(summary of parallel sessions)

Direct Searches for Higgs and Beyond the SM at the Tevatron

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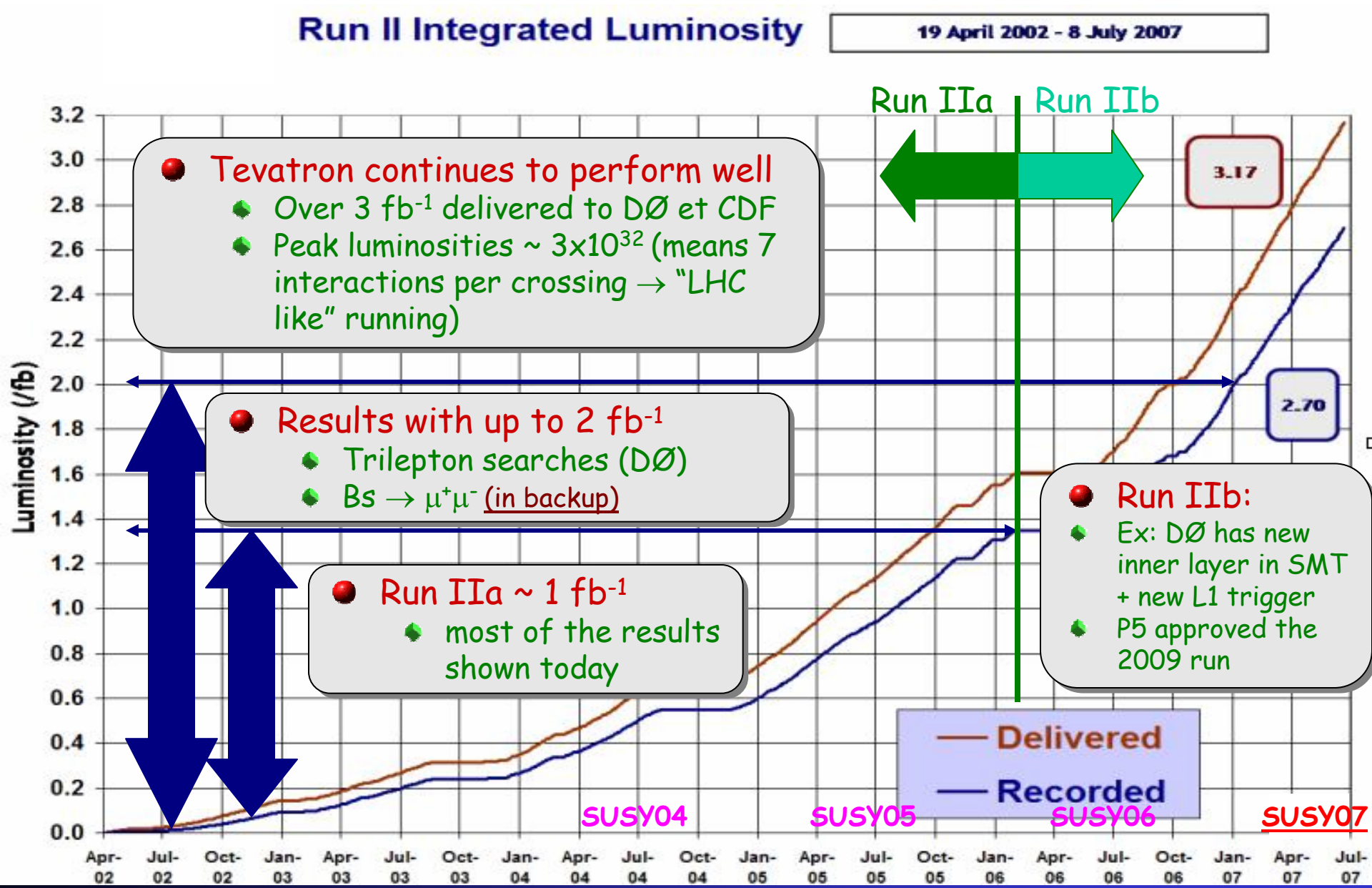
On Behalf of the
CDF & DØ Collaborations

SUSY 2007
Karlsruhe, Germany
July 26 - August 1, 2007

Tevatron data sample



- Tevatron continues to perform well
  - Over 3 fb^{-1} delivered to DØ et CDF
  - Peak luminosities ~ $3x10^{32}$ (means 7 interactions per crossing → "LHC like" running)
- Results with up to 2 fb^{-1}
  - Trilepton searches (DØ)
  - Bs → $\mu^+\mu^-$ (in backup)
- Run IIa ~ 1 fb^{-1}
  - most of the results shown today
- Run IIb:
  - Ex: DØ has new inner layer in SMT + new L1 trigger
  - P5 approved the 2009 run

What do we look for at Tevatron ?

some topics not covered today (in 30')

Beyond the Standard Model

- Enlarge the gauge group
  - Z', W'
- Signature based
  - (quasi)-model independant
- Repeat the history
  - Compositeness (e*,...)

(not covered today)

see backup

- Alternative EWSB mechanisms
  - TC, little Higgs,...

(not covered today)

- Relate quarks and leptons
  - Leptoquarks (LQ_3,...)

see backup for LQ_2

- Increase the number of dimensions
  - ADD, RS: excesses in jet+met and resonances
- Extend Poincaré group : SUSY
  - more or less constraint MSSM
  - mSUGRA without or with RPV
  - GMSB, AMSB, Split SUSY (longed lived part. signatures)

(not covered today)

- Indirect searches like rare decays $B_s \to \mu^+\mu^-$ → see backup

+

- Standard Model Higgs boson

- Non-SM Higgs

Long Lived Exotic Particle : CHAMPS

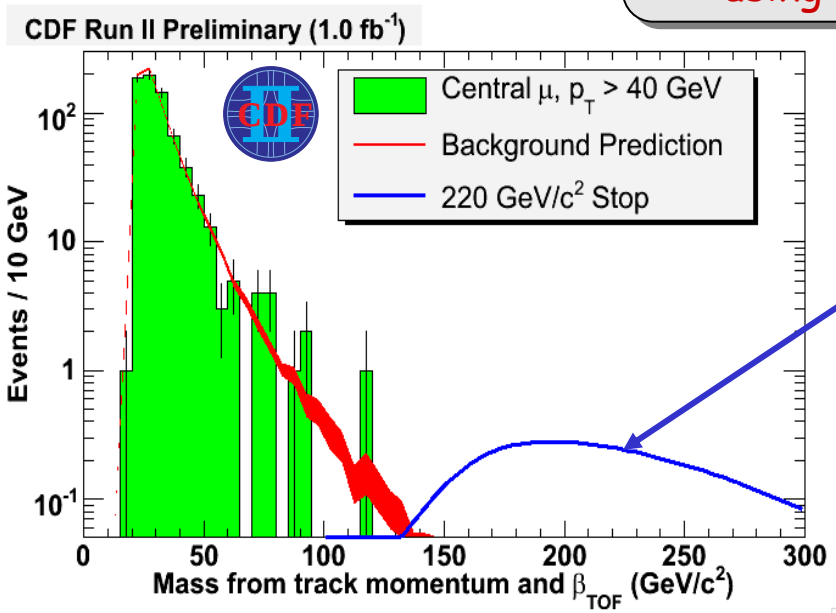
Vyacheslav Krutelyov's talk

- several models predict long-lived particles: charged or neutral, decaying inside or outside detector
  - Charged (AMSB with "wino" LSP)
    - AMSB with "wino" LSP
    - CHAMPS looks like slow μ
  - Neutral: decay inside detector
    - delayed photon (CDF) → GMSB
    - delayed jets (DØ, ex: "split susy")

- In the detector:
  - slowly moving, highly ionazing
  - large transverse momentum
  - reconstructed as a muon

- CDF CHAMPS analysis: measure time-of-flight using μ triggers

$m_{stop} > 250$ GeV

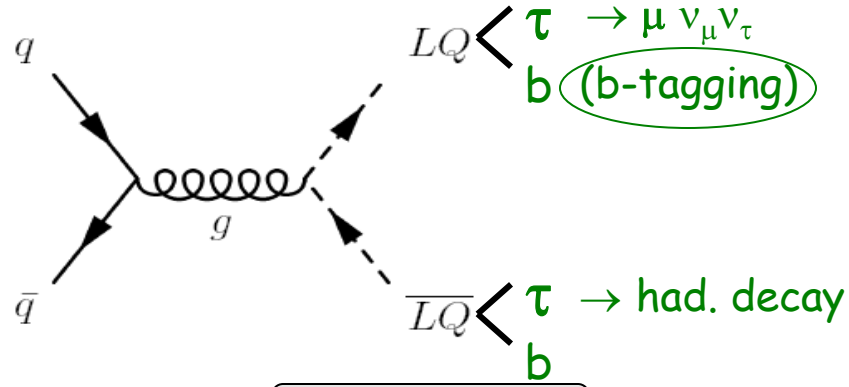


interpreted in the context of stable stop pair prod. model

3rd generation LQ: Scalar and Vector in $LQ_3LQ_3 \to \tau\tau bb$

Thomas Nunnemann's talk

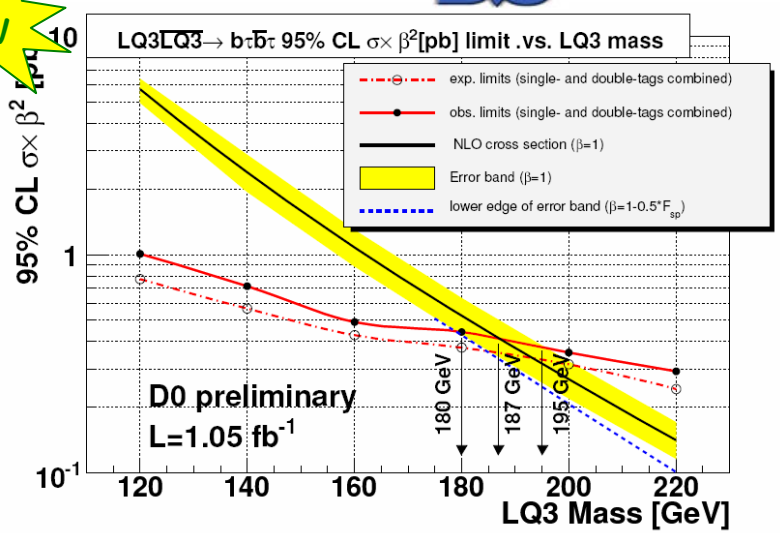
see backup for LQ_2



- LeptoQuarks postulated to explain the many parallels between the families of quarks and leptons
- are predicted in many extensions of the standard model (SU(5) grand unification, superstrings, compositeness models)

- Scalar :

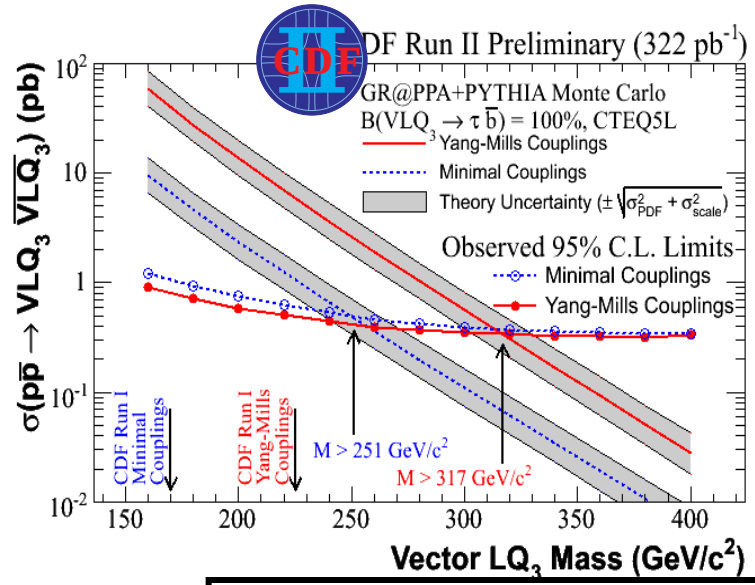
New



(LQ_3 > 229 GeV assuming $LQ_3LQ_3 \to \nu\nu bb$ in 0.4 fb^{-1})

scalar LQ_3 > 180 GeV (1 fb^{-1})

- Vector :



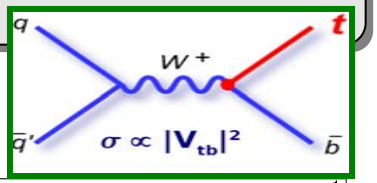
vector LQ_3 > 251 GeV (0.3 fb^{-1})

Extra Gauge Boson: Z' & W'

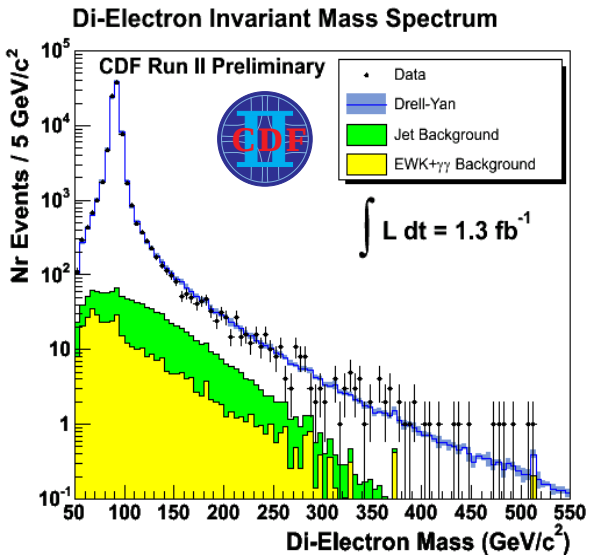
Carsten Magass's talk

Dominic Hirschbuehl's talk

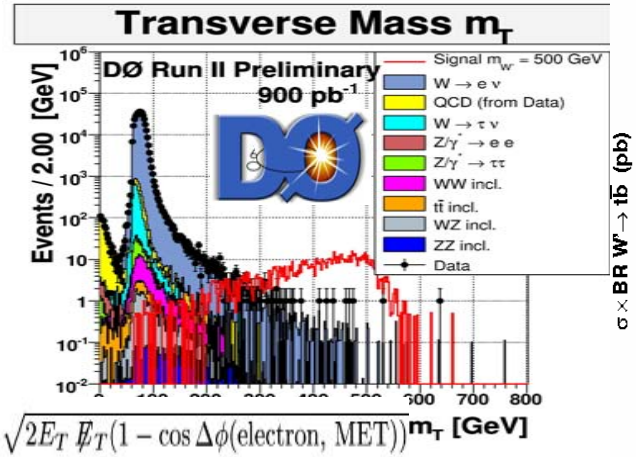
- Predicted in many beyond-SM scenarios: Left-Right-Symmetric models, GUT models which may also imply SUSY (e.g E_6), …

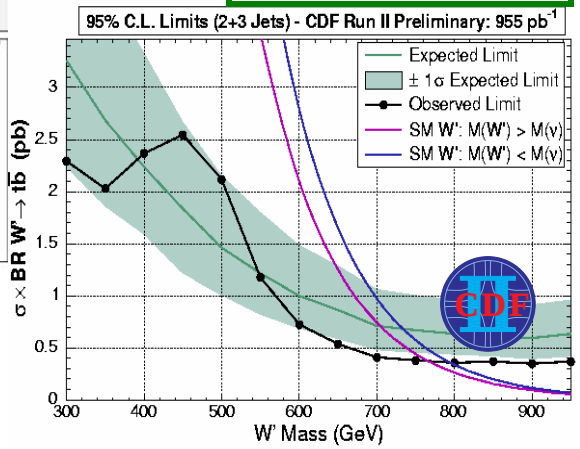


Z'→ee



W'→eν





- New limits @ 95% C.L : (depend of the models)
  - W' :
    - $M_{W'}$ > 790 GeV (CDF) with $\sigma(W'_L) = \sigma(W'_R)$
    - $M_{W'}$ > 965 GeV (DØ) if coupling to fermions is the same as in the SM W boson

But tb versus eν

- Z' : CDF
  - $M_{Z'}$ > 923 (SM type)
  - E6 Z' bosons have lower limits
- Z' : DØ
  - $M_{Z'}$ > 680 (leptophobic)

see talks on New Physics in "top quarks samples" ($t\bar{t}$ resonances)

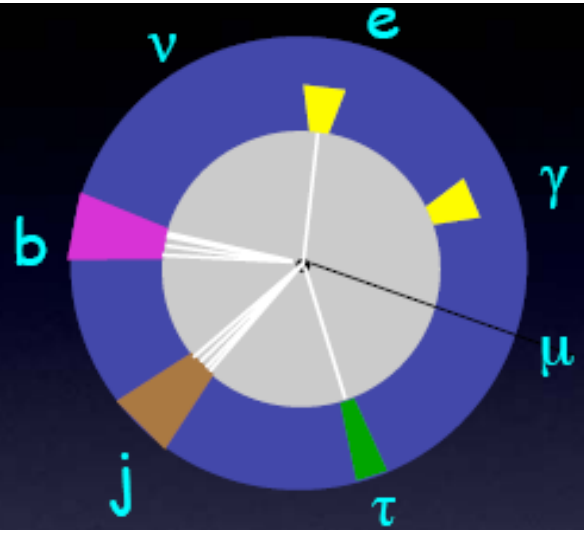
Isabelle Ripp-Baudot's talk

Susana Cabrera's talk

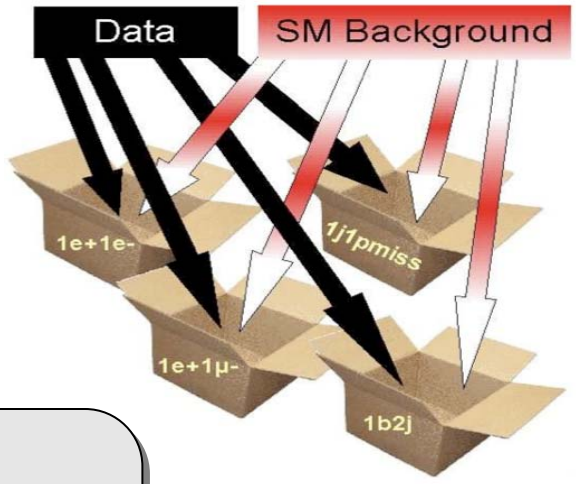
Model Independent Searches

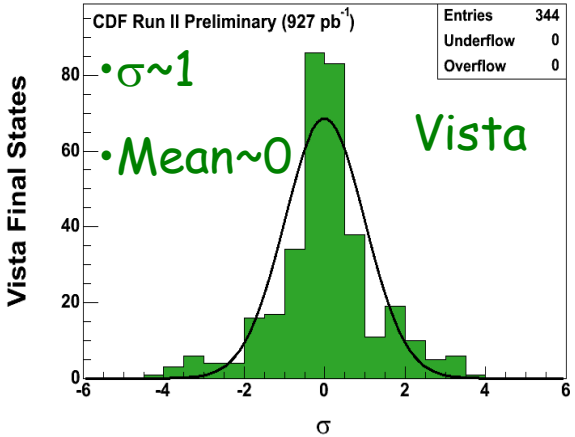
Georgios Choudalakis's talk

- A global analysis of CDF Run II data :



- Vista :
  - model-independent searches the bulk of distributions
  - is sensitive to new large cross section physics





- Sleuth :
  - quasi-model-independent searches the high-∑pT tails
  - sensitive to new electroweak scale physics

