

APROPOS: A PRogram to Obtain Properties Of Supersymmetry

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Supersymmetry

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Motivation

Why should we introduce more than 100 new parameters?

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Why should we introduce more than 100 new parameters?

- ▶ SM is not complete
- ▶ Hierarchy problem
- ▶ Dark matter
- ▶ Unification of gauge couplings
- ▶ Combines Poincaré group and internal symmetries of the gauge groups

SUSY models

By making some assumptions, one can reduce parameters
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- ▶ CMSSM (Constrained MSSM)
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- ▶ ...

Program structure

- ▶ Take high energy input

Program structure

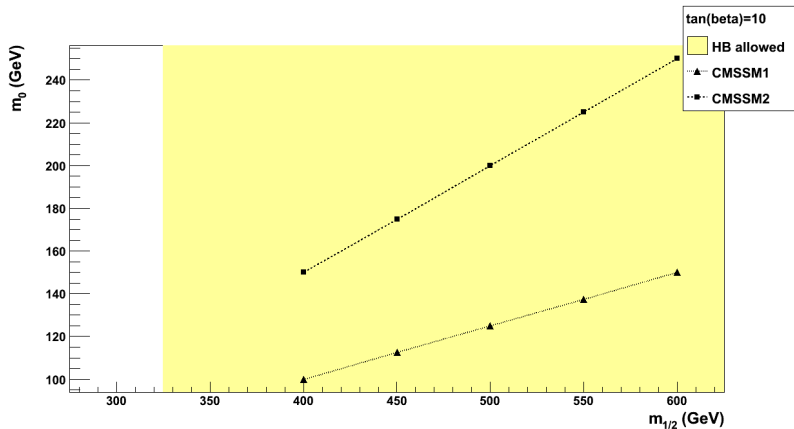
- ▶ Take high energy input
- ▶ Calculate spectrum

Program structure

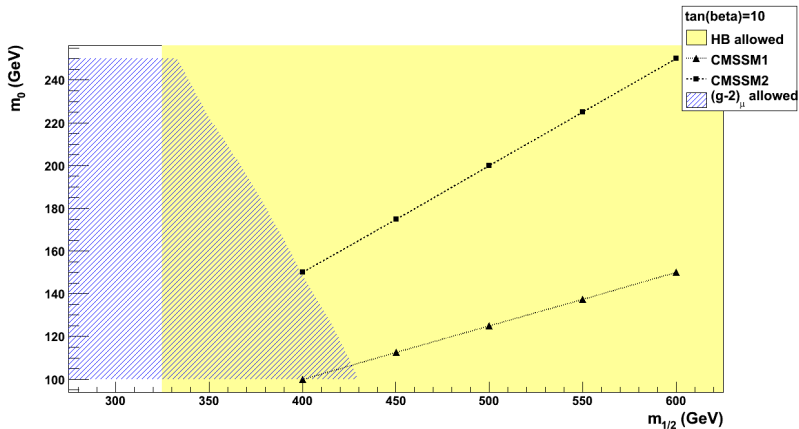
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- ▶ Calculate relevant observables
(HiggsBounds, $(g - 2)_\mu$, M_W)
⇒ Exclusions

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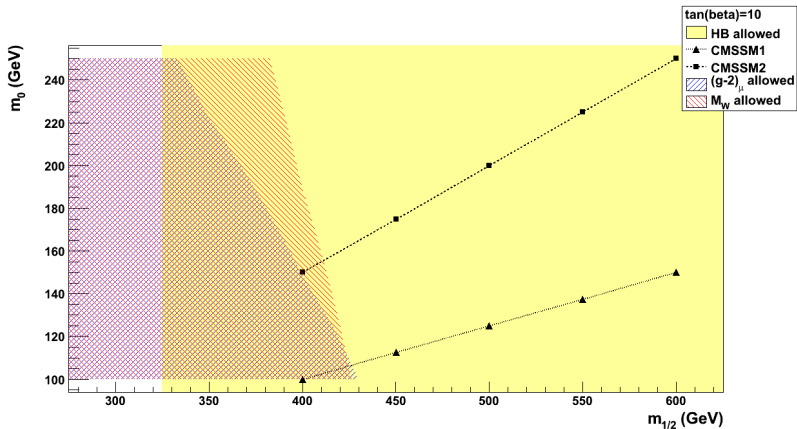
- ▶ Take high energy input
- ▶ Calculate spectrum
- ▶ Calculate relevant observables
(HiggsBounds, $(g - 2)_\mu$, M_W)
⇒ Exclusions
- ▶ Calculate branching ratios
⇒ Phenomenology prediction

