E439

RCNP EXPERIMENT

PROPOSAL FOR EXPERIMENT AT RCNP

14 July 2014

TITLE:
Study of the shell evolution at N=20 in neutron rich region through nucleon transfer reaction

SPOKESPERSON:

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EXPERIMENTAL GROUP:

Name	Institution	Title or Position
E.Ideguchi	RCNP, Osaka University	Associate Professor
A.Tamii	RCNP, Osaka University	Associate Professor
T.Koike	Tohoku University	Associate Professor
T.Hashimoto	Institute for Basic Science	Assistant Professor
H.J.Ong	RCNP, Osaka University	Lecturer
T.Suzuki	RCNP, Osaka University	Assistant Professor
G.Isago	RCNP, Osaka University	M2
M.Tanaka	RCNP, Osaka University	M2
H.Suzuki	RCNP, Osaka University	M2
N.Imai	CNS, University of Tokyo	Associate Professor
J.Lee	RIKEN, Nishina Center	Research Scientist
Y.Matsuda	RCNP, Osaka University	Post.Doc
Y.Ayyad	RCNP, Osaka University	Post.Doc
J.Tanaka	RCNP, Osaka University	D3
T.Itoh	RCNP, Osaka University	D3
CAGRA Collaboration		

RUNNING TIME:

Beam tuning	2 days
DAQ and circuit tuning	1 days
Data taking runs	6 days
Total	**9 days**

BEAM LINE: Ring : **EN course**

BEAM REQUIREMENTS:

Type of particle	^{36}**S**
Beam energy	**52 AMeV**
Beam intensity	$\leq$ **50 pnA**
Any other requirements	None

BUDGET:

Deuterium gas	80 kyen
Transport cost for CRYPTA	20 kyen
Silicon detector×3	900 kyen
PPAC×1	300 kyen
Experimental expenses	**1300 kyen**

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SPOKESPERSON: Tetsuya Yamamoto, Nori Aoi

SUMMARY OF THE PROPOSAL

We propose an experiment of (d,p) reaction on ^{32}Si, ^{30}Mg (N =19) and ^{28}Mg (N =18) to study the single particle states in ^{33}Si, ^{31}Mg and ^{29}Mg aiming at understanding the mechanism of shell evolution along $N = 20$. We identify the $3/2^+$ states and $7/2^-$ states in ^{31}Mg, ^{33}Si and ^{29}Mg by (d,p) reaction and extracted spectroscopic factors. These sates correspond to the $d_{3/2}$ and $f_{7/2}$ single neutron states which are well-separated in stable nuclei by the $N = 20$ shell gap, and are essential to clarified if the large collectivity observed in the island-of-inversion nuclei originates directory from quenching of $N = 20$ shell gap (between $f_{7/2}$ and $d_{3/2}$ states).

This experiment will be performed by bombarding a solid deuterium target with the ^{32}Si, ^{30}Mg and ^{28}Mg RI beams to induce the (d,p) reaction. The populated states are identified by the energy of deexcitation γ-rays together with particle identification information of reaction residues. The spin/parity (J^π) of the final states will be assigned from the transfered angler momentum determined by the angler distribution of the differential cross sections. From the magnitude of the cross section, spectroscopic factor will be determined.