Design and production of the Silicon VErtex LOcator for the LHCb experiment at CERN. During collisions of the two proton beams in the ‘Large Hadron Collider’ (LHC) B-mesons will be produced. The decay of these B-mesons is not invariant under Charge and Parity reversal: they show CP-violation. The B-mesons travel about 7 mm before decaying into other particles. The micro vertex has been designed to perform an accurate measurement of the decay position (vertex) of these B-mesons.

The VErtex LOcator consists of a row of silicon detectors, each 0.3 mm thick. Charged particles that traverse the silicon generate an electrical charge which can be measured. The silicon sensors are positioned perpendicular to the proton beam at a radial distance of 8 mm from the beam. In order to be very close to the proton proton interaction and have a minimal amount of material in front, the sensors have to be placed in a secondary vacuum box.

During the filling and ramping of the LHC ring the detectors have to be moved out by 30 mm in order to prevent radiation damage. For the actual measurements they have to be moved in again with a position accuracy of better than 0.05 mm.

The whole VErtex LOcator is placed inside the vacuum system. The detectors and the read-out electronics are constructed from radiation hard components. The heat produced by the electronics is taken care of by a cooling system that uses CO₂ as refrigerant. The signals from the detector are transported outside the vacuum system for analysis through 22,000 signal cables.

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