The DØ Collaboration and the Run IIb Upgrade: Goals and Commitment

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Institutions:

33 US, 40 non-US

Collaborators:

334 from US

312 from non-US institutions

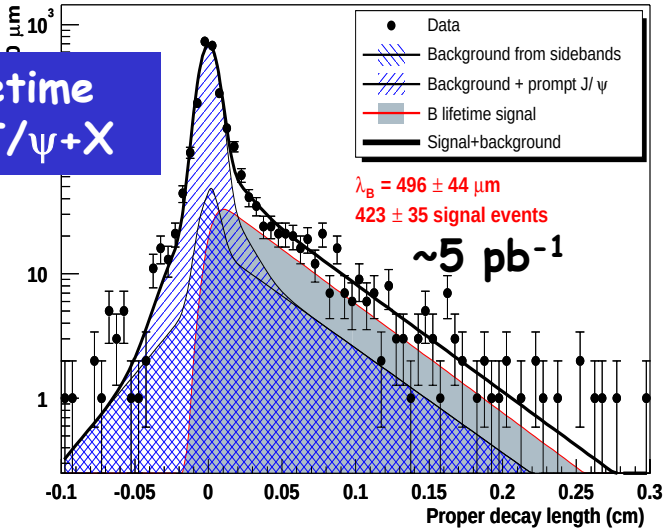
(note strong European involvement)

DØ status

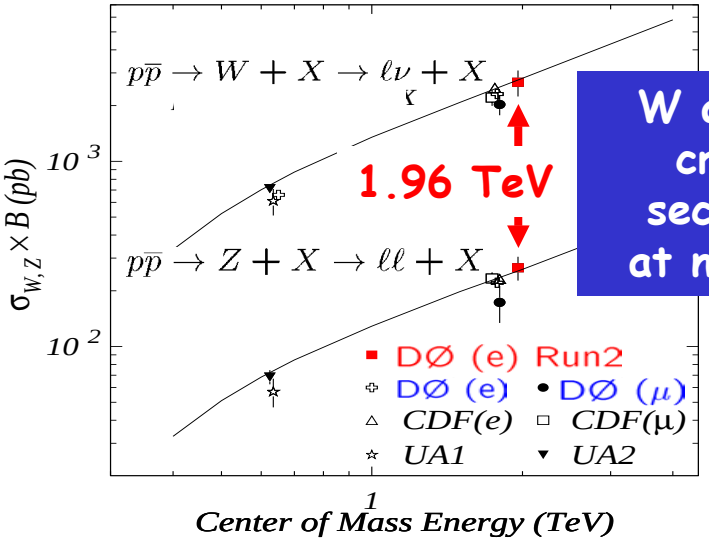
- The detector is working and is recording physics data
  - Silicon and fiber tracker hit efficiencies > 98%
- Data being reconstructed and analyzed with a latency of ~ 1 week
- First physics measurements were presented at ICHEP, based on 5-10 pb^{-1} of data
  - See www-d0.fnal.gov/results
- Improvements still in store:
  - Trigger and DAQ system
  - Offline reconstruction (alignment, efficiencies)
- By next summer (LP2003 at Fermilab), we expect physics results with a few hundred pb^{-1}
  - significantly increased sample over Run I with improved detector and a higher center of mass energy
    - Top quark measurements with increased statistics and purity
    - Jet cross section at high E_T (constrain gluon PDF)
    - New limits on physics beyond the SM
    - …

