International Atomic Energy Agency

INDC(NDS)-155/G+P

INDC INTERNATIONAL NUCLEAR DATA COMMITTEE

PROGRESS IN FISSION PRODUCT NUCLEAR DATA

No. 10

Information about activities
in the field of measurements and compilations/evaluations
of fission product nuclear data (FPND)

Collected by M. Lammer
Nuclear Data Section
International Atomic Energy Agency

September 1984

IAEA NUCLEAR DATA SECTION, WAGRAMERSTRASSE 5, A-1400 VIENNA

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FOREWORD

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

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 ninth issue of this series has been published in August 1983 as INDC(NDS)-143. The present issue includes contributions which were received by NDS between 1 August 1983 and 5 August 1984.

The next issue of this report series is envisaged to be published in June 1985.

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 65) 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 1985. All scientists who are presently working - or have recently completed work - in the field of FPND and who want to contribute to the 9th issue of this series, are kindly asked to send contributions to me between now and 15 May 1985, so that they reach NDS before 1 June 1985.

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 just carbon- or photocopies. It would be a great help for producing an 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)

1.2. Neutron reaction cross sections (cont'd)

*) gross FP-mixtures

+) several reactions not specified in detail

1.3. Decay data

1.3. Decay data (cont'd)

1.3. Decay data (cont'd)

+) several reactions not specified in detail

1.4. Delayed neutron (del-n) data

1.4. Delayed neutron (del-n) data (cont'd)

1.5. Decay heat

2. COMPILATIONS AND EVALUATIONS

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.

AUSTRALIA

Laboratory and address:	Australian Atomic Energy Commission Research Establishment, Lucas Heights Research Laboratories, Lucas Heights, New South Wales 2234, Australia
Names:	J.W. Boldeman, B.J. Allen, D.W. Lang, R.L. Walsh
Facilities:	3 MeV Van de Graaff accelerator, HIFAR and Moata reactors

---

1. Experiment: Measurement of fast neutron capture γ-ray spectra

   Method: NaI detector and pulsed Van de Graaff accelerator.

   Publications: Fast Neutron Capture γ-Ray Spectra in ^{88}Sr, B.J. Allen and F.Z. Company[d] 4th Int. Symp. Neutron Capture γ-Ray Spectroscopy and Related Topics (1981) Grenoble. Eds. T. von Egidy and F. Gonnenwein, Adam Hilger, p. 398.

   Average Neutron Capture γ-Ray Spectra in ^{139}La and ^{141}Pr, B.J. Allen and F. Z. Company[d] ibid., p. 401.

   Final papers in preparation.

---

2. Experiment: Cumulative yields of stable and long-lived isotopes of tin in neutron induced fission.

   (new) Thermal and epicadium fission of ^{233}U and ^{235}U.

   Epicadium fission of ^{238}U.

   Method: Mass spectrometer; reactor HIFAR.

   Accuracy: 1 to 5% relative.

   Completion date: Completed

   Publication: K.J.R. Rosman[a], J.R. de Laeter[a], J.W. Boldeman and H.G. Thode[b], Can. J. Phys. 61 (1983) 1490.

---

3. Experiment: Relative yields of stable isotopes in symmetric region in neutron induced fission.

   (new) Measurements of ^{233}U, ^{235}U, ^{239}Pu.

   Method: Mass spectrometer; reactor HIFAR.

   Accuracy: 1 to 5% relative.

   Completion date: December 1985

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4. Experiment: ν(A) measurements for ^{252}Cf(sf).

   (new) Analysis of effect of scission neutrons on ν(A) data.

   Method: 32 L liquid scintillator tank, surface barrier detectors.

   Completion date: Completed

   Publication: On the Effect of Scission Neutrons on ν(A) data for ^{252}Cf(sf), R.L. Walsh and J.W. Boldeman. To be published as Note in J. Nucl. Sci. and Eng. (1984).

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5. Experiment: Fragment angular distributions for ^{235}U(n,f).

   Analysis of effect of $K = 2^-$ channel in resonance region.

   Method: Surface barrier detectors.

   Completion date: Completed

   Publication: The $K = 2^-$ Channel in Resonance Neutron Fission of ^{235}U, J.W. Boldeman and A.R. de L. Musgrove. Submitted as Short Communication to Phys. Rev.

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6. Experiment: Subthreshold fission cross section for ^{230}Th(n,f).

   Method: Fast ionization chamber, 3 MV Van de Graaff accelerator.

   Completion date: November 1984

   Publication: Measurement of Subthreshold Fission Cross Section in ^{230}Th(n,f), R.L. Walsh and J.W. Boldeman. 10th Austral. Inst. Nucl. Sci. and Eng. Nucl. Phys. Conf., Canberra, Feb. 1984.

---

7. Experiment: Fragment mass yields for ^{230}Th(n,f).

   Method: Surface barrier detectors, 3 MV Van de Graaff accelerator.

   Completion date: December 1984

   Publication: J.W. Boldeman and R.L. Walsh. 9th Austral. Inst. Nucl. Sci. and Eng. Nucl. Phys. Conf., Feb. 1982.

---

8. Experiment: Mass dependence of pre-fission neutron emission from fission of ^{251}Es. (Collaboration with J.R. Leigh[c] and D.J. Hinde[c]).

   Method: 14 UD pelletron accelerator, 100 MeV ^{19}F incident on ^{232}Th, liquid scintillator, surface barrier detectors.

   Completion date: June 1985

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[a] Western Australian Institute of Technology, South Bentley, W.A.

[b] Dept. of Chemistry, McMaster University, Hamilton, Ontario, Canada

[c] Dept. of Nuclear Physics, Australian National University, Canberra, ACT

[d] University of Wollongong, Wollongong, NSW

BELGIUM

Laboratory and address : : - Nuclear Physics Laboratory
Proeftuinstraat 42
B-9000 Gent, Belgium

Names : H.Thierens, A.De Clercq, E.Jacobs, D.De Frenne, P.D'hondt, P.De Gelder and A.J.Deruytter.

Facilities : Linear Electron Accelerator, Gent
Reactor BR1, SCK/CEN Mol

Experiment : Kinetic energy and fragment mass distributions for ^{240,242,244}Pu sf, ^{239,241}Pu(n_{th},f) and ^{240,242,244}Pu(γ,f).

Method : Measured : photofission yields, fragment kinetic energies ; deduced : $\sigma(\gamma,f)$, kinetic energy- and provisional mass distributions with changing excitation energy of the compound system.

Completion date : ^{239,240}Pu : November 1980
^{241,244}Pu : September 1982
^{242}Pu : February 1983

Publications : -H.Thierens, A.De Clercq, E.Jacobs, D.De Frenne, P.D'hondt, P.De Gelder and A.J.Deruytter, Phys.Rev. C23, 2104 (1981)
-H.Thierens, A.De Clercq, E.Jacobs, M.Piessens, P.D'hondt and D.De Frenne, Phys.Rev. C27, 1117 (1983)
-H.Thierens, E.Jacobs, P.D'hondt, A.De Clercq, M.Piessens and D.De Frenne, Phys.Rev. C29, 498 (1984).

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° 156X, 38042 GRENOBLE, France

Names : : C. Wagemans, P. Schillebeeckx, P. D'Hondt, A. Emsallem, R. Brissot

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) P. D'Hondt et al., Proc. Int. Conf. on Nuclear Data for Science and Technology, Antwerp 1982,p. 147
2) A. Emsallem et al., Z. Phys. A315 (1984) 201.

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° 156X GRENOBLE, France
Names	:	C. Wagemans, P. D'Hondt, P. Schillebeeckx, R. Brissot
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, ^{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., Nucl. Phys. A369 (1981) 1 2) P. D'Hondt et al., Proc. Int. Conf. on Nuclear Data for Science and Technology, Antwerp 1982, p. 147

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, G. Wegener-Penning, 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) E. Allaert et al., Nucl. Phys. A380 (1982) 61 2) E. Allaert et al., Verhandl. DPG VI 18, 1150 (1983) 3) C. Wagemans et al., Phys. Rev. C30 (1984) 218

E.E.C. BELGIUM

Laboratory and address : CEC-JRC, Central Bureau for Nuclear Measurements, Geel, Belgium.

1. Names : H.H. Hansen.

Facilities : Double focusing magnetic β-ray spectrometer.

Experiments : Determination of decay properties of $^{90}Sr/^{90}Y$: endpoint energies of the β-spectra, spectrum shapes and the ratio of the number of β-particles emitted in both decays.

Methods : Recording of the β-ray spectra by scanning with small equa current increments. Separate treatment of the spectra in the energy regions between 550 and 2200 keV (^{90}Y decay) and between 100 and 550 keV (^{90}Sr decay). Shape correction coefficients were deduced from calculations of the spectrum shapes. From the Kurie plots values of the endpoint energies were obtained. After extrapolation of the Kurie plots to energy E = 0, the complete spectra of emitted β-particles have been calculated.

Accuracies : Random and systematic uncertainties have been combined corresponding to a 68 % confidence level : 0.12 and 0.29 % on the endpoint energies of $^{90}Y/^{90}Sr$ β-spectra respectively; 30 and 22 % on the skope correction coefficients of the β-spectrum in the ^{90}Y decay and that in the ^{90}Sr decay, respectively; 1 % was found on the relative intensities of both β-spectra.

Publication : H.H. Hansen, Int. J. Appl. Radiat. Isot., 34 (1983) 1241

E.E.C. BELGIUM (cont'd)

2. Names : H.H. Hansen, D. Mouchel, A. Nylandsted Larsen.

Facilities : Various scintillation detectors in slow and/or fast coincidence arrangements.

Experiments : Determination of half lives of excited nuclear levels in the nanosecond and microsecond region in ^{119}Sn, ^{121}Sb, ^{133}Cs and ^{181}Ta.

Methods : Measurements were carried out using the method of delayed coincidences with a time-to-amplitude converter operated in the start-stop mode. In the nanosecond time range gitter, drift and walk phenomena are serious sources of errors. They have been minimized by a careful time pick-off with fast timing detectors and electronics. In the microsecond time range the ratio of true delayed to chance coincidences influences considerably the final accuracy. A series of measures have been applied to reduce the chance coincidence rate.

Accuracies : Random and systematic uncertainties have been combined corresponding to a 68 % confidence level. The following values were found : 2 % (6.05 μs level at 6.2 keV in ^{181}Ta), 0.4 % (18.03 ns level at 23.9 keV in ^{119}Sn), 0.9 % (3.46 ns level at 37.1 keV in ^{121}Sb), 0.5 % (6.23 ns level at 81.0 keV in ^{133}Cs), 0.5 % (10.67 ns level at 482.2 keV in ^{181}Ta) and 0.8 % (17.64 μs level at 615.3 keV in ^{181}Ta).

Publications : A. Nylandsted Larsen, D. Mouchel and H.H. Hansen, Z. Phys. A294, 191 (1980)
D. Mouchel, A. Nylandsted Larsen and H.H. Hansen, Z. Phys. A300, 85 (1981)

E.E.C. BELGIUM

(cont'd)

H.H. Hansen, D. Mouchel and A. Nylandsted Larsen, Z. Phys. A305, 347 (1982)

D. Mouchel and H.H. Hansen, Int. J. Appl. Radiat. Isot., 34 (1983) 1201.

D. Mouchel and H.H. Hansen, Z. Phys. A315 (1984) 113.

3. Names : H.H. Hansen, D. Mouchel.

Facilities : Double focusing magnetic β-ray spectrometer.

Experiments : Determination of the internal conversion ratio K/LM+ for four pure E2 transitions in the decays of ^{152}Eu and ^{192}Ir.

Methods : Recording of electron spectra by scanning with small equal current increments. Background events and contributions of the continuous β-spectra have been subtracted. The intensities of the different conversion lines have been obtained by adding the counts registered for the various potentiometer readings.

Accuracies : Random and systematic uncertainties have been combined corresponding to a 68 % confidence level : they range between 1.4 and 3.8 %. The agreement between the experimental results and theoretical calculations is very good (within 1 %).

Publication : H.H. Hansen and D. Mouchel, Int. J. Appl. Radiat. Isot., 34 (1983) 1233.

4. Names : H.H. Hansen, D. Mouchel.

Facilities : High energy resolution, detection-efficiency calibrated Si(Li) photon detector.

Experiment : Determination of the K-shell internal conversion coefficient, α_K, for the 37.2 keV transition in ^{121}Sb after β^- decay of ^{121m}Sn.

Method : Photon spectra from thin sources have been measured at various source-detector distances. From the number of emitted X-rays and that of emitted γ-rays values of α_K have been deduced (XPG method). The K-shell fluorescence yield has been taken from the literature.

Accuracies : Random and systematic uncertainties have been combined corresponding to a 68 % confidence level to be 2.8 % on the final result of $\alpha_K = 9.52$.

Publication : H.H. Hansen and D. Mouchel, Z. Phys. A315, 239 (1984).

BULGARIA

Laboratory and address : University of Sofia, Faculty of Physics, Department of Atomic Physics, 1126 Sofia, Bulgaria

1. Names : E. Dobreva, N. Nenoff
M. Iovtshev (Institute for Nuclear Research and Nuclear Energy, Sofia)

Facility : Experimental reactor of the Institute for Nuclear Research and Nuclear Energy

Experiment : Measured yields of ^{131}I, ^{132}I, ^{133}I and ^{134}I for the epicadmium reactor neutron induced fission of ^{238}U. Deduced fractional independent yields for ^{132}I, ^{133}I and ^{134}I; most probable charge for the isobaric chains 132, 133 and 134; yields of precursor nuclides and chain yields for mass 131, 132, 133 and 134 relative to the cumulative yield of ^{135}I.

Method : Radiochemical separation of I, Ge(Li) γ-ray counting. Five independent runs with equal irradiation and different separation time.

Accuracy : Between 5 and 10 % ; 28 % for the lowest yield isotope (^{132}I).

Completion date : November 1979

BULGARIA

(cont'd)

Publications :
1. E. Dobreva, V. Gadjokov, M. Iovtshev, N. Nenoff. Annu. Univ. Sofia 70-71 (1979/80) 1.
2. E. Dobreva, N. Nenoff. J. Radioanal. Nucl. Chem. 81/1 (1984) 29.

2. Names: N. Nenoff et al

Experiment: Determination of 14 MeV neutron reaction cross sections for: $^{162}Dy(n,p)\,^{162}Tb$, $^{174}Yb(n,p)\,^{174}Tm$, $^{176}Yb(n,p)\,^{176}Tm$, $^{176}Yb(n,\alpha)\,^{173}Er$.

Method: Activation technique

Completion date: In progress, only preliminary data obtained.

Publication: Bulg. J. Phys. 10/6 (1983) 601.

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. 1985 November 2. 1987

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) 4πγ ionization chamber 2) 4πβ gas flow proportional counter 3) 4πβ-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:	4πγ 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.

