

Weekly Report

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VBF Higgs CP test

Background composition estimation:

- Purity 2x2DSB. Calculate $\gamma\gamma, \gamma j, j\gamma, jj$ event number and fraction

2015+2016 data, 36ifb:

```
Consistency check with sum over the bins:  
Ngg      = 247648  
Ngj      = 32505  
Njg      = 11423  
Njj      = 5505  
Purity    = 0.833604
```

2017 data, 44ifb:

```
Consistency check with sum over the bins:  
Ngg      = 233833  
Ngj      = 29814  
Njg      = 9626  
Njj      = 5003  
Purity    = 0.840292
```

Inclusive, no specific category.

Ref from Run2 80ifb: 75.6% for $\gamma\gamma$

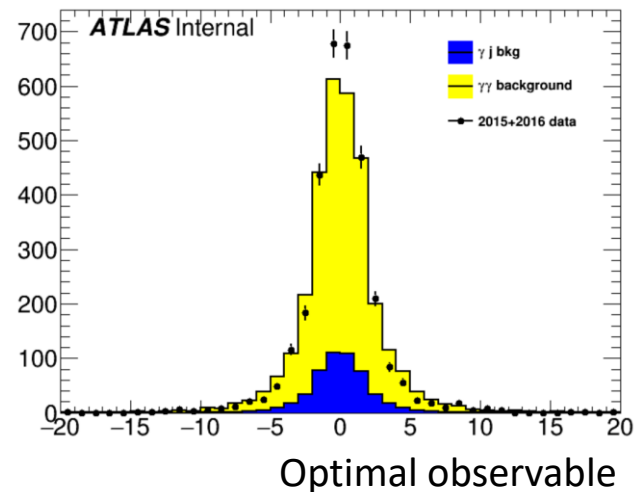
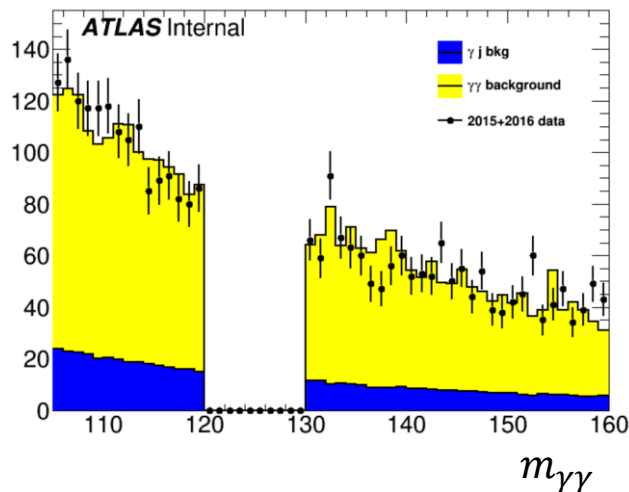
Ref from Run2 36ifb:

