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Operational deployment of automatic angular alignment for LHC collimators

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The Large Hadron Collider (LHC) features a collimation system that protects the machine against beam losses that may induce the loss of superconductivity in some exposed lattice magnets. Thus, optimal cleaning performance must be ensured at all times. The collimation system encompasses more than 100 collimators whose settings are organised in a well-defined transverse multi-stage hierarchy. A collimator alignment toolset has been developed over the years to automate the alignment of the system during beam commissioning. During alignment, the collimator jaws used to be kept parallel to the central beam orbit. However, further tightening of the collimation hierarchy to improve the β* reach is only possible if the collimator jaw angles are precisely adjusted to compensate for any mechanical or orbit tilts. Advanced alignment procedures have therefore been developed to compensate for these effects. The first operational deployment of jaw angle has been achieved in the 2024 run. The commissioning results leading to this milestone are reported in this paper, together with the optimisation of parallel jaw alignment and an overview of the operational architecture.

Footnotes

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