Photon Calibration Systematics

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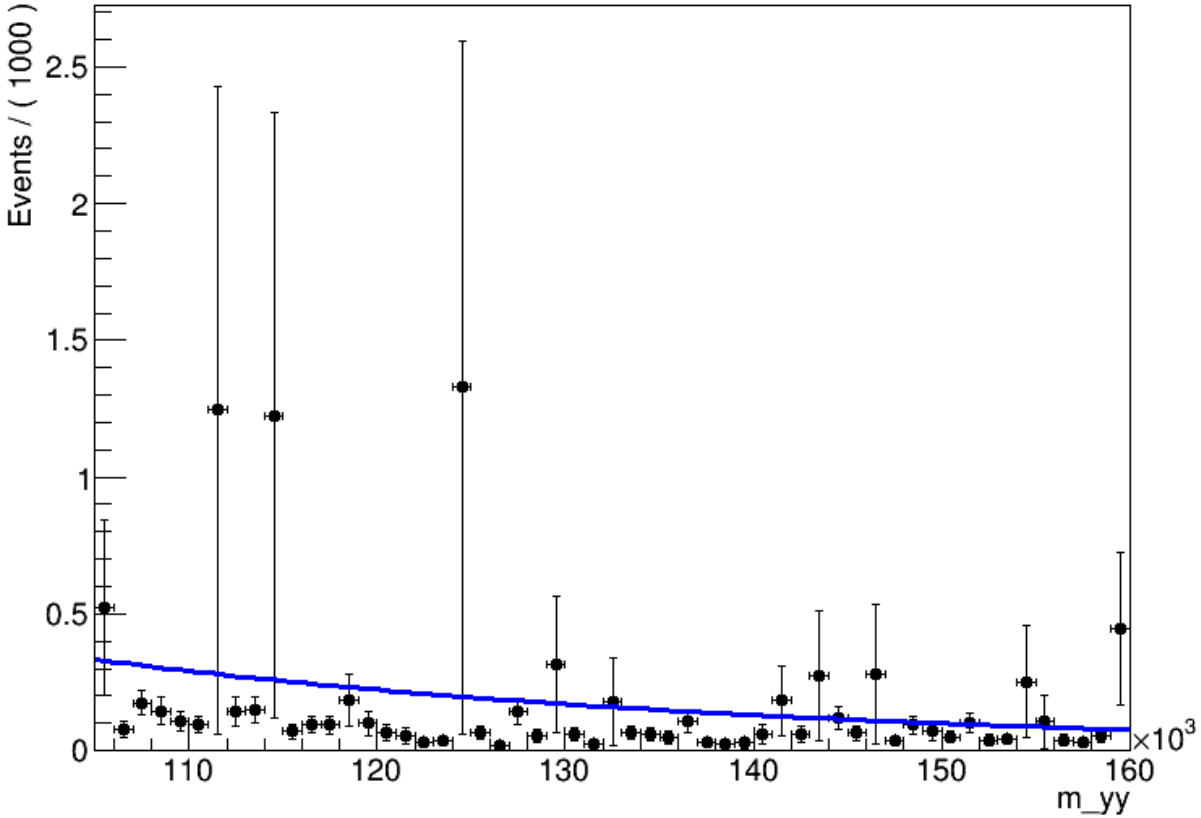
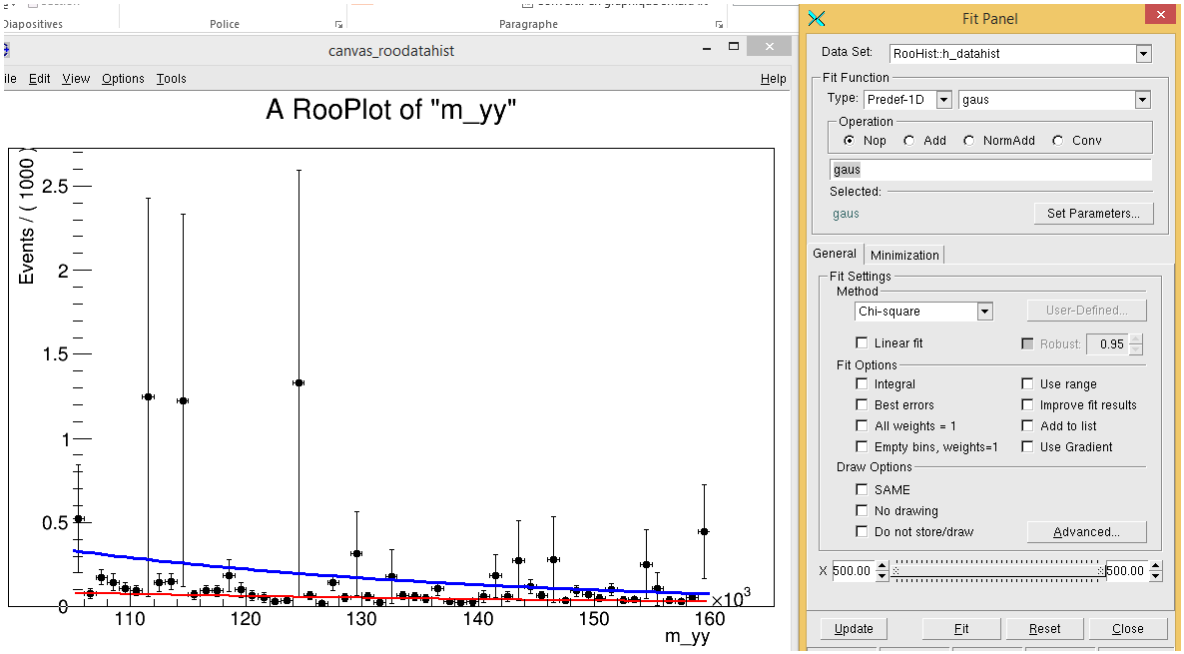
Minimal program doing a chi2FitTo with roofit, from a RooDataHist
→it seems that with the way we do, the errors are not taken into account as we would like. Indeed, we see that there are plenty of bins with tiny errors, but the fit behaves as if all bins would have the same errors.



