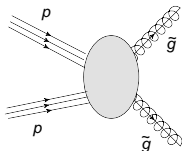


Simplified Models and the Interpretation of Supersymmetry Searches

Michael Krämer | Lennart Oymanns | Jory Sonneveld | Wolfgang
Waltenberger

RWTH Aachen / HEPHY Wien

March 4, 2013



A Simplified Model

Definition

$$\text{Simplified Models} = \text{SMS} = \text{SM} + \text{X}$$



Direct approach

data \rightarrow SUSY limits

?

Indirect SMS approach

data \rightarrow SMS \rightarrow SUSY limits

SUSY parameter space

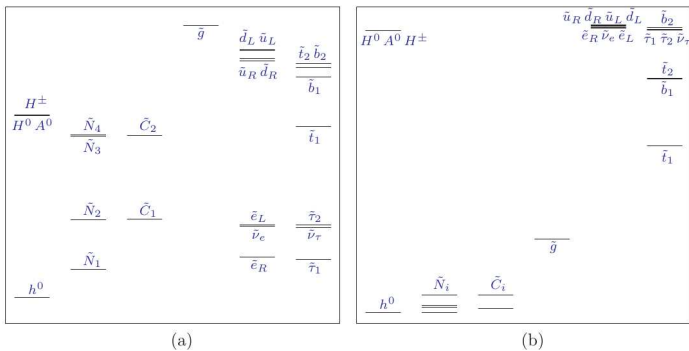
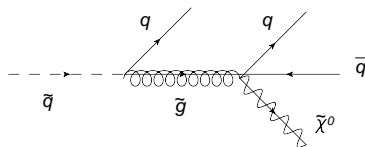
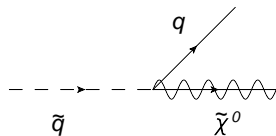
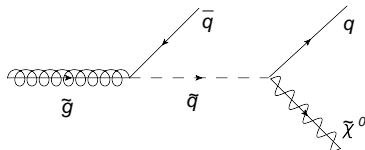
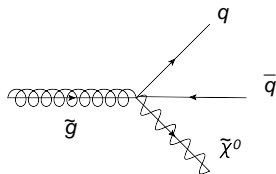


Figure from arXiv:hep-ph/9709356v6

Production

$$pp \rightarrow \tilde{g}\tilde{g}, \tilde{g}\tilde{q}, \tilde{q}\tilde{q}^*, \tilde{q}\tilde{q}$$

Decays:



Method

Search

jets + \cancel{E}_T



+

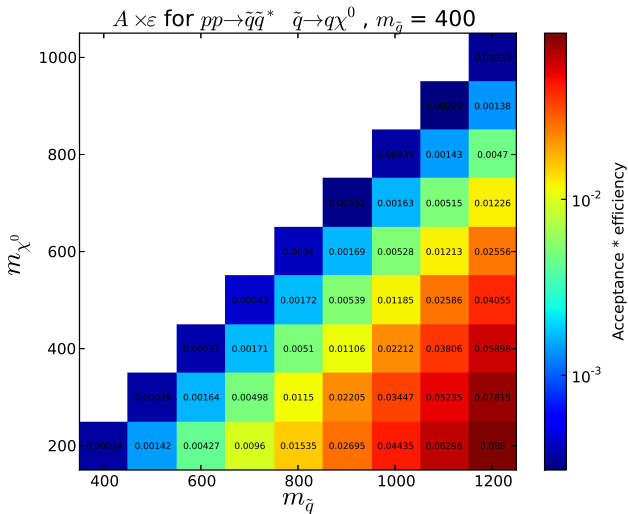


Goal

event selection $\rightarrow \mathcal{A} \times \varepsilon \rightarrow \sigma^{\text{UL}}$

See also CMS search [arXiv:1207.1898v2](https://arxiv.org/abs/1207.1898v2) and [arXiv:1301.2175v1](https://arxiv.org/abs/1301.2175v1)

Example $A \times \varepsilon$



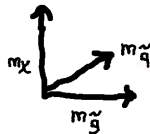
$A \times \varepsilon$: % of events that passed search criteria

Beyond CMS

CMS SMS

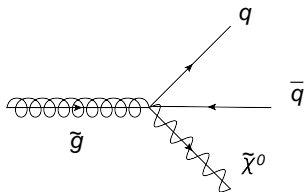


Our SMS



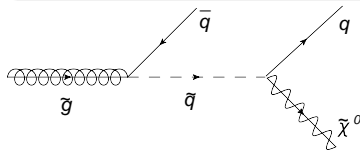
CMS Production Processes

$$pp \rightarrow \begin{array}{l} \tilde{g}\tilde{g} \\ \tilde{q}\tilde{q}^* \end{array}$$



Additional Processes

$$pp \rightarrow \begin{array}{l} \tilde{g}\tilde{q} \\ \tilde{q}\tilde{q} \end{array}$$



Weighted Channels

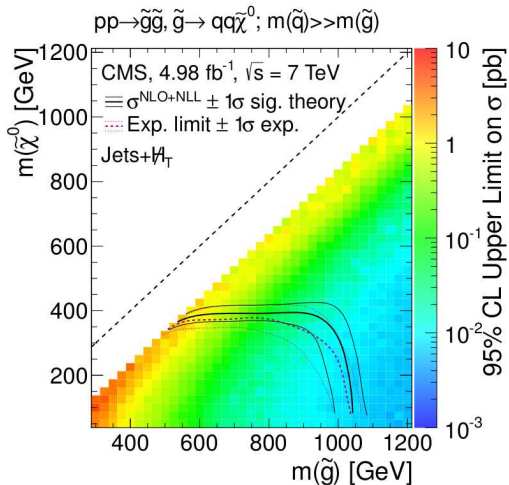
$$(A \times \varepsilon)^{\text{combined}} = \frac{\sum_{\text{prod+decay}} w_{\text{prod+decay}}^{\text{model}} A_{\text{prod+decay}}^{\text{SMS}}}{\sum_{\text{prod+decay}} w_{\text{prod+decay}}^{\text{model}}}$$
$$w_{\text{prod}}^{\text{model}} = \sigma_{\text{prod}}^{\text{model}} \text{Br}_{\text{decay}}^{\text{model}}$$

Limit Setting

- CLs using ROOT
- Rough estimate:

$$\sigma^{\text{UL}} \sim \frac{2\Delta B}{A \times \varepsilon \times \mathcal{L}}$$

Example σ^{UL}



See also

<https://twiki.cern.ch/twiki/bin/view/CMSPublic/PhysicsResultsSUS12011> .

Summary

data \rightarrow SUSY limits $\stackrel{?}{=}$ data \rightarrow SMS \rightarrow SUSY limits



Next

- 2 vs. 4 vs. 8 squarks
- Limit setting procedure
- data \rightarrow SMS \rightarrow UED limits