

New Web Quantity

(N. Otsuka, 2019-03-19, Memo CP-D/975)

1. What is “web quantity”?

The web quantity is not for compilers but for programmers who develop EXFOR retrieval systems. This quantity is adopted by many EXFOR web retrieval system as a key to find data sets of a specific quantity. Each quantity code (Dictionary 236) belongs to one of the following web quantities (Dictionary 113):

Web quantity	Expansion
CS	Cross section data
CSP	Partial cross section data
CST	Temperature dependent cross section data
DA	Differential data with respect to angle
DAE	Differential data with respect to angle and energy
DAP	Partial differential data with respect to angle
DE	Differential data with respect to energy
DEP	Partial differential data with respect to energy
E	Kinetic energies
FY	Fission product yields
INT	Cross section integral over incident energy
L	Scattering amplitudes
MFQ	Fission neutron quantities
MLT	Outgoing particle multiplicities
NQ	Nuclear quantities
POL	Polarization data
PY	Product yields
RI	Resonance integrals
RP	Resonance parameters
RR	Reaction rates
SP	Gamma spectra
SQ	Special quantities
TT	Thick target yields
TTP	Partial thick target yields

2. New web quantity defined by REACTION SF3-SF8

For users, however, the quantity of interest may be expressed by a combination of codes in REACTION subfields. Introduction of another new web quantity defined by REACTION SF3-SF8 could be useful to make EXFOR search by a quantity name easier.

Example

New web quantity	SF3	SF4	SF6	SF7	SF8	Expansion
CSNON	NON		SIG			Nonelastic cross section
CSTOT	TOT		SIG			Total cross section
CSG	G		SIG			Capture cross section

(The blank fields mean “any”).

The idea of this “New web quantity” is demonstrated on an “experimental” website: <https://www.jcprg.org/exfor/index-st.html>, where the system suggests some candidates if one types an word of the quantity of interest (e.g., “elastic”).

The screenshot shows a search interface with a 'Basic' section. The 'Quantity name' field contains the text 'elastic'. A dropdown menu is open, displaying the following suggestions:

- elastic scattering angular differential cross section
- elastic scattering cross section
- Elastic scattering Rutherford ratio
- inelastic scattering angular differential cross section
- inelastic scattering cross section
- inelastic scattering energy differential cross section (spectrum)
- nonelastic scattering cross section

The first three new web quantities on the pull down menu may be defined as follows:

New web quantity	SF3	SF4	SF6	SF7	SF8	Expansion
DAEL	EL		DA			Elastic scattering angular differential cross section
CSEL	EL		SIG			Elastic scattering cross section
DARTH	EL		DA		RTH	Elastic scattering Rutherford ratio

3. Two dictionary structure to support one-to-many relation

A limitation of the dictionary structure shown above is the one-to-one relation between the quantity name and the code combination. One quantity name may be related with several code combinations.

Example

Gamma production may be expressed by SF4=0-G-0 or SF7=G, and we would like to relate the quantity name and the code combinations as follows:

New web quantity	SF3	SF4	SF6	SF7	SF8	Expansion
		0-G-0	SIG			Gamma production cross section
CSGX			SIG	G		

It is however difficult to implement this structure as a single record of the Archive/Backup dictionary since we have to accommodate the SF3-SF8 combination plus expansion in the 80 column explanation field. A possible solution is to split the table to two dictionaries:

New web quantities

New web quantity	Expansion
CSGX	Gamma production cross section

REACTION subfield combinations

REACTION subfield combination	New web quantity	SF3	SF4	SF6	SF7	SF8
CSGX1	CSGX		0-G-0	SIG		
CSGX2	CSGX			SIG	G	

Example

For a user looking for “Gamma production cross section” (CSGX), the retrieval system goes through the second dictionary, and finds that two SF3-SF8 combinations (CSGX1 and CSGX2) are related with CSGX. Then the system extracts from the database all EXFOR data sets where

- (1) REACTION SF4=0-G-0 and SF6=SIG, or
- (2) REACTINO SF6=SIG and SF7=G.

4. Test dictionaries 114 and 115

I generated Dictionary 114 (new web quantities) and Dictionary 115 (REACTION subfield combinations). These are currently for testing purpose, and the status of their records is INT (internal). The structures and contents of these two dictionaries are appended to this memo. In the dictionaries in the appendix, the following two further extensions are made:

- 1) Not only REACTION SF3-SF8, but also RESULT code are included.
- 2) A SF3-SF8 combination can be related with two new web quantities. For example (SF3=NON, SF6=SIG) is related with (1) nonelastic scattering cross section (CSNON) or (2) total reaction cross section (CSTRC). This is useful when the same quantity has two naming conventions.

Comments from programmers (e.g., dictionary structure) and users (addition of new web quantities) are welcome!

