WP 2004-4
(CP-D/412 and CP-N/28)

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Memo CP-D/412

Date: 15 September 2004
To: Distribution
From: V.Zerkin

In reply to: Memo CP-N/28, H. Henriksson, 13 September 2004

SUBJECT: Experiences and remarks on the transition to CINDA2001.

There were 3 questions in the MEMO CP-N/28 from Hans Henriksson, NEA Data Bank concerning transition from old CINDA to new CINDA in NEA.

1. Can new Q values be added when no match is found (e.g. 'XXX', 'XX1', 'XX2')? Can text analysis of the Comments section be used? Should the original references be examined?

Unresolved issue with multiple translation of old CINDA to new <Reaction, Quantity> was solved in NDS/NNDC version of CINDA database by keeping the old Quantity codes in the new CINDA (users can retrieve data by old Quantity codes). New Quantity is defined for such cases as <Blank>. If user wants to retrieve by a new Quantity, code=<Blank> is used with Boolean .OR. in addition to the code defined by user. This means that user can find more data than he expected and therefore check-box "search old Cinda" records can be introduced. (Last feature is not yet implemented.)

2. Should multiple CINDA blocks be created when a non-unique SF6 is found? If so (as has been done at the NEA), then should the EXFOR line in CINDA be updated with the sub-work number?

Generally, we have decided not to do deep analysis (using EXFOR) during conversion.

3. Should new CINDA2001 blocks be created from charged particle induced reactions found in EXFOR?

Yes, it was done in NDS and available on our EXFOR-CINDA CD-ROM and on NDS Web-site since mid-2004.

General remark.

One general remark seems to be needed just to clarify status and possible directions of development of our cooperation. NRDC Network at the beginning was organized to exchange data between Nuclear Data Centers; so having agreement, data formats and protocols we suppose to have the same data libraries. Concerning further business of implementation (like software development, database schema, selection of environment, etc.) Data Centers only informed each others when found this to be useful for them; co-operation in those areas were voluntarily on bilateral basis and co-ordination was not really organized. As result, now Data Centers have partially common software, partially own software which they do not share with others (of course, in many cases, like Retrieval Software, it is dictated by differences in users' needs). Moreover, Data Centers have slightly different data in libraries (EXFOR) and additional work has to be done to merge them.

New CINDA. Migration to the new format and all related problems coincided with Migration Project (from VMS/DBMS to relational databases) being performed by collaboration between NDS-IAEA and NNDC-BNL. CINDA migration was not on first priority in that collaboration, but it was done and presented for user community on CD and Web this year (some maintenance features still have to be finished). Of course, it can be improved and changed if it will be found useful and reasonable.

At the end, it would be great, if we can agree about common approach to database part of our business, adopt a common database schema, intensify software exchange, etc., but since it is beside of the NRDC mandate (scope), we can either expand the scope or continue coordinate our efforts and decisions in this area on bilateral/group basis.

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MEMO CP-N/28

DATE: 13 September 2004
TO: Distribution
FROM: H. Henriksson
SUBJECT: Experiences and remarks on the transition to CINDA2001.

Abstract

As a part of the CINDA2001 transition work, a set of two programs have been developed to convert the current CINDA records database table to the new format, which includes the new reaction string formalism. To achieve this, a dictionary has been used where each CINDA quantity (old Q) is given a corresponding new reaction string (SF2, SF3) and a CINDA2001 quantity (new Q). However, for some cases there is more than one possible new Q value for a specific old Q value thus introducing an ambiguity, i.e. when converting CINDA data to the CINDA2001 format, multiple new Q values are possible. This problem can be solved, if the block under examination has a corresponding EXFOR work, thus the exact new Q value is derived from the EXFOR SF6. If the new Q value cannot be determined 'XXX', 'XX1' or 'XX2' are inserted as the new Q value depending on the point at which the program cannot determine the correct new Q. The characters are inserted in order to allow these data to be easily distinguished for future manual processing.

Tables 1 and 3 presents the different groups that are used to sort the CINDA blocks. Results are presented (Tables 2 and 4, and Appendices 1 and 3) together with a schematic flow chart of the transition work (Figure 1) and an example of the log file from the transition program (Appendix 7). The dictionary used for the new CINDA quantities is listed in Appendix 4 the dictionaries 45 and 47 from dictionary file 9185 are presented in Appendices 5 and 6, respectively, for comparison.

