International Atomic Energy Agency

INDC(NDS)-133/NE

INDC INTERNATIONAL NUCLEAR DATA COMMITTEE

IAEA Advisory Group Meeting

on

Nuclear Structure and Decay Data

Zeist, The Netherlands
11 - 14 May 1982

SUMMARY REPORT

Edited by A. Lorenz
Nuclear Data Section
International Atomic Energy Agency

August 1982

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Abstract

The IAEA Nuclear Data Section convened the fifth meeting of the international nuclear structure and decay data network at Zeist near Utrecht, in The Netherlands, 11 - 14 May 1982. The meeting was attended by 24 Scientists from 11 Member States and 2 international organizations, concerned with the compilation, evaluation, and dissemination of nuclear structure and decay data.

Foreword

The international nuclear structure and decay data (NSDD) network, consisting of numerous evaluation groups and data service centres, aims at a complete and continuous nuclear structure data evaluation of all isobaric mass-chains on a four-year cycle, the continuous publication of these evaluations and their dissemination to the scientific community. The evaluated mass-chain data resulting from this concerted international effort are published in Nuclear Physics A and the Nuclear Data Sheets, and comprise the currently recommended "best values" of all nuclear structure and decay data. The international NSDD network has evolved from the long-standing cooperation between the US effort, initiated by the Oak Ridge Nuclear Data Group and presently coordinated by the National Nuclear Data Centre at the Brookhaven National Laboratory, and the effort at the Rijksuniversiteit at Utrecht in the Netherlands.

Periodic meetings of this network have the objectives to maintain the coordination of all centres and groups participating in the compilation, evaluation and dissemination of NSDD, to maintain and improve the standards and rules governing NSDD evaluation, and to review the development and common use of the computerized systems and data bases maintained specifically for this activity.

DEFINITION OF TERMS

Nuclear Structure Data: numerical values of nuclear level structure and decay parameters and associated atomic parameters of pertinence to nuclear techniques and methods.

Tabulation: systematic collection and transcription of numerical information without critical selection or manipulation.

Compilation: systematic collection and transcription of information on a given subject with collation and re-organization for optimal presentation to the users.

Evaluation: critical appraisal of all available information compiled on a given subject and derivation of consistent best or preferred values with their uncertainties.

Mass-chain (vertical): pertaining to properties of nuclides with a given mass number.

Selected (horizontal): pertaining to a particular nuclear property or properties for a range of nuclides.

List of Abbreviations

CAJaD	Centre for Data on the Structure of the Atomic Nucleus and Nuclear Reactions of the USSR State Committee on the Utilization of Atomic Energy, located at the Kurchatov Institute in Moscow.
CBNM	Central Bureau for Nuclear Measurements, located at Geel, Belgium.
CODEN	International code for the abbreviation of periodical titles used by ASTM, INIS and Chemical Abstracts.
CPND	Charged Particle Nuclear Data.
EBCDIC	Extended binary-coded decimal interchange code.
ENSDF	Computer-based Evaluated Nuclear Structure Data File developed by US/NDP.
EXFOR	Exchange Format, internationally used format for the exchange of experimental nuclear reaction data.
FIZ	Fachinformationszentrum Energie, Physik, Mathematik GmbH, Eggenstein-Leopoldshafen, FRG.
IAEA/NDS	Nuclear Data Section of the International Atomic Energy Agency.
INDC	International Nuclear Data Committee.
INIS	International Nuclear Information System, operated by the IAEA, to replace Nuclear Science Abstracts.
KACHAPAG	Karlsruhe Charged Particle Group.
LIYaF	Leningrad Institut Yadernoy Fiziki: Data Centre of the Leningrad Nuclear Physics Institute of the USSR Academy of Sciences.
NSR	Nuclear Structure Reference (file).
NDS	Nuclear Data Sheets.
NSDD	NSD data = Nuclear Structure and Decay Data.
US/NNDC	US National Nuclear Data Centre, located at the Brookhaven National Laboratory.
US/NDP	Nuclear Data Project located at the Oak Ridge National Laboratory.

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I. Summary of the Meeting

A. Introduction

The fifth Advisory Group Meeting on Nuclear Structure and Decay Data (NSDD) was convened by the IAEA Nuclear Data Section in Zeist near Utrecht, in the Netherlands, 11 - 14 May 1982. The meeting was attended by 24 Scientists from eleven Member States and two international organizations, representing centres and groups concerned with the compilation, evaluation and dissemination of nuclear structure and decay (NSD) data. The list of participants is given in Appendix 1.

The meeting was conducted in two separate sessions; the morning sessions, devoted to the coordination of the NSDD network of centres and groups, were chaired by A. Lorenz and S. Pearlstein; the afternoon sessions, devoted to physics questions related to the evaluation of NSDD, were chaired by P. Twin. The Adopted Agenda is given in Appendix 2, and the list of papers submitted to the meeting by the participants is given in Appendix 3.

B. Objectives

The international NSDD Network, consisting presently of 16 evaluation groups in 11 Member States and 2 international data service centres, aims at a complete and continuous nuclear structure data evaluation of all isobaric mass-chains on a four year cycle, the continuous publication of these evaluated data, and their dissemination to the scientific community. This international cooperative effort is coordinated by the Nuclear Data Section of the IAEA.

The periodic meetings of the international NSDD network, have the objective of maintaining the coordination of all centres and groups participating in the compilation, evaluation and dissemination of NSDD, to maintain and improve the standards and rules governing NSDD evaluation, and to review the development and common use of the computerized systems and data bases maintained specifically for this activity.

All members of the international NSDD network are referred to in the text of this report by their identification code agreed at the May 1976 NSDD meeting. A current list of these centres, together with their codes and addresses, is given in Appendix 26.

C. Conclusions and Recommendations

While a more detailed account of the meeting proceedings is given in Part II of this report, the main achievements, summarized as conclusions and recommendations, are listed below. The Actions which resulted from this meeting are listed in Appendix 4.

Summary of Conclusions and Recommendations

- The meeting reviewed the status of the international NSDD Network, the progress of mass-chain evaluations, and the current mass-chain evaluation assignments. It concluded that even though a mass-chain evaluation cycle of four years had not yet been achieved, the overall progress was satisfactory.

- The meeting adopted priority criteria in the choice of mass-chains to be evaluated.

- The meeting reviewed and adopted revised procedures for the processing of mass-chains evaluations and procedures for the review of mass-chain evaluations prior to their publication.

- The meeting reviewed the status of the Nuclear Structure Reference File and of the Evaluated Nuclear Structure Data File (ENSDF), and discussed procedures for updating these files.

- The meeting discussed the ENSDF physics data processing codes and recommended required changes.

- The meeting reviewed and adopted formal procedures for the approval and adoption of format change proposals and/or procedural changes for ENSDF and the Nuclear Data Sheets.

- The meeting reviewed the status of all nuclear structure and decay data publications and recommended necessary changes.

- The meeting agreed on a geographical distribution of the responsibility to provide NSDD user services.

- The meeting discussed the physics of NSDD evaluation, came to a number of agreements with regard to terminology, and made substantial physics recommendations aimed at the improvement of the standards and rules governing NSDD evaluation.

D. Summary of NSDD Network Coordination Sessions
(Summarized by S. Pearlstein)

Agenda items C, D, E, and F concerning evaluation status, assignments, procedures, computer codes, publications, and services were discussed apart from nuclear physics considerations in so far as the subjects are separable.

Good process has been made in the evaluation of mass chains since the last meeting two years ago. Three groups had nearly completed their mass chain assignments and all other groups except a newly starting one had published A-chains. One group increased its commitment and other groups offered to help other groups until all A-chains had been evaluated at the least once by the NSDD network. The NNDC will recommend redirection of A-chain traffic as needed. The network

recommended that the frequency for subsequent evaluations be proportional to the intensity of research activity. Although the cycle time for evaluations is still considerably less than the ideal 4-year cycle, the cycle time should shorten with additional experience. There is no dead wood in the NSDD network. Existing groups are active and new evaluation groups are likely to join.

The NNDC undertakes to provide assistance to evaluations by the distribution of monthly reference lists and relatively computer independent physics analysis codes and improved documentation. The list of codes contains some originally written by ORNL and some developed by BNL. A schedule was presented for the availability of physics analysis, checking, and plotting codes. Some replacement codes were offered by members of the NSDD network. As a reult of an extensive BNL cleanup the computerized files were believed to be in very good condition and not likely to cause any processing difficulty.

The responsibility for publication of mass chains in Nuclear Data Sheets (NDS) and the maintenance of the Evaluated Nuclear Structure Data File (ENDF) has now been completely transferred to the NNDC at BNL who shall receive and will transmit all relevant material. Although publication of NDS is taking place monthly there is currently a 6-month back dating of issues due to previous delays. To streamline the editing of evaluations for publication and to clarify formats for evaluators and computer programmers a Style Manual was introduced by BNL in advance of the NSDD meeting. The Style Manual describes the conventions the evaluators are expected to use in preparing manuscripts for publication. Included are a complete description of formats to help insure a uniform interpretation of ENSDF data. The Style Manual will also include the minimum requirements for evaluations. The Style Manual exists in draft form. Comments are requested by 1 July 1982 for inclusion in a revised edition. Similar draft documentation exists for Nuclear Structure References (NSR), the computerized file from which Recent References is published. Comments are requested for revision on the same schedule. The material is computerized for easy updating. Although the formats and procedures for both ENSDF and NSR are expected to be relatively stable, proposed changes should be addressed to BNL who will evaluate and process proposals in consultation with the editors and other experts. If the contributions to ENSDF conform to the Style Manual computerized retrievals of data will be less problematic and the editing of manuscripts for NDS will be facilitated.

Several publications by the NSDD network are derived from ENSDF data. Since data in the range A = 5 to 44 are published without entry into ENSDF, completion of ENSDF is attempted through a cooperative effort. The project is only partially complete.

The next NSDD meeting should address the following areas:

1. Completion of NSDD evaluation assignments.
2. Recycling of evaluations on a priority basis.
3. Improvement of documentation of formats and procedures for ENSDF (Style Manual) and NSR.
4. Discussions of NSDD services and editorial functions.
5. Status of NSDD computer codes.
6. Completeness of ENSDF for computerized retrievals.

E. Next Meeting of the NSDD Network

a) Time and Place

The next meeting of the NSDD network was proposed to be held at the Fachinformationszentrum (FIZ) at Karlsruhe, Federal Republic of Germany, in May 1984. The exact date is to be specified by IAEA not later than May 1983.

II. Meeting Proceedings

A. NSDD NETWORK COORDINATION

A.1. Review of Actions from last meeting

April 1980 Meeting Actions were reviewed. For the full text of these Actions, the reader is referred to Appendix 4 of the 1980 NSDD Meeting Summary Report (INDC(NDS)-115/NE). Standing actions from the 1977 and 1980 meetings were adopted as continuing actions and are included in this meeting's List of Actions, Appendix 4.

Recommendations from the 1980 meeting were noted, and relegated for discussion and review under the pertinent agenda item of this meeting.

A.2. Status Reports from NSDD Network Members

Status reports made by the members of the NSDD network are reproduced in this report as Appendices. Summaries of these presentations and the reference to the relevant Appendix are given below.

1. Report on the NSDD Activities in the USSR. F.E. Chukreev. Appendix 5.

2. Status Report. Japanese Activities in Nuclear Structure and Decay Data. Z. Matumoto and T. Tamura. Appendix 6. (Recorded as AG-380/21).

3. Status Report. Fachinformationszentrum Energie, Physik, Mathematik GmbH, Karlsruhe, Federal Republic of Germany. H. Behrens and J.W. Tepel. Appendix 7. (Recorded as AG-380/22).

4. Statement on CBNM Activity in Evaluation and Compilation. W. Bambynek. Appendix 8. (Recorded as AG-380/24).

5. Progress Report from the University of Gent Group. P. DeGelder. Appendix 9.

6. Status Report from the French-Belgian group. J. Blachot. Appendix 10.

7. NEA/DB Customer Service from the ENSDF/NSR Files. G. Coddens. Appendix 11. (Recorded as AG-380/27).

8. Status Report. Nuclear Data Project in Kuwait. D.A. Viggars. Appendix 12. (Recorded as AG-380/28).

9. Status Report. United Kingdom. P.J. Twin. Appendix 13. (Recorded as AG-380/29).

10. Status Report. Nuclear Structure and Decay Data Evaluation in Sweden. P. Ekstroem and J. Lyttkens. Appendix 14. (Recorded as AG-380/29).

11. Status Report from the Utrecht Group. P.M. Endt and C. van der Leun. Appendix 15.

12. Status Report on Nuclear Structure and Decay Data Evaluation Project in Canada. J. Kuehner and J. Szuecs. Appendix 16. (Submitted after the meeting).

13. U.S. Contributions to International Cooperation in the Evaluation of Nuclear Structure Data. S. Pearlstein, J. Tuli, M. Martin, J. Dairiki, and R. Bunting. Appendix 17. (Recorded as AG-380/9).

A.3. Mass-Chain Evaluation Assignment and Status

A.3.1. Current Mass-Chain Evaluation Status

The mass-chain evaluation status of April 1982 (submitted at the meeting as AG-380/10) is given in Table I and in Table II. Table I shows which mass-chains are in progress, in review, or published within the current four-year period, and Table II gives the number of mass-chains completed, in progress or not being evaluated in the current five-year period. In the current five-year cycle (1978-1982) 50 mass-chains are not being evaluated.

A.3.2. Assignment of Mass-Chains

The current mass-chain assignments were reviewed; the status as of May 1982 is shown in Table III. Note that the assignments shown in Table I reflect the situation as of April 1982 (i.e., before this meeting).

In addition, the following temporary assignments were announced:

- mass-chain 188 is to be evaluated by KUW/ISR,
- mass-chains 149 and 151 were being evaluated by CAN/TAL,
- mass-chains 50 and 150 are to be evaluated by US/NNDC,
- mass-chain 55 has been given to the Chinese Nuclear Data Centre, Institute of Atomic Energy, Peking, in context of a bilateral arrangement between US/NNDC and that Institute.

The network welcomed the participation of a new group at the University of Warsaw, under Prof. J. Zylicz. This group will initially undertake the evaluation of mass-chain 210, before assuming responsibility of a specific A-range.

Table I

STATUS OF MASS CHAIN EVALUATIONS

April, 1982

A Mass Chain Published
(A) Mass Chain Finished and in Review
[A] Mass Chain in Progress or Will Begin Work On

Center	Assignment	1979	1980	1981	1982
BNL	136-145	136,140,144	145	139	(138),(137),[146],[50]^{E},[150]^{E}
INEL	153-162	154,159^{B}	158		(157),(153),[160],[161]
LBL (Includes Canada and USSR)	146-152 163-194		163,191,152^{C}	193,188,189,185^{D}	(187),(190),(169),[181]^{B} [192],[174]
ORNL (Includes Sweden)	45-64 195-237 239,241,243 245-263	60,62,63,64 101,103,105 111,119	106,115,196 200,204,206 212,213,217 221,225	197,243,245,247 246,248,250,252 254,256,258,260 262,249,251,253 255,257,259,261,263	(210),[208],[232],[236] (107),(108),[231],[234] [235],[239],[198]
U of Penn	5-20	5,6,7,8,9,10	11,12	13,14,15	16,17,(18),(19),(20),[5],[6]
UK (Includes Kuwait)	65-80	71	72,73,77	75,68,78	[65],[66],[67],(79),(69),(80) [74],[76]
FRG	81-100	84,87	85,91,92		[93],(94),(95),(96),[97],[98]
FR-BLG	101-117	101,103,105	106,112,115^{A}	116	(114),(102),(107),(108),[104] [110],[109],[111],[117],[105]
Japan	118-129	119,121	123	125	[118],[120],[122],[124] (126),(127),(128),[129]
USSR	1-4 130-135,164, 166,238,240, 242,244			134 244	(1),(3),(4),[164],[166], (238),(242),[240]
Sweden	113,61			113	[61]
Canada	149,151				[149]
Utrecht	21-44				Done 1978, next cycle due 1982
China	55^{F}				[55]

A. Evaluations done by US/NNDC
B. Evaluation done by US/NDP
C. Evaluation done by C. M. Baglin (NIRA at Yale Univ.)
D. Evaluation done by B. Singh and D. A. Viggars of Kuwait Univ.
E. Evaluation being done by members of BNL Physics Department.
F. Informal arrangement through US/NNDC

Table II

STATUS OF MASS CHAIN EVALUATION

(April 1982)

	Number of Mass Chains						
	Assigned	Completed and/or in Review				In Progress	Remaining
		1978	1979	1980	1981	1982	#
Center							
US/NNDC	10+1[a]	3	3	2	3	1	0
US/INEL	10-1[b]	0	2	1	2	2	2
US/LBL	39-3[c]	0	0	3[c]	7[e]	3	23
US/NDP	85-1+1[b]	20	10	11	24	8	12
US/UP	16	3	6	2	8	2	0
Non-U.S. Centers							
UK/Kuwait	16	1	1	3	8	4	0
FRG/FIZ	20	1	2	3	3	3	8
FR/CEA and BLG/Gent	17-1[a]-1[d]	-	3	2[a]	5	5	0
JAP/JAERI	12	0	2	1	4	5	0
CAJAD and LIYaF	10+4[f]+2[c]	0	0	0	5	5	4
SWD/LUND	1[b]+1[d]	-	-	0	1	1	0
CAN/TAL	2	-	-	-	-	1	1
NED/Utrecht	24	24	-	-	-	-	0
China		-	-	-	-	1	-
						Total	50

Mass-Chains to be reassigned: 45-64, 146-152, 163-166

[a] A=112 of FR/CEA responsibility

[b] A=154 done by US/NDP; A=61 temporarily to SWD/LUND

[c] A=152 completed by NIRA; 164 and 166 temporarily to USSR/CAYaD

[d] A=113 temporarily to SWD/LUND

[e] A=188 done by UK-Kuwait

f Masses 1-4

Table III

Mass-Chain Assignment as of May 1982

A-Range	Number of mass-chains	Responsible NSDD Evaluation Groups
1 -4	4	USSR
5 -20	16	US/UP
21 -44	24	NED/UTRECHT
45 -58	14	Unassigned
59 -64	6	SWD/Lund
65 -75	11	UK/Liverpool
76 -80	5	KUW/ISR
81 -100	20	FRG/FIZ
101-117	17	FR-BLG
118-129	12	JAP/JAERI
130-135	6	USSR
136-145	10	US/NNDC
146-148, 150, 152	5	Unassigned
149, 151	2	CAN/TAL
153-162	10	US/INEL
164, 166	2	USSR
163, 165	2	Unassigned
167-194	28	US/LBL
195-237	43	US/NDP
238, 240, 242, 244	4	USSR
239, 241, 243, 245	4	US/NDP
246-263	18	US/NDP

A.3.3. Manpower Commitment

The revised "Manpower Commitment of Evaluation Groups" as of May 1982 is shown in Table IV. The Table shows that at the present time there are almost 24 evaluator man-years (not counting support staff) committed to this international effort.

