T 7: Detectors II (Gaseous Detectors)

Time: Monday 16:45–18:00 Location: VG 1.102

T 7.1 Mon 16:45 VG 1.102

Development of a 3D read-out scheme for drift-tube chambers — Davide Cieri, Francesco Fallavolita, Oliver Kortner, Sandra Kortner, Hubert Kroha, •Nick Meier, Giorgia Proto, and Elena Voevodina — Max-Planck-Institute for Physics, Garching, Germany

Current drift-tube chambers only measure the coordinates of charged particle trajectories in the plane orthogonal to their anode wires. This limitation is usually overcome by a second set of detectors providing the coordinates along the anode wires. In this contribution the development of a 3D read-out scheme utilizing the propagation delay of the signals between both ends of a tube is presented. A achievable spatial resolution of about 20 cm along the wire is demonstrated for ATLAS monitored drift-tube chambers. This is limited by the resolution of the ATLAS TDC. Improvements with higher resolution TDC are under investigation for applications of drift tube detectors in experiments at future circular electron position and hadron colliders.

T 7.2 Mon 17:00 VG 1.102

Small-Diameter Muon Drift Tube Detector Chambers for the ATLAS Phase-II Upgrade: Performance Testing and Certification with New Readout — •Bastian Wesely, Fan Zhou, Oliver Kortner, Hubert Kroha, Nick Kube, Nick Meier, and Elena Voevodina — Max-Planck-Institute for Physics, Munich, Germany

To meet the requirements of the High-Luminosity LHC (HL-LHC), the Muon Drift Tube (MDT) chambers in the inner barrel layer (BIS) of the ATLAS muon spectrometer are being replaced with small-diameter Muon Drift Tube (sMDT) chambers. These advanced chambers will be integrated with triplets of thin-gap Resistive Plate Chambers (RPCs) to enhance the acceptance and robustness of the barrel muon trigger system. The sMDT chambers, designed with drift tubes that are half the diameter of the original MDT chambers, deliver an order-of-magnitude improvement in background rate capability. A total of 96 new sMDT chambers were constructed between January 2021 and September 2023 at two production sites. 50% of these chambers were produced at the Max Planck Institute for Physics (MPP) in Munich, and they are now being equipped with final readout electronics at BB5, CERN. In this contribution, we will present the certification methods and performance test results from the CERN BB5 facility, comparing them with the initial testing campaign conducted at the Max Planck Institute for Physics.

T 7.3 Mon 17:15 VG 1.102

Quality Control Framework for the CMS Drift Tube Electronics Upgrade — Dmitry Eliseev, •Nils Esper, Thomas Hebbeker, Kerstin Hoepfner, Markus Merschmeyer, Carsten Presser, and Alexander Schmidt — III. Physikalisches Institut A, RWTH Aachen University

The Drift Tube (DT) system is one of the muon subdetectors in the barrel region of the Compact Muon Solenoid (CMS) experiment. As part of the Phase-2 Upgrade for the High-Luminosity Large Hadron Collider (HL-LHC), the electronics of the DT system will be upgraded. This includes exchanging the minicrate electronics, which are mounted on each DT chamber. The new electronics feature the On-Board Electronics for Drift Tubes (OBDT) boards, responsible for the time-precise hit acquisition from the chamber front-ends and upstreaming of the hit data. The OBDTs also provide slow control functionalities for the chamber infrastructure. As part of the upgrade efforts, quality control instruments and procedures have been developed to be deployed at the minicrate assembly sites and at CERN. This talk describes the current status of the Phase-2 Upgrade activities, focussing on the minicrate testing framework.

T 7.4 Mon 17:30 VG 1.102

Upgrade of the MDT Front-end Electronics of the LMU Cosmic Ray Facility — •Eshita Kumar, Otmar Biebel, Valerio D'Amico, Stefanie Götz, Daniel Grewe, Ralf Hertenberger, Nirmal Mathew, Nick Schneider, Chrysostomos Valderanis, and Fabian Vogel — LMU München

As part of the Phase-II Upgrade of the ATLAS Muon Spectrometer for the High Luminosity LHC (HL-LHC), a new and enhanced trigger and readout system for the Monitored Drift Tube (MDT) chambers is being installed. To evaluate the Phase-II upgrades on an MDT chamber outside the ATLAS detector and independently of ongoing upgrade activities at CERN, the LMU Cosmic Ray Facility (CRF) in Garching serves as an ideal testing site. Equipped with two fully operational MDT chambers and scintillators for triggering, the facility has been upgraded with Phase-II front-end electronics to facilitate a comprehensive test. These new front-end electronics are tested using the MiniDAQ readout system. In this talk, the current status of the project and first results will be shown. A comparison between the performance of the original CRF electronics and the new Phase-II electronics will be presented.

T 7.5 Mon 17:45 VG 1.102

Development and Implementation of a new Trigger System in the LMU Cosmic Ray Facility for Level-0 MDT Trigger Processor Testing — •Nick Schneider, Otmar Biebel, Valerio D'Amico, Stefanie Götz, Ralf Hertenberger, Eshita Kumar, Chrysostomos Valderanis, Fabian Vogel, Daniel Grewe, and Nirmal Mathew — LMU München

The Phase-II Upgrade of the ATLAS Muon Spectrometer for the High Luminosity LHC (HL-LHC) includes the installation of a new and more efficient trigger and readout system for the Monitored Drift Tube (MDT) chambers. One of the components is the new Level-0 MDT Trigger Processor (L0MDT). The LMU Cosmic Ray Facility (CRF) is a test stand equipped with two ATLAS series production MDT BOS chambers and a scintillator hodoscope for triggering. It could be used to test L0MDT under realistic conditions. Since it is running on unsupported legacy electronics an upgrade to ALTAS Phase-II standard has to be done first. This also ensures that the CRF remains operational in the future. For the new electronics an upgrade of the trigger system is needed. In addition the regular Phase-II trigger path has to be changed such that it fits the specifications of the CRF including emulators for not yet available electronics. This talk will cover the operating principal and the hardware implementation of this new trigger system and will present some first results. The readout electronics will not be covered in this talk. A first aim after the full upgrade of the trigger and the readout electronics is to enable full testing of L0MDT in a realistic environment.