PROPOSAL FOR EXPERIMENT AT RCNP

14 Jan. 2002

TITLE: Neutron decay from the spin-isospin resonances in ²⁰⁸Bi

via the 208 Pb(3 He,t+n) reaction.

SPOKESPERSONS : Mamoru Fujiwara Associate Professor

RCNP, Osaka University Ibaraki, Osaka 567-0047

Phone: 06-6879-8914, Fax: 6879-8899 E-mail: fujiwara@rcnp.osaka-u.ac.jp

Hidetoshi, Akimune Lecturer

Dept. of Phys., Konan University

8-9-1 Okamoto Higashinada, Kobe 658-8501

E-mail: akimune@konan-u.ac.jp

EXPERIMENTAL GROUP:

H. Fujimura	RCNP	Research Fellow	S. Gales	Orsay	P
HK. Hara	RCNP	D2	J. Guillot	Orsay	
M.N. Harakeh	KVI	P	T. Inomata	WERC	Researcher
T. Ishikawa	Kyoto U.	D2	K. Kawase	RCNP	M1
T. Kawabata	RCNP	RF	A. Krasznahorkay	INR	P
K. Nakanishi	RCNP	M1	R.G. Zegers	RCNP	COE
U. Garg	U. ND	P	K. B. Nayak	U. ND	
H. Toyokawa	JASRI	R	M. Uchida	Kyoto U.D2	
A.M. van den Berg	KVI	P	T. Yamagata	Konan U.P	
K. Yamasaki	Konan U	. D2	M. Yosoi	Kyoto U	.RA
S. Nakayama	Tokushima U.P				

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 ³He

Beam energy 450 MeV
Beam intensity 2 nA
halo-free

BUDGET: Experimental expenses 100,000 Yen

TITLE: Neutron decay from the spin-isospin resonances in ²⁰⁸Bi

via the 208 Pb(3 He,t+n) reaction.

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 ²⁰⁸Pb(³He,t)²⁰⁸Bi 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 ²⁰⁸Pb, taking advantage of the high bombarding energy (E(³He)=450 MeV) available at RCNP. This leads to three major advantages. Firstly, the spin-isospin excitations in ²⁰⁸Bi are strongly excited via (³He,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.