RCNP EXPERIMENT E236

PROPOSAL FOR EXPERIMENT AT RCNP

27/01/2004

TITLE:

Study of Isovector Effective Interactions in Nuclei via $^{28}\mathrm{Si}(\vec{p},\vec{n})$

SPOKESPERSON:

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EXPERIMENTAL GROUP:

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H. Sakai	Univ. Tokyo	P	K. Yako	Univ. Tokyo	R.A.
T. Saito	Univ. Tokyo	D	H. Kuboki	Univ. Tokyo	M
M. Sasano	Univ. Tokyo	M	K. Hatanaka	RCNP	P
Y. Sakemi	RCNP	A.P.	A. Tamii	RCNP	A.P.
Y. Shimizu	RCNP	D	K. Fujita	RCNP	D
Y. Tameshige	RCNP	M	K. Sekiguchi	RIKEN	Res. Fellow
M. B. Greenfield	ICU	P			

RUNNING TIME:

Calibration of NPOL3	1.5 days
Measurement of σ and A_y	2.0 days
Measurement of D_{ij}	10.5 days
Total	14.0 days

BEAM LINE: N0 (NTOF facility + NPOL3)

BEAM REQUIREMENTS:

Type of particle	Polarized Protons
Beam energy	197 MeV
Beam intensity	$>$ 700 nA on target before pulse selection
Time resolution	$<$ 400 ps (FWHM)
Beam polarization	$>$ 0.7
Injection Mode	High Current Mode
Pulse selection	1/7

BUDGET:

Summary of budget request	2,500,000
Experimental expenses	1,500,000
Travel plan	1,000,000

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SUMMARY OF THE PROPOSAL

The study of stretched states through measurements of polarization transfer (PT) coefficients is suitable for getting information on the effective nucleon-nucleon (NN) interaction in nuclei. It is because (1) a stretched state can be described as an excited state with a simple one-particle one-hole ($1p$-$1h$) configuration in a shell model (SM) and (2) PT coefficients are robust to distortion effects than other spin observables such as analyzing powers A_y. Some measurements of PT coefficients in (p,p') scattering to stretched states suggest modifications of the effective NN interaction in nuclear medium. However, the (p,p') scattering mixes the isoscalar and isovector contributions (isospin-mixing effects). Thus we could not distinguish between the effect of medium modifications and that of isospin mixing.

In order to exclude this ambiguity, we propose to measure a complete set of PT coefficients for the pure-isovector $T=1$ excitation to the stretched 6^- (E_x=4.94 MeV) state in ^{28}P via ^{28}Si($\vec{p},\vec{n}$) at T_p=197 MeV. The results will be studied in a framework of DWIA with SM wave functions. Such a comparison will provide us information on tensor and spin-spin components of effective NN interactions. Furthermore data will be compared with DWIA calculations employing RPA response functions in order to assess the nuclear correlation effects in this momentum-transfer region.