Weekly report

FANGYI GUO

VBF Higgs CP test

MC sample: ATLAS official mc16a VBF, ggF and QCD background.

Event selection:

- No Dalitz, passIsolation, passPID, passTriggerMatch
- At least 2 photon + 2 jets
- $\frac{P_T}{m_{\gamma\gamma}} > 0.35(0.25)$
- $m_{jj} > 400GeV$
- $|\Delta\eta_{jj}| > 2$
- $|\eta^{Zepp}| < 5$

	ggH	bkg	VBF SM
SumW	2.2E+08	7601080	1506191.4
pre-sel	294.503	121132	75.8446
rel.pT	268.235	101221	68.4919
2jet	268.235	101221	68.4919
m_jj<400	30.7357	9228.79	37.832
deltaEta_jj>2	29.1328	7798.47	37.5759
Zepp<5	29.0554	7725.24	37.5583

Cut flow scaled to 36.1 fb-1

VBF Higgs CP test

Model: 2-demintion model for CP test

- $m_{\gamma\gamma}$: double-side CB for VBF+ggF signal sample
  2nd polynomial exponential PDF for QCD background.
- OO: double-side CB for each template.

a) Fit model with individual MC template.

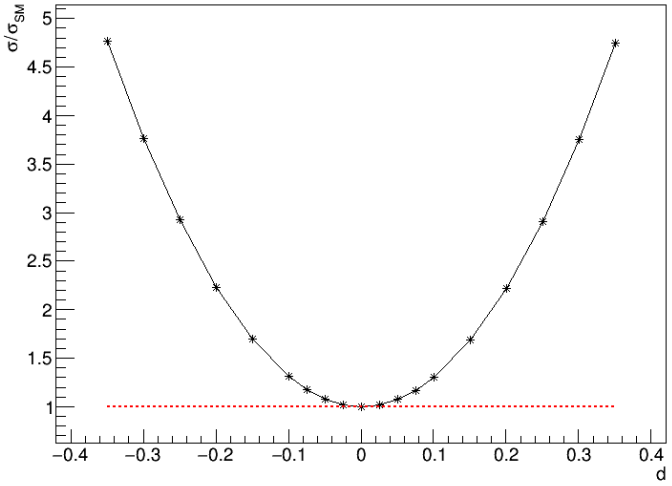
b) Fix N_{ggF}, fit 1-D $m_{\gamma\gamma}$ distribution to get $\hat{\mu}_{VBF}$, $\widehat{N}_{bkg}$.

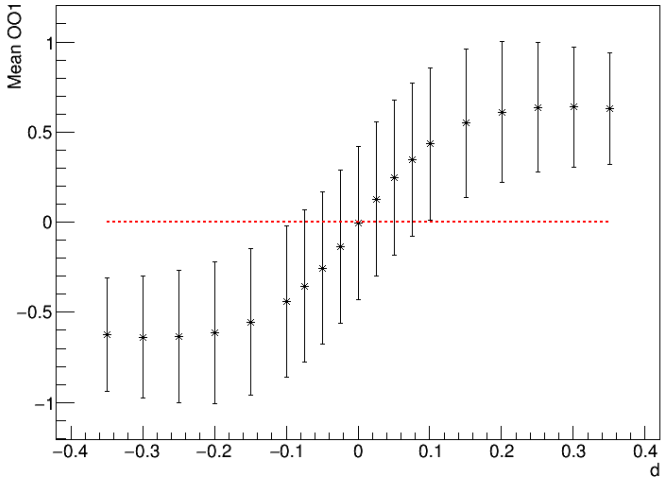
c) Construct 2-D model with:

$$PDF_{total}(m_{\gamma\gamma}, OO) = \hat{\mu}_{VBF} \times N_{VBF}^{SM} \times f_{sig}(m_{\gamma\gamma}) \times g_{VBF}(OO) + N_{ggF}^{SM} \times f_{sig}(m_{\gamma\gamma}) \times g_{ggF}(OO) + \widehat{N}_{bkg} \times f_{sig}(m_{\gamma\gamma}) \times g_{ggF}(OO)$$

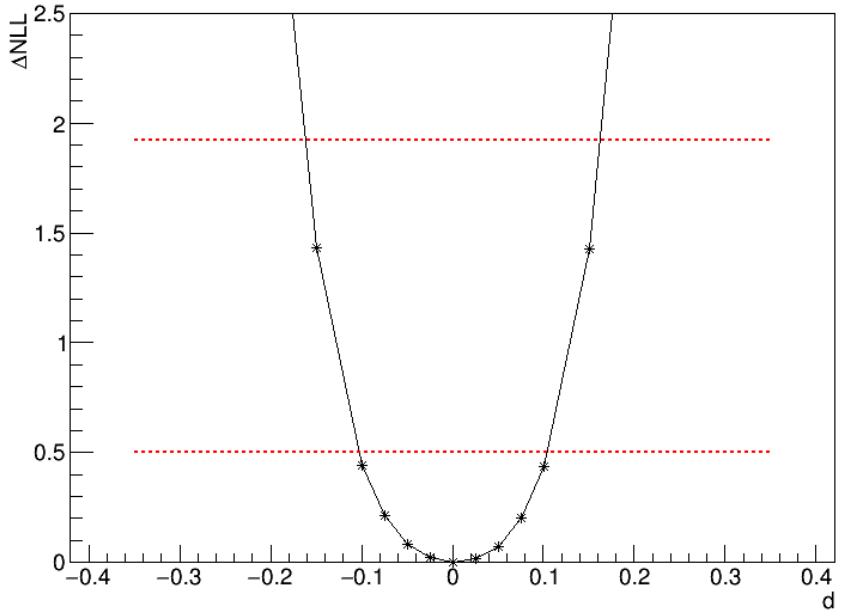
VBF Higgs CP test

d) Calculate NLL with $PDF_{total}(m_{\gamma\gamma}, OO)$ and SM Asimov data





VBF Higgs CP test



Next plan:

- Add BDT categorization
- Add truth level OO for check.

VBF Higgs CP test

Next plan:

- Add BDT categorization
- Add truth level OO for check.