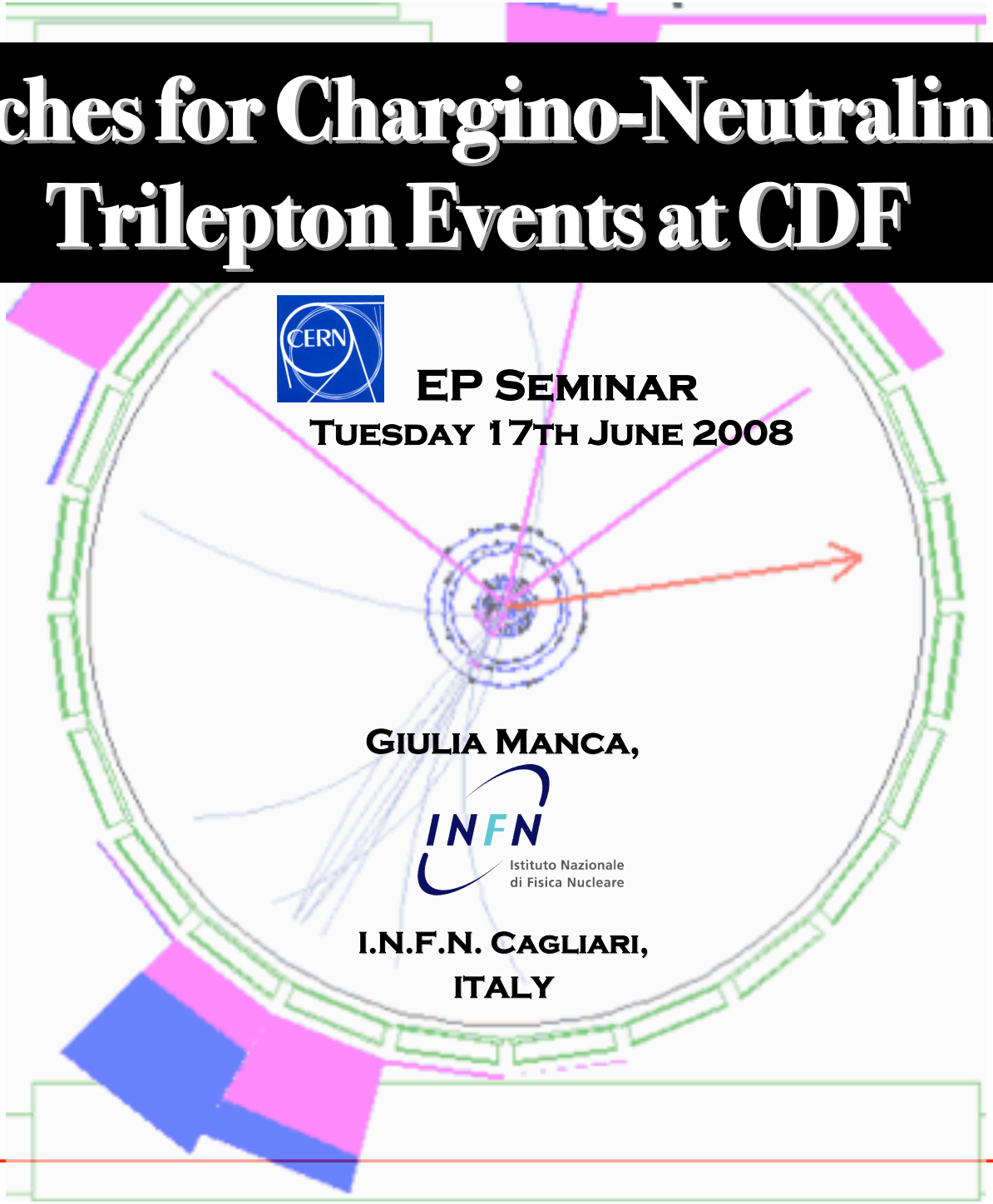
Searches for Chargino-Neutralino in Trilepton Events at CDF



EP Seminar

Tuesday 17th June 2008

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INFN Istituto Nazionale di Fisica Nucleare

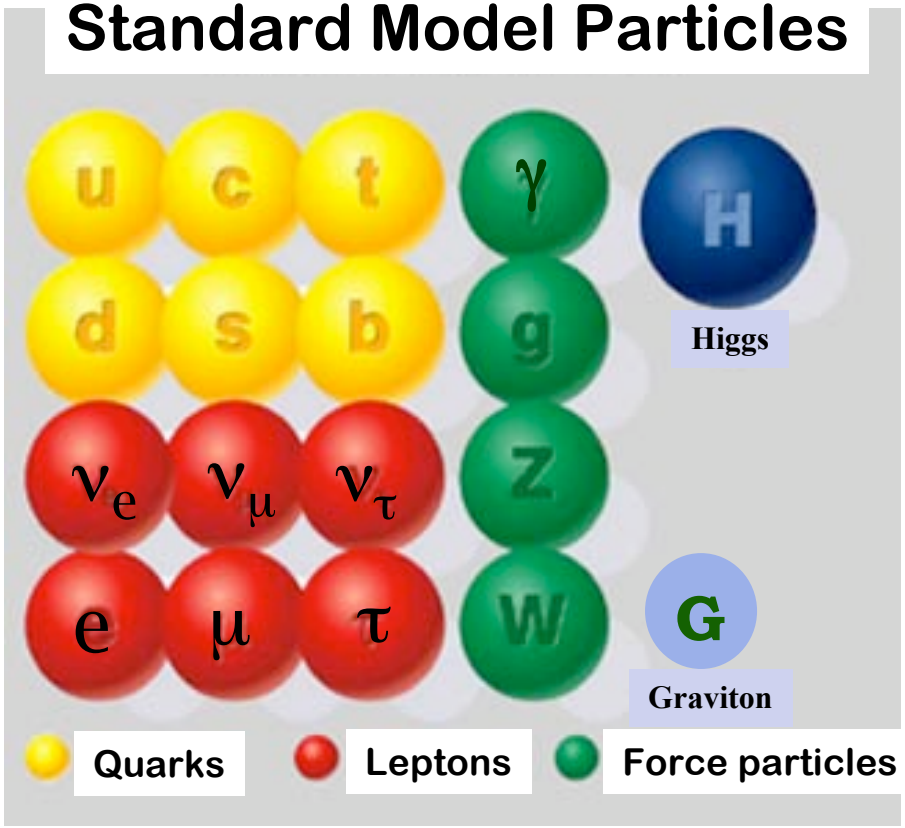
I.N.F.N. Cagliari, Italy

Outline

- Supersymmetry
- Searching for SUSY at CDF
- Chargino and Neutralino
  - Trileptons
  - Dileptons+track
- Results
- Conclusions
- Outlook

Supersymmetry: what ?

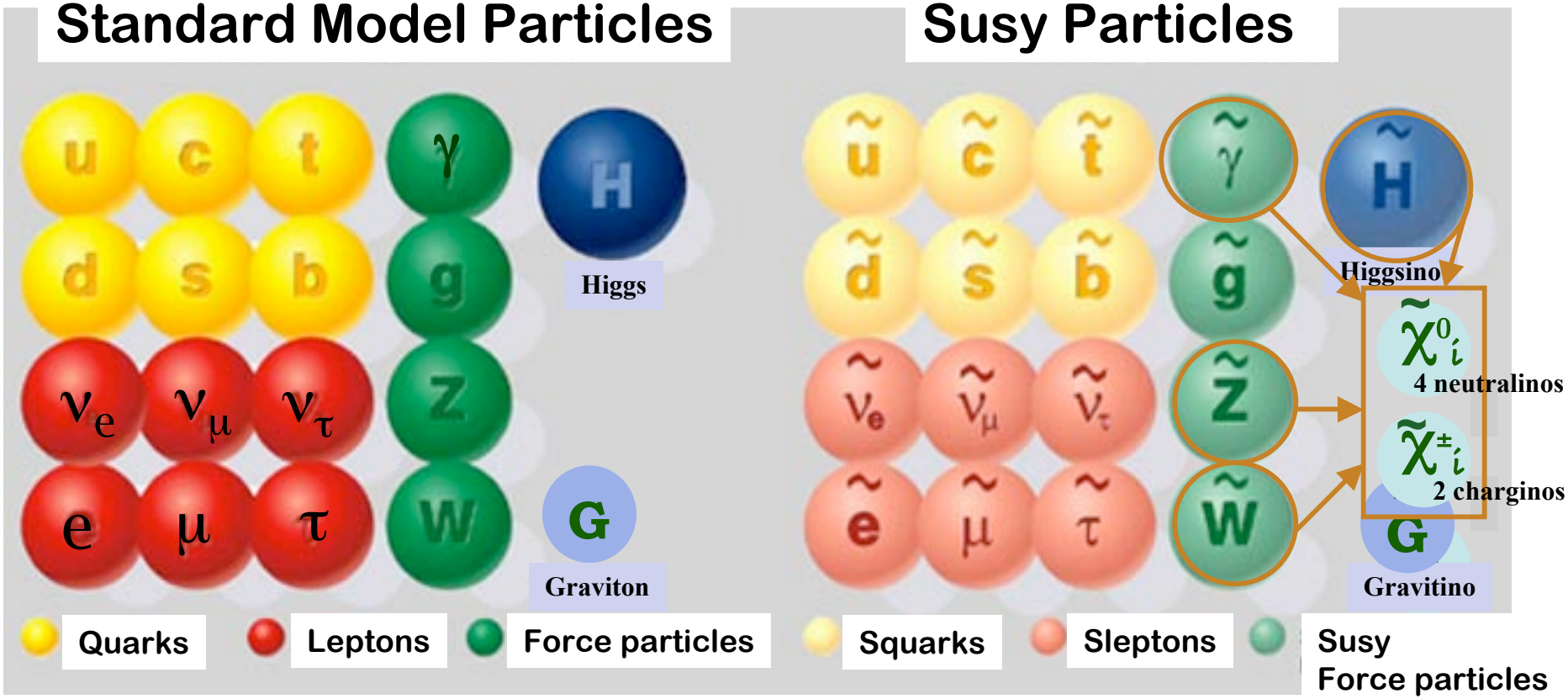
Extends the Standard Model (SM) by predicting a *new symmetry:*
spin-1/2 matter particles (fermions) <=> spin-1 force carriers (bosons)



Supersymmetry: what ?

broken

Extends the Standard Model (SM) by predicting a ***new symmetry:***
spin-1/2 matter particles (fermions) <=> spin-1 force carriers (bosons)



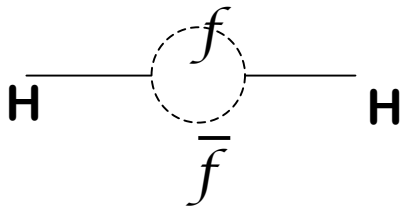
New Quantum Number R-Parity $\Rightarrow R_p = (-1)^{3B+L+2s}$ { +1 (SM particles), -1 (Susy particles)

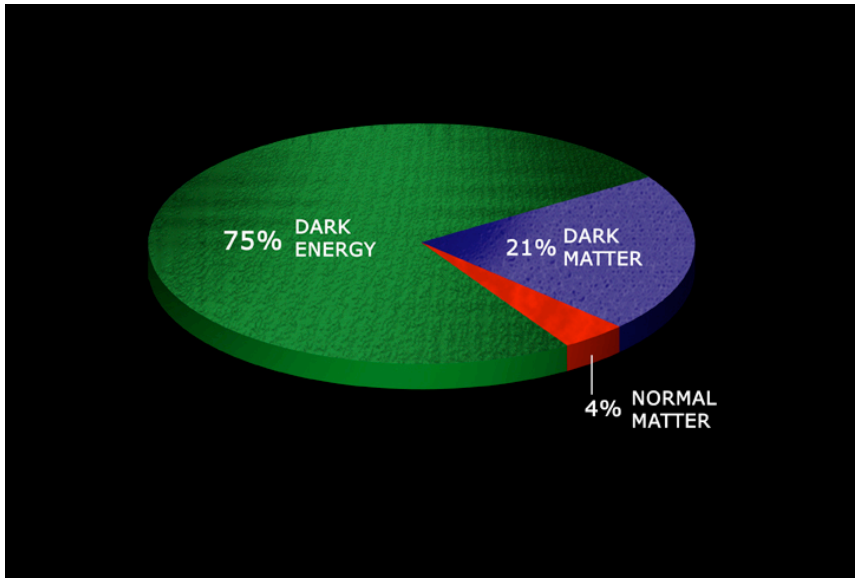
If R_p conserved Lightest SParticle (LSP) stable!

Supersymmetry: why ?

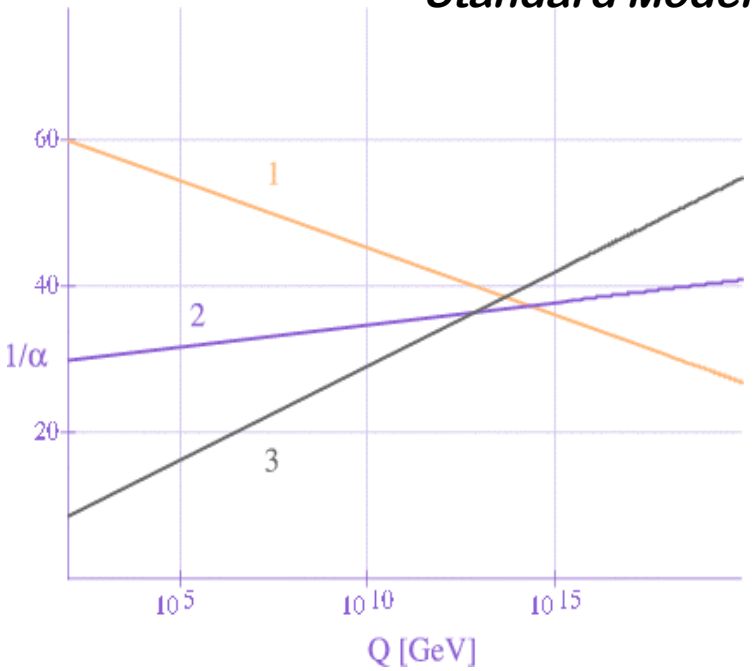
In the Standard Model

- Stabilisation of Higgs mass at EW scale
- Couplings don't unify at one scale
- Dark Matter
- Dark Energy
- Neutrino masses
- Gravity





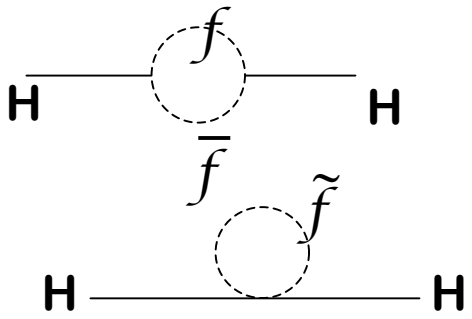
Standard Model

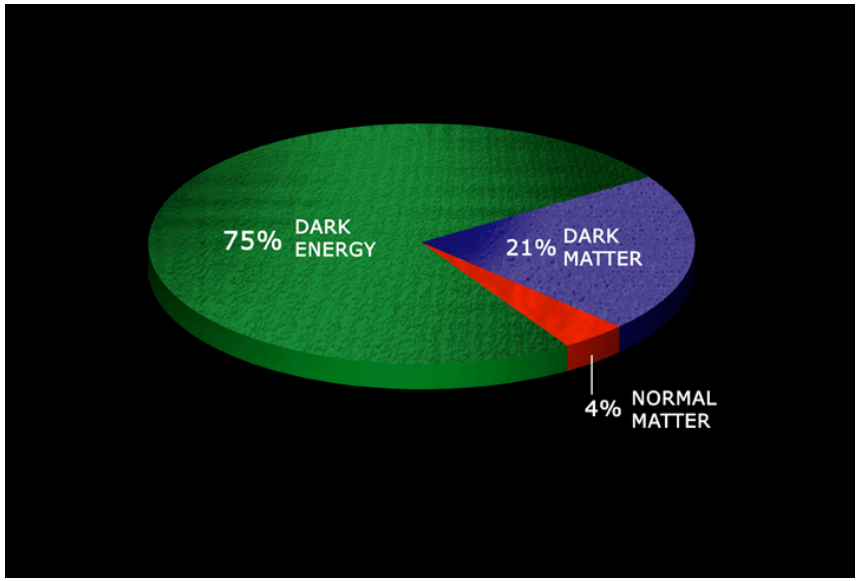


Supersymmetry: why ?

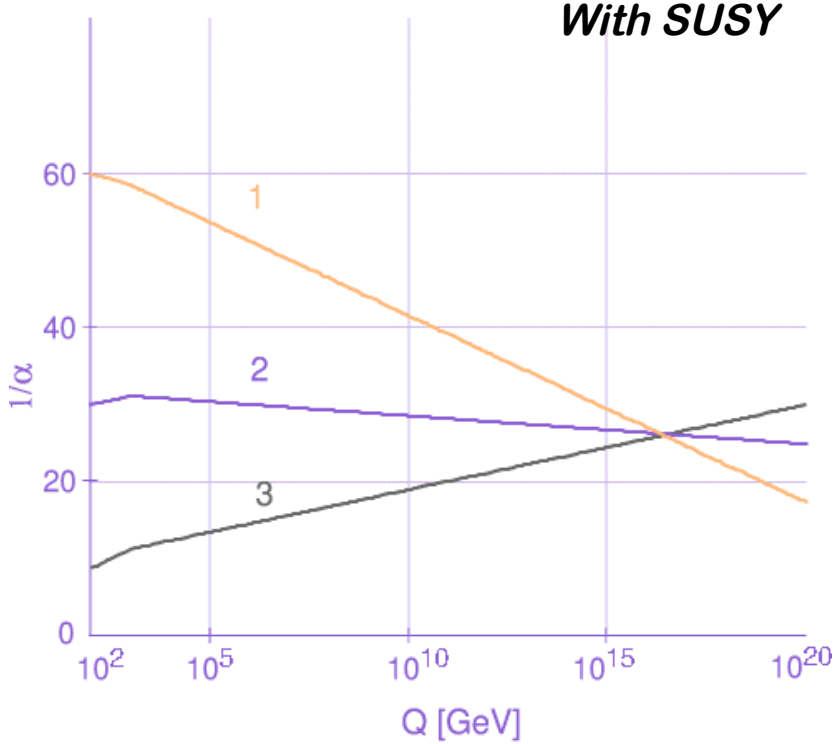
SUSY **In the Standard Model**

- ✓ Stabilisation of Higgs mass at EW scale
- ✓ Couplings don't unify at one scale
- ✓ Dark Matter ->LSP
- Dark Energy
- Neutrino masses
- ✓ Gravity



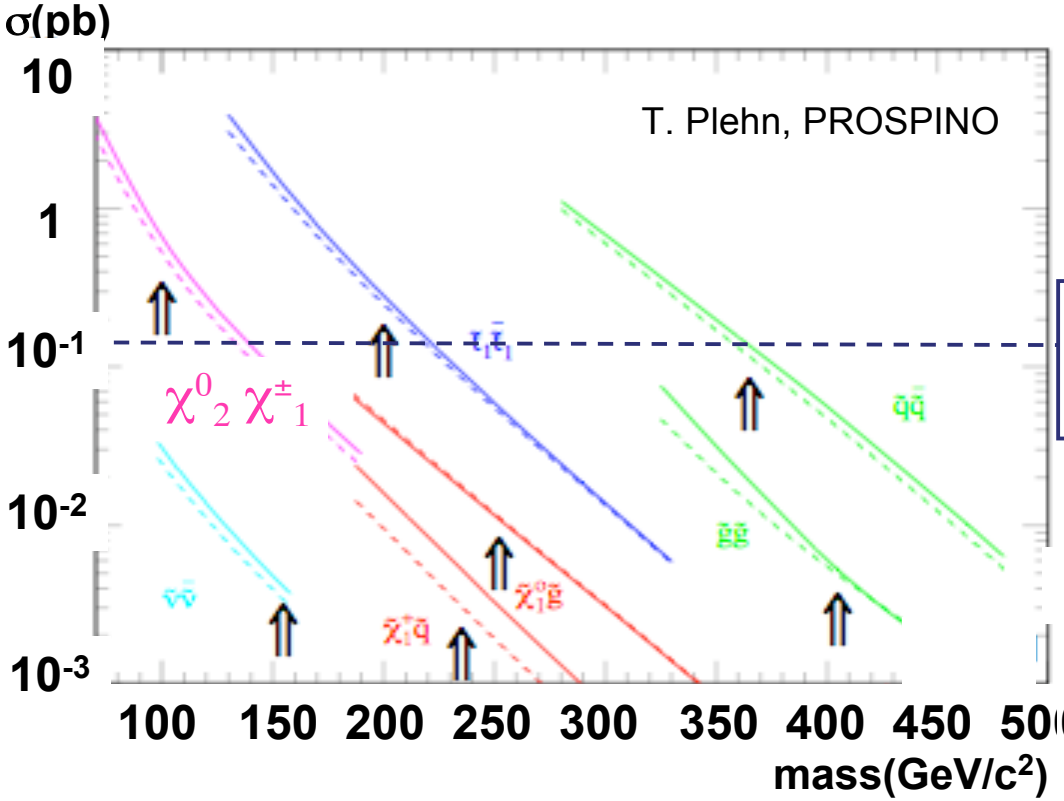


With SUSY

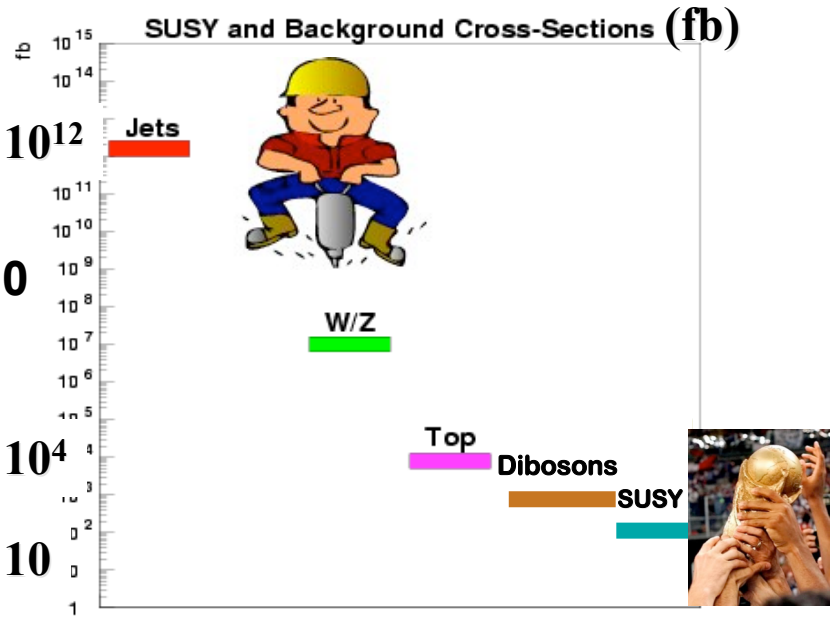


6 Supersymmetry: The Challenge

➡ VERY SMALL cross sections !!



200 events in 2 fb^{-1}



Compared to:
15x10^6 Zs, 14,000 t-antitop and 10,000 WZ

Supersymmetry: how?

Wide range of signatures: look for SUSY specific signatures or excess in SM ones; examples:

R_p :

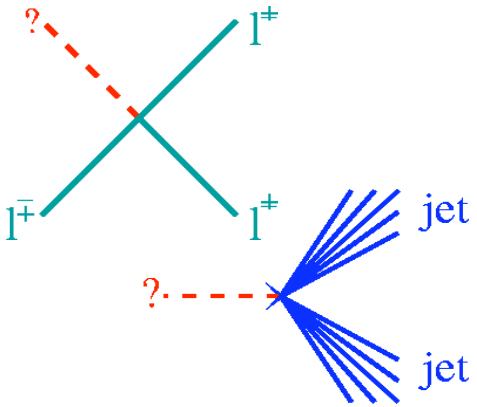
LSP ➡ Large Missing Energy $\not{E}_T$

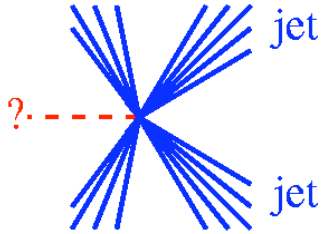
AND:

$\chi^0 \chi^\pm$ ➡ Isolated leptons

$\tilde{q}\,\tilde{g}$ ➡ Multijets

...and many more!



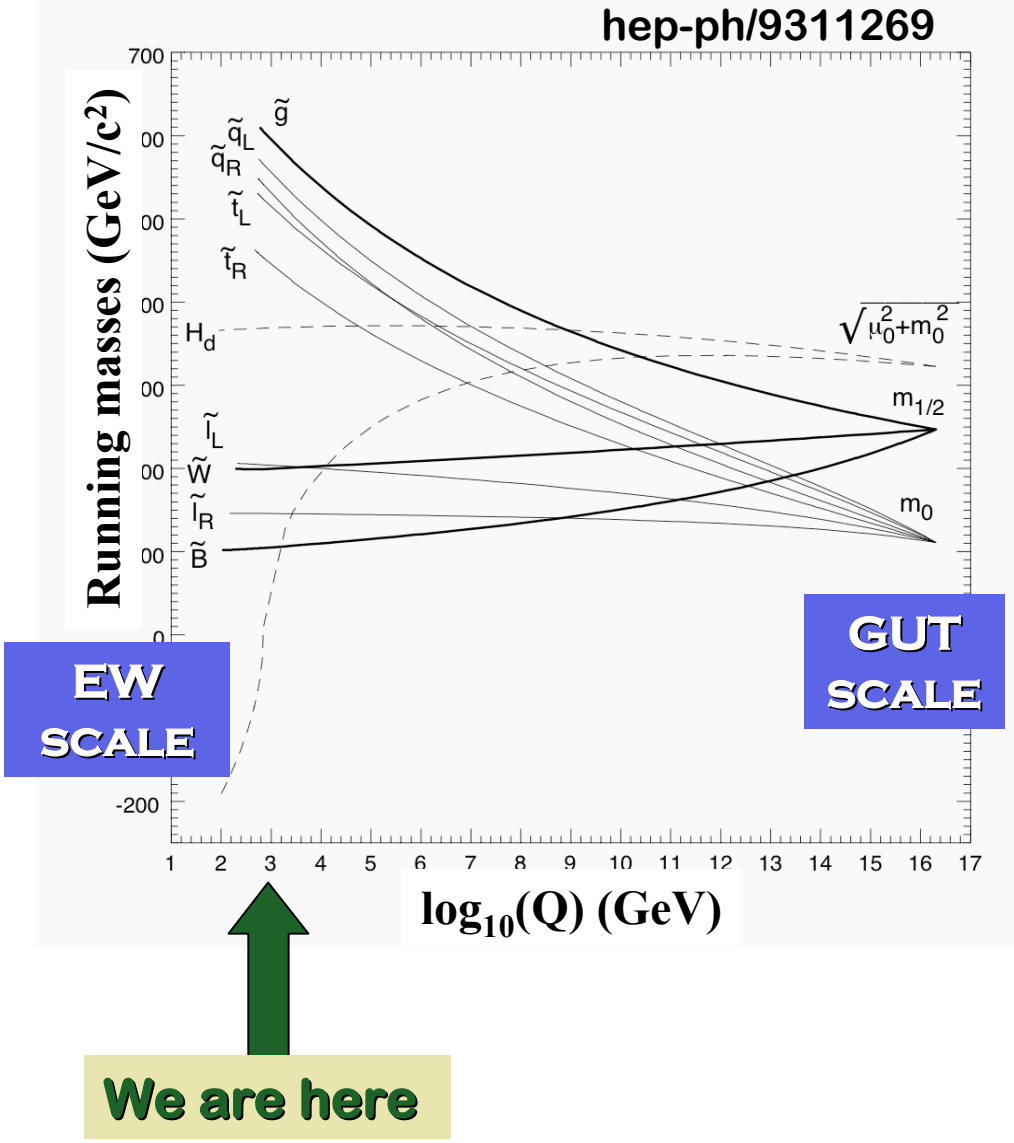


mSugra: a working model

- SUSY broken through gravity
- Five parameters:
  - m_0:common scalar mass at GUT scale
  - $m_{1/2}$:common gaugino mass at GUT scale

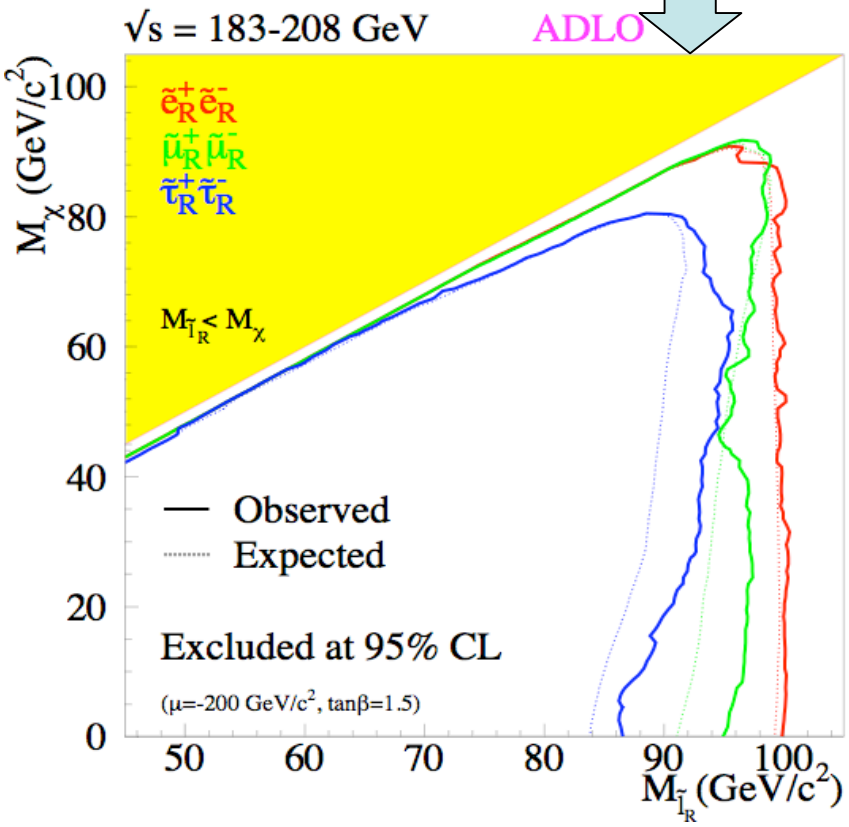
    (i.e. $M_1(GUT)=M_2(GUT)=M_3(GUT)= M_{1/2}$)
  - A_0: common trilinear scalar interaction at the GUT scale (Higgs-sfermion$_R$-sfermion$_L$)
  - tanβ: ratio of Higgs vacuum expectation values
  - Sign(μ), the higgsino mass parameter

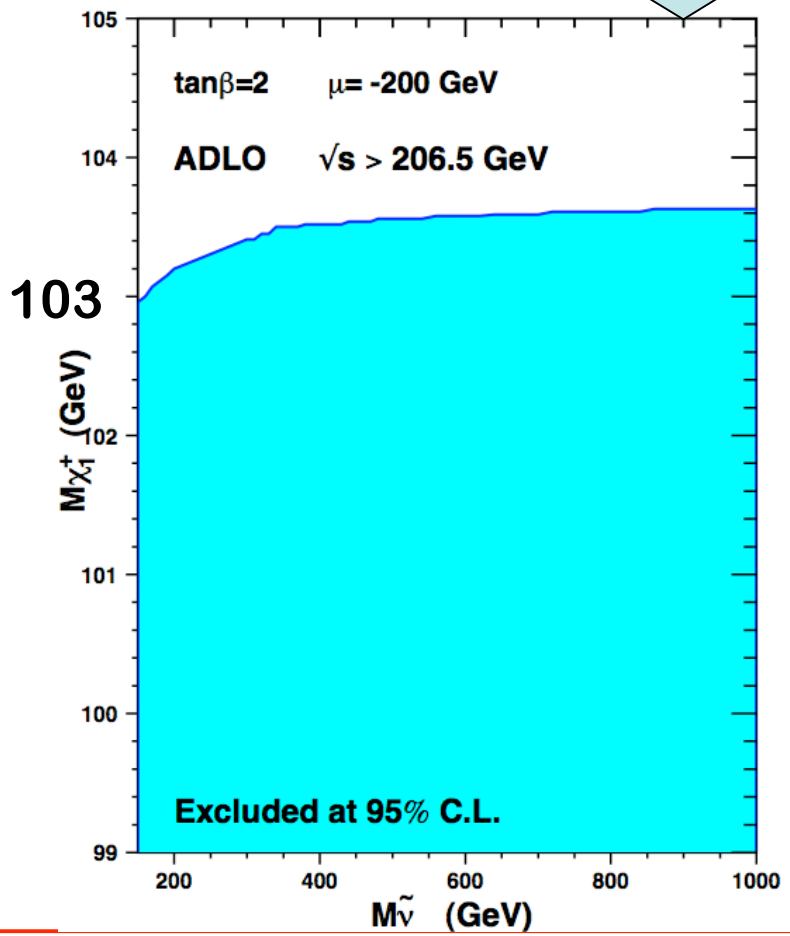
    (μ^2 determined by EWSB)
- Lightest supersymmetric particle(LSP) is the χ^0_1, stable



mSugra Existing Limits : LEP

- LSP > $M_Z/2$
- Chargino > 103 GeV/c^2 (heavy sneutrinos);
- Sleptons > 90-100 GeV/c^2 for $M(\chi_0^1) < M(\ell_R)$;





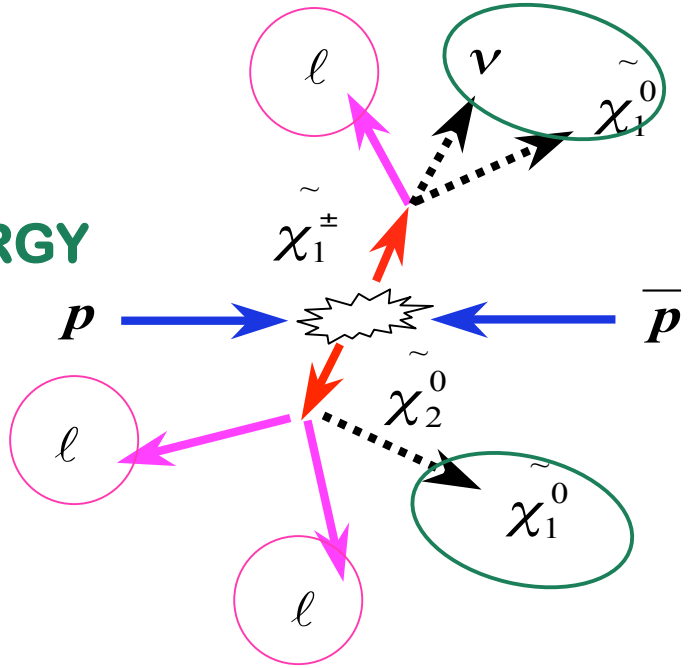
Searching for Chargino and Neutralino at

The signature

Chargino-Neutralino production :
Striking signature

THREE ISOLATED LEPTONS

If R_p conserved,
LARGE MISSING TRANSVERSE ENERGY
from the stable LSP+ν



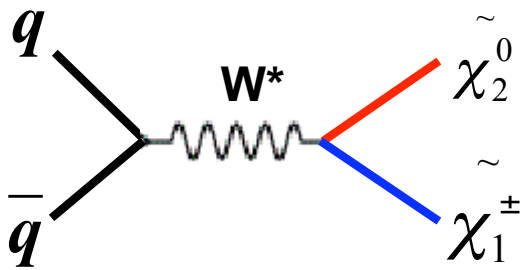
- Low background
- "Easy" to trigger

LITTLE MODEL DEPENDENCE

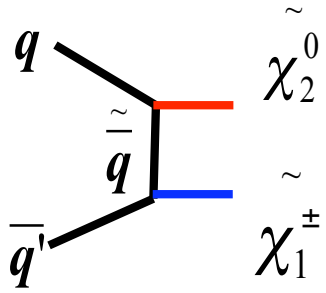
GOLDEN SIGNATURE AT THE TEVATRON !!

