Search for new physics in final states with a lepton and missing transverse energy

Selection

Require one muon ($p_T > 40$ GeV) or one electron ($p_T > 85$ GeV). Specific quality criteria are applied.

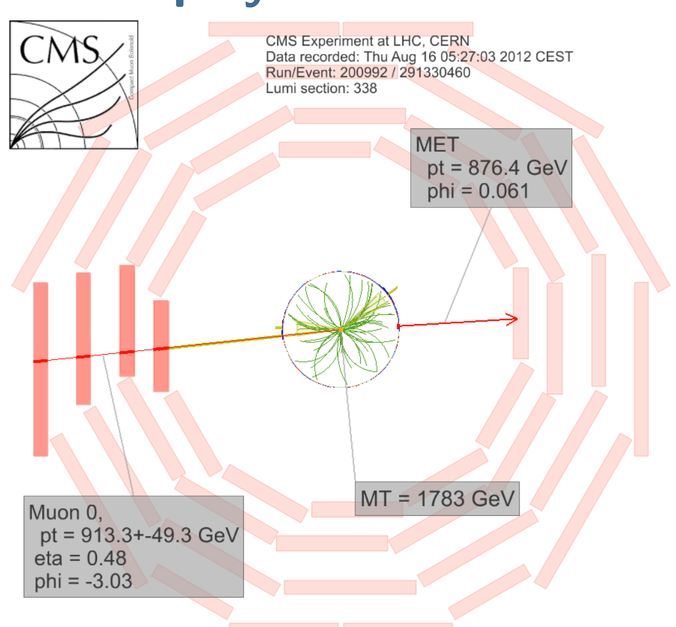
SM background

Primary background is $W \to \ell\nu$. Additionally: QCD multijet, $t\bar{t}$, Drell-Yan, Di-boson.

