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INDC INTERNATIONAL NUCLEAR DATA COMMITTEE

REPORT ON THE EIGHTH FOUR-CENTRE MEETING

Nuclear Data Section, I.A.E.A.

Vienna, 16 - 20 Oct. 1972

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Secretaries

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Agenda as adopted at the Meeting

I. Organization and Announcements

a) Introductory remarks and election of chairman and secretaries.

b) Consideration and adoption of agenda - meeting organization.

c) Review of actions from last 4C meeting.

II. Working Policies and Coordination of Centers

a) Short progress reports from Centers.

b) Recommendations to Centers from Nuclear Data Committees, Steering Committees, scientific meetings or other bodies.

c) Users' data requests and response by the Centers. Data request profile (experimental and evaluated)by iso-quant, requestor type (university, industry, etc.) and field of application (reactor, shielding, fusion, etc.). Standing requests.

c') User response to information contained in EXFOR.

d) Completeness of compilation of data from recent experiments.

e) Status of conversion from old experimental data files to EXFOR.

f) Necessary improvements in the functioning of the Four-Center Network.

g) Problems of obtaining basic measured data from authors (resonance parameters vs. line shape).

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a) Review of actions from last meeting and from 4C memos.

b) Experience with exchange-tapes.

c) Checking and correction of entries.

d) Existing programs and plans for automated data processing making use of EXFOR coded information.

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g) EXFOR-Manual: proposals for changes and additions, pending 4C-Memos, correspondence and any other new proposals.

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VI. Evaluated Data

a) Published index and documentation.

a') Common evaluation procedures.

b) Technical details concerning the exchange of evaluated data between the 4-Centers.

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VII. Trends and Developments in the Centers

a) Statement from the Centers.

b) Possible extension of the scope of EXFOR data.

c) Cross links RENDA-CINDA-EXFOR-EVALUATED DATA.

d) Information exchange on evaluation activities.

e) Cooperation between the four neutron centers and the centers for nuclear structure and reaction data.

f) Cooperation in CODATA compendium on Numerical Data Projects update.

g) Compilation of standard cross-section values.

VIII. Conclusions

a) Summary, recommendations, and actions.

b) Next meeting.

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EIGHTH FOUR-CENTRE MEETING

October 16 - 20, 1972

International Atomic Energy Agency, Vienna

SUMMARY MINUTES

I. Organization and Announcements

I.a Introductory remarks and election of Chairman and Secretaries

1. Opening talk was made by Schmidt, Dr. Kouvshinnikov, Scientific Adviser of the Soviet Mission in Vienna, represented CJD in absence of CJD staff members.

2. The meeting elected Dunford as Chairman, Calamand and Lemley as Secretaries, all three from NDS.

I.b Consideration and adoption of agenda - meeting organization

3. Pearlstein referred to Kolstad's letter which noted inadequacy of data transmission in EXFOR for 1970/71. A preliminary reply was drafted, and each Centre was to provide, for inclusion in the letter, statistics (Attachment 4CM/VIII/10) relating to the backlog of untransmitted recent data and to the time lag between receipt and transmission of new data.

4. Amendments of the Agenda suggested in Manokhin's letter were discussed and the Agenda revised accordingly by adding item VI a' "Common evaluation procedures." Other minor revisions were also included and the revised Agenda was adopted as given in Attachment 4CM/VIII/1.

I.c Review of actions from last 4C meeting

5. Lemmel introduced a list (Attachment 4CM/VIII/5) of uncompleted actions from the last meeting. Most of these actions were resolved during the meeting or were renewed under appropriate agenda items.

II. Working Policies and Coordination of Centres

II.a Short progress reports from Centres

6. Progress reports from each of the Four Centres are attached as documents 4CM/VIII/4, 4CM/VIII/5, 4CM/VIII/6, 4CM/VIII/7.

II.b Recommendations relevant to the Centres from Nuclear Data Committees, Steering Committees, scientific meetings or other bodies.

7. Dunford introduced the following INDC recommendations:

a) to publish a data request list for safeguards,

b) to consider the problem of compiling fission neutron spectra,

c) to publish the request list for fusion.

8. The Euratom Working Group on Reactor Dosimetry recommended:

a) the free exchange of evaluated reactor dosimetry cross sections,

b) that NDS take the lead in establishing standard values for reactor dosimetry cross-sections.

9. Fröhner reported on the CCDN Steering-Committee recommendations:

a) Fission neutron spectra data should be compiled in a 4C effort.

b) When necessary, Centres could "encourage" an author to send data by writing to his superior.

10. Pearlstein suggested to return this problem of obtaining data from measurers to the various nuclear data and advisory committees in case of recorded failure.

II.c Users' data requests and response by the Centres. Data request profile (experimental and evaluated) by iso-quant, requestor type (university, industry, etc...) and field of application (reactor, shielding, fusion, etc....). Standing requests.

11. Various statistics concerning data requested from NNCSC, CCDN and NDS by users appear in Attachments 4CM/VIII/8, 4CM/VIII/5 and 4CM/VIII/9. The validity and contents of statistics were discussed. It was pointed out that NDS and CCDN have no requests from industry. This may be because industrial users request data from (national) laboratories which in turn request data from the Centres. Hence industrial requests may appear as laboratory requests. It was agreed that the services offered by the data centres should be brought to the attention of potential users in industry. NNCSC publicizes its services at the American Physical Society meetings.

II.c' Users response to information contained in EXFOR.

12. The Centres reported that in general users seem satisfied with the content and structure of the bibliographical information contained in EXFOR.

13. A possible action was discussed: The Centres should agree on what information is essential for EXFOR and for journal articles which report experimental data. This agreement should then be communicated to the editors of all relevant journals.

II.d Completeness of compilation of data from recent experiments.

14. The Centres reported on their data coverage. NDS and NNCSC believe they have no backlog for data published since 1970 whose existence is known to them. CCDN hopes to eliminate its backlog during the next 6 months.

15. The Centres discussed what types of statistical information best enable them to analyze and compare their work. It was agreed that the Center heads should prepare for the next meeting a proposal on common quantities and formats to be used in the future by all Centres in their statistical reports. For the next meeting statistical reports will continue to be prepared according to the discretion of each Centre.

II.e Status of conversion from old experimental data files to EXFOR.

16. NDS presented the status of conversion from DASTAR to EXFOR as given in document 4CM/VIII/11. NNCSC stated that by the end of Jan/73 all old data will have been converted to EXFOR format and transmitted. The Centres agreed that compilation of new data deserved higher priority than conversion and transmission of older data.

II.f Necessary improvements in the functioning of the Four-Centre network.

17. The Centers recommended that information of general interest be communicated promptly to the other Centres, especially information which might affect operations or scheduling of work at another Centre. Further discussion of the functioning of the Four-Centre network was related to EXFOR.

18. Lemmel expressed the following view: "In past letters and memos there had been some concern that the EXFOR-system is not practical. However, such criticism seems only to refer to rather marginal items of EXFOR or to difficulties experienced during the set-up period. The complexity of the EXFOR system reflects only the complexity of the compiled data. The real difficulties encountered with the entries transmitted so far, were mainly due to insufficient education and supervision of the compilers. These difficulties are independent of the compilation or transmission systems used."

19. The meeting observed that the 4C-Memos have become an essential tool to coordinate the different philosophies of data compilation and exchange in a multilateral system like EXFOR and agreed upon the following new general procedures for sections of 4C-Memos which refer to data compilation and EXFOR.

20. Guidelines for 4C-Memos:

1) Contents of each memo will be summarized in a covering-page index.

2) Each subject will begin on a new page to facilitate distribution to the appropriate staff at each Centre for action.

3) Items requiring 4C agreement will be flagged with a special symbol in the index and on the appropriate subject page.

4) The 4C-Memo Number will appear on each page.

5) All proposed changes and additions to the dictionaries, EXFOR manual and LEXFOR will contain, when possible, a revised entry in the format of the appropriate document, in addition to the usual documentation.

6) In case of discussion, the originating Centre is responsible for collecting the points of agreement and issuing a final wording in the format of the appropriate document(s).

7) Proposals which do not evoke discussion will be entered after 4 weeks by the Centres responsible for maintenance of the document in question.

8) Updated manual pages documenting changes and additions will be issued by NNCSC as X4-Memos to all Centres immediately following agreement on such changes. Complete dictionaries will be distributed by NDS every 3 months. Intermediate dictionary update pages will be distributed as in the past.

21. It was agreed that from now on Centres will promptly acknowledge receipt of each transmission tape - CJD by cable, other Centres by airmail.

II.g Problems of obtaining basic measured data from authors.

22. The Centres noted the difficulty of obtaining basic data from authors who give only resonance parameters or average cross sections instead of the point data. When requesting data, the Centres should, when possible, emphasize a particular project or user so that authors will feel a sense of participation in some specific project. NNCSC suggested that the Centres advertise their services as part of a common international effort to compile,

evaluate and disseminate information in useful form to an international community of users.

III. EXFOR in detail

III.a Review of actions concerning EXFOR from the last meeting and from 4C-Memos.

23. Lemmel reviewed unresolved actions from 4C-Memos (Attachment 4CM/VIII/13) Agreements and actions are described below in the section marked 4CM/VIII/X4.

III.b Experience with exchange tapes.

24. An agreement was reached on Memo 4C-1/31 that subentries to be added to a previously transmitted entry may now be transmitted accompanied only by retransmission of the first subentry; other unchanged subentries need not be retransmitted. NNCSC will revise page IX.2 of the EXFOR manual appropriately.

25. When a subentry is changed, a "C" will be included in column 80 of the SUBENT record: alter-flags will be used on individual records as at present. Similarly, subentries added to an already existing entry will have "I" in column 80 of the SUBENT records. Centres will comply when their programming schedule permits.

26. It was agreed that in future the first subentry would also be included, when transmitting corrections in other subentries.

27. It was agreed that the programmers of each Centre will investigate the possibility of retransmitting only the BIB section of a subentry. This proposal is especially intended for transmission of revised BIB sections of subentries containing large data tables which remain unchanged. Proposals will be presented at the next 4C-Meeting.

28. Information to be given following keyword HISTORY was discussed. NDS wanted every change to be documented under HISTORY whereas NNCSC wished to document only important changes. Agreements reached appear in the LEXFOR entry of Attachment 4CM/VIII/X4 (§ 35).

III.c Checking and corrections of entries

29. NDS introduced a chart (Document 4CM/VIII/14) which itemized types of errors found in EXFOR transmissions from all Centres. The Centres thought this form of presentation would be useful in locating sources of error and recommended preparation of similar charts for future meetings.

30. In view of its large number of errors on ID and/or counts in system identifiers, CJD was asked to check these items more carefully in the future, because such errors make processing of EXFOR tapes very difficult. (Supplementary note: According to information from V. Manokhin, appropriate programs have been in operation since summer 1972 so that errors in the I.D. are now avoided).

31. Memo 4C-4/18 was discussed, and the meeting emphasized that TRANS tapes must be corrected by the originating Centre.

32. It appeared that check programs could considerably lower the error rate by cross-checking iso-quant vs data-unit, certain iso-quant modifiers vs. data-headings (e.g. DA vs. ANG), residual nucleus vs. iso-quant, data-units vs. data-heading, etc.

III.d Existing programs and plans for automated data processing making use of EXFOR coded information.

33. Lemmel presented the programs to be developed in the future at NDS (see document 4C/VIII/17). None of these future programs will require more EXFOR keywords or codes but on the other hand they will make crucial a correct entry of STANDARD. Before starting work on the details of a "computation format", NDS will try to minimize differences with possibly equivalent formats elsewhere. Pearlstein noted that he foresees the use of coded information to

produce data indexes.

III.e Critical assessment of keyworded, coded and free text information

34. NDCC, NDS and CJD preferred to cancel dictionaries 15 and 18-23; NNCSC pointed out that some basic codes on method information are desirable for automated production of BNL-325 and BNL-400. This was recognized by the other centres, and NNCSC was asked to submit condensed versions of dictionaries 18, 19, 21-23. It was agreed to cancel Dictionaries 15 and 20.

35. Preliminary versions of the condensed dictionaries appear in section 4CM/VIII/X4.

III.f Dictionaries: proposals for alterations and additions, pending 4C-Memos and any other new proposals for additions.

III.g EXFOR-Manual: proposals for changes and additions, pending 4C-Memos, correspondence and any other new proposals.

III.h LEXFOR: proposals for changes and additions, pending 4C-Memos, correspondence and any other new proposals.

36. Items III e-h are presented in detail in Attachment 4CM/VII/X4.

III.h' Priorities in EXFOR compilation.

37. The Centres agreed upon the following priorities for transmission of data to the other Centres in EXFOR format:

1) Data for the fissile and fertile nuclides.

2) Standard cross sections.

3) Data required for dosimetry, specifically relevant (n,p), (n,alpha) and (n,gamma) cross sections.

38. NNCSC made the following announcements related to publication of the revision of BNL-325:

a) For the next year priorities at NNCSC will be entirely determined by the production schedule for BNL-325.

b) During December and January, NNCSC will prepare the film covering data for the heavy nuclei.

39. Immediate transmission of data for the heavy nuclei by the other Centres would make the Book more complete. NNCSC will distribute the publication schedule for BNL-325 in a 4C-Memo so that other Centres can coordinate data transmissions appropriately.

III.i Handling of important data outside the present scope of EXFOR.

1) Fission product yields and other important fission product data.

40. The original proposal by NDS for compilation of fission yield data, which had been previously distributed in Memo 4C-3/42, was adopted with only minor revisions. Until final manual pages are issued, compilation should proceed according to the proposals of Memo 4C-3/42. Since most of the large quantity of existing data are conveniently summarized in published review articles (e.g. Walker, AECL-3037, Part I), or in articles currently in preparation, only data which are not included in or which are produced subsequently to these review articles need be compiled with high priority.

2) Capture gamma spectra

41. The proposal by CCDN (reported in Memo 4C-2/30, 31) was provisionally accepted. A LEXFOR entry from NNCSC is expected which will specify the data types to be compiled and additional quantity codes if needed. NNCSC should also investigate priorities for compilation as well as coordination of effort with other groups who compile gamma-spectra data.

3) Fission neutron spectra

42. The Centres agreed to compile fission neutron spectra data.

Memo 4C-3/64 was accepted with minor modification (see Section 4CM/VIII/X4/2).

III.j Other details pertaining to EXFOR

43. See Section 4CM/VIII/X4.

IV. CINDA in detail

IV.a Completeness and literature coverage of CINDA

44. Continuing publication of CINDA depends on the sale of sufficient copies (including bulk orders) which in turn depends on complete literature coverage. For the present it appears essential that NEA and the USAEC do not reduce the number of copies in their bulk orders.

45. Lemmel presented a detailed report which analyzed literature coverage by each CINDA centre. As reported at the 7th 4C Meeting, certain important report series continue to be the most serious omissions in all CINDA service areas. But also some journal articles and conference papers were found to be missing. This indicates that the systematic coverage control for new literature must be intensified at all CINDA centres. Lemmel suggested to include in CINDA-73 a list of the most important periodicals together with the last issue scanned.

46. The more complete coverage of USSR laboratory reports and CJD publications, which was announced at the 7th 4C Meeting, has not yet begun. CJD expects to eliminate its CINDA backlog by May 1973. Entries will be prepared in the old format until the new system becomes operational.

47. Probable reasons for incomplete coverage of the literature are

1) insufficient staff
2) inadequate checks on coverage by the CINDA centres because of competing duties such as programming and system development.

48. Pearlstein was asked to discuss with appropriate authorities the possibility of increasing the U.S. CINDA effort to cover adequately U.S. and Canadian literature, especially laboratory reports. He also stated that

NNCSC has the responsibility for the literature coverage for neutron data measurements.

49. It was agreed that any increased resources for CINDA should be used primarily to improve literature coverage rather than to clean up the file. The new systems developed at NDCC and DTIE, however, will offer increased capabilities for editing and reorganization of the file.

IV.b Report on the new system at NDCC and DTIE

50. Fröhner reported that the new CINDA system is expected to be operational next year. Programming for the core of the system is completed, but supplementary programs, including those for output and checking of input are still in the development stage. A preliminary Readers' Manual has been written by N.Tubbs, and a final version will be prepared when the system is complete. Some delay in conversion of the old file to the new file format may occur because of the significant number of old-file entries which must be manually converted. New CINDA entries will continue to be prepared in the old format and can be machine-converted when the new system becomes operational.

51. Attree requested that Tubbs send his CINDA-input check-program to NDS as an aid in rewriting the NDS checking programs for the new system.

52. The NDS Linotron program currently operates under the IBM "DOS" system, which will be frozen and available only at low priority in the first half of next year. All NDS CINDA programs will be rewritten only once to accomodate both the new CINDA system and the new computer operating system ("OS"); thus a long delay in the introduction of the new CINDA system could cause extreme inconvenience.

IV.c CINDA as an EXFOR index.

53. A data index line will be added to a block of reference(s) having the same Z-A-Q, Lab, "block number". At CCDN it is envisaged that data index lines

will be added automatically by extraction from the NEUDADA index; at NDS they will be added by hand until machine blocking has proven to be successful. CCDN is asked to distribute soon a detailed proposal specifying how data index lines will be produced automatically.

IV.d Status of publication schedule and distribution.

54. Because of the heavy work load placed on the IAEA Publication Division by the Proceedings of the 71 Geneva Conference, CINDA 72 was not distributed until October 1972 even though the Linotron processing had been completed in May. A conference with the Director of the Publication Division was held to discuss the 1973 schedule and prevention of such delays in the future.

55. NDS plans to publish a complete volume and a supplement each year so that up-to-date information becomes available every six months. The publication schedule for CINDA 73 appears in Attachment 4CM/VIII/18; processing will presumably be done under the new CINDA system.

V. RENDA in Detail

V.a Policy for the regular production of a world-wide RENDA within the context of 4-Centre Cooperation.

56. The Four Centres agreed to cooperate in the production of RENDA which will be called WRENDA, on a world-wide basis as summarized below based on the detailed proposal submitted for consideration by Attree and Dunford (Memo 4C-3/62).

57. The request list will consist of officially screened nuclear data requests submitted by responsible authorities. These data requests will be maintained as a single file of information including all types of nuclear data and application fields. The system is designed to be open ended to permit

extensions of the system to new application fields and new nuclear data types not currently allowed in the present RENDA.

58. A major new feature of this proposal is a "blocking system" for similar nuclear data requests. The "blocking" criteria are the following : 1) Target (Z and A), 2) Projectile, 3) Reaction. Data grouped in this manner represent a "measurement request" in the sense of the users of a request list. In general status comments apply equally to all the requests within a block. It is strongly felt that a logical grouping of the data such as proposed here will improve the comprehension and credibility of the WRENDA publication and ease the workload for the subject reviewers.

59. The operation of the WRENDA system will be carried out within the Four Centre framework. Each centre will be responsible for the communication with the screening authorities within its service area and for preparing coded entries (new or revised) for the nuclear data requests from its service area. These data will be forwarded to the NDS in the WRENDA transmission format described in the appendices of this document. The Nuclear Data Section will maintain the WRENDA master file and publish the WRENDA document from this file.

60. NDS provides the four centres with country retrievals which can be forwarded by the Centres to the appropriate reviewing authorities. New and Revised requests will be encoded by the Four Centres as well as any changes to the Status Comments and forwarded to NDS. Specialist review activities will be handled entirely by NDS. Specialists will no longer be requested to review individual requests but only the data groups or "blocks" previously described. Specialist comments will be encoded by NDS and integrated into the Status file.

61. The conversion of the present RENDA file held by CCDN will be done by NDS by the time the first "country" retrievals are scheduled for the initial review by the local screening authorities. This initial review of WRENDA will also be used to validate the converted entries.

62. Extensive discussion of an operational schedule and details of the WRENDA transmission format followed. This discussion included an alternative format presented by Fröhner (Memo 4C-2/33). A revised transmission format was adopted and appears in Appendix 4CM/VIII/16. It contains the technical details, revised entry forms and dictionary modifications which were agreed upon at the meeting. The annual production of WRENDA after 1975 appears feasible if new requests are submitted in parallel with the status reviews. The NDS is to contact the INDC for advice on this matter.

63. It was agreed that the meaning of requested accuracies should be discussed further by the Centres and by the INDC. Until a common understanding is reached, WRENDA must include necessary qualifying and explanatory information. [Note: It was recommended at the EANDC Meeting, November 1972, to eliminate reviews by subject specialists. Details to be supplied separately.]

VI. Evaluated Data

VI.a Published index and documentation.

64. Lemmel reported on possible use of CINDA as an index to evaluated data. Even with the new system it would be impossible, and perhaps undesirable, to include in the CINDA file all the information in an index such as CCDN Newsletter 14. In order to increase the versatility of the CINDA system for accommodation of additional types of information, the Saclay CINDA centre was asked to consider the possibility of allowing more than one comment line per data-index line.

65. A critical review of the contents of evaluated data files and brief description of computer programs to manipulate or translate these files has been prepared by T.A. Byer and is ready for publication. If such review proves useful, it should perhaps be continued on a regular basis.

66. NNCSC strongly requested that indexes and other descriptions of evaluated data be prepared exclusively from information contained on the distribution tapes or released with the specific approval of the originating centre. Inclusion of information obtained from informal communications can cause confusion.

VI.a' Common Evaluation Procedure

67. The Centres noted that they have already exchanged several evaluated data files originating in each of the service areas and that these files should be useful for analyzing different evaluation techniques and philosophies.

68. It was agreed to refer this topic to the INDC for their further consideration. The Centres thought that they could assist groups such as the INDC or a second Panel on Evaluation Techniques who might wish to study common evaluation procedures.

VI.b Technical Details concerning 4C exchange of evaluated data.

69. Lemmel requested that the other Centres send together with evaluated data files, certain supplementary information such as 2200 m/sec values, 20°C Maxwellian average cross sections, and resonance integrals since this information probably exists for most evaluated data files. Pearlstein confirmed that this information does exist for the ENDF/B files which have been released and promised to send it. CCDN calculates such information only when it is specifically requested.

70. In order to transmit in computer-compatible format unusual types of evaluated data which do not conveniently fit the established formats such as ENDF,UK or KEDAK, NDS suggested that such data be transmitted in EXFOR format, but outside the normal EXFOR transmissions of experimental data. Such evaluated data received at NNCSC, if important, would be put into the ENDF/A

library and distributed in that format. Requests to CCDN for evaluations which are not part of an evaluated data library would, with permission of the author, be sent in NEUDADA transmission format.

71. Exchange of data necessary for dosimetry was briefly discussed as a possible extension of the present scope of evaluated data exchange.

VI.c Archival files of evaluated data.

72. At present all Centres do in fact retain earlier evaluations in retrievable form. No binding agreements to continue to retain old evaluations were made.

VII. Trends and Developments in the Centres

VII.a Statements from the Centres

73. With the cooperation of Schett at CCDN, Liskien and Paulsen plan to publish a new computer produced atlas of threshold reactions by the end of 1973. This atlas will include only experimental data. There are no plans for a permanent commitment to update this atlas on a regular basis.

VII.b Possible extension of the scope of EXFOR data.

74. Only the previously discussed agreements to include data on fission yields, fission neutron spectra and gamma spectra were mentioned. See 4CM/VIII/X4, 4CM/VIII/X4/1 and 4CM/VIII/X4/2.

VII.c Cross links between RENDA-CINDA-EXFOR-evaluated data.

75. There was no discussion in addition to that which appears under the individual topics.

VII.d Information exchange on evaluation activities.

76. CCDN has assumed responsibility for publication of the EANDC "Ribon Newsletter". The subject of an international newsletter for evaluation activities, to be published by NDS, will be discussed further at the next INDC meeting. It was felt that INDC might wish to discuss extension of

coverage and distribution of evaluation newsletters if significant quantities of evaluated data become available from other sources in addition to the ENDF,UK and KEDAK libraries.

VII.e Cooperation between the Four Centres and centres for nuclear structure and reaction data.

77. Hjärne reported that an informal meeting of some members of INDC and of the International Working Group on Nuclear Structure and Reaction Data [IWGNSRD] would be held in Saclay immediately following the March 1973 Symposium on Applications of Nuclear Data in Science and Technology.

78. If INDC approves establishment of the newsletter proposed by IWGNSRD, the Four Centres might wish to participate.

VII.f Cooperation in CODATA compendium on Numerical Data Projects update.

79. In this Compendium CODATA publishes short descriptions of data compilations and evaluations in all fields. NDS promised CODATA to coordinate contributions from the Four Centres concerning neutron data compilation and evaluation. Schmidt will inquire about guidelines and deadlines for the next edition of this Compendium.

VII.g Compilation of standard cross-section values.

80. NDS briefly discussed plans to compile up-to-date values for cross sections which are used as standards. These standard cross sections would be used for computer renormalization of data sets on a consistent basis for use with a proposed "computation format", which is described in Attachment 4CM/VIII/17.

81. NNCSC recommends that specific unreleased evaluated data sets which are needed can be requested with the understanding that USAEC approval must be obtained. One approach is to direct a request simultaneously to NNCSC and USAEC.

VIII. Conclusions

VIII.a Summary, recommendation and actions

82. Lists of actions and recommendations from this meeting with references to the Minutes and the Attachments are included in Attachments 4CM/VIII/19 and 4CM/VIII/20. In order to promote better preparation for Four-Centre meetings, it was recommended that the list of actions from this Meeting be recirculated by NDS two months prior to the next meeting. New proposals should be distributed by the originating Centre at least two months prior to the next meeting. If this is not done, major new proposals cannot be discussed properly at the meeting.

VIII.b Next Meeting

83. Kouvshinnikov invited the Centres to hold their next meeting in Moscow. After discussion Kouvshinnikov was asked to report to the State Committee on Atomic Energy the following recommendations from the Meeting.

84. 1) The meeting should be for five (5) days - Monday through Friday, 4 - 8 June 1973, i.e. immediately following the Kiev Conference on Neutron Physics.

2) Wednesday and Thursday should be spent at FEI, Obninsk, in contact with the technical staff of CJD.

Some plenary sessions, particularly those pertaining to technical and administrative details of 4C cooperation, could also usefully be held at FEI, Obninsk.

3) Some participants expressed the desirability of discussions with neutron data evaluators from FEI, Obninsk, and other institutes.

85. Further details and any apparent conflicts will be worked out in correspondence with the State Committee.

86. All participants thanked Kouvshinnikov for representing the Obninsk Centre on short notice and wished Dr. Manokhin, the scheduled participant, a speedy and complete recovery from his sudden illness.

TECHNICAL DETAILS OF EXFOR

This document gives the detailed list of changes and additions which were agreed upon at the meeting. It is intended as a tool to define clearly who has to do what where.

Many agreements affect both parts of the manual (in several places) and the dictionaries. In order to allow easier and faster updating by the relevant Centres, we have tried as much as possible to list specifically the actions under three categories:
EXFOR manual, LEXFOR, the DICTIONARIES. A fourth category, Proposals and General Recommendations, includes other actions and considerations pertaining to EXFOR.

NNCSC will assume all the actions listed under EXFOR manual and most of the actions under LEXFOR; NDS will update the dictionaries. However, in view of the close interconnections existing between both manuals and the dictionaries, NNCSC and NDS will carefully review the four categories in order to detect possible omissions in the lists of actions for which they are responsible.

I. EXFOR Manual

The following actions will be carried out by NNCSC.

1. Update pages VIII.3-4 to the following:

Keyword categories:

In the following list of information-identifying keywords certain flags indicate which keywords must, or need not, be present and which keywords must, or need not, be followed by coded information:

```
0    TITLE
*    AUTHOR ((  ))
*    INSTITUTE ((3))
     EXP-YEAR ((  ))
*    REFERENCE ((4,5/6/7))
*    ISO-QUANT ((Z-S-A,14))
*    NUC-QUANT ((Z-S-A,14))
*    CMPD-QUANT ((Z-S-9,14))
0    STANDARD (Z-S-A,14)
0    METHOD (21)+
0    FACILITY (18)+
0    DETECTOR (22)+
0    ANALYSIS (23)+
     N-SOURCE (19)+
     INC-SPECT
     SAMPLE
     PART-DET ((13))
     EN-SEC
     RESID-NUC
     CORRECTION
0    ERR-ANALYS (DATA-ERR)
     COMMENT

     MISC-COL ((MISC1))
     FLAG ((1))
     TABLE-NR ((C,1))
0    STATUS (16)+
*    HISTORY ((see 2))
```

Explanations:

* This keyword must always be present. (Incidentally, all of these keywords must always be followed by coded information in parantheses as indicated by ( )).

