Report on the 3rd Asian Nuclear Reaction Database Development Workshop

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Abstract

This document summarizes the contents of the workshop on Nuclear Reaction Database Development Workshop. A short description of brief minutes, objectives, the main topics of the agenda, summary, concluding remarks and the list of participants are given.

1 Introduction

The 3rd Asian Nuclear Reaction Database Development Workshop was organized by Centre for High Energy Physics (CHEP), Kyungpook National University (KNU), Division of Advanced Nuclear Engineering (DANE), Pohang University of Science and Technology (POSTECH), and Nuclear Data Centre, Korea Atomic Energy Research Institute (KAERI). This workshop was partially supported by the Asia-Africa Science Platform Program (AASPP) and the Japan Society for the Promotion of Science (JSPS).

The workshop was held from Monday August, 27th through Wednesday August 29th, 2012 at Pohang Accelerator Laboratory in Pohang, Korea. Forty participants of nine cooperating institutes in Austria, China, India, Japan, Kazakhstan, Korea, Mongolia, Pakistan, and Vitenam attended the workshop. Main topics of the workshop were recent activities for the nuclear data Centre of Asian region, nuclear data measurement and its application, nuclear data evaluation and theoretical method.

2 Objectives

The purpose of this AASPP workshop is to know the current status of the recent nuclear data activities in the different Asian countries, their collaboration and also discuss to the possible efforts and ways to make this collaboration more deepen. The main objective of the workshop was to discuss about the nuclear data Centre activities, nuclear data measurement, development of new software and evaluation of the nuclear data.

Moo-Hyun Cho, the Director of PAL, Korea, inaugurated the workshop. Participants from the nine attending institutes of Asian region presented the brief status reports on the nuclear data activity, highlighting the general as well as staff situation of the Centres, their compilation

activities, data services and other nuclear activities (such as data measurement, data evaluation) of interest to the network and relevant publications.

In the AASPP workshop there were thirty presentations in total, ten from Korea, eight from (JCPRG) Japan, four from China, four from India, one from Mongolia, one from Kazakhstan, one from Vietnam and one from IAEA, Vienna. From these presentations, we learnt a lot about the recent Asian nuclear activities, nuclear data evaluation, theoretical method, nuclear data measurement and its application.

3 Main Topics of the Agenda

The main topics of discussion in this AASPP workshop are:

(i) Recent activities of Nuclear Data in Asian countries, compilation and development of Asian Nuclear collaboration.

(ii) Asian collaboration in Nuclear Reaction Data measurement.

(iii) Evaluation of Nuclear Reaction and Theoretical Method.

(iv) Experimental Nuclear Data activities of different countries.

The agenda covered the topics as detailed below:

a) Recent activities of Nuclear Data in Asian countries

- Young-Sik Cho from Korea reported the Korean activities in nuclear data Centre, nuclear data needs in Korea, nuclear data network in Korea and collaboration with International Atomic Energy Agency (IAEA), Organization for Economic Co-operation and Development (OECD), Brookhaven National Laboratory (BNL), European Union (EU), Japan Atomic Energy Agency (JAEA), China Institute of Atomic Energy (CIAE) and nuclear data evaluation activities and nuclear data measurement activities.
- Masayuki Aikawa from (JCPRG) Japan reported about the activities of the nuclear reaction data Centre of Hokkaido University, the main objectives of the JCPRG, collaboration with other Asian countries, brief introduction of HENDEL and GSYS software, development of new software, evaluation of data (^{6,7}Li+n, ^{16,17}O+n reaction).
- Zhigang Ge from China presented the progress of nuclear data Centre in China and new version of Chinese evaluated nuclear data library (CENDEL-3.2). He also reported about Chinese nuclear data activity in structure, advanced Chinese experimental facility (e.g. China advanced research reactor, China experiment fast reactor, China Spallation neutron source), progress in nuclear data measurement and international collaboration.
- Naohiko Otsuka from IAEA, Vienna, Austria reported about the Asian collaboration in nuclear reaction data measurement and compilation. He discussed about the progress in EXFOR compilation by Asian Centres in the International Network of Nuclear Reaction Data Centres (NRDC), analysis of experimental collaboration in Asian region, a new Asian collaboration-deuteron-activation. Naohiko Otsuka also shared his experience he gained from his participation in the EXFOR compilation of data with Asian countries and progress in experimental covariance.

