Memo 4C-3/153

To: Distribution

12 January 1976

From: H.D. Lemmel HDL

Subject: Manual Updates

Reference: 4C-1/68

Please, find enclosed all those Manual pages, on which we found errors or omissions. All of these pages had been communicated earlier. We believe that they do not contain any new proposal but represent the status of what had been agreed.

Please, inform us of those cases where you do not agree or where you find the labels or comments given in the margin not sufficiently clear.

All errors and omissions found are clearly marked and are either self-evident when comparing the NNCSC and NDS versions of the page concerned, or the relevant 4C-Memo number is given in the margin. We believe that this should be sufficient.

With respect to "NUC-QUANT and energy" our proposal for an improved Manual wording is included on the attached Lexfor page on "Incident-Neutron Energy".

Attachment

Distribution:

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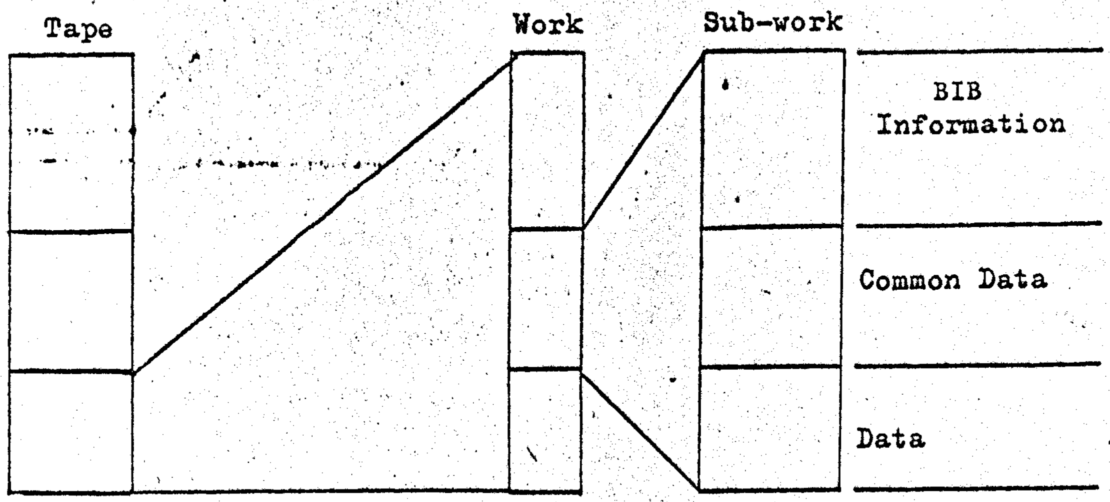
file

Summary of exchange tape format

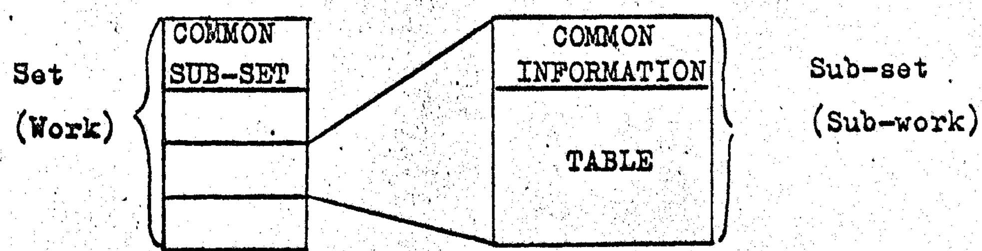
The exchange tape will contain a number of works. Each work will be divided into a number of sub-works. The sub-works will be further subdivided into BIB information, common data that applies to all lines of a data table in a sub-work and finally a data table. In order to guarantee that all of the information on the tape is meaningful, dictionaries may also be transmitted. The tape may therefore be considered to be of the following form:

→ 1 trivial



A number of system identifiers are used to define the beginning and end of each of the above units.

In order to avoid repetition of information that is common to all sub-sets within a set or to all lines within a sub-set, information may be associated with an entire set or with an entire sub-set. In order to accomplish this the first sub-set of each set which is given sub-accession number 1 must only contain information that applies to all other sub-sets, and within each sub-set the information common to all lines of the table simply precede the table. Two levels of hierarchy are thereby established to avoid repetition of information:



The common information (or common sub-set) is further subdivided into common BIB information (alphanumeric) and common data (numeric) information.

→ 1 trivial

I.4

DEFINITION OF A SUB-WORK

In order to avoid duplication of effort and to ensure that the identification scheme will be universally applicable, each centre will divide works into appropriate sub-works prior to transmission. This will ensure that a work has been divided into sub-works in a unique manner (by the originating centre) which may be referenced by all centers (i.e., avoids the possibility of two centers decomposing a work into different constituent sub-works, thus voiding the applicability of the universal identification scheme).

A sub-work will be defined as:

(1) A table of function of one or more independent variables: i.e., X, X' vs Y with associated errors for X, X' and Y and ~~a~~ possible flag (standard, misc. etc) (e.g., X = energy; X' = angle; Y = differential cross section)

unclear

(2) Independent variables will precede dependent variables and will be monotonic in the left-most independent variable. Values in following independent-variable columns must ~~increase~~ be monotonic~~ally~~ until the value in the preceding independent-variable column changes.

mistake!

(3) When more than one representation of Y is present, the table may be X vs. Y and Y', with associated errors for X, Y and Y' and a possible flag (e.g., X = energy; Y = absolute cross-section Y' = relative cross-section). The criteria for grouping a Y with a Y' is that they both be derived from the same experimental information by the author of the data.

trivial

(4) When a normalization is given, it may appear either in the COMMON portion of a sub-work (when uniformly applied to all points) or as an additional column of the data table (when applied pointwise).

(5) For some data the data-table does not have an independent variable X but only the function Y. (Examples: spontaneous nu-bar; resonance-energies without resonance-parameters; etc.)

(6) If the function Y is given for a single value of the variable X, and if this value of X is common for all sub-works in a given work, then X may be entered in the COMMON portion of the first sub-work. The following sub-works may then contain under DATA the value of Y only.

ORIGINATING CENTRE IDENTIFICATION (COLUMN 67)

This column contains a number to indicate the centre at which the information originated. The following numbers are assigned:

0 Users, center-internal or preliminary
1 NNCSC (Brookhaven)
2 CCDN (Saclay)
3 NDS (Vienna)
4 CJD (Obninsk)

Entries with the center-identification zero (0) are not part of the normal center-to-center transmission. The identification zero (0) may be assigned by users in order to allow them to transmit information to the centers in the exchange format, etc., or by centers for their internal use. Data sets which a data center may wish to compile from outside its own service area could get, preliminarily, an accession-number with the center-identification zero. Such data sets should not be included in the normal transmission tapes but should be sent to the responsible center for assigning a final accession-number, entering the data sets into their files and submitting them on a normal transmission tape.

The identifications 5 - 9 will be assigned as the need requires. They should not be used by centres in EXFOR transmissions until they are assigned.* This will avoid confusion and incompatibility when these identifications are assigned.

*Note: The identifications 5 - ~~9~~ 8 are presently being used by NNCSC for data translated from SCISRS-I to indicate the area to which the data translated belong, as follows:

5 NNCSC
6 CCDN
7 NDS
8 CJD

CENTRE ASSIGNED SUB-ACCESSION NUMBER (COLUMNS 72 - 74)

These columns contain a three digit sub-accession number assigned by the originating centre. The sub-accession number is used to divide a work into a number of sub-works while maintaining an inter-relationship between the sub-works (i.e. all sub-works within a given work contain the same universal accession number). Each sub-work may be conceptually thought of as an individual table of data and its associated bibliographic information (e.g. an angular distribution at ten energies would constitute ten sub-works).

Up to 999 sub-works (tables) may be associated with each work (universal accession number). The centre assigned sub-accession numbers should be sequentially assigned within each work starting at 1 and increasing toward 999.

overdue! 4C-3/130

The same sub-accession number must be associated with a sub-work throughout the life of the EXFOR system. If a sub-work is deleted from the system, the sub-accession number may not be assigned to a different sub-work within the same work. This is the only manner in which the sub-accession number (and universal accession number) may be used universally to reference a work over an extended period of time.

NDS-X4 75-10-1

II.5

SEQUENTIAL NUMBERING WITHIN A SUB-ACCESSION NUMBER (Cols.75-79)

These columns will contain a five-digit sequential number. The sequential number will be used to divide a sub-work (sub-accession number) into uniquely defined records associated with the sub-work (all records within a sub-work contain the same sub-accession number).

Up to 99,999 records may be associated with each sub-work (sub-accession number). The sequential numbering within each sub-work <u>MUST</u> begin at 1 and sequentially increase toward 99,999.

→ 4C-3/130

The function of the sequential numbering within each sub-work (sub-accession number) is to allow for reference at the record level during the ALTER procedure and to allow for personnel and machine checking the card sequence (e.g., check for cards out of order or for missing cards). Therefore, a given sequence number need not be associated with a given record over an extended period of time. As such, the records within a sub-work should be re-numbered sequentially following an ALTER procedure. Alterations on a work may be transmitted only by the origination centre.
THE RECORDS WITHIN A SUB-WORK MUST ALWAYS BE MAINTAINED IN SEQUENTIAL ORDER.

→ 4C-3/130

Overdue!

NDS-X4 35-2-1

III.

(9.) SUBENT N_1 N_2

This record must be the first one of each sub-work. N_1 and N_2 are interpreted as:

N_1 - An eight digit universal sub-accession number (originating centre identification, centre assigned accession and sub-accession number).

N_2 - Date of last alter (or date of entry if never altered) (year, month, date).

The record identification (Cols. 67-79) should contain the universal accession and sub-accession numbers (Cols. 67-74) and the sequence number one (00001) (Col. 75-79).

(10.) ENDSUBENT N_1 N_2

This record must be the last one of each sub-work. N_1 and N_2 are interpreted as:

N_1 - The number of records within the sub-work.

N_2 - Presently unused (may be blank or zero).

The record identification (Cols. 67-79) should contain the universal accession and sub-accession numbers (Cols. 67-74) and the sequence number 99999 (Cols. 75-79).

(11.) NOSUBENT N_1 N_2

This record indicates that a sub-accession number has been assigned by the centre but that either the information associated with it was not ready at the time the tape was transmitted by the unclear centre, or that the subentry has been ~~deleted.~~ combined into another subentry according to page IX.3. N_1 and N_2 are interpreted as:

N_1 - An eight-digit universal sub-accession number (originating centre identification, centre assigned accession and sub-accession number).

N_2 - Date of last alter or blank (if merely assigned and not yet used).

The record identification (Cols. 67-79) is the same as on a SUBENT card.

NDS-X-4 74-11-15 40-3/102 overdue

(12.) BIB N_1 N_2

This record must be the first one of each BIB-section if one is present. N_1 and N_2 are interpreted as:

N_1 - Number of keywords in the BIB-section, not counting pointors in col. 11 (compare page IV.3).

N_2 - Number of records in the BIB-section

(13.) ENDBIB N_1 N_2

This record must be the last one of each BIB-section if one is present. N_1 and N_2 are interpreted as:

N_1 - Number of records in BIB-section

N_2 - Presently unused (may be blank or zero)

(14.) NOBIB N_1 N_2

Positive indication that there is no BIB-section associated with the sub-work. N_1 and N_2 are interpreted as:

N_1 - Presently unused (may be blank or zero)

N_2 - Presently unused (may be blank or zero)

NOTE: The record identification (cols. 67-79) for these system-identifiers should contain the universal accession and sub-accession numbers of the sub-entry in which they are located, and the sequence number should naturally be assigned sequentially within the sub-entry.

