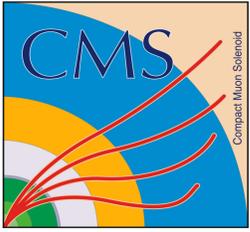


Measurement of the Inclusive Production Cross Sections for Forward Jets and Forward - Central Dijets in CMS at $\sqrt{s} = 7$ TeV



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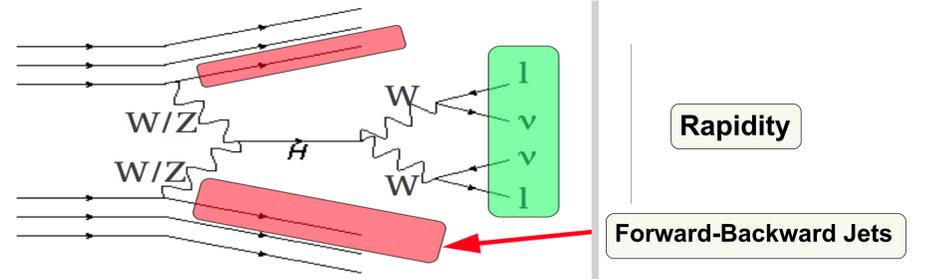
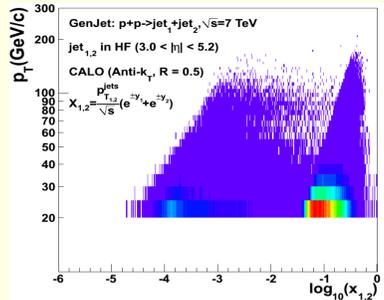
MOTIVATION

Large calorimeter coverage ($|\eta| < 5.2$) measured on forward jet production.

Forward jet production in CMS calorimeters:
Jets in HF are sensitive to $x = 0.0004$.

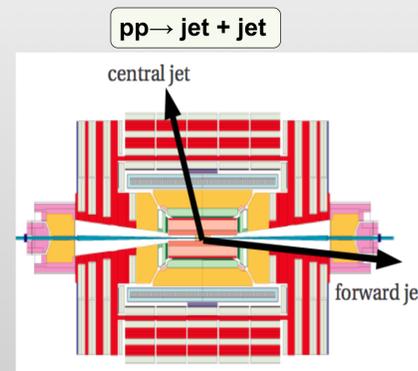
Forward jets probe the low- x and large- x domains; in $2 \rightarrow 2$ process,

Every 2 units of y : x_2^{\min} decreases by factor of ~ 10 .



- Provide measurements on central and forward jet associate production.
- Give information on multi-parton interaction and multi-jet production.
- Allow to study different types of parton radiation dynamics as implemented in the DGLAP, BFKL or the CCFM evolution equations.
- Necessary to check the background of the Higgs boson produced via the vector-boson fusion mechanism.

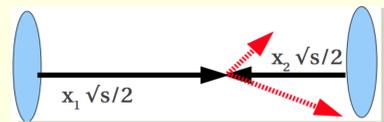
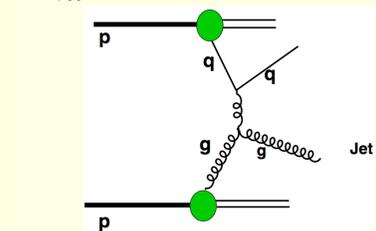
Central-Forward Dijet Cross section



- Central jet : $|\eta| < 2.8$
- Forward jet : $3.2 < |\eta| < 4.7$

Select events with the hardest jet in the forward region and the hardest jet in the central region.

$$\frac{d\sigma}{dp_T^{central} d\eta^{central} dp_T^{forward} d\eta^{forward}} \rightarrow \frac{d\sigma}{dp_T^{central} d\eta^{central}} \quad \frac{d\sigma}{dp_T^{forward} d\eta^{forward}}$$

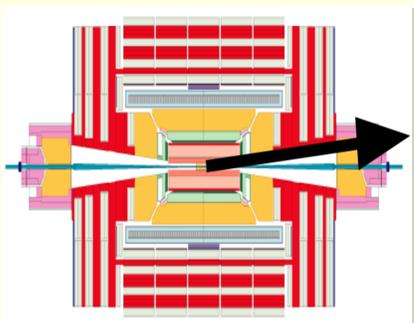


$$d\sigma(pp \rightarrow \text{jet}) = \text{PDF}(x_1, Q^2) \otimes \text{PDF}(x_2, Q^2) \otimes d\sigma(qg \rightarrow \text{jet})$$

$$x_2^{\min} \sim p_T / \sqrt{s} \cdot e^{-y} = x_T \cdot e^{-y}$$

Inclusive Forward Jet Cross section

$pp \rightarrow \text{jet} + X$



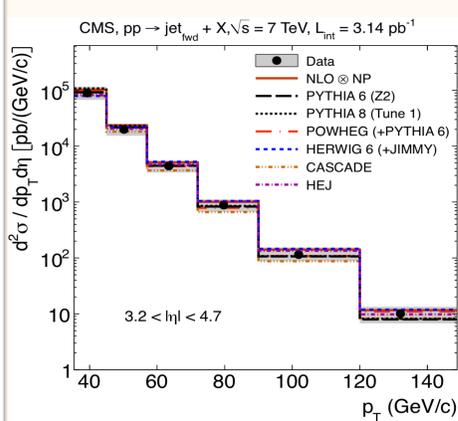
Forward jet : $3.2 < |\eta| < 4.7$

$$\frac{d^2\sigma}{dp_T d\eta} = \frac{C_{had}}{L \cdot \epsilon_i} \cdot \frac{N_{evts}}{\Delta p_T \cdot \Delta \eta}$$

