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UPGRADE OF THE ALICE INNER TRACKING SYSTEM: CONSTRUCTION AND COMMISSIONING

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ALICE (A Large Ion Collider Experiment) is the CERN LHC experiment optimized for the study of the strongly interacting matter produced in heavy-ion collisions, in particular the characterization of the quark-gluon plasma. After the successful operation of the experiment during the first two runs of the LHC, the ALICE collaboration is currently working on a major upgrade of its detector, to be installed during the Long Shutdown (LS2) in 2019-2020. The main goal is to increase the readout capabilities to allow for the readout and recording of Pb–Pb minimum bias events at rates in excess of 50 kHz, the expected Pb–Pb interaction rate at the LHC after LS2. One key part of the upgrade is the construction of a new Inner Tracking System (ITS) that will significantly improve the impact parameter resolution, tracking efficiency and readout capacity enabling precise measurement of low momentum particles. The new ITS consists of seven approximately-cylindrical detector layers based on CMOS Monolithic Active Pixel Sensors (MAPS) with the sensor matrix and readout integrated in a single chip, named ALPIDE (ALice Pixel DEtector), with a pixel size of $29 \times 27 \mu\text{m}^2$, covering an area of 10m^2 and containing about 12.5 billion pixels. All layers are mounted on ultra-lightweight carbon support structures with an embedded cooling system. This allows a reduction of the material budget down to the 0.3 % X_0 for the inner layers and 1% X_0 for the outer layers.

This talk will give a brief overview of the motivation of the upgrade, give details on the overall layout and reports on both the construction and commissioning status and plans. Ideas on a further novel vertex detector based on curved wafer-scale ultra-thin silicon sensors will be illustrated.

Possible applications of the technologies, developed by the ALICE collaboration, will be also shown.

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