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Studies of the factorization of proton densities in van der Meer scans and its impact on precision luminosity measurements for CMS

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The factorizability of the transverse proton density functions in x and y is assumed in the analysis of single-plane van der Meer (VdM) scans for absolute luminosity calibration. A correction to the calibration constants for nonfactorization effects in the proton density is then determined. The precision of the evaluation of this correction is one of the dominant sources of systematic uncertainty for the Run 2 (2015–2018) luminosity measurement in CMS. The VdM calibration technique and the methods used to estimate the bias due to the nonfactorization assumption are discussed.

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