# Searches in Dilepton Final States at CDF

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University of California, Davis
on behalf of CDF Collaboration

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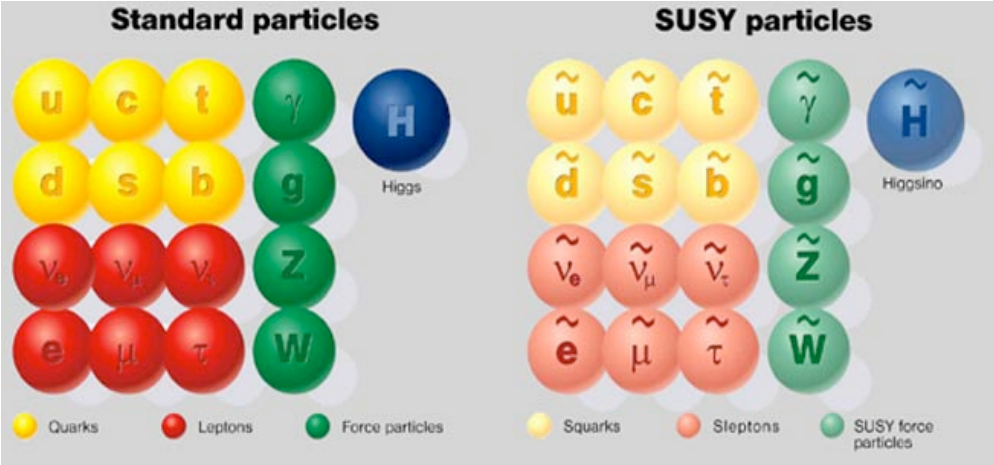
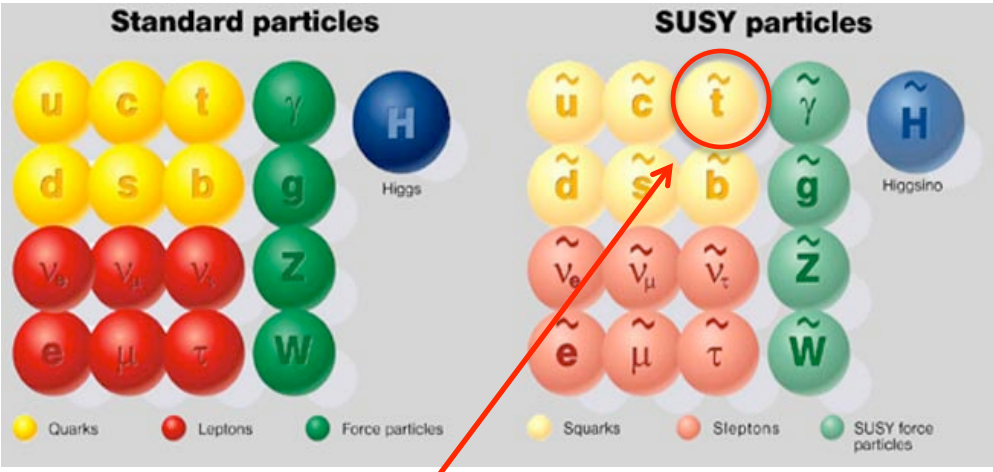
# In this talk




- Overview of most recent searches in dilepton final states from CDF experiment
- Searches for canonical super-symmetry (R-conserved, neutralino is LSP)
  - Stop
  - Chargino-Neutralino
- RPV Scenarios:
  - Sneutrino
- Fourth generation

# Searches for stop quark




$$m^2_{\tilde{t}_{2,1}} = \frac{1}{2}\left(m^2_{\tilde{t}_L} + m^2_{\tilde{t}_R} \pm \sqrt{(m^2_{\tilde{t}_L} - m^2_{\tilde{t}_R})^2 + 4m_t^2(A_t - \mu\cot\beta)^2}\right)$$

- Due to large top quark mass expect a large mass splitting for stop mass eigenstates
- And light stop

# Search for stop quark

$$\tilde{t}_1 \rightarrow b\tilde{\chi}_1^{\pm} \rightarrow b\tilde{\chi}_1^0 l\nu$$

- Assume

1. $\tilde{\chi}_1^0$ is the LSP
2. $m_{\tilde{t}_1} \lesssim m_t$
3. $m_{\tilde{\chi}_1^+} < m_{\tilde{t}_1} - m_b$

- Two b-jets (0 or >= 1 tag),
  missing $E_T$ and 2 opposite-sign leptons
- Main background is from ttbar

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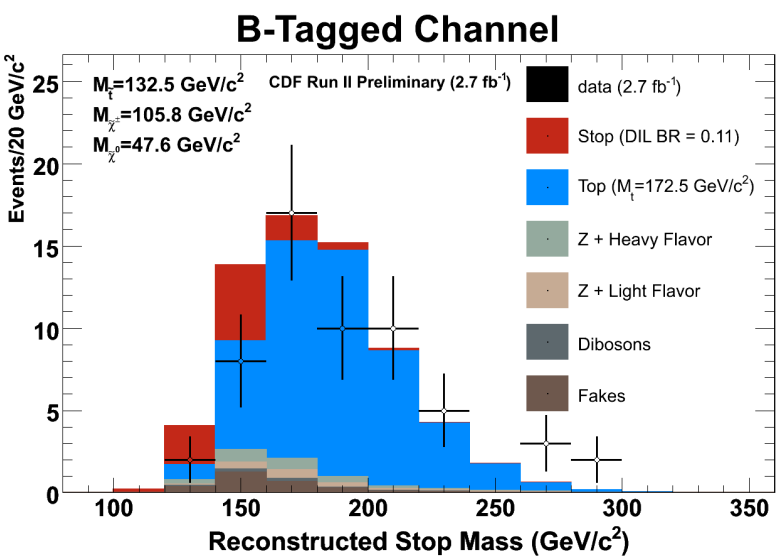


