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DAT/310(7)

KARLSRUHE CHARGED PARTICLE GROUP

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# Information

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Memo CP-B/14

Subjects: NDS-Manual Update
NNDC-Manual Update
Elements, Nuclides Dictionary
Multiple Residual Nucleus Formalism

References: Vienna-Memo of July 22nd (without CP-Number)
CP-C/14, CP-C/16
CP-D/32
CP-C/15

## I. Manual Updates from NDS and NNDC

Since NNDC has pointed out his responsibility for manual updates (CP-C/16), we comment in the following the NNDC proposal of CP-C/14 and refer to the NDS proposal only in cases where we feel the Vienna version may have advantages.

We agree with the general restructing of sections IV, V and VI but would like to keep included the following chapters yet contained in the NDS version.

NDS Sect. IV p. IV.3 (4) Codes and free text

NDS Sect. VI, p. VI.1: - The use of characters as pointers

p. VI.2: 1.) Multiple isoquants and reactions
The explanation should be kept here, also if by the reference to sect. VIII. a repetition of the information occurs.

p. VI.3: 2.) Vector common data
The explanation given in the NDS-version is in our opinion not redundant.

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P. VI.4: 3.) BIB/DATA links, and
p. VI.6:5.) Alternative results
Both cases are included in our generalized pointer concept (CP-B/9 item II, see also our comment in CP-B/13, item C2.15).

NNDC's classification of the chapter "links between Information-Identifier Keywords ..." (NNDC p. VI. 3 ff) according to BiB-keywords rather than Data-headings (like in the NDS proposal) seems to be slightly clearer. However, the "variable families" and their classification (A, C, E...) should be explained here in addition to the reference to p. V. 6 and from there to dict. 24.

In both proposals we miss our proposed manual addition on free text under REACTION (CP-B/8 item 5).

Our comments on the relevant sect. VIII will be postponed until we will have received the Brookhaven version. One general remark is only that we would prefer the alphabetical classification of keywords as proposed by NDS, since it makes the use of an index unnecessary.

II. Elements and Nuclides Dictionairies (CP-D/32)

1. We can accept the proposed restructuring of dict. 8 since it is not used in our programs up to now.
2. The proposed new nuclides dictionary (no. 27) and its format is in general acceptable.

A kind of such dictionary is necessary (and already used by KACHAPAG, and was given earlier to NDS) to check the reaction equation with respect to target/residual nucleus and incoming/outgoing particle balancing and reasonable 'target nuclide (stable or primordial isotope). Furthermore, the position of the residual nucleus within reasonable borderlines on the chart of nuclides is also tested. A check of further parameters (valid isomer code, half-life, natural abundance) is desirable (though there remain much more parameters, which cannot be checked automatically), but seems questionable for the following reasons:

a) All other parameters except Z, A "stability or primordiality" are experimental data and therefore subject to more or less severe changes especially in cases of old data, which would result in error messages when using new

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values in the dictionary. A dictionary for such values must, in addition, carefully and currently be updated.

b) With the proposed construction scheme it will be far from complete for a long time (at least with respect to possible product nuclides) since cases where the same final nucleus occurs in many experiments are not too frequent.

c) This dictionary must start at least with the about 300 stable and primordial isotopes and will soon grow up if all occuring product nuclei are included, each needing a whole record for the additional parameters.

We recommend, therefore, to consider carefully, whether such "physical" parameters and specific unstable nuclides are really necessary to minimize the construction and updating efforts for such a dictionary as well as its size (especially since at our computer center space for large resident disc files is not easily available).

Consequently, we feel that the check of the reaction equation in the manner as performed by our program, would be sufficient. An additional check of the half-life would be useful, but the length of the dictionary should be kept as short as possible. If necessary, the record structure of 80 characters should be given up to compress the data set (The KACHAPAG program uses, e.g., a compact character string for all element symbols and associates the numerical Z-value to each symbol by its position within the string).

III. Multiple Residual Nucleus Formalism (reply to CP-C/15)

We have discussed again this topic extensively on the basis of the last NNDC-Memo and tried to find another compromise between the two (meanwhile much closer as we feel) points of view.

1.) There are many agreements between the two proposals:

a) We appreciate the acception of the BIBFLAG and agree with the proposed coding. However, we want to focus attention on the fact that a restriction of the use of the BIBFLAG with special keywords - if necessary at all - should not exclude at least DETECTOR and COMMENT (and perhaps also METHOD and ERR-ANALYS ) which might be related to DECAY-DATA and RAD-DET.

b) We agree with the statement that REACTION should contain as many of fixed data as possible in a direct way.

