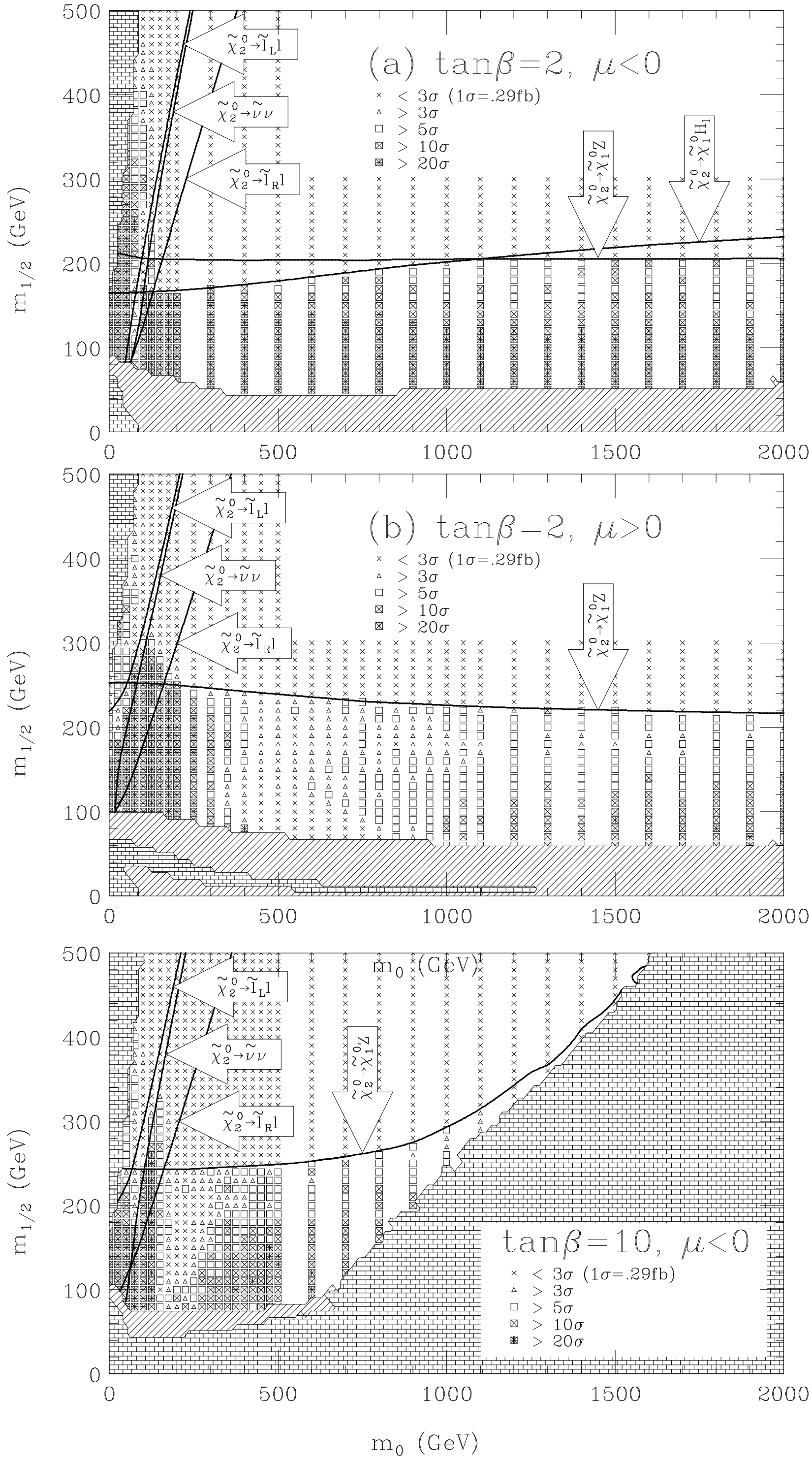
LHC: $\tilde{\chi}_1^{\pm}\tilde{\chi}_2^{0} \to 3$ leptons + $\not{E}_T$



Reach of the trilepton channel in SUGRA parameter space.

