

# Trilepton Analysis: The $WH$ and $ZH$ Signals and Backgrounds

1<sup>st</sup> Look at Possible Discriminating Variables

Jason Nett

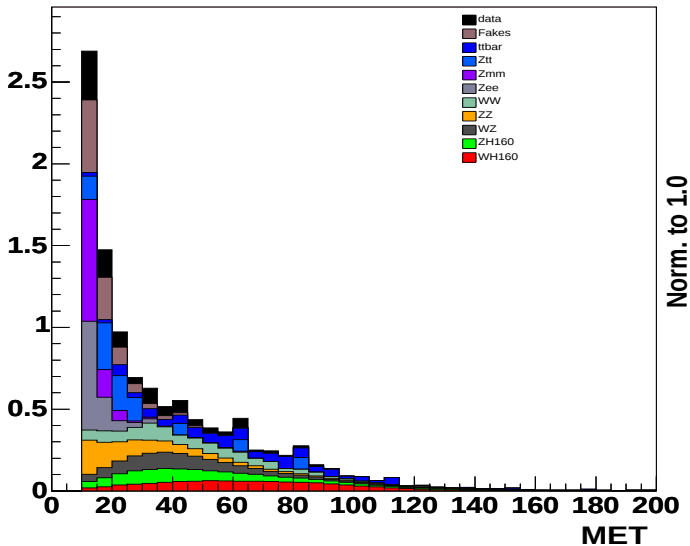
University of Wisconsin - Madison

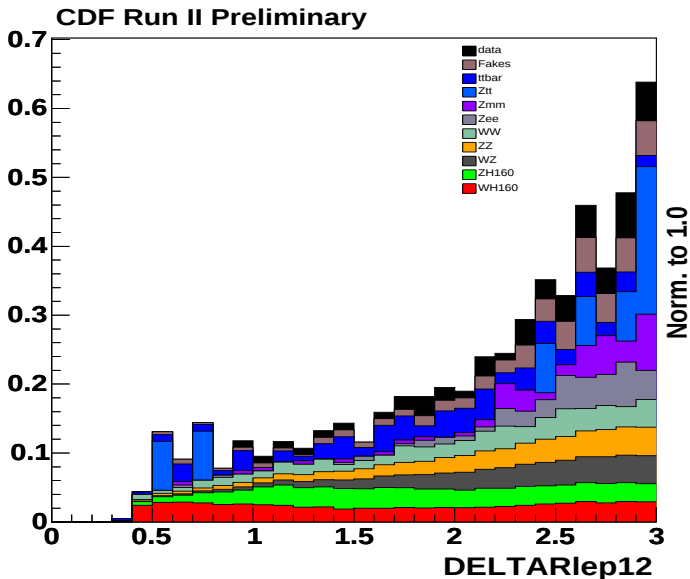
Collider Detector at Fermilab

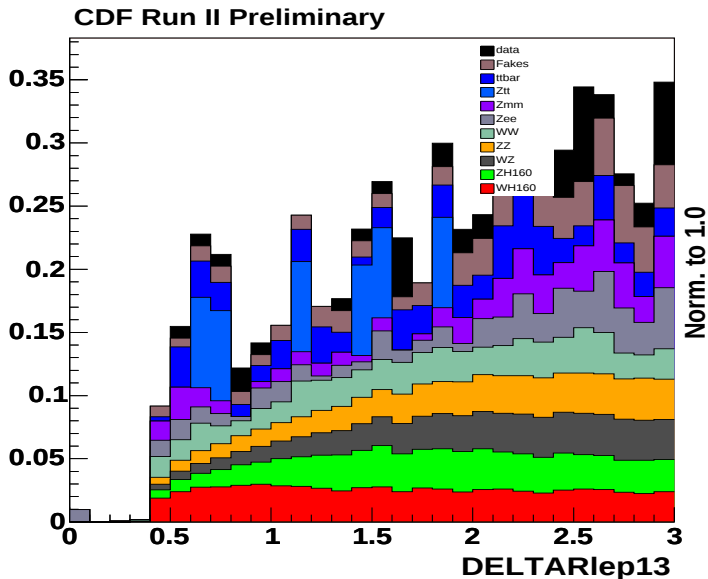
14 September 2009

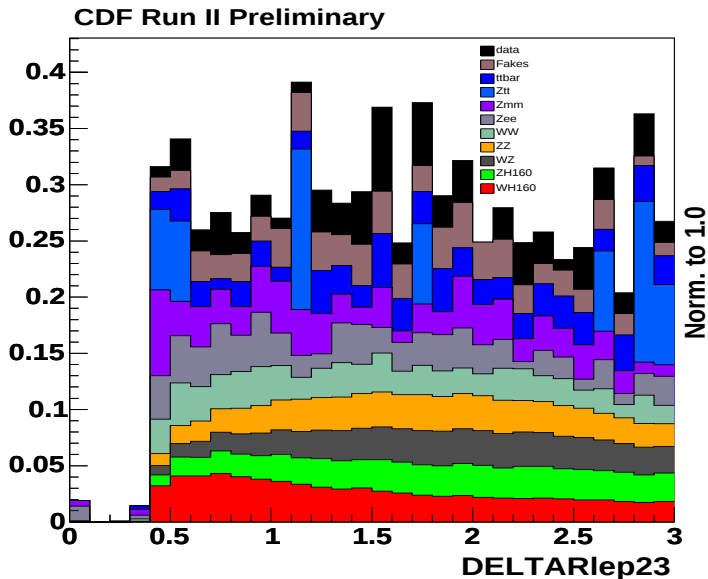
- 1st, 2nd, 3rd lepton  $p_T$
- 1st, 2nd, 3rd lepton  $\eta$
- 1st, 2nd, 3rd lepton  $\phi$
- $\cancel{E}_T$
- Dimass12, Dimass13, Dimass23
- $\Delta R$  lepton12,  $\Delta R$  lepton13,  $\Delta R$  lepton23
- $\Delta\phi(\text{lep1}, \cancel{E}_T)$ ,  $\Delta\phi(\text{lep2}, \cancel{E}_T)$ ,  $\Delta\phi(\text{lep3}, \cancel{E}_T)$

