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Operational handling of Crystal collimation at the LHC

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A non-negligible risk of magnet quenches occurring due to the reduced cleaning performance of the original LHC collimation system with lead ion beams was expected at an energy of 6.8 Z TeV beams. Crystal collimation has therefore been integrated into the HL-LHC upgrade baseline to overcome present limitations. The upgrade scope involves the installation of 4 new crystal primary collimators. Upgraded devices were installed based on the experience and experimental evidence gathered with a previously-installed test stand. In preparation to the new operational challenges, the controls of the new devices were integrated in the high-level LHC collimation control system, which is used to orchestrate the operation of these devices in harmony with all the other components of the machine. A dedicated application was also developed to address three main tasks: to find the main planar channeling of newly installed crystals using Machine Learning models developed at CERN; to optimise the angular orientation to maximise the channeling efficiency; to monitor that the optimal channeling orientation is kept throughout the fill. This paper will present and discuss all of these aspects.

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Footnotes

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Yes

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