Natural SUSY
Guida alla Discussione

Gabriella Gaudio (INFN Pavia)
Maurizio Pierini (CERN)

Discussion Outline

- missing corners?

- If not natural?

- To do with 8 TeV data?
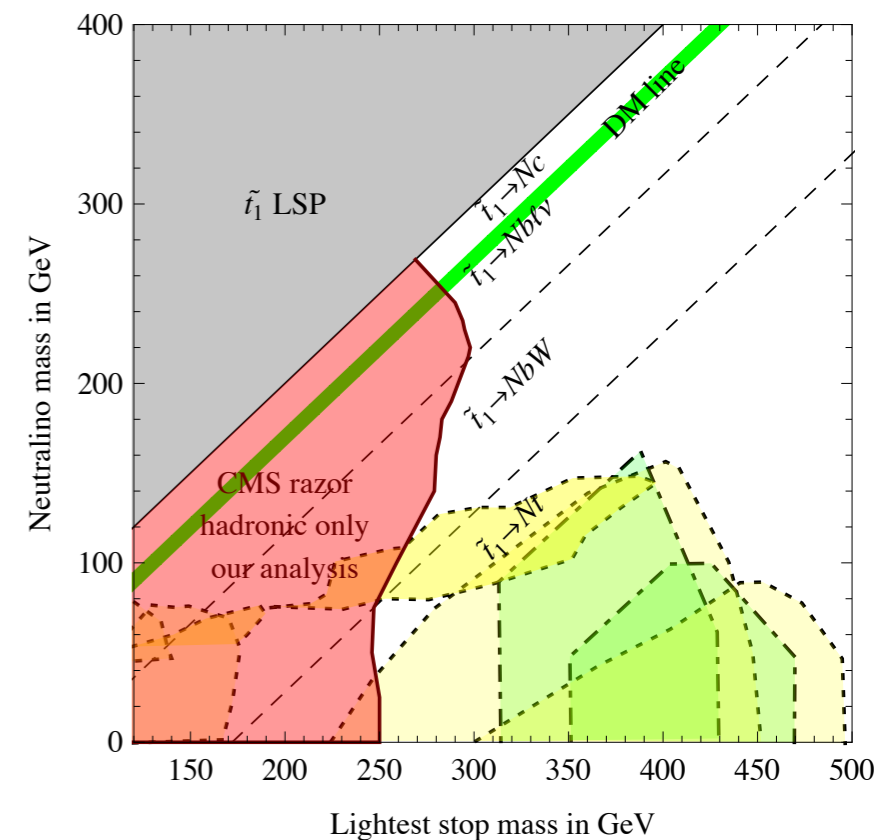
- In preparation for restart?

The Missing Corners

- ## Compressed Spectra

  See DM talk

  In the degenerate limit, we only see SUSY through ISR (monojet DM search)
  But with some (even small) splitting we should do more (new modified monojet/dijet searches, a few started already)
  Can we trigger these signature in a (more) efficient way @13 TeV?

- ## RPV SUSY

  See hadronic resonance talk

  If the LSP decays, the signature is multijet with b's, no more MET
  Overlap with (multi)jet resonance searches. But for high multiplicity the combinatoric prevents seeing the resonance
  For light-enough stop the trigger could be a problem. Parked data?
  Dedicated triggers for 13 TeV?
  And what about stability vs pileup@trigger?

If Not Natural?

Predicted range for the Higgs mass

Gluinos could fly in the detector *See LLP talk*

The light Higgs puts a bound on the high scale. O(cm) flight length is favored

We have extreme signatures covered by EXO

Something more similar to a btag could be needed

Very-degenerate ewkinos. Could give long-living charged/neutral particles decaying to leptons (see EXO analysis)

This signature could be common to natural SUSY too (only light higgsinos)

Need to progress on simulating this signatures (e.g. LLP in fastsim codes)

Low cross section and/or high mass could require more complex analyses (existing SUSY search + LLP tag)

$\tilde{q}$

O(100 TeV)

