Ukrainian Nuclear Data Centre (UKRNDC)

Progress Report to the

IAEA Technical Meeting on the Network of Nuclear Reaction Data Centres, 25 - 28 September 2006, IAEA, Vienna, Austria

> Summary of nuclear data activity by staff of the UKRNDC October 2004 –September 2006

Olena Gritzay Institute for Nuclear Research, Prospekt Nauky, 47, Kyiv, Ukraine, 03680 Web: http://ukrndc.kinr.kiev.ua/ e-mail: ogritzay@kinr.kiev.ua

Introduction

Ukrainian Nuclear Data Centre (UKRNDC) is subdivision within the Neutron Physics Department at the Institute for Nuclear Research of the National Academy of Sciences of Ukraine. UKRNDC has 5 permanent researchers. During years under review four members of the staff were widely involved in the experimental investigations of neutron cross sections at the Kyiv Research Reactor.

Compilation

We continue collection and compilation of experimental neutron data published by Ukrainian researchers. We also started to compile the experimental charged particle data and photonuclear data executed by Ukrainian scientists. EXFOR's entries sent to NDS IAEA by UKRNDC are presented in Table.

Collaboration

• We continue our collaboration with the Physical Department of the National Taras Shevchenko University of Kyiv. The teaching courses "*Nuclear Data for Science and Technology*" (36 hours per year) and "*Modern computer codes for nuclear data processing*" (36 hours per year) are lectured in 2004-2006 for graduate course students of NPD KNU. These courses include the following items: ENDF/B libraries, EXROR system, ENSDF library, the use of the PREPRO code in work with the ENDF libraries, the introduction to NJOY99 code system, the Network of Nuclear Reaction Data Centers and the use of the on-line services. The teaching courses "*Neutron Physics at the Kyiv Research Reactor*" (54 hours per year) are lectured in 2004-2006 for fourth-year students of NPD KNU.

• We had a collaboration with the Lawrence Livermore National Laboratory (STCU Project #P176, "*Experiments at Kyiv Research Reactor*") to determine the neutron standard cross sections with high accuracy. In frame of this activity the measurements of total, elastic scattering and angle scattering neutron cross sections were carried out at the reactor neutron filtered beams.

#	EXFOR's entry	N_SUB	Reference	Author
Neutron data				
1	32212	3	J,NST,1,389,200208	O.O. Gritzay, V.V.Kolotyi, O.I.Kalchenko, P.M.Vorona, M.L.Gnidak
2	32213	3	J,YF,61,(9),1562,199809	I.N.Vishnevsky, V.Yu.Denisov, V.A.Zheltonozhsky, S.V.Reshitko, L.V.Sadovnikov, N.V.Strilchuk
3	32214	2	C,2004SANTA,,969,2004	O.O.Gritzay, V.V.Kolotyi, N.A.Klimova, O.I.Kalchenko; M.L.Gnidak, O.I.Korol', P.M.Vorona
4	41012	1	C,87KIEV,2,283,198709	P.N.Vorona, V.P.Vertebnyy, A.I. Kal'chenko, V.G.Krivenko, L.E.Chervonnaya, V.Yu.Chervyakov
Charged particle data				
1	D5003	13	J,JP/G,7,1699,1981	M.P.Bilaniuk, V.V.Tokarevskii, V.S.Bulkin, L.V. Dubar, O.F.Nemets, L.I.Slyusarenko
2	D5004	7	J,IZV,50,(10),2016,1986	I.D.Fedorets, I.I.Zalubovskiy, B.A.Nemashkalo, V.E.Storizhko
3	D5005	10	J,IZV,69,(1),102,2005 J,VKHU,22,(2),86,2003	B.A.Nemashkalo,K.B.Shebeko, S.N.Utenkov B.A.Nemashkalo,I.D.Fedorets, R.P.Slabospicskij,K.B.Shebeko,S.N.Utenkov
4	D5006	3	J,IZV,69,(1),81,2005	I.M.Vishnevskyy, O.I.Davidovskaya, V.A.Zheltonozhskyy, M.V.Strilchuk, P.N.Trifonov
Photonuclear data				
1	G4001	3	J,UFZ,38,(6),846,1993	I.Z.Beseda, V.S.Bokhinyuk, A.I.Guty, A.P.Osipenko, N.V.Pashchenko, N.T.Sabolchy, I.V.Khimich, I.A.Shabalina
2	G4002	2	J,UFZ,35,(8),1153,1990	Ya.E.Kostyu, M.P.Medve, A.P.Osipenko, N.T.Sabolchy, I.V.Khimich, I.A.Shabalina
3	G4003	2	J,UZHV,12,83,2002	O.O.Parlag, V.T.Maslyuk, O.I.Lendel, V.A.Pilipchenko
4	G4004	2	J,UZHV,3,24,1998	O.I.Lendel, V.T.Maslyuk, O.O.Parlag, D.I.Sikora

Table. EXFOR's entries sent to NDS IAEA by UKRNDC.

