PROPOSAL FOR EXPERIMENT AT RCNP

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TITLE:
Magnetic Moment of ^{36,37}P

SPOKESPERSON:

Full Name	Kensaku Matsuta
Institution	Department of Physics, Osaka University
Title or Position	Associate Professor
Address	Machikaneyama 1-1, Toyonaka, Osaka 560-0043, Japan
Phone number	+81-6-6850-5520
FAX number	+81-6-6850-5535
E-mail	matsuta@vg.phys.sci.osaka-u.ac.jp

EXPERIMENTAL GROUP:

Full Name	Institution	Title or Position
Mitsunori Fukuda	Dept. of Physics, Osaka Univ.	Ass. Professor
Mortotsugu Mihara	Dept. of Physics, Osaka Univ.	Res. Associate
Tadashi Shimoda	Dept. of Physics, Osaka Univ.	Professor
Takashi Ohtsubo	Niigata Univ.	Ass. Professor
Takuji Izumikawa	Niigata Univ.	Ass. Professor
Sadao Momota	Kochi Univ. of Technology	Lecturer
Takashi Nagatomo	Dept. of Phys! ics, Osaka Univ.	D3
Maya Takechi	Dept. of Physics, Osaka Univ.	D2
Ryouhei Matsumiya	Dept. of Physics, Osaka Univ.	M1

RUNNING TIME:

Installation time without beam	3 days
Beam tuning and test running	2 days
Data runs	4 days
	(Total Beam Time 6 days)

BEAM LINE: Ring : EN course

BEAM REQUIREMENTS:

Type of particle	^{40}Ar
Beam energy	70 MeV per nucleon
Beam intensity	200 pnA
Any other requirements	beam pulsing

BUDGET:

Installation of DC power supply and RF amplifier	200,000
Catcher material (crystal etc.)	100,000
Travel expense	100,000
Total	500,000

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SUMMARY OF THE PROPOSAL

We propose an experiment on the magnetic moments of short lived β emitting nuclei ^{36,37}P, utilizing the powerful radioactive nuclear beam provided by the up-graded RCNP ring cyclotron and the fragment separator installed at EN course.

These nuclei has atomic number Z =15 and neutron number N = 19,20, i.e., they are near the shell gaps of the magic number 20 and the newly suggested magic number 16. From the experiment, we are able to discuss the configuration mixing information near the shell gaps. This information is important for understanding of the formation and vanishing of the shell gaps. Most of all, the spin and parity of the ground state of these nuclei is very important, but has not been determined yet. By measuring the g factors, we can determine the spins, compared with the theoretical pred! ictions.

In the proposed experiment, the polarized ^{36,37}P nuclei are produced in the heavy ion collisions and separated by a separator in EN course. After implanted in a single crystal Si, the magnetic moment, more exactly the g-factor, will be measured by means of the β-NMR technique. By comparing with the theoretical g-factors for several possibilities of the ground state spins, the experimental g-factors can determine the spins. The more detailed discussion can also be possible on the nuclear structure and the configuration mixing from the shell model calculations with the interaction between sd and f shells.

Although the qualitative understanding of the polarization mechanism is established, the actual degree of polarization to be obtained is not so clear. However, we can expect some of the polarization of around 3 %, and the abundant incident beam of ^{40}Ar can produce rather high rate of the β rays of about 250 c/s from the nuclei, which mak! es the present measurement possible in 4 days of net data taking time (6 days total including test run).