INDC(NDS)-77

International Atomic Energy Agency

INDC(NDS)-77
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INDC INTERNATIONAL NUCLEAR DATA COMMITTEE

2nd CPND-Meeting 1976

Report on the Second Consultants' Meeting on Charged Particle Nuclear Data (CPND) Compilation

Vienna, 28-30 April 1976

Edited by O. Schwerer

October 1976

IAEA NUCLEAR DATA SECTION, KÄRNTNER RING 11, A-1010 VIENNA

Reproduced by the IAEA in Austria
November 1976
76-9577

INDC(NDS)-77
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Introduction

The Second Consultants' Meeting on Charged-Particle Nuclear Data Compilation was held at the IAEA, Vienna, on 28 - 30 April 1976, immediately following the twelfth annual meeting of the Four Neutron Nuclear Data Centers on 26-28 April 1976. Both meetings were closely related due to the discussions on the Exfor system commonly used for the exchange of both data types, and most of the participants of the first of the two meetings stayed for the second. Both meetings together can be regarded therefore as the First Consultants' Meeting of Nuclear Reaction Data Centres - though photo-nuclear reaction data were not a topic of the meeting.

The present document contains the minutes of the meeting on charged-particle nuclear data; the minutes of the preceding neutron data meeting are contained in the document INDC(NDS)-78. Both documents include all the decisions on the Exfor system disregarding from which of the two meetings they resulted.

AGENDA

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Second CPND Meeting

Vienna, 28-30 April 1976

List of Participants

H. Behrens	ZAED Karlsruhe	Germany, Fed. Rep.
F.E. Chukreev L.L. Sokolovskij	CAJaD Moscow	USSR
G. Dearnaley	Harwell	UK
G. Erdtman	KFA Jülich	Germany, Fed. Rep.
I.A. Kondurov	Leningrad-Gatchina	USSR
G L. Lesca A. Schofield	~~NNCSC~~ Saclay NDCC	NEA
V.N. Manokhin V.G. Pronjaev	CJD Obninsk	USSR
A. Marcinkowski	IBJ Warsaw	Poland
H. Münzel F. Kronenberger	KFK Karlsruhe	Germany, Fed. Rep.
H. Ohnuma	Tokyo Inst. of Tech.	Japan
G S. Pearlstein C.L. Dunford, Chairman N.E. Holden	NNCSC Brookhaven	USA
G S. Râpeanu	State Comm. Bucharest	Romania
T. Tamura	JAERI	Japan

IAEA, NDS

Mrs. P.M. Attree
M.A. Khalil, part-time
Mrs. G. Lammer, Local Secretary
H.D. Lemmel, Scientific Secretary
R. Lessler, part-time
G A. Lorenz
K. Okamoto, part-time
G J.J. Schmidt
O. Schwerer, Local Secretary
M. Vlasov, part-time

IAEA, INIS Section

V. Gadjokov, part-time

List of Abbreviations used in this Document

CAJaD	Centr po dannym o stroenii atomnogo jadra i jadernykh reakcikh GKAE CCCP (Center for nuclear structure and reaction data of the USSR State Committee of the Utilization of Atomic Energy) at the Kurchatov Institute, Moscow.
CCDN	Centre de Compilation de Données Neutroniques; same as NDCC.
CINDA	A specialized bibliography and data index on neutron nuclear data operated jointly by NNCSC, NDCC, NDS and CJD. The master file is maintained at NDCC. Publications are made by IAEA.
CINDU	A catalogue of numerical data libraries available from NDS.
CJD	Centr po Jadernym Dannym, the USSR Nuclear Data Center at F.E.I. Obninsk.
CPND	Charged-particle nuclear reaction data.
EXFOR	Exchange Format, initially developed for the international exchange of neutron nuclear data.
IBJ	Instytut Badań Jadrowych (Institute of Nuclear Research), Warsaw.
INDC	International Nuclear Data Committee.
INIS	International Nuclear Information System, a bibliographic system operated by the IAEA.
Japanese Study Group	Study group for information processing in nuclear physics at the Tokyo Institute of Technology.
JAERI	Japan Atomic Energy Research Institute.
JNDC	Japanese Nuclear Data Committee
KACHAPAG	Karlsruhe Charged Particle Group, Germany Fed. Rep.
LIJaF	Leningradskij Institut Jadernoj Fiziki, Ak. Nauk SSSR (Leningrad Institute of Nuclear Physics, USSR Acad.Sci.).
NDCC	Neutron Data Compilation Centre (Centre de Compilation de Données Neutroniques - CCDN) of the OECD Nuclear Energy Agency, at Saclay near Paris.
NDP	Nuclear Data Project at Oak Ridge for nuclear structure and decay data.
NDS	IAEA Nuclear Data Section, Vienna.

NNCSC	USA National Neutron Cross-Section Center at the Brookhaven National Laboratory, Upton, N.Y.
NND	Neutron Nuclear Reaction Data.
NRDF	Nuclear Reaction Data File System developed by the Japanese Study Group.
"Reaction List"	The bibliography of the Oak Ridge CPND group, now merged with the Oak Ridge Nuclear Data Project. Published in "Atomic Data and Nuclear Data Tables".
"Recent References"	The bibliography of the Oak Ridge Nuclear Data Project for nuclear structure data, including many references on CPND. Published in "Nuclear Data Sheets".
ZAED	Zentralstelle für Atomkernenergie Dokumentation (documentation center for atomic energy) at Karlsruhe.

2nd Consultants' Meeting on Charged Particle Nuclear Data Compilation

Vienna, 28-30 April 1976

1. Opening, election of chairman, adoption of agenda

Prof. Glubrecht opens the meeting on behalf of the Director General of the IAEA, stressing the importance of data in general and the strongly increasing interest in CPND in particular. The IAEA appreciates very much the large number of participants. The fact that USA, West and East Europe, USSR and Japan are well represented at this meeting, is an indication for the well working international co-operation in nuclear data.

Mr. Schmidt thanks Prof. Glubrecht for the introduction and for his strong support of the NDS' program and the organization of this meeting.

Mr. Lemmel introduces the participants.

Mr. Dunford is elected as chairman.

The Agenda is adopted as given on page 7.

2. Progress since last meeting:

Brief status reports of data centers and groups

Mr. Kondurov reports on the LIJaF Data Centre at Leningrad. See Annex 1. The Leningrad Data Center was created some years ago to supply nuclear data for fundamental investigations. LIJaF is compiling Soviet references in NDP format ("Recent References" system) in cooperation with CAJaD.

Mr. Sokolovskij reports on the activities of CAJaD. See Annex 2. CAJaD, the leading organization in compilation, evaluation and dissemination of nuclear data in the USSR, has put all actions from the last CPND meeting into effect. Free exchange of experimental and evaluated data and easy access to the literature of interest are considered as basis for scientific work. This access can be reached in the best way by an international bibliographic reference file using the Oak Ridge NDP keyword system.

Mr. Muenzel reports on the KACHAPAG activities. The Karlsruhe group continues to improve the EXFOR format; to change the entries already available according to the recommendations of the last meeting; its routine compilation, so that now about 300 reactions are available on magnetic tape. A first KACHAPAG Information Letter on CPND (see Annex 3) was issued in March 1976.

Mr. Pearlstein appreciates the efforts of KACHAPAG to constructively improve the neutron EXFOR instead of creating a new system for CPND.

Mr. Lesca reports that CCDN is so far and in the near future not involved in compilation of CPND. The extend of participation of CCDN is not yet decided; no new activity will start within the next year. However, CCDN is willing to participate in the distribution of CPND.

Mr. Dearnaley reports on planned activities of Harwell. The Harwell group plans to compile differential CPND (secondary energy distributions) as needed for surface investigations and would like to cooperate with other groups within an international network. For the handling of magnetic tapes it is hoped to find help within the United Kingdom.

Mr. Râpeanu reports on the data activities of the State Committee for Nuclear Energy, Bucharest. The Romanian group has only started its activity. 2 libraries are maintained: DANEX for experimental neutron data in a format compatible with EXFOR, and DANEM for evaluated microscopic neutron data. No CPND activity is planned for the time being.

Mr. Erdtmann reports that the Kernforschungsanlage Juelich is mainly interested to know how to obtain CPND for applications in radioanalytical chemistry, in particular activation analysis. The Juelich Library of gamma-lines of radionuclides is based on a large number of charged-particle induced reactions. Since no own data group exists, no compilation of CPND is planned.

Mr. Marcinkowski reports on the activities of IBJ, Warsaw. See Annex 4. The activity was started a few months ago with the compilation of (p, gamma) reaction data. With respect to bibliography IBJ relies on the "Reaction List" and the "Recent References". It is intended to store resonance energies, other resonance characteristics and energies and intensities of most intensive gamma rays.

Mr. Ohnuma reports on the activities of the Japanese Study Group. See Annex 5. Summary: Regular contact to the JAERI group has been established. The description of NRDF-1 (Nuclear Reaction Data File) has been distributed among potential users in Japan, and NRDF-2, an actually working system compatible with EXFOR, is being discussed. For this purpose an analysis of EXFOR has been made.

Mr. Tamura from JAERI explains the present activities of the JNDC (JAERI Nuclear Data Committee), which is a standing committee of JAERI and the Atomic Energy Society of Japan.

In the discussion it was clarified that, in addition to the long existing JNDC, another Nuclear Data Committee has been newly formed within the Nuclear Physics Division of the Physical Society of Japan. Both committees are in contact but are independent of each other. Whereas the data activities of JNDC aim primarily at data evaluation for the nuclear energy program, the new committee is primarily interested in data for basic nuclear sciences.

Mr. Holden reports on the CPND activities in the USA:

"Effective 1 October 1976, the responsibility for charged particle data compilation and evaluation and customer services will be transferred to the National Neutron Cross Section Center at Brookhaven National Laboratory.

Initially there will be a staff of two physicists who will be responsible for maintaining a bibliography for integral CPND, for compiling experimental data as described at the September Consultants Meeting and evaluation of CPND for biomedical, fusion, neutron source and inverse reactions related to neutron reactions.

The Reaction List file and publication will cease with the annual publication for 1975. A final cumulative publication may be published. Coverage of the entire nuclear physics literature will be continued via Recent References."

The first KACHAPAG magnetic tape was recently received and could be indexed by NNCSC. NNCSC will try to improve the Oak Ridge keyword system in order to extract the CPND information.

Mr. Manokhin reports on CJD. No compilation of CPND is planned, but CJD is interested in information on CPND for evaluation purposes.

Mr. Lemmel reports on NDS. He refers to the report given at the Neutron Data Centres Meeting (see Annex 6). The NDS activities on CPND will concentrate on

- holding consultants' meetings of the CPND centers
- guiding the development of the CPND Exfor system (dictionaries, rules, etc.)
- supporting the exchange of CPND Exfor tapes and disseminate CPND to requestors in the NDS service area
- keeping contact with centers and groups trying to enlarge the number of coworkers within the CPND cooperation.

CPND compilation cannot be done at NDS due to lack of manpower.

Mr. Lemmel reads out a letter from Mr. Agrawal, India, who plans to compile (d,d) and (d,p) stripping cross sections and polarizations (see Annex 7).

Mr. Behrens reports on ZAED which is prepared to produce a CPND bibliography (see Annex 8).

Note: Some detailed proposals submitted to the meeting (see Annex 8) can be considered as partly superseded since ZAED wants to avoid duplication of effort with NNCSC (see item 4.1 of the agenda).

3. Cooperation scheme

3.1 Scope of activities

The scope of experimental data compilation, bibliographic and evaluation activities of the centres and groups represented are discussed. A summary is given on page 27; written proposals concerning especially the bibliographic file are submitted by ZAED (Annex 8, partly superseded) and by NNCSC (Annex 9). During the discussion it was suggested that ZAED investigate the use of INIS for retrieving CPND references in particular for integral CPND. (Action 1).

Mr. Chukreev presents 3 magnetic tapes containing all bibliographic information on Soviet literature in "Recent References" format covering the time period from 1971 to 1975. Action 3 of the last CPND meeting is herewith fulfilled. But it was mentioned that parts of these tapes will require some corrections.

On request of Mr. Muenzel, Mr. Ohnuma agrees to look for a person in Japan who is interested in compiling CPND for the input in the KACHAPAG file (Action 2).

Mr. Behrens reports on the "compilation of data compilations" to be issued by ZAED (according to Action 12 of the last CPND meeting). It will include all printed compilations of physical (not only nuclear) data, but no data libraries available only on magnetic tape. Those will be collected by NDS. The ZAED compilation is now being printed and will probably be published in June. A supplement is foreseen for the end of this year. (Note by editor: see H.Behrens, G.Ebel, Physik Daten, ZAED 3-1 1976.)

It is agreed that all centers will scan the ZAED compilation for completeness and send their suggested additions to ZAED for inclusion in the supplement. (Action 2a)

Mr. Lorenz says that the NDS project in this field was only started but did not progress very much due to limited manpower. For a narrower scope NDS can refer to the recently issued CINDU-11. (Note by ed.: see A.Lorenz, Comp.&Eval.of Nucl.Struct.&Decay Data, INDC(NDS)-80, Sept.76)

There was an Action of the last CPND meeting (No. 11 on NDS) to supply the CPND compilation groups with a list of CPND reactions needed for fusion. Since the list is just being prepared, this Action is continuing. (Action 3)

3.2 Master files

The problem where the CPND master files will be stored is discussed. The meeting agrees that the master file for integral data will be maintained by KACHAPAG which will take full responsibility for these entries. Concerning differential data, it will be investigated whether Japan and USSR will send differential and integral CPND on separate tapes or KACHAPAG will extract the integral CPND from a mixed-mode tape by "REACTION" codes (Action 4).

Mr. Muenzel offers also to store the differential data in the KACHAPAG master file, but without taking the responsibility for these entries.

The meeting decides that this problem needs further discussion and all centres are asked to prepare proposals for the next CPND meeting (Action 5).

4. Bibliographic data index

4.1 Computer file and publication

Mr. Dunford opens the discussion asking whether in addition to the "Recent References" a CINDA-type file is needed. Such a file would be data-oriented and probably more convenient for use in applied science. Several participants stress the needs for a CINDA-type bibliography, in particular for integral CPND;on the other hand "Recent References" is also needed, especially also for possible future extensions of the data compilation scope. Since it is possible to derive a reaction index from "Recent references", it is agreed that NNCSC should investigate the possibilities of making available a cumulative reaction index for integral and differential CPND (Recommendation).

Mr. Dunford presents the NNCSC proposal for a CPND bibliography, see Annex 9. Summary: Starting with October 1976 NNCSC will assume full responsibility for the compilation of a CINDA-type CPND bibliography for integral data (excitation functions to ground and metastable states and thick target yields). The file structure will closely follow the present neutron CINDA. NNCSC will scan all journals listed in the Annex and perform completeness checks by comparison with INIS retrievals. Initially, NNCSC will supply printed copies of an annual cumulative bibliography cost free to the distribution centres.

Mr. Behrens explains the ZAED proposal for a CPND bibliography (Annex 8). The proposal consists of a handbook in INIS format for the new literature and a cumulative bibliography for the years before 1976.

The meeting agrees that NNCSC should carry out its proposal (Action 6). First priority will be given to the publications listed, second priority to laboratory reports, and third priority to progress reports and other informal publications.

All CPND service centers will provide NNCSC with an estimate of the required number of copies of the CPND bibliography (Action 8).

It is also agreed that USSR continue supplying CPND bibliography in "Recent References" format.

Japan will try to provide the input of Japanese CPND literature in "Recent References" format.

With respect to the literature before 1976, the meeting asks ZAED to publish, if possible, in early 1977 a cumulative bibliography of integral CPND derived from the McGowan list (corresponding to the last part of the ZAED proposal given in Annex 8) and to investigate the costs and the mechanism of distribution (Action 7).

Mr. Behrens agrees to this proposal and withdraws the remaining part of his proposal given in Annex 8.

4.2 Nuclear data and INIS

Mr. Gadjokov from the INIS Section of the IAEA reports on the INIS system and on the "Technical Committee Meeting on the Treatment of Nuclear Data Sources in INIS" held on 1-2 April 1976 in Vienna. The purpose of this meeting was to improve cooperation and coordination between INIS and existing or planned nuclear data services, with special emphasis on data "flagging" and "tagging" in INIS. NDS is asked to distribute the minutes of this meeting to all data centers (Action 9).

In the following discussion several participants report experiences in using INIS retrievals as a source for nuclear data references. In particular the large output of inappropriate references is mentioned several times; the ratio "useful information"/"noise" in the case of integral CPND, was only 1:3. It was also mentioned that this ratio is not much better for the more specialized Reference List of McGowan, which also has insufficient retrieval facilities to separate integral from differential CPND.

Mr. Gadjokov explains that these unsatisfactory results are mainly due to the fact that INIS is not yet adequate as a source for nuclear data references; on the other hand some of the noise may be caused by inappropriate use of the INIS retrieval system or because of inexact or incomplete indexing by the respective national INIS indexers. The IAEA INIS Section can perform only random checks of the input but can not enforce the observation of the indexing rules. For specific extractions from the INIS file the participants may apply primarily to their national INIS liaison officers.

5. Generalized Exfor

The coding of reactions and "quantities" in the REACTION formalism has been proven to be practicable. It was also considered an essential contribution to the further development of the Exfor system. This was demonstrated by the fact that also the neutron data centers intend to change over, after some transition period, from the earlier ISO-QUANT formalism to the REACTION formalism.

The discussions were based on papers by

Muenzel (KACHAPAG Information 1 = CP-B/1, see Annex 3) *)
Ohnuma (CP-E/1 and CP-E/2, see Annexes 10 and 11) *)
Dunford (CP-C/1, see Annex 12)

The resulting conclusions can be found on pages 33-38 . Due to the overlap with the Exfor conclusions found at the preceding meeting of the neutron data centers, all Exfor conclusions are attached and grouped in three sections:

for CPND
for NND and CPND
for NND only.