- Kiyoshi Kato from Hokkaido University from Japan reported about the developments of Asian nuclear data collaboration, JCPRG collaboration with other Asian countries and JCPRG evaluation work.
- Pritam Das Krishnani from Bhabha Atomic Research Centre (BARC) India reported about the recent activities of nuclear data Centre and various experimental facilities in India.
- Naoya Furutachi (JCPRG) Japan reported about the current status of nuclear reaction data compilation activities at JCPRG nuclear data centre.
- Young-Sik Cho (KAERI) Korea reported about the nuclear data evaluation activities at KAERI .
- Nurgali Takibayev from Kazakhstan presented about the data Centre activities for Nuclear Physics and Astrophysics held in Al-Farabi Kazakh National University.
- Suren Davaa from Mongolia reported about the present status of nuclear data studies in Mongolia and data evaluation.

b) Nuclear Data Evaluation and Theoretical method

- Nuclear data Centre activities for Nuclear Physics and Astrophysics in Al-Farabi, University was presented by Nurgali Takibayev (Al-Farabi Kazakh National Univ., Kazakhstan).
- Compilation tools of JCPRG was discussed by Kohsuke Tsubakihara (JCPRG, Japan).
- Nuclear data activities at Mizoram University was discussed by Lalremruata Bawitlung (Mizoram Univ., India).
- Present status of nuclear data studies in Mongolia was discussed by Suren Davaa (NUM, Mongol).
- On microscopic description of light nuclear scattering was discussed by J. Yoo (KAERI, Korea).
- Description of even-even triaxial nuclei in the frame work of Asymmetric Rotor Model and the Interacting Boson Approximation was discussed by Vidya Devi (JCPRG, Japan).
- Analysis of two body resonances in the Complex Scaled Orthogonal Condition Model was discussed by Odsuren Myagmarjav (JCPRG, Japan).
- Recent EXFOR compilation in CNDC was discussed by Guochang Chen (CNDC, China).
- Application of EXFOR in the systematics of nuclear reaction excitation function was discussed by Jimin Wang (CNDC, China).
- R-matrix used for light nuclei cross section evaluation was discussed by Xi Tao (CNDC, China).

c) Nuclear Data Measurement and its Application

- Evaluation of nuclear reactions in JCPRG: analysis of ^{6,7}Li+n reaction was discussed by Ichinkhorloo Dagvadorj (JCPRG, Japan).
- Activities on the neutron and photon experiments at Hokkaido University was discussed by Ayano Makinaga (JCPRG, Japan).
- Experimental nuclear data activities in Vietnam was discussed by Pham Ngoc Son (VINATOM, Vietnam).

- Recent activities of nuclear data measurement in Korea was discussed by Guinyun Kim (KNU, Korea).
- New measurement of total and capture cross section DAQ systems at Pohang Neutron Facility was discussed by Manwoo Lee (DIRAMS, Korea).
- Neutron capture measurement of ^{161,162,163,164} Dy and the resonance analysis was discussed by Yeong-Rok Kang (DIRAMS, Korea).
- Excitation functions of the proton-induced nuclear reactions on natFe up to 40 MeV was discussed by Kwang-soo Kim (KNU, Korea).
- MC simulation of photo-neutron yield and optimization of photo-neutron spectrum was discussed by Muhammad Zaman (KNU, Korea).
- Measurement of total cross-sections for Fe in the neutron energy regions from 1 eV to 100 keV was discussed by Eunae Kim (POSTECH, Korea).
- Measurement of isomeric ratio for ^{143}Sm and EXFOR compilation was discussed by Sung-Chul Yang (KNU and KAERI, Korea).
- Experiences and lessons learnt in EXFOR compilation (Part-1) was discussed by Sylvia Badwar (NEHU, India).
- Experiences and lessons learnt in EXFOR compilation (Part-2) was discussed by Reetuparna Ghosh (NEHU, India).

