

UNIVERSIDAD DE OVIEDO



Electroweak SUSY production in multileptonic final states at CMS

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Introduction

→ Electroweak production could be the key in finding Supersymmetry at the LHC.

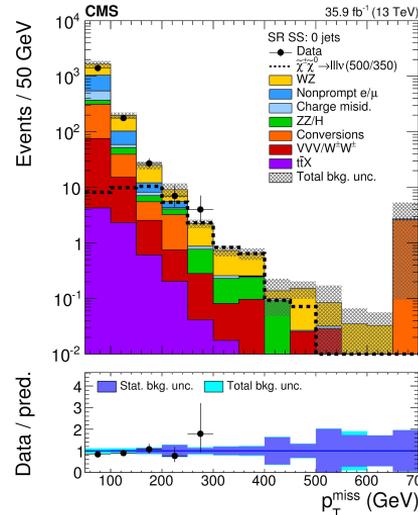
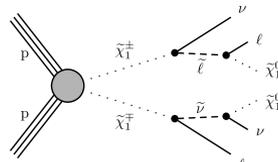
→ Specially clean final states in most production modes: contain leptons or SM bosons that decay leptonically.

→ Focusing on two main sets of results in multileptonic final states:

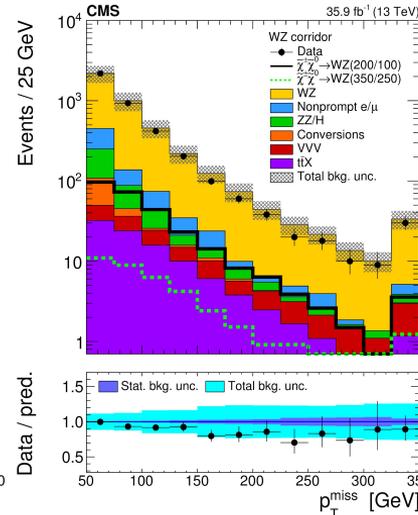
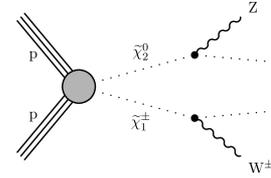
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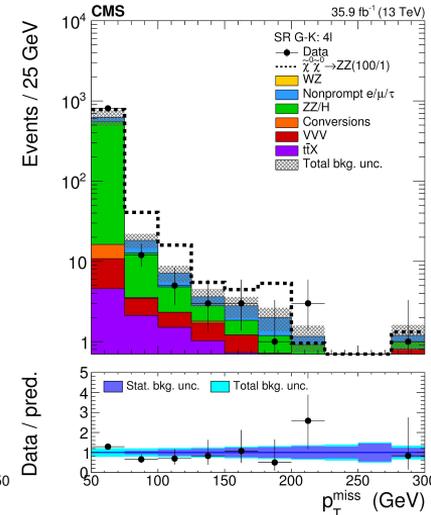
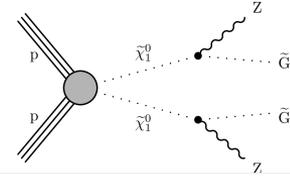
→ SUSY could be in a broad range of final states! Different lepton multiplicities and flavor combinations lead to very diverse final states with quite different background processes.



Same-Sign
Light lepton pair



Three light leptons



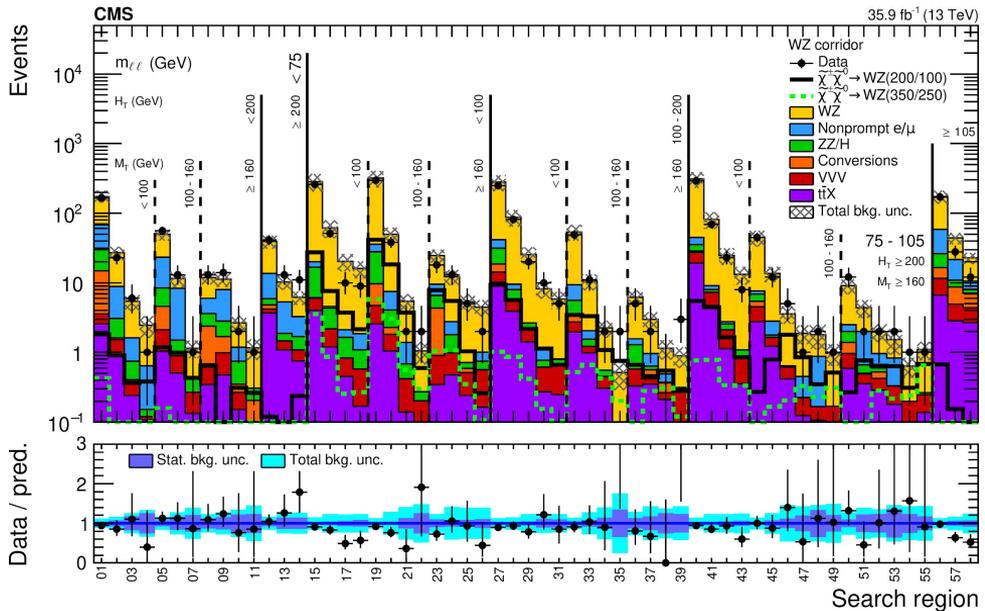
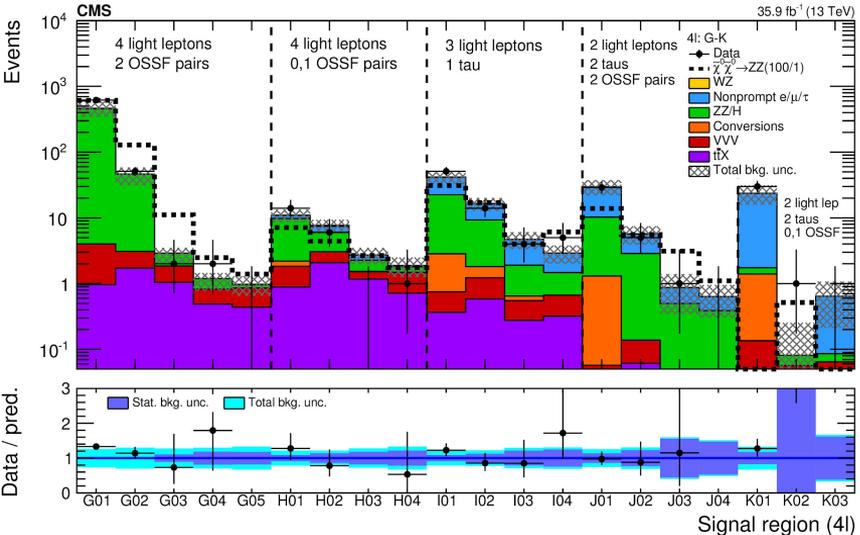
Fourth light leptons

