Fe5preting CMS data in the phenomenological MSSM

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Abstract

We in15rpret the data taken with the CMS detector during the 7 TeV LHC run within the phenomenological MSSM (pMSSM). The pMSSM is a 19-dimensional parametrization of the general MSSM, that captures most of the phenomenological features of the MSSM. It encompasses, and goes beyond, a broad range of more constrained SUSY models (such as the CMSSM). Using profile likelihoods, we

1 Introduction

After the successful operation of the Large Hadron Collider (LHC) and the CMS detector in 2010, and with good prospects for the future, the LHC is now ready to shed light on a number of open questions in Particle Physics, such as the mechanism of electroweak (EW) symmetry breaking, or the nature of the new physics Beyond the Standard Model (BSM) that stabilizes the EW scale.

A wealth of theories that extend the Standard Model have been put forth during the past decades. Supersymmetry (SUSY) is arguably the best motivated BSM theory — and certainly the most thoroughly studied. Indeed, searches

group equations to derive model-specific testable predictions. It is expected that once SUSY particles are discov-

For each of the 6K pMSSM points we generate 10K events.

We perform three blessed CMS analyses, namely the “di-jet $_T$

by weighting the ith pMSSM point by the likelihood value $L(\ _i)$ for that point. Since the sampling of points is uniform, the swarm of weighted points constitute a non-parametric representation of $L(\ )$.

For any likelihood function, exact confidence regions [29] can *always* be created in the unrestricted parameter space. However, such confidence regions are seldom useful when the dimensionality of the parameter space is large. It is more useful to examine parameters one or two at a time. In the current study, we examine each parameter separately using the profile likelihood, a broadly applicable frequentist construct.

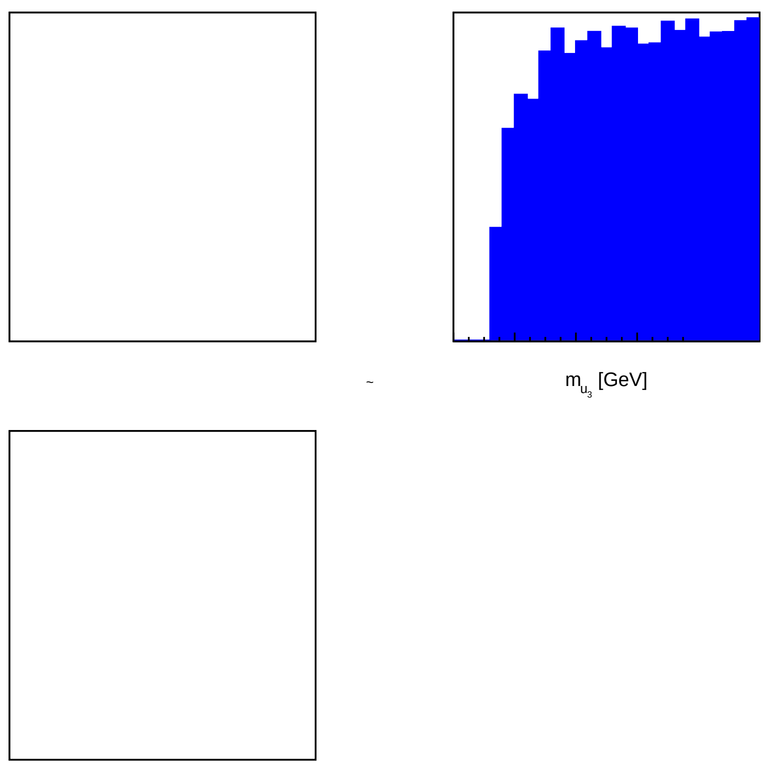

Figure 1: Ratios of profile likelihood L_p to maximum likelihood L_{max} shown for the squark mass parameters at SUSY scale. The colored and shaded histograms show the utions before and after the inclusion of the CMS results.

