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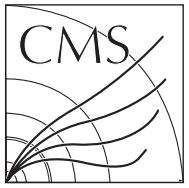

The Compact Muon Solenoid Experiment

Conference Report

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Measurement of the underlying event activity using charged particle jets in proton-proton collisions at 2.76 TeV

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Abstract

A measurement of the underlying event activity is performed in proton-proton collisionsat sqrt(s)=2.76 GeV, using data collected by the CMS experiment at the LHC.The average multiplicity and scalar-pT sum densities of charged particles in the azimuthalregion transverse to the leading charged particle jet at central pseudorapidities are studied.A steep rise of the underlying event activity is seen with increasing leading jet pTup to a few GeV/c, above which a slower rate of increase is observed. Bydividing the transverse region into the minimum and maximum activity ones on eachside of the leading jet, further information on the dynamic of the UE is obtained. Theresults are compared to predictions of several QCD-inspired models providingconstraints for the tuning parameters involved in these.

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Measurement of the underlying event activity using charged particle jets in proton-proton collisions at 2.76 TeV

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A measurement of the underlying event in proton-proton collisions is performed using events with a leading charged particle jet produced at central pseudorapidity ($|\eta^{\mathrm{jet}}| < 2$) and of transverse momentum ($p_{\mathrm{T}}^{\mathrm{jet}}$) in the range of 1 to 100 GeV. The analysis uses a data sample collected at the LHC by the CMS experiment at a centre-of-mass energy of 2.76 TeV, corresponding to an integrated luminosity of 0.3 nb^{-1}. The particle and Σp_{T} densities are studied in the transverse region, defined by the difference in azimuthal angle between the leading track jet and charged particle directions, $60^\circ < |\Delta\phi| < 120^\circ$. By dividing the transverse region into the minimum and maximum activity sides with respect to the highest p_{T} jet, and studying their difference, further information on the dynamics of the UE is obtained [1].

A steep rise of the underlying event activity in the transverse region is seen with increasing leading jet p_{T}. This fast rise is followed by a saturation region above ~ 8 GeV, with nearly constant multiplicity and small Σp_{T} density increase. Such a distinct change of the amount of activity depending on the transverse momentum of the leading charged-particle jet is clearly seen for all the observables. The difference between the minimum and maximum activity transverse regions show an increase of activity with $p_{\mathrm{T}}^{\mathrm{jet}}$ corroborating the hypothesis of an increasing contribution from initial- and final-state radiation.

The results are compared to recent Monte Carlo event generator tunes[2, 3, 4, 5, 6, 7]. By comparing data taken at $\sqrt{s} = 0.9$, 2.76 and 7 TeV [1, 8, 9], a strong growth with increasing centre-of-mass energy of the hadronic activity in the transverse region is also observed for the same value of the leading charged-particle jet p_{T}. All MC tunes predict the centre-of-mass energy dependence of the hadronic activity in a way that is very similar to data. These measurements are expected to play a significant role in the future development and tuning of MC models of the underlying event.

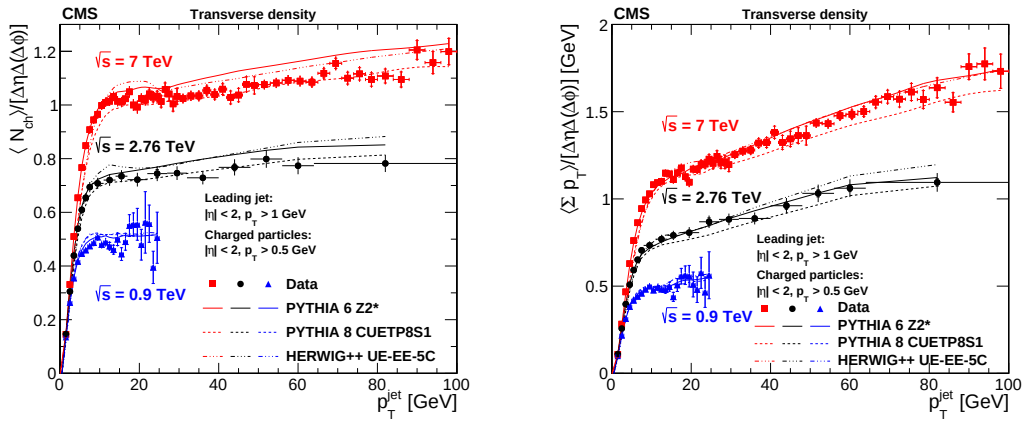

Figure 1: Comparison of UE activity at $\sqrt{s} = 0.9$, 2.76 and 7 TeV for for particle density (a) and Σp_{T} density (b) as a function of the leading charged-particle jet p_{T} [1, 8, 9].

Measurements of the underlying event activity has contributed to our understanding of soft dynamics and Monte Carlo generator tuning. A measurement of the underlying event activity at 13 TeV would be crucial for the verification of these tunes and provide additional discriminatory power of multi parton interactions and beam-beam remnants against initial- and final-state radiation effects on the UE activity.

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