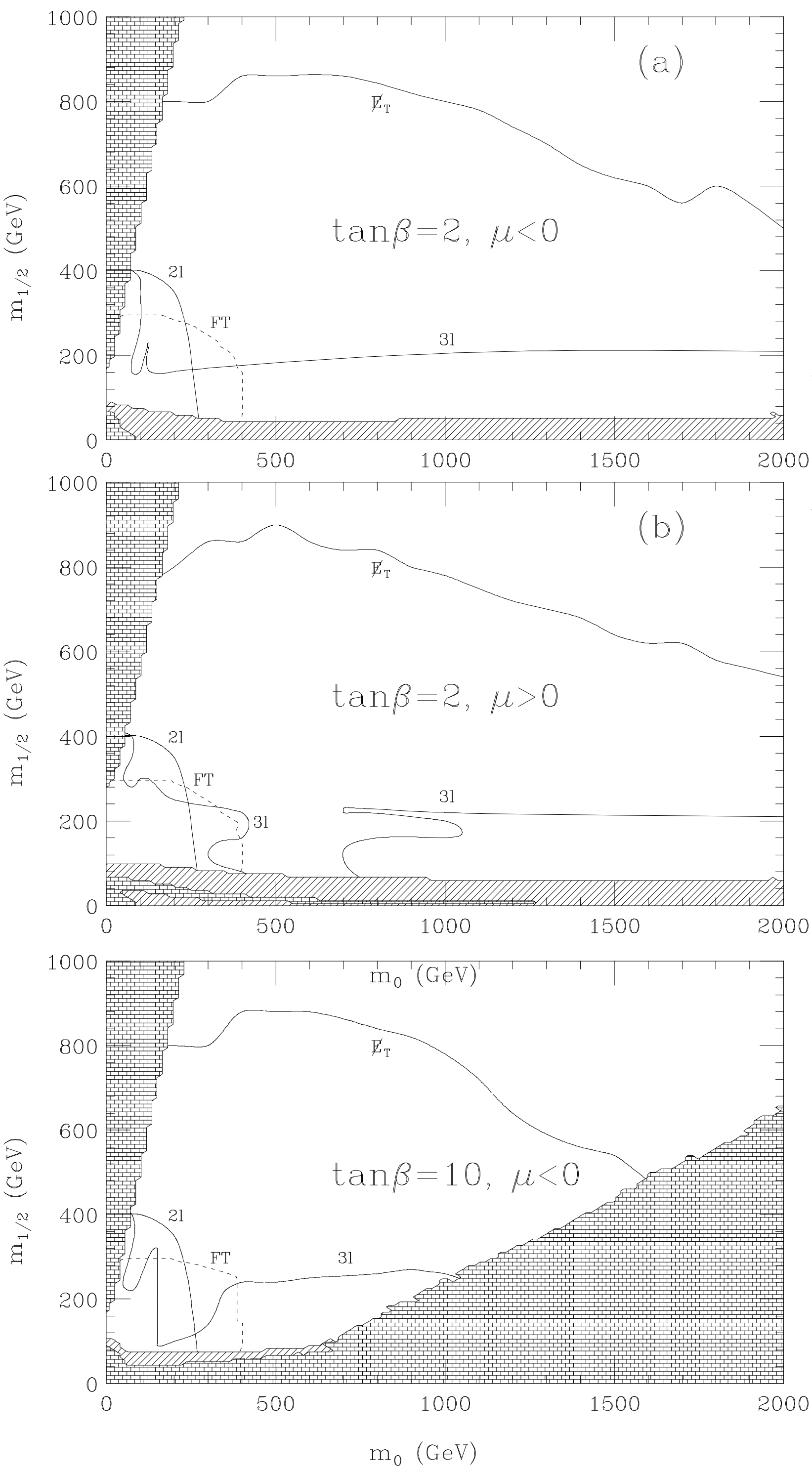
10 fb^{-1}

Squares are observable, x's and triangles are not.

3 isolated leptons
$p_T(l_1,l_2) > 20$ GeV/c
$p_T(l_3) > 10$ GeV/c
no central jets
$\not{E}_T < 100$ GeV