⇒

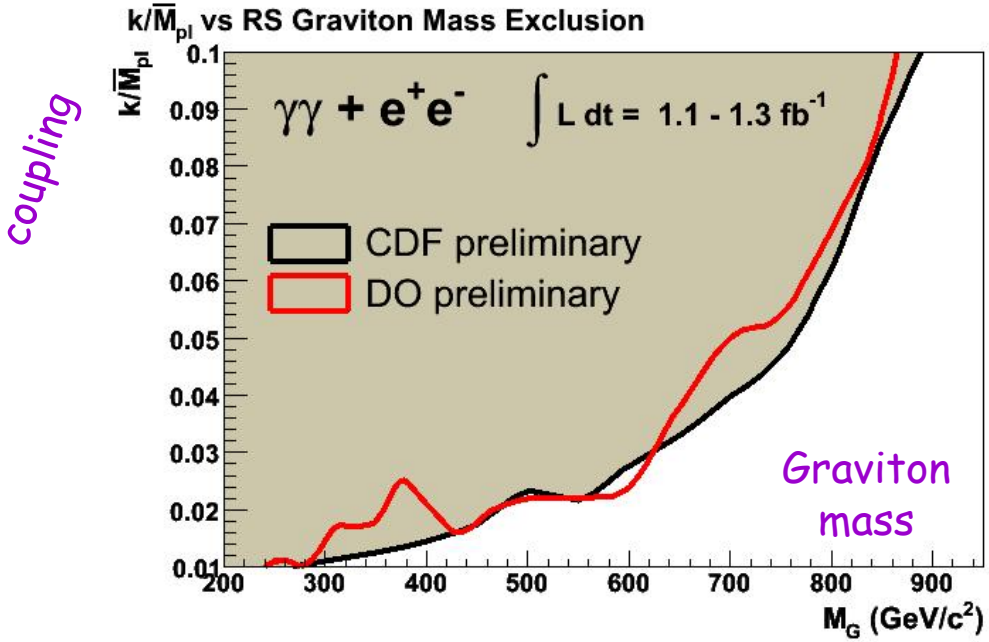
- This global analysis has revealed <u>no new physics</u> in 927 pb^{-1}

Large Extra Dimension: Randall – Sundrum Graviton

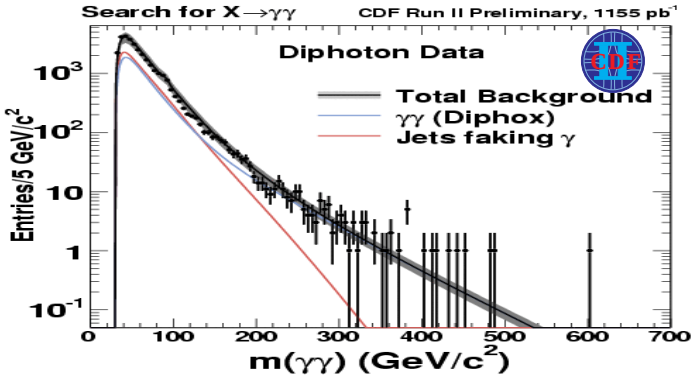
Carsten Magass's talks

Andrey Loginov's talk

existence of extra spatial D → hierarchy



- search in di-lepton resonances
- most sensitive is in di-photons

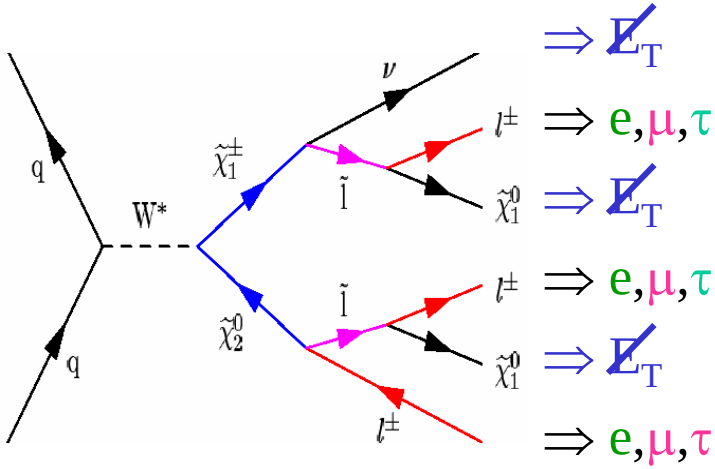


- exclude such gravitons → ee & γγ @95CL

- M_G >~ 900 GeV for $k\sqrt{(8\pi)}/M_{planck}$= 0.1
- M_G >~ 250 GeV for $k\sqrt{(8\pi)}/M_{planck}$= 0.01

Chargino & Neutralino Searches: Trileptons

- Clean experimental signature but
  - low cross sections ($\sigma \times BR < 0.5$ pb)
  - soft leptons
  - taus (at large tanβ)
    - needs large integrated luminosity
    - Combine various final states



- Selections
  - 2 well identified and isolated leptons: e or μ (rather soft Pt~10 GeV)
  - Isolated high quality track (= third lepton : e, μ, τ) with Pt~5 GeV
  - Transverse Missing energy (= neutrinos, neutralinos) with MET~20 GeV
  - Anti Z, Υ cuts
  - Or Like-Sign requirements (di-μ)

DØ Chargino & Neutralino update: $e^{\pm}e^{\pm}l$

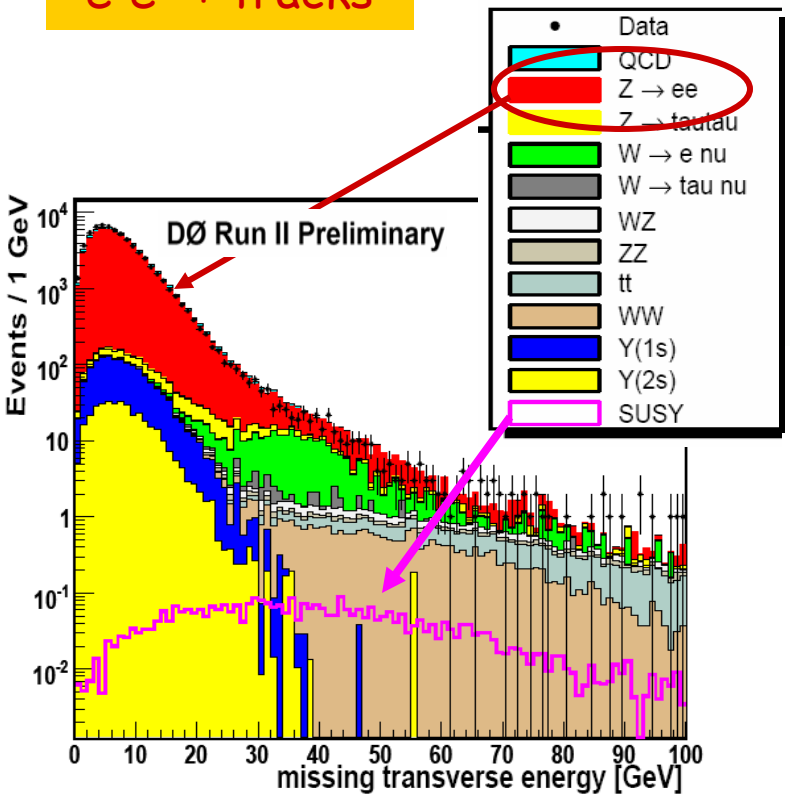
New

$\int L\,dt \approx 0.59\ fb^{-1}$

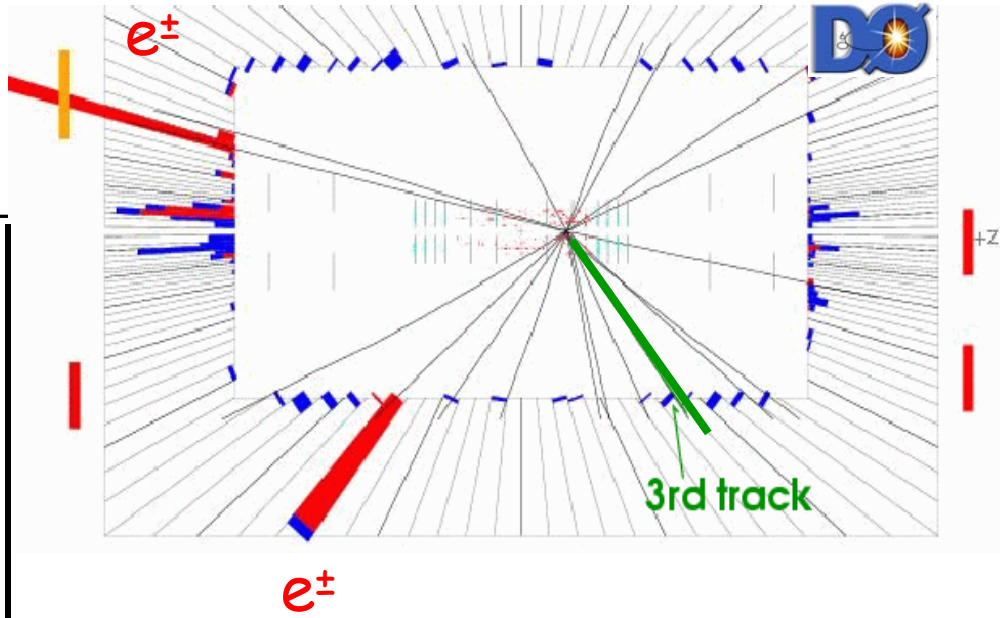
(RunIIb data)

Olav Mundal's talks

$e^{\pm}e^{\pm}$ + tracks



Missing E_T



0 (data) / 1.0 ± 0.3 (stat) ± 0.14 (sys) (SM)

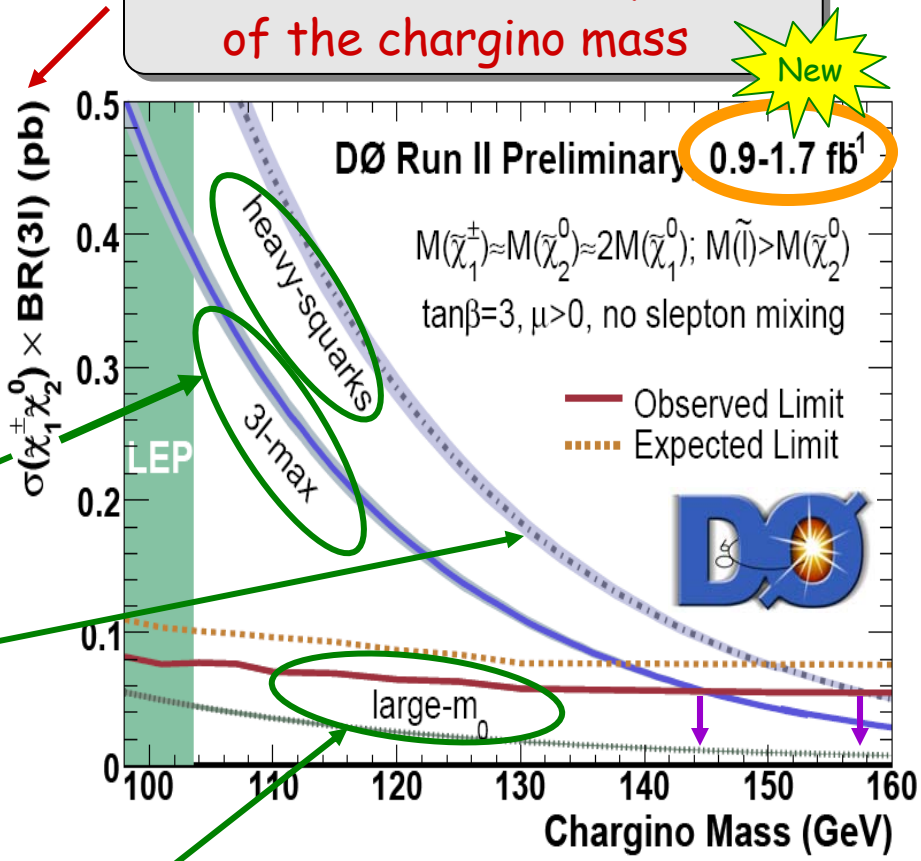
- Dominated by Drell-Yann and di-bosons
  - expect 0.5-2 SUSY events

DØ SUSY Limits : Trileptons

Olav Mundal's talks

- mSUGRA (inspired) framework
  - $m(\chi_1^{\pm}) \approx m(\chi_2^{o}) \approx 2m(\chi_1^{o})$
  - no-slepton mixing, $\tan\beta = 3$, $\mu>0$

- Limits on σxBr as function of the chargino mass



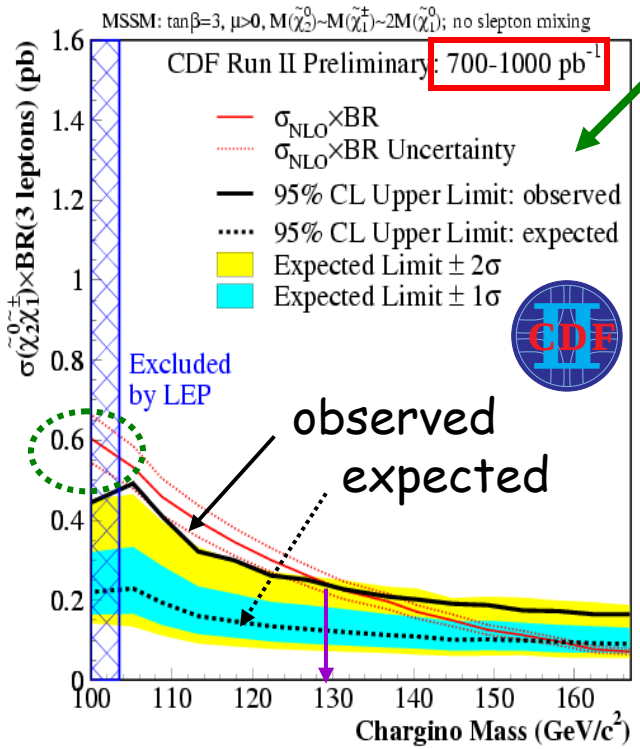
- 2 scenarios with enhanced leptonic branching fractions
  - 3l-max (maximal Br into leptons)
    - $m(\tilde{l}) > \approx m(\chi_2^{o})$
    - $m(\chi_1^{\pm}) > 145$ GeV
  - heavy squarks (large σ, Br into lep.)
    - same scenario but with relax scalar mass unification
    - $m(\chi_1^{\pm}) > 158$ GeV

- large m_o: heavy $\tilde{l}$ and $\tilde{q}$ $\Rightarrow$ small Br into leptons
  - W/Z decays dominate
  - no-sensitivity

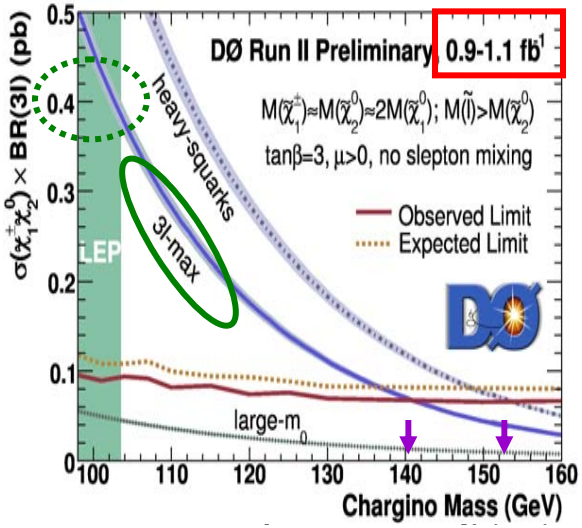
CDF SUSY Limits : Trileptons

Else Lytken's talks

- 3 scenarios (but ≠ DØ)

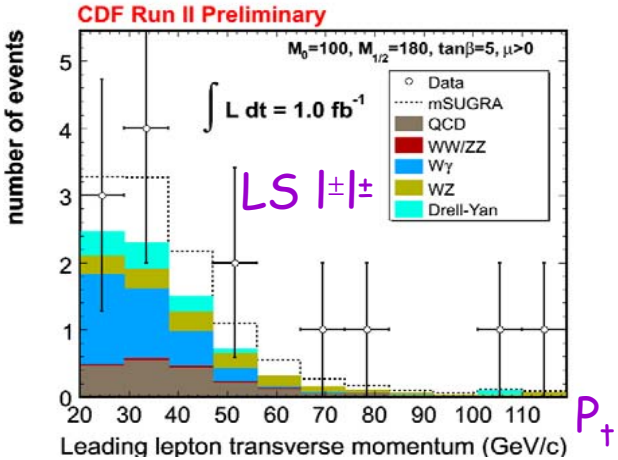


- CDF: MSSM no-slep. mix.
  - m_o=70 GeV
  - $m(\chi_1^{\pm})$>129 GeV (157 GeV sensitivity)



CDF has small excesses for LS eμ and ee+track

- CDF: standard mSUGRA (tan β = 3, μ>0)
  - m_o =60 GeV
  - no-sensitivity
- BR($\chi_1^{\pm}$/ χ_2^{o})=BR(W/Z) (same lept. BR) (~DØ large m_o)
  - more model independent
  - but no-sensitivity

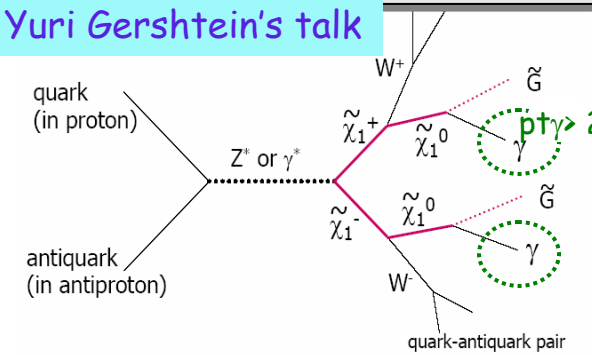


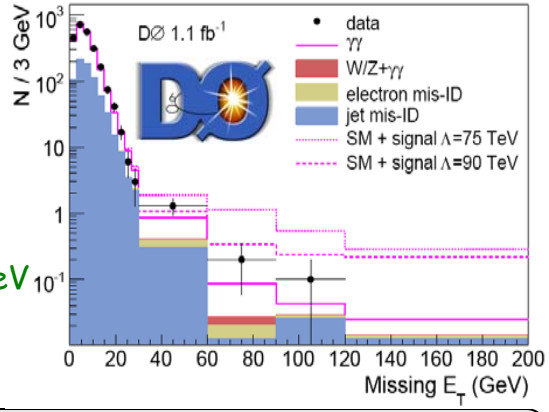
- Interpretation of DØ versus CDF: ex of the "no-slepton mixing" scenario
  - CDF: fixed low m_o ⇒ 2 body decays
  - DØ: sliding windows of m_o to have $m(\tilde{l})$>≈ $m(\chi_2^{o})$ ⇒ 3 body decays

DØ GMSB Search : γγ+Missing Transverse Energy

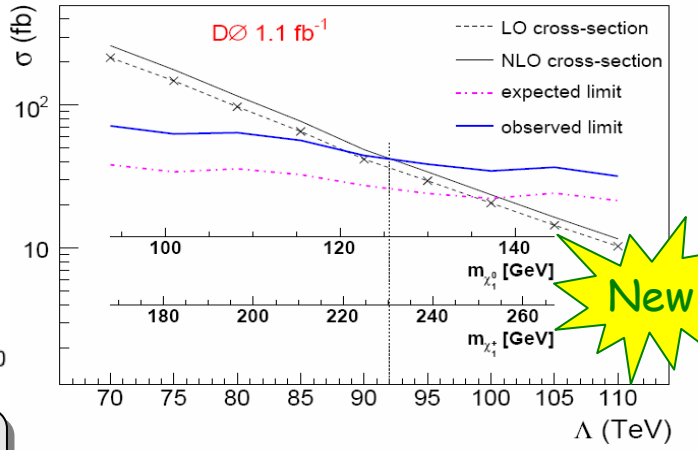
- LSP = gravitino G
- χ_1^0 decays into γ+G

