

LHC SUSY Limits and Implications for the Planning of Future Searches

A discussion on methods and feasibility

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ATLAS and CMS SUSY searches prompt two sets of questions:

- which constraints on SUSY are implied by LHC searches, are there islands not probed within the broad bounds on squark and gluino masses, possibly corresponding to distinct mass or coupling patterns ? (see Tom Rizzo's talk)
- which are the implications of searches for strongly-interacting SUSY particles at the LHC on the allowed spectra of the weakly-interacting SUSY particles, which are the objectives of future lepton colliders ?

These questions have already been addressed within several constrained SUSY models (CMSSM, mSUGRA, NUHM, ...).
How do their answers change when moving to the MSSM?

pMSSM Scan

To check the feasibility of an extended MSSM scan, using Superlso as framework:

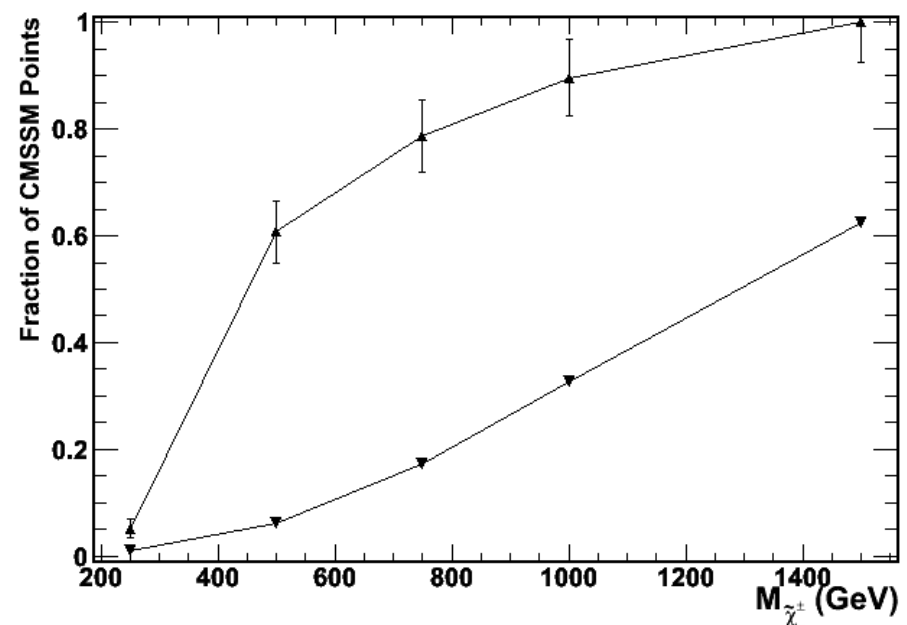
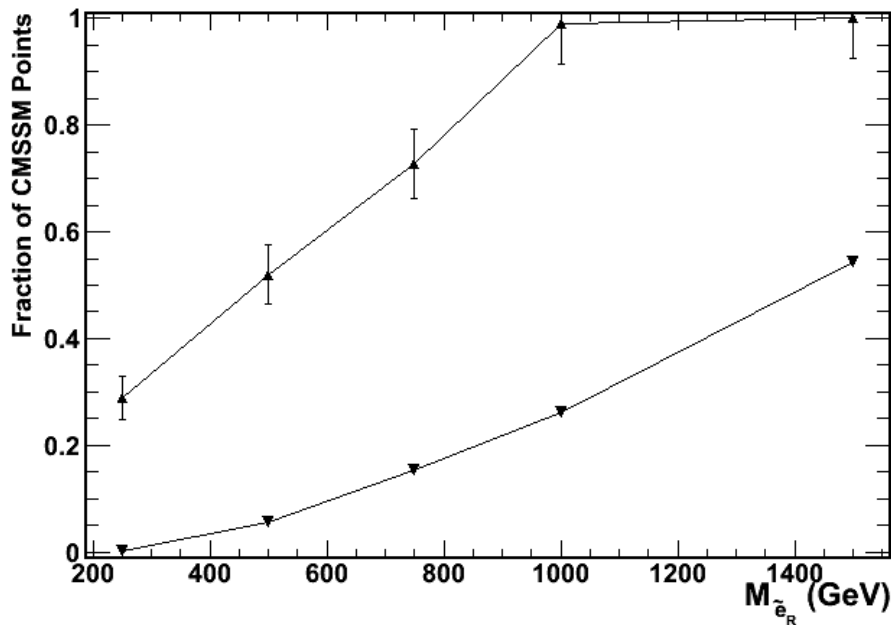
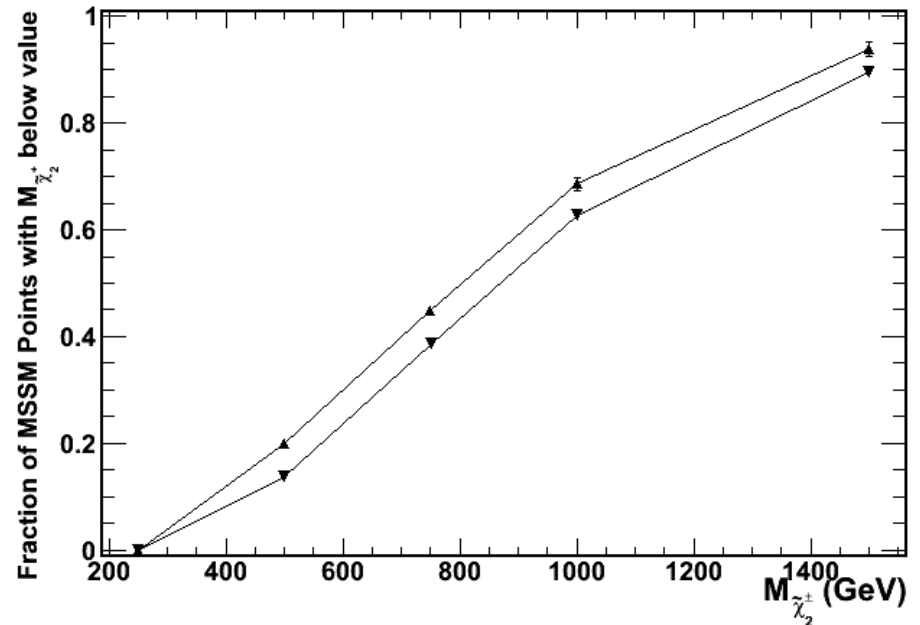
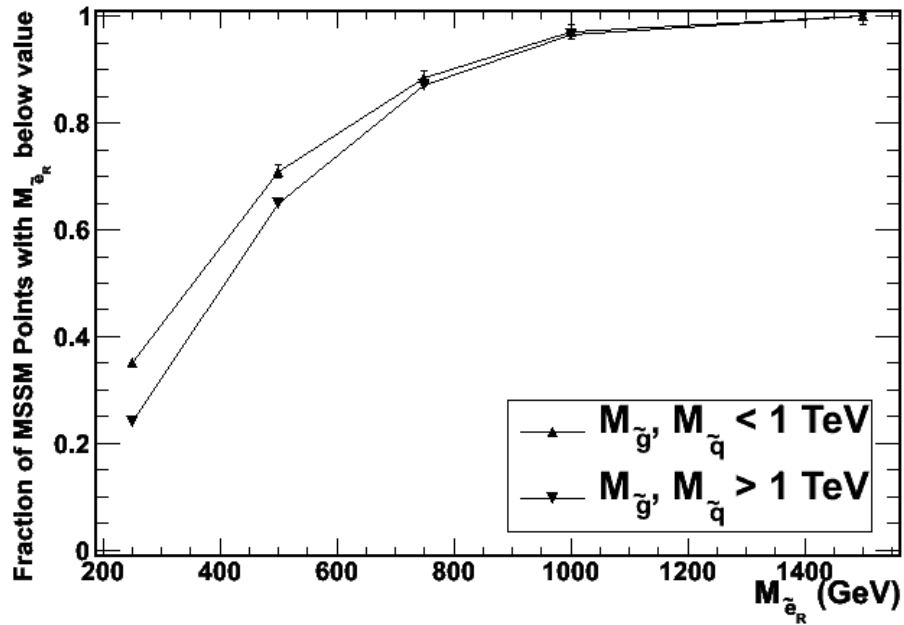
