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 $2 < x < 2$ process,
  - Every 2 units of $y$: $x_{min}$ decreases by factor of $\sim 10$.

Forward jet production measurements.

**RESULTS**

- 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.

**CONCLUSIONS**

Forward jet production in the $p_T$ range of 35-140 GeV/c has been measured using 3.14 pb$^{-1}$ of data collected in proton-proton collisions at $\sqrt{s} = 7$ 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 $\sqrt{s} = 7$ TeV is also presented. The total systematic uncertainty amounts to 30% dominated by the uncertainty of JES.

The study provides cross section measurement for central and forward jets, compared to various Monte Carlo predictions, including Pythia 6 D6T tune, Pythia 6 Z2 tune, Powheg+Pythia, Herwig++, Herwig+Jimmy, Powheg+Herwig, Cascade.

**REFERENCES**