NNCuts on LRHWW, Mll and MetSig

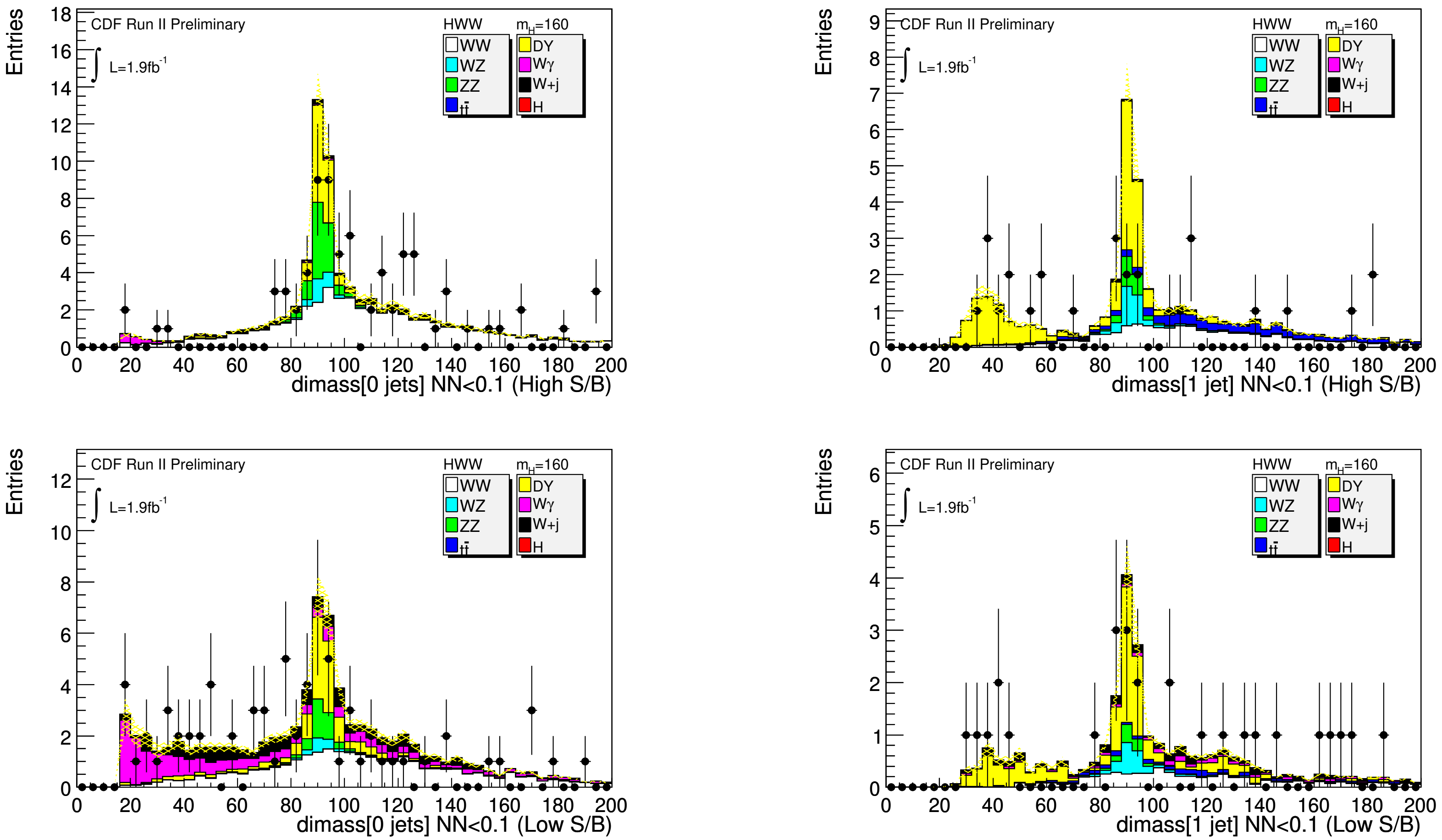
Richard St. Denis University of Glasgow/CDF

