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ALICE upgrades for Run 4

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The ALICE collaboration pursues several upgrades to further extend the reach of heavy-ion physics at the LHC. For LHC Run 4 (2029-2032), ALICE is pioneering the use of bent, wafer-scale pixel sensors to produce truly cylindrical tracking layers with very low material budget to replace the three innermost layers of the inner tracking system. The resulting improvement in pointing resolution will allow new measurements of heavy-flavour hadrons and dielectrons. In addition, a Forward Calorimeter (FoCal) system combines a high-granularity electromagnetic silicon-tungsten calorimeter with excellent two-shower separation for neutral pion reconstruction with a conventional hadronic calorimeter for photon isolation. Direct photon measurements with FoCal will provide unique constraints on the low- x gluon structure of protons and nuclei via forward measurements of direct photons.

For Run 5 and beyond, a next-generation detector system, ALICE 3, has been conceived to gain unique access to the interaction and thermalisation of heavy flavour probes in the QGP as well as to the thermal radiation carrying information about the temperature and the restoration of chiral symmetry. At its core, it combines a high-resolution vertex detector with a large-acceptance silicon pixel tracker. For the identification of particles, a combination of a time-of-flight system, a Ring-Imaging Cherenkov detector, an electromagnetic calorimeter, a muon identifier, and a dedicated forward detector for ultra-soft photons, are envisaged.

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