HH pair searches

CDS entry

combination with wwyy, bbyy, bbττ, bbbb

Xiaohu SUN 26-05-2015 IHFP [wwyy]https://cds.cern.ch/record/1967498 [bbtt]https://cds.cern.ch/record/1967500

[combination]https://cds.cern.ch/record/1984111/

Higgs approval: https://indico.cern.ch/event/387805/

Theoretical uncertainties

- Theoretical uncertainties estimated with variations on PDF/scale/radiation are being reproduced with a larger number of events
- Procedures are not changed since last time
- Now we produced 1.2M events -> 10 times of the the statistics of last time, since the beginning of this week
- /afs/cern.ch/work/x/xiaohu/public/HH-TheoUncer/

* all follows instructions from Paul T as used in AZh

Systematic uncertainties

 produce grouped systematic uncertainties with the script pointed by Carl

Set of nuisance parameters	Im	pact on	er	ror
Total	+	0.671	-	0.454
DataStat	+	0.603	-	0.431
FullSyst	+	0.294	-	0.143
Jets	+	0.130	-	0.059
Signal theory	+	0.107	-	0.039
Leptons	+	0.053	-	0.028
Lumi	+	0.037	-	0.013
Btagging	+	0.035	-	0.015
Photons	+	0.026	-	0.008
MET	+	0.019	-	0.009

hMSSM Interpretation

- Many thanks to Nikos and Allison, we have another new map file for hMSSM this week
- the strangely small BR_H_hh is fixed





hMSSM - limit parametrization

- The **non-SM BR** of h decays should be taken into account in the combined limits
- Assume mH=mA
- BR(h->yy/ww/bb/tautau) is a function of mH but NOT dependent on tb, we can simplify the parametrization
- Limit is parametrized as a function of
 - mH
 - BR(h-yy/ww/bb/tt)
- BRs are a group of fixed values according to mH



hMSSM – BR rescales

• Parametrization grid definition on mH,BRs

	260	300	350	400	500	800/1000
BR(yy)	0.6	0.7	0.8	0.8	0.9	1.0
BR(ww)	0.6	0.7	0.8	0.8	0.9	0.9
BR(bb)	1.2	1.2	1.2	1.1	1.1	1.0
BR(tauta u)	1.2	1.2	1.2	1.1	1.1	1.0

* rounding to 0.1

hMSSM – channel rescales

• translate BR rescales into channel rescales

	260	300	350	400	500	800/1000
bbyy	0.72	0.84	0.96	0.88	0.99	-
wwyy	0.36	0.49	0.64	0.64	0.81	-
bbtautau	1.44	1.44	1.44	1.21	1.21	1.0
bbbb	-	-	-	-	1.21	1.0





hMSSM – compared to other channels



low-tb-high

- BR map in plain files from Sven
 - tb~1, numeric instability, missing points;
 - inspired by Nikos, ask Sven to run the calculation with tb=1.01;
 - just added to the map file



https://twiki.cern.ch/twiki/bin/view/LHCPhysics/HXSWG3LowTanB

Summary

- Uncertainties are grouped and are estimated for each, we see statistical is still larger than systematic uncertainties; asked for more mass point, being running them
- 1.2M events, for signal theoretical uncertainty estimation
- hMSSM, map files has problem in Hhh BR (too small numbers) is fixed; preliminary exclusion plots; fixed gap issue asked by Jianming on Friday
- low-tanb-high, preliminary exclusion plots,
 fixed gap issue asked by Jianming on Friday





ggF H xsec





BR H->hh

BR_Hhh=6.3e-11 BR_HWW=0.60 BR_HZZ=0.24

BR_Hbb=0.14 BR_Htautau=0.017 BR_Hmumu=6.0e-5



×10⁻́





m_H/m_A

ATLAS Internal hMSSM

10 10 10 10 1.0 1.0 1.0 1.0 10 10 10 1.0 10 10 10 1.0 50 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 10 10 1.0 1.0 1.0 1.0 10 10 10 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 10 10 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 10 10 10 10 10 10 10 1.0 40 1.0 30 1.0 10 10 10 10 10 10 1.0 20 1.0 -1.0 -1-0 1.0 1.0 1.0 1.0 1.0 1.0 10 10 10 10 10 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 10 1.0 10 10 10 10 10 10 10 10 1.1 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 6.9 500 700 200 300 400600 800 900 spreading around mA ~10%

