

Resonance Parameter for Light-Nuclei Reaction (REACTION SF3)

(N. Otsuka, O. Schwerer, 2013-01-25. CP-D/774)

Recently we have found the following two REACTION codes for $\Gamma_\alpha = \Gamma_t$ in ${}^6\text{Li}(n,\alpha)$:

(3-LI-6(N,T),,WID)

(3-LI-6(N,A),,WID)

The current EXFOR Formats Manual Chapter 6 mentions that *there is no reaction product if the reaction specifies a resonance parameter*. Assuming that we can interpret this sentence as “the heaviest products of the reaction is not coded if the reaction specifies a resonance parameter”, we should code the above width as (N,T) rather than (N,A). To clarify this, we propose revisions of the LEXFOR and EXFOR Formats Manual as well as corrections of REACTION codes in 11 entries:

LEXFOR entry “Light-nuclei reactions (Z≤6)”

Light-Nuclei Reactions (Z≤6)

The light-nuclei reactions require special care, because many different notations exist. For example, the notations Li(n,d), Li(n,nd), Li(n,n α) may all describe the identical reaction, Li(n,nd) α .

Data retrievals for light-nuclei reactions are more difficult if the notations for these reactions are not standardized. Therefore, they should be entered using the following general rule: the heaviest of the reaction products is defined as the residual nucleus, and the remaining reaction products are sorted as given on EXFOR Formats Manual Chapter 6: **Reaction field**.

In angular or energy distributions the particle considered must be given in reaction SF7 when not self-evident. (See **Particles**).

Example:

In the reaction ${}^6\text{Li}(n,2np){}^4\text{He}$, the angular distribution:

of the neutrons: (3-LI-6(N,2N+P)2-HE-4,,DA,N)

of the protons: (3-LI-6(N,2N+P)2-HE-4,,DA,P)

of the alphas: (3-LI-6(N,2N+P)2-HE-4,,DA,A)

In resonance parameters, the reaction product (i.e., the heaviest of the products) is not coded.

Example:

In the reaction ${}^6\text{Li}(n,\alpha)$, $\Gamma_t = \Gamma_\alpha$ is coded as (3-LI-6(N,T),,WID) even if the width is determined by detection of alpha particles.

EXFOR Formats Manual Chapter 6

SF4. Reaction Product. In general, the heaviest of the products is defined as the reaction product (also called residual nucleus). In the case of two reaction products with equal mass, the one with the larger Z is considered as the *heavier* product. Exceptions or special cases are:

...

d) ~~There is no reaction product~~ A reaction product is not coded if the reaction specifies a resonance parameter (defined in Dictionary 236 by using the resonance flag ‘.’).

...

Proposed corrections

(3-LI-6(N,A),,WID) → (3-LI-6(N,T),,WID)
10072.003.4, 10228.003.2, 11082.003.1, 11164.002.2, 12735.004.4,
20059.004, 22529.002.3, 22605.002.2

(3-LI-6(N,A),,WID/RED,,RMT) → (3-LI-6(N,T),,WID/RED,,RMT)
10072.003.5, 10378.003.5

(3-LI-6(N,A)1-H-3,,SIG) → (3-LI-6(N,T)2-HE-4,,SIG)
20462-002-003