

# Weekly Report

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# Plotting

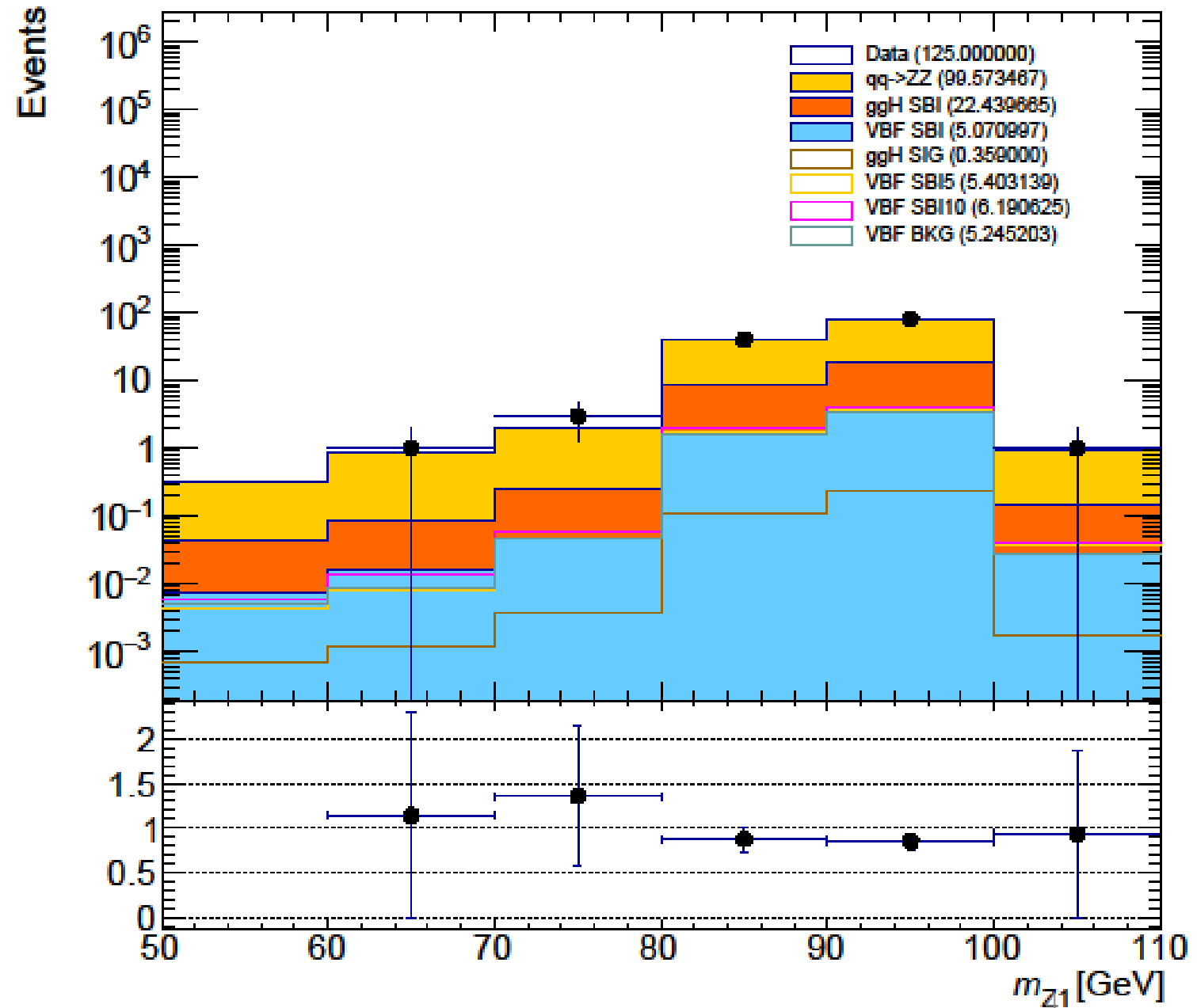
- Control region:  $m_{4\ell} \in [130, 220]$  GeV
  - without njets or other jets cuts
  - loose cuts:  $m_{4\ell} \in [130, 220]$  GeV,  $m_{jj} > 120$  GeV and  $n_{\text{jets}} \geq 2$
  - tight cuts:  $m_{4\ell} \in [180, 220]$  GeV,  $m_{jj} > 300$  GeV,  $n_{\text{jets}} \geq 2$  and  $|\Delta\eta_{jj}| > 3$
  - tighter cuts:  $m_{4\ell} \in [180, 220]$  GeV,  $m_{jj} > 400$  GeV &  $|\Delta\eta_{jj}| > 3.3$
- Signal region:  $m_{4\ell} \in [220, 2000]$  GeV
  - without cuts
  - loose
  - tight
  - tighter