Introduction

Both CINDA2001 transition programs read the CINDA records as a set of blocks. A CINDA block is a group of database rows which have the same Z, A, Q, Country, Lab and Block No. A CINDA block is determined to be EXFOR-related if one of the rows in the block has its reference type field equal to 4. Hence, the CINDA blocks being considered are split into those containing an EXFOR reference line and those which do not. In the same way, either it is ambiguous (as explained above, with more than one possible new Q value for a specific old Q value in the dictionary) or not (which makes it OK). When we combine these two criteria, a CINDA block falls into one of four groups according to Table 1 below.

Table 1. Groups used in the transition between the CINDA and CINDA2001 format, to illustrate the possible cases of correspondence.

Group:		Description
1.	Unique Q correspondence (no EXFOR work)	Direct conversion between old and new Q values exists, even if there is no EXFOR data available.
2.	Unique Q correspondence (with EXFOR work)	Direct conversion between old and new Q values exists, and related EXFOR work exists.
3.	Ambiguous new Q (no EXFOR work)	Ambiguous relationship between old and new Q values, and there are no related EXFOR works.
4.	Ambiguous new Q (EXFOR work exist)	Ambiguous relationship between old and new Q values, but EXFOR work exists and the ambiguity may be resolved.

The main transition program reads all CINDA data block by block. For each block the program determines in which of the above-mentioned groups it falls and this entire block is converted to the new CINDA2001 format as explained below. If it is not ambiguous (i.e. OK), the corresponding reaction string is found with the new Q value from the correspondence dictionary (Appendix 4) and this entire block is inserted into the CINDA2001 database table (Groups 1 and 2). If the block is ambiguous but no related EXFOR work exists, the block is inserted with its corresponding reaction string value from the dictionary but with an 'XXX' as the new Q value (Group 3). If the block is both ambiguous and EXFOR-related, this block is written to a file to be processed by the second transition program concentrating on the EXFOR-information (Group 4). Finally, the number of processed blocks in each of the four groups is reported and the results are split by the four working areas, see Table 2. In Appendix 1, the results are presented slightly different. The CINDA blocks in the four groups are here presented split into the different old Q-values.

Table 2. Summary of the work on the transition from CINDA to CINDA2001 split into blocks from the four areas.

Area	1. Unique Q (no EXFOR work)	2. Unique Q (EXFOR work)	3. New Q = XXX (no EXFOR data)	4. Ambiguous (EXFOR work)	Sum
1	17939	11161	7617	3797	**40514**
2	22898	6076	9472	4835	**43281**
3	13993	1924	8408	2481	**26806**
4	15663	4609	6733	1827	**28832**
Total	**70493**	**23770**	**32230**	**12940**	**139433**

A second program reads the ambiguous CINDA blocks where corresponding EXFOR information can be found (Group 4) and tries to resolve the ambiguity by looking into the related EXFOR data applying certain matching rules. These rules are described below and attached as Appendix 2.

Table 3. Groups used for the CINDA blocks where EXFOR related work exists.

Group:	Description
4.1. No Match	Related EXFOR data within the EXFOR work could not be found.
4.2. Match with rules	Related EXFOR data found and the ambiguity resolved when applying matching rules.
4.3. Ambiguous match	Related EXFOR data found but the ambiguity was not resolved.

To resolve the ambiguities, the program tries to find the exact EXFOR work that matches the CINDA block (i.e. the EXFOR data with the same values of Z, A, Work and Sub-work numbers as in the CINDA block). From the EXFOR database the SF6 value allows the new Q value to be determined. To achieve this, SF2 and SF3 values of the EXFOR work are compared to the corresponding reaction string (SF2, SF3) found in the correspondence dictionary (given in Appendix 4).

Work order:

The SF2 part is checked.

a) If the SF2 part (usually neutron - N) does not match the program marks that block as 'Ambiguous match' at once and writes it to a file for future manual processing. The new Q value for this group is 'XX1'.

