

# Internship Report



- Antoine RENAUD , L3 Phytem, ENS Cachan
- Supervisor: Marine KUNA
- Internship made in the Higgs ATLAS LPNHE group from 28/05/2012 to 29/06/2012.

## objectives:

Understand what is the impact of the presence of a signal in the background on expected/observed  $p_0$ /CLs

# Objectives of the internship

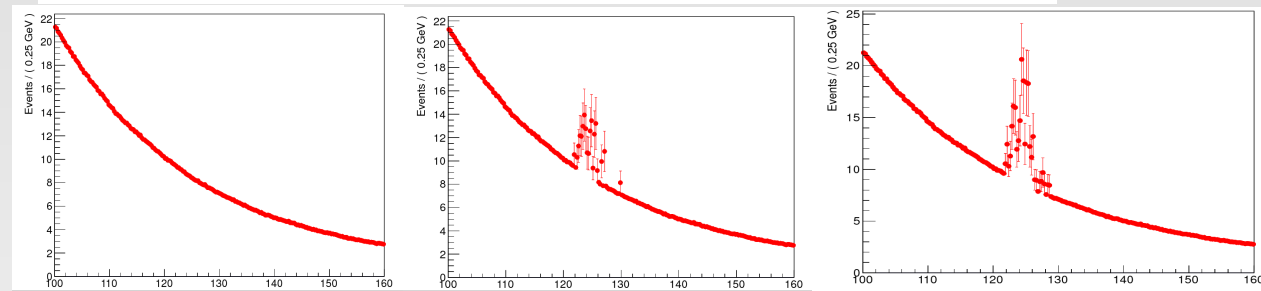
- Test#1: ->step 1: fit the invariant mass distribution in sherpa sample (Monte Carlo simulation)  $\gamma\gamma+yj+jj$ +Drell Yan with:

$$M_{\gamma\gamma} = 2p_T^{\gamma_1} p_T^{\gamma_2} [\cosh(\eta_1 - \eta_2) - \cos(\varphi_1 - \varphi_2)]$$

-signal SM x0

-signal SM x1

-signal SM x2



->step 2: Compute the observed/expected p0/CLs for the 3 different cases

- Test#2:->step 1: fit the invariant mass distribution in the 2011 data on:

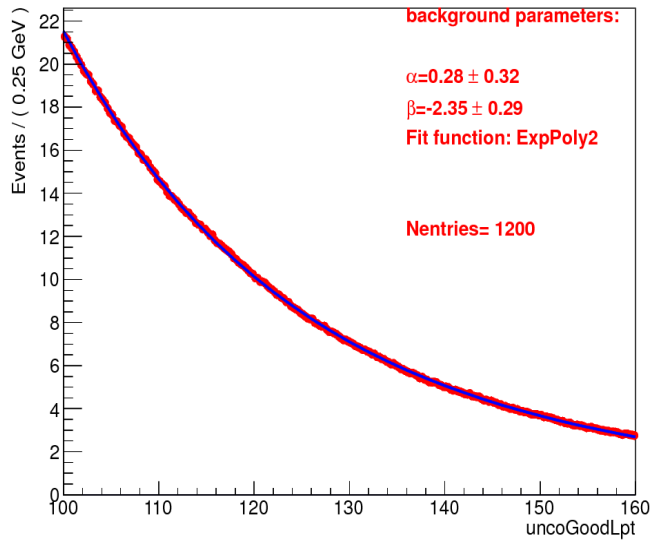
-[100,160] GeV

-[100,120]U[130,160] GeV

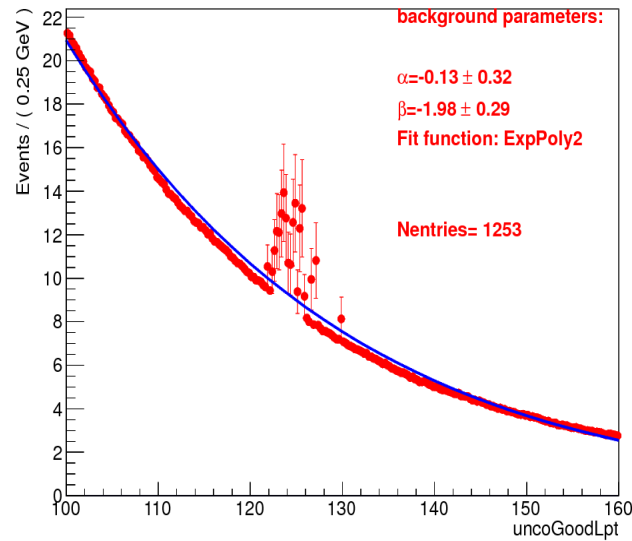
->step 2: Compute the observed/expected p0/CLs in both cases

# Sherpa $\gamma\gamma+yj+jj$ +Drell Yan fit

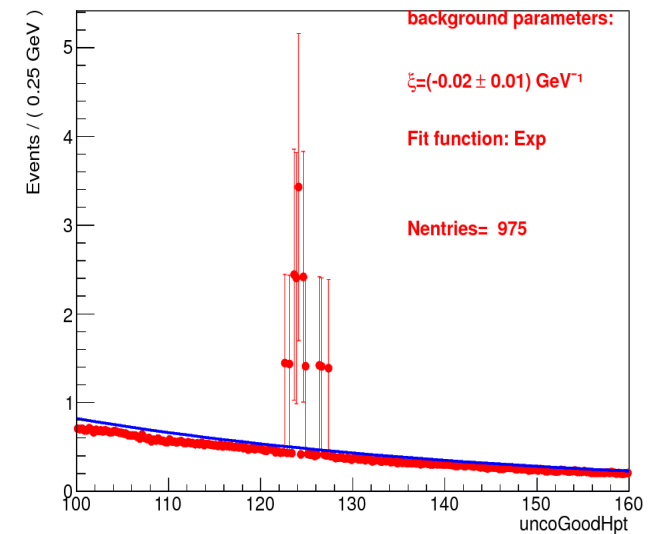
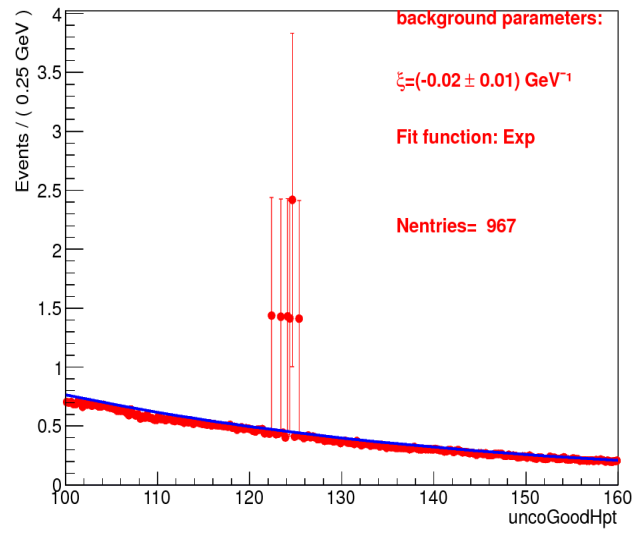
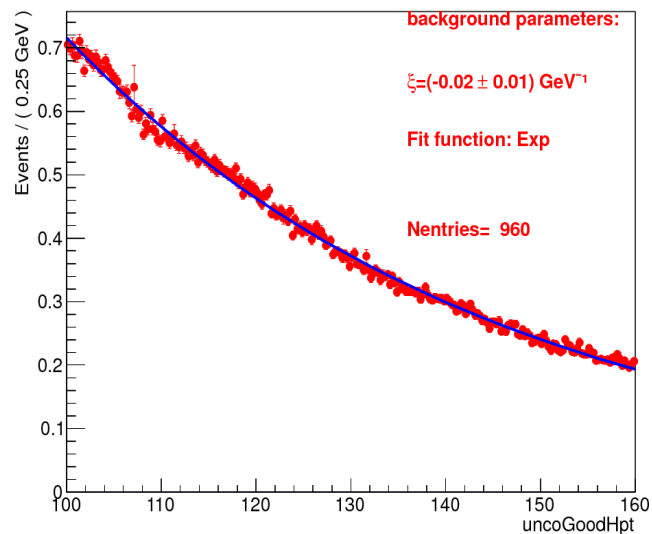
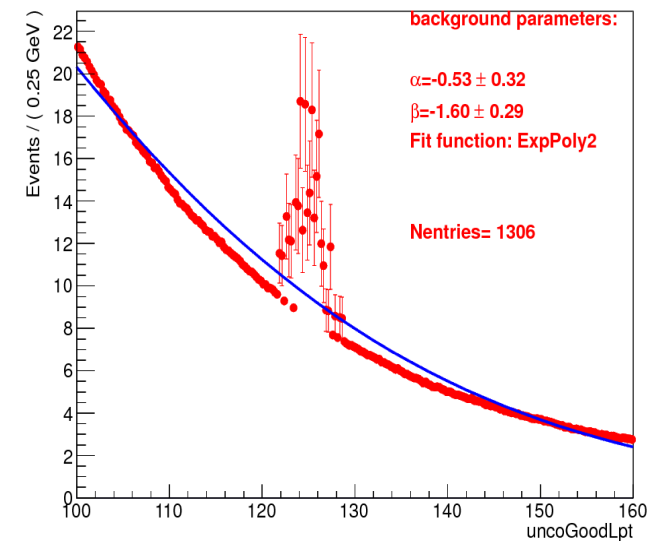
Background  
Only