SYSTEM IDENTIFIER	LEGAL FOLLOWING RECORD
(1) TRANS	DICTION+, NODICTION+, ENTRY, NOENTRY
(2) ENDTRANS	(no information follows ENDTRANS)
(3) DICTION+	(a dictionary record)
(4) ENDDICTION+	DICTION+, ENTRY, ENDTRANS*, NODICTION+, NOENTRY
(5) NODICTION+	DICTION+, ENTRY, ENDTRANS*, NODICTION+, NOENTRY
(6) ENTRY	SUBENT, NOSUBENT
(7) ENDENTRY	ENTRY, ENDTRANS, NOENTRY
(8) NOENTRY	ENTRY, ENDTRANS, NOENTRY
(9) SUBENT	BIB, NOBIB
(10) ENDSUBENT	SUBENT, ENDENTRY, NOSUBENT
(11) NOSUBENT	SUBENT, ENDENTRY, NOSUBENT
(12) BIB	(a bibliographic record)
(13) ENDBIB	COMMON, NOCOMMON
(14) NOBIB	COMMON, NOCOMMON
(15) COMMON	(a common data record)
(16) ENDCOMMON	DATA#, NODATA#, ENDSUBENT**, XDATA#
(17) NOCOMMON	DATA#, NODATA#, ENDSUBENT**, XDATA#
(18) DATA	(a point data record)
(19) ENDDATA	ENDSUBENT
(20) NODATA	ENDSUBENT
(21) XDATA	(a point data record)

* If only dictionaries are transmitted.

** In first sub-work only (i.e., sub-acc.number = 001) where no data section is present.

\# Not in the first sub-work (i.e., sub-acc.number = 001), where no data section is present.

\+ The keywords DICTION, ENDDICTION, NODICTION are not used in a normal center-to-center transmission tape. They may be used in a center-to-customer tape.

This section is identified on a transmission tape as that information between the system-identifiers BIB and ENDBIB. Although it is called 'BIB-section' it contains information other than the strictly bibliographic. That is, information required to describe an experiment (e.g. neutron-source, method, facility, etc.) is also included in this section. One sentence in NNCSC Manual page is superseded

A ~~BIB~~ record consists of up to four parts: keyword, machine retrievable information, free text and identification. The identification has been described in Section II and will not be dealt with further.

(1) Keyword (Information Identifier)

The keyword is used to define the significance of the bibliographic entry. The keyword must be left adjusted to begin in Col. 1, and must be totally contained within the first information field (Cols. 1-11).

Keywords must not exceed a length of 10 characters (this will insure they are followed by at least one blank or one pointer, see below). Within any one BIB-section a keyword must not be repeated, columns 1 - 10 of continuation cards must be blank and Col. 11 must be blank or contain a pointer. The pointer should be given in the first record of the information to which it is attached and should not be repeated on continuation records. The pointer is assumed to refer to all BIB - information until either another pointer is encountered or until a new keyword is encountered. This implies that pointer-independent information for each keyword appears first.

trivial

(2) Machine Retrievable Information

The machine retrievable information is used to define the actual bibliographic information. The machine retrievable information must be enclosed in parentheses and left adjusted so that the opening parenthesis appears in Col. 12. More than one piece of machine retrievable information may be associated with a bibliographic entry. These may be entered in two ways: either within one set of parentheses, each piece of machine retrievable information being separated by a comma; or with each piece of machine retrievable information between separate parentheses, in which case each set must have its opening parenthesis in Col. 12, although they may be separated by free text. For some keywords a

IV.1a restriction is placed upon the maximum length of the associated machine retrievable information; it may be continued onto successive records. Information on continuation records must not begin before Col. 12 (Cols. 1-10 must be blank and Col. 11 must be blank or contain a pointer, see <u>KEYWORD</u> above.

The machine retrievable information should be kept as concise as possible if it is to be used efficiently.

Note that some keywords have no machine retrievable information associated with them.

(3) Free Text

Used to describe the bibliographic information. It may immediately follow the closing parenthesis of the machine retrievable information (if this is not present, it may begin immediately in Col. 12). The free text may be continued on to any number of records. Free text on continuation records must not begin before Col. 12 (Cols. 1-10 must be blank and col. 11 must be blank or contain a pointer). The free text may include parentheses if necessary, although, in order to avoid confusion a left parenthesis in text should not be placed in col. 12 (as this implies the opening parenthesis of machine retrievable information).

obviously correction required

(4) Codes and Free Text

trivial

Free text following the codes must be completely self explanatory, and the codes must not be considered as part of the free text. The code is a retrievable abstract of the free text. The entering center should provide all free text associated with each code. The coded information serves only as a means for retrieval and not for output expansion. This implies that any coded information must be followed by free text repeating or specifying further the coded information.

The only exceptions to this rule are information associated with the keywords INSTITUTE, REFERENCE and ISØ-/CMPD-/NUC-QUANT, STANDARD, where the coded information should not be repeated in the free text. This means, one should not, for example, include the full name of the institute following the 7-character code; however, any additional information may follow in free text.

obvious

~~Note: If coded information is given under the key word STANDARD, this need not be repeated in the free text.~~

incomplete

~~Obviously,~~ The keywords AUTHOR, EXP-YEAR, HISTORY, HALF-LIFE, MISC-COL, ERR-ANALYS, FLAG, ~~TABLE-~~NR are cases to which the above rules do not apply.

The free text must use clear English phrasing and no codes are permitted within the free text.

trivial

An example of several ~~BIB~~ items of BIB information ~~entries~~ is given below:

```
1         11 12                                              66
AUTHOR       (J.W.DOW,M.P.JONES) This space may contain any free
             form text.  The beginning of a new BIB
             entry is indicated by a non-blank keyword field -
             Cols. 1-10.

INSTITUTE    (3AAABBB).  Since the keyword field is non-blank,
             this will be considered a new BIB entry

COMMENT      This is an example of a BIB entry without machine-
             retrievable information.  ~~This comment refers to all~~
             ~~pieces of information in the subentry.~~
          1  The pointer in column 11 indicates that this comment
             refers to those other pieces of information in the entry
             which are equally labeled.

HISTORY      (671102R) This is an example of a BIB entry
             with more than one piece of machine retrievable
             information.
             (680415) Further free text associated with this code
             is written here.

N-Source  1  (ABC,WXYZ) This is an example of a  BIB
             entry, with more than one piece of machine re-
             trievable information in one set of parentheses. The
             pointer in column 11 shows that this information belongs
             to those other pieces in the entry which are labeled
             with the same pointer.

          3  (DEF) This information belongs to those other pieces
             in the entry which are labeled with the same pointer.

ENDBIB
.
.
.
DATA
EN        3  DATA          1  DATA-ERR
EV           BARN             BARN
.
.
.
ENDDATA
```

makes no sense

The list of permissible keywords for the BIB section is given in Dictionary 2.

(4) As explained on P.IV.~~2a~~ 3 under "(5) Pointers" a one-character pointer can be placed in the last (eleventh) column of any column-heading field if the corresponding column is to be linked to some other part of the same subentry or subentry 001. For example, if one of the quantities in COMMON is common to all values in a particular column in the DATA section, the same pointer should appear in the last column of the corresponding column-heading fields in the COMMON and DATA section as shown in the example of p.V.3. *

(5) The example on p.VI.2 illustrates the simplest type of table representing the dependent variable DATA as a function of the independent variable ANG (one-dimensional table). The rules for two - and more - dimensional tables require distinction between four data categories occurring in data tables, namely

- independent variables (EN, EN-MIN, EN-RES, E, ANG,...);
- dependent variables (DATA, RATIO,...);
- associated quantities (EN-ERR, ANG-RSL, DATA-ERR,...);
- additional information (STAND, MISC, FLAG, HL,...).

The division between different categories and families within categories are defined in the Data heading keyword dictionary. (see VIII.21)

DATA tables must be arranged as follows:

- All columns with <u>independent variables</u> precede the columns with <u>dependent variables</u>. Columns on the left-hand side of the first dependent-variable column are considered as independent-variable columns, except those with associated quantities.
- Columns with <u>additional information</u> are preferably placed after the last dependent-variable column but if they refer to a specific column they may be placed next to it.

  <u>Note</u>: Some data-heading keywords may be used either as independent variables or as addtional information.
- Columns with associated quantities are placed right after the column they refer to.

  If the COMMON section is included for EXFOR table must then look as follows.

* See Implementation Schedule on page VI.8

** page numbering kept in NDS Manual as in original Potters proposal, since too tedious to change all cross-referencing, and since NNCSC page numbering is not consistent (see e.g. p. VI.8, VIII.12, VIII.21a).

VI.2d 6

Two-dimensional tables can be coded in different ways if pointers are used. The following examples illustrate this.

First alternative

Deleted

See also Example 13a

```
:
:
DATA
EN      ANG     DATA
MEV     ADEG    MB/SR
1.      10.     11.
1.      20.     12.
1.      30.     13.
2.      10.     21.
2.      20.     22.
2.      30.     23.
3.      10.     31.
3.      20.     32.
3.      30.     33.
:
:
ENDDATA
```

Second alternative

See Implementation Schedule page VI.8

```
:
:
ISO-QUANT  (...)
:
:
COMMON
ANG     1ANG    2ANG    3
ADEG    ADEG    ADEG
10.     20.     30.
ENDCOMMON
DATA
EN      DATA    1DATA   2DATA   3
MEV     MB/SR   MB/SR   MB/SR
1.      11.     12.     13.
2.      21.     22.     23.
3.      31.     32.     33
ENDDATA
```

NDS-X4 75-10-1

Implementation Schedule of Table Formats

<u>Ready to receive tables in the format indicated:</u>

<u>Table Format:</u>	NNCSC	NDCC	NDS*	CJD	Conclusion
Conventional multidimensional tables with two or more independent-variables columns, without pointers (cf.pp.VI.4, VI.5, <u>Example 13</u>)	1974[+]	1974[x]	1974	1974	can be transmitted
Unrestricted number of columns (cf.p. VI.1)	1974[+]	1974[x]	1974	1975	can be transmitted
Multiple Iso-Quant with pointers					
a) only resonance parameters of same isotope (compare pp.V.3, VIII.15)	1974[+]	1974[x]	1974	1974	can be transmitted
b) multiple representations of the same quantity, such as relative and normalized data, or ratios and absolute data (compare p.VIII.15)	1974[+]	1974[x]	1974	1974	can be transmitted
c) all quantities, and different ZA's	≥1976	1974[x]	1974	1974	postponed
Vector common data with pointers (cf.p. VI.6)	1975[#]	1974[x]	1974	1974	~~can be transmitted~~
Z and A as variables (cf.p. VIII.12)	≥1976	≥1976	1974	≥1976	postponed

overdue

* Note: Under NDS, the year 1974 was entered throughout; this expresses that NDS is willing to receive tables in any of these formats, even if they could not immediately be computer-processed.

\+ Implemented at NNCSC by 74-10-8 4C-1/49
x Implemented at NDCC by 74-8-28 4C-2/55
\# Implemented at NNCSC by 75-9-23 4C-1/64

Special cases:

ISO-QUANT NUC-QUANT CMPD-QUANT	One of these three keywords must be present; they are mutually exclusive.
METHOD FACILITY DETECTOR ANALYSIS	At least one of these keywords must be present; if a pertinent code in the relevant dictionary exists, then keyword and code should be given. It is advisable that all four of these keywords be given except when not relevant. For example: FACILITY is "not relevant" for spontaneous fission data.
PART-DET	The particle detected must be evident either from ISO-QUANT or from PART-DET. Examples: a proton detected in an NP reaction is regarded as evident from the ISO-QUANT; a proton from an NNP reaction is not. For details see the the LEXFOR entry "Particles".
STATUS	The keyword STATUS is not relevant, only when the source of the data is given under REFERENCE and no other STATUS information applies. (In NDS entries this keyword is always present.)
STANDARD and ERR-ANALYS~~IS~~	The compiler should treat these items with special care, and whenever necessary, he should request further information from the author.
(GEOMETRY)	This keyword is obsolete but may still exist in old entries.
(TABLE-NR)	This keyword is obsolete but may still exist in old entries.

mistake!

