HH pair searches

combination with wwyy, bbyy, bbττ, bbbb

Xiaohu SUN 18-05-2015 IHEP [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 uncertianties - HH

- 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
- MG5 only work when an terminal is active (gridpack mode is not explored from me), so the production locally on lxplus did go slowly due to unstable connections
- Now we produced 1.2M events -> 10 times of the the statistics of last time
- /afs/cern.ch/work/x/xiaohu/public/HH-TheoUncer/
- NNPDF is being merged manually due to a bug in old version MG5

* all follows instructions from Paul T as used in AZh

hMSSM Interpretation

- Many thanks to Nikos and Allison, we have a new map file for hMSSM last week
- Reported by Nikos, the only problem is that tb=0.9 has zero cross section and the grid is not enough for the low tb extrapolation
- Reported from me, strangely small BR_H_hh, because BR_H_AA is mistakenly stored instead of BR_H_hh
- This week, there might be another map file fixing the problems above; but the current one is reliable for preliminary checking on xs, width, BR etc.



ggF H xsec







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 6.9 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 - limit parametrization

- The non-SM BR of h decays should be taken into account in the combined limits
- mH is not largely deviating from mA, in most of the phase space mH~mA, we can use mA as mH approximately
 BR(h→ττ)/0.0632 ATLAS Internal
- 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
 - setting BR(h->yy/ww/bb/tautau) to a group of fixed values



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(tautau)	1.2	1.2	1.2	1.1	1.1	1.0

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

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	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	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	10 10 10	11	11	10 10 10	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											

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	14	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	1.3	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	1.0	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		11	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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										っ		0/_		12	ri	+	in	n	$\mathbf{\circ}$	n	P	D	k		h	`					·		
										<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	0.6	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		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	· ()	~∕∩		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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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	0.7 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	0.6	0.6 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 0.7	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
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									ŧU	70	<u>۱</u> (I d		d		וונ	- C)[]		۶K			Lc	JU	Lc	JU				A		

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

Summary

- More samples are produced, by now 1.2M events, for signal theoretical uncertainty estimation
- hMSSM, map files has problem in Hhh BR (too small numbers), Nikos is looking at it; They also found the values produced do not match Djouadi's in general, being investigated; citation issue is discussed in email thread; We are trying to redo limits as a function of mH,BRs in order to take into account of non-SM Brs in combination
- for low-tanb-high
 - I have finished the **conversion** of plain files to ntuple/map
 - preliminary checks on xs br
 - preliminary checks on exclusions bbyy/bbtautau
 - NEED to ask Sven to see if it is possible to have a better BR calc in tanb~1
 - We will use the **same parameterization** on mH and BRs



• BR(h-bb)/0.577 < 30% variation since 260 GeV BR(h \rightarrow bb)/0.577 ATLAS Internal hMSSM