Table IV

Manpower Commitment of Evaluation Groups
(As of May 1982)

Evaluation Group	Manpower Commitment (given in man-years (MY) of evaluator time)	
US/NNDC	2 1/2 MY plus 1 or 2 support	
US/NDP	2 1/2 MY plus 1 support	
US/LBL	2 1/2 MY plus 1/2 support	
US/INEL	1 MY plus 2 support	
US/UP	1/2 MY plus 1/2 support	
USSR/CAJaD	3 MY plus support staff	plus contracts with other organizations
USSR/LIYaF	2 MY plus support staff	
NED/UTRECHT	1/3 MY	
UK/Liverpool	1 MY	
FRG/FIZ	2 1/2 MY plus 1 support	
JAP/JAERI	1 MY plus support staff	
SWD/Lund	1 MY	
KUW/ISR	1 MY	
FR/CEA+BLG/Gent	1 1/2 MY plus support staff	
CAN/TAL	1 MY plus support staff	

A.3.4. Priorities in Mass-Chain Evaluation

The discussion on the priority criteria in the choice of mass-chains to be evaluated was introduced by a paper on "Priority Mass-Chains" by S. Pearlstein, included in this report as Appendix 18. The following recommendation was accepted by the meeting on this topic:

> Priority by the NSDD network should be given to completing all outdated A-chains for which they have responsibility. Before recycling their assignment the NNDC may ask their help in completing other A-chains that are in danger of not being evaluated at a frequency commensurate with the rest of the A-chains.
>
> The priority for reevaluation of A-chains should be proportional to the degree of research interest e.g., as measured by the number of references appearing since the last evaluation.

A.3.5. Procedure for Mass-Chain Evaluation and Review

In response to Action # 9 of the 1980 NSDD Meeting, US/NNDC has reviewed the mass-chain evaluation and review procedures, and has distributed it to the network as memorandum NS-1A/34. These procedures were presented at this meeting and were accepted by the network. The text of the procedures, reproduced below in their entirety, replace the "Normal Procedure for Mass-Chain Evaluation" and "Review Procedures" included in the Summary Report of the 1980 meeting (INDC(NDS)-115/NE).

The National Nuclear Data Center (NNDC) has the contractual responsibility for providing editorial services for Nuclear Data Sheets (NDS). Consequently, it has selected an editor and editor-in-chief. The editor, Jagdish Tuli, as well as support personnel and resources for editing and producing NDS and for maintaining the Evaluated Nuclear Structure Data File (ENSDF) reside with the NNDC. For continuity and assistance in maintaining high standards, the NNDC selected the head of the Nuclear Data Project (NDP), Murray Martin, to serve as Editor-in-Chief. The "Normal Procedure for Mass-Chain Evaluation" and "Review Procedures" are given below. These are essentially those adopted by the IAEA NSDD meetings of November 1977 and April 1980; however, they do reflect the changed NNDC responsibility which is already in effect for production, processing, and servicing of evaluations. In the discussion below, the term editor(s) refers to the composite of the editoral staff unless otherwise specified. The procedures given below, are applicable to all A-chains, except A=5-44.

A. NORMAL PROCEDURES FOR MASS-CHAIN EVALUATION

1. Evaluator notifies US/NNDC that evaluation is beginning for A = **. To avoid unnecessary duplication, prior arrangements should be made if the evaluation is outside evaluator's commitment.

2. NNDC send to the evaluator:

   a) Complete reference list for nuclei with A = **, and
   b) Complete listing of ENSDF card images for A = **.
   c) If unpublished, and if requested, an NDSLST-like listing will be provided.

3. NNDC continues to send monthly updates of NSR file reflecting new references added to the file for A = **.

4. As evaluation proceeds:

   a) Unusual documents are obtained by the evaluator from NNDC,
   b) Copies of private communications and other unusual sources are sent by the evaluator to NNDC for keynumber assignments and for inclusion in the NNDC library, and
   c) Parts of an A-chain may be sent to NNDC (cards or tape) for processing with NNDC programs which may not be available locally.

5. When the evaluation is complete, the evaluator will send all data sets for A = ** to NNDC, together with a transmittal form (reproduced here in Appendix 19) containing the processing information as detailed in J.K. Tuli memo NS-1A/28. Acknowledgement of receipt of the transmitted evaluations will be sent to the evaluator by BNL.

6. NNDC will place the data sets onto a temporary file, after correcting any serious format errors. (Evaluator will be informed of all changes. See 7).

7. NNDC will prepare from the submitted data sets:

   a) Preliminary tables, including tables of all data types from all data sets, in ENSDF-index order,
   b) Preliminary drawings, including a drawing for each data set and a summary drawing for the entire mass-chain,
   c) Preliminary reference list, and
   d) Preliminary abstract.

NNDC will also perform certain standard calculations and consistency checks on the submitted data sets. The preliminary manuscript and all relevant printouts will be sent to the evaluator, together with the current card listing. The records changed from the evaluator's original listing will be so indicated.

If these preliminaries suggest that major revisions of the data sets may be required, NNDC will also return a tape copy of the current data sets, together with some general comments about how the data sets must be improved; tapes will be returned in all cases if so requested. After the data sets have been expanded or corrected, the mass-chain should be re-submitted to NNDC as in item 5, above.

8. The evaluator will inform NNDC when the data sets for A = ** are complete.

9. NNDC will prepare two copies each of:

   a)Semifinal tables of data prepared in the standard order for Nuclear Data Sheets,
   b) Semifinal drawings organized into page layout,
   c) Semifinal reference list with all keynumbers identified,
   d) Semifinal abstract page, and
   e) Semifinal reference list.

   One copy will be sent to the evaluator; the other copy will be assigned to a referee for review (see review procedure).

10. The referee will send to the editor a report on the review of the submitted manuscript for "Nuclear Data Sheets for A = **". On the basis of the referee's report the editor will decide whether:

    a) The manuscript is accepted for publication in Nuclear Data Sheets, as regards completeness and correctness, and recommends prompt publication.
    b) The manuscript is generally satisfactory, but contains certain errors or omissions. The referee's report should document the problems in sufficient detail that the evaluator can take remedial steps.
    c) The first few pages of a manuscript contain substantive or systematic errors. The referee may reject it without further examination but clear justification must be presented in the written referee's report.

11. If a manuscript is accepted for publication in Nuclear Data Sheets (10a, above):

    a) The Editor will promptly notify the evaluator and assign a tentative publication data,
    b) Last minute corrections of typographical or other minor errors should be sent by the evaluator to NNDC,
    c) The Editor may also authorize changes in grammar, spelling, punctuation, and layout as may be required to ensure a uniform high quality for Nuclear Data Sheets (any such changes will be reported to the evaluator),
    d) The Editor shall send the final manuscript to the evaluator for proof-reading. Corrections of errors only shall be done and the manuscript submitted to the Editor by the Evaluator, within one week of receipt,
    e) The manuscript is now accepted for publication in Nuclear Data Sheets, and the evaluator's commitment to revise "Nuclear Data Sheets for A = **" has been completed, and
    f) NNDC will prepare final manuscript for publication (one preprint copy will be sent to the evaluator, when the photoready copy of the evaluation is sent to the publisher).

12. If the Referee has suggested minor changes (10b, above):

    a) The Editor will consider the referee's comments and send a copy of the Referee's report to the evaluator,
    b) The evaluator should mark data set revisions on one copy of the ENSDF card listing and return it to NNDC,
    c) NNDC will make the changes and prepare a revised semifinal manuscript (item 9, above), a copy of which will be sent to the evaluator, and
    d) The Editor may accept these changes as complying with the Referee's recommendation, or the Editor may make further consultation with the evaluator and the Referee until an acceptable manuscript is prepared. The manuscript is then processed as in item 11, above.

13. If the manuscript requires major revisions (10c, above):

    a) The Editor will consider the Referee's comments and send a copy of the Referee's report to the evaluator,
    b) The evaluator will make modifications at his own institution, and the manuscript should be re-submitted as in item 5, above and,
    c) The Editor may ask for a second Referee's opinion and proceed as in item 10, above.

14. After a manuscript has been accepted for publication in Nuclear Data Sheets; NNDC will

    a) will supply copies of reprints of article as received from Academic Press.
    b) Unless, expressly advised otherwise, replace all the old data sets for A = ** by the new data sets.
    c) Add a "Reference' data set containing keynumbers and the corresponding CODEN for all references contained in ENSDF for that A-chain.

15. If the evaluator believes that changes suggested by the Referee are not justified or are incorrect, an appeal, using the established arbitration procedure, may be made through the Editor.

B. REVIEW PROCEDURES

The review procedure adopted at the November 1977 IAEA NSDD meeting and endorsed at 1980 meeting has worked well and no major changes are proposed. There has been no occasion to invoke the arbitration clause in the review procedures and all matters were resolved between the editor, evaluator, and the referee. All A-chains are reviewed prior to their publication. The review procedure is summarized below:

1. Every A-chain to be published in the Nuclear Data Sheets journal will refereed.

2. Editors (Editor-in-Chief/Editor)
   It is the Editor-in Chief's responsibility to select referees, send guidelines to referees, consider referee's comments, send those comments which in his judgement are pertinent within the established guidelines to evaluators, consider evaluator's response, and supervise the review procedure (see below). The Editor-in-Chief in consultation with the Editor may delegate responsibility for specific mass chains to the Editor.

3. Referees

    a) The referee should be an experienced nuclear scientist from the international community.
    b) A scientist should preferably not be asked to referee more than one A-chain per year.
    c) Experienced NDS evaluators will referee the first A-chain from every new evaluator.
    d) Referee's comments and objections must be specific.
    e) In no case will a Referee rewrite an evaluation.
    f) Referee will be anonymous.

4. Arbitration
The responsibility for resolving disagreement between authors and referees is assigned to the Editor-in-Chief.

The Editor-in-Chief may consult with other experienced evaluators of NSDD to resolve such disagreements but retains authority to make final decisions.

In order to assure good quality in evaluation, particularly as the number of A-chains evaluated per year is likely to increase, it is important that as many experienced nuclear scientists should be solicited for refereeing purposes as possible. The Divisions of both the Nuclear Physics of APS and the European Physical Society have been approached for this purpose. The network was also requested to inform the Editor-in-Chief of Nuclear Data Sheets of the names of potential referees.

A.3.6. Network Membership

The list of all active and potential members of the NSDD network is given in Appendix 26.

It was agreed at the May 1976 NSDD meeting, that communication between network members should be in the form of NS-Memoranda carrying a designator identifying the originating centre by its code (see first column of Appendix 26). Each memorandum should therefore bear the following heading

NS-Memorandum-xx/n

where xx is the code of the originating centre and n is the number of the memorandum sent by that centre. Copies of all memoranda should be sent to IAEA/NDS.

A.4. NSDD Computer Files and Associated Programmes

A.4.1. Status of the Nuclear Structure Reference (NSR) File. (Reproduced from paper AG-380/16 by S. Ramavataram, US/NNDC).

The responsibility of maintaining and updating the Nuclear Structure Reference (NSR) File was transferred from the Nuclear Data Project (US/NDP) to the National Nuclear Data Center (US/NNDC) in October 1980. The 1980 Cumulative Edition of Recent References was published by US/NNDC.

The publication of the two four-monthly issues and the Cumulative Edition of Recent References for 1981 has proceeded smoothly. As an added convenience to the Scientific Community, the keynumbers assigned for the period September to December of each year will be underlined in the Cumulative issue. On the average about 4000 new entries are added to the File per year.

After the transfer to US/NNDC, the NSR Library was upgraded by improving the indexing procedure and eliminating superfluous Secondary References. A major cleanup of entries was carried out to distinguish Q-value selectors from those for quadrupole moment.

A tape of entries from Russian Journals and Secondary Sources was received from the compilers at USSR/LIYaF and successfully merged into the NSR file. Evaluator requests for References and Keynumbers are being handled promptly. As part of the Nuclear Data Sheet production activity at US/NNDC, the NSR File is updated for missing Codes, Reference, Authors, and Title.

US/NNDC has analyzed the contents of the NSR file. As of 15 April 1982, the file contained 86,644 entries of which 6301 have been entered by NNDC since the transfer from US/NDP. A breakdown of entries by publication year shows some interesting trends. The number of secondary references entered into NSR peaked in 1973 at 4788 and has declined steadily to approximately 1000 per year now. However, primary references have been maintaining a more or less steady level of entry, declining from 2700 per year in 1973-1974 to 2200 at present.

A tabulated content of the NSR File as of 15 April is shown in Table V.

A.4.2. Status of the Evaluated Nuclear Structure Data File (ENSDF)

a) ENSDF Status - (Reproduced from paper AG-380/13 by J.K. Tuli, US/NNDC).

The responsibility for the maintenance, update and distribution of ENSDF has been assumed by US/NNDC. The final update to the file was received from US/NDP in Dec. '81 and complete ENSDF was distributed to the network on Feb. 10, 1982.

As described in the NNDC memo NS/1A-30, ENSDF has been considerably cleaned up. Notable among the changes made were the removal of format records (NSDD recommendation at its 1980 meeting in Vienna), consistent I.D. records, correction of format errors and addition of reference data sets.

US/NNDC plans to send biannual updates of the file to the recipient centers. Those centers which have requested receiving complete file instead, would continue to receive full ENSDF every time.

Table V

Contents of the Nuclear Structure References File as of 15-Apr-82

Total References - 86644

References compiled at NDP - 80343

Compilation Statistics Since Transfer to NNDC

Year	Total	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1980	956										259	319	378
1981	4082	354	490	399	386	242	200	226	303	281	242	326	633
1982	1263	252	363	321	327								

1 Entries by Publication Year

Year	Total	NNDC	Prim.	Sec.	Year	Total	NNDC	Prim.	Sec.
1982	241	241	234	7	1945	18	0	18	0
1981	2703	2703	2196	507	1944	11	0	11	0
1980	3152	1839	2192	960	1943	20	0	20	0
1979	3964	703	2325	1639	1942	19	0	19	0
1978	4506	544	2377	2129	1941	37	0	37	0
1977	4969	138	2283	2686	1940	44	1	44	0
1976	4548	7	2407	2141	1939	52	1	52	0
1975	4937	9	2468	2469	1938	28	0	28	0
1974	5957	3	2689	3268	1937	27	0	27	0
1973	7563	4	2775	4788	1936	22	0	22	0
1972	6708	3	3523	3185	1935	42	0	42	0
1971	6068	1	3097	2971	1934	41	0	41	0
1970	4034	5	2678	1356	1933	25	0	25	0
1969	2912	1	2303	609	1932	20	0	20	0
1968	2339	2	2133	206	1931	17	0	17	0
1967	2213	0	2093	120	1930	10	0	10	0
1966	1927	4	1870	57	1929	4	0	4	0
1965	1676	1	1642	34	1928	5	0	5	0
1964	1777	1	1758	19	1927	4	0	4	0
1963	2052	2	2050	2	1926	1	0	1	0
1962	1893	1	1891	2	1925	1	0	1	0
1961	1800	2	1797	3	1924	5	0	5	0
1960	1765	0	1765	0	1923	0	0	0	0
1959	1208	0	1207	1	1922	0	0	0	0
1958	1199	1	1199	0	1921	0	0	0	0
1957	677	7	677	0	1920	1	0	1	0
1956	583	5	583	0	1919	0	0	0	0
1955	500	0	500	0	1918	1	0	1	0
1954	446	4	445	1	1917	0	0	0	0
1953	399	1	398	1	1916	0	0	0	0
1952	308	5	308	0	1915	0	0	0	0
1951	330	1	330	0	1914	1	0	1	0
1950	347	1	347	0	1913	0	0	0	0
1949	231	0	231	0	1912	0	0	0	0
1948	112	0	112	0	1911	0	0	0	0
1947	95	0	95	0	1910	1	0	1	0
1946	48	0	48	0					

b) ENSDF Content

The content of ENSDF as of 1 April 1982, as reported by US/NNDC is:

Card images:	4.3×10^5
Data Sets	
Adopted Levels, Gammas*	2017
Decay Data (including spontaneous fission)	2229
Reactions	3915
Comments	86
References	263
Total	8241

* Includes decay and reaction data sets for nuclei which have no adopted level data sets.

c) ENSDF Coding of A=5-44

In response to Action 28 of the 1980 NSDD Network meeting, US/NNDC coordinated an effort to merge the A=5-44 evaluations into ENSDF (see Memo NS-1A/16). The following centres agreed to collaborate in this effort:

US/NNDC	A = 5-12
US/NDP	A = 13-24
UK/Liverpool	A = 25-28
FR/Grenoble	A = 29-32
FRG/FIZ	A = 33-44

US/NNDC and FRG/FIZ reported that the coding to transform the data has been started, and that their contributions will be finished by the end of 1983.

