RCNP EXPERIMENT E278

PROPOSAL FOR EXPERIMENT AT RCNP

10 Oct 2005

TITLE:
Charged Particle Response of a Prototype Detector Array for the PoGO Astronomical Hard X-ray Polarimeter

SPOKESPERSON:

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EXPERIMENTAL GROUP:

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N. Kawai	Dep. of Phys, Tokyo Tech	(Prof.)
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T. Kamae	Stanford Linear Accelerator Center	(Prof.)
H. Tajima	Stanford Linear Accelerator Center	(Research Scientist)
T. Ylinen	Royal Inst. of Tech, Sweden	(Graduate Student)
M. B. Kiss	Royal Inst. of Tech, Sweden	(Graduate Student)

RUNNING TIME:	Instrument Setup	3-4 days
	Data Runs	2 days
	Cleaning Away	1-2 days

BEAM LINE: Ring : EN course, East Room

BEAM REQUIREMENTS:	Type of particle	Proton
	Beam energy	200$-$400 MeV
	Beam intensity	$\leq$ 0.1 fA
	Energy resolution	$\leq$ 1 MeV

BUDGET:	Experimental expenses	0 yen
	Travel plans - 10 participants should be supported by RCNP	

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SUMMARY OF THE PROPOSAL

The polarized Gamma-ray Observer (PoGO) is a new balloon-borne instrument designed to measure polarization from astrophysical object in 30-200 keV range. It is under development for the first flight in September 2008. The current design of PoGO consists of 217 phoswich units yielding a geometrical area of 930 cm^2, which promises to detect ≤ 10 % polarization from 100mCrab sources in a 6 hr balloon observation. In the balloon experiment, however, charged particle background (mainly protons) is often a serious problem. Expected rate would be ≥ 100 cts/s/unit, which is two orders of magnitude larger than signals from the astronomical sources. Energy deposited by each charged particle typically amounts to 100 MeV, and such a large signal would make a long tail in the output of PMT signal, resulting in a significant dead-time. In order to simulate a realistic condition in balloon orbit and demonstrate the background rejection scheme, we will take weak gamma-ray signals (59.5 keV from ^{241}Am) collimated on the fast plastic scintillator, under constant illumination of 200$-$400 MeV protons (100$-$1000 cts/s) coming from various incident angles. Intensity of the proton beam is monitored by a small plastic scintillator placed in front of the PoGO phoswich unit. By comparing the data obtained when the beam is ON and OFF, we can investigate the possible effects caused by the charged particles in detail.