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INDC INTERNATIONAL NUCLEAR DATA COMMITTEE

REPORT OF THE NUCLEAR DATA UNIT TO THE INTERNATIONAL NUCLEAR DATA COMMITTEE JUNE 1968 TO MAY 1969

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A. INTRODUCTION

The following report of the NDU covers the interval June 1968 to May 1969. For clarity of the records, it should be stated that this period was also the first year of the existence of the INDC; however, as such, it was the first in name only since essentially the committee had existed for several years, first as the ad hoc INDSWG and then as the Interim INDC. Thus there have been also previous reports by the NDU whose activities have been reported under the sub-titles of Meetings, Standards, Data Compilation and Exchange, and some additional item to cover items such as document exchange since these are continuing in nature. Although there are reasons for a change in such a presentation, the present report essentially adheres to the previous form to preserve continuity. A minor change has been made in the ambiguous case where the Agency convenes a Meeting on, say, Standards in which case the present approach is to include the corresponding report under Meetings rather than Standards.

It is anticipated that the NDU may be encouraged by the INDC to continue to be involved in a small way in evaluation; in addition, it was noted that the Standards Panel reviewed cross sections which are candidates along with those of the fissile nuclides at 2200 m/sec for sustained evaluation monitoring by the NDU. It seemed appropriate to include together "standard cross sections" and "standard cross section evaluations", thereby distinctly locating the recent 2200 m/sec. re-evaluation within this report. The activities of the NDU for June 1968 to May 1969 are grouped then under the principal headings of Meetings, INDC Secretariat Activities, Data Centre Activities, and Evaluation and Standards.

Finally, it should be explicitly recalled that the formal recommendations of the 1st meeting of the INDC pertained to (a) support for the proposed 2nd International Conference on Nuclear Data; (b) convening of a Panel on Nuclear Data; and (c) the printing and distribution of CINDA. Action has taken place on all these recommendations with results that will be found under the appropriate headings.

B. MEETINGS

1. The "Four-Centre Meeting" - December 1968, Vienna

The fourth of a series of "four centre meetings" was held - Vienna, 2-4 December 1968. The meeting took place with the support of the INDC which also recommended that a collective view of neutron data compilation be presented by the four centres at the Panel on Neutron Data Compilation scheduled for February 1969. Thus motivated, the centres directed the emphasis of the meeting to:

(a) achieving a mutually acceptable exchange format toward which considerable progress had already been made in previous meetings and contacts;

(b) anticipating the solution to the difficult question of a physical quantities classification scheme because the exchange format depended upon the general form of the representation that would be required.

The latter problem is related to a future unified index to the literature (presently CINDA) and to the stored data. Decisive moves towards a detailed solution of this particular problem were considered to be in the province of the forthcoming Panel.

Part of the meeting's proceedings was devoted, in the spirit of the INDC suggestion, to the drafting of a joint paper for presentation to the Panel on Compilation.

2. Compilation Panel - February 1969

Following the recommendations made by the INDC, the IAEA organized and convened a Panel on Neutron Data Compilation at the Brookhaven National Laboratory, 10-14 February 1969. The principal objective of the Panel was to review how the four principal data centres could ideally meet the demands and needs of experimental and theoretical neutron physicists, evaluators, reactor physicists and other existing and potential users as well as to examine very basic questions in regard to compilation. The Panel consisted of 31 scientists drawn from 12 countries, the European Nuclear Energy Agency (ENEA) and the IAEA. Dr. Ken Parker took the chair during the meeting. The NDU was represented by W.M. Good, L. Hjärne and V. Konshin; the latter served as scientific secretary to the meeting.

In accordance with its objectives, the Panel members considered current and future needs for nuclear data compilation, increasing the use and the future development of the world's principal neutron data centres, transmission of information between data centres and users, guidelines for the definition and classification of neutron reactions and associated data. After surveying these questions, the Panel came to certain conclusions which were summarized in the form of 26 recommendations directed to the data centres and their international steering committees, to all centres' users, and to the IAEA.

Thus the Panel's deliberations should not only serve to stimulate the efforts of the principal data centres to reach agreement on the many technical questions involved in their cooperative and exchange programs, but should also provide documented guidelines which will assist in the future development of the data centres for some time to come.

The summary findings, conclusions and recommendations of the Panel under the title "Report of the Panel on Neutron Data Compilation, Brookhaven National Laboratory, USA" (about 30 pages) will be published in the IAEA Technical Report Series by the end of 1969; it is anticipated that the draft of this publication will be distributed to the INDC members by the time of the INDC meeting in June.

The collection of individual technical papers presented at the Panel, upon which the deliberations of the Panel were based, was issued separately by the IAEA as an IAEA-Series document (IAEA-111) and has been distributed in the course of the month of April; this document bears the designation INDC(NDU)-9/U.

3. Participation in other activities

(a) L. Hjärne of the NDU participated as an Agency liaison representative in the Third Annual Meeting of the Committee on Data for Science and Technology (CODATA) in Frankfurt am Main, 28-29 June 1968. At the subsequent First International CODATA Conference, the nuclear data field was represented by J.J. Schmidt (Karlsruhe), N. Gove (Oak Ridge) and L. Hjärne (NDU). CODATA is an ICSU committee, and as such its sphere of interest is the coordination of the data activities of the various scientific unions. As the Agency is mission- rather than discipline-oriented, its role is at present rather that of an observer. The fourth annual CODATA meeting will take place in Rome, Italy, on 26-27 June 1969. Participation of the NDU at this meeting may have to be curtailed this year because of budget considerations.

(b) As part of a general effort to publicize the services rendered by the world-wide system of neutron data centres, A. Lorenz of the NDU presented a paper at the Panel on Nuclear Accident Dosimetry Systems, held at the IAEA headquarters in February 1969. A brief description of the world-wide effort in the collection, compilation, and dissemination of neutron data information, as performed by the IAEA Nuclear Data Section in cooperation with the three other regional data centres, was presented. The concept of a complete nuclear data information system was suggested, highlighting the potential benefits to nuclear data users in the field of physical dosimetry.

(c) In conjunction with his attendance of the Compilation Panel, L. Hjärne visited the Nuclear Data Group, the Charged Particle Data Group, the Radiation Shielding Information Centre and the Isotope Target Centre at the Oak Ridge National Laboratory, and the Standard Reference Data Office of the National Bureau of Standards in Washington, D.C.

C. INDC SECRETARIAT ACTIVITIES

1. Liaison Officers

A proposal (Appendix A) to revise the Liaison Officer system so as to encourage wider representation and closer collaboration from IAEA member states within the NDU Service Area will be presented for consideration at the 2nd INDC meeting.

In essence, the revision consists of restricting Liaison Members to IAEA member states within the NDU service area, and admitting for liaison all such member states that have interested and qualified technical personnel.

In order to achieve a higher degree of collaboration than exists at present, attempts will be stepped-up to implement the original recommendation INDSWG/R&C/4, Tokyo, 1965. In particular:

(a) the Liaison Officers will be informed more completely about activities in the area of Nuclear Data;

(b) the Liaison Officers will be solicited more frequently with regard to nuclear data information and relevant suggestions.

The problem, if it exists, of wider dissemination outside the NDU service area of information about INDC activities, can be considered under the separate problem of document distribution: in the present context it would not be a problem of Liaison Officer relationship.

2. Documents Distribution

A proposal to streamline the documents distribution procedure by the NDU has been drafted (Appendix B) and will be presented for discussion at the INDC meeting.

The NDU produces and/or distributes three primary classes of documents:

i) Documents transmitted by INDC members for distribution;

ii) Documents received by the NDU both from its service area and other Data Centres and organizations;

iii) Newsletters to INDC members and Liaison Officers.

The distribution of documents in classes (i) and (ii) above is invariably complicated by two factors:

(a) The existence of a complex class of distribution codes;

(b) The disparity, on most occasions, between the number of copies of a given document and the number of persons to whom this document should be sent.

The existing list of distribution categories, as evidenced in INDC-267, utilized the codes U, E, L, G, C, D, and N. There appears to be no strong reason to increase or decrease this number; however, the NDU does feel that there is a rather strong case for re-defining the N = Newsletter code, to include not only INDC members, as at present, but also all Liaison Officers and other especially interested individuals. One of the reasons for this is that the most important developments and questions raised in the present Newsletters should also be necessarily brought to the attention of the Liaison Officers. By this re-definition

of the N code, the NDU will produce one Newsletter, two to three times a year, to be distributed to both INDC members and Liaison Officers, and thus eliminate the need for a separate letter to Liaison Officers.

