2HDM discussion
- Introduction -

LHC HXS BSM/Heavy Higgs WG

WG meeting, 15 May 2013

We had our first meeting on the 2HDM on Friday 22. 3. 2013

https://indico.cern.ch/conferenceDisplay.py?confId=241815

Main discussion items where benchmark proposals, computing tools, kinematic and theoretical uncertainties of the signal prediction

Some follow-up items from that meeting, most of these will be discussed in today's talks:

Extend consideration to type III/IV benchmark models and charged Higgs searches, as well as to the scenario where the boson at 125 GeV is the heavier Higgs H → Howard, Oscar

Provide cross section / BR tables linked from the LHC HXSWG (benchmark dependent, so main discussion on that today) → Nikos (Oscar, Howard)

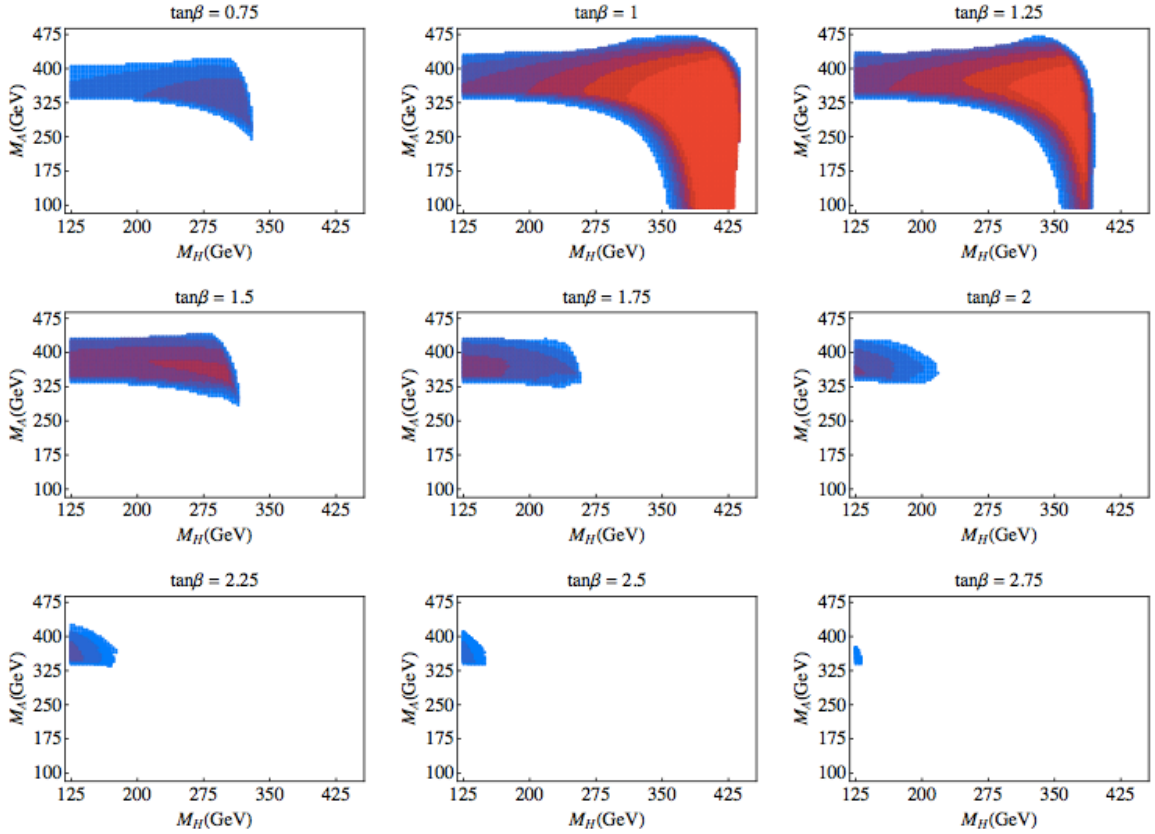


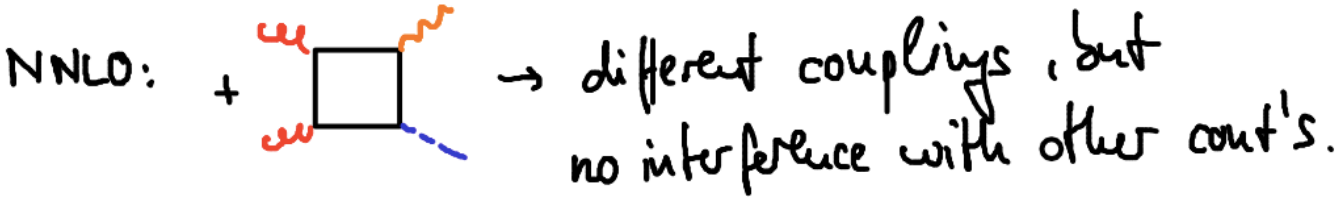
Figure 2: The viable particle spectrum for $0.75 \leq \tan\beta \leq 2.75$. The spectrum depends non-trivially on the charged Higgs mass ($M_{H^\pm}$). In each plot the viable parameter space in M_H-M_A plane shrinks as $M_{H^\pm}$ increases. $M_{H^\pm} = 380$ (420) GeV corresponds to the color blue (red).

arXiv:1304.0028

Similar studies in:
arXiv:1302.4022
arXiv:1303.0168
arXiv:1303.5098

Viable type-II parameters space taking into account EW fits, $B \to X_s\gamma$, perturbativity and vacuum stability

Ask the authors of VBF@NNLO and VH@NNLO to include the 2HDM couplings in a more formal way



VH@NNLO: Rober and collaborators are working on a consistent way to scale the calculation also at the NNLO. Unfortunately, the gluon-fusion contribution was calculated by Oliver who left Physics in the meantime, so this has to be redone

VBF@NNLO: Fabio/Marco explained that for VBF the situation is slightly different. The quark-loop terms turn out to be much smaller than for VH, and can be safely neglected. (In fact, as I understood their calculation for this part is also not a full NNLO computation but from an effective approach.)

Quantify width effects at higher masses due to H→hh/ZA/AA decays → Oscar

Quantify kinematic biases compared to the SM expectation in different regions of the parameter space → Gunar

2HDMC to SusHi interface for cross section calculation → Oscar and Robert work on this, already running but still needs to be finalised/cross-checked

Discuss further the best way how to implement or access the uncertainties due to the missing higher-order EW corrections → This seems to be the most difficult problem and there is not much progress here