baseline 78.7% for $\gamma\gamma$
for 4 VBF cat. 80%~84%

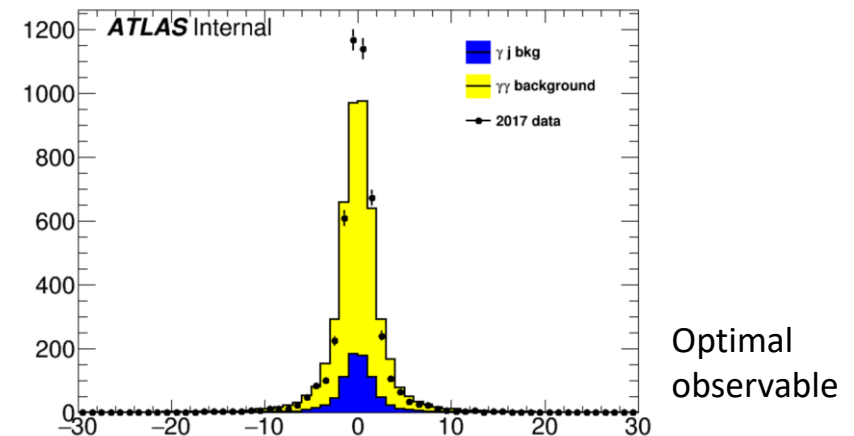
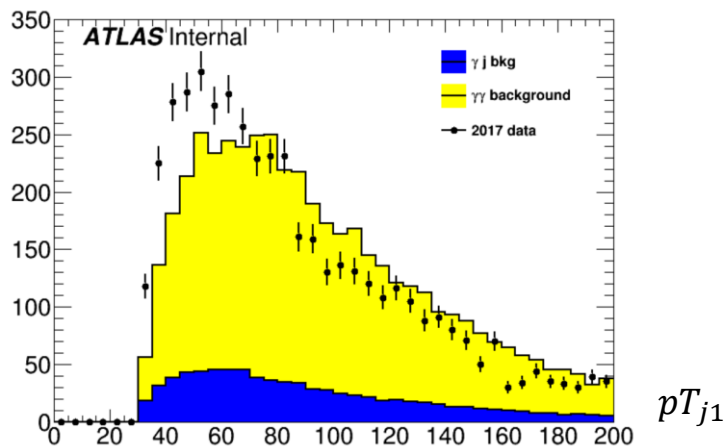
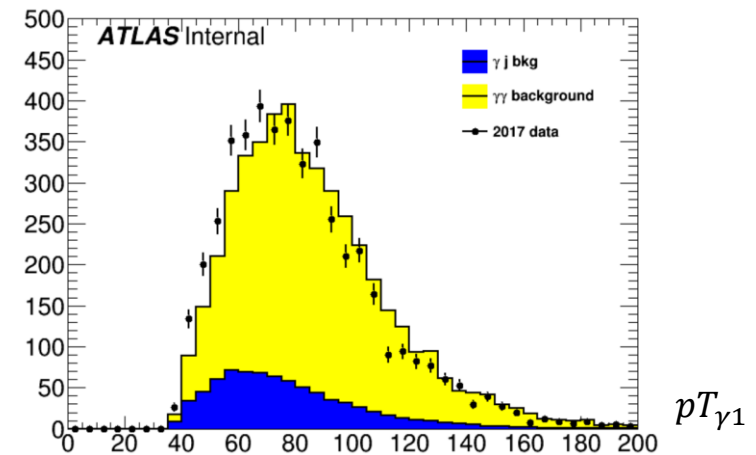
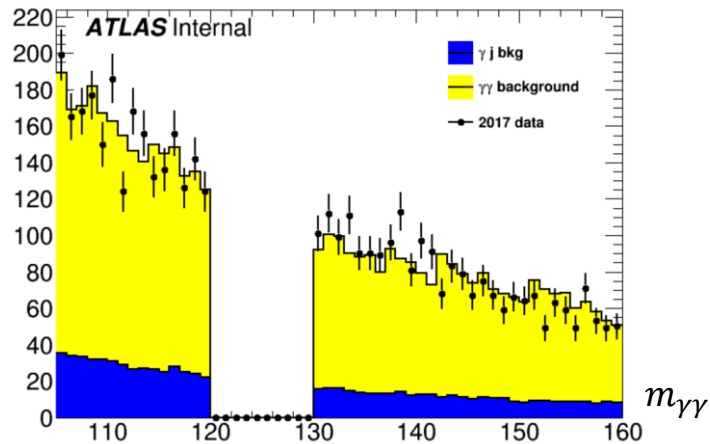
VBF Higgs CP test

Background component(36fb only):

- $\gamma\gamma$ background: MC simulation, mc16a_13TeV_Sherpa2_Diphoton90_175
- $\gamma j + jj$: Reverse ID&ISO from data. !(isPassedPID&&isPassedIsolation)
- Exclude signal region [120, 130] and scale to side-band data.



