

THE NEW INNER TRACKING SYSTEM OF THE ALICE EXPERIMENT: PHYSICS, DESIGN AND PERFORMANCE

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The ALICE detector at the LHC is specifically designed to investigate the properties of the strong interacting matter at extreme conditions of temperature and density, which lead to the deconfinement of quarks and gluons (QGP). Ultra-relativistic heavy-collisions are well suited to achieve these conditions and to study the properties of such a medium. The physics results achieved by ALICE during RUN 1 have confirmed the nature of the QGP as an almost perfect liquid and have demonstrated the experiment's excellent capabilities to measure high-energy nuclear collisions at LHC.

Despite this success there are several frontiers, including high precision measurements of rare probes over a broad range of transverse momenta, for which the current experimental setup is not yet fully optimized. ALICE is therefore preparing a major upgrade of its apparatus, planned for installation during the second long LHC shutdown in 2018–2019, which will enhance its physics capabilities enormously.

In the proposed upgrade plan, the ALICE detector will exploit the expected significant increase of Pb-Pb luminosity reading-out all interactions up to a rate of 50 kHz and accumulate more than 10 nb^{-1} of Pb-Pb collisions, corresponding to about 10^{11} interactions. One of the key detector to enhance the ALICE physics capabilities is the new Inner Tracking System, whose focus is on the improved performance for detection of heavy-flavour hadrons produced in the collisions and traversing the QGP medium. The greatly improved features of the new ITS in terms of determination of the distance of closest approach to the primary vertex, tracking efficiency at low transverse momenta, and read-out rate capabilities will be illustrated in this contribution. The R&D activities over the last four years, the technical implementation of the main detector components, and the detector and physics performance will be discussed. The plan for the construction of the new ITS will also be presented.