Grenoble has finished its translation and has sent it to the Utrecht group for checking.

UK/Liverpool and US/NDP would look into their area of responsibility and determine what needs to be done beyond what has been done for these masses by W.B. Ewbank.

The meeting recommended that the participating groups should investigate that the coding has been performed in accordance with the minimum requirements. All participating groups agreed to continue their responsibilities for future updates.

Action # 21

d) Updating of ENSDF between major reviews (Summarized by D.A. Viggars)

Discussion of this topic resulted in the following conclusions:

- there was general agreement that ENSDF should contain only evaluated data;
- if mistakes are discovered in a mass-chain evaluation, the evaluator concerned should be notified, and provide the required errata for incorporation in ENSDF;
- Pearlstein offered to incorporate unreviewed addenda provided by evaluators between major evaluations into the ENSDF working file;
- Martin recommended that INDC publications giving evaluated data should refer to ENSDF and discuss any differences from ENSDF values;
- Pearlstein noted that individual centres may develop their own versions of nuclear structure data bases for their own purposes;
- variety of views were expressed on the evolution of ENSDF. Most centres and evaluators held the view that ENSDF should serve as a comprehensive data base of evaluated data which could be used as a unique source for any number of specialized publications, on-line retrieval systems, etc..., as well as being the primary source for the publication of the Nuclear Data Sheets.

A.4.3. Status of NSDD Computer Processing Codes

The ENSDF physics processing codes: ANGCOR, GTOL, HSICC and LOGFT, checked out on DEC-System-10, CDC-7600 and IBM-370 computers, were distributed by US/NNDC to the network in July 1981. Corrections introduced since then, and the related list of update cards were sent out in March 1982. Because of extensive corrections in the HSICC code, a new version will be distributed to the network in July 1982.

The network requested US/NNDC to be more explicit in the explanations regarding changes made in the processing codes; the C-card comments being not always understandable.

At the request of the network, US/NNDC will replace the ANGCOR code which analyses angular correlation data by the more recent DELTA code.

Action # 19

A new code to calculate gamma-ray branching from ENSDF has been developed at FRG/FIZ. This code will be sent to US/NNDC, and will be distributed to the network.

US/NNDC will provide the network the following new processing codes over the next few months. These codes will be computer independent as far as possible, and when made operational at the network evaluation centres they should enable the evaluator to perform preliminary ENSDF format, physics and consistency checks, and obtain tabular and decay scheme representations of the evaluation.

Code	Projected Date
- ENSDF Format Check	October 1983
- Physics Check	October 1982
- MEDLIST	April 1983
- Tables (a basic program to output ENSDF Evaluation in tabular form on a line printer)	October 1982
- Plot (a basic program to draw a decay scheme from data sets in ENSDF format using Calcomp plotter)	October 1983

With regard to the MEDLIST code, the network requested that the dates of changes (updates or corrections) introduced in ENSDF data sets be indicated in the MEDLIST output in the form of a history record.

Action # 14

In a note submitted to the meeting (Appendix 21) SWD/Lund and has proposed to convert the ENSDF-associated processing codes to FORTRAN-77, so as to make them computer independent, easier to read, faster to run and easier to modify and debug.

Action # 8

A.4.4. Demonstration of the FRG/FIZ ENSDF on-line system

Using a dedicated telephone line from the meeting room in Zeist to the FIZ computer location in Karlsruhe, FRG/FIZ demonstrated the use of the on-line system they have developed for retrieving information from a converted version of the ENSDF file. A brief description of this system is given in the FRG/FIZ progress report given in Appendix 7.

A.5. NSDD Publications

A.5.1. Nuclear Data Sheets Publications

a) Current Status

At the 1980 NSDD meeting in Vienna, US/NNDC provided a tentative schedule for the transfer of the nuclear structure and decay data base and related publication activities from US/NDP to US/NNDC (see summary INDC(NDS)-115/NE, pages 4-5). Due to the excellent cooperation between the staff at US/NNDC and US/NDP a smooth transfer of responsibilities has been achieved according to the plans and close to the schedules presented at the last meeting.

The following outlines the major milestones achieved during the transfer process:

- By October 1, 1980 US/NNDC had developed programs for input, processing, maintenance, retrievals and publication from the NSR file.

- On October 1, 1980 US/NNDC assumed the responsibility for scanning of literature for the NSR file.

- All "Recent References" issues of Nuclear Data Sheets starting with the cumulative issue for year 1980 were produced by US/NNDC.

- By July/August 1981 US/NNDC had completed computer systems and trained staff for the processing and publication of all issues of Nuclear Data Sheets. This involved:

  a) Design of a suitable data base management system for ENSDF.
  b) Development of data base retrieval and maintenance systems.
  c) Development of format and other checking codes.
  d) Development of table generating code.
  e) Adaptation and augmentation of US/NDP code for plotting.
  f) ENSDF library retrieval facilities.
  g) Reference list generation from the NSR file using the key number referenced in the ENSDF evaluation.

- US/NNDC signed a contract with the Academic Press assuming responsibility for the publication of Nuclear Data Sheets.

- Starting with the June 1981 (Vol. 33 No. 2) issue, US/NNDC assumed responsibility for processing and preparing for publication all Nuclear Data Sheets issues. The June '81 issue was sent to the publisher on October 27, 1981.

- US/NNDC has been sending photo-ready Nuclear Data Sheets to Academic Press for publication with a frequency of one issue per month on the average.

Table VI

Nuclear Data Sheets Publication Status

A chains-published recently

NDS issue	A-chains
06/81	78, 188
07/81	Recent References
08/81	68, 185
09/81	197, 249-263 (odd)
10/81	Recent References
11/81	134, 189, 244
12/81	107,210

A-chains in prereview processing

1, 3, 4, 79, 128, 137, 169, 232-236

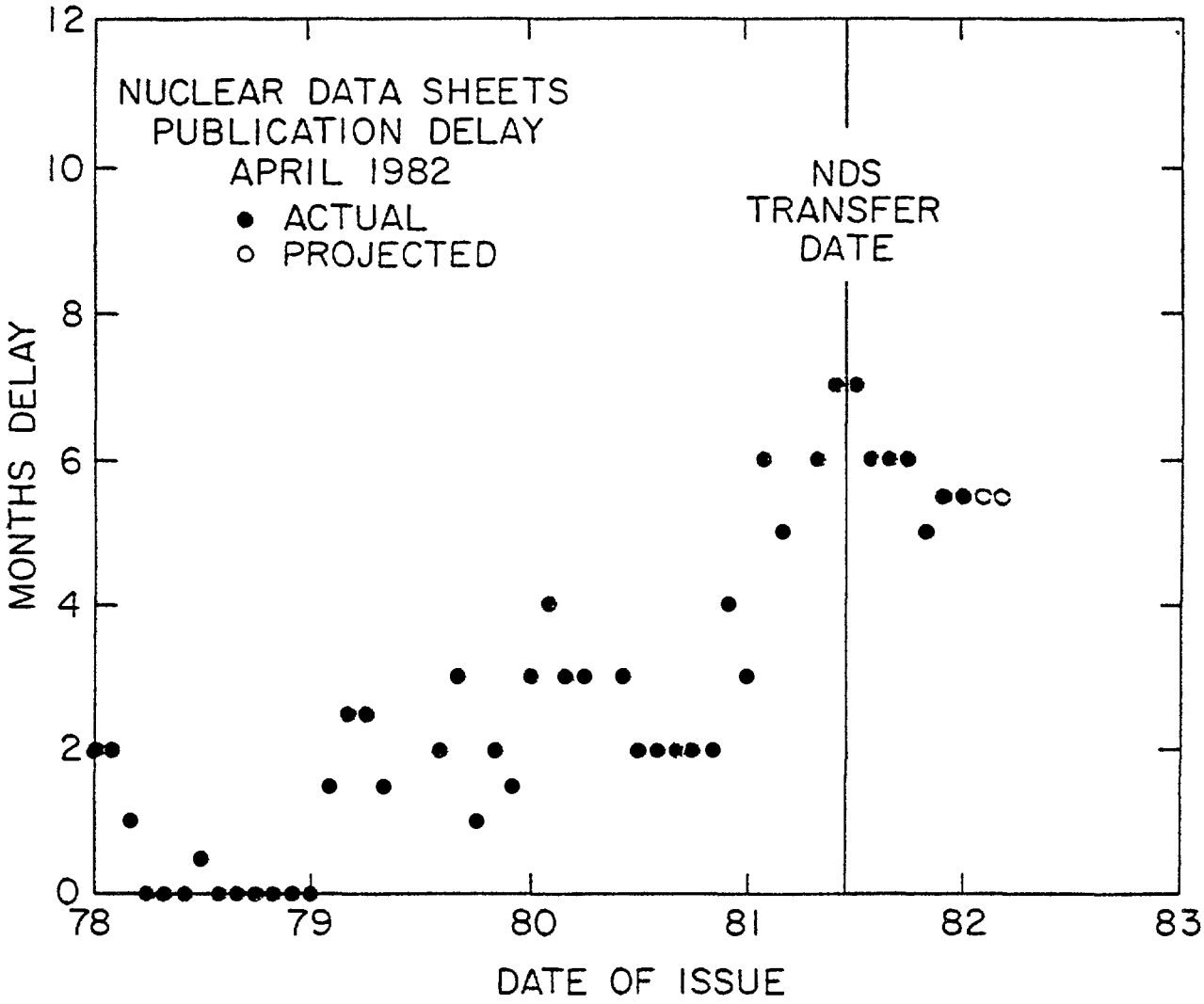
A-chains in Review

69, 138, 157

A-chains in post review processing

80, 95, 96, 102, 108, 114, 126, 127, 153, 190

Figure 1



Status of publication delay in Nuclear Data Sheets, April 1982

- Table VI gives the status of Nuclear Data Sheets publications starting with the 6/81 issue. Also included in the table are the evaluations at the various levels of processing.

- As stated earlier US/NNDC has been publishing about one issue per month. The back log in publication, which was about 6 months, when the publication activity was taken over by NNDC has remained at the same level. This is reflected in Figure 1 which summarizes the time lag before an issue of Nuclear Data Sheets reaches its subscribers.

b) Coding Manuals

The drafts of two coding manuals, one for the NSR input and one for the Nuclear Data Sheets were presented by US/NNDC to the network (see papers AG-380/6 and AG-380/7 respectively). Two Actions were put on the network to send in comments on the two manuals to US/NNDC before 30 July 1982. The final version of these manuals will be distributed separately by US/NNDC.

Actions # 10 # 11

The Nuclear Structure Reference Coding Manual is designed as a guide for NSR compilers, and contains primarily the basic conventions followed at US/NNDC in the maintenance updating of and retrieval from the NSR file.

The Nuclear Data Sheets Style Manual is designed to provide guidance to evaluators in coding and assembling mass-chain evaluations, and to set guidelines for the layout and presentation of evaluations in the Nuclear Data Sheets.

As all US/NNDC checking and editing programmes to process the input to the NSR file and the ENSDF library are based on the rules given in these manuals, US/NNDC requested that all evaluators comply with the proposed guidelines so as to avoid unnecessary delays in the Nuclear Data Sheet publication.

c) Procedures for the introduction of change in ENSDF and the Nuclear Data Sheets. (Reproduced from paper AG-380/2 by S. Pearlstein).

The National Nuclear Data Center (US/NNDC) has the responsibility for publishing Nuclear Data Sheets (NDS) and maintaining the source file Evaluated Nuclear Structure Data File (ENSDF). The documentation describing NDS and ENSDF are contained in the Style Manual which includes a description of ENSDF formats as an appendix. The experience gained in the publication of NDS, use of ENSDF, and the widespread international participation of evaluators may prompt changes in formats and procedures. This paper attempts to describe how proposals by NSDD network members for changes can be made in an orderly manner.

The following procedures, presented to the network, were agreed upon.

Formal Procedure for Approval and Adoption of Format Change Proposals and/or Procedural Changes for ENSDF and Nuclear Data Sheets
April 1982

1. New format proposals and/or procedural changes should be submitted to the NNDC and can be distributed to members of the NSDD for information. If a proposal is to be discussed at an NSDD meeting, it should be distributed at least 2 weeks before a meeting at which it will be discussed.

   Key elements in the proposal should be the change requested (R), reason for the change (R), method of implementation (O), projected impact on ENSDF or NDS publication, physics and other processing codes (O), proposed data for implementation (O). The R and O in parenthesis refer to Required and Optional but recommended, respectively.

2. The NNDC, in consultation with the editors, programmers and other experts as required, will inform the NSDD of its evaluation of the proposal and solicit comments from the NSDD at an NSDD meeting or by mail.

3. Based on its evaluation and the input received, the NNDC will inform the NSDD of the adoption, rejection, postponement, or need for reconsideration of the proposal. If adopted, the NNDC will establish a date of implementation and issue updates to the Style Manual and the ENSDF physics and processing codes.

A.5.2. Wallet Cards. (Reproduced from AG-380/18)

Next edition of wallet cards will be produced by US/NNDC some time during the latter half of 1982. This edition will be based on ENSDF and new Wapstra Masses. (See further discussion on masses under item B.2.). The format and contents of the wallet cards are expected to be similar to the last edition produced by US/LBL which was based upon Table of Isotopes data.

A.5.3. Wall Charts of Nuclides

The following is a summary of the current wall-chart efforts:

- United States: the next edition of the General Electric wall chart has been initiated, and is expected to be completed in 1983. US/NNDC has originated a computer-produced "Computope Chart" with an issue data of March 1982, which is available from US/NNDC on microfiche only.

- Federal Republic of Germany: the 5th edition of the Kernforschungszentrum Karlsruhe wall chart was published in 1981. The next Karlsruhe wall chart is expected to be published eight years from now.

- Japan: a revised edition of the Japanese Chart of Nuclides was published in 1981.

Action # 4

- USSR: there are no on-going wall-chart efforts in the USSR.

The discussion of the physics content of wall charts of nuclides is summarized under item B.2.

A.5.4. Radioactivity Handbook

A Radioactivity Handbook for applied users is planned to be produced on behalf of the US Nuclear Data Network by the Isotope Project at the Lawrence Berkeley Laboratory (US/LBL). The Handbook will be produced at four yearly intervals, beginning in 1984; data will be taken from the current version of ENSDF file supplemented by calculated and evaluated properties not included in ENSDF. The current status of the Handbook, and considerations which have been given for its preparation are described in Appendix 22. (See also a concise description of the Radioactivity Handbook in the US Progress report, Appendix 17).

A.5.5. Bibliographic Evaluations

The US/NNDC publication "A Source List of Nuclear Data Bibliographies, Compilations, and Evaluations", and the IAEA/NDS publication "Compilations and Evaluations of Nuclear Structure and Decay Data" have been stopped. The effort in the Federal Republic of Germany by the FRG/FIZ group, however is continuing, and the next issue of their "Bibliography of Existing Data Compilations" is expected to be published in 1982.

Action # 2

A.5.6. Horizontal Evaluations

The discussion on horizontal evaluations centered primarily on the desirability and the procedures to have horizontally evaluated data taken into account by mass-chain evaluators and assimilated in the ENSDF compilation. There was general agreement to maintain ENSDF as the data base designed specifically for the production of the Nuclear Data Sheets, and not to extend it to data not evaluated by mass-chain evaluators. In conclusion, the meeting recommended that:

> A statement to the effect that horizontal evaluations should be taken into consideration by mass-chain evaluators in the course of normal evaluation procedures, will be included in the guidelines for new evaluations in the ENSDF Style Manual, and
>
> That updates of the ENSDF data base should only be done by mass-chain evaluators in the course of the normal evaluation procedures.

At the same time, it was left to any centre or group to extend or alter their own version of the ENSDF data base to meet the requirements of their user community. Also on the topic of Horizontal Compilations, it was emphasized that such evaluations should be adequately documented, and if appropriate, compared with the corresponding values published in the Nuclear Data Sheets.

A.6. NSDD Data Centre Services

It was agreed that NSDD user services will be provided by the following data centres:

US/NNDC	services the USA and Canada
NEA/DB	services Wester Europe and Japan (except the FRG)
FRG/FIZ	services the Federal Republic of Germany
USSR/CAJAD	services the USSR and East European Countries
IAEA/NDS	services all other countries not covered by the other centres.

In addition, FRG/FIZ provides, for a nominal service charge, on-line bibliographic and numerical NSD data services to users in the Federal Republic of Germany, as well as other countries in Western Europe. US/NNDC is in the process of developing a system for on-line access to the ENSDF and NSR data bases in the United States.

B. PHYSICS OF NSDD EVALUATION

B.1. Terminology

With regard to the general usage of terminology, the network recommended that

> The IUPAP terminology, as defined in the latest IUPAP document on "Symbols, Units and Nomenclature in Physics", should be used in all NSDD publications, except as indicated in the Nuclear Data Sheets.

Action # 1

In this context it also recommended to:

> Include the conversion factor of days-to-year (based on the sidereal year of 365.256 days) in the Nuclear Data Sheets.

Symbols and abbreviations currently in use are printed on the inside of the back page of each issue of the Nuclear Data Sheets. A combined list of common sign conventions is being prepared by M. Martin (US/NDP) and C. van der Leun (NED/Utrecht), and will be distributed to the network by the end of 1982.

