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Memo CP-D/391

Date: 14 April 2004

To: Distribution

From: O. Schwerer

**Subject: Thick Target Yields and Multiplicities in TRANS O016
 (with Dictionary 25 and 36 additions)**

Three entries of TRANS O016 contain quantities which need further consideration and/or should be changed. I list below first the proposed actions (item I.) and then give detailed explanations under items II and III.

For the proposed change to subentry **O0941.003** (item I-e and III) I want feedback in particular from NNDC.

I. SUMMARY of proposed actions

a) Add to Dictionary 25:

PRD/MUC/SR	PYTA	products per micro-Coulomb per steradian
		= prod/ (micro-Coulomb * sterad)

b) Add to Dictionary 36:

PAR, TTY/PY/DA	Partial product yield as function of beam current, differential by angle (Dimension code PYTA)
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c) Entry O0861

Subentries 2,4,5,6:

- Change REACTION to **PAR, TTY/MLT/DA, G**
- Delete MISC column.

Subentries 3,7,8,9,10:

- Change REACTION to **PAR, TTY/PY/DA**
- Delete MISC column
- Change units PRT/MUC/SR to PRD/MUC/SR

d) Entry O0901

Subentries 2-64: Treat as O0861.003 (if SF4 = 0-G-0), or as O0861.002 (otherwise)

Subentries 65-107: Give authors' numbers under DATA with ARB-UNITS, and delete MISC

e) Subentry O0941.003

Change REACTION to (92-U-238(P,F)MASS,,NU)

II. Proton-induced thick target gamma yields in entries O0861 and O0901

a) O0861.002 (3-LI-0(P,INL)3-LI-0,PAR,PY/DA,,TT)

- 1) Since the data given are not the yield of the product in SF4 but the gamma yield, G must be added to SF7.
- 2) For the same reason, these data are to be considered "Thick Target Multiplicities" according to the definitions of memo CP-C/334. This is case 4b) of the memo (plus the additional parameter DA for the angular dependence).
- 3) Thick Target Multiplicities are coded either
,MLT,,TT (if given in units PRT/INC) or
,TTY/MLT (if given in units PRT/MUAHR ore equivalent)
(all according to CP-C/334).
- 4) The subentry gives the DATA in PRT/MUC/SR (as used by the authors).
These units require the REACTION code
(1) PAR,TTY/MLT/DA,G
(PRT/MUC is the same dimension as PRT/MUAHR.)

MISC gives the data in units PRT/INC/SR (converted by compiler).

If authors would have used these units, the data could be given under REACTION as

(2) PAR,MLT/DA,G,TT.

However, since (after the changes made for the final version of TRANS O016) DATA now contains the authors' original numbers, I think the **MISC column is no longer needed**. Anyway the free text under MISC-COL in subentry 1 is now incorrect (forgotten to change for final version).

- 5) We note that memo CP-C/334 has also case 4c) "Thick Target Gamma-Ray Yields" coded with SPC in SF6. Since the present data are not a gamma spectrum but the yield for one gamma line at one angle as function of incident proton energy, we believe that these data should be coded as described above rather than as spectrum data.

b) 00861.003 (5-B-0 (P , X) 0-G-0 , PAR , PY/DA , , TT)

- 1) Since SF4 = 0-G-0, no SF7 is required here.
- 2) Again, the subentry gives the DATA in PRT/MUC/SR (as used by authors) and under MISC the data in units PRT/ INC /SR (converted by compiler).
We think that MISC is not needed.

- 3) If we stick to a literal interpretation of CP-C/334 :

- Everything coded in SF4 is a "product" (with units PRD/...) (even if it is 0-G-0), and
- Only particles coded in SF3 or SF7 are "particles" (with units PRT/...),

then, (according to CP-C/334, case 4a, second option):

- the correct REACTION is
(5-B-0 (P , X) 0-G-0 , PAR , TTY / PY / DA)

- and the units for this subentry should be
PRD/MUC/SR

(The difference between PRD and PRT is a relatively minor point here but it is important to clarify this and use them consistently, to avoid further confusions.)

c) Similar subentries

00861 subentries 4,5,6: same case as subentry 2 (see above)

00861 subentries 7,8,9,10: same case as subentry 3 (see above)

00901 subentry 2: same case as subentry **00861.003** (see above)

00901 subentry 3: same case as subentry **00861.002** (see above)

00901 subentries 4-64: as **00861.003** (if SF4 = 0-G-0) , otherwise as **00861.002**

d) 00901 subentries 65-107:

These are "relative normalized neutron yields"; even after looking at the paper, it is not very clear how they were normalized (perhaps relative to the value for Pb at 7 MeV which appears as 100). I suggest to give the authors' numbers under DATA with units ARB-UNITS and remove also here the MISC column and the numbers which were converted by the compiler.

III. Fission fragment mass dependence of post scission neutron multiplicity **(subentry 00941.003)**

Following a suggestion by V.McLane, this is coded as

(92-U-238 (P , F) MASS , , MLT , N / FF)

Questions:

- 1) Why is FF needed in SF7? The multiplicity concerns the neutrons only; probably FF is meant to label the data as dependent on the fission fragments' mass. But is this not sufficiently described by MASS in SF4?
Also, it would be difficult to find a good expansion for the dictionary because SF4=MASS is not part of it. Therefore, it would be something like "neutron multiplicity dependent on fission fragments", unless we introduce a separate rule that this code can only be used with SF4=MASS.

- 2) Couldn't MLT, N be replaced by NU ? Then we would need to code only

$(92-U-238(P, F)MASS, , NU)$

which would not need any new dictionary entry at all.

As a compromise, we could use

$(92-U-238(P, F)MASS, , NU, FF)$

but then we have the same problem with the expansion as described above.

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