HH BSM BENCHMARKS

Summary of YR4

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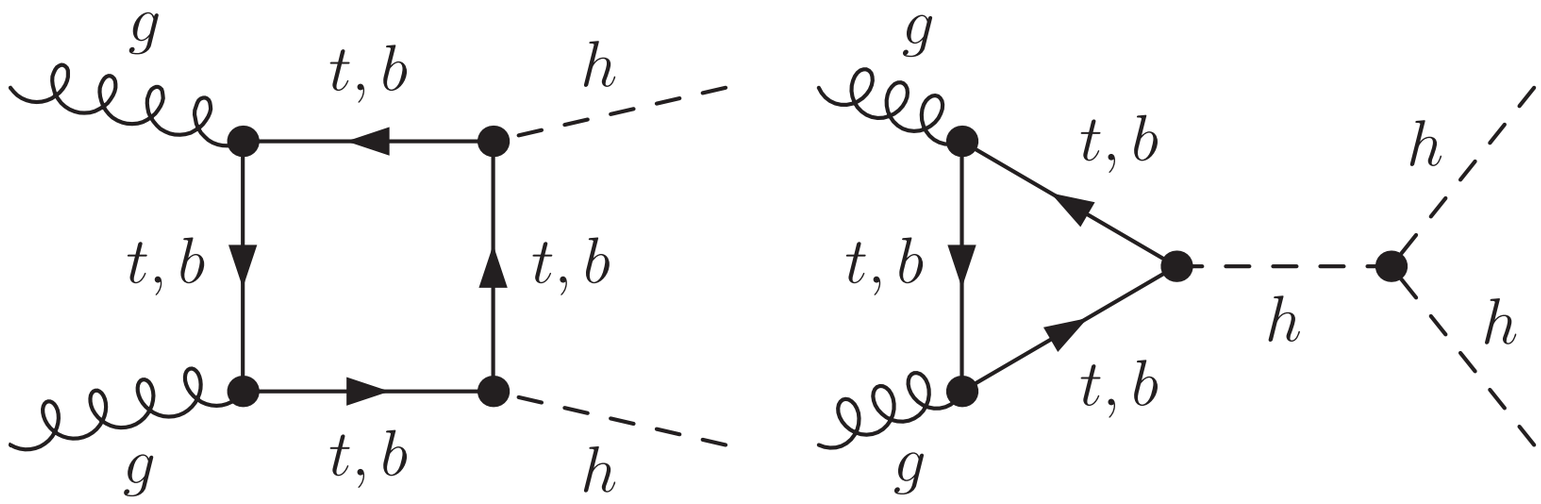


- **YR4**: consolidation of SM pp → hh expectations
  - normalisations with highes precisions available
  - subdominant hh channels beyond LO
  - relevance of top-thresold beyond LO

- **YR4**: first steps towards a hh BSM benchmarking
  - scope
    - BSM benchmarks related to other (e.g. single Higgs) measurements
    - phenomenologically transparent instead of determined by many parameters of a UV theory
  - cover resonant and non-resonant final states

