

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:

Full Name Kentaro Yako
 Institution Department of Physics, University of Tokyo
 Title or Position RA
 Address 7-3-1 Hongo, Bunkyo, Tokyo 113-0033, Japan
 Phone number +81-3-5841-4236
 FAX number +81-3-5841-7642
 E-mail yakou@phys.s.u-tokyo.ac.jp

EXPERIMENTAL GROUP:

Full Name	Institution	Title or Position
Hideyuki Sakai	Department of Physics, University of Tokyo	(P)
Hironori Kuboki	Department of Physics, University of Tokyo	(D3)
Masaki Sasano	Department of Physics, University of Tokyo	(D2)
Kichiji Hatanaka	RCNP	(P)
Hiroyuki Okamura	RCNP	(P)
Atsushi Tamii	RCNP	(AP)
Youhei Shimizu	RCNP	(PD)
Yuji Tameshige	RCNP	(D3)
Hiroaki Matsubara	RCNP	(D1)
Tomotsugu Wakasa	Department of Physics, Kyushu University	(AP)
Toru Shimoura	CNS, University of Tokyo	(P)
Tomohiro Uesaka	CNS, University of Tokyo	(AP)
Takahiro Kawabata	CNS, University of Tokyo	(RA)
Yukie Maeda	CNS, University of Tokyo	(PD)
Kenji Suda	CNS, University of Tokyo	(PD)
Kimiko Sekiguchi	RIKEN	(PD)
Kazuo Muto	Department of Physics, TIT	(AP)
Dieter Frekers	Department of Physics, Münster University	(P)
Mark B. Greenfield	ICU	(P)

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:

BEAM REQUIREMENTS: Type of particle Ring : WS course
 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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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 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 $^{48}\text{Ti}(n, p)$ and the $^{116}\text{Sn}(n, p)$ 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 $^{48}\text{Ca}(p, n)$ and $^{116}\text{Cd}(p, n)$, which gives constraints to the effective interaction in RPA calculations.