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Diffractive Jet Production in Deep-Inelastic Scattering with a Leading proton at HERA-2

H1 Collaboration

Abstract

The cross section for inclusive jet production in diffractive deep-inelastic scattering is presented. The leading final state proton is detected in the H1 Forward Proton Spectrometer. The data have been collected during the HERA-2 period and correspond to an integrated luminosity of 156.7 pb^{-1}. The data cover the range $x_{IP} < 0.1$ in fractional proton longitudinal momentum loss, $|t| \leq 1.0~\mathrm{GeV}^2$ in squared four-momentum transfer at the proton vertex and $4 \leq Q^2 \leq 110~\mathrm{GeV}^2$ in photon virtuality. The dijet topology is defined by two inclusive jets in the central region, found by the k_T cluster algorithm in the hadronic centre-of-mass system. The presented cross sections are corrected to the level of stable hadrons and compared to the Monte Carlo generator level predicitons and NLO predictions with applied hadronization corections. The NLO predictions describe the data in general well, while the Monte Carlo prediction shows a discrepancy in the overall normalisation.

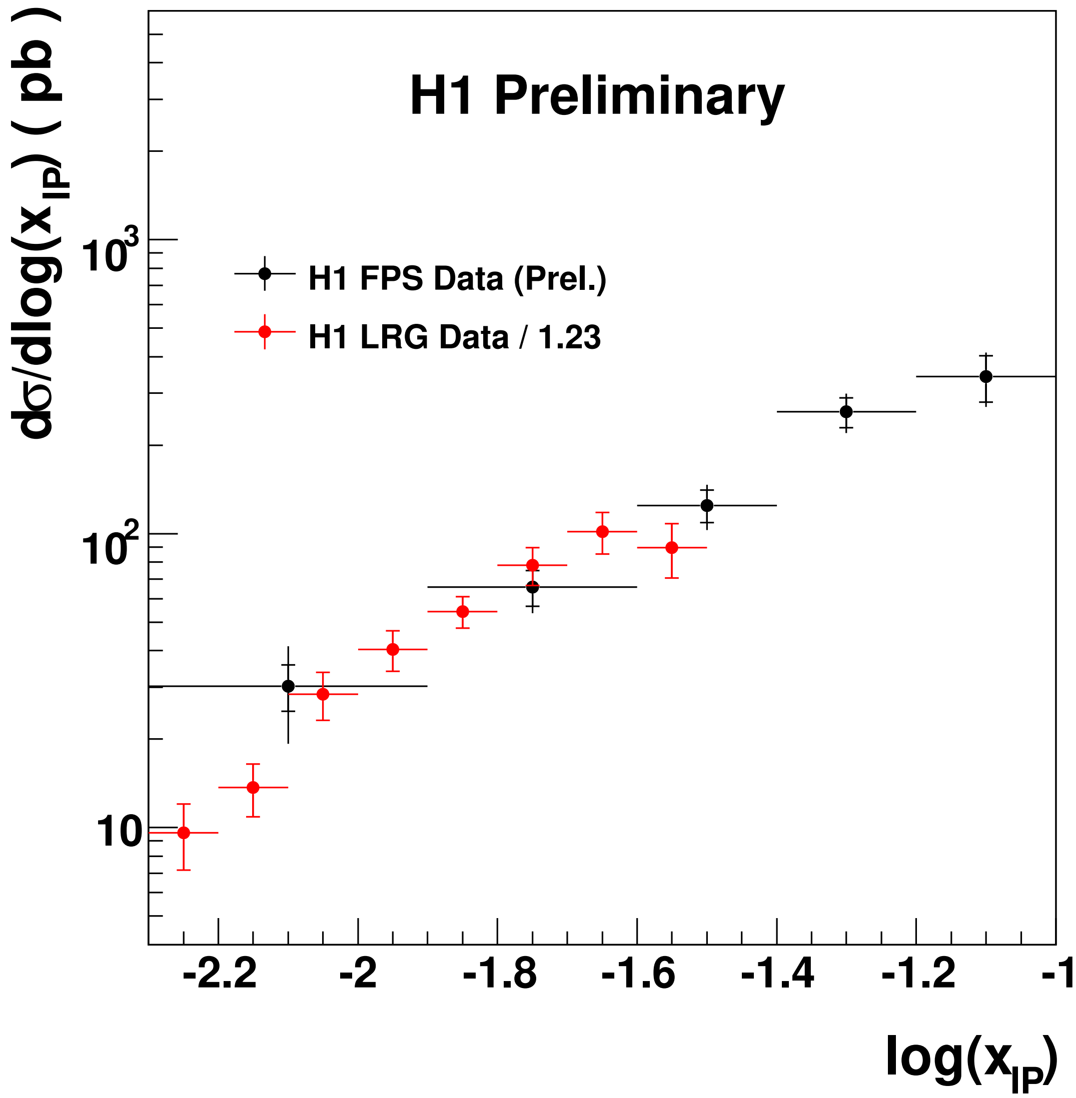

Figure 1: Differential cross section as a function of $log(x_{IP})$ for the new data with tagged proton ('FPS') to the result of the previous H1 analysis of diffractive dijets in large rapidity gap data. The published data are scaled down by the factor of 1.23 to account for the proton dissociation background not present in the proton tagged data. A good consistency between two independent experimental techniques is shown and also the phase space extension in x_{IP} by a factor of 3 can be seen.

