

Towards MightyPix, an HV-MAPS for the LHCb Mighty Tracker Upgrade

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The Mighty Tracker is a proposed upgrade to the downstream tracking system of LHCb for operations at high luminosities starting with the LHC Run 5 data taking period. It foresees the replacement of the most central area of the scintillating fibre tracker with HV-CMOS pixel sensors. Due to the increased luminosity of the LHC, occupancy would be too high for track reconstruction in the fibre tracker and the fibres could no longer withstand the radiation damage. HV-CMOS sensors have demonstrated a significant radiation tolerance and good performance making them an ideal choice of technology for the LHCb experiment.

Monolithic active pixel sensors (MAPS) fabricated in HV-CMOS processes provide fast charge collection via drift and allow the implementation of the readout on the same die as the sensitive volume. Due the use of commercial processes, these sensors can be fabricated at low cost as no hybridisation with bump bonds is required. Since they are not fully depleted, the inactive volume can be thinned away.

A dedicated sensor called the MightyPix is developed for this programme. It is based on the successful HV-MAPS families MuPix and ATLASpix and tailored to the requirements of LHCb. To demonstrate the feasibility of this technology for the LHCb environment, prototypes have been irradiated. These sensors are investigated in terms of efficiency, time resolution and power dissipation in temperature controlled environments. Results of measurements are presented.

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