

During the calculation of the final  $A_L^W$  a number of other signals need to be subtracted or corrected for. In the signal region, the near side region, we have the following  $A_L^{sig}$  (where the calculation should be done separately for each charge sign)

$$A_L^{sig} = f_{W \rightarrow \tau} A_L^{W \rightarrow \tau} + f_{Endcap} A_L^{Endcap} + f_Z A_L^Z + f_{QCD} A_L^{QCD} + f_W A_L^W \quad (1)$$

$$= (f_{W \rightarrow \tau} + f_W) A_L^W + f_{Endcap} A_L^{Endcap} + f_Z A_L^Z + f_{QCD} A_L^{QCD} \quad (2)$$

$$= (1 + f_{W \rightarrow \tau} - f_{Endcap} - f_Z - f_{QCD}) A_L^W + f_{Endcap} A_L^{Endcap} + f_Z A_L^Z + f_{QCD} A_L^{QCD} \quad (3)$$

And inverting, we have...

$$\rightarrow A_L^W = \frac{A_L^{sig} - f_{Endcap} A_L^{Endcap} - f_Z A_L^Z - f_{QCD} A_L^{QCD}}{1 + f_{W \rightarrow \tau} - f_{Endcap} - f_Z - f_{QCD}} \quad (4)$$

where we know both  $A_L^{sig}$  and  $A_L^{Endcap}$  from the data and we want to get  $A_L^W$ . All of the  $f_i$ s refer to the fraction of the signal that is due to the specific signal,  $i$ . In the determination of each  $f_i$ , the denominator is just the total number of signal counts from data and then the numerator for each one will be determined from different sources. The  $f_{W \rightarrow \tau}$  and  $f_Z$  will be determined from MC modulo a theory scale factor for the cross section differences between PYTHIA and pQCD, the  $f_{Endcap}$  and  $f_{QCD}$  are determined from data either by an absolute calculation or a fit and then lastly  $f_W$  is determined by the requirement that they all add up to 1.

We can get an estimate of  $A_L^{QCD}$  by using all the events that fail the signed pTbalance cut and then inverting the equation as follows

$$A_L^{QCDBack} = g_{QCD} A_L^{QCD} + g_Z A_L^Z \rightarrow A_L^{QCD} = \frac{A_L^{QCDBack} - g_Z A_L^Z}{g_{QCD}} \quad (5)$$

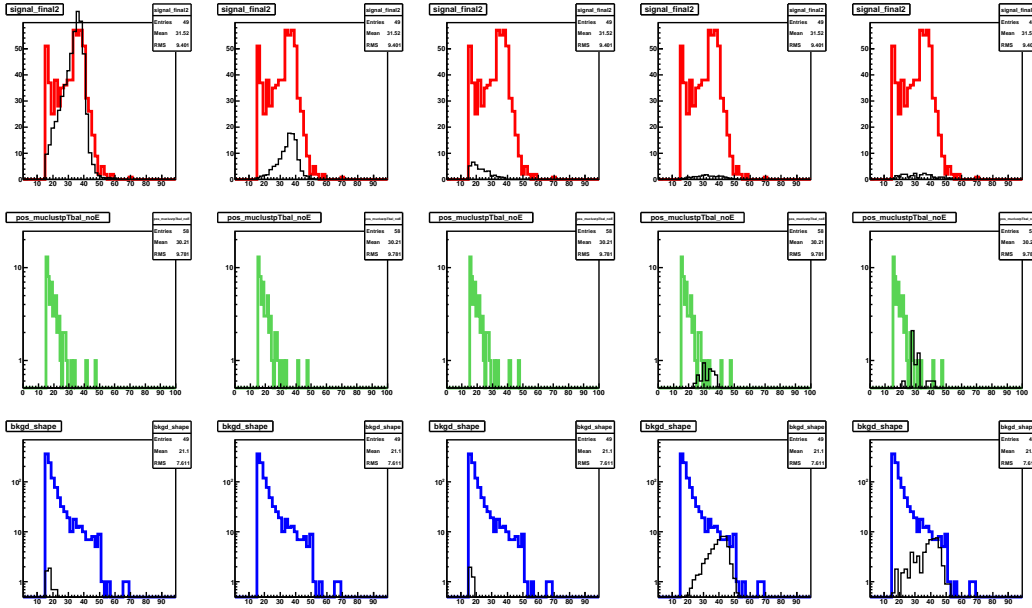


Figure 1: Signals and Backgrounds for positive charges. The top row is the signal region, the middle row is the missing endcap background and the bottom row is the reverse signed pT balance cut. The left column is the  $W^+$  MC, the 2nd column from the left is the  $W^-$  MC, the 3rd column from the left is the  $W^-; \tau$  MC, the 4th column from the left is the  $Z^-; \text{anything}$  MC, and the 5th column from the left is the  $Z^-; e^+e^-$  MC.

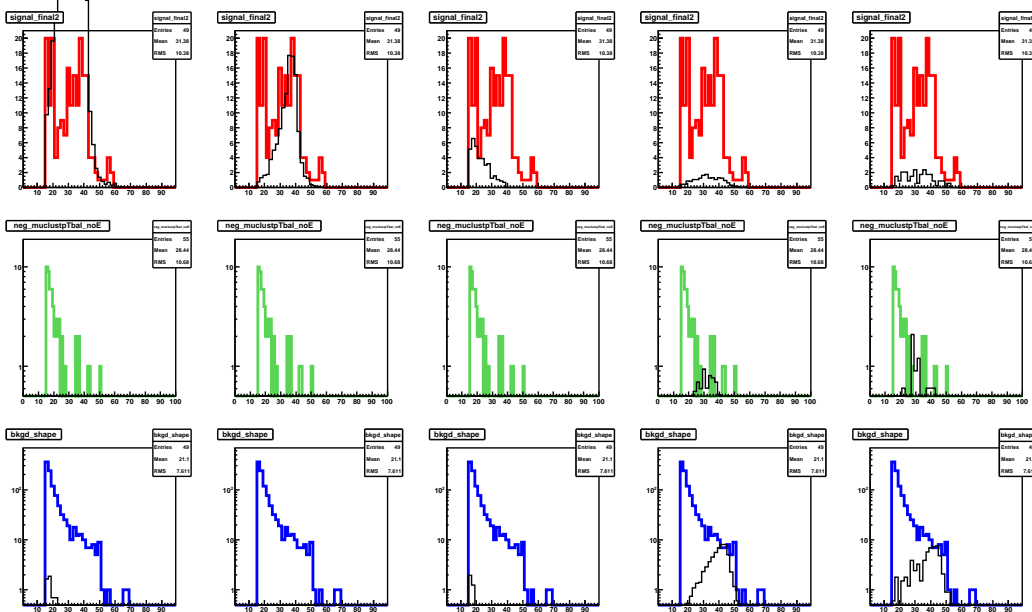


Figure 2: Signals and backgrounds for negative charges. The top row is the signal region, the middle row is the missing endcap background and the bottom row is the reverse signed pT balance cut. The left column is the  $W^+$  MC, the 2nd column from the left is the  $W^-$  MC, the 3rd column from the left is the  $W^-; \tau$  MC, the 4th column from the left is the  $Z^-; \text{anything}$  MC, and the 5th column from the left is the  $Z^-; e^+e^-$  MC.