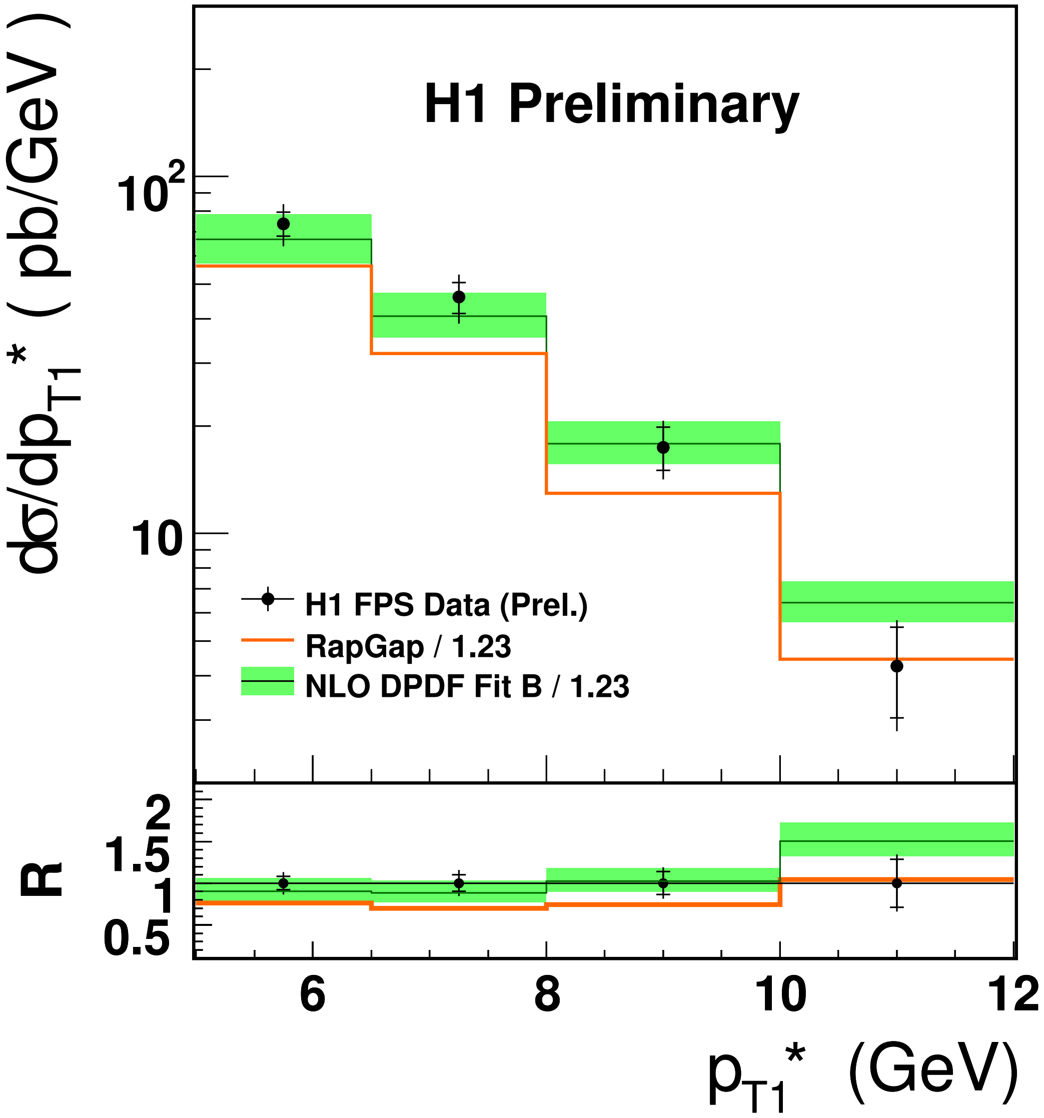

Figure 2: Differential cross section as a function of the transverse energy of the hardest jet in hadronic centre-of-mass system. The data are presented with the statistical error in the inner error bar and with the combined statistical and uncorrelated systematical error in the outer bar. The normalization uncertainty is approximately '5%' and it is not displayed. The comparison to Monte Carlo RapGap generator generator level cross section is presented as a red line. The NLO H1 2006 DPDF Fit B prediction corrected to the level of stable hadrons is presented in the green bar, the combined scale uncertainty and hadronization uncertainty is shown. The NLO prediction is in a good agreement with the data within the total error.

