Search for supersymmetry in the multijet + missing momentum final state

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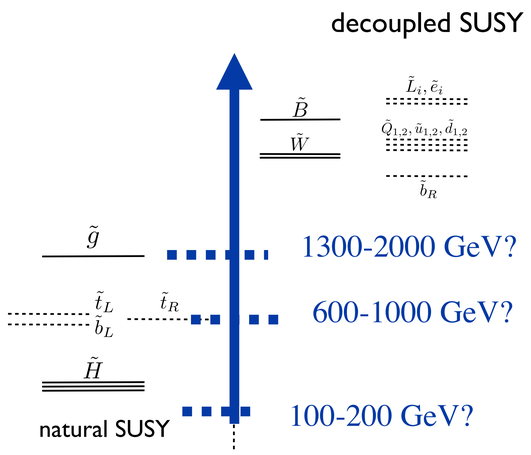
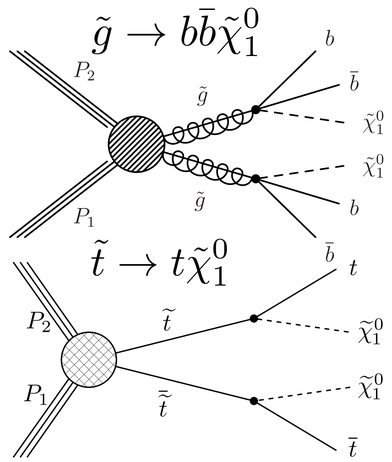
Why SUSY? Why now?



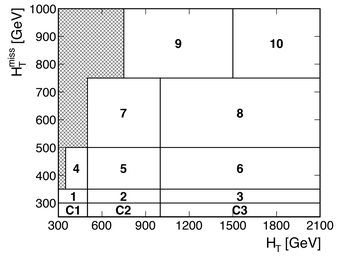


- "Natural" scenario: gluinos and squarks accessible at EWK scale
- Strongly-produced, distinct final states—**discovery potential**

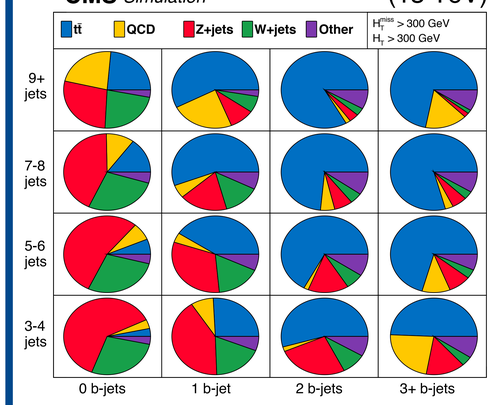
Selection & strategy

- Generic and inclusive
- Consider events with:
  - ≥3 jets (30+ GeV)
  - Missing momentum (300+ GeV)
  - No isolated leptons
- Bin in $N_{\text{jet}},\ N_{\text{b-jet}},\ H_T,\ H_T^{\text{miss}} \equiv \left| -\sum \vec{p}_T^{\ \text{jet}} \right|$

- **160 independent search regions**

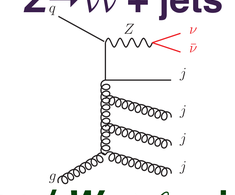


SM backgrounds

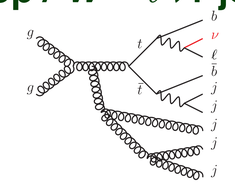


- At low N_{jet}, $N_{\text{b-jet}}$, mostly Z/W
- At high N_{jet}, $N_{\text{b-jet}}$, more $t\bar{t}$

$Z_q \to \nu\nu$ + jets



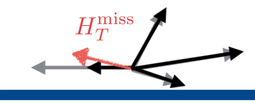
top / $W \to \ell\nu$ + jets



QCD multijet (fake- H_T^{miss})

Grey: true jet p_T

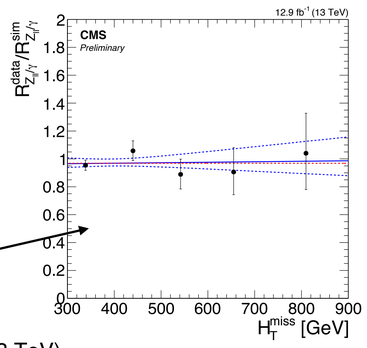
Black: measured jet p_T

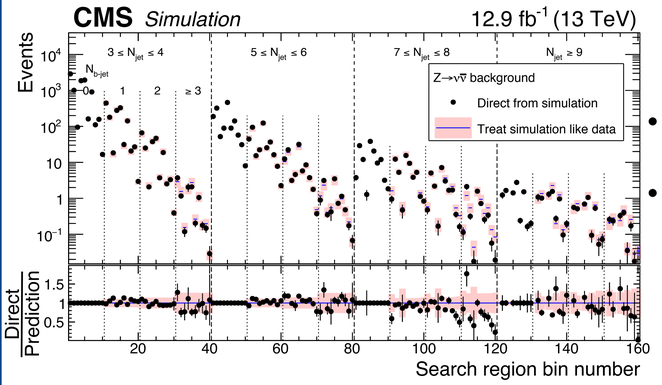


Background estimation

- Most sensitivity found on extreme tails of SM kinematic distributions
- **Measure all backgrounds in data using dedicated control regions**

