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# Test beam results with Depleted Monolithic Active Pixel Sensors (TowerJazz Investigator chip) at the SPS at CERN

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Depleted monolithic active pixel sensors (DMAPS) in CMOS technology are being investigated for the outer layers of the ATLAS Inner Tracker (ITk) for the High Luminosity LHC starting in 2026. The advantage of monolithic sensors with respect to hybrid technology is that there is only a single die integrating the functionality of sensor and readout, reducing the budget material and potentially the power consumption per chip. Furthermore, it simplifies the production process and reduces the costs and production time - particularly important for the large area to be covered by the outer layers.

The challenge of combining high-resistivity and full depletion of the sensitive layer, while ensuring radiation tolerance up to  $10^{15}$  neq/cm<sup>2</sup>, is being addressed since few years by a collaboration of several institutes. Few demonstrator detectors with different CMOS technologies and also different front-end designs have been tested in terms of charge collection, radiation tolerance and rate capability. One of such prototypes is the TowerJazz investigator. It is a collection of multiple pixel mini-matrices, differing among each other by several parameters (cluster size/pitch, collection n-well size and spacing between n-well and deep p-well) allowing to study the optimal configuration in view of a final design. The chip has been tested in a beam of charged pions at the SPS at CERN, where it was installed on an ATLAS FE-I4 based telescopes. The latter consists of a six-planes system of IBL-like 150um planar pixel sensors (250x50um<sup>2</sup> pitch) which are read out by the RCE DAQ system, with which a resolution of 8um is achieved.

In this contribution, the results obtained in the 2017 test beam campaign are presented, with special emphasis on the comparison of different mini-matrices, and also between unirradiated and irradiated samples.

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