With regard to item (b) raised above, the NDU is exploring both the possibility of re-printing some of the class (i) and (ii) documents if an adequate number of copies is not available and also the possibility of using the services of the INIS section for distributing on a request basis those documents in class (ii).

3. Targets, Samples, Etc.

The availability of materials and the means to fabricate targets and samples has always been a problem. It is not surprising that the Agency has received appeals for assistance in this matter, but it is at present powerless to contribute in any way.

The NDU has made a limited effort accordingly to ascertain possible Agency positions in response to possible needs. The basis for this modest action takes note that: (a) assistance to relatively under-privileged countries like aid to developing ones is a matter of high Agency priority; (b) promotion of international collaboration in the area of nuclear data will eventually imply assisting investigators with suitable skills and facilities to secure needed targets and samples.

The only definite action that has taken place to this time, based upon this problem of samples and targets, is the simplifying of procedures for obtaining small quantities of fissionable isotopes. However, numerous decisions have taken place which have been along the lines outlined in Appendix C.

D. DATA CENTRE ACTIVITIES

1. Service in NDU geographical area

During the past year, the NDU has made considerable progress with regard to compiling, disseminating and exchanging neutron data in its service area with special emphasis on Central and South America. This is evidenced by the fact that during this period the NDU has established contact with over 60 scientists engaged either in nuclear physics research or administration in Latin America. In addition, the number of data points collected from Latin America and entered into the DASTAR/CINDU system during this period are given below:

Argentina	Brazil	Chile	Colombia	Mexico
4	3203	230	1	81

Prior to 1968 these figures were all zero.

These figures do not necessarily reflect the relative levels of activity in neutron physics in these countries, but rather they indicate that the NDU has, so far, established better contact with

Chile than with either Mexico or Argentina, furthermore these figures represent only the results of initial efforts and do not indicate a "saturation level" of neutron physics productivity in these states.

Assuming the availability of funds, Dr. Byer of the NDU will make a field trip to Latin America between 23 June - 2 August 1969. This trip is motivated by the success of a similar trip that Mr. Lorenz made to Southeast Asia, India and Australia about a year ago.

The NDU is presently taking steps to enlarge the list of Latin American States which have Liaison Officers. Such officers already exist in Mexico, Argentina, Bolivia and Ecuador, whilst Brazil is represented on the INDC; the enlarged list will include Chile, Colombia, Paraguay, Peru, Venezuela and Uruguay.

From an overall point of view the DASTAR System has at the present time an estimated 150.000 data lines (or approximately 900 data sets) in storage. Based on the current CINDU catalogue, approximately 40% of the data sets in DASTAR have originated from the NDU service area. Effective utilization of the data centres requires educating all potential users to the services and benefits which the data centres can offer. The NDU is launching a campaign to obtain the names of all investigators in its geographical area as a prelude to such an educational effort.

In the process of data exchange and dissemination, in addition to transmitting approximately half a dozen of full reels of information on tape to scientists within the NDU service area, over 800 data sets (DASTARS) have been sent out (among 26 recipients), 33% of which to individuals within the NDU service area.

2. Inter-centre coordination and Systems development

The DASTAR/CINDU neutron storage and retrieval system has continued to function in this period at the NDU while discussions have been held on a new internationally compatible system; these discussions have taken place both within the NDU and with staff from other data centres. Thus, P.M. Attree, of the NDU, spent six weeks at NNCSC, Brookhaven, in September and October attending a workshop at which programmers from CCDN and LRL also contributed.

The main object of this workshop was to rewrite the retrieval part of the system, originally written for the CDC-6600 and IBM-7094, for the IBM-360/30, and to arrive at a joint proposal for an exchange format which would be mutually acceptable to all data centres. With each of the four centres compiling data from its own area, such a format is a basic necessity for centre-to-centre exchange and a detailed proposal for such an inter-centre exchange format now exists. In fact, large parts of the workshop format proposal formed the basis of discussions during the "Four-Centre" Meeting in December 1968, and the basic features of an exchange format acceptable to all four centres were agreed upon at that time. After further discussions following the Panel on Compilation, at Brookhaven, the basic format was accepted.

Vital to the efficient and effective use of an exchange format is a common system of data terminology, comprising detailed quantity dictionaries and a system of reaction classification. To meet the approval of users in the regional areas and the agreement of the four data centres, the question of a common system of data terminology has been the subject of discussions at a number of inter-centre meetings between the time of the December meeting and now. With the work of the December Four-Centre meeting as a basis, the Compilation Panel recommended that a working agreement on reaction classification, agreeable to all four centres, be formulated in the form of a detailed document by 31 May, and that it be distributed among interested parties at that time.

In a subsequent action, an "ad hoc" committee (composed of B. Diven, M. Goldberg, H. Goldstein, L. Hjärne, M. Kalos, H. Potters and A. Schett) convened at Columbia University, 24-25 February, to initiate the discussions on the reaction classification scheme for neutron-induced reactions. It was decided at that time that an acceptable scheme should be ready for final approval by the time of the next Four-Centre meeting, proposed to be held in Moscow, September 1969.

At the Nuclear Data Unit, systems work and programming is starting on the basis of what has been agreed. The basic data files at the NDU will be kept in a form similar to that of the exchange format. From the identified and coded information in the basic files, special purpose indexes will be extracted for retrieval and the internal use of compilers. It will also be possible to extract information for the periodic printing of an "International Data Index", if this is considered necessary.

During the month of April, two members of the NDU, P.M. Attree and H.D. Lemmel have visited the data centre at Obninsk. The object of this visit was to discuss the development of the exchange format and the data terminology questions with members of the USSR centre. In addition with the acquisition of a compatible tape unit by the Obninsk centre, the exchange of data between Obninsk and Vienna should operate in a similar way to that between other centres.

3. General Status of Compilation and Exchange

For a compilation to be useful, collection of information must be complete. To accomplish this satisfactorily requires a well defined system which is designed to guarantee immediate collection of new information on the one hand, and to collect with certainty that which already exists on the other. In the case of CINDA (the compilation of the bibliography to the literature) with its international reader system, total completeness of collection has essentially been achieved; thus CINDA now accumulates at about the rate that new information is produced.

The situation with regard to the numerical data, as previously outlined, is entirely different from that of CINDA. Although the rates are rising, acquisition of new data falls far short of production rate and collection of old data is far from complete. In the case of numerical data, no generally accepted system has in fact existed to assure completeness of compilation of those data which are current and those which are older but extant. Such a system would have the intrinsic difficulty, not encountered in the CINDA system, that each set of

collected original data requires correspondingly the originating investigator's cooperation. The recent Panel on Neutron Data Compilation could not in the time at its disposal have detailed such a system, but it set down suitable guidelines for approaching the problem. It advocated inducing investigators by every possible means to voluntarily enter their data in the data centres as soon and as reliably as possible. It also advocated improving the distribution of available data by (a) compiling a roster of investigators and the profiles of their individual needs, and (b) supplying to each automatically the information that is in his area of interest. These proposals suggest a system in which each investigator is at once a voluntary contributor to and a partial subscriber of data stored in the data centres. The NDU has taken steps to implement the Panel's recommendations. A roster of the interests and present activities of each neutron investigator in the IAEA Service Area is presently being compiled; however, since the undertaking has only begun no results are available at this time.

4. CINDA Development

CINDA has continued to be a top priority activity during the 1968 - 1969 time period. As just previously stated, the back-coverage is essentially complete, and the rate of CINDA entries from the NDU service area has reached a constant level; the majority of entries result from the coverage of current literature and from the revision of earlier entries which arise from the data compilation activity.

The CINDA computer programs are seriously outdated, and a major effort to revise the complete CINDA computer system has been proposed to be undertaken in the near future. In this respect, Prof. Goldstein, in coordination with the CINDA centres, has taken the initiative to start such a revision. At this time it has not been decided whether this revision will be an updating of the system within the present scope of CINDA, or that it will incorporate the development of a CINDA-type data index coordinated with the new systems development at the data centres. In the formulation of the Exchange Format structure, it was envisaged that information could be extracted directly from the data files to feed a CINDA type data index. In this context, data compilation and CINDA, which have so far been operated rather independently, would be much more coordinated, and would require a full-fledged CINDA participation in the activities of the four data centres (e.g. Four-Centre Meetings).

