



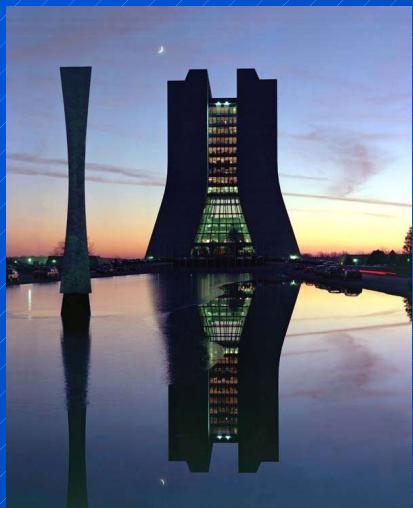
Physics Analysis/Publication Overview

Experiment, Computing, and Physics Status

Arnulf Quadt



RHEINISCHE FRIEDRICH-WILHELMUS-UNIVERSITÄT



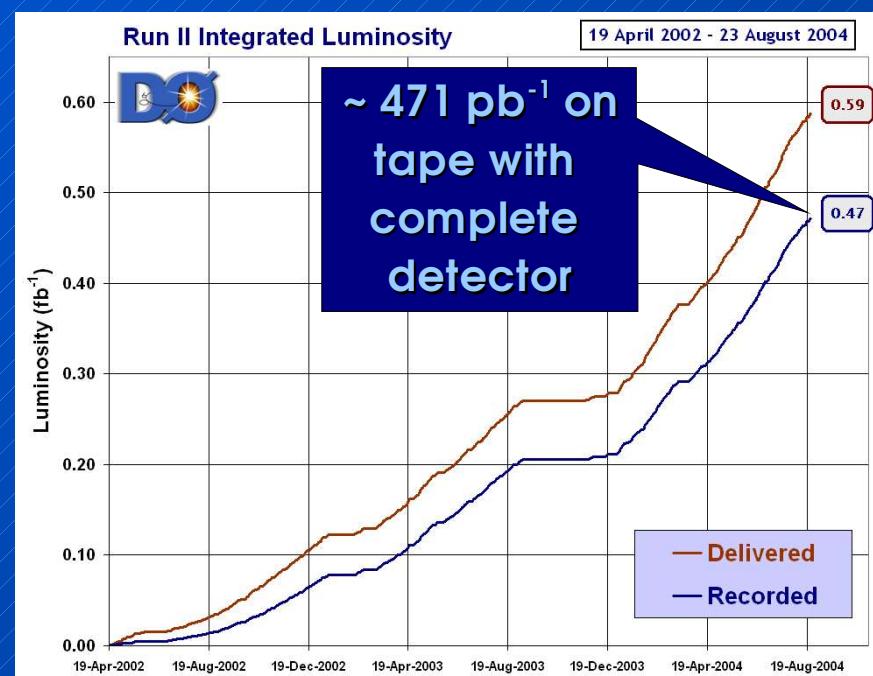
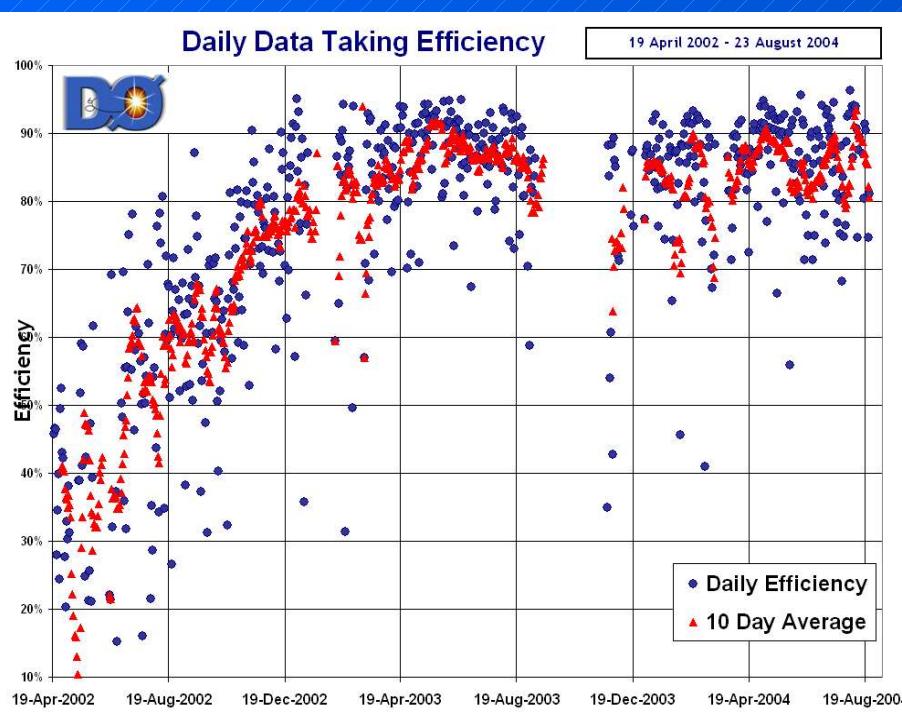
*Physics Advisory Committee Meeting
November 11-13, 2004*

Outline

- Detector Status, Operations, Shutdown
- Computing
- Physics Results and Publications

DØ Operations and Detector Status

DØ Data Taking



- around 90% most of the time
August 3rd: 96.3% all-time best
- Current upper limit: $\simeq 94\%$
3-6% global front end busy (tracking readout)

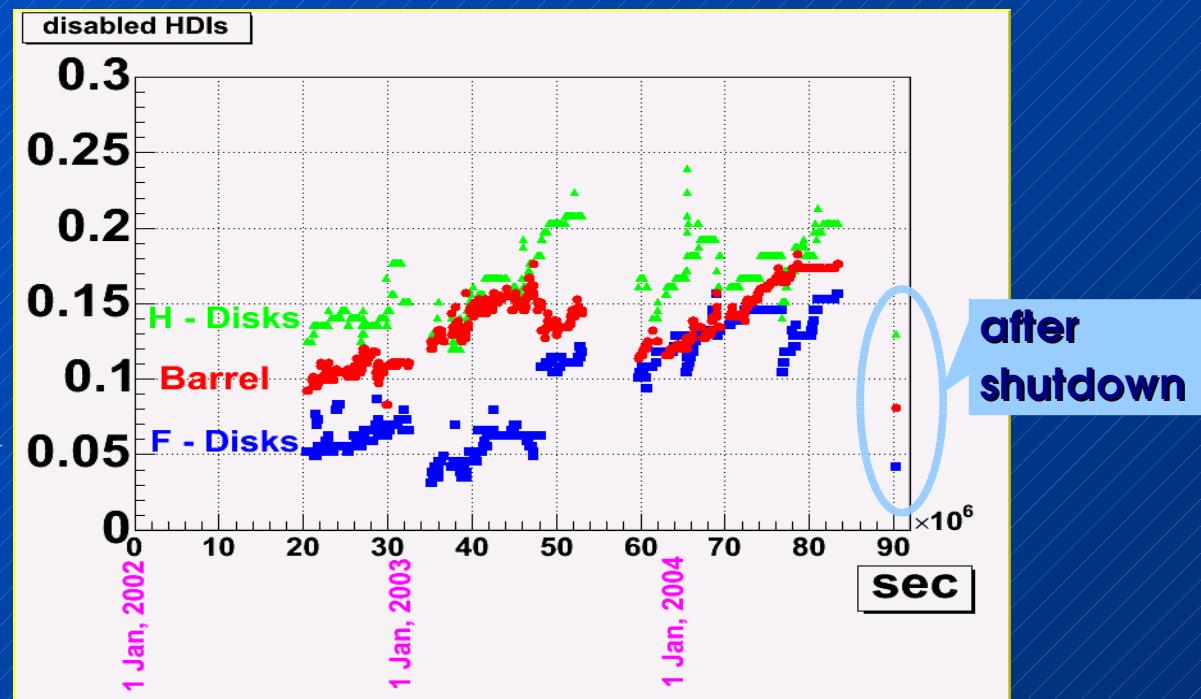
	Delivered	Recorded
Since April 19 th 2002:	587 pb^{-1}	471 pb^{-1} (80%)
Since October 1 st 2003:	316 pb^{-1}	265 pb^{-1} (84%)

Shutdown Goals and Status I

- Improve reliability and performance of the detector
 - Improve isolation of ground to reduce sensitivity to external noise sources (in particular CAL)
 - Attempt recovery of unresponsive CFT readout channels
 - Perform “routine” maintenance
 - Power supply (rad.hardness of muon system ...), cooling systems
 - Individual channel recoveries

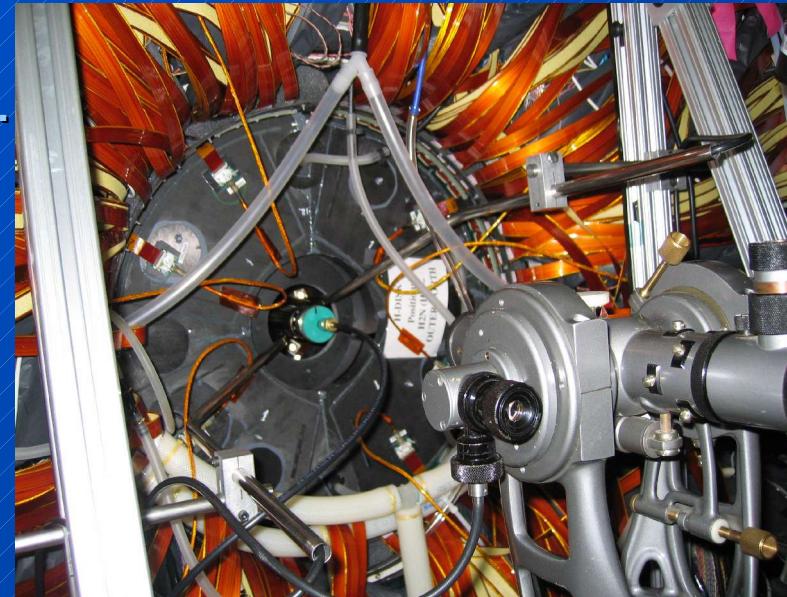
...

Study and recover disabled Si readout channels (HDI'')



Shutdown Goals and Status II

- Preparations to facilitate Run IIb upgrade installation
 - * Verify aperture for Silicon L0 detector installation
 - assumed 6.8 mm radial space. Survey clearance.
 - complicated and lengthy process
 - preliminary conclusion: enough clearance !
 - * DAQ/Online upgrade
 - * Infrastructure modifications for L1CalTrack, L1CTT, L1CAL



All DØ shutdown activities successful and on track ...
... expected to be completed by 22. November ...

DØ Computing

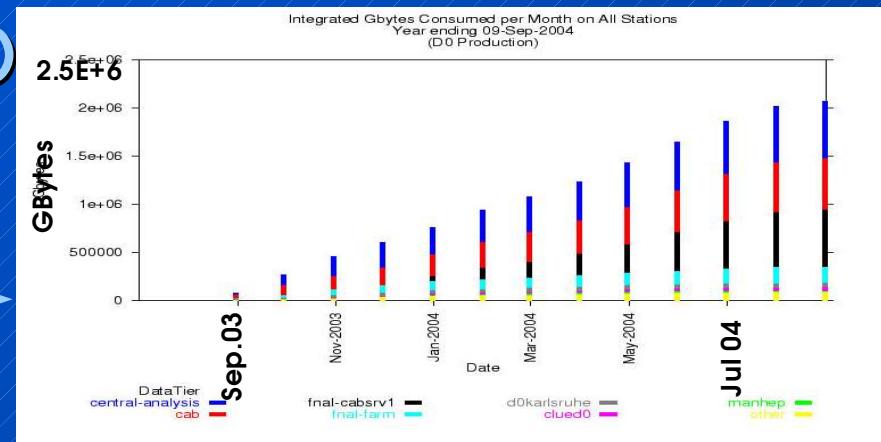
Computing Status

- **Globally – doing ok / well - thanks to hard work of (relatively) few**
 - Reconstruction keeping up with data taking
 - Data handling performing well
 - MC production exceeded 1M events/week
 - Reprocessing remotely
 - Analysis cpu adequate – expanding
- **Expect x10 more data, at higher instantaneous luminosity**
 - Manpower and CPU moving to LHC - shared resources
 - Increasing use of common solutions / grid

SAM & SAMGrid

SAM (Sequential Access to Metadata)

- developed by DØ & FNAL-CD
- 40 active SAM sites worldwide
- over 2 PB moved last year
- up to 200 TB moved per month



JIM (job & information management)

Runjob (job workflow management)

SAM + JIM = SAMGrid

JIM and SAMGrid now default

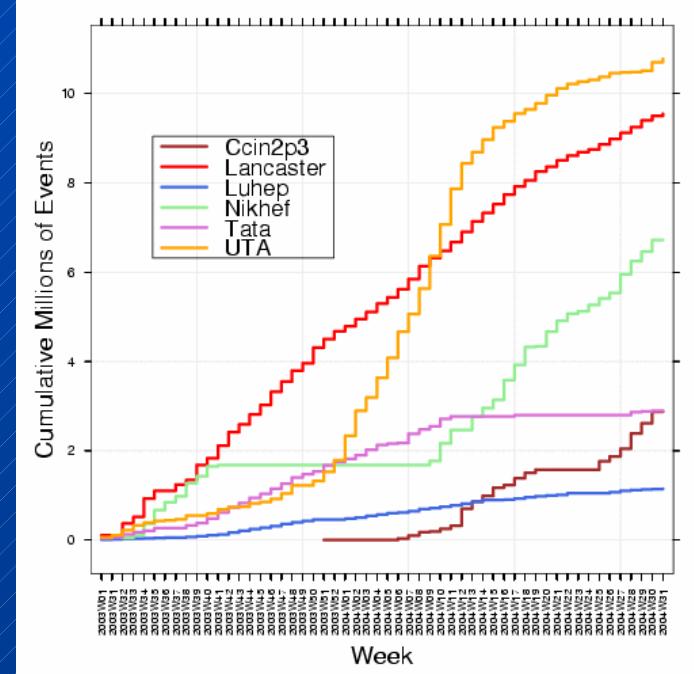
at many MC centres

37 M events last year (>2M with JIM)

1.0 – 1.5 M events/week

<http://samgrid.fnal.gov:8080/>

11 active JIM execution sites



Run II (Shank) Review

Annual Review (13-15 Sept.)

- formerly known as Bird Review
- Both DØ and CDF: <http://cdinternal.fnal.gov/RUNIIRev2004/runIIMP.asp>



Strong praise for DØ, particularly for:

- use of SAM
- Off-site reprocessing, using SAMGrid
- Move towards common solutions/being fully grid enabled
- Factor x2 gain in reco speed



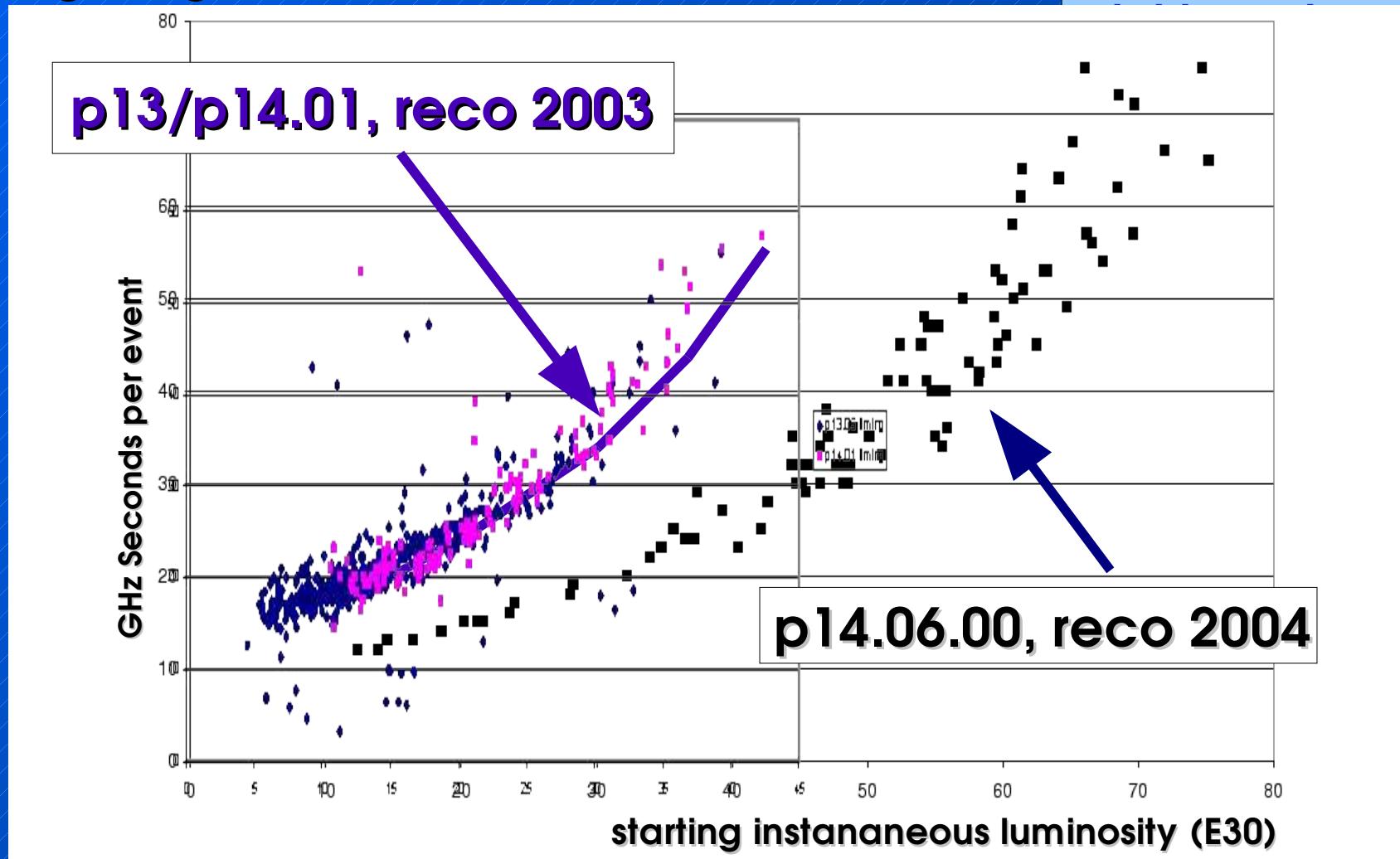
Given budget guideline at review: \$1.5 M

- \$300k below projected need
- cuts needed, probably from analysis CPU and disk,
cannot cut on tapes, avoid cutting on reco CPU
- Potentially worse for 2006: project \$2.3M
 - * affect planned rate to tape increase (lumi-related) (?)