2. REPORTS (Dictionary 6)

The report codes are based on CINDA.

Superseded history data be omitted

Each code in the dictionary consists of the alphanumeric character string which precedes the actual report number. The final character of the codes given in the dictionary is always a hyphen (-), except in the three cases where the report codes were 11 characters and the 12th character a hyphen. In these cases the hyphen has been dropped in the dictionary, but must be included in the report code entered by the compiler under REFERENCE.

These codes are used as the second subfield of the coding under the keyword REFERENCE, when the type-of-reference code is R or P.

The dictionary has been sorted by area, country, institute and report code. The area, country and institute codes appear in columns 60 to 66.

Up to 11 characters in the code.

General coding form: (R,Code-Number,(Volume or Part),page,date)
or (P,Code-Number,(Volume or Part),page,date)

(Note: the report code must be connected to the number by a dash.)

a) (R,UCRL-5341,5806) = UCRL report number 5351, published in June 1958.

b) (R,JINR-P-2713,6605) = Dubna report, series P, number 2713, published in May 1966.

c) (R,AERE-C/R-159,6403) = AERE-C/R report number 159, published in March 1964.

d) (P,WASH-1068,185,6603) = WASH progress report number 1068, page 185, published in March 1966.

VIII.10 important

General coding form: (C,Code,Volume, Page or (Paper Number), Date)

or (B,Code,Volume,(Part),Page,Date)

Note: The general rule for conference codes is to write the year of the conference followed by the city in which the conference took place, in a string of not more than 10 characters. For books the code consists of either the family name of the first author or a concise title of the book, abbreviated to a maximum length of 10 characters.

a) (C,67KHARKOV,,(56),6702) = 1967 Kharkov Conference proceedings, paper number 56, February 1967.

b) (C,66WASH,1,456,6603) = 1966 Washington Conference proceedings, Volume No. 1, page 456, March 1966.

c) (B,ABAGJAN,,123,64) = Book by Abagjan, page 123, published in 1964.

d) (B,MARION,4,(1),157,60) = Book by Marion, Volume 4, part 1, page 157, published in 1960.

4. PRIVATE COMMUNICATIONS or THESES

No dictionary is used for this reference type, the convention is to use the family name of the author and date for private communication or thesis, plus the page number if necessary.

General coding form: (W,Author,page,date)

or (T,Author,page,date)

a) (W,BENZI,661104) = private communication from Benzi received in November 4, 1966.

b) (T,ANONYMOUS,58,6802) = Page 58 of thesis by Anonymous, published in February 1968.

ISØ-QUANT*

This keyword is used to specify the isotope and the quantity which is presented by the compiled data set. This is a starred item and must be present, unless CMPD-QUANT or NUC-QUANT is used. The coding is divided into 5 subfields, each separated by a comma. Blanks within an ISØ-QUANT are not allowed.

First Subfield: Isotope

This consists of the atomic number Z, the element symbol S, the atomic weight A, and an isomer code, which are combined in a string of flexible length, each separated by a hyphen (-). If Z and A are unique for the whole subentry, then Z and A are 1 to 3 digit numbers without leading zeros. If Z and/or A occurs as a variable in the data table, the characters Z and/or A are to be used. If Z is a variable, element symbol EL should be used. A = 0 means natural isotopic composition. For isotopes in ground-state no isomer code is given; the codes for metastable states are: M1 or M2, etc. These isomer codes should only be used if they are associated with a clear definition in free text. See Dictionary 8 for the accepted element codes.

unclear

Mistake!

Sentence omitted

Examples of isotope field coding:

1-H-1
1-H-2
6-C-12
40-ZR-90
92-U-234
94-PU-239
95-AM-242-M1
Z-EL-A } Z,A ~~vectors,~~ variables see implementation schedule on page VI.8
Z-EL-0
54-XE-A

Second Subfield: Process/Parameter Designator.

Nuclear (or collective) process under study and/or parametric quantity derived for nucleus under study by experiment. 1 to 3 character code. See Dictionary 10 for the list of process and parameter codes.

Third Subfield: Function Designator.

Aspect of process or parameter studied, or useful collective term. 1 to 3 character code. See Dictionary 11 for the list of Function codes.

Fourth Subfield: Modifier Designator.

Flag to indicate departure from standard meaning of second and third subfields or combination of Process-Parameters and Functions. 1 to 3 character code. See Dictionary 12 for the list of Modifier codes.

Fifth Subfield: Particle Designator.

Particle code(s) indicating which of several outgoing particles the quantity refers to. 1 to 3 character code. The dictionary for this subfield is a subset of Dictionary 13 which is for use with the keyword PART-DET.

The particle-designator can be omitted if there is no ambiguity. For a quantity describing the correlation between outgoing particles, two particle-designators are entered, separated by a slash (/) (see "slash" convention described below).

(Mistakes in Nov. 1974 update of NNCSC!)
Evident when comparing with NNCSC page.

Rules for the ISO-QUANT Subfield 1 (isotope):

1. The isotope compiled is the target-nucleus.

Rules for the ISO-QUANT Subfields 2 through 5:

trivial

1. Any subfield may contain more than 1 code from the same dictionary separated by a slash. If the quantity code dictionary 14 gives an agreed upon sequence, this must be used. Other quantity code combinations may be ~~given in any sequence.~~ submitted for inclusion in Dict.

Example: INL,DA/DE
(= double differential inelastic scattering cross section)
(INL, DE/DA is illegal)

2. Redundant subfield codes are omitted.

3. If the information (code) in a given subfield, which is both followed and preceded by a code, is omitted, its following comma must always be present.

Example: NNP,DA,,P (angular distribution of protons from (n,np) reaction).

4. No trailing commas need to be given behind the last given subfield code.

Examples: TOT (total cross section)

EL,DA (angular distribution of neutrons from elastic scattering)

5. Only certain combinations of codes in the quantity-subfields are meaningful. These are listed in Dictionary 14 "QUANTITY CODES"; it includes: code of quantity, permissible units, and a brief definition.

NUC-QUANT*

The keyword "NUC-QUANT" is to be used instead of the keyword "ISO-QUANT," when the quantity defined does not refer to a target-nucleus. These quantities are:

SF = spontaneous fission
LDP = level-density parameter
TEM = nuclear temperature
SCO = spin-cut-off factor

as well as any other quantities having one of the above codes in the first quantity-subfield, e.g., SF/NU; compare Dictionary 14. The formalism for the coding of NUC-QUANT information is the same as that of ISO-QUANT, see page VIII.12 - 20, except that the isotope-field should not contain the target-nucleus but rather the nucleus to which the data is pertinent.

One of the three keywords, ISO-QUANT, CMPD-QUANT, or NUC-QUANT, must be present; they are mutually exclusive.

(In the NNCSC manual above info is given on p. VIII.15a together with some more info which rather belongs to Lexfor.)

CMPD-QUANT *

Quantities referring to chemical compounds, alloys, or mixtures, are entered under the keyword "CMPD-QUANT" and the A-number within the isotope is replaced by a 3 character compound code. Example: (26-FE-CMP, TØT). The more precise name and/or composition of the compound may be given in free text under the keyword "SAMPLE." Example: FE2-Ø3.

The CMP-QUANT consists of 5 subfields, each separated by a comma. The structure of the compound quantity is the same as of isotopes except that the A number is replaced by a three character compound code. (See Dictionary 9 for codes.) For the coding of subfields 2 to 5, see ISØ-QUANT.

One of the three keywords, ISØ-QUANT, NUC-QUANT, or CMPD-QUANT, must be present; they are mutually exclusive.

For coding rules see LEXFOR Compound codes.

Dictionary 12. Quantity-Subfield 3.
Miscellaneous modifiers.

The codes of this dictionary are used in the third subfield of the quantity codes, that is the fourth subfield in the coding under the bibliographic keywords ISO-QUANT, CMPD-QUANT, or STANDARD X 4C.2/26 p.7 D.5

The codes include various quantity-modifiers, which specify the representation of the quantity given, such as "times $\sqrt{E}$," "times 2ag," "spectrum average," and others. Overdue

For further details see the notes to Dictionary 14 (Quantity) on page VIII.19.

The author of this dictionary has not provided "expansions" of the codes as he felt they would be meaningless and that the full "Quantity expansion" should be used.

1 to 3 character code.

Dictionary 13. Particles.

The particle codes are used to enter the particle(s) detected under the information-identifier "PART-DET." A subset of these codes (G, N, P, D, T, HE_3, A, FF) may also be used for the "Particle-Designator," the fourth subfield in the quantity code, that is the fifth subfield under the bibliographic keywords ISO-QUANT, NUC-QUANT, and CMPD-QUANT, or STANDARD X

For further details see the notes to Dictionary 14 (Quantity) on page VIII.19.

1 to 3 character code.

Dictionary 14. Quantity Codes

superseded history

[illegible]

This dictionary gives in three columns:

1. the quantity code
2. the dimension
3. the expansion for output.

1. The quantity code is composed of the codes for the quantity-subfields given in dictionaries 10 - 13. The present list gives all meaningful combinations of the subfield-codes, that are in use. As with all other dictionaries, this list is open-ended, and other quantity codes may be added at the time when such data are entered into EXFOR.

In principle, the length of the quantity code is limited by the rules for its structure: 4 subfields separated by commas with up to two 3-character-codes per subfield separated by a slash, comes up to 31 characters. In practice, however, the codes are shorter. The longest code encountered in this list has 17 characters. The format of this list allows a maximum length of 18 characters, which is believed to be sufficient.

Because the character string for the quantities is longer than 11 characters, the format of this dictionary is different from all others. The expansion begins in column 23 and the dimension is given, starting in column 19.

trivial

The underline is missing in NCSC update.

To any of the listed quantity codes, the general quantity modifiers REL, AV,FCT, FIS, MXW, SPA, RAW, can be added, without entry in dictionary 14. If more than one of these modifiers apply, their sequence is arbitrary: MXW/REL or REL/MXW. Compare beginning of dictionary 12.

2. The dimension-code has the purpose to link the quantities-dictionary with the units-dictionary, in order to facilitate computer checks whether, in a data table, quantities and units are consistent.

superseded since long

3. The expansion is a short definition of the quantity. ~~up to 42 characters long.~~ It may be used for the output-format for customers.

More precise definitions of quantities are given in LEXFOR.

For the expansion, some conventions have been adopted:

1) "differential cross-section" means differential with respect to angle of outgoing particle.

2) "double differential" means differential with respect to angle and energy of outgoing particle.

3) "energy distribution" or "spectrum" means differential with respect to energy of outgoing particle.

4) * means "times"

   / means "division".

STANDARD

Information under this keyword is given either in free text or in computer-intelligible form with or without free text. In the latter case the isotope(s) and quantity(ies) used as standards for the experiment are coded following the rules for ISO-QUANT (see page VIII.12). However, Z or A as variables are not permitted under STANDARD. When two or more standards are to be given in computer-readable form, pointers are used according to the rules on page IV.3. For all further details see Lexfor under STANDARD.

4C-3/153

The keywords STAND1 and STAND2 are no longer used at NDS but may still be used by the other centers; they exist also in earlier entries.

(Dupl. with Lexfor)

In addition to the coded information in the [illegible] [illegible] to include in the free text the [illegible] [illegible] used.

Proposed Manual page VIII.21

Overdue 4C-3/141

NDS-XX-35-10-1

Dictionary 24. Data-Heading Keywords

These keywords are used in the COMMON and DATA sections, as column headings for defining the contents of these columns.

