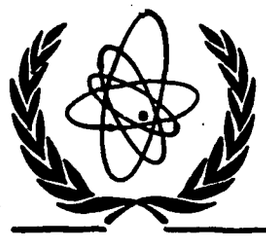

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IAEA Nuclear Data Unit

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ABSTRACT

The paper describes the present status of the neutron data compilation center of the IAEA Nuclear Data Unit, which is now in full operation. An outline is given of the principles and objectives, the working routines, and the services available within the two-fold functions of the Unit:

a) to promote cooperation and international neutron data exchange between the four major centers at Brookhaven, Saclay, Obninsk and Vienna, which share responsibilities in a geographical distribution of labour;

b) to collect systematically the neutron data arising from countries in East Europe, Asia, Australia, Africa, South and Central America and to offer certain services to these countries.

A brief description of DASTAR, the DAta STorage And Retrieval system, and of CINDU, the data Catalog of the IAEA Nuclear Data Unit, is given.

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Before entering upon a description of the data center activities at IAEA, it is perhaps well to state some views about objectives. These are: (a) that data taken at considerable expense should be made available immediately to the scientific and technical community - by no means should they become inaccessible or lost; (b) that data centers should offer a variety of services, so that various data users can exploit the data files; (c) that the local and regional data centers should be well coordinated within an international data system, in order to furnish greatest access to data with minimum duplication of effort. I should like to give an outline of our activity as a data center at IAEA.

The Nuclear Data Unit of the IAEA was established in 1964 on the recommendation of the International Nuclear Data Committee, to help promote the compilation and distribution of the growing fund of neutron data. In 1965, the IAEA Nuclear Data Unit began to contribute to the bibliographic index CINDA, and in 1966 it started acting as a neutron data center. The world-wide responsibility of data collection and dissemination is now shared between four centers, in a geographical distribution of labour, whereby:

- The NNCSC at Brookhaven services the US and Canada, supplemented by the CINDA operations at DTIE Oak Ridge
- The ENEA Neutron Data Compilation Centre at Saclay (France) services countries in Western Europe and Japan
- The Informacionnyj Centr po Jadernym Dannym (Nuclear Data Information Center) at Obninsk services the USSR
- The IAEA Nuclear Data Unit in Vienna services countries in Eastern Europe, Asia, Africa, South and Central America, Australia and New Zealand (referred to later as the IAEA service area).

This division of the world's neutron data compilation is significant and reasonable, because the problems to solve are specific for each area. These areas differ in their computer equipment, in their scientific interests, in the types of their laboratories and potential data users, and in their geographical and political situation, so that different services are required in each area. On account of these regional differences, it seems evident that it is at present not possible to strive for identical compilation systems in all centers. However, it is both essential and possible to create a common interface for data transfer between the centers.

The responsibilities of the IAEA Nuclear Data Unit have two aspects: (a) to promote data exchange between the four data centers, and (b) to compile and disseminate data within the IAEA assigned service area. First priority has been given so far to the international

exchange and coordination, which the IAEA sought to achieve through consultants' meetings between the four centers. Compilation within the Agency's service area is now being given comparable emphasis. In this area, the number of interested laboratories and the data flow from and to them is increasing.

With our dual responsibility in mind, we developed a data storage and retrieval system, which was designed after studying the experiences of Brookhaven and Saclay, with whom we consulted. I wish now to explain the most significant features of our system, which has been in operation since October 1966.

The system consists essentially of two main files: the data file, DASTAR (= DAta STorage And Retrieval), and a CINDA type index file, called CINDU (= Catalog of the IAEA Nuclear Data Unit). Periodic expanded prints of the index of this dual system provide a computerized publicizing medium for the stored data which is identified by means of accession numbers, called DASTAR-numbers. It is thus possible that scientific papers could not only quote references to, e.g., Atomnaja Energija vol. 20 p. 8, but also to DASTAR-00322 version 2. A reference to a data set in this way is unique; it would, of course, not replace the reference to a printed article, but only supplement it.

