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:

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EXPERIMENTAL GROUP:

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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	$\Delta E \leq 100keV$
		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.