The data-heading keywords include items such as:

independent variables (energy, angle, etc.)
parameters (temperature, spin, etc.)
coefficient numbers
errors, resolution, etc.
centre-of-mass indicator, compare Lexfor "Center-of-Mass System"

All possible data-heading keywords are given in Dictionary 24. The length of the keywords is restricted to 10 characters.

Repetition of column-headings

An actual column-heading may consist of a data-heading keyword (see Dict.24) and, perhaps, a pointer (see page VI.3).

Within the three sections COMMON section of subentry nnn ≠ 001,
DATA section of subentry nnn ≠ 001,
COMMON section of subentry ool of same entry,

no column-heading (= data-heading keyword plus pointer) may be repeated except for the following cases. (Any further case of repeated column-headings which the centers may agree to accept, must be described here.)
Any columns with identical column-heading must be adjacent and may appear within only one of the three sections mentioned above.

1.) Two or more unresolved energy levels are entered by repeating the data-heading keyword E-LVL as follows:

E-LVL	E-LVL	E-LVL
MEV	MEV	MEV
0.107	0.125	0.177

2.) An angle given in degrees and minutes must be entered in two separate columns with the data-heading ANG repeated as follows:

ANG	ANG
ADEG	AMIN
90.	47.

Similarly, any other data-heading keyword starting with ANG-... may be repeated in the same way.

3.) If a column is to contain half-life values in different units such as SEC, D, YR, these units need not be converted into a common unit. Instead the data-heading keyword, e.g. HL, may be repeated and a separate column for each unit may be entered as follows:

HL	HL	HL
SEC	D	YR
	15.	
		28.3
	100.3	
4.8		

Similarly, any other data-heading keyword starting with HL... may be repeated in the same way. This case cannot occur in a COMMON section.

4.) If two or more flags defined under the BIB keyword FLAG apply to the same line of the data table, a column-heading with the data-heading keyword FLAG may be repeated as follows:

FLAG	FLAG
NO-DIM	NO-DIM
1.	
3.	
2.	3.
1.	2.

etc.

The data-heading keyword FLAG cannot occur in a COMMON section.

NDS-X4 75-10-11

4C-3/97 p.4 NNCSC text item i. be interpolated.

HALF-LIFE This keyword is used to explain, to which nucleus a half-life value refers which may be given in the COMMON or DATA section. The coded information given under this keyword in parentheses, repeats the data-heading keyword used in the COMMON or DATA section, and specifies the relevant nucleus (see Example 17).

If more than one half-life is given, the relevant nuclei must be coded under this keyword. If only one half-life value is given under the data-heading keyword HL and no explanation is given under this keyword, then the half-life of the residual nucleus is meant.

See also in Lexfor under Isomeric States.

The free text must include the source of the half-life value.

4C-3/128

Half-life values in Exfor entries serve a double purpose: they may define a metastable state; and they may be, like a standard, basic parameters for deducing the cross-section value from the experiment.

Consequently, the half-life should be coded in computer-intelligible form

- whenever a code indicating a metastable state occurs in target-nucleus, quantity or residual nucleus
- when target nucleus or residual nucleus are not stable and their half-life is an essential parameter in the analysis of the experimental data.

4C-3/140

Furthermore, for certain data types the half-life functions as an independant variable to be coded under the data heading HL without an explanation under the BIB keyword HALF-LIFE. Compare in Lexfor under Delayed Fission Neutron Data.

Overdue

NDS-24 75-10-1

FLAG. This is used to explain the meaning of flags used in the data table. The actual flags are given in parentheses (each on a separate line, starting in Column 12), followed by free text explanation, as in the following example:

```
BIB
...
FLAG          (1.) Data averaged from 2 runs
              (2.) Modified detector used at this energy
...
ENDBIB
...
DATA
EN            DATA        FLAG
KEV           MB          NO-DIM
1.2           123.        1.
2.3           234.
3.4           456.        2.
ENDDATA
```

This keyword must be present if flags are used in the data table. No dictionary. Flags should only be used to supply information on single points (not entire sub-work).

4C-3/85 item 8

See also in Lexfor under FLAG

trivial

MISC-COL This keyword is used to explain the meaning of the miscellaneous column headings. In order to link explanations when more than one miscellaneous column is given, see the recommended form under ERR-ANALYS.

See also Lexfor under Miscellaneous

trivial

Alterations to EXFOR-entries

4C-3/153

1. Alterations to EXFOR-entries may be transmitted only by the originating center. They are included in the regular Exfor transmission.

2. If an entry is altered, those subentries which have been altered should be transmitted to all other centers accompanied by the retransmission of the first subentry. The minimum unit transmitted should be a subentry (NOT just the altered records). If individual altered subentries are transmitted, the appropriate ENTRY and ENDENTRY records should be included. All corrections should be documented by an appropriate entry under HISTORY.

   *The altered subentries should have a "C" in Column 80 of the SUBENT record.

4C-3/102

Serious corrections (for example those involving the COMMON or DATA section, or essential BIB-keywords such as ISO-QUANT, STANDARD, etc.) should be transmitted as quickly as possible. Less serious corrections could be made and transmitted as workloads permit.

   (Compare in Lexfor under "HISTORY").

   The ENTRY record should include the revised date in the N2 field and the alter flag "C" in Column 80.

3. Subentries to be added to a previously transmitted entry may be transmitted accompanied only by the retransmission of the first subentry; other unchanged subentries need not be retransmitted. (This supersedes a statement in item D.1 of the Protocol.)

   *The subentries to be inserted should have an "I" in Column 80 of the SUBENT record.

~~4. When a subentry is altered, the following are always sent:~~

   1) Subentry 1 from the same entry
   2) BIB-section complete (or NOBIB, if applicable);
   3) COMMON-section complete (or NOCOMMON, if applicable);
   4) DATA-section complete (or NODATA, if applicable), if altered, OR if the DATA-section remains unaltered, then transmit:

   XDATA N1 N2
     Data-heading record(s)
     Data-units record(s)
     First data-line
     Last data-line
   ENDDATA

   Where XDATA (meaning except data) obviously replaces DATA; N1 and N2 are assigned the same as on the normal DATA record transmission. (i.e., N1 = No. of coulmns, N2 = 2).

X trivial

   (Note: if only 1 or 2 data lines, then transmit with normal DATA and ENDDATA.)

5. In special cases, the Four Centers could agree bilaterally to transmit corrections at less than a subentry level. It is the responsibility of the originating center to correct its archives and to provide any center who requests it with the complete corrected subentry with alter flags. In such special cases, the originating center shall notify the other centers of the corrections being made via 4-Center Memos. The memos should include the new data on the archive subentry and an indication of what corrections have been made, e.g., the new card images of those records to be corrected.

---

*Centers will comply as their programming schedule permits.

IX.3

Deletion of Entries and Sub-entries

1. Any entry or subentry for deletion must have * in Column 80 of the relevant ENTRY or SUBENT record.

2. The following keywords must be included in the BIB-section of entry or subentry to be deleted:

   REFERENCE
   TITLE
   AUTHOR
   INSTITUTE
   ISO-QUANT
   HISTORY

The ENDBIB record will be followed by NOCOMMON, NODATA.

3. A mnemonic D to be attached to the date under HISTORY, will indicate the date of the deletion. Free text must be with this justifying the deletion.

4. Column 80 alter-flags must be used throughout the "deleted" entry or subentry as usual.

5. The accession number of the deleted entry (subentry) should not be used for another entry (subentry).

Retransmission of Subentries which have been combined into one subentry

In the case of a retransmission of a series of subentries (X through Y) which have been combined into one table, the following simplified flagging system may be used:

1. Enter under ~~history~~ HISTORY in the combined subentry:
   (yymmddA) Subentries X through Y combined

mistake

2. For subentries X + 1 through Y, transmit NØSUBENT records containing the subentry number in the N_1 field and * in Col. 80.

ACT

Activation

Definition: Activation is the production of a radioactive residual nucleus as a result of a neutron reaction. The activation cross-section is determined by measuring a specific decay radiation emitted by the product nucleus.

Usually, the activation cross-section can be identified with a specific reaction type. The data given should then be described by the appropriate quantity code, e.g. NG or NP,,PAR, and "(ACTIV)" (= activation) is entered under the keyword "METHOD".

In the case of older data, when the reaction type(s) leading to the activation was not specified, the quantity-code ACT has been used. It should not be used for the new data to be entered.

See also Isomeric States ~~.......~~ little sense
sentence omitted here makes

Sum-reactions: Frequently, the activation cross-section is given for an element with natural isotopic composition, or for some other mixture of isotopes, where two or more different parallel neutron reactions with different isotopes lead to the same radioactive residual nucleus. In such a case, the appropriate sum of iso-quants should be entered.

Note: The activation considered should be specified under an appropriate keyword, such as:

PART-DET, EN-SEC, RESID-NUC, or HALF-LIFE.

trivial

Initial

Angle

1. Differential Cross Sections (compare under Differential Data)

Quantities defining the angular distribution of an emitted particle or radiation are coded with the function 'DA' in the second quantity subfield. The angle given as variable in differential cross-sections, is the angle of the emitted particle or radiation against the incident neutron beam.

Example: NNP,DA,,P = angular distribution of protons emitted in the (n,np) reaction.

2. Angular Correlation

Quantities defining the angular correlation between two emitted particles or gammas are coded with the function-designator "COR" in the second quantity subfield. The angle given is defined by the two particles specified in the quantity code.

Example: NNP,COR = neutron-proton correlation in the (n,np) reaction.

3. Data Heading Keyword

The angle may be entered either as angle in degrees or as a cosine (units given as NO-DIM). An angle given in degrees and minutes must be entered in two separate columns with the data heading repeated. See Example 5.

Codes for data heading:

ANG = angle in lab system
ANG-CM = angle in Center-of-mass system
COS = cosine of angle in lab system
COS-CM = cosine of angle in Center-of-mass system
and other codes given in Dictionary 24 with specifier G.

CENTER O.M.

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 meant for 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.

A note introducing an essential change to previous practice was added, without 4C-approval, on the NNCSC update page labelled June 1975 (actually Oct. 1975).

Add the note proposed in 4C-3/149, which was agreed because no objection was received.

NDS-124 24-11-75

CINDA

Expansions not up to date, but trivial.

CINDA-quantities

The correspondence between CINDA-quantities and EXFOR-quantities is given in the following list. In the EXFOR-formalism given below, a hyphen "-" stands for a quantity-subfield that may have any code or may be blank.

