

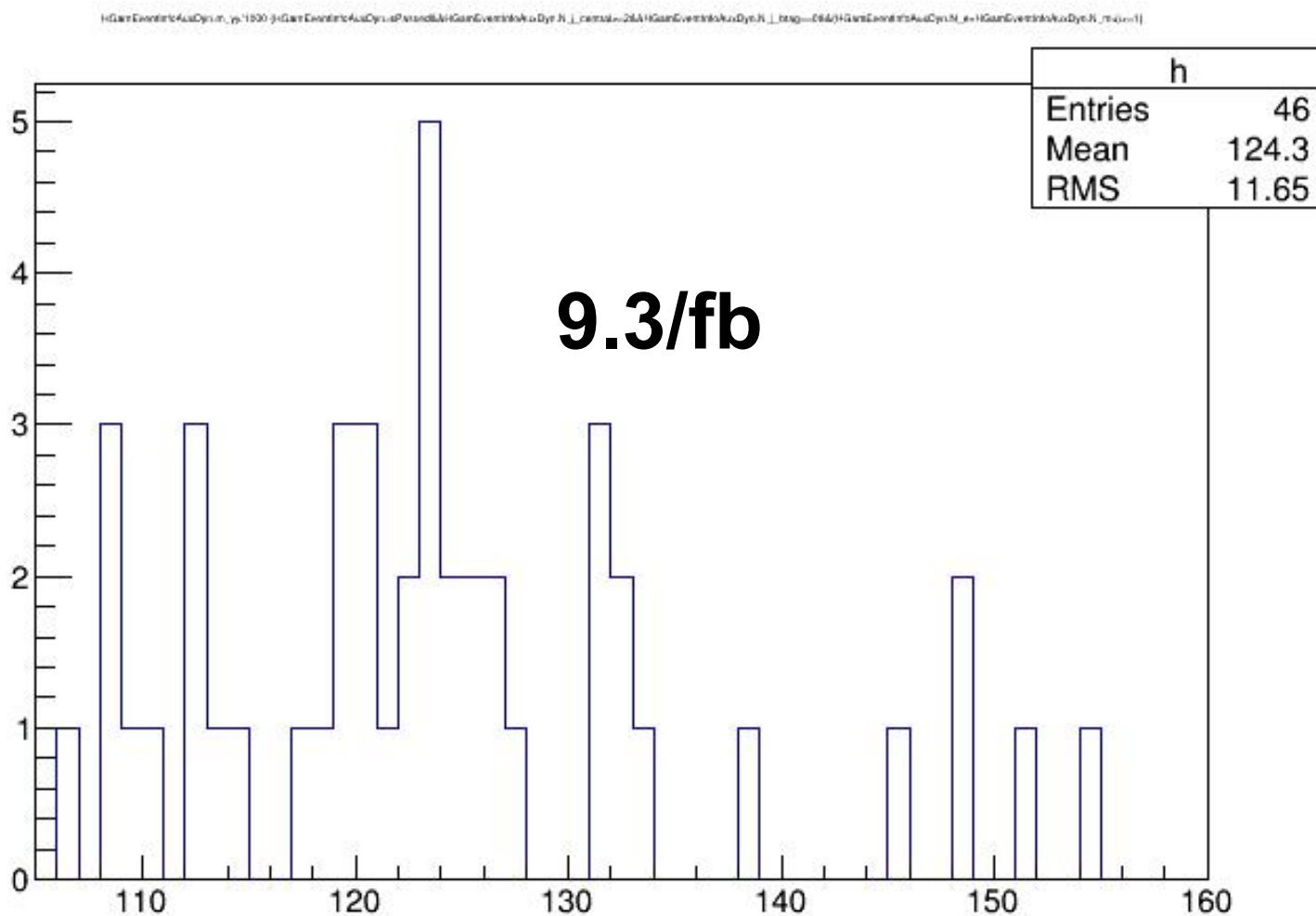
weekly report

Introduction

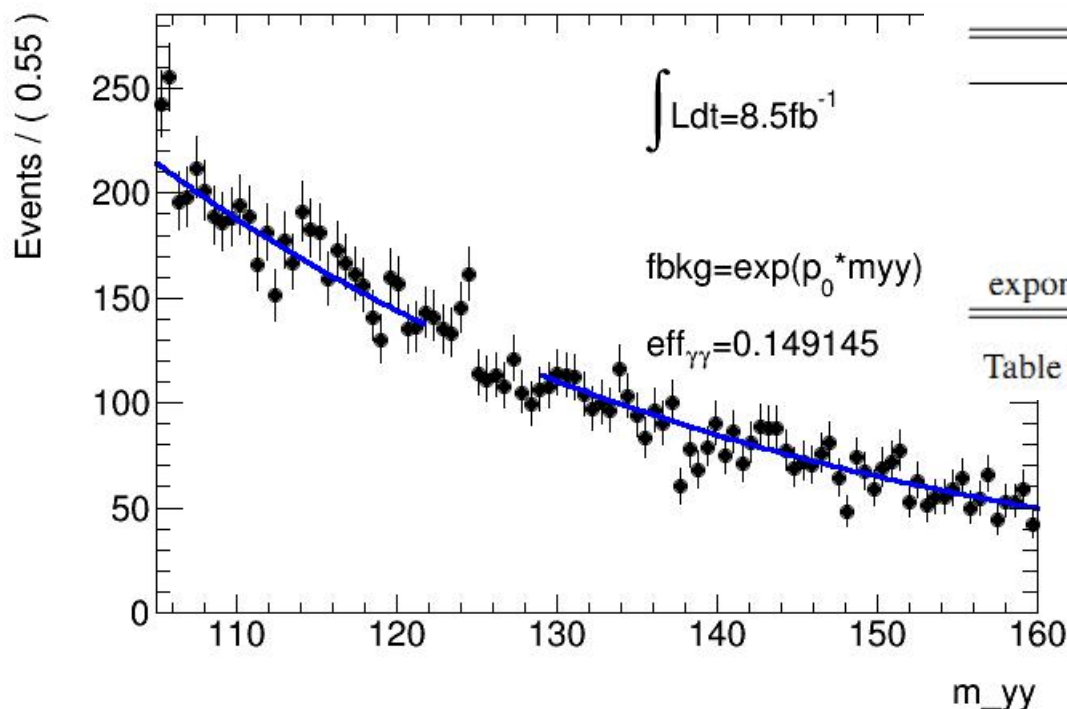
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- **dataset: h013 is launched, 2015 dataset from 3254/pb to 3194ipb**
 - **toroid on : 8589 ipb**
 - **toroid off : 9293 ipb**
 - **private MxAOD : 8545 ipb (toriod off GRL, several runs are missing)**
- **$W(l \nu)W(jj) \gamma \gamma$**
 - **workspace and p-value**
- **$W(jj)W(jj) \gamma \gamma$**
 - **first look at truth information**
- **750**
 - **show myy plots**
- **HGam coupling**
 - **some plots and plans**

$W(l\nu)W(jj)yy$ (8545ipb is used)



- background modelling:
 - extract the shape from 0 lep control region
 - validate the shape will not change from 0lep to ≥ 1 lep
 - number of continuum background is float and fitted from data
- Exponential fit on 0 lep control region
 - $f = \exp(a * m_{\gamma\gamma}) : a = 0.0265 \pm 0.0015$
 - $\text{eff}_{\gamma\gamma} = 0.149$, slightly different with Qi's result