Algorithms (P14 & P17) and Reprocessing

TeV has made tremendous progress and
the timing is again a problem

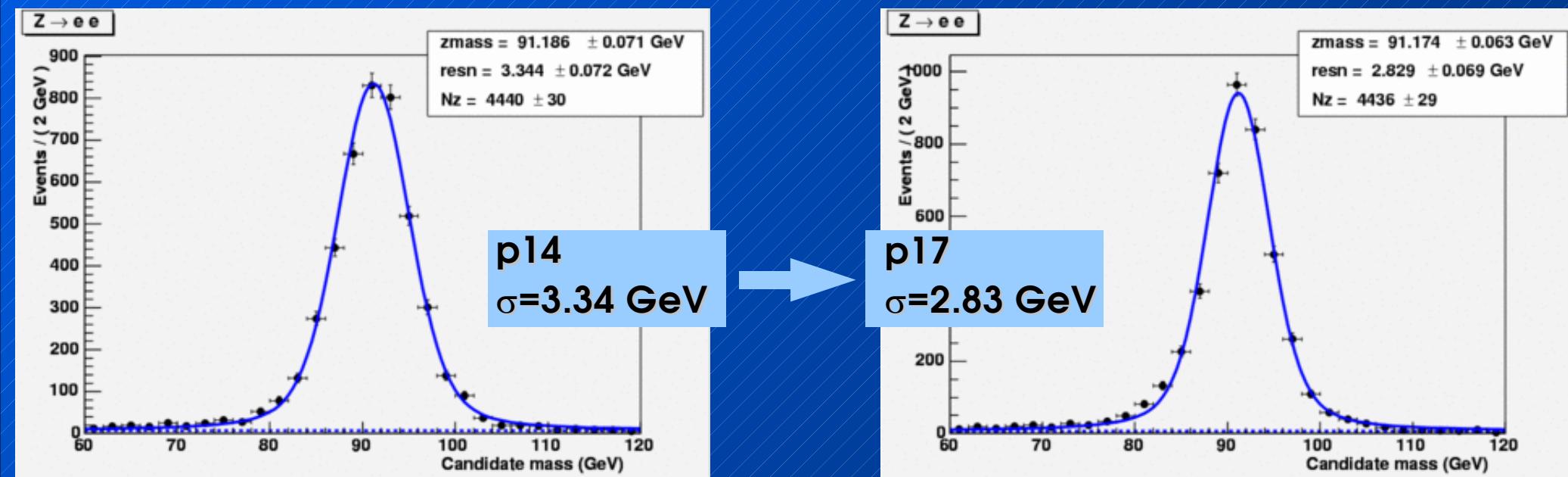
Here, reco cannot
keep up with data



P17 Algorithms

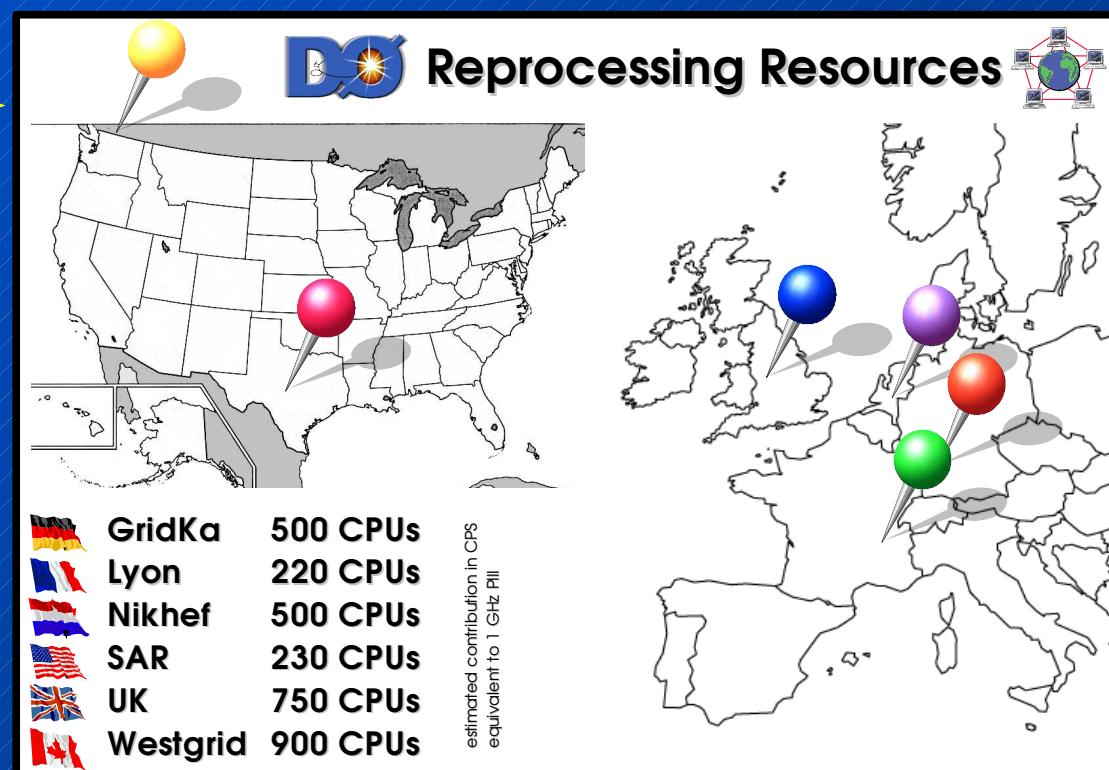
New reconstruction version p17:

- various qualitative improvements to tackle p14 limitations (CAL calibration ...)
 - detailed bookkeeping of changes in hall (database)
 - inter- ϕ calibration of the detector itself
(≠ from electronics calibration, cannot be seen with pulser calib.)
 - pedestal calibrations
 - non-linearity correction
 - gain calibration



P17 Reprocessing

- Level 3 trigger now in parts faster by 30%
- Reco timing task force
 - examine all aspects of the tracking: detector issues, algorithm, coding ...
 - Computing Division reacted quickly with 2 C++ experts
 - gained 20-30% from low level optimization (machine code) and investigations of algorithms ... more to come ...
 - also focus on memory consumption ...
- p17 being certified
(on physics and **remote processing**) →
- start ~20 pb-1 for tests and iterations
(bug fixes, further speedup)
- start reprocessing Jan.05
(≤ 4-6 months)
- Next: get ready for RunIIB integration and high lumi (200-300 E30) !



Plans

- Will use **SAMGrid** for p17 reprocessing
 - P14: 500 M events, 100 M done remotely
 - P17: 1000 M events = 250 TB – all remotely
 - from raw, need db access
 - Need people (remote sites)
- Important steps in our computing evolution
 - MC → Reprocessing → fixing → analysis ?
- Use of shared resources – **LCG**, **Grid3** ...
- Integration of tools: **runjob**, **dØtools**, **dØrte**, **SAMGrid**
- 2nd generation **SAM TV**
- Central farm to run with **SAMGrid**
- Analysis formats (TMB vs. ROOT trees)
 - Data format working group formed (TMB-tree based, common analysis format CAF)

DØ Physics Results

QCD Physics

Preliminary:

→ **Measurement of Inclusive and Dijet Cross Sections**

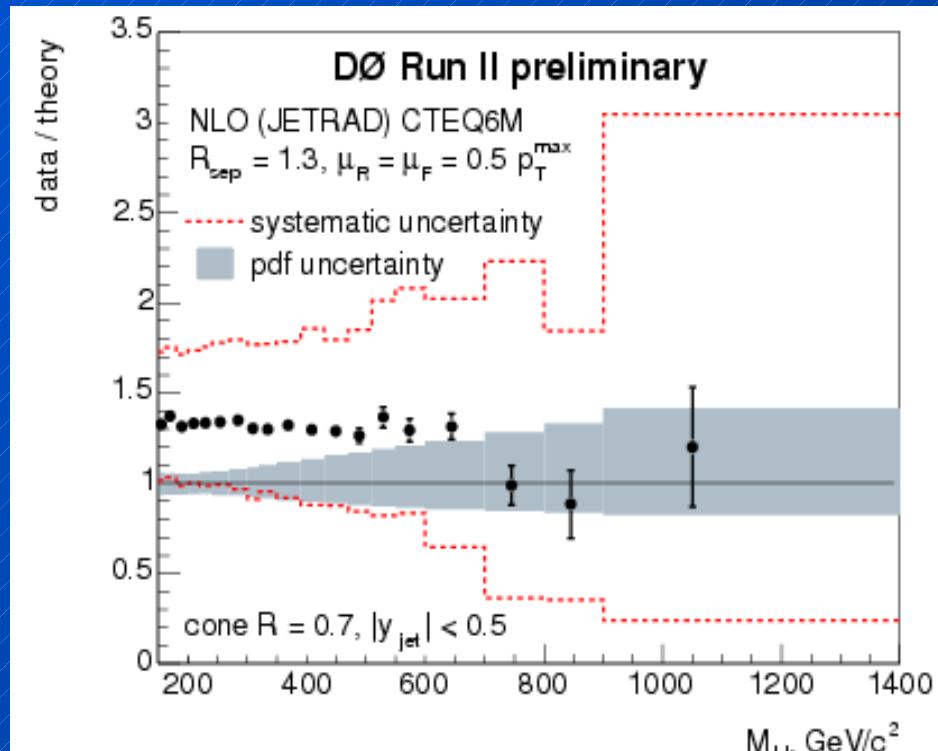
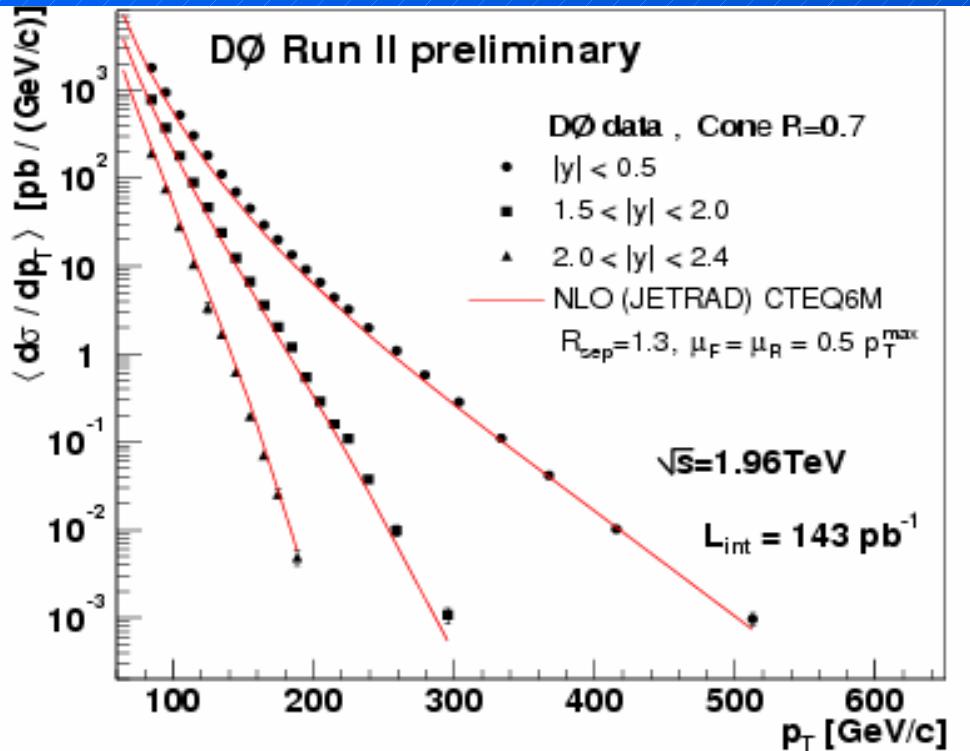
Submitted:

→ **Measurement of Dijet Azimuthal Decorrelations at Central Rapidities**

Fermilab-Pub-04-217-E, hep-ex/0409040

... more coming ...

Inclusive Jets and Dijet Cross Section

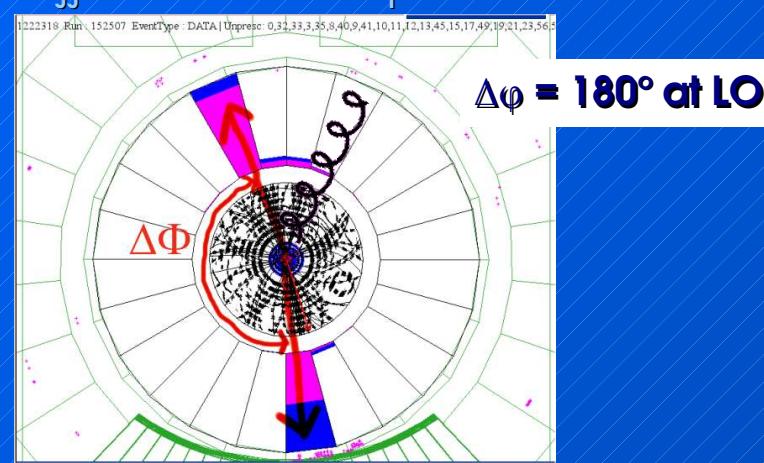


- First corrected Run II cross section for forward jets
- Important PDF information in cross section vs. rapidity
 - Good agreement between data and theory (NLO)
 - Large uncertainties due to jet energy scale
- Central region $|y_{\text{jet}}| < 0.5$, data sample $\sim 143 \text{ pb}^{-1}$
- Run II midpoint algorithm
- sensitive to hadronically decaying resonances

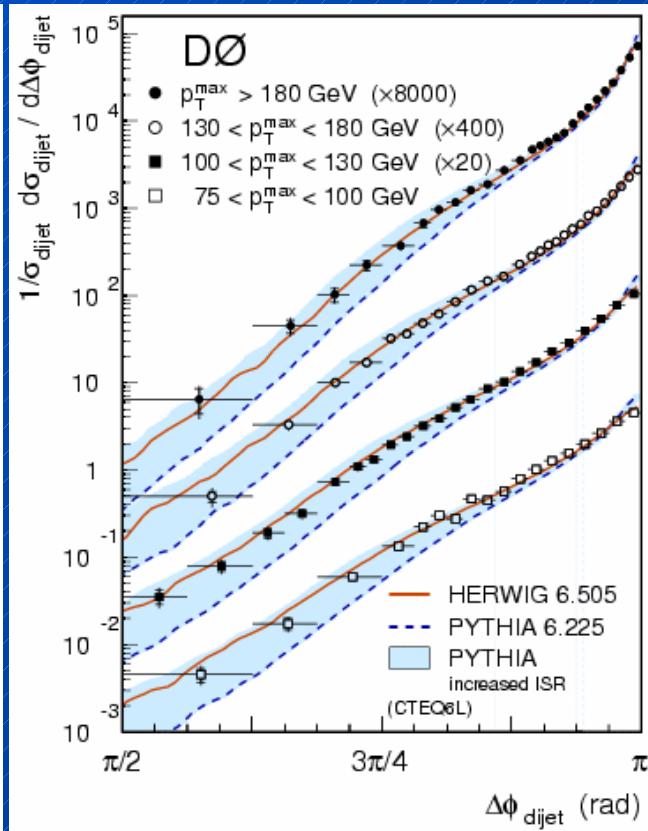
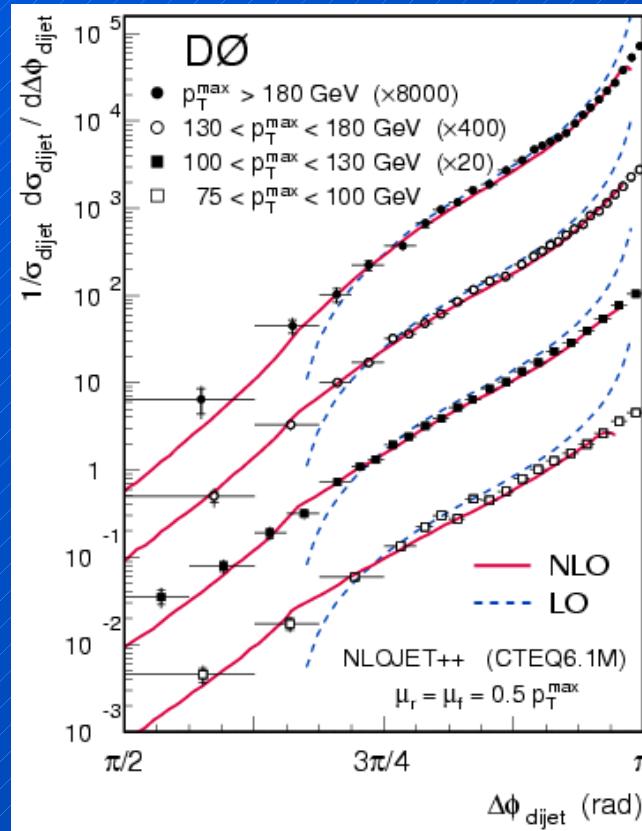
Φ Decorrelation

high mass event:

$M_{JJ} = 1364 \text{ GeV}$, $E_T = 633, 666 \text{ GeV}$



- test of multi-parton radiation
- pQCD & phenomenology
- sensitive to radiation/jets without measuring them ...
- 150 pb^{-1}



- observe increased decorrelation towards smaller p_T
- NLO pQCD describes data except for large $\Delta\phi$ (pQCD not predictive)

Top-Quark Physics

Preliminary:

- Search for single top production
- Measurement of the Top Quark Mass in l+jets Events
 - Measurement of $B(t \rightarrow Wb)/B(t \rightarrow Wq)$
 - W helicity of ttbar Decays in l+jets Events (topological)
 - W helicity of ttbar Decays in l+jets Events (b-tagged)
- Measurement of the ttbar Cross Section in l+jets Final States with Lifetime Tagging
- Measurement of the ttbar Cross Section in the l+jets Final State
- Measurement of the ttbar Cross Section in $e\mu$ Final State with Lifetime Tagging
- Measurement of the ttbar Cross Section in the Dilepton Final State
- Measurement of the ttbar Alljet Cross Section using Secondary Vertex Tagging

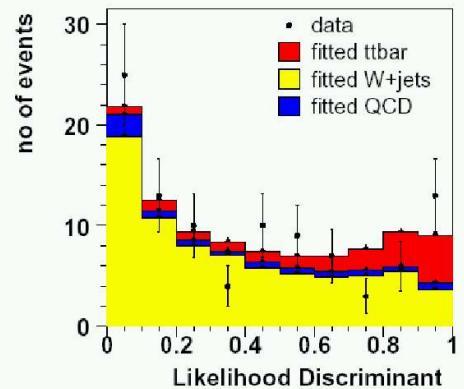
Submitted:

- Run I: New Measurement of the Top Quark Mass ...
hep-ex/0407005, submitted to PRL
- Run I: Helicity of the W Boson in Lepton+Jets ttbar Events
hep-ex/0404040, submitted to PRL

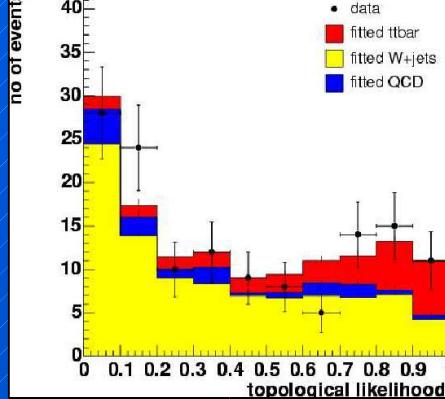
Top Quark Production

topological I+jets:

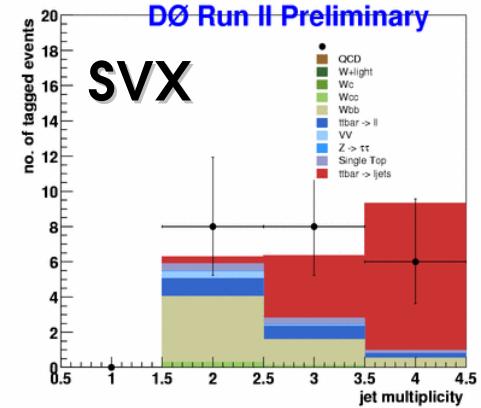
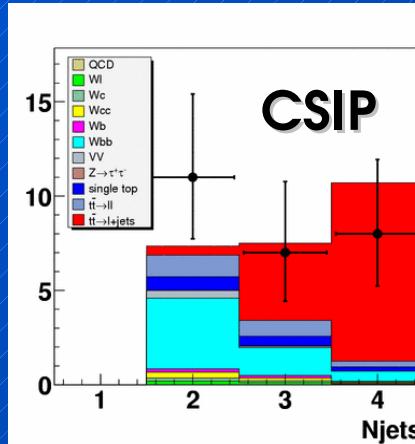
$\mu + \text{jets}$: 144 pb^{-1}



$e + \text{jets}$: 141 pb^{-1}

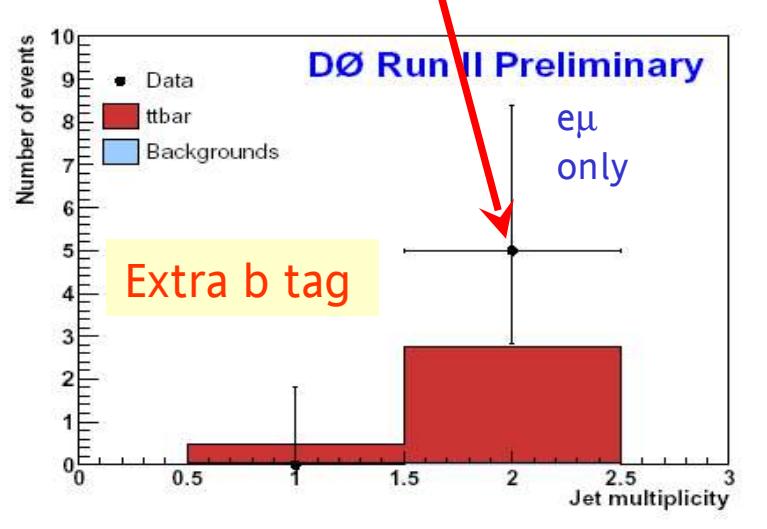


double b-tagged I+jets:

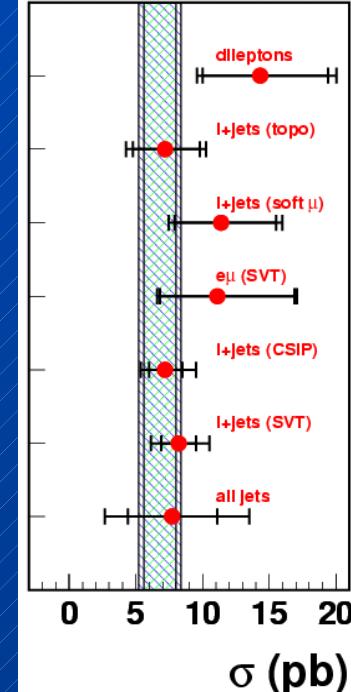


b-tagged $e\mu$:

Ultra-pure sample of top events



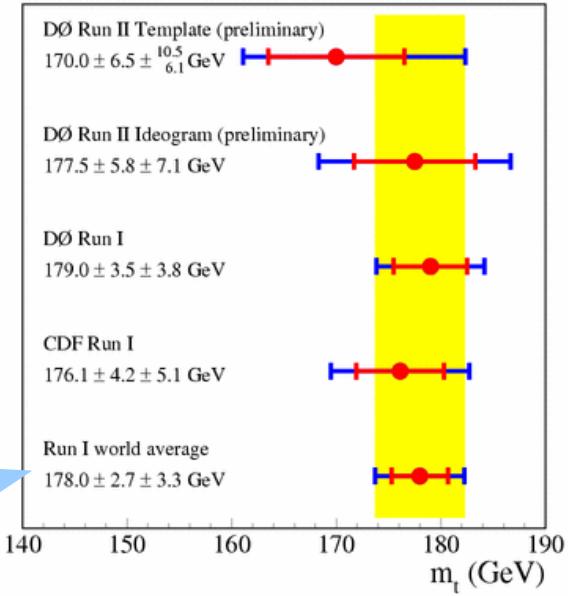
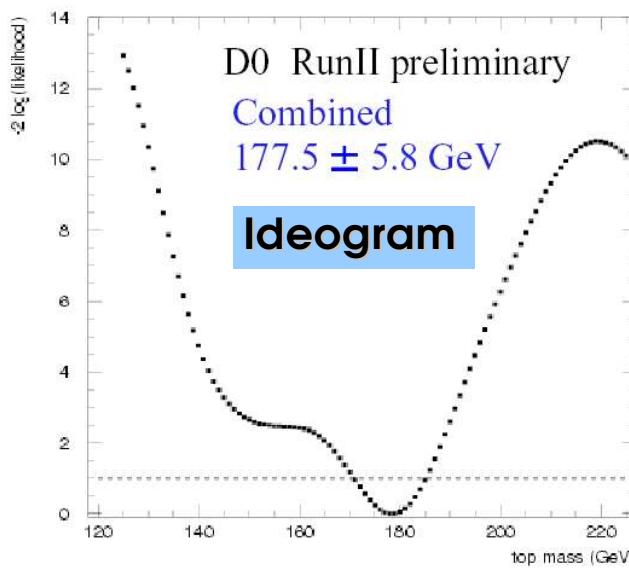
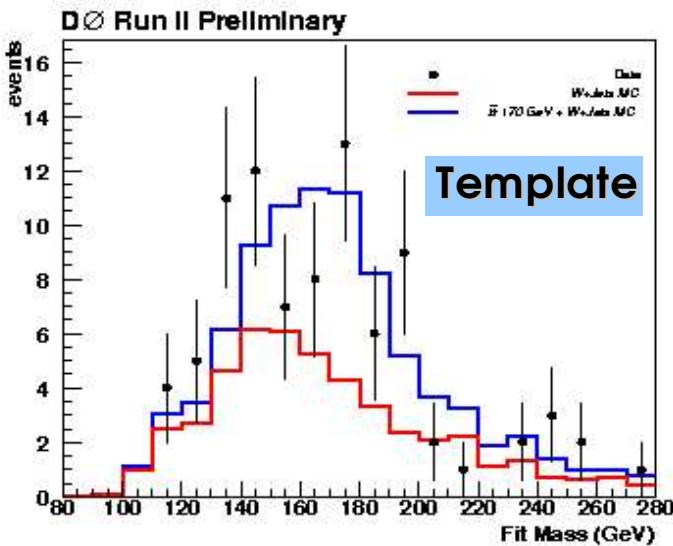
DØ Run II Preliminary



146 pb^{-1}	$14.3^{+5.1+2.6}_{-4.3-1.9} \text{ pb}$
143 pb^{-1}	$7.2^{+2.6+1.6}_{-2.4-1.7} \text{ pb}$
93 pb^{-1}	$11.4^{+4.1+2.0}_{-3.5-1.8} \text{ pb}$
158 pb^{-1}	$11.1^{+5.8+1.4}_{-4.3-1.4} \text{ pb}$
164 pb^{-1}	$7.2^{+1.3+1.9}_{-1.2-1.4} \text{ pb}$
164 pb^{-1}	$8.2^{+1.3+1.9}_{-1.3-1.6} \text{ pb}$
162 pb^{-1}	$7.7^{+3.4+4.7}_{-3.3-3.8} \text{ pb}$

Top Quark Mass in Run-II

- Measurements in 1+jets channel ($\sim 150 \text{ pb}^{-1}$)
- Template method uses templates for signal and background mass spectra
- Ideogram method uses analytical likelihood for event to be signal or background for each event



Template method $m_t = 170 \pm 6.5(\text{stat}) + 10.2/-5.7(\text{syst}) \text{ GeV}$

Ideogram method $m_t = 177.5 \pm 5.8(\text{stat}) \pm 7.1(\text{syst}) \text{ GeV}$

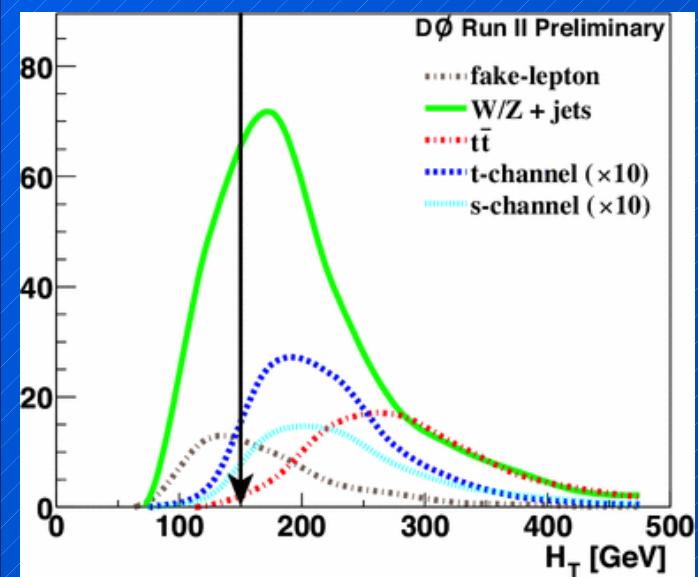
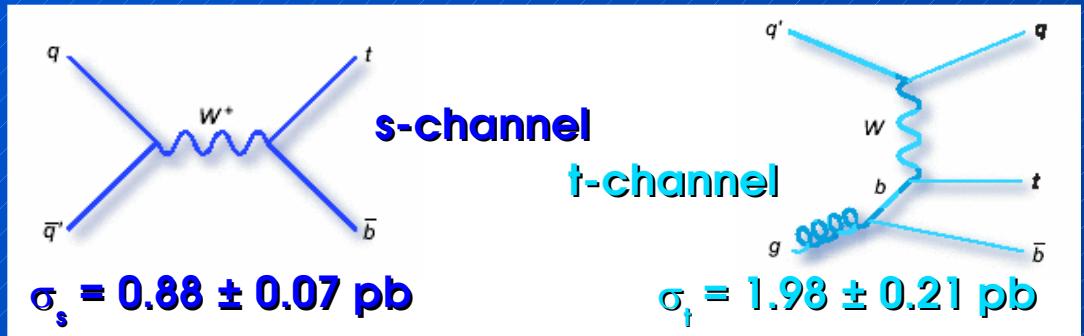
new world average due to DØ reanalysis (ME method)
Nature 429, 638-642 (10 June 2004), hep-ex/0406031

Single-Top Production

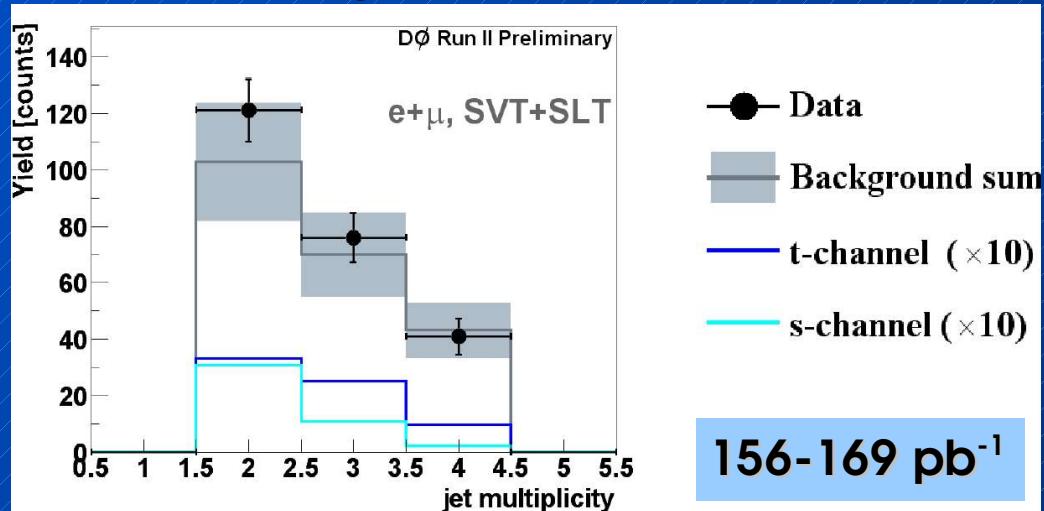
EW production of top quark
similar strength as strong production !!!

