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

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Institutions:

35 US, 41 non-US

Collaborators:

334 from US

312 from non-US institutions

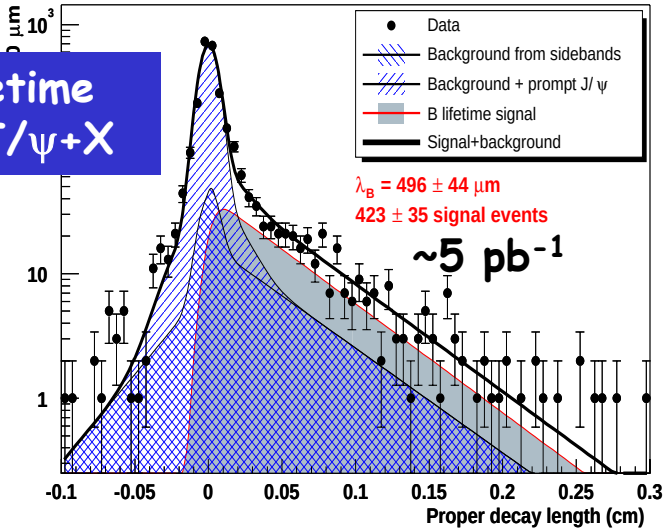
(note strong European involvement)

DØ status

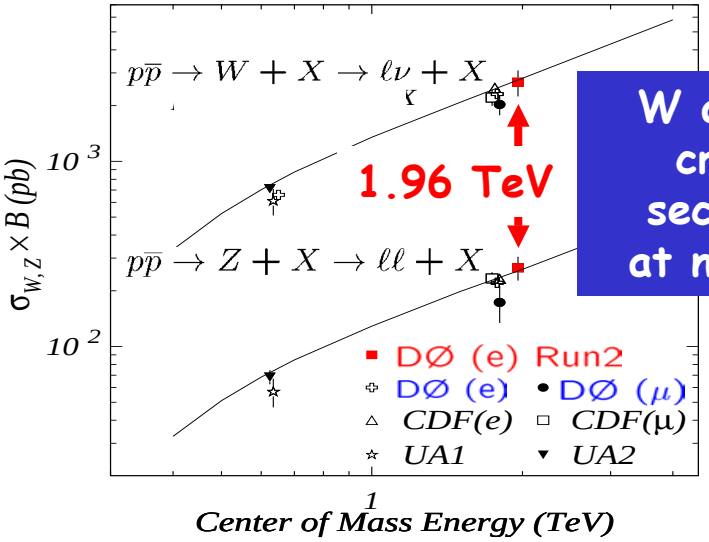
- The detector is working and is recording physics data
  - Silicon and fiber tracker hit efficiencies > 98%
- Reconstruction farm and analysis systems are working well
- First physics measurements were presented at ICHEP, based on 5-10 pb^{-1} of data
  - See www-d0.fnal.gov/results
- Improvements still 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

