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RESULTS ON DIJETS WITH A CENTRAL RAPIDITY GAP FROM CDF

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FOR THE CDF COLLABORATION

Results on dijets with a central rapidity gap at $\sqrt{s} = 1800$GeV are briefly summarized. Preliminary new results from data at $\sqrt{s} = 630$GeV are presented and compared to those at $\sqrt{s} = 1800$GeV.

1 Introduction

Dijet events with a central rapidity gap in between the jets are assumed to be due to the exchange of a strongly interacting color singlet(CSE). The main background to these events will come from color-octet exchanges with fluctuations to low multiplicities. Therefore the dijet events with a central rapidity gap, where the jets are on opposite sides in pseudo-rapidity (OS, $\eta_1 \cdot \eta_2 < 0$) are compared to events with dijets in which both jets are on the same side (SS, $\eta_1 \cdot \eta_2 > 0$).

The components of the CDF detector [1] relevant for the rapidity gap requirement are the central tracker ($|\eta| < 1.8$, $p_T^{track} > 300$MeV) and the central calorimeter ($|\eta| < 1.1$, $E_T^{tower} > 200$MeV [300MeV corrected]).

2 Dijets with a Central Rapidity Gap at $\sqrt{s} = 1800$GeV

At $\sqrt{s} = 1800$GeV dijet events with $E_T^{jet} > 20$GeV were selected and figure 1 shows on the left side the multiplicity distributions in the tracker and in the calorimeter for OS and SS dijet events. The excess seen for low multiplicities in the OS sample is attributed to CSE. From the tracking distribution a fraction of the colorless exchange to all OS dijet events of $R_{JGJ}(1800) = 1.13 \pm 0.12(stat.) \pm 0.11(syst.)\% = (1.13 \pm 0.16)\%$ has been measured [3], which is in agreement with the previous CDF publication [2]. The right side of figure 1 shows distributions for the OS dijet events with 0 tracks and 0-2 towers in the detector region of $|\eta| < 1.0$. The background in this sample is estimated to be about 15% . To gain safe conclusions on the kinematic properties of the dijets with a central rapidity gap, the fractions of the events from the signal

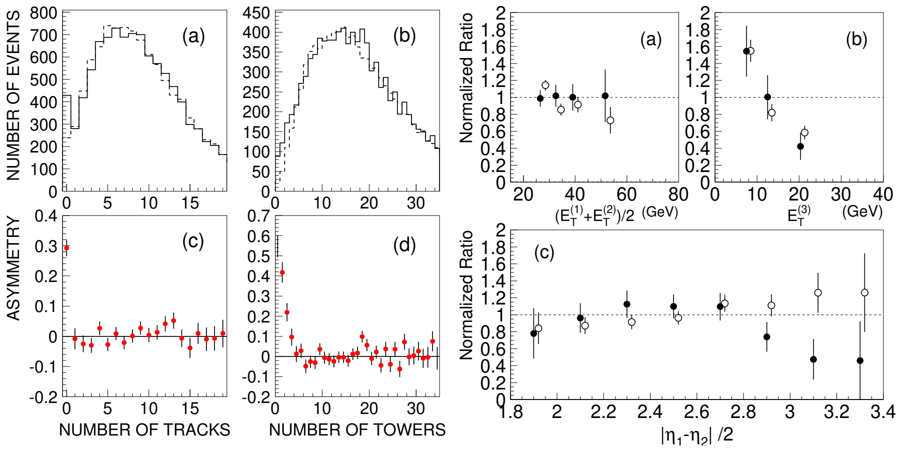

Figure 1: Left picture: Multiplicity distributions (a) for tracks and (b) for calorimeter towers in the regions $|\eta| < 1.0$ for OS (solid lines) and $|\eta| < 1.2$ of SS dijet events (dashed lines); (c,d) the asymmetry (bin-by-bin difference over sum) of the distributions shown in (a) and (b). Right picture: Normalized (to be unity on average) ratios of gap (solid points) and control samples (open circles) over all events versus: (a) the average E_T of the two leading jets, (b) the E_T of the third jet, and (c) half the η separation between the two leading jets.

region were compared to the fractions of the events from a control sample: those OS dijet events with a low multiplicity between the jets (1-3 tracks, up to 6 towers). From the right side of figure 1 a similar behavior of the signal and control events is derived. Within the (statistical) errors the fraction of the colorless exchange is independent of the jet E_T and the separation in η. The indication of a decrease at higher $\Delta\eta$ might be due to phase-space limitations.

3 Dijets with a Central Rapidity Gap at $\sqrt{s} = 630$GeV

A similar analysis as for the dijets at $\sqrt{s} = 1800$GeV was performed with the data at $\sqrt{s} = 630$GeV. For the same range in η the jet E_T was chosen to be $E_T > 8$GeV, so that at both center of mass energies similar x-values of the partons are probed. The multiplicities and asymmetries are shown in figure 2 on the left side. A fraction of: $R_{JGJ}(630) = 2.3 \pm 0.9(stat.) \pm 0.3(syst.)\% = (2.3 \pm 0.10)\%$ has been evaluated. For this lower center of mass energy the estimated background amounts to about 45% . Again the fractions of events from the signal region are compared to those from a control sample defined in the same way: both show a similar behavior. As at $\sqrt{s} = 1800$GeV, in this data set the fraction of the colorless exchange is independent of the jet average

