RCNP EXPERIMENT E332

PROPOSAL FOR EXPERIMENT AT RCNP

22 January 2009

TITLE:
Spectroscopy of ^{13,14}B via Transfer Reactions:
Probing the Structures of Low-lying States.

SPOKESPERSON:

Full Name	Hooi Jin ONG
Institution	Cosmonuclear Physics Division, RCNP, Osaka University
Title or Position	Assistant Professor
Address	10-1 Mihogaoka, Ibaraki-shi, Osaka 567-0047, Japan.
Phone number	+81-6-6879-8919
FAX number	+81-6-6879-8899
E-mail	onghjin@rcnp.osaka-u.ac.jp

Full Name	Isao TANIHATA
Institution	Cosmonuclear Physics Division, RCNP, Osaka University
Title or Position	Professor
Address	10-1 Mihogaoka, Ibaraki-shi, Osaka 567-0047, Japan.
Phone number	+81-6-6879-8918
FAX number	+81-6-6879-8899
E-mail	tanihata@rcnp.osaka-u.ac.jp

EXPERIMENTAL GROUP:

Name	Institution	Title or Position
H. SAKAGUCHI	Dep. of Applied Physics, Miyazaki Univ.	Professor
S. SHIMOURA	CNS, Univ. of Tokyo	Professor
T. KAWABATA	CNS, Univ. of Tokyo	Assistant Professor
S. OTA	CNS, Univ. of Tokyo	Research Associate
T. SHIMODA	Dep. of Physics, Osaka Univ.	Professor
K. MATSUTA	Dep. of Physics, Osaka Univ.	Associate Professor
M. FUKUDA	Dep. of Physics, Osaka Univ.	Associate Professor
A. ODAHARA	Dep. of Physics, Osaka Univ.	Associate Professor
M. MIHARA	Dep. of Physics, Osaka Univ.	Assistant Professor
D. NISHIMURA	Dep. of Physics, Osaka Univ.	D1
H. OKAMURA	RCNP	Professor
A. TAMII	RCNP	Associate Professor
T. SUZUKI	RCNP	Researcher
J. ZENIHIRO	RCNP	Research Associate
H. MATSUBARA	RCNP	D3
K. HIROTA	RCNP	M1

THEORETICAL GROUP:

Name	Institution	Title or Position
Y. SAKURAGI	Osaka City Univ.	Professor
M. TAKASHINA	RCNP	Researcher

RUNNING TIME:

Secondary beam tuning + contingency 1.5+0.5 days

^{13}B(p,d) reaction run	2.0 days
^{13}B(d,p) reaction run	3.0 days
Background measurements	2.0 days
Elastic scattering measurements	1.0 day
Total	**10.0 days**

BEAM LINE: **Ring : EN course.**

BEAM REQUIREMENTS:

Type of particle	^{15}**N**
Beam energy	**64 MeV/nucleon**
Beam intensity	$\geq$ **40 pnA (200 pnA if possible)**

OTHER REQUIREMENTS:

None.

BUDGET:

Development of 150 mm $\times$ 40 mm $\times$ 0.1 mm strip plastic scintillation detector with 1.5-mm pitch at F1 **1,000 kyen**

Travelling expenses including accommodation of 4 participants are to be provided by RCNP

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SPOKESPERSON: Hooi Jin ONG, Isao TANIHATA

SUMMARY OF THE PROPOSAL

We propose measurements of (p,d) and (d,p) reactions on ^{13}B in inverse kinematics using ^{13}B beam at 25 MeV/nucleon to study the structure of the low-lying states in ^{13,14}B. The experiment will be performed at the RCNP secondary beam line (the EN course). The main objective is to determine the magnitudes of the $0p_{1/2}$ and $1s_{1/2}$ components in the ground state of ^{13}B, as well as in the low-lying states of ^{14}B, by measuring the spectroscopic factors for the states populated in each reaction,

The (p,d) and the (d,p) measurements will be performed using polyethylene (CH_2) and CD_2 foils. Measurements with thin carbon foil target will also be performed to estimate the backgrounds due to the reaction with the carbon nucleus. To determine the optical potentials for use in the DWBA calculations, measurements of elastic scattering of deuteron on ^{12}B and proton on ^{14}B will also be performed. The outgoing ^{12,14}B will be measured using a ΔE-E plastic hodoscope. The recoil deuterons (protons) will be measured in coincident with the ^{12}B (^{14}B) by an array of telescopes consisting of silicon (ΔE) and CsI (E) detectors.

Based on the cross sections calculated by DWBA calculations, the beam time neccessary for the measurements of the (p,d) and (d,p) reactions is proposed.