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## Beam-beam interaction-induced bias to precision luminosity measurement

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The beam-beam interaction between the two circulating beams has been studied since the era of particle colliders started. This electromagnetic interaction occurs during collisions and can result in a significant bias on the measured luminosity. Numerical models have been developed to study the beam-beam induced bias on the Large Hadron Collider (LHC) luminosity measurements during van der Meer scans. They were further extended to reproduce the nominal operation configuration and study biases in more demanding conditions with beam train-dependent structures, and the extreme beam and machine parameters at the interaction points. In this report we compare results from a dedicated experiment performed at the LHC to those obtained with the numerical model. In addition, preliminary observations of the beam-beam impact to luminosity in physics operation are also discussed. The final aim of this study is to quantify the beam-beam bias to luminosity-based observables in hadron colliders. Firstly focusing on obtaining the precise luminosity calibration and further investigating an independent way to measure the detector-specific non-linearities and overall stability during nominal data-taking period.

### Collaboration / Activity

CERN/CMS/BRIL and EPFL/LPAP

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