RCNP EXPERIMENT E259

PROPOSAL FOR EXPERIMENT AT RCNP

21/02/2005

TITLE:

Coherent Pion Production Measurement from the reaction ^{12}C(p,nπ^+)^{12}C

SPOKESPERSON:

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RUNNING TIME:

Total: 10 days
WS 3 days
N0 3 (feasibility test)+ 4(data taking) days

BEAM LINE: N0 (N0 beam line +GEM detector + NPOL2), WS (WS beam line + Grand Raiden)

BEAM REQUIREMENTS:

Type of particle	Unpolarized Protons
Beam energy	400 MeV
Beam intensity	100 nA on target after 1/15 pulsing
Energy resolution	< 200 keV (FWHM)
Time resolution	< 400 ps (FWHM)

BUDGET:

Total budget request	3,900,000
Experimental expenses	3,700,000
Travel plan	200,000

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SUMMARY OF THE PROPOSAL

The physics goal of this experiment is to measure the Coherent Pion Production (CPP) such as ^{1}2C(p,nπ^+)$_{12}$C(Ground State) and investigate the short range component of the nuclear interaction. The experiment E169 was approved as the test experiment to establish the experimental technique to measure the coherent pions with coincidence of neutrons. We developed the new Gas Electron Multiplier (GEM) detector and its readout system for the charged pion measurement in approved experiment.

We performed the test experiment in September and December in 2004. Trigger counter for the pion is developed and procedure of coincidence with neutron was established. From this experiment, however, we understand that some improvements should be performed to identify the CPP event from enormous background clearly. It can be achieved by accurate measurement of pion tracking information with GEM counter to reconstruct a missing mass spectrum.

We plan to make the detection system with high position resolution, by using GEM detector and Space Wire readout system. The detector specification will be checked by spectrometer Grand Raiden. Then, we measure the CPP cross section with full setup including newly developed GEM and NPOL2 at N0 course to get quantitative information about the short range component, which is sensitive to the critical density of pion condensation phase.