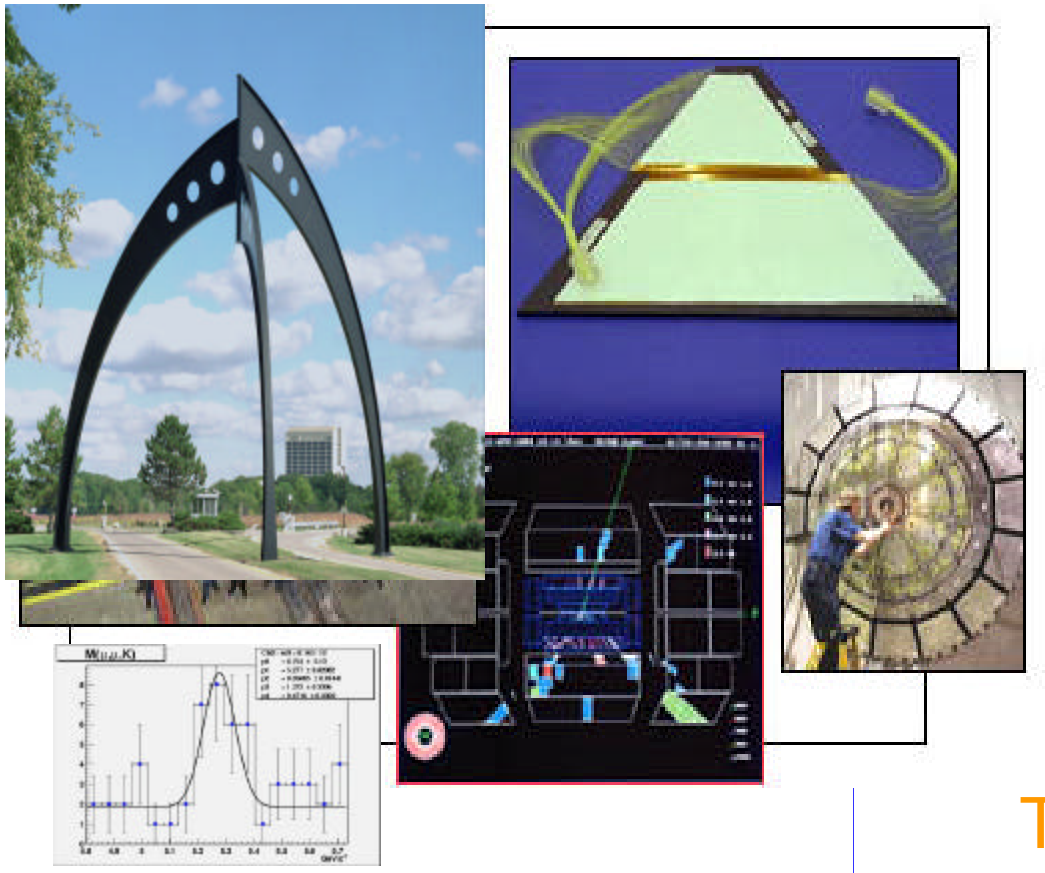
India in DØ



b quarks

Sudeshna Banerjee

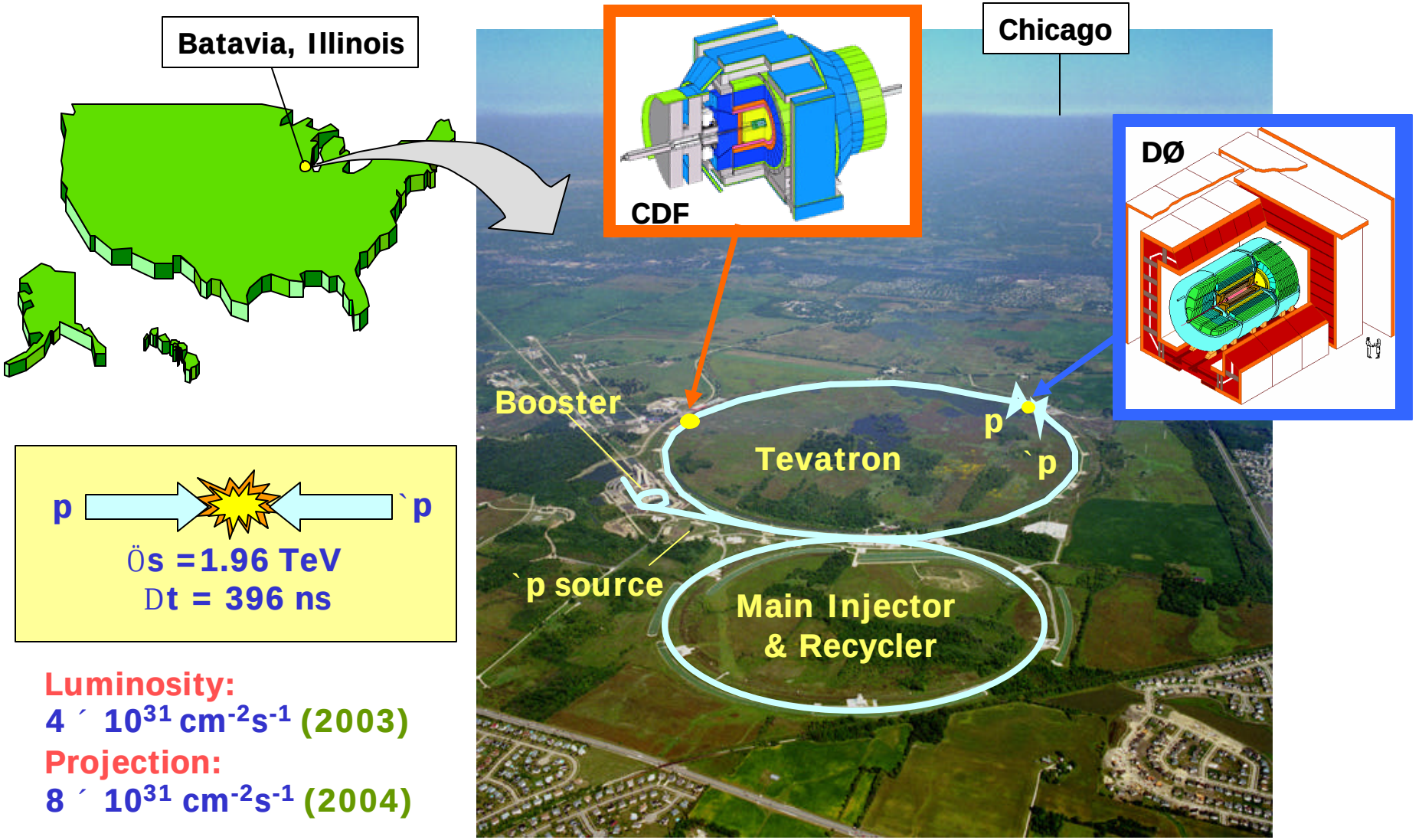
Tata Institute, Mumbai

Interaction meeting on

Linear Collider and Neutrino Physics

10-12 November

Fermilab



p `p

Ös =1.96 TeV

Dt = 396 ns

Luminosity:

$4 \times 10^{31}\ cm^{-2}s^{-1}$ (2003)

Projection:

$8 \times 10^{31}\ cm^{-2}s^{-1}$ (2004)

A Truly International Collaboration

Totals:

- 18 countries
  - Europe, Asia, and North, Central and South Americas
- 73 institutions & labs
  - 33 US
  - 40 non-US
- 646 physicists
  - 334 US
  - 312 non-US

History of D0 collaboration

DØ initial meeting in August 1983

Design report 1984: 14 institutions and 89 members

(one non US: Saclay)

First physics publication 1994: 35 institutions and 352 authors

(6 non US institutions
including 2 from India)

