

Gain Calibration of the Upgraded ALICE TPC

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A large Time Projection Chamber (TPC) is the main tracking and particle identification device of the ALICE experiment at the Large Hadron Collider (LHC) at CERN. In order to cope with the foreseen Pb-Pb interaction rate of 50 kHz in the Run 3 of the LHC, the MWPC-based readout chambers of the ALICE TPC were replaced by a GEM-based amplification stage. Combined with the new front-end electronics and the new online/offline system O2, a trigger-less operation of the TPC is possible, resulting in a continuous readout of the three-dimensional track information without dead time. After the new GEM-based readout chambers had been installed, an extensive commissioning program was carried out. It comprised, inter alia, measurements for the calibration of gain variations. These measurements were based on the irradiation of the TPC with an intense X-ray source and on the injection of the radioactive and gaseous isotope ^{83}mKr into the active volume. With them, the calibration of static gain variations (e.g. caused by variations of the hole sizes in the GEM foils) as well as dynamic ones (e.g. due to variations of pressure and temperature) was performed. The studies were essential for the upgraded TPC to reach its design performance, but also revealed some interesting features of the 4-GEM system (e.g. charging-up, wrinkles and sagging). In this talk, the results of the gain calibration of the upgraded ALICE TPC will be presented. The gain map of the detector as well as important parameters for the operation (e.g. the energy resolution) will be shown.

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