# Three-Jet Production in Deep-Inelastic Scattering at HERA

## H1 Collaboration — preliminary results for DIS 2001

Figure 1: A sketch of the angles $\theta_3$ and $\psi_3$ which are defined by the momenta $\vec{p}_3$, $\vec{p}_4$, $\vec{p}_5$ of the three jets and the proton beam ($\vec{p}_B$) in the three-jet center of mass frame.

Figure 2: The inclusive three-jet cross section (a) measured as a function of the four-momentum transfer squared $Q^2$. The predictions of perturbative QCD in leading order (dotted line) and in next-to-leading order with (solid line) and without hadronization corrections (dashed line) are compared to the data. Also shown is the ratio of the measured cross section and the theoretical prediction, including the effects from variations of $\alpha_s(M_Z)$, the renormalization scale $\mu_r$ and the gluon density in the proton. The ratio $R_{3/2}$ of the inclusive three-jet cross section to the inclusive dijet cross section (b) is compared to the next-to-leading order calculation including hadronization corrections (dotted line). The sensitivity of the calculation to parameter variations is indicated as in (a).

Figure 3: The inclusive three-jet cross section measured as a function of (a) the Bjorken scaling variable $x_{\mathrm{Bj}}$ and (b) the invariant three-jet mass $M_{3\mathrm{jet}}$. The predictions of perturbative QCD in leading order (dotted line) and next-to-leading order (solid line) with hadronization corrections are compared to the data.

Figure 4: The distributions of the jet energy fractions $X_3$ (top) and $X_4$ (bottom) in the three-jet center-of-mass frame at low $Q^2$ (left) and high $Q^2$ (right). The data are compared to the predictions of perturbative QCD in next-to-leading order (solid line) and to a three-jet phase space model (dotted line).

Figure 5: Distributions of $\cos\theta_3$ (top) and the angle $\psi_3$ (bottom) in the three-jet center-of-mass frame at low $Q^2$ (left) and high $Q^2$ (right). The data are compared to the predictions of perturbative QCD in next-to-leading order (solid line) and to a three-jet phase space model (dotted line).