International Atomic Energy Agency

INDC(NDS)-102/G+P

INDC INTERNATIONAL NUCLEAR DATA COMMITTEE

PROGRESS

IN

FISSION PRODUCT NUCLEAR DATA

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

collected
by
G. Lammer

Nuclear Data Section
International Atomic Energy Agency
Vienna, Austria

No. 5 June 1979

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FOREWORD

This is the fifth 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 fourth issue of this series has been published in July 1978 as INDC(NDS)-95/G+P. The present issue includes contributions which were received by NDS between 1 August 1978 and 15 May 1979.

The next issue of this report series is envisaged to be published in June 1980.

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SUBMITTING CONTRIBUTIONS

The next issue is expected to be published in June 1980. All scientists who are presently working - or have recently completed work - in the field of FPND and who want to contribute to the 6th issue of this series, are kindly asked to send contributions to me between now and the end of April 1980, so that they reach NDS before 30 April 1980.

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 write an appropriate note to me 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 are, for

Measurements:	Compilations:	Evaluations:
Laboratory and address: Names: Facilities:	Laboratory and address: Names:	Laboratory and address: Names:
Experiment: Method: Accuracy: Completion date: Discrepancies to other reported data: Publications:	Compilation: purpose: major sources of information: deadline of literature coverage: cooperation: other relevant details: computer file: completion date: Publications:	Evaluation: purpose: method: major sources of information: deadline of literature coverage: status: cooperation: other relevant details: computer file of compiled data: computer file of evaluated data: discrepancies encountered: completion date: Publications:

For the sake of consistency it is requested that the suggested headings be used as far as appropriate.

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.

G. Lammer

SUBJECT INDEX [a]

1. MEASUREMENTS

1.1. Fission yields

a) 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.

1.2. Neutron reaction cross sections

1.2. Neutron reaction cross sections (continued)

1.2. Neutron reaction cross sections (continued)

1.3. Decay data

1.3. Decay data (continued)

1.4. Delayed neutron data

1.4. Delayed neutron data (continued)

1.5. Decay heat

2. COMPILATIONS AND EVALUATIONS

I. MEASUREMENTS

(revisions with respect to the last issue are marked by a vertical bar in the margin)

BELGIUM

Laboratory :	Centre d'Etude de l'Energie Nucléaire CEN/SCK B-2400 MOL (Belgium)
Names :	P. del Marmol, P. Fettweis
Facilities :	BR1 Reactor
Experiment :	The independent isomeric yield ratio of $^{83m}Se/^{83g}Se$ is being determined in thermal neutron fission of ^{235}U.
Method :	Fast radiochemical separation of Se followed by γ-counting of the resulting activities.
Completion date :	The counting statistics of the measurements expected to be completed in 1978 were too low : The experiment is being repeated.

E.E.C. Belgium

(same as in INDC(NDS)-95)

Laboratory and address: JRC, CBNM, Geel, Belgium
+CNEN, Bologna, Italy

Names: A. Brusegan, C. Coceva+, F. Corvi, P. Giacobbe+, M. Magnani+, G. Rohr.

Facilities: Neutron time-of-flight spectrometers at the 60 MeV Linac (pulse width: 23 nsec).

Experiment: Resonance parameters for ^{91}Zr and ^{96}Zr.

Separated isotopes: 89% enriched ^{91}Zr and 57% ^{96}Zr.

1) Capture γ-ray measurements (^{91}Zr only).

Energy range: 150 eV - 3200 eV.

2) Capture measurement.

Energy range ^{91}Zr: 150 eV - 20 keV
^{96}Zr: 150 eV - 100 keV.

3) Total cross section measurements.

Energy range ^{91}Zr: 150 eV - 14.8 keV
^{96}Zr: 150 eV - 130 keV.

Method: 1) High and low energy γ-ray spectra measurements.

Detector: GeLi gamma ray spectrometer.
Flightpath: 13 m.
Sample thickness: $14.4 \cdot 10^{-3}$ at/barn.

2) Capture cross section measurements.

Detector: C_6F_6 detectors using Maier-Leibnitz method.
Flightpath: 60 m.
Sample material: ZrO_2
Sample thicknesses: ^{91}Zr: $7.310 \cdot 10^{-3}$ at/barn
^{96}Zr: $4.780 \cdot 10^{-3}$ at/barn
Neutron flux: boron slab with C_6F_6 detectors.
Normalization: Ag using black resonance technique.

3) Total cross section measurements.

Detectors: NaI(Tl) crystals with a boron slab.
Flightpath: 100 m.
Sample material: ZrO_2 enriched to 57% ^{96}Zr and 89% ^{91}Zr.
Sample thicknesses: ^{91}Zr $0.8 \cdot 10^{-3}$ at/barn
$2.4 \cdot 10^{-3}$ at/barn
$6.4 \cdot 10^{-3}$ at/barn
$14.4 \cdot 10^{-3}$ at/barn

E.E.C. Belgium

(cont'd)

^{96}Zr	$0.8 \cdot 10^{-3}$	at/barn
	$3.5 \cdot 10^{-3}$	at/barn
	$4.3 \cdot 10^{-3}$	at/barn

Accuracy: Expected on final resonance parameters

^{91}Zr $g\Gamma_n$, Γ_γ between 5% and 20%

^{96}Zr $g\Gamma_n$, Γ_γ between 10% and 20%

depending on the energy range and the strength of the resonances.

Expected completion date: ^{91}Zr : analysis finished

^{96}Zr : end of 1978

Publications :

A. Brusegan, F. Corvi, G. Rohr, C. Coceva, P. Giacobbe and M. Magnani, Neutron Resonance Parameters of ^{91}Zr, Proc. Int. Conf. on Neutron Physics and Nuclear Data for Reactors, Harwell, September 1978, p. 706

E.E.C., Belgium

Laboratory and address : JRC, CBNM, Geel, Belgium
+S.C.K./C.E.N., Mol, Belgium

Names : +P. Staveloz, +E. Cornelis, +L. Mewissen, +F. Poortmans
G. Rohr, R. Shelley, J. Winter, T. van der Veen

Facilities : Neutron time-of-flight spectrometers at the 150 MeV Linac (pulse width : 4 nsec)

Experiments : Resonance parameters for ^{104,105,106,108,110}Pd below 50 keV

1) Capture cross section measurements :
   ^{105}Pd and ^{108}Pd : measurements and analysis completed.

2) Total cross section measurements :
   ^{105}Pd and ^{108}Pd : measurements and analysis completed.
   ^{106}Pd : measurements completed, analysis in progress.
   ^{110}Pd : measurements nearly completed.

3) Scattering cross section measurements :
   ^{105}Pd and ^{108}Pd : measurements and analysis completed.

Method :

1) Capture cross section measurements.
   Detector : C_6D_6- detectors using Maier Leibnitz method.
   flight path length : 60 m.

2) Total cross section measurements.
   Detector : ^{3}He gaseous scintillators.
   flight path length : 30 m and 60 m.
   cooled samples at liquid nitrogen temperature.

3) Scattering cross section measurements.
   Detector : ^{3}He gaseous scintillators.
   flight path length : 30 m.

Accuracy : Mostly between 5% and 20% on resonance parameters $g\Gamma_n$ and Γ_γ depending on the energy range and on the strength of the resonance.

Expected completion date: ^{105}Pd and ^{108}Pd completed
analysis of data for other isotopes : June 1980.

Publications : Neutron Resonance Parameters of ^{105}Pd and ^{108}Pd, P. Staveloz, E. Cornelis, L. Mewissen, F. Poortmans, G. Rohr, R. Shelley, T. van der Veen, Proc. Int. Conf. on Neutron Physics and Nuclear Data for Reactors, Harwell, September, 1978, p. 701.

FRANCE

Laboratory : *Service RADIOCHIMIE ET PHENOMENOLOGIE*
Centre d'Etudes de BRUYERES-LE-CHATEL
B.P. n° 561 - 92542 MONTROUGE CEDEX - FRANCE.

Names : *J. LAUREC - A. ADAM.*

Facilities : *PROSPERO Critical assembly and LANCELOT 14 Mev neutrons generator (S.E.C.R./C.E. VALDUC)*
Radiochimical Laboratory
Calibrated Ge-Li spectrometers.

Experiments : *Determination of cumulative yields of some fission products (^{95}Zr, ^{97}Zr, ^{99}Mo, ^{103}Ru, ^{105}Rh, ^{127}Sb, ^{131}I, ^{132}Te, ^{140}Ba, ^{141}Ce, ^{143}Ce, ^{144}Ce, ^{147}Nd) for ^{233}U, ^{235}U, ^{238}U and ^{239}Pu, with fission spectrum and 14,7 Mev neutrons.*

Method : *The fission number is measured by a fission chamber. The fission products activities of fissile target nuclides are determined by gamma direct spectrometry measurements with calibrated Ge-Li spectrometers. The targets and chamber deposits masses are determined by alpha and mass spectrometries.*

Accuracy : *3 to 5 % ; the branching ratio error is not included ; this last error is variable from one isotope to the other (1 % to 5 %).*

Completion : *end of 1979.*

Publication : *internal reports ; C.E.A. report to be published.*

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 et A. MOUSSA.

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 fractionnal independent yield of ^{86}Br, ^{89}Rb, ^{134}I, ^{135}Xe, $^{136m+g}I$, ^{136}Cs, ^{137}Xe, ^{144}La isotopes and the fractionnal cumulative yields of the parents have been or would be measured for :
$^{235}U(n_{th},f)$, $^{235}U(n_f,f)$, $^{235}(n_{3MeV},f)$.

Method : Radiochemical separations for Cs136 and Ge/Li gamma spectrometry. For the others, direct growth and decay activities are measured with a Ge/Li detector and recorded in a multispectrum mode by a 4K multichannel analyser.

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

Completion date : December 1980.

Publication : International Symposium on Physics and Chemistry of Fission - 14/18 May 1979 - Jülich.

GERMANY, FED. REP.

Laboratory and address:

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

Names:

P. FISCHER, U. HARZ, P. PODEWILS, H.G. PRIESMEYER

Facility:

Fast Chopper Neutron Time-of-Flight Spectrometer, 42 m flight path in front of beam hole of 5 MW FRG-1 reactor. 15 ns/m nominal resolution, with special equipment for transmission measurements on highly radioactive samples; 11 Li-6 glass-scintillation detectors; max. rotor speed 15 000 upm; min. burst width 0.64 µs; min. time channel width 100 ns.

Experiments:

Neutron resonance investigation 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 with crystal spectrometer, which can be made available.

Completed: Tc 99 transmission with different sample thickness to clear up discrepancies in Γ_γ of first resonance; Data published in Proceedings of "Neutron Physics and Nuclear Data for Reactors and Other Applied Purposes" Harwell, September 1978, page 718.

Ongoing: Cs 133/135/137 FP mixture for isotope identification of 42.8 eV and 880 eV resonances;
Pu 240 precision measurement for resonance parameter determination of 1.056 eV resonance.

Planned: EuO isotope mixture from fast reactor control rod (transmission and resonance identification);
Kr transmission (stable isotopes), in order to prepare Kr 85 measurement, Sm 151 transmission.

Method:

Sample-in-beam, sample-out-of-beam transmission measurement;
black resonance or boron filter background determination technique.

Accuracy:

For resonance parameters: about 5 % or better, depending on statistical accuracy desired.

GERMANY, FED. REP.

(same as in INDC(NDS)-95)

Laboratory and address: Institut für Kernchemie
Universität Mainz
Postfach 3980
D-6500 Mainz, Germany

Names*: H. Ohm, A. Schröder, K.-L. Kratz (Kernchemie Mainz), K.D. Wünsch, G. Jung (Univ. Giessen/ILL Grenoble), C. Ristori, J. Crancon (CEN Grenoble)

*This work is a collaboration with:
- Institut Laue-Langevin - BP 156 - 38042 Grenoble.
- II. Physikal.Institut, Univ. Giessen - D-6300 Giessen.
- Laboratoire de Chimie Physique Nucléaire - DRF - CENG - 38041 Grenoble.

Facilities: Alkali isotope separator OSTIS installed at the Grenoble high-flux reactor.

Experiment: Energy spectra of β^--delayed neutrons have been measured in coincidence with γ-rays depopulating excited states in the respective neutron final nucleus.

With these data and the information from neutron singles and γ-ray spectra β^--strength functions which extend to near Q_β of six Rb isotopes have been constructed (A = 89,91, 93-95,97), their shapes exhibiting - in contrast to the present theoretical concepts - pronounced resonances and a systematic behaviour as a function of mass number an Q_β as expected from general nuclear strucutre considerations. The particular importance of these investigations lies in the fact that the shape of the β^--strength function is decisive not only in predictions of β-decay half-lives and β-delayed neutron emission probabilities, but also for radioactive decay heat analyses, especially for "loss-of-coolant accidents" (LOCA).

Work is progressing.

Publications:
K.-L. Kratz et al., Proc. Int. Workshop, Hirschegg, Austria, AED-Conf. 77-017-001 ff (1977) 208.
K.-L. Kratz et al., NEANDC(E)-192, vol. 5, p. 72 (1978).

GERMANY, FED. REP.

(same as in INDC(NDS)-95)

Laboratory and address:	Institut für Kernchemie Universität Mainz Postfach 3980 D-6500 Mainz, Germany
Names:	W. Rudolph, K.-L. Kratz, G. Herrmann
Facilities:	TRIGA Mark II reactor
Experiment:	The fractional independent fission yields and β^--delayed neutron abundances of the following nuclides were determined in thermal-neutron induced fission of ^{235}U: $^{87-92}Br$, $^{134,135}Sb$, $^{137-141}I$. With these data the neutron emission probabilities of the above precursors were obtained.
Method:	After pulsed irradiation (30 msec FWHM), fast chemical separations by hydride volatilization for Sb, and by formation of volatile methyl-compounds through recoil reactions for Br and I. γ-spectroscopic measurements via daughter nuclides, and neutron counting.
Accurary:	Error margins between $\pm$10 % and $\pm$60 % of the resulting value.
Publications:	W. Rudolph et al., J. Inorg. Nucl. Chem. 39 (1977) 753. K.-L. Kratz, Radiochim. Acta 25 (1978), 1.

GERMANY, FED. REP.

Laboratory: Institut für Kernchemie
Universität Mainz
Postfach 3980
D-6500 Mainz, Germany

Names: M. Weis, H.O. Denschlag

Facilities: TRIGA Mark II Reactor

Experiment: The fractional independent or fractional cumulative (FC) yields of the following nuclides were determined in the fission of ^{235}U by thermal neutrons: Nb-96, Nb-97(m+g), Nb-98m, Y-99 (FC), Zr-99, Nb-99m, Nb-99g, Zr-101 (FC), Nb-101, Mo-101, Zr-102 (FC), Nb-102(m+g), Nb-104(FC), Nb-105 (FC).

Method: Fast radiochemical separation of Nb or Zr after pulsed irradiation.

Accuracy: Generally ±5% (relative to value).

Completion date: 1979

Publications: Jahresberichte 1975, 1976 and 1977
Institut für Kernchemie
Universität Mainz

M. Weis, Dissertation, Mainz 1979

GERMANY, FED. REP.