The recommendation that the Agency print and distribute CINDA (not to be confused with the computer operation of CINDA) has been carefully examined by the IAEA Publications Committee, with proper regard to budget considerations. The findings, which take into account that a certain quota of subscriptions must be provided free, are as follows:

(a) The Agency is favourably disposed to assume the printing and distribution of CINDA as recommended. It is recognized, however, that the increased load on facilities and staff of the Agency would be such as to require overtime or outside contractual arrangements, either of which will raise the average production costs of the Agency printing services.

(b) There exist no provisions in the budget whereby the CINDA printing and distribution can receive Agency subsidy in 1970.

If an Agency subsidy, in addition to overhead, is assumed to accompany the Agency printing and distributing obligation, then budgetary action is required first (1971 earliest date to assume the obligation). On a self-supporting basis, however, the obligation could be assumed in 1970.

The Agency has examined the self-supporting prospects for CINDA and concludes that the printing and distribution can begin in 1970 without subsidy under certain conditions.

Assuming that an annual subscription to CINDA includes one cumulative volume of 1000 pages and two annexes of 500 pages each (or the equivalent), the delivered cost payable in currency of recipient country would be:

(a) $ 15 for a yearly subscription in the present format;

(b) $ 10 for a yearly subscription in the slightly reduced format of standard Agency publications (Appendix D).

In both instances the Agency requires a guarantee of at least 1000 subscriptions, and that shipments to the U.S.A., Europe and the USSR are done in bulk.

5. CINDU

The latest issue of the NDU data catalogue, CINDU-8, was published in January 1969; it contained at that time over 1100 citations (ZAQLYs) to the data that are stored in the DASTAR-CINDU system; over 40% of these refer to data which have been collected from the NDU service area. CINDU references experimental, theoretical and evaluated data in a merged form, while in the spirit of the "post-box" principle an annex lists the evaluated data separately. Although it is only a matter of programming whether one issues an "experimental CINDU" and an "evaluated CINDU" separately, or whether the two are merged into one, experience has shown that catalogue users prefer a joint index for experimental and evaluated data. This was demonstrated at the time when CINDA-67 was published in two volumes, one for evaluated and the other for experimental data. Admittedly, special retrievals from either one of the two files can be extracted any time for specific purposes.

The CINDU format (modified slightly when it will be retrieved from the newly devised format of the storage system under development), remains a possible International Stored-Data Index to complement the Literature Index CINDA. The mood at the Panel was to avoid dual indexes, however, and to proceed rather towards a unified index which would reference both the literature and the data in storage. CINDU will continue to operate and be distributed by the NDU for its own purposes until some effective international data index is achieved.

6. Evaluated Data Exchange

Since the initiation of the voluntary evaluated data exchange agreement at the last INDC meeting, a number of evaluated data sets have passed through the hands of the NDU. The "pink pages" of CINDU-8 show the extent of this exchange as of January 1968. The situation has not changed much since then. The importance of the exchange of evaluated data has been demonstrated by the fact that the distribution frequency of a set of evaluated data has been approximately five times that of a set of experimental data.

The present stage in the exchange of evaluated data can be regarded as a first step only. The NDU has received and passed on a number of evaluated data requests, which still have not been answered. In view of the importance of the evaluated data, there is need for the INDC to consider existing obstacles to an increased international evaluated data exchange with a view to recommend possible actions that the Agency might take for their removal.

With regard to evaluated data, there exists a situation which should be pointed out, viz.: the documentation that accompanies these data varies tremendously in quality and completeness. The data centres generally take the view that data are of little value if they are not accompanied by the pertinent auxiliary information, comments and bibliography. The adoption of an inter-centre exchange format for the evaluated data would provide a natural solution to this state of affairs. However, from experience with the experimental data exchange format, such a solution would require considerable preliminary consideration and exchange of views. This is a matter which is outside the province of IAEA action without prior INDC considerations.

E. EVALUATION AND STANDARDS

1. 2200 m/sec Review

Since there will be a separate progress report on the review of the 2200 m/sec fission constants, this section is restricted to comments of direct concern to the NDU. This present review has been much more thorough than the one completed in 1965; considerable amount of computation and correspondence with the consultants had to be done with the consequence that this activity has kept one staff member busy half-time during the last twelve months.

After the completion of this review, it is planned that the NDU will continue to monitor the 2200 m/sec fission data and will execute additional computer runs either on request or whenever new experimental data is likely to produce essential changes in the final values.

2. Request List - RENDA

At the present time, the compilation of requests for neutron data from the North American and Western European scientific and technical communities is carried out under the auspices of the EANDC. The name RENDA (REquests for Nuclear DAta) was given to this compilation of requests for neutron data for which either measurements do not exist presently, or for those cases where greater precision is desired than is presently available.

The last edition of RENDA (EANDC-78AL) was prepared by the European Nuclear Energy Agency (ENEA) in December 1968 on the basis of the current lists of requests from the USA, Canada, UK, Japan, Sweden, Switzerland, and the Euratom countries. This document was circulated in limited number by the Nuclear Data Unit in selected countries within its geographical area, and efforts were made to collect new entries from them by means of an accompanying circular letter.

It is anticipated that RENDA, because it has been developed by ENEA into a useful instrument, will eventually develop into a world-wide compilation, compatible with the Data and Bibliographic Compilations. Considerable thought has therefore been given to the consequences in such a case to the latter compilations' more recent developments in particular as regards definitions, terminology, etc.

F. SUMMARY

In a strictly formal sense, June 1968 - May 1969 was the first year of the existence of the INDC. The same year may well prove also to have been a decisive one for the international neutron data compilation and exchange effort as a result of the Panel on Compilation which considered the problems involved and subsequently rendered documented guidance for future development. Three INDC recommendations which pertained respectively to IAEA action in regard to (a) sponsorship of the 2nd International Conference for Nuclear Data; (b) convening of the Panel on Neutron Data Compilation; and (c) assuming the obligation for printing and distributing of CINDA, were acted upon with generally acceptable or favourable results. The four data centres worked together productively to design and develop an exchange format which would be compatible with the individual subjects of each centre individually. By means of workshops which involved exchanges of personnel, a certain degree of computer programme compatibility was also achieved. Through the efforts of the four data centres and with the aid of the Panel on Compilation, progress was made in the problems of the formulation and the classification of reactions and data types. This problem is rendered both difficult and important by the need for a future unified bibliographic and data index. Individuals of the NDU collaborated in further refinement and improvement in the CINDA system. Efforts were continued by the NDU to streamline its Secretariat services which include distribution and sending of documents, contacts with liaison officers, etc. The first revision of the 2200 m/sec evaluation was completed.

Not all was achieved that might have been desired. Requests by the NDU for progress reports from member states have not met with very enthusiastic response; the benefit of an INDC-RENDA cannot be reliably judged on the basis of the response so far received; the facilities compilation has been held in abeyance not only for reasons of priority but out of consideration towards Agency correspondents and liaison officers who must furnish the required information, and from whom other information is already desired.

APPENDIX A

LIAISON OFFICERS

The following is a proposed revision of the Liaison Officer system, to encourage wider participation and closer collaboration of member states within the NDU service area with the IAEA data centre.

A. Introduction

The concept of Liaison Officers was suggested in a recommendation by the INDSWG in the course of its Fourth Meeting in Tokyo, 10-16 September 1965. The original recommendation, item no. 6 of R&C/4, reads as follows:

" 6. (i) The letter from IAEA to Member States of 13 March 1964 calling for "recipients" did not include provision for collection of information through the IAEA Nuclear Data Unit from countries not having participants in INDSWG. The INDSWG recommends that provision now be made for collection and dissemination of information by the nomination of Liaison Officers from all interested Member States and other organizations working in the nuclear data field and not participating in INDSWG.

(ii) It is proposed that the Agency have Liaison Officers in the nuclear field to carry out the following functions:

(a) To inform the Nuclear Data Unit of the availability of information (data, compilations, evaluations, CINDA cards, reports, etc. ...). The Nuclear Data Unit will circulate the list of available information as soon as possible to all listed Liaison Officers and INDSWG participants.