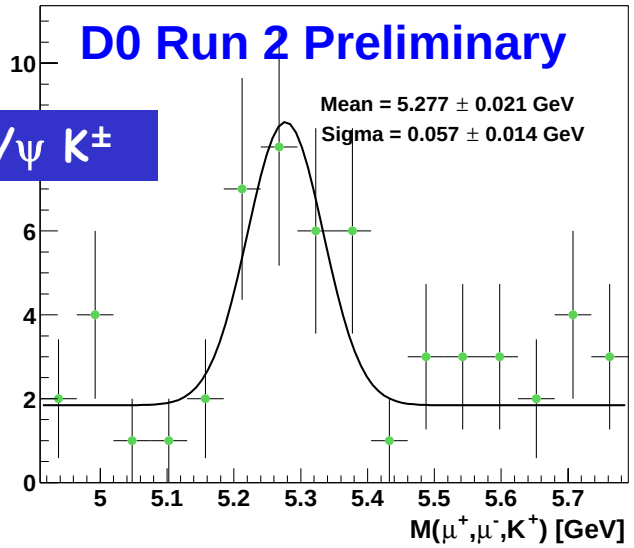
B lifetime
$B \rightarrow J/\psi + X$



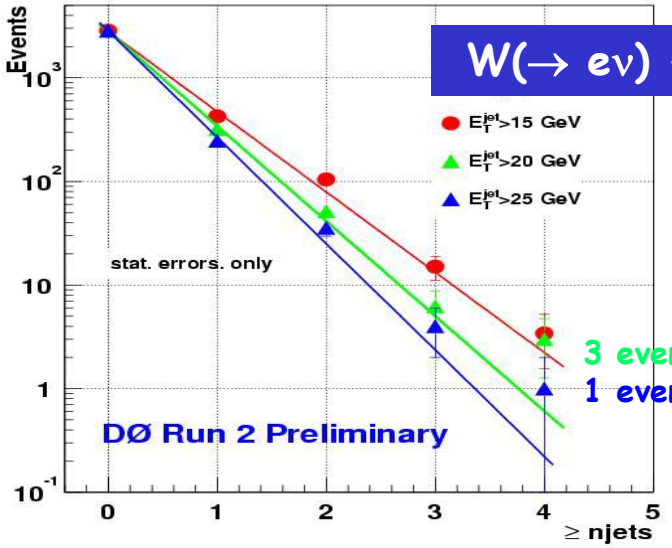
W and Z cross sections at new √s



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



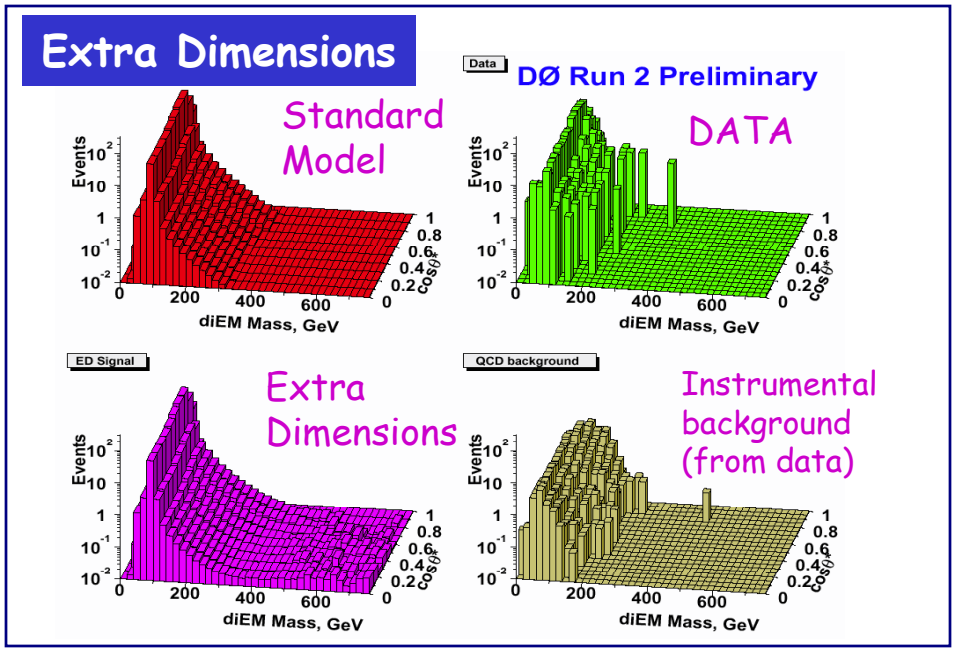
W(→ eν) + jets



Run II Searches for New Phenomena

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

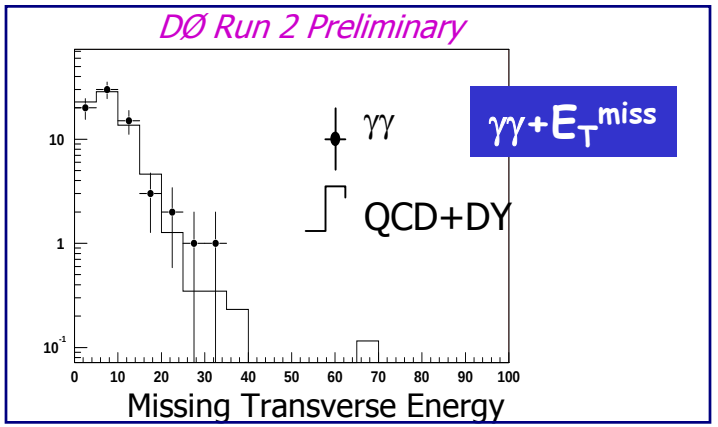
- Cross section for $\gamma\gamma + E_T^{miss} > 0.9$pb

