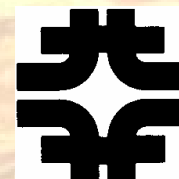
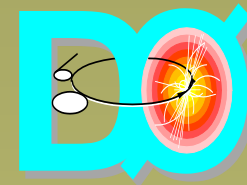


Tevatron Run I SUGRA Results

*On the behalf of the
CDF and DO Collaborations*

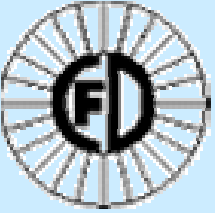




Outline

- *RPV mSUGRA stop search in tau channels (CDF)*
- *RPV mSUGRA search in muon channels (DØ)*
- *Search for Resonant Slepton in RPV mSUGRA (DØ)*
- *mSUGRA in single electron channel (DØ)*
- *Stop decay in 3-4 bodies (DØ):*





RPV mSUGRA Search in Decays of Stop Pair

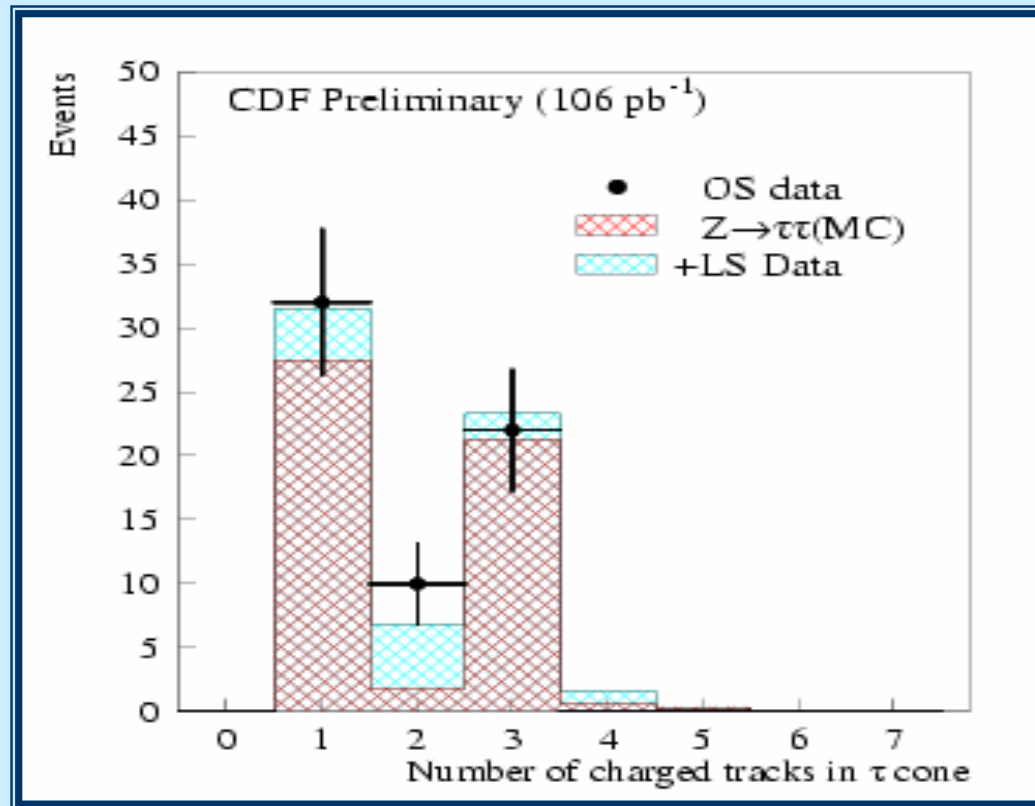
- Stop pair are produced thru RPC
- Assuming RPV only in the 3rd generation():

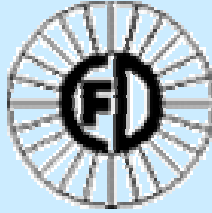
$$\tilde{t}\tilde{t} + X \rightarrow \tau_1 + b + \tau_h + \bar{b} + X$$