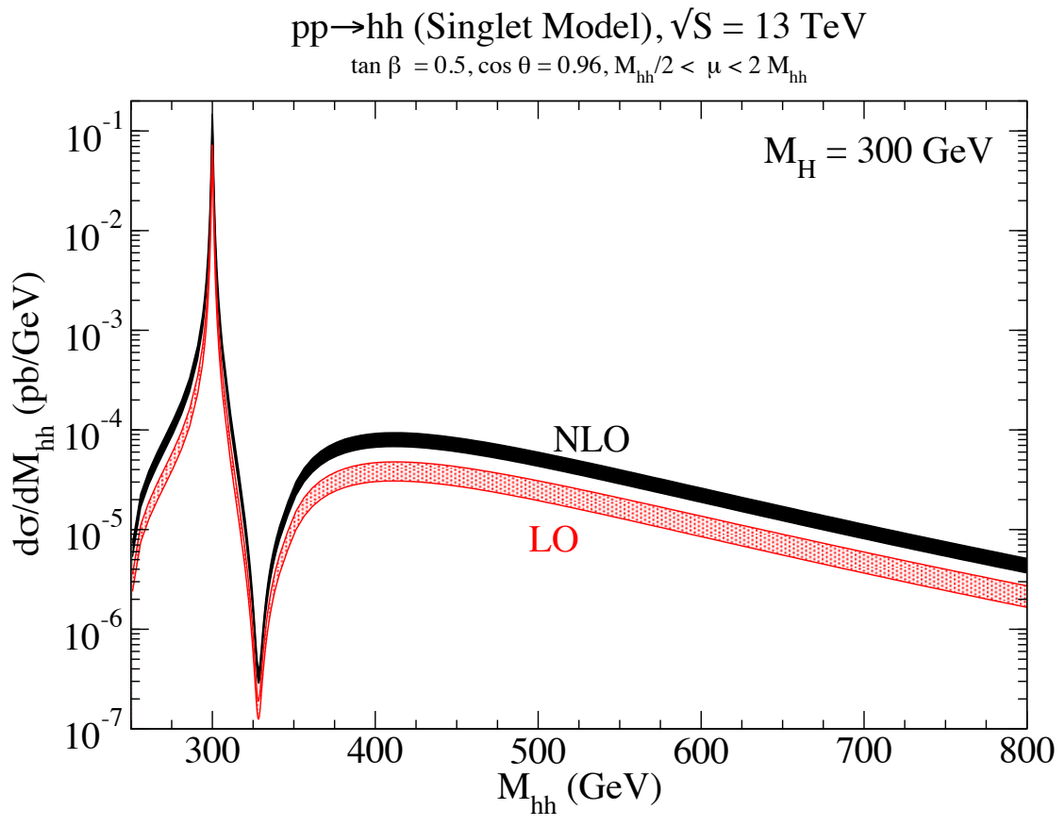
2HDM
SM+singlet

SMEFT

SM+singlet

[Robens, Stefaniak `15,`16]

M_H(GeV)	$\lvert\sin\alpha\rvert_{max}$	$BR(H \to h\,h)_{min}$	$BR(H \to h\,h)_{max}$
255	0.31	0.09	0.27
260	0.34	0.11	0.33
265	0.33	0.13	0.36
280	0.32	0.17	0.40
290	0.31	0.18	0.40
305	0.30	0.20	0.40
325	0.29	0.21	0.40
345	0.28	0.22	0.39
365	0.27	0.21	0.36
395	0.26	0.20	0.32
430	0.25	0.19	0.30
470	0.24	0.19	0.28
520	0.23	0.19	0.26
590	0.22	0.19	0.25
665	0.21	0.19	0.23
770	0.20	0.19	0.23
875	0.19	0.19	0.22
920	0.18	0.19	0.22
≥ 975	0.17	0.19	0.21



M_H (GeV)	Cross Section (fb)	PDF (%)	α_s (%)	scale (%)
260	278.06	2.2	2.0	+ 18.9 -14.8
275	311.39	2.2	2.0	+ 18.8 -14.9
300	303.35	2.2	2.0	+ 18.9 -14.9
325	290.68	2.2	2.0	+ 18.7 -14.9
350	307.86	2.3	1.9	+ 18.7 -15.0
400	286.17	2.4	1.9	+ 18.6 -15.0
450	217.24	2.5	1.9	+ 18.4 -15.1
500	163.98	2.7	1.8	+ 18.4 -15.1
600	103.53	2.7	1.8	+ 18.3 -15.1
700	76.07	2.8	1.8	+ 18.2 -15.1
750	68.32	2.8	1.8	+ 18.2 -15.1
800	62.86	2.8	1.8	+ 18.2 -15.1
900	56.04	2.7	1.9	+ 18.3 -15.1
1000	52.28	2.6	1.9	+ 18.3 -15.0

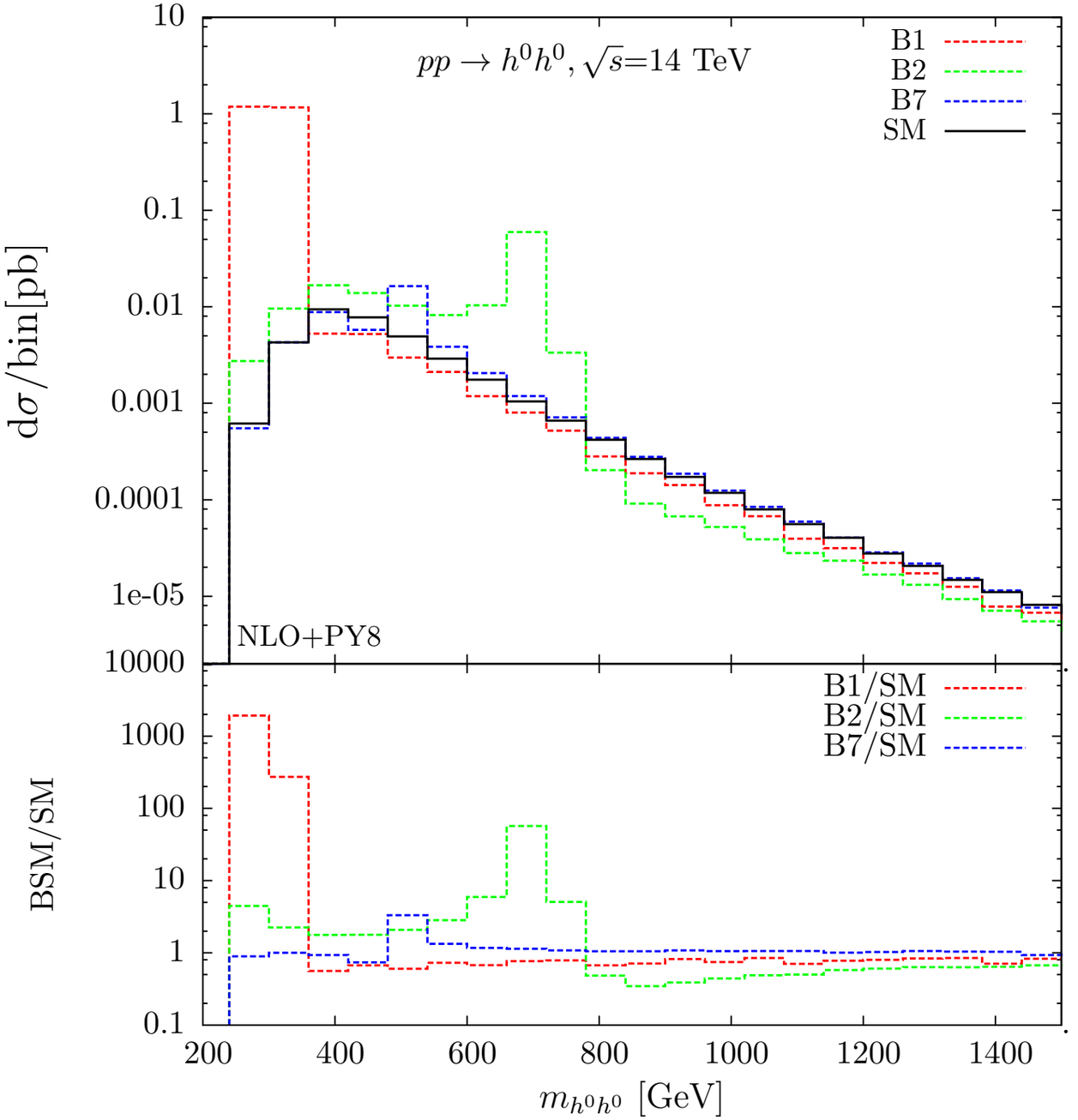
[Dawson, Lewis `15]

