



**The CDfE photonuclear data compilation and evaluation activity.
2016/2017 Progress Report.**

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Progress report to the Technical Meeting on the International Network of Nuclear Reaction Data Centres (NRDC) at the IAEA Headquarters in Vienna, Austria, from 23 to 26 May 2017.

This short report contains review of the main results obtained at the Russia Lomonosov Moscow State University Skobeltsyn Institute of Nuclear Physics Centre for Photonuclear Experiments Data (Centr Dannyykh Fotoyadernyykh Eksperimentov – CDfE) for the period of time from the IAEA’s Technical Meeting on the International Network of Nuclear Reaction Data Centres at the Nuclear Data Centre, Atomic Energy of China (CAEA), Beijing, China, from 7 to 10 June 2016 concern new photonuclear data compilations and old data corrections, analysis and evaluation of photonuclear data obtained in various experiments and nuclear data service in the whole.

General

The main CDfE responsibility in the NRDC Network is compilation and processing of photonuclear data. The main CDfE scientific activity is joint evaluating of photonuclear data obtained in various experiments.

The CDfE total permanent staff includes now four professional, three general service officers and three students of the MSU Physics Faculty.

The CDfE nuclear data activities in the whole are dissemination of international nuclear data for providing Lomonosov Moscow State University (Skobeltsyn Institute of Nuclear Physics, primarily) and scientific and educational institutes and organizations of Russian Academy of Science for basic research, education and various applications. The CDfE maintains several nuclear databases available through the CDfE Web-site – <http://cdfe.sinp.msu.ru>.

EXFOR Compilation

5 new CDfE EXFOR **trans.m083 – 087** TRANSEs and the *prelim.m088* have been produced and transmitted to the IAEA NDS.

All TRANSEs contain both **14** new ENTRYs and **87** *old* ENTRYs corrected in accordance with the new EXFOR format rules and the NRDC experts, first of all Naohiko Otsuka and Oscar Cabellos, comments and recommendations.

New and old trances contents

TRANS	Old	New	Total
m083	16	0	16
m084	16	3	19
m085	15	1	16
m086	15	3	18
m087	7	3	10
<i>prelim.m088</i>	18	4	22
All	87	14	101

Photonuclear Data Evaluation

In addition to activity in photonuclear data compilation and the CDFE continues the program of investigation of reliability partial photoneutron reaction cross sections obtained in various experiments using specially proposed objective physical criteria of data reliability. In addition to many nuclei investigated before (for example ^{94}Zr , ^{115}In , ^{116}Sn , ^{159}Tb , ^{181}Ta , ^{208}Pb , ^{209}Bi) in the frame of the IAEA Coordinated Research Project N F41032 “Updating the Photonuclear Data Library and generating a reference database for Photon Strenght Functions” (Research Contract N 20501 “Evaluation of Partial and Total Photoneutron Reactions Cross Sections Using New Objective Physical Data Reliability Criteria”) 9 new nuclei were investigated ($^{63,65}\text{Cu}$, ^{80}Se , ^{89}Y , ^{133}Cs , ^{138}Ba , ^{141}Pr , ^{165}Ho , ^{186}W). For all 9 nuclei using experimental-theoretical method for evaluation of reliable partial ((γ , 1n), (γ , 2n), (γ , 3n)) and total photoneutron reaction (γ , tot) = (γ , 1n) + (γ , 2n) + (γ , 3n) reactions cross sections were obtained. New reliable evaluated data were included into the EXFOR database.

The correspondent talks were presented at the 66 International Conference on the problems of nuclear spectroscopy and structure of atomic nucleus «Nucleus 2016». 10 – 14 October 2016, Sarov, Russia. Abstracts. FGUP «RFYAC-VNIIEF» and the International Conference on Nuclear Data for Science and Technology (Bruges, Belgium, 11-16 September, 2016). Correspondent articles are prepared for the journals Physical Review C, EPJ Web of Conference, Physics of Atomic Nuclei and Bulletin of the Russian Academy of Sciences.

Nuclear Database Service

The CDFE maintains several nuclear databases on the Web-site (<http://cdfe.sinp.msu.ru>):

- “Nuclear Reaction Database (EXFOR)”;
- “Complete Nuclear Spectroscopy Database "Relational ENSDF" (Evaluated Nuclear Structure Data File);
- “Nuclear Physics Publications ("NSR" Database)”;
- “Photonuclear Data Index since 1955” (bibliography of the articles included experimental photonuclear data);
- digital “Chart of Giant Dipole Resonance Main Parameters” (energy position, amplitude, width, integrated cross section of GDR);
- digital “Chart of Nucleus Shape and Size Parameters” (data on quadrupole moments, parameters of quadrupole deformation and charge radii; “Nucleus Ground and Isomeric State Parameters” (many useful information (masses, binding energy, nucleon separation energy, decay mode, energy of various decays, etc) on the nucleus as whole and its ground and isomeric states properties);
- digital “Chart of Atomic Nuclei” (main characteristics);
- “Calculator and Graph Engine for Atomic nuclei Parameters and Nuclear reactions and Radioactive Decays Features” (possibility for convenient calculation of various parameters and characteristics of nuclei, nuclear reactions and nuclear decays).

