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A photoelectric-effect-based field calibration system for the Time Projection Chamber at the CBELSA/TAPS experiment

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One challenge of gaseous tracking detectors, such as the Time Projection Chamber (TPC), is the calibration of the electric field inside the radiation sensitive volume. This is crucial since deviations from a perfectly homogeneous drift field have direct impact on the spatial resolution. Reasons for these deviations are static imperfections of the detector structure, on the one hand, and dynamic changes of the space charge inside the sensitive volume, on the other hand. The latter is collision rate dependent and mainly related to unwanted ion backflow from the amplification region near the readout plane. For the CBELSA TPC, a calibration system is planned, which is based on the T2K calibration system. Here, the photoelectric effect is used to release electrons at well-known positions on the cathode, which drift towards the readout plane and show the integrated spatial distortions. The concept of the calibration system as well as a dedicated test setup will be presented.

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