

Present and future beam collimation: challenges and solutions for HL-LHC and future projects

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The HL-LHC performance relies on handling safely and reliably high intensity beams of unprecedented stored energy. The 7TeV design target is compatible a factor 2 larger current than the LHC and levelled peak luminosities 5 times, and ultimately 7.5 times, larger. This goal requires a massive collimation system upgrade, both for the halo betatron collimation that must sustain beam losses up to 1MW, and for the collimation systems around the experiments. This paper describes the solutions elaborated for HL-LHC and the operational experience from a first collimation upgrade deployed in the 2019-2021 long shutdown. These upgrades include new low-impedance collimators, crystal collimation for ion beams and local dispersion suppression collimation. The present and future collimator design are presented. This effort paves the way for beam collimation solutions that are being studied for future projects like the lepton and hadron future Circular Colliders (FCC) presently pursued at CERN.

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