MEMO 4C-109
CP-C/8

Date: February 7, 1977

From: V. McLane (May), T.W. Burrows *TWB*

Subject:

I. General

At the present time, Neutron EXFOR and Charged-Particle EXFOR are separate systems, and should remain so for the near future developments. While all neutron data centres are on the distribution list for Charged-Particle Memos, these proposals may have been missed by those centre personnel who are not concerned with Charged-Particle data and vice versa. Therefore, until such time as Neutron and Charged-Particle EXFORS are merged into a single system, we believe that all future memos which deal with changes to the EXFOR system should be issued as joint Neutron-Charged-Particle Memos.

Due to the above arguments, and since there have been so many suggested changes in recent months, there may be some confusion as to what has been agreed. We propose to issue a provisional set of Manual update pages before the Four-Centre Meeting. We will try to include changes which have been proposed in Charged Particle Memos where they have been approved. <u>No changes will be considered as final until the updates have been approved.</u>

We would again like to make a plea for all data centres to list at the head of their memos the subjects contained in the memo. A cross reference to other memos is not enough.

II. Dictionary 2 (Inclusion of coding rules)

The coding rules for many bibliographic keywords are given in Dictionary 2 and, in some cases, are not even included in the manual. The manual should include a complete set of coding rules, which could then be removed from Dictionary 2.

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III. Manual Update for PART-DET (Memo CP-D/16)

        We agree to the proposal as made, however, we do not agree that it
belongs on page VIII.4 of the EXFOR Manual.

        We will agree to add the proposed wording to the LEXFOR entry
Particles and make the appropriate change on page VIII.3.

IV. STATUS keyword

        For machine processing of the data it is useful to specify dependent
data in a machine retrievable way so that two representations of the same
data set will not be used in an evaluation. For this reason we have pro-
posed in Memo 4C-1/101 the addition of second field to the coded infor-
mation under status be used as a cross reference. If the data are in the
same subentry, this field would be blank.

        Example: STATUS   (DEP,B0001004)
                                (SPSDD,B0001007)

        We propose the following wording be added to the EXFOR Manual on
page VIII.20.

STATUS

        Information under this keyword is given either in free text or as
coded information followed by free text. In the latter case a code is
entered from Dictionary 16. This may be followed by an eight-digit in-
teger giving the AN/SAN to which the data set is linked. For example,
a superseded data set would be liked to the data which superseded it as
follows:
                (SPSDD, 10048009)
[See also LEXFOR entry STATUS and Dependent Data]

Similar wording to be added to LEXFOR under STATUS and Dependent Data

V. Assumed Values (Re 4C-1/101)

        We propose the following wording be added to the EXFØR Manual on page
. VIII.25.

        ASSUMED May be followed by free text or coded information and free
        text. The coded information is used to link assumed values given
        under CØMMØN or DATA with the data-heading ASSUM, ASSUM1, etc., to
        the isotope and quantity of the value assumed. The data heading,
        isotope and quantity are given in parenthesis separated by commas.

            The isotope and quantity are coded following the rules for
        ISØ-QUANT (see page VIII.12-VIII.20)

            For further details see LEXFOR entry Assumed Values

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A LEXFOR Manual page will be drafted for Assumed Values.

VI. STANDARD/MØNITØR (including addition to Dictionary 24)

We propose that the above form as proposed for assumed values would be very useful to link standards to their values as coded under DATA or CØMMØN in the case where there is more than one standard given. The Manual wording under STANDARD would be similar to that proposed for ASSUMED.

We also propose the addition of the Data-Heading Keyword 'E-NRM' to Dictionary 24 to be used when a data set is normalized to a partial cross section, e.g., for a given gamma ray.

VII. DECAY-DATA

We propose using the keyword DECAY-DATA to code the decay information for the standard or monitor. As an alternative, if the other centers object, we propose the addition a new keyword for the coding of this information (perhaps, DECAY-MØN).

We agree that the formalism used in entry B0020 is necessary and propose that wording be added to the CPND EXFOR Manual as follows:

Whenever there are given two or more unresolved radiation energies for which one abundance is given, these should be coded in the same field separated by slashes.

VIII. Multiple Representations of the same variable (e.g., EN,EN-CM)

Coding more than one representation of the same variable introduces what we feel to be unnecessary complications for machine processing of the data. The program must decide in that case if these are really different representations for each point and which to use. We do not support a proposal to allow it. We see nothing wrong with converting the energies to the laboratory system. There is no requirement that data must be coded exactly as published.

IX. Isomeric Ratio Codes

The isomeric ratio codes RMG, RGM, and RMT can be introduced if Dictionary 36 is appropriately modified. We propose adding the code MX, where X equals the number of the metastable state. Thus, we could code the ratios as shown in the following examples:

Ratio of M1 to ground would be ",M1/GND, RMG,"
Ratio of M1 to total would be ", M1, RMT,"
Ratio of M1 + M2 to ground would be ", M/GND, RMG,"

Also, in some of our scanning efforts we have observed that the code RMM may be needed to represent measurement of the ratio of production of two isomeric states and a code RGT to represent the ground to total ratio.

