International Atomic Energy Agency

INDC(NDS)-168/G+P

INDC

INTERNATIONAL NUCLEAR DATA COMMITTEE

PROGRESS

IN

FISSION PRODUCT NUCLEAR DATA

Information about activities

in the field of measurements and compilation/evaluations

of fission product nuclear data (FPND)

collected

by

M. Lammer

Nuclear Data Section
International Atomic Energy Agency
Vienna, Austria

No. 11
September 1985

334 F4.06.2 3 October 1985

To: Recipients of "Progress in Fission Product Nuclear Data"

From: M. Lammer

Subject: Comments on Contributions

The value of "Progress in Fission Product Nuclear Data", lies in its timeliness and completeness. This current awareness publication helps scientists working in the field of FPND and saves time in the scanning of current literature. To maintain its effectiveness, it is important that the work of all FPND measurers, compilers and evaluators be included in this publication. Unfortunately, the number of contributions have decreased constantly over the last two years, reflecting either reduced activity in this field and/or a decreasing interest in this publication. If the present trend continues it may become necessary to discontinue its publication.

If you would like to see the continued publication of this report series, I urge all FPND producers to send in their contributions when they are requested.

If you are interested in receiving future issues of this publication, please complete the enclosed card and return it so as to reach me not later than 1 March 1986.

Note to contributors:

I would like to remind contributors of a few points, which have not always been followed in the past.

- This series covers only yields and fragment spectrum data from neutron-induced or sponaneous fission, not from gamma- or charged particle-induced fission.

- Contributions on ongoing experiments can continue to be included, but should be withdrawn after the work is completed, i.e.: after the final publication has been included in the contribution. There is no limit on continuing evaluations.

- It is important that originals of the contributions be submitted as your submissions are used directly for reproduction; photocopies reduce the quality of the print considerably.

- Finally, I want to urge contributors to observe the deadline given for submission of contributions in order not to delay the publication which unfortunately was the case in 1984 and this year.

Note on editing:

Due to lack of time, the editing done to distinguish between new, revised and unchanged contributions will be discontinued as of issue 12 in 1986.

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Reproduced by the IAEA in Austria
September 1985

FOREWORD

This is the eleventh issue of a report series on Fission Product Nuclear Data (FPND) which is published by the Nuclear Data Section (NDS) of the International Atomic Energy Agency (IAEA). The purpose of this series is to inform scientists working on FPND, or using such data, about all activities in this field which are planned, ongoing, or have recently been completed.

The types of activities being included in this report are measurements, compilations and evaluations of:

Fission product yields (neutron induced and spontaneous fission);
Neutron reaction cross sections of fission products;
Data related to the radioactive decay of fission products;
Delayed neutron data of fission products; and
lumped fission product data (decay heat, absorption etc.).

The main part of this report consists of unaltered original contributions which the authors have sent to IAEA/NDS. Therefore, the IAEA cannot be held responsible for the information contained nor for any consequences resulting from the use of this information. Contributions containing information on the data types given above are accepted. Contributions on experimental work can usually be included repeatedly until the final publication is presented. Contributions on evaluations continue to be included as long as the data or files are not superseded.

Each issue contains also a section with some recent references relative to fission product nuclear data, which were not covered by the contributions submitted.

The tenth issue of this series has been published in September 1984 as INDC(NDS)-155. The present issue includes contributions which were received by NDS between 1 October 1984 and 15 August 1985.

The next issue of this report series is envisaged to be published in July 1986.

NOTE TO MEASURERS

1. The Specialist's Meeting on Fission Product Yields and Decay Data (BNL, Brookhaven, USA, 24-27 Oct. 1983) again strongly recommended that measurers clearly and thoroughly report and document details of their results and error analysis.

2. There is a plea from evaluators thet measurers make their results available to them as soon as possible, even prior to publication. This is essential for a fast and timely updating of their data files and the publication of evaluation results (see 'Evaluations' starting page 53 for contact addresses of evaluators).

In particular, T.R.England (see contribution on page 55) has asked to inform the measurers' community that he is continuing and extending the fission yield compilation and evaluation of B.F.Rider. Furthermore, he invites users of his data to send criticisms and corrections of data or model parameters. It is important for him to bring the correspondence at least back to the level at Rider's time.

TABLE OF CONTENTS

Page numbers in brackets refer to collaborations, which are not listed under "Laboratory and Address".

SUBMITTING CONTRIBUTIONS

The next issue is expected to be published in July 1986. All scientists who are presently working - or have recently completed work - in the field of FPND and who want to contribute to the 12th issue of this series, are kindly asked to send contributions to me between now and 1 June 1986, so that they reach NDS before 15 June 1986.

Those scientists or groups who have already contributed to the present issue and who want to leave their contribution(s) unchanged or who wish to suggest only slight changes, should inform me accordingly before the above deadline.

Format:

The size of one contribution should preferably not exceed one page. Of course, the number of contributions per working group or laboratory is not restricted. Similar experiments (or calculations, evaluations, etc.) performed by one person or group should preferably be combined to one contribution, if this is possible without loss of clarity.

The headings suggested for the 3 types of contributions can be found opposite. For the sake of consistency it is requested that the suggested headings be used as far as appropriate.

Compilation and evaluations: If applicable, the availability of numerical data from computer files could be indicated either under the headings "Computer files..." or under a separate heading "Availability..."

Contact: If desired, the name of the person to be contacted for further information, or customer services in case of data files, can be given.

Editing: Since contributions received are generally used directly for publication, it is important that typed originals are sent and not edited report if a margin of 2 cm (or 1 inch for North American paper format) is left on each side of the text and a 5 cm space is left at the top of each page (or 3 cm, if the name of the country is included).

Comments or suggestions concerning the format, content and layout of this report series are most welcome and should be directed to me in time before the next issue.

I would like to thank the contributors for their cooperation.

M. Lammer

Measurements:	Compilations:	Evaluations:
Laboratory and address:	Laboratory and address:	Laboratory and address:
Names:	Names:	Names:
Facilities:		
Experiment:	Compilation:	Evaluation:
Method:	Purpose:	Purpose:
Accuracy:	Major sources of information:	Method:
Completion date:	Deadline of literature coverage:	Major sources of information:
Descrepancies to other reported data:	Cooperation:	Deadline of literature coverage:
Publications:	Other relevant details:	Status:
Contact:	Computer file:	Cooperation:
	Completion date:	Other relevant details:
	Publications:	Computer file of compiled data:
	Contact:	Computer file of evaluated data:
		Discrepancies encountered:
		Completion date:
		Publications:
		Contact:

SUBJECT INDEX

With respect to the earlier issues, underlined page numbers refer to new work, page numbers in brackets refer to unchanged contributions, and others refer to revised contributions.

1. MEASUREMENTS

1.1. Fission yields

1.1. Fission yields (cont'd)

1.2. Neutron reaction cross sections

1.2. Neutron reaction cross sections (cont'd)

1.2. Neutron reaction cross sections (cont'd)

FProd= gross FP-mixtures

Many= several nuclides not specified in detail

1.3. Decay data

1.3. Decay data (cont'd)

1.3. Decay data (cont'd)

1.3. Decay data (cont'd)

A= several nuclides within the mass chain given

Many= several nuclides not specified in detail

1.4. Delayed neutron (del-n) data

Many= several nuclides not specified in detail

1.5. Decay heat

2. COMPILATIONS AND EVALUATIONS

2. COMPILATIONS AND EVALUATIONS (cont'd)

I. MEASUREMENTS

Unchanged contributions are marked as such.

Updates: revisions with respect to the last issue are marked by a vertical bar on the left margin of the text.

New contributions show no marks.

BELGIUM

Laboratory and address : Nuclear Physics Laboratory
Proeftuinstraat 86
B-9000 Gent,Belgium

Names: E.Jacobs, D.De Frenne, A.De Clercq, M.Verboven, M.Piessens, G.De Smet

Facilities: Linear Electron Accelerator.

Experiment: Emission of light charged particles in photofission.
Mass and kinetic energy distributions for the photofission of ^{232}Th.

Method: Measured: light charged particles (^{3}H, ^{4}He, ^{6}He) emitted in the photofission of actinides, using ΔE-E detectortelescope particle identification system; deduced : $B/^{4}He$, $^{3}H/^{4}He$, $\langle E^{4}_{He}\rangle$, $\langle E^{3}_{H}\rangle$ and FWHM of the kinetic energy distributions.
Measured: catcherfoil γ-ray spectra and kinetic energies of the two fragments for ^{232}Th photofission; deduced : kinetic energy distributions, post-and preneutron mass distributions, neutron emission curves, range of ^{232}Th photofission products in Th.

Publication: P.D'hondt, E.Jacobs, A.De Clercq, D.De Frenne, H.Thierens, P.De Gelder and A.J.Deruytter, Phys.Rev. C21, 963(1980)

BELGIUM

Laboratory and address	:	Nuclear Physics Laboratory, Proeftuinstraat 86 B-9000 Gent, Belgium SCK/CEN, B-2400 Mol, Belgium Institut de Physique Nucléaire, 69622 Villeurbanne, France Institut Laue-Langevin, B.P. N° 156 X, 38042 Grenoble, France
Names	:	C. Wagemans, P. Schillebeeckx, A.Emsallem
Facilities	:	High Flux Reactor, Institut Laue-Langevin, Grenoble
Experiments	:	Thermal neutron induced (n,α) reactions on fission products.
Method	:	Charged particle detection with surface barrier detectors.
Completion date	:	Systematic study in progress.
Publications	:	1) A. Emsallem et al., Z. Phys. A315 (1984) 201. 2) C. Wagemans , Proc. 4th Int. Conf. on Neutron Induced Reactions, Smolenice (Czechoslovakia), June 1985.

BELGIUM

Laboratory and address	:	Nuclear Physics Laboratory, Proeftuinstraat 86, B-9000 Gent, Belgium SCK/CEN, B-2400 Mol, Belgium Institut Laue-Langevin, B.P. N° 156 X, Grenoble, France
Names	:	C. Wagemans, P. D'hondt, P. Schillebeeckx
Facilities	:	High Flux Reactor, Institut Laue-Langevin, Grenoble
Experiments	:	Absolute yields and energy distributions of the charged light particles emitted during the thermal neutron induced fission of ^{233}U, ^{235}U, ^{237}Np, ^{241}Pu, ^{239}Pu and ^{241}Am.
Method	:	The charged particles are identified with surface barrier (ΔE-E) telescope detectors.
Completion date	:	^{235}U completed; other isotopes in progress.
Publications	:	1) C. Wagemans et al., submitted to Nucl. Phys. A

E.E.C. BELGIUM

Laboratory and address	:	CEC-JRC, Central Bureau for Nuclear Measurements, B-2440 Geel, Belgium SCK/CEN, B-2400 Mol, Belgium
Names	:	C. Wagemans, P. Schillebeeckx, A.J. Deruytter
Facilities	:	Neutron time-of-flight spectrometer at the 150 MeV Linac. Thermal neutron beam at the Reactor BR1.
Experiments	:	Fission fragments kinetic energy and mass distribution for ^{238}Pu(s.f.), $^{239}Pu(n_{th},f)$ ^{240}Pu(s.f.), $^{241}Pu(n_{th},f)$, ^{242}Pu(s.f.) and ^{244}Pu(s.f.)
Method	:	Coincident fission fragments detected with surface barrier detectors. Deduced fragment mass and energy distributions.
Publications	:	1) C. Wagemans et al., Phys. Rev. C30 (1984) 218 2) P. Schillebeeckx et al., Proc. 4th Int. Conf. on Neutron Induced Reactions, Smolenice (Czechoslovakia), June 1985

BRAZIL

Laboratory and address:	Instituto de Engenharia Nuclear Comissão Nacional de Energia Nuclear Caixa Postal 2186 20001 - Rio de Janeiro - RJ - BRASIL
Names:	A.V. Bellido, S.C. Cabral
Facilities:	CV-28 Variable Energy Cyclotron Helium Jet Transport System.
Experiment:	Fission yield determinations and decay scheme investigations on short-lived fission products from actinides fissioned by charged particles.
Method:	Quick transport by a helium jet of the recoiling fission products from the irradiation chamber to the collection chamber (at 15 m distance) and then to the counting station situated just in front of a high resolution Ge(Li) detector. Identification and measurement of the fission products by gamma-ray spectrometry.
Accuracy:	Better than 10 %.
Completion date:	Work commencing.

BULGARIA

Laboratory and address :	University of Sofia, Faculty of Physics, Department of Atomic Physics, 1126 Sofia, Bulgaria
Names :	N. Nenoff, D. Kolev Hr. Gountchev, I.Ephtimov (Institute of plant protection, Kostinbrod)
Experiment :	Determination of 14 MeV neutron reaction cross sections for: $^{162}Dy(n,p)^{162}Tb$, $^{174}Yb(n,p)^{174}Tm$, $^{176}Yb(n,p)^{176}Tm$ $^{176}Yb(n,\alpha)^{173}Er$, $^{152}Sm(n,p)^{152m,g}Pm$, $^{178}Hf(n,p)^{178m,g}Lu$.
Method:	Activation technique
Completion date :	April 1984
Publications:	On the determination of reaction cross-sections for 14 MeV neutrons . A.Antov,E.Dobreva, I. Ephtimov,N.Nenoff,N.Stancheva. Bulg.J. Phys. 10/6 (1983) 601
	N.Nenoff,D. Kolev, R.Korrea, St.Gabrakov, Hr.Gountchev, Il.Penev. Submitted to Annu. Univ. Sofia

CANADA

Laboratories and Address: Atomic Energy of Canada Limited Research Company, Chalk River Nuclear Laboratories, Chalk River, Ontario, Canada, K0J 1J0

Names: L.W. Green and W.J. Edwards

Facilities: NRU Reactor

Experiment: Effective Neutron Capture Cross Section of ^{147}Nd in a Thermal Reactor.

Method:

1. Gamma spectrometric determination of depletion of ^{147}Nd caused by neutron irradiation in NRU. Involves production of ^{147}Nd from fission of ^{235}U, and separation of Nd.

2. Irradiation of ^{146}Nd in the NRU reactor for 2 years followed by mass spectrometric determination of the ^{148}Nd to ^{146}Nd ratio.

Accuracy: 8%

Completion dates:

1. 1986 November
2. 1988

Comments: Results from the activation method have been delayed because of interference from trace uranium in the neodymium fraction.

CANADA

Laboratory and Address: Chalk River Nuclear Laboratories
Chalk River, Ontario
Canada K0J 1J0

Names: J.G.V. Taylor and R.H. Martin

Facilities:

1) $4\pi\gamma$ ionization chamber
2) $4\pi\beta$ gas flow proportional counter
3) $4\pi\beta$-γ coincidence system
4) scintillation spectrometer
5) Ge(Li) detector
6) Radioisotope standardization laboratory

Experiment: Half-life values for ^{137}Cs, ^{152}Eu, ^{133}Ba and ^{109}Cd

Method: $4\pi\gamma$ ionization chamber.

Accuracy: < 0.22% for ^{137}Cs, < 0.10% for others.

Completion Date: Continuing and undetermined at present.

Discrepancies to other data: None at present.

Publication: None at present.

(same as INDC(NDS)-155)

CANADA

Laboratory and address: University of Toronto
Erindale College
3359 Mississauga Road North
Mississauga, Ontario
Canada L5L 1C6

Names: B. Singh†, D. Viggars†, D.A. Craig, J.K.P. Lee*
(† - University of Kuwait, * - McGill University)

Facilities: 14 MeV neutron generator producing ∿ 2×10^{10} n/s through the d,T reaction.

Experiment: Measurement of the half lives of ^{76}Ga and ^{124}In

Method: Gamma radiations studied with Ge spectrometers

Accuracy: γ-ray energy measurements to ≤0.6 keV in energy

Completion date: August 1984

Discrepancies to other reported data:

1) half-life determinations have been improved

Publications:
H.W. Taylor, D.A. Craig, J.K.P. Lee and B. Singh, "Half-life of the 3+ isomer of ^{124}In using a simple MCA-computer system". Nuc. Inst. and Methods 205 (1983) 365-369.
H.W. Taylor, D.A. Craig, B. Singh and D.A. Viggars, "The half life of ^{76}Ga". Int. J. Appl. Radiat. Isot. 36 (1985) 89

C H I N A

Laboratory and address: Laboratory of Neutron Physics,
Institute of Atomic Energy, Academia Sinica
P.O.Box 275-15, Beijing, China

Names: Bao Zongyu, Huang Shengnian, Meng Jiangchen and Han Hongyin

Facilities: Self-transfered source of Cf-252 spontaneous fission

Experiment: Determination of fission-fragment mass distribution and fission-fragment kinetic energy from Cf-252 spontaneous fission. Double kinetic energy correlation measurement. Calculation of energy balance. The fine structures on mass distribution at high kinetic energy region (E_K>200 MeV) deduced.

Method: Fission fragments detected by Au-Si detectors. Mass distribution and correlation of fragment kinetic energy versus fragment mass derived from the data obtained.

Accuracy: Fragment mass resolution about 5 u. Fragment energy resolution about 2 MeV. $7.6*10^6$ events collected.

Completion date: December 1980, March 1982

Publications:
Bao Zongyu et al., Chin. J. Nucl. Phys. 4 (1982) 41 (in Chinese; English translation: Chinese Physics 3 (1983) 129)
Bao Zongyu et al., Chin. Jour. Nucl. Phys. 5 (1983) 289 (in Chinese; English translation: Chinese Physics 4 (1984) 641)

C H I N A

Laboratory and address:	Laboratory of Neutron Physics and Laboratory of Radiochemistry, Institute of Atomic Energy,Academia Sinica P.O.Box 275-15,Beijing,China
Names:	Zhang Chunhua,Liu Conggui,Wan Xiuzhi,Li Ze, Chuei Anzhi,Chi Linkun and Zhang Shujing
Facilities:	Cockcroft-Walton accelerator, 130 c.c. Ge (Li) detector coupled with 4K analyzer
Experiment:	Determination of fission yields from 3 MeV neutron induced fission of U-238
Method:	Yields of fission products for 38 mass chains were determined by radiochemical method and/or direct gamma-ray spectrometry. 3 MeV neutrons were obtained from D-D reaction. Fission rate was measured absolutely using a double fission chamber.
Accuracy:	3.1---30.0 %
Completion date:	October 1982
Publication:	Chinese Journal of Nuclear and Radiochemistry,2,1(1985)

C H I N A

Laboratory and address:	Laboratory of Neutron Physics and Laboratory of Radiochemistry, Institute of Atomic Energy,Academia Sinica P.O.Box 275-15,Beijing,China
Names:	Li Ze,Zhang Chunhua,Liu Conggui,Wan Xiuzhi, Lu Huijun,Liu Yonghui,Chi Linkun and Zhang Shujing
Facilities:	Cyclotron, 130 c.c. Ge(Li) detector coupled with 4K analyzer
Experiment:	Mass distribution in the 8.3 MeV neutron induced fission of U-238
Method:	The fission yields of 46 mass chains were measured by direct Ge(Li) gamma-ray spectrometry and radiochemical method. 8.3 MeV neutrons were generated with the $D(d,n)^3He$ reaction,using a deuterium gas target. Fission rate was determined absolutely by a double fission chamber.
Accuracy:	2.9---7.0 %
Completion date:	September 1983
Publication:	Chinese Journal of Nuclear Physics,2,No.2 (1985)

China

(same as INDC(NDS)-155)

Laboratory and Address: Institute of Atomic Energy
Academia Sinica
P.O.Box 275
Beijing, China

Name: Wang Dao, Tang Peijia, Ju Changxin, Liu Daming, Wang Qing

Facilities:

^{252}Cf-Source

Heavy-Water Research Reactor

High Resolution Ge(Li) Gamma-ray Spectrometric System

Experiment:

Determination of ^{99}Mo cumulative yield of ^{235}U fission by the spontaneous fission neutrons of ^{252}Cf source

Method:

Gross fission product gamma-ray spectra were obtained using a large volume Ge(Li) detector, and then , the total energy peaks corresponding to ^{99}Mo 739Kev and ^{95}Zr 756 Kev gamma-rays were analysed. The R-value, ratio of ^{99}Mo relative cumulative yields for fast and thermal fission of ^{235}U, were determined. Absolute cumulative yield of ^{99}Mo is based on the normalization to the reference values of FPYs concerned.

Accuracy:

±2.8%(1σ uncertainty)

Completion Date:

1983

Discrepancies to Other Report Data:

Up to now, the published data can be divided into two groups— one, ∿6.40, another, ∿6.10. Our result agrees well with latter.

Publications:

to be published.

FRANCE

Laboratory and address : CENTRE D'ETUDES NUCLEAIRES DE GRENOBLE
DRF/SERVICE DE PHYSIQUE
Laboratoire de Physique Nucléaire
85 X - F 38041 GRENOBLE CEDEX

Names : J. BLACHOT, J. CRANÇON, Ch. HAMELIN, G. LHOSPICE

Facilities : Melusine reactor (thermal neutron and caramel system for fast neutrons) 3 MeV neutrons generator and high flux reactor of I.L.L.

Experiment : The element yields of Bromine, Krypton, Rubidium, Tellurium, Iodine, Xenon, Caesium, have been measured for :

$^{235}U(n_{th},f)$, $^{235}U(n_f,f)$, $^{235}(n_{3MeV},f)$, $^{232}Th(3MeV,f)$
$^{238}U(n_{3MeV},f)$, $^{*232}U(n_{th},f)$, $^{*229}Th(n_{th},f)$

Values for the odd even effects in Z for all these systems has been deduced.

Method : Direct growth and decay activities are measured with a Ge/Li detector and recorder in a multispectrum mode by a 4K multichannel analyser.

Accuracy : The average relative uncertainty of our measurements is between 5 and 10%.