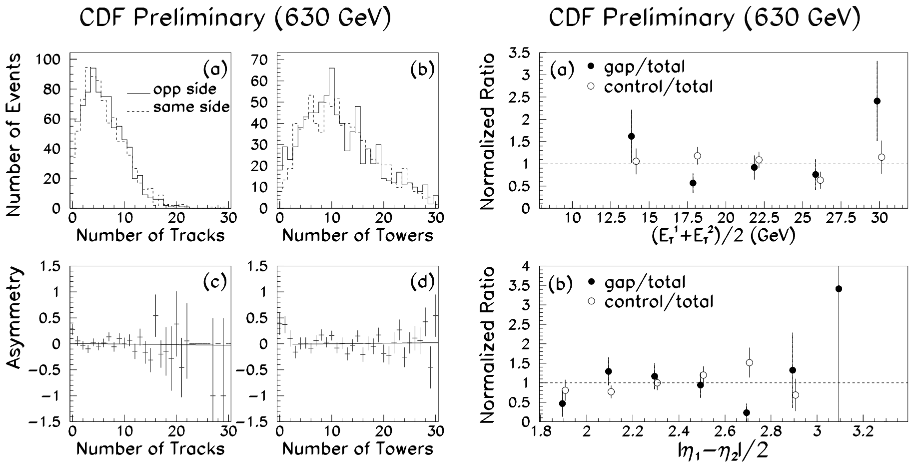

Figure 2: Left picture: Multiplicity distributions (a) for tracks and (b) for calorimeter towers in the regions $|\eta| < 0.9$ for OS (solid lines) and $|\eta| < 1.05$ (1.2) for tracks (towers) of SS dijet events (dashed lines); (c,d) the asymmetry (bin-by-bin diff. over sum) of the distributions shown in (a) and (b). Right picture: Normalized (to be unity on average) ratios of gap (solid points) and control sample events (open circles) over all events versus: (a) the average E_T of the two leading jets; (b) half the η separation between the two leading jets.

E_T and the separation in η.

4 Comparison of the Dijets at $\sqrt{s} = 1800$GeV to $\sqrt{s} = 630$GeV

The ratio of the fractions for the measurements at the two center of mass energies is evaluated to be: $R(\frac{630}{1800}) = 2.0 \pm 0.9$.

Assuming that the background events in the signal region have a similar dependence on $(E_T^1 + E_T^2)/2$ and $|\eta_1 - \eta_2|/2$ as those events from the control sample, the distributions of the latter were scaled to the estimated amount of background of 15(45)% for $\sqrt{s} = 1800(630)$GeV and statistically subtracted from the distributions of the signal events. Now the samples for the two center of mass energies can be compared in terms of the two variables of the scattered partons: x_i ($\approx (E_T^i \cdot e^{|\eta|})/\sqrt{s}$ for the OS kinematics) and x_T ($= E_T^i/2\sqrt{s}$). Both distributions, shown in figure 3, are consistent with being flat within the range of this measurement.

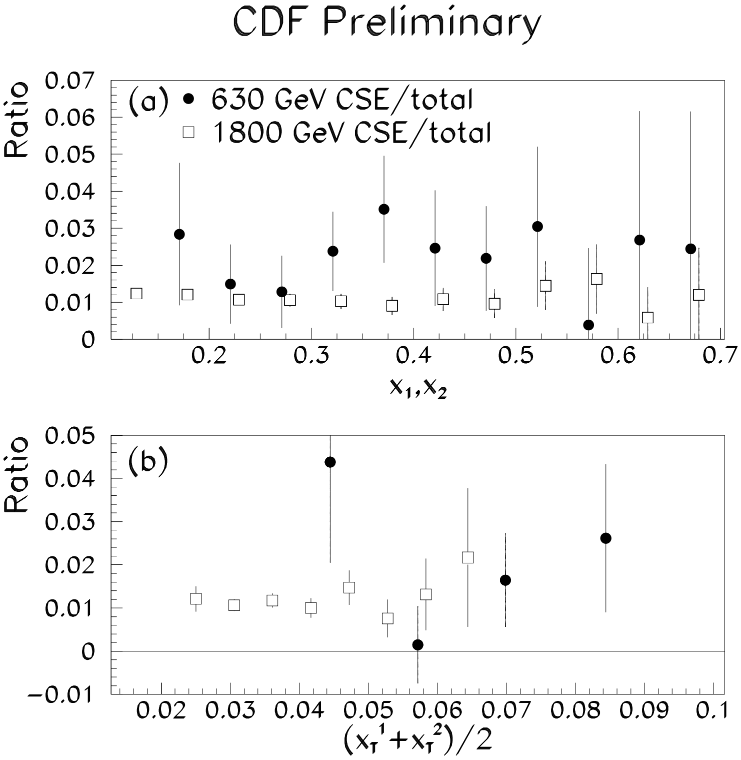

Figure 3: Comparison of distributions of the ratio of CSE events to all events for $\sqrt{s}$=630 and 1800 GeV: (a) x of the two leading jets (two entries per event); (b) x_T of the two leading jets. The overall normalization has been scaled to correspond to the value of the average ratio R measured using the track multiplicities.

Acknowledgments

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References

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2. F. Abe *et al*, *Phys. Rev. Lett.* **74**, 855 (1995).
3. F. Abe *et al*, *Phys. Rev. Lett.* **80**, 1156 (1998).