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(Revised)

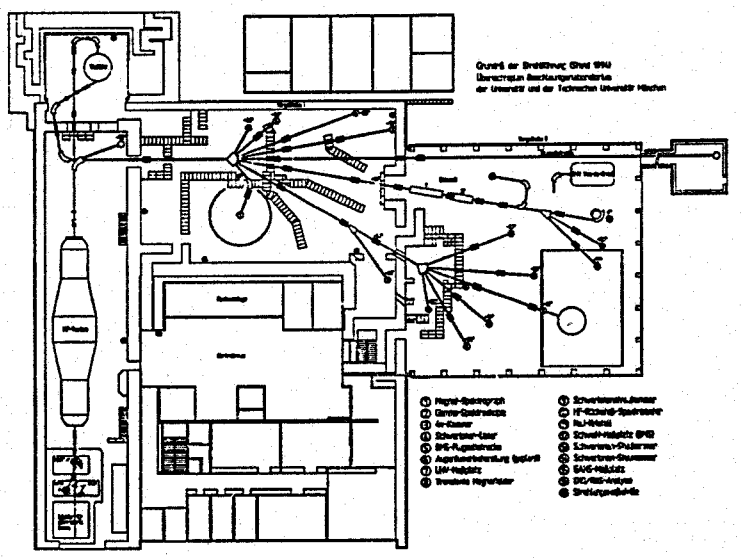
NUCLEAR ENERGY AGENCY

NUCLEAR SCIENCE COMMITTEE

Working Party on International Nuclear Data Measurement Activities

Newsletter on International Nuclear Data Measurement Activities

No. 1 (Revised)



November 1995

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INTRODUCTION

Following discussions within the Nuclear Energy Agency's Nuclear Science Committee (NEANSC) and its Working Party on International Nuclear Data Evaluation Cooperation (WPEC), it has became clear that a vehicle to promote international collaboration in the field of experimental nuclear data was urgently needed, mainly due to a dramatic decrease of resources available for these activities in member countries. This view of the situation was fully shared by a group of senior experts that met in May 1993 at NEA. The conclusions of this group have been published in a NEA report entitled "A Strategic View on Nuclear Data Needs".

The NEA Nuclear Science Committee has, following these recommendations, set up a Working Party on International Measurement Activities (WPMA). The objective of this Working Party is to co-ordinate differential nuclear data measurement activities in order to ensure an efficient use of the remaining resources. The measurement program is defined by the needs of the NEANSC Working Party on International Evaluation Cooperation (WPEC), as stated in its High Priority Request List. The WPMA held its first meeting at the NEA Headquarters in Paris on 16 May 1995.

One of the activities planned by the WPMA is to issue, on a yearly basis, a "Newsletter on International Nuclear Data Measurement Activities", as a means of information exchange between laboratories active in the field. The newsletter is also directed towards scientists engaged in nuclear data evaluation and applications, especially those working within the frame of the WPEC. The present document is the first issue of this newsletter.

The full text of this document can also been found on the NEA Data Bank's World Wide Web server (http://www.nea.fr/).

(The present revised issue of newsletter no. 1 contains additional material from Japanese laboratories, that had been lost during an electronic transfer earlier this year)

TABLE OF CONTENTS

CHINA

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Facilities

HI-13 tanden Van de Graaf accelerator with terminal voltage of 13 MV and pulsed beam of about 1 ns width, neutron sources: D(d,n),T(p,n) and T(d,n) using deuterium or tritium gas targets.

1. Cockcroft-Walton accelerator: maximum voltage: 600kv, DC beam 3-5 mA; Pulsed beam is under adjustment (expected pulse width is about 1.5 ns and average beam current is 30-50 microampears).

2. Detectors: liquid scintillator, NaI, BaF_2, BGO, and HpGe detectors, gridded ionization chamber and fast multilayer ^{238}U fission chamber.

Measurements recently completed or in progress

1. Elastic differential cross sections of C and ^{209}Bi at 37 MeV

2. Accurate measurement of differential cross sections from carbon at 10 MeV

3. Double differential cross sections of emission neutrons of (alpha,n) reaction on ^{56}Fe, ^{93}Nb and ^{115}In at incident energies of 12.3, 16.3 and 18.3 MeV

4. Activation cross section measurements of (n,p) reactions on $^{46,47,48}Ti$, ^{51}V, ^{54}Fe, ^{59}Co, $^{58,60,61}Ni$, $^{64,66,67}Zn$, $^{90,92}Zr$, $^{92,95,96,97,98}Mo$, ^{182}W, ^{187}Re, ^{194}Pt in the energy range 6 to 11 MeV

5. Activation cross section measurements of the ^{58}Ni (n,np+pn+d) reaction in the energy range 6 to 11 MeV

6. Activation cross section measurements of (n,α) reactions on ^{51}V, ^{54}Fe, ^{62}Ni, ^{63}Cu, ^{92}Zr, $^{92,98}Mo$, ^{184}W, $^{185,187}Re$ in the energy region between 6 and 11 MeV

7. Activation cross section measurements of (n,2n) reactions on ^{94}Mo and ^{181}Ta in 6 to 11 MeV region

8. Measurements of fission product yields of ^{235}U at 5 MeV

9. Measurements of the ^{6}Li(n,γ)^{7}Li reaction in the incident energy range 9 to 18 MeV

New measurements planned for near future

1. Double differential cross sections of secondary neutrons ^{51}V and ^{12}C at 10 MeV.

2. Prompt fission neutron spectrum of ^{238}U at 5.4 MeV.

3. Yields of fission products of ^{235}U at 5 MeV and 14 MeV

4. Cross sections of the ^{11}B(p,γ)^{12}C reaction in 5 to 15 MeV region

5. Cross sections of the ^{6}Li(n,γ)^{7}Li reaction in the energy region of 9 to 18 MeV

6. Study of activation cross sections in the neutron energy region of 6 to 12 MeV

7. Double differential cross sections of ^{56}Fe(n,α) and ^{58}Ni(n,α) reactions at about 10 MeV

Recent publications

1. Measurement of double differential cross sections of secondary neutrons from ^{238}U, ^{209}Bi, Fe and ^{9}Be
   Tang Hongqing, Qi Bujia, Zhou Zuying, Zhou Chengwei, Sheng Guanren, Xia Haihong and Ke Zungjian.
   Proc. Intern. Conf. on Nucl. Data for Sci. and Tech., Gatlinburg, 1994

2. Analysis of secondary neutron double differential cross sections of ^{238}U
   Shen Guanren, Zhang Jingshang and Sun Gang
   Chinese Journal of Nuclear Physics, V.16-4, 349 (1994)

3. Cross section measurement for reactions ^{137}Ba(n.p)^{137}Cs, ^{182}W(n,n α) ^{178}Hf(m2) and ^{193}Ir(n,2n)^{192}Ir(m2) at 14 MeV
   Chinese Journal of Nuclear Physics, V.16-3, 267 (1994)

4. Excitation Function of ^{51}V(n,p)^{51}Cr up to 22 MeV
   Zhao Wenrong, Lu Hanlin and Yu Weixiang
   Chinese Journal of Nucl. Phys., V. 16-1, 67 (1994)

5. Cross section measurement for ^{58}Ni(n,np+pn+d), ^{60}Ni(n,p)^{60}Co and ^{62}Ni(n,α)^{59}Fe reactions
   Lu Hanlin, Zhao Wenrong and Yu Weixiang
   Chinese Journal of Nuclear Physics, V.16-3, 263 (1994)

6. Measurement of cross sections by bombarding Fe with proton up to 19 MeV
Zhao Wenrong, Lu Hanlin and Yu Weixiang
Chinese Journal of Nucl. Phys., V.15-4, 337 (1993)

7. Measurement ot total cross sections for K-shell ionization by electron bombardment
Li Jingwen, Dong Zhiqiang, Zheng Xiantang, Hu Aidong and Zhou Shuhua
Nuclear Science and Techniques, V.5-4, 215, 1994

8. The gamma decay of ^{90}Ru
Zhou Shuhua, Li Jingwen, Zheng Xiantang, Wen Shuxian, Dong Zhiqiang, Zhen Hua and Hu Aidong
Z. Phys. A350, 7 (1994)

9. Measurement of prompt neutron spectra of ^{238}U fission induced by 10.17 and 12.12 MeV neutrons
Li Anli, Bai Xixiang, Wang Xiaozhong et al.
Nuclear Science and Techniques, V5-2 71 (1994)

10. Test of two dimensional position snesitive sillicon detector
Li Anli, Zhou Shuhua, Liu Weiping et al.
Atomic Energy Science & Tech., 28-4 324 (1994)

11. Efficiency calibration of neutron detectors with ^{252}Cf spontaneous fission neutrons
Li Anli, Wang Xiaozhong, Bai Xixiang et al.
Atomic Energy Science & Tech. 28-2, 133 (1994)

12. The production of ^{11}C and ^{7}Be secondary radioactive beams
Bai Xixiang, Liu Weiping, Qing Jiuchang et al.
Chinese Journal of Nucl. Phys., V.16-2, 100 1994)

13. Experimental study of the neutron spectra of ^{238}U fission induced by fast neutrons
Li Anli, Bai Xixiang, Wang Xiaozhong et al.
Chinese Journal of Nucl. Phys., V. 162-3, 255 (1994)

14. Measurement of neutron spectra from thick Be target bombarded with deuterons
Wang Xiaozhong, Bai Xixiang, Li Anli et al.
Nucl. Sci. and Tech., V.5-4, 193 (1994)

15. Fission product yields from 11.3 MeV neutron-induced fission of ^{238}U
Li Ze, Liu Yonghui, et al.
Radiochemica Acta, 64, 95 (1994)

16. Measurement and study of $^{16}O(n,\gamma)^{17}O$ in the pygmy resonance region
Huang Zhengde, Zhu Lihua, Hou Long and Ding Dazhao
Chinese Journal of Nucl. Phys., V.16-3, 270 (1994)

17. The study of the property and application of BaF_2 crystal
Zhu Lihua, Hou Long, Huang Zhengde and Ding Dazhau
Atomic Energy Science and Technology, V.28 (1994)

18. Measurement of fast neutron radiative capture cross section for $^{56}Fe(n,\gamma)^{57}Fe$ reaction from 9 to 20 MeV
Hou Long, Huang Zhengde, Zhu Lihua and Ding Dazhao
Chinese Journal of Nucl. Phys., V.16-4, 344 (1994)

19. Positron annihilation and perturbed angular correlation studies of defects in neutron and heavy ion irradiated Si
Zhu Shengyun, Li Anli, T. Iwata
Proc. of 10th Intern. Conf. on positron annihilation, Beijing, China, May, 1994

20. Measurement of the g factor of the 3.1232 MewV 19/2- level in ^{43}Sc by perturbed angular distribution method
Zhu Shengyun, Li Anli, et al.
Chinese Journal of Nucl. Phys., V.16-3, 239 (1994)

21. Charge transfer and normal state anomaly in Bi-based high Tc superconductors studied by positron annihilation
Chen Feng, Li Anli, et al.
Chinese Journal of Nucl. Phys., V.16-4, 178 (1994)

22. BaF_2 time differential perturbed angular distribution spectrometer
Zhu Shengyun, Li Anli
Nucl. Science and Technology, V.5-3, 134 (1994)

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Facilities

ECR source, compact cyclotron followed by a sector cyclotron, ions from 4 to 15 MeV/u ; ions injected into a second sector cyclotron; 10^{13} to 10^{9} pps for C to U at 95 to 25 MeV/u; macrostructure: 7 to 13.3 Mhz, microstructure 1 ns; 0.25 ns with reduced intensity; full energy beam in time sharing mode on two target stations; medium energy beam in parallel. SISSI equipment: two superconducting solenoids, located before and after the exotic beam production target. Increases the exotic beam intensity by a factor of 10 to 50.

Procedure to apply for beam time

Address a proposal to the contact person or to the director. Forms available from contact person for foreign users. Public presentation of proposals. PAC meets twice a year.

Program Advisory Committee (current membership)

2 in-house, 8 national, 2 international members.

Main instrumentation for nuclear physics experiments

Energy-loss magnetic spectrometer (SPEG) with high energy and angular resolution.
Achromatic mass spectrometer (LISE)
Large scattering chamber for 4 πdetectors (NAUTILUS).
4 π neutron detector (ORION)
TAPS γ-ray multidetector (available part-time, shared with GSI Darmstadt)
Charged-particle multidetector (INDRA)

Main fields of nuclear research

Nuclear Dynamics. Hot nuclei. Giant resonances. Exotic nuclei. Collisions induced by secondary beams.

Main fields of other research

Excitation and charge exchange in atoms. Energy dissipation and relaxation in solids. Ion-induced modifications in material. Microporous membranes. Simulation of spatial environment for electronic components.

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Facilities

Two synchrotrons, NIMAS, used as injector and accumulator ring, and SATURNE, the main ring. Available beams: protons to heavy ions (up to krypton), up to 2.9 GeV for protons and 1.15 GeV/A for ions with a charge to mass ratio of 0.5. Monoenergetic neutron-source: Be(d,n).
Detectors: magnetic spectrometers, NE213 liquid scintillators.

Measurements recently completed or in progress

1. Measurement of nucleon-nucleon cross-sections. F. Bystricky et al., Phys. Lett. 142 (1984) 180; F. Perrot et al., Nucl. Phys. B278 (1986) 881

2. Proton and pion production inp-nucleus collisions. DIOGENE collaboration. M.C. Lemaire et al., Phys. Rev. C43 (1991) 2711; 24 (1993) 180.

3. Measurement of neutron multiplicity distribution on thin targets induced by 0.475 MeV and 2 GeV protons and 2 GeV ^{3}He. ORION collaboration (GANIL Caen - HMI Berlin - SATURNE Saclay - IPN Orsay - Liege University). L. Pienkowski et al., Phys, Lett, B336 (1994) 147. J. Galin et al. Proceedings of the 8th Journées SATURNE, Saclay, May 5-6, 1994.

4. Neutron production double differential cross-sections on thin targets induced by protons and deuterons between 800 MeV and 2 GeV. Collaboration PTN Bruyères-le-Chatel, SATURNE Saclay, DAPNIA/SPhN Saclay and Uppsala University.

5. Residual nuclide production on thin targets. Collaboration leaded by Pr. R. Michel from Hannover University. R. Michel, Proceedings of Int. Conf. on Nuclear Data for Science and Technology, Gatlinburg, Tennessee, USA, May 9-13 (1994).

6. Residual nuclide production on thick targets. PTN Bruyères-le-Chatel.

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Facilities

1. Turnable CV28 compact cyclotron.
   Pulse width: 1.0 ns, repetition frequency: 0.5 - 10 Mhz, deuterium gas target, incident deuteron energy: 3-4 MeV, neutron production via the D(d,n) reaction, facility mainly used for nuclear data measurements.

2. Fixed multi-angle neutron time-of-fligth spectrometer.
   5 channels each separated by 12.5 degrees, 12 m fligth paths (extendable up to 25 m), NE213 liquid scintillators.

3. 3.75 MV Van de Graaff accelerator.
   DC or pulsed (2 ns). Monoenergetic neutron sources: ^{45}Sc(p,n), ^{7}Li(p,n), T(p,n), D(d,n) and T(d,n).
   White neutron sources with thick targets: Be(p,n) and Be(d,n).

Measurements recently completed or in progress

1. Elastic and inelastic neutron scattering on Fe. Energy range: 9.4 - 15.2 MeV.
   Paper at the Gatlinburg conference.

2. Elastic neutron scattering on Pb. Energy Range: 8.0 - 14.3 MeV.
   Measurement completed, analysis in progress.

3. Activation cross section measurement of ^{59}Co(n,p)^{59}Fe, ^{59}Co(n,α)^{56}Mn and ^{59}Co(n,2n)$^{58m+g}$Co.
   Energy range: 8.0 - 14.3 MeV.
   Paper at the Gatlinburg conference.

4. Activation cross section measurement of $^{103}Rh(n,n')^{103m}Rh$. (collaboration with IRK, Vienna).
   Energy range: 5.7 - 12.0 MeV.
   Paper at the Gatlinburg conference.

Measurements planned for the near future

1. Elastic and inelastic neutron scattering on Cr. Energy range: 8 - 15 MeV.

2. Activation cross section measurements of $^{52}Cr(n,p)^{52}V$, $^{52}Cr(n,2n)^{51}Cr$, $^{51}V(n,p)^{51}Ti$ and $^{51}V(n,\alpha)^{48}Sc$. Energy range: 8 - 14 MeV.

