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Proceedings of the

Sixth AASPP Workshop on Asian Nuclear Reaction Database Development

Hokkaido University, Sapporo, Japan

15 – 17 September 2015

Edited by

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January 2016

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Abstract

The 6th Workshop on Asian Nuclear Reaction Database Development was held from 15-17 September 2015 at Hokkaido University, Sapporo, Japan. This 6th workshop followed the workshops in Sapporo (Japan, 2010), Beijing (China, 2011), Pohang (Korea, 2012), Almaty (Kazakhstan, 2013) and Mumbai (India, 2014). The workshop was coordinated by the Asian Centre Heads of the International Network of Nuclear Reaction Data Centres and supported by International Atomic Energy Agency. The topics of the workshop were sharing information on activities of the nuclear data centres, EXFOR compilation, data evaluation, computational simulations and other related topics. The participants were attended from Austria, China, India, Japan, Kazakhstan, Korea, Mongolia, United States and Vietnam. In the workshop, 20 presentations were presented and summarized in these proceedings.

Table of Contents

Agenda	7
V. Semkova et al., Recent news in nuclear data development and services on EXFOR and IBANDL databases provided by IAEA-NDS	10
Chen Guochang et.al., Recent EXFOR Compilation in CNDC	13
Tao Xi et al., The Evaluations of 208,207,206,204Pb in CENDL-3.1	17
Wang Jimin et al., Evaluation of deuteron-induced excitation functions for $^{186}\text{W}(d,p)^{187}\text{W}$ and $^{186}\text{W}(d,2n)^{186}\text{Re}$	21
Guochang Chen et al., The Application of EMPIRE for Nuclear Data Evaluation of $n+^{238}\text{U}$	25
P.D. Krishnani, Recent Activities of Nuclear Data Physics Centre of India	30
Masayuki Aikawa, International Collaboration of Hokkaido University Nuclear Reaction Data Centre	31
Rie Sekine and Wataru Horiuchi, Evaluation of the photoabsorption cross section of few-nucleon systems with time-dependent method	33
D. Ichinkhorloo et al., The scattering cross sections for $^7\text{Li} + n$ reactions	34
A. Sarsembayeva et al., Upgrade of Japanese editor for EXFOR compilation	39
Bo Zhou et al., The container picture with two-alpha correlation for the ground state of ^{12}C	43
S. Imai et al., Monte Carlo simulation for thick-target yields deduced from inverse kinematics	46
N.Kenzhebayev and N.Otuka, Recent charged-particle induced reaction data measurements performed in Kazakhstan	49
A.D. Zhunisbek et al., CANRDB: current activities, issues and	50

prospects

N. Takibayev and B. Abdykadyrov, Neutron resonances at crystalline structures in the thermal range	53
Guinyun Kim et al., Measurement of Charged particle-, Neutron-, and Photon-induced Reactions in Korea	56
M.Odsuren and N.Otuka, Overview of Compilation for the EXFOR Library in Mongolia	57
M.Odsuren et al., (n, α) Reaction cross sections and angular distributions for several MeV neutrons	59
M. A. K. Lodhi, Computational cross sections of Bc absorption by hadrons	65
F.Kh. Ergashev et al., Investigation of the nuclear reaction $^{12}\text{C}(p,\gamma)^{13}\text{N}$ at the proton energies below 1 MeV	66
Tran Tuan Anh et al., Filtered neutron beam applications at the Dalat Research Reactor	68
List of Participants	73

CANRDB: current activities, issues and prospects

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The history of nuclear physics and nuclear research facilities started in Kazakhstan more than 60 years ago. Considerable part of it in the past was related to military tests of nuclear bombs and other activities at located here Semipalatinsk test site. Today the consequent problem of lands decontamination and radiation safety is a very important problem in our country. Rapid development of information technologies is common to various areas of science and research; it is particularly noticeable in nuclear physics. The amount of data obtained and used in modern nuclear physics is huge and continuously increases with time. Creation in 2013 of the Central Asian Nuclear Research Data Base (CA-NRDB) was therefore very important for the whole region of Central Asia.

The CA-NRDB group carries out an important work on the creation of specialized programs and data protection. New data sectors were created:

- Data on nuclear reactions for astrophysics;
- Data on neutron resonances for nuclear physics and nuclear astrophysics;
- Data on nuclear chemistry applications and on radio-active elements.

The important sector for nuclear medicine is at the beginning of creation and development. Our university already has agreements with research centers in South Korea. We started the collaboration with Hokkaido University, Osaka University and JAEA. New international scientific ties have emerged and strengthened (France, USA, Italy, etc.).