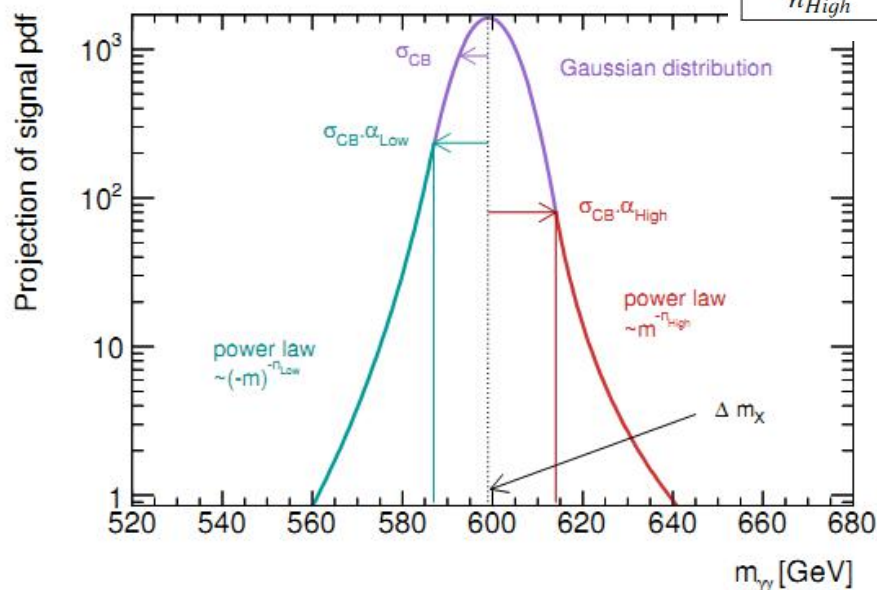


Function	NLL	$\epsilon_{\gamma\gamma}$
0 th -order polynomial	22777.2	12.36%
1 st -order polynomial	22681.4	14.06%
2 nd -order polynomial	22673.5	13.78%
exponential	22673.1	13.76%
exponential with 2 nd -order polynomial	22672.6	13.59%

Table 10: NLL and $\epsilon_{\gamma\gamma}$ with different background modeling.

- **SM Higgs modelling:**
 - from CB+GA(RUN1) to Double Sided CB
 - $\mu_{CB}, \sigma_{CB}, \alpha_{Lo}, n_{Lo}, \alpha_{Hi}, n_{Hi}$ is mass dependent
 - yield is mass dependent (but fit fails in ggH and WH process)
 - fix the yield to SM prediction in Pdf

Parameter	Parameterization	a	b	c
Δm_X	$a + bm_{nX} + cm_{nX}^2$	-0.014 ± 0.011	-0.042 ± 0.003	0.0008 ± 0.0003
σ_{CB}	$a + bm_{nX}$	1.528 ± 0.010	0.605 ± 0.002	
α_{Low}	$a + b/(m_{nX} + c)$	1.372 ± 0.013	5.466 ± 1.167	16.431 ± 4.587
n_{Low}	a	5.95		
α_{High}	$a + b/(m_{nX} + c)$	2.305 ± 0.015	-0.451 ± 0.112	2.0652 ± 0.527
n_{High}	a	3.15		

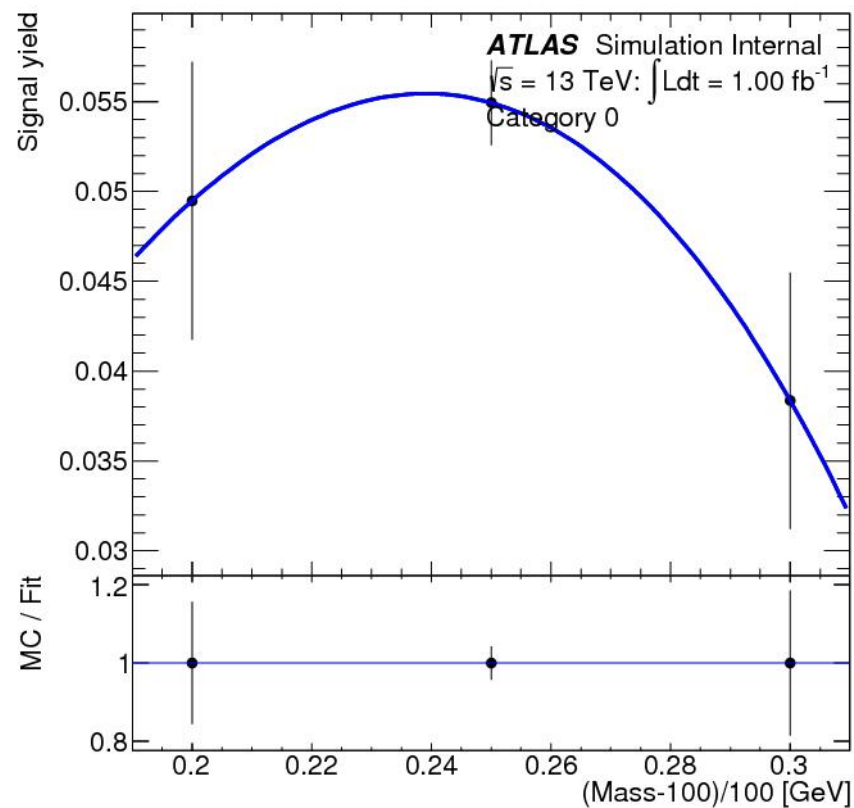
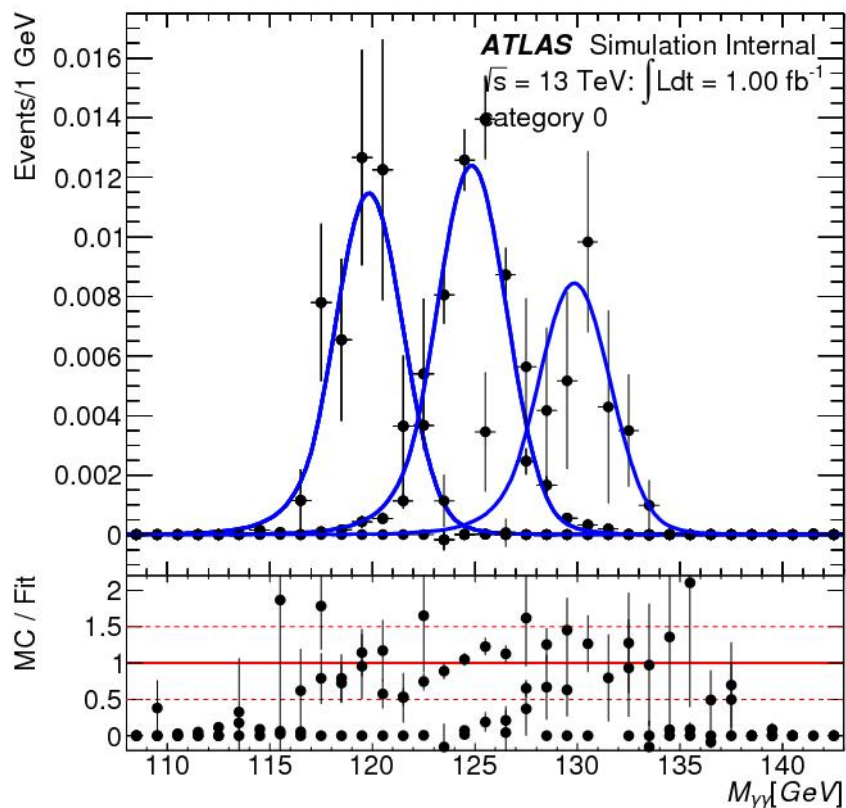


