Weekly Report

---SIQI LI

Event Selection Adjustment

Before	After
$E\gamma_{>}$40GeV	$E\gamma_{>}$25GeV
$E\gamma_{>}$40GeV	$E\gamma_{>}$25GeV
25GeV$_{<}pT\gamma 1_{<}$90GeV	25GeV$_{<}pT\gamma 1_{<}$90GeV
10GeV$_{<}pT\gamma 1_{<}$90GeV	10GeV$_{<}pT\gamma 2_{<}$12GeV
110GeV$_{<}$M$\gamma\gamma_{<}$140GeV	120GeV$_{<}$M$\gamma\gamma_{<}$130GeV
80GeV<RecoMgg<170GeV	80GeV<RecoMgg<170GeV
26GeV$_{<}E$mM$_{<}$77GeV	15GeV$_{<}E$mM$_{<}$120GeV
24GeV$_{<}E$mM$_{<}$80GeV	15GeV$_{<}E$mM$_{<}$120GeV
80GeV<Mmm<100GeV	0GeV<Mmm<240GeV
120GeV<RecoMmm<170GeV	100GeV<RecoMmm<170GeV

After Cut

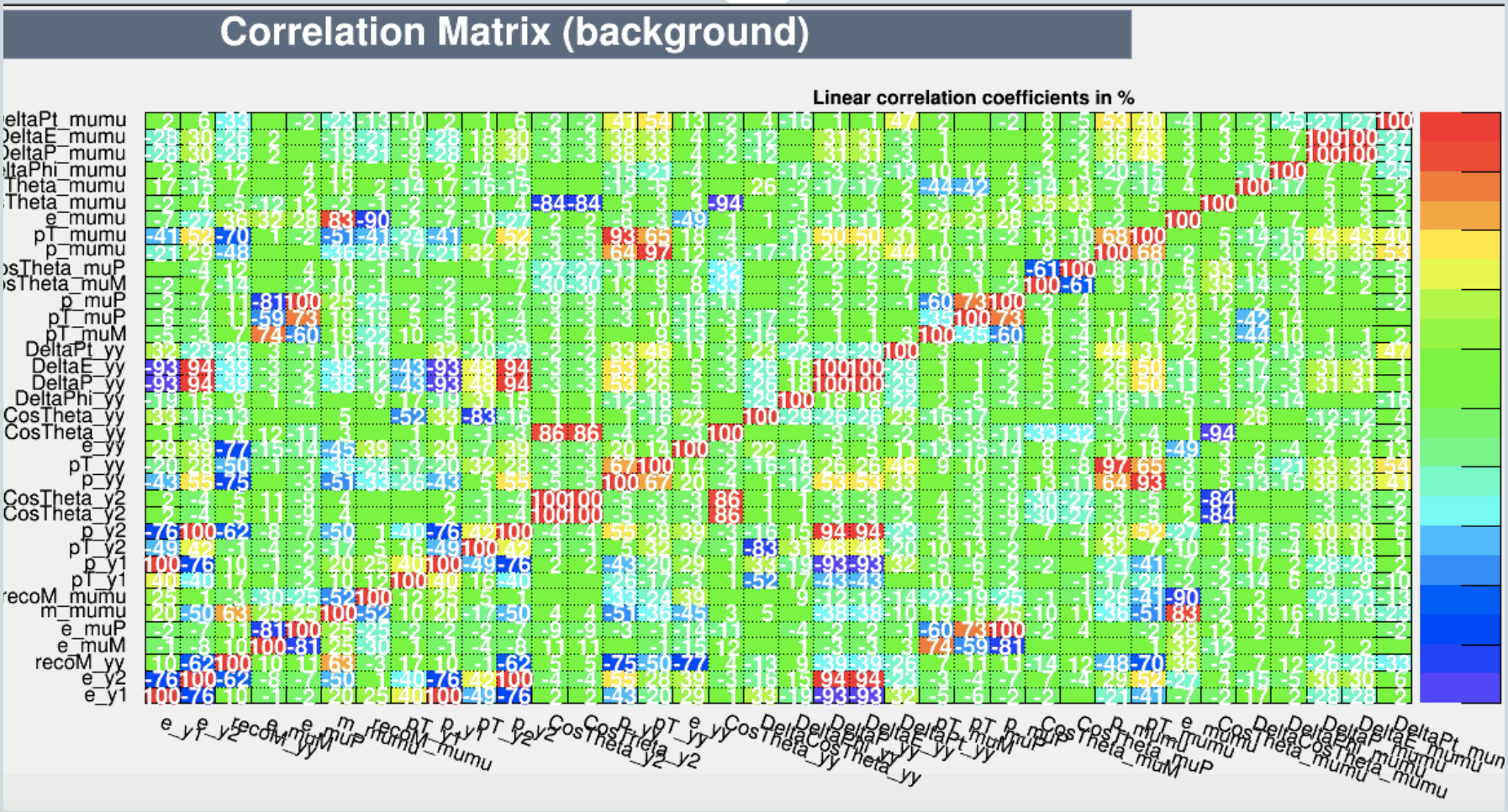
	$120eV < m_{\gamma\gamma} < 130eV$		$110eV < m_{\gamma\gamma} < 140eV$	
	Signal	Background	Signal	Background
Left Events	81795	2182	82733	6535
scaled to 5 ab-1	63.8216362	2241.422067	64.4117771	6712.96664

