

From gated to continuous readout: an upgrade of the ALICE TPC

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A large Time Projection Chamber is the main device for tracking and charged particle identification in the ALICE experiment at the CERN LHC. After the second long shutdown in 2019/20, the LHC will deliver Pb beams colliding at an interaction rate of about 50 kHz, which is about a factor of 100 above the present readout rate of the TPC. This will result in a significant improvement on the sensitivity of rare probes that are considered key observables to characterise the QCD matter created in such collisions. In order to make full use of this luminosity, a major upgrade of the TPC is required. The presently employed gating of the TPC wire chambers must be abandoned and continuously operated readout detectors using GEMs will be implemented.

To fulfill the challenging requirements of the upcoming upgrade, a novel configuration of GEM detectors has been developed. It allows to maintain excellent particle identification and efficient ion trapping by stacking four GEM foils operated under specific field configuration. Results of an extensive R&D program concerning ion backflow suppression, dE/dx resolution and stability against discharges will be presented. The status of the upgrade of the online calibration and data reduction system, as well as the development of a new readout electronics will be reported. We will also discuss the detector production phase, which is just starting.

Primary authors: Dr SMIRNOV, Nikolai (Yale University); GASIK, Piotr (Technische Universitaet Muenchen (DE))

Co-author: Dr MAJKA, Richard (Yale University)

Presenter: GASIK, Piotr (Technische Universitaet Muenchen (DE))

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