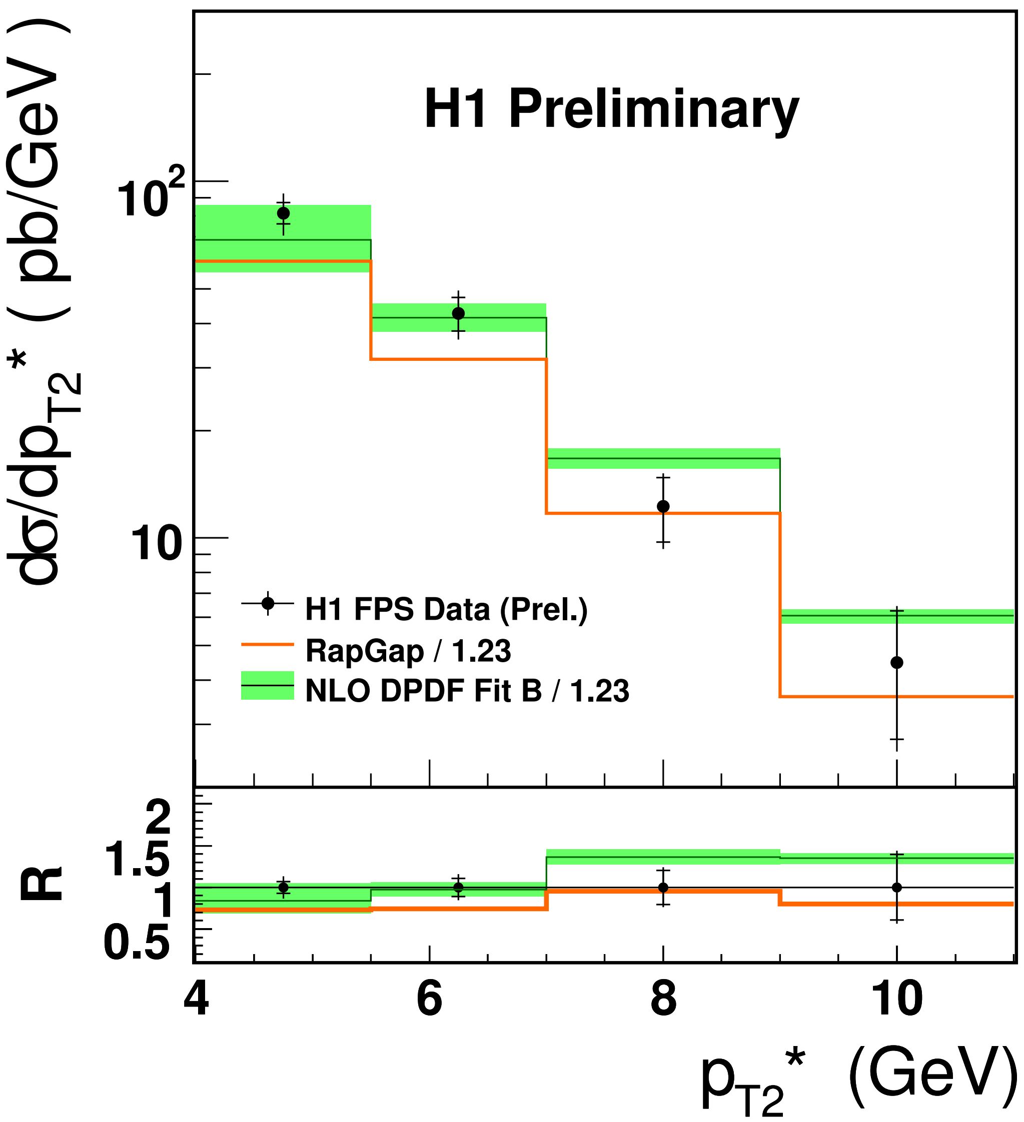

Figure 3: Differential cross section as a function of the transverse energy of the second hardest jet in hadronic centre-of-mass system. The data are presented with the statistical error in the inner error bar and with the combined statistical and uncorrelated systematical error in the outer bar. The normalization uncertainty is approximately ‘5%‘ and it is not displayed. The comparison to Monte Carlo RapGap generator generator level cross section is presented as a red line. The NLO H1 2006 DPDF Fit B prediction corrected to the level of stable hadrons is presented in the green bar, the combined scale uncertainty and hadronization uncertainty is shown. The NLO prediction agrees with the data within the total error.