(b) After each INDSWG meeting, a summary report including a list of all documents will be sent to the Liaison Officers and INDSWG participants by the Nuclear Data Unit. It is recommended that U and R documents automatically go to Liaison Officers.

(c) It is recommended that Liaison Officers receive a preliminary agenda for each INDSWG meeting as soon as it is prepared. Where active interest in items of an INDSWG meeting is indicated by a Liaison Officer, he may request approval from the IAEA through the Nuclear Data Unit to attend that meeting as an observer at the expense of his own Organization.

(iii) It is proposed that the Agency be advised to seek through official channels the nomination of one Liaison Officer

per Member State and other organizations working in the nuclear data field and not participating in INDSWG, with a copy of the letter to already nominated recipients for their information. "

As a result of this recommendation, the following Liaison Officers were nominated during the 1965-1966 time period:

Argentina	Mattei, Dr. Clara
Bolivia	Paz Lora, Cnl. Dim. Federico
Bulgaria	Nadjakov, Dr. Emil
Congo	Pollak, Dr. H.
Czechoslovak Soc. Rep.	Rocek, Dr. Jindrich
Ecuador	Grossmann, Dr. Ernesto
Hungary	Pal, Prof. Lenard
Israel	Ben-David, Dr. G.
Korea	Cho, Mr. Mann
Mexico	Graef Fernandez, Dr. Carlos
Pakistan	Islam, Dr. Mizanul
South Africa	Reitmann, Dr. D.
Thailand	Methasiri, Dr. T.
United Arab Republic	El-Nady, Prof. Mohamed
Viet-Nam, Republic of	Vo-Xuan-Bang, Mr.
Yugoslavia	Raisic, Dr. Nenad

Since the appointment of these Liaison Officers, the following information has been sent to them:

5 May 1966 - Letter to all correspondents on nuclear data, containing the periodical list of documents received by NDU;

22 August 1966 - Survey questionnaire for the IAEA Neutron Data Storage and Retrieval System;

30 January 1967 - Letter to all correspondents on nuclear data, containing periodical list of documents received by NDU;

3 April 1968 - Letter to Liaison Officers.

In addition, the Liaison Officers have been recipients of the U, E, C and D distribution.

B. Proposal

As it stands now, the system of Liaison Officers cannot be described as having been very successful. In order to follow up on the original INDSWG recommendation and to change the system to suit the present situation (since at the time of the Tokyo meeting, no clear definition of the NDU scope of activities existed), the following changes are suggested:

1) Re-define the status and functions of the Liaison Officers, and let them know what is expected from them.

- As worded in the INDSWG Recommendation R&C/4-6, the function of the Liaison Officer is designed to assist in the collection and dissemination of nuclear data information, and should include all interested IAEA Member States and other pertinent organizations not participating in INDSWG. It is suggested herewith that this definition be restricted to IAEA Member States within the NDU service area, and that a broader coverage of the NDU service area be instituted (see 2) below). As amended, the definition of a Liaison Officer would be as follows:

  " A scientist working in a field related to nuclear data in an IAEA Member State within the NDU service area, who also has a broad knowledge of his country's neutron/nuclear physics program, whose function is to provide a communication link between the IAEA-NDS Data Centre and the scientists producing and/or using nuclear data in their country, that is to assist in the dissemination of information from the centre and to encourage the collection of nuclear data information. "

  It is suggested that this definition be included in all letters to the Liaison Officers.

2) Review and enlarge the present list of 15 Liaison Officers.

- As it stands, the existing list of Liaison Officers was compiled at a time when little information or knowledge existed on the capacity or user potential of the Member States within the NDU service area (which did not exist as such at that time). Now, after the initial period of the centre's operation, it is possible and necessary to review and enlarge the existing list. A suggested list is given in Annex I. . Included in this list are the INDC members from the NDU Service Area (i.e. from Australia, Brazil, India, and Poland) who should be considered as Liaison Officers as well as INDC members. Another alternative would be to ask the INDC member in each of these four countries to designate a liaison officer in his country. The distribution list of every Liaison Officer letter should be included in the letter itself to let the recipients know the identity of their opposite numbers in every other country represented.

3) Keep the Liaison Officers posted at more frequent intervals, and supply them with more material.

- In order to maintain the interest and the active participation of the Liaison Officers, it is important to keep them posted

as often as it is practical. In this respect it would probably be advisable to have two information letters sent out per year (which should be the same as the INDC newsletter). They should also receive the preliminary agenda of every INDC meeting prior to the meeting (in keeping with the original INDSWG recommendation), and the reports of the INDC meetings. With regard to the semi-annual information letter, it would probably be best to have two specific months, e.g. March and September, when these letters would be distributed.

4) Use the Liaison Officers more efficiently in their capacity to provide the centre with nuclear data information.

- The Liaison Officer should be more informed of the interactions between the data centre and the scientific community within his country. To this end it would be advisable to institute the practice to send to the Liaison Officer a copy of every letter which is sent to scientists within his respective country. Furthermore, the Liaison Officers should be functional in providing information on the physics programs pertinent to the nuclear data efforts of the centre; it should be through their offices that lists of projects, facilities, scientists, etc. should be obtained by the centre for the area studies needed in the course of the data centre activities.

In conjunction with item 2 above, the following member states within the NDU service area have been invited to nominate a Liaison Officer:

Chile
Columbia
Finland
Formosa
Iraq
Peru
Philippines
Rumania
Venezuela.

A sample of the letters sent out in the course of the month of April 1969 is attached, see Annex II.

PROPOSED LIST OF NDU LIAISON OFFICERS

The codes given in parentheses indicate: G = member of INDC,
L = Liaison Officer.

1.	Argentina	Dr. Clara Mattei (L)
2.	Australia	Dr. John Symonds (G) (or new officer)
3.	Bolivia	Cnl. Dim. F. Paz Lora (L)
4.	Brazil	Prof. M. Damy de Souza Santos (G) (or new officer)
5.	Bulgaria	Dr. Emil Nadjakov (L)
6.	Chile	Nomination requested (proposed L)
7.	China	Nomination requested (proposed L)
8.	Colombia	Nomination requested (proposed L)
9.	Congo	Dr. H. Pollak (L)
10.	Czechoslovakia	Dr. J. Rocek (L)
11.	Ecuador	Dr. E. Grossmann (L)
12.	Finland	Nomination requested (proposed L)
13.	Hungary	Prof. L. Pal (L)
14.	India	Dr. A.S. Divatia (G) (or new officer)
15.	Iraq	Nomination requested (proposed L)
16.	Israel	Dr. G. Ben-David (L)
17.	Korea	Mr. Mann CHO (L)
18.	Mexico	Dr. C. Graef Fernandez (L)
19.	Pakistan	Dr. Mizamul Islam (L)
20.	Peru	Nomination requested (proposed L)
21.	Philippines	Nomination requested (proposed L)
22.	Poland	Dr. Z. Sujkowski (G) (or new officer)
23.	Romania	Nomination requested (proposed L)
24.	South Africa	Dr. D. Reitmann (L)
25.	Thailand	Mr. T. Methasiri (L)
26.	United Arab Republic	Prof. M. El-Nady (L)
27.	Uruguay	Nomination requested (proposed L)
28.	Venezuela	Nomination requested (proposed L)
29.	Viet-Nam	Mr. Vo-Xuan Bang (L)
30.	Yugoslavia	Dr. N. Raisic (L)
31.	JINR-Dubna	Nomination requested (proposed L)

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

KÄRNTNER RING 11, A-1010 VIENNA, AUSTRIA

TELEPHONE: 52 45 11
52 45 25
TELEX: 01-2645
CABLE: INATOM VIENNA

IN REPLY PLEASE REFER TO:
PRIERE DE RAPPELER LA RÉFÉRENCE:

21 April 1969

Sir,

By letter dated .. .., the Agency asked your Government for the nomination of one or more specialists in the nuclear data * field to serve as correspondents to the International Nuclear Data Scientific Working Group (INDSWG).

Since then, the INDSWG has been converted to a continuing body within the framework of the International Atomic Energy Agency, under the new name of International Nuclear Data Committee (INDC). At the same time, the nuclear data programme of the IAEA, which is concerned with the international exchange of nuclear data information, is now coordinated on a world-wide basis to function as a service centre to all interested Member States.