Laboratory:	Institut für Kernchemie Universität Mainz Postfach 3980 D-6500 Mainz, Germany
Names:	G. Fischbach, H.O. Denschlag
Facilities:	TRIGA Mark II Reactor
Experiment:	The fractional cumulative (*independent) yields of the following isotopes were measured in $^{235}U(n_{th},f)$: Ba-141*, Ba-143 to Ba-146, La-146, Ce-146, Ce-148 and Ce-149
Method:	Fast radiochemical separations and direct γ-ray spectroscopic measurement and/or indirect measurements via daughter nuclides.
Accuracy:	Varying
Completion date:	1979
Publications:	Jahresberichte 1975, 1976 and 1977 Institut für Kernchemie Universität Mainz

GERMANY, FED. REP.

(same as in INDC(NDS)-95)

Laboratory: Institut für Kernchemie
Universität Mainz
D-6500 Mainz, Germany and
Institut Laue Langevin
38 Grenoble, France

Names: H.O. Denschlag, Z. Alfassi (U. Beersheva, Israel), J. Blachot (CENG, Grenoble), H. Braun, W. Faubel, T. Izak-Biran (SOREQ, Israel), H. Meixler, G. Paffrath, W. Pörsch, H. Schrader, G. Siegert, T. Tamai (KURRI, Japan), A.C. Wahl (U.St.Louis, Mo,USA), K. Wolfsberg (LASL, USA).

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

Experiment: The charge distribution in the heavy-mass-peak fission products from $^{235}U(n_{th},f)$ is 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: 1979

Publication: Progress reports are appearing since 1975 in Jahresberichte, Institut für Kernchemie, Universität Mainz and Annex to the Annual Reports, Institut Laue Langevin, Grenoble.

GERMANY, FED. REP.

(same as in INDC(NDS)-95)

Laboratory:	Institut für Kernchemie Universität Mainz Postfach 3980 D-6500 Mainz, Germany
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:	1979
Publications:	Jahresbericht 1977 Institut für Kernchemie Universität Mainz

GERMANY, FED. REP.

Laboratory and address:	Physikalisch-Technische Bundesanstalt D-3300 Braunschweig, Bundesallee 100
Name:	K. Debertin
Facilities:	^{252}Cf-source; calibrated Ge(Li)-spectrometer.
Experiment:	Determination of ^{238}U-fission yields in the fast neutron spectrum of a ^{252}Cf-source.
Method:	The ^{252}Cf-source is mounted 15 m above ground in the open air. ^{238}U-samples are irradiated in a 1 cm distance. Fission product activities are determined by measuring the γ-ray spectrum with a calibrated Ge(Li)-spectrometer.
Accuracy:	$\pm$ 2 % to $\pm$ 5 % (1σ uncertainty)
Completion date:	1978
Publication:	Proceedings of the International Conference on Neutron Physics and Nuclear Data for Reactors and Other Applied Purposes, Harwell, 1978, page 229.

INDIA

Laboratory and Address: Radiochemistry Division
Bhabha Atomic Research Centre
Trombay, Bombay 400085, India

Names: Ramaswami A, Natarajan V., Sampath Kumar R., and R.H. Iyer.

Facilities : High Resolution Ge(Li) detector multichannel analyser, Solid State track detector and Optical Microscope.

Experiment : Measurement of the absolute fission yields in the neutron induced fission of actinide isotopes.

Method : Absolute yields - Short-lived fission products (half lives ranging from few minutes to few days) in the thermal neutron induced fission of ^{235}U, ^{239}Pu and ^{233}U and in the fast fission of ^{232}Th are being determined using high resolution gamma ray spectrometry. The total number of fissions in the sample was obtained by track etch technique using mica as the track detector.

Accuracy : 1 to 5% for the asymmetric fission products.

Completion: Data : Work on ^{235}U and ^{239}Pu were completed. Work on other nuclides are in progress.

Remarks : In this technique, errors arising out of inarruracies in the estimation of fission cross section due to variation of neutron energy spectrum, flux determination and in the estimation of the fissile atoms are eliminated.

Publications : To be published.

References :

1. Iyer, R.H., Sampath Kumar R., and Choudhuri N.K., Nucl. Inst. Methods, 115, 23(1974)

2. Ramaswami A, Natarajan V, Sampath Kumar R., and Iyer R.H. Presented in "Nuclear Physics and Solid State Physics Symposium" December 1978, held in Bombay, India.

3. 'Absolute fission yield measurements by track-etchcum-gamma Spectrometry'. Ramaswami A, Natarajan V, Srivastava B.K., Sampathkumar R., Choudhuri N.K., and Iyer R.H., JINC (in press).

I N D I A

Laboratory & Address	:	Radiochemistry Division Bhabha Atomic Research Centre Trombay, Bombay 400085
Names	:	S.B. Manohar, P.P. Venkatesan, S.M. Deshmukh Satya Prakash and M.V. Ramaniah
Facilities	:	High Resolution Ge(Li) gamma spectrometric system, beta proportional counters and low back ground counters
Experiment	:	Determination of fission yield in the neutron induced fission of ^{232}U.
Method	:	Fission yields in neutron fission of ^{232}U were determined employing direct counting of catchers on Ge(Li) as well as using radiochemical techniques. Yields were determined by comparison method using 235U and 99Mo as internal standard.
Accuracy	:	About 4-8% for asymmetric masses 12-15% for symmetric masses
Completion date	:	Already completed
Publications	:	To appear shortly in Phy. Rev. C.

I N D I A

Laboratory & Address	:	Radiochemistry Division Bhabha Atomic Research Centre Trombay, Bombay 400 085.
Names	:	S.A. Chitambar, S.N. Acharya H.C. Jain, C.K. Mathews and M.V. Ramaniah.
Facilities	:	CH-5 Mass spectrometer with thermoionic source assembly.
Experiment	:	Determination of fission yield in thermal neutron induced fission of ^{233}U, ^{235}U, ^{239}Pu and ^{241}Pu.
Method	:	Fission yields in thermal neutron induced fission of ^{233}U, ^{235}U, ^{239}Pu and ^{241}Pu have been determined for about 20 mass nos. in each of the fissioning system by employing mass spectrometric techniques for the determination of relative yields.
Accuracy	:	About 2-3 percent for asymmetric masses.
Completion date	:	March 1980.

I N D I A

Laboratory & Address	:	Radiochemistry Division Bhabha Atomic Research Centre Trombay, Bombay 400085
Names	:	S.B. Manohar, Tarun Datta, S.S. Rattan, Satya Prakash and M.V. Ramaniah
Facilities	:	High resolution Ge(Li) gamma spectrometric system.
Experiment	:	Charge Distribution in nuclear fission Determination of fractional cumulative yields of ^{134}I and ^{135}I in the spontaneous fission of ^{252}Cf
Method	:	Direct catcher foil counting on Ge(Li)
Accuracy	:	± 5%
Completion date	:	Already completed
Publication	:	Physical Review, C, 17(i) 188 (1978)

JAPAN

Laboratory and address: Nuclear Physics II Laboratory,
Japan Atomic Energy Research Institute,
Tokai-Mura, Naka-Gun, Ibaraki-Ken, Japan.

Names: A. Asami, Y. Nakajima, M. Mizumoto, M. Ohkubo,
Y. Kawarasaki, Y. Furuta (JAERI)
T. Yamamoto, M. Sugimoto (Tohoku Univ.)
Y. Kanda, T. Kawano (Kyushu Univ.)

Facilities: 120 MeV linac neutron TOF spectrometer.

1. Experiment: Neutron capture cross section measurements in the keV region.

Method: 3500 l liquid scintillator tank at 52 m flight path with a resolution of 1.9 to 0.5 nsec/m.

Analysis: Multiple scattering correction and self shielding (Schmitt, Monte Carlo) in the sample and neutron detector.
Self shielding correction (Dresner, Macklin).

(1) Samples: ^{151}Eu, ^{153}Eu, Eu. Chemical form Eu_2O_3, Separated isotope samples are enriched to over 96 % for each isotope, loaned from ORNL.

Accuracy: 6 to 10 %.

Energy region: 3 to 100 keV.

Expected completion date: ^{151,153}Eu May 1979.
Eu Sep. 1979.

Publication:

A. Asami et al., Neutron capture cross section measurements of ^{151,153}Eu and Eu, Topical Conf. of Technique on Neutron capture cross section measurements, ORNL, 1978.

M. Mizumoto et al., Average neutron capture cross sections of ^{151}Eu and ^{153}Eu from 3 to 100 keV, to be published.

(2) Samples: ^{143,145,146,148}Nd, enriched to over 91 % for each isotope, Nd_2O_3 in chemical form, loaned from ORNL.

Energy region: 5 to 300 keV.

Accuracy: 8 to 30 %.

Expected completion date: Dec. 1979.

Publication:

Y. Nakajima et al., Neutron capture cross section measurements of Nd-143, Nd-145, Nd-146 and Nd-148, Int. Conf. on Neutron Physic and Nuclear Data,Harwell., 1978, page 438.

JAPAN

(cont'd)

(3) Samples: $^{147,149}Sm$, enriched to over 97 % for each isotope, Sm_2O_3 in chemical form, loaned from ORNL.

Energy region: 1 eV to 300 keV.

Status: Measurements in progress.

2. Experiment: Neutron resonance parameters.

Method: A ^{6}Li-glass neutron detector and a Moxon-Rae detector at 47 m flight path.

Analysis: Atta-Harvey code and Monte Carlo code MCRTOF.

(1) Sample: Tb.

Results: Resonance parameters for 209 levels including 50 newly discovered ones in the region 3 to 1190 eV.

Completion date: Feb. 1978.

Publications:

M. Ohkubo, Y. Kawarasaki, Slow neutron resonances in Tb-159, JAERI-M 7545 (1978), also to be published in J. Nucl. Sci. Tech.

(2) Samples: $^{79,81}Br$, enriched to over 97 % for each sample, NaBr in chemical form, loaned from ORNL.

Status: Measurements in progress.

JAPAN

Laboratory and address: Institute of Atomic Energy, Kyoto University, Uji, Kyoto 611, Japan

Names: Tomota Nishi, 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 GeLi detectors.

Accuracy: Errors range from 7% to 20% with different combinations of the fission products and the fissile isotopes.

[Expected] completion date:) see Table I
Publication:)

Table I

Nuclides		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, Inter. Conf. on Nucl.
$^{132,134,136}I^{m,g}$	[Ind.]	Dec. 1976	Structure,Tokyo, Sep. 1977
$^{133,135}Xe^{m,g}$	[Ind.]	Dec. 1976	ibid.
$^{138}Cs^{m,g}$	[Ind.]	May. 1978	
$^{90}Rb^{m,g}$	[Ind.]	End of 1979	
$^{148}Pm^{m,g}$	[Ind.]	End of 1979	

JAPAN

Laboratory and address:	Research Laboratory for Nuclear Reactors, Tokyo Institute of Technology 2-12-1, O-okayama, Meguro-ku, Tokyo
Names:	N. Yamamuro, K. Saito, T. Wada (TIT) Y. Fujita, K. Kobayashi (Research Reactor Institute, Kyoto University)
Facilities:	46-MeV Electron Linear Accelerator (Research Reactor Institute, Kyoto University)
Experiment:	Capture Cross Section Measurements of ^{93}Nb, ^{127}I, and ^{133}Cs from 3 to 80-KeV using time-of-flight method
Method:	Gamma-rays from the neutron capture processes were detected by a C_6F_6 or a C_6D_6 liquid scintillation detector. Neutron flux impinging on the sample was measured by ^{10}B (93%) disk placed at the sample position. The absolute values of cross section were determined by normalizing to the 24-KeV cross sections measured with Fe-filtered method. Corrections for self-shielding and multiple scattering were performed using average cross sections. These data are currently examined for the correction for resonance self-shielding.
Accuracy:	Error of absolute cross section at 24-KeV is about 5% Statistical error of measured cross sections is 2 to 4%
(Expected) Completion Date:	June, 1979 for ^{93}Nb and ^{127}I Sept., 1979 for ^{133}Cs
Publications:	1. N. Yamamuro et al., J. Nucl. Sci. and Technol. 15 637 (1978) 2. N. Yamamuro et al., Proc. Inter. Conf. Neutron Physics and Nuclear Data for Reactors and other Applied Purposes AERE Harwell Sept., 1978, page 432.

JAPAN

(same as in INDC(NDS)-95)

Laboratory and address: Nuclear Engineering Research Laboratory
Faculty of Engineering
University of Tokyo
2-22 Shirane Shirakata, Tokai-mura Naka-gun
Ibaraki, Japan

Names: M. Akiyama and S. An

Facilities: Fast Neutron Source Reactor "YAYOI"

Experiment: Fission Product Decay Heat for Fast-Neutron Fission of ^{235}U, ^{238}U, Nat.U. and ^{232}Th for Cooling Times of 10^3 to 10^6 secs.

Method: Samples have been irradiated for 5 to 10 min. with fast neutrons. Gamma-ray energy spectra have been measured using NaI detector and beta-ray energy spectra have been obtained using plastic scintillation detector combined with $\Delta E/\Delta x$ type proportional counter to eliminate gamma-ray effects. Counting times have been chosen to provide good statistics within the time range of interest. Total energy release rates for beta and gamma-rays have been obtained to integrated beta and gamma-energy spectra respectively and summed to obtain the fission product decay heat.

The same experimental program has been planed for the more short cooling times using the fast pneumatic-tube irradiation facility and other fissile materials (^{239}Pu and ^{233}U).

Accuracy: <10% (expected)

(Expected) Completion Date: December 1978 for the more short cooling times
August 1979 for ^{239}Pu and ^{233}U.

Discrepancies to other Reported Data: Preliminary Data are in good agreement with other recent experiments.

Publications: M. Akiyama et al., "Kyōdō Riyō Seika Hōkoku-sho at Nuclear Engineering Research Laboratory U. of Tokyo, 1976, 1977.

SWEDEN

Laboratories:

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

Department of Nuclear Chemistry
University of Oslo
Oslo 3
Norway

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

Names:

The SISAK Collaboration:

G. Skarnemark and K. Brodén (Göteborg)

D. Eriksen and I. Haldorsen (Oslo)

N. Kaffrell, J. Stachel and N. Trautmann (Mainz)

Facilities:

Two SISAK systems for studies of radionuclides with half-lives >0.5 s.

Experiments:

$T_{1/2}$-determinations, γ-singles, time-γ-γ coincidence, γ-γ angular correlation and β-radiation measurements, at present on $^{106\text{-}108}$Tc.

Method:

Fast chemical on-line separations. The γ-measurements are carried out on flow cells or ion exchange columns. Ge(Li)-detectors are used.

Discrepancies to other data:

There are very few data available in this region.

SWEDEN

Laboratory and address: The Studsvik Science Research Laboratory
S-611 82 Nyköping, Sweden

Facility: The OSIRIS on-line separator has been used to extract selected nuclei from thermally fissioned ^{235}U.

1. Names: K Aleklett, O Glomset, P Hoff, E Lund and G Rudstam

Experiment: Delayed neutron emission probabilities, P_n-values have been deduced for the precursors: $^{79-83}Ga$, $^{87-89}Br$, $^{92-96}Rb$, $^{127-132}In$, $^{134,135}Sb$, $^{137-139}I$ and $^{141-145}Cs$.

