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Space-charge distortion calibration for the ALICE TPC in Run 3

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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 to preserve the intrinsic tracking precision of the TPC of 100 μm . A dedicated calibration procedure has been developed for the correction of the space-charge distortions. The measured integrated digital currents (IDCs) on the pads, which are used as an estimate for the space-charge density, are processed and taken as an input for a data-driven machine learning approach.

In this poster, procedures developed for the space-charge distortion calibration for the ALICE TPC in Run 3 will be presented.

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