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ATLAS New Small Wheel Performance Studies with First Data of LHC Run3

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After successfully completing Phase I upgrades during LHC Long Shutdown 2, the ATLAS detector is back in operation with several upgrades implemented. The most important and challenging upgrade is in the Muon Spectrometer, where the two inner forward muon stations have been replaced with the New Small Wheels (NSW) system featuring two entirely new detector technologies: small strip Thin Gap Chambers (sTGC) and the resistive Micromegas (MM).

After massive construction, testing and installation work in ATLAS, the two NSW endcaps are now fully operational in the experiment participating in the muon spectrometer tracking system and muon trigger system. At the same time completing the phase of commissioning of this completely new system. A huge effort has gone into the operation of the new data acquisition system, as well as the implementation of a new processing chain within the muon software framework.

The new detectors are fully integrated into the software. Tracking is performed with full consideration of the absolute alignment of each individual detector module by the ATLAS Muon Spectrometer optical alignment system. All the deviations from the nominal geometry of all the constituent elements of each sTGC and MM module are accounted for through the modeling of the real chamber geometry reconstructed from the information of the construction databases.

After an overview of the software implementation and the strategies adopted for the simulations and reconstruction, the studies on the performance of the NSW system from the 2022 and from the first months of 2023 RUN3 data taking will be reported.

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