Signal	Backgrounds
2 taus + 2b's	Z, γ^* ($\tau\tau$) + jets W (e ν , $\mu\nu$) + jets W ($\tau\nu$) + jets Diboson Multijet

τ_h selection (106 pb^{-1}):

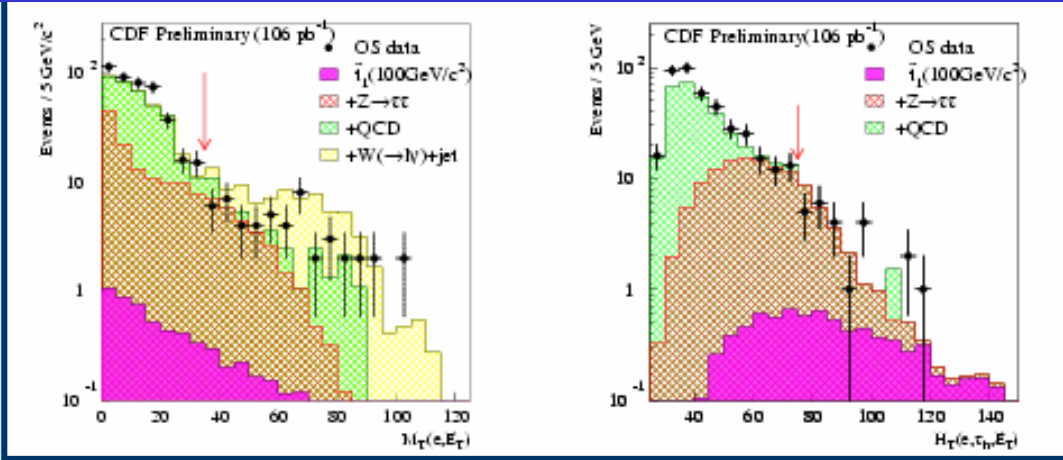
- τ_h : cluster $P_T > 15 \text{ GeV}/c$, $|\eta| < 1.0$
- τ_h ID: number of tracks and π^0 in a narrow cone, isolation energy, etc.





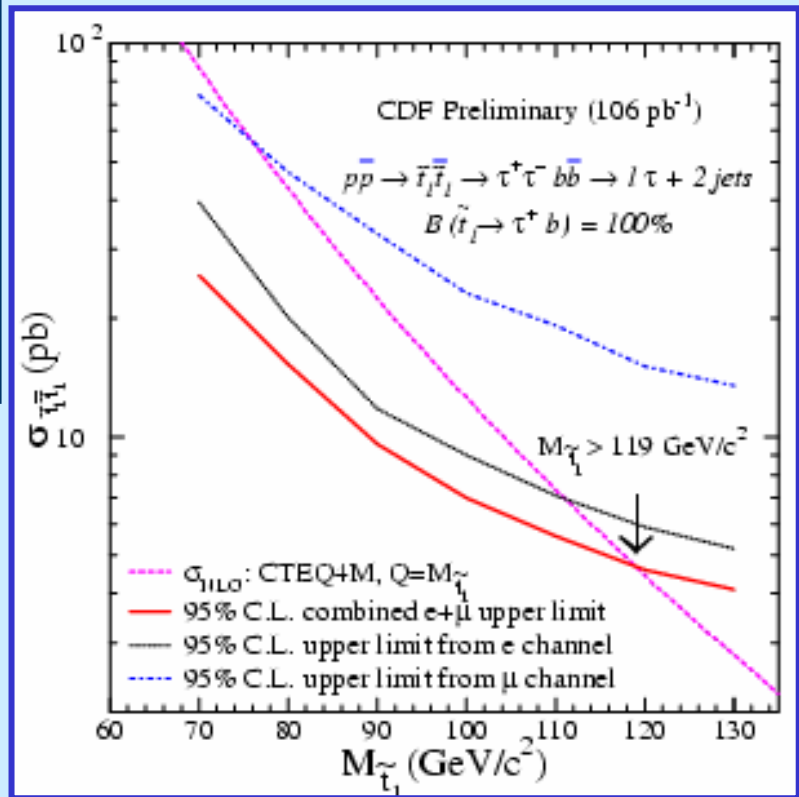
Additional Selections:

$$M_T(\text{lepton}, \cancel{E}_T) < 35 \text{ GeV}/c^2 \quad H_T(\text{lepton}, \tau_h, \cancel{E}_T) > 70 \text{ GeV}$$