10 December 2007

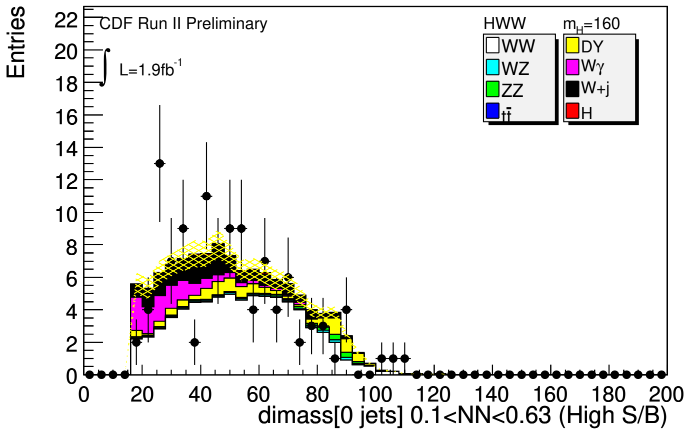
Outline

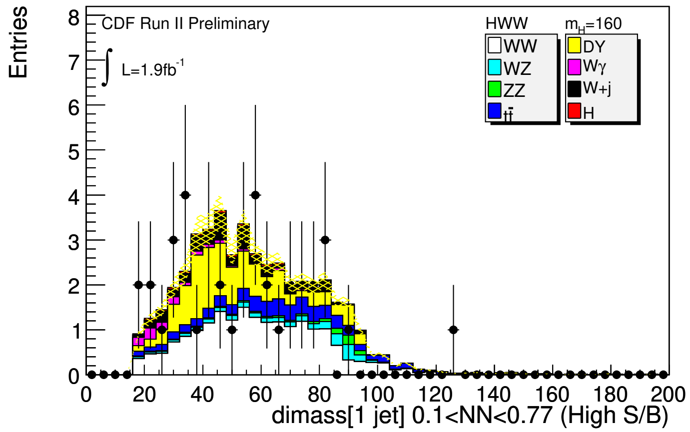
- Mll for various Cuts on NN
- MetSig for various Cuts on NN
- LRHWW for various cuts on NN