Yuri Gershtein's talk





- All backgrounds determined from data



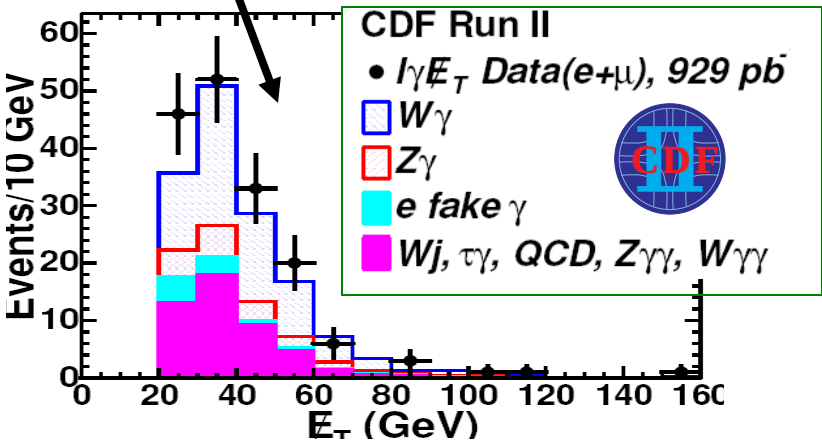
$m_{\chi^+} > 231$ GeV

$m_{\chi^0} > 126$ GeV

CDF Signature Based : γγ+X and MET+γ+lepton

- in 1.0 to 1.2 fb^{-1} : pTγ> 13 GeV
  - γγe : 3.8 ± 0.5 (exp.) / 1 (data)
  - γγμ : 0.7 ± 0.1 (exp.) / 0 (data)
  - γγγ : 2.2 ± 0.6 (exp.) / 4 (data)
  - γγ+ MET>150 GeV : 0.02± 0.01 (exp.) / 1 (data)
- Backgrounds : jets→γ_{fake} (π^0,K^0_s,..in jets) or e →γ_{fake} or Zγγ or

Andrey Loginov's talk

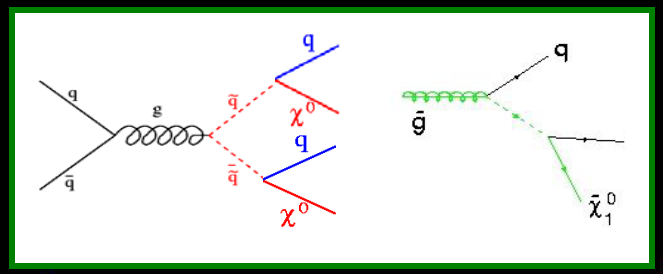


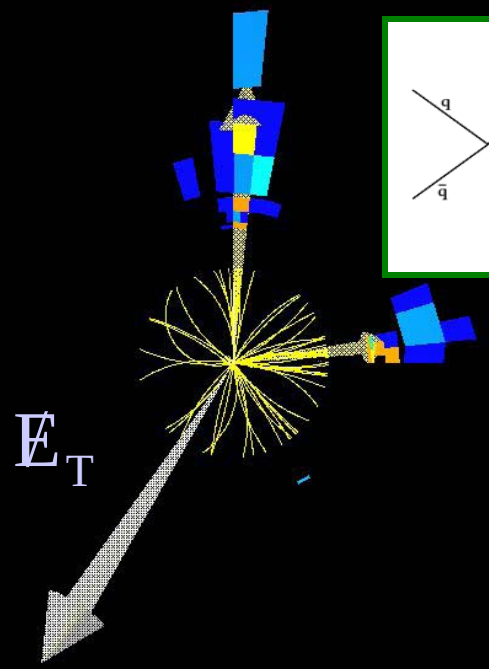
- CDF Run I excess not confirmed

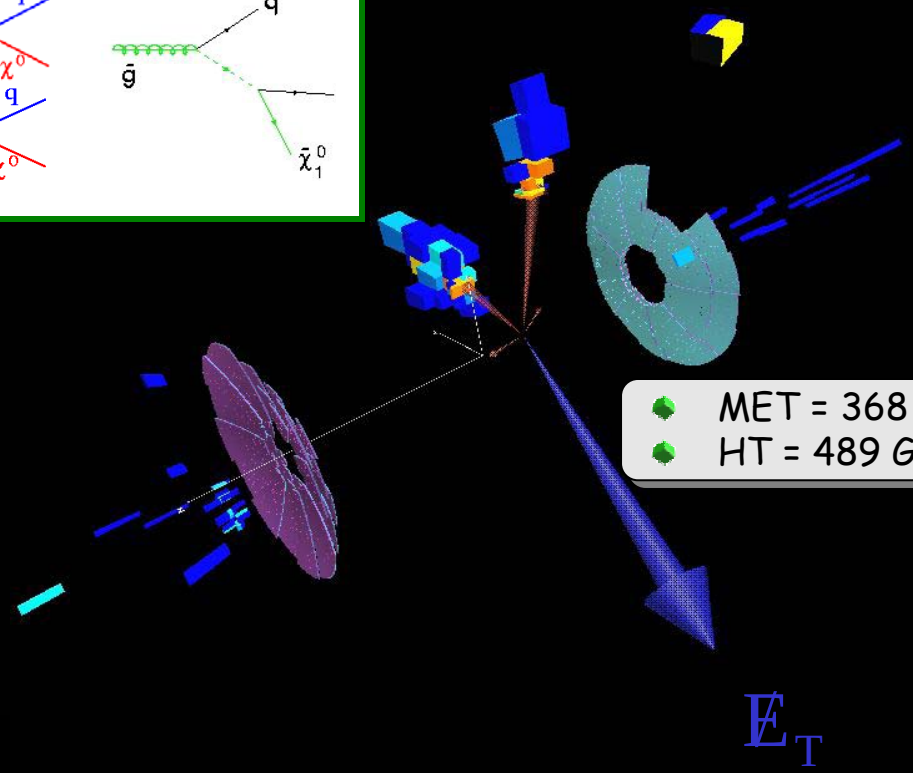
Generic Squarks and Gluinos : jets + MET

$\tilde{q}, \tilde{g}$

- cascade decays complicate the picture ⇒ model needed (mSUGRA)







- MET = 368 GeV
- HT = 489 GeV

- High m0=500: $m(\tilde{q}) > m(\tilde{g})$
  - "4-jet" + MET analysis ("gluino")
    - $\tilde{g}\tilde{g} \rightarrow q\bar{q}\chi_1^0 q\bar{q}\chi_1^0$

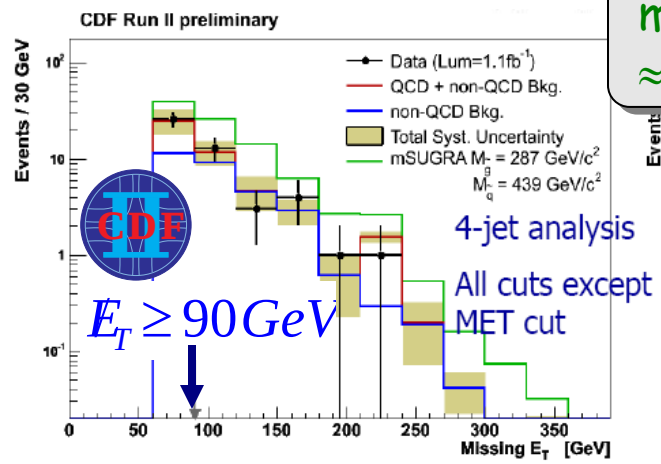
- Med. m0: $m(\tilde{q}) \sim m(\tilde{g})$
  - "3-jet" + MET analysis
    - $\tilde{q}\tilde{g} \rightarrow q\chi_1^0 q\bar{q}\chi_1^0$

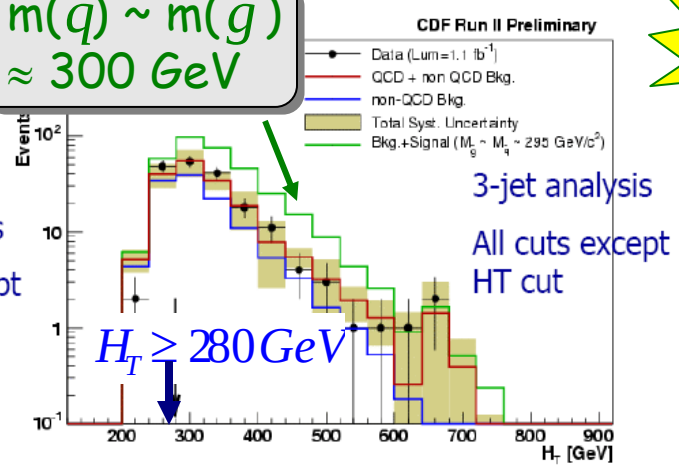
- Low m0=25: $m(\tilde{q}) < m(\tilde{g})$
  - "2-jet" + MET analysis ("squark")
    - $\tilde{q}\tilde{\bar{q}} \rightarrow q\chi_1^0 \bar{q}\chi_1^0$

CDF Squarks and Gluinos : update

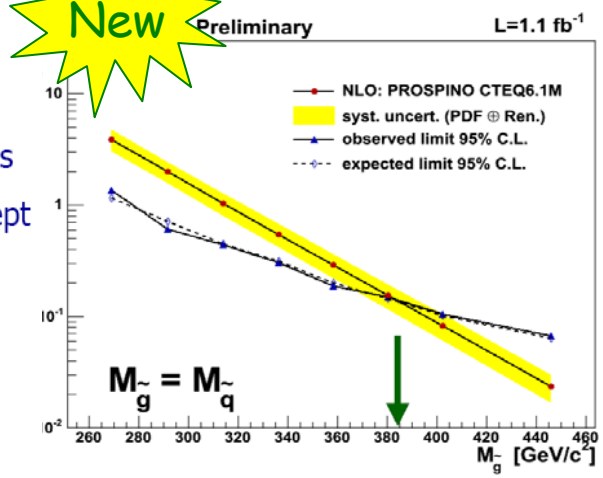
Monica D'Onofrio's talk

$m(\tilde{q}) \sim m(\tilde{g}) \approx 300$ GeV





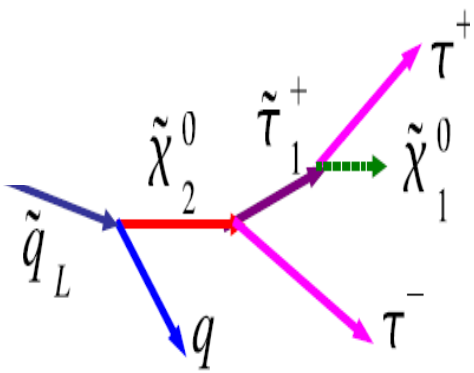
New



No significant deviation from SM expectations

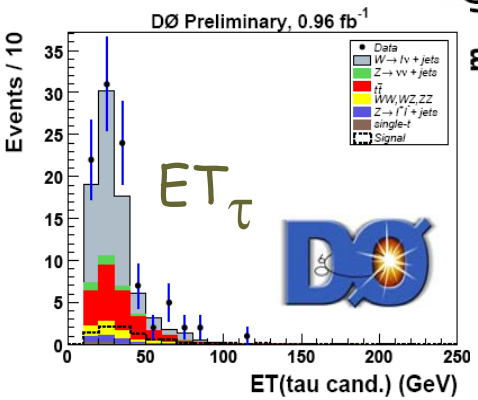
DØ: added the search with squarks prod with jets+met+hadronically decaying **TAUS**

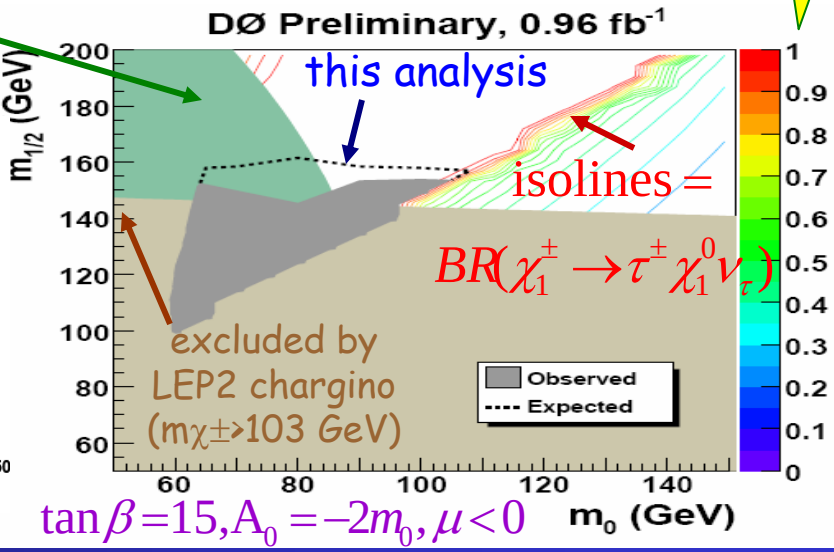
New



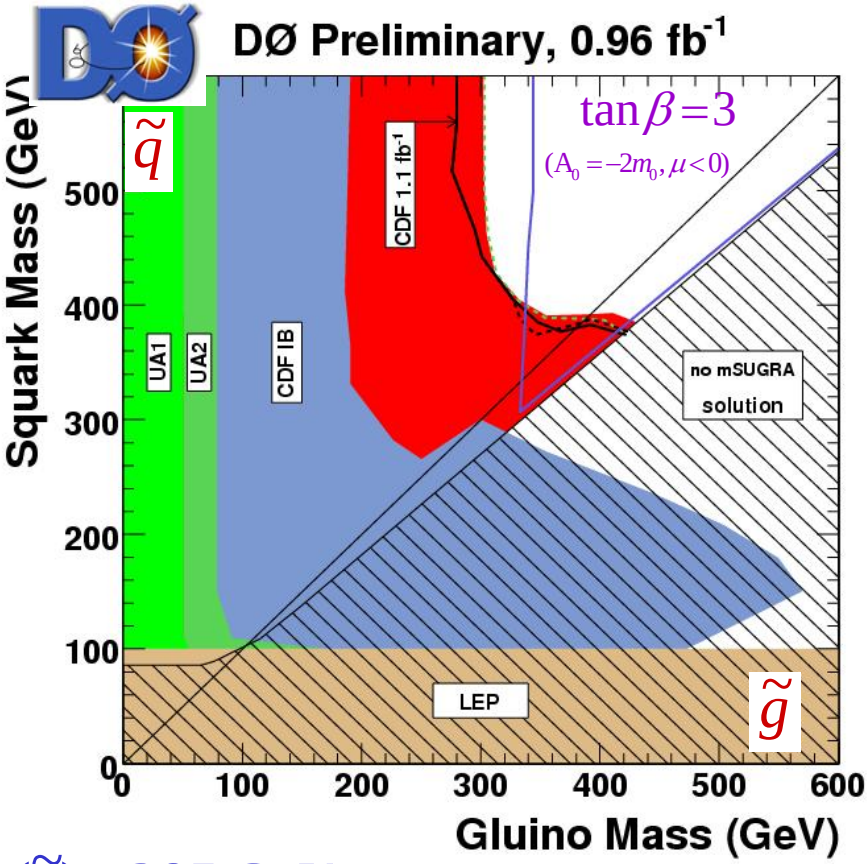
Mansoora Shamin's talk

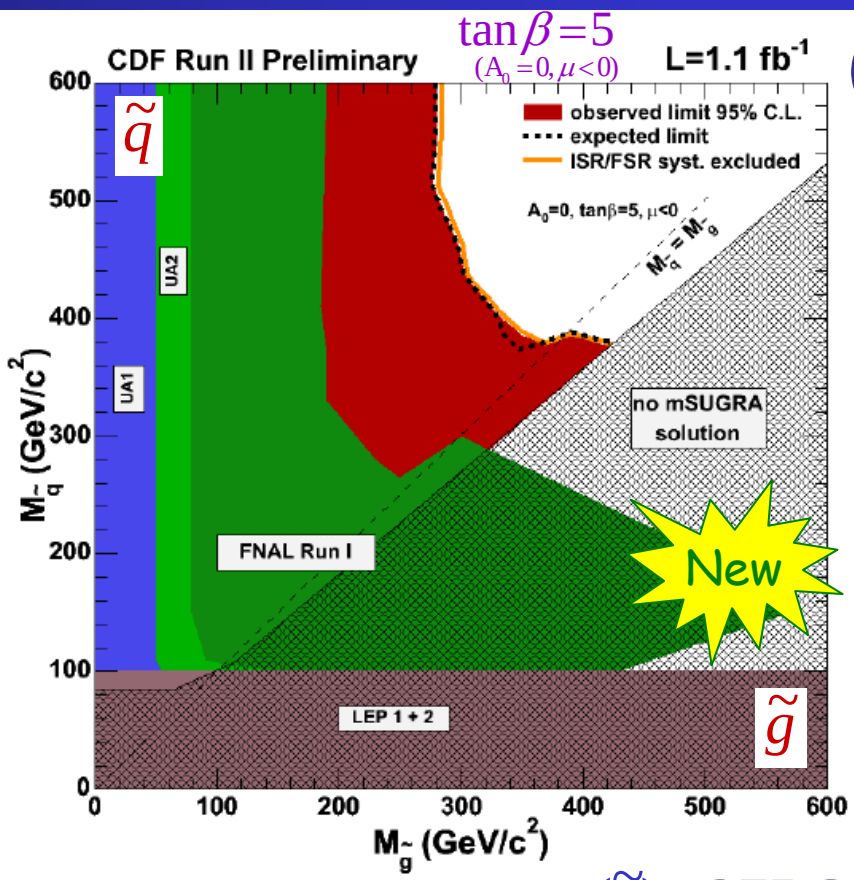
excluded by LEP2 sleptons (m_{sl}~100 GeV)





Generic Squarks and Gluinos : jets + MET $\tilde{q}, \tilde{g}$





$m(\tilde{q}) > 385\,GeV$

$m(\tilde{g}) > 302\,GeV$

- CDF & DØ: optimized for each of the 3 processes (low, medium, high mo)

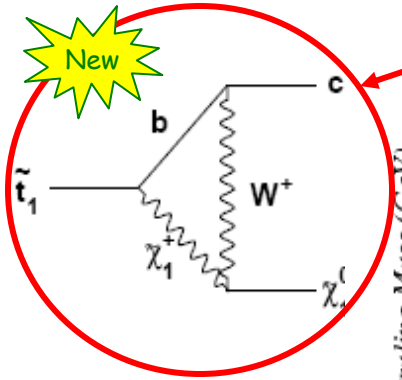
$m(\tilde{q}) > 375\,GeV$

$m(\tilde{g}) > 276\,GeV$

- NLO signal cross-sections uncertainties ARE included in the limit calculation
- Mass limit placed at the NLO nominal σ crossing

Stop Searches :

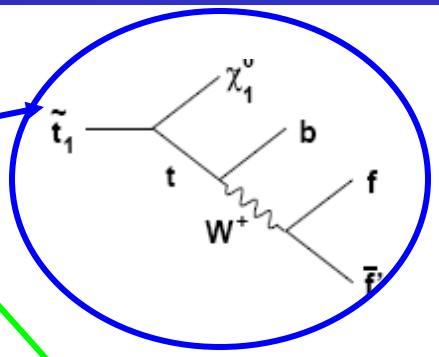
- For stop masses equal or lighter than the top quark mass:

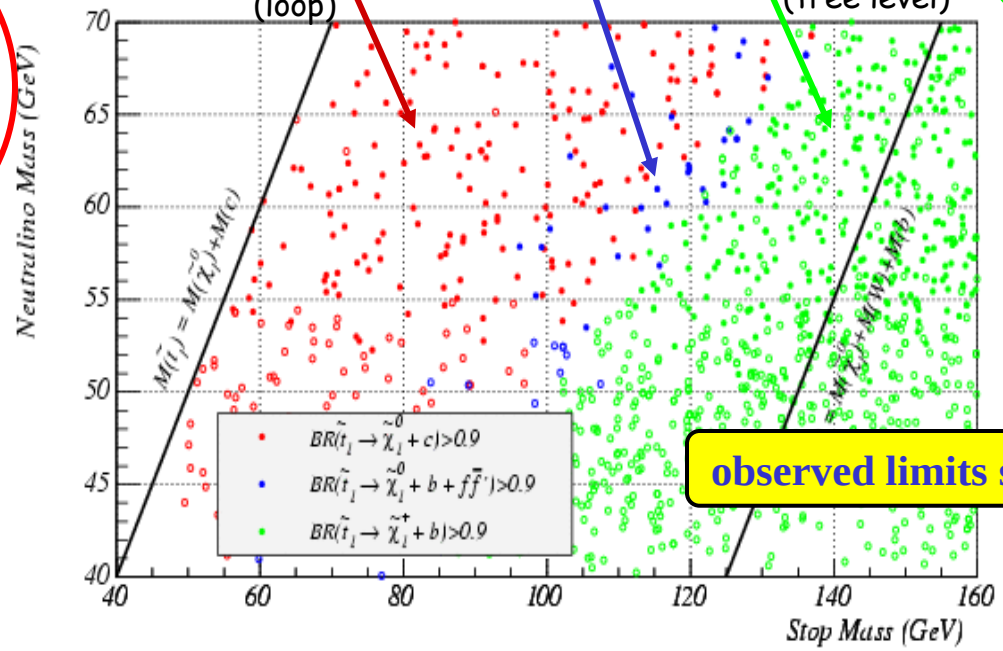


$\tilde{t}_1 \to c\,\tilde{\chi}^0$ (loop)