ATLAS Internal hMSSM m_ [%] 6.5 6.5 6.4 6.3 6.3 6.2 6.1 6.1 6.0 6.0 5.9 62 6.1 6.0 5.9 5.9 5.8 5.7 5.7 5.5 5.5 5.5 5.5 5.4 5.4 5.4 5.3 5.3 5.3 5.3 5.2 5.2 5.2 5.2 5.1 5.1 5.1 5.1 5.1 5.0 5.0 5.0 5.0 5.0 5.0 5.0 4.9 5.4 5.4 5.3 5.3 5.2 5.2 5.2 5.2 5.1 5.1 5.1 5.1 5.0 5.0 5.0 5.0 5.0 4.9 4.9 4.9 4.9 4.9 4.8 4.8 4.8 4.8 6.0 5.9 57 57 5.5 4.8 4.8 4.8 4.7 4.7 KK KK 4.9 4.9 4.9 4.8 4.8 4.8 4.7 4.7 4.7 4.7 4.7 4.6 4.6 4.6 4.6 4.5 4.5 4.5 4.5 4.5 4.5 4.5 4.6 4.4 4.4 **K D** 5.0 5.3 5.3 5.2 4.5 4.5 4.5 4.5 4.5 4.5 4.5 4.5 4.5 4.5 47 47 44 44 44 44 4.4 4.3 4.3 4.3 4.3 4.3 4.3 4.3 4.2 4.2 4.2 4.2 4.2 4.1 4.1 4.1 4.1 4.1 4.1 4.0 4.9 4.9 4.0 4.0 44 4.0 4.0 4.0 4.0 3.9 3.9 3.9 3.9 3.9 3.9 50 🛥 4.3 4.3 42 42 4.2 4.2 41 41 41 41 4.0 4.0 3.9 3.8 3.8 3.8 4.4 4.3 4.3 4.2 4.2 3.8 3.8 3.8 3.7 3.7 3.7 3.7 3.7 3.7 3.6 3.6 3.6 3.6 3.6 3.6 3.6 3.9 3.9 3.9 3.8 3.6 3.5 3.5 3.5 35 35 35 4.0 3.9 42 41 41 40 40 39 39 39 38 3.8 3.8 -8-8 3.8 3.7 3.7 3.7 3.5 3.5 3.5 3.5 3.5 3.5 3.4 3.4 3.3 3.3 3.3 3.3 3.2 3.2 3.2 3.2 3.2 3.1 3.1 3.1 3.1 3.1 3.1 3.1 3.1 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 29 29 29 34 34 33 33 32 2.9 2.9 2.9 2.9 2.9 2.8 2.9 2.9 2.8 2.8 28 28 28 28 2.7 2.7 2.7 3.2 3.1 3.1 3.1 2.9 28 28 27 27 27 27 27 27 27 27 27 26 26 26 26 26 40 30-2.7 2.7 2.7 2.6 2.6 2.6 2.6 2.6 2.6 2.6 2.6 2.5 2.5 2.5 2.5 2.5 2.5 2.5 2.5 2.5 2.5 2.4 2.7 2.7 2.7 2.6 2.6 2.5 2.5 2.5 2.4 2.4 1.9 1.9 1.9 1.9 1.8 1.8 1.8 1.8 1.6 1.6 1.5 1.8 1.8 1.8 1.8 1.7 1.7 1.7 1.7 1.7 1.6 1.6 1.6 1.6 30 115-1.6 1.3 1.3 1.0 1.0 0.9 1.0 1.0 1.0 1.0 1.0 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.8 0.8 0.8 0.8 0.8 0.8 0.8 0.8 0.8 0.9 0.9 0.9 0.8 0.8 0.8 0.8 0.7 0.7 0.7 0.7 0.7 0.7 0.6 0.6 0.6 0.6 0.6 0.6 20 0.7 0.7 0.5 0.5 0.6 0.6 0.5 0.5 0.6 0.6 0.6 0.5 0.5 0.6 0.6 0.5 0.5 0.5 0.5 0.5 0.5 0.4 04 04 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 04 04 0.4 0.4 0.3 0.8 0.3 0.3 0.3 0.3 0.3 0.3 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 10 0.2 0.1 0.1 6.2 0.2 02 02 02 02 0.1 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.1 0.1 0.1 0.2 02 02 0.2 0.2 0.2 0.1 0.1 0.2 0.3 0.3 0.3 0.3 0.3 0.3 0.1 0.1 0.1 0.1 0.2 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.4 0.4 0.5 0.5 0.5 0.5 0.1 0.2 0.2 0.3 0.3 0.3 0.4 0.4 0.4 0.4 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 02 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.3 0.4 0.5 200 300 400 500 700 600 800 900 below tb=25 width<1%m(H)

