E362

RCNP EXPERIMENT E

PROPOSAL FOR EXPERIMENT AT RCNP

12 July 2010

TITLE:

Characterization of quasi-monoenergetic neutron field and radiation instruments with spectrometry using 140 and 200 MeV ^{7}Li(p,n) reaction.

SPOKESPERSON:

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EXPERIMENTAL GROUP:

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Kichiji HATANAKA	RCNP, Osaka Univ.	(Professor)
Takashi NAKAMURA	CYRIC, Tohoku Univ.	(Professor Emeritus)

RUNNING TIME: Installation time without beam — 1 day (for each beam time)

Data runs — 3.0 days × 2 times = 6 days

BEAM LINE: Ring : N0 course

BEAM REQUIREMENTS:

Type of particle	p
Beam energy	140, 200 MeV
Beam intensity	≤ 1 μA

	Any other requirements halo-free, small emittance, beam pulsing	
BUDGET:	Traveling expenses	500,000 yen
	^{7}Li target	100,000 yen

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SUMMARY OF THE PROPOSAL

This proposal has a plan to perform the characterization of the RCNP monoenergetic neutron field and the radiation monitors of CERN ionization chambers, Bonner Sphere Spectrometeres (BSS), and extended REM counter using p-Li reaction at proton incident energies of 140 and 200 MeV. This proposal is the further extension of the recently carried out experiment (E280 and E323) of the shielding experiments and the response measurements with 250 and 392 MeV protons.

The quasi-mono energetic neutron beams are well suited for the calibration of detectors. In order to consider the correction required to derive the response in the peak region from the measured total response, we have proposed measurement of the neutron energy spectra at larger angles within 30° using the TOF method to reduce the uncertainty of the response in the continuum part. Experimental data and this correction method were measured and developed in previous experiment (E323) with 246 and 389 MeV protons and presented at Tenth meeting of the task force on Shielding Aspects of Accelerators, Targets and Irradiation Facilities (SATIF 10) sponsored by the OECD Nuclear Energy Agency (NEA). Committee strongly suggested us to continue the RCNP experiments and submit our data to Radiation Shielding and Dosimetry experiments data base (SINBAD) presented by OECD/NEA. We will also measure the gamma-rays spectra contaminating the neutron beam at the mono-energetic neutron field. The large liquid organic scintillator using the unfolding method will be employed.

After characterization of mono-energetic neutron field with 140 and 200 MeV protons, we will measure the response of radiation monitors for CERN ionization chambers and BSS of German Research Center of Environmental Health (HMGU) and AIST to benchmark neutron response calculations of these detectors using the Monte Carlo codes. We have already measured the response of these monitors with 250 and 392 MeV protons in our last experiments(E280 and E323). It would be very important to conduct the same series of measurements of response at an energy of 140 and 200 MeV which supposedly should not include photons originating from π^0 decay but only those coming from the excited states of ^{7}Be. 140 and 200 MeV energies are also important for the calibration of monitors because these energies are very close to the cascade peak (around 100 MeV) in the secondary cosmic neutron spectra.

The total required time will be 6 days of measurement time (including detector setup) for 140 MeV and 200 MeV protons.