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Overview of power deposition profiles in the LHC off-momentum cleaning section in Run 3

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Off-momentum losses at the start of the LHC acceleration ramp in proton runs gave rise to multiple beam dumps by exceeding Beam Loss Monitor (BLM) thresholds in the momentum cleaning insertion (IR3). Accurately estimating the power deposition profiles in IR3 is necessary to determine where BLM thresholds can be optimized, thereby reducing unnecessary beam dumps and improving machine availability and performance. Understanding the loss limits in IR3 is crucial for future High-Luminosity LHC (HL-LHC) performance.
In this study, we present FLUKA power deposition results and introduce a newly developed simulation model for BLM benchmarking in IR3. We provide a comprehensive overview of the power deposition in magnets and collimators, identifying potential bottlenecks in the system. Our simulations were benchmarked against multiple fills from 2023 and 2024 that led to beam dumps. The obtained results provide a deeper understanding of the IR3 collimation performance in view of HL-LHC operation in IR3.

Footnotes

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