The SF3 part of the reaction string is then considered.

b) If a direct match is found from the SF3, the new Q value is determined from the SF6 value, if unique. For the cases where multiple SF6 values exist, the transition program creates new CINDA lines for each match in the sub-works of the EXFOR work. For example, a CINDA block coded with Q='N2N' could link to multiple EXFOR sub-works containing SIG, DA, DE etc. in SF6. In principle the EXFOR sub-work can be inserted in the new CINDA line (instead of only the EXFOR work).

The program continues applying the following modifications to help in finding a match.

c) The SF3 information from the EXFOR work is split if a '+'-sign exists (so as to compare A+B and B+A).

d) Any digit multipliers (**except for 'N2N'**) are removed (e.g. '12' is removed for SF3 ='12N').

e) An 'X+' or '+X' in the dictionary SF3 is treated as a wildcard character, e.g. if the dictionary contains 'X+P' for SF3, any EXFOR SF3 value will be considered as a match as long as it has a P in it.

f) If SF6 contains a combination of quantity codes the new Q value is created appropriately, e.g. DA/DE becomes DAE, DA/DA/DE also becomes DAE.

g) An additional rule concerns the spontaneous fission: if in dictionary 47 (see Appendix 4), there is one line with a '*' (i.e. for NU, NUD, NUF, SFN, SFG, FPG, FPB, NFY, FRS, CHG) and the E field has 'SPON', the translation will be (0,F) instead of (N,F).

h) Equally the EXFOR SF4 field is also checked when the 'X' character appears in the retrieved EXFOR SF3 to see if the required particle is coded here, e.g. 'X+P' in the dictionary matches '(N,X)1-H-1' in the EXFOR reaction. A complete list of matching criteria is presented in Appendix 2.

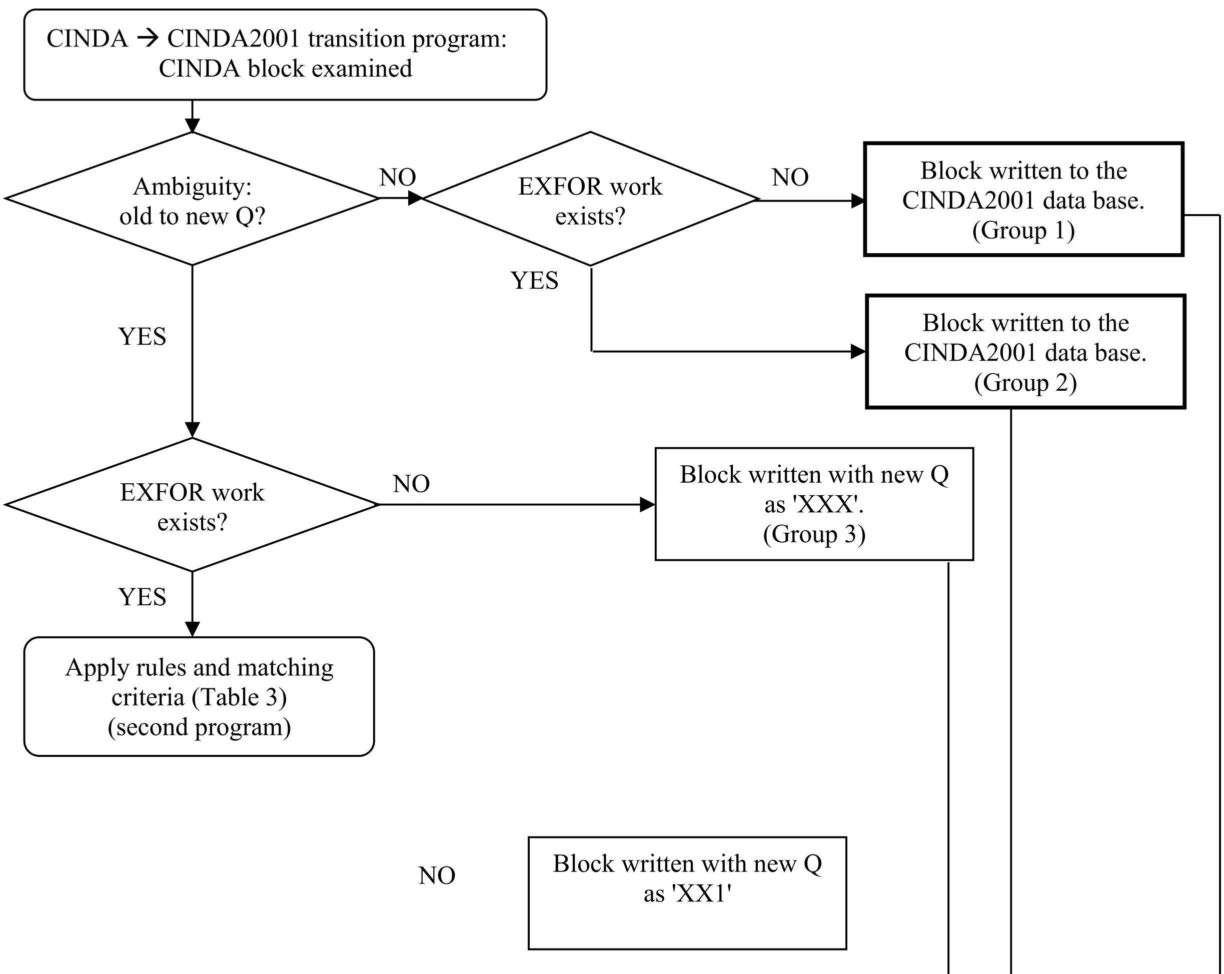
i) If the ambiguity is resolved after applying one of the above rules, the block is inserted into the CINDA2001 table with its reaction string and new Q value, determined from the SF6 value. If not, the block is reported as ambiguous and inserted with 'XX2' as the new Q value.