3. Long-lived activation products:
   Activation cross section measurements of $^{109}Ag(n,2n)^{108m}Ag$, $^{151}Eu(n,2n)^{150m}Eu$ and $^{159}Tb(n,2n)^{158}Tb$ (collaboration with KRI, St. Petersburg)
   Energy range: a few energies between threshold and 14 MeV.

Recent publications

1. D. Schmidt, B.R.L. Siebert, Partial Cross Section Determination of the Reaction $^{12}C(n,n')$ (Q=-9.641 MeV) Using a DD-Neutron Source. Nucl. Instr. Meth. A342 (1994) 544-551

2. D. Schmidt, Xia Haihong. Neutron Production by Deuteron Breakup on ^{4}He. Report PTB-N-18 (1994)

3. D. Schmidt, W. Mannhart, H. Klein, R. Nolte. Neutron Scattering on Natural Iron at Incident Energies between 9.4 and 15.2 MeV. Report PTB-N-20 (1994)

4. D. Schmidt, Xia Haihong. Analysis of the Gamma Ray Production in a Gas Target and Study of the Ion Pulse Shape. Report PTB-7.23-94-1 (1994)

5. D. Schmidt, W. Mannhart, R. Nolte. Neutron Scattering Cross Sections of Iron. Proc. Int. Conf. on Nuclear Data for Science and Technology, Gatlinburg 1994.

6. W. Mannhart, D. Schmidt, Xia Haihong. Measurement of the $^{59}Co(n,\alpha)^{56}Mn$, $^{59}Co(n,p)^{59}Fe$ and $^{59}Co(n,2n)^{58m+g}Co$ Cross Sections between 8 and 14 MeV. Proc. Int. Conf. on Nuclear Data for Science and Technology, Gatlinburg 1994.

7. M.M.H. Miah, H. Vonach, W. Mannhart, D. Schmidt. Measurement of the Cross Section for $^{103}Rh(n,n')^{103m}Rh$ in the Energy Range 6 - 12 MeV. Proc. Int. Conf. on Nuclear Data for Science and Technology, Gatlinburg 1994.

8. W. Mannhart, G. Boerker, H. Klein, D. Schmidt. Praezise Bestimmung der Streu- und Aktivierungsquerschnitte schneller Neutronen im Energiebereich 6 - 16 MeV (in German). PTB-Mitteilungen 104 (1994) 439-444

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Other Universities: I.Birn (T.U.Dresden), C.Nesaraja (Malaysia)
Recent Visitors: Z.Kovacs, S.Sudar, F.Tarkanyi (Hungary), Z.B.Alfassi (Israel)

Contact : S.M.Qaim

Facilities

1. Compact Cyclotron CV28 : variable energy p : 2-24 MeV; d : 3-14 MeV; ^{3}He : 5-36 MeV; ^{4}He : 6-28 MeV

2. Injector Cyclotron of COSY - internal beam p : 38 MeV

3. Radiochemical Laboratories

4. Detectors : Si(Li), Ge(Li), HPGe. Equipment for low-level beta counting.

Measurements recently completed or in progress

1. Neutron activation cross sections in the energy range of 4-12 MeV
   - As,Ge,Se : measurements on (n,2n), (n,p), (n,α) reactions completed.
   - Y : measurements on (n,p) and (n,α) reactions partly completed
   - Ag,Eu,Tb : measurements on (n,2n) reactions nearing completion (cooperation with Debrecen, Hungary)
   - Cr,Ni,Fe : measurements on (n,x) reactions initiated (cooperation with IRMM Geel)

2. Isomeric cross section ratios in neutron and charged particle induced reactions.
   - ^{75m,g}Ge :studied formation in (n,2n), (n,p) and (n,α) reactions; measurements and nuclear model calculations completed (cooperation with TU Dresden and IRK,Vienna)
   - ^{58m,g}Co :investigated formation in (n,p), (n,2n), (p,n), (d,n), (α,n) and (p,α) reactions; nuclear model calculations nearing completion (cooperation with Debrecen, Hungary)
   - ^{94m,g}Tc : studied formation in (p,n), (^{3}He,2n) and (α,pn) processes; model calculations in progress (cooperation with IRK, Vienna)

3. Complex particle emission reactions
   ^{7}Be emission: at E(p) < 100 MeV completed; at E(p) > 100 MeV in progress
   at E(^{3}He) < 36 MeV on light nuclei in progress
4. Excitation functions relevant to medical radioisotope production
   ^{52}Fe: measurements on ^{52}Cr(^{3}He,3n) process completed
   ^{94m}Tc: measurement on ^{93}Nb(^{3}He,2n) and ^{92}Mo(α,pn) processes completed
   investigations on ^{124}Te(p,n) reaction completed (cooperation with Debrecen, Hungary)

Recent publications

1. I.Birn and S.M.Qaim; Excitation functions of neutron threshold reactions on some isotopes of germanium, arsenic and selenium in the 6.3 to 14.7 MeV energy range. Nucl.Sci.Eng. 116, 125 (1994)

2. M.Bostan and S.M.Qaim; Excitation functions of threshold reactions on ^{45}Sc and ^{55}Mn induced by 6 to 13 MeV neutrons Phys.Rev. C49, 266 (1994)

3. F.Cserpak, S.Sudar, J.Csikai and S.M.Qaim; Excitation functions and isomeric cross section ratios of the ^{63}Cu(n,α)^{60m,g}Co, ^{65}Cu (n,α)^{62m,g}Co and ^{60}Ni (n,p)^{60m,g}Co processes from 6 to 15 MeV Phys.Rev. C49, 1525 (1994)

4. S.Sudar and S.M.Qaim; Excitaion functions of proton and deuteron induced reactions on iron and α-particle induced reactions on manganese in the energy region up to 25 MeV Phys.Rev. C50, 2408 (1994)

5. J.Csikai, A.Grallert, L.Olah and S.M.Qaim; Characteristics of low energy accelerator neutron sources Proc. Int. Conf. Nuclear Data for Science and Technology, Gatlinburg, Tennessee, USA, May 1994, American Nuclear Society, (1994) p.78

6. S.M.Qaim; Recent develpments in the study of isomeric cross sections Proc. In. Conf. Nuclear Data for Science and Technology, Gatlinburg, Tennessee, USA, May 1994, American Nuclear Society, (1994) p.186

7. B.Neumaier, F.Roesch, S.M.Qaim and G.Stoecklin; Radiochemical study of the ^{209}Bi(p,^{7}Be)^{203}Hg process from 20 to 70 MeV via identification of the emitted particle (^{7}Be) and the product nucleus (^{203}Hg) Radiochimica Acta 65, 1 (1994)

8. B.Scholten, S.M.Qaim and G.Stoecklin; Radiochemical studies of proton induced ^{7}Be-emission reactions in the energy range of 40 to 100 MeV Radiochimica Acta 65, 81 (1994)

9. S.M.Qaim, F.Roesch, B.Scholten, G.Stoecklin, Z.Kovacs and F.Tarkanyi; Nuclear data relevant to the production of medically important positron emitting radioisotopes ^{75}Br, ^{86}Y, ^{94m}Tc and ^{124}I at a small cyclotron Proc. Int. Conf. Nuclear Data for Science and Technology, Gatlinburg, Tennessee, USA, May 1994, American Nuclear Society (1994) p.1035

10. A.Fessler, Z.B.Alfassi and S.M.Qaim; Excitation functions of ^{3}He-particle induced nuclear reactions on natural chromium: possibilities of production of ^{52}Fe, ^{53}Fe and ^{52}Mn for medical use. Radiochimica Acta 65, 207 (1994)

11. M.Fassbender, A.F.Novgorodov, F.Roesch and S.M.Qaim; Excitation functions of ^{93}Nb(^{3}He,xn)Tc$^{93m,g,-94m,g,-95m,g}$ processes from threshold up to 35 MeV: possibility of production of ^{94m}Tc in high radiochemical purity using a thermochromatographic separation technique. Radiochimica Acta 65, 215 (1994)

12. F.-O. Denzler, F.Roesch and S.M.Qaim; Excitation functions of α-particle induced nuclear reactions on highly enriched ^{92}Mo: comparative evaluation of production routes for ^{94m}Tc. Radiochimica Acta, in press

JAPAN

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Facilities

1. Name of facility: Fusion Neutronics Source (FNS)
   Type of facility: 14 MeV Neutron Source
   - $^{3}H(d,t)^{4}He$ reaction
   - d+ beam specification: 350 keV, up to 20 mA
   - Neutron Yield: up to $3*10^{12}$ n/s

2. Availability of machine for nuclear data research:
   around 8-10 weeks/year (includes integral experiments)

3. Name of facility: JAERI Tandem Accelerator

4. Type of facility: Mono-energetic Neutron Source
   - $^{1}H(^{11}B,n)$ neutron source from 9 to 13 MeV neutron yield:10^{5-6}n/cm^{2}/s
   - $^{7}Li(p,n)^{7}Be$ neutron source from 17 to 30 MeV neutron yield:10^{6-7}n/cm^{2}/s

5. Machine time: 6 to 8 days/year

Measurements recently completed or in progress

1. "Measurements of neutron activation cross sections for short-lived radioactivity production reactions in an energy range from 13.5 to 14.9 MeV at FNS"

   A. Filatenkov (KRI), D.L. Smith (ANL) and Y. Ikeda (JAERI)

   The reactions measured are tabulated in the Table 1. The data processing is underway and cross sections will be finalized in the near future.

   The work was carried out in a collaboration with ANL, KRI and JAERI.

Table 1. Reactions investigated

Reaction	$T_{1/2}$ Eg (Branching)	Sample form	Class
$^{11}B(n,p)^{11}Be$	(13.8 s: 2125 keV(33%))	B_4C	S
$^{16}O(n,p)^{16}N$	(7.13 s: 6129 keV(69%))	SiO_2	S
$^{19}F(n,\alpha)^{16}N$	(7.13 s: 6129 keV(69%))	Teflon	S
$^{19}F(n,p)^{19}O$	(26.9 s: 197 keV(91%))	"	S
$^{23}Na(n,p)^{23}Ne$	(37.6 s: 440 keV(33%))	NaF	S
$^{27}Al(n,2n)^{26m}Al$	(6.4 s: 511 keV (200%))	Al	S
$^{28}Si(n,2n)^{27}Si$	(4.13 s: 5100 keV (200%))	SiO_2	S
$^{28}Si(n,p)^{28}Al$	(2.24 m: 1779 keV(100%))	"	M
$^{37}Cl(n,p)^{37}S$	(5 m: 3103 keV(94%))	KCl	M
$^{46}Ti(n,p)^{46m}Sc$	(18.67 s: 143 keV(56%))	SI	S
$^{53}Cr(n,p)^{53}V$	(1.61 m: 1006 keV(89.6%))	Cr metal	M
$^{52}Cr(n,p)^{52}V$	(3.75 m: 1434 keV))	"	M
$^{55}Mn(n,\alpha)^{52}V$	(3.75 m: 1434 keV))	MnCu	M
$^{89}Y(n,n')^{89m}Y$	(16 s: 909 keV))	Y metal	S
$^{119}Sn(n,p)^{119m}In$	(2.4 m: 763 keV(99.1%))	SI	M
$^{138}Ba(n,p)^{138m}Cs$	(2.9 m: 1436 keV(25%))	"	M
$^{138Ba}(n,2n)^{137m}Ba$	(2.552 m: 661.7 keV(89.9%))	"	M
$^{141}Pr(n,2n)^{140}Pr$	(3.39 m: 511 keV(97.4%))	Pr_6O_{11}	M
$^{186}W(n,2n)^{185m}W$	(1.67 m: 131 keV(4.4%))	SI	M
$^{204}Pb(n,2n)^{203m}Pb$	(6.2 s: 825.2 keV(73%))	"	S

SI = separated isotope; S = $T_{1/2}$ < 1 min; M = $T_{1/2}$ > 1 min

2. "Measurements of activation cross sections of importance for the neutron dosimetry at an energy range from 17.5 to 30 MeV using p-Li neutron monoenergetic neutron source at JAERI/TANDEM facility"; Uno, S. Meigo, S. Chiba, T. Fukahori and Y. Ikeda (JAERI)

We have initiated an experimental program two years ago for systematic measurements of activation cross sections for reactions of importance in the dosimetry study in a neutron energy region above 20 MeV. The reactions investigated are listed in Table 2. The p-Li mono-energetic neutron source has been developed at the JAERI/TANDEM facility. The neutron source intensity was determined with a proton recoil telescope counter and the time of flight technique incorporating an NE213. Also, total neutron yield was derived from ^{7}Be activity which is produced via $^{7}Li(p,n)^{7}Be$ reaction in the Li target. The data are to be finalized and to be issued very soon.

Table 2. Reactions investigated

Sample	Reaction	Half life	Q-value (MeV)
^{197}Au	$^{197}Au(n,2n)^{196m}Au$	9.7 h	-8.67
	$^{197}Au(n,2n)^{196m+g}Au$	6.183 d	-8.07
	$^{197}Au(n,3n)^{195}Au$	186.09 d	-14.72
	$^{197}Au(n,4n)^{194}Au$	1.646 d	-22.79
^{27}Al	$^{27}Al(n,\alpha)^{24m+g}Na$	14.659 h	-3.13
^{59}Co	$^{59}Co(n,2n)^{58m+g}Co$	70.916 d	-10.45
	$^{59}Co(n,3n)^{57}Co$	271.77 d	-19.03
	$^{59}Co(n,p)^{59}Fe$	44.496 d	-0.78
	$^{59}Co(n,\alpha)^{56}Mn$	2.5785 h	-0.33
^{169}Tm	$^{169}Tm(n,2n)^{168}Tm$	93.1 d	-8.03
	$^{169}Tm(n,3n)^{167}Tm$	9.24 d	-14.87
^{89}Y	$^{89}Y(n,2n)^{88}Y$	106.6 d	-11.48
	$^{89}Y(n,3n)^{87m}Y$	12.9 h	-21.21
^{93}Nb	$^{93}Nb(n,2n)^{92m}Nb$	10.15 d	-8.97
^{58}Ni	$^{58}Ni(n,2n)^{57}Ni$	1.503 d	-12.22
	$^{58}Ni(n,p)^{58m+g}Co$	70.916 d	0.40
	$^{58}Ni(n,np)^{57}Co$	271.77 d	-8.17
	$^{58}Ni(n,2np)^{56}Co$	77.7 d	-19.55
^{48}Ti	$^{48}Ti(n,p)^{48}Sc$	1.821 d	-3.21
	$^{48}Ti(n,np)^{47}Sc$	3.341 d	-11.44
	$^{48}Ti(n,2np)^{46m+g}Sc$	83.83 d	-22.09
^{nat}Cu	$^{nat}Cu(n,xn)^{64}Cu$	12.701 h	-9.91
	$^{nat}Cu(n,xn)^{61}Cu$	3.408 h	-19.74

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Facilities

1. 4.5 MV pulsed Dynamitron Accelerator (> 1.5 ns)
   Terminal chopper and buncher, Post-acceleration chopper
   Monoenergetic n-sources: 8 keV - 20 MeV
   ^{45}Sc(p,n), ^{7}Li(p,n), T(p,n), D(d,n), T(d,n)
   Quasi-mono-energetic n-sources: ^{14}N(d,n), ^{15}N(d,n)
   Continuous n-sources: Li(p,n), Be(d,n), Li(d,n)

2. Detectors:
   NE213, plastic, ^{6}Li-glass scintillators
   HPGe, NaI gamma-ray spectrometer
   Gridded-ionization chamber for (n,α), (n,p)
   Fission Chamber, Proton-recoil telescope, ^{6}Li-SSD flux detector
   Counter telescope for (n,z) measurement in tens MeV region

Measurements recently completed or in progress

1. Double-differential neutron emission cross sections at 14, 18 and 11.5 MeV.
   Nb, Mo, Ta, W, Bi, (Be); 14 and 18 MeV
   Si, Bi, Fe; 11.5 Me

2. Activation Cross Sections between 12 and 20 MeV
   ^{59}Co(n,2n)^{58}Co, ^{58}Ni(n,2n)^{57}Ni, ^{58}Ni(n,np)^{57}Co, ^{58}Ni(n,p-α)^{54}Mn, ^{89}Y(n,2n)^{88}Y, ^{169}Tm(n,2n)^{168}Tm, ^{197}Au(n,2n)^{196}Au, ^{197}Au(n,3n)^{195}Au.

3. Double-differential (n,x-α) Cross sections between 4.5 and 14 MeV
   Fe, Ni, Cu, ^{50}Cr; (IAEA CRP on improvement of α-production data)
   ^{58}Ni; high resolution α-emission spectra (4.8-5.8 MeV)
   ^{14}N(n,p)^{14}C cross section for stellar neutron spectrum (kT~25 keV).