3rd order poly is used for yield parameterization

smhiggs bkg modelling

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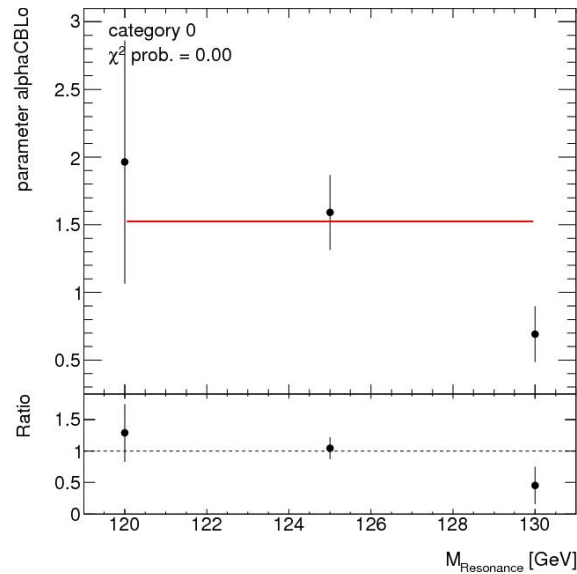
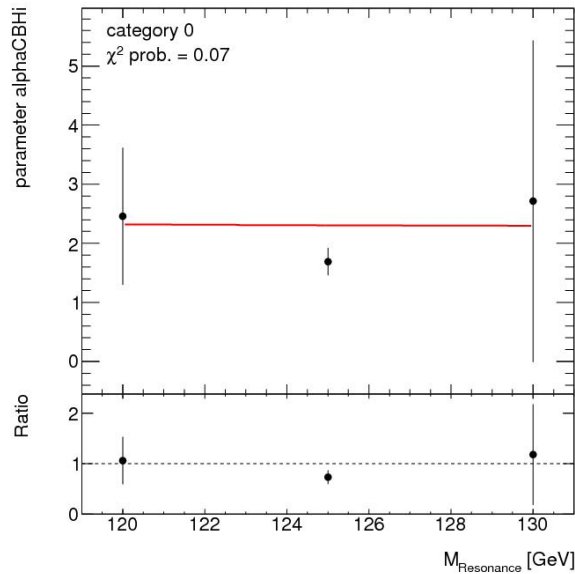
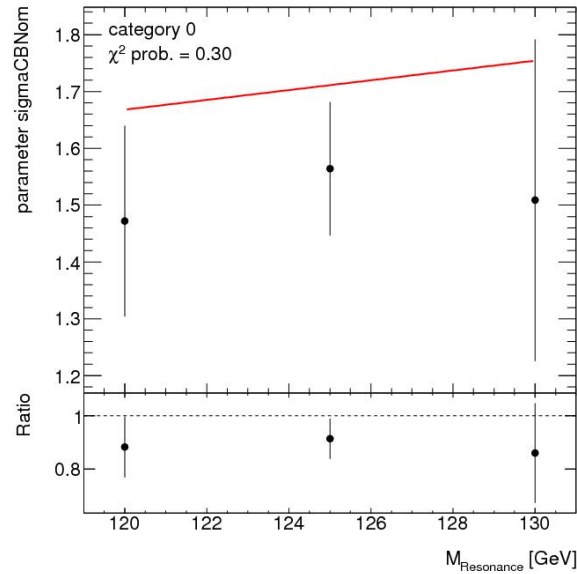
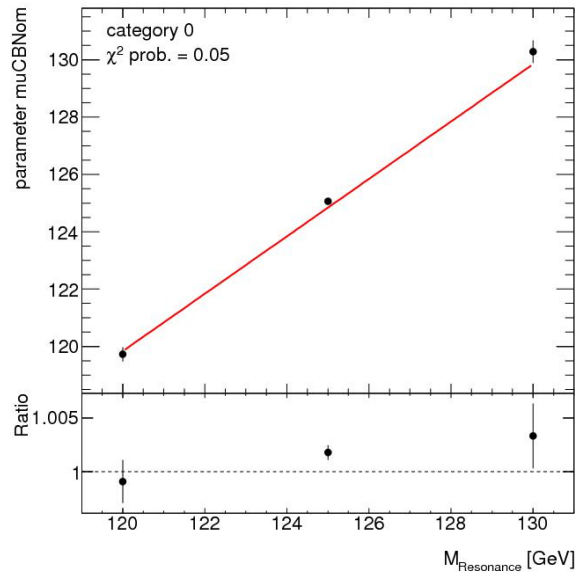
- shape and yield
- MC statistic is limited



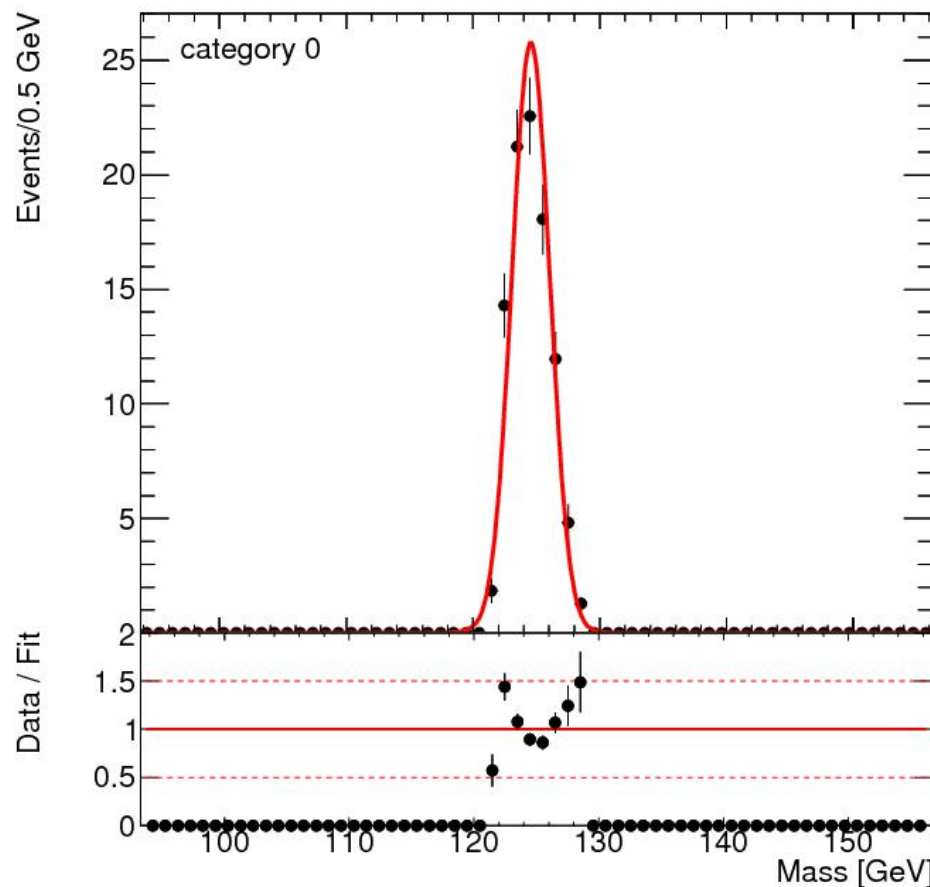
smhiggs bkg modelling

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- not too good!