CINDA		EXFOR
EVL	Evaluation	no correspondence
TOT	Total	TOT,-,-
SEL	Elastic	EL
DEL	Diff Elastic	EL,-,- but excluding blank, POL, ASY or POT in the second subfield EL/RAD
POL	Polarization	-,POL and -,ASY
POT	Potntal Scat	EL,POT
SIN	Tot Inelastc	INL
DIN	Diff Inelast	INL,-,-,- but excluding INL
DNG	Inelastic γ	ING,-,-
TSL	Thermal Scat	THS,-,- BAS FAS COH,- INC,-
SCT	Scattering	SCT,-,-
SNE	Nonelastic	NON,-,-
NEG	Nonelastic γ	GEM,-,-
REM	Disappearanc	not defined
ABS	Absorption	ABS,,-
RIA	Res Int Abs	ABS,RI
ACT	Activation	no correspondence
RIR	Res Int Act	no correspondence
NG	(n,γ)	NG,,-
RIG	Res Int Capt	NG,RI
SNG	Spect (n,γ)	NG,-,-,- but excluding RI and blank in second subfield
N2N	(n,2n)	N2N,-,-,-
N3N	(n,3n)	N3N,-,-,-
NEM	n Emission	NEM,-,-
NPR	n Production	NPR,-,-

CINDA-quantities (continued)

CINDA		EXFOR	
NP	(n,p)	NP,-,-,- N2P,-,-,- PEM,-,-,-	
NNP	(n,np)	NNP,-,-,-	
ND	(n,d)	ND,-,-,-	
NND	(n,nd)	NND,-,-,-	
NT	(n,t)	NT,-,-,-	
NNT	(n,nt)	NNT,-,-,-	
NHE	(n,He3)	N3,-,-,- NN3,-,-,-	
NA	(n,α)	NA,-,-,- N2A,-,-,- AEM,-,-,-	
NNA	(n,nα)	NNA,-,-,-	
not defined		NX,-,-,-	
NF	Fission	NF NF,,RTE NF,,MXW NF,,SPA	
RIF	Res Int Fis	NF,RI	
ALF	Alpha	ALF	
ETA	Eta	ETA,-,-	
NU	Nu	NU NU,,PR	SF/NU SF/NU,,PR
NUD	Delayd Neuts	NU,,DL	
NUF	Frag Neuts	not yet defined	
SFN	Spect Fiss n	NU,DE,-	NU,AKE,-
SFG	Spect Fiss γ	NF,-,-,G	NF,SPC
FPG	Fiss Prod γ	not yet defined	
NFY	Fiss Yield	NF,,TER NF,,RBT	NF,YLD,-
FRS	Frag Spectra	NF,-,-,PF	
CHG	Frag Charge	NF,ZP	
RES	Reson Params	-,RES -/PCS -/WID,-,- -/ARE D	Note: for ALF, RES see also Cinda under ALF ETA, RES ETA ETA/NU, RES ETA or NF NF, RES, TER NF
STF	Strnth Fnctn	STF	
LDL	Lvl Density	LDP TEM SCO	Cinda: target nucleus Exfor: compound nucleus
GN	(γ,n)	not yet defined	
GP	Photo-Fissn	not yet defined	

Correlation

CORREL

Example:

In entry 3.0036. the correlation function W(ANG1,ANG2,ANG3) between the angle of the scattered-neutrons detector and the azimuthal and polar angle of the gamma detector was entered under the quantity INL,CØR. The DATA were given in units of "gammas per steradian, per inelastic scattered neutron". These units were coded in the DATA table as "SEE TEXT" and explained in free text in the BIB-section.

In other cases the definition of the DATA entered under INL,CØR may be different, so that the definition must always be given in free text.

addition of this page is overdue
There is also a long-standing action to NNCSC
to explain the correlation quantities included in
their exchange tapes.

PRELIM. AX4 MDL 74-5-10
omitted in Jan. 74 update

Differential Data

Differential cross-sections with respect to the angle between outgoing particle or gamma and incident neutron-beam are coded with "DA" in the second quantity-subfield (function). Compare under Angle.

Differential cross-sections with respect to the energy of the outgoing particle or gamma are coded with "DE" in the second quantity-subfield.

Double differential cross-sections are coded with "DA/DE' in the second quantity-subfield.

Triple differential cross-sections, for example with respect to energies or angles of two outgoing particles, may be coded in the form of "DA/DE/DE" in the second quantity subfield.

If it is not evident from the quantity-code which outgoing particle is referred to, this is indicated in the fourth quantity-subfield.

The indication whether the differential cross-section, the angle, or the energy is given in the lab-system or centre-of-mass system is not entered within the quantity-code but in the data-headings; see Centre-of-mass System..

If the differential cross-sections are given not in absolute units but in the notation

$$\frac{4\pi}{\sigma}\,\frac{d\sigma}{d\Omega}(\vartheta) \qquad \text{(dimensionless)},$$

this is indicated by the modifier "RS" (ratio over sigma) in the third quantity-subfield. If the differential cross-sections are given in any other arbitrary units, this is indicated by the modifier "REL" (relative) in the third quantity-subfield.

In the quantities-dictionary 14 the term "differential cross-section" refers always to angular distributions, whereas energy-distributions are called "spectrum".

Examples of quantity-codes:

EL,DA = $\frac{d\sigma_{n}}{d\Omega}$ [b/sr]

EL,DA,RS = $\frac{4\pi}{\sigma_{n}}\frac{d\sigma_{n}}{d\Omega}$ no dimension

NP,DA = differential (n,p) cross-section

NNP,DA,,N = (n,np), angular distribution of neutrons

NNP,DA,,P = (n,np), angular distribution of protons

INL,DE = differential with energy of outgoing neutrons

ING,DE = differential with energy of inelastic gammas

INL,DA/DE = $\frac{d^2\sigma_{n'}}{dE'\,d\Omega}(E,E',\vartheta)$

NNP,DA/DE/DE,,N/P = a triple differential (n,np) crossesection; in this case one cannot specify in the quantity-code, to which of the outgoing particles the function "DA" refers; explanation must be given in free text.

→ 4C-3/139

FREE

Free Text

Be short and precise!

For general rules see page IV.2. The free text in EXFOR should be so clear that users who are not familiar with the system, can easily read it. No abbreviations should be used that are not self-explanatory. No codes from dictionaries are allowed in the free text.

Some examples:

1. Write NUCL.PHYS., and not NP
2. Write PERCENT, and not PC
3. Separate a number and its unit by a blank for clarity.
4. Element symbols and their Z and A values should be written in the free text as in ISØ-QUANT. The Z-value can be omitted. The 0 for natural elements should be omitted. Write U-235, and not 235U.

Standard values, parameters and other numerical values should, if suitable, be entered under DATA or COMMON, although they may be given also in free text for clarity.

When writing formulae in free text, the compiler should attempt to use the FORTRAN conventions, when they apply, with liberal use of parentheses for clarity.

Blank lines should be used with great discretion. Free text following codes can start right after the closing parenthesis, but should rather start in column 23 for more clarity. Continuation lines should start in column 12.

Parentheses () can be used in the free text except in column 12 where the opening parenthesis marks a code.

4C-3/138

The language of the free text is English. However, names of journals or other names should not be translated into English. Write 'Jaderna ja Fizika', and not 'Nuclear Physics' which means something else.

4C-3/139

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.

4C-1/21 p.3 *Data given for the data specification keyword NUC-QUANT are usually not given an incident energy. However, the compiler may decide to enter "EN" since, for instance, nuclear temperatures are not truly energy-independent.
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".

* Justification: The Four-Center agreement on this matter was documented in 4C-1/21 (by NNCSC!) page 3, and on this agreement the Lexfor entry should be based. We believe that this topic had been discussed exhaustively at that time. The presence of the keyword NUC-QUANT (instead of the usual ISO-QUANT) gives sufficient indication to computer programs that the data-heading EN has, in this case, not the same status as an independent variable as it has usually under ISO-QUANT.
Non-trivial revisions must not be introduced in Manual updates without prior 4C agreement.

NDS-LX4 35-10-1

4C-3/129

Isomeric States

1. If the target-nucleus of a neutron-induced reaction is in a metastable state, this is indicated in the iso-quant with the codes "M1" for the first and "M2" for the second metastable state in the form:

ISO-QUANT (95-AM-242-M1,NF). For target-nuclei in ground-state no isomer-code is given. The isomer-codes should only be used if they are associated with a clear definition in free text.

The half-life of the target nucleus in a metastable state should be entered under the bibliographic keyword HALF-LIFE and the numerical value given in CØMMØN or DATA.

HALF-LIFE (HL,95-AM-242-M1). Free text. (see example 17 and page VIII.24)

2. If the residual nucleus is in a metastable state, this may be indicated under the BIB keyword "RESID-NUC" either in parentheses or in free text:

either RESID-NUC (95-AM-242-M) plus any other free text

or RESID-NUC 95-AM-242M plus any other free text.

When the residual nucleus is coded in parentheses:
- the isomer code G for the ground-state is only given, when the nuclide has a metastable state,
- no isomer code is given for an unspecified state.

The half-life of the residual nucleus should be entered under the bibliographic keyword HALF-LIFE and the numerical value given in CØMMØN or DATA. (see example 17 and page VIII.24)

3. If a partial cross-section is given leaving the residual nucleus in its ground-state or in a metastable state, this is indicated by a quantity-modifier; examples:

NP,,GND partial (n,p) cross section populating the ground-state of the residual nucleus; to be used only, when a metastable state exists, otherwise use NP,,PAR.

NP,,MS partial (n,p) cross section populating a metastable state of the residual nucleus.

4. Isomeric ratios are coded as iso-quant ratios, for example:

ISO-QUANT ((Z-S-A,NP,,MS)/(Z-S-A,NP,,GND)), or

ISO-QUANT ((Z-S-A,NP,,MS)/(Z-S-A,NP)), etc.

We see no reason for omitting item 2 which, obviously, had only to be amended.

LIGHT-N

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

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

$Li^6(n,d)$ $Li^6(n,nd)$ $Li^6(n,n\alpha)$

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

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.

Example: In the reaction $Li^6(n,2np)He^4$ 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. $Li^7(n,2n\,d\,\alpha)$ is coded (3-LI-7,NND)
because (3-LI-7,N2N) means $Li^7(n,2n)Li^6$.

2. $C^{12}(n,npt2\alpha)$ is coded (6-C-12,NNT)
because (6-C-12,NNP) means $C^{12}(n,np)B^{11}$.

3. (n,3n) and (n,4n) reactions are coded as N3N and N4N.

trivial → Compare under 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.

June 1975

Light-Nuclei Reactions (continued)

Reaction	Threshold (MeV)	ISO-QUANT	Comments
$H^1(n,\gamma)D^2$	0	(1-H-1,NG)	
$D^2(n,\gamma)T^3$	0	(1-D-2,NG)	
$D^2(n,2n\ p)$	3.34	(1-D-2,N2N)	
$T^3(n,2n\ d)$	8.35	(1-T-3,N2N)	
$T^3(n,3n\ p)$	11.31	(1-T-3,N3N)	
$He^3(n,\gamma)He^4$	0	(2-HE-3,NG)	
$He^3(n,p\ t)$	0	(2-HE-3,NP)	
$He^3(n,2d)$	4.35	(2-HE-3,ND)	
$He^3(n,n\ p\ d)$	7.32	(2-HE-3,NNP)	
$He^3(n,2n\ 2p)$	< 14.	(2-HE-3,N2N)	(PL,23,477,66)
$He^4(n,d\ t)$	21.97	(2-HE-4,ND)	
$He^4(n,n\ p\ t)$	24.76	(2-HE-4,NNP)	
$He^4(n,2n)He^3$	25.72	(2-HE-4,N2N)	
$He^4(n,n\ 2d)$	29.80	(2-HE-4,NND)	
$Li^6(n,\gamma)Li^7$	0	(3-LI-6,NG)	
$Li^6(n,t\ \alpha)$	0	(3-LI-6,NT)	
$Li^6(n,n\ d\ \alpha)$	1.71	(3-LI-6,NND)	
$Li^6(n,p)He^6$	3.19	(3-LI-6,NP)	
$Li^6(n,2n\ p\ \alpha)$	5.43	(3-LI-6,N2N)	
$Li^6(n,n\ t)He^3$	18.42	(3-LI-6,NNT)	
$Li^7(n,\gamma)Li^8$	0	(3-LI-7,NG)	
$Li^7(n,n\ t\ \alpha)$	2.81	(3-LI-7,NNT)	via He^5 or three-particles break-up (NP/A,98,305,67) or via Li-7*, or via H-4.
$Li^7(n,2n)Li^6$	8.29	(3-LI-7,N2N)	
$Li^7(n,d)He^6$	8.87	(3-LI-7,ND)	
$Li^7(n,2n\ d\ \alpha)$	11.06	(3-LI-7,NND)	not N2N!
$Li^7(n,n\ p)He^6$	11.41	(3-LI-7,NNP)	
$Li^7(n,3n\ p\ \alpha)$	14.76	(3-LI-7,N3N)	incl. search for bound trineutron, compare Exfor- 1.0209.

