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The supersymmetric Higgs boson(s)

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Overview

- Part 1: Basic SUSY Higgs properties
- Part 2: Searching for SUSY Higgses
- Part 3: SUSY Higgs and precision computations

Lecture on blackboard + notes to be downloaded

Part 2: searching for supersymmetric Higgs bosons

SM Higgs branching ratios (predictions)

$$BR_{SM}(h_1 \to \bar{b}b) = 5.81 \times 10^{-1}$$

$$BR_{SM}(h_1 \to WW^*) = 2.15 \times 10^{-1}$$

$$BR_{SM}(h_1 \to gg) = 8.18 \times 10^{-2}$$

$$BR_{SM}(h_1 \to \tau\tau) = 6.3 \times 10^{-2}$$

$$BR_{SM}(h_1 \to \bar{c}c) = 2.88 \times 10^{-2}$$

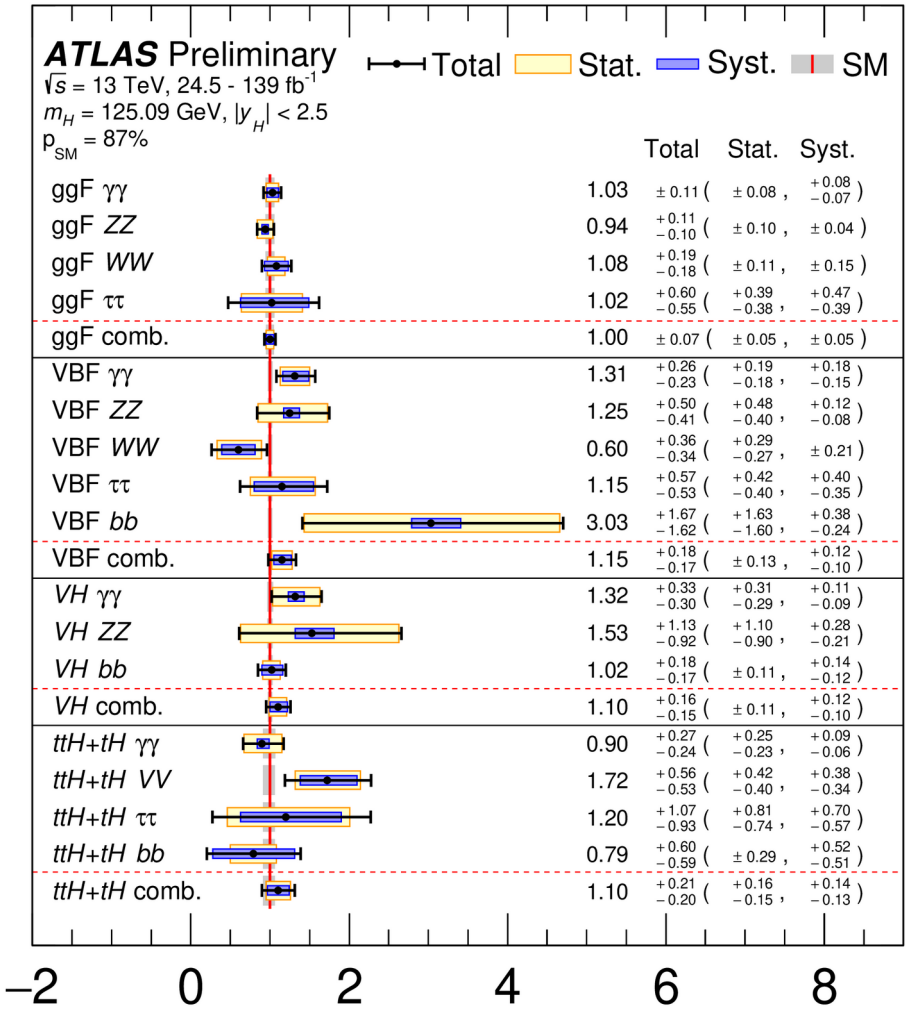
$$BR_{SM}(h_1 \to ZZ^*) = 2.64 \times 10^{-2}$$

