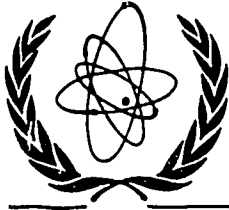


XA7601936

INDC(NDS)-71



International Atomic Energy Agency

INDC(NDS)-71
Distribution: L+N

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INTERNATIONAL NUCLEAR DATA COMMITTEE

Summary

of the

Consultants' Meeting

on

Charged Particle Nuclear Data (CPND) Compilation

Vienna, 8-12 September 1975

Edited by
H.D. Lemmel

January 1976

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

Summary, CPND Meeting 1975

This document, INDC(NDS)-71, is a summary
of the document INDC(NDS)-69.

Reproduced by the IAEA in Austria
March 1976
76-1347

Summary
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The IAEA Nuclear Data Section convened a Consultants' Meeting on Charged Particle Nuclear Data Compilation, Vienna, 8-12 September 1975.

The main results of the meeting were:

An agreement was reached for an international cooperation effort, coordinated by the Agency's Nuclear Data Section, on the compilation of charged particle induced nuclear reaction data, which gain increasing importance in various industrial and scientific applications in both developed and developing countries. The primary participating data centres are at Karlsruhe, Fed. Rep. of Germany, and at the Kurchatov Institute, Moscow, USSR, and other centres in Japan, U.K., U.S.A. and at NEA will contribute with data compilation or distribution services. The cooperation is based on the experiences gained from the international exchange of neutron nuclear data, and the same or similar computerized exchange systems (EXFOR) will be used. The role of the Agency's Nuclear Data Section had to be kept, due to manpower restrictions, at the minimum required level of coordinating and data dissemination functions.

The complete Minutes of the Meeting are included in the document INDC(NDS)-69 which is available, upon request, from the IAEA Nuclear Data Section. Of this document the following pages are included in the present summary document:

<u>Page</u>	
5-6	Introduction
7-8	Agenda
9	List of Participants
23-29	Conclusions and Recommendations

(The page numbers were left the same as in INDC(NDS)-69.)

INTRODUCTION

The present meeting was a successor to the IAEA Consultants' Meeting on Charged Particle and Photonuclear Reaction Data held in Vienna 24 - 26 April 1974 [1]. This earlier meeting, considering the needs for charged particle and photonuclear reaction data, documented in ref. [2], concluded:

"that the very valuable services provided by the existing centres and groups could be usefully enhanced by establishing a coherent international cooperation in the compilation, evaluation and dissemination of these data. This cooperation would require a free international exchange of experimental as well as evaluated data between the centres and groups concerned."

The International Nuclear Data Committee considered the topic at its seventh meeting in October 1974 and concluded [ref. 3, recommendation 2.4]:

"The Committee values the activity of the existing "non-neutron" nuclear data centres and groups and judges it important to continue this work, in most cases with increased support. It asks IAEA and its member states to support the above activity, especially the international coordination of this work and the exchange of appropriate "non-neutron" nuclear data and references, by continuing to convene meetings of "non-neutron" nuclear data centres and groups."

Since then, some essential steps towards an international cooperation in charged-particle nuclear data compilation have been made:

The charged-particle nuclear data group at Karlsruhe had prepared sample entries of charged-particle reaction data compiled in a format close to Exfor, a system which had been developed by the four neutron data centres for the exchange of neutron nuclear data [4]. The modified EXFOR system as proposed by Karlsruhe had meanwhile been reviewed by the four neutron data centres at their March 1975 meeting [5]. Also the Nuclear Data Centre at the Moscow Kurchatov Institute submitted sample entries in the format of the Karlsruhe Exfor system. Furthermore, a study group in Japan has recently developed the prototype of a Nuclear Data File. In the USA, the National Neutron Cross-Section Center has assumed responsibility for coordinating the US activities on charged-particle nuclear data with similar activities abroad.

On the basis of the conclusions of the 1974 Meeting and of the development which took place since then, the present meeting was the first to discuss technical details on an international cooperation and exchange of charged-particle nuclear data.

