

ATLAS ITK Strip Detector for the High-Luminosity LHC.

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High-Luminosity LHC

• The HL-LHC is an upgrade of the LHC expected to start operations in 2026

• Instantaneous luminosity up to 7.5x10³⁴cm⁻²s⁻¹, about 4 times the maximum luminosity expected for the LHC

• Up to 200 inelastic proton-proton collisions per beam crossing

• Total integrated luminosity up to 4000fb⁻¹

• The radiation levels in the detectors at the end-of-lifetime of the HL-LHC will be one order of magnitude larger than for the LHC

ATLAS Inner Tracker and Strip Detector

- **Pixel**: five barrels and multiple forward layers

tracks of charged particles, thus allowing to determine their momentum

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Local Supports

The basic building units are the staves and petals, for barrel and end cap respectively. These local supports provide geometric stability, cooling performance and supply of electrical connections to and from the modules

• Stave and petals have a carbon fiber-based core with integrated titanium cooling tubes. On both sides a bus tape is present, which provides electrical connections and on which the modules are attached adhesively

593 mm

modules

EoS

• The cooling will be provided by a CO evaporative system, which will allow stable operations down to -35°C

•The End-Of-Substructure (EOS) card is the interface between the stave and



Silicon Strip Modules

• n⁺-in-p float zone silicon sensors with active area \approx 10x10cm², 300-320µm thickness and 75.5µm strip pitch: - rectangular strips in the barrel, with lengths 2.4 and 4.8cm - radial strips in the end-caps, with lengths from 1.9 to 6cm

• The read-out ASICs (the ATLAS Binary Chips, ABC) and the Hybrid Controller Chips (HCC) are glued on the hybrid PCB, which is glued directly on the silicon sensor. Each read-out chip is wire-bonded to 256 strips

• The power board includes:

- A DC-DC converter to power the front-end read-out ASICs,
- which receives 11 V and supplies the hybrids with 1.5 V
- High-Voltage switch to disconnect non-operating modules
- Autonomous Monitor and Control Chip (AMAC) which



hybrids

monitors the current, voltage and temperature, controls the HV switch and provides interlock functionalities

• There will be **17888** modules in the ITk Strip Detector





References

ATLAS Collaboration, Technical Design Report for the ATLAS Inner Tracker Strip Detector (2017), CERN-LHCC-2017-005; ATLAS-TDR-025 https://cds.cern.ch/record/2257755

14th Pisa Meeting on Advanced Detectors

Isola d'Elba (Italy), 27 May – 2 June 2018