

Abstract

We present a study of the jet transverse structure of 78 nb⁻¹ integrated luminosity of proton-proton collisions at $\sqrt{s} = 7$ TeV. The jet transverse structure is measured using the second moment of the charged hadron transverse jet profile. A comparison with predictions from different Monte Carlo generators is presented.

Jet observables

- N_{ch} - the multiplicity of tracks of charged particles in a jet
- The charged particle transverse jet shape variable:

$$\langle \delta R^2 \rangle = \langle \delta \phi^2 \rangle + \langle \delta \eta^2 \rangle$$

$$\langle \delta \phi_{jet}^2 \rangle = \frac{\sum_{i \in jet} (\phi_i - \langle \phi \rangle)^2 \cdot p_T^i}{\sum_{i \in jet} p_T^i}$$

$$\langle \delta \eta_{jet}^2 \rangle = \frac{\sum_{i \in jet} (\eta_i - \langle \eta \rangle)^2 \cdot p_T^i}{\sum_{i \in jet} p_T^i}$$

Event selection and reconstruction

- Spring 2010 data.
- A minimum bias trigger
- Calorimeter jet trigger with a cut of 15 GeV (uncalibrated) is used for jets with $p_T > 40$ GeV (calibrated) where the trigger efficiency is close to one
- Anti Kt algorithm with $R=0.5$
- Jet-Plus-Track algorithm to correct the energy and the direction of jets
- A dijet sample of $6.7 \cdot 10^5$ events ($p_T > 20$ GeV for the leading jet and $p_T > 10$ GeV for the 2nd jet)
- $p_{T, track} > 0.5$ GeV
- Systematic errors: a variation of the jet energy scale within the uncertainty of 5% resulting in an error of 3% both for N_{ch} and δR^2 independent on jet p_T

Charged particle momenta in jets

Figure 1. N_{ch} and δR^2 as a function of p_T corrected with the JPT algorithm for quark, gluon and all jets using the Pythia

The difference between gluon radiation and quark radiation is apparent for $\langle N_{ch} \rangle$ and $\langle \delta R^2 \rangle$ with the same jet p_T

