



Contribution ID: 213

Type: **Parallel contribution**

## Azimuthal decorrelations and multiple parton interactions in

$\gamma + 2$  jet and  
 $\gamma + 3$  jet events in  
 collisions at  
 $\sqrt{s} = 1.96$  TeV

*Friday, 12 August 2011 08:00 (20 minutes)*

Samples of inclusive  $\gamma + 2$  jet and  $\gamma + 3$  jet events collected by the D0 experiment with an integrated luminosity of about  $1 \text{ fb}^{-1}$  in  $p\bar{p}$  collisions at  $\sqrt{s} = 1.96$  TeV are used to measure cross sections as a function of the angle in the plane transverse to the beam direction between the transverse momentum ( $p_T$ ) of the  $\gamma$ +leading jet system (jets are ordered in  $p_T$ ) and  $p_T$  of the other jet for  $\gamma + 2$  jet, or  $p_T$  sum of the two other jets for  $\gamma + 3$  jet events. The results are compared to different models of multiple parton interactions (MPI) in the `{sc pythia}` and `{sc sherpa}` Monte Carlo (MC) generators. The data indicate a contribution from events with double parton (DP) interactions and are well described by predictions provided by the `{sc pythia}` MPI models with  $p_T$ -ordered showers and by `{sc sherpa}` with the default MPI model. The  $\gamma + 2$  jet data are also used to determine the fraction of events with DP interactions as a function of the azimuthal angle and as a function of the second jet  $p_T$ .

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**Session Classification:** Perturbative and non-Perturbative QCD

**Track Classification:** Perturbative and non-Perturbative QCD