Physics with Run II data

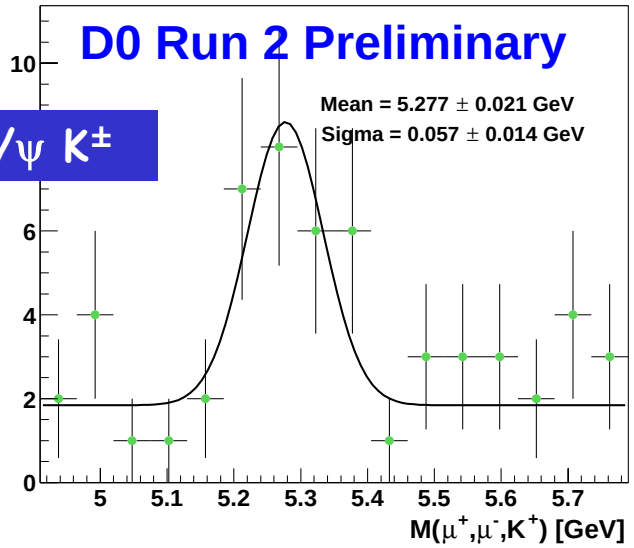
B lifetime
$B \rightarrow J/\psi + X$



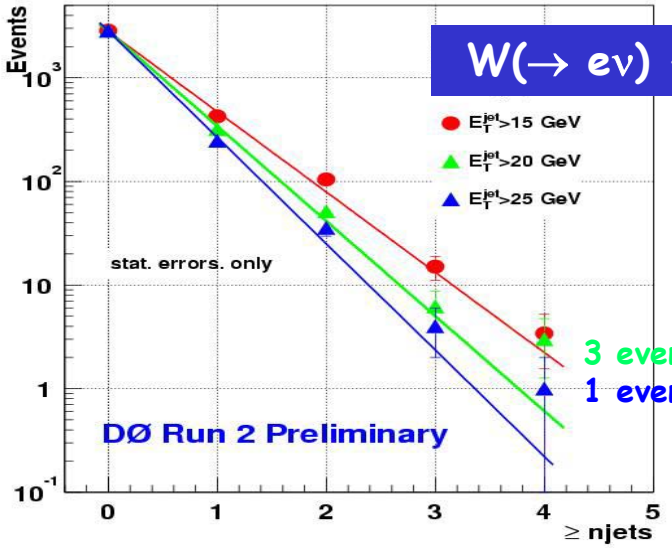
W and Z cross sections at new √s



$B^{\pm} \rightarrow J/\psi\ K^{\pm}$



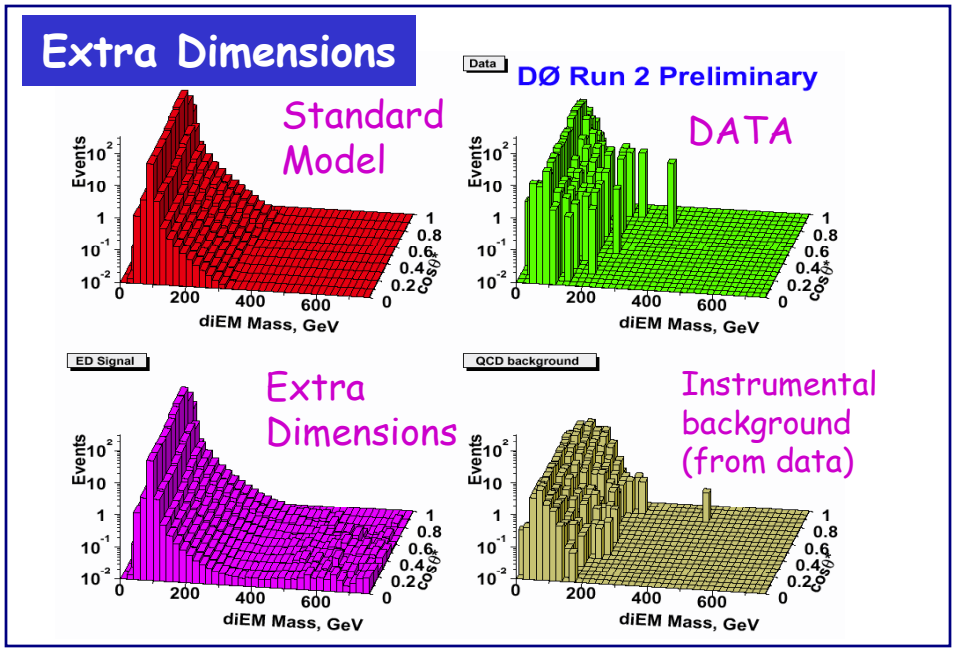
W(→ eν) + jets



Run II Searches for New Phenomena

Gauge mediated SUSY $\bar{p}p \rightarrow \gamma\gamma + E_T^{miss}$

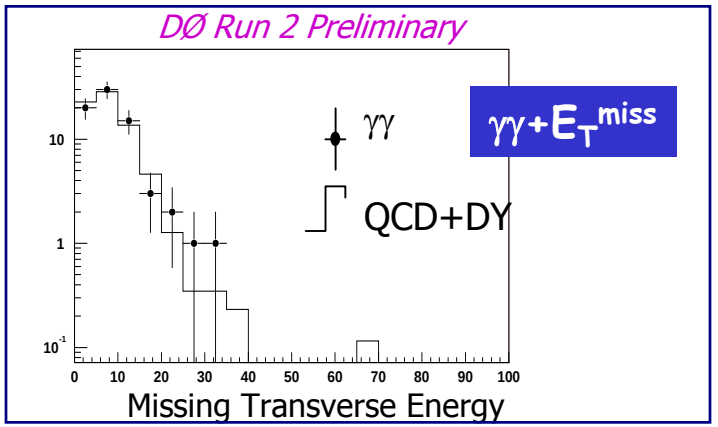
- Cross section for $\gamma\gamma + E_T^{miss} > 0.9$pb

