



ID de Contribution: 72

Type: Non spécifié

Quad module assembly and quality control for the ITk Pixel Detector upgrade for the high luminosity phase of LHC

mardi 26 novembre 2024 14:30 (30 minutes)

The ATLAS experiment is preparing for the high-luminosity phase of the LHC (HL-LHC) with a complete upgrade of its inner detector to an all-silicon inner tracker (ITk). Designed for enhanced granularity, radiation hardness, readout speed and low material budget, the ITk aims to maintain high performance in tracking and data acquisition under the challenging conditions of increased pile-up and radiation.

The final assembly of ITk quad sensor modules involves the integration of a carbon-fiber mechanical wirebond protection element, installed in the wire bond region of the Outer Barrel modules. To support this process, a mechanical wirebond protection tooling developed collaboratively by Japan and CERN is being incorporated into the assembly workflow at LPNHE and other outer barrel assembly sites.

ITK pre-production phase is expected to transition to full production by the end of 2024, data and experience from pre-production will support optimizations in the module production process, enhancing efficiency and refining quality control procedures.

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Classification de Session: Instrumentation