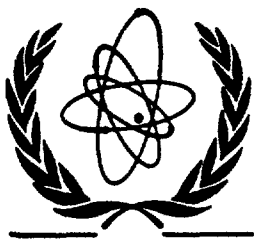
INDC(NDS)-182/GE



International Atomic Energy Agency

INDC INTERNATIONAL NUCLEAR DATA COMMITTEE

CO-ORDINATION OF THE INTERNATIONAL NETWORK OF NUCLEAR STRUCTURE AND DECAY DATA EVALUATORS

Summary Report of a Consultants' Meeting organized by the International Atomic Energy Agency and held at the Centre d'Etudes Nucléaires de Grenoble in Grenoble, France, 2 - 5 June 1986

Edited by A. Lorenz
Nuclear Data Section
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Reproduced by the IAEA in Austria
October 1986

86-04742

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 six-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 pioneering work in the late fourties and early fifties by physicists from the California Institute of Technology (Pasadena), the Rijksuniversiteit at Utrecht (Netherlands) and the Nuclear Data Group (Washington and Oak Ridge). The United State effort is presently coordinated by the US Nuclear Data Center at the Brookhaven National Laboratory.

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 physics 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.

Table of Contents

I. MEETING SUMMARY

A. Introduction

The seventh meeting of the International Network of Nuclear Structure and Decay Data (NSDD) Evaluators was convened by the IAEA Nuclear Data Section at the CEA of Grenoble in France, from 2-5 June 1986. The meeting was attended by 18 scientists from ten Member States and one international organization, 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: four half-day sessions devoted to the organizational aspects of the coordination of the NSDD network (chaired by A. Lorenz); and three half-day sessions devoted to the presentation and discussion of papers related to the physics of evaluation of NSDD (organized by J. Blachot of the CEA in Grenoble). The Adopted Agenda for the organizational part of the meeting is given in Appendix 2, and the list of papers presented during the physics sessions is given in Appendix 3. The list of papers submitted to the meeting by the participants is given in Appendix 4. The Actions which resulted from this meeting are listed in Appendix 5.

B. Meeting Objectives

The organizational part of the meeting concentrated on the following objectives:

- Consideration of network membership and mass-chain assignments: the Chinese Nuclear Data Center (PRC) was admitted as a full member of the Network and given a permanent A-chain assignment; the Banaras Hindu University Group (India) was given a temporary assignment of A=175 and 176 which are part of the US/LBL assignment.

- Review of NSDD evaluation status. There has been a considerable increase in the number of mass-chains submitted for publication per year (since 1984), it is expected that 30 mass-chains will be finished during 1986. For a (desirable) six-year cycle, one needs a production of 36 mass-chains per year.

- Consideration of changes in the Nuclear Data Sheets journal publication format. The network considered proposals (submitted by BNL) to revise the published output format of mass-chain evaluations in order to reduce the number of pages per published mass-chain (i.e. more efficient use of available page space) so as to avoid increase in journal subscription price, and to improve readability of the printed output.

- Review of evaluation rules, which is a continuous process to improve the methodology used by mass-chain evaluators.

C. Objectives of the NSDD Network

The international NSDD Network, consisting presently of 17 evaluation groups in 13 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 six-year cycle, the continuous publication of

these evaluated data in the Nuclear Data Sheets and Nuclear Physics A journals, 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 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.

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 6.

II. MEETING PROCEEDINGS

A. Review of Actions from last meeting

The April 1984 Meeting Actions were reviewed. For the full text of these actions, the reader is referred to Appendix 4 of the 1984 NSDD Meeting Report (INDC(NDS)-157/NE). Some of the actions from previous meetings were adopted as continuing actions and are included in this meeting's List of Actions (Appendix 4).

B. Short Report from NSDD Network Members

Status reports made by the members of the NSDD Network representing active evaluation groups are included in this report. The following reports were presented:

- Report from BLG/Gent. D. DeFrenne (86/20) Appendix 7
- Report from FR/CEA-Grenoble. J. Blachot (86/8) Appendix 8
- Report from NED/Utrecht. C. Van der Leun (86/21)Appendix 9
- Report from FRG/FIZ. H. Behrens (86/5) Appendix 10
- Report from PRC/CNDC. Zhou Enchen (86/6) Appendix 11
- Report from CBNM/Geel. W. Bambynek (86/1)
- Report from CAN/TAL. B. Singh (86/10) Appendix 12
- Report from KUW/ISR. D.A. Viggars (86/10) Appendix 13
- Report from UK/Liverpool. P.D. Forsyth (86/4) Appendix 14
- Report from US/NNDC. M. Bhat (86/2) Appendix 15
- Report from SWD/Lund*. P. Ekström (86/19) Appendix 16
- Report from JAP/JAERI*. T. Tamura (86/7) Appendix 17
- Report from USSR/CAJaD. F.E. Chukreev (86/22) Appendix 18

C. Status of the NSDD Network

At this meeting of the network, the Chinese Nuclear Data Centre, Beijing PRC (PRC/CNDC) was formally incorporated in the Network, and the Department of Physics of the Banaras Hindu University, Varanasi, India (IND/BHU) was given temporary assignment of two mass chains. The network now consists of 17 evaluation groups and 2 international data service centres.

The international NSDD network is responsible for the evaluation of mass-chains A=1-263. The current assignment of these mass-chains is given in Table 1.

As reported by US/NNDC, the evaluation of A=3, with special emphasis on medium and high energy data has recently been completed by H.R. Weller (Duke University) and D.R. Tilley (North Carolina State University).

D. Status of the NSDD Evaluation Effort

1. Mass-Chains 5-20: are being evaluated by F. Ajzenberg-Selove (Univ. of Pennsylvania) with a cycle time of about 5 years.

2. Mass-Chains 21-44: are being evaluated by P. Endt and C. Van der Leun (Univ. of Utrecht). The next publication of currently on-going evaluations is planned to be published in 1988.

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* In absentia

3. Mass-Chains ≥ 44: evaluated by the international NSDD network. The status of these mass-chain evaluations are shown on Tables 2, 3 and 4. As of this date there are 30 mass-chains in the production pipe-line for 1986. To achieve a six-year cycle, 36 mass-chains need be published per year.

E. Status of the Nuclear Data Sheets Publication (prepared by M. Bhat)

The memo NS/1A-102 of April 10, 1986, on the size of A-chains published in the Nuclear Data Sheets (NDS) and the proposed changes in the format of publication were discussed.

A summary of this discussion and the guidelines for the publication of A-chains as approved by the NSDD network at the meeting are as follows:

1. There has been a reduction in the number of subscribers to the NDS from about 1250 in 1980-1981 to about 650 at present.

2. The subscription for 1986 was based on an estimate of 2100 pages; however, the size of the NDS for 1986 is projected to be about 2700 pages. The publisher and the NNDC will subsidize the additional 600 pages.

3. The publisher estimates that the market can bear a maximum of 25 % increase in the subscription rate/year and this corresponds to an increase in page size from 2100 to 2600. However, it is felt that this increase may be spread over a few years depending on the market conditions as determined by the publisher.

4. In 1984, 24 A-chains were submitted for publication; this number in 1985 was 25. In 1986, 13 new A-chains were sent to the NNDC by the end of May and it is expected that 30 new A-chains will be done by the end of the year. The NNDC would like to publish the new A-chains as soon as possible after receiving them.

5. Some users have complained about the difficulty of finding what they want in the mass of details of an A-chain as published now.

It was generally agreed that in the present publication format there was a certain amount of redundancy, which, if removed could make the NDS more useful. The question was how to do it without reducing the essential physics content of an evaluation. In this context, the different parts of an evaluation, i.e. the Index, Drawings and the Table, were discussed and for every critic of one of these, there was an equally enthusiastic supporter who felt that the particular item was an essential part of the publication.

Out of the 63 kits (memo + examples of formats, B, C and D for A=57) sent out for comments, the NNDC had received 7 written comments: of these, one recommended further discussion and not doing anything till 1988, the rest thought that either format D was adequate or format D plus a few drawings would be their choice. The 3-4 nuclear chemists at BNL liked format D because it contained the essentials, i.e. adopted levels and gammas and decay data sets. D. DeFrenne found that his colleagues liked format C. However, they did not consider the format between C and D as they thought that such a choice was not available. This user input was also discussed for what it was worth with due consideration of the small size of the sampling.

Approved Guidelines for the Publication of A-chains in the Nuclear Data Sheets

June 1986

Only the following drawings and tables will be included in the published version of the evaluations in NDS (no change, of course, in what is included in the ENSDF):

a. Abstract including General Comments
b. Index
c. Drawings:

- Skeleton Scheme (Drawing 1)
- Decay Schemes (very large decay schemes, say, ≥ 2 pages, may be omitted at the editors' discretion).
- Reaction γ's (Only simple level schemes to be included as of now; but when the program for showing intra-band transitions is implemented, then reaction γ's with bands will also be shown. If there exist more than one dataset with bands, then adopted gammas with bands may be given instead.)

d. Tables:

- Adopted Levels
- Adopted Gammas
- Levels in decay for which $T_{1/2}$ or other properties are given
- Decay Gammas
- Levels seen in particle transfer reactions
- Levels in reactions with gammas for which $T_{1/2}$ are given
- Gammas seen in reactions.

If the decay or reaction gamma drawing is adequate, omit corresponding table and give only those γ's which have multipolarity or mixing ratios given.

In order to provide maximum information in this shortened version of data sheets, the following will be implemented as soon as possible.

a. Excitation energy uncertainties will be shown in gamma-ray tables.
b. Level footnotes and comments will be given in gamma table if there is no separate level table.
c. Uncertainties will be shown on β-radiation quantities in the decay schemes.
d. It will be possible to give only those levels in a level table for which $T_{1/2}$ are known.
e. It will be possible to show only those γ's in gamma tables for which multipolarities or mixing ratios are given.

Table 1

Mass-chain Assignments

June 1986

A-range	No. of mass-chains	Evaluation Group
1- 4	4	USSR
5- 20	16	Univ of Pennsylvania/USA
21- 44	24	Univ of Utrecht/Netherlands
45- 50	6	NNDC/USA
51- 56	6	CNDC/PRC
57,58	2	NNDC/USA
59- 64	6	Lund Univ./Sweden
65- 73	9	NNDC/USA
74- 80	7	Univ. of Kuwait/Kuwait
81-100	20	FIZ/FRG
101-117	17	Grenoble/FR-Gent/Belgium
118-129	12	JAERI/Japan
130-135	6	USSR
136-148	13	NNDC/USA
149,151	2	McMaster/Canada
150,152	2	NNDC/USA
153-162	10	INEL/USA
163,165	2	NNDC/USA
164,166	2	USSR
167-194	28	LBL/USA
195-198	4	CNDC/PRC
199-237	39	NDP/USA
238-244 (even)	4	USSR
239-243 (odd)	3	NDP/USA
245-263	19	NDP/USA

Table 2

STATUS OF MASS-CHAIN EVALUATIONS

June 2, 1986

A Mass-Chain Published
(A) Mass-Chain Submitted for Publication
[A] Mass-Chain Evaluation in Progress

Center	Assignment	1983#	1984#	1985#	1986#
BNL	45-58, 65-73, 136-148,150, 152,163,165	45,137	50,53,58,142, 146,148	48,141	47,57,(46),(49),(70),(140),(143), (145),(150),(165),[71],[136], [138],[147]
INEL	153-162	157	161	160,162	(155),(156),[154],[159]
LBL	167-194	192	171,174,181		[168],[180],[183]
ORNL	195-237, 239,241,243, 245-263	198,230,231, 234,235,239	207	203,205,241	208,(201),(204),(216-220-224-228),(226) (237),[202],[215-219-223-227],[222]
U of Penn	5-20	18,19,20	5-10	11,12	13,14,15,(16),(17),(18),[19]
UK		66,67			65
Kuwait	74-80		76		(74),[77]

#Nuclear Data Sheets issue year.