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c) In our opinion the data table of one subentry should not contain several complete excitation functions for any reactions with variable endproducts but rather data which depend only from one independent variable, that means either from energy (excitation function) or from product nucleus (mass/charge-distributions).

d) We have pointed out in several Memos that in our opinion clearly separating definitions for the various reaction mechanisms cannot be given; thus, we agree completely with NNDC's statement that the borderlines between the various processes are fuzzy.

2.) Taking these agreed upon facts into account, we draw the following conclusions:

a) From 1. b )it follows that explicit Z or A values (in cases of mass resp. charge distributions) should be given in the REACTION equation and not under COMMON or elsewhere.
The varying A or Z values, on the other hand, as well as the outgoing particles are true variables and must, therefore, be obtained from the data table or a balancing. The argument that such a balancing would not discriminate between separate nucleons and composite particles is in our opinion not a strong one, since everybody knows that in most experiments on e.g. (p,pn) reactions it cannot be distinguished between (p,pn) and (p,d) if the outgoing particles have not been identified directly. Therefore, such data must anyway be taken as a sum over "all possible reactions". A balancing effects nothing else. If composite particles have been identified, they can and must be coded explicitly or separate subentries must be used if these particles were not observed for all residual nuclei (see Memo CP-B/9, p. 4).

Regarding convenience of users, they will obtain an edited form of the subentry which should contain the result of the balancing. The judgement whether the balancing is meaningful or not (e.g. in cases of many outgoing particles), must anyway be made by the compiler and should be marked for the editing program by any code. This was the only intention of the code XNYP proposed in CP-B/9, p. 4.

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b) From 1. c) and d) it follows that the applicability of the variable product nucleus formalism should be coupled by no means to any type of process (except, maybe, the case of fission). The preconditions for using a special formalism should rather be formal ones to avoid differing interpretations of unclear physical facts. A much clearer procedure would, therefore, be a coupling of the formalism to the independent variable of the data table, that means: Z and/or A-values of variable endproducts may than be coded in one subentry if a distribution of different endproducts has been measured where Z and/or A acts as independent variable and the projectile energy is an additional parameter which can be given under COMMON. If such distributions have been measured at several energies, the compiler must decide whether to code several subentries for the different energies (with Z/A as the independent variable) or several subentries for the different endproducts (with the energy as the independent variable).
Furthermore, to code reaction mechanisms at all (in SF5) seems to be questionable (s. item 1 d.) above). To give such codes in SF5 (e.g. SPL, CN, DI) should be clearly stated as optional and the limited information due to the fuzzy borderlines between them should be mentioned clearly.

Summarizing we propose the following modified rules for the variable product nucleus (VPN) formalism:

1.) The VPN formalism serves to code in a compact form yields of Z and/or A distributions where Z and /or A acts as the independent variable in the data table (instead of the usual energy). In cases of several projectile energies separate subentries for either each energy or each product nucleus must be given.

2.) It can be used only in cases where
   a) several product nuclei result from one target/projectile combination
   b) all REACTION subfields (except SF 3,4) are identical
   c) the distribution has been measured at one projectile energy only (for more projectile energies separate subentries must be given either for each energy or for each product nucleus)
   d) REACTION SF 3 contains one of the present process codes F or X (see also 3. below), independent of which reaction mechanism is coded additionally (and optionally) in SF5.

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3.) A calculation of outgoing particles from a balance of subfield 1,2 and the data table should be performed by the editing program if it is meaningful. This case should be indicated by the compiler via any code (e.g. the proposed XNYP in SF3, but other proposals are welcome).

4.) Fixed Z(or A)values in cases of A(or Z) distributions should be given in REACTION SF 4 and not under COMMON to avoid further cross references to other keywords when constructing the complete reaction equation (in contrast, the energy given under COMMON, is not necessary for this purpose).

5.) The LEXFOR and manual entries proposed by NNDC are widely acceptable since they almost cover the above rules. It should be only added explicitly that the formalism is used for distributions with Z/A as independent variable(s) and that it is not coupled with any process code in SF5.

We feel that this proposal nearly approaches the different points of view. If, however, there remain further strong discrepancies, we would like to propose that the formalism should be restricted for the moment to the fission process exclusively. A further discussion of the other problems seems then to be more effective at the next charged particle meeting and should be postponed until then.

Final comments on the proposed LEXFOR and manual entries (especially on the definitions e.g. for fission and spallation) will be given after final agreement on the general formalism is achieved.

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