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Upgrade II of the muon detector at LHCb

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The LHCb experiment at CERN, operating at the LHC collider, enabled significant advances in flavor physics and electroweak studies in the forward region, demonstrating excellent performance during LHC Run 1 and Run 2. Upgrades in detectors resolution and trigger system technology were necessary to cope with the increased luminosity in Run 3, reaching a peak value of $\mathcal{L} = 2 \times 10^{33}$ cm^{-2}s^{-1}. In order to take full advantage of the enhanced luminosity in the forthcoming LHC high-luminosity era from Run 5 in 2035, a second major upgrade (the Upgrade II) is essential. This upgrade aims to maintain optimal performance at a peak luminosity of $\mathcal{L} = 1.5 \times 10^{34}$ cm^{-2}s^{-1}, while targeting an integrated luminosity of 300 fb^{-1}. This presentation will discuss the current state-of-the-art and future strategies for the LHCb muon detector Upgrade II. Key challenges include high hit rates, up to 1 MHz/cm^2, mostly of background particles, which significantly impact on muon identification efficiency. Solutions are proposed, ranging from new detector technologies with high performance readout electronics to improvements in the signal acquisition scheme. All aimed at mitigating inefficiencies and ensuring robust performance in the HL-LHC era.

Secondary track

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