

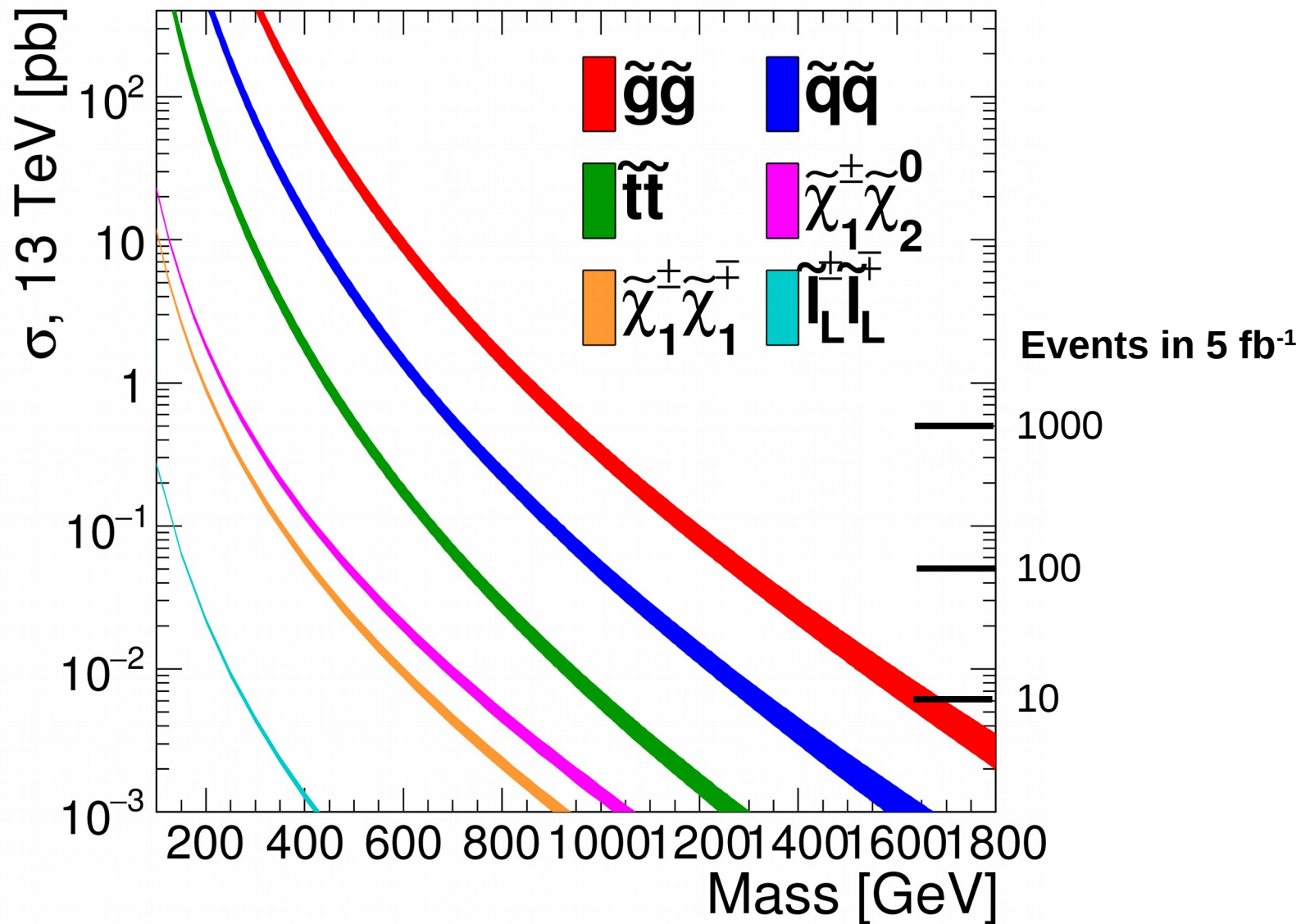
My Activities and the LPC: Trigger Coordination, SUSY Searches

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2016 LPC Distinguished Researcher

