

**E409**

## PROPOSAL FOR EXPERIMENT AT RCNP

17 July 2012

### TITLE:

Hadron Therapy related Data base and detector development

### SPOKESPERSON:

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**RUNNING TIME:** 16 hours each run; 4 parasitic runs.

**BEAM LINE:** NO area

**BEAM REQUIREMENTS:**

Type of particle	proton
Beam energy	400 / 230 / 160 / 100 MeV
Energy resolution	< 0.2 MeV
Beam intensity	< 10 nA
Beam dimension	FWHM ~ 2 mm/ 60 mm in diameter

**BUDGET:** 300,000 yen (He gas, experiment table, target materials)

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## SUMMARY OF THE PROPOSAL

Recent advances in cancer hadron therapy have imposed strong and urgent demands of suitable detectors for Quality Assurances (QA). We design the following detectors to meet such demands. Detectors designed and built are 1) MLFC (Multi Layer Faraday Cup) for range measurement, 2) MLIC (Multi Layer Ionization Chamber) for dose development in depth and 3) 2D pad or 1D double-side strip Ionization Chambers (2D IC) for lateral position measurement.

From clinical point of view, accuracy of simulation is equally important in treatment planning, which requires reliable data base. GEANT4 is one of the general accepted simulation codes in hadron therapy, which was originally developed in HEP community and later extended to hadron therapy. Detail of its data base needs verification and improvement in both nuclear and electromagnetic interactions. To collect these data adequate detectors are needed.

Purposes of this experiment are:

- 1) Measurements of multiple scattering from water at 100 to 400 MeV/c and verification of GEANT4 simulation with measurements. Similar measurements of multiple scattering from PMMA and aluminum targets shall be carried out as references for cross check.
- 2) To verify performances of detectors (MLIC and 2D detectors) meet their design goals, in particular they must meet clinic environment and QA purposes.
- 3) To perform relative calibrations of detectors.