

Results of the Malta CMOS pixel detector prototype for the ATLAS Pixel ITK

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The upgrade of the ATLAS experiment for the High-Luminosity LHC requires the installation of a new Inner Tracker detector to cope with the 5 fold increase in luminosity and a 10 fold increase in number of interactions per bunch crossing. A Monolithic Active Pixel Sensor prototype, MALTA, has been developed on 180 nm TowerJazz CMOS imaging technology, following the latest developments in CMOS sensor processing combining high-resistivity substrates with on-chip high-voltage biasing to achieve a large depleted active sensor volumes, to meet the radiation hardness requirements (1.5×10^{15} 1 MeV neq/cm²) of the outer barrel layers of the ITK Pixel detector. MALTA combines low noise (ENC < 20 e⁻) and low power operation (1uW/pixel) with a fast signal response (25 ns bunch crossing) in small pixel size (36.4 x 36.4 um²), and a small collection electrode (3um), with a novel high-speed asynchronous readout architecture to cope with the high hit-rates expected at HL-LHC. This contribution will present the results from the extensive lab testing and characterisation in particle beam tests have been conducted on this design and present the improvements that are being implemented in the next versions of the chip.

Authors: SOLANS SANCHEZ, Carlos (CERN); SHARMA, Abhishek (University of Oxford (GB)); SCHIOPPA, Enrico Junior (CERN); DACHS, Florian (Vienna University of Technology (AT)); PERNEGGER, Heinz (CERN); ASENSI TORTAJADA, Ignacio (Univ. of Valencia and CSIC (ES)); BERDALOVIC, Ivan (CERN); SIMON ARGEMI, Lluís (University of Glasgow (GB)); CARDELLA, Roberto (CERN); DAO, Valerio (CERN); HEMPEREK, Tomasz (University of Bonn (DE)); HIRONO, Toko (University of Bonn); HITI, Bojan (Jozef Stefan Institute (SI)); CAICEDO SIERRA, Ivan Dario (University of Bonn (DE)); RIEDLER, Petra (CERN); RYMASZEWSKI, Piotr (University of Bonn (DE)); SNOEYS, Walter (CERN); WANG, Tianyang (University of Bonn (DE)); WERMES, Norbert (University of Bonn (DE))

Presenter: SOLANS SANCHEZ, Carlos (CERN)

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