

Performance of the ATLAS RPC detector and L1 Muon Barrel trigger at $\sqrt{s} = 13$ TeV

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Resistive Plate Chambers (RPCs) are gaseous ionisation detectors that are employed by the Level-1 muon trigger system in the barrel region of the ATLAS muon spectrometer. The Level-1 muon trigger system selects muon candidates that are produced in proton-proton collisions at the Large Hadron Collider (LHC). Muon candidates are associated by the Level-1 system with the correct LHC bunch crossing and with one of the six transverse momentum thresholds. The RPCs are arranged in three concentric double layers and consist of approximately 3700 gas volumes, with a total surface of more than 4000 square meters. They operate in a toroidal magnetic field of approximately 0.5 Tesla and provide up to 6 position measurements along the muon trajectory, with a space-time resolution of about 1 cm x 1 ns.

This talk will present performance of the RPC detector and Level-1 Muon Barrel trigger system during the latest data taking period at a centre-of-mass energy of 13 TeV. New measurements of RPC cluster size, detector efficiency and timing resolution will be presented. Trigger efficiency measurements obtained using Z boson decays to a muon pair will be summarised. Measurements of gas-gap currents as a function of RPC high voltage and of environmental parameters will be also presented, both with/without beams in the LHC and with an instantaneous luminosity of up to $2 \times 10^{34} \text{ cm}^{-2} \text{ s}^{-1}$. Results of the extrapolations of the RPC detector response to the expected High Luminosity LHC luminosity will be shown. Finally, measurements of the RPC detector response at different high voltage and threshold settings will be discussed, also in the context of expected detector response at the High Luminosity LHC.

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