1

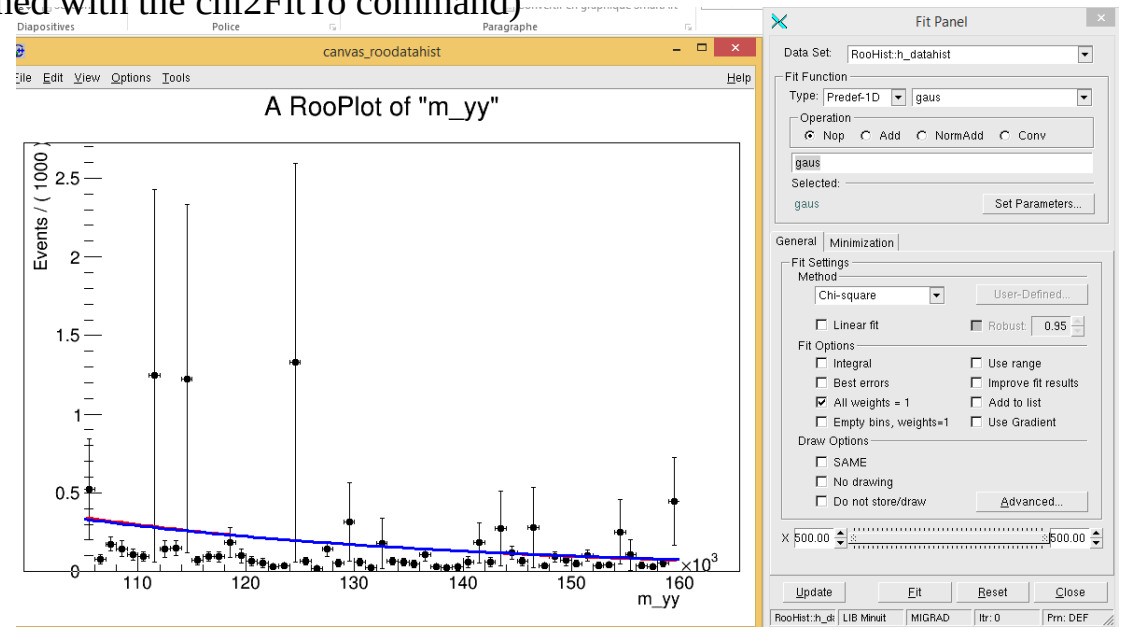
If we do a right button click on a point of the RooDataHist, in order to open a contextual window, and if we do a fit panel, and click on « Fit », the fit obtained looks to work. This is the red curve below :



So « somehow », there is the information that is stored somewhere that would « allow » to make the fit in a proper way.