MVA method

- Consider variables
  - P, E, pT, $cos\theta$ of two photon and two μ
  - ΔP, ΔE, $\Delta\phi$, $\Delta\, cos\theta$ between two photon, and two μ
  - Mass, recoil mass, pTt of two photon and two μ

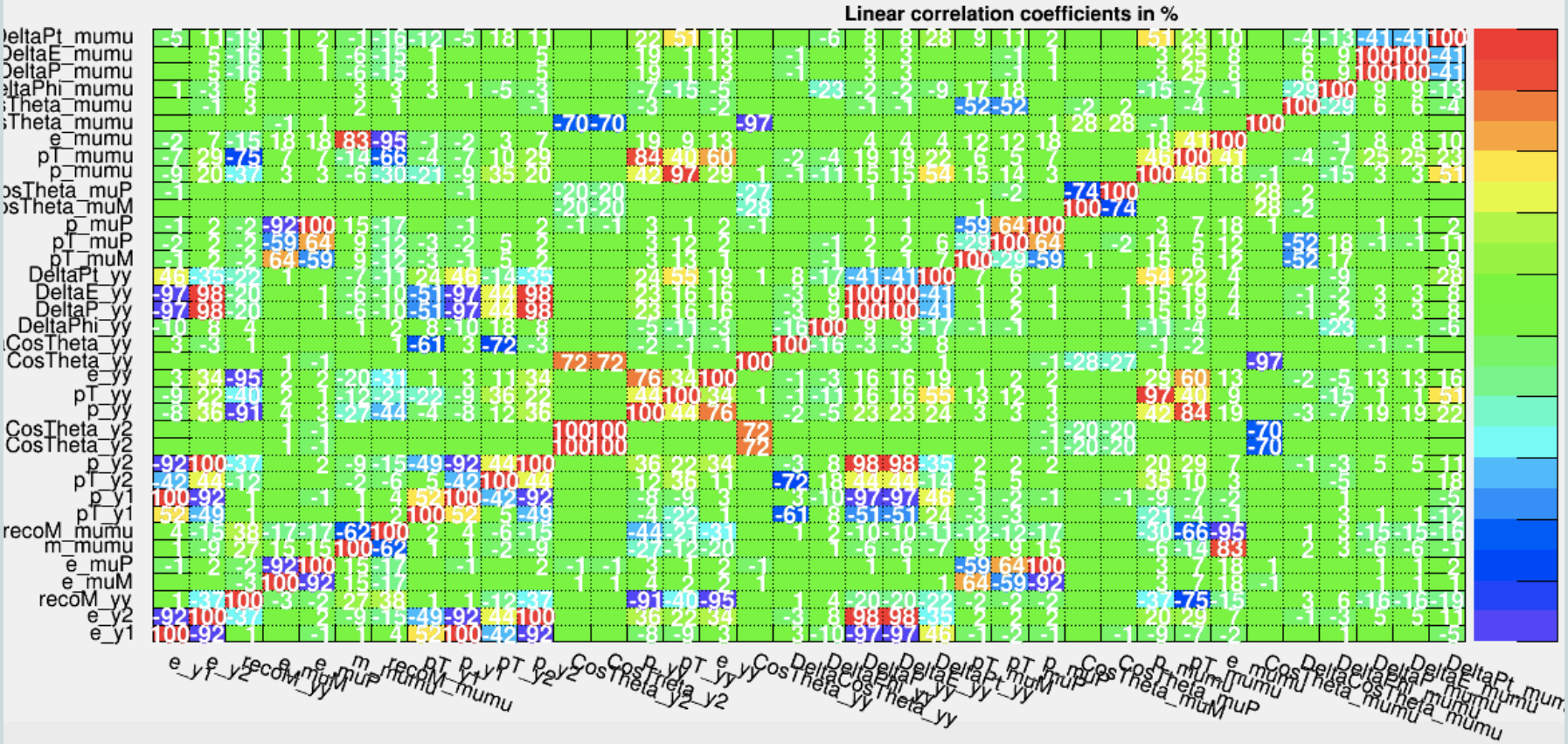
Totally 36 varibles

Variable Correlation Matrix



Variable Correlation Matrix

