# The post-Higgs MSSM scenario

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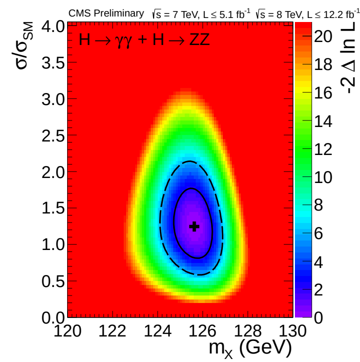
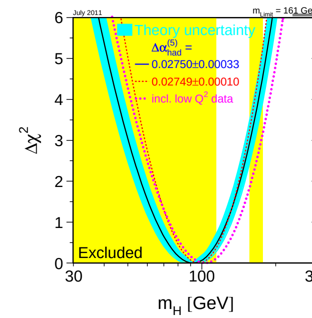
1. The Higgs sector of the MSSM
2. Implications from the Higgs mass
3. Implications from the Higgs properties
4. Implications from other Higgs searches
5. What next?

# 1. The MSSM Higgs sector



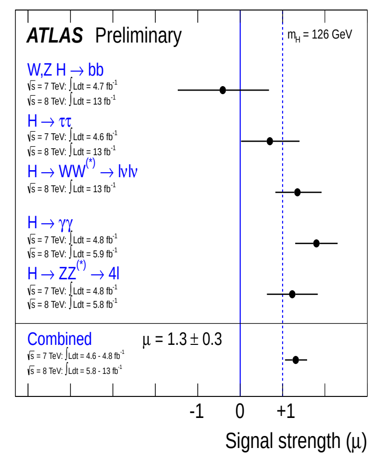



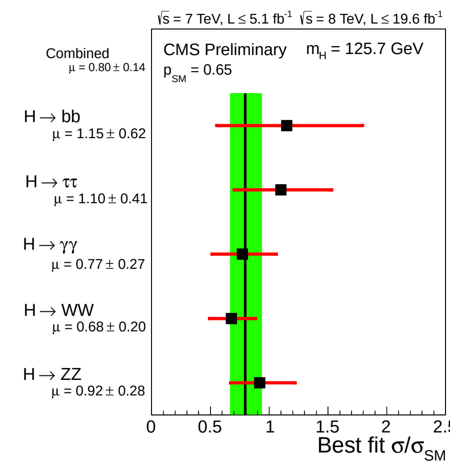

**We have observed a Higgs particle with a mass in the expected range:**

$\mathrm{M_H} = 92^{+34}_{-26}$ **GeV was expected**

$\mathrm{M_h} \approx 125$ **GeV is measured.**

**(no twin peaks anymore... yes?)**



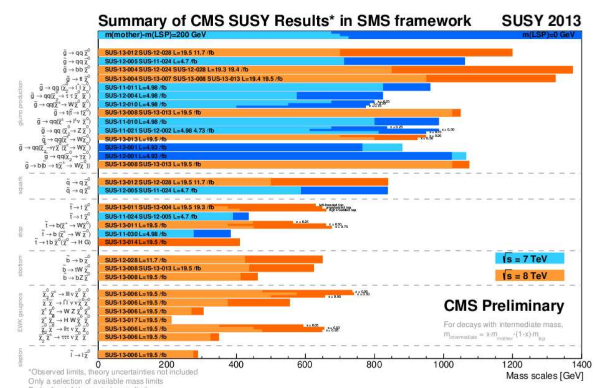

**Production rates compatible with with those expected in the SM:**

**fit of all the LHC Higgs data ⇒ agreement at the 20–30% level:**

$$\mu_{\rm tot}^{\rm ATLAS} = 1.30 \pm 0.30$$

$$\mu_{\rm tot}^{\rm CMS} = \ 0.87 \pm 0.23$$

**combined:** $\mu_{\rm tot}^{\rm lHC} \simeq 1.$




**No other new particle observed:**

**no other Higgs particle seen,**

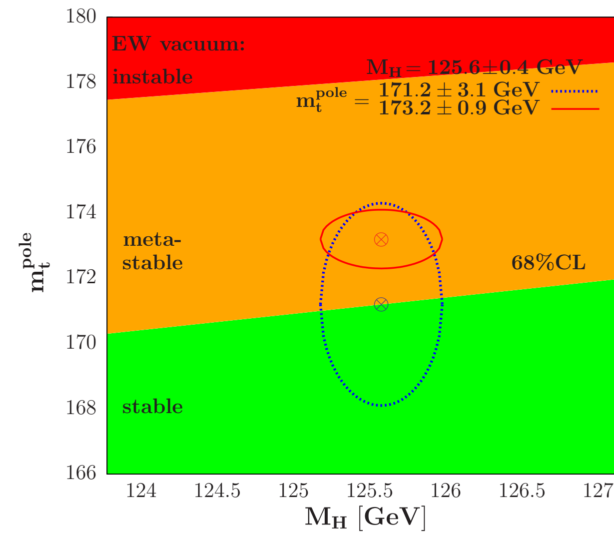
**no SUSY, KK, etc... new state...**

**looks like standardissimo, no?**

# 1. The MSSM Higgs sector

**Maybe we have the theory of everything?**

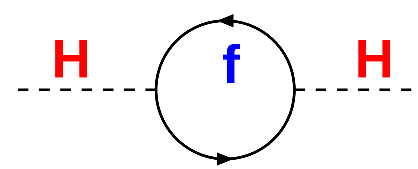
- renormalisable, unitary, perturbative, ...
- extrapolable to the hightest possible scale (EW vacuum (meta)stable up to Planck scale).
- Very successful in describing present data (with all problems disappearing one by one).




**It requires some extensions through...**

- dark matter: maybe Peccei–Quinn axion?
- neutrino masses, baryon asymmetry, ....
- gauge coupling unification problem: fixed in SO(10) with $M_{inter} \approx 10^{11}$ GeV?

corrections to $M_H$
with cut–off $\Lambda = M_{NP}$




$$\Delta M_H^2 \propto \Lambda^2 \approx M_P^2 ?$$

**Remains only the "mother of all problems":**

hierarchy problem calls for beyond the SM.
Three most discussed beyond SM scenarii:

- spin–zero Higgs = bound-state $\Rightarrow$ Technicolor: in "mortuary"?
- cut–off at TeV scale $\Rightarrow$ extra space-time dimensions: in "hospital"?
- new protecting symmetry $\Rightarrow$ Supersymmetry: in "trouble"?

**Here, I discuss the example of Supersymmetry and stick to MSSM.**

# 1. The Higgs sector MSSM

In the MSSM we need two Higgs doublets $H_1 = \binom{H_1^0}{H_1^-}$ and $H_2 = \binom{H_2^+}{H_2^0}$,

to generate up/down-type fermion masses while having chiral anomalies.

after EWSB, three dof for $W_L^\pm, Z_L \Rightarrow$ 5 physical states: $h, H, A, H^\pm$.

Only two free parameters at tree-level to describe the system $\tan\beta, M_A$:

$$M_{h,H}^2 = \frac{1}{2}\left\{M_A^2 + M_Z^2 \mp \left[(M_A^2 + M_Z^2)^2 - 4M_A^2 M_Z^2 \cos^2 2\beta\right]^{1/2}\right\}$$

$$M_{H^\pm}^2 = M_A^2 + M_W^2$$

$$\tan 2\alpha = \frac{-(M_A^2 + M_Z^2)\sin 2\beta}{(M_Z^2 - M_A^2)\cos 2\beta} = \tan 2\beta \, \frac{M_A^2 + M_Z^2}{M_A^2 - M_Z^2} \quad \left(-\frac{\pi}{2} \leq \alpha \leq 0\right)$$

$$M_h \lesssim M_Z |\cos 2\beta| + RC \lesssim 130 \text{ GeV} \;,\; M_H \approx M_A \approx M_{H^\pm} \lesssim M_{EWSB}.$$

- Couplings of $h, H$ to VV are suppressed; no AVV couplings (CP).
- For $\tan\beta \gg 1$: couplings to b (t) quarks enhanced (suppressed).

| $\Phi$ | $g_{\Phi \bar{u} u}$ | $g_{\Phi \bar{d} d}$ | $g_{\Phi VV}$ |
|---|---|---|---|
| $h$ | $\frac{\cos\alpha}{\sin\beta} \to 1$ | $\frac{\sin\alpha}{\cos\beta} \to 1$ | $\sin(\beta-\alpha) \to 1$ |
| $H$ | $\frac{\sin\alpha}{\sin\beta} \to 1/\tan\beta$ | $\frac{\cos\alpha}{\cos\beta} \to \tan\beta$ | $\cos(\beta-\alpha) \to 0$ |
| $A$ | $1/\tan\beta$ | $\tan\beta$ | $0$ |

In decoupling limit: MSSM Higgs sector reduces to SM with a light h.

