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Geometrical precision alignment of the Micromegas detectors for the ATLAS New Small Wheel upgrade

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The upgrade of the Large Hadron Collider (LHC) to the High Luminosity LHC (HL-LHC) is required to probe the physics beyond Standard Model. After the ongoing long shutdown (LS2) and eventually after LS3 in 2026, the accelerator luminosity will be increased up to 7 times as compared to designed luminosity value i.e. 1034 cm-2s-1. To meet the requirements of higher rates environment of HL-LHC era, the muon system of ATLAS detector needs to be upgraded. Therefore, the small wheel comprised of Cathode Strip Chambers (CSC), monitored Drift Tubes (MDT) chambers and Thin Gap Chambers (TGC) will be replaced by the New Small Wheel (NSW). The NSW will be constituted by MicroMegas gaseous detectors (from the MPGD family) and small-strip Thin Gap Chambers (sTGC). Micromegas detectors will be used for tracking as well as triggering purpose. For each of the two NSW, 16 modules will be installed in 16 sectors i.e. 8 large sectors and 8 small sectors; covering total area of ˜ 1200 m2, each detector with an individual area between 2 and 3 m2. Micromegas are ionization-based gaseous detectors made up of parallel plates, having a thin amplification region separated from the conversion region via a thin metallic mesh. The construction of Micromegas detectors as well as methods adopted to achieve the challenging required geometrical precision are presented. Specific measurement devices have been developed in the last few years to determine the mechanical metrology quality of Micromegas chambers, required for NSW. Planarity measurements of readout panels as well as module after assembly are done with a specifically developed co-ordinate measuring machine (CMM). The methodology to obtain such results as well as obtained results will be presented. Results of in-plane measurements (XY co-ordinate) performed using Rasnik masks etched on the PCBs are also shown.

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Secondary track (number)

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