

CMS emittance scans for 2017 luminosity calibration

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Emittance scans are short van der Meer type scans performed at the beginning and at the end of LHC fills. The beams are scanned against each other in X and Y planes in 9 displacement steps and are used for LHC diagnostics and since 2017 for CMS luminosity calibration cross check. An XY pair of scans takes less than 4 minutes elapsed time. BRIL project provides to LHC three independent online luminosity measurement from PLT, BCM1F and HF. The excellent performance of BRIL detectors, fast back-end electronics and CMS XDAQ based data processing and publication allow the use of emittance scans for linearity and stability studies of the luminometers. Emittance scans became a powerful tool and dramatically improved understanding of luminosity measurement during the year. Since each luminometer is independently calibrated in every scan the measurements are independent and ratios of luminometers can strictly be used as a final validation. Two independent analyses of emittance scans are launched: offline python based framework and online XDAQ based application. Results are published on the monitoring web-pages in real-time for the XDAQ based analysis and within typically 15 minutes for the python based framework, which has however the advantage of being rerunnable.

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