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Space point calibration of the ALICE TPC with track residuals

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In the upcoming LHC Run 3, starting in 2021, the upgraded Time Projection Chamber (TPC) of the ALICE experiment will record minimum bias Pb–Pb collisions in a continuous readout mode at 50 kHz interaction rate. This corresponds to typically 4-5 overlapping collisions in the detector. Despite careful tuning of the new quadruple GEM-based readout chambers, which fulfill the design requirement of an ion back flow below 1%, these conditions will lead to space charge distortions of several centimeter that fluctuate in time. They will be corrected via a calibration procedure that uses the information of the Inner Tracking System (ITS) and the Transition Radiation Detector (TRD) systems. They surround the TPC internally and externally, respectively. Such procedure is able to restore the TPCs intrinsic track resolution of a few hundred micrometer.

We present the required online tracking algorithm for the TRD, which is based on a Kalman filter. The procedure matches extrapolated ITS-TPC tracks to TRD space points utilizing GPUs.

Subsequently these global tracks are refitted neglecting the TPC information. The residuals of the TPC clusters to the interpolation of the refitted tracks are used to create a map of space charge distortions. Regular updates of the map compensate changes in the TPC conditions. The map is applied in the final reconstruction of the data. First performance results of the tracking algorithm and the space charge distortion maps will be shown.

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