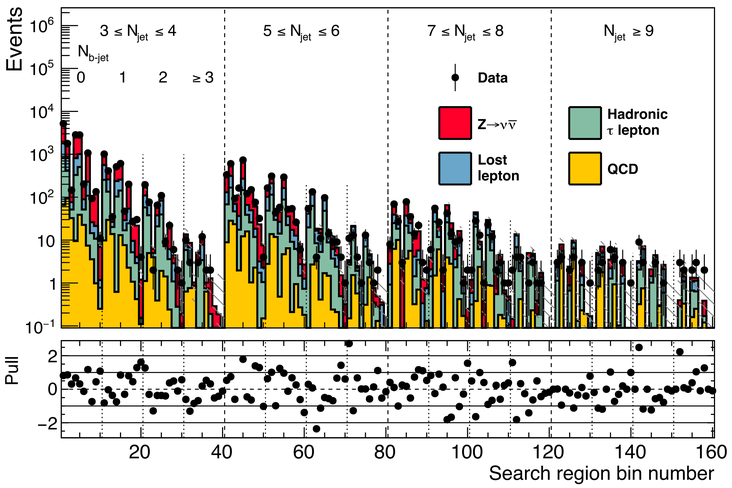
- **Example:** measure $Z \to \nu\nu$ + jets BG using γ + jets control region
- Use MC to correct for kinematic differences between Z & γ events
- Use $Z \to \ell\ell$ data to correct for any mis-modeling of Z BG in MC



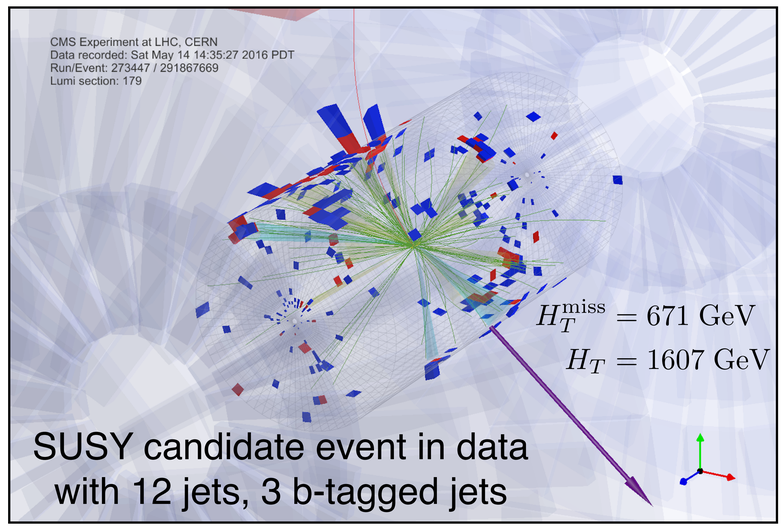


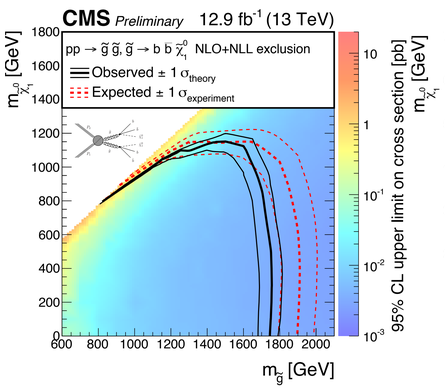
- Validate methods with MC closure tests
- From test performance, assign systematic uncertainties on BG measured in each bin

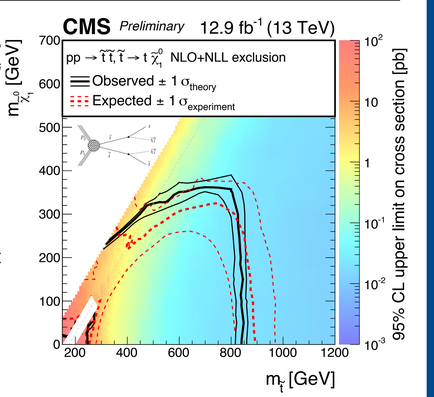
Results & interpretation



- Some ~1-2.5σ discrepancies between measured BG and observed data, but **no significant evidence for SUSY**
- Set limits on simplified models
- Can reach as far as 1620-1750 GeV in $m_{\tilde{g}}$, 780-1150 in $m_{\tilde{q}}$







For more info, see CMS-PAS-SUS-16-014

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