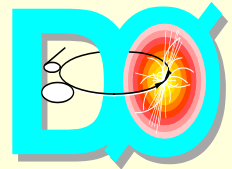
$\geq 2 \text{ jets: } E_T > 15 \text{ GeV}$

channel	Background	Events
e	1.92 ± 0.18	0
μ	1.13 ± 0.13	0



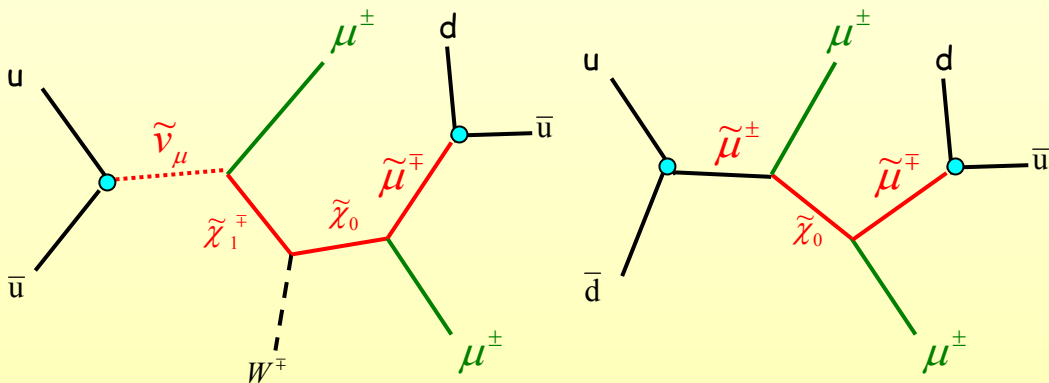
ALEPH Limit: $m_{\tilde{\tau}} > 93 \text{ GeV}/c^2$





Search for Resonant Slepton in RPV $mSUGRA$ (λ'_{211})

- Dominant coupling λ'_{211}
- Resonant $\tilde{\mu}$ or $\tilde{\nu}_\mu$ production;



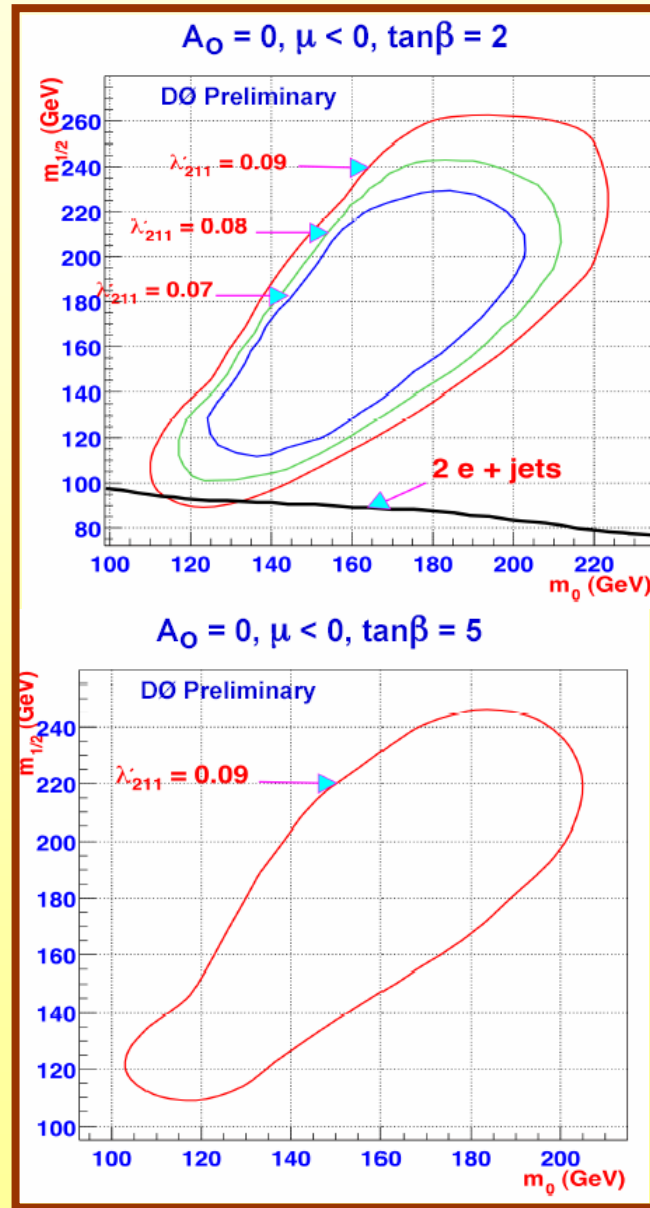
Signature	Backgrounds
$\geq 2\mu + \geq 2 \text{ jets}$	Drell-Yan, $t\bar{t}$, $Z+2\text{jets}$, $WW+\text{jets}$