Action # 5

B.2. Physics Content of the Wall Chart of Nuclides

The discussion of this topic centred primarily on the choice of atomic masses used in the production of wall charts, and in particular on the current status of A.H. Wapstra's latest evaluation. Wapstra's new midstream evaluation of atomic masses is available on tape from US/NNDC. This evaluation should be regarded as a private communication to US/NNDC, as Wapstra intends to publish his final evaluation some time early in 1983. According to Waspstra, the mass values in the presently available evaluation are almost final and evaluators should therefore be encouraged to use them. It was agreed that a statement regarding the use of Wapstra's atomic masses be included in the "minimum requirements" guidelines.

On the same topic, Chukreev reported that a new evaluation of 753 atomic masses will be published in the Soviet Nuclear Constants journal late this year. When received by the IAEA, IAEA/NDS will have this article translated and distributed to the network.

B.3. Evaluation Rules and Guidelines

B.3.1. Spin and parity assignment

It was pointed out that Rule 2 on Strong Arguments on Spin and Parity Assignments (see 1980 meeting report INDC(NDS)-115/NE, p. 28) is being re-drafted, and will be included in the Nuclear Data Sheets.

The meeting welcomed the paper submitted by R.B. Firestone (US/LBL) on the Study of Systematics with a view to new guidelines for spin and parity assignments (Appendix 24), and looked forward to learning the results of this proposal at the next NSDD meeting.

B.3.2. Gamma-Ray multipolarity assignments

Endt and Martin were asked to update the strong rules for gamma-ray multipolarity assignments by recommending new upper limits of gamma-ray strengths which should be incorporated in the Nuclear Data Sheets.

Action # 7

B.3.3. Arguments for Isobaric Spin Assignment

Endt and van der Leun were asked to agree on the final version of the Arguments for Isobaric Spin Assignment.

Action # 6

These rules (see 1980 Meeting Report INDC(NDS)-115/NE, p. 118) as corrected (by omitting the "Strong Arguments" subtitle, and replacing "Remarks" by "In addition to the arguments listed above: ..."), and as finally recommended by Endt and van der Leun, are recommended to be included as a separate section following the rules for J^{π} assignments, in the Nuclear Data Sheets.

B.3.4. Asymmetric Uncertainties ENSDF (summarized by S. Pearlstein)

In the discussion on asymmetric uncertainties which followed the introduction of the paper by De Gelder on "Uncertainties for log ft Values in ENSDF" (Appendix 23), it was concluded that these should not be given unless the two numbers were significantly different (e.g., a factor of two), and were considered by the evaluator to be of importance. Otherwise, symmetric uncertainties should be given. The evaluator should take the responsibility for providing asymmetric uncertainties when important. Presently, the ENSDF format allows for asymmetric uncertainties for mixing ratios, half-lives and log ft values only.

B.4. Statistical and systematic errors in gamma-ray energies (Summarized by Janis Dairiki)

Van der Leun pointed out that nuclear physics is maturing such that systematic errors are becoming more important than the statistical uncertainties. He then discussed the compilation of gamma-ray energy calibration standards based on the ^{198}Au line. Based on the experience obtained in compiling these standards he cautioned evaluators that any gamma-ray energies reported with less than 10 ppm error without special discussion are not to be believed.

Work is continuing on the gamma-ray energy calibration compilation. A separate compilation of energy standards based on mass differences is also being studied to check the consistency of the two sets of standards. Work is in progress to extend the standards to include higher gamma-ray energies, using, for example, the gamma-ray lines of ^{66}Ga and ^{16}O. If the two calibration scales are consistent, gamma-rays from (n,γ) reactions can be used to extend the energy range. A comparison is also being made between Ge(Li) and curved spectrometer energy measurements. The differences are greater than the quoted error but the reason for this is not yet clear.

Van der Leun also warned evaluators to be suspicious of gamma-intensity uncertainties (relative and absolute) quoted to $\sim$ 5 % unless there are special circumstances. Bambynek concurred and suggested a limit of 3 % for absolute uncertainties, based on recent experiments with multiple-line sources. In particular, the 1 % error sometimes claimed is impossible without special efforts. Ideally, of course, one would like to see the correlation matrix for a complete picture of the errors. Very few authors ever include this information, however.

B.5. Minimum Requirements for Evaluations (Summarized by R. Bunting)

All centres were encouraged to be more consistent in referencing resonance data in ENSDF. The minimum requirement recommended by the participants states that

> adopted level data sets shall contain references to resonance data evaluations (such as BNL-325) and subsequent publications. Where known from other resonance evaluations the evaluator shall also specify the number of known resonances and the energy region. This minimum requirement does not preclude the inclusion of more detailed data and references on the decay of resonance structures.

The subject of including experimental atomic data associated with nuclear decay was discussed. Bambynek asked if measured x-ray data are included in ENSDF. Martin confirmed that accurately measured x-ray data are included but not in a retrievable form.

The network also strongly recommended that adopted gamma-ray properties be required as part of the Adopted Levels data sets in ENSDF.

In conclusion, an action was placed on Martin to prepare a revised set of "Minimum Requirements for Evaluations" (which would include the above-mentioned points) and send it to IAEA/NDS before the end of 1982 for distribution to the network.

Action # 18

B.6. Proposed Physics Changes in ENSDF

B.6.1. New data sets

The proposal by Tepel to create a separate ENSDF data set for delayed particle decay data (Appendix 25) was discussed. US/NNDC agreed to circulate a proposal which would include Tepel's proposal.

B.6.2. Determination of parameters from angular correlation data (Summarized by De Gelder)

Discussion of the method to determine spins, multipole mixing, etc... from angular correlation data resulted in the decision to replace the currently used ANGCOR code by the new DELTA code (written by P. Ekstroem). US/NNDC was asked to replace the ANGCOR code in the package of codes distributed by US/NNDC to the network, and the network was asked to test the new DELTA code.

Action # 19

B.6.3. Unnecessary data in ENSDF (Summarized by De Gelder)

The network recommended, in general to reduce the number of A_2 and A_4 coefficients as well as cross section values in ENSDF, unless there was a justifiable reason to include them (for instance for reproducibility or to substantiate gamma-ray correlations).

B.6.4. Consideration of improved conversion coefficient tables (Summarized by Tepel)

The question whether the Hager-Selzer conversion coefficient tables presently used in ENSDF should be replaced by more recent tables such as those by Roesl or Band was discussed. Several participants including Endt and Behrens felt that the Roesl tables offered several advantages, e.g., a finer energy grid and the inclusion of higher shells. Martin pointed out that some of the Roesl values were in error due to a wrong binding energy (an error of 1 KeV) having been used. The meeting felt that it was not clear that any particular table was to be preferred. Karlsruhe promised to investigate the possibility of using the Roesl values in the HSICC code including the necessary program changes.

Action # 20

B.6.5. Calculation of the capture to positron ratio (Summarized by Tepel)

A long discussion arose on the electron capture-to-positron decay ratio situation. It was concluded that there was no clear-cut need to alter the present way of calculating the ratio in ENSDF, especially since a more sophisticated calculation including shielding and finite size effects was much more time consuming.

B.7. Developments in Nuclear Structure Physics (Summarized by Forsyth)

There was a general discussion of the trends in experimental nuclear structure data that might lead to changes in the types of information which would need to be evaluated.

- It was pointed out that more data was now appearing on delayed particle emission, heavy-ion reactions (both non-relativistic), and on neutron-rich nuclei far from stability, and that the situation regarding assignment of isospin was improving.

- Improved instruments and methods contributed to higher precision in measurements (e.g., in gamma-ray energies) with the result that systematic errors were becoming significantly more important than in the past. (See further consideration of this point in B.4. above).

- There was a discussion on spin and parity assignments, where it was pointed out that there was a tendency nowadays in the literature to make definite assignments from weak arguments, and that as theoretical ideas developed, there was a tendency to remove brackets from $J\pi$ assignments. Endt remarked that evaluators should be wary of $J\pi$ values assigned in (heavy-ion,xnγ) reactions when based solely on excitation functions and gamma-ray angular distributions. Such values should be put in brackets. Only if conversion coefficients, gamma-polarization or lifetimes are measured, can definite $J\pi$ assignments be made.

  On the same topic, Endt proposed to have a table of arguments for $J\pi$ assignments included in the Nuclear Data Sheets. It was pointed out by Martin that until now only the strongest arguments have been included.

- Questions were raised whether muon-capture energies, nuclear radii, or data on giant resonances, strength functions and intermediate resonances should be evaluated, and possibly in the future, properties such as the mass of the neutrino.

- There was a discussion on the inclusion of heavy ion data in ENSDF. Martin pointed out that various reaction data sets involving the same reaction mechanism should be included in a single data set; examples of this would be heavy-ion reactions and Coulomb excitation measurements. There was also a discussion on whether side-feeding information should be included or not.

- There was a discussion on the evaluation of life-times from measured B(E2) values. Endt and Martin agreed that this should be done whenever possible.

  In this context, Endt pointed out that it was not always clear to the reader of the Nuclear Data Sheets whether a B(E2) value was B(E2)↑ or B(E2)↓. The meeting felt that it should be made clear what was meant.

- There was a discussion on the feeding back of best values, e.g., branching ratios, into ENSDF and the risks that were involved on account of their correlated nature.

B.8. Report on the First Conference on Nuclear Structure Data Evaluation
(Reproduced from paper AG-380/19 by J. Dairiki)

The 1st Conference on Nuclear Structure Data Evaluation, organized by the Isotopes Project, was held at Asilomar, October 27-30, 1981, in conjunction with the APS/Division of Nuclear Physics fall meeting. Round table discussion sessions focused on evaluation as a science and on the role of evaluation within the scientific community. The Conference marked the beginning of a dialogue, in the international evaluation community, about the scientific problems associated with evaluating nuclear structure data. The Conference Proceedings (LBL-14070) contain a summary of the discussions, abstracts of evaluation papers presented at the DNP meeting and contributed papers on nuclear structure data evaluation.

There was a strong consensus that a second conference should be held in approximately one year, although no specific plans were formulated. The U.S. NDN at its April 6, 1982 meeting pointed out the importance of international participation in such a conference. An action was placed on Sol Pearlstein to explore the possibility of holding the 2nd Evaluator's Conference in conjunction with a meeting of either the American or European Physical Society or with another appropriate scientific conference.

Appendix 1

Advisory Group Meeting on Nuclear Structure and Decay Data

Zeist near Utrecht, The Netherlands, 11-14 May 1982

List of Participants

1.	W. Bambynek	CEC/CBNM, Geel, Belgium
2.	H. Behrens	FIZ, Karlsruhe, Fed. Rep. Germany
3.	J. Blachot	CEN, Grenoble, France
4.	R. Bunting	INEL, Idaho Falls, USA
5.	F.E. Chukreev	Kurchatov Institute of Atomic Energy USSR
6.	G. Coddens	NEA Data Bank, Saclay, France
7.	J. Dairiki	LBL, Berkeley, USA
8.	P. De Gelder	Gent University, Belgium
9.	L.P. Ekstroem	Lund University, Sweden
10.	P. Endt	Fys. Lab., Utrecht, Netherlands
11.	P.D. Forsyth	Liverpool University, UK
12.	V.V. Frolov	IAEA, Vienna
13.	E. Jacobs	Gent University, Belgium
14.	A. Lorenz	IAEA/NDS, Vienna
15.	J. Lyttkens	Lund University, Sweden
16.	M. Martin	ORNL/NDP, Oak Ridge, USA
17.	S. Pearlstein	NNDC, Brookhaven, USA
18.	Z. Matumoto	JAERI, Tokai-Mura, Japan
19.	J. Tepel	FIZ, Karlsruhe, Fed. Rep. Germany
20.	J. Tuli	NNDC, Brookhaven, USA
21.	P. Twin	Liverpool University, UK
22.	C. van der Leun	Fys. Lab. Utrecht, Netherlands
23.	D.A. Viggars	Kuwait University, Kuwait
24.	N.J. Ward	Liverpool University, UK
25.	J. Zylicz	University of Warsaw, Poland

Appendix 2

IAEA ADVISORY GROUP MEETING

on

NUCLEAR STRUCTURE AND DECAY DATA

Utrecht, The Netherlands, 11-14 May 1982

Adopted Agenda

Agenda items A, B, C, D, E, F and G were discussed during the morning sessions of the meeting. Agenda items H and I were taken up during the afternoon sessions. A demonstration of the FRG/FIZ on-line ENSDF system and a visit to the Fysisch Laboratorium at the Rijksuniversitet Utrecht were organized on Thursday 13 May.

A. Introductory Items

1. Opening Statements
2. Election of Chairmen
3. Adoption of Agenda
4. Announcements
5. Review of Actions and Recommendations from last meeting

B. NSDD Network

1. Short reports from network members
2. Report from the US NSDD Network

C. Current Mass-chain Evaluation and Nuclear Structure Sheets Publication Status

D. NSDD Computer Files and Associated Programmes

1. Status of the Nuclear Structure Reference (NSR) File
2. Status of the Evaluated Nuclear Structure Data File (ENSDF)
   a) ENSDF content status
   b) ENSDF update procedures
   c) ENSDF distribution
3. Status of NSDD computer programmes

E. NSDD Publications

1. Nuclear Data Sheets Publication
   a) Mass-chain publication - schedule and content
   b) Recent References - schedule and content
   c) Review and production details
   d) Procedural changes
2. Energy Levels of Light Nuclei (A=5-44) published in Nuclear Physics and the inclusion of evaluated data from these mass-chains in ENSDF
3. Other Publications
   a) Wallet cards
   b) Wall chart
   c) Radioactivity Handbook
   d) Bibliography of evaluations
   e) Other horizontal evaluations and their inclusion in ENSDF

F. NSDD Data Centre Services

1. NSDD service centres and geographical service areas

G. Mass-chain Evaluation Assignment

1. Assignment of mass-chains
2. Current man-power committment to mass-chain evaluation
3. Priorities in the choice of mass-chains to be evaluated
4. Review of mass-chain assignment procedures

H. Review of Evaluation Rules and Nuclear Structure Physics Topics

1. Physics content of Wall Chart of Nuclides
2. Common conventions and notations, abbreviations
3. IUPAP list of terminology and definition
4. Additions, changes and deletions of J assignment rules
5. Arguments on isospin assignment
6. Minimum standards for evaluations
7. New data sets
8. Uncertainties in Log ft values
9. Systematic and statistical errors of gamma-ray values

I. Developments in Nuclear Structure Physics

1. Experimental nuclear structure data
   - Quality and quantity of different types of data
   - Changes in relative importance and emphasis placed by experimentalists
   - Impact of new generation of accelerators
2. Use of evaluated data
   - Usefulness of NSDD publications to nuclear structure experimentalists and theorists
   - Usefulness of NSDD publications to applied users
   - What changes could be made to increase usefulness of NSDD publications

Appendix 3

List of Papers Submitted to the Meeting

AG-380/1 Updates for ENSDF Analyses Codes, J.K. Tuli. (Distributed as NS/1A-31). Not included in this report.

AG-380/2 Formal Procedures for Approval and Adoption of FormatProposals and/or Procedural Changes for ENSDF and Nuclear Data Sheets. S. Pearlstein. (Distributed as NS/1A-32). Incorporated in this report.

AG-380/3 Priority Mass Chains. S. Pearlstein. (Distributed as NS/1A-33). Included in this report as Appendix 17.

AG-380/4 Procedure for Mass Chain Evaluation and Review. (Distributed as NS/1A-34). Incorporated in this report.

AG-380/5 Formats and Procedures for ENSDF. C. Michael Lederer. (Distributed as NS/1C-82-1). Not included in this report.

AG-380/6 Nuclear Structure Reference Coding Manual (Draft) S. Ramavataram, C.L. Dunford. Not included in this report.

AG-380/7 Preliminary Draft of the NDS Style Manual M.R. Bhat and S. Pearlstein. (Distributed as NS/1A-35). Not included in this report.

AG-380/8 Reference Key Numbers J.K. Tuli. Not included in this report.

AG-380/9 U.S. Contributions to International Cooperation in the Evaluation of Nuclear Structure Data. Included in this report as Appendix 16.

AG-380/10 Status of Mass-chain evaluation. S. Pearlstein. Incorporated into this report.

AG-380/11 Nuclear Data Sheets - Publication. J.K. Tuli. Incorporated in this report.

AG-380/12 NNDC Services to the Network. J.K. Tuli. Incorporated in this report.

AG-380/13 ENSDF Status. J.K. Tuli. Incorporated in this report.

AG-380/14 Wallet Cards. J.K. Tuli. Incorporated in this report.

AG-380/15 Coding in ENSDF for A = 5-44. J.K. Tuli. Included in this report as Appendix 19.

AG-380/16 Status of the NSR File.
S. Ramavataram. Incorporated in this report.

AG-380/17 Radioactivity Handbook. J. Dairiki. Included in this report as Appendix 21.

AG-380-/18 New Guidelines for Spin and Parity Assignments.
R.B. Firestone. Included in this report as Appendix 23.

AG-380/19 Report on the 1st Conference on Nuclear Structure Data Evaluation. J. Dairiki. Incorporated in this report.

AG-380/20 Proposal for delayed particle decay data sets.
J.W. Tepel. Included in this report as Appendix 24.

AG-380/21 Status Report - Japanese Activities in Nuclear Structure and Decay Data.
Z. Matumoto and T. Tamura. Included in this report as Appendix 6.

AG-380/22 Status Report.
H. Behrens and J.W. Tepel.
Included in this report as Appendix 7.

AG-380/23 List of Physics Data Reports (FIZ). (Already published). Not included in this report.

AG-380/24 Statement on CBNM Activity in Evaluation and Compilation. W. Bambynek. Included in this report as Appendix 8.

AG-380/25 Uncertainties for log ft values in ENSDF.
P. De Gelder. Included in this report as Appendix 22.