4. Double-differential $^{12}C(n,xp)$ and (n,xd) cross sections at 40 and 64 MeV. (Collaboration with JAERI/Takasaki AVF cyclotron facility)
   Emission spectra and angular distribution; further correction needed.

Measurements planned for the near future

1. Double-differential neutron emission cross sections at 18 and 11.5 MeV. Improved energy resolution by long liquid scintillator detector. Low energy part emission spectra double-TOF technique.

2. Activation cross sections between 12 and 20 MeV. (n,2n), (n,xn) reactions.

3. Double-differential (n,x-α) cross sections between 4.5 and 14 MeV. ^{52}Cr, natCr, C(n,n-α); gridded-ionization chamber.

4. Double-differential (n,z) cross sections at 40 - 80 MeV. Spectrometer design to extend the measurements to α-particles and lower energy particles. Measurements for structural elements.

Recent publications

1. Measurement of Double-differential Neutron Emission Cross Sections of Nb, Mo, Ta, W and Bi for 14 and 18 MeV Neutrons.; M.Baba, S.Matsuyama, T.Ito, T.Ohkubo, and N.Hirakawa; Nucl. Sci. Technol., 31(8) (1994) 757

2. A Compact Post-acceleration Beam Chopper for a 4.5 MV Dynamitron Pulsed Neutron Generator; S.Matsuyama, M.Fujisawa, M.Baba, T.Iwasaki, S.Iwasaki, R.Sakamoto, N.Hirakawa, K.Sugiyama; Nucl. Instrum. Methods, A348 (1994) 34

3. Differential α-Production Cross Sections of Iron and Nickel for 4.3 to 14.1 MeV Neutrons; M.Baba, N.Ito, I.Matsuyama, S.Matsuyama, N.Hirakawa, S.Chiba, T.Fukahori, M.Mizumoto, K.Hasegawa and S.Meigo; Nucl. Sci. Technol., 31(7) (1994) 745

4. Large Solid Angle Spectrometer for the Measurements of Differential (n,charged-particle) Cross Sections; N.Ito, M.Baba, S.Matsuyama, I.Matsuyama and N.Hirakawa; Nucl. Instrum. Methods, A337 (1994) 474

5. Measurement of activation cross sections for Several Elements between 12 and 20 MeV; S.Iwasaki, S.Matsuyama, T.Ohkubo, H.Fukuda, M.Sakuma, M.Kitamura; Proc. Int. Conf. on Nuclear Data for Sci. and Technol., Gatlinburg 1994, p.305

6. Characterization and application of 20-90 MeV $^{7}Li(p,n)$ Neutron source at TIARA; M.Baba, T.Kiyosumi, T.Iwasaki, M.Yoshioka, S.Matsuyama, N.Hirakawa, T.Nakamura, Su.Tanaka, R.Tanaka, Sh.Tanaka, H.Nakashima, S.Meigo; Proc. Int. Conf. on Nuclear Data for Sci. and Technol., Gatlinburg 1994, p.90

7. Measurement of Double-differential (n,α) cross sections of Fe, Ni, Cu and ^{50}Cr for 4.5-14.1 MeV Neutrons; M.Baba, N.Ito, I.Matsuyama, S.Matsuyama, N.Hirakawa, S.Chiba, T.Fukahori,

M.Mizumoto, K.Hasegawa, S.Meigo; Proc. Int. Conf. on Nuclear Data for Sci. and Technol., Gatlinburg, 1994, p.941

8. Application of $^{15}N(d,n)$ Neutron Source for Neutron Scattering Cross Section Measurements; S.Matsuyama, D.Soda, M.Baba, T.Ohkubo, N.Hirakawa; Proc. Int. Conf. on Nuclear Data for Sci. and Technol., Gatlinburg, 1994, p.400

9. Application of Large-volume Liquid Scintillator to Scattering Cross Section Measurements; S.Matsuyama, T.Ohkubo, M.Baba, S.Iwasaki, D.Soda and N.Hirakawa; Proc. 1993 Nuclear Data Symp., JAERI-M 94-019 (1994) 210

10. Measurement of Double-differential α-Particle Production Cross Sections using a Gridded Ionization Chamber; I.Matsuyama, M.Baba, S.Matsuyama, T.Kiyosumi, T.Sanami, N.Hirakawa, N.Ito, S.Chiba, T.Fukahori, M.Mizumoto, K.Hasegawa, and S.Meigo; Proc. 1993 Nuclear Data Symp., JAERI-M 94-019 (1994) 191

11. Characterization and Application of 20-90 MeV $^{7}Li(p,n)$ Neutron Source at TIARA; M.Baba, T.Kiyosumi, T.Iwasaki, M.Yoshioka, S.Matsuyama, N.Hirakawa, T.Nakamura, Su.Tanaka, R.Tanaka, Sh.Tanaka, H.Nakashima and S.Meigo; Proc. 1993 Nuclear Data Symp., JAERI-M 94-019 (1994) 200

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Facility

AVF cyclotron: quasi-monoenergetic neutron standard field having energies of 22 and 33 MeV

Measurements recently completed or in progress

1. Neutron activation cross sections of ^{12}C, ^{23}Na, ^{25}Mg, ^{30}Si, $^{47,48}Ti$, ^{52}Cr, ^{55}Mn, ^{54}Fe, ^{59}Co, ^{58}Ni, ^{63}Cu, ^{64}Zn and ^{197}Au, mostly (n,xn) and (n,np) reactions in the energy range of 20 to 40 MeV. Cooperative work with Institute for Nuclear Study, Univ. of Tokyo(INS)

2. Neutron spallation cross sections of $^{209}Bi(n,xn)$, $^{27}Al(n,spal)^{22}Na$, $^{12}C(n,spal)^{7}Be$, $^{59}Co(n,xn)$ and $^{nat}Cu(n,spal)$ in the energy range of 20 to 150 MeV at AVF cyclotron facility, TIARA(Takasaki Research Establishment, JAERI) and at Separate Sector cyclotron facility, RIKEN (Institute of Physical and Chemical Research). Cooperative work with RIKEN, TIARA and INS

3. Neutron penetration through iron and concrete shields for 40.5 and 64.5 MeV quasi-monoenergetic neutrons at TIARA. Cooperative work with INS, TIARA and TOKAI Research Establishment, JAERI

4. Neutron and charged particle production yield from thick target bombarded He, C, Ne ions at HIMAC, National Institute of Radiological Sciences(NIRS). Cooperative work with INS, RIKEN and NIRS

Measurements planned for the near future

1. Thin target neutron yield bombarded by 135MeV/nuc heavy ions at RIKEN. Cooperative work with INS and RIKEN

Recent publications

1. Uno, Y. Uwamino, T.S. Soewarsono, T. Nakamura, "Measurement of the Neutron Activation Cross Sections of ^{12}C, ^{30}Si, $^{47,48}Ti$, ^{52}Cr, ^{59}Co and ^{58}Ni between 15 and 40 MeV", Nuci. Sci. Eng., in press.

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Facilities

1. 3U-HC Pelletron: 3MV single end Pelletron, DC or pulsed(1 ns) beam, monoenergetic neutron sources about 10 keV to 6 MeV through ^{7}Li(p,n), D(d,n) and other reactions.

2. Detectors: gamma-ray detectors (anti-Compton NaI(Tl), anti-Compton HPGe, large NaI(Tl)s with an annular plastic scintillator); plastic and liquid scintillators: gas scintillation drift chamber

Measurements recently completed or in progress

1. (n,γ) on ^{1}H from 10 to 550 keV, some results in a paper in The Astrophysical Journal

2. (n,γ) on ^{10,11}B and ^{19}F from 10 to 100 keV, papers at Gatlinburg Conference and Bologna Specialists' Meeting

3. (n,γ) on ^{148,149,152,154}Sm and ^{161,162,163}Dy from 10 to 550 keV, some results in papers at Gatlinburg Conference and Bologna Specialists' Meeting

4. (n,γ) on ^{140}Ce, ^{141}Pr and ^{167}Er from 10 to 550 keV, Data being analyzed

5. (n,γ) on ^{12}C from 300 to 550 keV, Data being analyzed

6. (n,p) on ^{14}N from 10 to 100 keV, paper at Assergi Symposium

Measurements planned for the near future

1. (n,γ) on ^{3}He, ^{6}Li, ^{13}C and ^{18}O from 10 to 100 keV

2. (n,γ) on ^{143,144,145,146}Nd, ^{147,150}Sm and ^{153}Eu from 10 to 550 keV

3. (n,p) on ^{3}He from 10 to 100 keV

Recent publications

1. Ohsaki, Y. Nagai, M. Igashira, T. Shima, K. Takeda, S. Seino and T. Irie: New Measurement of the 12C(n,γ)^{13}C Reaction Cross Section; The Astrophysical Journal, 422 (1994) 912.

2. Senoo, Y. Nagai, T. Shima, T. Ohsaki and M. Igashira; FA Monte-Carlo Code for Multiple Neutron Scattering Events in a thick Sample for (n,γ) Experiment; Nucl. Instr. and Meth. A339 (1994) 556-563.

3. Kitazawa, M. Igashira, S. Shibata, K. Tanaka, H. Takakuwa and K. Masuda: Retardation of Single-Particle E1 Transitions from the 622 keV Broad d-Wave Neutron Resonance in ^{9}Be; Nucl. Phys. A575 (1994) 72.

4. Igashira, K. Masuda, Y. Nagai and H. Kitazawa: Cross Section Measurements for Studies on Nuclear Transmutation and Nucleosynthesis; Proc. Int. Conf. on Nuclear Data for Science and Technology, Gatlinburg, Tennessee, 1994, ed. J. K. Dickens (American Nuclear Society, 1994) 1045-1051.

5. S. Suzuki, Y. Nagai, T. Shima, T. Kikuchi, H. Sato, T. Kii and M. Igashira: First Measurement of a p(n,γ)d Reaction Cross Section Between 10 and 80 keV; The Astrophysical Journal, 439 (1995) L59-L62.

6. Igashira, Y. Nagai, K. Masuda, T. Ohsaki and H. Kitazawa: Measurement of the ^{16}O(n,γ)^{17}O Reaction Cross Section at Stellar Energy and the Critical Role of Nonresonant p-Wave Neutron Capture; The Astrophysical Journal, 441 (1995)L89-L92.

7. Igashira, K. Masuda, S. Mizuno, M. Mizumachi, T. Ohsaki, T. S. Suzuki, Y. Nagai and H. Kitazawa: Measurements of keV-Neutron Capture Gamma Rays; Proc. Specialists' Meeting on Measurement, Calculation and Evaluation of Photon Production Data, Bologna, Italy, 1994, NEA/NSC/DOC(95)1 (1995) 269-280.

8. Kitazawa and M. Igashira: Non-Statistical Gamma-Ray Emission from Broad Neutron Resonances on p-Shell and sd-Shell Nuclei; ibid. 169-179.

9. Shima, K. Watanabe, T. Irie, H. Sato and Y. Nagai: A Gas Scintillation Drift Chamber for the ^{14}N(n,p)^{14}C Measurement; Nucl. Instr. and Meth. A356 (1995) 347-355.

10. Shima, K. Watanabe, H. Sato, T. Kii, Y. Nagai and M. Igashira: New Measurement of the ^{14}N(n,p)^{14}C Cross Section at Stellar Energy With a Drift Chamber; Proc. 3rd Int. Symp. on Nuclear Astrophysics, Assergi, Italy, 1994 (AIP Conference Proceedings 327, 1995) 205-208.

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Facilities

1. OKTAVIAN; Intense 14 MeV neutron source at Osaka University.
2. KUR-ISOL; He-jet type isotope separator on-line installed at 5 MW Research Reactor of Kyoto University.
3. TIARA-ISOL; AVF cyclotron with K-number of 110 at JAERI, Tasasaki .
4. JAERI-ISOL; Gas-jet type isotope separator on-line installed at the tandem accelerator facility at JAERI, Tokai.
5. kW TRIGA-2 reactor of Rikkyo University.
6. Detectors: Gamma-ray detectors (HPGe, LEPS). beta-ray detectors (Plastic scintillator, LEPS).

Measurements recently completed or in progress

1. Activation cross sections on Ta and W with 14 MeV neutrons. paper in J. Nucl. Sci. Technol.
2. Activation cross sections, paper at Gatlinburg conference.
3. Decay of ^{151}Pr to ^{151}Nd with KUR-ISOL, paper in J. Phys. Soc. Japan
4. Decay of a new isotope ^{127}Pr with TIARA-ISOL, paper in Z. Phys. A.
5. Decay of a new isotope ^{166}Tb to ^{166}Dy with JAERI-ISOL.
6. Q measurements of 14 neutron-rich nuclei in the mass region from 147 to 152, paper at Gatlinburg conference.

Measurements planned for near future

1. Activation cross sections of reactions producing short-lived nuclei on the rare-earth elements with 14 MeV neutrons.

2. Beta-decay half-life measurements of short-lived nuclei.

3. Decay scheme of neutron-deficient nuclei and neutron-rich nuclei in the rare-earth region.

Recent publications

1. Kasugai, M. Asai, A. Tanaka, H. Yamamoto, I. Jun, T. Iida and K. Kawad, Measurements of Activation Cross Sections on Ta and W with 14 MeV Neutrons, J.Nucl. Sci. Technol. 31, 1248 (1994)

2. Kasugai, H. Yamamoto, K. Kawade, Y. Ikeda, H. Maekawa, Activation cross-section measurement of reactions producing short-lived nuclei at neutron energy between 13.4 MeV and 14.9 MeV, in proc. Int. Conf. Nuclear Data for Science and Technology ed. by J. K. Dickens, Gatlinburg, TN, May 9-13, 1994 (American Nuclear Society, 1994) p.935.

3. Shibata, T. Ikuta, A. Taniguchi, A. Osa, A. Tanaka, H. Yamamoto, K. Kawade, J. Ruan, Y. Kawase and K. Okano, Beta decay of ^{151}Pr to leve in ^{151}Nd, J. Phys. Soc. Japan, 63, 3263(1994).

4. Sekine, A. Osa, M. Koizumi, S. Ichikawa, M. Asai, H.Yamamoto, and K. Kawade, Decay of the new isotope ^{127}Pr, Z. Phys. A349, 143-146 (1994)

5. Ikuta, A. Taniguchi, H. Yamamoto, K. Kawade,and Y. Kawase, Q measurements of 14 neutron-rich nuclei in the mass region from 147 to 152, in proc. Int. Conf. Nuclear Data for Science and Technology ed. by J. K. Dickens, Gatlinburg, TN, May 9-13, 1994 (American Nuclear Society, 1994) p.331, to be published in J. Phys. Soc. Japan.

6. Osa, M. Asai, M. Koizumi, T. Sekine, S. Ichikawa, Y. Kojima, H. Yamamot and K. Kawade, A decay of unstable Praseodymium isotopes: ^{127}Pr, ^{126}Pr the new isotope ^{125}Pr, to be published in Nucl. Phys.

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Facility

1. OKTAVIAN: 14MeV neutron sources of 2ns pulsed (20 microamp. time-averaged deuteron current at 2 MHz repetition, count-down to 1 kHz possible) and continuous (20mA max on rotating tritiated target) D-T neutrons. Deuteron energy is variable from 150 keV to 300 keV. H and He ion beams can be also used. OKTAVIAN is acronym of its Japanese facility name meaning Osaka University Intense 14MeV Neutron Source, belonging to Department of Nuclear Engineering, Osaka University

Measurements recently completed on in progress

1. Double differential proton and alpha-particle emission cross sections at 1 MeV for Be, C, Fe, Ni and Cu, paper at Gatlinburg Conference

2. Short-lived activation cross sections for Ta, W, Na, Si, Te, Ba, Ce, Sm, W, Os, in collaboration with Nagoya University (Kawade et al.),paper in J. Nucl. Sci. Tech.

Measurements planned for the near future

1. Reaction cross sections of FP elements at 14 MeV

2. Double differential charged particle emission cross sections for Li, B, and structural metal elements

3. Short-lived activation cross sections

Recent publications

1. Takahashi, "Japanese Activities in Nuclear Data Measurements for Fusion Applications", Proc. Int. Conf. Nuclear Data for Science and Technology, ed. J.K. Dickens, Gatlinburg, TN, May 9-13, 1994 (American Nuclear Society, 1994)p.847.

2. Kasugai, M. Asai, A. Tanaka, H. Yamamoto, I. Jun, and T. Iida, "Measurement of Activation Cross Sections on Tantalum and Tangusten with 14 MeV Neutrons", J. Nucl. Sci. Tech., 31, 1248 (1994).