CANADA

Laboratory and address: Nuclear Research Centre
The University of Alberta
Edmonton, Alberta
Canada T6G 2N5

Names: S.T. Lam, L.L. Yu, H.W. Fielding, W.K. Dawson
G.C. Neilson and J.T. Sample

Facilities: Subnano-second pulsed beam derived from 7 MV CN van de Graaff accelerator and Mobley magnet. Monoenergetic neutron beam obtained from $^{3}H(p,n)^{3}He$ and $^{3}H(d,n)^{4}He$ reactions using liquid nitrogen cooled tritium gas cell.

Experiment: Determination of fission-fragment mass distribution and fission-fragment kinetic energy from fast neutron induced fission of ^{238}U and ^{232}Th. E_n = 2.0 - 5.2 MeV in steps of about 0.5 MeV for ^{238}U fission. E_n = 1.6, 3.1 and 5.2 MeV for ^{232}Th fission. Comparison of fission-fragment mass distribution with statistical model calculation. Fission barriers and shell energies deduced.

Method: Fission fragment detected by Ortec surface barrier heavy-ion detector. Time-of-flight technique employed to measure fragment flight time. Fission-fragment mass distribution and correlation of fragment kinetic energy versus fragment mass derived from data.

Accuracy: Fragment mass resolution about 5 u. Fragment energy resolution about 2 MeV. A total of about 5000 fission events collected for each neutron energy.

Completion date: **The measurement programme has been completed.**

Publication: "Fast Neutron Induced Fission of ^{238}U"
S.T. Lam, L.L. Yu, H.W. Fielding, W.K. Dawson
G.C. Neilson and J.T. Sample. Phys. Rev. C22, 2485 (1980).

"Neutron induced Fission of ^{232}Th near threshold"
S.T. Lam et al., Phys. Rev. C28 (1983) 1212.

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 $\sim 2 \times 10^{10}$ 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 $\leq$0.6 keV in energy

Completion date: August 1984

Discrepancies to other reported data:

i) 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" (in preparation).

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. Phys., 3 129 (1983) Bao Zongyu et al., Chin. Jour. Nucl. Phys. (in Chinese), 5 259 (1983)

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:	Li Ze, Liu Conggui, Lu Huijun, Liu Yonghui and Wan Lianbi
Facilities:	130 c.c. Ge(Li) detector coupled with 4K analyzer, 0.3 microgram spontaneous fission source of Cf-252
Experiment:	44 absolute fission yields from spontaneous fission of Cf-252
Method:	Catcher foil technique was used. The activities of fission products were measured by means of a Ge(Li) gamma-ray spectrometer. The number of fission events was determined with low geometry method.
Accuracy:	2.9---22.7 %
Completion date:	March 1982
Publication:	Chinese Journal of Nuclear Physics, 5 226 (1983)

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, Yen Shuhen, Liu Conggui, Chuei Anzhi, Wan Lianbi and Wan Xiuzhi
Facilities:	Heavy-water Research Reactor, Cockcroft-Walton accelerator, 100 microgram Cf-252 neutron source
Experiment:	Determination of fission yields from thermal, fission spectrum and 14.9 MeV neutron induced fission
Method:	Yields determined radiochemically with either beta or gamma counting. Fast neutrons obtained from thermal fission of U-235, spontaneous fission of Cf-252 and D-T reaction, respectively. Fission rate measured absolutely by a double fission chamber.
Accuracy:	2.7---7.0 %
Completion date:	Completed
Publications:	Absolute determination of cumulative yields of several nuclides from thermal and fission spectrum neutron induced fission of U-235, Journal of Nuclear and Radiochemistry (in Chinese), 2 1 (1980) Absolute determination of cumulative yields of several nuclides from 14.9 MeV neutron induced fission of U-238, ibid, 2 193 (1980) Absolute determination of cumulative yields of several nuclides U-235 fission induced by neutrons of Cf-252 spontaneous fission, ibid, 4 44 (1982)

China

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 correspending 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:

$\pm$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 : Service RADIOCHIMIE & PHENOMENOLOGIE
Centre d'Etudes de BRUYERES-LE-CHATEL
BP n° 12 - 92542 MONTROUGE

Names : J. LAUREC, A. ADAM, T. DE BRUYNE

Facilities : LANCELOT 14 MeV neutrons generator (S.E.C.R. - C.E. VALDUC)
Radiochimical Laboratory
Calibrated Ge-Li spectrometers

Experiments : Determination of (n,2n) cross sections for $^{85,87}Rb$, ^{89}Y, ^{93}Nb, ^{103}Rh, ^{107}Ag, $^{140,142}Ce$, ^{169}Tm, ^{175}Lu, $^{185,187}Re$, ^{197}Au at 14,1 and 14,8 Mev incident neutron-energies.

Method : Activation of metallic discs. (Powder for Rubidium).
$^{27}Al\ (n,\alpha)^{24}Na$ cross section was used for standard. The activities were mesured on several Ge-Li spectrometers.

Accuracy : by 5%

Completion : Completed

Publication : CEA Report R 5109
"Mesures des sections efficaces de la réaction (n,2n) des nucléides ^{89}Y, ^{93}Nb, ^{103}Rh, ^{107}Ag, ^{189}Tm, ^{175}Lu et ^{187}Au à 14,1 et 14,8 MeV"
J. LAUREC, A. ADAM, T. DE BRUYNE

- Report in progress for $^{85,87}Rb$, $^{140,142}Ce$ and $^{185,187}Re$.

FRANCE

Laboratory and address : Département de Recherche Fondamentale
Laboratoire de Chimie Physique Nucléaire
Centre d'Etudes Nucléaires de Grenoble
85 X - 38041 GRENOBLE CEDEX - France.

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.

* Collaboration with CSTN, Alger

FRANCE

Laboratory and address:	Institut Laue-Langevin 156X F-38042 Grenoble
Names:	B. Pfeiffer (ILL), U. Stöhlker (II. Physik Giessen/ILL), F. Blönnigen (ILL/II. Physik 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, K.-L. Kratz) and Inst. für Metallphysik 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 thermal surface ionization source (2000 K) for Rb and Cs, 2) a high-temperature ion source (2700 K) for Ga, Rb, Sr, In, Cs, Ba and long-lived rare earth elements and 3) 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 (in collaboration with II. Physik 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). 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 with a new 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. Physik Giessen).
Completion date:	all work is in progress

*) see also contribution on page 23

FRANCE

(cont'd)

Publications:

Annex to the Annual Report ILL 1983, p. 13-20
Verhandl. DPG (VI) 19 (1984) D5.8, D6.1, D6.2, PS6.13, A9.1
B. Pahlmann et al.: Z. Physik A 308 (1982) 345 [1])
H. Gabelmann et al.: Z. Physik A 308 (1982) 359 [2])
K.-L. Kratz et al.: Z. Physik A 312 (1983) 43 [3])
J. Münzel et al.: Z. Physik A 313 (1983) 247 [4])
U. Keyser et al.: Z. Physik A 313 (1983) 251 [5])
B. Pfeiffer et al.: Z. Physik A, in print
K. Becker et al.: Z. Physik A, submitted to

[1]) Q_α-values: $^{84-98}Rb$, $^{142-146}Cs$ (see also page 40 of issue 9)
[2]) P_n-values: $^{97-99}Sr$, $^{97-99}Y$, $^{147,148}Ba$, $^{147,148}La$
[3]) γ-,ce- and delayed neutron spectroscopy: $^{95,97}Rb$
[4]) $T_{1/2}$: ^{100}Sr, ^{100}Y, ^{148}Ba, ^{148}La
[5]) Q_β-value: ^{100}Nb

FRANCE

(same as INDC(NDS)-143)

Laboratories and Adresses :
- Laboratoire de Chimie-Physique et Radiochimie(LCPR) Université de Nice, 06034 Nice Cédex, France
- Institut de Recherches sur les Energies Nouvelles(IREN) Faculté des Sciences, BP 322, Abidjan, Côte d'Ivoire

Names : J. Dalmasso, G. Barci, H. Maria, C. Ardisson, B. Weiss, H. Forest, G. Ardisson (LCPR)
A. Hachem (IREN)

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

Experiments : Measurements of Absolute K-X Transition Probabilities of Fission Products. These quantities are required for quantitative determination of FP activities in environmental samples by the X-Ray spectrometric method (1,2). Accurate determination of I_γ and E_γ in Fission Radionuclides. Decay Schemes.

Method : Very thin sources of radiochemically separated FP nuclides are measured with calibrated coaxial Ge(Li) detectors and planar HPGe detectors (25 and 200 mm^2). The following nuclides are investigated: ^{77}As, ^{95}Zr, $^{108}Ag^{m+g}$, $^{110}Ag^{m+g}$, ^{106}Ru-^{106}Rh, ^{125}Sb, ^{131}I, ^{132}I, ^{137}Cs, ^{140}Ba, ^{140}La, ^{144}Ce-^{144}Pr.

Accuracy : ΔE_γ between 5 to 100 eV, ΔI_γ between 5 to 15%. ΔI_{KX} between 5 to 15% (including error in branching ratios).

Completion date : Expected mid 84

Discrepancies: The new I_γ and E_γ values found for ^{77}As decay are given with better precision than ref(a). For ^{140}La, our $I_\gamma(487) = (45.10 \pm 0.9)\%$ (ref 3) disagree with earlier value of ref (b) i.e. $I_\gamma(487) = (38.1 \pm 0.5)\%$.

Publications :
1/G. Ardisson,G. Barci,J. Dalmasso,H. Maria."Determination of radionuclides in rain water by X-ray spectrometry", European Conference on Analytical Chemistry,Helsinki,(23-28 august 1981).
2/G. Ardisson"Determination of Fission Nuclides in rainwater by X-Ray spectrometry",Trends in Analytical Chemistry,1982, in press.
3/G. Ardisson"Intensités des γ associés à la décroissance de ^{140}La",Nucl. Instr. Methods,151(1978)505.
4/G. Mallet,J. Dalmasso,H. Maria,G. Ardisson,"Contribution à l'étude des états excités de ^{110}Cd peuplés lors de la désintégration de $^{110}Ag^m$",J. Phys.,G,7 (1981) 1259.
5/H. Maria,J. Dalmasso,G. Ardisson,"Sur l'énergie de la transition E1 de $^{108}Ag^m$",Nucl. Instr. Meth. 195 (1982) 621.

References :
a)G. Ardisson, C. Marsol,"Sur la mise en évidence de faibles branches β dans la désintégration de ^{77}As", Can. J. Phys., 49 (1971) 1731.
b)J.T. Harvey,J.L. Meason,J.C. Hogan and H.L. Wright," Gamma-ray intensities for the radioactive decay of Baryum 140 and Lanthanum 140"Nucl. Sci. Eng.,58 (1975) 431.

FRANCE

Laboratories and Adresses:
- Laboratoire de Chimie Physique et Radiochimie,(LCPR) Université de Nice, 06034 Nice Cedex, France.
- Institut de Recherches sur les Energies Nouvelles(IREN) Faculté des Sciences 04 BP 322 ,Abidjan, Côte d'Ivoire.

Names: J. Dalmasso, H. Maria, G. Barci, C.Ardisson-Marsol and G. Ardisson (LCPR)
A. Hachem (IREN)

Facilities: HPGe Planar détector, Ge-Li coaxial detectors 4 K multichannel analysers.

Experiment 1 : Reinvestigation of ^{77}As decay.

Method : ^{77}As nuclide was radiochemically separated from ^{77}Ge. The low energy spectrum of ^{77}As was measured with high resolution HPGe planar detector. Precise energies and intensities of 14 γ lines were obtained by simultaneous calibration with ^{152}Eu and ^{182}Ta sources.
Two unreported photons at 51.34 and 125.84 keV were interpreted as desexciting a $J^\pi = 9/2^+$ level at 175.33keV in ^{77}Se. ^{77}Se K_α and K_β X-ray intensities were also measured.

Accuracy : Within 5 to 15 eV for strong γ rays.

Table:

E_γ (keV)	I_γ (rel)	E_γ (keV)	I_γ (rel)
K_α 11.22 (1)	8.95 (10)	161.932 (10)	9.22 (43)
K_β 12.50 (2)	1.16 (11)	200.47 (2)	0.067(7)
13.4 (1)	0.01	239.011 (6)	100
51.34 (2)	0.045	249.805 (8)	24.8 (10)
62.2 (4)	0.005	270.850 (12)	0.52 (3)
81.15 (2)	0.024	281.642 (8)	3.64 (18)
87.854 (5)	12.7 (7)	439.493 (20)	0.064(7)
125.84 (2)	0.075 (7)	520.654 (15)	35.1 (14)
139.243 (15)	0.618 (43)		

Discrepancy: Good agreement with previous work of Ardisson and Marsol[1]. γ-rays at 167 and 177 keV reported by Cheng e.a.[2] were absent from our spectra. They could belong to ^{77}Ge as it has been reported elsewhere[3].

Publication: J. Dalmasso, H. Maria, G. Barci, G. Ardisson, Radiochimica Acta 33, (1983) 65.

References:

(1) G. Ardisson, C. Marsol, C.J. Phys., 49(1971) 1731.
(2) V.C.K. Cheng , Y.C. Liu, T.S. Heng , Chin.J.Phys. 18 (1980) 83.
(3) B. Singh and D.A. Viggars, Nucl. Data Sheets,29 (1980)75.

FRANCE

(cont'd)

Experiment 2 : Precise measurements of the ^{144}Ce γ lines

Method : Radiochemically separated ^{144}Ce was measured with HPGe detector. The system resolution was better than 180 eV at FeK_α line.
Precise energy of main photon lines were obtained by simultaneous counting runs with ^{57}Co, ^{152}Eu and ^{182}Ta.
A dispersion of 0.048 keV/channel was used in these experiments.

Accuracy : Within 5 to 50 eV for E_γ and 4 to 8 % for relative I_γ

Table :

E_γ (keV)	I_γ	Interpretation
5.012 (50)	5.44	$L_{\alpha_1} + L_{\alpha_2}$
5.486 (50)	5.28	$L_{\beta_1} + L_{\beta_3} + L_{\beta_4}$
5.851 (50)	1.6	$L_{\beta_{2,15}}$
6.297 (50)	0.8	L_{γ_1}
6.594 (50)	0.58	$L_{\gamma_2} + L_{\gamma_3}$
33.568 (10)	1.77	
35.547 (20)	20.0	$K\alpha_2$
36.026	37.0	$K\alpha_1$
40.739 (20)	12.8	$K\beta_1$
40.98 (20)	1.38	
41.778 (10)	2.93	$K\beta_2$
53.402 (5)	0.90	
80.120 (5)	12.25	
99.961 (20)	0.36	
133.515 (5)	100	

Discrepancy: The 59 keV isomeric transition reported by other authors[1] is not found in this experiment .

Publication: J. Dalmasso, H. Maria, A. Hachem, G. Ardisson Nucl. Instr. and Meth. in Phys. Res. 221 A (1984) 546.

References :

1. A. Anttila, M. Piiparinen, Z. Physik, 237 (1970) 126.
B.V.N. Rao, G.N. Rao, J. Phys Soc. Japan, 40, (1976) 1.

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 ($\sim 87\%$ ^{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:

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

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
		21 ± 1	ref. 3
α_K	10.60 ± 0.20	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.