- $W(l\nu)W(jj)yy$
 - Double Sided CB
 - fix the shape to $m_H=125$
 - $\text{yield} = \sigma(pp \rightarrow H \rightarrow hh \rightarrow WW\gamma\gamma \rightarrow l\nu jj yy) * \text{Lumi}(\text{fb}^{-1}) * \text{eff}(\text{depends on } m_H)$
 - use $m_H=260\text{GeV}$ here



S+B fit

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- fit result
- 1 XsecWWyy 7.14347e+00 +/-3.55959e+00
- 2 mh 1.24149e+02 +/-1.29320e+00
- 3 nbkg 3.08107e+01 +/-6.01324e+00

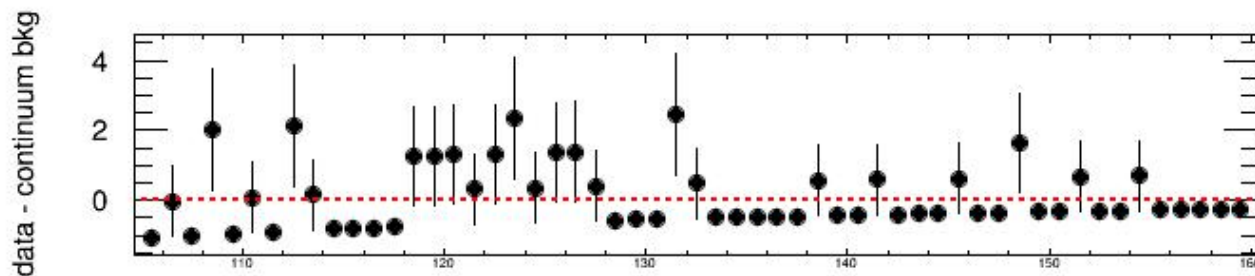
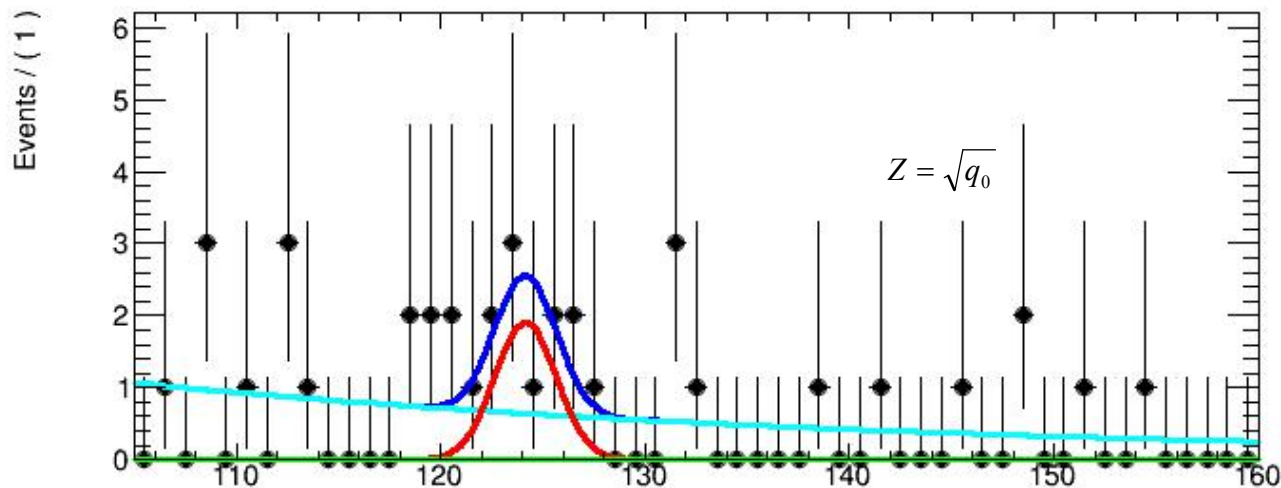
- significance

$$q_0 = -2 \ln \frac{L(0, \hat{\theta})}{L(\hat{\mu}, \hat{\theta})}$$

$$Z = \sqrt{q_0}$$

$$q_0 = 3.44$$

**Z = 1.85 sigma
to be confirmed!**



remaining issues

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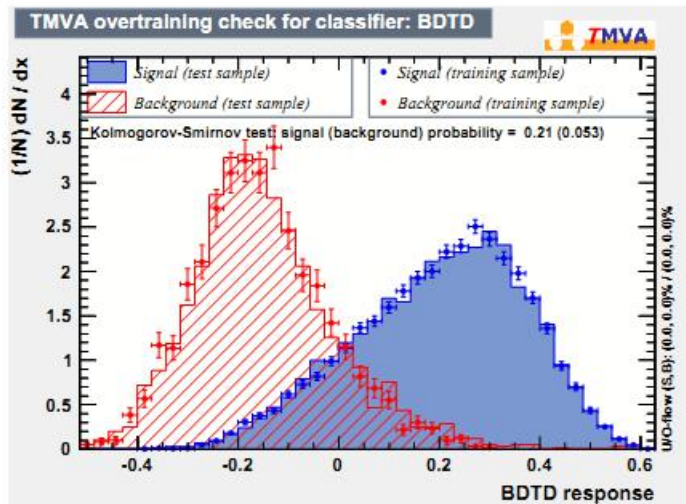
- **problems with DSCB**
 - **does not exist in standard RooFit library**
 - **can not open the workspace containing DSCB**
 - **ProfileLikelihoodRatio fit is not successful**

- testing the code...
- review what was done in RUN1

$$p_T(\gamma\gamma) + p_T(jet12) + p_T(missW) = 0 \quad (4)$$

It has to be noted that the *missW* component includes also contributions from *W* bosons decaying to two jets that fail the jet p_T threshold.