2

If this time, we click on the option « All weights=1 », the fit looks to behave like what was obtained with the chi2FitTo fit from a RooDataHist, some somehow, it shows that indeed, it appears as if the chi2FitTo had ignored the errors
(see the red curve obtain when we click on « Fit », which is almost the same as the blue one obtained with the chi2FitTo command)



Remark : doing a chi2FitTo, so somehow, it means that it takes into account the error, but in a strange way since the slope is too high)

So the question is : how to make the chi2FitTo command to take into account the different errors as we would expect ? Thank you

3

(remark : if we change the error of the 3 high value points, the slope changes when

Effect on systematics

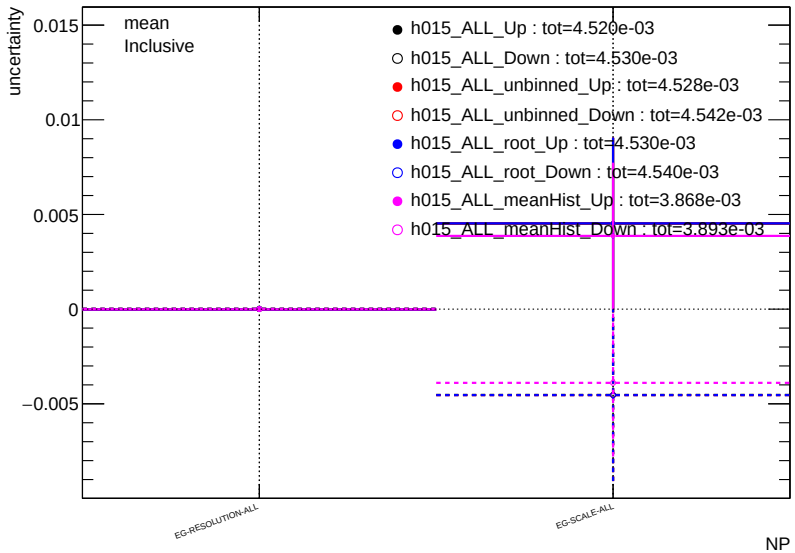
- Marc observed a difference in fit results depending on using ROOT or RooFit
  - "looks like" RooFit does not consider uncertainties in weighted RooDataHist
- Checked if effect has visible effects on calibration systematic determination for couplings analysis.
- 4 fit methods compared :
  - nominal : fit of weighted binned RooDataHist
  - unbinned : fit of weighted unbinned RooDataSet
  - root : fit of weighted binned TH1
  - meanHist : mean and RMS of weighted binned TH1

