Progress report on the CDFE photonuclear data compilation and evaluation activities for 2019/2021.

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Progress report for the Technical Meeting of the International Network of Nuclear Reaction Data Centres, from 4 to 7 May 2021.

The report contains the short review of the Centre for Photonuclear Experiments Data (Centr Dannykh Fotoyadernykh Eksperimentov - CDFE) of the Russia Lomonosov Moscow State University Skobeltsyn Institute of Nuclear Physics main results obtained for the period of time from the Technical Meeting of the International Network of Nuclear Reaction Data Centres at the IAEA's Headquarters in Vienna, Austria, from 9 to 12 April 2019. The new photonuclear data compilations and old data corrections, the results of analysis and evaluation of photonuclear data obtained in various experiments and nuclear data service in generally are presented.

General

The CDFE total permanent stuff includes now three professional, two general service officers and one post graduate student of the MSU Physics Faculty.

The main CDFE responsibility in the NRDC Network is compilation and processing of photonuclear data.

The main CDFE activity is 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 main CDFE scientific activity is analysis of reliability of the results of various experiments and joint evaluation of photonuclear reaction cross sections using physical data reliability criteria.

EXFOR Compilation

11 new CDFE EXFOR **trans.m100 – m110** TRANSes and one ***prelim.m111*** have been produced and transmitted to the IAEA NDS. All TRANSes contain **168** ENTRYs, compiled and/or corrected in accordance with the contents of the NRDC Network Memos, first of all CP-C/465 ("FPY compilation") and the NDS database "Articles for compilation" (https://www-nds.iaea.org/nrdc/alloc/). From those **48 new** and *120 old* ENTRY's were corrected in accordance with the new EXFOR format rules and the comments and recommendations of the NRDC experts, first of all Naohiko Otsuka, Michael Fleming, and Daniela Foligno (new ***prelim.m111*** contains 3 old corrected and **3** new ENTRYs).

The contents of all CDFE TRANSes transmitted to the IAEA NDS are presented in Table.

Participation in the IAEA CRP

The Research Contract N 20501 "Evaluation of partial and total photoneutron reactions cross sections using new objective physical data reliability criteria" in the frame of the Coordinated Research Project N F41032 "Updating the photonuclear data library and generating a reference database for photon strength functions" was finished [1]. Many new partial and total photoneutron reaction cross sections were evaluated using the experimental theoretical method based on objective physical data reliability criteria and used for updating of the IAEA photonuclear data library.

Table

New and *old* TRANSes and Prelim contents

TRANS	*Old*	**New**	Total
m100	*37*	**1**	38
m101	*37*	**-**	37
m102	*20*	**4**	24
m103	*2*	**22**	24
m104	-	**6**	6
m105	-	**4**	4
m106	*9*	**1**	10
m107	*3*	**-**	3
m108	*8*	**2**	10
m109	-	**3**	3
m110	*1*	**2**	3
All	*117*	**45**	162
prelim.m111	*3*	**3**	6
Common	*120*	**48**	168

In the frame of the finished IAEA – MSU SINP Research Contract N 20501 “Evaluation of partial and total photoneutron reactions cross sections using new objective physical data reliability criteria” mentioned above new data for partial (γ, 1n), (γ, 2n), (γ, 3n) and total (γ, tot) = (γ, 1n)+(γ, 2n)+(γ, 3n) photoneutron reaction cross sections were evaluated using experimental-theoretical method and objective physical criteria of data reliability for many nuclei (^{51}V, ^{59}Co, ^{63,65}Cu, ^{75}As, ^{76,78,80,82}Se, ^{89}Y, ^{90,91,92,94}Zr, ^{98}Mo, ^{103}Rh, ^{115}In, ^{112,114,116,117,118,119,120,122,124}Sn, ^{127}I, ^{133}Cs, ^{138}Ba, ^{140,142}Ce, ^{141}Pr, ^{145,148}Nd, ^{153}Eu, ^{159}Tb, ^{165}Ho, ^{181}Ta, ^{186}W, ^{188,189,190,192}Os, ^{197}Au, ^{206,207,208}Pb, ^{209}Bi and some others).

New reliable evaluated data were published [1,3-19], included into the EXFOR database [2] and used for renewal and updating of the IAEA photonuclear data library.

Nuclear Database Service

All nuclear databases maintained by the CDFE on the Web-site (http://cdfe.sinp.msu.ru) were updated.

Main publications

(Nucl. Dat. Sheets, Phys. Rev., Phys.Atom.Nucl., EPJ Web of Conf., etc.).

1. T.Kawano, Y S.Cho, P.Dimitriou, D.Filipescu, N.Iwamoto, V.Plujko, X.Tao, H.Utsunomiya, V.Varlamov, R.Xu, R.Capote, I.Gheorghe, O.Gorbachenko, Y.L.Jin, T.Renstrøm, M.Sin, K.Stopani, Y.Tian, G.M.Tveten, J.M.Wang, T.Belgya, R.Firestone, S.Goriely, J.Kopecky, M.Krtička, R.Schwengner, S.Siem, M.Wiedeking. IAEA Photonuclear Data Library 2019, Nuclear Data Sheets, 163 (2020) 109.

2. IAEA NDS Experimental Nuclear Reaction Data (EXFOR) database (https://www-nds.iaea.org/exfor/exfor.htm);
USA NNDC Experimental Nuclear Reaction Data (EXFOR) database (http://www.nndc.bnl.gov/exfor/exfor.htm);
MSU SINP CDFE Nuclear Reaction database (EXFOR) (http://cdfe.sinp.msu.ru/exfor/index.php).