STATUS OF MASS-CHAIN EVALUATIONS

June 2, 1986

A Mass-Chain Published
(A) Mass-Chain Submitted for Publication
[A] Mass-Chain Evaluation in Progress

Center	Assignment	1983#	1984#	1985#	1986#
FRG	81-100	95,98		81,94,97	(83),(93),(99),(82), [88], [89]
FR-BLG	101-117	110	104,109	101,103	105,(117),[106],[111],[115]
Japan	118-129,177*	128,129	124		(118),(122),[119], [120],[121],[177]
USSR	1-4,130-135, 164,166,238, 240,242,244	238	240	242	164,(133),(166), (244),[135]
Sweden	59-64,90*	59,61			(60),[90]
Canada	149,151,100*			149	[151]
The Netherlands	21-44				Done 1978; a new evaluation is in progress
China	51*-56*, 170*,172*, 195*-198*			55	51,(54),(56),(170), (172),[52],[195],[196]
Nat'l Tsing Hua Univ. Taiwan	73*,72*				(73),[72]

#Nuclear Data Sheets issue year

*Temporary assignment.

STATUS OF MASS-CHAIN EVALUATIONS
(June 2, 1986)

Center	Number of Mass Chains											
	Assigned	Published #									In Progress or Review	Older Than 1980 Lit. Cut-off And Not Being Worked On
		1978	1979	1980	1981	1982	1983	1984	1985	1986	1986	
BNL	40	3	3	2	1	1	2	6	2	2	12	3
INEL	10	0	1	1	0	1	1	1	2		4	1
LBL	28	0	0	2	4	3	1	3	0		3	12
ORNL	65	20	19	2	23	3	6	1	3	1	8	14
UP	16	3	6	2	3	2	9	6	2	3	4	0
UK		1	1	2	2	1	2	0	0	1		
Kuwait	7	0	0	1	1	2	0	1	0		2	0
FRG	20	1	2	3	0	1	2		3		4	7
France/ Belgium	17	-	0	0	1	2	1	2	2	1	5	2
Japan	12+1*	0	1	1	1	2	2	1	0		6	4
USSR	12	0	0	0	2	0	1	1	1	1	4	4
Sweden	6+1*	-	-	0	1	0	2	0	0		2	3
Canada	2+1*	-	-	-	-	0	0	0	1		1	0
Utrecht	24	24	-	-	-	-					-	
China	9*	-	-	-	-	0			1	1	7	0
Taiwan	2*										2	
										Total	64	50

#Nuclear Data Sheets Issue Year
*Temporary assignment

A-Chain Status in ENSDF

Center - ALL

16-May-86

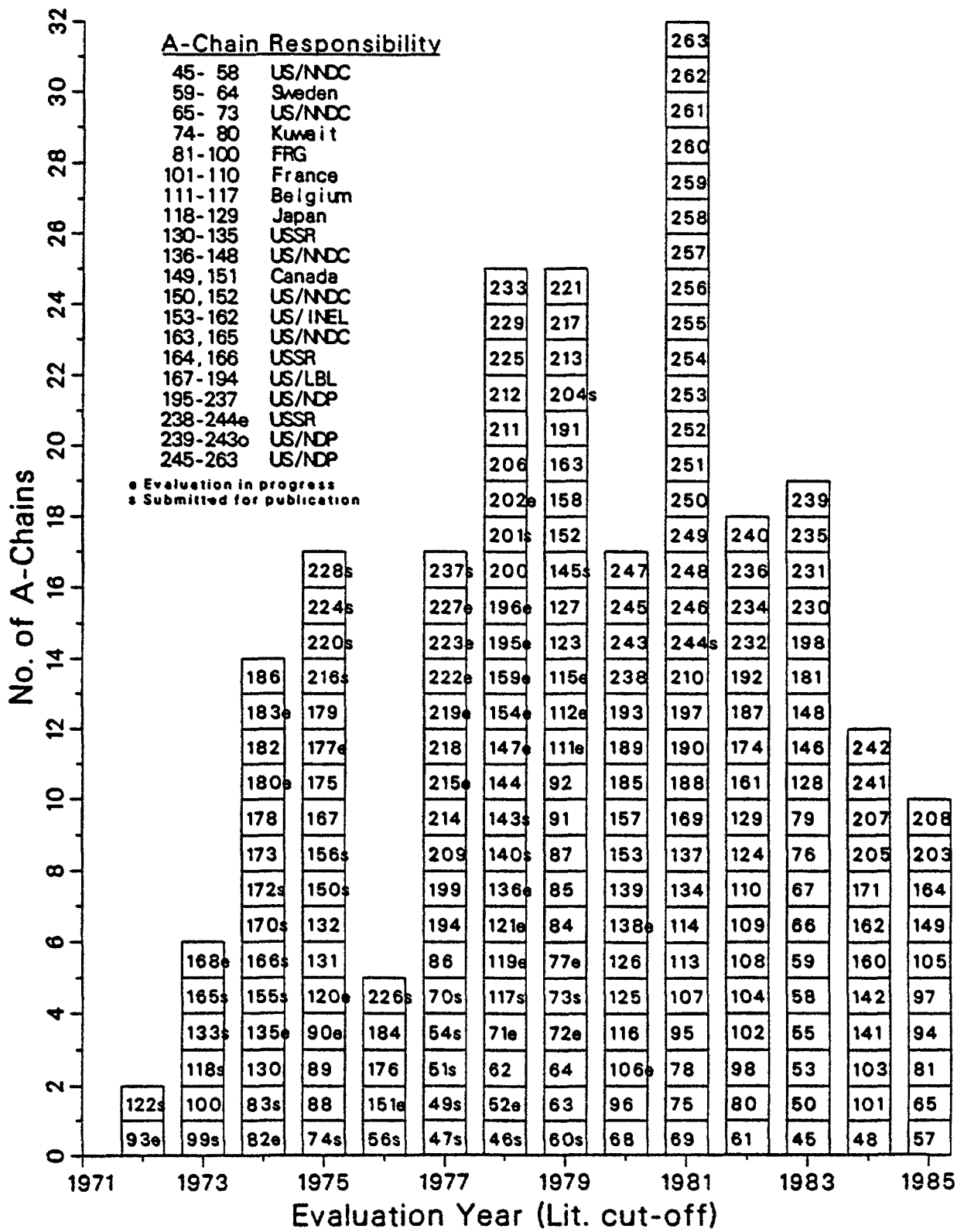

Fig. 1 Status of the ENSDF for A ≥ 45

J.K. Tuli distributed and discussed an internal NNDC memo produced after more discussion about the NSDD Memo NS/1A-102 and which contained guidelines which he feels to be a considerable improvement over any of the formats B, C or D. These guidelines are given below. If these guidelines are followed, Tuli felt that:

1. The style of the A-chains as published now would not be radically changed.

2. The essential physics content of an A-chain would appear in print.

3. Redundancy or duplication would be reduced.

4. The average length of an A-chain could be reduced to about 75-80 pages.

The Network felt that if the NNDC staff reduces the length of a submitted A-chain evaluation according to the guidelines, the evaluator should receive a copy of the revised A-chain before publication to make sure that (s)he agrees with the changes and that the essential physics information had not been eliminated in the size-reduction process. The NNDC agreed to do this, but worried that it might add 2-4 weeks to the production time. It was agreed that the guidelines given below would be followed as soon as possible. It was also pointed out that to follow these guidelines, it was essential that the evaluators start giving XREF in the data file. In all evaluations received after December 31, 1986, giving XREF will be mandatory. A new version of the code PANDORA (in the mail) has been modified to help the evaluator put XREF in the data file.

It should be stressed that with these changes the contents of the ENSDF will not be reduced in any way. The effort on the part of the evaluators to assemble an evaluation will also not increase significantly.

There was a lengthy discussion during the meeting on the relative merits of the guidelines and of format C distributed with NS/1A-102. H. Behrens and H. Müller (FIZ) felt that format C was superior to these guidelines and would like to go on record as having expressed dissent from the proposed course of actions.

F. Status of the ENSDF System

The ENSDF system consists of the evaluated nuclear structure and decay data file, a set of format, utility and physics checking codes, as well as physics analysis and applications codes. The system is maintained by the US/NNDC on a continuing basis.

F1. Current status of the ENSDF File

As of 22 August, 1986, the ENSDF data base consisted of 9765 data sets, containing 676 K records of 80 characters each. It is being continuously updated on the basis of new evaluations and a systematic process of clean-up.

In view of the fact that the evaluations of mass-chains A<45 are not automatically entered into ENSDF, an action was initiated at the 1982 NSDD meeting to establish a procedure for the conversion of these data into ENSDF. The responsibility for the conversion of these data into ENSDF has been taken by the following centres:

Centre	Responsibility	Status
US/NNDC	A = 5-12	Conversion up-to-date
US/NDP	A = 13-26	Conversion for A=25-26 has been done by B. Ewbank. Conversion for A=13-24 expected to be completed by September 1986.
FR/Grenoble	A = 27-32	Conversion up-to-date
US/LBL	A = 33-44	Conversion of decay data to be done by September 1986. Conversion of adopted levels (without cross-refs.) to be done by the end of 1986 with the help of FR/Grenoble.

The centres designated to perform these conversions will maintain this responsibility in the future.

The centres responsible for the evaluation or conversion of given mass-ranges, are also responsible for the clean-up of the ENSDF file in those A-ranges. The following centres have not yet completed their clean-up assignments:

Centre	Responsibility	Status
US/INEL	A = 153-162	Expect to complete clean-up by end of 1986.
US/LBL	A = 167-194	Will attempt to complete clean-up by end of 1986.
JAP/JAERI	A = 118-129	Status not known.
KUW/ISR	A = 74-80	Plan to initiate cleaning-up in 1986.

F2. Proposed Changes in ENSDF

1. Presentation of the conclusions and recommendations of the Formats and Procedures Subcommittee of the US Nuclear Data Network (presented by M.J. Martin).

2. Proposal on Common Standards and Equilibrium Intensities (presented by H.W. Müller, paper 86/17), included in this report as Appendix 19.

3. Suggestion to drop the NB field (presented by Tuli). Tuli is to formulate a proposal to be discussed at next meeting.

F3. Status of ENSDF Computer Programs

The current status of ENSDF computer programs is shown in Table 4 of Appendix 15.

- D. DeFrenne has converted a number of the ENSDF computer programs to IBM PC format. Effort is to continue for next two years.

- The programs GTOL and MEDLIST are currently being revised by US/NNDC.

G. NSDD Services and Publications

1. The US network is working on an on-line access to NSR and ENSDF (see US Progress Report, Appendix 15). (It was noted that the RECON system in the US is being discontinued).

2. FRG/FIZ is establishing an on-line service network (including NSR and ENSDF) for access in Europe, USA and Japan through the network STN International (this network is maintained by Chemical Abstracts Services (CAS), Columbus, Ohio, USA, by FIZ, Karlsruhe, FRG and by JICST, Tokyo, Japan) (see also FRG progress report, Appendix 10). FRG/FIZ suggested combining the various efforts for achieving on-line access to ENSDF and to make a joint effort to bring ENSDF into STN.