Main Efforts

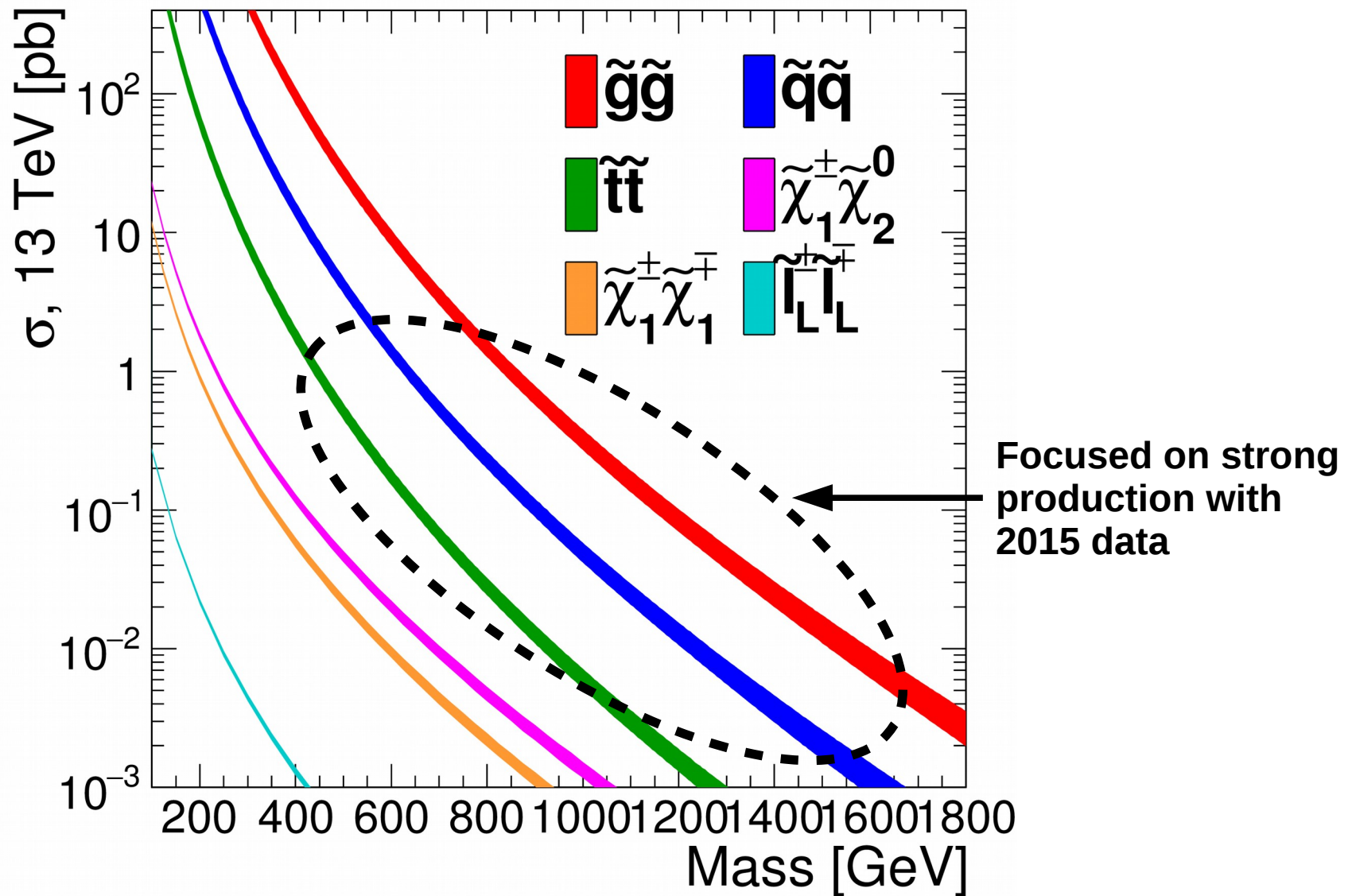
- **Physics analysis: searches for SUSY**
 - 2015: searches for strong SUSY production
 - 2016: adding searches for electroweak SUSY production
 - Many people involved are [LPC-based](#) or affiliated
 - Coordination through CMS Event at [LPC](#)
- **High Level Trigger: SUSY physics group contact**
 - Responsible for SUSY trigger strategy, monitoring performance
 - Coordination among SUSY analysts, many @ [LPC](#)
- **Live Event Display at Point 5**
 - Setup, maintenance, on-call support
 - Our images are also displayed live from the web at the [LPC](#)

