Upgrades Of The ATLAS Muon Spectrometer With sMDT Chambers

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Upgrades

- The muon detectors at S-LHC will face unprecedentedly seen high n/γ background due to the ≈ x10 increase in luminosity. High occupancy leads to significant deterioration of the muon detection efficiency of the MDT, compromising the physics reach
- The non-linear relationship drift-radius vs time of the MDT gas makes the region at radii>7mm more sensitive to the irradiation rate → a half size tube can continue to offer a good efficiency and resolution in a much higher radiation environment
- The design needed a new tube endplug to address the challenge of four times higher density of tube gas and electrical connections than a standard 3 mm MDT tube
- The semi-automatic tube wiring and gluing procedure allows a quick assembly of a chamber with precision measured, for the to installed sMDT, at the 10 μm
- In the "transition" region $1.0<|\eta|<1.3$ in the "large" sectors MDT are sandwiched by TGC doublets to offer a local 2D track measurement, which, with the aid of the Tile Calorimeter, can provide a good fake rejection
- For the "small" sectors nothing is in place and the "free" volume does not allows to add any new RPC, → re-use the MDT volume for both sMDT and RPC (BIS7/8)
- Other areas of the ATLAS detector will benefit from the possibility (as in the feet region at $\eta\approx0$ where, to leave room to ID services, only two MDT stations are traversed by muons originated in collisions) to add MDT with RPC.
- The two new installed sMDT chambers improve by 50% the momentum resolution for (simulated) 1 TeV muon traversing them.

Personal Contribution

Hardware: Long standing involvement with the ATLAS Muon Spectrometer especially the MDT detector (from 2004)

- Responsible of the front end Motherboard test and upgrade of the front end Chamber Service Module in the ATLAS cavern. sMDT are special in this sense: they are the only "MDT" chamber using two CSM per chamber because of the large number (624) of readout channels
- Co-leader of the commissioning, installation and integration in ATLAS of the MDT endcap chambers, including the most recent additions (EE chambers in the A-side) to complete the MDT system
- In charge of the offline analysis of the DCS data to monitor the environmental variables (temperature, magnetic-field and front end electronics parameters)
- Gas expert for the whole ATLAS MDT sub-detector

Upgrades

- Coordinator of the 2014-15 Cosmic Ray Milestone Runs data analysis Task Force: first time the collaboration could validate data collected inside the whole ATLAS DAQ by the sMDT chambers newly installed in the bottom sector 13. Their analysis (not blessed yet) show chamber performance in agreement with the results reported in the poster and track reconstructed using hits from these sMDT chambers
- Member of the BIS7/8 group responsible to upgrade the barrel inner MDT chambers at the largest η position of even sectors with sandwich of sMDT + RPC (newly conceived)