At its first meeting in Vienna, in 1968, the INDC emphasized the need to have liaison officers in each Member State which is active in the nuclear data field but from which there is not currently a scientist serving as member of INDC. The main functions of such liaison officers are to provide the INDC, through the Agency's Nuclear Data Section, with the relevant information concerning their respective countries' nuclear data programmes, measuring facilities, etc., and to promote the collection and dissemination of nuclear data information.

In view of the important role which such liaison officers can play in the nuclear data field, I have the honour to ask your Government to nominate a suitable scientist to serve in this capacity.

I am enclosing, for your information, a list giving the names of specialists presently serving on the INDC and of Liaison Officers to that Committee.

Accept, Sir, the assurances of my highest consideration.

A. Finkelstein
Deputy Director General
Department of Research
and Isotopes
For DIRECTOR GENERAL

Enclosure

INDC Members

Dr. J. Symonds (Australia)
Prof. M. Damy de Souza Santos (Brazil)
Dr. G.C. Hanna (Canada)
Prof. O. Kofoed-Hansen (Denmark)
Dr. R. Joly (France)
Dr. J.J. Schmidt (Federal Republic of Germany)
Dr. A.S. Divatia (India)
Dr. T. Momota (Japan)
Dr. Z. Sujkowski (Poland)
Dr. A.I. Abramov (USSR)
Dr. G.H. Kinchin (United Kingdom)
Dr. G.A. Kolstad (USA)

Liaison Officers

Dr. Clara Mattei (Argentina)
Col. Dim. F. Paz Lora (Bolivia)
Dr. E. Nadjakov (Bulgaria)
Dr. J. Rocek (Czechoslovak Socialist Republic)
Dr. E. Grossmann (Ecuador)
Prof. L. Pal (Hungary)
Dr. G. Ben-David (Israel)
Mr. Mann Cho (Korea)
Dr. C. Graef Fernandez (Mexico)
Dr. Mizanul Islam (Pakistan)
Dr. D. Reitmann (South Africa)
Mr. T. Methasiri (Thailand)
Prof. Mohamed El-Nady (United Arab Republic)
Mr. Vo-Xuan-Bang (Republic of Viet-Nam)
Dr. Nenad Raisic (Yugoslavia)
Dr. H. Pollak (Congo)

* Definition of Nuclear Data

In the context of this program, the term "nuclear data" refers to numerical and associated information pertinent to measured, deduced or calculated microscopic neutron cross sections, related fission, capture and scattering parameters, resonance and reaction parameters of neutron induced reactions, as well as other related physical constants used in reactor design.

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Please insert this Appendix B
between Appendix A and Appendix C
of INDC(NDU)-10/G, the "Report of
the Nuclear Data Unit to the
International Nuclear Data Committee,
June 1968 to May 1969".

DOCUMENTS DISTRIBUTION

In fulfilling its function as a data compilation centre, the Nuclear Data Unit in the course of implementing one of its primary objectives - to collect, compile and disseminate numerical neutron data on an international scale - also performs a further activity, that of distributing a wide class of documents related to the international neutron data effort. This latter activity, though of a peripheral nature to the general compilation effort, can in no way be regarded as trivial, due to the large number of man-hours which, both in the past and present, it has consumed. In attempting to "streamline" the distribution of documents, it is worthwhile to emphasize, at the outset, two factors which at present complicate the situation.

- On the one hand, there are two main categories of documents which are sent to or originate within the Nuclear Data Unit, these are:

I. INDC documents

II. Non-INDC documents: Documents received by the Nuclear Data Unit from its service area, other data centres and organizations

- On the other hand, there exists a complex set of distribution codes each one of which defines the extent and level to which any given document is disseminated.

In order to present an overall picture of the types of documents distributed by the Nuclear Data Unit it is worthwhile considering each of the above two categories of documents separately.

I. INDC Documents

These fall into three distinct classes:

(a) Documents, articles, indexes, reviews, etc. produced by the Nuclear Data Unit.

(b) Documents which are submitted by members of the INDC group to the Nuclear Data Unit for distribution either within the group or to a special list of persons preselected by the member who submitted such documents.

(c) Progress reports submitted to the INDC through the Nuclear Data Unit from countries which are not on the INDC.

Each of the above classes of INDC-Documents are self-explanatory, save for those produced by the Nuclear Data Unit; however, the following set of guidelines gives some indication of the types of documents which fall into this class (class (a)):

1. Each issue of CINDU and CINDA.

2. Papers produced by the staff of the Nuclear Data Unit for the explicit purpose of presenting to Panels, Symposia and Conferences the activities of the IAEA in the field of data compilation.

3. The Nuclear Data Unit Correspondents' list, the Facilities and Request lists for the service area of the Unit.

4. Proceedings of the Conferences on Nuclear Data for Reactors, and any other Conferences or Symposia organized by the Nuclear Data Unit.

5. All papers produced by the group involved in the 2200 m/sec review.

6. Reports, conclusions and recommendations of Panels held under the auspices of the IAEA and having some bearing on the activities of the Nuclear Data Unit.

7. Papers produced by the staff of the Nuclear Data Unit and addressed to INDC members, outlining the plans, current activities and progress of the Unit. For example, the "Newsletters" to INDC members and Liaison Officers.

8. Papers which have resulted from any critical review, assessment and evaluation or any activity of this nature performed by the Nuclear Data Unit.

II. Non-INDC documents: Documents received by the Nuclear Data Unit from its Service Area, other data centres and organizations

The documents from the service area are normally acquired in the process of "data coverage". On the other hand, documents from other data centres and organizations are sent to the Unit either as a result of a request or are submitted voluntarily. In both cases, only single copies of these documents are received.

Document Distribution

The distribution of documents in Category I (INDC documents) and Category II (non-INDC documents) has been complicated by two main factors:

(a) The existence of a complex set of distribution codes.

(b) The disparity between the number of copies of a given document and the number of persons to whom it should be distributed.

Before probing any more deeply into this question it would be worthwhile to recall the distribution codes recommended in INDC/R&C/6 Supplement (Moscow 1967), as well as those used in the Correspondents List, INDC-267.

Codes proposed in INDC/R&C/6 Supplement

G = Group only; copies for INDC participants and staff connected with the committee operation

R = For members of group as above; others on the list of specialists may request copies, which will generally be supplied by the IAEA or requested from the originators

U = Automatically sent to persons on the named lists but not to be sent to libraries without the author's permission

L = Liaison officers

D = CINDU = Un + data centres + special list

C = CINDA = Un + special list

U+, R+ as U, R above but may also be sent to libraries

Sub-categories:

a = IAEA to exercise discretion, following originator's instructions

n = not to recipients of EANDC documents (prior distribution)

p = to be published or incorporated in a report for sale or otherwise easily available

r = reactor physics or other special interest

s = subject to availability (reprinting not intended); number of available copies is small

The codes defined in INDC-267 are:

U = General distribution for documents originated by the IAEA NDU, the Soviet Union, and other parts of the world, except the U.S., Canada and countries associated with the ENEA. This list includes individuals on the EANDC distribution.

E = General distribution for documents originated anywhere in the world. This list excludes individuals on the EANDC"U" distribution list, and those who reside in countries associated with the EANDC.

L = Regional liaison officers of the Nuclear Data Unit.

G = INDC members and individuals associated with the committee operation.

C = Recipients of CINDA, the index to the literature on microscopic neutron data.

D = Recipients of CINDU, the catalogue of numerical neutron data available from the IAEA Nuclear Data Unit.

N = Recipients of the Nuclear Data Unit Newsletter.

As is evident, the sub-category codes proposed in INDC/R&C/6 Supplement tend to render the coded system somewhat unwieldy. For example, if the originator of a document feels that discretion should be exercised in its distribution, sub-category code -a-, then he should assign that document the most limited distribution, namely G. Furthermore, the sub-category codes s, r and p have been used very rarely in the past. In an effort to finalize and improve the system of distribution codes the NDU proposes that the codes defined in INDC(SEC)-3/U be used in the future:

U = General distribution for documents originated by the IAEA NDU, the Soviet Union, and other parts of the world, excluding those documents originated by the U.S., Canada and countries associated with the ENEA. This distribution list includes individuals on the EANDC distribution. These documents are not sent to libraries without the author's permission.