3. US/LBL has set up ENSDF on-line using commercial DATATRIEVE DBMS.

4. The "Table of Radioactive Isotopes" (originally called Radiactivity Handbook) book will be published in July 1986 by John Wiley & Sons, authored by E. Browne and R. Firestone (edited by V.S. Shirley). Hardcopy will be available at a cost of $ 50 - $ 60.

5. There are plans to revise the G.E. Chart of the Nuclides and publish the 14th Edition in the summer of 1988. FRG has no plans for a revised publication of their Wall Chart.

6. FRG/FIZ announced the publication of two reports
   - Data compilations in Physics. Report Nr. 355;
   - Catalog of Alpha Particles from Radioactive Decay. Report Nr. 29-1.

7. It was suggested that IAEA produce a pamphlet describing the NSDD network, its achievements and the usefulness of the NSD data.

H. Evaluation Rules and Procedures

1. ENSDF Procedures Manual (as distributed by M.R. Bhat in NS/IA-106 dated 27 June 1986)

The draft of the ENSDF Procedure's Manual sent out along with the NSDD Memo NS/1A-103 of April 23, 1986 was discussed. There was general agreement that it was a good idea to assemble in one folder all the miscellaneous memos, notes, references, etc., pertaining to evaluation procedures and methods. Each article in the Manual will be independent with its own pagination. If one thinks an article does not belong in the Manual, one should feel free to throw it out.

Please find below the Table of Contents of the ENSDF Procedures Manual which lists articles with names of persons who volunteered or whose names were suggested for revising these articles. The following schedule is proposed to keep the revision on track:

1. Send revised draft of articles so as to reach Mr. M.R. Bhat at the NNDC on or before December 31, 1986.

2. The NNDC will distribute copies to the network members for any comments, corrections, etc., to be received by the NNDC by February 28, 1987.

3. Final revised copies at the articles sent to the network by June 1, 1987.

ENSDF Procedures Manual Table of Contents

1.	A Brief Guide to the Preparation of Data Sets for Inclusion in the Evaluated Nuclear Structure Data File	T.W. Burrows (NNDC)
2.	Guidelines for Evaluators	M.J. Martin (NDP)
3.	Notes on Statistics for Physicists	No change
4.	Other Evaluations, Compilations and Theory Papers	T.W. Burrows (NNDC)
5.	Rules on J^{π} Assignments	M.J. Martin (NDP)
6.	Rules on J^{π} Assignments Based on Logft Values	M.J. Martin (NDP)
7.	Reduced Gamma-Ray Matrix Elements, Transition Probabilities and Single Particle Estimates	No change
8.	Phase Conventions for Mixing Ratios in Electromagnetic Transitions	M.J. Martin (NDP)
9.	Strengths of Gamma-Ray Transitions	No change
10.	EO Transitions	R.B. Firestone (LBL)
11.	Gamma-Ray Multipolarities and Mixing Ratios	No change
12.	Spectroscopic Factors and DWBA Analysis in Particle Transfer Reactions	No change
13.	Inelastic Scattering, Transition Rates and Sum Rules	No change
14.	Normalization Techniques	E. Browne (LBL)
15.	Hindrance Factors in α-Decay	M.R. Schmorak (NDP)
16.	Resonances - IAR, Giant and IAS	M.J. Martin (NDP)
17.	Rotational Bands	C.E. Reich (INEL)
18.	Fusion Evaporation Reactions	
19.	Polarization Data	

2. Discussion of Evaluatation Rules

(1) Table on J^{π}-assignments

The recommendation of the Karlsruhe-meeting that the other centers experiment with the table on J^{π} assignments, introduced by P. Ekström in the A=59 and 61 evaluations, was quite generally followed. Its introduction met with such a favourable comment that it was agreed upon that the J^{π} table will be incorporated in all future A-chain evaluations.

(2) Reaction-oriented vs. property-oriented evaluations

In addition to the J^{π} tables mentioned above, half-life tables have been introduced by some evaluators. Other possible property tables are discussed, like those on excitation energies, branching ratios, mixing ratios, spectroscopic factors. It was realized that with these tables we move away from the historic reaction-oriented set-up of the data sheets. In view of the evaluation of the field and due to pressure on the size of the evaluations, it was agreed that the evaluator may adopt a presentation at his discretion.

(3) High-lying levels

Martin's paper on high-lying levels was extensively discussed. It was agreed that the experiments on these levels that give

information on properties of bound states (J^{π}, E_x, $T_{1/2}$, decay, branchings) should be included in the Nuclear Data Sheets.

Primary γ-transitions from neutron- and proton-capture resonances and from thermal-neutron capture can in practically all cases be omitted from the printed version, but will be included in the ENSDF.

No agreement was reached on the acceptability of the "analogy rule" for J^{π} assignments to isobaric analogue states. We will not cut down on the information about high-lying, high-spin states, spontaneous fission isomers, delayed-particle emission, and giant resonances.

(4) Gamma-ray energies

The consequences of handling γ-ray energies as secondary data that can better be deduced from the adopted excitation energies, will be studied and discussed at a meeting in the future.

(5) J^{π}-assignment basis

The discussion leads to quite a number of adjustments in the rules for J^{π}-assignments. Martin will incorporate these in a new set of rules that will be circulated among the network members before they are published in the Nuclear Data Sheets.

(6) Use of systematics in mass-chain evaluations

Martin's paper on this topic will be re-written in the light of the detailed discussions. The topic will be discussed again during the next meeting.

(7) Completeness of the bibliography

It is underlined and agreed upon that the present pressure on cutting down on the size of the A-chain evaluations may not lead to giving up the ideal of a complete bibliography on the nuclei reviewed. The research community relies on the network in this respect.

(8) Other topics

Many topics were touched upon. Two warnings might be worthwhile to repeat:

- be aware of double-counting of errors in X/(X+Y) calculations;
- never use any computer program without a critical judgement of its output.

I. Next Meeting

The next meeting of the International NSDD Network has been invited by the Kuwait Institute for Scientific Research to take place in Kuwait. The IAEA and the network gratefully accepted this invitation. The meeting has been scheduled to take place during the last week of March 1988. (The meeting is to start on Sunday and last five days).

It was suggested that the meeting allowed for enough time for more extensive discussions on the physics of NSDD evaluation.

IAEA Meeting on the Coordination of the International Network of Nuclear Structure and Decay Data Evaluators

2-5 June 1986, Grenoble, France

List of Participants

Dr. Bambynek, W.	Bureau Central de Mesures Nucléaires Steenweg naar Retie B-2440 Geel
Dr. Behrens, H.	Fachinformationszentrum Energie, Physik, Mathematik GmbH Kernforschungszentrum D-7514 Eggenstein-Leopoldshafen
Dr. Bhat, M.R.	Bldg. 197D National Nuclear Data Center Brookhaven National Laboratory Upton, N.Y. 11973
Dr. Blachot, J.	DRF/Service de Physique Centre d'Etudes Nucléaires de Grenoble Lab. de Physique Nucléaire B.P. No. 85 F-38041 Grenoble Cedex
Dr. Browne, E.	Bldg. 50A Lawrence Berkeley Laboratory University of California Berkeley, CA 94720
Dr. Chmielewska, D.	Department P-II Institute for Nuclear Studies - (IPJ) PL-05 400 Swierk/Otwock
Dr. DeFrenne, D.	Laboratorium voor Kernfysika Proeftuinstraat 86 B-9000 Gent
Dr. Farhan, A.R.	Department of Physics Kuwait University P.O. Box 5969 Kuwait
Dr. Forsyth, P.D.	Oliver Lodge Laboratory University of Liverpool Oxford Street P.O. Box 147 Liverpool L69 3BX

Dr. Lee, M.A.	Idaho National Engineering Laboratory - EG&G Idaho, Inc. P.O. Box 1625 Idaho Falls, Idaho 83415
Dr. Lorenz, A.	IAEA/Nuclear Data Section P.O. Box 100 A-1400 Vienna
Dr. Martin, M.J.	MS-255, Bldg. 6000 Nuclear Data Project Oak Ridge National Laboratory P.O. Box X Oak Ridge, Tennessee 37831
Dr. Müller, H.W.	Fachinformationszentrum Energie, Physik, Mathematik GmbH Kernforschungszentrum D-7514 Eggenstein-Leopoldshafen
Dr. Singh, B.	Tandem Accelerator Laboratory McMaster University Hamilton, Ontario L8S 4K1
Dr. Tuli, J.	National Nuclear Data Center Brookhaven National Laboratory Upton, N.Y. 11973
Dr. Van der Leun, C.	Fysisch Laboratorium Rijksuniversiteit Princetonplein 5 P.O. Box 80 000 NL-3508 TA Utrecht
Dr. Viggars, D.A.	Department of Physics Kuwait University P.O. Box 5969 Kuwait
Dr. Zhou Enchen	Chinese Nuclear Data Center (CNDC) Beijing Atomic Energy Institute Ministry of Nuclear Industry P.O. Box 275(41) Beijing People's Rep. of China

IAEA Meeting on the Coordination of the International Network of Nuclear Structure and Decay Data Evaluators

2-5 June 1986, CEA Grenoble, France

Agenda for the organizational part of the meeting

Introductory Items

1. Opening Statements
2. Adoption of Agenda
3. Announcements

A. Review of Actions from last meeting
B. Short report from NSDD Network Members
C. Status of the NSDD Network
D. Status of the NSDD Evaluation Effort
E. Status of the Nuclear Data Sheets Publication
F. Status of the ENSDF System

    1. Current status of the ENSDF File
    2. Proposed Changes in ENSDF
    3. Status of ENSDF Computer Programmes

G. NSDD Services and Publications
H. Evaluation Rules and Procedures

    1. NSDD Evaluation Procedures Manual
    2. Review of Evaluation Rules

I. Next Meeting

List of Papers Presented during the Physics Part of the Meeting

Grenoble, 3-4 June 1986

Session 1: Tuesday, June 3, Morning

Chairman: Dr. Van der Leun

M.R. Bhat (BNL)
- Introduction to the NSDD Network

A. Gizon (ISN)
- Transitional nuclei in the A=130 mass region

E. Browne (LBL)
- A procedure for normalizing decay schemes.
- Calculated uncertainties of absolute gamma-ray intensities and decay branching ratios derived from decay schemes.

M. Lee (INEL)
- Evaluation of beta intensity data in nuclear decay schemes.

Session 2: Tuesday, June 3, Afternoon

Chairman: Dr. A. Gizon

C.F. Liang (Orsay)
- Octupole deformation in actinides

M.J. Martin (ORNL)
- Use of systematics in mass chain evaluations.
- Revision of bases for spin and parity assignments.
- High-lying levels.