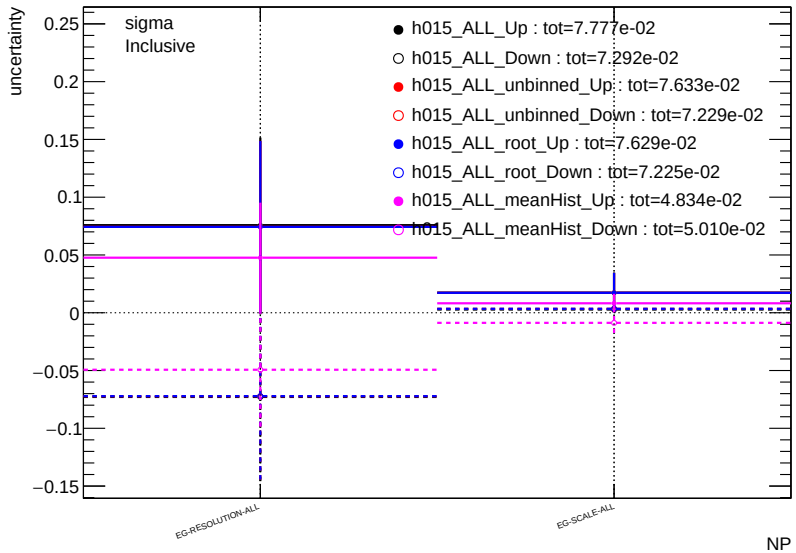
Inclusive Fit Values

NP	mean	sigma	alphaHi	alphaLow	nHi	nLow
RooFit						
Nominal	125.026	1.80019	1.40272	1.27818	42.7717	10.9658
EG-RESOLUTION-ALL–1down	125.029	1.67024	1.40272	1.27818	42.7717	10.9658
EG-RESOLUTION-ALL–1up	125.022	1.93601	1.40272	1.27818	42.7717	10.9658
EG-SCALE-ALL–1up	125.59	1.83223	1.40272	1.27818	42.7717	10.9658
EG-SCALE-ALL–1down	124.46	1.80542	1.40272	1.27818	42.7717	10.9658
Root						
Nominal	125.032	1.84212	1.6817	1.37856	6.73971	7.27819
EG-RESOLUTION-ALL–1down	125.033	1.70918	1.6817	1.37856	6.73971	7.27819
EG-RESOLUTION-ALL–1up	125.03	1.97901	1.6817	1.37856	6.73971	7.27819
EG-SCALE-ALL–1down	124.464	1.8484	1.6817	1.37856	6.73971	7.27819
EG-SCALE-ALL–1up	125.598	1.87389	1.6817	1.37856	6.73971	7.27819

Inclusive results in ALL model

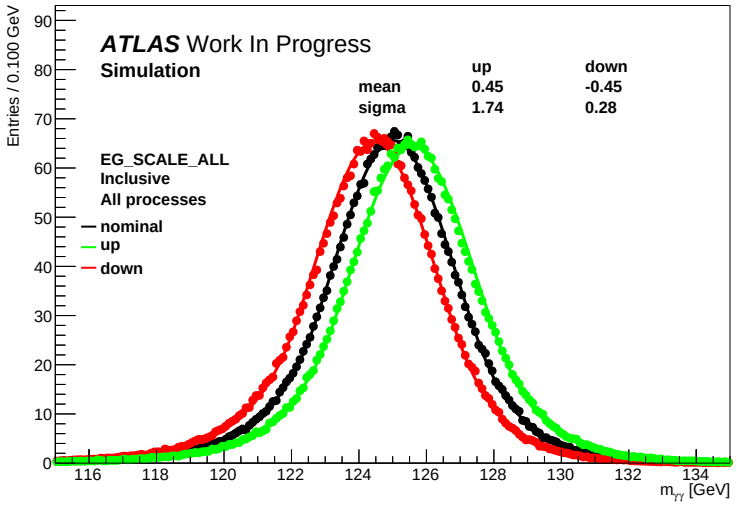
- Binned or unbinned fit with RooFit give similar results
- RooFit or Root give sligthly different systematics