E = General distribution for documents originated anywhere in the world. This list excludes individuals on the EANDC"U" distribution list, and those who reside in countries associated with the EANDC. (This has also been referred to as category Un.)

L = Regional liaison officers of the Nuclear Data Unit.

G = INDC members and individuals associated with the committee operation.

C = Recipients of CINDA, the index to the literature on microscopic neutron data. (This category consists of the distribution E + + special list.)

D = Recipients of CINDU, the catalogue of numerical neutron data available from the IAEA Nuclear Data Unit. (This category consists of the E distribution + data centres + special list.)

N = Recipients of documents (such as the NDU Newsletter) originated by the Nuclear Data Unit, and distributed to individuals who have an interest in the Nuclear Data Unit development. (This list is composed of the G + L distributions + special list.)

This proposed new list differs from the previous lists, in that all the sub-category codes and the R-code have been left out, whilst the N-code has been re-defined. The original N-code included all INDC members and a further 36 persons who were non-INDC members, of whom 12 were within the IAEA. The new definition of the N-code includes all INDC-members, all Liaison Officers and a few other interested parties. The reason for this is that most of the developments and questions raised in the NDU Newsletters should also be brought to the attention of the Liaison Officers. For example, the question of

Samples, the developments with regard to extending the scope of data compilation, and the preliminary agenda for forthcoming INDC meetings (as recommended in INDC/R&C/4, item no. 6). This re-definition of the N-code would overcome having to draw up two separate Newsletters, one for INDC-members and one for Liaison Officers, twice a year.

Given the above set of codes for INDC documents, the distribution and dissemination of these documents should be quite straightforward, provided that the NDU has sufficient copies to distribute to all those who should receive a given document. This problem does not arise for those INDC-documents or Newsletters which originate from within the NDU. However, it does arise, quite often, for those INDC documents sent to the NDU by INDC members for a special distribution, U,E,G, etc. and also for the progress reports submitted to the INDC and through the NDU by Liaison Officers.

A further problem also arises with respect to the distribution of the Category II - non-INDC documents - of which the NDU normally only receives single copies. The existence of these Category II documents is normally made known in an appendix attached to all Newsletters, and the recipients of these Newsletters may request a copy of any one of those documents.

Proposed Solution

In seeking to find solutions to the problems outlined above two facts should be borne in mind:

(a) INDC-documents are distributed by the NDU, in accordance to the code assigned to such documents, irrespective of whether or not they have been requested.

(b) Category II documents are only distributed on request.

1. Once a particular code is attached to INDC-documents, the originator can determine the number of copies required for distribution by an examination of the NDU Correspondents List INDC(NDU)-8/U (INDC-267). In this case every effort should be made by the originator to submit an adequate number of copies to the NDU. This is particularly so for those documents with U or E distribution.

2. In the case of Progress Reports submitted by Liaison Officers, since these are normally sent to the NDU in the form of appendices to letters and not in the form of documents, the NDU will get the appropriate number of xeroxed copies. These Progress Reports are for G distribution, thereby requiring approximately 20 copies.

3. For the non-INDC, Category II, documents, the NDU will follow two procedures, since these documents are only supplied by the NDU on a request basis and therefore knowledge of the number of copies required for distribution cannot be pre-determined.

(a) For Category II documents which may be considered as being "in the public domain" and which the author has no qualms about them being freely released, the NDU will inform the INIS Section of the existence of such documents. INIS will then prepare a microfiche and subsequently "advertise" the document in Atom Index (the index of the INIS compilation). In this case, any requestor will be supplied with a microfiche of the document on payment of 65 ₰ to INIS in the currency of the requestor's country. A statement to this effect will be made when such a document is listed in the appendix to the NDU Newsletters.

(b) For Category II documents which are not "in the public domain" the NDU will make xerox copies upon request and distribute them to the requestor, who will necessarily be a recipient of the NDU Newsletter.

In the case of the proposed solutions 2 and 3(b) imply that the NDU will have to budget for the cost of xeroxing those documents referred to above. Judging from past experience, it can be assumed that some 200 pages per month will have to be xeroxed, which means that at the present cost of the Agency's xeroxing service, of 1½ Austrian Schilling per page, the annual cost to the NDU would be approximately A.S. 3.600.-, or ₰ 150.

REQUESTS FOR SAMPLES FOR NUCLEAR DATA MEASUREMENTS

A. Introduction

The Agency has received four requests for targets for nuclear data measurements from Poland, India, Bulgaria and Pakistan. All these requests were for fissionable isotopes, and subsequently the Board of Governors made provisions for a simplified procedure for small quantities of such material (GOV/DEC 55 (XI) decision 57; see also GOV 1301).

The target material represents in most cases a small part of the total target cost compared to the cost of fabrication. Furthermore, the material is often already available to the Agency, but the requestor is not prepared to pay the cost of fabrication.

Most experiments with targets of this kind are not necessarily destructive to the targets, and when such targets can be made available for other experiments, corresponding savings in fabrication costs can be achieved. With this objective, the Nuclear Data Unit has set out to find a suitable way to locate existing targets which can still be used. However, the present channels of communications are not adequate to make feasible a systematic approach. Therefore an international pool of samples seems to be the best means to fully utilize existing targets, and to coordinate the supply of such targets. In this memorandum, a possible mechanism to deal with the problem will be outlined. It should be pointed out also that a request is usually made for a number of samples needed for a given experiment.

B. Mechanism for review of requests

The International Nuclear Data Committee has the necessary expertise to make reviews of sample requests to some depth, and it is suggested to let the committee decide on the details of the procedure for such reviews; to offset the disadvantage that the whole committee meets only annually, a sub-committee of three to five members could probably be set up for this purpose. The Agency could also ask member countries to furnish necessary expertise. The International Nuclear Data Committee is also in a position to make its recommendations on the basis of the needs for nuclear data measurements. The EANDC has sponsored in the past a request list for nuclear data measurements, RENDA, and it has been proposed that this list be made world-wide; the NDU has already received requests from a couple of countries for inclusion in such a list. If a proposed measurement can be matched with the needs for data spelled out in that list, the INDC would presumably assign a high priority in support of the experiment.

C. Financial support

Most requests for samples from the pool are expected to be financed by other sources, such as research contracts, technical contracts, technical assistance or bilateral assistance from one member country to another, but a few such requests should be

budgeted for directly. In the present case of the Bulgarian request, for example, there is a possibility that if the research contract, which has been granted for parts of the experiment already, cannot be made to cover the expenses for the samples as well, the remaining possibility is that another country provides assistance on a bilateral basis.

During the first few years we can expect less than six requests annually. The total cost for supplementing these requests could amount to the order of $ 25.000.-, although a more precise estimate is difficult to make as the cost can vary greatly from one request to another.

It is worth mentioning in this connection that the U.S. has made available to the Agency $ 50.000.- with the restriction that it be used for fissionable material. It can be argued that this fund would be made more useful if some fraction of it could be used to cover the cost of some sample fabrication.

D. Other contributions to the pool

Staff members of the Nuclear Data Unit have had informal contacts with producers of targets in the U.S. and Euratom. The target centre in Oak Ridge (which in 1967 produced some 250 targets and other samples per month) has reached far in developing standard procedures for the production; if the specifications of a sample are within certain limits, the sample can now be fabricated at comparatively low cost.

The Euratom target centre in Geel is of another type. There, fewer targets are produced but very strict specifications can be met. In the course of making such samples, there is a by-product of samples which do not quite meet the given specifications. If the fabrication costs are the only relevant ones, such by-product samples can be saved from being reprocessed, and can be used for other purposes.

It goes without saying that the Agency should ask that member countries make available to the pool these samples which they can spare. Also, it goes without saying that all samples paid in full or in part by the Agency in any other form (research contracts, etc.) must be returned to the pool after completed use, provided of course that they have not been damaged or contaminated.

The first steps to be taken

A good understanding on the part of the requestors for the costs of various types of samples would save much time and work for everybody concerned. In particular, the Agency could invite the producers of samples to submit lists of target specifications for low cost fabrication as some target production is rather standardized. The Agency could then take on the task to distribute such information through the media available to it.