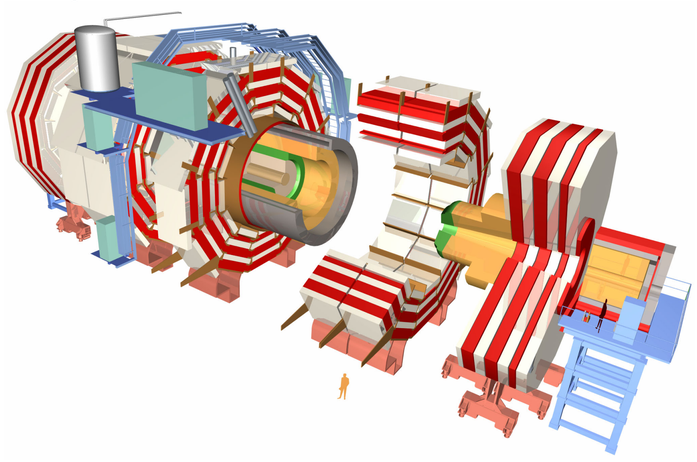
Observable

$$M_T = \sqrt{2 p_T^{\ell} E_T^{\text{miss}} (1 - \cos\phi)}$$

Event display

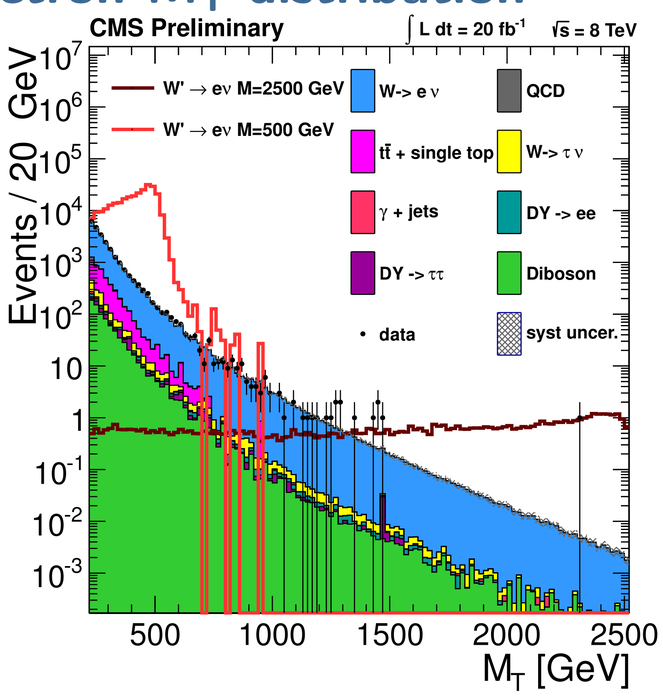


Compact Muon Solenoid

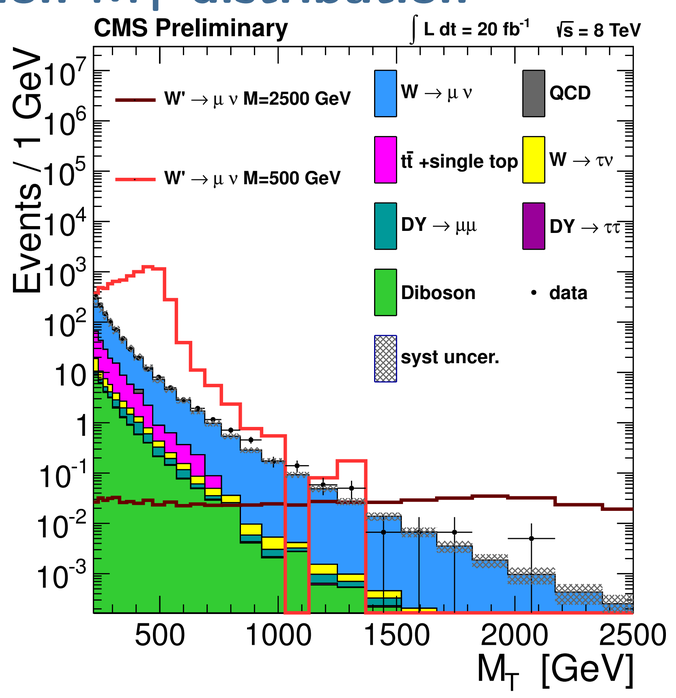


Reconstruction of high energy (TeV) electrons and muons as well as missing transverse energy.

Electron M_T distribution

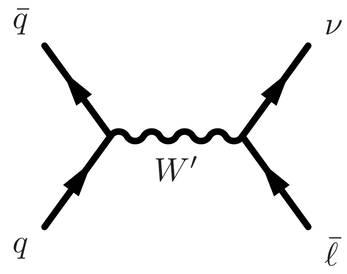


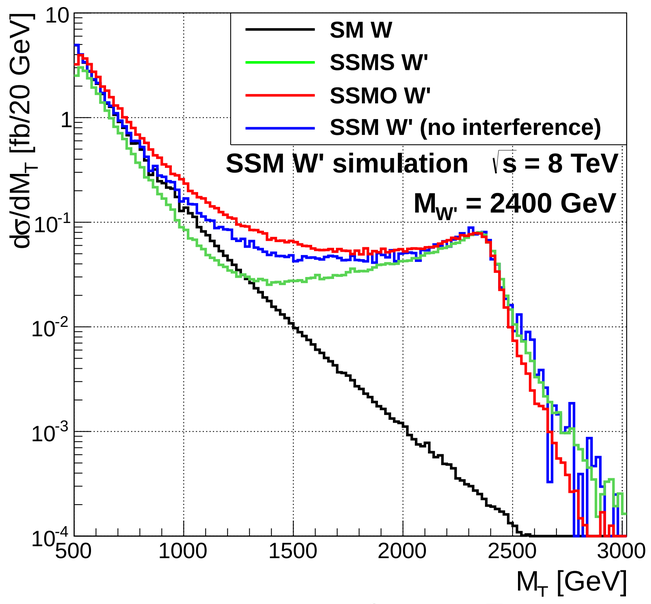
Muon M_T distribution



Sequential standard model W'

W' has same couplings as the SM W but different mass [1]. Different models of interference between W and W' are considered.





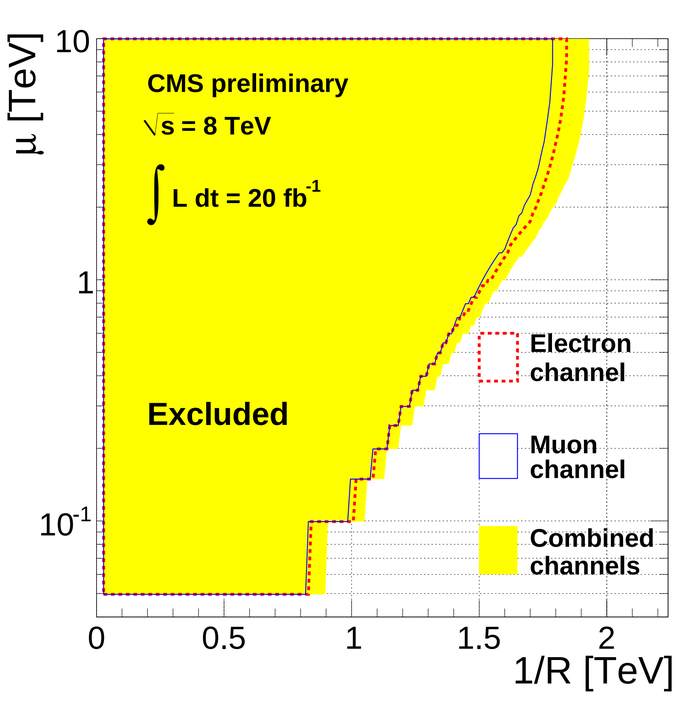
Split universal extra dimension

Additional compact fifth dimension of radius R and with bulk mass parameter μ [2, 3].

