

The LHCb vertex locator: present and future

M. van Beuzekom

NIKHEF, P.O. Box 41882, Amsterdam, The Netherlands

On behalf of the LHCb VELO group

LHCb is a forward-angle spectrometer, dedicated to the study of b-hadron physics, presently under construction at the Large Hadron Collider at CERN. The main task of the Vertex Locator (VELO) is to reconstruct primary and secondary vertices. It consists of two retractable detector halves with 21 silicon micro-strip tracking modules each. A module is composed of two half-discs of 300 μm thickness with R and Φ micro-strip geometry. The strip pitch varies from 40 to 102 μm and from 36 to 97 μm , for an R and Φ sensor, respectively. The sensors, of which the first sensitive element is positioned at 8.2 mm from the colliding beams, are operated under vacuum and cooled by CO_2 . The harsh non-uniform radiation environment has led to the choice of diffusion oxygenated float zone sensors with n^+ strips in n-bulk and p^+ ohmic contacts on the back plane. The signals are routed to 40 MHz analog Beetle1.5 chips, especially developed in a radiation tolerant 0.25 μm technology.

Four dedicated R-sensors located in the upstream hemisphere form the Pile-up system. It features digital readout and will veto bunch crossings with more than one interaction by means of dedicated vertex finding algorithms implemented in FPGAs. Under nominal LHCb running conditions the life time of the VELO detector is expected to amount to 3 years. Various upgrade scenarios are therefore already under study like 3D detectors and sensors based on n-in-p or pixel technology.

The construction of the VELO detector approaches its completion. The expected performance in terms of signal over noise, resolution and efficiency, based on simulations and extensive beam test experiments, will be discussed. An outlook towards possible upgrade scenarios will be presented.