

Implications of LHC SUSY Searches for the Linear Collider with pMSSM Scans

M Battaglia

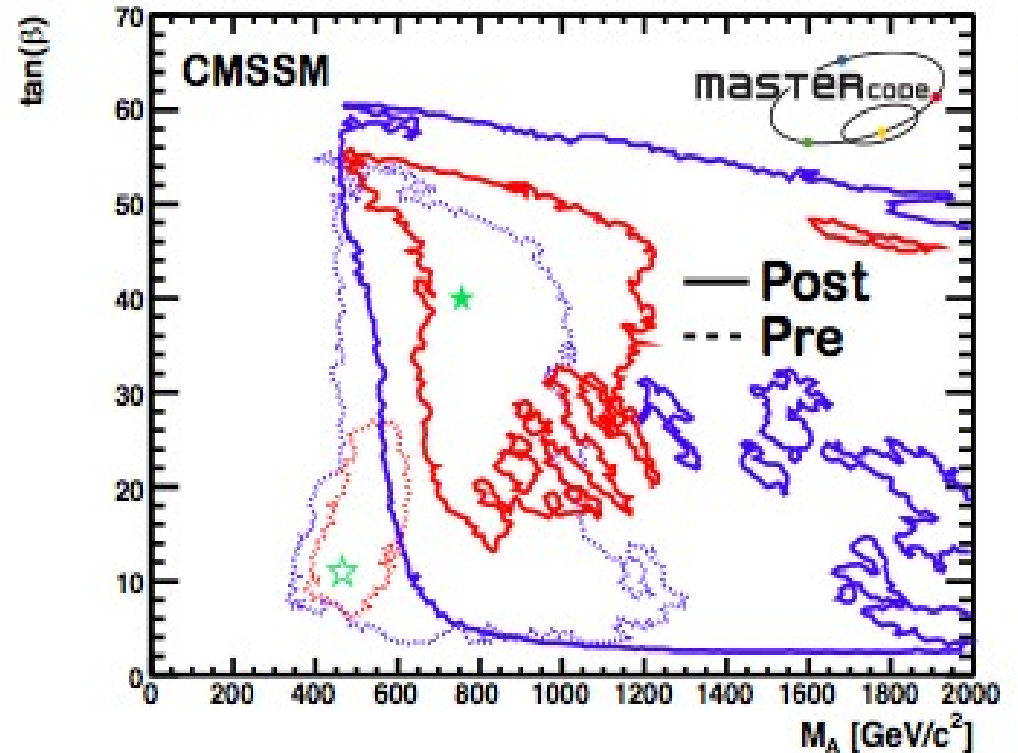
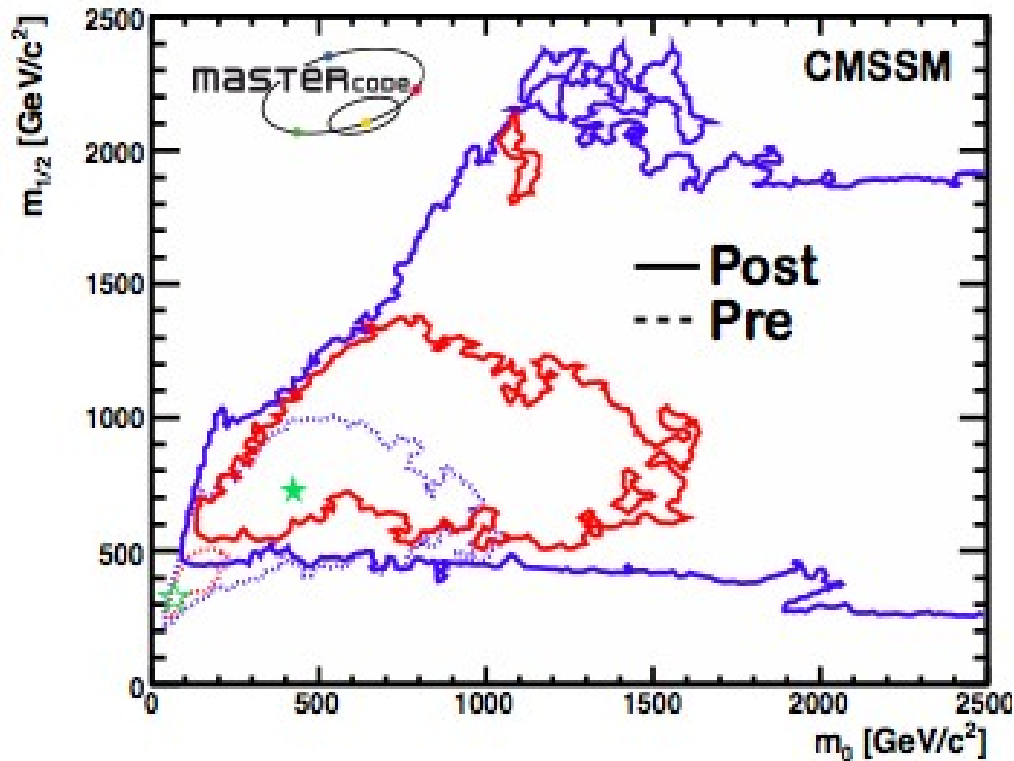
with contributions by A Arbey, J Hewett, N Mahmoudi and T Rizzo