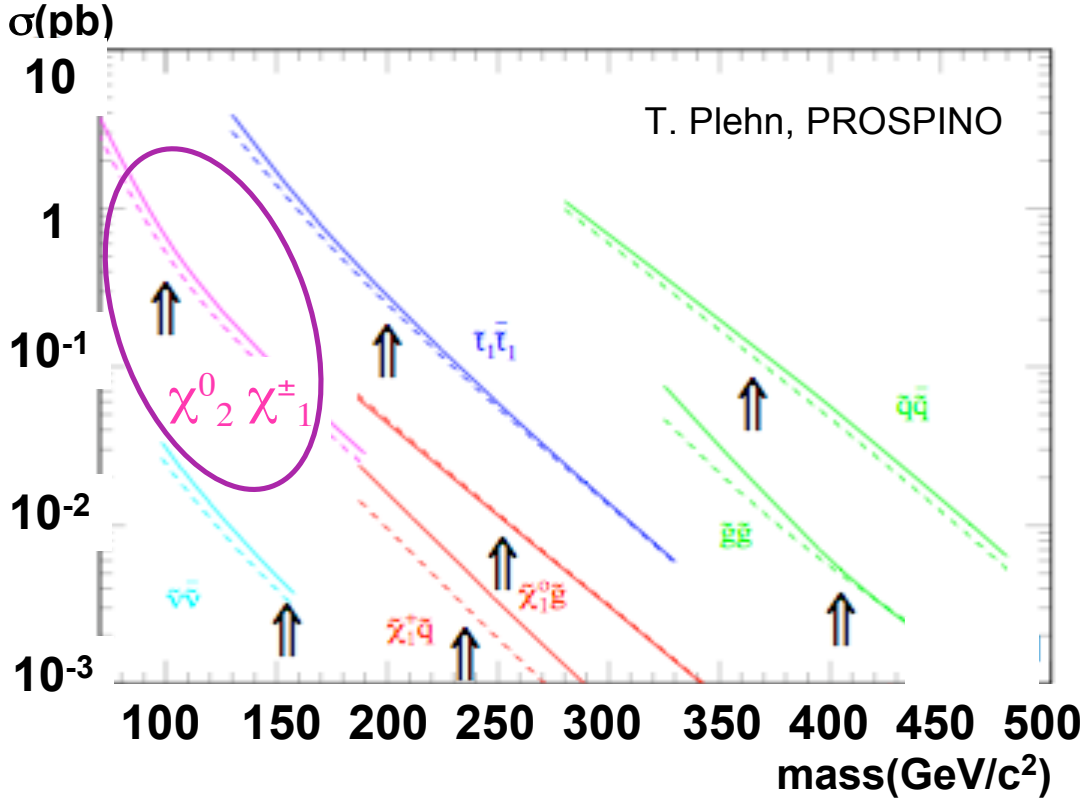
Chargino-Neutralino production...

- Low cross section (weakly produced)



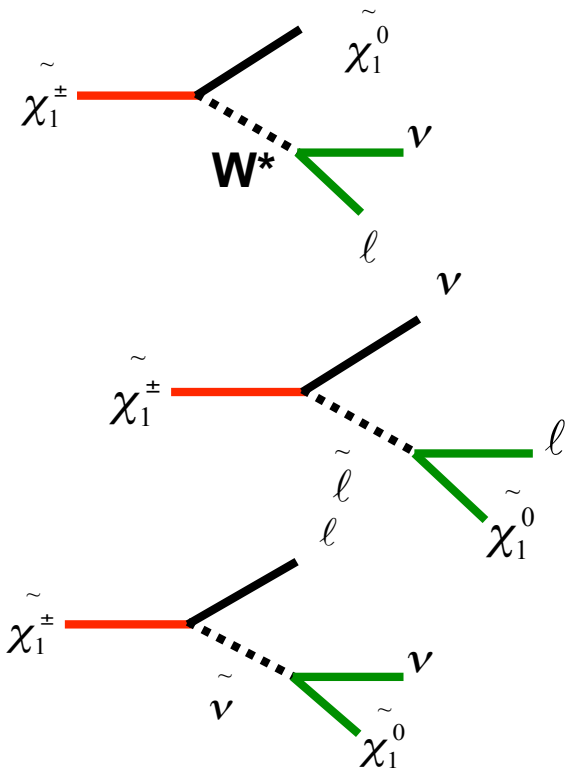
t-channel interferes destructively



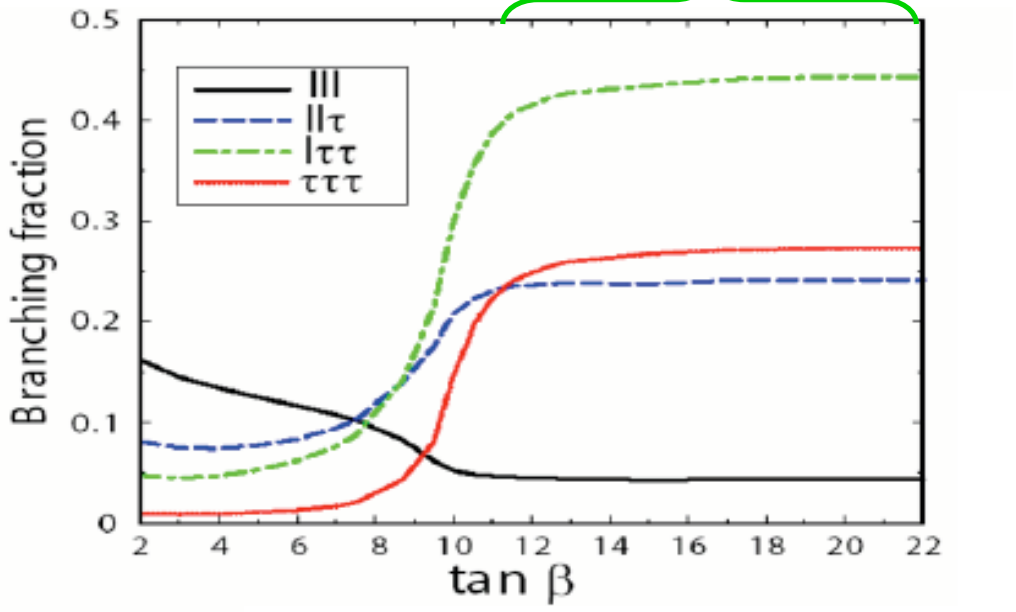


...and decay

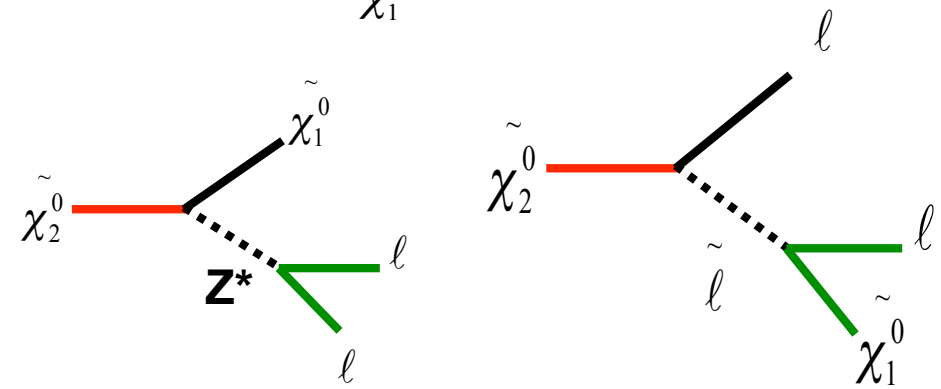
Chargino Decay

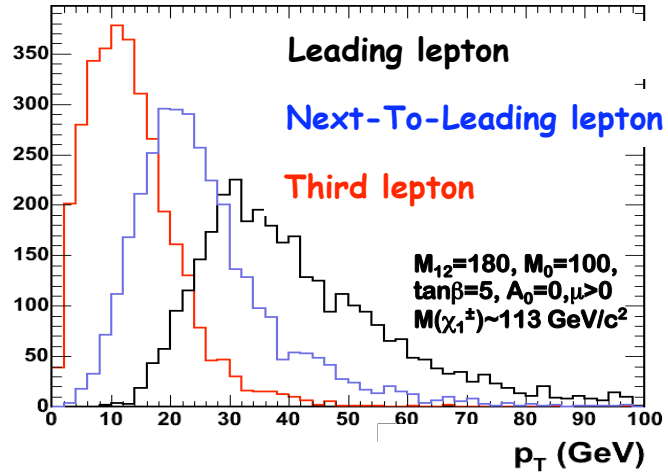


Leptons of 3rd generation are preferred



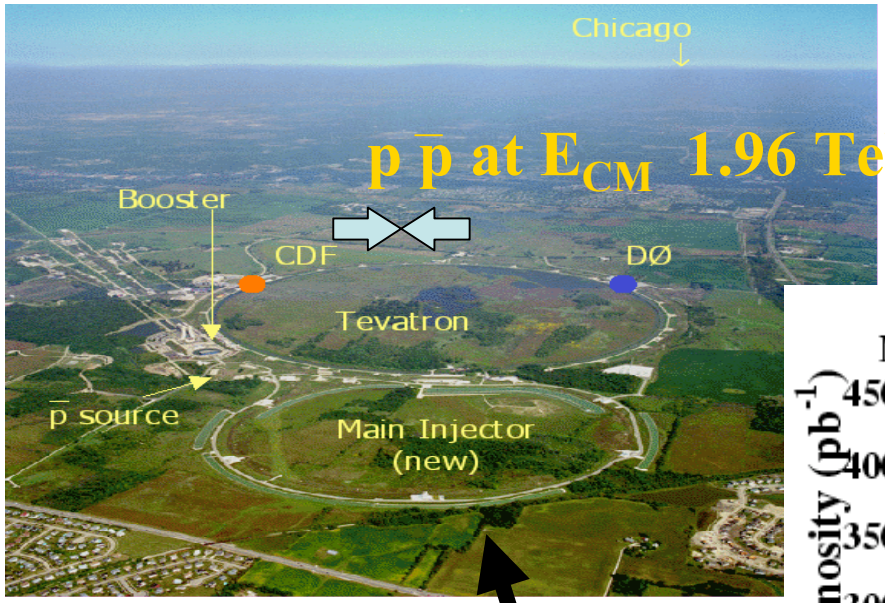
Neutralino Decay

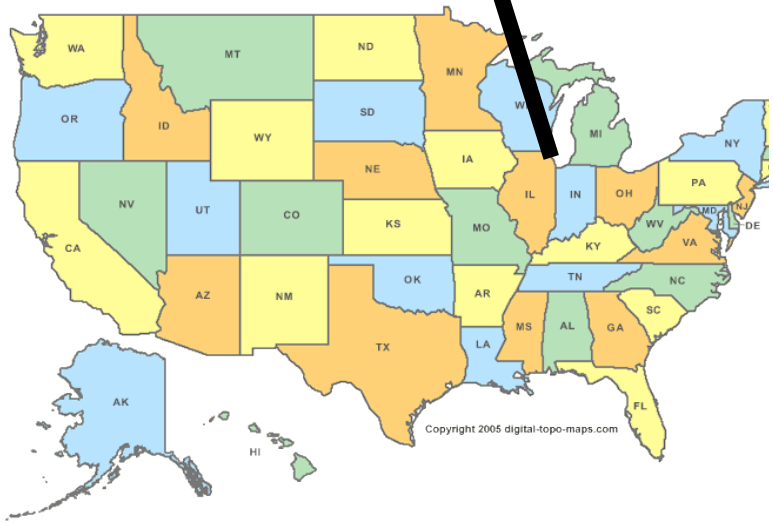




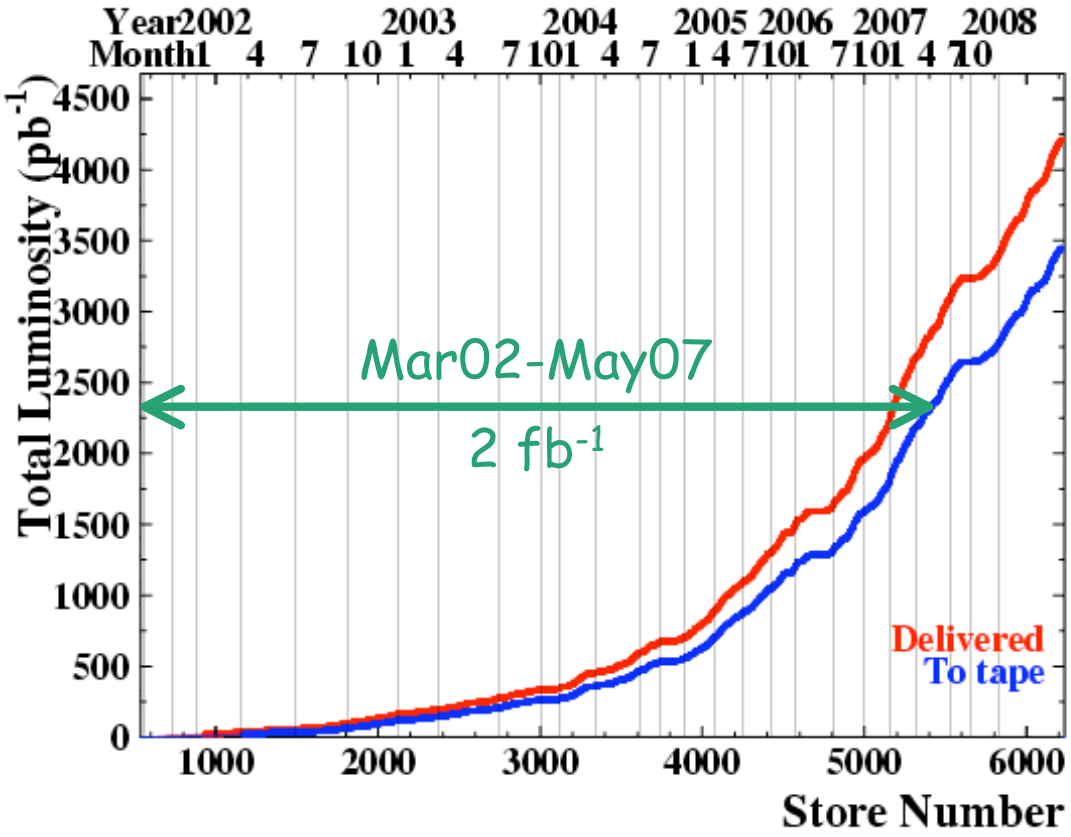
The Analyses

Tevatron and The Data

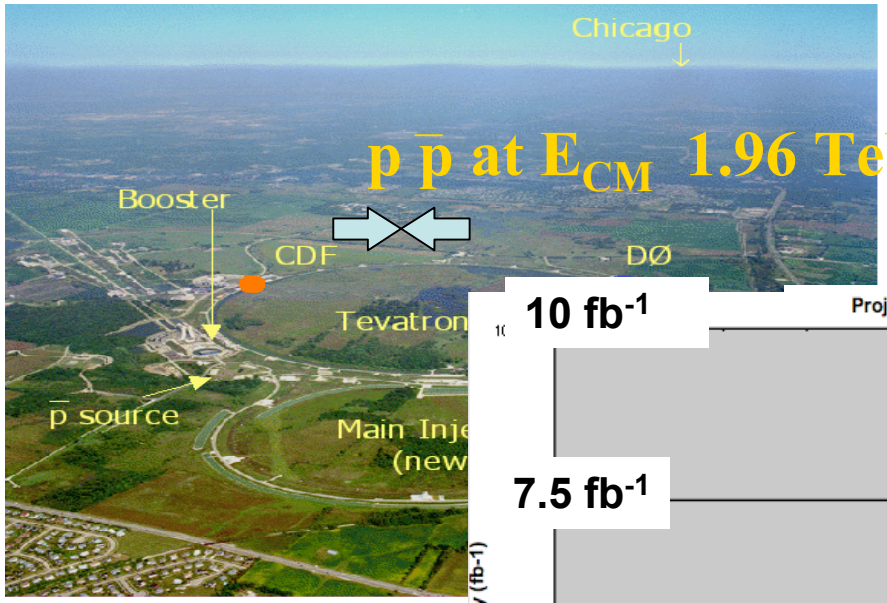




- High Luminosity
  - Tevatron more than 4 fb^{-1}!
  - Peak Luminosity=$3*10^{32}$
- CDF running at high efficiency



Tevatron and The Data



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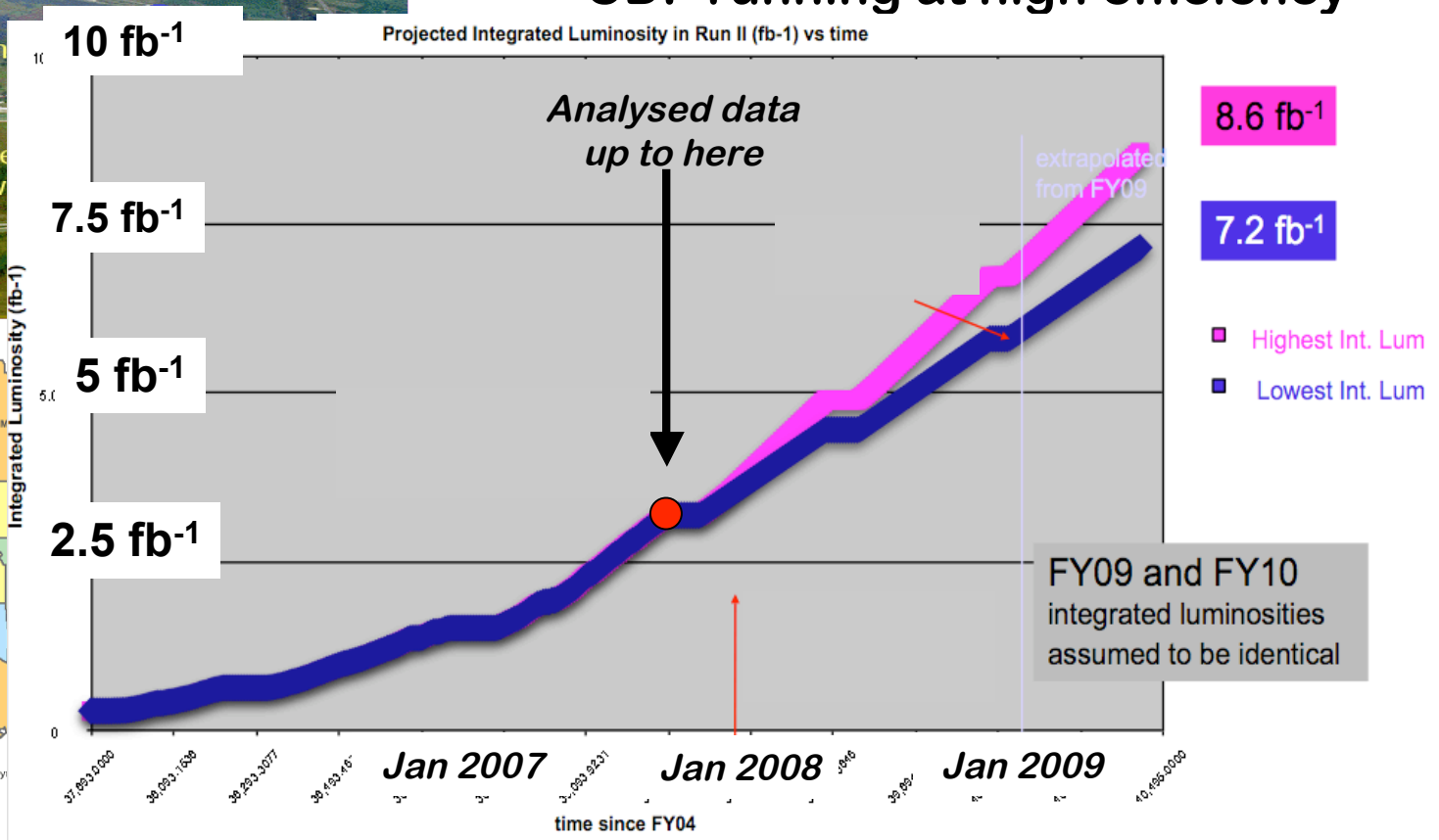
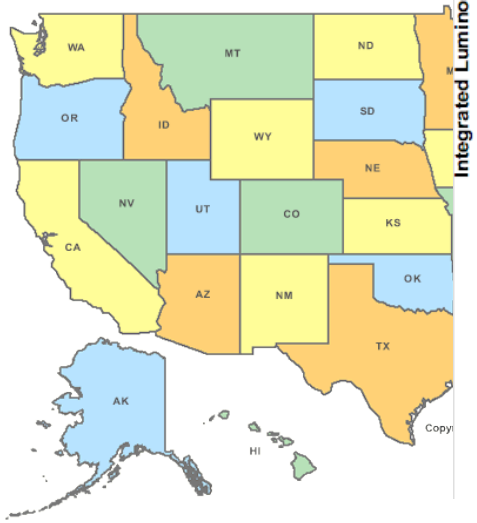
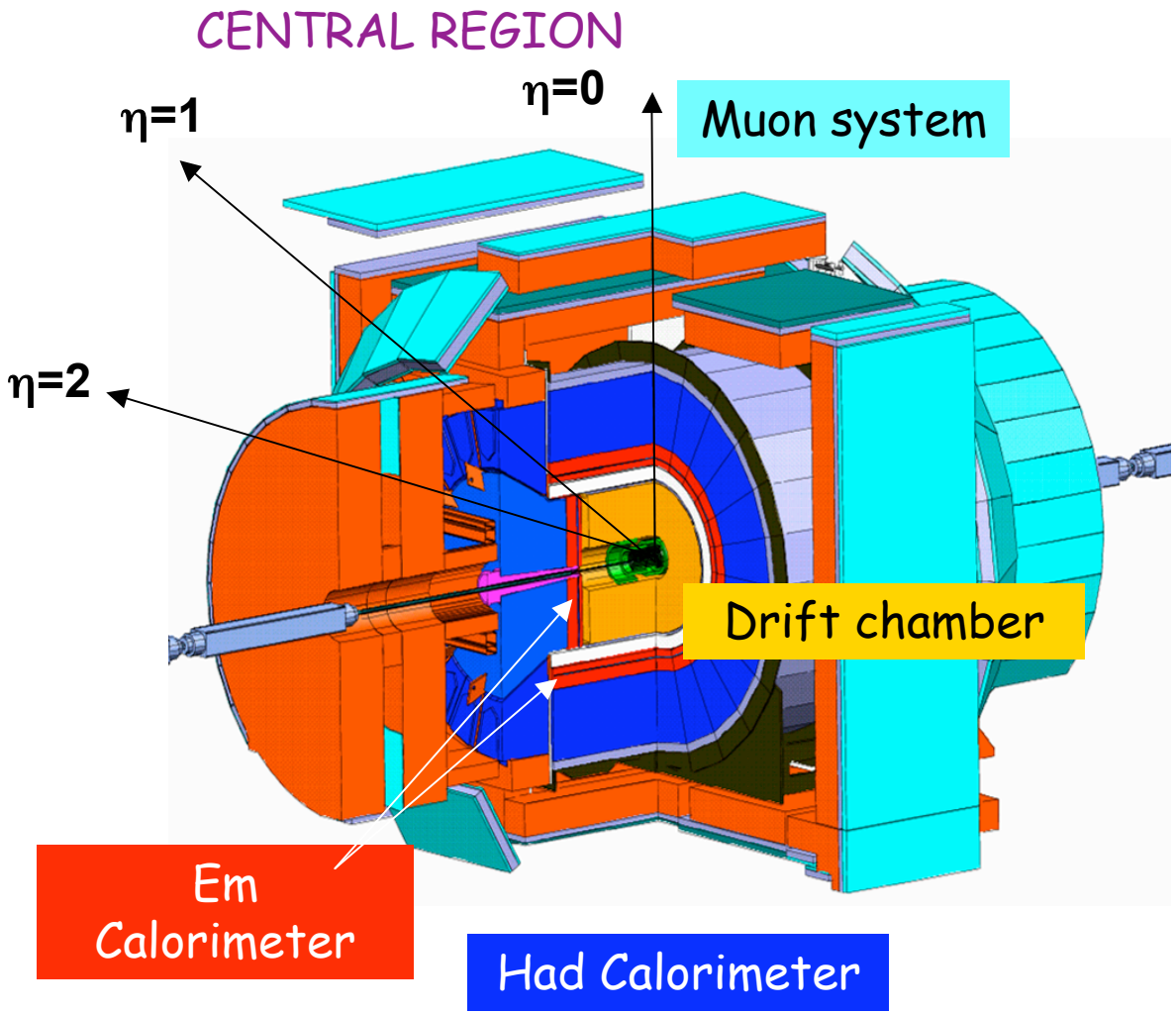
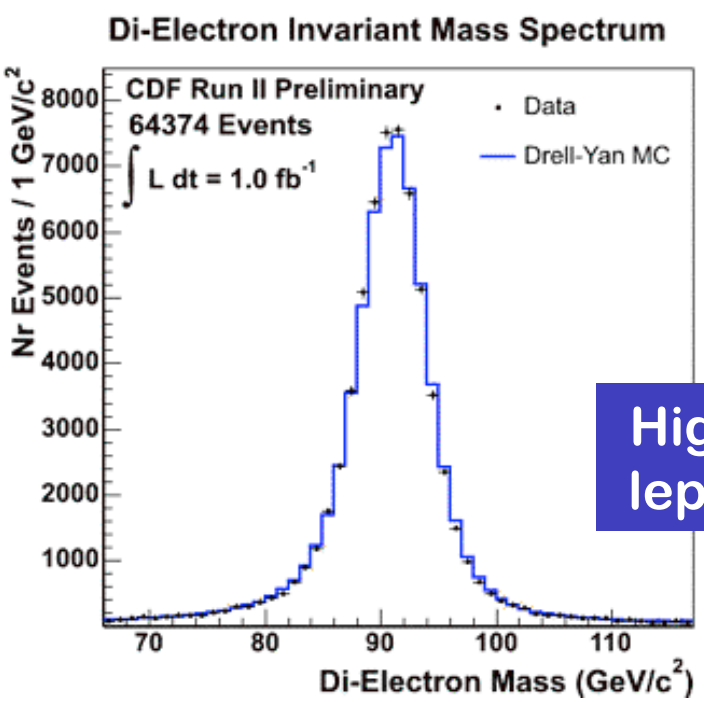




