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Searches for strong production of SUSY particles with two opposite-sign same-flavor leptons at CMS

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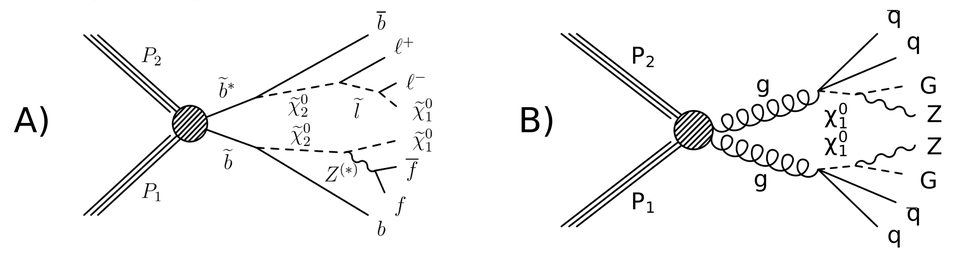
Introduction

A search for SUSY in events containing **two opposite-sign same-flavor leptons** (muons and electrons), jets, and E_T^{miss}
Search motivated by simplified models in which two leptons appear:
A) in the decay of a **Z boson** produced in the decay of sparticles
B) in the sequential two-body decay of a neutralino. m_{ll} distribution showing a **edge-shaped resonance**



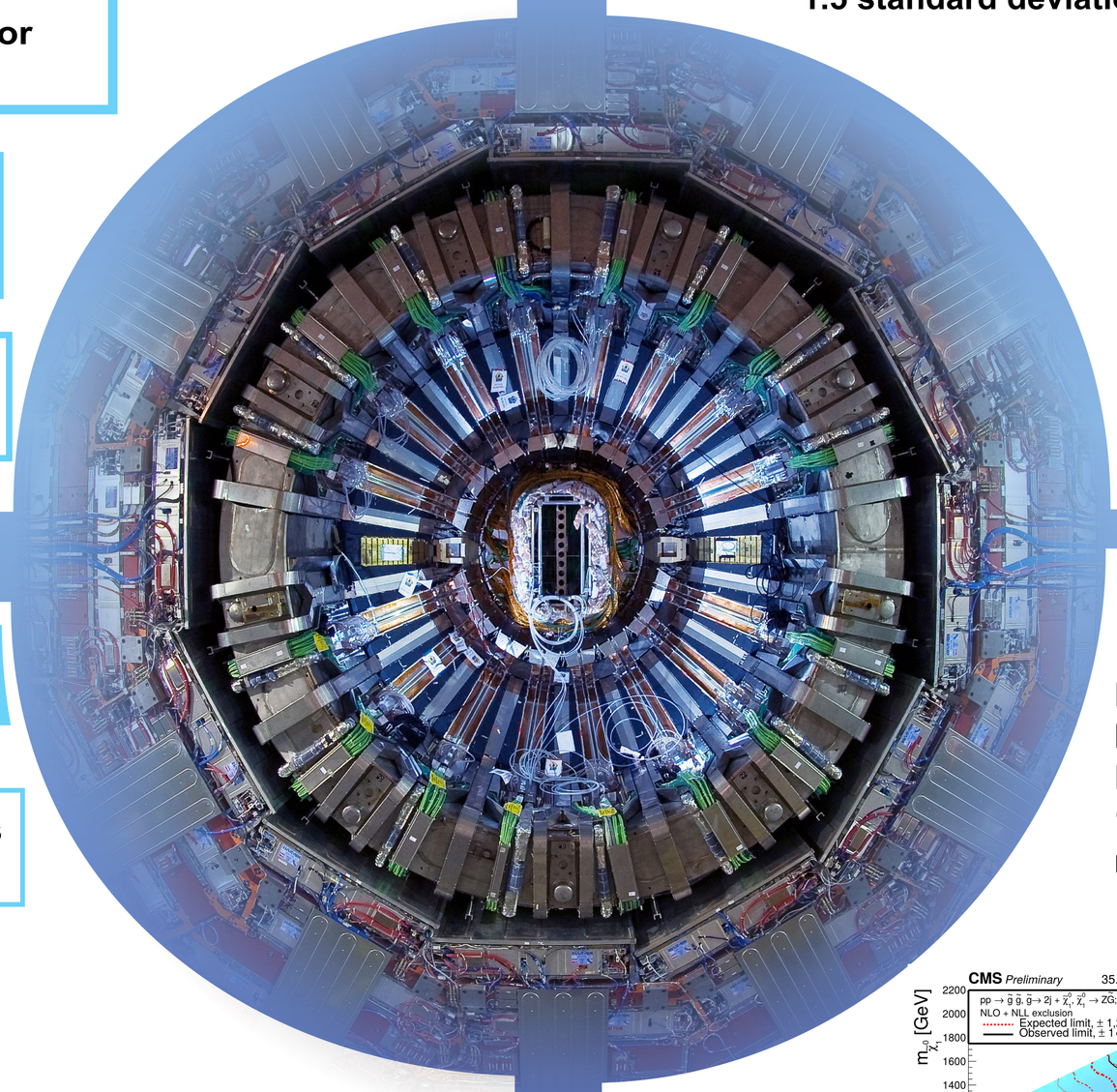
Search strategy and background estimation

