Contribution ID: **233** Type: **Poster**

Van der Meer calibration of the CMS luminosity detectors in 2017

Friday, 6 July 2018 20:15 (15 minutes)

To guarantee smooth and uninterrupted luminosity measurements the CMS experiment is equipped in Run II with three online luminometers: the Pixel Luminosity Telescope (PLT), the Fast Beam Condition Monitor (BCM1F) and the Forward Calorimeter (HF). For the offline luminosity measurement and a cross check of the online detectors the pixel detector is used (Pixel Cluster Counting, PCC). For the calibration of the luminometers once per year a full program of van der Meer (VdM) scans is performed. It consists of series of standard VdM scans and 4 imaging scans. In the standard VdM scans both beams are moving across each other and the transverse size of the beam overlap is defined. Imaging VdM scans are required to disentangle XY correlation. For steering magnet calibrations, under the special beam conditions during the VdM scan, the length scale (LS) calibration is performed. Detailed studies of the systematic effects of beam-beam deflections, orbit drift, LS calibration and unbunched beam correction allow precise luminosity calibration. The methodology of the luminosity calibration and final uncertainty on the integrated luminosity will be presented.

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Session Classification: POSTER

Track Classification: Posters