SUSY Production @ 13 TeV



Xsecs from: <https://twiki.cern.ch/twiki/bin/view/LHCPhysics/SUSYCrossSections>

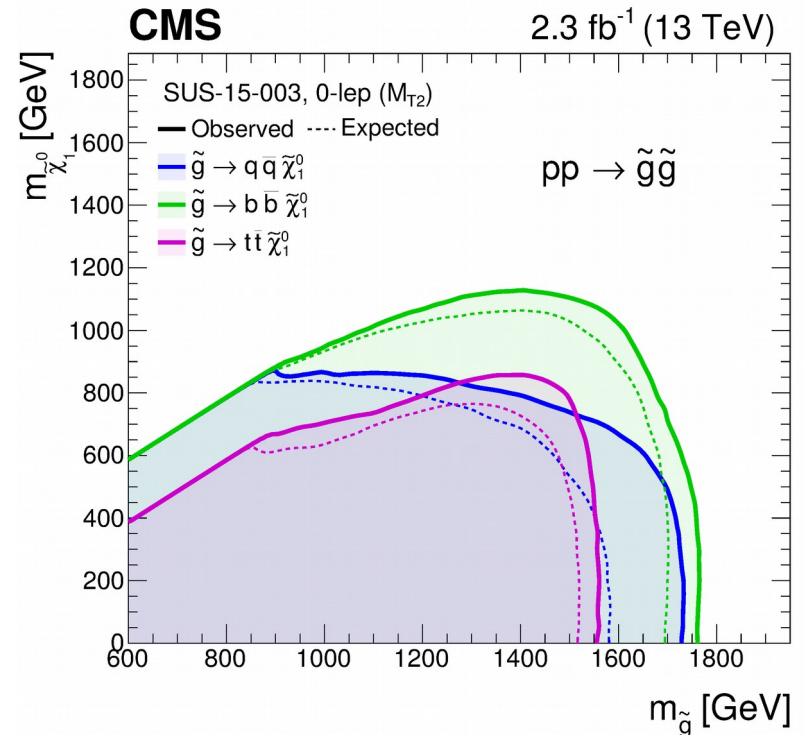
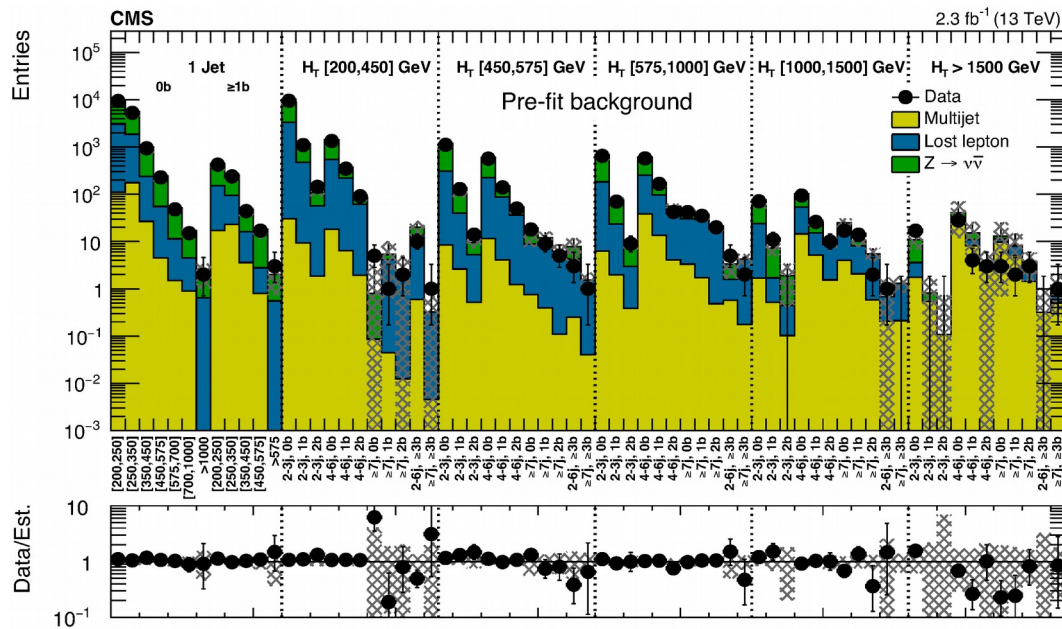
2015: Strong Production