Finally, the program reports the number of processed blocks (see Table 4 below) in a similar manner as the main program, here, divided into three columns (groups 4.1-4.3) instead. The same results, divided into Old Q-values, are presented in Appendix 3. An excerpt of the log file from the second transition program, where CINDA blocks where the old Q = 'NT', is shown in Appendix 7.

For a visual explanation of the transition work, a flow chart is shown below in Figure 1, as an illustration of the description given above.

Table 4. Summary of transition results of CINDA blocks where the the EXFOR work is ambiguous (group 4 in Tables 1 and 2 above), after applying processing rules described in Table 3.

Area	4.1 No match	4.2 Match with applied rules	4.3 Match is ambiguous	Sum
1	162	3527	108	**3797**
2	330	4384	121	**4835**
3	123	2336	22	**2481**
4	75	1684	68	**1827**
Total	**690**	**11931**	**319**	**12940**



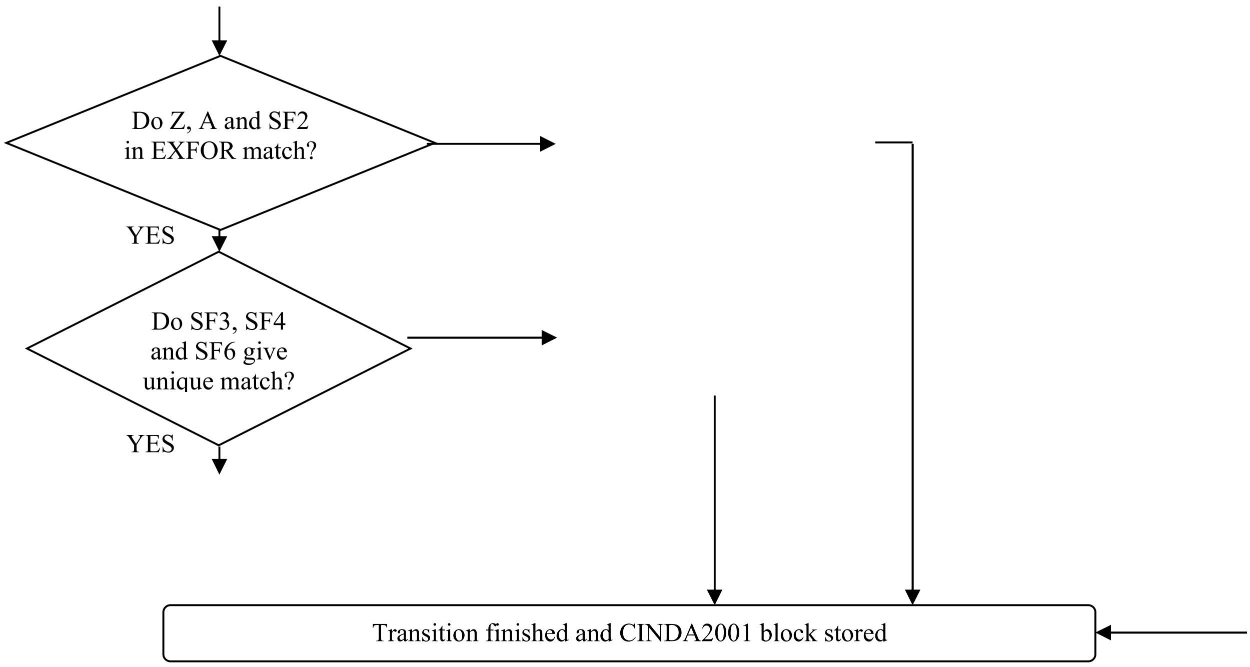


Figure 1. Schematic flow chart of the set of transition programs for the CINDA to CINDA2001 conversion.

Summary and final remarks

According to Table 1, about 68 % of the CINDA database can be directly converted to CINDA2001, of which about 51 % of the CINDA blocks have unique corresponding new Q values and 17 % are identified directly by the related EXFOR work.
Among the remaining 32 % of the CINDA blocks, 9 % have corresponding EXFOR works but there is some ambiguity (group 4). In this group the new Q value can be found for as many as 92 % of the CINDA blocks, when applying certain rules of transition concerning the SF2, SF3, SF4, and SF6 values (see text and Appendix 2). The dictionary used for this transition work (Appendix 4) was compared with the suggested dictionary 47 from file 9185 in Appendix 6. Here, the new Q values in **bold** face in the last column differ.

Of the remaining CINDA blocks in group 4, we only have about 1000 blocks to check manually, or 0.7 % of the total number of CINDA blocks. The total number for each area is between 150 and 450 blocks.