3. V.V.Varlamov. Evaluation of partial and total photoneutron reactions cross sections using new objective physical data reliability criteria. 3rd Research coordination meeting "Updating photonuclear data library and generating a reference database for photon strength functions", 17 – 21 December 2018, IAEA Headquarters, Vienna, INDC International Nuclear Data Committee Summary Report, INDC(NDS)-0777, IAEA NDS, Vienna, Austria, 2019, p. 10.

4. V.Varlamov, A.Davydov, V.Kaidarova, V.Orlin. Photoneutron reaction cross-section data for ^{75}As: Experiments and evaluation. Phys. Rev. C 99, N 2 (2019) 024608.

5. V.V.Varlamov, A.I.Davydov, B.S.Ishkhanov. New data on photoneutron reaction cross sections for ^{76,78,80,82}Se nuclei. Physics of Atomic Nuclei, 82, N1 (2019) 13.

6. V.V.Varlamov. Reliability of photonuclear data: various experiments and evaluations. Physics of Particles and Nuclei, 50, N5 (2019) 637.

7. V.V.Varlamov, A.I.Davydov, V.D.Kaidarova. Evaluation of reliable cross sections of photoneutron reactions on ^{103}Rh and ^{165}Ho. Physics of Atomic Nuclei, 82, N3 (2019) 196.

8. V.V.Varlamov, V.D.Kaidarova, V.N.Orlin. New reliable data on the photodisintegration of ^{160}Gd. Memoirs of the Faculty of Physics of the Lomonosov Moscow State University, N1, 2019, 1910202.

9. S.S.Belyshev, V.V.Varlamov, B.S.Ishkhanov, A.A.Kuznetsov, A.B.Priselkova, A.A.Prosnyakov, A.D.Fedorova, V.V.Khankin. Photodisintegration of ^{89}Y. Memoirs of the Faculty of Physics of the Lomonosov Moscow State University, № 2, 2019, 1920106.

10. A.I.Davydov, V.V.Varlamov, S.S.Belyshev, V.N.Orlin, B.S.Ishkhanov. New data on photodisintegration of nucleus ^{127}I: experiments and evaluation. Memoirs of the Faculty of Physics of the Lomonosov Moscow State University, № 3, 2019, 1930413.

11. S.Belyshev, A.Davydov, D.Filipescu, I.Georghe, B.Ishkhanov, V.Kaidarova, A.Kuznetsov, V.Orlin, K.Stopani, H.Utsunomiya, V.Varlamov. New reliable photoneutron reaction data for ^{159}Tb. International Conference on Nuclear Data for Science and Technology, May 19-24, 2019, Beijing, China. Conference Program & Abstract Book, China Nuclear Data Center, 2019, p. 58.

12. V.Varlamov, A.Davydov, B.Ishkhanov, V.Kaidarova, V.Orlin. Photoneutron reaction cross sections for ^{75}As and ^{181}Ta: Systematical uncertainties and data reliability. International Conference on Nuclear Data for Science and Technology, May 19-24, 2019, Beijing, China. Conerence Program & Abstract Book, China Nuclear Data Center, 2019, p. 144.

13. S.Belyshev, A.Davydov, D.Filipescu, I.Georghe, B.Ishkhanov, V.Kaidarova, A.Kuznetsov, V.Orlin, K.Stopani, H.Utsunomiya, V.Varlamov. New ^{209}Bi photodisintegration and physical criteria of data reliability. International Conference on Nuclear Data for Science and Technology, May 19-24, 2019, Beijing, China. Conference Program & Abstract Book, China Nuclear Data Center, 2019, p. 232.

14. Varlamov V.V., Davydov A.I., Ishkhanov B.S, Orlin V.N. New data on photodisintegration of ^{127}I: reliability of experimental reaction cross sections. LXIX International Conference «Nucleus-2019» on Nuclear Spectroscopy and Nuclear Structure "Fundamental Problems of Nuclear Physics, Nuclei at Borders of Nucleon Stability, High Technologies", Dubna, Russia, 1-5 July, 2019. Book of Abstracts. Joint Institute for Nuclear Researh, p. 48.

15. S.S.Belyshev, V.V.Varlamov, S.A.Gunin, A.I.Davydov, B.S.Ishkhanov, I.A.Pshenichnov, V.N.Orlin. Photoneutron reactions on ^{129}Xe nuclei and their electromagnetic dissociation in colliders. Physics of Atomic Nuclei, 83, N1 (2020) 2.

16. S.Belyshev, A.Davydov, D.Filipescu, I.Gheorghe, B.Ishkhanov, A.Kuznetsov, V.Orlin, K.Stopani, H.Utsunomiya, V.Varlamov. New ^{209}Bi photodisintegration data and physical criteria of data reliability. EPJ Web of Conferences, 239 (2020) 01031.

17. V.Varlamov, A.Davydov, B.Ishkhanov, V.Kaidarova, V.Orlin. Photoneutron reaction cross sections for ^{75}As and ^{181}Ta: Systematic uncertainties and data reliability. EPJ Web of Conferences, 239 (2020) 01035.

18. V.V.Varlamov, A.I.Davydov, V.N.Orlin. Photodisintegration of ^{127}I: Systematic Uncertainties of Experiments and Data Evaluated Using Physical Criteria. American Journal of Physics and Applications, 8 (2020) 64.

19. Varlamov V.V., Davydov A.I., Orlin V.N. Photoneutron reactions on ^{51}V: systematic uncertainties of experiments and new evaluated data. Yadernaya Fizika, 84, N3 (2021) 1.

Short-term (2021/2022) Program

The main items of CDFE (2021/2022) program, main priorities and most important tasks are traditional and the following:

- continuation of new photonuclear data compilation using EXFOR format, new TRANSes (M112, M113, etc.) production;
- correction of old ENTRYs 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;
- renewal and upgrading of all databases put upon the CDFE Web-site (http://cdfe.sinp.msu.ru).