Dictionary 114: New web quantities (114 records)

Line	Contents	Format	Archive	Trans	CHEX
1	Code	A7	13-19	N/A	
	Expansion	A80	44-123	N/A	
2+	Comment	A55	44-98	N/A	

INT 201900 ANA	analysing power
INT 201900 AX	alpha emission
INT 201900 CS	cross section
INT 201900 CS2N	(* ,2n) cross section
INT 201900 CSA	(* ,alpha) cross section (2-body reaction)
INT 201900 CSABS	absorption cross section
INT 201900 CSAX	alpha emission cross section
INT 201900 CSCUM	cumulative cross section
INT 201900 CSD	(* ,deuteron) cross section (2-body reaction)
INT 201900 CSDX	deuteron emission cross section
INT 201900 CSEL	elastic scattering cross section
INT 201900 CSF	fission cross section
INT 201900 CSFSA	fission spectrum averaged cross section
INT 201900 CSG	capture cross section
INT 201900 CSGO	gamma emission cross section
INT 201900 CSGE	gamma emission cross section (exclusive)
INT 201900 CSGX	gamma emission cross section (inclusive)
INT 201900 CSH	(* ,helion) cross section (2-body reaction)
INT 201900 CSHX	helion emission cross section
INT 201900 CSIND	independent cross section
INT 201900 CSINL	inelastic scattering cross section
INT 201900 CSNON	nonelastic scattering cross section
INT 201900 CSNX	neutron emission cross section
INT 201900 CSP	(* ,proton) cross section (2-body reaction)
INT 201900 CSPX	proton emission cross section
INT 201900 CSSCT	scattering cross section
INT 201900 CST	(* ,triton) cross section (2-body reaction)
INT 201900 CSTOT	total cross section
INT 201900 CSTRC	total reaction cross section
INT 201900 CSTX	triton emission cross section
INT 201900 DAA	(* ,alpha) angular differential cross section (2-body reaction)
INT 201900 DAAX	alpha emission angular differential cross section
INT 201900 DAD	(* ,deuteron) angular differential cross section (2-body reaction)
INT 201900 DADX	deuteron emission angular differential cross section

INT 201900 DAEAX	alpha emission double differential cross section
INT 201900 DAEDX	deuteron emission double differential cross section
INT 201900 DAEGO	gamma emission double differential cross section
INT 201900 DAEGE	gamma emission double differential cross section (exclusive)
INT 201900 DAEGX	gamma emission double differential cross section (inclusive)
INT 201900 DAEHX	helion emission double differential cross section
INT 201900 DAEL	elastic scattering angular differential cross section
INT 201900 DAENX	neutron emission double differential cross section
INT 201900 DAEPX	proton emission double differential cross section
INT 201900 DAETX	triton emission double differential cross section
INT 201900 DAGO	gamma emission angular differential cross section
INT 201900 DAGE	gamma emission angular differential cross section (exclusive)
INT 201900 DAGX	gamma emission angular differential cross section (inclusive)
INT 201900 DAH	(* ,helion) angular differential cross section (2-body reaction)
INT 201900 DAHX	helion emission angular differential cross section
INT 201900 DAINL	inelastic scattering angular differential cross section
INT 201900 DANX	neutron emission angular differential cross section
INT 201900 DAP	(* ,proton) angular differential cross section (2-body reaction)
INT 201900 DAPX	proton emission angular differential cross section
INT 201900 DAT	(* ,triton) angular differential cross section (2-body reaction)
INT 201900 DATX	triton emission angular differential cross section
INT 201900 DEAX	alpha emission energy differential cross section (spectrum)
INT 201900 DEDN	delayed fission neutron spectrum
INT 201900 DEDX	deuteron emission energy differential cross section (spectrum)
INT 201900 DEGO	gamma emission energy differential cross section (spectrum)
INT 201900 DEGE	gamma emission energy differential cross section (spectrum, exclusive)
INT 201900 DEGX	gamma emission energy differential cross section (spectrum, inclusive)
INT 201900 DEHX	helion emission energy differential cross section (spectrum)
INT 201900 DEINL	inelastic scattering energy differential cross section (spectrum)
INT 201900 DENX	neutron emission energy differential cross section (spectrum)
INT 201900 DEPFG	prompt fission gamma spectrum
INT 201900 DEPFN	prompt fission neutron spectrum
INT 201900 DEPX	proton emission energy differential cross section (spectrum)
INT 201900 DETX	triton emission energy differential cross section (spectrum)
INT 201900 DX	deuteron emission
INT 201900 EN	resonance energy
INT 201900 ETA	eta value
INT 201900 FY	fission product yield
INT 201900 FYAP	fission product most probable mass
INT 201900 FYCHG	fission product charge yield
INT 201900 FYCHN	fission product chain yield
INT 201900 FYCUM	fission product cumulative yield
INT 201900 FYDA	fission product angular differential yield
INT 201900 FYDE	fission product energy differential yield

