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Test-beam results on a monolithic pixel sensor in the 0.18 μ m Tower-Jazz technology with high resistivity epitaxial layer

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The ALICE experiment at CERN will undergo a major upgrade in the second Long LHC Shutdown in the years 2018-2019; this upgrade includes the full replacement of the Inner Tracking System (ITS), deploying seven layers of Monolithic Active Pixel Sensors (MAPS). For the development of the new ALICE ITS, the Tower-Jazz 180 nm CMOS imaging sensor process has been chosen as it is possible to use full CMOS in the pixel and different starting materials (including high resistivity epitaxial layers). A large test campaign has been carried out on several small prototype chips, designed to optimize the pixel sensor layout and the front-end electronics. Results match the target requirements both in terms of performances and of radiation hardness. Following this development, the first full scale chips have been designed, submitted and are currently under test, with promising results.

A telescope composed of 4 planes of Mimosa-28 and 2 planes of Mimosa-18 chips (monolithic pixel sensors both developed in the 0.35 μ m AMS process) is under development at the DAFNE Beam Test Facility (BTF) at the INFN Laboratori Nazionali di Frascati (LNF) in Italy. The telescope has been recently used to test a Mimosa-22 chip (a monolithic pixel sensor built in the 0.18 μ m TowerJazz process) and we foresee to perform tests on the full scale chips for the ALICE ITS upgrade by the end of this year.

In this contribution we will describe the TowerJazz process and show some first measurements of spatial resolution, fake hit rate and detection efficiency of the Mimosa-22 chip obtained at the BTF facility in June with an electron beam of 500 MeV.

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