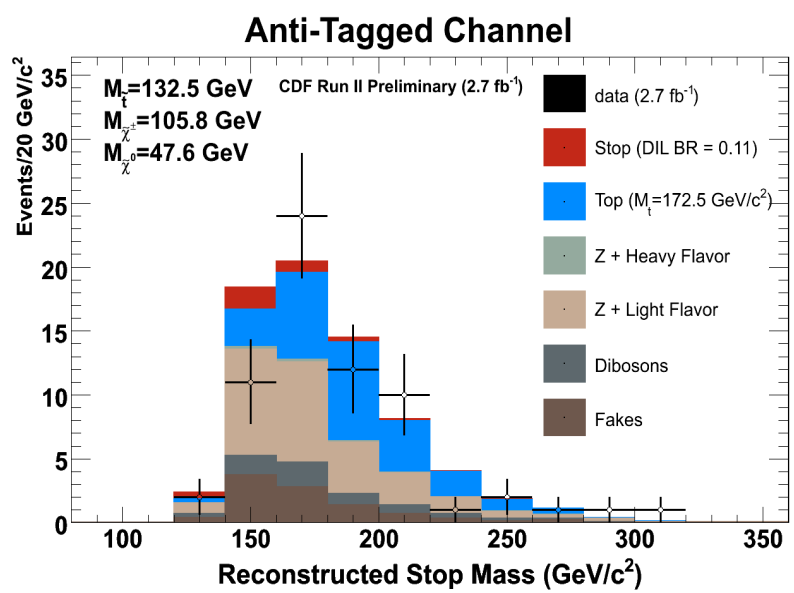

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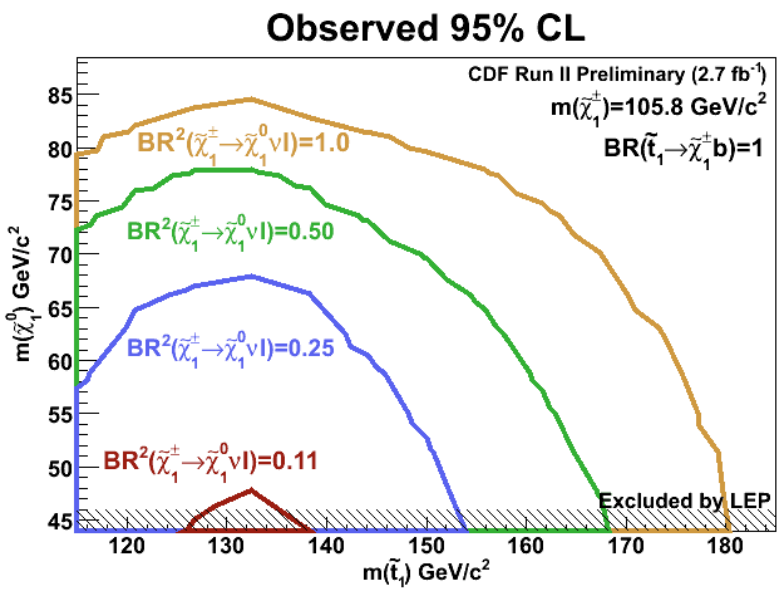
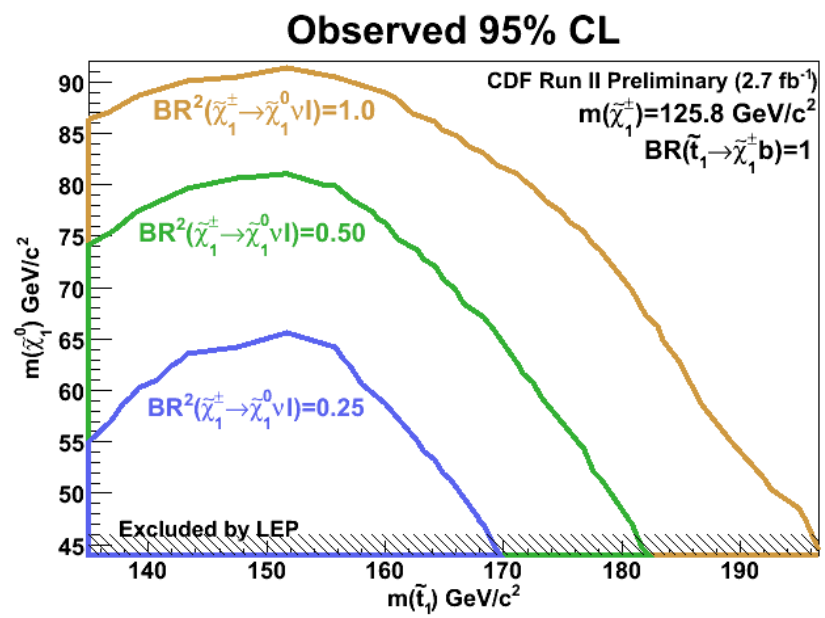
- Chargino leptonic BR depends on slepton sneutrinos masses
- First limits in this mode



