Kinematic Fits in the Leptonic Channel

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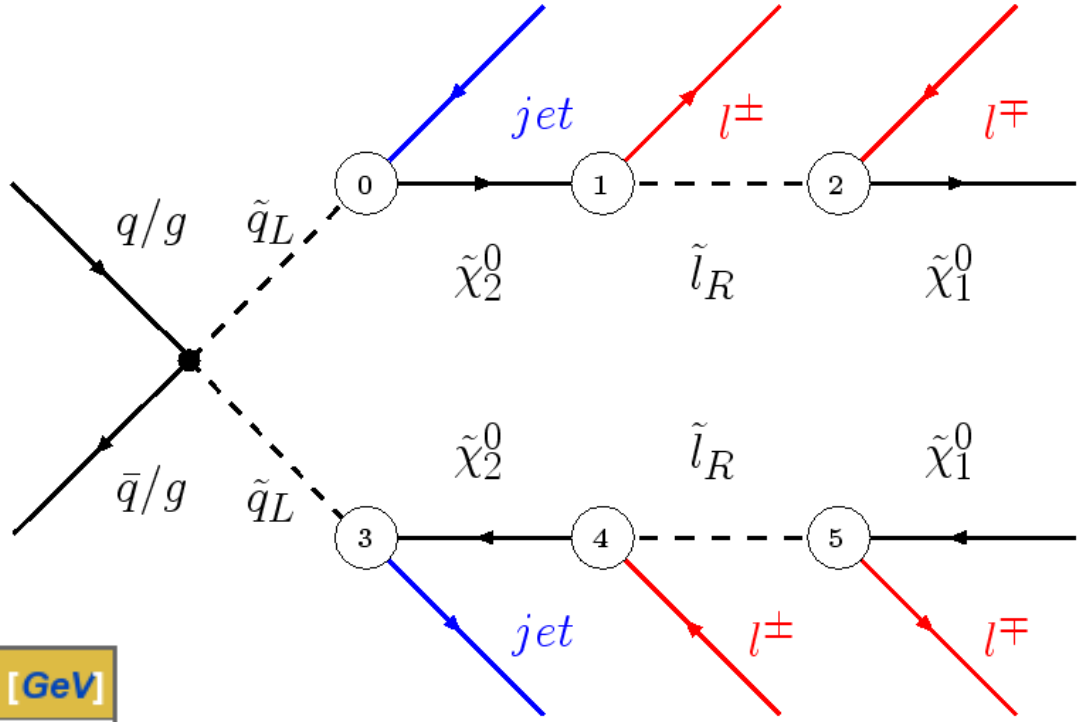
Benchmarkpoint & Cascade

mSUGRA Parameters

	SPS1a
m_0	100 *GeV*
$m_{1/2}$	250 *GeV*
A_0	-100 *GeV*
$\tan(\beta)$	10
μ	>0

Particle	Mass [*GeV*]	ΔM to next [*GeV*]
$\tilde{g}$	606	39 / 44
$\tilde{q}_L$	567 (ud) / 562 (cs)	387 / 382
$\tilde{\chi}_2^0$	180	37
$\tilde{l}_R^{\pm}$	143	46
$\tilde{\chi}_1^0$	97	