F. Hubert (Bordeaux)
- Exotics at GANIL

Session 3: Wednesday, June 4, Morning

Chairman: Dr. Bambynek

P. Quentin (Bordeaux)
- Microscopic theories for nuclear excitations at low energy

C. Van der Leun (Utrecht)
-Tuneable gamma-rays

F. Haas (Strasbourg)
- Structure of the negative parity states in the N=Z nuclei of the s-d shell

List of Submitted Reports

86/1	Progress report from CBNM, Geel (W. Bambynek)
86/2	Progress report from USA (M.R. Bhat) Appendix 15
86/3	" " " Kuwait (D.A. Viggars) Appendix 13
86/4	" " " UK (P.D. Forsyth) Appendix 14
86/5	" " " FIZ (H. Behrens, H.-W. Müller) Appendix 10
86/6	" " " China (Zhou Enchen) Appendix 11
86/7	" " " Japan (T. Tamura) Appendix 16
86/8	" " " France (J. Blachot) Appendix 8
86/9	Reduction of Evaluation Pages in NDS (J.K. Tuli)
86/10	Progress report from Canada (B. Singh) Appendix 12
86/11	Procedure for Normalizing Decay Schemes (E. Browne)
86/12	Calculated Uncertainties of Absolute γ-ray Intensities and Decay Branching Ratios Derived from Decay Schemes (E. Browne)
86/13	Use of Systematics in Mass Chain Evaluations (M. Martin)
86/14	Revision of Bases for Spin and Parity Assignments (M. Martin)
86/15	High-Lying Levels (M. Martin)
86/16	Evaluation of Beta Intensity Data in Nuclear Decay Schemes: Comments on Some Pitfalls (C.W. Reich)
86/17	Notes and Problems of MEDLIST with Decay Data Sets (H.W. Müller) Appendix 19
86/18	Formation of an On-Line Subcommittee (S. Pearlstein)
86/19	Status Report: Sweden (P. Ekström, et al) Appendix 17
86/20	Status Report: Belgian Group (D. DeFrenne) Appendix 7
86/21	Status Report: Utrecht (C. van der Leun) Appendix 9
86/22	Status Report: USSR Kurchatov Institute (F.E. Chukreev) Appendix 18

Actions

A number of Standing Actions which were carried over from previous meetings were combined into the following individual standing actions.

Standing Actions

Network	Inform the US/NNDC of errors or omissions in the NSR file and the Recent References publication.
Network	Inform the US/NNDC of mistakes in the ENSDF file pertinent to the mass-chains for which they are responsible.
Network	Inform NED/Utrecht and US/UP of mistakes identified in ENSDF for mass-chains 21-44 and 5-20 respectively.
Network	Send in to US/NNDC comments and suggestions on (as well as objections to) the ENSDF Style Manual and the NSR Manual, as well as on symbols, abbreviations and conventions used in the NDS publications.
Network	Send to M. Martin suggestions for additional "minimum requirements" to be used as guidelines for evaluators.
Network	Inform the network of any new computer codes written, and distribute those computer codes which could be useful to other members of the network.
US/NNDC	Communicate to the network all errors discovered in the ENSDF file and all changes made to the ENSDF file.

Actions arising from this meeting

1.	US/NNDC	Provide the Network with a list of Journals which use keywords.
2.	IAEA/NDS	Convey to those journals which agree to adopt keywords the information necessary to implement such a policy.
3.	Network	NSDD evaluators are encouraged to seek comments from their colleagues and/or experts in the pertinent mass region during the review and publication process.
4.	US/NNDC	Take information cut-off date into consideration in the formulation of NDS processing statistics.
5.	Tuli/Martin	Send to P. Endt and C. Van der Leun a printout with A=21-26 mass data converted by Ewbank to ENSDF format - for checking.

6.	IAEA/NDS	In collaboration with NNDC prepare a pamphlet advertising the NSDD network.
7.	US/NNDC	Write letter to USSR/CJD to clarify the situation whether their responsibility for the evaluations of masses A=1-4 should be maintained on the official Mass-Chain Assignment list.
8.	Martin	Prepare for next meeting a paper on Analogue States.
9.	Martin	Collect all existing and revised rules for J^{π} assignments in one paper and circulate to Network before the next meeting.
10.	Tuli	Send out to Network memorandum with all changes implemented in the formulation of ENSDF input.

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 U.S.A.	M. Martin
1C	US/LBL	*	Lawrence Berkeley Laboratory University of California Berkeley, Cal. 94720, USA	E. Browne R.B. Firestone
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.D. Forsyth
5A	FRG/FIZ	*+	Fachinformationszentrum Energie, Physik, Mathematik GmbH Kernforschungszentrum D-7514 Eggenstein-Leopoldshafen 2 FRG	H. Behrens

Code	Centre/Group		Address	Head of Project or Centre
6B	FR/CEA-Grenoble	*	DRF/Service de Physique CEA 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	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	P. Ekström
12A	KUW/ISR	*	Kuwait Institute for Scientific Research Shuwaik, Kuwait	A.R. Farhan
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	J.A. Kuehner
21	PRC/CNDC	*	Institute of Atomic Energy P.O. Box 275 (41) Beijing P.R. China	Zhou Chunmai
22	IND/BHU		Department of Physics Banaras Hindu University Varanasi - 221005 India	P.C. Sood

STATUS REPORT BELGIAN GROUP

D. De Frenne, E. Jacobs
Laboratorium voor Kernfysika,
86, Proeftuinstraat B9000 Gent, Belgium

1. Mass-chain evaluations.

Since the last NSDD meeting in Karlsruhe in 1984 the mass-chain evaluations of A=103 and 105 were finished and published in NDS45,363(1985) and NDS47,261(1986). The evaluation on mass-chain A=106 is in progress and will be finished in september 1986. For 1987 the evaluation of A=112 is planned.

2. Computer programs.

2a. The NDP programs FMTCHK, HSICC, LOGFT, GTOL, PANDORA, TREND, DELTA and ADINF have been adapted by A. De Clercq, M. Verboven and L. De Smet of our laboratory, for an IBM/PC-XT compatible personal computer. This system has 640 K RAM memory and an INTEL 8087 numerical processor, which is required for the IBM-Professional Fortran Package, and a 10Mbyte Winchester disk. All those progams are available to the members of the network and will be distributed by NNDC Brookhaven on request.

2b. A new program, FNE (Framework Nuclear data Extension) has been written by A. De Clercq. The aim of this program is to help the evaluator in preparing a dataset. All records forseen in the ENSDF format (e.g. L,G,C cards etc..) are pre-formatted and can be called on request. The possibility of correcting errors in a given record without damaging the structure of the record is also present. This program is an extension of the Ashton-Tate package FRAMEWORK (version 1.1, English version). It runs on a IBM/PC-XT compatible personal computer. Also a Hercules Graphics Card with a resolution of 720h x 348v on a IBM Monochrome Display is required.

STATUS REPORT ON FRENCH ACTIVITIES

IN NUCLEAR STRUCTURE AND DECAY DATA

Jean Blachot
CEA Grenoble

1. Mass-Chain Evaluation Schedule

Since the last NSDD Meeting, the status of the evaluation is summarized as:

Published : A=104 NDS 41, 325
A=109 NDS 41, 111
A=101 NDS 45, 800

Under review: A=117

Will be completed by end of 1986: A=111, 115

2. Computer programs

a) All the physics analysis programs are running on our prime facility. Up to now we have not been able to use PREND.

b) A program (SELECT) written in FORTRAN 77 has been developed. It can do different retrievals from the ENSDF data base. It could be available to the network.

INDC - Grenoble 1986

Status Report Utrecht

A. Energy levels of A = 21-44 nuclei
P.M. Endt and C. van der Leun

The sixth edition of this review article has been published in Nucl. Phys. A310 (1978) 1-766. Updating for the next edition is a continuous effort. A cycle-time longer than the traditional five years, is justified in view of the decreasing flow of new spectroscopic information.

Writing the seventh edition will start by the end of 1986, we hope.

B. Recommended standards for gamma-ray energy calibration
P.H.M. Van Assche, R.G. Helmer, C. van der Leun

The first edition of this horizontal evaluation (At. Data and Nucl. Data Tables 24 (1979) 39-48) is being updated. We plan to publish the next version shortly after the next Atomic Mass Conference (1988?).

STATUS REPORT

FACHINFORMATIONSZENTRUM ENERGIE, PHYSIK, MATHEMATIK GMBH
KARLSRUHE
FEDERAL REPUBLIC OF GERMANY
H. Behrens, H.-W. Müller

1. Mass chain evaluation

In the last two years our efforts have been concentrated on evaluation of mass chains. The status of the evaluations since the last meeting in April 1984 are as follows:

A = 98, 97, 94, 81	published
A = 83, 99	post review
A = 82, 93	completed, submitted for review
A = 88, 89	in work

So in total 16 mass chains have been evaluated by our center since 1977. Evaluation of the last two mass chains (A = 88, 89) of our range of responsibility is now in progress, and we will be through the first evaluation cycle in early 1987.
We also participated in the "clean-up" of mass chains. 12 older mass chains have been checked to see whether they comply with the current ENSDF formats.

2. Further developments of formats

Our special interest in this context is concerned with delayed - particle formats. A proposal was made, illustrating the advantages of the different proposed formats in sample data sets. Results, together with the detailed comments of M. Lederer, are adopted in the latest version of the ENSDF Preparation Manual by J.K. Tuli.

3. Maintenance and retrieval of databases

Since we offer the ENSDF, MEDLIST, and NSR databases on-line via telecommunication networks, a continuous effort was necessary for updating and maintenance.
After the ENSDF "clean-up", both ENSDF and MEDLIST have been completely reorganized.

The present contents of the databases are (last ENSDF and NSR update tapes not yet included):

ENSDF	9,430 data sets
MEDLIST	2,067 data sets
NSR	100,826 documents

Several requests for ENSDF and MEDLIST data have been answered. Most users asked for a larger excerpt of the databases on magnetic tape. The interest was approximately evenly distributed among both databases.

A Brief Introduction of NSDD Activities in China

Zhou Enchen
Chinese Nuclear Data Center
P. O. Box 275 (41), Beijing, China
(May, 1986)

In September of 1981, Dr. Sol Pearlstein, Director of NNDC, visited Chinese Nuclear Data Center (CNDC) and discussed the possibility about CNDC participating the international cooperative network of nuclear structure and decay data evaluation. With much interesting CNDC accepted Dr. Pearlstein's suggestion and determined to undertake NSDD evaluations. According to the agreement between CNDC and Dr. Pearlstein, ten mass chains will be assigned to China.

In February of 1983, Dr. Tom Burrows of NNDC came to CNDC for training Chinese NSDD evaluators. Scientists from Beijing, Changchun, and Shanghai presented the training course. Since then, four Chinese scientists have been sent to NNDC to perform NSDD evaluations, and with the help of NNDC, A=55, 51, 54, 56, 170, and 172 mass chain evaluations have been completed.

The first workshop of nuclear structure and decay data evaluation in China was held in Shanghai, October 11-13, 1984. The participants were from Physics Department, Jilin University, Changchun; Institute of Nuclear Research, Shanghai; Institute of Atomic Energy, Beijing. The workshop was conducted in three sections:

1) The Chinese NSDD evaluation group was formed, and Dr. Zhou Chunmei of CNDC was nominated for the liaison man.

2) The status of International Nuclear Structure and Decay Data Evaluation Network was introduced briefly.

3) The progress in the first mass chain evaluation in China, A = 55, was reported, and status for evaluation of A = 51, 54, and 56 was discussed in some details.

Ten permanent mass chain assignment has been made to China in February, 1986. They are A = 51 - 56, 195 - 198. 6 part-time (1.5 full time) scientists engage NSDD evaluations. Up to now, evaluations for A = 55, 51 have been published in "Nuclear Data Sheets". Evaluations for A = 54, 56, 170, 172 will be published soon in this year. By the end of 1987, Evaluations for A = 52, 195, and 196 will be completed. In a parallel action, the physical analysis programs HSICC, LOGFT, ANGCOR, GTOL, RULUR, TREND, PREND, physical check program PANDOR, and format check program FMCHK will be run normally on PDP 11/70, VAX 11/780, CYBER 170/825, and IBM system computers.