INT 201900 FYFRC	fractional cumulative fission product yield
INT 201900 FYFRI	fractional independent fission product yield
INT 201900 FYIND	fission product independent yield
INT 201900 FYPFG	prompt fission gamma yield
INT 201900 FYTER	fission product yield for ternary fission
INT 201900 FYZP	fission product most probable charge
INT 201900 GO	gamma emission
INT 201900 GE	gamma emission (exclusive)
INT 201900 GX	gamma emission (inclusive)
INT 201900 HX	helion emission
INT 201900 IR	isomeric ratio
INT 201900 KEPFG	prompt fission gamma most probable energy
INT 201900 KEPFN	prompt fission neutron most probable energy
INT 201900 KER	kerma factor
INT 201900 NUD	delayed fission neutron yield
INT 201900 NUP	prompt fission neutron yield
INT 201900 NX	neutron emission
INT 201900 PN	delayed neutron emission probability
INT 201900 PX	proton emission
INT 201900 RIABS	absorption resonance integral
INT 201900 RIF	fission resonance integral
INT 201900 RIG	capture resonance integral
INT 201900 RR	reaction rate
INT 201900 RSG	capture resonance strength (area)
INT 201900 RTHEL	Elastic scattering Rutherford ratio
INT 201900 RVAL	fission product R-value
INT 201900 RYLG	capture yield
INT 201900 TKE	total kinetic energy
INT 201900 TRN	transmission
INT 201900 TTYEOB	EOB thick target yield
INT 201900 TTYGX	thick target gamma yield
INT 201900 TTYNX	thick target neutron yield
INT 201900 TTYPHY	physical thick target yield
INT 201900 TTYSAT	saturation thick target yield
INT 201900 TX	triton emission
INT 201900 WID	resonance width

Dictionary 115: REACTION subfield combinations (108 records)

Line	Contents	Format	Archive	Trans	CHEX
1	Code	A7	13-19	N/A	
	New web quantity (primary)	A7	44-50	N/A	
	New web quantity (secondary)	A7	51-57	N/A	
	REACITON SF3	A10	58-67	N/A	
	REACTION SF4	A10	68-77	N/A	
	REACTION SF5	A10	78-87	N/A	
	REACTION SF6	A10	88-97	N/A	
	REACTION SF7	A10	98-107	N/A	
	REACTION SF8	A10	108-117	N/A	
	Result	A6	118-123	N/A	
2+	Comment	A55	44-98	N/A	

INT 201900 ANA	ANA					*ANA*
INT 201900 AX	AX		X	2-HE-4		
INT 201900 CS	CS				SIG	
INT 201900 CS2N	CS2N		2N		SIG	
INT 201900 CSA	CSA		A		SIG	
INT 201900 CSABS	CSABS		ABS		SIG	
INT 201900 CSAX	CSAX		X	2-HE-4	SIG	
INT 201900 CSCUM	CSCUM				*CUM*	SIG
INT 201900 CSD	CSD		D		SIG	
INT 201900 CSDX	CSDX		X	1-H-2	SIG	
INT 201900 CSEL	CSEL		EL		SIG	
INT 201900 CSF	CSF		F		SIG	
INT 201900 CSFSA	CSFSA				SIG	*FIS*
INT 201900 CSG	CSG		G		SIG	
INT 201900 CSGE	CSG0	CSGE			SIG	G
INT 201900 CSGX	CSG0	CSGX	X	0-G-0	SIG	
INT 201900 CSH	CSH		HE3		SIG	
INT 201900 CSHX	CSHX		X	2-HE-3	SIG	
INT 201900 CSIND	CSIND				*IND*	SIG
INT 201900 CSINL	CSINL		INL		SIG	
INT 201900 CSNON	CSNON	CSTRC	NON		SIG	
INT 201900 CSNX	CSNX		X	0-NN-1	SIG	
INT 201900 CSP	CSP		P		SIG	

