



Contribution ID: 1618

Type: **Invited Speaker / Conférencier invité**

Upgrading the ATLAS detector for a long and luminous career

Tuesday, 30 May 2017 15:30 (30 minutes)

Canada has been part of the ATLAS collaboration from inception: Canadian groups built significant parts of the original ATLAS detector, and have operated it and analyzed the data taken since the Large Hadron Collider (LHC) turned on. To keep up with the further increases in luminosity that will come from upgrades to the accelerator, portions of ATLAS must be replaced during two long shutdowns of the LHC. ATLAS Phase-I upgrades, to be installed during the 2019-20 shutdown, include replacement of the 10-metre “small wheels” of the Muon Spectrometer. Canadian groups are collaborating to build fifty of the 192 precision thin-gap chambers that will provide the triggers for the New Small Wheels. Continuing a long involvement in ATLAS liquid argon calorimetry, Canada is also building new electronics to allow the trigger-level granularity of the calorimeters to approach the full offline capability of the detector for Phase-I, and add new digital readout electronics for Phase-II. Phase-II upgrades will be installed during the final long shutdown (around 2024-26) before full High-Luminosity LHC (HL-LHC) operation at five to seven times the nominal design luminosity. Canadians are also participating in the Phase-II replacement of the entire inner tracking detector of ATLAS with an all-silicon tracker (ITk) consisting of both pixels and strips. Canada proposes to build a significant fraction of the endcap strips detector. The talk will describe these efforts in the context of the overall upgrade goals for Phases I and II.

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Session Classification: T4-3 Energy Frontier: Detectors and Future Developments (PPD) | Frontière d'énergie: détecteurs et développements futurs (PPD)

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