Background  
+Signal X1

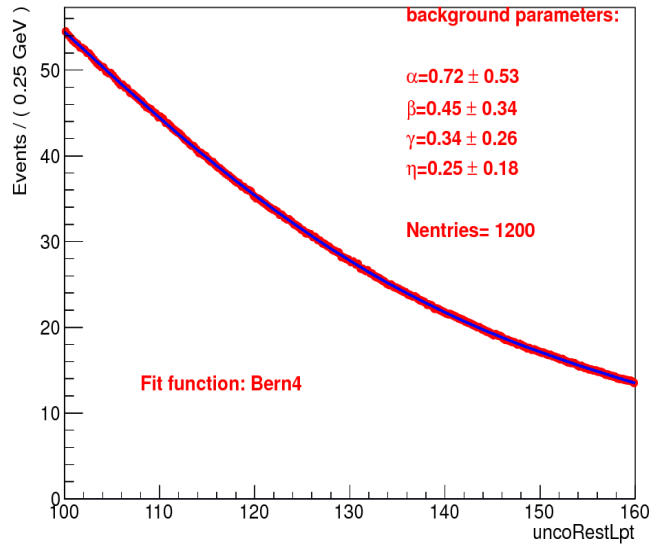


background  
+Signal X2

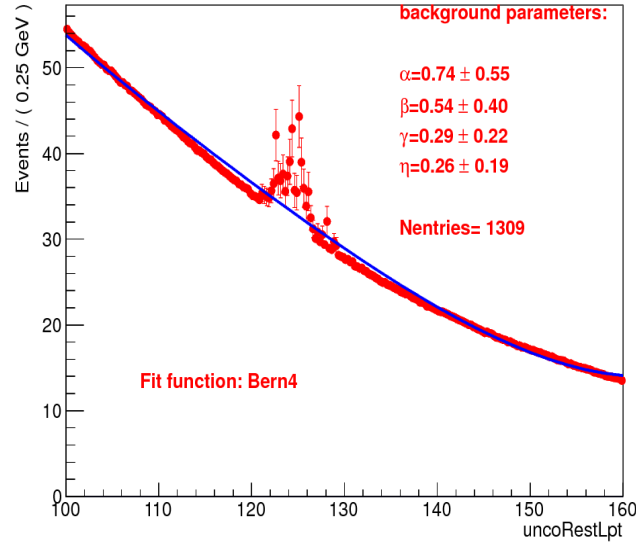


# Sherpa $\gamma\gamma+\gamma j+jj$ +Drell Yan fit

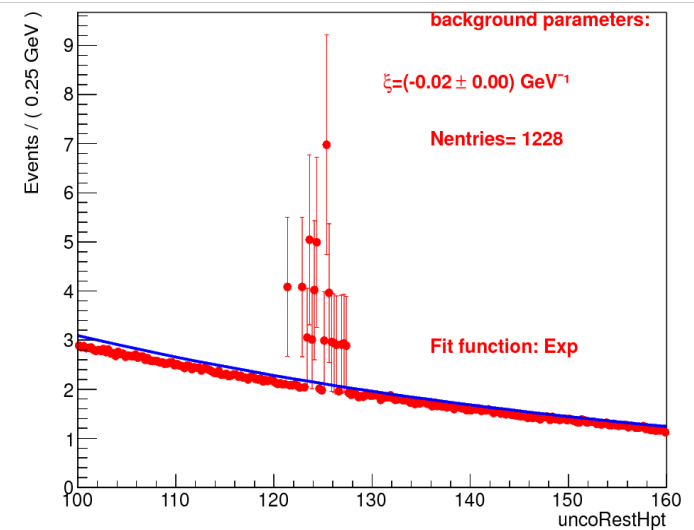
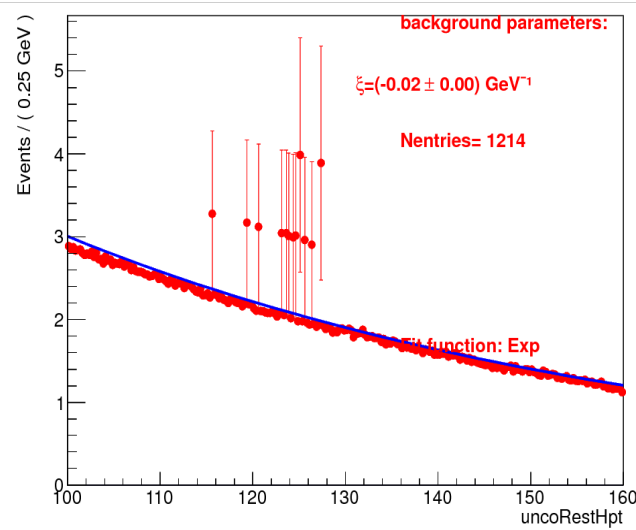
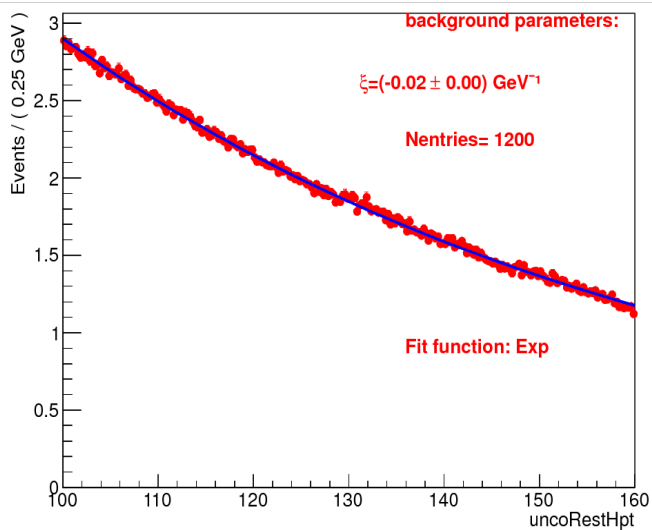
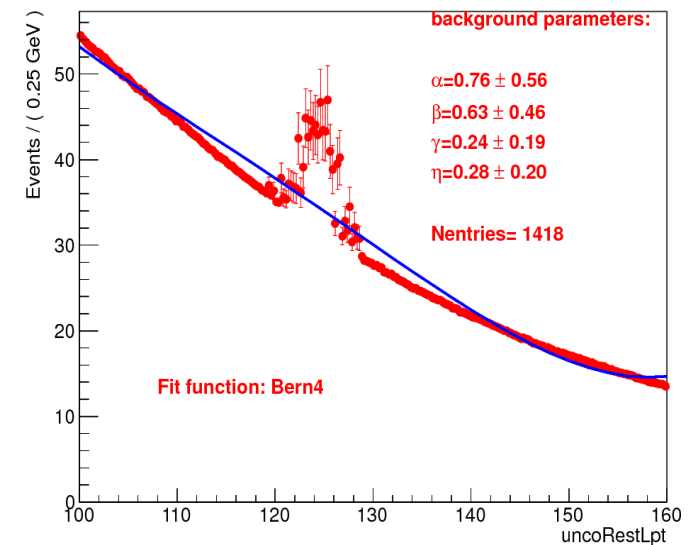
## Background Only



## Background +Signal X1

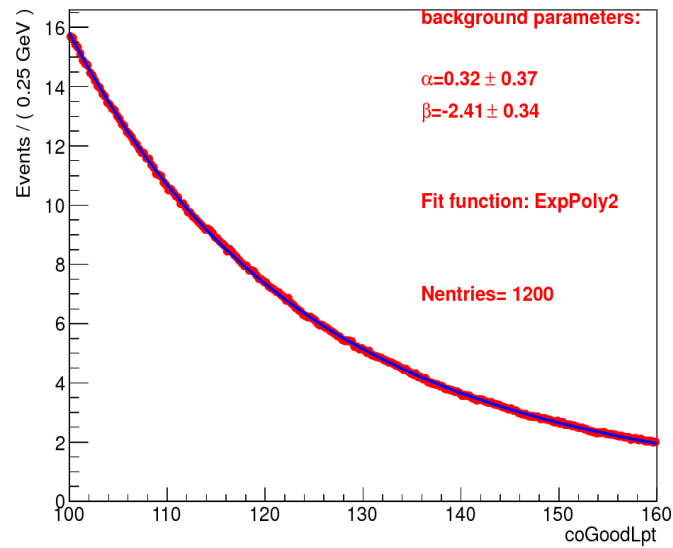


## background +Signal X2

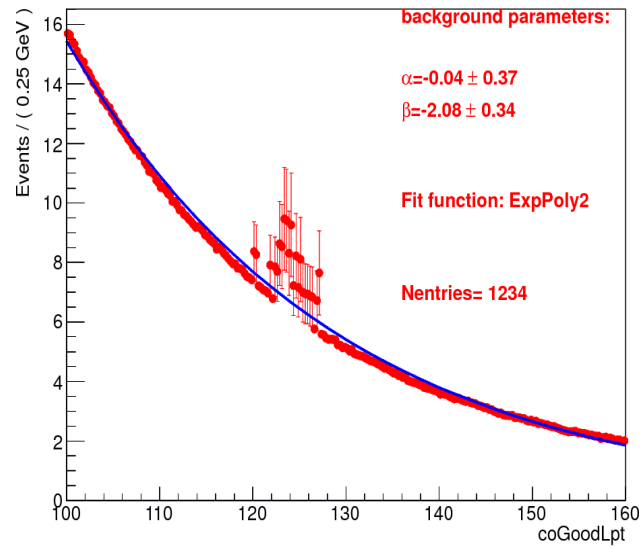


# Sherpa $\gamma\gamma+yy+jj$ +Drell Yan fit

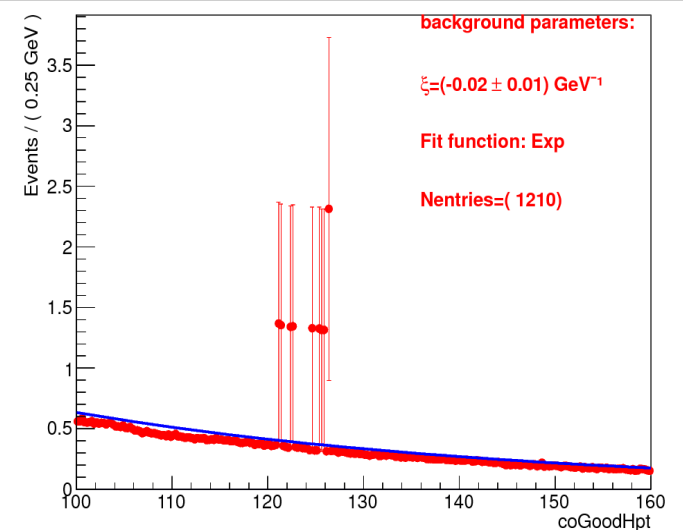
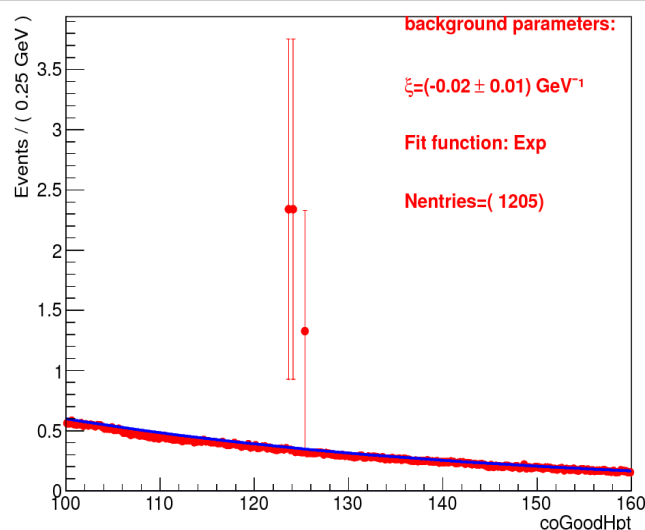
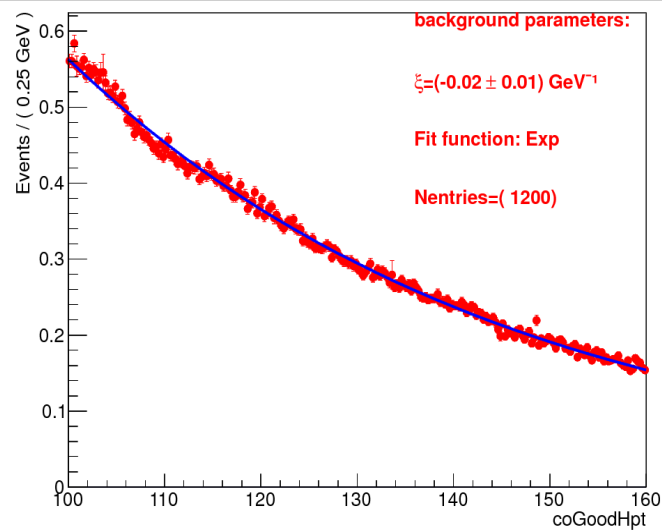
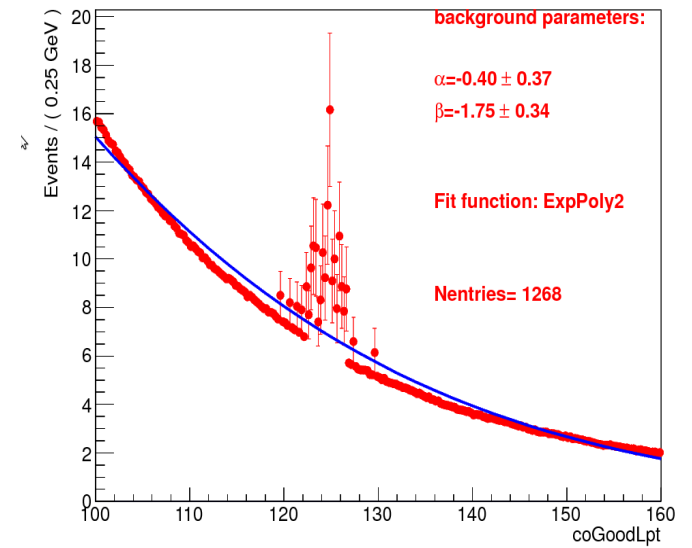
## Background Only



