

ALICE silicon tracker upgrades for LHC Run4 and beyond

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For the Long Shutdown 3 of the LHC the ALICE experiment is foreseeing an upgrade of the inner barrel of its Inner Tracking System: the ITS3.

This new vertex detector is based on Monolithic Active Pixel Sensors produced in a commercial 65 nm CMOS

technology. Each half layer is realized with a single stitched sensor of 26 cm in length and 8804; 50 μ m in thickness bent to form a half cylinder and held in place with carbon foam supports. The detector is air cooled allowing for an extremely low material budget of 0.07 X/X₀ per layer. With respect to the current ALICE vertex detector, ITS3 will improve the pointing resolution by a factor of two and the tracking efficiency by 30% for hadrons of low transverse momentum.

Parallely, ALICE is designing a next generation heavy-ion experiment for LHC Run 5 and 6.

Its tracking system will be based on a vertex detector, integrated in a retractable structure inside the beam pipe to achieve the best possible pointing resolution, and a very-large-area outer tracker, surrounding the vertex detector and covering about 8 units of pseudorapidity.

Both systems will be based on the same MAPS technology developed for ITS3 and will further push its detector requirements: the innermost vertex detector layer, placed at 5 mm from the interaction point, must withstand an integrated radiation load of 9×10^{15} 1 MeV neq/cm² NIEL and 288 Mrad TID; the outer tracker, extending from the beam pipe to a maximum radius of about 80 cm, covers more than 50 m² of area.

This contribution will cover both the ITS3 upgrade and the projects for ALICE3 silicon tracker, highlighting their requirements, sensor specifications, mechanics and integration. It will showcase the results achieved during the ITS3 R&D and outline the challenges expected for the implementation of the ALICE 3 tracking system.

Collaboration

ALICE

Role of Submitter

I am the presenter

Primary authors: CONTIN, Giacomo (Istituto Nazionale di Fisica Nucleare); AGLIETTA, Luca (INFN - Torino)

Presenter: AGLIETTA, Luca (INFN - Torino)

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