End of Run I in 1996

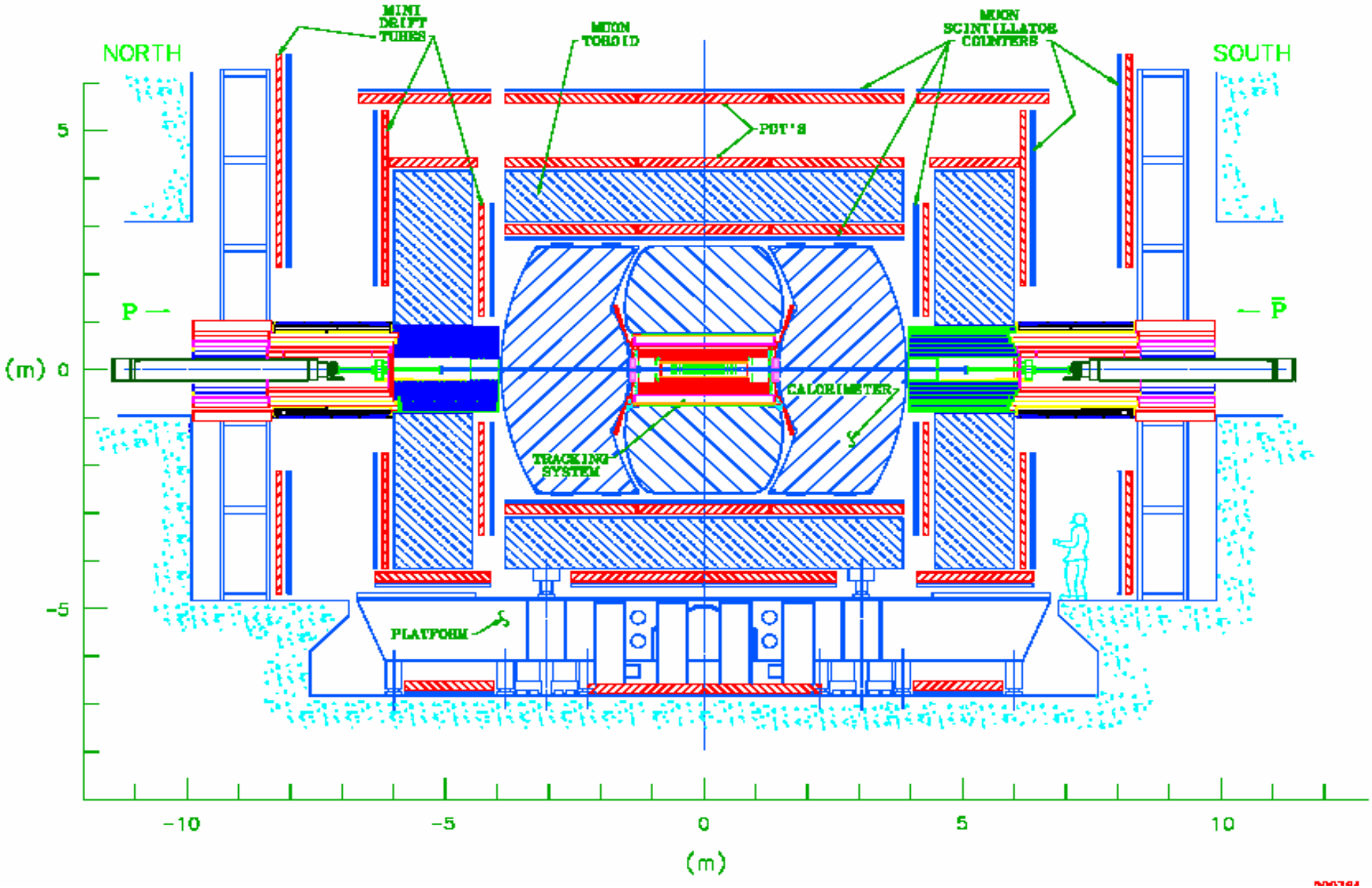
1997, 1998 expansion of collaboration ➔ more international