Publication: G. Barci et al. to be published

References :

1. C. M. Lederer, V.S. Shirley, Table of Isotopes, J. Wiley (1978)

FRANCE
(cont'd)

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.

GERMANY, DEM. REP.

Laboratory and address:	Zentralinstitut für Isotopen- und Strahlenforschung, DDR-7050 Leipzig, Permoserstraße 15
Name:	K.-P. Dostal
Facilities:	NaI (Tl) scintillation technique
Experiment:	Precision measurement of the half-life of ^{99m}Tc
Method:	A theoretically deduced time dependence of the nuclear decay rate contains both the dead time of the counting device and the decay constant of the nuclide. This relation provides the basis for a variational approach to the decay constant which takes a linearity measure as a criterion for the qualities of the actual constant and dead time. In doing so generalisation of G. R. Martin's dead time estimation method has been attained.
Accuracy:	$T_{1/2}$ (^{99m}Tc in TcO_4^-) = (6,0070 ± 0,0018) h. Better certainties are not observed;
Completion date:	June 1981
Discrepancies to other reported data:	Large discrepancies to other data are not observed.
Publication:	K.-P. Dostal, Isotopenpraxis, 18 (1982), 201

GERMANY Fed.Rep.

(same as INDC(NDS)-143)

Laboratory and address:

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

Names: P. Fischer, U. Harz, H.G. Priesmeyer

Facility:
Fast Chopper Neutron Time-of-Flight spectrometer, 42 m flightpath in front of beam hole of 5MW FRG-1 reactor. 15 ns/m nominal resolution, special equipment for transmission investigations of highly radioactive samples, 11 Li-6 glass detectors, max. rotorspeed 12000 rpm, min. burst width 0.64 μsec, 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. Possibility of extending energy range to thermal region using crystal spectrometer or neutron guide tubes.

Completed: Final measurements on one of the five gross-fission product samples show time variations useful for isotopic identifications.

Ongoing: Gross-fission product mixtures, comparative measurements; measurements using 24 keV Fe-filter neutrons.

Planned: Transmission experiments on I 129, Krypton isotopes and gross-fission products.

Method:
Sample in beam, sample out-of-beam transmission measurement, black resonance background determination technique.

Accuracy:
For resonance parameters : about 5 % or better, depending on statistical accuracy of transmission points.

Recent publications:

P. Fischer, U. Harz, H.G. Priesmeyer ATKE 38(1), (1981) 63
Neutron Resonance Parameters of ^{99}Tc in the Energy Range 4.5 to 25 eV.

P. Fischer, U. Harz, H.G. Priesmeyer GKSS 81/E/17
Die Energieeichung des IKK Fast-Choppers mit U 238 Standards - Die Resonanzparameter des Iridiums im Energiebereich bis 1.5 eV.

H.G. Priesmeyer, U. Harz, P. Fischer
Neutron Physics Activities at the FRG-I RESEARCH REACTOR
IAEA-SR-77/67 Seminar on Research Reactor Operation and Use, Jülich 1981.

GERMANY, FED. REP.

Laboratory: Kernforschungsanlage Jülich, Institut für Kernphysik, Postfach 1913, D-5170 Jülich 1

Names: K. Shizuma (1980-82 on leave from Hiroshima University, Japan), J.C. Hill (1980/81 on leave from Iowa State University, USA), H. Lawin, M. Shaanan (1980/81 on leave from Technion Haifa, Israel), H.A. Selič, K. Sistemich

Facility: Fission product separator JOSEF at reactor DIDO, Jülich

Experiment: Study of the β decay of ^{102}Y and the level scheme of ^{102}Zr

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

Accuracy: Varying

Completion: Completed

Publication: Phys. Rev. C 27 (1983) 2869.

GERMANY, FED. RFP.

Laboratories: Universität Mainz, Institut für Kernchemie, Postfach 3980 D-6500 Mainz
Gesellschaft für Schwerionenforschung, Postfach 110541, D-6100 Darmstadt
Kernforschungsanlage Jülich, Institut für Kernphysik, Postfach 1913, D-5170 Jülich

Names: K. Shizuma (KFA, 1980-82 on leave of absence from Hiroshima University, Japan), H. Ahrens (GSI), J.P. Bocquet (Université de Grenoble, France), N. Kaffrell (Uni Mainz), B.D. Kern (KFA, 1978 on leave of absence University of Kentucky, USA), H. Lawin (KFA), R.A. Meyer (KFA, 1982/83 on leave of absence from University of California, USA), K. Sistemich (KFA), G. Tittel (Uni Mainz), N. Trautmann (Uni Mainz)

Facilities: Fission product separators LOHENGRIN (High flux reactor, ILL Grenoble, France) and JOSEF (Reactor DIDO, Jülich)

Experiments: Study of the ß decays of ^{103,105}Nb and the level schemes of ^{103,105}Mo

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

Accuracy: Varying

Completion: Completed

Publication: Z. Phys. A - Atoms and Nuclei 315 (1984) 65.

Germany, Fed. Rep.

Laboratories: Universität Mainz, Institut für Kernchemie, Postfach 3980, D-6500 Mainz
Gesellschaft fur Schwerionenforschung, Postfach 110541, D-6100 Darmstadt
Kernforschungsanlage Jülich, Institut für Kernphysik, Postfach 1913, D-5170 Jülich

Names: T. Seo (KFA, 1983, on leave of absence from Kyoto University, Japan), A.-M. Schmitt (Uni Mainz), H. Ahrens (GSI), J.P. Bocquet (Université de Grenoble, France), N. Kaffrell (Uni Mainz), H. Lawin (KFA), G. Lhersonneau (KFA), R.A. Meyer (KFA, 1982/83 on leave of absence from University of California, USA), K. Shizuma (KFA, 1980-82 on leave of absence from Hiroshima University, Japan), K. Sistemich (KFA), G. Tittel (Uni Mainz), N. Trautmann (Uni Mainz)

Facilities: Fission product separators LOHENGRIN (High flux reactor, ILL Grenoble, France) and JOSEF (Reactor DIDO, Jülich)

Experiments: Study of the ß decays of ^{101,103}Zr and the level schemes of ^{101,103}Nb

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

Accuracy: Varying

Completion: Completed

Publication: Part of the results: Z. Phys. A - Atoms and Nuclei 315 (1984) 251, and Annual Report 1983 of the IKP, KFA Jülich

GERMANY, FED. REP.

LABORATORY: Kernforschungszentrum Karlsruhe
Institut für Angewandte Kernphysik

1. NAMES: H. Beer, F. Käppeler

FACILITIES: 1) pulsed 3 MV Van de Graaff, kinematically collimated neutron beam, 25 keV above the $^{7}Li(p,n)$ reaction threshold
2) Ge(Li) detector (rel. efficiency for ^{60}Co: 7 %, energy resolution at 1.33 MeV: 2 keV)

EXPERIMENT. 30 keV capture cross section of ^{124}Xe, ^{132}Xe, ^{134}Xe, $^{152,154}Sm$, $^{152,158}Gd$ and capture cross section of ^{151}Eu to the 9.3 h isomeric state in ^{152}Eu at 48.5 keV

METHOD: activation technique

ACCURACY: 5-10 %

COMPLETION DATE: Summer 1983

PUBLICATIONS: H. Beer, F. Fabbri, F. Käppeler, R.-D. Penzhorn, G. Reffo, R.A. Ward
Annual Report on Nuclear Physics Activities 1980-1982, KfK 3280 (Febr. 1982)

H. Beer, F. Käppeler, G. Reffo, G. Venturini, Astrophysics and Space Science 97 (9183) 95.

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2. 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

GERMANY, FED. REP.
(cont'd)

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 % dependent 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.
publication in progress

Germany, Fed Rep.

(cont'd)

3. 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

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; publication in progress

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)

Germany, Fed.Rep.

(cont'd)

4. Names : G.J.Mathews, F.Käppeler

Facility : 3.75 MV Van de Graaff

Experiment : Measurement of the neutron capture cross sections of $^{142,143,144}Nd$ for $6 < E_n < 250$ keV

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 5 % for energy intervals corrsesponding to the experimental resolution,systematic uncertainties 6 %.

Publication : The Astrophysical Journal (in press)

Discrepancies to other reported data : No discrepancies for $^{142,143}Nd$ but severe discrepancy for ^{144}Nd (compared to Musgrove et al., Proc.Int.Conf. on Neutreon Physics and Nuclear Data, Harwell, p. 438 (1979))

5. 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; publication in progress.

GERMANY, FED. REP.
(cont'd)

6. NAMES: G. WALTER, H. BEER, F. KÄPPELER
(new)

FACILITIES: pulsed 3.75 MV Van de Graaff

EXPERIMENT: capture cross section measurement on ^{80}Se

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

PUBLICATIONS: in progress

GERMANY, FED. REP.

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: Kernspektroskopie, Institut für Metallphysik,
Technische Universität, 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 antineutrinospectrum of a reactor core.

Method: βγ-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 date: 1.) Systematic investigation
2.) end of 1984

Publications: Yellow report CERN 81-09, p. 116
Zeitschrift für Physik A 308 (1982) 345
$^{94-98}Rb$, $^{142-146}Cs$
Z.f. Physik A 313 (1983) 251 : ^{100}Nb

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	I.Winkelmann, Dissertation, Technische Universität München, 1981 accepted by Phys. Rev.

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

Germany, Fed. Rep.

Laboratory and address: II. Physikalisches Institut, Universitaet Giessen Heinrich-Buff-Ring 16, D-6300 Giessen

Names: B. Pfeiffer (ILL), F. Bloennigen (ILL/II. Physik Giessen), J. Muenzel, K. Becker, K.-H. Kobras, G. Bewersdorf, V. Rabbel, W. Lippert, H. Wollnik (II. Physik Giessen), U. Stoehlker (II. Physik Giessen/ILL).

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 three different kinds of ion sources are used to study the products of thermal neutron induced fission of ^{235}U:

1) a thermal surface ionization source (2,000 K) for Rb and Cs,
2) a high-temperature ion source (2,700 K) for Ga, Rb, Sr, In, Cs, Ba and long-lived rare earth elements and
3) a negative ion source for Br and I.

Single gamma-rays, gamma multispectra, gamma-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.
Beta-single and beta-gamma coincidences which were taken with a new 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.

*) see also contribution on page 13

Completion date: All work is in progress.

Publications:
Annex to the Annual Report ILL 1983, p. 13-20
Verhandl. DPG (VI) 19 (1984) D5.8, D6.1, D6.2, PS6.13, A9.1
B. Pfeiffer et al.: Z. Physik A, in print
K. Becker et al.: submitted to Z. Physik A

GERMANY, FED. REP.

1. Laboratory: Institut für 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 $^{235}U(n_{th},f)$ are being 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.

Accuracy: Varying

Completion: Completed

Publications: H.O. Denschlag, H. Braun, W. Faubel, G. Fischbach, H. Meixler, G. Paffrath, W. Pörsch, 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. Pörsch, Dissertation, Mainz (in preparation); W. Ditz, Diplomarbeit, Mainz (in preparation); St. Hörner, Diplomarbeit, Mainz (in preparation).

2. Names: H.O. Denschlag, W. Ditz, U. Guttler, St. Horner, B. Sohnius, P. Stumpf (Universitat Mainz), and H. Faust (ILL, Grenoble)
(new)

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

Experiment: Selected fission yields and isomeric ratios (around A=134 and A=100) from $^{233}U(n_{th},f)$ are being measured at various well defined kinetic energies of the fission fragments

Method: See contribution above (Nr. 1)

Completion: 1985

3. Names: H. Braun, H.O. Denschlag

Facilities: TRIGA Mark II Reactor

Experiment: Yields and decay properties of the fission product chain with mass number A = 133 are being redetermined

Method: Radiochemical and by mass-spectrometry

Completion date: completed

Publications: Jahresbericht 1977 and 1980
Institut für Kernchemie
Universitat Mainz

H, Braun, Dissertation, Mainz 1983,
publication submitted to Radiochimica Acta

GERMANY, FED. REP.

(cont'd)

4. Names: B. Sohnius, H.O. Denschlag

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 are being redetermined relative to long-lived descendents

Method: Fast radiochemical and mass separations

Accuracy: Generally 10%

Completion date: Completed

Publications: B. Sohnius, M. Brügger, H.O. Denschlag in Report NEANDC (E)-232 U Vol. V INDC (Ger.)-24/L (1982) p. 46, and B. Sohnius, B. Pfeiffer, H.O. Denschlag in Report NEANDC (E)-242 U Vol. V INDC (Ger.)-25/L (1983) p. 47

5. Names: (new) H.-H. Meixler, K. Wolfsberg, and H.O. Denschlag

Facilities: TRIGA Mark II Reactor (Mainz)

Experiment: Fractional cumulative yields of isotopes of krypton and xenon in $^{249}Cf(n_{th}, f)$ and $^{250}Cf(sp.f)$

Method: Radiochemical (Emanation of rare gases from a stearate target)

Completion date: Completed

Publication: Can. J. Chem. 61, 665 (1983)

INDIA

Laboratory and Address: Nuclear Physics Division, Bhabha Atomic Research Centre, Trombay, Bombay-400 085, India.

Names: Rekha Govil, S.S. Kapoor, D.M. Nadkarni, S.R.S. Murthy and P.N. Rama Rao.

Facilities: CIRUS Reactor, BARC

Measurements: Measurements of Fragment Mass, Charge and Kinetic Energy Distributions in Thermal Neutron Fission of ^{235}U.

Method: A simultaneous measurement of mass (M), charge (Z) and kinetic energy (E_k) distributions in $^{235}U(n_{th},f)$ has been carried out using a back-to-back ΔE-E detector system. A pair of gridded ionization chambers filled with P-5 gas measured the energy losses ΔE_1, ΔE_2 of the complementary fragments in the gas and the residual fragment energies were measured with a pair of semiconductor detectors. The four parameter data were analysed to obtain fragment charge distributions using the mass momentum relations to obtain M and then using the dependance of ΔE on E/M and Z. The charge resolution was determined at the gas pressures of 40-, 150- and 270- torr and an optimum resolution of FWHM = 2.1±0.1 charge units was obtained at 270 torr. The variances σ_M^2, σ_Z^2 of the fragment mass and charge distributions obtained as a function of E_k at 5 MeV intervals. The results of σ_M^2, σ_Z^2 versus E_k suggest a strong dependance of neutron-proton correlations on the E_k in the nucleon exchange processes which result in the fragment mass and

(cont'd)

charge division.

Results: i) $\bar{M}_L$, $\bar{M}_H$, σ_M^2 versus E_k

ii) σ_z^2 versus E_k

Accuracy: Fragment mass distributions measured with an experimental resolution of FWHM ~ 4 amu. Fragment charge distribution with a resolution of FWHM = 2.1 ± 0.1.

Completion Date: April 1983

Discrepancies to other reported data: σ_M^2, σ_Z^2 versus E_k data reported for the first time. No similar data known to the authors.