Xsecs from: <https://twiki.cern.ch/twiki/bin/view/LHCPhysics/SUSYCrossSections>

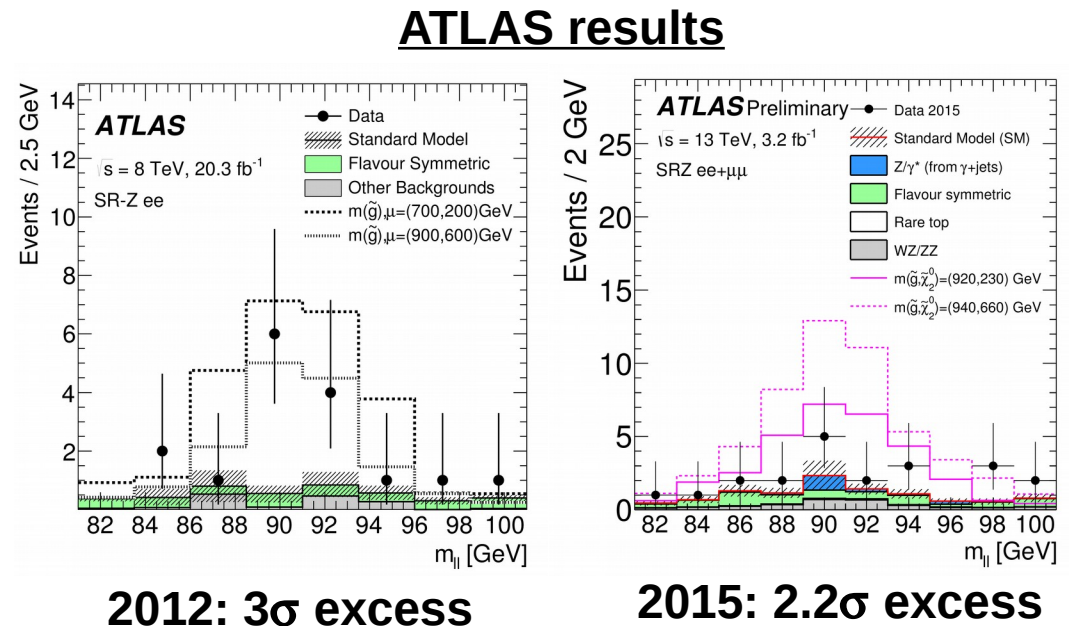
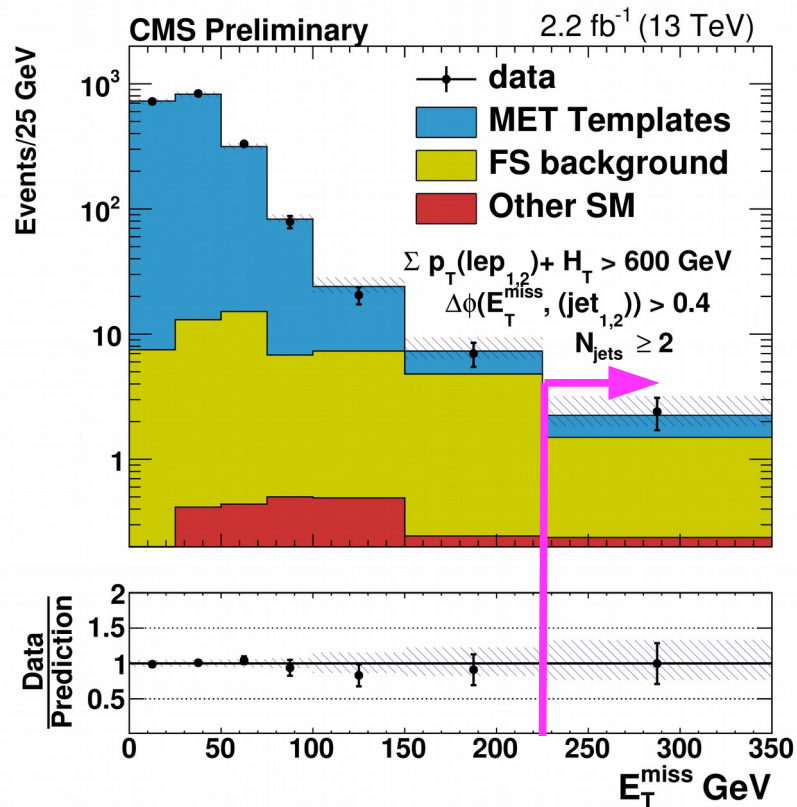
2015 Results: Jets+MET