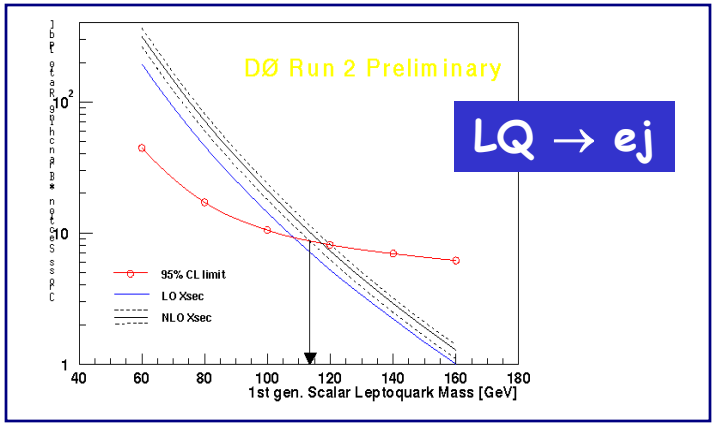


Extra dimension limits from $\bar{p}p \rightarrow ee, \gamma\gamma$

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

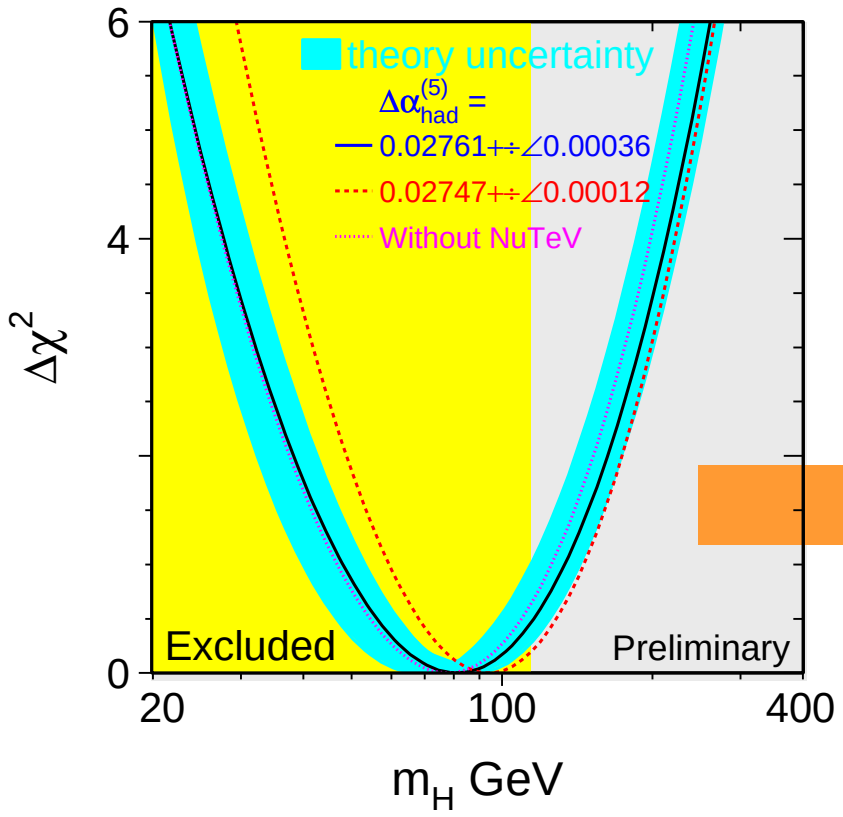
for B(LQ → ej) = 1

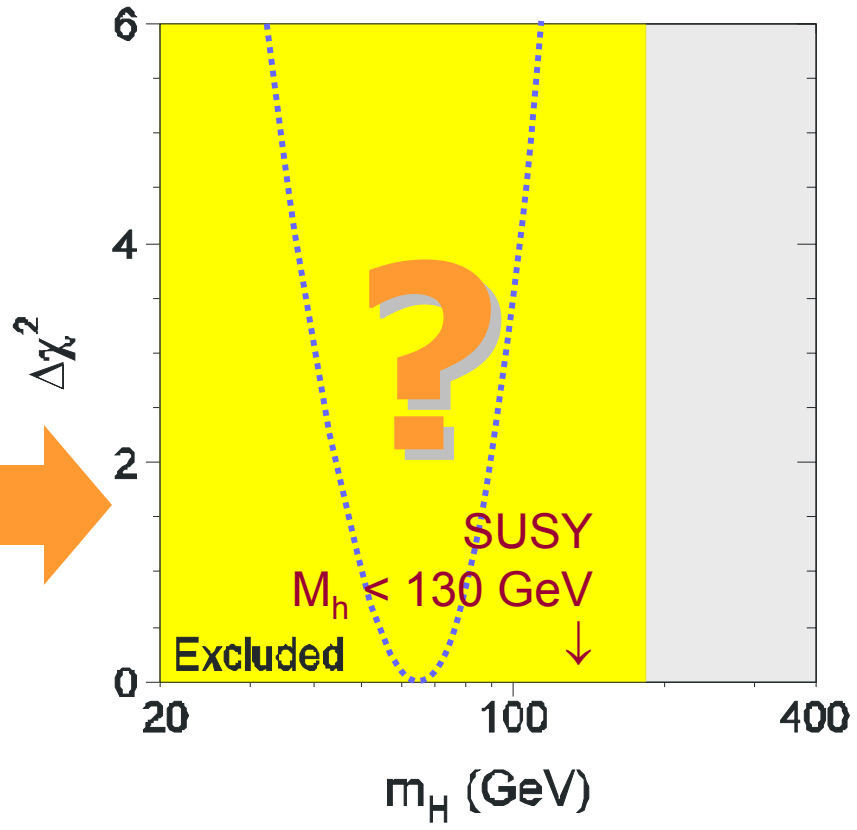
Run IIb is motivated by the physics

