

# SUSY search in multilepton finalstate

## Limit calculation / SR optimization

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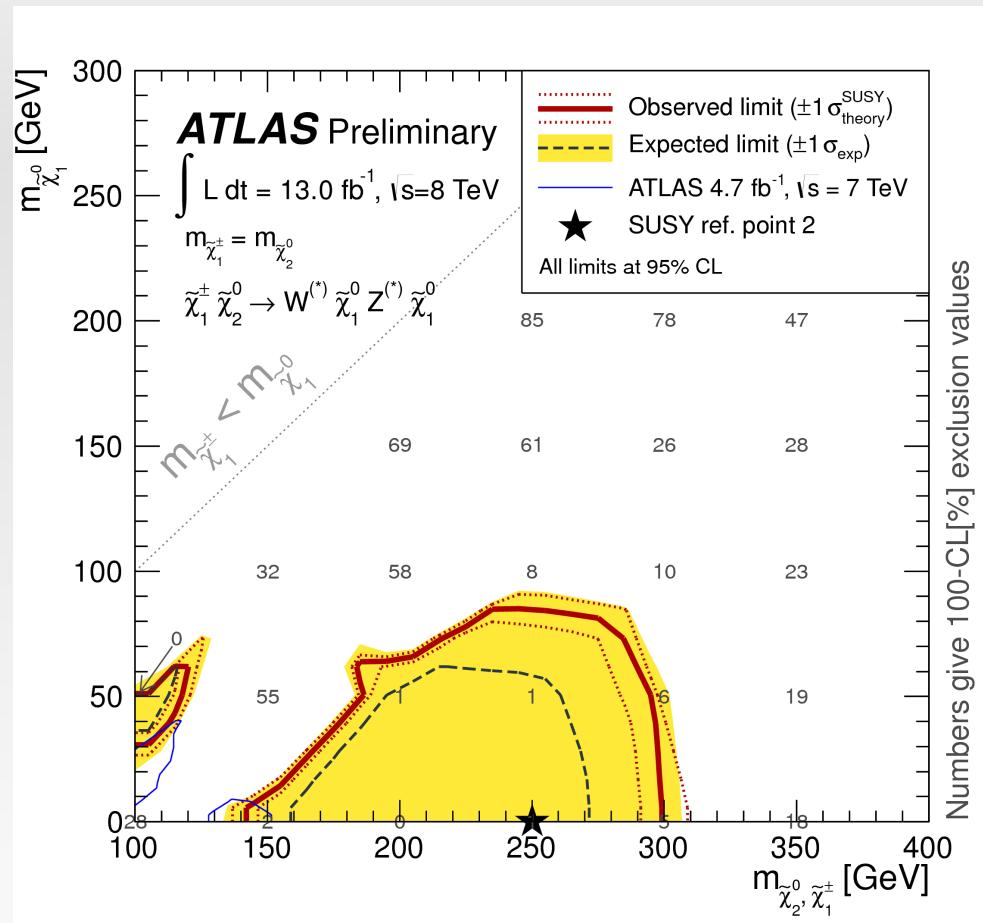


# Summary

- Consider weakly produced SUSY signal in finalstate with three leptons (electrons/muons) and missing transverse momentum in ATLAS at the LHC
- Clean channel, no QCD, but low statistics
- Main background WZ & ttbar  
Normalize WZ by simultaneously fitting in control region and signal region  
Estimate fake leptons with Matrix Method to control ttbar
- Different signal regions (SR) targeting at different models
- Interpret results in simplified models and phenomenological MSSM