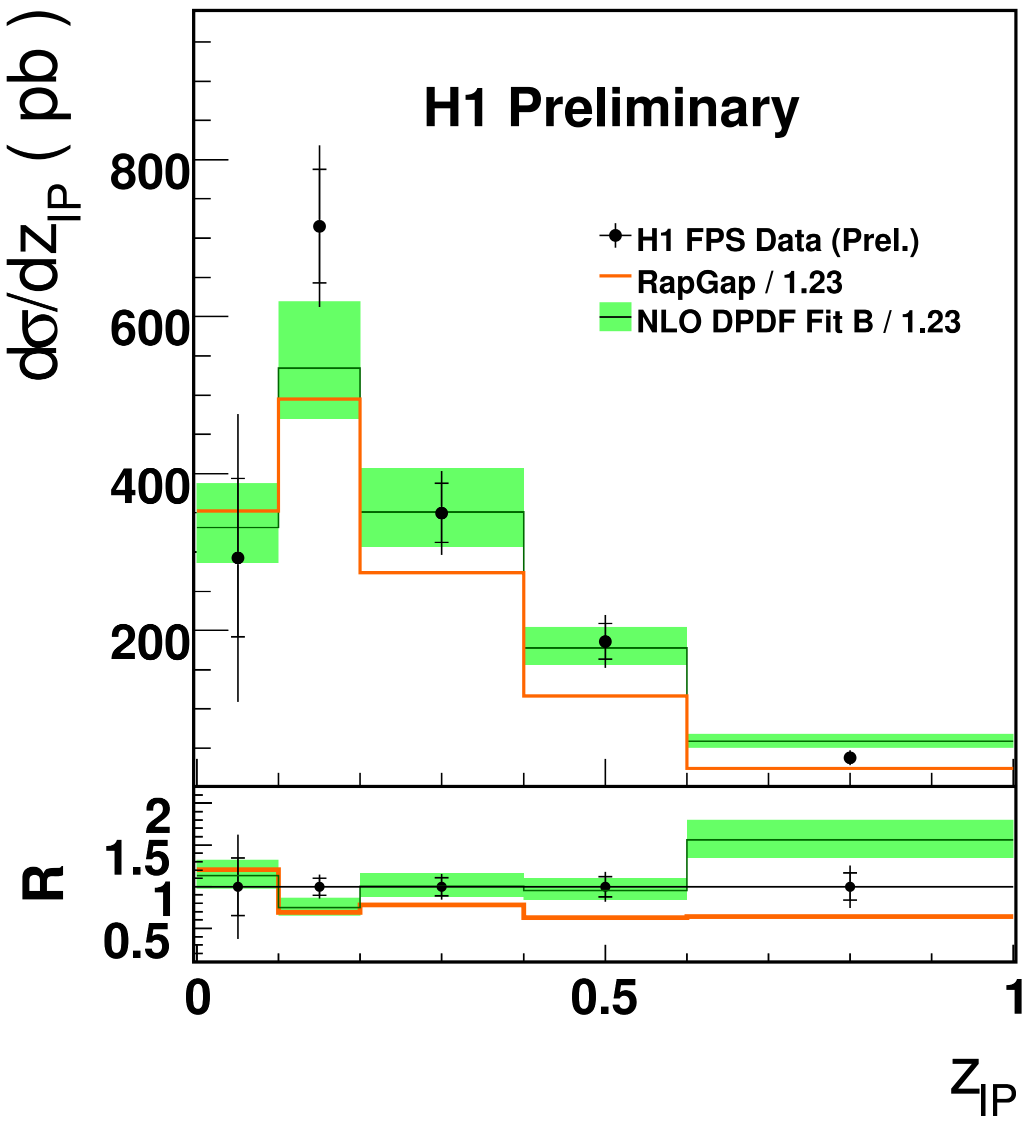

Figure 4: Differential cross section as a function of z_{IP}. The data are presented with the statistical error in the inner error bar and with the combined statistical and uncorrelated systematical error in the outer bar. The normalization uncertainty is approximately '5%' and it is not displayed. The comparison to Monte Carlo RapGap generator generator level cross section is presented as a red line. The NLO H1 2006 DPDF Fit B prediction corrected to the level of stable hadrons is presented in the green bar, the combined scale uncertainty and hadronization uncertainty is shown. The NLO prediction agrees with the data within the total error. In the highest bin effects of the direct pomeron remnant are expected. The discrepancy between the NLO prediction and the data might be related to missing pomeron remnant in the NLO prediction.