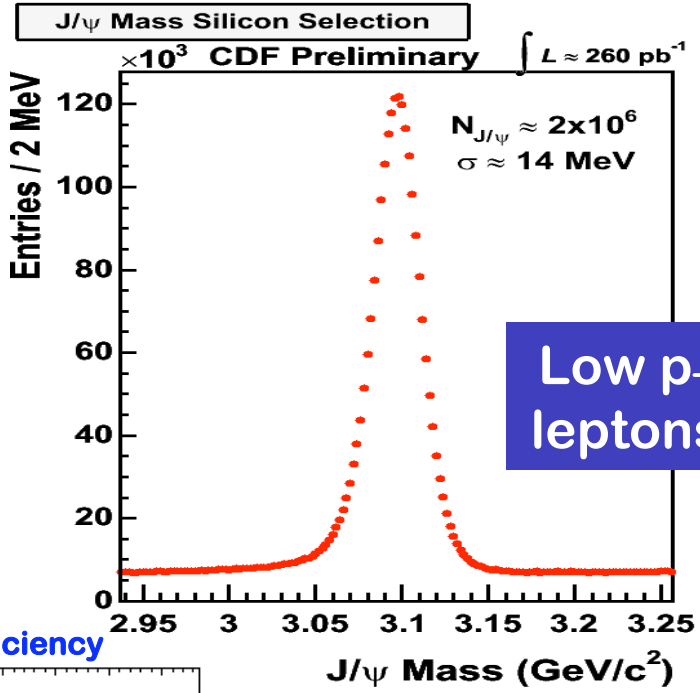
Finding SUSY at CDF



Leptons to discover SUSY: The SM Calibration Samples



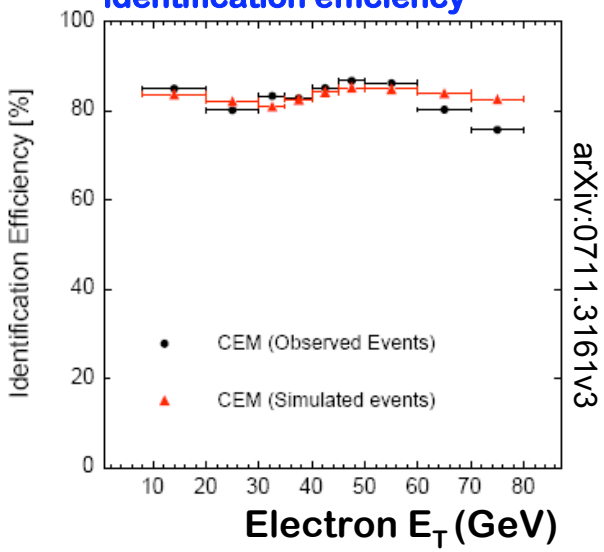
High p_T leptons



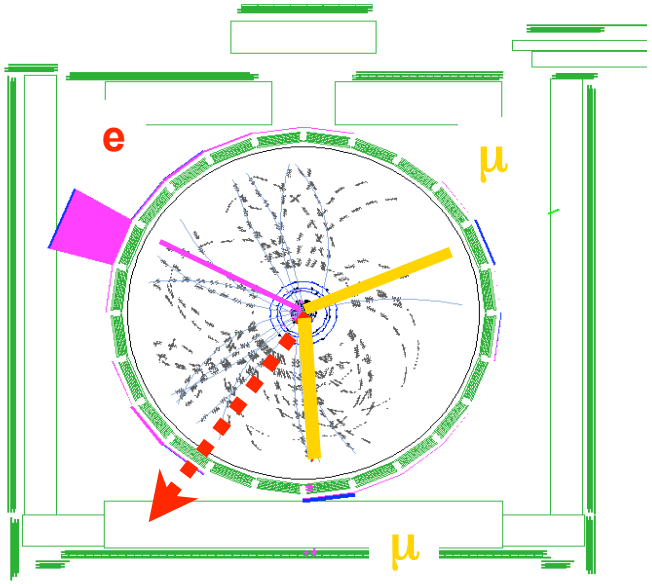
Low p_T leptons

- Lepton ID efficiencies
- Trigger efficiencies
- Calorimeter Calibration
- Lepton E and P Scale
- Luminosity

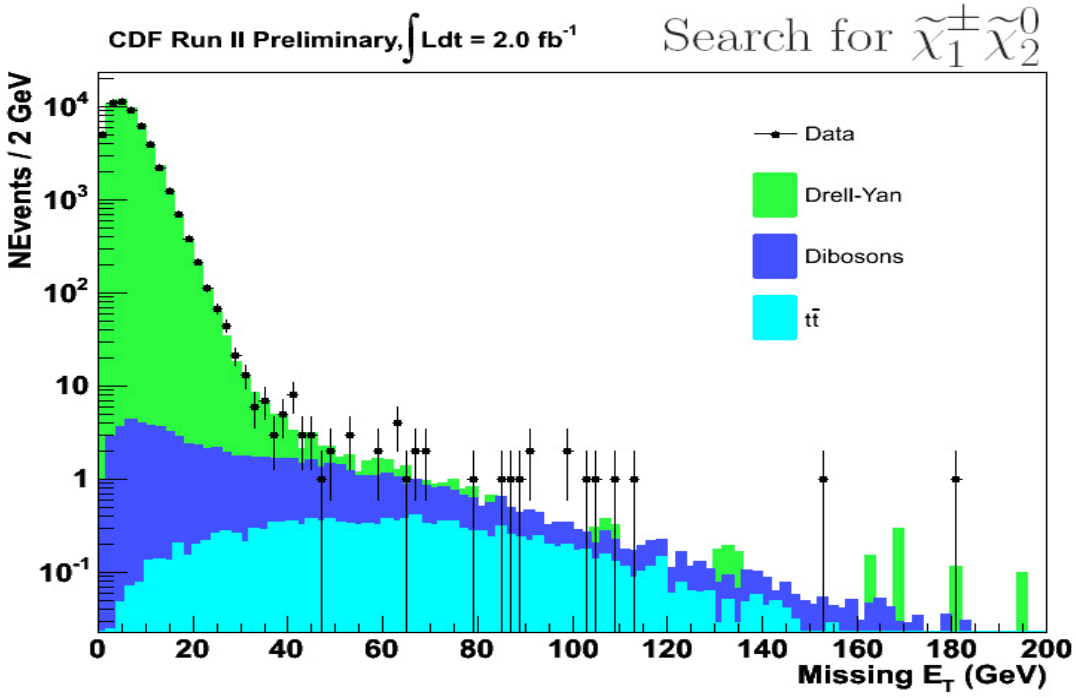
Central electron identification efficiency



The Missing Energy (MET)



Missing Transverse Energy (MET)



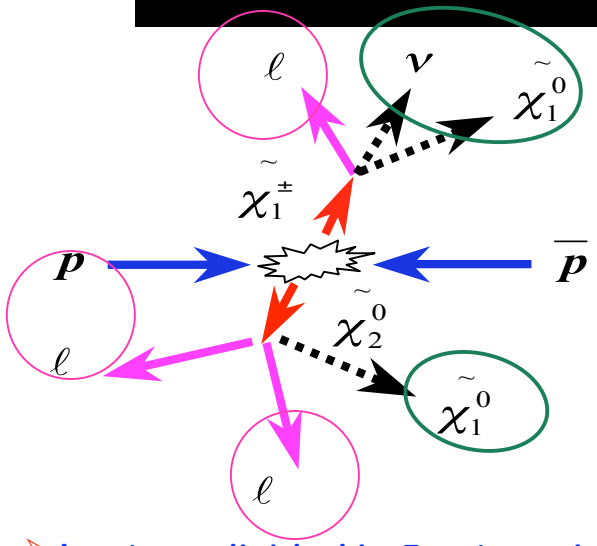
Real MET

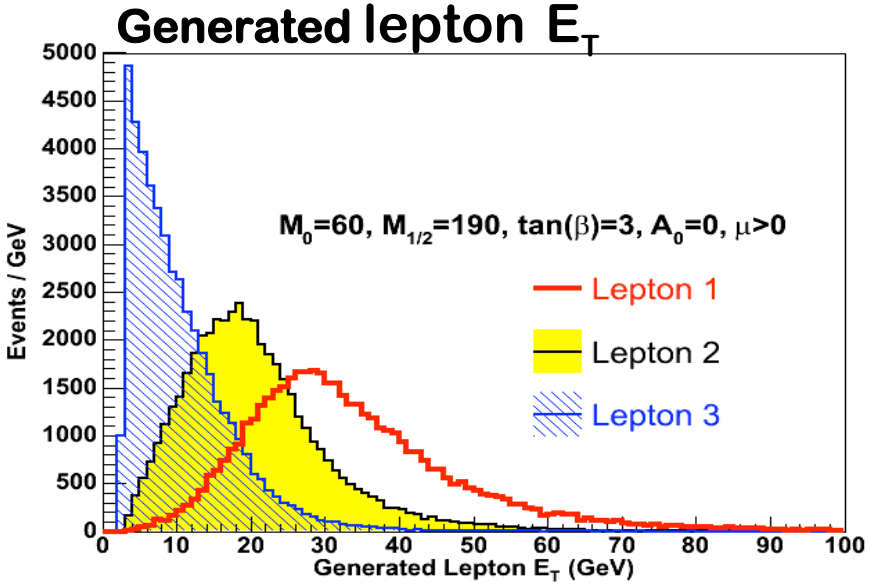
- ✓ Particles escaping detection

Fake MET

- ✓Muon p_T or jet E_T mismeasurement
- ✓Instrumental effects
- ✓Cosmic ray muons
- ✓Mismeasurement of the vertex

Analyses Overview





- Leptons divided in 5 categories (types) with "tight" and "loose" selections
- Five combinations of different leptons types

=> 5 exclusive analyses

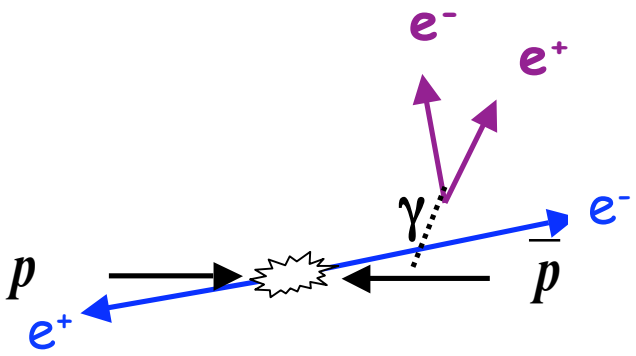
CHANNEL	LUM	TRIGGER PATH
3 channels: $\ell^\pm\ell^\mp + \ell^\pm$	2 fb^{-1}	High p_T Single Lepton and Low p_T Dilepton
2 channels: $\ell^\pm\ell^\mp$ + *track*		
ℓ =e,μ		

Use e/mu only
=>Very small backgrounds

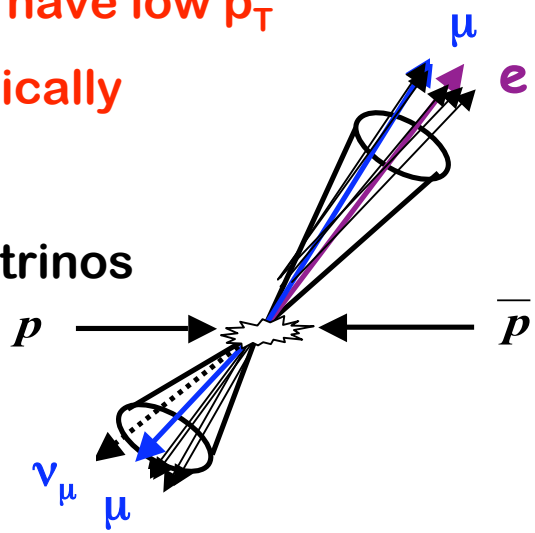
Sensitive to taus as 3rd lepton
=> Keeps acceptance at high tanβ

Backgrounds: how to reduce them?

- **DRELL YAN PRODUCTION + additional lepton**
  - Leptons have p_T same range as signal
  - Small MET
  - Low jet activity



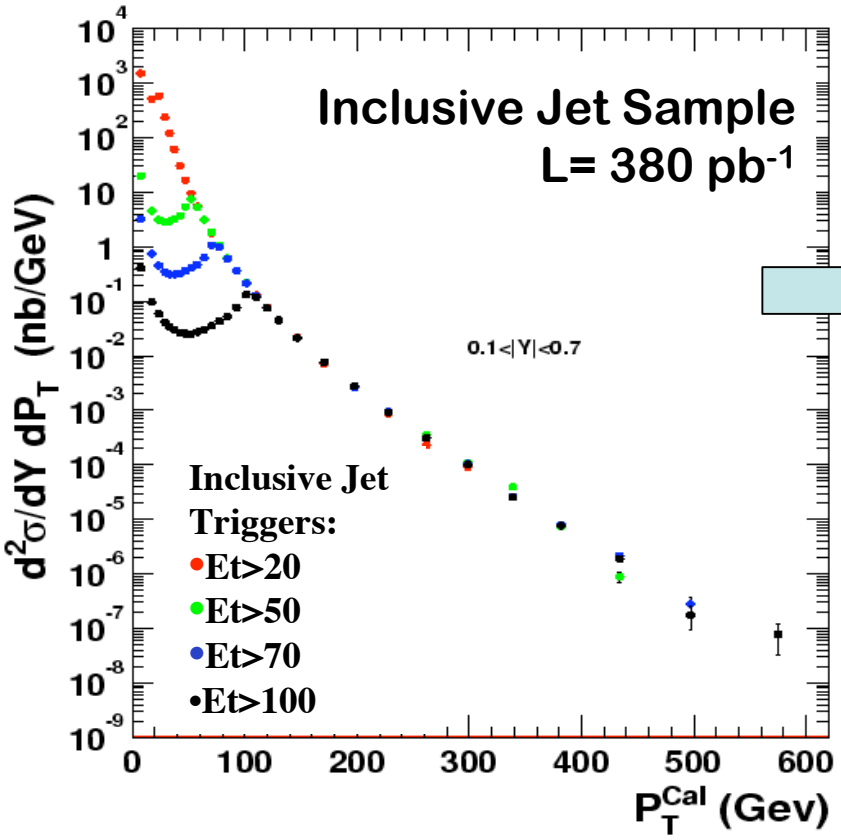
- **HEAVY FLAVOUR PRODUCTION**
  - Leptons mainly have low p_T
  - Leptons are typically not isolated
  - MET due to neutrinos

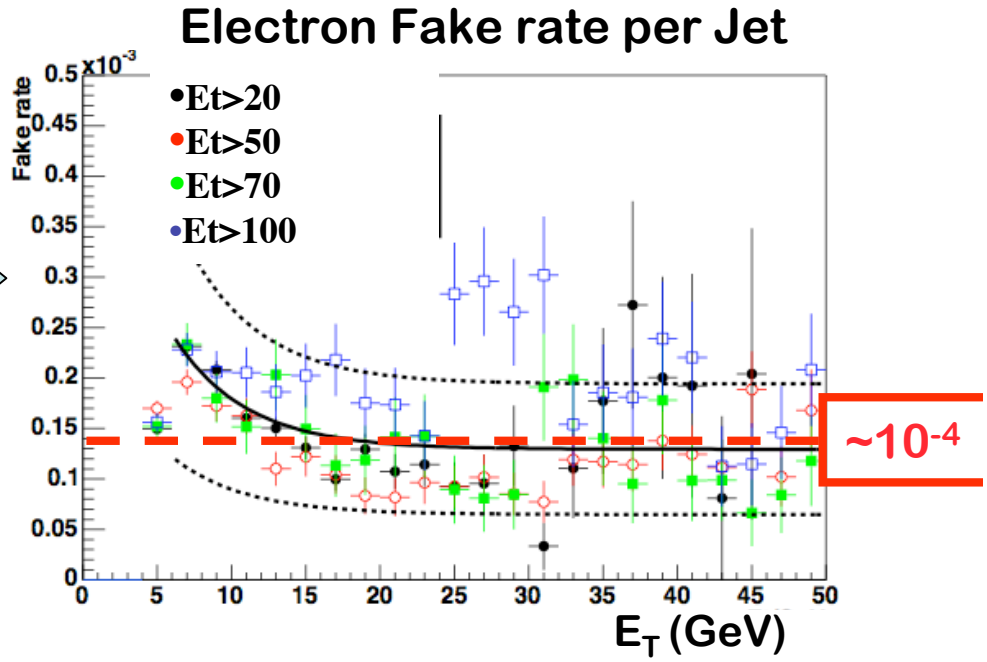


- **DIBOSON (WZ,ZZ) PRODUCTION**
  - Leptons have high p_T
  - Leptons are isolated and separated
  - MET due to neutrinos

irreducible background

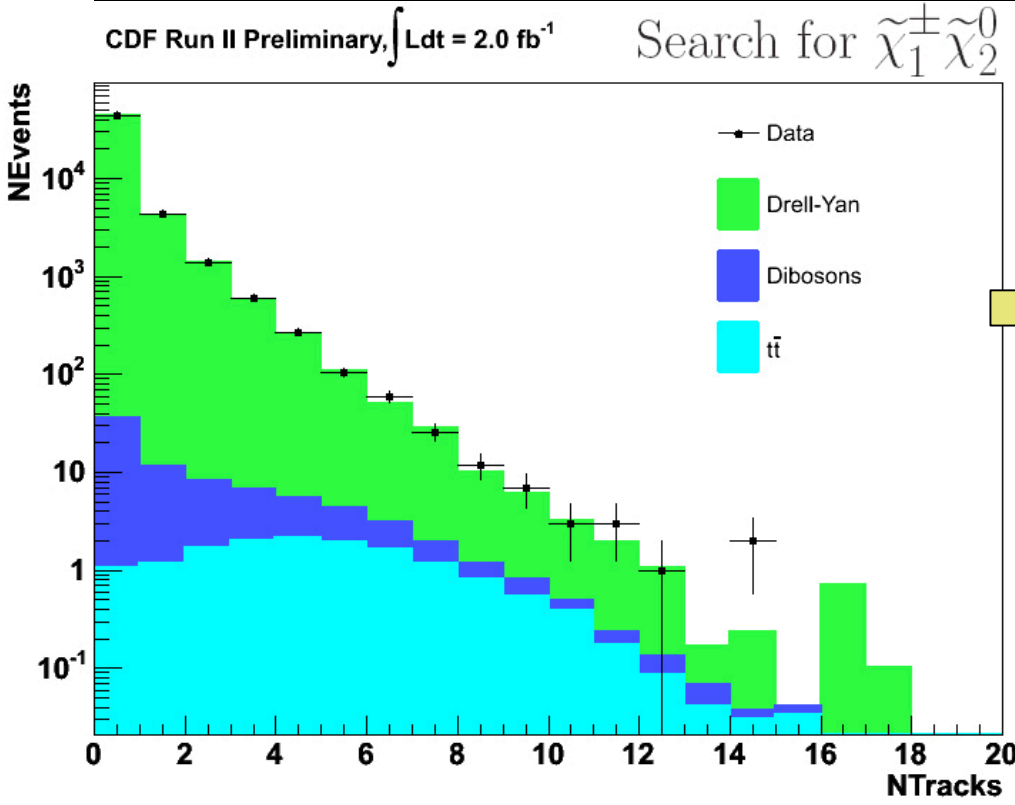
Jets Faking Leptons

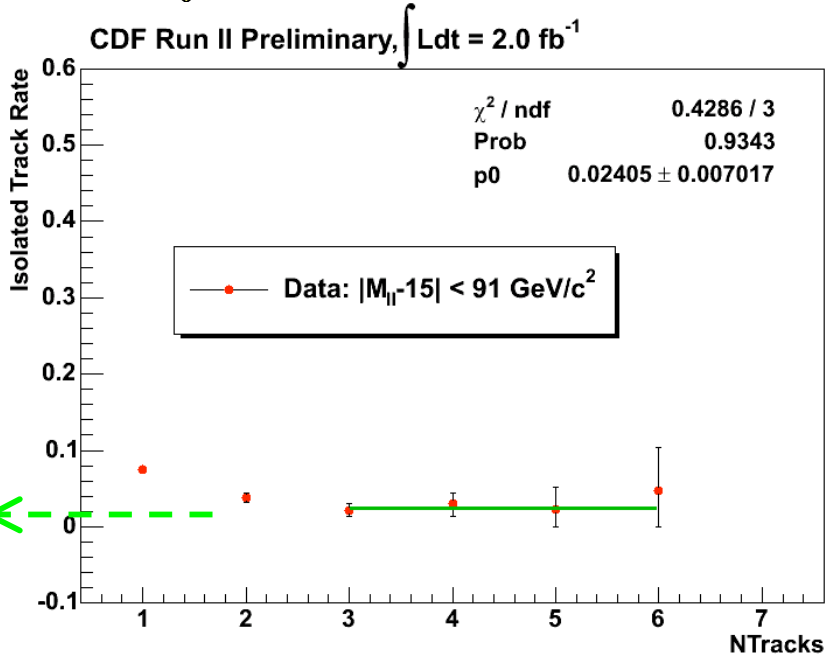




Inclusive Jet Sample with different trigger thresholds used to extract Fake rates

Fake Tracks



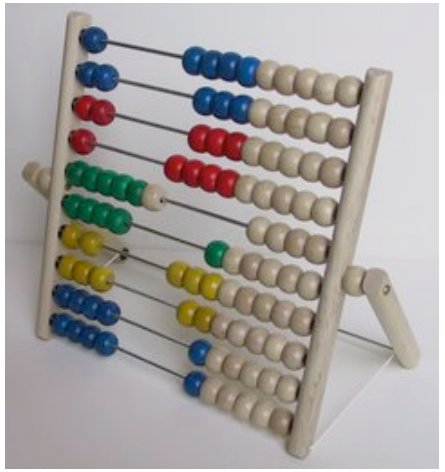


Track fake rate calculated in data and applied to MC on event-by-event basis

~ 10^{-2}

Analysis Strategy

COUNTING EXPERIMENT



- Optimise selection criteria for best signal/background value;
- Define the signal region and keep it blind
  - Test agreement observed vs. expected number of events in orthogonal regions ("control regions")
  - Look in the signal region and count number of SUSY events !!

  (Or set limit on the model)

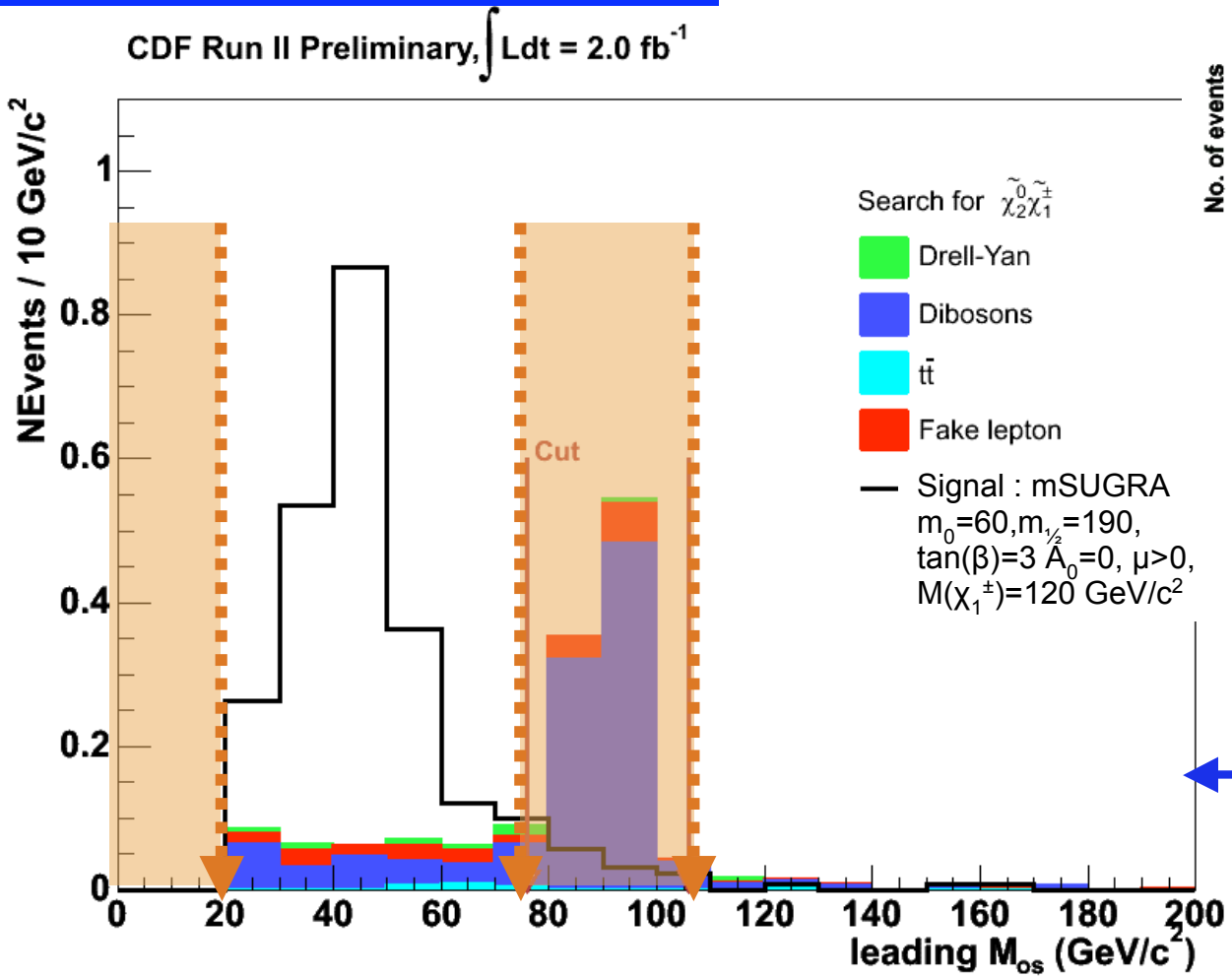
The Basic Selection

- **Two leptons preselection**
  - ➡ 1st lepton: 20(15), 2nd 10(8,5) GeV/c
- **Invariant Mass**
  - ➡ reject resonances and heavy flavours
- $\Delta\Phi(\ell\ell)$
  - ➡ Drell-Yan rejection
- **High Missing Transverse Energy**
  - ➡ further rejects Drell-Yan
- **Low jet activity**
  - ➡ reject ttbar,W+jets,Z+jets
- **Third lepton**

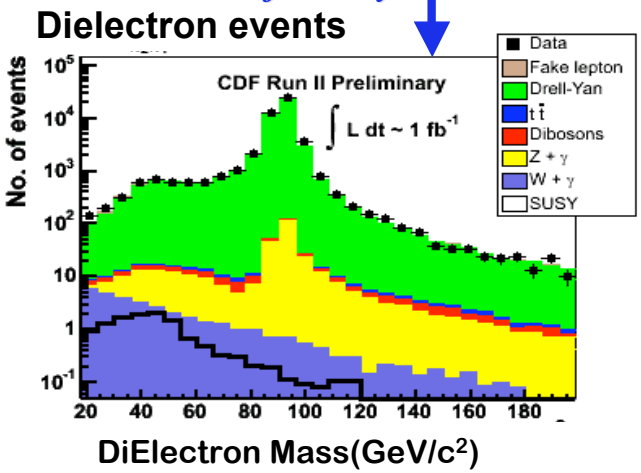
Minimal number of cuts to keep analysis simple while rejecting the most overwhelming backgrounds

Selection Criteria: MASS

Rejection of J/Ψ, Υ and Z



Events with 2 electrons before any other selection

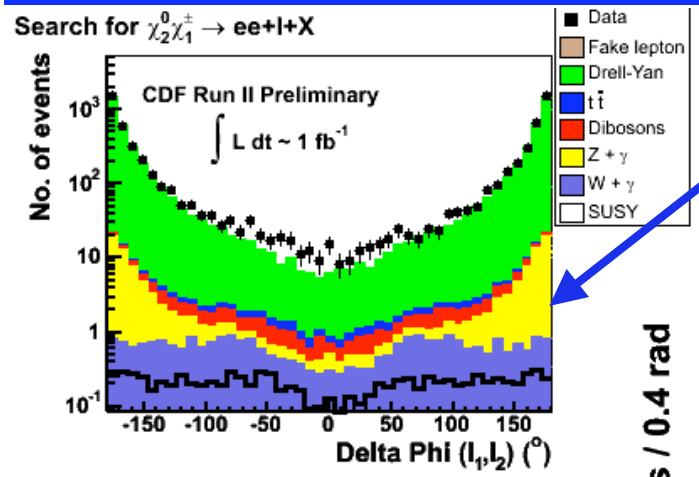


Events with 3 tight leptons after all other selections are made

- $M_{\ell\ell}$<76 GeV & $M_{\ell\ell}$>106 GeV
- $M_{\ell\ell}$> 20 GeV

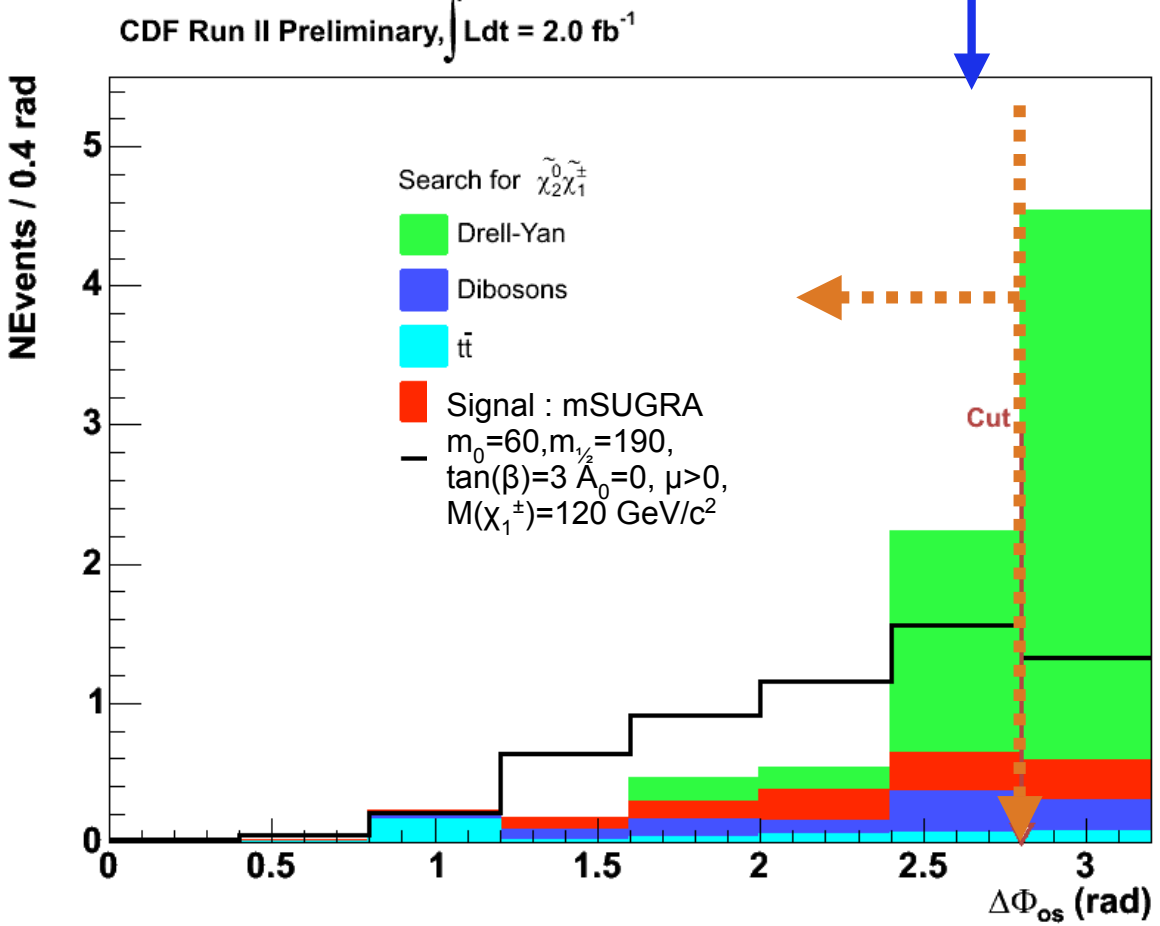
Selection Criteria: $\Delta\Phi(\ell,\ell)$