- direct probe of $|V_{tb}|$
- search for new physics
- topology similar to ttbar in 1+jets,

but lower jet multiplicity and more forward more background (W+jets, tt, dibosons, ...)



need ~ 1 fb^{-1}
for observation



95% CL limits	DØ
$\sigma(\text{s-channel})$	< 19 pb
$\sigma(\text{t-channel})$	< 25 pb
$\sigma(\text{s+t channels})$	< 23 pb

Higgs Searches

Preliminary:

- Search for $H \rightarrow WW$ Dilepton Decays
- Search for Technirho Production in the Mode $\pi_T \rightarrow W_0 T$
- A DØ Search for Neutral Higgs Bosons at High $\tan\beta$ in Multijet Events
- Search for non-SM Light Higgs Bosons in the $h \rightarrow \gamma\gamma$ Channel

Submitted:

- A measurement of the ratio of inclusive cross sections Zb/Zj
FERMILAB-PUB-04/297-E, hep-ex/0410078, submitted to PRL
- A search for Wbb and WH production in ppbar collisions at $\sqrt{s}=1.96$ TeV
FERMILAB-PUB-04/288-E, hep-ex/0410062, submitted to PRL

Published:

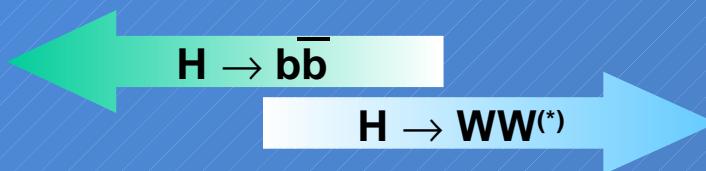
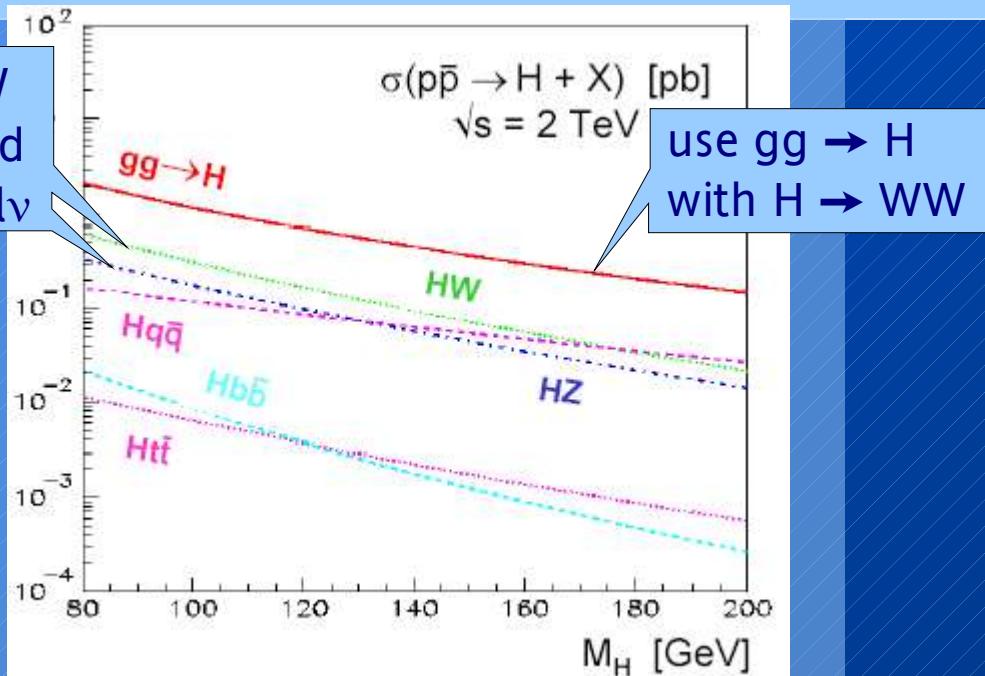
- Search for Doubly-charged Higgs Boson Pair Production
FERMILAB-PUB-04/045-E, hep-ex/0404015, Phys.Rev.Letters 93, 141801 (2004)

Standard Model Higgs Search

- Last missing particle in SM (EW symmetry breaking – mass)
- Light SM Higgs preferred
- Key to understand beyond-SM-physics (in MSSM $m_H < 135$ GeV)
- Search strategy a function of production and decay channel ...
- b-tagging a crucial tool

Example: Z($\rightarrow ee/\mu\mu$) b associated production

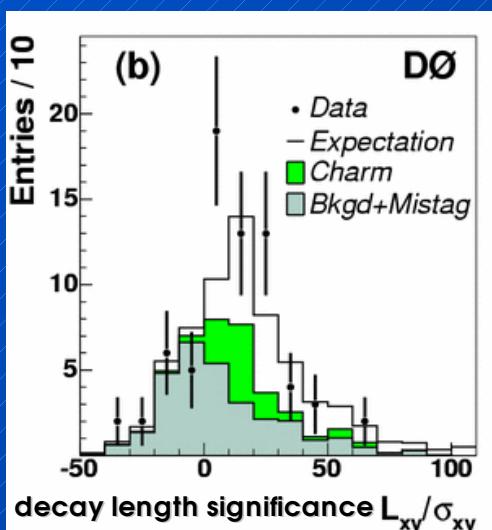
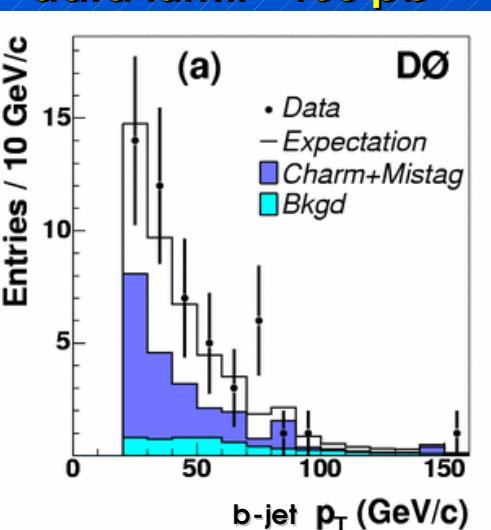
- background to ZH production
- probes PDF of b-quark
- data lumi: $\sim 180 \text{ pb}^{-1}$



Dominant decay modes

$$R = \frac{\sigma(p\bar{p} \rightarrow Zb)}{\sigma(p\bar{p} \rightarrow Zj)} = 0.023 \pm 0.004 (\text{stat.})^{+0.002}_{-0.003} (\text{syst.})$$

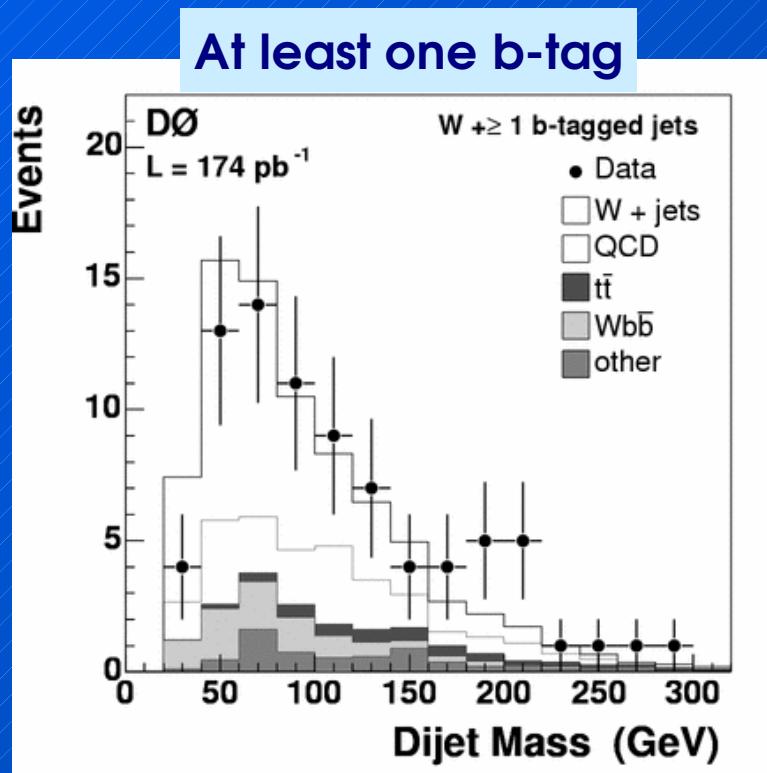
NLO Theory: $R \sim 0.018 \pm 0.004$ hep-ph/0312024
J. Campbell et al.



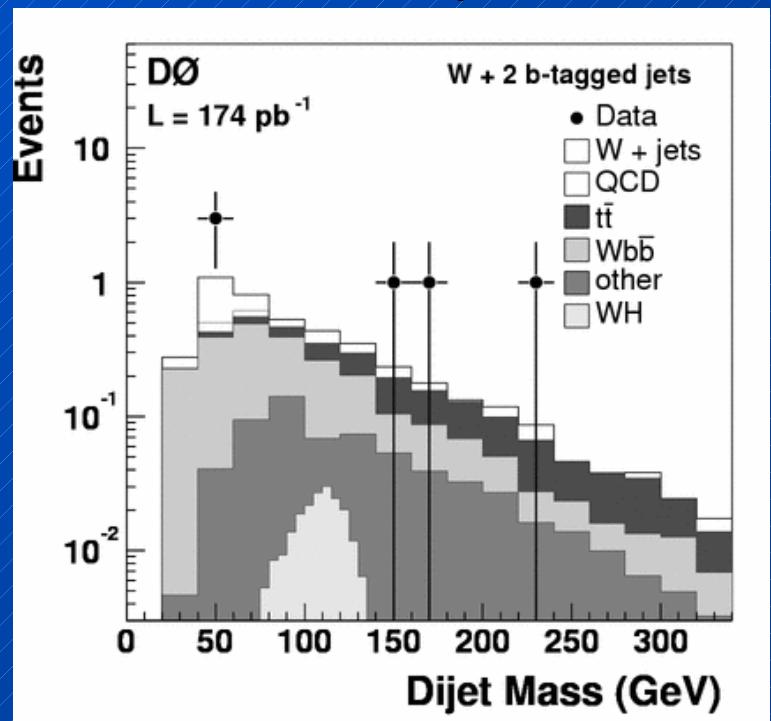
Search in the $W H \rightarrow e\nu b\bar{b}$ Channel

Event selection:

- central isolated $p_T(e) > 20 \text{ GeV}$
- MET $> 25 \text{ GeV}$
- $\geq 2 \text{ jets } E_T > 20 \text{ GeV}, |\eta| < 2.5$
- require jets to be b-tagged



- require exactly 2 b-tagged jets to suppress top bgd
- observe 6 events, expect 4.4 ± 1.2



limits (@ 95% CL) on the production of

- $\sigma(WH) B(H \rightarrow bb) < 9.0 \text{ pb}$ for $m_H = 115 \text{ GeV}$

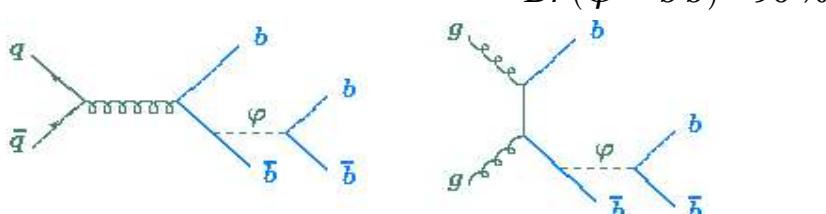
JES and MC simulation dominant syst.errors
... ($W \rightarrow \mu\nu$) -channel coming soon ...

Search for MSSM Higgs

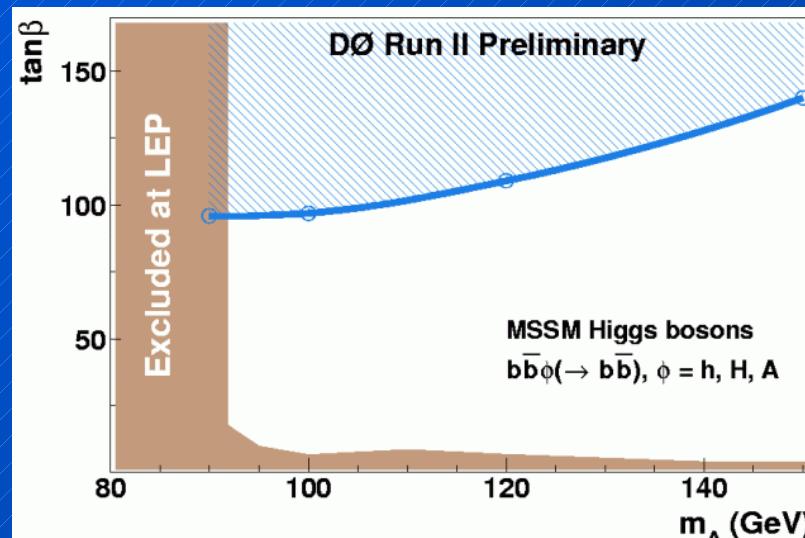
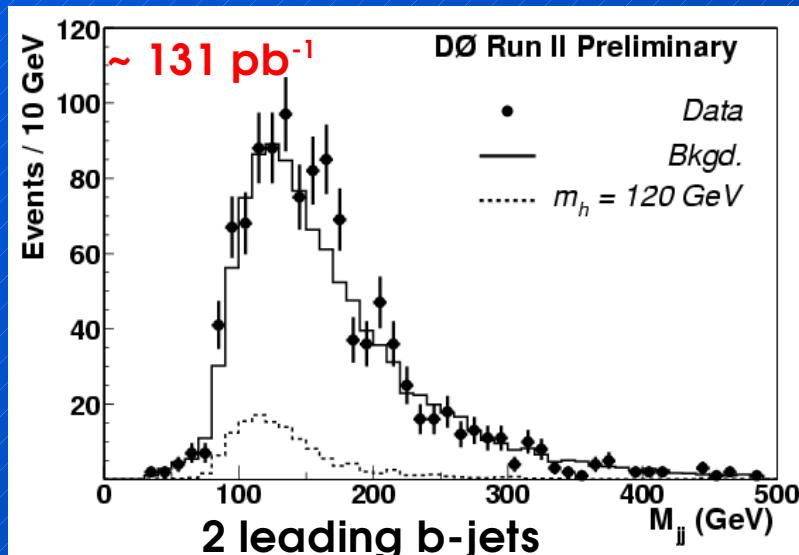
Two Higgs Doublets $\mathcal{H}_1, \mathcal{H}_2$ and 5 physical states

2 CP-even neutral Higgses h^0, H^0 $m_h < m_H$
 1 CP-odd neutral Higgs A^0
 2 charged Higgses H^\pm
 Free parameters:
 $\tan \beta = v_2/v_1$ (VEV ratio)
 α (mixing angle of h, H)
 μ Higgs mass parameter
 A_0 common trilinear
 Higgs-sfermion coupling

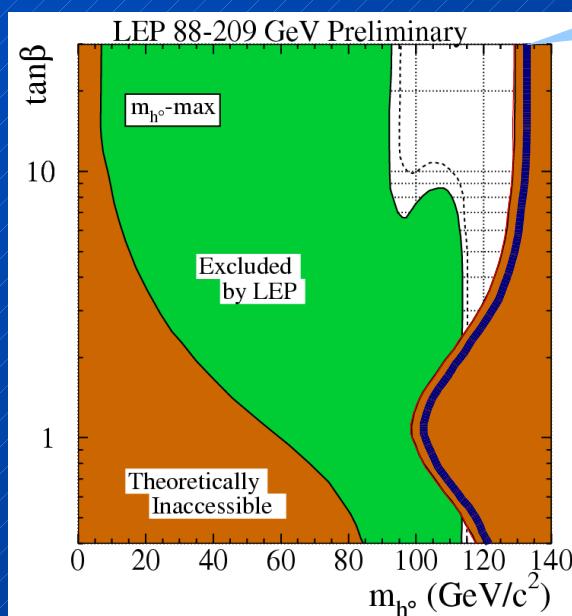
tree level:
 rad.corrected:
 $m_h < m_Z < m_H$
 $m_h < 130 \text{ GeV}$



- multi-jet sample (≥ 3 b-tagged jets)
- E_T cuts on jets optimized for Higgs masses



- significant improvements expected from reprocessing
- ... $bb\tau\tau$ coming next year ...



$$\Delta m_h^2 \sim \frac{m_t^4}{m_W^2} \times \left(\log \frac{m_{\tilde{t}_1}^2 m_{\tilde{t}_2}^2}{m_t^4} + \dots \right)$$

re-interpretation of LEP data
 due to new m_{top}

Electroweak Physics

Preliminary:

- Direct Measurements of the W Boson Width
- Measurement of $W \rightarrow e\nu$ and $Z \rightarrow ee$ Cross Sections
- Measurement of $Z \rightarrow \mu\mu$ Cross Section
- Measurement of $Z \rightarrow \tau\tau$ Cross Section
- Measurement of WW Cross Section
- Search for Inclusive WZ Production
- Measurement of $Z(\gamma) \rightarrow ll\gamma + X$ Cross Section
- Measurement of $W \rightarrow l\nu\gamma$ Cross Section

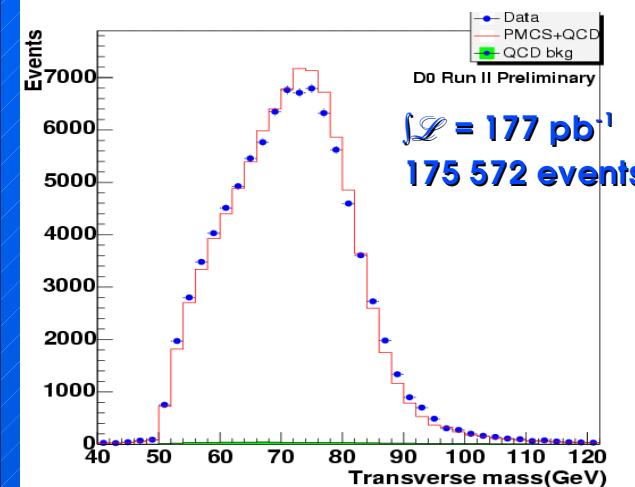
Submitted:

- Measurement of the WW production cross section

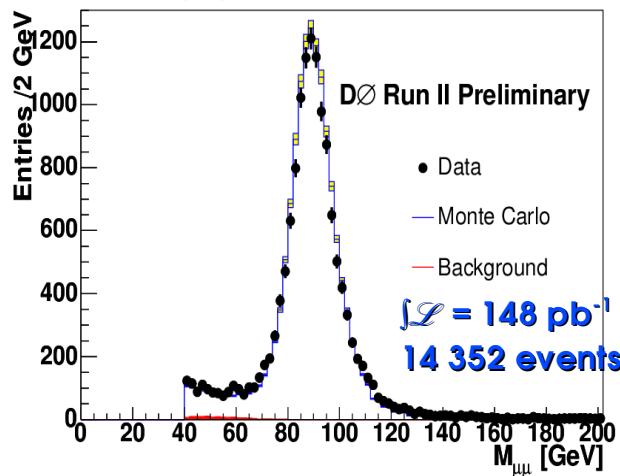
hep-ex/0410066, FERMILAB-PUB-04/293-E submitted to PRL

