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Crystal collimation for the HL-LHC upgrade using MERLIN++

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This paper details the implementation and benchmarking of crystal collimation within MERLIN++ accelerator physics library and demonstrates its application in simulating crystal collimation process for the High Luminosity upgrade of LHC at CERN. Crystal collimation is one of the key technologies suggested to enhance the current collimation system according to the requirements of HL-LHC upgrade due to its increased beam energy and luminosity. This paper outlines the proposed methodology for this study which includes implementing the demonstrated physics of particle crystal interaction in MERLIN++, benchmarking it with the existing experimental data and simulating the HL-LHC operational scenarios with the crystals as primary collimators. MERLIN++ has already been efficiently used for multiple LHC collimation studies which highlights its importance, making it an essential simulation tool for comparative analysis with other simulation tools, as relying on a single tool for concluding the HL-LHC collimation system is often insufficient. As collimation systems are fundamental for machine protection, accurately predicting the crystal collimation performance is of utmost importance to know how they will perform in HL-LHC to guarantee that the HL-LHC meets its intended objectives with crystal collimators.

Footnotes

Funding Agency

Paper preparation format

Region represented

Europe

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