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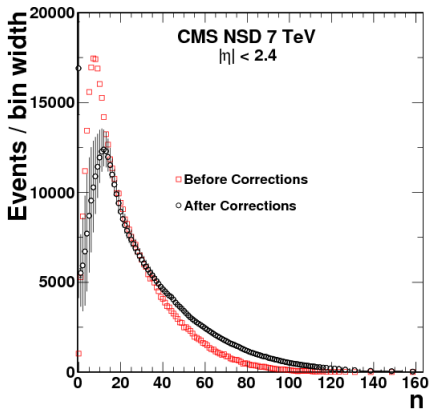
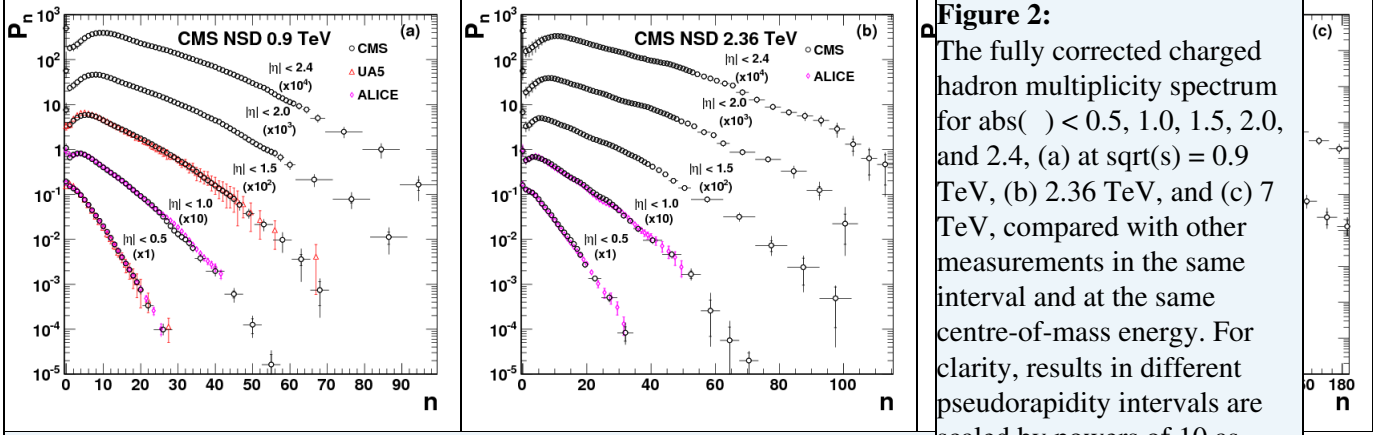
Charged particle multiplicities in pp interactions at sqrt(s) = 0.9, 2.36, and 7

All figures in a tar file : PNGs , PDFs
Link to values of the plots at the durham database : link
Link to published version on arxiv : paper

Abstract:
Measurements of primary charged hadron multiplicity distributions are presented for non-single-diffractive events in proton-proton collisions at centre-of-mass energies of √s = 0.9, 2.36, and 7 TeV, in five pseudorapidity ranges from abs( ) < 0.5 to abs( ) < 2.4. The data were collected with the minimum-bias trigger of the CMS experiment during the LHC commissioning runs in 2009 and the 7 TeV run in 2010. The multiplicity distribution at √s = 0.9 TeV is in agreement with previous measurements. At higher energies the increase of the mean multiplicity with √s is underestimated by most event generators. The average transverse momentum as a function of the multiplicity is also presented. The measurement of higher-order moments of the multiplicity distribution confirms the violation of Koba-Nielsen-Olesen scaling that has been observed at lower energies.

MC Tunes:
In the following plots we shown the following MC tunes: PYTHIA6 D6T and PYTHIA8.135 Tune1 as well as PHOJET

Figure	Abbreviated Caption
	**Figure 1:** A comparison of the uncorrected and fully corrected multiplicity distribution at sqrt(s) = 7 TeV for abs( ) < 2.4 . The uncertainties before corrections are statistical only, while after corrections the statistical and systematic uncertainties are added in quadrature.
	**Figure 2:** The fully corrected charged hadron multiplicity spectrum for abs( ) < 0.5, 1.0, 1.5, 2.0, and 2.4, (a) at sqrt(s) = 0.9 TeV, (b) 2.36 TeV, and (c) 7 TeV, compared with other measurements in the same interval and at the same centre-of-mass energy. For clarity, results in different pseudorapidity intervals are scaled by powers of 10 as

given in the plots. The error bars are the statistical and systematic uncertainties added in quadrature.

