Contribution ID: **120**   Type: **Oral**

Investigating the impact of 4D tracking in ATLAS and beyond

Tuesday 5 December 2023 10:00 (20 minutes)

The Inner Detector of the ATLAS Experiment will be upgraded to a full-silicon Inner Tracker (ITk) to cope with the extreme conditions of the High-Luminosity phase of the Large Hadron Collider, currently foreseen to start with Run 4 towards 2029. In order to address the challenge of pileup in the forward region of ITk, a High Granularity Timing Detector (HGTD) will provide time track measurements with a precision of 30ps for tracks with pseudo-rapidity larger than 2.4. Due to the high radiation dose in proximity of the interaction point, the two innermost pixel layers of the ITk are designed to be replaced after 2000 fb^{-1}. This represents a unique opportunity to bring in technological innovation and fully exploit the potential of HL-LHC by including fast-timing through 4-dimensional (4D) tracking in the ATLAS barrel region, enabling full hermitic coverage when combined with the HGTD. In this contribution, we will demonstrate how the availability of a timestamp for the tracks in the central ATLAS region allows to significantly enhance the physics potential and discovery reach beyond what can be achieved with the HGTD alone. In order to study the impact of 4D tracking on future collider experiments, the studies are extended to a generic detector layout via the ACTS library.

Submission declaration

Original and unplublished

Primary author: SANTI, Lorenzo (Sapienza Universita e INFN, Roma I (IT))

Co-authors: SCHWARTZMAN, Ariel Gustavo (SLAC National Accelerator Laboratory (US)); STREBLER, Thomas (CPPM, Aix-Marseille Université, CNRS/IN2P3 (FR))

Presenter: SANTI, Lorenzo (Sapienza Universita e INFN, Roma I (IT))

Session Classification: Day 2 - Session 1

Track Classification: New ideas and future applications