RCNP EXPERIMENT E311

PROPOSAL FOR EXPERIMENT AT RCNP

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TITLE:

Measurement of neutron energy spectra at 180 degrees in proton induced reaction at 150, 250 and 350 MeV

SPOKESPERSON:

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EXPERIMENTAL GROUP:

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Atsushi TAMII	Research Center for Nuclear Physics, Osaka Univ.	(Associate Professor)
Kichiji HATANAKA	Research Center for Nuclear Physics, Osaka Univ.	(Professor)

RUNNING TIME:	Installation time without beam	1 day(for each beam time)
	Test running time for experiment	0.5 days
	Data runs	4.5days (for 150, 250 and 350MeV proton)
BEAM LINE:		Ring : N0 course
BEAM REQUIREMENTS:	Type of particle	p
	Beam energy	150, 250, 350 MeV
	Beam intensity	$\leq$ 100 nA
	Any other requirements	halo-free, small emittance, beam pulsing
BUDGET:	Traveling expenses	500,000 yen

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SPOKESPERSON: Yosuke Iwamoto

SUMMARY OF THE PROPOSAL

Recently, the contribution of 180 degrees scattering neutrons, which come from mainly evaporation process, is getting more important because of radiation protection and shielding at some very high-intensity proton accelerator facilities. Neutron production double differential cross sections at 180 degrees have not been measured and studied yet. Therefore, it is interesting to find the systematic behavior of the evaporation neutron spectra, and to parameterize them for extending to different incident energies and target nuclei.

The moving source (MS) model which is based on the Maxwell-like distribution will be employed for analyzing the obtained data. The systematic values of amplitude, velocity and temperature in MS model will be decided by using obtained data in the wide target mass and incident energy ranges. The systematic of these parameters is very useful for the estimation of evaporation neutron cross section in a wide range of target masses and incident energies.

It is possible to measure neutrons at 180 degrees at the irradiation room of TOF course. and no other facilities can be available. In this study, we will measure the energy-angle differential neutron yields for the (p,xn) reaction of 150-350 MeV at 180 degrees on thin graphite, aluminum, iron and lead targets, and the parameterization of the evaporation cross sections will be made by MS model. To investigate consistency with other experimental data, measurement at 90 and 150 degrees will be also done.

An estimation of the background contribution due to room scattering will be performed by intercepting the neutrons produced at the target with a iron shadow bar. Installation time without beam is 1 (day) for each beam time, test running time to investigate background events is 0.5 (days) and data running time is estimated as 4.5 (days).