATRAN, MODULAR PROGRAMMING AND DATA SYSTEM	KAPL	R386
6600 F4	RS	I\$	SORSDB, PRESSURE VESSEL STRESS AND FATIGUE	KAPL	R391
6600 F4	RS	T M\$	CHECKER, CRECT, DAMMET, PLOTFB, SLAV3, ENDF/B PROC	NCSC	384
6600 F4	RS	XT B\$	M0807, 2-D DIFFUSION ABSORPTION REMOVAL X-SECS	BAPL	R280
6600 F4	RS	XT C\$	M0648, 1-D SLAB TRANSPORT WITH SLOWING DOWN	BAPL	R342
6600 F4	RS	XT H\$	WATER, STEAM TABLES 14.5-14,500PSIA 32-472DEGF	BAPL	R267
6600 F4	RS	XT I\$	CYGR02, STRESS ANALYSIS CYL FUEL ELEMENT	BAPL	R266
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\$	SIGPLOT, RESOLVED MULTILEVEL B-W X-SEC CALC	BNL	377
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	R352
6600 F4	RS P	F\$	STINT3, SINGLE-CHANNEL SPACE-TIME SYNTHESIS	KAPL	R389
6600 F4	RS P	H\$	RAPP, HIGH-VELOCITY FLOW STUDY STEAM-WATER MIX	KAPL	R382
6600 F4	RS P	I\$	STEM, MATRIX GENERATION FOR A SYSTEM OF BEAMS	KAPL	R337
6600 F4	RS P	I\$	TUBE, U-TUBE HEAT EXCHANGER STRESS ANALYSIS	KAPL	R378
6600 F4	RS P	N\$	LARCA, FLUX-WEIGHTING OF DTF4 CROSS SECTIONS	LASL	409
6600 F4	RS P	T A\$	TOR, THERMAL SCATTERING CRYSTALLINE MATERIALS	LASL	360
6600 F4	RS P	T B\$	GLEN, GROUP CONSTANT CALC FROM TOR OUTPUT DATA	LASL	361
6600 F4	RS P	T C\$	DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	LASL	209
6600 F4	RS P	T C\$	VARI-QUIR, TIME-DEP 2-D MULTI-GP DIFFUSION	WANL	212

6600 F4	RS P	T D\$	2DB, 2-D MULTIGROUP DIFFUSION AND DEPLETION	LASL	325
6600 F4	RS P	T F\$	NOAH, 1-D ONE-GP SPACE-TIME DIFFUSION FEEDBACK	BNL	405
6600 F4	RS P	T F\$	SAS1A, FAST REACTOR POWER AND FLOW TRANSIENTS	ANL	400
6600 F4	RS P	T I\$	GFM, EIGENVALUE PROBLEM FOR VIBRATING SYSTEMS	KAPL	R344
6600 F4	RS P	T I\$	SOR2, STRESS ANALYSIS SHELLS OF REVOLUTION	KAPL	R 80
6600 F4	RS P	T O\$	JITER, FLUCTUATION EXPERIMENT ANALYSIS	BAPL	R394
6600 F4	RS P	X I\$	FINEL, FINITE-ELEMENT STUDY 2,3-D STRUCTURES	KAPL	R404
6600 F4	RS P	XT A\$	PUN1, UNRESOLVED RESONANCE INTEGRALS X-SECS	BAPL	R359
6600 F4	RS P	XT A\$	SUMOR, S-WAVE NEUTRON X-SECTION CALCULATION	BAPL	R399
6600 F4	RS P	XT B\$	RESQ2, RESQO, DBF1, RESONANCE INTEGRAL HEX CELL	BAPL	R285
6600 F4	RS P	XT C\$	BE21, FEW-GP DISCRETE ORDINATES SLAB GEOMETRY	BAPL	R398
6600 F4	RS P	XT F\$	NOWIG, 1-D 2-GP KINETICS TEMPERATURE FEEDBACK	BAPL	R371
6600 F4	RS P	XT F\$	TWIGL, 2-D 2-GP SPACE-TIME DIFFUSION FEEDBACK	BAPL	R338
