

A Summary of the NRDF data and the exchanged CPND with EXFOR up to 1990

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Abstract:

The activity of the Japan Charged-Particle Nuclear Reaction Data Group includes the data compilation of CPND produced in Japan with NRDF format and data conversion into EXFOR for international exchange of the CPND. As an achievement of the past 16 years of the effort of the Group, some figures of the CPND compiled with NRDF and the CPND exchanged with EXFOR are presented.

1. Introduction

The CPND produced in Japan are being compiled with a format named NRDF by the Japan Charged-Particle Nuclear Data Group. The data compiling activity has been continued since 1979[3]. There was a turning point in the activity in 1987[4]; The status of the activity was changed into standing work from a research project. With this as a turning point, the Japan Charged-Particle Nuclear Data Group has been reorganized. This group is now composed of two committees and working staff[5]. The Advisory Committee consists of 11 members all over the nuclear research fields in Japan. The Executive Committee consists of 9 members near or in Sapporo. They are responsible for the activity of the group. Four members of the working staff are for data selection from journals, data coding, key-input or clerical work.

The Japan Charged-Particle Nuclear Data Group also is transforming the CPND in the NRDF into EXFOR for international cooperation and coordination in the field of nuclear reaction database activity. The transformed data is transmitted to the Nuclear Data Section(NDS) of IAEA. The Group is receiving the CPND in the form of EXFOR from the NDS.

As the result of these activities, the CPND in the forms of NRDF and EXFOR has been accumulated. Some summary figures up to 1990 of these NRDF and EXFOR data are presented here in after.

2. Data compiling with NRDF format

2.1 Amount of data compiled

Total data amount compiled with the NRDF is 1,146 entries, 62 MB by 1991. Table 1 shows the progress of the data compiling for the past years from 1980 to 1990.

Table 1. Amount of data compiled with NRDF format

year	data compiled in a year		accumulated data	
	number of record	amount	number of record	amount
1980	2,144	5.96 (MB)	2,144	5.96(MB)
1981	1,824	6.81	3,968	12.78
1982	1,801	6.52	5,769	19.30
1983	2,252	6.53	8,021	25.83
1984	1,703	5.03	9,724	30.86
1985	2,170	5.50	11,894	36.36
1986	962	3.14	12,856	39.50
1987	1,364	3.16	14,220	42.66
1988	1,384	3.30	15,604	45.96
1989	1,224	3.20	16,828	49.16
1990	1,282	2.90	18,100	52.06

2.2 Contents of NRDF data

Here we will introduce the content of NRDF data by showing several aspects. The 723 entries (where about 9,600 data tables are contained) out of total data compiled are loaded on a data storage and retrieval system of the NRDF data. This system is specific for the NRDF data only[1,2]. The system has a special list command "LISTX3". This command displays aggregated information about inverted index for each data item. The features of NRDF data given hereafter are reduced from the data obtained by using this "LISTX3" command.

2.2.1 Published year and data tables for the year

Table 2 shows years and the number of data tables which were published in each year.

2.2.2 Data source

The NRDF compiles CPND from articles published in journals. Table 3 shows

major journals from which data is taken, and ratios of the data.

Table 2. Number of data tables for the year

year	number of data tables
1969	3
1973	51
1974	109
1975	6
1976	108
1977	154
1978	803
1979	1443
1980	712
1981	312
1982	902
1983	1293
1984	1495
1985	1328
1986	557
1987	185
1988	117
1989	10

Table 3. Data source

journal	ratio
NP/A	35.1 %
PR/C	34.2
PL/B	7.5
JPJ	6.3
PRL	4.5
77TOKYO	3.4
SNP	1.5
CJP	1.1
NIM	0.8
JP/G	0.8
AUJ	0.6

2.2.3 Physical quantities

The NRDF contains about 150 kinds of physical quantities for CPND. Each entry of the NRDF usually contains several kinds of physical quantities. Table 4 shows some ratios of physical quantities contained in the entries in high ranking.