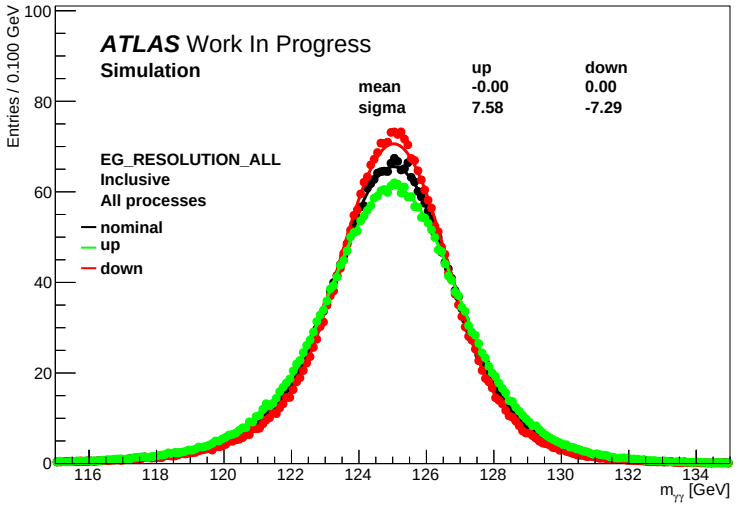




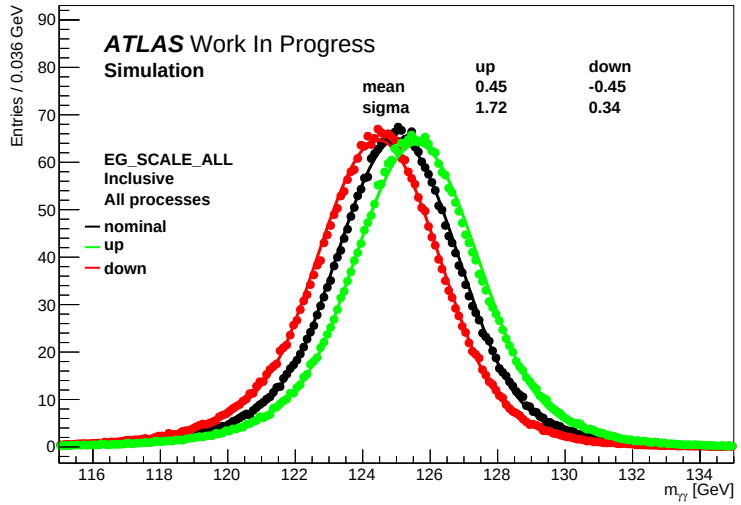
Fits

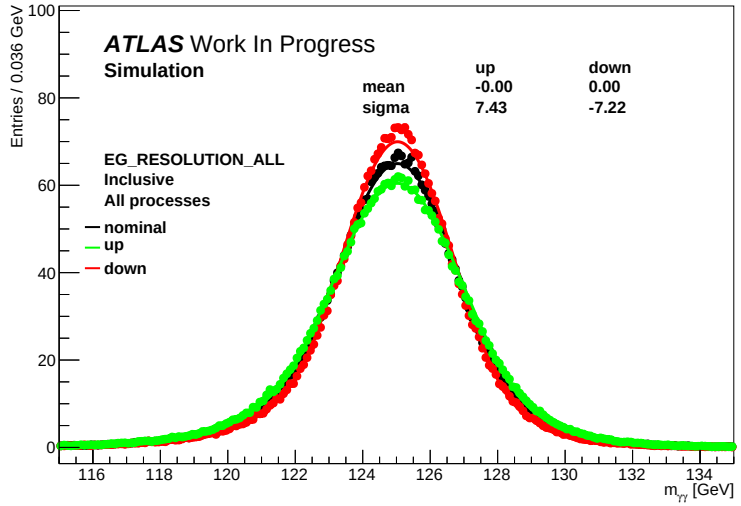
RooFit





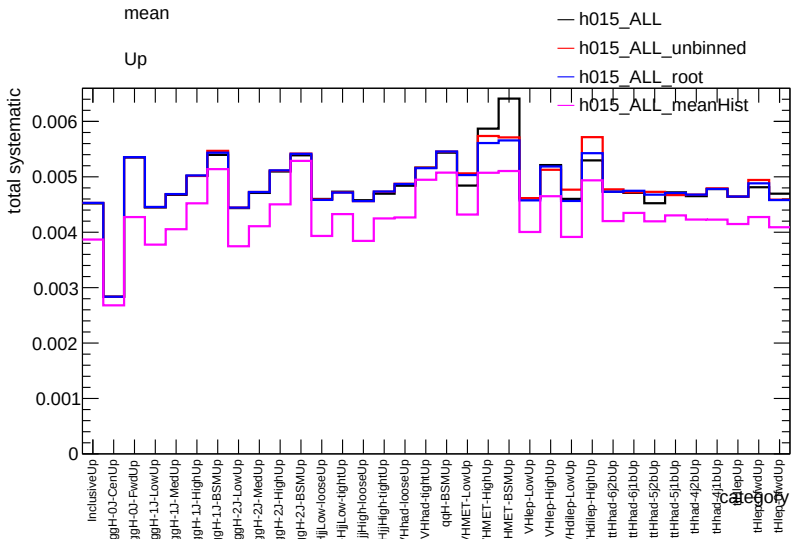
