Progress Report Nuclear Data Centre of INDIA from 2018-2019

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Outlines of the Talk

- Compilation of nuclear reaction data
- Promoting collaborative research
- Evaluation of nuclear reaction data

BRIEF HISTORY OF EXFOR ACTIVITIES IN INDIA

- Nuclear Data Physics Centre of India (NDPCI) is a research center for nuclear data activities in Bhabha Atomic Research Centre (BARC) in India.
- Bhabha Atomic Research Centre is the nodal centre for design, development and the application of nuclear technology for the welfare of mankind.
- BARC, Mumbai, is part of DAE (Department of atomic Energy) and is the nodal centre for the collaboration with IAEA-NDS, CERN, NRDC and others
- The BARC is responsible for theoretical, experimental nuclear physics research and code development for the implementation of Indian nuclear programme.

Data compilation GROUP in INdia

Compilation working Group	
Vidya Devi	IET, Bhaddal, Ropar (Compiler/Checker)
B. Rudraswamy (Imran Pasha)	Bangalore University, Bangalore
Ajay Tyagi (Aman Gandhi)	BHU, Varanasi
Gayatri Mohanto	BARC, Mumbai

List of EXFOR Entries Compiled and Checked 2018-2019

S.No.	Entry No.	Reference	Author
1.	G0512	J,JNR,314,1983,20172	H. Naik
2.	33106	J,ARI,127,92,2017	H. Naik
3.	33107	J,ARI,127,150,2017	R.Makwana
4.	33108	J,ARI,129,117,2017	H. Naik
5.	33109	J,EPJ/A,53,46,2017	P.Panikkath
6.	33110	J,JNR,314,457,2017	H. Naik
7.	33111	J,PR/C,96,024608,2017	S.Mukherjee
8.	33112	J,NSE,187,302,2017	M.S.Barough
9.	D6301	J,JP/G,44,015102,2017	S Adhikari
10.	D6302	J,JNR,314,1803,2017	Y.Sunitha
11.	D6303	J,NP/A,960,53,2017	H.Kuma
12.	D6304	J,NP/A,964,86,2017	H. Naik
13.	D6305	J,PR/C,95,014614,2017	D.R.Chakrabarty
14.	D6306	J,PR/C,95,034615,2017	A.Kundu
15.	D6307	J,PR/C,95,064602,2017	A.Maiti
16.	D6308	J,PR/C,95,064603,2017	R.Pandey
17.	D6309	J,PR/C,96,014617,2017	A.Maiti

18.	D6310	J,PR/C,96,014620,2017	A.Sood
19.	D6311	J,PR/C,96,024603,2017	A.Pal
20.	D6312	J,PR/C,96,034620,2017	A.Shrivastava
21.	D6313	J,PR/C,96,044616,2017	S.K.Pandit
22.	D6314	J,PR/C,96,054613,2017	A.Parihari
23.	D6315	J,PR/C,96,064609,2017	A.Sen
24.	D6316	J,PR/C,95,014612,2017	S.Sodaye
25.	D6317	J,PR/C,95,024604,2017	R.Tripathi
26.	D6318	J,PR/C,95,034610,2017	E.Prasad
27.	D6319	J,PR/C,96,014614,2017	Khushboo
28.	D6320	J,PR/C,96,034613,2017	B.R.Behera
29.	D6321	J,PR/C,96,044607,2017	M.Nandy
30.	D6322	J,PR/C,96,044608,2017	R.Tripathi
31.	D6323	J,PR/C,96,044614,2017	A.Yadav
32.	D6324	J,PR/C,96,054605,2017	A.Kumar
33.	D6325	J,PR/C,96,054614,2017	V.R.Sharma
34.	D6292	J,NP/A,974,9,2018	P.T.Muhammed Shan
35.	D6293	J,PR/C,44,2644,1991	R.H.Iyer
36.	D6294	J,IMP/E,3,239,1994	M.K.Bhardwaj
37.	D6295	J,PR/C,48,87,1993	R.H.Iyer

Promoting collaborative research

- BRNS is the nodal agency for the funding of collaborative research projects in the field of nuclear sciences.
- BRNS has dedicated committee for the projects falling in the category of nuclear data and application since २०१७.
- BRNS funded project on experimental nuclear data research requires the team concerned to make EXFOR compilation of their experimental result.