W/Z Production

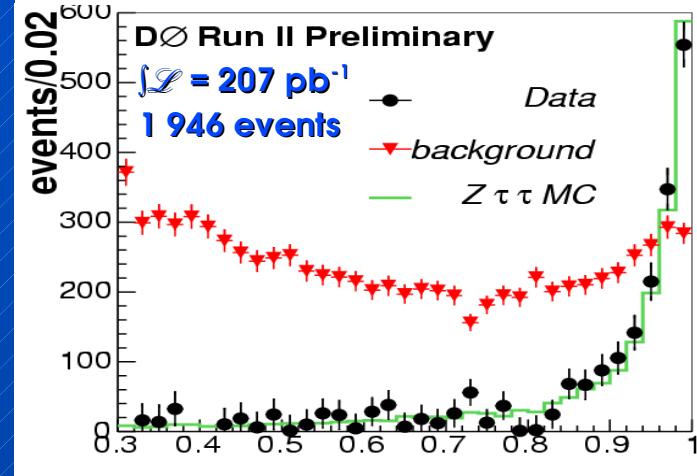
$W \rightarrow e\nu$



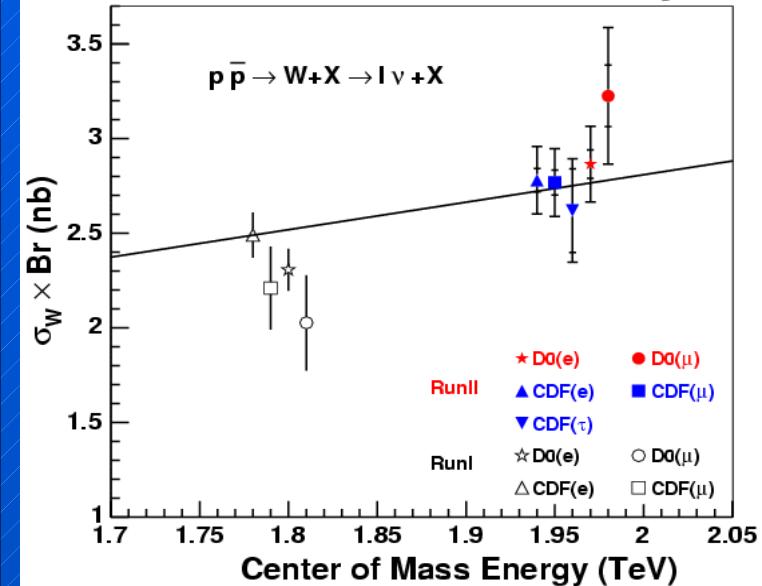
$Z \rightarrow \mu\mu$



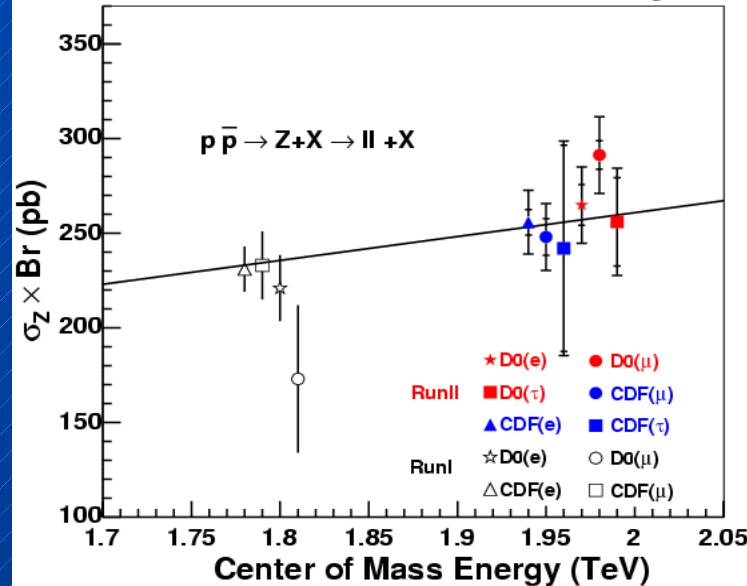
$Z \rightarrow \tau\tau$ ($\mu\nu\nu/\pi\nu$, $\rho\nu$, 3-prong)



CDF and D0 RunII Preliminary

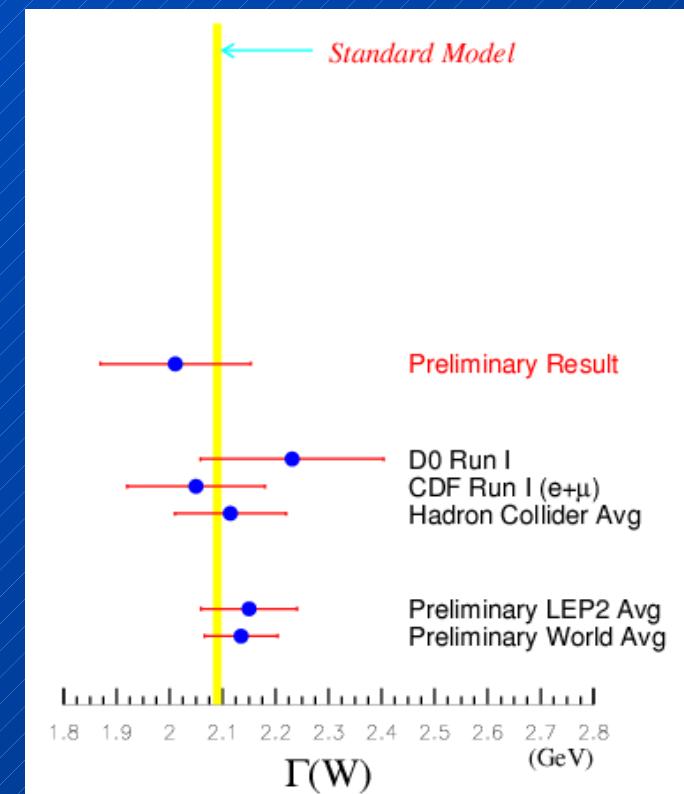
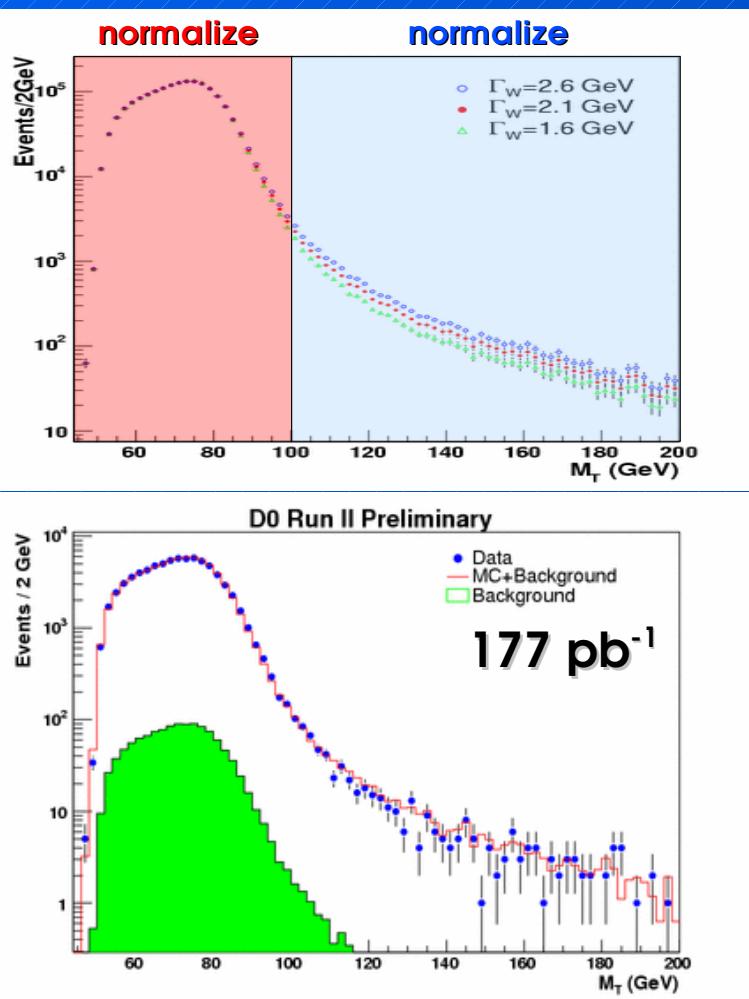


CDF and D0 RunII Preliminary



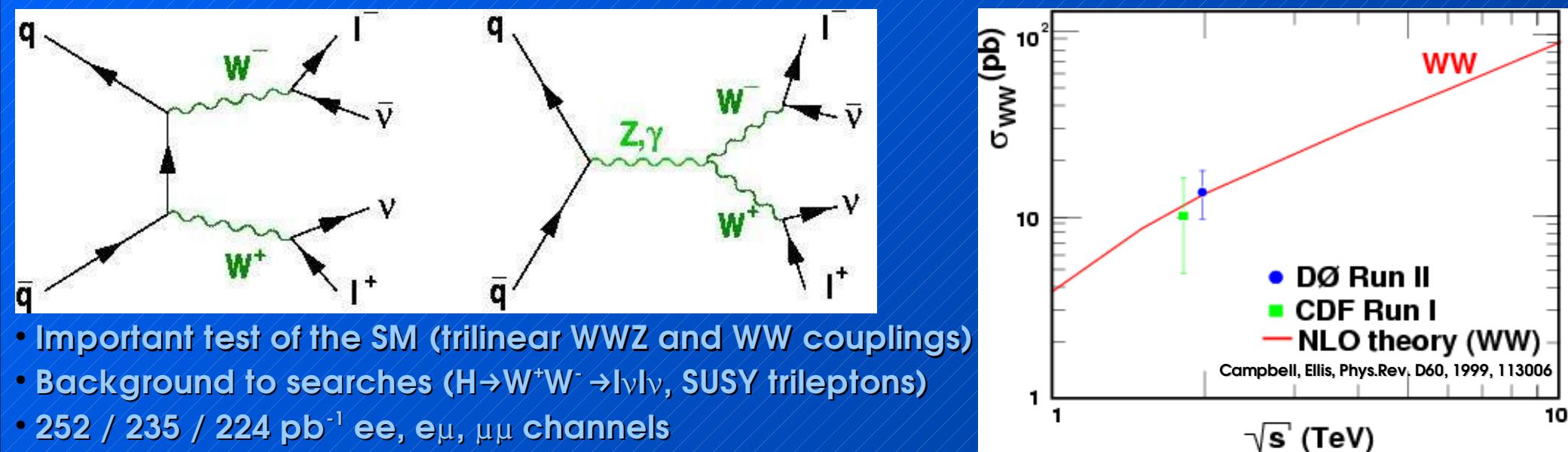
W-Boson Width (Direct)

- Γ_W precisely predicted in SM (masses and couplings)
- normalize m_T templates to 72285 $W \rightarrow e\nu$ candidates ($50 < M_T < 100$ GeV)
- fit predicted shape to 625 candidates in tail region ($100 < M_T < 200$ GeV)

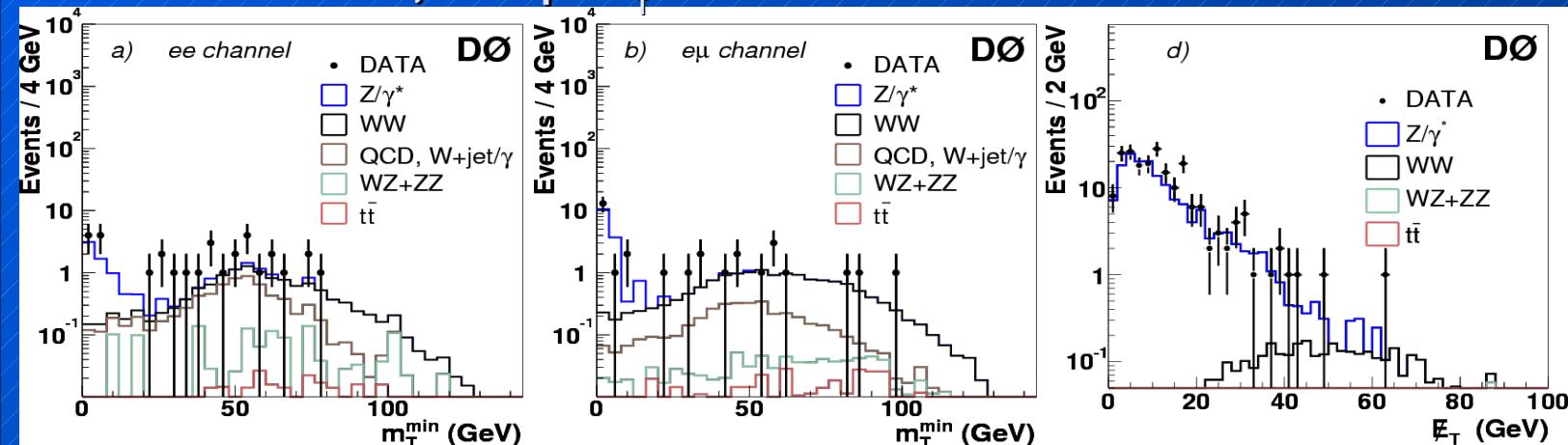


result: $\Gamma_W = 2.011 \pm 0.093 \text{ (stat)} \pm 0.107 \text{ (syst)} \text{ GeV}$
consistent with SM and indirect measurement
 syst. error dominated by EM & HAD resolution and underlying event

WW Production



after final selection, except m_T cut :



background prob.
 $CL_B = 2.3 \times 10^{-7} (5.2 \sigma)$

⇒ WW production observed !

$$\sigma(WW) = 13.8^{+4.3}_{-3.8} (stat)^{+1.2}_{-0.9} (sys) \pm 0.9 (limi) pb$$

New Phenomena Searches

Preliminary:

- Search for LED in the Dimuon Channel
- Search for LEP in the Dielectron and Diphoton Channels
- Search for LED in Jets+MET Topology
- Search for Randall-Sundrum Gravitons in the Dielectron and Diphoton Final States
- Search for Large and TeV-1 ED in the Dielectron Channel
 - Search for Chargino/Neutralino in the ee Final State
 - Search for Chargino/Neutralino in the $\mu\mu l$ Final State
 - Search for Chargino/Neutralino in the $e\mu l$ Final State
 - Search for Chargino/Neutralino in the Like-sign Muon Channel
 - Search for Chargino/Neutralino in the Trilepton (combined) Final State
- Search for R-parity Violating Resonant Slepton Production
- Search for Supersymmetry with R-parity Violation in the ee Final State
- Search for Supersymmetry with R-parity Violation in the $\mu\mu l$ Final State
- Search for Quark-electron Compositeness in ee Production
- Search for Technicolor Particles in the Dielectron Channel
- Search for Heavy Z' Bosons in the Dimuon Channel
- Search for Heavy Z' Bosons in the Dielectron Channel
- Search for Scalar Leptoquarks in the Acoplanar Jet Topology
- Search for First Generation Leptoquarks
- Search for Technirho Production in the Mode $\pi_T \rightarrow W\rho_T$
- Search for Anomalous Heavy-Flavor Production in Association with W Bosons
- Search for Squarks and Luinos in the Jets+MET Topology

Submitted:

- Search for Supersymmetry with Gauge-Mediated Breaking in Diphoton Events at DØ

FERMILAB-PUB-04/198-E, hep-ex/0408146, submitted to PRL



UNIVERSITY OF
ROCHESTER

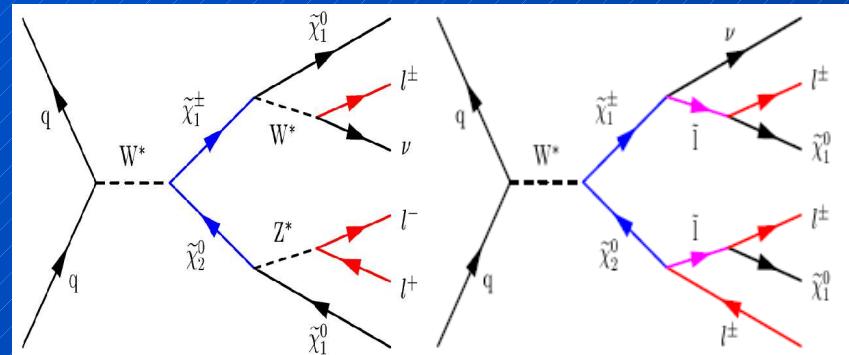
Page 31

SUSY - Trilepton Final States

Associate production of Chargino and Neutralino

$$p\bar{p} \rightarrow \tilde{\chi}_1^\pm \tilde{\chi}_2^0 \rightarrow 3\ell\nu \tilde{\chi}_1^0 \tilde{\chi}_1^0$$

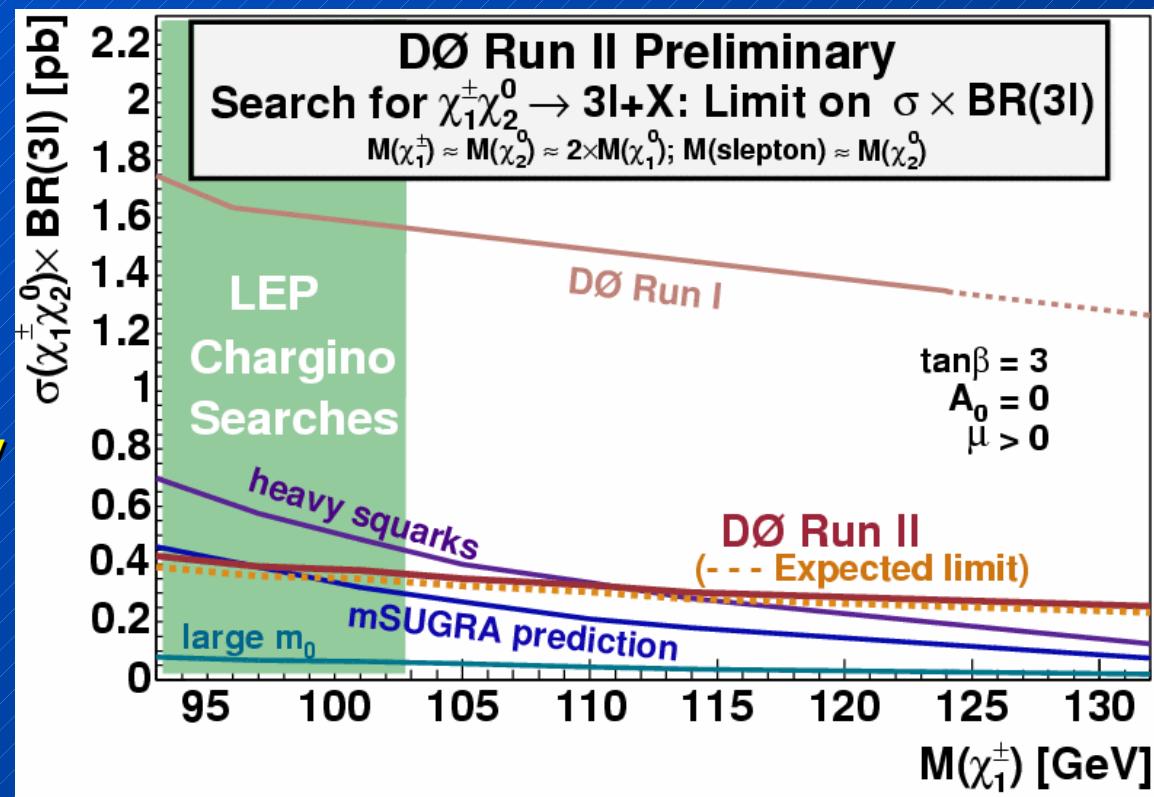
$$\text{Signature} = 3\ell + \cancel{E}_T$$



