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Performance, radiation resistance, and expectations of the Outer Tracker straw tube detector for the LHCb Experiment

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The LHCb experiment is a single arm spectrometer, designed to study CP violation in B-decays at the LHC. It is crucial to accurately and efficiently detect the charged decay particles, in the high-density particle environment of the LHC. For this, the Outer Tracker (OT) was constructed, consisting of 54,000 straw tubes, covering in total an area of 360 m² of double layers. The detector operated in 2011/2012 under large particle rates, up to 100 kHz/cm per straw in the region closest to the beam.

The performance of the OT detector during Run-I of the LHC has been studied in detail, in terms of efficiency, resolution and noise rate. Particular attention is devoted to the radiation hardness of this sensitive gaseous detector, that has shown to suffer from gain loss after mild irradiation in laboratory conditions. During the shutdown period of the LHC, extensive studies have been performed on subtle spatial alignment effects, and real-time calibration procedures have been prepared for run-II.

In addition, expectations of the OT during run-II in 2015 will be shown. The increased center-of-mass energy of 13 TeV will result in larger particle densities, which is further enhanced by out-of-time hits due to the reduced bunch spacing of 25ns in run-II.

Collaboration

LHCb

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