- four jets and BDT
- plan
investigate the 4jet signature

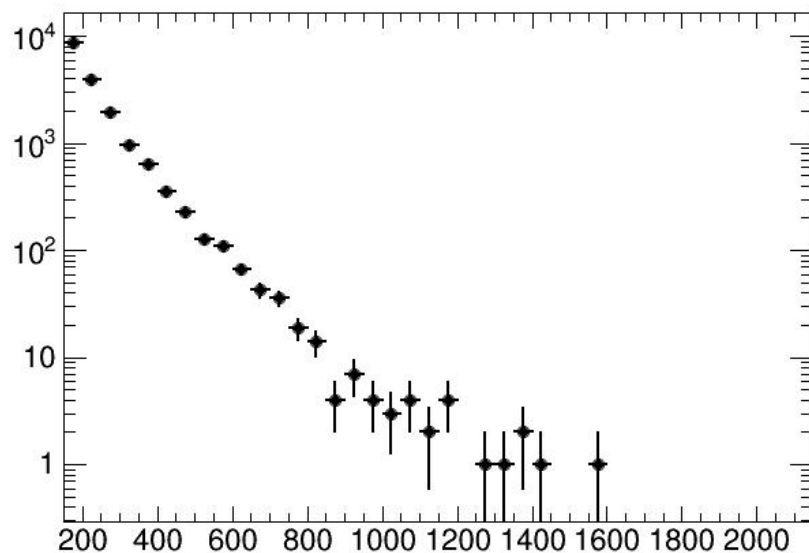
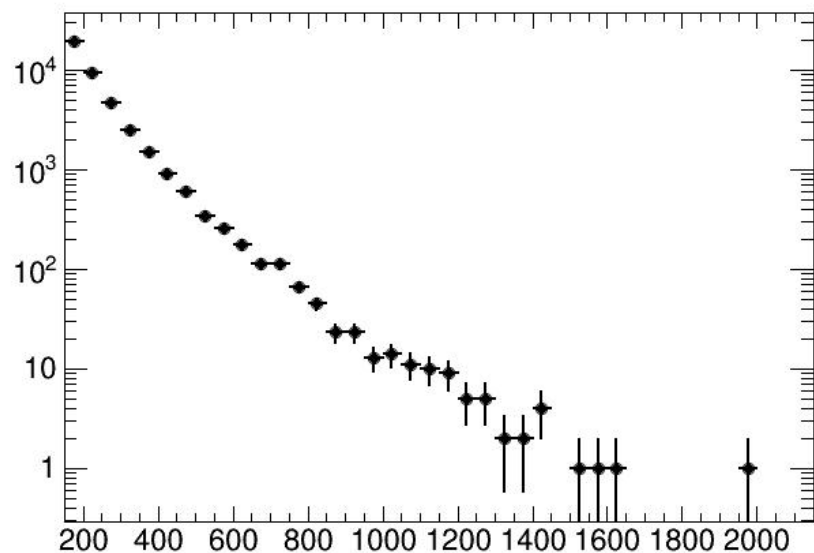
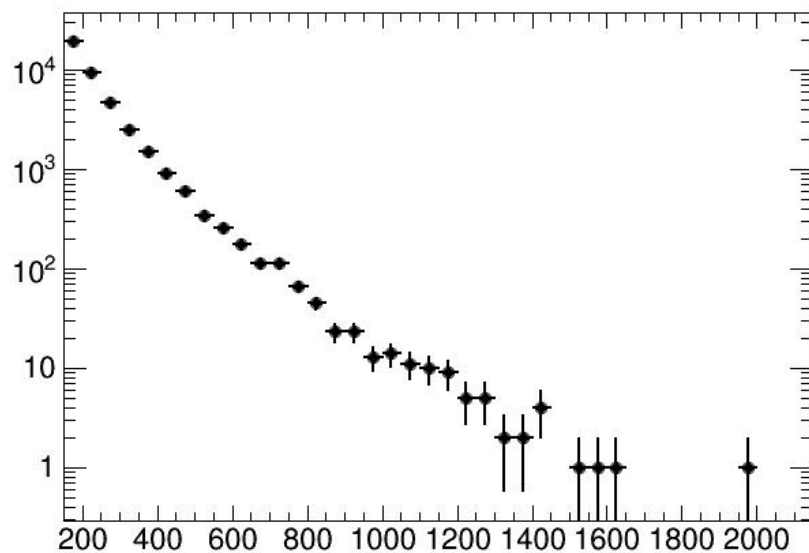
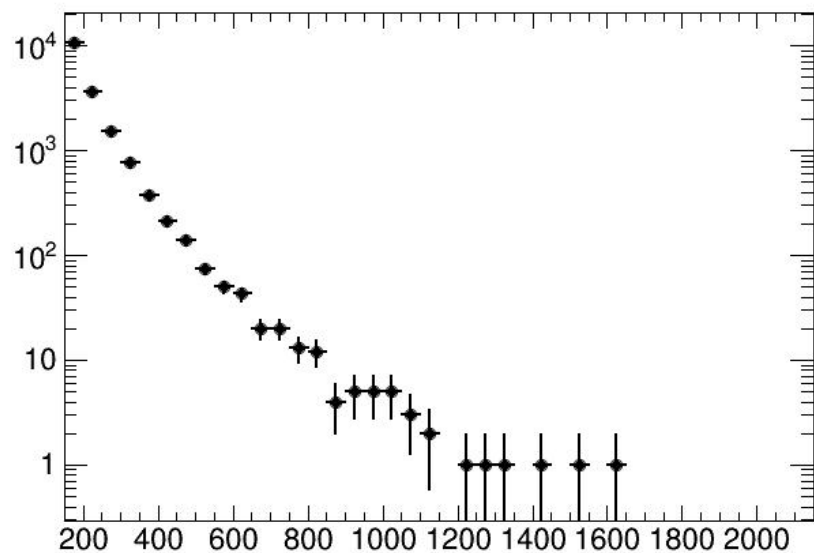


γ -related	jet -related	γjet -related
$p_T(\gamma 1)$	$p_T(jet 1)$	η^*
$\eta(\gamma 1)$	$\eta(jet 1)$	$\Delta\phi(\gamma\gamma, jet 12)$
$\phi(\gamma 1)$	$\phi(jet 1)$	$\Delta\eta(\gamma\gamma, jet 12)$
$p_T(\gamma 2)$	$E(jet 1)$	$min\Delta R(\gamma, jet)$
$\eta(\gamma 2)$	$p_T(jet 2)$	$E(missW)$
$\phi(\gamma 2)$	$\eta(jet 2)$	$m(missW)$
$p_T(\gamma\gamma)$	$\phi(jet 2)$	$\phi(missW)$
$\eta(\gamma\gamma)$	$E(jet 2)$	
$\phi(\gamma\gamma)$	$p_T(jet 12)$	
$p_{T_i}(\gamma\gamma)$	$\eta(jet 12)$	
$\Delta\phi(\gamma, \gamma)$	$\phi(jet 12)$	
$\Delta\eta(\gamma, \gamma)$	$E(jet 12)$	
	$\Delta\eta(jet 1, 2)$	

Table 9: Variable used in BDT training

750 (8585ipb)