Publications: i) "Measurement of Specific Energy Losses of Individual Fission Fragments with a Back-to-Back ΔE-E Detector System" - Rekha Govil, S.S. Kapoor, D.M. Nadkarni, S.R.S. Murthy and P.N. Rama Rao - to be published in Nucl. Instr.Meth.Phys.Res. (1984)

ii) "Measurements of Fragment Mass, Charge and Kinetic Energy Distributions in Thermal Neutron Fission of ^{235}U with a Back-to-Back ΔE-E detector system" - Rekha Govil, S.S. Kapoor, D.M. Nadkarni, S.R.S. Murthy and P.N. Rama Rao

Nucl. Phys. A410 (1983) 458.

LABORATORY AND ADDRESS	Radiochemistry Division Bhabha Atomic Research Centre Trombay, BOMBAY-400 085, INDIA
NAMES	Alok Srivastava, B.K. Srivastava, A.C.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 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
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-400 085, INDIA
NAMES	A.V.R. Reddy, S.B. Manohar, S.N. 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 $^{252}Cf(SF)$, $^{241}Pu(n_{th},f)$, $^{229}Th(n_{th},f)$
METHOD	Independent yields of Iodine Isotopes are determined γ-spectrometrically after performing radiochemical separations
ACCURACY	10 - 12% on the yields
COMPLETION DATE	Yields in the $^{252}Cf(SF)$ were determined. Experimental work in $^{241}Pu(n_{th},f)$ is completed. Work on $^{229}Th(n_{th},f)$ is in progress.
PUBLICATION	Part of work on iodine yields in $^{252}Cf(SF)$ was presented in the Symp. "Nuclear and Radiochemistry" B.H.U, Banaras, India (1981).

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
PUBLICATION	1. 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

Laboratory : Indian Institute of Technology, Kanpur - 208016 INDIA

Names : M.M. Sharma, A.K. Sinha and G.K. Mehta, I.I.T. Kanpur; D.M. Nadkarni, B.A.R.C. Trombay, Bombay

Facilities : 2 MeV Van de Graaff Accelerator

Experiment : Angular Distribution of Polar Light Charged Particles in Thermal Neutron Induced Fission of ^{235}U.

Method : A semiconductor ΔE-E particle telescope is used for particle identification and an ionization chamber used for fragment detection. The ionization chamber separates polar and equatorial light charged particles with the help of a collimator arrangement. Using different collimation for polar LCP region, yields of polar ^{1}H, ^{3}H and ^{4}He particles were measured in thermal neutron induced fission of ^{235}U. Using Monte Carlo simulation for the detection system, $\sigma(\theta)$ for the angular distribution of polar protons, tritons and α's were determined. Angular distribution of polar protons was found to be narrow compared to a wide distribution of polar tritons and alpha particles.

Accuracy : Refer to table

Completion Date: Dec. 1983

Table : The width of the angular distribution of polar LCPs

LCP	σ
Alpha	$(28.0 \pm 7.0)^{o}$
Proton	$(13.0 \pm 6.0)^{o}$
Triton	$(25.0 \pm 15.0)^{o}$

Publications : Unpublished

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 (submitted for publication)

INDIA

Laboratory and Address: Department of Physics, Faculty of Science, Punjabi University, Patiala-147002, India.

Names: K.Singh and H.S.Sahota

Facility: Intrinsic Ge, low energy Si(Li) and large size Ge(Li) detectors.

Experiment: Precision measurement of gamma-ray intensitis and gamma-gamma directional correlations in the decay of ^{125}Sb.

Method: The high resolution precisely calibrated semiconducto detectors were used to measure the intensities of several low energy lines below 200 keV. With the presence of 58, 693 and 729 keV gamma rays as 729→671, 729→36 and 729→0 transitions, the 729 keV level was confirmed. A 642 keV transition was found as $7/2^+ - 1/2^+$ M3 de-excitation. From directional correlation measurements on 204-176, 321-176, 208-428 and 208-463 keV cascades. The spin of 525 keV level was assigned as $7/2^-$ and some M3 content in 426 keV transition, in addition to M1+E2 was found.

Accuracy: Errors are quoted in parentheses.

Completion date: September 1981.

Discrepancies to other reported data: 1) ii) * iii)

Publications:

Raj Mittal, K. Singh and H.S. Sahota, Curr. Sci. (India) 51 (1982) 746.

K. Singh and H.S. Sahota Ind. J. Phys. (Calcutta) 56A (1982) 291.

K. Singh and H.S. Sahota Ind. J. Pure and Appl. Phys. (New Delhi) 21 (1983) 19

*

i) Intensity determinations for weak transitions have been improved

ii) New transitions with energies 20.14, 58.29, 111.36, 642.14, 693.23 and 729.62 keV have been observed.

iii) From coincidence measurements, the anomaly in the characters of 116.95 and 429.88 keV transitions have been removed.

Table-1 Relative gamma-ray intensities in the decay of ^{125}Sb

Energy (keV)	Relative intensity	Energy (keV)	Relative intensity	Energy (keV)	Relative intensity
20.1	0.068(2)	204.1	1.14(4)	463.4	35.50(7)
35.5	14.53(35)	208.0	0.82(2)	497.3	0.015(3)
58.2	0.91(4)	227.9	0.44(2)	600.5	60.50(10)
109.2	0.232(5)	315.1	0.013(2)	606.6	17.2(9)
111.3	0.0042(3)	321.0	1.30(5)	635.8	39.1(22)
116.9	1.060(10)	380.4	6.02(25)	642.1	0.160(9)
172.6	0.86(2)	408.0	0.61(3)	671.4	5.9(3)
176.3	24.5(8)	427.8	100	693.2	0.0015(6)
178.6	0.130(5)	443.4	1.12(5)	729.6	0.0025(7)
198.0	0.081(4)				

ISRAEL

Laboratory and Address: Soreq Nuclear Research Centre
70600, Yavne, Israel.

Names: G. Engler and M.S. Rapaport

Facilities: - 4MW research reactor
- SOLIS isotope separator

Experiment: Independent Fission Yields of Short-Lived Br and I Isotopes in Thermal Neutron Fission of ^{235}U

Method: SOLIS isotope separator operating on-line with 4MW research reactor at Soreq Nuclear Research Centre. Negative surface ionization integrated target-ion source system with ^{235}U targets enriched to 93% and exposed to thermal flux of $5x10^{8}$ n-cm^{-2}s^{-1}. Selective separation of Br and I isotopes.
The measurments consisted of β-scans using a 300 mμ Si surface barrier detector.

Accuracy: 10-20% depending on isotope

Results: Measured independ fission yields of $^{87-91}Br$ and $^{138-141}I$.

Completion date: Completed.

Discrepancies to other reported data: Reosonable agreements with other reported data.

Publication: Z. Phys. A 314 (1983) 59.

JAPAN

Laboratory and Address: Department of Physics, Faculty of Science,
Hiroshima University
1-1-89 Higashi-Sendamachi, Nakaku, Hiroshima 730, Japan

Names: Y. Yoshizawa and Y. Iwata

Facility: Ge(Li) spectrometer

Experiment: Precision measurement of gamma-ray intensities for ^{125}Sb

Method: The Ge(Li) detector was calibrated within uncertainties of 1 % with standard sources and cascade gamma rays in the energy range of 90 to 2750 keV. Relative intensities of gamma rays emitted from the ^{125}Sb nuclide were precisely measured. Gamma-ray intensities per decay were obtained from the relative gamma-ray intensities, theoretical internal conversion coefficients and beta branches. The intensity sum of all transitions feeding and crossing the isomer level at 145 keV of the daughter nucleus ^{125}Te.

Accuracy: For strong gamma rays, Accuracies of relative intensities and intensities per decay are within 1 % and 1.5 %, respectively.

Completion date: April 1982

Descrepancies to other reported data: Large descrepancies to other reported data are not recognized.

Table 1. Gamma-ray intensities for ^{125}Sb.

Gamma-ray energy (keV)	Relative intensity (%)	Intensity per decay (%)	Gamma-ray energy (keV)	Relative intensity (%)	Intensity per decay (%)
109.3	(0.241(24))	(0.071(7))	380.4	5.06(4)	1.500(19)
117.0	0.867(25)	0.257(8)	408.0	0.608(21)	0.180(6)
172.6	0.69(4)	0.205(12)	427.9	100.0(7)	29.6(3)
176.3	22.62(21)	6.70(9)	443.5	0.989(23)	0.293(7)
178.8	0.11(4)	0.032(13)	463.4	35.23(14)	10.44(12)
198.6	0.030(11)	0.009(3)	497.4	0.009(8)	0.0025(23)
204.1	1.08(3)	0.320(11)	600.6	59.54(22)	17.64(20)
208.1	0.788(21)	0.233(7)	606.6	16.94(7)	5.02(6)
227.9	0.433(12)	0.128(4)	635.9	37.87(14)	11.22(13)
321.0	1.391(24)	0.412(8)	671.4	6.039(24)	1.790(21)

Publication: Nucl. Instr. Meth. Phys. Res. 219 (1984) 123

JAPAN

Laboratory: Nuclear Physics II Laboratory
and address: Japan Atomic Energy Research Insitute
Tokai-mura, Naka-gun, Ibaraki-ken, Japan

Names: Y. Furuta, Y. Kawarasaki, M. Mizumoto, Y. Nakajima, M. Ohkubo, M. Sugimoto, S. Tanaka (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 for 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) Samples: Ag-107 and Ag-109 (metallic powder enriched to 98.22 and 99.32 % respectively).

1) Average capture cross section
Energy region: 3.3 to 700 keV
Accuracy: 4 to 7 % (Experimental uncertainties are represented with a covariance matrix)

2) Resonance parameters
Energy region: 1.5 to 7000 eV both for Ag-107 and Ag-109
Completion data: Completed
Publications: M. Mizumoto et al., J. Nucl. Sci. Technol. 20 (1983) 883
M. Mizumoto et al., NEANDC topical meeting 1984 Tokai

(2) Samples: Rb-85 and Rb-87 (RbCl powder enriched to 99.78 and 98.00 %, respectively)
Resonance parameters S0, D0
Rb-85 138 levels, En below 18.5 keV
Rb-87 30 levels, En below 48.6 keV
Completion date: Completed
Publications: M. Ohkubo, Y. Kawarasaki, M. Mizumoto, J. Nucl. Sci. Technol., 21 (1984) 254

(3) Sample: Sn-122 (Oxide powder enriched to 92.20 %)
Resonance parameters up to 30 keV
Completion date: Measurements are completed

JAPAN
(cont'd)

(4) 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.

(5) 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.

(6) 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 100 keV
Completion date: Measurements are completed.

JAPAN

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: see Table I

Table I

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

JAPAN

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

JAPAN

(same as INDC(NDS)-143)

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.
Full report will be published soon.

JAPAN

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, in press.

JAPAN

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) in press.

JAPAN

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

Names : Katsuhei Kobayashi, Itsuro Kimura

Facility : ^{252}Cf source of JAERI

Experiments : Average cross séctions to ^{252}Cf fission neutrons, of $^{24}Mg(n,p)^{24}Na$, $^{27}Al(n,p)^{27}Mg$, $^{32}S(n,p)^{32}P$, $^{51}V(n,p)^{51}Ti$, $^{54}Fe(n,p)^{54}Mn$, $^{56}Fe(n,p)^{56}Mn$, $^{58}Ni(n,p)^{58}Co$, $^{59}Co(n,\alpha)^{56}Mn$, $^{64}Zn(n,p)^{64}Cu$, $^{113}In(n,n')^{113m}In$, $^{115}In(n,n')^{115m}In$, $^{197}Au(n,2n)^{196}Au$, $^{46}Ti(n,p)^{46}Sc$, $^{47}Ti(n,p)^{47}Sc$, $^{48}Ti(n,p)^{48}Sc$, $^{199}Hg(n,n')^{199m}Hg$, $^{51}Cr(n,p)^{51}V$, and $^{204}Pb(n,n')^{204m}Pb$

Method : Gamma-rays (except ^{32}P) from the induced activities were measured with a Ge-Li counter. The average cross section for $^{27}Al(n,\alpha)^{24}Na$ was taken to be 1.006 mb as a reference value and the other values were normalized to it. In evaluation of errors, covariance matrix was taken into account.

Accuracy : 3∿5 %

Completion date : May 1984 (work completed)

Publication : K. Kobayashi et al., J. Nucl. Sci. Technol. Vol. 19 (1982) p. 341.
K. Kobayashi et al., Submitted to the Annu. Reports of the Res. Reactor Inst., Kyoto Univ., Vol. 17 (1984).

Japan

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

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: -decay of ^{151}Nd
angular correlation

Completion data: Experiment completed.
Data processing nearly achieved.

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

JAPAN

Laboratory and address :	Department of Nuclear Engineering, Nagoya University, Furo-cho, Chikusa-ku, Nagoya, 464, Japan
Names :	K. Kawade, K. Mio, T. Ishii, M. Yoshida, H. Yamamoto and T. Katoh (Nagoya Univ.), J. Run (Rikkyo Univ.), K. Okano and Y. Kawase (KURRI)
Facilities :	On-line mass separator (KUR-ISOL) installed at 5 MW Kyoto University Reactor.
Experiment :	Half-life measurements of levels in ^{93}Sr and ^{95}Sr.
Method :	Half-lives of the 213-keV level in ^{93}Sr and the 556-keV level in ^{95}Sr were measured from β-γ delayed coincidence
Accuracy :	Errors are 2.5-6.5 %
Completion date :	April 1983
Publication :	Annu. Rep. Res. Reactor Inst., Kyoto Univ., 16(1983)125.

JAPAN

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, 1983, to be published. M. Akiyama and S. An; JAERI-M 84-010, PP303 (1984).

JAPAN

Laboratory: 1. Department of Physics, Faculty of Scince Yamagata University

2. Division of Physics, Japan Atomic Energy Research Institute

Address: 1. Koshirakawa-cho, Yamagata, 990, Japan

2. Tokai-mura, Naka-gun, Ibaraki, 319-11, Japan

Names: H.Niizeki[1] and T.Tamura[2]

Facilities: 50 Mev Electron linear accelerator (Japan Atomic Energy Research Institute)

Experiments: The level scheme of ^{95}Y has been studied in the β-decay of ^{95}Zr.

Method: Radioactivity ^{95}Y (from $^{96}Zr(\gamma,p)$); measured E_γ, I_γ, I_β deduced log ft. ^{95}Zr deduced levels J,π. Enriched isotope, Ge(Li), anthracene scintillation detectors.

Accuracy: Details given in the publication.

Complation: Completed

Publication: Jour. Phys. Soc. Japan 52 (1983) 3743

SWEDEN

Laboratories:

Department of Nuclear Chemistry
Chalmers University of Technology
S-412 96 Göteborg
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Institut für Kernchemie
Johannes Gutenberg Universität
Postfach 3980
D-6500 Mainz
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Department of Nuclear Chemistry
University of Oslo
Blindern, Oslo 3
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, H. Tetzlaff and N. Trautmann (Mainz)
J. Alstad (Oslo)
M. Fowler (Los Alamos)

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

Experiments: Half-life determinations, Y-singles, Y-Y coincidence and Y-Y angular 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 address. 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: K. Aleklett, P. Hoff, E. Lund and G. Rudstam.

