RCNP EXPERIMENT E287

PROPOSAL FOR EXPERIMENT AT RCNP

26 January 2006

TITLE:

Search for High-Spin Shape Isomers in N=83 and a new region N=51 isotones

SPOKESPERSON:

Full Name	Atsuko Odahara
Institution	Dep. of Phys, Osaka Univ.
Title or Position	Associate Professor
Address	1-1 Machikaneyama, Toyonaka, Osaka 560-0043, Japan
Phone number	+81-6-6850-5745
FAX number	+81-6-6850-5764
E-mail	odahara@phys.sci.osaka-u.ac.jp

EXPERIMENTAL GROUP:

Full Name	Institution	Title or Position
Tadashi Shimoda	Dep. of Phys, Osaka Univ.	Professor
Takeshi Furukawa	Dep. of Phys, Osaka Univ.	D3
Yosuke Akasaka	Dep. of Phys, Osaka Univ.	M2
Akihiko Sato	Dep. of Phys, Osaka Univ.	M1
Tomonori Fukuchi	Dep. of Phys, Rikkyo Univ.	Post Doctoral Fellow
Yasuo Wakabayashi	Dep. of Phys, Kyushu Univ.	D3
	CNS, Univ. of Tokyo	
Tomokazu Suzuki	CYRIC, Tohoku Univ.	D3

RUNNING TIME: Installation time without beam 7 days
Test running time for experiment ^{86}Kr : 4 days
^{18}O : 4 days
Data runs ^{86}Kr : 6 days
^{18}O : 8 days

BEAM LINE: AVF : EN course

BEAM REQUIREMENTS: Type of particle ^{86}Kr
^{18}O
Beam energy ^{86}Kr : 645 MeV (7.5 MeV/u)
^{18}O : 99 and 117 MeV (5.5 and 6.5 MeV/u)
Beam intensity ^{86}Kr : 1 pnA
^{18}O : 0.6pμA

BUDGET: Experimental expenses 1,600,000 yen

TITLE:

Study of High-Spin Shape Isomers in N=83 and a new region N=51 isotones

SPOKESPERSON: Atsuko Odahara

SUMMARY OF EXPERIMENT

We propose the two types of experiments to search for high-spin shape isomers by the recoil-catcher method and by the RI beam secondary fusion reactions at EN course. The EN course will be used as a separator to obtain the high-purity and high-intensity RI beams. This course seems to allow the in-beam gamma-ray measurements with low background. This is because the RI production target locates in the other room than that for γ-ray measurements.

High-spin shape isomers of $49/2^+$ and 27^+ for odd and odd-odd nuclei are systematically studied in $N = 83$ isotones. These isomers are of stretch coupled configurations and oblate shapes. They are caused by the sudden shape change from near spherical to an oblate shape. Recently, we found the high-spin isomer in $N = 51$ isotone of ^{93}Mo. This isomer is expected to have the same isomerism with those in N=83 isotones.

The experiment of the first type is to search for high-spin isomers in a new region $N =$ 51 isotones by using the recoil catcher method at EN course. EN course will be used to separate the reaction products from the primary ^{86}Kr beam directly provided from the upgraded AVF cyclotron and ECR ion source. The ^{13}C target of 1.0 mg/cm^2 at F0 will be bombarded by the ^{86}Kr beam of 7.5 MeV/u with the intensity of 1 pnA. The reaction products will be transported to the catcher at F3 of about 16m downstream from F0. As flight time is calculated to be about 0.5 μs, γ-rays deexcited from the isomers with life times from a few hundreds ns to a few μs will be detected by the HP Ge detectors placed around the catcher at F3. We request twice of 2 day test runs for checking the separation between the primary beam and reaction products and 6 day beam time.

The second type of the experiment is to search for high-spin isomers in $N = 83$ isotones with $Z < 60$ by using the secondary fusion reactions. The RI beam of ^{17}N will be delivered using EN course with the ^{9}Be(^{18}O,^{17}N)^{10}B or ^{13}C(^{18}O,^{17}N)^{14}N primary reactions. The $N = 83$ isotones ^{142}Pr and ^{141}Ce will be produced by the ^{130}Te+^{17}N secondary fusion reactions. High-spin isomers can be searched by the delayed $\gamma\gamma$ coincidence method. We request twice of 2 day test runs for developing the ^{17}N RI beam and 8 day beam time.