Searches in leptonic channels with

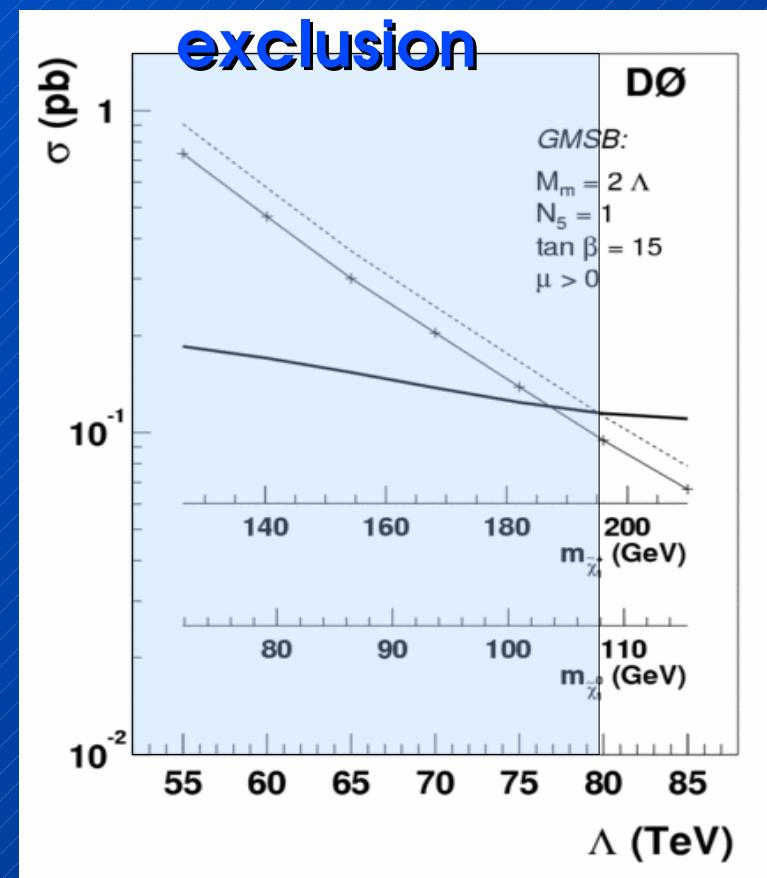
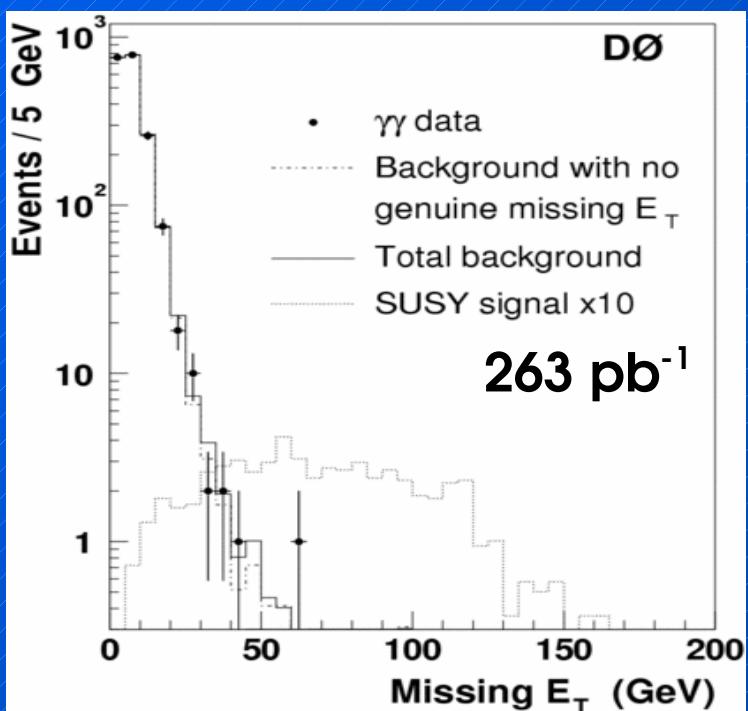
- e + e + l (track)
- e + mu + l (track)
- mu + mu + l (track)
- like sign mu + mu
- 147 – 249 pb⁻¹

- vast improvement over Run-I limits
- in mSUGRA exclude $m(\chi_1^\pm) < 97 \text{ GeV}$
- with 25% more data expect to reach LEP exclusion
- in models without sfermion mass universality: $m(\chi_1^\pm) > 111 \text{ GeV}$



Diphotons Events in GMSB

- Gauge-mediated SUSY – SUSY breaking at scale Λ , mediated by messengers
- Gravitino is LSP, NLSP is a neutralino or a slepton
- Assume here NLSP is neutralino:
Search for two photons with large missing E_T

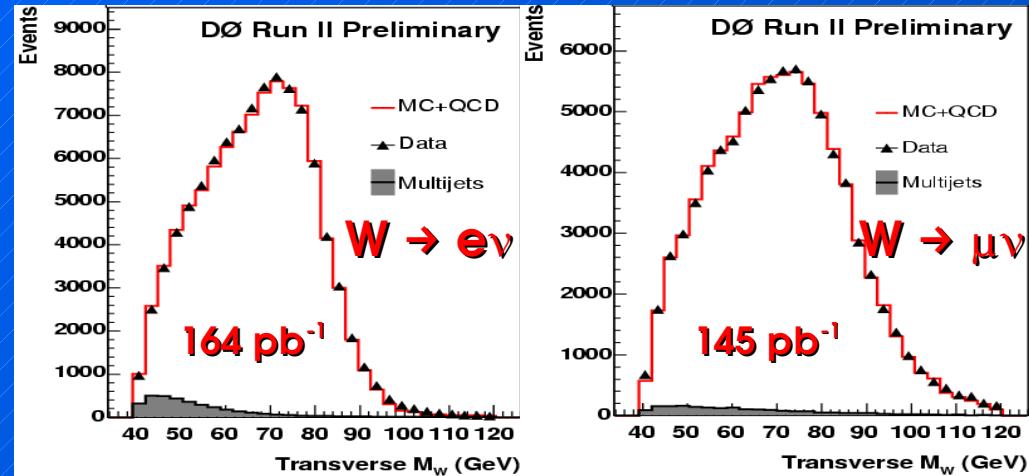


... most stringent limits for models
where neutralino is NLSP ...

$m(\tilde{\chi}_1^0) > 108$ GeV @ 95% CL
 $m(\tilde{\chi}_1^\pm) > 195$ GeV @ 95% CL

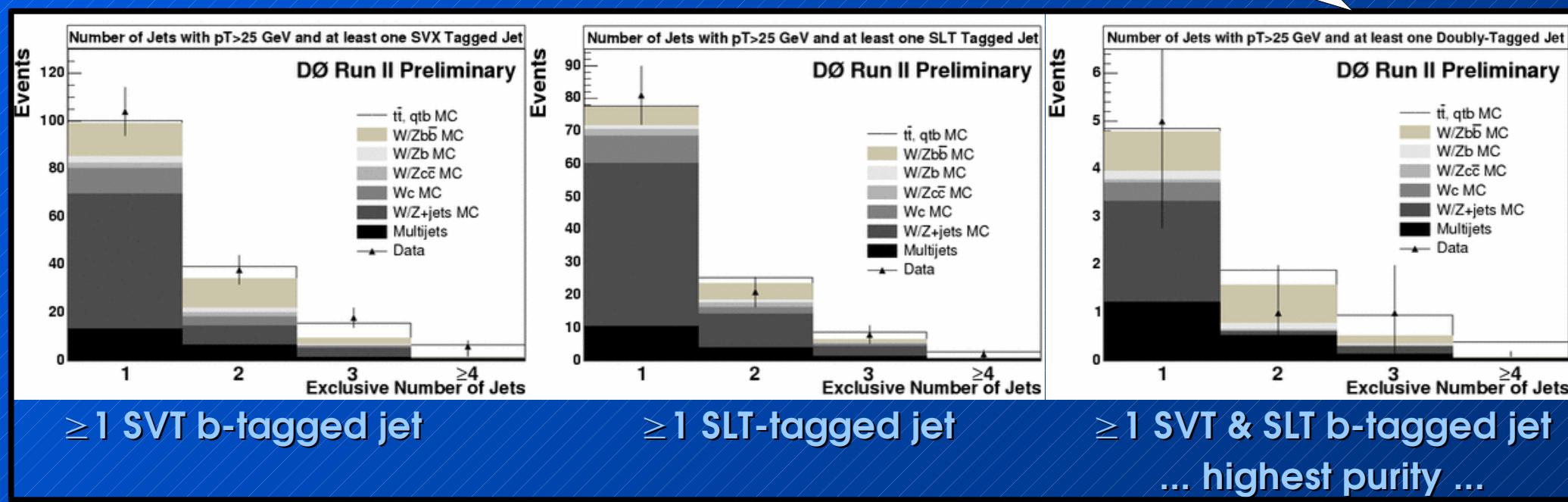
Anomalous Wbb Production

Heavy flavor content of W+jets events sensitive test of Standard Model



no significant departure from predicted rate

source	W+1jets	W+2jets	W+3jets	W+≥4jets
Data obs.	5	1	1	0
SM predict.	4.8 ± 1.1	1.9 ± 0.4	0.9 ± 0.2	0.3 ± 0.05
95% CL limit (evts)	6.78	3.88	4.17	3



b-Quark Physics

Preliminary:

- Reconstruction of Λ_b in Semi-Leptonic Decays
- Reconstruction of $B_s \rightarrow \mu D_s X$ Decays
- Reconstruction of B-Hadron Signals at DØ
- Observation of B_c Mesons and a Study of its Properties
- Observation of Semileptonic B decays to Narrow D^{**} Mesons
- Study of excited B-mesons (B^{**})
- Flavor Oscillations in B_d Mesons with 3-combined Taggers
- Flavor Oscillations in B_d Mesons with SS Tagging
- Flavor Oscillations in B_d Mesons with OS Muon Tagging
- Measurement of Upsilon (1S) Production Cross Section

Submitted:

- Measurement of the Λ_b lifetime in the decay $\Lambda_b \rightarrow J/\psi \Lambda^0$

FERMILAB-PUB-04/286-E, hep-ex/0410054, submitted to PRL

first submitted/published
 Λ_b exclusive lifetime

- Measurement of the ratio of B^+ and B^0 meson lifetimes

FERMILAB-PUB-04/284-E, hep-ex/0410052, submitted to PRL

- A Search for the flavor-changing neutral current decay $B_s \rightarrow \mu\mu$

FERMILAB-PUB-04/215-E, hep-ex/0410039, submitted to PRL

- Measurement of the B_s lifetime in the exclusive decay channel $B_s \rightarrow J/\psi \phi$

FERMILAB-PUB-04/225-E, hep-ex/0409043, submitted to PRL

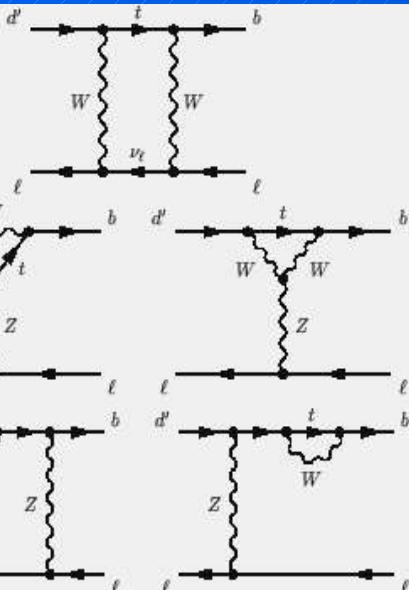
most precise submitted/published
single measurement of the B_s lifetime

Published:

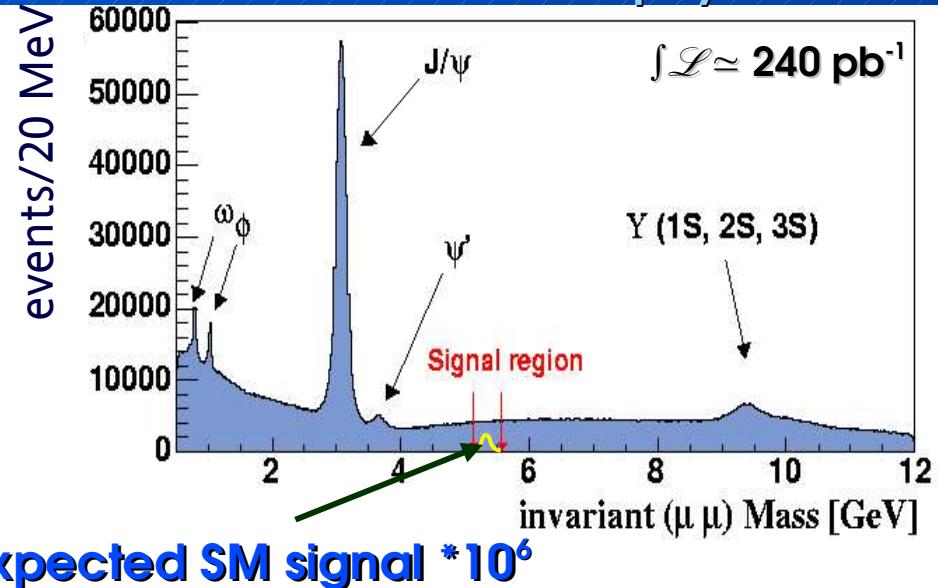
- Observation and Properties of the X(3872) Decaying to $J/\psi \pi^+ \pi^-$

FERMILAB-PUB-04/061-E, hep-ex/045004, Phys.Rev.Letters 93, 162002 (2004)

$B_s \rightarrow \mu^+ \mu^-$

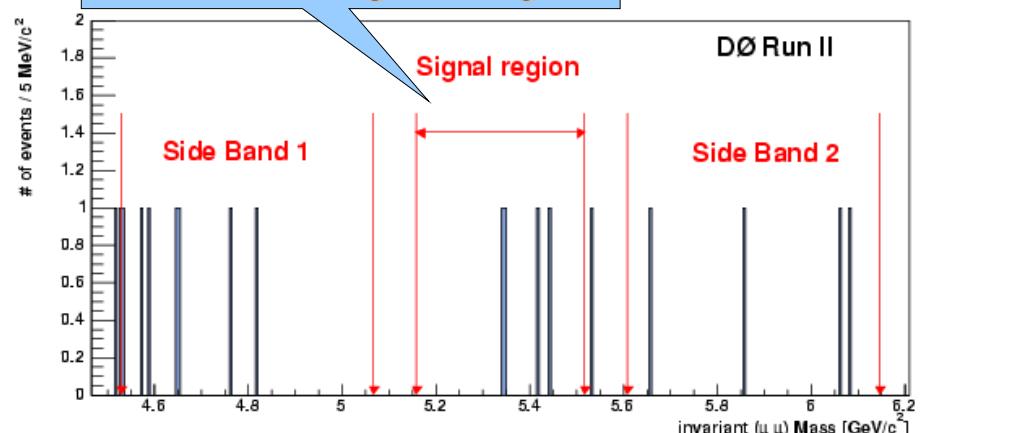


- Standard Model prediction: $BR(B_s \rightarrow \mu^+ \mu^-) = (3.4 \pm 0.5) * 10^{-9}$
- Excellent place to look for SUSY and other new physics



- Background prediction (from sidebands) = 3.7 ± 1.1 events

4 events in signal region



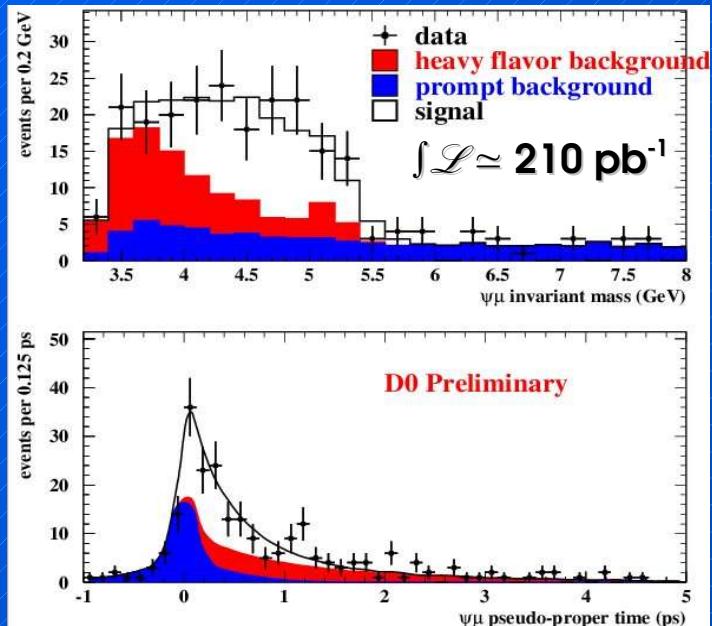
$$BR(B_s \rightarrow \mu^+ \mu^-) < 5.0 * 10^{-7} @ 95\% CL$$

... new best limit ...
... will keep improving with time ...