14 parameters scan (assume common M_{SUSY} mass for squarks), using **SoftSUSY** for spectrum calculation (SuSpect also tested), **HDECAY** for H (FeynHiggs also tested), **SDECAY** for Brs, **Superlso (Relic)** for flavour physics, g-2 and Ωh^2 (micrOMEGAS also tested)

	Points	ϵ	Cumulative ϵ
Sampled	$5.40 \cdot 10^6$	1	1
Valid MSSM	$1.66 \cdot 10^6$	0.307	0.307
χ^0_1 LSP + M_h	$1.12 \cdot 10^6$	0.673	0.206
Flavour	$0.95 \cdot 10^6$	0.852	0.176
g-2	$1.16 \cdot 10^5$	0.122	0.022
$\Omega_\chi h^2$ (<WMAP)	$8.47 \cdot 10^4$	0.728	0.016
$\Omega_\chi h^2$ (=WMAP)	$1.41 \cdot 10^3$	0.012	0.00026

Scan CPU
1.91 s/point on
lxbatch

ROOT Tuple
8Mb/25k points \rightarrow
160Gb/500M points

Contrasting pMSSM with CMSSM Scans



Work Plan

A two-phase program:

- 1) perform MSSM scans, study effects of different codes, define and apply constraints, generate database of accepted points, assess effect of lower limits on gluino and squarks for gaugino and slepton spectra;
- 2) interface to experimental analyses, determine observability of selected points, assess effects of experimental signatures on relation between gluino and squark limits and gaugino/slepton spectra (decays into χ^+_1 and χ^0_2 and into sleptons/leptons in final states with leptons)