6600 F4	RS P	XT F\$	WIGL2, 1-D 2-GP SPACE-TIME DIFFUSION 3-GEOM	BAPL	R274
6600 F4	RS P	XT G\$	FLASH2, LOSS-OF-COOLANT ACCIDENT ANALYSIS	BAPL	R295
6600 F4	RS P	XT G\$	M0555, ACT1, LOSS-OF-COOLANT ACCIDENT ANALYSIS	BAPL	R284
6600 F4	RS P	XT H\$	FIGRO, LSBR FUEL SWELLING TEMPERATURE STUDY	BAPL	R272
6600 F4	RS P	XT H\$	FLOT1, M0219, PWR FLOW TRANSIENT ANALYSIS	BAPL	R331
6600 F4	RS P	XT H\$	HOT2, 2-D TRANSIENT HEAT CONDUCTION PROGRAM	BAPL	R286
6600 F4	RS P	XT H\$	M0899, HOH, SFAM TABLES 14.5-2538 PSIA	BAPL	R294
6600 F4	RS P	XT H\$	TOPS, TRANSIENT THERMODYNAMICS OF PRESSURIZERS	BAPL	R348
6600 F4	RS P	XT H\$	WASP, WATER AND STEAM THERMODYNAMIC PROPERTIES	BAPL	R396
6600 F4	RS P	XT I\$	M0457, PIPE, ELASTIC STRESS OF PIPING SYSTEM	BAPL	R329
6600 F4	RS P	XT I\$	M0552, DYNAMIC ANALYSIS LINEAR ELASTIC SYSTEMS	BAPL	R283
6600 F4	RS P	XT I\$	SEALSHL2, SHELL STRESS ANALYSIS AXISYM LOAD	BAPL	R282
6600 F4	RS P	XT J\$	M0756, LETO, 1-D SLAB GAMMA-RAY TRANSPORT	BAPL	R343
6600 F4	RS P	XT L\$	BL47, DRAFTING TOOL TO PLOT PLANE STRUCTURES	BAPL	R373
6600 F4	RS P	XT P\$	DAFT1, LEAST SQUARES FIT FISSILE NUCLIDE DATA	BAPL	R327
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	T G\$	CONTEMPT, LOSS-OF-COOLANT ACCIDENT ANALYSIS	PPCO	297
7040 F+MAP	RS P	T G\$	RSAC, RADIOLOGICAL SAFETY ANALYSIS PROGRAM	PPCO	265
7040 F4	RS P	A\$	COMBCO, COMBINED R-W MULTI-LEVEL CONVOLUTION	PPCO	203
7040 F4	RS P	T C\$	TOPIC, 1-D FEW-GP SN APPROXIMATION CYLINDER	PPCO	148
7044 F+MAP	RS P	T B\$	GAROL, RESONANCE OVERLAP AND LATTICE EFFECTS	GGA	219
7044 F+MAP	RS P	T D\$	OPUS, POWER PLANT PERFORMANCE AND PRICE STUDY	GGA	226
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 F4	RS	A\$	FLANGE1, SCATTERING LAW X-SECTION CALCULATION	GGA	247
7044 F4	RS	I\$	CORE, CORE CONFIGURATION FUEL TEMPERATURE CODE	GGA	233
7044 F4	RS	T H\$	BLOOST5, POINT-KINETICS WITH 2-D HEAT TRANSFER	GGA	205
7044 F4	RS	XT G\$	PRECON, HTGR CONTAINMENT PRESSURE POST RUPTURE	GGA	228
7044 F4	RS P	A\$	FASDOP, X-SECTIONS FROM R-W RESONANCE DATA	GGA	216
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-FFEVER, 1-D FFW-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 G\$	RELAP2, REACTOR BLOWDOWN - EXCURSION ANALYSIS	INC	369
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\$	LEGCOEF3, LEGENDRE COEF CALC FOR ANGULAR DIST	GGA	217