Resulting actions concerning the generalized Exfor format can be found on page 30. (Actions 10-25)

*) Note: These papers had not officially been distributed as formal CP-Memos but are referred to elsewhere under CP-Memo codes.

6. Customer services

Several details concerning the customer services were already mentioned under other agenda items. In addition, the following statements are given:

Mr. Muenzel: KACHAPAG will publish a kind of handbook of the data available from the KACHAPAG file and also provide copies of the master file to CAJaD, NDS, CCDN, Japan and ZAED. Requests will be treated by ZAED. The data will be provided in form of graphs and of tables but no condensed computation format containing only the values is planned.

Mr. Muenzel requests from NDS to adapt the existing Exfor check program to the new CPND formalisms. He points out that it should be the function of the IAEA to provide the centers which use the Exfor system with the required computer programs. This would prevent both duplication of efforts and divergent development of the check programs.

Mr. Schmidt replies that NDS can provide KACHAPAG a copy of the check program whenever major changes are implemented, but has at present no manpower for the development of a new CPND check program. The NDS manpower for all CPND matters is limited to 1/2 to 1 manyear so far. Concerning customer services, NDS has an edited EXFOR format, but not yet a computational format.

Mr. Schofield: CCDN may be able to treat data in computational format.

Mr. Dunford: NNCSC has a format for sorting, reorganizing and plotting the data. Further developing of this program is planned for the coming year.

The participants agree to keep the others informed about the progress of the centre's computational formats, including plans and preliminary formats (Action 26, also continuing Action 2 from 11th 4-Centers meeting).

7. Network communications

The centres and groups presently cooperating in CPND are defined and to each of them a letter (A ... K) is attributed, which is used in memos (see below) and in col. 67 of Exfor entries compiled.

For the list of these groups and the addresses of the respective persons of contact see page 13. In page 14 the required formats for magnetic tape transmissions and the desired form of dictionaries to be distributed by NDS are listed. NDS will communicate to the Indian group the results of this meeting and ask for the required tape format and the address of the man of contact (Action 27). Harwell and IBJ will inform NDS as soon as possible about their tape format (Action 28).

All participants will ensure that all centres have got all memos issued so far (Action 29). All future communication will be done by CP memos. Their denomination will be CP-X/n, where X stands for the issuing centre and n is a current number within the centre. No separate CP-newsletter is planned. Any change in the centres' CPND programme, compared to the one defined at the meeting, will be communicated by CP-memo (Action 30).

All memos concerning EXFOR will also be communicated to CJD.

Mr. Dunford announces that NNCSC is prepared to send the bibliographic master file to everybody interested.

NDS is asked to issue a supplement to the EXFOR and LEXFOR manuals explaining the extensions for CPND. (Action 25)

All participants will communicate to NDS the names and addresses of persons interested in CPND activities for the creation of a distribution list of CPND documents (Action 31). This list will include measurers and users of CPND.

KACHAPAG will prepare a revision of their "Information No. 1" (Action 32) according to the agreements of this meeting.

The question of inclusion of photonuclear data in the CPND network is discussed. NNCSC will contact Mr. Fuller (Action 33) and CJD will investigate with the appropriate persons whether Soviet photonuclear data will be included. (Action 34)

If specific needs for certain types of CPND become known, NDS will inform data compiling centers. (Actions 35 and 3)

All participants will investigate and communicate whether there are other CPND activities not yet known to the network (Action 36).

A future protocol for all nuclear data centres, similar to the protocol for the four neutron data centres but more comprehensive, is discussed. The meeting feels that at present a formal protocol would be premature. This question will be discussed again at the next CPND meeting. The general agreements already achieved are summarized in a resolution (page 23).

8. Next meeting

Proposed time for the next Four Centres and CPND meeting: 25-29 April, following the Kiev Conference on neutron physics. Proposed place: possibly Obninsk for the Four Centres meeting and Moscow (Kurchatov Institute) for the CPND meeting.

In view of the fact that in many countries the support for compilation of CPND is small compared to its importance to various applications, the participants issued the following

RESOLUTION

The participants attending the CPND Meeting, realizing that the needs for compilation activities for CPND have been established repeatedly, resolved

- to promote and actively support the international cooperation efforts to compile CPND and make them available to data users,

- to urge the funding bodies of the participating groups to continue to support the activities of these groups on a long-term basis,

- to minimize difficulties and optimize the efficiency of CPND exchange by the adoption of common formats whenever possible,

- to urge the participating organizations to give high priority to the responsibilities which each of the participating groups assumed within the network operations for CPND.

Centers and groups active in compilation or dissemination of Charged Particle Nuclear Data.

A.	CAJaD	Dr. F.E. Chukreev Center for Nuclear Structure & Reaction Data of the USSR State Committee on the Utilization of Atomic Energy I.V. Kurchatov Institute of Atomic Energy Moscow, USSR
B.	KACHAPAG	Prof. H. Münzel Charged Particle Nuclear Data Group Institut für Radiochemie Kernforschungszentrum Karlsruhe Postfach 3640 D-75 Karlsruhe, Fed. Repub. of Germany
C.	NNCSC	Dr. S. Pearlstein National Neutron Cross Section Center Brookhaven National Laboratory Upton, L.I. N.Y. 11973, USA
D.	NDS	Dr. J.J. Schmidt Nuclear Data Section Div. of Research and Laboratories IAEA, P.O.B.590 Kärntnerring 11 1011 Vienna
E.	Study Group for Information Processing in Nucl. Physics	Prof. Hajime Tanaka Department of Physics Hokkaido University Sapporo, Hokkaido Japan
F.	Harwell	Dr. G. Dearnaley Nuclear Physics Div., Hangar 8 Atomic Energy Research Establishment Harwell, Didcot, OXON. OX11 ORA United Kingdom
G.	ZAED	Dr. H. Behrens Zentralstelle für Atomkernenergie-Dokumentation Kernforschungszentrum D-7514 Eggenstein-Leopoldshafen Federal Republic of Germany

H. IBJ

Dr. A. Marcinkowski
Nuclear Data Group
Inst. Badan Jadrowych
Hoza 69
PL-00-681 Warsaw, Poland

I. NDCC

Dr. L. Lesca
NEA Neutron Data Compilation Centre
B.P. no. 9
F-91190 Gif-sur-Yvette
France

K.

Dr. D.C. Agrawal
Physics Department
Banaras Hindu University
Varanasi
India 221005

Centres and groups who may eventually join the CPND network:

Present at the meeting, but CPND activities still in the planning stage:

Dr. S. Râpeanu
Comitetul de Stat pentru Energia Nucleara
B-dul Ilie Pintilie 5
Bucuresti
Romania

Interested, but could not participate in the meeting:

Dr. D. Brune
AB Atomenergi Studsvik
Fack, Nyköping 1
Sweden 61101

Required formats for transmission of magnetic tapes and dictionaries

Centre code	Tape format	Format for dictionary transmission by NDS
A	EBCDIC 9-track 800 bpi	tape
B	"	"
C	"	"
D	"	"
E	EBCDIC 9-track 1600 bpi preferred, 800 bpi acceptable	"
F*	EBCDIC 9-track 800 or 1600 bpi	printed
G	(through B)	(through B)
H	to be communicated	printed
I	EBCDIC 9-track 800 bpi	tape
K	to be communicated	to be communicated

* information supplied by mail after the meeting

Charged particle activities in the countries or centres represented

a. Scope of experimental data compilation activities

KACHAPAG: compilation of integral data, i.e. formation cross sections and thick targets yields for ground and/or metastable states.

targets: $Z \geq 3$

projectiles: all starting with p-reactions

incident energies: all

geographical scope: all, except USSR.

USSR: (CAJaD and partly CD LIJaF)
compilation of CPND produced in USSR, mainly integral, but also differential data (angular and secondary energy distribution). Important older data will be compiled also and be available later.

Japan: compilation of integral and differential CPND produced in Japan at present and in future.

Second priority will be given to all CPND produced in Japan in the past and CPND of special reaction types produced in other countries.

USA: at present, at the request of KACHAPAG, compilation of integral CPND produced in USA and Canada which are not available in published articles but only on magnetic tapes.

UK: differential data (secondary energy distribution) as needed for surface analysis; from past and future publications all over the world.

targets: H .....Ti
projectiles: p, d, He3, α, t (limited), and certain heavy ions.
incident energies: ≤ 5 MeV.

Poland: (p,γ)data: resonance energies, spins, parities, resonance widths, intensities and energies of intensive γ-rays;

all targets and energies, past and future publications all over the world.

India: (d,d) and (d,p) cross sections and polarizations for all target nuclei and energies, including angular distributions.

b. Bibliographic activities

NNCSC	will provide a CINDA-type file for integral CPND. This file will contain all publications which are published after 1 January 1976 and also those which contain data exchanged in CPND Exfor. US will publish and distribute free of cost an integral CPND bibliography to the CPND-network.
IAEA	if so requested, is prepared to print and distribute a bibliography.
CAJaD	with CD LIJaF will regularly prepare the input for Soviet literature on nuclear structure and decay data and nuclear reactions for "Recent References".
Japan	can probably provide the input of Japanese literature in INIS or "Recent References" format.
India	could probably also provide input in the same scope as their numerical data compilation.
ZAED	will not carry out its proposal (see Annex 8) in order to avoid duplication of efforts with NNCSC. Since there exists, however, some request for a cumulative bibliography for the years before 1976, ZAED will investigate the possibility of providing such a publication (last part of its proposal, Action 7). ZAED will soon decide whether this will be done and how (costfree or at which price) the printed issue will be distributed.

c. Evaluation activities

KACHAPAG:	continues the investigation of systematics of excitation functions; at the moment the energy region near Coulomb barrier is given highest priority. Comparison of different calculation programmes with each other and with experimental data.
CAJaD:	evaluation activity starting.
Japan:	no evaluations planned.
NNCSC:	a starter library of 305 nuclides has been distributed; no definite plans to improve the library. Certain CPND will be evaluated, the exact scope has still to be defined.

Actions of the CPND meeting

Actions concerning the cooperation scheme

Action No.	Action on	Action
1	ZAED	to investigate the use of the INIS keywords system for retrieving CPND references, in particular for integral CPND.
2	Ohnuma	to find a person in Japan who is interested in cooperation with the Japanese group to compile CPND for input in the KaChaPaG file.
2a	all	to review the "Compilation of compilations" by ZAED, when this has been issued, and send comments and additions to Behrens for inclusion in the Supplement.
3	NDS	(action 11 of Sep. 75 meeting continued) to supply the CPND compilation groups with a list of CPND reactions needed for fusion .
4	Japan USSR KACHAPAG	to investigate the problems of Japan and USSR sending differential and integral CPND on separate tapes; or for KACHAPAG to extract the integral CPND from a mixed-mode tape by 'REACTION' codes .
5	all centres	to discuss how differential CPND should be exchanged and where the master files should be stored, and to prepare the proposals for the next CPND-meeting .

Actions concerning the bibliographic data index

6	NNCSC	to proceed to produce a CINDA-type CPND index as described in the proposal of 8 April 1976.
7	ZAED	to publish, if possible, in early 1977 a cumulative bibliography of integral CPND derived from the McGowan list, and investigate the costs and the mechanism of distribution.
8	all CPND service centres	to provide NNCSC with an estimate of the required number of copies of the CPND bibliography .
9	NDS	to distribute the minutes (including the recommendations) of the 'Technical Committee Meeting on the Treatment of Nuclear Data Sources in INIS' to all data centres.

Actions concerning the generalized EXFOR format

10	Ohnuma	to write a memo describing the exact usage of the EXFOR code 'RES'.
11	NDS	to write a memo describing the exact usage of the EXFOR codes 'CN' and 'DI'.
12	NDS	to clarify the EXFOR manual on the use of the data-headings 'RATIO' and 'SUM'.
13	Ohnuma	to prepare a list of Japanese laboratories involved in the production of CPND .
14	NDS	to create the appropriate lab-codes and update the dictionaries accordingly .
15	Ohnuma	to distribute revised samples of coding differential CPND in EXFOR .
16	all data centres	to review and to comment on these coding samples .
17	NDS	to provide all data centres with all dictionaries for neutron- and CP-EXFOR, in the form of tapes or listings as specified in the minutes .
18	KACHAPAG NDS	to replace all 6-character codes in dictionaries 16, 18, 21, 23 by 5-character codes and communicate these changes to NDS for inclusion in the dictionaries.
19	all neutron data centres	to clarify in the Manual the rules about the use of pointers.
20	KACHAPAG	to draft a clarification of the meaning of the coding EXP/THEO within the REACTION field for inclusion in the manual or dictionary.
21	all EXFOR compiling centres	to investigate whether the suggested code (CUM) in dictionary 31 which has a length of 5 characters instead of the usual 3, creates difficulties in EXFOR programs or not .
22	NDS	to add to the dictionary 24 of column heading keywords additional varieties of keywords of the type HLn or MISCn, etc.
23	all EXFOR compiling centres	to check whether the conclusion about col. 67 of the ENDTRANS record is workable.
24	NDS	to update the EXFOR dictionaries according to the conclusions on the EXFOR system .
25	NDS	to write a supplement to EXFOR and LEXFOR manuals explaining the extensions for CPND .

Action concerning customer services

26	all data centres	(action 2 from 11th 4C-meeting continuing) keep the others informed about the progress of the centre's computational format, including plans and preliminary formats.

Actions concerning network communications

27	NDS	to communicate the results of this meeting to the Indian group and inquire about possible cooperation .
28	Dearnaley Marcinkowski	to inform NDS of their preferred tape format.
29	all data centres	to ensure that all other centres have got all memos issued so far (including KACHAPAG Information No. 1) .
30	all centres	to communicate any changes in the centres' CPND programme, compared to the one defined at the meeting, by CP-memo .
31	all	to communicate to NDS the names and addresses of persons interested in CPND activities (measurers and users) for the creation of a distribution list of CPND documents .
32*)	KACHAPAG	to prepare a revision of KACHAPAG Information No. 1.
33	NNCSC	to inform Mr. Fuller about the interest of the CPND network in including photo-nuclear data and explore the possibilities .
34	CJD	to investigate with the appropriate persons whether Soviet photonuclear data activities should be included in the CPND network .
35	NDS	to inform data compiling centers about any CPND needs that become known .
36	all	to investigate and communicate whether there are other CPND activities not yet known to the network.

*) meanwhile fulfilled by Memo CP-B/2.

Conclusions about the CPND Exfor system

REACTION

1. The coding rules under the keyword REACTION appear to be practicable. No objection to this concept was received. (Action 15 from previous meeting, which was to test the feasibility of this concept, is regarded as fulfilled.)

2. For the codes used under the keyword REACTION the following dictionaries are introduced

Dict. 30	on	Process	in Subfield 3
Dict. 31	on	Branch	in Subfield 5
Dict. 32	on	Quantity measured	in Subfield 6
Dict. 34	on	Modifiers	in Subfield 8
Dict. 35	on	Data type	in Subfield 9

The checking programs and the convenience of the compilers require to have a separate dictionary for each of the subfields. The contents of these dictionaries will be as specified in Memo CP-C/1, with some modifications as specified further below.

3. In subfield 3 of REACTION, two identical outgoing nuclides heavier than α are coded in the form 8-Ø-16+8-Ø-16. The proposals of coding this case in the form 2*8-Ø-16 or 2Ø-16 were not accepted, because the first case would require an extra programming branch for the star, and the second case would result in unsystematic coding of nuclides, since it was agreed to keep the Z-number for the target nucleus.

4. The code SEQ is introduced in dict. 31 (REACTION subfield 5: branch) indicating that the sequence of outgoing particles as specified in subfield 3 under REACTION is meaningful. In this case the general rule of coding outgoing particles in the sequence of increasing Z and A does not apply, and the residual nucleus is not necessarily the heaviest of the reaction products. (This decision also answers the proposal expressed in Memo CP-E/1 item 6).)

5. The codes M+, M-, and (M) are coded in the branch field and not in the modifier field under REACTION.

6. The code (CUM) in dictionary 31 (branch), which has a length of 5 characters instead of the usual 3, is accepted unless a code of this length creates too great difficulties in the programs of one of the centers. (Action 21 of the CPND meeting).

7. In Dictionary 32 (Quantity measured) the code YLD as proposed in Memo CP-C/1 was not accepted. The codes FY and PY are kept. PY is reserved for a product yield under undefined experimental conditions where SIG or TTY do not apply.

8. The codes proposed in Memo CP-E/1, item 1), for the "BRANCH" subfield under REACTION were not accepted since they were considered as not necessary for a unique description of the reaction and quantity measured.

9. If someone wishes to code ions in Exfor under REACTION or elsewhere, this will be done in the form 8-O-16(3+).

10. The "multiple-reaction" formalism with pointers may be used for the isomeric branches and ratios of the same reaction such that

    total reaction cross-section,
    partial cross-sections leading to isomeric states,
    sums and ratios of partial cross-sections

    may all be entered in a single subentry, provided that the target nucleus, the incident particle and the outgoing particles are the same. This possibility is so far restricted to CPND.

Items other than REACTION

11. For other codes, the existing dictionaries are used. The existing limitations in the length of codes (up to 5 characters in Dictionaries 16-23) are left unchanged. (Action 18 of the CPND meeting).

12. Under the keyword FACILITY different pairs of facility codes and lab-codes of the form (FACIL, 3NNNLAB) must be coded on separate lines.

13. KACHAPAG had given some monitor reactions in coded form and some in free text only. It was claimed that sometimes monitors seem to be doubtful and that in such cases the free text was preferred. Meeting participants found this procedure not clear enough and suggested that an explanation in free text would be desirable, for example in the form of a "COMMENT BY THE COMPILER ...". It was then confirmed that monitor reactions should preferably be given in coded form supplemented, where necessary, by free text explanation.

14. Alphabetic characters (instead of a digit in NND Exfor) to be entered in col. 67 and in the first position of accession-numbers, are accepted, despite of programming difficulties of some of the centers.