3. Yamauchi, Y. Kasugai, H. Yamamoto, A. Takahashi, T. Iida and K. Kawade, "Measurement of Formation Cross Sections Producing Short-lived Nuclei- Mg, S, Ga, Y, Mo, Pd, Sn-", JAERI-M 94-019, p.253 (1994).

4. Itoh, A. Tanaka, H. Yamamoto, T. Iida, A. Takahashi and K. Kawade, "Measurement of Beta-decay Half-lives of Short-lived Nuclei", JAERI-M 94-019, p.264.

5. Kondoh, A. Takahashi and H. Nishizawa, "Measurements of Double Differential Charged Particle Emission Cross Sections by Incident D-T neutrons", JAERI-Conf 95-008, p.149 (1995).

6. Itoh, M. Yasuda, H. Yamamoto, T. Iida, A. Takahashi and K. Kawade, "Measurement of Beta-decay Halfilives of Short Lived Nuclei by Using High Rate Spectroscopy Amplifier", JAERI-Conf 95-008, p.185 (1995).

7. Satoh, T. Matsumoto, Y. Kasugai, H. Yamamoto, T. Iida, A. Takahashi and K. Kawade, "Measurement of Formation Cross Sections Producing Short-lived Nuclei by 14 MeV Neutrons - Na, Si, Te, Ba, Ce, Sm, W, Os-", JAERI-Conf 95-008, p.189 (1995).

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Facilities

No own specific facility

Measurements recently completed or in progress

1. Measurement of Fragment mass dependent kinetic energy and neutron multiplicity for thermal neutron induced fission of Pu-239, with Research Institute, Kyoto University; Paper in J.Nucl. Sci. Technol.

2. Measurements of differential thick target neutron yields for charged particles, with JAERI

Recent publications

1. Nishio, Y. Nakagome, I. Kanno, I. Kimura,"Measurement of Fragment Mass Dependent Kinetic Energy and Neutron Multiplicity for Thermal Neutron Induced Fission of Pu-239", J. Nucl. Sci. Technol., 32, 404 (1995).

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Facilities

1. Kyoto University Reactor (KUR) of 5 MW: a light water moderated, tank type research reactor with 93 % enriched fuels.
   - Beam tubes: Fe-filtered beam, Triple-axis neutron spectrometer, Four-circle neutron diffractmeter, Neutron mirror guide and neutron scattering experiments, Irradiation for general purposes, Neutron radiography, Neutron mirror guide and neutron spin echo experiments, Low temperature irradiation loop, Isotope separator online.
   - Irradiation Facilities: Hydraulic conveyor located at the core center, Three pneumatic irradiation tubes located in the reflector, Slant exposure tube located outside the reflector.
   - Thermal columns: Graphite thermal column (Cold neutron source), Heavy water thermal column (Neutron standard field, BNCT and radiation biology).

2. 46 MeV Electron Linear Accelerator: maximum beam power 10 kW, 180 pps (for 4 micro-sec pulse width) to 400 pps (for 10 to 100 nano-sec), a water-cooled Ta target with about 10^{+12} n/sec neutron production.
   - Neutron time-of-flight method for neutron total and capture cross section measurements, Lead slowing-downspectrometer coupled to the linac

3. 14MeV Neutron Generator
   - This is attached with Kyoto University Critical Assembly (KUCA). 14 MeV neutrons are generated through T(d,n) reactions. It can be operated in both DC and pulsed mode. Peak neutron yield is about 10 to the 11th/second for pulsed operation and 9th for DC operation, respectively. A neutron flight path (9m) is equipped for TOF measurement. Neutron pulses with 200 ns or wider width are available.

Measurements recently completed or in progress

1. Katsuhei Kobayshi, Akihiro Yamanaka, Shuji Yamamoto, Yoshihiro Nakagome, Yoshiaki Fujita, Satoshi Kanazawa, and Itsuro Kimura, "Characteristics of the Kyoto University Lead Slowing-down Spectrometer Coupled to an Electron Linac"

2. Katsuhei Kobayashi, Mitsuharu Miyoshi, Shuji Yamamoto, Yoshiaki Fujita, Itsuro Kimura, Ikuo Kanno, Satoshi Kanazawa, and Nobuo Shinohara, "Fission Cross Section Measurement of ^{241}Am between 0.1 eV and 10 keV with Lead Slowing-down Spectrometer"

3. Katsuhei Kobayashi, Shuji Yamamoto, Yoshiaki Fujita, Oleg A. Shcherbakov, and Alexander B. Laptev, "Precise Measurement of Neutron Total Cross Section of ^{208}Pb and ^{nat}Pb"

4. Hiroshi Chatani, "Gamma-ray intensities of ^{231}Th"

5. Ichihara, Spatial distribution of reaction rates - ^{93}Nb(n,2n'), ^{90}Zr(n,2n), ^{115}In (n,n'), ^{197}Au(n,γ) - in metallyc thorium pile with and without the neutron multiplier.

6. Ichihara, Similar measurements in thorium oxide pile.

7. Ichihara, Neutron spectrum measurement from thorium metal scatterer using TOF method triggered by associate alpha-particles.

Measurements planned for the near future

1. Katsuhei Kobayashi, Shuji Yamamoto, Yoshiaki Fujita, Itsuro Kimura, Ikuo Kanno, Satoshi Kanazawa, Hideki Yamamoto, and Nobuo Shinohara, "Fission Cross Section Measurement of ^{243}Am between 0.1 eV and 10 keV with Lead Slowing-down Spectrometer"

2. Ichihara, Reaction rate distribution in thorium oxide pile with neutron multiplier.

Recent publications

1. Jose Roland Granada, C. Bonetto, Shu A. Hayashi, Katsuhei Kobayashi, Shuji Yamamoto, Yoshiaki Fujita, Itsuro Kimura, "Total Cross Section of Lead and Contributions from Fundamental Neutron Interactions", Physica B, 190, 259-266 (1993).

2. Akihiro Yamanaka, Itsuro Kimura, Satoshi Kanazawa, Katsuhei Kobayashi, Shuji Yamamoto, Yoshihiro Nakagome, Yoshiaki Fujita and Tadaharu Tamai, "Measurement of Fission Cross Section of Neptunium-237 in Resonance Region with Electron Linac-Driven Lead Spectrometer", J. Nucl. Sci. Technol., Vol.30, No.9, (1993).

3. Katsuhei Kobayashi, Akihiro Yamanaka and Itsuro Kimura, "Measurements of Thermal Neutron Cross Section and Resonance Integral for ^{237}Np(n,γ)^{238}Np Reaction", J. Nucl. Sci. Technol., Vol.31, No.12, 1239-1247 (1994).

4. Katsuhei Kobayashi, "Measurement of ^{233}U Fission Spectrum-Averaged Cross Sections for Some Threshold Reactions", Proc. of Eigth ASTM-Euratom Symp. on Reactor Dosimetry, held at Vail, Colorado, Aug.29-Sept.3, 1993, Edited by H.Farra IV, E.P.Lippincott, J.G.Williams and D.W.Vehar, STP 1228, ASTM, p.720-726, 1994.

5. Katsuhei Kobayashi, Masaharu Nakazawa, Shin Iwasaki, Tetsuo Iguchi, Yujiro Ikeda, Tsuneo Nakagawa, Kiyoshi Sakurai and Naoteru Odano, "JENDL Dosimetry File", Proc. of Eigth ASTM-Euratom Symp. on Reactor Dosimetry, held at Vail, Colorado, Aug.29-Sept.3, 1993, Edited by H.Farra IV, E.P.Lippincott, J.G.Williams and D.W.Vehar, STP 1228, ASTM, p.670-679, 1994.

6. Itsuro Kimura, Akihiro Yamanaka, Satoshi Kanazawa, Ikuo Kanno, Yoshiaki Fujita, Katsuhei Kobayashi, Yoshihiro Nakagome, Shuji Yamamoto and Tadaharu Tamai, "Measurement of Fission and Capture Cross Sections for Design of Transmutation Systems", Proc. of Int'l Conf. and Technol. Exposition on Future Nuclear Systems: Emerging Fuel Cycles and Waste Disposal Options, held on 12-17 Sept. 1993 at Seattle, U.S.A., Published by ANS, Inc., Illinois, pp.449-454 (1993).

7. I. Kimura, M. Miyoshi, I. Kanno, S. Kanazawa, K. Kobayashi, S. Yamamoto, and Y. Fujita, "Measurement of Fission Cross Section of ^{241}Am in Resonance Region with Electron Linac-Driven Lead Slowing-down Spectrometer", Presented at the Int'l Seminar on Neutron Spectroscopy, Nuclear Structure, Related Topics, ISINN-2, E3-94-419, pp.288-292, Dubna, April, 1994.

8. Katsuhei Kobayashi, Shuji Yamamoto, Yoshiaki Fujita, Oleg A. Shcherbakov, and Alexander B. Laptev, "Precise Measurement of Neutron Total Cross Section of Pb-208 and Pb-nat", Proc. of Int'l Conf. on Nucl. Data for Sci. and Technol., May 9-13, 1994, Gatlinburg, Tenn., Edited by J.K.Dickens, ORNL, Vol.1, 239-241 (1994).

9. Katsuhei Kobayashi, Shuji Yamamoto, Yoshiaki Fujita, Mitsuharu Miyoshi, Itsuro Kimura, Ikuo Kanno, and Satoshi Kanazawa, "Fission Cross Section Measurement of Am-241 between 0.1 eV and 10 keV with Lead Slowing-down Spectrometer", Proc. of Int'l Conf. on Nucl. Data for Sci. and Technol., May 9-13, 1994, Gatlinburg, Tenn., Edited by J.K.Dickens, ORNL, Vol.1, 242-244 (1994).

10. Katsuhei Kobayashi and Yoshiaki Fujita, "Neutron Cross Section Measurements with KURRI Linac", Annu. Rep. Res. Reactor Inst. Kyoto Univ., Vol.26, 92-117 (1993).

11. S.A.Hayashi, C.Ichihara, J.Yamamoto, S.Kanazawa, I.Kimura, "Fast Neutron Measurement from Thorium Scatterer Using Associate Particle Mmethod", in Proceedings of the 1990 symposium on nuclear data, JAERI-M 91-032(1991), p.237

12. C.Ichihara, S.Hayashi, K.Kobayashi, H.Nakamura, S.Kanazawa and I.Kimura, "14 MeV Neutron Transport in Thorium Metal Piles", ibid, p.415

13. I.Kimura, C.Ichihara, S.A.Hayashi, K.Kobayashi, H.Nakamura, S.Kanazawa and J.Yamamoto, "Characteristics of Thorium Loaded Fusion-Fission Hybrid System -14 MeV Neutron transport in Thorium -", in Proceedings of the Indo-Japan Seminar on Thorium Utilization (1991), p.255

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Facilities

No own specific facility. Experments are performed at Research Center for Nuclear Physics in Osaka University, which is a K=400 ring cyclotoron facility, and at Tandem Accelerator Laboratory in Kyushu University, which can provide polarized beams of upto 10 MV acceleration voltages

Measurements recently completed or in progress

Measurements of DDX and Analyzing powers of B(p,p') scattering. Collaboration with Kyushu University group.

Measurements planned for the future

The (p,xp) reactions on light nulei. Reactions around 300 MeV.

Recent publications

1. Koori, Y. Watanabe, H. Hane, H. Kashimoto, A. Aoto,H. Ijiri, K. Sagara, H. Nakamura, K. Maeda, T. Nakashima, Elastic and Inelastic Scattering of Protons from Oxygen-16, JAERI-M 94-011, (1994) Japan Atomic Energy Research Institute.

2. Koori, K. Ichiba, Y. Watanabe, H. Shinohara, T. Michibata, H. Ijiri, K. Sagara, H. Nakamura, K. Maeda, T. Nakashima, Measurement of (p,p') Spectra from Boron Isotopes Proc. 1994 Sym. on Nuclear Data, JAERI-Conf 95-008, (1995).

3. Watanabe, A. Aoto, H. Kashimoto, S. Chiba, T. Fukahori, K. Hasegawa, M. Mizumoto, S. Meigo, M. Sugimoto, Y. Yamanouti, N. Koori, M.B. Chadwick, P.E. Hodgson, Feshbach-Kerman-Koonin Model Analysis of Preequilibrium (p,p') and (p,n) Reactions at 12 to 26 MeV, Phys. Rev. C51, 1891 (1995).

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Facilities

Experimental Research of this group is being made at the proton synchrotron of the National Laboratory for High Energy Physics (KEK), located in Tsukuba, Ibaraki, Japan. The accelerator supplies protons of 12 GeV as a primary beam as well as protons and pions of 1 to 4 GeV/c as a secondary beam. The accelerator are capable of producing neutrons of 1 to 6 GeV, although machine time is limited for this purpose.

Measurements recently completed or in progress

1. Neutron-production double differential cross sections for C, Al, Fe, In, Pb at incident protons of 0.8, 1.5, and 3.0 GeV.

2. Gamma-Ray-production double differential cross sections for C, Al, Fe, In, Pb at incident protons of 0.8, 1.5, and 3.0 GeV.

Measurements planned for the near future

1. Neutron-production double differential cross sections for Al, Fe, Pb at incident pions of 0.8, 1.5, and 3.0 GeV.

2. Neutron flux measurement in the range of 1 to 6 GeV for experiment on activation cross section. The entire activation experiment will be made by collaboration of many groups, headed by Prof. T. Shibata of Institute of Nuclear Research, University of Tokyo.

Recent publications

1. Ishibashi, T. Nakamoto, N. Matsufuji, N. Shigyo, K. Maehata, Y. Wakuta,, Y. Watanabe, H. Takada, S. Meigo, S. Chiba, M. Numajiri, T. Nakamura, "Measurement of neutron-production double-differential cross sections for incident Protons of 0.8, 1.5 and 3.0 GeV", in Proc. of Int.

Conf. on Nuclear Data for Science and Technology, ed. J. K. Dickens, Gatlingburg, TN, May 9-13, 1994 (American Nuclear Society, 1994) p.347.

2. Nakamoto, K. Ishibashi, N. Matsufuji, N. Shigyo, K. Maehata, S. Meigo, H. Takada, S. Chiba, M. Numajiri, T. Nakamura, Y. Watanabe, "Spallation neuron measurement by Time-of-Flight method with a short flight path", Submitted to the Journal of Nuclear Science and Technology.

3. Nakamoto, K. Ishibashi, N. Matsufuji, N. Shigyo, K. Maehata, "Charged particle identification including pions by the pulse shape discrimination with NE213 liquid scintillator", Submitted to the Review of Scientific Instruments.

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Graduate student (1993-1995): M. Hayashi, Y. Nakao, M. Harada, M. Higashi, S. Yoshioka, and K. Sato. plus many external coworkers

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Facilities

10MV Tandem Van de Graaff (belonging to Department of Physics) : DC operation. Unpolarized and polarized proton and deuteron beams with energies up to about 19 MeV. Other HI beams are also available.
Detectors: dE-E counter telescope consisting of two or three silicon semiconductors

Measurements recently completed or in progress

1. Double differential cross sections (DDXs) of (p,p') for ^{60}Ni and ^{93}Nb at 14.1 MeV. Data being analyzed.

2. Double differential cross sections of (p,p') for ^{98}Mo and ^{106}Pd at 26 MeV using JAERI Tandem with JAERI and Tokushima.University. Published in Physical Review C.

Measurements planned for the near future

1. DDXs of (p,p') for ^{58,60}Ni and ^{93}Nb at 14.1 MeV and 18 MeV for comparison with (n,n') data.

2. DDXs of all emitted charged particles (p, d, t, ^{3}He, and α) from proton-induced reactions on Fe-isotopes , Zr-isotopes and ^{93}Nb at 25 MeV using JAERI Tandem accelerator.

3. Coincidence spectra of proton and alpha from proton-induced reactions on ^{12}C at energies from 12 to 30 MeV using Kyushu and JAERI Tandem accelerators.

Recent publications

1. Watanabe, A. Aoto, H. Kashimoto, S. Chiba, T. Fukahori, K. Hasegawa, M. Mizumoto, S. Meigo, M. Sugimoto, Y. Yamanouti, N. Koori, M.B. Chadwick and P.E. Hodgson, "Feshbach-Kerman-

Koonin model analysis of preequilibrium (p,p') and (p,n) reactions at 12 to 26 MeV", Phys. Rev. C 51, 1891 (1995).

