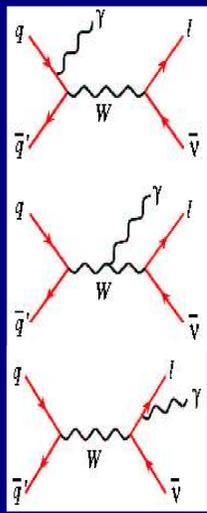


## W GAMMA PRODUCTION

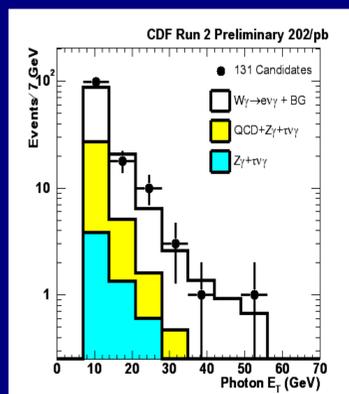
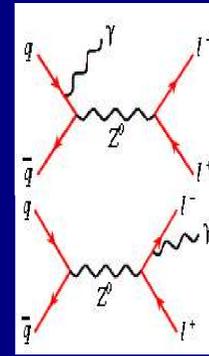


ASSOCIATED  $W\gamma$  AND  $Z\gamma$  PRODUCTION IS AN IMPORTANT TEST OF THE NON-ABELIAN NATURE OF THE STANDARD MODEL AS IT IS SENSITIVE TO TRIPLE-GAUGE BOSON INTERACTIONS.

THESE MEASUREMENTS WERE PREVIOUSLY STATISTICS LIMITED, BUT THE IMPRESSIVE PERFORMANCE OF THE TEVATRON IN RUN II HAS ENABLED SM PREDICTIONS FOR  $W\gamma$  AND  $Z\gamma$  PRODUCTION TO BE MORE VIGOROUSLY TESTED THAN EVER BEFORE.

THE CROSS-SECTIONS FOR THESE PROCESSES, WHICH ARE OF THE SAME ORDER AS  $tt$ , HAVE BEEN MEASURED TO A NEW DEGREE OF ACCURACY.

## Z GAMMA PRODUCTION



$$\sigma(W\gamma) \times \text{BR}(W \rightarrow l\nu) = 19.2 \pm 1.7_{\text{STAT}} \pm 2.0_{\text{SYST}} \pm 1.1_{\text{LUM}} \text{ pb}$$

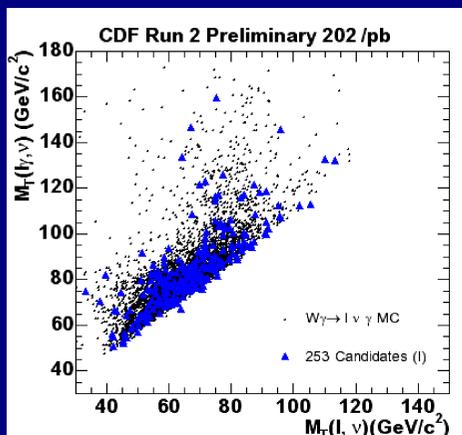
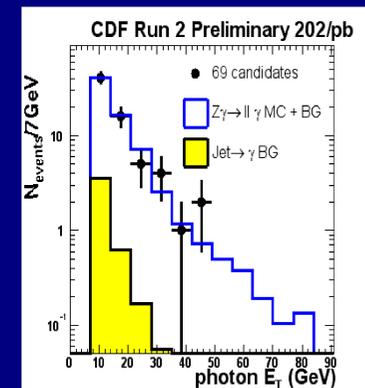
\* For  $E_T(\text{photon}) > 7 \text{ GeV}$  and  $\Delta R(l, \gamma) > 0.7$  :  
 $\sigma(W\gamma) \times \text{BR}(W \rightarrow l\nu)$  (Theory) =  $19.3 \pm 1.4 \text{ pb}$

PHOTON  $E_T$  SPECTRUM FOR  $W$  GAMMA EVENTS. DATA IS DISPLAYED ALONGSIDE SIGNAL + BKGD SIMULATION PREDICTIONS.

$$\sigma(Z\gamma) \times \text{BR}(Z \rightarrow l^+l^-) = 5.3 \pm 0.6_{\text{STAT}} \pm 0.3_{\text{SYST}} \pm 0.3_{\text{LUM}} \text{ pb}$$

\* For  $E_T(\text{photon}) > 7 \text{ GeV}$  and  $\Delta R(l, \gamma) > 0.7$  :  
 $\sigma(Z\gamma) \times \text{BR}(Z \rightarrow l^+l^-)$  (Theory) =  $5.4 \pm 0.3 \text{ pb}$

