Performance of the ATLAS RPC detector and trigger at 13 TeV

**Introduction**

The ATLAS experiment utilizes the Resistive Plate Chambers detector (RPC) for the first-level muon trigger system in the barrel region of the detector. This poster presents measurements of RPC detector and trigger performance using proton-proton collisions at a centre-of-mass energy of 13 TeV collected in 2018, showing results in terms of the detector and trigger timing and efficiency.

**The ATLAS RPC Detector and Trigger System**

The present ATLAS muon trigger in the barrel region is based on:

- 3 concentric RPC layers
- 16 physical sectors, ~3700 gas volumes
- Each physical sector is segmented in 4 trigger sectors
- 64 trigger sectors in side A and side C
- Each trigger sector is segmented along η in towers [1] [3]

The Level-1 (L1) trigger algorithm is based on hit coincidence of 3 concentric RPC stations [3]:

- low p_T trigger: coincidence between the innermost two RPC stations
- high p_T trigger: additional confirmation on the third external station

**Performance in one detector gas gap**

- All muon tracks are extrapolated to the RPC surface from MDT detector
- Only muons with tracks extrapolated inside the boundary are used for the study of this gas gap

**Trigger efficiency vs. offline muon p_T**

- L1 muon barrel trigger efficiency for offline muons as a function of their transverse momentum [4].
- Efficiencies are measured using a tag-and-probe method with Z → µµ candidates
- Efficiency for the low p_T trigger thresholds (MU4, MU6, MU10) reaches a plateau of about 78% for high p_T trigger thresholds (MU11, MU20, MU21) is around 68% [1]
- Efficiencies for all thresholds are very close to the geometrical acceptance values, confirming the good detector performance

**Plateau value of the L1 muon barrel trigger efficiency for offline muons as a function of time [4]**

- Each point corresponds to a different ATLAS run recorded in 2018
- Only runs with integrated luminosity greater than 50 pb^{-1} are used

**Trigger timing performance**

- Fraction of RPC high-pT trigger hits associated correctly to the collision Bunch Crossing (BC) for the whole RPC trigger system as a function of time [4].
- Each point corresponds to a different ATLAS run recorded in 2018
- Only runs with integrated luminosity greater than 50 pb^{-1} are used
- The fraction of high p_T muons associated to the correct BC is 99.6% [1]

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