E398

DETAILED DESCRIPTION OF PROPOSED RESEARCH

PROPOSAL FOR EXPERIMENT AT RCNP

February 13, 2013

TITLE:
Measurement of γ-ray s from ^{16}O(p,p') and ^{12}C(p,p')

SPOKESPERSONS:

Full name	Makoto Sakuda
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EXPERIMENTAL GROUP:

Name	Institution	Title or Position
T. Yano	Department of Physics, Okayama University	Postdoc
T. Mori	Department of Physics, Okayama University	Graduate Student (D2)
I. Ou,	Department of Physics, Okayama University	Graduate Student (M1)
Y. Yamada	Department of Physics, Okayama University	Student (M1 from April)
T. Kayano	Department of Physics, Okayama University	Student (M1 from April)
N.Aoi	RCNP, Osaka University	Professor
M.Yosoi	RCNP, Osaka University	Associate Professor
E. Ideguchi	RCNP, Osaka University	Associate Professor
T. Suzuki	RCNP, Osaka University	Assistant Professor
T. Hashimoto	RCNP, Osaka University	Assistant Professor
K. Miki	RCNP, Osaka University	Postdoc
T. Ito	RCNP, Osaka University	Graduate Student(D1)
T. Yamamoto	RCNP, Osaka niversity	Graduate Student(M2)
H. Akimune	Department of Physics, Konan University	Associate Professor
Y. Koshio	ICRR, Kamioka Observatory, University of Tokyo	Assistant Professor

Possible members
Konan University Group

THEORETICAL SUPPORT:

Name	Institution	Title or Position
Omar Benhar,	INFN, Universita di Roma, Sapienza,	Professor
Artur Ankowski,	INFN, Universita di Roma, Sapienza,	Postdoc
Toshio Suzuki	Nihon University	Professor
Toru Sato	Osaka University	Associate Professor

RUNNING TIME: Beam and detector tuning time 3 days
Data runs 6 days

BEAM LINE: Ring: WS course

BEAM REQUIREMENTS:
Type of particle proton
Beam energy 300 MeV
Other requirements for (p,p')
unpolarized, halo-free beam 10nA,
energy resolution ≤ 100 keV

BUDGET:

1) From JSPS Grants-In-Aid for Scientific Research (Kiban-B, M.Sakuda, 2011-2014) for the title "Measurement of γ–rays in O(p,p') experiment for neutral-current ν-O interactions"
3,100,000yen (2012), 3,100,000yen (2013), 3,100,000yen (2014)—2/3 of them is used for the salary for a postdoc.
2) 500,000 yen for a target holder and remote controlling system.
400,000yen for 4 sets of a PMT and an acrylic light guides (2 completed)
150,000yen for 5 charge amplifiers (Hoshin)
100,000yen for support structure around the target
700,000yen for a VME-ADC for the gamma-ray detectors (Mesytec MADC-32)
Total 1,850,000yen.

Sakuda will pay 600,000yen for a part of the above items from his JSPS Grant-In-Aid budget. Our target chamber and a target holder may be used by another user. Also, the VME modules will be used for other users. We ask the travelling expense for the collaborators to come to RCNP and conduct the experiment.

SUMMARY OF THE 2nd E398 PROPOSAL

We propose to measure both the branching ratios of γ-ray emission from excited states above 5 MeV including giant resonance of ^{16}O and ^{12}C, as the functions of excitation energy (E_x) in 1 MeV step. Here, we measure the excitation energy (E_x=5-30MeV) and the energy of γ-rays (E_γ) in the O, C (p, p'γ) **at the forward scattering angles of 0°-3°**, and for E_γ >5 MeV γ-ray emission.

Proposed experiment will provide the fundamental and important information not only for the γ-ray production from **primary neutral-current neutrino-oxygen (-carbon) interactions** but also for that from the **secondary hadronic (neutron-oxygen and -carbon) interactions**. This experiment will provide essential information for γ-ray production in NC ν-O and ν-C reactions. Such information will be of vital importance to Supernova neutrino experiments and Neutrino oscillation experiments.

In the second stage, we would like to perform ^{16}O, $^{12}C(^3He,t\,\gamma)$ (ΔT=1) experiments at 0 degrees to continue the systematic study of spin-isospin response through the measurement of the γ-ray production with oxygen and carbon nuclei.

(We have modified the event rate with Cellulose instead of the previous value for Mylar.)