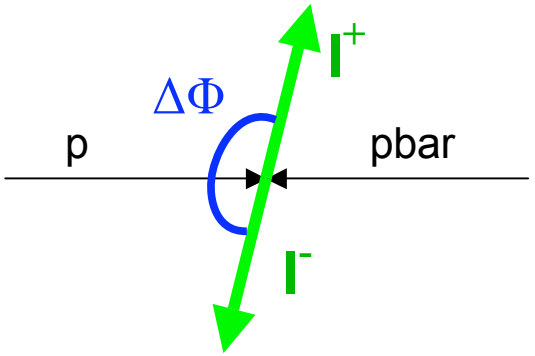
Drell-Yan reduction



Events with 2 electrons before any other selection

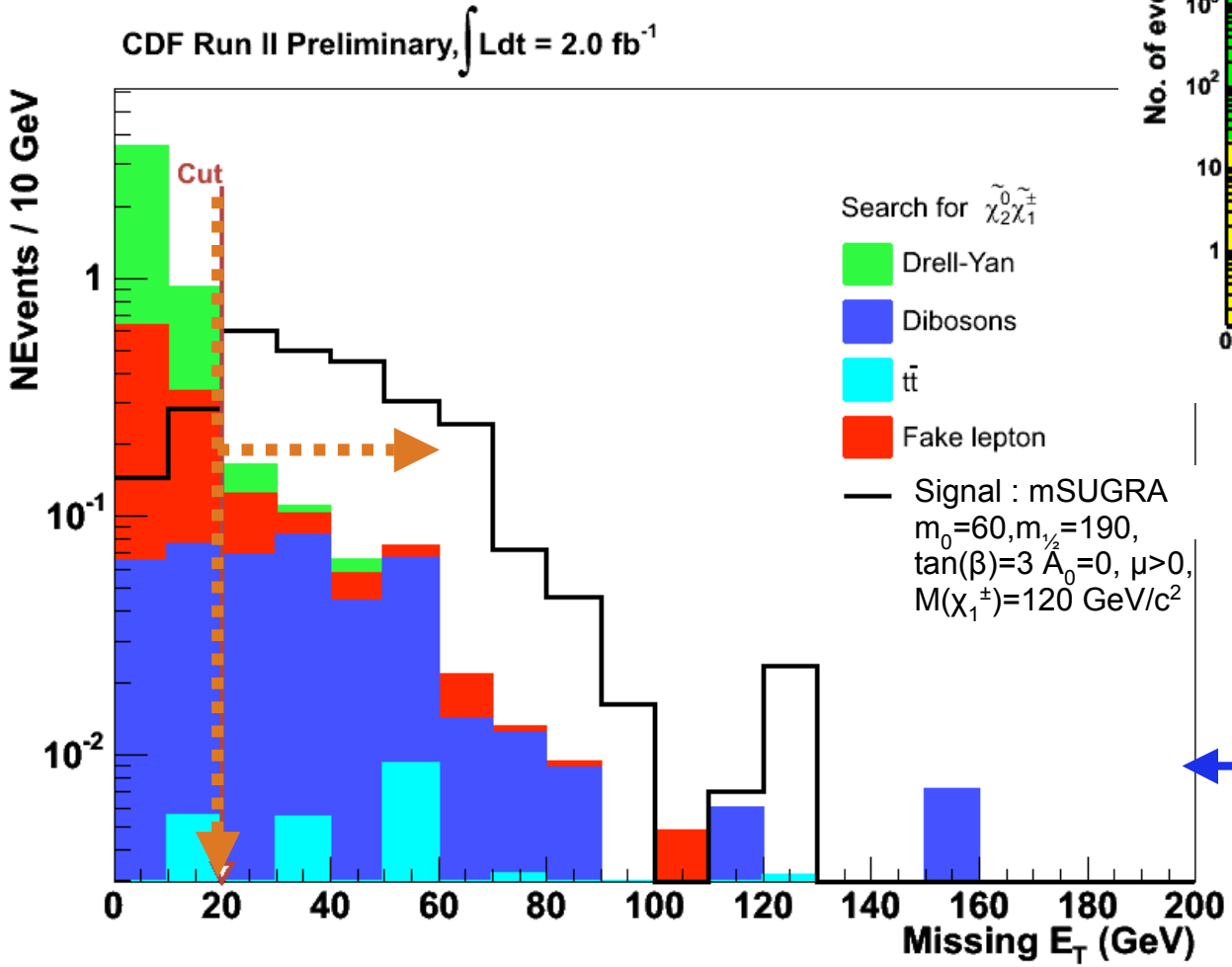
Events with 2 tight leptons+track after all other selections are made



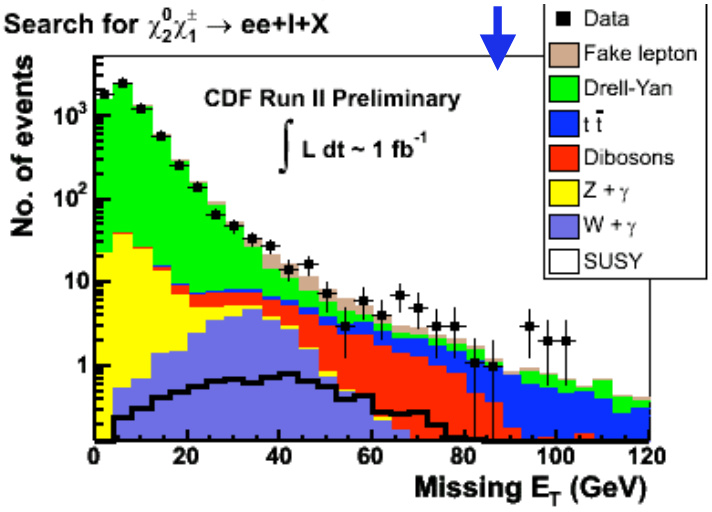


Selection Criteria: MET

Reducing Drell-Yan by asking MET > 20 GeV



Events with 2 electrons after the mass selection

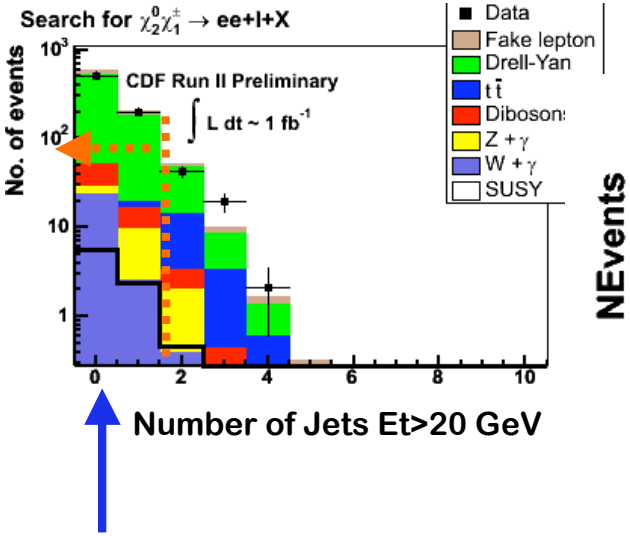


Events with 3 tight leptons after all other selections are made

...no data yet!!

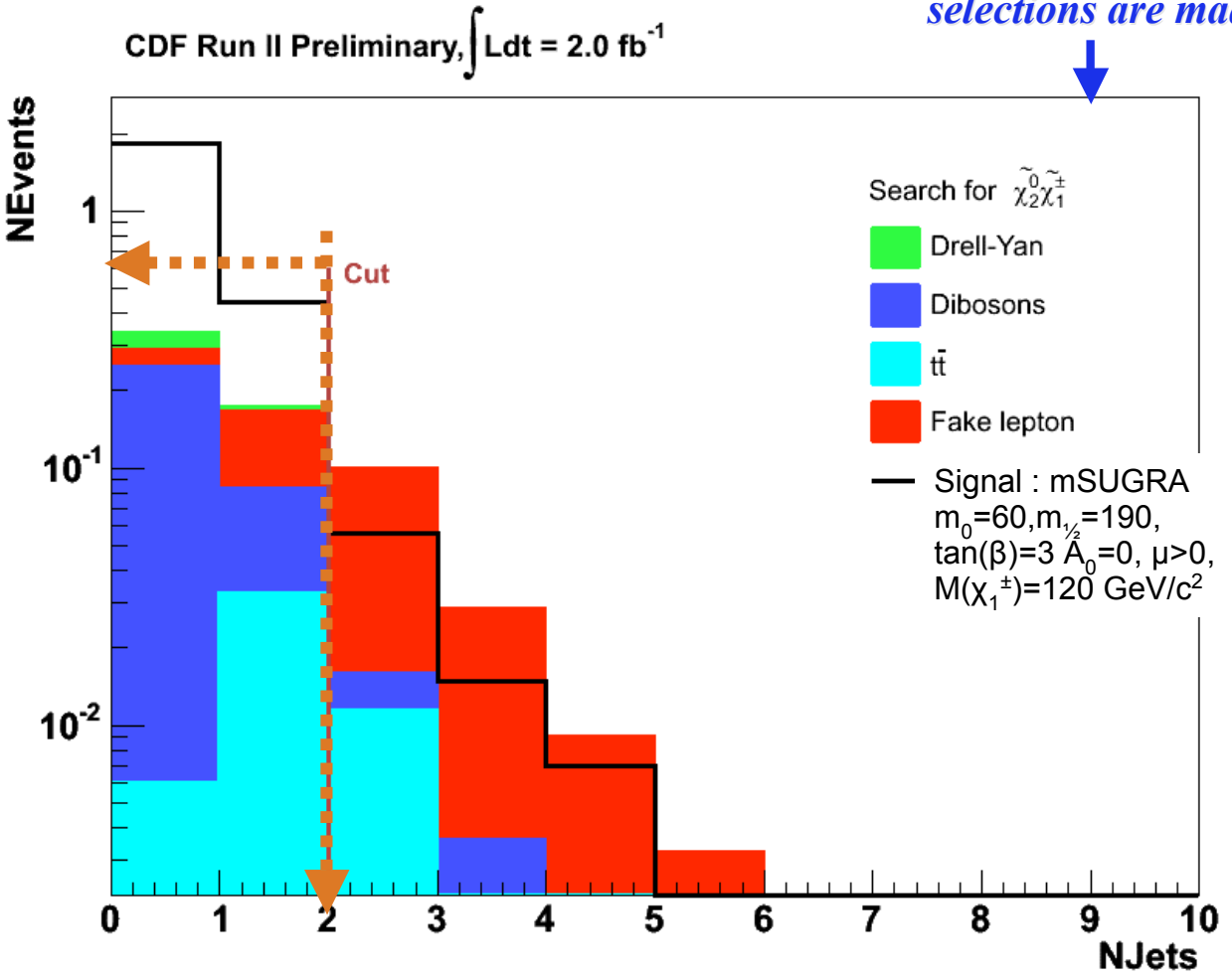
Selection Criteria: JET VETO

Rejection of top-antitop, fakes



Events with 2 electrons after the mass and met selection

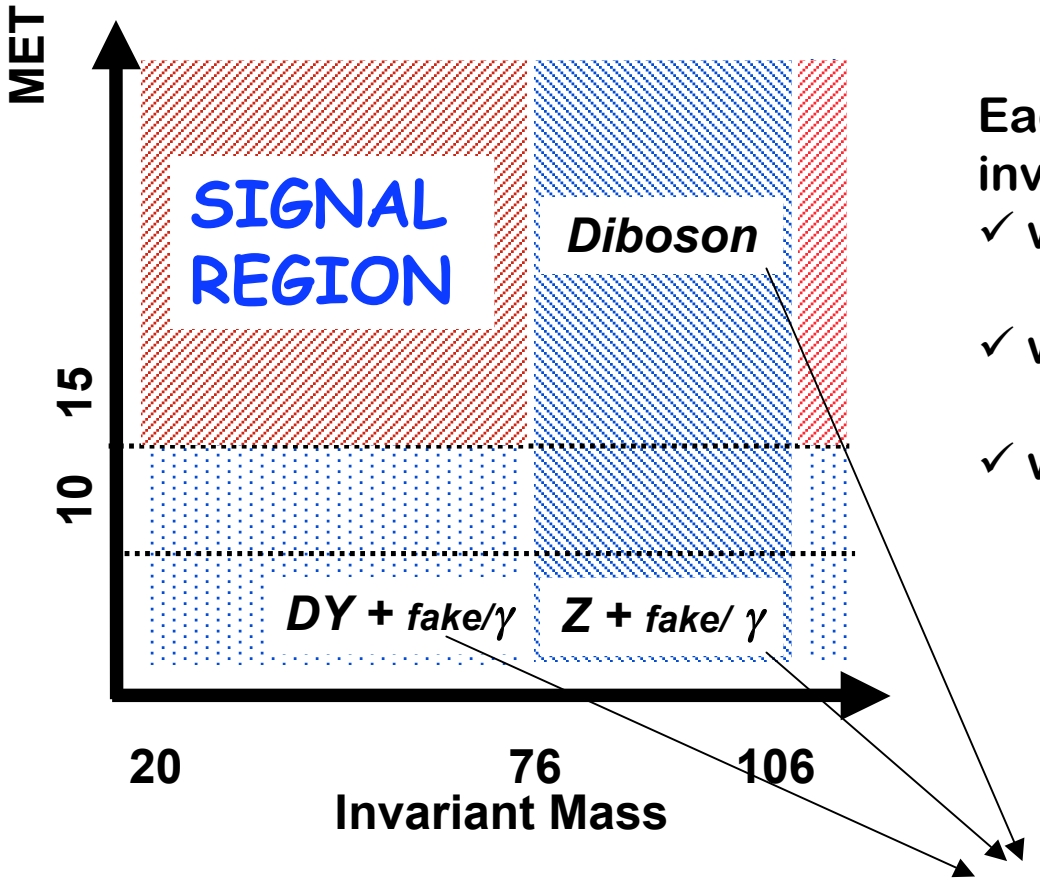
Events with 3 tight leptons after all other selections are made



Kinematic Variable	Kinematic Cut
Jet E_T > 20 GeV	n. Jets < 2
$H_T = \Sigma jet E_{Tj}$	H_T < 80 GeV

Understanding of the Data: The Control Regions

Control regions defined as a function of M($\ell\ell$) and MET:



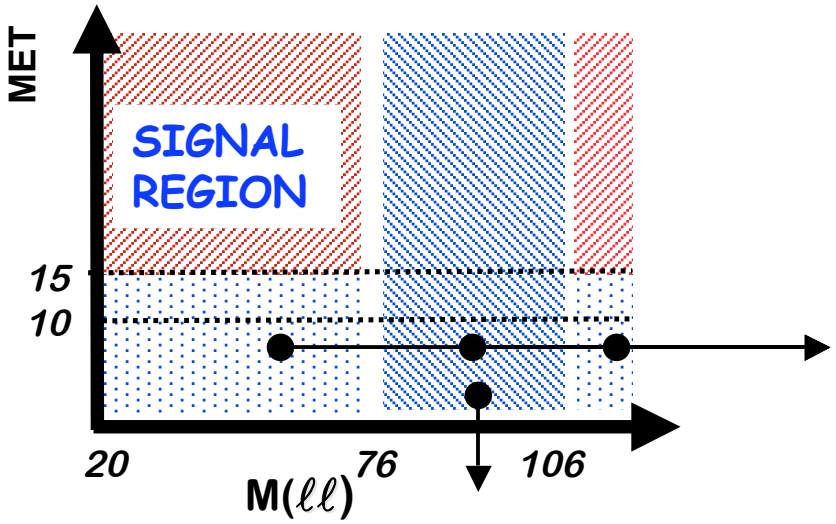
Each CONTROL REGION is investigated:

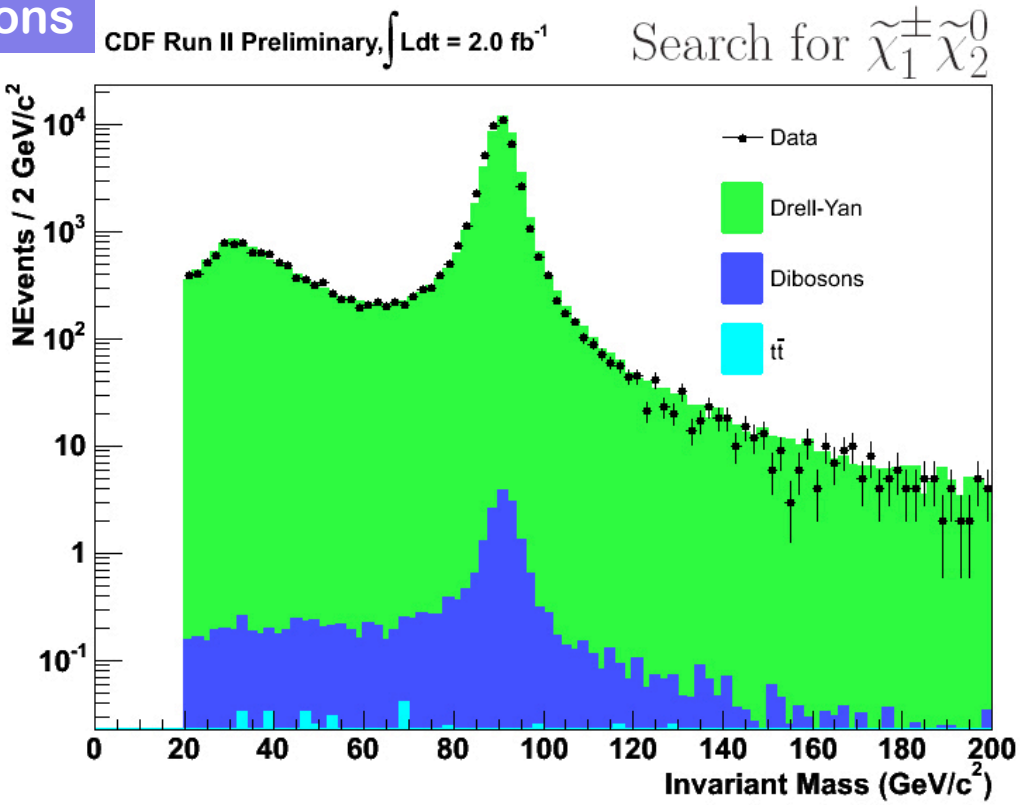
- ✓ with different jet multiplicity
  check NLO processes
- ✓ with 2 leptons requirement
  gain in statistics
- ✓ with 3 leptons requirement
  signal like topology

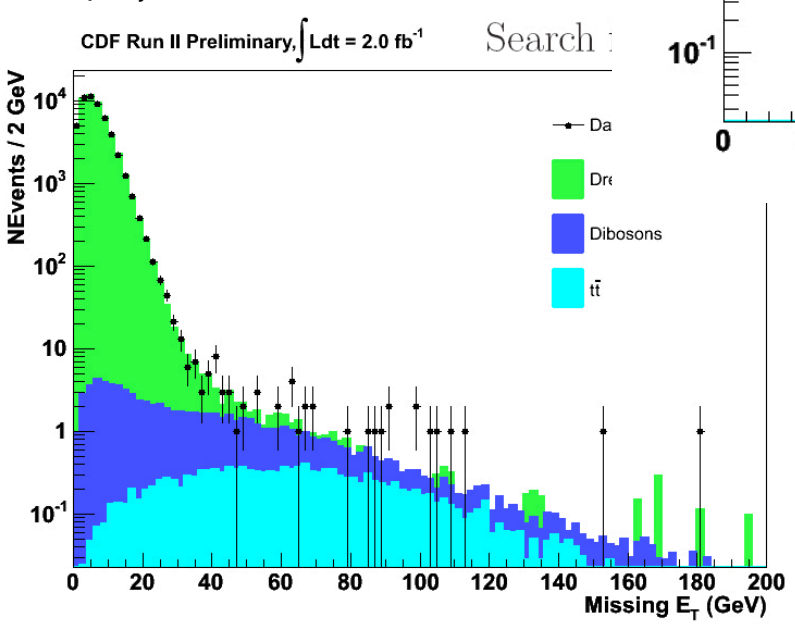
Main background tested for trileptons

Dileptons Control Regions

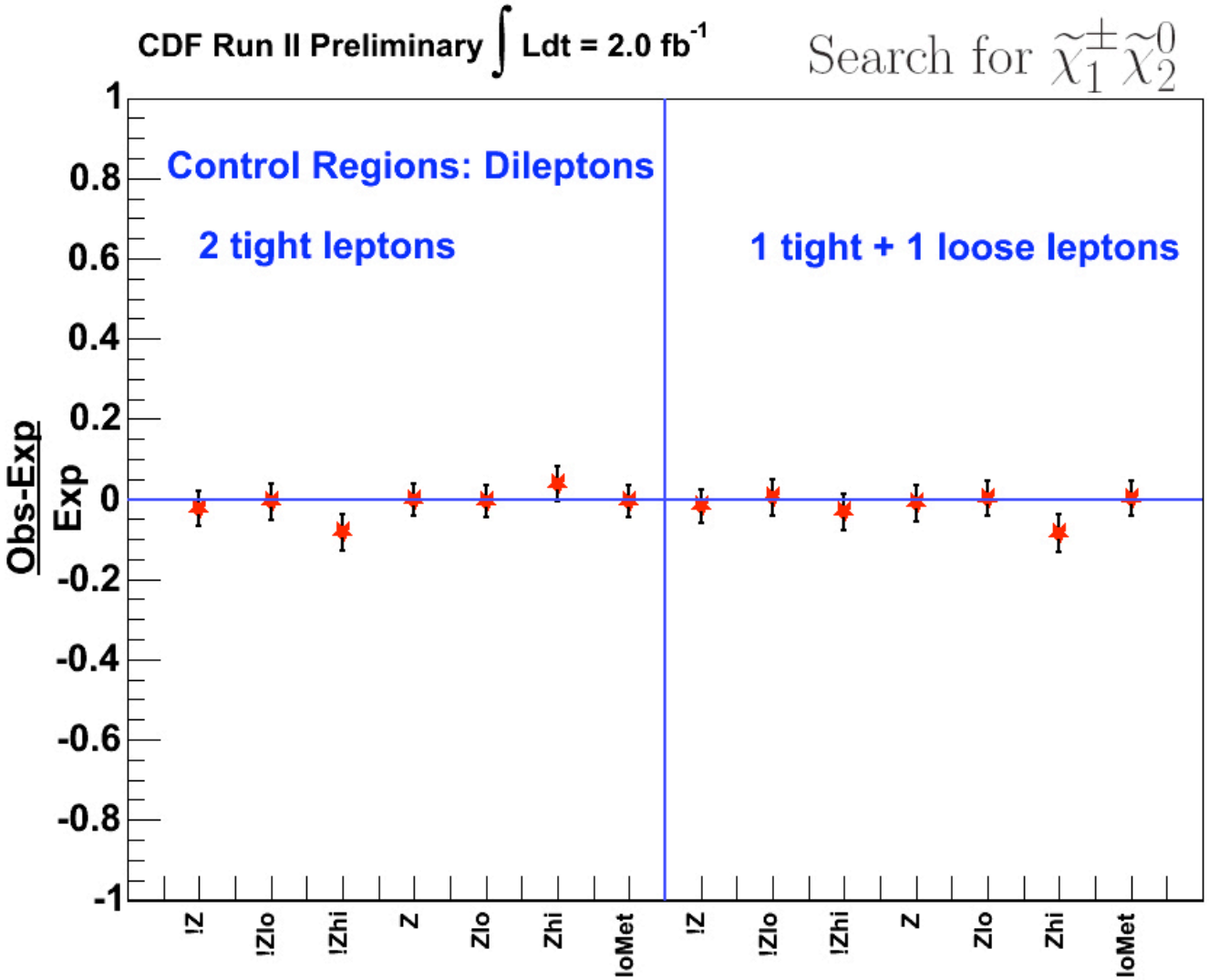
Testing Control Regions with two leptons







Summary: Dilepton Control Regions



Good agreement over all control regions for all categories !

Dileptons Control Regions

If you really want to check…

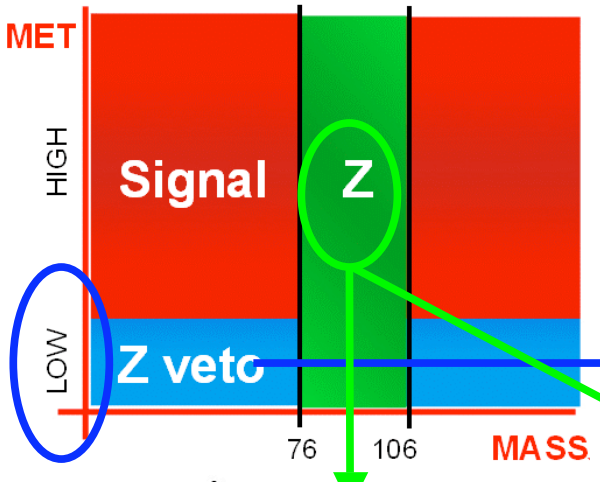
CDF RUN II Preliminary $\int \mathcal{L}dt = 2.0$ fb^{-1} : Search for $\widetilde{\chi}_1^{\pm}\widetilde{\chi}_2^0$

Name	Z$\rightarrow ee$	Z$\rightarrow \mu\mu$	Z$\rightarrow \tau\tau$	WW	WZ	ZZ	$t\bar{t}$	Expected	Observed
2tight									
!Z	9847.8	5034.7	1310.2	93.3	1.6	7.1	57.1	16352 ± 716	15966
!Zlo	7705.6	4240.6	477.7	4.7	0.1	2.3	1.0	12432 ± 569	12352
!Zhi	858.4	205.5	550.3	83.5	1.4	3.6	55.0	1758 ± 80	1612
Z	31178.2	19870.4	21.9	22.4	6.3	35.8	15.0	51150 ± 2034	51042
Zlo	25577.6	16665.6	11.1	1.6	0.2	13.4	0.2	42270 ± 1682	42093
Zhi	1261.1	741.5	6.4	19.0	5.8	15.9	14.4	2064 ± 92	2143
lo	33349.6	20903.9	488.7	6.3	0.3	15.7	1.2	54766 ± 2212	54445
Z(ee)	31178.3	0.0	6.7	6.5	4.0	21.9	4.7	31222 ± 1710	31074
Z($\mu\mu$)	0.0	19867.7	3.9	4.6	2.3	13.9	3.0	19895 ± 1102	19942
!Z(ee)	9847.9	0.0	497.8	29.9	1.1	4.3	18.3	10399 ± 617	10033
!Z($\mu\mu$)	0.0	5015.4	243.2	18.2	0.4	2.3	10.9	5290 ± 352	5198
eμ	0.0	21.9	580.4	56.5	0.1	0.5	35.1	694 ± 47	761

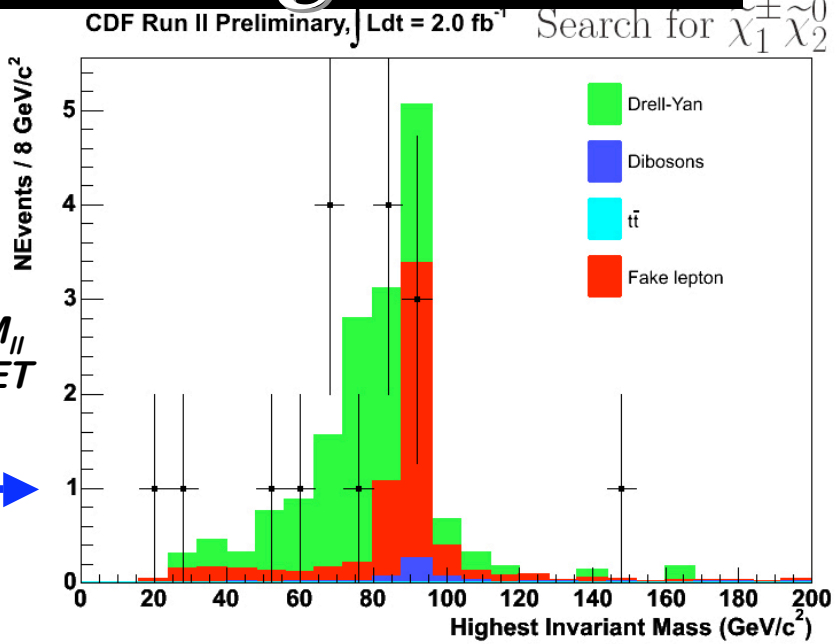
Uncertainties are statistical, lepton ID, trigger efficiencies and NLO corrections to the cross sections