Experiment (same as INDC(NDS)-143) Characterization of and P_n values for delayed neutron precursors of yttrium and lanthanides[1)]

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. Separation of fluoride ions with CF_4 addition to the ion source.

1) ^{147}La, $^{147,149}Ce$, $^{147,149}Pr$

Completion date: Indefinite for the P_n studies as such.

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

Experiment Total beta decay energies and atomic masses.

Method: Beta particles were recorded in coincidence with gamma rays depopulating known levels in the daughter nucleus. The end-point energies of the beta-spectra were determined, and by adding the level energy the total beta-decay energies were obtained.

The beta-particles were 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. Sangariyavanish, 'Total beta decay energies of neutron rich Zinc isotopes, A=75-80', contribution to the 7th AMCO conference at Darmstadt, 3-7 Sept. 1984

3. Names: P. Aagaard, E. Lund, G. Rudstam and H-U Zwicky.

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 efficiency, 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.

Completion date: 1984.

4. Names: P. Aagaard, E. Lund, G. Rudstam and J. Eriksen.
(same as INDC(NDS)-143)

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 measurement of the gamma and beta activities. Well calibrated detectors have been used, a Ge(Li) detector for the determination of the intensities of certain gamma transitions and a plastic scintillator for determination of the beta activity.

Completion date: 1984.

5. Names: K. Aleklett, B. Fogelberg, P. Hoff, E. Lund and A. Sangariyavanish

Experiment: Nuclear spectroscopic studies of the decays of $^{75,77,79,80}Zn$ and $^{139,140}I$. The studies aim at level scheme determinations to be combined with the Q_β-studies.

Completion date: 1985.

Publication: E. Lund, K. Aleklett, P. Hoff, decay schemes and total decay energies of ^{139}I and ^{140}I (to be published 1984)

6. Names: B. Fogelberg, P. Hoff and E Lund.

Experiment: Nuclear spectroscopic studies of the decays of $^{113,114,115}Ag$. The studies aim at level scheme determinations to be combined with the Q_β-studies.

Publication: E. Lund and B. Fogelberg, 'The Q-value and decay properties of ^{114}Ag', Z. Phys. A 315 (1984) 295.

7. Names: B. Fogelberg, P. Hoff and G. Skarnemark.

Experiment: Nuclear spectroscopic studies of fission product nuclei. The energy levels and transition probabilities between these are studied. Recent studies include levels populated in the decays of ^{131}In, ^{133}Sn and ^{149,150}Ce.

Publications: S. Raman, B. Fogelberg, J.A.Harvey, R.L. Macklin, P.H. Stelson, A. Schröder and K.-L. Kratz, Overlapping beta-decay and resonance neutron spectroscopy of levels in ^{87}Kr, Phys. Rev. C 28 (1983) 602.

J. Blomqvist, A. Kerek and B. Fogelberg, 'The single proton nucleus ^{133}Sb', Z. Phys. A 314 (1983) 199.

B. Fogelberg and J. Blomqvist, 'Identification of the complete set of single-hole states in ^{131}Sn', Phys. Lett. B 137 (1984) 20.

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 accelerator, Ge(Li) spectrometers, proton recoil telescope, long-counters.

Results:

Measurements in the neutron energy range 2-4.5 MeV for the nuclei ^{115}In and ^{197}Au.

Publications:

P. Andersson, R. Zorro and I. Bergqvist, Nuclear Physics Reports LUNFD6/(NFFR)/1-26/(1982).

Work in progress:

Measurements for ^{115}In and ^{197}Au in the neutron energy range 4.5-7.6 MeV have been concluded. The results are currently being prepared for publication.

Address:

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

Contact:

P. Andersson.

TURKEY

Laboratory and address: M.E.T.U. Chemistry Department -Ankara, TURKEY

Names : L.Toppare, H.N.Erten and N.K.Aras

Facilities : A 1 μg ^{252}Cf source electroplated on a nickel backing.
Ge (Li) detectors and multi-channel analyzer.

Experiment: Yields of products in the spontaneous fission of ^{252}Cf

Method : Direct γ-ray spectroscopy technique.

Accuracy : Between 5-10 %.

Completion Date : 1982

Descrepancies to other

Reported data : No fine structure as reported for thermal neatron fission of ^{235}U and ^{239}Pu was observed.

Publications : L.Toppare, H.N.Erten and N.K.Aras
Can.J.Chem. 61, 649 (1983).

UNITED KINGDOM

Laboratory and Address:	AERE, Harwell	UKAEA, AERE, Harwell, Oxfordshire OX11 ORA U.K.
Names:	J. G. Cuninghame, H. E. Sims	
Facilities:	ZEBRA - BIZET	
Experiment:	To measure the effect of change of reactor neutron spectrum on fission yields.	
Method:	Four irradiations, each of two ^{235}U, two ^{238}U and two ^{239}Pu metal beads of approx. 100mg. weight have been made; two were in the inner breeder island and two in the outer core. One of the samples of each of the fissile materials was counted directly on a calibrated Ge(Li) detector, while the other was dissolved and used to prepare purified samples of certain fission products of very low yield, viz. As, Ag, Cd, Sn, Sb and Rare Earths. Final results have now been obtained which give complete fission yield curves for fission of ^{235}U in both the inner and outer core positions of a "conventional" fast reactor core arrangement. They show that there is no significant change in fission yields between the two core positions, even though the neutron spectrum in the outer position is much softer than that in the inner. Final calculations of the other 10 fission yield curves are now in progress.	
Accuracy:	Expected ± 10%	
Completion date:	Held up for lack of effort - no completion date available.	

UNITED KINGDOM

Laboratory and Address: AERE, Harwell — UKAEA, AERE, Harwell, Oxfordshire OX11 ORA U.K.

Names: J.G. Cuninghame, H.E. Sims

Facilities: Variable Energy Cyclotron
Helium jet recoil transport system.

Experiment: Decay scheme studies on short-lived fission products.

Method: Generate fission products by cyclotron irradiation, cluster with potassium chloride, and transport by helium jet to detection system for decay scheme study and analysis.
Fast automatic chemistry apparatus to be developed for rapid chemical separations of fission products from helium jet.

Completion date:
1. He jet setting up and testing completed.
2. Fast chemistry equipment operational by mid-1985.
3. First results from fission products end 1985.

UNITED KINGDOM (same as INDC(NDS)-143)

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 have been made by this and two other European Laboratories* using sources prepared from samples of the same solution, the latter having been distributed by NPL on behalf of the International Committee for Radionuclide Metrology (ICRM). Preliminary analysis of the data suggests good agreement on the end point energies (preliminary NPL values 2279.7 ± 1.6, 545.8 ± 0.7 keV) but some variation in shape factor and intensity ratio.	
Accuracy:	The final uncertainties on the end point energies are expected to be within ± 1 keV.	
Completion date:	It is hoped to make further measurements and to complete this work by mid 1985.	

* Central Bureau for Nuclear Measurements, Geel (see also INDC(NDS)-143/GP and H H Hansen, Int. J. Appl. Radiat. Isot. 34 (1983) 1241)

and

Technische Hogeschool, Delft

UNITED KINGDOM

Laboratory and address:	Birmingham Radiation Centre	University of Birmingham P.O. Box 363 Birmingham B15 2TT United Kingdom
Names:	J.G. Owen, J. Walker, D.R. Weaver	
Facilities:	3MV Dynamitron accelerator (Birmingham) and the Tandem Van de Graaff and IBIS (Harwell)	
Experiments:	Delayed neutron spectrum measurements following monoenergetic 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 give near-equilibrium contributions from all delayed neutron groups.	
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.	

UNITED KINGDOM

LABORATORY AND ADDRESS	Physics Division, University of Sussex, Brighton BN1 9QH, East Sussex, England
NAMES	W D Hamilton, B More, S A Hamada, A R H Subber, B Pfeiffer (ILL Grenoble), F Hoyler (ILL Grenoble)
FACILITIES	HDR, ILL Grenoble, mass separator OSTIS, γ-$\gamma(\theta)$ correlations, Ge(Li) detectors
EXPERIMENT	The determination of level schemes from coincidence measurements and the energy and intensity of decaying transitions. Measurements of γ-γ directional correlations and the assignment of level spins and parities and the determination of the multipolarities and multipole mixing ratios of linking transitions. $^{92,94,95}Sr$, ^{96}Y, ^{124}Cd, ^{132}I, ^{132}Xe, $^{140,142,144,146}Ba$, $^{140,142,144,146}Ce$, $^{144,146}Nd$, ^{154}Sm, ^{156}Gd.
METHOD	The on-line mass separator OSTIS is used to select fission products of ^{235}U. γ-γ correlation measurements may be made directly on the collected activity or indirectly when a tape transport system carries the activity to a remote measuring point. By selecting the counting times, the activity due to a particular isotope in the decay chain may be enhanced. Directional correlation measurements are also made following neutron capture by stable isotopes to yield detailed data on final members of the decay chains.
ACCURACY	Energy and intensity measurements are limited by calibration source precision and statistics to typically 0.2 keV and 2% respectively. Most populated levels lying below about 2.5 MeV have unambiguous spin assignments.
COMPLETION DATE	Work in progress.
DISCREPANCIES TO OTHER REPORTED DATA	Levels additional to those found in early ARC experiments have been identified in ^{124}Te and $^{144,146}Nd$.
PUBLICATIONS	Levels and transitions in $^{142,144}Ce$ populated following the β-decay of $^{142,144}La$, E Michelakakis, W D Hamilton, P Hungerford, G Jung, P Pfeiffer, S M Scott, J Phys G8 (1982) 111
	Gamma-gamma directional correlations in ^{146}Nd, D M Snelling and W D Hamilton, J Phys G9 (1983) 111
	Gamma-gamma directional correlations in ^{144}Nd, D M Snelling and W D Hamilton, J Phys G9 (1983) 763
	Are primary γ-ray intensities in ARC measurements a reliable basis for level identification and spin-parity assignment W D Hamilton, S J Robinson, D M Snelling, J Phys G (1983) L13

U.S.A.

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

Names: Z. Berant, John C. Hill, M.E. Nieland, J.A. Winger, F.K. Wohn, A. Wolf, H. Yamamoto (Berant and Wolf supported jointly by Ames and BNL.)

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: ^{83}Ge, ^{97}Y, ^{99}Rb, ^{99}Sr, ^{100}Y, ^{101}Sr, ^{101}Y, ^{124}Ag, ^{135}Te, $^{142,144,146}Ba$, $^{146m,g}La$, ^{148}Ba, ^{148}Ce, ^{150}Ce, ^{150}Pr, ^{152}Pr, ^{152}Ce.

Methods: state-of-the-art β and γ spectroscopy: β and γ singles, γ multiscaling, $\beta\gamma$ and $\gamma\gamma t$ coincidences, $\gamma\gamma t$ 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%, β energies to < 100 keV, half-lives to 2-10%.

Completion date: published since January 1983: listed below.
nearing completion: decays of ^{99}Rb, $^{97,99,100}Y$, ^{135}Te, $^{146m,g}La$, ^{150}Pr
data analysis in progress: decays of ^{83}Ge, ^{101}Sr, ^{101}Y, ^{150}Ce

Publications:†

1. "Rotational Structure and Nilsson Orbitals for Highly Deformed Odd-A Nuclei in the A~100 Region," Wohn, Hill, Petry, Dejbakhsh, Berant and Gill, Phys. Rev. Lett. 51, 873 (1983).

2. "Magnetic Moments of 2^+ States as a Probe of the Effective Proton Boson Number near the Z=64 Subshell," Wolf, Berant, Warner, Gill, Shmid, Chrien, Peaslee, Yamamoto, Hill, Wohn, Chung and Walters, Phys. Lett. 123B, 165 (1983).

3. "Parabolic Energy Dependence of Odd-Odd Multiplets in N=83 Nuclides," Walters, Chung, Brenner, Aprahamian, Gill, Chrien, Shmid, Wolf and Yuan, Phys. Lett. 125B, 351 (1983).

4. "Levels in ^{148}Ce from the Decay of Mass-separated ^{148}La," Gill, Shmid, Chrien, Chu, Wolf, Brenner, Sistemich, Wohn, Yamamoto, Chung and Walters, Phys. Rev. C 27, 1732 (1983).

5. "Decay of Neutron-rich ^{152}Pr and ^{152}Ce," Hill, Yamamoto and Wolf, Phys. Rev. C 27, 2857 (1983).

6. "Levels in ^{102}Zr Populated in the Decay of ^{102}Y," Shizuma, Hill, Lawin, Shaanan, Selic and Sistemich, Phys. Rev. C 27, 2869 (1983).

7. "Gamma-Gamma Angular Correlation Studies for ^{142}Ce," Wolf, Chung, Walters, Gill, Shmid, Chrien and Peaslee, Phys. Rev. C 28, 352 (1983).

8. "A 4-Detector System for Gamma-Gamma Angular Correlation Studies," Wolf, Chung, Walters, Peaslee, Gill, Shmid, Manzella, Meier, Stelts, Liou, Chrien and Brenner, Nucl. Instrum. and Meth. 206, 397 (1983).

9. "Decay of ^{142}Ba to Levels of Odd-Odd ^{142}La," Chung, Walters, Brenner, Aprahamian, Gill, Shmid, Chrien, Yuan, Wolf and Berant, Phys. Rev. C 28, 2099 (1983).

10. "Decay of 0.61-s ^{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).

11. "Identification and Decay of ^{124}Ag," Hill, Wohn, Berant, Gill, Chrien, Chung and Aprahamian, Phys. Rev. C 29, 1078 (1984).

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

BNL: R.E. Chrien, Y.Y. Chu, R.L. Gill, H.I. Liou, H. Mach, V. Manzella, E. Meier, G. Peaslee, A. Piotrowsky, M. Shmid, M.L. Stelts, D.D. Warner, L.-J. Yuan.
Clark University: A. Aprahamian, D.S. Brenner, M.K. Martel
KFA Jülich: K. Sistemich
University of Maryland: N.K. Aras, C. Chung, W.B. Walters
University of Oklahoma: H. Dejbakhsh, R.F. Petry

Laboratory and address:

Argonne National Laboratory
9700 South Cass Avenue
Argonne, Illinois 60439 U.S.A.

Research:

Neutron total, elastic, and inelastic scattering cross sections of light-mass fission products (Z=39-52). *)

Authors:

A. B. Smith, P. T. Guenther, and J. F. Whalen.

Facilities:

Argonne FNG (Fast-Neutron Generator), 10-angle Time-of-Flight Facility.

Status:

Results to 4.0 MeV have been completed and formally published (see publication 10, below). Measurements are continuing over the energy range 4-10 MeV. A comprehensive evaluation of niobium is in progress.