Conclusions relevant to the NND and CPND Exfor systems

EXFOR structure

1. The SUBENT record may contain in fields $N_4 - N_5$ (cols.45–66) center internal information which is of no interest to recipients of the entry. (Although this is a KACHAPAG internal matter, this should be added in the Manual on page III.6, in order that Exfor users may find an explanation of the meaning of this field, and in order to avoid that this field is assigned a different purpose.)

2. Col. 67 in the ENDTRANS record is to contain the number of character of the originating center, followed by 9's in col. 68–79. (This applies for center-to-center transmission tapes where throughout the tape col. 67 contains the code of the originating center. In other tapes which may contain Exfor entries from various centers, the record identification field cols, 67–79, of the ENDTRANS record should be such that it sorts at the end of the tape. Compare Manual page III.3.) Action 23 of CPND meeting.

3. Trailing records to fill up the last block should be repetitions of the ENDTRANS record.

4. It should be stated explicitly in the Manual (e.g. on page V.1. and VI.1.) that in the COMMON and DATA sections the number of columns is unrestricted.

Pointers, etc.

5. Pointers may be used in subentry 001 if they apply to all following subentries.

6. Compilers are reminded of the rule that a pointer in the BIB-Section refers to all subsequent records until a new pointer or keyword is encountered.

7. If two different numerical results of the same quantity are obtained from the same experiment by two different ways of analysis or normalization, two separate subentries must be made, linked to each other by appropriate STATUS information. The solution with pointers as illustrated in the following example

```
ISO-QUANT  (...)
ANALYSIS  1(...)
          2(...)
ENDBIB
DATA
EN       DATA      1DATA      2
```

   is so far not accepted by all centers and can therefore not be used in NND Exfor transmission tapes.

8. In general pointers are used only when the data table contains more than one DATA column. The different DATA columns are defined, by means of pointers, either by the quantities coded under ISO-QUANT/REACTION or by the parameters entered under COMMON. In addition, items of BIB information may be labelled by the same pointers.

   In the following example pointers may be used within a BIB Section even if the data table contains only one DATA column without a pointer.

```
DETECTOR  1(...)
          2(...)
PART-DET  1(...)
          2(...)
```

   (Note: NNCSC does not recommend the use of pointers in this case unless linked to a multiple Iso-quant, but can accept such constructions.)

Exfor Conclusions

Dictionaries and codes

9. The code XR for X-rays is accepted in dictionary 13. The origin of the X-rays (K, L, M etc) is not coded but may be given in free text.

10. The length of the codes in dictionaries 16-23 remains restricted to 5 characters. Action 18 of the CPND meeting.

11. The codes proposed in Memo CP-E/1, item 2, as addition to Dict. 22 on Detectors were accepted. However, the code for "position sensitive solid state detectors" was changed to PSSSD.

12. In dictionary 24 the keywords of the type HLn will continue to be given explicitly as HL1, HL2, HL3, etc., since check programs in various centers need to have these codes in dictionary 24. NDS will enter additional such keywords in dictionary 24 as they occur, and will enter for each of these keywords one or two additional varities, e.g. HL4 etc. in order to obtain more flexibility. (This is in reply to the proposal on the bottom of Memo 4C-1/80, dispatched 76/4/12). Action 22 of the CPND meeting.

13. The codes proposed in Memo CP-E/1, item 3, as additions to Dict. 25 on Units were accepted.

14. Dict. 25 on Units will continue to include all unit-keywords, and the idea to construct the unit-keywords from certain elements such as MU-, N-, P-, F- for micro, nano, pico, femto, was not accepted. However, whenever new unit-keywords are introduced, such prefixes should be used in a consistent manner.

15. The decay units DPS and MUCI/MUA are both entered in dict. 25. In Exfor entries preferably the same units should be used as given by the author.

16. The column-heading keyword RATIO and SUM are kept (SUM so far in CPND Exfor only). NDS should clarify their use. Action 12 of the CPND meeting.

Rules

17. The Lexfor entry on "Nearly monoisotopic elements" as proposed in item E of memo 4C-1/76 of 76-3-26 is accepted and shall be added to the Lexfor entry on "Monoisotopic elements". (Note by editor: On this Lexfor page the element symbols should be written consistently with capital characters only.)

18. If the coded information under DETECTOR starts with COINC, then all detector codes following in the same pair of parentheses refer to the coincidence arrangement. Any other detector to be coded must be given in a separate line, as for example

DETECTOR (COINC, DET1, DET2). FOR XYZ RADIATION
(DET3). FOR UVW RADIATION

In the parentheses describing the coincidence arrangement, a detector code may be given more than once.

(Note: This formalism was not formally adopted for NND. We believe however that it would not disturb any existing programs so that it should be acceptable also for NND.)

19. Isomeric ratios and sums are entered in addition to the partial isomeric cross-sections only when they were given by the author. For NND they are entered in separate subentries; for CPND the Multiple-Reaction formalism may be used for entering such data in a single subentry.

20. The revised Lexfor entry proposed in Memo 4C-3/162 of 76/4/7 about differential cross-sections relative to its value at a given angle, is accepted.

21. The rules for the use of the keyword ANALYSIS should be clarified in Dict.2.

22. The proposal about the coding of metastable states of the residual nucleus where the sequence number of the state obtained may be unknown, was accepted as proposed in CP-B/1 pages 1,2.

23. For certain keywords the prescription exists (Manual page IV.2) that any information given in parentheses must be repeated in free text. Thus, in an "edit" program the coded information may be ignored in these cases.

    If the compiler prefers not to repeat the coded information in the free text, a point is entered in the position following the closing parenthesis, or the entire field from the closing parenthesis up to column 66 are left blank. Both, the point or the blank field serve as an indicator to an "edit" program that the coded information requires expansion.

24. The proposal to allow in the DATA-section for semi-numerical data, such as "smaller than", 7/2-, X for a blank, etc., was not accepted, since this would create difficulties in programming and since not all computers accept a symbol like "smaller than".

25. The BIB-Section in Exfor has its name for purely historical reasons. It rather functions as a "TEXT"-Section containing bibliographic, physics and administrative (e.g. HISTORY) information. (This clarification should be added on the top of page IV.1 of the Manual.)

26. If original data are given together with deduced values within the same subentry using the "multiple-isoquant" resp. "multiple reaction" formalism with pointers, then a note "DEDUCED QUANTITY" or "DEDUCED FROM..." should be given in free text behind the isoquant/reaction concerned. In addition, under STATUS coded information is entered linked by pointers to the relevant REACTION resp. ISO-QUANT. Some details in the use of STATUS codes may have to be defined in this connection.

27. Different representations of the same variable must not be given within the same subentry unless they have different pointers. For example, the incident energy cannot be given in EV and ANGSTROM, or ANG-CM and ANG cannot both be given. (KACHAPAG is considering the usefulness of giving lab-system and center-of-mass system data in the same subentry and will eventually propose introducing this option at least for CPND.)

Conclusions about the NND Exfor system

Rules specific to NND

1. The proposal contained in Memo 4C-1/76 section D about angular correlations and triple differential cross-sections is postponed until conversion from ISO-QUANT to REACTION formalism since the quantity codes proposed are too long for inclusion in dictionary 14.

2. Memo 4C-1/77 (dispatched 76/4/2) proposing a Lexfor entry on resonance integrals is accepted, except for the sentence "If no value of the cutoff energy is given it may be coded as 0.5 eV". In such case 0.5 eV may rather be entered under the column heading EN-MIN-APX. Alternatively a comment on the cutoff energy may be entered in free text only until further information is received from the author.

   Also, the Note on page 2 of Memo 4C-1/77 should be revised such that all resonance integrals, disregarding whether they were directly measured or deduced from $\sigma(E)$ measurements, may be coded in Exfor with appropriate explanation in free text and under STATUS.

3. For data entered under NUC-QUANT the column heading EN must not be given. If the incident neutron energy is not irrelevant as may be the case for level density parameters, it may be entered in free text. (This is to be added on Manual-page VIII.16.)

4. Memo 4C-1/80 (dispatched 76-4-12) on pointers and standards was accepted (except for the last 3 lines which are discussed elsewhere in the present conclusions). The contents of this memo should be included in Lexfor under Standard. The column heading keywords STAND1 and STAND2 are not obsolete.

5. The Lexfor entry on Single-Level Resonance Parameters proposed in 4C-1/78 (dispatched 76/4/12) was accepted with some minor modifications:
   - Under 1) Resonance energy: a) When the resonance energy is determined ... (instead of assigned)
   - 4 lines further below: omit the word "only"
   - Under 2) Resonance widths: keep the definition of Γ_γ from the previous Lexfor entry
   - last line of same page: write units throughout in the style of column-headings: EV, MILLI-EV, etc.
   - Under 3) Reduced neutron widths: the characters "mu" and "v" are inconsistent
   - omit the note: "E_o is in eV". In the formulae given E_o may have any unit. Example: $E_o = 1.2$ keV, then 1.2 keV/eV = 1200 which is to be entered in the formula.
   - Under 4) Peak cross-section: Add to the "Note" NF,RES,TER. (A probably preferable correction of NF,RES,TER into NF/PCS,,TER should be postponed until the conversion from ISO-QUANT to REACTION formalism.)
   - Under 5) Resonance area: the factor in front of the ratio is inconsistent and disagrees with previous Lexfor entry. NNCSC is asked to check what is correct. Also the units should be mentioned.
   - Under 6) Special representations: there is a typing error in the code SQ/SO.

6. The question of Fission Yield Standards (see proposed Lexfor entry in Memo 4C-3/122 of 75/5/13) was postponed until after the conversion from ISO-QUANT to REACTION formalism.

7. The "multiple-isoquant" formalism for isomeric cross-sections (compare item 19. of the NND+CPND Exfor conclusions) was not yet accepted for NND.

Nuclear Structure and Nuclear Reaction Data Activity in the LIJaF Data Centre

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This report is presented to the Nuclear Structure and Decay Data Meeting and the 2-nd Consultants' Meeting on CPND Compilation, IAEA, Vienna, April-May, 1976. The main aim of the meetings is to promote the international cooperation in the field of compilation, evaluation and distribution of data on nuclear structure and nuclear reactions.

Bibliographic Data Exchange

1. The basis of any informational system (especially of that presupposing international data exchange) is the bibliographic reference file comprising bibliographic document descriptions and descriptions of their contents as well in terms of a certain keyword system adequate to an automated document retrieval. At present three nuclear data bibliographies are in use :

CINDA - Index of neutron data papers;
INIS - Bibliographic system for data on nyclear technology, in the main;
NDP - Recent References system adopted in Oar-Ridge for nuclear structure and nuclear reaction data.

2. Developing the bibliographic system that provides the fundamental nuclear physics investigations the Data Centre accepted the NDP format for it embraces the description of papers on neutron physics, reactions with charged particles, and is used in descripting theoretical works on low energy nuclear physics. The format is being developed long enough, and the NDP-file contains almost all the works on nuclear physics. Nearly all the principal nuclear physics journals use NDP key-word descriptions of articles.

3. The LIJaF Data Centre cumulates the descriptions of all works on nuclear physics printed by the soviet publishers. About 1500 such abstracts enveloping the period from 1972 till now are filed by the Centre. These abstracts are partially published by our Centre /1/ (radioactivity and nuclear reactions) and CAJaD (theoretical works on nuclear structure) /2/.

In accordance with the requirements of our retrieval system the NDP format is transformed, when entering, into the internal format which rubricates out the authors, the title, ect., the key-words being reconstructed in the form that is more convenient for a retrieval. Fig.1 illustrated the two formats. The result may be printed both in Russian alphbet and in the form of transliterated text. The logging is performed in EBCDIC-code on 9-track, 800 bpi magnetic tape.

4. The NDP format may be accepted as a basis of the international bibliographic file on nuclear structure and nuclear reactions including the charged-particle reactions. The alternations and additions to the format proposed at the first CPND Meeting /3/ are well feasible and may be realized "in praxi". The main problem to be solved is the creation of the organization principles of the system

functioning, i.e. :

a) free exchange of information;

b) regional data handling;

c) coordinating centre (centres);

d) dynamics and discipline of exchange;

e) sofware unification where possible;

f) procedure and periodicity of issue of current and cumulative publications.

5. When organizing the international bibliographic file there appears the problem of a uniform global index-number which is to be given by many groups independently. Resting on such an index particular files may be corporated with automatic diagnosis and duplicated record elimination. The experience shows that for data handling (provided that the quantity of income documents is not more than 10000 per year) it is enough to use an index cosisting of year-number (2 digits), three initial letters of the first author, and three final digits of journal page number , wherefrom the work begins, or the preprint/report number if there is a single work in the issue.

Random coincidences are here small and will be absolutely ejected by a computer analysis if the agreed abbreviation of an issue title is added.

6. As concerning the agreement in the abbreviations of magazines and other issues, the international system CODEN is likely to be accepted, and for the proceedings of conferences and specialized meeting - the abbreviations of EXFOR dictionary.

7. The LIJaF Data Centre is ready to participate in the international bibliographical data exchange and take the corresponding work load in preparation and distribution of key-word abstracts on the nuclear physics papers printed by Soviet Publishing Houses.

Numerical Data Exchange

1. The totality of the produced and published numberical data is so monstrous that it is difficult to raise the question of the presentation of all these data in a computer format. None the less, there exists an urgent necessity in having raw information selected by a certain technique. Well-known "Nuclear Data Sheets" periodically publishes selections of the best works on the A-chains provided with partial evaluation of measured quantities.

These data are being recorded in Oak-Ridge on magnetic tape using the ENSDF format. That format was specially developed for the presentation of data on the properties of nuclear levels and transitions between them and that is why it can be used for the computer presentation of the results of particular experimental works dealing with nuclear structure. The Data Centre made an attempt to record in this format the work on the investigation of low-lying excited states of ^{134}Cs /4/.

2. Another way of presentation of concrete work results is "horizontal" compilations. The Data Centre collects data and maintains the files on lifetimes of nuclear excited states /5/, nuclear moments /4/, properties of 0^+ excited states and E0-transitions /6/. The question of recording the data on rotational bands of the deformed nuclei /7/ and β-decay of analogue states /8/ is considered.

Till now each of the "horizontal" files existed in its own format. At the same time all of them are describing the properties of excited nuclear states. The Data Centre elaborates the format for the presentation of published numerical data on nuclear level characteristics. An example of a record of such a kind is given in Fig.2 .

3. One should specify that none of the formats described is good enough to record the raw spectra (γ- and β - spectra coinci - dences, angular distributions ...). EXFOR is to be the closest one to solve the problem. So, it is worth examining the question of adopting EXFOR to present raw experimental data, the more so that the journals have no possibility to publish all of them.

Evaluated Data

1. Two tendences can be distinguished now in the activity on evaluated nuclear structure data. These are general and specialized evaluations.

General evaluations (see for example Nuclear Data Sheets, Tables of Isotopes /9/, Radioactive Nuclei Decay Schemes /10/) collect the best and average characteristics of ground and excited states These evaluations are usially followed by a list of corresponding references; for the most important values several quantities are given at the discretion of evaluator. Such a data presentation gives the possibility to do a critical analysis of the data used. These selections are very helpful for fundamental research implementation.

Meeting the needs of applied researches the works on specialized evaluations are widely developed simultaneously. The file on the decay data of more than 800 nuclei /11/ compiled to provide the reactor technology business for may serve as an example of work of this kind.

The data comprised in specialized files are actually of reference character, as a user treats them indisputably. That fact implies, naturally, high requirements upon the preciseness and reliability of the data of this kind.

2. Aiming at information supply of fundamental nuclear physics investigations the Data Centre is interested in maintaining the general and specialized evaluated data. Among specialized evaluations (for such investigations) the most important ones are the metrological data on nuclear radiation characteristics necessary for calibration measurements, the data of atomic physics (X-ray energies, attenuation coefficients ...) etc.

3. The Centre is deeply interested in maintaining the common file of evaluated data on nuclear structure; this is why we are ready to participate in international cooperation taking upon ourselves evaluation on 1-2 mass-chains with A in the range of 104–134. As to the main principles of cooperation the Centre holds the ground of a free interchange of data.

4. Discussing the conception of international file of evaluated data on nuclear structure it is necessary to solve the following question: which of nuclei characteristics should be presented in the file, as far as too much data are obtained in nuclear structure investigations.

The ultimate objective of the experimental part of nuclear spectroscopy research is the constructioning of scheme of excited states of nuclei under study, where the quantum characteristics of each level (i.e., energy, spin, parity, magnetic and electric nuclear moments and partial transition probabilities, etc.) are performed as completely as possible.

The aim is reached by measurements of distributions of energetic, time and space radiations connected with the process under study. The designing of the level scheme out of the results of these measurements is done in several steps.

I. The result of the first step - distribution measurements - is a set of raw s p e c t r a . The information is objective for a definite instrument as mispresenting is due only to the instrumental function.

II. Taking into account the instrumental function within a certain mathematical model enables one to calculate the values of characteristics of the r a d i a t i o n s measured , the mispresentations connected with an accuracy of the model being introduced. When studying the bound nuclear states, such characteristics are the radiation energy (E_γ, E_{β^-}, E_{β^+}, E_α etc), their intensities (I_γ, I_{β^-} etc.), the complicated events intensities ($I_{\gamma\gamma}$, $I_{\beta\gamma}$ etc.) and the intensities dependences on time, direction in space, polarization, magnetic field and other parameters ($I = I(t, \vartheta, H \ldots)$).

III. An account for process' kinematics and for electromagnetic nature of radionational transitions permits to calculate the t r a n s i t i o n energies, their intensities and multipolarities, possible values of spins and parities of nuclear states, the transitions take place between.

IV. These data are enough to construct a model-independent scheme of excited states and to obtain their quantum characteristics: l e v e l energies (E), their spins and parities (J^π), magnetic and electric moments (μ, Q), and partial widths determining the transition probabilities.

That step is the highest degree of generalization of the experimental nuclear structure data and it faces the theory, so that it is possible to compare the deduced characteristics with the nuclear model predictions in view of checking up the latter.