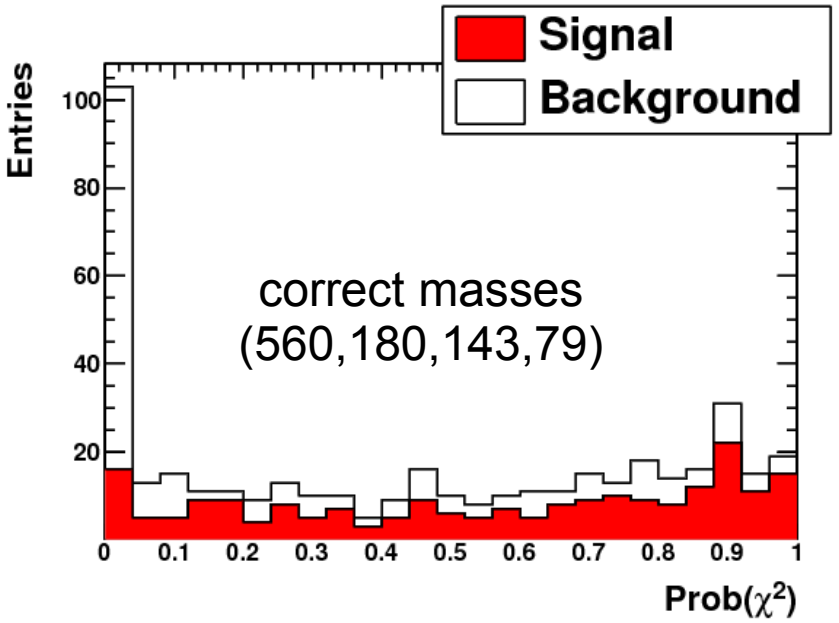
X-section: ~36 pb @ 14 TeV

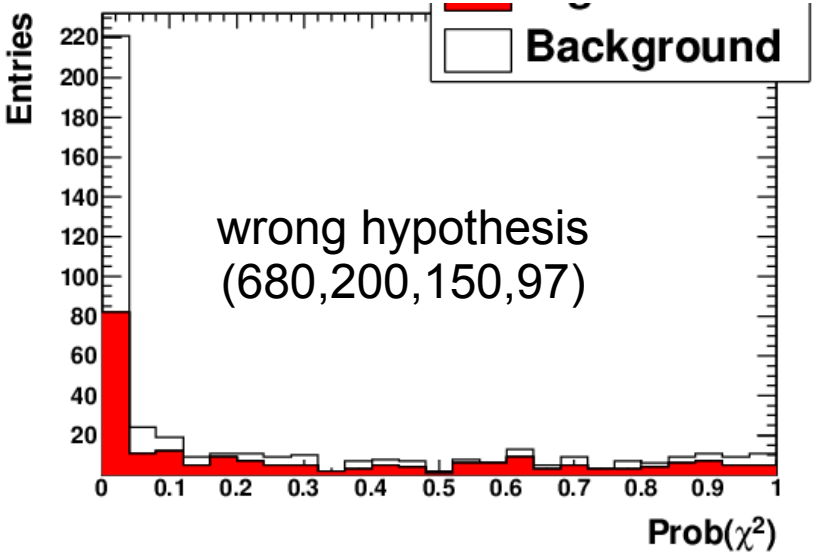


Leptonic Cascade

- 2 jets + 2x2 OSSF leptons
- 16/32 possible combinations
- BR = $1.7*10^{-3}$

Likelihood Definition





- Hypotheses close to true masses fit on average better
- Use events' combined fit probability to quantify how good the assumed masses fit.

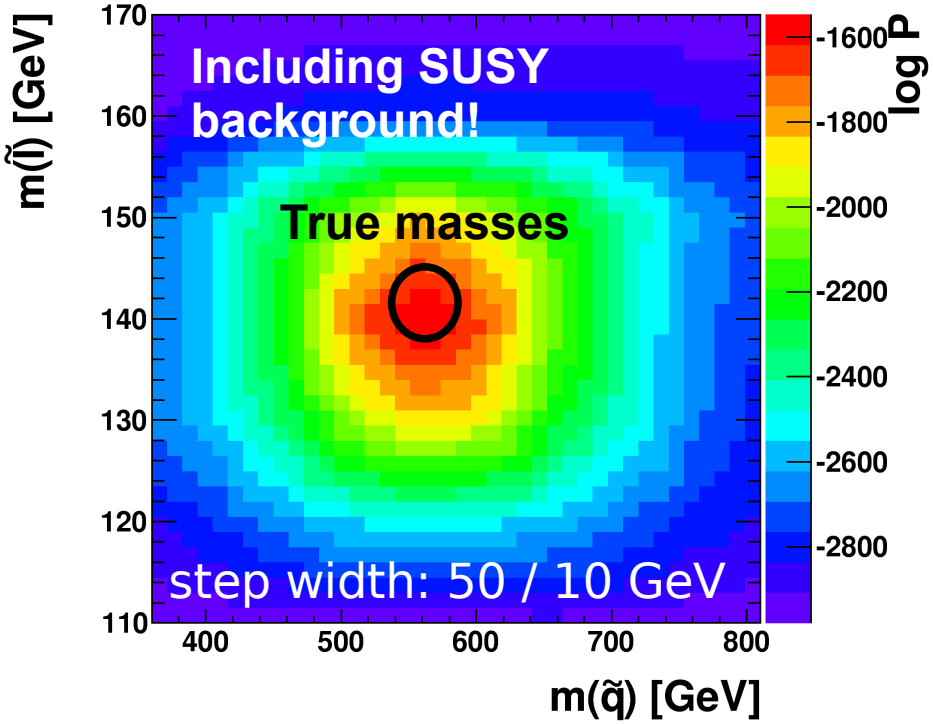
$$\log \mathcal{P} = \sum_{i}^{N} \log P(\chi_i^2)$$

