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The ALICE TPC Upgrade Project

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The ALICE TPC will undergo a major upgrade during the next LHC long shutdown in preparation for the higher luminosity planned for LHC Run-3 to start in 2021. This upgrade will allow ALICE to access new levels of sensitivity for untriggered processes. The present TPC is limited to recording minimum bias lead-lead collisions at a rate of about 1000 Hz. The upgrade will allow recording the full expected lead-lead collision rate of 50 kHz.
The present ALICE TPC uses multi-wire proportional (MWPC) chambers for readout. A gating grid is used to block positive ions created at the anode wires from flowing back into the main drift volume creating track distortions. The gating grid has an intrinsic dead time that limits the maximum collision rate that can be recorded. The goal of this upgrade is to replace the MWPCs and gating grid with Gas Electron Multiplier (GEM) arranged in a configuration that allows one to maintain the spatial and energy resolution of the present TPC. The electronics will be replaced with continuous readout electronics based on a new purpose designed chip. The project involves building 80 quadruple-GEM chambers (72 installed in the TPC plus 4 spares) utilizing 640 GEM foils. In order to accomplish such a large project the design, construction, quality assurance and testing are divided across many institutions and countries.
The motivation for the technology choices, status of the project, construction methods, quality assurance and testing procedures for the GEM foils and new readout chambers will be presented. Results from testing GEM foils, first chambers and readout electronics also will be presented.

Preferred Track

Future Experimental Facilities, Upgrades, and Instrumentation

Collaboration

ALICE

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