Completion date: ^{235}U, ^{238}U, ^{232}Th during 1980 and 1981, ^{229}Th and ^{232}U in progress.

Publications :

Nuclear Physics A361 (1981) 213.

International Symposium on Nuclear Physics, Florence, Italy, 29 Aug. - 3 Sept. 1983.

Ch. Hamelin, Ph-D Thesis, July 1983.

Specialists" meeting on Yields and Decay Data of Fission Product Nuclei, BNL, USA, 24-27 October 1983.

Nuclear data for basic and Applied Science Santa Fe (USA) - May 13-17 1985.

* Collaboration with CSTN, Alger

Laboratory and address: Institut Laue-Langevin
156X
F-38042 Grenoble

Names: B. Pfeiffer (ILL), U. Stöhlker (II. Physikal. Institut Giessen/ILL), F. Blönnigen (ILL/II. Physikal. Institut Giessen), H. Weikard (ILL/T.U. Braunschweig) in collaboration with II. Physikal. Institut Giessen (J. Münzel, K. Becker, K.-H. Kobras, G. Bewersdorf, V. Rabbel, W. Lippert, H. Wollnik) and D.R.F.C.E.N. Grenoble (E. Monnand, J.A. Pinston) and Kernchemie Mainz (H. Gabelmann, H.O. Denschlag, St. Hörner, K.-L. Kratz) and Inst. für Metallphsik und Nukleare Festkörperphysik der T.U. Braunschweig (U. Keyser, B. Pahlmann, F. Münnich)

Facilities: On-line mass separator OSTIS (PN6) installed at an external neutron guide of the high-flux reactor of the ILL.

Experiment: Nuclear spectroscopic studies of very neutron-rich fission products*).

Method: Different kinds of ion sources are used at OSTIS to study the products of thermal neutron induced fission of ^{235}U:
1) a high-temperature ion source (2700 K) for Ga, Rb, Sr, In, Cs, Ba and long-lived rare earth elements and
2) a negative ion source for Br and I.
Single gamma-rays, gamma multispectra, gamma-gamma and beta-gamma coincidence and gamma-gamma-angular correlation measurements allowed to establish or extend level schemes of numerous isotopes, especially in the N = 60 region at the onset of stable deformation and near ^{132}Sn with the closed n- and p-shells. (in collaboration with II. Physikal. Institut Giessen and C.E.N. Grenoble).
Performance of beta-delayed-neutron gamma coincidences yielded information on the feeding of individual excited states by delayed neutrons in Sr, Ba and Sn isotopes (in collaboration with Kernchemie Mainz).
Measurements of yields and isomer ratios of $^{123-129}In$ in the fission of Uranium-235 with thermal neutrons (in collaboration with Kernchemie Mainz).
Q_β-values were measured with two kinds of detector systems:
a) beta-gamma coincidences were performed with a big plastic scintillator ΔE-E telescope to study low yield isotopes with an accuracy of the order of 100 keV (in collaboration with T.U. Braunschweig) and
b) beta single and beta-gamma coincidences were taken on A = 94 to 99 and A = 128 and 130 with a gas detector-Ge(HP) ΔE-E telescope (Ge(HP): 800 mm^2 surface and 13 mm thickness). All elements of an isobaric chain were measured with high precision so that the cumulative error for the mass excess of the most unstable member should be less than 100 keV (in collaboration with II. Physikal. Inst. Giessen).

*) see also contribution on pages 15,16

Completion date: all work is in progress

Publications:
Annex to the Annual Report ILL 1985, p. 48-50
Verhandl. DPG (VI) 20 (1985) F2.3, F2.8, G3.3, G3.6, A5.8, G3.7, G4.2, H2.8
K. Becker et al.: Z. Physik A319 (1984), 193-203[1]
F. Blönnigen et al.: Proc. 7th Int. Conf., AMCO-7[2] (1984), 134
H.O. Denschlag et al.: Progress Report NEANDC(E)[4](1984)[3]
K.-L. Kratz et al.: Proc. 7th Int. Conf., AMCO-7[4] (1984), 127-133
J. Münzel et al.: Z. Physik A321 (1984)[5]
B. Pahlmann et al.: Proc. 7th Int. Conf., AMCO-7 (1984), 148[6]
B. Pahlmann et al.: Z. Physik A318 (1984), 371[6]
B. Pfeiffer et al.: Z. Physik A317 (1984), 123[7]
S. Robinson et al.: in print[8]
B. Sohnius et al.: Radio chemica acta in print[9]

1) $\gamma\gamma$-spectroscopy: ^{98}Sr, ^{98}Zr
2) Q_β-value: A = 95,96,97,98
3) Yields and isomer ratios: In 123-129
4) Q_β, B_n values: A = 90,140
5) $\gamma\gamma$-spectroscopy: ^{100}Y and ^{100}Zr
6) Q_β-values around A = 100
7) $\gamma\gamma$: ^{99}Sr
8) $\gamma\gamma$ spectroscopy: A = 140
9) Absolute γ-ray intensities: A = 142-144,146,147

FRANCE

Laboratories and Adresses :
- Laboratoire de Chimie Physique et Radiochimie (LCPR) Université de Nice, 06034 Nice Cedex, France.
- Faculté des Sciences - Université Omar Bongo - Libreville Gabon.

Names : J. Dalmasso, H. Forest, G. Ardisson

Facilities : HPGe, Ge(Li) detectors, 4K multichannels analysers.

Experiment : New weak β branches from $^{144}Pr^{m+g}$ isomers decays.

Method : Radiochemically separated ^{144}Ce sources in equilibrium mixture with ^{144}Pr isomers have been reinvestigated with HPGe and Ge(Li) detectors. γ - γ coincidence experiments were performed with the 696.5 keV γ ray

Results : Nineteen γ-rays were attributed to $^{144}Pr^{m+g}$ decays, of which 3 are new from earlier results [1]. Levels at 2072.8 (2^+), 2368.3 (2^+), 2581.8 (3^+), 2675.3 (0^+) keV are found to be fed in these decays A tentative 2945.6 keV level ($J^\pi = 3\text{-}5^\pm$) is also suggested

Accuracy : $\Delta E_\gamma \leq 0.1$ keV ; $\Delta I_\gamma \sim 5$ %

Discrepancy : A 2842.9 keV from ref (1) could not be found

Publication : J. Dalmasso, H. Forest, G. Ardisson, Phys Rev., 31 C (1985) on press

Reference :
1) M.S. Pravikoff, G. Barci-Funel and G. Ardisson, Radiochem. Radioanal. Letters 40, 123 (1979)

FRANCE

Laboratory and Adresse: Laboratoire de Chimie-Physique et Radiochimie (LCPR) Université de Nice, 06034 Nice Cédex, France

Names : G. Barci, J. Dalmasso, G. Ardisson

Facilities : HPGe detectors, 4 K analysers.

Experiment : Decay of long-lived ^{129}I

Method : Thin ^{129}INa sources (~87% ^{129}I) were measured with high-resolution (FWHM = 180 eV) HPGe planar detector coupled with a 4K multichannel analyser. Intensity of K_α, K_{β_1} and K_{β_2} X-ray lines was accurately measured together with the 39.57 keV photon. Correcting K_α, K_β and γ areas for efficiency, taking account of Ge K_α and K_β escape intensities, we could deduce the K Internal Conversion Coefficient of the 39.57 keV photon from:

$$\alpha_K = \frac{\varepsilon_\gamma}{S_\gamma \bar{\omega}_K} \sum_i \left(\frac{S_{K_i}}{\varepsilon_{K_i}} + \frac{S_{e K_i}}{\varepsilon_{e K_i}} \right)$$

where : ε relative efficiency
e= Ge K_α (K_β) escape peak
$i = \alpha_1, \alpha_2, \beta'_1, \beta_2$
$\bar{\omega}_K$ = fluorescent yield = 0.889 (ref 1)

Energy of ^{129}I photon was determined by simultaneous counting with ^{241}Am, ^{133}Ba and ^{152}Eu sources.

	Present work	Previous	
E_γ	39.578 (4) keV	39.6	ref. 2
α_K	10.60 ± 0.20	21 ± 1	ref. 3
		10.6	ref. 4
		10.2 ±0.5	ref. 2

Accuracy : ΔE_γ = 4eV ; 2% on α_K

Discrepancy: Good agreement with ORNL[4] (error not given) and Ragimov[2] measurements. Disagreement with Walthert[3] experiment.

Publications : G. Barci-Funel, M.C Kouassi, G. Ardisson, Nucl. Instr. and Meth. in Phys. Res. in press (1985).

FRANCE (cont'd)

References :

1. C.M. Lederer, V.S. Shirley, Table of Isotopes, J. Wiley (1978).
2. T.K. Ragimov, D.F. Rau, V.I. Timoshin, Izv. Akad. Nauk SSSR, Ser. Fiz., 41 (1977), 1222
3. A. Walthert, E. Baumgartner, P. Huber, Helv. Phys. Acta, 38 (1965) 514.
4. S.A. Reynolds, J.F. Emery, ORNL 4343(1968) 78.

GERMAN DEMOCRATIC REPUBLIC

Laboratory and address:	Zentralinstitut für Kernforschung Rossendorf DDR 8051 Dresden Postfach 19
Names:	K.Dietze, H.Kumpf, B.Bohmer
Facilities:	Fast-thermal coupled systems RRR/SEG-IV and RRR/SEG-V characterized by an energy-independent adjoint flux
Experiment:	Integral test of FPND by C/E-ratios
Method:	Measurements of central reactivity worths of isolated and mixed fission products by means of pile-oscillator technique Measurement of mass dependence and extrapolation to infinitely small mass values Determination of flux-weighted effective absorption cross sections relative to ^{10}B Integral test of the absorption data by C/E-ratios, especially of resonance self-shielding factors Comparison of different FPND
Samples:	Isolated isotopes of Mo, Ru, Pd ^{149}Sm, ^{103}Rh, ^{93}Nb, ^{109}Ag, ^{141}Pr, ^{133}Cs Natural mixtures of Mo, Pd, Cd
Accuracy:	$\Delta k/k \approx 10^{-8}$ ±10 – 15 % in C/E-ratios
Completion date:	SEG-IV: 1983/1984 SEG-V : 1985/1986

Discrepancies to other reported data:
Discrepancies have been stated for different materials and data sets, especially the under- or overestimation of the self-shielding effect by f_c-factors

Publications: Preliminary results are summerized in internal reports
Cd: K.Dietze et al.,Kernenergie 28 (1985) 2 p.75
Other publications in progress

Laboratory and address:

Institut für Reine und Angewandte Kernphysik der Universität Kiel (IKK), Postfach 11 60, D-2054 Geesthacht, Reaktorstation

Names:

U. Harz, H.-G. Priesmeyer

Facility:

Fast Chopper Neutron Time-of-Flight spectrometer, 42 m flightpath in front of beam hole of 5 MW FRG-1 reactor. 15 ns/m nominal resolution, special equipment for transmission investigations of highly radioactive samples, 11 Li-6 glass detectors, max. rotorspeed 12 000 rpm, min. burst width 0.64 usec, min. time channel width 100 nsec, 2560 time-of-flight channels.

Experiments:

Neutron resonance investigations by transmission measurements between 1 eV and 1.5 keV on separated stable or radioactive isotopes of special interest to reactor physics (especially fission products), gross fission products. Possiblity of extending energy range to thermal region using neutron guide tubes.

Completed: - Measurements on five gross-fission product samples show time variations useful for isotopic identifications.
- Gross-fission product mixtures measurements using 24 keV Fe-filter neutrons.

Ongoing: - Transmission experiments on I 129.

Method:

Sample in beam, sample out-of-beam transmission measurement; black resonance background determination technique; iron-titanium filter-difference technique.

Accuracy:

For resonance parameters: about 5 % or better, depending on statistical accuracy of transmission points.
24 keV total cross sections: about 1 %.

Recent publications:

Fischer, Harz, Priesmeyer: "Total neutron cross section of the proton bound in zirconium hybride at low temperature", ATKE/Kerntechnik 43 (1983) 294.

Henkens, Fischer, Harz, Priesmeyer: "24.4 keV neutron beam filter facility at the reactor FRG-1", ATKE/Kerntechnik 46 (1985) 50.

Priesmeyer, Fischer, Harz, Henkens: "The total n,p-cross section at the iron-titanium filter difference energy", Nuclear Data for Basic and Applied Science, Sante Fe, May 13 - 17, 1985.

Laboratories: Kernforschungsanlage JÜlich, Institut für Kernphysik, Postfach 1913, D-5170 JÜlich

Names: G. Lhersonneau, D. Weiler, P. Kohl, H. Ohm, K. Sistemich, R.A. Meyer (on leave of absence from University of California U.S.A.)

Facilities: Fission product separator JOSEF (Reactor DIDO, JÜlich)

Experiments: γ decay of a new high spin isomer in ^{97}Y

Method: Separation of the fission products according to their mass and nuclear charge. Measurement of γ singles and γ-γ-t coincidence spectra.

Accuracy: varying

Completion: completed

Publication: Annual Report 1984 of the IKP, KFA JÜlich, *manuscript in preparation to be submitted.*

Germany, Fed. Rep.

Laboratory:	Kernforschungsanlage Jülich, Institut für Kernphysik, Postfach 1913, D-5170 Jülich
Names:	G. Menzen, A. Wolf (visiting scientist from the Negev Nuclear Research Centre, Israel), H. Lawin, G. Lhersonneau, K. Sistemich
Facilities:	Fission product separator JOSEF (Reactor DIDO, Jülich)
Experiment:	Study of the g factors of the 2^+ levels in ^{102}Mo and ^{104}Mo.
Method:	Time-integral perturbed angular correlation measurements
Accuracy:	16% for ^{102}Mo; 60% for ^{104}Mo
Completion:	completed
Publication:	Z. Physik A-Atoms and Nuclei 321(1985) in press

GERMANY, FED. REP.

1. NAMES:	G. Walter, F. Käppeler
FACILITIES:	Pulsed 3 MV Van de Graaff
EXPERIMENT:	Capture Cross Section Measurements on ^{80}Kr and ^{86}Kr Between 4 and 300 keV Neutron Energy
Method:	Continuous neutron energy spectrum from ^{7}Li(p,n) reaction; High pressure gas samples (300 bar in stainless steel spheres of 20 mm diameter and 0.5 mm wall thickness); Capture events detected by 2 C_6D_6-detectors of 1 l volume with pulse height weighting; Neutron energy determination by time-of-flight with a resolution of 1.5 ns/m; ^{197}Au-sample used as a standard.
ACCURACY:	Statistical uncertainty typically 5-10% for energy intervals corresponding to the experimental resolution. Systematic uncertainties between 4 and 10 % depending on the isotopic composition of the samples.
COMPLETION DATE:	Completed
DISCREPANCIES TO OTHER REPORTED DATA:	No such data available
PUBLICATIONS:	Preliminary data are summarized in internal reports. Submitted to Nucl. Sci. Eng.

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2. NAMES:	R.R. Winters, F. Käppeler, K. Wisshak, G. Reffo, A. Mengoni
FACILITY:	3.75 MV Van de Graaff
EXPERIMENT:	Neutron Capture Cross Sections measured: $\sigma_{n\gamma}$ for ^{148,149,150}Sm for $4 < E_n < 250$ keV calculated: $\sigma_{n\gamma}$ for the unstable isotopes ^{147}Nd, ^{147,148}Pm, ^{151}Sm

GERMAY, FED. REP.

(cont'd)

METHOD: Continuous neutron energy spectrum from $^{7}Li(p,n)$ reaction;
Capture events detected by 2 C_6D_6-detectors of 1 l volume with off-line pulse height weighting;
Neutron energy determination by time-of-flight with a resolution of 1.5 ns/m;
^{197}Au sample as a standard

ACCURACY: Statistical uncertainty typically 3 % for energy intervals corresponding to the experimental resolution.
Systematic uncertainties 4.5 %

COMPLETION DATE: Completed;
Astrophysical Journal (in print)

DISCREPANCIES TO OTHER REPORTED DATA: No discrepancies for ^{148}Sm, but severe discrepancies for ^{149}Sm (compared to Mizumoto et al., Proc. Int. Conf. on Nuclear Cross Sections for Technology, Knoxville, Tennessee, p. 328 (1979) and for ^{150}Sm (compared to Kononov et al., Sov. J. Nucl. Phys., 27 (1978) 5)

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3. NAMES: G. Walter, H. Beer

FACILITY: 3.75 MV Van de Graaff

EXPERIMENT: Measurement of the Maxwellian Average Neutron Capture Cross Sections of $^{79,81}Br$ and $^{85,87}Rb$ at kT = 25 keV

METHOD: Activation technique

ACCURACY: 5 - 18 %

COMPLETION DATE: Completed; Astronomy and Astrophysics (in print)

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4. NAMES: G. Walter, H. Beer, F. Käppeler

FACILITIES: Pulsed 3.75 MV Van de Graaff

EXPERIMENT: Capture Cross Section Measurement on ^{80}Se

GERMANY, FED. REP.

(cont'd)

METHOD: Continuous neutron energy spectrum from $^{7}Li(p,n)$ reaction;
Capture events detected by two C_6D_6-scintillators of 1 l volume;
Pulse height weighting technique;
Neutron energy determination by time-of-flight;
^{197}Au-sample used as a standard.

ACCURACY: 6.8 % for Maxwellian average cross section at kT = 30 keV

COMPLETION DATE: Summer 1984

DISCREPANCIES TO OTHER REPORTED DATA: No such data available.

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5. NAMES: (new) H. Beer

FACILITY: 3.75 MV Van de Graaff

EXPERIMENT: Measurement of the Maxwellian Average Neutron Capture Cross Sections of ^{139}La at kT = 25 keV

METHOD: Activation technique

ACCURACY: 7 %

COMPLETION DATE: Completed

DISCREPANCIES TO OTHER REPORTED DATA: Serious discrepancies compared to Musgrove et al., Austr. J. Phys. 30, 899 (1977)

GERMANY, FED. REP.

(same as INDC(NDS)-155)

Laboratory and address: Physikalisch-Technische Bundesanstalt
D-3300 Braunschweig, Bundesallee 100

Names: K.F. Walz, K. Debertin, H. Schrader

Facilities: Ionisation chamber; Ge(Li)-spectrometer

Experiment: Determination of half-lives of ^{85}Kr, ^{90}Sr, ^{99}Mo, $^{99}Tc^{m}$, ^{125}Sb, ^{131}I, ^{140}Ba, ^{140}La, ^{144}Ce, ^{152}Eu, ^{154}Eu, ^{155}Eu.

Method: The decay of the radioactive substance in a source is followed over a period of several half-lives.

Accuracy: 0.1 % to 0.01 % (1σ)

Completion date: partly completed,
partly ongoing

Publication: K.F. Walz, K. Debertin and H. Schrader:
Half-Life Measurements at the PTB.
Intern. J. Appl. Rad. Isotopes 34
(1983) 1191

GERMANY, FED. REP.

Laboratory and address: Institut für Metallphysik und Nukleare Festkörperphysik
Technische Universität Braunschweig, Mendelssohnstr. 3
D-3300 Braunschweig, Germany

Names: U. Keyser, F. Münnich, B. Pahlmann

Facilities: On-line mass separator LOHENGRIN and OSTIS, installed at the high-flux reactor of the ILL, Grenoble, France.

Experiments: 1) Determination of beta-decay energies of very neutron-rich isotopes available from fission of ^{235}U and ^{239}Pu.

2) Sum-beta-spectra of ^{235}U and ^{239}Pu from thermal neutron fission to deduce the antineutrino spectrum of a reactor core.

Method: $\beta\gamma$-coincidence measurements with a plastic-scintillator telescope, β-singles measurements with a high-purity Ge detector.

Accuracy: ΔE between 70 keV and 150 keV, depending upon the complexity of the decay scheme.

Completion data: 1) Systematic investigation
2) end of 1984

Publications:

Critical Survey of Beta-Decay Energies and Nuclear Masses for the Neutron-Rich Rb and Cs Isotopes; CERN-Report 81-09,116(1981)

Beta-Decay Energies and Nuclear Masses of Very Neutron-Rich Rb and Cs Isotopes; Z.Physik A308,345(1982) *)

Beta-Decay Energy and Nuclear Mass of ^{100}Nb; Z.Physik A313,251(1983)

The Study of Nuclear Structure Effects in the Mass Region A $\approx$ 100 by Means of Beta-Decay Energies; AMCO-7, O.Klepper ed., THD 26,148(1984)

Some Critical Remarks on the Determination of Masses from Beta-Endpoint Measurements; AMCO-7, THD 26,155(1984)

Investigation of the Integral Beta-Spectra of $^{235}U(n_{th},f)$- and $^{239}Pu(n_{th},f)$-Fission Products; AMCO-7, THD 26,619(1984)

Q_β-Values and Masses of Neutron-Rich Nuclei with A = 99 and A = 100; Z.Physik A318,371(1984)

Experimental Beta-Decay Energies of Very Neutron-Rich Light Fission Products; Proc.Int.Conf.Nucl.Data Basic and Applied Science, 1985 im Druck

*) $^{94-98}Rb$, $^{142-146}Cs$

See also contribution on page 9.

Germany,Fed.Rep.

Laboratory and address	Institut für Radiochemie Technische Universität München 8046 Garching
Names	D.C.Aumann*, I.Winkelmann
Facility	Linear accelerator (D-T neutrons)
Experiment	Determination of fission yields for fission of Pu-242 induced by 15.1-MeV neutrons
Method	Yields determined (1) by γ-counting of irradiated Pu-242 sample and (2) radiochemically with either γ- or ß-counting. Yields of 65 fission products, representing 43 mass chains,have been determined
Accuracy	Yields determined by γ-counting:5-10% Yields determined radiochemically:10-20%
Completion date	completed
Publication	Phys. Rev. C 30 (1984), 934-940

* Present address: Inst. f. Physikalische Chemie, Abt. Nuklearchemie Univ. Bonn

GERMANY, FED. REP.

