# Weekly Report

FANGYI GUO

VBF Higgs CP test

MC sample:

- ◦ VBF: mc16 13TeV, VBFH125 gamgam DAOD

   ~20% events have 3 quarks in final state in truth level.

   Asked the Run2 derivation group, no reply yet.

- ◦ ggH: mc16a 13TeV MxAOD
- ◦ QCD background: mc16a 13TeV Sherpa diphoton MxAOD sample.
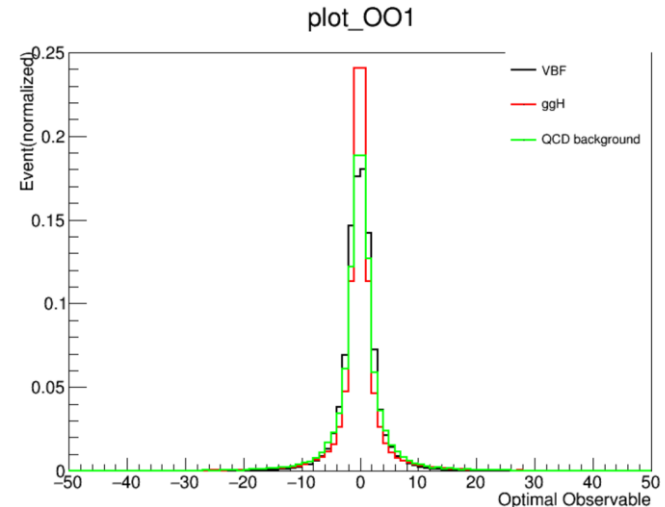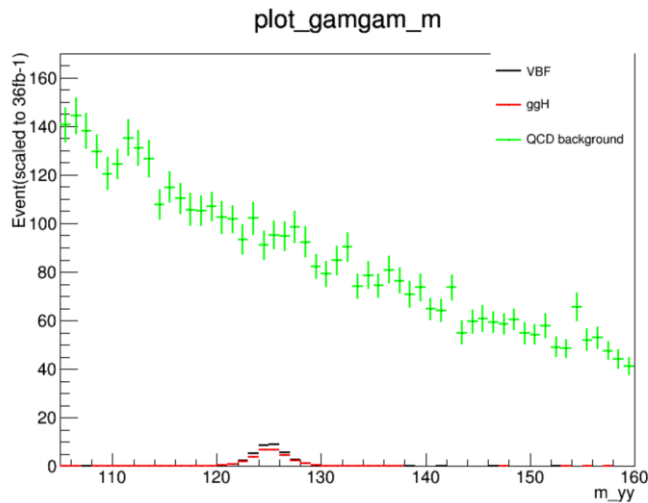
Re-weight for CP mixing VBF sample:

- ◦ Calculate the weight with VBF truth MC.
- ◦ Remove events with weight>1500
   (~1.9% events abandoned).
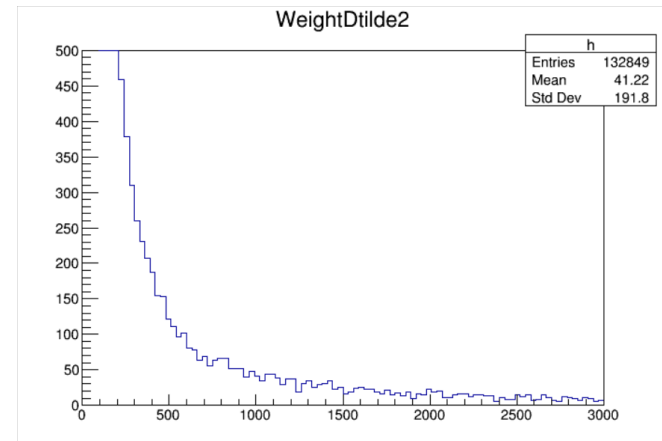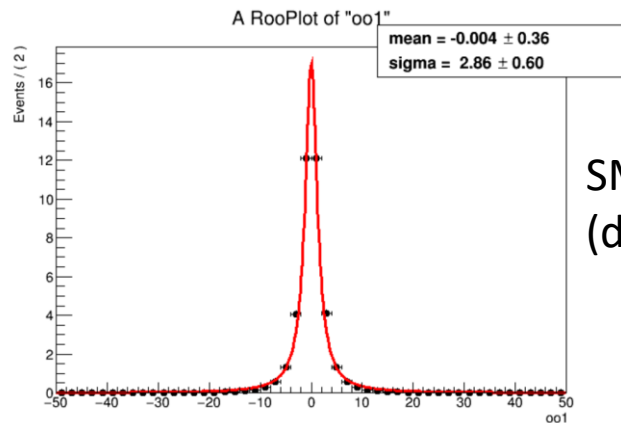
VBF Higgs CP test

Now we can have:

- Kinematic variables distribution for 3 sample
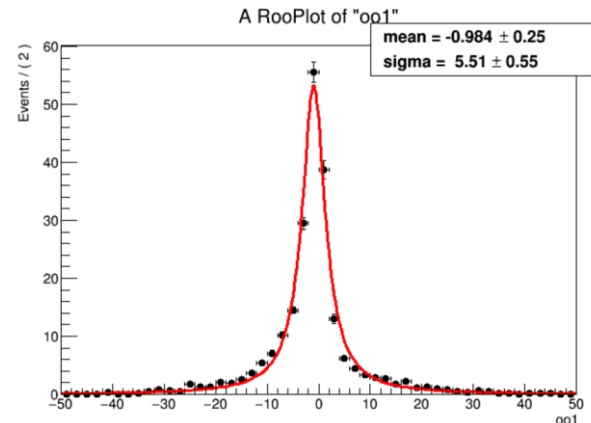- Optimal Observable