# 1. The Higgs sector MSSM

Life is more complicated and radiative corrections have to be included.

The CP-even Higgses described by $2 \times 2$ matrix including corrections:

$$\mathbf{M_S^2} = \mathbf{M_Z^2} \begin{pmatrix} c_\beta^2 & -s_\beta c_\beta \\ -s_\beta c_\beta & s_\beta^2 \end{pmatrix} + \mathbf{M_A^2} \begin{pmatrix} s_\beta^2 & -s_\beta c_\beta \\ -s_\beta c_\beta & c_\beta^2 \end{pmatrix} + \begin{pmatrix} \Delta\mathcal{M}_{11}^2 & \Delta\mathcal{M}_{12}^2 \\ \Delta\mathcal{M}_{12}^2 & \Delta\mathcal{M}_{22}^2 \end{pmatrix}$$

and the two Higgs masses and the mixing angle $\alpha$ are given by:

$$\mathbf{M_{h/H}^2} = \frac{1}{2}\left(\mathbf{M_A^2} + \mathbf{M_Z^2} + \mathbf{C_+} \mp \sqrt{\mathbf{M_A^4} + \mathbf{M_Z^4} - 2\mathbf{M_A^2 M_Z^2 c_{4\beta}} + \mathbf{C}}\right)$$

$$\alpha = \frac{\mathbf{2\Delta\mathcal{M}_{12}^2 - (M_A^2 + M_Z^2) s_\beta}}{\mathbf{C_- + (M_Z^2 - M_A^2) c_{2\beta} + \sqrt{M_A^4 + M_Z^4 - 2M_A^2 M_Z^2 c_{4\beta} + C}}}$$

with

$$\mathbf{C_\pm} = \mathbf{\Delta\mathcal{M}_{11}^2 \pm \Delta\mathcal{M}_{22}^2}$$

$$\mathbf{C} = \mathbf{4\Delta\mathcal{M}_{12}^4 + C_-^2 - 2(M_A^2 - M_Z^2) C_- c_{2\beta} - 4(M_A^2 + M_Z^2)\Delta\mathcal{M}_{12}^2 s_{2\beta}}$$

The dominant corrections come from stop/top sector with a leading term:

$$\mathbf{\Delta\mathcal{M}_{11/12}^2 \sim 0}\ ,\ \mathbf{\Delta\mathcal{M}_{22}^2} \sim \epsilon = \frac{\mathbf{3\,\bar{m}_t^4}}{\mathbf{2\pi^2 v^2} \sin^2\beta}\left[\log\frac{\mathbf{M_S^2}}{\mathbf{\bar{m}_t^2}} + \frac{\mathbf{X_t^2}}{\mathbf{M_S^2}}\left(\mathbf{1} - \frac{\mathbf{X_t^2}}{\mathbf{12\,M_S^2}}\right)\right]$$

still a simple picture but with a few additional parameters $\mathrm{M_S}, \mathrm{X_t}$...

# 2. Implications from the Higgs mass

**The mass value 126 GeV is rather large for the MSSM h boson,**

**$\Rightarrow$ one needs from the very beginning to almost maximize it...**

**Maximizing $M_h$ is maximizing the radiative corrections; at 1-loop:**

$$M_h \overset{M_A \gg M_Z}{\to} M_Z|\cos 2\beta| + \frac{3\bar{m}_t^4}{2\pi^2 v^2 \sin^2\beta}\left[\log\frac{M_S^2}{\bar{m}_t^2} + \frac{X_t^2}{M_S^2}\left(1 - \frac{X_t^2}{12 M_S^2}\right)\right]$$

- **decoupling regime with $M_A \sim \mathcal{O}$(TeV);**
- **large values of tan$\beta \gtrsim 10$ to maximize tree-level value;**
- **maximal mixing scenario: $X_t = A_t - \mu\cot\beta = \sqrt{6}M_S$;**
- **heavy stops, i.e. large $M_S = \sqrt{m_{\tilde{t}_1} m_{\tilde{t}_2}}$.**

**We choose at maximum $M_S \lesssim 3$ TeV, not to have too much fine-tuning....**

- **Do the complete job: two-loop corrections and full SUSY spectrum.**
- **Use RGE code (Suspect) with RC in $\overline{\rm DR}$/compare with FeynHiggs (OS).**

**Perform a full scan of phenomenological MSSM with 22 free parameters:**

- **determine regions of parameter space where $123 \leq M_h \leq 129$ GeV (3 GeV uncertainty includes both "experimental" and "theoretical" error);**
- **require h to be SM–like: $\sigma(h) \times BR(h) \approx H_{SM}$ ($H = H_{SM)}$ later).**

**Many anlayses! Here, the one from Arbey et al. 1112.3028+1207.1348.**

# 2. Implications from the Higgs mass

**Main results:**

- **Large $\mathrm{M_S}$ values needed:**
  – $\mathrm{M_S} \approx 1$ **TeV: only maximal mixing,**
  – $\mathrm{M_S} \approx 3$ **TeV: only typical mixing.**
- **Large tan$\beta$ values are favored,**
  **but tan$\beta \approx 3$ possible if $\mathrm{M_S} \approx 3$TeV.**

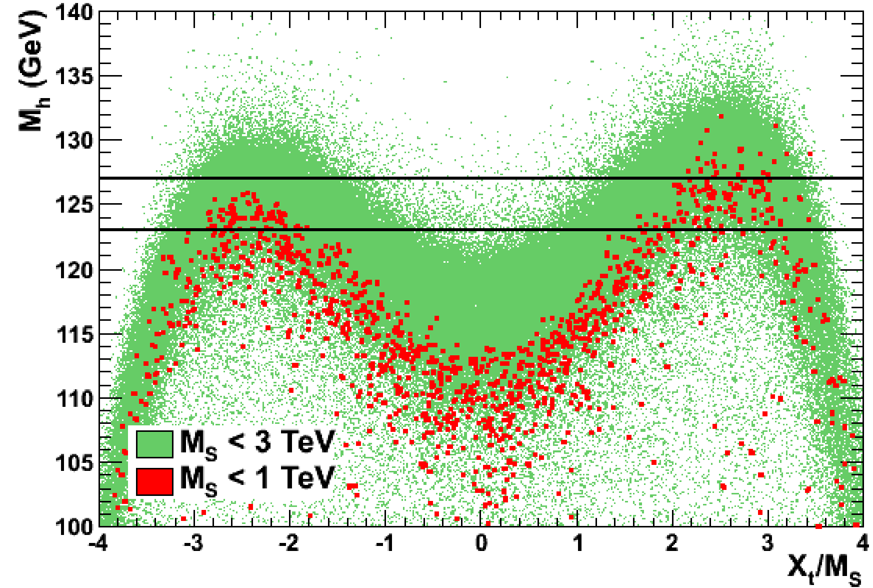
**How light sparticles can be with the constraint $\mathrm{M_h} = 126$ GeV?**

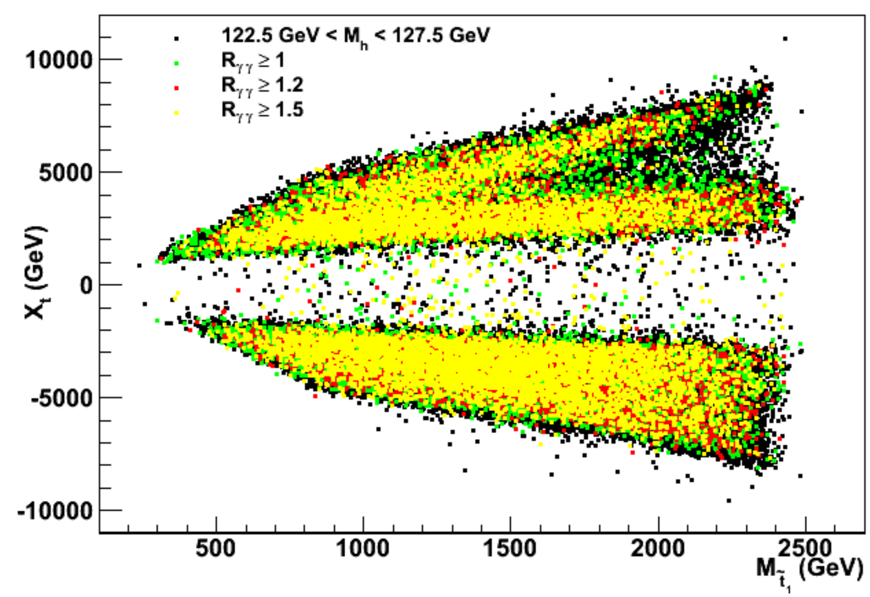
- **1s/2s gen. $\tilde{\mathrm{q}}$ should be heavy...**

