RCNP EXPERIMENT E293

PROPOSAL FOR EXPERIMENT AT RCNP

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TITLE: Resolving the discrepancy of 0° spectra between (^{3}He, t) and (p, n) reactions on ^{116}Cd target

SPOKESPERSON:

Name	Hiroyuki Okamura
Institute	Research Center for Nuclear Physics, Osaka University
Title or Position	Professor
Address	10–1 Mihogaoka, Ibaraki, Osaka 567-0047, Japan
Phone number	+81-6-6879-8930
FAX number	+81-6-6879-8930
E-mail	okamura@rcnp.osaka-u.ac.jp

EXPERIMENTAL GROUP:

Name	Institution	Title or Position
K. Yako	Dept. of Physics, Univ. of Tokyo	RA
M. Sasano	Dept. of Physics, Univ. of Tokyo	D2
H. Sakai	Dept. of Physics, Univ. of Tokyo	P
A. Tamii	RCNP, Osaka Univ.	AP
Y. Sakemi	RCNP, Osaka Univ.	AP
H. Matsubara	RCNP, Osaka Univ.	D1
K. Hatanaka	RCNP, Osaka Univ.	P
T. Wakasa	Dept. of Physics, Kyushu Univ.	AP
M. Dozono	Dept. of Physics, Kyushu Univ.	M2
E. Ihara	Dept. of Physics, Kyushu Univ.	M1
R.G.T. Zegers	NSCL, Dept. of Physics, Michigan State Univ.	AP
H.J. Wörtche	KVI, Univ. of Groningen	AP
Lucia-Ana Popescu	KVI, Univ. of Groningen	PD
M.N. Harakeh	KVI, Univ. of Groningen	P

RUNNING TIME:

Tuning	5 hrs (^{3}He, t)	5 hrs (p, n)
Data runs	18 hrs (^{3}He, t)	24 hrs (p, n)
	8 hrs (elastic)	
Total	2.5 days	

BEAM LINE:

Ring:	WS course	N0 course

BEAM REQUIREMENTS:

Type of particle	^{3}He	p
Beam energy	140 MeV/A	140 MeV
Beam intensity	30 nA	100 nA (after 1/5 pulsing)

BUDGET:

Travel expense	0.5 M yen

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SPOKESPERSON: Hiroyuki Okamura

SUMMARY OF THE PROPOSAL

Intermediate-energy (p, n) and $(^3\mathrm{He}, t)$ reactions have been extensively used to extract $B(\mathrm{GT})$ strengths, utilizing their proportionality to cross sections at zero momentum-transfer, and are the major tools at RCNP making the facility outstanding. It is known, however, that extracted $B(\mathrm{GT})$ strengths can differ by 50% at maximum depending on targets and levels excited due to differences in reaction mechanism. Systematic studies of such mechanisms are being carried out to reduce the ambiguity of extracted $B(\mathrm{GT})$.

In E272 collaboration, we found the $^{116}\mathrm{Cd}(p, n)$ spectrum at 0° and 300 MeV is significantly different from the previously measured $^{116}\mathrm{Cd}(^3\mathrm{He}, t)$ spectrum at 0° and 150 MeV/A. Particularly the deduced $B(\mathrm{GT})$s for $^{116}\mathrm{Cd}_{\mathrm{g.s.}}[0^+] \rightarrow {}^{116}\mathrm{In}_{\mathrm{g.s.}}[1^+]$ are different by almost one order of magnitude, which appears unlikely to be explained by the difference of reaction mechanism. Since this transition is of importance in relation to the matrix element of double β-decay, $^{116}\mathrm{Cd} \rightarrow {}^{116}\mathrm{Sn}$, it is an urgent issue to trace the origin of discrepancy.

We thus propose to measure the $^{116}\mathrm{Cd}(^3\mathrm{He}, t)$ reaction again with improved angular resolution, partly to confirm the difference is not caused by instrumental problems, and mainly to obtain the angular distribution which allows the detailed study of the reaction mechanism. We also propose to measure the ^{3}He elastic scattering on ^{116}Cd and the $^{116}\mathrm{Cd}(p, n)$ reaction at 140 MeV, which will greatly help the reaction study.