Laboratory and address:	II. Physikalisches Institut, Universität Giessen Heinrich-Buff-Ring 16, D-6300 Giessen
Names:	F. Blönnigen (ILL/II. Physik, Giessen); K. H. Kobras, G. Bewersdorf, V. Rabbel, W. Lippert, H. Wollnik (II. Physik, Giessen); U. Stöhlker (ILL/II. Physik, Giessen)
Facilities:	On-line mass separator OSTIS (PN6) installed at an external neutron guide of the high-flux reactor of the Institut Laue-Langevin (ILL) in Grenoble.
Experiment:	Nuclear spectroscopic studies of very neutron-rich fission products.
Method:	At OSTIS two different kinds of ion sources are used to study the products of thermal neutron induced fission of ^{235}U: 1) high-temperature ion source (2700 K) for Ga, Rb, Sr, In, Cs, Ba and long-lived rare earth elements and 2) negative ion source for Br and I. Single gamma-rays, gamma-multispectra, gamma-gamma-coincidence and gamma-gamma-angular correlation measurements allow to establish or extend level schemes of numerous isotopes, especially in the N=60 region at the onset of stable deformation and near the closed shell nucleus ^{132}Sn. Beta-single and beta-gamma coincidences which were taken with a new gas detector-Ge(HP) E-E telescope (Ge(HP): 800 mm² surface and 13.5 mm thickness). Q_β measurements were performed in the regions of A=95 to 99 and A=128 to 130. All elements of an isobaric chain were measured with high precision so that the cumulative error for the mass excess of the most unstable member should be less than 100 keV.

See also contribution on page 9.

Completion data: All work is in progress.

Publications:

K. Becker et al.; "Gamma-Gamma Angular Correlation Measurements of Tranisitions in ^{98}Sr and ^{98}Zr and Confirmation of Shape Coexistence in ^{98}Sr", Z. Physik A 319 (1984) 193.
F. Blönnigen et al.; "Proc. 7th Int. Conf. on Atomic Masses and Fundamental Constants; AMCO-7 (1984) 134.
B. Pfeiffer et al.; "Rotational Bands in ^{99}Sr", Z. Physik A 317 (1984) 123.
J. Münzel et al.; "Level Schemes of ^{100}Y and ^{100}Zr from the Beta-Decay of Mass Separated ^{100}Sr", Z. Physik A 321 (1985) 515.

1. Laboratory: Institut fur Kernchemie
Universität Mainz
D - 6500 Mainz, Germany

Names: H.O. Denschlag et al. (see 'Publications'), (Univ. Mainz), H. Faust and H. Schrader (ILL, Grenoble)

Facilities: LOHENGRIN mass separator for unslowed fission products at ILL, Grenoble

Experiment: The charge distribution and isomeric yield ratios among heavy-mass peak fission products (A = 130-147) from ^{235}U(n_{th},f) have been measured at various well defined kinetic energies (excitation energies) of the fission fragments

Method: Fission fragments separated according to mass (resolution $\frac{M}{\Delta M}$ = 400) and kinetic energy (resolution 2 MeV) are intercepted on a moving transport tape, transported continuously or discontinuously in front of a Ge(Li) γ-ray detector, and counted via the γ rays emitted in their β-decay.

Completion: Experimentally completed

Publications: H.O. Denschlag, H. Braun, W. Faubel, G. Fischbach, H. Meixler, G. Paffrath, W. Porsch, M. Weis, H. Schrader, G. Siegert, J. Blachot, Z.B. Alfassi, H.N. Erten, T. Izak-Biran, T. Tamai, A.C. Wahl, K. Wolfsberg, in Physics and Chemistry of Fission (Proc. Symp. Jülich, 1979), IAEA, Vienna (1980), Vol. II, p. 153-176, and further experimental work: W. Faubel, Dissertation, Mainz (1980); H. Braun, Dissertation, Mainz (1983); B. Sohnius, Dissertation, Mainz (1984); W. Porsch, Dissertation, Mainz (in preparation); W. Ditz, Diplomarbeit, Mainz (1985); St. Hörner, Diplomarbeit, Mainz (in preparation).

GERMANY, FED. REP.
(cont'd)

2. Names: C. Lietz, H.O. Denschlag, W. Ditz, U. Güttler, B. Sohnius, P. Stumpf (Universität Mainz), and H. Faust (ILL, Grenoble)

Facilities: LOHENGRIN mass separator for unslowed fission products at ILL Grenoble

Experiment: Selected fission yields and isomeric ratios in 12 mass chains of $^{233}U(n_{th},f)$ have been measured at various well defined kinetic energies of the fission fragments

Method: See contribution above (Nr. 1)

Accuracy: 10%

Completion: 1985/86

Publication: C. Lietz, Diplomarbeit (in preparation)

3. Names: (new) St. Hörner, H.O. Denschlag, W. Ditz, U. Güttler, B. Sohnius, P. Stumpf, H. Faust

Facilities: LOHENGRIN mass separator for unslowed fission products at ILL (Grenoble)

Experiment: Isomeric formation ratios of ^{96}Y, ^{97}Y, and ^{98}Y in the fission of ^{235}U with thermal neutrons are being determined at various kinetic energies of the fragments.

Method: Mass separation (see contribution No. 1, above)

Accuracy: ± 10 %

Completion: 1985/86

Publication: Preliminary results in 'Jahresbericht 1984', this institute and St. Hörner, Diplomarbeit (in preparation)

GERMANY, FED. REP.
(cont'd)

4. Names: H. Braun, H.O. Denschlag, T. Izak-Biran, W. Lauppe

Facilities: TRIGA Mark II Reactor, Mass separators JOSEF (Jülich) and LOHENGRIN (Grenoble)

Experiment: Yields and decay properties within the fission product chain with mass number A = 133 have been redetermined

Method: Fast radiochemistry and mass spectrometry

Accuracy: Generally 10%

Completion date: completed

Publications: Radiochimica Acta 36, 95 (1984)

5. Names: B. Sohnius, M. Brügger, H.O. Denschlag, B. Pfeiffer

Facilities: TRIGA Reactor (Mainz), HELIOS mass-Separator (Mainz), OSTIS mass-separator (Grenoble)

Experiment: Gamma-ray line intensities of short-lived nuclides in chains 142, 143, 144, 146, and 147 have been redetermined relative to long-lived descendents

Method: Fast radiochemistry and mass spectrometry

Accuracy: Generally 10%

Completion date: Completed

Publications: Radiochimica Acta, 125 (1984) 125.*)

*) $^{142,143}Cs$, $^{142,143,144,146}Ba$, $^{143,146,147}La$, $^{146,147}Ce$

GERMANY, FED. REP.
(cont'd)

6. Names: St. Hörner, H.O. Denschlag, H. Gabelmann, K.-L. Kratz, B. Pfeiffer, U. Stöhlker
(new)

Facilities: OSTIS mass separator, ILL (Grenoble)

Experiment: Fission yields and isomeric formation ratios of the In-isotopes 123-129 from U-235 thermal neutron fission.

Method: γ-ray spectrometry after mass separation

Completion: 1985/86

Publication: Preliminary results in 'Jahresbericht 1984' this institute, and St. Hörner, Diplomarbeit (in preparation)

INDIA

Measurements:

Laboratory and address: Department of Physics,
Aligarh Muslim University,
Aligarh-202001 (India)

Names: M. Afzal Ansari, R.K.Y. Singh, M.L. Sehgal, V.K. Mittal, D.K. Avasthi & I.M. Govil.

Facilities: (a) Variable Energy Cyclotron of Panjab University, Chandigarh.
(b) 50 cm^3 Ge(Li) Spectrometer

Experiment: Measurement of Fast neutron radiative Capture cross-sections.

Method: Neutrons of desired energies were produced using T(p,n) reactions. These neutrons were used as a probe for producing (n,r) reactions on the desired enriched and non enriched samples. The activation technique is evolved.

Accuracy: ± 8-12% depending upon isotopes.

Completion date: November, 1982

Publications: (i) "Radiative capture cross sections of Isotopes of Gd, Sm and V between 1 and 3 MeV",
M. Afzal Ansari, R.K.Y. Singh, M.L. Sehgal, V.K. Mittal, D.K. Avasthi & I.M. Govil,
Ann. Nucl. Energy (U.K) 11(1984) 173

(ii) "Isomeric cross-sections of In and Rh at neutron energies of a few MeV".
M. Afzal Ansari, R.K.Y. Singh, M.L. Sehgal, V.K. Mittal, D.K. Avasthi & I.M. Govil.
Ann. Nucl. Energy (U.K) 11 (1984) 607.

INDIA

LABORATORY AND ADDRESS	Radiochemistry Division Bhabha Atomic Research Centre Trombay, BOMBAY-400 085, INDIA
NAMES	Alok Srivastava, S.K. Srivastava, A.G.C. Nair, S.B. Manohar, Satya Prakash and M.V. Ramaniah
FACILITIES	1. Class A Radiochemical Laboratory 2. 8% HP Ge Detector Multichannel analyser
EXPERIMENT	Nuclear Charge Distribution Studies Fractional Independent Yields and Cumulative Yields
METHOD	Fractional Independent Yields of ^{101}Tc, ^{103}Tc, ^{104}Tc and ^{105}Tc in the spontaneous fission of ^{252}Cf and in thermal neutron induced fission of ^{233}U, ^{235}U and ^{239}Pu are determined γ-spectrometrically after performing radiochemical separations.
ACCURACY	10 - 12% on the Yields
STATUS	Completed
PUBLICATIONS	1. Cumulative Yields of short-lived Ru isotopes in the spontaneous fission of ^{252}Cf - J. Radioanal. Nucl. Chem. 82 (1984) 263. 2. Nuclear Charge Distribution in the Spontaneous Fission of ^{252}Cf: Isotopic Yield Distribution for Technetium Isotopes - Radiochim. Acta 35 (1984) 15.

INDIA
(cont'd)

LABORATORY AND ADDRESS	Radiochemistry Division Bhabha Atomic Research Centre Trombay, BOMBAY-400085, INDIA
NAMES	A.V.R. Reddy, S.B. Manohar, S.M. Deshmukh, T. Datta, Satya Prakash and M.V. Ramaniah
FACILITIES	1. Class A Radiochemical Laboratory 2. 8% HP-Ge Detector Multichannel Analyser
EXPERIMENT	Isotopic yield distribution in the low energy fission of $^{252}Cf(SF)$, $^{241}Pu(n_{th},f)$, $^{229}Tn(n_{th},f)$, $^{241}Am(n,f)$.
METHOD	Independent yields of Iodine isotopes are determined γ-spectrometrically after performing radiochemical separations.
ACCURACY	10 - 12% on the yields
STATUS	Yields in the $^{252}Cf(SF)$ were determined. Experimental work in $^{241}Pu(n_{th},f)$ is completed. Work on $^{229}Th(n_{th},f)$ and $^{241}Am(n,f)$ is in progress.
PUBLICATIONS	Part of work on iodine yields in $^{252}Cf(SF)$ was presented in the Symp. "Nuclear and Radiochemistry", B.H.U., Banaras, India (1981). Isotopic yield distribution of iodine in thermal neutron induced fission of ^{241}Pu, International Symposium on Artificial Radioactivity, University of Poona, Pune, India (Jan. 1985).

INDIA

(cont'd)

LABORATORY AND ADDRESS	Radiochemistry Division Bhabha Atomic Research Centre Trombay, BOMBAY-400 085, INDIA
NAMES	A. Ramaswami, B.S. Tomar, H. Naik, Satya Prakash and M.V. Ramaniah
FACILITIES	1. Class A Radiochemical Laboratory 2. 8% HP Ge detector Multichannel analyser
EXPERIMENT	Determination of yields of short-lived rare earth fission products in the spontaneous fission of Cf-252.
METHOD	Radiochemical separation and gamma-ray counting
ACCURACY	5 - 10% on the yields
STATUS	Completed in November 1983.
PUBLICATION	Yields of short-lived rare earth isotopes in the spontaneous fission of ^{252}Cf, Paper presented in the Symposium on 'Radiochemistry and Radiation Chemistry' held at Bombay, India, December 1983.

INDIA

(cont'd)

LABORATORY AND ADDRESS	Radiochemistry Division Bhabha Atomic Research Centre Trombay, BOMBAY-400085, INDIA
NAMES	S.K. Das, A. Goswami, B.S. Tomar, Satya Prakash and M.V. Ramaniah
FACILITIES	1. Class A Radiochemical Laboratory 2. 60 c.c. Ge(Li) detector Multichannel analyser
EXPERIMENT	Determination of independent isomeric yield ratio of ^{138}Cs in thermal neutron fission of ^{233}U and ^{239}Pu.
METHOD	Fast radiochemical separation and gamma spectrometry
ACCURACY	Precision on yield ratios: 5 - 10%
STATUS	Completed in March 1985
PUBLICATION	To be communicated.

INDIA

(cont'd)

LABORATORY AND ADDRESS	Radiochemistry Division Bhabha Atomic Research Centre Trombay, BOMBAY-400085, INDIA
NAMES	N. Chakravarty, A.G.C. Nair, A. Goswami, B.K. Srivastava, Satya Prakash and M.V. Ramaniah
FACILITIES	1. Class A Radiochemical Laboratory 2. HP Ge detector 4K analyser
EXPERIMENT	β^- branching fraction of ^{117}Cd isomers and internal transition of $^{117}In^m$.
METHOD	Radiochemical separation followed by daughter activity using γ-spectrometry
ACCURACY	10 - 12%
STATUS	Completed in March 1985.
PUBLICATION	To be communicated to Radiochimica Acta.

INDIA

(cont'd)

LABORATORY AND ADDRESS	Radiochemistry Division Bhabha Atomic Research Centre Trombay, BOMBAY-400085, INDIA
NAMES	A. Ramaswami, N. Chakravarty, S.S. Rattan, R.J. Singh, Satya Prakash and M.V. Ramaniah
FACILITIES	1. Class A Radiochemical Laboratory 2. HP Ge detector and multichannel analyser
EXPERIMENT	Nuclear charge distribution studies, Fractional cumulative yields in reactor neutron induced fission of ^{237}Np.
METHOD	Fast radiochemical separation and gamma-ray spectrometry.
ACCURACY	10 - 12% on the yields.
STATUS	Likely to be completed by mid-1986.
PUBLICATIONS	

INDIA

Laboratory : Indian Institute of Technology, KANPUR-208016, INDIA

Names : M.M. Sharma, S.C.L. Sharma, A.K. Sinha and G.K. Mehta, I.I.T. Kanpur

Facilities : 2 MeV Van de Graaff Accelerator

Experiment : Angular distribution of light charged particles with respect to neutron direction in fast neutron induced fission of ^{235}U.

Method : Particle identification was performed by using a semiconductor ΔE-E detector telescope. The angular information of the particles with respect to the detector axis was also obtained by telescope[1] using the technique developed in our laboratory. Experiments have been carried out at several neutron energies between thermal and 1 MeV and the anisotropies in the angular distributions of alpha particles are determined.

Accuracy : Refer to the table

Completion Date : April 1983

Table : Anisotropies $(Y^{(0^o)}/Y^{(90^o)}$ of the ternary alpha particle angular distribution

Neutron Energy	Anisotropy
(140 ± 30) KeV	(-85 ± 28)%
(170 ± 25) KeV	(-87 ± 32)%
(200 ± 25) KeV	(-94 ± 31)%
(400 ± 200) KeV	(-10 ± 28)%
(600 ± 180) KeV	(-25 ± 19)%
(1000 ± 170) KeV	(-50 ± 27) %

Publications: Nucl. Instr. Meth. in Phys. Res. (in press)

Pramana 24 (1985) 131

JAPAN

Laboratory and address: Linac Laboratory
Japan Atomic Energy Research Institute
Tokai-mura, Naka-gun, Ibaraki-ken, Japan

Names: Y. Furuta, Y. Kawarasaki, M. Mizumoto, Y. Nakajima
M. Ohkubo and M. Sugimoto (JAERI)
Y. Kanda, I. Tsubone (Kyushu Univ.)

Facilities: Neutron time-of-flight spectrometers at the 120 MeV electron linear accelerator

Experiments: Average neutron capture cross section measurements in keV region and resonance parameter measurements.

- **Detectors**: 500 l liquid scintillator tank and Moxon-Rae detector ^{6}Li-glass and ^{10}B-NaI detectors for neutron flux and transmission measurements.
- **Flight paths**: 47 m and 52 m for capture measurements
  47 m, 56 m, 100 m and 190 m flux and transmission measurements.
- **Resonance analysis**: The Atta-Harvey area analysis code and the multi-level Breit-Wigner code SIOB
  Monte Carlo code CAFIT, TACASI and FANAC

(1) Sample: Sn-122 (Oxide powder enriched to 92.20 %)
Resonance parameters up to 30 keV
Completion date: Completed
Publication: Y. Nakajima et al., Int. Conf. Nuclear Data for Basic and Applied Science, Santa Fe, New Mexico, May, 1985

(2) Samples: Sb-121 and Sb-123 (metallic powder enriched to more than 90 %)
Resonance parameters, S0, D0
En below 5 keV
Completion date: Measurements are completed.

(3) Samples: Gd-155 and Gd-157 (Oxide powder enriched to 91.77 and 88.63 %, respectively)

1) Average capture cross sections
   Energy region: 1.1 to 220 keV
   Accuracy: 6 to 9 %
2) Resonance parameters
   Energy region: Gd-155 En below 500 eV
   Gd-157 En below 2 keV
   Completion date: Measurements are completed.

JAPAN
(cont'd)

(4) Samples: Ba-135, Ba-137 and Ba-138 (nitrate and carbonate powder enriched to 79.04, 81.90 and 99.67, respectively)
Energy region: less than 300 keV
Completeion date: Measurements are completed
Publication: M. Mizumoto et al., Int. Conf. Nuclear Data for Basic and Applied Science, Santa Fe, New Mexico, May 1985

(5) Samples: Ce-142 (Oxide powder enriched to 92.11 %) and Ce-nat.
Completion date: Measurements and analyses are completed.
Resonance parameters up to 50 keV.
Γ_n, SO, DO for Ce-142.
Publication: M. Ohkubo et al., Int. Conf. Nuclear Data for Basic and Applied Sceence. Santa Fe, New Mexico, May 1985

JAPAN

(same as INDC(NDS)-155)

Laboratory and address: Institute of Atomic Energy, Kyoto University, Uji, Kyoto 611, Japan
Names: Ichiro Fujiwara and Nobutsugu Imanishi
Facilities: 5 MW research reactor [Research Reactor Institute, Kyoto University]
Experiment: Cumulative and independent fission-yields of some fission products in the thermal-neutron induced fission of ^{233}U, ^{235}U and ^{239}Pu.
Method: Radiochemical for fission yields; Instrumental with germanium detectors.
Accuracy: Errors range from 7 % to 20 % with different combinations of fission products and the fissile isotopes.
[Expected] completion date: see Table I
Publication:

Table I

Nuclide		Completion date	Publication
$^{128,130,132}Sn$, ^{133}Sb $^{128,130,132}Sb^{m,g}$, ^{131}Sb, $^{131,133}Te^{m,g}$	[Cum.] [Ind.]	Sep. 1975	N. Imanishi, I. Fujiwara and T. Nishi, Nucl. Phys. A263, 141 (1976)
^{135}I	[cum.]		T. Nishi, I. Fujiwara and N. Imanishi, Int. Conf. on Nucl. Structure, Tokyo, Sep. 1977
$^{131,133}I$, $^{132,134,136}I^{m,g}$	[Ind.]	Dec. 1976	
$^{133,135}Xe^{m,g}$	[Ind.]	Dec. 1976	I. Fujiwara, N. Imanishi and T. Nishi, J. Phys. Soc. JAPAN 51,1713(1982)
$^{138}Cs^{m,g}$	[Ind.]	May 1978	
$^{90}Rb^{m,g}$	[Ind.]	End of 1984	

JAPAN

Laboratory and address: Research Reactor Institute, Kyoto University
Kumatori-cho, Sennan-gun, Osaka, Japan

Names: K. Okano, Y. Kawase and Y. Funakoshi

Facilities: On-line mass separator(KUR-ISOL) installed at 5 MW Kyoto University Reactor.

Experiment: Half-life measurements of ^{93}Sr, ^{94}Sr and ^{143}Ba.

Method: Gamma-rays following the decay of ^{93}Sr, ^{94}Sr and ^{143}Ba were measured with a Ge(Li) detector.

Accuracy: Estimated errors are 0.3-0.6%.

Completion date: The measurements are completed.

Publications: Annu. Rep. Res. Reactor Inst., Kyoto Univ., 16(1983) 108

Full paper in preparation

JAPAN

(cont'd)

Laboratory and address: Research Reactor Institute, Kyoto University
Kumatori-cho, Sennan-gun, Osaka, Japan

Names: K. Okano, Y. Funakoshi and Y. Kawase

Facilities: On-line mass separator(KUR-ISOL) installed at 5 MW Kyoto University Reactor.

Experiment: Determination of delayed neutron emission probability by a β-γ spectroscopic method.

Method: Gamma-rays in the decay chain of ^{94}Rb were measured with a Ge(Li) detector. The P_n value of ^{94}Rb was deduced from γ-ray intensity ratio of 1427.6 keV (^{94}Sr) and 590.2 keV(^{93}Sr).

Accuracy: The associated error of P_n is about 7%.

Completion date: The measurement for the ^{94}Rb precursor is completed. The experiment for ^{95}Rb is now in progress. The extension of the method to other Rb and Cs isotopes is planned.

