

Reaction Product Field (SF4) for Quantities at Resonance

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Our coding rule about SF4 (reaction product):

There is no reaction product given if the reaction specifies a resonance parameter (defined in Dictionary 236 by using the resonance flag ‘.’).

In addition to resonance parameters, “quantities at resonance” (RES in SF8, e.g. cross section at resonance , SIG, , RES) also have the resonance flag in dictionary 236. Deletion of resonance flags is proposed for the “quantities at resonance”.

Example:

Quantity	Present coding	Proposed coding
Resonance energy	(92-U-235 (N, 0) , , EN)	(unchanged)
Capture width	(92-U-235 (N, G) , , WID)	(unchanged)
Fission width	(92-U-235 (N, F) , , WID)	(unchanged)
Capture cross section at resonance	(92-U-235 (N, G) , , SIG, , RES)	(92-U-235 (N, G) 92-U-236 , , SIG, , RES)
Fission cross section at resonance	(92-U-235 (N, F) , , SIG, , RES)	(unchanged)
Multiplicity at resonance	(92-U-235 (N, G) , , MLT, , RES)	(92-U-235 (N, G) 92-U-236 , , MLT, , RES)

There are about 80 subentries which give quantities at resonance and require nuclide code in SF4. This new coding would be applied when the relevant subentries are retransmitted. (not urgent correction).

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In EXFOR, we have following rules about resonance parameters:

- 1) Resonance parameters are flagged with a "." in dictionary 236;
- 2) There is no reaction product (SF4) given if the reaction specifies a resonance parameter;
- 3) For resonance parameters, resonance energy is specified. It is coded either under the data heading EN-RES, or, if coded under REACTION (specified by the code EN given in REACTION SF6), under the heading DATA.

All resonance parameters defined in dictionary 236 by resonance flag "." are summarized in next page. Some codes (e.g. cross section at resonance) are for "quantities given at resonances" rather than "resonance parameters", and it would be useful to give reaction product in SF4 for such quantities. Therefore we propose

- 1) to change reaction type of cross section and partial cross section at resonance from RP and RPP to CSR (cross section at resonance) and CRP (partial cross section at resonance), respectively.
- 2) to remove resonance flags of quantity codes which reaction types are other than RP, RPP, RE or RPE.

Dictionary 213 (Reaction type)

CSR Cross section at resonance
CRP Partial cross section at resonance

Reaction Type	CINDA quantity	Independent variable family flag(s)
CSR	CS	1
CRP	CSP	1, 3

Example (30092.003)

8-O-16 (N,A) , , SIG , , RES → 8-O-16 (N,A) 6-C-13 , , SIG , , RES

Resonance parameters defined in dictionary 236
(Type = reaction type, Flag = resonance flag)

Code	Type	Dim.	Expansion	Proposal	
				Flag	Type
,AG,,AA	RP	BERE	Adler-Adler symmetry coefficient	Y	RP
,AH,,AA	RP	BERE	Adler-Adler asymmetry coefficient	Y	RP
,AKE,*,RES	RPE	E	Average kinetic en. of specif.part. at reson.	N	RPE
,ALF,,RES	ALR	NO	Capture-to-fission (alpha) ratio at resonance	N	ALR
,AP,*F,RES	APR	NO	Most probable mass of fragment specif.at reson.	N	APR
,ARE	RP	B*E	Resonance area	Y	RP
,ARE,,RTE	RP	BERE	Resonance area * square root(E)	Y	RP
,D	RP	E	Average level spacing	Y	RP
,EN	RE	E	Resonance energy	Y	RE
,EN,,AA	RE	E	Adler-Adler resonance energy	Y	RE
,ETA,,RES	ETR	NO	Eta at resonance	N	ETR
,ETA/NU,,RES	ETR	NO	Eta/Nu at resonance	N	ETR
,INT,,RES	ITR	B*E	Cross-section integral over inc. energy at res.	N	ITR
,J	RP	NO	Spin J	Y	RP
,L	RP	NO	Momentum L	Y	RP
,MLT,G,RES	MTR	YLD	Average particle multiplicity at resonance	N	MTR
,NU,,RES	NUR	FY	Total Nu-bar at resonance	N	NUR
,PHS,,VGT	RP	A	Vogt relative phase	Y	RP
,PTY	RP	NO	Parity	Y	RP
,SIG,,RES	RP	B	Cross section at resonance	N	CSR
,SIG,,RES/RTE	RP	BRE	Cross section * square root(E) at resonance	N	CSR
,SIG,,SFC/RES	RP	B*E	S-factor for cross section at resonance	N	CSR
,SPC,,RES	SPR	YLD	Gamma spectrum at resonance	N	SPR
,SPC,,TT	SP	YLD	Gamma spectrum for thick target	N	SP
,STF	RP	NO	Strength function	Y	RP
,SWG	RP	NO	Statistical weight factor g	Y	RP
,WID	RP	E	Resonance width	Y	RP
,WID,,2AG	RP	E	2ag * resonance width	Y	RP
,WID,,2G	RP	E	2g * resonance width	Y	RP
,WID,,4AG	RP	E	4ag * resonance width	Y	RP
,WID,,AA	RP	E	Adler-Adler Nu	Y	RP
,WID,,AG	RP	E	ag * resonance width	Y	RP

