RCNP EXPERIMENT E

PROPOSAL FOR EXPERIMENT AT RCNP

30 September 2022

TITLE:
Searching for highly-excited pair vibration modes in ^{118}Sn using alpha-induced pair-transfer reactions

SPOKESPERSON:

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EXPERIMENTAL GROUP:

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S. Shimoura	RIKEN Nishina Center	Researcher
M. Matsuo (Theory)	Department of Physics, Niigata University	Professor
K. Yoshida (Theory)	Department of Physics, Kyoto University	Assistant Professor

RUNNING TIME:

Installation time without beam	3.0 days
Startup and Calibration	1.5 days
Data runs for $(\alpha, {}^6\mathrm{He})$	4.0 days
Data runs for elastic scattering	1.0 day
Changing angles and magnetic fields	0.5 days

BEAM LINE: AVF : WS course

BEAM REQUIREMENTS:

Type of particle	^{4}He
Beam energy	100, 80, and 60 MeV
Beam intensity	500 enA
Any other requirements	energy spread $\lesssim$ 100 keV, halo-free, small emittance

BUDGET:

$\mathrm{He}(50\%) + \mathrm{CH_4}(50\%)$ gas (2 full bottles)	60k yen $\times$ 2
Normal He gas (4 full bottles)	20k yen $\times$ 4
Total	200k yen

TITLE:
Searching for highly-excited pair vibration modes in ^{118}Sn using alpha-induced pair-transfer reactions

SPOKESPERSON: Masanori Dozono and Shinsuke Ota

SUMMARY OF THE PROPOSAL

The proposed experiment aims to search for highly-excited pair vabiration modes in ^{118}Sn to study the property of pair correlations in nuclei and nuclear matters. Encouraged by the test experiment at CYRIC in Tohoku University, the $(\alpha, ^6\mathrm{He})$ reaction is used as a tool to explore high-lying pairing states. In this experiment, we measure cross sections for the $^{120}\mathrm{Sn}(\alpha, ^6\mathrm{He})^{118}\mathrm{Sn}$ reaction at an angular range of $\theta_{\mathrm{lab}} = 1.5^\circ - 17^\circ$ where the angular distributions are characteristic of different multipolarities. The incident energy of 100 MeV is selected to satisfy the $\Delta L = 0$ matching condition at $E_x \sim 14$ MeV in ^{118}Sn. The multipole decomposition analysis is applied to identify the $L = 0$ pair vibration states. For the reaction study, we measure the cross sections for low-lying states at two different beam energies of 80 and 60 MeV. The results will be compared with the existing (p, t) data and theoretical calculations to clarify the reaction mechanisms.