## Background +Signal X1

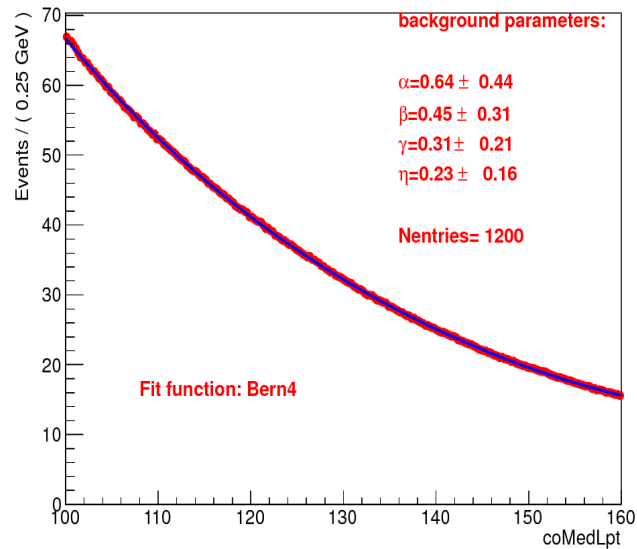


## background +Signal X2

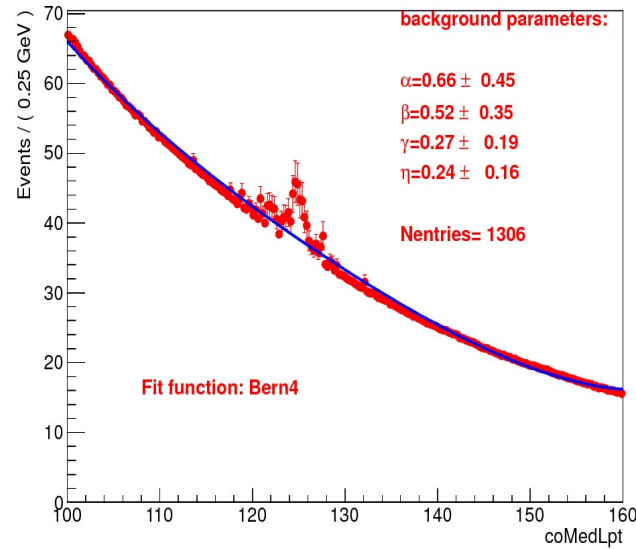


# Sherpa $\gamma\gamma+\gamma j+jj$ +Drell Yan fit

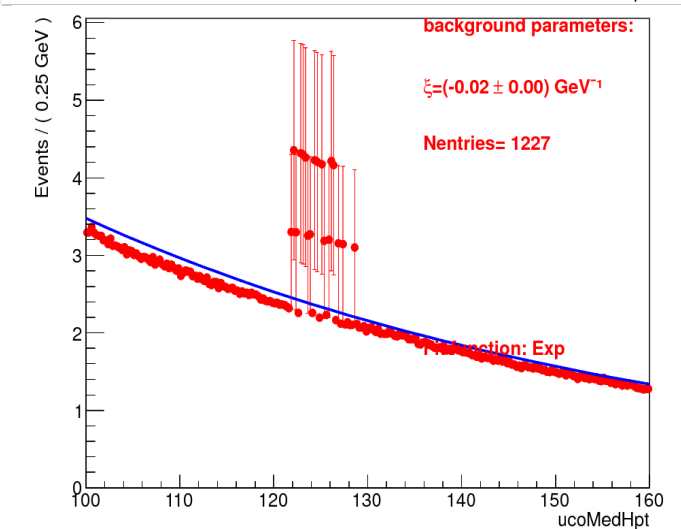
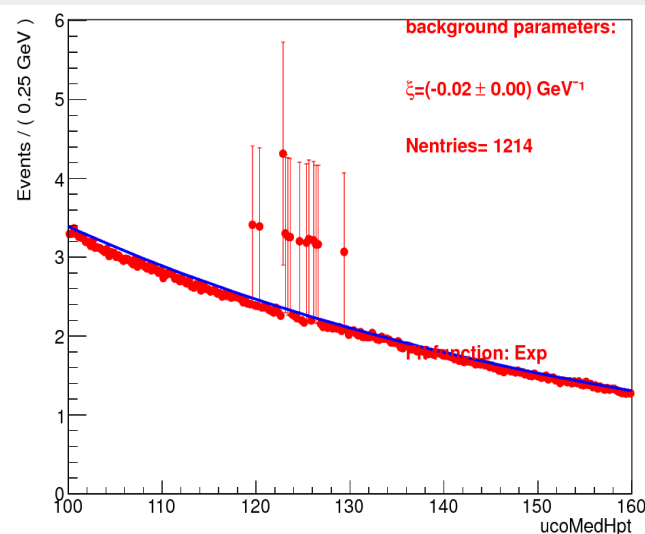
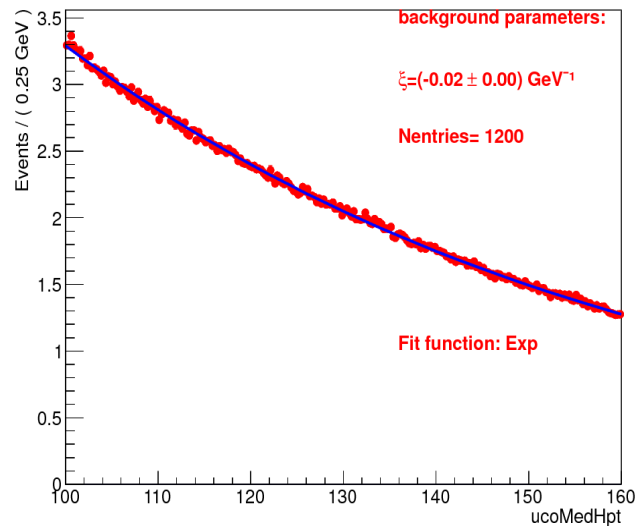
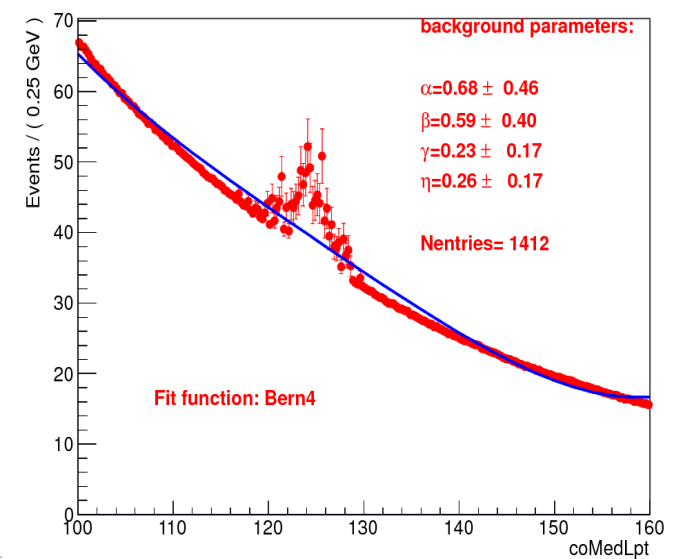
## Background Only