Sanction Number/File No.	Title of the Project	Principal Investigator	Principal Collaborator	Cost and Duration	Status
36(6)/14/92/2014-BRNS	Compilation of Experimental Nuclear Reaction data using EXFOR Editor and Measurement of Nuclear Reaction Cross section using Kamini Reactor	Dr. Rudraswamy B., Department of Physics, Jnanabharathi campus, Bangalore University, Bangalore – 560056	Dr. G. Pandikumar, IGCAR, Dr. E. Radha, IGCAR	24.12 Lakhs 3 Years 2014-2017 (Extended)	Project ongoing
36(6)/14/21/2016-BRNS	EXFOR compilation of Nuclear Data	Dr. Vidya Devi, Department of Physics, IET Bhaddal Technical Campus, Bhaddal, Ropar	Dr. Alok Saxena, Head, NPD, BARC Devesh Raj, RPDD, BARC	16.00 Lakhs 3 Years 2016-2019	Project Ongoing
	Cross section	Dr. Ajay Kumar, B-42, Brij Enclave,		19.43	

36(6)/14/22/2016-BRNS	Study of neutron induces reaction cross section up to 18 MeV for advanced reactor design	Professor Surjit Mukherjee, Physics Department, M.S. University of Baroda, Vadodara	Dr. B.K. Nayak, NPD, BARC, Dr. S.V. Suryanarayana, NPD, BARC	16.18 Lakhs 3 Years	Project ongoing
36(6)/14/30/2017-BRNS	Measurement Analysis, Evaluation and Compilation of Nuclear Reaction Data at Low and Medium Energy	Dr. M.M. Musthafa, Professor of Physics, University of Calicut	Dr. S. Jagdeesan, BARC	30.0 Lakhs 3 Years	Project ongoing
36(6)/14/49/2016-BRNS	Measurement of section of metastable states of a few nuclei produced through Photon	Dr. Sanjay Daga, Professor of Physics, Mhatama Jyoti Ba Phule Pune University, Pune	Dr. Rahul, RCD, BARC	42.13 Lakhs 3 Years	Project ongoing
36(6)/14/60/2016-BRNS	Nuclear Structure & Decay Data Evaluation for Nuclear Models and Dosimetric Applications	Dr. Sukhjeet S. Dhindsa, Associate Professor, Physics, Akal University	Dr. Gopal Mukherjee, VECC, Kolkata	23.00 Lakhs 3 Years	Project ongoing

DAE-BRNS RESEARCH PROJECT ON MEASUREMENT OF INCIDENT NEUTRON DATA ON SODIUM AND IRON BY BHU, VARANASI

- Two neutron activation experiments were performed at different neutron energies. The neutrons were produced through d(t,α)n and Be reactions respectively using Purnima and FOTIA facilities in BARC, Mumbai.
- The cross section for different reaction channels such as (n,γ), (n,p), (n, α) and (n,2n) for the Sodium and other different reactor structural elements like Potassium, Iodine and Copper were studies.
- In the case of १४.९२ MeV neutrons, 27Al(n,a)24Na monitor reaction was used for the neutron flux measurement and for low energy neutrons we have used 115In(n,n')115In as a monitor reaction

EXPERIMENTAL WORK DONE AT BANGALORE UNIVERSITY UNDER DAE-BRNS RESEARCH PROJECT

An experiment was carried out using neutron beam to irradiate foils such as Molybdenum, Niobium, Cerium, Gold, Indium, and Tungsten with FOTIA and PURNIMA neutron generator facilities available in BARC, Mumbai to get the following Nuclear reactions.

I. FOTIA: 100Mo(n,γ)101Mo, 115In(n,n')115In
II. PURNIMA: 92Mo(n,p)92mNb, 92Mo(n,a)89Zr, 96Mo(n,p)97Mo, 97Mo(n,p)97Nb, 93Nb(n,2n)92mNb, 93Nb(n,a)90mY, 140Ce(n,2n)139gCe, 142Ce(n,2n)141Ce, 197Au(n,2n)196Au, 115In(n,2n)114In

EVALUATION WORK

India's programme of nuclear data science includes nuclear data physics experiments, Cross-section evaluations and processing of covariances, raw data compilations in EXFOR (IAEA) formats.

Covariance Analysis of some experimental data and use of covariances to define error margins due to uncertainties in nuclear data.

We calculated uncertainty propagation in cross section measurement by using three different methods such as Sandwich formula, Unscented Transform method and Monte Carlo method.

The task of evaluation of nuclear data has been recently initiated in India but lot of work need to be done in order to gain expertise before being able to make high quality basic nuclear data evaluations.

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THANKS