Method: Neutron and beta activities are measured simultaneously in MCA mode. The neutron counter consists of 29 ^3He counters imbedded in parafine and the beta particles are detected with a 2 mm plastic detector. A Ge(Li) detector monitors the source purity. The calibration of the detectors have been performed most carefully and the P_n-values have been determined with an accuracy of typically 5 %.

Completion date: Completed and ready for publication.

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

Experiment: Total beta decay energies and atomic masses have been deduced for the following nuclides: $^{75-78}Zn$, $^{76-79}Ga$, $^{79,80}Ge$, $^{80,81,83}As$, $^{85-89}Br$, $^{120-129}In$, $^{127,132}Sn$, $^{128,130-132,134}Sb$ and $^{134,135}Te$.

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 Si(Li) detector and the gamma-rays in a Ge(Li) detector or two NaI(Tl) crystals. In the future the experimental arrangement will be improved by using two Ge(Li) detectors for the gamma registration.

Publications:
K Aleklett, E Lund, G Rudstam, Nucl Phys A281, 213 (1977),
K Aleklett, E Lund, G Nyman, G Rudstam, Nucl Phys A285, 1 (1977)
E Lund, K Aleklett, G Rudstam, Nucl Phys A286, 403 (1977)
K Aleklett, E Lund and G Rudstam, Phys Rev C18, 462 (1978)
K Aleklett, E Lund and G Rudstam, Total β-decay energies and masses of $^{85-89}Br$, to be published in Z Physik A.

Completion date: Indefinite

SWEDEN
(cont'd)

3. Name: P Hoff

Experiment: Nuclear spectroscopic studies of the beta-decays of ^{88}Br and ^{138}I for determination of delayed neutron emission to excited states in ^{87}Kr and ^{137}Xe respectively, are completed. Similar studies of the decays of ^{81}Ga, ^{89}Br, $^{93-96}Rb$, ^{135}Sb and ^{139}I, complemented with theoretical calculations of the delayed neutron branching ratios, are under way. Absolute γ-ray intensities have been deduced for the decays.

Publications: P Hoff, Levels of ^{137}Xe and ^{138}Xe populated in the decay of ^{138}I, J Inorg Nucl Chem (in press).

P Hoff, The decay of ^{88}Br, Physica Scripta (in press).

4. Names: B Fogelberg, H Tovedal

Experiment: Nuclear spectroscopic studies of short lived fission product nuclei by means of γ-ray and conversion electron spectroscopy and measurements of level half-lives.

Studies of the decays of even mass isotopes of In with A $\simeq$ 120 - 128 were completed during 1978. A project consisting of comprehensive studies of the decays of ^{137}I and ^{87}Br is expected to be completed during 1979.

Completion date: Indefinite for the nuclear spectroscopy project as such.

Publication: B Fogelberg and P Carlé, Levels and transition probabilities in $^{120,122,124,126,128}Sn$ studied in the decay of In isotopes, Nucl Phys (in press).

5. Names: G Rudstam and K Aleklett

Experiment: Experimental determinations of the average radiation energies of individual fission products. The measurements of average beta energies are completed and the experimental determinations of average gamma energies are in progress.

Evaluation: The average beta and gamma energies in the decay of 382 known fission products have been determined. As far as possible the values are based on experimental data direct determinations, published decay schemes, and a study of beta strength functions. In cases for which no experimental data exist the average energies have been derived using extrapolated beta strength function.

Publications: G Rudstam and K Aleklett, The energy distribution of antineutrinos originating from the decay of fission products in a nuclear reactor, The Studsvik Science Research Laboratory Report NFL-2 (1978).

G Rudstam and K Aleklett, Average beta and gamma energies of fission products, The Studsvik Science Research Laboratory Report NFL-7 (1979).

G Rudstam, Detailed comparison between decay heat data calculated by the summation method and integral measurements, The Studsvik Science Research Laboratory Report NFL-9 (1979).

SWEDEN

Laboratory and address:	Neutron Physics Laboratory AB Atomenergi Fack S-611 01 NYKÖPING Sweden
Names:	P-I Johansson and G Nilsson
Facilities:	6 MeV VdG accelerator PDP-15 Computer 24 k memory (on line) NaI(Tl) and Ge(Li) spectrometers, β-spectrometer CDC-CYBER 73 omputer (off line)
Experiment:	The objective of the experiment is to improve on the accuracy of currently available fission product decay heat data by means of radiometric study of small uranium specimens at cooling times longer than 3 seconds after irradiation with thermal neutrons. The residual power of gamma and beta radiation from thermal fission of ^{235}U has been obtained with an accuracy of ± 7 % in the time interval 10 sec to 25 min after fission. Measurements are in progress for studying also the residual power due to β-emission from ^{239}Pu.
Method:	A facility for thermal neutron irradiation of fissile specimens using a VdG accelerator has been built. Specimens are transported between the neutron source and a spectrometer by means of a pneumatic system. The absolute number of fissions in the sample is determined by two independent methods: a) by utilizing an absolutely calibrated fission chamber with an active volume of about the same size as the samples, b) by counting the number of gamma quanta emitted from fission products with known yields and decay properties. The beta radiation is measured with Si(Li) crystal. Sample transportation, irradiation and counting times are handled by a PDP-15 computer. Spectra are automatically stored on magnetic tape for off-line data analysis, i.e. the transformation from measured pulse height spectra to energy spectra.
Accuracy:	Better accuracy than ± 10 % is expected for the total energy released as β or γ-radiation from the fission products at any time between a few seconds and 30 minutes after fission.
Completion date:	Measurements on gamma-radiation from ^{235}U were completed in December 1976 and the study on beta emission were completed in March this year. The measurement on ^{239}Pu will be completed in October 1979.

SWITZERLAND

Laboratory and address:	Eidg. Institut für Reaktorforschung, CH-5303 Würenlingen Institut für anorganische, analytische und physikalische Chemie, Universität Bern, CH-3012 Bern, Switzerland
Name:	H.R. von Gunten
Facility:	Swimming-pool type reactor (SAPHIR)
Experiments:	Determination of independent and cumulative yields in the fission of ^{232}Th, ^{233}U, ^{235}U, ^{239}Pu, and other nuclides. Absolute yields in reactor neutron fission of ^{232}Th. Independent yields of ^{148m}Pm and ^{148g}Pm (thermal neutron fission of ^{233}U and ^{239}Pu).
Method:	Radiochemical and instrumental (GeLi).
Accuracy:	5 - 10 %
Measurements completed:	^{148}Pm: completed, report in preparation ^{232}Th: completion date uncertain
Publications:	- T. Kaiser and H.R. von Gunten, Independent yields of ^{96}Nb and 51 min ^{98}Nb in the thermal neutron-induced fission of ^{233}U, ^{235}U and ^{239}Pu, J. Inorg. Nucl. Chem. 40, 377 (1978). - T. Kaiser and H.R. von Gunten, Cumulative mass yields in the neutron-induced fission of ^{239}Pu at the resonance energy of 0.3 eV. Phys. Rev. C17, 1510 (1978). - H. Gäggeler and H.R. von Gunten, Charge distribution in the photofission of ^{238}U with Bremsstrahlung of E_{max} 20-50 MeV. J. Inorg. Nucl. Chem. 40, 1859 (1978).

UNITED KINGDOM

Laboratory and Address:	AEE Winfrith	UKAEA Atomic Energy Establishment Winfrith Dorchester, Dorset DT2 8DH
Names:	M. F. Murphy, W. H. Taylor	
Experiment:	Measurement of gross beta-decay power from products of ^{239}Pu and ^{235}U fission in a fast reactor. Irradiation period 10^5 seconds, detection continued up to 3.10^7 seconds after shutdown. Experiment completed.	
Method:	Thin deposits of ^{239}Pu and ^{235}U irradiated with catcher foils at centre of Zebra core with neutron energy spectrum close to that of fast power reactor. Fissions monitored by absolute (Alpha-calibrated) counters. Catcher foils transferred rapidly to scintillation detector, current output from photo-multiplier being measure of beta power. Calibrated using standard Sr-90/Y-90 source. Results of various subsidiary experiments have confirmed the validity of the experimental method and determined the necessary corrections.	
Accuracy:	Target accuracy is $\pm$ 7% (standard error) on absolute beta power as function of time from 30 seconds to 1 year after irradiation.	
Completion Date:	Complete.	
Publication:	An unclassified Winfrith report (AEEW-R1212) has been published.	

UNITED KINGDOM

Laboratory and Address	AERE Harwell	UKAEA, AERE, Harwell, Oxfordshire OX11 ORA U.K.
Names:	J. G. Cuninghame, H. H. Willis	
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 core and two in the outer. 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. More irradiations will have to be carried out and we are still some way from being able to determine the numbers of fissions absolutely but preliminary results are promising.	
Accuracy:	Expected $\pm$ 10%	
Completion date:	Expected end - 1979	

UNITED KINGDOM

Laboratory and Address:	AERE Harwell	UKAEA AERE, Harwell Oxfordshire, OX11 ORA
Names:	I. C. McKean and E. A. C. Crouch	
Experiment:	^{3}H yield in thermal and fast fission spectra for U and Pu isotopes	
Facilities:	GLEEP and 'ZEBRA' Reactors	
Method:	The tritium produced in fission is converted to tritiated water, separated from other fission products and measured by liquid scintillation counting. A preliminary experiment has been completed in which solutions of ^{235}U were irradiated in a thermal flux. Samples have been irradiated in GLEEP (^{235}U + ^{239}Pu in solution). Irradiations in ZEBRA-BIZET (^{235}U + ^{239}Pu metal) are planned for mid - 1979.	
Accuracy:	± 10%	

UNITED KINGDOM

(same as in INDC(NDS)-95)

Laboratory and Address:	DNPDE	Dounreay Nuclear Power Development Establishment, UKAEA, Northern Division, Thurso, Caithness, Scotland KW14 7TZ
Names:	W. Davies, V.M. Sinclair	
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 16% burn-up of the fissile material, the ^{238}U capsule to about 0.7% burn-up, the ^{240}Pu capsule to about 4% burn-up and the ^{241}Pu capsule to about 23% 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:	1980	

UNITED KINGDOM

(same as in INDC(NDS)-95)

Laboratory and Address	N.P.L. Teddington	Division of Radiation Science and Acoustics National Physical Laboratory Teddington Middlesex TW11 OLW
Names:	P. Christmas, P. Cross	
Facilities:	$\pi\sqrt{2}$ Beta-ray spectrometer, isotope separator	
Experiment:	Determination of K & L internal conversion coefficients of ^{133m}Xe.	
Method:	Peak-to-Beta-Spectrum (PBS). The study of instrumental distortions of beta-spectra in the $\pi\sqrt{2}$ spectrometer has been completed and submitted for publication, together with a paper describing the application of the PBS method to ^{137}Cs. The results quoted in the latter include precise values for the internal conversion coefficients and gamma-ray intensity per disintegration for the 662 KeV transition.	
Accuracy:	Target is $\pm$ 1 per cent.	
Completion Date:	Uncertain, due to lack of effort.	

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	
Experiment:	Delayed neutron spectrum measurements following mono-energetic fast neutron induced fission in ^{235}U	
Method:	^{3}He spectrometer; cyclic irradiation and counting to give near equilibrium contributions from all delayed neutron groups	
Accuracy:	Uncertainties on response function and efficiency measurements of the ^{3}He spectrometer are estimated to give rise to $\pm$ 5% error on the final spectra. When combined with statistical errors in the delayed neutron counts the overall error is estimated as $\pm$ 7% in the range 0.1-1MeV. Above 1MeV an uncertainty of 15-20% is expected. Below 0.1MeV corrections due to scattering are less certain and work is in hand to assess their influence on the accuracy	
Completion date:	Measurements at 0.94, 1.44, 1.76 and 6.0MeV are complete. Further measurements at other energies and with other fissioning nuclides are in progress	
Discrepancies with other reported data:	This work shows significant numbers of delayed neutrons above 1MeV as does the measurement of Evans and Krick. This is in marked disagreement with measurement made with proton recoil spectrometers (e.g. Eccleston and Woodruff) which show very little high energy contribution. At delayed neutron energies less than 0.1MeV this work shows considerable emission as does that of Eccleston and Woodruff; the spectral shapes are very different, however.	
Publications:	Owen J.G., Walker J., Weaver D.R. 'Energy spectra of delayed neutrons from uranium fission'. Proceedings of the International Conference on Neutron Data and Nuclear Data for Reactors, Harwell, September 1978. OECD Nuclear Energy Agency (1978) 606-609. Walker J., Weaver D.R., Owen J.G. 'Delayed neutron measurements with a 3MV Dynamitron accelerator'. Proceedings of the Fifth Conference on the Application of Small Accelerators, Texas, November 1978.	

United Kingdom

Laboratory and address : University of London Reactor Centre, Silwood Park, Sunninghill, Ascot, Berkshire, SL5 7PY.

Names : B.J. Olomo, T.D. Mac Mahon.

Facilities : $4\pi\beta$-γ coincidence system, Ge(Li) detectors.

Experiment : Measurement of absolute gamma-ray emission probabilities in fission products.

Method : Thin sources prepared from solutions of the radioisotope.
Total disintegration rate measured in $4\pi\beta$-γ coincidence system.
Gamma-ray emission rates determined using calibrated Ge(Li) detectors.
Combination of results gives number of gamma rays emitted per disintegration.

Accuracy : Target accuracy is 1% (1σ), accuracies achieved within range 0.8 - 1.2%, limited mainly by efficiency calibration of Ge(Li) detectors.

Completion date : $^{144}Ce/^{144}Pr$: completed early 1979.

$^{140}Ba/^{140}La$: Aug/Sept 1979.

Results :

	E_γ(keV)	I_γ(%)	I_γ(%) Ref 1
^{144}Ce	134	10.69 ± 0.12	11.09 ± 0.16
^{144}Pr	696	1.484 ± 0.012	1.342 ± 0.013
^{144}Pr	1489	0.276 ± 0.002	0.279 ± 0.003
^{144}Pr	2186	0.786 ± 0.009	0.700 ± 0.010

The above results have not yet been published.

Reference 1 : K. Debertin et al. Ann. Nucl. Ener. 2, 37-43 (1974).