STATUS of MASS-CHAIN EVALUATIONS at McMASTER UNIVERSITY, Canada (June 1986)

Since 1981, a grant from the National Sciences and Engineering Research Council of Canada has been supporting an equivalent of about one full time equivalent position to participate in the international network responsible for mass-chain evaluations. The first mass-chain from the group A = 149 was published in 1985. The second mass-chain A = 151 is expected to be submitted for publication in Fall 1986. Work on A = 100 (temporarily assigned for McMaster) will start soon after the completion of the 151 mass-chain.

There has been a substantial reduction in the present three year grant (1986-89) such that only about 0.5 full time equivalent position can be supported. This is likely to slow down the evaluation activity at McMaster.

STATUS REPORT : KUWAIT NUCLEAR DATA GROUP

Since the last network meeting mass 76 has been published. In January 1986 mass 74, the final mass chain in the first cycle of the Kuwait allocation was submitted to Brookhaven.

Work has now begun on the re-evaluation of mass 77. This is a major task since substantial new data on this mass chain have become available since the last cut-off date of December 1979. Furthermore the changes in style and standards of Nuclear Data Sheets since 1979 necessitate changes even where there is no new data. It is expected that the re-evaluation should be complete by the end of 1986. The current project schedule envisages continuing re-evaluations on an approximately 6 year cycle.

The Kuwait Nuclear Data group is undergoing personnel changes. Dr. Singh left in November 1984, though he has kept in close touch with the work of the Kuwait group. Dr. Viggars will be leaving Kuwait in January 1987.

In late 1984 Drs. Ameenah Rajab Farhan and Shaheen Rab joined the project. They attended an orientation session at Brookhaven in December 1985 and also visited the Berkeley group.

The Kuwait group continues to operate an information service for Middle Eastern, African & Asian countries. About 25 enquiries have been answered to date. It is hoped to develop an interactive system linked to the Gulflink computer network.

Status Report : United Kingdom

P.D. Forsyth (Liverpool University)

1. Personnel

Dr. N.J. Ward the sole evaluator in the U.K. working on the Nuclear Data Project left Liverpool in October 1984 to take up employment elsewhere. This resulted in the termination of nuclear structure evaluation in the U.K.

2. Mass-chain Report

The mass-chain A=65 was submitted in September 1984 and has recently been published after revision by Dr. J. Tuli.

At the last Advisory Group Meeting in April 1984, the U.K. group reluctantly relinguished responsibility for the mass-chains A=65 to 73, the mass-chains A= 74 and 75 which had originally been assigned to them having been taken over by the Kuwait group. The mass-chain A=165 which had previously been assigned to the U.K. group on a temporary basis was reassigned to the NNDC in February 1985.

3. Present situation

Although a post funded by the U.K. Science and Engineering Research Council was available when Dr. Ward left, it was decided that it would not be possible to set up a viable evaluation group with just one evaluator. Consequently efforts have been made to obtain funding for a second evaluator from the Atomic Energy Industry. Dr. B.H. Patrick at the A.E.R.E., Harwell, has been pursuing this matter for the past 18 months. The situation at the present time appears to be that there is general agreement in the nuclear industry that evaluation is important, that the U.K. should participate in this international collaboration and that steps should be taken to obtain funds for an evaluator. Attempts are being made to obtain these funds but at the present time it is uncertain whether or not they will be successful. It is assumed that the SERC might be prepared to fund a second post and it is proposed that the two scientists should work half-time on evaluation and the remainder on experimental nuclear structure research.

U.S. Contributions to the International Co-operation in the Evaluation of Nuclear Structure Data

M.R. Bhat

(May 15, 1986)

I. Introduction

This report reviews the evaluation of nuclear structure, decay data and related activities of the U.S. Nuclear Data Network (USNDN). USNDN is comprised of BNL - National Nuclear Data Center (NNDC), INEL - Nuclear Physics Branch, LBL - Isotopes Project, ORNL - Nuclear Data Project (NDP), University of Pennsylvania - Light Nuclei Energy Levels Evaluation Project, and the NBS - Photon and Charged Particle Data Center.

II. Status Reports of The U.S. Nuclear Data Network (USNDN)

A. BNL - National Nuclear Data Center (NNDC)

1. Recruitment of New Evaluators

H. R. Weller (Duke University) and D. R. Tilley (North Carolina State University) have finished evaluating A = 3 with emphasis on medium and high energy data. A draft of this evaluation is being distributed for comments. The participation of the Chinese Nuclear Data Center (CNDC) Institute of Atomic Energy, Beijing, PRC is continuing. Two physicists, Zhou Chunmei and Wang Gongqing spent slightly more than a year at the NNDC and finished evaluating A = 54, 56, 170 & 172. Ming-ming King from the National Tsing Hua University, Taiwan, spent about six months at the NNDC and completed evaluation of A = 73. On her return to Taiwan, she will continue work on A = 72. There are plans to do nuclear structure evaluations at the Center de Calcolo del CNEN, Bologna, Italy. E. Menapace reports that funds have been allocated for this effort and the Center is looking for a suitable candidate. P.C. Sood, Banaras Hindu University has accepted temporary assignment of A = 175, 176 pending completion of financial and administrative arrangements.

2. Evaluator Training Course

The NNDC held a training course for evaluators Dec 2-6, 1985. Instruction was provided by T. W. Burrows, R. R. Kinsey and J. K. Tuli of BNL and M. J. Martin of ORNL. It was attended by Ameenah Farhan and Shaheen Rab (Kuwait), Holger Sievers (FIZ, Karlsruhe), Wang Gongqing (Institue of Nuclear Research, Shanghai), Zhou Chunmei (CNDC, Beijing) and Ming-ming King (National Tsing Hua University, Taiwan).

3. Nuclear Structure References (NSR).

a. The NSR File Status

As of April 21, 1986, the NSR file contained 101942 entries. As Table 1 indicates, the number of primary entries is steady at about 2300/year. Primary reference coverage is complete. In spite of the limited manpower

Table 1

Contents of the Nuclear Structure References File as of 23-Apr-86

Total References - 101942

References compiled at NDP - 80342

Compilation Statistics Since Transfer to NNDC

Year	Total	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1980	955										259	318	378
1981	4081	354	490	399	386	242	199	226	303	281	242	326	633
1982	3992	252	359	321	326	327	444	307	380	317	315	307	337
1983	3831	293	331	307	347	374	327	275	304	311	403	247	312
1984	3955	309	322	304	283	304	309	554	325	275	379	356	235
1985	3610	342	313	443	214	292	299	453	106	282	297	416	153
1986	1176	308	392	330	146								

Entries by Publication Year

Year	Total	NNDC	Prim.	Sec.	Year	Total	NNDC	Prim.	Sec.
1986	230	230	222	8	1947	96	1	96	0
1985	2843	2843	2331	512	1946	49	1	49	0
1984	3400	3400	2634	766	1945	18	0	18	0
1983	3752	3752	2609	1143	1944	11	0	11	0
1982	3597	3597	2265	1332	1943	20	0	20	0
1981	3506	3506	2339	1167	1942	19	0	19	0
1980	3783	2470	2219	1564	1941	38	1	38	0
1979	4040	839	2333	1707	1940	44	1	44	0
1978	4540	578	2401	2139	1939	52	1	52	0
1977	4992	161	2292	2700	1938	28	0	28	0
1976	4557	16	2409	2148	1937	27	0	27	0
1975	4948	20	2475	2473	1936	22	0	22	0
1974	5965	11	2694	3271	1935	42	0	42	0
1973	7568	9	2777	4791	1934	41	0	41	0
1972	6718	13	3526	3192	1933	25	0	25	0
1971	6073	6	3100	2973	1932	20	0	20	0
1970	4037	9	2679	1358	1931	18	1	18	0
1969	2920	9	2305	615	1930	10	0	10	0
1968	2342	5	2136	206	1929	4	0	4	0
1967	2220	7	2099	121	1928	5	0	5	0
1966	1932	9	1872	60	1927	4	0	4	0
1965	1684	9	1650	34	1926	1	0	1	0
1964	1784	8	1763	21	1925	1	0	1	0
1963	2057	7	2054	3	1924	5	0	5	0
1962	1895	3	1893	2	1923	0	0	0	0
1961	1801	3	1798	3	1922	0	0	0	0
1960	1769	4	1769	0	1921	0	0	0	0
1959	1208	0	1207	1	1920	1	0	1	0
1958	1199	1	1199	0	1919	0	0	0	0
1957	684	14	684	0	1918	1	0	1	0
1956	590	12	590	0	1917	0	0	0	0
1955	507	7	507	0	1916	0	0	0	0
1954	450	8	449	1	1915	0	0	0	0
1953	406	8	405	1	1914	1	0	1	0
1952	310	7	310	0	1913	0	0	0	0
1951	333	4	333	0	1912	0	0	0	0
1950	349	3	349	0	1911	1	1	1	0

available, secondary entries have stabilized at approximately 1000/year. The statistics in Table 1 do not show this for 1984, 1985 as there is a delay in entering the secondary references into the NSR file.

b. Improvements in the NSR file

In order to serve the expanding interests of the NSR user community, the scope of subjects covered now includes not only pion induced reactions, pion production and other intermediate energy data, but also nuclear structure

information deduced from such front-line topics as quark models, relativistic Dirac reaction theories etc. The entire NSR library was reindexed in April 1984. As a result of the modifications to the NSR keywording rules, we are able to retrieve entries relevant to the Bibliography of Integral Charged-Particle Nuclear Data (CPBIB). The NNDC has produced two issues of the CPBIB (BNL-NCS-51771, 1984; BNL-NCS-51771, 1985, supplement - No. 1) and supplement NO. 2 is ready for publication.

c. The NSR Publication

The publication of the four-monthly issues of the Recent References has proceeded according to schedule. Minor changes have been made to the introductory pages.

d. The NSR Coding Manual and the Coding of Russian, Japanese & Chinese Journals.

The NSR coding manual is being updated continuously for the compilation effort at the NNDC. A revised version is being considered for distribution to data centers already involved in preparing NSR entries.

Two tapes have been received from the USSR compilers at Gatchina. The entries covering several Russian conferences were in most cases compatible with the NNDC coding procedures. After minor modifications, the USSR entries were merged into the NSR file at the NNDC. The Russian journals, however, are being coded at the NNDC. No proposals have been received from the Data Centers in Japan and China to compile journals from their countries. Journals from these countries are currently being compiled at the NNDC.

e. Keyword Abstracts

The new arrangement set up by Physical Review for the NNDC to directly receive author keyword abstracts is in operation. The author keyword abstracts constitute about 40-50% of the NSR entries. However, they need considerable editing before entry into the NSR file.

f. NSR Services

Monthly and triannual distribution of the NSR file entries are being sent to the various data centers and evaluators according to schedule. A-chain related updates as well as the handling of evaluator key-numbers and references have been further streamlined. Evaluator suggested corrections to NSR file entries continue to be made on a regular basis. In 1985, altogether 37 retrieval requests for the NSR file were received and processed by the NNDC.

