RCNP EXPERIMENT E280

PROPOSAL FOR EXPERIMENT AT RCNP

TITLE:

Characterization of LHC radiation monitoring equipment and benchmark of Monte Carlo calculations

SPOKESPERSON:

Full Name	Christian THEIS
Institution	Safety Commission/Radiation Protection European Organization for Nuclear Research (CERN)
Title or Position	Researcher
Address	Geneva 23, CH-1211 Geneva, SWITZERLAND
Phone number	+41 22 767 8069
FAX number	+41 22 767 5700
E-Mail	Christian.Theis@cern.ch

EXPERIMENTAL GROUP:

Full Name	Institution	Title or Position
Christian THEIS	CERN	Researcher
Helmut VINCKE	CERN	Researcher
Stefan ROESLER	CERN	Researcher
Markus RETTIG	CERN	Researcher
Doris FORKEL-WIRTH	CERN	Researcher
Hans-Georg MENZEL	CERN	Group leader
Shingo TANIGUCHI	Japan Synchrotron Radiation Research Institute	Researcher
Takashi NAKAMURA	Cyclotron & Radioisotope Center, Tohoku University	Professor Emeritus
Atsushi TAMII	Research Center for Nuclear Physics, Osaka University	Ass. Professor
Kichiji HATANAKA	Research Center for Nuclear Physics, Osaka University	Professor

RUNNING TIME	1 day of installation + 5 days of measurements, including detector setup for the respective measurements
BEAM LINE	Ring N0 course
BEAM REQUIREMENTS	Type of particle: p Beam energy: 150, 250, 392 MeV Beam intensity: 2.5, 25, 400, 600, nA Any other requirements : none
BUDGET	n/a, travel & shipping expenses will be paid by CERN

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SUMMARY OF THE PROPOSAL

The monitoring of ionizing radiation around high-energy accelerators like the Large Hadron Collider (LHC) and its injectors presents a major challenge due to the mixed radiation fields which are characterized by a complex particle composition and a wide range of particle energies. This is common for all high energy hadron accelerators and requires monitoring systems which are specially designed for such a metrological task. In the framework of the design and legal certification process of the LHC radiation monitoring system it is intended to characterize and to evaluate the response of various active radiation detection systems like high-pressure or open-air ionization chambers and passive dosimeters like Radio-Photo-Luminescence (RPL) or alanine dosimeters.

High energy neutrons are contributing a major part to the ambient dose equivalent encountered at many locations around the LHC. Hence, it is of great importance to expose the aforementioned detectors to quasi-mono-energetic high-energy neutrons in the energy-range of 150 to 400 MeV. The experimental results will be directly compared to the FLUKA simulations that have already been performed. The benchmark will also provide important feedback for the improvement of the design of the monitoring equipment in collaboration with the manufacturers. Furthermore, the results will be used to prove the appropriateness of the equipment to the legal authorities, which is of crucial importance.

During the measurements we will expose high-pressure ionization chambers of the type Centronic IG5-A20 and IG5-H20, filled with argon and hydrogen, as well as open-air ionization chambers (PMI) to neutron energies of 150, 250, and 400 MeV. The total created electric charge in the respective active volume will be monitored and compared to the results obtained by Monte Carlo simulations. In addition, passive RPL and alanine dosimeters will be placed close to the target in order to measure and calibrate their response to a neutron dominated radiation field. Also these measurements will be used to benchmark Monte Carlo simulations predicting the energy deposition in the various dosimeter types. The total required time will be 1 day of installation and 5 days of measurement time (including detector setup) for 3 proton energies.