O This keyword must always be present except when it is not relevant. For explanation of "not relevant" see in LEXFOR. For example: ERR-ANALYS is "not relevant" for quantum - numbers.

( ) If the keyword is present, coded information in parentheses must be given. (3) refers to the relevant dictionary, nr. 3. In other cases an example of coded information is shown in the table.

(19)+ Either free text or coded information in parentheses plus possibly free text may be given. The number refers to the relevant dictionary. If a pertinent code in the relevant dictionary exists, then keyword and code should be given. The "+" sign indicates that the coded information in parentheses must be repeated in the free text. For details see the following pages and in LEXFOR.

Special cases:

ISO-QUANT NUC-QUANT and CMPD-QUANT: One of these three keywords must be present; they are mutually exclusive.

METHOD FACILITY, DETECTOR and ANALYSIS: At least one of these keywords must be present; if a pertinent code in the relevant dictionary exists, then keyword and code should be given. It is advisable that all four of these keywords be given except when not relevant. For example: FACILITY is "not relevant" for spontaneous fission data.

PART-DET: The particle detected must be evident either from ISO-QUANT or from PART-DET.Examples: a proton detected in an NP reaction is regarded as evident from the ISO-QUANT; a proton from an NNP reaction is not. For details see the LEXFOR-entry "Particles".

STATUS: The keyword STATUS is not relevant, only when the source of the data is given under REFERENCE and no other STATUS information applies. (In NDS entries this keyword is always present).

STANDARD and ERR-ANALYSIS: The compiler should treat these items with special care, and wherever necessary, he should request further information from the author.

(GEOMETRY) This keyword is obsolete but may still exist in old entries.

2. These changes on pages VIII.3-4 require many corresponding modifications in various places of both manuals.
3. Take care of the Manual corrections from Memo 4C-3/60.
4. Add on page VIII.5, that for a 6 character lab-code when the 7th character would be blank, the closing parenthesis can be written either (1USAGA) or (1USAGA)
5. Add on page VIII.12, that no blank within the parentheses of one isoquant unit is allowed.
6. Add on page VIII.14, that blanks are allowed between units of ISO-QUANT combinations.
7. Add on page VIII.15: "The iso-quant separator "+" does not always mean a mathematical sum."
8. Since the dictionary 15 (standards) has been cancelled, many small changes are required in both manuals.
9. The same with the cancelling of dictionary 20 (sample).
10. The same with the cancelling of the modifier DRT.
11. Add in chapter VI of the Manual (Data Table Section):
"Every line in a data table must give data information. This means for example that a blank in a column headed DATA is only permitted when another column contains the data information on the same line, e.g. under DATA-MAX. Supplementary information such as resolution or standard values must not be given in a line of a data table, which has no data information. In all fields except the independent variables, blanks are permitted."

12. Add on page IX.4 the proposal in second paragraph of Memo 4C-2/23 about new proposals.

13. Add on page II.6 the agreement on alter-flags in ENTRY and SUBENTRY records (see paragraph 24 of the Summary Minutes).

14.A. The extinct flag is dropped from the dictionaries, this requires a change on page VII.3

14.B. On page VIII.16 of the Manual the wording under CMPD-QUANT is incomplete. The "three rules" of page 4 and the second half of paragraph 1 on page 5 of Memo 4C-3/34 must be added.

II. LEXFOR

A) New LEXFOR entries

15. Potters (CCDN) will submit a LEXFOR entry on the use of the RAW modifier.

16. Following correspondence with Crouch of Harwell, revision of the original NDS proposal given in Memo 4C-3/42, concerning compilation of fission products yields, was not necessary and the proposal was adopted with minor corrections as given in appendix 4CM/VIII/X4/1. NNCSC will enter it in LEXFOR.

17. NDS proposal on fission-spectra data was accepted with modification of first paragraph. It will be entered in LEXFOR as given in appendix 4CM/VIII/X4/2.

18. Lammer (NDS) will submit a LEXFOR entry on experimental methods for fission-product yields.

NNCSC will prepare the following LEXFOR entries:

19. Entry about all Polarization and Asymmetry quantity-codes.

20. Entry about Multilevel Resonance Parameters.

21. Entry giving a list of strictly monoisotopic elements. For such elements A=0 is forbidden. LEXFOR should also give a list of nearly monoisotopic elements, where A is left to the discretion of the compiler.

22. It was finally agreed that the flag for independent variables in dictionary 24 (column headings) will be kept and NNCSC will provide a

LEXFOR entry on independent variables.

B) Changes or additions to already existing LEXFOR entries

NNCSC will make the following changes and/or additions to LEXFOR:

23. Prepare a new STATUS entry. This keyword is now only compulsory when relevant. Codes PUBL and PRIV are deleted. Also change under 6 to: "... Data were then converted from SCISRS-1 or NEUDADA." NNCSC is also to enter an explanation of the status-code UNOBT.

24. Add under "Particles" the definition of "decay-gammas" (DG) as in 4C-3/57. Also the new code (B) should be defined here.

25. Add under "Nonelastic" a note that the compilers may have sometimes entered "nonelastic" for "inelastic", when they did not know whether another reaction was present.

26. Under "Quantum Numbers", remove the wording "or of nuclear level" under "Parity".

27. Correct under "Errors" part a.): EN-ERR = ..."not to be confused with energy-resolution EN-RSL". (instead of "confounded with").

28. The fact that the dictionary 15 (standards) has been cancelled, requires many small changes in both manuals, for example in LEXFOR under "Differential": in example 3 take out "enter (RATIO) under STANDARD." See also paragraph 38 of this appendix.

29. The same with the cancelling of dictionary 20 (samples).

30. The same with the cancelling of the DRT modifier.

31. Under "Angle", take out the sentence "If another angle is meant..."

32. Under "CINDA-quantities", take out under SF/NU: "Cinda: target nucleus, Exfor: compound."

33. When the modifier MXW is present, the spectrum temperature must be given in free text under INC-SPECT. This requires a change in LEXFOR under

"Spectrum Average". Add in the same LEXFOR entry:
"The modifier MXW must always be used with EN-DUMMY= 0.0253 eV.
Other than thermal maxwellian spectra are entered with the modifiers FIS or SPA."

34. Wave-length: See Paragraph 66

35. Under "NODATA", correct the end of first paragraph to:
"...data which will be entered into the system with extensive delay or not at all."
Add at the end of second paragraph:
"Also the date when the data are expected to be released should be given, if known, or, in the case when data will never be released, the reason should be given."

36. Since the quantity-code ACT is cancelled, the LEXFOR entry "Activation" needs revision.

37. Insert under "HISTORY", following the second paragraph:
"In particular it is desirable to document under HISTORY important corrections or revisions to an entry or subentry. Such important alterations are flagged with the code "A" following the date. The purpose of this flag is to automate as far as possible follow-up actions resulting from the alteration, such as updating of an index, or informing data users who had received the earlier version.

The following items are considered sufficiently important to be flagged with A:

- any change in the numbers given under COMMON or DATA
- any change of the meaning of these numbers (e.g. due to change of ISO-QUANT, units, the iso-quant under STANDARD, etc)

- any other change that the compiler considers important enough that earlier recipients of the entry should be informed.

"Less important changes which the compiler wishes to document may be referenced following the code "U". NDS compilers are urged to document all changes under HISTORY".

The following examples should be added on the same LEXFOR-page:
"(721017A) Some mispunches in data table corrected.
(721130U) Spelling error in BIB section corrected."

38. The LEXFOR entry "Standard" was changed to the following:

(essential changes are marked in the left hand margin; in addition all information about the Standards dictionary was omitted).

"Standard"

Standard information can be entered either in free text under the keyword STANDARD or in computer-intelligible form, with or without free text. In the latter case the numerical data of the standard used is entered in the COMMON or DATA section under the data-heading keyword 'STAND'; isotope and quantity of the standard are entered under the keyword STANDARD following the same rules as for ISO-QUANT. It is desirable to include in the free text the bibliographic reference pertinent to the standard used.

The keyword STANDARD must be present, except when it is not relevant, as for those quantities which are usually obtained without a standard, that is:

* resonance-parameters except resonance areas, peak cross sections and similar quantities (if cross-reference is made to EXFOR-subentry containing the data from which the resonance parameters were deduced);
* the quantities STF, D, LDP, TEM, SCO, RAD, TOT;
* ISO-QUANT ratios;
* if the modifiers REL, RS, RSL, RBT or others that exclude a standard have been used.

For all other quantities that can usually be measured either with a standard or absolutely, the positive statement ABSOLUTE in free text is

pertinent information to the user of EXFOR and should therefore be included. It should be noted however, that so-called "absolute" data often nevertheless depend on the assumption of certain numerical values (e.g. for calibrations or corrections); it may be desirable to give such values in free text under STANDARD. For more complicated description of standards or normalization procedures a cross-reference to published literature may be sufficient.

Cases how standard values can be entered in computer-retrievable form:

1.
2. (unchanged as previously)
3.
4.

38A. NNCSC will revise the entry on Analysis to include explicitely the following information:

Resonance-parameters require an entry under ANALYSIS explaining how they have been obtained. "Single level" or "multi-level" must be given in coded form, and a more precise definition of the analysis is desirable in free text, at least in the form of a cross-reference to the literature where the analysis description can be found.

NNCSC will also revise appropriately existing entries on resonance parameters and include the above information in the proposed entries on resonance parameters for which it has responsiblity.

38A.1. Many corrections to LEXFOR indicated in Memo 4C-3/59 must still be made.

The indicated Centre is responsible for drafting or outlining the following revisions which will then be entered in LEXFOR by NNCSC.

38B. CCDN will revise the entries on Two-dimensional Tables and fitting coefficients to include the following information:

Two-dimensional tables of fitting-coefficients can be transmitted, on a trial basis, in one single subentry in the following form:

DATA EN	NUMBER	DATA	DATA-ERR
EV	NØ-DIM	....	....
150.	0.	....	....
150.	1.	....	....
150.	2.	....	....
150.	3.	....	....
185.	0.	....	....
185.	1.	....	....
185.	2.	....	....
185.	3.	....	....

For the time being, centres may transmit in either the old or the new format. Centres should collect experiences and test to what further kinds of data this new format can be extended.
CCDN will also prepare a Memo considering the flagging of independent variables in connection with two-dimensional tables.

38C. NDS expressed the desirability of giving in EXFOR a complete bibliography which would include progress-reports and duplicate publications. It is particularly essential to give a warning in free text when references include superseded data. **NDS will submit an appropriate LEXFOR entry.**

III. Dictionaries

NDS will carry out the following actions.

39. Revise dictionary 2 according to the new keyword categories (see paragraph 1 of the present appendix). The category flags will be removed from the keywords, but the free text will give brief information about the use of the keywords and their codes.

40. The meaning of the code "A" must be changed in dictionary 2 under HISTORY to "important alterations", and a code U for "unimportant alterations" must be added.

41. The extinct flag is to be dropped from the dictionaries.

42. The PAR modifier shall be restricted to the specific meaning of "leaving the residual nucleus in a specific level or emitting a specific gamma or particle group". Modify dictionary 12.

43. The modifier DRT wascancelled. Correct dictionary 12.

44. The quantity-code ACT was dropped.

Update dictionaries 10 and 14.

45. Add to Dict.14 NU,DA,PAR/RSD as corrected in Memo 4C-2/31
NU,AKE/DA
SCT/ARE
NF,RES,TER (as it stands).

G,RES must be combined with ISO-QUANT (Not NUC-QUANT), correct dict. 14 page 7

46. The dictionaries 15 (standards) and 20 (samples) are cancelled

47. Codes PRIV and PUBL are deleted from dictionary 16 (Status)

48. Dictionary 18 (facility) was reduced to the following:

CCW	(COCKCROFT-WALTON ACCELERATOR)
LINAC	(LINEAR ACCELERATOR)
ICTR	(INSULATED CORE TRANSFORMER ACCELERATOR)
VDG	(VAN DE GRAAFF)
VDGT	(TANDEM VAN DE GRAAFF)
CYGFF	(CYCLOGRAAFF)
CYCLO	(CYCLOTRON)
SYNCH	(SYNCHROTRON)
BETAT	(BETATRON)
MICRT	(MICROTRON)
DYNAM	(DYNAMITRON)
OSCIP	(PILE OSCILLATOR)
CHOPF	(FAST CHOPPER)
CHOPS	(SLOW CHOPPER)
SELVE	(VELOCITY SELECTOR)
SPECM	(MASS SPECTROMETER)
SPECD	(DOUBLE MASS SPECTROMETER)
SPECC	(CRYSTAL SPECTROMETER)

49. Dictionary 19 (neutron source) was reduced to the following:

PHOTO	(PHOTO-NEUTRON) GENERAL
POLNS	(POLARIZED NEUTRON SOURCE)
P-D	(PROTON-DEUTERIUM)
P-T	(PROTON-TRITIUM)
P-BE	(PROTON-BERYLLIUM)
P-LI7	(PROTON-LITHIUM 7)
D-D	(DEUTERON-DEUTERIUM)
D-T	(DEUTERON-TRITIUM)
D-LI	(DEUTERON-LITHIUM
D-BE	(DEUTERON-BERYLLIUM)
D-C12	(DEUTERON-CARBON 12)
D-C14	(DEUTERON-CARBON 14)
D-N15	(DEUTERON-NITROGEN 15)
A-BE	(ALPHA-BERYLLIUM)
PU240	(SPONT.FISS.PLUTONIUM-240)
CM244	(SPONT.FISS.CURIUM-244)
CF252	(SPONT.FISS.CALIFORNIUM-252)
EXPLO	(NUCL.EXPLOSIVE DEVICE)
EVAP	(EVAPORATION NEUTRONS)
REAC	(REACTOR)
THCOL	(THERMAL COLUMN)

50. Codes of dictionary 21 (method) are reduced to the following

COINC	(COINCIDENCE)
DIFFR	(DIFFRACTION)
REFL	(TOTAL REFLECTION FROM MIRRORS)
MAGFR	(MAGNETIC FIELD ROTATION)
TOF	(TIME-OF-FLIGHT)
SLODT	(SLOWING-DOWN-TIME)
CADMB	(CADMIUM BATH)
MANGB	(MANGANESE BATH)
ACTIV	(ACTIVATION)
REAC	(REACTIVITY MEASUREMENT)
BURN	(BURN-UP)
ASSOP	(ASSOCIATED PARTICLE)
PLSED	(PULSE DIE-AWAY)

51. Codes of dictionary 22 (detectors) are reduced to the following:

GLASD	(GLASS DETECTOR)
TRD	(TRACK DETECTOR) ALL WHICH ARE NOT GLASS
SOLST	(SOLID-STATE DETECTOR)
GELI	(GERMANIUM-LITHIUM DETECTOR)
THRES	(THRESHOLD DETECTOR)
MOXR	(MOXON-RAE DETECTOR)
HORBU	(HORNYAK BUTTON DETECTOR)
SCIN	(SCINTILLATION DETECTOR)
STANK	(SCINTILLATOR TANK)
MTANK	(MODERATING TANK DETECTOR)
CSICR	(CESIUM-IODIDE CRYSTAL)
NAICR	(SODIUM-IODIDE CRYSTAL)
FISCH	(FISSION CHAMBER)
LONGC	(LONG COUNTER)
PROPC	(PROPORTIONAL COUNTER)
TELES	(COUNTER TELESCOPE)
BPAIR	(ELECTRON-PAIR SPECTROMETER)FOR GAMMAS
PHD	(PULSE-HEIGHT DISCRIMINATION)

52. Codes of dictionary 23 (analysis) are reduced to the following:

AREA	(AREA ANALYSIS)
SHAPE	(SHAPE ANALYSIS)
4PI1A	(4PI TIMES DIFFERENTIAL CROSS-SECTION AT ONE ANGLE)
SLA	(SINGLE LEVEL ANALYSIS)
MLA	(MULTILEVEL ANALYSIS)

The dictionaries under items 48 to 52 are preliminary; the final versions will be submitted by NNCSC, the other centers having no interest in the maintenance of these dictionaries.

53. In dictionary 24 (data-headings) the data heading TEMP is restricted to the meaning of "sample temperature".
54. The additions to dictionaries required by the agreement on compilation of fission yields will be made (see appendix 4CM/VIII/X4/1).
55. The additions to dictionaries required by the agreement on fission spectra data will be made (see appendix 4CM/VIII/x4/2).
56. The new keywords ELEMENT and MASS added to dictionary 24 (Data-headings) will also have the flags for independent variables.
57. After extensive discussion, dictionary 8 (elements) stays as it stands and the codes T and D are now forbidden.

Paragraph numbers 58, 59 and 60 are unassigned.

IV. Proposals and General Recommendations pertaining to EXFOR

61. HALF-LIVES

The following proposal arose from discussions at the meeting. It shall be treated and adopted in the same way as a proposal in a 4C-Memo. If discussions arise in 4C-Memos, NDS will formulate the final version based on the discussion

Add in dict. 2 under ISO-QUANT:

(Z-S-A-M) IF IT IS A METASTABLE STATE AND UNCERTAIN WHETHER FIRST OR SECOND ETC.

Add in dict. 2 a new keyword:

HALF-LIFE TO EXPLAIN HALF-LIVES given in COMMON OR DATA. FORMAT EITHER FREE TEXT OR:
(HL1, Z-S-A-M) WITH OR WITHOUT FREE TEXT.
If more than one half-life is given the relevant nucleus must be coded under this keyword.
If only one half-life is given under HL and no explanation is given under this keyword then the half-life of the residual nucleus is meant.

Replace the data-heading keyword H-LIFE by:

HL, HL1, HL2, HL3 and HL-ERR etc for various half-lives.

Add in LEXFOR under HALF-LIFE an example, such as:

```
ISO-QUANT ((Z-S-A-M1, NG,,MS)/(Z-S-A-M1, NG,,GND))
HALF-LIFE (HL1,Z-S-A-M1)
          (HL2,Z-S-A'-M)
          (HL3,Z-S-A'-G)

COMMON
HL1       HL1-ERR   HL2       HL2-ERR   HL3       HL3-ERR
MIN       MIN       YR        YR        HR        HR
...       ...       ...       ...       ...       ...
```

The LEXFOR entry should include: "The free text should contain whether the half-life value was measured by the author or assumed by author or compiler."

Paragraph number 62 is unassigned.

63. The important fission data listed in Memo 4C-3/48 should be transmitted in EXFOR with top priority; in particular, it should be verified that the version transmitted is up-to-date. A few data transmitted were already superseded at the time of transmission; additional care should be taken that this is avoided.

64. All Centers are asked to contribute LEXFOR entries about experimental methods and other physics information useful for compilers. Such entries should carry the name of the author. This may give useful information about specific experts in the Centers.

65. NDS will prepare for next 4C meeting a shortened EXFOR manual to better advertise the exchange format among data producers, customers, etc.....

66. The following proposal was introduced at the Meeting, but discussion has arisen in Memos 4C-1/32 and 4C-3/78 and will continue at the next meeting.

"Add under Wave-length:

The energy range of a table having the incident neutron wave-length as independent variable, must not be given under EN-MIN and EN-MAX in the COMMON section, but may be entered in the first and last line of the DATA table under EN."

Fission-Yields

To be entered in LEXFOR:

Fission-Yields

Review-article see e.g. A.C. Pappas, J. Alstad, 69VIENNA,,669,6907.

Fission-process: The capture of the incident neutron creates a highly excited compound-nucleus showing large deformation which leads to scission or to other competing reactions like neutron-evaporation or gamma-emission. At the scission-stage the nucleus generally devides into two deformed and excited fission fragments. In a small fraction of the scissions the nucleus devides into three fragments, where the size of the third fragment varies between a scission-neutron and a fragment similar in size to the other two. (See Ternary Fission). These fragments are called primary, initial, or pre-neutron emission fragments.

The primary fragments repel each other, obtain their full kinetic energy (e.g. 90 MeV), emit prompt neutrons ($< 4 \times 10^{-14}$ sec) and gamma-rays ($< 10^{-11}$ sec), are slowed down in the surrounding medium and stopped. These fragments are called secondary, final, post-neutron emission fragments, or primary fission-products. (The emitted gamma-rays may cause conversion betas and X-rays.)

The primary products undergo(after 10^{-2} sec and more) a series of beta-decays forming secondary products and end up in stable nuclei. For certain products the emission of delayed neutrons is competing with the beta-decay process.

In most of these stages mass-yields and charge-dispersions are measured as well as energy-distributions. The terms "fragments" and "products" are not clearly distinguished. Most frequently "fission-fragments" are meant as primary fragments and "fission-products" are the end-products. However, the border-line between fragments and products is varying, and often the word "fragments" is used as overall term including all stages of decay. Often fission-fragments are specified by their mass only including all Z-numbers. so that the fragment-yield remains constant during beta-decay. Fission products are usually specified by Z and A. A specified fission-product is obtained in two ways: either immediately from fission (primary yield) or from the decay of another fission product. Thus, the total amount of a specified fission-product varies in time. Very short-living fission-products may nevertheless be most important. because some have extremely high capture cross-sections (10^6 b). Finally, all decay to stable end-products, partially via metastable states. For odd A-numbers there exists only one stable end-product, that is significantly formed in fission, for even A-numbers one or two.

Units:
A mass-yield or fission-product yield, when measured absolutely, is given in per-cent per fission (code: PC/FIS). See Example 14. Fissions and fragments must then be counted independently. If only relative yields are given, the modifier REL should be used with the Isoquant and the DATA-Unit code is ARB-UNITS. Since in ternary fission more than two fragments are formed per fission, the yields for all fragments sum up to a bit more than 200%. However, emission of light particles in ternary fission does not change the sum of yields in the binary fission mass range usually measured, and other mass splits in ternary fission are negligible. Therefore relative yield measurements (ARB-UNITS) may be normalized to 200%, if the measurement was made for a sufficient large number of fragments; if this is done, the data-table may include some values that have not been measured but obtained by interpolation; such values must be labelled by flags. Different ways to obtain absolute yields will be discussed in a forthcoming LEXFOR entry about fission yield measurement methods.

Primary fission-fragment-yield. This is the primary yield per fission of fission-fragment mass A before prompt neutron-emission. It may also be called pre-neutron-emission fragment-mass distribution. Quantity-code: NF,YLD,PRE. See Example 14.a. In all experimental techniques corrections for some prompt neutrons already emitted cannot be avoided.

Secondary fission-fragment yield. This is the secondary yield per fission of fission-fragment mass A after prompt-neutron emission, but before beta-decay and delayed neutron-emission. It may also be called post-neutron-emission fragment-mass distribution. Quantity-code: NF,YLD,SEC. See Example 14.a.

Independent fission-product yield. This is the direct or independent yield per fission of a primary fission-product specified by Z and A, after prompt neutron emission, but before beta-decay and delayed-neutron emission, including only the direct yield and not the yield obtained from decay of other fission-products. See Example 14.b. Quantity-code: NF,YLD,IND.

Sum-rule: $\sum_{\substack{\text{all } Z \\ A=\text{const}}}$ NF,YLD,IND = NF,YLD,SEC

Note: Experimental data of independent yields of the product Z.A include a portion yielding from the delayed neutron-emission of the product Z.A + 1 or from the beta-decay of the product Z-1.A, if separation times are not short against the relevant decay-times. Corrections are required which should be mentioned under "CORRECTION". Fragment-mass yields are not affected by beta-decay but only by delayed neutron-emission.

Cumulative fission-product yield. This is the cumulative yield per fission of a fission-product specified by Z and A, after prompt neutron-emission, including the independent yield plus the yield from decay of other fission-products. See Example 14.b. Quantity-code: NF,YLD,CUM.

Sum-rule:

NF,YLD,CUM for the β-decaying product Z-1.A
\+ NF,YLD,IND for product Z.A

= NF,YLD,CUM for product Z.A, if the products Z-1.A and Z.A + 1 are not delayed neutron-emitters.

The following events may add to the cumulative yield of the fission-product Z.A in its ground-state:

independent yield from fission
beta-decay from product Z-1.A in ground-state
beta-decay from product Z-1.A in a metastable state
delayed neutron-emission from product Z.A + 1
internal transition from a metastable state of product Z.A

In addition, the product Z.A may be formed from neutron capture in the product Z.A-1, which is not included in the "cumulative yield".

The cumulative yield is often given for a metastable state of a fission-product Z.A; this is entered in EXFOR by means of flags, see Example 16.

Total chain-yield. The total chain-yield per fission of fission-fragment mass A is the sum of the cumulative yields of all stable fission-products having the same mass A. See Example 14.a. In the case that only one stable fission-product per mass A exists, the total chain-yield for mass A is identical with the cumulative yield of the stable end-product Z.A.

Fractional yields.
The fractional independent fission-product yield is defined relative to the cumulative fission-product yield or relative to the total chain-yield.

The fractional cumulative fission-product yield is defined relative to the total chain-yield.

In all cases the data are entered as ratios of iso-quants. See Example 14.c.

((92-U-235,NF,YLD,IND)/(92-U-235,NF,YLD,CUM))
((92-U-235,NF,YLD,IND)/(92-U-235,NF,YLD.CHN))
((92-U-235,NF,YLD,CUM)/(92-U-235,NF,YLD,CHN))

The distribution of charge Z within a given fragment mass-chain A is called charge-dispersion. See Example 15.a. It can empirically be approximated by a Gaussian distribution with a most probable charge Zp. See Example 15.b. The fractional independent yield of a fission product (after prompt neutron emission) is given by

$$P(Z) = (\pi c)^{-1/2} \exp\left[-(Z-Zp)^2/c\right],$$

whereas the fractional cumulative yield is given by

$$\sum_{0}^{Z} (P_n) = \frac{1}{\sigma\sqrt{2\pi}} \int_{-\infty}^{Z+1/2} \exp\left\{\frac{-(n-Zp)^2}{2\sigma^2}\right\} dn$$

The parameters c and σ are widths of the distributions, related by $c \approx 2\,(\sigma^2 + 1/12)$ For charge dispersion, fractional yields are defined only as ratios to total chain yield.

Reference:

A.C. Wahl et al. Phys. Rev. 126, 1112 (5/62)

Note: The Gaussian width parameter has been assumed to be approximately constant for all A chains, as given by Wahl et al. Therefore Zp has sometimes been determined from a single fractional yield measurement. However, there is evidence for a variation of c and σ with mass A and they may be determined together with Zp. Therefore in a comment the Gaussian width parameter used should be explained (value or reference).

The following definition of charge distribution (primary charge function) is now generally accepted: distribution of primary charge as a function of primary mass. This quantity is deduced, either from other quantities (charge dispersion, mass distribution), or from instrumental measurements of fragment mass (kinetic energy) and X-rays, both methods involving uncertain corrections for prompt neutron emission. As this quantity is mainly of interest for studies of the fission process, but not in applied fields, no codes are proposed.

Note: Angular distributions and energy-spectra of fission fragments are coded as NF,DA,,FF and NF,DE,,FF and similar codes given in dictionary 14.