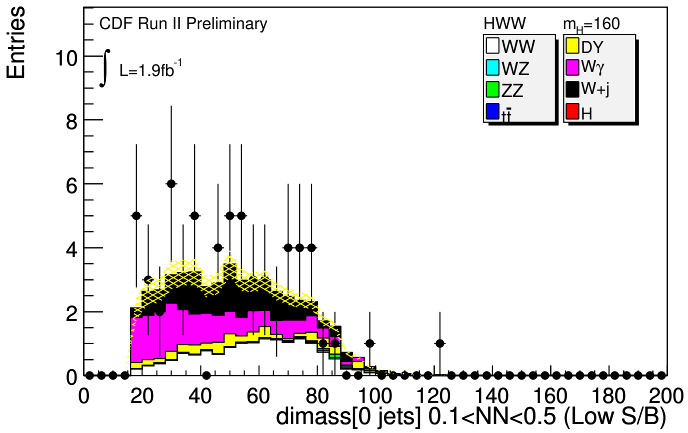
dimass: $NN < 0.1$ cut

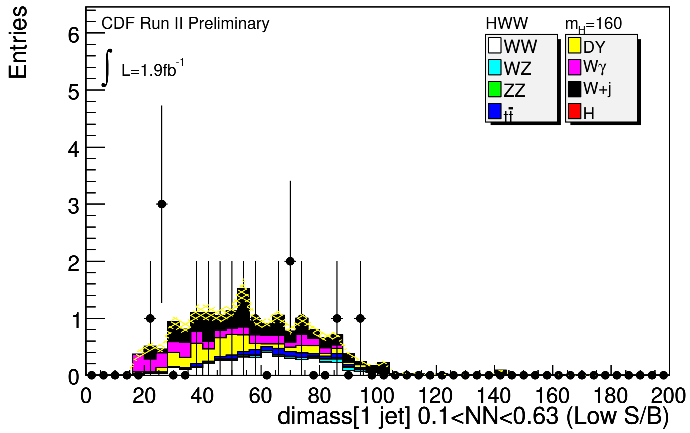


dimass: $0.1 < NN <$ 80% cut

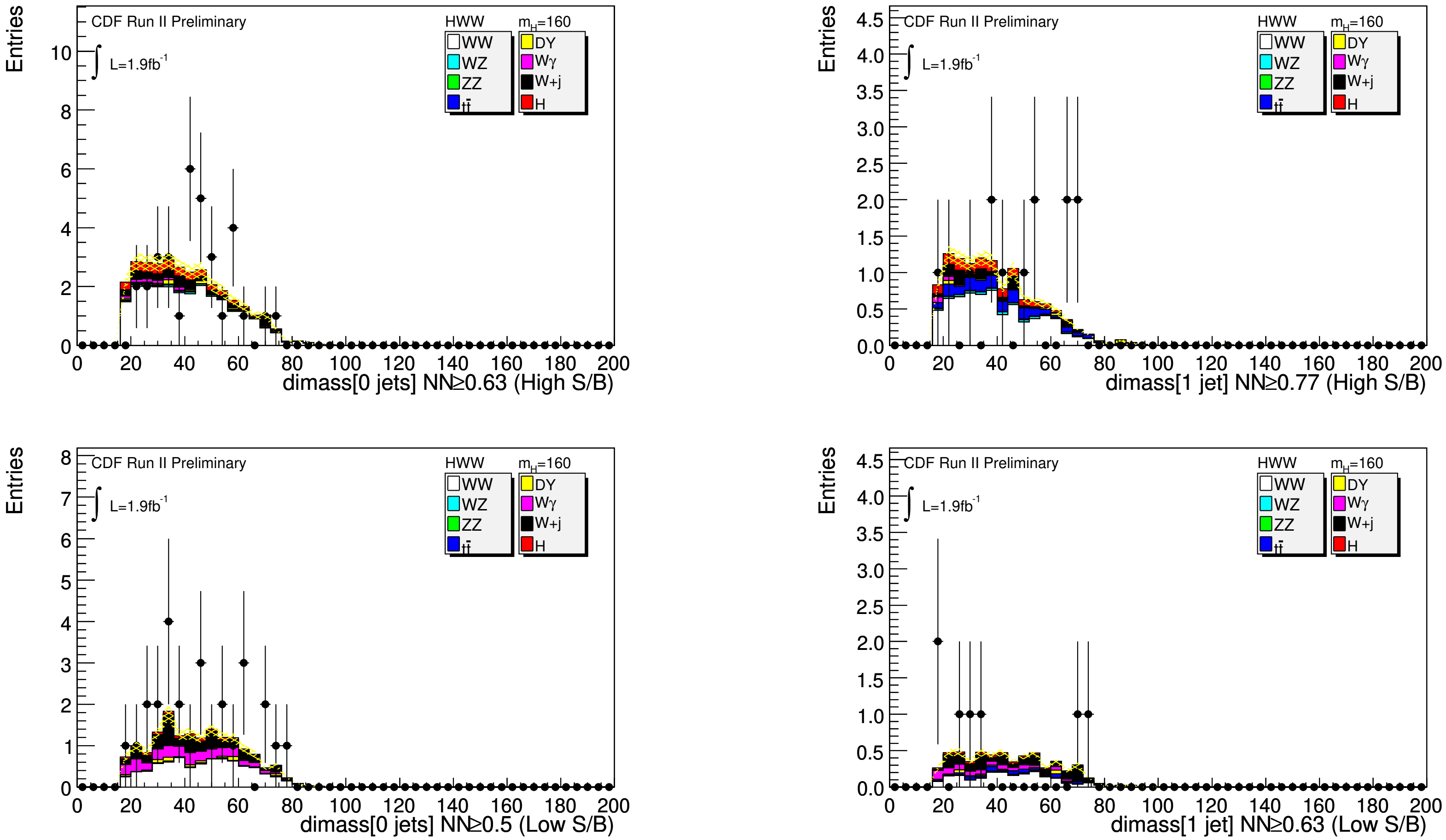




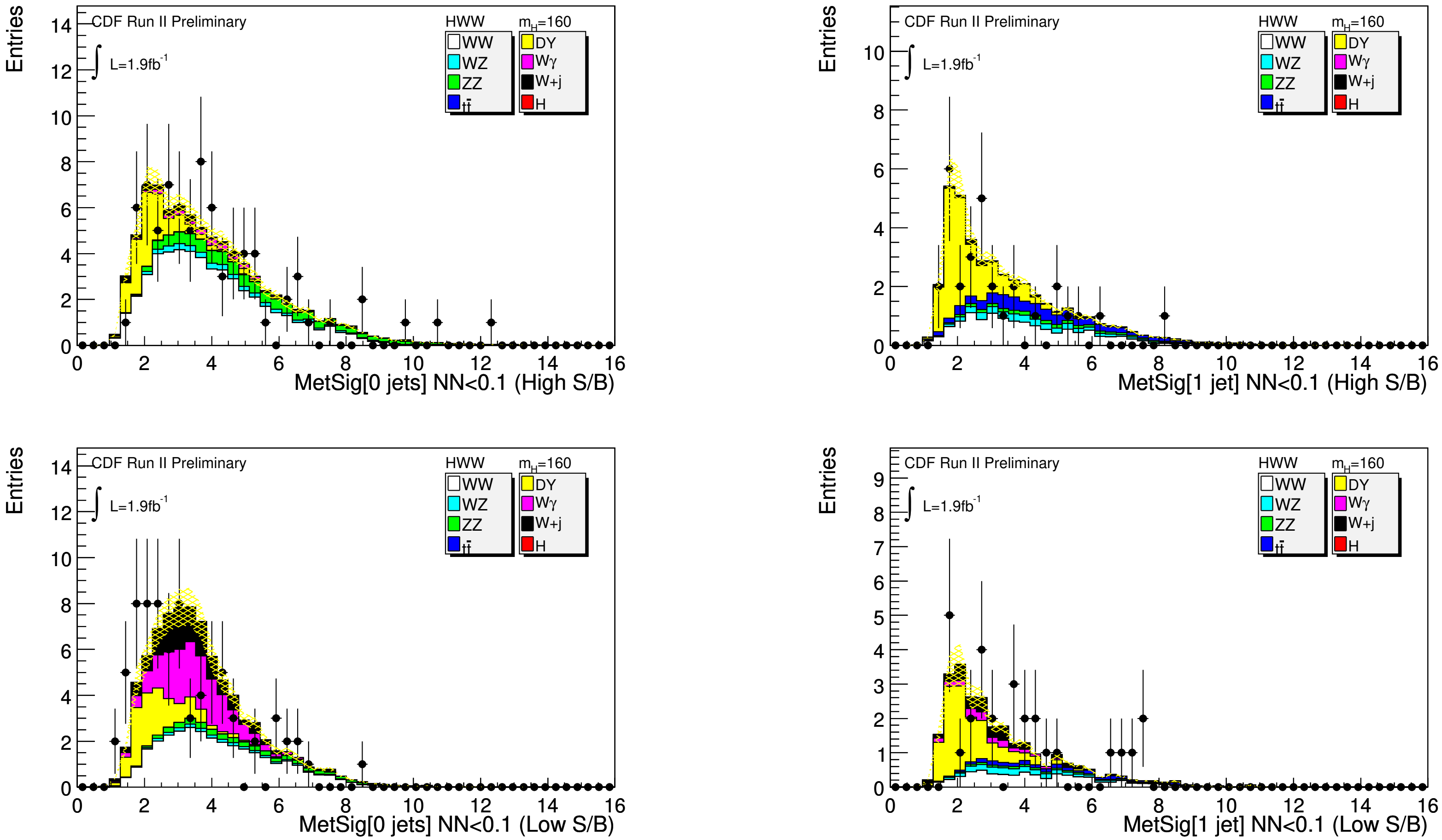




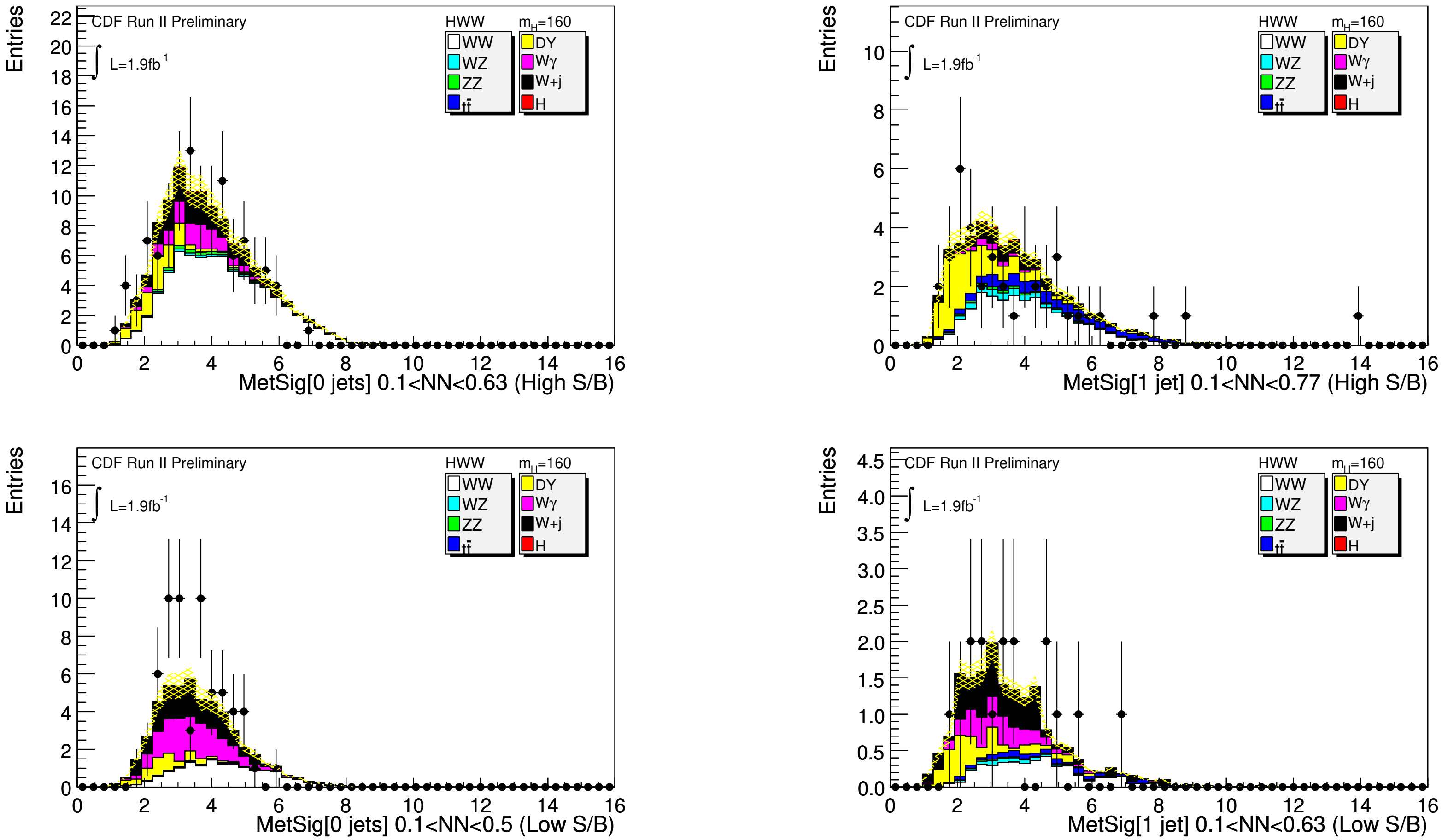
dimass: $NN \geq 80\%$ cut



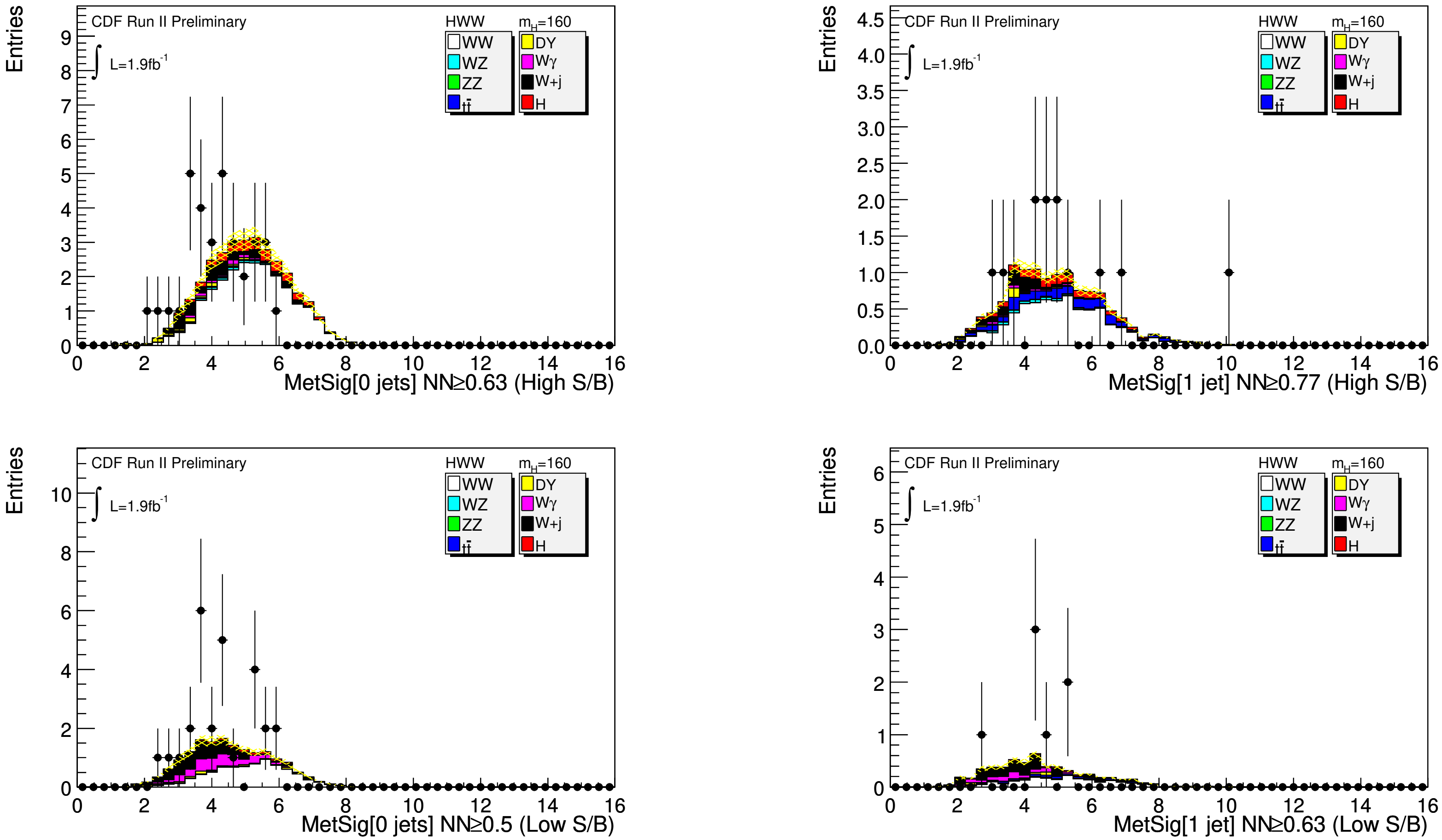
MetSig: $NN < 0.1$ cut



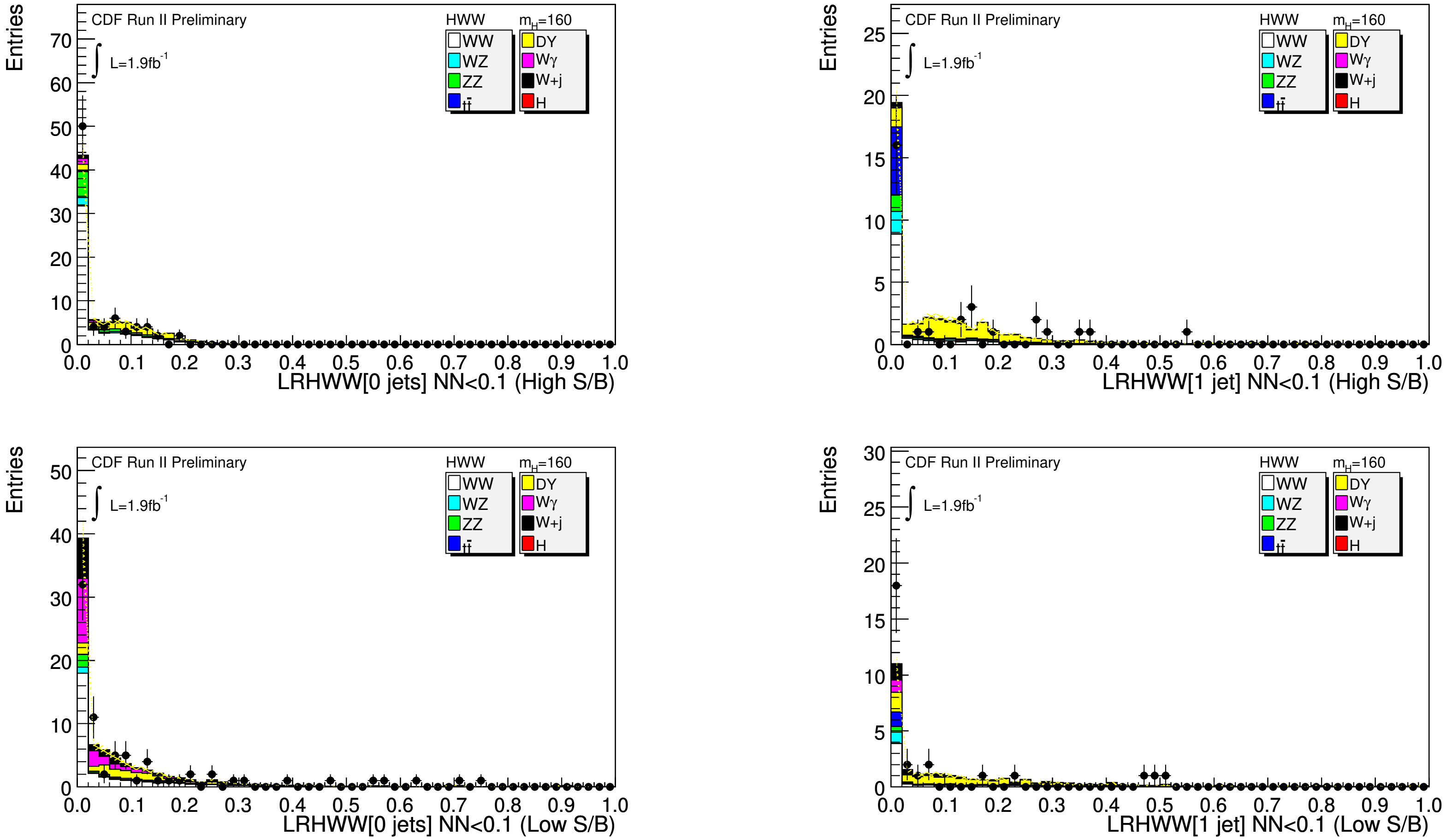
MetSig: $0.1 < NN <$ 80% cut



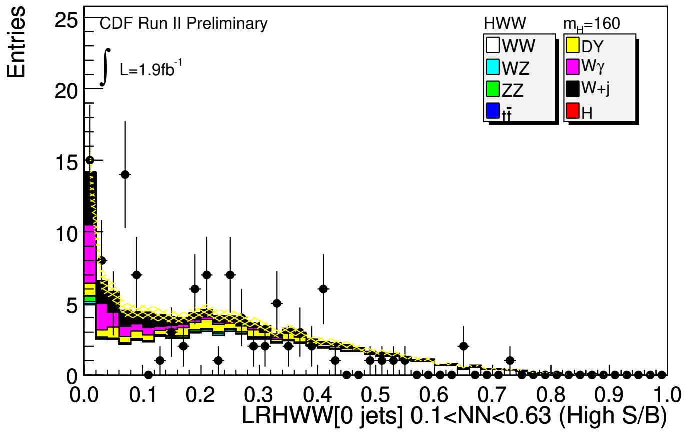
MetSig: $NN \geq$ 80% cut

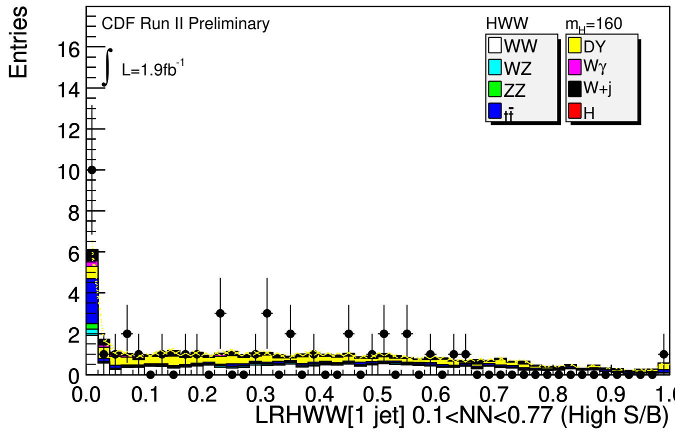


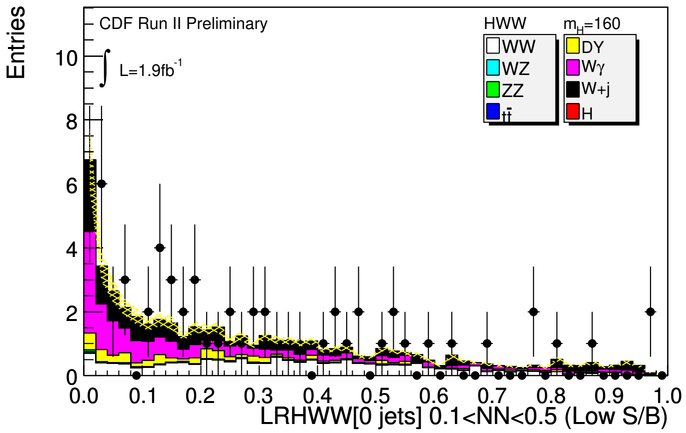
LRHWW: $NN < 0.1$ cut

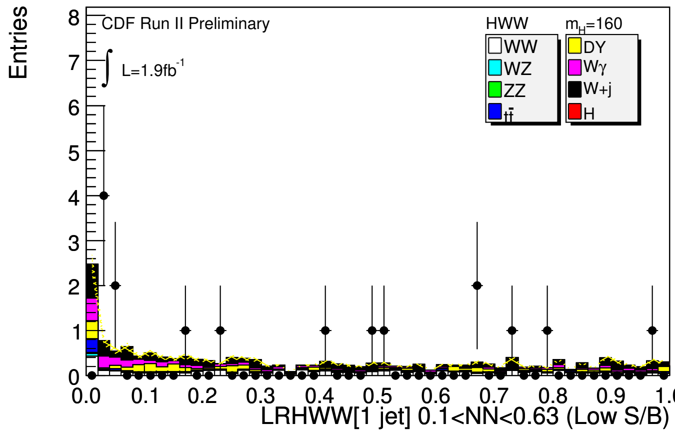


LRHWW: $0.1 < NN <$ 80% cut

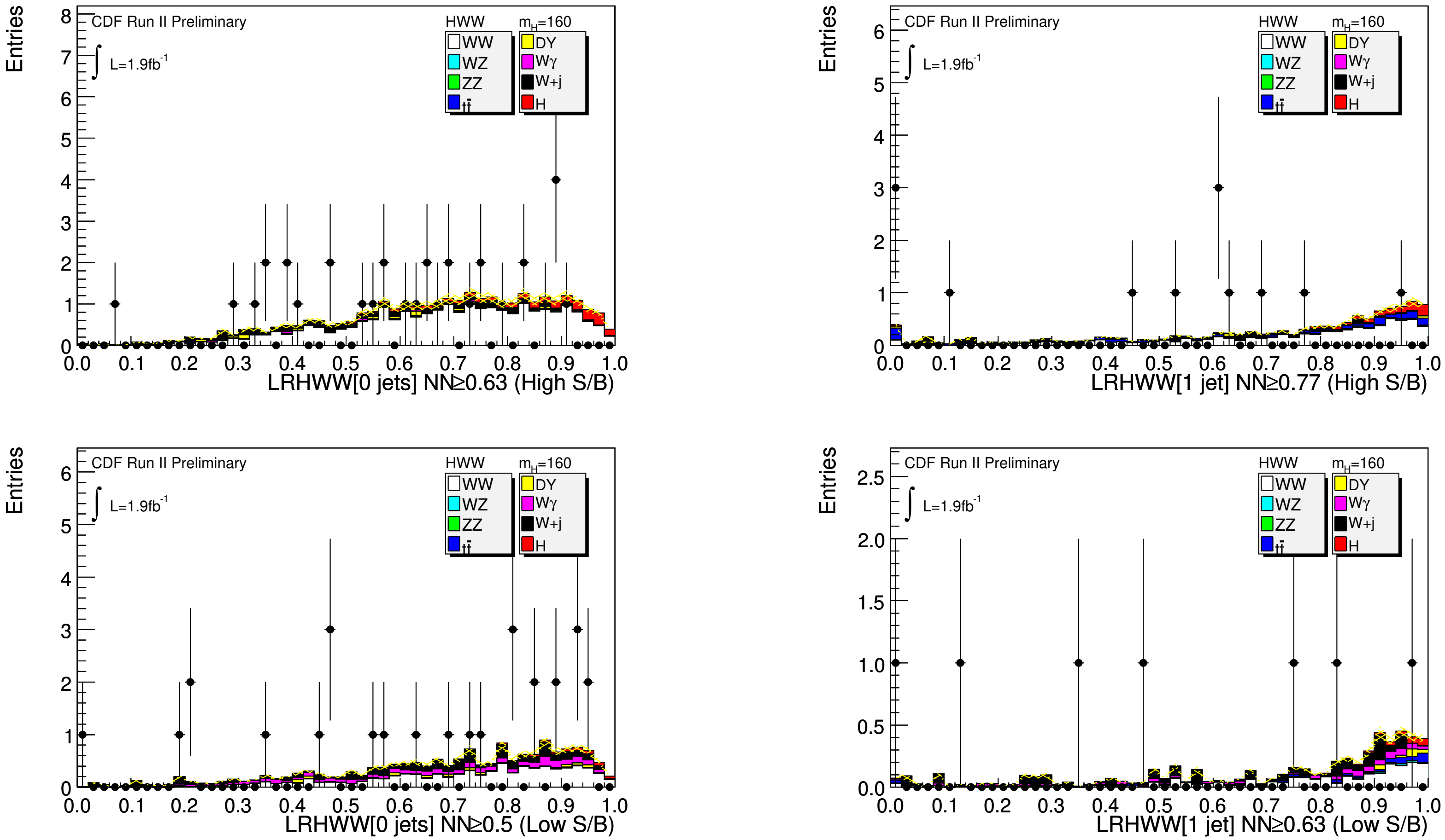








LRHWW: $NN \geq$ 80% cut



