

# RIBF ULIC Symposium/mini-WS Report

\* English only

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Title	[RIBF-ULIC-miniWS-028] An investigation into multi-neutron detection via NEBULA and new neutron detectors		
Date	Oct. 10 – 11, 2013		
Place	Room 306, RIBF bldg., RIKEN Nishina Center		
Language	[ ] English [ x ] Japanese		
HP address	https://indico2.riken.jp/indico/conferenceDisplay.py?confId=1311		
Contact Person(s) (Name, Affiliation)	Yukie Maeda (U. of Miyazaki), Yosuke Kondo (Tokyo Tech), Masaki Sasano (RNC)		

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	[Breakdown] Travel expense and Accommodation fee Yukie Maeda: 51,440 JPY Shuhei Gotanda: 27,020 Yoshihisa Kanaya: 48,440 JPY		
Co-hosting / any financial support from other organization(s)		-	

## Summary of discussions and its (expected) results:

The neutron detector array NEBULA is a key element associated with the SAMURAI facility at RIBF, which is constructed to measure the four momentum vectors of fast neutrons with large acceptance and high efficiency. It is necessary to simulate multi-neutron (3n or 4n) detection with high-resolution or high-efficiency with using NEBULA in various configurations or a combination between NEBULA and other neutron detectors because various experimental plans are proposed recently.

This mini-workshop was consists of 3 parts as follows;

1. Tutorial of NEBULA simulator (C++ program based on Geant4 tool kit with ROOT libraries).
2. Report on the latest result of analysis of cross-talk events of NEBULA.
3. How to improve and develop NEBULA simulator to support multi-neutron detections for future proposals.

In session 1, all participants installed NEBULA simulator (smsimulator which can be downloaded from <http://be.nucl.ap.titech.ac.jp/~nebula/simulator.php>) in their PC and learn how to use and improve it for their own requirements. In session 2, the latest results of the analysis of 7Li(p,n) data of Day-1 experiment were presented and quantitative analysis of how to reject cross-talk events in the 1n-measurement were made. In session 3, we discussed about how to improve the original smsimulator concretely to simulate multi-neutron detection with regarding cross-talk events. And we exchanged opinions about correspondence between smsimulator with ANAROOT and about what physical models are good enough for multi-neutron detection simulator. On the basis of these discussions on 10<sup>th</sup>, we actually upgraded original smsimulator to estimate cross-talk events in 1n detection measurement and we compare the simulated result and the data. We successfully reproduced the character of analyzed Day-1 data, so we will continuously upgrade the smsimulator in cooperation.

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Please attach other documents as needed.