Degenerate Higgs Studies

Jonathan Hays

Disclaimer ☺

- Plots shown here are back of envelope toy studies taken form publically available plots from ATLAS and CMS
- Do not represent a public statement from either collaboration
- Very rough calculations (and probably wrong ☺)

Spin/Parity

ATLAS gamma-
gamma 0+ versus 2+

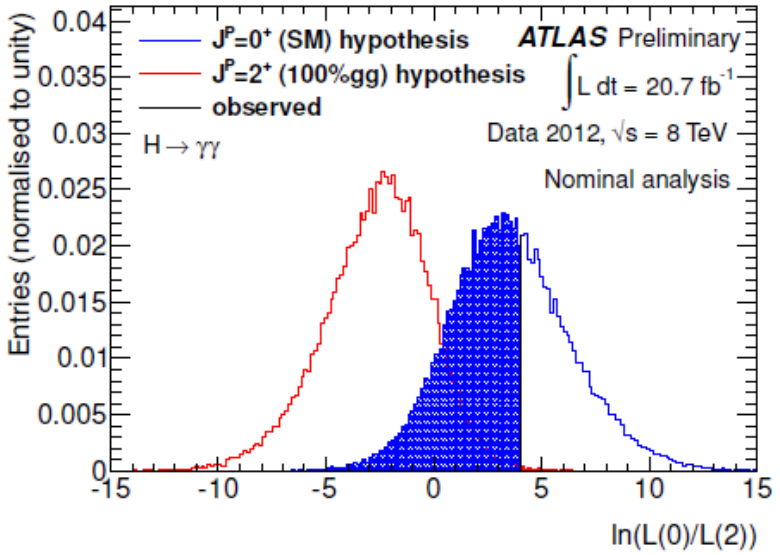
Separation is about 2.6 sigma for gg prod.
And about 1.1 sigma for qq prod

So estimated 2sig. Sensitivity for f (as defined by Andrey) is:

2+ gg: 0.77
2+ qq: none

And projected to 300/fb

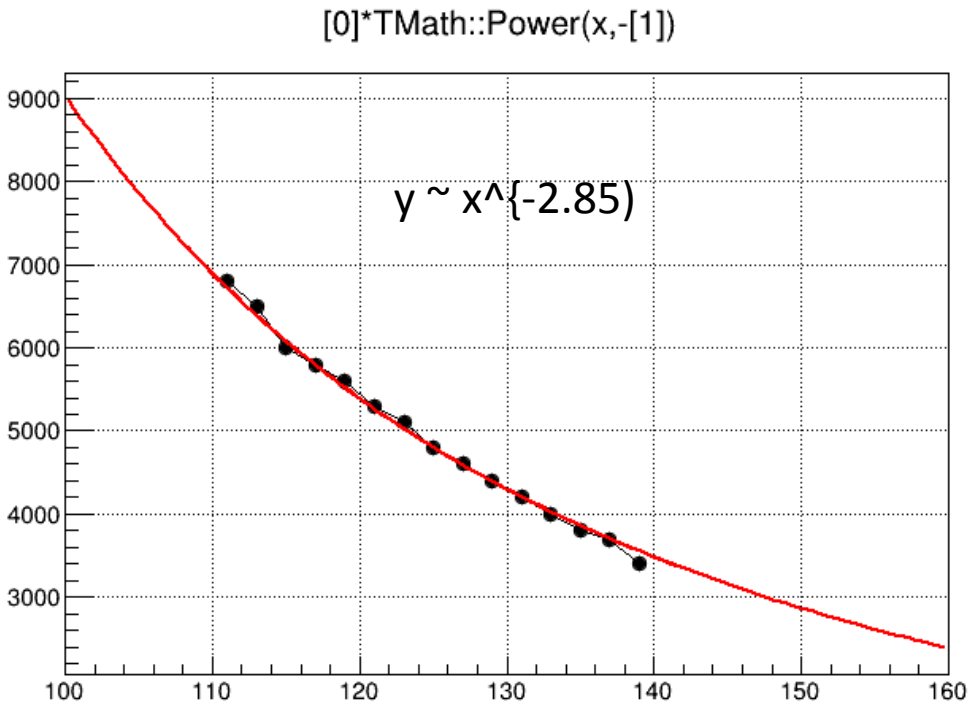
2+ gg: 0.22
2+ qq: 0.53



$f_{q\bar{q}}$ (%)	Spin hypothesis	p-values (%)		$1 - CL_S(2^+)$ (%)
		expected	observed	
0	0^+	1.2	58.8	99.3
	2^+	0.5	0.3	
25	0^+	5.2	60.9	94.6
	2^+	3.9	2.1	
50	0^+	19.8	70.8	74
	2^+	18.7	7.6	
75	0^+	31.9	90.2	66
	2^+	30.5	3.3	
100	0^+	14.8	79.8	88
	2^+	13.5	2.5	

Mass

Model background with a simple power law – for fully inclusive diphotons
Estimated by reading numbers from the public plots.

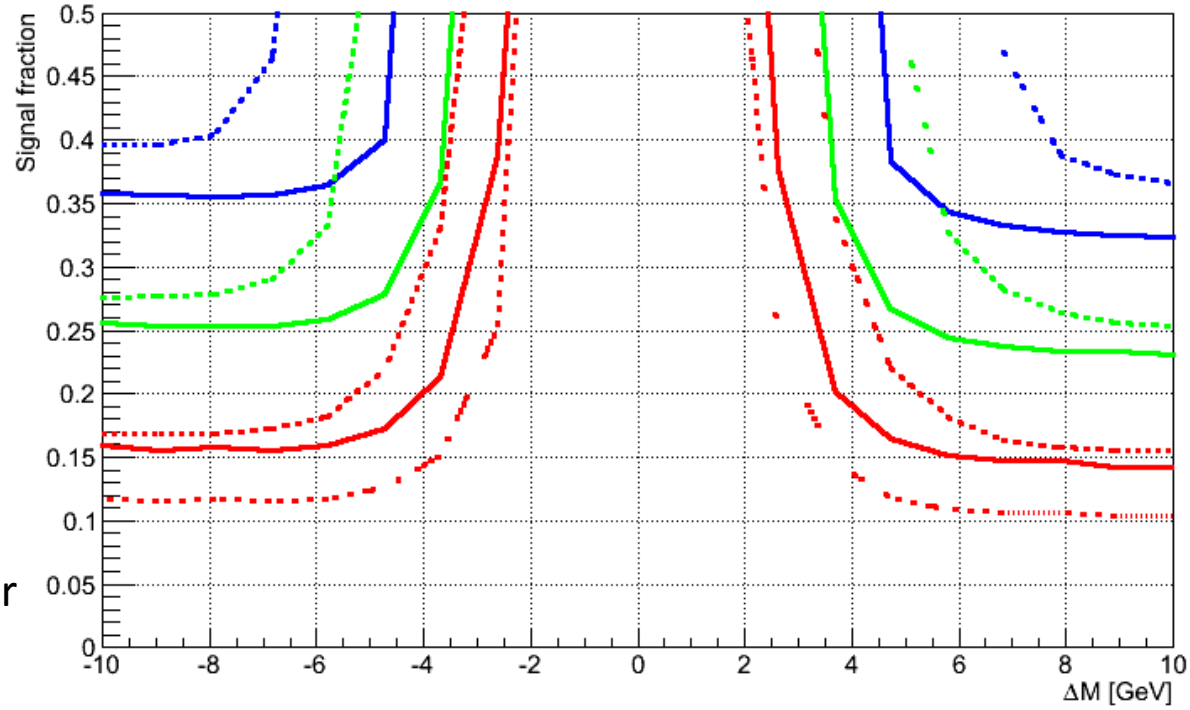


Signal model single or double gaussian with resolution of 1.8 GeV (taken from ATLAS Conf note)

Use likelihood procedure with asimov data for double peaked scenario (as described by Andrey)

Mass

One sigma bound
Two sigma bound
Three sigma bound



Dotted lines show impact of a 20% uncertainty on the resolution

Dot-dashed show similar for CMS – though probably not terribly robust due to difficulty in getting good numbers from docs.

Numbers very likely optimistic due to modelling choices