Contribution ID: **22** Type: **Oral presentation (preferred)**

Overview of recent activation benchmarks at the CERN High Energy Accelerator Mixed Field facility (CHARM) and the CERN Shielding Benchmark Facility (CSBF)

Thursday, 30 May 2024 09:40 (20 minutes)

The CERN High Energy AcceleRator Mixed Field facility (CHARM) at CERN is designed to test electronic devices in high-energy and mixed radiation fields resembling particle accelerators, ground-level, atmospheric, and space environments. Located at the East Experimental Area, it receives a 24 GeV/c pulsed proton beam from the CERN Proton Synchrotron (PS), with pulses of 350 ms having maximum intensities of 8.0E11 protons per pulse: the extracted beam impacts on a 50 cm long copper or aluminium target. The intensity, energy spectrum and relative particle composition of the secondary high-energy and mixed field at the different irradiation locations can be for instance tuned by remotely changing the target and/or by inserting in the irradiation room concrete and iron shielding walls up to a thickness of 80 cm.
The CERN Shielding Benchmark Facility (CSBF) is located laterally above the CHARM target and incorporated within its roof shielding: it makes parasitic use of the beam conditions at CHARM for activation measurements, characterization of shielding materials and radiation detectors in high-energy neutron. Thanks to a 200 cm long custom-made removable sample-holder concrete block, it also allows for irradiation of passive detectors at various depths within the roof shielding.
During the operational year, one week of beam time is typically dedicated to radiation protection measurements and radiation benchmark studies. This paper provides an overview of benchmarks conducted at CHARM and CSBF over the past two years covering activation in neutron-dominated radiation fields and mixed radiation fields. An example for the former case is the study of neutron streaming through the CHARM access maze using activation detectors in which experimental results were compared against FLUKA, PHITS, and Geant4 simulations. Several FLUKA benchmarks in the CHARM target room and in the shielding structure of CSBF will also be discussed: these focused on the production of medium- to long-lived radionuclides in commonly used materials for accelerator high-energy physics experiment components, ranging from copper and aluminium to steel.

Scientific Topic 1

Scientific Topic 2

Scientific Topic 3

Code benchmarking and intercomparison

Scientific Topic 4

Scientific Topic 5

Induced radioactivity and decommissioning

Scientific Topic 6

Scientific Topic 7

Scientific Topic 8

Primary author: Dr BOZZATO, Davide (CERN)

Co-authors: Mr DEVIENNE, Arnaud (Fusion for Energy); Dr DYRCZ, Patrycja (CERN); Dr FROESCHL, Robert (CERN); Dr INFANTINO, Angelo (CERN); Mr LORENZON, Tommaso (CERN); Dr TISI, Marco (CERN); Dr KAJIMOTO, Tsuyoshi (Hiroshima University); Dr LEE, Eunji (KEK); Dr NAKAO, Noriaki (Shimizu Corporation); Dr SANAMI, Toshiya (KEK); Dr ROESLER, Stefan (CERN); Dr BRUGGER, Markus (CERN)

Presenter: Dr BOZZATO, Davide (CERN)

Session Classification: Session 5 - Induced Radioactivity

Track Classification: Induced radioactivity and decommissioning