20	00				3(00)			4	00)			5	00	0			6	0	0			7	0	0			8	30	0				90)0	n	1/	A
	1.0	12	1.2	12	1.2	1.2	1.1	11/1	[11]	14	14	$1 \mathcal{A} $	$\{ J \}$	1,4	44	14	44	161	10	1 1	14	14	14	1.9	1.9	1.0	14	$1. \frac{1}{2}$	14	1.4	1.0	1.9	1.0	1.0	1.0[1.0	1.0	1.0	1.0	1.0
	1.8	1.3	1.2	12	1.2	12	1.1	1.1	1.1	1.1	7.1	1.1	1/1	1.1	1.1	1/1	1.3	1.1	1.1	1.1	1.7	1.1	1.1	1.0	1.0	1.0	1.0	1.8	1.0	1.0	1.0	1.0	1.0	1.0	1.8	1.0	1.8	1.0	1.0	1.0
2	1.0	1.9	1.2	12	1.2	12	1.2	1/1	1.1	1.1	14	14	14	1.1	1.1	\mathbf{M}_{i}	14	14	1.0	1.1	1.1	6.0	1.1	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
\circ	1.0	1.0	1.8	1.0	1.8	1.0	1.0	1.0	1.0	1.8	1.0	1.0	1.0	1.8	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.8	1.0	1.0	1.0	1.0	1.8	1.0	1.8	1.0	1.0	1.0	1.0	1.8	1.0	1.8	1.0	1.0	1.0
	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	1.1	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	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.8	1.0	1.0	1.0	1.0	1.0	1.0	1.8	1.0	1.8	1.0	1.0	1.0
- 4	1.0	10	1.8	1.0	1.8	1.0	1.0	1.0	1.0	141 148	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	10	1.8	1.0	1.0	1.0	1.0	1.0	10	1.8	1.0	1.2	1.0	1.0	1.0
	100	1.5	1.0	1.0	1.1	1.0	1.1	1.0		1.1	1.0		1.0	1.1	1.0		1.00		1.0	1.0	1.0	1.01	1.0	1.00	9.0	1.00	3.0	1.0	9.0	1.00	3.0	1.0	10	10	1.00	9.0	1.0	10	1.0	1.0
	1.0	1.0	1.8	12	1.2	1.0	1.2	1.0	1.1	1.4	1/1	1.0	1/1	1.1	1.0	1.1	1.0 1.0	1.1	1.0	11	1.1	1.0	1.1	1.0	1.0	1.0	4.4	1.8	4.4	1.0	1.0	1.6	1.0	10	1.0	1.0	1.5	10	1.6	1.0
	9.9	1.0	1.48	1.0	1.8	1.4	1.4	1.4	1.0	Tall A.A.	1.4	nue a e	1.65	1.4	n astr a né	1.4	1.48	1.4	1.02	- 144 - 14	1.4	a na	1.4	1.42	1.0	1.02	1.0	1.02	1.0 1.0	108	1.0	1.6	1.00	1.0	1.00	1.0	1.0	1.02	1.8	1.0
ю	1.2	-12	1.2	12	1.2	12	1.1	1/1	11	141. 112	1.1	14	1/1	1.1	14	1.1 11 A	1.0	1.1	1.0	11	1.1 11 8	1.1	1.1	1.0	1.0	1.01	1.0	1.8	14	1.8	1.8 1.0	1.8	1.0	1.0	1.8	1.0	1.8	1.0	1.8	1.0
\sim	اللك ا	1.0	1.8	1.0	1.8	1.0	1.0	1.0	1.0	148	1.0	108	1.0	1.8	1.0	1.0	1.0	1.0	1.0	1.0	1.8	1.0	1.8	1.0	1.0	1.01	1.0	1.8	1.0	118 118	1.0 4 0	1.8	1.0	1.0	1.8 1.8	1.0	1.8	1.0	118 A A	1.0
	42	12	1.2	11	14	14	14	1/1	1.1	14	1.1	14	14	14	14	14	1.1	1.1	1.0	10	1.0	1.0	1.0	1.0	1.0	1.0	10	1.0	1.0	1.0	1.0	1.0	1.0	10	1.0	1.0	1.0	1.0	1.0	1.0
	-1-0	1.0	1.8	1.0	1.0	1.0	1.0	1.0	1.0	1.8	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.8	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	12	1.0	1.0	1.0
- 8	-1:1-	-1.1	1.4	14	14	14	1.1	1/1	11	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
_	-1-0	1.0	1.8	1.0	1.0	1.0	1.0	1.0	1.0	1.8	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.8	1.0	1.8	1.0	1.0	1.0	1.0	1.0	1.0	1.8	1.0	1.0	1.0
	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	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	1.0	1.0	1.8	1.0	1.0	1.0	1.0	1.0	1.0	1.8	1.0	1.8	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.6	1.0	1.6	1.8	1.6	1.8	1.0	1.0	1.0	1.0	1.8	1.0	1.8	1.0	1.0	1.0
10	12	-1.2	1.2	12	14	14	1.1	1/1	1.1	14	1/1	14	1/1	1.1	1.1	14	1.0	14	1.1	1.1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.8	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.8	1.0	1.0	1.0
	13	1.3	1.4	12	1.2	12	1.2	1.2	1.1	1.5	1.1	1.1	1.7	1.1	1.2	1.1	1.3	1.1	1.0	1.1	1.1	1.1	1.1	1.1	1.1	1.0	1.6	1.8	1.0	1.8	1.0	1.6	1.0	1.0	1.8	1.0	1.8	1.0	1.0	1.0