$E_T^j > 20 \text{ GeV}$ (2 jets), $p_T^\mu > 20 \text{ GeV}/c$
 $|\eta^j| < 2.5, |\eta^{\mu_1, \mu_2}| < 1.0, 1.7$
 $H_T > 50 \text{ GeV}$
 cosmic rays removal



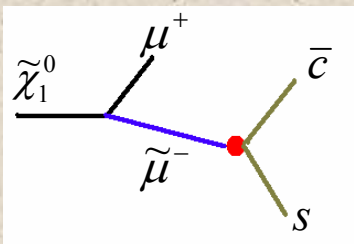
$\int L dt = 94 \text{ pb}^{-1}$

$Z+2\text{jets}$	4.8
$t\bar{t}$	0.53
Total bg	5.34 ± 0.07
Obs.	<u>5</u>



Search for Resonant Slepton in RPV $mSUGRA$

- $SUSY$ particles pair produced
- one dominant coupling λ'_{2jk} ($j=1,2; k=1,2,3$)
- only the LSP have RPV decay ($\mu j' j''$)



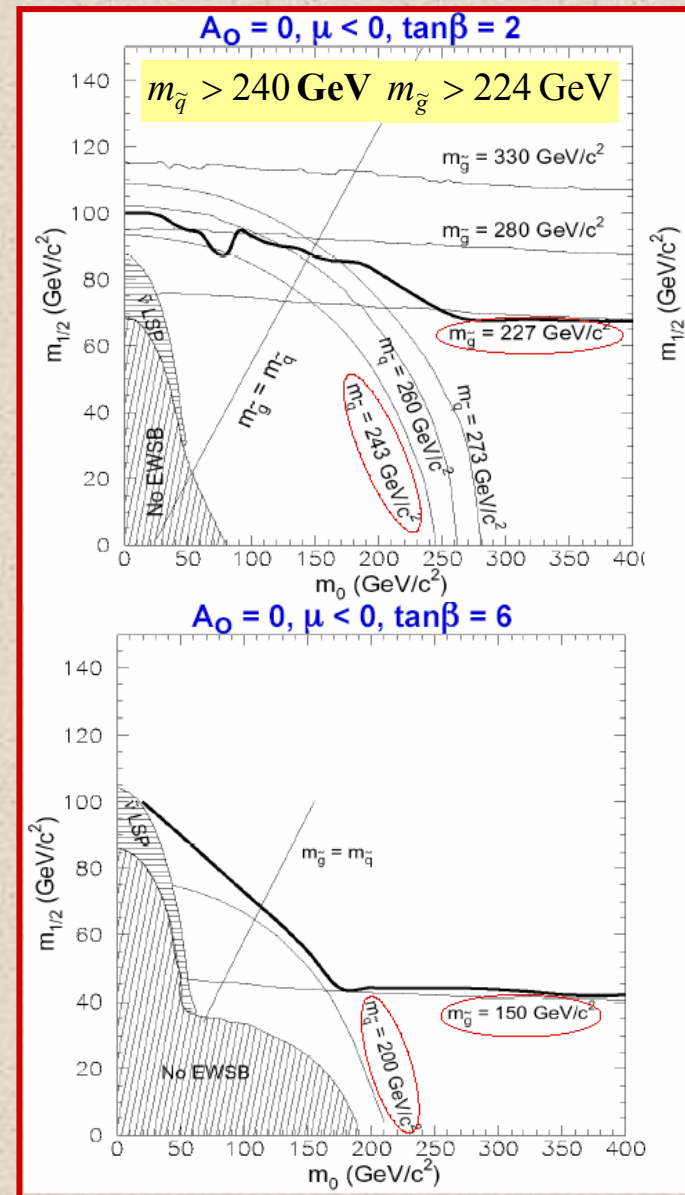
Signature	Backgrounds
$\geq 2\mu + \geq 4 \text{ jets}$	Drell-Yan, $t\bar{t}$, $W \rightarrow \mu\mu$, $Z \rightarrow \tau\tau \rightarrow \mu\mu$