4 Summary

Summary on the basis of all thirty presentations and group discussion held in workshop is discussed as below:

For Nuclear Evaluation of Data

China

- Covariance evaluation system (COVAC), is being developed for structure and fission nuclide and one-dimensional sensitivity/uncertainty(S/U) analysis code SENS1D, based on the generalized perturbation theory, has been developed in 2011.
- The CENDL-3.2, general purpose evaluated nuclear data file, will be released and systematics was used to predict various neutron-induced reactions.
- Adjusting Parameters of R-Matrix for Light nuclei (APRML), is being used to calculate n+^{6}Li reaction.

Japan

- ^{6,7}Li+n, ^{16,17}O+n reactions were evaluated with Continuum Discretized Coupled Channel Method (CDCC) and Cluster Orbital Shell Model (COSM) + Complex Scaling Method (CSM), respectively.

Korea

- KERCEN has been improved to have a capability of calculating uncertainties in the resonance region using Multilevel Breit-Wigner (MLBW) formalism.
- Cross sections and their covariances for ^{237}Np and ^{240}Pu are being evaluated above the resonance region and No-Core Shell Model/ Resonating Group Method (NCSM/RGM) approach is being studied.

Mongolia

- Systematical analysis of (n,α) and (n,p) cross sections using the statistical model, excitation model and Plane Wave Born Approximation (PWBA) was carried out.

For Nuclear Evaluation of Data Measurement and its Application

In these sessions for nuclear data measurements and its application, there were nine presentations in total, seven from Korea, one from Japan and one from Vietnam. In these presentation each country reported there experimental facility and experimental activities. In this AASPP workshop there were a large discussion on the experimental facilities of the Asian region. From these discussions we concluded that

- Lack of experimental facilities for nuclear data measurement in many Asian countries
- Lack of experts and young researcher for nuclear data measurement.
- Need more data in various fields of applications.
- In future it is necessary to make Asian network to utilize the facilities and experts.

For Nuclear Database Network

- Provision of regional data to the world / to the country.
- Visibility of activities of the country (more citation).
- Need to better understanding of various experiments.
- Very fruitful communication (not like official meetings nor big conferences.)
- Unique role activity of data Centres (compilation, evaluation: slightly different from pure research)
- This type of workshop gives good opportunity to meet people who are not in the data Centre meetings and also to meet with young researchers of the country.

5 Concluding Remarks

Some concluding remarks on the basis of the group discussion in that AASPP workshop were

- Asian workshops will promote the nuclear data activities, data measurement and data evaluation.

- Exchange and educate the young researcher by sharing information about the nuclear data activities.
- Promotion of some collaborative compilation exercise and evaluation of data in future workshops. It will be very helpful to understand the different type of techniques and software for compilation of data by different countries and will reduce the problems that occur in data compilation.

Acknowledgement

The authors would like to acknowledge the support by "'R&D' Platform Formation of Nuclear Reaction Data in Asian Countries (2010-2013)", Asia-Africa Science Platform Program, Japan Society for the Promotion of Science.