- M_{T2} inclusive analysis: search for jets+MET covering broad range of topologies
 - Public results for December 2015, paper submitted to JHEP
 - Worked with [LPC DR Claudio Campagnari](#) + UCSB, ETH, CERN
- Constraints for gluinos and squarks extended beyond run 1 limits by ~ 300 GeV

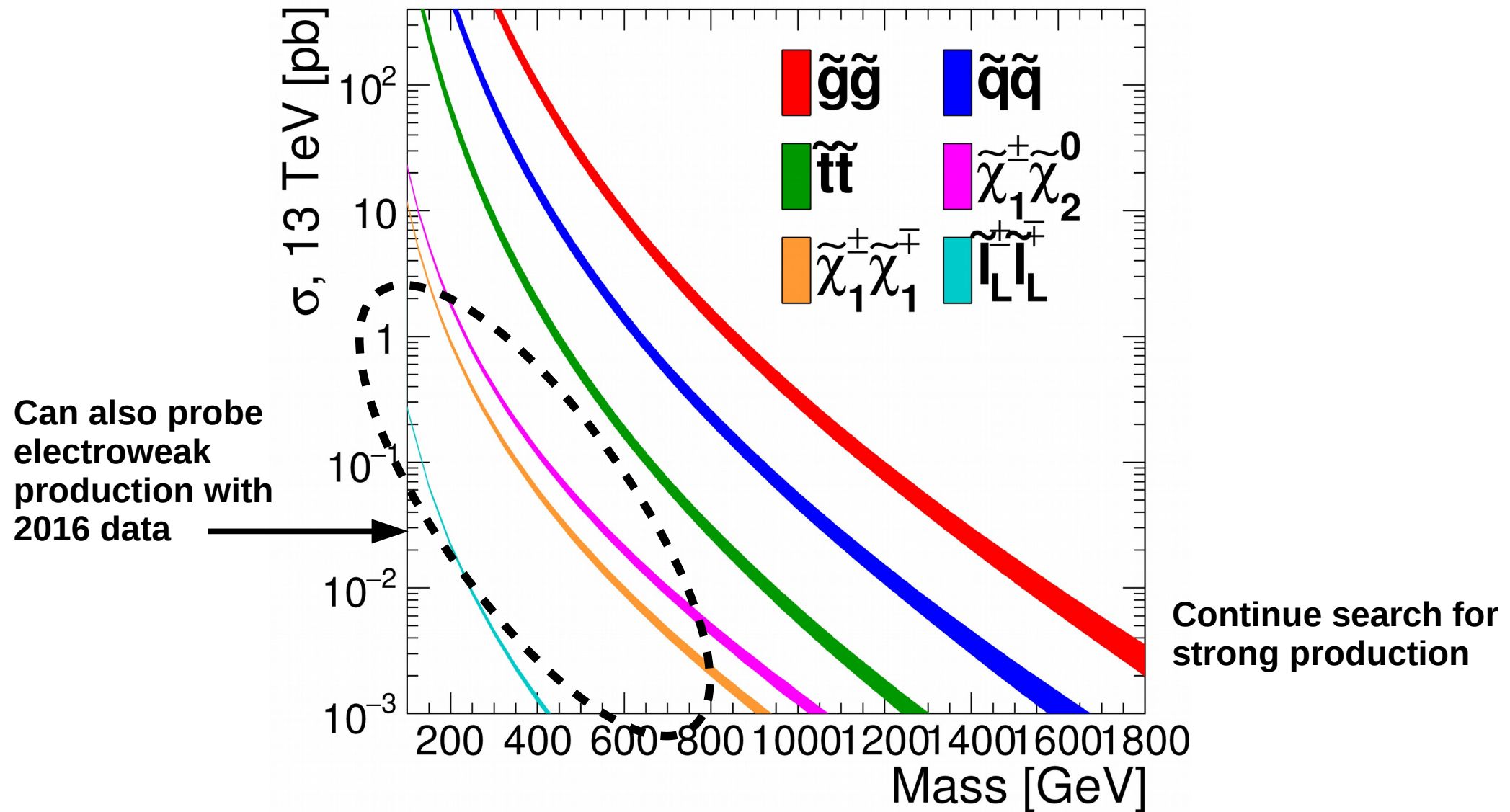


2015 Results: Z+jets+MET

- inclusive search for $Z(\ell\ell^-)+\text{jets}+\text{MET}$
 - Public results for December 2015, paper appearing shortly
 - Working with CERN, ETH, RWTH, Oviedo
- **3σ excess reported by ATLAS** at 8 TeV
- Defined signal region to check this at 13 TeV: **no excess for CMS**, **still 2.2σ excess for ATLAS**
 - Lots of comparisons and discussions → **will see what 2016 data says..**



2016: Extend to Ewk Production



