WP 2001-23

CINDA2001 MANUAL

Revisions as of 24 May 2001

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Attached is a revision of the CINDA2001 manual which we formulated in Vienna the week before the meeting. It is formatted to be inserted into the **EXFOR manual** as **chapter 10: "CINDA Bibliographic System"**. New dictionaries will be designed especially to meet the CINDA needs and will be part of the EXFOR dictionaries. Therefore no special appendices are needed for the CINDA manual.

The revisions include corrections and clarifications in the wording as well as some more substantial changes. The more important items are:

TARGET:
The old MANY and FPROD get the artificial Z value 999 to ensure their sorting at the end of the book/retrieval, and are to be coded as **999MNY** and **999FPR**

REACTION
- In CINDA the REACTION consists of **2 fields: incoming and outgoing** The codes in these fields correspond in the general case to EXFOR REACTION SF2-SF4.
- In the outgoing field, if there are many outgoing nuclides, or, in general, too many codes to fit into the field, they will be replaced by the code **PRD** (= products). the individual products would in this case be listed in a product line (**hierarchy 8)**.

QUANTITY
- The new **Dictionary 45** will contain all quantity codes to be used for CINDA.
- The correspondence between the **old CINDA quantity codes** and the new REACTION + QUANTITY combination will be presented in Dictionary 47 (see WP 2001-24).

ENERGY RANGE
- A **blank energy field** will be used in entries for spontaneous fission and nuclear quantities. Hence the codes 'SPON' and '/' will no longer exist.
- Some changes have been introduced for energy spectra: the new code **THRML** = thermal reactor spectrum will replace the old code PILE, and MAXW will be used only for pure Maxwellian spectra or data corrected for that.
- Entries for energy spectra will contain the **spectrum code** in the E-min field and may give the **numerical equivalent** (corresponding to EN-DUMMY in EXFOR) in the E-max field. These numerical equivalents will replace the previous 'internal sorting value'. Hence we will need distinctions between MAXW-THRML and FAST-FISS (which have the same EN-DUMMY in EXFOR); the default numerical equivalents will be given in the new Dictionary 48.
- These new features have some consequences:
  - A Maxwellian spectrum at 30 keV can be coded as 'MAXW 3.0+04'.
  - It is no longer allowed to combine spectrum codes with numerical energy values (other than the numerical equivalent).
- How these new features will be handled in the CINDA book is still to be decided.

HIERARCHY

Both, hierarchy **8 and 9** entries have now the information in the comments field, and the energy and reference fields are left blank. We have not yet decided whether to include such entries in the CINDA book; this will be discussed and decide upon at the meeting.

Details of the new coding rules as outlined above and coding **examples** will be included when everything is approved and finalized.

CINDA2001

MANUAL

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CINDA Bibliographic System

HISTORY

CINDA2001 was designed to replace the CINDA database which was originally designed in 1958[1] as a Card Index to Neutron Data. CINDA was adopted in the 1970's by the four Neutron Data Centers as an international index to the neutron data; the compilation scheme remained essentially unchanged until 1998.

In the meantime, the Nuclear Reaction Data Network had evolved from the original four centers to a group of thirteen centers involved in the compilation of nuclear reaction data for incident charged particles and photons, in addition to neutrons. The need for an index that would allow the inclusion of all reaction data, and the need to update the format for the year 2000 lead to a complete redesign of the bibliographic system.

The new system is more compatible with EXFOR/CSISRS, and has adopted many of the same the codes used in this database, thereby eliminating the need for users of nuclear reaction data to learn different sets of notation when accessing the bibliographic and data files.

INTRODUCTION

CINDA2001 is a computerized bibliographic file containing references to information on nuclear reactions. Included are references to measurements, calculations, evaluations, and reviews of nuclear reaction and other related data. In the case of experimental or evaluated data, references to the databases where the actual values may be obtained are also included.

Identical copies of this database are maintained by the four core centers in the Nuclear Data Center Network.[2] These master files are updated periodically and exchanged among the centers. Retrievals from CINDA2001, as well as the experimental and evaluated databases, are available through the Internet using World Wide Web or by direct access using TCP/IP's TELNET command.[3]

[1] CINDA was designed by Herbert Goldstein, a professor in the Department Of Applied Physics and Engineering at Columbia University, see Nuclear Development Corporation of America report NDA 2-80 (1958).

