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Performance of the LHCb VELO

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LHCb is a dedicated experiment to study new physics in the decays of beauty and charm hadrons at the Large Hadron Collider (LHC) at CERN. The beauty and charm hadrons are identified through their flight distance in the Vertex Locator (VELO), and hence the detector is critical for both the trigger and offline physics analyses. The VELO is the highest resolution vertex detector at the LHC.

The VELO is the silicon detector surrounding the LHCb interaction point, and is located only 7 mm from the LHC beam during normal operation. The VELO is moved into position for each fill of the LHC, once stable beams are obtained. The detector is centred around the LHC beam during the insertion by the online reconstruction of the primary vertex position.

The VELO consists of two retractable detector halves with 21 silicon micro-strip tracking modules each. A module is composed of two n^+ -on- n 300 micron thick half disc sensors with R-measuring and Phi-measuring micro-strip geometry, mounted on a carbon fibre support paddle. The minimum pitch is approximately 40 μm . The detectors are operated in vacuum and a bi-phase CO_2 cooling system used. The detectors are readout with an analogue front-end chip and the signals processed by a set of algorithms in FPGA processing boards.

The VELO has been successfully operated for the first LHC physics runs. Operational results show a signal to noise ratio of around 20:1 and a best hit resolution of 4 microns.

for the collaboration

For the LHCb VELO group.

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