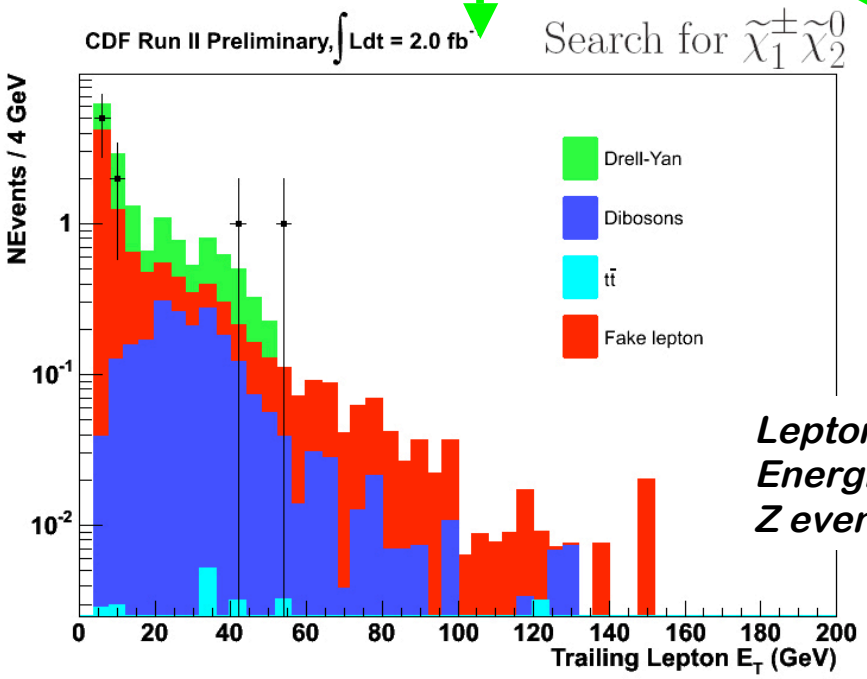
Trileptons Control Regions

3 tight leptons

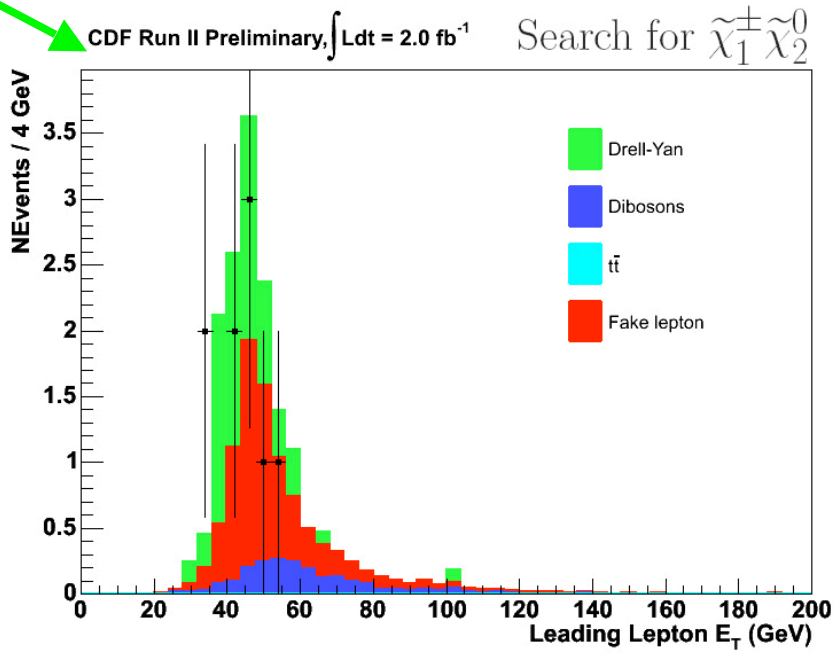


Highest M_{ll} for low MET events



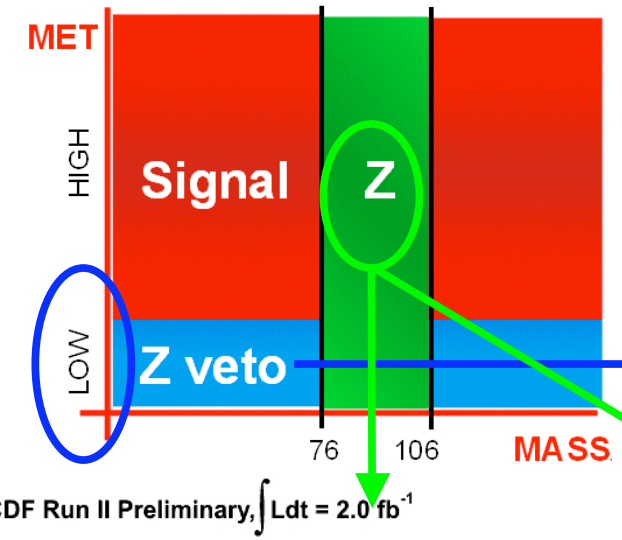


Leptons Energies for Z events

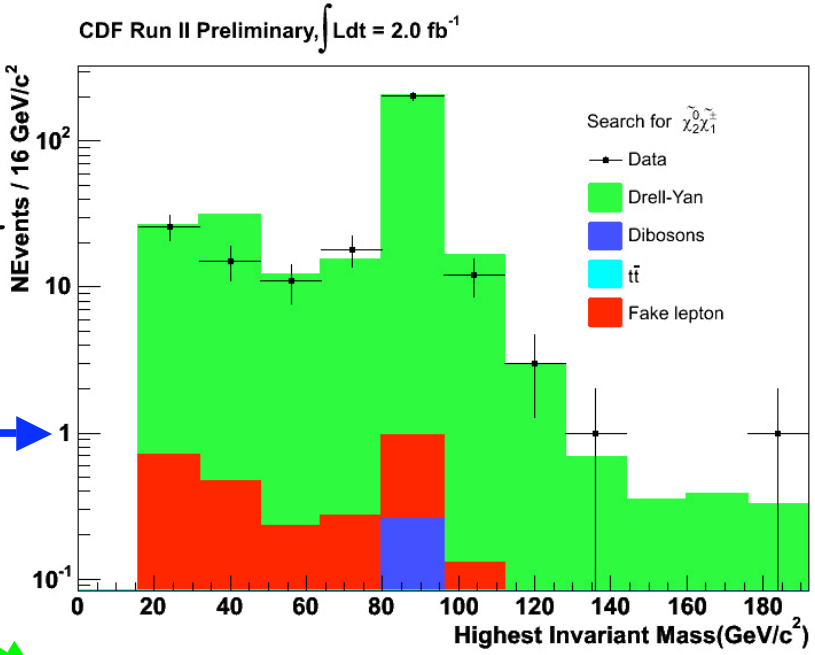


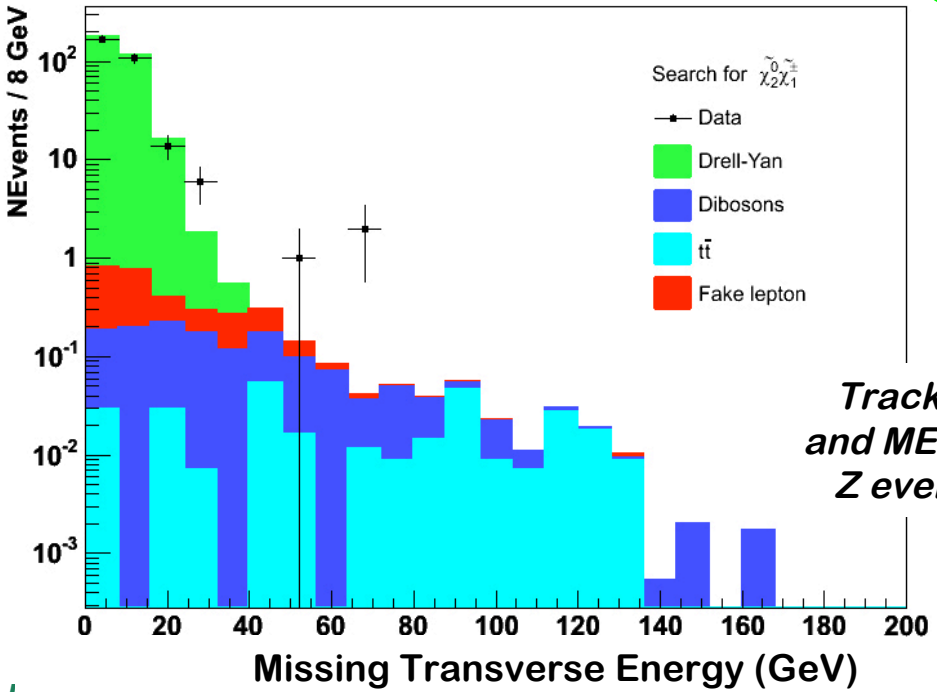
Dilepton+track Control Regions

2 tight leptons+ track category

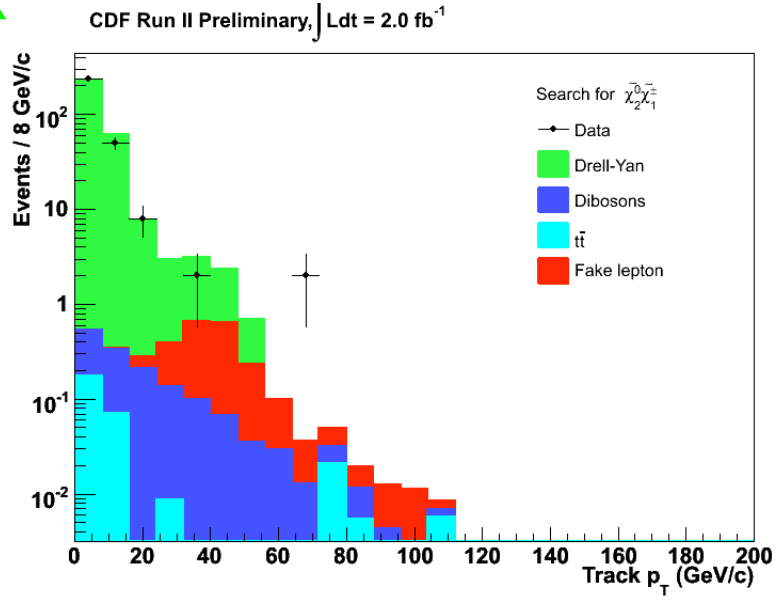


Highest M_{ll} for low MET events

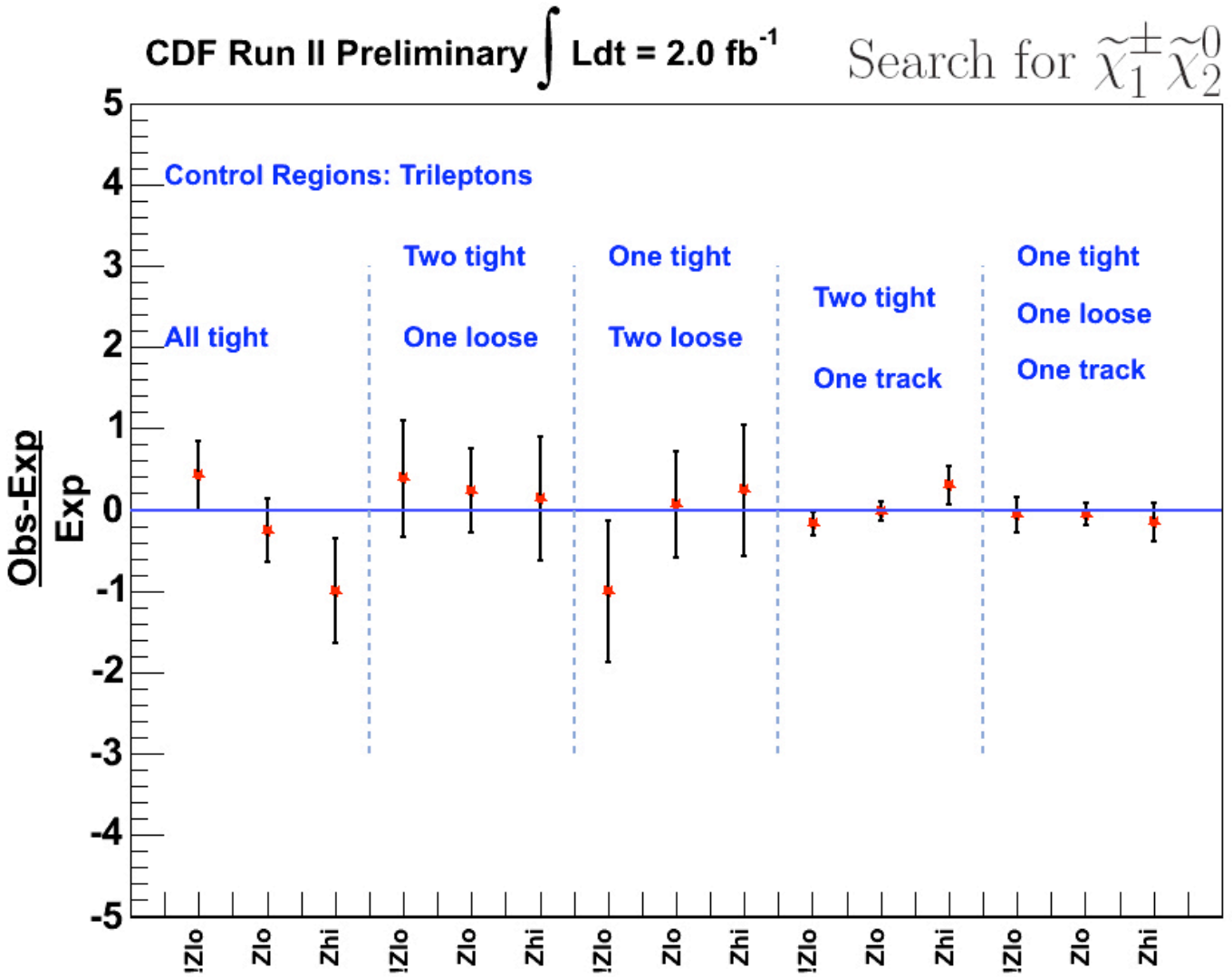




Track Pt and MET for Z events



Overview Control Regions



AGAIN-Good agreement over all control regions for all categories !

Trileptons Control Regions

CDF RUN II Preliminary $\int \mathcal{L}dt = 2.0$ fb^{-1} : Search for $\widetilde{\chi}_1^{\pm}\widetilde{\chi}_2^0$

Name	Z→ ee	Z→ $\mu\mu$	Z→ $\tau\tau$	WW	WZ	ZZ	$t\bar{t}$	Fakes	Expected	Observed
3tight										
lo	7.58	2.92	0.00	0.00	0.05	0.57	0.00	6.01	17.1 ± 5.3	17
!Zlo	3.73	1.25	0.00	0.00	0.04	0.17	0.00	1.14	6.3 ± 2.7	9
Z	4.67	2.17	0.00	0.01	1.30	0.82	0.02	7.68	16.7 ± 5.7	9
Zlo	3.86	1.67	0.00	0.00	0.01	0.40	0.00	4.87	10.8 ± 4.2	8
Zhi	0.00	0.09	0.00	0.01	1.23	0.30	0.02	1.06	2.7 ± 1.7	0
2tight,1loose										
lo	0.74	3.38	0.00	0.00	0.04	0.31	0.00	2.57	7.0 ± 3.0	9
!Zlo	0.64	1.09	0.00	0.00	0.02	0.10	0.00	0.33	2.2 ± 1.5	3
Z	0.10	2.69	0.00	0.00	1.09	0.64	0.01	3.13	7.7 ± 3.2	8
Zlo	0.10	2.29	0.00	0.00	0.02	0.21	0.00	2.24	4.9 ± 2.5	6
Zhi	0.00	0.08	0.00	0.00	1.05	0.34	0.01	0.28	1.8 ± 1.3	2
1tight,2loose										
lo	0.57	1.81	0.00	0.00	0.03	0.19	0.00	1.68	4.3 ± 2.3	3
!Zlo	0.12	0.96	0.00	0.00	0.00	0.07	0.00	0.29	1.4 ± 1.3	0
Z	0.64	1.09	0.00	0.00	0.70	0.32	0.02	2.63	5.4 ± 2.7	6
Zlo	0.45	0.84	0.00	0.00	0.03	0.12	0.00	1.39	2.8 ± 1.9	3
Zhi	0.19	0.09	0.00	0.00	0.62	0.14	0.02	0.57	1.6 ± 1.3	2

CDF RUN II Preliminary $\int \mathcal{L}dt = 2.0$ fb^{-1} : Search for $\widetilde{\chi}_1^{\pm}\widetilde{\chi}_2^0$

Name	Z→ ee	Z→ $\mu\mu$	Z→ $\tau\tau$	WW	WZ	ZZ	$t\bar{t}$	Fakes	Expected	Observed
2tight,1Track										
lo	168.37	138.84	1.73	0.02	0.02	0.35	0.02	2.39	312 ± 35	290
!Zlo	49.31	35.84	1.61	0.01	0.01	0.10	0.00	1.57	88 ± 13	72
Z	166.42	140.97	0.12	0.13	0.32	0.77	0.29	1.82	311 ± 34	299
Zlo	119.06	103.00	0.12	0.01	0.01	0.25	0.02	0.83	223 ± 26	218
Zhi	14.67	10.40	0.00	0.09	0.30	0.41	0.27	0.67	27 ± 6	34
1tight,1loose,1Track										
lo	55.02	170.96	0.74	0.01	0.01	0.24	0.05	1.37	228 ± 30	214
!Zlo	6.64	25.38	0.74	0.00	0.00	0.08	0.03	0.90	34 ± 7	31
Z	69.45	202.01	0.15	0.11	0.27	0.56	0.30	1.13	274 ± 35	246
Zlo	48.38	145.58	0.00	0.01	0.00	0.15	0.02	0.47	195 ± 26	183
Zhi	8.59	17.69	0.00	0.10	0.27	0.32	0.28	0.48	28 ± 6	23

Systematic Uncertainty

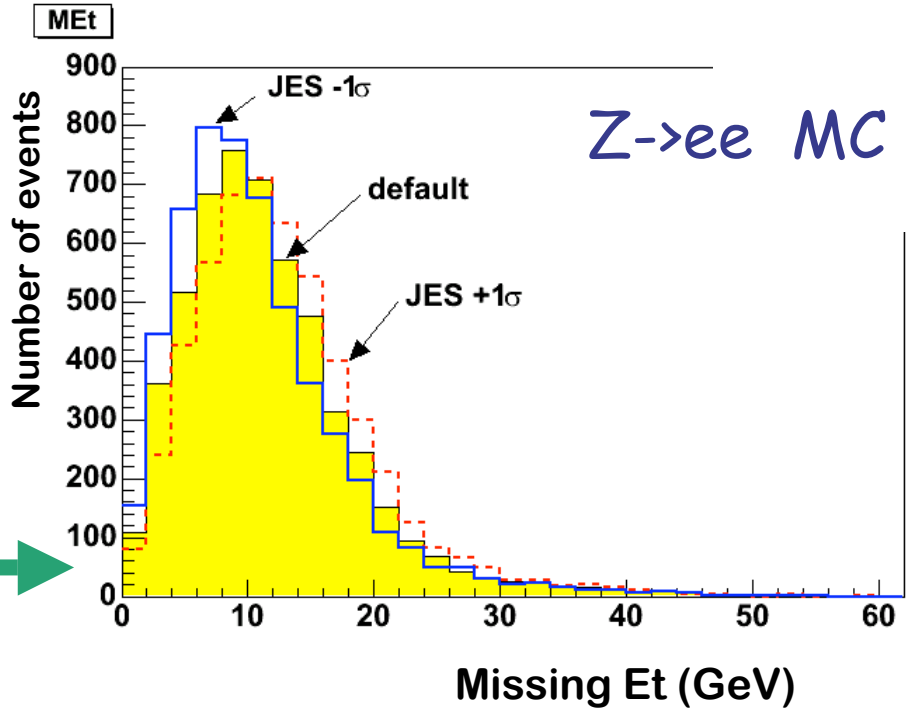
Major systematic uncertainties affecting the measured number of events

➢ **Signal**

- Production Cross Section 10%
- Lepton ID 4%
- Initial/Final State Radiation 4%

➢ **Background**

- Fake lepton method 10%
- Jet Energy Scale 5%
- Production Cross sections 5%



➢ **Common to both signal and background**

- Luminosity 4%
- PDFs 2%

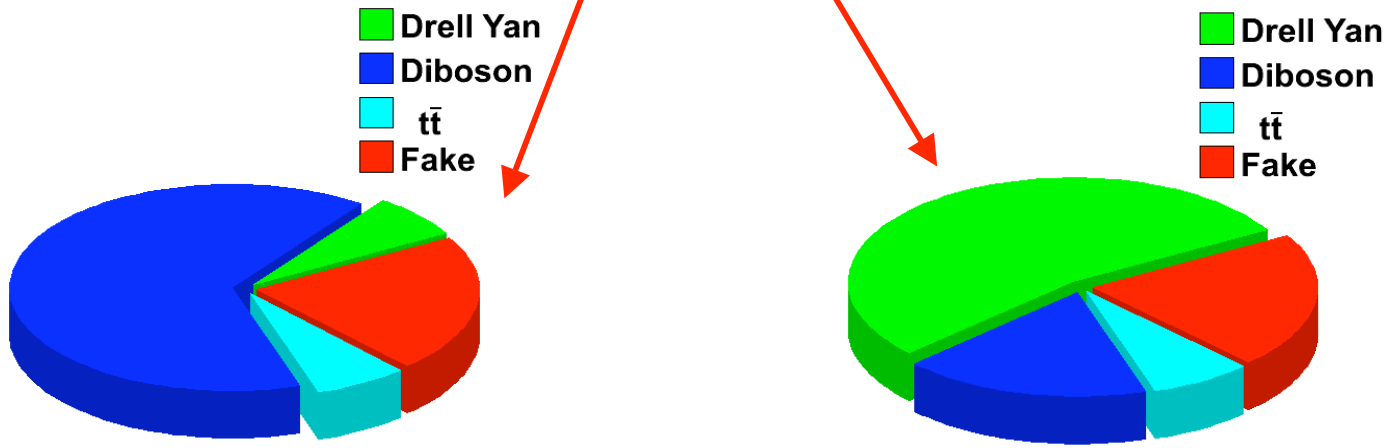
Let's look at the signal region !

Results !

Look at the "SIGNAL" region

Signal : mSUGRA m_0=60, $m_{1/2}$=190, tan(β)=3, A_0=0, μ>0, $M(\chi_1^{\pm})$=120 GeV/c^2

Analysis	Luminosity (fb^{-1})	Total predicted background	Example SUSY Signal	Obs-erved data
Trileptons $\ell^{\pm}\ell^{\mp}+\ell^{\pm}$	2	0.88±0.13	4.50±0.63	?
Dileptons + track $\ell^{\pm}\ell^{\mp}+$ *track*	2	5.50±1.14	6.90±0.92	

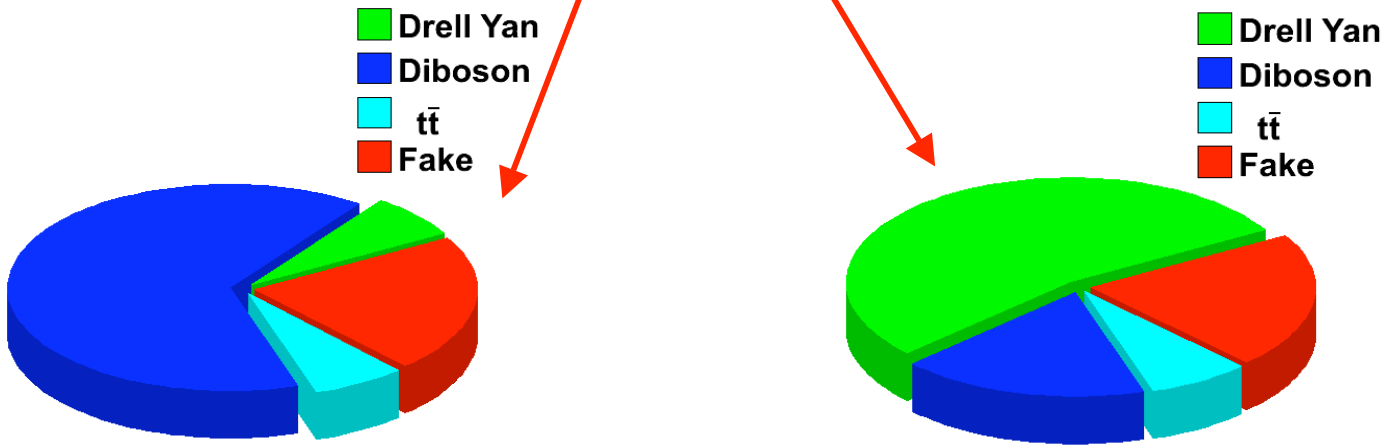


Results !

Look at the "SIGNAL" region

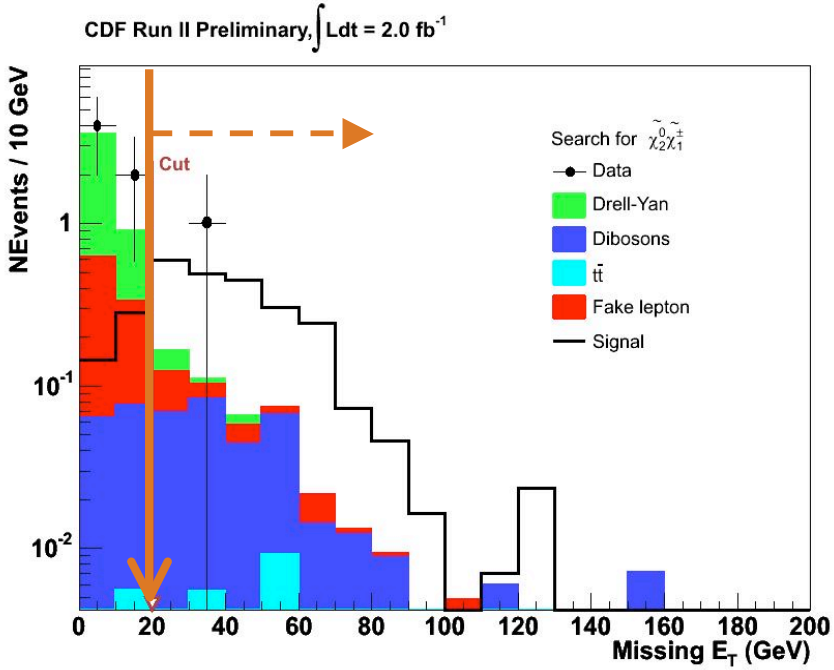
Signal : mSUGRA m_0=60, $m_{1/2}$=190, tan(β)=3, A_0=0, μ>0, $M(\chi_1^{\pm})$=120 GeV/c^2

	Analysis	Luminosity (fb^{-1})	Total predicted background	Example SUSY Signal	Obs-erved data
Trileptons	$\ell^{\pm}\ell^{\mp}+\ell^{\pm}$	2	0.88±0.13	4.50±0.63	1
Dileptons + track	$\ell^{\pm}\ell^{\mp}+$ *track*	2	5.50±1.14	6.90±0.92	6

