Simplified $pp \to \tilde{q}\tilde{q}^* \to q\tilde{\chi}_1^0 \bar{q}\tilde{\chi}_1^0$ at $\sqrt{s} = 100$ TeV

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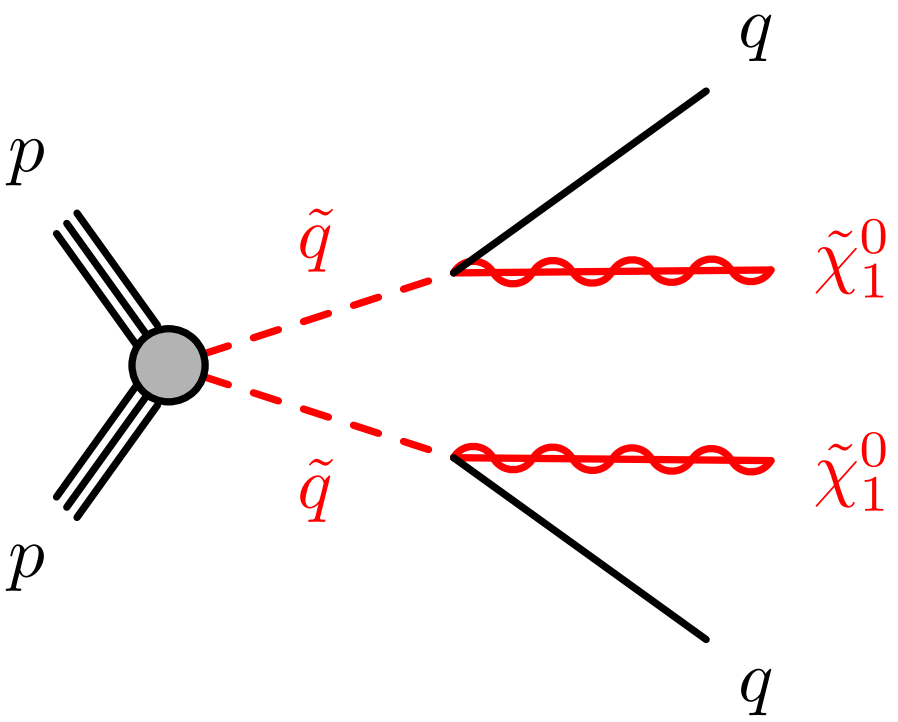

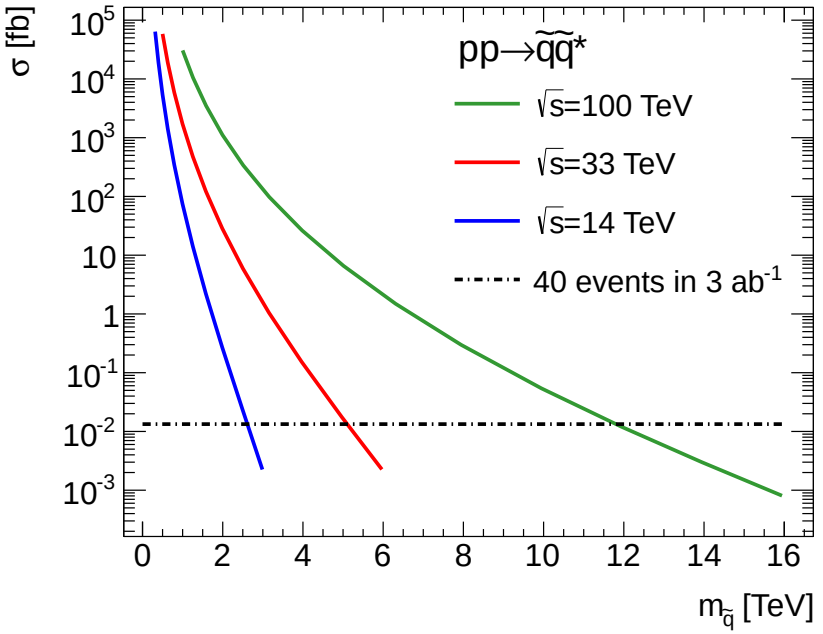

- Originally probed in 1311.6480 using simple jets+$E_{\mathrm{T}}^{\mathrm{miss}}$ analysis
- Poor discovery reach for this simplified model motivated a second look
- Took inspiration from CMS: 1502.04358
  - They bin events in number of jets, number of b-jets
  - Also bin in $H_{\mathrm{T}}^{\mathrm{jets}}$ and m_{T2}
  - Combine multiple SRs in global fit
- Plan: revisit optimization with Snowmass samples