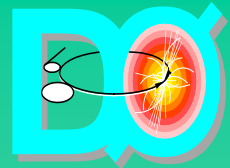
$E_T^j > 15 \text{ GeV}$ (4 jets)
 $p_T^{\mu_1, \mu_2} > 15, 10 \text{ GeV}/c$
 $|\eta^j| < 2.5, |\eta^{\mu_1, \mu_2}| < 1.0, 1.7$
 $H_T^{\mu, j} > 150 \text{ GeV}$
 Aplanarity > 0.03
 $M_{\mu_1, \mu_2} > 5 \text{ GeV}$



$\int L dt = 77.5 \text{ pb}^{-1}$

Z+jets	0.14 ± 0.03
$t\bar{t}$	0.04 ± 0.01
Total bg	0.18 ± 0.04
Obs.	<u>0</u>



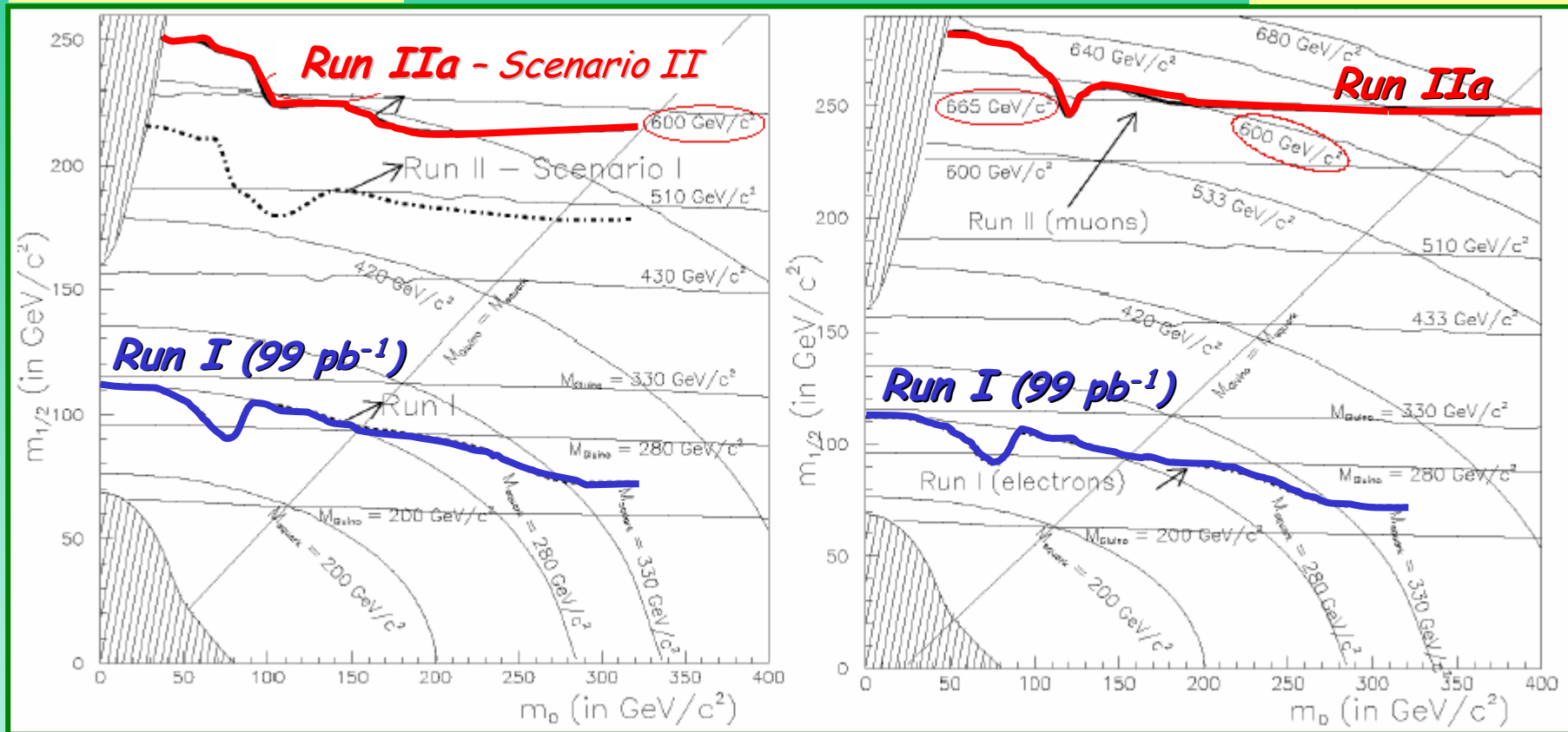


Dilepton channel il Run 2a

$$A_0 = 0, \mu < 0, \tan \beta = 2$$

