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Memo CP-E/122

Date: October 4, 2007
To: Distribution
From: OTSUKA Naohiko
Subject: Multiplicity of prompt gamma in capture reaction (22960.005-006)

Energy spectra of prompt gamma in capture reaction (particles/capture/MeV) are compiled in 22960.005-006 in PRELIM.2186 in which REACTION code

`(40-ZR-94(N,G)40-ZR-95,,PY/DE)`

or

`(40-ZR-94(N,G)40-ZR-95,,PY/DE,G)`

is proposed for them. The first one is impossible because the first REACTION code means "product yield of ^{95}Zr". But the second option might be possible.

There is not clear explanation of difference between "`MLT`" and "`PY`" in LEXFOR. However, LEXFOR "Thick- and thin-target yields" (submitted by Memo CP-C/347 = WP2004-18 and approved after corrections) implies the following rule:

- `PY` refers product (SF4)
- `MLT` refers outgoing particle (SF3)

Example:

`(40-ZR-94(N,G)40-ZR-95,,PY/DE,,TT):` Thick target product yield of ^{95}Zr

`(40-ZR-94(N,G)40-ZR-95,,MLT/DE,,TT):` Thick target yield multiplicity of gamma.

Therefore I would like to propose

`(40-ZR-94(N,G)40-ZR-95,,MLT/DE)`

for gamma spectra in 22960.005-006, from the view of consistency with "thick- and thin-target yield" case.

We also need addition of a new unit code for "particles/capture/MeV":

Dictionary 25 (Data Units)

`PT/RCT/MEV`	`1/E`	particles per reaction per MeV

Example (22960.006 proposed in PRELIM.2186)

```
SUBENT        22960006   20070810                                    22960  6    1
BIB                 3          6                                    22960  6    2
REACTION   (40-ZR-94(N,G)40-ZR-95,,PY/DE) Units gamma-rays/MEV      22960  6    3
                                          /capture                  22960  6    4
ERR-ANALYS (E-ERR-DIG)  Gamma energy digitizing error               22960  6    5
           (ERR-DIG)    Data digitizing error                       22960  6    6
           (DATA-ERR)   Error from the graphic bars                 22960  6    7
STATUS     (CURVE) Fig.5  of main reference (Lower curve)           22960  6    8
ENDBIB              6          0                                    22960  6    9
COMMON              3          3                                    22960  6   10
EN         E-ERR-DIG  ERR-DIG                                       22960  6   11
KEV        MEV        PER-CENT                                      22960  6   12
    546.    5.5054E-03 5.4585E-03                                   22960  6   13
ENDCOMMON           3          0                                    22960  6   14
DATA                3        135                                    22960  6   15
E          DATA       DATA-ERR                                     22960  6   16
MEV         PT/RCT/MEV PT/RCT/MEV                                   22960  6   17
    0.62096    0.23656     0.2263                                   22960  6   18
    0.66127    0.48725    0.39558                                   22960  6   19
    0.70642    0.38889    0.36468                                   22960  6   20
```

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Gamma Spectra

(See also **Partial Reactions**).

Data to be compiled in EXFOR

Neutron capture γ-ray spectra were not given high priority in the past, so data compilation was not required until 2004.

1. **Intensities of γ lines**

REACTION coding: SPC in SF6 (Process).

Example: (…(N,G)…,,SPC)

Units: code from Dictionary 27 with the dimension ~~SPC~~ **YLD** (*e.g.*, ~~GAM/100N~~ **PC/INC**)

The γ-ray energies are discrete values coded under the data heading E.

Relative measurements require the addition of the REACTION modifier REL and units ARB-UNITS.

2. **Continuous spectra of unresolved γ's**

REACTION coding: DE in SF6 (Process).

Example: (…(N,G)…,,DE)

Units: code from Dictionary 27 with the dimension DE (*e.g.*, MB/MEV)

The γ-ray energy is a continuous variable coded either as a range with data headings E-MIN and E-MAX, or with the mid-point of the energy bin given under the data heading E and the bin width given under E-RSL.

3. **Partial radiation widths**

REACTION coding: WID in SF6 (Process), PAR in SF5 (Branch).

Example: (…(N,G),PAR,WID)

Units: code from Dictionary 27 with the dimension E (*e.g.*, EV)

The secondary energy variable coded is:

- either the γ-ray energy, coded under the data heading E,
- or the final level energy, coded under the data heading E-LVL-FIN,
- or the initial and final energy, coded under the headings E-LVL-INI and E-LVL-FIN.