

# CENTRAL AND FORWARD INCLUSIVE JETS AT TEVATRON

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We report on a new measurement of the rapidity dependence of the inclusive jet production cross section in  $p\bar{p}$  collisions at  $\sqrt{s} = 1.8$  TeV using  $92 \text{ pb}^{-1}$  of data collected by the DØ detector at the Tevatron collider, and on a measurement of the ratio of central inclusive cross sections from two center-of-mass energies, 0.63 TeV and 1.8 TeV, as a function of jet  $x_T$ .

## 1 Introduction

We report on measurements of jet cross sections performed at Tevatron in 1994-95, in the DØ experiment, based on a luminosity of  $92 \text{ pb}^{-1}$ . Jets are reconstructed using an iterative cone algorithm with a fixed cone radius of  $R=0.7$  in  $(\eta, \phi)$  space, where  $\eta$  is the pseudorapidity, and  $\phi$  the azimuth. Offline data selections eliminate contamination from background caused by electrons, photons, noise, or cosmic rays. The details of the cuts are described elsewhere<sup>1</sup>. The jet cross section measurements allow a direct comparison with NLO QCD<sup>2</sup> using recent parton distribution functions<sup>3</sup> over many orders of magnitude.

## 2 Inclusive jet cross sections at $\sqrt{s} = 1.8$ TeV

The DØ collaboration has recently measured the rapidity dependence of the inclusive jet production cross section. The differential cross section is determined over seven orders of magnitude as a function of jet transverse energy in five intervals of  $|\eta|$ , up to  $|\eta| = 3$ , thereby significantly extending previously available measurements from CDF and DØ beyond  $|\eta| = 0.7$  (see figure 1).

The results are compared to the  $\alpha_s^3$  predictions from JETRAD<sup>2</sup>. The renormalization and factorization scales are set to  $E_T^{max}/2$ , the parton clustering parameter to  $R_{sep} = 1.3$ . Comparisons have been made using CTEQ and MRST parametrisations<sup>3</sup>. Figure 2 shows the comparisons on a linear scale with the CTEQ4HJ PDF, which appears to best describe the data in all  $|\eta|$  intervals. The error bars are statistical, while the error bands indicate one standard deviation systematic uncertainties. Quantitative comparison ( $\chi^2$  tests) is now underway.

### 3 Ratio of inclusive jet cross sections

The DØ collaboration has recently measured the ratio of inclusive jet cross sections at two center-of-mass energies,  $\sqrt{s} = 0.63$  TeV and 1.8 TeV, in the central region of pseudorapidity. This measurement is quite important since several theoretical uncertainties (notably due the choice of various PDFs) are reduced significantly in the ratio. Many experimental uncertainties also cancel due to their correlated nature at both energies. Figure 3 shows the DØ measurement of the ratio as a function of jet  $x_T = 2E_T/\sqrt{s}$ , and the theoretical predictions from JETRAD for different choices of the input parameters. Good agreement between theory and data is observed in the shape, and the normalization appears to be in agreement within 1–2 standard deviations. The region  $x_T = 0.1 - 0.2$  however deserves further investigations.

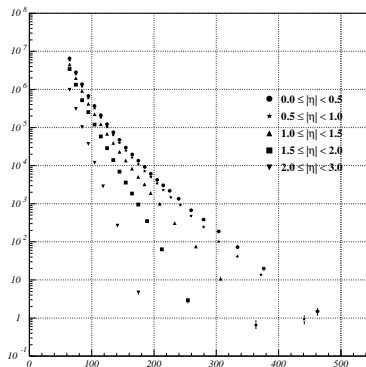


Figure 1: DØ measurement of rapidity dependence of single inclusive jet production cross section  $d^2\sigma/(dE_T D\eta)$  (in fb/GeV) presented as a function of jet  $E_T$  (in GeV) in five jet  $|\eta|$  intervals.

### References

1. DØ Collaboration, Phys. Rev. Lett. **82**, 2451, (1999), CDF Collaboration, Phys. Rev. Lett. **77**, 438 (1996).
2. W.T. Giele, E.W.N. Glover, and D.A. Kosower, Phys. Rev. Lett. **73**, 2019 (1994); S.D. Ellis, Z. Kunszt, and D.E. Soper, Phys. Rev. Lett. **64**, 2121 (1990); F. Aversa et al., Phys. Rev. Lett. **65**, (1990).
3. H.L. Lai et al., (CTEQ Collaboration) Phys. Rev. **D51**, 4763 (1995); A.D. Martin et al., (MRST Collaboration) Eur. Phys. J. **C4**, 463 (1998).

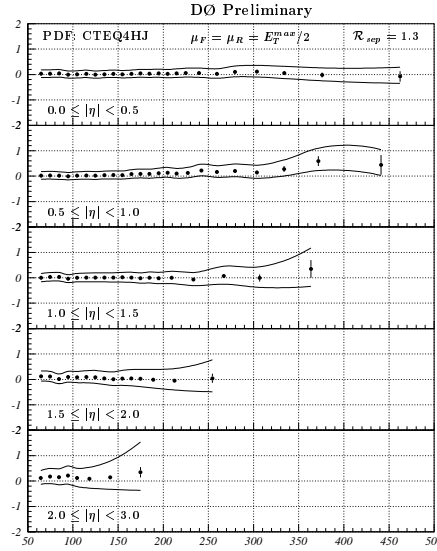


Figure 2: Comparison of DØ measurement of rapidity dependence of single inclusive jet production cross section presented as a function of jet  $E_T$  (in GeV) in five jet  $|\eta|$  intervals and NLO QCD predictions. The vertical axis is the ratio between measurement and theory.

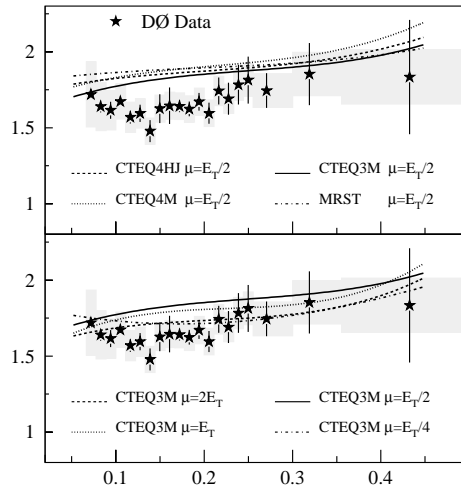


Figure 3: DØ measurement of the ratio of central inclusive jet cross sections from two center-of-mass energies, 0.63 TeV and 1.8 TeV, along with predictions obtained from JETRAD. The horizontal axis is  $x_T = 2E_T/\sqrt{s}$ .