The data of the IV-th step can make a conten of a file on the evaluated nuclear structure data. Yet this case is not realizable because of the following reasons:

a) the spins and parities are known not for all the deduced levels;

b) not all the transitions measured in decay and reactions are placed usually in the level scheme.

Keeping in mind what has been said above it is reasonable to divide the file under discussion into two parts: (1) characteris - tics of levels and (2) characteristics of radioactive decay. The first part will contain the data of the IV-th and III-rd steps of investigation, and the second one - of the II-nd step. Nuclear characteristics to be presented in files are listed in Table 1 and 2 .

5. The question of choicing the computer format to present data in international file is a minor one and can be solved in practical discussion.

Programs for Solving Problems in Atomic Nuclear Physics

The LIJaF Data Centre carries out a permanent wokr on assembling the library of problem-orientated computer programs to cope with the tasks of atomic and nuclear physics. The existence of such a library will reduce the time and efforts spent both when comparing the achieved experimental results with the predictions of different models, and when examining the abilities of new models. The presence of a whole row of common elements in varios problems of atomic and nuclear physics (such as solving of Schrödinger single particle equation for a number of specific potentials, calculations of matrix

elements of different kind of single- and two- particles operators, diagonalization of matrices, a variety of transformation functions and coefficients etc.) is a peculiar feature. Thus, one of the primary tasks of the Data Centre activity is to identify such common elements and to create the library of corresponding computer programs. Certain efforts are undertaken in this direction by enlisting the cooperation of scientific staff of our Institute and Soviet and foreign scientific institutions as well.

Since the programs comprising the library of the Centre are intended for a user who may have no contracts with the authors, a number of specific demands must be fulfilled.

First of all, each program has the description of the problem stated, of the solution technique, and of its structure. It is adequate to make out the essence of the problem to be solved. The discription contains the formulae used, and all the values involved are explained. Such descriptions are published as preprints; their abstracts are collected in Bulletin of the Data Centre /4/, The library is adopted for BESM-6 computer.

Using some programs of the library the Data Centre has produced the Tables of Klebsh-Gordan Coefficients /12/, the Tables of Electron Energy Eigenvalues, Densities nearby Zero and Mean Values of Selfconsistent Atom and Ion Fields /13/, and the Tables of Internal Conversion Coefficients for Light Nuclei ($Z \leq 30$) /14/.

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Translated from Russian

Centre for Nuclear Structure and Reaction Data of the
USSR State Committee on the Utilization of
Atomic Energy

The Centre's experience of charged particle nuclear data compilation

(Report for the 2nd IAEA Consultants Meeting on
Charged Particle Nuclear Data Compilation)

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A number of recommendations were made at the IAEA Consultants Meeting on Charged Particle Nuclear Data Compilation which took place from 8 to 12 September 1975 [1].

The Centre for Nuclear Structure and Reaction Data (CAJaD) of the USSR State Committee immediately embarked on their implementation. At a meeting of representatives of institutes which come under the USSR State Committee and the USSR Academy of Sciences it was agreed that the authors of scientific works would - in collaboration with the staff of CAJaD - prepare numerical material for a charged particle nuclear data file covering the subjects agreed upon at the IAEA Consultants Meeting. The representatives of institutes expressed the wish that numerical data compilation activities be extended to include works containing differential data, in which scientists concerned with fundamental research are interested.

CAJaD, knowing the difficulties which neutron data centres encounter in obtaining numerical material from authors (by no means every reference in CINDA has an asterisk), decided to devote attention to the formulation of organizational and technical measures.

After several trials we established that the best way of obtaining numerical data from authors was to break the task down into three stages:

1. CAJaD locates publications with charged particle nuclear data and its staff prepares an ENTRY. The publication is described and an indication given of the experimental technique and any special features of the experiment. Approximate values are entered in the DATA sections and two copies of the printout - (Listing) ENTRY - are sent to the author(s) for checking;

2. The author(s) correct(s) the ENTRY text, puts the true values in the DATA sections and returns one copy to CAJaD;

3. CAJaD carries out the necessary editing of the ENTRY text and a last check to ensure compliance with the EXFOR rules.

Experience - admittedly limited so far - has shown that, with this division of labour, the author(s) rapidly and very carefully correct(s) the material prepared by CAJaD.

We plan to automate the first stage as far as possible, so that the work can be performed in the conversational mode by someone with qualifications lower than those required at present.

Work on automation of the third stage is progressing. The material received from the Nuclear Data Section is proving very helpful, although we cannot use the programs as our computer does not have a translator from PL-1.

CAJaD is waiting for the final version of the "Agreements about the CPND EXFOR system" reached during the meeting in September 1975. So far (as of 20 February 1976) we have only a rough version, and we do not want to have to do the work twice.

Soviet scientists appreciate the IAEA's efforts to arrange for international co-operation in the compilation and evaluation of nuclear data. However, they almost all feel that such co-operation is possible only on the basis of a free exchange of experimental and evaluated data. Their reasoning is logical: "If a need for certain data arises, in the absence of a free exchange of data it is quicker to carry out measurements and evaluation independently than to await the outcome of talks about the transfer of data. In the absence of a free exchange of data, for a country to meet its own needs it should not waste resources on the preparation of

data for an international file but rather carry out evaluations to the extent necessary. Thus, if there is no free exchange, we shall have to meet many of our own requirements while contributing at the same time to an international scheme."

It is obvious that effective international co-operation must be based on a free exchange of data.

It is also obvious that the co-ordinated work of scientists from many countries is possible only when an evaluator has easy access to the literature on the question of interest to him. This problem must be solved through an international bibliographic file covering the field of interest and arranged in such a way that automatic retrieval of the necessary literature is possible. When choosing the format and contents of such a file, one is compromising between two contradictory requirements:

- The file should contain only the necessary minimum of information about the investigations carried out, so that the associated costs may be kept as low as possible;
- The file should be designed for the needs not only of the present but also, at least, of the next decade.

In our opinion, a file meeting these requirements might well be based on the keyword system used at Oak Ridge.

Our reasons for favouring this system have been stated on a number of occasions (see, for example, Ref. [2]).

As such a system is clearly redundant in the sense that it enables one to describe investigations relating to "differential" data, if it were adopted there will be no need to construct a completely new bibliographic file when one starts making practical use of "differential" data (which is inevitable).

Could part of the INIS file be adopted as an international file of bibliographic data? In our opinion, it could not. It is being developed [3] with a view not to its improvement as a system permitting machine retrieval

but to its becoming an ordinary abstract journal like the journals of the All-Union Institute of Scientific and Technical Information (VINITI), "Nuclear Science Abstracts", etc.

With a keyword system of the Oak Ridge type, it would be possible to publish the information most needed at a given time - for example, by selecting from it only those works which contain "integral" data and converting them to a format of the CINDA type.

The modernized EXFOR system is suitable for the "factographic"*/ file of nuclear reaction data.

Our experience indicates that the description of investigations involves only dictionary difficulties, which can easily be overcome in the normal course of work. For example, P.P. Dmitriev's very active team, articles by whom appear in almost every issue of "Atomnaya Ehnergiya", presents data in terms of μCi/μA·hour - i.e. in terms of activity per unit charge. Is this unit convenient, or would it be better to speak in terms of yield (radioactive nuclei/beam particle)? Such questions can be resolved in the normal course of work.

CAJaD will be responsible for the dissemination of both evaluated and experimental data in the USSR.

REFERENCES

[1] Consultants Meetings on Charged Particle Nuclear Data (CPND). Compilation, Vienna, 8-12 Sept. 1973. INDC (NDS) - 069.

[2] SOKOLOVSKIJ, L.L., FENIN, Yu.I., CHUKREEV, F.E., INDC (NDS) - 61/W + spec. Vienna, 1974.

[3] INIS Atomindex, Vol. 6, N 18 (part II). 15 September 1975, RN 199042-202245, p. 306, 201952.

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*/ Translator's note. "Factographic" data represent a stage beyond the "bibliographic" stage, being related to information analysis.

Memo CP-B/1

KARLSRUHE CHARGED PARTICLE GROUP

Information Nr. 1

KERNFORSCHUNGSZENTRUM · D-7500 KARLSRUHE · POSTFACH 3640 · TELEX 7826-484

Karlsruhe, March 1976

Last year it was decided to start with an international cooperation in the field of compilation, evaluation and dissemination of integral charged particle reaction data, like cross sections and thick target yields. For details see INDC(NDS)-69, which contains the conclusions of the Consultants' Meeting in Vienna (September 1975). It was also accepted that the Nuclear Data Section of the IAEA should annually convene such Meetings so that the groups actively engaged in handling charged particle reaction data could discuss pertinent subjects. It was proposed that in between the groups should inform each other about the progress of the work, necessary changes in the keywords etc.

At the Consultants' Meeting it was decided that the Charged-Particle-File (KACHAPAG-File) should be based on the EXFOR-format used for the compilation of Neutron-Data. This is possible only if several changes are introduced. At the meeting the proposed changes were discussed at length and many recommendations were formulated. Since we did not receive any objections we assume that these recommendations are generally accepted and that we can proceed with this new version of the EXFOR-format.

In addition to the changes in the codes considered in Vienna the following topic should be discussed: According to the rules given in LEXFOR, metastable states are denoted by Z-S-A-Mi. The number i can be omitted only if the sequence is uncertain. This nomenclature is possibly applicable for neutron reactions, where in general well investigated nuclides are formed. But LEXFOR gives no rules for which an excited state should be called a metastable state. In the case of charged particle induced reactions the nuclides formed are

normally not so well-investigated and sometimes it is even not known whether the product is in the ground or the metastable state. Therefore additional information should be given for an unambiguous description of the product, for instance the half-life and/or the energy of the radiation emitted in the decay. Consequently we propose that the number of the metastable state is only optional and that the nuclide formed in the reaction should be unambiguously defined by the properties given under the keywords 'PART-DET' or 'RAD-DET'.

The EXFOR-dictionaries, which were developed for describing neutron data, contain many codes not used for the compilation of cross sections and thick target yields for charged particle induced reactions. For the convenience of compilers we have prepared a list of the codes actually applied in Karlsruhe. As can be seen from table 1 only 7 out of 23 dictionaries are used in full length (neglecting some minor changes). The codes of the other dictionaries applied up to now in the KACHAPAG-File are listed in table 2. This list already contains all the changes approved by the Consultants' Meeting of last year.

(Prof. Dr. H. Münzel)

Table 1

1USANAL	(FERMI NATIONAL LAB., BATAVIA, ILLINOIS)		
1USASTB	(STATE UNIVERSITY OF NEW YORK, STONY BROOK, N.Y.)		
2JAPNII	(NIIGATA UNIV., NIIGATA		
DICTIONARY	4 700109 TYPE OF REFERENCE	3	UNCHANGED
DICTIONARY	5 751210 JOURNALS	3	UNCHANGED
	WITH THE FOLLOWING CHANGES AND ADDITIONS:		
NC	(NUOVO CIMENTO). NUOVO CIMENTO SER.10	2ITY	
	STARTING WITH VOL.1 (1955) UNTIL VOL.39 NO.4 (1965)		
NC/A	(NUOVO CIMENTO A) NUOVO CIMENTO SECTION A, SER.10	2ITY	
	STARTING WITH VOL.40 NO.1 (1965) UNTIL VOL.70 (1970)		
	SER.11 STARTING WITH VOL.1 (1971)		
	NOTE = NC/A CONTAINS ELEMENTARY PARTICLE PHYSICS		
NC/B	(NUOVO CIMENTO B) NUOVO CIMENTO SECTION B, SER.10	2ITY	
	STARTING WITH VOL.40 NO.1 (1965) UNTIL VOL.70 (1970)		
	SER.11 STARTING WITH VOL.1 (1971)		
PPS/A	(PROC.PHYS.SOC.(LONDON)SECT.A) PROCEEDINGS OF THE	2UK	
	PHYSICAL SOCIETY, LONDON, SECTION A		
PRS/A	(PROC.ROY.SOC.,LONDON,SER.A) PROCEEDINGS OF THE	2UK	
	ROYAL SOCIETY, LONDON, SERIES A, MATHEMATICAL AND		
	PHYSICAL SCIENCES		
DICTIONARY	6 751110	3	UNCHANGED
	WITH THE FOLLOWING ADDITION:		
CERN-	(CERN EUROP.ORG.FOR NUCL.RES.) CERN EUROPEAN	2ZZZCER	

Table 2

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DICTION              2     750930 INFORMATION IDENTIFIER KEYWORDS 3

TITLE       KEYWORD OBLIGATORY EXCEPT WHEN NOT RELEVANT.            3
            FREE TEXT ONLY.                                         3
AUTHOR      KEYWORD + ALL NAMES IN PARENTHESES OBLIGATORY.          3
INSTITUTE   KEYWORD + CODED INFORMATION IN PARENTHESES OBLIGATORY. 3
            SEE DICTIONARY 3 FOR INSTITUTES.                        3
REFERENCE   KEYWORD + CODED INFORMATION IN PARENTHESES OBLIGATORY. 3
            UP TO 6 SUBFIELDS IN CODE.                              3
            SEE DICTIONARY 4 FOR REFERENCE-TYPE                     3
            SEE DICTIONARY 5 FOR JOURNALS                           3
            SEE DICTIONARY 6 FOR REPORTS                            3
            SEE DICTIONARY 7 FOR CONFERENCES AND BOOKS              3
            ------------------------------------------------------3
            'METHOD', 'FACILITY', 'DETECTOR', 'ANALYSIS'.           3
            AT LEAST ONE OF THESE KEYWORDS MUST BE PRESENT.  IF A   3
            PERTINENT CODE IN THE RELEVANT DICTIONARY EXISTS,       3
            THEN KEYWORD AND CODE SHOULD BE GIVEN.                  3
METHOD      KEYWORD OBLIGATORY EXCEPT WHEN NOT RELEVANT.  FREE TEXT3
            OR CODED INFORMATION IN PARENTHESES PLUS FREE TEXT.     3
            SEE DICTIONARY 21                                       3
FACILITY    THE FIRST SUBFIELD OF THE KEYWORD GIVING THE TYPE OF
            THE FACILITY (SEE DICT.18) IS OBLIGATORY EXCEPT WHEN
            NOT RELEVANT. THE SECOND SUBFIELD GIVING THE LOCATION
            OF THE FACILITY (SEE DICT.3) IS OPTIONAL. CODED
            INFORMATION IN PARENTHESES AND/OR FREE TEXT.
DETECTOR    KEYWORD OBLIGATORY EXCEPT WHEN NOT RELEVANT.  FREE TEXT3
            OR CODED INFORMATION IN PARENTHESES PLUS FREE TEXT.     3
            SEE DICTIONARY 22                                       3
ANALYSIS    KEYWORD OBLIGATORY EXCEPT WHEN NOT RELEVANT.  FREE TEXT3
            OR CODED INFORMATION IN PARENTHESES PLUS FREE TEXT.     3
            SEE DICTIONARY 23                                       3
            ------------------------------------------------------3
SAMPLE      KEYWORD OPTIONAL.  FREE TEXT ONLY.                      3
            ------------------------------------------------------
*COMMENT    THE PARTICLE OR NUCLIDE DETECTED MUST BE EVIDENT
*           EITHER FROM 'REACTION','PART-DET','RAD-DET' OR
*           'DECAY-DATA'.
REACTION    KEYWORD + CODED INFORMATION IN PARENTHESES OBLIGATORY
            FOR CHARGED PARTICLE INDUCED REACTIONS.  UP TO
            9 SUBFIELDS  (SF1(SF2,SF3)SF4,SF5,SF6,SF7,SF8,SF9)
            SF1 TARGET NUCLIDE Z-S-A(-MX)  (SEE EXPLANATION BELOW)
            SF2 PROJECTILE                 (SEE DICT.13 AND EXPL.BELOW)
            SF3 OUTGOING PARTICLE(S)       (SEE DICT.13 AND EXPL.BELOW)
            SF4 PRODUCT NUCLIDE Z-S-A(-MX) (SEE EXPLANATION BELOW)
            SF5 BRANCH                     (SEE DICT.10 + DICT.12)
            SF6 QUANTITY MEASURED          (SEE DICT.10)
            SF7 PARTICLE, NOT USED FOR REACT. WITH CHARGED PARTICL.
            SF8 MODIFIER                   (SEE DICT.12)
            SF9 CLASSIFICATION             (SEE DICT.12)
            DIFFERENT TYPES OF OUTGOING PARTICLES IN SF3 MUST BE
            SEPARATED BY + , E.G. 2N+P+A.
            THE NUCLIDE IS GIVEN IN THE FORM Z-S-A. IN GENERAL THIS
            MEANS THE GROUND-STATE OF THE NUCLIDE, WHICH COULD ALSO
            BE GIVEN EXPLICITLY BY Z-S-A-G. A METASTABLE STATE IS
            DEFINED BY Z-S-A-M. IF MORE THAN ONE METASTABLE STATE
            EXISTS THE NOTATION Z-S-A-M1, Z-S-A-M2 ETC. MAY BE
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DICTION 2 75 930 INFORMATION IDENTIFIER KEYWORDS 3

USED. IN ANY CASE THE DEFINITION MUST BE UNAMBIGUOUS BY STATING ADDITIONAL PROPERTIES OF THE STATE, LIKE HALF-LIFE AND/OR RADIATION ENERGY.
FOR SF2 AND SF3 PARTICLES HEAVIER THAN AN ALPHA PARTICLE ARE CODED IN THE SAME WAY AS IN SF1 AND SF4.
IF SF5 TO SF9 CONTAIN MORE THAN ONE CODE A SLASH IS USED FOR SEPARATION.

