Novel real-time alignment and calibration of the LHCb Detector in Run2

LHCb has introduced a novel real-time detector alignment and calibration strategy for LHC Run 2. Data collected at the start of the fill will be processed in a few minutes and used to update the alignment, while the calibration constants will be evaluated for each run. This procedure will improve the quality of the online alignment. For example, the vertex locator is retracted and reinserted for stable beam collisions in each fill to be centred on the primary vertex position in the transverse plane. Consequently its position changes on a fill-by-fill basis. Critically, this new real-time alignment and calibration procedure allows identical constants to be used in the online and offline reconstruction, thus improving the correlation between triggered and offline selected events. This offers the opportunity to optimise the event selection in the trigger by applying stronger constraints. The required computing time constraints are met thanks to a new dedicated framework using the multi-core farm infrastructure for the trigger. The motivation for a real-time alignment and calibration of the LHCb detector is discussed from both the operational and physics performance points of view. Specific challenges of this novel configuration are discussed, as well as the working procedures of the framework and its performance.

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