## CDF Run II Preliminary

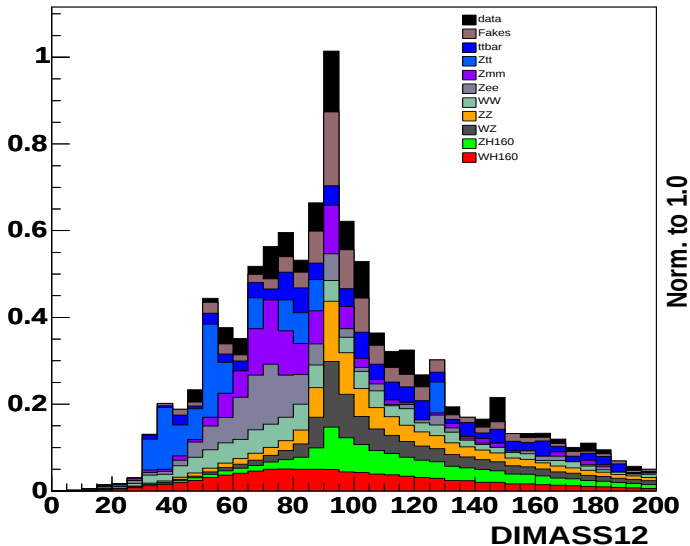




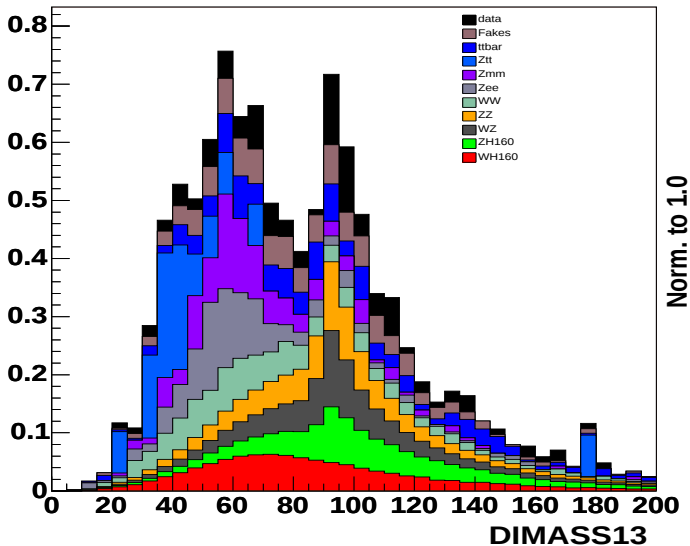




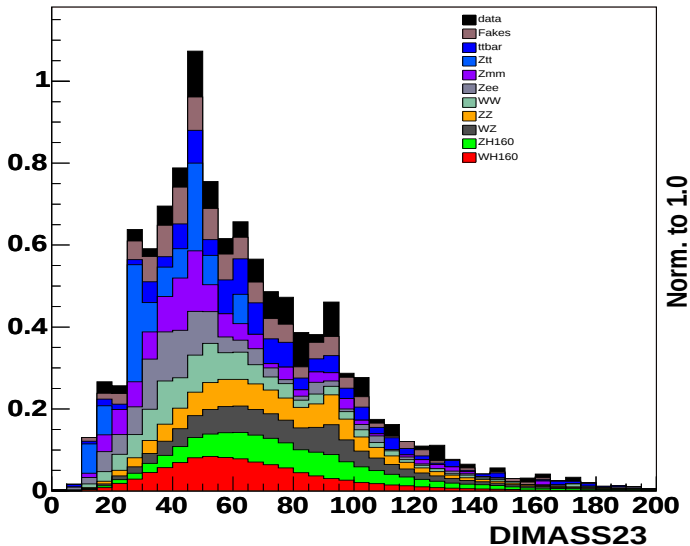
## CDF Run II Preliminary

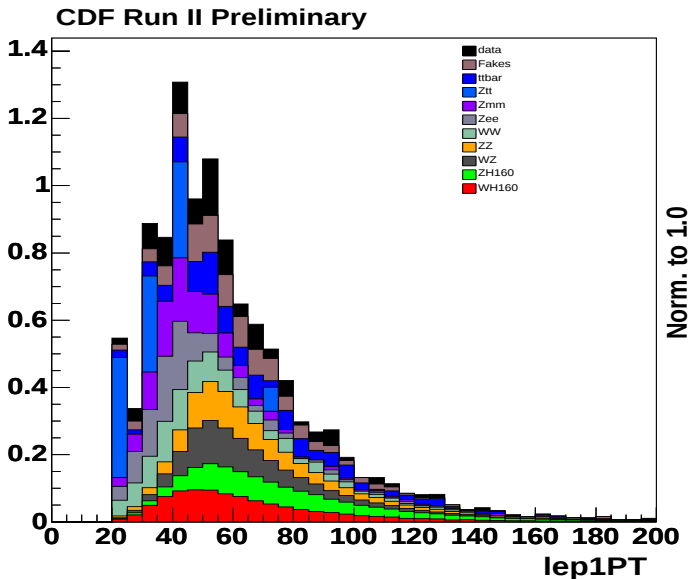


## CDF Run II Preliminary

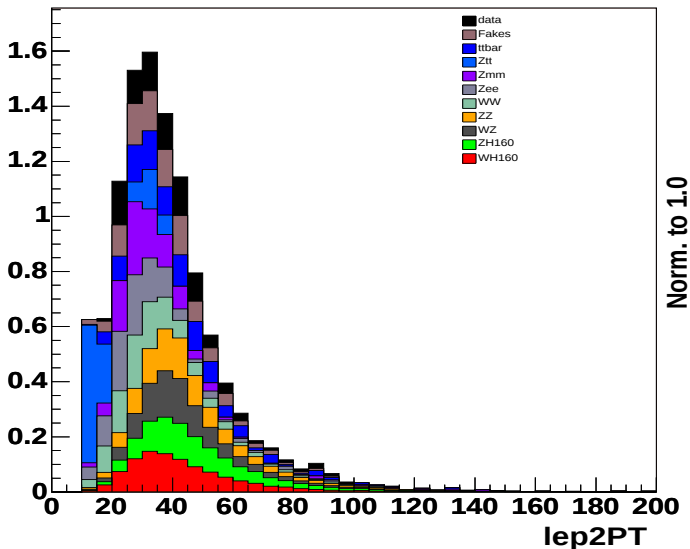