This work suggests that the CINDA2001 transition should be smooth and that most of the new CINDA2001 blocks will contain valid new Q values. Some questions remain though:

> ***Can new Q values be added when no match is found (e.g. 'XXX', 'XX1', 'XX2')? Can text analysis of the Comments section be used? Should the original references be examined?***
>
> ***Should multiple CINDA blocks be created when a non-unique SF6 is found? If so (as has been done at the NEA), then should the EXFOR line in CINDA be updated with the sub-work number?***
>
> ***Should new CINDA2001 blocks be created from charged particle induced reactions found in EXFOR?***

Acknowledgements

The work has been developed at the NEA thanks to Mark Kellett, Tuncay Ergun has written the transition programs with comments from Pierre Nagel.

Appendix 1.

Summary of transition results divided on the old CINDA quantity.

Old Q value	1. Unique Q (no EXFOR work)	2. Unique Q (EXFOR work)	3. New Q = XXX (no EXFOR data)	4. Ambiguous (EXFOR work)
TEM	0	0	45	36
NND	0	0	61	15
NNT	0	0	69	41
DEM	0	0	74	30
NHE	0	0	161	108
FPB	0	0	189	0
AEM	0	0	256	151
PEM	0	0	279	137
NNA	0	0	302	99
NT	0	0	431	300
SCT	0	0	497	200
FPG	0	0	526	15
ND	0	0	534	277
NEM	0	0	621	316
NEG	0	0	639	352
NNP	0	0	714	373
SFN	0	0	726	130
NXN	0	0	934	91
DNG	0	0	1445	984
GN	0	0	1815	9
TSL	0	0	2131	541
DIN	0	0	3301	1566
NA	0	0	4077	1818
N2N	0	0	5833	2533
NP	0	0	6570	2818
NX	63	55	0	0
ETA	221	83	0	0
NUF	223	18	0	0
SFG	261	7	0	0
ALF	366	118	0	0
RIF	455	91	0	0
RIG	486	109	0	0
CHG	529	60	0	0
POT	559	242	0	0
GF	662	1	0	0
POL	861	363	0	0
NUD	894	132	0	0
SNE	977	428	0	0
ABS	1401	357	0	0
NU	1542	363	0	0
FRS	1815	311	0	0
SIN	1836	354	0	0
NFY	2528	1096	0	0
SEL	2536	1353	0	0
RIA	3393	982	0	0
STF	3468	1152	0	0
DEL	3705	1983	0	0
LDL	4110	440	0	0
NF	4292	1193	0	0
TOT	4589	4148	0	0
SNG	4889	626	0	0
EVL	5557	0	0	0
RES	5796	2795	0	0
NG	12479	4910	0	0
Total	**70493**	**23770**	**32230**	**12940**