Publications: Annu. Rep. Res. Reactor Inst., Kyoto Univ., 16(1983) 47

Full paper in preparation

JAPAN

(cont'd)

Laboratory and address: Research Reactor Institute, Kyoto University
Kumatori-cho, Sennan-gun, Osaka, Japan

Names: Y. Funakoshi, K. Okano and Y. Kawase

Facilities: On-line mass separator(KUR-ISOL) installed at 5 MW Kyoto University Reactor.

Experiment: Determination of the decay scheme of ^{94}Sr.

Method: Gamma-ray singles and coincidence spectra in the decay of ^{94}Sr were measured with Ge(Li) detectors. Beta-ray spectra were taken with a Ge(HP) detector.

Accuracy: Gamma-ray energies to 0.1-0.2 keV, gamma-ray intensities to 5-10%.

Completion date: February 1983

Publications: Preliminary note;Annu. Rep. Res. Reactor Inst. Kyoto Univ., 15(1982)151.
Nuclear Physics A431 (1984) 461.

JAPAN

(cont'd)

Laboratory and address: Research Reactor Institute, Kyoto University
Kumatori-cho, Sennan-gun, Osaka 590-04, Japan

Names: Y. Kawase, Y. Funakoshi and K. Okano

Facilities: On-line mass separator(KUR-ISOL) installed at 5 MW Kyoto University Reactor

Experiment: Search for an Isomer in ^{94}Rb

Method: The half-life of the β- and γ-rays were measured with a plastic and a Ge(Li) detectors. Low-energy γ-rays and the Rb X-ray were taken with a Ge(HP) detector to search for an isomeric transition in ^{94}Rb.

Accuracy: Half-lives to 10-110 ms, γ-ray upper limit of 3×10^{-4} and X-ray upper limit of 8×10^{-5}.

Completion date: February 1984

Publications: Z. Physik, A-Atoms and Nuclei 318 (1984) 191.

JAPAN
(cont'd)

Laboratory and address: Research Reactor Institute, Kyoto University
Kumatori-cho, Sennan-gun, Osaka 590-04, Japan

Names: K. Okano, Y. Kawase and Y. Funakoshi

Facilities: On-line mass separator(KUR-ISOL) installed at 5 MW Kyoto University Reactor

Experiment: Determination of the P_n value of ^{95}Rb by a β-γ Spectroscopic Method

Method: Gamma-rays following the decays of mass 95 chain and mass 94 chain were measured with a Ge(Li) detector. The P_n value of ^{95}Rb was determined by the yields of principal γ-rays from ^{95}Zr and ^{94}Sr.

Accuracy: 7.5 %

Completion date: February 1984

Publications: Annu. Rep. Res. Reactor Inst. Kyoto Univ., 17(1984) 110

Japan

Laboratory and address: Research Reactor Institute, Kyoto University
Kumatori-cho, Sennan-gun, Osaka 590-04

Names: H.Iimura, T.Seo, S.Yamada, S.Uehara, T.Hayashi

Facilities: On-line pneumatic irradiation system installed at 5 MW Kyoto University Reactor

Experiment: β^--decay of ^{151}Nd
γ-γ angular correlation

Completion data: Experiment completed.
Data processing nearly achieved.

Publications: Annu. Rep. Res. Reactor Institute, Kyoto Univ., 16(1983)128, 17(1984)127.

J. Phys. Soc. JPN 54(1985)908.

JAPAN

Laboratory and address :	Department of Nuclear Engineering, Nagoya University, Furo-cho, Chikusa-ku, Nagoya, 464, Japan
Names :	T. Ishii, M. Yoshida, H. Yamamoto, K. Kawade, and T. Katoh (Nagoya Univ.), J-Z. Ruan (Rikkyo Univ.), K. Okano and Y. Kawase (Kyoto Univ.).
Facilities :	On-line mass separator (KUR-ISOL) installed at 5 MW Kyoto University Reactor.
Experiment :	Half-lives of levels in ^{141}Ba
Method :	Half-lives of the 55.0 keV and the 48.5 keV levels in ^{141}Ba were obtained from β-γ and γ-γ delayed coincidence measurements.
Accuracy :	Errors are within 20 %
Completion date :	April 1984
Publication :	Annu. Rep. Res. Reactor Inst., Kyoto Univ., 17(1984)122.

JAPAN

(same as INDC(NDS)-155)

Laboratory and address:	Nuclear Engineering Research Laboratory Faculty of Engineering University of Tokyo 2-22 Shirane, Shirakata, Tokai-mura Ibaraki 319-11, Japan
Names:	M. Akiyama, Y. Oka, S. Kondo and S. An
Facilities:	Fast Neutron Source Reactor "YAYOI" A 14 MeV neutron generator
Experiment:	Measurements of gamma decay heat from fission products for 14 MeV neutron fissions of ^{235}U, ^{238}U and ^{232}Th. Measurements of beta decay heat from fission products for fast neutron fissions of ^{238}U and ^{232}Th.
Method:	Samples were irradiated for short periods with fast neutrons or 14 MeV neutrons, and returned immediately after irradiations to a counting area. Gamma-ray energy spectra emitted from the irradiated sample were measured using a NaI detector, and beta-ray spectra were obtained a plastic scintillation detector combined with $\Delta E/\Delta X$ type proportional counter to eliminate gamma-ray effects. Counting times were chosen to provide good statistics within the time range of interest. Energy release rates for beta- and gamma-rays were obtained to integrate beta and gamma energy spectra respectively and summed to obtain total decay heat from fission products.
Accuracy:	For 14 MeV neutron fissions gamma decay heat for ^{235}U 7 - 17 % gamma decay heat for ^{238}Th 4.5 - 7.5 % gamma decay heat for ^{232}Th 4.3 - 11.5 %
Completion date:	Measurements of gamma decay heat for 14 MeV neutron fissions were already completed. The beta decay heat for fast neutron fissions of ^{238}U and ^{232}Th will be measured in this year.
Discrepancies to other reported data:	Present data of gamma decay heat for 14 MeV neutron fissions are in reasonable agreement with results of current summation calculations.
Publications:	M. Akiyama and S. An; Proceedings of Specialists Meeting on Yields and Decay Data of Fission Product Nuclides, BNL 51778 (1984) 305 M. Akiyama and S. An; JAERI-M 84-010, PP303 (1984).

SWEDEN

Laboratories:

Department of Nuclear Chemistry
Chalmers University of Technology
S-412 96 Göteborg
Sweden

Institut für Kernchemie
Johannes Gutenberg Universität
Postfach 3980
D-6500 Mainz
Germany

Department of Nuclear Chemistry
University of Oslo
Boks 1033
N-0315 Oslo
Norway

Nuclear Chemistry Division
Los Alamos National Laboratory
Los Alamos, New Mexico 87545
U.S.A.

Names:

G. Skarnemark and M. Skålberg (Göteborg)
N. Kaffrell, J. Rogowski, H. Tetzlaff and
N. Trautmann (Mainz)
J. Alstad (Oslo)
M. Fowler and K. Wolfsberg (Los Alamos)

Facilities:

SISAK system for studies of radionuclides with half-lives down to less than 1 s.

Experiments:

Half-life determinations, γ-singles, γ-γcoincidence and γ-γangular correlation measurements. At present, our measurements are concentrated on very neutron-rich isotopes of technetium, ruthenium, rhodium and palladium formed in thermal-neutron induced fission of Cf-249.

Method:

Fast chemical on-line separations. The measurements are carried out on flow cells or ion exchange columns. The fission products are transported from the target cell via a gas jet system. Ge detectors are used.

Completion date:

SWEDEN

Laboratory and adress:

The Studsvik Science Research Laboratory,
S-611 82 Nyköping, Sweden.

Facility:

The OSIRIS on line mass separator is used to extract selected nuclei from thermally fissioned ^{235}U. The extraction method has been extended in the sense that Al or CF_4 is added to the ion source to facilitate separation of halogenes or lanthanides, respectively.

1. Names:

E. Lund and G. Rudstam.

Experiment

Characterization of and P_n values for delayed neutron precursors.

Method:

Simultaneous measurement of neutron and beta activities in a multiscaling mode. Neutron counter consisting of 29 ^3He counters imbedded in paraffine. Beta counter being a 2 mm plastic scintillator.

SWEDEN
(cont'd)

Completion date: Indefinite for the P_n studies as such.

2. Names: K. Aleklett, B. Ekström, B. Fogelberg, E. Lund, L. Spanier and G. Rudstam

Experiment: Total beta decay energies and atomic masses.

Method: Beta particles are recorded in coincidence with gamma rays depopulating know levels in the daughter nucleus. The end-point energies of the beta-spectra are determined, and by adding the level energy the total beta-decay energies are obtained.
The beta-particles are recorded in a standard HPGe detector and the gamma-rays in a Ge(Li) detector.

Completion date: Indefinite for the experiment as such.

Publication: K. Aleklett, B. Fogelberg, E. Lund and A. Sangsriyavanish, Total beta decay energies of neutron rich Zinc isotopes, A=75-80, Proceedings of the 7th AMCO conference at Darmstadt, 3-7 Sept. 1984, p. 102.

SWEDEN
(cont'd)

3. Names: B. Ekström, H. Göktürk, E. Lund and G. Rudstam.

Experiment: Yields of products from thermal-neutron induced fission of ^{235}U.

Method: The activity of a fission product is determined by means of gamma spectroscopy and of neutron counting. After correction for delay, counting effiency, branching ratio and reactor power the result will be a product of the fission yield and the overall separation efficiency. The latter factor is nearly the same for all isotopes of a given element. Thus relative yields are directly obtainable and have to be normalized against the yield of one of the isotopes determined absolutely by any other technique. Measurements have been extended to include Cd and In isotopes with A = 119 - 132

Extended Completion date: 1986

Publications: G. Rudstam, P. Aagaard, H.-U. Zwicky, Studsvik research report NFL-42 (1985).

4. Names: B. Ekström, H. Göktürk, G. Rudstam and J. Eriksen

Experiment: Gamma branching ratios for fission products.

Method: Gamma branching ratios for products induced in thermal-neutron fission of ^{235}U have been determined by simultaneous measurements of the beta and gamma activities. Well calibrated detectors have been used. Measurements have been extended to include Cd and In isotopes with A = 119 - 132.

Extended Completion date: 1986

5. Names: B. Ekström, B. Fogelberg, H. Göktürk, P. Hoff, E. Lund and G. Skarnemark.

Experiment: Nuclear spectroscopic studies of the decays of short lived fission products. Recent or current studies concern the decays of $^{74-78}Cu$, $^{75-80}Zn$, $^{123-130}Cd$.

Publications: B. Fogelberg and J. Blomqvist, Single hole and three-quasi-particle levels in ^{131}Sn observed in the decay of $^{131g,m1,m2}In$, Nucl. Phys. A429 (1984) 205.

B. Fogelberg, A. Aprahamian, R. L.Gill, H. Mach and D. Rehfield, Study of the three β-decaying isomers of ^{130}In, Phys. Rev. C31 (1985) 1026.

B. Fogelberg and A. Karek, A determination of the strengths of some 1:st forbidden β-transitions, NEANDC specialists meeting on yield and decay data of fission product nuclides, BNL-51778 (1984) 319 *)

E. Lund, G. Rudstam, P. Aagaard and H-U. Zwicky, Gamma branching ratios for fission products, application to the studies of thermal fission of ^{235}U, ibid. p. 137. +)

*) $^{127,127m,129,129m,131m1,131m2,132}In$, ^{133}Sn, $^{134,134m}Sb$, ^{135}Te

+) $^{84-88}Br$, $^{84,88-94}Kr$, $^{88-90,90m,91-94}Rb$

SWEDEN

LABORATORY:
Department of Nuclear Physics, University of Lund.

NAMES:
P. Andersson, R. Zorro and I. Bergqvist.

ACTIVITY:
Neutron capture cross section measurements with the activation technique. Experimental and theoretical determination of corrections due to background low energy neutrons produced in reactions like (n,n') and (n,2n) and charged-particle reactions like (p,n) and (d,n) in target backing etc.

FACILITIES:
3 MV Pelletron tandem accelerator, Ge(Li) spectrometers, proton recoil telescope, 4πβ scintillator, long-counters.

RESULTS:
Measurements in the neutron energy range 2.0-7.7 MeV for the nuclei ^{115}In and ^{197}Au.

PUBLICATIONS:
1) P. Andersson, R. Zorro and I. Bergqvist,
THE INFLUENCE OF BACKGROUND NEUTRONS ON (n,γ) ACTIVATION MEASUREMENTS IN THE NEUTRON ENERGY REGION 2.0-7.7 MeV.
Nucl. Instr. Meth. A234(1985)573
2) P. Andersson, R. Zorro and I. Bergqvist,
CROSS SECTIONS FOR $^{197}Au(n,\gamma)^{198}Au$ AND $^{115}In(n,\gamma)^{116m}In$ IN THE ENERGY REGION 2.0-7.7 MeV.
Accepted for publication in Nuclear Physics.

WORK IN PROGRESS:
Cross section measurements for the reaction $^{208}Pb(n,\gamma)^{209}Pb$ in the neutron energy range 2-8 MeV, using a 4πβ scintillator.

ADRESS:
Department of Nuclear Physics, University of Lund,
Sölvegatan 14, 223 62 Lund, Sweden.

CONTACT:
P. Andersson.

UNITED KINGDOM (same as INDC(NDS)-155)

Laboratory and Address:	DNPDE — Dounreay Nuclear Power Development Establishment, UKAEA, Northern, Division, Thurso, Caithness, Scotland KW14 7TZ
Names:	T W Kyffin, C G Allan
Facilities:	PFR
Experiment:	The measurement of the absolute yields of ^{90}Sr, ^{137}Cs, ^{144}Ce, ^{143}, ^{145}, ^{146}, ^{148}, ^{150}Nd and perhaps other fission products, from the fission of ^{235}U, ^{238}U, ^{239}Pu, ^{240}Pu and ^{241}Pu. In progress.
Method:	Twelve sealed stainless steel capsules are to be irradiated. Of these - 3 capsules contain ^{235}U as highly enriched uranium dioxide, 3 capsules contain ^{239}Pu as low ^{240}Pu content plutonium dioxide, 2 capsules contain ^{238}U as depleted uranium dioxide with an isotopic analysis of 99.7% ^{238}U, 1 capsule contains ^{240}Pu as a dried aqueous solution of plutonium with an isotopic analysis of 99% ^{240}Pu, 1 capsule contains ^{241}Pu as a dried aqueous solution of plutonium with an isotopic analysis of 93% ^{241}Pu, and 2 capsules contain no added fissile material. The ^{235}U and ^{239}Pu capsules contain stainless steel powder mixed with the fissile material dioxide for heat transfer reasons. It is expected that the ^{235}U and ^{239}Pu capsules will receive irradiation corresponding to about 35% burn up of the fissile material, the ^{238}U capsule to about 1.5% burn up the ^{240}Pu capsule to about 10% burn up and the ^{241}Pu capsule to about 50% burn up. A set of capsules identical to the irradiated set except for irradiation in the reactor will be dissolved and analysed alongside the irradiated set, the objective being to improve the reliability of the analyses. The aim is to correlate loss of fissile material during irradiation with the amounts of fission products formed, for each capsule, (except ^{238}U) to enable absolute measurements of fission yields to be obtained.
Accuracy:	± 2% for ^{235}U and ^{239}Pu fission yields ± 6% for ^{238}U, ^{240}Pu and ^{241}Pu fission yields
Expected completion date:	1986

UNITED KINGDOM

Laboratory & address: National Physical Laboratory, Queens Road, Teddington, Middlesex, TW11 OLW, UK

Names: P Christmas, P Cross, S M Judge

Facilities: Iron-free, $\pi\sqrt{2}$ magnetic β-ray spectrometer

Experiment: Measurement of β-spectra of ^{90}Sr-^{90}Y to determine shape factors and end point energies. Measurements were made by this and two other European Laboratories* using sources prepared from solution distributed by NPL on behalf of the International Committee for Radionuclide Metrology (ICRM).

Results: From the data of all three laboratories mean values for the endpoint energies were obtained which are not grossly different from those of CBNM.[1] However, the target accuracy of $\pm$ 1 keV was not achieved and the participants are agreed upon the desirability of further measurements (none planned in the immediate future).

Completion date: This work is now complete and a report is available.[2]

Publications:

(1) H H Hansen, Int. J. Appl. Radiat. Isot. 34(1983)124

(2) P Christmas, NPL Report RS(EXT)77 (ICRM-S-14) National Physical Laboratory (1985).

* Central Bureau for Nuclear Measurements, Geel

and

Technische Hogeschool, Delft

UNITED KINGDOM

Laboratory and Address: Birmingham Radiation Centre, University of Birmingham, P.O. Box 363, Birmingham B15 2TT

Names: J.G. Owen, J. Walker, D.R. Weaver, S. Chilton

Facilities: 3MV Dynamitron accelerator (Birmingham) and the Tandem Van de Graaff and IBIS (Harwell)

Experiment: Delayed neutron spectrum measurements following fast neutron induced fission in ^{235}U and ^{239}Pu

Spectrum measurements of Am/Li sources as recommended by the March 1979 Vienna Consultant's Meeting on Delayed Neutron Properties have been completed. An international round-robin of measurements of Am/Li sources is in progress. Requests to join this round-robin should be sent to D.R. Weaver.

Method: ^{3}He spectrometers; for delayed neutron measurements cyclic irradiation and counting to determine contributions from each delayed neutron group.

Accuracy: A full covariance matrix is calculated.

Publication: A paper on the measurement of the NPL's 5 Ci Am/Li source has been published.

U.S.A.

Laboratory and address: Ames Laboratory--USDOE
Iowa State University
Ames, Iowa 50011

Names: John C. Hill, R. Moreh, M.E. Nieland, J.A. Winger, F.K. Wohn

Facilities: mass separator TRISTAN on-line to HFBR at Brookhaven National Laboratory (see also BNL contribution)

Experiments: β and γ spectroscopy of decays of the fission products: ^{82}Ge, ^{83}Ge, ^{97}Y, ^{99}Rb, ^{99}Y, ^{100}Sr, ^{100}Y, ^{101}Sr, ^{101}Y, ^{102}Sr, ^{135}Te, ^{136}I, ^{138}Cs, ^{146}Ba, ^{146}La, ^{148}Cs, ^{150}Ce, ^{150}Pr.

Methods: state-of-the-art β and γ spectroscopy: β and γ singles, γ multiscaling, βγ and γγt coincidences, γγt angular and perturbed angular correlations. HpGe and Ge(Li) detectors for γ, HpGe and plastic detectors for β.

Accuracy: γ energies to ~0.1 keV, γ intensities (relative or absolute) to 3-10%, half-lives to 2-10%.

Completion date: published since January 1984: Listed below
nearing completion: decays of ^{83}Ge, ^{100}Y, ^{101}Sr, ^{102}Sr, ^{135}Te, ^{146}La, ^{150}Ce, ^{150}Pr
data analysis in progress: decays of ^{99}Rb, ^{99}Y, ^{100}Sr, ^{101}Y, ^{148}Ce

Publications:†

1. "Decay of 0.61-sec ^{148}Ba to Levels of Odd-Odd ^{148}La," Chung, Walters, Aras, Wohn, Brenner, Chu, Shmid, Gill, Chrien, and Yuan, Phys. Rev. C 29, 592 (1984).
2. "Identification and Decay of ^{124}Ag," Hill, Wohn, Berant, Gill, Chrien, Chung, and Aprahamian, Phys. Rev. C 29, 1078 (1984).
3. "Rotational Structure of Highly Deformed ^{99}Y: Decay of ^{99}Sr," Petry, Dejbakhsh, Hill, Wohn, Shmid, and Gill, Phys. Rev. C 31, 621 (1985).
4. "Rotational Structure of Highly Deformed ^{99}Y: Particle-Rotor Model Calculations," Wohn, Hill, and Petry, Phys. Rev. C 31, 634 (1985).

U.S.A.

(cont'd)

5. "g Factor of 4_1^+ States in the N=82 Isotones ^{136}Xe and ^{138}Ba," Berant, Wolf, Hill, Wohn, Gill, Mach, Rafailovich, Kruse, Wildenthal, Peaslee, Aprahamian, Goulden, and Chung, Phys. Rev. C 31, 570 (1985).
6. "Decay of 2.22-sec $^{146}_{56}Ba_{90}$ to Levels in Odd-Odd $^{146}_{57}La_{89}$," Chung, Walters, Brenner, Gill, Shmid, Chu, Chrien, Yuan, Wohn, and Meyer, Phys. Rev. C 31, 2199 (1985).
7. "The g-Factor of the $7/2^+$ 1264.4 keV Level in ^{97}Zr," Berant, Gill, Rafailovich, Chrien, Hill, Wohn, Petry, Chung, Peaslee, and Mohsen, Phys. Lett. 156B, 159 (1985).

†Tristan users working with the Ames group in studies listed above:

BNL: Z. Berant, R.E. Chrien, Y.Y. Chu, R.L. Gill, H. Mach, G. Peaslee, A. Piotrowsky, M. Shmid, D.D. Warner, A. Wolf., L.J. Yuen
Clark University: A. Aprahamian, D.S. Brenner
KFA Julich: K. Sistemich
University of Maryland: M.K. Aras, C. Chung, W.B. Walters
University of Oklahoma: H. Dejbakhsh, J. Goulden, R.F. Petry

U.S.A.

(same as INDC(NDS)-155)

Laboratory and address: Idaho National Engineering Laboratory
EG&G Idaho, Inc.
P.O. Box 1625
Idaho Falls, Idaho 83415 USA

Names: R. C. Greenwood, R. A. Anderl, J. D. Cole, R. G. Helmer, C. W. Reich

Experiment: Nuclear decay properties ($T_{\frac{1}{2}}$, average β and γ decay energies, β-strength functions, β-branching, γ-branching) of short-lived fission products.