PART-DET THE PARTICLE DETECTED MUST BE EVIDENT EITHER FROM 'ISO-QUANT' OR FROM 'PART-DET'. IF KEYWORD PRESENT, THEN CODED INFORMATION IN PARENTHESES OBLIGATORY. SEE DICTIONARY 13

RAD-DET KEYWORD AND CODED INFORMATION IN PARENTHESES ARE OBLIGATORY IF THE NUCLIDE OBSERVED IS NOT OBVIOUS FROM 'REACTION' OR 'DECAY-DATA'. THE FIRST SUBFIELD GIVES THE NUCLIDE AND THE ADDITIONAL SUBFIELDS THE TYPES OF THE RADIATION OBSERVED (SEE DICT.13).
IF KEYWORD PRESENT, THE DATA FOR OBSERVED RADIATION HAS TO BE GIVEN UNDER 'DECAY-DATA'.

DECAY-DATA KEYWORD OPTIONAL. IF KEYWORD PRESENT, THEN CODED INFORMATION IN PARENTHESES OBLIGATORY. THE SUBFIELDS ARE SEPARATED BY COMMAS (SF1,SF2,...)
SF1 NUCLIDE Z-S-A(-MX) (SEE 'REACTION')
SF2 HALF-LIFE (FLOATING POINT NUMBER)
SF3 TYPE OF RADIATION (SEE DICT.13)
SF4 ENERGY OF RADIATION IN KEV (FLOATING POINT NUMBER)
SF5 ABUNDANCE OF RADIATION PER DECAY (FLOAT. PT. NUMB.)
SF... SF3,SF4 AND SF5 MAY BE REPEATED AS OFTEN AS NECESSARY
FREE TEXT OPTIONAL.

MONITOR KEYWORD OBLIGATORY EXCEPT WHEN NOT RELEVANT. CODED INFORMATION UP TO 13 SUBFIELDS IN PARENTHESES PLUS FREE TEXT.
SF1 TO SF4 MONITOR REACTION, NOTATION AS GIVEN IN 'REACTION' SF1 TO SF4.
SF5 ACCESSION NUMBER OF MONITOR REACTION IN EXFOR FILE
SF6 FIRST AUTHOR OF PUBLICATION, ADDITIONAL AUTHORS ARE NOTED BY +. EXAMPLE, LANGE+,
SF7 TO SF11 OR SF12 REFERENCE,NOTATION AS GIVEN IN 'REFERENCE'.
NEXT SUBFIELD (SF12 OR SF13) OPTIONAL INFORMATION ABOUT THE DATA, AS EVALUATED OR RECOMMENDED DATA (SEE DICT.12)

REL-REF KEYWORD OPTIONAL. CODED INFORMATION UP TO 8 SUBFIELDS IN PARENTHESES PLUS FREE TEXT.
SF1 THE REASON FOR CITING THE REFERENCE (SEE DICT.20). IF THE CODE 'N' IS USED A FREE TEXT IS OBLIGATORY.
SF2 FIRST AUTHOR OF PUBLICATION, ADDITIONAL AUTHORS ARE NOTED BY +
SF3 TO SF8 REFERENCE, NOTATION AS GIVEN IN 'REFERENCE'
THE KEYWORD 'REL-REF' REFERS TO PUBLICATIONS WHICH ARE RELEVANT TO AN ENTRY OR A SUBENTRY, FOR INSTANCE TO THOSE PUBLICATIONS WHICH ARE INCLUDED IN AN EVALUATION.

ADD-RES KEYWORD 'ADDITIONAL RESULTS' OPTIONAL. FREE TEXT OR CODED INFORMATION IN PARENTHESES PLUS FREE TEXT (SEE

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DICTION            2     750930 INFORMATION IDENTIFIER KEYWORDS 3

          DICT.2 ).
CORRECTION KEYWORD OPTIONAL.  FREE TEXT ONLY                        3
ERR-ANALYS KEYWORD OBLIGATORY EXCEPT WHEN NOT RELEVANT.             3
          FREE TEXT, OR HEADING OF RELEVANT ERROR-COLUMN IN         3
          PARENTHESES PLUS FREE TEXT                                3
COMMENT    KEYWORD OPTIONAL.  FREE TEXT ONLY                        3
MISC-COL   KEYWORD OPTIONAL.  IF KEYWORD PRESENT THEN COLUMN-       3
          HEADING 'MISC', 'MISC1' OR 'MISC2' ETC. IN PARENTHESES    3
          IS OBLIGATORY.                                            3
FLAG       KEYWORD OPTIONAL.  IF KEYWORD PRESENT THEN THE FLAG      3
          NUMBER IN PARENTHESES IS OBLIGATORY.                      3
STATUS     KEYWORD OBLIGATORY EXCEPT WHEN THE SOURCE OF THE DATA    3
          IS GIVEN UNDER 'REFERENCE' AND NO OTHER 'STATUS'          3
          INFORMATION APPLIES.  CODE FROM DICT 16 IN PARENTHESES    3
          PLUS FREE TEXT.  FREE TEXT ALONE IF NO CODE APPLIES.      3
HISTORY    KEYWORD + CODED INFORMATION IN PARENTHESES OBLIGATORY    3
          GIVING A DATE IN THE FORM YYMMDD PLUS A ONE CHARACTER     3
          ACTION-CODE. THE DATE IS OBLIGATORY, THE ACTION-CODE IS   3
          OPTIONAL. THE ALLOWED ACTION-CODES ARE FOLLOWING          3
          R - DATA RECEIVED AT THE CENTRE                           3
          C - COMPILED AT THE CENTRE                                3
          L - ENTERED INTO LIBRARY                                  3
          T - CONVERTED FROM PREVIOUS COMPILATION                   3
          E - TRANSMITTED TO OTHER CENTRES                          3
          A - IMPORTANT ALTERATIONS                                 3
          U - UNIMPORTANT ALTERATIONS                               3
          D - ENTRY OR SUBENTRY DELETED. THIS MUST BE FOLLOWED BY   3
              FREE TEXT JUSTIFYING THE DELETION                     3


DICTION           10     741002 QUANT-FIELD 1 (PROCESSES+PARAMS)3

TOT        TOTAL REACTION CROSS SECTION INCLUDING SCATTERING
NON        NONELASTIC = TOTAL REACTION CROSS SECTION EXCEPT
          ELASTIC SCATTERING
ABS        ABSORPTION = TOTAL REACTION CROSS SECTION EXCEPT
          SCATTERING
          ------------------------------------------------------3
GEM        GAMMA-EMISSION, SHOULD BE APPLIED ONLY IF THE CODE
          G+X IS USED IN SF3 OF 'REACTION' (OUTGOING PARTICLES)
NEM        NEUTRON-EMISSION, SHOULD BE APPLIED ONLY IF THE CODE
          N+X IS USED IN SF3 OF 'REACTION' (OUTGOING PARTICLES)
PEM        PROTON EMISSION, SHOULD BE APPLIED ONLY IF THE CODE
          P+X IS USED IN SF3 OF 'REACTION' (OUTGOING PARTICLES)
AEM        ALPHA-EMISSION, SHOULD BE APPLIED ONLY IF THE CODE
          A+X IS USED IN SF3 OF 'REACTION' (OUTGOING PARTICLES)
SIG        (SIGMA) CROSS SECTION FOR THE FORMATION OF THE
          SPECIFIED PRODUCT NUCLIDE OR THE SPECIFIED REACTION-
          TYPE (X,Y)
TTY        (THICK-TARGET-YIELD) THICK-TARGET-YIELD FOR THE
          SPECIFIED PRODUCT NUCLIDE
FY         (FISSION YIELD) INDEPENDENT, CUMULATIVE AND TOTAL CHAIN
          YIELD SEE MODIFIER (DICT.12)
PY         (PRODUCT YIELD) IN CASE OF CHARGED PARTICLE REACTIONS
          THIS CODE IS USED WHENEVER 'SIG', 'TTY' OR 'FY'
          CANNOT BE APPLIED, E.G. AVERAGE CROSS SECTION FOR A
          LIMITED ENERGY RANGE. EXPLANATORY FREE TEXT IS
          OBLIGATORY.
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DICTION 12 750106 QUANT-FIELD 3 (MODIFIERS) 3

RAW	(RAW DATA (SEE TEXT))	3
REL	(RELATIVE DATA) TO BE COMBINED WITH ARBITRARY UNITS,	3
	OTHERWISE USE FCT.	3
FCT	(DATA TIMES A FACTOR (SEE TEXT))	3
AV	(AVERAGE)	3
PAR	PARTIAL = LEAVING THE RESIDUAL NUCLEUS IN A SPECIFIC	3
	LEVEL OR EMITTING A SPECIFIC GAMMA OR PARTICLE GROUP	3
PR	PROMPT	3
DL	DELAYED	3
CN	PARTIAL CROSS-SECTION VIA COMPOUND NUCLEUS	3
DI	PARTIAL CROSS-SECTION VIA DIRECT INTERACTION	3
M+	INCLUDING FORMATION VIA ISOMERIC TRANSITION	
M-	EXCLUDING FORMATION VIA ISOMERIC TRANSITION	
(M)	INCLUSION/EXCLUSION OF FORMATION VIA ISOMERIC TRANSITION UNCERTAIN (COMMENT BY THE COMPILER)	
BIN	BINARY	
TER	TERNARY	3
IND	INDEPENDENT YIELD OF THE PRODUCT NUCLIDE VIA DIRECT FORMATION ONLY	
CUM	CUMULATIVE YIELD, I.E. YIELD OF THE PRODUCT NUCLIDE VIA DIRECT FORMATION AND RADIOACTIVE DECAY, EXCLUDING ISOMERIC TRANSITION.	
(CUM)	APPLICATION OF THE CODE 'CUM' IS UNCERTAIN (COMMENT BY THE COMPILER)	
*COMMENT	THE MODIFIER IND AND CUM ARE USED FOR ALL KINDS OF	
*	NUCLEAR REACTIONS.	
	----------3	
	CODES FOR CLASSIFICATION USED IN SF9 OF 'REACTION'	

EXP	EXPERIMENTAL DATA	
THEO	CALCULATIONS BASED ON THEORY	
EVAL	EVALUATED DATA	
RECOM	RECOMMENDED DATA	

DICTION 13 741031 PARTICLES 3

G	(GAMMAS) EXCEPT DECAY GAMMAS	3
N	(NEUTRONS)	3
P	(PROTONS)	3
D	(DEUTERONS)	3
T	(TRITONS)	3
HE3	(HE-3)	3
A	(ALPHAS) HE-4	3
FF	(FISSION FRAGMENTS)	3
	----------	3
DG	(DECAY GAMMAS) USED FOR GAMMAS EMITTED FROM METASTABLE	3
	STATES AND FOR GAMMAS FOLLOWING A PARTICLE-EMITTING	3
	DECAY (E.G. BETA DECAY)	3
AR	(ANNIHILATION RADIATION)	3
B-	(DECAY BETA-)	3
B	(DECAY BETAS) UNSPECIFIED WHETHER B+ OR B-	3
B+	(DECAY BETA+) POSITRONS	3
E	(ELECTRONS) OTHER THAN DECAY BETAS	3
RCL	(RECOIL NUCLEUS)	3
RSD	(RESIDUAL NUCLEUS)	3
PN	(PROMPT NEUTRONS)	3
DN	(DELAYED NEUTRONS)	3
XR	(X-RAYS)	
X	(UNDEFINED OUTGOING PARTICLES) IF THE AUTHOR DOES NOT STATE THE KIND AND NUMBER OF THE OUTGOING PARTICLES IN CHARGED PARTICLE INDUCED REACTIONS OR IF AMBIGUITY EXISTS IN RESPECT TO THE REACTION TYPES INVOLVED.	
EC	(ELECTRON CAPTURE)	
SF	(SPONTANEOUS FISSION)	

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DICTION            16      730122   STATUS                                3

PRELM       (PRELIMINARY DATA) DATA LABELLED BY AUTHOR AS PRELIM'RY3
               FREE TEXT= AUTHOR'S INFORMATION ABOUT FINALIZING THE3
                          DATA.                                      3
               ALSO TO BE USED FOR 'DATA NOT TO BE QUOTED PRIOR    3
                                   TO PUBLICATION'.               3
SPSCD       (DATA SUPERSEDED) DATA SUPERSEDED BY AUTHOR'S REVISION,3
               AND REVISED DATA ENTERED IN LIBRARY.               3
               FREE TEXT= CROSS-REFERENCE TO SUPERSEDING DATA TABLE3
DEP         (DEPENDENT DATA)                                      3
               FREE TEXT= CROSS-REFERENCE TO THE INDEPENDENT DATA  3
                          FROM WHICH DEPENDENT DATA WERE OBTAINED. 3
               EXAMPLE= GAMMA-WIDTH WHEN OBTAINED BY SUBTRACTION   3
                        FROM INDEPENDENTLY MEASURED TOTAL-WIDTHS   3
                        AND NEUTRON-WIDTHS.                        3
APRVD       (APPROVED BY AUTHOR) PROOF-COPY WAS APPROVED BY AUTHOR 3
               AND AUTHOR'S CORRECTIONS HAVE BEEN ENTERED.        3
               FREE TEXT= NAME AND DATE OF APPROVAL               3
UNOBT       (DATA UNOBTAINABLE FROM AUTHOR)                       3
               FREE TEXT= EXPLANATION WHY UNOBTAINABLE            3
OUTDT       (NORMALIZATION OUT-OF-DATE)                           3
              FREE TEXT= REASON OR CROSS-REFERENCE TO RENORMALIZED 3
                         DATA TABLE                              3
RNORM       (DATA RENORMALIZED) DATA RENORMALIZED BY OTHER THAN   3
               AUTHOR.                                            3
               FREE TEXT= EXPLANATION OF RENORMALIZATION AND CROSS-3
                          REFERENCE TO AUTHOR'S ORIGINAL DATA.    3
               NOTE= ONLY TO BE USED FOR NON-TRIVIAL RENORMALIZATN 3
                     BY AN EVALUATOR. COMPILATION CENTRES SHOULD   3
                     GENERALLY STORE THE AUTHOR'S ORIGINAL         3
                     NORMALIZATION.                                3
COMP        DATA OBTAINED FROM PUBLICATION BY THE COMPILER,
            CHECKED, BUT NOT APPROVED BY THE AUTHOR
CURVE       DATA OBTAINED FROM A CURVE WITH A DATA-POINT READER
CPX-CURVE   DATA OBTAINED FROM A CURVE WITH A DATA-POINT READER
            BY K.F.MCGOWAN ET AL., PUBLISHED IN
            ORNL-CPX-1 (1964) FOR REACTIONS WITH MN,FE,CO
            ORNL-CPX-2 (1964) FOR REACTIONS WITH NI, CU
            NUCL.DATA,A1,203 (1966) FOR REACTIONS WITH LI,BE,B
            NUCL.DATA,A2,1 (1966) FOR REACTIONS WITH C
            NUCL.DATA,A3,123 (1967) FOR REACTIONS WITH N,C


DICTION            18      730426   FACILITY                              3

CCW         (COCKCROFT-WALTON ACCELERATOR)                        3
LINAC       (LINEAR ACCELERATOR)
VDG         (VAN DE GRAAFF)                                       3
VDGT        (TANDEM VAN DE GRAAFF)                                3
CYGFF       (CYCLOGRAAFF)                                         3
CYCLO       (CYCLOTRON)                                           3
SYNCH       (SYNCHROTRON)                                         3
ISOCYC      (ISOCHRONOUS-CYCLOTRON, AVF-CYCLOTRON)
SYNCYC      (SYNCHROCYCLOTRON)
MICRT       (MICROTRON)                                           3
DYNAM       (DYNAMITRON)                                          3
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DICTION 20 ADDITIONAL RESULTS/RELATED REFERENCES

RANGE	(RANGE OF RECOILS MEASURED)
DECAY	(DECAY PROPERTIES OF THE PRODUCT NUCLIDE)
ANGD	(ANGULAR DISTRIBUTION)

CODES USED IN SF1 OF 'REL-REF'

E	REFERENCE USED IN THE EVALUATION
C	CRITICAL REMARKS
N	NOTE, SEE FREE TEXT

DICTION 21 730426 METHOD 3

COINC	(COINCIDENCE)	3
ACTIV	(ACTIVATION)	3
REC	(CROSS SECTIONS OR YIELDS DETERMINED BY THE COLLECTION OF RECOILS)	
HEJET	(COLLECTION BY HE-JET)	
CHSEP	(CHEMICAL SEPARATION)	
ASEP	(SEPARATION BY MASS SEPARATOR)	
SITA	(SINGLE TARGET IRRADIATIONS)	
STTA	(STACKED TARGET IRRADIATIONS)	
MONSEP	(SEPARATE MONITORFOIL)	
MONMIX	(MIXED MONITOR) MONITOR AND TARGET COMBINED AS CHEMICAL COMPOUND OR MIXTURE OR MONITOR REACTION HAS THE SAME TARGET NUCLIDE AS THE REACTION GIVEN UNDER 'REACTION'.	
EDEG	(ENERGY-DEGRADATION BY FOILS) ENERGY-DEGRADATION OF THE BEAM BEFORE HITTING THE TARGET ARRANGEMENT.	
INTB	(IRRADIATION WITH INTERNAL BEAM)	
EXTB	(IRRADIATION WITH EXTERNAL BEAM)	
BCINT	(BEAM CURRENT INTEGRATED) CODE USED ONLY IF VALUES GIVEN IN THE DATA SECTION ARE BASED ON THIS MEASUREMENT	