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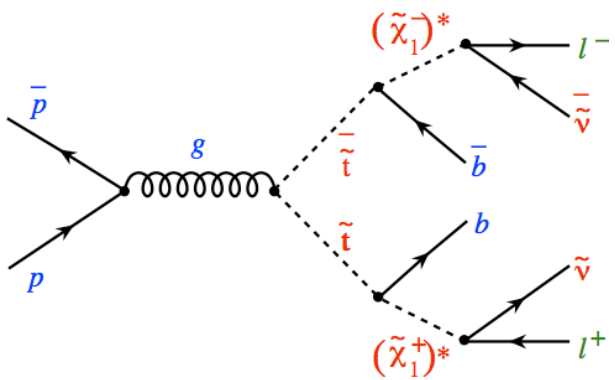
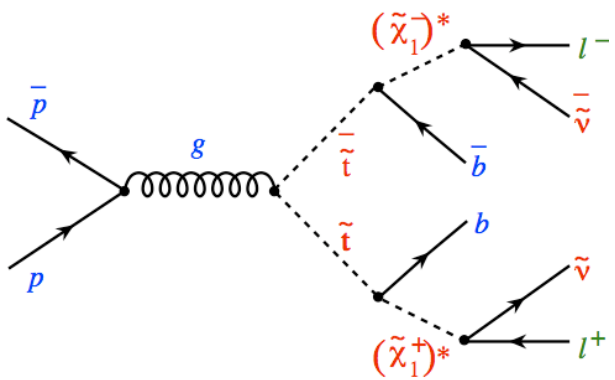



- Assume sneutrino is LSP

# Search for stop quark




- Assume sneutrino is LSP
- Dedicated dilepton triggers
- Two low-$P_T$ leptons (e OR $\mu$) , $P_T$ > 10 and 5 GeV
- At least one jet , $E_T$ > 15 GeV
- Significant missing $E_T$ > 30 GeV

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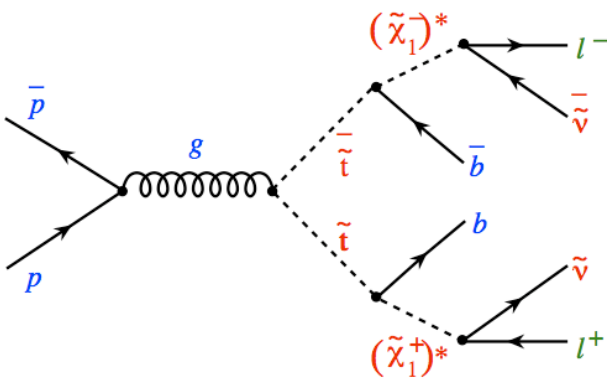