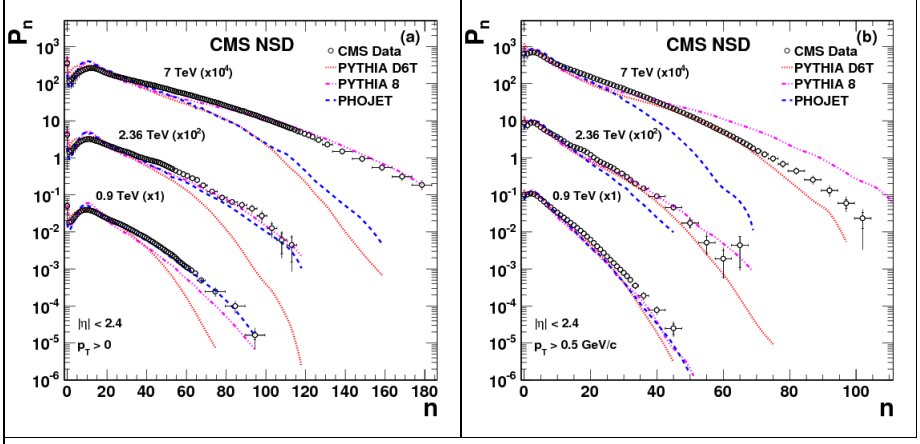


Figure 3:
The charged hadron multiplicity distributions with abs( ) < 2.4 for (a) pT > 0 and (b) pT > 500 MeV/c at sqrt(s) = 0.9, 2.36, and 7 TeV, compared to two different PYTHIA models and the PHOJET model. For clarity, results for different centre-of-mass energies are scaled by powers of 10 as given in the plots.

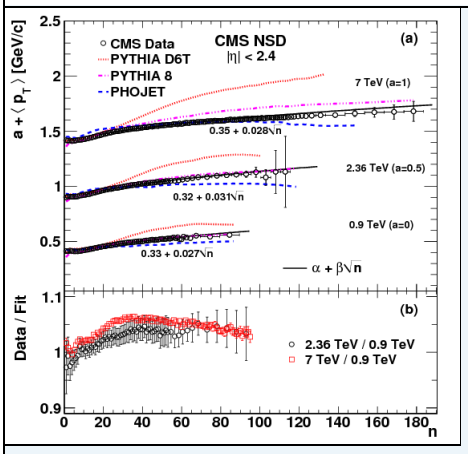


Figure 4:
(a) A comparison of pT versus n for abs( ) < 2.4 with two different PYTHIA models and the PHOJET model at sqrt(s) = 0.9, 2.36, and 7 TeV. For clarity, results for different energies are shifted by the values of a shown in the plots. Fits to the high-multiplicity part (n > 15) with a linear form in n are superimposed. (b) The ratios of the higher-energy data to the fit at sqrt(s) = 0.9 TeV indicate the approximate energy independence of pT at fixed n.