Present CINDA page format

58 CERIUM PAGE 564 JUNE 15 1968

ELEMENT S A	QUANTITY	TYPE	ENERGY MIN	ENERGY MAX	DOCUMENTATION REF VOL PAGE DATE	LAB	COMMENTS	SERIAL NO.
CE	DIFF INELAST	EXPT-JOUR	1.4 7		YF 4 1154 D/66	FEI	SAL'NIKOV+ SPEC OF SECNDARY NS.CURVE	533871
2							ENGL TRANSL SNP 4 831 6/67	533885
3							FEI-30 D/69 SAME CURVE, SIMILAR TEXT	533898
4							YFI-2 11 /66 (ENGL INDSWG-126E 10)ABSTR	533912
CE	DIFF INELAST	EXPT-REPT	1.5 7		NDL TR 86 1/67	TNC	MORGAN+2.TABLE.A=90DEG FINAL E.7-9HV	32561
CE	DIFF INELAST	EXPT-JOUR	5. 6	7. 6	NP A112 337 5/68	ALD	OWENS+.3ES.FROM N SPECT 90DEG NDG.	545567
2							SEE ALSO AWRE-CNR/PR/10 4/68	545541
CE	INELST GAMMA	-	1.6 6	2.7 6	PPG MATH BRTOL 5/59		ES ONLY + IA,SPIN ASSGN,LVL SCHMS	6145
CE	INELST GAMMA	-	TR	UP	BAPS7 624W10 D/62		STANFORD DR NDLDAUER CALC	6146
CE	INELST GAMMA	EXPT-PROG	1.7 6	4.5 6	WASH1056 XVIA2 3/65	TNC	MATHUR,DATA AT 3.2MEV BEING ANAL,TBC	23237
CE	INELST GAMMA	EXPT-PROG	3.0 6	4.5 6	WASH1064 P.191 0/65	TNC	NELLIS+,THETA=90DEG,4 ES	28224
CE	INELST GAMMA	EXPT-PROG	8. 5	2. 6	WASH1074 117 4/67	TNC	TO BE COMPLETED NDG	36176
CE	INELST GAMMA	EXPT-PROG	8. 5	2.1 6	ORO-2791-26 95 8/67	TNC	MORGAN+ NAI(TL)+GE-LI ANG DIST CURVS	38312
CE	INELST GAMMA	EXPT-PROG	8. 5	2.1 6	WASH1079 163 0/67	TNC	TUCKER NAI(TL) SPEC+SIGS TABLE TBC	37730
CE	INELST GAMMA	EXPT-JOUR	5. 6	7. 6	NP A112 337 5/68	ALD	OWENS+.3ES.TOF SPECT 90 DEG. NDG.	545593
CE	N2N REACTION	EVAL-REPT	TR	1.5 7	UCRL-5351 N/58	LRL	HOWERTON.ASSUMED CURVE,EFF TR=10MEV	513343
CE	THRMLSCATLAW	REVW-JOUR	COLD		JAP 36 1078 3/65	ORL	MAGNETIC PROPS FROM N DIFFR XPTS	25160
CE	THRMLSCATLAW	EXPT-JOUR	7.T-2		ACR 20 315 2/66	BKB	N DIFFRACTION SAM=.75+-.02CM-12	517686
CE	ABSORPTION	EXPT-JOUR	PILE		PPS A63 1175 0/50	HAR	COLMER+LITTLER.PILE OSC REL HAR B	505695
2							SEE ALSO AERE NR 927 JUNE 1950	505696
CE	ABSORPTION	EXPT-JOUR	PILE		PR 80 342 N/50	ANL	HARRIS+.PILE OSC.REL TO BORON.APPROX	39271
CE	ABSORPTION	EXPT-JOUR	THR		PR 83 643 8/51	ORL	POMERANCE LOCAL OSC REL AU ABS 95 B	19391
CE	RES INT ABS	EXPT-JOUR			AE 3 507 D/57	CCP	KLIMENTOV+.EPI CD REACTIVITY REL LI	521687
2							ENGLISH SJA 3 1387 (57), JNE 9 20 (6/59	521688
CE	RES INT ABS	REVW-CONF			64GENEVA P102 5/64	SAC	CARRE+CF CALC VAL+EXP BY TATTERSAL	534578
CE	ACTIVATION	EXPT-ABST	6		BAP 11 741 CJ8 7/66	GA	.5,1.6MEV GS WITH TOS OF 8MICROSEC	29007
CE	N,GAMMA	EXPT-JOUR	4.0 5		PR 120 556 0/60	LAS	DIVEN,SC-T.	29748
2							SUPERSEDES WASH1021	30889
CE	N,GAMMA	EXPT-JOUR	3.0 4	6.5 4	PR 129 2695 3/63	ORL	MACKLIN+ LIQ SCINT,.35+-5,84-2MB	37506
2							SUPERSEDES PR 122 182 4/61 BNL653(N-31	37138
3							61VIENNA 1 95,8/61,P.73	544463
CE	SPECT NGAMMA	-	THR		NC 11 609SWSS 1/59		LINE ENERGIES ONLY CRYSTAL SPEC	5861
CE	LVL DEN LAW	EXPT-JOUR	1.4 7		HPA 36 1059 0/63	BAS	PLATTNER+TOF TBL12ELEM.CFD TH	545154
CE	LVL DEN LAW	EXPT-CONF	5. 6	7. 6	65ANTWRP 122 7/65	ALD	OWENS+TOMLE. FERMI GAS CST FR.INELSC	503717
CE	LVL DEN LAW	EXPT-REPT	1.4 7		FEI-30 D/69	FEI	ANUFRIENKO+.PARAMS FROM NONELASTIC	529495
CE	LVL DEN LAW	EXPT-JOUR	5. 6	7. 6	NP A112 337 5/68	ALD	OWENS+.LVL DENS VERSUS EXCIT.MEAN T	545491
2							SEE ALSO AWRE-CNR/PR/10 4/68	545506
CE 136	ACTIVATION	EXPT-JOUR	PILE		PR 103 917 8/56	ORL	BROSI+,6.3B CE137 .68 CE137M DCAYSC	34389
CE 136	N,GAMMA	EXPT-JOUR	THR		PR 88 412 0/52	ORL	POMERANCE.PILE OSC.ESTIM.ERROR 100PC	39408
CE 136	N,GAMMA	EXPT-JOUR	THR		PR 129 769 1/63	NYR	KEISCH,RATIO ISOMER ACT TO GND ACT.	27718
CE 136	N,GAMMA	COMP-JOUR	THR		NP 60 241 N/64	ANL	BISHOP+EXP AND TH ISOMER RATIOS CFD	526074
CE 138	N,GAMMA	EXPT-JOUR	THR		PR 88 412 0/52	ORL	POMERANCE.PILE OSC.	39407
CE 138	N,GAMMA	EXPT-JOUR	PILE		PR 128 761 0/62	BNL	SEMGAL,0.65+-.22B REL CE140.1400 ACT	29679
CE 138	N,GAMMA	COMP-JOUR	THR		NP 60 241 N/64	ANL	BISHOP+EXP AND TH ISOMER RATIOS CFD	526075
CE 139	ACTIVATION	EXPT-JOUR	PILE		PR 128 761 0/62	BNL	SEMGAL, 18+-5MB(55SEC)REL AL27	29676
CE 139	N,PROTON	EXPT-ABST	6.0 6	1.4 7	DA 29 6709 5/65	MIS	WOOD.INVERSE REACTION	503718
CE 140	EVALUATION	EVAL-REPT	4.1-1	1. 7	GA- 2451 (1111) 8/61	GA	JOANOU+.60GROUP DATA FOR GAM-I ABS	510816
CE 140	EVALUATION	EVAL-CONF	1. 3	1. 7	66PARIS 119 0/66	BOL	BENZI NG. UK FORMAT AVAILABLE CCDN	523305
CE 140	TOTAL XSECT	EXPT-ABST	5.0 2	1.2 5	PR 98 1162A 5/55	DKE	NEWSON ABSTRACT MAIO RES ES GIVEN	35628