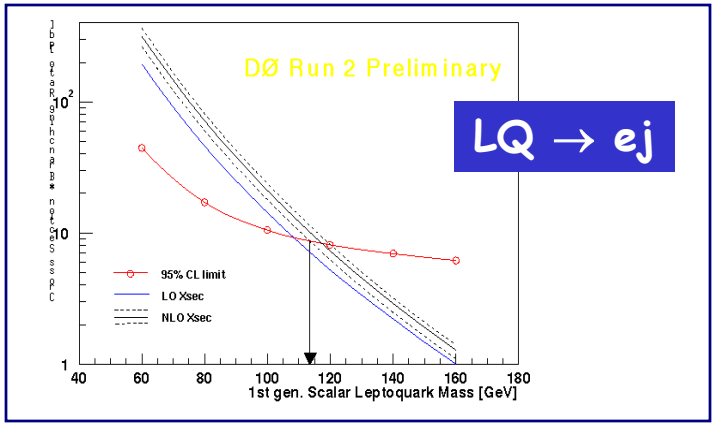


Extra dimension limits from $\bar{p}p \rightarrow ee, \gamma\gamma$

M_S(GRW) > 0.92 TeV

Run II limits are not yet competitive, but show we are ready for physics





First generation leptoquark

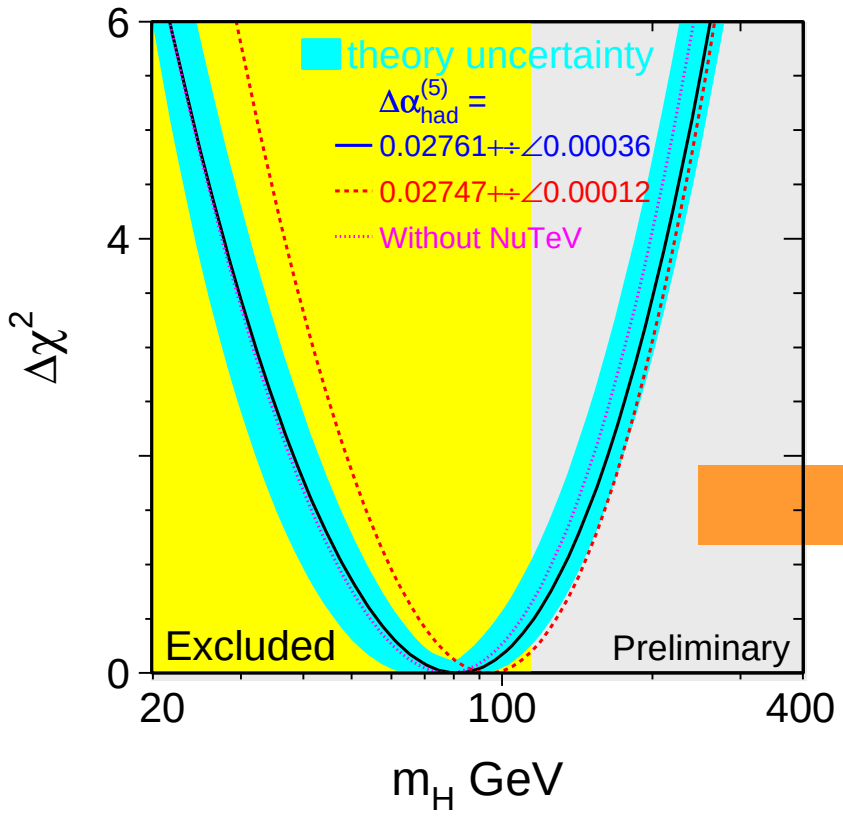
M_{LQ} > 113 GeV for B(LQ → ej) = 1

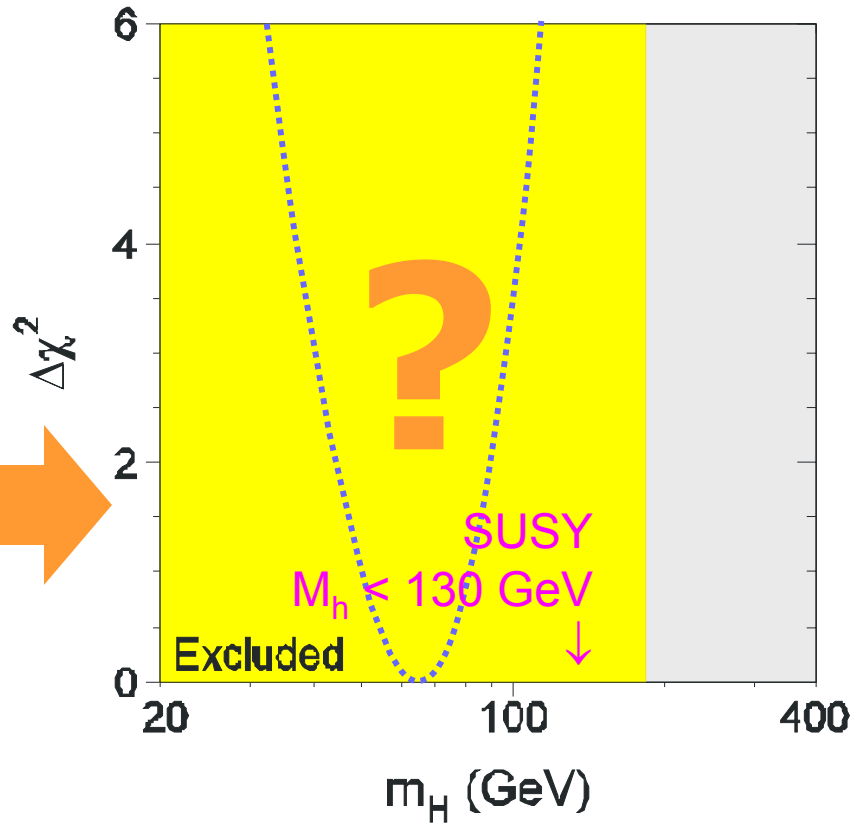
Run IIb is motivated by the physics

- There is a clear consensus within the experiment that
  - Run II is simply the best physics in the world
  - Run IIb is an integral and essential part
    - A chance to definitively address really big questions, rather than just to refine our knowledge of the standard model particles
  - nature has been immensely kind to us to give us this opportunity, and the collaboration will seize it wholeheartedly and with zeal

- DØ continues to attract new physicists and experimental groups of the highest quality, based on this physics potential