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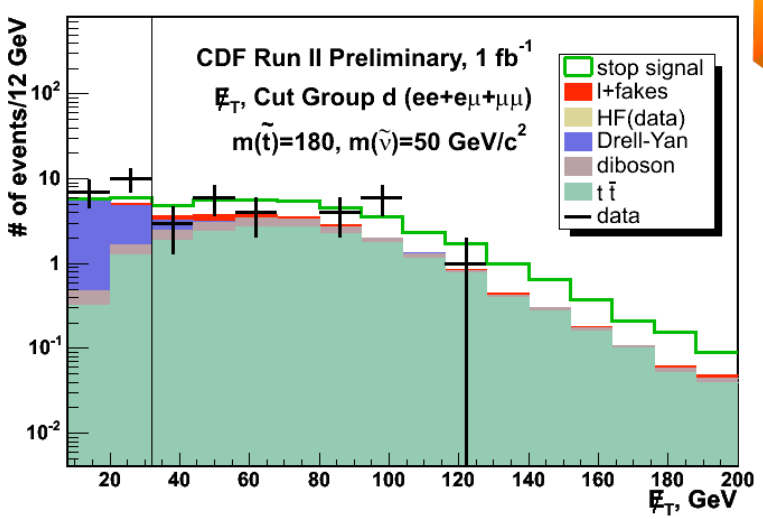
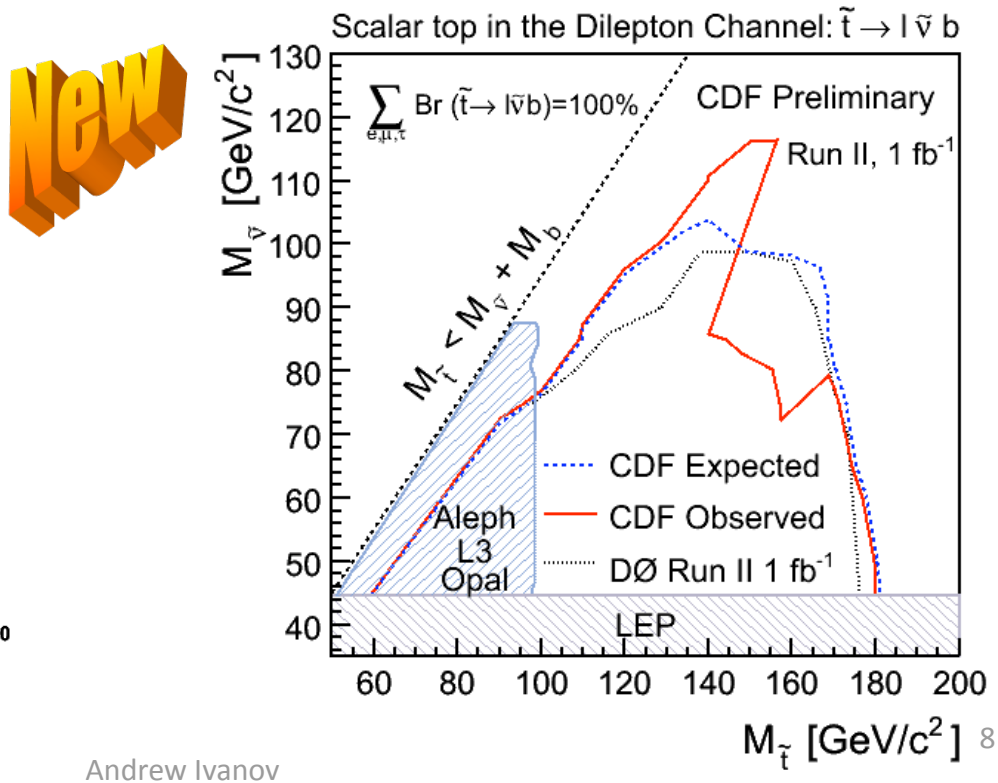
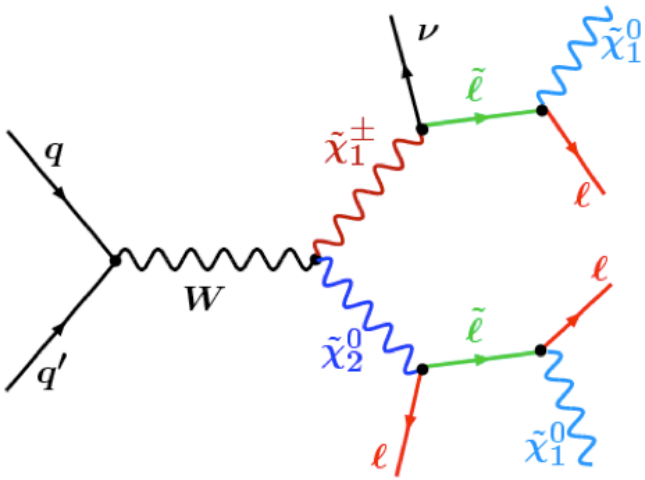


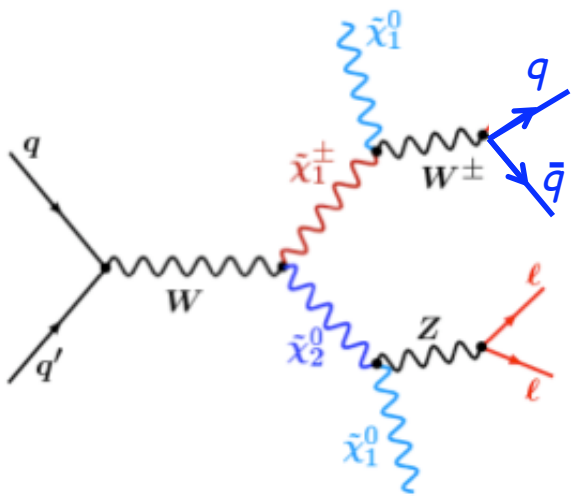



# Search for Chargino-Neutralino Production




- Expect trilepton + missing $E_T$ signature
- Discussed earlier this morning

# Search for Chargino-Neutralino Production




- In case of high $m_0$ (heavy sleptons / sneutrinos)
  - Expect on-shell W and Z
- Select two leptons making Z peak
- and at least two jets peaking at W mass
- Require large missing $E_T > 40$ GeV
- Main background is Z + jets

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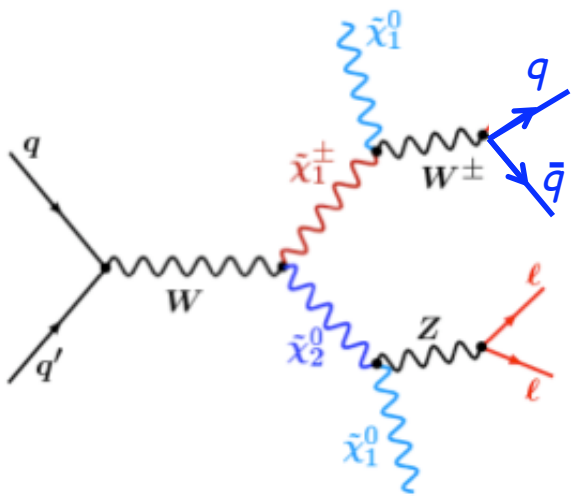