INT 201900 CSPX	CSPX	X	1-H-1	SIG	
INT 201900 CSSCT	CSSCT	SCT		SIG	
INT 201900 CST	CST	T		SIG	
INT 201900 CSTOT	CSTOT	TOT		SIG	
INT 201900 CSTX	CSTX	X	1-H-3	SIG	
INT 201900 DAA	DAA	A		DA	
INT 201900 DAAX	DAAX	X	2-HE-4	DA	
INT 201900 DAD	DAD	D		DA	
INT 201900 DADX	DADX	X	1-H-2	DA	
INT 201900 DAEAX	DAEAX	X	2-HE-4	DA/DE	
INT 201900 DAEDX	DAEDX	X	1-H-2	DA/DE	
INT 201900 DAEGE	DAEGO	DAEGE		DA/DE	G
INT 201900 DAEGX	DAEGO	DAEGX	X	0-G-0	DA/DE
INT 201900 DAEHX	DAEHX	X	2-HE-3	DA/DE	
INT 201900 DAEL	DAEL	EL		DA	
INT 201900 DAENX	DAENX	X	0-NN-1	DA/DE	
INT 201900 DAEPX	DAEPX	X	1-H-1	DA/DE	
INT 201900 DAETX	DAETX	X	1-H-3	DA/DE	
INT 201900 DAGE	DAGO	DAGE		DA	G
INT 201900 DAGX	DAGO	DAGX	X	0-G-0	DA
INT 201900 DAH	DAH	HE3		DA	
INT 201900 DAHX	DAHX	X	2-HE-3	DA	
INT 201900 DAINL	DAINL	INL		DA	
INT 201900 DANX	DANX	X	0-NN-1	DA	
INT 201900 DAP	DAP	P		DA	
INT 201900 DAPX	DAPX	X	1-H-1	DA	
INT 201900 DAT	DAT	T		DA	
INT 201900 DATX	DATX	X	1-H-3	DA	
INT 201900 DEAX	DEAX	X	2-HE-4	DE	
INT 201900 DEDN	DEDN	F		*DL*	NU/DE
INT 201900 DEDX	DEDX	X	1-H-2	DE	
INT 201900 DEGE	DEGO	DEGE		DE	G
INT 201900 DEGX	DEGO	DEGX	X	0-G-0	DE
INT 201900 DEHX	DEHX	X	2-HE-3	DE	
INT 201900 DEINL	DEINL	INL		DE	
INT 201900 DENX	DENX	X	0-NN-1	DE	
INT 201900 DEPFG	DEPFG	F	0-G-0	*PR*	FY/DE
INT 201900 DEPFN	DEPFN	F		*PR*	NU/DE
INT 201900 DEPX	DEPX	X	1-H-1	DE	
INT 201900 DETX	DETX	X	1-H-3	DE	
INT 201900 DX	DX	X	1-H-2		
INT 201900 EN	EN			EN	
INT 201900 ETA	ETA			ETA	
INT 201900 FY	FY			FY	

INT 201900	FYAP	FYAP	F			AP		
INT 201900	FYCHG	FYCHG	F		CHG	FY		
INT 201900	FYCHN	FYCHN			CHN	FY		
INT 201900	FYCUM	FYCUM	F		*CUM*	FY		
INT 201900	FYDA	FYDA	F			FY/DA		
INT 201900	FYDE	FYDE	F			FY/DE		
INT 201900	FYFRC	FYFRC	F					FRCUM
INT 201900	FYFRI	FYFRI	F					FRIND
INT 201900	FYIND	FYIND	F		*IND*	FY		
INT 201900	FYPFG	FYPFG	F	0-G-0	*PR*	FY		
INT 201900	FYTER	FYTER	F		*TER*	FY		
INT 201900	FYZP	FYZP	F			ZP		
INT 201900	GE	GO	GE				G	
INT 201900	GX	GO	GX	X	0-G-0			
INT 201900	HX	HX	X		2-HE-3			
INT 201900	IR	IR			*-*/*		*/RAT	
INT 201900	KEPFG	KEPFG			0-G-0	*PR*	KE	
INT 201900	KEPFN	KEPFN			0-NN-1	*PR*	KE	
INT 201900	KER	KER					KER	
INT 201900	NUD	NUD	F		*DL*	NU		
INT 201900	NUP	NUP	F		*PR*	NU		
INT 201900	NX	NX	X		0-NN-1			
INT 201900	PN	PN				PN		
INT 201900	PX	PX	X		1-H-1			
INT 201900	RIABS	RIABS	ABS			RI		
INT 201900	RIF	RIF	F			RI		
INT 201900	RIG	RIG	G			RI		
INT 201900	RR	RR				SGV		
INT 201900	RSG	RSG	G			WID/STR		
INT 201900	RTHEL	RTHEL	EL			DA		*RTH*
INT 201900	RVAL	RVAL	F					RVAL
INT 201900	RYLG	RYLG	G			RYL		
INT 201900	TKE	TKE				*KE	LF+HF	
INT 201900	TRN	TRN				TRN		
INT 201900	TTYEOB	TTYEOB				TTY		*EOB*
INT 201900	TTYGX	TTYGX	X		0-G-0	PY		*TT*
INT 201900	TTYNX	TTYNX	X		0-NN-1	PY		*TT*
INT 201900	TTYPHY	TTYPHY				TTY		*PHY*
INT 201900	TTYSAT	TTYSAT				TTY		*SAT*
INT 201900	TX	TX	X		1-H-3			
INT 201900	WID	WID				WID		