



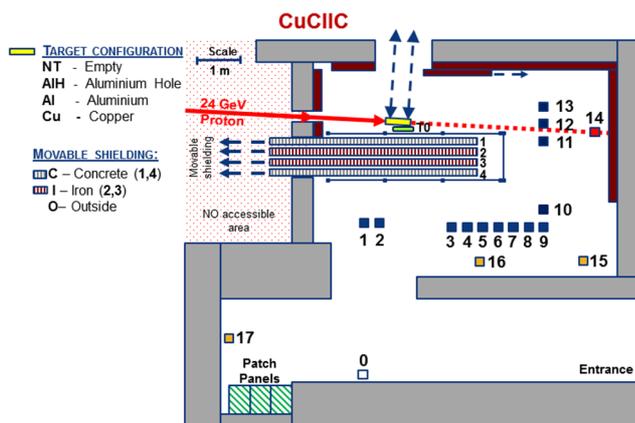
CHARM: the mixed field irradiation facility at CERN

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The CERN High energy Accelerator Mixed field (CHARM) facility [1] has been designed to be a test bench for the qualification of large electronic systems and components in view of their implementation in the harsh environment of the Large Hadron Collider (LHC) underground areas, where high radiation levels are expected [2]. The complex radiation field of CHARM is unique in terms of multitude of particles (neutrons, protons, kaons, pions, muons, electrons, photons) generated from the interaction of a mono-energetic (24 GeV/c) proton beam, extracted from the CERN Proton Synchrotron (CPS), with a cylindrical metal target (Al or Cu). The multiple facility configurations allow to emulate radiation spectra very similar to the LHC tunnel and shielded areas but also the ground, atmospheric and space ones [3]. In particular, the use of different targets and of a movable shielding made of layers of concrete and/or iron allows varying the hardness and the particle population in predefined test locations. In spite of the complexity of the facility, the mixed field has been characterized by a complex calibration procedure providing, an accurate mapping of the irradiation area in terms of total ionizing dose, high-energy hadron fluence (>20 MeV), thermal neutron fluence and 1 MeV neutron equivalent fluence, quantities required to evaluate all the radiation effects to the electronics. The lecture will describe the complexities and singularities of this unique facility providing also an overview of the mixed field characterization procedure.



[1] "CHARM website," CERN, [Online]. Available: <http://charm.web.cern.ch/>. [Accessed 2017].

[2] K. Roed et al., "An overview of the radiation environment at the LHC in light of R2E irradiation test activities," CERN, Geneva, 2011.

[3] J. Mekki et al., "CHARM: A Mixed Field Facility at CERN for Radiation Tests in Ground, Atmospheric, Space and Accelerator Representative Environments," IEEE Trans. Nucl. Sci., vol. 63, no. 4, pp.2106-2114, 2016.