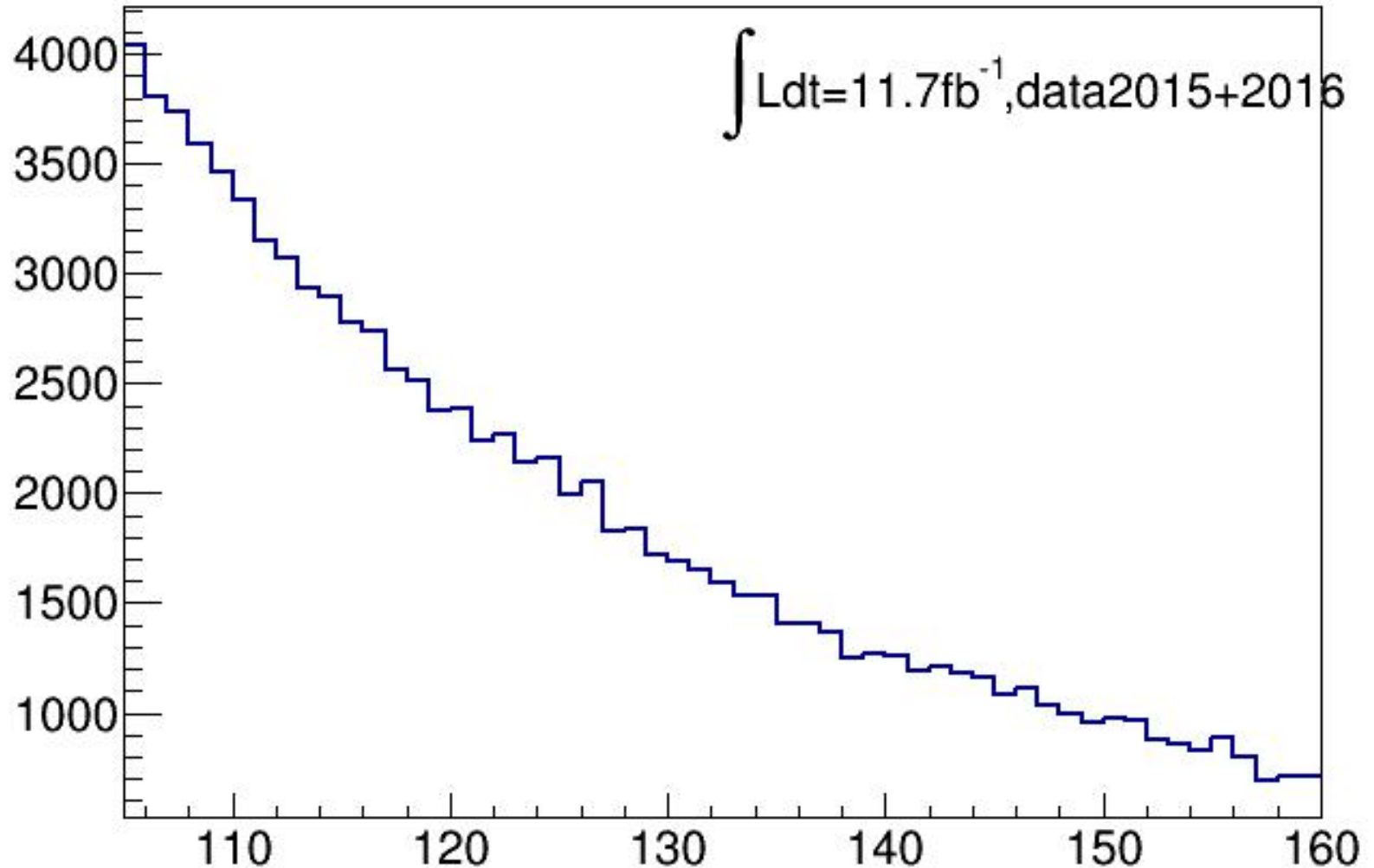
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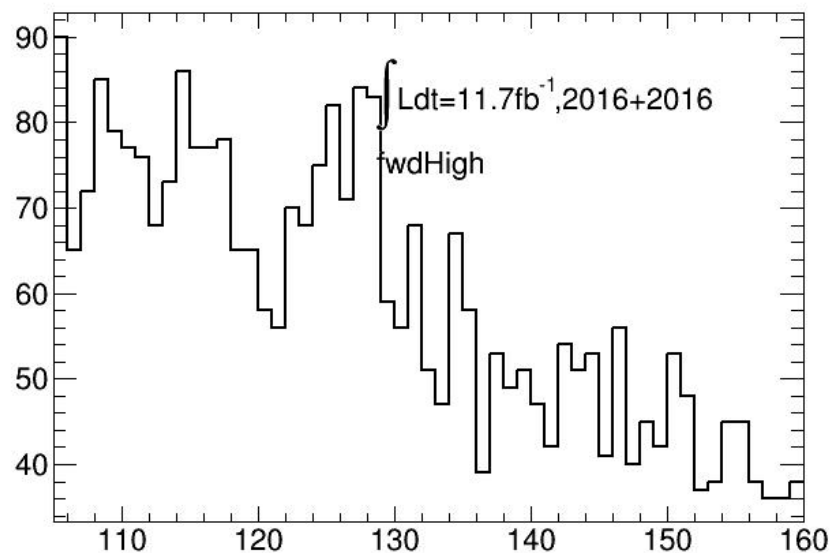
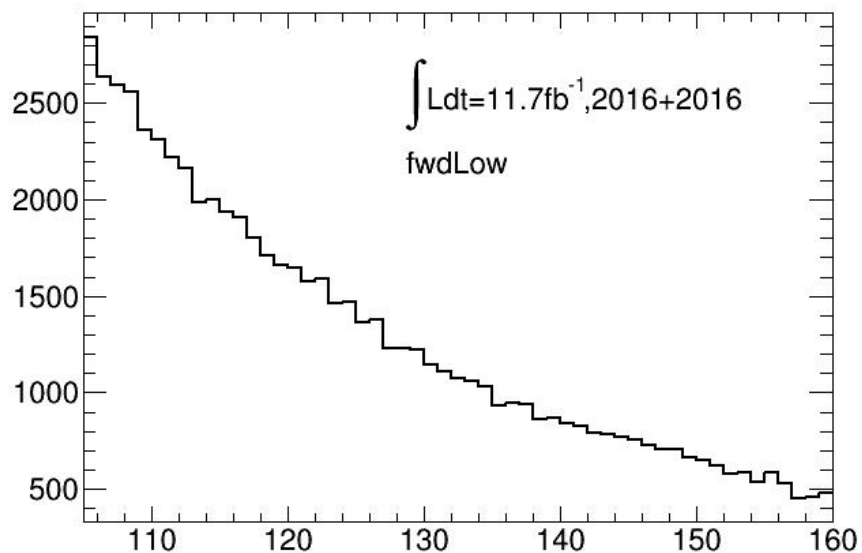
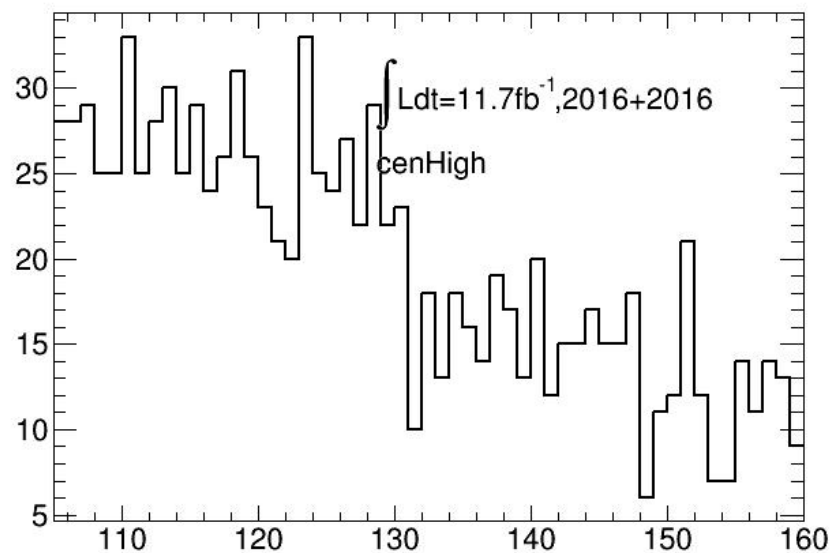
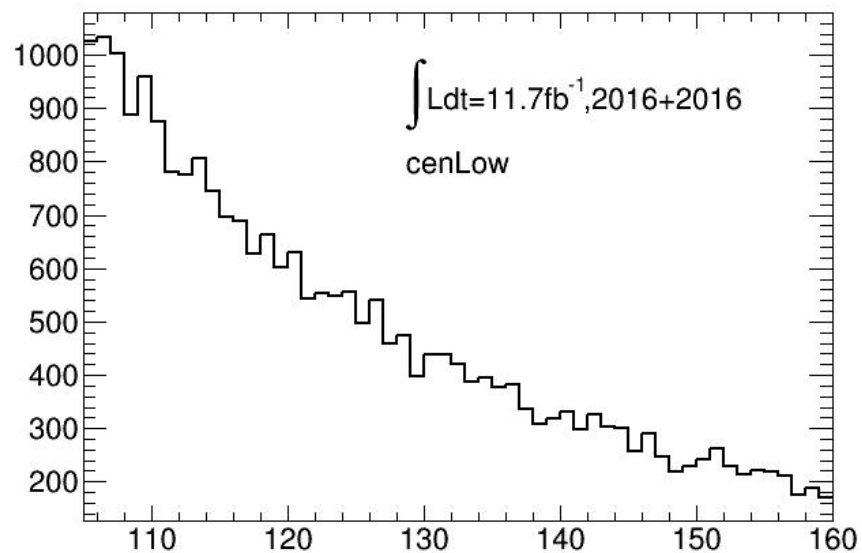