$\tilde{g}$

$\tilde{\chi}^0 \ \tilde{\chi}^+$
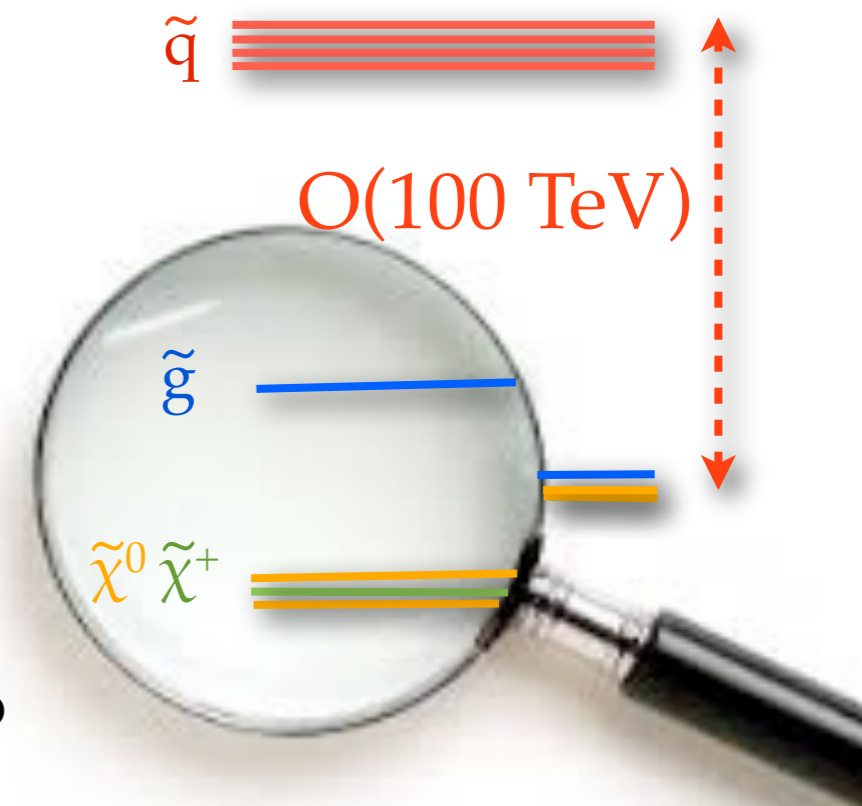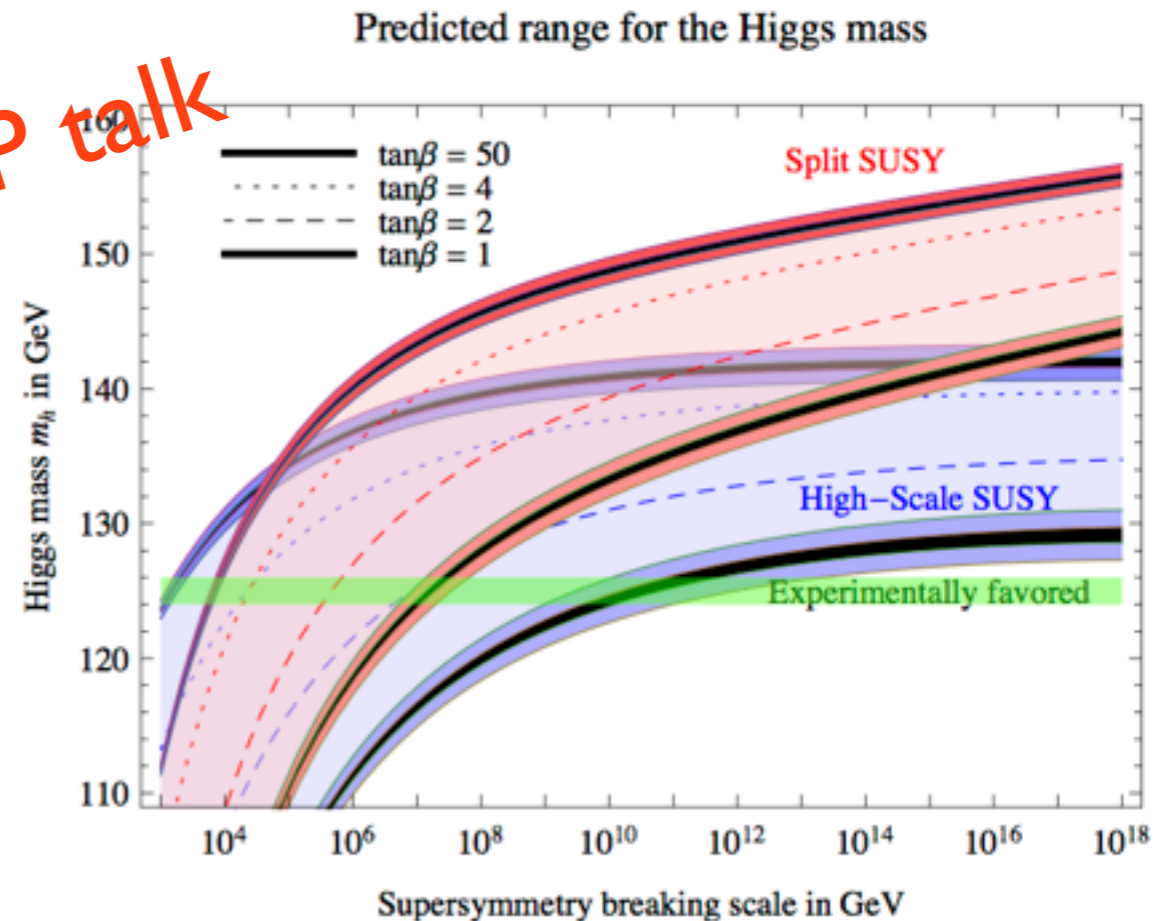
To do with 8 TeV data

- More and more exclusive analyses

- Might need to go back to inclusive searches (e.g. multijet/noMET searches for RPV)

- Use this opportunity to prepare WITH DATA the 13 TeV restart

COMMISSION WITH DATA THE TAILS OF THE KINEMATIC VARIABLES

- understanding the ISR modeling in MC
- data/mc comparisons of the MET/HT/etc tails
with pure ttbar and Z+jets control samples
- investigate jet substructure (e.g. heavy gluino to
light stop+top)

Preparing for 13 TeV data

- Having dedicated triggers ready

  low-energy specific signatures for compressed spectra, jet substructure, multiplicity triggers
  Need to keep the triggers PU insensitive
  Need to maintain trigger thresholds low

- Having the tools ready

  Do we trust the ISR description in MC (needed for compressed spectra)
  Can we trust mc predictions to establish low-cross section signal in the bulk of the distribution (the signal is not necessarily on the tail)

- Be prepared to high-statistics analyses

  What did we learn from 7TeV/8TeV shape analyses?
  Can we do more?