Customer Services

- During 2004-2006 the data for users requests were prepared and adapted (from ENDF, ENSDF and EXFOR libraries) for our institute researchers and for ones from other institutes. The organizations, whose requests on nuclear data have arrived and were executed in the accounting period:
 - 1. Center of Environmental Problems INR of NASU.
 - 2. Department of Nuclear Physics of Kyiv National University.
 - 3. Department of Nuclear Physics of the Institute for Nuclear Research (INR) of NASU.
 - 4. Department of Physics of Biological Systems of the Institute of Physics of NASU.
 - 5. Department of the Theory of Nuclear Reactions INR of NASU.
 - 6. Department of Nuclear Reactions INR of NASU.
 - 7. Kharkiv Institute of Physics and Technology.
 - 8. Uzhgorod Institute of Nuclear Physics of NASU.

• The UKRNDC site is operating. Ukrainian customers, especially students and those physicists, who wish to prepare the pointwise and multigroup cross sections self-dependently, but do not have a good experience in it, use this site very often. Address of the UKRNDC site: *http://ukrndc.kinr.kiev.ua*.

Calculation

• The code FILTER_L for simulation of neutron filters was modernized and calculations for the filter component optimization were carried out.

• Several modules (subroutines) were developed and added to the C_SG-W code for treatment of instrumental spectra in the scattering neutron cross section measurements.

• The ACE-format libraries for the isotopes which are the main constituents of the RBMK-1000 fission fragments and reactor fuel , namely, 83,85 Kr, 89,90 Sr, 90,91 Y, 95 Zr, 95 Nb, 95 Mo, 99 Tc, $^{101, 103, 106}$ Ru, $^{103, 104}$ Rh, 105 Pd, $^{109, 110}$ Ag, 113 Cd, 115 In, 127 I, $^{125, 126}$ Sb, $^{131, 133}$ Xe, $^{133, 134, 135, 137}$ Cs, $^{141, 144}$ Ce, $^{143, 145}$ Nd, $^{148, 149}$ Pm, $^{147, 149, 150, 151, 152}$ Sm, $^{152, 153, 154, 155}$ Eu, 157 Gd, $^{234, 235, 236, 237, 238}$ U, $^{238, 239, 240, 241, 242}$ Pu, $^{241, 242m, 243}$ Am, $^{242, 244}$ Cm, were produced. The input data were taken from five nuclear data libraries: BROND-2, ENDF-VI (rel. 8), JEFF-3.0, JENDL-3.3, CENDL-2. Calculations were made for three temperatures, T=0K, 293K and 593K, by NJOY99.81 code on the computer with RISC/6000 processor under AIX operating system.

• The Monte Carlo calculations by means of the MCNP4C code were carried out to estimate functions of detector efficiency, thickness of the carbon samples, thickness of the standard sample, geometry, filter energy, etc., required for determination of the scattering neutron cross sections for carbon.

Experimental Neutron Data Measurements

• The technique for investigation of the elastic scattering neutron cross section was developed and experimental installation was designed and mounted on the ninth horizontal channel at the Kyiv Research Reactor (KRR).

• The technique for investigation of the angle scattering neutron cross section was developed and two experimental installations were designed and mounted on the eighth horizontal channel at the KRR.

• The total neutron cross sections for natural carbon were measured using neutron filtered beams at the eight average energies 2, 3.5, 12, 24, 55, 59, 133 and 148 keV with accuracy better than 1%.

• The neutron scattering cross sections for natural carbon were measured using neutron filtered beams at the five average energies 2, 3.5, 24, 54 and 133 keV with accuracy better than 2%.

• The angle scattering neutron cross sections for natural carbon were measured using neutron filtered beams with the three average energies 2, 59 and 133 keV at the angles 30^{0} , 55^{0} , 90^{0} , 125^{0} and 150^{0} with accuracy better than 7%.

• The capture cross section for 181 Ta $(n,\gamma)^{182}$ Ta reaction was measured with accuracy about 5% at quasi-monochromatic neutron beam with main energy 2 keV at the KRR using activation method.

Visits and Conferences

• In July 16-20, 2006 O. Gritzay took part in the INMM 47th Annual Meeting, Nashville, Tennessee,USA.

• In May 29-June 3, 2006 the UKRNDC's staff took part in the International Conference Current Problems in Nuclear Physics and Atomic Energy (NPAE-2006), Kyiv, Ukraine.

• In May 18-20, 2005 N. Klimova took part in the Conference IEP-2005, Uzhhorod, Ukraine.

• In November 2005 O. Gritzay took part in the Fifth International Conference on Nuclear and Particle Physics, , Cairo, Egypt.

• In October 12-14, 2005 N. Klimova took part in the IAEA Technical Meeting, , IAEA, Austria, Vienna.

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