2. Watanabe, A. Aoto, H. Kashimoto, S. Chiba, T. Fukahori, K. Hasegawa, M. Mizumoto, S. Meigo, M. Sugimoto, Y. Yamanouchi, N. Koori, M.B. Chadwick, and P.E. Hodgson, "Measurement of Double Differential Charged-Particle Emission Cross Sections for Reactions Induced By 26 MeV Protons and FKK Model Analysis", Proc. Int. Conf. on Nuclear Data for Sci. and Tech. (Ed., J.K. Dickens, American Nuclear Society, Inc.), Gatlinburg, Tennessee, p. 308. (1995)

3. Watanabe, M. Harada, Y. Koyama, H. Kashimoto, H. Shinohara, and S. Chiba, "Calculations of Double Differential Particle Emission Cross Sections for Nucleon-Induced Reactions on ^{12}C and Carbon Kerma Factors Using A Monte Carlo Method", Proc. Int. Conf. on Nuclear Data for Sci. and Tech. (Ed., J.K. Dickens, American Nuclear Society, Inc.), Gatlinburg, Tennessee, p. 574. (1995)

4. Hayashi, Y. Nakao, S. Yoshida, M. Harada, M. Higashi, H. Ijiri, and Y. Watanabe, "Measurement of Preequilibrium (p,p') Spectra at Small Angles", Proc. of the 1994 Nuclear Data Symposium, JAERI-Conf-008, p.225 (1995).

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Facilities

1. MV single stage Van de Graaf EG-1, DC or pulsed (1-2 ns);
   average current: 50μA (1 MHz), 5μA (2 MHz);
   monoenergetic n-sources: ^{7}Li(p,n), T(p,n), D(d,n), T(d,n);
   white n-source with thick target ^{7}Li(p,n), Be(d,n).

2. MV Cascade Accelerator KG-2.5, DC (<=500μA);
   monoenergetic n-sources: ^{7}Li(p,n), T(p,n), D(d,n), T(d,n);

3. 4.5 MV Tandem Accelerator EGP-10M, DC or pulsed (1nsec),
   monoenergetic n-sources: T(p,n), D(d,n)-solid and gas targets, ^{7}Li(p,n) metal target.

   14 MeV neutron source on the base cascade accelerator KG-0.3, DC or pulsed (2 MHz, 1-2 ns) d
   average current: DC<=50μA, pulsed mode 10μA, flight path up to - 10 m.

4. 7.5 MV Tandem Accelerator EGP-15-in progress

5. 30 MeV electron accelerator (microtron M-30)

Detectors:

plastic and liquid scintillator; Li glass scintillator, NaI, BGO and Ge(Li) detectors, fast fission chambers, gridded ionization chambers; time of flight neutron spectrometers.

Measurements recently completed or in progress

1. ^{242m}Am, ^{245}Cm, ^{247}Cm fission cross sections. (relevant to WPEC subgroup 8)
   Cross sections measured between 130 keV and 7 MeV, Van de Graaf monoenergetic neutrons; preliminary data published at Catlinburg Conference.

2. ^{58}Ni(n,α)
   (Collaboration IRK, Vienna and LANL, Los-Alamos-IPPE)
   Measurement of double-differential spectra in the neutron energy range from 3 to 7 MeV (Van de Graaf monoenergetic neutrons); theoretical analysis of partial cross sections and angular distributions.

3. ^{17}O(n,α).
   (Collaboration IRK, Vienna and LANL, Los-Alamos-IPPE)
   Measurement of cross-section at the point En=0.95 MeV for astrophysical applications.

4. ^{243}Am(n,f) fragment mass distribution.
   Measurement at Cascade Accelerator (monoenergetic neutrons near the fission threshold); analysis within the mass-channels model by Brosa, development of the systematics for Standard-I component, yield for odd-Z nuclei.

5. ^{236}U(n,f) fragment mass distribution.
   Measurement at Cascade Accelerator (monoenergetic neutrons 1 MeV).
   Investigation of yields and properties of high asymmetric fission fragments binary fission; prediction of Fe and Ni isotopes yield for major fissile nuclei.

6. Inelastic scattering by ^{238}U, ^{232}Th and ^{235}U.
   EG-1 TOF spectrometer, neutron energies 0.2-0.6MeV, ^{238}U data are being evaluated now.

7. Capture cross section measurements with total energy BGO detector.
   (Collaboration KfK-IPPE), neutron energies 20-200keV, TOF method

8. ^{232}Th(n,f) fission neutron spectra.
   (Collaboration Radium Chlopin Institute St.Petersburg - IPPE)
   Measurement at Cascade Accelerator (monoenergetic neutrons 17.7 MeV).

9. ^{238}U(n,f) fission neutron spectra.
   (Collaboration Radium Chlopin Institute, St.Petersburg-IPPE)
   Measurement at Cascade Accelerator at neutron incident energies 16.0 and 17.7MeV. Fission neutron spectra were measured against ^{252}Cf spontaneous fission spectra.

10. ^{232}Th(γ,f) energy dependence of photofission cross section.
    Microtron M-30, gamma energy range 5-9 MeV with step 25 keV.

11. ^{231}Pa(γ,f) energy dependence of photofission cross section.
    Microtron, gamma energy region 5-9 MeV with step 25 keV.

12. (α,n) double-differential cross section.
(Collaboration CIAE, Beijing-IPPE). CIAE HI-13 tandem accelerator, ^{56}Fe, ^{93}Nb, ^{115}In data were measured;

13. ^{232}Th total cross section
(Collaboration JINR, Dubna-IPPE)
Measurement done in resonance region from 4 eV to 200 keV with white neutron source, (pulsed reactor IBR-30) and in energy region 200 keV-10 MeV with time of flight spectrometer on the base of ^{252}Cf fast neutron source.

14. ^{208}Pb(n,xγ) photon production cross sections.
(Collaboration IRK (Vienna), Physical Institute (Bratislava)-IPPE), 14 MeV neutron generator.

15. Spherical benchmarks experiments.
(Collaboration Institute fur Neutronenphysik and Reactortechnik, KFK-IPPE).
Measurement of the neutron leakage spectra from Be and Fe spheres for 14 MeV incident neutrons. Experimental data are compared with transport calculations using the data from ENDF-B6, EFF-1, BROND-2 libraries.

16. Neutron transmission and Doppler coefficients.
(Collaboration JINR-IPPE)
Measurement for ^{232}Th, ^{235}U, ^{239}Pu (metallic disks) in the neutron energy range from 1 eV to 200 keV. Whit neutron spectra (pulsed reactor IBR-30), flight paths 60 m, 123 m and 1006 m.

Measurements planned for the near future

1. ^{238}Pu, ^{243}Cm, ^{244}Cm, ^{246}Cm, ^{248}Cm (n,f).
Fission cross sections for 150keV -7MeV neutrons

2. ^{53}Cr, ^{56}Fe(n,α) reactions.
(Collaboration IRK, LANL-IPPE)
Measurement of double-differential spectra in the neutron energy range from 3 to 7 MeV.

3. ^{17}O(n,α) reaction.
(Collaboration LANL-IPPE).
Measurement of angular distribution and total cross section in the energy range from 100 to 800 keV.

4. ^{237}Np(n,f), ^{232}Th(n,f).
Measurement of fission product yields.

5. Detailed measurement of mass yields for ^{238}U spontaneous fission.
(Collaboration JINR-IPPE).

6. ^{238}U(n,f) fission neutron spectra.
Measurement of double-differential neutron spectra at initial neutron energy 13.0, 14.7, 16.0 and 17.7 MeV.

7. $^{234}U(\gamma,f)$.
Measurement of photofission cross section in the gamma energy range 5-9 MeV.

8. (p,n) reaction
Measurement of double-differential neutron emission cross section for some Sn-isotopes and Pb-isotopes.

9. (n,xγ) photon production cross section from interaction of 14 MeV neutron with light nuclei Na,P.

10. Spherical benchmark experiment.
New measurement of neutron leakage spectra from Fe spheres using new electronics and acquisition system.

11. $^{237}Np(n,f)$ delayed neutron yields
Measurement in the neutron energy range from 0.7-1.5 MeV.

Recent publications

1. Fast neutron induced fission cross sections of ^{242m}Am, ^{245}Cm, ^{247}Cm, B.I.Fursov, B.F.Samylin, G.N.Smirenkin, V.N.Polynov; Proc. Int. Conf. on Nuclear Data for Science and Technology, Gatlinburg, 1994, v.1 p.269.

2. (n,α) Reaction studies using a gridded ionization chamber, A.A.Goverdovsky, V.A. Khryachkov, V.V.Ketlerov, V.F.Mitrofanov, H.Vonach, R.C.Haight; Proc. Int. Conf. Nucl. Data for Sci. and Technology, Gatlinburg, 1994, V.1, P. 117-123.

3. Spectrometric aspects of charged particles detection in neutron induced reactions, A.A. Goverdovsky, V.A.Khryachkov, V.V.Ketlerov, V.F.Mitrofanov; Proc. ISINN-II, JINR, Dubna, 1994.

4. Properties of standard-Imasschannelinfissionof Z-odd nuclei, A.A.Goverdovsky,V.A. Khryachkov, V.F. Mitrofanov; Report INDC(CCP)-382, 1994, Vienna, IAEA.

5. Mass-angular correlations of uranium fission fragments, A.A. Goverdovsky, V.A. Khryachkov, V.F.Mitrofanov, B.D.Kuzminov; Russian J. Nuclear Phys., 1995, in press.

6. Uranium cold deformed fission in high mass asymmetry region, A.A. Goverdovsky,V.A.Khryachkov, V.F.Mitrofanov; Russian J. Nuclear Phys., 1995, in press.

7. The structure of fragment mass-energy distributions from ^{243}Am fast neutron induced fission, A.A.Goverdovsky, V.A.Khryachkov, V.F.Mitrofanov; Russian J. Nuclear Phys., 1995, in press.

8. Inelastic Neutron scattering by ^{235}U, ^{238}U Nuclei, N.V.Kornilov, A.B.Kagalenko; Nucl. Sci. and Eng. 1995

9. Inelastic Neutron Spectra and cross sections for ^{238}U; Report to ILC meeting, Gatlinburg, 1995, preprint FEI-2363, 1994, (English)

10. Pre-acceleration Neutron Emission - is it evaluation trick or reality? N.V. Kornilov, A.B. Kagalenko, Report to 2nd Intern. Seminar on Inter. of Neutrons with Nucl. Dubna 1994

11. Origin of low energy 'tail' for monoenergetic neutron sources, N.V.Kornilov, A.B.Kagalenko; will be submitted to 3 Intern. Seminar on Inter. of Neutrons, with Nucl. Dubna 1995

12. Method for determination of Center-of-Mass velocity with laboratory neutron spectra analysis, N.V.Kornilov, A.B.Kagalenko; Will be submitted to 3 Intern. Seminar on Inter. of Neutrons with Nucl. Dubna 1995,

13. ^{237}Np Fission neutron spectra for primary neutron energy 2.9 and 14.7 MeV, G.S.Bojkov, V.D.Dmitriev, M.I.Svirin, G.N.Smirenkin; Russian J. Nuclear Phys., 1994, v.57 N 12, p.2126.

14. Yield and cross section of gamma induced fission for ^{232}Th and ^{236}U, A.S.Soldatov, G.N.Smirenkin; Russian J. Nuclear Phys., 1995, v.58, N 82, p.32

15. The analysis of high energy part of neutron spectra in (α,xn) reaction, B.V.Zhuravlev; Izvestiya of Russian Academy of Science, ser.Physics, 1994,v.58,Nb.5, p.66.

16. Nuclear level density of ^{113}Sn,^{114}Sn, ^{115}Sn, ^{116}Sn from the analysis of neutron spectra in ^{115}In(p,xn), ^{115}In(d,xn) and ^{113}Cd(α,xn) reactions, B.V.Zhuravlev, A.G.Dovbenko; Russian J. Nuclear Phys.,1995, v.58, Nb 2, p.8

17. Nuclear lever densities and neutron cascade emission cross-sections from the analysis of neutron spectra in (α,xn) reactions on ^{115}In and ^{122}Sn, B.V.Zhuravlev, A.G.Dovbenko; Russian J. Nuclear Phys., in press

18. Neutron leakage spectrum from Fe sphere with Cf neutron source, B.V.Zhuravlev, A.A.Lychagin, V.I.Trykova,V.G.Demenkov, P.A.Androsenko, V.I.Sinitsa; Atomnaya Energiya, 1994, v.76, Nb.3, p.229.

19. Measurement and calculation of ^{235}U, ^{239}Pu and ^{232}Th neutron transmissions in energy range 2.15-14 MeV for temperatures 77K and 293K, Yu.V.Grigoyev, V.V.Sinitsa, G.P.Georgiev, N.N.Gundorin; Proc.Int.Conf. on Nuclear Data for Science and Technology, Gatlinburg,1994, v.2, p.990.

20. Neutron Leakage from Beryllium Shells, B.V.Devkin, M.G.Kobozev, S.P.Simakov, U.Fischer, E.Wiegner e.a.; Proc. of Int. Conf. on Nuclear Data for Science and Technology (May 1994 Gatlinburg, USA), v.2, p.916.

21. Neutron Leakage Spectra from Iron Spheres, B.V.Devkin, M.G.Kobozev, S.P.Simakov, U.Fischer, U.von Moellendorff, E.Wiegner e.a.; Symposium on Fusion Technology, (August 1994 Karlsruhe, Germany), in press.

22. Analyses of Nb(n,xn) and Bi(n,xn) reaction for 5 to 26MeV incident neutrons, V.P.Lunev, V.G.Pronyaev, S.P.Simakov e.a.; Proc. of Int. Conf. on Nuclear Data for Science and Technology (May 1994 Gatlinburg, USA), v.1, p.554.,

23. Study of gamma-radiation from interaction of 14.7MeV neutrons with ^{208}Pb, S.Hlavac, P.Oblozinsky, H.Vonach, A.Pavlik, S.P.Simakov e.a. ; Proc. of Int. Conf. on Nuclear Data for Science and Technology (May 1994 Gatlinburg, USA), v.1, p.288.

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Facilities

The Svedberg Laboratory, Box 533, S-751 21 Uppsala, Sweden:

Gustaf Werner cyclotron: Isochronous mode< 100 MeV protons and 196 Q^2/A MeV heavy ions. Synchrocyclotron mode < 180 MeV protons. Light unpolarized and polarized ion source as well as a heavy ion source.

The CELSIUS ring: Ions from the Gustaf Werner cyclotron can be injected, stored, cooled and accelerated in CELSIUS. The maximum energy for protons is 1360 MeV and for ions with charge-to-mass ratio of one half 470 MeV/nucleon. Cluster-jet, fibre and hydrogen pellet target system in operation.

The Neutron Research Laboratory, Studsvik, S-611 82 Nyköping:

The R2, 50 MW high flux swimming-pool reactor. About 10 different experimental channels are used for neutron scattering experiments with different types of neutron diffractometers.The R2-0, 1MW swimming pool reactor is used as a neutron source for the on-line isotope separator OSIRIS built for studies of short lived fission products.

Measurements recently completed or in progress

Neutron Physics Programme:

1. Studies of neutron-proton scattering in the energy region 100 - 200 MeV.

2. Studies of nuclear structure by the (n,p)-reaction and simultaneously tests of intermediate energy nuclear reaction cross section calculation models.

3. Neutron-Induced Fission Cross Sections of ^{209}Bi and ^{238}U in the Intermediate Energy Region (in collaboration with the Khlopin Radium Institute, St. Petersburg, Russia).

4. Studies of the Dynamics in the Fission Process (in collaboration with the Khlopin Radium Institute, St. Petersburg, Russia).

5. Measurements of residual nuclide production cross sections of proton-induced reactions relevant for accelerator-driven nuclear waste transmutation (in collaboration with Universitaet Hannover and Koeln).

6. Participation in an experiment at SATURNE, Saclay, France in collaboration with several French laboratories to study the production of spallation neutrons induced by protons and deutrons incident on heavy targets of interest for accelerator based transmutation.

7. Design and construction of a neutron spectrometer (magnetic proton recoil spectrometer (MPR)) for neutron diagnostics of burning fusion plasmas. The spectrometer will be tested at JET, Culham, UK with a scheduled start in 1996. Neutron transport for shielding and neutron scattering in the plasma environment is studied for background estimations.

Nuclear Physics/Nuclear Chemistry Programme:

1. Measurements of the fission product yield for thermal fission of ^{233}U (in progress) and fast fission of ^{232}Th (planned).

2. Fundamental studies of nuclear spectroscopy for neutron rich nuclei (fission products) at the OSIRIS facility.

3. Studies of the reaction mechanism in heavy-ion induced reactions.

Measurements planned for the near future

1. Measurements of (n,x)-reaction differential cross sections in the energy region 50-100 MeV of interest for fast neutron cancer therapy.

