



Contribution ID: 125

Type: **Oral Presentation**

ALICE 3: a next-generation heavy-ion detector for LHC Run 5

Wednesday, 25 March 2026 12:15 (20 minutes)

The ALICE Collaboration has proposed a completely new apparatus, ALICE 3, for the LHC Run 5 (LoI, arXiv:2211.02491). The detector consists of a large pixel-based tracking system covering eight units of pseudo-rapidity, complemented by multiple systems for particle identification, including silicon time-of-flight layers, a ring-imaging Cherenkov detector, a muon identification system, and forward detectors for event characterisation. Track pointing resolution of better than 10 micron for $p_T > 200$ MeV/c can be achieved by placing the vertex detector on a retractable structure inside the beam pipe. ALICE 3 will, on the one hand, enable novel studies of the quark-gluon plasma and, on the other hand, open up important physics opportunities in other areas of QCD and beyond. The main new studies in the QGP sector focus on low- p_T heavy-flavour production, including beauty hadrons, multi-charm baryons and charm-charm correlations, as well as on precise multi-differential measurements of dielectron emission to probe the mechanism of chiral-symmetry restoration and the time-evolution of the QGP temperature. Besides QGP studies, ALICE 3 can uniquely contribute to hadronic physics, with femtoscopic studies of the interaction potentials between charm mesons and searches for nuclei with charm, and to fundamental physics, with tests of the Low theorem for ultra-soft photon emission. The presentation will cover the detector concept, the physics performance, and the status of detector R&D.

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Session Classification: Parallel VIII: Open Questions and Future