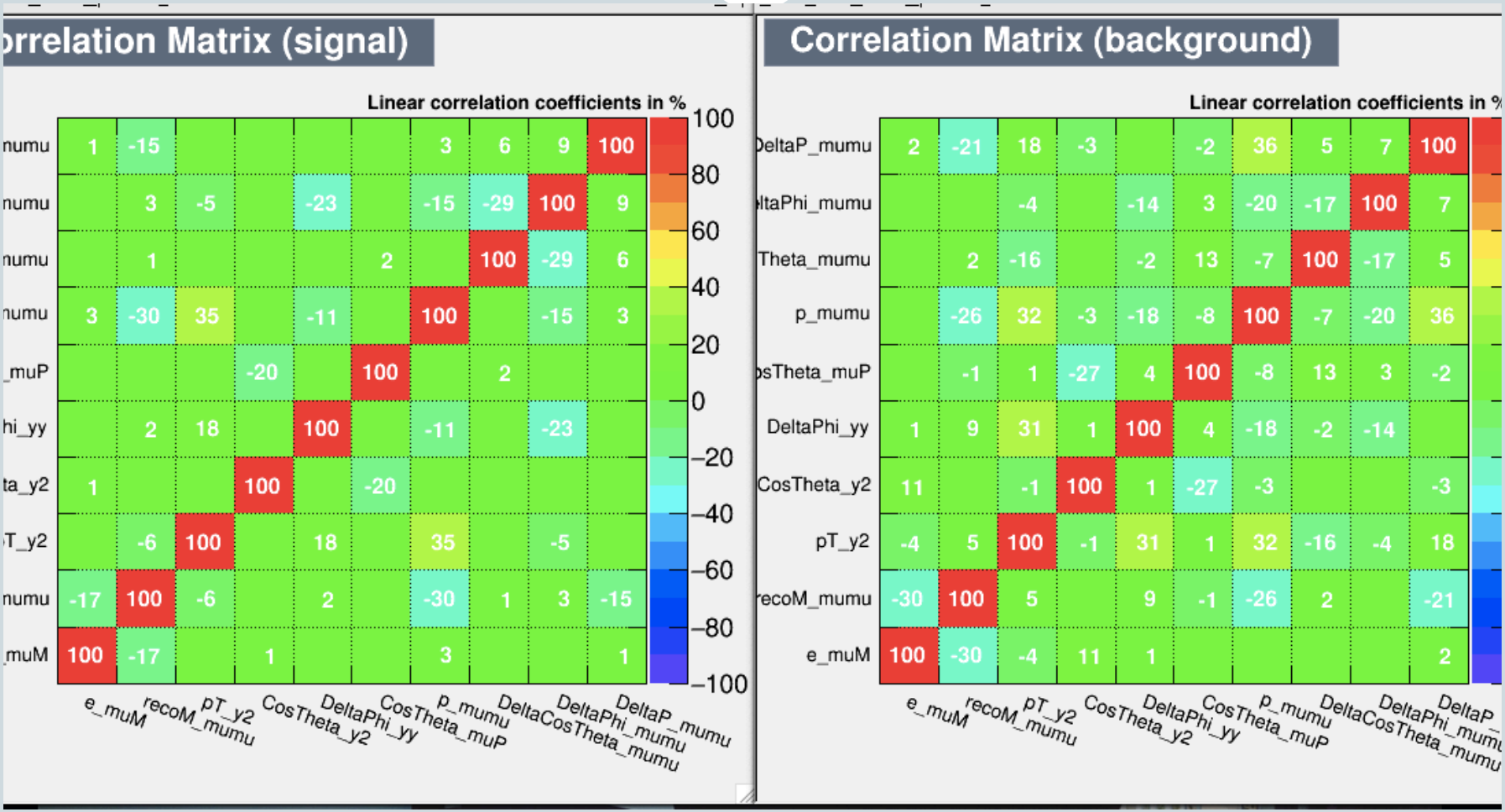
Correlation Matrix (signal)



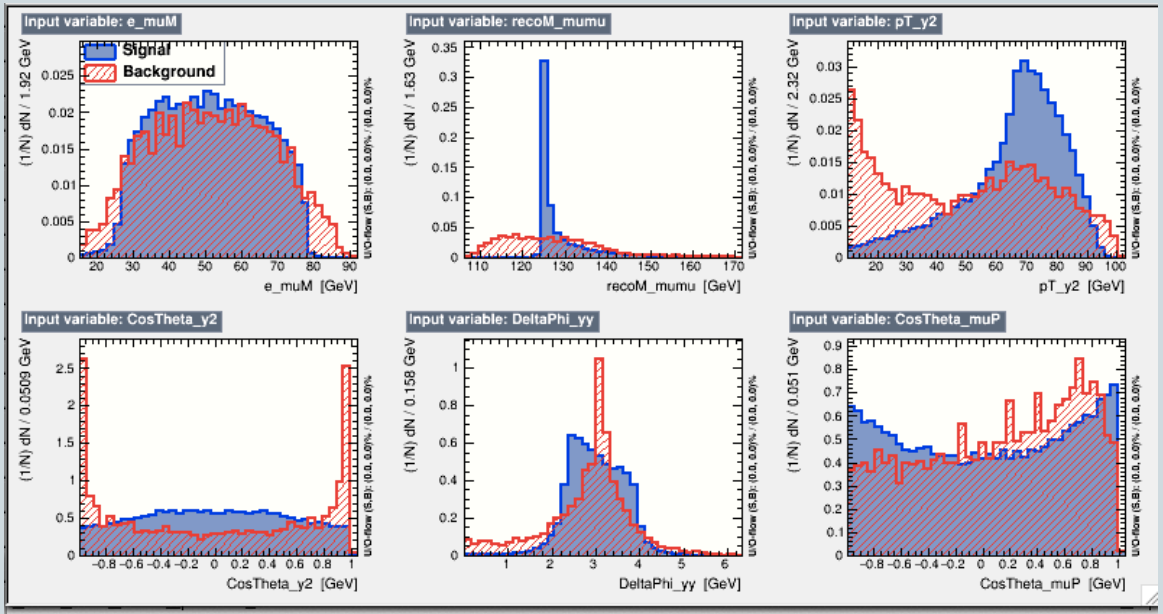
Remaining Variables

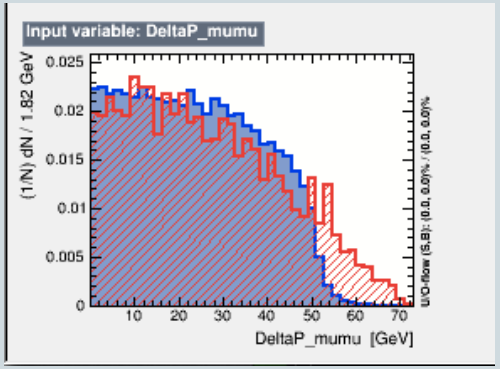
- Energy of μ minus
- recoil mass of μ
- pT of γ2
- $cos\theta$ of γ2
- $\Delta\phi$ of γγ
- $cos\theta$ of μ plus
- $\Delta\ cos\theta$ of μμ
- $\Delta\phi$ of μμ
- ΔP of μμ