2. Measurements of neutron scattering differential cross sections in the energy region 100-200 MeV.

Recent publications

1. Nuclear Data Standards for Nuclear Measurements, OECD/Nuclear Energy Agency Report NEANDC-311 "U", OECD/NEA 1992, Ed. H. Conde.

2. T. Ronnqvist, H. Conde, N. Olsson, R. Zorro, J. Blomgren, G. Tibell, O. Jonsson, L. Nilsson, P.-U. Renberg and S.Y. van der Werf, Backward angle n-p differential cross section at 96 MeV, Phys. Rev. C45 (1992) R496.

3. H. Conde, N. Olsson, E. Ramstrom, T. Ronnqvist, R. Zorro, J. Blomgren, A. Hakansson, G. Tibell, O. Jonsson, L. Nilsson, M. Osterlund, W. Unkelbach, J. Wambach, S.Y. van der Werf, J. Ullmann and S.A. Wender, The ^{90}Zr(n,p)^{90}Y Reaction at En = 98 MeV, Nucl Phys A545 (1992) 785.

4. T. Ronnqvist, H. Conde, N. Olsson, E. Ramstrom, R. Zorro, J. Blomgren, A. Hakansson, A. Ringbom, G. Tibell, O. Jonsson, L. Nilsson, P.-U. Renberg, S. Y. van der Werf, W. Unkelbach and F.P. Brady, The ^{54,56}Fe(n,p)^{54,56}Mn Reactions at En = 97 MeV, Nucl Phys A563 (1993) 225.

5. N. Olsson, H. Conde, E. Ramstrom, T. Ronnqvist, R. Zorro, J. Blomgren, A. Hakansson, G. Tibell, O. Jonsson, L. Nilsson, P.-U. Renberg, A. Brockstedt, P. Ekstrom, M. Osterlund, S.Y. van der Werf, D.J. Millener, G. Szeflinska and Z. Szeflinski, The ^{12}C(n,p)^{12}B reaction at E_n = 98 MeV, Nucl Phys A559 (1993) 368.

6. G. Rudstam, K. Aleklett and L. Sihver, Delayed neutron branching ratios of precursors in the fission product region, Atomic Data and Nuclear Data Tables 53 (1993) 1

7. J. Kallne and G. Gorini, Count rate performance of spectrometers for fusion neutrons, Rev. Sci. Instr. 64 (1993) 2765

8. J. Kallne and G. Gorini, Next step neutron diagnostics, Proc Int Conf on Plasma Physics (EPS 1993) p 6.

9. R. Bodemann, H.-J. Lange, I. Leya, R. Michel, T. Schiekel, R. Rosel, U. Herpers, H.J. Hoffmann, B. Dittrich, M. Suter, W. Wolfi, B. Holmqvist, H. Conde and P. Malmborg, Production of residual nuclei by proton-induced reactions on C, N, O, Mg, Al and Si, Nucl Instr Meth in Phys Res B82 (1993) 9.

10. H. Conde, K. Elmgren, S. Hultqvist, J. Nilsson, N. Olsson, T. Ronnqvist, E. Traneus, V. P. Eismont, A.V. Prokofyev and A. N. Smirnov, A. Facility for Measurements of Fission Cross Sections at Intermediate Energies, Uppsala University Neutron Physics Report UU-NF 94/#6 (Jan 94).

11. V. P. Eismont, A. V. Prokofyev, A. N. Smirnov, H. Conde, K. Elmgren, J. Nilsson, N.Olsson, E. Ramstrom and T. Ronnqvist, Neutron Induced Fission Cross Sections of ^{209}Bi and ^{238}U in the Intermediate Energy Region, Proc. of the Int. Conf. on Nuclear Data for Science and Technology, Gatlinburg, USA, 5-14 May 1994, ed. J K Dickens (La Grange Park: ANS, 1994) p 360.

12. V. P. Eismont, A. V. Prokofyev, A. N. Smirnov, H. Conde, K. Elmgren, J. Nilsson, N. Olsson, and T. Ronnqvist, A Facility for Measurements of Fission Cross Sections of Heavy Nuclei for Intermediate Energy Particles, Proc. of the Int. Conf. on Nuclear Data for Science and Technology, Gatlinburg, USA, 5-14 May 1994, ed. J K Dickens (La Grange Park: ANS, 1994) p 93.

13. O. Batenkov, M. Blinov, M. Majorov, A. Mogaev, S. Smirnov, A. Veshikov, H. Conde, K. Elmgren, S.Hultqvist, T. Ronnqvist and R. Zorro, "High-Precision Neutron Spectrometer for Study of Spontaneous and Ion Induced Fission", Proc. of the Int. Conf. on Nuclear Data for Science and Technology, Gatlinburg, USA, 5-14 May 1994, ed. J K Dickens (La Grange Park: ANS, 1994) p 136.

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15. E. Ramstrom, H. Conde, J. Nilsson, N. Olsson, T. Ronnqvist, R. Zorro, J. Blomgren, A. Hakansson, A. Ringbom, G. Tibell, O. Jonsson, L. Nilsson, P.-U. Renberg, W. Unkelbach and H. Lenske, Multistep direct reaction analysis of continuum proton spectra produced in neutron reactionsat En = 98 MeV, Proc. of the Int. Conf. on Nuclear Data for Science and Technology, Gatlinburg, USA, 5-14 May 1994, ed. J K Dickens (La Grange Park: ANS, 1994) p 542.

16. P. Antozzi, G. Gorini, J. Kallne, N. Olsson and E. Ramstrom, Nuclear Data and Neutron Diagnostics of ITER Plasmas, Proc. of the Int. Conf. on Nuclear Data for Science and Technology, Gatlinburg, USA, 5-14 May 1994, ed. J K Dickens (La Grange Park: ANS, 1994) p 838.

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18. B. Fogelberg, M. Hellstrom, D. Jerrestam, H. Mach, J. Blomqvist, A. Kerek, L.O. Norlin and J. P. Omtvedt, Detailed spectroscopy of the doubly magic nuclide ^{132}Sn: First observation of octupole collectivity, Phys Rev Lett 73 (1994) 2413.

19. H. Conde, A. Backlin, S. Carius, E. Traneus, W. Gudowski, E. Moller, T. Thedeen, J.-O. Liljenzin, M. Skalberg, C. Mileikowsky, E. Tenerz, K. Hannerz, C. Sundqvist and Ch. Pind, Accelerator-driven Nuclear Synergetic Systems - An Overview of the Research in Sweden, Proc. of the International Conference on Accelerator-driven Transmutation Technologies and Applications, MGM Grand Hotel, Las Vegas, NV, USA, July 25-29, 1994.

20. H. Conde and W. Gudowski, Swedish Perspective on the Accelerator-driven Nuclear System, Proc of the 3rd International Information Exchange Meeting of Actinide and Fission Product Partitioning and Transmutation, Cadarache, December 12-14, 1994.

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Facilities

No experimental facilities.

Measurements recently completed or in progress

1. Neutron activation cross sections measured for ^{63,65}Cu, ^{123,124,128,130}Te and ^{203}Tl in the energy range 13-15 MeV.
   Used isotopically-enriched samples of Te and Tl and natural Cu samples.
   Experiment conducted at Fusion Neutronic Source (FNS), JAERI, Tokai, Japan, in collaboration with Y. Ikeda and coworkers. Irradiations completed in February 1993.
   The results for Cu have been published and counting and data analysis are in progress for the remaining reactions.

2. Neutron activation cross sections measured for ^{179}Hf(n,2n)^{178m2}Hf in the energy range 13-15 MeV.
   Used Hf sample enriched in ^{179}Hf.
   Experiment conducted at Fusion Neutronics Source (FNS), JAERI, Tokai, Japan, in collaboration with Y. Ikeda and coworkers. Irradiations completed in February 1994.
   Counting and data analysis are in progress.

3. Neutron activation cross sections measured for ^{11}B(n,p)^{11}Be, ^{16}O(n,p)^{16}N, ^{19}F(n,α)^{16}N, ^{19}F(n,p)^{19}O, ^{23}Na(n,p)^{23}Ne, ^{28}Si(n,p)^{28}Al, ^{37}Cl(n,p)^{37}S, ^{46}Ti(n,p)^{46m}Sc, ^{52}Cr(n,p)^{52}V, ^{53}Cr(n,p)^{53}V, ^{55}Mn(n,α)^{52}V, ^{64}Ni(n,np)^{63}Co, ^{89}Y(n,n')^{89m}Y, ^{119}Sn(n,p)^{119}mSn, ^{138}Ba(n,2n)^{137m}Ba, ^{141}Pr(n,2n)^{140}Pr, ^{186}W(n,2n)^{185}W and ^{204}Pb(n,2n)^{203m}Pb in the energy range 13-15 MeV.
   Combination of isotopically-enriched and natural element samples used.
   Experiment conducted at Fusion Neutronics Source (FNS), Jaeri, Tokai, Japan, in collaboration with Y. Ikeda and coworkers, and A. Filatenkov, Khlopin Radium Institute, St. Petersburg, Russia.; Data analysis in progress.

Measurements planned for the near future

1. It is planned to continue a program of neutron activation cross sections at JAERI in the energy range 13-15 MeV. The focus next will be on reactions with moderately short half lives (minutes to hours). Some possibilities are: $^{14}N(n,2n)^{13}N$, $^{29}Si(n,p)^{29}Al$, $^{29}Si(n,np)^{28}Al$, $^{46}Ti(n,2n)^{45}Ti$, $^{50}Cr(n,2n)^{49}Cr$ and $^{204}Pb(n,n')^{204m}Pb$.

2. An experiment is planned in collaboration with the Ohio University group to measure angular distributions for the 9Be(d,n) thick- target neutron source reaction.

Recent publications

1. S. Chiba and D.L. Smith, "Impacts of Data Transformations on Least-squares Solutions and Their Significance in Data Analysis and Evaluation", Journal of Nuclear Science and Technology (Japan), Vol. 31, No. 8, pp.770-781 (1994).

2. R.C. Ward, I.C. Gomes and D.L. Smith, "A Survey of Selected Neutron-activation Reactions with Short-lived Products of Importance to Fusion Reactor Technology", Report INDC(USA)-106, International Atomic Energy Agency, Vienna, Austria (1994).

3. D.L. Smith and A.B. Pashchenko, "Investigation of the Generation of Several Long-lived Radionuclides of Importance in Fusion Reactor Technology: Report on a Coordinated Research Program Sponsored by the International Atomic Energy Agency", Proceedings of an International Conference on Nuclear Data for Science and Technology, Gatlinburg, Tennessee, 9-13 May 1994.

4. D.L. Smith and F.A.N. Osadebe, "Fitting Radioactive Decay Data by Covariance Methods", Proceedings of an International Conference on Nuclear Data for Science and Technology, Gatlinburg, Tennessee, 9-13 May 1994.

5. Y. Ikeda, D.L. Smith, Y. Uno, Y. Kasugai, C. Konno and H. Maekawa, "New Measurements of Activation Cross Sections for the $^{63,65}Cu(n,2n)^{62,64}Cu$ Reactions at Energy Range 13.3 - 14.9 MeV", Proceedings of an International Conference on Nuclear Data for Science and Technology, Gatlinburg, Tennessee, 9-13 May 1994.

6. J.W. Meadows, D.L. Smith, L.R. Greenwood, D.W. Kneff and B.M. Oliver, "Measurement of the $^{9}Be(n,2n)^{8}Be$ Reaction Cross Section in the $^{9}Be(d,n)$ Thick-target Neutron Spectrum", Annals of Nuclear Energy, Vol. 21, No. 3, pp. 155-164 (1994).

7. B.J. Micklich, M.K. Harper, L. Sagalovsky and D.L. Smith, "Nuclear Data Needs and Gatlinburg, Tennessee, 9-13 May 1994. Sensitivities for Illicit Substance Detection Using Fast-neutron Transmission Spectroscopy", Proceedings of an International Conference on Nuclear Data for Science and Technology, Gatlinburg, Tennessee, 9-13 May 1994.

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Facilities

1. WNR/LANSCE: Spallation neutron sources of pulsed neutrons. The WNR fast neutron source is not moderated, LANSCE is.

   WNR: Spallation source with proton energy of 800 MeV.Micropulse width 150 ps, which, with neutron scattering in production target gives neutron pulse width of 1 ns or less for MeV neutrons. Neutron energies from 100 keV to 800 MeV: spallation neutron spectrum. Six neutron flight paths with lengths from 9 to 90 meters.

   LANSCE: Moderated spallation neutron source; subthermal to about 100 keV neutron energy. Three flight paths dedicated to neutron nuclear physics.

2. Ion Beam Facility:FN Tandem Van de Graaff, DC or pulsed (sub 1 ns); monoenergetic neutron sources about 100 keV to 25 MeV through ^{7}Li(p,n), ^{9}Be(d,n),D(d,n) and other reactions.

3. Detectors: various detectors including charged particle detectors (2 types, for example for 1-50 MeV protons and alphas and 50-300 MeV protons); gamma-ray detectors (HPGe,BGO,NaI(Tl)); fission detector arrays; particle-tracking detectors (wire chamber arrays); plastic and liquid scintillators.

Measurements recently completed or in progress

1. Helium production at 10 MeV for isotopes of iron and nickel, with IRK (Vienna), Argonne National Laboratory and Rockwell Int. paper at Gatlinburg Conference

2. (n,xα) on ^{56}Fe and ^{59}Co from threshold to 50 MeV, with Ohio University, IRK (Vienna), NIST, TU Munich; papers at Gatlinburg Conference

3. (n,xα) on carbon from threshold to 50 MeV, with Ohio University, IRK (Vienna), NIST, TU Munich; paper at Gatlinburg Conference

4. (n,xnγ) on ^{207,208}Pb and (n,pxnγ) on ^{208}Pb. En=3 to 200 MeV, with IRK (Vienna), paper at Gatlinburg Conference

5. ^{58,60}Ni(n,xα) from threshold to 30 MeV, with Ohio University, IRK (Vienna), NIST, TU Munich. Data being analyzed

6. Spallation product yields with 800 MeV protons on various targets. Paper at Gatlinburg Conference

7. ^{27}Al(n,xγ) from threshold to 400 MeV. With IRK (Vienna), paper at Gatlinburg Conference

8. Parity violation in neutron resonances TRIPLE collaboration. Paper at Gatlinburg Conference

9. Fission cross sections of ^{237}Np, ^{247}Cm, ^{250}Cf and ^{254}Es. With Lawrence Livermore, Rensselaer, Oak Ridge. Paper at Gatlinburg Conference

10. Neutron-proton bremsstrahlung with many co-workers, presented at American Physical Society meeting

Measurements planned for the near future

1. Oxygen (n,xα) and (n,xp) from threshold to 30 MeV (maybe higher).

2. Sodium (n,xγ) from 1 to 100 MeV.

3. ^{93}Nb and ^{89}Y (n,xα) and (n,xp) from threshold to 30 MeV.

4. Fission cross sections of rare actinides.

5. Study of parity violation in neutron resonances

Recent publications

1. H. Vonach, A. Pavlik, M.B. Chadwick, R.C. Haight, R.O. Nelson, S.A. Wender, and P.G. Young, "^{207,208}Pb(n,xng) Reactions for Neutron Energies from 3 to 200 MeV," Phys. Rev. C50, 1952 (1994).

2. S.M. Sterbenz, F.B. Bateman, T.M. Lee, R.C. Haight, P.G. Young, M.B. Chadwick, F.C. Goeckner, C.E. Brient, S.M. Grimes, H. Vonach, and P. Maier-Komor,"The ^{56}Fe(n,xa) Reaction from Threshold to 30 MeV," in Proc. Int. Conf. Nuclear Data for Science and Technology, ed. J.K. Dickens, Gatlinburg, TN, May 9-13, 1994 (American Nuclear Society, 1994) p. 314.

3. F. Goeckner, S.M. Grimes, C.E. Brient,T.M. Lee, S.M. Sterbenz, F.B. Bateman, R.C. Haight, P.G. Young,M.B. Chadwick, O.A. Wasson and H. Vonach, "The ^{59}Co(n,α) Reaction from Threshold to 30 MeV," in Proc. Int. Conf. Nuclear Data for Science and Technology, ed. J.K. Dickens, Gatlinburg, TN, May 9-13, 1994 (American Nuclear Society, 1994) p. 318.

4. R.C. Haight, T.M. Lee, S.M. Sterbenz, F.B. Bateman, S.M. Grimes, R.S. Pedroni, V. Mishra, N. Boukharouba, F.C. Goeckner, O.A. Wasson and H. Vonach, "Alpha-particle Emission from Carbon Bombarded with Neutrons Below 30 MeV," in Proc. Int. Conf. Nuclear Data for Science and Technology, ed. J.K. Dickens, Gatlinburg, TN, May 9-13, (American Nuclear Society, 1994) p. 311.

