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Transverse-momentum and pseudorapidity distributions of charged hadrons in pp collisions at sqrt(s) = 7 TeV

Abstract

Charged-hadron transverse-momentum and pseudorapidity distributions in proton-proton collisions at sqrt(s) = 7 TeV are measured with the inner tracking system of the CMS detector at the LHC. The charged-hadron yield is obtained by counting the number of reconstructed hits, hit-pairs, and fully reconstructed charged-particle tracks. The combination of the three methods gives a charged-particle multiplicity per unit of pseudorapidity, dN(charged)/d(eta), for |eta| < 0.5, of 5.78 +/- 0.01 (stat) +/- 0.23 (syst) for non-single-diffractive events, higher than predicted by commonly used models. The relative increase in charged-particle multiplicity from sqrt(s) = 0.9 to 7 TeV is 66.1% +/- 1.0% (stat) +/- 4.2% (syst). The mean transverse momentum is measured to be 0.545 +/- 0.005 (stat) +/- 0.015 (syst) GeV/c. The results are compared with similar measurements at lower energies.

Approved Plots from QCD-10-006

No PAS (special approval), so the approved plots are the ones in the paper.

Figure	Abbreviated Caption
Figure1.pdf	Differential yield of charged hadrons in the range abs(eta) < 2.4 in 0.2-unit-wide bins of abs(eta) in NSD events. The solid curves represent fits of the Tsallis parametrization to the data. The measurements with increasing eta are successively shifted by six units along the vertical axis.
Figure2.pdf	Charged-hadron yield in the range abs(eta) < 2.4 in NSD events as a function of pT; the systematic uncertainties are smaller than the symbols. The measurements at root(s) = 0.9 and 2.36 TeV are also shown. The solid lines represent fits of the Tsallis parametrization to the data.
Figure3.pdf	Distributions of dNch/deta, averaged over the three measurement methods and compared with data from UA5 (ppbar, with statistical errors only) and ALICE (with systematic uncertainties). The shaded band shows systematic uncertainties of the CMS data. The CMS and UA5 data are averaged over negative and positive values of eta.
Figure4.pdf	Average pT of charged hadrons as a function of the centre-of-mass energy. The CMS measurements are for abs(eta) < 2.4. Also shown are measurements from the ISR (pp), E735 (ppbar), and CDF (ppbar) for abs(eta) < 0.5, and from UA1 (ppbar) for abs(eta) < 2.5. The solid line is a fit of the functional form = 0.413 - 0.0171 ln s + 0.00143 ln^2 s to the data. The error bars on the CMS data include the systematic uncertainties.
Figure5.pdf	Average value of dNch/deta in the central eta region as a function of centre-of-mass energy in pp and ppbar collisions. Also shown are NSD and inelastic measurements from the NAL Bubble Chamber (ppbar), ISR (pp), UA1 (ppbar), UA5 (ppbar), CDF (ppbar), STAR (pp), PHOBOS (pp), and ALICE (pp). The curves are second-order polynomial fits for the inelastic (solid) and NSD event selections (dashed). The error bars include systematic uncertainties, when available. Data points at 0.9 and 2.36 TeV are slightly displaced horizontally for visibility.

Link to the paper in CDS ⧉

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