The charge sensitivity calibration of the upgraded ALICE Inner Tracking System

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The ALICE detector is undergoing an upgrade for Run 3 at the LHC. A new Inner Tracking System is part of this upgrade. The upgraded ALICE ITS features the ALPIDE, a Monolithic Active Pixel Sensor. Due to IC fabrication variations and radiation damages, the threshold values for the ALPIDE chips in ITS need to be measured and adjusted periodically to ensure the quality of data-taking. The calibration is implemented within the O^2 system, thus it runs in the same framework as the normal operation. This paper describes the concept and implementation of the calibration for the upgrade ALICE ITS.

Summary (500 words)

A Large Ion Collider Experiment (ALICE) is one of the four major experiments conducted at the CERN Large Hadron Collider (LHC). The ALICE detector is currently undergoing an upgrade for the upcoming Run 3 at the LHC, and the new Inner Tracking System (ITS) sub-detector is part of this upgrade. The ALICE Inner Tracking System is the innermost sub-detector in the ALICE apparatus. The ITS is responsible of determining the primary vertices, recon- structing secondary vertices, and improving the resolution of the ALICE Time Projection Chamber.It is composed of ~24,000 Monolithic Active Pixel Sensors (ALPIDE chips) distributed on seven concentric cylindrical layers surrounding the beam pipe. The charge threshold of the chips are key parameters for the performance in terms of data uniformity. Due to IC fabrication variations and radiation damages, the threshold values for all the ALPIDE chips in the ITS need to be measured and adjusted periodi- cally to ensure stability in the qual- ity of the data captured. The calibration of the ITS is implemented within the ALICE Online-Offline computing system, thus it runs in the same framework as used during the normal operation. This paper describes the concept and implemen- tation of the calibration method for the upgrade ALICE ITS. The work focuses on the implementation of the raw data parser for calibration, and the S-curve measurement of the charge threshold of ALPIDE chips.

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