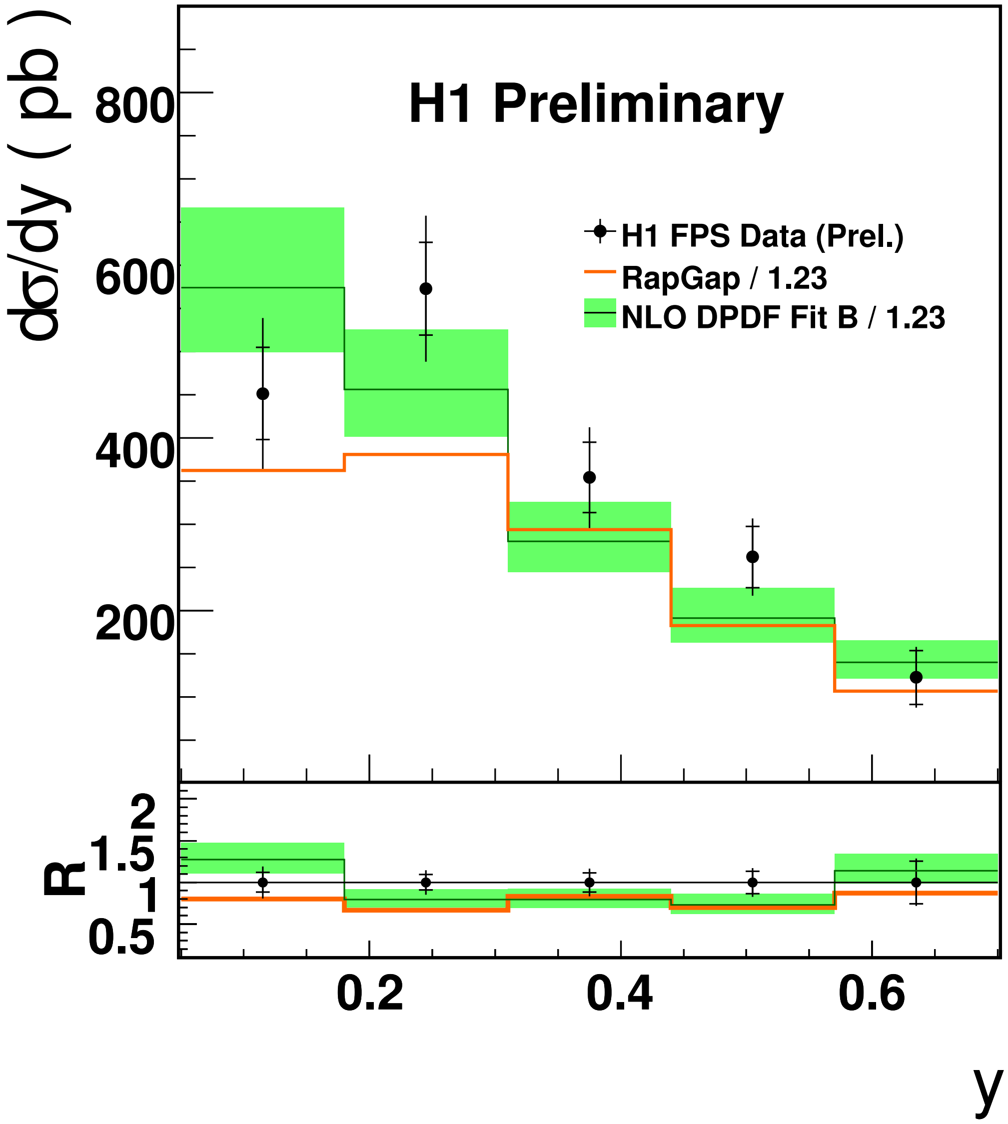

Figure 5: Ddifferential cross section as a function of y. The data are presented with the statistical error in the inner error bar and with the combined statistical and uncorrelated systematical error in the outer bar. The normalization uncertainty is approximately '5%' and it is not displayed. The comparison to Monte Carlo RapGap generator generator level cross section is presented as a red line. The NLO H1 2006 DPDF Fit B prediction corrected to the level of stable hadrons is presented in the green bar, the combined scale uncertainty and hadronization uncertainty is shown. The NLO prediction agrees with the data within the total error. The discrepancy observed in the first bin might be related to the missing pomeron remnant in the NLO calculation.

