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Latest results on monolithic sensors with additional gain produced with a 110 nm technology for the ALICE 3 Time of Flight detector

In preparation for LHC Runs 5 and 6, the ALICE Collaboration has proposed a next-generation heavy-ion experiment, ALICE 3, which will be installed during the LHC Long Shutdown 4. This new experimental apparatus will feature exceptional pointing resolution and excellent Particle Identification (PID). A key component will be a Time-Of-Flight system utilizing silicon sensors, achieving an outstanding time resolution of 20 ps. To meet these ambitious goals, several silicon technologies are under investigation, particularly fully depleted CMOS sensors with additional gain. A significant R&D effort is essential, as the time resolution of CMOS sensors needs to be pushed significantly beyond the current state of the art to satisfy the stringent requirements of future experiments. Notably, recent developments have integrated Low Gain Avalanche Diode (LGAD) technology into the design of fully depleted Monolithic Active Pixel Sensors (MAPS).

This poster will focus on two main aspects: the Monte Carlo simulation carried out to design the latest production of a Monolithic sensor with additional gain produced with a commercial 110 nm technology, and the experimental results concerning timing resolution obtained from laboratory tests and in a test beam conducted at the CERN Proton Synchrotron in October 2024.

Following this discussion, an overview of the next steps in the R&D will be presented.

Category

Experiment

Collaboration (if applicable)

ALICE Collaboration

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