**But not main player here: the stops:**
$\Rightarrow \mathrm{m}_{\tilde{\mathrm{t}}_1} \lesssim 500$ **GeV still possible**
**(and compatible with direct limits).**

- $\mathrm{M_1}, \mathrm{M_2}$ **and $\mu$ unconstrained,**
- **non-univ. $\mathrm{m_{\tilde{f}}}$: decouple $\tilde{\ell}$ from $\tilde{\mathrm{q}}$.**

**EW sparticles can be still very light but watch out the new LHC limits..**



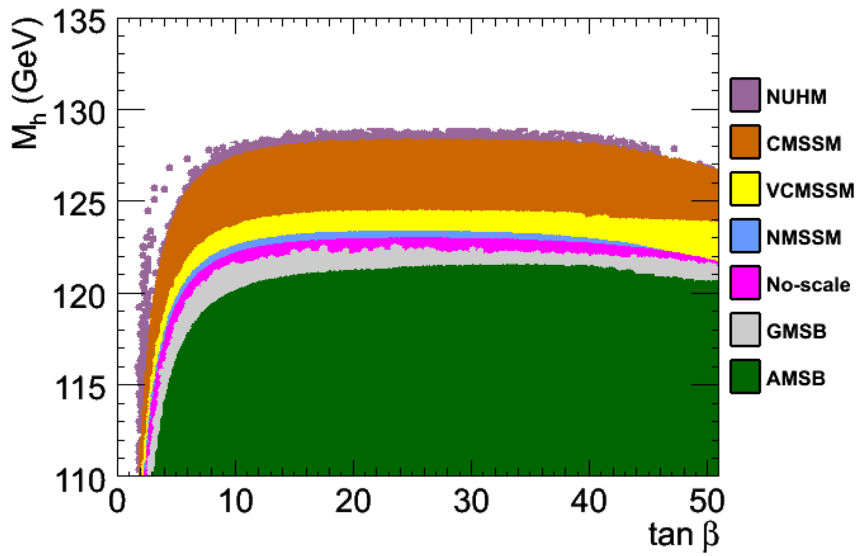
# 2. Implications from the Higgs mass

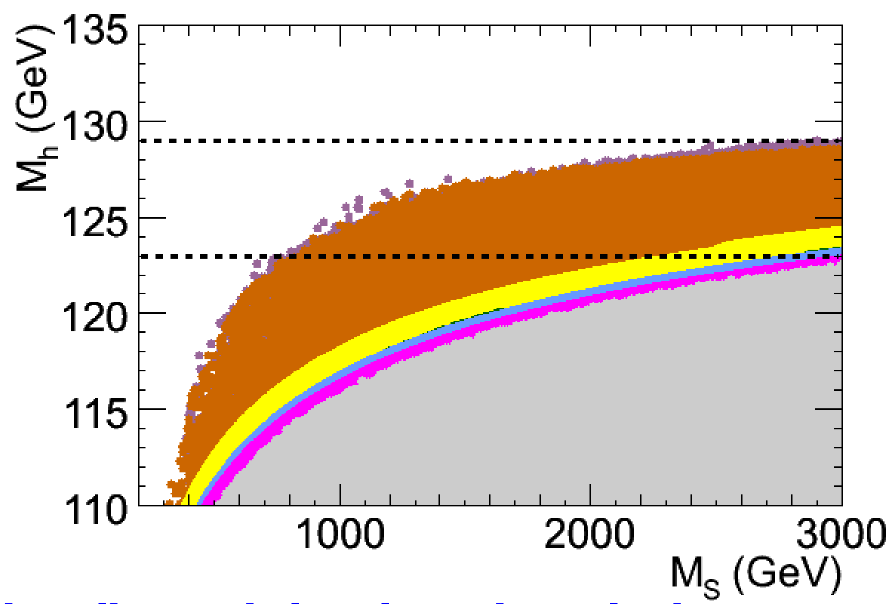
**Constrained MSSMs are interesting from model building point of view:**

– concrete schemes: SSB occurs in hidden sector $\xrightarrow{\text{gravity,..}}$ MSSM fields,
– provide solutions to many problems in general MSSM: CP, flavor, CCB,..
– parameters obey boundary conditions ⇒ small number of basic inputs.

- **mSUGRA**: $\tan\beta\ ,\ m_{1/2}\ ,\ m_0\ ,\ A_0\ ,\ \text{sign}(\mu)$
- **GMSB:** $\tan\beta\ ,\ \text{sign}(\mu)\ ,\ M_{\rm mes}\ ,\ \Lambda_{\rm SSB}\ ,\ N_{\rm mess\ fields}$
- **AMSB:**, $m_0\ ,\ m_{3/2}\ ,\ \tan\beta\ ,\ \text{sign}(\mu)$

full scans of the model parameters with $123\ \text{GeV} \le M_h \le 129\ \text{GeV}$.




very strong constraints and some (minimal) models already ruled out...

# 2. Implications from the Higgs mass

**As the scale $M_S$ seems to be large, consider two extreme possibilities.**

- **Split SUSY: allow fine–tuning:**

**scalars (including $H_2$) at high scale**
**gauginos–higgsinos at weak scale**
**(unification+DM solutions still OK).**

$M_h \propto \log(M_S/m_t) \Rightarrow$ **larger.**

- **SUSY broken at the GUT scale:**

**give up fine-tuning and everything else**
**still, $\lambda \propto M_H^2$ related to gauge cplgs**

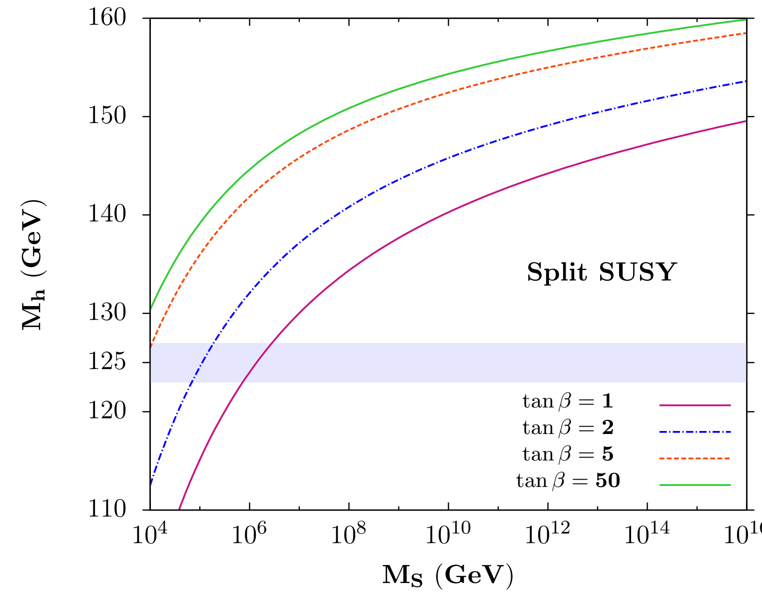
$$\lambda(\tilde{m}) = \frac{g_1^2(\tilde{m}) + g_2^2(\tilde{m})}{8}(1 + \delta_{\tilde{m}})$$

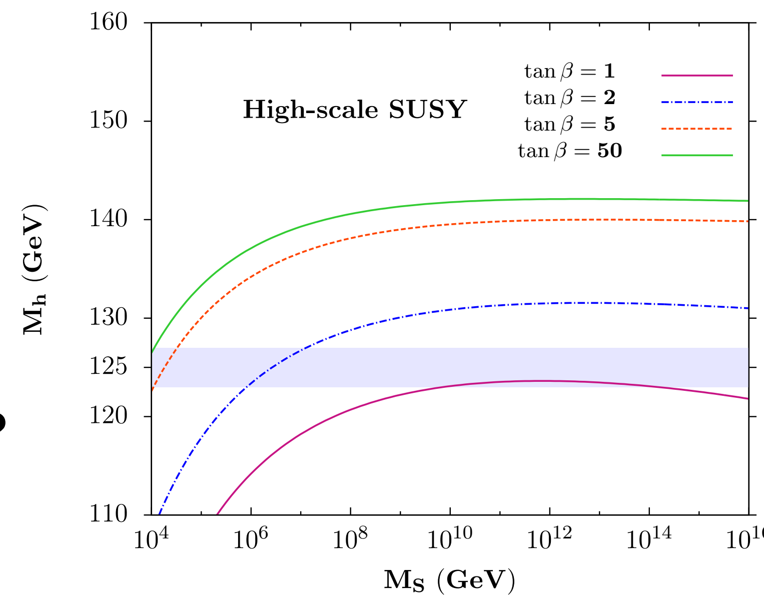
**... leading to $M_H =$120–140 GeV ...**

**In both cases small $\tan\beta$ are needed.**

**note 1: $\tan\beta \approx 1$ still possible,**
**note 2: $M_S$ large but not $M_A$ possible!?**

**Consider general MSSM with $\tan\beta \approx 1$!**



# 3. Implications from the Higgs properties

In principle, once the angles $\beta$ and $\alpha$ known, all h couplings are fixed:

MSSM: $c_V^0 = \sin(\beta-\alpha)$ , $c_t^0 = \cos\alpha/\sin\beta$ , $c_b^0 = -\sin\alpha/\cos\beta$

if only radiative corrections to masses $M_{h/H}$ and $\alpha$ taken into account.