[2] These core centers are: the US National Nuclear Data Center, the NEA Data Bank, the IAEA Nuclear Data Section, and the Russian Nuclear Data Center at Obninsk. See Appendix A for complete information on the Nuclear Reaction Data Centers.

[3] See Appendix A for access to your nearest data center.

The information in the CINDA2001 Database is obtained from scanning the available literature, both published and unpublished. Coverage is "complete" for neutron data from 1935 to the present. Coverage for charged-particle data is nearly complete for 1980 to the present, and less complete before 1980. Coverage for photon-induced data is taken from Photonuclear Data[4] which covers the period 1976 to the present.

This manual is intended to be a complete guide to the indexing of information in the CINDA2001 system.

CINDA2001 EXCHANGE FORMAT

The CINDA2001 exchange file consists of a series of 125-character record plus a header record which gives information about the attached file. The format of the header record is:

Columns	Content	Use
1-5	ID	CINDA
6	*(blank)*	
7-15	Type of file	READER or EXCHANGE; left-adjusted
16-22	Exchange number	Area code, number of exchange for area; right-adjusted.
23-33	Date of exchange	8-digit right-adjusted integer: year, month, day (YYYYMMDD)
34-44	Number of records on file	Right-adjusted integer

Files transmitted will be either exchange files or reader files. The format of these files is the same, but the content will differ slightly; the differences are noted under the sections on the appropriate fields.

Exchange files consist of records produced for transmitting entries from a center's own area of responsibility.

Reader files contain records produced by the transmitting center for an area outside its responsibility and transmitted to the responsible center for addition to its database. After the update of its database, the records will be transmitted by the responsible center to all other centers.

[4] V. V. Varlamov, V. V. Sapuchenko, M. E. Stepanov, **Photonuclear Data 1976-1995**, Photonuclear Experimental Data Center, Moscow University (1996).

The fields given in the CINDA2001 exchange format are as follows.

Columns	Contents	Formats	Example
1	Operation code	A1	As in CINDA
2-8	Target Nucleus	2I3,A1	Target Z, A, isomeric state (ZZAAAM)
9-23	Reaction	A15	Generally, EXFOR REACTION SF2-SF4
24-27	Quantity	A4	From DANIEL Dictionary 13.
28-33	Institute	A6	EXFOR code without area code
34-37	Block #	A1,I3	Area code, followed by center assigned block #
38-39	Sequence #	I2	Sequence within block (blank on Reader files).
40	Work type	A1	As in CINDA[5]
41	Reader code	A1	At discretion of center (blanks allowed)[6]
42-55	Energy range	2(E7.1)	Minimum, maximum energy (±n.n±ee)
56	Hierarchy code	I1	Hierarchy for references
57-85	Reference	A23,I6	Type: as in CINDA (A1), Reference code: as in EXFOR (A22), Date: year and month (YYYYMM)
86-125	Comment	A40	As in CINDA

Updates to the formats must be agreed upon by the four core centers.

Any codes to be used in CINDA2001 are included in dictionaries contained in the DANIEL dictionary database. Updates to the dictionaries must be submitted before any code not given in these dictionaries may be used on a CINDA2001 exchange file.

Details for the coding and content of each of the above fields are given on the following pages.

[5] With the exception that the mixed mode codes will be eliminated. For example, entries for theoretical calculations will be separated from experimental data.

[6] That is, centers may choose not to use a reader code.

OPERATION CODE (Column 1)

The operation code is a signal to the database update code as to what operation must be performed. The following list contains the legal operation code and their use.

Code	Meaning	Exchange Use	Reader Use
A	Add record	Block number and sequence number must be specified	Block number may be specified; sequence number must be blank.
D	Delete record	Block number and sequence number must be specified	Block number and sequence number must be specified.
M	Modify record	Block number and sequence number must be specified	Block number and sequence number must be specified

The remainder of the record must be complete for both reader and exchange format.

TARGET NUCLEUS (Columns 2-8)

The target nucleus is given as 2 three-digit integers (Z and A) , both right-adjusted in their field, plus an isomeric state code. All legal Z, A codes are found in DANIEL Dictionary 27. The isomeric state code is blank for a nucleus in the ground state, and consists of the metastable state code M for a nuclide in a metastable state.

