RCNP EXPERIMENT E201

PROPOSAL FOR EXPERIMENT AT RCNP

27 January 2003

TITLE:

Study of Three Nucleon Force Effects via the $n+d$ elastic scattering at 250 MeV

SPOKESPERSON:

Name	Yukie Maeda
Institution	Department of Physics, University of Tokyo
Title or Position	Student (D2)
Address	7-3-1, Hongo, Bunkyo-ku, Tokyo 113-0033, Japan.
Phone number	+81-(0)3-5841-4238
FAX number	+81-(0)3-5841-7642
E-mail	yukie@nucl.phys.s.u-tokyo.ac.jp

EXPERIMENTAL GROUP:

Name	Institution	Title or Position
Hideyuki Sakai	Dep. of Physics, Univ. of Tokyo	(P)
Atsushi Tamii	Dep. of Physics, Univ. of Tokyo	(RA)
Michio Hatano	Dep. of Physics, Univ. of Tokyo	(D2)
Takaaki Saito	Dep. of Physics, Univ. of Tokyo	(D1)
Hironori Kuboki	Dep. of Physics, Univ. of Tokyo	(M1)
Kichiji Hatanaka	RCNP, Osaka Univ.	(P)
Yasuhiro Sakemi	RCNP, Osaka Univ.	(AP)
Tomotsugu Wakasa	RCNP, Osaka Univ.	(RA)
Junichiro Kamiya	RCNP, Osaka Univ.	(D3)
Youhei Shimizu	RCNP, Osaka Univ.	(D1)
Kunihiro Fujita	RCNP, Osaka Univ.	(M2)
Takahiro Kawabata	CNS, Univ. of Tokyo	(RA)
Kentaro Yako	CNS, Univ. of Tokyo	(PD)
Kimiko Sekiguchi	RIKEN	(PD)
Hiroyuki Okamura	Dep. of Physics, Saitama Univ.	(AP)
Kenji Suda	Dep. of Physics, Saitama Univ.	(D3)
Hiroyuki Kamada	Dep. of Physics, Kyushu Institute of Technology	(AP)
M.B. Greenfield	International Christian Univ.	(P)

RUNNING TIME:	Test running time for experiment	2 days
	Data runs	7.5 days
BEAM LINE:		WS course + LAS
BEAM REQUIREMENTS:	Type of particle	p
	Beam energy	250 MeV
	Beam intensity	500 nA
	Energy resolution	< 0.5 MeV (FWHM)
BUDGET:	Experimental expenses	1,850,000 yen
	Travel plan	600,000 yen
	Total	2,450,000 yen

TITLE:
Study of Three Nucleon Force Effects via the $n+d$ elastic scattering at 250 MeV

SPOKESPERSON: Yukie Maeda

SUMMARY OF THE PROPOSAL

Three-nucleon force (3NF) effect is one of the hot topics in nuclear physics. Theoretically, we can treat the three nucleon state exactly by solving Faddeev equation with modern nucleon-nucleon (NN) interaction. The 3NF effects can be studied by comparing precise experimental results and the exact Faddeev calculations. Recently it has been found that differential cross sections of the elastic $p+d$ scattering in the intermediate energy region can be well reproduced by incorporating the 3NF in the Faddeev calculation.

However, the 3NF effects have been studied by comparing the $p+d$ experimental data with the $n+d$ calculations because the inclusion of the Coulomb interaction into the calculation is very difficult. To study the 3NF effects in a Coulomb-free system, we have performed an $\vec{n}+d$ elastic measurement at $E_n = 250$ MeV in the angular region $\theta_{cm} = 85^\circ$ – 180° at First by employing the (n,p) facility.

Last year, we proposed to measure the differential cross sections for the $n+d$ elastic scattering at $E_n = 250$ MeV in the forward angular region. The importance of the physics was recognized and a half of the proposal, the measurement for $\theta_{cm} = 10^\circ$ – 60° with neutron TOF facility, was approved.

We have carried out the approved experiment, then we propose the other part, the $n+d$ elastic measurement for $\theta_{cm} = 60^\circ$ – 90° at the (n,p) facility. These data together with the earlier results cover almost the full angular region and allow us to make a Coulomb free comparison of the data with the Faddeev calculations for the first time in the intermediate energy region.