$\tilde{t}_1 \to b\,\tilde{\chi}^0\, f\,\bar{f}'$

$\tilde{t}_1 \to b\,\tilde{\chi}^{+/-}$ (tree level)





- m_0 = 200 to 600 GeV
- $m_{1/2}$ = 110 to 180 GeV
- A_0 = –500 to –1000 GeV
- tanβ = 3 and 10 to 50 (10 step)
- both signs of μ

observed limits still ×10 σ_{theo}

see backup

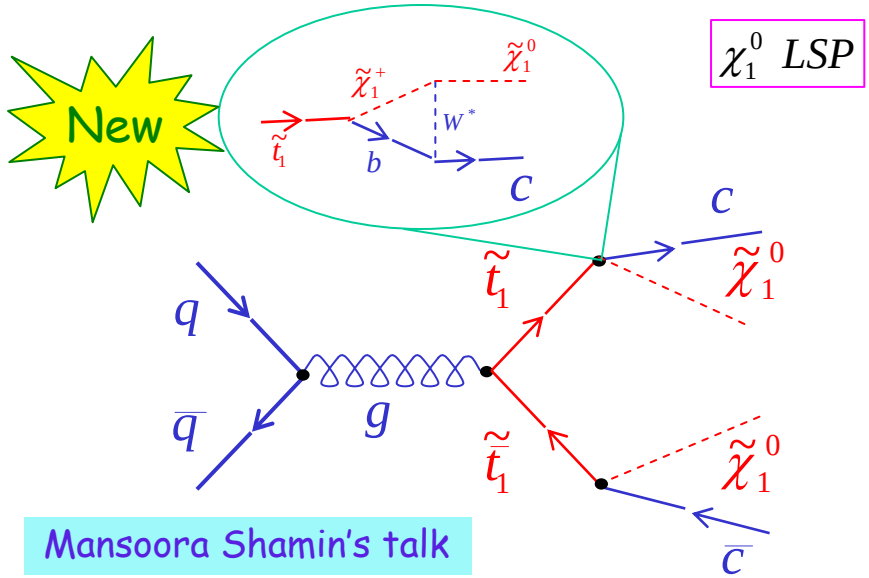
Su-Jung Park's talk

- In addition if m(slepton)<m(squark) and heavy chargino:

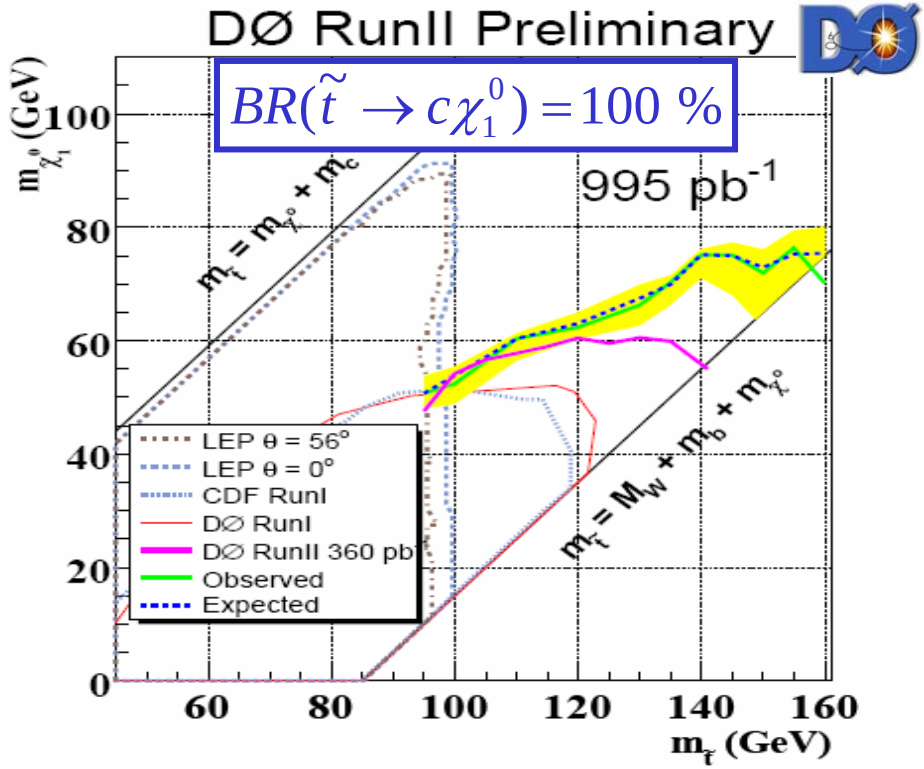
$$\tilde{t}_1 \to b l^+ \tilde{\nu}_l \text{ and } \tilde{t}_1 \to b \tilde{l}^+ \nu_l$$

(not covered today)

DØ Stop Search : $\tilde{t} \rightarrow c\,\chi_1^0$



Mansoora Shamin's talk



SM process	Number of events
$W \rightarrow l\nu$+jets	20.62 ± 2.34
$Z \rightarrow \nu\nu$ +jets	13.23 ± 1.76
$W \rightarrow l\nu$ +HF $(b\bar{b}, c\bar{c})$	11.94 ± 1.06
$Z \rightarrow \nu\nu$+HF $(b\bar{b}, c\bar{c})$	11.60 ± 0.78
WW, WZ, ZZ	2.70 ± 0.27
$t\bar{t}$	2.17 ± 0.07
Single top	1.76 ± 0.05
$Z \rightarrow ll(e, \mu, \tau)$+jets	0.12 ± 0.09
$Z \rightarrow ll(e, \mu, \tau)$+HF $(b\bar{b}, c\bar{c})$	0.09 ± 0.04
Total BKG	64.21±3.22
Data	66

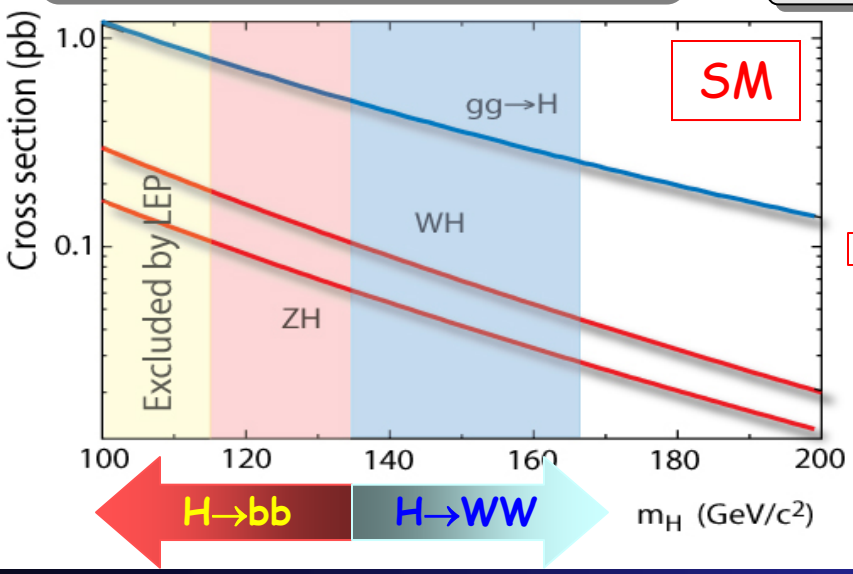
stop summary	DØ Run II	CDF Run II
$\tilde{t}_1 \rightarrow c\tilde{\chi}_1^0$	158 GeV (with 1000 pb^{-1})	132 GeV (with 295 pb^{-1})
$\tilde{t}_1 \rightarrow bl^+\tilde{\nu}_l$	186 GeV (with 400 pb^{-1})	--
$\tilde{t}_1 \rightarrow bW^+\tilde{\chi}_1^0$	no-sensitivity (with 1 fb^{-1})	--

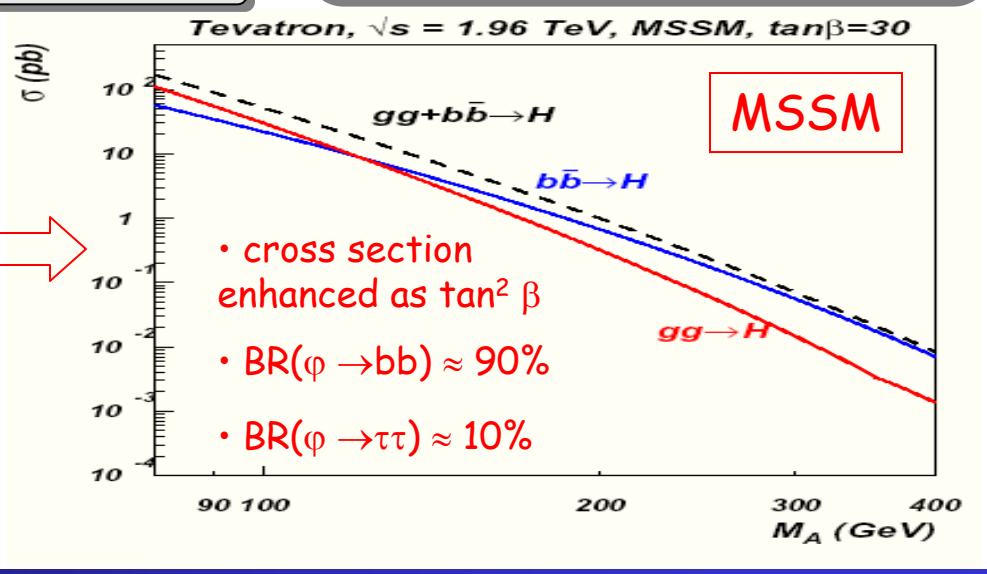
Higgs Bosons Searches

- Standard Model Higgs boson
- Non-SM Higgs

Higgs Boson(s) Searches

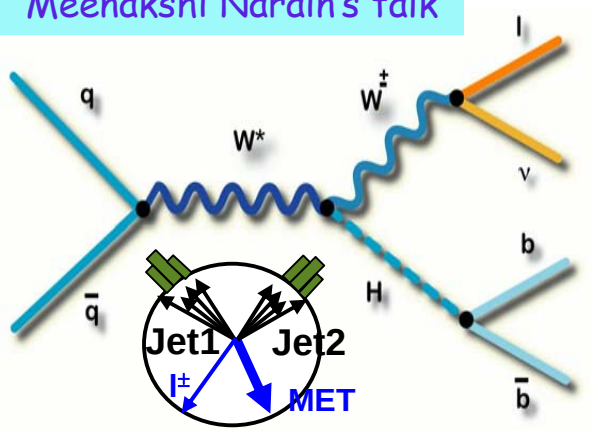
- Low mass (mH < 135 GeV)
  - WH→lνbb
  - ZH →llbb
  - ZH →ννbb
- High mass (mH > 135 GeV)
  - H→WW
- Combinations
- Fermiophobic Higgs
  - (not covered today)
- Higgs triplet
  - H^{++}
- MSSM Higgs Doublet
  - Charged Higgs: t→H^+b
    - Gerald Grenier's talk
  - Neutral Higgs: φ=H,h,A





Low Mass Higgs: WH→lνbb

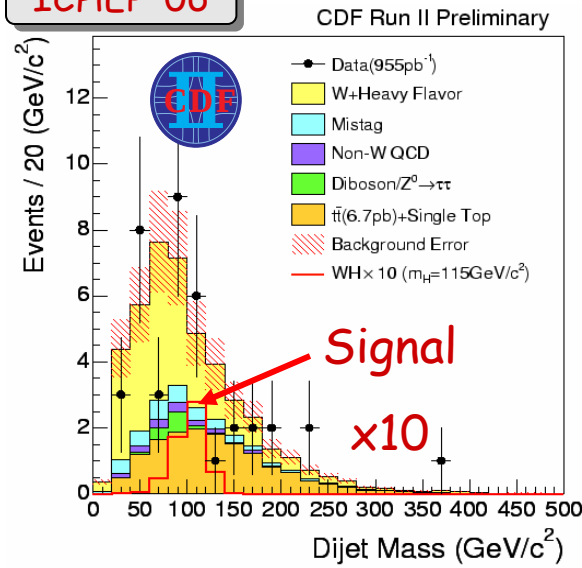
Meenakshi Narain's talk



- Cuts based analyses
- DØ also ME analysis

- Basic event selection
  - Isolated lepton, pT>20 GeV
  - Missing Energy >20 GeV
  - 1 or 2 b-jets >15 GeV (CDF) or >20 GeV (DØ)
- Backgrounds
  - W+jets, QCD, top, di-boson

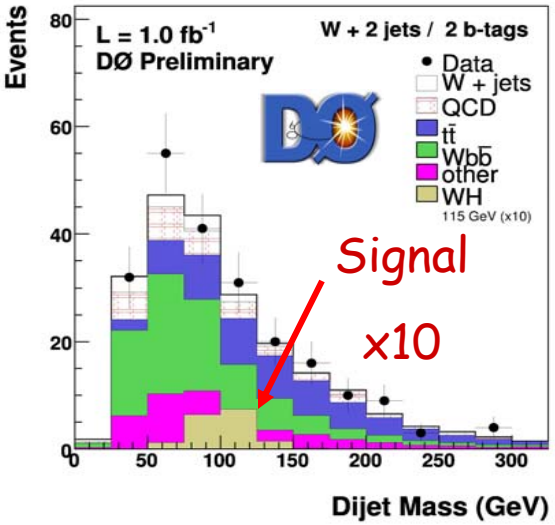
ICHEP '06



LO Matrix Element: event PDF for signal and background ⇒

$$D(\vec{x}) = \frac{P_{WH}(\vec{x})}{P_{WH}(\vec{x}) + \sum_i c_i P_{Bi}(\vec{x})}$$

Moriond '07



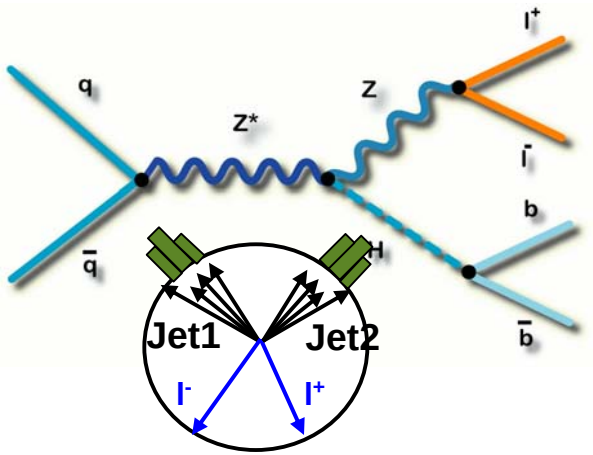
- CDF Result (ICHEP '06):
  - Combine results of 2 b-tags and 1 b-tag
  - Extract limit from fit to di-jet mass

DØ Result (Moriond EW '07)
- μ channel: gain ~50 % more signal by Oring all μ triggers
- High efficiency (70 %) using Neural Net b-tagger

$\sigma_{excl} / \sigma_{SM} \sim 9$

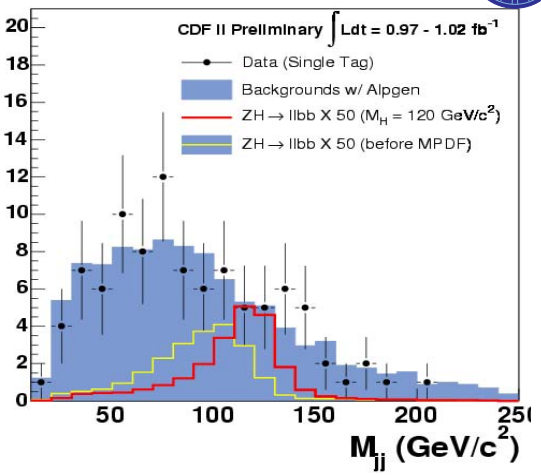
Low Mass Higgs: ZH→llbb

Meenakshi Narain's talk



- Cleanest low mass Higgs signal (no MET)
- But low cross-section x Br(Z→ll)
  - Isolated lepton
  - 1 or 2 b-jets >15 GeV (DØ) or >25,15 GeV (CDF)
- Backgrounds
  - Z+jets, QCD, top, ZZ & WZ

Moriond '07

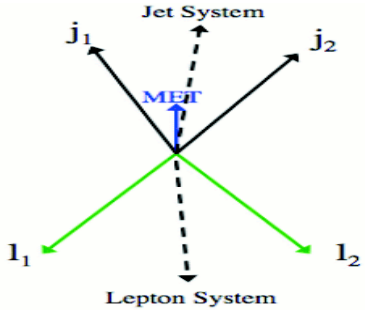


- DØ (Nov`06): 2 b-tag + di-jet search windows
- CDF (Moriond QCD`07): 1 tight or two loose b-tags, use NN + adjust jets:

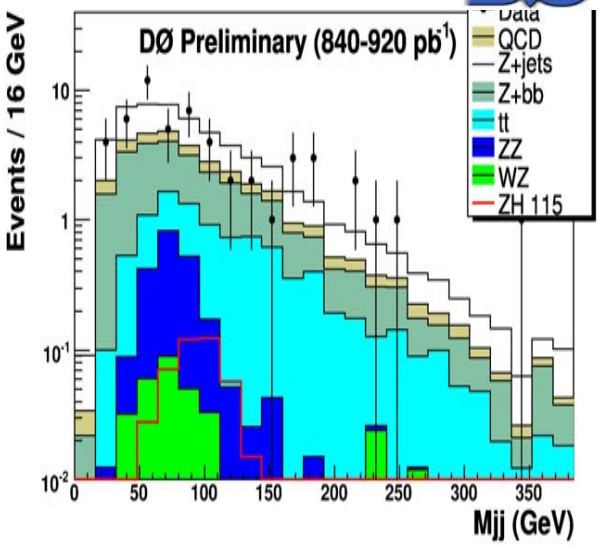
CDF adjust jets to balance MET

⇒ improved di-jets mass

CDF new analysis is equivalent to x2 more data



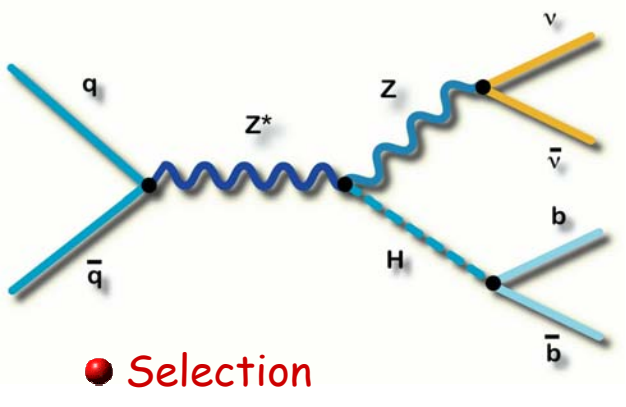
Nov '06

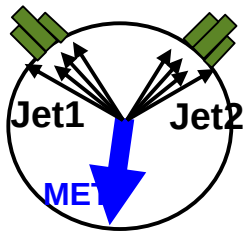


$\sigma_{excl} / \sigma_{SM} \sim 16$

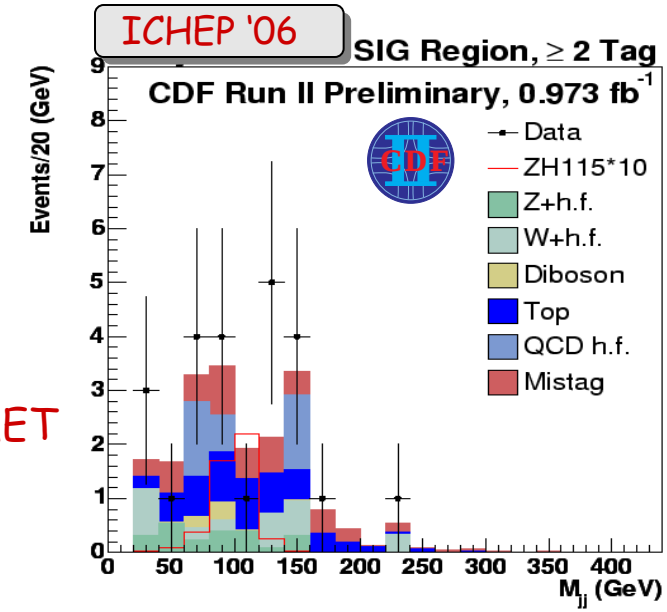
Low Mass Higgs: ZH→ ννbb

Meenakshi Narain's talk



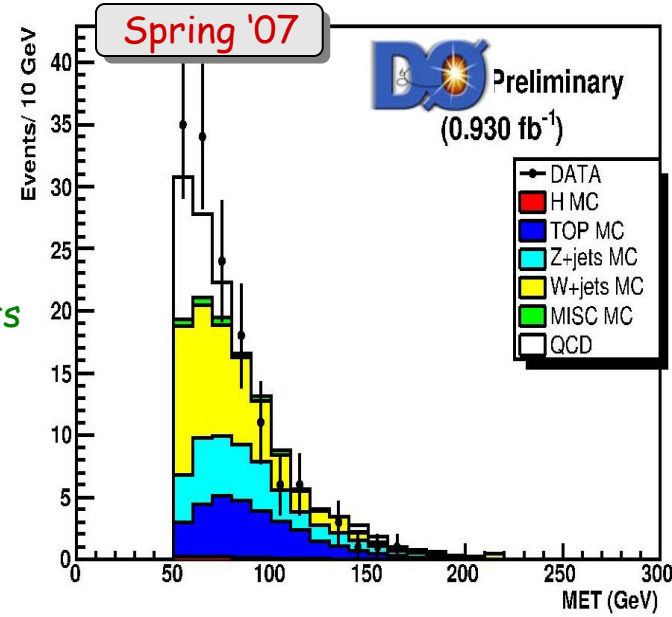


- Larger cross-section & acceptance
- But harder: no lepton, MET

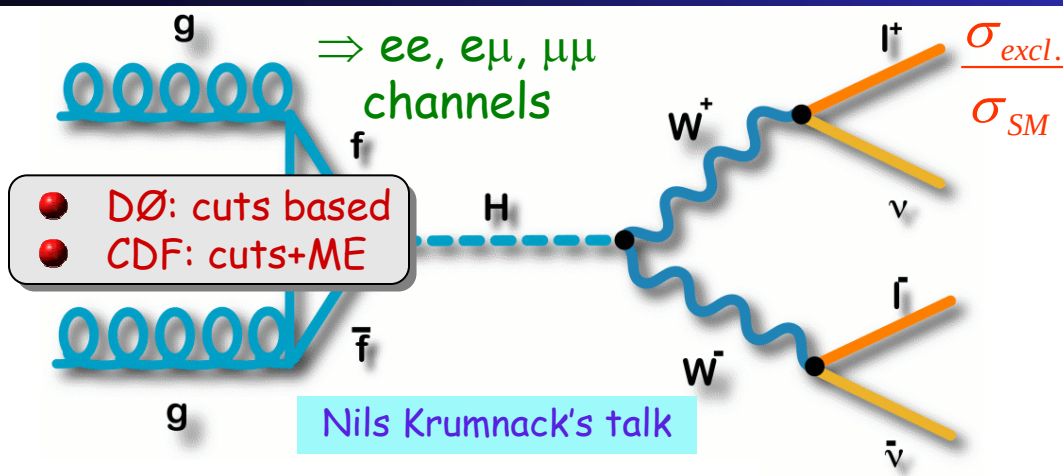


- Selection
  - veto isolated leptons
  - 1 or 2 b-jets, CDF >60,20 GeV, DØ> 20 GeV
  - MET (not aligned in φ with jets), CDF >75 GeV, DØ> 50 GeV
  - B-tags: CDF 1 & 2 b-tag sample, DØ 1 tight + 1 loose
- Backgrounds
  - W/Z+jets, top, di-boson measured with Monte Carlo
  - Instrumental QCD: missing ET from mis-measured QCD jets (determined from data)
- Bonus
  - includes WH→(l±)νbb, when the lepton is missed

$\sigma_{excl} / \sigma_{SM} \sim 10$



Higher Mass (~160 GeV) SM Higgs: H→WW→lνlν

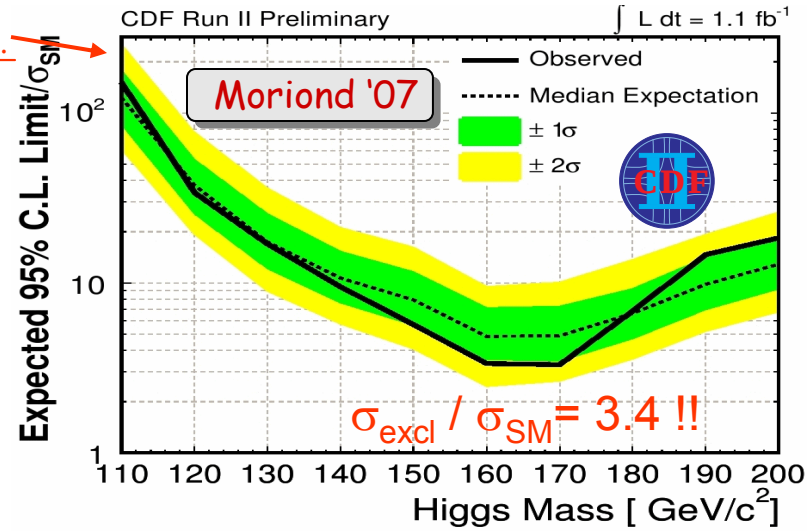


⇒ ee, eμ, μμ channels

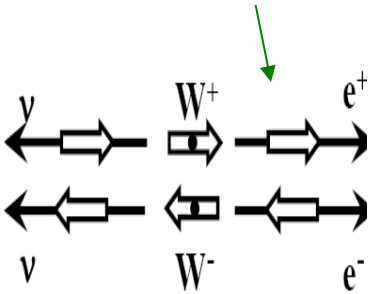
- DØ: cuts based
- CDF: cuts+ME

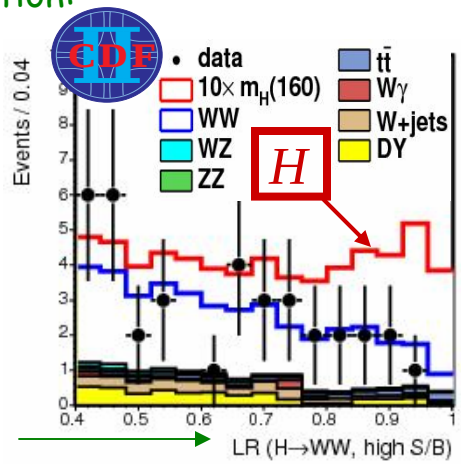
Nils Krumnack's talk

$\frac{\sigma_{excl.}}{\sigma_{SM}}$



- Selection
  - MET>20 GeV, isolation
  - Veto on # of jets, HT=∑ PT
  - $D\Phi_{ll}$ against WW background
  - WW from spin 0: leptons prefer to point in same direction:



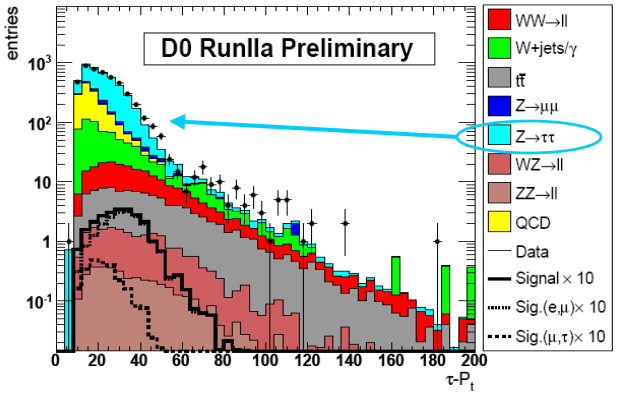


Likelihood ratio

- we take advantage of all final states !
  - New DØ analysis: $H \rightarrow WW^{*} \rightarrow \mu + \tau_{had}$

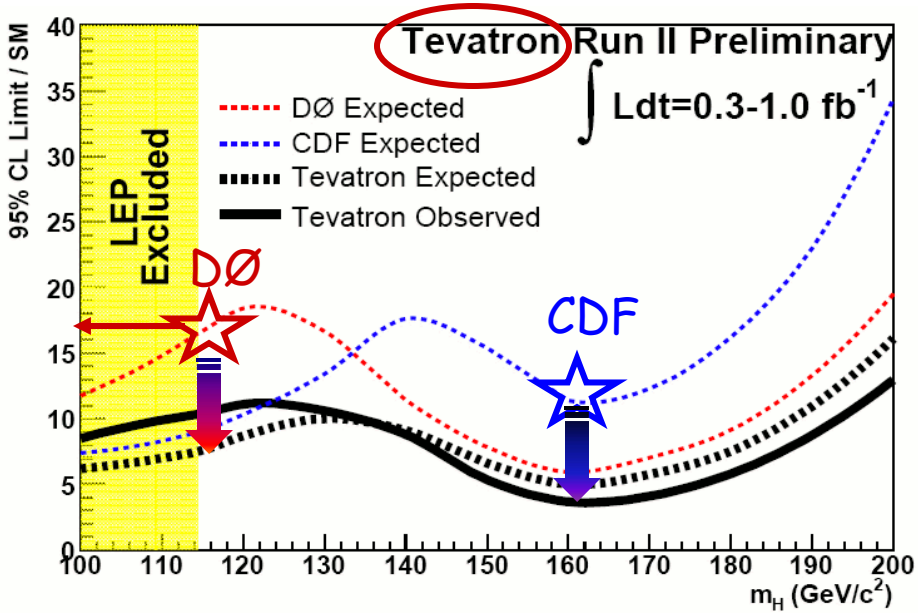
New

1 fb^{-1}



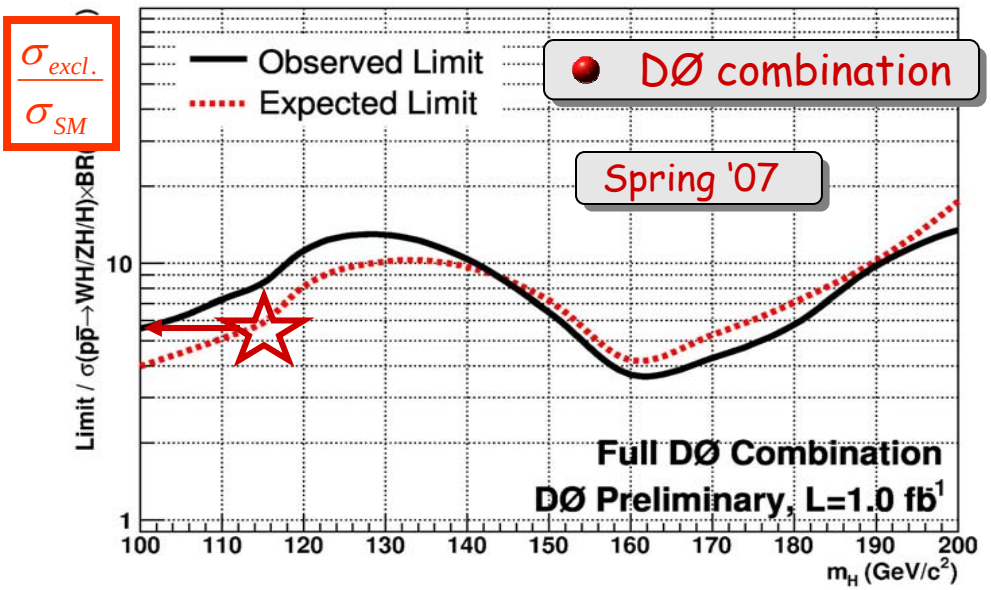
ET_{τ}

SM Higgs Combination : Tevatron combination



- Summer `06: 1st DØ+CDF combination with ~ 0.3-1.0 fb^{-1}

- Since then: lots of progress
  - better sensitivity in all channels
  - NN b-tag or selection, ME,..
  - equivalent to x2 more luminosity!



- ex: DØ alone has tighter limits
  - X factor of ~ 3 at low mH
  - progress faster than √L gain

- New results coming soon & Will be followed by an updated combination

Tevatron SM Higgs Sensitivity

- Though we are not quite there, we know we are missing pieces:
  - Advanced analysis selections (example of improvements demonstrated in previous slides)
  - Missing channels in the combination (WH→WWW, single/double tag combinations, …)
  - New channels (taus, H→ZZ, hadronic H→WW, …) in the pipeline
  - Improve systematic uncertainties, New SMT Layer 0 @DØ

Ingredient	Equiv Lumi Gain	Xsec Factor MH=115 GeV	Xsec Factor MH=160 GeV
Today with $1 fb^{-1}$	-	5.9	4.2
Lumi = $2 fb^{-1}$	2	4.2	3.0
b-Tag (Shape + LayerØ)	1.5	3.4	3.0
Multivariate Techniques	1.7	2.6	2.3
Improved mass resolution	1.5	2.1	2.3
New Channels	1.3/ 1.5	1.9	1.9
Reduced systematics	1.2	1.7	1.7
Two Experiments	2	1.2	1.2

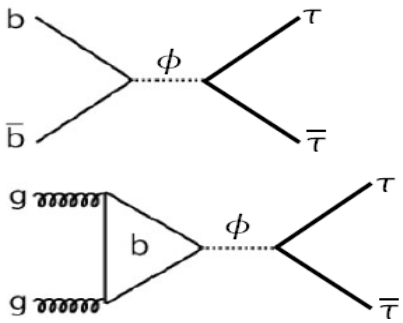
+ to reach 95% C.L. exclusion :

- mH~115 GeV ⇒ need $3 fb^{-1}$
- mH~160 GeV ⇒ need $3 fb^{-1}$

Neutral MSSM Higgs: di-tau SUSY Higgs Decays

Tim Scanlon's talk

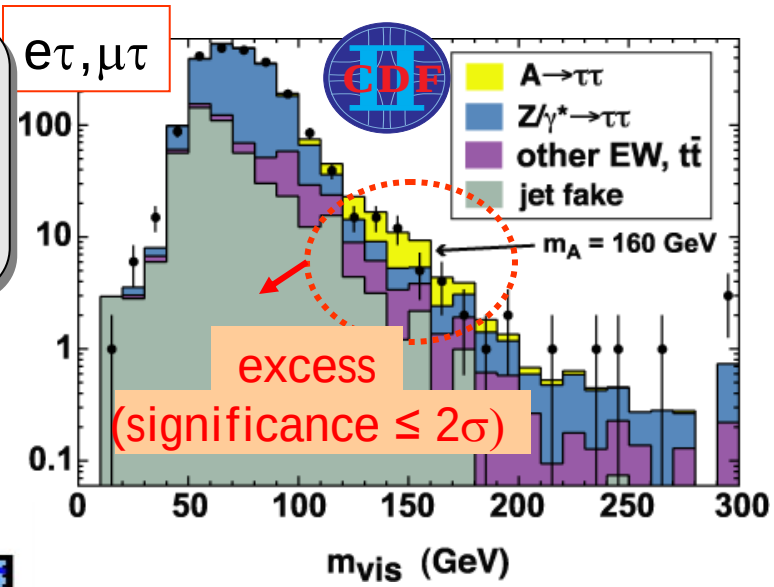
Ilya Kravchenko's talk

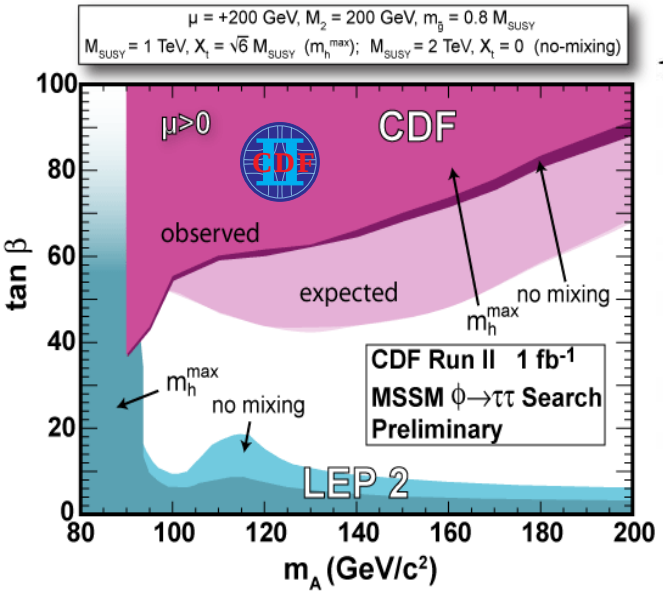


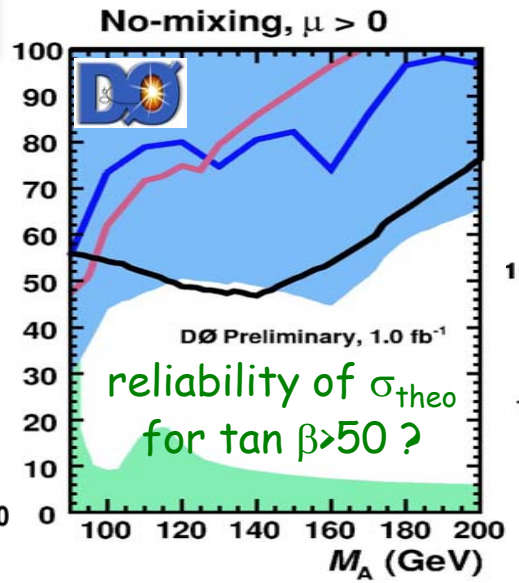
- CDF: τ cone size select.
  - $\tau_e\tau_{had}$, $\tau_\mu\tau_{had}$, $\tau_e\tau_\mu$
- DØ: τ NN selection
  - $\tau_\mu\tau_{had}$

$$\tau_e \to e\nu_e\nu_\tau \qquad \tau_\mu \to \mu\nu_\mu\nu_\tau$$

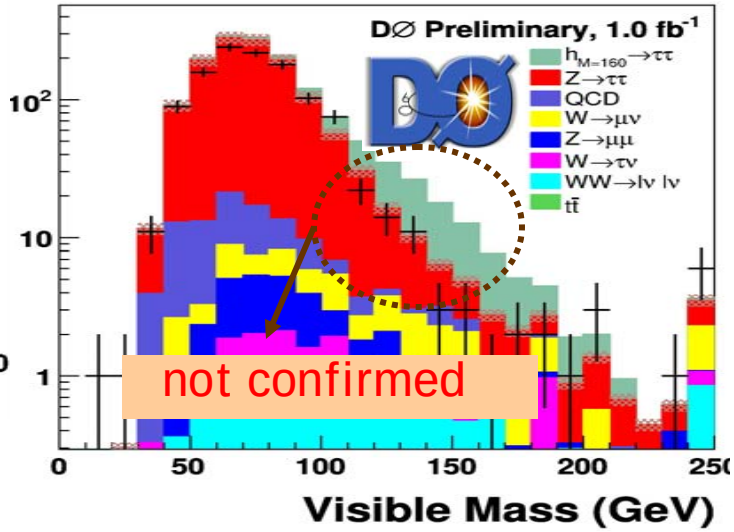
$$\tau_{had} \to had \;\; \nu_\tau$$







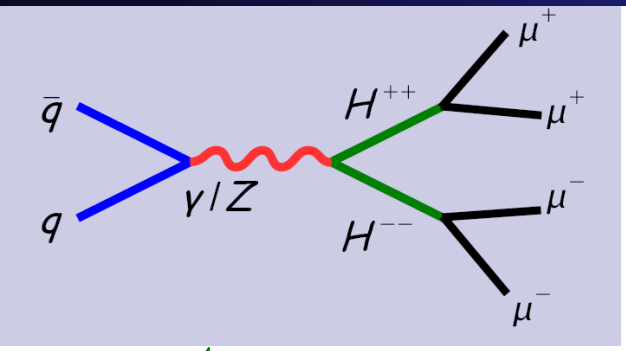
$$M_{\rm vis} = \sqrt{(P^\mu + P^\tau + \not{P}_{\rm T})^2}$$



