**Nuclear Data Section**

**International Atomic Energy Agency**

**P.O.Box 100, A-1400 Vienna, Austria**

**Memo CP-D/975**

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**To:** Distribution

**From:** N. Otsuka

**Subject: New web quantity**

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

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **New webquantity** | **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 webquantity** | **SF3** | **SF4** | **SF6** | **SF7** | **SF8** | **Expansion** |
| CSGX |  | 0-G-0 | SIG |  |  | Gamma production cross section |
|  |  | 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 webquantity** | **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!

**Distribution:**

a.koning@iaea.org

abhihere@gmail.com

aloks279@gmail.com

cgc@ciae.ac.cn

dbrown@bnl.gov

draj@barc.gov.in

fukahori.tokio@jaea.go.jp

ganesan555@gmail.com

gezg@ciae.ac.cn

imai@nucl.sci.hokudai.ac.jp

iwamoto.osamu@jaea.go.jp

j.c.sublet@iaea.org

jmwang@ciae.ac.cn

kaltchenko@kinr.kiev.ua

kenya.suyama@oecd.org

l.vrapcenjak@iaea.org

manuel.bossant@oecd.org

masaaki@nucl.sci.hokudai.ac.jp

michael.fleming@oecd.org

mmarina@ippe.ru

nicolas.soppera@oecd.org

n.otsuka@iaea.org

nrdc@jcprg.org

odsuren@gmail.com

ogritzay@kinr.kiev.ua

ogrudzevich@ippe.ru

otto.schwerer@aon.at

pikulina@expd.vniief.ru

pritychenko@bnl.gov

samaev@obninsk.ru

sbabykina@yandex.ru

scyang@kaeri.re.kr

selyankina@expd.vniief.ru

sonzogni@bnl.gov

stakacs@atomki.hu

stanislav.hlavac@savba.sk

sv.dunaeva@gmail.com

taova@expd.vniief.ru

tarkanyi@atomki.hu

vvvarlamov@gmail.com

v.zerkin@iaea.org

vidyathakur@yahoo.co.in

yolee@kaeri.re.kr

zholdybayev@inp.kz

**cc:**

stanislav.simakov@partner.kit.edu

talou@lanl.gov

**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 CSG0 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 DAEG0 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 DAG0 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 DEG0 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 G0 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 DAEG0 DAEGE DA/DE G

 INT 201900 DAEGX DAEG0 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 DAG0 DAGE DA G

 INT 201900 DAGX DAG0 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 DEG0 DEGE DE G

 INT 201900 DEGX DEG0 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 G0 GE G

 INT 201900 GX G0 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