



RooStats Validation with $H \rightarrow WW$

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On behalf of ATLAS Higgs WG

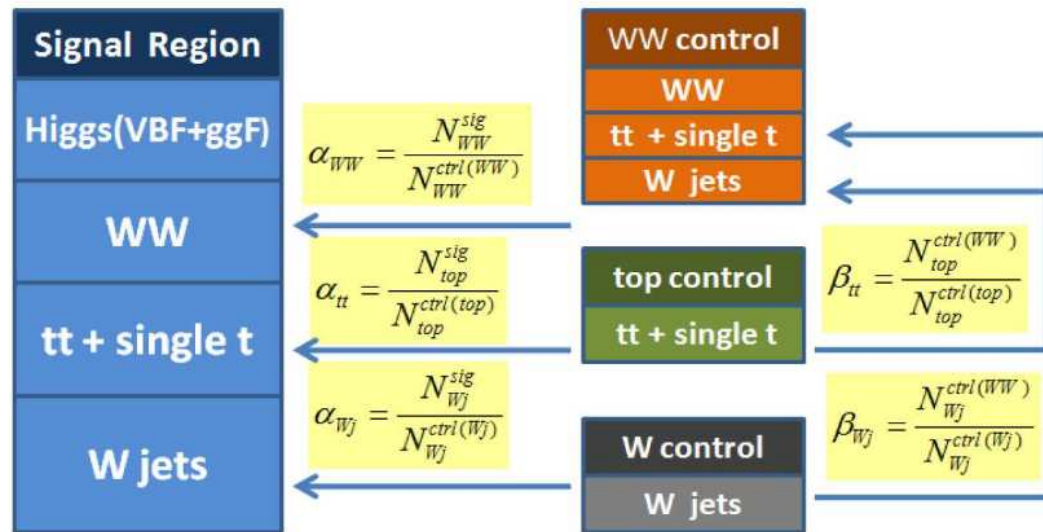
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Validation

- Build $H \rightarrow WW \rightarrow l\nu l\nu$ model in RooStats
- Compare Bill Quayle's private implementation of profile likelihood with RooStats ProfileLikelihoodCalculator
 - This is used in our 7/8/9 TeV sensitivity study (ATL-COM-PHYS-2010-726)

ATLAS $H \rightarrow WW \rightarrow \ell\nu\ell\nu$ Review



- Number counting experiment with one signal region and control regions for major backgrounds
- α terms derived from Monte Carlo describe extrapolation of backgrounds into signal region
- β terms also used to describe extrapolation of contributions between control regions

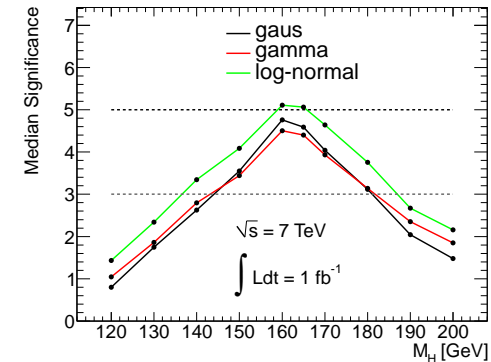
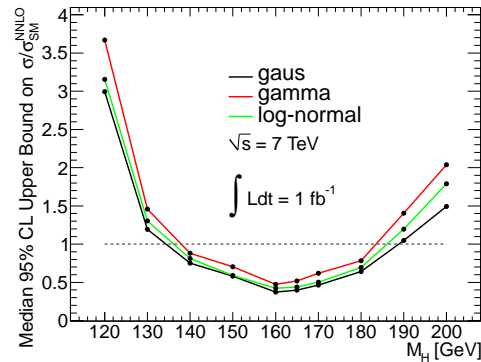
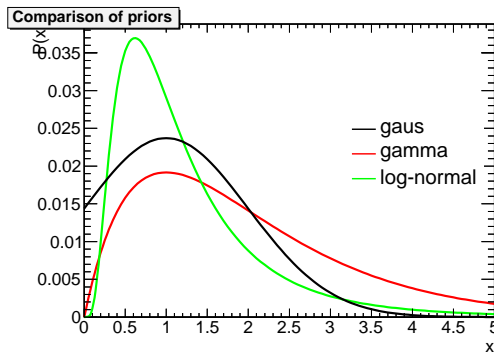
Systematics

- In almost all cases systematics are treated as affecting the α s and β s going into the signal and control regions
- Also included are luminosity and lepton efficiency uncertainties
- Large uncertainties mainly from MC stat

Analysis channel	$\sigma_{\alpha_{WW}}$	$\sigma_{\alpha_{top}}$	$\sigma_{\alpha_{W+jets}}$	$\sigma_{\beta_{top}}$	$\sigma_{\beta_{W+jets}}$
H+0j	7.3%	108%	100%	74%	100%
H+1j	17%	52%	91%	20%	78%
H+2j	54%	43%	-	18%	-

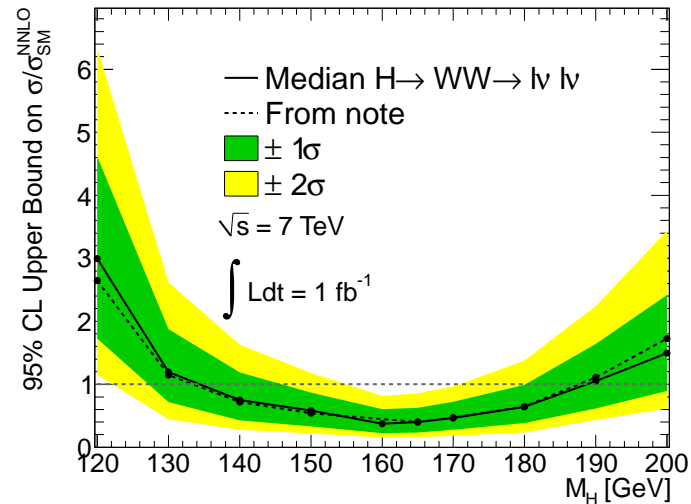
* ATL-PHYS-PUB-2010-009

Note on priors



- There is some dependence of one's result on the prior PDFs assumed
- This is understandable given the large systematics
- The note uses truncated gaussians for priors, so this is ultimately used for comparison

Profile Likelihood Results



Comparison of upper limit on signal strength between implementations

Mass	120	130	140	150	160	165	170	180	190	200
Median UL	3.0	1.2	0.75	0.58	0.37	0.40	0.46	0.64	1.1	1.5
UL from note	2.7	1.2	0.72	0.54	-	0.40	0.47	0.65	1.1	1.7

- General agreement in much of the mass range
 - Better agreement where signal is large
- Deviations could be due to differences in implementation



Future work

- Plan on comparing other decay modes
- Decays with simpler treatments will lend to better validation results
- Export my workspace for someone else to handle
 - Good to know if others can reproduce exact results with same workspace



Summary

- General agreement between private profile likelihood implementation and ProfileLikelihoodCalculator
 - Still room for improvement
 - Differences in treatment of systematics?
- Further compare this and other Higgs analyses
- Validate updated inputs to $H \rightarrow WW$