STOP SEARCHES

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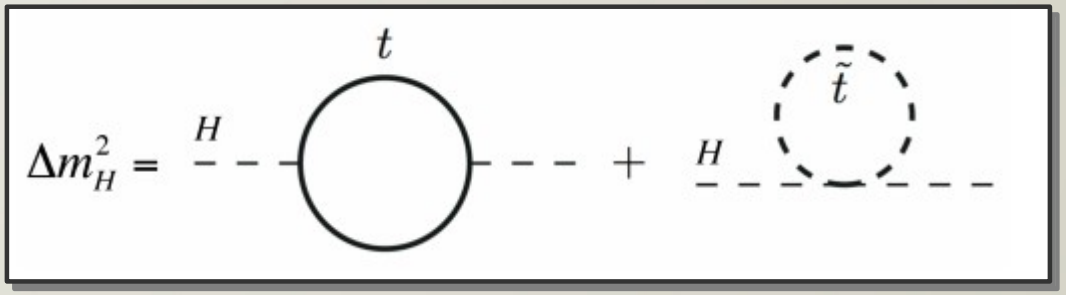
Motivation

The Higgs boson has been found at 126 GeV at the LHC

SM hierarchy problem: Higgs mass receives large radiative corrections → largest contribution from top quark



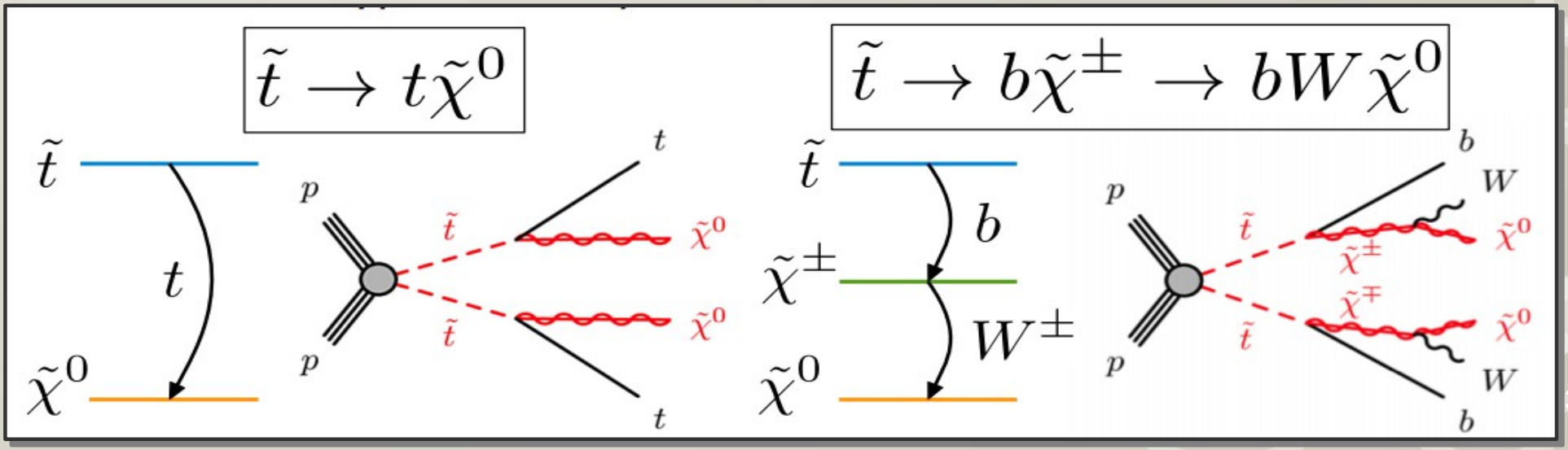
Top squarks (stops) are crucial for SUperSYmetry solution to the hierarchy problem

Naturalness (not fine-tuned) requires light stop (a few hundred GeV) that cancels top quark contribution to ΔM_H^2

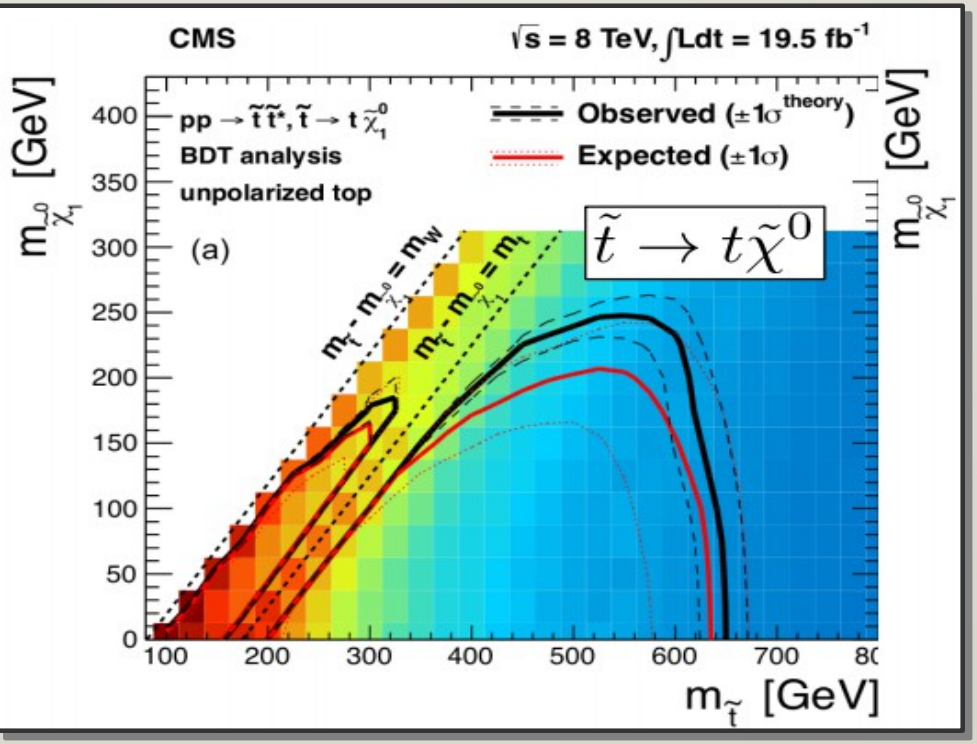
In R-parity conserving SUSY, stop quarks are pair-produced and decay to stable Lightest SUSY Particle (often the lightest neutralino) wich provides a dark matter candidate → Missing E_T signature in the detector