Annex. I

List of Participants

NAME	AFFILIATION
Zhigang Ge	China Institute of Atomic Energy, China
Jimin Wang	China Institute of Atomic Energy, China
Xi Tao	China Institute of Atomic Energy, China
Guochang Chen	China Institute of Atomic Energy, China
Young-Ouk Lee	Korea Atomic Energy Research Institute, Korea
Choong-Sup Gil	Korea Atomic Energy Research Institute, Korea
J Yoo	Korea Atomic Energy Research Institute, Korea
Jongwoon Kim	Korea Atomic Energy Research Institute, Korea
Tae-Yung Song	Korea Atomic Energy Research Institute, Korea
Young-Sik Cho	Korea Atomic Energy Research Institute, Korea
Lee Manwoo	Dongnam Institute of Radiological and Medical Science, Korea
Yeong-Rok Kang	Dongnam Institute of Radiological and Medical Science, Korea
Kyoungrak Yi	Dong-A University, Korea
Tae-Ik Ro	Dong-A University, Korea
Guinyun Kim	Kyungpook National University, Korea
Chang Gi Huh	Kyungpook National University, Korea
Sung-Chul Yang	Kyungpook National University, Korea
Kwangsoo Kim	Kyungpook National University, Korea
Dongpil Seo	Kyungpook National University, Korea
Muhammad Shahid	Kyungpook National University, Korea
Muhammad Zaman	Kyungpook National University, Korea
Kyungsook Kim	Kyungpook National University, Korea
Kim Eunae	Pohang University of Science and Technology, Korea
Sunggyun Shin	Pohang University of Science and Technology, Korea
Pham Ngoc Son	Vinatom, Vitnam
Suren Davaa	Nuclear Research Centre, Mongolia
Pritam Krishnani	Bhabha Atomic Research Centre, India
Lalremruata Bawitlung	Mizoram University, India
Reetupurna Ghosh	North Easten Hill University, India
Sylvia Badwar	North Easten Hill University, India
Nurgali Takibayev	Al-Farabi Kazakh National University, Kazakhstan
Toshiyuki Katayama	Hokusei Gakuen University, Japan
Naoya Furutati	Hokkaido University, Japan
Masayuki Aikawa	Hokkaido University, Japan
Ayano Makinaga	Hokkaido University, Japan
Vidya Devi	Hokkaido University, Japan
Odsuren Myagmarjav	Hokkaido University, Japan
Kohsuke Tsubakihara	Hokkaido University, Japan
Ichinkhorloo Dagvadorj	Hokkaido University, Japan
Naohiko Otsuka	IAEA Nuclear Data Section, Austria

Annex. II

PROGRAM

Aug. 27	(Monday)	
08:30-9:30	Registration	
09:30-10:00	Opening and Welcome Address	Moo-Hyun Cho (PAL, Korea)
	Session-I	Chairperson
10:00-12:00	Asian Nuclear Data Centre Activity	Kiyoshi Kato (JCPRG, Japan)
10:00-10:30	Korean Activities for Nuclear Data Centre	Young-Sik Cho (KAERI, Korea)
10:30-11:00	Japanese Activities for Nuclear Data Centre	Masayuki Aikawa (JCPRG, Japan)
11:00-11:30	Chinese Activities for Nuclear Data Centre	Zhigang Ge (CNDC, China)
11:30-12:00	Recent Activities of Nuclear Data Physics Centre of India	Pritam Das Krishnani (BARC, India)
12:00-13:00	Lunch	
	Session-II	Chairperson
13:00-15:00	Nuclear Data Evaluation and Theoretical Method	Toshiyuki Katayama (Hokusei-gakuen Uni., Japan)
13:00-13:30	Asian Collaboration in Nuclear Reaction Data Measurements and Compilation	Naohiko Otsuka (IAEA, Austria)
13:30-14:00	Current Status of Nuclear Reaction Data Compilation Activities at JCPRG	Furutachi Naoya (JCPRG, Japan)
14:00-14:30	Nuclear Data Evaluation Activities at KAERI	Young-Sik Cho (KAERI, Korea)
14:30-15:00	Developments of Asian Nuclear Data Collaborations	Kiyoshi Kato (JCPRG, Japan)
15:00-15:30	Coffee Break	
	Session-III	Chairperson
15:30-18:00	Nuclear Data Evaluation and Theoretical Method	Young-Ouk Lee (KAERI, Korea)
15:30-16:00	Al-Farabi University Data Centre for Nuclear Physics and Astrophysics	Nurgali Takibayev (Al-Farabi Kazakh National Univ, Kazakhstan)
16:00-16:30	Compilation Tools of JCPRG	Kohsuke Tsubakihara (JCPRG, Japan)

16:30-17:00	Nuclear Data Activities at Mizoram University	Lalremruata Bawitlung (Mizoram Univ., India)
17:00-17:30	Present Status of Nuclear Data Studies in Mongolia	Suren Davaa (NUM, Mongolia)
17:30-18:00	On Microscopic Description of Light Nuclear Scattering	J. Yoo (KAERI, Korea)
18:30-20:30	Welcome Reception	