HGam Coupling -- myy plots

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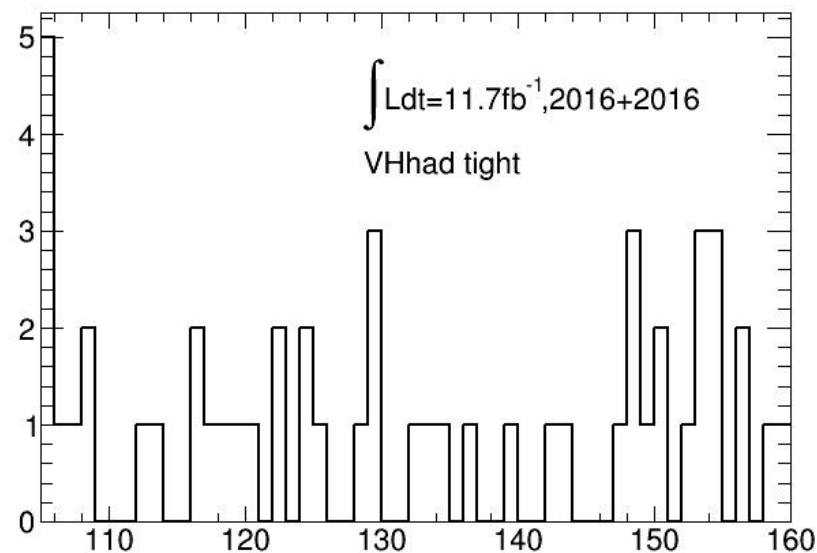
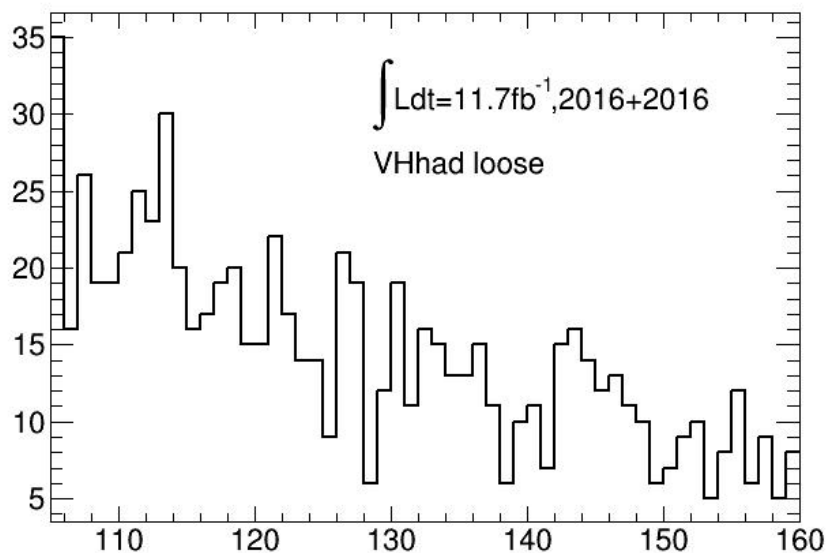
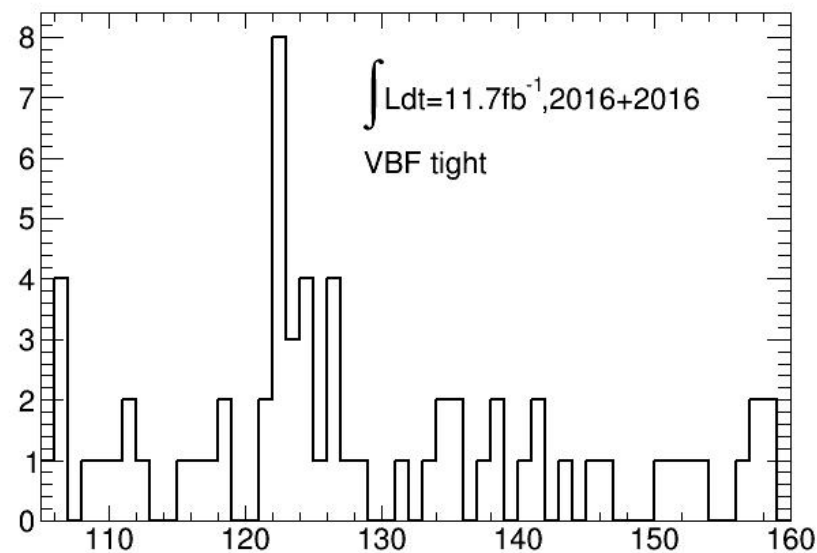
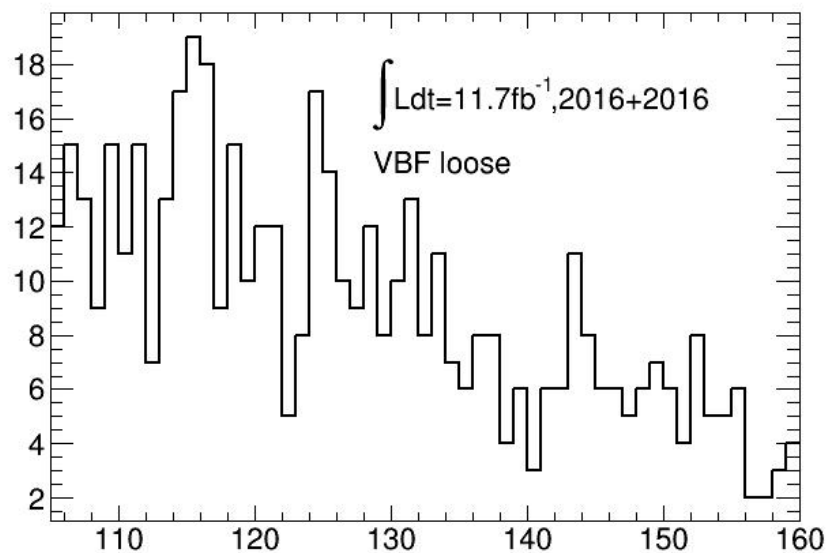
- inclusive $3.2+8.5=11.7\text{fb}^{-1}$





