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P1.27: The ATLAS ITk Strip Detector for the Phase-II LHC Upgrade

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ATLAS-ITK Strip Collaboration

(the speaker to be selected by the ITk Speakers Committee after the contribution acceptance)

The inner detector of the present ATLAS experiment has been designed and developed to function in the environment of the present Large Hadron Collider (LHC). At the ATLAS Phase-II Upgrade, the particle densities and radiation levels will exceed current levels by a factor of ten. The instantaneous luminosity is expected to reach unprecedented values, resulting in up to 200 proton-proton interactions in a typical bunch crossing. The new detectors must be faster and they need to be more highly segmented. The sensors used also need to be far more resistant to radiation, and they require much greater power delivery to the front-end systems. At the same time, they cannot introduce excess material which could undermine tracking performance. For those reasons, the inner tracker of the ATLAS detector was redesigned and will be rebuilt completely.

The ATLAS Upgrade Inner Tracker (ITk) consists of several layers of silicon particle detectors. The innermost layers will be composed of silicon pixel sensors, and the outer layers will consist of silicon microstrip sensors. This contribution focuses on the strip region of the ITk. The central part of the strip tracker (barrel) will be composed of rectangular short (~ 2.5 cm) and long (~5 cm) strip sensors. The forward regions of the strip tracker (end-caps) consist of six disks per side, with trapezoidal shaped sensors of various lengths and strip pitches. After the completion of final design reviews in key areas, such as Sensors, Modules, Front-End electronics, and ASICs, a large scale prototyping program has been completed in all areas successfully. We present an overview of the Strip System and highlight the final design choices of sensors, module designs and ASICs. We will summarise results achieved during prototyping and the current status of pre-production and production on various detector components, with an emphasis on QA and QC procedures.

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