The data file DASTAR is characterized by two main features:

(1) It has a completely flexible format. Thus, we are able to store every piece of data without any loss of information. In general, we store all data in its original format, as we receive it, table by table and unmerged. Format conversions which need manpower and may introduce mistakes, are avoided. However, with each data set the FORTRAN format statement is stored, so that automated data processing, plotting, etc., is possible.

(2) Numerical data are of little value if they are not accompanied by a minimum of explanatory comments including information on normalization, corrections, definitions, etc. We do not store any data set without such comments.

The CINDU file serves a variety of different functions:

(1) A printed version of CINDU is published about quarterly as a means of announcing new results. A data compilation is of little value if its contents are not known. The value of this publication is evidenced by the fact that data requests which refer directly to CINDU are increasingly frequent.

(2) CINDU furnishes a bibliography to each data set. Care is taken that this bibliography is complete. It is possible to retrieve data not

only by a main reference but by any secondary reference as well.

(3) CINDU is the DASTAR retrieval organ. It is a compact source of information upon which retrievals are most commonly made, such as by element, isotope, quantity, energy, date, laboratory, references, authors, etc. It is linked to the data files by accession numbers. This separation of data and index is efficient and eliminates time consuming searches through large data files for single sets of data. Entry is also efficient because an index entry can be made even before data entry is complete. CINDU-6 which was printed November 21, indexes data which were received on November 20.

(4) The data index CINDU allows various specialized data files to be kept, all indexed by accession-numbers. E.g., resonance parameters, thermal scattering data, gamma spectra, etc., seem to require different files but could all be retrieved from the same central index CINDU.

(5) CINDU, perhaps with minor modifications, could be extended to an international index referring to various local data files.

Important though systems and computer operations may be, there are also certain practices which we have also found to be of importance. I want to mention only two:

(1) A most important routine, we find, is to send proof-copies of the data sets to the authors. The purpose is not to relieve the data center from checking responsibility, but to make as sure as possible that everything is correct and nothing has been lost. A by-product of the practice is that authors tend to take increased interest in the data compilation, and higher accuracy is assured. The value of the proof-copy principle is shown by the fact that about one in every eight data sets undergoes correction by the author, sometimes on account of unpublished revisions of the data, sometimes on account of misprints in the printed literature.

(2) Detailed records are maintained to determine the data flow; these records show what data have been sent to whom. This makes it possible to send data revisions automatically to all recipients of the earlier versions. This service, which is of essential interest to both data users and producers, reduces "noise" in the data files, which has been part of the general criticism against data centers.

This was a brief outline of the DASTAR-CINDU system. The entire work, including designing and programming the system, as well as compiling and disseminating over 100.000 data points, preparing plots, etc., was done essentially by two physicists and a part

time programmer within a year. The system is sufficiently flexible that additional features can be added as need arises. In particular, we are considering adding features which might be required for better compatibility between the systems of the various data centers, at the present especially in connection with the new plans at Brookhaven. An essential need for effective exchange between centers at the present time is a joint data index, which could later on be combined with the bibliographical index CINDA. A consultants' meeting took place in Saclay in February 1968 to consider this problem and to recommend compatible formats, definitions, etc.

In summary, our present activities are: to promote the coordination between the four major neutron data centers, and to compile and disseminate data within our geographical service area, using the tools of CINDA, DASTAR and CINDU. These goals will need most of our efforts for the near future. Our experience indicates that services to data users are increasingly becoming obligations of the data center. From this point of view, more emphasis should be given to investigating and analyzing what services to offer. Thus, for example, for the experimenters, the centers from their vantage point should supply various types of transformations of data; for the evaluators, reactor physicists and designers, greater attention should be given to the exchange of evaluated data. In these ways it would be ensured that maximum profit could be drawn from the data on file.