However also direct/vertex corrections have to be included! $\Rightarrow$ Figure

The two important SUSY (QCD) corrections affect the t,b couplings:

$c_b \approx c_b^0 \times [1 - \frac{\Delta_b}{1+\Delta_b} \times (1+\cot\alpha\cot\beta)]$ with $\tan\alpha \overset{M_A \gg M_Z}{\rightarrow} \frac{-1}{\tan\beta}$

$c_t \approx c_t^0 \times [1 + \frac{m_t^2}{4 m_{\tilde{t}_1}^2 m_{\tilde{t}_2}^2}(m_{\tilde{t}_1}^2 + m_{\tilde{t}_2}^2 - (A_t - \mu\cot\alpha)(A_t + \mu\tan\alpha))]$

- $c_\tau, c_c$ and $c_t$ from $pp \to Ht\bar{t}$ do not involve same vertex corrections.
- $gg \to h$ process has $\tilde{t}, \tilde{b}$ loops and $h \to \gamma\gamma$ has also $\tilde{\tau}$ and $\chi_i^\pm$ loops.

In general case, we need (at least) 7 couplings $c_g, c_\gamma, c_t, c_b, c_c, c_\tau, c_V$.
(not to mention the invisible Higgs decay width that enters all BRs...)

8 parameters fit difficult! Simpler to make reasonable approximations:

- low sensitivity on $h \to c\bar{c}$, $h \to \tau\tau$ and $pp \to ttH$ at the LHC....
- in $h \to \gamma\gamma$ additional $\tilde{b}, \tilde{\tau}, \chi_1^\pm$ contributions smaller than those of $\tilde{t}$.

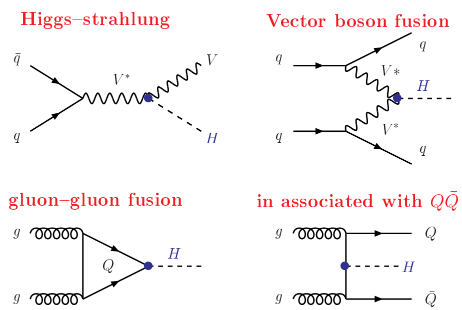
$\Rightarrow$ assume $c_c = c_t, c_\tau = c_b$ and $c_t(ttH) = c_t(ggF), c_\gamma \approx c_g \approx c_t$:

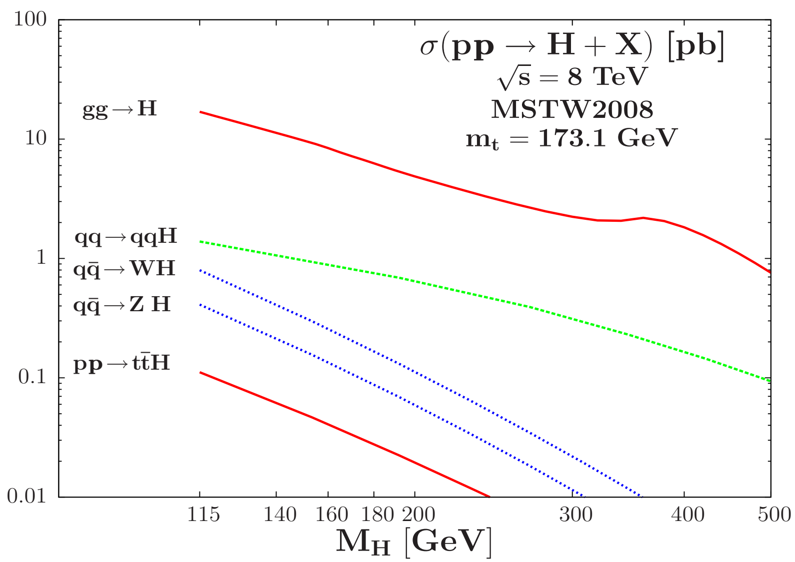
reduce the problem to a fit of three couplings: $c_V, c_b, c_t$.

# 3. Implications from the Higgs properties

**Adapt the SM Higgs rates to that of h close to the decoupling limit...**

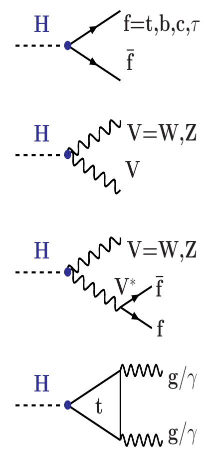
**Main Higgs production channels:**

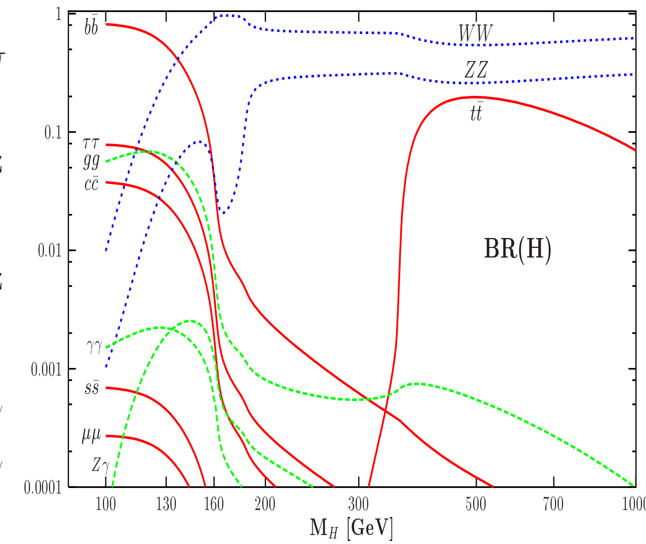



**gg→ h by far dominant process proceeds via heavy quark loops!**

**Higg decays branching ratios:**




– $\mathrm{h} \to \mathrm{b\bar{b}} \approx 60\%$: **dominant**

– $\mathrm{h} \to \mathrm{cc}, \tau\tau, \mathrm{gg} = \mathcal{O}(\text{few }\%)$

– $\mathrm{h} \to \gamma\gamma, \mathrm{ZZ}^* \to 4\ell^{\pm} \propto 10^{-3}$

**main points besides $\alpha, \beta \Rightarrow$**

**change in $\mathrm{h} \to \mathrm{b\bar{b}}$ drastic,**

**more loops in $\mathrm{h} \to \mathrm{gg}, \gamma\gamma$...**

# 3. Implications from the Higgs properties

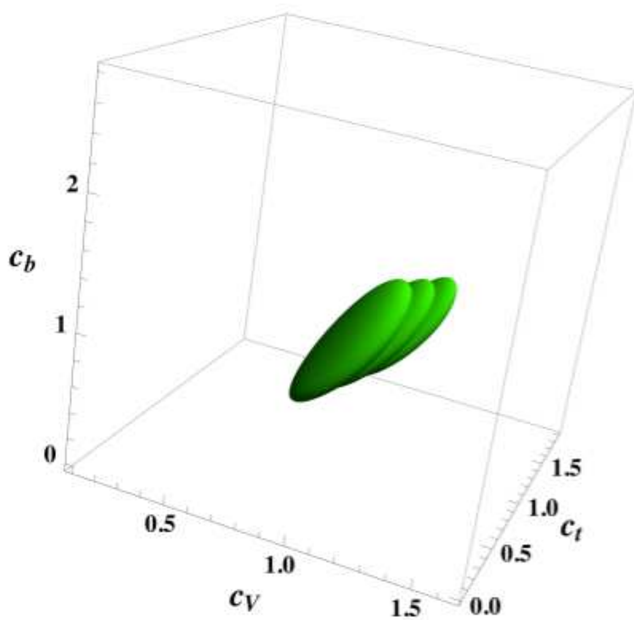
$\Rightarrow$ general MSSM at LHC is described by $\mathrm{M_h}$ and $\mathrm{c_V}, \mathrm{c_t}, \mathrm{c_b}$.

