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Report of Abstracts

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The LHCb trigger system: performance and outlook

Summary

Abstract content

The LHCb experiment is a spectrometer dedicated to the study of heavy flavor at the LHC. The rate of proton-proton collisions at the LHC is 15 MHz, of which only 5 kHz can be written to storage for offline analytsis. For this reason the LHCb data acquisition system – trigger – plays a key role in selecting signal events and rejecting background. In contrast to previous experiments at hadron colliders, the bulk of the LHCb trigger is implemented in software and deployed on a farm of 20k parallel processing nodes. This system, called the High Level Trigger (HLT) is responsible for reducing the rate from the maximum at which the detector can be read out, 1.1 MHz, to the 5 kHz which can be processed offline, and has, on average, 20 ms to decide whether to accept an event. The inherent flexibility of this software trigger allowed LHCb to run at twice its design instantaneous luminosity in 2012. Simultaneously, the HLT performed far beyond the nominal design in terms of signal efficiencies, in particular for charm physics. It also showcased a number of pioneering concepts, for example : the deployment of an inclusive multivariate B-hadron tagger as the main physics trigger of the experiment, buffering of events to local disks in order to leverage the otherwise idle resources when the LHC does not produce collisions, and simulation-free event-by-event trigger efficiency corrections. This talk will cover the design and performance of the LHCb trigger system, and discuss planned improvements beyond LS1, in particular plans for real-time detector alignment and calibration in order to allow the trigger to perform offline quality selections, as well as plans for the LHCb upgrade trigger.

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Comments:
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