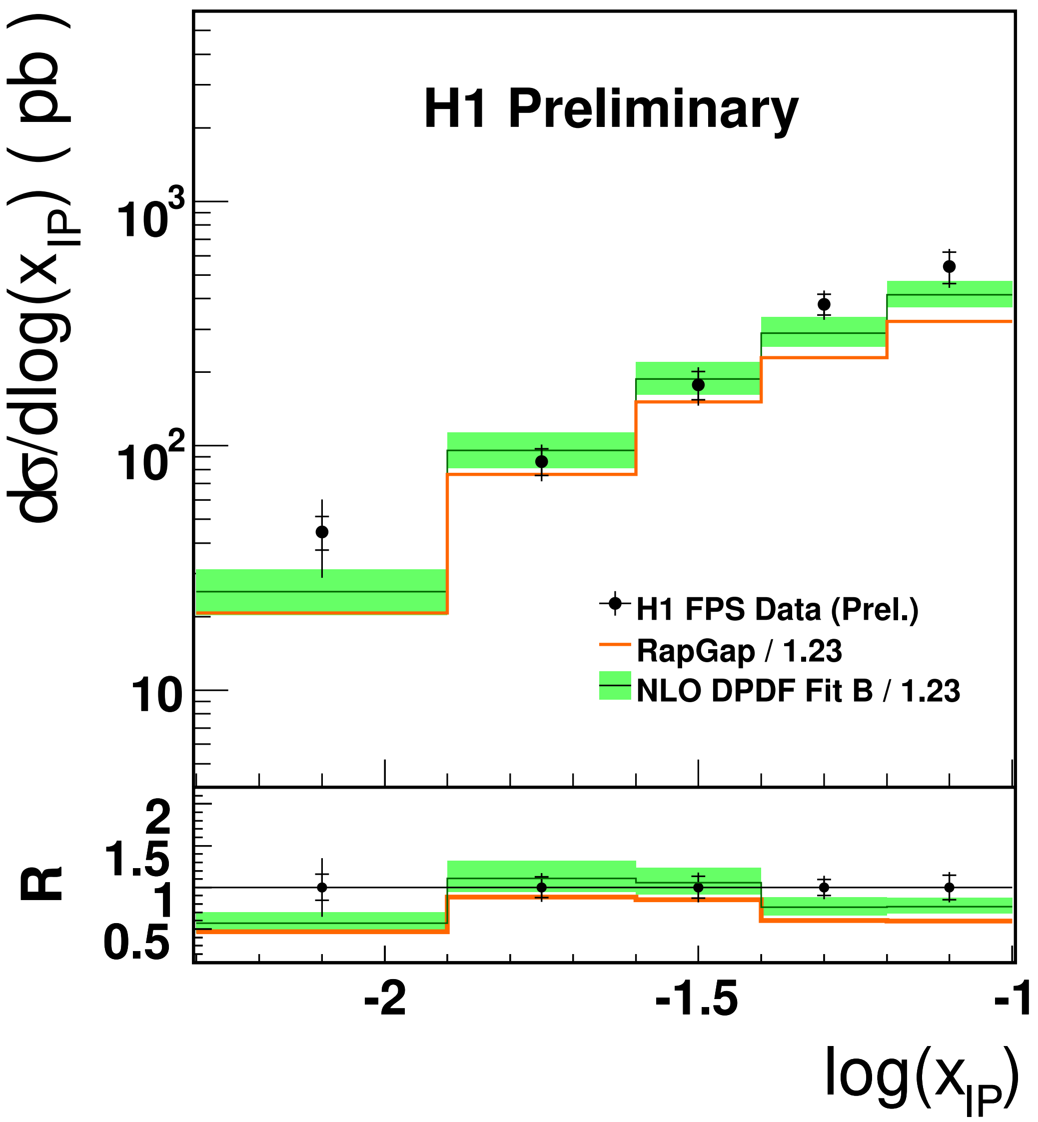

Figure 6: Differential cross section as a function of $log(x_{IP})$. The data are presented with the statistical error in the inner error bar and with the combined statistical and uncorrelated systematical error in the outer bar. The normalization uncertainty is approximately '5%' and it is not displayed. The comparison to Monte Carlo RapGap generator generator level cross section is presented as a red line. The NLO H1 2006 DPDF Fit B prediction corrected to the level of stable hadrons is presented in the green bar, the combined scale uncertainty and hadronization uncertainty is shown. The NLO prediction agrees with the data and the assumed Regge factorization is confirmed within the total error.