Xsecs from: <https://twiki.cern.ch/twiki/bin/view/LHCPhysics/SUSYCrossSections>

2016 Analysis Planning

- Organized **Electroweak and Compressed SUSY Event @ LPC**
 - Together with **LPC DRs Lesya Shchutska, Markus Stoye + others at LPC**
 - 64 participants from CMS, 46 in person at the LPC
- Developed **coherent overview of search program** for 2016
 - Including analysis overlaps and common issues



2016 Analyses Covered at Event

- 3-4 ℓ (on and off-Z)
- 2 ℓ OS onZ + V(jj)/H(bb)
- 2 ℓ OS non-resonant
- 2 ℓ OS soft
- 2 ℓ SS
- 2 ℓ + VBF (including τ_h)
- 1 ℓ + H(bb)
- 1 ℓ soft
- H(bb)H(bb)+MET
- H($\gamma\gamma$) + ℓ / V(jj) / H(bb) / jets
- 2 taus (2 τ_h , $\ell+\tau_h$)
- γ + MET
- γ + ℓ + MET
- soft jets + MET (stop)

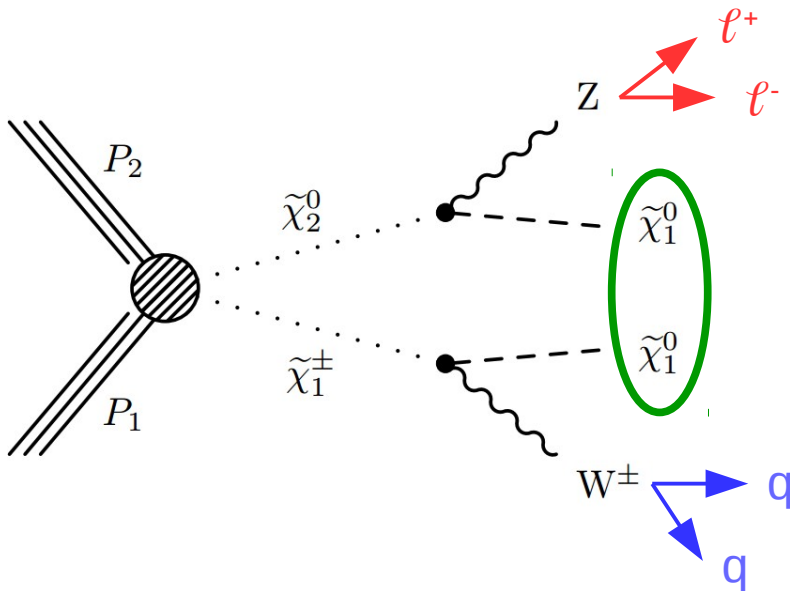
Broad program of searches
planned to exploit 2016 dataset