Appendix 2.
Processing rules for matching CINDA2001 blocks which have a related EXFOR work (group 4).

CINDA2001		EXFOR information
New Q		**SF4:**
NEM	→	0-NN-1
NEG	→	0-G-0
PEM	→	1-H-1
DEM	→	1-H-2
TEM	→	1-H-3
AEM	→	2-HE-4
NHE	→	2-HE-3
NNT	→	1-H-3
NT	→	1-H-3
DIN	→	0-NN-1
NP	→	1-H-1
NT	→	1-H-3
ND	→	1-H-2
NA	→	2-HE-4
DNG	→	0-G-0
DNG	→	INL
ND	→	N+P
NT or NNT	→	1-H-4 or T
NHE	→	Z-2,A-2
		SF6:
SIG	→	CS
DA/DE	→	DAE
D3A	→	DAE

Appendix 3.
Summary of transition results after applying processing rules, divided on the old CINDA quantity.

Old Q value	4.1 No match	4.2 Match with applied rules	4.3 Match is ambiguous
NXN	0	87	4
NND	1	11	3
FPG	2	13	0
NNT	2	39	0
NHE	3	105	0
SFN	3	127	0
DEM	5	24	1
TEM	5	31	0
SCT	7	150	43
GN	9	0	0
AEM	9	141	1
PEM	10	125	2
NNA	12	81	6
NT	13	284	3
NEM	17	297	2
NEG	24	307	21
TSL	36	455	50
ND	45	199	33
NNP	64	268	41
NA	70	1718	30
DNG	75	904	5
DIN	84	1458	24
N2N	93	2414	26
NP	101	2693	24
Total	**690**	**11931**	**319**

Appendix 4:
Modified CINDA dictionary (based on dictionary 47) used for the transition programs described in this memo.

Old Q	Reaction string	New Q						
SEL	N,EL	CSP						
DEL	N,EL	DA						
POL	N,X	POL						
POT	N,EL	CS						
SIN	N,INL	CS						
DIN	N,INL	XXX	CS,	DA,	DE,	DAE		
SCT	N,SCT	XXX	CS,	DA				
N2N	N,2N	XXX	CS,	DA,	DE,	DAE		
NXN	N,XN	XXX	CS,	DA,	DE,	DAE		
NEM	N,X+N	XXX	CS,	DA,	DE,	DAE		
NG	N,G	CS						
RIG	N,G	RI						
SNG	N,G	SP						
DNG	N,INL+G	XXX	CS,	DA,	SP			
NEG	N,X+G	XXX	CS,	DA,	SP			
NP	N,P	XXX	CS,	DA,	DE,	DAE,	SP	
NNP	N,N+P	XXX	CS,	DA,	DE,	DAE,	SP	
PEM	N,X+P	XXX	CS,	DA,	DE,	DAE		
ND	N,D	XXX	CS,	DA,	DE,	DAE,	SP	
NND	N,N+D	XXX	CS,	DA,	DE,	DAE,	SP	
DEM	N,X+D	XXX	CS,	DA,	DE,	DAE		
NT	N,T	XXX	CS,	DA,	DE,	DAE,	SP	
NNT	N,N+T	XXX	CS,	DA,	DE,	DAE,	SP	
TEM	N,X+T	XXX	CS,	DA,	DE,	DAE		
NHE	N,HE3	XXX	CS,	DA,	DE,	DAE,	SP	
NA	N,A	XXX	CS,	DA,	DE,	DAE,	SP	
NNA	N,N+A	XXX	CS,	DA,	DE,	DAE,	SP	
AEM	N,X+A	XXX	CS,	DA,	DE,	DAE		
NF	N,F	CS						
RIF	N,F	RI						
ALF	N,ABS	ALF						
ETA	N,ABS	ETA						
NU	N,F	NU						* If Energy = SPON -> 0,F
NUD	N,F	NUD						*
NUF	N,F	NUF						*
SFN	N,F	XXX	SP,	E				*
SFG	N,F	SP						*
FPG	N,F	XXX	SP,	E,	PY			*
FPB	N,F	XXX	SP,	E,	PY			*
NFY	N,F	FY						*
FRS	N,F	SP						*
CHG	N,F	CHG						*
TOT	N,TOT	CS						
SNE	N,NON	CS						
NX	N,X	CS						
ABS	N,ABS	CS						