U. S. A.

Laboratory and address:	Argonne National Laboratory 9700 South Cass Avenue Argonne, Illinois 60439 USA
Names:	L. E. Glendenin, J. E. Gindler, J. W. Meadows
Facilities:	Fast-neutron generator facility (FNGF)
Experiment:	Determination of fission yields for mono-energetic neutron-induced fission as a function of incident neutron energy over the range 0.1 to 8 MeV.
Method:	Yields determined (1) radiochemically with either β- or γ-counting and (2) by γ-counting irradiated foils of fissionable material. Neutrons produced by Li-p or D-d reaction. Flux monitored with fission chamber utilizing as the fission source the same material as that being irradiated. Absolute yields determined from flux measurements and/or 200% normalization of mass-yield distribution.
Accuracy:	Yields > 1% determined by γ-counting: 3-5% Yields < 1% determined by γ-counting: 5-20% Yields determined radiochemically with β-counting: 10-20%
Completion date:	Measurements of $^{238}U(n,f)$ for 1.5, 2.0, 3.9, 5.5, 6.9, and 7.7 MeV neutrons (published Jan. 1978). $^{232}Th(n,f)$ in progress; work to be completed by mid-1979. Continuing program for other fissile and fertile nuclides.
Publications:	"Mass distributions in monoenergetic-neutron-induced fission of ^{238}U", S. Nagy, K. F. Flynn, J. E. Gindler, J. W. Meadows, and L. E. Glendenin, Phys. Rev. C17, 163 (1978).
	"Fission yields for fast-neutron fission of uranium-238", J. E. Gindler, L. E. Glendenin, J. W. Meadows, and K. F. Flynn, Nucl. Sci. Eng. 70, 101 (1979).

U.S.A.

Laboratory and Address

Argonne National Laboratory
9700 South Cass Avenue
Argonne, Illinois USA

Names

A. Smith, P. Guenther, G. Winkler* and J. Whalen

Facilities

Monoenergetic pulsed-beam accelerator

Experiment

Fast-Neutron Total and Scattering Cross Sections of ^{107}Ag in the MeV Region

Neutron total cross sections are measured from 0.25 to 4.5 MeV at intervals of $\lesssim$10 keV. Neutron differential elastic- and inelastic-scattering cross sections are measured from 1.5 to 4.0 MeV at intervals of $\leq$0.2 MeV. Cross sections for scattering into more than 20 energy groups are determined. Cross sections calculated from an optical-statistical model are in quantitative agreement with measured neutron inelastic-scattering cross sections. In the context of this model, significant dependence of the inelastic-scattering process on parity and/or deformation is not in evidence. The interpretation of the observed neutron inelastic-neutron-scattering results is consistent with previous reported J^{π} assignments and the systematics of nuclear-level-densities.

Publication

Argonne National Laboratory Report, ANL/NDM-46 (1979)

*Permanent address: Institut fuer Radiumforschung und Kernphysik, A-1090 Vienna, Boltzmanngasse 3, Austria.

U. S. A.

FPND NEWSLETTER CONTRIBUTION - I

Laboratory: Idaho National Engineering Laboratory

Address: Allied Chemical Corporation
550 Second Street
Idaho Falls, Idaho 83401
United States

Name: William J. Maeck

Experiment: Fast Reactor Fission Yields and Determination of Burnup for Fast Reactor Fuels

A program is in progress at the Idaho Chemical Processing Plant (ICPP) laboratories to accurately measure absolute fast reactor fission yields for ^{233}U, ^{235}U, ^{238}U, ^{237}Np, ^{239}Pu, ^{240}Pu, ^{241}Pu, ^{242}Pu, ^{241}Am, and ^{243}Am. The irradiations were conducted in EBR-II, Row-8. The analytical measurements have been completed for all samples except ^{243}Am. Reports have been issued giving fast reactor yield data for ^{233}U, ^{235}U, ^{238}U, ^{237}Np, ^{239}Pu, ^{240}Pu, ^{241}Pu, and ^{242}Pu.

Method: The principal measurement technique is isotope dilution mass spectrometry for the isotopes of Kr, Rb, Sr, Zr, Mo, Ru, Xe, Ce, Ba, La, Ce, Nd, and Sm. The number of fissions is established by the summation of the total atoms in the heavy mass peak.

Accuracy: In general, the uncertainties associated with ^{233}U, ^{235}U, ^{237}Np, ^{239}Pu, ^{241}Pu, and ^{242}Pu yields range from 1.0-1.5% relative, and for ^{238}U and ^{240}Pu yields, the uncertainties range from 1.5-3.0% relative.

Future Work: Data reduction, statistical analysis and calculation of the fast fission yields for ^{241}Am is in progress.

To augment the fast yield data obtained from the irradiation in Row-8 of EBR-II, samples of ^{233}U, ^{235}U, ^{239}Pu, and ^{241}Pu which were irradiated in Row-2 of EBR-II are being analyzed. These data will provide more

(cont'd)

information relative to the effect of neutron energy on fission yields. The analysis of the ^{233}U and ^{235}U samples has been completed and analysis of the ^{239}Pu and ^{241}Pu samples is in progress.

The fabrication of samples for irradiation in the Fast Flux Test Facility (FFTF) at Hanford, Washington, is in progress. These samples will be irradiated in late 1979 and will be used to provide FFTF benchmark fast yield data for ^{233}U, ^{235}U, ^{239}Pu, and ^{241}Pu.

Special Comments: All yield data reported from this work are associated with a measured or calculated neutron spectrum. The study to correlate yields with neutron energy is continuing.

Publications: The results of this measurement program are published in a series of Allied Chemical Corporation - Idaho Chemical Programs reports designated ICP-1050-I, II, III, etc. The following reports are available from the National Technical Information Service, U.S. Dept. of Commerce, 5285 Port Royal Road, Springfield, Virginia, 22161, USA.

1. W. J. Maeck, Editor, "Fast Reactor Fission Yields for ^{233}U, ^{235}U, ^{238}U, ^{239}Pu and Recommendations for the Determination of Burnup on FBR Mixed-Oxide Fuels: An Interim Project Report," Allied Chemical Corporation - Idaho Chemical Programs Rept., ICP-1050-I (January 1975).

2. W. J. Maeck, Editor, "Fast Reactor Fission Yields for ^{239}Pu and ^{241}Pu," Allied Chemical Corporation - Idaho Chemical Programs Rept., ICP-1050-II (August 1977).

3. W. J. Maeck, W. A. Emel, A. L. Erikson, J. E. Delmore, J. W. Meteer, "Fast Reactor Fission Yields for ^{237}Np," Allied Chemical Corporation - Idaho Chemical Programs Rept., ICP-1050-III (September 1977).

4. W. J. Maeck, R. L. Eggleston, A. L. Erikson, R. L. Tromp, "Fast Reactor Fission Yields for ^{240}Pu and ^{242}Pu," Allied Chemical Corporation - Idaho Chemical Programs Rept., ICP-1050-IV (February 1979).

U. S. A.

FPND NEWSLETTER CONTRIBUTION - II

Laboratory: Idaho National Engineering Laboratory

Address: Allied Chemical Corporation
550 Second Street
Idaho Falls, Idaho 83401
United States

Name: William J. Maeck

Experiment: Thermal Fission Yields for ^{235}U and ^{239}Pu

An existing experiment has been extended to remeasure the major fraction of the mass yield curve for the thermal fission of ^{235}U and ^{239}Pu. The need for this program resulted from serious discrepancies in some measured relative isotopic ratios for certain isotopes in the thermal fission of ^{239}Pu. New yield values, based on the analysis of six ^{235}U samples (three at 1 a/oF and three at ∿35 a/oF) have been published.

Method: The principal measurement technique is isotope dilution mass spectrometry for the isotopes of Kr, Rb, Sr, Zr, Mo, Ru, Xe, Cs, Ba, La, Ce, Nd, and Sm. For the ^{235}U samples, the number of fissions was established by two methods: 1) the summation of the total atoms in the heavy mass peak, and 2) the heavy element difference technique.

Accuracy: The uncertainties associated with these new ^{235}U yields range from 0.5-1.5% relative. A comparison of the number of fission determined by the summation technique and the heavy element difference technique show an agreement of ±0.5% relative.

Future Work: Analysis of six ^{239}Pu samples (three at 1 a/oF and three at ∿40 a/oF) has been completed and data reduction is in progress. A final report giving new ^{239}Pu thermal yield data will be issued late in 1979.

Data Discrepancies: See Publication 1.

Publications:

1. W. J. Maeck, W. A. Emel, J. E. Delmore, F. A. Duce, L. L. Dickerson, J. H. Keller, R. L. Tromp, "Discrepancies and Comments Regarding ^{235}U and ^{239}Pu Thermal Fission Yields and the Use of ^{148}Nd as a Burnup Monitor," Allied Chemical Corporation - Idaho Chemical Programs Rept., ICP-1092 (December 1976).

2. W. J. Maeck, W. A. Emel, F. A. Duce, R. L. Tromp, J. W. Meteer, "Absolute Thermal Fission Yields for ^{235}U," Allied Chemical Corporation - Idaho Chemical Programs Rept., ICP-1142 (September 1978).

U. S. A.

FPND NEWSLETTER CONTRIBUTION - III

Laboratory: Idaho National Engineering Laboratory

Address: Allied Chemical Corporation
550 Second Street
Idaho Falls, Idaho 83401
United States

Name: William J. Maeck

Experiment: Natural Fission Reactor Studies: ^{238}U Spontaneous Fission Yields

In the process of analyzing approximately 25 rich uranium ore samples for fissiogenic ruthenium, a preliminary estimate of the ^{238}U spontaneous fission yields for ^{99}Ru, ^{101}Ru, ^{102}Ru, and ^{104}Ru has been obtained. The measurement technique was mass spectrometry.

After correction for the natural Ru component and the fissiogenic component resulting from ^{235}U induced fission, the best estimate for the isotopic composition of ^{238}U spontaneous fission Ru is:

99	0.236
101	0.285
102	0.314
104	0.165

Using a value of 6.0% for the ^{238}U spontaneous fission yield of ^{99}Mo, the preliminary ^{238}U spontaneous fission yields for the Ru isotopes are:

^{99}Ru	6.0% (relative to ^{99}Mo)
^{101}Ru	7.25
^{102}Ru	8.0
^{104}Ru	4.2

These values have been updated and supersede those reported in INDC (NDS)-86.

A new ore sample, believed to have a very high fraction of spontaneous fission is being hi-graded and will be analyzed to give improved ^{238}U spontaneous fission data for ruthenium. A new mass spectrometric measurement procedure for ruthenium has been developed which gives more reliable data on the 10-25 ng level.

U.S.A.

Laboratory and address: Idaho National Engineering Laboratory
EG&G Idaho, Inc.
P. O. Box 1625
Idaho Falls, Idaho 83401
U.S.A.

Names: Y. D. Harker, R. A. Anderl

Experiment: Integral cross-section measurements in fast-reactor type environments.

Method: Multiple samples of highly-enriched isotopes of neodymium, samarium, and europium, specifically, ^{143}Nd, ^{144}Nd, ^{145}Nd, ^{146}Nd, ^{148}Nd, ^{150}Nd, ^{147}Sm, ^{149}Sm, ^{151}Eu, ^{152}Eu, ^{153}Eu, and ^{154}Eu were irradiated in a row 8 position of EBR-II. Samples and dosimetry sets of spectrum monitors were located both at the reactor midplane and in the axial reflector. Reaction rates for the spectrum monitors were determined by the gamma-spectrometric technique using Ge(Li) spectrometers. A spectrum-unfolding code was used to obtain flux and neutron-spectral shape information from the monitor reaction rates. Reaction rates for the fission product samples were measured using mass-spectrometer techniques. The results are used in the integral testing of multi-group cross sections by least squares adjustment techniques.

Accuracy: 5% to 10%

Measurements Completed: Integral capture reaction rates obtained for ^{143}Nd ^{144}Nd, ^{145}Nd, ^{147}Sm, ^{149}Sm, ^{151}Eu, ^{152}Eu, ^{153}Eu and ^{154}Eu are summarized in Table 1.

Completion Date: Additional mass spectrometry measurements are underway to improve the accuracy of the Eu reaction rates. These measurements, a detailed characterization of the neutron environment and integral data testing will be completed by the end of 1979.

Publications: R. A. Anderl et al, "EBR-II Irradiation of enriched Isotopes of Neodymium, Samarium, and Europium," Trans. Am. Nucl. Soc. 28, 745 (1978).

U.S.A.
(cont'd)

TABLE I

INTEGRAL CAPTURE REACTION RATES MEASURED FOR ISOTOPES OF Nd, Sm AND Eu IRRADIATED IN A ROW 8 POSITION OF EBR-II.

Isotope	Axial[a] Position	Reaction Rate[b] (rps/atom) x 10^{10}	Reaction Rate (Fission Product) / Reaction Rate ($^{235}U(n,f)$)
^{143}Nd	+3.8	5.026(1.1)	.215(3.9)
	+38.8	8.746(.6)	.380(3.6)
^{144}Nd	+3.8	1.060(2.0)	.0459(3.8)
	+38.8	.993(1.1)	.0431(3.7)
^{145}Nd	+3.8	7.645(1.0)	.327(3.8)
	+38.8	14.55(.6)	.632(3.6)
^{147}Sm	-3.8	23.11(.6)	.988(3.7)
	+31.2	44.81(1.2)	1.88(3.8)
^{149}Sm	-3.8	40.90(2.4)	1.75(4.4)
	+31.2	81.51(3.3)	3.43(4.8)
^{151}Eu	+3.8	54.0(6.0)	2.34(6.8
	+38.8	112.9(6.0)	4.90(6.9)
^{152}Eu	-3.8	51.6(10.0)	2.23(11.0)
	+31.2	74.6(10.0)	3.14(11.0)
^{153}Eu	+3.8	29.6(5.0)	1.28(5.9)
	+38.8	61.9(4.0)	2.69(5.3)
^{154}Eu	-3.8	37.5(8.1)	1.62(8.7)
	+31.2	62.0(8.2)	2.61(9.0)

[a] Axial location is the axial distance from reactor midplane at 0 to the axial midpoint of the experiment capsule.

[b] Example, reaction rate for $^{143}Nd(n,\gamma)^{144}Nd$ at axial position of +3.8 cm is $(5.026 \times 10^{-10} \pm 1.1\%)$rps/atom.

U.S.A.

Laboratory and address:	Idaho National Engineering Laboratory EG&G Idaho, Inc. P. O. Box 1625 Idaho Falls, Idaho 83401 USA
Names:	R. J. Gehrke, R. G. Helmer
Facilities:	1) 4π β-γ coincidence counting system 2) Calibrated Ge(Li) spectrometers
Experiment:	Determination of absolute γ-ray emission probabilities for important fission-product isotopes.
Method:	The decay rates are determined by the 4π β-γ coincidence counting system, which has two separate pulse-processing systems. One system is based on fixed pulse widths. The other is based on variable pulse widths and an overlap coincidence circuit. The dead time of the beta, gamma and coincidence channels is measured by counting the pulses from a 10 MH clock. The variable pulse width system is useful in measuring the γ-ray emission probabilities of short-lived (< 30 m) fission products, where high count rates are needed. The γ-ray emission rates are determined by Ge(Li) spectrometers whose efficiencies have been measured to an accuracy of $\pm 1\frac{1}{2}\%$ (1σ) between 0.3 and 2 MeV.
Accuracy:	$\pm$ 1% to $\pm$ 5% (1 uncertainty)
Measurement Completed:	Emission probability of the prominent 165.9-keV γ ray from ^{139}Ba decay has been determined with a precision of $\sim$ 1.1% (1σ level) and the ^{139}Ba half-life has been remeasured with a precision of $\sim$ 0.3% (1σ level). From this former datum, it is possible to derive more precise emission-probability values for the γ rays from the ^{139}Xe and ^{139}Cs parent-members of the A-139 decay chain
Completion Dat :	Measurement activity is an on-going effort. ^{139}Ba measurement completed in March, 1979. ^{145}Pr and ^{146}Pr measurements to be completed by October, 1979
Publications:	L. O. Johnson and R. J. Gehrke "A High Rate 4π β-γ Coincidence Counting System", IEEE Transactions on Nuclear Science, Vol. NS-26, No. 1, 476 (1979).