electron channel

muon channel



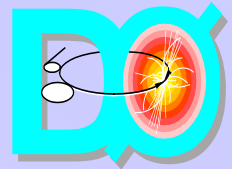
Scenario I → Luminosity Extrapolation from Run 1 results

Scenario II → (I) taking into account Detector upgrades

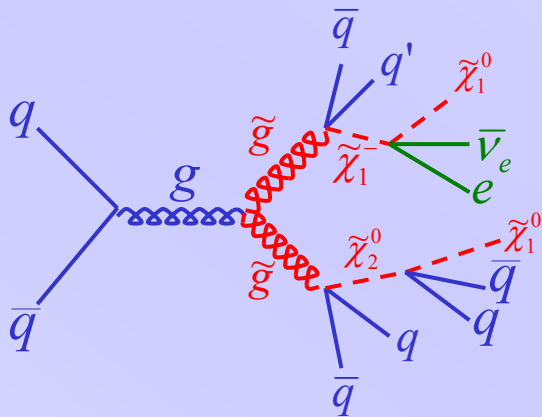


$$\tilde{m}_{\tilde{g}} \sim 550 \text{ GeV}$$

$$\tilde{m}_{\tilde{q}} \sim 500 \text{ GeV}$$



Search for RPC mSUGRA in single e Channel



- Sensitive to moderate m_0 region; complements dilepton, jets+ \cancel{E}_T searches.