7044 F4	RSBP	T N\$	CROSSPLOT, SC4020 PLOTS FROM X-SECTION TAPES	GGA	207
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

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	T	B\$	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	ORNL	240
7090	F+FAP	RS	P	T	M\$	DFSR, DATA FILE SERVICE ROUTINES ENDF TAPES	BNL	236
7090	F+FAP	RS	PL	T	B\$	GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV	BNW	185
7090	F+FAP	RS	PL	T	B\$	TEMPEST2, THERMAL NEUTRON SPECTRUM X-SECTIONS	AI	50
7090	F+FAP	RS	PL	T	C\$	AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	AI	29
7090	F+FAP	RSB		T	A\$	TUZ, UNRESOLVED REGION RESONANCE INTEGRAL CALC	GGA	42
7090	F+FAP	RSB		T	A\$	ZUT, RESOLVED REGION RESONANCE INTEGRAL CALC	GGA	41
7090	F+FAP	RSBP		T	D\$	DOB, 2-D FEW-GP DIFFUSION BURNUP 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+MAP	RS	P	T	C\$	TDSN, 2-D MULTIGROUP DISCRETE ORDINATE PROGRAM	LER	312
7090	FLOCO	RS	P		B\$	MCS, MONTE CARLO NEUTRON PENETRATION STUDY	LASL	202
7090	FLOCO	RS	P		B\$	ZOT, GROUP-COLLAPSING OF MULTI-GP X-SECTIONS	LASL	113
7090	FLOCO	RSBP			C\$	2DXY, 2-D MULTI-GP SN APPROXIMATION XY GEOM	AGC	18
7090	FLOCO	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	ORNL	381
7090	F2	RS			B\$	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 AIMAND FOG CODES	AI	30
7090	F2	RS			E\$	AIREK3, SPACE-INDEPENDENT KINETICS W/FEEDBACK	AI	121
7090	F2	RS			E\$	SNAPKIN5/5A, 1-REGION KINETICS SNAP GEOMETRY	AI	122
7090	F2	RS			I\$	CROCK, SPACE POWER PLANT DESIGN OPTIMIZATION	AI	112
7090	F2	RS			I\$	FUGUE, STEADY-STATE TEMPERATURE VOID FRACTION	AI	48
7090	F2	RS			I\$	SHOCK, SPACE POWER PLANT DESIGN OPTIMIZATION	AI	114
7090	F2	RS			J\$	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	D\$	SIZZLE, 1-D MULTIGROUP DIFFUSION DEPLETION	AI	58
7090	F2	RS	P		B\$	BAM, S4 CYL CELL CODE AND TEMPEST COMBINATION	AI	108
7090	F2	RS	P		B\$	BOUNCE, FLUX DIST IN MULTI-PIN FUEL ELEMENT	AGC	237
7090	F2	RS	P		B\$	SAIL, 1-D 1-GP SN APPROXIMATION SLAB GEOMETRY	AI	52
7090	F2	RS	P		C\$	MIST, 1-D FEW-GP SN DOUBLE SN APPROX SLAB GEOM	PPCO	59
7090	F2	RS	P		D\$	AIMFIRE, URANIUM FUEL CYCLE COST ANALYSIS	AI	55
7090	F2	RS	P		D\$	ISOCRUNCH, REACTION DECAY CHAIN ANALYSIS	ORNL	180
