RCNP EXPERIMENT E186

PROPOSAL FOR EXPERIMENT AT RCNP

14 Jan. 2002

TITLE : Neutron decay from the spin-isospin resonances in ^{208}Bi via the ^{208}Pb(^{3}He,t+n) reaction.

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EXPERIMENTAL GROUP :

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RUNNING TIME : Detector setup, energy calibration 1.0 days
Angle calibration and raytrace parameter determination 1.0 days
Calibration run with ^{48}Ti target nucleus 1.0 days
Run for ^{208}Pb target nucleus 10.0 days

BEAM LINE : WS course (Grand Raiden)

BEAM REQUIREMENTS :	Type of particle	^{3}He
	Beam energy	450 MeV
	Beam intensity	2 nA
		halo-free

BUDGET : Experimental expenses 100,000 Yen

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SPOKESPERSON : Mamoru Fujiwara and Hidetoshi Akimune

SUMMARY OF THE PROPOSAL

An observatory for the multiflavor neutrinos from supernovae is planned to be constructed with a scintillation detector using neutral-current (NC) and charge-current (CC) processes on lead. We will measure neutron decay following the ^{208}Pb(^{3}He,t)^{208}Bi reaction at 450 MeV in order to simulate the CC process and to give the absolute efficiency for the detection of neutrino flux from supernovae near our Galaxy.

The proposed experiment is a continuation of the series of experiments for the charge-exchange reaction on ^{208}Pb, taking advantage of the high bombarding energy (E(^{3}He)=450 MeV) available at RCNP. This leads to three major advantages. Firstly, the spin-isospin excitations in ^{208}Bi are strongly excited via (^{3}He,t) reactions at 450 MeV. Secondly, because of purely kinematic reasons, the background due to quasifree reactions is suppressed by requiring coincidences between tritons at forward angles and neutrons at backward angles. Finally, neutron decay experiments are practically only possible for charge-exchange reactions when ejectiles are measured with the magnetic spectrometer.

The combination of these factors indicates that neutron decay measurements from the spin-isospin resonances are only possible at RCNP, and we can gain the energy spectra of decay neutrons needed for the studies of supernova neutrinos. Better insight can be also gained into the decay mechanisms of the Gamow-Teller, SDR, IVSMR resonances.