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# MSSM scenarios with low $\tan\beta$ and Heavy SUSY

-- Mario Pelliccioni - 2015-02-17

## Public document LHCHSWG-2015-002

A detailed discussion and comparison of the subsequent scenarios can be found in:

"Benchmark scenarios for low  $\tan\beta$  in the MSSM"

E. Bagnaschi, F. Frensch, S. Heinemeyer, G. Lee, S. Liebler, M. Mühlleitner, A. M. Carn, J. Quevillon, N. Rompotis, P. Slavich, M. Spira, C. Wagner, R. Wolf  
LHCHSWG-2015-002 [↗](#)

## "Low- $\tan\beta$ -high" scenario with FeynHiggs [↗](#)

STATUS 2019: This scenario is outdated. Please use the scenarios from 1901.05933 on the main webpage of the subgroup.

\* benchmark5-v0.pdf: write-up

\* FeynHiggs [↗](#) input file, as linked from the BR web page (using this special input file to ensure the correct SM parameters).


\* BR output files as linked from the BR web page (keys here)

**NOTE:** neutral-Higgs BRs updated on 28.04.2015 with agreed SM inputs and improved calculation of  $H \rightarrow hh$  width; charged-Higgs BRs updated on 13.05.2015

- BR(h, low- $\tan\beta$ -high): BR.low- $\tan\beta$ -high.h0.output
- BR(H, low- $\tan\beta$ -high): BR.low- $\tan\beta$ -high.HH.output
- BR(A, low- $\tan\beta$ -high): BR.low- $\tan\beta$ -high.A0.output
- BR(Hp, low- $\tan\beta$ -high): BR.low- $\tan\beta$ -high.Hp.output

\* Experimentally excluded regions in the low- $\tan\beta$ -high scenario as obtained with HiggsBounds4.2 [↗](#) (provided by Tim Stefaniak): HBchannels\_noHS.eps.gz

\* Below are attached the final merged ROOT files to be used with the v1.0 access tool, which contain Higgs masses and widths, ggF cross sections, bbH 4FS, 5FS and Santander-matched cross sections, scale and pdf-alpha\_s cross section uncertainties, and branching ratios.

 27.05.2016: Update of the 8 and 13 TeV ROOT histograms with corrected bbH cross sections .

- low- $\tan\beta$ -high files
  - ◆ low- $\tan\beta$ -high\_8TeV.root: 8 TeV,  $\tan(\beta)$ : 0.5-10,  $m_A = 150-500$  GeV
  - ◆ low- $\tan\beta$ -high\_13TeV.root: 13 TeV,  $\tan(\beta)$ : 0.5-10,  $m_A = 150-500$  GeV


## The hMSSM approach:

Details, definitions and discussions can be found in the two original papers:

Fully covering the MSSM Higgs sector at the LHC [↗](#)

The post-Higgs MSSM scenario: Habemus MSSM [↗](#)

\* Below are attached the final merged ROOT files to be used with the v1.0 access tools, which contain Higgs masses and widths, ggF cross sections, bbH 4FS, 5FS and Santander-matched cross sections, scale and pdf-alpha\_s cross section uncertainties, and branching ratios.

 27.05.2016: Update of the 8 and 13 TeV ROOT histograms with corrected bbH cross sections .

- hMSSM files
  - ◆ hMSSM\_8TeV.root: 8 TeV,  $\tan(\beta)$ : 0.8-60,  $m_A = 130-1000$  GeV
  - ◆ hMSSM\_13TeV.root: 13 TeV,  $\tan(\beta)$ : 0.8-60,  $m_A = 130-2000$  GeV

## Effective THDM with high-scale SUSY boundary conditions

Higgs Bosons in Heavy Supersymmetry with an Intermediate  $m_A$  [↗](#)

Vacuum stability and supersymmetry at high scales with two Higgs doublets [↗](#)

## Sample input files for the computation of cross sections and branching ratios

- Input for FeynHiggs [↗](#):  
Example input file for "low-tb-high" scenario:  
low-tb-high-LHCHXSWG-SMinput.in  
To be used together with the data file "low-tb-high-LHCHXSWG.dat" linked above in the "FeynHiggs" subsection.
- Input for SusHi [↗](#):  
Example input file for "low-tb-high" scenario:  
lowtanbhigh\_mA300\_t b2.0\_SusHiinput.in  
Zipped form of all "low-tb-high" scenario input files:  
lowtanbhigh\_SusHiinput.tar.gz  
Example input file for the hMSSM hMSSM\_SusHiinput.in (to adjust: and  $m_H$  according to hMSSM formulas)
- Input for HDECAY: hdecay.in

## Links to discussions and talks

1st Video meeting on 15 December 2014 [↗](#)

Talk at the 9th general meeting of the HXSWG on 23 January 2015 [↗](#)

2nd Video meeting on 12 February 2015 [↗](#)

3rd Video meeting on 29 May 2015 (access restricted) [↗](#)

Talk at the 10th general meeting of the HXSWG on 15 July 2015 [↗](#)

4th Video meeting on 15 February 2016 [↗](#)

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This topic: LHCPHysics > HXSWG3LowTanB

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