$$BR_{SM}(h_1 \to \mu\mu) = 2.2 \times 10^{-4}$$

$$BR_{SM}(h_1 \to \gamma\gamma) = 2.27 \times 10^{-3}$$

$$BR_{SM}(h_1 \to Z\gamma) = 1.54 \times 10^{-3}$$

$$\mu = 1.06 \pm 0.07 \text{ (ATLAS)}$$



$$\mu = 1.02^{+0.07}_{-0.06}\ (\text{CMS})$$

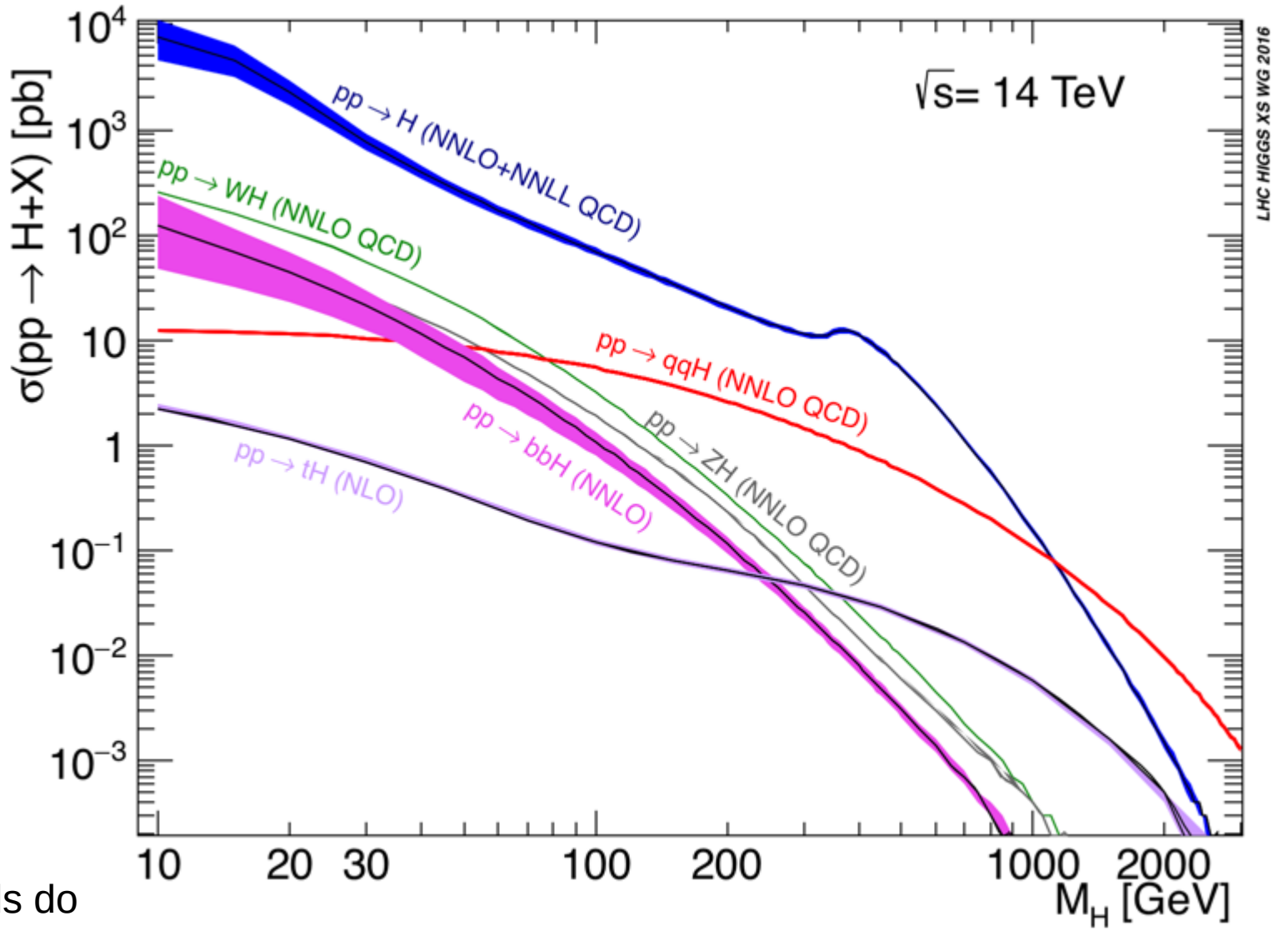
SM-like Higgs production

This assumes that a new Higgs boson has the same couplings as the light Higgs … not a good approximation for SUSY theories.

