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Characterization of a hybrid GEM-Micromegas detector with respect to its application in a continuously read out TPC

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In the context of the upgrade of the LHC during the second long shutdown the interaction rate of the ALICE experiment will be increased up to

50 kHz for Pb-Pb collisions. As a consequence, a continuous operation and read-out of the Time Projection Chamber (TPC) will be required.

To handle the expected increase of space-charge distortions without a gating grid, the ion backflow of the charge amplification system has to be significantly reduced, maintaining at the same time an excellent detector performance and stability. Although a solution with four Gaseous Electron Multipliers (GEMs) has been adopted for the upgraded chambers,

an alternative approach using one Micromegas (MM) and two GEMs has also been investigated. Due to the geometric and electrostatic structure of the MM the ion backflow suppression capability is superior to a single GEM. The two GEM stages in front of the MM are installed to further reduce the ion backflow and to keep the discharge probability of the device at a reasonable level. The recent results of this study will be presented and compared to measurements with four GEM foils.

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