U.S.A.

LABORATORY	Lawrence Livermore Laboratory University of California P.O. Box 808 Livermore, CA 94550, U.S.A.	McClellan Central Laboratory 1155th Technical Operations Squadron McClellan AFB, CA 95652, U.S.A.
1. NAMES	D. R. Nethaway A. L. Prindle	W. A. Myers M. V. Kantelo R. L. Osborne
FACILITY	FLATTOP Critical Assembly (Pu), Los Alamos Scientific Laboratory.	
EXPERIMENT	Measure fission yields (both total chain yields and independent yields) for fission of Pu-240 induced by fission-spectrum neutrons.	
METHOD	Measurements were made both by doing chemical separations and by direct counting with Ge(Li) detectors. The accuracy of the measurements is about ± 5%. Absolute yields are based on a comparison with U-235 fission yields and on a normalization of the mass-yield curve.	
COMPLETION DATE	The experiment is finished.	
PUBLICATION	Phys. Rev. C 18, 1700 (1978), (Report UCRL-80020).	

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2. NAMES	D. R. Nethaway A. L. Prindle D. H. Sisson	M. V. Kantelo R. A. Sigg
EXPERIMENT	Measure fission yields for fission of Am-241 induced by fission-spectrum neutrons.	
METHOD	Measurements are being made by doing chemical separations on the irradiated Am-241 samples and by using the recoil catcher-foil technique. Absolute yields will be based on a comparison with U-235 fission yields and on a normalization of the mass-yield curve.	
COMPLETION DATE	The measurements are finished, and we plan to start writing a report for publication soon.	

U.S.A.

LABORATORY	Lawrence Livermore Laboratory University of California P.O. Box 808 Livermore, CA 94550, U.S.A.	McClellan Central Laboratory 1155th Technical Operations Squadron McClellan AFB, CA 95652, U.S.A.
3. NAMES	D. R. Nethaway A. L. Prindle D. H. Sisson	M. V. Kantelo R. A. Sigg
FACILITY	Livermore ICT Facility (14-MeV neutron source)	
EXPERIMENT	Measure fission yields for fission of Am-241 induced by 14.8-MeV neutrons.	
METHOD	Measurements were made by doing chemical separations on the irradiated Am-241 samples, and by using the recoil catcher-foil technique. The accuracy of the measurements is about ± 5%. Absolute yields are based on a normalization of the mass-yield curve.	
COMPLETION DATE	The experiment is finished.	
PUBLICATION	A rough draft has been written which will be issued as a Lawrence Livermore Laboratory Report and then submitted to Phys. Rev. C.	

U.S.A.

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

Names: J. K. Dickens and J. W. McConnell

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

Experiment: Absolute yields of forty-nine fission products, representing thirty-six mass chains created by thermal-neutron fission of ^{239}Pu have been determined.

Method: A one microgram sample of ^{239}Pu was irradiated for 100 sec with thermal neutrons. Following irradiation the sample was moved to a low-background counting area. Gross fission product gamma-ray spectra were obtained using a large-volume Ge(Li) detector. Counting intervals were initiated between 1550 and 2.6×10^6 sec following the end of the irradiation.

Accuracy: Absolute 1σ uncertainties range between 2.5 and 25%, made up of 2.0% uncertainty assigned to detector efficiency, 1.3% uncertainty in determining the number of fissions created in the sample, and uncertainties in peak extraction and in branching ratios and lifetimes given in the literature.

Completion Date: January 1979

Discrepancies to Other Report Data: Cumulative fission yields agree well with previous measurements and recommended evaluations except for mass chains between 101 and 107, for which the present results are larger than previously determined.

Publications: J. K. Dickens and J. W. McConnell, "Fission-product Yields for Thermal-neutron Fission of ^{239}Pu, (preprint available May 1979).

U.S.A.

Laboratory and address: Oak Ridge National Laboratory
P. O. Box X, Building 6010
Oak Ridge, Tennessee 37830, U.S.A.

Names: J. K. Dickens

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

Experiment: Absolute yields of seventeen fission products, representing sixteen mass chains created by thermal-neutron fission of ^{241}Pu have been determined.

Method: A one microgram sample of ^{241}Pu was irradiated for 50 sec with thermal neutrons. Following irradiation the sample was moved to a low-background counting area. Gross fission-product gamma-ray spectra were obtained using a large volume Ge(Li) detector. Six counting measurements were made between 17 and 210 hours after the irradiation.

Accuracy: Between 4% and 15% (1σ), made up of 2.5% uncertainty assigned to detector efficiency, 2.8% uncertainty in determining the number of fissions created in the sample, and the remainder due to uncertainties in peak extraction and in branching ratios and lifetimes given in the literature. Uncertainties assigned to nine of the measured yields are smaller than existing evaluated uncertainties for these yields.

Completion Date: September 1978

Discrepancies to Other Report Data: Data agree with evaluation of Crouch (E. A. C. Crouch, Atomic Data and Nucl. Data Tables 19, 419 (1977)) for fifteen of the measured values.

Publications: J. K. Dickens, "Fission Yields for Thermal-Neutron Fission of ^{241}Pu," Nucl. Sci. Eng. (in press).

U.S.A.

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

Names: J. K. Dickens and R. W. Peelle

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

Experiment: Total Beta and Gamma Energy Release for Thermal-Neutron Fission of ^{235}U, ^{239}Pu, and ^{241}Pu for Cooling Times of 2 to 14000 secs.

Method: Microgram samples of ^{235}U, ^{239}Pu, and ^{241}Pu have been irradiated for short periods with thermal neutrons, and returned pneumatically to a counting area. Beta- and gamma-ray energy spectra of moderate resolution have been obtained using scintillation detectors (NE110 for beta rays and NaI for gamma rays) for selected time intervals within the time range of interest. The spectra have been reduced to differential production cross sections $d\sigma/dE$ and have been integrated to obtain total energy release rates for beta and gamma rays (separately). These data have been summed to obtain the total energy release.

Accuracy: 3% (1σ) for ^{235}U and ^{239}Pu, 4% for ^{239}Pu

Completion Date: May 1977 for ^{235}U, December 1977 for ^{241}Pu, and August 1978 for ^{241}Pu

Discrepancies to Other Report Data: Data are in reasonable agreement with other recent experiments and with results of summation calculations. However, present results are up to 15% smaller than recent data from Los Alamos; these discrepancies have not been resolved.

Publications:

J. K. Dickens, J. F. Emery, T. A. Love, J. W. McConnell, K. J. Northcutt, R. W. Peelle, and H. Weaver, "Fission-Product Energy Release for Times Following Thermal-Neutron Fission of ^{235}U Between 2 and 14000 Seconds," ORNL/NUREG-14 (October 1977).

J. K. Dickens, J. F. Emery , T. A. Love, J. W. McConnell, K. J. Northcutt, R. W. Peelle, and H. Weaver, "Fission-Product Energy Release for Times Following Thermal-Neutron Fission of ^{239}Pu Between 2 and 14000 Seconds," ORNL/NUREG-34 (April 1978).

J. K. Dickens, T. A. Love, J. W. McConnell, J. F. Emery, K. J. Northcutt, R. W. Peelle, and H. Weaver, "Delayed Beta- and Gamma-Ray Production Due to Thermal-Neutron Fission of ^{235}U, Spectral Distributions for Times After Fission Between 2 and 14000 Sec: Tabular and Graphical Data," NUREG/CR-0162, ORNL/NUREG-39 (August 1978).

J. K. Dickens, J. F. Emery, T. A. Love, J. W. McConnell, K. J. Northcutt, R. W. Peelle, and H. Weaver, "Fission-Product Energy Release for Times Following Thermal-Neutron Fission of ^{241}Pu Between 2 and 14000 Seconds," NUREG/CR-0171, ORNL/NUREG-47 (August 1978).

U.S.A.

Laboratory: Oak Ridge National Laboratory, Bldg. 6010, P. O. Box X, Oak Ridge, TN 37830

Names: R. L. Macklin

Facilities: Oak Ridge Electron Linear Accelerator (ORELA)
Flight Path 7

Experiment: Fast Neutron (n,γ) Cross Sections E_n = 2.6 - ∿500 keV
Target-isotopes: see table below

Method: Total Prompt Photon Energy Detectors, Neutron Time-of-Flight. Nucl. Instr. and Meth. 91, 565-571 (1971), Phys. Rev. C11, 1270-1279 (1975).

Accuracy: 2-5% in cross section, ≳0.2% resolution (FWHM)

[Expected] completion date: See table below

Publications: "

Isotopes	Completion Date	Publications
^{86}Kr	indefinite	Data taking planned for 1979
^{86,87,88}Sr	1979, plan to remeasure ^{87}Sr w. D. Drake (LASL)	"Valence Neutron Capture in ^{88}Sr", J. W. Boldeman, B. J. Allen, A. R. de L. Musgrove, Nucl. Phys. A269, 397 (1976)
^{89}Y	1976	J. Boldeman et al, Nucl. Sci. Engr. 64, 744 (1977)
90,91,92,94Zr	1976	"The 292.4 eV Neutron Resonance Parameters of ^{91}Zr", R. L. Macklin, et al, Nucl. Sci. Engr. 62, 174 (1977) "keV Neutron Capture in Zirconium-91", J. W. Boldeman et al, AAEC/E 367 "The Neutron Total and Capture Cross Sections of ^{92,94}Zr", J. W. Boldeman et al, Nucl. Phys. A263, 389 (1976) "High Resolution Neutron Transmission and Capture for ^{91}Zr", A. R. Musgrove et al, Austral. J. Phys. 30, 391 (1977)
^{93}Nb	1976	R. L. Macklin, "Neutron Capture Cross Section of Niobium from 2.6 to 700 keV", Nucl. Sci. Engr. 59, 12 (1976)

U.S.A.
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Isotopes	Completion Date	Publications
92,94,95,96,97,98,100Mo	1976	"Neutron Resonances in ^{100}Mo and Valence Neutron Capture", H. Weigmann et al., Phys. Rev. C (in press) "Resonance Parameters, Capture Gamma-Rays and Reaction Mechanisms in ^{98,100}Mo + n", H. Weigmann et al., Proc. Spec. Mtg. on Structural Materials for Fast Reactors (Geel, Belgium Dec. 1977). "Average Neutron Resonance Parameters and Radiative Capture Cross Sections for the Isotopes of Molybdenum", A. R. de L. Musgrove et al., Nucl. Phys. A270, 108 (1976)
100,101,102,104Ru	1979	analysis proceeding
103Rh	1979	analysis proceeding
104,105,106,108,110Pd	1979	"104,105,106,108,110Pd(n,γ) Cross Sections above 2.6 keV", R. L. Macklin et al., Nucl. Sci. Engr. (in press 1979)
106,108,110,111,112, 113,114,116Cd	1978	"Neutron Capture Resonance Parameters and Cross Sections for the Even-A Isotopes of Cd", A. R. Musgrove et at., J. Phys. G, 4, 771 (1978)
122,123,124,125, 126,128,130Te	1977	R. R. Winters (Denison University, ORNL Consultant) analyzing the data.
133Cs	indefinite	data taken
134,135,136,137,138Ba	1976	"keV Neutron Resonance Capture in Barium-137", A. R. de L. Musgrove et al., Aust. J. Phys. 29, 157 (1976) "keV Neutron Capture Cross Sections of ^{134}Ba and ^{136}Ba", Nucl. Phys. A256, 173 (1976). See below w. ^{140}Ce
139La	1978	"Resonant Neutron Capture in ^{139}La", A. R. Musgrove et al., Austral. J. Phys. 31, 47 (1978)

U.S.A.
(cont'd)

Isotopes	Completion Date	Publications
^{140}Ce	1978	"Resonance Neutron Capture in ^{138}Ba and ^{140}Ce and the Prompt Neutron Correction to Gamma-Ray Detectors", A. R. Musgrove et al., Austral. J. Phys. (in press) "Non-Statistical Neutron Capture in 140Ce", A. R. Musgrove et al., Austral. J. Phys.
^{141}Pr	1977	Data taken, analysis at Lucas Heights
$^{142,143,144,145,146,148}Nd$		"Non-Statistical Effects in the Radiative Capture Cross Sections of the Neodymium Isotopes", A. R. Musgrove et al., AAEC/E 401
^{159}Tb	1978	"Neutron Capture Cross Section of ^{159}Tb From 2.6 to 700 keV", M. Mizumoto et al., Phys. Rev. C17, 522 (1978)
^{165}Ho	1976	"The $^{165}Ho(n,\gamma)$ Standard Cross Sections from 3 to 450 keV", R. L. Macklin, Nucl. Sci. Engr. 59, 231-236 (1976)
^{169}Tm	1979	Data taken, analysis by D. Drake, J. Malanify (LASL) and R. Macklin (ORNL), "Fast Neutron Capture Cross Sections of ^{169}Tm, ^{191}Ir, ^{193}Ir and ^{175}Lu for $3 \leq E_n \leq 2000$ keV", R. L. Macklin et al., Los Alamos Report LA-7479-MS (1978)

For most of these measurements, see also: Proceedings of an International Conference on Neutron Physics and Nuclear Data for Reactors and Other Applied Purposes, Harwell, 1978, page 449.

CONTRIBUTION TO "PROGRESS IN FISSION PRODUCT NUCLEAR DATA"

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 ^{235}U 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. Ions are collected on a moving tape collector system for a short time interval during and after the neutron pulse. The radioactive decay of the two isomers is followed by beta and gamma counting to determine the relative yield of each isomer.

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: It is hoped to complete this work by spring of 1980.

U.S.A.

Laboratory and address: University of Illinois
Nuclear Radiation Laboratory
Nuclear Engineering Program
Urbana, Illinois 61801
U.S.A.

Names: Bernard W. Wehring

Facilities: Illinois Advanced TRIGA 1.5-MW Nuclear Reactor,
HIAWATHA Fission-Fragment Mass Spectrometer.

Experiment: Direct Physical Measurement of the Primary Postneutron-Emission Nuclide Yields in Thermal-Neutron Fission of U-235, Pu-239, and U-233

Method: The fission-fragment recoil mass spectrometer HIAWATHA, consisting of a cylindrical focusing electrostatic analyzer and time-of-flight system, is used to determine fragment masses while fragment energy loss is used to identify fragment atomic numbers in a multiparameter experiment. All fragment velocities and charge states are measured.

Accuracy: 0.5-amu mass resolution, achieved,
about 1-Z atomic-number resolution, achieved,
1% standard error (relative error) in largest mass yield, achieved,
0.02-0.1% standard error (absolute error) in nuclide yields, achieved.

Completion date:

Publications:

Gino DiIorio, "Direct Physical Measurement of Mass Yields in Thermal Fission of Uranium 235," Ph.D. Thesis, University of Illinois at Urbana-Champaign, 1976.

