RCNP EXPERIMENT E191

PROPOSAL OF EXPERIMENT AT RCNP

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Nuclear Responses for Double Beta Neutrinos and Double Spin Isospin Resonances "Updated Proposal of E177"

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RUNNING TIME :	Beam preparation and beam tuning	1.0 days
	Data runs	7 days

BEAM LINE : WS course

APPARATUS : Grand Raiden, standard VDC

BEAM REQUIREMENTS :	Type of particle	^{11}B
	Beam energy	751 MeV
	Beam intensity	5 nA
	Beam energy resolution	less than 500 keV
	Beam quality	halo free

BUDGET : Experimental expense 4.3 M Yen

SCHEDULE : Before the summer shutdown of 2002

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SPOKESPERSONS : Takahisa, Keiji

SUMMARY OF THE PROPOSAL

Double beta decays ($\beta\beta$) are of current interest in view of particle, astro and nuclear physics. Neutrino-less double beta decays ($0\nu\beta\beta$), which require the neutrino helicity mixing, are sensitive to the Majorana masses of light and heavy neutrinos(ν), right-left mixings of weak currents, and to SUSY-neutrino couplings,and others beyond the standard theory. Finite ν-masses give contributions to non-baryonic hot dark matters in the universe.

Nucleon (quark) sectors of double beta decays include mainly double isospin-flip and double isospin flip nuclear weak responses. The nuclear spin-isospin operator $\sigma\tau$ results in the broad GTR (Gamow Teller resonance) and double GT ones(DGTR). Recently, $\beta\beta-\nu$ responses have been analyzed in terms of couplings of single particle-hole GT states and GTR. Here DGTR play crucial roles for the $\beta\beta-\nu$ responses.

Double giant resonances are of great interest to see resonance features at high excitation energy regions. DGTR standing on the GTR, however, have not well studied. It is shown that nuclear weak responses relevant to the isospin and isospin-spin mode are investigated by studying strong processes of charge-exchange(isospin-flip) spin-flip nuclear reaction. Actually, charge-exchange (^{3}He,t) reactions with E(^{3}He) = 450MeV are used to study

isospin spin responses for $\beta\beta$-nuclei. The charge-exchange reactions at the intermediate energy excite preferentially the isospin spin modes.

The present proposal aims at studies of double spin-isospin responses in view of the $\beta\beta - \nu$ decays. The double isospin spin giant resonances are investigated by means of double charge-exchange nuclear reactions. E115 has been proposed by H.Ejiri, et. al. in 1997 to study double GT strengths and nuclear responses for $\beta\beta - \nu$'s by means of the (^{11}B,^{11}Li) reactions at RCNP. It was approved in 1997. Since then, the ^{11}B beam adequate for the experiment has not been available, and thus the experiment has not been carried out. At the previous experiment(E177), the (^{11}B,^{11}Li) double charge exchange reaction was carried out by using of ^{11}B(E=751MeV) beam by RING-cyclotron. We can clearly identify the scattered ^{11}Li particle by using the drift time and energy loss technique. Therefore, the (^{11}B,^{11}Li) double charge exchange reaction have been shown possible. The present proposal is based on the proposal E115, and the previous test experiment of E177.