Canadian Association of Physicists

Association canadienne des physiciens et physiciennes

Contribution ID: **253**

Type: **Oral (Non-Student) / Orale (non-étudiant(e))**

Characterizing the pre-production petals for the ATLAS Inner Tracker strip detector

Tuesday 10 June 2025 11:45 (15 minutes)

For the High Luminosity Upgrade of the Large Hadron Collider, the ATLAS experiment will replace its current Inner Detector with an all-silicon Inner Tracker (ITk), which consists of pixel and strip systems. Relative to the current detector, the ITk features larger forward coverage, an order-of-magnitude increase in granularity, and improved radiation hardness. Its significantly enhanced tracking performance will enable precision measurements of fundamental physics. In the context of Higgs boson measurements, the ITk's larger forward coverage will increase the acceptance of Higgs boson production via vector-boson fusion by twofold, and the ITk's superior vertex reconstruction — coupled with state-of-the-art particle identification algorithms — will be crucial in probing the Higgs boson's self-coupling and its couplings to second-generation fermions.

The ITk strip system's forward detectors or "end-caps" will consist of 7,000 silicon sensor modules. These modules are mounted onto large, double-sided support structures called "petals" which provide readout, control, power, and cooling to the underlying modules. To facilitate the assembly of petals, an automated system has been developed consisting of a programmable gantry robot capable of dispensing adhesive as well as lifting and placing modules with micron-level precision. This automated system streamlines the production process and ensures uniformity across international production clusters.

This contribution presents the latest results from the assembly of the first pre-production ITk petals in Canada and globally, including the considerations of the automated system's design and the characterization of the mechanical and electrical performance of the petals post-assembly. This contribution will also summarize the design choices for the end-cap detectors which ensure robust operation at very cold ($\leq -35\,^{\circ}$C) temperatures, as would occur during catastrophic cooling failures. Both topics are highly relevant to ongoing and future silicon detector design.

Keyword-1

Hadron collider physics

Keyword-2

Silicon detectors

Keyword-3

Detector design and testing

Author: BASSO, Matthew (TRIUMF (CA))

Presenter: BASSO, Matthew (TRIUMF (CA))

Session Classification: (PPD) T1-8 New detectors and searches for dark matter II | Nouveaux détecteurs et recherche de la matière noire II (PPD)

Track Classification: Technical Sessions / Sessions techniques: Particle Physics / Physique des particules (PPD)