RCNP EXPERIMENT E241

PROPOSAL FOR EXPERIMENT AT RCNP

24 February 2004

TITLE:
Nuclear Responses for Double Beta Neutrinos and Double Spin Isospin Resonances. "Updated Proposal of E191 and E225"

SPOKESPERSON:

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RUNNING TIME:	Installation time without beam	2 days(for each beam time)
	Test running time for experiment	1 days
	Data runs	12 days
BEAM LINE:		Ring : WS course
BEAM REQUIREMENTS:	Type of particle	Boron 11
	Beam energy	758 MeV
	Beam intensity	5 nA
BUDGET:	Experimental expenses	0.3milion yen

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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 ($0\nu\beta\beta$) are sensitive to the Majorana masses of light and heavy neutrinos(ν), right-left mixings of weak currents,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. At the previous experiment(E191), the (^{11}B,^{11}Li) double charge exchange reaction for ^{56}Fe and ^{13}C was carried out by using of ^{11}B(E=758MeV) beam by RING-cyclotron. We can clearly identify the scattered ^{11}Li particle by using the drift time and energy loss technique. We have measured the peak of ground state ^{13}C(^{11}B,^{11}Li) ^{13}O reaction. We have also measured the DIAS(Double Isobaric Analogue State) and DGDR(Double Giant Resonance built on Isobaric analogue state) about ^{56}Fe that was measured $\pi+\pi$- reaction. However we could not clearly identify the DGTR. Therefore,.the present proposal is final measurement of the ^{56}Fe(^{11}B,^{11}Li) reaction.