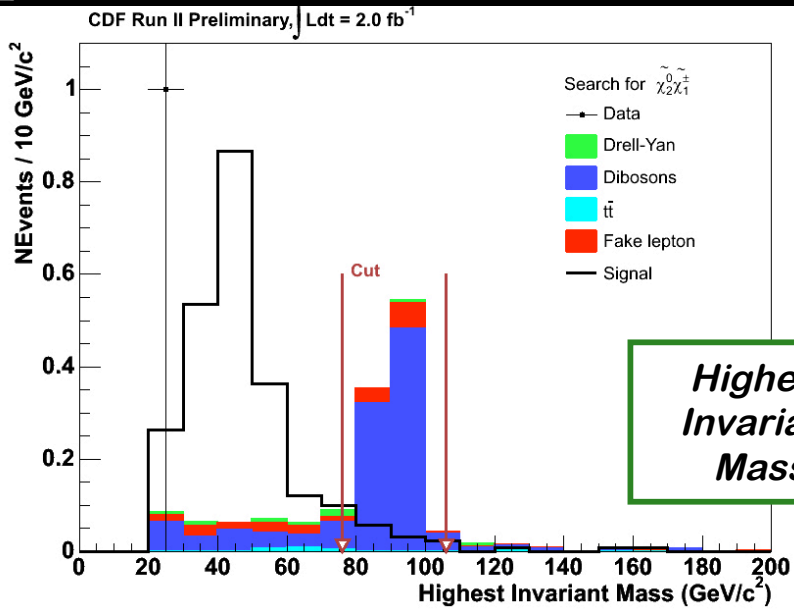


Trileptons

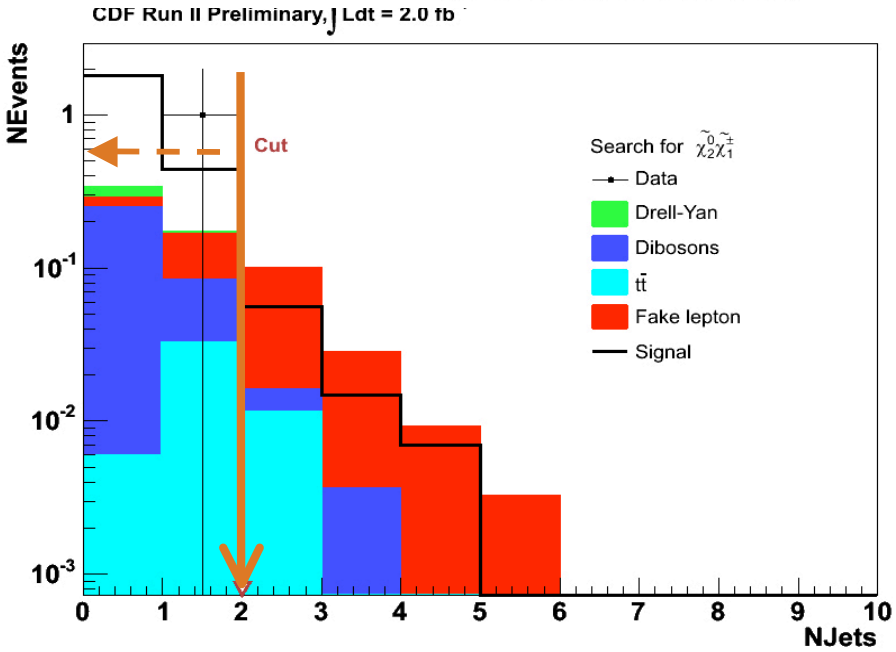
3 tight leptons



Missing Transverse Energy

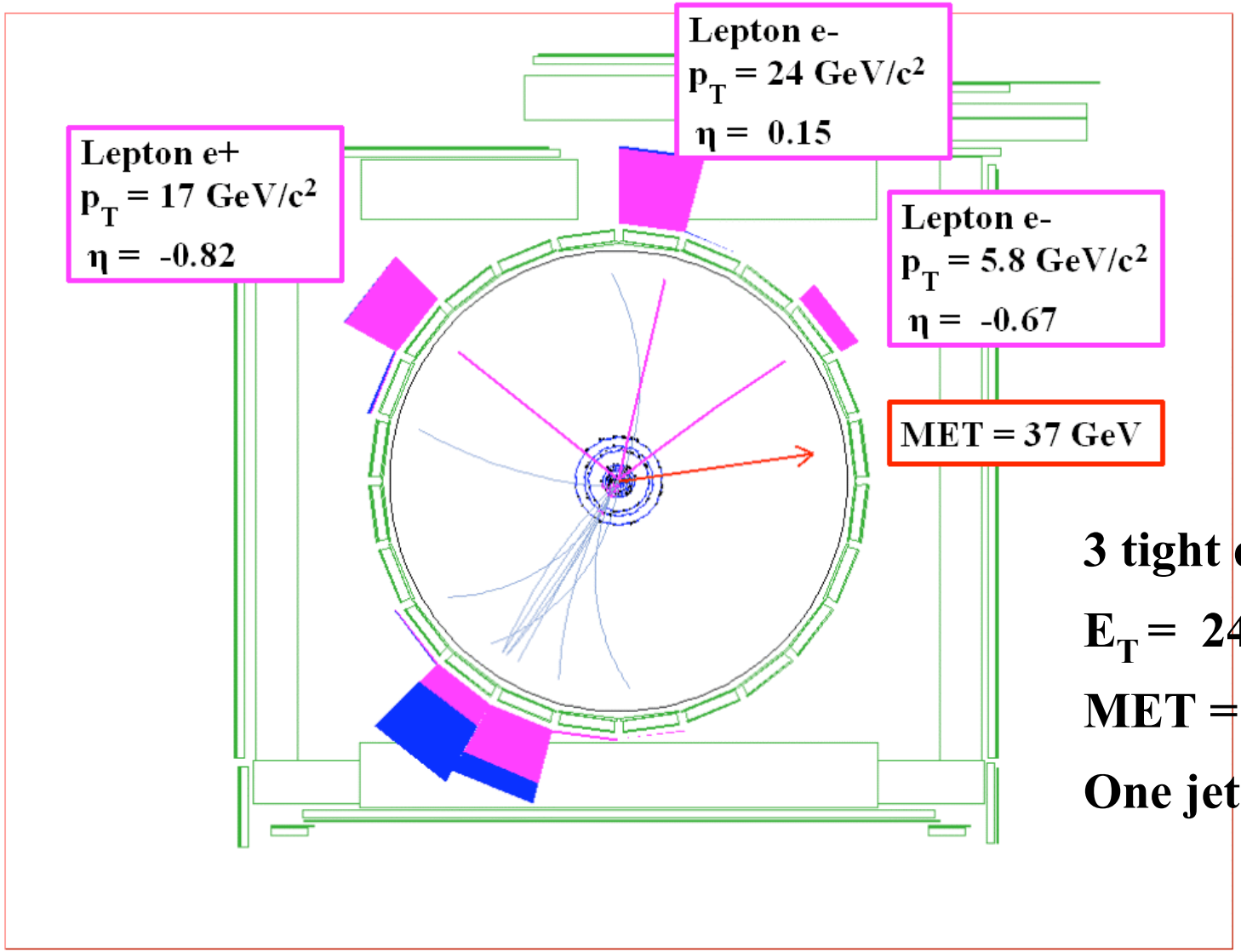


Highest Invariant Mass



Observation of 1 event consistent with SM expectactions

Trilepton Event



3 tight electron event

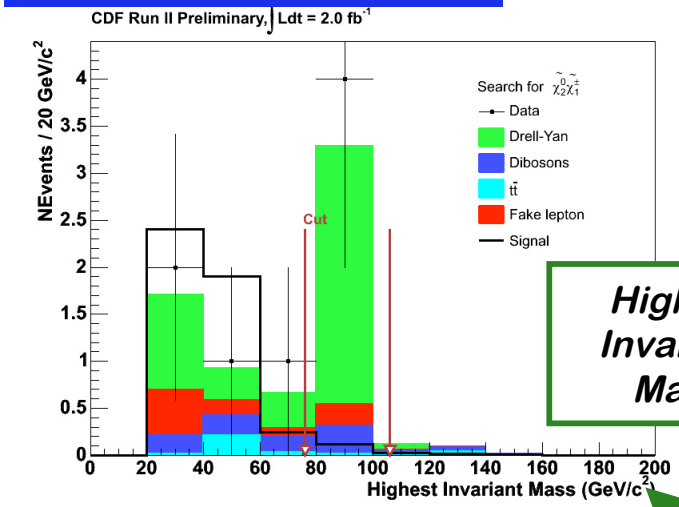
E_T = 24 , 17 , 6 GeV

MET = 37 GeV

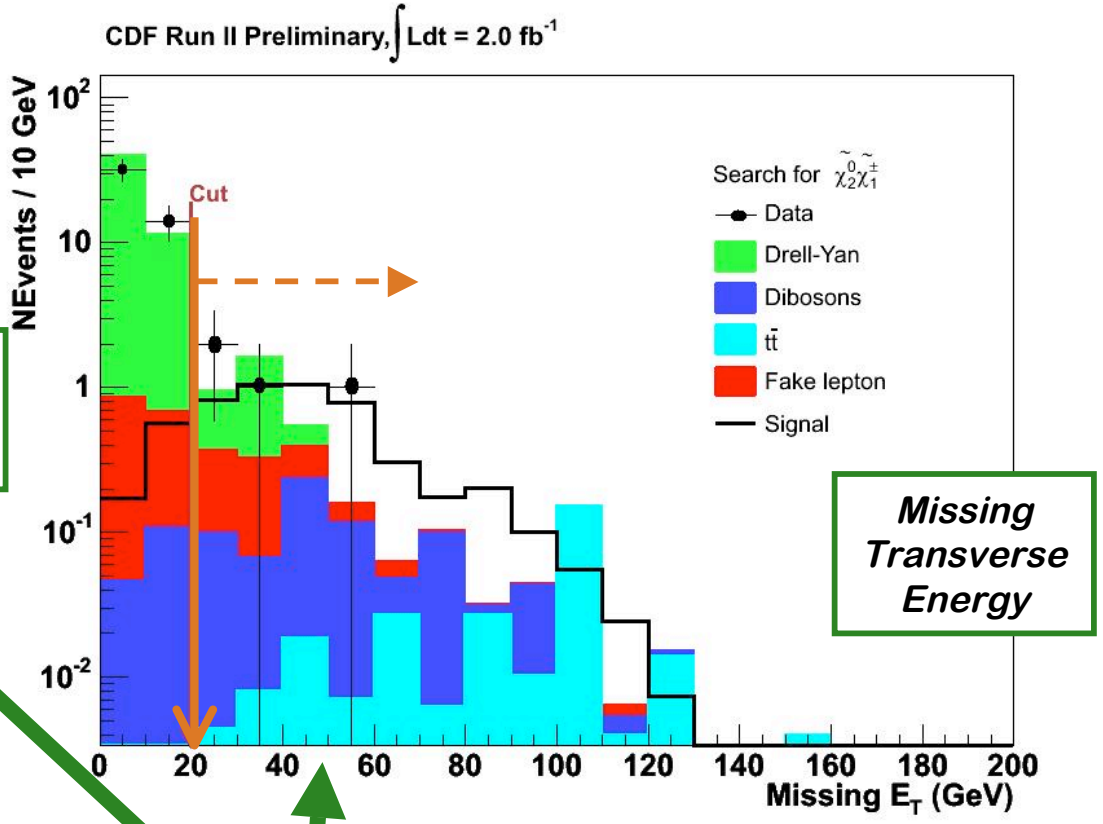
One jet, Jet E_T = 60 GeV

Dilepton + track

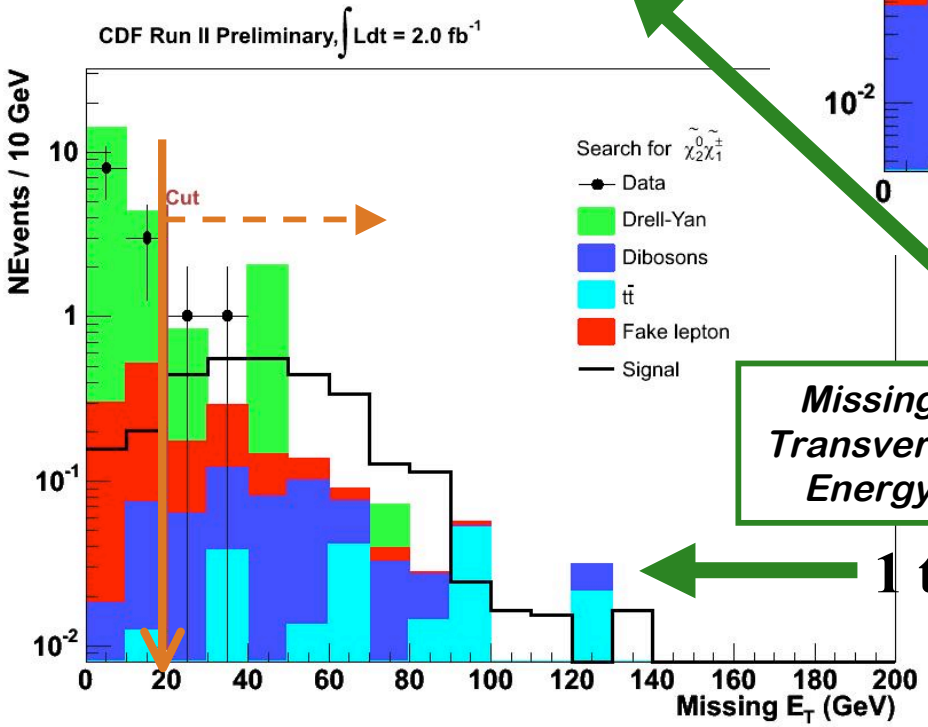
Dilepton + track category



Highest Invariant Mass



Missing Transverse Energy



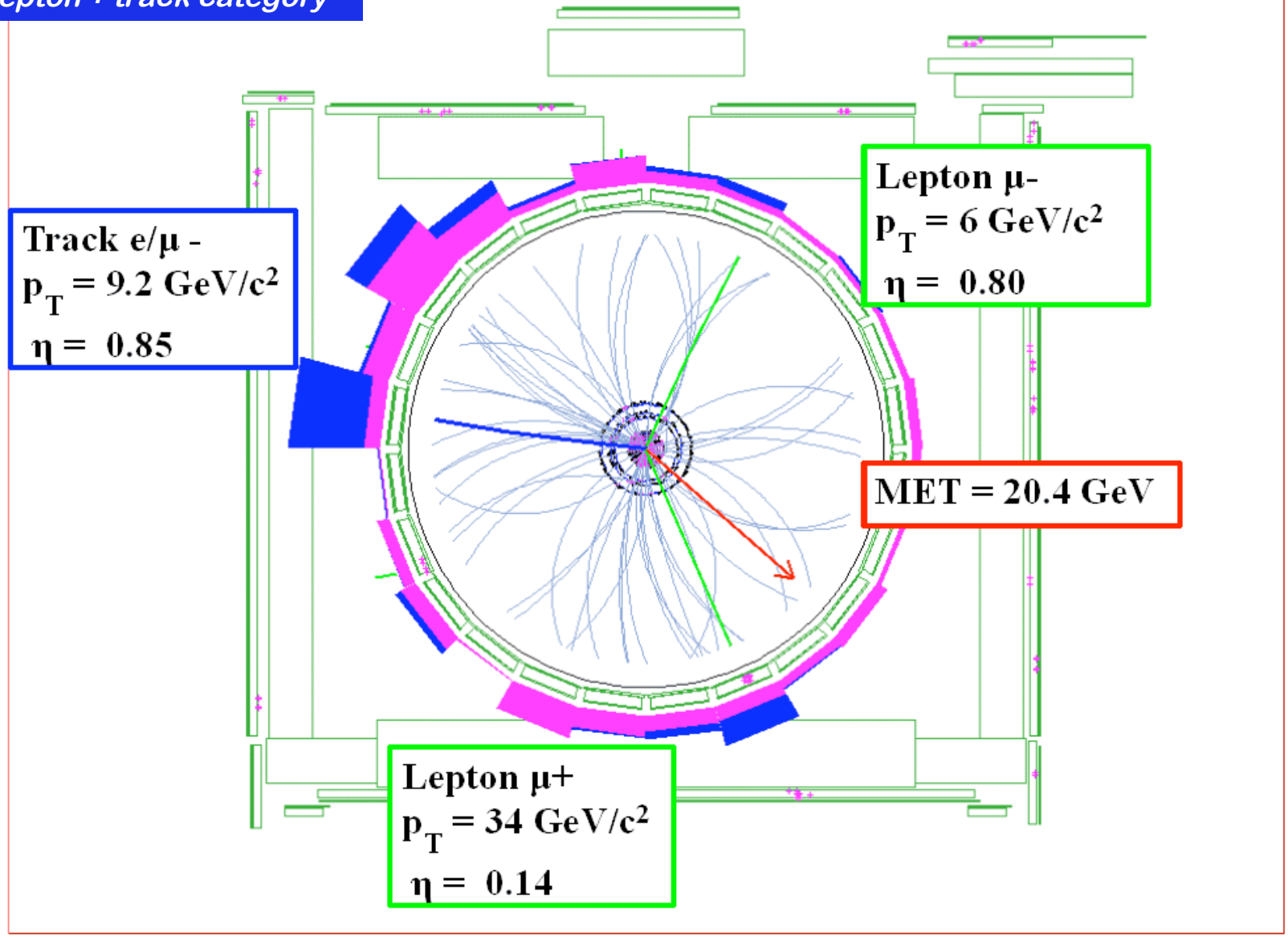
Missing Transverse Energy

2 tight, 1 Track → 4 events

1 tight, 1 loose, 1 Track → 2 events

Dilepton+track event

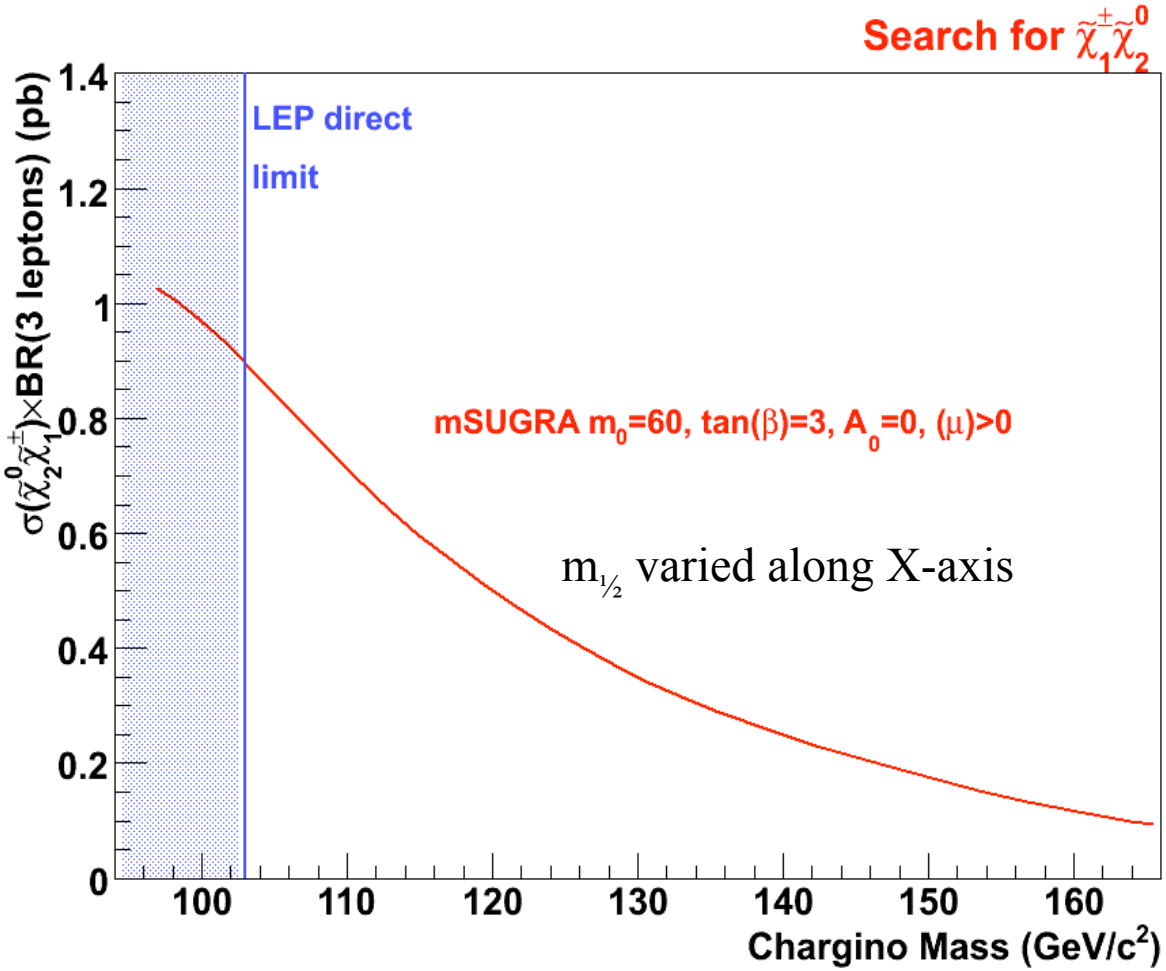
2 tight lepton + track category



Interpretation of results

No SUSY :(

- Combined all analyses to obtain a limit on the mass of the chargino in mSugra



Interpretation of results

No SUSY :(

- Combined all analyses to obtain a limit on the mass of the chargino in mSugra

➡ **Observed limit:**

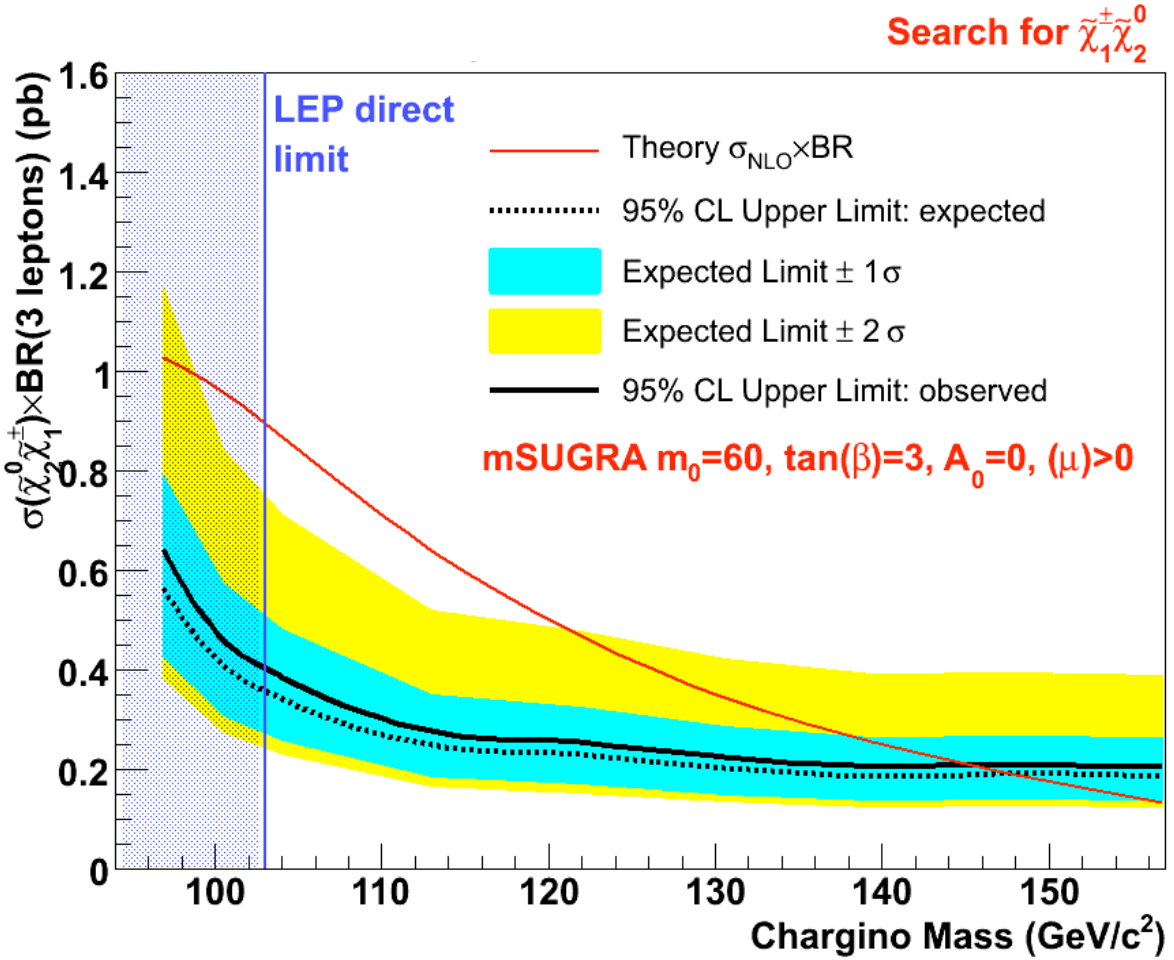
$M(\chi^{\pm}_1) \sim 145$ GeV/c^2

σxBR ~ 0.25 pb

➡ **Sensitive to:**

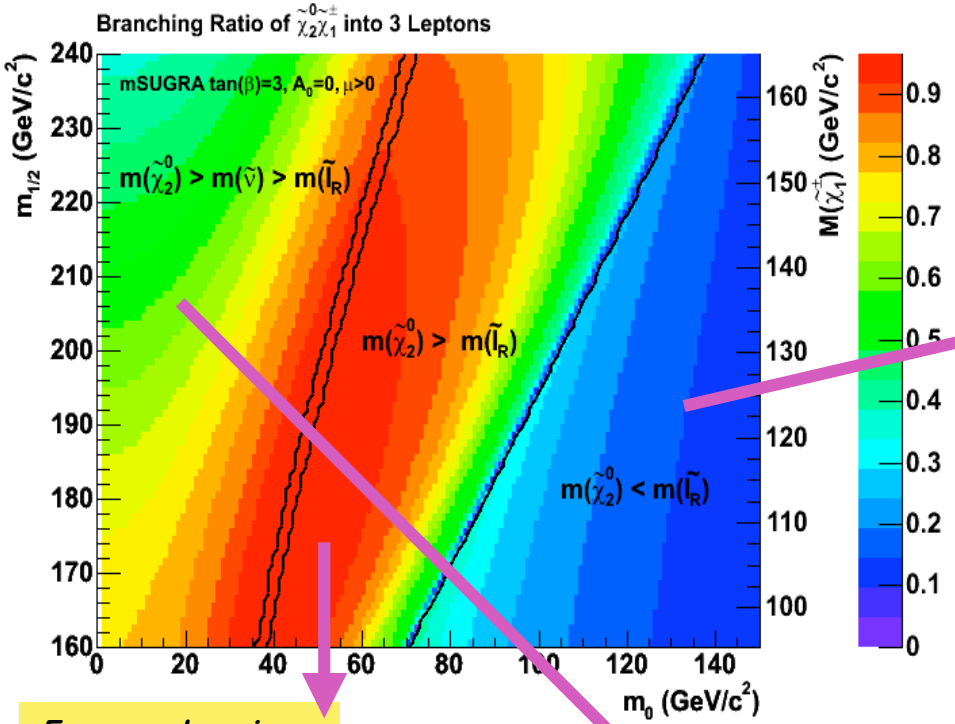
$M(\chi^{\pm}_1) \sim 147$ GeV/c^2

σxBR ~ 0.2 pb

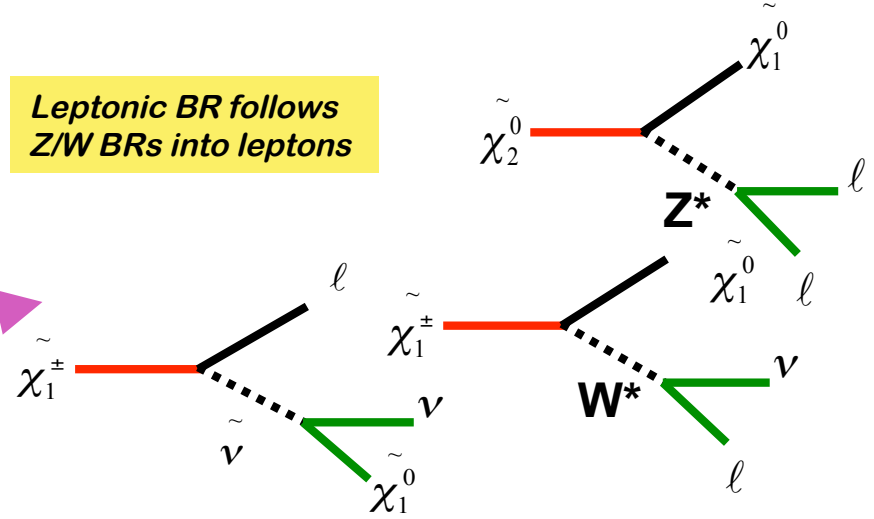


FIRST CHARGINO MASS LIMIT BEYOND LEP IN MSUGRA AT TEVATRON

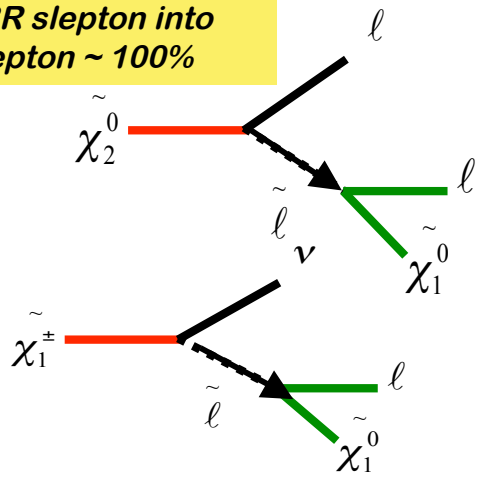
Sigmas and Branching Ratios



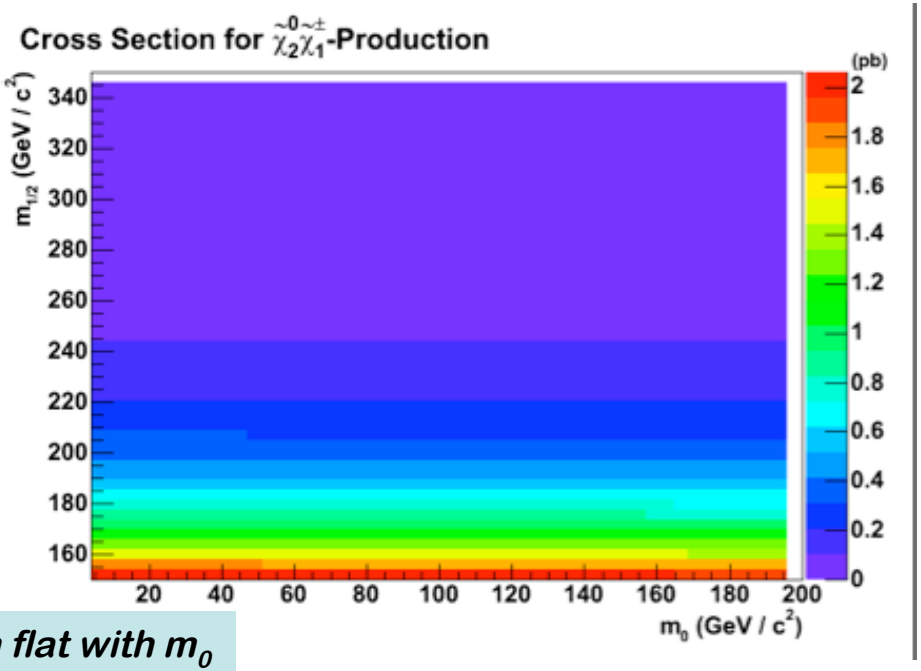
Leptonic BR follows Z/W BRs into leptons