5. R.C. Haight, T.M. Lee, S.M. Sterbenz, F.B. Bateman, S.M. Grimes, R.S. Pedroni, V. Mishra, N. Boukharouba, F.C. Goeckner, O.A. Wasson, A.D. Carlson, C.M. Bartle, P. Maier-Komor, and H. Vonach, "Neutron-induced Charged-particle Emission Studies below 100 MeV at WNR," in Proc. Int. Conf. Nuclear Data for Science and Technology,ed. J.K. Dickens, Gatlinburg, TN, May 9-13, 1994 (American Nuclear Society, 1994) p. 154.

6. C.M. Bartle and R.C. Haight,"Response of Alkali Halide Scintillators to Neutrons from 5 to 100 MeV,"in Proc. Int. Conf. Nuclear Data for Science and Technology, ed. J. K. Dickens, Gatlinburg, TN, May 9-13, 1994 (American Nuclear Society, 1994) 157.

7. A. Gavron and J.P. Lestone, "Statistical Model of Actinide Fission - Calculating the ^{237}U Fission Cross Section," in Proc. Int. Conf. Nuclear Data for Science and Technology, ed. J.K. Dickens, Gatlinburg, TN, May 9-13, 1994 (American Nuclear Society, 1994) 649.

8. R.O. Nelson and S.A. Wender, "Neutron-Induced Gamma-ray Production from Carbon and Nitrogen," in Proc. Int. Conf. Nuclear Data for Science and Technology, ed. J.K. Dickens, Gatlinburg, TN, May 9-13, (American Nuclear Society, 1994) p. 357.

9. H. Hitzenberger, A. Pavlik, H. Vonach, M.B. Chadwick, R.C. Haight, R.O. Nelson and P.G. Young, in Proc. Int. Conf. Nuclear Data for Science and Technology, ed. J.K. Dickens, Gatlinburg, TN, May 9-13 (American Nuclear Society, 1994) p. 367.

10. A. Pavlik, H. Vonach, R.O. Nelson, R.C. Haight, S.A. Wender, P.G. Young and M.B. Chadwick, "^{208}Pb(n,xγ) Reactions for Neutron Energies up to 200 MeV,"submitted to proceedings of IAEA meeting on gamma-ray production, Bologna, November 1994.

11. A.D. Carlson, N.W. Hill. W.E. Parker, K. Meggers, P.W. Lisowski, G.L. Morgan, and S. Seestrom, "Measurements of the Fission Cross Section of ^{237}Np," in Proc. Int. Conf. Nuclear Data for Science and Technology,ed. J.K. Dickens, Gatlinburg, TN, May 9-13, 1994 (American Nuclear Society, 1994) p. 40.

12. G.E. Mitchell et al. (TRIPLE Collaboration), "Parity Violation in Neutron-Nucleus Scattering," in Proc. Int. Conf. Nuclear Data for Science and Technology, ed. J.K. Dickens, Gatlinburg, TN, May 9-13 (American Nuclear Society, 1994) p. 208.

13. Y. Danon, M.S. Moore, P.E. Koehler, R.W. Lougheed, R.W. Hoff, and N.W. Hill, "Measurement and Analysis of the Neutron-Induced Fission Cross Sections of ^{247}Cm, ^{250}Cf and ^{254}Es," in Proc. Int. Conf. Nuclear Data for Science and Technology, ed. J.K. Dickens, Gatlinburg, TN, May 9-13, 1994 (American Nuclear Society, 1994) 245.

14. M.S. Moore et al., "Development of a Technique for Measuring Cross Sections of Interest to Accelerator Transmutation of Waste (ATW)", in Proc. Int. Conf. Nuclear Data for Science and

Technology, ed. Dickens, Gatlinburg, TN, May 9-13, 1994 (American Nuclear Society, 1994) p. 1075.

15. A. Michaudon, "Basic Physics with Spallation Neutron Sources", in Proc. Int. Conf. Nuclear Data for Science and Technology, ed. J.K. Dickens, Gatlinburg, TN, May 9-13, 1994 (American Nuclear Society, 1994) p. 1081.

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Facilities

The major facility is a 5.5 MV, type CN Van-de-Graaff accelerator with nanosecond terminal pulsing and with a Mobley post-acceleration compression system. Nominal burst duration is 500 ps; with a reduction of beam current to 8 microA (protons) 250 ps burst durations have been measured. An inclined field acceleration tube has been ordered and a new terminal pulsing system is under construction.
The accelerator laboratory also has a variety of radiation detectors, NIM modules, computers and other experimental equipment.

Work recently completed or in progress

1. Prompt fission neutron energy spectra for ^{235}U and ^{239}Pu.

2. Two-parameter measurement of nuclear lifetimes.

3. "Black" neutron detector.

4. Elastic and inelastic neutron scattering studies in ^{197}Au and ^{239}Pu.

5. Neutron induced defects in silicon dioxide MOS structures.

6. Response of a ^{235}U fission chamber near reaction threshold.

7. Efficiency calibration of a liquid scintillation detector using the WNR facility at LAMPF.

8. Prompt fission neutron energy spectrum measurements below the incident neutron energy.

Recent publications

Journal Articles

1. "Fluences and Spectra of Accelerator Generated Fast Neutrons", G.H.R. Kegel, P. Bertone, D.L. Case, D.J. DeSimone, C.K.C. Jen, C. Narayan, M. O'Connor, and P. Staples, IEEE Trans. Nucl. Sci. NS-39, December 1992.

2. "A Framework for Understanding Fast-Neutron Induced Defects in SiO_2 MOS Structures", W. Chang, J. Elect. Materials 21, 693 (1992).

3. "Ion Beam Analysis of Li Diffused Ge-Li Interfaces", C.K.C. Jen, G.H.R. Kegel, and Kei-Peng Jen, J. Vac. Sci. Technol. A 10(4), Jul/Aug 1992, p.2832.

4. "Radiation Damage Studies with Accelerator Generated Neutrons", G.H.R. Kegel, P.F. Bertone, D.L. Case, D.J. DeSimone, C.K.C. Jen, and C. Narayan, "First International Conference on Large Scale Applications and Radiation Hardness of Semiconductor Detectors", Firenze, Italy, July 7-9, 1993 (submitted to "Nuovo Cimento" for publication).

5. "Prompt Fission Neutron Energy Spectra Induced by Fast Neutrons", P. Staples, J.J. Egan, G.H.R. Kegel, A. Mittler, and M.L. Woodring (submitted to Nucl. Phys. A).

6. "Neutron Scattering Angular Distributions in ^{239}Pu at 570 keV and 700 keV", Gang Yue, M. O'Connor, J.J. Egan, and G.H.R. Kegel, (submitted to Nucl. Sci. Eng.).

Conference Proceedings:

1. "Neutron Scattering in ^{239}Pu from 0.2 to 1.0 MeV", J.J. Egan, G.H.R. Kegel, G. Yue, A. Mittler, P.A. Staples, D.J. DeSimone, and M.L. Woodring, in Proc. of the Int. Conf. on Nuclear Data for Science and Technology, 13-17 May, 1991, Julich, Germany; S.M. Qaim (Ed), Springer Verlag, Berlin, 1992, p.59.

2. "Neutron Energy Spectra from Proton Irradiated Thick Li Targets", G.H.R. Kegel, D.J. DeSimone, P.F. Dugan, J.J. Egan, C.K.C. Jen, A. Mittler, and P.A. Staples, in Proc. of the Int. Conf. on Nuclear Data for Science and Technology, 13-17 May, 1991, Julich, Germany; S.M. Qaim (Ed), Springer Verlag, Berlin, 1992, p.433.

3. "Fast Neutron Inelastic Scattering Cross Sections from 2.3 to 3.0 MeV for the Actinide Nuclei ^{232}Th and ^{238}U", E. Sheldon, A. Alijar, J.J. Egan, G.H.R. Kegel, and A. Mittler, in Proc. of the Int. Conf. on Nuclear Data for Science and Technology, 13-17 May, 1991, Julich, Germany; S.M. Qaim (Ed), Springer Verlag, Berlin, 1992, p.59.

4. "Measured and Calculated Neutron Scattering Cross Sections for the Actinide Nuclei ^{232}Th, ^{238}U, ^{239}Pu", E. Sheldon, E.D. Arthur, J.J. Egan, G.H.R. Kegel, A. Mittler, and P.G. Young, in Selected Topics in Nuclear and Astrophysics : Proceedings of the 22nd Masurian Lakes Summer School on Nuclear Physics, Piaski, Poland 26 Aug.-5 Sept. 1991, ed. by Z. Sujkowski and G. Szeflinska, Soltan Institute for Nuclear Studies, SINS 2124/A Otwock-Swierk, Poland (1991) p.88.

5. "Fast Neutron Irradiation of the Highly Radioresistant Bacterium Deinococcus radiodurans", D.L. Case and G.H.R. Kegel, in Proceedings of DNA REPAIR: Mechanisms of DNA Repair of Oxidative Damage, 23-27 June, 1993, Holmenkollen, Norway.

6. "Extension of Prompt Fission Neutron Spectrum Measurements to Energies Below the Incident Neutron Energy", M.L. Woodring, J.J. Egan, G.H.R. Kegel, and P. Staples, in Proc. of the Int. Conf. on Nuclear Data for Science and Technology, Gatlinburg, Tennessee, 9-13 May, 1994; J.K. Dickens (Ed), ANS, La Grange Park, Ill, U.S.A. 1994; p.266.

7. "Elastic and Inelastic Neutron Scattering in ^{197}Au at 1.5 MeV", M. O'Connor, G. Yue, J. Chen, Chandrdika Narayan, G.H.R. Kegel, and J.J. Egan, in Proc. of the Int. Conf. on Nuclear Data for Science and Technology, Gatlinburg, Tennessee, 9-13 May, 1994; J.K. Dickens (Ed), ANS, La Grange Park, Ill, U.S.A. 1994; p.260.

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9. "Neutron Scattering Cross Sections for ^{239}Pu at 700 keV", G. Yue, M. O'Connor, J.J. Egan, and G.H.R. Kegel, in Proc. of the Int. Conf. on Nuclear Data for Science and Technology, Gatlinburg, Tennessee, 9-13 May, 1994; J.K. Dickens (Ed), ANS, La Grange Park, Ill, U.S.A. p.248.

10. "Use of the WNR Spallation Neutron Source at LAMPF to Determine the Absolute Efficiency of a Neutron Scintillation Detector", P.A. Staples, J.J. Egan, G.H.R. Kegel, M.L. Woodring, D.J. DeSimone, and P.W. Lisowski, in Proc. of the Int. Conf. on Nuclear Data for Science and Technology, Gatlinburg, Tennessee, 9-13 May, 1994; J.K. Dickens (Ed), ANS, La Grange Park, Ill, U.S.A. 1994; p.151.

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Facilities

1. NIST 20 MW research reactor with a liquid hydrogen cold neutron source (moderator). A National Repository for Fissionable Isotope Mass Standards.NIST deposits and reference deposits obtained from at other laboratories are stored and made available for experiments.

2. Detectors:
   Plastic and liquid scintillators, Li glass detectors, ionization chambers, Ge(I) detectors, Black neutron detectors, Dual thin scintillator, proton recoil telescope.

3. Most of the experimental work by this group is performed at the Ohio University Van de Graaff, ORNL ORELA, LANL WNR or LANL LANSCE facilities.

Measurements recently completed or in progress

1. H(n,n) angular distribution measurement at 10 MeV neutron energy, measurements recently started at Ohio University.(Improvement of standard cross section)

2. Measurements of the $^{10}B(n,\alpha^{1},\gamma)$ Cross Section from 10 keV to 1 MeV at ORELA. This measurement is completed. (Contribution to ILC on $^{10}B(n,\alpha)$)

3. Total neutron cross section measurements of ^{10}B and ^{11}B, made at ORELA. The data was obtained from 20 keV to 20 MeV neutron energy. The analysis is nearly completed. (Contribution to ILC on $^{10}B(n,\alpha)$)

4. Measurements of the $^{10}B(n,\alpha\ ^{1},\gamma)$ Cross Section from 300 keV to 20 MeV at ORELA. This measurement is now being analyzed. (Contribution to ILC on $^{10}B(n,\alpha)$)

5. Measurements of the neutron fission cross sections of ^{232}Pa and ^{238}Np in resonance region made at the LANSCE facility. The data is presently being analyzed at LANL (needed for transmutation work)

6. Fission cross section measurements of ^{237}Np from the resonance region to 2 MeV. This work done at the LANSCE facility is nearly completed. (Improvement of dosimetry standard cross section)

7. Neutron induced charged-particle production measurements from oxygen and nitrogen for neutron energies from 1 to 40 MeV. The data analysis is in progress. (For medical therapy and radiation protection)

Measurements planned for the near future

1. Continue the work on the measurement of the H(n,n)H angular distribution at Ohio University

2. Continue the work on the $^{10}B(n,\alpha^1\gamma)$ cross section at WNR

3. Extend the measurements of the O(n,z) and N(n,z) cross sections to include a wider range of outgoing particles and energies.

Recent publications

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2. R.A. Schrack, O.A. Wasson, D.C Larson, J.K. Dickens, and J.H. Todd, "The $^{10}B(n,\alpha^1\gamma)^7Li$ Cross Section Between 0.2 and 4.0 MeV", Nucl. Sci. Eng. 114, 352 (1993).

3. O.A. Wasson, A. D. Carlson, R. A. Schrack, J. A. Harvey, and N.W. Hill,"Total Neutron Cross Section Measurements of ^{10}B and ^{11}B," Proceedings of the International Conference on Nuclear Data for Science and Techology, Gatlinburg, May, 1994, (to be published).

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Facilities

1.5 MV tandem accelerator, pulsed beams of p, d, ^{3}He and ^{4}He available;
30 m flight path; two (n,z) spectrometers; GeLi, NE213, Si surface barrier and Li glass detectors.

Measurements recently completed or in progress

1. Neutron total cross sections of ^{27}Al, ^{28}Si, ^{40}Ca:
   Measurements span the range of 4 to 12 MeV and have been analyzed to yield level density information;
   Published in W. Abfalterer et al.,Phys. Rev. C47, 1033 (1993).

2. ^{57}Fe(p,n)^{57}Co measurements to study the level density of ^{57}Co:
   Measurements with E < 4 keV have been made of the ^{57}Fe(p,n)^{57}Co reaction to look for new levels in ^{57}Co. Thick targets have also been used to study the evaporation spectrum. Fourteen new levels were found and level density parameters were deduced for ^{57}Co.
   Published in V. Mishra et al., Phys. Rev. C40, 750 (1994).

3. ^{59}Co(n,xα) measurements have been made at Los Alamos (WNR):
   Cross sections for ^{59}Co(n,xα) have been measured for neutron energies between 5 and 40 MeV. Angular distributions and emission spectra have been compared with Hauser-Feshbach calculations;
   To be submitted to Nuclear Science and Engineering in 1995.

4. ^{56}Fe(n,xα) measurements have been made at WNR:
   Cross sections for the ^{56}Fe(n,xα) reaction have been measured at Los Alamos from 5 MeV to 40 MeV;
   These will be submitted to Nuclear Science and Engineering in 1995.

5. Elastic n-d measurements at 8, 10 and 14 MeV :
   Cross sections for n-d elastic scattering from 140 to 180 degree have been measured at 8, 10 and 14 MeV. The data resolve a discrepancy between two previous measurements.
   Published in C.H. Howell et al.,Few Body Systems 16, 127 (1994).

6. Study of low energy optical potentials for protons on iron:
   A study of proton scattering from ^{54}Fe and ^{56}Fe has been completed for energies from 3 to 8 MeV. Substantial differences were found between the potentials for ^{54}Fe and ^{56}Fe at energies below 5 MeV.
   Published in N. Boukharouba et al., Phys. Rev. C46, 2375 (1992).

7. Measurement of n-p elastic scattering at 10 MeV :
   A measurement of n-p scattering cross sections at 0, 12, 24, 36, 48 and 60 degrees (proton recoil angle) is underway. A final measurement is planned in May 1995.

8. Measurement of the $^{10}Be(\alpha,n)^{13}C$ cross section:
   Measurements of the $^{10}Be(\alpha,n)$ cross section at a number of energies between 4 and 10 MeV have been completed. The data can be used to infer the $^{13}C(n,\alpha^0)^{10}Be$ cross section.
   An R-matrix analysis is underway.