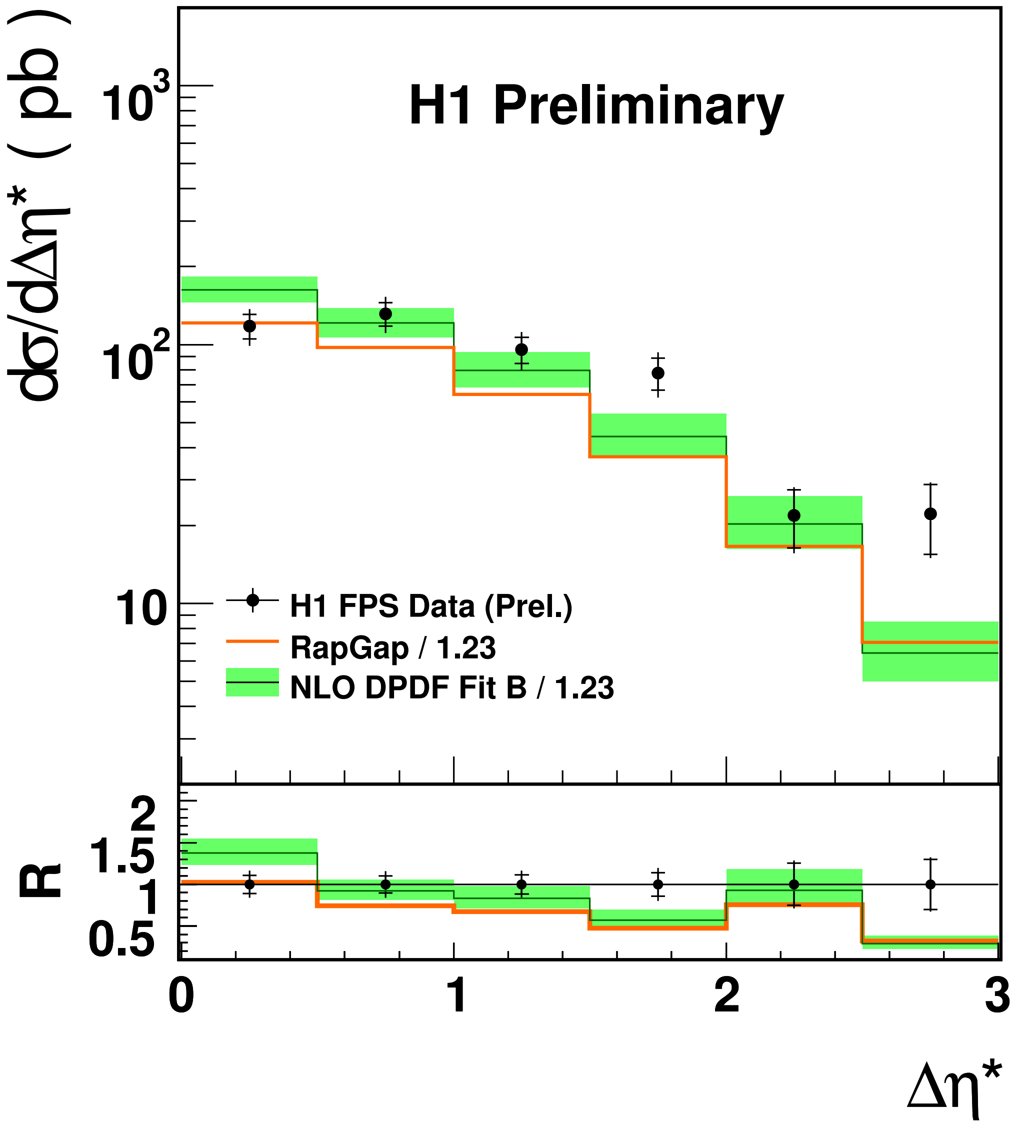

Figure 7: Differential cross section as a function of the absolute value of the difference of η of the two jets in the hadronic centre-of-mass system. The data are presented with the statistical error in the inner error bar and with the combined statistical and uncorrelated systematical error in the outer bar. The normalization uncertainty is approximately '5%' and it is not displayed. The comparison to Monte Carlo RapGap generator generator level cross section is presented as a red line. The NLO H1 2006 DPDF Fit B prediction corrected to the level of stable hadrons is presented in the green bar, the combined scale uncertainty and hadronization uncertainty is shown. The NLO prediction agrees with the data within the total error. The topology in the very last bin referrs to the configuration of two jets with very large rapidity gap. The discrepancy beyond the total error may hint to a different parton dynamics than the DGLAP evolution equations provide.