CMSSM: $\tan(\beta) = 10$ 

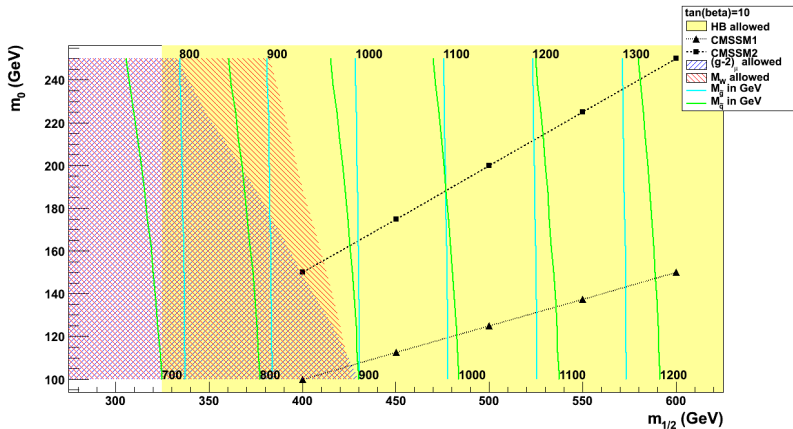
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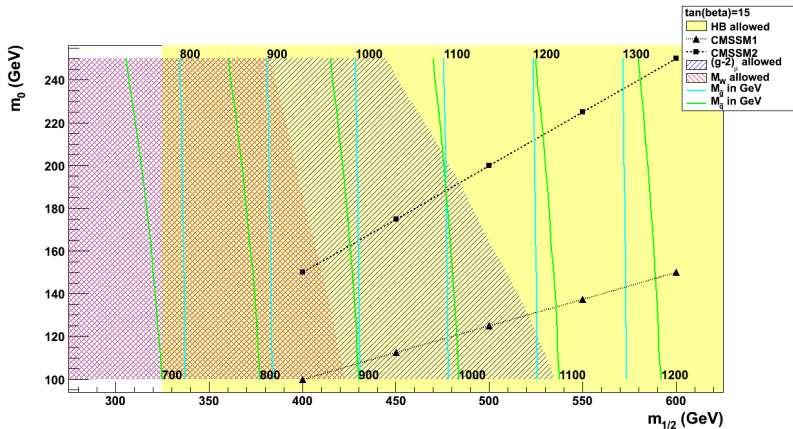
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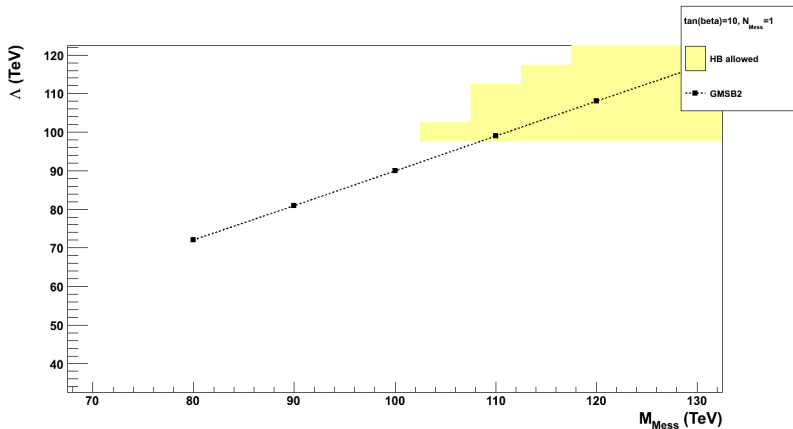


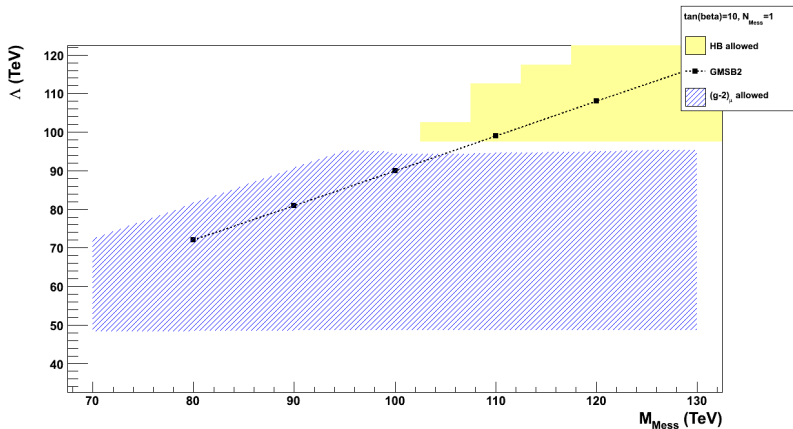
CMSSM: $\tan(\beta) = 15$



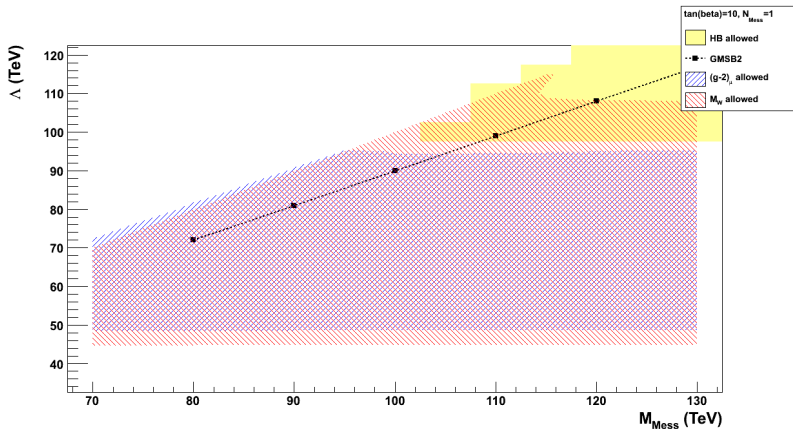
CMSSM

- ▶ higher $\tan(\beta)$ preferred
- ▶ no constraints from HiggsBounds
- ▶ $(g - 2)_\mu$ and M_W allowed area excluded by LHC