DICTION 22 730426 DETECTORS 3

GLASD	(GLASS DETECTOR)	3
TRD	(TRACK DETECTOR) ALL WHICH ARE NOT GLASS	3
SOLST	(SOLID-STATE DETECTOR)	3
GELI	(GERMANIUM-LITHIUM DETECTOR)	3
SCIN	(SCINTILLATION DETECTOR)	3
CSICR	(CESIUM-IODIDE CRYSTAL)	3
NAICR	(SODIUM-IODIDE CRYSTAL)	3
LONGC	(LONG COUNTER)	3
PROPC	(PROPORTIONAL COUNTER)	3
TELES	(COUNTER TELESCOPE)	3
FISCH	(FISSION CHAMBER)	3
BPAIR	(ELECTRON-PAIR SPECTROMETER) FOR GAMMAS	3
GEMUC	(GEIGER MUELLER COUNTER)	
IOCH	(IONIZATION CHAMBER)	
COIN	(COINCIDENCE COUNTER ARRANGEMENT) CODE AND DETECTOR(S) USED MUST BE GIVEN SEPARATED BY SLASH(ES)	

```
DICTION            23     73 122    ANALYSIS                              3


AREA       (AREA ANALYSIS)                                                 3
INTANG     (INTEGRATION OF ANGULAR DISTRIBUTION)

DICTION            24     751110 DATA-HEADING KEYWORDS                    3


EN         INCIDENT NEUTRON ENERGY, LAB-SYSTEM                            A3
*COMMENT   THE MEANING OF THE CODE 'EN' SHOULD BE EXTENDED TO
*          'ENERGY OF INCIDENT PROJECTILE, LAB-SYSTEM'. THIS
*          EXTENSION SHOULD ALSO APPLY TO THE OTHER CODES, WHICH
*          CONTAIN 'EN', LIKE 'EN-CM'.
EN-APRX    APPROXIMATE VALUE OF INCIDENT NEUTRON ENERGY                   A3
EN-CM      INCIDENT NEUTRON ENERGY, C-M-SYSTEM                            A3
EN-MIN     LOW LIMIT OF INCIDENT N-ENERGY RANGE, LAB-SYSTEM               A3
EN-CM-MIN  LOW LIMIT OF INCIDENT N-ENERGY RANGE, C-M-SYSTEM               A3
EN-MAX     HIGH LIMIT OF INCIDENT N-ENERGY RANGE, LAB-SYSTEM              A3
EN-CM-MAX  HIGH LIMIT OF INCIDENT N-ENERGY RANGE, C-M-SYSTEM              A3
EN-ERR     ERROR OF MONOCHROMATIC INCIDENT-NEUTRON ENERGY OR              B3
           UNCERTAINTY OF THE CENTRAL ENERGY IN AN INCIDENT                3
           NEUTRON-SPECTRUM.                                               3
EN-ERR1    ENERGY ERROR, IF MORE THAN ONE ERROR IS GIVEN.                 B3
           EXPLANATION UNDER 'ERR-ANALYS'.                                 3
EN-ERR2    SECOND ENERGY ERROR, IF MORE THAN ONE ERROR IS GIVEN.          B3
           EXPLANATION UNDER 'ERR-ANALYS'                                  3
+EN-ERR    + UNSYMMETRIC ENERGY-ERROR                                     B3
-EN-ERR    - UNSYMMETRIC ENERGY-ERROR                                     B3
EN-NRM     NORMALIZATION ENERGY. TO BE USED WHEN A DATA SET IS             3
                                 NORMALIZED TO ONE ENERGY ONLY.            3
E          ENERGY OF OUTGOING PARTICLE, LAB-SYSTEM                        E3
E1         ENERGY OF OUTGOING PARTICLE, AS DEFINED IN BIB-SECT'N          E3
E2         ENERGY OF OUTGOING PARTICLE, AS DEFINED IN BIB-SECT'N          E3
E-APRX     APPROXIMATE VALUE OF OUTGOING PARTICLE ENERGY,LAB-SYS          E3
E-CM       ENERGY OF OUTGOING PARTICLE, C-M-SYSTEM                        E3
E-MIN      LOW LIMIT OF OUTGOING-PARTICLE E-RANGE, LAB-SYSTEM             E3
E-CM-MIN   LOW LIMIT OF OUTGOING-PARTICLE E-RANGE, C-M-SYSTEM             E3
E-MAX      HIGH LIMIT OF OUTGOING-PARTICLE E-RANGE, LAB-SYSTEM            E3
E-CM-MAX   HIGH LIMIT OF OUTGOING-PARTICLE E-RANGE, C-M-SYSTEM            E3
E-RSL      OUTGOING-PARTICLE ENERGY-RESOLUTION                            F3
E-ERR      OUTGOING-PARTICLE ENERGY-ERROR                                 F3
+E-ERR     +UNSYMMETRIC OUTGOING-PARTICLE ENERGY-ERROR                    F3
-E-ERR     -UNSYMMETRIC OUTGOING-PARTICLE ENERGY-ERROR                    F3
E-EXC      EXCITATION-ENERGY                                              E3
DATA       HEADING FOR COLUMN GIVING THE QUANTITY SPECIFIED                3
           UNDER 'ISO-QUANT' OR 'REACTION'.
DATA-APRX  APPROXIMATE VALUE OF DATUM                                      3
DATA-MIN   LOW LIMIT OF DATUM                                              3
DATA-MAX   HIGH LIMIT OF DATUM                                             3
DATA-ERR   DATA-ERROR. EXPLANATION TO BE GIVEN UNDER 'ERR-ANALYS'          3
DATA-ERR1  FIRST DATA-ERROR, IF MORE THAN ONE ERROR-COL IS GIVEN.          3
             EXPLANATION UNDER 'ERR-ANALYS'                                3
DATA-ERR2  SECOND DATA-ERROR,IF MORE THAN ONE ERROR-COL IS GIVEN.          3
             EXPLANATION UNDER 'ERR-ANALYS'                                3
DATA-ERR3  THIRD DATA-ERROR, IF MORE THAN ONE ERROR-COL IS GIVEN.          3
             EXPLANATION UNDER 'ERR-ANALYS'                                3
+DATA-ERR  + UNSYMMETRIC DATA-ERROR. EXPLANATN UNDER 'ERR-ANALYS'          3
-DATA-ERR  - UNSYMMETRIC DATA-ERROR. EXPLANATN UNDER 'ERR-ANALYS'          3
RATIO      HEADING FOR COLUMN GIVING THE RATIO SPECIFIED UNDER             3
           'ISO-QUANT' OR 'REACTION' OR THE QUANTITY/STANDARD
           RATIO.
RATIO-MIN  LOW LIMIT OF RATIO                                              3
RATIO-MAX  HIGH LIMIT OF RATIO                                             3
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DICTION              24      75111  DATA-HEADING KEYWORDS                3

RATIO-ERR  RATIC-ERROR                                                   3
RATIO-ERR1 FIRST RATIO-ERROR, IF MORE THAN ONE RATIO-ERROR IS            3
           GIVEN. EXPLANATION UNDER 'ERR-ANALYS'                         3
RATIO-ERR2 SECOND RATIO-ERROR, IF MORE THAN ONE RATIO-ERROR IS           3
           GIVEN. EXPLANATION UNDER 'ERR-ANALYS'                         3
+RATIO-ERR +UNSYMMETRIC RATIO-ERROR. EXPLANATN UNDER 'ERR-ANALYS'        3
-RATIO-ERR -UNSYMMETRIC RATIC-ERROR. EXPLANATN UNDER 'ERR-ANALYS'        3
SUM        HEADING FOR COLUMN GIVING THE SUM SPECIFIED UNDER
           'REACTION'.
SUM-ERR    SUM-ERROR. EXPLANATION TO BE GIVEN UNDER 'ERR-ANALYS'
+SUM-ERR   +UNSYMMETRIC SUM-ERROR. EXPLANATION UNDER 'ERR-ANALYS'
-SUM-ERR   -UNSYMMETRIC SUM-ERROR. EXPLANATION UNDER 'ERR-ANALYS'
MONIT      HEADING FOR THE COLUMN GIVING VALUES FOR THE MONITOR.
FLAG       FLAG. MEANING OF FLAGS GIVEN UNDER THIS HEADING TO BE         3
             EXPLAINED IN BIB-SECTION UNDER 'FLAG'                       3
MISC       HEADING FOR A COLUMN WITH SUPPLEMENTARY INFORMATION           3
           FOR WHICH NO DATA-HEADING KEYWORD HAS BEEN DEFINED.           3
           EXPLANATION TO BE GIVEN UNDER 'MISC-COL' KEYWORD              3
MISC1      FIRST MISCELLANEOUS COLUMN - IF MORE THAN ONE IS GIVEN        3
             SAME USAGE AS -MISC-(SEE ABOVE)                             3
MISC2      SECOND MISCELLANEOUS COLUMN -IF MORE THAN ONE IS GIVEN        3
             SAME USAGE AS -MISC-(SEE ABOVE)                             3
MISC3      THIRD MISCELLANEOUS COLUMN - IF MORE THAN ONE IS GIVEN        3
             SAME USAGE AS -MISC-(SEE ABOVE)                             3
           ------------------------------------------------------------- 3
           NOTE= THE CHARACTERS AND DIGITS IN COL.66 ARE USED FOR        3
                 COMPUTERIZED CHECKING OF COLUMN-SEQUENCE. SEE           3
                 MANUAL.                                                 3
```

DICTION 25 750715 DATA UNIT KEYWORDS 3

	=NOTE= THE UNIT 'PER-CENT' IS NOT		3
	TO BE USED UNDER THE HEADINGS		3
	'DATA','RATIO' AND DERIVATIVES.		3
	DEVIDE BY 100 AND USE 'NO-DIM'.		3
PER-CENT	PERCENT		3
PC/FIS	PERCENT PER FISSION	NFY	3
NO-DIM	NO DIMENSION	NO	3
ARB-UNITS	ARBITRARY UNITS TO BE COMBINED		3
	WITH THE 'REL' MODIFIER IN THE		3
	ISO-QUANT.		3
SEE TEXT	RARE UNITS WHICH ARE NOT CODED		3
	BUT USED UNDER 'MISC' ONLY		3
GEV		E	1.E+93
MEV		E	1.E+63
KEV		E	1.E+33
EV	ELECTRON-VOLTS	E	1.E+03
GEV/C	GEV PER LIGHT VELOCITY	E/C	3
YR	YEARS (=365.2422 DAYS)	TIME	3.155693E+73
D	DAYS	TIME	8.64E+43
HR	HOURS	TIME	3.6E+33
MIN	MINUTES (NOT ANGULAR)	TIME	6.E+13
SEC	SECONDS (NOT ANGULAR)	TIME	1.E+03
MSEC	MILLISECONDS	TIME	1.E-33
MICROSEC	MICROSECONDS	TIME	1.E-63
NSEC	NANOSECONDS	TIME	1.E-93
M		L	1.E+03
CM		L	1.E-23
MM		L	1.E-33
MU	MICROMETERS, MICRONS	L	1.E-63
MILLI-MU	MILLI-MICRONS	L	1.E-93
ANGSTROM		L	1.E-103
KB	KILOBARNS	B	1.E+33
B	BARNS	B	1.E+03
MB	MILLIBARNS	B	1.E-33
MICRO-B	MICROBARNS	B	1.E-63

Status Report of IBJ

Charged Particle Group of the

Institute of Nuclear Research Statement

The Nuclear Data Group of the Institute of Nuclear Research started its activity in the begining of 1976. This activity has been directed towards the compilation and evaluation of certain types of charged particle data and selected neutron nuclear data.

At present the Nuclear Data Group has a staff of 6 physicists constituing three subgroups. Theirs main interest concerns thermal and resonant neutron data, fast neutron data and charged particle nuclear data, respectively. The split into three groups is a consequence of the fact that the Nuclear Data Group members are the employees of three independent departments of the Institute of Nuclear Research, namely the Reactor Calculation Division, the Nuclear Reaction Dpt and the Dpt of Physics of the Atomic Nucleus.

The Charged Particle Nuclear Data group has started with compilation of the (p,γ) reaction data. This choice was substantiated by the role, which the (p,γ) reaction plays in applications of (charged particle,γ) reactions in nuclear analysis [1,2] and the scarcity of complete, new and

specialized compilations of the (p,γ) reaction data.

The experience we have gained in experimental investigation of the radiative proton capture emboldens us to continue evaluating the recommended data.

In respect to bibliography we rely on the "Reaction List" and the "Recent References" lists.

The compiled experimental data include the resonance energies, resonance width or relative yield and the most intensive primary and secondary γ-ray energies as well as their intensities. At present we are engaged in developing a programme for extraction of the desired information from the experimental data, published usually in a form of a decay scheme, and in developing a format for the storage of the compiled data on a magnetic tape. Use will be made of the EXFOR - system as far as possible.

We assume that most preferable to the users will be an output in the form of some kind of book or table sheets. Retrievals in other form can also be provided to the users.

---

[1] Charged Particle-Induced Radiative Capture, Proceedings of a Panel, Vienna 9 - 13 October 1972, IAEA, Vienna 1974

[2] Atomic Energy Review, Vol 12, Number 2, Vienna 1974

Status Report of Japanese Group

1) Regular contact with JAERI group has been established.
In the discussion it has been agreed that cooperation of two groups should be started towards providing regular input of Japanese language publications to existing bibliographic systems. Details of the cooperation will be arranged in near future.

2) Nuclear Data Committee has been organized in the Nuclear Physics Division of the Physical Society of Japan. Among the members of the committee are Ikegami and Ohnuma from our group, Tsukada from JAERI, and Hasegawa from the Institute for Nuclear Study, University of Tokyo.

3) The description of NRDF-1, along with a short guide to present data activities in the world, our plans and perspective, and request for cooperation, has been distributed among potential users in Japan.

4) Analysis of EXFOR and its comparison with NRDF-1 have been made. Sample EXFOR input of differential CPND was written. Proposals for additions and modifications of EXFOR will be presented.

5) The outline of NRDF-2 are being discussed. NRDF-2 will be an actually working system. Our first consideration in the design of the system will be given to its compatibility with EXFOR.
NRDF-2 will hopefully be working at the end of this year. Collection of data will start from the end of this year or early next year.
Scope of our compilation will be: (1) all kinds of CPND produced in our country; and (2) CPND of specific reaction types produced in other countries. We are hoping to collect some 100 MB of information within three years. Support and cooperation of IAEA and other centers in the collection of data will be greatly appreciated. Exchange of our data with other centers will possibly be complied with starting from 1977.

6) At the same time we will make effort to:
i) keep close contact with the nuclear physics community in Japan, until nuclear data compilation will be regarded as a part of physicists' daily research activities which they are responsible for;
ii) promote interest of young physicists in nuclear data compilation and thus prepare future compilers and evaluaters;
iii) establish a permanent nuclear data center or an equivalent after the three year period.

Brief NDS Report to the 1976 4C-Meeting

1. STAFF

1.1 Since the last 4C-Meeting A. Calamand and J. Lemley left the Section.

1.2 New staff are: R. Lessler, who works on Wrenda and the targets-and-samples program. R. Yaghubian, who has previously been working as a temporary consultant and has now a fixed-term appointment, works on data compilation and request services. O. Schwerer, who is also involved in data compilation and request services.

1.3 For 1977 a new physicist's post is likely to become available. This will be devoted to neutron data in order to cover the increasing workload of data request services.

1.4 A new unit for Atomic and Molecular Data for Fusion is envisaged for 1977 within the Nuclear Data Section.

2. CHANGE OF PREMISES

2.1 In the new premises at Wasagasse, three kilometers away from the IAEA main building, NDS was, for several months, separated from the computer. Many compilation activities and request services got seriously delayed during this period.

2.2 Meanwhile NDS has its own RJE station for card input and printer output, linked to the Agency's computer by a telephone line. This serves most of the needs of NDS except for magnetic tape handling. Repeatedly there were difficulties resulting from transporting tapes to and back between Wasagasse and computer.

2.3 Since the staff has to travel frequently between Wasagasse and Kärntner-ring, NDS encounters an effective loss of manpower between 5 and 10 percent.

3. CINDA

3.1 CINDA75 and its Supplement were published. The printing of CINDA76 is presently in a crisis, because the Linotron machine at Frankfurt has given up its ghost. Several other machines are presently under consideration. We still have the hope that the publication date of CINDA76 will be delayed not more than two weeks.

3.2 The Cinda coverage of areas 3 and 4 has been reported in Memo 4C-3/158 of 1976-3-4. There are no significant gaps except, perhaps, for some USSR lab reports. A number of Cinda relevant articles from rare report series and theses has been found from INIS retrievals.

3.3 Considerable Cinda clean-up has been done for area 3. The Exfor data index lines are up to date. However, since much of the clean-up was done before the LINK operation became effective, we have the problem of a disturbing number of duplications. Also a number of recent entries made at NNCSC and NDCC for labs of area 3 could not yet be blocked systematically.

3.4 At the 1975 INDC Meeting the two-years publication cycle of Cinda has been approved for the 1976/77 period. The centers have been urged however, to issue in 1978 an archival volume which would remain valid for a longer period, supplemented by periodical issues for new literature only.

4. EXFOR

4.1 Compilation of Exfor data continued. Presumably, NDS is quite complete for newest data. However, the backlog accumulated during the 1974 period when several posts were vacant, could not yet be worked off.

4.2 The Exfor check program and the Exfor Edit program for customers have been improved.

4.3 The NNCSC Exfor tapes converted from SCISRS-1 were quite important for many data requests. However, not yet all of them have been worked into our master file.

4.4 The Exfor/Cinda dictionaries were frequently updated, without delay, whenever a new code was introduced.

4.5 The NDS Exfor Manual is still maintained separately from the official NNCSC Exfor Manual, though after the last NNCSC updates both Manuals have again become more similar.

5. CUSTOMER SERVICES

5.1 CINDU-11, the new catalogue of data available from NDS, has been issued. Its character has changed completely. Previous issues of CINDU had indexed Dastar and Exfor data in detail, a function which has now been taken over by Cinda. The new issue of CINDU gives only more general information on the numerical data libraries available, which include

experimental neutron data (5 libraries)
evaluated neutron data (ca. 15 libraries, depending on the definition of the term "library")
photonuclear data (1 library)
charged-particle nuclear data (2 libraries)
nuclear structure and decay data (4 libraries).

5.2 The request statistics is attached. NDS now receives, on average, one request per working day. Out of these there are about

1 request per week for evaluated data
1 request per week involving retrievals from Exfor
3 requests per week of more trivial nature requesting a document or a single data set.

Compared to the calendar year 1974 (which admittedly was low due to vacant posts) the data request and dissemination statistics have about doubled.