RIA	N,ABS	RI					
RES	N,0	RP					
STF	N,EL	RP					
LDL	0,0	NQ					
GN	G,N	XXX	CS,	DA,	DE,	DAE,	SP,
GF	G,F	MFQ					
EVL	N,X	EVL					
TSL	N,THS	XXX	CS,	L			

Appendix 5:
Dictionary 45 from dictionary file 9185.

Old Q	New Q	Description
ALF	MFQ	Alpha
AMP	L	Length or amplitude
COR	COR	Angular correlation
CS	CS	Cross section
CSN	CSP	Differential with respect to number of particles
CSP	CSP	Partial cross section
CST	CST	Temperature dependent cross section
D3A	DAE	Triple differential dAngle1/dAngle2/dE'
D3E	DAE	Triple differential dAngle/dE1'/dE2'
D4A	DAE	Quadruple diff. dAng1/dAng2/dE1'/dE2'
DA	DA	Differential d/dAngle
DAA	DA	Double differential dAngle1/dAngle2
DAE	DAE	Double differential dAngle/dE'
DAP	DAP	Partial differential d/dAngle
DAT	DA	Temperature-dependent Legendre coefficient
DE	DE	Differential d/dE'
DEP	DEP	Energy spectrum for specific group
DP	DE	Diff. by linear momentum of outgoing part.
DT	DA	Diff. by 4-momentum transfer squared
EC	COR	Energy correlation
EMC	COR	Effective mass correlation
ETA	MFQ	Eta
FRS	FY	Fragment spectra
FY	FY	Fission product yield
INT	INT	Cross section integral over incident energy
KE	E	Kinetic energy
KER	SQ	Kerma factor
LMC	COR	Partial linear momentum correlation
MLT	MLT	Multiplicity
NQ	NQ	Nuclear quantity
NU	MFQ	Nu
NUD	MFQ	Nu delayed
POL	POL	Polarization
POD	POL	Differential polarization
POT	CS	Potential scattering
PY	PY	Product yield (other than fission)
RI	RI	Resonance integral
RP	RP	Resonance parameter
RR	RR	Reaction rate
SIF	SQ	Self indication
SPC	SP	Gamma spectrum
TSL	CS	Thermal scattering
TT	TT	Thick target yield
TTD	TTD	Differential thick target yield, d/dAngle
TTP	TTP	Partial thick target yield

<u>Appendix 6:</u>
Dictionary 47 from dictionary file 9185.

Old Q	Reaction	New Q		New Q (as used by NEA) (see Appendix 4)
SEL	N,EL	CS		**CSP**
DEL	N,EL	DA		DA
POL	N,X	POL		POL
POT	N,EL	POT		**CS**
SIN	N,INL	CS		CS
DIN	N,INL			XXX
SCT	N,SCT			XXX
N2N	N,2N			XXX
NXN	N,XN			XXX
NEM	N,X+N			XXX
NG	N,G			**CS**
RIG	N,G	RI		RI
SNG	N,G			**SP**
DNG	N,INL+G			XXX
NEG	N,X+G			XXX
NP	N,P			XXX
NNP	N,N+P			XXX
PEM	N,X+P			XXX
ND	N,D			XXX
NND	N,N+D			XXX
DEM	N,X+D			XXX
NT	N,T			XXX
NNT	N,N+T			XXX
TEM	N,X+T			XXX
NHE	N,HE3			XXX
NA	N,A			XXX
NNA	N,N+A			XXX
AEM	N,X+A			XXX
NF	N,F	CS		CS
RIF	N,F	RI		RI
ALF	N,ABS	ALF		ALF
ETA	N,ABS	ETA		ETA
NU	N,F	NU	* If Energy = SPON -> 0,F	NU
NUD	N,F	NUD	*	NUD
NUF	N,F	NU	*	**NUF**
SFN	N,F	NU	*	**XXX**
SFG	N,F	SPC	*	**SP**
FPG	N,F	SPC	*	**XXX**
FPB	N,F	SPC	*	**XXX**
NFY	N,F	FY	*	FY
FRS	N,F	FRS	*	**SP**
CHG	N,F	FY	*	**CHG**
TOT	N,TOT	CS		CS
SNE	N,NON	CS		CS
NX	N,X			**CS**
ABS	N,ABS	CS		CS
RIA	N,ABS	RI		RI