Currently in 2003: 73 institutions and 646 members on masthead

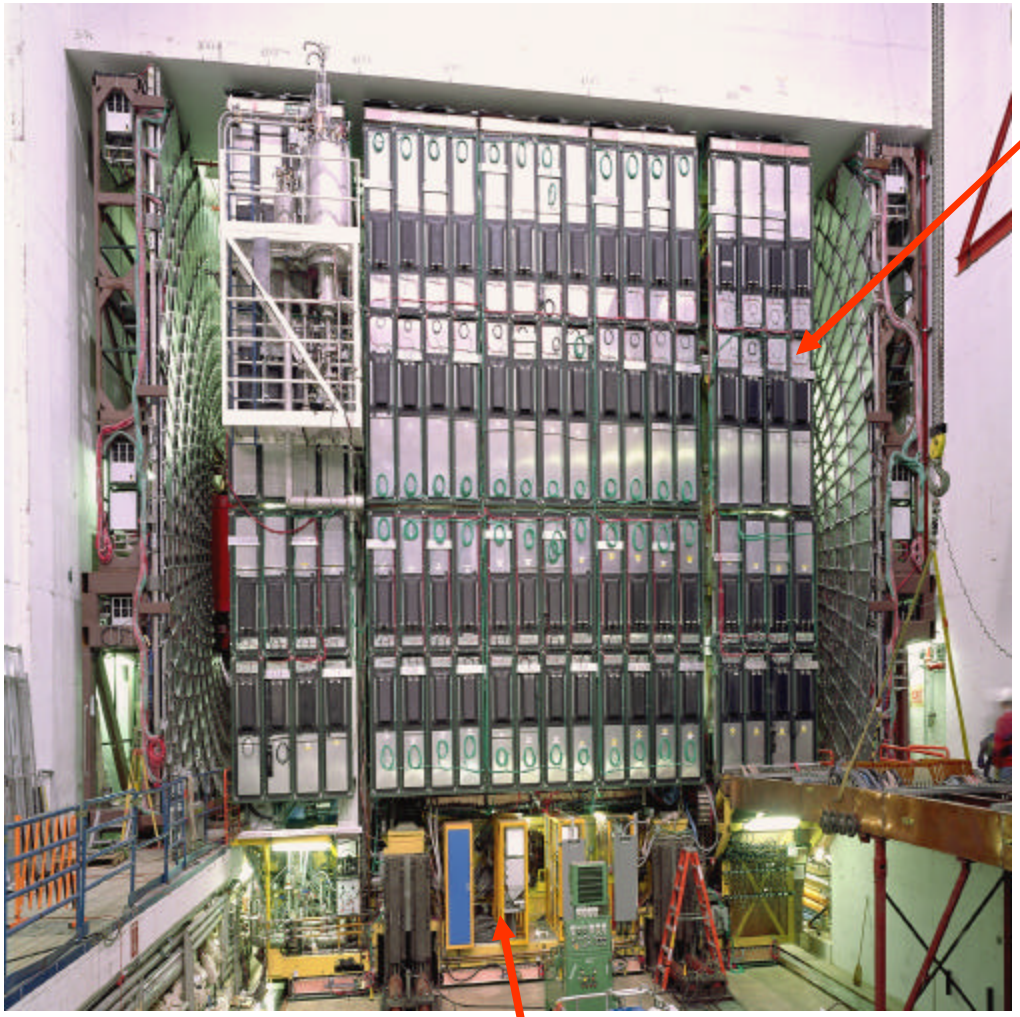
33 US and 40 non US institutions
334 members from US and 312 from non US institutions