- 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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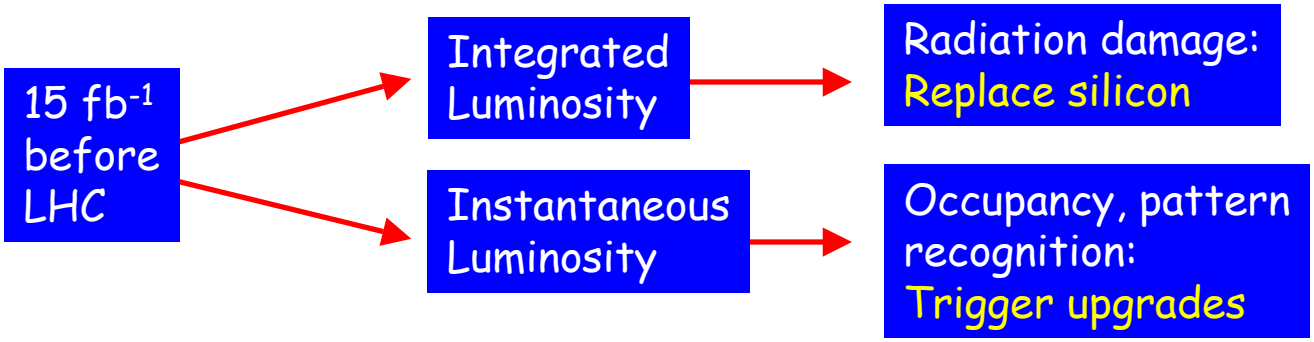
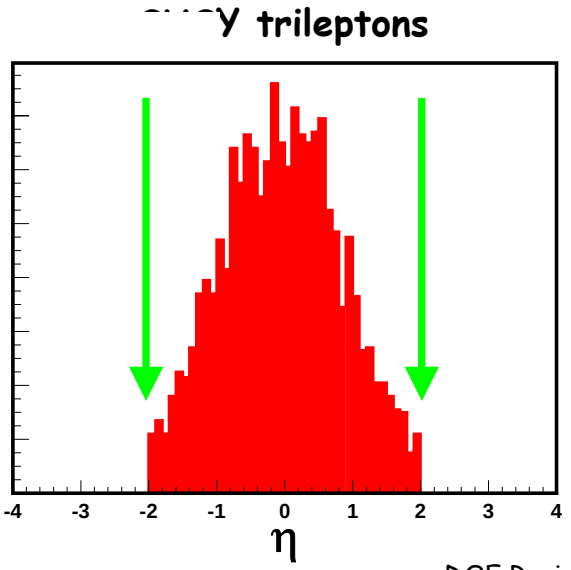
Grünewald, Heintz, Narain, Schmitt, hep-ph/0111217
Assumes current central values
$\delta\Delta\alpha^{(5)}_{had}(M_Z^2) = 10^{-4}$, δM_W = 20 MeV, δm_t = 1 GeV