6. EVALUATED DATA

6.1 Several new evaluated data files were received from the other centers and are gratefully acknowledged.

6.2 The processing of evaluated data takes an increasing amount of time at NDS, part of which could be saved if there were fewer mistakes in the data transmitted.

6.3 NDS has started a file in Exfor format for selected important evaluated data which are not part of one of the established evaluated data libraries. The file has the name VIEN (= various international evaluated neutron data) and its accession numbers start with the character V. VIEN data will be transmitted outside the normal Exfor transmission.

7. DOCUMENTS

7.1 For a list of documents translated and/or distributed by NDS see INDC(SEC)-53/U (June 1976).

8. DATA REVIEWS

8.1 The full report (planned as INDC(NDS)-64) on the third IAEA evaluation of the 2200 m/s and thermal Maxwellian neutron data of the main fissile isotopes, a summary of which had been presented at the 1975 Washington Conference, could not be completed, mainly due to the less efficient working conditions at Wasagasse.

8.2 The work on the review of threshold reactions for reactor neutron dosimetry continues.

9. WRENDA

9.1 WRENDA75 has been published in June 1975. WRENDA76 is being prepared.

9.2 New or changed requests have been received from France, Sweden, Switzerland, Japan, UK, Germany F.R., Netherlands (all these through NDCC), Australia, Bulgaria, German Dem.Rep.

The requests from USA and USSR remained mostly unchanged.

9.3 NNCSC and NEA transmitted the requests according to actions 21 and 22 from last 4C-Meeting.

Physics Department
Banaras Hindu University
Varanasi - 221005, India

April 16, 1976

Dear Dr. Lemmel,

Thank you for your letter dated March 22, 1976 and the report INDC (NDS) -69 on the 1975 Meeting on Charged Particle Nuclear Data Compilation and the Exfor Manual Dictionaries. I am indeed grateful to you for inviting me to the next meeting of CPND group on 28-30 April 1976 and for taking such keen interest in my activities. I wish I could attend this meeting however, to arrange for travel funds in India is a hard job despite the fact that you have tried to move India's representative to IAEA all by yourself. I, on my side, am trying the best I can, but it will be really great good luck if I am able to find travel support in such short time. However, I am keeping my fingers crossed.

I am giving below a brief outline regarding the proposed compilation which, if you think fit, may be conveyed to the CPND group meeting for their comments and suggestions.

In the proposed compilation we plan to present the numerical results of angular distribution measurements of (d,d) and (d,p) stripping cross-sections and polarizations (iT_{11}, T_{22} ... etc.) for all nuclei and at all incident deuteron energies for the period 1969-1975. The (d,p) transition is characterized by the state (Excitation Energy and J^{π}) in which the stripped neutron is captured, and therefore at a particular incident deuteron energy and for a target various angular distributions of the (d,p) reaction characterized by the captured neutron state will be presented.

Just to give you an idea about the organisation of the data in our proposed compilation I am giving here a table (Table A) which describes the contents of the compilation. This table of

contents will be followed by the tables of (d,p) stripping data (Tables B, C ...).

This compilation has been undertaken in view of the importance of (d,p) stripping data for nuclear structure studies. Moreover, it is felt that a compilation of numerical material in the proposed form is necessary with the recent introduction of a new editorial policy by nuclear physics journals, to exclude publications of experimental results in numerical form. This will save considerable time of other workers in collecting the data. Recently we wanted to do some coupled channel calculations for (d,p) stripping for chromium isotopes, and it took us around three months to collect the data from the authors and from the plots available in the journals. Collecting data from the plots is really a tough job as well as inaccurate. The present compilation will automatically complete the compilation of neutron single particle states in nuclei.

The compilation is in yet a preliminary stage. The compilation of the references, their keywords abstracts, and the addresses of the authors have been already completed. We are planning to send a letter, one copy of which is enclosed herewith, to all the authors, in which they are requested to send to us the data available with them. I hope this letter will serve our purpose. This letter will be printed after getting your approval and we will start despatching them to the authors.

I am not sure about the success of this compilation as it depends upon the cooperation from a large number of authors. Furthermore, the work needs more time than I am able to devote since it is a side work. However, if authors cooperate, I hope to finish it within six months.

I shall anxiously await your reply.

Yours sincerely,
D.C Agrawal
(D.C. Agrawal)
Post-Doctoral Fellow

To
Dr. H.D. Lemmel
Nuclear Data Section
Division of Research & Laboratories
International Atomic Energy Agency
Vienna, Austria.

INTERNATIONAL ATOMIC ENERGY AGENCY
AGENCE INTERNATIONALE DE L'ENERGIE ATOMIQUE
МЕЖДУНАРОДНОЕ АГЕНТСТВО ПО АТОМНОЙ ЭНЕРГИИ
ORGANISMO INTERNACIONAL DE ENERGIA ATOMICA

KÄRNTNER RING 11, P.O. BOX 590, A-1011 VIENNA, AUSTRIA

NUCLEAR DATA SECTION

Date:

Dear

The (d,p) stripping reaction has been of quite interest since its importance was recognized by Butler in 1950. Keeping in view the various approaches which are in progress for (d,p) stripping calculations and the importance of these for nuclear structure study we are compiling the numerical results of angular distribution measurements of the (d,d) and the (d,p) stripping cross sections and polarizations (iT_{11}, T_{22} .... etc.) for all nuclei and at all incident deuteron energies for the period 1973 and onwards. This will save time of others in collecting the data. The International Atomic Energy Agency has shown keen interest in making available the present compilation either in the form of a report or it may be computerized. We, therefore, request you to send us a copy of the tables of data (both published and unpublished) of your group in any form either as a laboratory report, reprint, preprint, thesis or just in the form of tables. Even if you have a single copy of it, please send it; we promise to return it back. You are further requested to bring in our knowledge any other sources where we may get these data. It is needless to add that due acknowledgement of your cooperation will be made.

Please note that not only the numerical experimental results but also details on the error analysis and, where applicable, values of reference data used (standard cross-sections, half-lives, etc.) are important for the compilation.

With best regards,

Yours sincerely,

(D.C. Agrawal)

Note by editor:
The draft circular letter as of 1976/4/16 has been replaced here by the final one which was sent to 134 addresses in Oct.1976.

Mailing Address:

D.C. Agrawal
Room 8, Barhar Kothi
Durga Kund
Varanasi-221005, INDIA

Samples of the proposed tables

Table A. Compilation of (d,p) stripping data

Target	Deuteron Energy (MeV)	Excitation Energy (MeV)	J^{π}	Type of data	$(\theta_i - \theta_f)$	No.of points	Table No.	Reference
^{52}Cr	10	0.00	3/2	SIG(CM)	5.3-130.9	30	B	Nucl.Phys.A196,225(1972)
		0.565	1/2	,,	5.3-131.0	30	C	,,
..	..	..	..	..	..	..	..	..
^{52}Cr	10	0.00	3/2	$1T_{11}$	5.3-126.0	29	D	Nucl.Phys.A196,225(1972)
		0.565	1/2	,,	,,	29	F	,,
..	..	..	..	..	..	..	..	..

Table B

θ CM	SIG(CM)
5.3	6.0
7.8	8.7
10.4	10.7
..	..
..	..
..	..
126.0	0.189
130.9	0.182

Table D

θ CM	$1T_{11}$	Error
5.3	0.217	0.008
7.8	0.185	0.006
10.4	0.157	0.005
..	..	..
..	..	..
..	..	..
121.0	-0.209	0.017
130.0	-0.310	0.018

Proposal for a CPND Bibliography

H. Behrens
ZAED

ZAED is willing to produce a CPND bibliography in a form of a printed handbook or booklet. Cumulative volumes may also be published (including the past).

The scope of the bibliography will include:

a) integral cross sections,
excitation function, and
thick target yields

b) All target nuclei with $Z > 1$

c) All possible nuclear reaction types.

This bibliography will be published in INIS-format. It will include a bibliographic part as well as an abstract. The production of this bibliography will be carried out by making first a query in the INIS-System by using the relevant descriptors. The in this special case remaining noise of about 75% will be afterwards selected out by hand in cooperation with the group of Prof. Münzel. Furthermore a more detailed classification than in the INIS system contained will be introduced. At the end the bibliography will be classified according to

a) type of nuclear reaction (i.e. proton reactions, deuteron reactions etc.)

b) type of target nucleus (another possibility would be to list the target nuclei in a subject index).

In addition to this classification the following indexes would be contained in the bibliography:

a) Author Index

b) Index of Cooperate Entries

c) Report Number Index

d) Subject Index

The first issue of our bibliography could be brought out in the first half of 1977.

A cumulative bibliography of the years before 1976 will be produced in a way different from those discussed above. A special selection of the relevant references from the Charged Particle Reaction List will be carried out by hand (5% of the whole content only).

Proposal for a CPND Bibliography

C. L. Dunford

NNCSC

The current "Reaction List" file and publication will be discontinued in the next few months. A final cumulative volume may be published. As of October 1, NNCSC will assume full responsibility for the compilation of a charged particle bibliography of much restricted scope, but slightly more extensive than that outlined at the 1975 Consultants' Meeting.

1. The data scope included
    a) excitation functions to ground and metastable states
    b) thick target yields
2. For all targets $Z \geq 1$
3. For all projectiles $Z \geq 1$, $A \geq 1$
4. For lowest projectile energies of 100 MeV or less
5. All publications which
    a) are published after the last Reaction List
    b) contain data exchanged in CPND EXFØR
    c) are journals, conference proceedings or laboratory reports

The file contents and structure will closely follow the present neutron (CINDA) system but will incorporate additional features from the Reaction List. Attached is a schematic card input format indicating file contents. There would be one entry for each reaction and quantity given in a reference.

The literature coverage and coding of all entries would be done initially at NNCSC. Coverage control would be provided through regular retrievals from the Recent References file and from reference lists provided by other centers (particularly useful would be Russian literature with English keywords). Should the scope of the compilation expand then NNCSC might request assistance from other centers much as is done with CINDA at present.

As with the literature coverage, NNCSC feels that it should take responsibility for publication at least in the first few years of publication. NNCSC proposes to publish in a 6 x 9 inch format a cumulative bibliography on an annual basis. Initially, copies would be supplied cost free to designated distribution centers.

As long as the number of total pages (copies x pages/copy) remains less than 100,000 NNCSC believes it can supply this service to the network.

CPND Bibliography Card Input Format

Card #1

Columns		
1-71	Reaction Branch, Parameter	(as in CPND EXFØR)
72	Compiler code	(as in CINDA)
73	Operational code	(as in CINDA)
74-79	Serial number	
80	"A"	

Card #2

1-3	Laboratory	(as in CINDA)
4	Worktype	(as in CINDA)
5-22	Reference	(as in EXFØR)
23-30	Energy range	(as in CINDA)
31-39	CPND EXFØR acession number	(LNNNN.NNN)
40	Hierarchy	(as in CINDA)
41-43	Block number	(as in CINDA)
44-72	First Author and comment	(as in CINDA)
73	Operation code	(as in CINDA)
74-79	Serial number	
80	"B"	

Initial List of Journals to Be Scanned

Journal

Ann. Phys. (N.Y.)
Ann. Phys. (Paris)
Australian J. Phys.
Bull. Acad. Sci. USSR,
Phys. Ser.
Can. J. Chem.
Can. J. Phys.
Compt. Rend. Ser. B.
Czech. J. Phys.
Helv. Phys. Acta
Izv. Akad. Nauk SSSR,
Ser. Fiz.
J. Inorg. Nucl. Chem.
J. Phys. A.
J. Phys. (Paris)
J. Phys. Soc. Japan
Lett. Nuovo Cimento, Ser. 2
Nucl. Phys.
Nuovo Cimento
Particles and Nuclei
Physica Scripta
Phys. Letters
Phys. Rev.
Phys. Rev. Letters
Radiochim. Acta
Rev. Mex. Fis.
Rev. Roum. Phys.
Sov. At. Energy
Sov. J. Nucl. Phys.
Ukr. Fiz. Zh. (Ukr. Phys. J.)
Yad. Fiz. (Sov. J. Nucl. Phys.)
Z. Physik

(Note: This has not initially been distributed as a formal CP-Memo but was referred to elsewhere under this code.)

Proposals for additions and modifications

1) It is proposed to give reaction type codes in the "BRANCH" subfield of REACTION.

Reaction type codes are either formed from particle codes, for instance,

PG for (p,γ) reactions,

DP for (d,p) reactions,

HE3A for (^{3}He,α) reactions,

DNP for (d,np) reactions,

PPG for (p,p'γ) reactions, etc.,

or chosen from DICTION-10. Additions to DICTION-10 proposed are:

RES for resonance experiments;

1TRS for single-nucleon transfer reactions in general, such as (^{12}C,^{13}C) and (^{16}O,^{15}N);

nTRS(n=2,3,..) for n-nucleon transfer reactions in general, such as (^{18}O,^{16}O) and (p,^{6}Li).

2) Additions to DICTION-22 (DETECTORS) proposed.

MAGSP magnetic spectrometer or spectrograph

PLATE nuclear plates

PSOLST position sensitive solid state detectors

SWPC position sensitive single-wire proportional counters

MWPC position sensitive multi-wire proportional counters

3) Additions to DICTION-25 (UNITS) proposed.

MU-B/SR microbarns per steradian

N-B/SR nanobarns per steradian

(In DICTION-25 there are now MICRO-B, MUB/SR/MEV, and MU-B/MEV. The first two should be replaced by MU-B and MU-B/SR/MEV, respectively.)

An alternative may be to assume certain prefix as universal UNIT modifiers. Possible examples are

MU- for 10^{-6},

N- for 10^{-9},

P- for 10^{-12},

F- for 10^{-15}.

Thus N-B/SR means nanobarns per steradian, N-SEC nanoseconds, N-AMP nanoamperes, etc.

4) Inclusion of some semi-numerical data should be considered in DATA-section.

Examples of semi-numerical data :

<0.01

1/2

7/2-

(blank) or X in order to distinguish unknown values from 0.0.

5) Technical or experimental information is included in BIB-section at the moment. Is it not better to have EXP-section and thus leave BIB-section for purely bibliographic information?

6) In **REACTION**, outgoing particles separated by + signs should be understood as

(A) a positive indication of multiple emission

and (B) a positive indication that the sequence of the outgoing particles is irrelevant or unknown.

Thus

i) it is not necessary to write (P,D+G) etc., although gamma rays are also emitted in many differential cross section measurements;

ii) (D,P) should be enough, if only protons are detected, even in a case of (d,p) reaction leading to unbound states of the final nucleus;

iii) one writes, for example, (40-ZR-90(D,P)40-ZR-91(N)40-ZR-90,...)

(a) if neutron groups emitted from unbound states in ^{91}Zr are measured,

or (b) if neutrons are detected in coincidence with proton groups leading to certain unbound states of the intermediate nucleus ^{91}Zr,

in other words,

(c) if (d,p) reaction is known to precede the neutron emission;

iv) one writes (40-ZR-90(D,N)41-NB-91(P)40-ZR-90,...)

(a) if proton groups emitted from unbound states in ^{91}Nb are measured,

or (b) if neutrons are detected in coincidence with protons emitted from unbound states in ^{91}Nb,

in other words

(c) if (d,n) reaction is known to precede the proton emission;

v) one writes (40-ZR-90(D,N+P)40-ZR-90,....)

(a) if the sequence is unknown,

or (b) if deuteron breakup cross section in the field of ^{90}Zr is measured,

or (c) in other cases where positive indication of two-particle emission is required and the sequence is irrelevant or unknown.