AG-380/26 Bibliothêques de Données Nucleaires pour les Noyaux Lourds, les Produits de Fission et les Produits d'Activation. C. Fiche. Not included in this report. (Can be obtained from J. Blachot).

AG-380/27 NEA DB Customer Service from the ENSDF/NSR Files.
G. Coddens.
Included in this report as Appendix 10.

AG-380/28 Status Report - Nuclear Data Project in Kuwait.
Included in this report as Appendix 11.

AG-380/29 Status Report - United Kingdom.
P.J. Twin. Included in this report as Appendix 12.

AG-380/30 Status Report - Nuclear Structure and Decay Data Evaluation in Sweden.
P. Ekstroem and J. Lyttkens.
Included in this report as Appendix 13.

AG-380/31 PM on ENSDF-Associated Programs.
P. Ekstroem and J. Lyttkens. Included in this report as Appendix 20.

Appendix 4

NEW ACTIONS

1. IAEA/NDS	Inquire about the possibility to have the IUPAP and IUPAC terminology booklets reproduced and distributed to the network.
2. Behrens	Publish the cumulative version of their compilation of evaluations bibliography, in accordance with the recommendation of the network.
3. IAEA/NDS	Obtain the gamma-ray atlas published at Rossendorf, GDR, and distribute it to the network if possible (or in the form of computer tape if available).
4. IAEA/NDS	Obtain copies of the 1980 Japanese chart of nuclides and distribute it to the network.
5. Martin and Van der Leun	Continue action #13 and #14 of the 1980 meeting (on symbols, abbreviations and conventions), and distribute their recommendations before January 1983.
6. Van der Leun and Endt	Agree on the final version of the "Arguments for Isobaric Spin Assignment", and submit it to Martin for inclusion in the Nuclear Data Sheets.
7. Endt and Martin	Update the strong rules for gamma-ray multipolarity assignments, by recommending new upper limits of gamma-ray strengths, which should then be incorporated in the Nuclear Data Sheets.
8. US/NNDC	Investigate the feasibility to upgrade the ENSDF programs to make them upward compatible with ANSI Standards.
9. Tepel	Send the ADINF programme (which calculates adopted gamma-ray branching) to US/NNDC for distribution to the network.
10. All Centres	Communicate to US/NNDC comments on the Style Manual distributed as AG-380/7, before July 1, 1982.
11. All Centres	Communicate to US/NNDC comments on the NSR Manual distributed as AG-380/6, before July 1, 1982.
12. IAEA/NDS	Write editors of physics journals (except Phys. Rev. and Nucl. Phys.) to include keywords in published nuclear physics papers.

13. All Centres (Standing Action)	Send US/NNDC all reports and documents pertaining to A-chain evaluations which are difficult to obtain through normal channels.
14. US/NNDC	Investigate the feasibility to include a history record in ENSDF.
15. Tepel	Distribute to the network the graphical overview of mass-chain publication frequencies.
16. US/NNDC	In the future, supply to the network information similar to that referred to in Action #15.
17. IAEA/NDS	Try to enlist the services of other evaluators in countries not participating in the NSDD network.
18. Martin	Provide IAEA/NDS before the end of 1982 for distribution to the network, the list of "minimum requirements" which should be used as guidelines by NSDD evaluators.
19. US/NNDC	Replace the ANGCOR code by the DELTA code in the package of codes distributed by NNDC.
20. FRG/FIZ	Investigate the feasibility of adopting the new Roesel conversion coefficient tables, and to inform the network before the next meeting of this action.
21. Martin	Send to the responsible centres the data for masses A=5-44 that have been translated into the ENSDF format.
22. Network	Write in to IAEA/NDS suggestions for next meeting's "Physics" topics at least two months before the next meeting.

STANDING ACTIONS FROM PREVIOUS MEETINGS

77/38. Network	Send copies of all relevant NSDD network correspondence to IAEA/NDS.
77/39. NSDD Centres	Distribute on a regular basis those computer codes which could be useful to other members of the network.
77/40. US/NNDC	Communicate to the network all errors discovered in the ENSDF file and all changes made to the ENSDF file.

80/ 4. Network	Distribute to the network any documents or reports which substantiate the use and usefullness of NSDD evaluations.
80/ 7. Network	Investigate if there are any appropriate groups interested to participate in the mass-chain evaluation effort.
80/10. Network	Inform the Editor of Nuclear Data Sheets of the names of potential referees.
80/23. Network	Communicate to US/NNDC and US/NDP identified errors in the keywords in "Recent References".
80/24. NSDD Evaluators	Help clean up NSR file in the process of evaluation, by informing US/NNDC of the identified errors.
80/26. Network	Send to M. Martin any suggestions for additional "minimum requirements" to be used as guidelines by evaluators.
80/27. Network	Keep the Nuclear Data Sheet list of Symbols and Abbreviations under constant review, and send suggestions for changes to US/NDP.
80/29. NSDD Evaluators	Communicate identified mistakes in the ENSDF file pertinent to the mass-chain for which they are responsible to US/NNDC and US/NDP for all mass-chains, and in addition to NED/Utrecht for mass-chains 21-44, and to US/UP for mass-chains 5-20

Appendix 5

L82-22460
Translated from Russian

ACTIVITIES ON THE EVALUATION OF NUCLEAR STRUCTURE AND DECAY DATA AT THE ATOMIC AND NUCLEAR DATA CENTRE OF THE USSR STATE COMMITTEE ON THE UTILIZATION OF ATOMIC ENERGY

F.E. Chukreev and E.N. Shurshikov

1. Work carried out by the Atomic and Nuclear Data Centre

As is well known, the Atomic and Nuclear Data Centre of the USSR State Committee on the Utilization of Atomic Energy evaluates the structural properties and decay data for nuclei with mass A = 1-4, 238, 240, 242, 244 [3]. During 1977-81 we performed evaluations for all the mass chains with which the Centre is concerned and the evaluated data were sent on magnetic tapes to the USA.

Unfortunately, because of organizational difficulties during the period of setting up the network of our centres, only the evaluation for A = 244 went through the full agreed cycle of review, and will be published soon. the time lag between completion of our evaluation and publication is more than three years.

A number of our other evaluations did not reach the addressee and in January 1982 we had to send again a whole series of previously evaluated mass chains.

Recently we planned an interruption with a view to improving the organization of the entire process, and we hope that the formative difficulties are already over.

It was because of these same difficulties that, unaware of the fate of its evaluations, the Leningrad Institute of Nuclear Physics held back new evaluated data, and these have been despatched only now.

The sole problem in our evaluation was masses with A = 240, for which up to 1981 there were no new experimental data. The latter are now available and the evaluation will be completed in 1982.

In the case of A = 242 we have finished a new evaluation, and the data have already been sent to the network of nuclear data centres.

Since the last Advisory Group Meeting on Nuclear Structure and Decay Data (Vienna 1980) Professor E.P. Grigor'ev's team from the Leningrad University has joined in the evaluation work. Unfortunately, they have so far not been able to overcome the difficulties which they encountered.

In summary, it is to be pointed out that a long gap still remains between the completion of evaluation and its dissemination among users. In our opinion, the data centres should have the results of new evaluations, in the form of preliminary reports, immediately after these are completed.

2. New publications

The book entitled "The Radiation Spectra of Radioactive Nuclides" edited by Professor K. Ya. Gromov was published in 1980 [1]. Although the authors of this book maintain that the data contained therein are experimental, these are actually evaluated data obtained after many years of research and comparison with the data of other laboratories. We hope that this book has reached the colleagues to whom it was sent.

The Atlas [2], published in the German Democratic Republic, is conceptually related to Ref. [1]. We did not distribute the Atlas since it was published outside the USSR.

3. ENSDF format

In using the ENSDF file, we faced certain difficulties due to some lack of clarity in the definition of numerical data. From Memo IC/1982-I we learned that the ENSDF format is to be revised, and in this connection we should like to point out that without precise definitions of fields containing only numerical data it is very difficult to use the ENSDF file for inclusion of these and other processes in the calculations.

[1] "The Radiation Spectra of Radioactive Nuclides" (GROMOV, K.Ya., Ed.), FAN, Tashkent (1980) (in Russian).

[2] VYLOV, Ts., et al., "The radiation spectra of radioactive nuclides measured with semiconductor detectors", ZfK-399, March 1980 (cited in Russian).

[3] "IAEA Advisory Group Meeting on Nuclear Structure and Decay Data, IAEA, Vienna, 21-25 April 1980", INDC(NDS)-115/NE.

Appendix 6

Status Report
Japanese Activities in Nuclear Structure and Decay Data

Z. Matumoto and T. Tamura

Nuclear Data Center, Japan Atomic Energy Research Institute

Mass-chain evaluation work has been progressed in these two years almost normally. At present we are evaluating the last 3 masses, 118, 120 and 122, with a hope to end the first revision of 12 masses (A=118-129) within 1982. As the second round revision, we hope to take the responsibility of maintaining the same mass region of A=118-129 on a 4-year cycle.

1. Time schedule

A=121,123,125	were published until April 1981	
A=119	was published in February 1979 by NDP	
A=127	will be published in vol.35 of NDS, 1982	(1st
A=126,128,129	were submitted until April 1982	cycle)
A=124	submission planned for summer 1982	
A=118,120,122	submission planned for end of 1982	
A=119,121,123	will be begun in 1982	(2nd cycle)

2. Computer programs for evaluation and compilation

The computer programs, HSICC, GTOL, LOGFT, DATACHK, ANGCOR, MEDLIST, have been successfully operated on FACOM M-200 (JAERI in house) and IBM 370 computers. Supplemental programs for data-set retrieve, and decay-scheme plot, have also been utilized in evaluation works.

Programs for retrieving and editting the Nuclear Structure Reference File (NSRF) have been developed. In the retrieve program, various combinations of the KEYWORDS, SELECTRS and other record identifiers are used to search for references of various categories. In the edit program, data files in card image characters are transformed into the extended EBCDIC cord used in NSRF.

Compilation of Japanese references using this system will be contributed in near future.

3. Chart of Nuclides

The second version* of the Chart of Nuclides by Yoshizawa et al. has been distributed.

4. Utilization of ENSDF and NSRF in Japan

The Evaluated Nuclear Structure Data File (ENSDF) and NSRF have begun utilized in various nuclear power development programs and nuclear physics researches:

a) calculation of decay heat from fission products** and transactinides,

b) calculation of generation of fission products and transactinides,
c) calculation of dose rate for medical application,
d) evaluation of decay scheme,
e) revision of Chart of Nuclides.

* Y. Yoshizawa, T. Horiguchi and M. Yamada: Chart of Nuclides, INDC(JAP)-57/L October 1980, Japanese Nuclear Data Committee/ Nuclear Data Center.

** T. Yamamoto, M. Akiyama, Z. Matumoto and R. Nakasima, JNDC FP Decay Data File, INDC(JAP)-59/L, 1981 (JAERI-M 9357).
H. Ihara, Z. Matumoto, K. Tasaka, M. Akiyama, T. Yoshida and R. Nakasima, JNDC FP Decay and Yield Data, INDC(JAP)-63/L, 1981 (JAERI-M 9715).

Appendix 7

STATUS REPORT

FACHINFORMATIONSZENTRUM ENERGIE, PHYSIK, MATHEMATIK GMBH
KARLSRUHE
FEDERAL REPUBLIC OF GERMANY

H. Behrens and J.W. Tepel

1. Participation in the Nuclear Structure Cooperation

Since the last meeting of the international network the mass chains A = 85, 91 and 92 have been published in Nuclear Data Sheets. Two more chains, viz. A = 95 and 96 were submitted for publication more than a year ago. Mass 96 was received back from review at the beginning of this year and should appear in print shortly. Mass 95 has as yet not been returned from the reviewer. The chains A = 93, 98 and 97 are nearly completed and A = 94 and 82 are being evaluated at present.

The BNL FORTRAN analysis programs HSICC, GTOL and LOGFT have been tested on our Siemens 7.76o BS2ooo Computer Installation. After some adjustments concerning the handling of text strings all three programs seemed to function correctly. Difficulties were encountered with the LOGFT program which occasionally went into loops. At present we make use of the BNL HSICC program together with the FORTRAN/ASSEMBLER versions of GTOL and LOGFT originally received from the NPD, ORNL.

2. Program development: ENSDF loaded as ADABAS-Files

Considerable effort was undertaken in order to load ENSDF as ADABAS-files on our computer. Since ADABAS makes use of the relational model of data bank structures, the complex hierarchical relationships inherent in ENSDF had to be represented in some way. The problem was solved by making use of the 19-digit key described previously (Retrieval from ENSDF: INKARET System, Appendix 21 of the Summary Report, IAEA Advisory Group Meeting in Nuclear Structure and Decay Data, Vienna 198o). The original ENSDF was split into four different files:

(1) The original File accessible through Atomic Mass, Chemical Element name and 19-digit key containing the 8o-byte ENSDF-records as free text,

(2) A file containing all quantities which appear once only in any data set. These include data from the Identification Record,P, N, and Q-records as well as the complete set of Nuclear Structure References Key Numbers.

(3) A Level file containing all ENSDF-levels as well as any data connected to individual levels. These data include quantities appearing as free text on level continuation cards such as quadrupole moments G-factors etc. as well as ß-decay and electron capture data.

(4) A Gamma file containing all ENSDF-gammas together with any data accociated with such gammas.

New data is treated by a set of PL/1 programs and merged into the existing files. Updates and deletions from the ADABAS files can easily be made using standard system functions. Retrieval of data from the files is very flexible, since any data items can be adressed individually. 86 of a total of 127 data fields have been declared as descriptors. Inverted lists are automatically maintained for the descriptor fields by the ADABAS DBMS and guarantee quick access to the data.

3. The Nuclear Structure References File (NSR)

Retrieval of NSR-documents with PL/1 programs has now been discarded. Instead the ADABAS DBMS is used to store, manipulate and retrieve NSR-data. The high-level programming language NATURAL is used to access the ADABAS files. Update tapes are received on a monthly basis from the NNDC and are merged into the existing file.

4. MEDLIST File

At the Fachinformationszentrum Energie, Physik, Mathematik MEDLIST data is kept as an ADABAS file. The data is constantly updated from new ENSDF decay data sets. In this way we are able to satisfy numerous requests for MEDLIST data without the need for time consuming MEDLIST calculation on each occasion.

5. Bibliography of existing Data Compilations
A database which contains bibliographic items of all world wide existing physics data compilations was established by us in the past and is updated at regular intervals. 4 printed versions have also been published in the meantime. Since 1980 the database was updated once.

6. Horizontal Compilations and Evaluations

One of the major objectives of the Fachinformationszentrum is to issue data compilations (and evaluations) for certain subfields of physics. A number of the items already published are also of relevance to nuclear physics. These compilations are always published in the series "Physics Data".

Appendix 8

Statement on CBNM Activity in Evaluation and Compilation

W. Bambynek

1. Compilation of internal conversion data

A compilation of experimental results of internal conversion coefficients and their ratios for nuclides with $Z > 60$ is in progress. Results quoted with an error and published later than November 1965 are included. Separate tables are prepared for results from studies on radioactive nuclides, from nuclear reaction experiments, from measurements of E0 transitions, and from studies in various chemical environments. The tables include information on the origin of the isotope, transition energies, spin and parity of initial and final levels, experimental technique used, and literature references.

2. Evaluation of K-shell fluorescence yields

An evaluation of all K-shell fluorescence yields published later than 1972 is in progress. From these data and those included in the 1972 review [1] a list of recommended data for all atomic numbers will be produced. The new evaluation will be finished by the end of 1982.

[1] W. Bambynek, B. Crasemann, R.W. Fink, H.-U. Freund, Hans Mark, C.D. Swift, R.E. Price, P. Venugopala Rao, X-ray fluorescence yields, Auger, and Coster-Kronig transition probabilities, Rev. Mod. Phys. 44, 716 (1972), 46, 853 (1974).

3. Critical survey of data sources

A survey of the most important compilations and evaluations in the nuclear field is in progress in collaboration with the FIZ, Karlsruhe, the Institut für Kernenergetik, Stuttgart and the Institut für Kernchemie, Darmstadt.
CBNM is responsable for the data sources on nuclear decay and on radioactivity.

4. Directory of certified radioactive reference materials

On request of the International Atomic Energy Agency, Vienna, an International Directory of Certified Radioactive Reference Materials has been compiled and stored on disk for retrieval by computer. It lists the products given in the catalogues of 16 suppliers. Included are only those products for which certificates are delivered and whose uncertainties are given according to defined rules. The data have been written on magnetic tape and sent to the IAEA.

5. Recommended list of transactinium nuclear decay data

CBNM collaborates in a critical appraisal of the current status of heavy element radionuclide decay data, in particular half lives, energies and emission probabilities of alpha particles and gamma rays, which are compiled by members of the IAEA Coordinated Research Programme on the Measurement and Evalutation of Transactinium Isotope Decay Data [2]

[3] A. Lorenz (ed.), INDC(NDS)-126/NE (1981)

Appendix 9

STATUS REPORT

FRENCH, BELGIUM GROUP

J. BLAGHOT

The advisory group meeting in VIENNA (1980) assigns to the collaboration the responsability for A = 101 - 117.

A - FRENCH GROUP

1 PERSONNEL :

J.OMS, J.P.HUSSON (116,104), G.MARGUIER (116,114,117), F.HAAS (116,111) J.BLACHOT (116,114,104,109), have and are contributing to the mass evaluation. All the coding and the Physics code test are done in GRENOBLE (J.B).

2 COMPUTER :

All the analysis programs are fully operation on the IBM of SACLAY. HSICC is also running on the PRIME (GRENOBLE).

3 MASS-CHAIN SCHEDULE :

A = 116	published NDS 32, 287 (1981)	
A = 114	post review stage	
A = 104	submission planned for	July 82
A = 109	" "	May 83
A = 111	" "	December 83
A = 117	" "	"

4 RADIOACTIVITY FILE :

Our Radioacvity file has been updated with all the ENSDF distributions (last 82 (1)).

