Contribution ID: **1262** Contribution code: **TUPS027** Type: **Poster Presentation**

RF power margin for operation with fixed-target in the CERN SPS

Tuesday 3 June 2025 16:00 (2 hours)

The CERN Super Proton Synchrotron (SPS) Radio Frequency (RF) system was upgraded as part of the Large Hadron Collider Injector Upgrade (LIU) project, and now comprises six 200 MHz travelling wave structures, each fed by a separate RF power amplifier. While the upgrade was targeting the peak power for capture and acceleration of the beams for the High Luminosity LHC, it also brought an increase in the available average power for fixed-target beams. The additional power introduced margins which were first probed and exploited in 2024, when the SPS RF system had to be operated at majorly reduced power, during failures that blocked a single power amplifier or accelerating structure. Specific examples from the 2024 run are given, together with the mitigation measures. This contribution summarizes the efforts and results, highlighting in particular the improvements needed for the control of the RF voltage for easier switching to the degraded mode of operation and back, as well as the impact of the impedance of an undriven cavity.

Footnotes

Paper preparation format

LaTeX

Region represented

Europe

Funding Agency

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Session Classification: Tuesday Poster Session

Track Classification: MC4: Hadron Accelerators: MC4.A04 Circular Accelerators