2.2.4 Institute

The NRDF contains the data produced in Japan in the rate of 48.3 percent. The NRDF is now primarily compiling CPND produced in Japan. However in the early stage of the data compiling activity, proton-induced data not limited in Japan were also compiled.

Table 5 shows the institutes in Japan at which experiments were performed, and the rate of data for each institute.

Table 4. Physical quantities

physical quantity	ratio
ANGL-DSTRN	66.9 %
DSIGMA/DOMEGA	60.5
ANALPW	27.5
ENGY-SPEC	24.0
XSECTN	22.3
OPT-POL-PARA	18.0
EXC-FUNCT	17.6
SPIN	17.1
PTY	16.5
EXC-ENGY	16.4

Table 5. Institute and its data rate

institute	rate of data
INS	20.2 %
IPC	4.7
JAE	2.3
JCL	1.2
KEK	0.3
KTO	2.4
KYU	6.1
OSA	2.3
RCN	47.8
TIT	2.3
TOH	2.1
TSU	8.1

3. International data exchange

In the worldwide view point, nuclear reaction data is exchanged in a format named EXFOR. This format was originally developed in 1969 for neutron data exchange. In 1976, it was extended for the exchange of all nuclear reaction data[6].

In order to participate in the international nuclear data community, the data in NRDF should be transformed into EXFOR. Therefore we developed a database translator named NTX in 1982[7], which was revised later. Using the NTX, we have been transforming the CPND of NRDF produced in Japan into EXFOR, and sent them to NDS of IAEA since 1982.

3.1 Data transmission

When we send some nuclear reaction data entries to other centers, the data entries are merged in a magnetic tape which is called TRANS tape. Each TRANS tape has its original center identification and sequential number such as E001, E002, and so on[8]. Original center identification 'E' is assigned to the Japan Charged-Particle Nuclear Reaction Data Group.

We submitted TRANS E001 to NDS in 1982 as a trial of NTX translation.

which contained only one entry. Then in 1983 TRANS E002 was sent to NDS in order to check the achievement of the translation. This TRANS contained several tens entries. The result of the conversion was discussed with NDS staff in Vienna. There were several defects found in conversion principles and in the NTX program itself. The principal defect to cause difficulty in translation was that this version of NTX tried to convert all quantities to EXFOR.

The conversion principle was altered to a new one. That was: to select quantities which correspond to the quantities defined in the EXFOR system from a NRDF entry, and to convert only these selected quantities to EXFOR entries. The second version of NTX was revised with this principle in 1984.

In 1988, TRANS E003 and E004 was submitted. The TRANS E004 was a first TRANS that was registered in the EXFOR E series library in NDS. In 1989 TRANS E005 and E006, in 1990 TRANS E007 and E008, and in 1991 E009 were submitted

The TRANS E009 contains 19 entries. These 19 entries were selected from the NRDF data which were compiled in 1990. In 1990 we compiled 59 entries as a whole with NRDF. So thirty percent of the NRDF data were transformed into EXFOR.

At the same time, we sent a representative of the Japan Charged Particle Nuclear Data Group to "IAEA Consultants' Meeting of the Nuclear Reaction Data Centers" and "IAEA Specialists Meeting on Technical Aspect of Nuclear Data Processing and Exchange" from 1989 every year.

3.2 Received data in EXFOR

We have received several TRANS tapes from NDS. These TRANS contained CPND and photo-nuclear data in EXFOR. The data received are accumulated in a disc file of the computer system of Hokkaido University Computing Center.

A index database of the received data is also prepared. The EXFOR accumulated file and the index database can be accessed through the computer system of Hokkaido University Computing Center. A index listing can be produced from the index database by using the index listing program prepared. The programs for the index database and for the index listing were installed with the NDS Data Index System[9] and the NDS Data Dictionary System[10].