- Correlation between $m_{\gamma\gamma}$ and OO1 is: -0.4%(VBF), 0.7%(ggH), -0.1%(bkg)
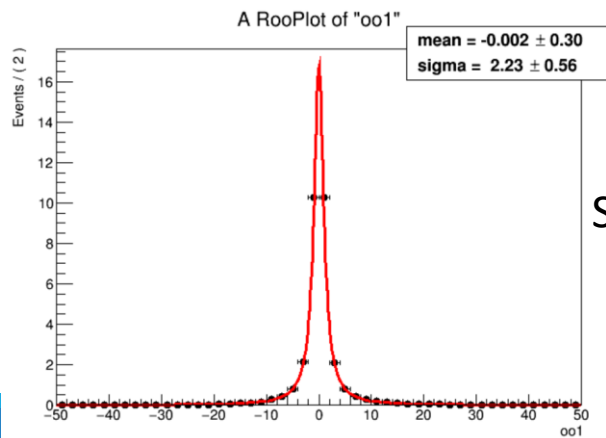
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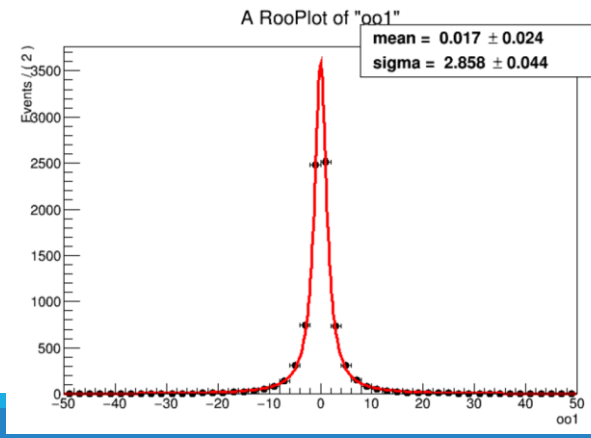
Fit the OO with Breit Wigner distribution

SM VBF (d=0)
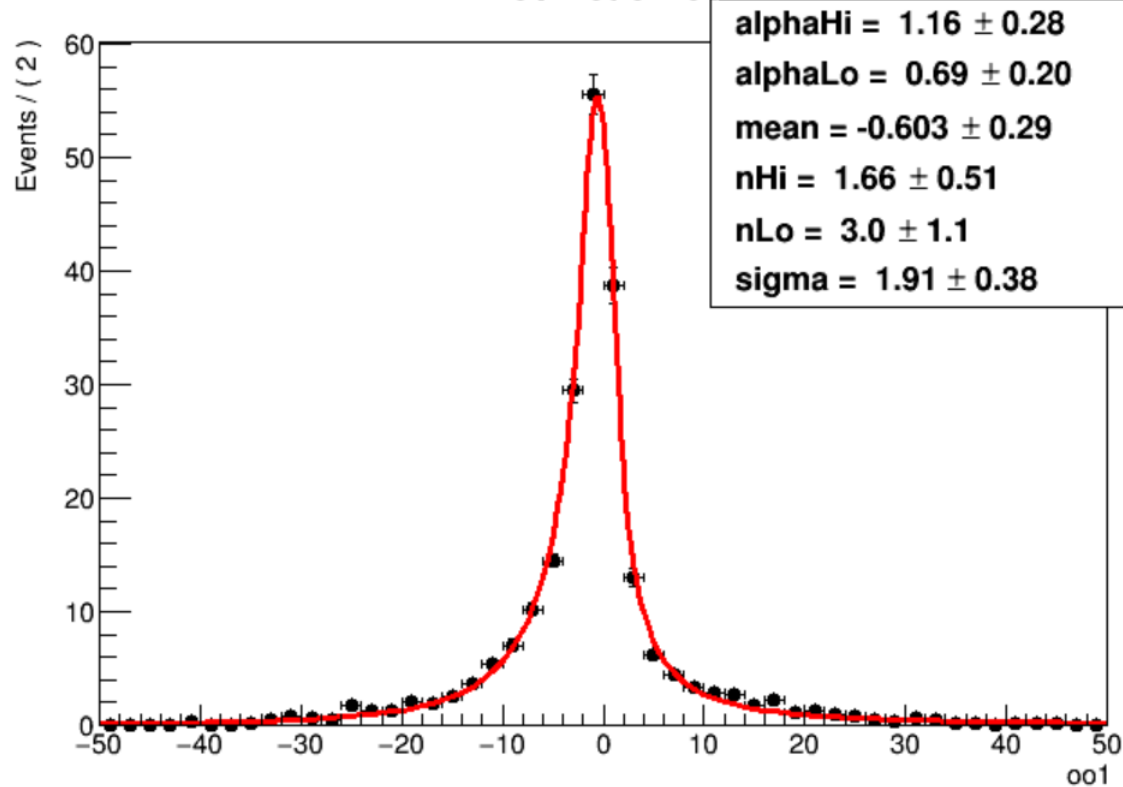
VBF d=-0.4

SM ggH

QCD background

VBF Higgs CP test

Next step:

- Build appropriate model for OO and $m_{\gamma\gamma}$
- Do hypo-test and calculate NLL
- Give a report in next week's ATLAS HGam subgroup meeting.

A RooPlot of "oo1"

alphaHi = 1.16 ± 0.28
alphaLo = 0.69 ± 0.20
mean = -0.603 ± 0.29
nHi = 1.66 ± 0.51
nLo = 3.0 ± 1.1
sigma = 1.91 ± 0.38

Double-side CB fit for OO1, VBF d=-0.4