BR(h $\rightarrow\gamma\gamma$)/0.00228 ATLAS Internal hMSSM

0.4 0.5 0.6 0.5 0.7 0.7 0.7 0.8 0.8 0.8 0.8 0.9 0.9 0.9 0.9 1.0 0.9 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 074 0.5 0.9 0.9 1.0 1.0 1.0 1.0 1.0 1.0 1.0 0.4 0.9 0.9 0.9 0.9 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 0.4 0.5 0.9 0.9 0.9 09 09 09 10 1.0 1.0 1.0 1.0 1.0 1.0 1.0 0.4 0.5 0.9 0.9 0.9 0.9 0.9 0.9 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 04 0.5 1.0 1.0 1.0 1.0 0.9 0.9 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 50 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 0.9 0.9 0.9 0.9 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 0.4 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 0.4 0.5 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 0.9 0.9 0.9 0.4 0.5 0.9 0.9 0.9 0.9 0.9 1.0 0.9 0.9 0.9 1.0 1.0 1.0 10 10 10 10 10 10 1.0 1.0 0.4 0.5 6.9 0.9 0.9 09 09 09 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 0.4 0.5 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 40 0.9 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 0.4 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 0.4 1.0 1.0 1.0 1.0 1.0 0.5 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 0.9 0.9 0.9 0.9 0.9 0.9 1.0 1.0 0.4 0.5 0.9 0.9 0.9 0.9 0.9 0.9 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 09 09 09 09 09 09 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 0.4 0.9 0.9 0.9 09 09 09 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 0.4 0.5 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 30 0.9 0.9 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 0.9 0.9 0.9 0.9 1.0 1.0 1.0 1.0 0.4 0.9 0.9 0.9 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 0.4 0.9 0.9 0.9 0.9 0.9 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 0.4 0.9 0.9 0.9 1.0 1.0 1.0 1.0 1.0 0.4 0.5 0.9 0.9 0.9 0.9 1.0 1.0 1.0 1.0 1.0 1.0 1.0 0.4 0.9 0.9 0.9 0.9 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 0.4 0.5 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 20 04 0.5 0.9 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 0.9 0.9 0.9 0.9 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 0:4 0.9 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 0.4 0.9 0.9 0.9 0.9 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 0.4 0.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 0.4 0.5 0.5 0.9 0.9 0.9 0.9 0.9 0.9 1.0 1.0 1.0 1.0 04 0.5 09 09 09 10 10 10 10 10 10 10 10 10 10 10 10 10 0.9 1.0 1.0 1.0 1.0 0.4 0.5 0.9 0.9 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 10 0.4 0.5 0.9 0.9 0.9 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 10.4 1.0 1.0 1.0 1.0 1.0 0.4 0.9 0.9 0.9 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 0.9 0.4 0.5 0.9 1.0 1.0 0.7 1.0 0.9 0.9 0.5 0.5 0.5 0.7 0.7 0.9 0.9 0.9 0.9 0.9 0.9 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 0.7 0.9 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 500 700 200 300 400 600 800 900

40% variations away from SM BR

BR(h→WW)/0.215 ATLAS Internal hMSSM

0.9 0.9 0.9 0.9 0.9 0.9 0.4 0.5 0.9 6.9 0.9 0.9 0.9 6.9 0.9 0.9 0.9 0.9 0.9 0.4 0.5 0.8 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.4 0.5 0.5 0.8 0.8 0.9 0.9 0.9 0.9 6.9 0.9 0.5 04 05 0.8 0.8 0.9 0.0 0.9 0.9 09 09 0.9 0.9 07 08 0.8 0.9 0.9 0.9 04 05 6.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 50 0.4 0.9 0.5 0.8 0.9 0.5 0.4 0.5 0.4 0.5 0.5 0.6 0.6 0.7 0.8 0.8 0.8 0.8 0.9 6.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 04 05 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.4 0.5 0.9 0.4 0.5 0.9 0.9 6.9 0.9 0.9 0.9 0.5 0.4 0.5 0.0 0.9 0.9 0.9 40 0.4 0.9 6.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.4 0.5 04 05 05 0.5 0.5 8.0 0.8 8.0 0.8 8.0 0.8 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.7 0.8 0.9 0.9 074 0.5 0.7 0.7 0.8 0.8 0.8 0.8 0.8 0.8 0.8 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.4 0.5 0.8 0.8 0.8 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.4 0.5 0.9 0.9 0.9 09 09 0.9 0.9 0.4 0.5 0.9 0.9 0.9 0.9 0.9 0.9 0.9 30 0.4 0.5 0.9 0.9 0.9 0.5 0.4 0.5 0.9 0.9 0.9 0.4 0.5 0.6 0.6 0.7 0.7 0.8 0.8 0.8 0.8 0.8 0.8 0.8 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.4 0.5 05 05 0.7 0.8 0.8 0.8 0.8 0.8 0.8 0.8 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.4 0.5 0.5 0.8 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.7 0.8 0.8 0.8 0.8 0.8 0.8 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.4 0.5 0.9 0.9 0.9 0.9 0.9 0.9 0.4 0.5 0.9 0.9 0.9 0.9 0.9 0.9 0.9 20 0.4 0.5 0.9 0.9 0.5 0:4 0.5 0.9 0.9 0.4 0.6 0.6 0.7 0.8 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.5 04 05 0.7 0.7 0.8 0.8 0.8 0.8 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.4 0.5 0.5 0.8 0.8 0.5 0.5 0.7 0.7 0.7 0.8 0.8 0.8 0.8 0.8 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 6.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 04 0.5 0.9 0.9 0.9 09 09 0.9 0.9 0.9 0.9 0.9 0.9 0.5 0.4 0.5 0.9 0.9 0.9 0.9 0.9 0.9 0.9 10 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.4 0.5 0.4 0.9 0.9 0.9 0.9 0.4 0.5 0.6 0.6 0.9 0.9 0.9 0.9 0.4 0.5 0.5 0.6 0.7 0.7 0.8 0.8 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 6.9 0.9 0.9 0.9 0.7 0.8 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.5 | 0.5 | 0.5 | 0.7 | 0.7 | 0.8 | 0.8 0.8 0.8 6,9 6,9 6,9 0.8 0.8 6.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.8 0.8 0.8 0.9 0.9 0.9 0.9 0.9 0.9 0.91 0.9 0.9 0.9 0.9 0.9 0.9 1.0 200 300 400500 600 700800 900 50% variations away from SM BR