Gino DiIorio and B. W. Wehring, "Direct Physical Measurement of Mass Yields for $^{235}U(n_{th},f)$," Trans. Am. Nucl. Soc. 24, 459 (1976).

Gino DiIorio and B. W. Wehring, "HIAWATHA, A Fission-Fragment Recoil Mass Spectrometer," Nucl. Instr. Methods 147, 487 (1977).

R. B. Strittmatter and B. W. Wehring, "Direct Physical Measurement of Nuclide Yields for $^{235}U(n_{th},f)$," Trans. Am. Nucl. Soc. 27, 862 (1977).

R. B. Strittmatter, "Nuclide Yields for Thermal Fission of Uranium 235," Ph.D. Thesis, University of Illinois at Urbana-Champaign, 1978.

R. B. Strittmatter and B. W. Wehring, "Direct Measurement of Nuclide Yields in Thermal-Neutron Fission Using HIAWATHA," Proceedings of the International Conference on Neutron Physics and Nuclear Data for Reactor and other Applied Purposes, Harwell, September 25-29, 1978.

II. COMPILATIONS AND EVALUATIONS

(revisions with respect to the last issue are marked by a vertical bar in the margin)

FRANCE

LABORATORY AND ADDRESS : LABORATOIRE DE METROLOGIE DES RAYONNEMENTS IONISANTS
CEN SACLAY
BP 2
91190 GIF SUR YVETTE

NAMES : J. LEGRAND, F. LAGOUTINE

EVALUATION : Radionuclide decay data

PURPOSE : To provide recommended values and uncertainties for the nuclear data, including half-lives, Q-values, branching fractions for the various decay modes, energies and intensities of all emitted radiations (e.g. β, C.E, γ, X-ray) ; K and total ICC.

METHOD : Selection of sources materials. Data evalued on the basis of the rules established by the European group.

STATUS : Evaluation of the following F.P. ^{86}Rb, ^{89}Sr, ^{90}Sr, ^{91}Y, ^{95}Zr, ^{106}Ru, ^{106}Rh, ^{127m}Te, ^{131}I, ^{131m}Xe, ^{131m}Te, ^{137}Cs, ^{140}Ba, ^{141}Ce.

COMPLETION DATE : 1977 - 1979

PUBLICATION : Table de radionucléides vol. 1 - 2 - edition CEA-LMRI ISBN-2-7272-0004-8. Some 80 nuclides are available, including the F.P.

PHONED ACTIVITIES : continuous evaluation

INDIA

Laboratory and address: Health Physics Division
Bhabha Atomic Research Centre
Bombay 400 085, India.

Names: P.P.Chakraborty, D.N.Sharma, M.R.Iyer and A.K.Ganguly.

THEORETICAL COMPILATION

(1) Type of data: Mass yield and Elemental yield prediction of fragments for spontaneous fission of various fissioning nuclides.

(2) Purpose: To predict mass and elemental yield of fragments from various fissioning nuclei using a model which is independent of any input fission data.

(3) Major source of information: The stable neutron numbers as a function of Z of nuclei obtained from the Nuclear Mass Tables is the only input required for the calculations. Using this input data the Order Disorder Model is applied to the fissioning nucleus to predict yield values.

(4) Results and discrepancies: The various characteritics of the mass yield distribution, viz., peak-to-valley ratios, bunching of higher mass peaks etc. agree well with those of experimental data. The absolute values have some discrepancies with experimental values, though an improvement in the right direction has been noticed by using the later data on nuclear stability. This leads to the conclusion that the accuracy of the predictions depend on the accuracy of the only input data used in the calculations viz., the stable

INDIA
(cont'd)

neutron number values. The yield distribution predicted for trans-californium nuclei show the onset of symmetric division for fission of higher mass number nuclei.

(5) Completion date: The first stage of the computation is completed by February 1977 and further improvement of the predictions is under progress using the improved stability data of nuclei.

(6) Publications: (i) Chakraborty P.P.

Asymmetry of Mass and Charge Distribution in Low Energy Fission and Fissile Material Identification Techniques

Ph D Thesis, Gujarat University, India 1977

(ii) Chakraborty P.P., Sharma D.N. , Iyer M.R. and Ganguly A.K.

Asymmetry of Mass and Charge Division

To be published.

ITALY

Laboratory and address:	CNEN, Centro di Calcolo Via Mazzini, 2 - 40138 Bologna, Italy
Names:	F. Fabbri, T. Martinelli, E. Menapace, M. Motta G.C. Panini, G. Reffo, M. Vaccari, A. Ventura
Evaluation:	The revision of the previous evaluations concerning Pd-105, Nd-143, Sm-149, Sm-151 on the basis of recent experimental microscopic and integral data
Purpose:	Estimate of long term reactivity changes and FP accumulation in fast reactor
Method:	Calculations by BW-single and -multilevel formalism (resonance region) and by statistical and optical models
Major sources of information:	NEUDADA, CINDA, Nuclear Data Sheets
Deadline of literature coverage:	December 1978
Status:	The full evaluation and file compilation in the range 0-15 MeV of the before mentioned isotopes is in progress and the results are under discussion with the cooperating parts (see below)
Cooperation:	CEA - Cadarache and Saclay and ECN Petten
Other relevant details:	25 group cross sections at infinite dilution and 0°K temperature have to be generated for each evaluated isotope
Computer file of evaluated data:	ENDF/B format.
Publications:	Tables of Neutron Resonance Data and Parameters for 63 Fission Products Evaluated and Compiled at the Bologna Centre (1977). A. Montaguti, M. Vaccari, CNEN-RT/FI(78)23. Multigroup Cross-Sections of 63 Fission Product Nuclei from Different Nuclear Data Files. A. Montaguti, G.C Panini, M. Vaccari, CNEN-RT/FI(78)16.

JAPAN

(same as in INDC(NDS)-95)

Japanese Nuclear Data Committee / Decay Heat Nuclear Data Working Group

R. Nakasima (Hosei University) group leader
M. Yamada (Waseda University),
T. Tamai (Kyoto University)
I. Otake and A. Zukeran (Power Reactor and Nuclear Fuel Development Corp.)
S. Iijima, T. Murata, T. Yoshida and M. Iida (Nippon Atomic Industry Group Co.)
T. Hojuyama (Mitsubishi Atomic Power Industry)
K. Umezawa, T. Tasaka, Z. Matumoto and T. Tamura (Japan Atomic Energy Research Institute)
M. Akiyama (University of Tokyo)
T. Yamamoto (Tohoku University)

1. Compilation: Decay data and delayed neutron data
Purpose: For summation calculation of decay heat
Major Sources of Information: Journals, Nuclear Data Sheets and ENSDF
Deadline of Literature Coverage: None
Cooperation: None
Computer File: Nuclear structure data file NDFILE and retrieval program ABEG. ORNL Evaluated Nuclear Structure Data File, ENSDF.
Expected Completion Date: Continuous compilation
Publication: in plan

2. Evaluation: Estimation of decay and delayed neutron data
Sensitivity study for decay heat
Purpose: Making more reliable estimation of released beta and gamma energies for short-lived fission products
Estimation of delayed neutron emission probability
Estimation of the effects of experimental errors in decay data
Method: Application of gross theory of beta decay
Search and use of systematics
Major Sources of Information: Own compiled data
Deadline of Literature Coverage: None
Status: Estimation of released beta and gamma energies completed, but minor correction required
Estimation of delayed neutron emission probability almost completed, but quite preliminary
Computer program for sensitivity studies in preparation
Cooperation: None
Computer File of Evaluated Data: in plan
Discrepancy Encountered: Gamma ray assignments in the case of beta decays of both the ground and isomeric states, for example Rb-90
Intensity of the ground state beta
Publication: T. Yoshida, Nucl. Sci. Eng. 63 (1977) 376

JAPAN

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

Names : S. Iijima, M. Kawai, T. Murata, T. Yoshida (Nippon Atomic Industry Group Co., Ltd.)
S. Igarasi, T. Nakagawa, Y. Kikuchi, Z. Matumoto, H. Nishimura (JAERI)
H. Matsunobu (Sumitomo Atomic Energy Industries, Ltd.)
H. Sasaki (Mitsubishi Atomic Industries, Inc., now at PNC)
T. Aoki (Fuji Electric Co.)
K. Maki, A. Zukeran (Hitachi Ltd.)
T. Watanabe (Kawasaki Heavy Industries)
I. Otake (PNC)
R. Nakasima (Hosei Univ.)

Evaluation : Neutron cross sections of Nd isotopes.

Method : Calculation with spherical optical model and statistical theory. Single and multi-level BW formula in thermal and resonance regions. Optical model parameters are determined by SPRT method. Level density parameters are re-evaluated.

Source : NEUDADA, CINDA, and the recent capture data for Nd isotopes at JAERI and Lebedev institute. Integral data from STEK and CFRMF.

Deadline of literatur coverage : Spring, 1979

Status : Progress is very slow. Difficulties are encountered in the consistent determination of level density parameters a, T, etc.

Other relevant details :

The evaluation of 68 nuclides was completed in Aug., 1977, and the file is available from NEA Data Bank. Integral test calculation using STEK reactivity data and CFRMF activation data was completed recently. Results are being examined.

Computer file of evaluated data : JENDL (ENDF/B-4 format)

cont'd

JAPAN

cont'd

Expected completion date : The work is largely behind schedule.

Discrepancies encountered :

Summarized in No. 4 of publication list.

Recent publications :

1. H. Matsunobu and T. Watanabe, compilation of measured capture cross sections for JENDL FPND file, JAERI-M 7568 (1978).
2. Z. Matsumoto, T. Murata and R. Nakasima, Level scheme for some fission product nuclides. Comparison of level scheme used by JAERI and Petten, JAERI-M 7734 (1978).
3. S. Iijima et al., J. Nucl. Sci. Technol. 14 161 (1977).
4. S. Iijima, IAEA-213, Petten 1977, Review Paper No. 9.
5. H. Nishimura et al., Integral test of JENDL-FP data file, JAERI-M report (to be published shortly)

NETHERLANDS

Laboratory and address
Netherlands Energy Research Foundation (ECN)
Postbus 1, 1755 ZG Petten, The Netherlands.
Telephone: (02246) - 6262, telex: 57211 reacp nl

Names
J.W.M. Dekker, H. Gruppelaar, R.J. Heijboer and A.J. Janssen

Evaluation
(1) RCN-2 evaluation of neutron cross sections (σ_t, σ_e, $\sigma_{n\gamma}$, $\sigma_{nn'}$-matrix, σ_{n2n}) for about 60 fission products in the energy range of 10^{-3} eV to 15 MeV, in KEDAK type format, for the following elements, Zr, Nb, Mo, Tc, Ru, Rh, Pd, Ag, Cd, Te, I, Xe, Cs, La, Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb.
(2) Generation of group cross sections for fast reactor calculations based on RCN-2 evaluation in the 26-group ABBN scheme with a fast reactor flux weighting spectrum and error files for capture group constants, including 26×26 covariance matrices.
(3) Adjustment of capture group constants based on (2) and integral STEK+CFRMF measurements.
(4) Generation of an adjusted point cross sections library based on STEK+CFRMF integral data.
(5) Calculation of pseudo-fission-product cross sections.

Purpose
Fast breeder power-reactor data needs.

Method
Calculation with multilevel Breit-Wigner formula, optical model and revised statistical model, taking into account all available experimental information.

Major sources of information
BNL-325, NEUDADA, CINDA, Nuclear Data Sheets, recent literature, integral data mainly from STEK and CFRMF.

Status
(1-3) Completed and reported for 40 isotopes;
planned for 1979: new evaluations for Eu-isotopes, revisions for important fission products;
planned for 1980: 25 other isotopes.
(4) In progress, completed 1979-1980.
(5) Updating in 1980.

Computer file
(1) KEDECN, KEDAK type format (co-operation with Dr. B. Goel, KfK, Karlsruhe), has been sent to NEA Data Bank at Saclay.

Completion date
1979/1980.

Recent publications
(1) H. Gruppelaar, Tables of RCN-2 fission-product cross section evaluation, part 1, ECN-13 (1976), part 2, ECN-33 (1977), and part 3 (in press).
(2,3) J.W.M. Dekker, Tables and figures of adjusted and unadjusted capture group cross sections based on the RCN-2 evaluation and integral measurements in STEK, part 1, ECN-14 (1977), part 2, ECN-30 (1977), and part 3, ECN-54 (1979).

NETHERLANDS

(cont'd)

(2,3) J.W.M. Dekker and H.Ch. Rieffe, Adjusted capture cross sections of fission-product nuclides from STEK reactivity worths and CFRMF activation data, ECN-28 (1977) and part 2, ECN-55 (1979).

(5) R.J. Heijboer, Pseudo fission-product cross sections for a 1300 MWe fast breeder reactor (status July 1978), ECN-52 (1978).

UNITED KINGDOM

(same as INDC(NDS)-95)

Laboratory and Address:	AERE Harwell	UKAEA AERE, Harwell, Oxfordshire, OX11 ORA
Name:	E.A.C. Crouch	
Compilation:	Chain, Cumulative and Independent fission product yields for all neutron induced fission reactions with neutrons of energy up to 14 MeV, including spontaneous fission. Ongoing compilation.	
Purpose:	Basic data for fission yield evaluation.	
Sources:	Journals, Proceedings of Learned Societies, or other open literature, Project reports if the work is complete but unlikely to be published.	
Deadline:	No results prior to 1950 are collected.	
Cooperation:	We are prepared to exchange files with other groups.	
Computer File:	Information held in standard forms on Computer Files.	
Completion Date:	Continuous compilation.	
Publications:	AERE R6642 'A library of neutron induced fission product yields maintained and interrogated by computer methods'. 'Part I: The establishment of the library'. E.A.C. Crouch, December 1970. AERE R7207 'A library of neutron induced fission product yields maintained and interrogated by computer methods'. 'Part II: The interrogation of the library'. E.A.C. Crouch, August 1972. Fission Product Yields from Neutron-Induced Fission - E.A.C. Crouch. Atomic Data and Nuclear Data Tables, Vol. 19, 5, May 1977. (Contains experimental values and adjusted values after fitting to conservation laws.)	

UNITED KINGDOM

Laboratory and Address:	AERE Harwell UKAEA AERE Harwell Oxfordshire OX11 ORA
Name:	E.A.C. Crouch
Evaluation:	(1) Neutron induced fission product yields for all fissile nuclides at neutron energies up to 15 MeV; chain yields and independent yields. (2) Adjustments of the chain yields and the calculated independent yields to force agreement with the conservation laws i.e. to form a 'consistent set'.
Purpose:	UKND File to be used in Reactor design and operation.
Method:	(1) The individual yields for a given reaction (both chain and independent), are examined, weighted and the means calculated together with the errors. (2) The evaluated yields are augmented by interpolation to fill missing values or in the case of independent yields by calculation based on parameters estimated from known values. The results are fitted by least squares to the conservation conditions to give adjustments for chain yields and independent yields. Almost complete - the fitting of conservation laws and the equality of yields of complementary elements. The set will be tested for its ability to produce an estimate of after heat from ^{239}Pu Fission nearer to experimental values than previous sets.
Sources:	Compilation mentioned above.
Deadline:	No results prior to 1950 are collected. Compilations believed to be complete up to end 1975, some 1976 results included.
Status:	Evaluation and Consistent set complete at January 1977. Further development continuing.
Co-operation:	We are prepared to exchange files with other groups.
Computer Files of Compiled Data:	Compilation as above.
Computer File of Evaluated data:	Magnetic tape or punched cards of the consistent set in ENDF/BIV format.
Discrepancies found:	Files are compared with those of B.F. Rider and discrepancies found are resolved.
Publication:	Fission Product Yields from Neutron-Induced Fission. E. A. C. Crouch. Atomic Data and Nuclear Data Tables, vol. 19, 5, May 1977.