Observations Concerning Dilepton Mass

- The NN<0.1 cut isolates the Z peak.
  - High S/B 0 jet has almost no Fake/Wγ; the continuum background is WW and the WZ and ZZ are concentrated at the Z mass with about 30% from ZZ.
  - The Low S/B 0 jet has a significant Fake/Wγ contribution, especially below the Z mass. The data are systematically higher and hence this Fake/Wγ may be underestimted.
  - For High S/B and 1 jet, there is about 50% of the expected number of events. There is a low mass bump of pure DY.
  - Fir Low S/B and 1 jet, statistics are low but the agreement is fine, and there is also a low mass bump.

- For $0.1 < NN < 80\%$ cut, there is no evidence of a Z contribution.
  - 0 jet: The Fake/Wγ in at lower mass in High and at all masses below the Z for Low S/B.
  - 1 Jet: Very little Fake/Wγ in high S/B. More DY in high S/B. Also, WZ/ZZ contribute noticeable here in the 1 jet High S/B and less so in the other cases. The 1 jet low S/B again has Fake/Wγ that masks the W/Z contribution.
- for NN$> 80\%$ cut the kinematic coverage is the same as for the $0.1 < NN < 80\%$ which therefor provides a good control region.

Observations Concerning MetSig

- $NN < 0.1$
  - The DY is at low MetSig in all cases
  - There is signficant Fake/Wγ for Low S/B 0 jet.
  - The WZ and ZZ are uniformly dense over MetSig$>$2.5
  - Top has its main contirbution for MetSig$>$2.5 and High S/B 1 jet.
- $0.1 < NN <$ 80% Cut
  - The Fakes/Wγ contribution dominates in Low S/B 0 jet.