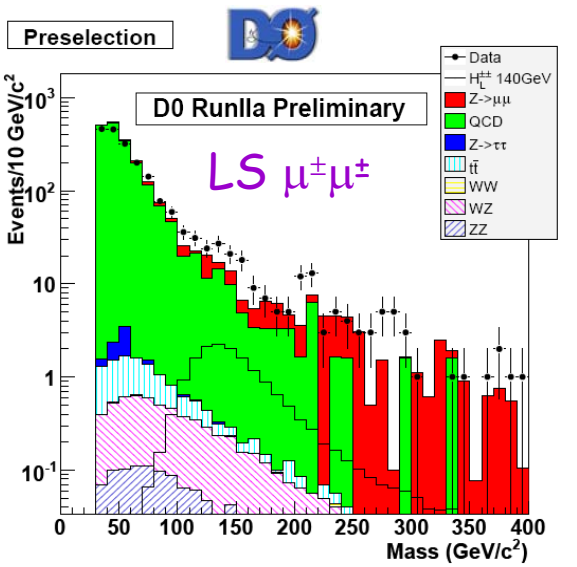
- no mixing and m_h^{max} benchmark scenario
- 90<mA<200, tan β>50 GeV excluded

Doubly Charged Higgs: $H^{++}H^{--} \rightarrow \mu^+\mu^+\mu^-\mu^-$

Gerald Grenier's talk



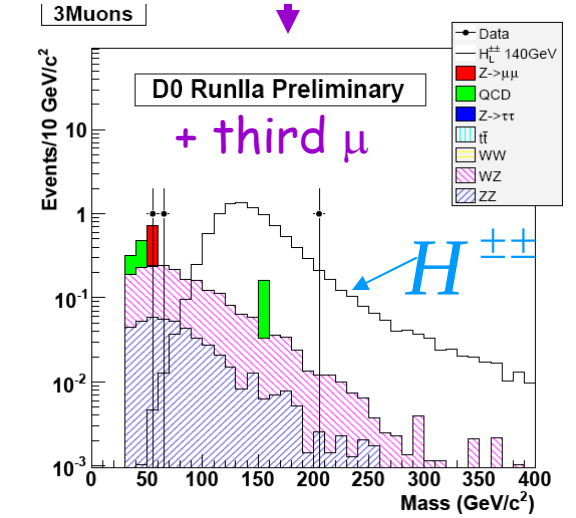
Doubly-charged Higgs bosons are predicted in many scenarios such as Left-Right symmetric models, Higgs triplet models and little Higgs models



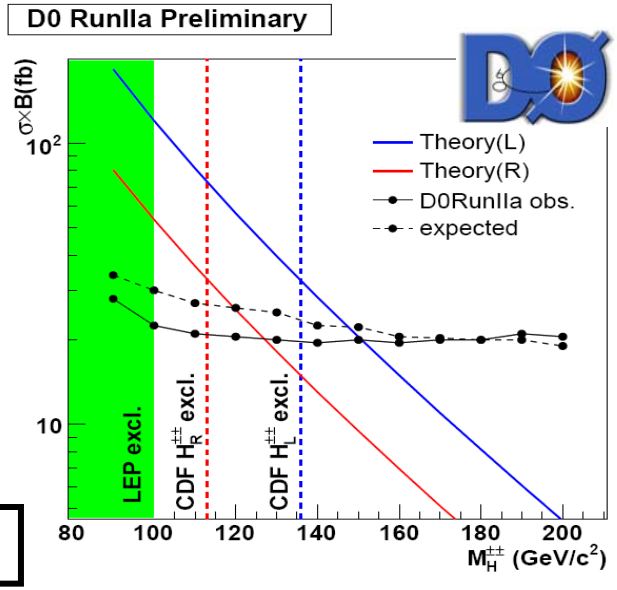
New

(1 fb^{-1})

- Strategy
  - 3 isolated muons Pt>15 GeV
  - One pair of like sign muons
- Signal efficiency ~ 30%



- Main backgrounds:
  - mis-identified muon from Z
  - 3 muons from WW,WZ,ZZ
  - QCD background from semileptonic decays (obtained from data by reversing isolation cut)



$m_{H^{\pm\pm}_R} > 126$ GeV

$m_{H^{\pm\pm}_L} > 150$ GeV

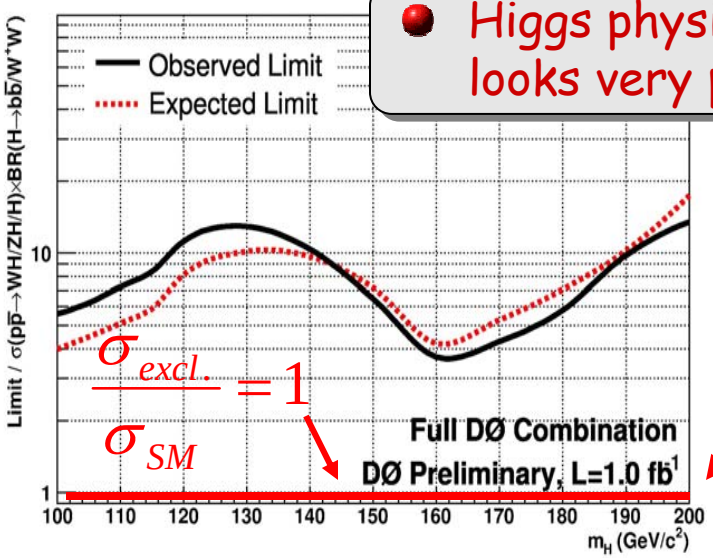
3 (data) / 3.1 ± 0.5 (SM)

Conclusion: very exciting time to work at Tevatron

- In 30': focus on (some) recent BSM and direct Higgs searches results with more than 1 fb^{-1}

- A few small excesses but so far the Standard Model is standing well

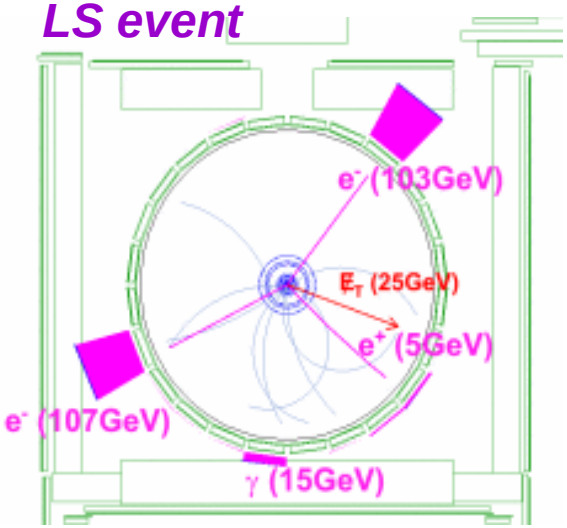
- Higgs physics in Run II looks very promising



$$\frac{\sigma_{excl.}}{\sigma_{SM}} = 1$$

we won't stop here!!

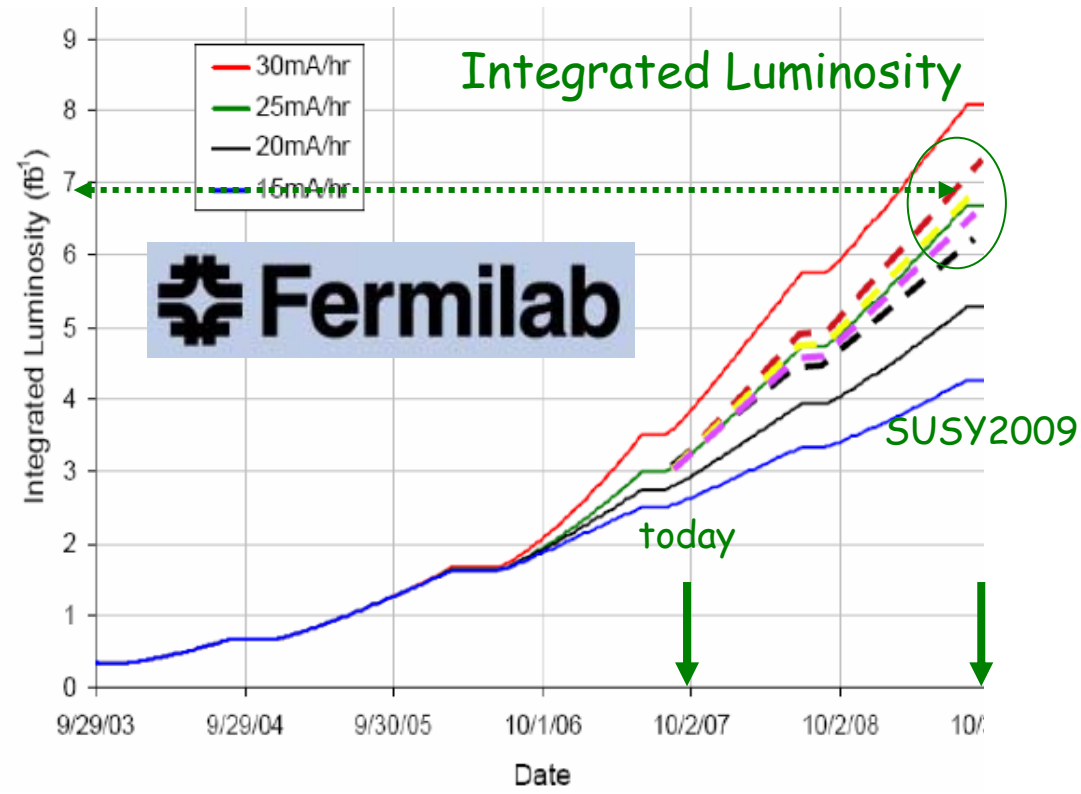
LS event



- ***Higgs is reachable if Higgs is light or near 160 GeV***

Tevatron Run II: Integrated Luminosity Prospects

- Tevatron Run II will provide ~7 fb^{-1} more data yet to be searched through the end of 2009
- Significantly better than the baseline projection formulated in 2003
- A great achievement from the Tevatron



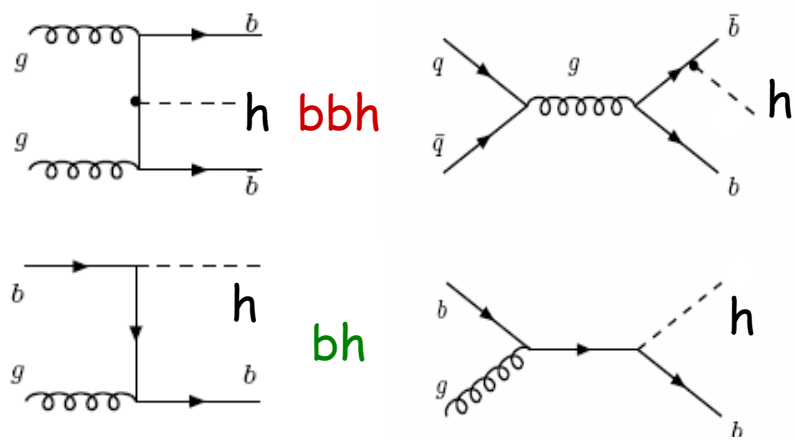
The search for the Higgs bosons and physics beyond the Standard Model will greatly benefit from this integrated luminosity

BACKUP

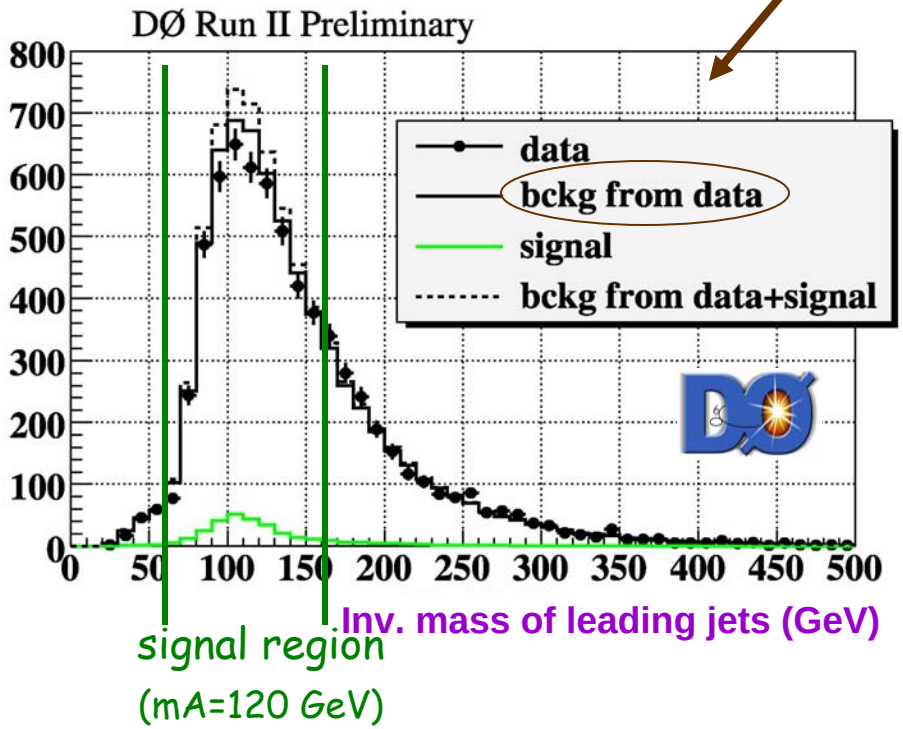
- In 30': focus on (some) recent BSM and direct Higgs searches results with more than 1 fb^{-1}
  - apologies to those results that couldn't be shown today (please see parallel sessions and backup slides)
  - many updates and new results coming soon (DØ/CDF have more than 3 fb^{-1} on tape)

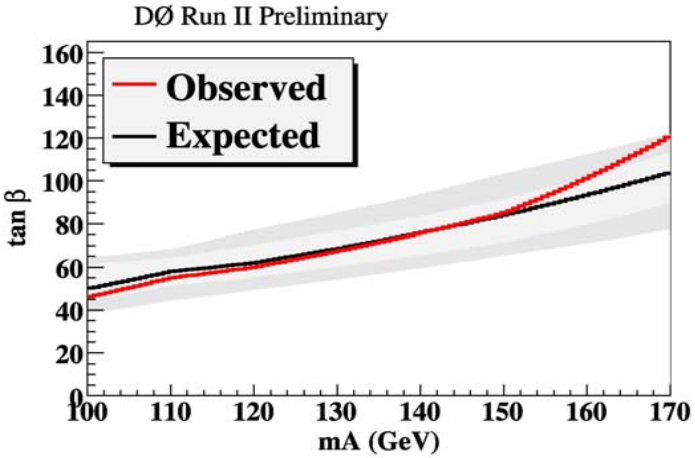
Neutral MSSM Higgs: bbb(b) SUSY Higgs Decays

Tim Scanlon's talk



- ≥ 3 b-tagged jets: pT> 40, 25, 15 GeV
  - look for a bump in the invariant mass of the 2 leading jets
- background from data (bbb, bbc, bbj, …)
  - triple b-tag shape estimated from double-b-tagged dijets mass spectrum
  - rate normalized outside signal window





- excludes a significant portion of (tan β, m_A)
- analysis being optimized to maximize sensitivity

Not Covered Today: Indirect Searches and New Physics in Top quarks

(in 30')

+ other indirect searches where new physics can compete with SM

Elliot Cheu's and Philipp Mack's talks

- ex: B physics
  - Rare decays
    - $B_s \to \mu^+\mu^-$,
    - $D^+ \to \pi^+\mu\mu$, ...
  - CP violation
    - $\varphi_s \approx 0$ in SM

see backup

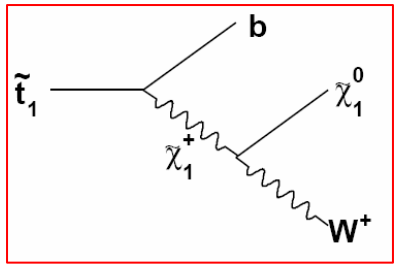
Pieter van den Berg's and James Walder's talks

- ex: New Physics in Top quarks samples

Susana Cabrera's talk

Isabelle Ripp-Baudot's talk

same final state than tt pair production (leptons+jets)

