non-perturbative effects determined using the PYTHIA event generator. The data and QCD predictions are in reasonable agreement for the $|y| < 0.4$ region which is not surprising as the MSTW2008 global fit includes the inclusive jet data (see Section V C). For higher $|y|$ bins, the data are below the theoretical predictions but within $1\,\sigma$ of the total experimental systematic uncertainty. The DØ collaboration is searching for new particles using these data.

B. Dijet angular distributions

The angle between the initial and final state partons in the center of momentum frame is sensitive to the spin of the exchanged or the intermediate particle and thus can be used to search for physics beyond the Standard Model. At hadron colliders, dijet production is dominated by the t channel exchange of a gluon, a massless vector boson, and the angular distribution has the familiar Rutherford scattering form

$$\frac{d\hat{\sigma}}{d\cos\theta^*} \sim \frac{1}{(1-cos\theta^*)^2} = \frac{1}{\sin^4(\theta^*/2)} \tag{11}$$

where θ^* is the angle between the jet and the beam direction in the dijet center of momentum frame. The angular distribution of the new particles proposed in many new physics scenarios is relatively flat in $\cos\theta^*$. For example, the angular distribution of spin 1 particles (W', Z', Axigluon, coloron) decaying in fermions is $d\sigma/d\cos\theta^* \sim 1+cos^2\theta^*$. Theories in which quarks are composite particles but with the compositeness scale much higher than the available energy, can be parametrized by an effective Lagrangian of the type [62, 73, 74],

$$\mathcal{L} = \eta\frac{g^2}{4\Lambda^2}(\bar{q}_i\gamma^\mu q_i)(\bar{q}_j\gamma_\mu q_j) \qquad i = L, R,\ j = L, R$$

where Λ is a parameter in the theory which controls the characteristic energy of the new interactions. The parameter η is ± 1 and determines the sign of interference between new interactions and the SM interactions. The main effect of substructure is to increase the proportion of centrally produced jets, which can be observed in the jet angular distributions [73].

The ADD LED models [75, 76], proposed to solve the hierarchy problem, i.e. the difference between electroweak scale ($\sim$ 100 GeV) and the Plank scale M_{Pl} ($\sim 10^{19}$ GeV), assume the existence of extra spatial dimensions in which gravity is allowed to propagate. As a