Publications:

1. A. Smith, P. Guenther and J. Whalen, ANL/NDM-70 (1982).
2. A. Smith, P. Guenther and J. Whalen, ANL/NDM-76 (1982).
3. A. Smith, P. Guenther and J. Whalen, ANL/NDM-68 (1982).
4. A. Smith, P. Guenther and J. Whalen, ANL/NDM-71 (1982).
5. A. Smith and P. Guenther ANL/NDM-66 (1982).
6. A. Smith and P. Guenther ANL/NDM-72 (1982).
7. A. Smith, P. Guenther and J. Whalen, ANL/NDM-78 (1982).
8. C. Budtz-Jørgensen, P. Guenther and A. Smith, ANL/NDM-73 (1982).
9. A. Smith, P. Guenther and J. Whalen, ANL/NDM-75 (1982).
10. A. Smith, P. Guenther and J. Whalen, Nucl. Phys. A415 1 (1984). *)

*) Y,Zr,Nb,Mo,Rh,Pd,Ag,Cd,In,Sn,Sb.

U.S.A.

Laboratory and address:

Argonne National Laboratory
9700 South Cass Avenue
Argonne, Illinois 60439, U.S.A.

Research:

Fast-neutron total, elastic scattering and inelastic gamma-ray production cross sections are measured in the low-MeV energy range. Results are analyzed using the optical-statistical model.

Authors:

A. B. Smith, P. T. Guenther, J. F. Whalen, I. J. van Heerden* and W. R. McMurray**.

Facilities:

Argonne: FNG accelerator, total cross section apparatus, 10-angle time-of-flight apparatus.

National Accelerator Center, Faure, South Africa: 6 MV Van de Graaff accelerator, Gamma-ray facility.

Status:

Broad-resolution neutron total cross sections of elemental indium were measured from 0.8 to 4.5 MeV at intervals of $\lesssim$ 50 keV. Differential neutron-elastic-scattering cross sections were measured from 1.5 to 3.8 MeV at intervals of $\lesssim$ 50 to 100 keV and at 10 to 20 scattering angles distributed between $\sim$20 and 160 degrees. (n;n',γ) measurements were made for neutron energies from 0.86 to 2.4 MeV at intervals of $\approx$ 100 keV, and at a gamma-ray emission angle of 55 degrees. The gamma-ray results were associated with the excitation of 36 levels in indium and were used to deduce the inelastic-neutron-scattering cross sections for levels to excitation energies of $\approx$ 1.9 MeV. The experimental results are discussed in terms of the optical-statistical model and of the characteristics of the excited levels of indium. A journal article summarizing this work is in preparation.

Publications:

None

* University of Western Cape, Bellville 7530, South Africa

**National Accelerator Center, Faure 7130, South Africa

Laboratory and address:

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

1. Names: R. C. Greenwood, R. A. Anderl, R. G. Helmer, C. W. Reich

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

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

2. Names: R. G. Helmer

   Experiment: Precise γ-ray intensity measurements to determine γ-emission probabilities.

   Facility: γ-ray spectrometers using Ge detectors.

   Methods: Determination of γ-ray emission rates from measured γ spectra and sample decay rates.

   Publications: R. G. Helmer, "Variation of Ge-Detector Efficiency with Source Diameter and Radial Source Position," Int. J. Appl. Radiat. Isot. 34, 1105 (1983).

   R. G. Helmer, "Precise Efficiency Calibration of Ge Semiconductor Detectors for 30-2800 keV γ-rays," report EGG-PHYS-5735 (November 1983).

U.S.A.

LABORATORY

Lawrence Livermore National Laboratory
University of California
P.O. Box 808
Livermore, CA 94550, U.S.A.

NAMES

D. R. Nethaway
F. F. Momyer
C. F. Smith
N. A. Bonner

FACILITIES

Livermore RTNS-2 Accelerator (D-T Neutrons)

FLATTOP Critical Assembly(^{235}U and ^{239}Pu), Los Alamos National Laboratory

EXPERIMENT

Measure fission yields of rare gases, especially 10.7-y ^{85}Kr, for fission of ^{235}U, ^{238}U, and ^{239}Pu induced by fission-spectrum and 14-15 MeV neutrons. Several rare-earth yields will also be measured, such as ^{156}Eu and ^{161}Tb.

METHOD

Measurements will be made by separating and counting the gaseous products from the dissolved target. Other products will be measured by direct Ge(Li) counting of an aliquot of the solution, and by chemically separating and counting various rare-earth products. Fission yields will be measured relative to known yields of products such as ^{95}Zr, ^{99}Mo, and ^{147}Nd. We plan to have about 10^{14} fissions in each target of uranium or plutonium. The relative fission yields will be measured with an accuracy of about 2-5%.

COMPLETION DATE

We have finished several irradiations so far: ^{235}U, ^{238}U, and ^{239}Pu with fission-spectrum neutrons (two irradiations), and ^{235}U at 14.3 and 14.7 MeV, ^{238}U at 14.4 MeV, and ^{239}Pu at 14.8 MeV. We plan to have two more irradiations this year: ^{238}U at 14.8 MeV and ^{239}Pu at 14.4 MeV, and then prepare reports on the results.

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; Analysis and Report 1985-6

Publications:

R.L. Macklin, "Fission Product ^{129}I and Natural ^{127}I Neutron Capture Cross Sections and Resonances", Nucl. Sci. Eng. 85, 350 (1983)

S. Raman, B. Fogelberg, J.A. Harvey, R.L. Macklin, P.H. Stelson, A. Schröder, and K.-L. Kratz, "Overlapping β Decay and Resonance Neutron Spectroscopy of Levels in ^{87}Kr", Phys. Rev. C 28, 602 (1983)

H. Beer, G. Walter, R. L. Macklin, F. 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 (accepted) (1984)

R. L. Macklin, "Neutron Capture Measurements on Fission-Product Palladium-107," Nucl. Sci. Eng. (submitted) (1984)

*^{151,153}Eu (data sent to BNL-Sigma Center), ^{93}Zr

U.S.A.

Laboratory and Address: Oak Ridge National Laboratory
P. O. Box X, Building 6010
Oak Ridge, Tennessee 37831, USA

1. Names: L. D. Merriman, J. K. Dickens, and J. W. McConnell

Facilities: Fast Rabbit Transport Station of the Oak Ridge Research Reactor (ORR)

Experiment: (new)
Absolute yields of 12 fission products having half-lives between 4.2 min and 84 min, representing 12 mass chains created by thermal-neutron fission of a sample enriched in the isotope ^{243}Cm have been determined.

Method: A 0.077 μgram sample of ^{243}Cm (in the form of curium nitrate) was irradiated for 180 sec by thermal neutrons. Unseparated fission-product γ-ray spectra were obtained between 11 min and 21 hrs after the end of the irradiation.

Accuracy: Relative 1σ uncertainties are between 5 and 15%. Absolute uncertainties have not yet been determined.

Completion date: This part, January 1984. Completion of the total data reduction is anticipated by December 1984.

Discrepancies: The data are in reasonable agreement with prior ^{243}Cm(n,f) fission-product yields reported by David G. Breederland, "Fission Product Yields for Thermal-Neutron Fission of Curium-243," ORNL/TM-8168 (1982).

Publication: L. Douglas Merriman, "Fission-Product Yields for Thermal-Neutron Fission of ^{243}Cm Determined with a High-Resolution Low-Energy Germanium Gamma-Ray Detector," ORNL/TM-9049 (1984).

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2. Names: D. G. Breederland, J. K. Dickens, and J. W. McConnell

Facilities: Fast Rabbit Transport Station of the High Flux Isotope Reactor (HFIR)

Experiment: (same as INDC(NDS)-143)
Absolute yields of 23 fission products having half-lives between 6 hr and 65 days, representing 16 mass chains created by thermal-neutron fission of a sample enriched in the isotope ^{243}Cm have been determined.

Method: A 0.077 μgram sample of ^{243}Cm (in the form of curium nitrate) was irradiated for 150 sec by thermal neutrons. Unseparated fission-product γ-ray spectra were obtained between 22 hrs and 79 days after the end of the irradiation.

Accuracy: Relative 1σ uncertainties are between 1 and 25%. Absolute uncertainties have not yet been determined.

Completion date: First part, December 1981. Completion of the total data reduction is anticipated by December 1983.

Discrepancies: There are no prior measurements for ^{243}Cm(n,f) fission-product yields.

Publication: David G. Breederland, "Fission Product Yields for Thermal-Neutron Fission of Curium-243," ORNL/TM-8168 (1982).

U. S. A.

Laboratory and Address:

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

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 235U by use of an on-line mass spectrometric technique. A short burst of neutrons from the TRIGA reactor is used to produce various isomers of Br, Rb, In, I, and Cs fission products within the surface ionization source. Selective ionization performs the rapid chemical separations and magnetic analysis performs the mass separation to give the desired nuclides as a beam of ions. For 90Rb and 138Cs the half-lives of the isomers are long enough so that samples can be collected and the beta counting done off-line in a low-background environment. Preliminary data gives an independent isomer yield ratio for 90Rb which is more than twice the estimated value [1].

[1] D. Madlund and T. England, Nucl. Sci. Eng., 64, 859 (1977).

Accuracy:

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

Completion Date:

Work is continuing.

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 containing 3 rings of counter tubes. 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 97-99, Ba and La precursors at masses 146-148, Ag precursors at masses 121-124, and In precursors at masses 127-130. 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 $P_n i$ 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%.

Discrepancies:

P_n values for Sr, Y, Ba, and La precursors at masses 97-99 and 146-148 are found to be very small (<1%).

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).

U.S.A.

Laboratory and Address:	University of Lowell Lowell, Mass. 01854
Names:	G. Couchell, W. Schier
Facilities:	5.5-MV Van de Craaff, 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; initially for U235 and Pu239.
Method:	Beta-neutron time-of-flight method using helium jet and tape transport system together with Pilot U plastic and Li6-glass scintillators. Reactor neutrons are used for thermal fission, accelerator neutrons for fast fission.
Status:	Composite spectra were measured with Pilot U plastic scintillators for eight delay times ranging from 0.17 to 85.5s following thermal fission of U235. In progress: Li6-glass measurements for the same eight time intervals; together with the Pilot U studies, each delayed-neutron spectrum spans an energy range, 0.01 to 2.0 MeV. During the year the same studies will be conducted following fast neutron fission of U235.

U.S.A.

Laboratory and address	Washington University, Department of Chemistry, St. Louis, MO 63130 U.S.A.
Names	A.C. Wahl, T.M. 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 tin and indium fission products for A = 121, 123, 125, 127, and 128 have been determined (Ref. 1), and data from measurements for yields of ^{121}Ag, ^{121}Cd, ^{121}In are now being analyzed. 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	Measurements are complete, and publication is planned for 1984 and 1985.
Publications	1. T.M. Semkow, A.C. Wahl, and L. Robinson, Phys. Rev. C (submitted, 1984). 2. 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). 3. E.N. Vine and A.C. Wahl, "Fractional Independent Yields of ^{104}Tc and ^{105}Tc from Thermal-Neutron-Induced Fission of ^{235}U and ^{239}Pu," J. inorg. nucl. Chem. 43, 877 (1981). 4. M.M. Fowler and A.C. Wahl, "Yields and Genetic Histories of ^{128}Sb, ^{129}Sb, and ^{130}Sb from Thermal-Neutron-Induced Fission of ^{235}U," J. inorg. nucl. Chem. 36, 1201 (1974). 5. B.R. Erdal, A.C. Wahl, and R.L. Ferguson, "Modes of Formation of Tin Fission Products," J. inorg. nucl. Chem. 33, 2763 (1971).

USSR

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. Koldoboskij, Yu. F. Koleganov, V.M. Kolobaskhin, 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)

2. Names: A.N. Gudkov, V.M. Zhivun, A.V. Zvonarev, A.F. Zolotov, A.B. Koldoboskij, Yu. F. Koleganov, V.M. Kolobaskhin, 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)

3. Names:	A.N. Davletshin, V.M. Zhivun, V.V. Kovalenko, A.B. Koldoboskij, V.M. Kolobaskhin, 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., "Eperimental 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 : 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.

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.

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 and 110.

Purpose : to give a critical survey of all available information concerning A = 102, 103, 105 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 1983
110 : October 1982

Computer file of evaluated data : ENSDF

Completion date : 102 : March 1982
103 : September 1984
105 : probably end of 1984
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).

China

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

Name: Wang Dao, Yang Yan, Ma Lizhen, Cui Anzhi, Jiang Jian, Yang Xiaobo, Chen Maoquan, Tang Funan, Chang Zhiyong

Compilation and Evaluation:

The experimental data of fission product yields are being compiled and evaluated for neutron induced fission processes (neutron energies up to 15 Mev)

Purpose:

To provide the evaluated FPY's data for CENDL

Source:

The open literature

Deadline:

Ongoing. For current version (Version 3, revised),Cut-off date is approximately June,1979.

Status:

Determinating the individual data of FPYs with the considerable discrepancies each other.

Details:

For current version, the fission product yields of the following fissioning systems are included:*)

Th232F	PU239F	U238HE	Am241T	Es254T
U233F	Pu241F	Np237HE	Am242mT	Fm255T
U235F	Th232HE	Pu239HE	Cm245T	Fm257T
U238F	U233HE	Pu240HE	Cf249T	
Np237F	U235HE	Pu241T	Cf251T	

Computer File:

The compiled and evaluated data are on a computer file (in free format), and can be available from CNDC.

Completion date:

1979, for current version(revised).

Publications:

hsj-80038.

*) F = fast , HE = 14-15 MeV, T = thermal

China

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

Name: Wang Dao

Evaluation:

Evaluation of ^{99}Mo cumulative yield of ^{235}U fission by the fission spectrum neutrons.

Purpose:

In view of the considerable difference in data of ^{99}Mo cumulative yields of ^{235}U fission induced by fission spectrum neutrons, and ^{99}Mo frequently be taken as the reference product in measurements of fission product yields, it's our purpose to determine the reasonable value of ^{99}Mo yield.

Sources:

The open literature

Deadline:

Data by the end of 1983 are collected.

Status:

Recommended value was given, 6.12(±1.6%).

Details:

The above mentioned recommended value was determined through the following works:

(1) Perform the testing measurement(see "Experiments" part);
(2) Evaluate the published data of ^{99}Mo cumulative yields;
(3) Compile the data about the neutron-energy dependence of ^{99}Mo cumulative yields.

Completion Date:

1983

Publications:

To be published.

FRANCE

(same as INDC(NDS)-143)

Laboratory and address : Département de Recherche Fondamentale
Laboratoire de Chimie Physique Nucléaire
Centre d'Etudes Nucléaires de Grenoble
85 X - 38041 GRENOBLE CEDEX - France.

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.