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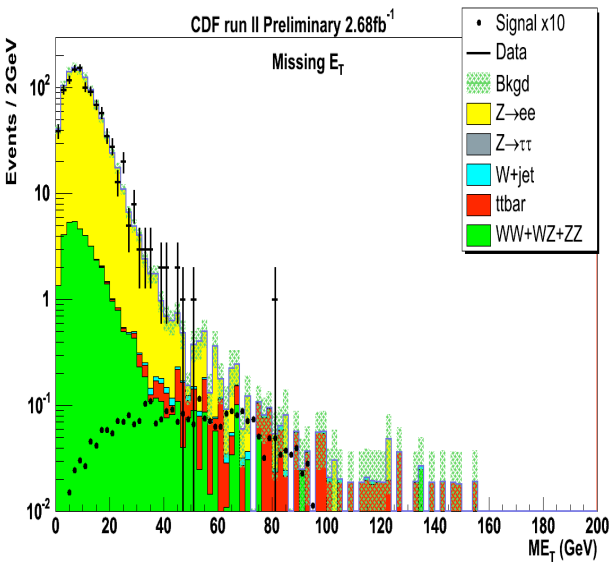
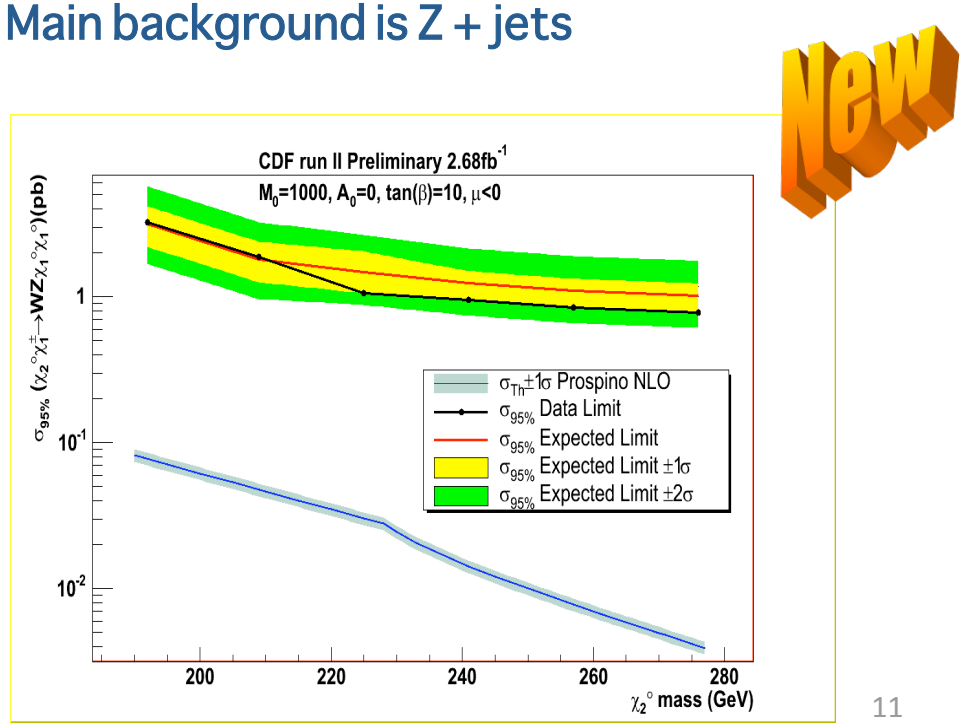
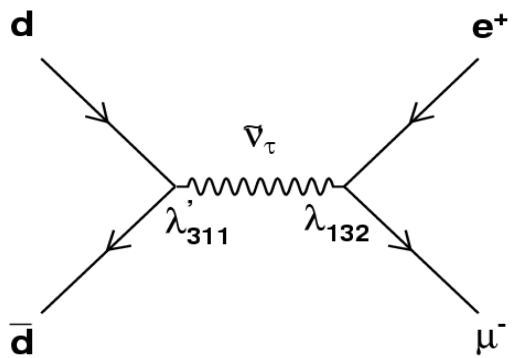
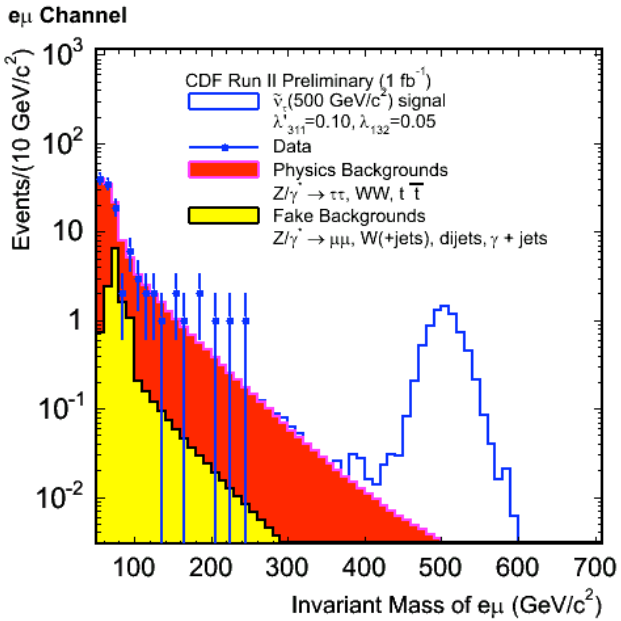