## Background +Signal X1

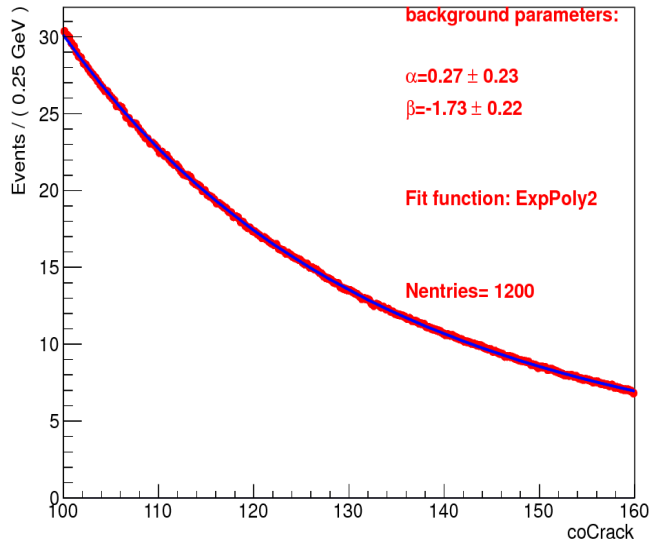


## background +Signal X2

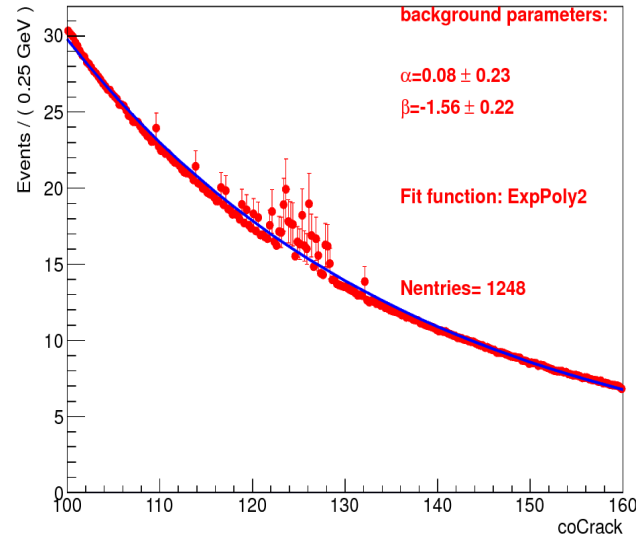


# Sherpa $\gamma\gamma+yy+jj+Drell$ Yan fit

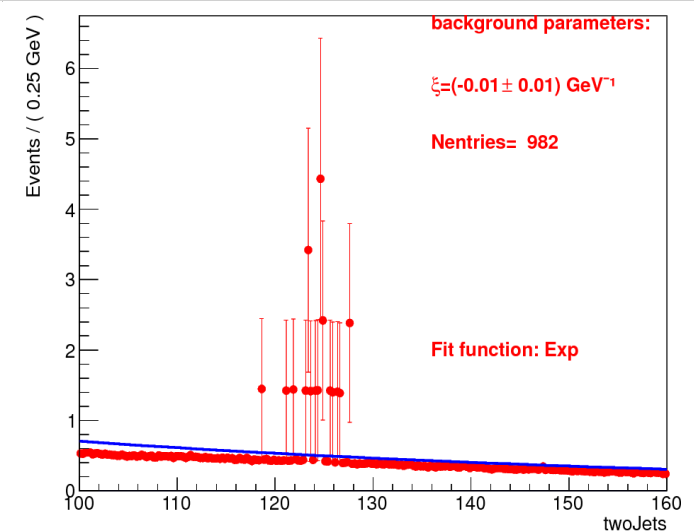
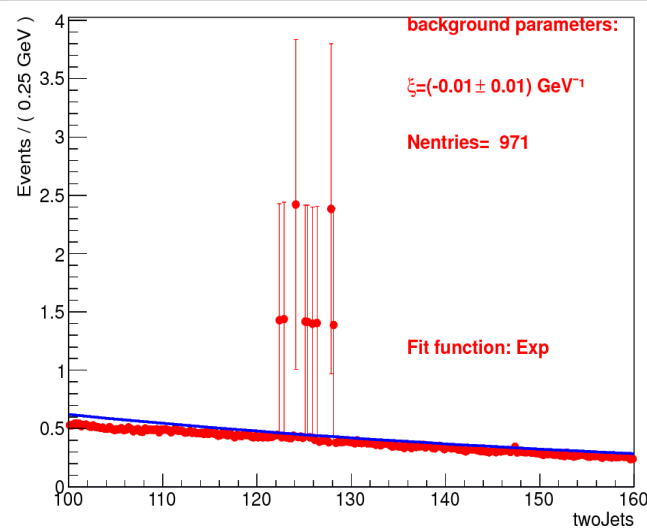
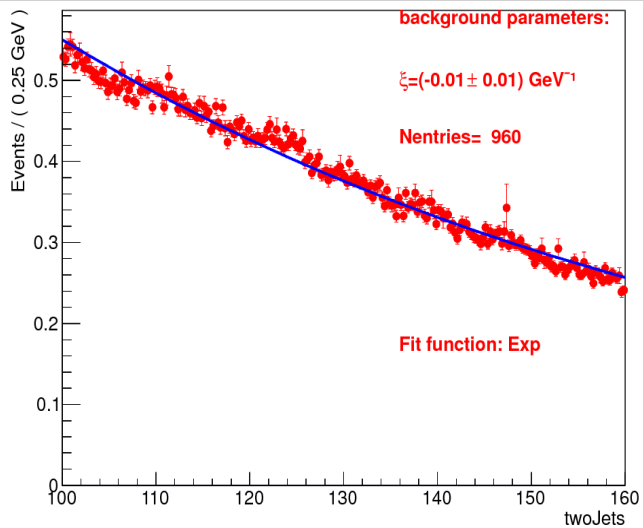
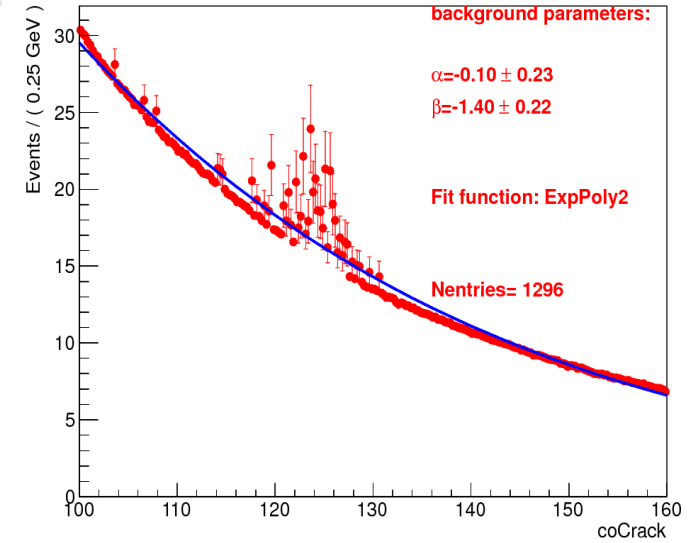
## Background Only



## Background +Signal X1

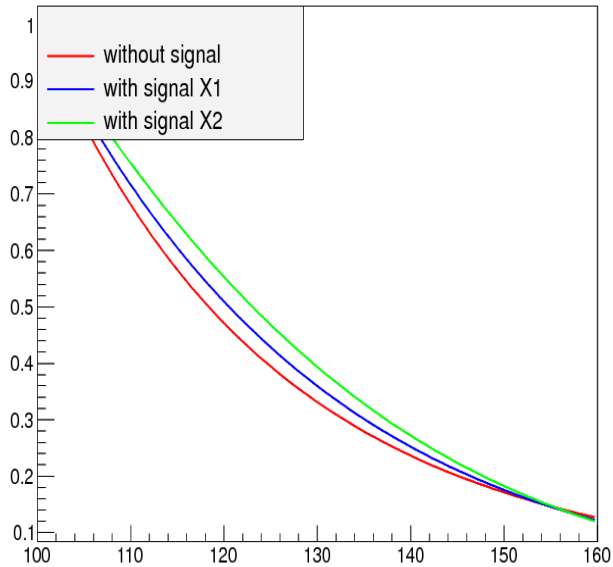


## background +Signal X2

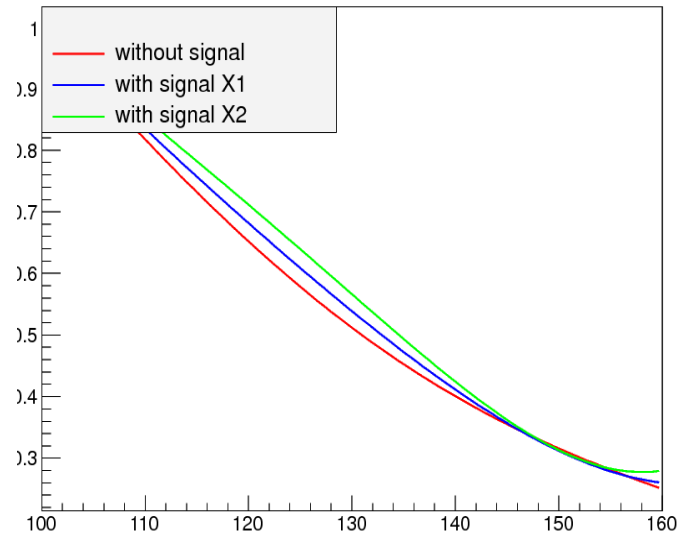


# Superimposed results

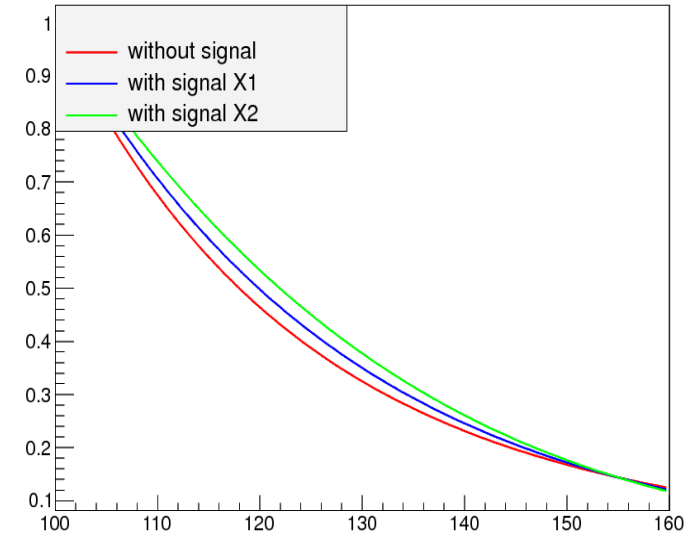
uncoGoodLpt



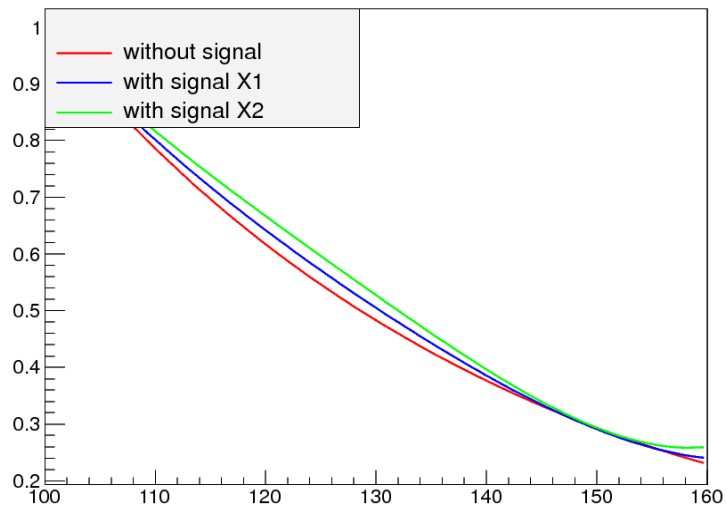
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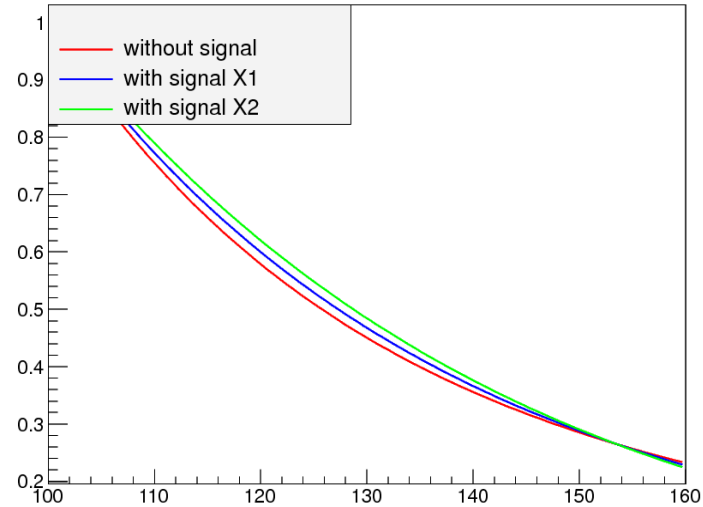
coGoodLpt