BR(h→bb)/0.577 ATLAS Internal hMSSM

50 1.3 1.3 40 1.4 1.3 1.3 1.2 1.2 1.2 1.2 1.2 1.1 30 13 13 13 12 12 12 12 12 11 $20 \frac{14}{14} \frac{13}{13} \frac{12}{12} \frac$ 10 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.3 1.3 1.3 1.2 1.2 1.2 1.2 1.1 1.1 1.0 1.0 1.0 1.0 1.1 1.1 1.1 1.1 1.1 1.1 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.3 1.3 1.2 1.2 1.2 1.2 1.2 1.1 1.1 1.1 1.1 1.1 111 111 111 1.4 500 700 200 300 400 600 800 900

30% variations away from SM BR

BR(h\rightarrowtt)/0.0632 ATLAS Internal hMSSM

50 1.4 1.3 1.3 40 1.0 1.0 1.0 1.0 1.0 1.0 20 10 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.3 1.3 1.3 1.2 1.2 1.2 1.2 1.2 1.1 1.1 1.1 1.1 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.1 1.1 1.1 300 400500 700800 200 600 900 30% variations away from SM BR

hMSSM Interpretation - BR*BR

- bbyy is rescaled by BR(bb)BR(yy)
- bbtautau is rescaled by BR(bb)*BR(tautau)
- wwyy is rescaled by BR(yy)BR(WW)
- bbbb is rescaled by BR(bb)^2
- these BR products make the rescaling in each channel quadratically larger/smaller
 - e.g. BR variation=30% -> limit variation=69%
- if the couplings are rescaled in the same way, the rescaling on products will be "squared", such as hbb/htautau, hww/hyy
 - affecting channels: bbtautau, bbbb, wwyy

BR(h $\rightarrow\gamma\gamma$)/0.00228 * BR(h \rightarrow bb)/0.577 ATLAS Internal hMSSM

0.5 0.6 0.7 0.8 0.8 0.9 05 05 07 08 08 0.9 50 1.0 0.5 0.6 0.7 -0-5 0.5 0.7 0.8 0.8 0.8 0.9 0.5 0.5 0.7 0.8 0.8 0.5 0.5 0.7 0.8 0.8 40 0.5_0.5 0.7 1.0 0.9 1.0 0.5 0.6 0.7 0.8 0.8 0.5 0.5 0.7 0.8 0.8 30 0.5 0.6 0.7 0.5 0.5 0.7 0.8 0.8 1.0 20 0.5 0.6 0.7 0.8 0.8 0.5 0.6 0.7 0.8 0.8 0.5 0.5 0.7 10 0.5 0.7 0.8 0.8 0.9 0.9 0.9 300 200 400 500 600 700800 900 scales on hyy and hbb cancel

fortunately. bbyy variates < 30%

BR($h \rightarrow \tau \tau$)/0.0632 * BR($h \rightarrow bb$)/0.577 ATLAS Internal hMSSM

1.1 1.1 1.1 1.1 1.1 1.1 1.1 1.1 1.1 1.8 1.7 1.5 1.5 1.4 1.4 1.3 1.3 1.3 1.3 1.2 1.2 1.2 1.2 1.2 12 11 11 11 11 1.1 1.1 1.1 1.1 1.1 1.1 1.1 1.1 1.1 1.1 1.1 1.1

60% variation on BRtt*BRbb

low-tb-high

- BR map in plain files from Sven
 - some incomplete phase points in very low tanb and mA region (theoretically unstable)
 - some duplicated phase points due to technical issues
- I have stripped out all duplicated phase points and converted available points into **ntuple and map** formats

- XS map from Stefan, but the current numbers are only used for giving an idea of xs and scale uncertainties
- I have merged them into our **map** files