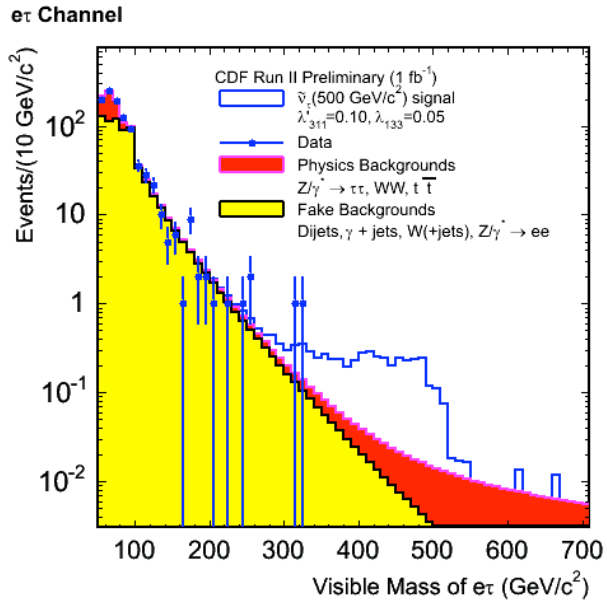



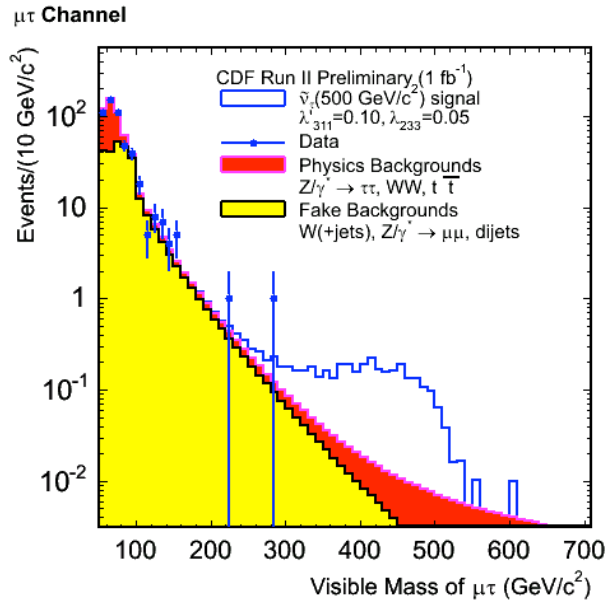
# Search for scalar neutrino



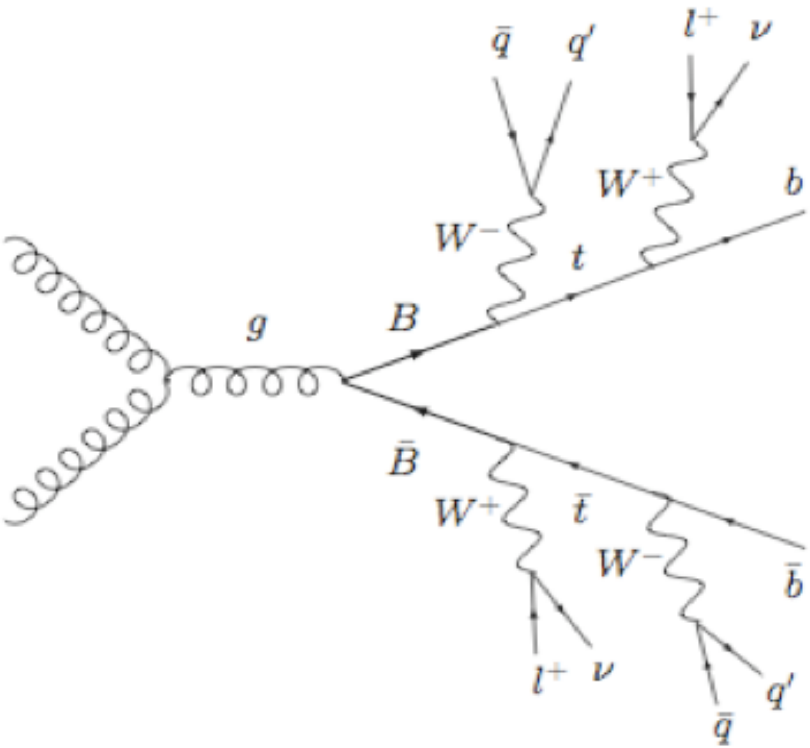

- R = (-1) $^{3B+L+2S}$ violation scenario
- If realized, expect a prominent peak at dilepton (different flavor) invariant mass distribution
- Set limits on λ couplings



