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Performance of the ATLAS New Small Wheels

Thursday 3 April 2025 13:45 (30 minutes)

As the Large Hadron Collider (LHC) transitions into the High-Luminosity era (after 2029), all experiments are undergoing significant upgrades to cope with the more intense collision environment and to select the most interesting – and often rarest – events. For the ATLAS experiment, these upgrades are carried out in multiple steps. The first upgrade (Phase 1) was completed in 2022, while the second phase (Phase 2) is currently being prepared for 2026.

A major upgrade during Phase 1 was the replacement of the inner forward muon spectrometer (Small Wheels) with the New Small Wheels (NSWs) to handle the increased particle fluxes with excellent spatial and temporal resolution, effectively reducing fake triggers and pile-up. The NSWs consist of two gaseous detector technologies: small-strip Thin-Gap Chambers (sTGCs) and Micro-Mesh Gaseous Structure (Micromegas) detectors.

This talk will highlight the performance of these new detector technologies in the ATLAS muon spectrometer and assess their success in reducing pile-up while maintaining excellent spatial and temporal resolution with high efficiency and longevity during HL-LHC operation.

Further, studies on Micromegas position reconstruction will be presented, focusing on algorithms optimized for inclined particle trajectories.

Keywords: ATLAS; NSW; Micromegas; sTGC; Muon spectrometer

Presenters: VOGEL, Fabian (LMU München); VOGEL, Fabian (Ludwig Maximilians Universitat (DE))

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