For compound nucleus properties, *e.g.*, resonance parameters, the nucleus entered is the target for the reaction(s) analyzed.

For a theoretical work giving systematic trends over many nuclei, the code MNY may be used in the A field; use Z equal to 999. The code MNY may be used either in place of, or in addition to, separate entries for the individual nuclei.

Naturally occurring elements

For naturally occurring elements that contain a mixture of isotopes, a zero is entered in the A-number field. For monoisotopic elements, the Z and A of the isotope are given. For nearly monisotopic elements, *i.e.*, for elements where the principal isotope is more than 99% of the natural isotopic mixture, the Z,A of that isotope may be given if the contribution from other isotopes to the reaction given is negligible.

Compounds and Mixtures

For compounds and mixtures, a 3-character compound code is given instead of the A number and is left adjusted in the field. Single element compounds, *e.g.*, molecular hydrogen, should not be coded as compounds. If information is deduced for a constituent element of a compound or mixture, it should be entered under that element.

The general code zzzCMP, where zzz is the major component of the compound, may be used if the compound is not given specifically in the dictionary. The name of the compound should be given in the comment. If more than one element may be considered a major component, choose the element with the highest Z number.

For data given for mixed fission products, *i.e.*, an aggregate of those fission products produced in a given fission reaction, the code FPR is given in place of the A value; use Z equal to 999.

REACTION (Columns 9-23)

The code for reaction is given as two fields: incident and outgoing, generally, the same as EXFOR REACTION SF2 and SF3. However, in some case, information from reaction SF4 will be included in the outgoing field.

The incident field contains one of the following:

1. A particle code from DANIEL Dictionary 33 which contains a non-blank character in the third position of the Allowed Subfield field, *e.g.*, P or HE3.;

2. A chemical symbol and A-number (SSAAAM) from DANIEL Dictionary 27 which contains a non-blank character in the third position of the Nuclide Uses field; for a nucleus in a metastable state the code is followed by an M, *e.g.*, CL 35 or AM242M.

The outgoing field contains one of the following.

1. A particle code from DANIEL Dictionary 33 which contains a non-blank character in the fourth position of the Allowed Subfield field, *e.g.*, P or HE3;

2. A nuclide code, *i.e.*, chemical symbol and A-number (SSAAA) taken from DANIEL Dictionary 27 which contains a non-blank character in the fourth position of the Nuclide Uses field; for a nuclide in a metastable state, the code is followed by the code M, *e.g.*, CL 35 or AM242M;

3. A process code taken from DANIEL Dictionary 30, *e.g.*, TOT or EL, with the addition of the code PRD for product yield, *e.g.*, X+PRD.

4. A combination of the above with the codes separated by a "+". The order of codes is: particles ordered from lightest to heaviest,[7] followed by nuclide codes ordered from lightest to heaviest, followed by process codes in alphabetical order. The exception to this rule is: when the order in which the reaction proceeds is given explicitly, the codes are given in that order.

5. For complete evaluations covering many reactions, and given over a defined energy range, the code **EVAL** may be entered in the outgoing field.

6. For complex reactions with many outgoing particles, the code **CMPLX** may be used in this field in place of all other codes.

QUANTITY (Columns 24-27)

The legal quantity codes are given in DANIEL Dictionary 45.

For complete evaluations, covering many reactions and quantities, this field contains the code EVL.

INSTITUTE (Columns 28-33)

The institute is given as a six-character code consisting of a country code followed by an institute code. These codes are found in DANIEL Dictionary 3, CINDA Code field.

If more than one institute is involved in the work, the main institute is given. The main institute is defined as the institute at which the principal investigator resides, or the institute at which the work was done. Links to the other institutes are given on Institute Cross Reference Records (hierarchy 9, see Hierarchy Code). An entry is made for each institute containing at least one reference.

BLOCK NUMBER (Columns 34-37)

The block number consists of the area code for the responsible center, followed by a three-digit block number, *e.g.*, L198. The area codes to be used are those assigned for EXFOR.

The block number is assigned only by the center responsible for the entry.

[7] Lightest to heaviest is defined as in order of lightest Z, then in order of A.

SEQUENCE NUMBER (Columns 38-39)

The Sequence Number is a 2-digit, right-adjusted integer denoting the sequence within a block. It is assigned ***only*** by the center responsible for the entry.

