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Emittance and luminosity monitoring and modelling for LHC Run 3

Wednesday, 22 May 2024 16:00 (2 hours)

A comprehensive model accurately depicts and tracks emittance and luminosity evolution in the Large Hadron Collider (LHC), considering known effects like IBS, synchrotron radiation damping, coupling and incorporating data-driven factors on emittance growth and intensity losses. Used extensively in LHC Run 2, the model is updated for compatibility with new optics and operational schemes in Run 3, featuring luminosity leveling. This paper discusses the analysis of 2022 and 2023 LHC data, exploring emittance evolution and identifying extra blow-up at injection and collision energies compared to model predictions. Examining the model's agreement with collision data provides insights into the impact of degradation mechanisms, configuration options, filling schemes, and beam types on delivered luminosity. These studies offer valuable insights into potential gains in integrated luminosity for subsequent Run 3 years.

Footnotes

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