E420

RCNP EXPERIMENT E

PROPOSAL FOR EXPERIMENT AT RCNP

13 February 2013

TITLE:
Characterization of quasi-monoenergetic neutron field and radiation instruments with spectrometry using 100 and 300 MeV ^{7}Li(p,n) reaction.

SPOKESPERSON:

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RUNNING TIME: Installation time without beam 1 day
Data runs 3 days × 2 times = 6 days

BEAM LINE: Ring: N0 course

BEAM REQUIREMENTS:

Type of particle	proton
Beam energy	100 and 300 MeV
Beam intensity	1 nA-1μA
Any other requirements	halo-free, small emittance, beam pulsing

BUDGET:

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SPOKESPERSON: Yosuke IWAMOTO

SUMMARY OF THE PROPOSAL

This proposal has a plan to perform the characterization of the RCNP monoenergetic neutron field and the radiation monitors such as CERN ionization chambers, Bonner Sphere Spectrometers (BSS) and extended REM counters using the p-Li reaction at proton incident energies of 100 and 300 MeV. This proposal is the further extension of the recently carried out experiment (E280, E323 and E362) of the response measurements with 140, 200, 250 and 392 MeV protons. It is the final proposal of our series experiments.

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 for high-energy neutron detectors, we have proposed the subtractions of the response obtained at larger angles (15◦ - 25◦) from the 0◦ data in the continuum part.

After characterization of mono-energetic neutron field with 100 and 300 MeV protons, we will measure the response of radiation monitors (ionization chamber, extended REM monitors and liquid organic scintillators) of CERN, J-PARC and Spring-8 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 in our last experiments (E280, E323 and E362). It would be very important to conduct the same series of measurements of response at energy of 100 and 300 MeV. 100 MeV neutron beam supposedly should not include photons originating from $\pi 0$ decay but only those coming from the excited states of ^{7}Be. It is 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 and in the radiation fields encountered at accelerator facilities behind massive lateral shielding.

The total required time will be 6 days of measurement time (including detector setup) for 100 MeV and 300 MeV protons.