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Benchmarking of LHC beam intensity dependent transverse tune corrections at injection energy

Wednesday 4 June 2025 16:00 (2 hours)

Observations of betatron tune evolution during LHC beam injection have revealed a significant tune error, strongly correlated with beam intensity. This finding highlights limitations in the existing feedforward corrections based on Laslett coefficients. A dedicated machine development study was conducted to refine intensity-dependent tune corrections. Utilizing high-precision, per-bunch tune measurements facilitated by the LHC transverse feedback system, the study characterized tune shifts under varying intensities and beam conditions. The results uncovered pronounced discrepancies between horizontal and vertical planes, which deviate from predictions made by the current correction model. These insights provide a critical foundation for improving the accuracy of intensity-dependent tune adjustments, impacting operational stability and efficiency, in particular when considering future operation of the high-luminosity LHC.

Footnotes

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