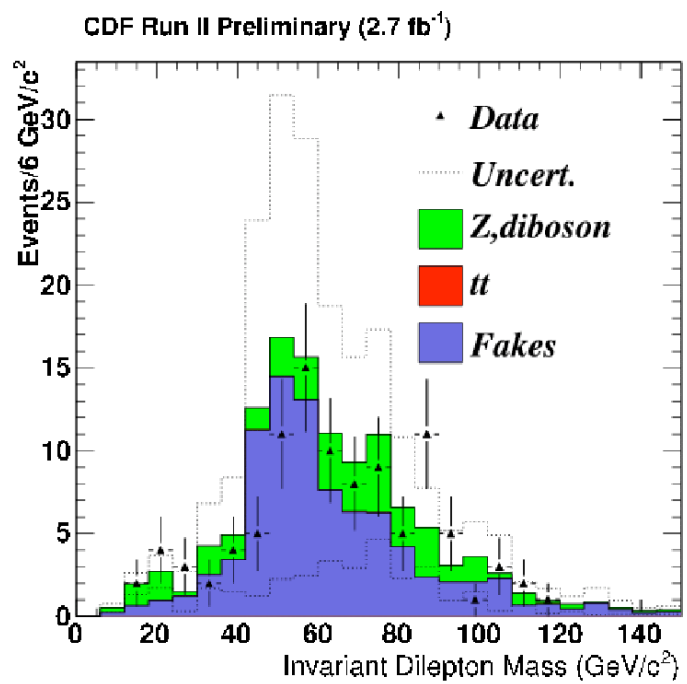



# Search for 4-th generation down-type quark (b′)




$$Q\bar{Q} \rightarrow (tW^{\mp})(\bar{t}W^{\pm})$$

- Require two same-sign leptons
- Plus jets with at least one b-tag




Control Region: e-mu
Low missing $E_T$, no b-tag

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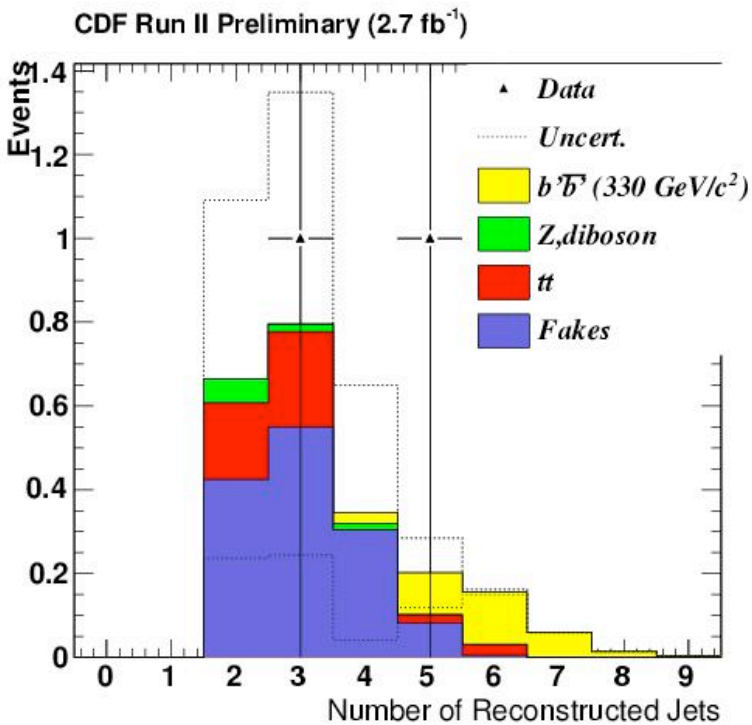
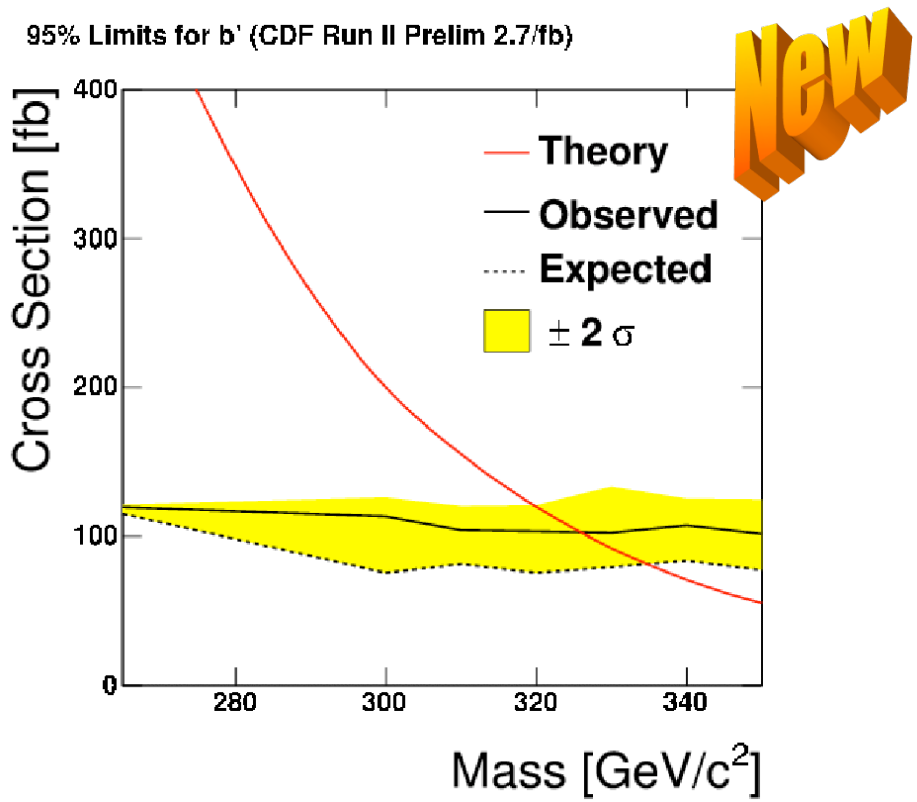