On the other hand, we can use these values by rescaling the couplings:

$$\sigma \simeq \sigma_{\mathrm{SM}} \times \left| \frac{g_{hii}}{g_{hii}^{SM}} \right|^2$$

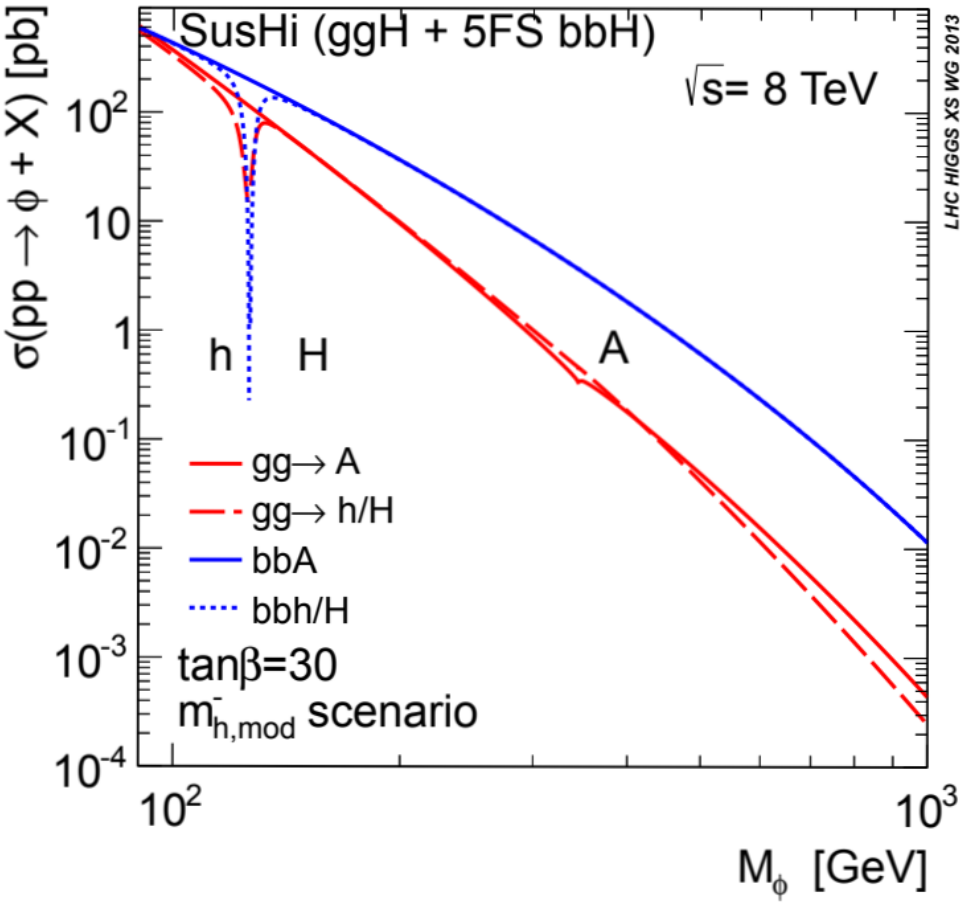
Effectively this is what HiggsBounds/HiggsTools do