Useful additional comments

NDS-LX4 74-11-15

MONOISOTOPIC ELEMENTS

MONO

Monoisotopic elements should be entered with their appropriate A-number. A = 0, which means natural isotopic mixture, should not be used for monoisotopic elements.
A list of monoisotopic elements follows:

Z- S- A
4-BE-9
9-F-19
11-NA-23
13-AL-27
15-P-31
21-SC-45
25-MN-55
27-CO-59
33-AS-75
39-Y-89
41-NB-93
45-RH-103
53-I-127
55-CS-133
59-PR-141
65-TB-159
67-HO-165
69-TM-169
79-AU-197
83-BI-209
90-TH-232

Nearly monoisotopic elements may be entered (at NDS: must be entered) with the A-number of their main isotope. A list of such elements follows:

2-HE-4
6-C-12
7-N-14
8-O-16
23-V-51
57-LA-139
73-TA-181

Only in exceptional cases the spurious isotopes of these elements will have a noticible influence on neutron data.

For non-natural elements A=0 (e.g. 94-PU-0) makes no sense and the appropriate isotope number must be entered.

4C-3/97 74-4-8 p.2

cf 4C-3/139

Multilevel

Multilevel Resonance Parameters

Adler-Adler Resonance-Parameters

Adler-Adler coefficients are entered under the quantity-codes

AMU,RES	μ_λ	Resonance energy, with the dimensions of an energy
ANU,RES	ν_λ	corresponding to half the total width, with the dimension of an energy
AGF,RES	$G_{\lambda f}$	fission symmetry coefficient, with the unit B*EV*RT-EV
AHF,RES	$H_{\lambda f}$	fission asymmetry coefficient with the unit B*EV*RT-EV
AGG,RES	G_λ^γ	capture symmetry coefficient in B*EV*RT-EV
AHG,RES	H_λ^γ	capture symmetry in B*EV*RT-EV
AGT,RES	G_λ	total symmetry coefficient ← units ?
AHT,RES	H_λ	total asymmetry coefficient ←

The parameters are functions of μ, which corresponds to the resonance-energy. Since this representation of the energy causes trouble in a data retrieval by energy, the energy-limits of the Adler-Adler fit must be entered explicitly in the "COMMON" data section under the data-heading keywords "EN-MIN" and "EN-MAX".

1. Total Cross Section

$$\sigma_T(E) = \frac{2C}{E}(1-\cos\omega)$$
$$+ \frac{C}{\sqrt{E}} \sum_{R=1}^{NRS} \frac{\nu_R^T\left[G_R^T \cos\omega + H_R^T \sin\omega\right] + \left(\mu_R^T - E\right)\left[H_R^T \cos\omega - G_R^T \sin\omega\right]}{\left(\mu_R^T - E\right)^2 + \left(\nu_R^T\right)^2}$$
$$+ \frac{C}{\sqrt{E}}(AT_1 + AT_2/E + AT_3/E^2 + AT_4/E^3 + BT_1 * E + BT_2 * E^2)$$

2. Captive Cross Section

$$\sigma_{n,\gamma}(E) =$$
$$\frac{C}{\sqrt{E}} \sum_{R=1}^{NRS} \frac{\nu_R^\gamma\left[G_R^\gamma \cos\omega + H_R^\gamma \sin\omega\right] + \left(\mu_R^\gamma - E\right)\left[H_R^\gamma \cos\omega - G_R^\gamma \sin\omega\right]}{\left(\mu_R^\gamma - E\right)^2 + \left(\nu_R^\gamma\right)^2}$$
$$+ \frac{C}{\sqrt{E}}(AC_1 + AC_2/E + AC_3/E^2 + AC_1/E^3 + BC_1 * E + BC_2 * E^2) \qquad \omega \equiv 0$$

3. Fission Cross Section

$$\sigma_{n,f}(E) =$$
$$\frac{C}{\sqrt{E}} \sum_{R=1}^{NRS} \frac{\nu_R^f\left[G_R^f \cos\omega + H_R^f \sin\omega\right] + \left(\mu_R^f - E\right)\left[H_R^f \cos\omega - G_R^f \sin\omega\right]}{\left(\mu_R^f - E\right)^2 + \left(\nu_R^f\right)^2}$$
$$+ \frac{C}{\sqrt{E}}(AF_1 + AF_2/E + AF_3/E^2 + AF_4/E^3 + BF_1 * E + BF_2 * E^2) \qquad \omega \equiv 0$$

$\omega = 2ka$

where k is the neutron wave number

$$k = 2.196771\left(\frac{AWRI}{AWR + 1.0}\right) \times 10^{-3}\sqrt{E(eV)}$$

and

a = AP = effective scattering radius

$$\frac{C}{E} = \pi\lambda^2 = \frac{\pi}{k^2}$$

NØDATA

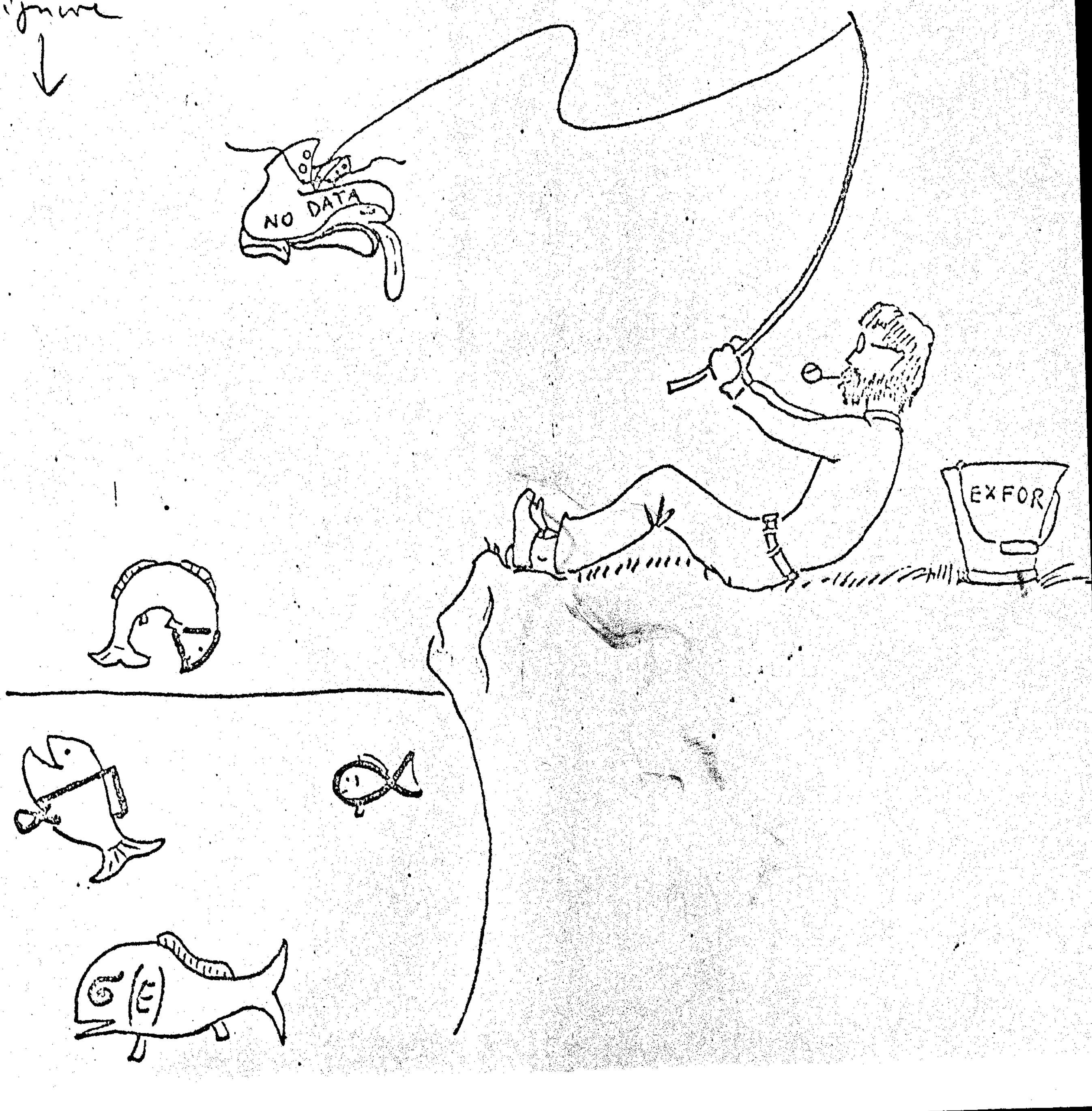
In the case where a centre is aware that data exist, but the centre is unable to obtain the data, an entry should be made into EXFOR to inform the other centres (and their users) of the status of the data. This will eliminate many repeated requests for the same data and much needless bookkeeping concerning data which will be entered into the system with extensive delay or not at all.

The BIB-section should contain at least the first category keywords as in a normal entry with STATUS "data unobtainable from author" (UNOBT). Also the date when the data are expected to be released, should be given, if known; or, in the case that data will never be released, the reason should be given.
The COMMON section should contain minimum and maximum energy, if known.

Where there is more than one ISO-QUANT, these should be entered as subentries including the system identifier NODATA.

The entering of any further information in BIB or COMMON is optional.

ignore



NDS Lx47 25-2-78

NUC

NUC-QUANT

The keyword "NUC-QUANT" is to be used instead of the keyword "ISO-QUANT", when the quantity defined does not refer to a target-nucleus. These quantities are:

SF = spontaneous fission
LDP = level-density parameter
TEM = nuclear temperature
SCO = spin-cut-off factor

as well as any other quantities having one of the above codes in the first quantity-subfield, e.g. SF/NU; compare dictionary 14. The formalism for the coding of NUC-QUANT information is the same as that of ISO-QUANT, see page VIII.12 - 20, except that the isotope-field should not contain the target-nucleus but rather the nucleus to which the data is pertinent.

One of the three keywords, ISO-QUANT, CMPD-QUANT or NUC-QUANT, must be present; they are mutually exclusive.

Quantities to be entered under "NUC-QUANT" (compare Dictionary 14):

1. Spontaneous fission. see LEXFØR 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".

(In the NNCSC manual above info is on page VIII.15a although much of it clearly belongs into Lexfor.)

Particles

1. Keyword "PART-DET": This keyword is used to identify the particle(s) actually detected in the experiment, regardless of the quantity given in the data-table. For codes see dictionary 13. This keyword must always be present if the particle detected is not evident from the data specification. Codes must be followed by free text.

Particles detected in successive ISO-QUANT's of an ISO-QUANT combination should be coded on successive lines.

The particles detected in a monitor reaction should not be coded.

Distinguish the different codes for decay-gammas (DG) and other gammas (G). and also for the different β-particles: decay-electrons (B-), decay-positrons (B+) and other electrons (E).

2. Particle-Designator: The fourth quantity-subfield indicates, when necessary, which of several outgoing particles the quantity refers to. See page VIII.12. Note that only a subset of dictionary 13 can be used in the quantity-code, see page VIII.18.

→ 4C-3/139

Quantum-Numbers

Momentum "ℓ" - the orbital angular momentum of neutrons exciting a compound-nucleus resonance

Resonance-Spin "J" - the total spin-value of the compound-nucleus resonance

Parity "π" - the parity of a compound-nucleus resonance

These quantum-numbers can be entered in two different ways:

a) frequently such quantum-numbers are parameters of strength-functions, reduced neutron-widths, or other quantities. Then they are entered as parameters in an additional column of the data table, either in the "COMMON" or in the "DATA" section, under the data-heading keywords (see Example 3):

MOMENTUM L
SPIN J
PARITY .

b) If the quantum-number is the result of the resonance parameter analysis, one of the following quantity-codes is used as part of the iso-quant, which then requires a separate subentry:

L,RES
J,RES
PTY,RES .

