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CPV in b-quarks from $t\bar{t}$ events & Performance studies of the RPC detector and L1 Muon Barrel Trigger

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CP violation (CPV) refers to the non-conservation of charge and parity symmetries, leading to differences between particles and antiparticles that can be probed in heavy flavour decays. In particular, semileptonic decays of b-hadrons provide a sensitive environment to search for CPV through charge asymmetry measurements. Using $t\bar{t}$ events collected by the ATLAS detector, where b-hadrons are abundantly produced, charge correlations can be studied between the lepton from the W boson decay and the soft muon from the semileptonic decay of a b-hadron. With the ATLAS analysis tools, relevant kinematic distributions are produced and the corresponding charge asymmetries are extracted, allowing the study of possible CP-violating effects. The Resistive Plate Chambers (RPCs) provide the muon trigger in the Barrel region of the ATLAS Muon Spectrometer. They consist of about 3700 gas volumes and over the past two years the gas mixture has been modified to reduce the greenhouse impact. Consequently, the impact of the new gas mixture on the muon detection and trigger efficiency has been investigated. In addition, a new software has been developed to estimate the trigger efficiency based on the number of RPC gas volumes reported as off in the Detector Control System.

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