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Luminosity determination at LHCb during Run 3

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During Runs 1 and 2, the LHCb detector optimized its performance by stabilizing the instantaneous luminosity throughout each fill, adjusting the distance between the colliding beams using a hardware-based trigger system. In Run 3, the LHCb experiment underwent a major upgrade to accommodate a fivefold increase in luminosity, transitioning to a fully software-based trigger. A new luminometer, PLUME, was installed and successfully commissioned, providing enhanced real-time luminosity measurements. Furthermore, new online proxies from nearly all sub-detectors are now utilized to deliver real-time luminosity measurements, both integrated and per bunch crossing. Additionally, dedicated offline counters are recorded via a specialized data stream operating at a rate of 30 kHz, enabling precise offline luminosity calibration. This talk will provide an overview of the upgraded luminosity measurement capabilities at LHCb and of the systems employed to perform such measurements, presenting the first results obtained from data collected during 2023 and 2024, including the measurement of the ghost charge fraction using the beam-gas imaging technique.

Secondary track

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