

PROPOSAL FOR EXPERIMENT AT RCNP

6 February 2017

TITLE:**Effect of nuclear ground-state deformation on $L \leq 3$ isoscalar giant resonances in Nd isotopes****SPOKESPERSONS:**

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EXPERIMENTAL GROUP:

Name	Institution	Title or Position
M. Fujiwara	RCNP, Osaka University	Professor
N. Kalantar-Nayestanaki	KVI-CART, University of Groningen	Professor
U. Garg	Department of Physics, University of Notre Dame	Professor
H. Akimune	Department of Physics, Konan University	Professor
M. Itoh	Tohoku University	Associate Professor
Y. Matsuda	Tohoku University	Assistant Professor
Y. Ishibashi	Tohoku University	PD
J. Okamoto	Tohoku University	M2
K. Karasudani	Tohoku University	M1
T. Kawabata	Department of Physics, Kyoto University	Associate Professor
T. Furuno	Department of Physics, Kyoto University	D3
M. Tsumura	Department of Physics, Kyoto University	D3

M. Murata	Department of Physics, Kyoto University	D2
K. Inaba	Department of Physics, Kyoto University	M1
Y. Takahashi	Department of Physics, Kyoto University	M1
T. Takeda	Department of Physics, Kyoto University	M1
Y.K. Gupta	Bhabha Atomic Research Centre, Mumbai	Scientific Officer
M.A. Najafi	KVI-CART, University of Groningen	Post doctorate
C. Douma	KVI-CART, University of Groningen	Ph.D. student

RUNNING TIME:

Preparation time without beam	2.0 days
Beam tuning	1.0 day
Data runs for calibration	0.3 days
Data runs for elastic scattering	1.0 day
Data runs for inelastic scattering	4.4 days
Changing targets and magnetic fields	0.4 days

BEAM LINE:

Ring: WS course

BEAM REQUIREMENTS:

Type of particle	alpha
Beam energy	400 MeV
Beam intensity	10 nA
Other requirements	energy resolution ≤ 200 keV halo-free, small emittance, single-turn extraction

BUDGET:

Experimental expenses 1,600,000 yen for enriched targets
 Travel and local support for the out-stationed participants are hoped to be provided by RCNP.

TITLE:**Effect of nuclear ground-state deformation on $L \leq 3$ isoscalar giant resonances in Nd isotopes****SPOKESPERSONS:** Soumya Bagchi and Muhsin N. Harakeh**SUMMARY OF THE PROPOSAL**

The proposed experiment aims to measure the isoscalar giant resonances in Nd isotopes to study the effect of nuclear ground-state shape deformation on the strength distributions of giant resonances. The nuclear ground-state shape changes from almost spherical to prolate in going from ^{142}Nd to ^{150}Nd . We will measure the $L \leq 3$ giant resonances in stable even-A isotopes of Nd from ^{142}Nd to ^{150}Nd by inelastic α -particle scattering at very forward angles (including 0°) where the angular distributions are characteristic of different multipolarities. We will also obtain the elastic-scattering data in case of ^{142}Nd , to extract the optical-model potential parameters. The optical potential parameters will be validated by calculating the angular distributions of the 2^+ and 3^- states for ^{142}Nd and comparing with existing data. The strength of the giant resonances will be extracted in a multipole decomposition analysis. To establish the effect of deformation on isoscalar giant resonances further, measurements on the strongly deformed rare-earth nuclei, ^{168}Er and ^{172}Yb , will also be performed.