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New approach

- Start from a zero-lepton, jets+$E_{\mathrm{T}}^{\mathrm{miss}}$ sample:
  - Electron, muon, tau veto
  - ≥ 2 jets with $p_{\mathrm{T}} > 100$ GeV
  - min$\Delta\phi(E_{\mathrm{T}}^{\mathrm{miss}}$,4 leading jets$) < 0.3$
  - $E_{\mathrm{T}}^{\mathrm{miss}}/\sqrt{H_{\mathrm{T}}^{\mathrm{jets}}} \geq 15$ GeV$^{1/2}$
  - No b-tagging requirement/veto, no binning in n-jets
- Require $E_{\mathrm{T}}^{\mathrm{miss}} > (0.5 \times H_{\mathrm{T}}^{\mathrm{jets}})$ (optimized scale from 0.2 to 0.6)
- Bin events by $H_{\mathrm{T}}^{\mathrm{jets}}$: 2, 3, 4, 5, 6, 8, 10, 15 TeV
- Optimize a cut on m_{T2} for each signal point, for each bin
  - m_{T2} defined with leading two jets and $p_{\mathrm{T}}^{\mathrm{miss}}$
  - Optimization using Z_n with a total background uncertainty of 20%
  - Typical m_{T2} cut: $0.7 \times m(\widetilde{q})$ for $m(\widetilde{\chi}_0^1) = 0$
- Throw all optimized SRs into RooStats to get a combined limit
  - Assume 20% uncertainties on each background component (V+jets, $t\bar{t}$, QCD, $t+V$, $t\bar{t}+V$)

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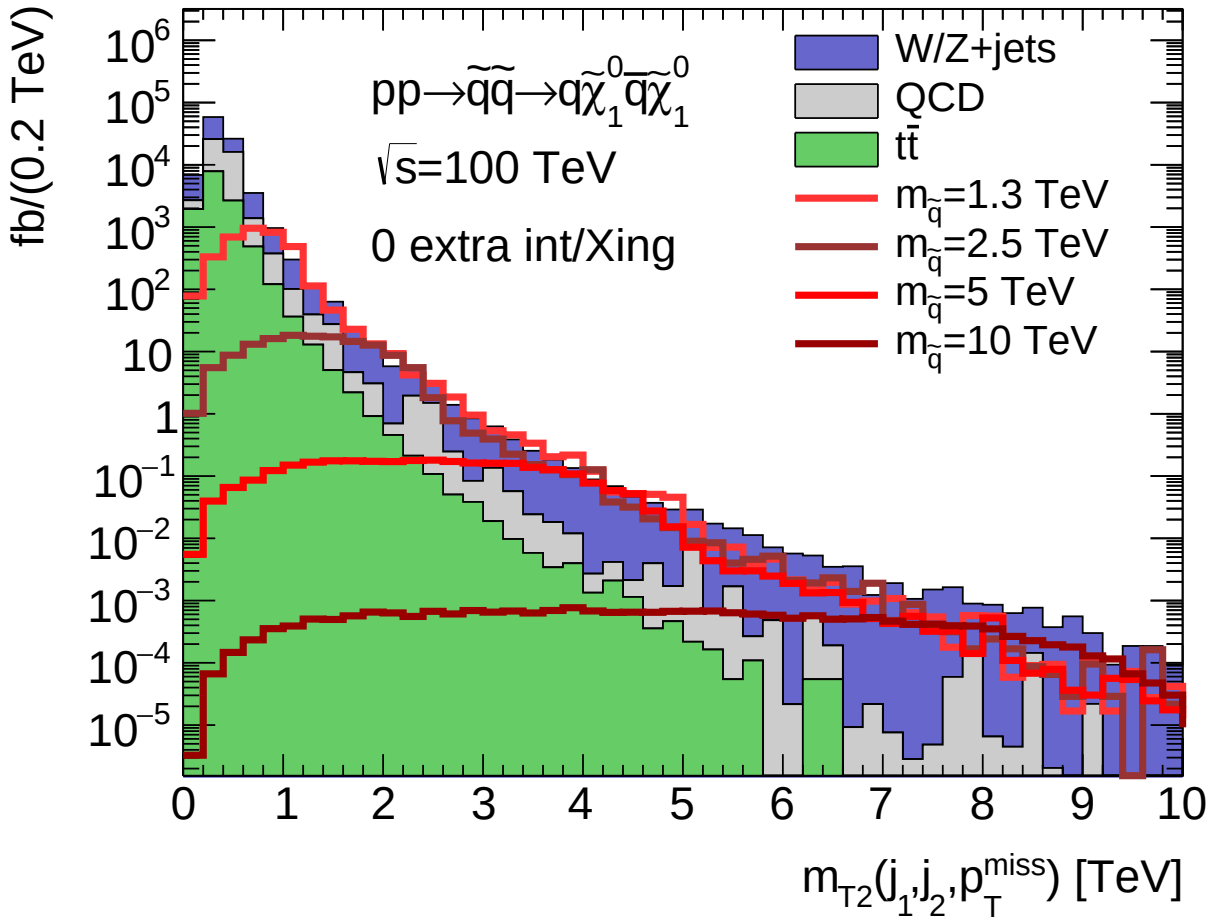
Example m_{T2} after some preselection:



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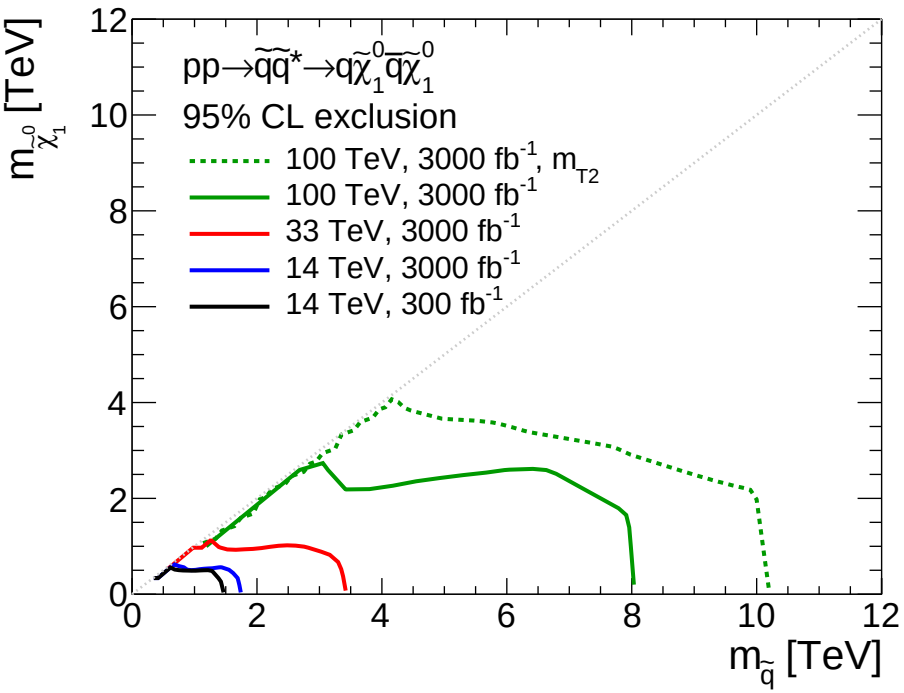

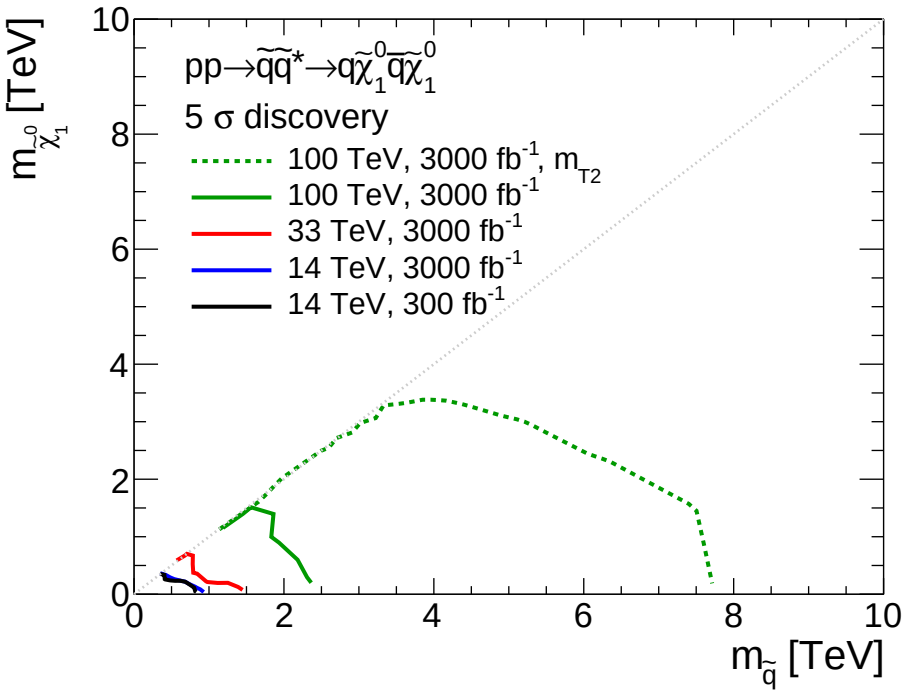

Some notes:

- Discovery with around 400 produced events, not much more room for improvement for massless neutralinos
- Backgrounds at high-m_{T2}, high-$H_{\mathrm{T}}^{\mathrm{jets}}$ are mostly $Z \to \nu\nu$+jets, so uncertainties of $\sim$20% are not too conservative