# Plotting

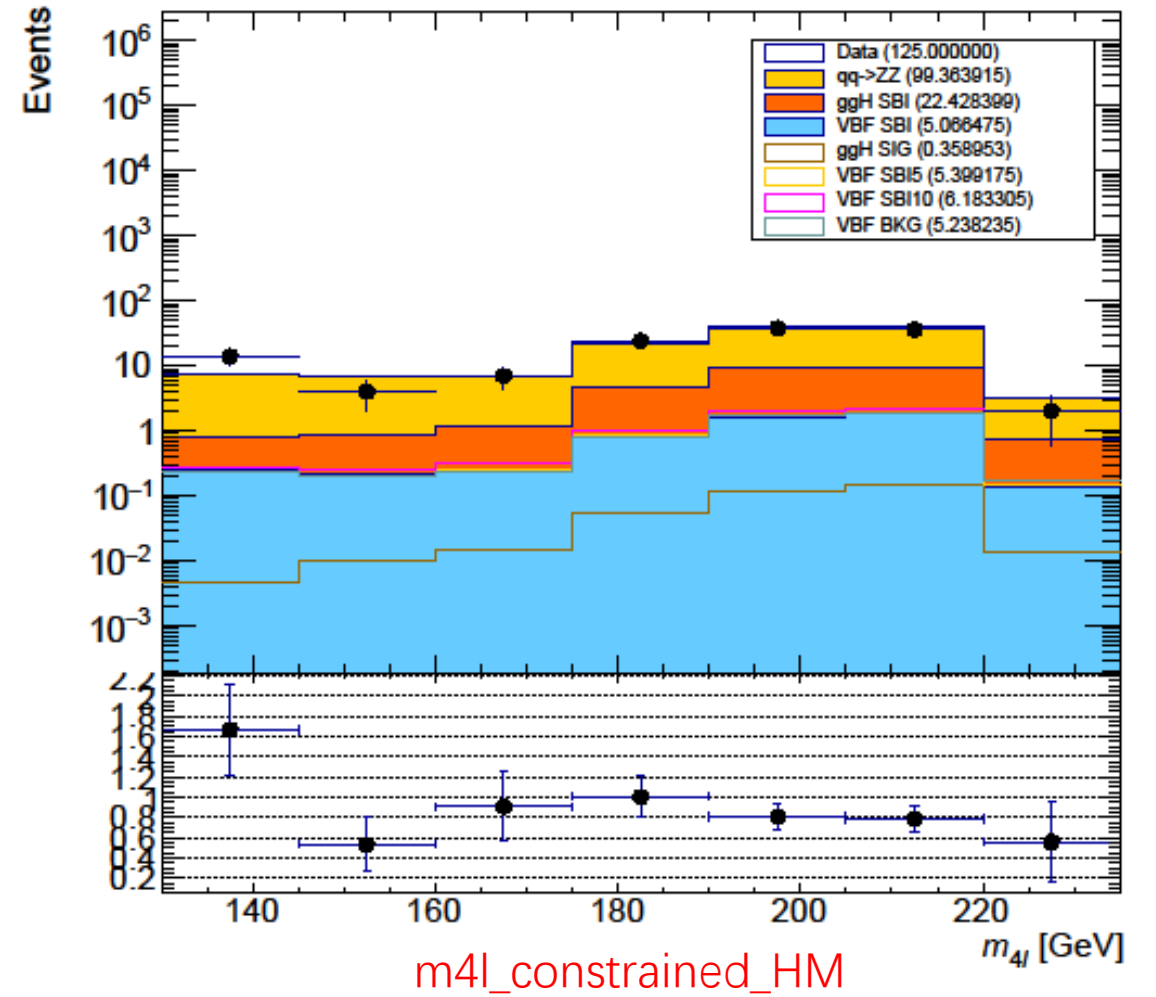
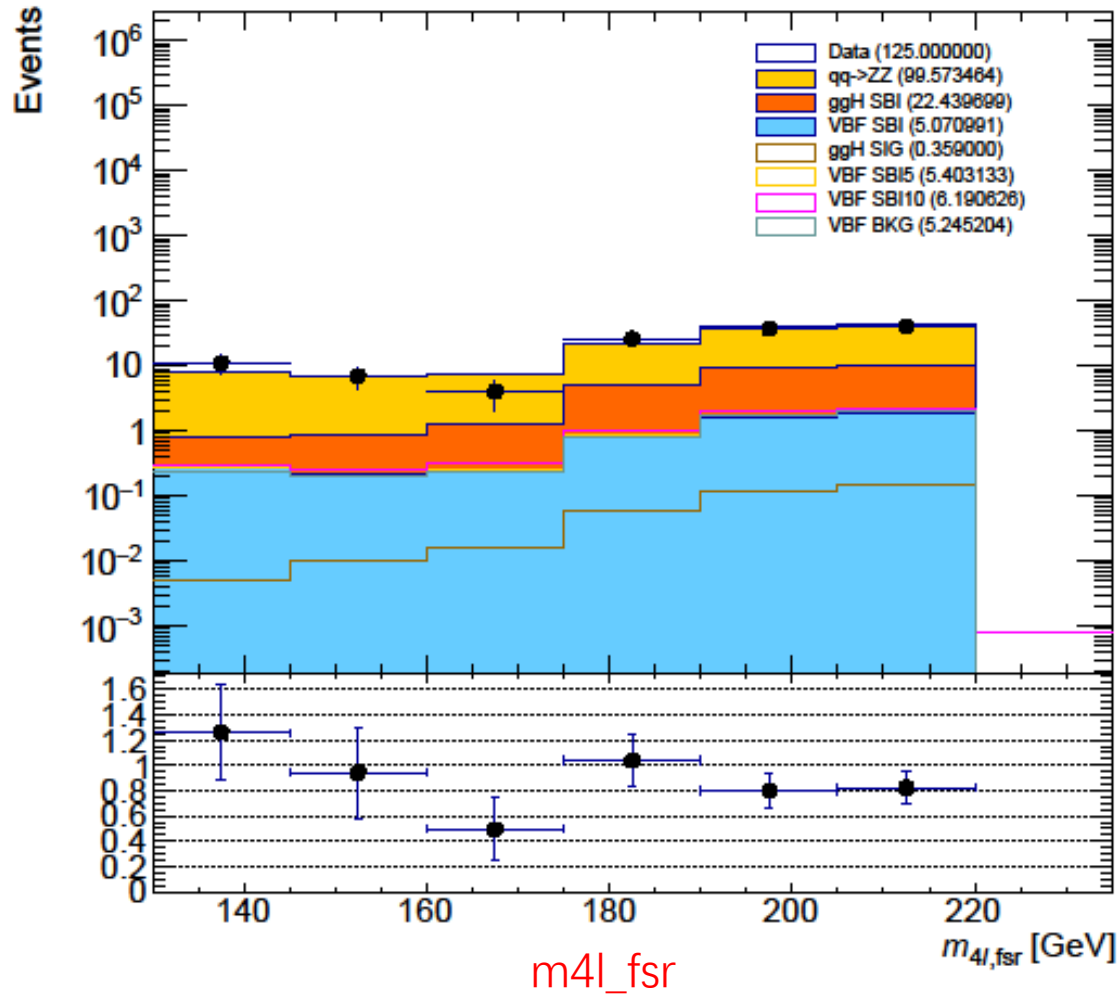
- Variables:
  - Higgs system: H4l mass, H pT, H eta and ME (matrix element)
  - Jet system: Njets and pT jet, eta jet (for the 2 leading jets)
  - ME LA variables:  $\cos \theta^*$ ,  $\cos \theta_1$ ,  $\cos \theta_2$ ,  $\Phi$ ,  $\Phi_1$ , Z1 mass, Z1 pT, Z2 mass, Z2 pT
  - Zeppenfeld variable:  $\eta^* = \eta_{4l} - (\eta_{\text{jet } 1} + \eta_{\text{jet } 2})/2$  of the H and 2 leading jets
- Total:  $19 \times 4 \times 2 = 152$