B_c Observation & B** Studies

B_c last ground state to be clearly observed

Here: B_c → (J/ψ → μμ) μ + X

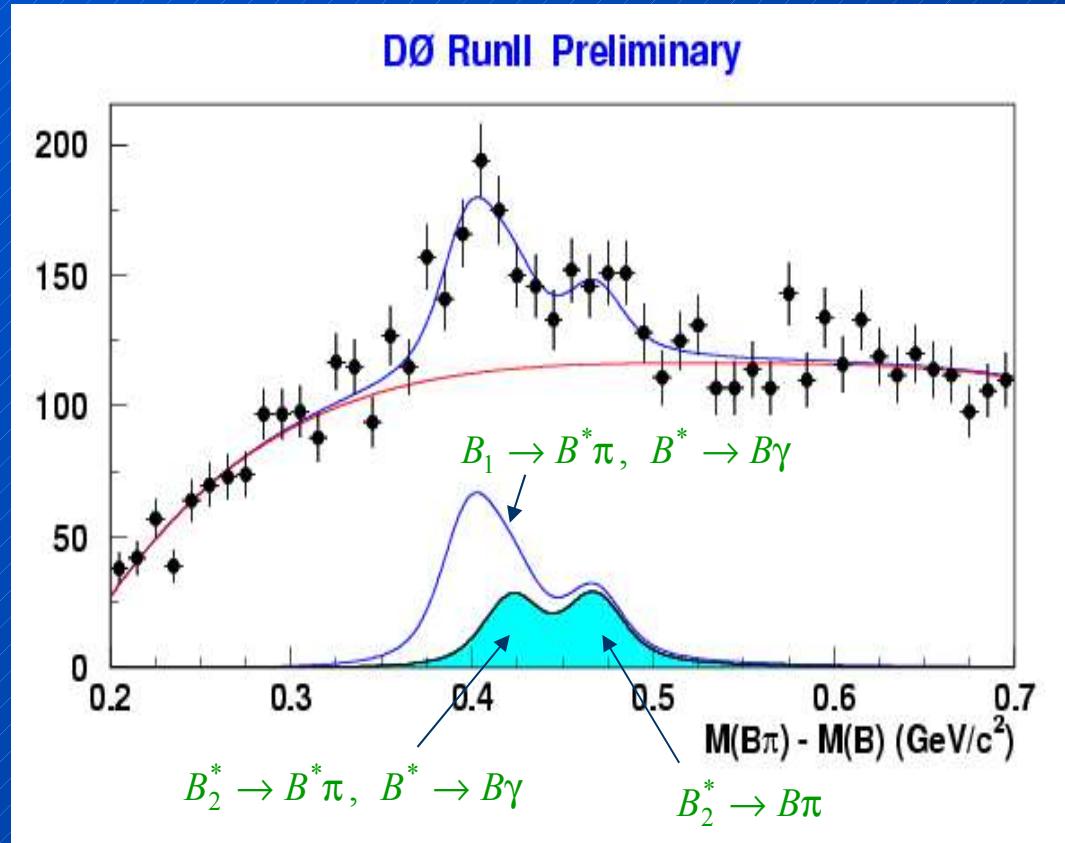


combined lifetime and mass fit:

- N(B_c) = 95 ± 12 ± 11
- m(B_c) = 5.95 ± 0.14 ± 0.34 GeV/c²
- τ(B_c) = 0.45 ± 0.12 ± 0.12 ps

models expect: m(B_c) ~ 6.5 GeV/c²,
τ(B_c) ~ 0.3-0.5 ps

So far only B⁺, B_d⁰, B_s⁰ (J^P=0⁻) and B* (J^P=1) established separately



First observation of separated narrow states !

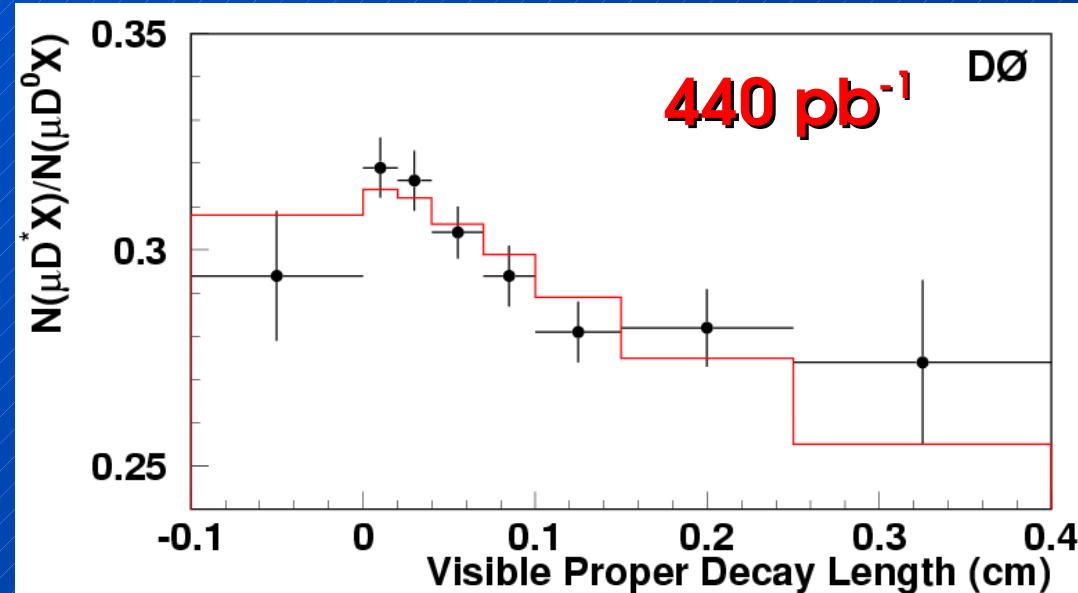
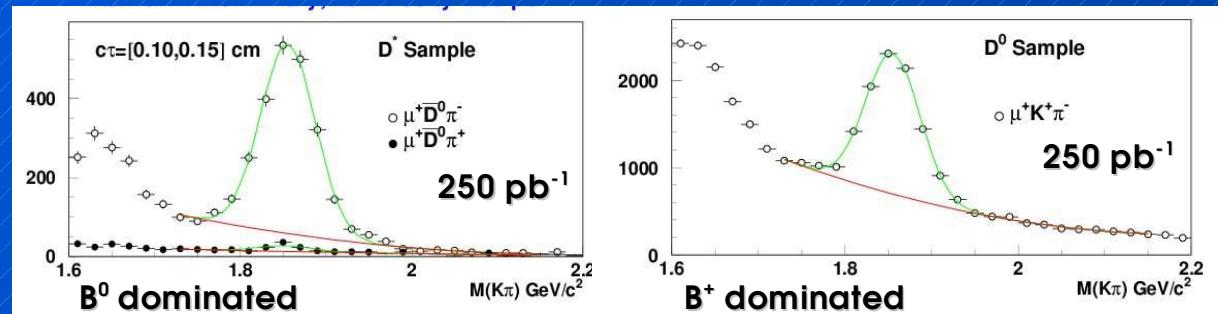
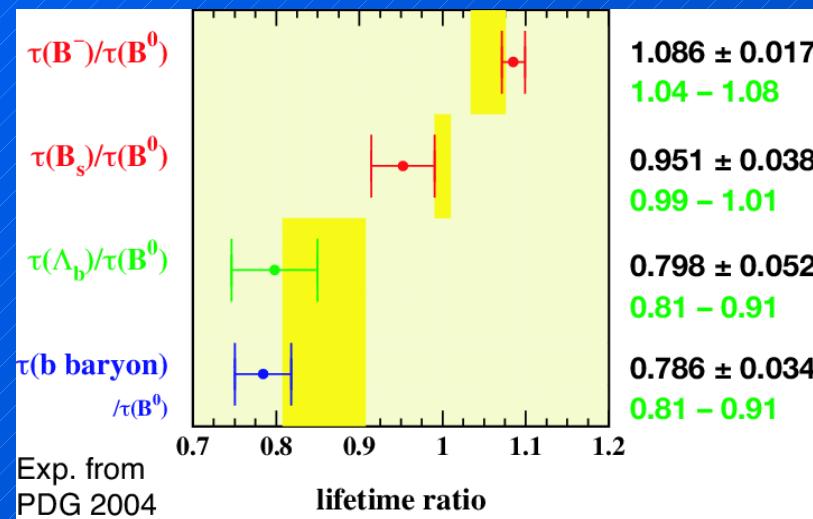
$$m(B_1) = 5724 \pm 4(\text{stat}) \pm 7(\text{syst}) \text{ MeV/c}^2$$

$$m(B_2^*) - m(B_1) = 23.6 \pm 7.7(\text{stat}) \pm 3.9(\text{syst}) \text{ MeV/c}^2$$

$\tau(B^+)/\tau(B^0)$

Good test of theory:

- Operator production expansion (OPE)
- Heavy quark effective theory (HQET)
- lattice gauge predictions



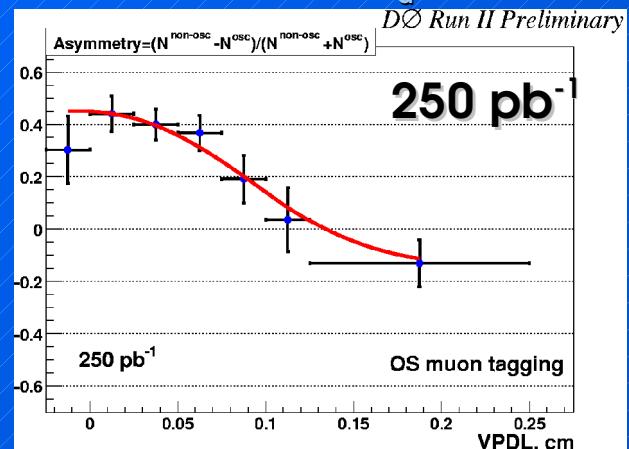
$$\tau(B^+)/\tau(B^0) = 1.080 \pm 0.016(\text{stat}) \pm 0.014(\text{syst})$$

$$1.086 \pm 0.017 \text{ world average}$$

... worlds most precise
submitted/published measurements ...

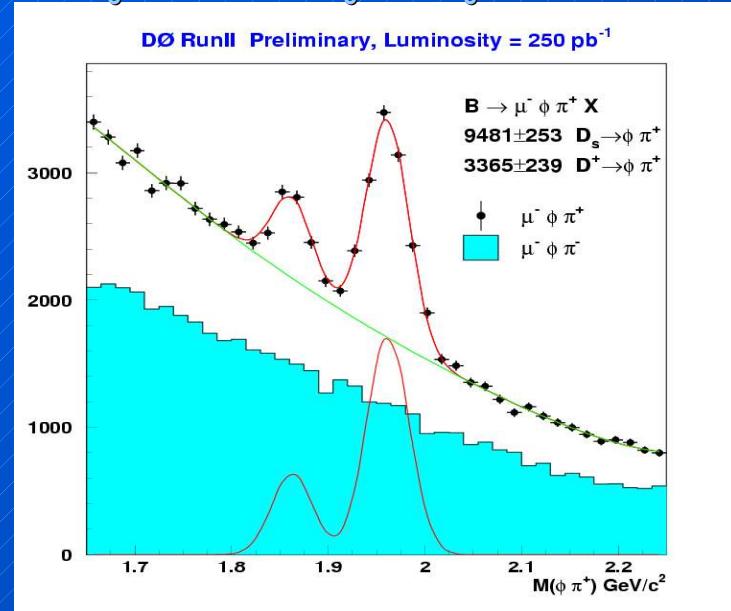
B_s Status and Plans

1.) Demonstrate B_d mixing



$$\Delta m_d = 0.506 \pm 0.055 \pm 0.049 \text{ ps}^{-1}$$

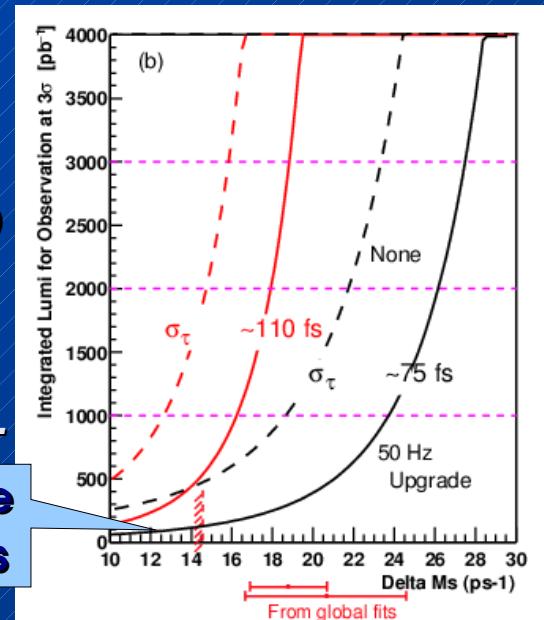
2.) B_s sample: B_s → (D_s → φπ⁺) μν



3.) upgrade L3 trigger bandwidth and Si layer 0

- following the PACs earlier encouragement, DØ has been actively investigating offsite facilities for primary reconstruction that would permit us to significantly increase the number of b-physics trigger that we record (and greatly enhance our B_s mixing reach)
- two DØ universities (Indiana and Oklahoma) have now pledged very significant funds on a one-to-one matching basis
- we are working on a specific proposal to DOE (perhaps NSF) for the support of such a facility at the universities
⇒ Collaboration review in Dec.

MC studies: DØ proper lifetime resolution with layer 0: 63-87 fs



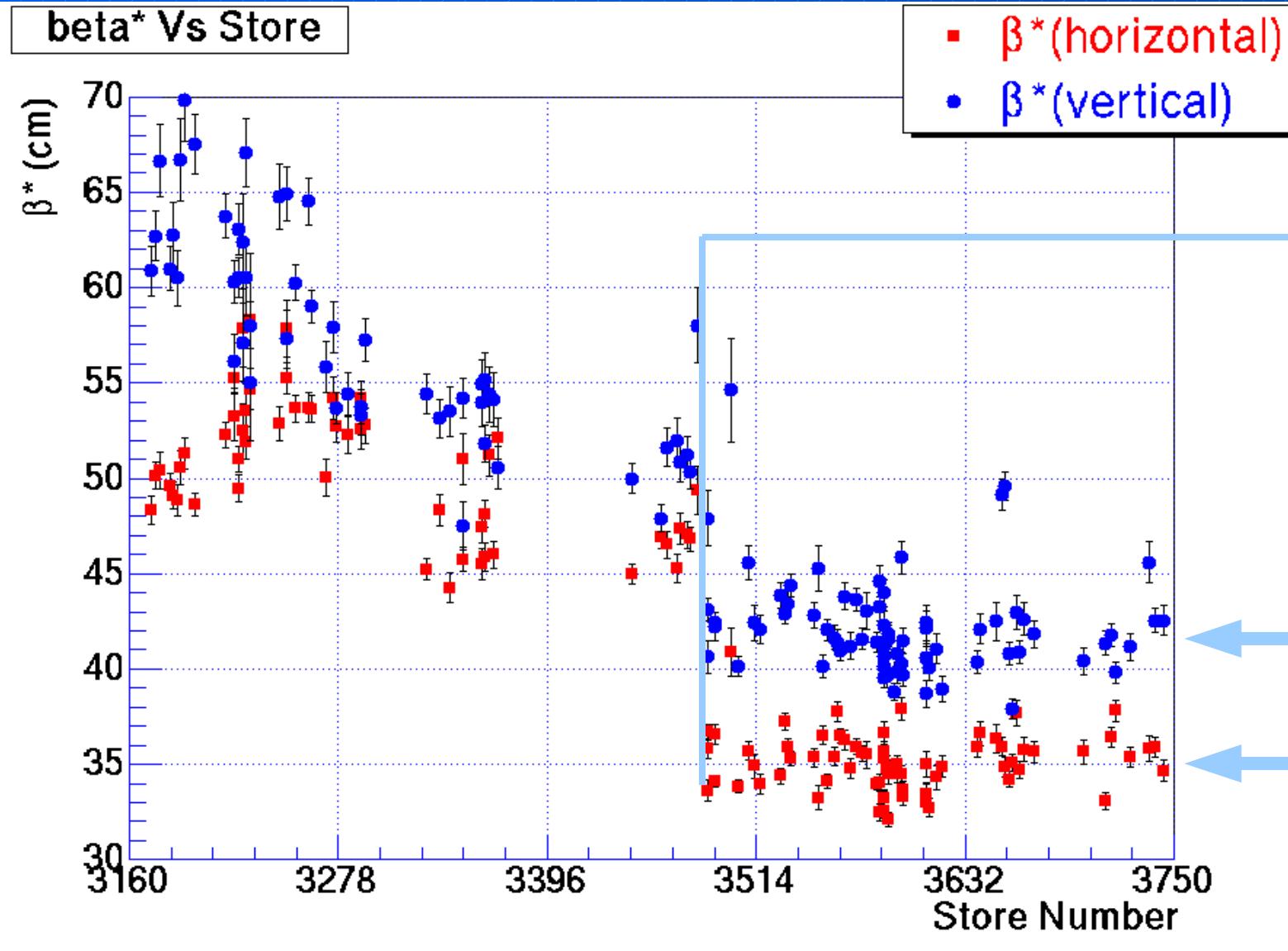
Summary and Conclusion

- DØ is doing well, awaiting end of shutdown
- preparations for high lumi phase ongoing
trigger and layer 0 upgrade ... B-physics program ...
- wealth of physics results
2 papers published, 9 (+2) papers submitted
DØ competitive in many areas
... more to come ...