[:] 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, e.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-LMRI, containing among other radionuclides, the following fission products:

- 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 : Kr-88, Sb-124, Te-129m, Nd-147, Sm-151, Pu-238, Th-228 + daughters. (publication by the end of 1984)
  in preparation : Np-237, Am-241

GERMANY, DEM. REP.
(same as INDC(NDS)-143)

Laboratory and address: Zentralinstitut für Kernforschung
Rossendorf
DDR 8051 Dresden
Postfach 19

Names: H.-C. Mehner, E. Franke

Evaluation: Effective resonance integral of ^{133}Cs in reactor fuel elements

Purpose: To clear differences between experimental and calculated fission product concentrations of ^{134}Cs observed in investigations of burnt fuel elements

1. Method: Calculation of effective resonance integral of ^{133}Cs taking into account shielding by ^{238}U resonances and self-shielding using Breit-Wigner formalism with Doppler broadening

Major sources of information: BNL-325, 3rd. ed. 1973

Status: Completed

Publication: Radiochem. Radioanal. Letters 43 (1980) 77

2. Method: Calculation of the effective resonance integral of ^{133}Cs with the cell-code PEACO-II

Major sources of information:
- Y. Ishiguro, PEACO-II, JAERI-M 5527 (1974)
- BNL-325, 3rd. ed., 1973 for ^{133}Cs data
- JAERI-1255 (1978) for ^{238}U data

Status: under work

Publication: in plan

GERMANY, FED. REP.

GPND-Working Group

Laboratory: Max-Planck-Institut für Kernphysik,
Postfach 103980, D-6900 Heidelberg

Names: J. Metzinger, H.V. Klapdor

Calculation: Decay heat of fissile materials ^{235}U, ^{238}U, ^{239}Pu, ^{241}Pu

Computer Code: THOR-I

Method: Microscopic calculation of beta strength function of neutron-rich nuclei. Consistent prediction of beta decay half lives and reactor electron and antineutrino spectra.

Status: Excellent agreement with recent Oak Ridge experiments (Dickens et al.)

Publications:
H.V. Klapdor, J. Metzinger, Phys. Rev. Lett. 48 (1982) 127 and Phys. Lett. 112 B (1982) 22
H.V. Klapdor, J. Metzinger, T. Oda, At. Data Nucl. Data Tables 30, No. 4 (1984)
H.V. Klapdor, Proceed. Int. Symp. Nucl. Spectrosc., Osaka (1984)

GERMANY, FED. REP.

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

Names: U. Reus and W. Westmeier

Compilation: Gamma-Ray Catalog[§]

Type of data: Compilation of energies and intensities of gamma-rays originating from the radioactive decay of nuclides, as well as other important decay properties of these nuclides.

Arrangement: Part I is a listing of ca. 32,000 gamma-rays ordered by increasing energy with the corresponding nuclei and other information needed for identification purposes.
Part II is ordered by nuclides (A,Z) and contains the complete data sets for 2526 nuclides and isomers (i.e. more than 47,000 gamma- and X-rays), decay data, references, comments etc.

Purpose: Identification of gamma-rays, data for cross-section calculations, activity determination, activation analysis etc.

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

Deadline of literature coverage: All information received before June 30, 1982, has been included.

Other details: Intensities are given as gamma-rays (or X-rays) per 100 decays where possible to allow the determination of absolute quantities. K-X-ray intensities have been calculated where no experimental data were available.

Current status: completed.

Publication: *Atomic Data and Nuclear Data Tables, Volume 29*, no. 1 (July 1983) and no. 2 (Sept.1983).

[§]Work performed with the support of GSI (Gesellschaft für Schwerionenforschung mbH, D-6100 Darmstadt).

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: Mid 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 (1984); in press.
iii) D.R.Saroha and R.K.Gupta, Phys. Rev. C (1984); submitted.

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) A previous evaluation of Pd-105 has been revised, taking into account most recent capture data at thermal energy and in KeV region and previous data corrected by the authors for systematic errors. The new evaluation agrees reasonably with indications from integral capture data. (Work documented on ENEA report TIB/FICS/DACO(83) 19. ii) The final selection of FP evaluations for the international File JEF has been performed in cooperation with ECN-Petten. (Work documented on JEF-DOC/30). iii) The validity of Gilbert-Cameron approach has been investigated at the light of recent theoretical studies. The spin distribution of p-h level density has been investigated in terms of combinatorial calculations in the frame of the BCS model. (Work published on C.P.C. 29,375(1983).
Purpose:	Evaluation of reliable FP data, mainly capture cross sections, for estimating of long term reactivity effects in fast reactors.
Major sources of information:	EXFOR, CINDA up to 83 edition, Nuclear Data Sheets.
Deadline of literature coverage:	December 1983.
Status:	See above text.
Cooperation:	CEA-Cadarche, KfK Karlsruhe and ECN-Petten.

Japan

Laboratory and address :	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), S. Igarasi 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 100 FP nuclides (Z=36 to 65), for JENDL-2 FP Library. (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. Strength function model in unresolved resonance region which is extended to 100 keV, compared to 50 keV as in JENDL-1. Optical model parameters are determined by SPRT method. Level density parameters are re-evaluated, deriving systematics of parameters. (2) Calculation using JAERI-FAST type 70-group cross sections with resonance self-shielding factors, and the neutron spectrum data from STEK and CFRMF data.
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. Optical model parameters were re-determined in element-wise way for Kr-Tb. Level density parameters were determined for about 130 nuclides based on level spacing data, level scheme data, and the systematics. Extensive Evaluation of resonance parameters is in progress. (2) Analysis of STEK reactivity data for weak absorbers was completed. Revised calculation of CFRMF activation rates is planned using ENDF/B-5 spectrum field. (3) FP data library for thermal reaction application was prepared, and the fission product model was investigated for LWR calculation.

(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

(cont'd)

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

Other relvant details : File compilation of the evaluated data and cross section adjustment based on data are in progress.

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

Expected completion date : End of 1984.

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) T. Yamamoto, T. Takeda, T. Yoshida, S. Iijima : Extension of fission product model for use in lattice calculation of thorium fueled BWR, ibid. 20 (1983) 523.

(3) 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.

(4) JNDC FP Neutron Cross Section Evaluation Working Group : Evaluation of Fission Product Neutron Cross Sections for JENDL, presented at Topical Discussions during the 24th NEANDC Meeting, 14 March 1984, Tokai-mura (the proceedings to be published as JAERI-M report).

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. Yamada (Waseda University)
T. Tamai (Kyoto University) M. Akiyama (University of Tokyo)
I. Otake (Fuji Electric Co.,Ltd.) A. Zukeran (Hitachi Ltd.)
S. Iijima, T. Murata, T. Yoshida (Nippon Atomic Industry Group Co.)
T. Hojuyama (Mitsubishi Atomic Power Industry Co.)
K. Umezawa, K. Tasaka, Z. Matumoto(+), T. Tamura, H. Ihara,
J. Katakura (JAERI)

1. Compilation: Decay data and delayed neutron data
   Purpose: Revision of a 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) Simple analytical model for FP capture effect on decay heat
   Purpose: (1) Update JNDC FP Decay and Yield Data Library
   (2) Preparation of a set of simple analytical functions to reproduce easily the neutron capture effect on FP decay heat
   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) The set of simple functions reproduced the neutron capture effect quite well.

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

Discrepancy encountered: Discrepancies still remain at cooling times around 1000 seconds.

Availability of Nuclear Data: Contact Mr. H. Ihara
Japan Atomic Energy Research Laborartory
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)

JAPAN

(cont'd)

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', OECD/NEA Nuclear Data Committee Mtg. on "Yield and Decay Data of Fission Product Nuclides" at Brookhaven National Laboratory (1984)

J. Katakura, M. Akiyama, T. Yoshida, Z. Matumoto, R. Nakasima, 'An Attempt for Revision of JNDC FP Decay Data File', JAERI-M report, to be published

S. Iijima, T. Yoshida, 'A Four-Chain Approximation Method for Calculation of Neutron Capture Effect on FP Decay Heat', to be submitted for publication in a journal

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(+) deceased

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 section 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.

UNITED KINGDOM

LABORATORY/ADDRESS

CEGB,
BERKELEY NUCLEAR LABORATORIES,
BERKELEY,
GLOUCESTERSHIRE
GL13 9PB

Working Group:

A. TOBIAS	CEGB, BNL
A.L. NICHOLS	AEE, WINFRITH
M.F. JAMES	AEE, WINFRITH
H.E. SIMS	AERE, HARWELL
B. ALLDRED	BNFL, SELLAFIELD
D.G. VALLIS	MOD, ALDERMASTON

Evaluation.

Radionuclide Decay Data

Purpose:

To provide a comprehensive, up-to-date data library of radioactive decay data including half-lives, Q-values, branching ratios, α, β and γ energies and intensities and associated uncertainties.

Status:

i) The current UK fission product decay data library is UKFPDD-2 which has been available since 1980/81. It contains data for 855 nuclides of which 736 are radioactive and 390 have spectral data.

ii) The spectral data given in UKFPDD-2 have been extracted to provide an additional data base for the inventory/decay heat code FISP6, enabling the calculation of detailed radiation spectra emitted by irradiated fuel.

iii) A retrieval system for spectral data has been developed for use with ENDF/B-IV and V format decay data libraries - in particular UKFPDD-2, UKPADD-1 and UKHEDD-1. Catalogues of spectral data can be presented in increasing energy order or by nuclide and with a variety of editing options.

Progress:

i) The decay data processing code COGEND has been modified to provide data on discrete K-X rays instead of a single average K-X ray as previously.

ii) Data for short-lived fission products have been extracted from the literature and, together with the $\sim$ 300 fission products evaluated in 1979/1980 for UKFPDD-2, have been converted to ENDF/B-V format using the revised version of COGEND. It is expected that these data will form the basis of UKFPDD-3.

Publications:

i) "UKFPDD-2 - A Revised Fission Product Decay File in ENDF/B-IV Format", by A. Tobias and B.S.J. Davies, 1980, RD/B/N4942.

ii) "FISP6 - An Enhanced Code for the Evaluation of Fisson Product Inventories and Decay Heat" by A. Tobias, 1982, CEGB Report TPRD/B/0097/N82.

iii) "A Retrieval System for Spectral Data from ENDF/B Format Decay Data Files", by A. Tobias, 1981, CEGB Report RD/B/5170N81.

iv) "The UKCNDC Radioactive Decay Data Libraries" by A. Tobias, B.S.J. Davies, A.L. Nichols and M.F. James, 1983, Nuclear Energy, Vol. 22 No. 6, pp 445-552.

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.

U.S.A.

(same as INDC(NDS)-143)

Laboratory and address:

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

Names:

RE Schenter, FM Mann, DL Johnson, and 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 fission yield 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 expected to be released Sep. 1982 and May 1983.

U.S.A.

(cont'd)

References:

Results for delayed neutron spectra were reported at the Internat. Conf. on Nuclear Data for Science and Technol., Antwerp, 6-10 Sep. 1982.

Other 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 $T_{1/2}$; 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 data 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 Evaluation Methods and Procedures, BNL-NCS-51363, Vol. I, 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.

U.S.A *)

LABORATORY AND ADDRESS: Los Alamos National Laboratory, PO 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. 1-3).

B. Delayed neutron spectra and Pn values.

This effort is continuing. Pn evaluations have been accepted for publication (Ref. 5) and preliminary integral spectra published (Ref. 4).

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. 6).

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. 7.

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 SPEC5 Code (Ref. 8). These are available, but not published.

D. Few-group β and γ spectral fits, curies, and total decay power 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. 9).

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.

*) revision of 3 contributions from issue 9

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. R. 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-51363, 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 to be publisshed 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. [Los Alamos Nat. Lab. informal document LA-UR-83-2531.]

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). [Los Alamos informal document LA-UR-83-1270.]

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

6. 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). [This report is to be published by the Electric Power Research Institute, June 1984.]

7. 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).

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

9. W. B. Wilson, T. R. England, R. J. LaBauve, and D. C. George, "DKPOWR: A Code for Calculating Decay Power, Energy, Activity, and $\beta + \gamma$ Spectra in LWR Fuel Using Fission Pulse Functions," prepared for publication by the Electric Power Research Institute, May 1984.

U.S.A.

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 (to be published).

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 (to be published).

U.S.A.

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-neutron-induced fission of ^{235}U (Ref. 2). 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 1985 or 1986. Limited numbers of preprints of references 1 and 2 are now available for distribution.
Publications	1. 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, to be published. 2. 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. 3. A.C. Wahl, "Systematics of Nuclear Charge Distribution in Fission - The Z_p Model", J. Radioanal. Chem. 55, 111 (1980). 4. 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.

U S S R

Laboratory and Address:		Fiziko-Energeticheskij Institut, Obninsk, and Institut Atomnoi j Energii I.Y. Kurchatova, Plochad I.V. Kurchatova, 46, Moscow, 123182 USSR
Names	:	Abagyan L.P., Zakharova S.M., Yudkevich M.S.
Evaluation	:	Capture cross sections for Sm isotopes
Purpose	:	Production of the 21,80 and 25-group cross section libraries for thermal, epithermal and fast reactor calculations
Method	:	Re-evaluation of resonance parameters and average resonance parameters, thermal and resonance neutron cross sections and capture resonance integrals. Calculation of capture cross sections using the recommended parameters in thermal and resonance region. Review of available σ_c evaluations in the unresolved resonance region to choose the best of them for Sm isotopes
Major sources of information	:	Original papers on experimental data and available evaluations
Publication	:	1. Zakharova S.M., Abagyan L.P., Yudkevich M.S., Kapustina V.F. The multi-group capture cross section library for fission products, P.2. Even Sm isotopes. Analytical review OB-161, Obninsk, 1982, 35 p. 2. Zakharova S.M., Abagyan L.P., Yudkevich M.S., Manturov G.N. The multi-group capture cross section library for fission products, Sm-151, Sm-153 isotopes. Analytical review OB-174, Obninsk, 1983, 59 p.

USSR

Laboratory and address:	Moscow Physical Engineering Institute 115409 Moscow
Names:	A.N. Gudkov, V.M. Zhivun, A.V. Koldosbskij and V.M. Kolobaskhin.
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.V. Koldobskij, V.M. Kolovaskhin, "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).

U S S R

Laboratory and Address:		Moscow Physical Engineering Institute, Kashirskoc street 31, Moscow, 115 409, USSR
Names	:	A.F. Grashin, A.D. Efimenko, V.M. Kolobashkin
Evaluation	:	Independent fission product yields and average number of prompt fission neutrons
Purpose	:	Calculation of the fission product yields, formed in different low energy fission reactions ((n,f), (γ,f), spont. fiss. etc.)
Method	:	The fission yield calculations are based on the thermodynamical model proposed by the authors. Thermodynamical functions are constructed by taking deformation - and shell effects into account
Results	:	The calculation method is presented and illustrated on some specific instances
Comparison with other models	:	Unlike the generally accepted Zp-model of charge distribution, the presented method does not depend on the availability of experimental reference points, and can be used for a wider range of fissionable nuclei from Thorium up to Fermium
Publications	:	1. A.F. Garshin, "Thermodynamical model of fission", present-day questions of physics of fission, publ. by Mosc. Phys.-Engin. Institute, Moscow, 1983, p. 28; 2. A.F. Garshin, A.D. Efimenko, V.M. Kolobashkin, "New thermodynamical approach to nuclear fission". Abstracts of papers presented at the 34th Conference on "Nuclear Spectroscopy and Structure of the Atomic Nucleus", publ. by Nauka, Leningrad, 1984, p. 478.

