

NEW INNER TRACKING SYSTEM (ITS) FOR OPEN CHARM DIRECT MEASUREMENTS BY ALICE AT THE LHC: STATUS AND PERSPECTIVES

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One of the main goals of the ongoing upgrade of ALICE during the second long LHC shutdown (LS2) is to significantly improve the charged particle tracking and secondary vertex reconstruction, as well as the readout rate capabilities of the detector system. The ALICE physics programme of measurements of low momentum charm and beauty hadrons and low-mass dielectrons in heavy-ion collisions at the LHC requires the development of an entirely new Inner Tracking System (ITS2) with the increased capabilities in readout speed, impact parameter resolution and the reduced material budget. These requirements are met in the ITS2 design by the application of arrays of novel coordinate-sensitive CMOS Monolithic Active Pixel Sensors (MAPS) with the sensor matrix and readout integrated in a single chip, named ALPIDE (ALice Pixel DEtector). Besides MAPS, large improvements of the tracking precision and efficiency of registration of particles with low transverse momentum were achieved by a large reduction of the material budget of the ITS2 in the region close to the interaction point. As a result, the record low level of 0.38% radiation length (X/X_0) per layer for each of three innermost layers is achieved, ensuring the overall improved efficiency for heavy-flavor measurements at low p_T .

The first part of the talk is devoted to the general physics motivation, requirements and status of the ITS2 preparations for the start of RUN3 at the LHC. The second part of the presentation will cover new ideas of the ALICE upgrade during the next Long Shutdown 3 (LS3) in the period 2023- 2024 and the ongoing R&D on the development of a high granularity fast detector (ITS3) which will further reduce the material to X/X_0 below 0.05% per layer, will be presented. This will include the concept of the ITS3, the status of very thin ($\sim 20 \mu\text{m}$) MAPS sensor developments as well as the ongoing studies of the extra-light-weight mechanics and gas-cooling issues.

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