E412

RCNP EXPERIMENT E

PROPOSAL FOR EXPERIMENT AT RCNP

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TITLE:

Development of a new neutron detector with a high position resolution with proton and neutron beams around 100, 150, and 200 MeV

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RUNNING TIME: Installation time without beam 7 days(for each beam time)
Setup of the detectors and DAQ 0.8 days

	Proton measurement	0.3 days
	Neutron measurement	3.9 days
BEAM LINE:		Ring : N0 course
BEAM REQUIREMENTS:	Type of particle	protons
	Beam energy	100, 150, and 200 MeV
	Beam intensity	$\geq$ 100 nA after the pulsing of 1/5
	Any other requirements	time width $\leq$ 250 ps
		halo-free, small emittance
BUDGET:	Experimental expenses	100,000 yen
	Travel plan	600,000 yen
	Total	700,000 yen

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Development of a new neutron detector with a high position resolution with proton and neutron beams around 100, 150, and 200 MeV

SPOKESPERSON: Yuki Kubota

SUMMARY OF THE PROPOSAL

We propose to characterize the performances of a new neutron detection system with a position resolution better than 3 mm developed at the RIKEN RIBF using proton and neutron beams with energies from 100 to 200 MeV in conjunction with the neutron time-of-flight facility. The prototype detector of this system is designed for measuring neutron single-particle-state spectra on unstable nuclei with a separation energy resolution of 1 MeV. The neutron-detection part is highly segmented and consists of 64 plastic scintillating fibers each with sizes of $3.75 \times 3.75 \times 1000$ mm^3. Multi-anode photomultiplier tubes (PMTs) at the both ends are used for reading out the scintillator light on the basis of fiber by fiber, enabling one to achieve the position resolution of 2.6 mm. A faint proton beam at 200 MeV and mono-energetic neutron beams produced through the ^{7}Li$(p,n)^{7}$Be(g.s.+0.43 MeV) and ^{12}C$(p,n)^{12}$N(g.s.) reactions at 0° from proton beams at 100, 150, and 200 MeV will be used for determining the neutron-detection efficiency, the position resolution along both the short and long sides of the detector, the time resolution, and the proportion of the effective area in the scintillation part.