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Test-beam activities and results for the ATLAS ITk pixel detector

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The Phase-II upgrade of the LHC will result in an increase of the instantaneous luminosity up to about $5 \times 10^{34} \text{ cm}^{-2} \text{ s}^{-1}$. To cope with the challenges the current Inner Detector will be replaced by an all-silicon Inner Tracker (ITk) system. The Pixel Detector will have to deal with occupancies of about 300 hits/FE/s as well as a fluence of $2 \times 10^{16} \text{ n}_{\text{eq}} \text{ cm}^{-2}$.

Various sensor layouts are under development, aiming at providing a high performance, cost effective pixel instrumentation to cover an active area of about 10 m^2 . These range from thin planar silicon, over 3D silicon, to active CMOS sensors.

After extensive characterization of the sensors in the lab, their charge collection properties and hit efficiency are measured in common testbeam campaigns, which provide valuable feedback for improvements of the layout. Testbeam measurements of the final prototypes will be used for the decision of which sensor types will be installed in ITk.

The setups used in the ITk Pixel testbeam campaigns will be presented, including the common track reconstruction and analysis software. Results from the latest measurements will be shown, highlighting some of the developments and challenges for the ITk Pixel sensors.

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