A part of the file was published in Annales de Physique vol 6 (1981).

B - BELGIAN GROUP

P.De GELDER, D.De FRENNE, E.JACOBS, Nuclear Physics Laboratory GHENT, Belgium.

They would take the responsability over the mass 102,104*,,105,106,108 and 110.

The recent versions of the programs HSICC, GTOL and LOGFT are running on our VAX 11 system.

- mass 102 was submitted in the final version in March 1982.
- Mass 110 will very probably be submitted in June 1982.
- the evaluation of mass 105 will start around June 1982.

* second cycle

Appendix 10

NEA DB CUSTOMER SERVICE FROM THE ENSDF/NSR FILES

1. The ENSDF File

The NEA Data Bank has recently installed the most recent (February 1982) version of the ENSDF received from BNL on a private disk on the Saclay IBM 3033 computer of the CISI network. The utility programs FETCH, MEDLIST, NDSLIST, and HSICC are operational and stored on the same disk, which is accessible for all users connected to the CISI network in France, Belgium and the United Kingdom. Users will have to pay for the mounting of this private disk and the computing time but the maintenance of the files is at the expense of the NEA DB. Users who are not connected to the CISI network can contact the NEA DB to obtain retrievals on listings. These are free of charge.

The Data Bank experienced some difficulty in loading this last ENSDF tape and a set of FORTRAN programs had to be developed to make the sorting order of the data sets for this consistent with the input requirements of the START program. These programs perform a tape to tape conversion and can be run on our own internal PDP-11 computer using very little disk space (approximately 800 K). They are rather installation-dependent but users who have similar probems in loading the file can obtain the converted tape or information about these programs on request from the NEA DB.

2. The Nuclear Structure Reference File

The NEA DB has also developed a set of COBOL programs to store the NSR file on to disk in ISAM files from which retrievals can be made according to three criteria: reference, key number and ZA.

A lower data limit can be imposed and retrieval outputs can be obtained on tape or listing. In the case of retrieval on ZA one can specify whether the nucleus should be considered as target or as daughter nucleus. For the moment, these programs are installed only on our own PDP-11/70 and the retrievals are run at night because of disk space problems. Users in the NEA area can obtain retrievals from the NSR-file on listing or on magnetic tape in listing format free of charge by simple request to the NEA DB. We are examining the possibility of making the NSR file directly available to users of the CISI network.

Gerrit CODDENS

Appendix 11

STATUS REPORT

Nuclear Data Project in Kuwait

Mass chain status

The following mass chains evaluated by the Kuwait group are now in print

A = 77 NDS 29 75 (1980)

A = 78 NDS 33 189 (1981)

A = 188 NDS 33 275 (1981)

Mass 188 was prepared in collaboration with the Lawrence Berkeley Laboratory Nuclear Data Group.

The evaluation of mass 80 was submitted in July 1981 and has been accepted for publication.

The evaluation of mass 79 was submitted in April 1982.

Work is at present in progress on mass 76. It should be submitted about January 1983.

This will complete the first evaluations of the mass chains assigned to Kuwait.

Development of evaluation and retrieval systems

Until 1981 the Nuclear Data Group used a remote job entry system linked to the Kuwait Government Computing Centre. During 1981 operations were transferred to a local IBM 4341 machine in the Kuwait Institute for Scientific Research. The work is now carried out entirely by direct entry of data to this machine using a video terminal dedicated to the Nuclear Data Project.

The complete ENSDF and NSREF files are now available in Kuwait and retrieval programs have been developed to provide listings of level properties, gamma rays and references. These have been used by local physicists.

The retrieval system will be developed further when a data base management system becomes available next year. It is intended to make ENSDF and NSREF information available to local physicists.

Since NDSLIST and the associated plotting routines are not yet implemented in Kuwait we continue to use the facilities of Oak Ridge National Laboratory for the final preparation of manuscripts. We are grateful to the staff of the Oak Ridge Nuclear Data Project for their help in this.

Appendix 12

Status Report : United Kingdom

P.J. Twin (University of Liverpool)

The United Kingdom is responsible for the mass chains A = 65-75.

1. Personnel

The U.K. Science and Engineering Research Council has continued the funding of one post previously for data evaluation. Additional effort has been provided by other scientists.

Since the last Advisory Group Meeting in April 1980 there have been a number of personnel changes. Dr. N. Ward started work as a data evaluator in October 1980 and Dr. F. Kearns left in September 1981 after carrying the main evaluation work for the first 4 years. Dr. L.P. Ekstrom left in September 1980 to work at Lund and Dr. J.N. Mo is no longer involved in evaluation work.

2. Mass-chain Schedule

2.1 Completed mass-chains

A = 70,71,72 and 73 were submitted prior to the previous Advisory Group Meeting over the period January 1978 to December 1979.

A = 75 was submitted August 1980

A = 68 was submitted September 1980

A = 69 was submitted July 1981

2.2 Mass-chains under review

A = 67 submission planned for May 1982

A = 66 submission planned for June 1982

A = 65 submission planned for January 1983

2.3 Future plans

It is planned to complete A = 74 by mid 1983. This will complete the first complete cycle by the U.K. of their mass chain region A = 67 to A = 75. The second U.K. submission of A = 70 is planned for early 1984 which will be six years after the first A = 70 submission.

It is estimated that the manpower to complete the 11 mass chains will be approximately 7.5 F.T.E. evaluator years work.

3. Location

Most of the evaluation work is carried out at Liverpool University. Use is still made of the computer and library services at the Daresbury Laboratory.

Appendix 13

STATUS REPORT

Nuclear Structure and Decay Data Evaluation in Sweden

Peter Ekström and Jacquette Lyttkens

Lund University

Financial Support and Personnel

In spite of the pessimistic note on which the last status report ended, NSDD evaluation work is still alive and well in Sweden. The Swedish Nuclear Power Inspectorate has very generously promised to support one post for a period of, in the first instance, four years from July 1, 1981. We have also obtained some additional funding from a power company, Sydkraft AB.

Jacquette Lyttkens has, during the first year, been mainly responsible for the evaluation work, while Peter Ekström has been engaged in computer program development.

Mass Chain Evaluation

A=113 (in collaboration with Liverpool University) has been published in Nuclear Data Sheets.

A=61 will be submitted shortly.

Computer Programs

The ENSDF associated programs HSICC, HSMRG, GTOL, and LOGFT have been modified to run on our Norsk Data (ND-500) computer. Two programs, LEVELS and GAMMAS, have been written to facilitate the putting together of Adopted Levels and Gammas. The gamma-gamma correlation program DELTA and some small interactive programs (BRANCH, AVERAGE, and WEISSKOPF) are also available.

A preliminary version of a program to retrieve data sets from an ENSDF tape has been written.

Appendix 14

STATUS REPORT UTRECHT

P.M. Endt and C. van der Leun

a) Energy levels of A = 21 - 44 nuclei.

Errata and addenda to the sixth edition of this review article (Nucl. Phys. A310 (1978) 1) have been published in Nucl. Phys. A344 (1980) 526.

Preparations for the next edition, which is scheduled to appear in 1983/4, are in progress.

b) Gamma-ray transition strengths.

A = 6 - 44, ADNDT 23 (1979) 3
A = 45 - 90, ADNDT 23 (1979) 547
A = 91 - 150, ADNDT 26 (1981) 47
A > 150, ADNDT, to be published

c) Gamma-ray energy calibration standards.

A task group of the IUPAP commission on Atomic Masses and Fundamental Constants (P. Van Assche, R.G. Helmer, C. van der Leun) has recommended a consistent set of gamma-ray energies for calibration purposes in ADNDT 24 (1979) 39.

Appendix 15

Status Report on Nuclear Structure and Decay Data

Evaluation Project in Canada

At the last meeting of the Advisory Group on Nuclear Structure and Decay Data, Dr. J. Kuehner from McMaster University expressed our intentions to join in the evaluation work. Consequently, the Canadian team was assigned the responsibility for evaluating the mass chains A=149 and 151.

This project is presently financed by the Natural Sciences and Engineering Research Council (NSERC) and is being carried out at McMaster University. Due to personnel problems, active work on the project was delayed by a year and a half. Active work started only in September 1981 under the overall direction of Dr. J. Kuehner, when Dr. J. Szűcs joined the project. She devoted ∿ 60% of her time to evaluation. Recently, Dr. M. Johns joined us as well and he will work about ∿ 40% of his time on the NSDD project.

All the data analysis programs (GTOL, LOGFT, ANGCOR, HSICC) were supplied to us by Brookhaven and by January 1982 they were running on the CYBER computer of the university.

Presently we are working on the evaluation of the mass chain A=149 and it is well underway. Since both evaluators are new to this project, they are planning to visit Brookhaven or Oak Ridge for an evaluation orientation meeting after working on the mass chain for a few months. We hope that A=149 will be finished and submitted by next spring and A=151 by the next Advisory Group meeting.

Appendix 16

IAEA Advisory Group Meeting on

Nuclear Structure and Decay Data for Applications

Utrecht

11-14 May 1982

U.S. Contributions to International Cooperation in the Evaluation of Nuclear Structure Data.

I. Introduction

This report reviews the evaluation work and related activities of the U.S. Nuclear Data Network* (USNDN), the coordinated group of U.S. evaluation centers.

During this report period, a major event was the completion of changes in responsibility for the publication of Nuclear Data Sheets (NDS) and the maintenance of the Evaluated Nuclear Structure Data File (ENSDF).

II. Status Reports of the U.S. Nuclear Data Network

A. BNL National Nuclear Data Center

1. Coordination and Potential New Evaluators

The NNDC continued its coordination of the USNDN and contact with international evaluation groups. The Chinese Nuclear Data Center, Institute of Atomic Energy, Peking, PRC was sent relevant material to begin evaluation of A = 55 and are in the process of increasing their commitment. They would like to send 1 or 2 evaluators for training at NNDC in the near

*USNDN is comprised of BNL-National Nuclear Data Center (NNDC), INEL-Nuclear Physics Branch, LBL-Isotopes Project, NBS-Photonuclear Data Center, ORNL-Nuclear Data Project (NDP), and U. Pennsylvania-Energy Levels of Light Nuclei.

future. Nuclear research physicists at BNL are cooperating with the NNDC in A chain evaluation.

2. Nuclear Structure References

The compilation activity for the Nuclear Structure Reference (NSR) files continues to run smoothly at a rate of about 320 entries a month. A recent review of the contents of the data base shows that the compilation rate for primary references has remained roughly constant for more than ten years; however, the entry of secondary references has dropped sharply starting with the shift from full-time to half-time compiler at the Nuclear Data Project (NDP) beginning in 1978.

NNDC has now produced a total of two cumulative issues and two supplement issues (see section 4) of Recent References. Because of the backlog in publication of mass-chain evaluations, the RR issues have been published immediately instead of waiting for the issues of February, June and October, as in the past. Evaluators have been receiving their monthly retrievals on a regular basis. NSR file updates for those who maintain a copy of the file are available on a monthly or four-monthly basis.

During the past year corrections to the entire NSR file have been completed so that "Q" for Q-values is distinguishable from "Q" for quadrupole moments. As each mass chain is prepared for publication, CODEN, REFERENCE, AUTHOR and TITLE records are added for references in which they are missing. Galley proofs of articles of Nuclear Physics, Part A are checked for key words on a regular basis.

3. Evaluated Nuclear Structure Data File (ENSDF)

A program (NSDCHK) to check ENSDF formats was written, the ENSDF file was run through it and the format errors were corrected.

A final update to the ENSDF was received at NNDC toward the end of December 1981. This included all the A-chains that were processed at NDP during 1981. This update was also corrected for format errors and merged with the corrected ENSDF. The Network was informed of the format corrections made and the corrected file was distributed in February, 1982.

4. Nuclear Data Sheets (NDS) Publication

On October 27, 1981, NNDC sent the June 1981 (Vol. 33, No. 2) issue of the Nuclear Data Sheets to Academic Press. This was the first issue of NDS produced with the NNDC publication system. The Table below lists the issues of NDS with their contents and the dates they were sent to the publisher.

TABLE OF NDS PUBLICATIONS JUNE 81 - JAN 82

Month/Year	Vol/No.	Contents	Date Sent to Publisher
6/81	33/2	78,188	Oct. 27, 1981
7/81	33/3	Rec. Ref.	Nov. 13, 1981
8/81	33/4	68,185	Dec. 22, 1981
9/81	34/1	197,249-263(odd)	Feb. 2, 1982
10/81	34/2	Rec. Ref	Feb. 19, 1982
11/81	34/3	134,189,244	March 20, 1982
12/81	34/4	107,210 (anticipated)	April 15, 1982
1/82	35/1	127,190 and/or 96 (anticipated)	May 15, 1982

The actual date of publication of an issue of NDS is at present delayed compared to the date on the issue by about 6 months.

5. Mass-Chain Evaluation and Other Related Activities

Evaluation of A = 146 has begun.

In addition to completing its mass-chain assignments, part of the NNDC evaluator effort during the transfer of responsibilities has been directed toward completing an ENSDF data system, providing specifications for publication of Nuclear Data Sheets, and coding ENSDF entries for data published in Nuclear Physics. With most of this work now completed and a collaborative effort started with the BNL Physics Department the NNDC will increase its mass chain responsibility drawing from lists provided by centers wishing to reduce their assisgnments.

NNDC participated with colleagues in the Physics and Chemistry Departments at Brookhaven, Vanderbilt University, Colorado University, California University and the Lawrence Berkeley Laboratory in research on:

a. analysis of ^{164}Er and ^{162}Dy high spin states (N = 96 nuclei);
b. description of collective bands in strongly and weakly deformed nuclei;
c. applicability of variable moment of inertia model for nuclei in different regions;
d. study of γ and β -vibrational states and octupole vibrational bands in rare earth and actinide nuclei.
e. investigation of the decay scheme of high-spin isomers of ^{240}Np and ^{242}Nb.

The Nuclear Physics section of the AIP 50th anniversary Handbook was contributed by NNDC.

6. Neutron Cross Sections Vol 1, Part A

Evaluation of the neutron resonance parameters and thermal data for Z = 1-60 was completed and published as Neutron Cross Sectons Vol 1, Part A (formerly known as BNL-325). It is anticipated that the evaluation of Z = 61-100 will be completed by about September 1982, and Part B will be published in December 1982.

7. ENSDF Related Codes

The ENSDF physics processing codes: ANGCOR, GTOL, HSICC and LOGFT checked out on DEC System-10, CDC-7600 and IBM-370 computers were distributed to the network in July 1981. Some of the bugs corrected since then and the related list of update cards were sent out in March 1982. Because of extensive corrections in HSICC, a new version was distributed to the network in March 1982.

Work is in progress to finalize a machine independent version of the ENSDF format checking code NDSCHK. It is anticipated that this will be ready for distribution in October 1983. NNDC is also working on machine independent versions of other ENSDF processing codes. A list of these and their expected dates of completion may be found in the section on Network Services.

8. Data Services

NNDC has been providing retrievals and monthly updates to the evaluators of Nuclear Data Sheets and others requesting the service. Several request for other specific non-standard retrievals from ENSDF were also satisfied.

NNDC refereed several mass chains before publication.

B. INEL- Nuclear Physics Branch

The evaluations for A=153 and 157 are in the review process. R.L. Bunting is currently working on the A=160 evaluation and C.W. Reich has started evaluating data for the A=161 mass chain. Dr. Milland A. Lee has returned to university teaching after a successful tenure as an evaluator at INEL.

The Idaho National Engineering Laboratory has been assigned a unique zip code. The new address is:

EG&G Idaho, Inc.

P.O. Box 1625

Idaho Falls, Idaho 83415

C. LBL - Isotopes Project

1. Data Evaluation

Evaluations of mass chains A=185, 188 and 193 were published during the past year. Mass chains A=169, 187, 189 and 190 are in or through the review process while updates of mass chains A=174, 181 and 192 are in progress.

While Eddie Browne spent a year's leave in Argentina (September 1980 through August 1981), we were fortunate to have the "loan" of Yurdanur Ellis-Akovali from the Nuclear Data Project. This provided a fruitful exchange of ideas and

approaches between individuals and between the two centers. I hope this will lead to further evaluator exchanges, a concept encouraged by the Panel on Basic Nuclear Data Compilations.

2. Radioactivity Handbook

Two major steps are involved in the production of the Radioactivity Handbook from the ENSDF file. The first of these is the construction of a modified ENSDF file--AENSDF (Applied ENSDF)--which can be used directly to produce the Handbook. The AENSDF file will contain only "adopted levels" data sets and decay data sets, modified to include adopted "best values" for level and gamma properties.

Two major computer codes have been developed to facilitate the modification of ENSDF. The first code establishes all parent-daughter links (within a given mass chain A, and for A+4 and A-4) and checks all data sets for completeness and consistency. Some editing of the ENSDF file will be necessary as each mass chain is processed. The second code provides "best values" for γ-ray properties, independent of the decay parent, in cases where ENSDF does not. This code will also produce the AENSDF file. The procedure is automated; however, it provides for (optional) evaluator guidance and intervention. In addition, holes, inconsistencies, and errors in the ENSDF file are making it apparent that time-consuming evaluator input will be necessary as each mass chain is processed.

The second major step in the production of the Handbook is the presentation of the desired data in formats convenient to the users--data in tabular form and in decay scheme drawings. Work

has begun on the tabular data output program. This includes additional calculations to provide recommended data on atomic radiations and conversion electrons. No major deviations from the original "proposed contents and formats" are anticipated; however, output formats will continue to be refined as work proceeds.