Search divided in two parts: **on-Z search** and **off-Z search**
Common baseline selection and background estimation methods

Flavor symmetric processes producing **same amount of opposite** and same-flavor pairs (**tt**, DY to ττ, WW)
Estimated using the **opposite-flavor region as a sideband**

Instrumental E_T^{miss} from **Drell-Yan like processes** is estimated from a γ+jets data sample (templates)

Other backgrounds or **rare** estimated using dedicated MC samples and validated in control regions



Search regions

Events with a **dilepton pair**, **two jets** and E_T^{miss} **> 100 GeV** are considered

Off-Z search:
Events required to have
$E_T^{miss} > 150$
$m_{T2} > 80$ GeV

Events are further classified according to:
m_{ll}
as tt-like or non-tt-like

On-Z search
Events are required to have
$|m_{ll} - 91\ GeV| < 5\ GeV$
Events are further classified depending on their hadronic activity and E_T^{miss}

NLL discriminant

Likelihood discriminant NLL is used to classify events in the off-Z search as tt-like or non-tt-like

The pdf of four **mildly correlated** $\Delta\phi_{\ell\ell},\ \sum m_{lb},\ p_T^{\ell\ell},\ E_T^{miss}$ variables is extracted from the tt-enriched opposite-flavor region

Logarithm of likelihood is calculated under the assumption of the four variables being independent, as

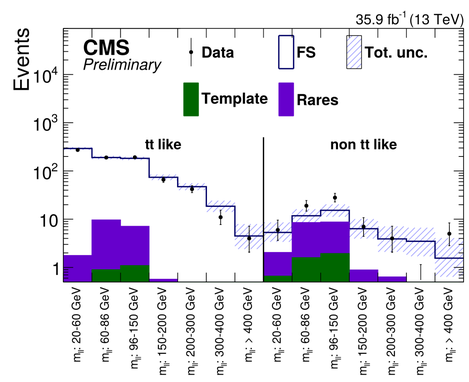
$$\mathrm{NLL} = -\sum \log f_i(x_i)$$

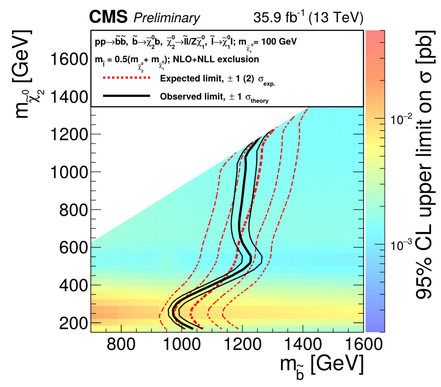
where x_i are the input variables and f_i, their pdfs

Results of the off-Z search

Results **compatible with Standard Model** predictions in all search regions
Probing **sbottom masses** up to **1.2 TeV** depending on the edge location

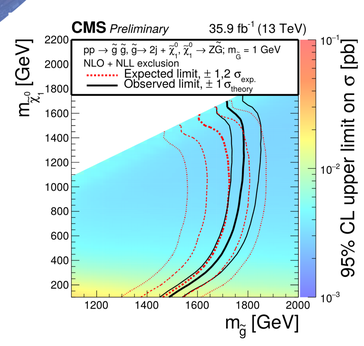
Deviation corresponding to **1.5 standard deviations**

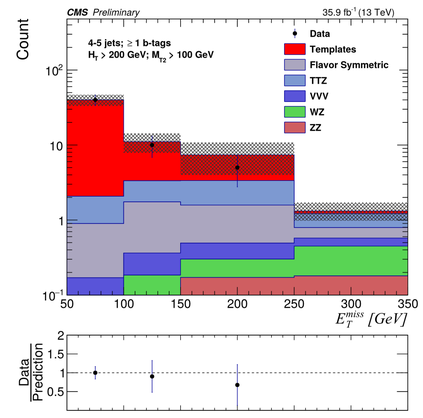




Results of the on-Z region

Results **compatible with Standard Model** in all search regions
Excluding **gluino masses** up to **1.5-1.7 TeV** depending on the neutralino mass





References

Search for new physics in final states with two opposite-sign, same-flavor leptons, jets, and missing transverse momentum in pp collisions at $\sqrt{s}$ = 13 TeV
CMS-PAS-SUS-16-034