

Summary

In this thesis, first experimental results on inclusive 2-jet and 3-jet event cross-sections as well as their ratio R_{32} are presented using the data from the proton-proton collisions at a center-of-mass energy of 8 TeV collected with the Compact Muon Solenoid (CMS) detector at the Large Hadron Collider (LHC). The data corresponds to an integrated luminosity of 19.7 fb^{-1} . Jets are reconstructed with the anti- k_t clustering algorithm for a jet size parameter $R = 0.7$. The cross-sections are measured as a function of the average transverse momenta p_T of the two leading jets in a phase space region ranging up to jet p_T of 2.0 TeV and an absolute rapidity of $|y| = 2.5$. The measurements, after correcting for detector effects are well described by predictions at next-to-leading order in perturbative QCD and additionally compared to several Monte Carlo event generators. The inclusive multijet production cross-section is an important observable which provides the details of parton distribution functions of the colliding protons and the precise measurement of the strong coupling constant α_s . Instead of individual cross-sections, the ratio of cross-sections is a better tool to determine the value of α_s as many theoretical and experimental uncertainties cancel in the ratio. The experimental value of α_s at the scale of the Z boson mass is extracted from a fit of the measured R_{32} for the first time using CMS data at 8 TeV. The value agrees well with the world average value as well as previous measurements.