- [1] Summary Report on the Consultants' Meeting on Charged Particle and Photo-nuclear Reaction Data, 24-26 April 1974, Vienna, INDC(NDS)-59, IAEA, Vienna, June 1974. For the papers submitted see INDC(NDS)-61, IAEA, Vienna, July 1974.
- [2] Symposium on Nuclear Data in Science and Technology, Paris 1973, Proceedings IAEA, Vienna, 1973, and:
A. Calamand: Survey of current and future needs for charged particle and photo-nuclear reaction data, INDC(NDS)-62.
- [3] Official Minutes of the Seventh INDC Meeting, Lucas Heights, 7-11 Oct. 1974, INDC-18, IAEA, Vienna, 1975.
- [4] USA National Neutron Cross-Section Center, NEA Neutron Data Compilation Centre, IAEA Nuclear Data Section, USSR Centr po Jadernym Dannym: EXFOR Manual, internal distribution.
- [5] Report on the Eleventh Four-Centre Meeting, Brookhaven, National Laboratory, USA, 10-14 March 1975, INDC(NDS)-68, IAEA, Vienna 1975.

Consultants' Meeting

on

Charged Particle Nuclear Data (CPND) Compilation

Vienna, 8-12 September 1975

Agenda

I. Brief review of current and planned CPND compilation activities

Bibliography, Compilation and Evaluation of CPND

- Specific user needs;
- Scope, content and format;
- Publications and services.

II. Matters of technical cooperation

A. Bibliography

1. Experience gained from the use of "Recent References", as far as related to CPND; any changes desirable?
2. Who compiles what where?
 - Continue centralized input?
 - Start coordinated input from different Centres and Groups?
 - Practical details for coordinated input.
3. Publications and services.

B. Compilation and Exchange of CPND

1. Principle decision whether a format close to the "neutron data EXFOR" is acceptable, mutatis mutandis, for CPND.
2. Scope and distribution of work between Centres and Groups involved.
 - Targets, projectiles, reactions, quantities;
 - Experimental, deduced, interpolated, theoretical data, thick target yields;
 - Selective versus comprehensive compilation;
 - Distribution of work defined by physics criteria (excitation function, angular distribution, etc.) and/or geographical origin of data;
 - Possible future extension of the scope (heavy ions?).
3. Technical details, contents and format.
 - Numeric information;
 - Bibliographic and experimental description;
 - Keywords, codes, retrievability (what is needed?)
 - What modifications to EXFOR are required?
 - Codes for reactions and quantities;
 - Associated parameters (standard reference values, half-lives, etc.)
 - Accession-numbers.
4. Organization of cooperation.
 - Mechanisms for exchange, compiler's and system manual, dictionaries of codes and keywords, meetings;
 - Implementation schedule.

C. Evaluation of CPND

1. Scope;
2. Feasibility of cooperation;
3. Common method of evaluation;

D. Service to users

III. Review of actions, conclusions and recommendations from this meeting

<u>Schedule:</u>	Monday morning:	agenda item I
	Monday afternoon:	II.A.1,2
	Tuesday morning:	II.A.3
	Tuesday afternoon:	II.B.1,2
	Wednesday:	II.B.3
	Thursday morning:	II.B.4 and II.D
	Thursday afternoon:	II.C
	Friday:	III

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(Chairman)
(Scientific Secretary)

CONCLUSIONS AND RECOMMENDATIONS

User needs and data scope

(Agenda items I, II.B.2)

Conclusions:

- C 1. The need of various users for compilations of charged-particle nuclear reaction data (CPND), in particular of integral CPND cross-sections, has been assessed in earlier meetings. It is strongly felt that the arguments given at these meetings stressing the importance of the compilation of such data, are still valid. Therefore, urgency should be given to corresponding compilation efforts.
- C 2. It is realized that for data applications primarily integral CPND are needed, and such data should be given priority. The interest for differential CPND comes mainly from the research community.
- C 3. In the present document, the term "integral CPND" is understood to include
- excitation functions for the formation of residual nuclei in ground-state or metastable state;
 - thick target yield data;
- both for targets with $Z > 4$ and projectiles of protons and heavier particles.

Recommendation:

- R 1. Within the field of CPND, the compilation and exchange of "integral CPND" should be given priority.