One major retrieval for the NSR file was carried out in 1986 for Dr. S. Raman (ORNL) for a B(E2) compilation effort. A request from Dr. A. Wasson (NBS) for light charged particle induced pion production cross section was also treated as a special retrieval. A retrieval request for g-factor/magnetic moments for H. Mach-BNL was also received in 1986.

g. NSR On-Line Services

Early in 1986 we were informed by the OSTI division of DOE that the NSR data base would no longer be supported on the RECON system at Oak Ridge without supplementary funding. Therefore, after December 31, 1986, NSR will no longer be available on-line in the U.S. NNDC has made its on-line version of the NSR data base available to a limited number of scientists on a trial basis. The data base resides on one VAX-11/780 and is accessable over a telephone connection.

A-Chain Status in ENSDF

Center - ALL

16-May-86

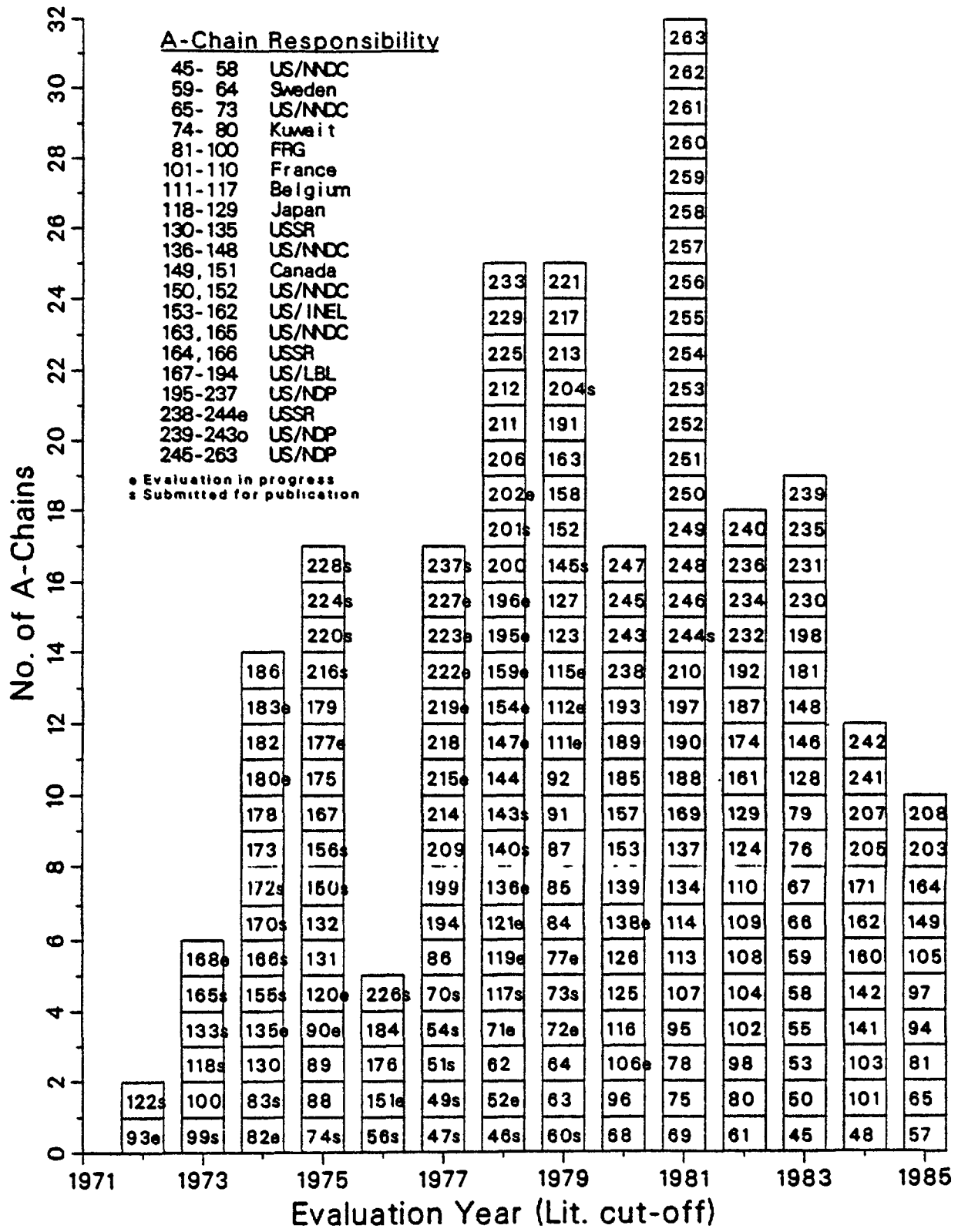

Fig. 1 Status of the ENSDF for A ≥ 45

We are presently planning to link our VAX-11/780 to other computers via one or more networks through the central VAX cluster at BNL. When completed, access to NSR and other on-line bases at NNDC will be facilitated. Discussions to be held in mid-May with other members of the USNDN will help set scope of future on-line services to be offered in the U.S..

4. The Evaluated Nuclear Structure Data File (ENSDF)

a. The ENSDF Status

At the Karlsruhe meeting of the NSDD in April 1984, the NNDC proposed that all the member institutions participate in a further cleaning up of the ENSDF. This was meant to be a one time effort with the different evaluation centers concentrating on the A-chains permanently assigned to them and involving no new evaluation of data. This proposal was approved by the NSDD and instructions for the clean-up were sent to the network members with a deadline of June 15, 1985. The data centers at Oak Ridge, Karlsruhe, Lund, Ghent, Grenoble, Moscow, Leningrad and Brookhaven participated in the clean-up. Although most of the ENSDF was cleaned up, A-chains assigned to the data centers not mentioned in the above list remain more - or - less the same as before.

The ENSDF is distributed twice a year; once in February and in August. Usually only those A-chains that have been modified since the last distribution are sent out, however, those data centers which have requested the complete file will continue to receive the full ENSDF.

According to the recommendations of the 1980 NSDD meeting in Vienna, the following centers agreed to code the evaluations for A = 5-44 published in Nuclear Physics for entry into the ENSDF.

Data Center	A
USA/NNDC	5-12
USA/NDP	13-24
UK/Liverpool	25-28
France/Grenoble	29-32
FRG/FIZ	33-44

For A = 13-15 new evaluations have been published (Nuc. Phys. A449, 1 (1985)); new evaluations for A = 16, 17, 18 have been completed and work on A = 19 is expected to start shortly. The data for A = 33-44 in the ENSDF are based on the 1973 evaluation and need to be updated.

The current status of the mass-chains in the ENSDF is shown in Fig 1., which also shows those A-chains that are being evaluated and/or that have been submitted for publication.

b. The Nuclear Data Sheets (NDS) Publication

Twenty five A-chains were published in the NDS and reached the subscriber in the calender year 1984 (NDS, 38/4, 39-42) representing 2,773 pages. In 1985, 22 A-chains were published (NDS, 43/1 - 46/4) covering 3001 pages. The publication of the NDS has been back on schedule as of the August 1985 issue, Vol 45, No 4.

The processing statistics for the A-chains for 1985 and 1986 are given in Tables 2 and 3. The elapsed times spent at the NNDC, the evaluator, reviewer, the Editor-in-Chief and the publisher are shown along with the total elapsed time for the published A-chains. The NNDC can plan for and control processing at the NNDC only; the other elapsed times can be reduced only with

Table 2

Nuclear Data Sheets Processing Statistics for 1985

Vol/No: 43/1 - 46/4

NDS Vol/No	NDS Date	A	Date Received	NNDC#	Elapsed time (months) Evaluator†	Review	Editor-in Chief	Publisher	Date on Shelf	Total Elapsed Time(mo)
43/1	09/84	161	11/21/83	6.7	3.2	1.2	0.3	2.2	01/3/85	13.6
43/2	10/84	171	02/28/84	5.4	1.8	1.6	0.4	1.9	02/1/85	11.1
		240	03/11/83	6.6	12.4	0.9	1.1	1.9	02/1/85	22.9
43/3	11/84	181	09/19/83	5.8	7.1	1.8	0.5	2.4	03/1/85	17.6
		207	03/06/84	4.4	2.8	2.1	0.2	2.4	03/1/85	11.9
43/4	12/84	53	03/21/84	5.4	2.3	2.9	0.5	2.1	04/23/85	13.2
		142	05/18/84	3.3	1.5	3.9	0.4	2.1	04/23/85	11.2
44/2	02/85	94	09/05/84	3.4	1.3	1.4	0.4	2.1	05/17/85	8.6
		241	09/10/84	3.1	1.6	1.1	0.5	2.1	05/17/85	8.4
44/3	03/85	55	03/07/84	7.4	1.4	3.9	0.2	2.0	05/28/85	14.9
44/4	04/85	162	09/17/84	4.4	2.5	0.5	0.2	2.9	07/01/85	9.6
45/1	05/85	141	08/17/84	3.5	1.5	3.8	0.2	2.5	07/22/85	11.5
		205	11/07/84	3.5	1.2	1.3	0.3	2.5	07/22/85	8.8
45/3	07/85	103	09/26/84	6.1	1.1	1.7	0.2	2.1	08/13/85	11.2
		242	10/16/84	2.8	3.3	1.7	0.4	2.1	08/13/85	10.3
45/4	08/85	48	11/29/84	3.1	0.8	3.1	0.2	2.2	09/04/85	9.4
		101	09/18/84	3.2	1.4	4.7	0.2	2.2	09/04/85	11.7
46/1	09/85	149	12/13/84	3.3	2.7	1.6	0.2	2.1	10/04/85	9.8
46/2	10/85	160	09/21/84	3.9	4.0	3.0	0.4	1.8	10/18/85	13.1
		203	05/07/85	2.0	0.7	0.7	0.2	1.8	10/18/85	5.4
46/4	12/85	81	02/06/85	3.7	1.8	1.8	1.0	2.1	12/16/85	10.4
		97	09/05/84	5.1	3.7	4.1	0.6	2.1	12/16/85	15.6
		Average		4.4	2.7	2.2	0.4	2.2		11.8
		Nominal		4.5	3.0*	2.5*	1.0*	2.0		13.0

Total processing time for preparing pre-review and post-review copies and implementing post-review and final corrections.

† Total time for pre-review and post-review corrections.

* Includes time in transit.

the active co-operation of the persons involved. Evaluators can help by submitting mass-chains corrected for format and physics errors and by responding promptly and completely to comments or questions by the reviewer or editors. The averages in Table 2 are found to be within nominal values for the different stages of processing in spite of a few glaring exceptions.

c. The Size of A-chains Published in the NDS

In 1985, 22 A-chains were published in the NDS with an average size of 114 pages/A- chain and one A-chain (A=55) occupied 196 pages. In 1984, 24 mass-chains were submitted for publication and this number in 1985 was 25. With new groups contributing evaluations and increased efficiency due to

Table 3

Nuclear Data Sheets Processing Statistics for 1986

Vol/No: 47/1 - 48/1

NDS Vol/No	NDS Date	A	Date Received	NNDC#	Elapsed time (months) Evaluator†	Review	Editor-in Chief	Publisher	Date on Shelf	Total Elapsed Time(mo)
47/1	01/86	57	12/27/84	5.9	3.8	1.1	0.3	2.0	01/28/86	13.1
		65	03/12/85	3.3	2.1	2.6	0.5	2.0	01/28/86	10.5
47/2	2/86	105	04/04/85	5.0	1.7	1.5	0.4	2.0	02/24/86	10.6
		164	07/26/84	3.7	9.0	3.9	0.5	2.0	02/24/86	19.1
47/4	4/86	208	11/30/84	7.6	4.2	2.9	0.9	1.3	04/16/86	16.9
48/1	5/86	47	11/26/84	7.0	3.0	5.5	0.6			
		51	06/25/85	5.3	0.6	2.7	0.6			

Total processing time for preparing pre-review and post-review copies and implementing post-review and final corrections.

