RCNP EXPERIMENT E202

PROPOSAL FOR EXPERIMENT AT RCNP

27 January, 2003

TITLE: Search for alpha cluster excitation in ^{6,7}Li

SPOKESPERSON:

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EXPERIMENTAL GROUP:

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Kosuke NAKANISI	RCNP, Osaka University	M2
Masaru YOSOI	Dept. of Physics, Kyoto University	Research Associate
M.B. GREENFIELD	Dept. of Physics, ICU	Professor

RUNNING TIME:

Total running time not including beam preparation — 3 days

BEAM LINE:

WS-course, Grand RAIDEN

BEAM REQUIREMENTS:

Type of particle	proton
Beam energy	300 MeV
Beam intensity	$\sim$ 10 nA
Other requirements	Energy resolution $\sim$ 150 keV
	Beam must be halo-free
	Energy stability over experimental run is required

BUDGET:

Travel plans - 11 participants should be supported by RCNP

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SUMMARY OF THE PROPOSAL

The present work aims at the search for the excited α-cluster states (the giant dipole resonance and spin dipole resonance of an α-cluster) expected to locate at $E_x \approx$ 27 MeV in ^{6,7}Li by using the (p,p) reaction. Analogs of these states have been found by Nakayama et al., at the first time, in ^{6,7}He by using the (^{7}Li,^{7}Be) reaction at RCNP. They observed resonance at Q≈-30 MeV in the excitation energy spectra for ^{6,7}He with the spin-flip and spin-nonflip transitions. Based on the observed location, width, shapes, ΔL and ΔS of these resonance, they concluded that the observed resonance are the analogs of the excited α-cluster states in ^{6,7}Li. In the E172-experiment, we confirmed existence of their analogs in ^{6,7}Be by using the (^{3}He,t) reaction at 450 MeV and at a forward angular region. In the parent nuclei, i.e., ^{6,7}Li, however, no such high-lying states have been reported. To confirm existence of the excited α-cluster states in ^{6,7}Li, we propose a singles experiment of the ^{6,7}Li(p,p) reaction at 300 MeV. Since this reaction has an advantage to excite the isovector resonance, the Giant dipole resoance and spin dipole resonance of an α-cluster in ^{6,7}Li are possibly excited.