# Some problems

- Number of events  $< 1$
- Normalization?
- loose cuts,  $m_{Z1}$



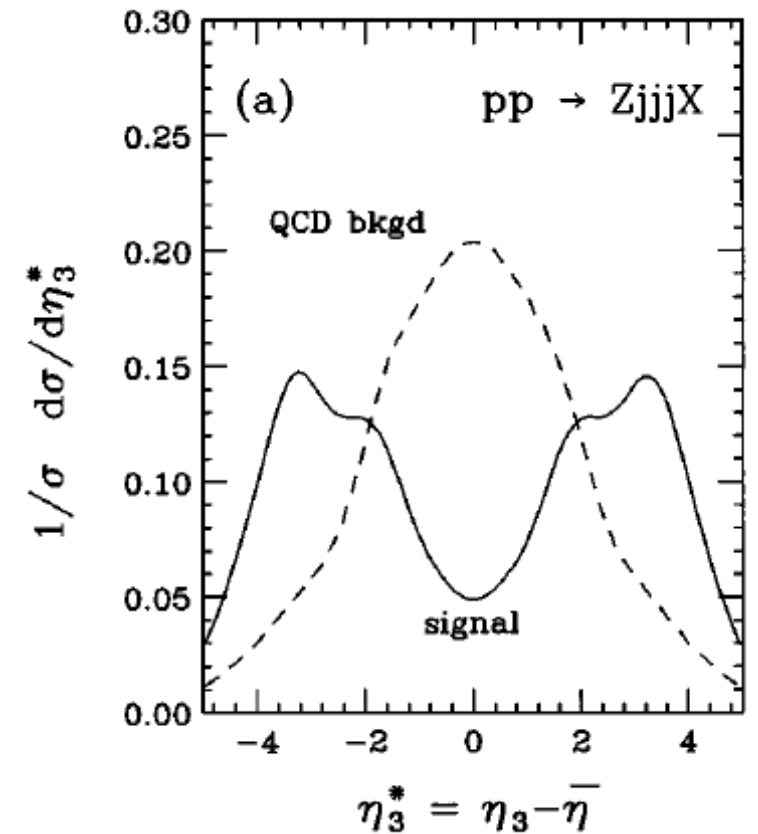
# Some problems



loose cuts:  $m_{4\ell} \in [130, 220]$  GeV,  $m_{jj} > 120$  GeV and  $n_{jets} \geq 2$