What Run IIb can do for us





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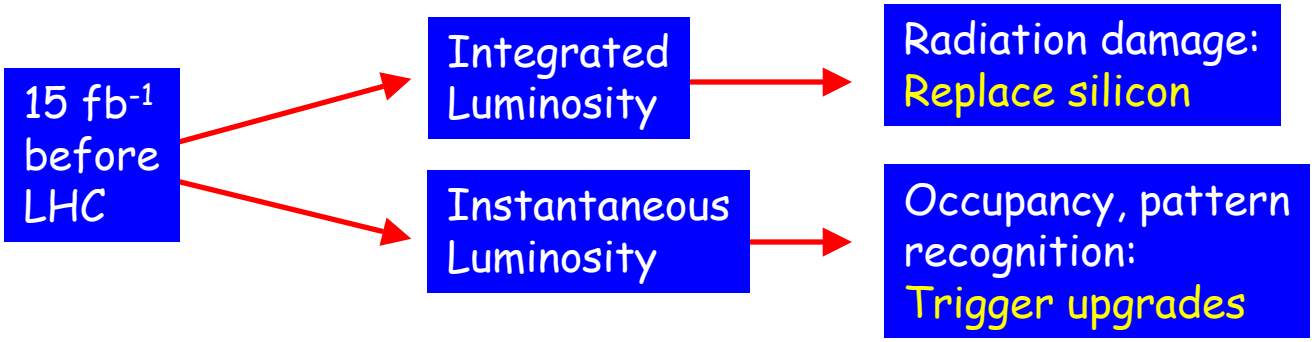
Grünewald, Heintz, Narain, Schmitt, hep-ph/0111217

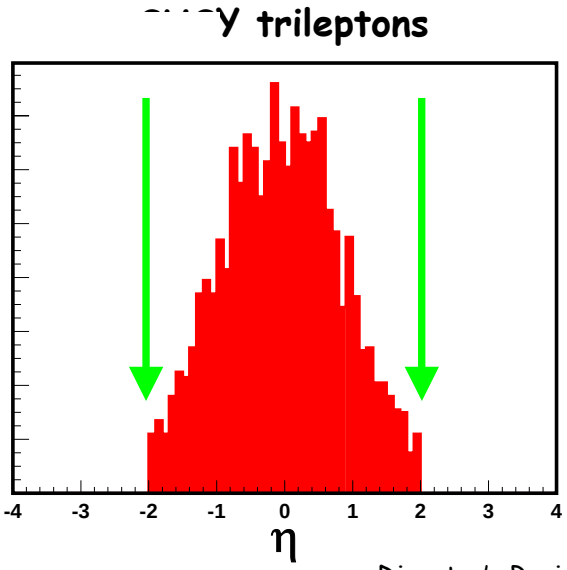
Assumes current central values
$\delta\Delta\alpha^{(5)}_{had}(M_Z^2) = 10^{-4}$, δM_W = 20 MeV, δm_t = 1 GeV

Physics goals drive the upgrades

- The Director has set the goal of achieving ~15 fb^{-1} before the LHC starts producing physics



- The run IIb physics goals require efficient triggering and reconstruction of
  - isolated leptons
    - (including taus if possible)
  - jets
  - missing E_T
  - b-tagging
- Kinematic range for all objects is typically p_T > 15 GeV, $|\eta|$ < 2



We need to be realistic

- Over the past three years, the collaboration has been stretched:
  - At the start, a significant number of students were still working on Run I
  - Huge effort towards detector construction, installation, commissioning, operations for Run IIa
  - Serious and increasing work on Run IIb
- We now have a working detector and we are doing physics, but the exercise was neither smooth nor painless
- What has this taught us?
  - A better sense of our own capabilities and weaknesses
    - Ability to mobilize the collaboration for projects such as the silicon detector construction
    - Need to strengthen long-term institutional bonds to detector efforts
  - Importance of physics as a motivator

Run IIb is an integral part of Run II

- We do not plan to have a separate collaboration list or author list for Run IIb
  - Run IIb is a project undertaken by the collaboration as a whole
  - Run IIb construction work is service work to DØ
    - True even for groups that may ramp down after 2005-6
  - We can and will direct effort from any and all groups in DØ
- We are all aware that there will be a need to balance potential conflicts between
  - Run IIb work
  - Run IIa operations and maintenance, software, computing
  - Physics analysis

While physics may seem to conflict with "real work," I believe this is strongly outweighed by its positive impact in recruiting the best students, postdocs and university groups.