coMedLpt

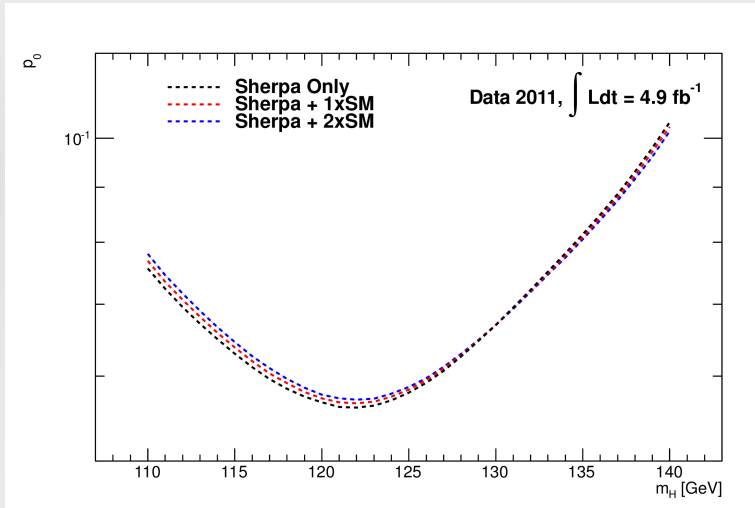


coCrack

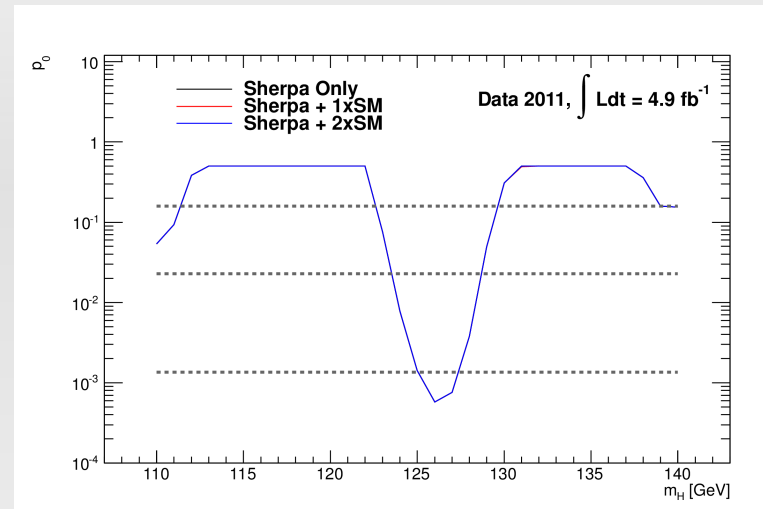


# Observed/expected p0/CLs

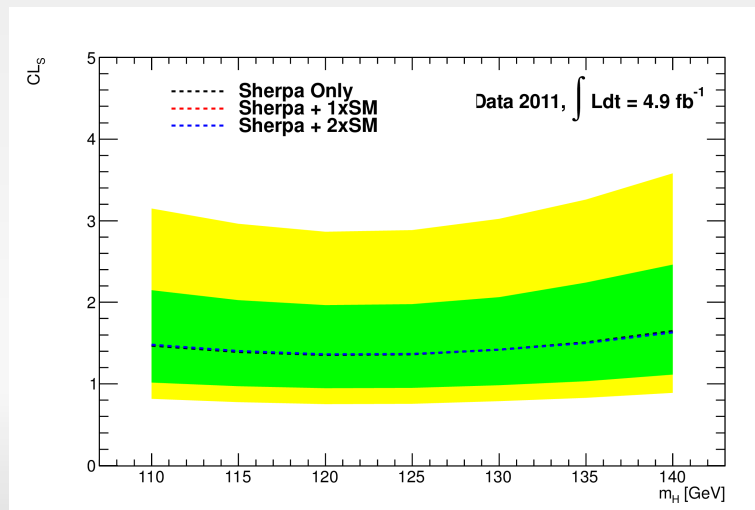
## Expected p0



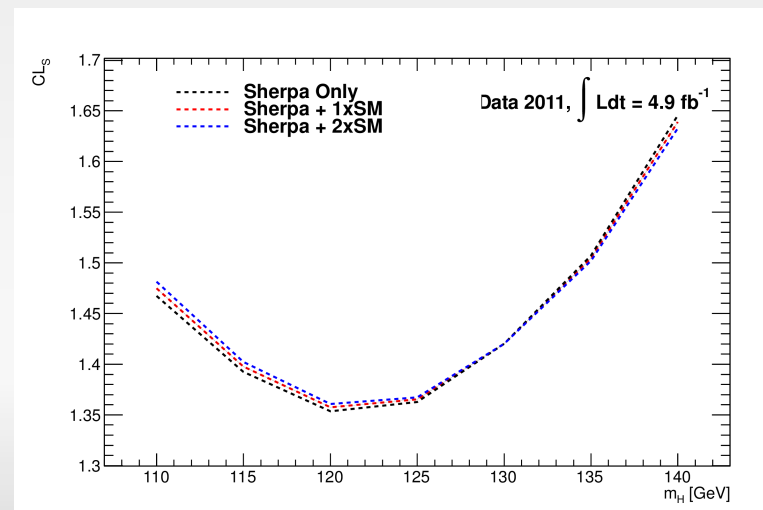
## Observed p0



## Expected CLs

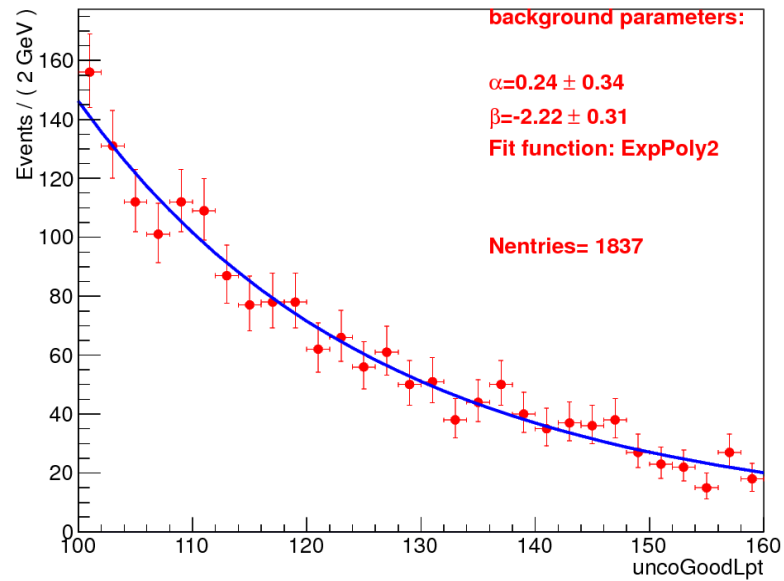


zoom

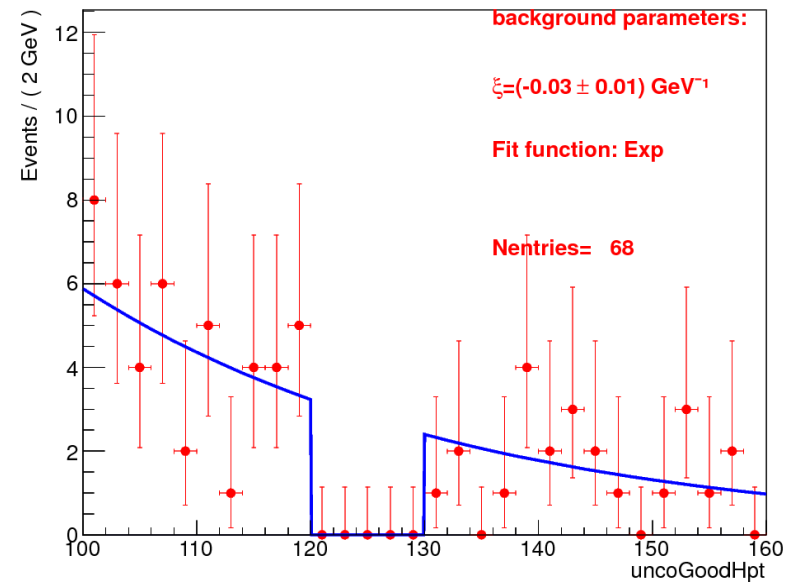
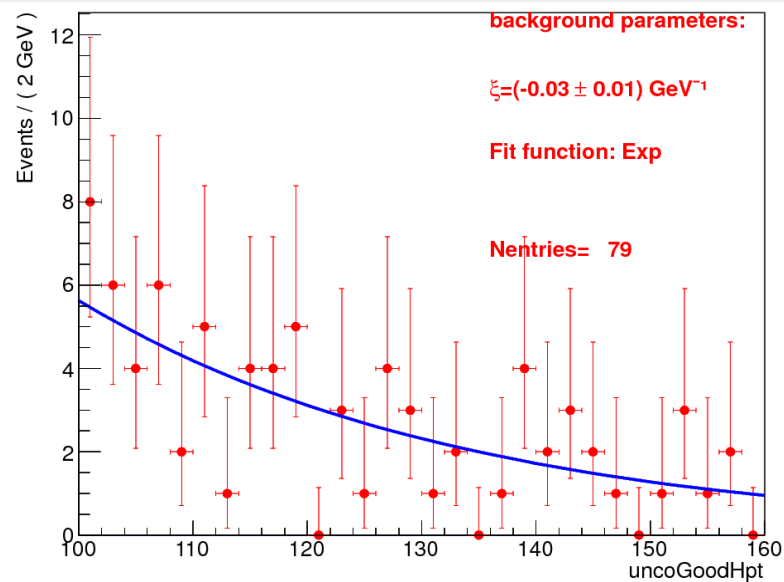
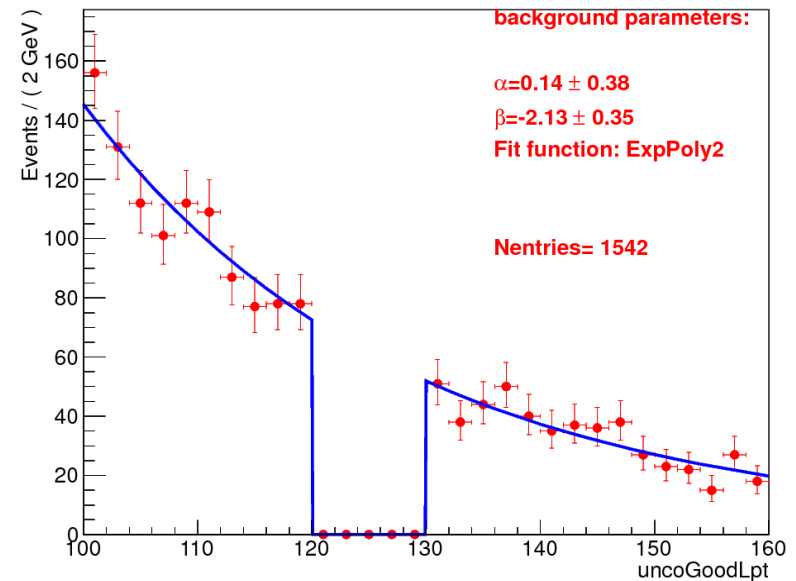