https://twiki.cern.ch/twiki/bin/view/LHCPhysics/HXSWG3LowTanB









ATLAS Internal low-tanβ-high

1.2

tanβ	0	1.0 1.0 1.0 1.0 1.0 1.0	1.0 1.0 1.0	_	1.2																										
-	9 1.0 1.0	1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0	1.0 1.0 1.0	1.0 1.0 1.0 1.0																											
	1.0 1.0 1.0 1.0	1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0	1.0 1.0 1.0	1.0 1.0 1.0 1.0		1																									
	1.0 1.0 1.0	1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0	1.0 1.0 1.0 1.0																												
	1.0 1.0 1.0	1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0	1.0 1.0 1.0	1.0 1.0 1.0 1.0	1.0 1.0 1.0	_	0.8																								
	6 1.0	1.0 1.0 1.0 1.0 1.0 1.0	1.0 1.0 1.0																												
	5 1.0	1.0 1.0 1.0 1.0 1.0 1.0	1.0	1.0	1.0 1.0 1.0	1.0	1.0 1.0 1.0	-	0.6																						
	4 10	1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0	1.0 1.0 1.0 1.0		0.4																										
	1222	1.1 1.0 1.1 1.0 1.1 1.1	1.0 1.0 1.0		0.4																										
	3 11	14 14 14 14 14 14	11	11 11	1.0 1.1 1.1	1.0 1.0 1.1	1.0 1.0 1.1	1.0 1.0 1.0		0.2																					
	2 11 12 12	1.1 1.1 1.1 1.1 1.2 1.2	11	11	11	11	11	10 10 10	11	11	11 11 11	1.0 1.1 1.1	1.0 1.1 1.1	1.0 1.1 1.1	1.0 1.0 1.1	1.0 1.0 1.1	1.0 1.0 1.0	1.0													
	200	1.2 1.2 1.3 1.2	1.2	25	12 50	1.2	1.1	1.1	30	11 10)()	1.1	1.1	1.1	35	50	1.1	1.1	1.1	11 11 4		1.1	1.1	1.1	1.0 1.1 4.5	10 1.1 50	1.0	1.0	1.0	50	0	0
	200			n	nH	11	ha	as	3	0	%		sp	ore	22	ad	in	g	a	W	a	у	fr	or	n	m	٦A		m _A	v	

m_H/m_▲

$\Gamma_{\rm H}/{\rm m}_{\rm H}$	[%]
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ATLAS Internal low-tanβ-high

	10					••																					-						
ğ	10	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2		
۲		0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2		
Ť,		0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2		
	a	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	_	4
	3	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2		-
		0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2		
		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2		
	g	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2		35
	0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2		0.0
		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2		
		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2		
	1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2		2
	-T	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2		3
		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2		
		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2		
		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2		0 E
	6	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	_	2.5
		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2		
		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2		
	_	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2		~
	- 51	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2		2
		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2		
		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2		
		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2		
	4	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2		1.5
		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3		
		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3		
		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4		
	- 31	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.4		1
	Ŭ	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5		•
		0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.6	0.6	0.6		
		0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.4	0.4	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.7	0.7	0.7		
	2	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.4	0.4	0.5	0.5	0.6	0.5	0.7	0.7	0.7	0.8	0.8	0.8	0.8		0.5
	-	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.4	0.5	0.5	0.6	0.7	0.7	1.0	1.0	0.9	0.9	0.9	1.0	1.0	1.0		0.0
		0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.4	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.2	1.3	1.4	1.5	1.5	1.6	1.6	1.7		
		0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.3	0.5	0.6	0.8	0.9	1.1	1.2	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.0	2.1	2.2	2.2		
	_ 1!	-nan	-nan	-nan	-nan	-nan	-nan	0.3	0.3	0.3	0.2	0.0	1.7	0.0	1.0	1.3	1.5	1.7	1.9	2.1	2.2	2.3	3.9	2.7	2.9	3.0	3.1	3.2	3.3	3.4	4.5		
	20	0				25	50				-30)()				-3!	50				- 40	nn				4!	50				50	0	
						-`					00					0.					- 11	00									m	•	
											•	^/	2	th			11	h r		Cr	\mathbf{n}	2								I	''A		
													U			3	VC		У	21		al	1C										

BR(N→DD)/U.5/ /

ATLAS Internal low-tanβ-high

~	10																										-						
É	10	14	14	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.1	11	11	14	14	11	11	11	11	11	11	1.1		1.4
ы		14	14	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.1	1.1		14		1.1	14	1.1	11	1.1		
ţ		1.4	1.4	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.2	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1		
	0	1.4	1.4	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1		
	9	1.4	1.4	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1		
		1.4	1.4	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1		12
		1.4	1.4	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1		1.2
	-	1.4	1.4	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1		
	8	1.4	14	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	11	11	11	11	11	11	11	11	11	11	11	11		
	•	1.4	14	4.9	4.9	4.9	4.9	4.9	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	11	11	14	11	11	11	11	11	11	11	11	11		
		1.4	1.4	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	14	14	1.1	14	1.1	14	1.1	14	1.1	14	14	1.1		
		1.4	1.4	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1		1
	-	1.4	1.4	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1		•
	1	1.4	1.4	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1		
		1.4	1.4	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1		
		1.4	1.4	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1		
		1.4	1.4	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1		~ ~
	6	1.4	1.4	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1		0.8
	0	1.4	1.4	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1		
		1.4	1.4	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1		
		1.4	1.4	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1		
	_	1.4	14	1.8	1.8	1.8	1.8	1.8	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	11	11	14	11	11	11	11	11	11	11	11	11	14		
	- 5	1.4	14	1.0	1.0	4.9	1.0	1.0	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	11	11	11	11	11	11	11	11	11	11	11	11	11		~ ~
	•	14	14	1.3	1.3	1.8	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.1				1.1		14		14	14	14	11			0.6
		14	14	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.1		1.1	1.1	1.1		1.1		1.1	1.1	1.1	11	1.1		
		14	14	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.1		1.1	4.4	1.1	1.1	4.4	4.4	1.1		
		1.4	1.3	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1		
	- 4	1.4	1.4	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1		
		1.4	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1		~ 4
		1.4	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1		0.4
		1.4	1.3	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1		
	3	1.4	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1		
	5	1.4	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1		
		1.4	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1		
		14	1.4	1.4	1.4	1.0	1.0	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.1	11	11	11	11	11	11	11	11	11	11	11	11	11		00
	~	1.4	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	14		11	11	11		12		11	12	11	11	11		0.2
	- 2	1.4		1.3	1.3	1.3	1.3	1.2	4.0	4.0	4.0	1.2	1.2	1.2	1.2	1.2	1.2				1.1	12	12		12		12	12		÷.	11		
	_	14	14	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2			10	1.1	10		10		10	1.1		÷.	11		
		1.4	1.4	1.4	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1		
		1.4	1.4	1.4	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1		
	- 1							1.3	1.2	1.2	1.3	0.3	0.2	0.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	0.9	0.0	1.2	1.2	1.1	1.2	1.1	1.1	1.1	0.0		^
	- 06	5				20	50				00	2				20	50				AC	n n				ΛĖ	50				EÓ	<u>ہ</u>	U
	20	50				20	50				JU	10				5	50				4(50				40	90				20	0	
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										<u> </u>	U	/0	V		(コし	IU		U		D					J							

