RCNP EXPERIMENT E202

PROPOSAL FOR EXPERIMENT AT RCNP

27 January, 2003

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

SPOKESPERSON:

Tamio YAMAGATA
Professor of Physics
Department of Physics, Konan University, Kobe 658-8501
e-mail: yamagata@center.konan-u.ac.jp
TEL: 078-435-2469
FAX: 078-435-2539

EXPERIMENTAL GROUP:

Hiroaki UTSUNOMIYA	Dept. of Physics, Konan University	Professor
Hidetoshi AKIMUNE	Dept. of Physics, Konan University	Associate Professor
Kaoru YAMASAKI HARA	Dept. of Physics, Konan University	D3
Shintaro NAKAYAMA	Dept. of Physics, Univ. of Tokushima	Professor
Ken-ichi FUSHIMI	Dept. of Physics, Univ. of Tokushima	Associate Professor
Yuko MATSUI	Dept. of Physics, Univ. of Tokushima	M1
Minoru SAKAMA	Rad. Sci. Eng., Univ. of Tokushima	Research Associate
Masayoshi TANAKA	Kobe Tokiwa Jr. College	Professor
Mamoru FUJIWARA	RCNP, Osaka University	Associate Professor
Keigo HARA	RCNP, Osaka University	D3
Keigo KAWASE	RCNP, Osaka University	M2
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.