The units under "DATA" will be "NO-DIM". The quantum-numbers themselves, must be entered with a decimal point.

4C-3/153

Note for Renda: Spin, Parity and Energy of levels are grouped together in one Renda category called LQN (Level quantum numbers).

new page 1-01-52 XY-50N

RESID-NUC

RESID

Under the keyword "RESID-NUC" a description of the residual nucleus and pertinent information regarding its characteristics may be given. This information may be given

- either in free text,
- or with the residual nucleus coded within parentheses, possibly followed by free text.

For the coding of the residual nucleus see Dictionary 2 under RESID-NUC.

This keyword is not obligatory.

The residual nucleus should always be included in coded form in the case where the quantity given is measured on an isotopic mixture, but leads to a specified residual nucleus.

See also Isomeric States.

→ cf 4C-3/139

ignore if you wish

cf action 32 of 1975 NC-Meeting

Recipe for checking the coded residual nucleus (HOL)

The keyword RESID-NUC should occur only together with ISO-QUANT, not with NUC-QUANT or CMPD-QUANT.

To code a residual nucleus seems to be appropriate only for a limited number of reactions. It cannot be coded in the case of fission quantities and sum reactions. It is silly to be coded for resonance-parameters and most scattering data except for INL.

Therefore, the residual nucleus should be coded only then when the first quantity subfield under ISO-QUANT is identical with one of the codes given in the list attached. In these cases the residual nucleus can be computed from the target-nucleus by incrementing Z and A as indicated in the list. This list should be open-ended.

For isomeric states the following checks should be made. If the residual nucleus has the isomer code G then the modifier GND must be present in the third quantity subfield. If the residual nucleus has the isomer codes M, M1, M2 etc., then the modifier MS must be present in the third quantity subfield.

Q	Z	A
INL	0	0
NG	0	+1
N2G	0	+1
N2N	0	-1
N3N	0	-2
N4N	0	-3
NP	-1	0
NNP	-1	-1
N2P	-2	-1
ND	-1	-1
NND	-1	-2
NT	-1	-2
NNT	-1	-3
N3	-2	-2
NN3	-2	-3
NA	-2	-3
NNA	-2	-4
N2A	-4	-7

Furthermore, the correctness of the element-symbol should be checked against the Z-number of the residual nucleus.

Exception: For light-element reactions with target $Z \leq 6$ the computation of the residual nucleus from the iso-quant may fail, because more particles than indicated by the quantity code may be omitted.

For natural targets with $A = 0$ the residual nucleus cannot be computed from the iso-quant and should therefore not be checked except for the correct Z-S combination. If the residual nucleus is coded in the case of a natural target, then the quantity must be a sum-reaction like NX or AEM. But don't check this because it occurs too seldom.

Messages:

If Z-S does not match, error.
If isomer code does not match the quantity modifier, error.
If the resid-nuc computation does not match the coded resid-nuc: error when $Z \geq 7$, but warning when $Z \leq 6$.
If RESID-NUC occurs together with NUC-QUANT or CMPD-QUANT, error.
If RESID-NUC occurs together with a natural target, warning because not checked.
If the resid-nuc is coded but the first quantity subfield contains a valid quantity code not included in the attached list, and if $A \neq 0$, error.

RESOL

Resolution

The word "resolution" can mean different things: it can describe the energy (angular) spread of the incident neutrons, or the channel-width, or combinations. Explanation should be given in free text. Free text concerning the incident neutrons is given under "INC-SPECT".

* Distinguish between error and resolution, where possible. E.g., the energy-resolution describes the distribution curve of the energy-spread, and is usually defined as "full width at half maximum". The energy-error describes the uncertainty of the central energy of the resolution-curve.

The energy-resolution can be given in energy-units, in percent, or in units of a reciproke velocity (e.g. nsec/m).

Codes to be used as data-headings: (see dictionary 24)

EN-RSL	energy resolution of incident neutron beam
E-RSL	energy resolution of outgoing particles or gammas
ANG-RSL	angular resolution

* 4C-2/36

'The terms resolution and error are often mixed up in literature. In general, for energies (EN and E) and ANGLE the resolutions are given and sometimes also the error, but (nearly) never the error only'.

omitted in Jan 74 update
PRELIM LX4 HOL 74.5.10

Single-Level Resonance Parameters

The following is valid for Breit-Wigner (R-matrix) formalism. See also Average Resonance-Parameters, Quantum-Numbers, Multilevel Resonance Parameters ...

1. Resonance-widths are coded with "WID" in the first quantity-subfield, following the relevant reaction code:
   - TOT/WID = total width Γ_t
   - EL/WID = neutron-width Γ_n
   - NG/WID = capture-width, gamma-width Γ_γ, including all primary gamma-decays not followed by a neutron- or charged-particle emission.
   - NP/WID = proton-width Γ_p
   - NA/WID = alfa-width Γ_α
   - NF/WID = fission-width Γ_f

   and others as given in dictionary 14.

2. Peak Cross-Sections are defined as cross-section values at peak of compound-nucleus resonance in natural line-shape in a Breit-Wigner formalism, corrected (where important) for instrumental or temperature effects. These are coded with "PCS" in the first quantity-subfield, for example (see dictionary 14):

   TOT/PCS = total peak cross-section
   Eta or Alpha at resonance are coded as ETA,RES or ALF,RES.

trivial →

3. Reduced Neutron-Width

Definition: In practice, the reduced s-wave neutron-width is determined by dividing the neutron-width by the square-root of the resonance-energy in eV (compare BNL-325):

$$\Gamma_n^{(o)} = \frac{\Gamma_n}{\sqrt{E_o/eV}} \qquad (1a)$$

The reduced p-wave neutron width is defined by

$$\Gamma_n^{(1)} = \frac{\Gamma_n}{\sqrt{E_o/eV}} \left(1 + \frac{1}{k_o^2 \; R^2}\right) \qquad (1b)$$

Quantity-code: EL/WID,RED

The s-wave respectively p-wave is specified under the data heading "MOMENTUM L" (see Example 3). The dimension is that of an energy, e.g. eV or meV.

Note: More accurately, the definition is

$$\Gamma_n^{(\ell)} = \frac{\Gamma_n}{v_\ell \sqrt{E_o/eV}} \qquad (2)$$

where v is the penetration-factor of the nucleus.
(Compare: KFK-120 part 1, page B 57).

Note: Some authors give the reduced neutron-width (for s-wave neutrons) as

$$\Gamma_n^{(o)} = \frac{\Gamma_n}{\sqrt{E_o}} \qquad (3)$$

which has the dimension of the square-root of an energy, e.g. $\sqrt{eV}$. (Compare: Hennies, 66PARIS Vol.2, page 333). For consistency, only definition (1) with the dimension of an energy should be used in EXFOR, the numerical values of definitions (3) and (1) being anyway identical except for the dimensions.

4. Special Representations are

NF/WID,SO	=	$\sigma_o \Gamma_f$
TOT/WID,SQ/SO	=	$\sigma_o \Gamma_t^2$
EL/WID,,G	=	$g \Gamma_n$
EL/WID,,2G	=	$2g\Gamma_n$
EL/WID,,AG	=	$ag\Gamma_n$
EL/WID,,2AG	=	$2ag\Gamma_n$
EL/WID,RED	=	reduced neutron width, see above
NG/WID,,AV	=	$\langle \Gamma_\gamma \rangle$ see Average Resonance-Parameters

and others as given in dictionary 14. Some of these data require additional parameters such as the momentum "ℓ" to be given in the data table; see Quantum-Numbers.

5. Resonance-Energy

There are two ways of entering resonance-energies:

a) the resonance-energy may be entered as a parameter of resonance-widths or peak cross-sections under the data-heading keyword "EN-RES". (If the resonance energies are not determined by authors, they should be entered in this manner.)

b) the resonance-energy may be given in a data-table. In this case, the quantity-code "EN,RES" is entered as part of any iso-quant, and the associated data column has the data heading keyword "DATA". (When the resonance energy is determined by the authors, it should be entered in this manner.

6. Resonance-area. The fission resonance area is defined as

$$\frac{2\pi^2 \lambda_o^2}{\sqrt{E_{res}}} \; \frac{\Gamma_n^o \Gamma_f}{\Gamma} \quad [b \cdot eV]$$

This is coded as NF/ARE. Other resonance areas correspondingly.

to be added

Standard information can be entered either in free text under the keyword STANDARD or in computer-intelligible form, with or without free text. In the latter case, the numerical data of the standard used may be entered in the "COMMON" or "DATA" section under the data-heading keyword "STAND". Isotope and quantity of the standard are entered under the keyword "STANDARD" following the same rules as for ISO-QUANT. It is desirable to include in the free text the bibliographic reference pertinent to the standard used.

The keyword "STANDARD" must be present, except when it is not relevant, as for such quantities which are usually obtained without a standard, that is:

* resonance-parameters except resonance areas, peak cross sections and similar quantities (if cross-reference is made to EXFOR subentry containing the data from which the resonance parameters were deduced)
* the quantities STF, D, LDP, TEM, SCO, RAD, TOT
* ISO-QUANT ratios
* if the modifiers RS, RSL, RSD, REL or others which exclude a standard have been used.

For all other quantities that can usually be measured either with a standard or absolutely, the positive statement ABSOLUTE in free text is pertinent information to the user of EXFOR and should therefore be included. It should be noted however, that so-called "absolute" data often nevertheless depend on the assumption of certain numerical values (e.g., for calibrations or corrections); it is desirable to give such values in free text under STANDARD. The compiler should restrict the use of the term absolute only to those cases in which it is sure there are no 'hidden' standards. For more complicated description of standards or normalization procedures a cross-reference to published literature may be sufficient.

Cases:

1. If the standard values are given at several energies, these are given in the data table as an additional column under the heading "STAND" (see Example 4.a).

2. If a standard value is given only at one energy, there are two possibilities:

   a) Either the standard is entered as in case 1. above; the column headed "STAND" is then blank except at one energy.

   b) Or the standard is entered in the "COMMON"-section under the heading "STAND" together with the normalization-energy under the heading "EN-NRM" (see Example 4.b). ("EN-NRM" is omitted if the data-table includes only one energy-value which is identical with the normalization-energy.)

3. If the originally measured ratio "data/standard" is also given, see Example 2.

4. If a data-set is normalized at two or more energies in an unspecified way, this should be noted in free text in an appropriate place.

5. If two or more standards are given in computer-readable form, the column-heading STAND is repeated in the COMMON or DATA section, and pointers are used to establish the link to the Iso-quants entered in the BIB section under STANDARD. For the rules about pointers see Manual page IV.3. (Note: the keywords STAND 1 and STAND 2 are no longer used at NDS but still exist in old entries and in new entries from the other centers.)

trivial

STATUS

STATUS

Under the information-identifier keyword "STATUS" various groups of information are combined. Compare Example 6. The codes in dictionary 16 have rather detailed explanation, but some general items should be borne in mind:

1. Preliminary superseded final - If the codes (PRELM) or (SPSDD) are absent, the data are understood as final data. The status-code of a preliminary data set is changed from (PRELM) to (SPSDD) as soon as the final data are also entered. Therefore, the codes (PRELM) and (SPSDD) exclude each other.

The frequent case that a preliminary data set is replaced by its final version, can be solved in two ways:

a) the final set replaces the preliminary set under the same subentry-number, so that the preliminary set is deleted from the file.

b) the final set is entered under a new subentry-number (preferably of the same entry), and the earlier set is labelled with (SPSDD); in both subentries cross-references to the other are entered in free text. This way is preferred to case a) if the earlier set had already been published.