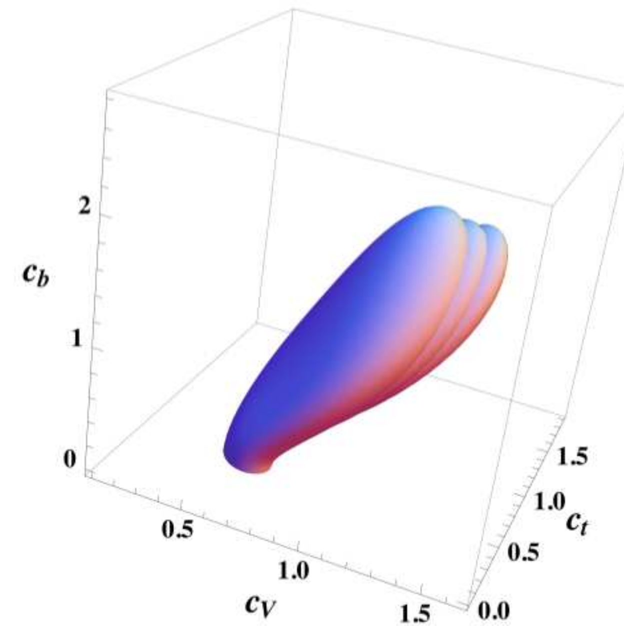
**3-dimensional fit in $[\mathrm{c_t}, \mathrm{c_b}, \mathrm{c_V}]$ space:** AD, Maiani,Polosa,Quevillon,Riquer

– ATLAS+CMS 2013 data for signal strengths in all channels;

– consider the ($\approx$ 15–20%) theory uncertainty as a bias not nuisance;

– use ratios of signal strengths where theory uncertainty cancels out.



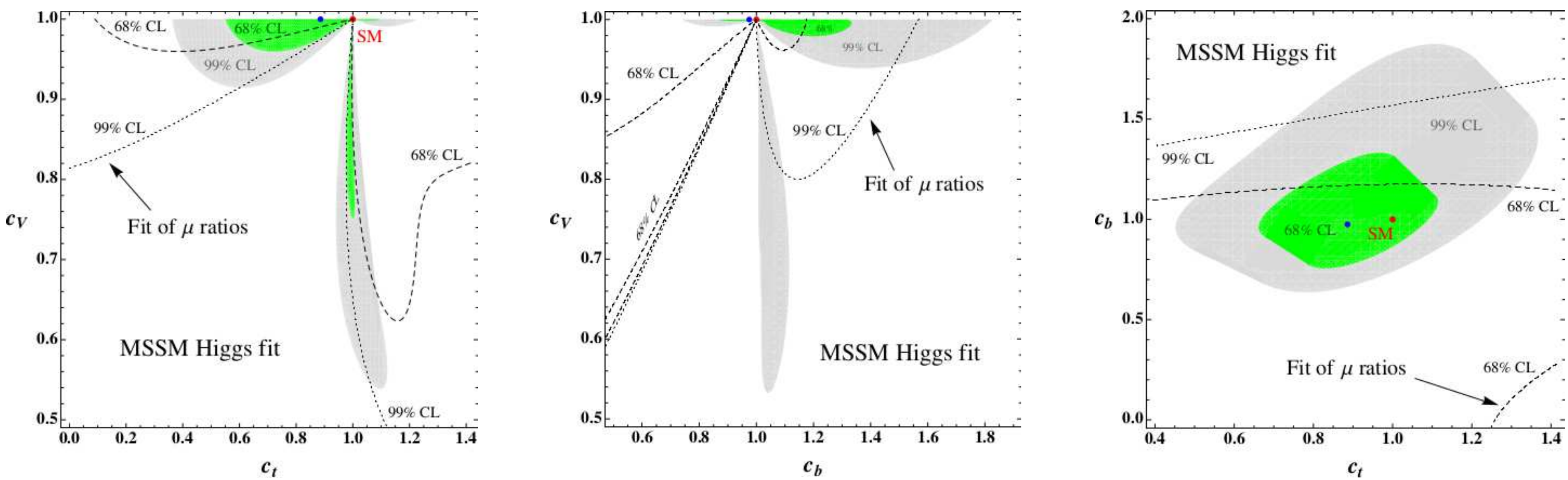

1$\sigma$ 3–dimension fit 3$\sigma$ 3–dimension fit

(3 regions for central and two extreme choices of the theory prediction).

Best-fit value: $\mathrm{c_t} = 0.894,\ \mathrm{c_b} = 1.007, \mathrm{c_V} = 1.02$ with $\chi^2$ =64.80 (71).

# 3. Implications from the Higgs properties

**Now back to MSSM relations and make a 2–dimensional fit for simplicity (the assumption is that there is no direct correction and one $c_i$ is fixed).**




$$(c_t = 0.9, c_V = 1.0), \quad (c_b = 0.97, c_V = 1.0), \quad (c_t = 0.89, c_b = 0.97).$$

**are now the best-fit points; combining the three possible cases, one has:**

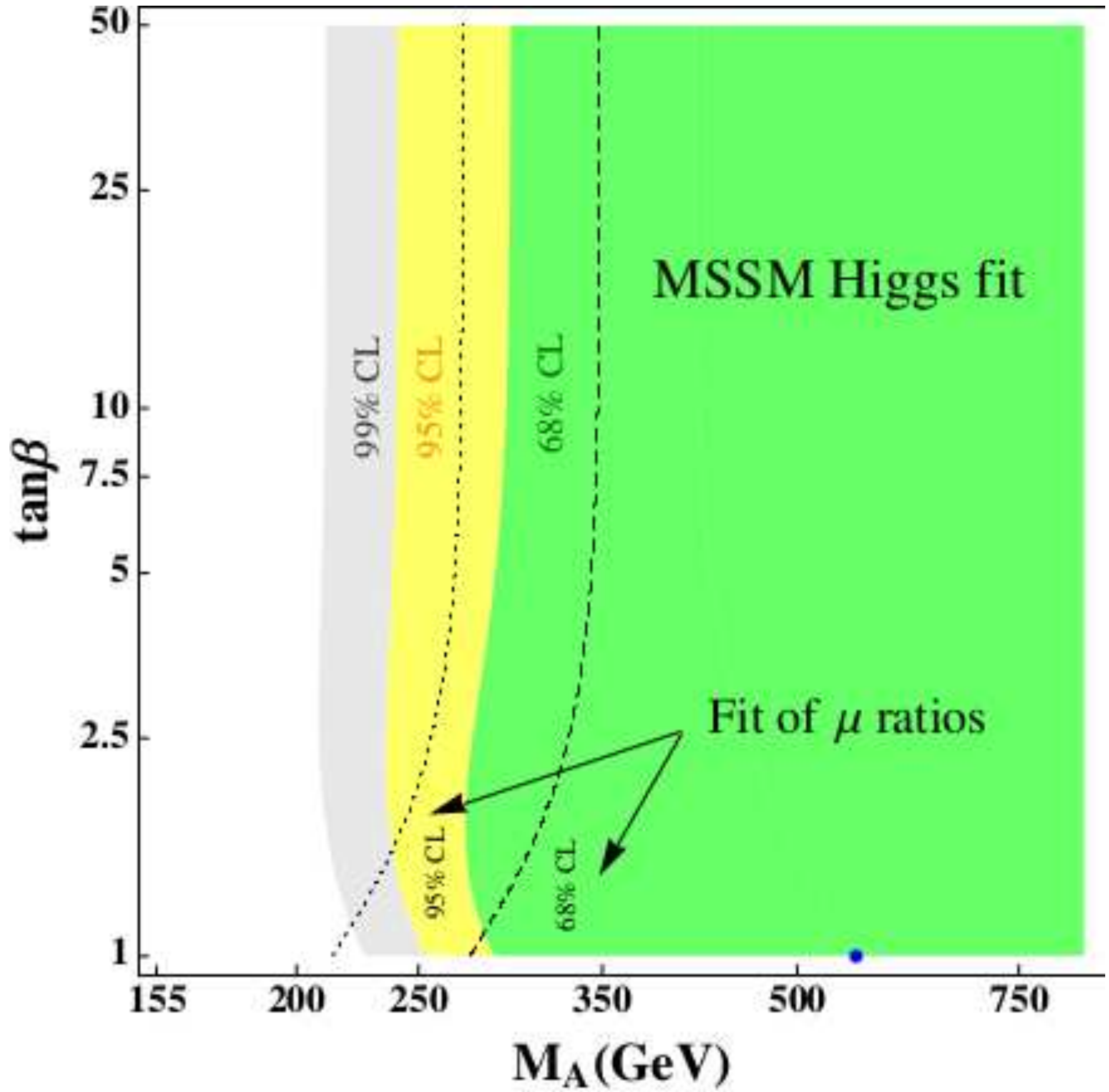
$$\tan\beta = 1 \text{ and } M_A = 560 \text{ GeV}$$