Facility: Two 600-μg ^{252}Cf spontaneous-fission sources coupled via He gas-jet transport to a chemical separation laboratory and an on-line isotope separator.

Method: Fast on-line chemical or mass separations followed by γ- and β-ray measurements.

Measurements Completed: $^{152,153,154}Pm$ decay measurements in progress. $^{136-139}I$, $^{140-143}Cs$ and $^{135-137}Te$ γ-ray spectral measurements in progress.

U.S.A.

(cont'd)

Laboratory and address: Idaho National Engineering Laboratory
EG&G Idaho, Inc.
P.O. Box 1625
Idaho Falls, ID 83415 USA

Names: R. C. Greenwood, A. J. Caffrey

Experiment: Delayed-neutron energy spectral measurements of fission-product isotopes.

Facility: TRISTAN ISOL system at Brookhaven National Laboratory

Method: Isotope separation on line with gas-filled proton-recoil proportional counters and liquid scintillation detectors used to measure delayed-neutron spectra.

Measurements Completed: $^{93-97}Rb$ and $^{143-145}Cs$

Publications:

R. C. Greenwood and A. J. Caffrey, "Measuring Delayed Neutron Spectra - A Comparison of Techniques," NEANDC Specialists Meeting on Yields and Decay Data of Fission Product Nuclides, Brookhaven National Laboratory, October 24-27, 1983, BNL-51778, p. 365.

R. C. Greenwood and A. J. Caffrey, "Delayed-Neutron Energy Spectra of $^{93-97}Rb$ and $^{143-145}Cs$," Nuclear Science and Engineering, accepted for publication.

Measurements

Laboratory	Oak Ridge National Laboratory, P.O. Box X, Oak Ridge, Tennessee USA 37831
Name:	R. L. Macklin
Facility:	Oak Ridge Electron Linear Accelerator (ORELA)
Experiment:	Neutron Capture Cross Sections 2.6-2000 keV*
Method:	Neutron Time-of-Flight; prompt gamma cascade energy by liquid scintillator pulse height weighting
Accuracy:	Estimated 5% or less
Completion Date:	Experiment 1984-1985; Analysis and Report 1985-86
Publications:	H. Beer, G. Walter, R. L. Macklin, P. J. Patchett, "Neutron Capture Cross Sections and Solar Abundances of ^{160,161}Dy, ^{170,171}Yb, ^{175,176}Lu and ^{176,177}Hf to Study the S-Process Nucleosynthesis of the Radionuclide ^{176}Lu," Phys. Rev. C 30, 30 (1984). R. L. Macklin, "Neutron Capture Measurements on Fission-Product Palladium-107," Nucl. Sci. Eng. 89, 79 (1985). H. Beer, G. Walter, and R. L. Macklin, "The ^{163}Dy-^{163}Ho Branching: An s-Process Barometer," p. 778 in Capture Gamma-Ray Spectroscopy and Related Topics, S. Raman, Editor, Knoxville, TN, September 10-14, 1984. R. L. Macklin, "Neutron Capture Measurements on Radioactive ^{93}Zr," Astrophysics and Space Science (accepted February 1985). R. L. Macklin, J. A. Harvey, and N. W. Hill, "Neutron Transmission Measurement and Resonance Analysis of ^{93}Zr from 60 to 6000 eV," Phys. Rev. C (submitted) (1985).

*^{147,148,149,150}Sm, ^{152,154,155,157}Gd.

Laboratory and Address:

Pacific Northwest Laboratory
P. O. Box 999
Richland, WA 99352

Names: P. L. Reeder and R. A. Warner

Facilities:

SOLAR - Spectrometer for On-Line Analysis of Radionuclides. This is an on-line mass spectrometer which incorporates a ^{235}U target in a surface ionization source located in the thermal column of a 1 MW TRIGA reactor at Washington State University, Pullman, WA.

Experiment:

Isomer yield ratios for $^{235}U + n_{th}$.

Method:

Ratios of independent yields of fission product isomers are being measured for thermal neutron fission of ^{235}U by use of an on-line mass spectrometric technique. A short burst of neutrons from the TRIGA reactor is used to produce isomers of ^{90}Rb and ^{138}Cs fission products within the surface ionization source. Surface ionization performs the rapid chemical separation and magnetic analysis performs the mass separation to give the desired nuclides as a beam of ions. The collected ions are beta counted either off-line or on-line to determine the apparent isomer yield ratio. The apparent ratio is extrapolated to zero ion collection time to determine the independent isomer yield ratio. The experimental value is compared to a theoretical calculation of average angular momentum versus isomer yield ratio.[1]

[1] G. P. Ford, K. Wolfsberg, and B. R. Erdal, Phys. Rev. C 30, 195 (1984).

Accuracy:

The final accuracy will probably depend more on how well the decay schemes are known for particular cases than on statistical uncertainties.

Completion Data:

Work is continuing on ^{138}Cs.

Publications:

1. P. L. Reeder, R. A. Warner, G. P. Ford, H. Willmes, "Independent Isomer Yield Ratio of ^{90}Rb from Thermal Neutron Fission of ^{235}U," PNL-SA-13182, (submitted to Phys. Rev. C). May, 1985.

U.S.A.

Laboratory and Address:

Pacific Northwest Laboratory
P. O. Box 999
Richland, WA 99352

Names: P. L. Reeder and R. A. Warner

Facilities:

TRISTAN - This is an on-line isotope separator located at the High Flux Beam Reactor at Brookhaven National Laboratory, Upton, NY

Experiment:

Half-lives, P_n values, average energies, and neutron gated gamma spectra are being measured for separated delayed-neutron precursors.

Method:

Delayed neutrons from separated precursors are counted in a polyethylene moderated counter. Beta and neutron growth and decay curves are measured to determine half-lives and P_n values. Data have been obtained for Sr and Y precursors at masses 97-102, Ba and La precursors at masses 146-149, Ag precursors at masses 121-124, and In precursors at masses 127-132. Work is continuing on precursors at other elements. Gamma spectra in coincidence with delayed neutrons are being measured to provide partial neutron emission probabilities to excited states of the (A-1) daughter. The P_n are being compared to predictions of a beta decay model.

Accuracy:

The accuracy of the P_n measurements depends primarily on the accuracies of the neutron and beta counter efficiencies. The overall accuracy is expected to be about ±7%.

Completion Date: Work is continuing.

Publications:

1. P. L. Reeder, R. A. Warner, and R. L. Gill, "Half-lives and Emission Probabilities of Delayed Neutron Precursors $^{121-124}$Ag", Phys. Rev. C 27, 3002 (1983).

2. P. L. Reeder and R. A. Warner, "Delayed Neutron Precursors at Masses 97-99 and 146-148", Phys. Rev. C 28, 1740 (1983).

3. P. L. Reeder, R. A. Warner, R. M. Liebsch, R. L. Gill, and A. Piotrowski, "Delayed Neutron Precursor ^{75}Cu", Phys. Rev. C 31, 1029 (1985)

4. R. A. Warner and P. L. Reeder, "Delayed Neutron Data from TRISTAN", PNL-SA-12858, May 1985. (Int. Conf. Nuclear Data Basic and Applied Science, May 13-17, 1985, Santa Fe, NM.)

U.S.A.

Laboratory and Address: University of Lowell
Lowell, Mass. 01854

Names: G. Couchell, W. Schier

Facilities: 5.5-MV Van de Graff, 1-MW swimming pool reactor, helium jet, tape transport system, beta-neutron time-of-flight spectrometer.

Experiment: Delayed-neutron energy spectra as a function of time following fission of U235, Pu239 and U233.

Method: Beta-neutron time-of-flight method using helium jet and tape transport system together with Pilot U plastic, Bc501 (PSD liquid) adn Li6-glass scintillators. Reactor neutrons are used for thermal fission, accelerator neutrons for fast fission.

Status: Composite spectra spanning an energy range, 0.01 to 2.00 MeV, have been measured for eight delay times ranging from 0.17 to 8.5 s following thermal fission of U235. Studies for the same delay-time intervals are now being completed for fast neutron-induced fission of U235. Thermal fission studies of Pu239 are now in progress and U233 mesurements will be initiated later this year.

Publication:

W.A. Schier et al., New experimental system for measuring composite delayed neutron spectra following fission, Nucl. Instr. Meth. Phys. Res. 227 (1984) 549.

U.S.A.

Laboratory and address	Washington University, Department of Chemistry, St. Louis MO 63130 U.S.A.
Names	A. C. Wahl, T. Semkow, L. Robinson
Facilities	Cyclotron, 14-MeV neutron generator, and Los Alamos Omega West Reactor
Experiment	Determination of independent yields for products with Z near 50 from fission of ^{235}U by thermal and 14-MeV neutrons.
Method	Fractional independent or cumulative yields of ^{121}Ag, ^{121}Cd, ^{121}In and ^{121}Sn and of tin and indium fission products for A = 123, 125, 127, and 128 have been determined. Rapid (~1 sec), continuous solvent-extraction separations of short-lived fission products from their beta-decaying precursors were carried out using a SISAK-2 system containing H-10 centrifuges. Relatively long-lived tin descendents in each phase were purified and measured radiochemically for yield determinations.
Completion date	Completed and published.
Publications	1. L. Robinson, A. C. Wahl, T. M. Semkow, and A. E. Norris, "Nuclear-Charge Distribution for A = 121 from Thermal-Neutron-Induced Fission of ^{235}U", Phys. Rev. C. 31, 1334 (1985). 2. T. M. Semkow, A. C. Wahl, and L. Robinson, "Yields of In and Sn Products from Thermal- and 14-MeV-Neutron-Induced Fission of ^{235}U", Phys. Rev. C 30, 1966 (1984). 3. T. M. Semkow and A. C. Wahl, "Extraction of Ag(I), Cd(II), In (III), Sn(II), Sn(IV), Sb(III), and U(VI) from Aqueous Solutions by Ketone Solutions Using Single-Step Batch and Continuous SISAK Methods", J. Radioanal. Chem. 79, 93 (1983).

U.S.S.R.

Laboratory and address:	Institute of Nuclear Physics, Kaz. SSR Akademy of Sciences, Alma-Ata 82, 480082, USSR.
Names:	V.M.Kartashov, A.G.Troitskaya
Facilities:	Nuclear Reactor WWR-K, Alma-Ata, 50 cm iron double focusing β-spectrometer.
Experiment:	Study of decays of ^{152}Eu ($T_{1/2} \approx 13$ y) and ^{152m}Eu ($T_{1/2} = 9{,}3$ h). The experimental ratios of conversion line intensities in the energy region from 70 keV to 1500 keV, the experimental intrinsic conversion coefficients for twenty three transitions in ^{152}Sm and eleven transitions in ^{152}Gd have been obtained. E0-transition parameter values, ^{152}Eu decay branching ratio to levels of ^{152}Sm and ^{152}Gd have been estimated.
Method:	β-spectrometric measurments of conversion electrons with a set resolution 0,62 ÷ 0,03 %. The sources have been produced by scattering of Eu_2O_3, enriched to about 98 % in ^{151}Eu, onto Al-foil backing in vacuum after irradiation of this oxide in the reactor.
Accuracy:	Between 1 % and 30 % for conversion line intensities over the range of relative intensities $I \div 10^{-5}$. The conversion coefficients of the most intense lines have been determined with the uncertainties 1,5 ÷ 2,0 %.
Completion Date:	Work is continuing.
Discripancies to Other Report Date:	Comparisons of experimental conversion coefficients, determined from our conversion line intensity values, with the same, obtained from the priar measurements of other authors, are given in Ref. 1.

U.S.S.R.

(con'd)

Publications:

I. V.M.Kartashov, A.G.Troitskaya, G.A.Shevelyov "ICC of ^{152}Eu-decay transitions", Izv. Acad. Nauk SSSR, Ser.Fiz., 45, 705 (1981).

2. V.M.Kartashov, V.S.Kim, A.G.Troitskaya "ICE ^{152}Eu-decay spectra precision measurments", in "Tochnie izmereniya v Yadernoy spektroskopiyi"Vilnus, "Mokslas", 1984, p. 24-29.

3. V.M.Kartashov, A.G.Troitskaya "ICC of some transitions of ^{152}Sm and ^{152}Gd", in Proceeding of the XXXIII Conf. on Nuclear Spectroscopy and Nuclear Structure, April 1983, Moscow, USSR, p.114.

4. V.M.Kartashov, A.G.Troitskaya "EO-transitions of ^{152}Sm and ^{152}Gd", in Proceeding of XXXIV Conf. on Nuclear Spectroscopy and Nuclear Structure, April 1984, Alma-Ata, USSR, p. 115-116.

USSR

(same as INDC(NDS)-155

Laboratory and address:	Moscow Physical Engineering Institute 115409 Moscow
1. Names:	A.N. Gudkov, V.M. Zhivun, A.V. Zvonarev, A.F. Zolotov, A.B. Koldobskij, Yu. F. Koleganov, V.M. Kolobashkin, S.V. Krivasheev and N.S. Piven'.
Facilities:	BR-1 research reactor and calibrated coaxial Ge(Li) detector.
Experiment:	Determination of yields from ^{242}Pu and ^{241}Am fast fission.
Method:	Semiconductor gamma-spectrometry of irradiated samples without chemical separation.
Results:	28 fission product yield values for ^{242}Pu and 26 values for ^{241}Am were obtained for the first time.
Accuracy (average):	~10%
Discrepancies with respect to other reported data:	Within the error limits there is no agreement between the data obtained in the present work and those published earlier on the yields of ^{131}I and ^{138}Cs from ^{241}Am fission.
Publications:	A.N. Gudkov, et al., "Determination of ^{242}Pu and ^{241}Am fission product yields for fast reactor spectrum averaged neutrons by semiconductor gamma-spectromentry," Atomnaya Energiya, 54 (1983) 404-406 (English: Soviet At. En. 54 (1983) 414)

USSR

(cont'd, same as INDC(NDS)-155)

2. Names: A.N. Gudkov, V.M. Zhivun, A.V. Zvonarev, A.P. Zolotov, A.B. Koldobskij, Yu. P. Koleganov, V.M. Kolobashkin, S.V. Krivasheev and N.S. Piven'.

Facilities: BR-1 research reactor and calibrated coaxial Ge(Li) detector.

Experiment: Determination of yields from ^{237}Np fast fission.

Method: Semiconductor gamma-spectrometry of irradiated samples without chemical separation.

Other details: Yields of 30 fission products were found, 18 of which for the first time.

Accuracy: ~10%.

Discrepancies with respect to other reported data: Within the error limits there is no agreement between the data obtained in the present work and those published earlier for the yields of ^{103}Ru, ^{133}I, ^{135}Xe and ^{143}Ce (see Meek, M.E., Rider B.F., NEDO-12154-2 (1977)).

Publications: A.N. Gudkov, et al., "Determination of ^{237}Np fission product yields for fast reactor spectrum averaged neutrons by semiconductor gamma-spectromentry" in: Problems of Atomic Science and Technology. Series: Nuclear Constants No. 1 (50) (1983) 48-50 (in Russian).

USSR

(cont'd, same as INDC(NDS)-155)

3. Names: A.N. Davletshin, V.M. Zhivun, V.V. Kovalenko, A.B. Koldobskij V.M. Kolobashkin, S.V. Krivasheev, N.S. Piven', A.O. Tipunkov, S.V. Tikhonov and V.A. Tolstikov.

Facilities: KG-2,5 accelerator and calibrated coaxial Ge(Li) detector.

Experiment: Measurement of ^{238}U fission product yields for 1050 keV neutrons.

Method: Semiconductor gamma-spectrometry of irradiated samples without chemical separation.

Results: The values of eleven ^{238}U fission product yields were obtained.

Accuracy (average): ~20%.

Discrepancies with respect to other data: Within the experimental errors cited there is no agreement between the yield values obtained in this work and those published earlier for ^{91}Sr, ^{105}Ru, ^{133}I and ^{139}Ba (see: S. Nagy, K.F. Flynn, J.E. Gindler et al., Nucl. Phys. 17 (1978) 163-171).

Publications: A.N. Davletshin, et al., "Experimental determination of fission product yields and radiative capture cross-sections for the interaction of 1050 keV neutrons with ^{238}U nuclei" in: Methods of Experimental Nuclear Physics in Studies of Fission Processes and Products, Energoatomizdat, Moscow (1983) p. 3-9 (in Russian).

II. COMPILATIONS AND EVALUATIONS

Unchanged contributions are marked as such.

Updates: revisions with respect to the last issue are marked by a vertical bar on the left margin of the text.

New contributions show no marks.

Belgium

Laboratory and address: Nuclear Physics Laboratory
Proeftuinstraat 86
B-9000 Gent, Belgium

Names : D.De Frenne, E.Jacobs

Evaluation: Nuclear Data Sheets for A = 102, 103, 105, 106 and 110.

Purpose : to give a critical survey of all available information concerning A = 102, 103, 105, 106 and 110 nuclei, and derivation of consistent best or preferred values with their uncertainties.

Method : Cfr. Nuclear Data Project

Major sources of information : Recent References of NDP

Deadline of literature coverage: 102 : March 1982
103 : June 1984
105 : February 1985
110 : October 1982

Computer file of evaluated data : ENSDF

Completion date : 102 : March 1982
103 : September 1984
105 : March 1985
106 : probably half of 1986
110 : December 1982

Publications : -P.De Gelder, D.De Frenne, E.Jacobs, Nucl.Data Sheets, 35 , 443 (1982)
-P.De Gelder, E.Jacobs, D.De Frenne, Nucl.Data Sheets, 38, 545(1983).

BELGIUM

Laboratory and address : Institute for Nuclear Sciences, Proeftuinstraat 86, B-9000 Gent, Belgium
* Central Research Institute for Physics, H-1525 Budapest 114, P.O.Box 49, Hungary

Names : F.De Corte, A.Simonits*, L.Moens, A.De Wispelaere, J.Hoste

Compilation and Evaluation : Compilation of evaluated nuclear activation and decay data for 72 isotopes (among which many fission products) useful in (n,γ) reactor neutron activation analysis

Purpose : Providing a comprehensive and coherent list of recommended k_0-factors, 2200 $m.s^{-1}$ (n,γ) cross-sections, (n,γ) resonance integrals, effective resonance energies, half-lives, absolute gamma intensities, etc.

Method and Sources : Cooperative experimental determination - especially of k_0-factors, cross-sections and resonance integrals - in the THETIS reactor (Gent) and the WWRS-M reactor (Budapest), and critical comparison of the results with literature data (existing compilations, evaluations and individual papers). Calculation of effective resonance energies, based on resonance parameter data from NNDC/BNL. Critical selection of half-lives, absolute gamma intensities, etc. from published results.

Status : Data for 72 isotopes published; data for ∿ 30 isotopes in progress. Calculation of updated effective resonance energies for 127 isotopes completed.

Publications :

1. A.Simonits, L.Moens, F.De Corte, A.De Wispelaere, A.Elek, J.Hoste, J.Radioanal.Chem.(Data Section) 60 (1980) 461
2. F.De Corte, A.Simonits, L.Moens, A.De Wispelaere, J.Hoste, "A compilation of evaluated activation and decay data for use in (n,γ) reactor neutron activation analysis", Proceedings "Nuclear Data for Science and Technology", Antwerp, 6-10 Sept. 1982 (Ed. K.H.Böckhoff, CBNM) D.Reidel Publishing Company, 1983.
3. L.Moens, F.De Corte, A.De Wispelaere, J.Hoste, A. Simonits, A.Elek, E.Szabo, J.Radioanal.Nucl.Chem. (Data Section), 82 (1984) 385.