2. Dependent - See under Dependent Data.

3. Approved - After the proof-copy has been approved by the author the code (APRVD) is entered. Absence of the code (APRVD) means: no reply on the proof-copy has yet been received from the author.

4. Source of the data - The actual source where the numerical values of the data set were taken from, may be entered in free text.

5. Normalization - If the codes (OUTDT) and (RNORM) are absent, data are compiled as resulting from the author's corrections and normalization. Only in exceptional cases it is allowed to compile re-normalizations or re-assessments of the data as given by an evaluator. Compare under Renormalization and Correction.

The renormalized or reassessed data set is labelled with (RNORM). The old data set which is superseded by the later renormalization or reassessment is labelled with (OUTDT).

6. The above status-codes may be missing even if they apply when the code (SCSRS) is given. Data with the code SCSRS were converted from SCISRS-1 or NEUDADA. The code (SCSRS) need not be followed by free text.

7. Unobtainable data - see Unobtainable Data.

See also pages VIII.3 and VIII.4

→ clarification proposed

Tautologies

Iso-quant-separator "also", code: =
For the coding-rules of this separator see page VIII.14. In general it is to be used when a data set can equally well be described by two or more quantity codes, whih are identical in the energy-range considered. Two or more iso-quants can be given separated by equal-signs. The consequence is that this data set will be indexed and retrieved under both iso-quants. The sequence of the iso-quants should be such that the narrower quantity or the one which is entered in CINDA is given in the first position, when such criteria apply.

Not to be used in the following cases:

1. When a data set extends beyond a known threshold, the quantity-code that is valid above the threshold-energy should be used. See under Threshold.

2. When the compiler has doubts whether the one or the other quantity is actually given in the table, the compiler must decide in favour of one of the possible quantity-codes.

3. Sum-quantities, like "absorption", should only be used when two or more reactions are energetically possible: The iso-quant (1-H-1,NG) is only entered as such and (1-H-1,ABS) must not be added using the "also"-separator, although this quantity is often called "absorption".

Note: NDS will probably not use this iso-quant separator at all. An example where NNCSC will probably use this separator can be found under Inelastic Gamma-Emission.

UNITS

NDS-7X4-52-7-1

Units

A datum or value is always a combination of a number and a unit. Example: 500 mb and .5b is the same value. mb and b are units of the same dimension or units-group. Units of the same dimension can be converted into each other by multiplication with a numerical (dimensionless) factor. Example: Angström and cm are units of the same dimension. A quantity can have only one dimension. Or: A quantity-code can be combined with only one group of units. Or: Data with different dimensions cannot have the same quantity-code. In dictionary 14 each quantity-code is followed by a code indicating the permissible dimension. Examples: "E" means energy-units (milli-eV, eV, keV, MeV, etc.). "NO" means dimensionless, that is percent or unit "one". The same dimension-codes are also given in the "Units" dictionary 25, so that a computer-check is possible whether in a data table a given quantity-code is combined with a unit which has the correct dimension. For example, the quantity "NF", having the dimension "B", can only be given in the Units KB, B, MB, or MICRO-B. In the "Units" dictionary, for each unit a conversion-factor is given, which allows computerized conversion between different units of the same dimension. The data units are entered in the "COMMON" and "DATA" section below the data-heading to define the units of the contents of each column. See Example 5.

Special cases:

1. An angle given in degrees and minutes must be entered in two separate columns with the data-heading "ANG" repeated.

2. If data are given in arbitrary units, "ARB-UNITS", the quantity-code is marked as "relative" by entering the modifier "REL" in the third quantity-subfield. See Relative.

see note at the bottom

3. Errors must have the same dimension (not necessarily the same units) as the quantity they refer to, - or percent.

4. PER-CENT is forbidden for use with the data-heading keywords DATA, DATA1, DATA2 etc., and RATIO, RATIO1, RATIO2 etc. Data should be converted to NO-DIM by dividing the results by 100. If the DATA (or RATIO) error is given in per-cent, this always means a percentage of the relevant DATA (resp. RATIO).

4C-1/59

5. The unit "SEE TEXT" is used in a MISC column only and is explained in free text under MISC-COL. See Lexfor entry Miscellaneous.

Note: The compiler should avoid any carelessness in the use of units. This would jeopardize any automatic data-processing. It is forbidden to set the light-velocity c = 1 or Planck's constant h = 1 as is usually done in high-energy physics.

additions overdue

The items 3. and 4. under special cases were omitted in the Jan1974 update.

WAVE-L

Wave-length

The wave-length λ of an incident neutron corresponds to the neutron-energy E:

$$E/\mathrm{meV} = \frac{81.8}{(\lambda/\text{Å})^2}$$

mistake

λ	E
1 Å	81.8 meV
1.8 Å	25.3 meV
2 Å	20.5 meV
4 Å	5.1 meV
6 Å	2.3 meV
10 Å	0.8 meV

The wave-length of the incident neutron is entered under the data-heading keyword EN with units ANGSTROM.

Note: If for whatever reason, the compiler converts the wave-length to neutron energy, this should be noted in the BIB-section.

EXAMPLES OF EXFOR-CODING

1. sample of an EXFOR transmission tape
2. data-headings RATIO, STAND, DATA
3. "ℓ" as parameter for reduced neutron-width
4. normalization
5. data-units, relative data, degrees and minutes
6. authors, status, history
7. error-columns
8. flags
9. differential partial inelastic data
10. double-differential inelastic data
11. relative differential data
12. unresolved levels
13. two-dimensional tables
14. fission-yields
15. fission-product charge: charge dispersion
16. relative comulative yields of metastable fission-products
17. isomeric cross sections

Ex 13a

Example 13a: A table with 3 independent variables.

NNCSC Manual apparently has still the example with TABLE-NR

NDS-Lxx 74-11-15 replacing TABLE-NR concept

level (keV)	Energy (keV)	θ(lab) 30°	60°	90°	120°	140°	150°
152	570	65.4 ± 13.4	68.7 ± 5.0	67.6 ± 4.2	64.6 ± 3.5		70.5 ± 3.9
283	570	30.0 ± 2.4	28.3 ± 1.9	28.0 ± 2.2	24.7 ± 2.2		27.4 ± 2.2
283	700	20.9 ± 5.0	22.9 ± 1.5	20.8 ± 2.1	20.9 ± 1.5		22.1 ± 2.1
514	700	16.6 ± 1.8	16.6 ± 2.4	17.9 ± 2.4	18.2 ± 2.4		13.9 ± 3.0
733	1200	14.7 ± 1.2	17.3 ± 1.5	14.7 ± 1.1	16.5 ± 1.2	16.8 ± 1.8	

```
SUBENT        30179005                                                 30179005
BIB                                                                    30179005
ISO-QUANT     (37-RB-85,INL,DA,PAR) ANGULAR DISTRIBUTIONS FOR          30179005
              POPULATION OF SPECIFIC LEVELS AT VARIOUS INCIDENT        30179005
              NEUTRON ENERGIES.                                        30179005
COMMENT       LEVEL ENERGIES WERE DERIVED FROM GAMMA SPECTRA MEASURED30179005
              IN SEPARATE NEUTRON INELASTIC SCATTERING EXPERIMENTS     30179005
              BY THE SAME AUTHORS.                                     30179005
ERR-ANALYS    (DATA-ERR) IS STATISTICAL ONLY AND INCLUDES EFFECTS OF   30179005
              BACKGROUND SUBTRACTION.                                  30179005
ENDBIB                                                                 30179005
**************************************************************************

NOCOMMON                                                               30179005
**************************************************************************
DATA                          6                                        30179005
E-LVL      E-LVL-ERR  EN         ANG        DATA       DATA-ERR        30179005
KEV        KEV        KEV        ADEG       MB/SR      MB/SR           30179005
152.       1.         570.       30.        65.4       13.4            30179005
152.       1.         570.       60.        68.7       5.0             30179005
152.       1.         570.       90.        67.6       4.2             30179005
152.       1.         570.       120.       64.6       3.5             30179005
152.       1.         570.       150.       70.5       3.9             30179005
283.       2.         570.       30.        30.0       2.4             30179005
283.       2.         570.       60.        28.3       1.9             30179005
283.       2.         570.       90.        28.0       2.2             30179005
283.       2.         570.       120.       24.7       2.2             30179005
283.       2.         570.       150.       27.4       2.2             30179005
283.       2.         700.       30.        20.9       5.0             30179005
283.       2.         700.       60.        22.9       1.5             30179005
283.       2.         700.       90.        20.8       2.1             30179005
283.       2.         700.       120.       20.9       1.5             30179005
283.       2.         700.       150.       22.1       2.1             30179005
514.       2.         700.       30.        16.6       1.8             30179005
514.       2.         700.       60.        16.6       2.4             30179005
514.       2.         700.       90.        17.9       2.4             30179005
514.       2.         700.       120.       18.2       2.4             30179005
514.       2.         700.       150.       13.9       3.0             30179005
733.       1.         1200.      30.        14.7       1.2             30179005
733.       1.         1200.      60.        17.3       1.5             30179005
733.       1.         1200.      90.        14.7       1.1             30179005
733.       1.         1200.      120.       16.5       1.2             30179005
733.       1.         1200.      140.       16.8       1.8             30179005
```

Ex13b

NDS-LX4 74-11-15 new page

<u>Example 13b:</u> A table with "vector common data" using pointers (see Implementation Schedule page VI.8) and with more than 6 columns.

```
SUBENT        30179004     741115
BIB                  3          6                                     3017900400001
ISO-QUANT   (37-RB-0.EL.LEG.RS)                                       3017900400002
            COEFFICIENT NUMBER.L. IS GIVEN UNDER HEADING 'NUMBER'.    30179004
STATUS      (DEP) DATA WERE DERIVED BY A LEGENDRE FIT OF THE          30179004
            DIFFERENTIAL ELASTIC SCATTERING CROSS SECTIONS GIVEN IN   30179004
            ENTRY 30179.002.                                          30179004
ERR-ANALYS  DATA-ERRORS REPRESENT THE GOODNESS OF FIT ONLY.           30179004
ENDBIB                                                                30179004
COMMON                   4          3                                 30179004
NUMBER      1NUMBER    2NUMBER    3NUMBER    4                        30179004
NO-DIM      NO-DIM     NO-DIM     NO-DIM                              30179004
1.          2.         3.         4.                                  30179004
ENDCOMMON                3                                            30179004
DATA                     9          98                                30179004
EN          DATA       1DATA-ERR  1DATA      2DATA-ERR  2DATA        330179004
DATA-ERR    3DATA      4DATA-ERR  4                                   30179004
KEV         NO-DIM     NO-DIM     NO-DIM     NO-DIM     NO-DIM        30179004
NO-DIM      NO-DIM     NO-DIM                                         30179004
 130.       -0.057     0.041      0.260      0.073      -0.085        30179004
0.074        0.233     0.095                                          30179004
 150.        0.140     0.123      0.112      0.188      -0.047        30179004
0.175        0.051     0.209                                          30179004
 180.        0.125     0.024      0.217      0.039      -0.104        30179004
0.036        0.118     0.044                                          30179004
 190.        0.198     0.020      0.211      0.033      -0.013        30179004
0.030        0.104     0.036                                          30179004
 200.        0.245     0.015      0.241      0.027       0.011        30179004
0.026        0.072     0.035                                          30179004
 220.        0.224     0.028      0.285      0.051       0.054        30179004
0.050        0.162     0.066                                          30179004
 240.        0.351     0.052      0.358      0.096       0.074        30179004
0.089        0.133     0.123                                          30179004
```

etc.

etc.