

# Report of the RIBF ULIC mini-Workshop: Nuclear reaction database of unstable nuclei beam experiments and its application

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## Abstract

A collaborative research was launched in 2010 between the Hokkaido University Nuclear Reaction Data Centre and the RIKEN Nishina Center, in order to advance the availability of the nuclear reaction data produced at RIBF. A mini-Workshop was held under the collaboration and reported in this article.

## 1 Introduction

The 3rd RIBF ULIC mini-workshop was held in RIKEN Nishina Center to promote the research collaboration between two centers (Hokkaido University Nuclear Reaction Data Centre (JCPRG), and RIKEN Nishina Center). Total 15 participants joined the mini-Workshop on the nuclear reaction database of unstable nuclei beam experiments and its application. Participants were eight from JCPRG Hokkaido University, five from RIKEN Nishina Center, two from other universities and four organizations participated in the mini-Workshop (University of Tokyo, Osaka University, RIKEN and Hokkaido University) out of organizations of Japan. Total nine presenters were delivered, 4 hands-on-session. In addition, the first and second RIBF ULIC mini-workshops were held at RIKEN in 2010 and 2011, respectively.

The purpose of this workshop was to extend the current status of the research methods and to promote a collaboration on the experiment for photon activation and neutron transmission. This workshop is mainly organized by the JCPRG, and the travel expenses of JCPRG participants were supported by the RIKEN-JCPRG research collaboration.

## 2 Objectives

The mini-Workshop was directed by H. Sakurai (University of Tokyo). After the opening speech of H. Sakurai, the first session “RIKEN-JCPRG collaboration: current status and its problem” was started by presentation of M. Aikawa (JCPRG, Hokkaido University). He talked about the main objectives of the JCPRG, which are compilation of charged-particle and gamma induced reaction data obtained in Japan, evaluation of nuclear reaction data on light nucleus such as reaction cross section on carbon isotopes,  ${}^6,{}^7\text{Li}+n$  reactions,  ${}^{16,17}\text{O}+\gamma$  reactions. Also, the structure of  ${}^9\text{Be}$ ,

experiment of photon activation, neutron transmission, photon scattering on the different natural samples and nucleosynthesis. Furthermore, he reported about the development of collaboration among Asian and International Nuclear Reaction Data Centers (NRDC), the progression of under construction of XML type database and a software development by MML researchers at Hokkaido University.

A. Kohama (RIKEN Nishina Center) presented a talk with the title as Collaboration “Study for advanced application of RIBF nuclear reaction data”: Effort at RIKEN. His presentation was focused on the present status of compiled data of RIKEN by JCPRG, the processing of summary web, compilation report via RNC news, future plan of the experiment on the RIBF and their applications. Moreover, he pointed out the lack of data for human body, for instance: C, H, N, O, S, because few data are available on the data base.

After talk of A. Kohama the second session “Report of the RIKEN Activity” of the mini-Workshop started by H. Otsu (RIKEN Nishina Center). Session 2 consisted of two presentations on the subject of RIKEN activities.

S. Nishimura (RIKEN Nishina Center) presented a talk with the title as Harvest of decay properties foreseen in coming five years. He showed a brief introduction of past experiments, a plan of near future and experimental set up in 2009 at RIBF, calculated results of r-process abundance, evaluation of shell structure around  $N=70$  and EURICA project at RIBF.

The third session “Nuclear data application” of the mini-Workshop was started by the report of M. Takashina (Osaka University), the title of the presentation was “Particle simulations in medicine and nuclear reactions”. He talked about residual radioactivity in particle cancer therapy, evaluation results of  $(p,X)$  cross section on the  $^{12}\text{C}$ ,  $^{16}\text{O}$  by different theoretical models.

N. Furutachi (JCPRG, Hokkaido University) reported “Current status and tasks of evaluation activities in JCPRG”. His presentation focused on the evaluation of  $^{16,17}\text{O}(n,\gamma)$  cross section by using cluster orbital shell model (COSM) and complex scaling method (CSM), study of nuclear structure of  $^9\text{Be}$ , calculation of reaction cross sections of neutron rich carbon isotopes, evaluation of  $^{6,7}\text{Li}+n$  reactions, nuclear reaction data file for astrophysics (NRDF/A) and current status of compilation of RIKEN data at JCPRG.

