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Layout overview and developments for the upgrade of the inner tracker of the ATLAS experiment for the High-Luminosity LHC

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In the high luminosity era of the Large Hadron Collider, the instantaneous luminosity is expected to reach unprecedented values, resulting in about 200 proton-proton interactions in a typical bunch crossing. To cope with the resultant increase in occupancy, bandwidth and radiation damage, the ATLAS Inner Detector will be replaced by an all-silicon system, the Inner Tracker (ITk), aiming to provide tracking coverage up to $|\eta|<4$.

The ITk consists of an inner pixel and an outer strip detector. The total surface area of silicon in the new pixel system could measure up to 13 mˆ2, depending on the final layout choice. The strip detector will compromise up to 190 mˆ2 of silicon.
The design is developed by careful compromises of the conflicting requirements of a low mass, mechanically stable tracker with sufficient number of high granularity sensors for high quality tracking. The required number of hits has to be achieved with various layers of silicon sensors in r-phi.
In the collaboration, a large effort is ongoing to evaluate the design both with simulation and experimental results. First results are collected in the Strip tracker technical design report. Many additional results especially for the pixel detector are in preparation for the Pixel detector technical design report which is due before the end of 2017. An overview of the layout developments and latest design and performance estimates of the ITk detector is presented. Furthermore, highlights of the design choices discussed.

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