**$m_{b'}$> 326 GeV at 95% C.L.**

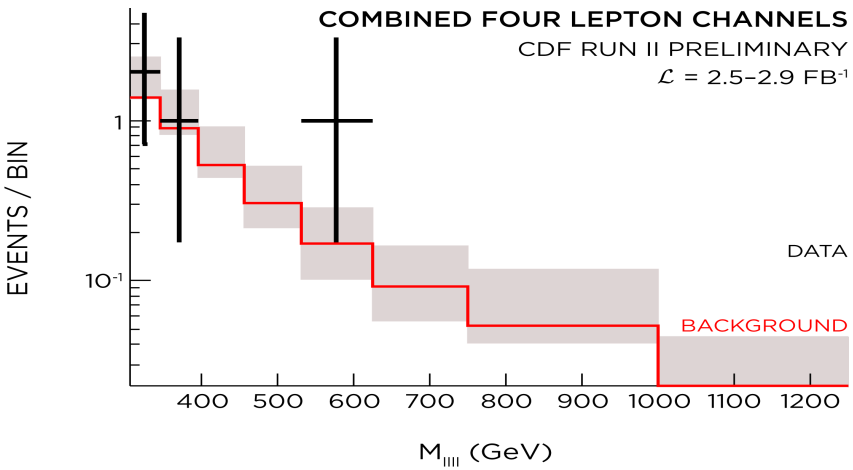
# Summary

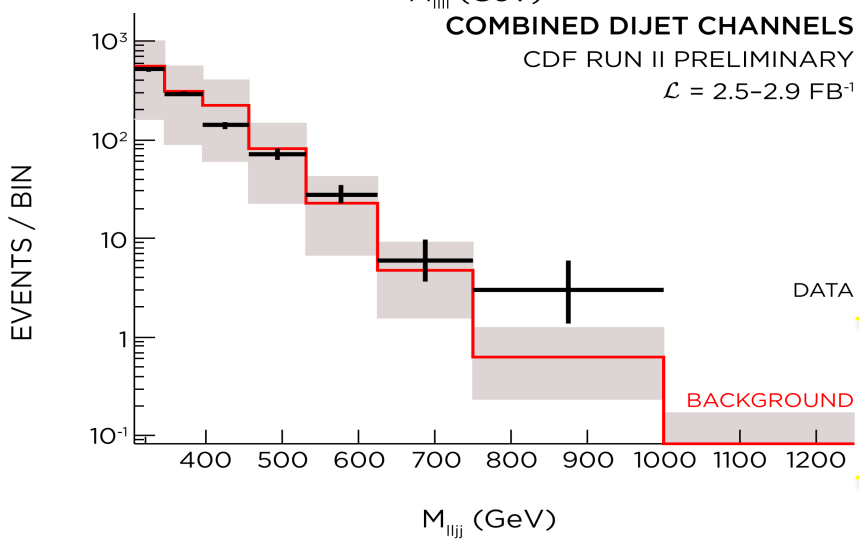
- Tevatron is running well with over 5 $fb^{-1}$ collected and counting
- Tevatron experiments search for new physics in a variety of signatures
- Most recent searches in dilepton final states from CDF presented
- So far results are frustratingly consistent with SM
- 
- Find these and future results at:
  - http://www-cdf.fnal.gov/physics/exotic/exotic.html

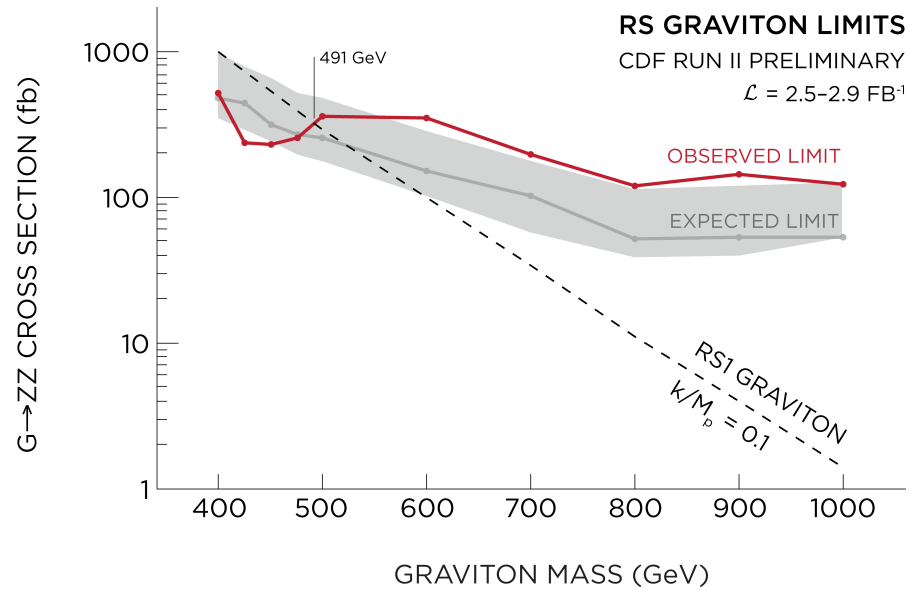
# Thank You!

# Diboson Resonance Searches

- X->ZZ->4 leptons and 2 lepton+2jets
- With improved forward track reconstruction and more efficient identification




**$m_G$> 491 GeV ($k/M_p$=0.1) at 95% C.L.**