Recent publications

1. "Nuclear Level Densities at High Excitations" , M.G. Mustafa, M. Blann, A.V. Ignatyuk and S.M. Grimes, Phys. Rev. C45, 1078 (1992).

2. "Parameterization of the Nuclear Level Density at Energies Above 100 MeV", S.M. Grimes, Zeit. fuer Physik A343, 125 (1992).

3. "Role of Isospin in Neutron- and Alpha-Induced Reactions", S.M. Grimes, Phys. Rev. C46, 1064 (1992).

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5. "Level Densities of ^{28}Al, ^{29}Si and ^{41}Ca Inferred from Fluctuation Measurements", W. Abfalterer, R.W. Finlay, S.M. Grimes, and V. Mishra, Phys. Rev. C47, 1033 (1993).

6. "Theoretical Treatment of Analog (p,n) Cross Sections for Odd Nuclei: Application to Measurements of ^{105}Pd at 26 MeV", V.A. Madsen, R.W. Bauer, J.D. Anderson, V.R. Brown, B.A. Pohl, C.H. Poppe, S. Stamer, E. Mordhorst, W. Scobel and S.M. Grimes, Phys. Rev. C47, 2077 (1993).

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Facilities

ORELA: Electron linac-intense, pulsed, white neutron source

Electron energy :	180 MeV maximum
Peak Current	20 amps maximum
Power on target	60 kW maximum
Pulse width	4 - 30 ns
Repetition rate	12 - 1000 Hz
Neutron targets	Ta with H_2O moderator
Be block	(En > 1 MeV)
Neutron production	10^{14} n/sec at 50 kW
Neutron spectrum	4 x 10^{13} n/MeV/sec at 1 MeV
	4 x 10^{10} n/MeV/sec at 14 MeV
Number of flight paths	10
Flight path stations	18
Flight path lengths	9 to 200 m, underground
Detectors:	plastic (NE110) scintillators
	liquid (NE-213, C_6D_6) scintillators
	^{6}Li glass
	BaF_2 multicrystal detector
	HP Ge detectors
	Fission chambers
Measurement Possibilities	Total, capture, scattering, fission, neutron and gamma-ray production cross sections
Energy range	Sub-thermal to 80 MeV (maximum), focus on resonance region and fusion energy range

Recent activities

As a result of changing program directions within the US Department of Energy, the measurement component of the US Nuclear Data Program has been eliminated.

However, the Oak Ridge Electron Linear Accelerator (ORELA) continues to operate as part of a program in Nuclear Astrophysics and Fundamental Interactions. Currently, operation is limited to 10-12 weeks per year for this work. Nuclear Data related work can be done at ORELA, but the requesting program must now pay the cost of the measurement.

The accelerator continues to operate well; a recently completed run for 3 weeks, 7 days/week, 24 hours/day, achieved 96% beam-on-target time.

INTERNATIONAL ORGANISATIONS

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Facilities

1. IBR-30+LUE-40: subcritical pulsed reactor drived by LINAC, high intensity pulsed neutron spectrometer(pulse width 4 μs) with 8 neutron flight paths.

2. 4 MV single stage Van de Graaff, DS, monoenergetic n-sources: ^{7}Li(p,n) reaction.

3. IBR-2: powerful pulsed reactor (pulse width 0.2ms, 5Hz).

4. Detectors: liquid scintillators, NaJ(Tl) detectors, HP Ge, Ge(Li)spectrometers, multidetector systems for g-ray and neutron registration; gridded ionization chambers, systems for polarization of neutrons and nuclei, for alignment of nuclei.

Measurements recently completed or in progress

1. Measurements of fission fragments angular anisotropy from resonance neutron induced fission of ^{235}U aligned target. (Collaboration PEI,Obninsk - FLNP)

2. Measurements of ^{238}U, ^{239}Pu, ^{232}Th targets transmission in energy range 2eV - 14MeV for the temperatures 77 and 293 K. (Collaboration PEI, Obninsk - FLNP)

3. Measurements of gamma-ray multiplicity and spin identification of neutron resonances in ^{113}In, ^{115}In, ^{119}Sn, ^{155}Gd, ^{157}Gd, ^{177}Hf, ^{181}Ta. (Collaboration INRNE, Bolgaria, - FLNP)

4. Measurements of (n,p) cross sections for stellar temperatures on ^{7}Be and ^{14}N. (Collaboration INR, Kiev - FLNP)

5. Measurement of the a-particle angle distributions for $^{40}Ca(n,\alpha)$ and $^{58}Ni(n,\alpha)$ reactions on fast neutrons. (Collaboration PTNNC,Beijing - FLNP)

6. Measurements of two-quanta gamma-cascade following thermal neutron capture for ^{137}Ba, ^{138}Ba, and ^{196}Pt.

7. Measurement of the ratio of delayed neutron yields for ^{233}U to ^{235}U. (Collaboration CEA-Cadarache, Birminghem, - FLNP)

8. Measurement of multiplicity of the promt-fission g-quanta in ^{237}Np resonances.

Measurements planned for the near future

1. Measurement of the delayed neutron yield in $^{233}U(n,f)$ and $^{239}Pu(n,f)$ reactions on thermal neutrons up to several hundreds of milliseconds time-intervall.

2. Measurements of the gamma-ray multiplicity and spin identification of ^{117}Sn, ^{178}Hf, ^{179}Hf neutron resonances. (Collaboration INRNE, Bulgaria - FLNP)

3. Investigation of the gamma-ray cascades for ^{165}Ho and ^{169}Tm compound nucleus.

4. Precise measurement of the $^{35}Cl(n,p)$ thermal cross section

5. Measurement of the $^{36}Cl(n,p)$ thermal cross section. (Collaboration PINP, Gatchina - FLNP).

6. Subbarier fission cross section measurement for ^{234}U up to several hundreds of eV.

7. Angle anisotropy of fission fragments measurements for $^{235}U(n,f)$ and $^{239}Pu(n,f)$ reactions in resonance region.

Recent publications

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9. V.A. Bondarenko, I.L. Kuvaga, P.T. Prokofjev, A.M. Sukhovoj, V.A.Khitrov, Yu.P. Popov, V. Paar, S. Brandt. Levels of the ^{137}Ba Studied with Neutron Induced Reactions. In: Spetialists' Meeting on Measurement Calculation and Evaluation of Photon Production Data, Bologna, Nov.1994. Booklet of abstracts, p.23.

10. V.A.Bondarenko,I.L. Kuvaga, P.T. Prokofjev, A.M. Sukhovoj, V.A. Khitrov, Yu.P.Popov, S.Brant, V.Paar, L.J.Simicic. Particle-hole states in ^{138}Ba. In: Capture Gamma-ray Spectroscopy and Related Topics. Ed. J.Kern, Fribourg, 20-24 September 1993, p.375-376.

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19. Yu.M. Gledenov, V.I. Salatski, P.V. Sedyshev. The ^{14}N(n,p)^{14}C reaction cross section for thermal neutrons. Z.Phys. A346, 307-308 (1993).

20. Yu.M. Gledenov, G. Khuukhenkhuu, M.V. Sedysheva, G. Unenbat. Systematics of the fast neutron induced (n,α) reaction cross sections. JINR Communication, E3-94-316, Dubna, 1994.

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Facilities

1. GELINA: 150 MeV electron linac pulsed white neutron source (pulse width 1 ns) with 10 neutron flight paths.

2. MV single stage Van de Graaff, DC or pulsed (0.4 - 2 ns);
monoenergetic n-sources: ^{7}Li(p,n), T(p,n), D(d,n), T(d,n).
white n-source with thick targets: ^{7}Li(p,n), ^{7}Li-Be(d,n).

3. Detectors: plastic and liquid (NE-213, C_6D_6) scintillators;
Li glass scintillators; NaI, BaF_2, BGO and HP Ge detectors;
gridded ionization chambers, proton recoil telescopes.

Measurements recently completed or in progress

1. High resolution total cross sections (relevant to WPEC subgroup 15).
Natural Fe: measurements finished, data at NEA Data Bank;
Al: data at NEA Data Bank, analysis in progress;
V: measurements started.

2. ^{58}Ni(n,γ) (relevant to WPEC subgroup 11).
Preliminary radiative widths obtained, published at Gatlinburg Conference.

3. Total cross section of ^{10}B (contribution to ILC on ^{10}B(n,α)).
Cross section measured between 100 eV and 100 keV (Linac) and between 1 and 20 MeV (Van de Graaff white source).

4. Elastic and inelastic scattering from Na (suggested European high priority requirement).
Elastic scattering angular distribution and yield of inelastic gamma-ray (440 keV) measured from 0.2 to 2 MeV;
Resonance analysis together with ORELA total x-section.

5. Double-differential (n,ch.p.) cross sections (relevant to WPEC subgroup 1).
Measurements at Van de Graaff (monoenergetic neutrons).
^{58}Ni(n,α): measurements relative to ^{27}Al(n,α) at 6.5, 8.0, 9.0, and 15.6 MeV;
^{63}Cu(n,p): measurement relative to ^{58}Ni(n,p) at 2.0, 3.0, 4.5, 5.5, 6.5, 8.0, 9.0, and 15.2 MeV; at 15.2 MeV also relat. to ^{27}Al(n,α).

6. ^{237}Np total and capture cross sections (collaboration CEA,Saclay - IRMM) (relevant to WPEC subgroup 8).
Measurements done in low resonance region (0.4 to 100 eV);
Resonance parameter analysis in progress.

7. Inelastic scattering of fission products (relevant to WPEC subgroup 10).
Measurements at Van de Graaff white source;
detecting gamma-rays with HP Ge detector; natural samples;
Pd(n,n'): data up to 3 MeV; final report in preparation;
Mo(n,n'): measurements in progress.

8. ^{238}U(n,n') (relevant to WPEC subgroup 4).
Measurement at GELINA with Fe-filter in scattered beam;
Yields cross section at 68, 127, 182 and 214 keV;
Paper at Gatlinburg Conference.

9. ^{235}U (ternary fission) (collaboration University of Gent - IRMM).
E(ion ch.)/E(s.b.det.) telescope to separate $\alpha$and t;
Paper describing results in resonance region submitted to
Nuclear Physics; further measurements to 30 keV planned.

10. ^{235}U(n,f) / ^{1}H(n,n) (improvement of standard cross sections).
Measured energy loss in sample (octacosanol or tristearin) differs from literature; needed for corrections.

11. ^{237}Np(n,f) fragment mass distribution.
Measurement at Van de Graaff (monoenergetic neutrons) to 5 MeV; analysis in terms of Brosa model;
Interpretation of nubar(E) in terms of fission modes; Final paper in preparation.

12. Doppler broadening of resonances ("Human Capital and Mobility network") (for U, UO_2 suggested European high priority request)
First test runs (Hg_2Cl_2, U metal and UO_2) being analysed.

13. (n,p) and (n,α) reactions in resonance region (collaboration University of Gent - IRMM).
Measured ^{35}Cl, ^{36}Cl, ^{41}Ca; astrophysical interest, also systematics of α-strength near threshold; paper on ^{35}Cl published in Nuclear Physics.

14. Neutron capture cross sections of interest for stellar nucleosynthesis (collaboration KFK - IRMM).
Measurements performed on ^{138}Ba and ^{208}Pb.

15. Spins of p-wave resonances in ^{238}U and ^{113}Cd (collaboration TU Delft - JINR - IRMM).
In connection with P-violation experiments (LANL);
Paper at Gatlinburg Conference.

Measurements planned for the near future

1. Fe(n,n') (collaboration CEA, Cadarache - IRMM).
High resolution measurement (1 ns / 100 m) planned in "unresolved resonance" region.

2. 99Tc total and capture cross sections (collaboration CEA, Saclay - IRMM).
Measurements planned in low resonance region.

3. Activation cross sections (collaboration KFA, Julich - IRMM).
Measurements are planned on several Cr-isotopes, ^{58}Ni and ^{54}Fe (isomer ratios); measurements at IRMM Van de Graaff mainly in the energy range 14 to 20 MeV.

Recent publications

1. "Very high resolution transmission measurements and resonance parameters of ^{58}Ni and ^{60}Ni"; A. Brusegan, G. Rohr, R. Shelley, E. Macavero, C. Van der Vorst, F. Poortmans, L. Mewissen and G. Vanpraet; Proc. Intern. Conf. on Nuclear Data for Science and Technology, Gatlinburg 1994.

2. "Resonance neutron capture in ^{58}Ni"; F. Corvi, M.C. Moxon and K. Athanassopulos;Proc. Intern. Conf. on Nuclear Data for Science and Technology, Gatlinburg 1994.

3. "Very high resolution measurements of the total cross section of natural iron"; K. Berthold, C. Nazareth, G. Rohr and H. Weigmann; Proc. Intern. Conf. on Nuclear Data for Science and Technology, Gatlinburg 1994.

4. "Resonance parameters of ^{27}Al+n from very high resolution transmission measurements"; G. Rohr, R. Shelley, C. Nazareth and M.C. Moxon; Proc. Intern. Conf. on Nuclear Data for Science and Technology, Gatlinburg 1994.

5. "The total neutron cross section of ^{10}B from 80 eV to 100 keV and from 1 to 19 MeV"; A. Brusegan, A. Crametz, E. Macavero, W. Schubert, C. Van der Vorst and E. Wattecamps; Proc. Intern. Conf. on Nuclear Data for Science and Technology, Gatlinburg 1994.

6. "Analysis of eta measurements for ^{235}U in the thermal neutron energy region"; M.C. Moxon, J.A. Wartena and H. Weigmann; Proc. Intern. Conf. on Nuclear Data for Science and Technology, Gatlinburg 1994.

7. "Inelastic scattering from ^{238}U"; M.C. Moxon, C. Burkholz, J.A. Wartena, H. Weigmann and G. Vanpraet; Proc. Intern. Conf. on Nuclear Data for Science and Technology, Gatlinburg 1994.

8. "Resonance parameters of ^{138}Ba+n from high resolution transmission measurements"; A. Brusegan, E. Macavero and C. Van der Vorst; Proc. Intern. Conf. on Nuclear Data for Science and Technology, Gatlinburg 1994.

9. "Measurement of (n,n'γ) cross sections for low-lying levels of palladium isotopes"; A. Meister, G. Rollin, W. Schubert and E. Wattecamps; Proc. Intern. Conf. on Nuclear Data for Science and Technology, Gatlinburg 1994.

10. "Double-differential (n,xp) and (n,xα) cross section measurements of ^{27}Al, ^{58}Ni, and ^{63}Cu in the neutron energy range from 2.0 to 15.5 MeV"; C. Tsabaris, E. Wattecamps and G. Rollin; Proc. Intern. Conf. on Nuclear Data for Science and Technology, Gatlinburg 1994.

11. "Investigation of the fission reaction ^{237}Np(n,f) for incident neutron energies from 0.3 MeV to 5.5 MeV"; P. Siegler, F.-J. Hambsch and J.P. Theobald; Proc. Intern. Conf. on Nuclear Data for Science and Technology, Gatlinburg 1994.

12. "Spin assignment of neutron resonances for parity violation studies"; F. Corvi, F. Gunsing, K. Athanassopulos, H. Postma, Yu.P. Popov and E.I. Sharapov; Proc. Intern. Conf. on Nuclear Data for Science and Technology, Gatlinburg 1994.

13. "Determination of the ^{35}Cl(n,p)^{35}S cross section and its astrophysical implications"; S. Druyts, C. Wagemans and P. Geltenbort; Nucl. Phys. A573 (1994) 291.

14. "Recent (n,p)- and (n,α)-measurements of relevance to astrophysics"; C. Wagemans, S. Druyts and R. Barthelemy; Proc. Third Intern. Symp. on Nuclear Astrophysics "Nuclei in the Cosmos", Gran Sasso (I), 1994.

15. "Ternary-to-binary fission ratios in the resonances for ^{235}U(n,f)"; S. Pomme and C. Wagemans; submitted to Nucl. Phys.

16. "Measured and calculated differential and total yield cross section data of ^{58}Ni(n,xα) and ^{63}Cu(n,xp) in the neutron energy range from 2.0 to 15.6 MeV"; C. Tsabaris, E. Wattecamps, G. Rollin and C. Papadopoulos; submitted to Nucl. Sci. Eng.

17. "Is there a pulse height defect for methane ?"; F.J. Hambsch, J. Van Aarle and R. Vogt; submitted to Nucl. Instr. Meth.

18. "Gamma-ray production at the threshold of inelastic neutron scattering on light nuclei"; H. Maerten, J.A. Wartena and H. Weigmann; Specialists' Meeting on Measurement, Calculation and Evaluation of Photon Production Data, Bologna 1994.