Backup Slides

Luminosity & Luminous Region

from transverse beam profile vs. z-vertex (DØ Si tracker) extract β^* :



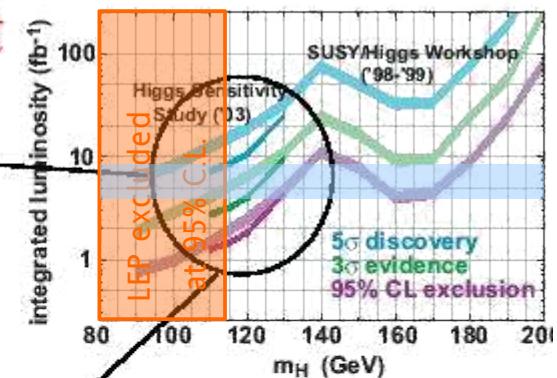
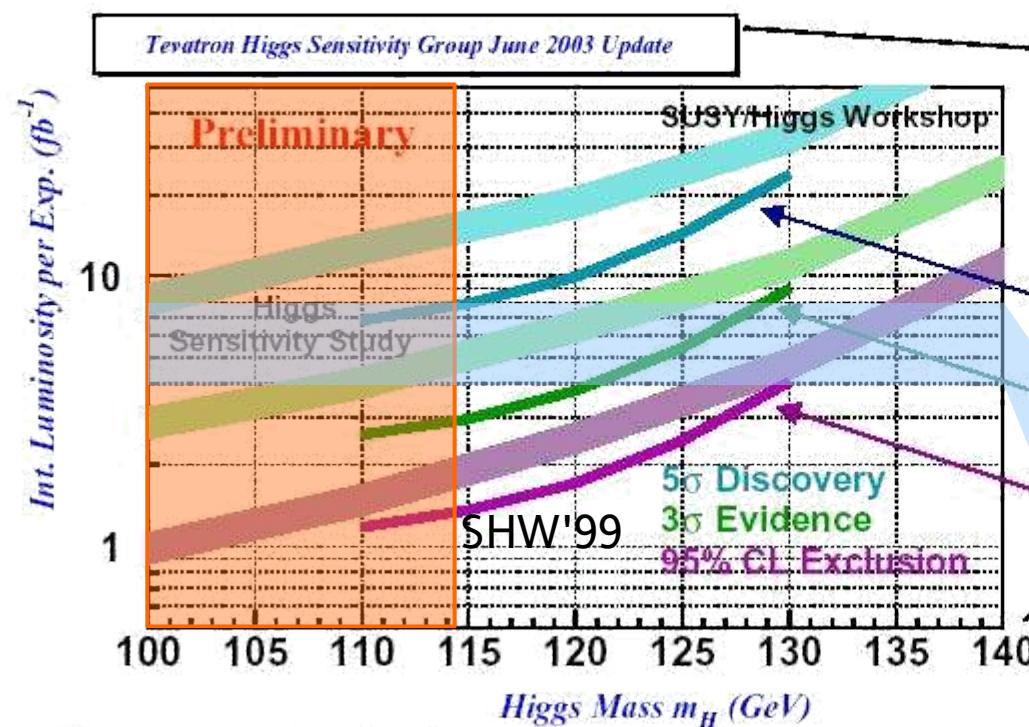
improved beam
optics ...
Thanks a lot !!!

to be understood

as expected

Prospects on Sensitivity to SM Higgs

Combined DØ/CDF Result



5 σ discovery
3 σ evidence
95% CL exclusion

luminosity projection (fb^{-1})

year	baseline	design
2003	0.28	0.3
2004	0.59	0.68
2005	0.98	1.36
2006	1.48	2.24
2007	2.11	3.78
2008	3.25	6.15
2009	4.41	8.57

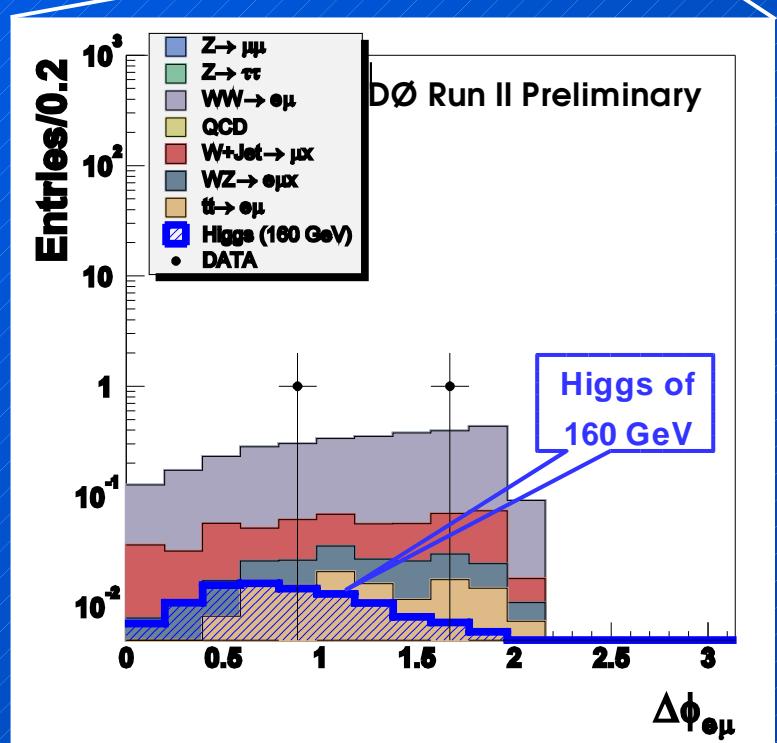
- combined ll , vv , lv channels
- no systematics included yet
- no $H \rightarrow WW^*$ channel; impacts $m_H > 125$ GeV
- assumes upgraded detector
- reaching interesting sensitivity with 2 fb^{-1}

Search in the $H \rightarrow WW^* \rightarrow llvv$ Channel

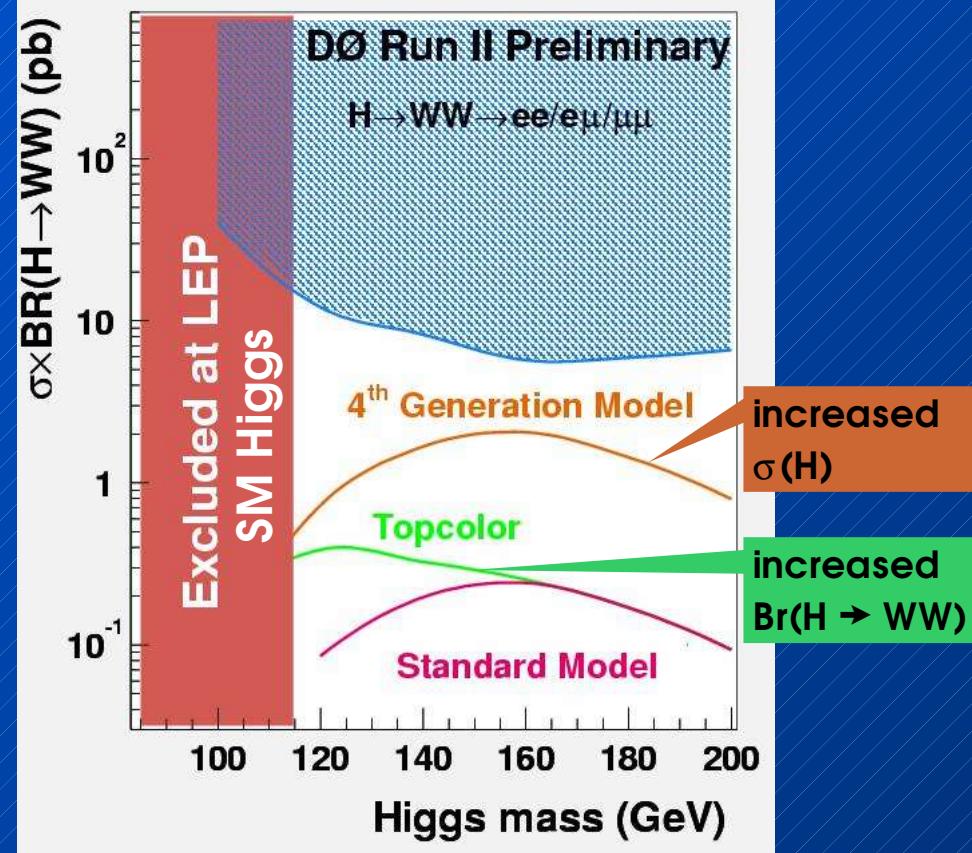
- data set: ~ 180 (ee), 160 (e μ) and 150 ($\mu\mu$) pb^{-1}
- cannot reconstruct Higgs mass due to 2 ν
- exploit $\Delta\phi(l)$ spin correlations to suppress the bkgd.

after full selection

	ee	e μ	$\mu\mu$
Observed	2	2	5
Expected	2.7 ± 0.4	3.1 ± 0.3	5.3 ± 0.6



Excluded cross section times
Branching Ratio at 95% C.L.



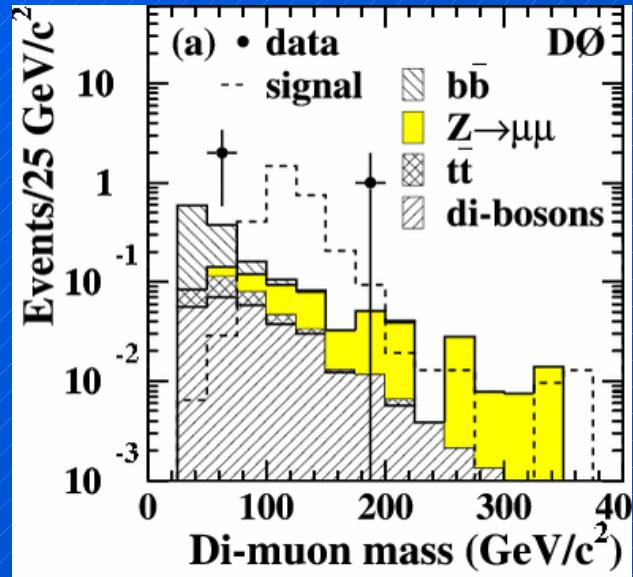
... first Higgs sensitivity at high masses !
... extended models in reach soon ...

Search for Doubly Charged Higgs Bosons

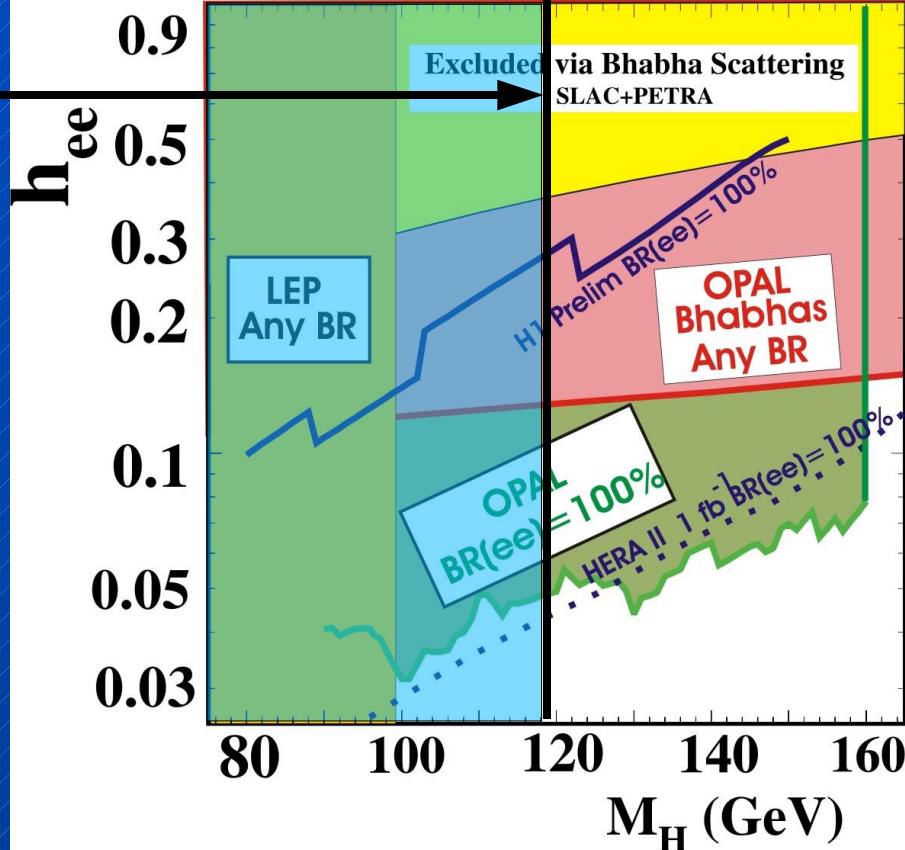
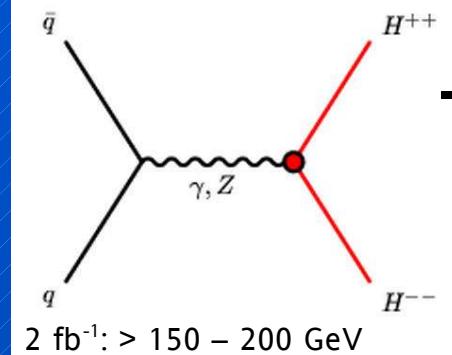
H^{++}/H^{--} predicted in models that contain Higgs triplets

- Left-Right (LR) symmetric models
- SUSY LR models: low mass ($\sim 100 \text{ GeV} - 1 \text{ TeV}$)

- search: $H^{++/-} \rightarrow \mu^\pm \mu^\pm$ (same sign di-muons in 113 pb^{-1})



pair production at TEVATRON



$$M(H_L^{\pm\pm}) > 118.4 \text{ GeV}$$

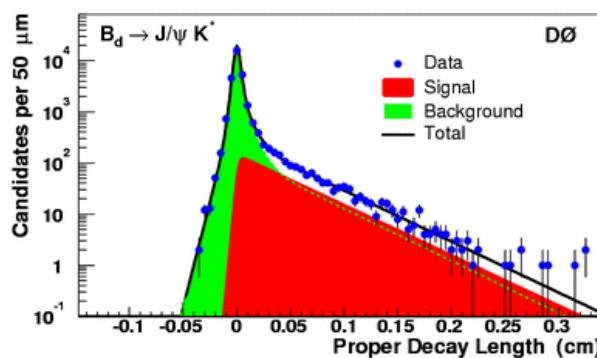
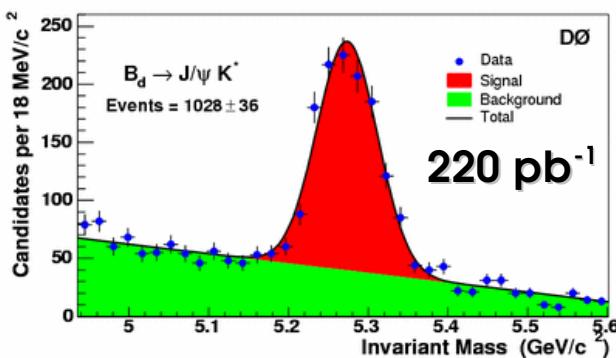
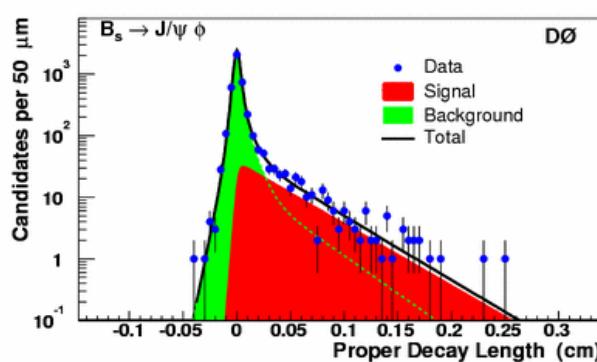
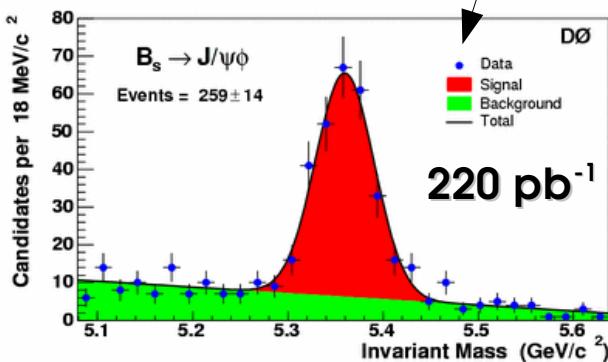
$$M(H_R^{\pm\pm}) > 98.2 \text{ GeV}$$

B_s lifetime

In b-sector lifetime differences (B_d , B_s , ...) expected to be small

Lifetime difference of B_s and \bar{B}_s postulated

B_s semileptonic and $B_s \rightarrow J/\psi \phi$ have different composition of B_s and \bar{B}_s



from simultaneous fit to mass and proper decay lengths:

$$\tau(B_s^0) = 1.444^{+0.098}_{-0.090} \text{ (stat)} \pm 0.020 \text{ (syst)} \text{ ps}$$

$$\tau(B^0) = 1.473^{+0.052}_{-0.050} \text{ (stat)} \pm 0.023 \text{ (syst)} \text{ ps}$$

$$\tau(B_s^0) / \tau(B^0) = 0.980^{+0.075}_{-0.070} \text{ (stat)} \pm 0.003 \text{ (syst)} \text{ ps}$$

... most precise submitted/published single measurement of the B_s^0 lifetime ...