Example 14: Fission-yields

a) Primary fission-fragment yield:

```
ISO-QUANT   (92-U-235,NF,YLD,PRE)
...
COMMON
EN
EV
0.0253
ENDCOMMON
DATA
MASS        DATA
NO-DIM      PC/FIS
...         ...
```

The secondary fission-fragment yield is entered as above; only the quantity-modifier PRE is replaced by SEC. The total chain-yield has the modifier CHN instead.

b) Independent fission-product yield:

```
ISO-QUANT   (92-U-235.NF,YLD,IND)
...
COMMON
EN
EV
0.0253
ENDCOMMON
DATA
ELEMENT     MASS        DATA
NO-DIM      NO-DIM      PC/FIS
...         ...         ...
```

The cumulative fission-product yield is entered as above; only the quantity-modifier IND is replaced by CUM.

c) Fractional yields:

```
ISO-QUANT   ((92-U-235,NF,YLD,IND)/(92-U-235,NF,YLD,CHN))
...
COMMON
EN
EV
0.0253
ENDCOMMON
DATA
ELEMENT     MASS        RATIO
NO-DIM      NO-DIM      NO-DIM
...         ...         ...
```

Example 15: Fission-product charge: charge dispersion

a) Fractional yields

```
ISO-QUANT   ((92-U-235,NF,YLD,IND)/(92-U-235,NF,YLD,CHN))
...
COMMON
MASS        EN
NO-DIM      EV
135.        0.0253
ENDCOMMON
DATA
ELEMENT     RATIO
No-DIM      NO-DIM
53.         ...
54.         ...
55.         ...
...         ...
```

Fractional cumulative yields are entered as above, with IND replaced by CUM. For charge dispersion the second isoquant of the ratio must always have the modifier CHN.

b) Most probable charge

```
ISO-QUANT   (92-U-235,NF,ZP)
...
COMMON
EN
EV
0.0253
ENDCOMMON
DATA
MASS        DATA
NO-DIM      NO-DIM
```

Example 16: Relative Cumulative yields of metastable fission-products

```
BIB
...
ISO-QUANT   (92-U-235,NF,YLD,CUM/REL)
FLAG        (0.) FISSION-PRODUCT IN GROUND-STATE
            (1.) FISSION-PRODUCT IN FIRST METASTABLE STATE
...         NOT FLAGGED = FIS.PROD. WITHOUT METASTABLE STATE
ENDBIB
COMMON
EN
EV
0.0253
ENDCOMMON
DATA
```

ELEMENT	MASS	FLAG	HL	DATA
NO-DIM	NO-DIM	NO-DIM	D	ARB-UNITS
50.	118.			...
50.	119.	0.		...
50.	119.	1.	...	...
50.	120.			...
50.	121.	0.	...	...
50.	121.	1.	...	...
50.	122.			...
50.	123.	0.	...	...
50.	123.	1.	...	...
51.	123.			...
...	...	...	...	...

```
ENDDATA
```

To be added to dictionaries:

The preceding proposal requires the following dictionary-entries:

D.14 Quantities

NF,YLD,PRE	NFY	(PRIMARY FISSION-FRAGMENT YIELD)
NF,YLD,SEC	NFY	(SECONDARY FISSION-FRAGMENT YIELD)
NF,YLD,IND	NFY	(INDEPENDENT FISSION-PRODUCT YIELD)
NF,YLD,CUM	NFY	(CUMULATIVE FISSION-PRODUCT YIELD)
NF,YLD,CHN	NFY	(TOTAL CHAIN-YIELD PER FISSION)
NF,ZP	NO	(MOST PROBABLE CHARGE OF FISSION-FRAGMENTS)

D.11

YLD	YIELD, to be moved from D.12 to D.11
ZP	MOST PROBABLE CHARGE

D.12

PRE	)
SEC	)
IND	)Modifiers for specific fission-yield quantities
CUM	)
CHN	)

D.24 Data-headings

ELEMENT	Z-NUMBER OF ELEMENTS
MASS	A-NUMBER OF ISOTOPES

D.25 Units

PC/FIS	PER-CENT PER FISSION	NFY

Fission Neutron Spectra Data

This subject concerns the following data-types which should be compiled in EXFOR.

1.) energy-spectra of fission neutrons, point-data

2.) fitting-parameters of fission-neutron spectra

3.) fission-neutron spectrum averaged cross-sections

Literature, e.g.: James Terrell: Fission Neutron Spectra and Nuclear Temperature, Phys. Rev. 113, p.527, Jan. 1959.

Prompt Fission Neutron Spectra. 71 VIENNA

A note on incident neutrons: Fission-neutron spectra are dependent on the energy of the incident neutrons. Data are given for "thermal" and "fast" fission. "Thermal" fission spectrum data refer to both: 0.0253 eV neutrons and thermal Maxwellian neutrons; the results are indistinguishable. It is therefore not recommended to use the MXW modifier when incident neutrons are thermal Maxwellian. Also for fission spectrum data, induced by fast neutrons (monoenergetic or spectrum average) it is recommended to enter a numerical value for the incident neutron-energy and not to use the modifier SPA. The modifiers MXW or SPA are not relevant in this case, and the quantity codes are complex enough without. The incident neutron spectrum needs only to be described in free text under INC-SPECT.

1.) For point-data of fission-neutron energy-spectra

the following quantity-codes exist already in dictionary 14 or can be formed in analogy:

NU,DE	energy-spectrum of fission-neutrons, total
NU,DE,PR	energy-spectrum of prompt fission-neutrons
SF/NU,DE	energy-spectrum of spontaneous fission-neutrons, total
SF/NU,DE,PR	energy-spectrum of spontaneous prompt fission-neutrons

In the literature, these data are usually called $\chi(E)$. Data are mostly given in arbitrary units, which require the REL modifier in the quantity-code. In the normalized form $\int \chi(E)\, dE = 1$ data have the units of a reciprocal energy.

The data are functions of the outgoing-neutron energy E, with the incident neutron-energy EN to be entered under COMMON.

2.) Fission-neutron spectrum data are fitted either to a Maxwellian or to a Watt-spectrum or to one of several other defined spectra.

The Maxwellian spectrum has the shape

$$N(E) \sim \sqrt{E}\, \exp(-E/T)$$

where E is the energy of the fission-neutron and T is the spectrum-temperature given in MeV. Often given are also the average kinetic energy $\overline{E}$ and the most probable energy E_p which are defined as

$$\overline{E} = 3T/2$$

$$E_p = T/2 = \overline{E}/3$$

The Wattspectrum is based on the assumption that fragments emit neutrons with a Maxwellian spectrum in the center-of-mass system. The shape of the Watt spectrum is

$$N(E) \sim \exp(-E/T)\, \sinh\left(\tfrac{2}{T}\sqrt{EE_f}\right)$$

where T is the spectrum-temperature given in MeV but deviating from the temperature defined in the Maxwellian fit; E_f is a theoretical "fragment kinetic energy per nucleon". The average kinetic energy $\overline{E}$ is defined here as

$$\overline{E} = E_f + 3T/2.$$

The numerical value of $\overline{E}$ should be approximately the same disregarding to which spectrum shape the data were fitted.

Since the average kinetic energy $\overline{E}$ is the only quantity which is comparable in all fits, EXFOR entries should be made for the quantity $\overline{E}$, which should be coded

$$\overline{E} = \text{NU,AKE}.$$

Details of the fit and of the spectrum shape assumed should be given under ANALYSIS; also any further numerical parameters obtained in the fit such as T, E_p or E_f shall be entered here in free text. By this procedure it is avoided that the Watt-spectrum parameters are entered in three different subentries, one each for the quantities $\overline{E}$, T and E_f. When in the case of a Maxwellian fit the author gives only T, the compiler is asked to calculate $\overline{E}$ from $\overline{E} = 3T/2$.

In most cases only the prompt neutrons are considered; the quantity-code is then

NU,AKE,PR

Data are functions of incident neutron energy EN except in the case of spontaneous fission, where the quantity-code is

SF/NU, AKE, PR

Again, no modifier shall be given to indicate an incident neutron spectrum.

3.) Fission neutron spectrum averaged cross-sections are entered with the modifier FIS. (Note that this modifier was introduced only at the end of 1972; data compiled earlier were coded with the more general modifier SPA.)

This is to be combined with an entry under EN-DUMMY. The numerical value under EN-DUMMY should be the temperature $T = 2/3\ \overline{E}$ of the given spectrum, or 1.5 MeV if T is not known.

It must be evident in the EXFOR-entry

* whether data were measured directly and in what kind of spectrum (free text under METHOD and INC-SPECT)
* or whether data were calculated by integrating a measured cross-section curve over an assumed fission-neutron spectrum (free text under ANALYSIS).

In the first case it should be specified in free text from which nuclide and incident neutron-energy the fission-neutron spectrum is resulting.

In the latter case it should be noted that it is essential to give the assumed spectrum type and its parameters, as well as how the fit was made (e.g. in a N(E)-versus-E scale or in a $N(E)/\sqrt{E}$-versus-E scale.

Fission spectrum average cross-sections are defined as

$$\overline{\sigma} = \frac{\int \sigma(E)\ N(E)\ \sqrt{E}\ dE}{\int N(E)\ \sqrt{E}\ dE}$$

Concluding Remarks

The knowledge of the shape of the fission-spectrum is developing, and Maxwellian and Watt spectrum are now considered only as rough approximations. Presently preferred is a "double Watt spectrum", and the Cf-252 spectrum which is more accurately known suggests that none of the presently used fits is sufficient. Therefore, it is most important to compile point-data of the energy-distribution of fission-neutrons. However, mean-energy values are also desirable to compile because they are rather independent of the spectrum shape assumed and frequently needed for measurement analysis (detector response, etc.).

(Lemmel)

Review of actions from last meeting

Reference is made to numbered items of INDC(NDS)-41. Actions that have not or only partially been fulfilled, are listed below.

Working Policies

4. CINDA entries have not been transmitted when EXFOR-entries were delayed.

5. Specified data types as suggested by various committees have partially not yet been transmitted.

8. INDC has not sufficiently discussed the difficulties of obtaining data from authors.

10. Completeness of EXFOR-entries since 1970 has probably not been achieved.

EXFOR dictionaries

27. Modes how to approve and add new codes to dictionaries must be discussed from scratch after it has been decided which dictionary to retain.

35. NNCSC was to present a report on the coding of multilevel resonance parameters.

36. NNCSC was to monitor the use of the DRT-modifier.

37. NDS could not add the PAD modifier to D.12, because its meaning was not clear to NDS.

EXFOR Manual and LEXFOR

42. It was recommended that updated Manual pages be transmitted as soon as possible after the meeting. This was done only on 26 July 1972.

46. Report by NNCSC on the use of the keyword PART-DET is expected.

53. An update of LEXFOR was to be distributed by NNCSC by 1 March 1972. This was however only done on 31 July 1972.

Date scope

56. Crouch (Harwell) has not prepared a fission product yields classification scheme. After correspondence with Crouch, the original proposal on quantity-codes for fission-product yields by NDS (4C-3/42) does not require a change.

58. NNCSC was to prepare a detailed proposal of how to include gamma-spectra data in EXFOR.

60. NDS was to prepare a detailed proposal of how to include fission-spectra data in EXFOR. This is presented at this meeting in memo 4C-3/64.

Other EXFOR details

64. The question of blanks in DATA columns has not yet been solved.

CINDA

67. The completeness of CINDA with respect to lab reports has not improved.

68. The announcements of CJD to prepare CINDA-entries (besides journals and conferences) also for preprints from all USSR institutes, CJD Bulletins and collection of abstracts, has not been fulfilled.

70. The re-programming of CINDA has made considerable progress, but no detailed proposal how to extract EXFOR-index CINDA-entries from EXFOR has been circulated by NDCC.

NNCSC Progress Report

I. Introduction

For the past year NNCSC has continued its work in its three major areas of responsibility: compilation, evaluation and computer applications.

II. Computer Applications

In the past year we have added the following to our PDP-10 - PDP-15 complex:

- An additional 32K of PDP-10 core (Total PDP-10 core 80K).
- Two additional disk units - an additional 10 million words of mass storage (Total PDP-10 mass storage 20 million words.)
- Graph tablet-device with provisions to input graphical data.
- Provisions to utilize the light pen on the PDP-15 graphical display.
- Miscellaneous utility features.

Anticipated additions for the coming year are addition access terminals for the PDP-10 along with remote access terminals via telephone lines.

III. Evaluation

The third version of the Evaluated Nuclear Data File (ENDF/B-III) was released in February 1972. It contains data for 229 materials. Ten of these materials are scattering law data sets. Eighty-seven contain photon interaction cross section data for natural isotopes. One hundred and thirty-two contain neutron cross section data for isotopes of elements.

The ENDF/B-III files for six materials used as cross section standards have been sent to the Nuclear Data Section of the IAEA for world-wide use: H, ^{3}He, ^{6}Li, ^{10}B, ^{197}Au, ^{235}U. The bases for these evaluations were assembled in BNL-17188 (ENDF-179) "ENDF/B-III Cross Section Measurement Standards," by M.K. Drake, in July, 1972.

Evaluations have been completed on Si, Kr and Xe. They have been put into ENDF/B format.

4. Compilation

The scope, format, and manner of publication of the new BNL-325 are now well defined. It will be a completely new Third Edition, compressed to two volumes for ready usefulness. Volume I (tables) will contain only recommended values of thermal cross sections, resonance parameters, and associated quantities such as resonance integrals and strength functions. Volume II (curves) will contain graphical representations of the energy dependence of the cross sections, together with some of the experimental data points. In both volumes, references to all the experimental measurements will be listed, even when the values themselves do not appear explicitly. The data pages of both volumes will be computer prepared; and the curves of Volume II will be developed by automatic fitting routines applied under interactive graphics control. Completeness of data input is being verified by checking against CINDA. Volume I will appear first, in the first half of 1973.

The first-order checking of the SCISRS - CSISRS translation has been completed and the data for Z $\geq$ 88 have been incorporated into the CSISRS library.

The physics group has begun in assisting in the compilation of new data and we have essentially eliminated the backlog of data to be coded.

Since the start of EXFOR the NNCSC has sent 10 transmission tapes consisting of 131 major references and 137 000 data points (including corrections).

CCDN Progress Report

October 1971 - October 1972

1. Introduction

During the period under review the activities of the CCDN - compilation and dissemination of bibliographic, experimental and evaluated neutron data - continued. There were some important changes in the staff: Horst Liskien left the centre at the end of September 1971 and was replaced by Fritz Fröhner (from Kernforschungszentrum Karlsruhe) who took up duty as the new Head of the Centre in December 1971, and Hans Willars left at the end of January 1972 and was replaced by Claes Rickeby as the senior programmer in June 1972.

2. CINDA

In spite of difficulties caused by Nigel Tubb's sickness the book tapes for CINDA 72 and for the 1972 supplement were sent off to NDS on time, i.e. on 14 April and on 28 September, respectively.

After an interruption due to the four-months vacancy of the senior programmer's post work on the new CINDA programme system is making good progress. The new system will provide for faster computer operations, better retrievability, link to the experimental-data index and blocking of entries referring to the same set of data. It is expected to be operational in time for CINDA 73. With the exception of the input-translation programme for US tapes, basic programmes for all CCDN CINDA operations exist and are being tested. The coverage control will be run as a separate operation, for the moment with the old programmes. In preparing the transfer of the CINDA file to the new system we tried to improve the file as much as possible: we wrote to CINDA readers and to physicists in different laboratories and got quite a number of corrections and new information. All centres are now agreed on the input format to the new CINDA system, and a temporary reader's manual has been distributed to readers and the other centres recently.

3. Experimental Data

The compilation of experimental data is continuing and has resulted in the incorporation of about 170 000 new data points into NEUDADA. About 50% of these points were entered directly, 40% needed some tidying up and the rest required more information from authors. At the same time the non-numerical information required for the EXFOR data exchange was prepared.

A new index file to the experimental data was produced. This was a basic step in the programme to make CINDA an index to computerized neutron data. The new index was published as CCDN Newsletter/Bulletin 13 in February 1972.

The preparation of EXFOR tapes is continuing steadily after a pause at the beginning of 1972. This pause was caused by a lack of disk space together with urgent RENDA and CINDA commitments before new disk drives became operational in April 1972. Five EXFOR tapes with a total of 110 works, 946 subworks and 214 926 records (excluding system records) were prepared during the last twelve months. The backlog in the centre's EXFOR compilation work which in May 1972 amounted to about 15 tapes worth of data is foreseen to be eliminated by about May 1973.

Although EXFOR is used for data transmission to the other centres, all other computer operations at the CCDN involving experimental data - including compilation work - are based on the more convenient NEUDADA system. A programme for format conversion from NEUDADA to EXFOR has been completed, and a first version of a programme for conversion in the reverse direction is operational.

4. Evaluated Data

CCDN's activity in the field of evaluated data continued to be restricted to the collection and dissemination of evaluated data. During the past year the following evaluated data were received:

- new versions of UKNDL updated with respect to Ti-46, Ni-58, U-235, U-238, Pu-239;
- revised (n,γ), (n,n') and $(n,2n)$ data for fission products in UK format from Benzi;
- Pu-239, Pu-240 and Pu-241 data in UK format from Ribon;
- a new version of the Australian fission product library from Cook;
- version III of ENDF/B;
- U-238 data from Abagyan (the first evaluated data from the Soviet Union).

The contents of the evaluated files were published as CCDN Newsletter/Bulletin 14, May 1972. Following a proposal by Ribon and discussions at the 1972 INDC meeting the CCDN will in future take over publication of the evaluation newsletter started by Ribon.

5. RENDA

In accordance with the agreements between the EANDC, the INDC, IAEA and NEA, future editions of the RENDA book will be world-wide, reviewed by the INDC and published by IAEA/NDS. For the publication of the first world-wide WRENDA list CCDN merged new requests and

topical reviewers' comments from the EANDC area and the requests from the rest of the world sent by NDS into the existing RENDA file. The new file was handed over to NDS for publication. After completion of a first version of the world-wide request list (RENDA 72) a long list of belated new US entries was received. It was therefore decided to merge these at the CCDN with help from NDS and to publish the new list as WRENDA 73. The merge was performed in October 1972.

6. Retrievals from the CCDN's Files

The last extensive retrieval statistics was prepared in April 1972. During the 12-month period beginning 1st April 1971 the CCDN received

- 143 requests for experimental data
- 71 " " evaluated "
- 16 " " bibliographic references.

The total number of requests (230) is slightly higher than during the previous year (212). Many of the requests necessitated quite sophisticated retrievals as illustrated by the fact that the 143 requests for experimental data necessitated about 2200 specific retrievals from the NEUDADA files. The Z-A-Q combinations requested are shown in the attached retrieval statistics. The last sheet shows the origin of the requests. The majority of the requests comes from nuclear physicists and evaluators at national research centres. The data types most frequently asked are

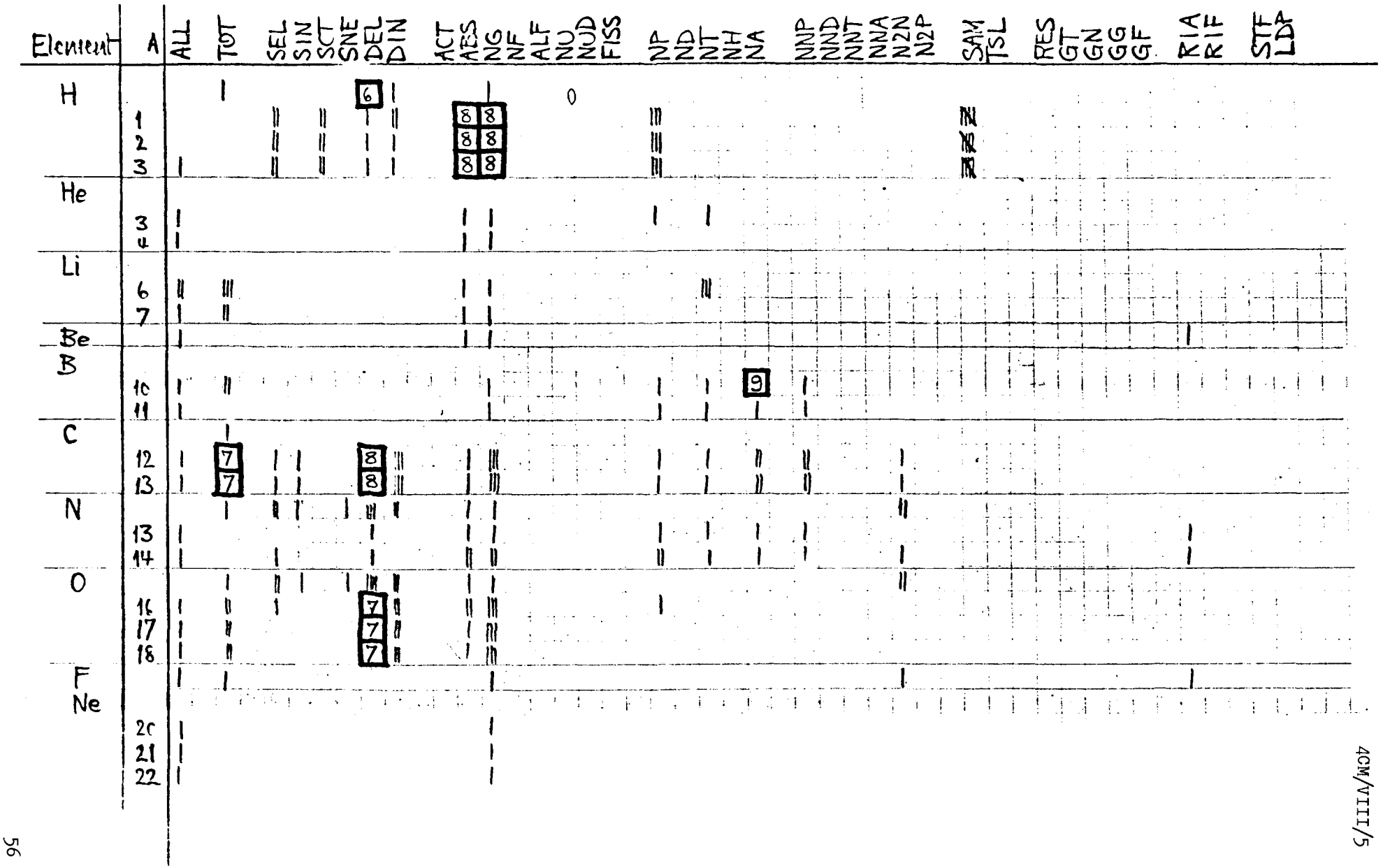
- fission and total cross sections, α and $\bar{\nu}$ values for fissile nuclei;
- capture and scattering cross sections for non-fissile nuclei, with inelastic scattering as much in demand as elastic scattering;
- standard cross sections.

The needs of reactor physicists are clearly reflected (cf. structural materials and fissile nuclei). There is a conspicuous absence of certain groups of potential users, e.g. universities and especially nuclear industry, which can only partially be explained by the fact that some requests from industry reach the centre via national labs and therefore appear in the wrong category of our statistics.

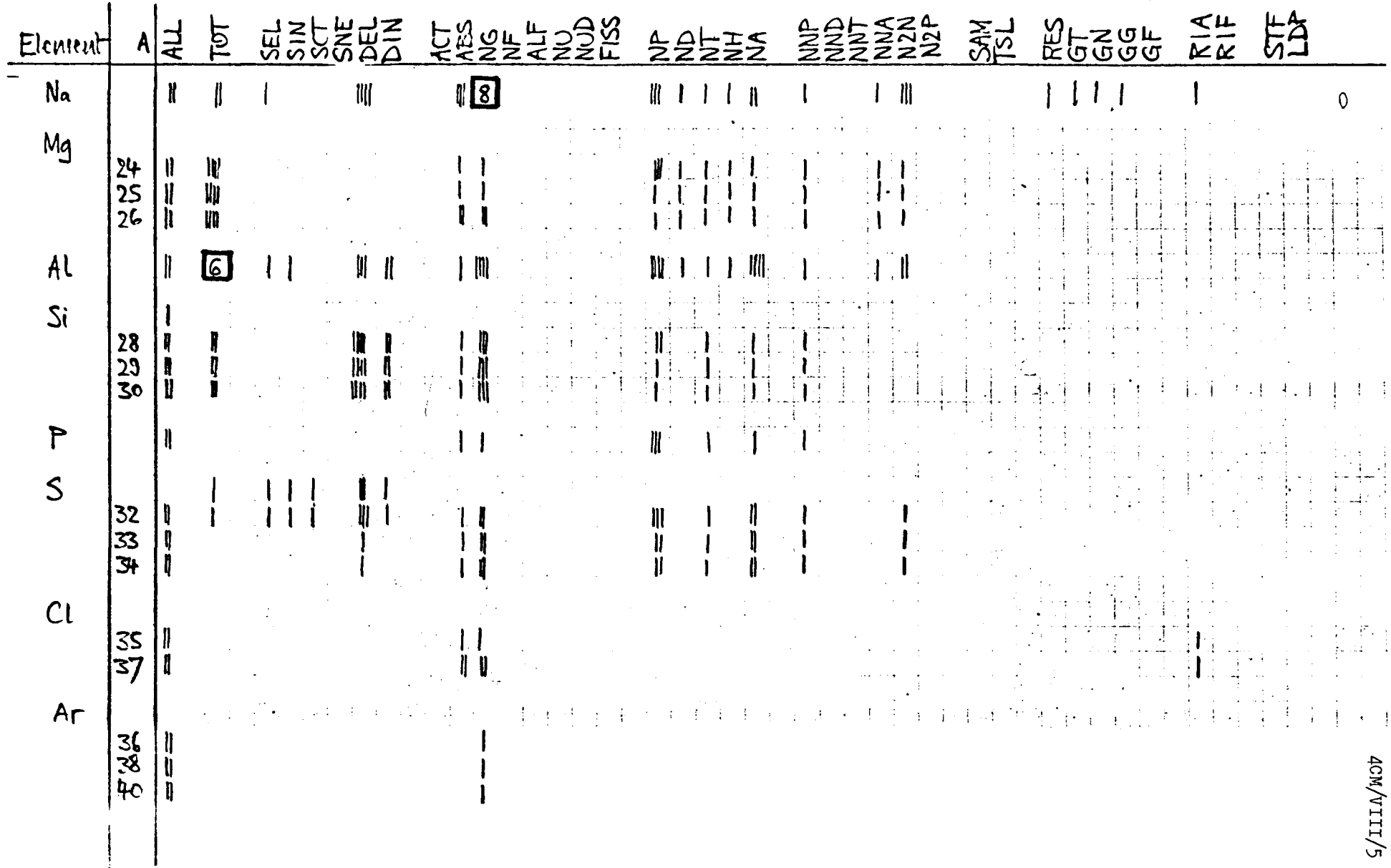
7. Computer Installation

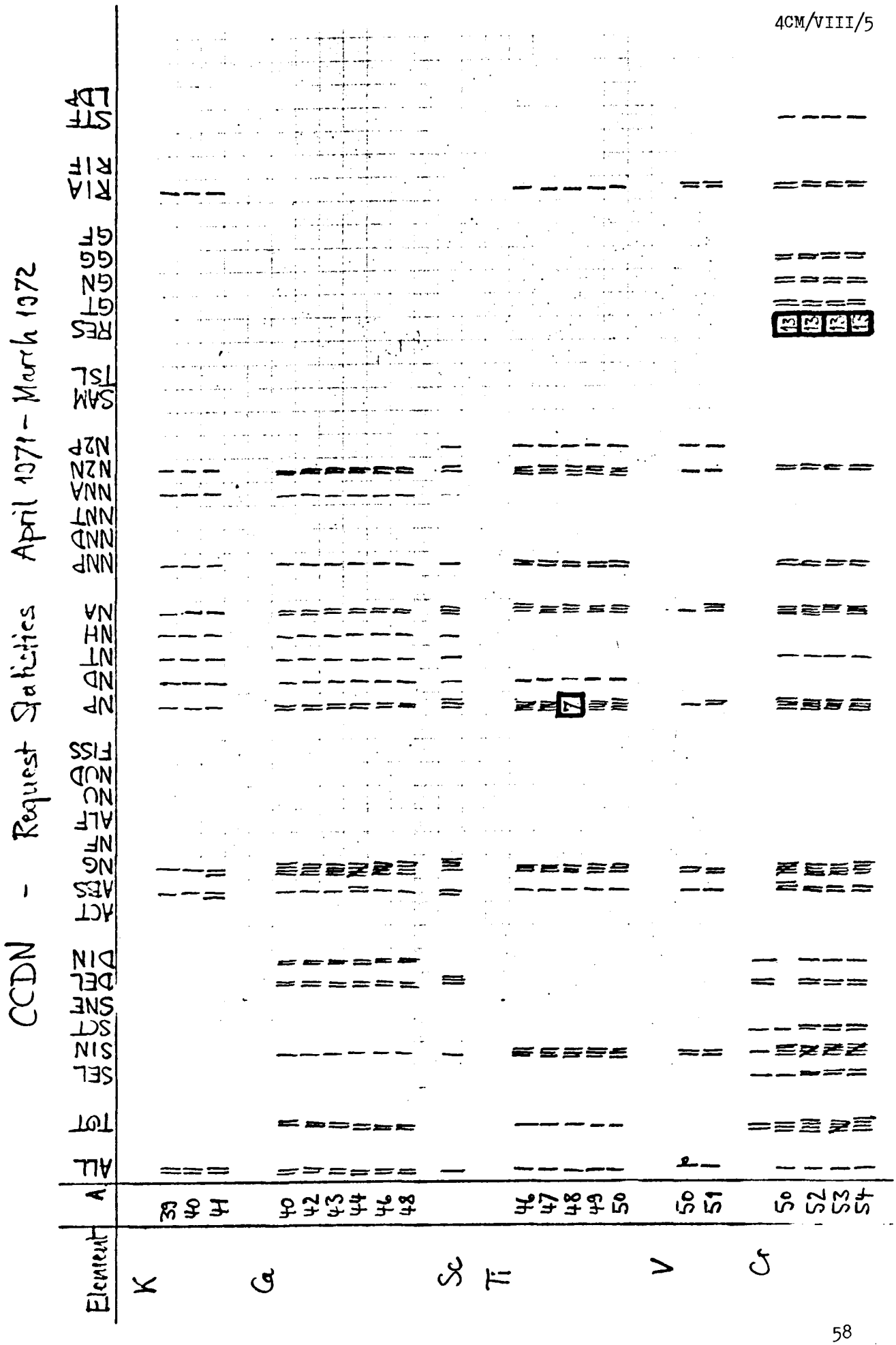
The disk storage capacity necessary for direct-access operations was increased to 4 x 29 M bytes by the installation of four CDC 2314 disk drives in April 1972. All programmes are now run under DOS (disk operating system).