$$P_i = P_{\mathrm{cut}} \ \mathrm{for} P_i < P_{\mathrm{cut}}$$

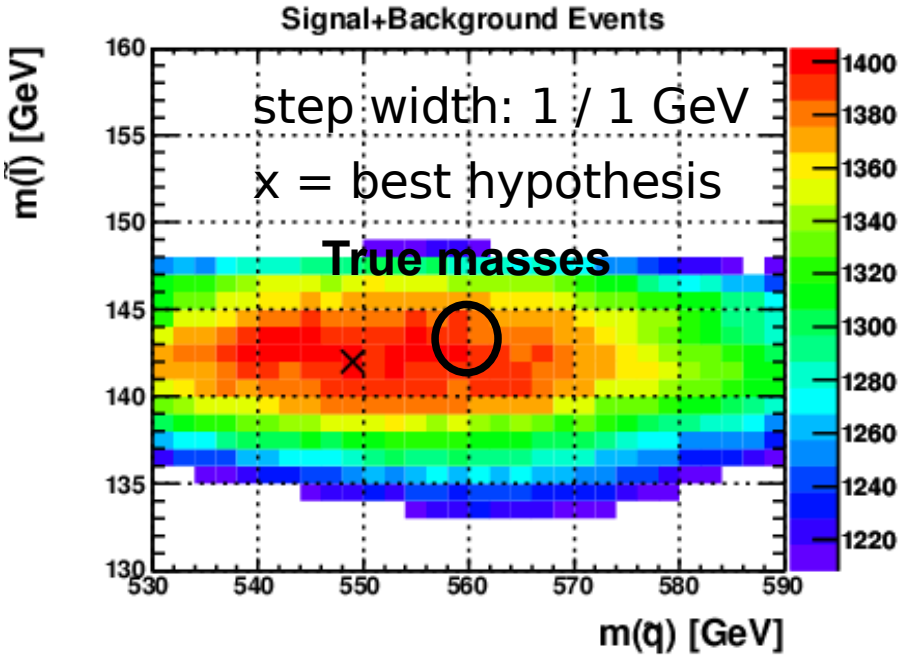
  - Cut-off to avoid numerical fluctutations
  - P_{cut}=0.001

Mass Scan

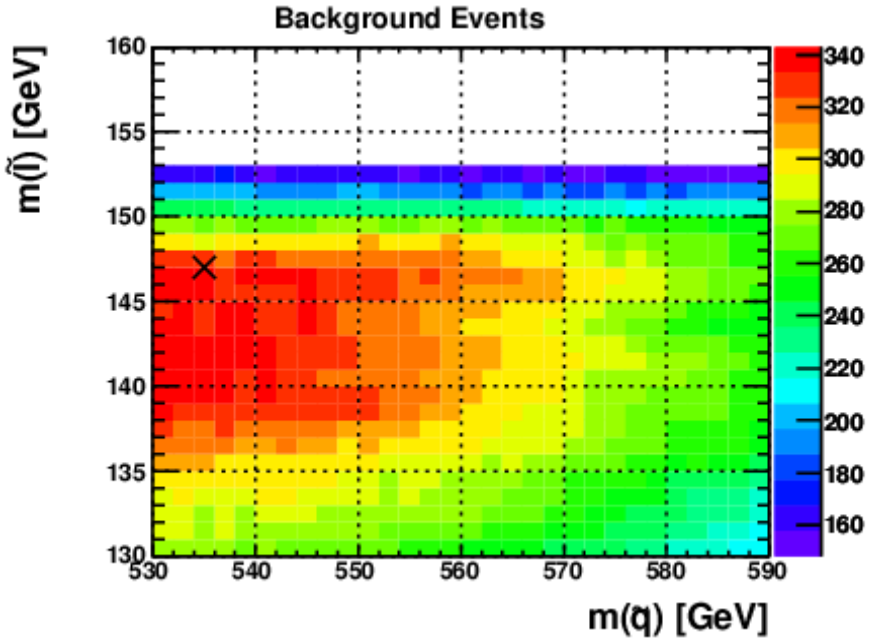
- Scan over possible mass values
  - Test each mass hypothesis with the fit on each event
  - Find best fitting hypothesis