E.E.C. Belgium

Laboratory and address	:	CEC-JRC, Central Bureau for Nuclear Measurements, B-2440, Geel, Belgium
Name	:	W. Bambynek
Evaluation	:	Emission Probabilities of Selected X Rays for Radionuclides Used as Detector-Calibration Standards
Purpose	:	Produce a preliminary list of data with the view of establishing an internationally agreed data file for detector calibration purposes
Major sources of information	:	Nuclear Data Sheets, recently published papers, preprints of recent work
Dead line of literature coverage	:	Middle 1984
Completion date (Preliminary list)	:	November 1984
Publications	:	Proc. IAEA Advisory Group Meeting on Nuclear Standard Reference Data, Geel, November 1984. To be published by IAEA, Vienna

E.E.C. Belgium

Laboratory and address	:	CEC-JRC, Central Bureau for Nuclear Measurements, B-2440, Geel, Belgium
Name	:	H.H. Hansen
Evaluation	:	K-shell and total internal conversion coefficients for nuclear transitions in the decay of ^{22}Na, ^{51}Cr, ^{54}Mn, ^{57}Co, ^{60}Co, ^{65}Zn, ^{109}Cd, $^{113}In^{m}$, $^{115}In^{m}$, ^{137}Cs, ^{139}Ce, ^{141}Ce, ^{198}Au and ^{203}Hg
Purpose	:	To provide recommended values of internal conversion coefficients of some selected nuclear transitions suitable for detector calibration
Method	:	Compilation and critical analysis of published results; calculation of weighted average values and corresponding uncertainties
Major sources of information	:	Two compilations of experimental internal conversion data by H.H. Hansen, Physics Data 17-1 (1981) and 17-2 (in press)
Dead line of literature coverage	:	March 1983
Status	:	Completed
Discrepancies encountered	:	Case of 661.6 keV transition in the decay of ^{137}Cs; no recommended values given
Publications	:	H.H. Hansen, GE/R/RN/01/84; European Applied Research Reports (to be published)

E.E.C. Belgium

Laboratory and address	:	CEC-JRC, Central Bureau for Nuclear Measurements, B-2440, Geel, Belgium
Name	:	R. Vaninbroukx
Evaluation	:	Emission Probabilities of Selected Gamma Rays for Radionuclides Used as Detector-Calibration Standards
Purpose	:	Produce a preliminary list of data with the view of establishing an internationally agreed data file for detector calibration purposes
Major sources of information	:	Nuclear Data Sheets, recently published papers, preprints of recent work
Dead line of literature coverage	:	Middle 1984
Completion date (Preliminary list)	:	November 1984
Publications	:	Proc. IAEA Advisory Group Meeting on Nuclear Standard Reference Data, Geel, November 1984. To be published by IAEA, Vienna

China

Laboratory and address:	Institute of Atomic Energy P. O. Box 275 (41) Beijing, China
Names:	Wang Dao, Bu Yang, Chang Yongfu, Li Guang, Liu Conggui, Liu Daming, Lu Huijun, Tang Peijia, Cai Dunjiu
Compilation and evaluation:	Fission product yields
Purpose:	To provide a updated data library of fission product yields
Sources of information:	The open literature
Deadline of literature coverage:	June 1985
Status:	Under Work
Details:	On the basis of the documents NEDO-12154-3(B) (1980) and HSJ-8003 (1979), and replenishing them with the data published during the last few years, we are carrying out a new evaluation of fission product yield data to produce more than 50 sets of recommended values of fission product yields in well-known Dr. Rider file format.
Computer file:	In preparation
Completion date:	Expected to complete by the end of 1985
Publication:	Will be available in tape form

FRANCE

(same as INDC(NDS)-155)

Laboratory and address : CETRE D'ETUDES NUCLEAIRES DE GRENOBLE
DRF/SERVICE DE PHYSIQUE
Laboratoire de Physique Nucleaire
85X - F 38041 Grenoble Cedex

Name : J. BLACHOT

Cooperation : C. FICHE[:::] for developping the file and J.C. NIMAL[::]
B. DUCHEMIN[*] for the applications in summation calculation.

Compilation and Evaluation : Radionuclide decay data :
- to provide a comprehensive data bank of radioactive decay data with : half lives, Q-values, branching ratios, nuclear and spectra α, β, γ, energies and intensities with associated uncertainties.

Purpose :
- Decay data file for summation calculation of decay heat (Pepin code).
- Data bank for all people using decay data parameters.

Sources : ENSDF file mostly and new recent works on short lived F.P. not yet evaluated in ENSDF.

Computer file and programs :
- EDIBIN, TRIGAL, ISOTAB Programs
- Magnetic tape available on line for those using the French CISI Network.
- Off line from the NEA Data bank (Saclay).

Publication :
- AT. Data and Nucl. Dat. Tab. Vol. 20 (1977) p.241.
- Annales de Physique Vol 6S (1981)
- Int. Conf. on Nuclear Data for Science and Technology, Anwerp, Belgium, 6-10 Sept. 1982; proceedings page 249.

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[*] CEN/CADARACHE -
C.E.A - BP.1 - 13115 St-PAUL LES DURANCE

[::] CEN/SACLAY-
C.E.A - BP.2 - 91190 GIF SUR YVETTE -

FRANCE

Laboratory and address: Laboratoire de Métrologie des Rayonnements Ionisants
C.E.N. de Saclay
B.P. No. 2, F-91190 Gif sur Yvette

Names: F. Lagoutine, N. Coursol, J. Legrand

Evaluation: Radionuclide decay data

Purpose: Preparation of a document providing recommended values of the principle decay scheme parameters: half-life, energies and intensities of various radiations emitted (e.g. β, γ, c.e., X-rays)

Method:
- critical analysis of published results
- determination of mean values and associated uncertainties

Source of information: Nuclear Data Sheets, INIS-Atomindex, other recent publications

Publications: Table de radionucléides, edition CEA-LNRI, containing among other radionuclides, the following fission produots:

- Vol.1: Kr-85, Mo-99, Tc-99, Ru-103 + Rh-103m, Sb-125 + Te-125m, Xe-133, Xe-133m, Ce-144 + Pr-144 (updated publication available)
- Vol. 2 : Rb-86, Rb-88, Sr-89, Sr-90 + Y-90, Y-91 Ru-106 + Rh-106, Te-127m + Te-127, I-129, Te-131m + Te-131, Xe-131m, Ba-140 + La-140, Pr-143. Zr-95 + Nb-95, 95m, I-131, Cs-137 + Ba-137m Ce-141 (updated publication available)
- Vol. 3 : first part : Sr-92, Y-92, Pm-147, Ra-266 + chain of daughters Pu-239, Pu-240, Pu-241, U-236, U-237, Cm-244 (1983 edition available)
  second part : Y-88, Sb-122, Sb-124, Xe-127, Nd-147, Sm-151, Ho-166m, Pu-238 (publication second half-year 1985)
  in preparation : Kr-88, Np-237, Am-241.

GERMANY, FED. REP.

Laboratory and address: Inst. for Nuclear Chemistry
Philipps-University Marburg
Hans-Meerwein-Straße
D-3550 MARBURG

Names: W. Westmeier and A. Merklin

Compilation: Alpha-Energy Table[£]

Type of data: Compilation of energies and intensities of alpha particles originating from radioactive decay of nuclides, as well as other important decay properties of the nuclides.

Purpose: Identification of alpha peaks, data for cross section calculations, activity determination, etc.

Major sources of information: Nuclear Data Sheets and almost all major journals in nuclear physics and chemistry.

Deadline of literature coverage: April 30, 1985.

Current status: Literature survey completed. Data are presently compiled, evaluated, and computer stored for retrieval and printout generation.

Contact: Dr. W.Westmeier, Kernspektrometrie: Beratung&Software
Möllner Weg 5, D-3557 Ebsdorfergrund-Mölln

£ Work supported by the Fachinformationszentrum Energie, Physik, Mathematik (FIZ) in Karlsruhe.

INDIA

Laboratory and address : Department of Physics, Panjab University, Chandigarh-160014 (INDIA)

Names : D.R.Saroha, R.Aroumougame, R.K.Gupta

Evaluation : Charge distribution yields in the spontaneous fission of ^{236}U and ^{252}Cf nuclei.

Purpose : To predicat and study the fine structure of the charge distribution yields in fission fragments of the naturally fissioning nuclei by using Fragmentation theory and two-centre shell model.

Method :
i) Charge distribution yields of light mass products (A = 97-104) in the spontaneous fission of U-236 are obtained by solving a stationary Schrödinger equation numerically. The width of distribution, the most probable charge and the odd-even proton effects are also calculated.

ii) The time-dependent Schrödinger equation in coupled charge asymmetry and relative separation coordinates solved analytically to obtain the charge distribution yield in the fission of U-236.

Major sources of information : Journals and reports

Deadline of literature coverage : end of 1984

Status :
i) Fine structures in charge distribution yields of light mass products (A = 97-104) of U-236 are observed to give rise to strong proton odd-even effects. This odd-even proton effect is shown to be due to the shell effects and the structures of mass-parameters.

ii) Additional proton odd-even effect due to coupling of charge asymmetry coordinate to the relative separation coordinate is observed in charge distribution yields of U-236.

Publications :
i) D.R.Saroha and R.K.Gupta, Phys. Rev C 29 (1984) 1101.
ii) R.K.Gupta and D.R.Saroha, Phys. Rev. C 30 (1984) 395.
iii) D.R.Saroha, Ph.D. Thesis 1984, Panjab University, Chandigarh.

ITALY

Laboratory and address: ENEA, Via Mazzini 2, 40138 Bologna, Italy

Names: C. Coceva, P. Giacobbe, M. Magnani

Purpose: To solve discrepancies in resonance parameters of Zr-91.

Method: Re-analysis of the raw experimental data from Oak Ridge and Geel which gave discrepant results.
The method was a simultaneous shape analysis of the two transmission experiments accounting for the different experimental conditions and particularly for the different resolution functions.

Results: The analysis showed complete consistency of the two experiments. A new list of resonance parameters up to 18.7 keV was prepared.

Status: Completed.

Publication: Accepted for publication in Nuclear Science and Engineering.

I T A L Y

Laboratory and address: ENEA, Laboratorio Dati Nucleari e Codici, Via Mazzini 2, 40138 Bologna, Italy.

Names: F. Fabbri, G. Maino, E. Menapace, G.C. Panini, G. Reffo, M. Vaccari, A. Ventura.

Work completed and Methods:

i) Neutron capture cross sections have been estimated for the following targets: Se-76,-78,-79,-80, Br-79,-81, Kr-78,-79,-80, -81,-82,-83 and -84 (1 KeV$\leq$En$\leq$1 MeV), Sm-148, -149,-150 (1 KeV$\leq$En$\leq$100 KeV), Os-187 (1 KeV$\leq$En$\leq$70 KeV), Ir-191,-193 (300 KeV$\leq$En$\leq$1.3 MeV).

ii) Energy and parity distributions of nuclear excited states have been investigated in the frame of microscopic Nilsson-BCS formalism for deformed nuclei in the lanthanide region.
An extended version of the interacting boson model has been formulated for estimating giant resonance properties. Gamma ray absorption and scattering calculations in the giant dipole resonance region were applied to Nd and Sm nuclei.

iii) Study has been carried out on the effects of refraction and bound nucleon-nucleon scattering in preequilibrium angular distribution.

Purpose: FP data calculations for various scientific and technological applications.

Major sources of information: EXFOR, CINDA up to 84 edition, Nuclear Data Sheets.

Deadline of literature coverage: December 1984.

Status: See above text.

Cooperation: CEA-Cadarache, KfK Karlsruhe and ECN-Petten.

JAPAN

Laboratory and address : Japan Atomic Energy Research Institute, Tokai-mura, Naka-gun, Ibaraki, Japan

Name : Y. Kaneko, F. Akino, T. Yamane

Evaluation : Delayed neutron fraction for thermal fission of ^{235}U

Purpose : Reactivity scale for crtical experiment, Reactor Dynamic Analysis

Method : For evaluating the delayed neutron data, comparisons were made between calculation and measurement on five integral quantities: inverse kinetic parameter, central reactivity worth of Th, NU and EU rod, central reactivity worths of burnable poison rods, effective multiplication factor, and Incresse of prompt neutron decay constant due to insertion of central control rods.

The values of $X_i = (C_i/E_i - 1)$ are squared, weighted by the inverse variances $1/\sigma_i^2$, and summed up;

$\chi^2 = \sum_i \frac{1}{\sigma_i^2} \sum X_i^2$.

Minimization of χ^2 requires the βeff's to be higer than Keepin's by 7.55 %, and valuea thus corrected are very close to those obtained using the ENDF/B-IV deta library.

Major source of information : Critical experiments at VHTRC (Very High Temperature Reactor Critical Assembly) at JAERI, ENDF/B-IV

JAPAN
(cont'd)

Status : Evaluation of delayed neutron fraction for thermal fission of ^{235}U has been completed under the condition that decay constants of the precursors are without any uncertainty.

Publication : Y. Kaneko, F. Akino and T. Yamane, J. Nucl. Sci. Technol., 21, 487 (1984)

Laboratory and addres : Japanese Nuclear Data Committee/FPND W.G., Japan Atomic Energy Research Institute, Tokai-mura, Naka-gun, Ibaraki 319-11, Japan

Name : S. Iijima, M. Kawai (group leader) (i)
Y. Kikuchi, Y. Nakajima, T. Nakagawa, H. Nishimura (ii)
H. Matsunobu (iii), A. Zukeran (iv), T. Watanabe (v)
M. Sasaki (vi), T. Nishigori (vii)

Evaluation : (1) Neutron cross sections of the following 100 FP nuclides for JENDL-2 FP Library:

Kr-83, Kr-84, Kr-85, Kr-86, Rb-85, Rb-87, Sr-86, Sr-87, Sr-88, Sr-90, Y-89, Zr-90, Zr-91, Zr-92, Zr-93, Zr-94, Zr-95, Zr-96, NB-93, Mo-92, Mo-94, Mo-95, MO-96, Mo-97, Mo-98, Mo100, Tc-99, Ru100, Ru101, Ru102, Ru103, Ru104, Ru106, Rh103, Pd104, Pd105, Pd106, Pd107, Pd108, Pd110, Ag107, Ag109, Cd110, Cd111, Cd112, Cd113, Cd114, Cd116, In115, Sb121, Sb123, Sb124, Te128, I-127, I-129, Xe131, Xe132, Xe133, Xe134, Xe135, Xe136, Cs133, Cs135, Cs137, Ba134, Ba135, Ba136, Ba137, Ba138, La139, Ce140, Ce142, Ce144, Pr141, Nd142, Nd143, Nd144, Nd145, Nd146, Nd148, Nd150, Pm147, Sm147, Sm148, Sm149, Sm150, Sm151, Sm152, Sm154, Eu151, Eu152, Eu153, Eu154, Eu155, Gd155, Gd156, Gd157, Gd158, Gd160, Tb159

(2) Integral test of JENDL FP Library.

Purpose : Fast breeder reactor and thermal reactor calculation.

Method : (1) Calculation with spherical optical model and statistical theory. Single and multi-level BW formula in thermal and resonance regions. Negative resonances were introduced to reproduce the thermal cross sections. Strengh function model was employed in unresolved resonance region up to 100 keV. Optical model parameters were determined by SPRT method. Level density parameters were re-evaluated, deriving systematics of parameters. Gamma-ray strength function were studied in detail. The results of integral tests on JENDL-1 were taken into account the evaluation.

(2) Calculation using JAERI-FAST type 70-group cross sections with resonance self-shielding factors, and the neutron spectrun data frpm STEK and CFRMF data. Covariances of flux and cross sections are considered.

(i) Nippon Atomic Industry Group Co., Ltd. (ii) JAERI (iii) Sumitomo Atomic Energy Industries, Ltd. (iv) Hitachi Ltd. (v) Kawasaki Heavy Industries (vii) Mitsubishi Atomic Power Industries, Ltd. (viii) Osaka University.

Major sources of information : EXFOR Library, CINDA, BNL-325 and recent literature. Integral data from STEK, CFRMF and EBR-II.

Status : (1) Evaluation for 100 FP nuclides has been completed in October 1984. Covariance data for capture cross sections are preliminary evaluated for several nuclides on the basis of strength function model.

(2) Group cross sections for JENDL-2 FP nuclides were generated using a revised version of MINX code. Pleriminary calculation of CFRMF activation rates for some nuclides such as Ag-109 and Sm-149 has been made using ENDF/B-5 spectrum field.

(3) Codes for cross section adjustment based on integral data and for calculation of covarince matrices were developed.

Other relvant details : The compilation of File 1 data about data documentation and the preparation of the code system for integral test are in progress.

Computer file of evaluated data : JENDL (ENDF/B-IV Format).

Expected completion date : End of 1986.

Publications : (1) S. Iijima, M. Kawai : Systematics of neutron total cross sections of fission product nuclei, J. Nucl. Sci. Technol., 20 (1983) 77 (short note).

(2) S. Iijima, T. Yoshida, T. Aoki, T. Watanabe, M. Sasaki : Study of systematics and the determination of level density parameters of fission product nuclei, ibid. 21 (1984) 10.

(3) JNDC FP Neutron Cross Section Evaluation Working Group : Evaluation of Fission product Neutron Cross Sections for JENDL, JAERI-M 84-182, p. 23 (1984)

(4) T. Aoki, S. Iijima, M. Kawai, Y. Kikuchi, H. Matsunobu, T. Nakagawa, Y. Nakajima, T. Nishigori, M. Sasaki, T. Watanabe, T. Yoshida, A. Zukeran: Evaluation of FP Cross Sections for JENDL-2, presented at Int. Conf. on Nuclear Data for Basic and Applied Science, May 1985, Santa Fe, Poster Session JC36.

Japanese Nuclear Data Committee, Decay Heat Evaluation Working Group

Secretariat address:
Japan Atomic Energy Research Institute
Tokai-mura, Naka-gun, Ibaraki-ken 319-11, Japan

Members:
R. Nakasima (Hosei University), M. Akiyama (University of Tokyo)
T. Tachibana, M. Yamada (Waseda University)
S. Iijima, T. Murata, T. Yoshida (Nippon Atomic Industry Group Co.)
H. Ihara, J. Katakura, T. Tamura, K. Tasaka, K. Umezawa (JAERI)
T. Tamai (Kyoto University), I. Otake (I.S.L. Inc.)
T. Hojuyama (MAPI), A. Zukeran (Hitachi Ltd.)

1. Compilation: Decay data and delayed neutron data
Purpose: Revision of the FP decay data library completed in 1981 for summation calculation of decay heat
Major Source of Information: Journals, Nuclear Data Sheets, and ENSDF
Expected Completion Date: Continuous compilation

2. Evaluation: (1) Evaluation of raw decay data by comparing calculated decay heat with measured data from University of Tokyo and also from abroad
(2) Theoretical calculations of delayed gamma-ray spectra for no-data short-lived FPs and their assessment
Purpose: (1) Update JNDC FP Decay and Yield Data Library
(2) To provide users with delayed gamma-ray spectrum data of nuclear fuels
Major Source of Information: Own compiled data
Status: (1) Satisfactory agreement was obtained between calculation and measurement for FP decay heats of Th-232, U-233, -235, -238 and Pu-239 from Univ. of Tokyo (fast and 14 MeV neutrons).
(2) Calculated and measured gamma-ray spectra shortly after a fission burst are in good agreement.

Computer File of Evaluated Data: JNDC Nuclear Data Library of Fission Products

Discrepancy encountered: Discrepancies in the gamma-ray component of decay heat still remain around 1000 second cooling.

Availability of Nuclear Data: Contact Mr. H. Ihara
Japan Atomic Energy Research Institute
Tokai-mura, Ibaraki-ken 319-11, Japan

Publication: T. Yoshida, 'Theoretical Calculation of Decay Data of Short-Lived Nuclides for JNDC FP Decay Data File', JAERI-M 83-127 (1983)

Publication: (cont'd) K. Tasaka, H. Ihara, M. Akiyama, T. Yoshida, Z. Matumoto, R. Nakasima, 'JNDC Nuclear Data Library of Fission Products', JAERI 1287 (1983)

T. Yoshida, M. Akiyama, Z. Matumoto, J. Katakura, R. Nakasima, 'Decay Heat Data Needs', Proc. NEANDC Specialists Meeting on Yield and Decay Data of Fission Product Nuclides, p.265, BNL 51778, Brookhaven National Laboratory (1983)

J. Katakura, M. Akiyama, T. Yoshida, Z. Matumoto, R. Nakasima, 'An Attempt for Revision of JNDC FP Decay Data File', JAERI-M report, JAERI-M 84-117 (1984)

T. Yoshida, J. Katakura, 'Energy Spectrum of Delayed Fission-Gamma-Ray' to be presented at the 1985 Fall Mtg. of the Atomic Energy Society of Japan

S. Iijima, T. Yoshida, 'A Four-Chain Approximation Method for Calculation of Neutron Capture Effect on FP Decay Heat', Proc. 1984 Fall Mtg. of the Atomic Energy Society of Japan, Vol.1 p. 129 (in Japanese)

NETHERLANDS

Laboratory and address
Netherlands Energy Research Foundation (ECN)
P.O. Box 1, 1755 ZG Petten, The Netherlands.
Telephone: (02246)-4949, telex: 57211 reacp nl.

Names
H. Gruppelaar, A.J. Janssen, H.A.J. van der Kamp, R.J. Heijboer.

Evaluation
(1) See previous newsletters about the RCN-2 evaluation (43 materials) and the RCN-3 evaluation (37 materials). New work has been started on the RCN-4 evaluation which will be issued in KEDAK as well as ENDF/B-V format. Some evaluations are also made for JEF-2.
(2) Integral-data test of JEF-1 data file (cooperation with CEA-Cadarache).
(3) Pseudo-fission product group constants based upon JEF-1 (26 groups ABBN).

Purpose
Fast breeder power-reactor data needs.

Method
Calculation with multilevel Breit-Wigner formula, optical model, statistical model and direct models, taking into account all available experimental information. Adjustment of point-wise given capture cross sections to integral data.

Major sources of information
BNL-325, EXFOR, CINDA, Nuclear Data Sheets, recent literature, integral data from STEK, CFRMF, RONA, ZONA, PHENIX.

Status
(1) Recently completed RCN-4 evaluations: ^{129}I, ^{101}Ru. In progress: ^{102}Ru, ^{104}Ru, ^{107}Pd.
(2) Integral-data test completed for 40 materials.
(3) Pseudo-fission products in preparation.

Computer file
RCN-2 and RCN-3 libraries in KEDAK-format, available from NEA Data Bank. RCN-4 library (KEDAK, ENDF/B-V format) in preparation.

Completion date
1987.

Recent publications

[1] Plakman, J.C. (comp.), Fast reactor programme. Annual progress reports, ECN-115 (1982), ECN-138 (1983), ECN-155 (1984).
[2] H. Gruppelaar, Status of recent fast capture cross sectio, evaluations for important fission product nuclides, NEANDC/NEACRP Specialists' Mtg. on Fast-neutron capture cross sections, Argonne, 20-23 April, 1982. NEANDC(US)-214 (1983) 473.
[3] H. Gruppelaar et al., Integral Test of Fission Product Cross Sections, Int. Conf. Nuclear Data for Basic and Applied Science, Santa Fe, NM, May 1985.

UNITED KINGDOM

Laboratory and Address:
UKAEA
AEE Winfrith
Dorchester
Dorset DT2 8DH

Names:
M.F. James, E.A.C. Crouch (AERE Harwell, retired), P.S. Whitworth, Miss C. Dunn

Evaluation:
Fission Product Yields

Purpose:
To produce two libraries of fission product yields in ENDF/B-V Format. One Library (C4U) contains yields evaluated from available measurements while the second library (C4A) contains yields obtained from a least-squares adjustment of the C4U data constrained to fit conservation laws.