# Data 2011 fit

## Without Cut

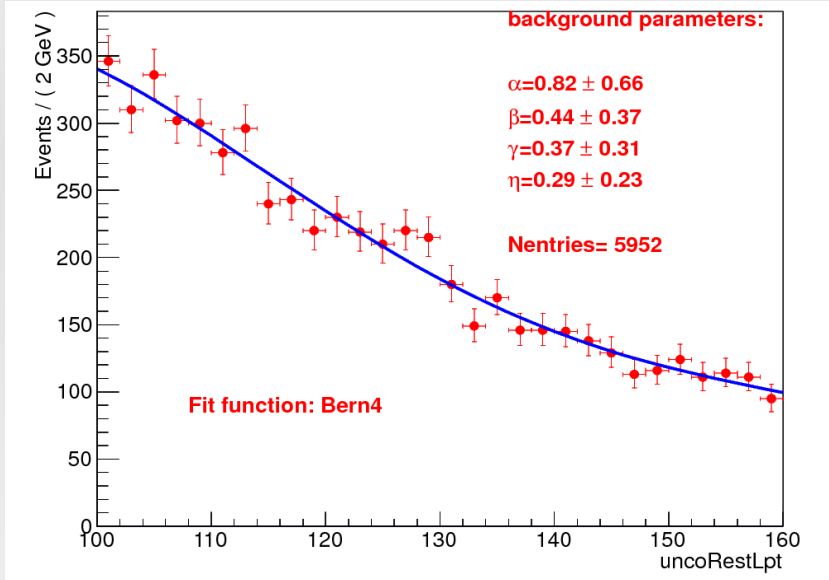


## With Cut

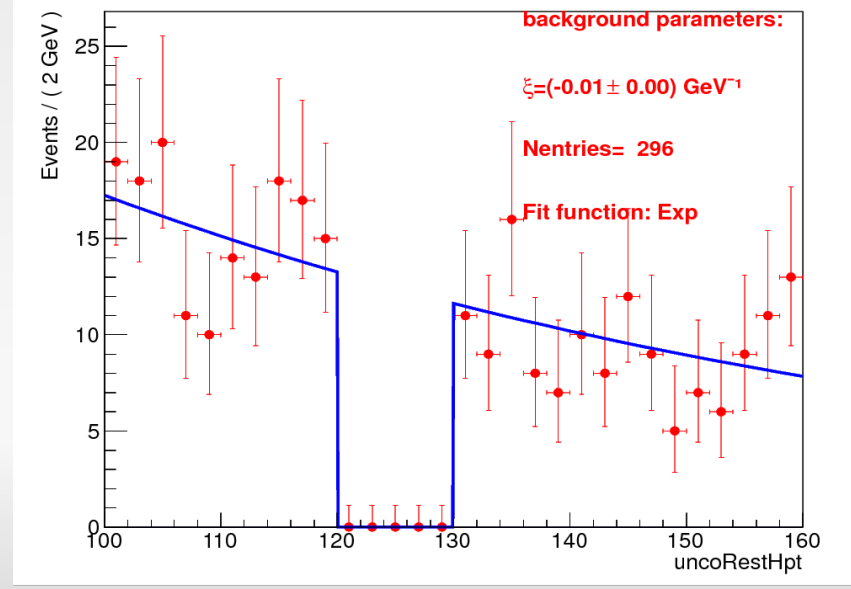
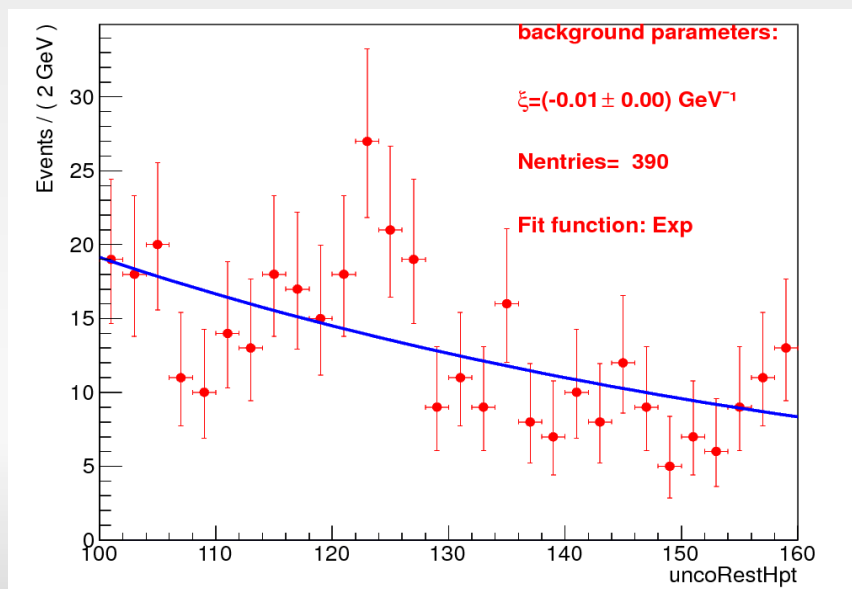
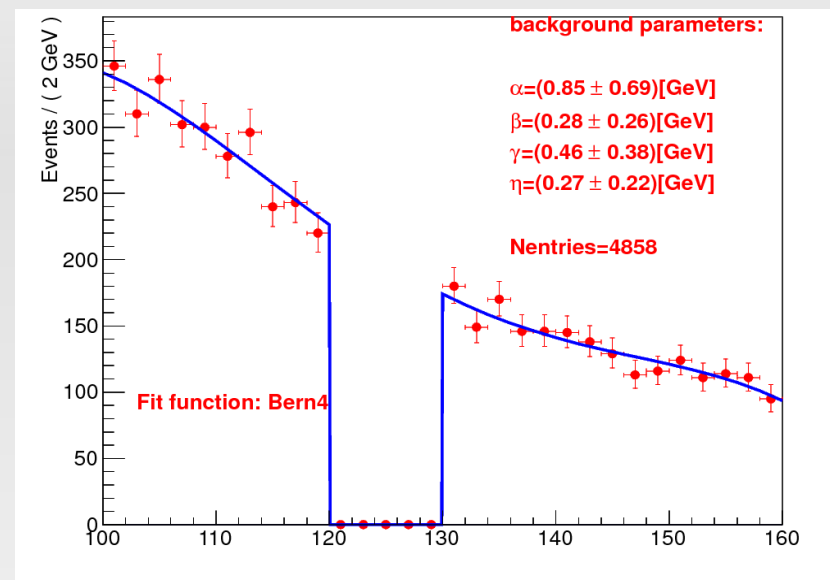


# Data 2011 fit

## Without Cut

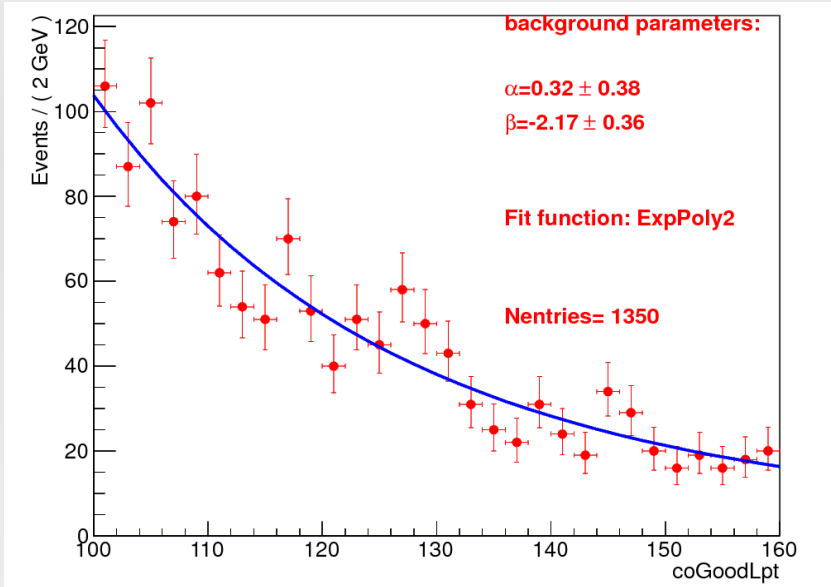


## With Cut

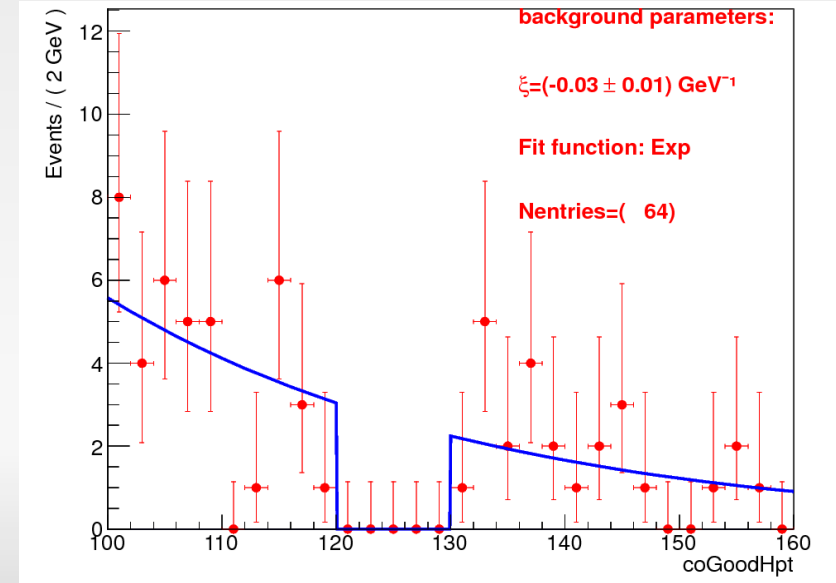
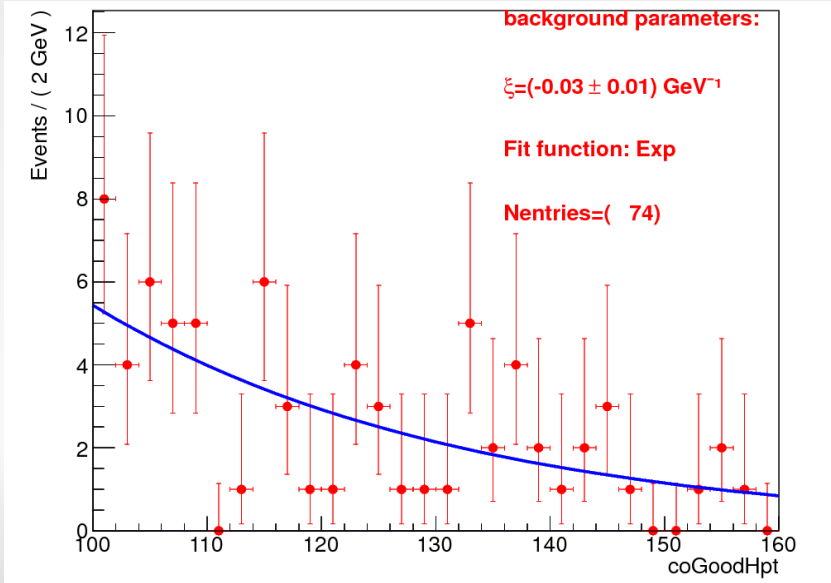
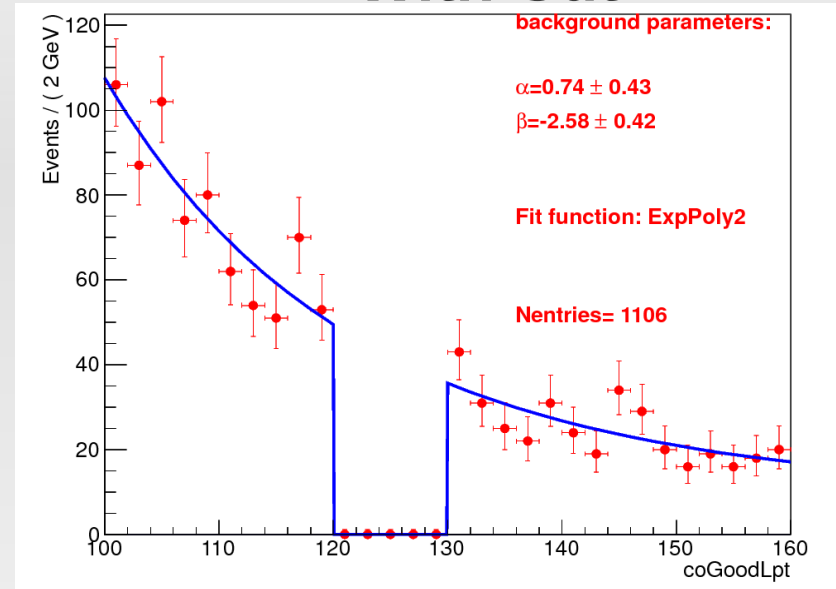


