

E396

PROPOSAL FOR EXPERIMENT AT RCNP

18 July 2012

TITLE:

**Measurement of (p,d) reaction at forward angles:
Studying possible effect of tensor interactions in nuclei**

SPOKESPERSONS:

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
E-mail onghjin@rcnp.osaka-u.ac.jp

Full Name Satoru TERASHIMA
Institution Beihang Univ.
Title or Position Research Associate
Address Xueyuan Road 37, Haidian Dist., Beijing, China.
Phone number +86-8231-7935
E-mail tera@buaa.edu.cn

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
E-mail tanihata@rcnp.osaka-u.ac.jp

EXPERIMENTAL GROUP:

Name	Institution	Title or Position
N. AOI	RCNP	Professor
T. HASHIMOTO	RCNP	Assistant Professor
K. MIKI	RCNP	Researcher
H. SAKAGUCHI	RCNP	Guest Scientist
A. TAMII	RCNP	Associate Professor
J. TANAKA	RCNP	Ph.D Student
T. YAMAMOTO	RCNP	Master's Student
M. FUKUDA	Department of Physics, Osaka Univ., Japan	Associate Professor
K. MATSUTA	Department of Physics, Osaka Univ., Japan	Associate Professor
M. MIHARA	Department of Physics, Osaka Univ., Japan	Assistant Professor
D. NISHIMURA	Department of Physics, Tokyo Univ. of Science, Japan	Assistant Professor
A. OZAWA	Tsukuba Univ.	Associate Professor
X. Y. LE	Beihang Univ.	Professor
L. H. ZHU	Beihang Univ.	Professor
B. H. SUN	Beihang Univ.	Associate Professor
G. L. ZHANG	Beihang Univ.	Associate Professor
T. F. WANG	Beihang Univ.	Lecturer
C. L. GUO	Beihang Univ.	Ph.D Student
W. W. QU	Beihang Univ.	Ph.D Student
L. YU	Beihang Univ.	Ph.D Student
H. MATSUBARA	RIKEN	Special Postdoctoral Researcher
J. ZENIHIRO	RIKEN	Researcher
T. KAWABATA	Kyoto Univ.	Associate Professor
Y. MATSUDA	Kyoto Univ.	Researcher

RUNNING TIME: GR set up and tuning 1 day
(p,d) reaction runs for three energies 4.5+0.5 days

BEAM LINE: Ring : WS beam line and Grand Raiden Spectrometer.

BEAM REQUIREMENTS: Type of particle p
Beam energy 198, 295 and 392 MeV
Beam intensity 10 nA
Single turn and halo-free beam
Achromatic beam providing resolution ≤ 100 keV
Dispersive beam providing resolution ~ 50 keV

OTHER REQUIREMENTS:

BUDGET: Experimental expenses 200,000 Yen
Local travel expenses for collaborators from abroad as well as
from other Japanese institutes.

TITLE:

**Measurement of (p,d) reaction at forward angles:
Studying possible effect of tensor interactions in nuclei**

SPOKESPERSON: Hooi Jin ONG, Satoru TERASHIMA, Isao TANIHATA

SUMMARY OF THE PROPOSAL

Measurement of (p,d) reactions at forward deuteron-scattering angle on ^{12}C and ^{16}O targets using proton beams at 198 MeV, 295 MeV and 392 MeV are proposed as an extension of our previous experiment (RCNP-E314 experiment) to study the possible effect of tensor interactions in high-momentum component in nuclei. The experiment will be performed using the Grand Raiden spectrometer at 0 degree as well as at several small angles. Better quality achromatic proton beams are requested to achieve an energy resolution below 100 keV (FWHM) in the residual nucleus excitation energy spectrum. To determine the systematic error due to the partially unresolved states, measurements with dispersive beams are also proposed.

The present experiment aims

- (a) to examine quantitatively any possible effect of reaction mechanisms on the previous (p,d) reaction measurements at angles greater than or equal to 10 degrees, and
- (b) to resolve the doublet excited ($1/2^+$ and $5/2^+$) states in ^{15}O so as to enable quantitative discussions.

For these purpose, energy spectra up to about 20 MeV, with resolution below 100 keV (achromatic mode) and 50 keV (dispersive mode) sufficient to separate the $1/2^+$ and $5/2^+$ states in ^{15}O , will be measured. The cross sections populating several low-lying excited states as well as the ground state will be determined. The $^{12}\text{C}(p,d)$ measurement will be used mainly to subtract the background due to the ^{12}C contaminant in the ^{16}O target.

Based on the data from the previous experiment, we would like to request beam time of 1.5 days for measurements with each energy. In addition to the time for setting up the detector system, beam tuning and 0.5 day for contingency purpose, a total beam time of 6 days is requested.