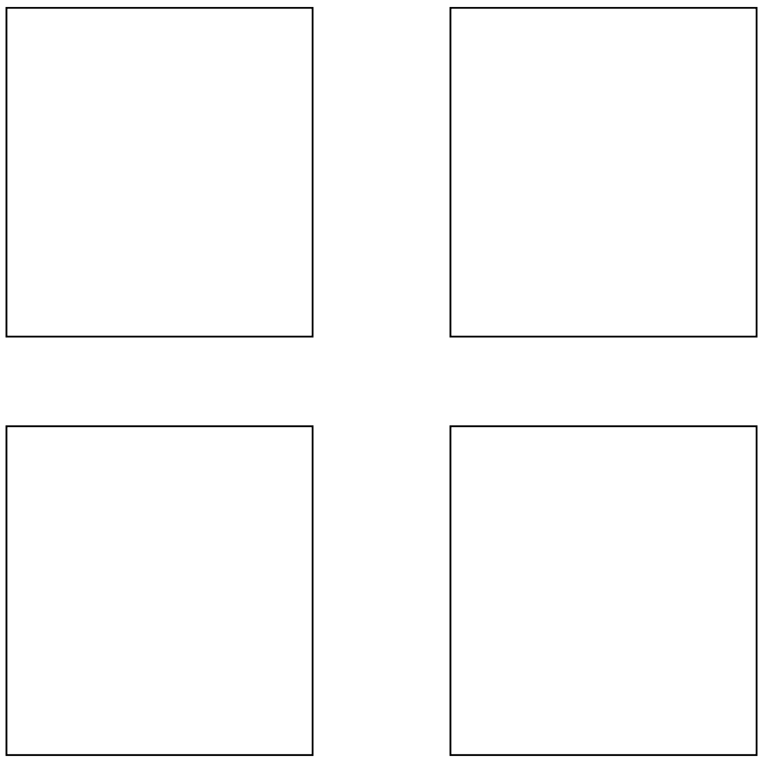

Figure 2: Ratios of profile likelihood L_p

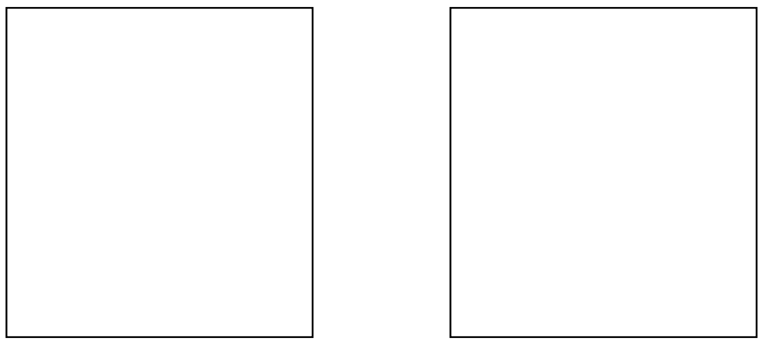

Figure 3: Ratios of profile likelihood L_p

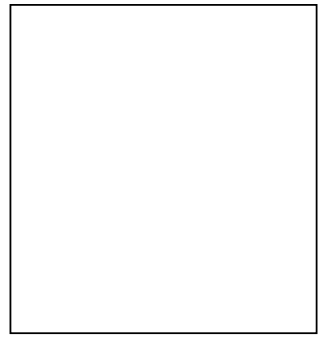

Figure 4: Ratios of profile likelihood L_p to maximum likelihood L_{max} shown for trilinear couplings at SUSY scale. The colored and shaded histograms show the distributions before and after the inclusion of the CMS results.

