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New analysis tools for LHC aperture measurements

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Aperture measurements at the Large Hadron Collider (LHC) are routine procedures conducted during the early stages of beam commissioning, prior to the injection of high-intensity beams. This is to ensure that the aperture, defining the clearance for the circulating beams, is protected by the LHC collimation system. Local aperture measurements are performed to probe the available aperture at specific locations. Such measurements are carried out by applying a local orbit bump in the area of interest. The bump amplitude is increased until the beam touches the aperture, visible through signals in the local Beam Loss Monitors. This contribution introduces a refined approach to analyse local aperture measurements by incorporating measured beam position monitor (BPM) signals to enhance the precision of the analysis. Using the Xsuite package, the orbit bump is simulated and rematched to the measured BPM signal to enhance the analysis and quantify the uncertainties with respect to the theoretical beam orbit. Using past measurement data, we compare the results obtained using the established and revised methodologies and conclude on derived measurement uncertainties.

Footnotes

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Region represented

Europe

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