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ELEMENT S A	QUANTITY	TYPE	ENERGY MIN	ENERGY MAX	DOCUMENTATION REF VOL PAGE	DATE	LAB	COMMENTS	SERIAL NO.
CA 044	INELST GAMMA	EXPT-JOUR	2.6 6		PR 102 767	4/56	LAS	DAY.1.1368 FOR 1.152-MEV GAMMA 95DEG	35758
CA 044	INELST GAMMA 2	EXPT-JOUR	3.5 6	5.0 6	PR 140 B1541	D/65	TNC	TOF.CS.ARS 90DEG SIG 1.158GAMMA.CURV SUPERSEDES BAP59 693 R9 OCT.1964	26879 26882
CA 044	N2N REACTION	THEO-JOUR	1.3 7	1.5 7	NSE 23 238	M/65	BNL	PEARLSTEIN +AVG FISS SPECT.STAT MOD	34974
CA 044	N3N REACTION	THEO-JOUR	FISS		NSE 23 238	M/65	BNL	PEARLSTEIN. STATISTICAL MODEL	34870
CA 044	ACTIVATION	EXPT-JOUR	PILE		PR 72 888	M/47	ANL	SEREN+.UNRELIABLE CA45 DECAY SCHEME	514304
CA 044	ACTIVATION	EXPT-PROG	PILE		WASH 191	6/56	ORL	CF56 6 21 OD788 PM10PC	14659
CA 044	N,GAMMA	EXPT-CONF	1.5 5		58GENEVA15 50	9/58	KUR	LEIPUNSKIJ.PPR2219,VAL GVN	542246
CA 044	N,GAMMA	EXPT-CONF	THR		62MADRAS 429	2/62	TRM	LUTHRA.VAL GVN,RADIATION DAMAGE	538148
CA 044	N,GAMMA	THEO-CONF	2.5-3		66MOSCOW NSP	2/66	CCP	TBL GIVEN	508477
CA 044	N,GAMMA	EXPT-REPT	THR		UCRL50001 66 2	6/66	LRL	F.P.CRANSTON MOXON RAE DETECTOR	31278
CA 044	N,GAMMA	EXPT-PROG	THR		WASH1071 82	M/66	LRL	CRANSTON+.MOXON-RAE DETECTOR	32153
CA 044	N,GAMMA	EXPT-ABST	THR	6	BAP 11 909 59	D/66	LRL	WHITE+2.PILE BEAM SIG=1.1+-0.28	31139
CA 044	N,GAMMA	EXPT-JOUR	THR		NP A102 226	9/67	UTR	CRUPPELAAR+ 1.48 OKS CRANSTON+	534924
CA 044	SPECT NGAMMA	EXPT-PROG	THR		ORNL3425 60	63	ORL	REL INTENSITY VERSUS CHANNEL NUMBER	504459
CA 044	SPECT NGAMMA	EXPT-JOUR	THR		PR 135 B52	7/64	ANL	COTE.ANG.CORR.OF CASCO GS TO FIND J.	19576
CA 044	SPECT NGAMMA	EXPT-PROG	THA		EANDC(E)89 U	1/68	RCN	SPILLING+	538492
CA 044	N,PROTON 2	EXPT-JOUR	1.4 7		ZET 31 360	8/56	CCP ENGLISH	REL CA42 -24 JET 4 291 3/57	511243 511716
CA 044	N,PROTON 2	EXPT-JOUR	1.4 7		ZET 33 1520	D/57	CCP ENGLISH	ACT+RECHEM,REL TO CA42 -24/1 JET 6 1174 6/58	511244 511717
CA 044	N,PROTON 2	EXPT-JOUR	1.5 7		OAWA 98 200	M/61	IRK	HILLE. ACTIVATION. REL AL(N,ALPHA) SEE ABSTCT EANDC(OR)11L 8 1/63	545711 545716
CA 044	N,PROTON 2	EXPT-JOUR	1.4 7		ZET 45 505	8/63	RAZ ENGLISH	LEVKOVSKII.ACTIVATION.SIG=37+-7MB JET 18 213 1/64	532303 511246
CA 044	N,PROTON	EXPT-PROG	5.6 6	8.5 6	EANDC E 57U 1	2/65	FRK	BASS+4PI BETA COUNTING 3VALUES	532256
CA 044	N,PROTON	EXPT-JOUR	1.5 7		NP 69 153	7/65	PAT	KMURANA+SIG=91+-20MB CFD STAT THEORY	526340
CA 044	N,PROTON	COMP-JOUR	1.4 7	1.5 7	NUC 23 8 112	8/63	IND	CHATTERJEE TABLE WITH REFS	25329
CA 044	N,PROTON	EXPT-CONF	1.4 7		66BOMBAY 60	2/66	TAT	TIWARI+.VAL GVN CFD REFS,ACTIVATION	539413
CA 044	N,PROTON	EXPT-JOUR	1.5 7		NC 44 2B 460	8/66	TOR	MIMETTI+.ACT MEAS. 39+-7 MB	517386
CA 044	N,PROTON	EXPT-CONF	1.4 7		66PARIS I 216	8/66	TAT	PPR12,TIWARI+.ACTIVATIONMETHOD	527564
CA 044	N,PROTON 2	EXPT-JOUR	1.4 7		NP A91 222	1/67	OEB	CSIKAI+NAGV 45+-6MB CFD GARDNER THY SEE ALSO AR B 79 (6/66)	520586 531616
CA 044	N,PROTON	THEO-JOUR	1.4 7		NP A96 121	4/67	TIT	GARDNER+ RELATIVE ISOTOPIC X SECTION	524681
CA 044	N,PROTON	REVW-JOUR	1.4 7		NFF 16 123	2/68	OEB	CSIKAI. VAL GVN CFD REFERENCES.ACTIV	543310
CA 044	N,PROTON	THEO-JOUR	1.4 7		NP A110 317	3/68	TAT	TIWARI+.SIGMA FROM LVL DENS R 44	541444
CA 044	N,DEUTERON	EXPT-CONF	1.4 7		66BOMBAY 60	2/66	TAT	TIWARI+.VAL GVN CFD REFS,ACTIVATION	539415
CA 044	N,DEUTERON 2	EXPT-CONF	1.4 7		66PARIS I 216	8/66	TAT	PPR12,TIWARI+.ACTIVATIONMETHOD ABSTRACT ONLY.FULL PAPER SEE INDC-156	527565 527571
CA 044	N,ALPHA	EXPT-CONF	1.4 7		60WALTAIR 297	2/60	MUA	KMURANA+.VAL GVN REL FE56(N,P),C-M	538216
CA 044	N,ALPHA 2	EXPT-JOUR	1.5 7		OAWA 98 200	M/61	IRK	HILLE. ACTIVATION. REL AL(N,ALPHA) SEE ABSTCT EANDC(OR)11L 8 1/63	545712 545715
CA 044	N,ALPHA	THEO-JOUR	1.4 7		NP 60 49	M/64	TIT	GARDNER+PREDICTED BY EMPIRICAL FORM	525775
CA 044	N,ALPHA	EXPT-PROG	6.7 6	1.5 7	EANDC E 57U 1	2/65	FRK	BASS+G+4PI-BETA COUNT 4VALUES	532079
CA 044	N,ALPHA	EXPT-JOUR	1.6 7		NP 66 419	5/65	BEM	PEIL.ACT 29+-6MB REL FE56 NP=12ORB	534311
CA 044	N,ALPHA	EXPT-JOUR	1.5 7		NP 69 153	7/65	PAT	KMURANA+SIG=113+-20MB CFD STAT THEOR	526341
CA 044	N,ALPHA	EXPT-JOUR	FISS	1.5 7	ZN 20A 1583	D/65	BER	61.INICROB(FISS) 64.THICROB(15MEV)	516225
CA 044	N,ALPHA	EXPT-CONF	1.4 7		66BOMBAY 60	2/66	TAT	TIWARI+.VAL GVN CFD REFS,ACTIVATION	539414
CA 044	N,ALPHA	EXPT-JOUR	1.5 7		NC 44 2B 460	8/66	TOR	MIMETTI+.ACT MEAS. 35+-6 MB	517387
CA 044	N,ALPHA	THEO-JOUR	1.4 7		NP A110 317	3/68	TAT	TIWARI+.SIGMA FROM LVL DENS AR41	541447
CA 044	LVL DEN LAW	THEO-JOUR	6		EN 15 1 94	8/68	RBL	FACCHINI+ LOL PARS FROM LOW EN RES	540395