UNITED KINGDOM

Laboratory and Address	AERE Harwell	UKAEA, AERE, Harwell, Oxfordshire, OX11 ORA U.K.
Names:	E. A. C. Crouch	
Evaluation:	Compilation and evaluation of the half lives of delayed neutron emitter precursors and emission probabilities of the delayed neutron emitters. Hence, using the fission product consistent sets, calculation of the delayed neutron yields.	
Purpose:	UK Nuclear Data File for use in Reactor design and operation calculations.	
Sources:	The open literature.	
Deadline:	Continuous compilation.	
Status:	Compilation of delayed neutron data proceeding.	
Co-operation:	We are prepared to exchange information with other groups.	
Computer files:	Not yet implemented.	

UNITED KINGDOM

Laboratory and Address	CEGB Berkeley	Berkeley Nuclear Laboratories Berkeley Gloucestershire GL13 9PB U.K.

Working Group:	B.S.J. Davies	CEGB, BNL.
	A. Tobias	CEGB, BNL.
	J.R. Parkinson	BNFL, Windscale.
	M.F. James	AEE, Winfrith.
	A.L. Nichols	AEE, Winfrith.
	D.G . Vallis	AWRE, Aldermaston.
	Mrs. K.M. Glover	AERE, Harwell.
	G. Evangelides	Imperial College, London.

1. Compilation and Evaluation:

Radionuclide decay data

purpose: to provide a comprehensive, updated data file of radioactive decay data, including half lives, Q-values branching ratios, mean α, β and λ energies and intensities with associated uncertainties.

progress: the FPND set which was formed by merging the data of A. Tobias with the US ENDF/B IV decay data file has become the recommended set for decay-heat calculations in the U.K. It is now known as UKFPDD-1.

Data for about 80 nuclides has been re-evaluated and has been provisionally merged with UKFPDD-1 forming a new set which will be tested in decay heat calculations.

2. Decay scheme calculations - the CASCADE Programme

purpose: to compare experimental data with decay data calculated from a more basic data set (e.g. US ENSDF file) and to produce mutually consistent catalogues of emission data for different radiation types.

progress: the CASCADE code development is nearing completion. CASCADE and its suite of programmes are being tested in all of the possible options to eliminate any bugs.

The major $\lambda - \lambda$ and $\lambda - x$ and other coincidence data sets can now be evaluated automatically.

The results can be reproduced in standard ENDF/B IV and/or V format. Decay data information not previously included in ENDF/B IV or V but evaluated by CASCADE can be included in an ENDF/B IV or V type format (e.g. inclusion of $\lambda - \lambda$ coincidence data tables). This is now being tested.

completion date: expected complete by end of 1979.

Publications:

TOBIAS, A. FISP-5 An extended and improved version of the fission product code FISP. RD/B/N4303.

UNITED KINGDOM

(cont'd)

TOBIAS, A.	A brief description of the ENDF/B-V format adopted for use in the U.K. Decay and Fission Product Data files. RD/B/N4423.
TOBIAS, A.	Extensions to COGEND for ENDF/BV output of spontaneous fission decay data. RD/B/N4309.
DAVIES, B.S.J. et al	The U.K. Chemical Nuclear Data Files: An evaluated set of radioactive decay data for reactor calculations. Presented at the International Conference on Neutron Physics and Nuclear Data for Reactors and other applied purposes, Harwell 25-28 Sept. 1978.
WOOLLAM, P.B.	An assessment of the data for decommissioning calculations on Ag-108 metastable. - RD/B/N4373

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:	To be decided	
Deadline of literature coverage:	None	
Status:	April 1979: Collection of numerical data and uncertainty information begun	

U.S.A.

Laboratory and address:		National Nuclear Data Center Building 197D Brookhaven National Laboratory Upton, New York 11973
Names	:	S. Mughabghab N. Holden
Evaluation	:	Revised edition of BNL-325 Vol. 1
Information Source	:	All experimental measurements of thermal cross sections, resonance parameters, and average resonance parameters.
Details	:	BNL-325, Vol. 1, Resonance Parameters will appear in two parts: the first part covering elements and isotopes for Z=1-60; the second part, 61-99. The format will be the same as that of the third edition. Additional quantities such as incoherent scattering cross sections, 30 keV Maxwellian average capture cross sections, γ-ray strength functions will be included. The introduction will be expanded to incorporate among other things a table of resonance energies used as standards, calculations of thermal cross sections according to the Lane-Lynn theory.
Computer File	:	The resonance parameter data will be on a computer file and can be sent to users on request.
Completion Date	:	It is hoped that Part 1 will be completed sometime during the summer of 1979; Part II by the year end.
References:	:	S. F. Mughabghab and D. I. Garber BNL-325, Neutron Cross Sections, Vol. 1, Resonance Parameters (third edition) 1973.

U.S.A.

Laboratory and address:	Idaho National Engineering Laboratory EG&G Idaho, Inc. P. O. Box 1625 Idaho Falls, Idaho 83401 USA
Names:	C. W. Reich, R. L. Bunting, R. G. Helmer, M. A. Lee
Compilation;	Decay data for fission products. Quantities treated include: $T_{1/2}$; $Q\beta$; 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 sources of information:	Nuclear Data Sheets, journals and preprints of recent work.
Deadline of literature coverage:	Ongoing. For Version V of ENDF/B, cut-off date is 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 317 fission-product nuclides (and isomeric states) have been prepared for inclusion in the ENDF/B-V Fission-Product File.
Publications:	C. W. Reich, "Applications of Fission-Product Decay Data", in Proceedings of the Isotope Separator On-Line Workshop, U. S. DOE Report BNL 50847 (July, 1978) pp. 109-148.

U.S.A.

Address:

General Electric Company
Vallecitos Nuclear Center
P. O. Box 460
Pleasanton, California 94566, USA

Name:

Dr. Benjamin F. Rider

Compilation:

Fission Product Yields for 30 Fissioning Systems

U235T	Pu239T	U233F	Pu241F	U234F	Pu238F
U235F	Pu239F	U233HE	Pu242F	U237F	Am241F
U235HE	Pu241T	U236F	Th232H	Pu240H	Am243F
U238F	U233T	Pu239H	Np237F	U234HE	Np238F
U238HE	Th232F	Pu240F	Cf252s	U236HE	Cm242F

Purpose:

For Burnup, fission rate, shielding, fission product source terms, inventory, and decay heat calculations. Basis for ENDF/B-V yields of USA National Nuclear Data Center.

Sources:

CINDA, INIS Atomindex, Journals, Correspondence, Reports

Deadline:

Ongoing

Cooperation:

Brookhaven National Laboratory, Cross Section Working Evaluation Group (CSEWG) Evaluated Nuclear Data File (ENDF/B-V)

Details:

Approximately 18,000 entries from 1200 references, 100% proof read against original publications in 1979 for reliability; intercompared in cooperation with E.A.C. Crouch compilation at Harwell for completeness and accuracy. Independent and cummulative yields from weighted averages of measured yields, unmeasured yields computed from best available models. Isomer ratios of independent yields to metastable and ground states from measurement and calculated from nuclear spins for unmeasured isomers of known spin states. YIELDS OF 102 DELAYED neutron emitters included with P_n values such that independent yields are before delayed neutron emission and cumulative yields are after delayed neutron emission. Charge balance adjusted to conserve protons, including ternary fission. Resulting yields give fission product decay heat power for U235T in good agreement with experiment.

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Completion Date:	March 17, 1979, for current version (revised annually).
Publications:	"Compilation of Fission Product Yields", NEDO-12154-3A (1979), available on microfiche only from General Electric Co., Vallecitos Nuclear Center, P. O. Box 460, Pleasanton, California 94566, USA - ATTN: Dr. B. F. Rider.

U.S.A.

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 Fission Product Data File and Fission Yield Files

A. Coordinate generation and testing of complete ENDF/B-V file which will contain cross sections, decay data and fission yields for 877 fission product nuclei and 11 fissionable nuclei. Coordination is part of the responsibility as Chairman of CSEWG (Cross Section Evaluation Working Group) Fission Product and Actinide Data Subcommittee. Two fission product working groups 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-IV with emphasis on capture. Use will be made of combining recent integral and differential data results from CFRMF, STEK, RPI and ORNL.

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

purpose:

Update ENDF/B Fission Product Data Files

completion dates:

ENDF/B-V FP file will be issued July 1979. ENDF/B-V fission yield files issued April - May 1979.

references:

R. E. Schenter, "Fission Product and Actinide Data Evaluations for ENDF/B-V," Trans. Am. Nuc. Soc. 28 (1978) 738.

Additional references related to this work may be obtained from RE Schenter.

U.S.A.

Laboratory and Address:

University of California
Los Alamos Scientific Laboratory
P. O. Box 1663
Los Alamos, New Mexico 87545 (U.S.A.)

Names:

T. R. England (LASL)
R. E. Schenter (HEDL)
B. F. Rider (G.E.)
J. Liaw (U. of Oklahoma)

Compilation:

Library of evaluated fission product yields for Version V of the Evaluated Nuclear Data Files (ENDF/B-V).

Deadline of Literature Coverage:

Mid-1978, including recent unpublished data.

Cooperation:

Subcommittee consisting of members from major U.S.A. commercial and government laboratories.

Other Relevant Details:

Twenty yield sets for 11 fissionable nuclides ($^{233,235,236,238}U$, $^{239,240,241,242}Pu$, ^{237}Np, ^{232}Th, and ^{252}Cf). Each set contains ~1100 yields and uncertainties; independent yields before delayed neutron emission and cumulative yields (by A and Z) after delayed neutron emission are given. Yield distributions account for isobaric states, Z and N pairing effects, ternary fission and delayed neutron branching.

Completion Date:

August 1978 for compilation.
Phase I testing completed.
Phase II testing in progress.

Publications:

Report on Phase I testing, and other relevant details in progress.

Computer File:

Distributed by the National Nuclear Data Center at the Brookhaven National Laboratory.

U.S.A.

LABORATORY AND ADDRESS:

University of California
Los Alamos Scientific Laboratory
P O Box 1663
Los Alamos, New Mexico 87545 (USA)

NAMES:

T. R. England
R. J. LaBauve
W. B. Wilson

COMPILATION:

Library of processed 154-group ENDF/B-IV fission product reaction cross sections.

PURPOSE:

Data file of multigroup values (10^{-5} eV-20 MeV) for use in collapsing to few-group values.

MAIN SOURCE OF INFORMATION:

ENDF/B-IV Fission-Product Data File

OTHER RELEVANT DETAILS:

Cross sections were processed into the Power Reactor Studies (PRS) 154-group structure described in Ref. 1 and 2, using the PRS Neutron Flux Weighting Function described in Ref. 1. Cross sections were processed at 900 or 1000 K at infinite dilution. A total of 181 nuclides are described with total, elastic, total inelastic, and radiative capture multigroup values. Additional neutron absorption reaction cross-section tabulations are given for 36 of the nuclides. A total of 960 multigroup cross-section tabulations are included in the data file, which is issued with a companion collapsing code TOAFEW.

COMPUTER FILE:

The data file and collapsing code are available from the Radiation Shielding Information Center, Oak Ridge National LAboratory, P O Box X, Oak Ridge, Tennessee 37830 (USA).

REFERENCES:

1. W. B. Wilson, T. R. England, and R. J. Labauve, "Multigroup and Few-Group Cross Sections for ENDF/B-IV Fission Products; the TOAFEW Collapsing Code and Data File of 154-Group Fission-Product Cross Sections," Los Alamos Scientific LAboratory report LA-7174-MS (March 1978).

2. R. J. LaBauve and W. B. Wilson, "Proposal to Extend CSEWG Neutron and Photon Multigroup Structures for Wider Applications," Los Alamos Scientific Laboratory report LA-6240-P (February 1976).

U.S.A.

Laboratory and Address:

University of California
Los Alamos Scientific Laboratory
P. O. Box 1663
Los Alamos, New Mexico 87545

Names:

T. R. England
R. J. LaBauve
D. G. Madland
W. B. Wilson

Cooperation:

R. E. Schenter, chairman of the ENDF/B actinide and fission product subcommittee, and F. Schmittroth of the Hanford Engineering Development Laboratory, P. O. Box 1970, Richland, Washington 93352.

Compilations:

A) Nuclide Parameter Evaluated Compilations

1) β and γ decay energies, branching fractions [decay and (n,γ)], half-lives, Q-values and cross sections for 824 fission products are tabulated in Ref. 1. This is a basic data set that includes the major types of parameters, with corrections, from ENDF/B-IV, except for yields and the energy dependence of cross sections.

2) Multigroup β and γ spectra are tabulated in Ref. 2 for 180 fission product nuclides. The β spectra are given in 75 groups and the γ spectra in 150 groups. These data are based on ENDF/B-IV.

3) Multigroup cross sections are compiled in Ref. 11, processed from ENDF/B-IV.

4) Few group fitted spectral functions available in Ref. 9.

5) Comparisons with experiment and a new decay heat standard are presented in Ref. 14. Reference 15 is a code incorporating the pulse function data of the new ANS Decay Heat Standard.

B) Evaluations

1) Yield distribution (pairing effects) and branching to isomeric states are evaluated and modeled in Refs. 3 and 4. Estimated values from the modeling are also included in these references.

2) Ternary fission is evaluated and compiled in Ref. 5.

3) β and γ spectra, decay heating and absorption buildup are evaluated by comparison with experiment in Refs. 6-13.

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Purpose:

Research by the Los Alamos nuclear data group (T-2) is directed at improvement in the national data file ENDF/B and at the use of these data in, e.g., determining a new decay heat standard, absorption buildup, etc.

References

1. T. R. England and R. E. Schenter, "ENDF/B-IV Fission Product Files: Summary of Major Nuclide Parameters," Los Alamos Scientific Laboratory report LA-6116-MS [ENDF-223] (October 1975).

2. T. R. England and M. G. Stamatelatos, "Multigroup Beta and Gamma Spectra of Individual ENDF/B-IV Fission-Product Nuclides," Los Alamos Scientific Laboratory report LA-NUREG-6622-MS (Decamber 1976).

3. D. G. Madland and T. R. England, "The Influence of Pairing on the Distribution of Independent Yield Strengths in Neutron-Induced Fission," Los Alamos Scientific Laboratory report LA-6430-MS [ENDF-240] (July 1976).

4. D. G. Madland and T. R. England, "Distribution of Independent Fission-Product Yields to Isomeric States," Los Alamos Scientific Laboratory report LA-6596-MS [ENDF-241] (November 1976).