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")

Charge distributions in thermal neutron induced fission of ^{229}Th

S.S. Rattan, A.V.R. Reddy, R.J. Singh, Satya Prakash and H.V. Ramaniah
Radiochim. Acta 33 (1983) 189.

Measurement of charge distributions for $^{229}Th(n_{th},f)$ and $^{235}U(n_{th},f)$

M. Djebara, M. Asghar, J.P. Bocquet, R. Brissot, M. Maurel, H. Nifenecker and Ch. Ristori
Nucl. Phys. A 425 (1984) 120

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 ^{242m}Am

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

Correlation between the spectrum of long-range alpha particles and the fragments in the spontaneous fission of ^{252}Cf

Han Hongyin, Huang Shengnian, Meng Jiangchen and Ding Shengyue
Chinese J. Nucl. Phys. 5 (1983) 142)
(English: Chinese Phys. 3 (1983) 987)

III.2. Neutron reaction cross sections

Measurement of the cross section for the reaction $^{90}Zr(n,2n)^{89}Zr$

Zhao Wenrong, Lu Hanlin, Fan Peiguo
Chin. J. Nucl. Phys. 6 (1984) 80
(in Chinese with English abstract)

Cross section for $^{93}Nb(n,2n)^{92m}Nb$ reaction

Lu Hanlin, Fan Peiguo, Zhao Wenrong, Teng Dan
Chin. J. Nucl. Phys. 6 (1984) 76
(in Chinese with English abstract)

Total neutron cross sections of Magnesium, Aluminium, Silicon, Zirconium, Niobium and Molybdenum in energy range from 0.001 to 0.3 eV

O. Aizawa, T. Matsumoto, H.Kadotani
J. Nucl. Sci. Technol. 20 (1983) 713

Determination of the $^{103}Rh(n,2n)^{102}Rh$ and $^{103}Rh(n,2n)^{102m}Rh$ reaction cross-section, averaged over a fission spectrum

R.R. Pla, I.M. Cohen
J. Radioanal. Nucl. Chem., Letters 84 (1984) 227

Absolute neutron cross section measurement in the energy range between 2 and 5 MeV

H.A. Hussain, S.E. Hunt
Int. J. Appl. Radiat. Isot. 34 (1983) 731

(incl.: $^{115}In\ (n,\gamma)^{116m}In$)

Determination of some neutron activation parameters of ^{115}In

G.M. Stukov
At. En. 51 (1981) 61
(Engl.: Soviet At. En. 51 (1982) 483)

Levels and transitions in ^{124}Te following thermal-neutron capture by ^{123}Te and β decay of oriented ^{124}Sb

S.J. Robinson, W.D. Hamilton, and D.M. Snelling
J. Phys. G. 9 (1983) 961

A Determination of the ^{130}Te thermal neutron capture cross section

J. Honzátko, K. Konečný, Z. Kosina, F. Bečvář, E.A. Eissa
Czech. J. Phys. B 34 (1984) 520

The thermal neutron cross-sections and resonance integrals of ^{127}I, ^{128}I and ^{129}I

L. Friedmann and D.C. Aumann
Radiochimica Acta 33 (1983) 183

KeV-neutron capture in Cesium-133, Gold-197 and Tantalum-181

N. Yamamuro, M. Igashira, T. Sekiya, H. Shirayanagi
J. Nucl. Sci. Technol. 20 (1983) 797

The cross sections of the (n,2n) reactions on ^{134}Ba, ^{142}Nd, ^{150}Nd and ^{144}Sm

An Jong Do, J. Dresler, U. Garuska, M. Herman, A. Marcinkowski
J. Phys. G. 10 (1983) 91

The gamma-spectrum of $^{135,137}Ba$ from the $(n,n'\gamma)$ reaction

V.A. Bondarenko, N.O. Kramer, I.L. Kuvaga, P.T. Prokof'ev, G.L. Rezvaya, T.L. Solomonova
Latv. PSR Zinat. Akad. Vestis Fiz. Teh. Zinat. Ser. 6 (1983) 8 (in Russian)

A study of ^{141}Pr by the $(n,n'\gamma)$ reaction

B. Trostell, B. Fogelberg
Phys. Scr. 29 (1984) 100

Radiation spectra of ^{153}Eu from the (n,e^-) and $(n,n'\gamma)$ reactions

V.A. Bondarenko, L.I. Simonova, M.P. Beitinsh, P. Prokof'ev
Latv. PSR Zinat. Akad. Vestis Fiz. Teh. Zinat. Ser. 6 (1983) 3 (in Russian)

Radiative capture cross-sections of istotopes of Gd, Sm and V between 1 and 3 MeV

M. Afzal Ansari, R.K. Yaiskul Singh, M.L. Sehgal, V.K. Mittal, D.K. Avasthi and I.M. Govil
Ann. Nucl. Energy 11 (1984) 173

Lumped fission product neutron cross sections based on ENDF/B-V for fast reactor analysis

J.R. Liaw and H. Henryson II
Nucl. Sci. Engg. 84 (1983) 324

III.3. Decay data

(for delayed neutron precursor decay data see also "delayed neutrons")

Enery available for the double beta-decay of ^{76}Ge

R.J. Ellis, B.J. Hall, G.R. Dyck, C.A. Lander, K.S. Sharma, R.C. Barber and H.E. Duckworth
Phys. Lett. B 136 (1984) 146

Precise Q_β measurements for A = 91 to 93 mass chains

R. Iafigliola, M. Chatterjee, H. Dautet and J.K.P. Lee
Can. J. Chem. 61 (1983) 694

Rotational Bands in ^{99}Sr

B. Pfeiffer, E. Monnand, J.A. Pinston, J. Muenzel, P. Moeller, J. Krumlinde, W. Ziegert, and K.-L. Kratz
Z. Phys. A. 317 (1984) 123

On the level structure of ^{99}Tc

H.A. Ismail, S. Abdel Malak, S. El-Fiki, H. El-Enany, A. Sroor and A.M. Hassan
Nucl. Sci. (Taiwan) 20 (1983) 58

Study of double β-decay of ^{100}Mo

Yu. G. Zdesenko, V.N. Kuts, I.A. Mytsyk and A.S. Nikolaiko
Izv. Akad. Nauk SSSR, Ser. Fiz. 47 (1983) 839
(Engl.: Bull. Acad. Sci. USSR, Phys. Ser. 47, no 5 (1983) 6)

The collective structure of $^{106,108}Ru$

J. Stachel, N. Kaffrell, N. Trautmann, K. Brodén, G. Skarnemark, D. Eriksen
Z. Phys. A 316 (1984) 105
(see also contribution on page 37)

Level structure of ^{109}Ag from studies of the decay of ^{109g}Pd

C. Dednam and D.W. Mingay
South African J. Phys. 5 (1982) 100

On the decay of ^{109}Pd to ^{109}Ag

Z. Awwad, T. Bayomy and N.A. Mansour
Atomki Koezl. 24 (1982) 123

Decay of ^{109g}Pd to the levels of ^{109}Ag

M.B. Chatterjee and B.B. Baliga
Fizika 15 (1983) 273

Radiative β decay in ^{111}Ag

A. Basavaraju, P. Venkataramaiah, K. Gopala, H. Sanjeeviah
J. Phys. G 10 (1984) 563

Determination of some neutron activation parameters of ^{115}In

G.M. Stukov
At. En. 51 (1981) 61
(Engl.: Soviet At. En. 51 (1982) 483)

(incl.: T1/2 of In-116m)

Decay study of ^{117}In isomer pair.
1. Isomer-free preparation and accurate measurement of half-lives

Shouzow Fukushima and Asae Mito
Radiochimica Acta 30 (1982) 61

Low energy nuclear states in ^{124}Te

G. Mardirosian and N.M. Stewart
Z. Phys. A 315 (1984) 213

Levels and transitions in ^{124}Te following thermal-neutron capture by ^{123}Te and β decay of oriented ^{124}Sb

S.J. Robinson, W.D. Hamilton, and D.M. Snelling
J. Phys. G. 9 (1983) 961

Gamma-ray cascade population of the $19/2^-$ - isomer in the decay of $^{133}Te^m$ to levels of ^{133}I

W.B. Walters, E.A. Henry and R.A. Meyer
Phys. Rev. C 29 (1984) 991

Gamma ray emission probabilities in the decay of ^{140}Ba and ^{140}La

J.B. Olomo and T.D. Mac Mahon
J. Phys. E. 17 (1984) 124

Excited states above the 6^+ isomer in ^{140}Ce

W. Enghardt, H.U. Jager, L. Kaubler, H.-J. Keller,
H. Prade, F. Stary
Z. Phys. A 316 (1984) 245

Internal conversion studies in the decay of ^{143}Ce

K.V. Ramaniah, S.B. Reddy, P.R.L. Sarma and K.V. Reddy
Indian J. Phys. A 57 (1983) 368

The decay of 56-s ^{148}Ce to levels of odd-odd ^{148}Pr

N.K. Aras, C. Chung, S. Faller, C.A. Stone, W.B. Walters,
R.L. Grill, M. Shmid and R.E. Chrien
Can. J. Chem. 61 (1983) 780

Studies on the radioactive decay of ^{147}Nd

H.A. Ismail, N. El-Enany, S. Abdel-Malak, S. El-Fiki,
A. El-Shershaby and A.M. Hassan
Nucl. Sci. (Taiwan) 20 (1983) 8

A study on the decay scheme of ^{147}Nd

Liu Yunzuo, Zhou Jiewen, Wang Changru, Hu Dailing,
Hu Baohua, Huo Junde
Chin. J. Nucl. Phys. 5 (1983) 312
(in Chinese with English abstract)

The half-life of ^{152}Eu

S. Baba, S. Ichikawa, K. Gunji, T. Sekine, H. Baba and
T. Komori
Int. J. Appl. Radiat. Isot. 34 (1983) 891

Electromagnetic transition probabilities in the doubly odd N=91 nucleus ^{154}Eu

H. Rotter, C. Heiser, K.D. Schilling, W. Andrejtscheff,
L.K. Kostov, M.K. Balodis
Nucl. Phys. A 417 (1984) 1

Properties of transitions observed in the ^{161}Tb decay

V. Hnatowicz, O. Dragoun
Czech. J. Phys. B 33 (1983) 1084

III.4. Delayed neutrons

Delayed neutron energy spectra from Rb-93,94,95,96,97 and Cs-143,144,145,146

L.J. Yuan, T. Yeh
Nucl. Sci. (Taiwan) 20 (1983) 89
(in Chinese with English abstract)

Delayed neutron yield and decay constants for thermal neutron-induced fission of ^{235}U

S. Synetos, J.G. Williams
Nucl. Energy 22 (1983) 267

III.5. Decay heat

Decay heat and decay rate of actinides in highly neutron-irradiated Uranium initially of high ^{235}U content

K. Shure
Nucl. Sci. Engg. 85 (1983) 51

Measurement of the electron spectra from products of fission of ^{235}U and ^{239}Pu by thermal neutrons

A.A. Borovoi, Yu.V. Klimov, V.I. Kopeĭkin
Yad. Fiz. 37 (1983) 1345
(Engl.: Sov. J. Nucl. Phys. 37 (1983) 801)

Residual energy liberation of the products of ^{235}U fission by thermal neutrons

A.A. Gribin and B.G. Pologikh
At. En. 51 (1982) 16
(Engl.: Soviet. At. En. 51 (1982) 421)

III.6. Reviews and summaries

Double beta decay: recent developments and projections

F.T. Avignone, R.L. Brodzinski, D.P. Brown, J.C. Evans, W.K. Hensley, H. Reeves, N.A. Wogman
Fourth Workshop on Grand Unification, Philadelphia, PA, USA, 21-23 April 1983 (Boston, MA, USA: Birkhauser 1983). Proceedings p. 174

β-decay phenomenology of nuclear fission products

J.A. Behr and P. Vogel
Nucl. Phys. A 11 (1983) 199

Semi-empirical estimation of β-strength functions and delayed neutron emission probabilities

T. Tachibana
J. Phys. Soc. Japan 53 (1984) 543

Distribution of delayed neutron yields versus proton, neutron, and mass numbers: application to proton pairing in fission yields

P.L. Reeder and R.A. Warner
Nucl. Sci. Eng. 87 (1984) 181

Application of ENSDF data to decay power and gamma-ray spectrum calculation

J. Katakura, T. Hara, Y. Naito
JAERI-M-83-016 (1983)

IV. MEETINGS

NEANDC/NEACRP Specialist's Meeting on Fast-Neutron Capture Cross Sections

Argonne National Laboratory, USA, 20-23 April 1982

Proceedings published as ANL-83-4 (=NEANDC(US)-214/L) in 1983.

Specialists' Meeting on Yields and Decay Data of Fission Product Nuclides

Brookhaven National Laboratory, Upton, N.Y., USA

24th - 27th October 1983

Proceedings published as BNL-51778 in 1984

TABLE OF CONTENTS*

* Review papers are presented in the order given at the meeting. Poster papers are given in alphabetical order, by author, under the appropriate topic.

Fifth International Symposium on
CAPTURE GAMMA-RAY SPECTROSCOPY AND RELATED TOPICS
Knoxville, Tennessee USA 10-14 September, 1984

The Fifth International Symposium on Capture Gamma-Ray Spectroscopy and Related Topics will be held at the Holiday Inn World's Fair, Knoxville, Tennessee on 10-14 September 1984. This Symposium is a sequel to meetings held at Studsvik (1969), Petten (1974), Brookhaven (1978), and Grenoble (1981). Sponsorship has been received from the American Physical Society, the American Nuclear Society, the European Physical Society, the U. S. Department of Energy, the U. S. National Science Foundation, and the Oak Ridge National Laboratory.

The Symposium will maintain the general spirit and intent of the earlier conferences by providing a forum for the discussion of neutron capture spectroscopy, *but will be much broader in scope.* Thus, the main topics will be γ-ray spectroscopy following neutron and proton capture, nuclear models, neutron and proton resonances, fast-nucleon capture, and nucleon-capture mechanisms. Additional topics such as capture of heavier ions; $(n,n'\gamma)$, (n,α), and (n,p) reactions; $(p,p'\gamma)$, (p,α), and (p,n) reactions; statistical properties of nuclei; photon and neutron strength functions; photon scattering, (γ,n), (γ,p), and (γ,f) reactions; gamma-ray standards; nuclear masses; stellar nucleosynthesis; practical applications; and new instruments will also be represented at this Symposium. An attendance of over 300 is expected on the basis of a previous questionnaire.

The five-day Symposium will consist of oral presentations and poster sessions with no parallel sessions. There will be time for approximately 40 invited talks of varying lengths. Contributed papers are important to this Symposium and all accepted contributions will be presented in poster sessions. The proceedings will include both invited and contributed papers. Both types can have multiple authorships. The conference language will be English. An industrial exhibition is also planned for this Symposium.

All correspondence related to this Symposium should be sent to S. Raman, Physics Division, Oak Ridge National Laboratory, P. O. Box X, Oak Ridge, Tennessee 37831. Telephone (615) 574-4496 or FTS 624-4496. Telex: 810 572 1076 USDOE OKRE.