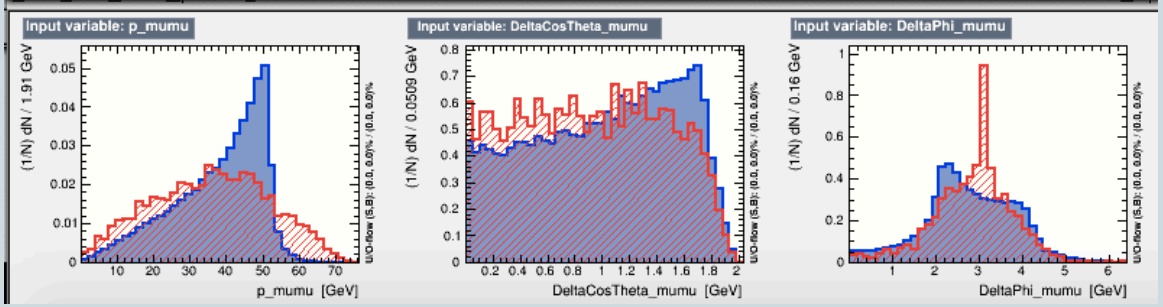
Variable Correlation Matrix



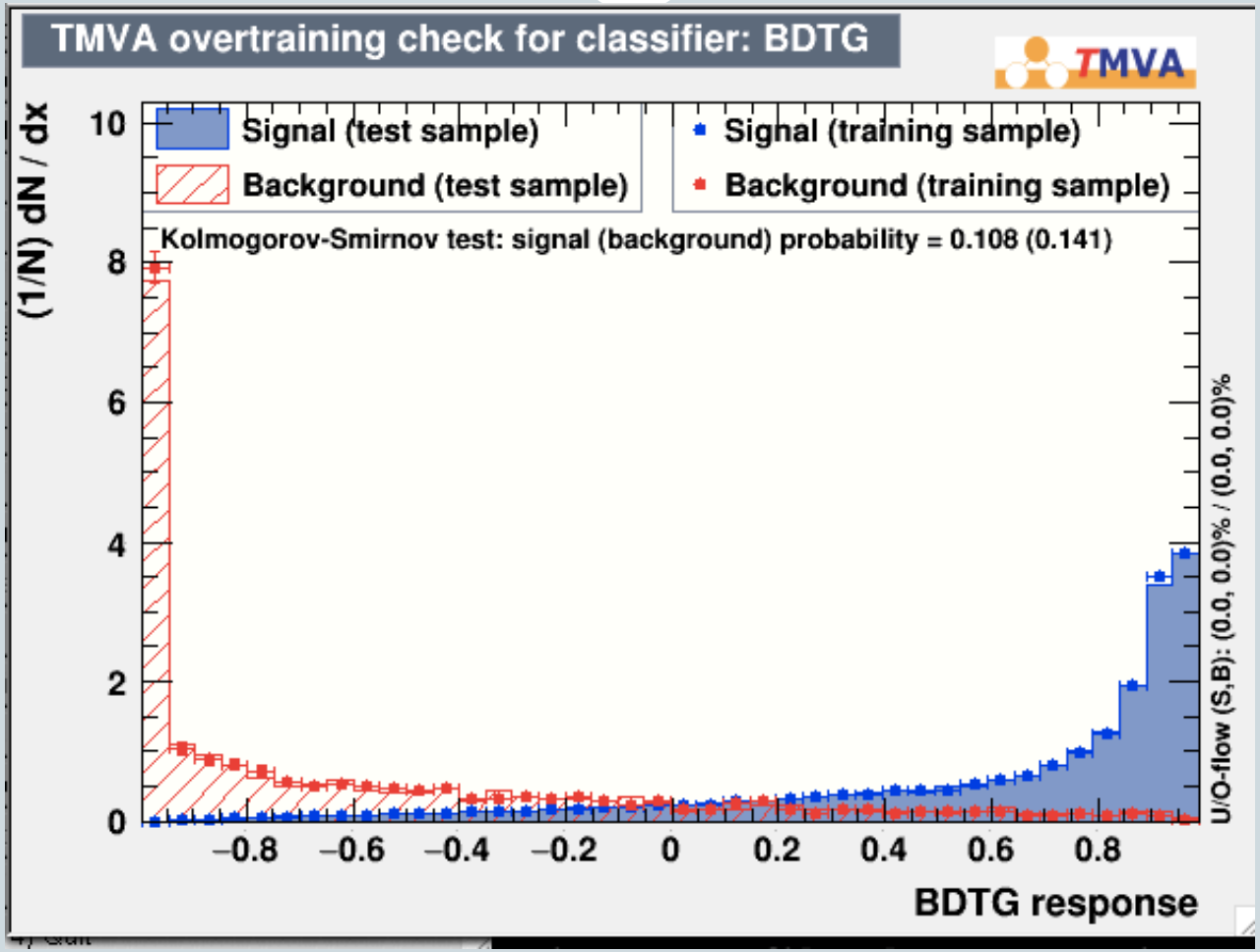
Input Variables



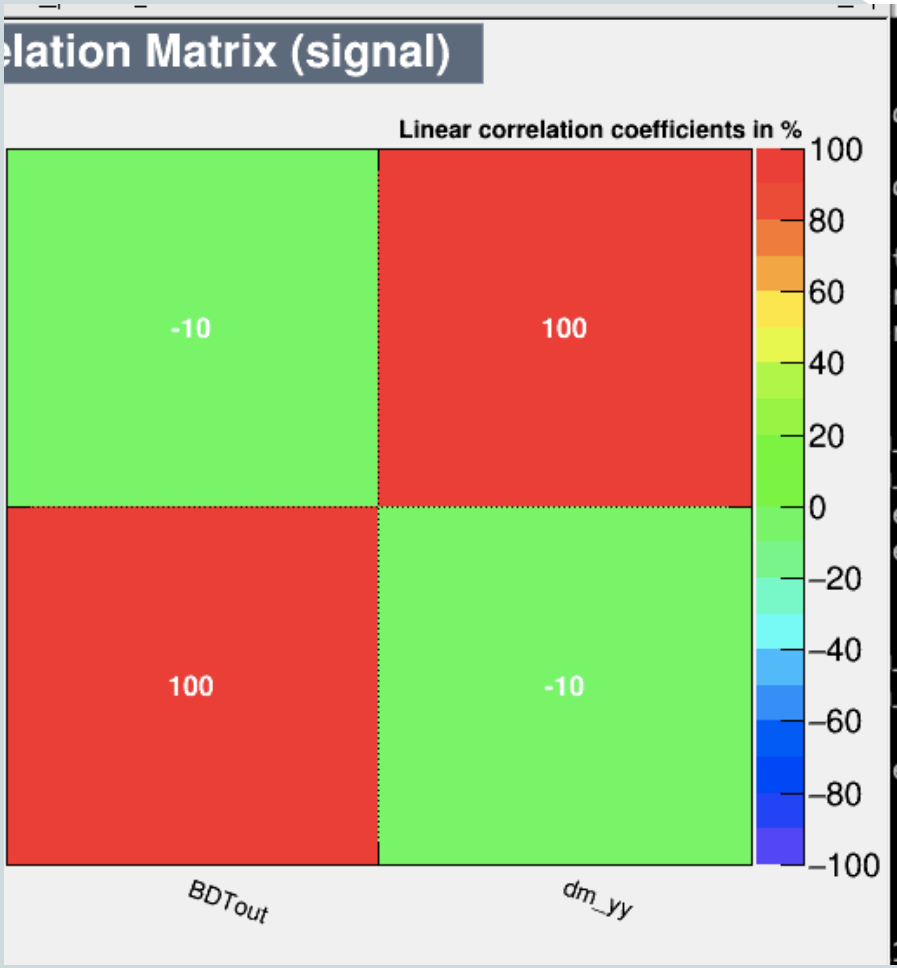


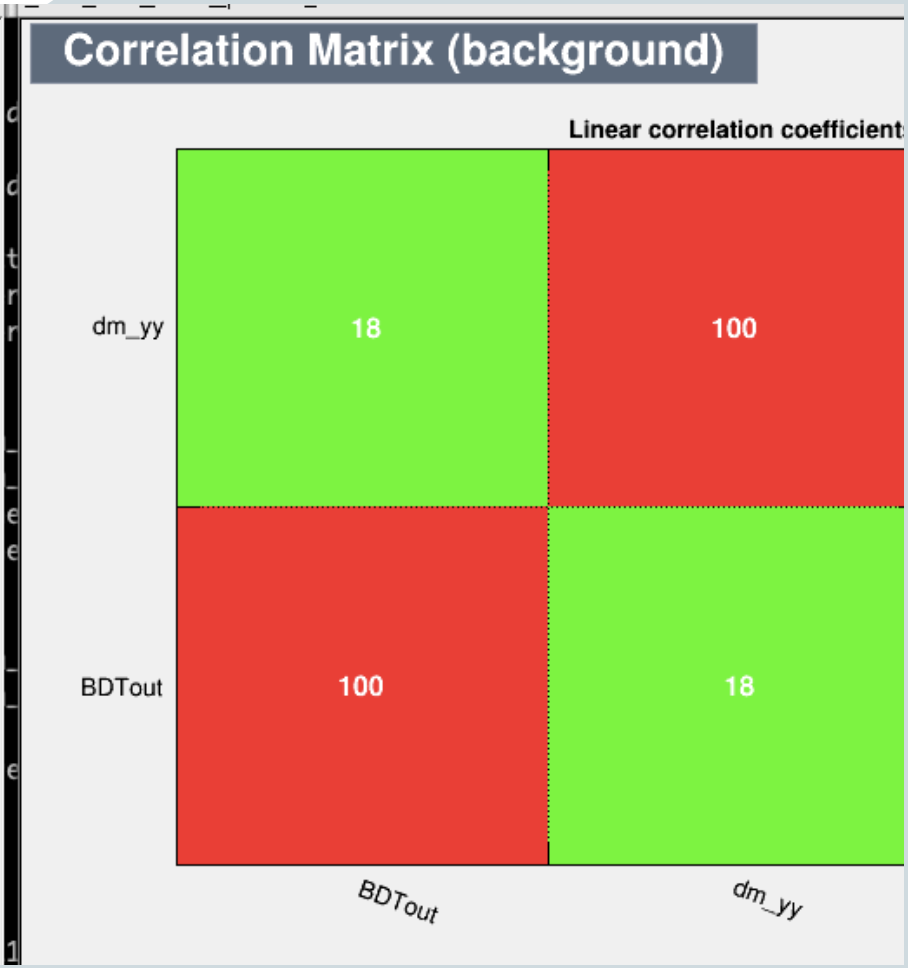