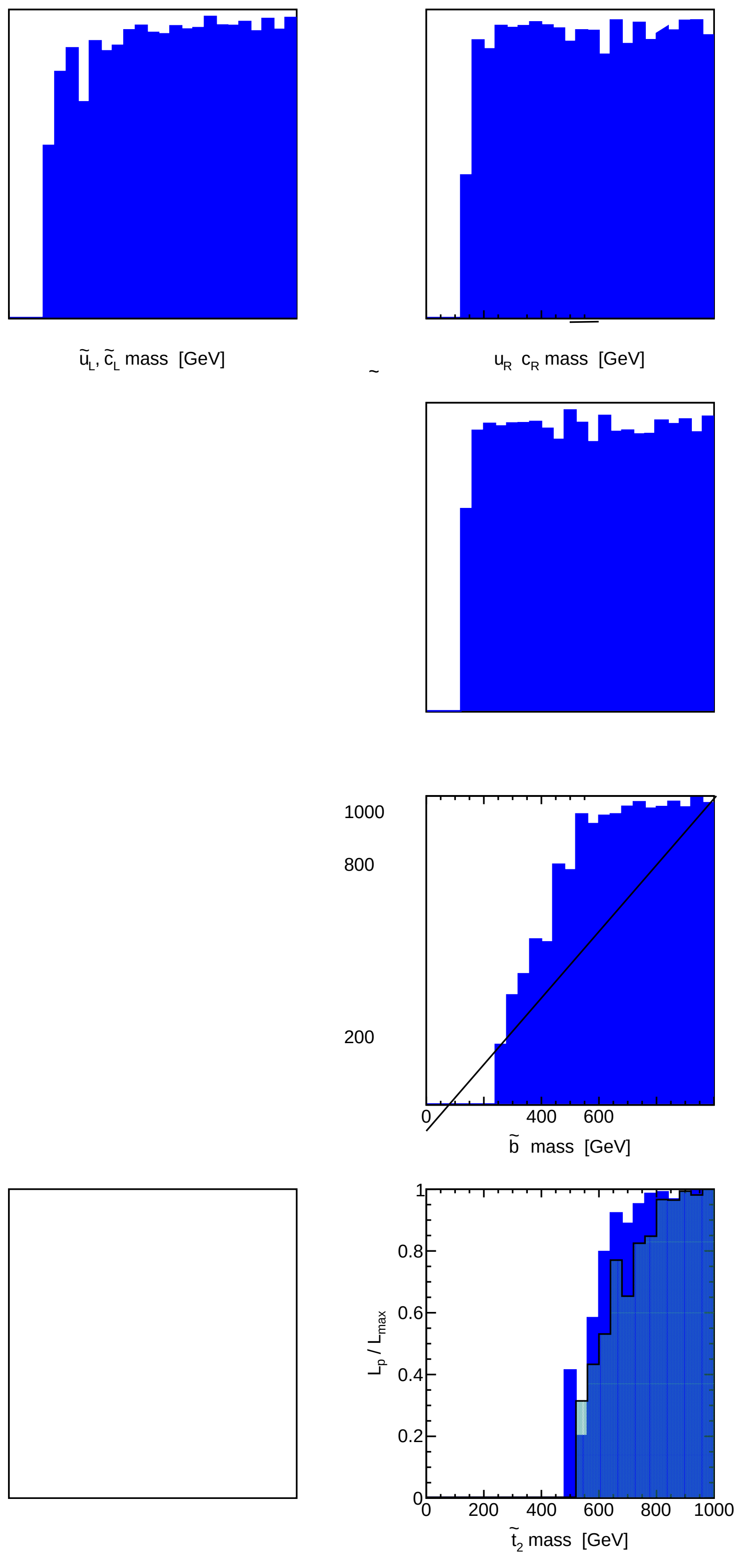

Figure 6: Ratios of profile likelihood L_p to maximum likelihood L

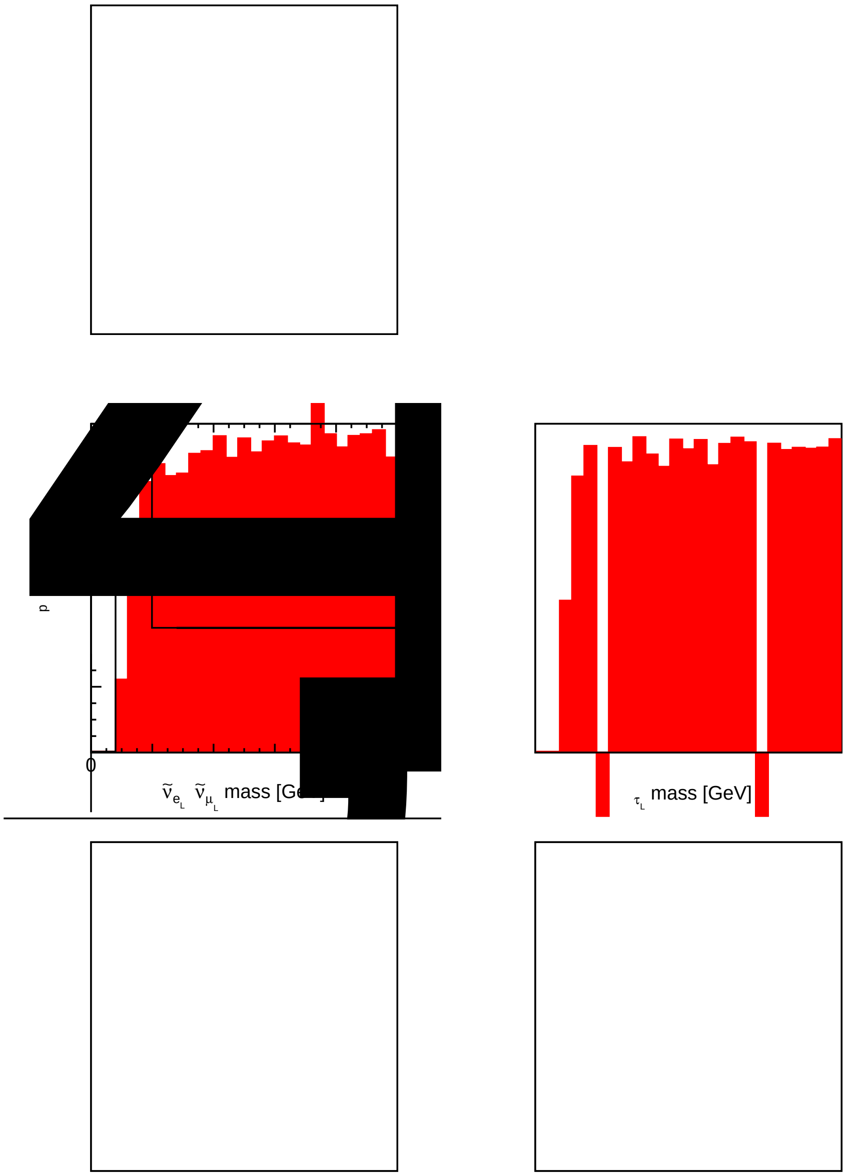

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Figure 10: Ratios of profile likelihood L_p to maximum likelihood L_{max} shown for chargino masses. The colored and shaded histograms show the distributions before and after the inclusion of the CMS results.

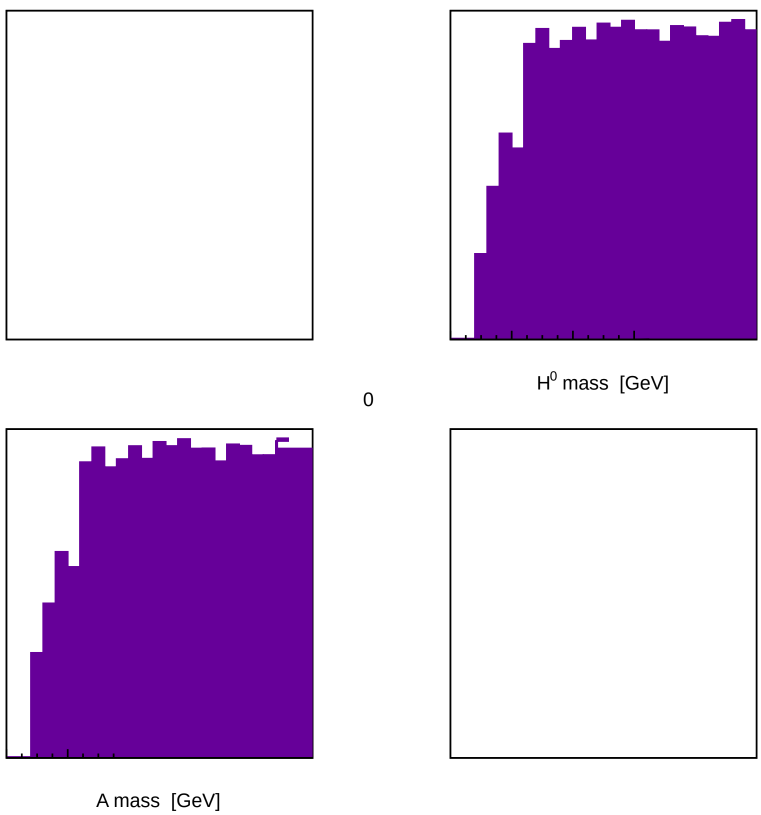

Figure 11: Ratios of profile likelihood L_p to maximum likelihood L_{max} shown for the Higgs masses. The colored and shaded histograms show the distributions before and after the inclusion of the CMS results.

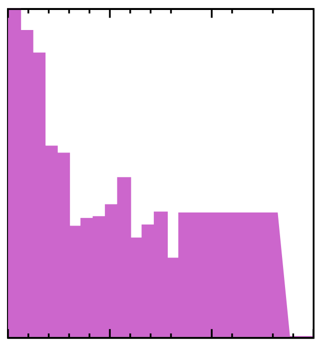

Figure 12: Ratio of profile likelihood L_p to maximum likelihood L_{max} shown for lightest neutralino dark matter relic density. The colored and shaded histograms show theutions before after the inclusion of the CMS results.

10,11 Find largest density $DMAX$

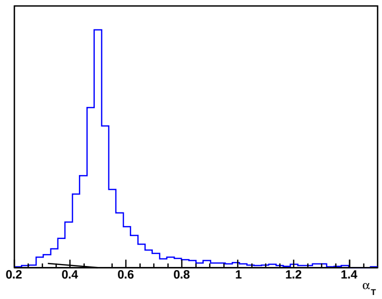

Figure 17: Event distribution using CMSSW Full simulation along with Delphes for LM1 benchmark points, as a function of $_T$ (top left),

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