Incident Energy Differential Physical Thick Target Yield (SF8=TM)

(N. Otsuka, S. Takács, 2016-02-23, Memo CP/D-893)

LEXFOR "Thick- and Thin-Target Yields" explains that the **production thick target yield per 1 MeV of target thickness** is coded with `TTY,,TM` in REACTION SF6-SF8 and a unit code with dimension `TTTE` (e.g., `CI/AHR/MEV`), but it does not explain the idea of this quantity. As mentioned in Memo CP-A/155, this quantity has been typically seen in articles reporting charged-particle induced reaction activation experiments by the Milan group (M. Bonardi et al.).

The actual meaning of this quantity is the **differential of the physical thick target yield with respect to the incident energy**. From the equation of the LEXFOR entry, the physical thick target yield for the initial proton energy of E_0 is

$$\alpha_{phy}(E_0) = \int_0^{E0} dE [-(1/\rho)(dE/dx)]^{-1} \sigma(E) (1/Ze),$$

and its energy differential is

$$d\alpha_{phy}(E)/dE = (d/dE) \int_0^{E0} dE' [-(1/\rho)(dE'/dx)]^{-1} \sigma(E') (1/Ze)$$

$$= [-(1/\rho)(dE/dx)]^{-1} (1/Ze) \sigma(E),$$

where E is not a secondary energy but the incident energy. This equation implies that we can derive the cross section $\sigma(E)$ by measuring the physical thick target yield at various incident energies.

In order to express the meaning of the quantity more appropriately, we propose to make obsolete two relevant quantity codes `,TTY,,TM` and `CUM,TTY,,TM`, and replace them with `,TTY/DEN,,PHY` and `CUM,TTY/DEN,,PHY`, where a new parameter code `DEN` is introduced to express "differential with respect to the incident energy".

Dictionary 32 (Parameters)
`DEN`   Differential with incident energy

Dictionary 34 (Modifiers)
`TM`   (*Obsolete*)

Dictionary 236 (Quantities)

`,TTY,,TM`	(*Obsolete*)
`CUM,TTY,,TM`	(*Obsolete*)
`,TTY/DEN,,PHY`	Physical thick target yield differential with respect to incident energy
`CUM,TTY/DEN,,PHY`	Cumulative physical thick target yield differential with respect to incident energy

`M+,TTY/DEN,,PHY`   Physical thick target yield differential with respect to incident energy including formation by partial feeding via isomeric transition

There are 13 affected existing entries of which 1 is from area A, 2 are from area O, and 10 are from area D. If this proposal is accepted, `M+,TTY/DEN,,PHY` replaces `M+,TTY,,TM` proposed in Memo CP-N/129.

Revision of LEXFOR

~~Production Thick Target Yield per 1 MeV of Target Thickness~~

~~REACTION Coding:~~ ~~`TTY,,TM` in SF 6.~~

~~Units~~~~: a code from Dictionary 25 with dimension `TTTE`,~~ *~~e.g.~~*~~, `CI/AHR/MEV`~~

Physical Thick Target Yields Differential with respect to Incident Energy

REACTION Coding: `,TTY/DEN,,PHY`.

Units: a code from Dictionary 25 with dimension `TTTE`, *e.g.*, `MBQ/C/MEV`