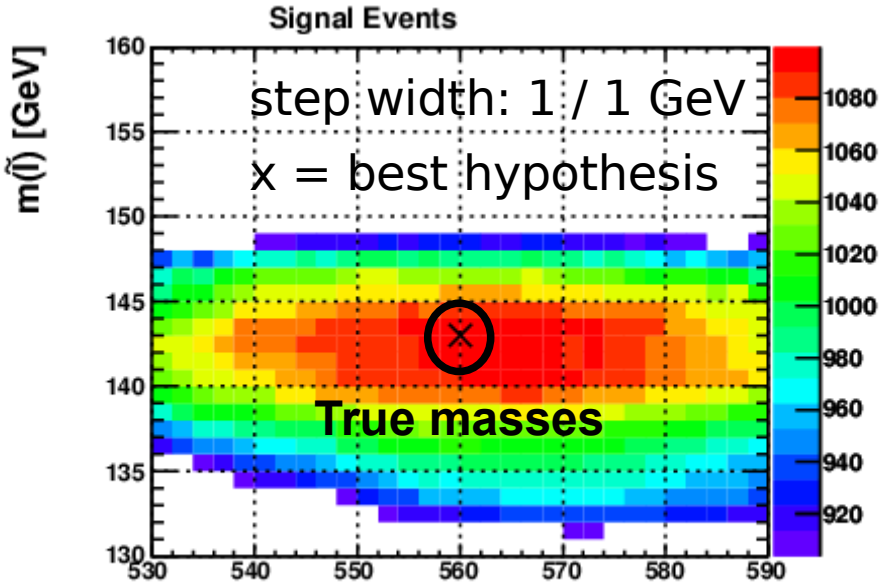


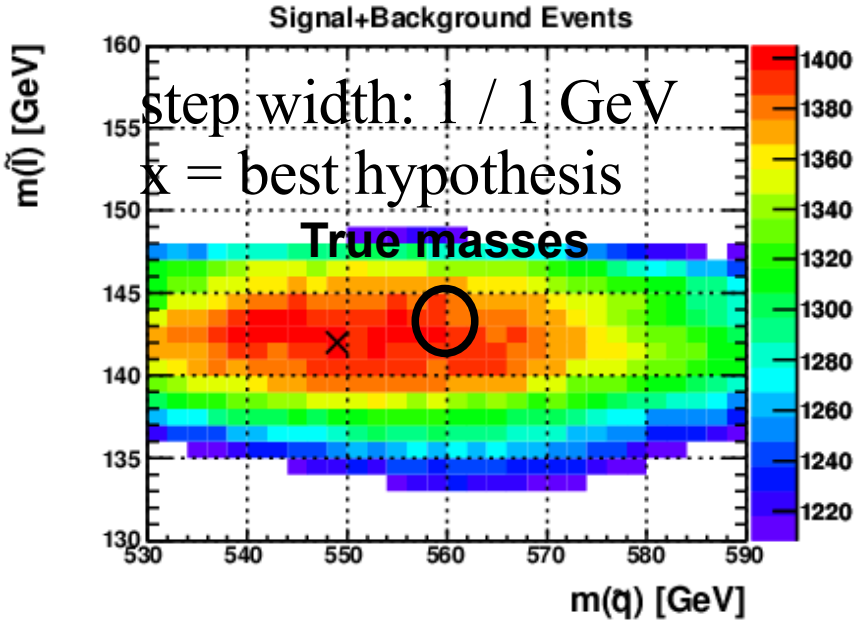
- Visualization in 2D mass plane:
  - Fix neutralino and LSP masses to true values
  - Vary squark & slepton masses
- Shift of maximum w.r.t true masses



Effect of Background







- Background shifts maximum away from true values
- Effect becomes smaller when increasing P_{cut}

Confidence Intervals?!

- Closer look at the maximum
  - Boundaries are given by $\Delta L=3$
  - Should correspond to 1σ if everything correct
- How to interpret this?
- Need finer scan