LCWS 2011
Granada, Spain, September 26, 2011

LHC Searches and the CMSSM

ATLAS+CMS (1 fb⁻¹) + Xenon-100 Data



CMSSM

60 million points sampled

Ellis, LPCC 09/2011

Preferred regions in constrained models move to larger masses and open up at the cost of worsening the fit probability.

Most general MSSM models with conservative enough parameter set to be useful for scans:

- CP and R-parity conserving
- Neutralino LSP
- First two sfermion families degenerate

19-parameter pMSSM

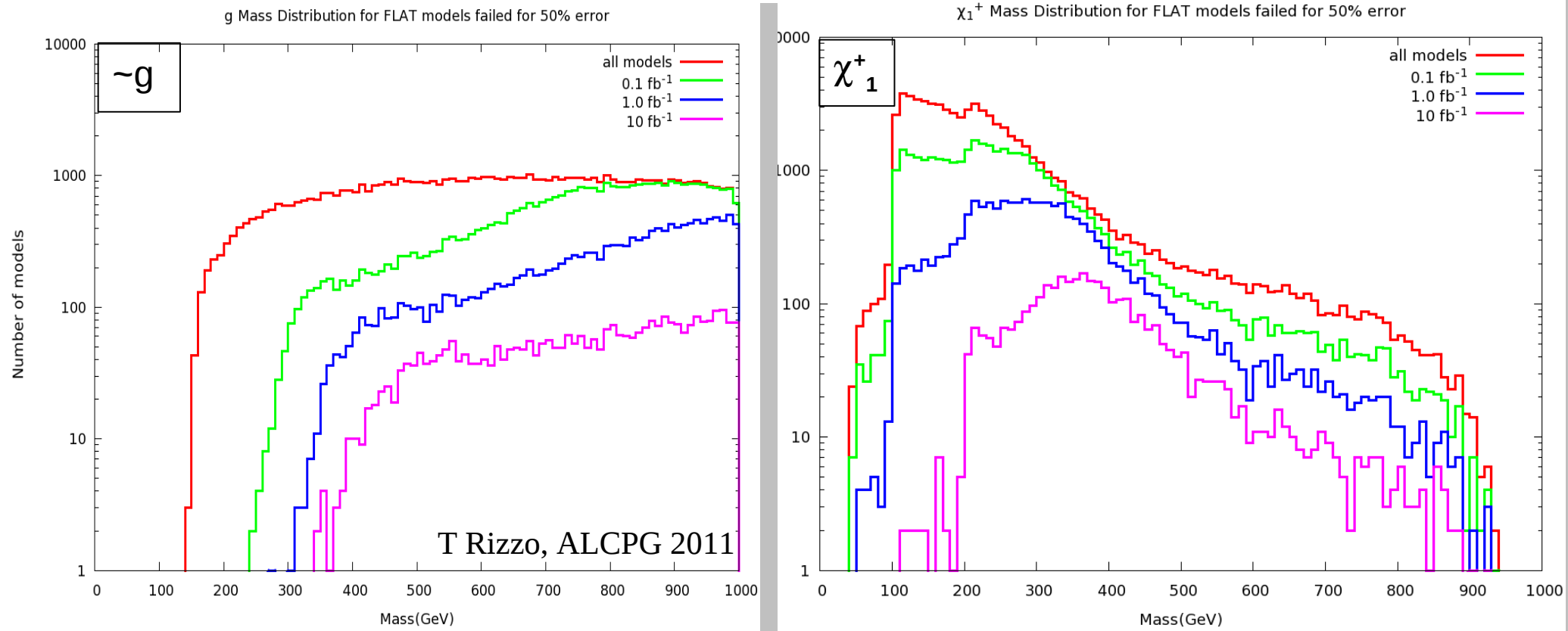
Scans in pMSSM remove mass relations between sparticles typical only of constrained models

Provide understanding of interplay of flavour physics, low energy, relic dark matter, direct DM searches + LHC searches in shaping mass spectra of viable SUSY models.

