

# ZHH Analysis.

## ZHH/WBF Separation

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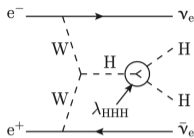
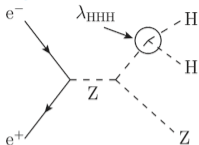
Di-Higgs analysis working meeting  
January 16, 2025



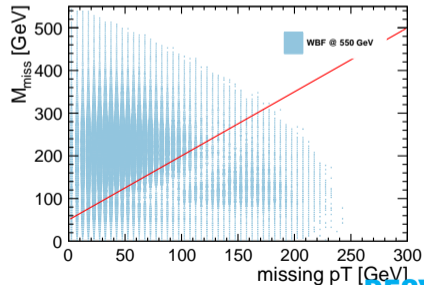
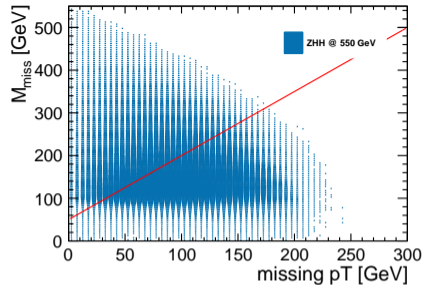
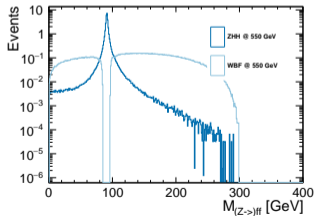
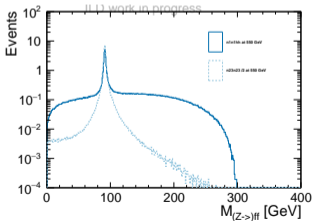
HELMHOLTZ



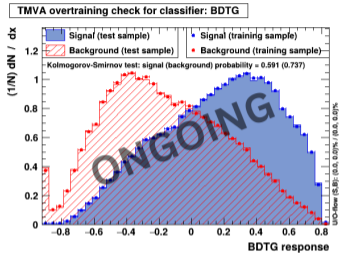
# ZHH/WBF Separation



- Contribution from WW fusion to ZHH final non-negligible @ 550 GeV
- Split  $\nu_e \bar{\nu}_e HH$  channel into two channels by simple shape comparison on the Z-mass

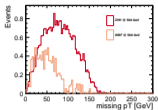


# ZHH/WBF Separation

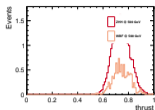


- Variables:  $p_T$ ,  $\mathcal{M}$ ,  $E_{vis}$ , thrust,  $M_{vis}$  (i.e.  $M_{HH}$ )
- Q: Would the ZHH/WBF separation (with line cut or BDT or...) create a bias in the event selection when extrapolating the precision reach in the  $\nu_e \bar{\nu}_e HH$  channels?

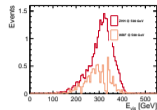
Precuts: None of the preselection cuts appear biased for ZHH/WBF separation (very loose)



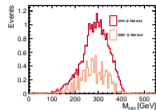
$10 < p_T < 180$  GeV



thrust < 0.9



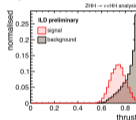
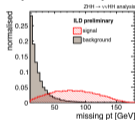
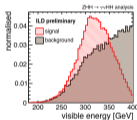
$E_{vis} < 400$  GeV



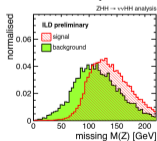
$M_{vis} > 220$  GeV

Final selection:

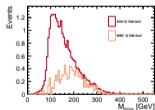
- $bbbb$  vs.  $\nu\nu HH$  ( $\nu\nu bbbb$ ):  $E_{vis}$ ,  $p_T$ , thrust



- $lvbbqq$  vs.  $\nu\nu HH$  ( $\nu\nu bbbb$ ):



VS



- $ZZH/Z$  vs.  $\nu\nu HH$  ( $\nu\nu bbbb$ ): ...