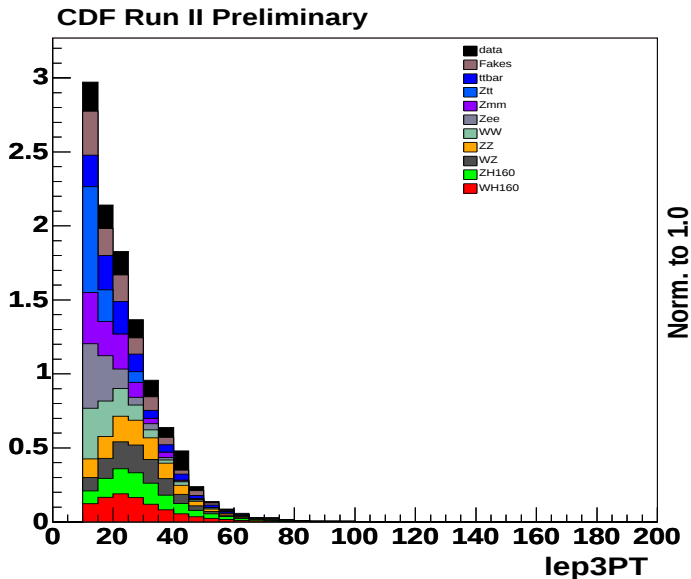
## CDF Run II Preliminary



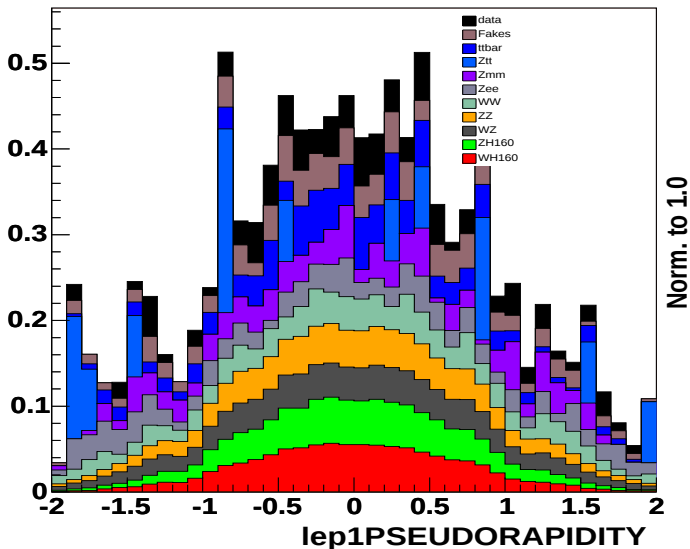


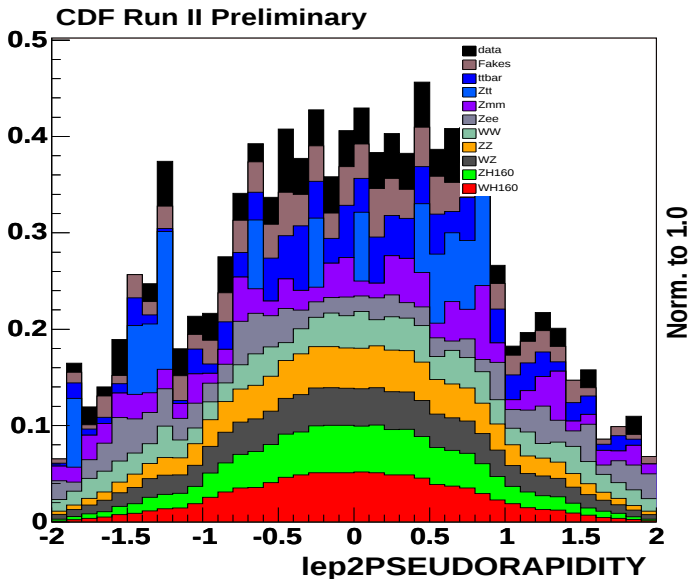
## CDF Run II Preliminary

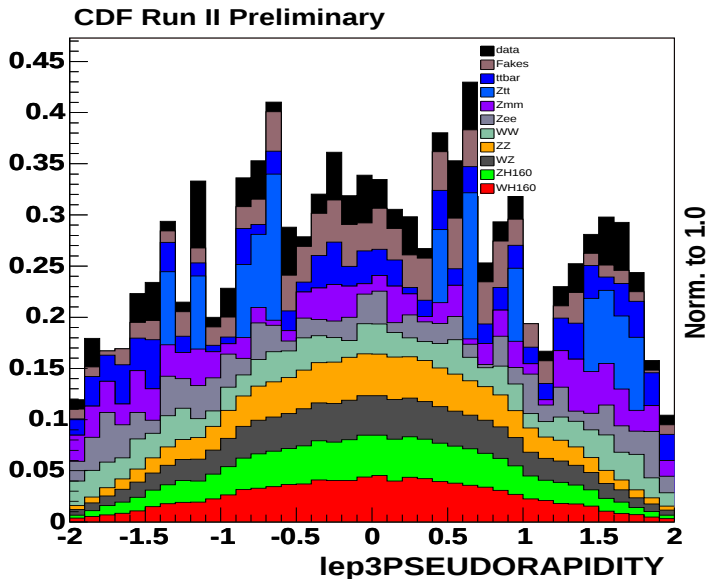




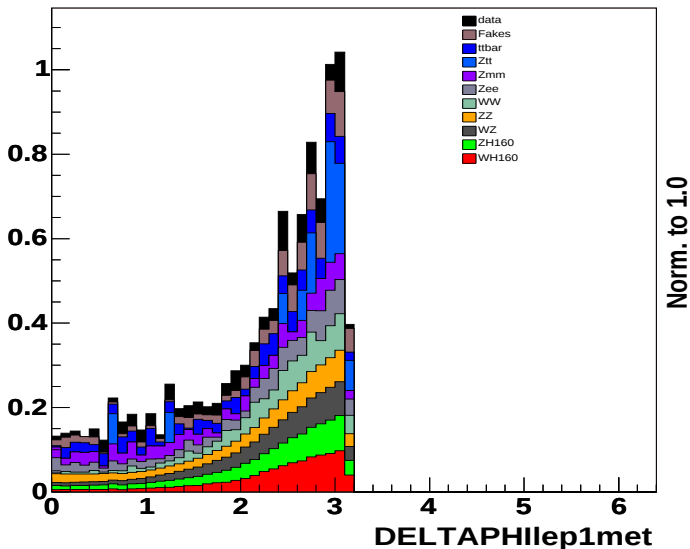
## CDF Run II Preliminary



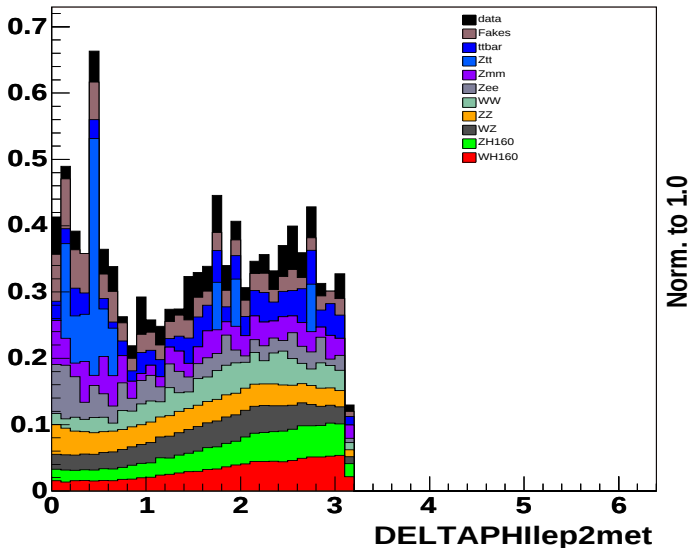