TMVA overtraining Check

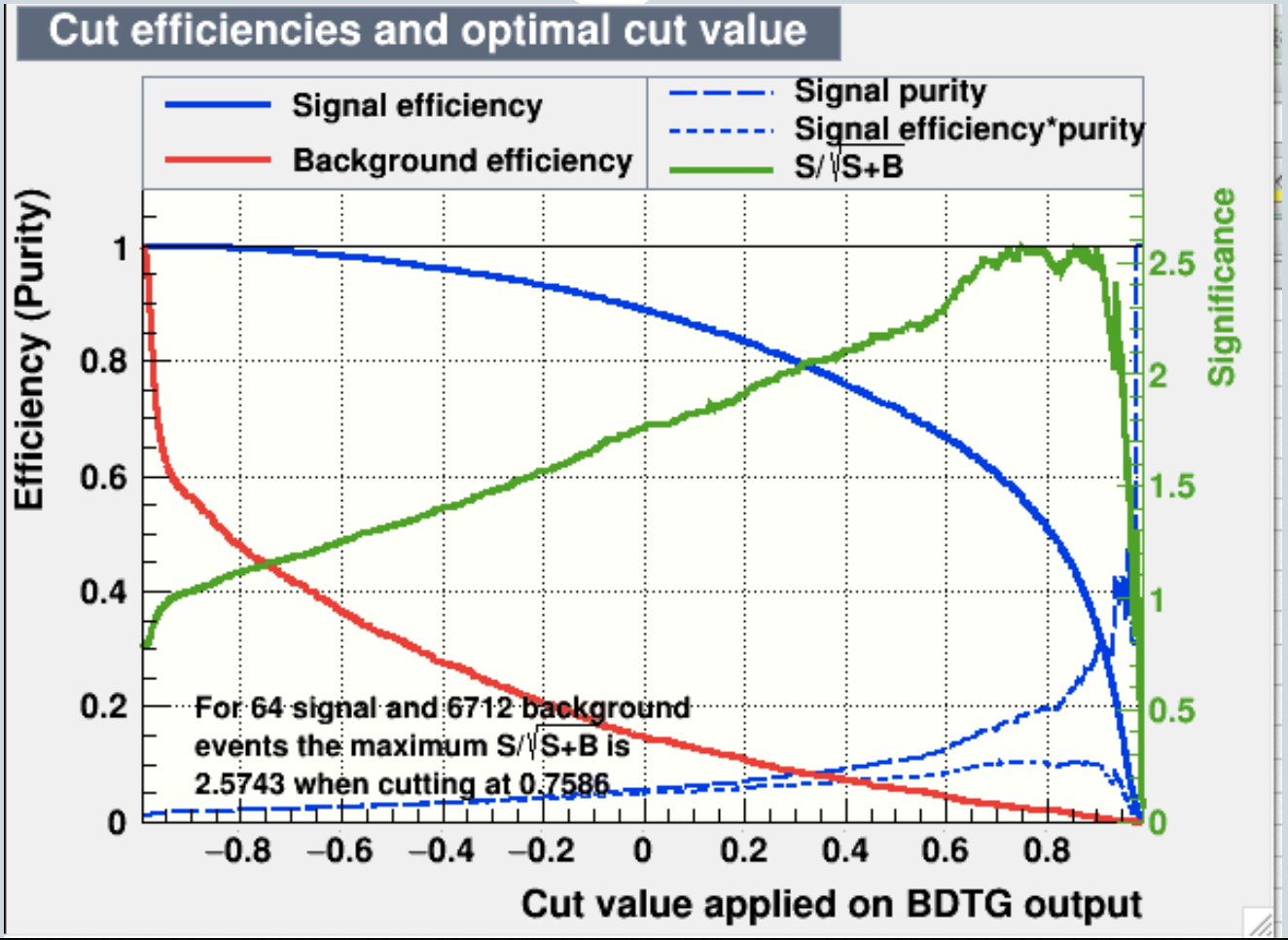


Correlation Between BDT and mγγ



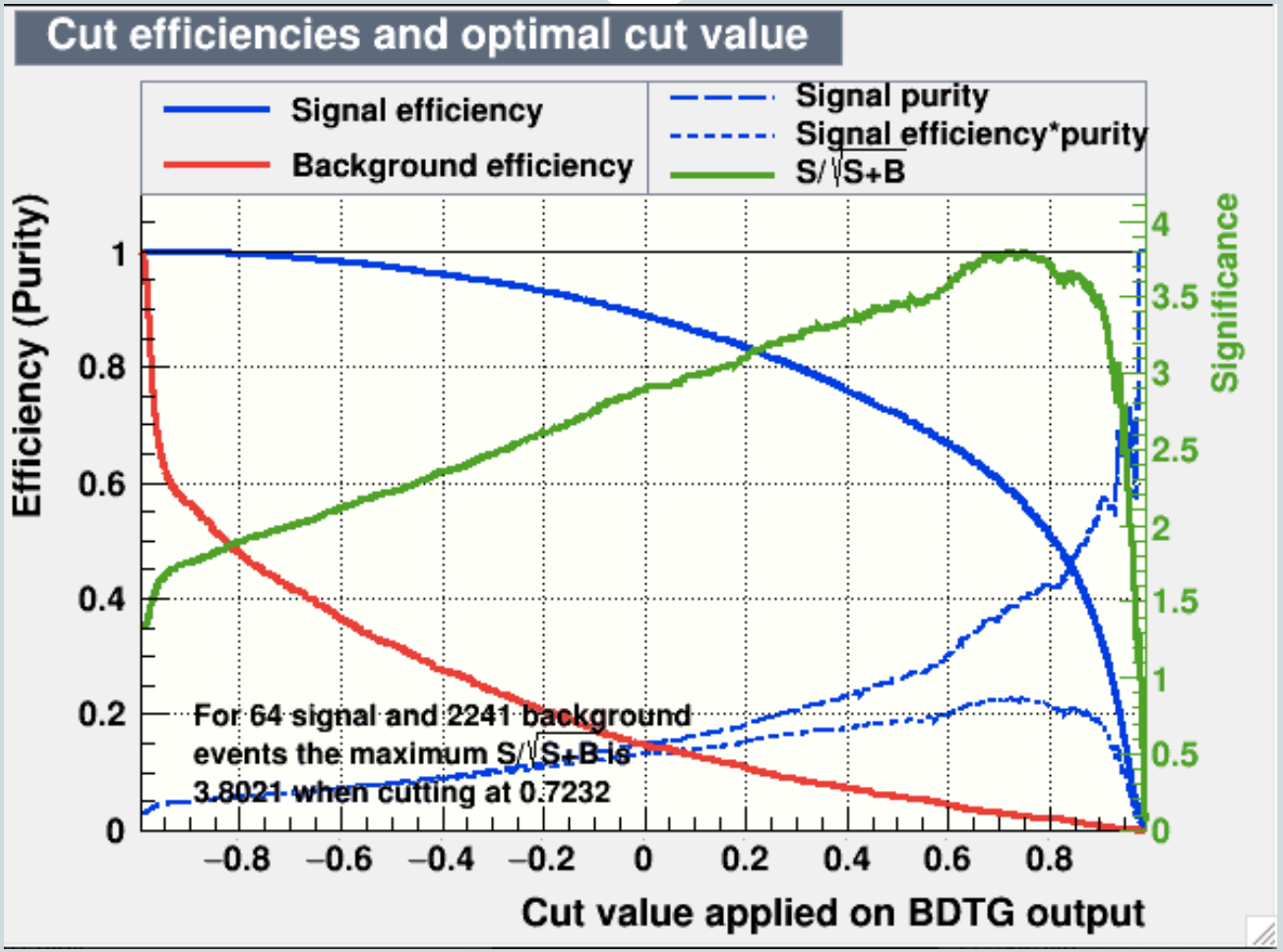


Cut Efficiencies




```
--- Classifier   (  #signal, #backgr.)  Optimal-cut  S/sqrt(S+B)      NSig       NBkg    EffSig   EffBkg
--- -------------------------------------------------------------------------------------------------
---       BDTG:  (       64,     6712)       0.7586      2.57426  35.43935   154.0863    0.5537  0.02296
--- -------------------------------------------------------------------------------------------------
```