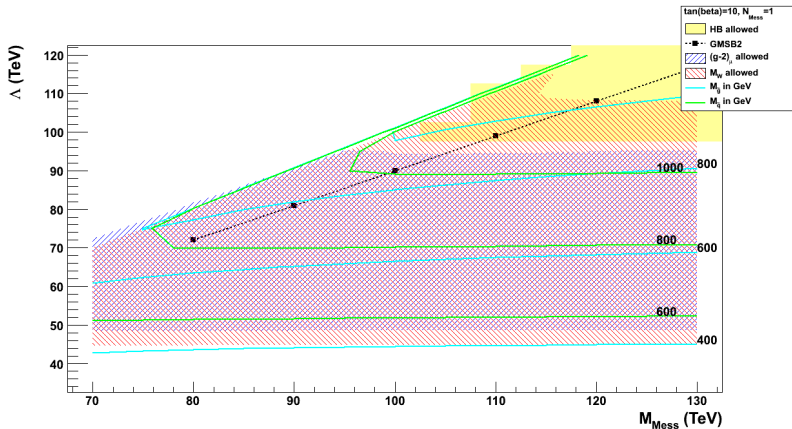
GMSB: $\tan(\beta) = 10$, $N = 1$ 

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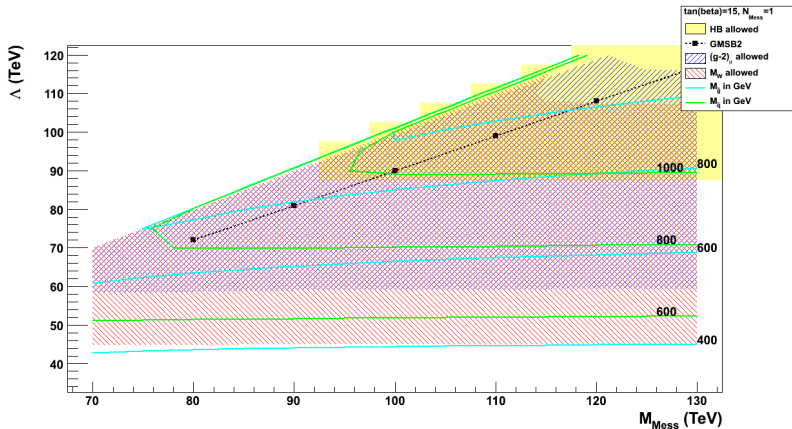
GMSB: $\tan(\beta) = 10, N = 1$



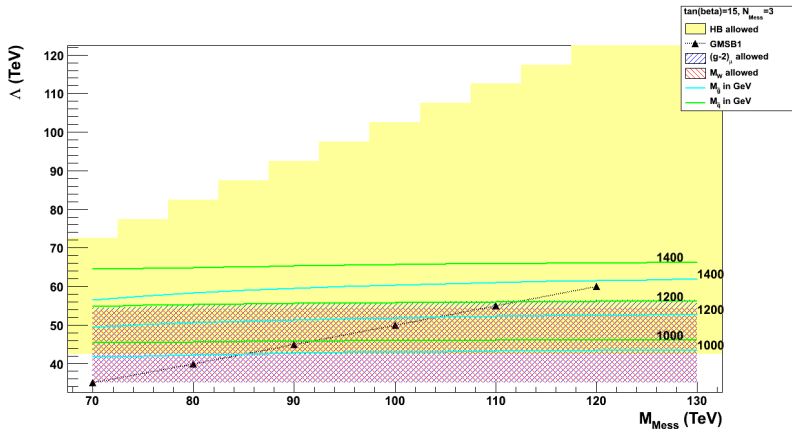
GMSB: $\tan(\beta) = 10, N = 1$



GMSB: $\tan(\beta) = 15, N = 1$



GMSB: $\tan(\beta) = 15, N = 3$



GMSB

- ▶ Higher $\tan(\beta)$ preferred
- ▶ Slightly better than CMSSM for $N = 1$
- ▶ Good agreement for $N = 3$

Conclusions

- ▶ CMSSM is under pressure
- ▶ No large change in exclusion lines before LHC upgrade

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- ▶ CMSSM is under pressure
- ▶ No large change in exclusion lines before LHC upgrade
- ▶ Good agreement for GMSB
- ▶ Larger Color splitting \Rightarrow light color neutral particles
- ▶ Sensitivity increases with Luminosity!