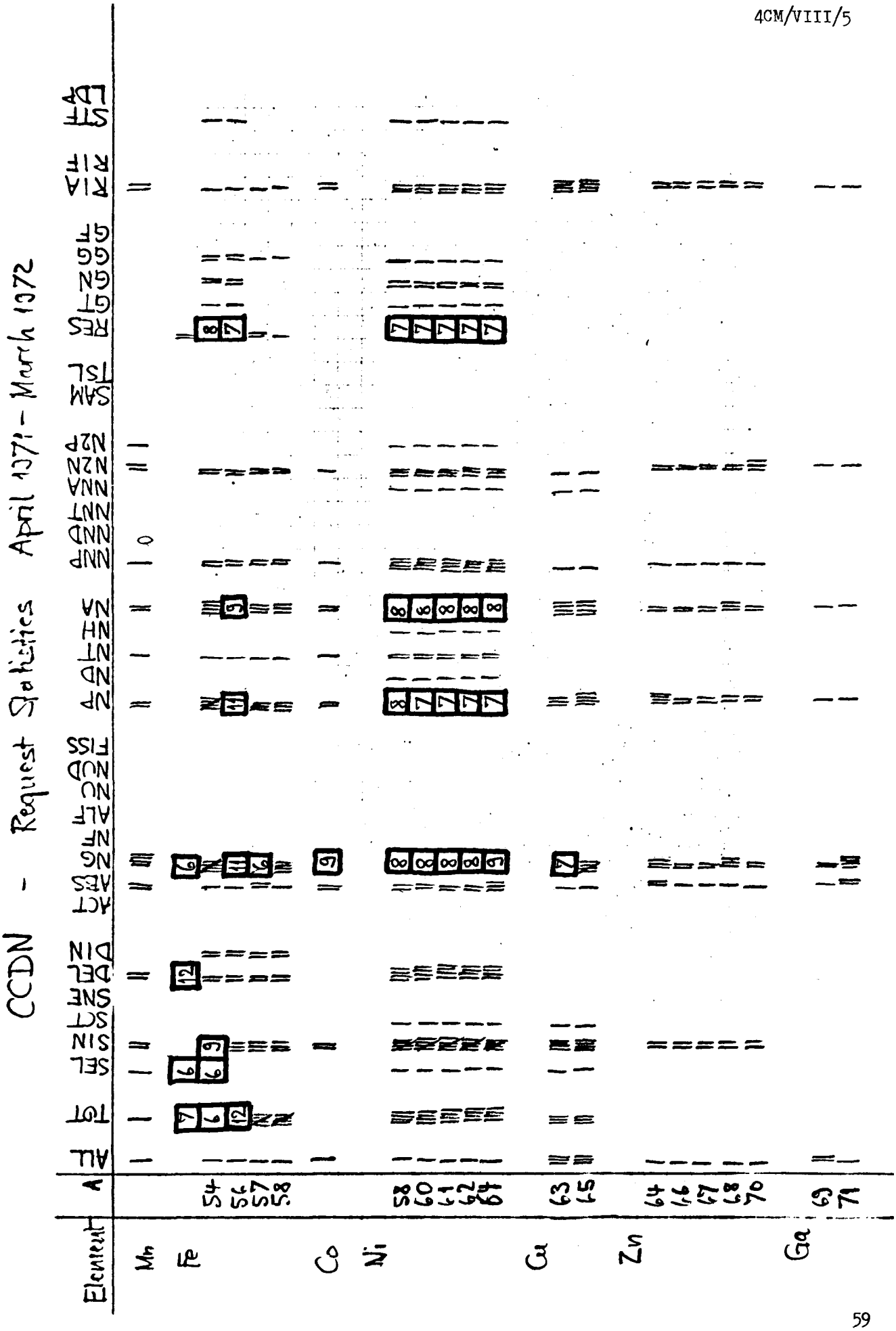
CCDN - Request Statistics April 1971 - March 1972



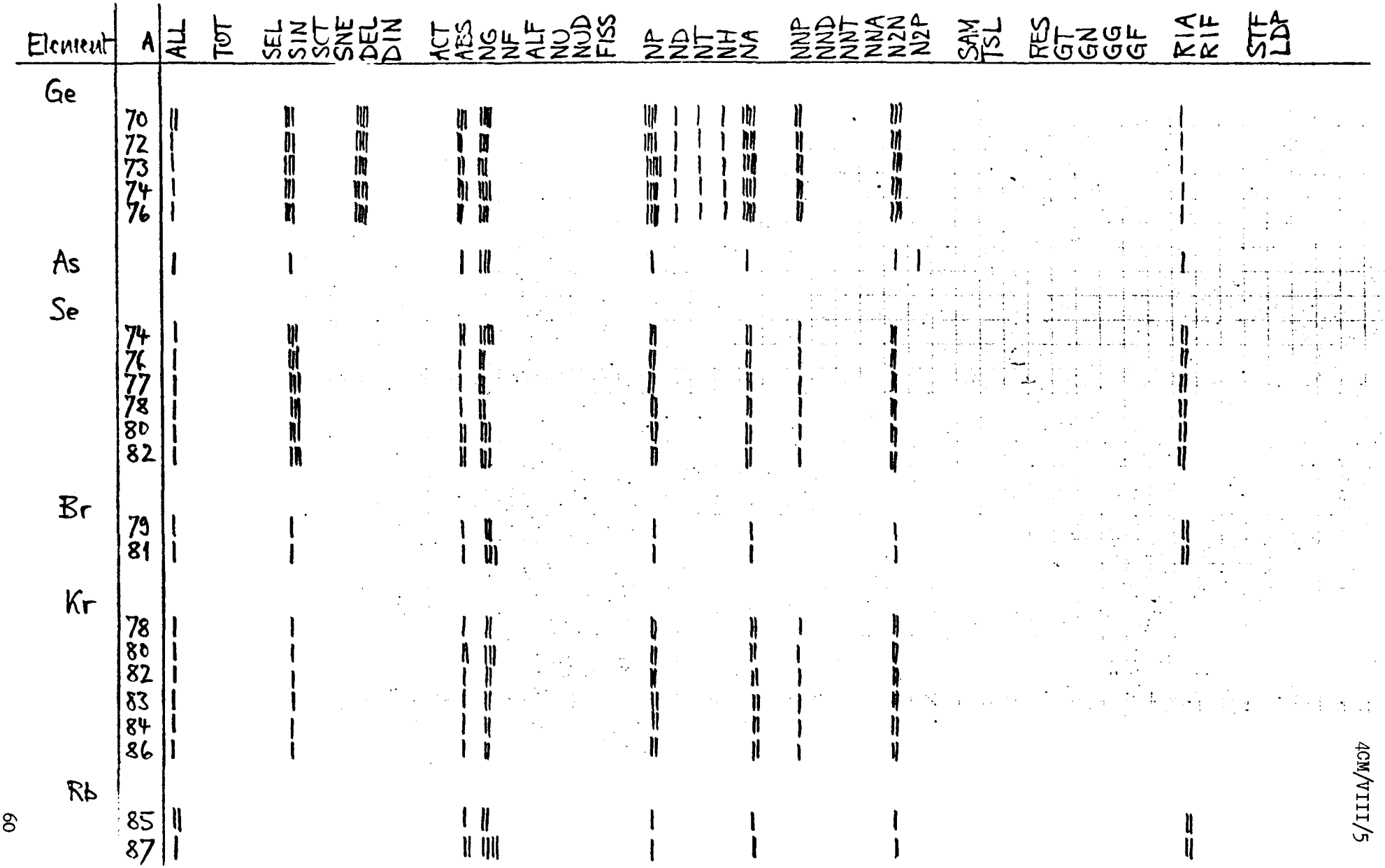
CCDN - Request Statistics April 1971 - March 1972



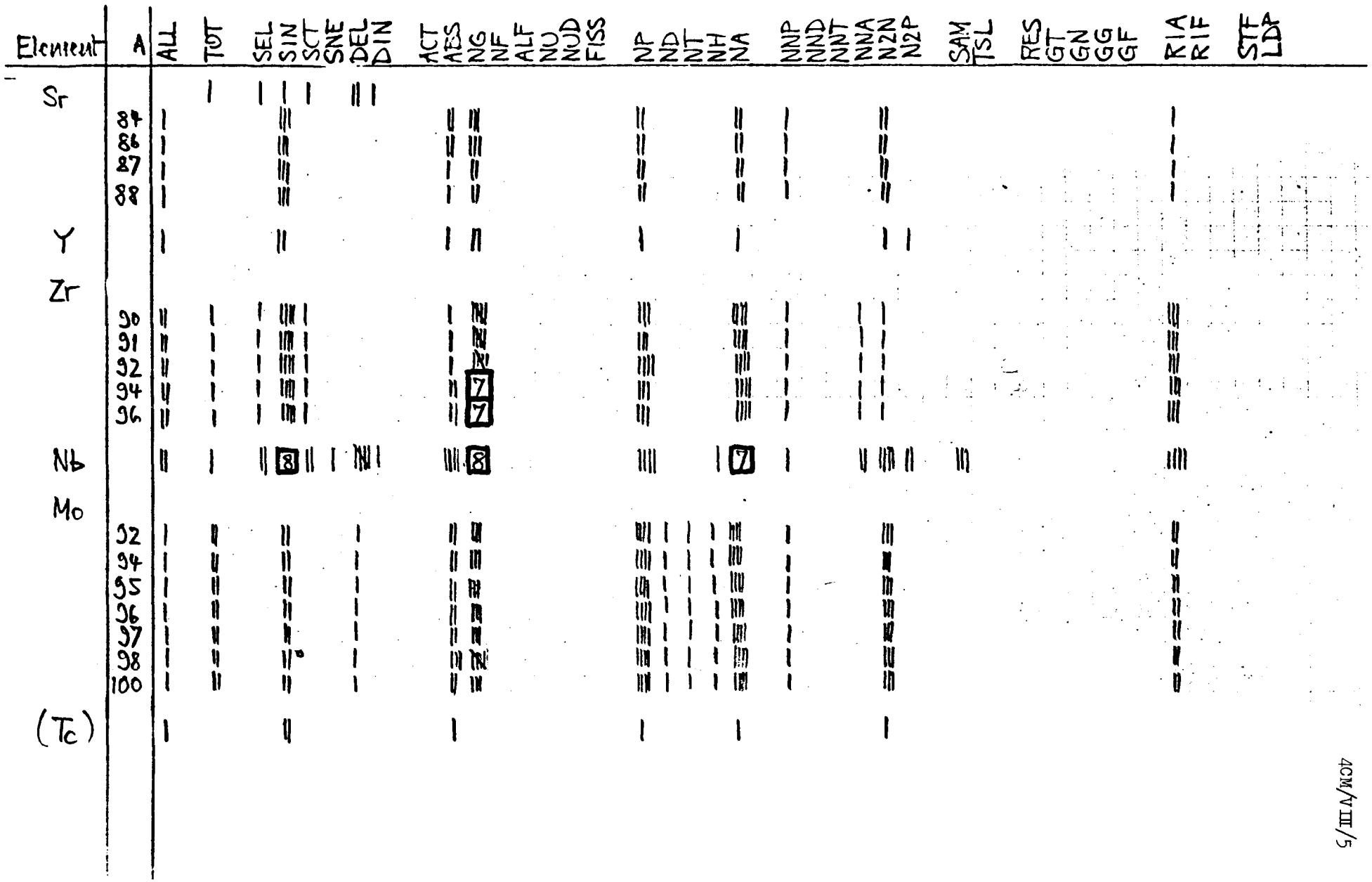

CCDN - Request Statistics April 1971 - March 1972
Element
A
ALL
TOT
SEL
SIN
SCT
SNE
DEL
DIN
ACT
ATS
NG
NF
ALF
NCD
FIS
NP
ND
NT
NH
NA
NNP
NNT
NNA
N2N
N2P
SAM
TSL
RES
GT
GN
GG
FF
RIA
STA
K
Ca
Sc
Ti
V
Cr


CCDN - Request Statistics April 1971 - March 1972
Element
A
Mn
Fe
Co
Ni
Cu
Zn
Ga
ALL
TOT
SEL
SIN
SCT
SNE
DEL
DIN
ACT
ATS
NG
NF
ALF
NCU
NCD
FISS
NP
NTD
NH
NA
NNP
NNTD
NNTA
N2N
N2P
SAM
TSL
RES
GTT
GGN
GTG
RIA
STA
DAT

CCDN - Request Statistics April 1971 - March 1972



CCDN - Request Statistics April 1971 - March 1972



CCDN - Request Statistics April 1971 - March 1972

Element	A	ALL	TOT	SEL	SIN	SCT	SNE	DEL	DIN	ACT	ABS	NG	NF	ALF	NU	NUD	FISS	NP	ND	NT	NH	NA	NNP	NND	NNT	NNA	N2N	N2P	SAM	TSL	RES	GT	GN	GG	GF	RIA	RIF	STF	LDP
Ru	96	I									I	II						I				I					I									II			
	98	I									I	II						I				I					I									II			
	99	I									I	III						I				I					I									II			
	100	I									I	II						I				I					I									II			
	101	I									I	II						I				I					I									II			
	102	I									I	III						I				I					I									II			
	104	I									I	III						I				I					I									II			
Rh		II			IIII						III	III						III	I	I	I	IIII	I				III	I								II			
Pd	102	I						III			II	III						III	I	I	I	III	I				II									II			
	104	I						II			II	III						III	I	I	I	III	I				II									II			
	105	I						III			II	III						III	I	I	I	III	I				II									II			
	106	I						III			II	III						III	I	I	I	III	I				II									II			
	108	I						III			II	III						III	I	I	I	III	I				II									II			
	110	I						III			III	IIII						III	I	I	I	III	I				II									II			
Ag	107	II	I		II						I	II						I				I					I									II			
	109	I	I		II						I	III						I				I					I									II			
Cd	106	I			II			III			III	IIII						III	I	I	I	III	I				II									I			
	108	I			II			III			III	III						III	I	I	I	III	I				II									I			
	110	I			II			III			III	III						III	I	I	I	III	I				II									I			
	111	I			II			III			III	III						III	I	I	I	III	I				II									I			
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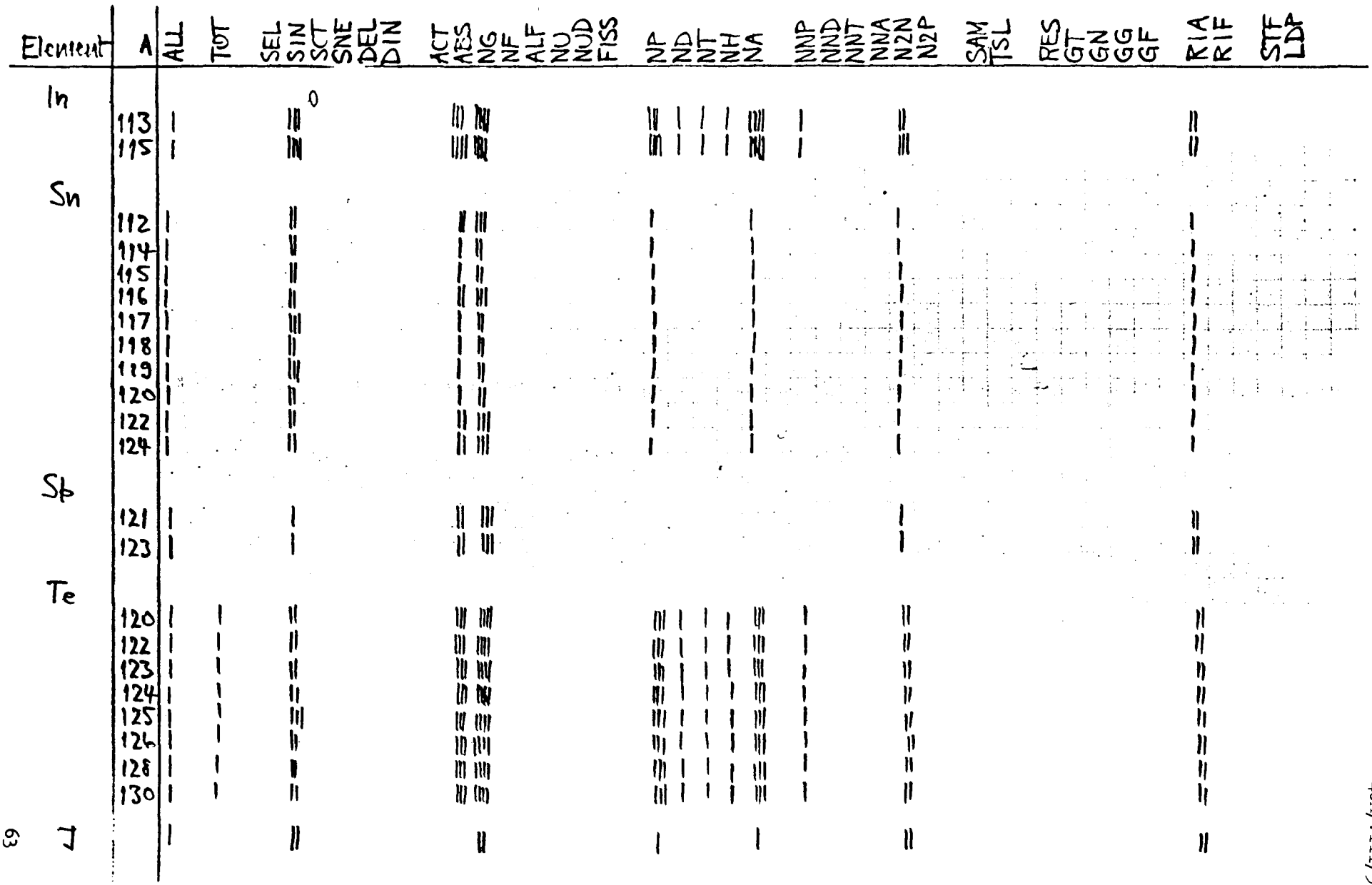
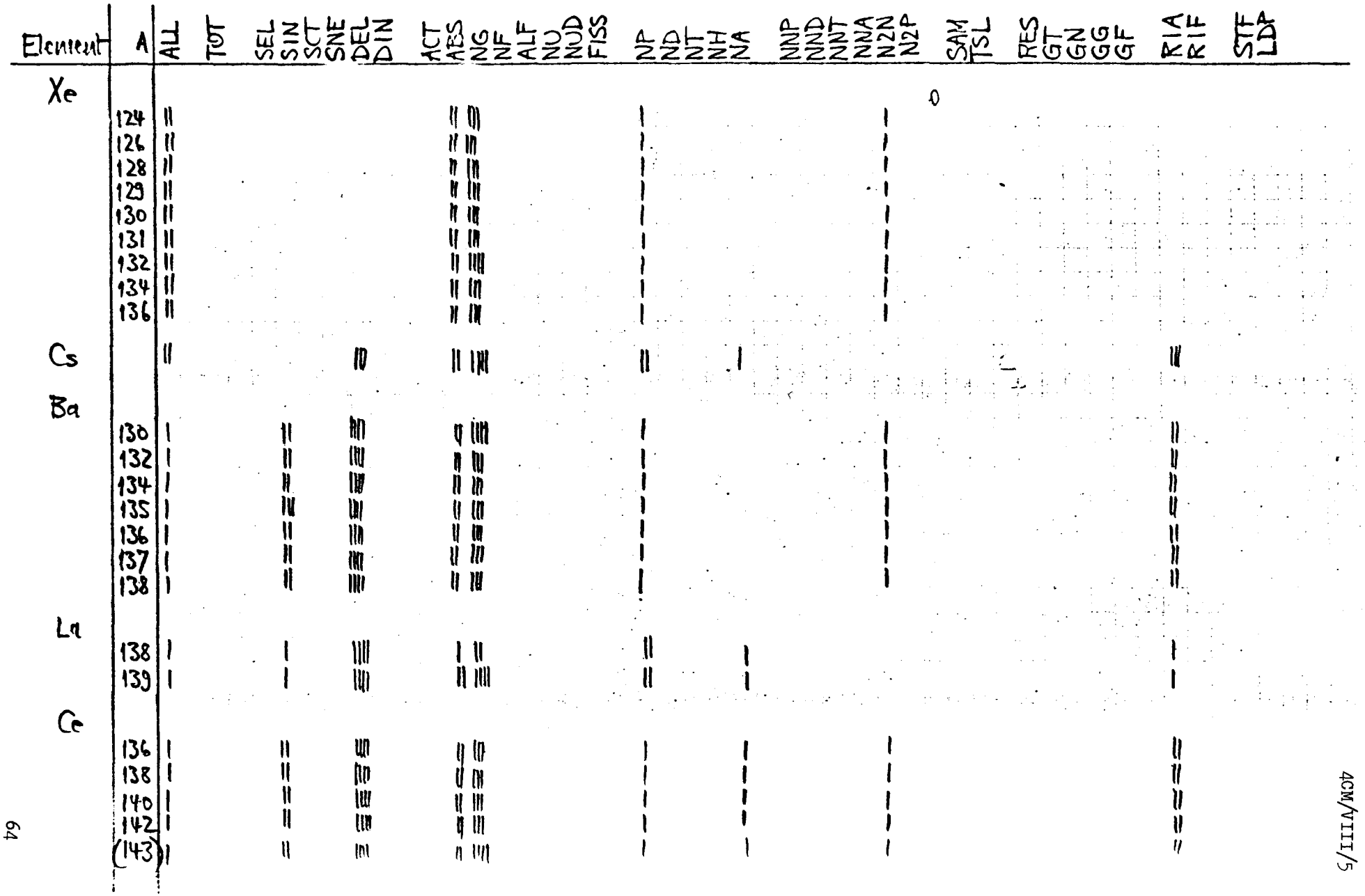
CCDN - Request Statistics April 1971 - March 1972



CCDN - Request Statistics April 1971 - March 1972



CCDN - Request Statistics April 1971 - March 1972

Element	A	ALL	TOT	SEL	SIN	SCT	SNE	DEL	DIN	ACT	ABS	NG	NF	ALF	NU	NUD	FISS	NP	ND	NT	NH	NA	NNP	NND	NNT	NNA	N2N	N2P	SAM	TSL	RES	GT	GN	GG	GF	RIA	RIF	STF	LDA
Gd																																							
	152	II	I	I	II	I		III			II	7						III	I	I	I	6	II			I	II									IIII			
	154	II	I	I	II	I		III			II	6						IIII	I	I	I	6	II			I	II									IIII			
	155	III	I	I	II	I		III			II	6						IIII	I	I	I	6	II			I	II									IIII			
	156	II	I	I	II	I		III			II	6						IIII	I	I	I	6	II			I	II									IIII			
	157	II	I	I	II	I		III			II	6						IIII	I	I	I	6	II			I	II									IIII			
	158	II	I	I	II	I		III			II	6						IIII	I	I	I	6	II			I	II									IIII			
	160	II	I	I	II	I		III			II	6						IIII	I	I	I	6	II			I	II									IIII			
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	156	I						III			II	III						III	I	I	I	III	I				II									I			
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	161	I						III			II	III						III	I	I	I	III	I				II									I			
	162	I						III			II	III						III	I	I	I	III	I				II									I			
	163	I						III			II	III						III	I	I	I	III	I				II									I			
	164	II						III			II	IIII						III	I	I	I	III	I				II									I			
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	162	I			I			III			III	IIII						I				I					I									III			
	164	I			I			III			III	IIII						I				I					I									III			
	166	I			I			III			III	IIII						I				I					I									III			
	167	I			I			III			III	IIII						I				I					I									III			
	168	I			I			III			III	IIII						I				I					I									III			
	170	I			I			III			III	IIII						I				I					I									III			
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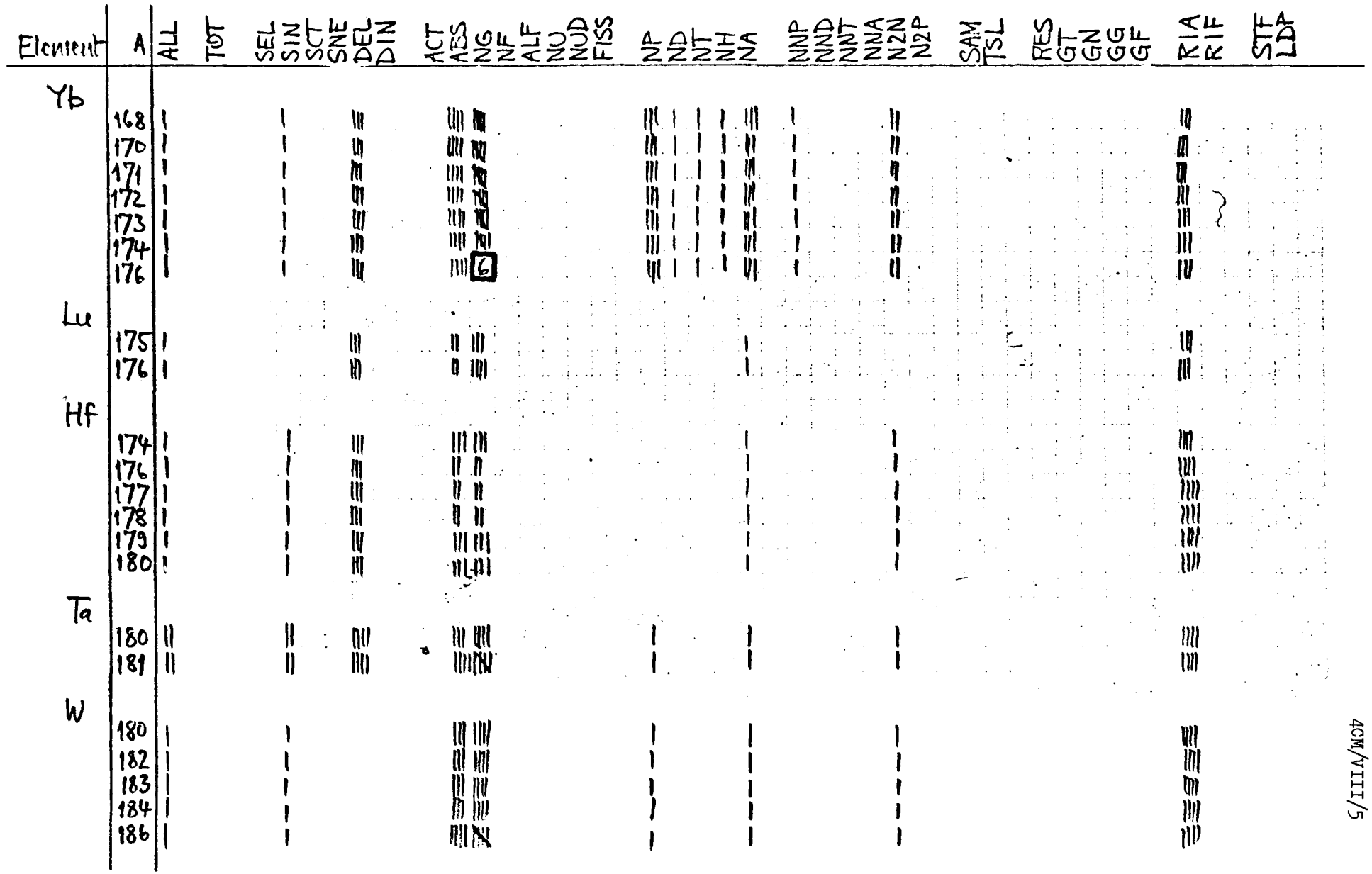