† Total time for pre-review and post-review corrections.

* Includes time in transit.

recycling, it is reasonable to expect 30 A-chains this year. If a 6-year evaluation cycle is achieved, the NDS would have to publish about 36 A-chains/year. The NDS subscription rate at present is based on 2100 pages/year. If the average size of the A-chains is not reduced, the total number of pages of the NDS published per year and the subscription rate would increase with a possible decrease in the total number of subscribers which has gone down in recent years. With all these facts in mind it is obviously necessary to reduce the size of the A-chains. A number of proposals have been considered to achieve this goal and to make these proposals more concrete; A=57 was taken as an example and reproduced in three different formats. These examples were sent out to some 73 physicists including members of the NSDD and others interested in this problem. It is hoped that a consensus could be reached on a format with reduced number of pages and which will be adopted for future publications.

d. Status of the NDS Production Pipeline

At present there are 29 A-chains in the production pipeline. The processing codes have been made more efficient by including as many automatic features as possible. Since each A-chain has its own special problems, complete automation is not possible and some "handcrafting" needing the intervention of the production staff is essential. Such handcrafting is done in the final stages of production to increase its efficiency. This has resulted in a reduced processing time.

The number of new A-chains submitted for publication in 1984 was 24; and in 1985: 25. This is a significant increase over 18 that were submitted in 1983. The NSDD network should be congratulated on this increase. This and the more efficient processing of A-chains at the NNDC has made it possible to put the NDS publication back on schedule. The number of A-chains submitted by May 15, 1986 was 11.

e. The ENSDF Coding Manual

The manual is in the process of being revised and is expected to be distributed towards the end of 1986. This should contain all the agreed changes in the ENSDF formats including those approved at Grenoble.

f. The ENSDF Procedures Manual

A draft of the Procedures Manual was sent to the NSDD network in April '86 with a request for comments. This is a collection of memos, notes, etc., which had been available to the evaluator for the past few years. They have to be updated, merged or missing portions added. What is needed are short articles on various evaluation problems so that the manual could be a handy reference.

g. ENSDF On-line Services (NUDAT)

The nuclear physics data base contains numerical data selected from several data bases and organized for on-line retrieval. Specifically, the data included are: 1) Adopted levels for all nuclides from ENSDF, 2) Adopted gammas for all nuclides from ENSDF, 3) Nuclide ground and metastable state properties from the "Wallet Cards" and 4) Radiations from nuclides found in the "Wallet Cards" file generated by the MEDNEW program from the ENSDF file. Other data such as thermal and resonance data are being considered for inclusion.

The data base is accessible on the NNDC VAX-11/780 as a series of data files maintained by the DATATRIEVE DBMS software. The NUDAT system is written in Fortran-77 and uses a Fortran - DATATRIEVE interface for accessing the data. The retrieval program is designed for interactive use by the scientific community, by being structured to logically construct the full retrieval specifications and making "help" information available at all points where user input is required.

5. Mass-chain Evaluations and Other Related Activities

Evaluations of A = 45, 46, 47, 48, 49, 53, 57, 70, 141, 142, 143, 145, 150 and 165 have been finished and submitted for publication since the last report of March 15, 1984. Work is in progress on A = 71, 136, 138 and 147. Apart from the publication of the NDS, the NNDC physicists' effort has been directed towards improving NDS processing and production codes, training sessions, ENSDF code development and the writing of manuals. Some NNDC evaluators have also collaborated with their colleagues in the Physics and Chemistry Departments at Brookhaven, Iowa State University, Lawrence Berkeley Laboratory, Kernforschungs-anlage Julich and the Koln University in carrying out research on nuclear structure and decay data.

6. Nuclear Structure Related Publications

Nuclear Wallet Cards were published and distributed in January 1985.

COMPUTOPE CHART is a chart of the nuclides distributed by the NNDC as a microfiche. The latest edition published in September 1985 contains information extracted from:

Evaluated Nuclear Structure Data File (ENSDF), November 1984.

Evaluated Nuclear Data File (ENDF/B-V 1979), revised through 1984.

Neutron Cross Sections, Vol. 1, Academic Press 1981 (A), 1984 (B).

Atomic Masses, A. Wapstra et al., Nucl. Phys. A432, 1985.

Isotopic Composition of the Elements 1983, Pure Appl. Chem., 56, 675 (1984).

Chart of the Nuclides, General Electric Co., 1984.

Nuclear Wallet Cards, J. Tuli, 1985.

The production of the microfiche from these data bases is an automated push-button operation. On-line searches of the contents of the COMPUTOPE CHART that can satisfy several criteria are also possible.

7. The ENSDF Related Codes

The ENSDF physics processing codes: FMTCHK, TREND, PREND, DELTA, GTOL, HSICC, LOGFT, MEDLST, PANDORA, RULER, and INSDF continue to be maintained by the NNDC. These are listed in Table 4 with their functions. The programs FMTCHK and TREND have been updated to reflect new formats. The code INSDF originally written in BASIC by P. Thieberger of the BNL Physics Department has been converted to FORTRAN-77. IBM-PC versions of these codes were developed by D.de Frenne of Ghent University and were made available by him for distribution to the network in early 1986. GABS is a new code received from the Isotopes Project (LBL) for calculating uncertainties of absolute γ - intensities. Table 4 gives the current status of the various programs.

8. User Services

The NNDC provides the following services to the NSDD network evaluators on a routine basis:

(i) Monthly NSR updates to all evaluation centers for A-chains assigned to them.

(ii) Complete NSR list at the start of an A-chain evaluation.

(iii) Copies of references to evaluators (with help from the NDP for older references).

(iv) ENSDF updates are sent twice a year.

(v) NSR updates are sent once in four months. Number of references added to the NSR since the last publication of the respective evaluations are sent twice a year.

(vi) Special retrievals from the NSR and the ENSDF.

(vii) Maintain the ENSDF physics processing codes and send corrections and updates.

(viii) A plot of the new NSR references vs. mass number and table giving the number of new references added since the last evaluation are sent every six months.

On-line access to the NSR and NUDAT, a numeric data base selected from the ENSDF and other data bases at the NNDC has also been available on a limited basis for some time.

Table 4

Status of ENSDF Physics Processing Codes

Code	Function	Fortran-66	Fortran-77	IBM-PC	BASIC
FMTCHK	Format check of a file in ENSDF format		I	D	
TREND	Displays ENSDF data in tabular form		I	D	
PREND	Constructs level diagrams from the ENSDF data sets		D		
DELTA	Analyzes angular correlation data		D	D	
GTOL	Least-squares fit to γ energies to determine level energies and feedings		D	D	
HSICC	Interpolates internal conversion coefficients		I	D	
LOGFT	Calculates logft		I	D	
MEDLST	Calculates atomic and nuclear radiations and checks energy balance	I	D	D	
PANDORA	Physics check of the ENSDF data sets. Helps with adopted gammas and XREF		I	D	
RULER	Calculates reduced transition probabilities		D		
INSDF	Interactive program to create ENSDF data sets		D		D
GABS	Calculates uncertainties of absolute γ -intensities		D		

I - machine independent version
D - machine dependent version
(D) - machine dependent version under development

B. INEL - Nuclear Physics Branch

The mass region assigned to INEL is that for which 153 < A < 162. The evaluation of the mass chains with A=154 and 159 is currently in progress and will be completed this fiscal year. This represents the beginning of the second evaluation cycle for our ten mass chains. With these two evaluations underway, the status of the evaluation work for our region of responsibility can be summarized as follows:

A-Chain	Status (according to currency)
154	Underway (FY-1986)
159	Underway (FY-1986)
158	NDS 31, 381 (1980)
153	NDS 37, 487 (1982)
157	NDS 39, 103 (1983)
161	NDS 43, 1 (1984)
162	NDS 44, 659 (1985)
160	NDS 46, 187 (1985)
155	Submitted for publication
156	Submitted for publication

As is evident from this listing, with the completion of the A=154 and 159 evaluations, our mass chains will, with one exception, satisfy one of the desired objectives of the international evaluation network (namely, currency $\lesssim$ 5 years).

Some effort has been expended to permit data sets to be generated (or constructed) using IBM-AT computers, including the use of lower-case characters which have not been used before. In order to minimize potential problems later on, several preliminary data sets produced in this manner have been sent to NNDC for examination and comment.

D. de Frenne of Univ. of Ghent has produced IBM-AT versions of the six CYBER-based processing codes (FMT, GTOL, TREND, HSICC, LOGFT, DELTA) used to check data sets for errors and generate additional information. Three of these new versions (FMT, GTOL, LOGFT) have been implemented on our AT computers and are in active use. Implementation of the others is in progress.

C. LBL - Isotopes Project

1. Mass-Chain Evaluation.

The Isotopes Project has two full-time and one part-time scientists responsible for evaluating mass chains A=167-194. Mass chains were not evaluated during 1984-1985 because all of the group's effort was dedicated to the completion of the Table of Radioactive Isotopes. Our evaluation activity resumed in January 1986, and we are presently working on mass chains A=168,180 and 183, hoping to achieve our expected goal of a five year cycle for A=167-194. The evaluations of mass chains A=171, 174, and 181, completed before 1984, were published in 1984-1985.

2. Table of Radioactive Isotopes.

The book was completed and sent to the publisher in January 1986. The Table of Radioactive Isotopes is a comprehensive and critical evaluation of nuclear and atomic properties of radioactive isotopes. It has been especially tailored to the needs of applied users in industry, biology, medicine, and other fields, but serves as an indispensable reference for nuclear physicists and chemists. Detailed radiation data for about 2000 of the 2755 known

nuclides are presented in this up-to-date and concise single-volume book, which will be available in June 1986.

3. LBL/ENSDF Database and On-Line Access.

A numerical version of ENSDF, the LBL/ENSDF database, has been fully implemented in the LBL cluster of VAX-11/8600 computers, and is available on-line through regular telephone lines or computer networks. The database is not being updated at the present time. The Isotopes Project is represented at the "On-Line Subcommittee" of the U.S. Nuclear Data Network, which is studying the feasibility of on-line access to ENSDF.

4. Evaluation Methodology.

One of the main goals of the Isotopes Project is to establish uniform procedures for evaluating and analyzing nuclear data for ENSDF. These procedures are generally implemented by computer programs, such as SPINOZA (for checking the consistency of decay-scheme data), and GABS (for calculating uncertainties of absolute γ-ray intensities), which are distributed to evaluators by the National Nuclear Data Center, Brookhaven National Laboratory.

D. ORNL - Nuclear Data Project Activity Report

This report covers the period from May 1984 to April 1986.

1. Mass chain Evaluations

a. Mass chains 198, 203, 205, 207, 208, 230, 231, 234, 235, 239, 241 have been published.

b. Mass chains 201, 204, 216, 220, 224, 226, 228, and 237 have submitted to BNL.

c. Mass chains 202, 215, 219, 222, 223, and 227 are presently being worked on.

2. Mass Chain Review/Editing

The Nuclear Data Project staff provided reviews of the mass chains 45, 47, 48, 49, 50, 51, 53, 54, 55, 57, 58, 65, 81, 101, 122 124, 133, 141, 142, 143, 145, 148, 149, 150, 161, 164, 166, 171, 181, 192, and 240. These reviews are in addition to the final checks of all mass chains (by the Editor-in-Chief) prior to publication.