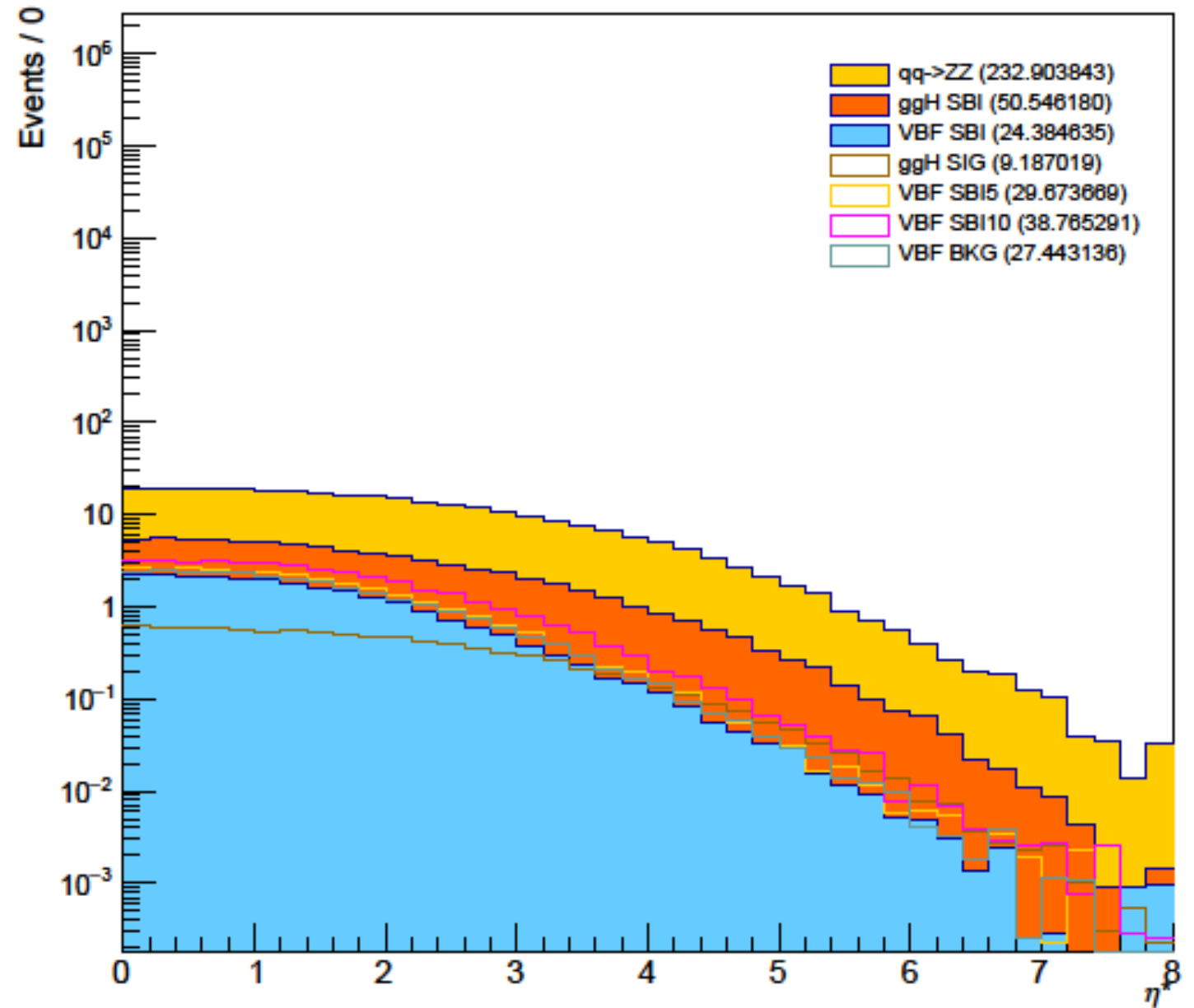
# Some problems

- Zeppenfeld variable:  $\eta^* = \eta_4 - (\eta_{\text{jet } 1} + \eta_{\text{jet } 2})/2$ 
  - Original definition:  $\eta_3^* = \eta_3 - \bar{\eta} = \eta_3 - \frac{\eta_j^{\text{tag1}} + \eta_j^{\text{tag2}}}{2}$
  - Zjj events: Z+3-parton signal and bkg events (3 jets)
  - Tagging jets: the two most energetic jets
  - Color exchange between the incident partons, as in the case of the QCD background, leads to minijet activity in the central region.
  - Our case: 4l  $\rightarrow$  the third jet, the two jet  $\rightarrow$  tagging jets



# Some problems

- Signal region, loose cut
- No signal?



# Next steps

- Check which variables have the most discriminating power
- Discriminate
  - 1) VBF against ggH
  - 2) VBF against Bkgs