ROOT

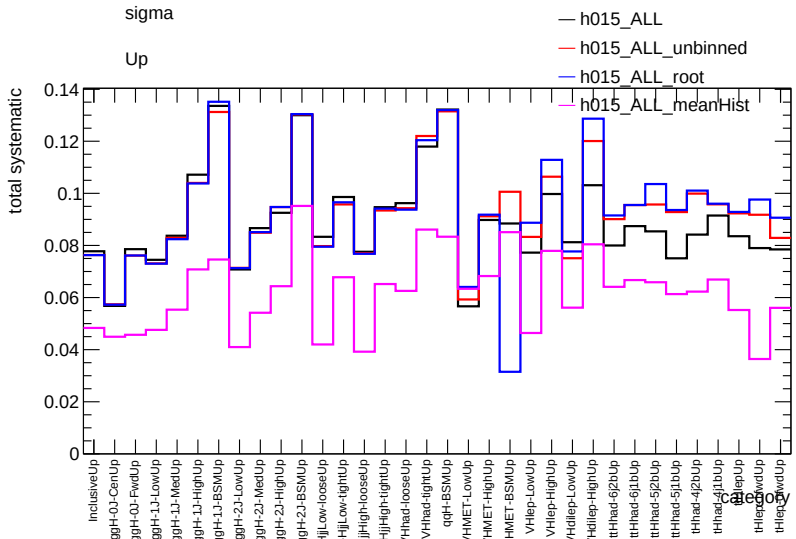




Categories

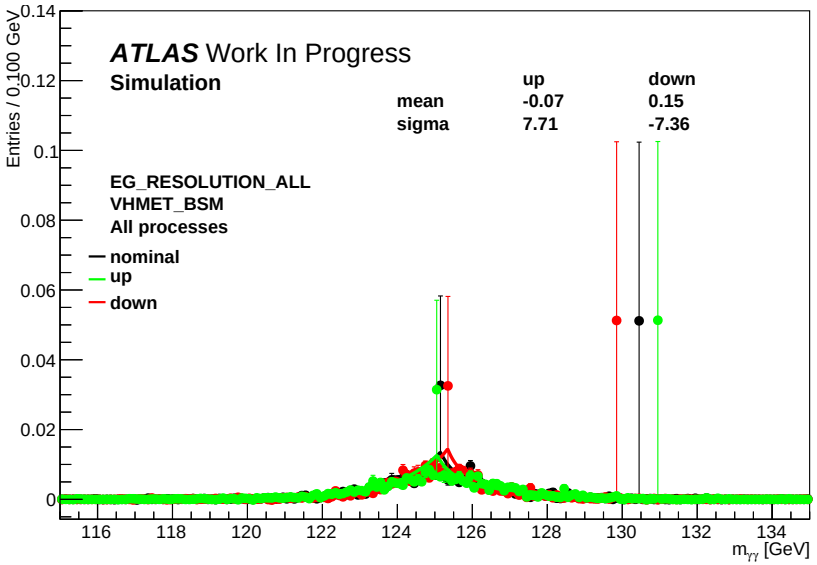
ROOT and RooFit methods shows significant difference in VH and ttH categories