BR(h $\rightarrow \gamma \gamma$)/0.00228 *ATLAS* Internal low-tan β -high

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10																												-				
10	0.4	0.4	0.4	0.5	0.5	0.6	0.5	0.5	0.5	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9		
	0.4	0.4	0.4	0.5	0.5	0.6	0.6	0.5	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9		00
	0.4	0.4	0.4	0.5	0.5	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9		0.9
a	0.4	0.4	0.4	0.5	0.5	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9		
9	0.4	0.4	0.4	0.5	0.5	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9		
	0.4	0.4	0.4	0.5	0.5	0.6	0.5	0.5	0.5	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9		<u> </u>
	0.4	0.4	0.4	0.5	0.5	0.6	0.6	0.5	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9		0.0
0	0.4	0.4	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9		
0	0.4	0.4	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9		
	0.4	0.4	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9		07
	0.4	0.4	0.5	0.5	0.5	0.6	0.5	0.5	0.5	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9		0.7
_	0.4	0.4	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9		
- 7	0.4	0.4	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9		
	0.4	0.4	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	_	06
	0.4	0.4	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9		0.0
_	0.4	0.4	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9		
6	0.4	0.4	0.5	0.5	0.5	0.6	0.5	0.5	0.5	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9		
Ŭ	0.4	0.4	0.5	0.5	0.5	0.6	0.6	0.5	0.6	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9		05
	0.4	0.4	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9		0.5
	0.4	0.4	0.5	0.5	0.5	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9		
5	0.4	0.4	0.5	0.5	0.5	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9		
9	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	_	01
	0.4	0.4	0.5	0.5	0.5	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9		0.4
	0.4	0.4	0.5	0.5	0.5	0.6	0.5	0.5	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9		
	0.4	0.4	0.5	0.5	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9		
- 4	0.4	0.4	0.5	0.5	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9		03
	0.4	0.4	0.5	0.5	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9		0.5
	0.4	0.5	0.5	0.5	0.5	0.6	0.5	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9		
~	0.4	0.5	0.5	0.5	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.0	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9		
- 3	0.4	0.5	0.5	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9		02
	0.4	0.5	0.5	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9		0.2
	0.5	0.5	0.5	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9		
	0.5	0.5	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9		
- 2	0.5	0.5	0.5	0.5	0.5	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9		01
_	0.5	0.6	0.6	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.0	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9		0.1
	0.6	0.6	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9		
	0.6	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0		
1.					L		0.9	0.9	0.9	0.8	0.9	0.4	0.7	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.0	0.0	0.9	0.9	0.9	0.9	1.0	1.0	1.0	0.0		0
20	າດ				2	50				30	0				24	50				40	n				4	50				50	0	0
2					2	50				00					0.	0				-τ	0				Τ.	0				~~~		
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									- 4	·(J)	~∕∩		d			$\mathbf{I}(0)$		()	()	Б	ĸ	r	1	V١	/					~		



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ATLAS Internal low-tanβ-high

