**Nuclear Data Section**

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**Memo CP-D/1012**

**Date:** 19 April 2021

**To:** Distribution

**From:** N. Otsuka

**Subject: Multiple appearance of MASS, ELEMENT, and ISOMER**

Multiple appearance of an independent variable heading is allowed when the dataset is for the sum of two independent variable value. However, some repetitions are originated from coding errors.

***Example*:**

MASS in the COMMON section must be MASS-NRM. “(MONIT)” must be added to the second code string under the keyword MONITOR.

SUBENT 22073002 880805

BIB 5 12

REACTION (95-AM-241(N,F)MASS,CHN,FY,,SPA)

MONITOR (92-U-235(N,F)MASS,CHN,FY,,SPA) USED FOR RELATIVE

DETERMINATION OF FISSION YIELDS.

(95-AM-241(N,F)MASS,CHN,FY,,SPA) USED FOR ABSOLUTE

NORMALIZATION OF FISSION YIELDS.

…

ENDBIB 12

COMMON 2 3

MASS MONIT

NO-DIM PC/FIS

1.4000E+02 6.0000E+00

ENDCOMMON 3

DATA 3 35

MASS DATA DATA-ERR

NO-DIM PC/FIS PC/FIS

8.8000E+01 7.5000E-01 9.0000E-02

8.9000E+01 1.0000E+00 2.0000E-01

9.1000E+01 1.7200E+00 2.1000E-01

…

1.3900E+02 6.2100E+00 2.9000E-01

1.4000E+02 6.0000E+00 1.5000E-01

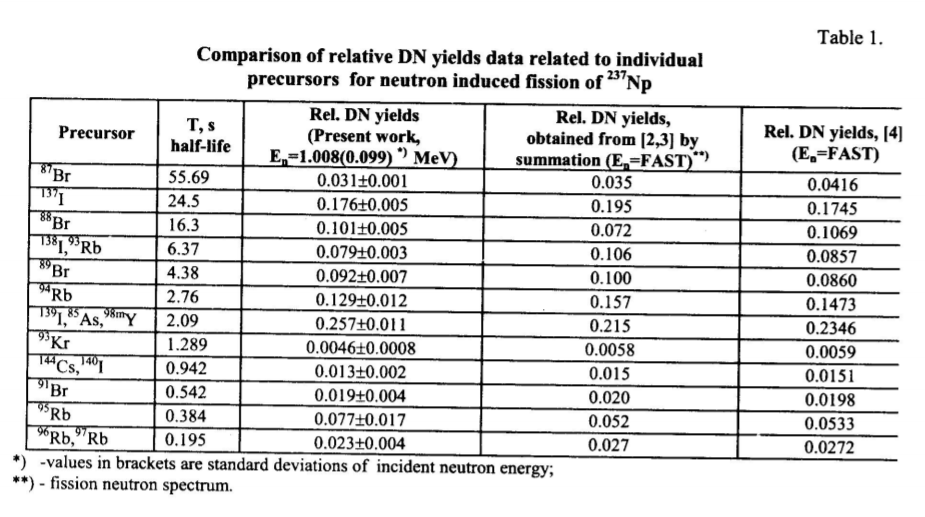
1.4100E+02 5.1500E+00 3.1000E-01

…

I checked multiple appearance of MASS, ELEMENT and ISOMER in EXFOR Master (Ver.2021-04-06), and the result is appended to this memo.

Repetition of both ELEMENT and MASS (41300.002)

During this review, I found it is not trivial to express the quantity summed over several nuclides in the ELEM/MASS formalism (41300.002):



SUBENT 41300002 20191112

BIB 6 38

REACTION ((93-NP-237(N,F)ELEM/MASS,DL,NU)/

(93-NP-237(N,F),DL/IND,NU))

…

ENDBIB 38

NOCOMMON 0 0

DATA 11 60

EN EN-ERR **ELEMENT MASS ELEMENT MASS**

**ISOMER ELEMENT MASS** DATA ERR-T

MEV MEV **NO-DIM NO-DIM NO-DIM NO-DIM**

**NO-DIM NO-DIM NO-DIM** NO-DIM NO-DIM

0.586 0.078 **33. 85. 39. 98.**

**1. 53.** 139. 0.257 0.012

…

The compiler tried to express the delayed neutron fraction for the 2.09 sec group by using three pairs of (ELEMENT,MASS) of precursor nuclides (33-AS-85, 39-Y-98-M1, 53-I-139) instead of the half-life (HALF-LIFE). But the above coding would be interpreted as the direct product of ELEMENT and MASS, i.e.,

(ELEMENT,MASS) = (33,39,53)×(85,98,139) = (33,85) + (33,98)+(33,139)+(39,85)+…

As an-hoc solution, I suggest replacement of (ELEMENT, MASS) with HALF-LIFE in 41300.002.

Repetition of ELEMENT – Chain yield? (13332.002, 13969.002, 22064.003, M0202.002-003)

In the tables of these articles, some fission yields are reported with two nuclides (mother and daughter) on the same mass chain. The mother nuclide often has longer half-life. It could be author’s intention to report the chain yield instead of the cumulative yield. These cases must be further investigated by the originating centres.

**Appendix: Multiple appearance of MASS, ELEMENT and ISOMER in EXFOR Master**

|  |  |
| --- | --- |
| **MASS** |  |
| 22073.002 | MASS -> MASS-NRM in COMMON. Add (MONIT) to the second MONITOR code string. |
| 41300.002 | ELEM/MASS,DL,NU -> ,DL/GRP,NU. Replace (ELEMENT,MASS) with HALF-LIFE. (Unresolved precursors of the group-wise delayed neutron fraction.) |
| 41308.003, 41308.004 | (Ok) |
| C2498.003 | Delete the fourth column of the DATA section under MASS. (Digitized masses before rounding?) |
|  |  |
| **ELEMENT** |  |
| 13332.002 | Chain yield? (Delete ELEMENT?) 111Pd+111Ag, 129mSb-129Te, 132Te+132I, 141Ce+141La. The same notation of the sum is used in 13969.002 measured by Kuroda’s group. The two nuclides were isolated and counted separately? |
| 13969.002 | Chain yield? (Delete ELEMENT?) 143Ce+143Pr, 156Sm+156Eu. The authors mention the two nuclides were isolated and counted separately. |
| 22064.003 | Chain yield? The activity of the short-lived daughter is measured. 97Zr+97Nb, 99Mo+99mTc. The authors explain their yields as “mass yield” in Table 2. |
| 30787.003.1, 30787.003.2, 30787.004.1, 30787.004.2, 30787.005.1, 30787.005.2 | ELEMENT=43 in the common subentry (001) must be deleted. |
| 41300.002 | (See above) |
| M0202.002, M0202.003 | Chain yield? (Delete ELEMENT?) Yields are given for 88Kr+88Rb, 92Sr+92Y, 95Zr+95Nb, 97Zr+97Nb, 99Mo+99Tc (99mTc?), 132Te+132I, 140Ba+140La. |
|  |  |
| **ISOMER** |  |
| F1217.004 | (Ok) |
| F1299.002 | (Ok) |
| G0065.002 | (Ok) |
| L0214.003, L0214.004 | (Ok) |
| O0989.002 | (Ok) |

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