VBF Higgs CP test

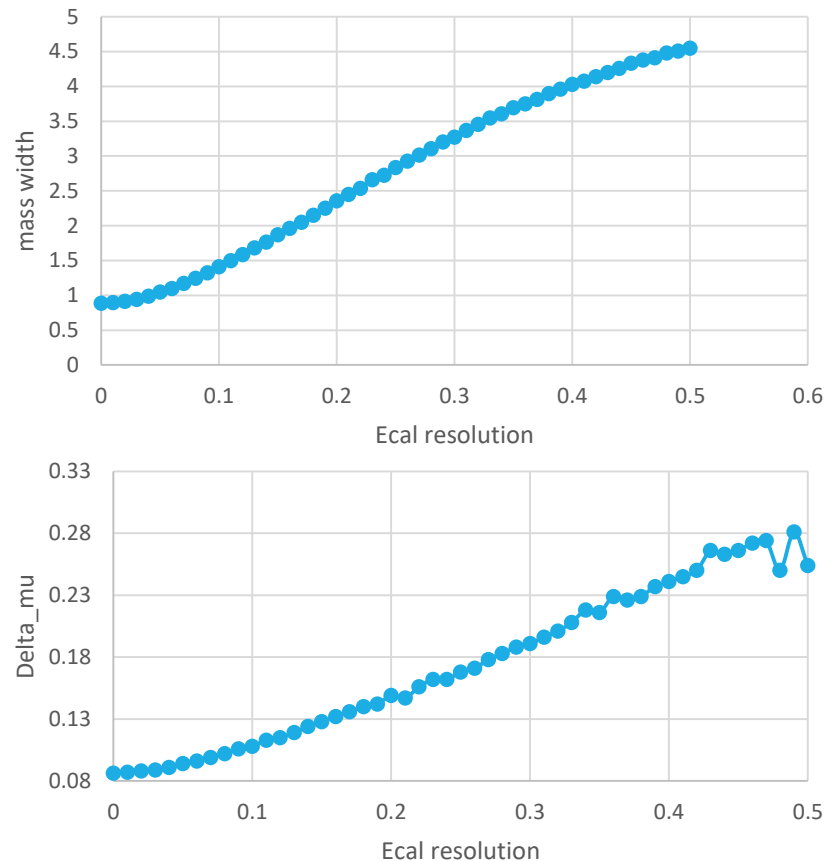


CEPC photon resolution

A relation between $\gamma\gamma$ precision, mass width and Ecal resolution

- $\frac{\delta E}{E} = A \oplus \frac{B}{\sqrt{E}}$, where A is from constant, and B is from sampling.
- Present CEPC benchmark: A=1%, B=16%.
- Fix A to 1%, change B from 1% to ~30%
- MC sample:
 - full simulation ZH->qqqy signal,
 - fast simulation qqqy final state background.
- Reconstruction:
 - Signal: jets from JetClustering Processor, photon from MCParticle+smearing
 - Background: JetClustering + PhotonSelection Processor.

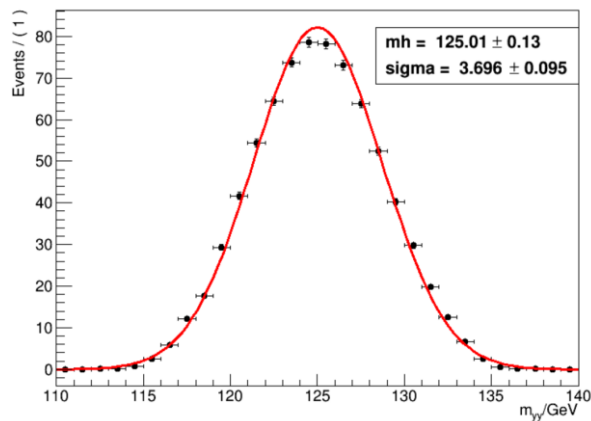
CEPC photon resolution



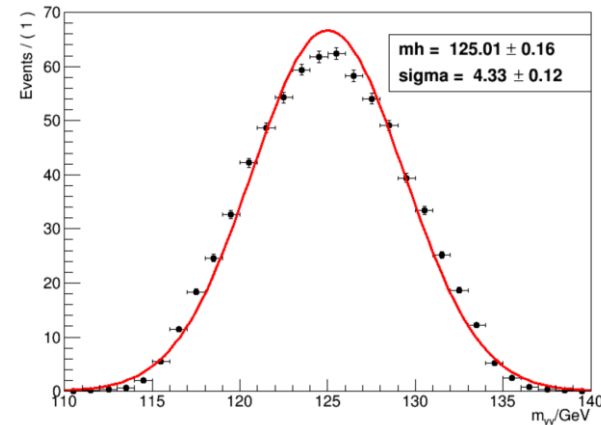
Relationship between Ecal resolution B and di-photon mass with and delta_mu

When $B > \sim 35\%$, Gauss can not fit the signal shape, so delta_mu is not precise as expected.

CEPC photon resolution



$B=35\%$



$B=45\%$