**which, with $M_h = 125$ GeV implies $M_H = 580$ GeV, $M_{H^\pm} = 563$ GeV.**

**But the minimum is flat and many points (with high $\tan\beta$) are also OK...**

# 3. Implications from the Higgs properties

**Signal strengths and ratios fit turned in a $[\tan\beta, M_A]$ constraint...**

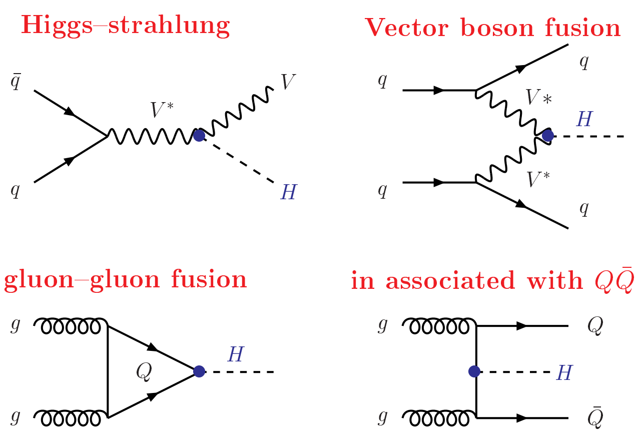


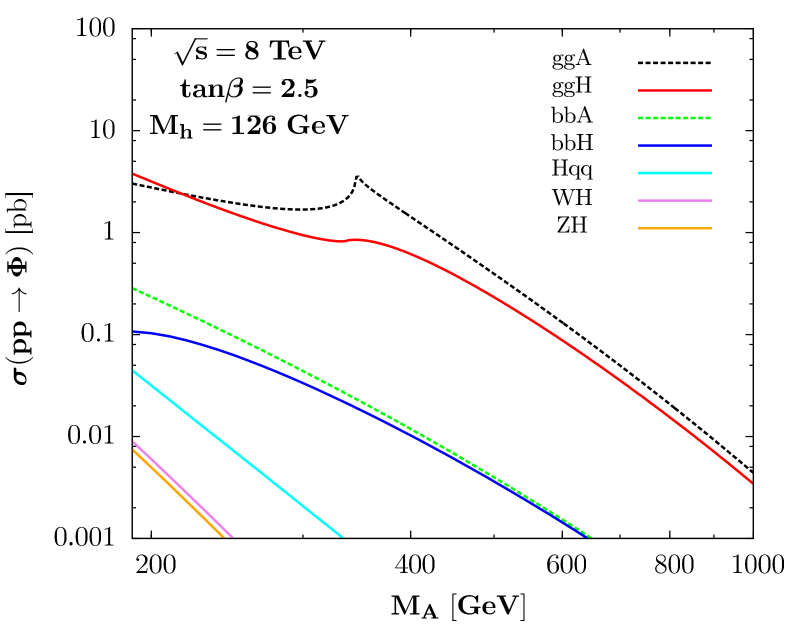

AD, Maiani, Moreau, Polosa, Quevillon, Riquer.

# 4. Implications from heavy Higgsses searches

**Besides superparticles, the heavier H/A/$H^{\pm}$ states can also be produced.**

## SM production mechanisms




## What is different in MSSM

- **All work for CP–even h,H bosons.**
  - in $\Phi V$, $qq\Phi$ h/H complementary
  - additional mechanism: qq $\to$ A+h/H
- **For $gg \to \Phi$ and $pp \to QQ\Phi$**
  - include the contr. of b–quarks
  - dominant contr. at high tan$\beta$!
- **For pseudoscalar A boson:**
  - CP: no $\Phi A$ and $qqA$ processes
  - $gg \to A$ and $pp \to bbA$ dominant.
- **For charged Higgs boson:**
  - $M_H \lesssim m_t$: $pp \to t\bar{t}$ with $t \to H^+ b$
  - $M_H \gtrsim m_t$: continuum $pp \to t\bar{b}H^-$

**At high tan$\beta$ values:**

- h as in SM with $M_h = 115-130$GeV
- dominant channel: $gg, b\bar{b} \to \Phi \to \tau\tau$

# 4. Implications from heavy Higgsses searches

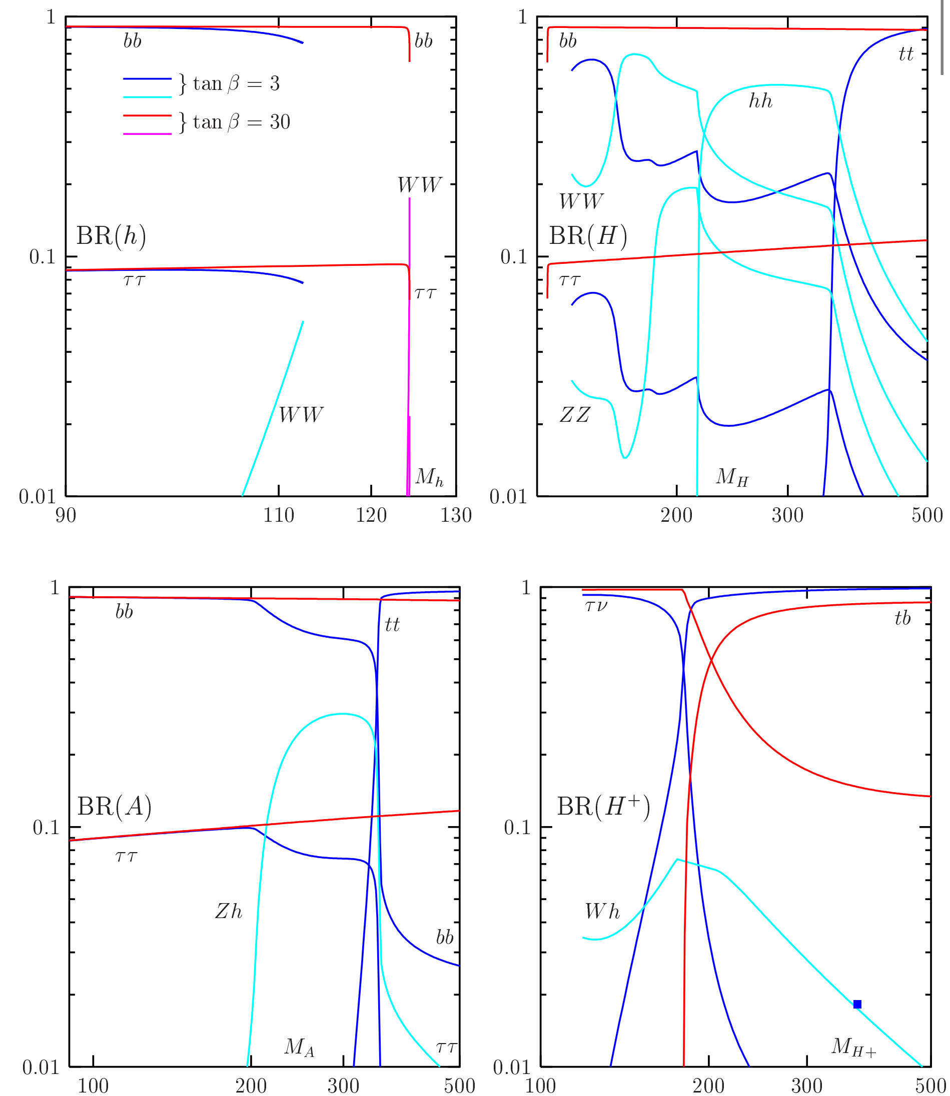
**MSSM Higgs detection modes:**

**General features for h/H/A/H$^\pm$**

- $\mathrm{h}$: same as $\mathrm{H_{SM}}$ in general (especially in decoupling limit).
- $\mathrm{A}$: only $\mathrm{b\bar{b}}, \tau^+\tau^-$, $\mathrm{t\bar{t}}$ decays (no VV decays, $\mathrm{hZ}$ suppressed).
- $\mathrm{H}$: same as $\mathrm{A}$ in general as $\mathrm{WW}, \mathrm{ZZ}, \mathrm{hh}$ modes suppressed.
- $\mathrm{H^\pm}$ : $\tau\nu$ and $\mathrm{tb}$ decays (depending if $\mathrm{M_{H^\pm}} <$ or $> \mathrm{m_t}$).