  - The DY contribution apprears stronger in the 1 jet and especially in High S/B. The W/Z contribution seen in High S/B 1 jet is also visible here in the MetSig$>$2.5 region.
- $NN >$ 80% Cut

- The kinematic coverage here compares well with that in the $0.1 < NN <$ 80% region. The composition and proportion of backgrounds is well matched in the 0 jet.
- The 1 jet background in the control region contains a DY contribution that is not expected in this signal region. Nonetheless WW dominates the High S/B and the mixture of WW and Fakes/Wγ in the Low S/B is reasonable, although statistics are poor.

LRHWW Observations

- The $NN < 0.1$ cut corresponds strongly to the peak at LRHWW=0.
- The intermediate NN score region corresponds to the intermediate LRHWW values as was expected from the high degree of correlation in the two estimators.
- The high score region has little statistics and again reflects the correlation between the estimators. There is clearly no control region in this case.

Summary

- For the discriminant variables that caused concerns regarding the agreement of data and Monte Carlo, we have been able to define control regions in which the agreement is good and remove regions that were not relevant from consideration: the $NN < 0.1$ region
- However, for this $NN < 0.1$ region, we do see a contribution of ZZ to the Z mass that is particularly clean in the High S/B 0 jet although an identically shaped DY contribution is present. A cut on MetSig clearly would remove this with high efficiency.
- For Mll, the isolation of the Z peak with $NN < 0.1$ is striking. This cut also brings out the lowest LRHWW values.
- The region from $0.1 < NN <$80% cut offers a good control

region with a good mixture of backgrounds distributed over the same kinematics as the signal region, $NN > 80\%$ cut. The exception is the additional DY background in the 1 jet High S/B control region that is not expected in the signal region.

- The control region shows that for the Low S/B there is some discrepancy in the data and background predictions for 0 jet. Statistics are too low in the 1 jet bin to say much. The dominant background is Fake/Wγ and this needs to be investigated. While this does not dominate the High S/B region it may be important since it does lie in the kinematic signal region.