Favoured region : BR slepton into lepton ~ 100%



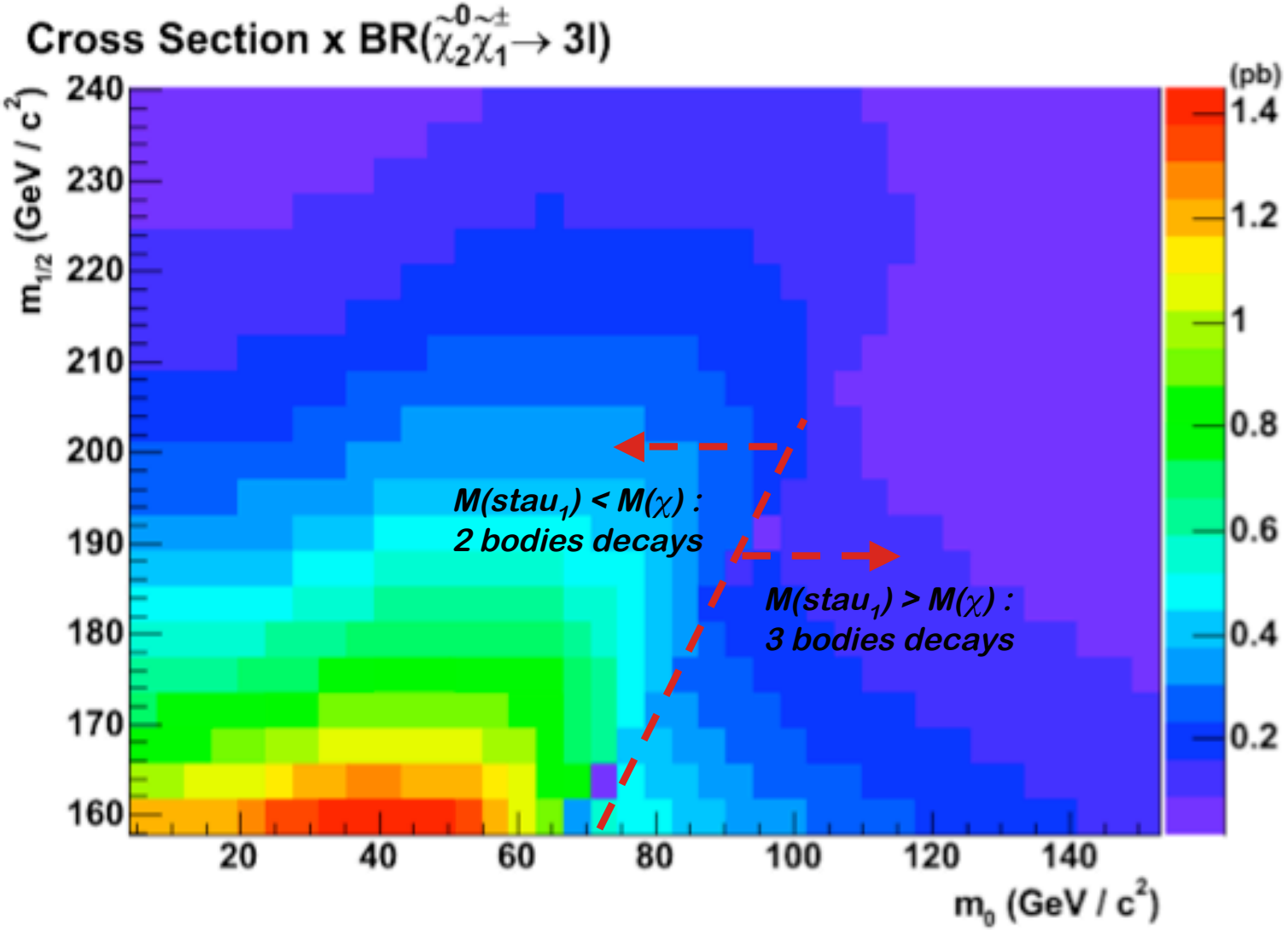
Neutralino goes always to invisible



Cross section flat with m_0

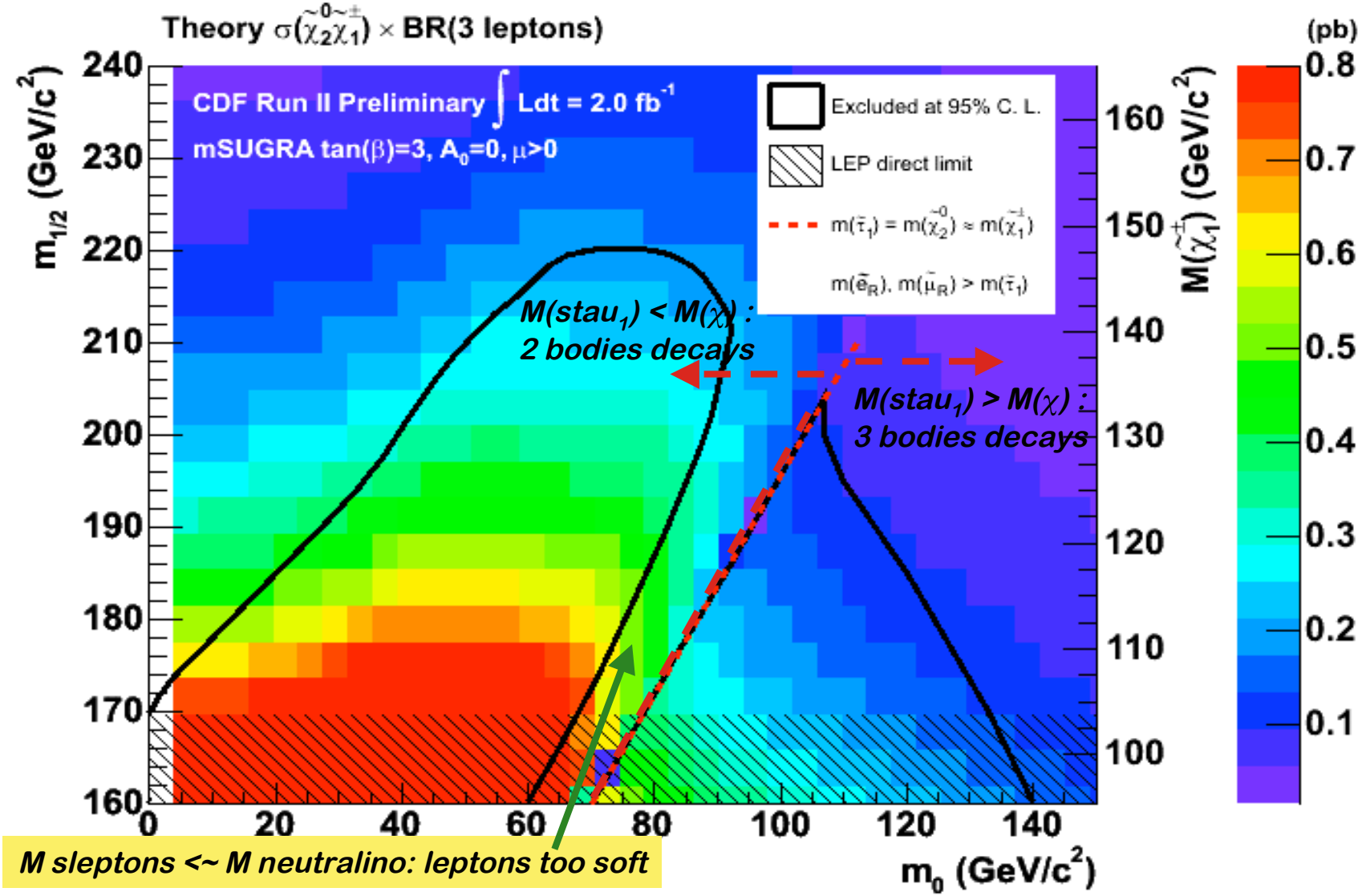
Exclusion limits in m_0-$m_{1/2}$ plane

The product of the two



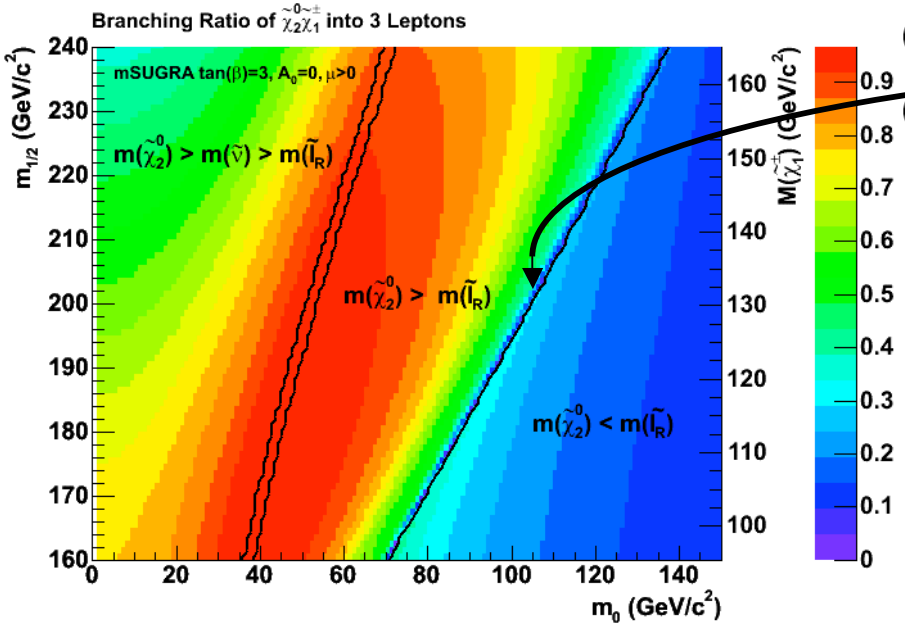
Exclusion limits in m_0-$m_{1/2}$ plane

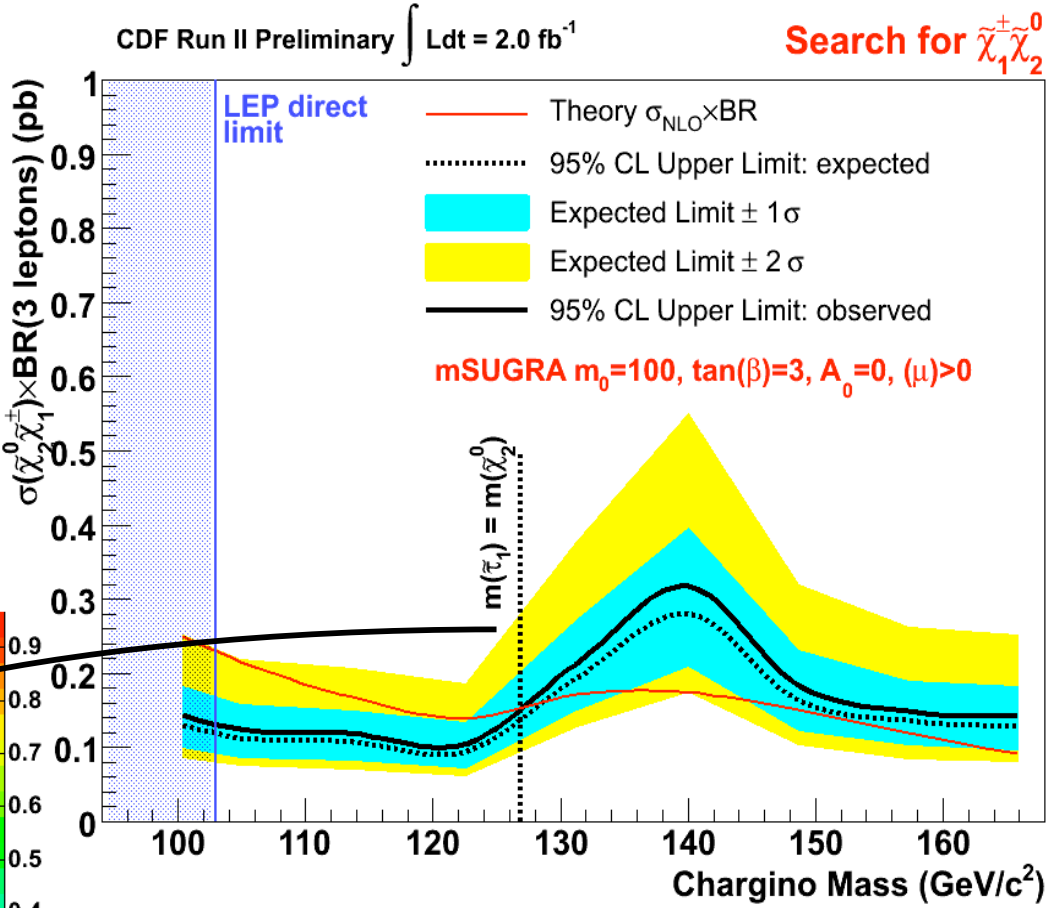
The product of the two



Changing m_0

- By changing value of m_0 we go through a mass discontinuity
  - ➡changes in leptons Pt affect acceptance





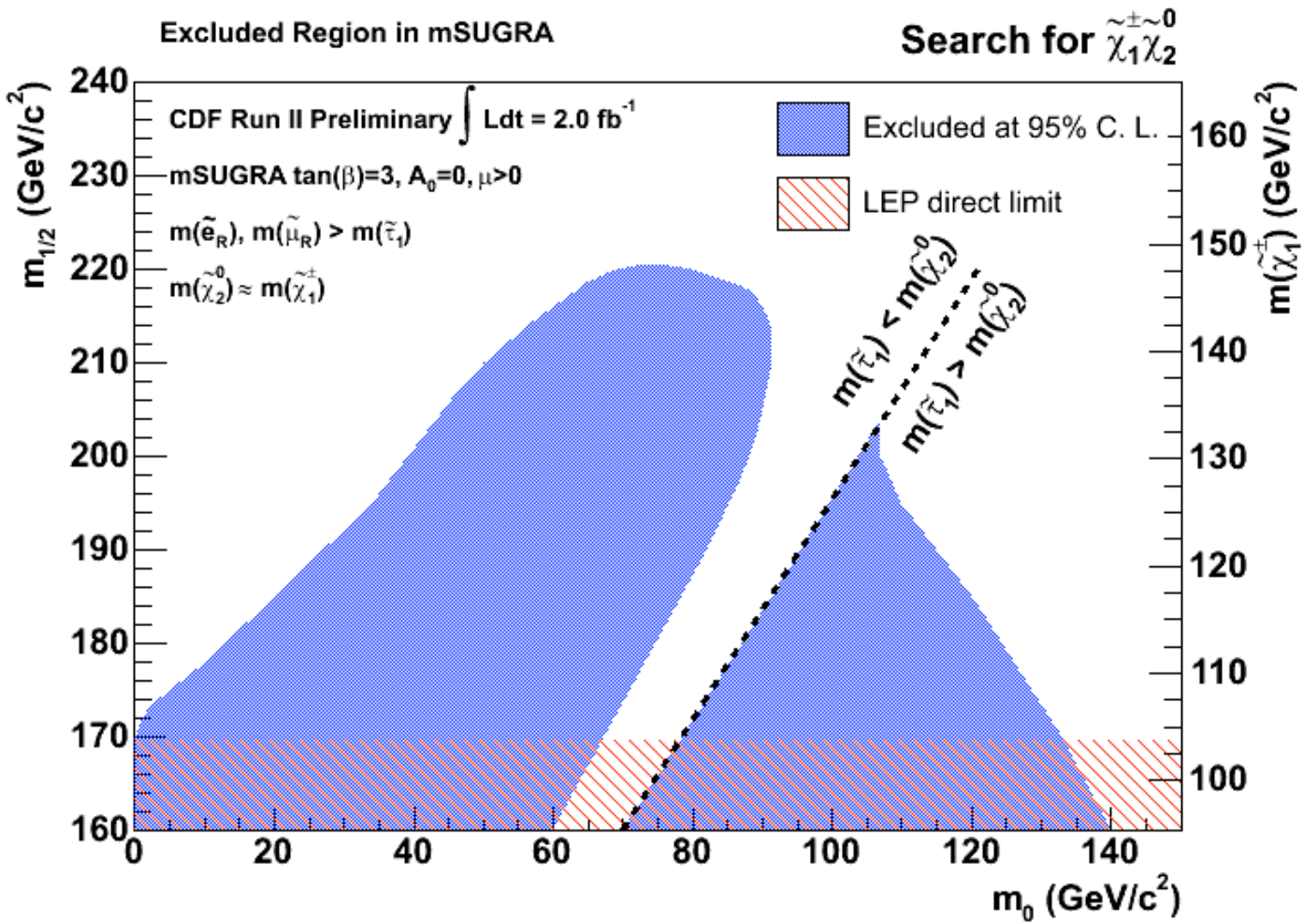
➡**Observed limit:**

$M(\chi^\pm_1) \sim 127$ GeV/c^2

σxBR ~ 0.18 pb

Exclusion Plane

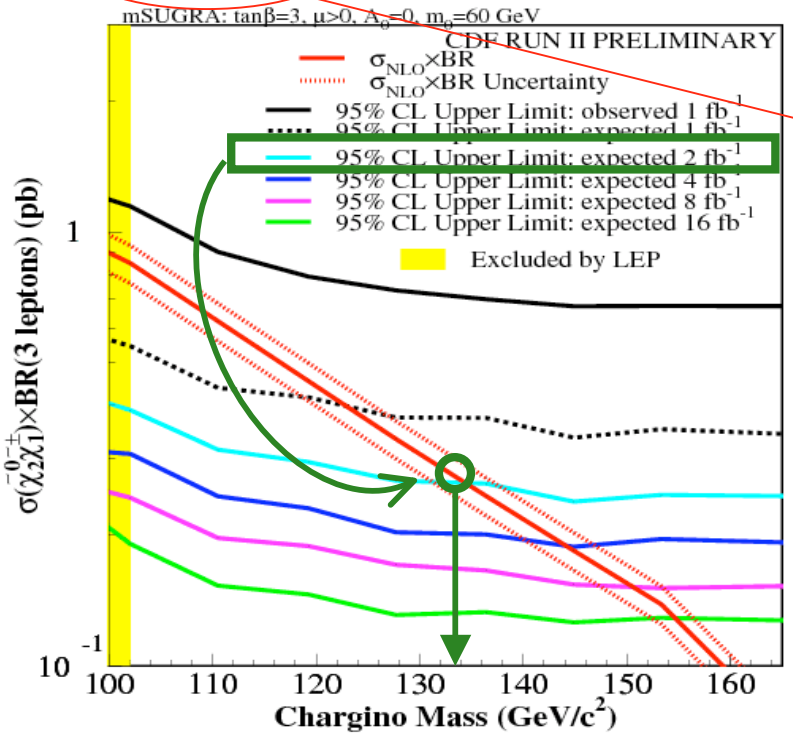
Limit in the m_0-$m_{1/2}$ plane

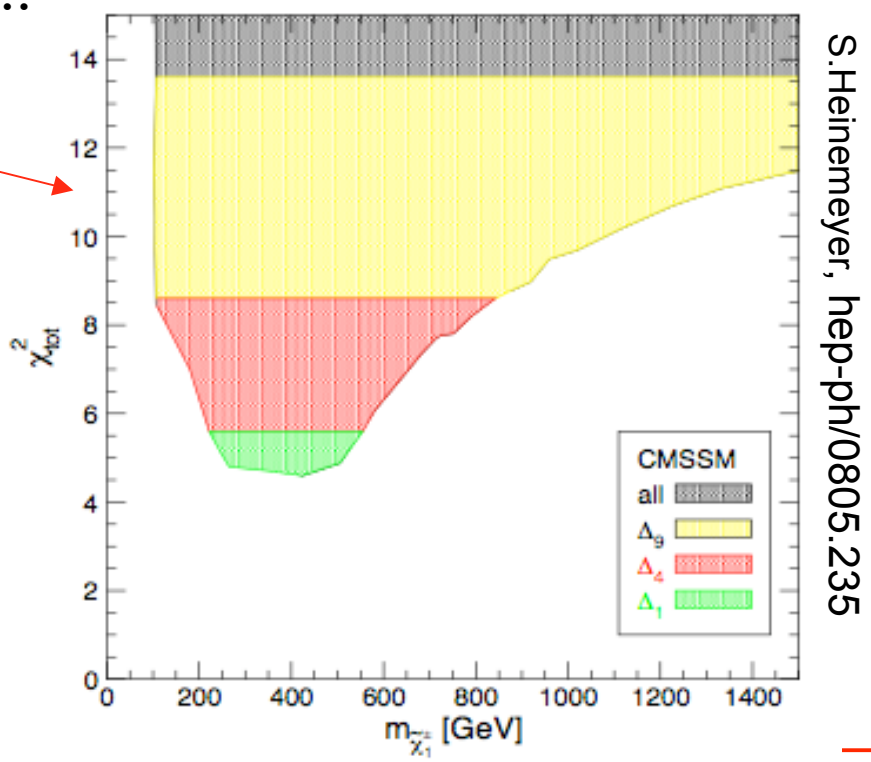


Summary and Outlook: Chargino and Neutralino in mSugra

Trileptons signatures:

- CDF analysed 2 fb^{-1} of data and observed no excess
- Set first limit in mSugra at the Tevatron beyond LEP! Already better than expectactions
- ~ 4 fb^{-1} of data collected and ready to be analysed
- With 7-8 fb^{-1} by the end of RunII we should be sensitive to Chargino masses up to ~300 GeV and σxBR ~ 0.05-0.01 pb !!



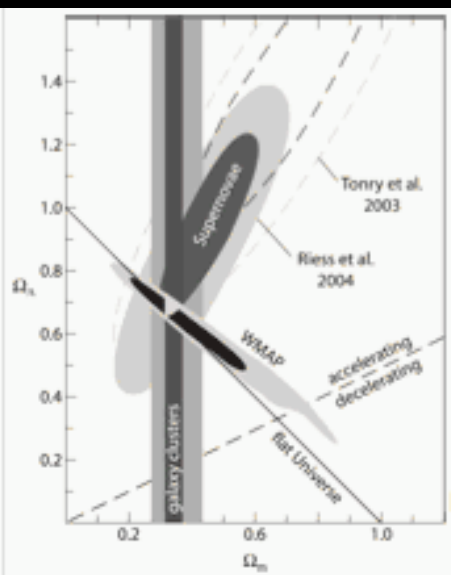


S.Heinemeyer, hep-ph/0805.235

Back-up

Evidence for Dark Matter

1. Binding of galactic clusters too strong for known amount of matter
2. Rotation curves of galaxies: velocities flatness out
3. Gravitational lensing observed where should not be matter
4. Hot gas bound to clusters too strongly
5. Cosmic Microwave Background indicates model of universe with 25% of DM
6. Large Scale Structure mesurements agreed with modeld with DM and DE
7. Big Bang nucleosynthesis predicts baryon density ~4% as fitted from 5.
8. Fits from distant supernovae probe presence DM and DE
9. Colliding galactic clusters ("bullet clusters") show separation DM from gaseous halo from baryonic matter

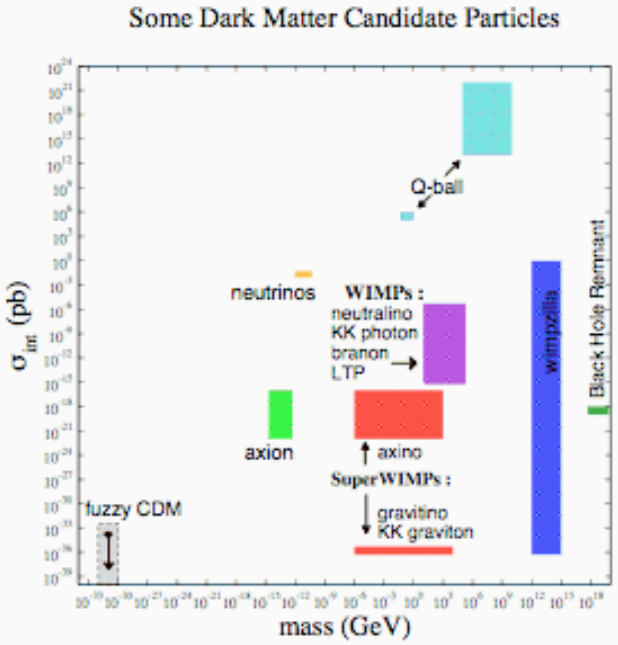


Concordance cosmology:

$\Omega_{tot} = 1$

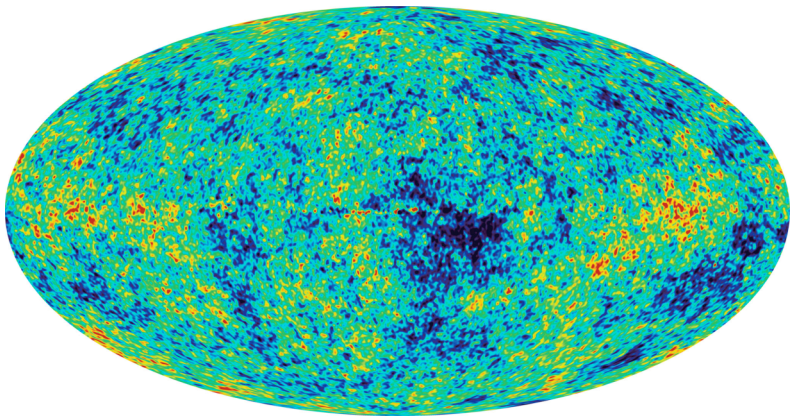
$\Omega_\Lambda \approx 0.74$

$\Omega_m \approx 0.26$

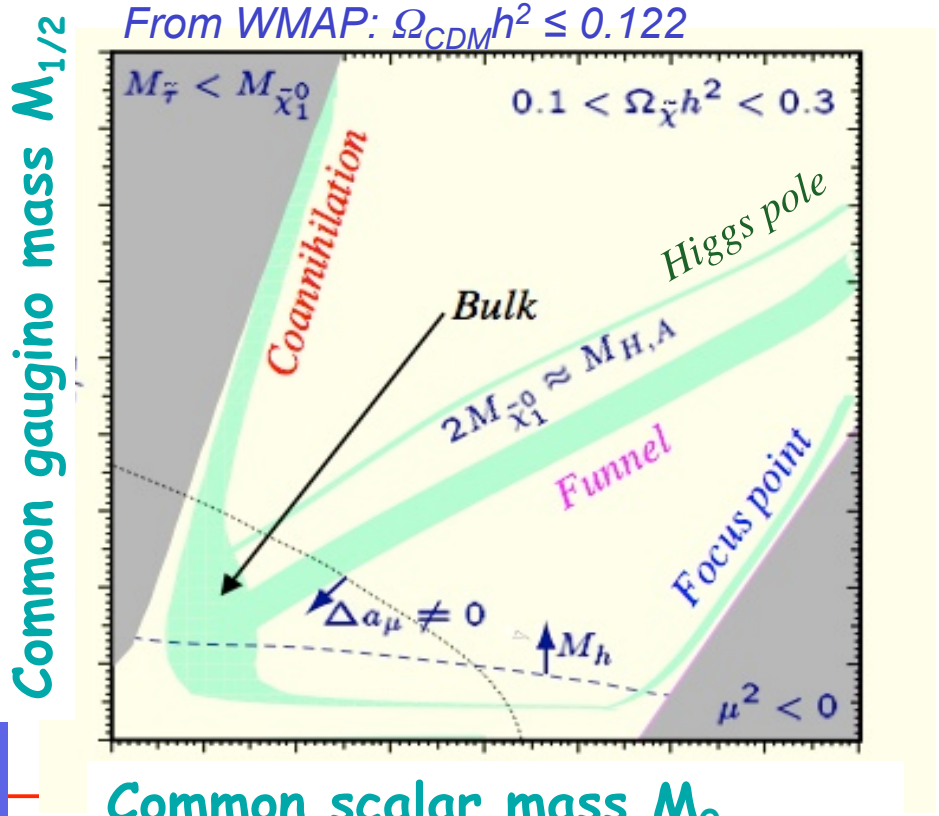


mSugra & Dark Matter

- **Evidence for Dark Matter**
  Among others:
  - galaxy rotation
  - fluctuations in the cosmic microwave background (WMAP)
- **In mSugra and with Rp conserved and EW radiative corrections,**
  - 5 main regions where neutralino fulfills the WMAP relic density



From WMAP: $\Omega_{CDM}h^2 \leq 0.122$



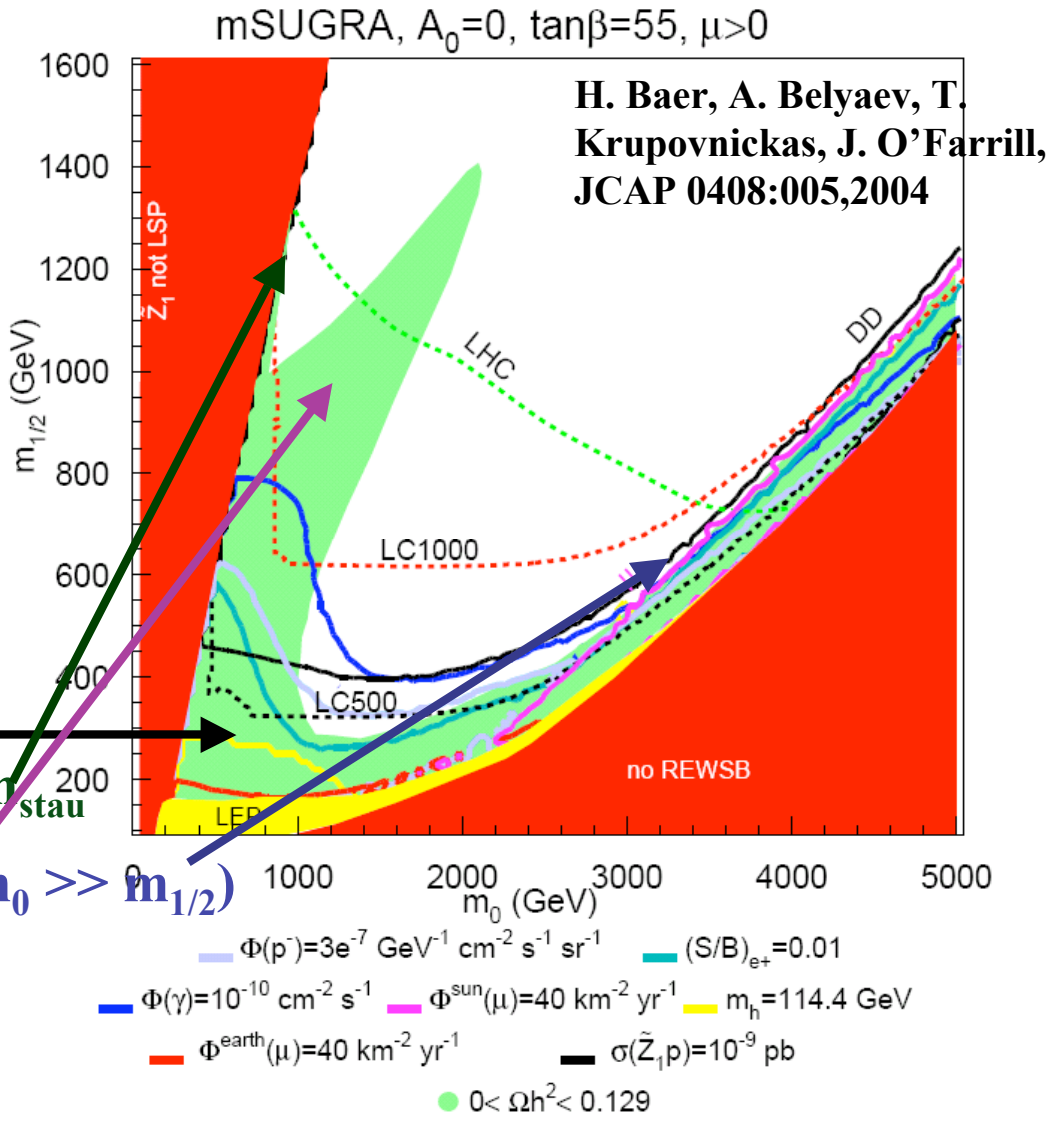
- **bulk (low m_0 and $m_{1/2}$):** $\tilde{\chi}\tilde{\chi}\text{-}\tilde{\ell}\text{->}\ell\bar{\ell}$
- **stau coannihilation $m_\chi \approx m_{stau}$:** $\tilde{\chi}\tilde{\tau}\text{->}\tau\gamma$
- **focus point ($m_0 >> m_{1/2}$) :** $\tilde{\chi}\tilde{\chi}\text{->}WW,ZZ,Zh$
- **funnel region ($m_{A,H} \approx 2m_\chi$):** $\tilde{\chi}\tilde{\chi}\text{-}A,H\text{->}b\bar{b}$
- **Higgs pole:** $2m_{\chi^0_1} < m_h$

Tevatron sensitive to the BULK region

mSugra & Dark Matter

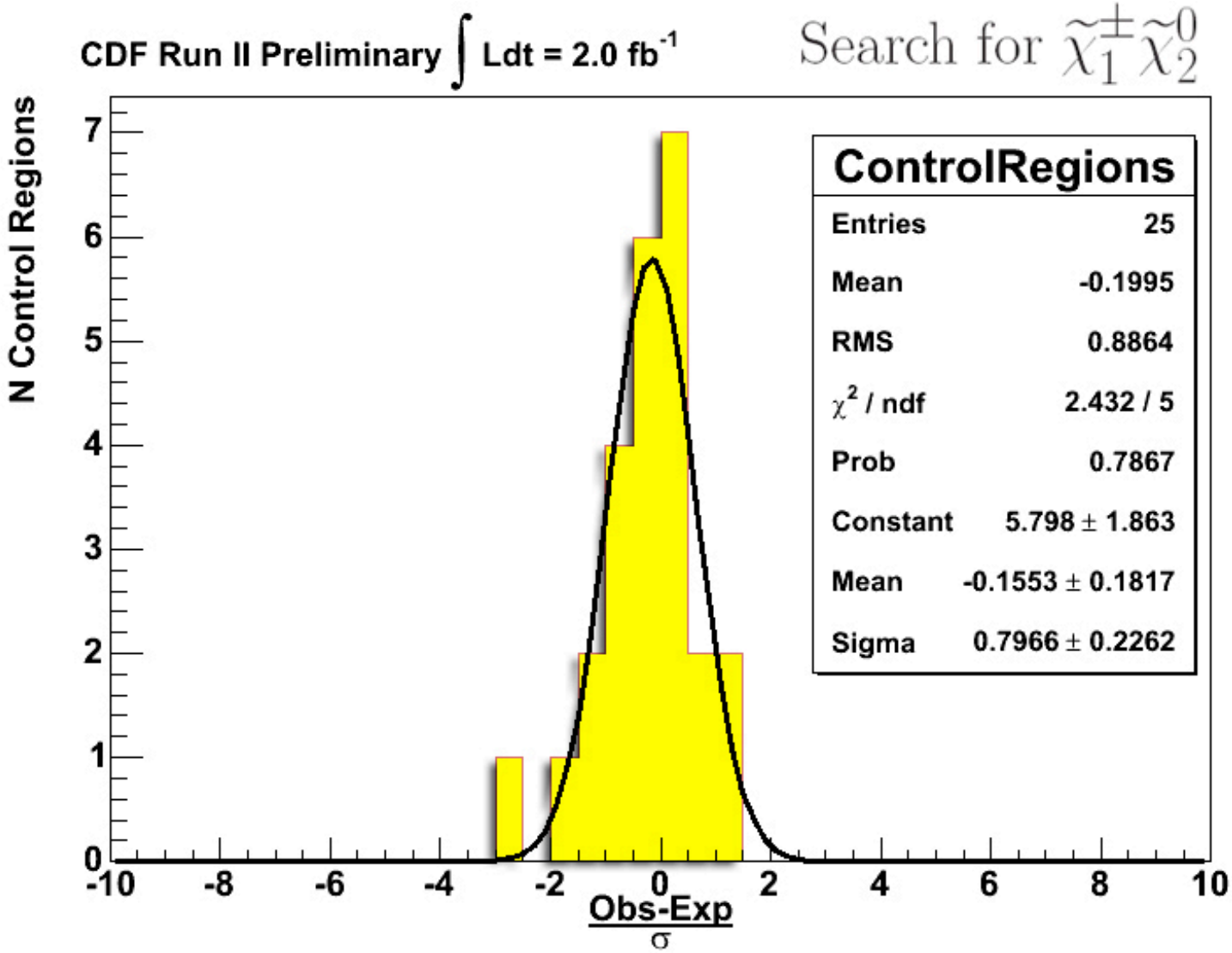
- Evidence for Dark Matter
  - galaxy rotation
  - fluctuations in the cosmic microwave background (WMAP)
- In mSugra and with Rp conserved and EW radiative corrections,
  - 4 main regions where neutralino fulfills the WMAP relic density

HOWEVER: MORE OPTIONS WITH LESS CONSTRAINED MODELS



- bulk region (low m_0 and $m_{1/2}$)
- stau coannihilation region $m_\chi \approx m_{stau}$
- hyperbolic branch/focus point ($m_0 >> m_{1/2}$)
- funnel region ($m_{A,H} \approx 2m_\chi$)

Dilepton CRs: Pull



Estimating Backgrounds

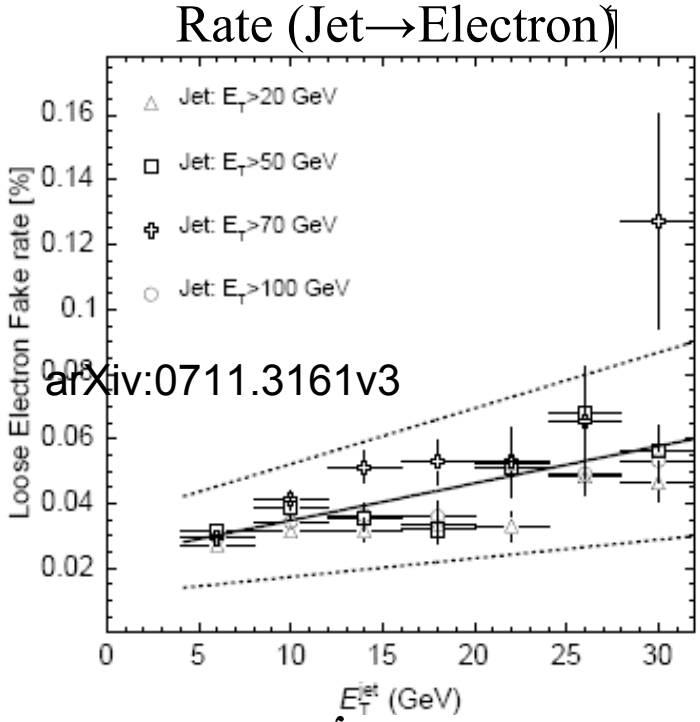
Rate for Leptons :

DY + (had→lep)

