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# Comparative study of MALTA pixel detectors on epitaxial and Czochralski silicon

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The High Luminosity upgrade of the LHC necessitates extensive upgrades to its four major experiments. Specifically for ATLAS, the installation of the Inner Tracker (ITK) requires the development of new radiation hard silicon pixel sensors. Depleted Active Monolithic Pixel Sensors (DMAPS) produced in standard CMOS processes are a cost effective and lightweight alternative to state-of-the-art hybrid detectors if they can fulfill the given requirements for radiation hardness, signal response time and hit rate capability. The MALTA and Mini-MALTA sensors were shown to maintain sufficient detection efficiency after irradiation to the life time dose expected at the outer layers of the ITK. These sensors feature a small symmetric pixel pitch of only 36.4\textmu m, a low capacitance of <5fF/pixel of the collection electrode, low noise of roughly ENC\approx10e\textsuperscript{-} and low power consumption of roughly 1\textmu W/pixel. Further improvements to detector efficiency are explored by changing the starting material for these sensors and using Czochralski instead of epitaxial silicon. The depleted region in the sensor can then be extended further by increasing the bias voltage. In turn, this increases the amount of collected charge and thus the signal in the sensor. This talk will discuss laboratory IV measurements, analogue signal studies and beam test results obtained with this new type of the MALTA detector and show comparisons to detectors on epitaxial silicon before and after irradiation.

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