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

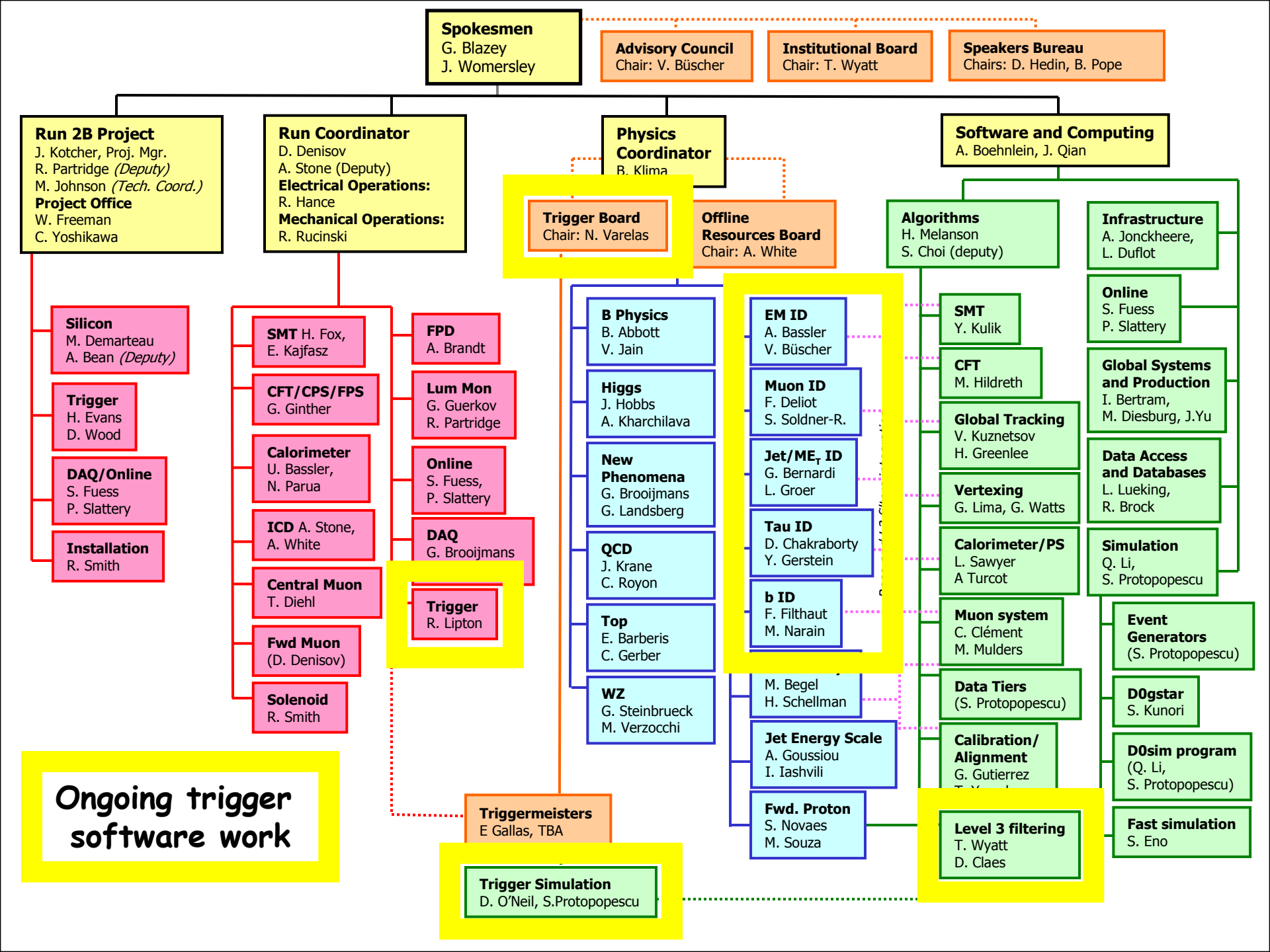
- Presentation by the Director to DØ Collaboration Meeting in July
- Presentation by the Project Manager and Discussion at the DØ Institutional Board meeting
- Run IIb project MOU and SOW for institutions involved in the upgrade
  - Covers physicist contributions to project tasks
- General collaboration MOU covering FY 2003-2005 for all DØ institutions (copies are available in the documentation)
  - Covers physicist contributions to DØ as a whole
- Followed up by discussions with key universities