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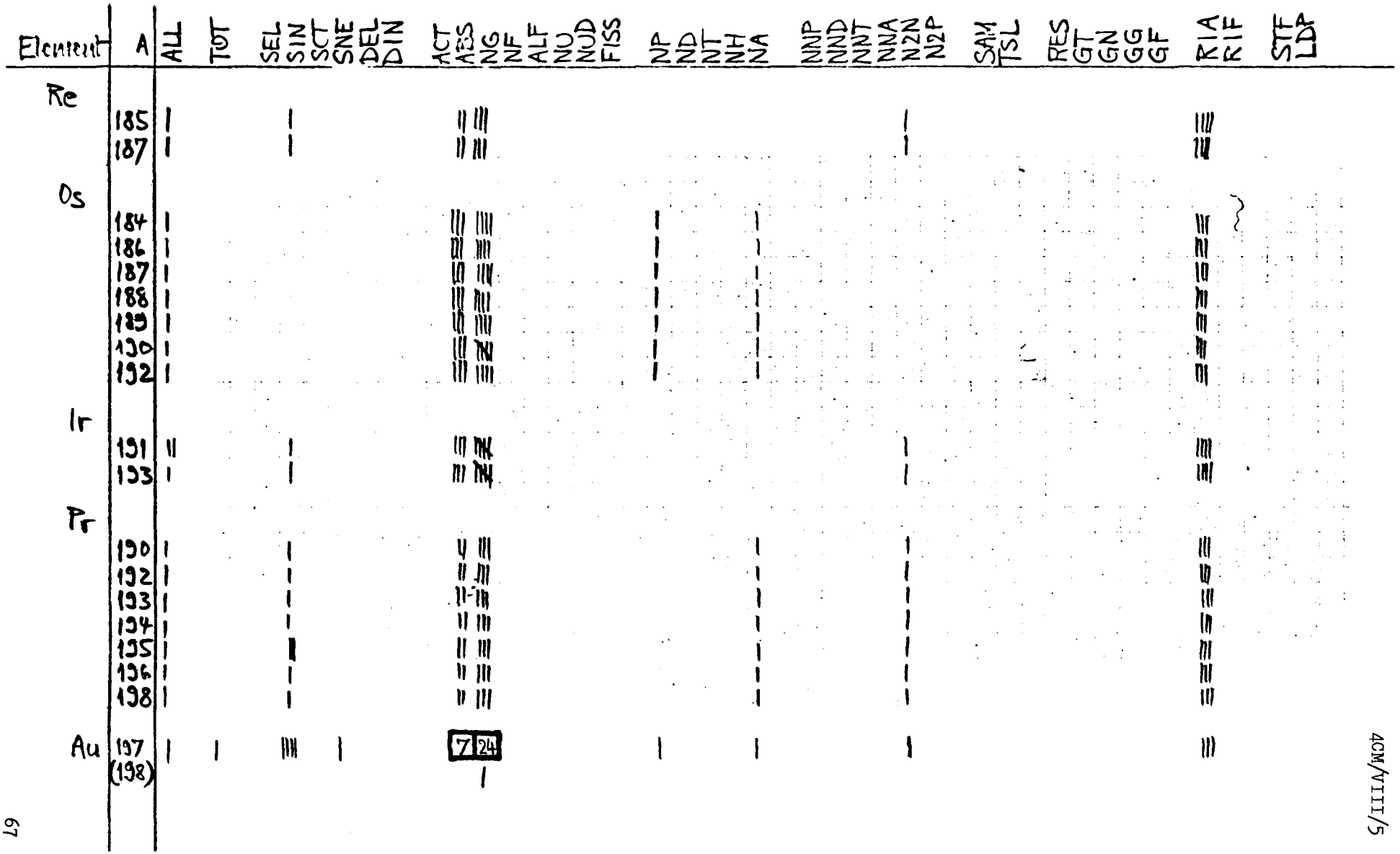

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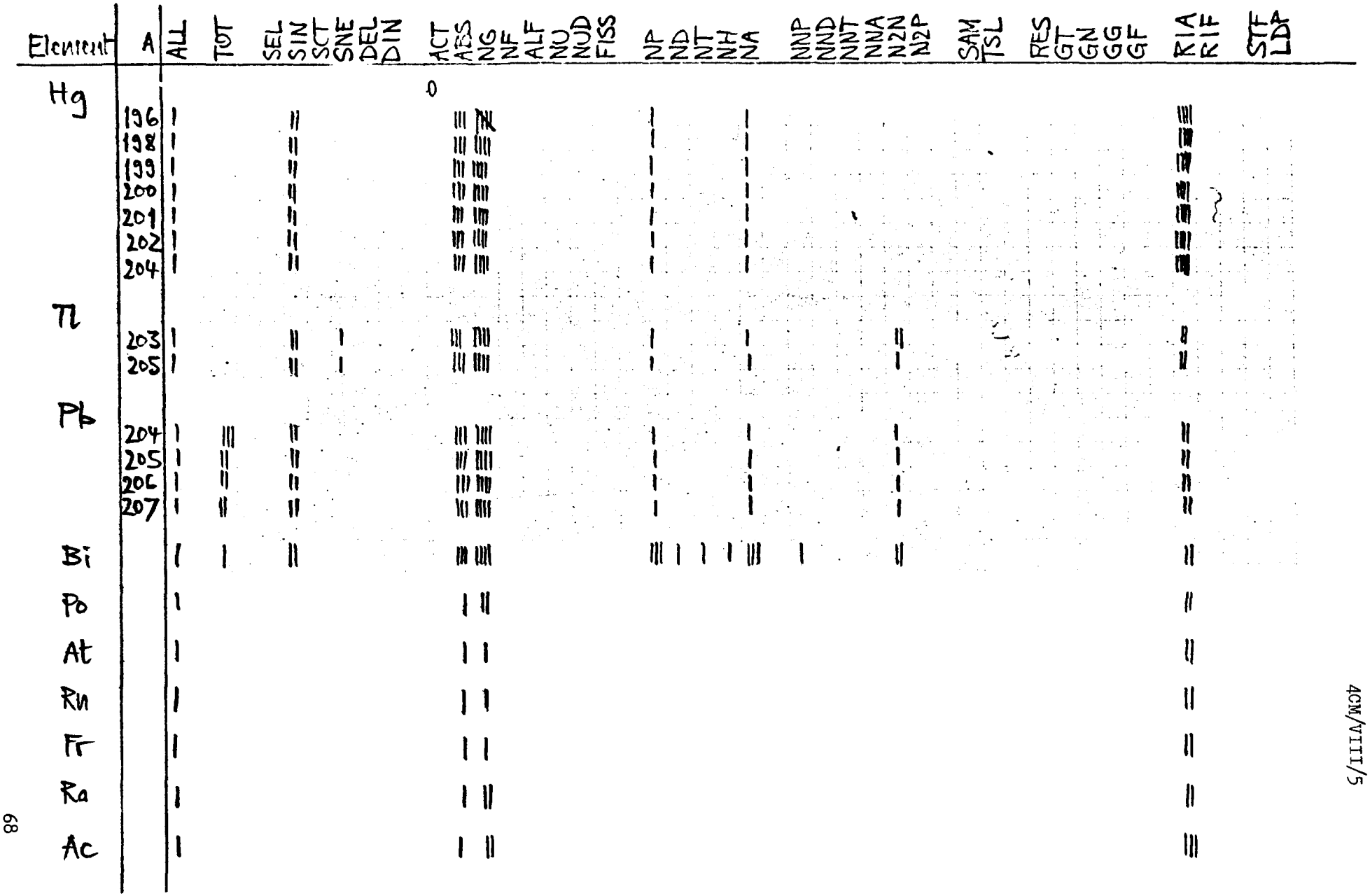

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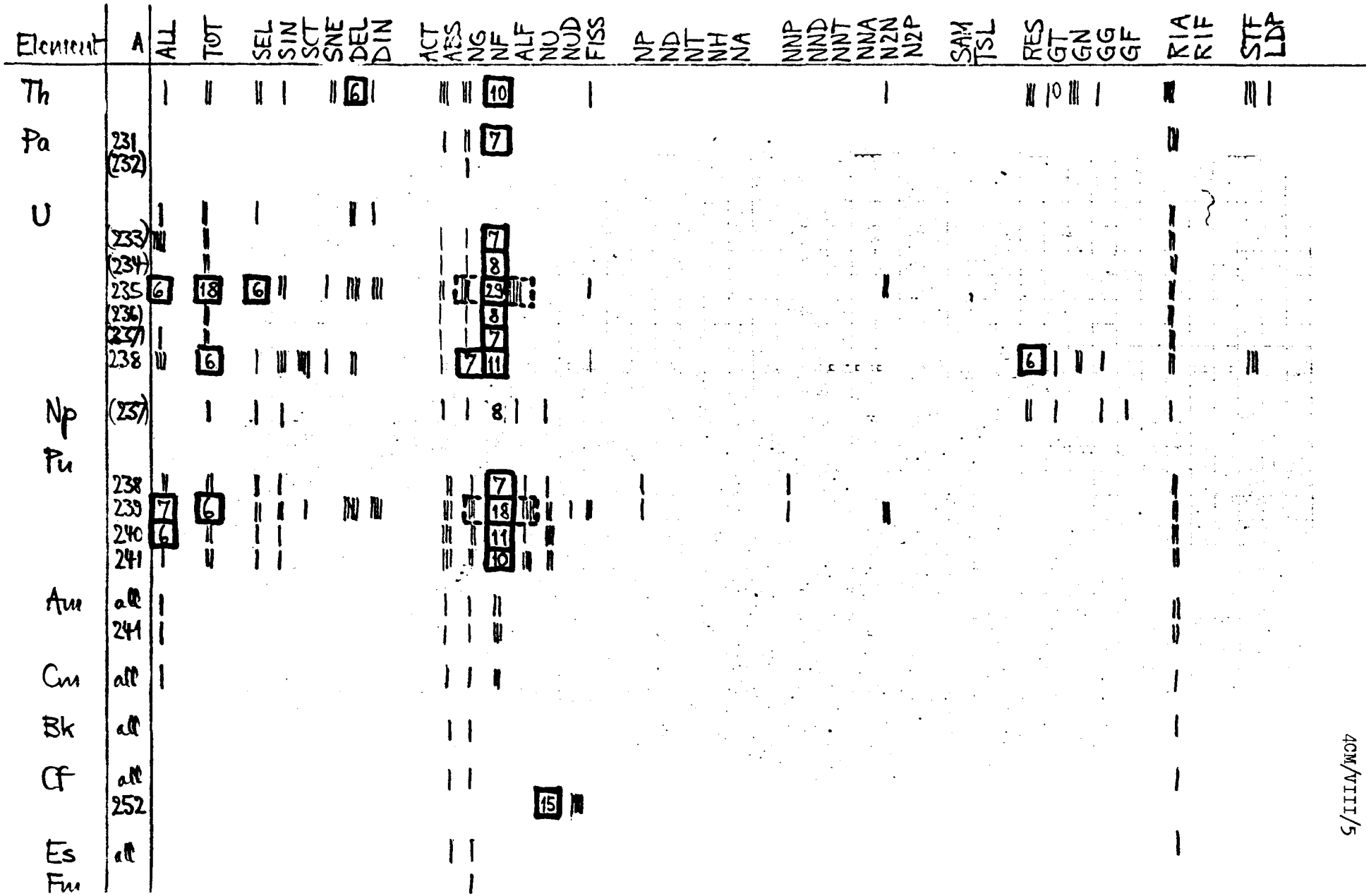


Origin of Requests from CCDN Service Area

L: National Labs
U: Universities
I: Industry
O: Others

Country	Exp. Data L	Exp. Data U	Exp. Data I	Exp. Data O	Eval. Data L	Eval. Data U	Eval. Data I	Eval. Data O	Literature Searches L	Literature Searches U	Literature Searches I	Literature Searches O	
A	III					I			I				5
B	IIII IIII				III								14
DK													–
F	IIII 45 IIIII	I			IIII IIII IIII 10								64
D	IIII IIII IIII II	III			IIII IIII I	II			I	II			36
I	IIII	IIII			III					I			12
J	III				III	II							9
NL					I	I			I				3
N								IFA					1
SP													–
S	IIII IIII				IIII				I				16
CH	I	I			I			I					4
GB	IIII IIII III	I	III		III	II			III				27
	106	11	3	–	50	8	0	2	8	3	0	–	191

NDS progress report

Since the last 4C-Meeting NDS experienced a rather large turnover in staff. Alex Lorenz, Valja Konshin and Peter Kaas left NDS and were replaced by Charles Dunford from Atomics International, USA, Mercury Vlasov from the Academy of Sciences, Kiev, USSR, and Meinhart Lammer from Seibersdorf, Austria. This was effected usually only half a year later, as for reasons of budgetary savings all vacant posts in the IAEA had to be held open for half year periods at that time. Two other new staff members of NDS are Jim Lemley from Los Alamos, USA, and Alain Calamand from CEN Saclay, France, replacing former staff members Bak and Koster respectively who left NDS in the first half of 1971. At present, NDS is again fully staffed with ten physicists, three programmers, two data-processing clerks and four secretaries. NDS was allocated a fourth secretary because of an enormous increase in typing workload.

In May 1972, CINDU-10 was published; it contains an up-to-date catalogue of experimental and evaluated neutron nuclear data available from NDS data files.

The publication of CINDA was continued with the second (cumulative) supplement to CINDA-71 published in December 1971 and the new total volume CINDA-72 which came out recently. The unfortunate delay of the publication of CINDA-72 was solely due to the incidental overload, in addition to the normal work load, of the Agency's Publication Division caused by the publication of the proceedings of the 1971 Geneva Conference.

The reviews on α (Pu-239) by Konshin and Sowerby, on Pu-239 fission and the Pu-239/U-235 fission ratio for fast neutron energies by Byer and on $\bar{\nu}$ data for all heavy isotopes by Manero were completed and will be published in the December 1972 issue of Atomic Energy Review. They represent substantial progress over similar work in the past particularly by treating systematic errors, and it is hoped they will be of benefit to evaluation work connected with national fast reactor programs. Present and near-future NDS review work concerns a second up-date of the 2200 m/sec fissile isotope standard constants

(H.Lemmel et al.), reactor dosimetry cross sections (M.Vlasov et al.) and standard reference cross sections (J.Lemley et al.)

The receipt by NDS of the NNCSC file with ENDF/B standard data and of the updated file containing additional cross sections for carbon is gratefully acknowledged. The first mentioned file or subsets of it were distributed to a number of users in the NDS service area and to CJD upon request. From CJD an evaluation report on fast U-235 fission standard cross sections by Konshin and Nikolaev was received, translated within the Agency and distributed as INDC(CCP)-26/U report. Also the first full evaluated data file from the Soviet Union covering all neutron cross sections for U-238 was received from CJD.

NDS maintains a small support programme for the supply of targets and samples for nuclear data measurements to laboratories mainly in developing countries. It has received multiple requests from eight research groups in seven countries and, with INDC approval, is currently undertaking the necessary steps to fulfill these requests.

Regarding past meetings, NDS organized the first meeting of the International Working Group for Nuclear Structure and Reaction Data (IWGNSRD) in Vienna in March this year. The meeting started a review of non-neutron nuclear data requirements for various applied purposes. As a first step it identified the major fields of nuclear data application and linked these to the existing compilations.

Future Meetings organized by NDS

1. Symposium on Applications of Nuclear Data in Science and Technology, Paris 12 - 16 March 1973 (Scientific Secretary: L. Hjärne)

This symposium will convene representatives from various application fields (reactors, fusion, safeguards, medicine and others) which use nuclear data in the development of nuclear methods, in nuclear design studies and others.

Contributions from these people are supposed mainly to pinpoint deficiencies, gaps, etc. causing severe penalties in the available compilations and eavluations of nuclear data. It is conceived as a teach-in to the compilers and evaluators present who in turn will review in one session the major activities in their field. It is hoped that the symposium will provide a comprehensive survey of the more important needs for improving the existing compilations and evaluations and help to bridge the still existing information gaps between data compilers and suppliers and data users.

2. Panel on Fission Product Nuclear Data, late 1973, (exact time and place still to be determined (Scientific Secretaries: M.Lammer, H.Lemmel)

This will be the first meeting on this topic, and its principal purpose will be to review the status of fission product nuclear data of importance to reactor design, shielding, nuclear materials safeguards and other nuclear applications.

The main data items to be discussed will be

- yields for thermal and fast neutron induced fission;
- capture and other neutron reaction cross sections;
- half life data;
- delayed neutron precursors and their data (half lives, emission probabilities and yields, decay schemes);
- decay schemes, β - and γ-ray spectra and intensities.

The main discussion topics (in short) will be:

- review of the technical background for fission product nuclear data requirements and their priorities;
- critical assessment of the status of knowledge of fission product nuclear data;
- critical comparison of available microscopic data evaluations;

- review of integral measurements of fission product nuclear data;
- issue of recommendations for future work on fission product nuclear data for the benefit of the variety of users of these data.

The meeting is supposed to convene users, compilers and evaluators and measurers of fission product nuclear data. A small preparatory meeting is planned for 11-13 December 72 at Agency's Headquarters in Vienna, to develop the programme of the Panel in detail.

3. Study Group Meeting on Nuclear Data Requirements for Shielding, about mid 1974. (Exact time and place still to be determined; still to be approved by the Agency's Scientific Advisory Committee) (Scientific Secretary: Ch. Dunford).

This meeting is planned in response to the increasing nuclear data needs of the shielding community as expressed e.g. by members of the programme committee for the Fourth International Conference on Reactor Shielding held in Paris in October this year and by a Panel on Nuclear Data Requirements for Shielding at this same conference. It is supposed to define more specifically the nuclear data requirements for shielding as emanating from detailed sensitivity studies whose results from various shielding groups are expected to become available in about the first half of 1974. The meeting should be composed about two-thirds by shielding specialists and one-third by nuclear data specialists. The results of this meeting will be reported at the Third IAEA Conference on Nuclear Data for Reactors planned for 1974.

4. Third Conference on Nuclear Data for Reactors, September or October 1974. (exact time and place still to be determined, still to be approved by the Agency's Scientific Advisory Committee) (Scientific Secretary: Ch.Dunford)

This Conference will be a follow-up of the two previous IAEA Conferences in Paris (1966) and Helsinki (1970). Unlike the former conferences this one will give more emphasis to detailed application fields like shielding, radiation damage and others. The first meeting of the programme committee for this conference will take place in Paris on 25 and 26 November 1972.

REPORT FROM THE USSR NUCLEAR DATA CENTRE (CJD)

Note from the Secretaries:

The accompanying report on work at the USSR Nuclear Data Centre (CJD) was received from V. Manokhin, Acting Director of the Centre, during his visit at NDS in November 1972 for inclusion in the Minutes of the 8th 4C Meeting as the official report of CJD. The original text and an English translation follow.

Д О К Л А Д

о деятельности Центра по ядерным данным на 5 заседании МКЯД, Вена 17-22 июля 1972 г.

Л.Н.Усачёв, В.И.Попов

Введение.

Любая деятельность должна начинаться с обоснования ее полезности. В деятельности по ядерным данным-это выявление запросов и составлениесписков потребностей. В Сакле и Вене аналогичная деятельность ведет к изданию РЕНДА.

В Обнинске мы вырабатываем несколько иной подход к проблеме составления РЕНДА. Мы не просим специалистов, занимающихся реакторами, выдавать нам требования на конкретные микроскопические измерения, распределять необходимые точности между различными сечениями - в этом они не специалисты. Мы просим их выставить обоснованные с технико-экономической точки зрения требования на допустимую величину погрешности расчета реакторного параметра, проистекающую из-за неточности в ядерных данных. Кроме этого мы просим от них коэффициенты чувствительности величины реакторного параметра к изменению ядерных данных. Эти коэффициенты чувствительности содержат всю необходимую с точки зрения выработки требований на ядерные данные информацию о реакторе и не содержат лишней.

Вопрос о том, какой совокупностью измерений обеспечить расчет реакторного параметра с требуемой точностью, с нашей точки зрения должен решаться с помощью математического ап -

парата теории планирования эксперимента в тесном контакте со специалистами как по микроскопическим, так и по интегральным измерениям. Для выработки оптимального плана важно оценить относительные стоимости экспериментов. Существенно также правильно учитывать корреляцию погрешностей при измерениях и оценке, поскольку на скоррелированные погрешности требования существенно жёстче. Информацию о достигнутых к настоящему моменту точностях при измерениях каждого рода необходимо иметь, во-первых, для сравнительной оценки стоимостей экспериментов и, во-вторых, для того, чтобы делать заключения о необходимости дальнейшего уточнения величин из сравнения достигнутой и требуемой точностей.

Достигнутую точность можно определить только в процессе оценки ядерных данных, так как погрешность, вследствии систематических ошибок, непредусмотренных авторами, выявляется только при сравнении с результатами, полученными другой методикой. Таким образом, деятельность по оценке ядерных данных необходима для выработки списка потребностей в ядерных данных. То есть мы считаем невозможным заниматься РЕНДА без теснейшей связи этой деятельности с деятельностью по оценке ядерных данных.

Как некоторую особенность организации работ в Центре можно отметить еще и то, что реферирование работ в Обменном формате распределено по темам. Причем сотрудник, реферирующий, например, работы по неупругому рассеянию, будет заниматься оценкой по этой теме в содружестве со специалистами по измерениям этой же величины, а также по ее теоретической интерпретации.

ОРГАНИЗАЦИЯ И СОСТАВ ЦЯД.

Центр по ядерным данным в настоящее время насчитывает 31 человек и включает следующие группы:

I. Группа определения потребностей в точности данных и планирования микроскопических и интегральных экспериментов.

2. Группа по созданию машинных библиотек и оценке ядерных данных. Основные задачи группы: реферирование в ЭКСФОР, реферирование по системе СИНДА, сбор информации для машинных библиотек экспериментальных и оцененных данных, подготовка ответов на запросы, постановка программ расчета и оценки нейтронных сечений, составление каталогов. Разработка автоматизированной системы оценки. Организация оценки и участие в ней.

3. Группа программного обеспечения машинных библиотек экспериментальных и оцененных данных. Основные задачи группы: перезапись зарубежных лент с ядерными данными, составление и постановка программ, обслуживающих машинные библиотеки.

4. Группа общего математического обеспечения. Основные задачи группы: обслуживание потребителей ЭВМ Центра по эксплуатации трансляторов, постановка нового диспетчера, транслятора и мониторной системы ФОРТРАН, программного обеспечения графопостроителя и дисплея и т.д.

5. Группа изданий ЦЯД. Основные задачи группы: издание Бюллетеня, сборников аннотаций и др.документов Центра, ответы на запросы, обслуживание библиотеки ЦЯД и др.

6. Группа эксплуатации ЭВМ. Задачи: а) собственно эксплуатация; б) подсоединение нестандартных внешних устройств: магнитофонов западного стандарта, дисков, дисплея, графопостроители.

7. Консультант по вопросам теории.

8. Руководитель ЦЯД и его заместитель.

Центр по ядерным данным выполняет следующие виды работ:

I. Сбор информации по ядерным данным по СССР и обмен данными с МАГАТЭ и зарубежными центрами. Совместно с зарубежными центрами разработана система обменного формата ЭКСФОР и в этой системе в ЦЯД прореферировано IOO работ. В МАГАТЭ посланы 3 магнитные ленты с записью около 30 отечественных работ и переписано 30 зарубежных лент с ядерными данными на ленты отечественного образца.

К создаваемой машинной библиотеке ЭКСФОР, содержащей уже около 200000 точек экспериментальных сечений, создается комплекс обслуживающих программ проверки, записи, поиска распечатки и т.д. Написано около IO таких программ.

Из МАГАТЭ получена библиотека КЕДАК оцененных данных на магнитных лентах, содержащая 300000 точек, которая размножается в ЦЯД и передается потребителям.

2. ЦЯД регулярно вносит вклад в создание международного библиографического справочника СИНДА, реферируя советские работы (примерно IO% общего количества мирового реферирования).

3. В 1972 г. введена в строй ЭВМ ЦЯД М-222. На ней поставлен и эксплуатируется транслятор ТА-IМ, а также новый более эффективный и надежный диспетчер. Ведется работа по постановке ФОРТРАНА и Мониторной системы.

4. На базе ЭВМ создается автоматизированная система оценки ядерных данных, включающая машинную библиотеку экспериментальных ядерных данных,

, графикопостроитель, дисплей (будет введен в 1973 г.) и набор программ обработки данных и теоретического расчета сечений.

Первая очередь этой системы, осуществляемая в 1972 г., позволит усовершенствовать и ускорить процесс оценки и привлекать специалистов других институтов.

5. Ведется работа по планированию экспериментов и определению необходимой точности ядерных констант. На основе математической теории эксперимента разработаны алгоритмы и отлажены программы по трем направлениям:

а) для определения необходимой точности микроскопических констант;

б) для проверки информативности каждого интегрального эксперимента;

в) для подгонки ядерных данных по совокупности микроскопических и интегральных экспериментов.

На ЭВМ ЦЯД ставится комплекс программ расчета коэффициентов чувствительности по обобщенной теории возмущений, которые необходимы для внедрения в практическую деятельность указанных выше результатов.

6. К марту 1972 г. Центром по ядерным данным издано 6 бюллетеней (7 в печати) с приложениями и 12 сборников аннотаций "Ядерно-физические исследования в СССР". Бюллетень ЦЯД изменил название и будет выпускаться под названием "Ядерные константы".

7. В 1971-72 гг. по запросам 37 потребителей было отправлено примерно 59000 страниц (в основном в виде фотокопий).

В это число не входит основная (регулярная) рассылка бюллетеней ЦЯД и копий атласов БНЛ (2000 томов).

Центром организована оценка сечений деления урана-235 в быстрой области, размножен и распространен небольшой сборник статей по методике оценки, проведен ряд семинаров и совещаний (в т.ч. несколько межинститутских) по методикам оценки и координации работ по оценке.