5. D. G. Madland and Leona Stewart, "Light Ternary Fission Products: Probabilities and Charge Distributions," Los Alamos Scientific Laboratory report LA-6783-MS [ENDF-247] (April 1977).

6. D. G. Foster, Jr. and T. R. England, "Time-Dependent Spectra of Photons and Spontaneous-Fission Neutrons for Applied Problems," Invited Paper, Trans. Am. Nucl. Soc. 23, 551 (1976).

7. T. R. England and M. G. Stamatelatos, "Beta and Gamma Spectra and Total Decay Energies from Fission Products," Trans. Am. Nucl. Soc. 23, 493 (1976).

8. M. G. Stamatelatos and T. R. England, "Fission-Product Gamma-Ray and Photoneutron Spectra and Energy-Integrated Sources," NUREG-0155 [LA-NUREG-6345-MS] (Issued December 1976) (See also Addendum 1, March 1977).

9. R. J. LaBauve, et al., "The Application of a Library of Processed ENDF/B-IV Fission-Product Aggregate Decay Data in the Calculation of Decay-Spectra," LA-7483-MS (September 1978).

10. M. G. Stamatelatos and T. R. England, "Short Irradiation Fission-Product Beta Spectra and Total Energy: Calculations Versus Experiment," (ANS Summary accepted for ANS Annual Meeting June 12-17, 1977).

U.S.A.

(cont'd)

11. T. R. England, W. B. Wilson, and M. G. Stamatelatos, "Fission-Product Data for Thermal Reactors
Part 1
A Data Set for EPRI-CINDER Using ENDF/B-IV
Part 2
Users Manual for EPRI-CINDER Code and Data," Los Alamos Scientific Laboratory reports LA-6745-MS and LA-6746-MS (December 1975) [To be issued by EPRI ~ March 1977].

12. W. B. Wilson and T. R. England, "Status of Fission-Product Data for Absorption Calculations," LA-UR-78-1452, (May 1978).

13. E. T. Jurney, P. J. Bendt, and T. R. England, "Fission Product Gamma Spectra," LA-7620-MS (January 1979).

14. T. R. England, R. E. Schenter, and F. Schmittroth," Integral Decay-Heat Measurements and Comparisons to ENDF/B-IV and V," NUREG/CR-0305 [LA-7422-MS] (August 1978).

15. W. B. Wilson, T. R. England, and R. J. LaBauve," DKPOWR: A Code for Calculating Fission-Product Decay Power (report in preparation).

U.S.A.

(same as in INDC(NDS)-95)

Laboratories	Washington University, Dept. of Chemistry, St. Louis, MO., USA Los Alamos Scientific Laboratory, Group CNC-11, Los Alamos, NM USA
Names	A. C. Wahl and K. Wolfsberg
Compilation and Evaluation	Independent yields and other data related to nuclear charge distribution in fission are being compiled and evaluated for low-energy fission processes (excitation energies up to ~ 20 MeV).
Purpose	Development of systematics that will allow reliable estimates to be made for unmeasured independent yields and that will increase understanding of the fission mechanism.
Sources	Journals, reports, preprints, and personal communications
Method	Data from various types of measurements are compared for evaluation of the reliability of the newer methods.
Cooperation	We are prepared to exchange files with other groups.
Computer File	Information is held in standard forms on computer files.
Completions	Continuous compilation
Publications	A. C. Wahl, A. E. Norris, R. A. Rouse, and J. C. Williams, in Proceedings of the Second International Atomic Energy Symposium on Physics and Chemistry of Fission, Vienna, Austria, 1969 (I.A.E.A.), p. 813. K. Wolfsberg, Los Alamos Scientific Laboratory Report No. LA-5553-MS (1974). 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.

III. RECENT PAPERS RELATED TO FPND

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

1. Fission yields
2. Neutron reaction cross sections
3. Decay data
4. Delayed neutron data
5. FP decay heat
6. FP data reviews.

Completeness of this Section has not yet been attempted.

1. Fission yields

Yields of Sn and Sb isotopes in the vicinity of the closed shell N=82 from reactor neutron induced fission of ^{232}Th.

T. Izak-Biran, S. Amiel:
J. Inorg. Nucl. Chem. 40 (1978) 937

[ind. yields of ^{131,132}Sn, $^{131-133}$Sb]

Fission product yields from 6-9 MeV neutron-induced fission of ^{235}U and ^{238}U.

T.C. Chapman, G.A. Anzelon, G.C. Spitale, D.R. Nethaway:
Phys. Rev. C 17 (1978) 1089

[^{235}U, ^{238}U (n,f), E_n= 6.0, 7.1, 8.1, 9.1 MeV; measured yields of 28 mass chains, table]

Absolute yields of ^{99}Mo and ^{111}Ag in the reactor neutron induced fission of ^{238}U.

S.G. Marathe, V.K. Rao, V.K. Bhargava, S.M. Sahakundu, R.H. Iyer:

J. Inorg. Nucl. Chem. 40 (1978) 1981

The fine structure of the fission yields of heavy nuclei.

K.A. Petrzhak, E.V. Platygina, V.F. Teplykh:
Soviet Atomic Energy 42 (1977) 337

[^{232}Th, ^{235}U, ^{239}Pu (n,f), E_n=15 MeV; relative yields of $^{131-135}$Xe isotopes]

A general correlation for independent fission product yield uncertainties.

B.I. Spinrad, C.H. Wu:
Nucl. Scie. and Engg. 66 (1978)421

[correlation between experiment/theoretical yield ratios and the distance of the FP from Z_p]

Prediction of fission product mass yields and related parameters.

T. Yamamoto, K. Sugiyama:
Ann. Nucl. Energy 5 (1978) 613

[^{232}U, ^{238}Pu thermal fission, $^{234,236}U$, $^{240,242}Pu$ fission with E_n=2MeV; A=71-163 chain yields predicted by semi-empirical method]

Analytic formula for isobaric charge distribution of ^{235}U fission products by thermal neutrons, taking parity effects into account.

A.A. Byalko, V.M. Zhivun, V.V. Kovalenko, A.B. Koldobskij:
Soviet Atomic Energy 43 (1978) 657

Light-charged-particle emission in keV neutron-induced fission of ^{239}Pu.

B. Krishnarajulu, S. Sen, G.K. Mehta
J. Phys. G 5 (1979) 319

2. Neutron reaction cross sections

Neutron capture and transmission measurements on fission product Pd-107.

U.N. Singh, R.C. Block, Y. Nakagome
Nucl. Sci. and Engg. 67 (1978) 54

[$E_n \leq 700$ eV; table of resonance parameters]

Neutron total cross section measurement on ^{140}Ce.

H.S. Camarda
Phys. Rev. C 18 (1978) 1254

[E_n=20-240 keV; table of resonance-parameters]

Capture cross section measurements of ^{141}Pr.

P.S. Feigenbaum, U.N. Singh, R.C. Block

[E_n = 20 eV - 60 keV; table of newly observed resonances]

Uncertainties on a pseudo fission product for fast power reactors.

G. Langlet, P. Coppé, J.P. Doat:
NEACRP-L-190 (1977)

A review of multigroup nuclear cross section processing. Proceedings of a Seminar Workshop, Oak Ridge, Tenn., March 14-16, 1978.

Compiled by D.K. Turbey, H.R. Hendrickson:
ORNL/RSIC-41 (Oct. 1978)

Graphs of neutron capture cross sections of fission product isotopes from FPLIB-65/ENDF/B-IV.

M. Mattes:
ZAED-10-1 (1978)

[FPLIB-65 is a 65-group cross section library generated from ENDF/B-IV]

3. Decay data

Decay energies of gaseous fission products and their daughters for A=88 to 93 and A=138 to 192.

F.K. Wohn, W.L. Talbert Jr.:
Phys. Rev. C 18 (1978) 2328

[$^{88-93}Kr$, $^{88,90-93}Rb$, $^{138-142}Xe$, $^{138-142}Cs$, ^{141}Ba: Q_β]

Identification of ^{147}Cs and half-life determinations for Cs and Ba isotopes with A=144-147 and Rb and Sr isotopes with A=96-98.

F.K. Wohn, K.D. Wünsch, H. Wollnik, R. Decker, G. Jung, E. Koglin, G. Siegert:
Phys. Rev. C 17 (1978) 2185

Half-lives of the new isotopes ^{100}Rb, ^{100}Sr, ^{148}Cs and of ^{99}Rb, ^{99}Sr and ^{147}Cs.

E. Koglin, G. Jung, G. Siegert, R. Decker, K.D. Wünsch, H. Wollnik:
Z. Phys. A 288 (1978) 319

Precision beta endpoint energy measurements of Rb and Cs fission products with an intrinsic Ge-detector.

K.D. Wünsch, R. Decker, H. Wollnik, J. Münzel, G. Siegert, G. Jung, E. Koglin:
Z. Phys. A 288 (1978) 105

[$^{88-94}$Rb, $^{139-144}$Cs]

Identification of short-lived Ru and Rb isotopes in fission by rapid chemical separations.

G. Franz, G. Herrmann:
J. Inorg. Nucl. Chem. 40 (1978) 945

[$^{107-113}$Ru, $^{108-111}$Rh: half-lives, strong γ-rays]

The decay of 79.8 sec ^{109}Rh into levels of ^{109}Pd.

G. Franz:
J. Inorg. Nucl. Chem. 40 (1978) 1467

[^{109}Rh: decay scheme, γ-rays]

Beta spectrum of ^{143}Ce.

K.V. Ramaniah, P.R. Sarma, K.V. Reddy:
Current Science 46 (1977) 503

[^{143}Ce: β-spectrum, decay scheme]

Evaluation of the decay characteristics of isobars with A=95.

Yu.I. Grigor'yan, L.L. Sokolovskij, F.E. Chukreev, E.N. Shurshikov:
INDC(CCP)-122 (1978), translation of IAE-2761 (1976)

[Evaluated half-lives, β- and γ-spectra, decay schemes of ^{95}Kr - ^{95}Mo]

Problems of radioactive decay (in French).

F. Lagoutine, Lab. de Métrologie des Rayons Ionisants, 1978.

[includes, among others, a table of evaluated half-lives and uncertainties of more than 140 important nuclides, comprising more than 50 F.P.]

The 1977 Atomic Mass Evaluation.

A.H. Wapstra, K. Bos:
Atomic Data and Nucl. Data Tables vol. 19 (1977) 177 (Pt.I), 215 (Pt.II), 277 ([t.III); and vol. 20 (1977) 1 (Pt. IV)

[Part I : Atomic mass table;
Part II : Nuclear reaction and separation energies;
Part III: Systematics of separation and decay energies;
Part IV : Evaluation of input values; adjustment procedures. Accepted and rejected experimental data compared to adjusted values]

4. Delayed neutrons

Gross properties of delayed neutron spectra.

O.K. Gjötterud, P. Hoff, A.C. Pappas:
Nucl. Phys. A 303 (1978) 281

[Calculation of envelopes for d.n. spectra of ^{85}As, $^{88,89}Br$, ^{135}Sb, ^{136}Te, $^{138,139}I$, ^{143}Cs; compared to experiments]

Detailed structure of delayed neutron spectra.

O.K. Gjötterud, P. Hoff, A.C. Pappas:
Nucl. Phys. A 303 (1978) 295

[Calculation of d.n. spectra of $^{87-89}Br$, ^{93}Rb, ^{135}Sb, ^{136}Te, $^{137-139}I$, ^{143}Cs with statistical model; compared to experimental spectra]

5. Decay heat

Experimental simulation of the gamma spectra from mixed fission products (in German).

D. Zappe:
Isotopenpraxis 14 (1978) 267

(simulation by a mixture of 12 radioactive nuclides, viz: ^{22}Na, ^{54}Mn, $^{56,57}Co$, ^{65}Zn, ^{88}Y, ^{113}Sn, ^{137}Cs, ^{140}La, ^{143}Pm, ^{203}Hg]

Heat production and fragment capture cross section in thermal reactors.

P.E. Nemirovskij, V.A. Chepurnov:
Soviet Atomic Energy 42 (1977) 48

[short description of what the programme can do; no results given]

Fission products decay power after fast neutron fission in U235, U238 and Pu239 - calculations and comparisons with experiments.

K.P.N. Murthy, R. Shankar Singh:
R.R.C.-15 (1976)

[calculation with computer code CHANDY-II]

Summation calculations of fission product decay heat, their uncertainties and their applications to a fast breeder reactor.

T. Yamamoto, K. Sugiyama:
Annuals of Nucl. Energy 5 (1978) 621

[summation with computer code DHEAT-2]

Fission products and secondary gamma-ray spectra in plutonium fueled fast reactor.

A. Razani:
Nucl. Engg. and Design 44 (1977) 285

[calculation with computer code LAPHANO]

A review of the theory and application of sensitivity and uncertainty analysis proceedings of a seminar-workshop, Oak Ridge, Tenn., August 22-24, 1978.

Edited and compiled by C.R. Weisbin, R.W. Roussin, H.R. Hendrickson, E.W. Bryant:
ORNL/RSIC-42 (Feb. 1979)

[Contents of Session I: Sensitivities and Uncertainty Analysis for Fast and Thermal Reactors:

1. "The Use of Cross-Section Sensitivities in the Analysis of Fast Reactor Integral Parameters," P.J. Collins and M.J. Lineberry (Argonne National Laboratory, Idaho).

2. "Advances in Fast Reactor Sensitivity and Uncertainty Analysis," J.H. Marable and C.R. Weisbin (Oak Ridge National Laboratory).

3. "Controlled Cross-Section Adjustment by Integral Data," U. Salmi, J.J. Wagschal, A. Ya'ari, and Y. Yeivin (Racah Institute of Physics, The Hebrew University, Israel)

4. "Sensitivity Analysis Applied to the Calculation of Detector-Response Kernels," W.H. Scott, Jr. (Science Applications, Inc., La Jolla), and P.J. McDaniel, J.H. Renken, and S.A. Wright (Sandia Laboratories, New Mexico)

5. "Sensitivity of Water Reactor Fuel Cycle Parameters and Costs to Nuclear Data," M. Becker, D.R. Harris, B. Quan, and J.M. Ryskamp (Rensselaer Polytechnic Institute).

6. "Nonlinear Model Fitting of Thermal Neutron Data and its Application in Resonance Parameter Uncertainty Analysis," J.K. Thompson (Battelle Pacific Northwest Laboratories).

7. "Fission Product Decay Power and Uncertainties After Realistic Reactor Operating Histories," T.J. Trapp (Battelle Pacific Northwest Laboratory), and B.I. Spinrad (Oregon State University).]

6. Fission product data reviews

Fission yields: measurement techniques and data status.

W.J. Maeck:
NBS-Spec. Publ. 493 (1977) 146

Fission yield data.

H.O. Denschlag:
Proc. of Int. Conf. on Neutron Physics and Nuclear Data for Reactors and Other Applied Purposes, Harwell, Sept. 1978; page 569

[survey of availability of experimental and complete sets of evaluated fission yield data; systematics, adjustment methods]

Sources of Atomic and Nuclear Data for Biomedical Purposes.

P.D. Holt:
Phys. Med. Biol. 1979, Vol. 24, No. 1, 1-17