RCNP EXPERIMENT E290

PROPOSAL FOR EXPERIMENT AT RCNP

1 May 2006

TITLE:

Study of intermediate states of double beta decay nuclei via (n,p) reactions at 300 MeV

SPOKESPERSON:

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EXPERIMENTAL GROUP:

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Dieter Frekers	Department of Physics, Münster University	(P)
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RUNNING TIME:

Installation time without beam	5 days (for each beam time)
Development of device	0 days
Test running time for experiment	1 days
Data runs	34 days
Uninstallation time	3 days (for each beam time)

BEAM LINE: Ring : WS course

BEAM REQUIREMENTS:

Type of particle	unpolarized p
Beam energy	300 MeV
Beam intensity	$\leq$ 350 nA
energy resolution	$\leq$ 200 keV
	halo-free

BUDGET:

Experimental expenses	0 yen
Travel plan	500,000 yen

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Study of intermediate states of double beta decay nuclei via (n,p) reactions at 300 MeV

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SUMMARY OF THE PROPOSAL

The double β decay with two neutrinos in the final state ($2\nu\beta\beta$-decay) is an allowed second-order weak process. The transition matrix element depends on the excitation energies of the virtually excited Gamow-Teller (GT) intermediate states, the GT matrix elements from the mother nucleus to the intermediate states, and those from the daughter nucleus to to the intermediate states. The half lives of $2\nu\beta\beta$-decay nuclei directly obtained by counting experiments are not understood theoretically. Our objective is to study the GT transition strengths from daughter nuclei by the ^{48}Ti(n,p) and the ^{116}Sn(n,p) reactions. The β^+ GT strength distributions will be obtained for up to 50 MeV excitation energy by means of multipole decomposition analysis. The data will be analyzed together with the E272 data of the ^{48}Ca(p,n) and ^{116}Cd(p,n), which gives constraints to the effective interaction in RPA calculations.