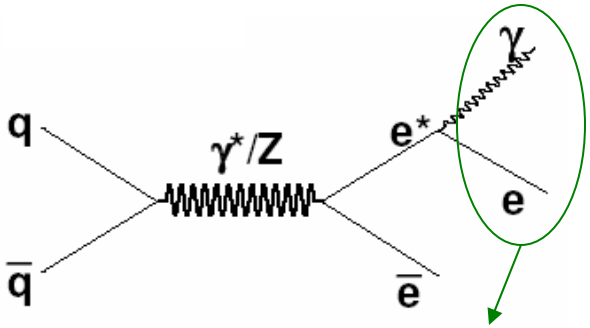


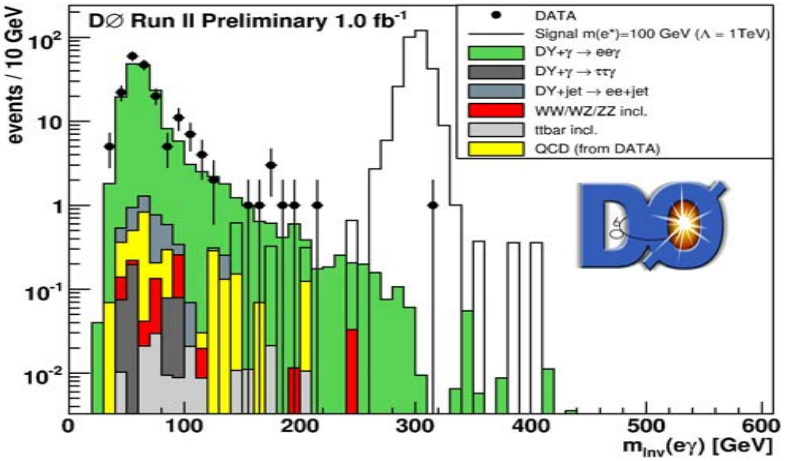
see backup

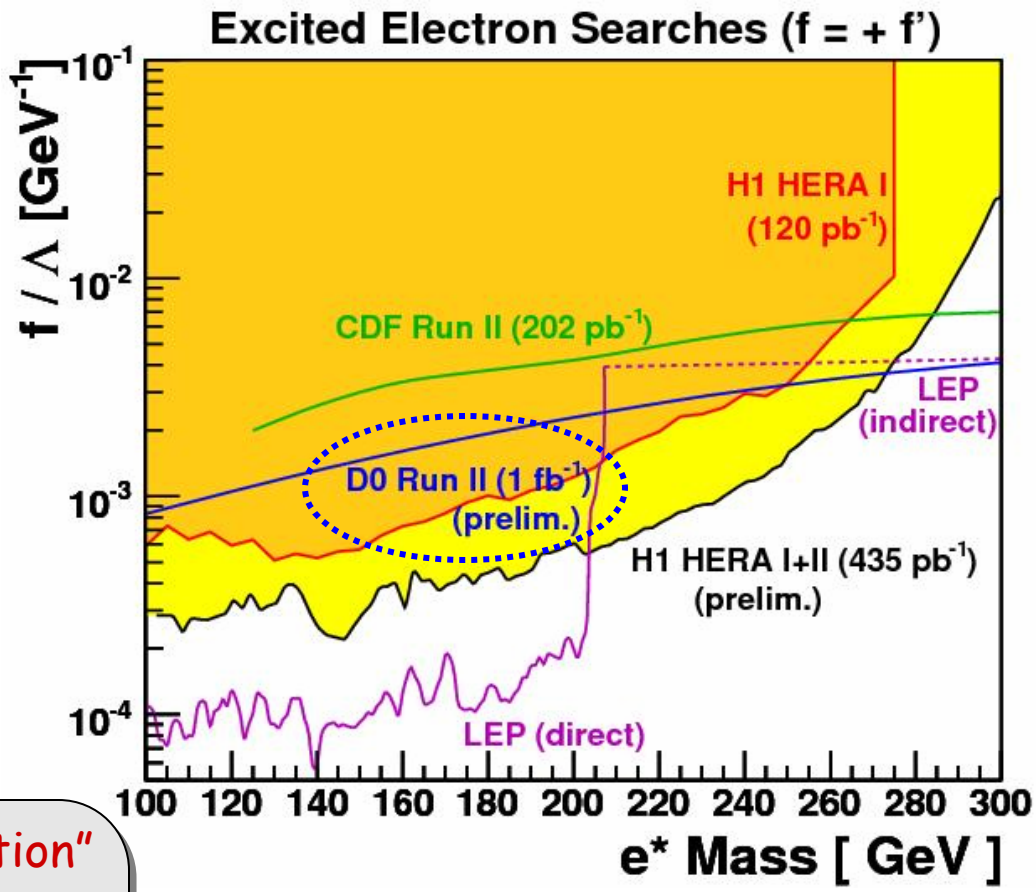
Su-Jung Park's talk

Compositeness : excited electrons

Carsten Magass's talks



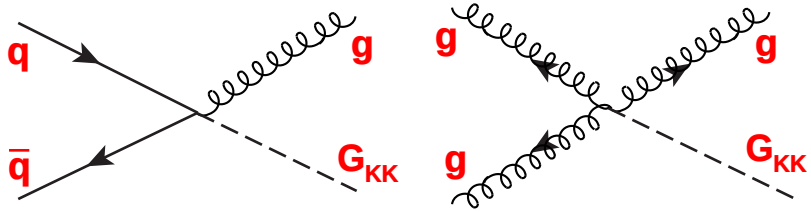




- production via "contact interaction"
  - proton-antiproton → ee*
- decay via "gauge interaction"
  - e* → eγ
- search in the eeγ final state
  - m_{e^*} > 946 GeV for Λ = m_{e^*} (Λ compositeness scale)

- DØ 1 fb^{-1} result put tight constraints on e* (assuming same acceptance for gauge and CI production mechanisms)

Large Extra Dimension: ADD gravitons model

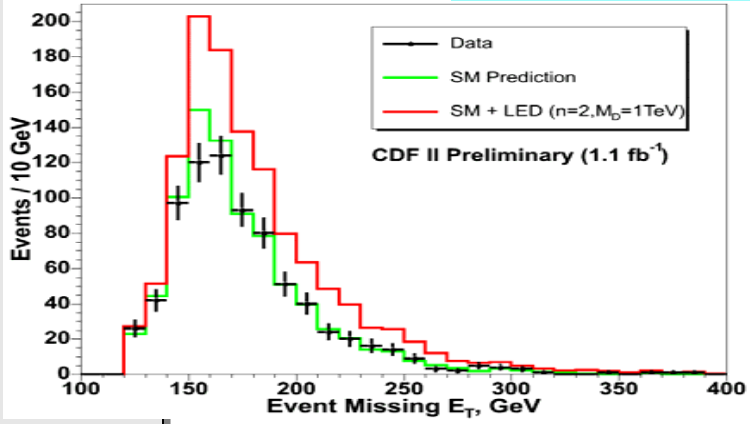


- Search for "monojet"+MET

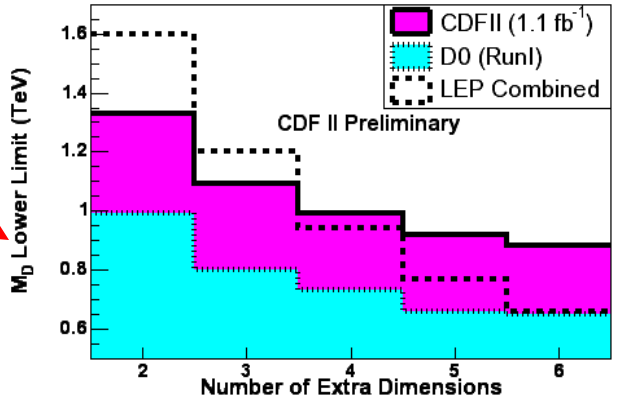
$\not{E}_T$

Carsten Magass's talks

- Main selection cuts
  - Event Missing Et > 120 GeV
    - $\not{E}_T$ away from jets
  - Leading Jet Et > 150 GeV
    - soft jets from ISR are allowed
  - No isolated leptons
- Main backgrounds
  - $Z \to \nu\nu$ + jets (50%)
    - calibrated with $Z \to ee$ and $W \to e\nu$
  - QCD multijet negligible (5%)
- Results
  - **779 (data) / 819 ± 71 (SM)**
  - N=6, M_D>0.88 ⇒ size of the extra dimension< 3.1 10^{-11} mm
    - (assuming here compactification on a torus…)

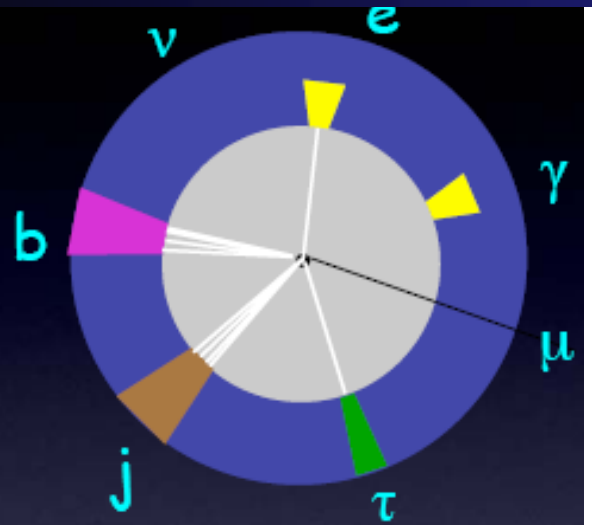


Fundamental Planck scale M_D

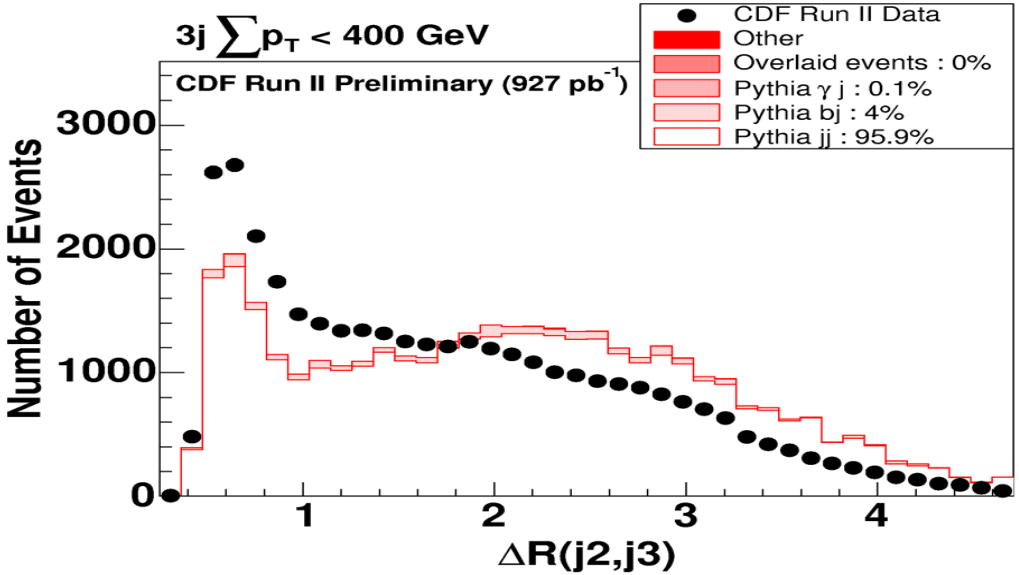


Model Independent Searches

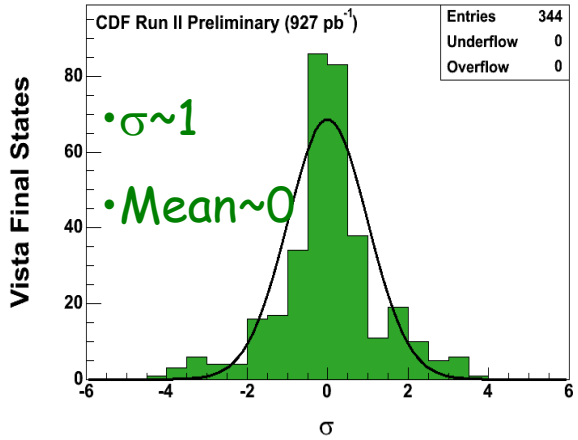
Georgios Choudalakis's talk



- A global analysis of CDF Run II data :
  - Vista :



Vista

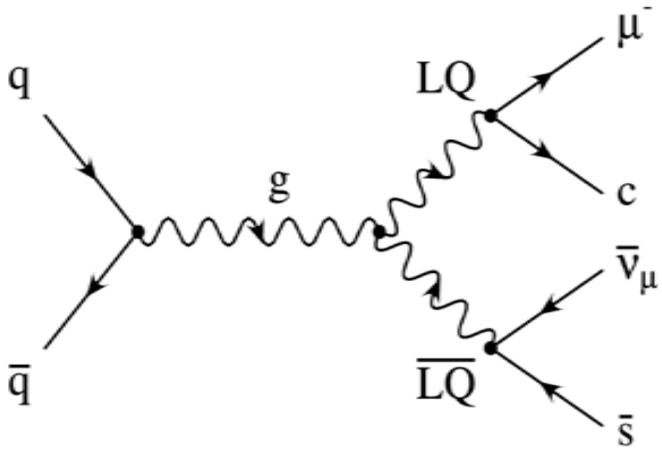


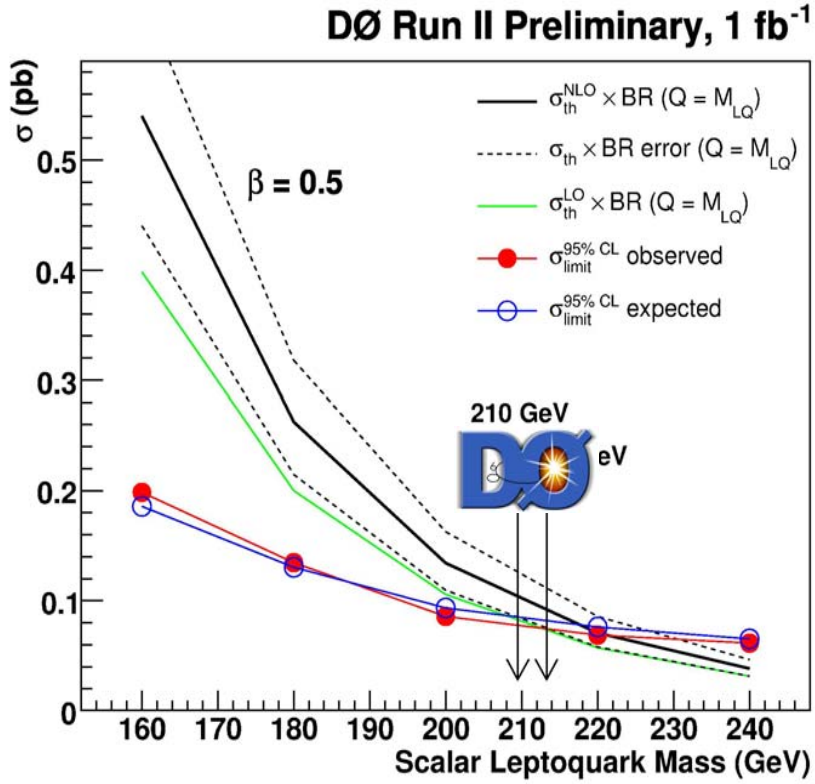
- in few cases: apparent difference between the field's state-of-the-art showering algorithms and data

Leptoquark: $LQ_2 \rightarrow \mu q$

$\mu\nu$ + 2 jets final state

Thomas Nunnemann's talk



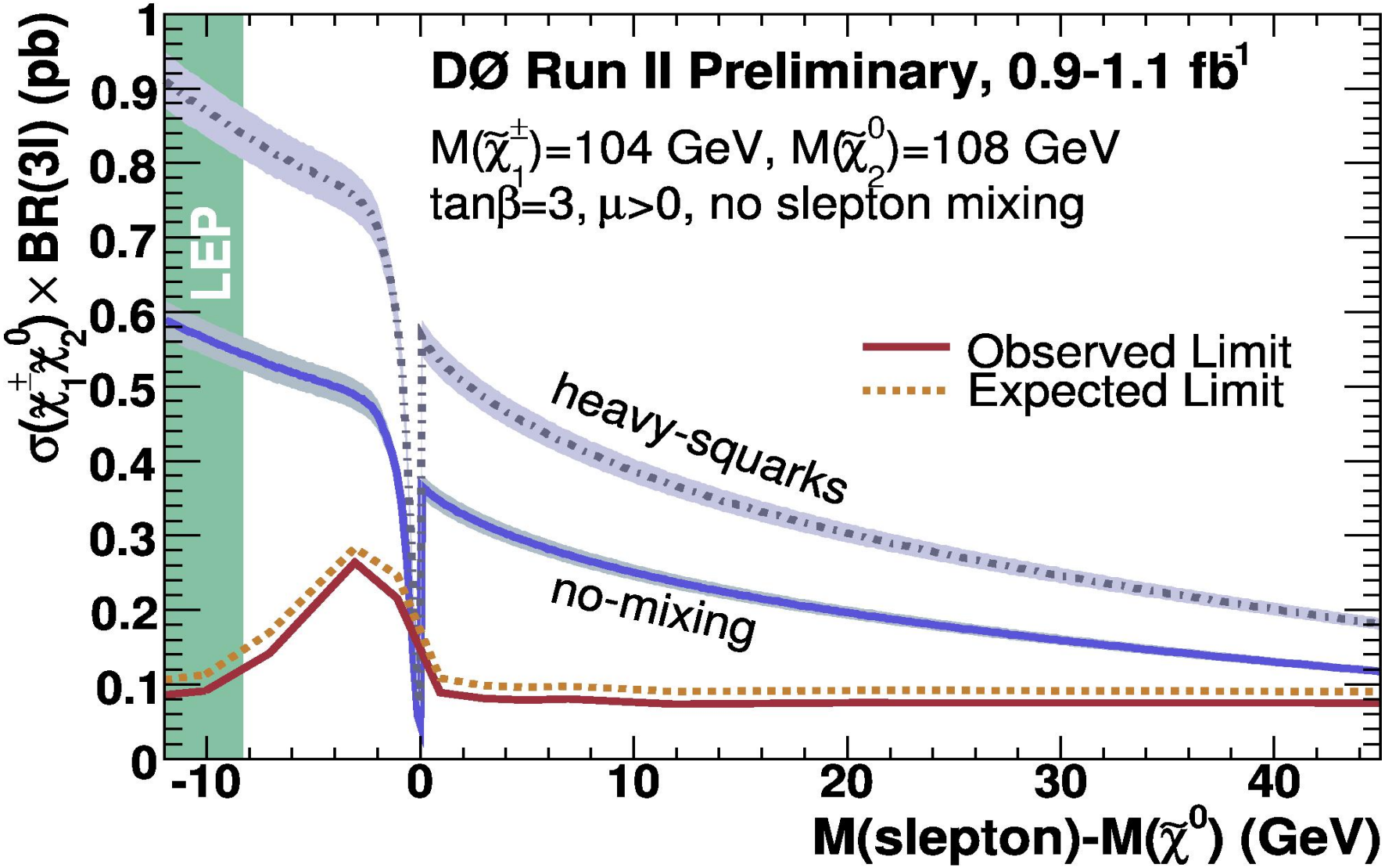


- Br($LQ_2 LQ_2 \rightarrow \mu q \upsilon q$)= $2\ \beta(1-\beta)$
- with β= Br(LQ_2 -> μq) = 0.5 (choice)

$m_{LQ2} > 214$ GeV

DØ SUSY Limits : Trileptons

Olav Mundal's talks



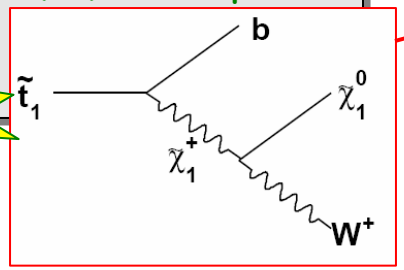
DØ Stop Search: Leptons+Jets Final State

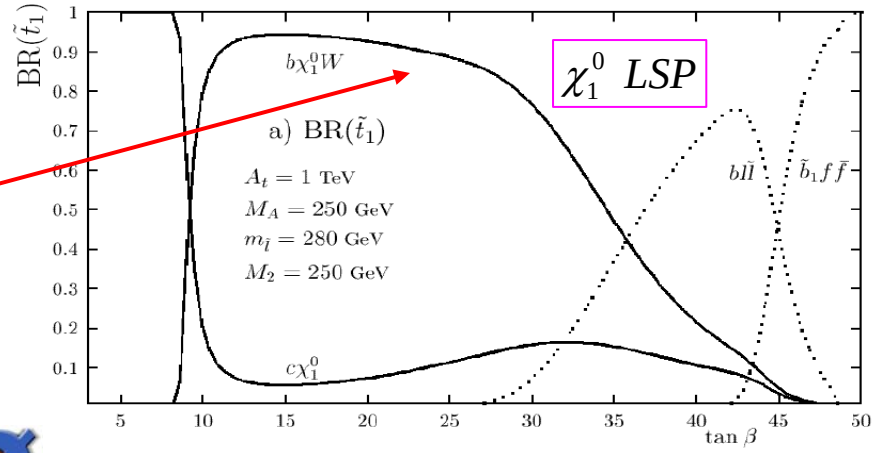
Su-Jung Park's talk

- m(stop) ~ m(top) (or lighter)
  - σ(stop)~0.6 pb & σ(tt)~6.77 pb

m($\chi^{\pm}$) ~ 100 GeV
m(χ^0) ~ 50 GeV

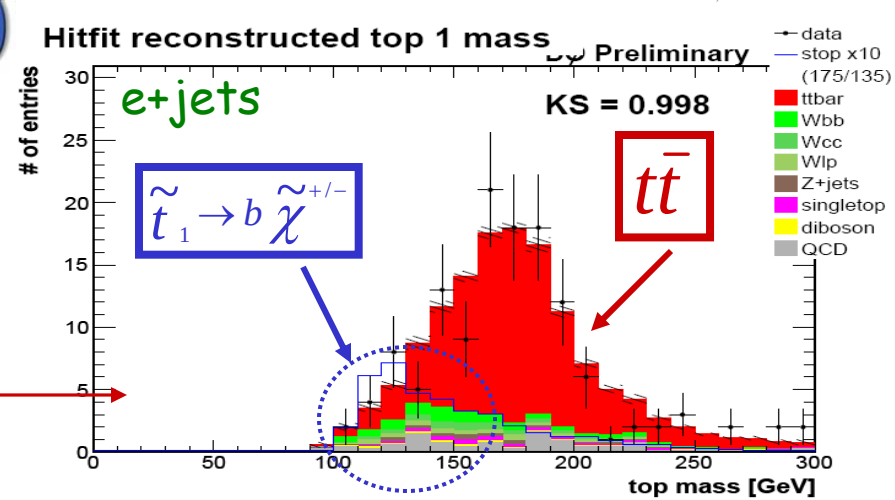
New





same final state than tt pair production (leptons+jets)