CPND Bibliographic System

(Agenda item II.A)

Conclusions:

The meeting discussed various possibilities for creating an international CPND bibliography, and came to the following conclusions:

- C 4. Since the USA offered to continue to maintain a worldwide CPND bibliography, it is suggested that a new appropriate system or a revised form of an existing system be developed in the USA, but that the following requirements expressed in the meeting be considered.
- C 5. At present, there exist three nuclear data bibliographies: Cinda, Recent References, Reaction List, which are partially overlapping. For each of them some modifications would be desirable to make it suitable as an international CPND bibliography.
- C 6. If a Cinda-type system is used, more space for the reaction is needed than in the neutron Cinda, in order to allow also for the coding of heavy ion reactions. This means, that either the free text comment field must be shortened to have more space for the coding of the reaction, or that the system must be expanded to more than one card per input record.
- C 7. If a Recent-References type system is used, input and file should preferably be restricted to the standard BCD character-set, in order to facilitate international exchange of the file. The lab of data origin should possibly be entered in retrievable form using the Exior lab-codes. A feature for blocking different references that refer to the same data set, is desirable such that a data-set oriented sort is possible. The data-type (experimental, theoretical, evaluated) should be entered in retrievable form.
- C 8. In either case, the following features are desirable:
 - a) For charged-particle reactions, information should be entered in retrievable form, indicating whether the reference considered contains integral CPND or other data.
 - b) Publication in a compact handbook should be possible.
 - c) The system should be designed such that multilateral input is possible as well as easy retrievals on a variety of computers.
- C 9. The new system should be capable of including, by machine conversion, the old bibliography of the Reaction List and perhaps the relevant part of Recent References, even if these machine converted entries do not fulfil all of the specifications of the new system (example: missing lab. code).
- C 10. The feasibility of having a single bibliography system for all nuclear data, including neutron data, should be investigated.
- C 11. It is desirable to investigate the feasibility of deriving a nuclear data bibliographic file from a more general bibliographic system, especially from INIS.

Recommendations:

- Action 2. R 2. The meeting appreciates the offer of the USA to continue to assume the primary responsibility, in cooperation with other data centres, for a worldwide CPND bibliographic system. It is recognized that the centre responsible for this system should decide on its structure, but it is recommended that the following features be seriously considered when developing the CPND bibliographic system:
- a) Publication of a compact handbook should be possible, which should be data-set oriented rather than reference oriented.
 - b) Publication of such a handbook for "integral CPND" only should be possible.
 - c) A cumulative publication including earlier CPND bibliographies should be possible.
 - d) The coding of the CPND reactions should allow for heavy-ion reactions; retrievals should be possible for target nuclei, incident particles, outgoing particles and residual nuclei.
 - e) The input and the master file should employ the standard BCD character set.
 - f) Entries should contain the laboratory of data origin using the Exfor lab-codes.
- Actions 3.+4. R 3. It is recommended that CAJaD and a Japanese center regularly provide input to the CPND bibliographic system for the Russian and Japanese language publications. This input should have the general form of Recent References, until such time that the USA in consultation with the cooperating centers determines that another input format is needed.
- Action 5. R 4. Priority should be given to the coverage of journals. It should be investigated how many important data sets are published only in laboratory-reports or conference-proceedings. Depending on the outcome of such investigations, such literature should eventually be included in the CPND bibliography.
- R 5. The bibliographic information should be freely exchanged, and the master file should be easily accessible by all cooperating centres and groups. The centre in charge should send, in regular intervals (e.g. every six months), an update tape of the CPND bibliography to the Karlsruhe CPND group and to CAJaD, and to other cooperating centres upon request.
- Actions 6.+7. R 6. It is recommended that ZAED and NDS investigate the feasibility of deriving input for a nuclear data bibliographic file from a more general bibliographic system, especially from INIS.
- Action 8. R 7. The meeting recommends the publication of a cumulative bibliography to "integral CPND". Later cumulative publications should be envisaged at two-years intervals. NDS and ZAED should investigate the technical possibilities for such publications based on a computer file provided by the USA. A draft of the bibliography should be submitted to the cooperating centres for discussion.
- R 8. The published bibliography should include information on evaluated integral CPND, but references to experimental and evaluated data must be distinguishable.

Compilation and exchange of CPND
=====
(Agenda item B.2)

The meeting discussed the scope and distribution work between the CPND compilation groups and came to the following conclusions:

- C 12. The meeting recognizes the value of past compilation activities and urges the continuation and possibly the expansion of these activities. In particular, the efforts of the Karlsruhe CPND group for a systematic compilation of "integral CPND" in the Exfor format is recognized as most valuable. The recommendations of this meeting are based on the assumption that the Karlsruhe CPND group will maintain the Master Data File for "integral CPND", which would be the core of an international network of CPND compilation and exchange.