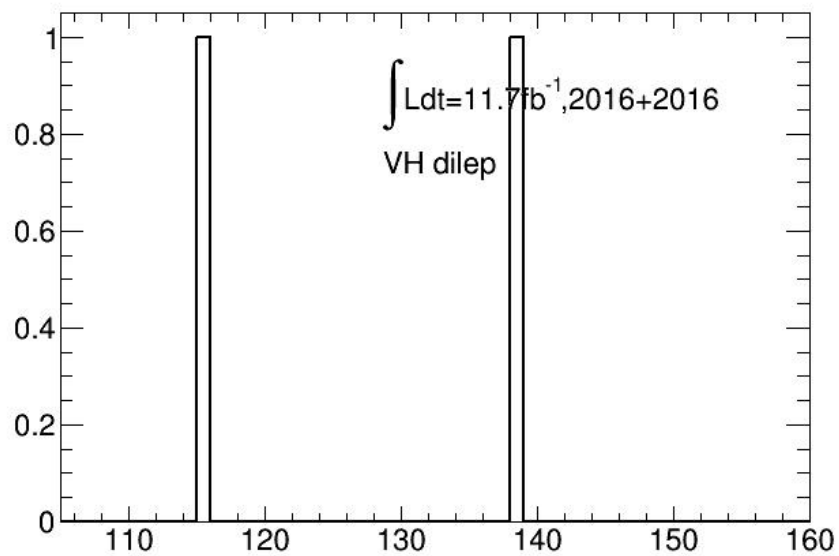
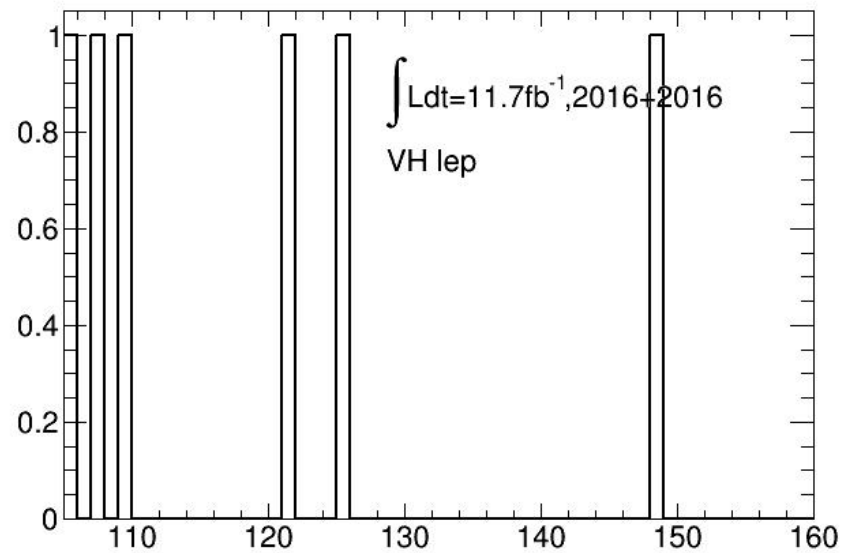
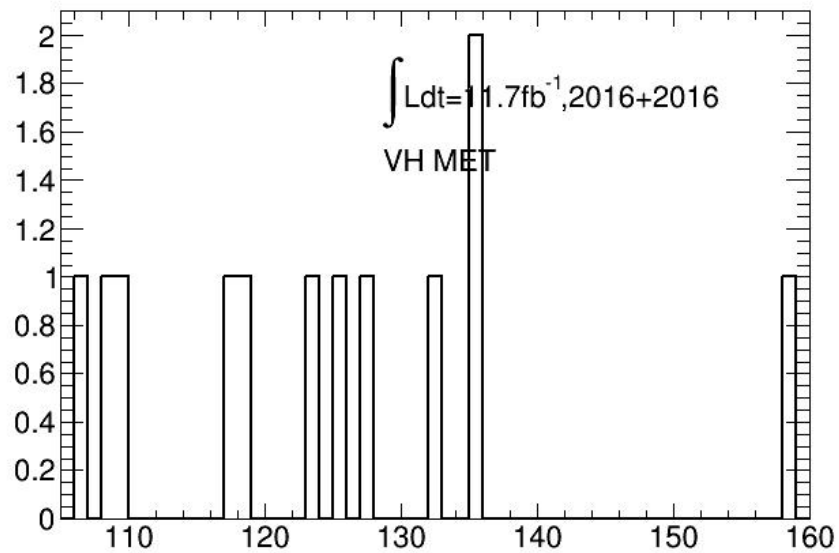
VBF and VHhad

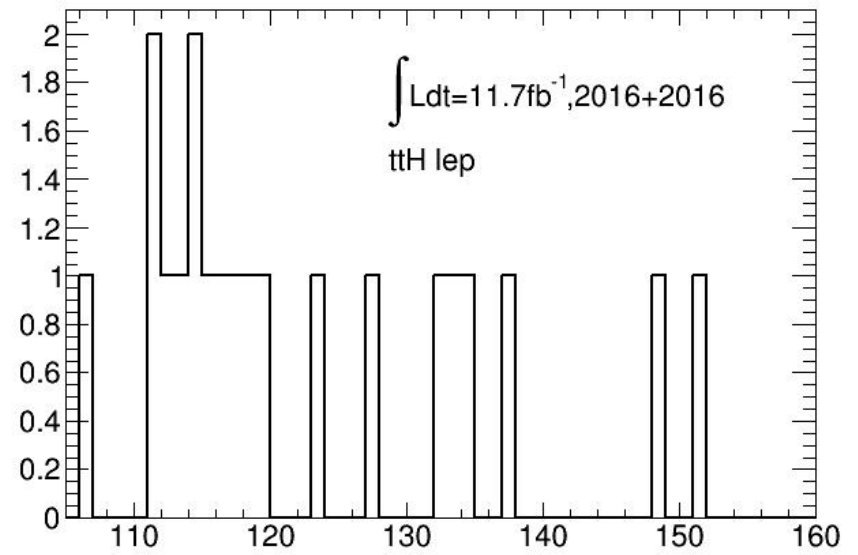
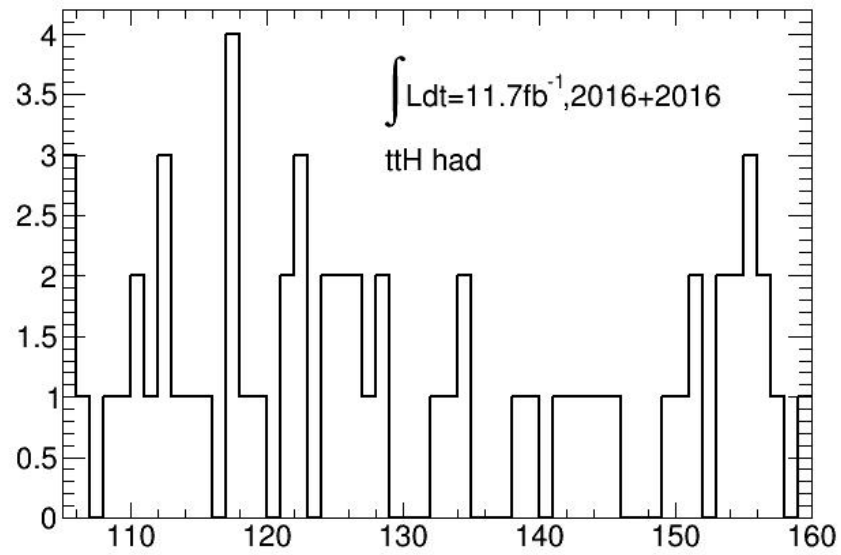
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VH non-had

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plans

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- **touch the statistic interpretation**
 - **already contributions from Jared**
 - **fit the signal strength**
 - **p-value**