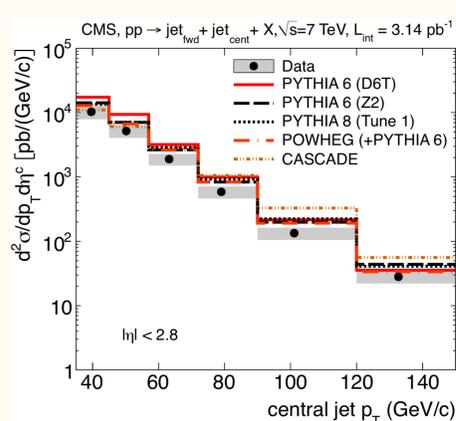
- L is the integrated luminosity.
- C_{had} accounts for bin-to-bin migrations due to p_T resolution and detector to particle corrections.
- Δp_T and $\Delta \eta$ are the transverse momentum and pseudorapidity bin sizes.
- ϵ_i is trigger efficiency of the jet trigger.

RESULTS

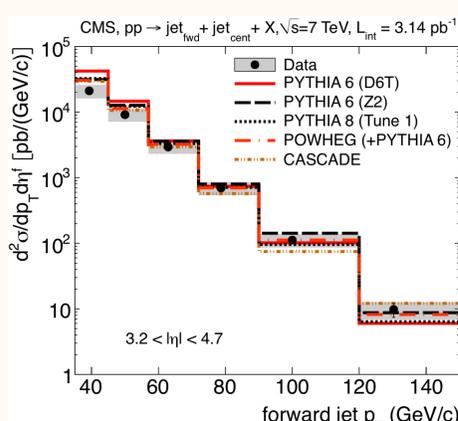
CONCLUSIONS



Inclusive jet cross section fully corrected and unfolded, compared to particle-level predictions.

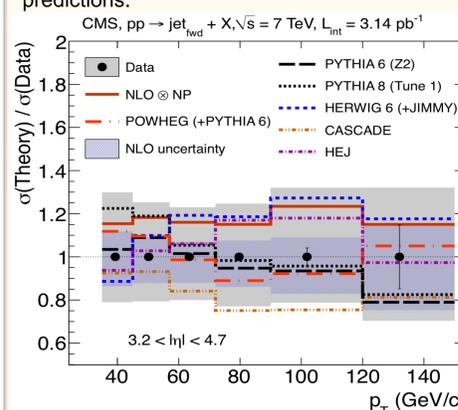


None of the predictions can describe all details of the limit.

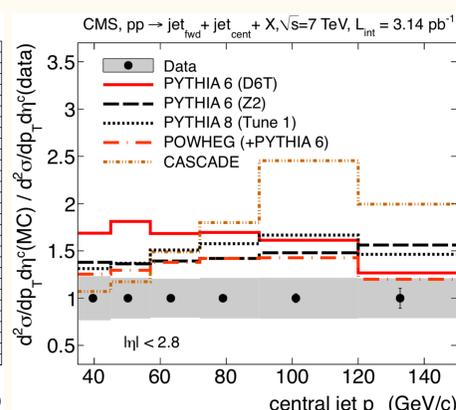


Forward jet production in the p_T range of 35-140 GeV/c has been measured by using 3.14 pb^{-1} of data collected in proton-proton collisions at $\sqrt{s} = 7 \text{ TeV}$. The total systematic uncertainties are of the order of $\pm 25\%$ and dominated by the absolute jet energy scale. Within the current experimental and theoretical uncertainties, perturbative calculations reproduce globally well the measured forward jet cross section. The measurement provides a first test of perturbative QCD calculations in the forward region at the highest energies ever, as well as a first cross-check for QCD background estimates of other scattering processes, such as vector boson fusion, characterized by forward/backward jet production.

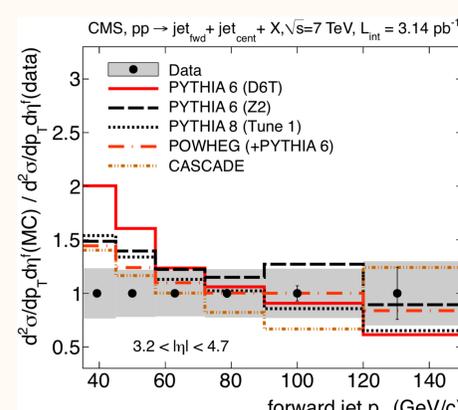
The measurement of central forward jet associate cross section using 3.14 pb^{-1} of data collected in pp collisions at $\sqrt{s} = 7 \text{ TeV}$ is also presented. The total systematic uncertainty amounts to 30% dominated by the uncertainty of JES.



Ratio of theory/data for the forward jet spectrum.
The predictions are in good agreement with the measurements.



Pythia 8 (Tune1) and Pythia 6 (Z2) describe data better than the D6T tune.



REFERENCES

- CMS Collaboration, JHEP 2012, Vol. 2012, No. 6. 36.