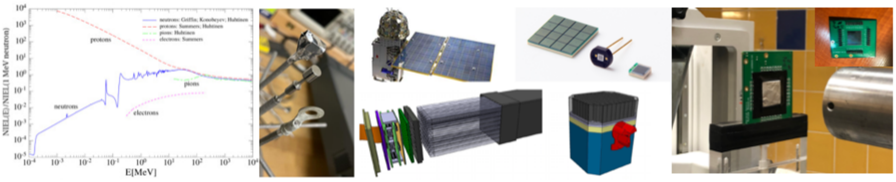

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The Bern medical cyclotron as a facility for radiation hardness studies

Monday 25 April 2022 13:00 (25 minutes)

Radiation tolerance tests on particle detector components such as SiPMs and their associated electronics are crucial to the success of high-energy physics experiments and scientific missions in space. To this end, an 18 MeV proton beamline is operational at the medical cyclotron of the Bern University Hospital (Inselspital). While the cyclotron's primary purpose is the production of medical radioisotopes, which is typically done overnight, the accelerator is usually available during the day for radiation hardness tests and other multi-disciplinary research activities. The beamline transports the protons from the cyclotron bunker to an adjacent experimental bunker. A 1.8-m thick wall separates the two bunkers, effectively shielding the experimental area from the high radiation environment in the cyclotron bunker. The beam parameters can be adjusted to a high degree to accommodate the user requirements. In particular, the beam spot size can be tuned from a few mm2 to a few cm2, thanks to two independent quadrupole doublets along the beamline, and the ion source current, the Radio-Frequency (RF) and the current in the main coil of the cyclotron can be varied to achieve a proton flux ranging from 5·109 p·cm-2·s-1 to 4·1011 p·cm-2·s-1 on the Device Under Test (DUT). This corresponds to a dose rate to the DUT between 20 Gy/s and 1.5 kGy/s. This talk will introduce the facility, focusing on its potential interest for space applications, and will present some ongoing developments on beam instrumentation. Finally, a new project will be presented in which it is intended to produce a controlled neutron beam for radiation hardness tests, from nuclear reactions induced by the primary proton beam on targets of different materials.

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