2HDM

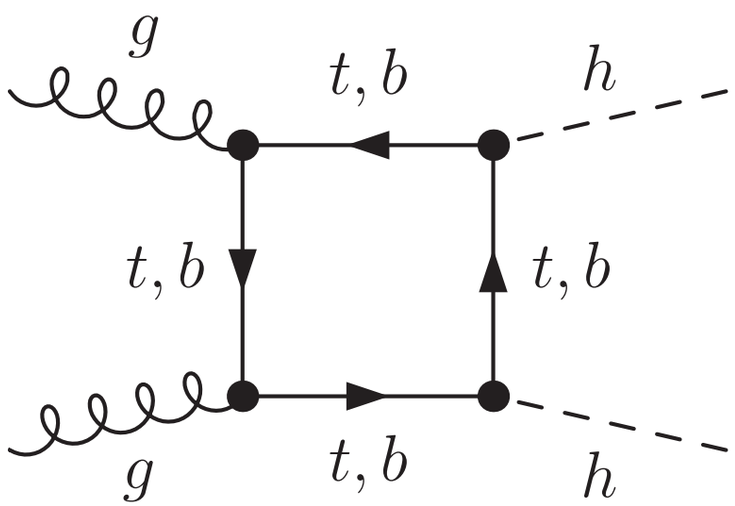
e.g. [Hespel, Lopez-Val, Vryonidou `14]
[Haber, Stal `16]

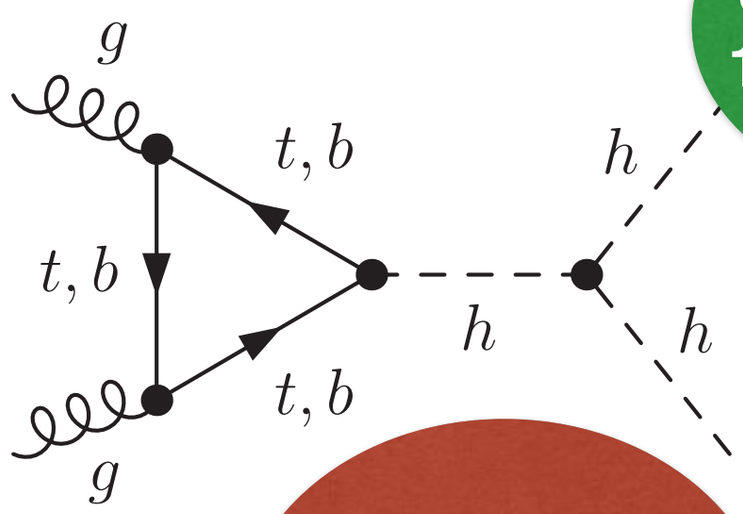
	$\tan\beta$	α	m_{H^0}	m_{A^0}	$m_{H^\pm}$	m_{12}^2
B1	1.75	-0.5881	300	441	442	38300
B2	1.50	-0.6792	700	701	670	180000
B7	10.00	0.1015	500	500	500	24746

cross section similar to SM, however including resonance effects



- **after YR4?**





scalars other than the 125 GeV Higgs

BSM in loops

BSM in s-channel within LHC reach

- can we make this reasonably model-independent
- complementarity to single Higgs measurements
- format of feeding constraints back to theory