,WID,,G	RP	E	g * resonance width	Y	RP
,WID,,RM	RP	E	Reich-Moore resonance width	Y	RP
,WID,,RM/G	RP	E	g * Reich-Moore resonance width	Y	RP
,WID,,RM/SQ/G	RP	E2	g * Reich-Moore resonance width squared	Y	RP
,WID,,S0	RP	B*E	Resonance width * peak cross section	Y	RP
,WID,,SQ	RP	E2	Resonance width squared	Y	RP
,WID,,SQ/G	RP	E2	g * resonance width squared	Y	RP
,WID,,SQ/S0	RP	BE2	Resonance width squared * peak cross section	Y	RP
,WID,,VGT	RP	E	Vogt resonance width	Y	RP
,WID,,VGT/2G	RP	E	2g * Vogt resonance width	Y	RP
,WID/RED	RP	E	Reduced width	Y	RP
,WID/RED,,2AG	RP	E	2ag * reduced width	Y	RP
,WID/RED,,2G	RP	E	2g * reduced width	Y	RP
,WID/RED,,4AG	RP	E	4ag * reduced width	Y	RP
,WID/RED,,AG	RP	E	ag * reduced width	Y	RP
,WID/RED,,G	RP	E	g * reduced width	Y	RP
,WID/RED,,RM	RP	E	Reich-Moore reduced resonance width	Y	RP
,WID/RED,,RM/2G	RP	E	2g * Reich-Moore reduced resonance width	Y	RP
,WID/RED,,RMT	RP	E	R-matrix reduced resonance width	Y	RP
,WID/RED,,RMT/AMP	RP	RE	R-matrix reduced width amplitude	Y	RP
,WID/RED,,VGT	RP	E	Vogt reduced resonance width	Y	RP
,WID/STR	RP	E	Resonance strength	Y	RP
,WID/STR,,RG	RP	E	Resonance strength * $(2J(i)+1)*(2J(j)+1)$	Y	RP
1,WID,,RM	RP	E	Reich-Moore resonance width for channel 1	Y	RP
1,WID,,VGT	RP	E	Vogt resonance width for channel 1	Y	RP
2,WID,,RM	RP	E	Reich-Moore resonance width for channel 2	Y	RP
2,WID,,VGT	RP	E	Vogt resonance width for channel 2	Y	RP
3,WID,,RM	RP	E	Reich-Moore resonance width for channel 3	Y	RP
4,WID,,RM	RP	E	Reich-Moore resonance width for channel 4	Y	RP
EP,STF	RPP	NO	Strength function for electr.polarity given	Y	RPP
MP,STF	RPP	NO	Strength function for magnetic polarity given	Y	RPP
PAR,DA,,RES	DPR	DA	Partial diff. cross section at	N	DPR

			resonance		
PAR,MLT,,RES	PZR	YLD	Partial multiplicity at resonance	N	PZR
PAR,MLT*,RES	PZR	YLD	Partial multiplicity of part.spec. at resonance	N	PZR
PAR,SIG,,RES	RPP	B	Partial cross section at resonance	N	CRP
PAR,STF	RPP	NO	Partial strength function	Y	RPP
PAR,WID	RPP	E	Partial width	Y	RPP
PAR,WID,,G	RPP	E	g * partial width	Y	RPP
PAR,WID/RED,,RMT	RPP	E	R-matrix red.resonance width f.partial reaction	Y	RPP
PAR,WID/STR	RPP	E	Partial resonance strength	Y	RPP
PAR,WID/STR,,RG	RPP	E	Partial Resonance strength * (2J(i)+1)*(2J(j)+1)	Y	RPP
PR,NU,,RES	NUR	FY	Prompt Nu-bar at resonance	N	NUR
TER,SIG,,RES	RP	B	Ternary fission cross section at resonance	N	CSR
TER/BIN,SIG/RAT,,RES	RP	NO	Ternary/binary cross section ratio at resonance	N	CSR