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Space-charge distortions in the ALICE TPC in Run 3 — •Matthias Kleiner for the ALICE-Collaboration — Institut für Kernphysik, Goethe-Universität Frankfurt

The Time Projection Chamber (TPC) is the main tracking and particle identification detector of the ALICE experiment at the CERN LHC. For Run 3, starting in 2022, interaction rates of 50 kHz in Pb-Pb collisions require a major upgrade of the TPC readout system. The Multi-Wire Proportional Chambers (MWPCs) were replaced by stacks of four Gas Electron Multiplier (GEM) foils, allowing continuous data acquisition. Due to intrinsic properties of the GEMs, a significant amount of ions produced during the electron amplification drifts into the active volume of the TPC, leading to space-charge distortions of the nominal drift field. Various effects, such as variations in the number of collisions for a given time interval, cause fluctuations of the space-charge distortions on very short time scales. These fluctuations have to be corrected in time intervals of 5-10 ms to preserve the intrinsic space point resolution of the TPC of 100 μm. To accomplish this challenging task, a dedicated correction scheme based on data-driven machine learning techniques is developed.

In this talk, an overview about space-charge distortions and distortion fluctuations in the ALICE TPC in Run 3 will be presented, along with simulations of the expected distortions and the planned correction procedures.

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