X. Spallation Definition

We believe that when processes are used in SF3 the keyword should describe the process accurately since the angular, energy, charge, and mass distributions would vary greatly for different processes. This was our intent in proposing a code for spallation (SPL). In CP-D/11, it is noted that "fission is defined in LEXFOR as the sum of all interactions in which at least two reaction products have $A > 6$. This would certainly include 'spallation', ..." However, on the following page in LEXFOR under fission yields, the fission process is defined as follows:

The capture of the incident neutron creates a highly excited compound-nucleus showing large deformation which leads to <u>scission</u> or to other competing reactions like neutron-evaporation or gamma emmission.

The spallation process, on the other hand, has as its main feature that the primary interaction occurs between the individual nucleons of the two interacting nuclei. The distributions of these two processes would be considerably different. For example, the emitted prompt neutron spectrum from fission would be considerably softer than from spallation. Also, the mass distributions would be very different. The implication in CP-D/11 that the spallation process could be coded as fission (F) would lead to great difficulties in the retrievals. For example, a person interested in retrieving fission data for a systematic study would also receive all the spallation data.

CP-D/11 also notes that spallation could be coded in the form (Z-S-A (P,N+P+A+8-∅-16)...). This would be exceedingly difficult to retrieve on and would be the equivalent of coding fission as (92-U-235(N,N + 54-XE-131 + 38-SR-104 +...)...).

Of course, there will be cases where various processes are competitive or where various descriptors may be used. We would suggest in the case of spallation that where a definite particle or group of particles is emitted and the spallation process is not being studied, per se, the particles be given in SF3: e.g., 82-PB-208(P,4N)83-BI-205. Also, where processes are competitive, the processes should all be given in SF3; e.g., for 800-MeV protons on ^{238}U, 92-U-233(P,F+SPF).

It would be useful to move both the codes for fission and spallation to SF5, since they really describe the physics of the process in a manner similar to the codes for direct interaction (DI) and compound nucleus formation (CN). However, since the code for fission (F) is already so imbedded in EXFOR, this is not practical.

XI. Prompt Fission (re CP-B/3)

We do not understand what is meant by prompt fission and would like KACHPAG to explain in more detail.

XII. <u>Product Yield Data (Including Fission and Spallation)</u>

The following is an attempt to formulate a proposal for the coding of all yield data, including fission and spallation product yields. It attempts to generalize and simplify the coding of these data, and is meant to include all points which have been discussed in previous memos. (Memos CP-B/5, CP-C/5, CP-D/11).

1) <u>Definition</u> Product yield data shall be defined as all data for which the reaction as specified may lead to more than one product nucleus and for which the product nucleus is one of the parameters of the data presented.

<u>Note</u>: Currently, the reactions for which this applies are fission, spallation and isotope production cross sections (X in SF3).

2) The <u>REACTIØN codes</u> should be generalized since SF3,SF5 and SF6 would be sufficient to differentiate reactions.

Since mass yields, charge yields and product yields are really different data, they should be differentiated in the quantity fields. This could be done either in the branch field (SF5) or in the quantity field (SF6).

We propose the following:

Add to Dictionary 31 (SF5):
- ZYD charge yield
- MYD mass yield
- PYD product yield

Add to Dictionary 32 (SF6):
- YLD yield

[This would replace FY,PY and the proposed SPY]

Add to Dictionary 13 (SF4)
- FRG fragment
- PRO product

[These would replace FF,SF and the proposed FP,SPF]

Examples:

(92-U-235(N,F)PRØ,ZYD,YLD)
(6-C-12(P,SPL)PRØ,MYD,SIG)
(26-FE-0(N,X)PRØ,PYD,SIG)

3) <u>Specification of the product nucleus</u>

a) In the case where there is one specific product nucleus given, it may be coded as specified for reaction subfield 4.

b) In other cases, the product nucleus will be specified in the CØMMØN or DATA sections under the Data-Heading Keywords ELEMENT or MASS.

We propose that, in the case where a product nucleus is measured for a given isomeric state, rather than introducing a new Data-Heading Keyword a decimal could be added to the MASS column, as follows:

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> blank = total for all known isomeric states
> .1 = ground state (used only when known metastable states exist)
> .2 = metastable state
> .9 = two or more unresolvable isomeric states

4) The <u>decay data</u> for these product nuclei would be given in either of the following ways:

- a string of DECAY-DATA entries (as proposed in Memo CP-D/11)

- under the appropriate column headings in the COMMON or DATA section.

This would require the addition of a new keyword for abundance ABUND.

In this case, for half-lives no coded information would be required under the bibliographic keyword HALF-LIFE

5) <u>Standards</u> In order to be able to define standards for product yield data we propose the addition of the Data-Heading Keywords Z-NRM and A-NRM.

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