Major Source of Information:
1. Scientific journals.
2. Laboratory reports containing accounts of completed work which are unlikely to be published in the open literature.

Deadline of Literature Coverage:
Mid 1981

Status:
Two libraries of independent yields are now available; cumulative yields are being generated. Documentation is in draft form.

Computer File of Evaluated Data:
Available from NEA Data Bank

Completion Date:
The Cumulative Yield Data Libraries are scheduled for completion in August 1985. Work has begun on the next evaluation.

UNITED KINGDOM

Laboratory and Address:

CEGBA
Berkeley Nuclear Laboratories
Berkeley
Gloucestershire GL13 9PB
United Kingdom

Working Group:

A. Tobias	CEGB, BNL
A.L. Nichols	AEE Winfrith
M.F. James	AEE Winfrith
M.E. Sims	AERE Harwell
B. Alldred	BNFL Sellafield

Evaluation:

Radionuclide Decay Data

Purpose:

To provide a comprehensive, up-to-date library of radioactive decay data including half-lives, Q-values, branching fractions, alpha, beta and gamma energies and emission probabilities and corresponding uncertainties.

Status:

1. The current UK Fission product decay data library is UKFPDD-2 which was released in 1980/81. It contains data for 855 nuclides of which 736 are radioactive and 390 have spectral data.
2. The spectral data of UKFPDD-2 are available as an additional data base for the inventory/decay heat code FISP6, permitting the calculation of detailed radiation spectra from irradiated fuel.
3. A spectral data retrieval system is available for use with ENDF/B-IV and V format decay data files (UKFPDD-2, UKHEDD-1 and UKPADD-1 in particular). Catalogues of spectral data can be output as functions of nuclide or radiation energy with a variety of editing options.

Progress:

Data for short-lived nuclides continue to be extracted from the literature and, with the 300 fission products evaluated in 1979/80 for UKFPDD-2, have been processed into ENDF/B-V format using the latest version of COGEND (which includes all K-X-rays). In addition to forming the basis of UKFPDD-3 these data constitute a major component of the UK contribution to the JEF1 decay data file.

UNITED KINGDOM
(cont'd)

Publications:

1. "UKFPDD-2: A Revised Fission Product Decay Data File in ENDF/B-IV Format" by A. Tobias and B.S.J. Davies, 1980, CEGB Report RD/B/N4942.
2. "FISP6 - An Enhanced Code for the Evaluation of Fission Product Inventories and Decay Heat" by A. Tobias, 1982, CEGB Report TPRD/B/0097/N82.
3. "A Retrieval System for Spectral Data from ENDF/B Format Decay Data Files" by A. Tobias 1981, CEGB Report RD/B/5170N81.
4. "The UKCNDC Radioactive Decay Data Libraries" by A. Tobias, B.S.J. Davies, A.L. Nichols and M.F. James, 1983, Nuc. Energy, Vol. 22 No. 6, pp 445-552.
5. "Evaluated Decay Data for Reactor Applications: The UKCNDC Data Libraries" by A.L. Nichols and A. Tobias, 1984, Nuc. Inst. Methods, Vol. 223, pp 487-491.

UNITED KINGDOM

Laboratory and address: IMPERIAL COLLEGE REACTOR CENTRE, Silwood Park, Ascot, Berkshire, SL5 7PY, England

Names: P.W. Gray, T.D. Mac Mahon

Evaluation: Half-Life of ^{90}Sr

Purpose: To provide a recommended value for the half-life of ^{90}Sr derived from the inconsistent set of experimental values reported in the literature.

Method: Nine experimentally determined values of the ^{90}Sr half-life reported in the years 1955 to 1985 have been considered. The set of data show a large degree of inconsistency when subjected to any statistical test. We do not feel justified in rejecting the 3 values out of the 9, which would be necessary to leave a consistent set, since these 3 would include two of the most recent measurements and the most precise measurement.

A method has been evolved (Reference 1) which adjusts the information content (inverse of the variance) of the two most precise measurements; this is followed by a uniform inflation of the uncertainties to achieve consistency.

The resulting recommended value for the half-life of ^{90}Sr is:-

$$28.7 \pm 0.2 \text{ y}$$

Reference 1: P.W. Gray, T.D. Mac Mahon "Strontium 90 Half-Life Evaluation" Imperial College Reactor Centre Research Report ICRC/85/2, May 1985.

UNITED KINGDOM

Laboratory and address: Birmingham Radiation Centre, University of Birmingham, P.O. Box 363, Birmingham B15 2TT, United Kingdom

Name: D.R. Weaver

Evaluation: Equilibrium and near-equilibrium delayed neutron spectra

Purpose: For reactor physics calculations and analysis of delayed neutron yield measurements. The evaluation was recommended by the March 1979 Vienna Consultants' Meeting on Delayed Neutron Properties

Method: Calculation of a full covariance matrix for the spectra

Deadline of literature coverage: None. Raw experimental data from laboratories who used either ^{3}He or proton recoil counters has been obtained. Further data would be welcomed

Status: A method of obtaining a full covariance matrix has been derived based upon the sensitivity of the spectra obtained from unfolding to changes in the calibration parameters of the detector and counting statistics. A paper describing the technique and measurement of an Am/Li spectrum using a ^{3}He counter has been published. A discrepancy between some published proton recoil measurements and ^{3}He results has been resolved. A detailed paper is in preparation.

Data presented at 1985 Santa Fe neutron conference show significant systematic variations in emission of delayed neutrons of energies less than 200 keV as a function of primary neutron energy in the range 0.5 to 1.75 MeV for fission of U-235.

U.S.A.

Laboratory and address:

Hanford Engineering Development Laboratory
P.O.Box 1970
Richland, WA 99352

Names:

RE Schenter, FM Mann, F Schmittroth

Evaluation:

ENDF/B-V, Mods to ENDF/B-V, and ENDF/B-VI Fission Product Data File and Fission Yield Files

A. Coordinate generation and testing of complete ENDF/B-FP files which will contain cross sections, decay data and fission yields for approximately 900 fission product nuclei and 20 fissionable nuclei. Coordination is part of the responsibility as Chairman of CSEWG (Cross Section Evaluation Working Group) Fission Product and Actinide Data Subcommittee. Two subcommittees related and contributing to this subcommittee are chaired by TR England (LASL) and CW Reich (INEL) and cover the areas of fission yields and experimental decay data, respectively. Evaluations to these files will be contributed by essentially all CSEWG member laboratories.

B. Evaluate important FP cross sections for fast and thermal reactor application. These will mainly involve updating about 180 cross section evaluations from ENDF/B-V with emphasis on capture. Use will be made of combining recent integral and differential data results from CFRMF, STEK, RPI and ORNL.

C. Evaluate delayed neutron spectra using summation method from individual precursors in cooperation with TR England (LASL) and CW Reich (INEL). Precursors without experimental spectra will be predicted using the computer code BETA.

D. Evaluate decay data parameters $\bar{E}_\beta$, $\bar{E}_\gamma$ for "theoretical" ("no line data") FP nuclides using BETA code, extrapolated "fits" to known data, and integral results of recent decay heat measurements.

E. Analyze fissionyield experimental results from FFTF.

Purpose:

Update ENDF/B Fission Product Data Files

Completion dates:

ENDF/B-V file was issued May 1980. ENDF/B-V Fission Yield Files issued April/May 1979. Mods to ENDF/B-V released Sep. 1982 and May 1983.
ENDF/B-VI expected to be issued 1989.

References related to this work may be obtained from R.E.Schenter

For further information see also LANL contribution.

U.S.A.

Laboratory and address: Idaho National Engineering Laboratory
EG&G Idaho, Inc.
P.O. Box 1625
Idaho Falls, Idaho 83415 USA

Names: M. A. Lee, C. W. Reich

Compilation: Decay data for fission products. Quantities treated include $T_{\frac{1}{2}}$; Q_β; branching fractions for the various decay modes; energies and intensities of all emitted radiations (e.g., β, γ, c.e., x-ray); K-, L- and total ICC; delayed-neutron energy spectra for individual precursors; uncertainties in all measured values.

Purpose: Decay data file for ENDF/B.

Major source of Information: Nuclear Data Sheets, Table of Isotopes (7th Ed.), recently published papers, preprints of recent work.

Deadline of literature coverage: Ongoing. For Version V of ENDF/B, cut-off date was approximately September, 1978.

Computer File: Decay data are included in ENDF/B Fission Product File. Tapes available through normal ENDF/B procedures. Evaluated decay data sets for 318 fission-product nuclides (and isomeric states) have been prepared for inclusion in the ENDF/B-V Fission-Product File.

Publications:

R. L. Bunting and C. W. Reich, "Evaluation Procedures for Experimental Decay Data," in Proceedings of the Conference on Nuclear Data Evauation Methods and Procedures, BNL-NCS-51363, Vol. 1, pp. 163-183 (March, 1981).

C. W. Reich and R. L. Bunting, "The Use of Data from Beta-Strength-Function Experiments to Obtain Average Decay-Energy Values for Short-Lived Fission-Product Nuclides," Nuclear Science and Engineering 82, (1982) 132.

T. R. England, P. G. Young, R. E. Schenter, F. M. Mann and C. W. Reich, "Fission Product and Actinide Data Status in ENDF/B", Presentation at the 24th Meeting of the NEANDC, Tokai, Japan, March 12-16, 1984, LA-UR-84-788.

U.S.A

LABORATORY AND ADDRESS: Los Alamos National Laboratory, P.O. Box 1663
Los Alamos, New Mexico 87545 U.S.A.

NAMES:
T. R. England
R. J. LaBauve
W. B. Wilson
D. C. George
B. F. Rider

COOPERATION: HEDL(see HEDL contributions), INEL, BNL, and ENDF/B subcommittees, plus other worldwide contributors.

PURPOSE: To provide evaluations and compilations for ENDF/B and processed libraries based on ENDF/B files.

EVALUATIONS:

A. Fission-Product Yields:

Preliminary evaluations for 50 yield sets have been made. This is a continuing effort for ENDF/B-VI. ENDF/B-V yields (20 sets) are currently available for distribution (Refs. 1-2). The 50 yield sets described in Ref. 3 have some subsequent additional updating.

B. Delayed Neutron Spectra, Pn Values, and Kinetics

This effort is continuing. Pn evaluations have been published (Ref. 5) and integral spectra published (Refs. 4 and 6), along with kinetics effects (Ref. 7).

COMPILATIONS/ LIBRARIES:

A. A summary report containing all ENDF/B-V total decay parameters, halflives, few-group processed cross sections, mass chain yields, schematics of coupled nuclides, supplementary data, and a listing of questionable data has been completed. This report will serve as a reference document for ENDF/B-V data (Ref. 8).

B. Processed multigroup cross sections (154 groups) for all ENDF/B-V fission products and actinide cross sections are available along with a collapsing code in Ref. 9.

C. Multigroup decay spectra (158 groups) for $\beta^{\pm}$, γ, α, discrete electrons and neutrinos based on ENDF/B-V decay data have been generated using the SPECS Code (Ref. 10). These are available, but not published.

D. Few-group β and γ spectra, curies, and total decay power analytical fits based on ENDF/B-V data (and modified by experiments in which such integral data were available) are included in the library for the DKPOWR Code (Ref. 11).

All processed libraries based on a released version or mod of ENDF/B are available. Several libraries for codes such as the various versions of CINDER are also available. Current references are based on ENDF/B-V or subsequent work.

U.S.A. (cont'd)

REFERENCES:

1. General Electric (Vallecitos Nuclear Center) report series, "Compilation of Fission Product Yields:" M. E. Meek and B. F. Rider, NEDO-2154 (1972); B. F. Rider and M. E. Meek, NEDO 2154-1 (1978); B. F. Rider, NEDO-2154-3(B), [ENDF-292] (1980); and B. F. Rider, NEDO-2154-3(C) [ENDF-322] (1981).

2. B. F. Rider, T. R. England, D. G. Madland, J. R. Liaw, and R. E. Schenter, "Evaluation of Fission Product Yields for the U.S. National Nuclear Data Files, "Proc. Conf. Nucl. Data Evaluation Methods and Procedures, Brookhaven National Laboratory, Sept. 25, 1980, BNL-NCS-51365, DOE-NDC-23, NEANDC(US)-209, INDC(USA)-85 (March 1981).

3. T. R. England and B. F. Rider, "Status of Fission Yield Evaluations," invited paper published in Proc. of Specialists' Meet. on Yields and Decay Data for Fission Product Nuclides, Oct. 24-27, 1983, Brookhaven National Laboratory, sponsored by OECD/NEA Nuclear Data Committee. [BNL 51772.]

4. T. R. England, W. B. Wilson, R. E. Schenter, and F. M. Mann, "Aggregate Delayed Neutron Intensities and Spectra Using Augmented ENDF/B-V Precursor Data," Nucl. Sci. Eng. 62, 139 (Oct. 1983).

5. F. M. Mann, M. Schreiber, R. E. Schenter, and T. R. England, "Evaluation of Delayed Neutron Emission Probabilities," Nucl. Sci. Eng. 87, 618 (July 1984).

6. T. R. England, M. C. Brady, W. B. Wilson, R. E. Schenter, and F. M. Mann, "Delayed Neutron Spectra and Intensities from Evaluated Precursor Data, to be published in Proc. of the Int. Conf. on Nuclear Data for Basic and Applied Science, Santa Fe, N. M., May 13-17, 1985 (LA-UR-85-1673).

7. R. T. Perry, W. B. Wilson, T. R. England, and M. C. Brady, "Application of Evaluated Fission-Product Delayed Neutron Precursor Data in Reactor Kinetics Calculations," to be published in Proc. of Int. Conf. on Nuclear Data for Basic and Applied Science, Santa Fe, N. M., May 13-17, 1985 (LA-UR-85-1730).

8. T. R. England, W. B. Wilson, R. E. Schenter, and F. M. Mann, "ENDF/B-V Summary Data for Fission Products and Actinides," Los Alamos informal document LA-UR-83-1285 (May 1984) (ENDF 322). Electric Power Research Inst. report NP-3787, December 1984.

9. W. B. Wilson, T. R. England, R. J. LaBauve, and R. M. Boicourt, "The TOAFEW-V Multigroup Cross-Section Collapsing Code and Library of 154-Group Processed ENDF/B-V fission-Product and Actinide Cross Sections," Electric Power Research Inst. report EPRI NP-2345. [Los Alamos Nat. Lab. informal document LA-UR-81-1762 Rev (April 1982).]

10. T. R. England, R. J. LaBauve, W. B. Wilson, and N. L. Whittemore, "SPEC5: Code to Produce Multigroup Spectra," in Applied Nuclear Data Research and Development Quarterly Progress Report, Jan. 1-March 31, 1981," C. Baxman and P. Young, Comps., Los Alamos Scientific Laboratory report LA-8874-PR (July 1981), p. 50.

11. W. B. Wilson, T. R. England, R. J. LaBauve, and D. C. George, "DKPOWR: A Code for Calculating Decay Power, Energy, Activity, and β + γ Spectra in LWR Fuel Using Fission Pulse Functions," prepared for publication by the Electric Power Research Institute, May 1984. [Los Alamos informal document LA-UR-85-157 (January 1985.)]

Laboratory and Address: Oak Ridge National Laboratory
P. O. Box X, Building 6010
Oak Ridge, Tennessee 37830, USA

1. Name: J. K. Dickens

Compilation and Evaluation: Data file of fission-product radioactive β-decay information including energies, E_β, and absolute branching ratios, A_β, and degree of forbiddenness for 353 fission products, augmented by average β-ray energies for 183 additional fission products.

Purpose: To compute gross fission-product β-ray spectra obtained, e.g., following fission of ^{235}U so as to determine the associated "reactor antineutrino" spectrum to be used in experimental measurements of antineutrino-induced reactions.

Major sources of Information: Nuclear Data Sheets, Table of Isotopes (7th Edition), and recent published literature.

Deadline: January 1982 for the current compilation.

Status: Data file is available from the ORNL Radiation Shielding Information Center.

Publications: J. K. Dickens, "Electron Spectra from Decay of Fission Products," ORNL/TM-8285 (September 1982); J. K. Dickens, "Electron Antineutrino Spectrum for $^{235}U(n,f)$," Phys. Rev. Lett. 46, 1061 (1981); J. K. Dickens, "Calculated Beta-Ray Spectra from Decay of Fission Products Produced by Thermal-Neutron Fission of ^{235}U," Phys. Lett. 113B, 201 (1982); J. K. Dickens, "Microscopic Beta and Gamma Data for Decay Heat Needs," OECD/NEA Nuclear Data Committee Specialists Meeting on "Yields and Decay Data of Fission Product Nuclides," Brookhaven National Laboratory, October 24-27, 1983; proceedings: BNL 51778 (1984) 247.

2. Name: J. K. Dickens and P. T. Perdue

Compilation: Data file of radioactive γ-decay information including energies and absolute intensities when available, or relative intensities when absolute values are not available.

Purpose: Identification of responsible radionuclides for data reduction of high-resolution Ge(Li) spectroscopy.

Major Sources: Nuclear Data Sheets and Table of Isotopes (7th Edition). New literature values are being incorporated on a continuing basis.

Deadline: Continuing.

Status: Three data files contain data for 1177 radionuclides between ^{7}Be and ^{254}Es. About 80% of the 4800 entries are up to date (March 1984). The remainder are being upgraded on a continuous basis. The primary file is ordered by increasing Z and A; the file contains information useful for neutron activation analysis (NAA). There is a secondary file consisting of all γ rays ordered by increasing γ-ray energy; for each entry a second γ ray is included if available. There is an additional secondary file of radionuclides ordered by increasing half life; no γ-decay information is in this file. These data files are available from the ORNL Radiation Shielding Information Center.

Publication: Radiation Shielding Information Center Document No. DLC088/TPASGAM, "Informal Notes," J. K. Dickens and P. T. Perdue (April 1982); J. K. Dickens, "Microscopic Beta and Gamma Data for Decay Heat Needs," OECD/NEA Nuclear Data Committee Specialists Meeting on "Yields and Decay Data of Fission Product Nuclides," Brookhaven National Laboratory, October 24-27, 1983; proceedings: BNL 51778 (1984) 247.

Laboratory and address Washington University, Department of Chemistry, St. Louis MO 63130 U.S.A.

Name A. C. Wahl

Compilation and evaluation Independent yields and other data related to nuclear-charge distribution in fission are compiled and evaluated for low-energy fission reactions (excitation energies up to ~20 MeV). The current compilation includes data for thermal-neutron-induced fission of ^{233}U, ^{235}U, and ^{239}Pu, for spontaneous fission of ^{252}Cf, and for fission-spectrum-induced fission of ^{235}U (Ref. 3). Data for other fission reactions may be added.

Purpose Systematic trends in independent yields (IN) are derived from the data by use of empirical models, which allow estimates to be made of independent yields for all fission products and contribute to the understanding of fission-reaction mechanisms.

Sources of information Journals, reports, preprints, other compilations, and personal communications.

Method Original values of experimental data and uncertainties are maintained in a file, and average values are calculated and normalized for each A, when sufficient data exist, so that the sum of fractional independent yields (FI) is unity. The set of FI values for each fission reaction, or IN values derived from them, are treated by the method of least squares to derive systematic trends in the yields described by the Z_p and A_p' models.

Experimental yield data are evaluated by comparison with other data, with average yield values, and with yields calculated from the models.

Cooperation We are prepared to exchange files with other groups.

Computer file Information is held in standard form in computer files.

Completions Compilation is continuous; evaluations and redetermination of parameters for models occurs every 2 or 3 years. A report of data, evaluations, and model estimated yields and uncertainties is planned for 1986. Limited numbers of preprints of references 2 and 3 are now available for distribution.

U.S.A.

(cont'd)

Publications

1. A. C. Wahl, "Nuclear-Charge Distribution Near Symmetry for Thermal-Neutron-Induced Fission of ^{235}U", Phys. Rev. C 32 (1985) 184.

2. A. C. Wahl, "Nuclear Charge Distribution in Fission," in Proceedings of the Conference on New Directions in Physics and Chemistry, Los Alamos National Laboratory, April 13-15, 1983, edited by N. Metropolis and G. -C. Rota, (Academic Press, in press).

3. A. C. Wahl, "Compilation and Evaluation of Nuclear-Charge-Distribution Data for Thermal-Neutron-Induced Fission of ^{235}U, ^{233}U, and ^{239}Pu, for Spontaneous Fission of ^{252}Cf, and for Fission-Spectrum-Neutron-Induced Fission of ^{235}U", (1982), unpublished.

4. A. C. Wahl, "Systematics of Nuclear Charge Distribution in Fission The Z_p Model", J. Radioanal. Chem. 55, 111 (1980).

5. A. C. Wahl, "Nuclear-Charge Distribution in Fission - Investigation of Systematics and Methods of Estimation of Independent Yields," Contribution to IAEA Petten Panel on Fission Product Nuclear Data - Sept., 1977. Published in: INDC(NDS)-87 (1978), 215.

USSR

(same as INDC(NDS)-155)

Laboratory and address: Moscow Physical Engineering Institute
115409 Moscow

Names: A.N. Gudkov, V.M. Zhivun, A.B. Koldobskij and V.M. Kolobashkin.

Evaluation: Fission product mass yields.

Purpose: Prediction of fragment mass distributions from fission induced by neutrons of three energy groups (thermal, fission spectrum and 14.8 MeV).

Method: The method of "three fixed energies" with determination of reference parameters by the least-square method.

Sources of information: M.E. Meek, B.F. Rider, NEDO-12154-2 (1977). E.A.C. Crouch, Atomic and Nuclear Data Tables 19 (1977) 417-532.