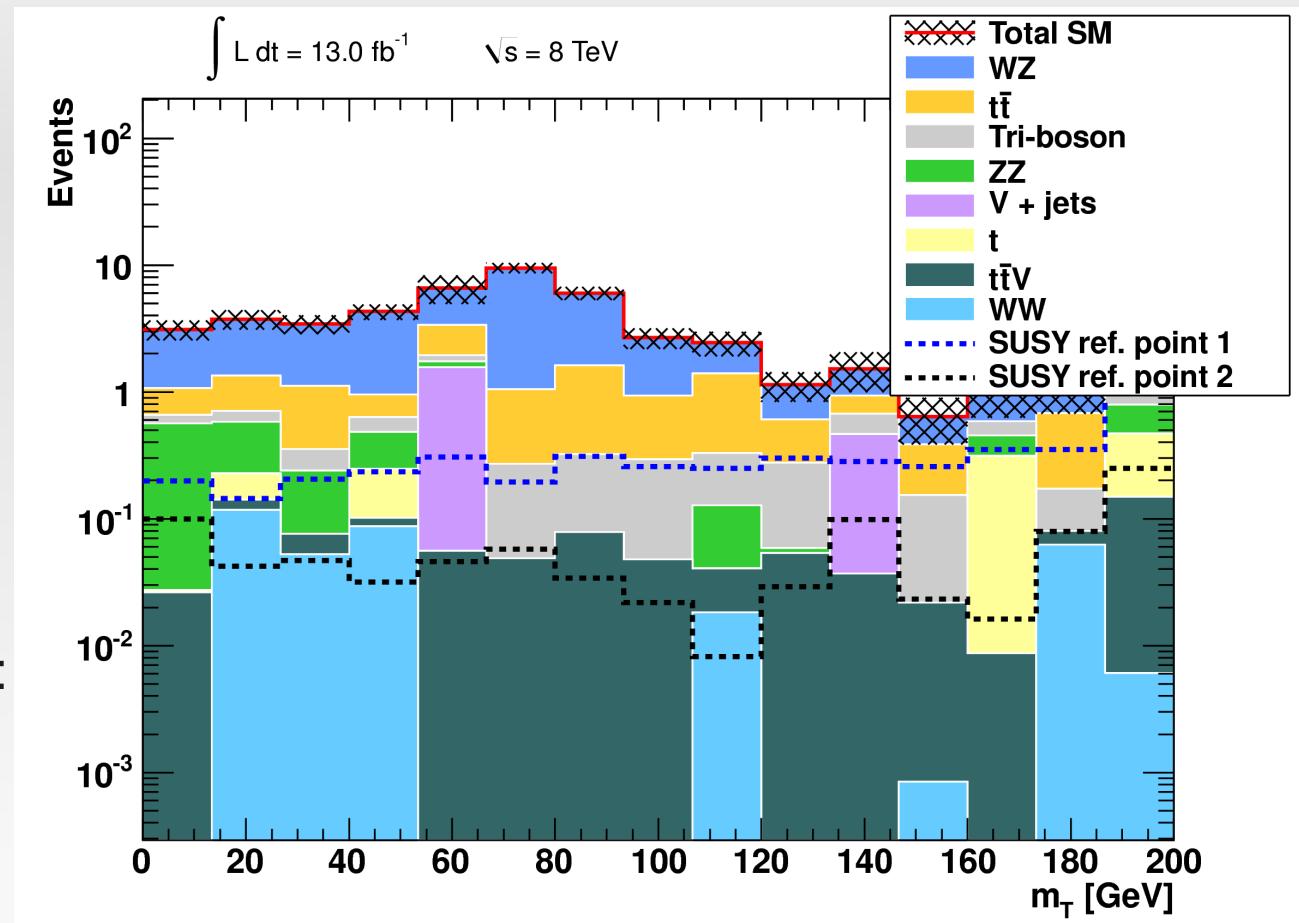
# My contribution: Limit setting

- Get background and signal estimation
- Consider discovery p-value and calculate exclusion limits
- Constructing likelihood and subsequently test statistic, maximize it to get  $P(\text{data}|\text{model})$
- Plot the excluded region at 95 % CL



# My contribution: SR optimization

- How can we improve our discovery potential/exclusion limit?
- Choose smart SR
- Apply n-1 cuts and see where the best nth cut could lie
- Example on the right: Cut  $m_T$  at 120 GeV
- Receipt for Moriond



# My contribution: SR binning

- Last slide: "Choose smart SR" (by considering two SUSY ref points)
- Is that really smart if you actually have ~500 SUSY points?
- Other approach: Bin the SR
- Positive aspects of binning the SR:
  - Every signal point will pick up best region(s) in the likelihood
  - More regions → More information → Better discovery potential
- Negative aspects:
  - Background estimation in many regions laboursome for Matrix Method
  - Some bins might have very low MC statistics, background not well understood in those bins
  - Add systematics and likelihood gets very complicated (many nuisance parameters ), might get computationally heavy
- Not ready for Moriond, but aiming at paper after Moriond