Для ускорения создания советской библиотеки оцененных данных ЦЯД принял решение положить в основу имеющиеся в ЦЯД файлы оцененных данных и организовать работу по пересмотру важнейших элементов и величин. Результаты оценки публикуются в изданиях ЦЯД. В текущем году будут опубликованы: оценка урана-238 (полный файл), оценка сечения деления урана-235 выше 10 кэв и др.

72-8960
Translated from Russian

REPORT ON THE WORK OF THE NUCLEAR DATA CENTRE (CJD)

Fifth meeting of INDC,
Vienna, 17-22 July 1972

L.N. Usachev and V.I. Popov

Introduction

The first step in any kind of activity is to specify its purpose. In nuclear data work this means eliciting requests and preparing lists of requirements. In Saclay and Vienna this work results in the publication of RENDA.

At Obninsk we are developing a rather different approach to the problems associated with RENDA. We do not ask reactor specialists to say what specific microscopic measurements should be made or to indicate the accuracies required for different cross-sections, because they are not specialists in that area. We ask them to indicate what inaccuracy resulting from inexact nuclear data can be permitted (from the technical and economic points of view) in the calculation of a reactor parameter. We also ask them to give us factors for the sensitivity of a reactor parameter to changes in nuclear data. These sensitivity coefficients contain all the reactor information necessary for determining the nuclear data requirements but no excess information.

The question what combination of measurements ought to be used to calculate a reactor parameter with the required accuracy should, in our opinion, be answered by applying the mathematics of experiment planning theory in close co-operation with specialists on both microscopic and integral measurements. If an optimum plan is to be worked out it is important to estimate the relative costs of experiments. It is also important to take proper account of the correlation of errors in measurements and calculations, since the requirements as regards correlated errors are considerably more rigorous. Information regarding the accuracies which have so far been reached in different measurements is necessary first for comparing the costs of experiments and, second, in order to see whether any further improvement in accuracy is necessary (by comparing the requested accuracy with that already achieved).

The achieved accuracy can be determined only in the process of evaluating nuclear data, since the inaccuracies resulting from systemic errors not foreseen by the authors appear only in comparison with results obtained by

other methods. Nuclear data evaluation is thus necessary for preparing a list of nuclear data requirements. In other words, we think it is impossible to operate RENDA unless it is closely connected to the work of nuclear data evaluation.

As a special feature of the way things are done at the Centre, mention should also be made of the fact that the scanning of works in exchange format is divided up according to subjects: staff engaged on scanning, say, works on inelastic scattering will be concerned with evaluation for this subject, in co-operation with experts specialized on the measurement of this quantity and on its theoretical interpretation.

Administration and staffing of the Nuclear Data Centre

The Nuclear Data Centre at present employs 31 persons and includes the following groups:

(1) A group for determining the accuracy requirements of data and for planning microscopic and integral experiments;

(2) A group for setting up machine libraries and evaluating nuclear data. The main functions of this group are: scanning in EXFOR; scanning for CINDA; collecting information for machine libraries of experimental and evaluated data; answering requests; preparing programmes for calculating and evaluating neutron cross-sections; producing catalogues; developing an automated evaluation system; organizing the evaluation and participating in it;

(3) A group for programming the machine libraries of experimental and evaluated data. Its main tasks are: to copy foreign tape recordings of nuclear data and to prepare and implement programmes for servicing the machine libraries;

(4) A general mathematical group. Its main tasks: to give assistance with translators operation to customers using the Centre's computer; to install a new despatcher, translator and monitor system (FORTRAN), to programme plotters and displayers, etc.;

(5) The Nuclear Data Centre publications group. Main tasks: to publish a bulletin, books of abstracts and other documents, to answer requests, service the CJD library, etc.;

(6) Computer operating group. Tasks: (a) the actual operation of the computer; (b) to adapt non-standard external equipment, such as western standard tape recorders, discs, displayers, plotters;

(7) A consultant for theoretical questions;

(8) The Director of the CJD and his Deputy.

The Nuclear Data Centre carries out the following types of work:

(1) Collects information on nuclear data in the USSR and exchanges data with the IAEA and with foreign centres. In collaboration with foreign centres it has prepared the EXFOR exchange format system and 100 works have been scanned at CJD in this system. Three magnetic tapes have been sent to the IAEA with recordings of about 30 Soviet works and 30 foreign tapes with nuclear data have been copied on to Soviet-type tape.

For the EXFOR machine library, which already contains about 200 000 experimental cross-section points, a series of servicing programmes is being prepared for checking, recording, searching, printing, etc. About ten such programmes have been written.

The KEDAK library of evaluated data with 300 000 points on magnetic tapes has been obtained from the IAEA; this is being reproduced at CJD for dispatch to customers;

(2) CJD contributes regularly to the CINDA international bibliographic file with scans of Soviet works (about 10% of the entire world's scanning);

(3) The CJD M-222 computer was put into operation in 1972. A TA-1M translator was installed on the computer and is in operation, along with a new, more efficient and reliable despatcher. The FORTRAN system and a monitor system are being introduced;

(4) The computer is being used to provide an automated system of nuclear data evaluation, with a machine library of experimental nuclear data, plotter, display system (to be introduced in 1973), and a set of programmes for data processing and theoretical calculation of cross-sections.

In the first application of this system to be set up in 1972, it will be possible to improve and accelerate the evaluation procedure and to attract specialists at other institutes;

(5) Work is being done on experiment planning and on determining the accuracy required in nuclear constants. Algorithms have been worked out and three types of programme prepared on the basis of mathematical experiment theory:

(a) To determine the accuracy required in microscopic constants;

(b) To check the information capacity of each integral experiment;

(c) To fit nuclear data resulting from microscopic and integral experiments.

A series of programmes is being used on the CJD computer for calculating sensitivity factors from generalized perturbation theory, these being needed for practical application of the results mentioned above;

(6) By March 1972 the CJD had published six bulletins (the seventh is in press) with appendices, and 12 books of abstracts, "Nuclear Physics Research in the USSR". The CJD bulletin has changed its name and will be published as "Nuclear Constants";

(7) In 1971-72, about 59 000 pages (mainly photocopies) were sent out in response to requests from 37 customers. This number does not include the regular issues of CJD bulletins and copies of the BNL reports (2000 volumes).

The Centre has arranged for the evaluation of uranium-235 fission cross-sections in the fast range, has reproduced and distributed a small book of articles on evaluation methods, and has held a number of seminars and meetings (including some inter-institute meetings) on evaluation methods and the co-ordination of evaluation work.

In order to speed up the establishment of a Soviet library of evaluated data, the CJD decided to use as a basis the evaluated data files which it holds and to revise the more important elements and quantities. The results of the evaluation are appearing in CJD publications. During the course of this year the following publications will appear: uranium-238 evaluation (full file), evaluation of the uranium-235 fission cross-section above 10 keV, etc.

Requests for Experimental Data

Twelve Month Period, 1 October 1971 - 30 September 1972

A. Number of Requests Received 141

B. Form of Request

	#	%
Written	30	21.3
Verbal	105	74.5
Continuing[1]	6	4.2
	141	100.0

C. Request Source

	#	%
National Laboratories[2]	65	46.1
Educational Institutions	36	25.5
Industrial Concerns	25	17.7
Government Agencies	15	10.7
	141	100.0

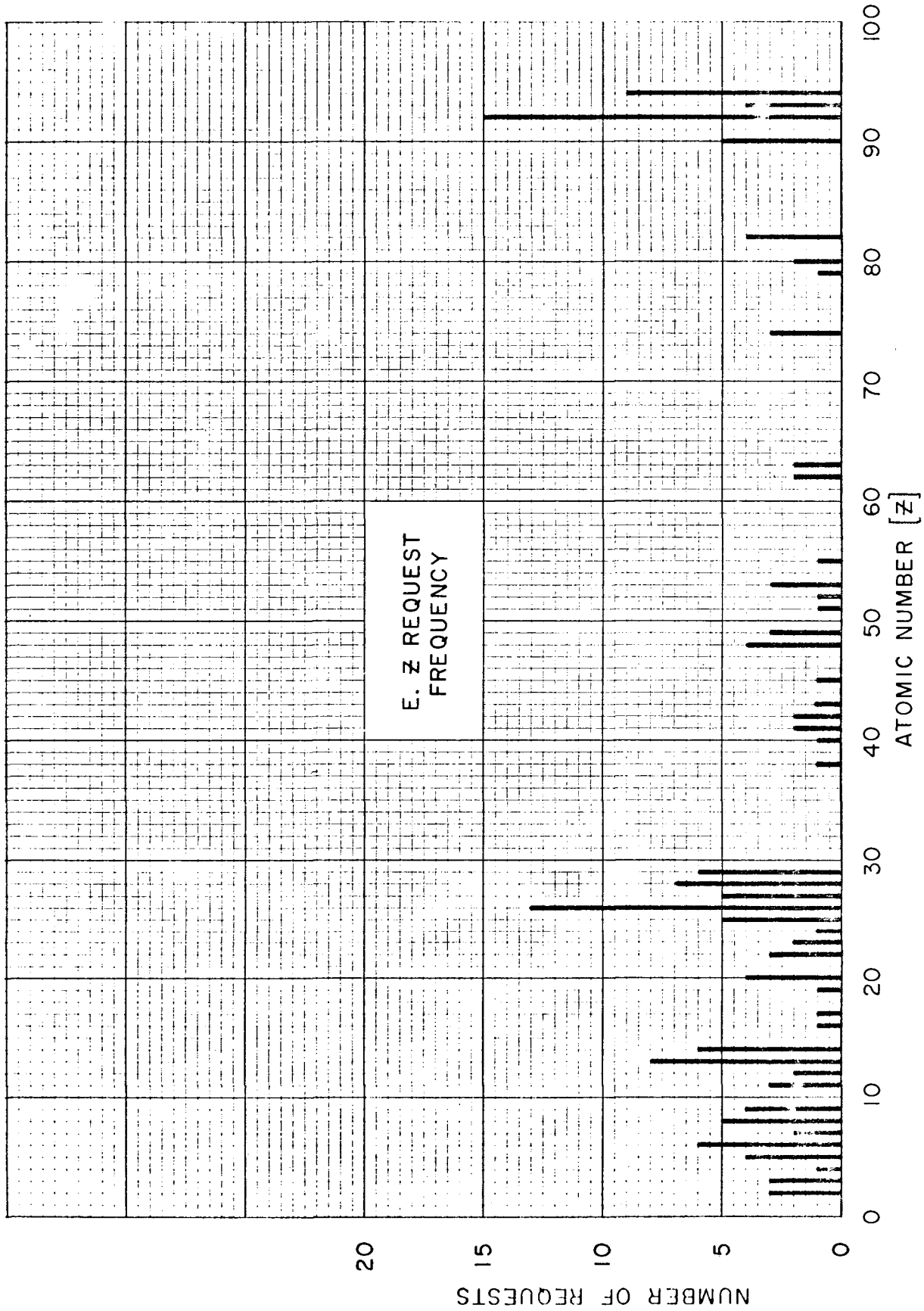
D. Requested Transmission Mode[3]

	#	%
Data sent on N.N.C.S.C. tape (loan)	53	37.6
Data sent on requestor's tape	20	14.2
Data listing(s)	85	60.3
Plots (# of sets)	23	16.3
Request answered on telephone	9	6.4
Punched cards (# of sets)	2	1.4
Xerox copies (Private communications, data not yet formatted, etc.)	5	3.5

[1] A standing request for certain data, serviced as pertinent information is received.

[2] ANL, BAPL, BNL, KAPL, LASL, LRL, ORNL, SRL.

[3] Some users request data in more than one mode.


E. Z REQUEST FREQUENCY
NUMBER OF REQUESTS
0
5
10
15
20
ATOMIC NUMBER [Z]
0
10
20
30
40
50
60
70
80
90
100

Requests for → / Request origin ↓	Experimental Data		Evaluated Data		Documents		Cinda Retrievals		TOTALS	
	Cumulat. Totals	1 Oct 71 - 1 Oct 72	Cumulat. Totals	1 Oct 71 - 1 Oct 72	Cumulat. Totals	1 Oct 71 - 1 Oct 72	Cumulat. Totals	1 Oct 71 - 1 Oct 72	Cumulat. Totals	1 Oct 71 - 1 Oct 72
Incoming from area:										
1	23	1	1	0	24	4	0	0	48	1
2	34	2	2	1	49	13	1	0	86	16
3	70	11	42	12	56	12	15	0	183	35
4	39	5	15	3	11	3	7	0	72	11
Subtotal	116	19	60	16	140	32	23	0	389	67
Follow-up to area:										
1	59	6	1	0	0	0	0	0	60	6
2	55	6	13	4	2	0	16	1	86	11
3	46	0	1	1	0	0	0	0	47	1
4	30	2	1	0	3	1	0	0	34	3
Subtotal	190	14	16	5	5	1	16	1	227	21
NDS origin, sent to area:										
1	24	1	1	0	2	1	0	0	27	2
2	30	0	7	4	4	1	4	0	45	5
3	116	16	0	0	1	1	0	0	117	17
4	11	1	1	1	0	0	0	0	12	2
Subtotal	181	18	9	5	7	3	4	0	201	26
TOTALS	537	51	85	26	152	36	43	2	817	114

* From NDS to other centres (or physicists in area 3) to help fulfill an incoming request.

Comments on filled and unfilled Requests

A. Overall Period

From the request log listings of 1) filled requests and 2) unfilled requests, one can roughly say that 1/4 of all requests on NDS have not been as yet fulfilled. This ratio may drop to ≈ 1/5 if one considers, in the list of unfilled requests, particular items* of a given request have been filled.

B. Period 1 Oct 1971 - 1 Oct 1972

We have registered 114 requests in this 12 month period. 72 of them are filled, 42 remain unanswered as yet. If one considers the same bulk of requests by "items" the figures are: 357 have been filled or tagged "no information avail."; 95 items are unfilled, thus giving the same ratio as for the overall period of NDS request activities, i.e. between 1/4 and 1/5 of unsatisfied requests.

* Item is defined as: - data for one ZAQ
- data for a specified REF
- one document

Comments on request activities for the 12-month period (1 Oct 1971 - 1 Oct 1972)

As compared with the previous period (Jul 1970 - Oct 1971) (note that this period was 30% longer than the present one), the number of requests registered at NDS has dropped nearly to the half (224 for last period, 114 for this period).

1.	(1970-1971)	Previous period: incoming req. for experimental data :	30
	(1971-1972)	Present period: " " " " "	19
		Previous period: " " " evaluated data :	26
		Present period: " " " " "	16
		Previous period: " " " documents :	50
		Present period: " " " "	32
		Previous period: " " " Cinda retrievals :	8
		Present period: " " " " "	0
2.		Previous period: NDS originated req. for exp. data :	54
		Present period: " " " " "	18
		Previous period: " " " evaluated data :	37
		Present period: " " " " "	5
		Previous period: " " " documents :	53
		Present period: " " " "	3
		Previous period: " " " Cinda retrievals :	11
		Present period: " " " " "	0

Experimental Data Dissemination
(as of 1 Oct 1972)

Area	Number of data sets*		Number of data lines	
	Cumulat. total	1 Oct 1971 - 1 Oct 1972	Cumulat. total	1 Oct 1971 - 1 Oct 1972
1	531	0	34 921	0
2	254	1	15 639	0
3	1 460	780	211 437	34 360
4	169	23	136 207	41 399
Total	2 414	804	398 204	75 759

* Data set: 1 EXFOR subentry or 1 DASTAR

Evaluated Data Dissemination
(as of 1 Oct 1972)

Area	Number of data sets **		Number of data lines	
	Cumulat. total	1 Oct 1971 - 1 Oct 1972	Cumulat. total	1 Oct 1971 - 1 Oct 1971
1	603	368	213 810	121 845
2	622	390	221 474	120 085
3	2 790	1 188	1 374 772	236 584
4	867	454	527 808	130 890
Total	4 882	2 418	2 337 864	617 404

** Data set: 1 nuclide for UKNDL, ENDF/B, Kedak, Boyad, BOL and AUL or one DASTAR

Comments on Data Dissemination

For the same two periods under comparison, the statistics of data dissemination has significantly improved (≈ double)

1. Experimental data:

previous period:	no. of sets:	381	no. of lines:	73 474
present period:	" "	804	" "	75 759

2. Evaluated data:

previous period:	no. of sets:	1 330	no. of lines:	1 208 296
present period:	" "	2 418	" "	617 404

Exfor Data Dissemination at NDS

A. 10 Jun 1970 - 1 Oct 1972 (Overall period)

With the exception of 4 entries of Exfor data from area 3 sent to Story (2UKWIN) on 10 Jun 1970, 1 entry from area 4 sent to Sowerby (2UKHAR) on 29 Nov 1971 and 2 entries from area 2 sent to Konshin (4CCPINP) on 11 Aug 1971 and 10 Apr 1972*, all Exfor data have been disseminated in area 3 to the following countries: Australia, Bulgaria, Hungary, India, Korea, Pakistan, Rumania and Yugoslavia.

Exfor data from area	no. of sub-entries	no. of lines
1	124	465
2	377	71 407
3	258	1 504
4	15	60
Total	774	73 436

* included in this table

B. Period Oct 1970 - Oct 1971

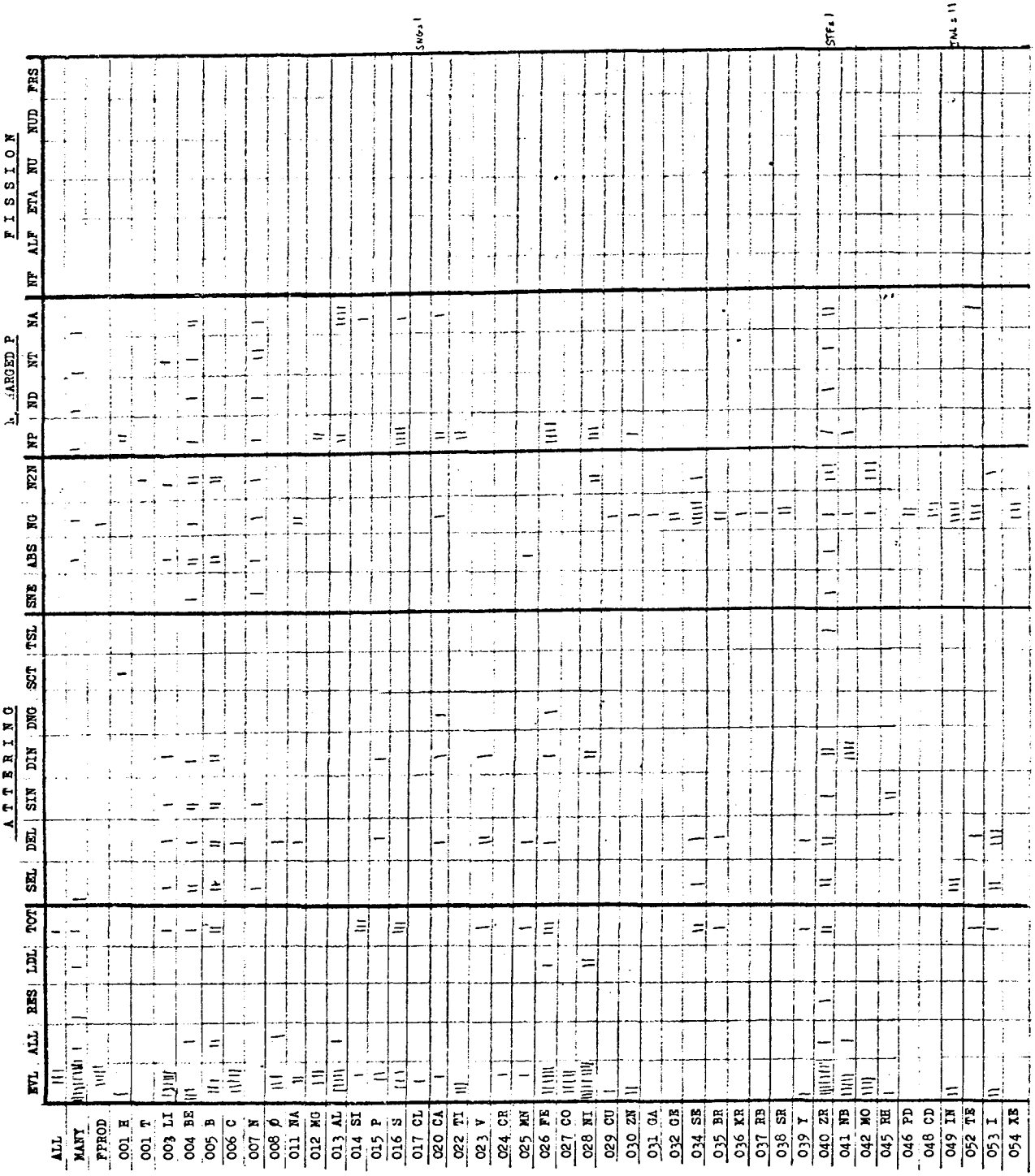
Sent to: Australia, Hungary, Rumania.

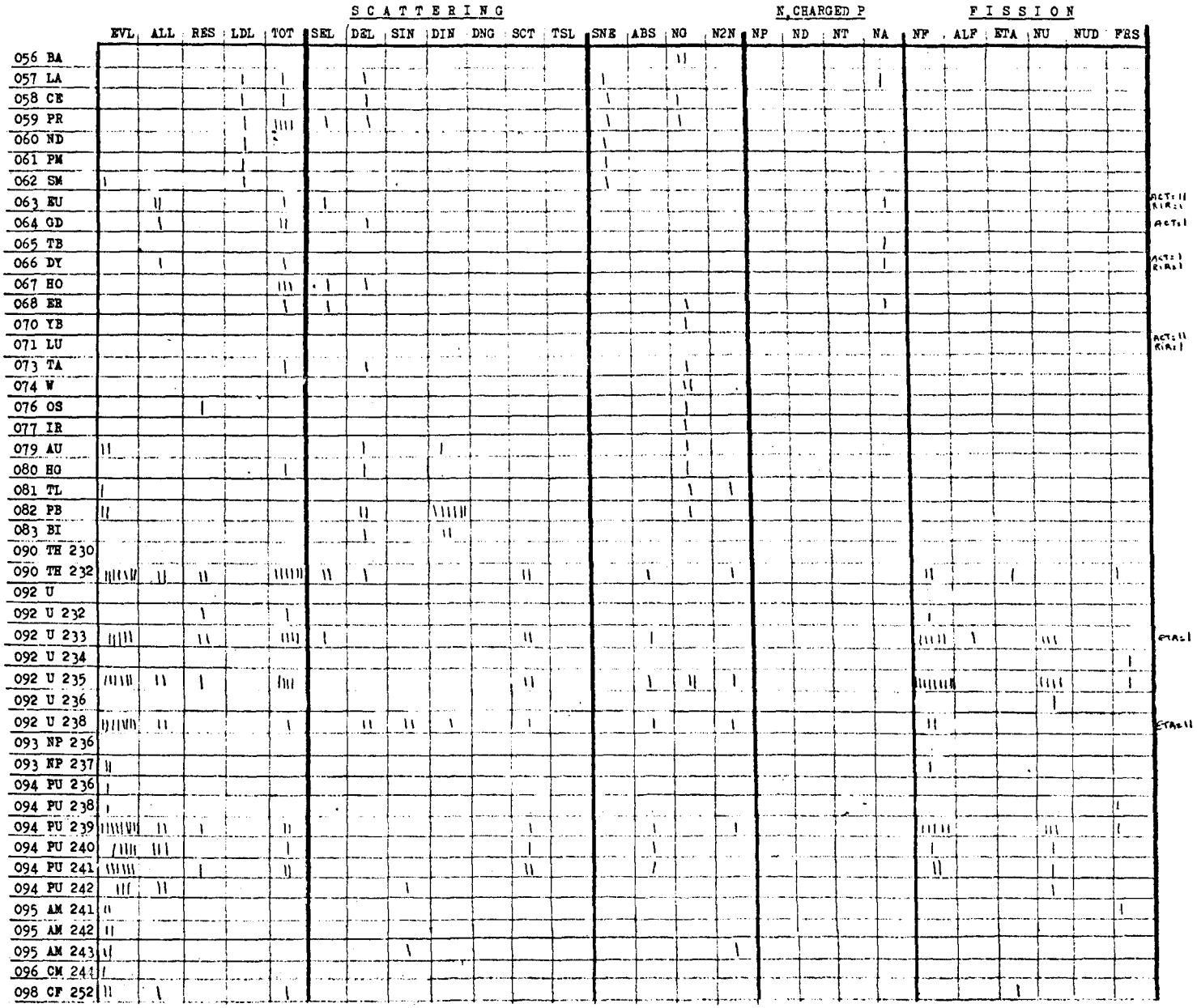
Exfor data from area	no. of sub-entries	no. of lines
1	11	11
2	140	44 322
3	110	168
4	7	53
Total	268	44 554

C. Period Oct 1971 - Oct 1972

Sent to Bulgaria, India, Korea, Pakistan and Yugoslavia.

Exfor data from area	no. of sub-entries	no. of lines
1	113	454
2	237	29 093
3	143	1 331
4	8	7
Total	501	30 885


ATTERRING
FISSION
ALL
MANY
FPROD
001 H
001 T
003 LI
004 BE
005 B
006 C
007 N
008 O
011 NA
012 MG
013 AL
014 SI
015 P
016 S
017 CL
020 CA
022 TI
023 V
024 CR
025 MN
026 FE
027 CO
028 NI
029 CU
030 ZN
031 GA
032 GE
034 SE
035 BR
036 KR
037 RB
038 SR
039 Y
040 ZR
041 NB
042 MO
045 RH
046 PD
048 CD
049 IN
052 TE
053 I
054 XE
EVL
ALL
RES
LDL
TOT
SEL
DEL
SIN
DIN
DMG
SCT
TSL
SNB
ABS
NG
N2N
NP
ND
NT
NA
NF
ALF
ETA
NU
NUD
PRS


SCATTERING
N,CHARGED P
FISSION
EVL ALL RES LDL TOT SEL DEL SIN DIN DNG SCT TSL SNE ABS NG N2N NP ND NT NA NF ALF ETA NU NUD FRS
056 BA
057 LA
058 CE
059 PR
060 ND
061 PM
062 SM
063 EU
064 GD
065 TB
066 DY
067 HO
068 ER
070 YB
071 LU
073 TA
074 W
076 OS
077 IR
079 AU
080 HG
081 TL
082 PB
083 BI
090 TH 230
090 TH 232
092 U
092 U 232
092 U 233
092 U 234
092 U 235
092 U 236
092 U 238
093 NP 236
093 NP 237
094 PU 236
094 PU 238
094 PU 239
094 PU 240
094 PU 241
094 PU 242
095 AM 241
095 AM 242
095 AM 243
096 CM 244
098 CF 252

Status of Data Compilation at the Centres

Note from the secretaries: The following statistics have been prepared by each of the Centres for inclusion with the letter from the Centres to G.A. Kolstad. As of 13 December 1972 no information had been received from CCDN.

Data-Compilation Statistics from NNCSC

NNCSC Statistics as of October 31, 1972

# of works assigned	290	
# of work sent	152	
# of works to be sent by 12/72	21	
# of works for which data has not been obtained	17	226
# of works for which author proofs have been sent and not yet returned	36	
# of works in process	64	

CCDN EXFOR Statistics

Status at 18.12.72
(counting from the beginning of EXFOR in
July 1970, excluding mere retransmissions)

	Received from			Sent by
	NNCSC	NDS	CJD	CCDN
Works	236	194	36	126
Subworks	2,289	1,377	294	1,202
Comment records	10,237	13,642	2,094	16,702
Data records	117,158	14,238	4,753	339,653

Estimates:

Time-lag between availability of data and awareness at CCDN :

~0 for data from main labs, $\leq$ 9 months for others.

" " " awareness at CCDN and incorporation into internal (NEUDADA) file :

~2 to 4 months in 85% of all cases, ~5 to 12 months for "problem" data.

" " " awareness at CCDN and EXFOR transmission :

~6 to 18 months typically, e.g. our EXFOR tape 2005 of 8.9.72 contained data from May 1972 and data reported at the Knoxville conference (August 1971).

