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Tracking system of the LHCb upgrade

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The upgrade of the LHCb experiment will run at an instantaneous luminosity of $2 \times 10^{33} \text{ cm}^{-2} \text{ s}^{-1}$ with a fully software based trigger, allowing to read out the detector at a rate of 40MHz. For this purpose, the full tracking system will be newly developed: the vertex locator (VELO) will be replaced by a pixel-based detector, withstanding the high radiation dose and providing an excellent track reconstruction with an efficiency of above 99% for all charged particles of interest. Upstream of the magnet, a silicon micro-strip detector with a high granularity and an improved acceptance coverage, called the Upstream Tracker (UT), will replace the current silicon strip tracker, and provide a rough momentum estimate. The tracking system downstream of the magnet will be replaced by the Scintillating Fibre tracker (SciFi), which will consist of 12 layers using 2.5m long scintillating fibres read out by silicon photo-multipliers, providing a spatial resolution better than 100 micron and resulting in a total momentum resolution of 0.4% for charged particles with a momentum of 20 GeV.

We will present the performance of the tracking system for the LHCb upgrade, highlighting the improvements with respect to the current tracking system of LHCb, and review the track finding strategy. Special emphasize will be put on the need for fast track reconstruction in the software trigger, also giving examples of the potential use of parallelism in the pattern recognition. Finally, we will give some prospects of the physics performance with the LHCb upgrade for channels relying on excellent tracking capabilities.

Collaboration

LHCb collaboration

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