The W boson has a Kaluza-Klein partner W^2_{KK}, which couples to SM particles.

$$m_{W^2_{\text{KK}}} = m_W^2 + (2/R)^2$$

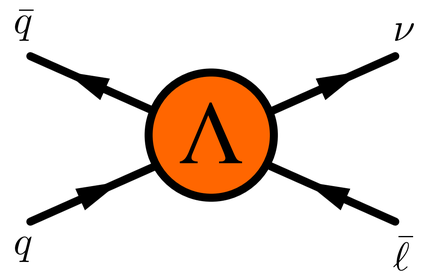
Reinterpretation of the SSM W' mass limits.

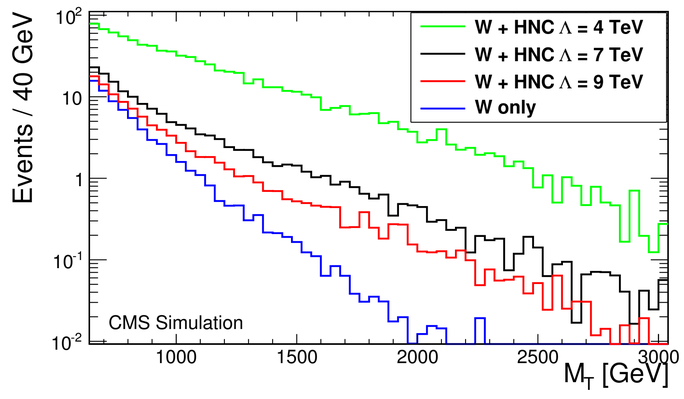


Contact interactions

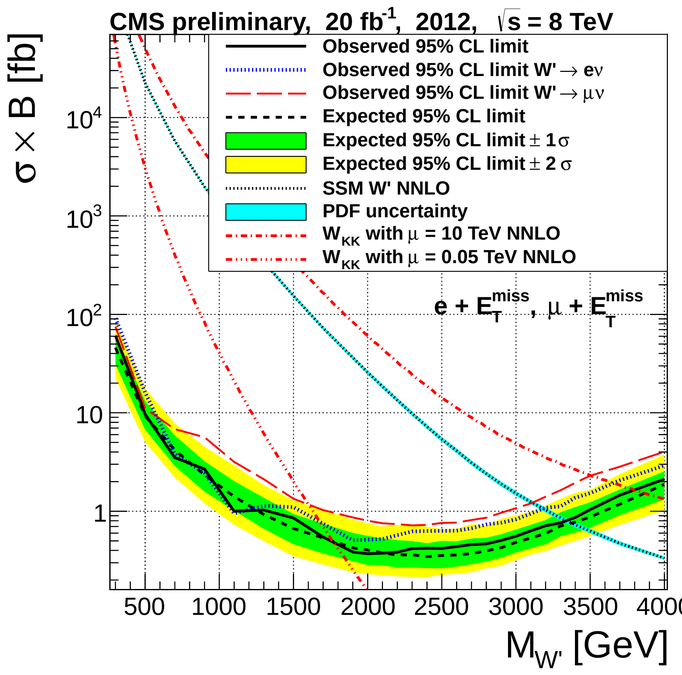
Known particles are assumed to be composite objects [4, 5].

At the energy scale Λ the constituents bind.





This analysis constrains Λ to $\Lambda > 13.0$ TeV (electron channel) $\Lambda > 10.9$ TeV (muon channel) with 95% confidence level.



Limits derived on the W' mass (95% confidence level):

Model	Observed	Expected
SSM (NNLO)	3.35 TeV	3.40 TeV
SSMO (LO)	3.80 TeV	3.80 TeV
SSMS (LO)	3.10 TeV	3.20 TeV

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Bibliography

[1]: Altarelli et al., Z. Phys. C 45 (1998) 109
[2]: Chen et al., JHEP 09 (2009) 078
[3]: Kong et al., JHEP 04 (2010) 081
[4]: Terazawa et al., Phys. Lett. B112 (1982) 387
[5]: Lane et al., Phys. Rept. 278 (1997) 291

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