Contribution ID: **31** Type: **Oral Presentation**

ALICE upgrades for LHC Run 4 and beyond

The primary objective of the ALICE physics program is to investigate the properties of the quark-gluon plasma (QGP), the deconfined state of strongly interacting matter, and to understand how these properties emerge from the fundamental interactions governed by quantum chromodynamics (QCD). By colliding heavy nuclei, the LHC generates quark-gluon plasma with record-breaking temperature and lifespan, allowing for in-depth study.
A major upgrade was performed on ALICE during the LHC Long Shutdown 2 (2019–2022), and further improvements, including the upgrade of the inner tracker (ITS3) and the installation of a forward calorimeter (FoCal), are planned for Long Shutdown 3 (2026-2029).
For the future, beyond LHC Run 4, the ALICE Collaboration has put forward a proposal for a next-generation, fully silicon-based detector optimized for high-precision tracking and particle identification in heavy-ion collisions (LoI, arXiv:2211.02491). Cutting-edge technologies are under development to pursue a track-pointing resolution better than 10 microns for particles with transverse momentum above 200 MeV/c.
The ALICE 3 experiment will drive significant progress in QGP research while also enabling novel studies in other areas of QCD and fundamental physics. Core QGP investigations will focus on low-pT heavy-flavor production, notably beauty hadrons, multi-charm baryons, charm-charm correlations, and high-precision dielectron emission measurements. Furthermore, ALICE 3 will uniquely contribute to hadronic physics through femtoscopic studies and searches for charmed nuclei, and to fundamental physics by testing the Low theorem for ultra-soft photon emission
This presentation will provide an overview of all the future ALICE upgrades, giving physics motivations and focusing on the status of the R&D for the chosen technologies of the different detectors.

Author: COLELLA, Domenico (INFN and University of Bari)

Presenter: COLELLA, Domenico (INFN and University of Bari)

Session Classification: Parallel session

Track Classification: Accelerators and Instrumentation