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		I\$	WIREX, COMPUTER-PRODUCED WIRING LISTS UHTREX	LASL	315
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		O\$	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	B\$	AGN-SIGMA, CALC OF MULTI-GP TRANSFER MATRICES	AGC	243
7090	F2	RS	P	T	C\$	EQUIPOISE3, 2-D 2-GROUP DIFFUSION SLAB CYL	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	P	T	L\$	DPC, DATA PREPARATION FOR 2-D DESIGN PROGRAMS	LASL	234
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	PLXT		B\$	GAM1, FAST NEUTRON SPECTRUM X-SECTION CALC	GGA	33
7090	F2	RS	PLXT		B\$	HAMMER, CRITICAL EXPERIMENT ANALYSIS SYSTEM	BNL-DP	277
7090	F2	RS	PLXT		C\$	DTF2, 1-D MULTI-GP DISCRETE ORDINATE CALC	AI	151

7090 F2	RSB	F\$	HATCHET, COUPLED NEUTRONICS-HYDRODYNAMICS CODE	AGC	153
7090 F2	RSR	T D\$	FEVER, 1-D FEW-GP DIFFUSION DEPLETION PROGRAM	GGA	117
7090 F2	RSBP	D\$	NPRFCOP, FUEL CYCLE COSTS PERFORMANCE DATA	KE	146
7090 F2	RSBP	D\$	NUCY, SOLUTION OF NUCLIDE CHAIN EQUATIONS	ORNL	134
7090 F2	RSBP	J\$	LIPREFAN1, MC NEUTRON PENETRATION CALCULATION	DAC	123
7090 F2	RSBP X	C\$	HERFSY1, LATTICE PARAMETERS HETEROGENEOUS CALC	FMA	136
7090 F2	RSBPL T	J\$	MAC, SHIELD DESIGN MULTIGROUP SLAB GEOMETRY	BNW	143
7090 F2	RSBPLXT	B\$	AGN-GAM, FAST SPECTRUM MULTI-GP CONSTANT CALC	AGC	204
7090 F4	RSBP	A\$	MUFFLE, FISSILE NUCLIDE X-SECTION EVALUATION	ORNL	323
7090 MAD	RSB	O\$	BURP1, DETECTOR EFFICIENCY POINT SOURCE	UM	164
7090 MAD	RSB	O\$	BURP2, DETECTOR EFFICIENCY DISK SOURCE	UM	165
7090 MAD	RSB	O\$	BURP3, DETECTOR EFFICIENCY POINT SOURCE	UM	166
7090 MAD	RSB	O\$	BURP4, GAMMA-RAY PHOTOFRACITION SOLID CRYSTAL	UM	169
7090 MAD	RSB	O\$	BURP5, GAMMA-RAY PHOTOFRACITION WELL CRYSTAL	UM	170
7094 F+FAP	RS	L T M\$	MOMUS, X-SECTION LIBRARY UTILITY PROGRAM	AI	159
7094 F+FAP	RS	P T B\$	EPITHERMOS, SPECTRUM AND X-SECTION CALCULATION	GEV	201
7094 F+FAP	RS	P T G\$	AISITE2, PARAMETRIC SITE REQUIREMENT STUDY	AI	172
7094 F+FAP	RS	PL T B\$	AILMOE, X-SECTION CALC ELASTIC SCAT RESONANCES	AI	147
7094 F+FAP	RS	PL T B\$	GRAVE, GROUP-AVERAGING X-SECTIONS PARAMETERS	AI	162
7094 F+FAP	RS	PL T B\$	TYCHE3, MONTE CARLO SLOWING-DOWN DENSITY CALC	AI	149
7094 F+FAP	RS	PL T G\$	CURIE,DOSE,THUNDERHEAD, EXTERNAL+INTERNAL DOSE	AI	196
7094 F+MAP	RS	P A\$	CHAD, LEGENDRE COEF CALC FOR ANGULAR DIST DATA	AI	215