Recommendations:

- R 9. Existing CPND compilation activities should possibly be expanded. They should continue within an international coordinated effort of CPND compilation and exchange. All CPND should be freely exchanged, and the computer files should be easily accessible by all cooperating centres and groups.
- R 10. The Karlsruhe CPND group should maintain the CPND Master Data File. Data compiled at other centers should be sent to Karlsruhe for updating the Master Data File. The Karlsruhe CPND group should make available to the cooperating centres either copies of the entire Master Data File or copies of update tapes.
- R 11. a) The Karlsruhe CPND group should continue to compile "integral CPND" except as noted below.
b) CAJad should compile "integral CPND" produced in the USSR.
c) The USA Center should compile "integral CPND" from USA and Canada in the case that such data cannot be compiled directly from published literature, and should make such data available upon request.
- Action 9. R 12. Pertinent groups in Japan as well as interested groups in other countries should investigate the feasibility of participating in the CPND compilation effort.

See also the related actions 10.-12.

The CPND Exchange Format
(Agenda item II.B.1)

Conclusions:

- C 13. The Karlsruhe CPND group and CAJAD had prepared trial compilations of integral CPND in a modified Exfor format which were discussed by the four neutron data centers, and at the present meeting. It was concluded that a modified Exfor format provides suitable means for the international exchange of CPND.
- C 14. The investigations of the Japanese Study Group have indicated the desirability and the feasibility of creating a CPND File which would be used by nuclear physicists in the field of basic research as well as for applied purposes.

Recommendations:

- Actions R 13. A modified Exfor format should be used for the exchange of CPND.
13.+14.
- R 14. The Japanese Study Group should continue its effort; the system to be developed should be operated on a long-term basis; it should be developed with due consideration for participating in the international CPND exchange.

For detailed agreements about the CPND Exfor system see page 31.

Organization of cooperation
(Agenda item II.B.4)

Conclusions:

- Action C 15. Generally, the mechanisms of data exchange as developed for
20. neutron data, are adopted.
- C 16. In general, the rules contained in the Exfor Manual for neutron data will apply, but an addendum will be needed for special rules required for CPND.
- Action C 17. The cooperating CPND centres are included in the update and
19. exchange system of Exfor dictionaries.

Recommendations:

- R 15. The IAEA should continue to coordinate the activities of CPND centers and groups, and should continue to convene, at regular intervals, consultants meetings between representatives of the cooperating CPND centers. Copies of bilateral correspondence on CPND compilation and exchange should be sent to NDS.
- R 16. NNCSC should continue to maintain the Exfor Manual for neutron data; NDS should produce an addendum to it for CPND. NDS should maintain the Exfor dictionaries for neutron data and CPND.
- Action
19.

CPND evaluation
(Agenda item II.C)

Conclusions:

- C 18. CPND evaluation has been discussed. A detailed discussion of evaluation methods appears to be premature, but should be re-considered at some later time.
- C 19. The purpose of CPND evaluation is to give users recommended values for the quantities they are interested in. Any method of obtaining such recommended values is included in the term "evaluation". The users should be supplied also with information about the reliability of the data.
- C 20. Evaluated CPND can be included in the CPND Exfor file in such a way that they can be readily distinguished from other types of data. It is however recognized that Exfor is not suitable for a comprehensive evaluated CPND library similar in concept to ENDF/B.
- C 21. It was noted that a generalized ENDF format suitable for all nuclear data is being discussed in the USA.

Recommendations:

- R 17. Existing CPND evaluations should be distributed to the other centers, in any suitable form but preferably on magnetic tape, along with adequate documentation.
- R 18. Interested centers should send to NNCSC comments on a generalized ENDF/B system to be developed. (See Annex 13.)
- Action
21.

Services to users

(Agenda item II.D)

Conclusions:

- C 22. For integral CPND data a large user community prefers to have a handbook with data on their desks. In addition there will be the need for computer retrievals from the computer file, in order to have more up-to-date information.
- C 23. In addition, specialized CPND publications may be needed. NDS is considering the needs for publishing a specialized compilation of CPND required for nuclear fusion development.

Recommendations:

- R 19. The Karlsruhe CPND group should continue to publish compilations on "integral CPND".
- R 20. The following centres should provide computer retrievals from the CPND Exfor Library to the respective service areas:
 - NNCSC to USA and Canada
 - CAJaD to USSR
 - ZAED to F.R. of Germany
 - NDCC to other European OECD countries and to Japan
 - NDS to its service area as defined within the neutron data cooperation.
- Action 21. The compilation of specific data required for specialized publications, e.g. on CPND for fusion, should be given priority.

