RCNP EXPERIMENT E170

PROPOSAL FOR EXPERIMENT AT RCNP

17 May 2001

TITLE:

Study of Anomalous Pion Production in Proton Collisions with Nuclear Targets

SPOKESPERSON:

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EXPERIMENTAL GROUP:

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Natalia S. Topilskaya	Institute for Nuclear Research of Russian Academy of Sciences, Moscow

RUNNING TIME:	Installation time without beam	—
	Test running time for experiment not including beam preparation	2 days
	Data runs	8 days
BEAM LINE:		Ring : WN course or WS course(if possible)
BEAM REQUIREMENTS:	Type of particle	protons
	Beam energy	340, 350, 360, 370 MeV
	Beam intensity	≤ 10 nA
	Any other requirements	energy resolution ≤ 100 keV
BUDGET:	Experimental expenses	No special experimental expenses from RCNP
	Travel plans	2 participants from Institute for Nuclear Research of Russian Academy of Sciences, Moscow, will be supported by fellowship programs

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SUMMARY OF THE PROPOSAL

Several experiments performed recently on pion production in proton-medium weight nuclei collisions revealed a considerable increase of pion yield at 350 MeV proton energy with narrow width of about 5 MeV. This resonance-like structure could be accounted for by the new phenomena in connection with nonnucleon degrees of freedom in nuclei.
However due to some experimental complications these experiments were limited to very few points on the resonance curve. Therefore the exact position and the width of the resonance were determined with poor accuracy.
We plan to realize the detailed measurements of excitation function for positive and negative pion production in proton-nucleus collisions on RCNP K=400 cyclotron. LAS spectrometer will be used as pion detector. In order to confirm the observed resonance-like effect the pion production measurements with proton beam should be performed at several proton energies near 350 MeV on targets of Cu, C and Pb for pion production angles from 40^o to 140^o. From the measurements of pion angular distributions one could determine the spin, isospin and parity of the resonance under investigation.