	-1-9	1.9	1.4	1.2	1.2	1.2	1.2	12	11.11 11.11	1.1	14	1.1	1.4 1.4	14.4	1.0	1.1	1.0 1.0	11.1	1,0	1.1 1.1	1.4	1.0	14.4	1.0	1.1	1.0	1.0	1.8	1.0	1.8	1.0	1.0	1.0	1.0	1.8	1.0	1.8	1.0	1.0	1.0
	1.20	12	1.0	12	1.2	12	1.2	1.0	n na fili Lini de la	121	171 111	141	171	161	1.0	161 161 F	11.00 11.00	161 at 1	140	1641) 1610	141	140	161	1.0	101	1.00	1.0	1.0	10	1.0	10	1.0	1.0	1.0	1.0	10	1.0	10	1.0	1.0
12	121	13 13	1.0	1.2	1.2	1.2	1.2	12	111. 11 - 1	1.4	1.1	1.1	1.1	1.1	1.1	1.1	1.3L 1.1 - 2.	1.1	1.31	1.1 11 - 1	1.1	1.3	1.1	1.3	1.1	1.01	4.4	1.8	4.0 4.0	1.0	10.	1.4	1.0	10	1.8 1.8	10	1.5	10	6.8 6.6	1.0
	1.3	1.3	1.8	12	1.2	12	1.2	12	1.1	1.1	1.1	14	1.1	1.1	1.1	1.1	1.4	1.1	1.1	1.1	1.1	1.1	1.1	14	1.1	1.0	1.0	1.8	1.0	118 - 118 -	1.0	1.8	1.0	1.0	1.8	1.0	1.2	1.0	1.8	1.0
	13	1.3	1.8	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	13	1.1	1.1	101	1.1	1.1	1.1	1.1	11	1.0	10	1.0	1.0	1.0	1.0	1.0	1.0	10	1.0	1.0	1.8	1.0	1.0	1.0
14	1.3	1.3	1.8	12	1.2	12	1.2	1.2	1.1	1.4	1.1	1.1	1.1	1.1	1.1	1.1	1.3	1.1	1.0	1.1	1.1	1.1	1.1	1.1	1.1	1.0	1.0	1.8	1.0	1.8	1.0	1.0	1.0	1.0	1.0	1.0	1.2	1.0	1.0	1.0
4.8	13	1.2	1.8	12	1.2	1.2	1.2	1.2	1.1	14	14	14	14	1.1	14	14	1.4	1.1	1.0	11	1.1	1.1	1.1	1.4	1.1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.8	1.0	1.8	1.0	1.0	1.0
	1.3	1.3	1.8	12	1.2	12	1.2	12	1.1	1.4	1.1	1,1	1/1	1.1	1.1	1.1	1.3	1.1	1.1	1.1	1,1	1.1	1.1	1.1	1.1	1.0	1.0	1.8	1.0	1.8	1.0	1.0	1.0	1.0	1.8	1.0	1.9	1.0	1.0	1.0
	1.4	1.3	1.8	1.2	1.2	1.2	1.2	1.2	1.1	1.4	14	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	1.0	1.0	1.8	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.8	1.0	1.0	1.0
10	1,4	1.3	1.8	12	1.2	12	1.2	12	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.3	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.0	1.6	1.8	1.0	1.8	1.0	1.0	1.0	1.0	1.8	1.0	1.8	1.0	1.0	1.0
10	1.4	1.5	1.8	12	1.2	12	1.2	12	14	14	14	14	1/1	14	1.0	14	1.0	14	1.1	14	14	1.1	14	1.1	1.1	1.0	1.0	1.8	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	1.4	1.3	1.8	12	12	12	12	12	11	1.1	1.1	14	1.1	1.1	1.1	1.1	1.1	11	1.1	11	1.1	1.1	1.1	1.1	1.1	1.0	1.0	1.8	1.0	1.8	1.0	1.0	1.0	1.0	1.8	1.0	1.8	1.0	1.0	1.0
	1.4	1.5	1.1	12	1.2	12	12	12	1.1	14	14	14	141	14	1.1	14	1.1	14	1.1	1.1	1.1	1.1	14	1.1	1.1	1.0	10	1.0	1.0	u.	1.0	10	1.0	1.0	1.0	1.0	÷.	1.0	1.0	1.0
18	1.4	1.8	1.8	12	1.2	12	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	1.1	1.0	10	1.0	1.0	10	1.0	1.0	1.0	1.0	1.0	1.0	10	1.0	1.0	1.0
	1.0	4.4	4.8	12.	1.0	14.	1.4	14	i tere. La set	tat. Alte	1.1 1.1	1.4	1999. 1999 -	an an	an. An	an an	1998) 1999 -	an a	tat. Anti-	an.	an an	an.	an an	tan. Anton	an a	1.0	4.6 -	1.0	4.0	10	10	1.6	1.0	4.0	1.0	10	1.0	1.0	1.6 1.6	1.0
	1.8	1.2	1.0	12	1.2	12	1.2	12	1.1. 1.1.	141. 14.1	14.	141 14 1	141	141 - 141	1.0	141. Al 1	1.0	1.1 - 1.1	141 111	141. 212	141 - 313 -	1.0	141 - 141	1.0	1.1	1.0	1.0	1.8	1.0	1.0	1.0	1.8	1.0	1.0	1.02 1.08	1.0	1.8 1.8	1.0	1.6	1.0
	1.0	4.0	1.48 A 10	1.2	1.2	1.3	1.2	1.2	1.1 	1.4	1.1	1.1	1.1	1.1	1.1	1.1 	1.0	1.1	1.0	1.1 	1.1	1.1	1.1	1.1	1.1	1.02	6.0 A A -	tan. Alƙa	8.0 8 6 -	1.19 1.10	1.0 4 G	1.49 1. A -	10	4.0 4.0	tan. Alim	4.0 4.0	168 21 S	1.0	nar Alfa	1.0
		10.10	1.0			10.00																				1.00	10.00	1.0	10.00	1.10	10.00	11.0	4.45	1.0	1.0	10.01	10.00	4.45	winds -	1.0

