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The ATLAS New Small Wheel Simulation and Reconstruction Software and Detector Performance Studies

Tuesday, 17 May 2022 19:00 (1 hour)

After successfully completing the phase-I upgrades during the long-shutdown 2 of LHC, the ATLAS detector is now ready to take Run3 collision data, with several upgrades implemented. The most important and challenging being in the Muon Spectrometer, where the two forward inner muon stations have been replaced with the New Small Wheels (NSW) equipped with two completely new detector technologies: the small strips Thin Gap Chambers (sTGC) and the Micromegas (MM).

Following the enormous effort for the construction, commissioning and installation of the NSW, the muon software required extensive revisions and new implementations, as well as migration to new multi thread approach. The new detectors have been fully integrated into the software. The detectors response is simulated and compared with real data from cosmic ray's test benches and test-beams. Nominal geometries, misalignments, and deformations, as well as other possible deviations from nominal operating conditions resulted from the detectors validation studies, have been implemented for a realistic study of final performances.

The simulation of both sTGC and MM trigger was implemented, and performance evaluated in different configurations, with and without background, serving as a crucial input for the optimization and hardware implementation of the trigger logic. Full muon reconstruction performance studies are performed and all the software tools, including dedicated data format, are now ready for early data-taking detector commissioning, and for physics analyses.

After an overview of the software implementation and the adopted strategies for simulations and reconstruction, a summary of the studies carried out will be presented.

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