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Laboratory and testbeam characterization of ALICE MAPS

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In view of the LHC upgrade to high-luminosity LHC, trackers need to be upgraded to comply new stringent requirements in terms of position (˜5um) and time (˜10ps) resolution. These properties are required for dealing with an extremely high event rate, identifying particles and reconstructing originating collision and vertex positions.
MAPS are good candidates for present and future trackers thanks to their property of embedding sensor and electronics in the same layer, thus greatly reducing the material in particle tracks.

Within the presented context, ALICE has already installed the ALice PIxel DEtector (ALPIDE) MAPS in the new detector Inner Tracking System and further developments are foreseen for the innermost tracker upgrade in 2025.
By exploiting its reduced thickness (50um), the ALPIDE can be bent in cylindrical shape with radius of 18 mm without degradation of efficiency or spatial resolution. This minimizes the achievable distance from the beam pipe and gives the structure an intrinsic stability, removing the need of considerable support structures, with further reduction of the material budget.
At the same time, new chips based on 65nm CMOS technology are being tested in laboratories and testbeams.

In this talk, some results of my work at Nikhef, as member of the Detector R&D group with focus on fast timing for ALICE, are presented. A laboratory timing characterization of 180nm CMOS technology (on which the ALPIDE is based), recent testbeam results with bent ALPIDE and some preliminary timing measurement results of testbeams with the newly arrived 65nm CMOS chips are discussed.

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