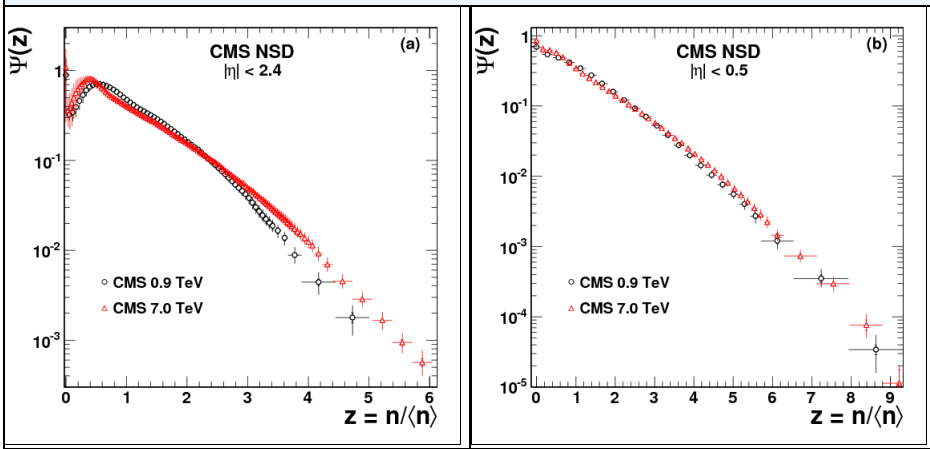
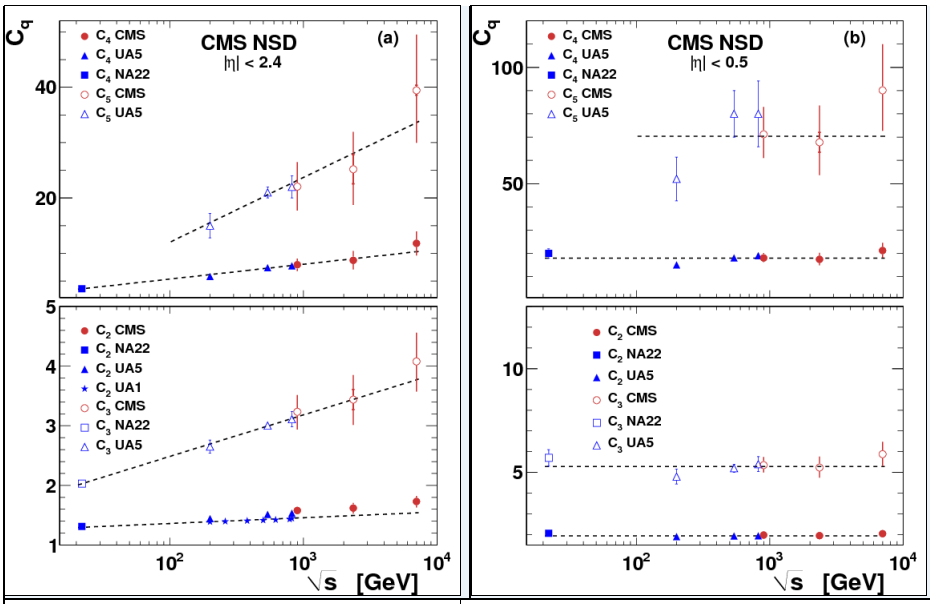


Figure 5:
The charged hadron multiplicity distributions in KNO form at two pseudorapidity intervals, (a) abs( ) < 2.4 and (b) abs( ) < 0.5.

Figure 6:
Fits of the log s dependence of the normalised moments Cq of the multiplicity distribution for (a) abs( ) < 2.4 (assuming linear dependence) and (b) abs( ) < 0.5 (assuming no dependence), including data



from lower energy experiments. For sqrt(s) = 0.9 TeV, data from experiments other than CMS were drawn shifted to lower sqrt(s) for clarity.

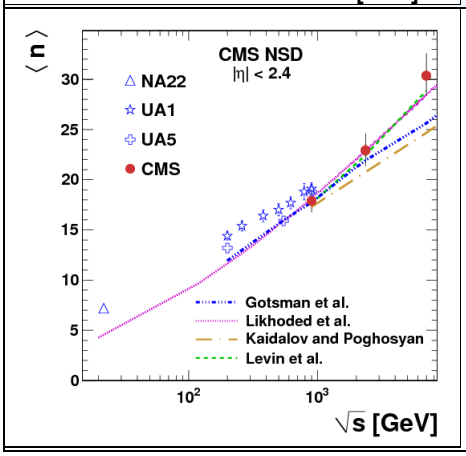


Figure 7:
The evolution of the mean charge multiplicity with the centre-of-mass energy for abs( ) < 2.4, including data from lower-energy experiments for abs( ) < 2.5. The data are compared with predictions from three analytical Regge-inspired models and from a saturation model.

-- RomainRougny - 06-Apr-2011

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