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Calibration of the LHCb calorimetric system

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Content

LHCb experiment is one of the four main spectrometers at the Large Hadron Collider. The primary goal of LHCb experiment is the search for indirect evidence of new physics in CP violation and rare decays of hadrons, which contain heavy quarks. The calorimeter system of LHCb consists of four sub-detectors: Scintillator Pad Detector followed by a Preshower detector and then an electromagnetic (ECAL) and hadronic (HCAL) calorimeters. The main purpose of the calorimeter system is the identification of hadrons, photons and electrons, and the measurement their energies and positions. This information is the basis of the Level-0 trigger, which is required for initial event selection. The LHCb ECAL is a «shashlik» type calorimeter of $25 X_0$ thickness. A number of calibration techniques are applied sequentially. The final calibration method is based on reconstruction of the π^0 meson invariant mass, which allows to achieve the accuracy of measuring the electron and photon energies of 2%. The Hadron Calorimeter is a sampling iron-scintillator calorimeter of 5.6 nuclear interaction lengths thickness with structure arranged along the collider beam direction. HCAL calibration is based on hydraulic movement of ~ 10 mCi radioactive ^{137}Cs source through every cell. This method provides very detailed information about the calorimeter and allows to measure the response of every individual scintillating tile. The layout of the LHCb calorimeters and these calibration systems and details of the calibration procedures are reported. Special emphasis is put on the data analysis procedure and visualization software. The latest results on the HCAL performance are presented.

Summary

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