Aug. 28	(Tuesday)	
	Session-IV	Chairperson
08:30-10:30	Nuclear Data Measurement and its Application	T. I. Ro (Dong-A Univ., Korea)
08:30-09:00	Evaluation of Nuclear Reactions in JCPRG: Analysis of ^{6,7}Li+n reaction	Ichinkhorloo Dagvadorj (JCPRG, Japan)
09:00-09:30	Activities on the Neutron and Photon experiments at Hokkaido University	Ayano Makinaga (JCPRG, Japan)
09:30-10:00	Experimental Nuclear Data Activities in Vietnam	Pham Ngoc Son (VINATOM, Vietnam)
10:00-10:30	Coffee Break	
	Session-V	Chairperson
10:30-12:00	Nuclear Data Measurement and its Application	T. Y. Song (KAERI, Korea)
10:30-11:00	Recent Activities of Nuclear Data Measurement in Korea	Guinyun Kim (KNU, Korea)
11:00-11:30	New Total and Capture Cross Section DAQ Systems at Pohang Neutron Facility	Manwoo Lee (DIRAMS, Korea)
11:30-12:00	Neutron Capture Measurement ^{161,162,163,164}Dy and the Resonance Analysis	Yeong-Rok Kang (DIRAMS, Korea)
12:00-13:00	Lunch	
	Session-VI	Chairperson
13:00-15:00	Nuclear Data Measurement and its Application	Pham Ngoc Son (VINATOM, Vietnam)
13:00-13:20	Excitation Function of the Proton-Induced Reaction on ^{nat}Fe upto 40 MeV	Kwan-Soo Kim (KNU, Korea)
13:20-13:40	MC Simulation of Photo-Neutron Yield and Optimization of Photo-Neutron Spectrum	Mohammad Zaman (KNU, Korea)

13:40-14:00	Measurement of Total Cross-Sections for Fe in Neutron Energy Regions from 1eV to 100keV	Eunac Kim (POSTECH, Korea)
14:00-14:20	Measurement of Isomeric Ratio for ^{143}Sm and EXFOR Compilation	Sung-Chul Yang (KNU/KAERI, Korea)
14:20-14:40	Experiences and Lesson Learnt in EXFOR Compilation (Part-1)	Sylvia Badwar (NEHU, India)
14:40-15:00	Experiences and Lesson Learnt in EXFOR Compilation (Part-2)	Reetupurna Ghosh (NEHU, India)
15:00-15:30	Coffee Break	
	Session-VII	Chairperson
15:30-18:00	Nuclear Data Evaluation and Theoretical Method	Z. Ge (CNDC, China)
15:30-16:00	Description of Even-Even Triaxial Nuclei in the framework of ARM and IBA model	Vidya Devi (JCPRG, Japan)
16:00-16:30	Analysis of Two Body Resonances in the Complex Scaled Orthogonal Condition Model	Odsuren Myagmarjav (JCPRG, Japan)
16:30-17:00	Recent EXFOR Compilation in CNDC	Guochang Chen (CNDC, China)
17:00-17:30	Application of EXFOR in the Systematics of Nuclear Reaction Excitation Function	Jimin Wang (CNDC, China)
17:30-18:00	R-matrix used for Light Nuclei Cross Section Evaluation	Xi Tao (CNDC, China)
18:30-20:30	Banquet	

Aug. 29	(Wednesday)	
	Session-VIII	Chairperson
08:30-10:00	Development of the Asian Nuclear Database Network	Masayuki Aikawa (JCPRG, Japan)
08:30-10:00	Discussion	
10:00-10:30	Coffee Break	
	Session-XI	Chairperson
10:30-12:00	Discussion and Conclusion	Nurgali Takibayev (Al-Farabi Kazakh National Univ, Kazakhstan)
10:30-11:00	Summary of Nuclear Reaction	Young-Ouk Lee (KAERI, Korea)

11:00-11:30	Summary of Nuclear Data Measurement	Guinyun Kim (KNU, Korea)
11:30-12:00	Summary of Nuclear Database Network	Naohiko Otsuka (IAEA, Austria)
12:00-12:20	Concluding Remarks	Kiyoshi Kato (JCPRG, Japan)
12:20-13:30	Lunch	
14:00-19:00	Excursion	

Annex. III

Group Photos