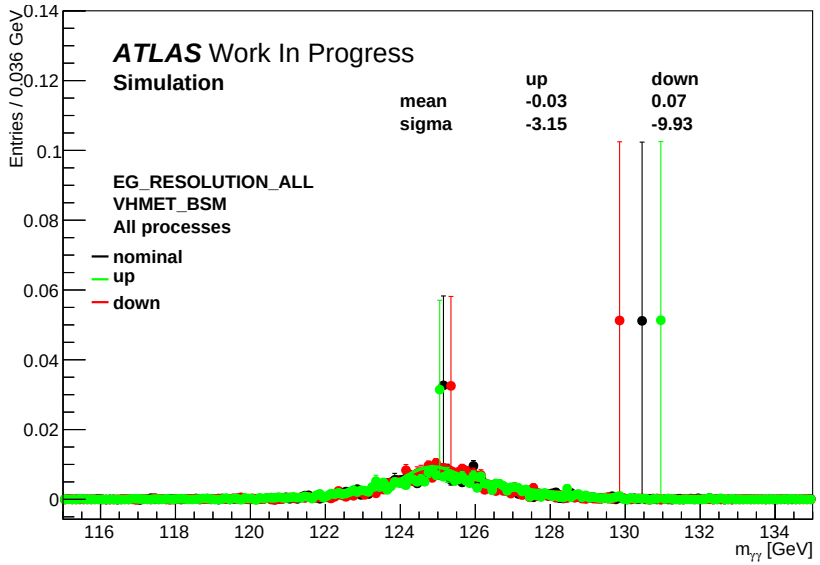




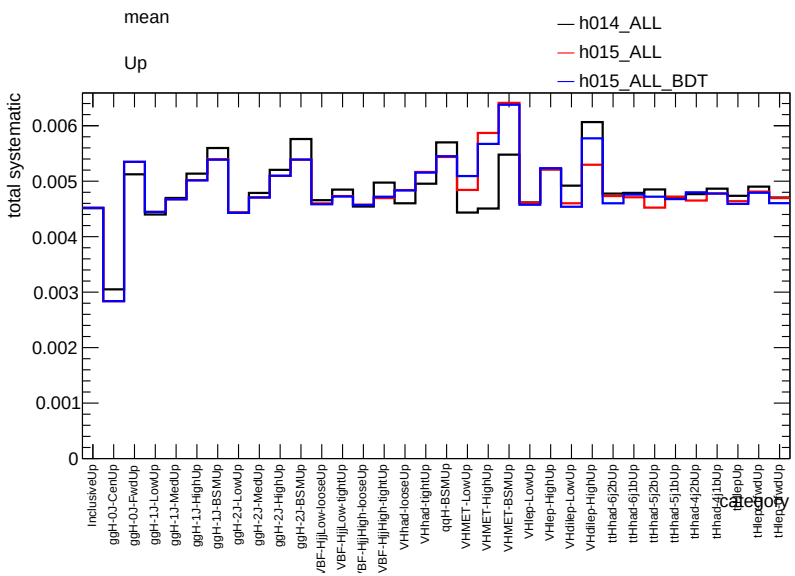
RESOLUTION VHBSM

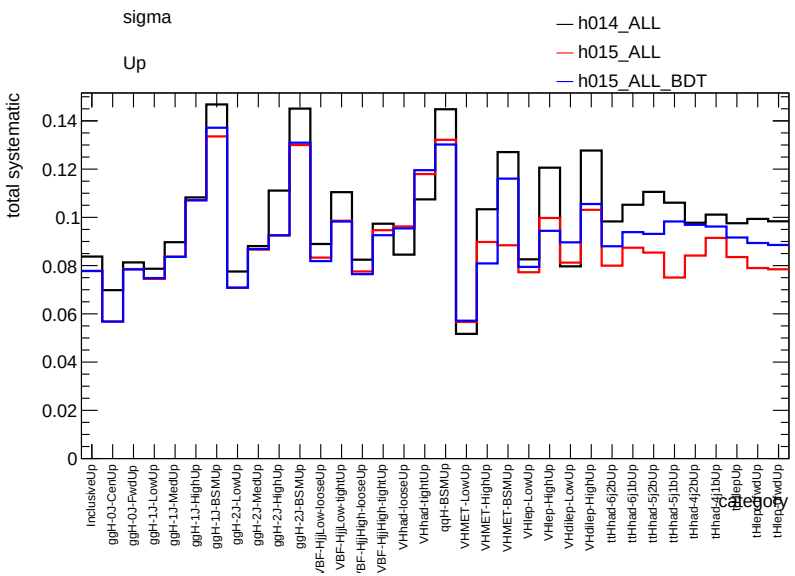
NP	mean	sigma	alphaHi	alphaLow	nHi	nLow
RooFit						
Nominal	125.144	0.120372	0.207774	0.1117	1.24293	13.9984
$EG_{RESOLUTIONALL\_1down}$	125.338	0.111511	0.207774	0.1117	1.24293	13.9984
$EG_{RESOLUTIONALL\_1up}$	125.053	0.129649	0.207774	0.1117	1.24293	13.9984
$EG_{SCALEALL\_1down}$	124.352	0.117578	0.207774	0.1117	1.24293	13.9984
$EG_{SCALEALL\_1up}$	125.941	0.12559	0.207774	0.1117	1.24293	13.9984
ROOT						
Nominal	124.919	0.919806	0.487448	1.08326	6.73773	3.7769
$EG_{RESOLUTIONALL\_1down}$	125.001	0.828496	0.487448	1.08326	6.73773	3.7769
$EG_{RESOLUTIONALL\_1up}$	124.877	0.890828	0.487448	1.08326	6.73773	3.7769
$EG_{SCALEALL\_1down}$	124.211	0.955802	0.487448	1.08326	6.73773	3.7769
$EG_{SCALEALL\_1up}$	125.624	0.919994	0.487448	1.08326	6.73773	3.7769