Analysis of  $^{6,7}\text{Li}+n$  reactions using the continuum discretized coupled channel (CDCC) method was reported by D. Ichinkhorloo (JCPRG, Hokkaido University). The author presented about results of scattering phase shifts, inelastic scattering angular distributions, neutron energy spectra at fixed energy and emission angle.

Toward a new utilization system of nuclear databases with the Webble World was discussed by T. Oogi (JCPRG, Hokkaido University). His presentation was consisted with the development of Webble World software, which is mainly developed by MML researchers using the Microsoft Visual Studio 2010 Professional.

A. Makinga (JCPRG, Hokkaido University) presented about instruction of new web site of JCPRG, NRDF/A, activities of nuclear data experiments at Hokkaido University such as: photon/neutron activation analysis, photon/neutron transmission and photon scattering with different target.

The fourth session of the Workshop was started by discussion of the collaboration between two centers, compilation of proceedings, unpublished experimental data and the collaboration of experiments by linear accelerator of Hokkaido University.

The closing remarks was presented by M. Aikawa after the discussion.

### **3 Summary**

The RIBF ULIC mini-Workshop was successfully held in RIKEN. Total 15 participants joined the mini-workshop on the Nuclear reaction database of unstable nuclei beam experiments and its application.

### **Acknowledgement**

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## Annex. I

### List of Participants

NAME	AFFILIATION
M. Aikawa	Nuclear Reaction Data Centre, Hokkaido University
M. Fujimoto	Meme Media Laboratory, Hokkaido University
N. Furutachi	Nuclear Reaction Data Centre, Hokkaido University
D. Ichinkhorloo	Meme Media Laboratory, Hokkaido University
K. Kato	Nuclear Reaction Data Centre, Hokkaido University
H. Kohama	Nishina Center, RIKEN
S. Kubono	Nishina Center, RIKEN
A. Makinaga	Nuclear Reaction Data Centre, Hokkaido University
T. Nakatsukasa	Nishina Center, RIKEN
S. Nishimura	Nishina Center, RIKEN
M. Odsuren	Meme Media Laboratory, Hokkaido University
T. Oogi	Meme Media Laboratory, Hokkaido University
H. Otsu	Nishina Center, RIKEN
T. Sanami	KEK, University of Tokyo
M. Takashina	Osaka University

## Annex. II

### PROGRAM

10:00-10:05	Opening	Sakurai Hiroyoshi (RIKEN Nishina Center)
	Session-I	Chairperson
10:05-10:55	RIKEN-JCPRG collaboration: Current status and its problem	Kato Kiyoshi (Hokkaido University)
10:05-10:30	The research collaboration between RIKEN Nishina Center and Hokkaido University Nuclear Reaction Data Centre (JCPRG): A case of JCPRG	Aikawa Masayuki (Hokkaido University)
10:30-10:55	Collaboration “Study for advanced application of RIBF nuclear reaction data” Effort at RIKEN	Kohama Akihisa (RIKEN Nishina Center)
	Session-II	Chairperson
10:55-11:45	Report of the RIKEN Activity	Fujimoto Masayuki (Hokkaido University)
10:55-11:20	Current status and future plan of RIBF experiments	Otsu Hideaki (RIKEN Nishina Center)
11:20-11:45	Harvest of decay properties foreseen in coming five years	Nishimura Shunji (RIKEN Nishina Center)
11:45-13:20	Lunch	
	Session-III	Chairperson
13:20-15:25	Nuclear Data Application	Otsu Hideaki (RIKEN Nishina Center)
13:20-13:45	Particle simulations in medicine and nuclear reactions	Takashina Masaaki (Osaka University)
13:45-14:10	Current status and tasks of evaluation activities in JCPRG	Furutachi Naoya (Hokkaido University)
14:10-14:35	Analysis of ${}^6,{}^7\text{Li}+n$ reaction using CDCC method	Dagvadorj Ichinkhorloo (Hokkaido University)
14:35-15:00	Toward a new utilization system of nuclear databases with the Webble World	Oogi Taira (Hokkaido University)
15:00-15:25	Nuclear transformation and nuclear data	Makinaga Ayano (Hokkaido University)
15:25-15:40	Coffee Break	
	Session-IV	Chairperson
15:40-16:40	Discussion	Aikawa Masayuki (Hokkaido University)
15:40-16:40	Closing remarks	Aikawa Masayuki (Hokkaido University)