WORK TYPE (Column 40)

The one-character Work Type code gives the type of work referenced, *e.g.*, experimental, evaluated. For a reference containing more than one type of work, a separate block should be entered for each type, for example, an experimental work in which extensive[8] model calculations were done.

READER CODE (Column 41)

A one-character Reader Code may be used, at the discretion of the entering center, to identify the compiler of the entry. This field may be left blank. A list of current and formerly used Reader Codes is given in Dictionary 47.

ENERGY RANGE (Columns 42-55)

The energy range field consists of two floating-point numbers (2E7.1) which give the minimum and maximum energies for the data referenced. If the data is presented only at one energy, it is given in the first field; the second field is blank. If an upper limit only is known, it is given in the second field; the first field is blank.

If only the approximate range is known, only the exponents are entered.

A five-character code is used to define the energy for spectrum-averaged values. A list of all legal codes is given in DANIEL Dictionary 48.

If the reference covers two or more distinct energy ranges that may be viewed as separate experiments or calculations, separate entries should be made. *Example*: a measurement at thermal energy of Maxwellian-averaged cross section and a separate measurement over the energy range 5 eV to 6 keV.

If no information on the energy is given, the code NDG (no data given) is used.

For quantities for which an incident energy is meaningless, *i.e.*, nuclear and spontaneous fission quantities, both fields are left blank.

[8] By extensive is meant that each work is extensive enough to warrant publication on its own. For example, a comparison of measured angular distributions with optical model calculations is not regarded as fulfilling this criterion. This comparison should be noted in the comment for the experimental data.

HIERARCHY CODE (Column 56)

The one-digit Hierarchy code is used to distinguish between different types of records, or to denote the importance of a reference. Valid hierarchy codes are defined in the following table.

Code	Use
1	Main publication. Assigned only to a publication known to be the definitive publication.
2	Published reference (journal or conference proceeding).
3	Other major reference, such as, complete laboratory report or a thesis.
4	Translation for reference with hierarchy 1-3.
5	Minor reference, such as, a progress report, a meeting abstract, or a private communication.
6	Data index entry. A reference to an entry in a data library which gives the numerical data referenced in the block.
8	A reaction product record. Gives, in the Comments field, a list of the reaction products measured in a nuclide production or fission product yield measurement (SSAAAM), separated by commas. The energy and reference fields are blank.
9	An institute cross-reference record. Lists, in the Comments field, codes for other institutes involved in the producing the data, separated by commas. The energy and reference fields are blank.

REFERENCE (Columns 57-85)

The reference consists of three fields: reference type, reference code, and reference date. The format of the reference field depends on the reference type. The exceptions are:

For Hierarchy 8 and 9 records, the entire reference field is blank.

Reference type (Column 57)

The Reference Type consists of a one-character code taken from DANIEL Dictionary 4.

Reference Code (Column 58-79)

In general, references are coded as for EXFOR and use the same dictionaries and codes. See the EXFOR Manual for coding rules, and DANIEL Dictionaries 5-7 for document codes.

1. For reference type codes 0 and 4:
   - columns 58-62 EXFOR
   - columns 63-67 EXFOR Accession number (or 00000, if unassigned)
   - column 68 full stop (.)
   - column 69-71 EXFOR Subaccession number

2. For reference type code 3:
   - columns 58-63 evaluated file name (see DANIEL Dictionary 44)
   - columns 64-79 version number, data set number.

Reference Date (Column 80-85)

The reference date is given as an 6-digit integer: 4-digit year, 2 digit month (YYYYMM). If the month is not known, it may be omitted.

COMMENTS (Columns 86-125)

Comments for reference records should start with the first author's last name, terminated with a full stop (.) for a single author or a plus sign (+) for multiple authors. If no author is known, column 86 should contain a full stop.

The author's name is followed by additional, abbreviated information about the work.

The comment should contain information on whether and how the data is presented in the reference.

Examples: NDG (no data given)
GRPH (graphs)
TBL (table)

For allowable character set and translation of Cyrillic characters, see EXFOR Manual, Chapter 1.

Comments for the data index lines should contain:
for EXFOR, the number of data lines, and type of data;
for evaluations, the evaluator.

For Hierarchy 8 and 9 records, the comment filed has a special significance, see Hierarchy Code.