$$E_T^e > 20 \text{ GeV}$$

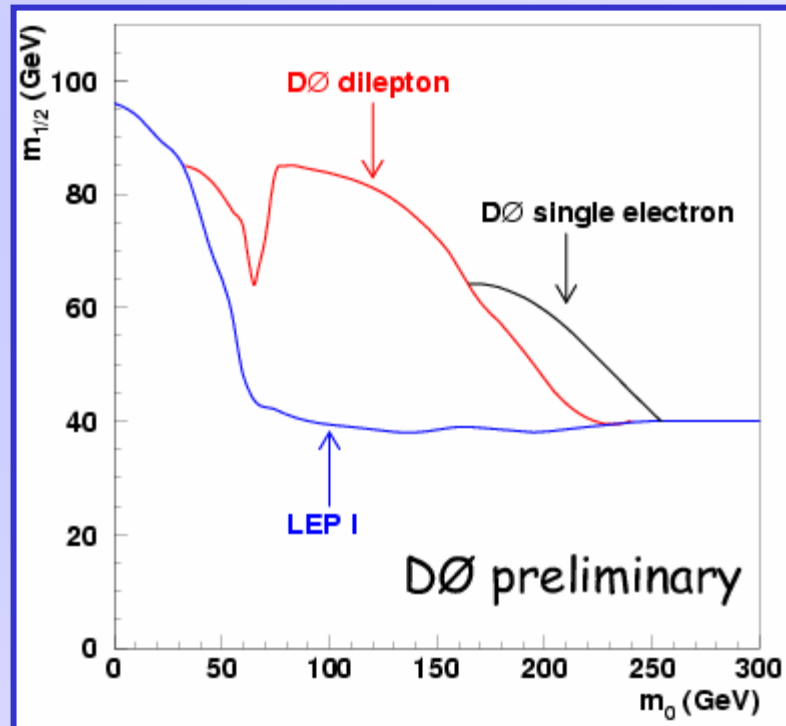
$$E_T^j > 15 \text{ GeV (4 jets)}$$

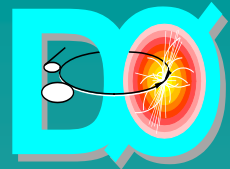
$$\cancel{E}_T > 25 \text{ GeV}$$

$$\int L dt = 92.7 \text{ pb}^{-1}$$

Used Neural Network to further optimize signal significance

$t\bar{t}$	16.8 ± 5.2
$WW + \geq 2 \text{ jets}$	1.4 ± 0.3
Multijet	19.1 ± 4.7
$W + \geq 4 \text{ jets}$	43.0 ± 7.6
Total background	80 ± 10
Observed	72