(A selection of) the searches

→ Final states with **4 leptons** are usually sensitive to HH+LSPs, ZZ+LSPs, HZ+LSPs production.

→ The more taus in the final state, the more likely it is to have final state Higgses. The classification based on tau multiplicity and charge (categories G-K).

→ p_T^{miss} is used as S/B discriminant for all categories, bins are adjusted based on SM backgrounds.

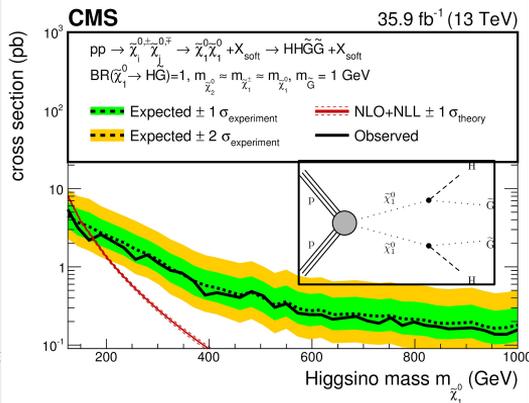
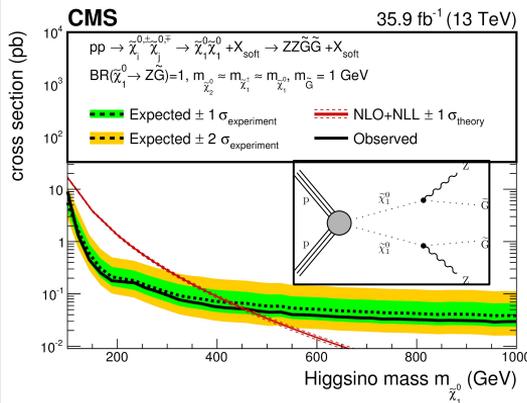


→ Final states with **3 light leptons** are sensitive to a very broad range of new physics.

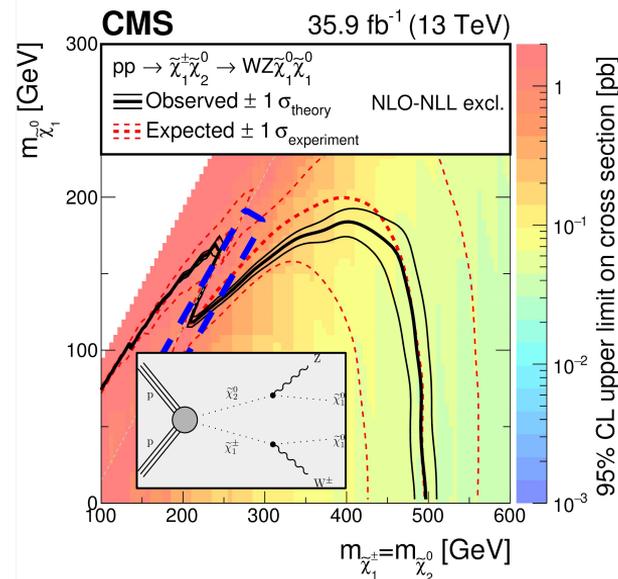
→ Discrimination towards the whole set of possible signal processes is achieved through dedicated signal binning in several high level variables (m_T , H_T , m_{ll} , p_T^{miss})...

→ ... and precise validation (estimation) of the SM WZ (non prompt) predictions in data sidebands.

Interpretations



- The sensitivity to higgsino pair production is obtained from four lepton final states.
- Exclusions of higgsino masses between 150 to 450 GeV are reached, depending on its branching fractions.
- These measurements are extremely dominated by the statistical uncertainties with small contributions due to background (ZZ/non-prompt) normalizations.



- Sensitivity to $WZ\chi\chi$ production in the three light lepton final state.
- Exclusion limits of up to 500 (200) GeV in the NLSP (LSP) mass are reached.
- Notable features a “dip” in exclusion in the regions of $m_{\text{NLSP}} - m_{\text{LSP}} \sim m_Z$, where signal and SM WZ are nearly identical. Precise WZ estimation effort starts to “close the gap”.