RCNP EXPERIMENT E157

PROPOSAL FOR EXPERIMENT AT RCNP

28 August 2000

Study of the Spin Dependent ^{3}He-Nucleus Interaction at 450 and 300 MeV

Spokesperson:

Name	Junichiro Kamiya	Name	Kichiji Hatanaka
Institution	RCNP, Osaka University	Institution	RCNP, Osaka University
Title	Doctor course student	Title	Professor
Address	10-1, Mihogaoka, Ibaraki, Osaka 567-0047	Address	10-1, Mihogaoka, Ibaraki, Osaka 567-0047
Phone number	+81-6-6879-8935	Phone number	+81-6-6879-8928
FAX number	+81-6-6879-8899	FAX number	+81-6-6879-8899
E-mail	kamiya@rcnp.osaka-u.ac.jp	E-mail	hatanaka@rcnp.osaka-u.ac.jp

EXPERIMENTAL GROUP:

Name	Institution	Title or Position
T. Noro	RCNP, Osaka University	AP
M. Yosoi	RCNP, Osaka University	RA
T. Wakasa	RCNP, Osaka University	RA
H. Yoshida	RCNP, Osaka University	D3
E. Obayashi	RCNP, Osaka University	D2
D. Hirooka	RCNP, Osaka University	M2
Y. Kitamura	RCNP, Osaka University	M1
Y. Shimizu	RCNP, Osaka University	M1
H. Sakaguchi	Department of Physics, Kyoto University	AP
T. Kawabata	Department of Physics, Kyoto University	D3
M. Uchida	Department of Physics, Kyoto University	D1
Y. Yasuda	Department of Physics, Kyoto University	M2

RUNNING TIME: 14 days
BEAM LINE: Ring: WS course, Grand Raiden

BEAM REQUIREMENTS:

Type of Particle	^{3}He
Beam Energy	450, 300 MeV
Beam Intensity	1 - 50 pnA
Energy Resolution	$\leq$ 200 keV

BUDGET:

Experimental expenses	2,500,000

Study of the Spin Dependent ^{3}He-Nucleus Interaction at 450 and 300 MeV

SPOKESPERSON: Junichiro Kamiya, Kichiji Hatanaka

SUMMARY OF THE PROPOSAL

Interactions between complex nuclei are most fundumental subjects in nuclear physics and many studies have been performed both experimentally and theoretically. The spin dependence of the nucleus-nucleus interaction is of special interest because it closly related to the nuclear strucure and reaction mechanism as well as to the spin dependence of the interaction between constituent particles. There have been intensive studies on spin dependent deuteron-nucleus interactions and continuum-discretized coupled-channels(CDCC) calculations have shown that the breakup effect is the key to understanding the experimental data, since a strong coupling appears betwen the elastic channel and breakup channels.

Study of the spin dependent interaction between ^{3}He and nuclei at intermediate energy region is especially interesting because the reaction mechanism is simple. There are theoretical investigations based on folding models which is a starting point to understand the ^{3}He-nucleus interaction microscopically. They employed two types of folding models, the single-folding model and the double-folding model, which predict the ^{3}He-nucleus central and spin-orbit potentials. They could obtain precise fits to the cross section data by renormalizing the central components of the folding potentials. The folding spin-orbit potential predicts large value of the analyzing power for the ^{3}He elastic scattering. Ths spin-orbit potential has also a large effect on the cross section in a wide range of the scattering angle. This effect is significant enough to affect the results of the optical-model analysis of the cross section data using the central potential alone. It is strongly demanded to measure the polarization observables of ^{3}He-nucleus collisions in order to understand ^{3}He-nucleus interactions and raction mechanisms.

In this experiment, we measure the angular distribution of the polarization for ^{3}He elastic scattering off ^{12}C, ^{58}Ni and ^{208}Pb at 450 and 300 MeV. Angular range covers from 5° to 20°(25° for ^{12}C) in the center of mass system, where it is possible to distingush predictions by two folding models(SF and DF) and obtain the spin-orbit potential in the optical model.