BR(h\rightarrowWW)/0.215 ATLAS Internal low-tan\beta-high

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ta	

10	0.3	0.4	0.4	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8		2 5
	0.3	0.4 0.4	0.4 0.4	0.5 0.5	0.5 0.5	0.5 0.5	0.6 0.6	0.5 0.5	0.6 0.6	0.6 0.6	0.5 0.7	0.6 0.7	0.7 0.7	6.7 6.7	0.7 0.7	0.7 0.7	0.7 0.7	0.7 0.7	0.7 0.7	0.8 0.7	0.8 0.8		3.5									
~	0.3	0.4 0.4	0.4 0.4	0.5 0.4	0.5 0.5	0.5 0.5	0.6 0.5	0.6 0.6	0.6 0.6	0.6 0.6	0.7 0.7	0.7 0.7	0.7 0.7	0.7 0.7	0.7 0.7	0.7 0.7	0.8 0.7	0.7 0.8	0.7 0.8	0.7 0.8	0.8 0.8											
9	0.3	0.4	0.4 0.4	0.4 0.5	0.5 0.5	0.5 0.5	0.5 0.5	0.6 0.6	0.6 0.6	0.6 0.6	0.5 0.5	0.7 0.7	0.7 0.7	0.7 0.7	0.7 0.7	0.7 0.7	0.7 0.7	0.8 0.8	0.9 0.8													
	0.3	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.6	0.5	0.5	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8		3
8	0.3	0.4	0.4	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.5	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8		
Ŭ	0.3	0.4 0.4	0.4 0.4	0.5 0.4	0.5 0.5	0.5 0.5	0.6 0.6	0.6 0.6	0.6 0.6	0.6 0.6	0.5 0.7	0.5 0.7	0.7 0.7	0.8 0.8																		
	0.3	0.4 0.4	0.4 0.4	0.5 0.5	0.5 0.5	0.5 0.5	0.5 0.5	0.6 0.6	0.6 0.6	0.6 0.6	0.7 0.6	0.7 0.7	0.8 0.7	0.8 0.8		25																
7	0.3	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.6	0.5	0.5	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8		2.5
· 1	0.3	0.4	0.4	0.5	0.5	0.5	0.6	0.5	0.6	0.6	0.5	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8		
	0.3	0.4 0.4	0.4 0.4	0.5 0.5	0.5 0.5	0.5 0.5	0.6 0.6	0.6 0.6	0.6 0.6	0.5 0.5	0.5 0.5	0.7 0.7	0.7 0.7	0.7 0.7	0.7 0.7	0.7 0.7	0.7 0.7	0.8 0.8														
6	0.3	0.4 0.4	0.4 0.4	0.5 0.5	0.5 0.5	0.5 0.5	0.5 0.5	0.5 0.5	0.6 0.6	0.6 0.6	0.5 0.5	0.7 0.7	0.7 0.7	0.7 0.7	0.7 0.7	0.7 0.7	0.7 0.7	0.8 0.8	0.8 0.8	0.8 0.7	0.8 0.8		2									
	0.3	0.4	0.4	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.8	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8		-
	0.3	0.4 0.4	0.4 0.4	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.5 0.7	0.7	0.7 0.7	0.7	0.7	0.7	0.7 0.7	0.7 0.7	0.7 0.8	0.8 0.8	0.8											
5	0.3	0.4 0.4	0.4 0.4	0.5 0.5	0.5 0.5	0.5 0.5	0.5 0.6	0.6 0.6	0.6 0.6	0.6 0.6	0.7 0.6	0.7 0.7	0.7 0.7	0.7 0.7	0.7 0.7	0.7 0.7	0.7 0.8	0.8 0.8														
	0.3	0.4	0.4 0.4	0.5 0.5	0.5 0.5	0.5 0.5	0.6 0.6	0.5 0.5	0.6 0.6	0.6 0.6	0.5 0.7	0.7 0.7	0.7 0.7	0.7 0.7	0.7	0.7	0.7 0.7	0.7 0.8	0.8 0.8	0.8 0.9	0.8 0.9	0.8 0.9		1.5								
	0.4	0.4	0.4	0.5	0.5	0.5	0.6	0.5	0.6	0.6	0.5	0.7	0.7	0.7	0.7	0.8	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8		
4	0.4	0.4 0.4	0.4 0.4	0.5	0.5 0.5	0.5 0.5	0.6	0.6 0.6	0.6 0.6	0.6 0.6	0.7 0.7	0.7 0.7	0.7 0.7	0.7	0.7 0.7	0.7 0.7	0.7 0.7	0.7 0.7	0.7 0.7	0.8 0.8												
	0.4	0.4 0.4	0.4 0.5	0.5 0.5	0.5 0.5	0.5 0.5	0.6 0.6	0.6 0.6	0.6 0.6	0.7 0.7	0.8 0.8		1																			
_	0.4	0.4	0.4	0.5	0.5	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8		'
- 3	0.4	0.4	0.5	0.5	0.5	0.6	0.5	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8		
	0.4	0.4 0.4	0.5 0.5	0.5 0.5	0.5 0.5	0.6 0.6	0.5 0.5	0.5 0.5	0.6 0.6	0.7 0.7	0.7 0.7	0.7 0.7	0.7 0.7	0.7	0.7 0.7	0.7 0.7	0.8 0.8	0.8 0.9	0.8 0.9	0.8 0.8												
	0.4	0.4 0.4	0.5 0.5	0.5 0.5	0.5 0.5	0.6 0.6	0.6 0.6	0.6 0.6	0.6 0.6	0.7 0.7	0.7 0.8	0.8 0.8		0.5																		
2	0.3	0.4	0.4	0.5	0.6	0.6	0.6	0.5	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8		
	0.2	0.3	0.4	0.4	0.5	0.5	0.5	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8		
- 1	0.3	0.3	0.4	0.5	0.5	0.6	0.7 0.7	0.7 0.7	0.7 0.7	0.7 0.3	0.7	0.7 3.6	0.8	0.8 0.8	0.8 1.5	0.8	0.8 0.8	0.8		0												
20	0				2	50				30	00				3	50				4(00				45	50				50	0	0
	-									0/		.~							Г	חו			+-						I	m,	-	
									ŧU	70	<u>۱</u> (I d		d		וונ	- C)[]		۶K			Lc	JU	Lc	JU				A		