The Handbook will contain a decay scheme for each parent isotope. The existing level-scheme graphics program (used for the seventh edition of the Table of Isotopes) has been adapted to handle data in ENSDF formats. The new version has been tested (and debugged) on data sets from many mass chains. As the AENSDF file is built up, decay-scheme processing will begin.

3. 1st Conference on Nuclear Structure Data Evaluation

This conference was organized by Isotopes Project members and held at Asilomar, CA, October 27-30, 1981, in conjunction with the APS/Division of Nuclear Physics fall meeting. It marked the beginning of a dialogue, in the international evaluation community, about the scientific problems associated with evaluating nuclear structure data. The published Proceedings, containing a summary of the discussion sessions, abstracts of evaluation papers presented at the DNP meeting and contributed papers on nuclear structure data evaluation, will be available in May.

4. Reviews of the Project's Activities

The Isotopes Project was reviewed as part of the assessment of DOE's Basic Energy Sciences Program. This consisted of preparation of an information packet detailing the Project's

activities for a review panel, as well as a presentation to the panel in Washington (November 1981). Later in November, the activities of the Project were reviewed by the National Academy of Sciences Panel on Basic Nuclear Data Compilations (Tom Tombrello, Chairman). As a result, the Panel has encouraged the Isotopes Project to present a proposal for production of a nuclear structure handbook at the Panel's next meeting (late 1982).

5. Systematic Properties/Evaluation Guidelines

Innovative research into the evaluation of the systematics of nuclear properties is being initiated. This work is expected to result in the creation of new guidelines for evaluation and is a significant contribution to the body of knowledge in nuclear physics. Preliminary results concerning γ-ray transition probability systematics and β-decay log ft systematics were presented at the Asilomar APS/DNP meeting and are included in the Proceedings of the 1st Conference on Nuclear Structure Data Evaluation.

6. Table of Isotopes Sales

As of January 1, 1982, sales of the seventh edition of the Table of Isotopes totalled 7085 copies (3455 clothbound and 3630 paperback).

D. ORNL - Nuclear Data Project

1. Mass Chain Evaluation

a. During the period April 1981 to April 1982, the mass chains A = 185, 197, 243, 245, 247, and 249-263 (odd A) were published. In addition, the mass chains A = 107, 187, 210,

232, and 236 have been submitted for publication.

b. By the end of the calendar year we expect to finish the mass chains A = 198, 208, 230, 231, 234, 235, and 239.

c. The loss of one evaluator (Ben Harmatz) will make it difficult to maintain a four-year cycle for the mass chains A $\geq$ 195 (excluding 238, 240, 242, 244) which are presently the responsibility of the Nuclear Data Project. However, we expect to get temporary help (possibly up to 3 mass chains/year) from some ex-evaluators at ORNL.

2. Mass Chain Review/Editing

A thorough review and editing of 17 mass chains was provided.

3. Individually, or in collaboration with other researchers in the Physics Division, NDP staff members have published or prepared for publication the following papers:

a. R.L. Robinson, R.L. Auble, I.Y. Lee, M.J. Martin, G.R. Young, J. Gomez del Campo, J.B. Ball, F.E. Bertrand, R.L. Ferguson, C.B. Fulmer, J.R. Wu, J.C. Wells, H. Yamada, "Fast protons and alpha particles from the ^{12}C + ^{60}Ni reaction," Phys. Rev. C24, 2084 (1981)

b. M.J. Martin, "Radioisotopes," Encyclopedia of Chemical Technology - Third Edition, John Wiley and Sons, Inc., to be published

c. K.S. Toth, D.M. Moltz, Y.A. Ellis-Akovali, C.R. Bingham, M.D. Cable, R.F. Parry, J.M. Wouters, "Single-proton states in ^{147}Tb," Phys. Rev. C25, 667 (1982)

d. C. Schuck, N. Bendjaballah, R.M. Diamond, Y. Ellis-Akovali, K.H. Lindenberg, J.O. Newton, F.S. Stephens, J.D. Garret, B. Herskind, "Multiquasiparticle configuration effects deduced from the very

frequency discrete lines spectroscopy of ^{165}Yb," Phys. Rev. C, to be published

e. Y.A. Ellis-Akovali, "r_o parameters for α decaying even-even nuclei," Asilomar conference (1981)

f. Y.A. Ellis-Akovali, D.M. Moltz, K.S. Toth, J.D. Cole, H.K. Carter, "Identification of ^{150}Er," Bull. Amer. Phys. Soc. 27, 522 (1982)

E. University of Pennsylvania Report

A=16, 17 have been published in Nuclear Physics. Work on the evaluation of A=18, 19, 20 has been finished and preprints were sent out to about 150 persons for comments. It is expected that these three mass-chains will appear in print soon. Evaluations of A=5, 6 have been started and appears to be slightly ahead of a schedule based on 4-year cycle.

F. NBS - Photonuclear Data Group

As a result of a reorganization of Data Center activities within NBS, the Photonuclear Data Center no longer exists as a separate, well-defined entity. A small Photonuclear Data Group is, however, trying to maintain minumum services for the local research programs and outside members of the scientific community to the extent possible with the available resources.

The Photonuclear Data Group is completing work on the second supplement to NBS Special Publication 380, Photonuclear Reaction Data, 1973. This supplement will contain a complete annotated index to the published experimental data entered into the Group's files from January 1978 through April 1982. It will also contain an index to the cross section data available in the Group's digital cross

section library. The planned publication date is August 1982. With the publication of this supplement a complete annotated index covering the period from 1955 through 1981 will then be avaialble by using NBS SP 380 in conjunction with its two supplements.

The evaluation of the photonuclear reaction data for the nuclides ^{12}C, ^{14}N, and ^{16}O, circulated for comments in 1980, has been revised and updated to take into cognizance both the comments received as well as the new measurements completed subsequent to the completion of the original draft. This annotated compilation will contain a consistent set of cross section data in both graphical and tabular form for each nuclide. Also included will be tables of energy weighted moments of the various reaction cross sections as well as bremmsstrahlung weighted yields and radio-activity decay data for the residual nuclides produced by the various reactions. The final compilation will also be available for circulation, in preprint form, in August.

Appendix 17

BROOKHAVEN NATIONAL LABORATORY

MEMORANDUM

NS/1A-33

DATE. April 13, 1982

TO. NSDD

FROM: S. Pearlstein

SUBJECT. Priority Mass Chains

The 4-year cycle is not yet a reality. Those masses for which information is changing or expanding rapidly should be considered for reevaluation more frequently than others. A crude indicator of nuclear structure research activity is the number of references denoting a particular residual mass.

C. Dunford has scanned the Nuclear Structure Reference (NSR) file for primary and secondary references included in the NSR file since the beginning of 1977. These are plotted in Figure 1. The following features are noted.

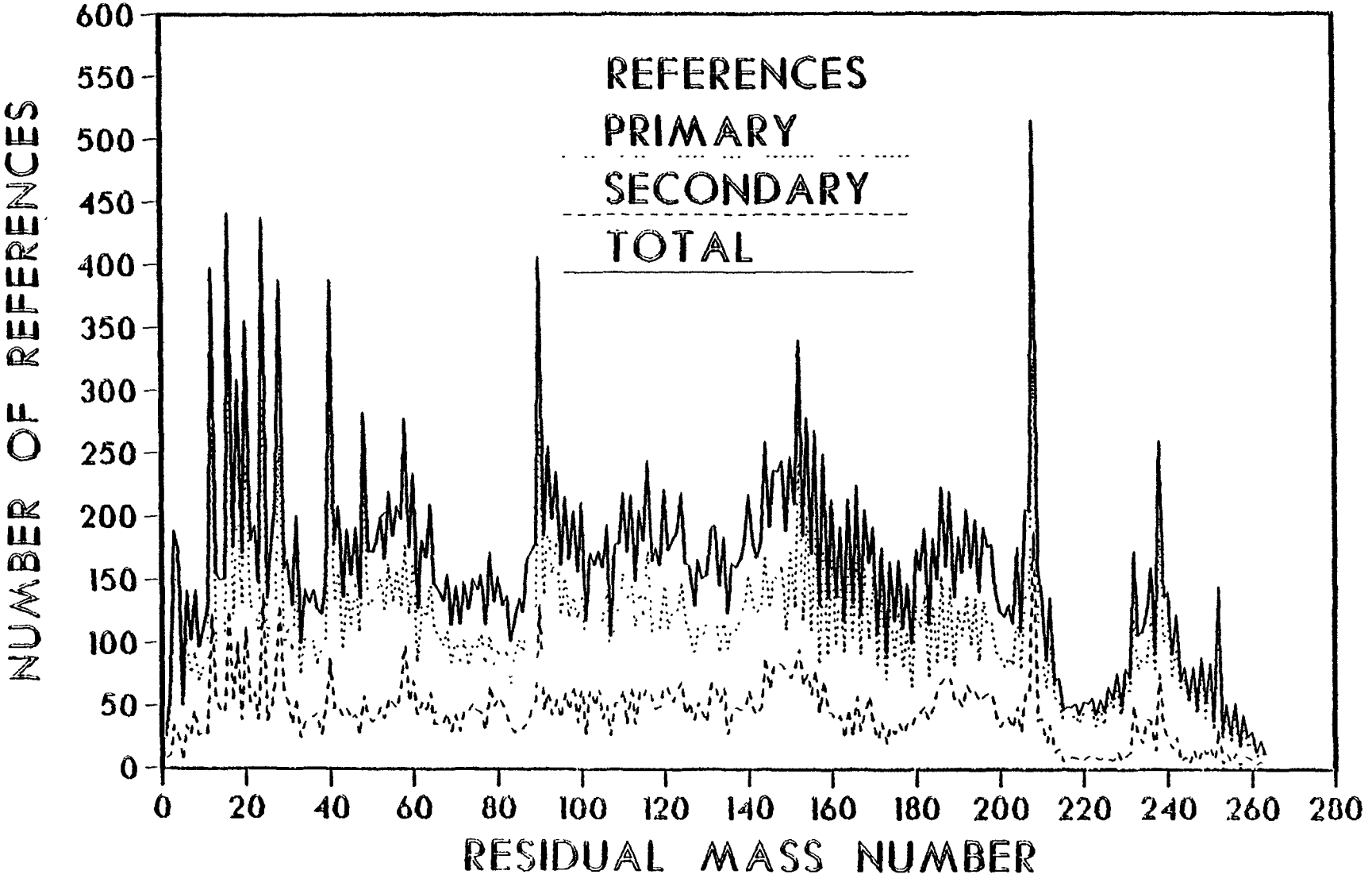
1. Although smaller in number the secondary references follow the same trends as the primary references.

2. There is a strong odd-even effect. The number of references to even mass residual nuclides consistently are greater than that for neighboring odd mass nuclides.

3. The research activity on numerous light masses and masses 40, 90, 208, 238 and 252 is significantly greater than that on their neighbors. Receiving honorable mention are masses 48, 58 and 152. These areas of increased activity correspond to doubly magic nuclei, strongly deformed nuclei, and the sharply transitional region near A = 152.

SP:jb

REFERENCES ON RESIDUAL NUCLIDES 1977-



Appendix 18

NDS Evaluation Transmittal

Mail to: Dr. J. K. Tuli
National Nuclear Data Center
Building 197D
Brookhaven National Laboratory
Upton, N.Y. 11973, U.S.A.

Please include the following for prompt processing of your A-chain:

A. MASS NUMBER =

Evaluator Name:

INSTITUTE:

ADDRESS:

B. ITEMS ENCLOSED

1. MAGNETIC TAPE
DESCRIPTION: MODE — EBCDIC/ASCII/BCD
No. of Tracks: — 9 Tr/7 Tr
DENSITY: — 556/800/1600/6250
BLOCKING Factor:
No. of Records (if known):

2. DATA BANK LISTING (optional) — Yes/No

3. ABSTRACT

4. COPYRIGHT RELEASE FORM

5. REQUEST TO REPLACE EXISING ENTRIES
IN ENSDF for this A-number

C. SHOULD THE FOLLOWING PROGRAMS BE RUN AND NEW RECORDS INSERTED IN YOUR EVALUATION?

HSICC — Yes/No
LOGFT — Yes/No

D. ANY OTHER COMMENTS:

Appendix 19

BROOKHAVEN NATIONAL LABORATORY

MEMORANDUM

DATE: MAY 1982

TO: NSDD

FROM: J. K. Tuli, NNDC

SUBJECT: Coding in ENSDF for A = 5-44

Enclosed memo (NS-1A/16) dated October 1980 describes the arrangement agreed upon for coding the evaluations for A=5-44 into ENSDF format.

The status of NNDC effort in this regard is given below:

A=5-10	Data have been coded in ENSDF format. The coded data have been run through format checking. Presently, the checking for typographical errors and omissions is in progress.
A=11-12	Most of the data have been coded in ENSDF format. Format checking is in progress.

JT:anl

encl.

Appendix 20

PM on ENSDF-Associated Programs

Peter Ekström and Jacquette Lyttkens

Lund University

The ENSDF-associated programs provided by the NNDC are not, as it is stated on the distribution form, written in machine independent code. The fact is that there are three different versions of most programs, for IBM, DEC and CDC, but since these computer manufacturers do not dominate the market now as much as they did a few years ago, this is not sufficient.

The main problems occur for:

(i) READ/WRITE on disc (machine dependent routines) and
(ii) Character string handling (word length).

I think that the most practical way to solve the problems is to gradually convert the code into FORTRAN 77 (ANSI X3.9-1978). This standard has now been implemented by most computer manufacturers.

A conversion to FORTRAN 77 would have the following advantages:

(i) The codes would be truly computer independent, provided that your favourite computer has a FORTRAN 77 compiler. If that is not the case all statements are at least well defined.

(ii) Programs can be written in such a way that they are easier to read. This would make the programs easier to modify and debug.

(iii) The programs would become shorter and faster (which can be of interest if one has to pay for computer time or if one is of an impatient disposition). As an example the program GTOL has been converted to FORTRAN 77 and this has cut the execution time by 50% (a more thorough revision would do even better), and the string handling library was cut down from about 2500 to 1100 lines.

(iv) The programs would become more reliable partly because of what was said under point (ii) and also since character string handling can be made safer with CHARACTER variables.

Appendix 21

Radioactivity Handbook

Janis Dairiki
Lawrence Berkeley Laboratory
Berkeley, California, U.S.A.

Status

Two major steps are involved in the production of the Radioactivity Handbook from the ENSDF file. The first of these is the construction of a modified ENSDF file--AENSDF (Applied ENSDF)--which can be used directly to produce the Handbook. The AENSDF file will contain only adopted levels data sets and decay data sets, modified to include adopted "best values" for the level and gamma properties. The second major step is the presentation of the desired data in formats convenient to the users--data in tabular form and in decay scheme drawings.

Two major computer codes have been developed to facilitate the modification of ENSDF. The first code establishes all parent-daughter links (within a given mass chain A, and for A+4 and A-4) and checks all data sets for completeness and consistency. Some editing of the ENSDF file will be necessary as each mass chain is processed. The second code provides "best values" for γ-ray properties, independent of the decay parent, in cases where ENSDF does not. This code will also produce the AENSDF file. The procedure is automated: however, it provides for (optional) evaluator guidance and intervention. Holes and inconsistencies in the ENSDF data, as well as problems posed by the file structure, are making it apparent that substantial (time-consuming) evaluator input will be necessary as each mass chain is processed. Development of the second code is nearly complete: creation of the AENSDF file will begin by the end of the summer.

We are now turning our attention to the Handbook output formats. The level-scheme graphics program used for the Table of Isotopes has been adapted to handle data in ENSDF formats and is now in routine use. Tabular data outputs will appear essentially as presented in the Handbook sample distributed earlier. They will, however, continue to be refined as work proceeds. Recommended values for atomic properties and conversion electrons will also be included. Sources of the input parameters to be used in the calculation of these properties are indicated on the attached list: comments and suggestions are invited.

Implications for ENSDF

The ENSDF file was created by the Nuclear Data Project at ORNL in order to facilitate production of the Nuclear Data Sheets. Upon formation of the international evaluation network, ENSDF (with its existing formats and structure) was adopted as the common repository for all evaluated mass-chain data. In addition to forming a basis for Data Sheets production, ENSDF is now also expected to serve as a medium for the exchange of data between centers, as an all-purpose retrievable data base, and as a basis for other derived publications.

The Radioactivity Handbook effort is the first real test of ENSDF's role in producing a new major publication. Many problems have been encountered. It is becoming increasingly evident that the existing file cannot be used in a relatively straightforward manner to produce any derived publication without additional, substantial evaluator effort. In the long run, this will seriously limit the usefulness of ENSDF. The National Academy of Sciences Panel on Basic Nuclear Data Compilations (Tom Tombrello, Chairman) has recognized this and has pointed out the importance of ready retrieval from and multiple applications of the file without the need for further "re-evaluation". We would like to see the international evaluation network give a high priority to improving ENSDF, restructuring it if necessary, so that it will be a truly standard, uniform data base.

The recent "News of ENSDF Formats and Procedures", an attachment to C. Michael Lederer's memo dated February 11, raises many subject areas relating to establishing an ENSDF standard. These have also impacted the Handbook effort. I suspect that many of these topics will be brought up again later in this meeting when we discuss the subject of changes in both ENSDF and the Nuclear Data Sheets. In the meantime, let us examine some of the problems we've encountered.

Lack of a standard

Holes and inconsistencies in the ENSDF file, such as missing decay modes or data on comment cards (where they are not retrievable) rather than on second cards, have necessitated an extra programming step in order to establish all parent-daughter links required to extract data for the Handbook. As each mass chain is processed, ENSDF will be edited to correct all such data omissions and discrepancies. Such problems can be prevented in the future by precisely defining all quantities and fields in each record of the file. This is the basis of a standard and is fundamental to ENSDF and to the evaluation effort. I would also suggest that this is an alternative answer to the pending action item from the 1980

IAEA Advisory Group meeting, requesting network members to submit suggestions for additional minimum standards to Murray Martin. We can best satisfy this action by precisely defining all standards.

