

Memo 4C-3/148

To: Distribution

19 November 1975

From: H.D. Lemmel *Lemmel*

Subject: Center-of-Mass Indicator in Column-Heading Keywords

Reference: Manual Update of 29 October 1975

In the Manual Update of 29 October 1975 a "Note" was added at the end of the Lexfor entry "Center-of-Mass System", which forbids the use of, e.g., the column-headings ANG and ANG-CM in the same subentry. Such a rule does not correspond to previous practice, and we do not recall that the contents of this Note had been agreed. In particular, we do not like the proposal included in this Note recommending that Independent Variables or DATA be coded under MISC, in the given case.

Instead of this Note, we suggest to add explicitly:

"A DATA table of a subentry may include simultaneously data-headings referring to the lab-system and center-of-mass system, if data were given this way by the author, as for example

	ANG	ANG-CM	DATA
or	ANG	DATA	DATA-CM."

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Center-of-Mass System

The indication whether data are given in lab-system or center-of-mass system is given within the data-heading keywords, not within the quantity-codes. All quantities are understood to represent the lab-system, except those where the data-headings are labelled with "CM", as for example:

EN-CM = incident neutron energy in CMS

E-CM = energy of outgoing particle in CMS

COS-CM = cosine of angle in CMS

NUMBER-CM = heading for the coefficient-number, when the (Legendre or cosine-fit refers to an angle given in CMS, independently of whether it has been made from an angular distribution in CMS or whether it has first been made from an angular distribution in the lab-system and then converted to CMS.

DATA-CM = heading for data which are in CMS with respect to at least one variable.

and others as given in dictionary 24.

Note: Only one representation (i.e. either lab or center-of-mass) for each parameter should be coded as a variable in the data table. Other representation may be added under the column heading MISC is considered desirable by the compiler.

Data Specification Keywords

The significance of the information given in the data table is defined by one of three following Data Specification Keywords which must be included in the bibliographic section for each data table. The coded information includes an isotope or compound and the quantity measured.

ISØ-QUANT: used for neutron-induced reactions on a particular isotope or mixture of isotopes.

CMPD-QUANT: used for neutron-induced reactions on a chemical compound or mixture

[See Compound codes]

NUC-QUANT: used when the quantity defined does not refer to the target nucleus.

1. Spontaneous fission, see Spontaneous Fission.
2. The Level-Density Parameter, which is proportional to single-particle level-spacing at top of Fermi-sea in the Fermi-gas model of nucleus, in specified formalism, is coded with the quantity-code "LDP".
3. The Nuclear Temperature from the Fermi-gas model of nucleus is coded with the quantity-code "TEM".
4. The Spin-cut-off factor is coded with the quantity-code "SCO".

See EXFOR pages VIII.12 - VIII.20 for Data Specification Keyword coding rules.

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Incident-Neutron Energy

The energy of the incident neutrons is, in general, entered under the data-heading keyword "EN". Some other relevant data-headings can be found in dictionary 24.

If the incident-neutron energy is given only indirectly, some tricks are foreseen to facilitate a data-retrieval by "EN":

1. If the energy is given as "MU-ADLER" (equivalent to resonance-energy in Adler-Adler formalism), the energy-range of the data-set is given explicitly in the "COMMON" section under the data-headings "EN-MIN" and "EN-MAX".

2. If the data are averaged over an incident neutron spectrum, an equivalent energy is given under the heading "EN-DUMMY"; see under Spectrum Average.

Data given for the data specification keyword NUC-QUANT should not be given an incident energy.

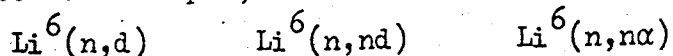
Information on the characteristics of the resolution and the spectrum of the incident neutron beam is entered in free text under the keyword "INC-SPECT". This keyword is not obligatory. No dictionary exists. Compare under Measurement Techniques.

Compare: Secondary Energies, for which the data-heading code is "E" as distinct from distinct from "EN".

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Light-Nuclei Reactions ( $Z \leq 6$ )

The light-nuclei reactions require special care, because many different notations exist. For example, the notations



may all describe the identical reaction  $\text{Li}^6(n,nd\alpha)$ .

In EXFOR, data retrievals for light-nuclei reactions would be made rather difficult, if the ISO-QUANT notations for these reactions were not standardized. A well established CINDA-rule says that these reactions shall be described by the two lightest outgoing particles.

For the help of the compiler, the following table lists all possible light-nuclei reactions, together with their thresholds. The threshold-energies were taken from UCRL-14000, May 64, R.J. Howerton et al: Thresholds of Nuclear Reactions. Note however, that the list below gives only the end-products, and that in some cases competing reactions exist that lead to the same end-products.

In angular or energy distributions the particle considered must be given in the forth subfield of the quantity-code when not self-evident from process-parameter

Example: In the reaction  $\text{Li}^6(n,2np)\text{He}^4$  the angular distribution of the neutrons is (3-Li-6,N2N,DA)

of the protons: (3-Li-6,N2N,DA,,P)

of the alphas: (3-Li-6,N2N,DA,,A).

There are some exceptions from the lightest-particles-rule:

1.  $\text{Li}^7(n,2n d \alpha)$  is coded (3-LI-7,NND)  
because (3-LI-7,N2N) means  $\text{Li}^7(n,2n)\text{Li}^6$ .
2.  $\text{C}^{12}(n,npt2 \alpha)$  is coded (6-C-12,NNT)  
because (6-C-12,NNP) means  $\text{C}^{12}(n,np)\text{B}^{11}$ .
3. (n,3n) and (n,4n) reactions are coded as N3N and N4N.

Compare under Light-Nuclei Reactions and Particle-out Reactions.

Note: NNCSC feels that the system should not be bound for all time by the two-lightest-particles rule for all nuclei.

In EXFOR no other ISO-QUANT should be used for the light-nuclei reactions than those listed below. In all these reactions it is recommended to make use of the keyword "PART-DET". In addition to the processes listed below, only scattering processes exist for these nuclei as well as sum cross-sections such as NX (charged-particles emission), AEM (alfa-emission), etc.

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Threshold

A data set may extend beyond a threshold. For example, a data table resulting from a neutron-detecting experiment may actually give in a single data set

1. EL below the inelastic threshold-energy, and  
SCT above the inelastic threshold-energy; or
2. SCT below the (n,2n) threshold-energy, and  
NPR above the (n,2n) threshold-energy.

In these cases the wider definition should be used, that is:

In the first case, the table should be entered under the quantity SCT, in the second case under NPR.

The compiler is not allowed to split the data set in two parts below and above the threshold.

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When retrieving, e.g., for elastic scattering data, EL, one should realize that it may also be worth-while to retrieve on total scattering SCT, with  $EN \leq \text{threshold-energy}$ .

If, however, in the case 1. above, the data table has been corrected for inelastic neutrons, or if the portion of inelastic neutrons measured is negligible, the data set may well be given the quantity-code EL

| See also Tautologies.