3. Other Activities

In addition to the mass-chain publication, the following publications have been authored or co-authored by members of the NDP staff:

Ellis-Akovali, Y.A., K.S. Toth, D.M. Moltz, F.T. Avignone, E.C. Schloemer, and M.D. Cable, "Search for the M4 Isomeric Transition in ^{149}Er," Bull.Am. Phys.Soc. 29, 718 (1984)

Ellis-Akovali, Y.A., K.S. Toth, F.T. Avignone, R.S. Moore, J.M. Nitschke, P.A. Wilmarth, P.K. Lemmertz, D.M. Moltz, and D.C. Sousa, "Single-Neutron and Single-Proton States in ^{149}Er and ^{149}Ho," Bull.Am.Phys.Soc. 30, 743 (1985); submitted for publication (April 1986)

Ellis-Akovali, Y.A., K.S. Toth, H.K. Carter, and R.L. Mlekodaj, "Alpha-Decay Rate of ^{194}Pb," Bull.Am.Phys.Soc. 30, 1274 (1985)

Martin, M.J., "Nuclear Decay Data for Selected Radionuclides," Appendix A of A Handbook of Radioactivity Measurements, National Council on Radiation Protection and Measurements Report No. 58 (Second Edition) (1985)

Martin, M.J. "ENSDF: The Evaluated Nuclear Structure Data File," First International Laser Science Conference, Dallas, TX, November 18-22 (1985)

McGowan, F.K., N.R. Johnson, JR., I.Y. Lee, W.T. Milner, C. Roulet, J. Hattula, M.P. Fewell, Y.A. Ellis-Akovali, R.M. Diamond, F.S. Stephens, and M.W. Guidry, "A Test of the Triaxial Rotor Model and the IBFM Description of the States from Coulomb Excitation of ^{191}Ir," Bull.Am.Phys.Soc. 29, 1049 (1984)

McGowan, F.K., N.R. Johnson, I.Y. Lee, W.T. Milner, C. Roulet, J. Hattula, M.P. Fewell, Y.A. Ellis-Akovali, R.M. Diamond, F.S. Stephens, and M.W. Guidry, "Test of the Triaxial Rotor Model and the Interacting Boson Fermion Approximation Description of Collective States in ^{191}Ir," Phys. Rev. C33, 855 (1986)

Schuck, C., N. Bendjaballah, R.M. Diamond, Y. Ellis-Akovali, K.H. Lindenberger, J.O. Newton, F.S. Stephens, J.D. Garrett, and B. Herskind, "Evidence for Reduced Neurtron Pairing Correlations in ^{165}Yb," Phys. Lett. 142B, 253 (1984)

Schuck, C., F. Hannachi, R. Chapman, J.C. Lisli, J.N. Mo, E. Paul, D.J.G. Love, P.J. Nolan, A.H. Nelson, P.M. Walker, Y. Ellis-Akovali, N.R. Johnson, and N. Bendjaballah, "Gamma-Spectrometry with Compton Suppressed Detectors," 23rd Int. Mtg. Nuclear Physics, Bormio, Italy, January 21-26 (1985)

Toth, K.S., D.M. Moltz, F.T. Avignone, E.C. Schloemer, M.D. Cable, and Y.A. Ellis-Akovali, "Identification of ^{149}Er Via Its Beta-Delayed Proton Activity," Bull.Am.Phys.Soc. 29, 718 (1984)

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E. University of Pennsylvania

Since the last report, A = 11-12 (NPA433, 1 (1985)) and A = 13 - 15 (NPA449, 1 (1986)) have been published. Evaluation of A = 16, 17 has been completed. After receiving comments on the pre-print of the evaluation it will be finalized and sent for publication in July, 1986. Evaluation of A = 18 has been finished in preliminary draft form and a pre-print will be distributed for comments on August 1, 1986. Work on A = 19 will be started shortly.

F. The NBS Photon and Charged Particle Data Center

A computer program to be run on personal computer (IBM PC or compatible) to calculate accurate photon cross sections for scattering, photoabsorption and pair production, as well as corresponding attenuation coefficients, in the energy region from 1 keV to 100 GeV has been developed. The program can be used to obtain these cross sections for a standard energy grid, or for any desired list of energies, for all elemental substances, for any compound, or for any mixture of elements and/or compounds. The program, when applied to compounds and mixtures, is based on the linear combination of data for elements, and allows production of a cross section table which includes the cross sections at and immediately below all absorption edges for all atomic constituents.

The program, written in FORTRAN 77, on an IBM PC XT, has also been tested on a Compaq PC, and will probably run on any IBM clone. The hardware requirements are modest; a 256-K memory and a 8087-coprocessor are sufficient. The computation time is typically a fraction of a minute for a cross section table (approximately 100 energies) for a given material. The required input data base is contained on a single 5-1/4" floppy disk, and a small part of another disk contains the program.

Thirteen volumes of the Photonuclear Data-Abstract Sheets, (E.G. Fuller and H. Gerstenberg, Photonuclear Data-Abstract Sheets, 1955-1982, NBSIR 83-2742 (1986)) including nuclei up through Thallium have been published. These abstract sheets cover most classes of experimental photonuclear data leading to information of the electromagnetic matrix element between the ground and excited states of a given nucleus. This fifteen volume work contains nearly 7200 abstract sheets and covers 89 chemical elements from hydrogen through americium. It represents a twenty-seven year history of the study of electromagnetic interactions.

STATUS REPORT: SWEDEN

Nuclear Structure and Decay Data Evaluation in Sweden

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Sweden is responsible for the mass chains 59-64 and temporalily for A=90.

Financial support and personnel

The project is funded (one full-time post) jointly by the Swedish Nuclear Power Inspectorate (SKI), the National Defence Research Establishment (FOA), the National Committee for Used Nuclear Fuel (NAK), the National Institute of Radiation (SSI), Studsvik Energiteknik and Vattenfall. This post has, during the last two years, been shared between the four scientists listed above.

Mass-chain evaluation

Since the last NSDD meeting the evaluation of A=60 has been published, and work on A=90 has been started.

Computer programs

All codes necessary for the mass-chain evaluation are running on the local computer. We have advanced plans to put recent parts of the Nuclear Structure Reference file on disc, and write programs to retrieve references on line (also via the Swedish data network SUNET). This would make it possible to find references not only on a specific nucleus or reaction, but also on a specific subject, e.g. 'Gamow-Teller resonances' or 'electric monopole resonance'

Services to NSDD users

New editions of the γ-ray catalogues (γ-rays ordered by energy and nucleus) have been printed and distributed to NSDD users. MEDLIST output has been produced and some ENSDF data has been retrived for some Swedish NSDD users.

Status Report on Japanese Activities in Nuclear Structure and Decay Data

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1. Mass-chain evaluation schedule

The Japanese group has just completed the first cycle of the assigned mass region, 118 - 129 in the past years. We wish to maintain the same region in the immediate future with 5-year cycle. Besides, we will evaluate A=177 temporarily.

The recent status of the evaluation is summarized as:

A=118, 120, 122	under review
A=119, 121	will be completed by August 1986
A=177 (temporarily)	will be completed by December 1986
A=123, 125, 127	will be completed by December 1987.

2. Evaluation Procedure

Our group hopes to introduce new techniques in the evluation and utilization of NSDD made available in the network.

Evaluation of data on the structure of nuclei and their decay properties conducted by the Atomic and Nuclear Data Centre (TsAYaD) of the USSR State Committee on the Utilization of Atomic Energy

(V.A. Vukolov, F.E. Chukreev and E.N. Shurshikov)

In 1984 and 1985, TsAYaD pursued the evaluation of nuclear structure data falling within its province. During that period, evaluations were completed for the mass chains A = 164 (in June 1984), A = 166 (in January 1985), A = 244 (in June 1985) and A = 3 (in April 1986). The last two of these evaluations constituted the beginning of a second cycle of compiling more precise data.

Notes on problems of MEDLIST with decay data sets

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A.) EO Transitions

For EO transitions, K/T, L/T, ... have to be given on a continuation card, at least in DECAY data sets. (A quick run through ENSDF showed that they are missing in most cases!) Otherwise MEDLIST cannot calculate the conversion electron intensities. The procedure for the calculation of K/T, L/T, ... is described in Ref. 1.). Since these calculations are rather tredious, the HSICC program should be modified to do this work.

1.) R.B. Firestone, EO Transition Probabilities in: Evaluated Nuclear Structure Data File (Draft), p. 119 (1986).

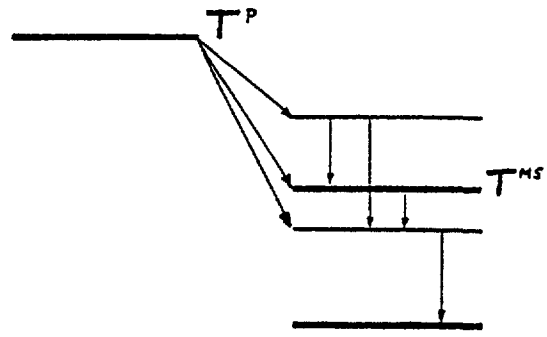
B.) Isomeric state in daughter nucleus

A problem arises with the intensities of isomeric transitions in the beta decay data sets which is not settled in ENSDF rules. Remember a parent decaying to a metastable state with the half-life large compared to the half-life of the isomer ($T^P \gg T^{MS}$). In this case, after a time large against the half-life of the isomer, we get a transient equilibrium. The question is whether or not the equilibrium intensity should be included in the data set. Some evaluators do so, others do not. If $T^P \lessapprox T^{MS}$, no equilibrium is reached, and hence no intensity can be given.

I suggest not to include equilibrium intensities, in accordance with Ref. 2.) and 3.). The equilibrium intensity should be given to NDS or ENSDF users only in a comment. The user of the MEDLIST data has to calculate himself either equilibrium or time-dependent intensities from IT DECAY data set. The user has not to care whether IT intensities are included or not. However, to calculate the intensities he needs the fraction of the decay feeding the isomeric state. I suggest that the evaluator has to deduce this quantity and display it on a new field (or in a comment). This value should also appear with the MEDLIST data. (Same procedure as in Ref. 2.) and 3.).)

Including equilibrium intensities often may save the user from tedious calculations. On the other hand, since no intensity can be given if $T^P \lessapprox T^{MS}$, there will be data sets with IT intensities and others without them. An

arbitrary limit has to be introduced when equilibrium intensities must be given and when not. I remember further that even in cases where $T^{P} \gg T^{MS}$, an equilibrium intensity has no practical importance if T^{MS} is very long.



The situation may be even more compilated if gammas have a spontaneous component from direct feeding plus a slow component from IT DECAY (see drawing). Combining both intensities on the RI field would be very misleading and does not reflect the situation. I suggest to include the spontaneous component on the RI field and give the combined intensities in a comment. Again, dealing with MEDLIST data, the IT DECAY data have to be added suitably by the user.

Summary:

A decision is needed whether or not equilibrium intensities from IT decay have to be inserted on the RI field or a beta decay data set. A consistent treatment is only possible if equilibrium intensities are not given on the RI field but in a comment. In either case, the fraction of decay feeding the isomer should be calculated by the evaluator and displayed with the data.

2.) M.J. Martin, Nuclear Decay Data for selected Radionuclides, ORNL-5114 (1976).

3.) D.C. Kocher, Nuclear Decay Data for Radionuclides ocurring in Routine Releases from Nuclear Full Cycle Facilities, ORNL/NUREG/TM-102 (1977).