– loop decays strongly suppressed

– possible new effects from SUSY!?




**For tan$\beta \gg$1, only decays into b/$\tau$:**

**BR:** $\Phi \to \mathrm{b\bar{b}} \approx 90\%$, $\Phi \to \tau\tau \approx 10\%$

**For tan$\beta \approx$1, other good channels:**

$$\mathrm{H/A \to tt, H \to WW, ZZ}$$
$$\mathrm{A \to hZ, H \to hh}$$

# 4. Implications from heavy Higgsses searches

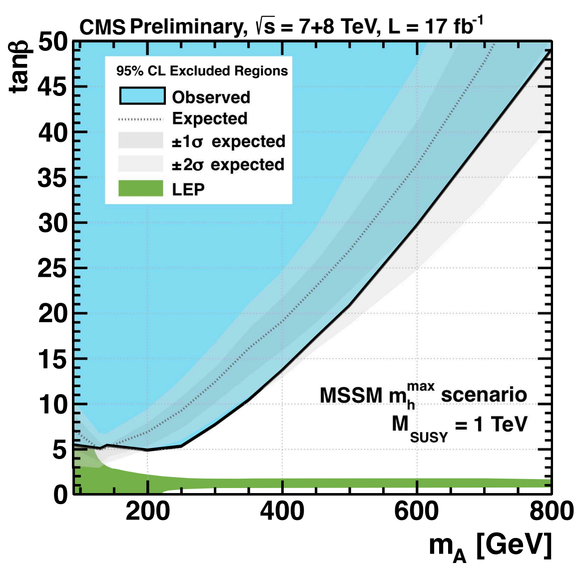
**Most efficient channels for the production of the heavier MSSM Higgses.**

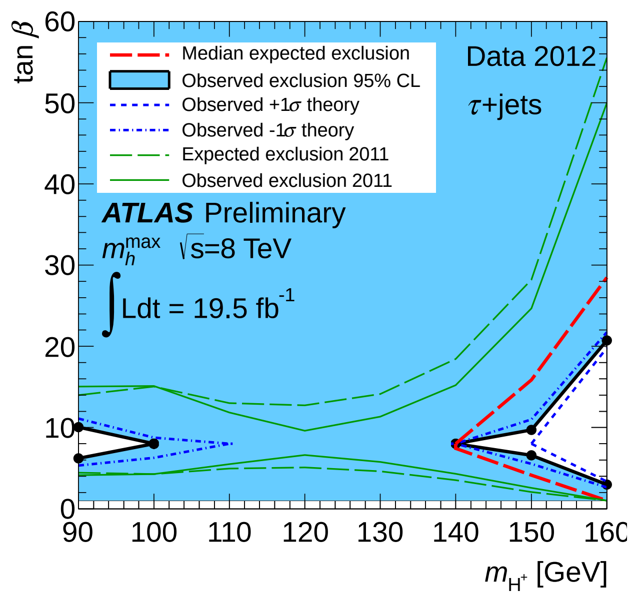
- **Searches for the $\mathrm{pp} \to \mathrm{A/H/(h)} \to \tau\tau$ resonant process:**

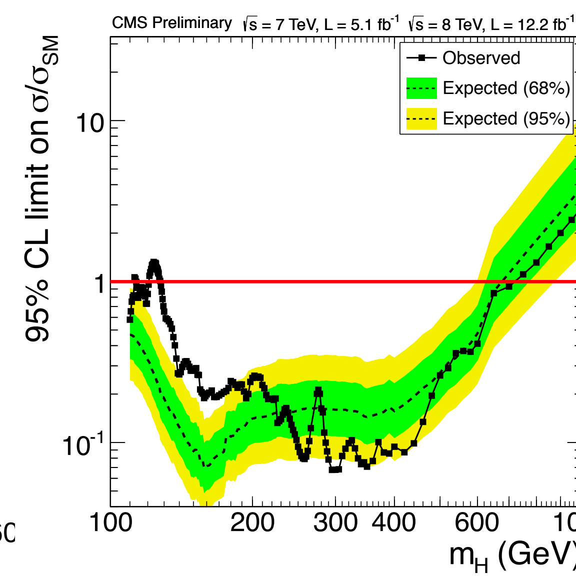
  $\Rightarrow$ **rules out high $\tan\beta$ for low $\mathrm{M_A}$ values.**
- **Searches for charged Higgs in $\mathrm{t} \to \mathrm{bH^+} \to \mathrm{b}\tau\nu$ decays:**

  $\Rightarrow$ **rules out almost any $\tan\beta$ value for $\mathrm{M_{H^\pm}} \lesssim 160$ GeV.**
- **Non observation of heavier Higgs bosons in H$\to$ZZ,WW modes:**

  $\Rightarrow$ **no analysis yet!? The width is different from SM-case.**
- **Also searches for $\mathrm{A} \to \mathrm{hZ}$ and $\mathrm{H} \to \mathrm{hh}$ but not in the MSSM....**
- **Searches for heavy tt resonances but not in the MSSM ($\mathrm{KK}, \mathrm{Z'}$)...**



# 4. Implications from heavy Higgsses searches

The most constraining channel is by far the $pp \to \tau^+\tau^-$ process.

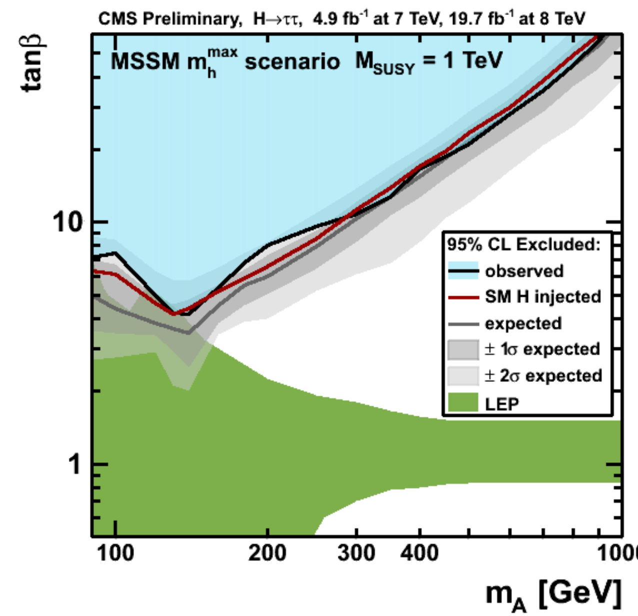
However, there are problems with the interpretation in the MSSM context.

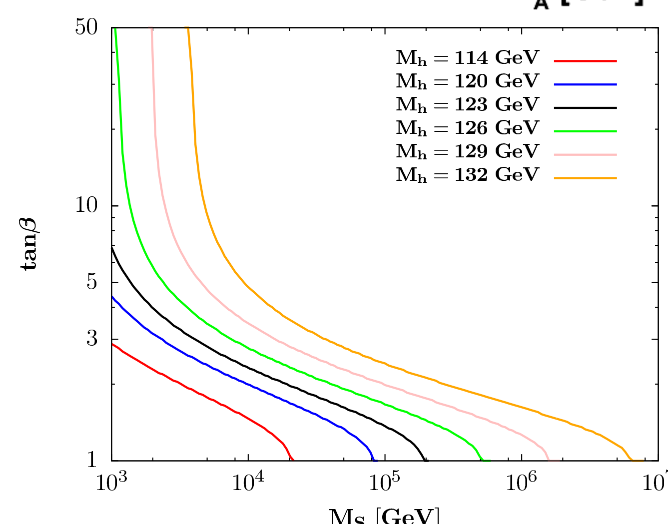
- Derived in the "Mh-max scenario" that maximizes radiative corrections to $M_h$ (but constraints are solid at high–tan$\beta$).
- Uses the $M_S = 1$ TeV benchmark that is ruled out in most (realistic) cases.
- Uses LEP2 constraint $M_h \gtrsim 114$ GeV which is now superseded by the LHC (and this rules out all tan$\beta \lesssim 3$ values).
- Does not take into account LHC data: h has 125 GeV and SM–like couplings..