# Data 2011 fit

## Without Cut

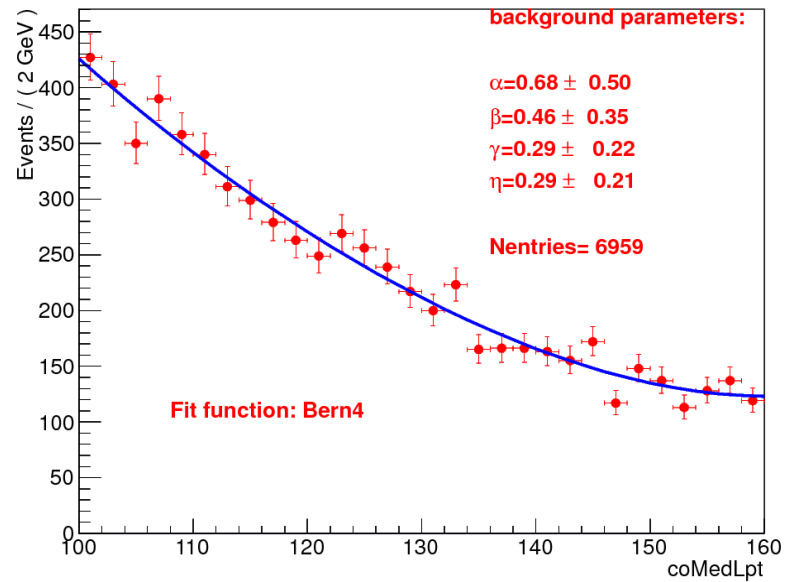


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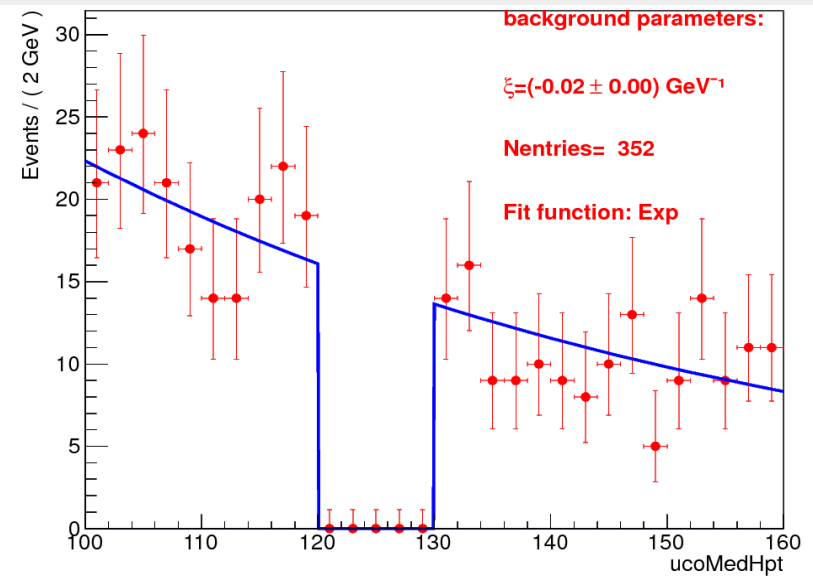
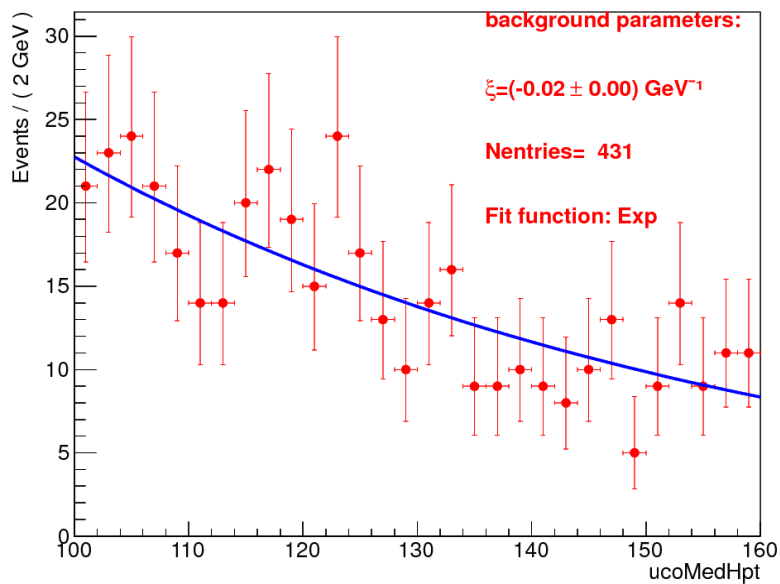
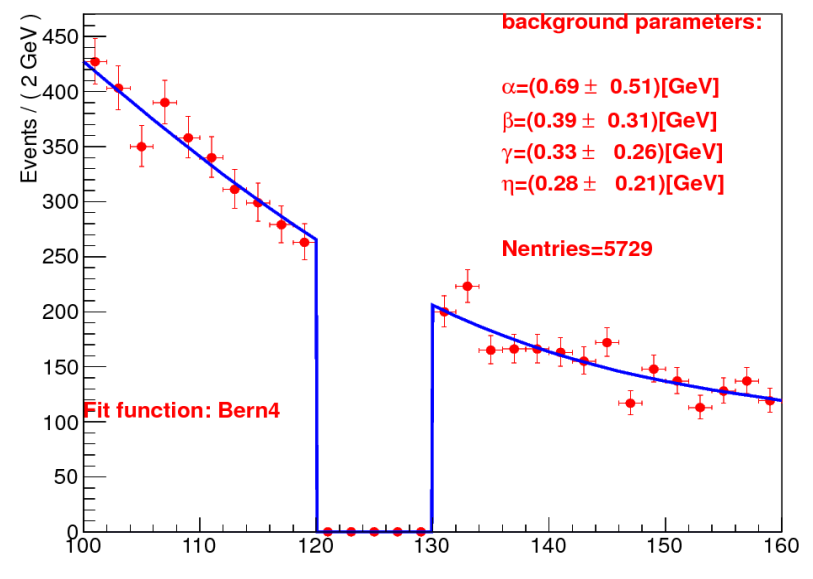


# Data 2011 fit

## Without Cut

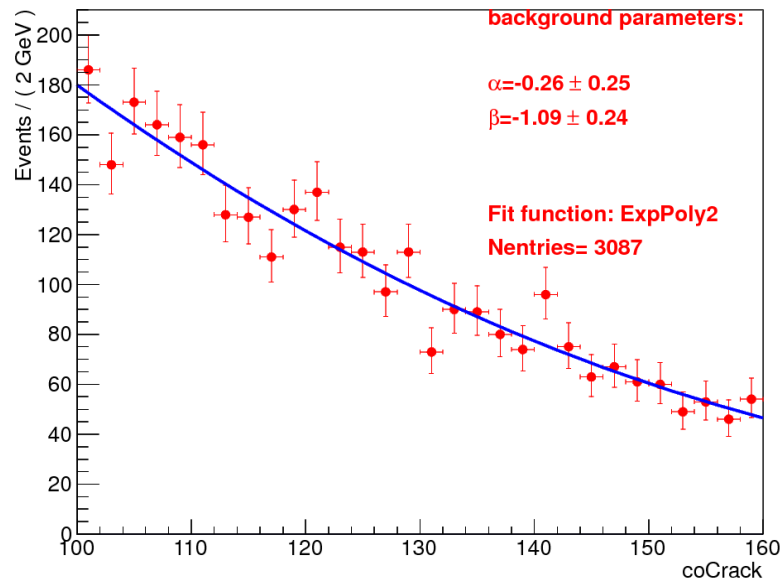


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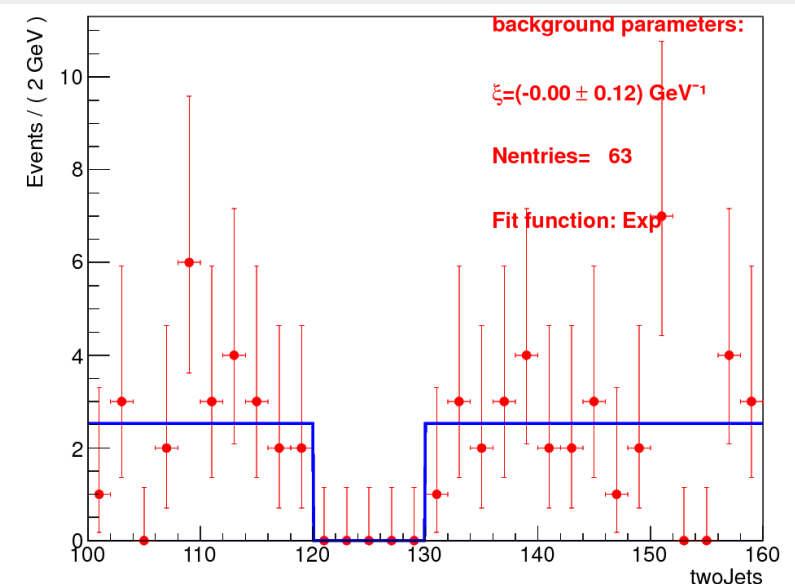
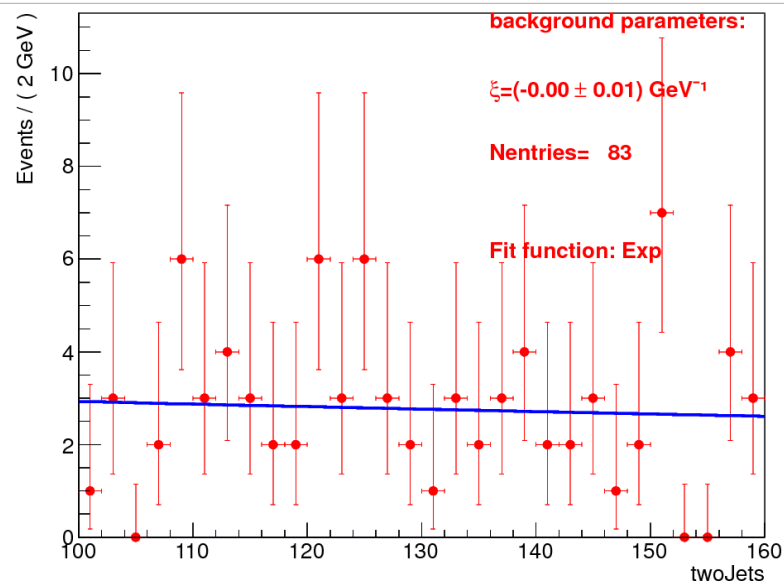
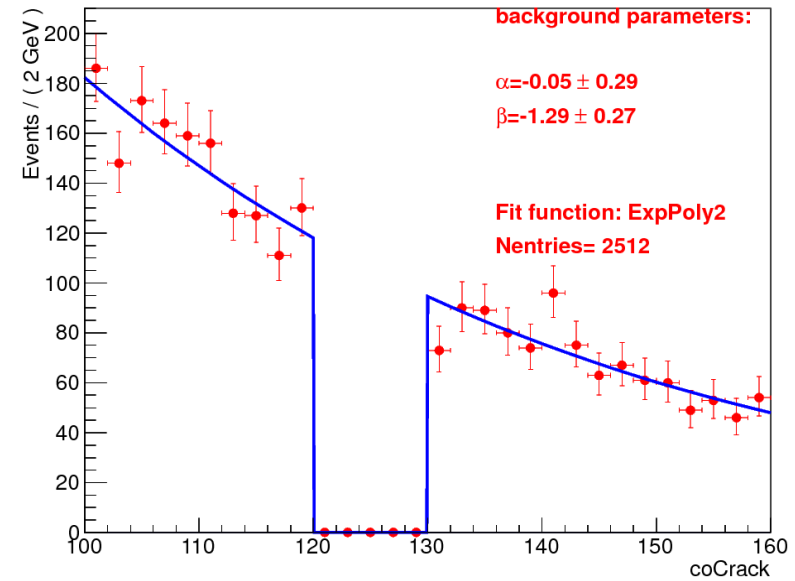