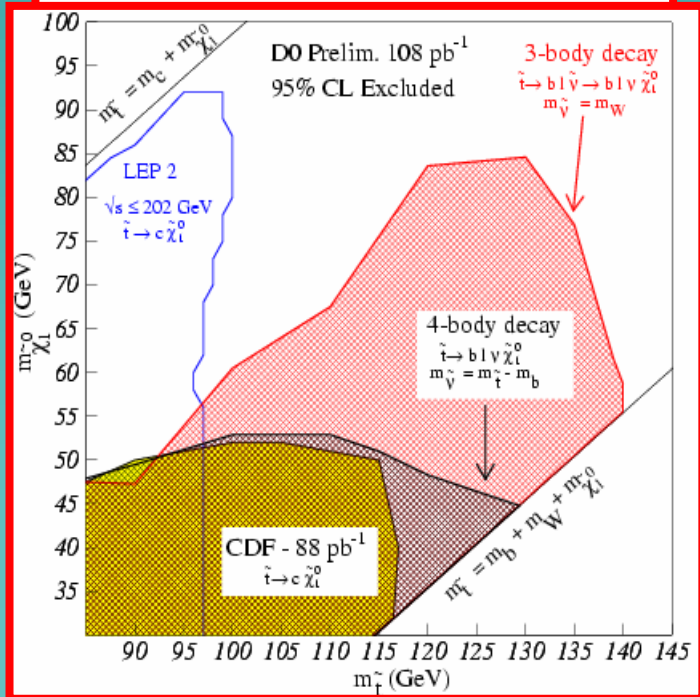
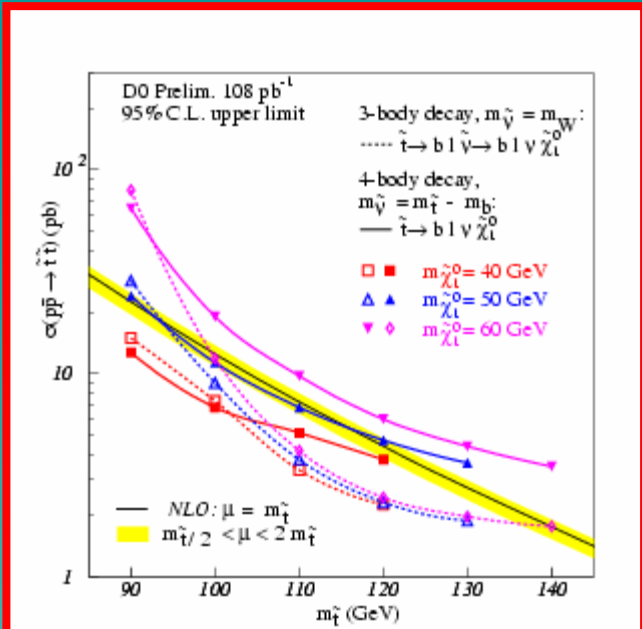
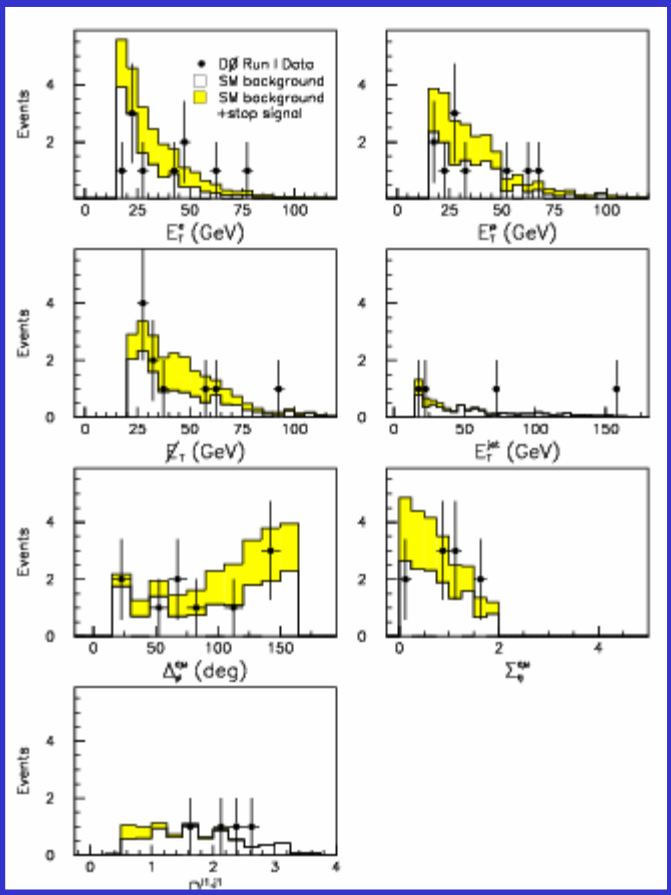




Stop decay in 3-4 body

$\int L dt = 108 \text{ pb}^{-1}$

Signature	Backgrounds
$e + \mu + \text{MET} + \text{jets}$	$QCD \text{ multijet and missID, } WW \rightarrow \mu\nu e\nu, Z \rightarrow \tau\tau \rightarrow e\mu, t\bar{t}, D\bar{Y}$



Conclusions

- *Searches for New Physics in Run I data are still actively being pursued.*
- *Better limits have been achieved recently:*
 - *RPV mSUGRA stop search in tau channels (CDF)*
 - *RPV mSUGRA search in muon channels ($D\emptyset$)*
 - *Search for Resonant Slepton in RPV mSUGRA ($D\emptyset$)*
 - *mSUGRA in single electron channel ($D\emptyset$)*
 - *Stop decay in 3-4 bodies ($D\emptyset$):*