BR(h→γγ)/0.00228 * BR(h→bb)/0.577

ATLAS Internal low-tanβ-high

	10.																																1
Ę	10	0.5	0.5	0.6	0.5	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0		
a		0.5	0.5	0.6	0.6	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0		
ţ		0.5	0.5	0.6	0.6	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0		
	0	0.5	0.5	0.6	0.6	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0		1
	9	0.5	0.5	0.6	0.6	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0		
		0.5	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0		
		0.5	0.6	0.5	0.5	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0		
		0.5	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0		
	8	0.5	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0		
		0.5	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0		
	1	0.5	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0		0.8
		0.5	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0		0.0
	7	0.5	0.6	0.6	0.5	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0		
	- 1	0.5	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0		
		0.5	0.6	0.5	0.5	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0		
		0.5	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0		
	6	0.5	0.6	0.6	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0		
	0	0.5	0.6	0.6	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0		06
		0.5	0.6	0.6	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0		0.0
		0.5	0.6	0.6	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0		
	_	0.5	0.6	0.6	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0		
	- 51	0.5	0.6	0.6	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0		
		0.5	0.6	0.6	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0		
		0.5	0.6	0.6	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0		
		0.5	0.6	0.6	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		04
	4	0.5	0.6	0.6	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		0.4
		0.5	0.6	0.5	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		
		0.6	0.6	0.5	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		
		0.6	0.6	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		
	പ	0.6	0.6	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		
	<u>ା</u>	0.6	0.6	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		
		0.6	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		02
		0.5	0.7	0.7	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		0.2
	_	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		
	- 21	0.7	0.8	0.8	0.8	0.8	0.0	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		
	_	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		
		0.8	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		
		0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1		
	- 1J							1.1	1.1	1.1	1.1	0.3	0.1	0.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	0.9	0.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	0.0		0
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BR(h \rightarrow tt)/0.0632 * BR(h \rightarrow bb)/0.577 ATLAS Internal low-tan β -high



bbyy exclusions low-tb-high

- make a preliminary exclusion plot for bbyy on the value of xsec(ggHhh)BR(bb)BR(yy)*2
- the exclusion is seen in very low tanb region
- maybe better to use logY





500

m₄

bbtt exclusions low-tb-high

- make a preliminary exclusion plot for bbtautau on the value of xsec(ggHhh)BR(bb)BR(tautau) *2
- the exclusion is seen in very low tanb region
- maybe better to have logY

bbtt exclusions low-tb-high

- In very low tb, there are theoretically *unstable* phase points -> contour failures ...
- justify the exclusion script itself does not have any problem. assume limit is 10 times better, i.e. 1/10*current limit (plot on the right)

450

500

m₄

Theoretical uncertainties

_	The uppertainting do not hour	bbtautau	PI	DF	ISR,	SFR	Scale		
•	i ne uncertainties do not nave	57	Low	High	Low	High	Low	High	
	a specific pattern along mass	Resonant(260)	1.1	18.2	14.8	54.5	15.2	54.5	
•	but fluctuation seems to be	Resonant(300)	4.7	8.0	9.9	14.7	10.3	32.0	
	large	Resonant(350)	21.6	12.7	36.3	21.7	22.5	30.7	
		Resonant(400)	20.8	2.3	41.7	14.3	47.9	20.5	
•	in agreement to use averaged	Resonant(500)	4.2	2.2	25.0	7.2	33.3	12.6	
	value in all masses	Resonant(1000)	33.3	5.0	33.3	11.5	33.3	5.2	
		non-resonant	11.8	3.5	29.4	5.8	39.2	12.7	

Mass WWYY	260	300	350	400	500	Sm_hh	
SCALE	2.2%	2.8%	3.2%	1.6%	2.3%	2.2%	
PDF	4.6%	2.7%	7.0%	6.9%	1.9%	4.0%	
ISRFSR	6.7%	4.1%	2.7%	3.7%	3.2%	1.7%	46

Channel limits [res]

Interpolated mass points

 In both low mass and high mass regions, more mass points are interpolated from available points

Local p₀

10⁻¹

10⁻²

 10^{-3}

PREVIOUS

- WWyy obs bbtt obs

-A-- bbbb obs

ATLAS

Internal

√s = 8 TeV

Theoretical uncertianties

- Theoretical uncertainties are estimated with variations on PDF/scale/radiation → three nuisance parameter are created for them respectively
- For PDF uncert, compare MSTW2008lo68 and NNPDF to nominal sample cteq6l1
- For factorization/renormalization uncert, compare
 - cteq6l1_facDn_renDn
 - cteq6l1_facNo_renDn
 - cteq6l1_facUp_renNo
 - cteq6l1_facDn_renNo
 - cteq6l1_facNo_renUp
 - cteq6l1_facUp_renUp
- For ISR/FSR uncert, compare isr_up/dn and fsr_up/dn
 - * all follows instructions from Paul T as used in AZh

https://twiki.cern.ch/twiki/bin/view/LHCPhysics/HXSWG3LowTanB