# Data 2011 fit

## Without Cut

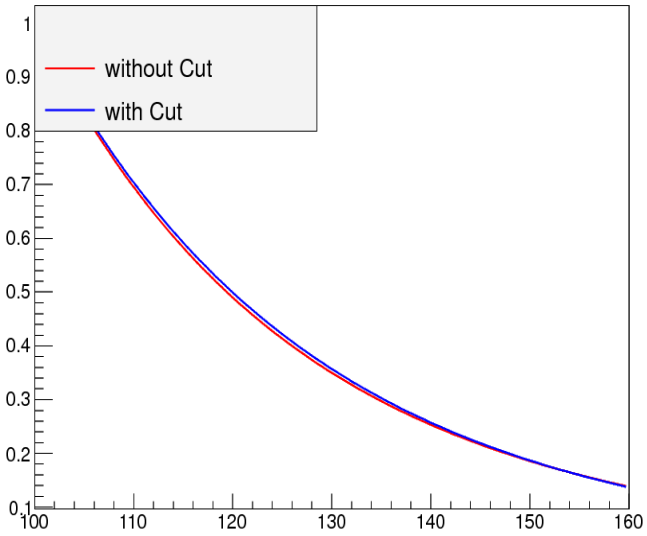


## With Cut

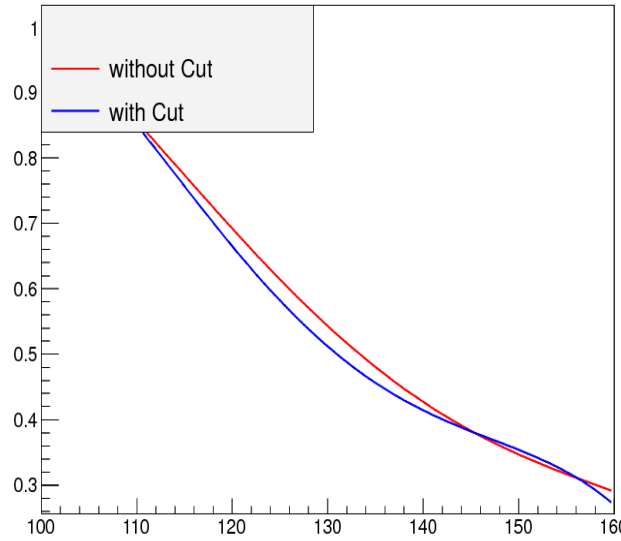


# Superimposed results

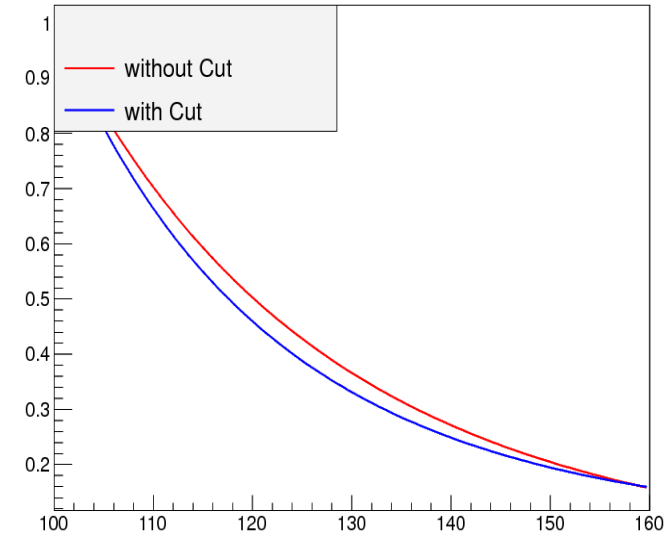
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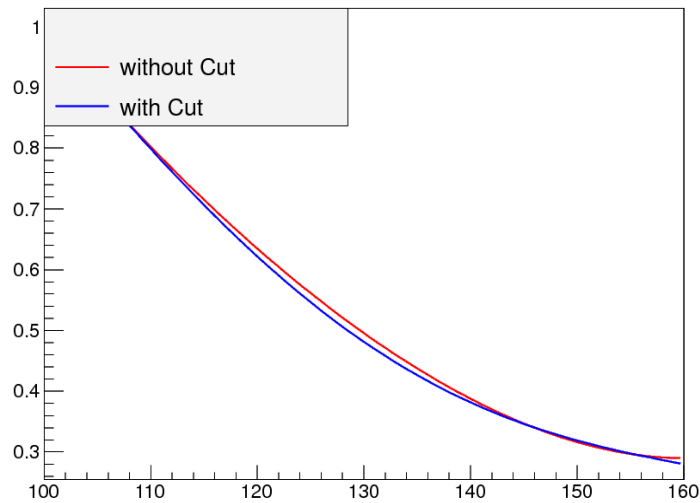
uncoRestLpt



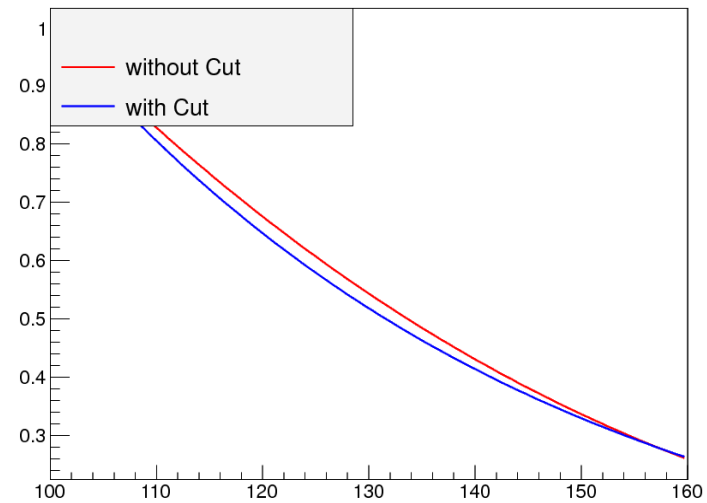
coGoodLpt



coMedLpt

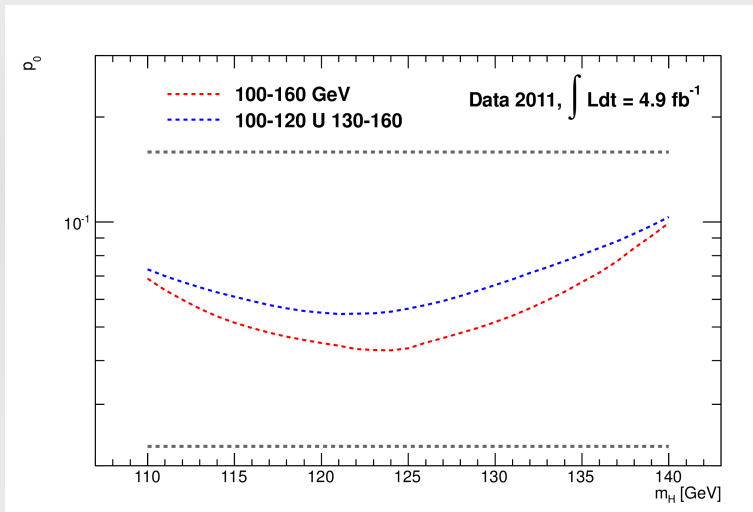


coCrack

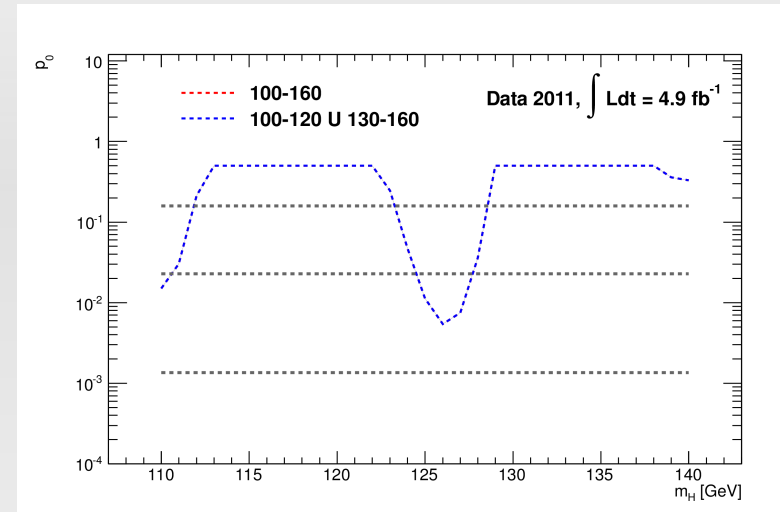


# Observed/expected p0/CLs

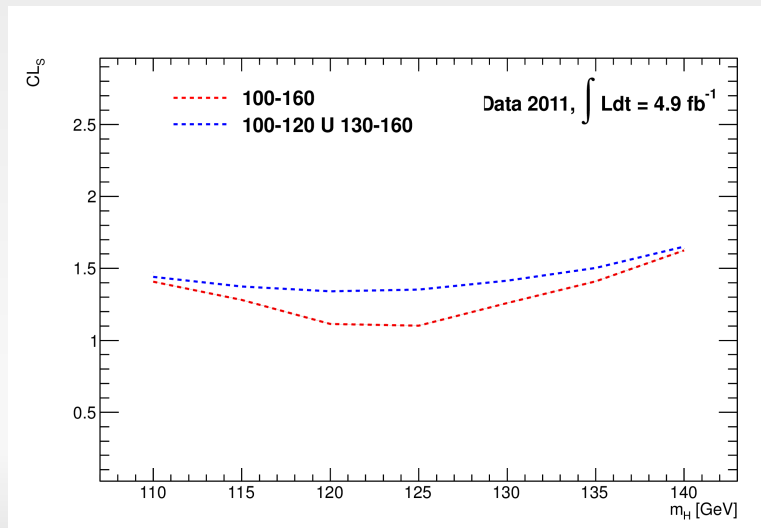
## Expected p0



## Observed p0



## Expected CLs



# Categories and signal