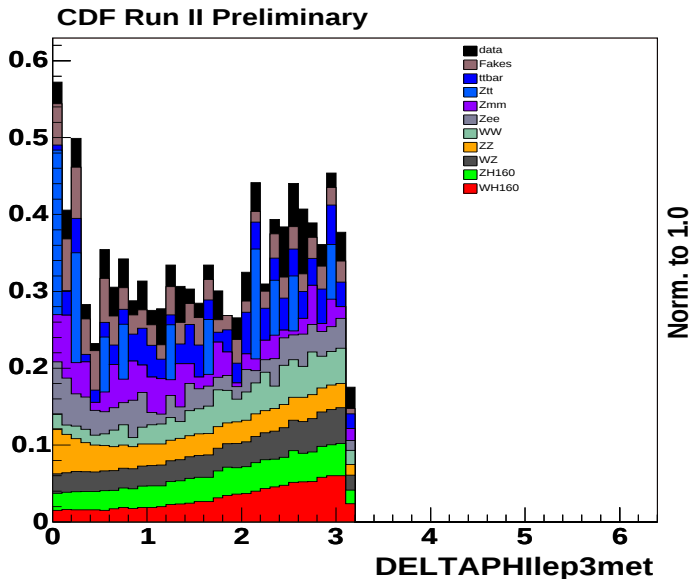


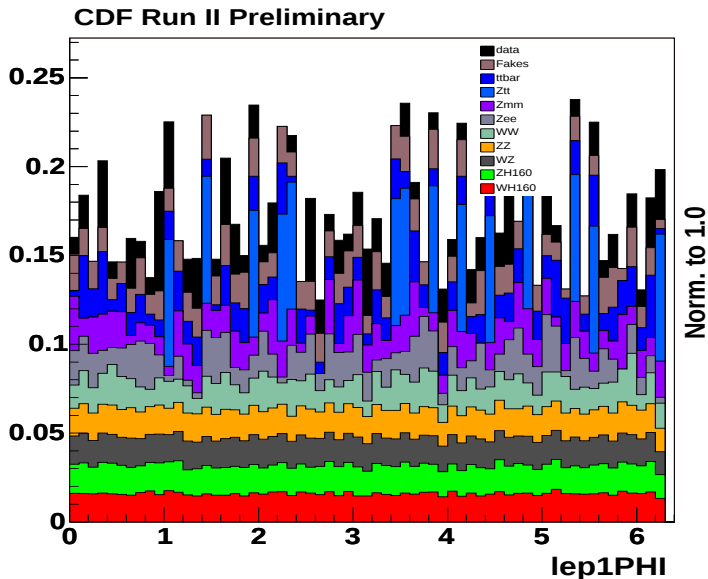
## CDF Run II Preliminary

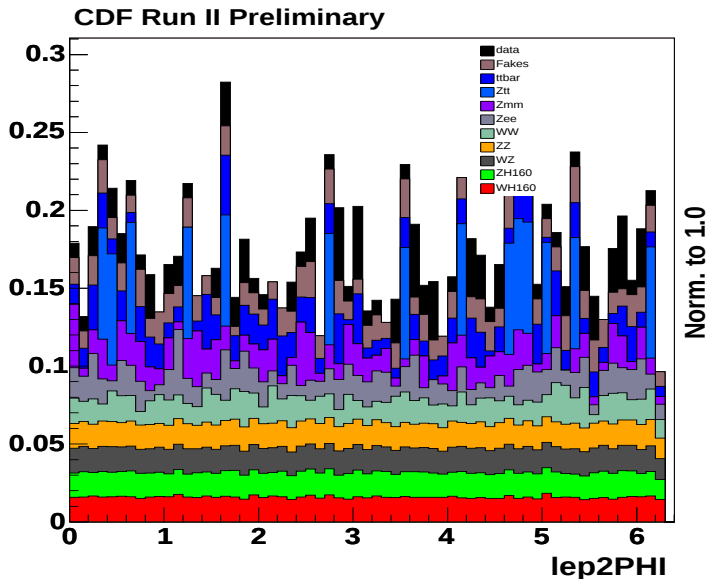


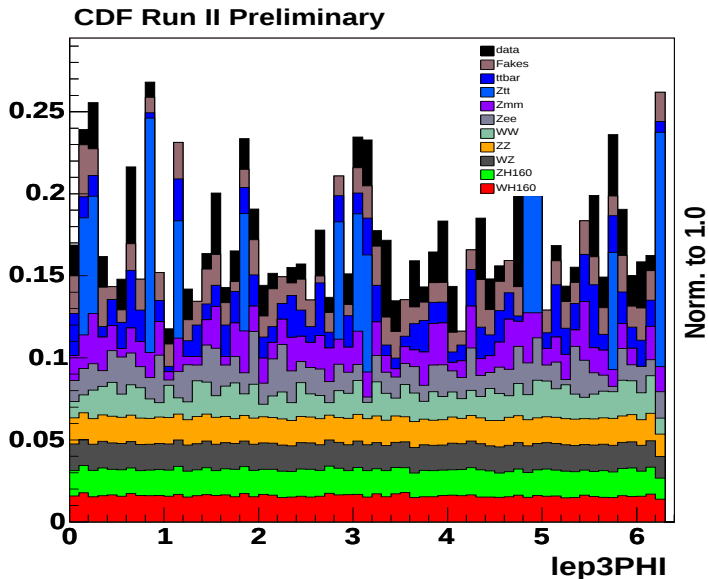
## CDF Run II Preliminary











# Preliminary Conclusions/Next Steps

- $\cancel{E}_T$  should be a strong discriminant for  $WH$  and good for  $ZH$ , except  $ZH$  and  $WZ$  (the most prominent background) look similar. The next most prominent backgrounds are  $ZZ$  and  $V$ +Jets which have much lower  $\cancel{E}_T$ .
- The Dimass values also look promising for  $WH$ , but I have yet to try after removing the  $Z$ -peak or looking only at the  $Z$ -peak.
- To a lesser extent, lead lepton  $p_T$  peaks relatively lower for  $WH$ .
- I have yet to check for angles with jets—important for  $ZH$  which is strong in the  $N_{\text{Jet}} \geq 2$  bin.
- I have yet to check the  $N_{\text{Lep}}$  and  $N_{\text{Jet}}$  bins themselves here.