First three BD were produced and are maintained using data funds of Nuclear Reaction Data Centres Network, USA NNDC and NSDD, other DB were produced by the CDFE.

Short-term (2017/2018) Program

The main items of CDFE (2017/2018) program, main priorities and most important tasks are traditional and the following:

- continuation of new photonuclear data compilation using EXFOR format, new TRANSES (M088, M089, etc.) production;
- correction of old ENTRIES in accordance with new EXFOR coding rule changes and the NRDC Network experts comments and recommendations;
- continuation of analysis and evaluation using objective physical criteria of total and partial photonuclear reaction cross sections obtained in various experiments;
- upgrading of all databases put upon the CDFE Web-site (<http://cdfe.sinp.msu.ru>).

Main Publications

1. V. Varlamov, B. Ishkhanov, V. Orlin. Reliability of $(\gamma,1n)$, $(\gamma,2n)$, and $(\gamma,3n)$ cross-section data on ^{159}Tb . Phys. Rev. C95, N5 (2017) 054607.
2. B.S.Ishkhanov, V.N.Orlin, N.N.Peskov, V.V.Varlamov. Photoneutron reactions in the range of Giant Dipole Resonance. Physics of Particles and Nuclei, 48, N1 (2017) 76 - 83.
3. V.V.Varlamov, B.S.Ishkhanov, V.N.Orlin, N.N.Peskov. Data on photoneutron reactions from various experiments for ^{133}Cs , ^{138}Ba and ^{209}Bi nuclei. Physics of Atomic Nuclei, 79, N4 (2016) 501 – 513.
4. V.V.Varlamov, A.I.Davydov, M.A.Makarov, V.N.Orlin, N.N.Peskov. Reliability of the data on the cross sections of the partial photoneutron reaction for $^{63,65}\text{Cu}$ and ^{80}Se nuclei. Bulletin of the Russian Academy of Sciences, Physics, 80, №3 (2016) 317 - 324.
5. Vladimir Varlamov, Boris Ishkhanov, Vadim Orlin, Nikolai Peskov, Mikhail Stepanov. Photoneutron reaction cross sections from various experiments – analysis and evaluation using physical criteria of data reliability. EPJ Web of Conferences (2017), in print.
6. Varlamov VV, Ishkhanov BS, Orlin VN, Peskov NN, Stepanov ME. Photoneutron reaction cross sections from various experiments – analysis and evaluation using physical criteria of data reliability. ND2016 Programme & Abstract Book, 11-16 September, Brugges, Belgium, Joint Research Centre, European Comission, 2016, p. 266.
7. Gheorgine I., Filipescu D., Katayama S., Utsunomiya H., Belyshev S.S., Varlamov V.V., Shima T., Amano S., Miyamoto S. Partial photoneutron cross section measurements on ^{209}Bi . ND2016 Programme & Abstract Book, 11-16 September, Bruges, Belgium, Joint Research Centre, European Comission, 2016, p. 307.
8. V.V.Varlamov, A.I.Davydov, V.N.Orlin, N.N.Peskov. Photodisintegration of ^{89}Y and physical criteria of data reliability. 66 International Conference on the problems of nuclear spectroscopy and structure of atomic nucleus «Nucleus 2016». 10 – 14 October 2016, Sarov, Russia. Abstracts. FGUP «RFYAC-VNIIEF», 2016, p. 145.
9. V.V.Varlamov, V.N.Orlin, N.N.Peskov. Evaluation of partial photoneutron reaction cross sections for ^{141}Pr and ^{186}W using physical criteria of data reliability. 66 International Conference on the problems of nuclear spectroscopy and structure of atomic nucleus «Nucleus 2016». 10 – 14 October 2016, Sarov, Russia. Abstracts. FGUP «RFYAC-VNIIEF», 2016, pp. 146 - 147.
10. V.V.Varlamov, B.S.Ishkhanov. Modern status of photonuclear data. 66 International Conference on problems of nuclear spectroscopy and structure of atomic nucleus «Nucleus 2016». 10 – 14 October 2016, Sarov, Russia. Abstracts. FGUP «RFYAC-VNIIEF», 2016, pp. 148 - 149.