RCNP EXPERIMENT E173

# PROPOSAL FOR EXPERIMENT AT RCNP

28 May 2001

## TITLE:
## Study of decay mode of the $1^+$ states in $^{176}$Lu after solar neutrino absorption via $^{1276}$Yb($^3$He,t$\gamma$)$^{176}$Lu high resolution coincidence measurement


**SPOKESPERSON:**

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**EXPERIMENTAL GROUP:**

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| T. Ishikawa | Univ. of Kyoto | J. Jänecke | Univ. of Michigan |
| J. Kamiya | RCNP | T. Kawabata | RCNP |
| S. Nakayama | Univ. of Tokushima | R.S. Ragahavan | Bell Laboratories |
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| M. Tanaka | Kobe Tokiwa Jr. College | M. Uchida | Univ. of Kyoto |
| K. Yamasaki | Univ. of Konan | H.P. Yoshida | RCNP |
| M. Yosoi | Univ. of Kyoto | R.G.T. Zegers | JAERI |


**RUNNING TIME:** Installation time without beam — 3 days(for each beam time)
Data runs — 10 days

**BEAM LINE:** Ring : WS course

**BEAM REQUIREMENTS:**

| | |
|---|---|
| Type of particle | $^3$He |
| Beam energy | 450 MeV |
| Beam intensity | $\sim$ 0.5 nA |
| Any other requirements | energy resolution $\leq$ 200 keV |
| | halo-free, small emittance |

**BUDGET:** Experimental expenses — 1,700,000 yen
Travel plans — 8 participants should be supported by RCNP

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**Study for decay mode of the $1^+$ states in $^{176}$Lu after solar neutrino absorption via $^{176}$Yb($^3$He,t$\gamma$)$^{176}$Lu high resolution coincidence measurement**

**SPOKESPERSON:** Keigo Hara and Mamoru Fujiwara

## SUMMARY OF THE PROPOSAL

Discrete Gamow-Teller transitions $^{176}$Yb $\rightarrow$ $^{176}$Lu at low excitation energies have been measured via the $^{176}$Yb($^3$He,t)$^{176}$Lu reaction at 450 MeV. The low Q($\nu$)-value in Yb-Lu indicates that Yb-based $\nu$ detectors are well suited for a direct measurement of the sub-MeV solar electron-neutrino ($\nu_e$) spectrum including pp neutrinos. Furthermore, we can reduce the background greatly be employing a delayed-$\gamma$ coincidence technique. Detailed study of the $\gamma$-decay mode after the solar neutrino absorption is required for this purpose. A test experiment of a $\gamma$-coincidence measurement with $\Delta E_\gamma \sim 4$ keV has already successfully completed. It is demonstrated that the ($^3$He,t$\gamma$) experiments with high resolution Ge detectors at RCNP will provide a new means to study the nuclear structure via the measurements of the discrete $\gamma$-decays from the spin-isospin states in nuclei