Parameter	Range
$\tan \beta$	[1, 60]
M_A	[50, 2000]
M_1	[-2500, 2500]
M_2	[-2500, 2500]
M_3	[50, 2500]
$A_d = A_s = A_b$	[-2000, 2000]
$A_u = A_c = A_t$	[-2000, 2000]
$A_e = A_\mu = A_\tau$	[-2000, 2000]
μ	[-1000, 2000]
$M_{\tilde{e}_L} = M_{\tilde{\mu}_L}$	[50, 2500]
$M_{\tilde{e}_R} = M_{\tilde{\mu}_R}$	[50, 2500]
$M_{\tilde{\tau}_L}$	[50, 2500]
$M_{\tilde{\tau}_R}$	[50, 2500]
$M_{\tilde{q}_{1L}} = M_{\tilde{q}_{2L}}$	[50, 2500]
$M_{\tilde{q}_{3L}}$	[50, 2500]
$M_{\tilde{u}_R} = M_{\tilde{c}_R}$	[50, 2500]
$M_{\tilde{t}_R}$	[50, 2500]
$M_{\tilde{d}_R} = M_{\tilde{s}_R}$	[50, 2500]
$M_{\tilde{b}_R}$	[50, 2500]

PMSSM scans pioneered by B Allanach (PRD81 (2010) 095012) and J.Hewett, T Rizzo et al. (JHEP 0902 (2009) 023, EPJC 71 (2011) 1697 and arXiV:1103.1697[hep-ph])

SUSY Spectra of pMSSM points surviving LHC search at 7 TeV at various lum. (scan mass parameters limited to 1 TeV)



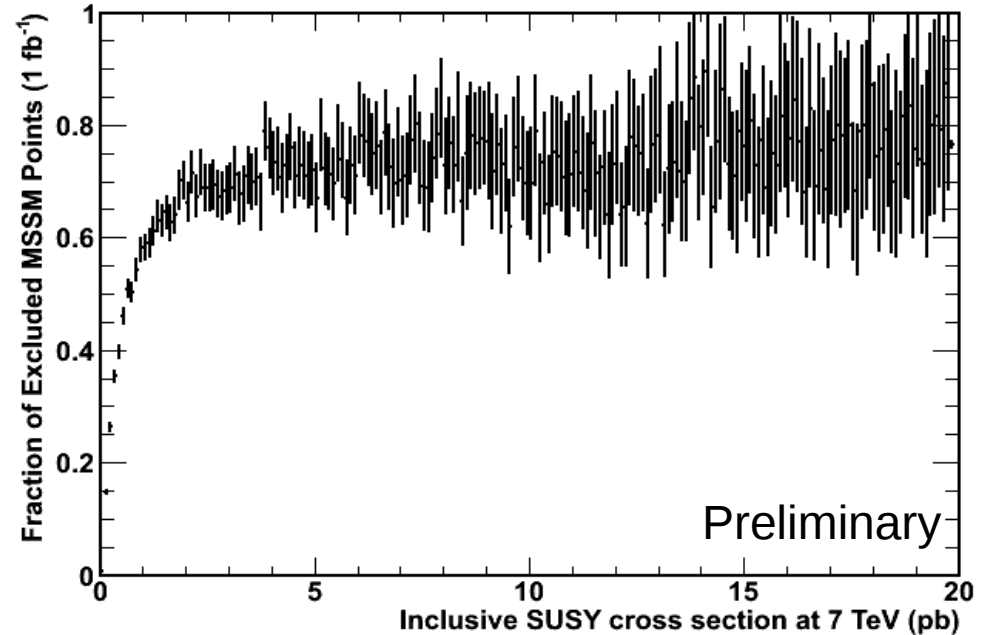
Recently increased attention to pMSSM in the context of the interpretation of LHC searches (see LPCC workshop “Implications of LHC results for TeV-scale Physics”, CERN, 29 Aug – 2 Sept 2011) (see arXiV:1109.5119[hep-ph]);

Preliminary results of pMSSM flat scan including heavy flavour, g-2 and relic DM constraint + CMS searches (had α_T , 2l OS, 2l SS)