Percentage of data available since the beginning of EXFOR (July 1970) entered into EXFOR :

~60% (~80% of data important for reactor calculations).

EXFOR Compilation Statistics at NDS

NDS distributed 6 transmission tapes between

No. 3003 on 4 Feb 1971 and
No. 3008 on 13 Dec 1972.

(The first two transmission tapes contained trial entries and dictionaries.)

These included 201 entries (works) with 1389 subentries (data-sets). In addition, 246 subentries were revised and re-transmitted. (The revisions were due to revisions by the authors, adding of more information due to new publications, and some corrections of compilation mistakes.)

These included 54 entries (works) with 409 subentries (data-sets) and 81 revised subentries of data published in the years 1969-1972. It is believed that data of these four years have been transmitted with a completeness of about 60%. For another 25% (20-25 entries) data are available at NDS and are envisaged to be transmitted in March 1973. For the remaining 15% data are requested from the author but not yet received, and some publications dated 1972 will become available only in 1973.

For the years 1968 and earlier it is believed that 85-90% of existing data have been transmitted including the almost completed Dastar-Exfor conversion. The last 10 Exfor-entries resulting from Dastar-conversion are planned for transmission in March 1973. Remaining gaps are likely to concern mostly less important data such as scattering data on obscure chemical compounds.

EXFOR Compilation Status at CJD

As of 1 December 1972, four EXFOR exchange tapes have been transmitted by the Obninsk Center to the other three centers. These tapes contain 36 EXFOR entries. By the first of January 1973 the next tape (4006) will be transmitted. At some time shortly thereafter corrections for tapes 4002 and 4003 will be transmitted. By the end of March 1973 tape 4001 will be transmitted as well as tape 4007 with about 10 entries. The interface problems with the Western type magnetic tape units have been solved and tape production can proceed on a routine basis. The center expects to transmit about two EXFOR tapes every three months in the future. The center has a capacity of producing approximately 100 EXFOR entries per year.

For the period from the inception of EXFOR (since 1970) there are approximately 150 works from the USSR to be compiled. The present backlog of untransmitted works is between 100 and 120. We expect to transmit at least 50% of these works before 1 January 1974 as well as all current works. Some of the backlog results from inability to obtain data rapidly from the authors, but we will continue our efforts to obtain the needed information as rapidly as possible.

As far as the period before the inception of EXFOR is concerned at the present time 65 works have been already coded and will be transmitted before June 1973.

The future compilation activities at CJD will assign top priority to the compilation of current data sets and those from the period 1970-1972 which are still untransmitted. Lower priority will be assigned to the conversion of DASTAR (from USSR) and other data not yet on files but obtainable.

V. Manokhin

30 November 1972

4C - Meeting Agenda Item IIe.

Status of conversion from DASTAR to EXFOR

Priorities for conversion were assigned as follows:

Priority 1 - Isotopes most needed for reactors and shielding.
Priority 2 - everything else.

Conversion from DASTAR to EXFOR started in February 1970.

The following table shows the progress made:

	From Feb 1970 to Oct 1971	From Nov 1971 to Oct 1970	Total
Priority 1	226	28	254 DASTARS
Priority 2	26	1	27 DASTARS

The 29 DASTARS converted in the last year have resulted in 14 EXFOR entries (50 subentries). All have been transmitted to the other centres.

Most of the DASTARS were not straight forward conversions, but involved considerable updating and revision of the data.

The following are still waiting for conversion:

Priority 1 - 77 DASTARS
Priority 2 - 111 DASTARS

Comments on EXFOR

by

J.R.Lemley

A possible criterion of the success of an Exchange Format (EXFOR) is whether all data available at one Center are also available at all the other Centers. In order to avoid the statistical effects of the masses of data accumulated in various data centers before establishment of the regular exchange system, probably only data compiled since the EXFOR system began operation in 1970 should be considered. A more instantaneous measure of the success of EXFOR would be a comparison of the rate at which data are compiled into a center's internal system with rate at which data are transmitted to other centers. An examination of the time interval between compilation in an internal system and transmission in EXFOR format might also be an appropriate criterion.

Since only a relatively small fraction* of the existing experimental data have been measured in the NDS service area, prompt and complete transmission of data to us from the other Centers is essential in order for us to answer data requests which originate in the NDS service area. At present most requests for experimental data cannot be satisfactorily answered only with data already in the NDS library. However, the inadequate content of the NDS library is to a great extent compensated by the rapid responses received from most other Centers in answer to our follow-up requests for data necessary to answer the specific requests. Generally in order to facilitate rapid response to our follow-up requests, we ask for and accept retrievals in the user format of the other centers. A consequence of this is that the same data might have to be requested more than once since after the first request the data could not be entered permanently in our internal system. The number of our follow-up requests to the

* Perhaps 7% according to an analysis of CINDA entries by Nigel Tubbs. See the report on the last 4C-Meeting , INDC(NDS)-41, p. 61-62.

other centers could be significantly reduced by more frequent and complete transmission of new experimental data in regular exchange tapes.

At present, many of the data in the NDS library are archival in the sense that archival data have ceased to evolve. In many cases we receive data only after they have become archival. Ideally NDS would like to maintain on file the latest version of every experiment in progress and be able to update the file instantaneously whenever there is a revision or an addition to the data.

Since NDS is heavily dependent on the other Centers for many significant data sets, both old and new, we would be willing to consider compromises and changes in the EXFOR rules provided they result in more complete and up-to-date data libraries at all the Centers.

1. We would consider accepting first-version machine (or manual) translation from the various internal systems, even if they contained only keywords AUTHOR, LABORATORY, (REFERENCE), ISO-QUANT STATUS, HISTORY and a data section. If you have an automatic translation button, please push it frequently and send us the results.
2. We would prefer not to have transmission of a data set delayed for months in order to receive an author-approved version on the first transmission. (The proposal by NNCSC to introduce a status entry for "not-author-approved" should be discussed. Such a flag should not replace explicit identification of the source of the data, however.)
3. We would accept (and process) the increased number of retransmissions necessary to update preliminary or incomplete entries.
4. We would consider proposals to simplify EXFOR or to make it more compatible with existing internal systems in order to make translation into EXFOR less consuming of time and manpower.

NDS is particularly interested in information which other centers may have about the types of scientists who use their data and about uses to which the data (including bibliographic information) are put. Such information might suggest modification of the types and formats of information to be included in EXFOR. NNCSC and CCDN have both suggested eliminating certain coded and hence retrievable information, and we agree that their proposals should be discussed particularly in connection with the experience of the Centers and with user "feed back". If, for example, evaluators were the only users of the bibliographical data, perhaps only the keywords AUTHOR, LABORATORY, ISO-QUANT and REFERENCE should be retained because evaluators would presumably want to read the important references thoroughly anyhow. What information in addition to the numerical data do experimental physicists use? NDS welcomes commentary and statistics from the other Centers which might help to analyze these questions.

In the future the Centers may want to exchange other types of (nuclear) data in addition to neutron data. At present, the RENDA system is being expanded to accommodate requests for other types of data in addition to neutron data. EXFOR could perhaps be rather easily adapted for the exchange of other types of reaction data, but it is apparently less appropriate for exchange of information on decay schemes and gamma spectra. In addition to

the anticipated proposals for inclusion of fission fragment data and gamma production data in EXFOR, we welcome the views of the other Centers on the anticipated future of international data exchange and the Data Center System.

Review of unsolved items from 4C-Memos

Items which have been discussed but not solved, and actions that have not or only partially been fulfilled, are listed below. Excluded are corrections to EXFOR entries.

4C-2/21 11 Oct. 71

Page 1 item 3: The question about which secondary numerical data (As standards, half-lives etc.) must be entered in numerical form under COMMON or BIB, has not yet been solved. Continued 4C-3/52 last page, 4C-2/25 page 3.

4C-1/19 8 Nov. 71

The proposed rules for unobtainable data (STATUS = UNOBT) should be entered in LEXFOR.

4C-3/43 30 Nov. 71

Paragraphs 4 and 5 on page 15 should be included on page IX.2 of the Manual. These were omitted in X4-5 without reason. Paragraph 4 was amended in page 2 of 4C-2/23. See also 4C-3/60 page 5 item 7.

4C-2/23 17 Jan. 71

The proposal in the second paragraph of page 2 should be entered in an appropriate place of the Manuals. (Concerning non-retroactive nature of new proposals.)

4C-3/47 1 Jan. 72

NDS expressed the need of giving complete bibliography in EXFOR . No objection was received, but exchange tapes received still contain insufficient bibliographic information. See also 4C-3/57 middle of page 6 and 4C-3/63 re entries 1.0048. and 1.0207.

4C-3/48 Jan. 72

NDS pointed out some extremely important fission data which should be compiled in EXFOR with top priority. From NDCC we got at least an immediate NEUDADA retrieval on this subject but the response through EXFOR transmission was extremely incomplete.

4C-3/51 19 Jan. 72

There are different opinions about alter flags in ENTRY and SUBENTRY records. (page 1 item 5)

4C-3/52 20 Jan. 72

Last page: Comments on 4C-2/21 item 3 about secondary numerical data.

4C-1/21 1 Feb. 72

Page 31 NDS encounters much unnecessary trouble, when the HISTORY of a corrected entry does not state clearly what has been changed. See also 4C-1/22 item 4.

4C-1/22 18 Feb. 72

Page 1 item 3. NDS disagrees that source of data is not needed after author approval is received. It is also against agreements to put the source of data under REFERENCE. See also 4C-3/63.

4C-2/28 27 March 27

Some questions on retransmission of corrected entries are discussed, which may need further consideration.

4C-3/58 3 Aug. 72

A few of the errors listed that were found in X4-5 have not been corrected yet.

4C-3/59 16 Agu. 72

The errors found in LX4-3 were not yet corrected.

4C-2/30 1 Sept. 72

Flagging of independent variables in dictionary 24. Question to NNCSC. General and other modifiers p.3.

4C-2/31 5 Sept. 72

Keywords and codes, see also 4C-1/30

Agenda Item IIIb.

Attached is a chart showing the types and number of mistakes found on EXFOR tapes.

The following TRANS tapes were considered: -

1003	2002	3003	4002
1004	2003	3004	4003
1005	2004	3005	4004
1006	2005		
1007	2006		
1008	2007		
1009			

If the same (or very similar) mistake was made throughout an entry, it was only counted once.

The following were not included, as they can be considered "a matter of taste": -

- Missing references;
- Additional data tables found in the main reference but not compiled;
- STATUS; the use of this keyword is very varied among centres; in many cases DEP was (perhaps) missing;
- HISTORY; again, use varies among centres; often not used to indicate corrections;
- FLAG; sometimes used in data-tables of one line; sometimes in SAN=001, when not pertaining to whole entry.

Most of the mistakes in Quantity fell into the following categories: -

- Syntax mistakes (missing comma or parenthesis);
- Missing or wrong function (eg. DE);
- Missing or wrong modifier (mostly REL and PAR);
- Confusion between GEM, ING, INL.

Most of the data-heading mistakes at NDS were the use of EN-ERR when EN-RSL should have been used.

Most of the RESID-NUC errors were omissions of the G, M1 etc. extensions.

CENTRE	1	2	3	4
ISOTOPE (COMPOUND, NUCLIDE) WRONG				
QUANTITY WRONG				
DATA HEADING AND/OR UNITS WRONG				
MISTAKE IN NUMERICAL DATA (including data missing – except half-lives)				
DECIMAL POINT MISSING IN DATA TABLE OR COMMON				
ID AND/OR COUNTS ON SYSTEM IDENTIFIERS WRONG.				
STANDARD WRONG OR MISSING				
INSTITUTE WRONG				
REFERENCE WRONG				
PART-DET WRONG OR MISSING				
RESID-NUC WRONG				
* KEYWORD/CODE WRONG OR MISSING (FACILITY, N-SOURCE, SAMPLE, METHOD, ANALYSES, DETECTOR)				
UNCLEAR TEXT				
INCONSISTENCY BETWEEN ISO-QUANT AND DATA.				

*Does not include "free text missing".

Cumulative Analysis of Record Types in EXFOR Transmission

For every EXFOR transmission tape received by or dispatched from CCDN, Potters routinely tabulates the number of entries, subentries and records of each type. In the following tabulation the unabbreviated headings for columns 4 through 8 are "Bibliographical Records", "Common Records", "Data Records", "System Records" and "Total Records", respecitvely.

The quantity of new data transmitted in EXFOR is somewhat misrepresented by these statistics because the following two types of data have been included without separate itemization.

(1) The statistics include data which were converted from obsolete internal formats into EXFOR and subsequently transmitted. Such data are generally old and frequently obsolete. They were anyhow available previously from at least one Centre and therefore theoretically from all.

(2) The statistics include retransmissions of previously transmitted entries which have been altered. The subwork totals for each area may be adjusted for retransmitted subentries using the information given in the last table.

EXFOR rules have always required complete retransmission of any subentry which has been changed in any way. In spite of the resulting redundancy in transmission, complete retransmission has been the simplest infallible method for making alterations without introducing errors. Proposals to relax this rule were introduced on a trial basis at this Meeting.
See 4CM/VIII/X4.

EXPOR TAPES OF AREA 1, NNCSC DATE 10/10/72

TAPE NO	WORKS	SUBWORKS	BIB REC.	COMM.REC.	DATA REC.	SYST.REC.	TOT.REC.	DATE	MESSAGES
1001	17	99	618	9	11545	888	13060	22/06/71	
1002	16	196	871	86	10763	2000	13720	19/07/71	
1003	15	67	428	27	16975	660	18090	26/08/71	
1004	9	30	194	6	26447	273	26920	24/09/71	
1005	30	203	1335	144	10768	2243	14490	03/01/72	
1006	27	752	2729	631	8142	8633	20135	18/04/72	
1007	8	109	404	96	8278	1255	10033	15/05/72	
1008	30	215	809	125	10215	2270	13419	21/06/72	
1009	34	209	1021	98	7397	2121	10637	10/08/72	
1010	9	435	1015	379	2351	5036	8781	06/09/72	
10	195	2315	9424	1601	112881	25379	149285	IN 28 MONTHS	

EXFOR TAPES OF AREA 2, NDCC DATE 10/10/72

TAPE NO	WORKS	SUBWORKS	BIB REC.	COMM.REC.	DATA REC.	SYST.REC.	TOT.REC.	DATE	MESSAGES
2001	9	228	4270	86	38462	2306	45124	18/11/70	
2002	1	9	136	0	40317	93	40546	25/03/71	
2003	1	7	113	0	35767	75	35955	26/03/71	
2004	5	12	300	0	22478	112	22890	27/03/71	
2005	97	733	9163	337	5688	7428	22616	08/09/71	
2006	3	42	835	15	30335	431	31616	02/07/72	
2007	1	8	200	3	39824	93	40120	03/07/72	
2008	1	8	103	0	83154	84	83341	07/09/72	
2009	8	155	1582	59	43628	1549	46818	08/09/72	
9	126	1202	16702	500	339653	12171	369026	IN 28 MONTHS	

EXFOR TAPES OF AREA 3, NDS DATE 10/10/72

TAPE NO	WORKS	SUBWORKS	BIB REC.	COMM.REC.	DATA REC.	SYST.REC.	TOT.REC.	DATE	MESSAGES
3001									MISSING
3002									MISSING
3003	49	336	2542	87	1294	3185	7108	03/02/71	
3004	33	297	1910	41	1825	2737	6513	13/05/71	
3005	27	198	2112	94	4680	2018	8904	03/01/72	
3006	53	371	3185	103	3729	3524	10541	24/06/72	
3007	27	138	1461	35	918	1260	3674	26/09/72	
5	189	1340	11210	360	12446	12724	36740	IN 28 MONTHS	

EXFOR TAPES OF AREA 4, CJD DATE 10/10/72

TAPE NO	WORKS	SUBWORKS	BIB REC.	COMM.REC.	DATA REC.	SYST.REC.	TOT.REC.	DATE	MESSAGES
4001									MISSING
4002	14	76	435	30	736	728	1929	23/12/70	
4003	8	59	685	12	1669	725	3091	10/09/71	
4004	7	108	513	37	1737	1142	3429	29/06/72	
3	29	243	1633	79	4142	2595	8449	IN 28 MONTHS	

EXFOR TAPES OF ALL CENTRES, DATE 10/10/72

	CENTRE	NO TAPES	WORKS	SUBWORKS	BIB REC.	COMM.REC.	DATA REC.	SYST.REC.	TOT.REC.	DATE LAST TAPE
1	NNCSC	10	195	2315	9424	1601	112881	25379	149285	06/09/72
2	NDCC	9	126	1202	16702	500	339653	12171	369026	08/09/72
3	NDS	5	189	1340	11210	360	12446	12724	36740	26/09/72
4	CJD	3	29	243	1633	79	4142	2595	8449	29/06/72
TOTAL GEN.		27	539	5100	38969	2540	469122	52869	563500	IN 28 MONTHS

SUBWORKS

	Centre	NoSubw	Retransm	New Subw
1	NNCSC	2315	236	2079
2	NDCC	1202	0	1202
3	NDS	1304	121	1219
4	CJD	243	0	243
TOTAL GEN.		5100	357	4743

WRENDA: World Request List for Nuclear Data

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* Page numbers in 4CM/VIII/16 refer to the internal sequential numbering which appears under the document number in the upper right corner of each page.

General comments

1. The system has been split into two separate files; viz - the Request File and the Status File. The two files are linked by the Z,A,Q key.

2. By an agreed date within each cycle, each center should transmit to NDS two files: - 1: Input to the Request File
2: Input to the Status File.

3. With only very minor changes, the formats of these two files are those agreed at the 4 Centre Meeting.

4. Each request has a 4-digit number assigned by the centre, of which the first digit is the centre-number. This number will never change, and must be unique for new requests submitted within any one year. This number, preceded by the year-of-request will be considered as the unique request-identification (REQU-ID). (Note that year-of-request is the year when the request was initiated, and will never change). When converting the master file to the new system NDS will reassign request-numbers to all the present requests, based on these rules.

5. If anything within a request has been altered between transmissions, then the complete request should be transmitted, with its original REQU-ID and the appropriate status code.

6. Requests may be transmitted in any order, although we would prefer to have them sequenced by REQU-ID (col. 71-76).

7. Within a request, records should be ordered by card-type (col. 77). When merging requests at publication time, care will be taken not to interfere with this sequence within any one request, i.e. the requester's comments will not be separated from his request.

8. Requests which are "satisfied" or "withdrawn" should not be sent in the transmission for the Request File, but should be sent as two separate lists, by REQU-ID only.
A satisfied request is a request which the original requester or relevant local committee considers to be satisfied, (i.e. the measurement has been made to the required accuracy). It will not appear in the main listing at publication time, but in a separate list following the main one and will thereafter be dropped from the publication.
A withdrawn request is a request which the original requester or relevant local data committee considers is no longer needed. (Usually because the measurement is no longer relevant to existing programs, or existing data is now considered to be sufficient). It will be referenced at the end of the publication following its withdrawal and then dropped completely.

9. A block of entries to the status file is defined by the same Z,A,Q and energy-type. The status file is divided in this way for the purpose of review. In the published WRENDA, all the requests for a given Z,A,Q will be printed, followed by the status comments for each energy-type.

10. There may in fact be very few status comments coming from the centres. For example, many US requests have "STATUS-NONE", in which case nothing would be sent.

11. NDS could send a copy of both master files to the other centres immediately after the files are closed for publication.

12. NDS could send to the other centers, listings (or tapes) of the requests originating from their area, sorted by country, together with relevant status comments, for use in updating requests.

13. NDS is willing to supply all the WRENDA programs, as they become operational, to any centre who is interested. The programs will be written in PL/I for running under O.S.

14. The character set to be used is the same as for EXFOR.

Input to Request File

Request Card

(Card-type A.) First card of each request. One and only one per year/ request number.

col. 1 - 2 S. 2 character element symbol. Left adjusted.
FP ≡ FPROD in the CINDA and present RENDA sense.

3 - 5 A. 3 digits with leading zeroes. (000 for natural elements).
OR, 3 characters for compounds as used in EXFOR and CINDA.

6 Blank.

7 - 26 Projectile, Reaction-modifier. Up to 20 character string left adjusted in field with a comma separating the two codes.
See Page 10 for projectile codes.
See Page 11 for reaction-modifier codes.

27 - 30 Blank.

31 - 36 E-min. (ev). n.nn±m or blank.

37 Blank.

38 - 43 E-max. (ev). n.nn±m or blank.

44 Blank.

45 - 46 Application code. Up to 2 characters, left adjusted in field.
See Page 13.

47 Blank.

48 Priority code. 1 character. See Page 14.

49 Blank.

50 - 53 Accuracy (in %) nn.n or blank.

54 - 69 Presently unused.

70 Status code. 1 character. See Page 14.

71 - 72 Year of request. 2 digits.

73 - 76 Request number. 4 digits, of which the first is the area-code (as for EXFOR).

77 Card-type 'A'

78 - 80 Blank.

Name card

(Card-type B) Second card of each request. There may be more than one B-card, but all institutes must be from the same country in one request. Multiple countries necessitates multiple requests.

col. 1 - 15	Blank.
16 - 18	Institute. 3 character code, left adjusted. The last 3 characters of the EXFOR codes, which should be the same as the CINDA codes.
19	Blank.
20 - 55	Requester's name. Up to 36 characters, left adjusted in field. Same coding procedure as EXFOR.
56 - 70	Presently unused.
71 - 72	Year of request. As on card-type A.
73 - 76	Request number. As on card-type A.
77	Card-type. 'B'
78 - 80	Blank.

Comments Card (Card-type C,D,E) These cards give further free text comments on the reaction and accuracy, if needed, and the reason for the request.

col. 1 - 19	Blank.
20 - 69	Free text comments.
70	Blank.
71 - 72	Year of request. As on card-type A.
73 - 76	Request number. As on card-type A.
77	Card-type: 'C' for comments which further specify the reaction.
	'D' for comments which further specify the required accuracy and resolution.
	'E' for comments concerning the reason for the request and any further information the requester may care to include.
78 - 80	Blank.

Note: The comments cards must be in C,D,E order.

WRENDA REQUEST FORM
IAEA NUCLEAR DATA SECTION

Numbers	Letters
0, Ø zero	Ø
1 one	L, I
2, Z two	Z
5 five	S
7 seven	J

Coded ..... Checked .....

Punched ..... Verified .....

Repeat on each card. →

Request Year	Request Number
71	73 76

S A Projectile, Reaction-modifier

S	A	Projectile, Reaction-modifier	Energy (ev) Min ±	Energy (ev) Max ±	Appl. Code	Prior. Code	Accuracy %	Status Flag	
1	3 5	7 26	31 36	38 43	45 46	48	50 53	70	77 A

Institute Requesters Name

Institute	Requesters Name	
16 18	20 55	77 B
		B
		B
		B
		B

Requesters' Comments on reaction (C), accuracy (D) and reason etc. (E).

Comments	Card-type* (C, D or E)
20 69	77

*In sequence C, D, E.

Input to Status File

First card of each comments-block. One and only one per block.

col. 1 - 2	S.	2 character element symbol. Left adjusted.
		FP ≡ FPROD in the CINDA and present RENDA sense.
3 - 5	A.	3 digits with leading zeroes. (000 for natural elements)
		OR, 3 characters for compounds as used in EXFOR and CINDA.
6		Blank.
7 - 26	Projectile, Reaction-Modifier.	Up to 20 character string,
		left adjusted in field with a comma separating the two codes.
		See Page 10 for projectile codes.
		See Page 11 for reaction-modifier codes.
27 - 30		Blank.
31 - 40	Energy-type.	Up to 10 character code, left adjusted. See Page 15.
41 - 77		Presently unused.
78 - 79	Card sequence.	'01'
80		Blank.

Second and following cards of each comments-block.

col. 1 - 50	Reviewer's comments.	
51 - 77		Presently unused
78 - 79	Card sequence.	'02', '03', etc.

Note: It is recommended that card number 2 contain the name and institute of the reviewer, but this is optional.

WRENDA STATUS FORM

IAEA NUCLEAR DATA SECTION

Numbers	Letters
0, Ø zero	Ø
1 one	I, I
2, 2 two	Z
5 five	S
7 seven	J

Coded ..... Checked .....

Punched ..... Verified .....

S A Projectile, Reaction-modifier Energy type

1 2 3 5 7 26 31 40

Card Sequence

0,1

Reviewers Comments

Name and Institute. (optional) →

50

0,2
0,3
0,4
0,5
0,6
0,7
0,8
0,9
1,0
1,1
1,2

Incident particle (projectile) codes

0 - No incident particle

G - Photon

N - Neutron

P - Proton

D - Deuteron

T - Triton

3 - Helium-3

A - Alpha

LI6 - Lithium-6

More to be added, as required.

This list also defines the sorting order.

The following table gives a list of the quantities recognized by WRENDA and their sorting order.

Quantity (Reaction-modifier) Codes

LDP	Level density parameters
LQN	Discrete level structure (Energy and spin and parity)
TOT	Total cross section
EL	Elastic cross section
EL,DA	Differential elastic cross section
INL	Inelastic cross section
INL,DA	Differential inelastic cross section
INL,DE	Energy distribution of inelastic neutrons
INL,DA/DE	Double differential (energy, angle) inelastic cross section
THS	Thermal scattering law
SCT	Total scattering cross section (elastic + inelastic)
SCT,DA	Differential total scattering cross section
NON	Non-elastic cross section
ABS	Absorption cross section
G	Capture cross section
G,DE	Energy distribution of capture gamma rays
ING	Photonproduction cross section in inelastic scattering
GEM	Total photon production cross section
N	Neutron production cross section e.g. (p,n)
2N	Two neutron production cross section e.g. (n,2n)
3N	Three neutron production cross section e.g. (n,3n)
NEM	Neutron emission cross section
P	Proton emission cross section e.g. (n,p)
NP	Neutron and proton emission cross section e.g. (n,np)
D	Deuteron emission cross section
ND	Neutron and deuteron emission cross section e.g. (n,nd)
T	Triton emission cross section
NT	Neutron and triton emission cross section
3	Helium-3 emission cross section
A	Alpha emission cross section
F	Fission cross section

NF	Second chance fission cross section
ALF	Capture to fission ratio e.g. (N,G/N,F)
ETA	Number of neutrons emitted per neutron absorption
NON/ETA	Number of neutrons emitted per non-elastic process
NU	Number of neutrons emitted per fission
NU,,DL	Information on delayed fission neutrons
NU,,FF	Information on neutrons emitted by a given fragment
NU,DE	Energy spectrum of fission neutrons
F,DE,,G	Spectrum of prompt gamma rays emitted in fission
F,,TER	Fission product mass yield spectrum
F,,,FF	Information on energy, angle or velocity distribution of fission fragments
RES	Resonance parameters
ABS,RI	Absorption resonance integral
G,RI	Capture resonance integral
F,RI	Fission resonance integral

The following changes from the current RENDA are recommended.

1) The "quantity modifiers will no longer exist. They will be relegated in most cases to the comments to a request. In some cases where important they have been made a part of the WRENDA quantity definition. In particular this applies to resonance parameters (RP), inelastic gamma rays (DNG), non-elastic gammas (NEG), neutron emission (NEM), n,2n, n,3n, etc.

2) Deleted were

CHG	Fragment Charge
REM	Disappearance
ACT	Activation
FPG	Fission Product Gammas
NPR	Neutron Production
RIR	Activation Resonance Integral

Application Codes.

Rb	Fission Reactors.
RA	" " , Core Physics.
RB	" " , Shielding.
RC	" " , Dosimetry.
RD	" " , Radiation Damage.
Fb	Fusion.
Nb	Safeguards.
Sb	Space

Priority Codes.

1 digit codes.

For fission reactors, as used in current RENDA,

see RENDA 72, pages vi and vii.

For fusion a different criteria has been approved by the International Fusion Council, see INDC(NDS)-45/L, page 46.