We can be more relaxed: $M_S \gg M_Z$ and choose it in order that LHC data OK:

$\Rightarrow$ more consitent/realistic approach,

$\Rightarrow$ much less model dependance.



# 4. Implications from heavy Higgsses searches

**Model independent – effective – approach**

**Habemus MSSM (hMSSSM):**

**AD, Maiani,Polosa,Quevillon,Riquer**

- **We turn $M_h \approx M_Z|\cos 2\beta|$+RC to RC= 125 GeV - $f(M_A, \tan\beta)$**

**ie. we "trade" RC with the measured $M_h$**

**MSSM with only 2 inputs at HO: $M_A, \tan\beta$**

$$M_H^2 = \frac{(M_A^2+M_Z^2-M_h^2)(M_Z^2 c_\beta^2+M_A^2 s_\beta^2)-M_A^2 M_Z^2 c_{2\beta}^2}{M_Z^2 c_\beta^2+M_A^2 s_\beta^2-M_h^2}$$

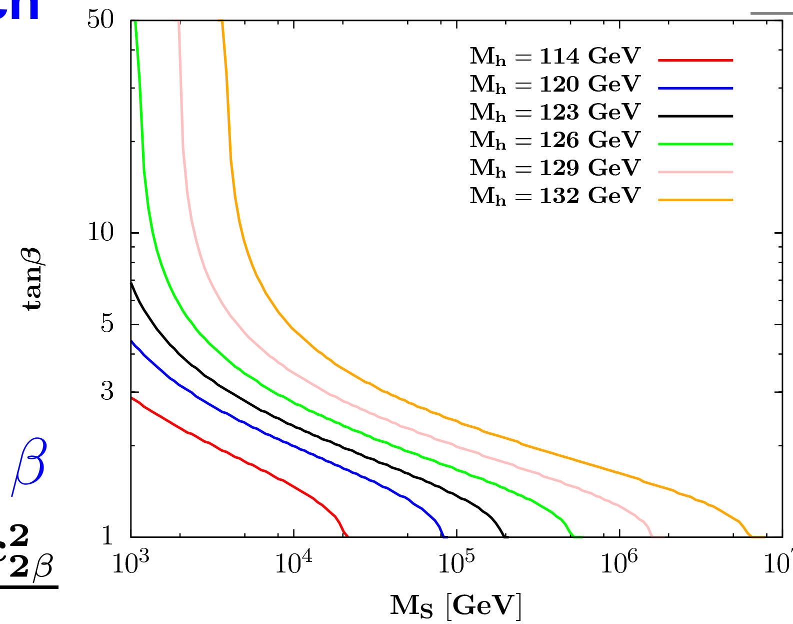
$$\alpha = -\arctan\left(\frac{(M_Z^2+M_A^2)c_\beta s_\beta}{M_Z^2 c_\beta^2+M_A^2 s_\beta^2-M_h^2}\right)$$

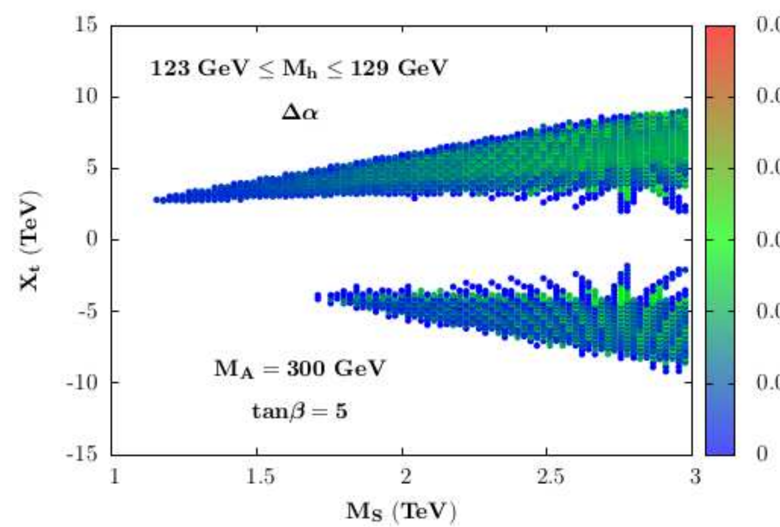
$$M_{H^\pm} \simeq \sqrt{M_A^2+M_W^2}$$

**Clearly works when leading RC only:**

$$\Delta\mathcal{M}_{22}^2 = \frac{M_h^2(M_A^2+M_Z^2-M_h^2)-M_A^2 M_Z^2 c_{2\beta}^2}{M_Z^2 c_\beta^2+M_A^2 s_\beta^2-M_h^2}$$

**But we checked that it is also good in general, ie for $\Delta\mathcal{M}_{11,12}^2 \neq 0$.**



# 4. Implications from heavy Higgsses searches

**LHC run 1 legacy on the MSSM $[\mathrm{M_A}, \tan\beta]$ plane in the hMSSM:**

- $\mathrm{pp} \to \mathrm{H/A} \to \tau\tau$
- $\mathrm{t} \to \mathrm{H^+ b} \to \mathrm{b}\tau\nu$

**(also at low tan$\beta$ values**

- **H$\to$WW and ZZ**

**(but width as in SM).**

- **CMS A$\to$hZ analysis**
- **CMS H$\to$hh (to update)**

**(both MSSM interpreted).**

- $\mathrm{pp} \to \mathrm{H/A} \to \mathrm{t\bar{t}}$

**with complete analysis:**

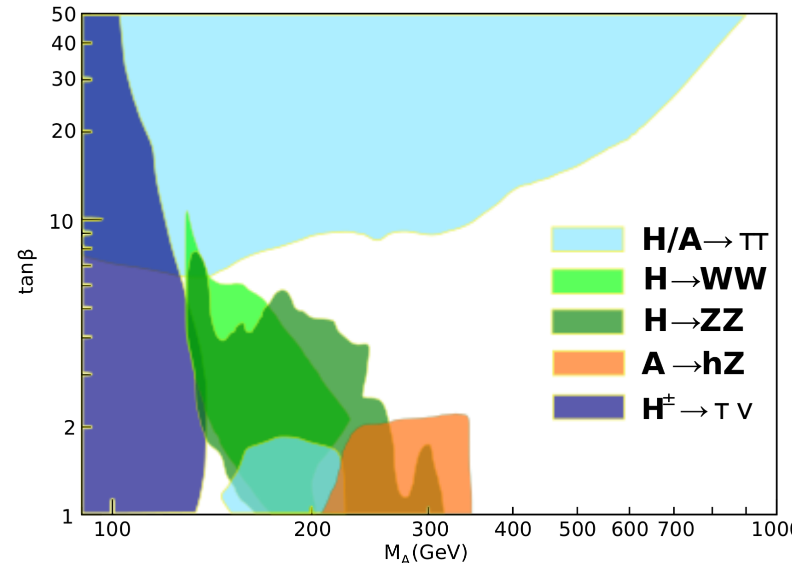
**– effect of total width**

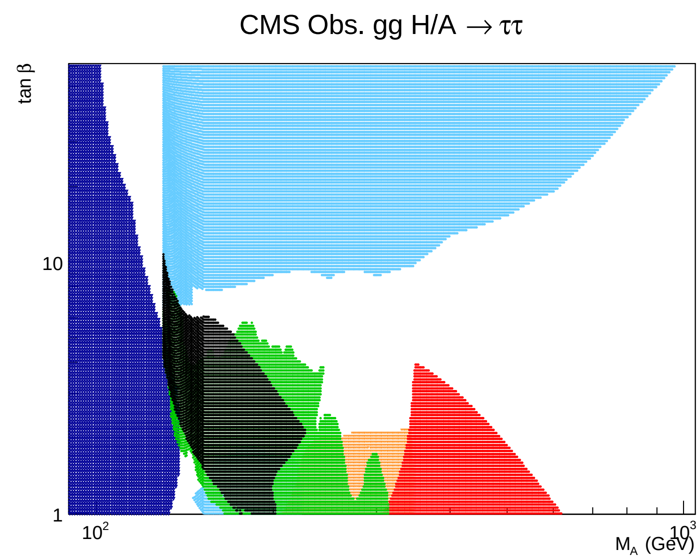
**– S and B interference**

**– boosted top jets**

**the action is at low tan$\beta$!**

**Orsay+Rome collaboration.**



# 5. What next?

## KEEP GOING!

**It is still “action” time:**

- **keep measuring the Higgs properties: the devil is hidden in the details...**
- **keep searching for the heavier Higgses, some can be around the corner, ...**
- **keep searching for SUSY with more focus on stops and EW states..**

**and keep an open mind towards overlooked and extended scenarios...**

**Thank you!**