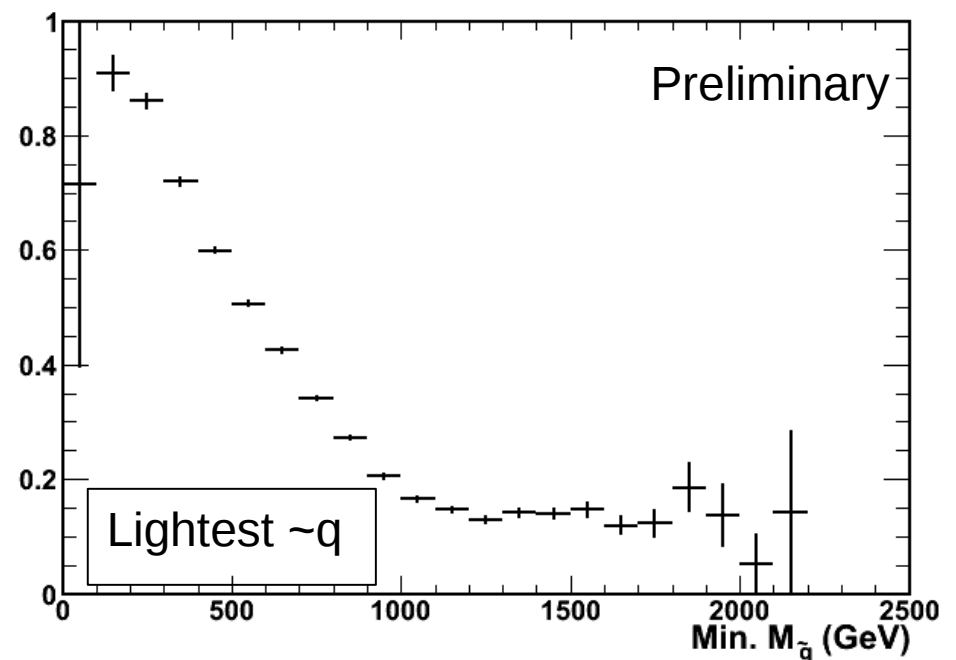
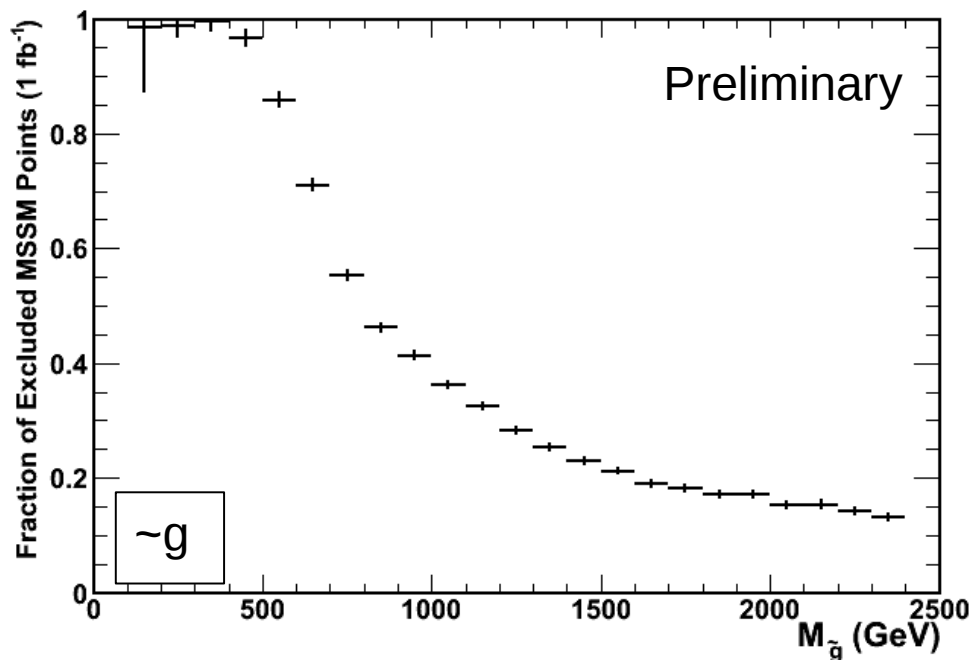
presented in terms fraction of points compatible with non-LHC constraints excluded by CMS searches (as of EPS2011 1 fb⁻¹):

(A Arbey, MB, N Mahmoudi)

LHC Limits and inclusive NLO SUSY Cross Section



LHC Limits and the Spectra of Strongly-interacting SUSY Particles



LHC Limits and the Spectra of Weakly-interacting SUSY Particles