Status codes.

+	New request.
A	Modified due to partial satisfaction.
B	Modified due to partial withdrawal.
C	Altered - minor changes which do not affect the menaing of the request.

Energy-Type Codes

THERMAL	-	Thermal energy range
RESONANCE	-	Resonance energy range
FAST	-	Fast energy range
THERM.AV.	-	Thermal spectrum averages
FISS.AV.	-	Fission spectrum averages

This list also defines the sorting order.

WRENDA REQUEST FORM
IAEA NUCLEAR DATA SECTION

Numbers	Letters
0, Ø zero	Ø
1 one	I
2, Z two	Z
5 five	S
7 seven	J

Coded ..... Checked .....

Punched ..... Verified .....

Repeat on each card. → Request Year: 69 | Request Number: 1001

S	A	Projectile, Reaction-modifier	Energy (ev) Min ±	Energy (ev) Max ±	Appl. Code	Prior. Code	Accuracy %	Status Flag	
1	3 5	7 26	31 36	38 43	45 46	48	50 53	70	77
PU	240	N, RES	1.00+2	5.00+3	RA	3	10.	+	A

Institute	Requester's Name	
16 18	20 55	77
AML	R.A.AVERY	B
LMB	P.B.HEMMING	B
		B
		B
		B

Requesters' Comments on reaction (C), accuracy (D) and reason etc. (E).

Card-type* (C, D or E)

10 69	77
NEEDED FOR FAST REACTOR CALCULATIONS INCLUDING	E
DOPPLER EFFECT.	E

*In sequence C, D, E.

WRENDA REQUEST FORM
IAEA NUCLEAR DATA SECTION

Numbers	Letters
0, Ø zero	Ø
1 one	I
2, Z two	Z
5 five	S
7 seven	J

Coded ..... Checked .....

Punched ..... Verified .....

Repeat on each card. →

Request Year	Request Number
69	2001

S	A	Projectile, Reaction-modifier	Energy (ev) Min ±	Energy (ev) Max ±	Appl. Code	Prior Code	Accuracy %	Status Flag	
PU	240	N, GEM	1.20+5		RA	3	20.	+	A

Institute: WIN

Requester's Name: C. G. CAMPBELL

	B
	B
	B
	B
	B

Requesters' Comments on reaction (C), accuracy (D) and reason etc. (E).

	Card-type* (C, D or E)
GAMMA SPECTRUM NEEDED.	C
LOW RESOLUTION FOR NEUTRON ENERGY ADEQUATE.	D
FOR STUDY OF ACTIVATION AND HEAT RELEASE IN CORE.	E

*In sequence C, D, E.

WRENDA REQUEST FORM
IAEA NUCLEAR DATA SECTION

Numbers	Letters
0, Ø zero	Ø
1 one	I, I
2, Z two	Z
5 five	S
7 seven	J

Coded ..... Checked .....

Punched ..... Verified .....

Repeat on each card. →

Request Year (71–72)	Request Number (73–76)
66	1002

S (1)	A (3–5)	Projectile, Reaction-modifier (7–26)	Energy (ev) Min ± (31–36)	Energy (ev) Max ± (38–43)	Appl. Code (45–46)	Prior. Code (48)	Accuracy % (50–53)	Status Flag (70)	(77)
PU	240	N, INL	4.50+4	1.00+7	RA	2	20.	+	A

Institute (16–18)	Requester's Name (20–55)	(77)
GE	T.SNYDER	B
ANL	P.B.HEMMIG (1969)	B
		B
		B
		B

Requesters' Comments on reaction (C), accuracy (D) and reason etc. (E).

(10–69)	Card-type* (C, D or E) (77)
EMISSION CROSS SECTION MIGHT BE EQUALLY USEFUL AT	C
THE HIGHER ENERGIES.	C

*In sequence C, D, E.

WRENDA STATUS FORM

IAEA NUCLEAR DATA SECTION

Numbers	Letters
0, Ø zero	Ø
1 one	I
2, Z two	Z
5 five	S
7 seven	J

Coded ..... Checked .....

Punched ..... Verified .....

S	A	Projectile, Reaction-modifier	Energy type	Card Sequence
1 2	3 5	7 26	31 40	
PU	240	N, RES	RESONANCE	0,1

Reviewer's Comments

Name and Institute. (optional) →

JOLY I(SACLAY)	0,2
THE IMPORTANT DISCREPANCY ON GAMMA-GAMMA ACCORDING	0,3
TO GEEL, HARWELL AND RPI HAS TO BE SOLVED.	0,4
	0,5
	0,6
	0,7
	0,8
	0,9
	1,0
	1,1
	1,2

Internal record format of Request File

col.	1 - 2	Application code
	3 - 5	Z
	6 - 8	A (internal numerical equivalent for compounds)
	9 - 11	Projectile (internal numerical equivalent)
	12 - 15	Reaction-modifier (internal numerical equivalent)
	16	Priority
	17	Status code
	18 - 19	Year of request
	20 - 23	Request number
	24	Card-type
	25 - 26	Card sequence within type
	27	Area code - first character from Request number
	28 - 30	Country code
	31 - 80	Columns 1 - 44 and 50 - 53 of card type A;
		" 16 - 55 of card type B;
		" 20 - 69 " " " C,D,E.

Col. 1 - 23 and col. 27 - 30 are constant on all records within one request.

Col. 3 - 15 define a "block" at book-printing.

Master file: sorted by: Year of request; request number; card-type; card sequence number.

Book sort: Application code; Z; A; projectile; reaction-modifier; year of request; request number; card-type; card sequence number.

Reviewer sort: Z; A; etc. as for book.

4-Centre sort: Area; country; Z; A; etc. as for book.

Internal record format of Status File.

col. 1- 3	Z
4 - 6	A (internal numerical equivalent for compounds)
7 - 9	Projectile (internal numerical equivalent)
10 - 13	Reaction-modifer (internal numerical equivalent)
14 - 15	Energy type (internal numerical equivalent)
16 - 17	Card sequence within type
18 - 67	Columns 1 - 40 of first card Columns 1 - 50 of second and following cards.
68 - 72	Presently unused.

Col.1 - 15 define a "block" at book-printing, and are constant for all records within a "block".

Master file: sorted by: Z; A; Projectile; Reaction-modifier; Energy-type; card-type; card-sequence.

Book sort: same as master file.

WRENDA SORT

WRENDA	EXFOR	RENDA	CINDA
		NPR	NPR
		NPRA	NPR
		NPRE	NPR
		NPRT	NPR
	ACT	ACT	ACT
	EL,POL		POL
	EL,POT		POT
	STF		STF
		CHG	CHG
		FPG	FPG
		REM	REM
		RIR	RIR
0,F	SF		
0,LDP	LDP	LDL	LDL
0,LQN		LVL	
0,NU	SF/NU		
A,N		AN	
G,F		GF	GF
G,N		GN	GN
N,2N	N2N	N2N	N2N
N,2N		N2NE	N2N
N,2N	N2N,DA	N2NA	N2N
N,2N	N2N,DA/DE	N2NT	N2N
N,3	N3	NH	NHE
N,3	N3,DA	NH A	NHE
N,3N	N3N	N3N	N3N
N,A	NA	NA	NA
N,A	NA,DA	NA A	NA
N,ABS	ABS	ABS	ABS
N,ABS,RI	ABS,RI	RIA	RIA
N,ALF	ALF	ALF	ALF
N,D	ND	ND	ND
N,D	ND,DA	ND A	ND
N,EL	EL	SEL	SEL
N,EL,DA	EL,DA	DEL	DEL
N,ETA	ETA	ETA	ETA
N,F	NF	NF	NF
N,F,DE,,G	NF,DE,,G	SFG	SFG
N,F,RI	NF,RI	RIF	RIF
N,F,,TER	NF,,TER	NFY	NFY
N,F,,,FF	NF,,,FF	FRS	FRS
N,G	NG	NG	NG
N,G,DE	NG,DE	SNG	SNG
N,G,RI	NG,RI	RIG	RIG
N,GEM	GEM	NEG	NEG
N,GEM	GEM,DE	NEGE	NEG
N,GEM	GEM,DA/DE	NEGT	NEG
N,ING	ING	DNG	DNG
N,ING	ING,DA	DNGA	DNG
N,ING	ING,DE	DNGE	DNG
N,ING		DNGT	DNG
N,INL	INL	SIN	SIN
N,INL,DA	INL,DA	DINA	DIN
N,INL,DA/DE	INL,DA/DE	DINT	DIN
N,INL,DE	INL,DE	DINE	DIN
N,NA	NNA	NNA	NNA
N,ND	NND	NND	NND
N,NEM	NEM	NEM	NEM
N,NEM		NEMA	NEM
N,NEM		NEME	NEM

N,NEM		NEMT	NEM
N,NON	NON	SNE	SNE
N,NON	NON,DA	SNEA	SNE
N,NON	NON,DE	SNEE	SNE
N,NON		SNET	SNE
N,NON/ETA	NON/ETA	ETA	ETA
N,NP	NNP	NNP	NNP
N,NT	NNT	NNT	NNT
N,NU	NU	NU	NU
N,NU,DE	NU,DE	SFN	SFN
N,NU,,DL	NU,,DL	NUD	NUD
N,NU,,FF		NUF	NUF
N,P	NP	NP	NP
N,P	NP,DA	NP A	NP
N,RES	-/WID	RP	RES
N,RES	-/PCS	RP	RES
N,SCT	SCT	SCT	SCT
N,SCT,DA	SCT,DA	SCTA	SCT
N,T	NT	NT	NT
N,T	NT,DA	NT A	NT
N,THS	THS	TSL	TSL
N,TOT	TOT	TOT	TOT
P,N		PN	

EXFOR SORT

WPENDA	EXFOR	RENDA	CINDA
		CHG	CHG
		FPG	FPG
		NPR	NPR
		NPRA	NPR
		NPRE	NPR
		NPRT	NPR
		REM	REM
		RIR	RIR
0,LQN		LVL	
A,N		AN	
G,F		GF	GF
G,N		GN	GN
N,2N		N2NE	N2N
N,ING		DNGT	DNG
N,NEM		NEMA	NEM
N,NEM		NEME	NEM
N,NEM		NEMT	NEM
N,NON		SNET	SNE
N,NU,,FF		NUF	NUF
P,N		PN	
N,RES	-/WID	RP	RES
N,RES	-/PCS	RP	RES
N,ABS	ABS	ABS	ABS
N,ABS,RI	ABS,RI	RIA	RIA
	ACT	ACT	ACT
N,ALF	ALF	ALF	ALF
N,EL	EL	SEL	SEL
N,EL,DA	EL,DA	DEL	DEL
	EL,POL		POL
	EL,POT		POT
N,ETA	ETA	ETA	ETA
N,GEM	GEM	NEG	NEG
N,GEM	GEM,DA/DE	NEGT	NEG
N,GEM	GEM,DE	NEGE	NEG
N,ING	ING	DNG	DNG
N,ING	ING,DA	DNGA	DNG
N,ING	ING,DE	DNGE	DNG
N,INL	INL	SIN	SIN
N,INL,DA	INL,DA	DINA	DIN
N,INL,DA/DE	INL,DA/DE	DINT	DIN
N,INL,DE	INL,DE	DINE	DIN
0,LDP	LDP	LDL	LDL
N,2N	N2N	N2N	N2N
N,2N	N2N,DA	N2NA	N2N
N,2N	N2N,DA/DE	N2NT	N2N
N,3	N3	NH	NHE
N,3	N3,DA	NH A	NHE
N,3N	N3N	N3N	N3N
N,A	NA	NA	NA
N,A	NA,DA	NA A	NA
N,D	ND	ND	ND
N,D	ND,DA	ND A	ND
N,NEM	NEM	NEM	NEM
N,F	NF	NF	NF
N,F,DE,,G	NF,DE,,G	SFG	SFG
N,F,RI	NF,RI	RIF	RIF
N,F,,TER	NF,,TER	NFY	NFY
N,F,,,FF	NF,,,FF	FRS	FRS
N,G	NG	NG	NG
N,G,DE	NG,DE	SNG	SNG

N,G,RI	NG,RI	RIG	RIG
N,NA	NNA	NNA	NNA
N,ND	NND	NND	NND
N,NP	NNP	NNP	NNP
N,NT	NNT	NNT	NNT
N,NON	NON	SNE	SNE
N,NON	NON,DA	SNEA	SNE
N,NON	NON,DE	SNEE	SNE
N,NON/ETA	NON/ETA	ETA	ETA
N,P	NP	NP	NP
N,P	NP,DA	NP A	NP
N,T	NT	NT	NT
N,T	NT,DA	NT A	NT
N,NU	NU	NU	NU
N,NU,DE	NU,DE	SFN	SFN
N,NU,,DL	NU,,DL	NUD	NUD
N,SCT	SCT	SCT	SCT
N,SCT,DA	SCT,DA	SCTA	SCT
0,F	SF		
0,NU	SF/NU		
	STF		STF
N,THS	THS	TSL	TSL
N,TOT	TOT	TOT	TOT

RENDA SORT

WRENDA	EXFOR	RENDA	CINDA
	EL,POL		POL
	EL,POT		POT
	STF		STF
0,F	SF		
0,NU	SF/NU		
N,ABS	ABS	ABS	ABS
	ACT	ACT	ACT
N,ALF	ALF	ALF	ALF
A,N		AN	
		CHG	CHG
N,EL,DA	EL,DA	DEL	DEL
N,INL,DA	INL,DA	DINA	DIN
N,INL,DE	INL,DE	DINE	DIN
N,INL,DA/DE	INL,DA/DE	DINT	DIN
N,ING	ING	DNG	DNG
N,ING	ING,DA	DNGA	DNG
N,ING	ING,DE	DNGE	DNG
N,ING		DNGT	DNG
N,ETA	ETA	ETA	ETA
N,NON/ETA	NON/ETA	ETA	ETA
		FPG	FPG
N,F,,,FF	NF,,,FF	FRS	FRS
G,F		GF	GF
G,N		GN	GN
0,LDP	LDP	LDL	LDL
0,LON		LVL	
N,2N	N2N	N2N	N2N
N,2N	N2N,DA	N2NA	N2N
N,2N		N2NE	N2N
N,2N	N2N,DA/DE	N2NT	N2N
N,3N	N3N	N3N	N3N
N,A	NA	NA	NA
N,A	NA,DA	NA A	NA
N,D	ND	ND	ND
N,D	ND,DA	ND A	ND
N,GEM	GEM	NEG	NEG
N,GEM	GEM,DE	NEGE	NEG
N,GEM	GEM,DA/DE	NEGT	NEG
N,NEM	NEM	NEM	NEM
N,NEM		NEMA	NEM
N,NEM		NEME	NEM
N,NEM		NEMT	NEM
N,F	NF	NF	NF
N,F,,TER	NF,,TER	NFY	NFY
N,G	NG	NG	NG
N,3	N3	NH	NHE
N,3	N3,DA	NH A	NHE
N,NA	NNA	NNA	NNA
N,ND	NND	NND	NND
N,NP	NNP	NNP	NNP
N,NT	NNT	NNT	NNT
N,P	NP	NP	NP
N,P	NP,DA	NP A	NP
		NPR	NPR
		NPRA	NPR
		NPRE	NPR
		NPRT	NPR
N,T	NT	NT	NT
N,T	NT,DA	NT A	NT
N,NU	NU	NU	NU

N,NU,,DL	NU,,DL	NUD	NUD
N,NU,,FE		NUF	NUF
P,N		PN	
		REM	REM
N,ABS,RI	ABS,RI	RIA	RIA
N,F,RI	NF,RI	RIF	RIF
N,G,RI	NG,RI	RIG	RIG
		RIR	RIR
N,RES	-/WID	RP	RES
N,RES	-/PCS	RP	RES
N,SCT	SCT	SCT	SCT
N,SCT,DA	SCT,DA	SCTA	SCT
N,EL	EL	SEL	SEL
N,F,DE,,G	NF,DE,,G	SFG	SFG
N,NU,DE	NU,DE	SFN	SFN
N,INL	INL	SIN	SIN
N,NON	NON	SNE	SNE
N,NON	NON,DA	SNEA	SNE
N,NON	NON,DE	SNEE	SNE
N,NON		SNET	SNE
N,G,DE	NG,DE	SNG	SNG
N,TOT	TOT	TOT	TOT
N,THS	THS	TSL	TSL

CINDA SORT

WRENDA	EXFOR	RENDA	CINDA
0,F	SF		
0,LQN		LVL	
0,NU	SF/NU		
A,N		AN	
P,N		PN	
N,ABS	ABS	ABS	ABS
	ACT	ACT	ACT
N,ALF	ALF	ALF	ALF
		CHG	CHG
N,EL,DA	EL,DA	DEL	DEL
N,INL,DA	INL,DA	DINA	DIN
N,INL,DE	INL,DE	DINE	DIN
N,INL,DA/DE	INL,DA/DE	DINT	DIN
N,ING	ING	DNG	DNG
N,ING	ING,DA	DNGA	DNG
N,ING	ING,DE	DNGE	DNG
N,ING		DNGT	DNG
N,ETA	ETA	ETA	ETA
N,NON/ETA	NON/ETA	ETA	ETA
		FPG	FPG
N,F,,,FF	NF,,,FF	FRS	FRS
G,F		GF	GF
G,N		GN	GN
0,LDP	LDP	LDL	LDL
N,2N	N2N	N2N	N2N
N,2N	N2N,DA	N2NA	N2N
N,2N		N2NE	N2N
N,2N	N2N,DA/DE	N2NT	N2N
N,3N	N3N	N3N	N3N
N,A	NA	NA	NA
N,A	NA,DA	NA A	NA
N,D	ND	ND	ND
N,D	ND,DA	ND A	ND
N,GEM	GEM	NEG	NEG
N,GEM	GEM,DE	NEGE	NEG
N,GEM	GEM,DA/DE	NEGT	NEG
N,NEM	NEM	NEM	NEM
N,NEM		NEMA	NEM
N,NEM		NEME	NEM
N,NEM		NEMT	NEM
N,F	NF	NF	NF
N,F,,TER	NF,,TER	NFY	NFY
N,G	NG	NG	NG
N,3	N3	NH	NHE
N,3	N3,DA	NH A	NHE
N,NA	NNA	NNA	NNA
N,ND	NND	NND	NND
N,NP	NNP	NNP	NNP
N,NT	NNT	NNT	NNT
N,P	NP	NP	NP
N,P	NP,DA	NP A	NP
		NPR	NPR
		NPRA	NPR
		NPRE	NPR
		NPRT	NPR
N,T	NT	NT	NT
N,T	NT,DA	NT A	NT
N,NU	NU	NU	NU
N,NU,,DL	NU,,DL	NUD	NUD
N,NU,,FF		NUF	NUF

	EL,POL		POL
	EL,POT		POT
		REM	REM
N,RES	-/WID	RP	RES
N,RES	-/PCS	RP	RES
N,ABS,RI	ABS,RI	RIA	RIA
N,F,RI	NF,RI	RIF	RIF
N,G,RI	NG,RI	RIG	RIG
		RIR	RIR
N,SCT	SCT	SCT	SCT
N,SCT,DA	SCT,DA	SCTA	SCT
N,EL	EL	SEL	SEL
N,F,DE,,G	NF,DE,,G	SFG	SFG
N,NU,DE	NU,DE	SFN	SFN
N,INL	INL	SIN	SIN
N,NON	NON	SNE	SNE
N,NON	NON,DA	SNEA	SNE
N,NON	NON,DE	SNEE	SNE
N,NON		SNET	SNE
N,G,DE	NG,DE	SNG	SNG
	STF		STF
N,TOT	TOT	TOT	TOT
N,THS	THS	TSL	TSL

Existing programs and plans for automated data processing at NDS

1. The basic EXFOR program system is working. Compilation format is similar to but not identical with EXFOR format. The check program which checks NDS-made entries and incoming exchange tapes will be expanded to include validity-checks of ISO-QUANT and cross-checks between ISO-QUANT, data headings, data units etc. Retrieval is made by (sub)entry-numbers only; the (sub)entry-numbers required are retrieved from Cindu. Energy-retrieval within a subentry will be added. Requester's output format(s) may require further studies.

2. A computation format is planned, so far restricted to data that are a function of E only (total, fission and other cross-sections, eta, alpha, nu -bar). The purpose of the computation format is twofold: automated data processing such as plotting, and to give users a compact numerical table aside from the text part of EXFOR. Only those EXFOR data will be converted to the computation format that are requested in this format for a specific purpose, and no data are stored in this format. Conversion from EXFOR to the computation format requires
   - unification of data units; the conversion factors exist in the units-dictionary.
   - unification of data representation such as conversion of data given as $\sigma\sqrt{E}$ into σ.
   - renormalization of different data sets to consistent standard values. This will only be done at the request of the user. It is envisaged to try to renormalize data automatically - this requires that standard values, where applicable, are entered in EXFOR in retrievable form.

Automated renormalization requires that a separate file with up-to-date standard cross-sections be held ; such a file will anyway be needed as a service to customers.

All data files held at NDS, including evaluated data, must be convertible to the computation format.

3. Request-Log and Data-Distribution-Log will eventually be compared automatically with new Limbo input and with incoming transmission tapes, in order to check

   * whether a new EXFOR entry meets a request, in particular a standing request;
   * whether a corrected EXFOR entry must be sent to somebody who received the old version of the entry.

CINDA Publication Schedules

Attached are the detailed schedules for CINDA 73, main volume and supplement, and outline schedules for CINDA 74. These were agreed upon at a meeting on 19 Oct. 1973, Present were: -

Publication division - Mr. Metzendorf
Mr. Dietl
CCDN - Dr. Fröhner
NDS - Mrs. Attree
Dr. Lemmel
Mr. Lammer

Detailed schedule for CINDA 73 main volume

1 May 1973	Deadline for last entries to reach CCDN.
21 May 1973	CINDA 73 master tape received by NDS from CCDN. All tables needed for Appendices (in particular lab-and ref-codes) received by NDS from CCDN.
6 June 1973	Processing at NDS completed and tapes shipped to ZMD.
26 June 1973	Linotron processing completed and film shipped to NDS.
1 August 1973	Printing and binding completed. Ready for distribution.

Note: It was agreed that Mr. Metzendorf's division would be kept informed of the progress with the new CINDA computer systems, in the hope that the above schedule could be brought forward, even by a few days. Printing during the summer months is a problem.

Detailed schedule for CINDA 73 Supplement

1 Oct. 1973	Deadline for last entries to reach CCDN.
29 Oct. 1973	CINDA 73 Supplement master tape received by NDS from CCDN. All tables needed for Appendices received by NDS from CCDN.
12 Nov 1973	Processing at NDS completed and tapes shipped to ZMD.
23 Nov. 1973	Linotron processing completed and film shipped to NDS.
1 Jan. 1974	Printing and binding completed. Ready for distribution.

Publication schedule for CINDA 74.

CINDA 74 main volume.	CCDN deadline	1 March 1974
	Publication date	1 June 1974
CINDA 74 Supplement	CCDN deadline	1 Sept. 1974
	Publication date	1 Dec. 1974

LIST OF ACTIONS

Action Number	Defining Paragraph in 4CM/VIII/MIN	Responsible Centre/person	Action pertaining to
1.	3	all Centres	provide statistics on compilation for letter to Kolstad.
2.	10	NDS	inform INDC of problems of obtaining data from authors.
3.	13	all Centres	prepare recommendation to editors of journals about types of information which the Centres need to have included in journal articles.
4.	15	all Centres	prepare for the next meeting an agreement on common quantities and formats for the statistical reports of all centres.
5.	21	all Centres	acknowledge receipt of all tran-tapes promptly.
6.	24	NNCSC	revise EXFOR Manual page IX.2
7.	27	all Centres	investigate possiblity of retransmitting only the BIB section of a subentry.
8.	34	NNCSC	submit condensed versions of Dictionaires 18,19,21-23.
9.	39	NNCSC	circulate publication schedule for BNL-325.
10.	41	NNCSC	prepare LEXFOR entry on types of gamma spectra data to be compiled; introduce new quantity codes if necessary.
11.	41	NNCSC	investigate priorities for compilation of gamma spectra data.
12.	41	NNCSC	investigate coordination of compilation effort with other groups who compile gamma spectra data.
13.	45	all Centres	improve the completeness of CINDA.
14.	48	Pearlstein	explore increase of U.S. CINDA effort with appropriate authorities.
15.	51	Tubbs	send CINDA-input check program to NDS.

Action Number	Defining Paragraph in 4CM/VIII/MIN	Responsible Centre/Person	Action pertaining to
16.	53	CCDN	distribute a detailed proposal on machine addition of data index lines to CINDA blocks.
17.	62	NDS	discuss with INDC proposed annual publication of WRENDA.
18.	64	CCDN	evaluate the possibility of allowing more than one comment line per data-index line in CINDA.
19.	68	NDS	refer the topic of Common Evaluation Procedure to INDC.
20.	69	all Centres	send existing supplementary information for evaluated data files such as 2200m/sec values, 20° Maxwellian average cross sections, etc.
21.	79	Schmidt	inquire deadlines for next CODATA Compendium.
22.	79	all Centres	contribute to the CODATA Compendium according to guidelines obtained by Schmidt.
23.	82	NDS	recirculate List of Actions from this Meeting two months prior to next meeting.
	Defining Paragraph in 4CM/VIII/X4		
24.	4CM/VIII/X4, Part I	NNCSC	MAke the numerous revisions of the EXFOR manual agreed at the 8th 4C Meeting.
25.	4CM/VIII/X4, Part II	NNCSC	Make the numerous revisions of the LEXFOR manual agreed at the 8th 4C Meeting.
26.	4CM/VIII/X4, Part III	NDS	Make the dictionary revisions agreed at the 8th 4C Meeting.
	Defining Paragraph in 4CM/VIII/X4		
27.	15	CCDN	submit LEXFOR entry on the RAW modifier.
28.	18	NDS	submit LEXFOR entry on experimental methods for fission-product yields.
29.	19	NNCSC	submit LEXFOR entry on all Polarization and Asymmetry quantity-codes.
30.	20	NNCSC	submit LEXFOR entry about Multilevel Resonance Parameters.

Action Number	Defining Paragraph in 4CM/VIII/X4	Responsible Centre/Person	Action pertaining to
31.	21	NNCSC	submit LEXFOR entry listing all strictly monoisotopic and nearly monoisotopic elements.
32.	22	NNCSC	submit LEXFOR entry on independent variables.
33.	38B	CCDN	revise the LEXFOR entry on two-dimensional tables.
34.	38C	NDS	submit LEXFOR revision to include warning about references which contain superseded data.
35.	48-52	NNCSC	submit final shortened versions of Dictionaries 18-19, 21-23
36.	63	all Centers	transmit in EXFOR the important fission data listed in Memo 4C-3/48.
37.	65	NDS	submit shortened versions of the EXFOR/LEXFOR manuals.

LIST OF RECOMMENDATIONS

Rec. Number	Defining Paragraph in 4CM/VIII/MIN	Recommendation to	Recommendation
1.	10	all Centres	tabulate statistics for data requests by Z-A-Quantity
2.	17	all Centres	communicate promptly information which might affect operations or scheduling of work at other Centres
3.	25	all Centres	comply as soon as possible with new EXFOR correction procedures involving Column 80 of certain records.
4.	29	NDS	produce itemized chart of errors found on EXFOR transmission tapes.
5.	30	CJD	use correct system identifiers.
6.	32	all Centres	continue development of EXFOR checking programs
7.	39	CCDN, NDS, CJD	transmit heavy nuclei data to NNCSC immediately; needed for BNL-325.
8.	40	all Centres	begin compilation of fission-yield data
9.	66	all Centres	prepare indexes of evaluated data exclusively from information released by the originating centre
10.	81	CCDN, NDS, CJD	request specific ENDF/B data sets simultaneously from NNCSC and USAEC when unreleased data has been used as a standard reference cross section
11.	82	all Centres	circulate new proposals at least 2 months prior to next meeting