A Fast High-Resolution Muon Drift Chamber Prototype for LHC Upgrades

Abstract

The proposed upgrade of the Large Hadron Collider at CERN to luminosities above 1×10^{34} cm^{-2}s^{-1} necessitates the replacement of a large number of tracking chambers of the muon spectrometer of the ATLAS experiment to avoid deterioration of the momentum measurement at high background rates. Furthermore, the installation of additional fast high-resolution tracking chambers in the innermost forward region of the muon spectrometer would improve its tracking performance in the pseudo-rapidity region of 2.0–2.7 even at nominal LHC operating conditions.

A new design of a drift tube chamber, using 15 mm diameter aluminum tubes, will be presented, including the necessary services, as e.g. a modular gas distribution system and high density front-end electronics boards. We report on the assembly procedure and our experience with the construction of a first full-sized prototype chamber with 1152 drift tubes, covering an area of 1 m^2. Measurements of the achieved mechanical precision and results of the quality assurance tests will be discussed.