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Memo CP-D/541

Date: 30 December 2008
To: Distribution
From: N. Otsuka,

Subject: **Fission neutron distribution (41516.002-008)**
Reference: Memo 4C-4/173

Concerning 41516 (PRELIM.4145), A. S. Vorobyev et al. [1] gives angular and energy distribution of prompt neutrons from thermal neutron induced fission to study contribution of prompt neutrons emitted by a fissioning nucleus ("scission neutron") and by fission fragments. For this purpose, neutron emission angle θ is measured from direction of light fission fragment momentum (as mentioned under REACTION in free texts).

REACTIONs and unit codes are used in PRELIM.4145 are summarized below:

Sub#	REACTION	Unit
.002	(92-U-235(N,F),PR,NU/DA)	PRT/FIS/SR
.003	(92-U-235(N,F),PR,AKE/DA,N)	MEV
.004, .005	(92-U-235(N,F),PR,NU/DA/DE)// (92-U-235(N,F),PR,NU/DA/DE))	NO-DIM
.006	(92-U-235(N,F),PR,NU/DA/DE)	NO-DIM
.007	(92-U-235(N,F),PR,NU/DE,LF,REL)	NO-DIM
.008	(92-U-235(N,F),PR,NU/DE,HF,REL)	NO-DIM

1. Heading and unit codes

The following corrections would be proposed:

Sub #	Comment
002-003	Use ANG-RL instead of ANG.
004-005	Use new heading codes ANG-RL-** instead of ANG-**.
006	Use a new unit code P/FS/MEVSR instead of NO-DIM

Dictionary 24 (Data headings)

ANG-RL-DN	Relative angle in denominator
ANG-RL-NM	Relative angle in numerator

Dictionary 24 (Data units)

PRT/FIS/SR	(update of unit family: 1/A → FYDA)
P/FS/MEVSR	particle/fission/sr/MeV (unit family: FYAE)

Dictionary 26 (Unit families)

FYDA	per-cent per fission per solid angle
FYAE	per-cent per fission per solid angle per energy

(These codes are added when they are used in the final TRANS.4145 without objections from other centers.)

2. Quantity codes

(1) 41516.002-006

Differential prompt neutron multiplicity (not cross section) with respect to independent variables of neutron has been coded by PR,D*,N rather than PR,NU/D* (* = A, E,…). The latter has been used to define prompt fission neutron multiplicity at a given variables of fission fragments. If we stick this convention, the following modification should be applied to 41516.002-006:

Sub #	In PRELIM.4145	A possible solution
002	PR,NU/DA	PR,DA,N+LF (new code)
003	PR,AKE/DA,N	PR,AKE/DA,N/N+LF (new code)
004-006	PR,NU/DA/DE	PR,DA/DE,N+LF/N (new code)

(2) 41516.007-008

There is a code

PR,DE,N,MXD prompt neutron spectrum relative to Maxwell distribution of given temperature

in dictionary 236. However, source of prompt neutron (emitted by light fragment or heavy fragment) cannot be given on the basis of this quantity code because SF7 is occupied by N (neutron). So a possible solution is PR,DE,N,MXD/MSC instead of PR,NU/DE,*F,REL.

Outgoing light particles from fission are often measured in coincidence with fission fragments. We would introduce new branch or modifier codes which mean “measured in coincidence with light/heavy fragment”. Further comprehensive investigation is necessary.

Reference

[1] V.G. Vorobyev *et al*., Nucl. Instrum. Meth. A **598**(2009)795

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