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:

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EXPERIMENTAL GROUP:

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Takeshi Furukawa	Dep. of Phys, Osaka Univ.	D3
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Akihiko Sato	Dep. of Phys, Osaka Univ.	M1
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Yasuo Wakabayashi	Dep. of Phys, Kyushu Univ.	D3
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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.