I would much rather have the problem of balancing physics with detector work than have no physics to offer.

How we are addressing the issue

- Presentation by the Director to DØ Collaboration Meeting in July
- Presentation by the Project Manager and Discussion at the DØ Institutional Board meeting
- Distribution of a general collaboration MOU covering FY 2003-2005 to all DØ institutions (a copy is included in the "red" book)
  - this MOU is in addition to the Run IIb project MOU and SOW; it covers physicist contributions to DØ as a whole
  - followed up by discussions with key universities
- The following table shows
  - Run IIb silicon project contributions
    - for all the institutions participating in the silicon detector
  - Overall physicist contributions to DØ
    - where they have been specified so far

30 institutions responded so far
7 signed MOU's in hand

Institution	Full Run II?	IIb Projects	Physicists (non-faculty)	Other projects of the group
Beijing (China)		Si	1 full time at Sidet	
Boston	Yes	STT	3 PD, 4 GS	none (yet)
Brown	Yes	Si, *	1 FTE for Si, others for *	none
CINVESTAV (Mexico)		Si	1 FTE for Si	
Columbia	Yes	Cal Trig	3 PD, 5 GS, 2 EE, Techs	~ none
Fermilab	Yes		7.5 for Si, others for *	
Florida State	Yes	STT, Si	2 PD, 3 GS	CMS
Fresno	Yes	Si	2 FTE masters students	none
Illinois at Chicago		Si	2.5 FTE	CMS
Imperial (UK)	Yes, '08	*	3 Res, 2 PD($\rightarrow$1 in '04), 3 GS	CMS
Indiana	Yes	Si	1 Res, 2 GS	
Kansas	Yes	Si	4 FTE	CMS
Kansas State	Yes	Si	3 Res, 1.5 PD, 1 GS	CMS
LBNL		*	1 PD, 1 GS	none
Louisiana Tech	Si	2 PD, 1 GS		none
Manchester (UK)	Yes, '08	Trk Trig	1-2 PD, 2-3 GS	
Michigan	Yes	*	1 PD, 2-3 GS	
Michigan State	Yes	Cal Trig	2 Eng, 3 PD, 4 GS	ATLAS
Moscow State (Russia)		Si	2 FTE for Si	
Nebraska	Yes	*	1 PD, 1 GS	CMS, Auger
NIKHEF (NL)		Si	1 FTE	
Northwestern		Si, *	1 FTE for Si, others for *	
Princeton		*	1 PD, 1 GS	CMS
Rice		Si, *	1 FTE for Si, others for *	
Rochester	Yes	*	2 Res, 1 PD, 5 GS	CMS, ATLAS
Stony Brook	Yes	STT, Si, *	1 Eng, 6 PD, 5 GS	ATLAS, KOPIO
Washington		Si, *	2 FTE for Si, others for *	ATLAS

German Groups committed through 2005; will discuss beyond that at their quarterly meeting next week
French groups committed at current level through 2005-6, are involved in construction of L1 calorimeter upgrade and L2 beta upgrade

* = general service work on Run IIa M&O and Run IIb as needed

- We have identified sufficient physicist personnel for the Run IIb silicon project (33 FTE's; need ~ 31)
  - Real people (real names!)
- The same is true for trigger, DAQ and online projects (though not listed in full here)
- From this partial list of institutions, we have already ~ 14 postdocs and ~19 students who are not committed to Run IIb projects and who could be called upon for (e.g.) silicon detector work at Sidet in the future (at ~50% level?)
- The table is based on about a third of DØ, and does not yet include complete responses from many groups heavily involved in Run II

Conclusions

- The DØ Collaboration is committed to Run IIb. The physics opportunities are unique.
- We take the issue of availability of physicist effort seriously, and we have unequivocally passed this message to the collaboration and to the Institutional Board.
- Physicist effort for IIb looks reasonable so far.
- We are working to ensure that it is put on a firm footing on the timescale of the Lehman Review, through multi-year, institutional MOU's with all DØ collaborators.