Chen, FSU-HEP-950720

LHC SUGRA Reach



FT - limit of reasonable fine tuning *

$\not{E}_T$ - reach using jets + $\not{E}_T$

$\not{E}_T > 500$ GeV

$E_T^j > 100$ GeV

3l - reach using $\tilde{\chi}_1^{\pm}\tilde{\chi}_2^0$ trileptons

2l - reach using dileptons from sleptons

$p_T(l) > 80$ GeV/c

$\not{E}_T > 100$ GeV

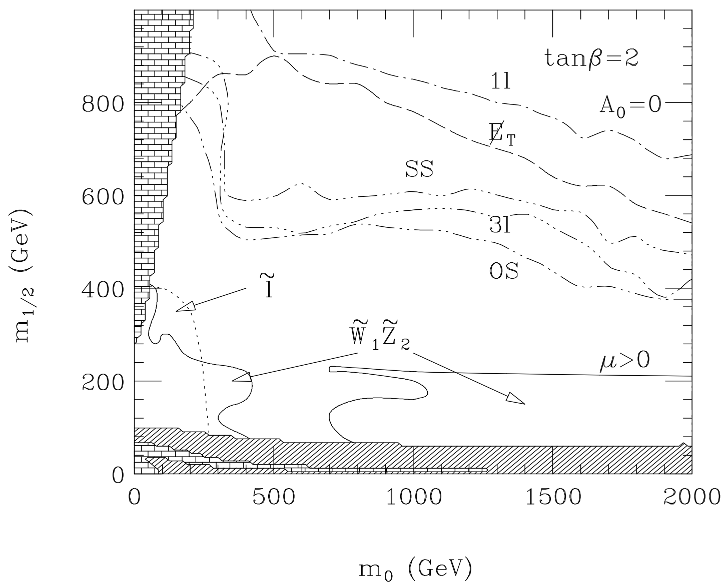
10 fb^{-1}

* Anderson, Castaño Chen, FSU-HEP-950720

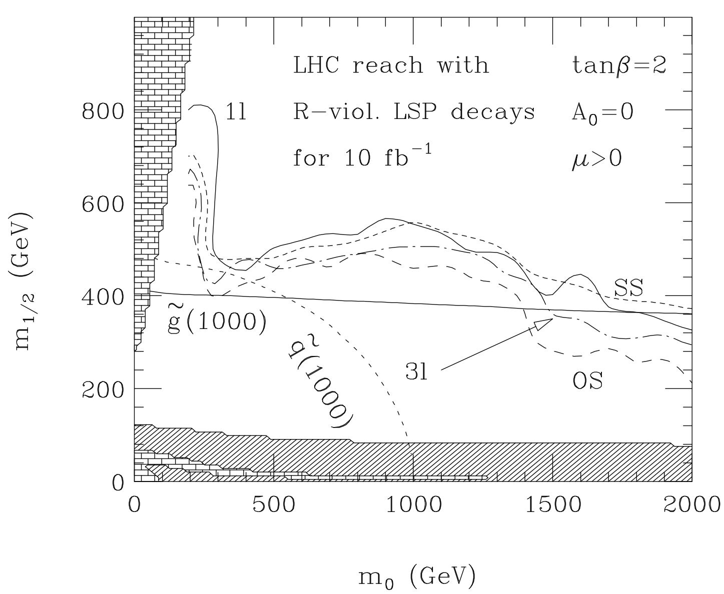
LHC R-Parity Comparison

Non-conservation of R-parity leads to non-conservation of lepton and/or baryon number

LSP will decay to $2l + \nu$, $2j + l + \nu$ or to 3 jets



R-parity conserved



Baryon number non-conservation, but at a small enough level that ordinary gauge and Yukawa interactions dominate production and decay mechanisms

In both plots, $\tan\beta = 2$, $\mu > 0$, $A_0 = 0$

SUSY Measurement

- Tevatron
  - clean trilepton signal from $\tilde{\chi}_1^{\pm}\tilde{\chi}_2^0$ production
    - allow measurement of the mass difference between χ_1^0 and χ_2^0
    - distinguish between models where neutralinos decay to real sleptons and those where three-body decays dominate
  - perhaps measurement of the mass difference between gluinos and $\tilde{b}_1$
- LHC
  - measurement of SUGRA parameters
    - or exclusion of SUGRA model
  - measurement of SUSY masses
    - squark/gluino masses to the 10% level
  - test unification of gaugino masses

SUSY Future Summary

- Luminosity upgrades of the Tevatron will allow experiments to probe most of the parameter space favored by fine-tuning arguments
  - but still possible to have squarks and gluinos with masses below 1 TeV/c^2 and no detectable signal
- If SUSY is not discovered at the Tevatron, the LHC will discover it or rule it out
  - within SUGRA, the reach is well beyond that needed for weak scale SUSY
  - even if R-parity is not conserved, expect discovery

Conclusion

Something should be out there...

We're still looking and the prospects are good!