⇒ lepton = e, μ



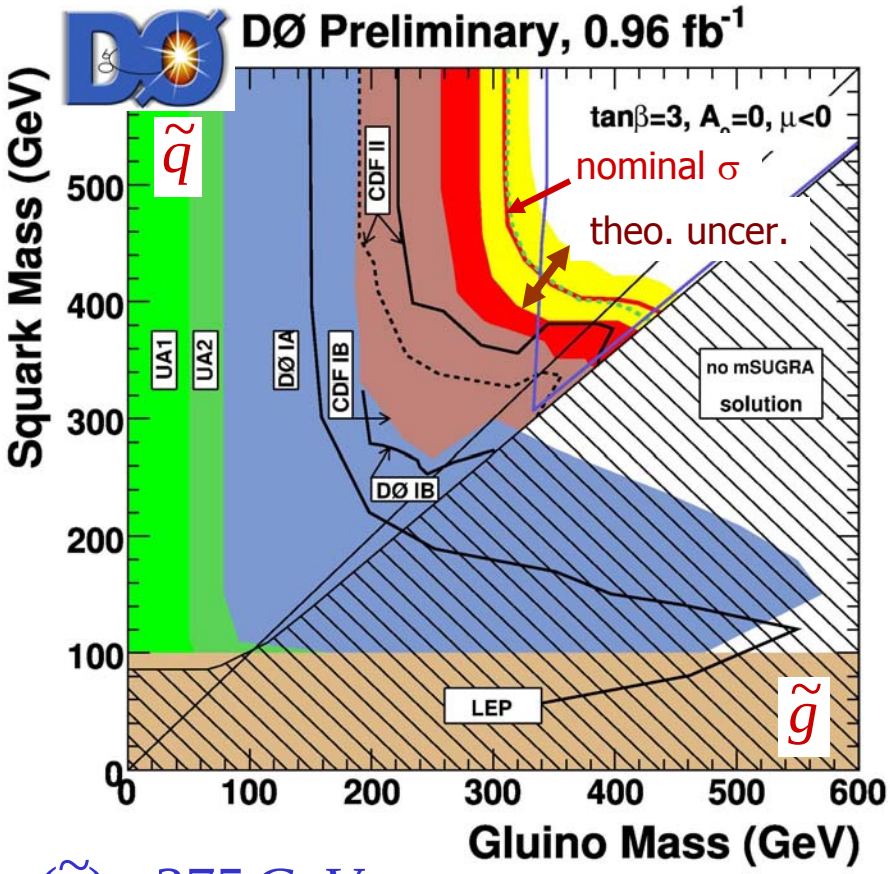
- Main analysis cuts:
  - Isolated high pt lepton > 20 GeV
  - 2 b-jets and 2 light-jets (pt1>40)
  - MET > 25 GeV + angle(lep,MET)
  - At least 1 b-jet (Neural Net) "tight"
  - Kinematic fit to tt hypothesis
  - Likelihood discriminant

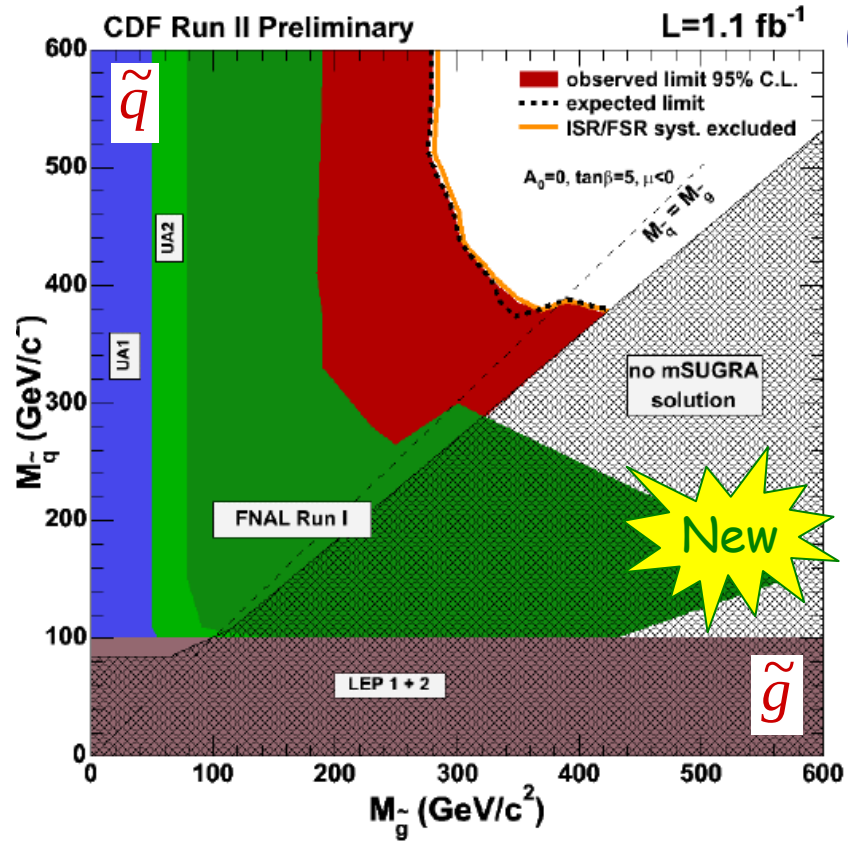
- Main backgrounds
  - tt dominates
  - W+jets = $W_{jj}+W_{cc}+W_{bb}$ = data-multijets-N_{tt}-N_{Z+jets}-$N_{single\text{-}top}$ -$N_{di\text{-}bosons}$

- M(stop)~175 GeV: cuts:
  - ε≈4% and ~3±0.1 events exp.

observed limits still ×10 σ_{theo}

Generic Squarks and Gluinos : jets + MET $\tilde{q}, \tilde{g}$





$m(\tilde{q}) > 375\,GeV$

$m(\tilde{g}) > 289\,GeV$

- CDF & DØ: optimized for each of the 3 processes (low, medium, high mo)

$m(\tilde{q}) > 375\,GeV$

$m(\tilde{g}) > 276\,GeV$

- NLO signal cross-sections uncertainties NOT included in the limit calculation
- Mass limit placed at the NLO most conservative (i.e lowest) σ crossing

- NLO signal cross-sections uncertainties ARE included in the limit calculation
- Mass limit placed at the NLO nominal σ crossing

BSM in top antitop samples: resonances

Direct search for heavy vector boson $Z' \to t\bar{t}$.

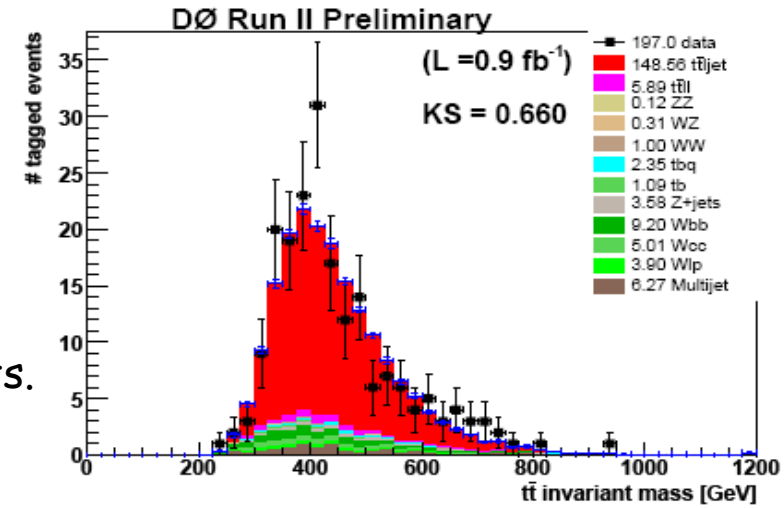
Dataset: 0.9 fb^{-1} ℓ+jets

Hypothesis: $\Gamma_{Z'} = 0.012\ M_{Z'}$ << detector resolution

Selection: at least one b-tagged jet

Observable: $M_{t\bar{t}} \to$ use of $\not{E}_T$, $p_T(\ell)$ and 4 leading jets.

Binned likelihood on $t\bar{t}$ invariant mass distribution.

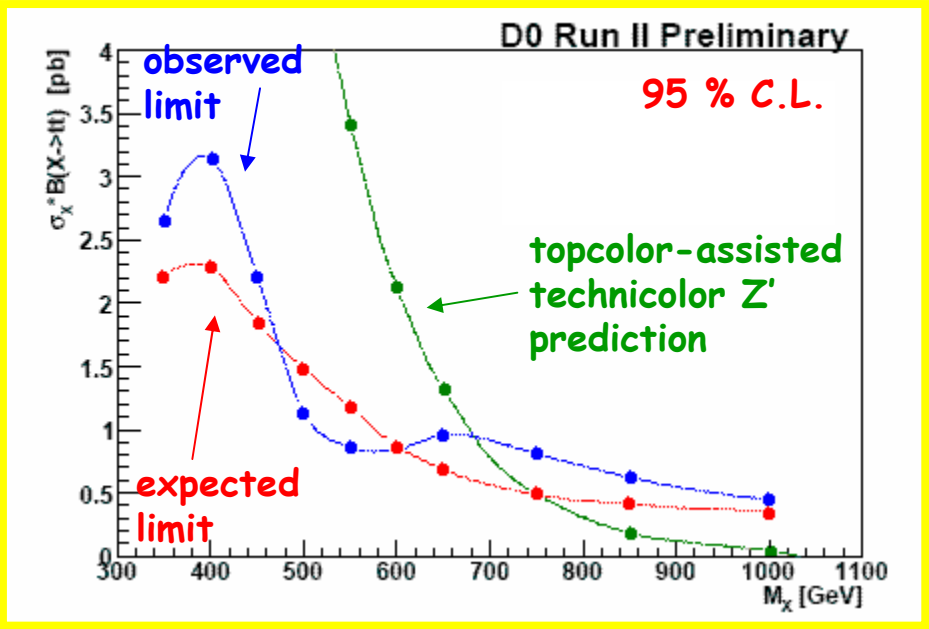


Bayesian approach

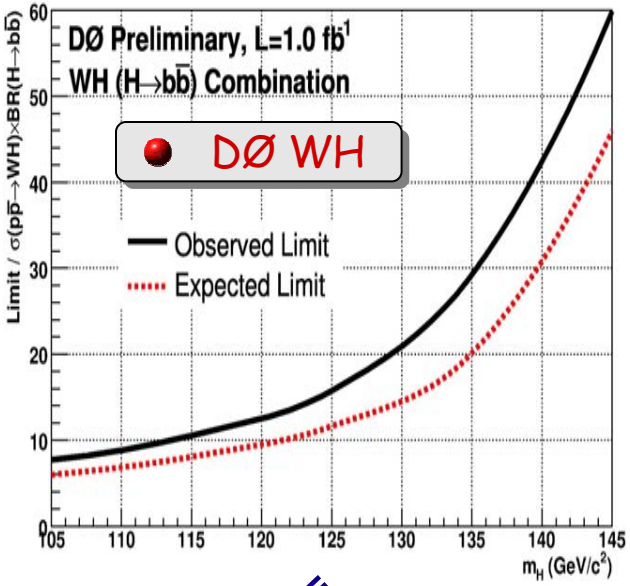
→ upper limits on $\sigma_{Z'} \times B(Z' \to t\bar{t})$

→ exclusion of a leptophobic Z' with $M_{Z'} < 680\ GeV/c^2$ @ 95 % C.L.

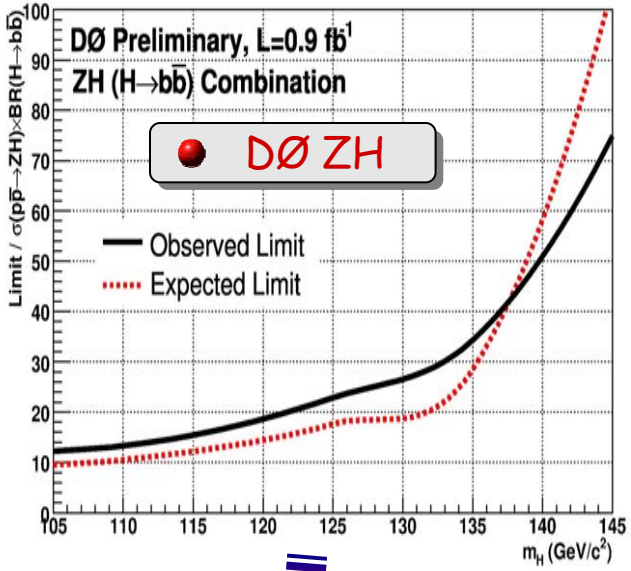
Isabelle Ripp-Baudot's talk



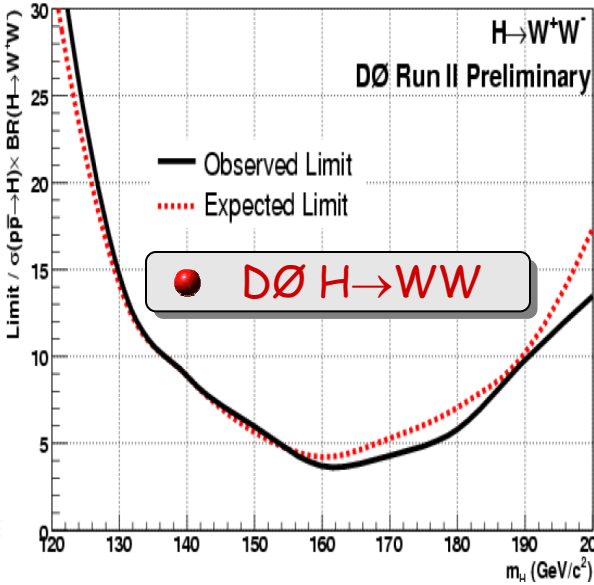
SM Higgs Combination : example with DØ $\frac{\sigma_{excl.}}{\sigma_{SM}}$



DØ WH



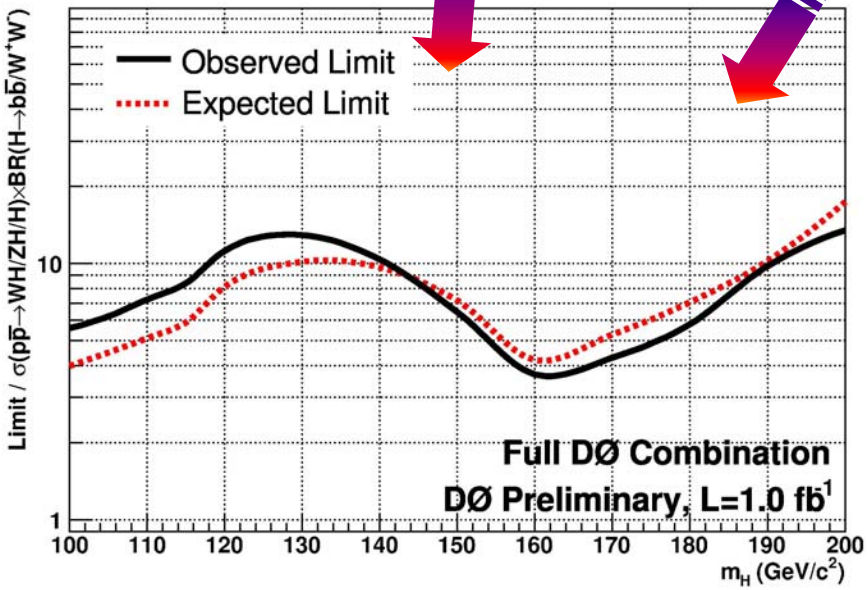
DØ ZH



DØ H→WW

DØ combination

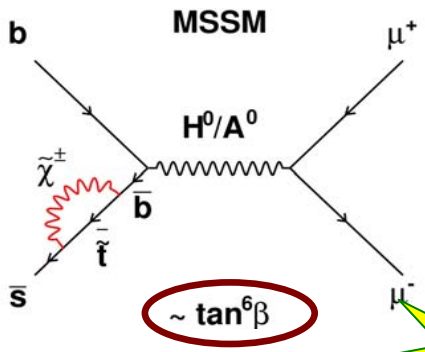
Spring '07



Indirect limits from B-physics: $B_s \rightarrow \mu^+\mu^-$

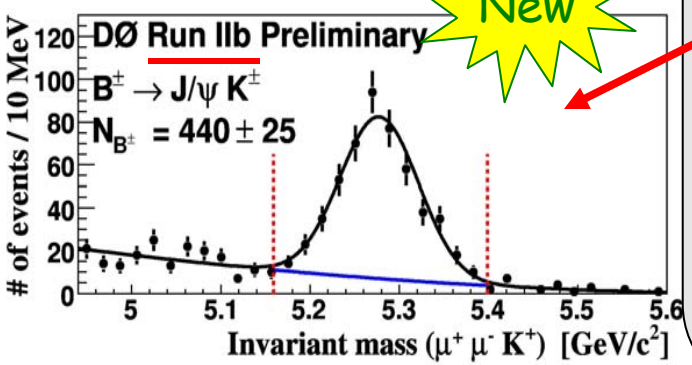
$\int L\,dt \approx 2\ fb^{-1}$

Elliot Cheu's and Philipp Mack's talks



- In SM, tiny BR~3.5 10^{-9} (and 25 times smaller for Bd)
- But in SUSY, enhancement ~ $(\tan\beta)^6$ factor

New



- CDF & DØ: blind analysis using signal MC and side band data
- Normalize to the $B^+ \rightarrow J/\psi\ K^+$ mode
- Use a Likelihood ratio to discriminate from huge $\mu\mu$ background using:
  - Secondary vertex displacement
  - B pointing angle to Primary Vertex
  - B isolation,…
- Look inside a mass window:

1 (data) / 1.27 ± 0.037 (SM)

1 (data) / 0.8 ± 0.2 (SM)

2 (data) / 1.5 ± 0.5 (SM)

$\int L\,dt = 0.8\ fb^{-1}$

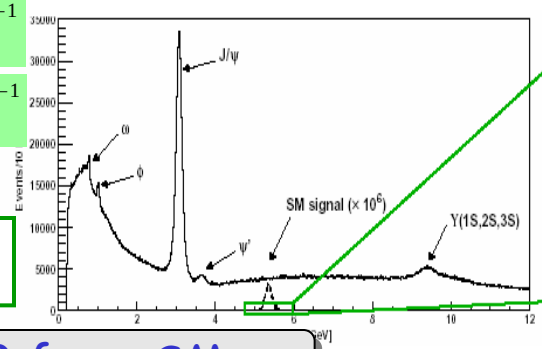
$\int L\,dt = 1.3\ fb^{-1}$

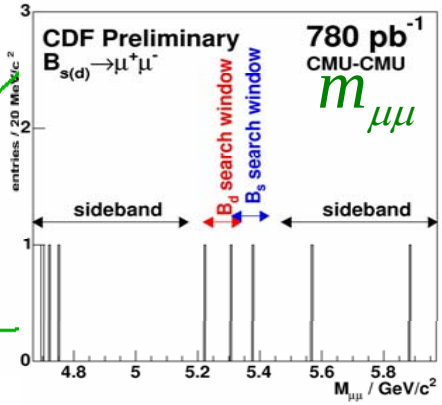
$\int L\,dt = 0.5\ fb^{-1}$

BR($B_s \rightarrow \mu^+\mu^-$) @90% CL:

- DØ < 7.5 10^{-8}
- CDF < 8.0 10^{-8}

⇒ < 4.7 10^{-8}





- limits only a factor of 20 from SM…