RCNP EXPERIMENT E302

PROPOSAL FOR EXPERIMENT AT RCNP

February 5, 2007

TITLE:
High resolution study of the ^{150}Nd(^{3}He,t) reaction at 140 MeV/nucleon

SPOKESPERSON:

Name	Remco Zegers	Carol Guess
Institution	NSCL, Michigan State University	
Title or Position	Assistant Professor	PhD. Student
Address	East Lansing, MI 48823, USA	
Phone number	+1-517-333-6473	+1-517-333-6416
FAX number	+1-517-353-5967	+1-517-353-5967
E-mail	zegers@nscl.msu.edu	guess@nscl.msu.edu

EXPERIMENTAL GROUP:

Full Name	Institution	Title or Position
T. Adachi	RCNP, Osaka University	(PD)
H. Akimune	Konan University	(AP)
Sam Austin	NSCL, Michigan State University	(P)
D. Bazin	NSCL, Michigan State University	(Staff Physicist)
H. Dohmann	IKP, University of Münster	(PhD. Student)
M. Dozono	Kyusyu University	(M2)
H. Ejiri	RCNP, Osaka University & ICU, Tokyo	(P. Em.)
D. Frekers	IKP, University of Münster	(P)
K. Fujita	RCNP, Osaka University	(D3)
Y. Fujita	Osaka University	(AP)
M. Fujiwara	RCNP, Osaka University	(AP)
E-W. Grewe	IKP, University of Münster	(PhD. Student)
K. Hatanaka	RCNP, Osaka University	(P)
M.N. Harakeh	KVI, Groningen University	(P)
W. Hitt	NSCL, Michigan State University	(PhD. Student)
S. Hollstein	IKP, University of Münster	(PhD. Student)
E. Ihara	Kyusyu University	(M1)
R. Meharchand	NSCL, Michigan State University	(PhD. Student)
H. Okamura	RCNP, Osaka University	(P)
L. Popescu	KVI, Groningen University	(PD)
Y. Sakemi	CYRIC, Tohoku University	(P)
Y. Shimbara	NSCL, Michigan University	(PD)
Y. Shimizu	RCNP, Osaka University	(PD)
Y. Tameshige	RCNP, Osaka University	(D3)
J.H. Thies	IKP, University of Münster	(PhD. Student)
H. Wörtche	KVI, Groningen University	(AP)
M. Yosoi	RCNP, Osaka University	(AP)

RUNNING TIME:	sieve-slit measurements	0.5 shifts
	beam tuning time	3 days
	Data runs	9.5 shifts
BEAM LINE:		Ring : WS course

BEAM REQUIREMENTS:

	Type of particle	$^{3}He^{2+}$
	Beam energy	420 MeV
	Beam intensity	$\geq$ 10-20 nA
	Any other requirements	$\Delta E \leq 100$keV
		small emittance
BUDGET:	Experimental expenses	Vacuum transporter of ^{150}Nd target

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SUMMARY OF THE PROPOSAL

We propose to measure the multipole strength distribution in ^{150}Pm via the ^{150}Nd(^{3}He,t) reaction at 140 MeV/nucleon, focusing on extracting the Gamow-Teller, spin-dipole and quadrupole components. There are two main motivations to study these reactions:

1. ^{150}Nd is one of the candidates for neutrinoless double beta decay (to ^{150}Sm), and of the possible candidates it has the largest expected nuclear sensitivity. However, virtually no experimental data is available on the intermediate nucleus (^{150}Pm). Such information is of vital importance for testing the theoretical calculations, which are used for designing future double-beta decay experiments and, if they are successful, to determine the effective neutrino mass.

2. To study the isovector multipole response of heavy deformed nuclei. Most of the experimental information available on the excitation of giant resonances via charge-exchange reaction is from experiments on spherical nuclei. With the advent of fast-beam facilities focusing on experiments with unstable beams and, therefore, often strongly deformed nuclei, the need for detailed studies on stable nuclei is pressing.

The data gathered in this experiment are to be combined with results from a ^{150}Sm(t,^{3}He) experiment at the NSCL, which has already been accepted by the NSCL Program Advisory Committee.