Traditionally, al-Farabi Kazakh National University supports the close relations and cooperation with the Institute of Nuclear Physics (Almaty) and L.N. Gumilyov Eurasian National University (Astana), where main accelerators and basic experimental facilities for nuclear physics are located:

- isochronous cyclotron
- the small-sized cyclotron
- the accelerator of heavy ions DC-60
- electrostatic recharging accelerator UKP-2-1
- research nuclear reactor WWR-K, etc.

Joint research groups in nuclear physics conduct new experiments and take part in international collaborations with JINR (Dubna, Russia) and CERN, where our students acquire practical skills and gain experience.

The accelerator of heavy ions DC-60. It was manufactured in Flerov Laboratory of nuclear reactions of the Joint Institute for Nuclear Research (Dubna, Russian Federation). Physical start of the accelerator took place on September 21st, 2006 in Astana. This is the first in the Central Asia powerful accelerator of heavy ions which consists of an injector-implanter based on ECR-source, a cyclotron and channels of transportation of heavy ions. The injector-implanter allows to produce bunches of ions with energies up to 40 keV per charge. One of the main components of the cyclotron is a source of heavy ions. It can work as a heavy ion injector in cyclotron for generating high energy ion beams or operate in autonomous regime in experiments with low energy beams.

National Nuclear Center of the Republic of Kazakhstan was founded at beginning of 90' at the former Semipalatinsk test site. Now NNC operates several facilities and has the departments: Tokamak KTM, Park of Nuclear Technologies, Radiation Technologies Complex and Museum of former Semipalatinsk nuclear test site, etc.

The current CA-NRDB activities

The CA-NRDB of the characteristics of nuclear reactions and properties of atomic nuclei is replenished with the database of hazardous chemical and radioactive substances. Following the suggestions of radio ecologists, we started to form a sector in the Database on hazardous chemical and radioactive substances.

The Ministry of Education and Science of Kazakhstan funded our database in 2013-2015. We plan to prepare and submit a new project related to the development of CA-NRDB for the next three years.



Fig. 1: Main page of CANRDB cite

Currently, our team is actively working on expansion of the database, improvement of the website productivity, further development of the specialized software, and fostering partnership with international nuclear physicists. We already developed our website with ergonomic graphical interface and own database structure. CA-NRDB website is available in three languages – Kazakh, English and Russian at <http://canrdb.kaznu.kz/>. Our database is designed to support educational activities and scientific research. An extensive electronic library was also created to incorporate textbooks, presentations, lecture materials, scientific papers, etc.

Below is a list of latest changes in the CA-NRDB website and database:

Server components have been replaced by a newer version: IIS (Internet Information Services) 7 to IIS 8; Created a new connection string script to improve a website connection speed; Added sections for “Nuclear Data Editor” and “Neutron Resonance Data”; Added and filled a section “Publications”; Created a graphical interface of the database: GNUI MySQL and etc...

We also improved the efficiency of the database. As a result, CA-NRDB now has multi-level streaming and relational I/O massive data. The sector (<http://canrdb.kaznu.kz/>) was established in the Information department of KazNU. The database is constantly updated and has already proved to be useful for students specializing in physics and nuclear physics.

It was important for the KazNU to create the special educational sector of the CA-NRDB which included the following:

- Nuclear Reaction Database for Education (for students and teachers);
- Virtual Laboratories: Computer laboratory practice “Interaction of particles with matter” (created by T.S. Ramazanov, A.V. Yushkov, V.V. D’yachkov et. al.); Computer laboratory practice “Study of gamma rays and neutrons produced in nuclear reactions” (F.B. Baimbetov, A.H. Abuldaev, V.V. D’yachkov et. al.);
- Electronic handbooks (A.V. Yushkov, V.V. D’yachkov)
 - Nuclear Data Base Reviewer & Calculator (Yushkov, V.V. D’yachkov and Yu. A. Zaripova)
- Data on interaction of gamma rays with matter; alpha particles with matter
- a Handbook of atomic nuclei, etc.

Our CA-NRDB team maintains friendly cooperative relations with many data centers in different countries. We look forward to our fruitful cooperation with the team of Hokkaido University and we are planning to upload all the noticeable domestic papers into the EXFOR by the next technical meeting in Beijing on 26-29 April, 2016.

We thank the MSU database team and prof. V.V. Varlamov for their support and useful advices. The main objective of the CA-NRDB is the development and formation in Kazakhstan of open and user-friendly database on nuclear reactions with further incorporation of this database into the international network of nuclear databases under the IAEA.

This year our database was significantly improved and we recreated a database data structure by using a SQL Server technology from Microsoft Corporation.

The CA-NRDB team has participated in the technical meeting of NRDC under the auspices of the IAEA held in Vienna (Austria) on April 21-23, 2015. Participation in this meeting was of particular importance for the CA-NRDB team and allowed to present our activities among experienced colleagues from other centers with nuclear databases.



Fig. 2: Young scientists at JAEA training seminars 2015