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BR(h-yy), variations are ~40% since 260GeV

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



• BR(h-tautau) variation $\sim 30\%$ at most since 260 GeV BR(h $\rightarrow \tau\tau$)/0.0632 ATLAS Internal hMSSM

1.4 1.4 1.3 1.0 1.4 1.3 1.1 18 1.1 1.4 1.0 1.0 1.0 1.3 1.3 1.1 1.1 1.4 1.0 1.3 1.1 1.1 1.4 1.1 1.1 1.1 1.4 16 1.4 1.0 1.4 1.1 1.1 1.1 1.4 1.3 1.3 1.0 1.0 1.4 1.3 1.3 14 14 13 13 1.1 1.1 1.1 1.4 1.3 1.3 1.4 1.3 1.3 4.9 1.1 1.1 1.1 14 13 13 12 1.1 1.1 1.1 1.1 12 12 12 13 13 13 1.0 7.4 1.3 1.3 4.4 1.1 1.1 1.4 1.3 1.3 1.1 1.1 1.1 1.1 1.1 1.1 1.3 10 12 12 12 12 1.0 1.0 1.0 1.0 1.0 1.0 1.1 1.1 1.1 1.1 1.1 1.1 1.0 8 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 11 14 14 14 1.0 1.0 4.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.2 1.2 1.2 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 1.0 1.0 6 1.3 1.3 1.1 1.1 1.1 1.1 1.1 1.1 1.1 1.0 12 12 12 1.0 1.3 1.3 1.3 1.2 1.2 1.2 1.2 1.1 1.1 1.1 11 11 11 1.0 1.0 1.0 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 4 1.0 1,3 1,1 1,1 1,1 1,1 1.1 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.1 1.1 1.0 2 1.3 1.0 1.0 1.0 1.3 1.1 1.1 1.1 1.1 1.1 1.0 1.0 1.0 1.0 1.0 1.3 1.1 1.1 1.1 1.3 1.3 1.2 1.2 1.2 1.2 1.0 1.0 1.0 1.0 1.0 1.0 1.1 1.1 1.1 1.0 1.0 1.0 1.0 1.0 1.1 1.3 | 1.3 | 1.2 | 1.2 | 1.2 | 1.2 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 1.0 1.0 1.0 1.0 111 111 111 1.4 700 200 300 500 600 800 400 900 MA