SAMPLE ENTRY PRESENTED BY DR. OHNUMA

*) Note: This has not initially been distributed as a formal CP-Memo but was referred to elsewhere under this code.

```
TRANS              Z001      751119                                          Z000000000000

ENTRY              Z0001     751119                                          Z000100000001

SUBENT             Z0001001  751119                                          Z000100100001

BIB                     12        17                                         Z000100100002
TITLE          (P,D) REACTION AT 52 MEV.I.58NI(P,D)57NI(EXPERIMENT          Z000100100003
               AL)                                                          Z000100100004
AUTHOR         (H.OHNUMA,T.SUEHIRO,M.SEKIGUCHI,S.YAMADA)                    Z000100100005
INSTITUTE      (ZJAPINS)                                                    Z000100100006
REFERENCE      (J,JPJ,36,1236,7405)                                         Z000100100007
FACILITY       1(SYNCYC,ZJAPINS)                                            Z000100100008
COMMENT        1EN=51.93 MEV, EN-RSL=40 KEV, AVERAGE BEAM 40NA,             Z000100100009
               BEAM SPOT 3MM*5.5MM                                          Z000100100010
REACTION       (28-NI-58(P,D)28-NI-57,PD,DA,D,,EXP)                         Z000100100011
DETECTOR       2(MAGSP,PROPC,SCIN)                                          Z000100100012
COMMENT        2PROPC IN FOCAL PLANE OF MAGSP GATED BY SCIN                 Z000100100013
               RESOLUTION=70 KEV, SOLID ANGLE=1.8 MSR                       Z000100100014
SAMPLE         99.8 PER CENT NI-58 SELF SUPPORT 2.7 MG/CM**2                Z000100100015
ERR-ANALYS     RELATIVE ERR=STATISTICAL/BG SUBTRACTION/PEAK SEPARATION      Z000100100016
               ABS ERR= 20 PER CENT                                         Z000100100017
HISTORY        (751119C)                                                    Z000100100018
ENDBIB                  17                                                  Z000100100019

NOCOMMON                                                                    Z000100100020

ENDSUBENT               18                                                  Z000100199999

SUBENT             Z0001002  751119                                          Z000100200001

NOBIB                                                                       Z000100200002

COMMON                  8         6                                         Z000100200003
EN             EN-RSL       E-LVL      1E-LVL      4E-LVL      5E-LVL      6Z000100200004
E-LVL      7E-LVL       8                                                   Z000100200005
MEV            KEV          MEV        MEV         MEV         MEV         Z000100200006
MEV            MEV                                                         Z000100200007
  51.93          40.           0.00       0.76        1.10        2.56     Z000100200008
   5.59           6.02                                                     Z000100200009
ENDCOMMON               6                                                   Z000100200010

DATA                   13         3                                         Z000100200011
ANG-CM         DATA-CM      3DATA-ERR  3DATA-CM    4DATA-ERR   4DATA-CM    5Z000100200012
DATA-ERR   5DATA-CM     6DATA-ERR  6DATA-CM    7DATA-ERR   7DATA-CM    8Z000100200013
DATA-ERR   8                                                               Z000100200014
ADEG           MB/SR        MB/SR      MB/SR       MB/SR       MB/SR       Z000100200015
MB/SR          MB/SR        MB/SR      MB/SR       MB/SR       MB/SR       Z000100200016
MB/SR                                                                      Z000100200017
   6.0            5.37          0.06       1.06        0.02        1.04     Z000100200018
   0.02           3.43          0.04       2.46        0.04        0.69     Z000100200019
   0.02                                                                    Z000100200020
   8.0            4.94          0.05       1.00        0.02        0.95     Z000100200021
   0.02           2.86          0.04       1.16        0.03        0.67     Z000100200022
   0.02                                                                    Z000100200023
  10.6            3.85          0.05       0.92        0.02        0.73     Z000100200024
   0.02           2.57          0.04       0.51        0.02        0.64     Z000100200025
   0.02                                                                    Z000100200026
ENDDATA                15                                                  Z000100200027

ENDSUBENT              26                                                  Z000100299999

ENDENTRY                2                                                  Z000199999999
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ENTRY            Z0002     751119                                    Z000200000001

SUBENT         Z0002001     751119                                    Z000200100001

BIB                   6          7                                    Z000200100002
TITLE       A STUDY OF 50V USING THE DIRECT REACTIONS 49TI(3HE,D)      Z000200100003
            AND 51V(D,T)                                              Z000200100004
AUTHOR      (A.SQURKES,H.OHNUMA,N.M.HINTZ)                            Z000200100005
INSTITUTE   (1USAMIN)                                                 Z000200100006
REFERENCE   (J,NP1A,217,438,73)                                       Z000200100007
FACILITY    (VDGT,1USAMIN)                                            Z000200100008
HISTORY     (751119C)                                                 Z000200100009
ENDBIB                7                                             Z000200100010

NOCOMMON                                                              Z000200100011

ENDSUBENT            10                                             Z000200199999

SUBENT         Z0002002     751119                                    Z000200200001

BIB                   4          7                                    Z000200200002
REACTION    (22-TI-49(HE3,D)23-V-50,HE3D,DA,D,,EXP)                   Z000200200003
DETECTOR    1(MAGSP,PLATE)                                            Z000200200004
COMMENT     1RESOLUTION=20 KEV, PLATE COVERED BY POLYETHYLENE         Z000200200005
SAMPLE       100 MU-G/CM**2 THICK SELF SUPPORTING FOIL                Z000200200006
             CUMPOSITION OF TI-49 TARGET IN PER CENT                  Z000200200007
                TI-46      TI-47      TI-48      TI-49      TI-50    Z000200200008
                 2.0         1.8       18.8       75.7        1.7   Z000200200009
ENDBIB                7                                             Z000200200010

COMMON                6          3                                    Z000200200011
EN          E-LVL     2E-LVL     3E-LVL     4E-LVL     5E-LVL     6Z000200200012
MEV         KEV        KEV        KEV        KEV        KEV        Z000200200013
  22.0        0.0      225.       321.       356.       390.       Z000200200014
ENDCOMMON             3                                             Z000200200015

DATA                 11          2                                    Z000200200016
ANG-CM      DATA-CM   2DATA-ERR  2DATA-CM   3DATA-ERR  3DATA-CM   4Z000200200017
DATA-ERR    4DATA-CM  5DATA-ERR  5DATA-CM   6DATA-ERR  6          Z000200200018
ADEG        MU-B/SR    MU-B/SR    MU-B/SR    MU-B/SR    MU-B/SR    Z000200200019
MU-B/SR     MU-B/SR    MU-B/SR    MU-B/SR    MU-B/SR               Z000200200020
  10.1       960.        20.       730.        20.       640.       Z000200200021
  20.        520.        20.       450.        20.                  Z000200200022
  20.2       860.        20.       630.        20.       540.       Z000200200023
  20.        420.        20.       350.        20.                  Z000200200024
ENDDATA               8                                             Z000200200025

ENDSUBENT            24                                             Z000200299999

SUBENT         Z0002003     751119                                    Z000200300001

BIB                   4          5                                    Z000200300002
REACTION    (23-V-51(D,T)23-V-50,DT,DA,T,,EXP)                        Z000200300003
DETECTOR    1(MAGSP,PSOLST)                                           Z000200300004
COMMENT     1THREE 1 CM * 3CM * 700 MU-M POSITION SENSITIVE DETECT    Z000200300005
            ORS IN THE FOCAL PLANE.   RESOLUTION=10 KEV               Z000200300006
SAMPLE      CARBON BACKED NATURAL V.  80 MU-G/CM**2                   Z000200300007
ENDBIB                5                                             Z000200300008

COMMON                6          3                                    Z000200300009
EN          E-LVL     2E-LVL     3E-LVL     4E-LVL     5E-LVL     6Z000200300010
MEV         KEV        KEV        KEV        KEV        KEV        Z000200300011
  19.5        0.0      228.       321.       357.       387.       Z000200300012
ENDCOMMON             3                                             Z000200300013

DATA                 11          2                                    Z000200300014
ANG-CM      DATA-CM   2DATA-ERR  2DATA-CM   3DATA-ERR  3DATA-CM   4Z000200300015
DATA-ERR    4DATA-CM  5DATA-ERR  5DATA-CM   6DATA-ERR  6          Z000200300016
ADEG        MU-B/SR    MU-B/SR    MU-B/SR    MU-B/SR    MU-B/SR    Z000200300017
MU-B/SR     MU-B/SR    MU-B/SR    MU-B/SR    MU-B/SR               Z000200300018
  15.3       234.        15.       345.        16.       456.       Z000200300019
  17.        567.        18.       678.        19.                  Z000200300020
  18.6       432.        25.       543.        26.       656.       Z000200300021
  27.        765.        28.       876.        29.                  Z000200300022
ENDDATA               8                                             Z000200300023

ENDSUBENT            22                                             Z000200399999

ENDENTRY              3                                             Z000299999999
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```
ENTRY           Z0003     760206                                  Z0003000000001

SUBENT        Z0003001    760206                                  Z0003000100001

BIB                10          18                                 Z0003000100002
TITLE        (P,D) REACTIONS INDUCED BY A POLARIZED PROTON BEAM    Z0003000100003
AUTHOR       (B.MAYER,J.GOSSET,J.L.ESCUDIE,H.KAMITSUBO)           Z0003000100004
INSTITUTE    (2FR SAC,ZJAPIPC)                                    Z0003000100005
REFERENCE    (R,IPCR-CYCLOTRON-REPORT-12,7106)                    Z0003000100006
FACILITY     1(ISOCYC)                                            Z0003000100007
COMMENT      1EN=16.6-24.5 MEV, BEAM POLARIZATION NORMALLY ABOUT 80 Z0003000100008
             PER CENT. BEAM POL MONITORED BY CARBON POLARIMETER.  Z0003000100009
             AVERAGE BEAM 5 N-AMP. FOR FURTHER DETAILS OF EXP SEE Z0003000100010
             PHYS. REV. 184(1969) 1217.                           Z0003000100011
DETECTOR     2(SOLST,TELES)                                       Z0003000100012
COMMENT      2SIXTEEN DE-E TELESCOPES OF SI-DETECTORS             Z0003000100013
             SOLID ANGLE 1.1 MSR,  ANG RESOL 0.6 DEG              Z0003000100014
             OVERALL ENERGY RESOLUTION 80 TO 150 KEV              Z0003000100015
ERR-ANALYS   PURELY STATISTICAL.   ERRORS IN ABS CROSS SECTIONS   Z0003000100016
             ESTIMATED TO BE 10 PER CENT, ARISING PRIMARILY FROM  Z0003000100017
             DIFFERENCES IN SOLID ANGLES AND DETECTOR EFFICIENCIES Z0003000100018
             AND NOT AFFECTING ASYM.                              Z0003000100019
HISTORY      (760206C)                                            Z0003000100020
ENDBIB             18                                             Z0003000100021

NOCOMMON                                                          Z0003000100022

ENDSUBENT          21                                             Z0003000199999


SUBENT        Z0003002    760206                                  Z0003000200001

BIB                 2           2                                 Z0003000200002
REACTION     (28-NI-58(P,D)28-NI-58,PD,ASY,D,,EXP)                Z0003000200003
SAMPLE       99.95 PER CENT NI-58 SELF SUPPORT 0.8 MG/CM**2       Z0003000200004
ENDBIB              2                                            Z0003000200005

COMMON              5           3                                 Z0003000200006
EN           E-LVL  3E-LVL      4E-LVL      5E-LVL      6         Z0003000200007
MEV          MEV     MEV         MEV         MEV                  Z0003000200008
  24.5         0.0       0.78        1.12        2.59            Z0003000200009
ENDCOMMON           3                                            Z0003000200010

DATA                9           3                                 Z0003000200011
ANG-CM       DATA-CM 3DATA-ERR  3DATA-CM    4DATA-ERR  4DATA-CM  5Z0003000200012
DATA-ERR     5DATA-CM 6DATA-ERR 6                                 Z0003000200013
ADEG         NO-DIM   NO-DIM     NO-DIM      NO-DIM     NO-DIM    Z0003000200014
NO-DIM       NO-DIM   NO-DIM                                      Z0003000200015
  16.6         0.11       0.01                          -0.19     Z0003000200016
   0.01       -0.13       0.01                                    Z0003000200017
  20.2         0.14       0.01        0.17        0.03   -0.20     Z0003000200018
   0.02       -0.06       0.01                                    Z0003000200019
  22.6         0.22       0.01        0.01        0.03   -0.10     Z0003000200020
   0.03        0.0        0.01                                    Z0003000200021
ENDDATA            10                                             Z0003000200022

ENDSUBENT          21                                             Z0003000299999


SUBENT        Z0003003    760206                                  Z0003000300001

BIB                 2           2                                 Z0003000300002
REACTION     (28-NI-61(P,D)28-NI-60,PD,ASY,D,,EXP)                Z0003000300003
SAMPLE       79.2 PER CENT NI-61 SELF SUPPORT 4.0 MG/CM**2        Z0003000300004
ENDBIB              2                                            Z0003000300005

COMMON              3           3                                 Z0003000300006
EN           E-LVL  7E-LVL      8                                 Z0003000300007
MEV          MEV     MEV                                          Z0003000300008
  16.6         1.33      2.16                                    Z0003000300009
ENDCOMMON           3                                            Z0003000300010

DATA                5           7                                 Z0003000300011
ANG-CM       DATA-CM 7DATA-ERR  7DATA-CM    8DATA-ERR  8         Z0003000300012
ADEG         NO-DIM   NO-DIM     NO-DIM      NO-DIM               Z0003000300013
  15.0         0.06       0.02        0.01        0.04            Z0003000300014
  20.7         0.07       0.02       -0.08        0.04            Z0003000300015
  25.3         0.03       0.02       -0.06        0.04            Z0003000300016
 110.5        -0.05       0.07       -0.12        0.10            Z0003000300017
 115.5        -0.12       0.08                                    Z0003000300018
 119.8        -0.28       0.08                                    Z0003000300019
 125.7        -0.31       0.09                                    Z0003000300020
ENDDATA             9                                            Z0003000300021

ENDSUBENT          20                                            Z0003000399999

ENDENTRY            2                                            Z0003999999999
```

```
ENTRY            Z0004     760206                                  Z000400000001

SUBENT        Z0004001     760206                                  Z000400100001

BIB                 13          29                                 Z000400100002
TITLE      SPIN-FLIP PROBABILITIES VIA ISOBARIC ANALOGUE RESONANCEZ000400100003
           S IN 50TI(P,P)50TI INELASTIC SCATTERING                 Z000400100004
AUTHOR     (T.NOJIRI,H.TOYAMA)                                     Z000400100005
INSTITUTE  (2JAPTIT,ZJAPTUE)                                       Z000400100006
REFERENCE  (J,JPJ,37,1479,7412)                                    Z000400100007
REACTION   (22-TI-50(P,P)22-TI-50(G)22-TI-50,INL/RES,SFP,P/G,,EXP)Z000400100008
FACILITY   1(VDG,2JAPTIT)                                          Z000400100009
COMMENT    1EN=3,588-3,606, EN-RSL=0,01 PER CENT, EN-STEP=3 KEV    Z000400100010
            AVERAGE BEAM=0,5 MU-AMP                                Z000400100011
DETECTOR   2(S/LST)                                                Z000400100012
           3(NAICR)                                                Z000400100013
PART-DET   2(P) INEL SCATT PROTONS VIA IAR                         Z000400100014
           3(G) 1.55 MEV GAMMA FROM 1ST 2+ IN TI-50                Z000400100015
COMMENT    2THREE SI DETECTORS IN COINC WITH 5IN*4IN NAI(TL) PLACEDZ000400100016
            PERPENDICULAR TO SCATT PLANE,                          Z000400100017
            SOLID ANG=1.3 MSR,  HALF ANG=1.2 DEGREE                Z000400100018
           3NAI(TL) IN COINC WITH INEL SCATT PROTONS               Z000400100019
            SOLID ANG=91 MSR,  HALF ANG=3.5 DEGREE                 Z000400100020
SAMPLE     (22-TI-0XI)  10 MU-G/CM**2 ENRICHED TI-50 ON C          Z000400100021
             ISOTOPIC COMPOSITION (PER CENT)                       Z000400100022
              TI-46      TI-47      TI-48      TI-49      TI-50    Z000400100023
               2.7        2.48       24.1       2.99       67.72   Z000400100024
ERR-ANALYS UNCERTAINTY INCLUDES                                    Z000400100025
              AMBIGUITY IN GAMMA-DETECTOR EFFICIENCY               Z000400100026
              AMBIGUITY IN BACK GRD SUBTRACTION                    Z000400100027
              AMBIGUITY IN ACC COINC SUBTRACTION                   Z000400100028
              STATISTICAL ERRORS                                   Z000400100029
           ERRORS DUE TO FINITE ANGLES OF DETECTORS MUCH SMALLER   Z000400100030
           THAN STATISTICAL ERRORS                                 Z000400100031
HISTORY    (760206)                                                Z000400100032
ENDBIB              30                                             Z000400100033

NOCOMMON                                                           Z000400100034

ENDSUBENT           33                                             Z000400199999


SUBENT        Z0004002     760206                                  Z000400200001

BIB                  1           2                                 Z000400200002
MISC-COL   (MISC1) SPIN-FLIP PROBABILITIES                         Z000400200003
           (MISC2) ERROR OF MISC1                                  Z000400200004
ENDBIB               2                                             Z000400200005

COMMON               6           3                                 Z000400200006
EN         EN-RES     SPIN J      PARITY     E-LV-INI   E-LVL-FIN  Z000400200007
MEV        MEV        H-BAR       NO-DIM     MEV        MEV        Z000400200008
   3,588    11,575       2.5         -1.        1,55       0.0     Z000400200009
ENDCOMMON            3                                             Z000400200010

DATA                 3           4                                 Z000400200011
ANG        MISC1      MISC2                                       Z000400200012
A-DEG      NO-DIM     NO-DIM                                      Z000400200013
  45.0      28,5         4.0                                       Z000400200014
  60.0      27,3         3.0                                       Z000400200015
  75.0      29,5         4.0                                       Z000400200016
  90.0      29,5         3.5                                       Z000400200017
ENDDATA              6                                             Z000400200018

ENDSUBENT           13                                             Z000400299999

ENDENTRY             2                                             Z000499999999

ENDTRANS             2           0                                 9999999999999
```

MEMO CP-C/1

From: V. McLane May, C. Dunford

Subject: CPND Dictionaries

Reference: CP-B/1 also known as KACHAPAG Information #1
Memo 4C-3/160

We believe that EXFØR dictionaries 10-14 should be left unmodified, and that new dictionaries be added which correspond to usage in specific fields for the keyword REACTION. We believe that this procedure will ease the adoption of the keyword REACTION in the neutron EXFØR. We also believe that the assignments to the various dictionaries were not logical. We propose the following new dictionaries which could easily be expanded to handle neutron data.

Dictionary 15: (Data type)

EXP
THEØ
EVAL
RECØM

Dictionary 26: ((Processes), other than those specified by a combination of particles).

TØT
NØN
ABS
EL*
INL

* If (p,p) is taken to mean total scattering.

Dictionary 27: Branch

PAR
PR
DL
CN
DI
M+
M-
(M)
BIN
TER
IND
CUM
(CUM)

Dictionary 28: (Quantity)

EM**
SIG
TTY
YLD**

** Have combined GEM, PEM, AEM, TEM into single emission quantity EM and have combined FY and PY into single quantity YLD. Remainder of reaction code should be sufficient to distinguish these.

Dictionary 29: Modifiers

RAW
REL
FCT
AV

Dictionaries 16-23

The introduction of six character codes introduces complications into all our processing codes. We do not see the need to expand to six characters, since the limit of intelligible 5-character codes is not anywhere near being reached.

The purpose of the codes is to be machine identifiable. The use of easily recognizable codes is meant to help the compiler, not the user.

Dictionary 24: (Data-heading Keywords)

There is presently an EXFØR proposal to drop the keywords RATIØ (and associated keywords). This was needed in EXFØR for use with the ISØ-QUANT separater ',' which allowed a ratio and its normalized cross section to be coded in the same entry. With the addition of pointers, there is no longer a need for distinguishing between DATA and RATIØ. This would also pertain to the keyword SUM.

Sol Pearlstein

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