The variety of notations found in the JPI field, as noted in "News", while far from being the only example, is, perhaps, the most graphic example of the variations (and resulting confusion) which occur when there is no specific definition. Once all quantities are precisely defined, the manual should be revised and fleshed out to reflect the definitions, and checking programs can be implemented to enforce them. This will guide the evaluator and insure retrievability of information in the data file.

"Best" values in an evaluated file

A much harder problem to address is the need to develop a uniform policy as to what information is included in ENSDF and how it is best presented. Since ENSDF is an evaluated file, one expects it to contain "best" or recommended values. This is true for the adopted levels data sets but not necessarily for other data sets. Currently we have a non-uniform, hybrid system. In particular, many evaluators include the best (i.e., adopted) values of E_γ, multipolarities and mixing ratios in each decay data set. Others may also include the best I_γ, JPI and level half-lives, but most do not.

In order to arrive at a uniform set of recommended values for decay properties for the Radioactivity Handbook, it has been necessary to construct a modified file, AENSDF, which does contain best values for all level and γ-ray properties (independent of parent) in each decay set. In keeping with the policy adopted at the 1980 IAEA meeting, we have used an appropriate least squares method for determination of γ-ray intensities. A semi-automated process has been developed to produce the AENSDF file. However, considerable evaluator time and effort are still required since the computer cannot (and should not) make physics decisions. The network needs to address the desirability of making each decay set as complete and accurate as possible: in effect, an adopted decay set.

Expanded adopted level scheme

Looking ahead to a different type of publication, one which would concentrate on nuclear structure data, the capability to include feeding information on the adopted levels scheme would be extremely useful to the reader. Additional information can be conveyed by indicating which reactions (including decay) populate each level of a given nucleus. This would also be of immediate benefit to Nuclear Data Sheets and

could. in most cases. replace the present ladder diagrams. Since the evaluator already makes these decisions, there is little additional effort required.

The ENSDF format needs to be modified to include the pointers which make such an expanded level scheme possible. One way to do this is to assign an identifying index to each reaction and decay set and then indicate levels populated in each by affixing the appropriate indices to each adopted level. A more sophisticated double pointer system could also be designed in which a constant value of a level index is assigned to equivalent levels in all data sets, including the adopted one.

These are some of the subjects which need to be addressed as we continue the job of refining the evaluation procedure and insuring that ENSDF will readily satisfy all its intended roles. Experience gained from the Handbook effort can play a valuable part in this process.

X-ray and Auger-electron Energies and Intensities for the Radioactivity Handbook

R.B. Firestone, LBL

A. Calculation of atomic vacancies following decay

1. ICC for Z = 30-104: F. Rösel, H.M. Fries, K. Alder, and H.C. Pauli, Atomic Data and Nucl. Data Tables 21, nos. 2-5(1978).
2. ICC for Z < 30: I.M. Band, M.B. Trzhaskovskaya, and M.A. Listengarten, Atomic Data and Nucl. Data Tables 18, 433(1976).
3. EC radial wavefunctions (a la Mann and Waber) as given in W. Bambynek et al., Rev. Mod. Phys. 49, 77(1977).
4. EC exchange and overlap correction factors calculated in the manner of Bahcall ($Z \leq 54$) and Martin, Blichert-Toft ($Z \geq 55$); ibid.

B. Sources of data for calculating x-ray and Auger-electron energies or intensities

1. ω_K, ω_{L_i}, a_K, a_{L_i}, f_{12}, f_{13}, f'_{13}: M.O. Krause, J. Phys. Ref. Data 8, 307(1979).
2. K_α, K_β, L_α, L_β, L_γ, L_η, L_ℓ:
   a. Experiment: S.I. Salem et al., Atomic Data and Nuclear Data Tables 14, 91(1974).
   b. Theory: J.H. Scofield, Atomic Data and Nuclear Data Tables 14, 121(1974) and Phys. Rev. 1041(1974).
3. Theoretical Auger transition probabilities: M.H. Chen et al., Atomic Data and Nucl. Data Tables 24, 13(1979).
4. X-ray energies: J.A. Bearden, Rev. Mod. Phys. 39, 78(1967).
   Z > 84: F.T. Porter and M.S. Freedman, J. Phys. Ref. Data 7, 1267(1978).
5. Auger-electron energies: F.B. Larkins, Atomic Data and Nucl. Data Tables 20, 338(1977).

C. Errors: Intensity errors will be derived from all sources (including estimates of error in theoretical data) and standard statistical error reduction techniques will be utilized.

Appendix 22

IAEA Advisory Group Meeting on

Nuclear Structure and Decay Data

Zeist, 11-14 May 1982

Uncertainties for log ft values in ENSDF

In the memorandum 1C/1982-1 (C.M.Lederer) on "Formats and Procedures for ENSDF", the possibility of giving asymmetrical uncertainties for more quantities is considered. In response to this, we present some considerations on the uncertainties for log ft values.

Asymmetrical uncertainties for log ft values could indeed be useful for β-branches with small intensity and large uncertainties. In this case, the program LOGFT gives an underestimation of the upper limit for the calculated log ft value.

In a survey of the most recent NDS, some different approaches are encountered:

- the uncertainty is given as calculated by the LOGFT program, resulting in an underestimation of the upper limit for the log ft value (see example A=249)
- a correct asymmetrical uncertainty is given, corresponding to the uncertainty on the β-intensity (see example A=113)
- in some mass chains, systematically no uncertainties are given for log ft values (A=106,185)

As log ft values are considered to provide strong arguments for spin and parity assignments, a more uniform approach may be profitable.

P. De Gelder

Gent, 5 May 1982

β+,ε Data from ^{248}Es ε Decay 76Ah07

Eε	E(level)	Iε†	Log ft	Comments
(91 7)	1304.3	0.038 6	6.35 12	εL=0.626 13; εM+=0.374 13.
(127 7)	1267 8	0.036 8	6.73 12	εL=0.665 6; εM+=0.335 6.
(157 7)	1238.0	0.054 9	6.81 10	εK=0.08 4; εL=0.63 3; εM+=0.294 16.
(177 7)	1218.5	1.6 2	5.51 9	εK=0.19 4; εL=0.56 3; εM+=0.253 15.
(195 7)	1199.8	0.026 7	7 45 13	εK=0.28 4; εL=0.498 22; εM+=0.219 12.
(387 7)	1007.9	1 7 2	6.55 6	εK=0.616 5; εL=0.275 3; εM+=0.1084 14.
(493 7)	902 5	0.21 3	7 73 7	εK=0.6614 22; εL=0.2445 15; εM+=0.0941 7.
(543 7)	852.2	2.1 3	6.84 7	εK=0.6750 17; εL=0.2352 12; εM+=0.0898 6.
(582 7)	813.2	9.9 13	6.24 6	εK=0.6835 15; εL=0.2293 10; εM+=0.0872 5.
(952 7)	443.0	1.6 3	7 53 9	εK=0.7242; εL=0.2013 3; εM+=0.07450 14.
(958 7)	437 5	8.5 13	6.81 7	εK=0.7245, εL=0.2011 3; εM+=0.07440 13.
(1016 7)	379 5	41 6	6.18 7	εK=0.7277; εL=0.1989 3; εM+=0 07340 12.
(1152 7)	243.1	0.4 4	6.3 5	εK=0.7339; εL=0.19462; εM+=0.07150 9.

Continued on next page (footnotes at end of table)

β-radiations from ^{113}Ag β- decay (68.7 s) 75BrYM

Measured Eγ, Iγ, γγ coin, γ(t), Eβ, βγ coin, 75BrYM.
Others: 69Hn01,70Ma47.
β- branches were obtained from (γ+ce) imbalance at each level.

Eβ	Iβ	Log ft	Comments
(858)	0.5 3	5.3 +4-2	Avg Eβ=291 8.
(1006)	≈0.44	≈5.6	Avg Eβ=351 9.
(1046)	≈0.99	≈5.3	Avg Eβ=368 9.
(1345)	≈8.9	≈4.8	Avg Eβ=495 9.
(1470)	≈2.4	≈5.5	Avg Eβ=549 9.
(1595)	≈0.60	≈6.3	Avg Eβ=604 9.
(1737)	≈5.8	≈5.4	Avg Eβ=668 9.

Appendix 23

NEW GUIDELINES FOR SPIN AND PARITY ASSIGNMENTS

R.B. Firestone
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Berkeley, CA 94720

In answer to the call for changes and additions to the spin and parity rules in ENSDF, I have initiated an in-depth research project to study nuclear decay and reaction systematics. The bases for spin and parity, as outlined in Nuclear Data Sheets, are generally correct, but they are not always directly useful for determining the actual spins and parities. This is due to the fact that many JPI values are derived strictly on the basis of nuclear systematics. For example, the strong rule that all even-even nuclei have 0^+ ground states is based on systematics, although it has already been suggested that certain very-deformed, exotic nuclei may have J>0 ground states. Experimental scientists and evaluators continuously use systematics to analyze data, yet such information is often fragmentary, out-of-date, or hard to come by in the literature. As a result, data are analyzed on the basis of individual impressions of the systematic trends which, correctly or not, then become incorporated into the fabric of future systematics.

Many such difficulties with the NDS spin and parity rules can be fruitfully investigated. The recommended upper limits for gamma-ray transition probabilities are correct, but they are not always applicable. For instance, magnetic transitions can be fastest near closed nuclear shells. Thus, if multipoles are to be assigned on the basis of half-life, a new criterion for deformed nuclei must be defined. Assignments on the basis of logft values are also nuclear structure dependent, but, in addition, logft values depend on a detailed knowledge of the decay scheme which must be separately considered in creating the associated spin and parity assignment rules. As an additional example, the rotational quantum numbers cannot be routinely assigned without performing appropriate calculations and establishing reasonable values for the band parameters from systematics. Some examples of the difficulties associated with the lack of systematics are included below.

The problems with the spin and parity assignment rules can be resolved by a consistent analysis of the systematics of the data, which could then be made available, in a useful format, to experimenters and evaluators. The systematic trends must be clearly presented and substantiated by the use of well accepted

theory. Permissible boundaries for experimental quantities should be established and guidelines for spin and parity assignment must be drawn. Importantly, the data underlying the systematics must be maintained in an updatable form so that new information can be added, on a continuing basis, to further update or modify the spin and parity rules.

I have begun just such a comprehensive study of nuclear systematics based on various evaluated sources such as ENSDF, the Table of Isotopes, Endt's compilation of gamma-ray transition probabilities, and other information. Computerized data files of log*ft* values, gamma-ray transition probabilities, and alpha-particle hindrance factors are currently being prepared, and additional files are being planned. This data will be subdivided on the basis of nuclear structure and transition type, and systematized with consideration of nuclear structure theory. Anomalous or extreme data points will be reevaluated and the theoretical analysis will be refined in an iterative process to arrive at the most useful criteria for assigning spins and parities. Rules will be drawn including general guidelines, instructions for interpreting the relevant nuclear structure considerations, and graphs or charts displaying the known systematics. The associated data files will be maintained in a computer searchable database for convenience of analysis and updating. Additional information not measured, but predicted on the basis of interpolation or extrapolation with strong theoretical justification, will also be generated for possible incorporation into ENSDF. Apparent errors in the literature or evaluations will be identified for correction of the various evaluated data files. Finally, my computer code SPINOZA will be updated to check ENSDF format datasets for the proper application of the systematics in assignment of spins and parities.

The results of this project will be published in refereed journals and the Nuclear Data Sheets. I will seek the continuing advice of the evaluation and experimental nuclear science community in this effort, and additional advice or information will be welcome. This project is envisioned as an ongoing program of research with the first results expected by 1983.

Appendix 24

Date: May 2, 1982

From: J.W. Tepel

Subject: Proposal for delayed particle decay data sets

In contrast to delayed particle decay data, normal particle decay fits well into the existing ENSDF-framework and should be treated in a manner similar to alpha decay data sets. We follow in part a proposal by J.K. Tuli dated October 6, 1981 , which was sent to us towards the end of 1981. The type of particle decay should be unambiguously noted on the ID-card, e.g.

14CCS 141CS N DECAY (LEVEL)

It will also be necessary to define new record types:

U for Neutron Cards, and
V for Proton Records.

Guiding principle in designing new data sets should be: economic and unambiguous registration of the new data. We suggest therefore that U and V Records have an unique format, independent of their use in delayed or normal decay data sets.

The format suggested is the following:

Column	Field Name
1-9	Normal meaning, use U or V in column 8
10-19	Particle energy (E), only if measured
20-21	DE
22-29	Measured particle intensity (I)
30-31	DI
32-39	Intermediate parent level energy (IPE) (leave blank if unknown or not applicable)
40-41	DIPE
42-76	Blank
77	Comment Flag
78-79	Coincidence
80	S or ?

For delayed particle decay data sets more than a single particle record may be associated with any particular level in the final nucleus. Furthermore, in order to distinguish between normal and delayed decay data, we suggest that the hitherto unused columns 56 to 60 in the PARENT RECORD contain the NUCID of the intermediate nucleus for all delayed decay data sets. This is important for analysis programs contriving to set up intensity balance for the final nucleus, which means integration over all side-feeding particle branches.

A typical delayed neutron decay data set might look as follows: (all fields have their usual contents, except as noted):

```
I.      14CBA    141CS B-,N DECAY (1.14 M  )
        14CBA C  Comments
        14CBA  N NR,NT,BR as usual, NB multiplier to convert
                 relative particle intensities to intensities
                 per 100 decays through this decay branch
        141CS  P Columns 56 to 60 contain  141BA
        14CBA  L 0.0
               U 2105    20  0.50  10   5600   50
               U 1200    30  0.10   5   5700   50
               U             1.50  20
               L 1500    10
               U  ...
               U  ...
               G 1500
               etc.
```

Any information on the intermediate parent levels should be contained in the data set:

```
II.     141BA    141CS B- DECAY (1.14 M)
```

Furthermore, branching of parent nucleus levels (141CS) should be indicated: %B-=100 % %DN=33.5 (% delayed neutrons)

Error messages from the data checking programs should occur whenever

(1) a value has been entered for the intermediate parent level energy LPE, but the NUCID-field columns 56 to 60 is empty.
(2) more than one particle card is present for empty NUCID

Apart from such formal errors, physical data checking should also be performed using Q(B-) and S(N).

Appendix 25

Addresses of Members of the NSDD Network

(Active mass-chain evaluation centres are indicated by an asterisk, NSDD distribution centres are indicated by an +)

Code	Centre/Group	Address	Head of Project or Centre
1A	US/NNDC	*+ National Nuclear Data Centre Brookhaven National Laboratory Upton, New York 11973, USA	S. Pearlstein
1B	US/NDP	* Nuclear Data Project Oak Ridge National Laboratory Oak Ridge, Tennessee 37830 USA	M. Martin
1C	US/LBL	* Lawrence Berkeley Laboratory University of California Berkeley, Cal. 94720, USA	C.M. Lederer
1D	US/INEL	* EG and G Idaho, Inc. P.O. Box 1625 Idaho Falls, Idaho 83401, USA	C.W. Reich
1E	US/UP	* University of Pennsylvania Philadelphia, Penn. 19174, USA	F. Ajzenberg-Selove
2A	USSR/CAJaD	*+ Institut Atomnoi Energii I.V. Kurchatova 46 Ulitsa Kurchatova Moscow, D-182, USSR	F.E. Chukreev
2B	USSR/LIYaF	* Data Centre Leningrad Nuclear Physics Inst. Gatchina, Leningrad Region 188350, USSR	I.A. Kondurov
3A	NED/Utrecht	* Fysisch Laboratorium P.O. Box 80 000 Princetonplein 5 3508 TA Utrecht, The Netherlands	C. van der Leun
4A	UK/Liverpool	* Oliver Lodge Laboratory University of Liverpool Liverpool L69 3BX, U.K.	P.J. Twin

Code	Centre/Group		Address	Head of Project or Centre
5A	FRG/FIZ	*+	Fachzinformationszentrum Energie, Mathematik GmbH Kernforschungszentrum D-7514 Eggenstein-Leopoldshafen 2 FRG	H. Behrens
6B	FR/CEA-Grenoble	*	Centre d'Etudes Nucleaires de Grenoble Cedex No. 85 F-38041 Grenoble-Gare	J. Blachot
7A	IAEA/NDS	+	Nuclear Data Section International Atomic Energy Agency P.O. Box 100 A-1400 Vienna, Austria	A. Lorenz
8A	NEA/DB	+	NEA Data Bank B.P. No. 9 F-91190 Gif-sur-Yvette France	N. Tubbs
9A	CBNM/Geel		Bureau Central de Mesures Nucleaires C.E.C. Steenweg naar Retie B-2440 Geel, Belgium	W. Bambynek
10A	JAP/JAERI	*	Japan Atomic Energy Research Institute Division of Physics Tokai-Mura, Naka-Gun Ibaraki-Ken 319-11, Japan	T. Tamura
11A	SWD/Lund	*	University of Lund Institute of Physics Solvegatan 14 S-223 62 Lund, Sweden	J. Lyttkens
12A	KUW/ISR	*	Kuwait Institute for Scientific Research Shuwaik, Kuwait	A. Shihab-Eldin
19A	BLG/Gent	*	Laboratorium voor Kernfysika Proeftuinstraat 86 B-9000 Gent, Belgium	D. De Frenne
20A	CAN/TAL	*	Tandem Accelerator Laboratory McMaster University Hamilton, Ontario L8S 4K1 Canada	J.A. Kuehner