Analyses with LPC contribution
in blue

US groups involved:
Caltech, CMU, FNAL, Purdue,
Rutgers, TAMU, UCSB, UCSD,
UCR, UF, Vanderbilt

2016 Analyses: Electroweak SUSY

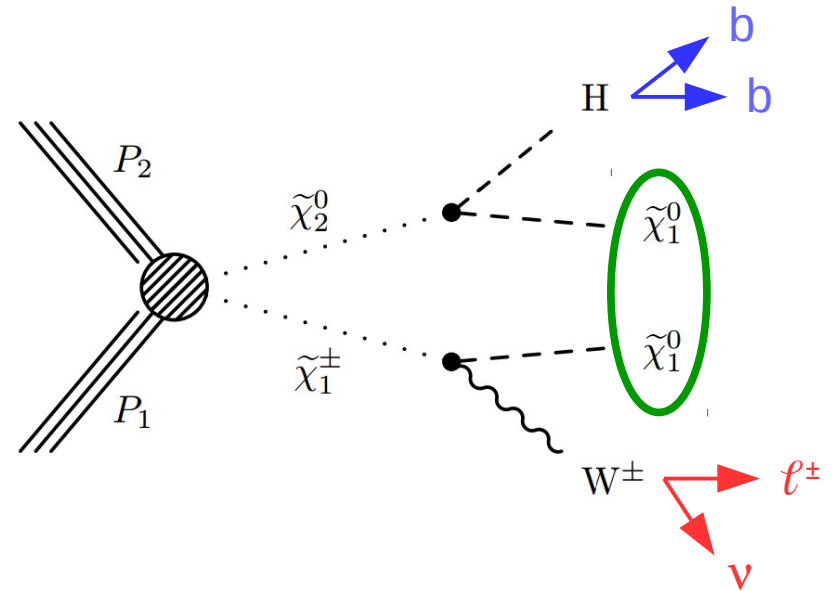
- Typical signature of electroweak SUSY: two bosons + MET



W(qq)Z($\ell^+\ell^-$)+MET:

Straightforward extension of existing Z+jets+MET search

Optimizing signal regions, add to ICHEP 2016 analysis



W($\ell^+\nu$)H(bb)+MET:

Use techniques from 2015 stop 1ℓ search (LPC effort) and 8 TeV version

Working with [Fermilab postdoc Mia Liu](#), targeting ICHEP 2016

Trigger and LPC

- CMS trigger evolves rapidly at times, especially in the months leading up to data taking
 - Contacts needed for disseminating latest information and recipes
- As responsible for SUSY trigger strategy, collaborated with several LPC DRs and residents to define and implement plans
 - Large involvement from LPC in CMS SUSY physics group
- Also critical: training younger students to understand trigger
 - Trigger exercises at LPC CMSDAS, Jan 2016
 - With LPC DR Lesya Shchutska + others
 - Organizing Trigger HATS @ LPC, June 2016
 - HATS = Hands-On Advanced Tutorial Session
 - With other LPC residents: Len Apanasevich, Zhenbin Wu, Jingyu Zhang

Conclusions

- 2016 will be an exciting year for SUSY searches
 - Targeting both strong and now electroweak production
- LPC plays a strong role in coordinating SUSY searches
 - Especially a complex effort like electroweak SUSY
 - Involving many institute groups and combinations of analyses
- LPC also a good platform for trigger coordination
 - Several developers and users in one place
 - Events to provide trigger training for CMS collaborators