Memoranda of Understanding

- As of 9/17/02, we have MOU's in hand from 68 of 76 institutions.
- All are committed to full Run IIb or are developing proposals for continued participation.
- We have identified sufficient physicist effort for the Run IIb detector projects.
  - Summed person-years meet or exceed requirements extracted from the resource-loaded schedule for both silicon tracker and trigger/DAQ/Online projects.
- We have a large number of students and postdocs who are available for Run IIb projects
  - Provides physicist effort for Run IIa operations and software
  - Each institution has agreed that such people can be targeted for silicon detector work at Sidet, or other similar needs
    - Provides contingency on physicist effort

Software development

- Run IIb project does not explicitly include physicists working on the development of software (including algorithms for level 2 and level 3 triggers)
- Given that DØ is a running experiment, we feel it is not appropriate to separate this from the ongoing development of software for Run II
  - 7 FTE working now on Level 2 software
  - 7.5 FTE working now on Level 3 software
    - These groups will naturally transition from Run IIa to Run IIb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R. Partridge (Deputy)
M. Johnson (Tech. Coord.)
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Run Coordinator
D. Denisov
A. Stone (Deputy)
Electrical Operations:
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Mechanical Operations:
R. Rucinski
Physics Coordinator
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Trigger
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DAQ/Online
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Installation
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SMT H. Fox,
E. Kajfasz
CFT/CPS/FPS
G. Ginther
Calorimeter
U. Bassler,
N. Parua
ICD A. Stone,
A. White
Central Muon
T. Diehl
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Solenoid
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Lum Mon
G. Guerkov
R. Partridge
Online
S. Fuess,
P. Slattery
DAQ
G. Brooijmans
Trigger
R. Lipton
B Physics
B. Abbott
V. Jain
Higgs
J. Hobbs
A. Kharchilava
New Phenomena
G. Brooijmans
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E. Barberis
C. Gerber
WZ
G. Steinbrueck
M. Verzocchi
EM ID
A. Bassler
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Muon ID
F. Deliot
S. Soldner-R.
Jet/ME$_T$ ID
G. Bernardi
L. Groer
Tau ID
D. Chakraborty
Y. Gerstein
b ID
F. Filthaut
M. Narain
M. Begel
H. Schellman
Jet Energy Scale
A. Goussiou
I. Iashvili
Fwd. Proton
S. Novaes
M. Souza
SMT
Y. Kulik
CFT
M. Hildreth
Global Tracking
V. Kuznetsov
H. Greenlee
Vertexing
G. Lima, G. Watts
Calorimeter/PS
L. Sawyer
A Turcot
Muon system
C. Clément
M. Mulders
Data Tiers
(S. Protopopescu)
Calibration/
Alignment
G. Gutierrez
Level 3 filtering
T. Wyatt
D. Claes
Online
S. Fuess
P. Slattery
Global Systems and Production
I. Bertram,
M. Diesburg, J.Yu
Data Access and Databases
L. Lueking,
R. Brock
Simulation
Q. Li,
S. Protopopescu
Event Generators
(S. Protopopescu)
D0gstar
S. Kunori
D0sim program
(Q. Li,
S. Protopopescu)
Fast simulation
S. Eno
Triggermeisters
E Gallas, TBA
Trigger Simulation
D. O'Neil, S.Protopopescu
Ongoing trigger software work

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.
- We believe the needed physicist effort for Run IIb is available within the collaboration, and the conflicts with Run IIa operations and analysis are manageable.
- We are working to ensure that physicist effort is placed on a firm footing, through multi-year, institutional MOU's with all DØ collaborators.