

Summary Report of the mini-Workshop on the “Problems and Future Development of the Experimental Data Compilation of Unstable Nuclei Beam Experiments”

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Abstract

This document summarizes the contents of the mini-Workshop on processing of development of the experimental data compilation of unstable beam experiments. A short description of the main topics, the list of participants and comments are given.

1 Introduction

The User Liaison and Industrial Cooperation Group (ULIC), RIKEN Nishina Center for Accelerator-Based Science supported a mini-Workshop on processing of development of the experimental data compilation of unstable beam experiments. The mini-Workshop took place at conference hall, RIBF building, RIKEN Nishina Centre during 13-14 December, 2011.

2 Background

Development of a knowledge base and providing accurate description of the basic nuclear interactions is a fundamental and central part of the evolution of nuclear science and technology. It is a part of the inevitable necessity of knowledge sharing on nuclear data for various applications in nuclear physics.

“Nuclear reaction data” have been a crucial resource in nuclear technology (e.g., fission, fusion energy and medical diagnostics) as well as science (e.g., nuclear physics, astro-physics, nuclear chemistry and earth science). The numerical data describe quantitatively the physical properties of atomic nuclei and the fundamental physical relationships governing their interactions, there by characterizing the physical processes underlying all nuclear technologies. Generation and proper use of nuclear data comprising measurement and evaluation of recommended values of accurate nuclear

data belong to cutting-edge science and form an important component of basic nuclear physics. Various reaction models have been developed based on nuclear theory and phenomenology, and they have been verified by experimental nuclear reaction data and utilized for revision of evaluated nuclear reaction data.

Hokkaido University Nuclear Reaction Data Centre (JCPRG) compiles and accumulates charged-particle nuclear reaction data obtained in Japanese facilities in their own data format (NRDF: Nuclear Reaction Data File) which are distributed through the internet. A part of compiled files is translated to the EXFOR format for the transmission of the experimental nuclear reaction data between national and international nuclear data centers for the benefits of nuclear data users in all countries.

This report here presents an overview on the progress of the research collaboration between RIKEN Nishina Centre and JCPRG.

3 Objectives and Main Topics of the Workshop

The purpose of this mini-Workshop is to know the current status of the research collaboration and discuss the possible efforts and ways to make this collaboration more deepen. The research collaboration between RIKEN Nishina Center and Hokkaido University Nuclear Reaction Data Centre (JCPRG) is in the second year and has to be developed further.

Participants, each of whom is a user, an experimentalist or a compiler of nuclear data, have discussed the future collaboration focusing on the compilation and evaluation of nuclear reaction data produced in RIKEN. The objective of this workshop was to familiarize the participants to different problems and future development of the experimental data compilation of unstable nuclei beam experiments.

The main topics of discussion in this mini-Workshop are:

- (i) Different type of problems occurs in the time of compilation.
- (ii) The future developments of compiling the data of unstable nuclei beam experiments.
- (iii) Discussion on the astrophysical nuclear reaction and their compilation.

In the mini-Workshop, there were eight presentations in total, five from JCPRG (including a former member) and three from RIKEN Nishina Center. From these presentations, we learnt alot about the recent activities of nuclear reaction experiments and theoretical research held in RIKEN and the nuclear data compilation in JCPRG.

The presentations covered the topics as detailed below:

- a) The topic covered on the current situation and the various issues of the experimental data to the database and advance use in the research
 - Nuclear structure reactions around threshold energy regions are discussed by Kiyoshi Kato from Hokkaido University.

- The description about the RIKEN RIBF 2010 mini-Workshop and the subsequent progress is discussed by Kosuke Tsubakihara from Hokkaido University.
 - The current situation of RIKEN data compilation and challenges standing in the times of compilation is discussed by Naoya Furutachi from Hokkaido University.
- b) The topic covered on the description of recent RIKEN activities
- Systematic provision of RIBF data and its issues are presented by the Akihisa Kohama from the RIKEN Nishina Center.
 - Possibility of nuclear data researches in RIBF is discussed by Hideaki Otsu from the RIKEN Nishina Center.
 - Treatment of proton elastic scattering data is discussed by Juzo Zenihiro from the RIKEN Nishina Center.
- c) The topic covered on the Future Development of the above mention activities
- Data evaluation for astrophysical nuclear reactions (NRDF/A) using cluster orbital shell model (COSM) adopted the Gamow state is discussed by Kazuyuki Yamamoto from Hokkaido University.
 - The astrophysical nuclear reactions database NRDF/A development – compiled from the experimental system and there issues are discussed by Ayano Makinaga from the Hokkaido University.
 - Evaluation of differential cross sections of nucleon-nucleus scattering using the continuum-discretized coupled-channels (CDCC) method is discussed by Takuma Matsumoto from Kyushu University.

Some presentations are based on the compilation work and the information about the software used in compilation such as HENDEL and GSYS. There were also discussions on the quality of good numerical data, problems which can be faced in the compilation of the numerical data, and the methods to sort out them. These discussions were very helpful to us to propose a procedure to receive experimental information and numerical data from RIKEN.

4 Summary

As a result of discussion in mini-Workshop on problems and future development of the experimental data compilation of unstable nuclei beam experiment, we could propose a procedure to deliver experimental information and numerical data from RIKEN to JCPRG. In addition, the consensus within the participants about compilation of proceeding, doctoral thesis and unpublished experimental data has been reached. We will develop our collaboration in line with the discussion.

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 and the support by the collaboration project between Faculty of Science, Hokkaido University and RIKEN.

Table 1: List of Participants

NAME	AFFILIATION
A. Kohama	RIKEN Nishina Center
T. Nakatsukasa	RIKEN Nishina Center
T. Uesaka	RIKEN Nishina Center
T. Tsubakihara	Hokkaido Univ.
Y. Abe	Osaka Univ.
M. Kimura	Hokkaido Univ.
M. Aikawa	Hokkaido Univ.
Vidya Devi	Hokkaido Univ.
J. Zenihiro	RIKEN Nishina Center
T. Matsumoto	Kyushu Univ.
M. Odsuren	Hokkaido Univ.
K. Yamamoto	Hokkaido Univ.
A. Makinaga	Hokkaido Univ.
H. Sakurai	RIKEN Nishina Center
K. Kato	Hokkaido Univ.
N. Furutachi	Hokkaido Univ.
H. Otsu	RIKEN Nishina Center
T. Motobayashi	RIKEN Nishina Center

Table 2: Programme

12月13日

15:00-17:00 連携の現状・課題について

- Nuclear Structures and Reactions around Threshold Energy Regions
加藤幾芳 (北大理)
- 2010年度理研 RIBF ミニワークショップとその後の進展について
椿原康介 (北大知識メディア)
- JCPRG における理研データ採録の現状と課題
古立直也 (北大理)
- 陽子弾性散乱測定データの取り扱いについて
銭廣十三 (理研仁科センター)

12月14日

10:00-10:40 理研の活動

- RIBF データの系統的提供と課題
小濱洋央 (理研仁科センター)
- RIBF での核データ研究の可能性
大津秀暁 (理研仁科センター)

10:40-11:00 休憩

11:00-12:30 今後の発展

- Gamow 状態を取り入れた COSM による天体核反応データ評価 (NRDF/A)
山本一幸 (北大知識メディア)
- 天体核反応データベース NRDF/A の開発 -実験系から見た採録の課題-
牧永あや乃 (北大知識メディア)
- 離散化チャネル結合法による核子-軽核散乱の微分断面積の評価
松本琢磨 (九大理)

12:30-13:30 昼食

13:30-15:00 ディスカッション