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ITS3: the next upgrade of the ALICE Inner Tracking System

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The ALICE experiment, optimized to study nuclei collisions at the ultra-relativistic energies provided by the LHC, is approaching to a new upgrade phase, foreseen in 2026 during the third Long Shutdown of the accelerator. This upgrade includes the replacement of the 3 innermost layers of the Inner Tracking System, the detector closest to the interaction point, which is currently made of 7 layers of Monolithic Active Pixels (MAPS).

The main features of this new vertex detector, named ITS3, are the extremely low material budget (only 0.07% X_0 per layer) and the reduced radial distance of 19 mm to the interaction point. To achieve this goal, the ITS3 will be made of wafer-scale monolithic pixel sensors, thinned down to 50 μm and curved in order to ensure a true cylindrical geometry, without any flexible printed circuits in the active area. The mechanical support and the cooling system will be optimized to reduce the total material budget: the layers will be kept in place thanks to ultra-light carbon foam support elements, and they will be cooled through a low-speed air flow.

The success of the project depends on many interconnected aspects and an intense R&D activity is ongoing to investigate all these components, from the development of the sensor to the mechanics, cooling and integration. This contribution summarizes the status of the project and presents selected results from the characterisation of the first prototype chips.

session

A. Facilities and Detectors

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