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The IRRAD Proton Irradiation Facility Data Management, Analytics, Control and Beam Diagnostic systems: current performance and outlook beyond the CERN Long Shutdown 3

Tuesday 23 September 2025 16:00 (1h 30m)

The proton irradiation facility (IRRAD) at the CERN East Area was built in 2014 during the Long Shutdown 1 (LS1), and later improved during the LS2 (2019), to address the needs of the HL-LHC accelerator and detector upgrade projects. IRRAD, together with the CHARM facility on the same beamline, exploits the 24GeV/c proton beam of the Proton Synchrotron (PS) providing an essential service at CERN showcasing more than 4400 samples irradiated during the last decade. IRRAD is operated with precise custom-made irradiation systems, instrumentation for beam monitoring (IRRAD-BPM), operational GUIs (OPWT) and a dedicated data management tool (IDM) for experiments follow-up and samples traceability. Moreover, performance tracking generated by custom-made analytics tools (Jupyter, etc.) guarantees regular feedback to the PS operation, thus maximizing the beam availability for IRRAD. While the HL-LHC components qualification is coming to an end with the LS3 (2026-2028), new challenges arise for future detector, electronics components and material irradiations: reaching extremely high fluence levels, operating lower momenta or heavy ion beams, being some of those. In this context we first describe the last (software and hardware) improvements implemented at IRRAD after the LS2 and then present the challenges ahead that will drive future upgrades such as, for example, applying Machine Learning techniques to the IRRAD-BPM data aiming to achieve real-time automatic beam steering and control

Footnotes

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