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ITk Strip Module Design and Performance

The all-silicon ATLAS Inner Tracker (ITk), vertexing and tracking device for the High-Luminosity LHC project, should operate at an ultimate peak instantaneous luminosity up to $7.5 \times 10^{34} \text{cm}^{-2}\text{s}^{-1}$ corresponding to approximately 200 inelastic proton-proton interactions per beam crossing. The ITk Strip Detector will consist of a four-layer barrel and a forward region composed of six disks on each side of the barrel. They will be composed of individual structures called staves and petals, whose production will require almost 18,000 single-sided strip modules of 8 different designs with the hybrid circuits carrying the front-end microelectronics ASICs glued to the sensor surface. The sensing elements are high resistivity n-in-p silicon strips capable of withstanding fluences up to $1.2 \times 10^{15} \text{neq/cm}^2$. Both irradiated and non-irradiated samples of strip modules undergo testing procedures including test beam campaigns supplemented by laser and beta source tests to check that they meet the design requirements of the detector. Detail description of the strip module design will be presented as well as performance characteristics from the prototype tests.

Primary author: SYKORA, Martin (Charles University (CZ))

Presenter: SYKORA, Martin (Charles University (CZ))