

Dijet angular distributions in proton–proton collisions : At $\sqrt{s} = 7$ TeV and $\sqrt{s} = 14$ TeV

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Abstrak

This thesis is based on the first data from the Large Hadron Collider (LHC) at CERN. Its theme can be described as the classical Rutherford scattering experiment adapted to the LHC, measurement of scattering angles to search for new physics and substructure. At the LHC, colliding quarks and gluons exit the proton collisions as collimated particle showers, or jets. The thesis presents studies of the scattering angles of these jets. It includes a phenomenological study at the LHC design energy of 14 TeV, where a model of so-called large extra dimensions is used as a benchmark process for the sensitivity to new physics. The experimental result is the first measurement, made in 2010, by ATLAS, operating at the LHC start-up energy of 7 TeV. The result is compatible with the Standard Model and demonstrates how well the physics and the apparatus are understood. The first data is a tiny fraction of what will be accumulated in the coming years, and this study has set the stage for performing these measurements with confidence as the LHC accumulates luminosity and increases its energy, thereby probing smaller length scales.