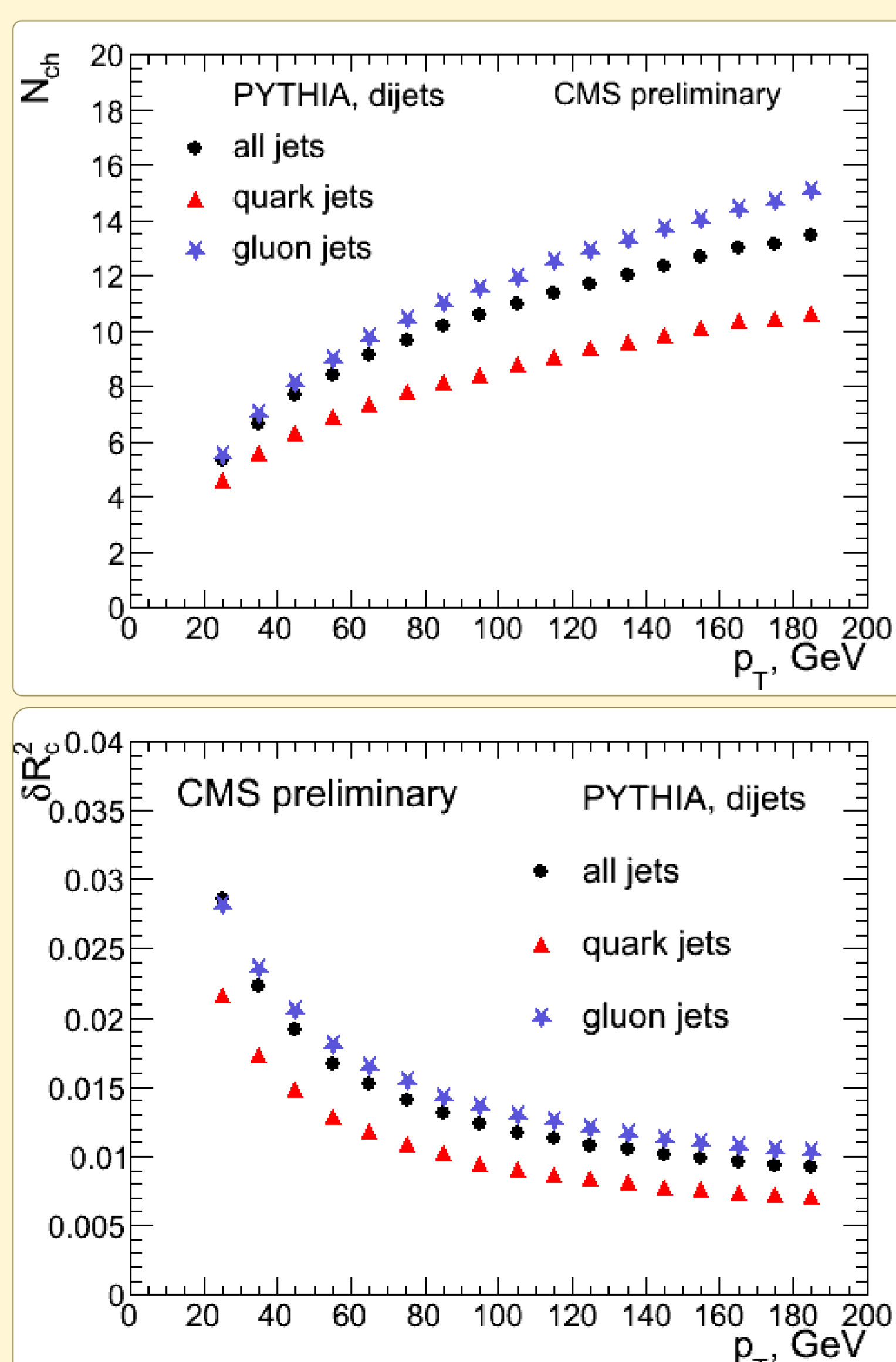
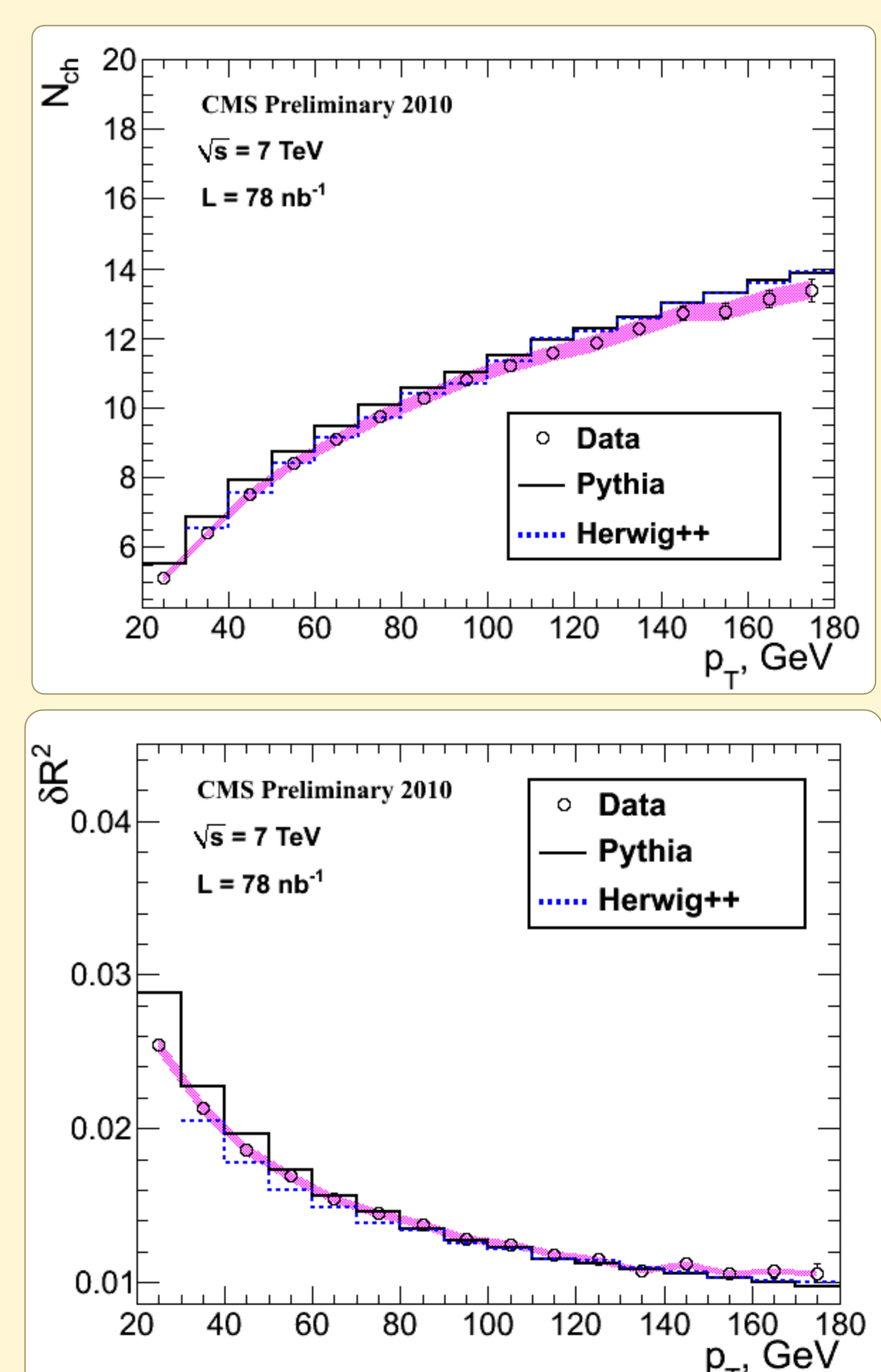


Figure 2. N_{ch} and δR^2 as a function of p_T . Data are shown with statistical error bars and a band denoting systematic errors. Also shown are predictions based on the Pythia and Herwig



References: CMS-Collaboration, "Jet Transverse Structure and Momentum Distribution in pp Collisions at 7 TeV", CMS Physics Analysis Summary CMS-PAS-QCD-10-014 (2010)