7094 F+MAP	RS	P T E\$	AIROS, SPACE-INDEPENDENT KINETICS W/FEEDBACK	AI	163
7094 F+MAP	RS	PLXT A\$	TRIX1, RESONANCE INTEGRAL X-SECTION CALC	AI	208
7094 F+MAP	RS	PLXT B\$	LASER, SPECTRUM CALC WITH BURNUP CYL LATTICE	WAPD	249
7094 F+MAP	RSBP	T G\$	SATURATED BLOWDOWN2, BLOWDOWN ANALYSIS LOFT	KF	200
7094 FAP	RS	P T H\$	RATH, 2- OR 3-D HEAT CONDUCTION LUMPED MASS	LASL	242
7094 F2	RS	P A\$	EXT, X-SECTIONS FROM B-W RESONANCE PARAMETERS	WANL	238
7094 F2	RS	P F\$	WEAK EXPLOSION, COUPLED NEUTRON-HYDRODYNAMICS	APDA	145
7094 F2	RS	P H\$	FLOW-MODEL, MULTI-CHANNEL 2-D 2-PHASE FLOW	AI	246
7094 F2	RS	P J\$	SHOF, SHIELD WEIGHT OPTIMIZATION DOSE CALC	AI	197
7094 F2	RS	P P\$	EXPALS, LEAST SQUARES EXPONENTIAL DECAY CURVES	LRL	321
7094 F2	RS	P T A\$	2PLUS, NON-SPHERICAL OPTICAL MODEL X-SECTIONS	AI	254
7094 F2	RS	P T G\$	TRANS-FUGUE1, TRANSIENT FLOW AND HEAT TRANSFER	AI	268
7094 F2	RS	P T H\$	HEATING2, TRANSIENT STEADY-STATE HEAT TRANSFER	AI	198
7094 F2	RS	PL T I\$	CYCLOPS1, THERMODYNAMIC CYCLE ANALYSIS	AI	244
7094 F2	RS	PL T M\$	FCSIL, EXPERIMENTAL NEUTRON DATA LIBRARY	LRL	351
7094 F2	RSB	T N\$	CPS, SC4020 PLOTS FROM SCISRS X-SECTION TAPES	WANL	239
7094 F2	RSBP	H\$	AXFLU, HEAT TRANSFER MOLTEN FUEL TUBE BUNDLES	LASL	182
7094 F2	RSBP	H\$	AXTHRM, HEAT TRANSFER SOLID FUEL TUBE BUNDLES	LASL	183
7094 F2	RSBP	T H\$	PTH1, BLOWDOWN PRESSURE TEMPERATURE HISTORY	KE	155
7094 F4	RS	E\$	R102, SPACE-INDEPENDENT INVERSE KINETICS CALC	WANL	168
7094 F4	RS	T P\$	LASL LEAST SQUARES, GENERAL CURVE FITTING	LASL	62
7094 F4	RS	P A\$	AVERAGE, UNRESOLVED REGION AVERAGE X-SEC CALC	BNL	376
7094 F4	RS	P A\$	SIGPLOT, RESOLVED MULTILEVEL B-W X-SEC CALC	BNL	377
7094 F4	RS	P B\$	GAMMA-P, PRODUCTION X-SECTIONS FOR GAMMA-RAYS	GEC	235
7094 F4	RS	P E\$	R101, SPACE-INDEPENDENT KINETICS KEX OPTIONS	WANL	255
7094 F4	RS	P F\$	MARS, 2-D EXCURSION CALCULATION R-Z GEOMETRY	APDA	293
7094 F4	RS	P T B\$	GAROL, RESONANCE OVERLAP AND LATTICE EFFECTS	LER	219
7094 F4	RS	P T C\$	DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	LER	209
7094 F4	RS	P T F\$	TSN, SPATIALLY-DEPENDENT REACTOR KINETICS	AI	309
7094 F4	RS	P XT C\$	VARI-QUIR3, 2-D MULTI-GP DIFFUSION XY RZ RTH	WANL	264
7094 F4	RSBPLXT	D\$	NAP, NEUTRON-INDUCED GAMMA-RAY RADIOACTIVITY	IITR	314

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