RES	N,0	RP	RP
STF	N,0	RP	RP
LDL	0,0	NQ	NQ
GN	G,N		XXX
GF	G,F		**MFQ**
EVL	N,X	EVL	EVL
TSL	N,THS	TSL	XXX

APPENDIX 7.

Excerpt from log from second transition program for CINDA old Q = 'NT'

```
----------------------------------------------------------------------------------------------
MATCHAMB:
   ID Z   A   Q   COU LAB BLK H W R RDATE  REFERENCE      COMMENTS
  90271 3   6   NT  UK  HAR 150 1 E J 197010 JNE24323      SOWERBY+ TOF REL TO B-10 NA
  90272 3    6    NT   UK   HAR  150  3  E  C  197006  70HELSIN1  161    SOWERBY+26.  EXPTL+RECOMMENDED
SIG(E)
  90273 3   6   NT  UK  HAR 150 5 E R 197003 AERE-R-6316    SOWERBY+ SIG REL B-10 TBL GRPH
  90274 3   6   NT  UK  HAR 150 6 E 4 197601 EXFOR20462.    86PTS.SIGMA.

WORK  SUB Z   A   Q   LAB SF2      SF3       SF4            SF6         REACTION
20462 2   3   6   NA  HAR N        A                        SIG         (N,A),,SIG
20462 3   3   6   NA  HAR N        A                        SIG         (N,A),,SIG

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NOMATCH:
   ID Z   A   Q   COU LAB BLK H W R RDATE  REFERENCE      COMMENTS
  92797 3   6   NT  USA LRL 776 3 E J 197608 NSE60383       CZIRR. RATIO WITH U235 NF. TBL,GRPH.
  92798 3   6   NT  USA LRL 776 6 E 4 197801 EXFOR10547.002 .40 PTS. RATIO U235(NF)/LI6(NT).

WORK  LAB RDATE    MDATE      DDATE
10547 LRL 197608   20040902

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MATCHAMB:
   ID Z   A   Q   COU LAB BLK H W R RDATE  REFERENCE      COMMENTS
 163433 7   14  NT  SWD LND 1   1 E J 197112 PS4165        NYBERG+. +N,ALPHA. MEASRD NONEL GS
 163434 7   14  NT  SWD LND 1   3 E R 196904 LU-NP-6902     NYBERG+ EQUIVALENT TO PS 4 165
 163435 7   14  NT  SWD LND 1   6 E 4 197405 EXFOR20245.005 1PNT.D/DA.

WORK  SUB Z   A   Q   LAB SF2      SF3       SF4            SF6         REACTION
20245 5   7   14      LND N        X         0-G-0          DA          (N,X)0-G-0,PAR,DA

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MATCHAMB:
   ID Z   A   Q   COU LAB BLK H W R RDATE  REFERENCE      COMMENTS
  32316 7   14  NT  USA RIC 752 3 E J 195209 PR87716       LILLIE+ CLOUD CH. P,D,T EMISSION.
  32317 7   14  NT  USA RIC 752 6 E 4 197607 EXFOR11302.004 .1 PT. SIGMA. PEM+DEM+N,T.

WORK  SUB Z   A   Q   LAB SF2      SF3       SF4            SF6         REACTION
11302 4   7   14  SNE RIC N        X         1-H-1          SIG         (N,X)1-H-1,,SIG

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