Cut Efficiencies when 120eV<mγγ<130eV



BDT Response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           BDTout    dm_yy
 BDTout:   +1.000   -0.110
  dm_yy:   -0.110   +1.000
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Correlation matrix (Background):
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           BDTout    dm_yy
 BDTout:   +1.000   +0.184
  dm_yy:   +0.184   +1.000
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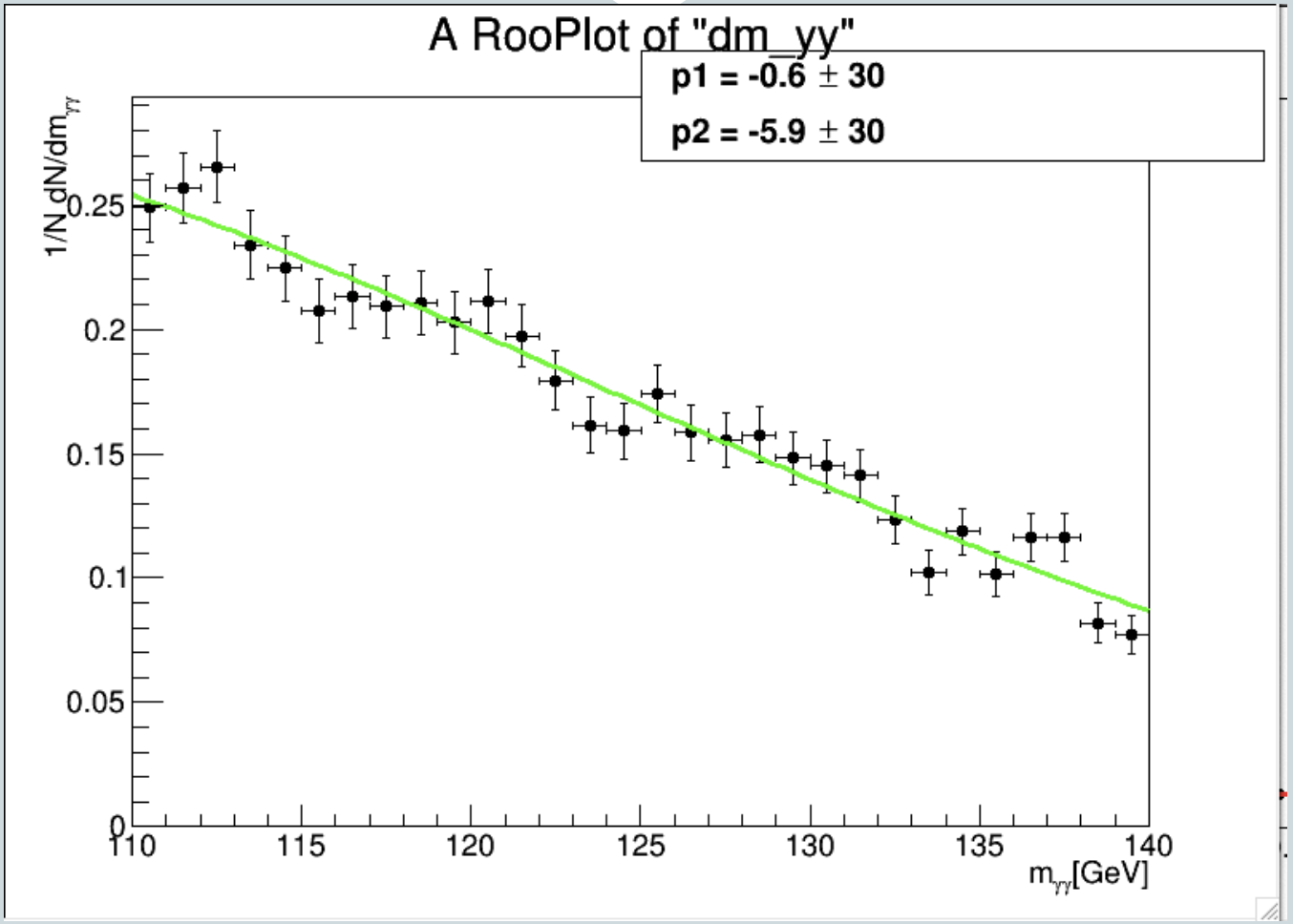
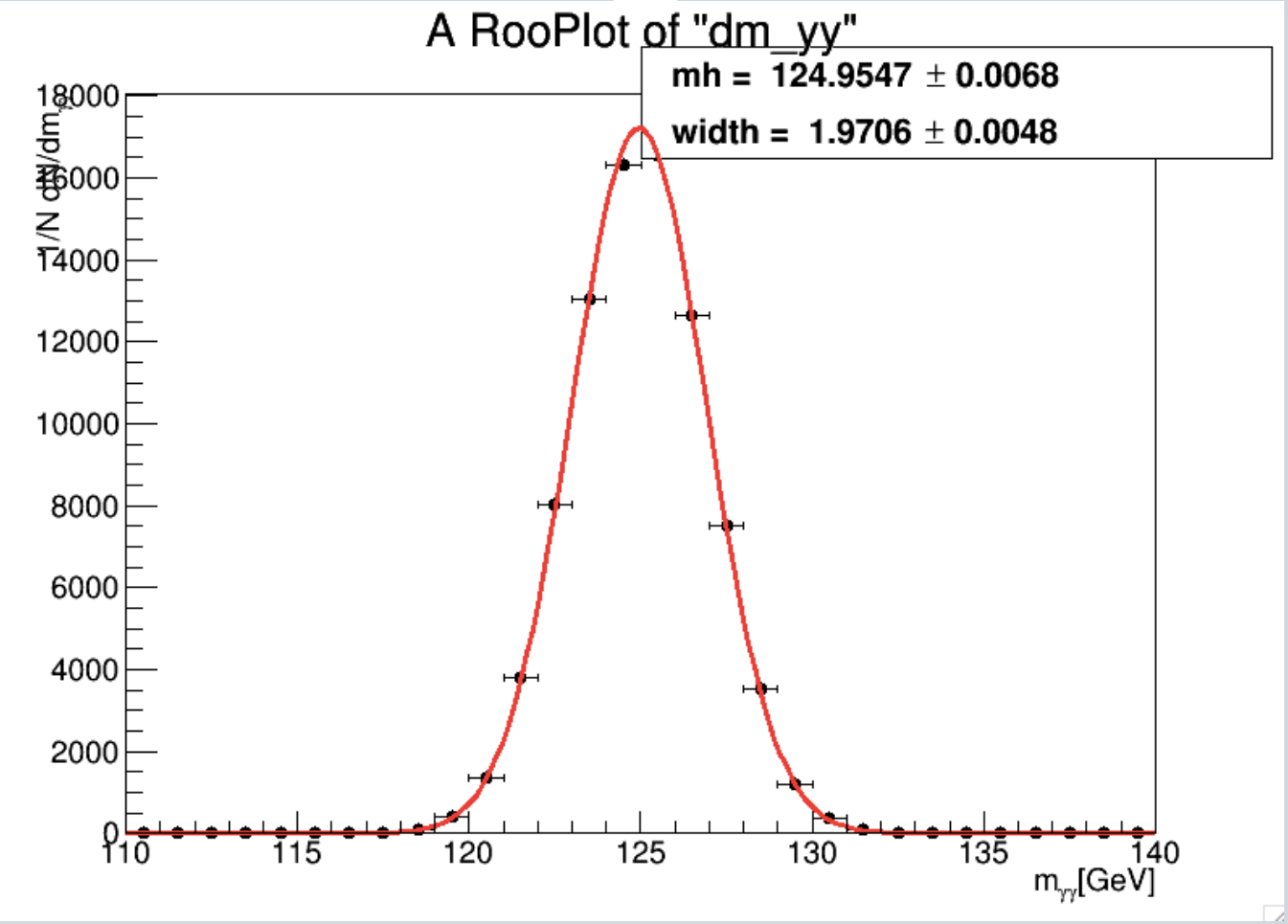
```

Background Model



Signal Model



Signal