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Expected tracking and readout performance of the ATLAS Phase-II Inner Tracker Upgrade

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With its increased number of proton-proton collisions per bunch crossing, track reconstruction at the High-Luminosity LHC (HL-LHC) is a complex endeavor. The Inner Tracker (ITk) is a silicon-only replacement of the current ATLAS tracking system as part of its Phase-II upgrade.

It is specifically designed to handle the challenging conditions resulting from the increase in luminosity.

Having undergone a series of layout optimizations, the ITk pixel detector now features a reduced radius of its innermost barrel layer, among other changes. This contribution will discuss the evolution of the ITk design, alongside its impact on the tracking performance and some higher-level object reconstruction and identification.

To ensure stable data-taking conditions, it is critical to manage the rate at which ITk data is being read out. ITk information is read out for bunch crossings selected by the first level trigger with an expected rate of 1 MHz. Recent calculations on the expected data rates at the design frequencies will be presented, and handles to ensure rates stay below the bandwidth thresholds will be discussed.

Collaboration

ATLAS

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