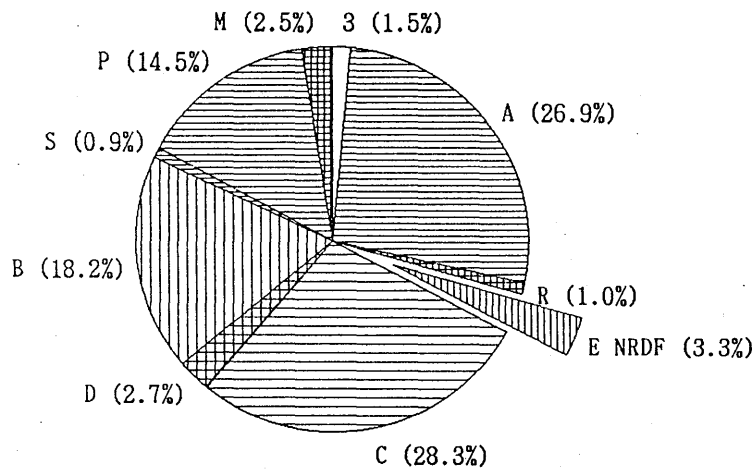
The total amount of the data received is 27 MB, 991 entries and 14,780 subentries by 1991. There are 11 original files identified. The number of entries of each file is listed in Table 6.

Fig. 1 shows the contribution of the NRDF to the international activity of CPND compiling by drawing the data on table 6.

Table 6. EXPOR data received

originating center	file id.	number of entries	content
NRDF	E	33	CPND
NDS	3	15	NND
CAJAD	A	267	CPND
KACHAPAG	B	180	CPND
NNDC	C	280	CPND
NDS	D	27	CPND
NDS	G	1	Photo
CDFE	M	25	Photo
NDS	P	144	MacGowen file
RIKEN	R	10	CPND
CNDC	S	9	CPND

Fig. 1. Contribution of NRDF
Data received from NDS by 1991/10



4. Concluding remarks

The Activity of the Japan Charged-Particle Nuclear Reaction Data Group was depicted by showing some figures of the CPND compiled with NRDF and the received data with EXFOR. We believe that this is one of the successful ways in cooperating and coordinating internationally. As fig.1 shows, the contribution of the NRDF is not so high at the present. We are supposed to increase the ratio of the contribution.

There are also some problems which remain for the data compiling with NRDF. One of them is to establish a way of the direct data acquisition from authors. Another one is to find a convenient way to get author's proof.

As the amount of stored data grows, new data needs arises. In order to meet this new needs, the data storage and retrieval system of NRDF is to be revised by using some database management system on the market.

References

- [1] M. Togashi and H. Tanaka, Scientific information system for nuclear physics research, in Scientific Information in Japan, H. Inose(ed.), North-Holland Publishing Company 1981.
- [2] M. Togashi and H. Tanaka, An information management system for charged particle nuclear reaction data, Journal of Information Science, Vol. 4, No. 5, 1982, pp. 213-224.
- [3] H. Tanaka(ed.), Research and Development Report of Charged-Particle Nuclear Reaction Database(in Japanese), Japan Charged Particle Nuclear Reaction Data Group, 1981.
- [4] NRDF Annual Report 87, Japan Charged-Particle Nuclear Reaction Data Group, 1988.
- [5] NRDF Annual Report 90, Japan Charged-Particle Nuclear Reaction Data Group, 1991.
- [6] A. Calamand and H. D. Lemmel, Short Guide to EXFOR, IAEA-NDS-1, 1981.
- [7] M. Chiba, T. Katayama and H. Tanaka, A database translator of nuclear reaction data for international data exchange, Journal of Information Science, Vol. 12, No. 4, 1986, pp153-165.
- [8] V. McLane(ed.), EXFOR Manual, 1989.
- [9] P. M. Attree and P. M. Smith, System Specification for the NDS Data Index System, IAEA-NDS 6, 1979.
- [10] P. M. Attree and P. M. Smith, System Specification for the NDS Dictionary System, IAEA-NDS 6, 1979.