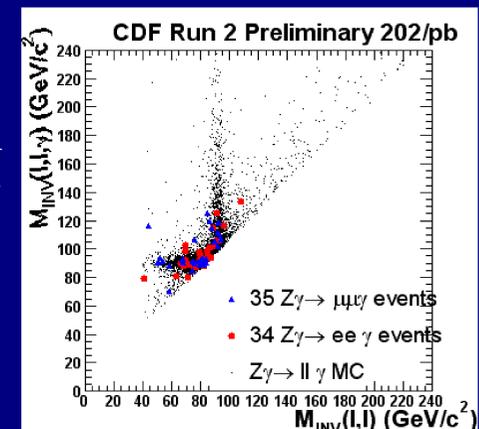
PHOTON  $E_T$  SPECTRUM FOR  $Z$  GAMMA EVENTS



X-AXIS IS THE TRANSVERSE MASS OF THE LEPTON AND NEUTRINO FROM  $W$  DECAY. THE Y-AXIS IS THE TRANSVERSE MASS OF THE (LEPTON+PHOTON) SYSTEM TOGETHER WITH THE NEUTRINO FROM  $W$  DECAY.



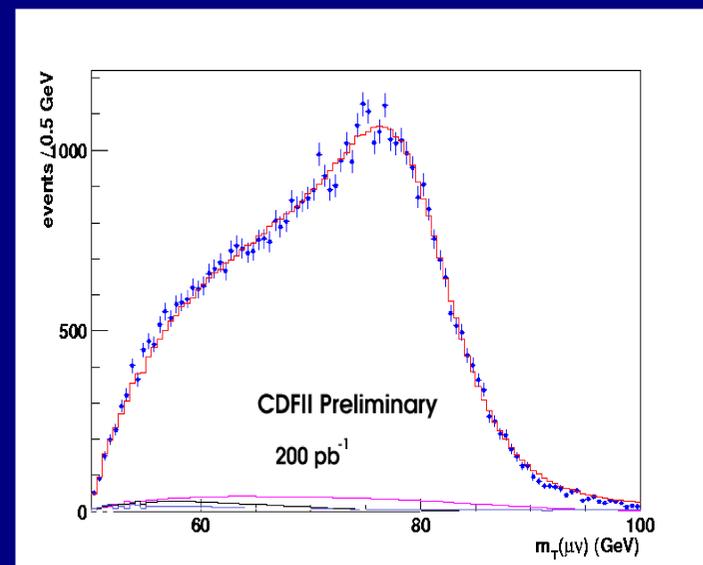
X-AXIS IS INVARIANT MASS OF THE LEPTONS FROM  $Z$  DECAY. THE Y-AXIS IS THE INVARIANT MASS OF THE  $Z$  DECAY PRODUCTS TOGETHER WITH THE PHOTON.



## W MASS MEASUREMENT

JUST AS PRECISE EWK MEASUREMENTS GAVE INDIRECT EVIDENCE FOR A TOP MASS NEAR 175 GEV BEFORE THE TOP WAS DISCOVERED HERE AT THE TEVATRON, PRECISE MEASUREMENT OF THE  $W$  MASS WILL EITHER GIVE SOME INDICATION OF THE HIGGS MASS OR A SIGNAL FOR NEW PHYSICS. IT IS ALSO A DIRECT AND STRINGENT TEST OF THE STANDARD MODEL.

THE RESTRICTED RAPIDITY COVERAGE OF A HADRON COLLIDER MEANS THAT THE  $W$  MASS HAS TO BE INFERRED FROM ITS TRANSVERSE COMPONENT. THIS IS EFFECTIVELY ACHIEVED BY DELICATELY FITTING  $W$  MONTE CARLO SAMPLES OF VARYING MASSES TO THE DATA AS SHOWN IN THE PLOT OPPOSITE. HOWEVER, TO ACHIEVE THE DESIRED RESOLUTION THIS FIT HAS TO BE VERY EXACT, AND THIS CAN ONLY BE ACHIEVED WITH A LARGE VOLUME OF DATA. CURRENTLY THIS MEASUREMENT IS STATISTICS LIMITED, BUT WITH  $2 \text{ fb}^{-1}$  CDF ALONE WILL ACHIEVE RESOLUTION OF  $\Delta M_W = 40 \text{ MeV}$ . THIS WILL BE SIMILAR TO ALL CURRENT DIRECT MEASUREMENT DATA COMBINED.



$W(\mu\nu)$  TRANSVERSE MASS PLOT. DATA IN BLUE AND SIGNAL + BKGD MC IN RED. NOTE THAT CURRENTLY WE ARE PLOTTING IN BINS OF 500MEV, SOME TEN TIMES LARGER THAN THE DESIRED  $W$  RESOLUTION.