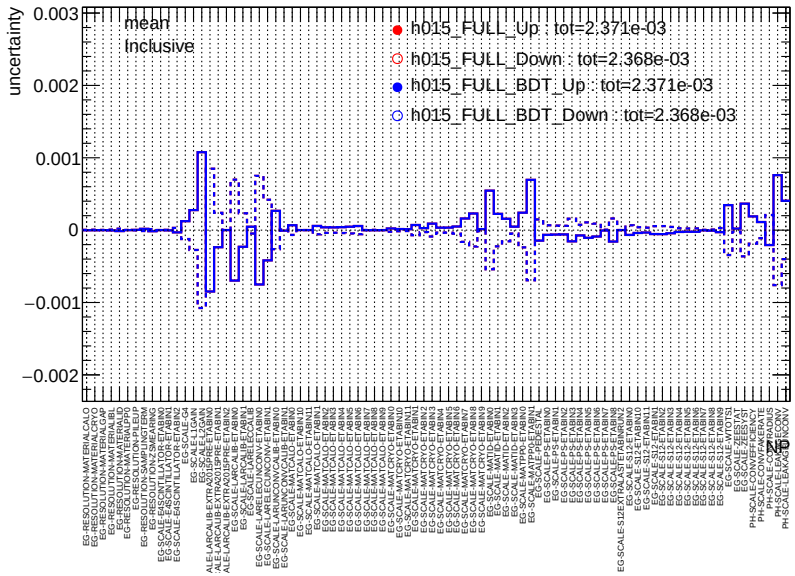


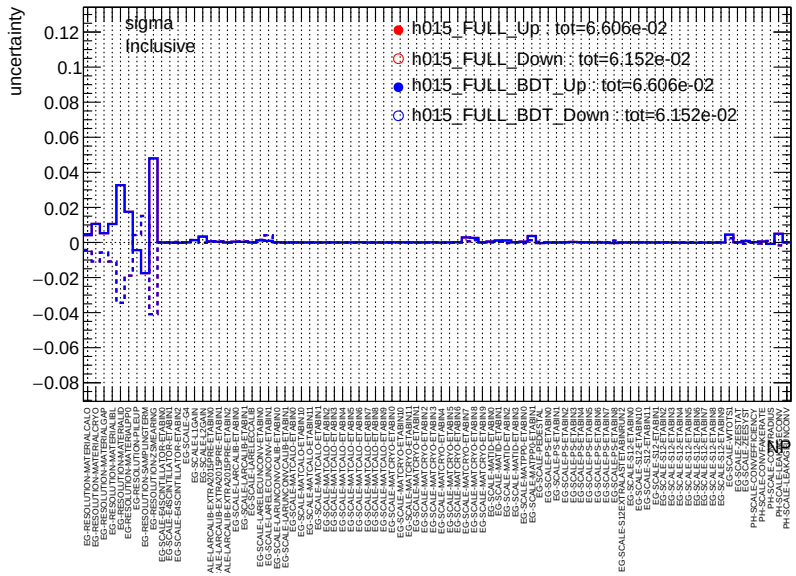
h015 Results ALL





h015 Results FULL Inclusive





h015 Results FULL categories