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Standalone track reconstruction in LHCb's SciFi detector for the GPU-based High Level Trigger

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As part of the Run 3 upgrade, the LHCb experiment has switched to a two stage event trigger, fully implemented in software. The first stage of this trigger, running in real time at the collision rate of 30MHz, is entirely implemented on commercial off-the-shelf GPUs and performs a partial reconstruction of the events. We developed a novel strategy for this reconstruction, starting with two independent tracking algorithms, in the VELO and SciFi detectors, forming track segments which are then matched and merged to form full tracks, suitable for selecting events at LHCb. A key point enabling this sequence is the SciFi tracking algorithm, which was implemented for GPU with special care in order to meet the throughput requirements of a real time trigger.

Developing such algorithm is challenging due to the high number of track hypothesis that needs to be tested. We discuss how this challenge was overcome by using the GPU architecture efficiently and how the efficiency of the new sequence is compared to the current baseline reconstruction.

Significance

References

<https://cds.cern.ch/record/2811214>

Experiment context, if any

LHCb

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