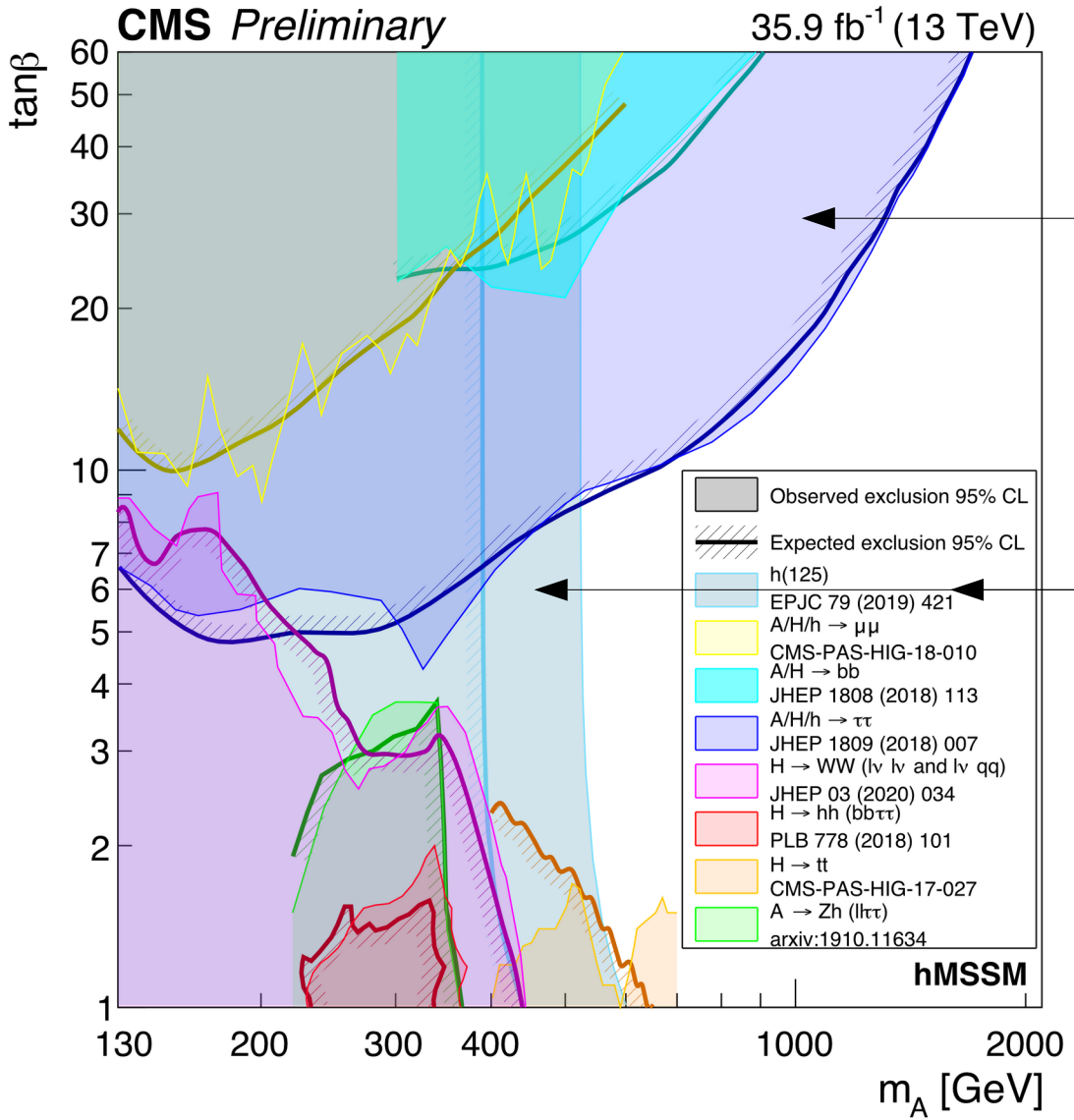
Higgs production

Production for BSM Higgses can be computed for specific models using all known corrections in SusHi

Or it can be interpolated from SM Higgs calculations by rescaling gluon fusion, quark fusion computations etc by effective couplings



MSSM Higgs searches



$\tan\beta$ enhanced decays to taus

SM Higgs-like couplings

NB also have a limit of about 560 GeV from $B \to s\gamma$