Contribution ID: **687** Contribution code: **MOPM101** Type: **Poster Presentation**

Upgrade of the LHC main RF system for HL-LHC

Monday 2 June 2025 16:00 (2 hours)

In the era of the High-Luminosity Large Hadron Collider (HL-LHC), the main RF system will be limited in voltage and power on the injection plateau due to strong beam loading. At the same time, significant start-of ramp losses, that are originating from capture and flat bottom losses, are expected and can severely impact machine availability or even prevent the beam from reaching the collision energy. In this contribution, we present the recent experience with high-intensity beams during operation and dedicated measurements to give an update on the estimated RF voltage reach for HL-LHC beam parameters. Projections for beam losses at capture, along the flat bottom, and at the start of the ramp are calculated, taking into account also the effect of intra-beam scattering. We discuss in detail the mitigation measures put in place, such as high-efficiency klystrons, the revision of beam loss monitor thresholds at the start of the ramp, and automatic working point optimization.

Footnotes

Paper preparation format

LaTeX

Region represented

Europe

Funding Agency

Research supported by the HL-LHC project

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Session Classification: Monday Poster Session

Track Classification: MC1 :Colliders and Related Accelerators: MC1.A01 Hadron Colliders