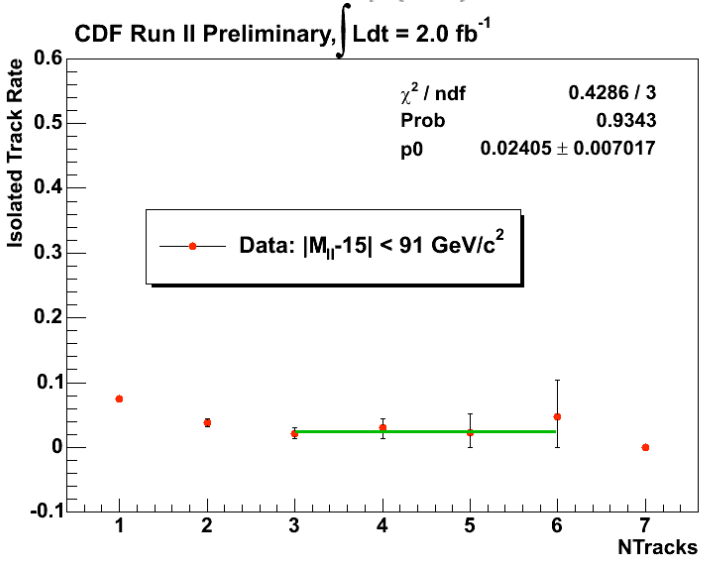
WW + (had→lep)

W+jets + (had→lep)

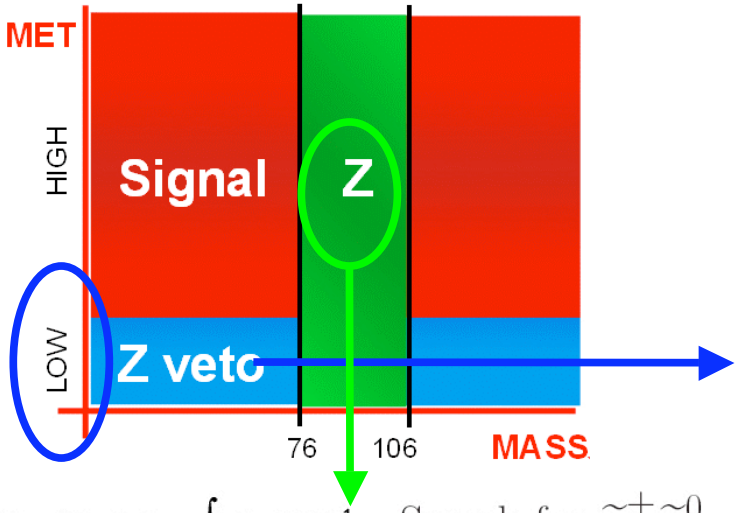
Estimated in **DATA**

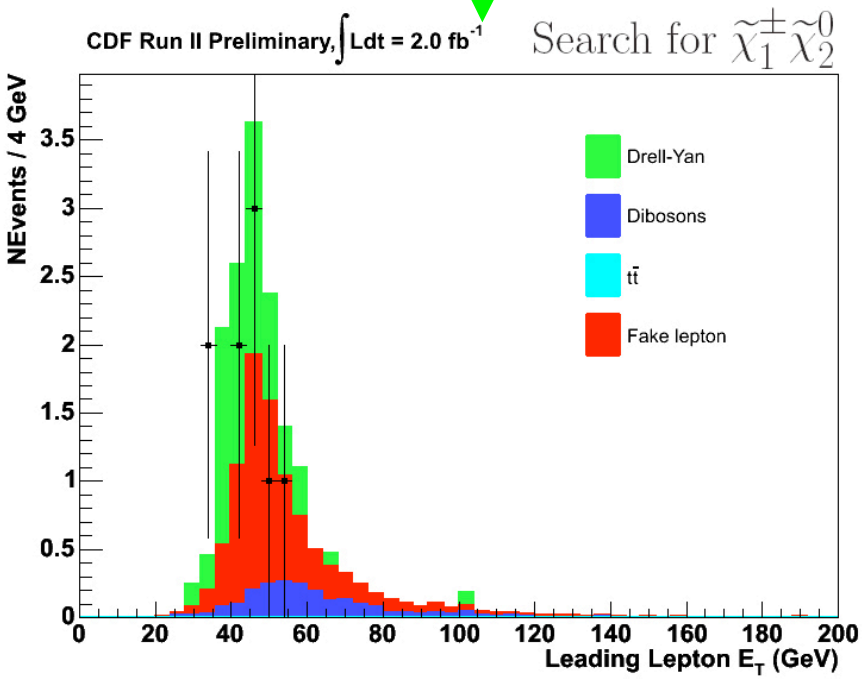


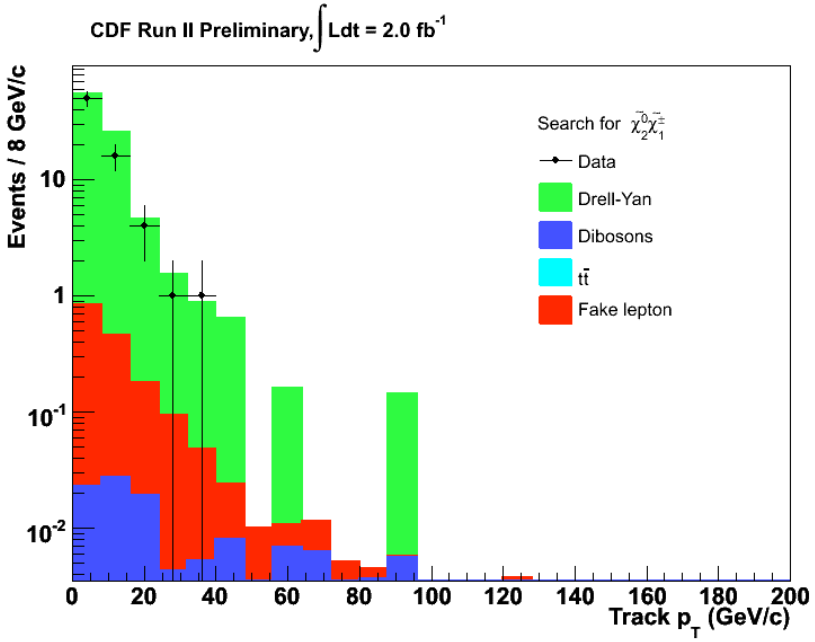
Rate for Candidate Tracks:
DY + track
WW + track
Estimated in **MC**
(but, normalized to data)



Trileptons Control Regions





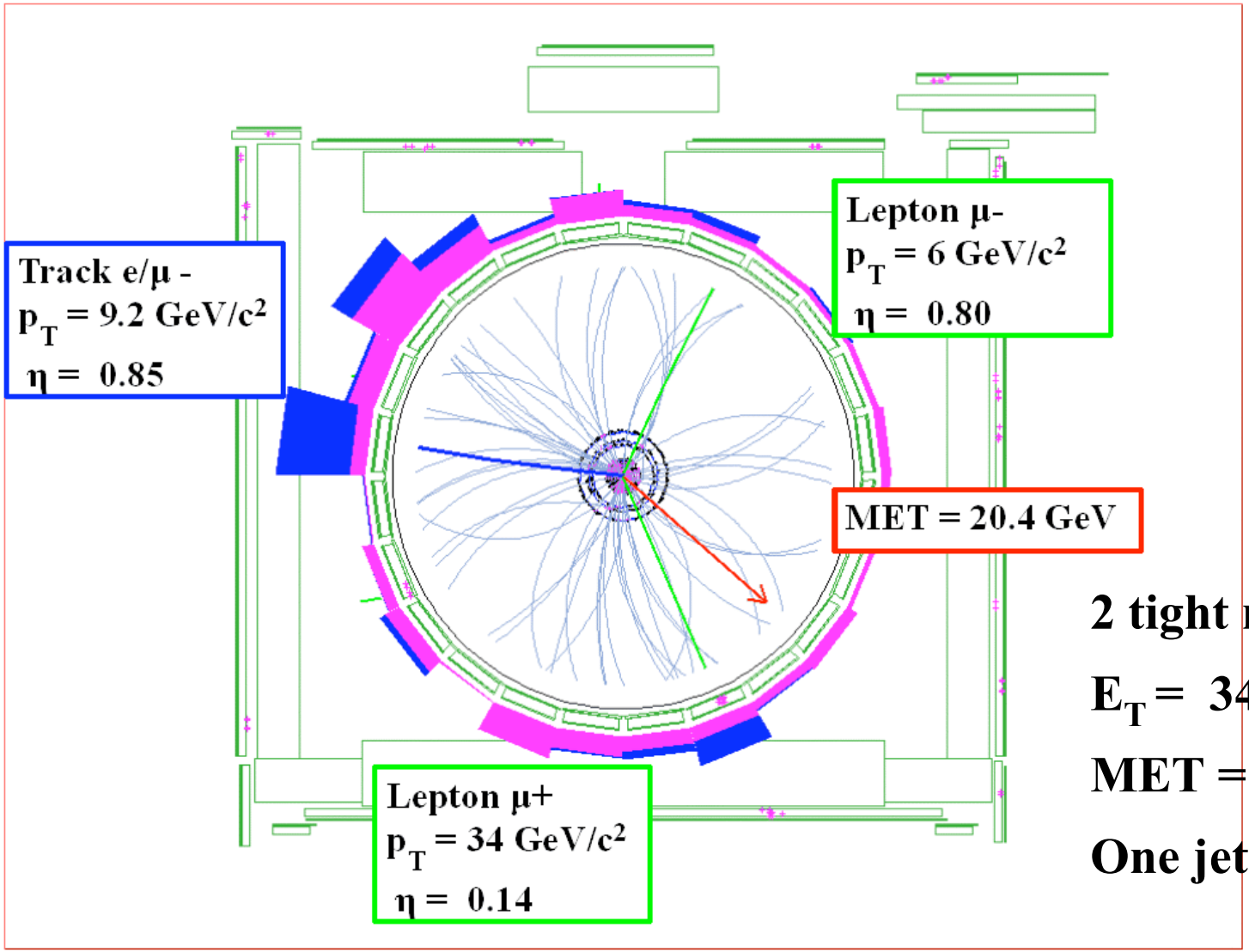


Breakdown of events in Signal Region

CDF RUN II Preliminary $\int \mathcal{L}dt = 2.0$ fb^{-1} : Search for $\tilde{\chi}_1^{\pm}\tilde{\chi}_2^0$

Channel	Signal	Background	Observed
3tight	$2.25 \pm 0.13(\text{stat}) \pm 0.29(\text{syst})$	$0.49 \pm 0.04(\text{stat}) \pm 0.08(\text{syst})$	1
2tight,1loose	$1.61 \pm 0.11(\text{stat}) \pm 0.21(\text{syst})$	$0.25 \pm 0.03(\text{stat}) \pm 0.03(\text{syst})$	0
1tight,2loose	$0.68 \pm 0.07(\text{stat}) \pm 0.09(\text{syst})$	$0.14 \pm 0.02(\text{stat}) \pm 0.02(\text{syst})$	0
Total Trilepton	$4.5 \pm 0.2(\text{stat}) \pm 0.6(\text{syst})$	$0.88 \pm 0.05(\text{stat}) \pm 0.13(\text{syst})$	1
2tight,1Track	$4.44 \pm 0.19(\text{stat}) \pm 0.58(\text{syst})$	$3.22 \pm 0.48(\text{stat}) \pm 0.53(\text{syst})$	4
1tight,1loose,1Track	$2.42 \pm 0.14(\text{stat}) \pm 0.32(\text{syst})$	$2.28 \pm 0.47(\text{stat}) \pm 0.42(\text{syst})$	2
Total Dilepton+Track	$6.9 \pm 0.2(\text{stat}) \pm 0.9(\text{syst})$	$5.5 \pm 0.7(\text{stat}) \pm 0.9(\text{syst})$	6

EVENTS



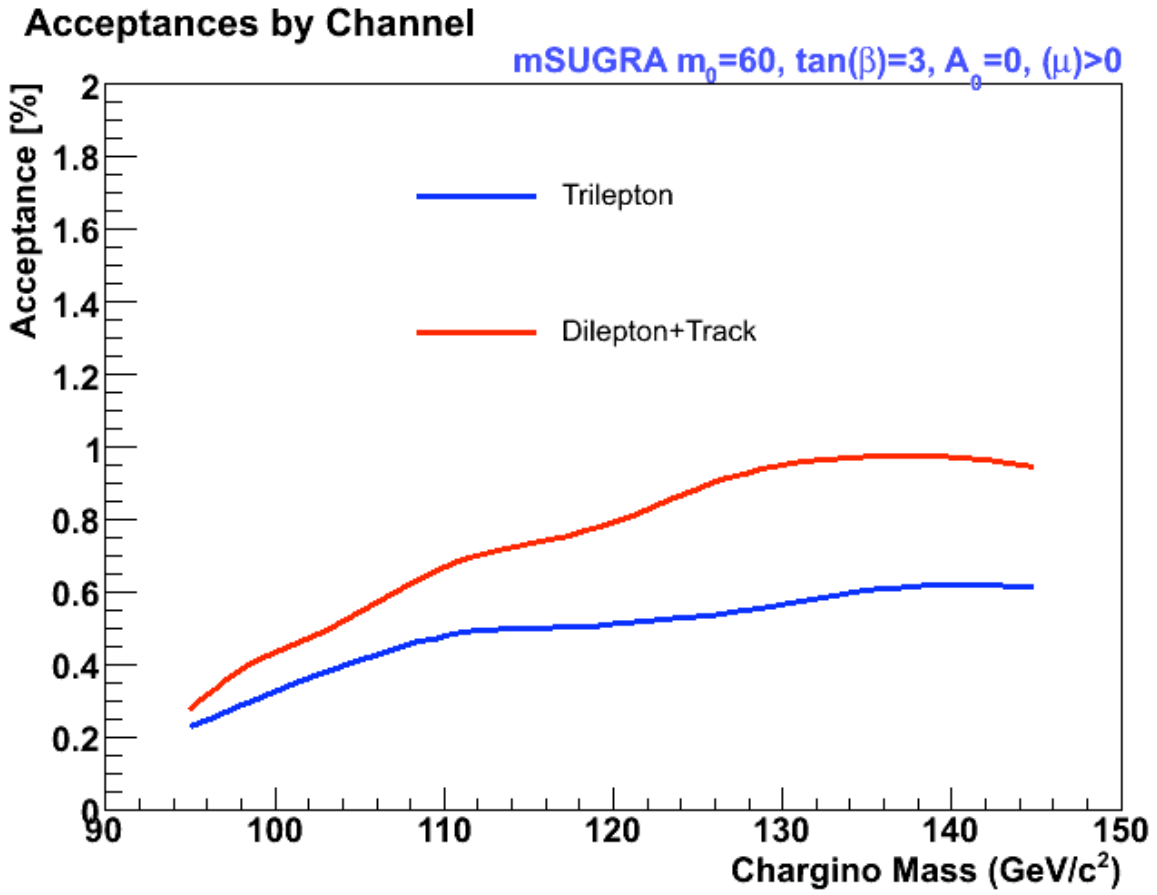
2 tight muons + 1 Track

E_T = 34 , 6 , 9 GeV

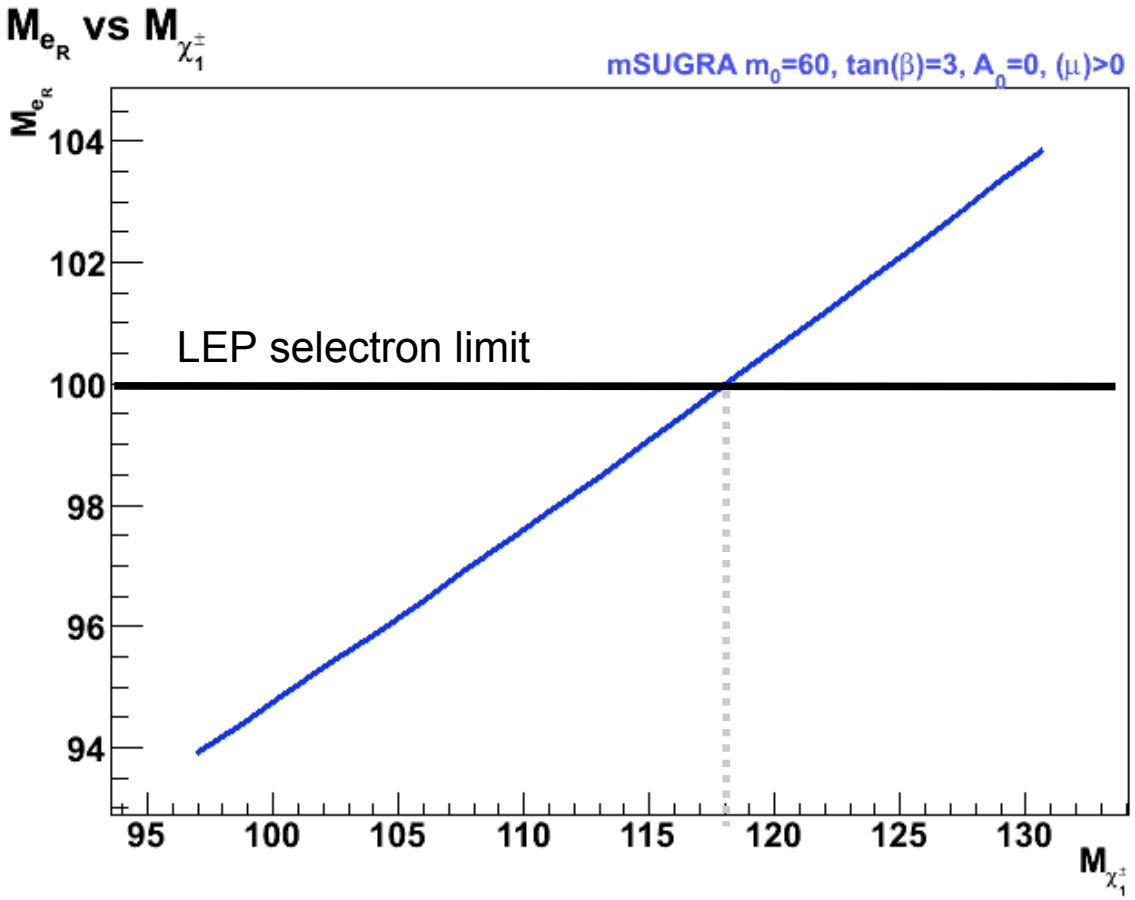
MET = 20.4 GeV

One jet, Jet E_T = 22 GeV

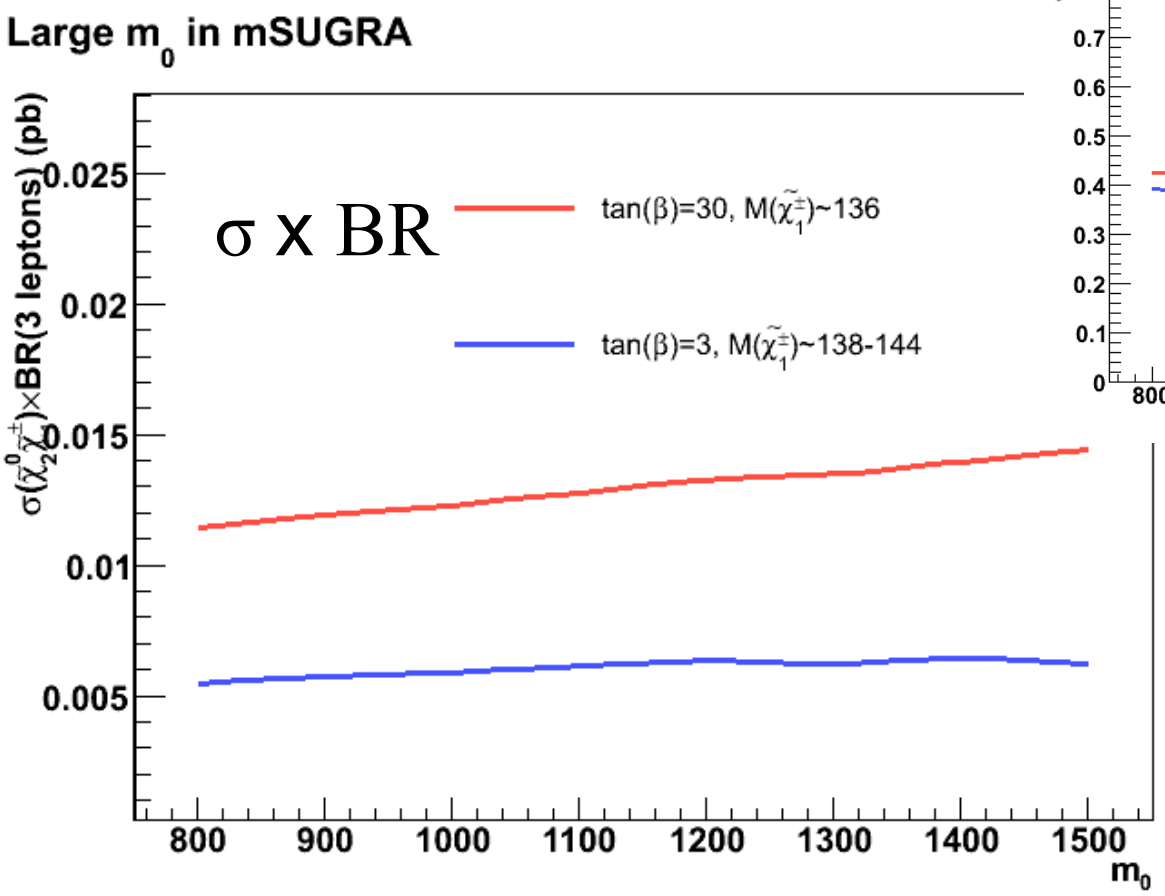
Signal Plots : Acceptances by Channel

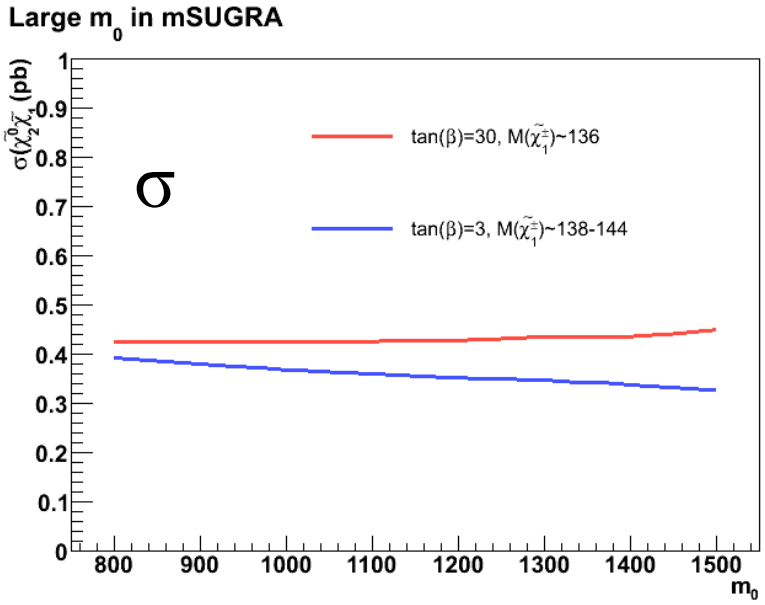


Signal Plots
M(selectron) vs M(chargino)



Signal Plots : Large m_0



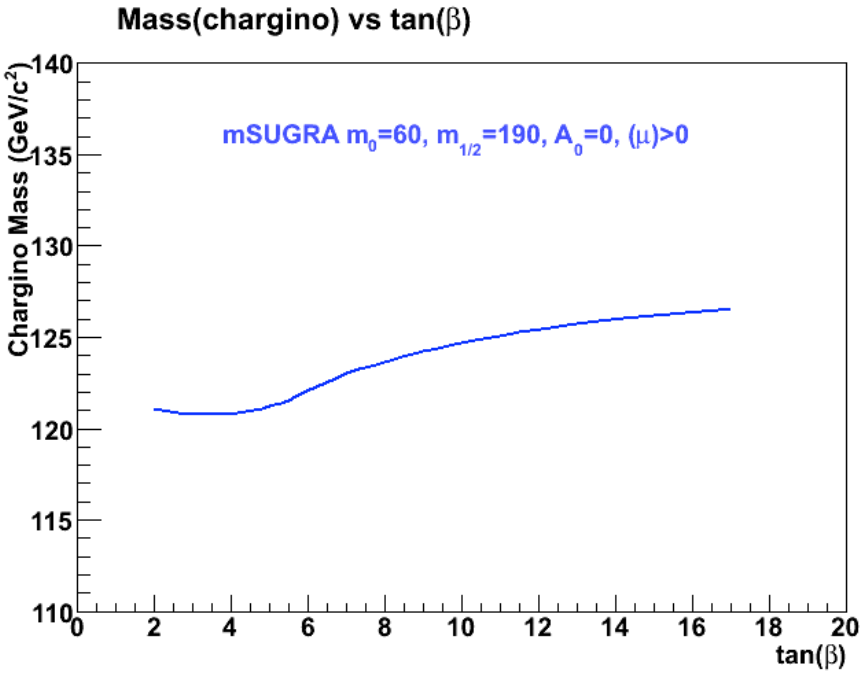


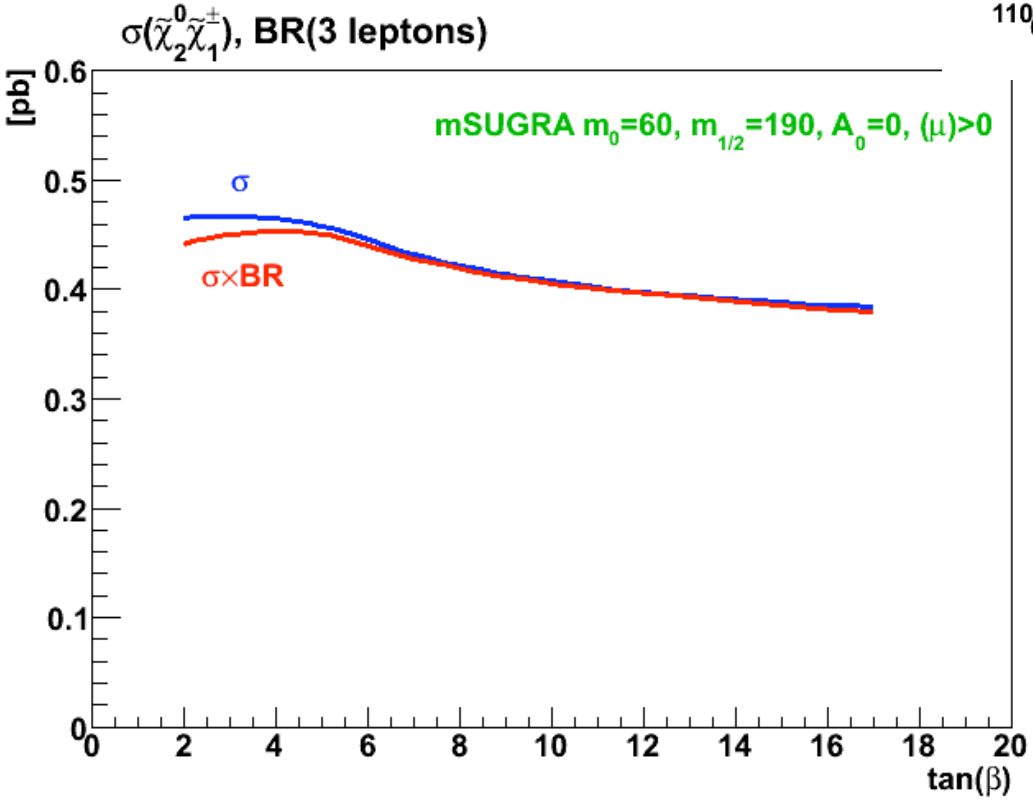
tan(β) = 30

tan(β) = 3

$m_{1/2}$ =190, A_0=0, μ>0

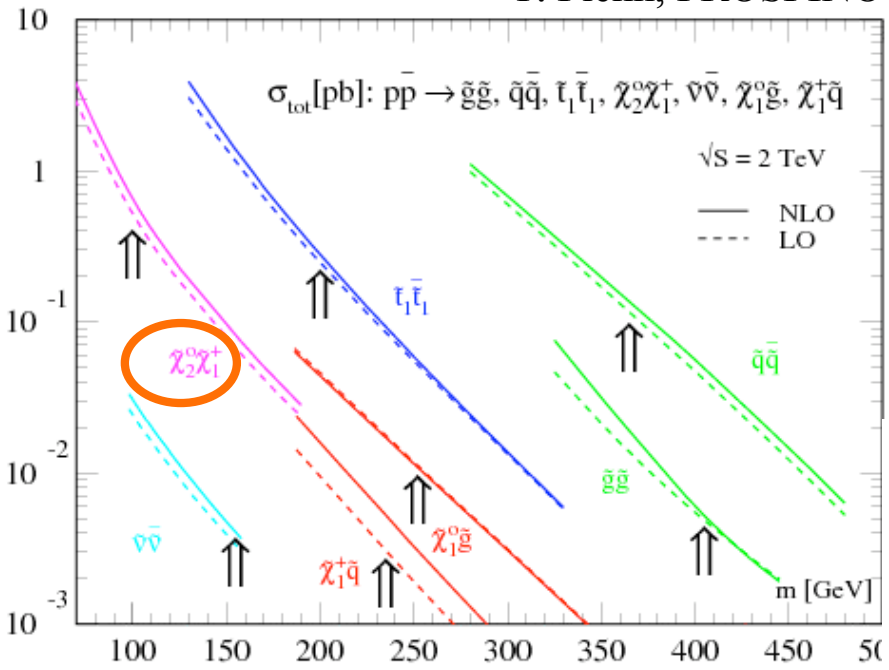
Signal Plots tan(β) variation

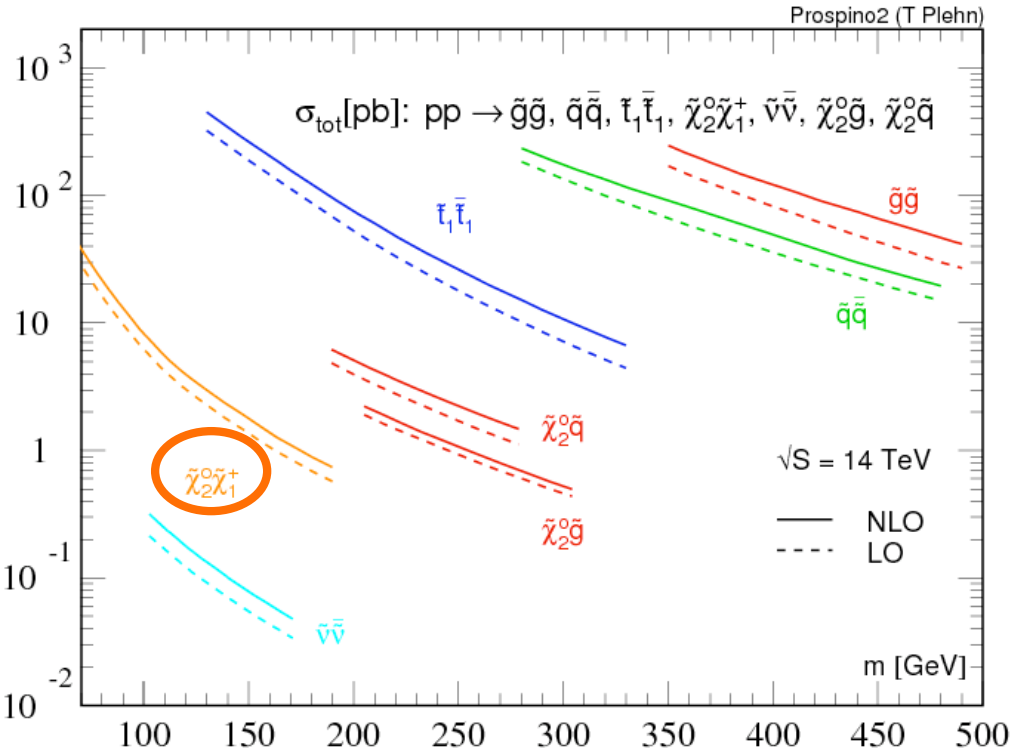




Cross Sections : Tevatron & LHC

T. Plehn, PROSPINO





If we don't find it…there is always the LHC

Even if we don't want to hear that