RCNP EXPERIMENT E184

PROPOSAL FOR EXPERIMENT AT RCNP

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TITLE: Search for tri-nucleon cluster structure in ^{6}Li

SPOKESPERSON:

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EXPERIMENTAL GROUP:

Kenichi FUSHIMI	Dept. of Physics, Univ. of Tokushima	Associate Professor
Kayoko ICHIHARA	Dept. of Physics, Univ. of Tokushima	M1
Tamio YAMAGATA	Dept. of Physics, Konan University	Professor
Hiroaki UTSUNOMIYA	Dept. of Physics, Konan University	Professor
Hidetoshi AKIMUNE	Dept. of Physics, Konan University	Lecturer
Kaoru YAMASAKI	Dept. of Physics, Konan University	D2
Masayoshi TANAKA	Kobe Tokiwa Jr. College	Professor
Mamoru FUJIWARA	RCNP, Osaka University	Associate Professor
Keigo HARA	RCNP, Osaka University	D2
Kousuke NAKANISHI	RCNP, Osaka University	M1
Keigo KAWASE	RCNP, Osaka University	M1
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 4 days

BEAM LINE:

WS-course, Grand RAIDEN, NaI(Tl) and Si detectors

BEAM REQUIREMENTS:

Type of particle	$^3He^{2+}$
Beam energy	450 MeV
Beam intensity	a few tens nA
Target	^{7}Li, ^{12}C
Other requirements	Energy resolution $\sim$ 300 keV

Beam must be halo-free and stability over several days is required

BUDGET:

Experimental expenses 4,000,000 yen

Travel plans - 10 participants should be supported by RCNP

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SUMMARY OF THE PROPOSAL

We aim at searching for a tri-nucleon cluster-structure in ^{6}Li by using the ^{7}Li(^{3}He,α) reaction at 450 MeV. We will measure the followings; (1) angular distributions of singles spectra at $\theta \leq 5^{\circ}$ and (2) charged particles (p, d, t, ^{3}He and α) and γ-rays decaying from excited states of ^{6}Li.

In the E164-experiment, a di-triton cluster-structure in ^{6}He was identified in the (^{7}Li,^{7}Be) reaction on ^{6}Li. This shows for the first time an existence of a triton-triton cluster-structure in ^{6}He. Based on the isobaric invariance, we suppose that the state with the tri-nucleon cluster-structure (t+^{3}He) in ^{6}Li should exist at around an excitation energy with the same mass-excess in ^{6}He. To confirm this expectation, we propose singles and coincidence measurements in the ^{7}Li(^{3}He,α) reaction at 450 MeV.