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Collimation quench test at the LHC with a 6.8 TeV proton beam

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The High Luminosity upgrade of the CERN Large Hadron Collider (HL-LHC) aims to achieve stored beam energies of 680 MJ. One possible limit to the achievable intensity is the quench limit of the superconducting magnets downstream of the betatron collimation insertion. At HL-LHC beam intensities, even a tiny amount of particles leaking out of the collimation system may be sufficient to quench them. The quench limit of these magnets, when exposed to proton loss, depends crucially on a variety of parameters. It can only be accurately estimated through dedicated beam tests that determine it under realistic operating conditions. In this paper, we present the design and execution of a quench experiment carried out at the LHC in 2022 with proton beams at 6.8 TeV. We describe the experimental approach, the result, and the analysis of the test that aims to probe the collimation cleaning performance while deliberately inducing beam losses of up to 1000 kW. The result of these tests is crucial input for the need of future collimation upgrades.

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Footnotes

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