Contribution ID: **570** Contribution code: **WEPM001** Type: **Poster Presentation**

High Luminosity LHC optics: machine development results

Wednesday 4 June 2025 16:00 (2 hours)

As the High Luminosity LHC (HL-LHC) era approaches, precise control of the accelerator becomes increasingly critical. Machine studies are essential to address the forthcoming challenges and develop correction strategies based on experimental measurements. Although the upgraded inner triplets are not yet available, key features of the HL-LHC optics can still be investigated. This includes exploring the high Achromatic Telescopic Squeeze (ATS) factors in the neighboring arcs of the high-luminosity interaction regions, particularly under flat optics configurations. A beta blow-up is also implemented in the long straight section containing most of the beam instrumentation to improve their sensitivity at top energy. This paper presents experimental measurements, evaluates arc phase errors, and discusses the implementation of local corrections. Sextupole bumps in the arcs were employed to mitigate these errors, demonstrating their effectiveness in optimizing machine performance.

Footnotes

Paper preparation format

LaTeX

Region represented

Europe

Funding Agency

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Session Classification: Wednesday Poster Session

Track Classification: MC5: Beam Dynamics and EM Fields: MC5.D01 Beam Optics Lattices, Correction Schemes, Transport