

# Production, quality control and performance studies of the small-diameter Muon Drift Tube Detectors for the Phase-II Upgrade of the ATLAS Muon Spectrometer

D. Buchin<sup>1</sup>, F. Fallavollita<sup>1</sup>, O. Kortner<sup>1</sup>, H. Kroha<sup>1</sup>, G. Proto<sup>1</sup>, A. Reed<sup>1</sup>, M. Rendel<sup>1</sup>,  
**E. Voevodina**<sup>1</sup>

<sup>1</sup>Max Planck Institut für Physik, Werner Heisenberg Institute  
Föhringer Ring 6 D-80805 München, Germany

In the next long shutdown for the Phase-II Upgrade of the Large Hadron Collider (LHC) in 2026–2028, the 96 new integrated muon tracking and trigger modules will be installed at the ends of the toroid magnet coils in the small azimuthal sectors of the inner barrel layer (BIS1-6) of the ATLAS muon spectrometer in order to increase the trigger efficiency in the barrel region and to improve the rate capability of the muon chambers in the regions of high background rate corresponding to the High Luminosity-LHC project. The new muon module consists of the small-Diameter Muon Drift Tube (sMDT) chamber with a 15 mm tube diameter and thin-gap Resistive Plate Chamber (RPC) triplet with 1 mm gas gap thickness. Due to the narrow available space, the BIS1-6 project foresees to replace the all-existing Monitored Drift Tubes, used for the precise position measurement in this area, with muon stations formed by sMDT and RPC, capable of withstanding the higher rates and provide a robust standalone muon confirmation. Moreover, the advantages of sMDT technology are not only to make room for the new trigger chambers, but it has already demonstrated their excellent precise tracking measurement over large areas at high background rates. In the past few years, ATLAS MDT group of the Max Planck Institute for Physics (MPI) in Munich designed, assembled and qualified 48 sMDT detectors with a total number of the drift tube of about 27000. For this reason, the detailed common assembly protocol and quality control procedures have been established, with the ambitious goal to ensure standardization of the performance of the constructed detectors and their components. In this contribution, we present the final results of the QC tests performed on the 48 BIS1-6 sMDT chambers assembled by the MPI Munich production site following the well-defined specification parameters.