BR(h-WW) variation ~50% starting from 260GeV BR(h→WW)/0.215 ATLAS Internal hMSSM

	0.4 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	0.8	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	0.9	0.9	0.9	0.9	0.9	0.9	0.9
	0.4 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	0.8	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	0.9	0.9	0.9	0.9	0.9	0.9	0.9
	0.4 0.5	0.5	0.6	0.6	0.7	0.7	0.7	8.0	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	0.9	0.9	0.9	0.9	0.9	0.9	0.9
10	0.4 0.5	0.5	0.5	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	0.9	0.9	0.9	0.9	0.9	0.9	0.9
10	0.4 0.5	0.5	0.6	0.5	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	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	0.9	0.9	0.9	0.9	0.9	0.9	0.9
	0.4 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	0.8	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	0.9	0.9	0.9	0.9	0.9	0.9	0.9
	0.4 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	0.8	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	0.9	0.9	0.9	0.9	0.9	0.9	0.9
16	0.4 0.5	0.5	0.5	0.5	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	0.9	0.9	0.9	0.9	0.9	0.9	0.9
10	0.4 0.5	0.5	0.5	0.5	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	0.9	0.9	0.9	0.9	0.9	0.9	0.9
	0.4 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	0.8	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	0.9	0.9	0.9	0.9	0.9	0.9	0.9
	0.4 0.5	0.5	0.6	0.6	0.7	0.7	0.7	0.8	0.8	0.8	8.0	8.0	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	0.9	0.9	0.9	0.9	0.9	0.9	0.9
4.4	0.4 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	0.8	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	0.9	0.9	0.9	0.9	0.9	0.9	0.9
14	0.4 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	0.8	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	0.9	0.9	0.9	0.9	0.9	0.9	0.9
	0.4 0.5	0.5	0.6	0.6	0.7	0.7	0.7	0.8	0.8	8.0	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	0.9	0.9	0.9	0.9	0.9	0.9	0.9
	0.4 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	0.8	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	0.9	0.9	0.9	0.9	0.9	0.9	0.9
10	0.4 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	0.8	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	0.9	0.9	0.9	0.9	0.9	0.9	0.9
12	0.4 0.5	0.5	0.5	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	0.9	0.9	0.9	0.9	0.9	0.9	0.9
	0.4 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	0.8	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	0.9	0.9	0.9	0.9	0.9	0.9	0.9
	10:4 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	0.8	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	0.9	0.9	0.9	0.9	0.9	0.9	0.9
10	0.4 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	0.8	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	0.9	0.9	0.9	0.9	0.9	0.9	0.9
10	0.8 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	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	0.9	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	0.9	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	0.9	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	0.9	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	0.9	0.9	0.9	0.9	0.9	0.9
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	0.9	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	0.9	0.9	0.9	0.9	0.9
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	0.9	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	0.9	0.9	0.9	0.9	0.9
	07 07	0.9	0.0	0.5					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	0.0	0.9	0.9		
	0.0 0.0	0.0	0.0	0.0	0.0	0.0	0.9	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	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.0	0.9	0.9
C	0.5 0.5	0.5	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	0.9	0.9					0.9	0.9	0.9	0.9	0.0	0.9	0.9
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	0.9	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	0.9	0.9	0.9	0.9	0.9
	04 0.5	0.6	0.6	0.7	0.7	0.7	8.0		8.0	0.8	8.0		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	0.9	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	0.9	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	0.9	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
4	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	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
4	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	0.9	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	0.9	0.9	0.9	0.9
	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	0.9	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
	0.9 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	0.9	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	0.9	0.9	0.9	0.9
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	0.9	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	0.9	0.9	0.9	0.9	0.9
2	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	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
	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	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
	0.7 0.7	10.8	0.8	0.8	0.8	10.9	10.9	9.9	9.9	0.9	9.9	9.9	9.9	9,9	6.9	0,9	640	019	ejo	0.9	0.9	0.9	0.9	1.0	1.0	1.9	1.9	1.9	1.9	1.0	1.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
2	00			20	n				1	00	1			5	0	1			6	ŝ	0			-	70	0			\$	20	0				ar	10			Λ
2	00			90	50	9			+	U.	/			J	00	,			U		0			- 1	U	0				50	0				30	0			A

Theoretical uncertainties

_	The uppertainting do not hour	bbtautau	PI	DF	ISR,	SFR	Sc	ale	
•	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 W/W/W/	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%	37



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

······ WWγγ 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

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

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
	- 2h	۱O				25	50				30	۱O				21	50				40	າດ				<u>4</u> F	50				50	0	0
	20	0				2	0				00	0				0.	0				-τ	0				Τ.	0				~~~		
						21	1 0	/	×	n r	1	+:	\sim	`	~ "		DI	2	h		~ /	* Ľ	חכ		h	h	h				Π _Δ		
						31	JŽ	0	V	dľ	Id	L	U		Uľ		Dt	1		- V	/ V	⁻ " [って			D	D				~		

BR(h \rightarrow tt)/0.0632 * BR(h \rightarrow bb)/0.577 ATLAS Internal low-tan β -high

