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The upgrade of the LHCb trigger for Run III

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The LHCb detector at the LHC is a general purpose detector in the forward region with a focus on reconstructing decays of c- and b-hadrons. For Run III (2021 onwards) of the LHC, LHCb will take data at an instantaneous luminosity of 2 × 10ˆ{33} cm−2 s−1, five times higher than in Run II (2015-2018). To cope with the harsher data taking conditions, the LHCb collaboration will upgrade the DAQ system and install a purely software based trigger, in addition to various detector upgrades, to process the 30MHz of inelastic collisions delivered by the LHC. A new trigger strategy with real-time reconstruction, alignment and calibration will be employed. We demonstrate how the modified detector infrastructure will be able to face this challenge and discuss the necessary changes to the reconstruction sequence, with particular attention to the performance and execution time budget. We present a novel strategy to distribute and maximise the bandwidth among the different physics channels using a genetic algorithm. This maximises the efficiency for useful physics events.

Experimental Collaboration

LHCb

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