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Depleted Monolithic Active Pixel Sensors (DMAPS) in 180 nm TowerJazz and 150 nm LFoundry Technology for High Radiation and High Rate Environments

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Monolithic active pixel sensors with depleted substrates are a promising option for pixel tracker detectors in high radiation environments. Exploiting high resistivity silicon substrate and high bias voltages in commercial CMOS technologies allows to enhance the radiation tolerance to levels of high radiation environments. As part of the DMAPS development, two full-size prototypes with the same column-drain readout architecture are currently tested and characterized in Bonn.

LF-Monopix2 is designed in 150 nm LFoundry CMOS technology employing a large charge collection electrode in which each pixel's digital electronics are integrated. This generally results in short drift paths and a homogeneous electric field across the sensor. Optimization of the pixel layout minimizes potential cross talk from the digital circuitry into the sensor node compared to its predecessor while reducing the pixel size to 50x150 um^2. The 180 nm TowerJazz CMOS technology used for TJ-Monopix2 features a small charge collection electrode with separated readout electronics. An additional n-type implant ensures full depletion of the sensitive volume. A smaller pixel size and low detector capacitance are benefits of this design resulting in lower noise.

In this talk results of the ongoing characterization of both prototype DMAPS are presented. Latest measurements for both Monopix chips as well as their predecessors are shown. Furthermore, upcoming plans and preliminary results of the testbeam campaign for both Monopix2 chips are discussed.

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