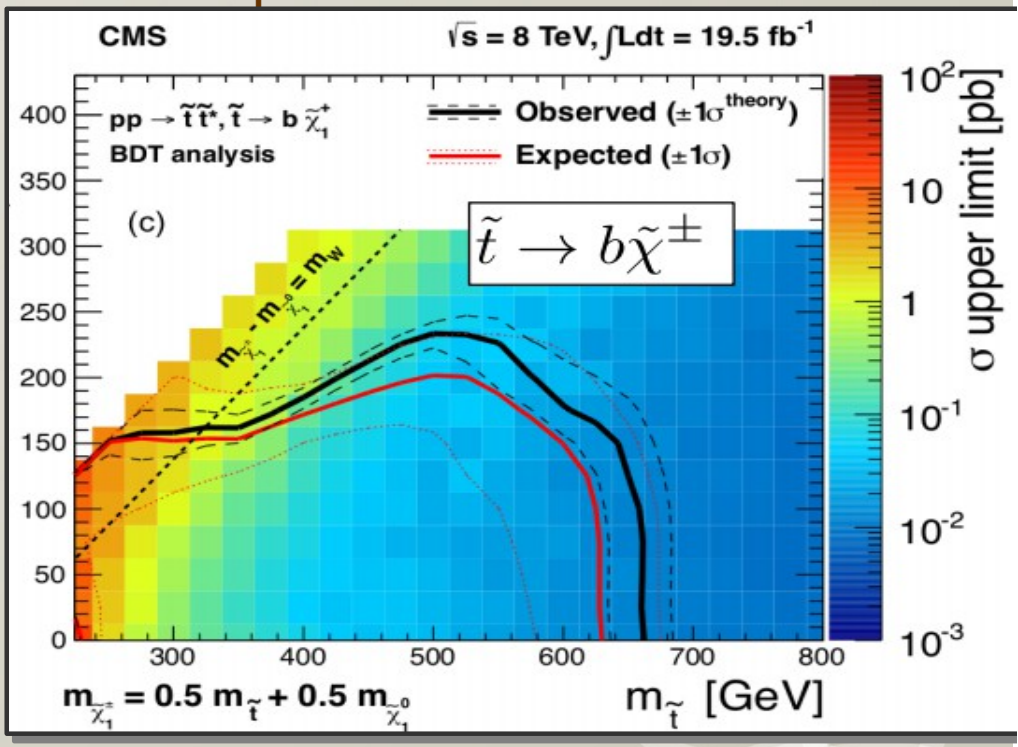
Stop searches

- Searching for a superpartner of the top quark (stop)
- Predicted by super symmetric models
- **Signature:**
  - 1 electron/muon
  - >= 4 jets , >= 1 btag
  - High MET
- **Strategy:**
  - BDT approach
  - Parallel Cut & Count approach
- **Main backgrounds:**
  - Dileptonic ttbar,semileptonic ttbar,W+jets, Others (Single-top, tt+V, dibosons...)
- Two types of decays are considered:



- **Results published using the full 8 TeV dataset (SUS-11-013).**
- **Observed yields are consistent with predicted background → no evidence for stop**
- **Upper limits have been derived both for CMS and ATLAS.**
- **CMS: comparison with the theory excludes m_{stop} up to 650 GeV**





- **ATLAS: depending on the decay mode masses up to 610 GeV are excluded**

- **LIP is leading the optimization effort of the analysis at 8 TeV (and beyond)**
- **An iterative approach has been followed in order to determine the most optimal set of variables to be used as input for the BDT**
  - **Removing some variables with respect to the publication since they were not adding much to the final sensitivity**
  - **Adding new variables optimized for each of the signal regions: further exploiting kinematical differences between signal/background and correlations.**
- **A significant improvement is foreseen for 8 TeV with respect to the publication.**
  - **An optimal set of variables has been determined**
  - **Looking at the temperature maps a gain of sensitivity ~ 50 GeV for neutralino ~50-100 GeV for stop can be expected (rough estimate for the moment)**
- **Some additional improvements will be implemented for the 13 TeV analysis**