Results: Recommended values of parameters were obtained for calculation of fragment mass distributions for thermal neutron fission of $^{233,235}U$, $^{239,241}Pu$ and ^{249}Cf, fission neutron induced fission of $^{233,235,238}U$, ^{237}Np and ^{239}Pu, and 14.8 MeV neutron fission of $^{235,238}U$, $^{239,240}Pu$ and ^{241}Am.

Discrepancies with respect to reported data: The calculation formula and values for most parameters differ from those used earlier.

Publications: A.N. Gudkov, V.M. Zhivun, A.B. Koldobskij, V.M. Kolobashkin, "A method for predicting the fission product mass yields from the fission of heavy nuclei induced by neutrons of three energy groups" in: Experimental Methods of High- and Low-Energy Nuclear Physics, Energoatomizdat, Moscow (1982) p.61-66 (in Russian).

III. RECENT PUBLICATIONS RELATED TO FPND

The publications listed below refer to activities related to FPND which are not covered by the contributions contained in this issue. They are sorted according to

1. Fission yields and charge distribution
2. Neutron reaction cross sections
3. Decay data
4. Delayed neutron data
5. FP decay heat
6. Reviews and summaries

Completeness of this Section has not yet been attempted. For papers presented at meetings see section IV.

III.1. Fission yields and charge distribution

(For fission yields of delayed neutron precursors see also "delayed neutrons")

Mass and kinetic energy distribution in cold fission of ^{233}U, ^{235}U and ^{239}Pu induced by thermal neutrons

M. Montoya
Z. Phys. A 319 (1984) 219

Independent yields of the isomers of ^{133}Xe and ^{135}Xe for neutron-induced fission of ^{233}U, ^{235}U, ^{238}U, ^{239}Pu, and $^{242}Am^{m}$

G.P. Ford, K. Wolfsberg, and B.R. Erdal
Phys. Rev. C 30 (1984) 195

Cumulative yields of short-lived fission products in thermal-neutron fission of U-235

C. Chung, A.A. Hasan and S. Sahin
Radiochimica Acta 37 (1984) 131

Semiempirical description of the mass distribution for the $^{238}U(n,f)$ process in the 1.5- to 15-MeV energy interval

S. Nagy, S. Daróczy, P. Raics, I. Boda and I. Matajsz
Nucl. Sci. Eng. 88 (1984) 154

Fission yields in the thermal neutron fission of plutonium-239

H.C. Jain and M.V. Ramaniah
Radiochimica Acta 37 (1984) 63

Fission yields at different fission-product kinetic energies for thermal-neutron-induced fission of ^{239}Pu

C. Schmitt, A. Guessous, J.P. Bocquet, H.-G. Clerc, R. Brissot, D. Engelhardt, H.R. Faust, F. Gönnenwein, M. Mutterer, H. Nifenecker, J. Pannicke, Ch. Ristori and J.P. Theobald
Nuclear Physics A 430 (1984) 21

Fission-fragment energy correlation measurements for $^{252}Cf(sf)$ and structures in far-out asymmetric fission

G. Barreau, A. Sicre, F.Caitucoli, M. Asghar, T.P. Doan, B. Leroux, G. Martinez and T. Benfoughal
Nuclear Physics A 432 (1985) 411

III.2. Neutron reaction cross sections

Low-lying levels of ^{77}Se studied by thermal neutron capture and evidence for a new term in the E2 operator of TQM (IBM)

Y. Tokunaga, H. Seyfarth, R.A. Meyer, O.W.B. Schult, H.G. Börner, G. Barreau, H.R. Faust, K. Schreckenbach, S. Brant, V. Paar, M. Vouk and D. Vretenar
Nuclear Physics A 439 (1985) 427

Spectrum of secondary neutrons and cross section of the (n,2n) reaction at niobium

A.A. Lychagin, V.A. Vinogradov, O.T. Grudzevich, B.V. Devkin, G.V. Kotel'nikova, V.I. Plyaskin and O.A. Sal'nikov
At. En. 57 (1984) 266 (Engl.: Soviet At. En. 57 (1985) 726)

Comparative analysis of estimates of neutron radiative capture cross sections for the most important fission products

T.S. Belanova, L.V. Gorbacheva, O.T. Grudzevich, A.V. Ignatyuk, G.N. Manturov and V.I. Plyaskin
At En. 57 (1984) 243 (Engl.: Soviet At. En. 57 (1985) 694)

(incl. Zr-93, Mo-99, Tc-99, Ru-101,102,104,106, Rh-103, Pd-105,107, Ag-109, I-129, Xe-131, Cs-133,135, Ce-144, Pm-147)

^{134}Cs level structure deduced from the (n,γ) reaction

T. J. Kennett, W.V. Prestwich and J.S. Tsai
Can. J. Phys. 62 (1984) 861

Neutron absolute and total cross section difference measurements in the mass-140 region

H.S. Camarda, T.W. Phillips and R.M. White
Phys. Rev. C 29 (1984) 2106

Investigation of the $^{149}Sm(n,\alpha)^{146}Nd$ reaction induced by fast neutrons

W. Augustyniak, L. Glowacka, M. Jaskola, J. Turkiewicz, L. Zemlo, J. Dalmas, E. Gadioli, E. Gadioli Erba
Nuovo Cimento A 85 ser. 2 (1985) 217

III.3. Decay data

(For delayed neutron precursor decay see also "delayed neutrons")

End-point energy of H-3 beta decay

J.J. Simpson, W.R. Dixon, R.S. Storey
Phys. Rev. C 31 (1985) 1891

Neutrinoless double beta decay in ^{76}Ge for transitions to excited states of ^{76}Se

P. Hubert, F. Leccia, D. Dassie, P. Mennrath, M.M. Villard, A. Morales, J. Morales, R. Nunez-Lagos, J.A. Villar
Nuovo Cimento A 85 ser. 2 (1985) 19

Energy levels of ^{76}Se from the decay of ^{76}As

H. Abou-Leila, L. Al-Houty, H.A. Ismail and N. Abdel Basset
Nucl. Sci. J. 21 (1984) 181

Level structure of ^{77}As and ^{77}Se from the decay of ^{77}Ge

V.K.C. Cheng, Y.C. Liu and T.S. Ueng
Chin. J. Phys. (Taiwan) 18 (1980) 83

Study of the level structure of ^{77}As by sum-coincidence measurement

Y.C. Liu, J.R. Chen and W.S. Hsu
Chin. J. Phys. (Taiwan) 18 (1980) 128

Deformation in odd-mass nuclei near A ~ 100: one- and three-quasiparticle nilson states in $^{99}_{39}Y_{60}$

R.A. Meyer, E. Monnand, J.A. Pinston, F. Schussler, I. Ragnarsson, B. Pfeiffer, H. Lawin, G. Lhersonneau, T. Seo and K. Sistemich
Nuclear Physics A 439 (1985) 510

Double gamma decay in ^{40}Ca and ^{90}Zr

J. Schirmer, D. Habs, R. Kroth, N. Kwong, D. Schwalm, M. Zirnbauer and C. Broude
Phys. Rev. Lett. 53 (1984) 1897

Beta-decay of the 5.9 min isomer of ^{108}Rh

P. Bhattacharya
Nuovo Cimento A 79 (1984) 471

Exponential behavior of the radioactive decay of $^{116m_1}In$

P.M. Gopych, I.I. Zalyubovskii, V.V. Sotnikov, A.F. Shchus, I.F. Barchuk, V.S. Bulkin, V.I. Golyshkin and A.F. Ogorodnik
Izv. Akad. Nauk. SSR, Ser. Fiz., 48 (1984) 938 (Engl.: Bull. Acad. Sci. USSR, Phys. Ser., 48, no 5 (1984) 98)

The beta-decay of tellurium 135 and 137

M. Samri, G.J. Costa, G. Klotz, D. Magnac, R. Seltz and J.P. Zirnheld
Z. Phys. A 321 (1985) 255

Operation of a high temperature ion source at the helium-jet on-line isotope separator facility helios

M. Brügger, N. Hildebrand, T. Karlewski, N. Trautmann, A.K. Mazumdar and G. Herrmann
Nucl. Instr. Meth. Phys. Res. A 234 (1985) 218
(incl.: decay data of 3.8 s Pr-152)

Measurement of relative intensities of gamma-rays from the decay of ^{152}Eu

Wang Xinlin, Li Xiaodi, Du Hongshan
Chin. J. Nucl. Phys. 6 (1984) 286

Precise conversion electron intensities of ^{152}Eu decay for detector calibration purposes

G.G. Colvin and K. Schreckenbach
Nucl. Instr. Meth. Phys. Res. 228 (1985) 365

Precision measurements of γ-rays in the decay of ^{161}Tb

G. De Chambrier, B. Aas, W. Beer, I. Beltrami, Th. v. Ledebur, H.J. Leisi, W. Ruckstuhl, G. Strassner, A. Vacchi, U. Kiebele and R. Weber
Nucl. Instr. Meth. Phys. Res. 227 (1984) 512

III.4. Delayed neutrons

Intense mass-separated beams of halogens and beta-delayed neutron emission from heavy bromine isotopes

G.T. Ewan, P. Hoff, B. Jonson, K.-L. Kratz, P.O. Larsson, G. Nyman, H.L. Ravn and W. Ziegert
Z. Phys. A 318 (1984) 309

III.5. Decay heat

III.6. Reviews and summaries

Radiochemical studies on fission of actinides

M.V. Ramaniah
Pramana 24 (1985) 137

Studies of light-charged particle emission in fission at Trombay

S.S. Kapoor and D.M. Nadkarni
Pramana 24 (1985) 144

Beta decay far from stability and its role in nuclear physics and astrophysics

H.V. Klapdor
Fortschr. Phys. 33 (1985) 1

IV. MEETINGS

NEANDC Topical Conference on "Measurements and Evaluations of Nuclear Data and Decay Heat for Fission Products"

The topical conference was held on March 14, 1984 in the middle of the 24th meeting of the Nuclear Energy Agency Nuclear Data Committee (NEANDC) from March 12 through 16, 1984 in Tokai Research Establishment of JAERI. The proceedings were published as JAERI-M-84-182.

International Symposium on In-Beam Nuclear Spectroscopy

Debrecen, Hungary, May 14-18, 1984

Proceedings (Zs. Dombrádi and T. Fényes, editors) published by Akadémiai Kiadó, Budapest (1984).

Page: Selected papers:

Fifth International Symposium on
Capture Gamma-Ray Spectroscopy and Related Topics

Knoxville, Tennessee, USA, 10-14 September, 1984

Proceedings (S. Raman, editor) published as AIP Conference Proceedings Series (series editor: Hugh C. Wolfe) Nr. 125, American Institute of Physics, New York, 1985.

Page: Selected papers:

Page: Selected papers:

International Conference on Nuclear Data for Basic and Applied Science

Santa Fe, New Mexico, USA, 13-17 May, 1985

Selected papers:

Selected papers:

DB03 Experimental Beta-Decay Energies of Very Neutron-Rich Light and Heavy Fission Products

U. Keyser, F. Muennich, B. Pahlmann, M. Graefenstedt, H.R. Faust and H. Weikard

(see contribution on page 15)

DB04 Application of Evaluated Fission-Product Delayed-Neutron Precursor Data in Reactor Kinetics Calculations

R.T. Perry, W.B. Wilson, T.R. England and M.C. Brady

JA02 The Determination of the Nb-93(n,n')Nb-93m Excitation Function Using Foil Activation

D.B. Gayther, M.F. Murphy, K. Randle, W.H. Taylor and C.A. Uttley

JA05 Measurements of the Short Lived Cumulative Fission Yield of U-235

A.A. Hasan, S. Sahin and C. Chung

JA06 Neutron Radiative Capture and Transmission Measurements of Ba-135, Ba-137 and Ba-138

M. Mizumoto, M. Sugimoto, M. Ohkubo, Y. Nakajima, Y. Furuta and Y. Kawarasaki

(see contribution on page 23)

JA08 Measured Dependence of some effective Cross Sections on Thermal Neutron Temperatures in the Range -195 Degrees C to 300 Degrees C

A. Okazaki and R.T. Jones

(including In-115)

JA12 Reactor Burn-Up Cross Sections of Cr-51,Fe-59,Zn-65,Rb-86 and Ru-103

S. Katcoff

JA13 Average Capture in Sm-149

F. Corvi, A. Brusegan and T. Van der Veen

JA22 Accurate Determination of the Parameters of the 292.4-eV Resonance of Zr-91 and the 301.3-eV Resonance of Zr-96

M.M. Salah, J.A. Harvey, N.W. Hill, A.Z. Hussein and F.G. Perey

JA24 Cross Sections of Fast Neutron Induced Reactions on Molybdenum Isotopes

A. Marcinkowski, K. Stankiewicz, U. Garuska and M. Herman

Paper No.: Selected papers:

JA37 Measurement of High Threshold Activation Cross Sections for 13.5 to 15.0 MeV Neutron

Y. Ikeda, H. Miyade, K. Kawade, H. Yamamoto, K. Oishi, H. Maekawa, T. Katoh and T. Nakamura

(including Zr-90, Nb-93 (n,2n))

JA46 Measurements of 14 MeV Neutron Activation Cross Sections

R. Pepelnik, B. Anders and B.M. Bahal

(including: (n,p) for $^{68,70}Zn$, $^{90,91,92,94}Zr$, $^{110,111,114,116}Cd$;
(n,α) for $^{90,94}Zr$, ^{93}Nb, ^{110}Cd, ^{138}Ba;
(n,2n) for $^{90,96}Zr$, ^{127}I, ^{138}Ba;
(n,n') for ^{111}Cd, ^{136}Ba, ^{137}Ba;
(n,n'α) for ^{93}Nb).

JA57 Shell and Coulomb Effects in Cold Fission Fragments of U-233, U-235 and Pu-239 induced by Thermal Neutrons

M. Montoya

JA59 Post-Neutron Mass Distribution for U-235 (nth,f)

M. Haddad, J. Crancon, Ch. Hamelin, G. Lhospice, M. Asghar and J. Blachot

(see contribution on page 8)

JA63 Characteristics of Triton Acommpanied Fision of Cf-252

H. Han, S. Huang, J. Meng and Z. Bao

JA64 Charge Distribution in Nuclear Fission Taking Into Account Inherent Error of Theoretical Expression

A. Zukeran

JA66 Correlation Between Neutron Emission, Fragment Angle, Mass and Energy in the Spontaneous Fission of Cf-252

C. Budtz-Jorgensen and H.H. Knitter

JA68 Long Range Alpha Particle Associated Neutron Induced Fission of U-235

J. Pannicke, M. Mutterer, J.P. Theobald, P. Heeg, K. Weingaertner, G. Barreau, B. Leroux and F. Goennenwein

JA69 Mass and Kinetic Energy Distribution of Fragments from the Cm-245(n,f) Reaction

P. Koczon, M. Mutterer, J.P. Theobald, M.S. Moore, F. Goennenwein, P. Geltenbort, A. Oed and J. Pannicke

Paper No.: Selected papers:

JA70 Angular Distribution of Polar Light Particles in the Fission of U-235

M.M. Sharma and G.K. Mehta

(see contribution on page 23)

JA72 Absolute Yields of Some Fission Products in the Fast Neutron Induced Fission of Th-232 and U-238

S. Ram, N.L. Singh, S.K. Bose and J. Rama Rao

JA73 Light Nuclei from the Thermal Neutron Induced Fission of U-235

T.P. Doan, G. Barreau, A. Sicre, F. Caitucoli, B. Leroux, J.P. Theobald, M. Mutterer and P. Koszon

JA74 High Resolution Study of U-235(nth,f) and Th-229(nth,f) with Cosi Fan Tutte Mass Spectrometer

A. Sicre, A. Boukellal, G. Barreau, F. Caitucoli, T.P. Doan, B. Leroux, P. Geltenbort, F. Goennenwein, A. Oed and M. Asghar

JA76 Mass-Energy Correlations for Pa-231(n,f), U-235(n,f) and Np-237(n,f) as a Function of Neutron Energy

T. Benfoughal, M. Asghar, B. Leroux, A. Sicre, T.P. Doan, F. Caitucoli and G. Barreau

JA77 Fission Fragment Energy Correlation Measurements for Cf-252(sf)

G. Barreau, A. Sicre, F. Caitucoli, T.P. Doan, B. Leroux, G. Martinez, M. Asghar and T. Benfoughal

JA78 Total Neutron Cross Sections of Molybdenum, Cadmium, and Bismuth

A.B. Popov and G.S. Samosvat

JA79 Differential Elastic Scattering Cross Sections of Cadmium Isotopes and p-Neutron Strength Functions in the Range 50 < A < 130

A.B. Popov and G.S. Samosvat

BB05 Neutron Fission of Th-230 Revisited

J.W. Boldeman and R.L. Walsh

AC01 (n,charged particle) Reaction Cross Sections for FMT-Relevant Materials

S.M. Qaim, R. Woelfle, G. Stoecklin, M.M. Rahman, S. Sudar and A. Suhaimi

(including: (n,p) for Mo-92,95,96,97,98 and (n,α) for Mo-92,98)

Paper No.: Selected papers:

DA02 Beta-Delayed Neutron Spectra for Application in Reactor Technology, Nuclear Physics and Astrophysics

K.L. Kratz

IB03 Integral Test of Fission-Product Cross Sections

H. Gruppelaar, R.J. Heijboer, A.J. Janssen, H.A.J. Van der Kamp, N. Karouby-Cohen, L. Martin-Deidier, G. Rimpault and M. Salvatores

(see contribution on page 51)

JB02 Neutron Resonance Parameters of Sn-122

Y. Nakajima, M. Ohkubo, Y. Furuta, M. Sugimoto and Y. Kawarasaki

(see contribution on page 23)

JB04 Angular-Distribution Neutron-Emission Spectra of Niobium Following Bombardment by 8.4 MeV Neutrons

P.T. Guenther and A.B. Smith

JB27 Preequilibrium Effects in Neutron, Proton and Alpha Emission of Nb-93 Reactions

S.B. Garg

JB34 Evidence of Triaxial Shapes in the Sm-152 Isotope from Low Energy Neutron Inelastic Scattering Studies

J.R. Fernandez and R. Cabezas

JB39 Level Density Shell Effects in Neutron Induced Reactions on Molybdenum Isotopes

M. Ivascu, M. Avrigeanu and V. Avrigeanu

JB42 Delayed Neutron Spectra and Intensities from Evaluated Precursor Data

T.R. England, M.C. Brady, W.B. Wilson, R.E. Schenter and F.M. Mann

(see contribution on pages 54,55)

JB43 Fission-Product Decay Heat for Fast-Neutron Fissions of U-238 and Th-232

M. Akiyama, Y. Oka, S. Kondo and S. An

(see contribution on page 28)

Paper No.: Selected papers:

JB44 Data Reduction and Analysis in Delayed-Neutron Time-of-Flight Studies

C.A. Ciarcia, L.V. Fisteag, R.S. Tanczyn, G.P. Couchell and W.A. Schier

(see contribution on page 37)

JB45 Search for Energy Dependence among Composite Delayed Neutron Spectra of U-235

W.A. Schier, Q. Sharfuddin, G.P. Couchell, L.V. Fisteag, M.H. Haghighi, D.J. Pullen and R.S. Tanczyn

(see contribution on page 37)

JB50 Isomer Yield Ratios for Rb-90 and Cs-138 from Thermal Neutron Fission of U-238

P.L. Reeder, R.A. Warner, H. Wilmes and G.P. Ford

(see contribution on page 36)

JB52 Extended Analysis of Delayed-Neutron Spectra from Fast Fission in U-235

J. Walker, D.R. Weaver and J.G. Owen

(see contribution on pages 33,53)

CB01 A New Calculation of Nuclear Reactor Decay Heat

J. Metzinger and H.V. Klapdor

GC02 A 4-pi Barium-Fluoride Detector for High Precision Measurements of Neutron Capture Cross Sections in the keV Range

K. Wisshak and F. Kaeppeler

(see contribution on pages 13,14)

GC04 Mass Spectrometry of Fission Fragments by Simultaneous Energy and Time-of-Flight Measurements

P. Geltenbort, F. Goennenwein, A. Oed and P. Perrin

JC35 Neutron Resonances in Ce-142

M. Ohkubo, M. Mizumoto, Y. Nakajima, M. Sugimoto, Y. Furuta and Y. Kawarasaki

(see contribution on page 23)

Paper No.: Selected papers:

JC36 Evaluations of FP Cross Section for JENDL-2

T. Aoki, S. Iijima, M. Kawai, Y. Kikuchi, H. Matsunobu, T. Nakagawa, Y. Nakajima, T. Nishigori, M. Sasaki, T. Watanabe, T. Yoshida and A. Zukeran

(see contribution on page 49)

AD02 Fast Neutron Interaction with Niobium

A. Smith, P. Guenther, W. Poenitz, D. Smith, J. Whalen and R. Howerton

BC02 Neutron-Fragment Angular Coorelations in U-235(nth,f)

C.B. Franklyn

BC03 U-235 + n/sub/th Cold Fission Configurations Studies

J. Trochon, G. Simon, J.W. Behrens, F. Brisard and C. Signarbieux

BC04 Fission Fragment Energy Correlations for 13 Actinides Ranging from Th to Cf

F. Caitucoli, M. Asghar, G. Barreau, T.P. Doan, B. Leroux, A. Sicre, P. Perrin and M. Maurel

BC05 Mass and Energy Distribution of Fission Fragments in Cf-249(nth,f)

E. Aker, D. Engelhardt, R. Brissot, P. Geltenbort, F. Goennenwein, A. Oed, J. Gindler, B. Wilkins, G. Barreau and B. Leroux

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