Composition of collaboration dramatically changed since ~1998

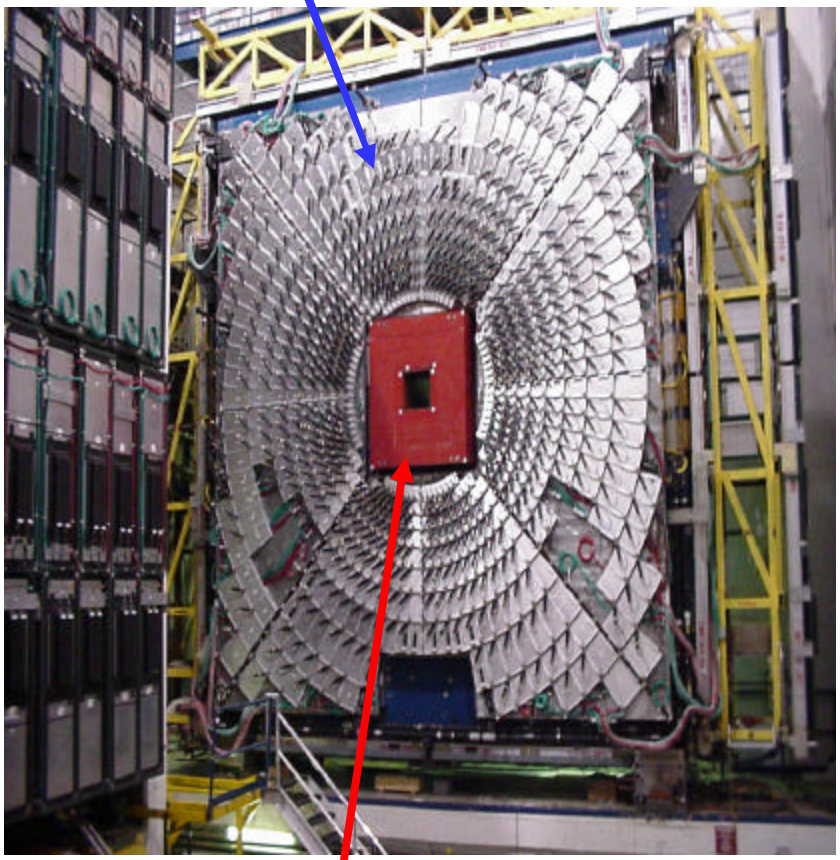
DØ Detector


NORTH
SOUTH
MINI DRIFT TUBES
MUON TOROID
MUON SCINTILLATOR COUNTERS
PDT'S
CALORIMETER
TRACKING SYSTEM
PLATFORM
P
$\bar{P}$
5
0
-5
(m)
-10
-5
0
5
10
(m)

DØ Detector



muon system



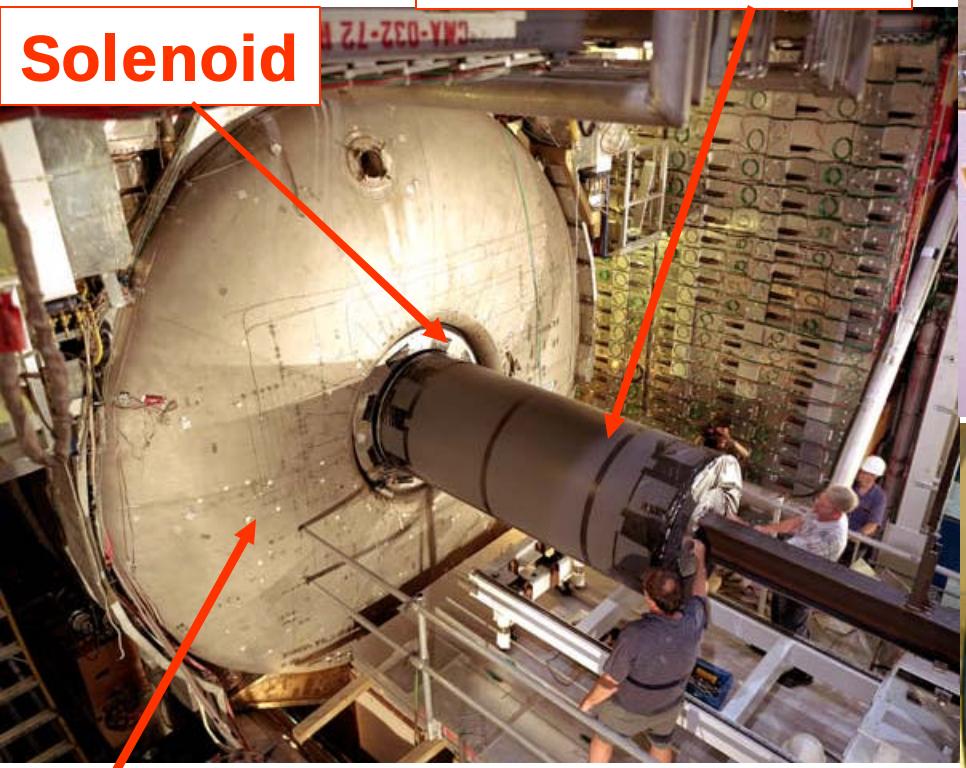
electronics

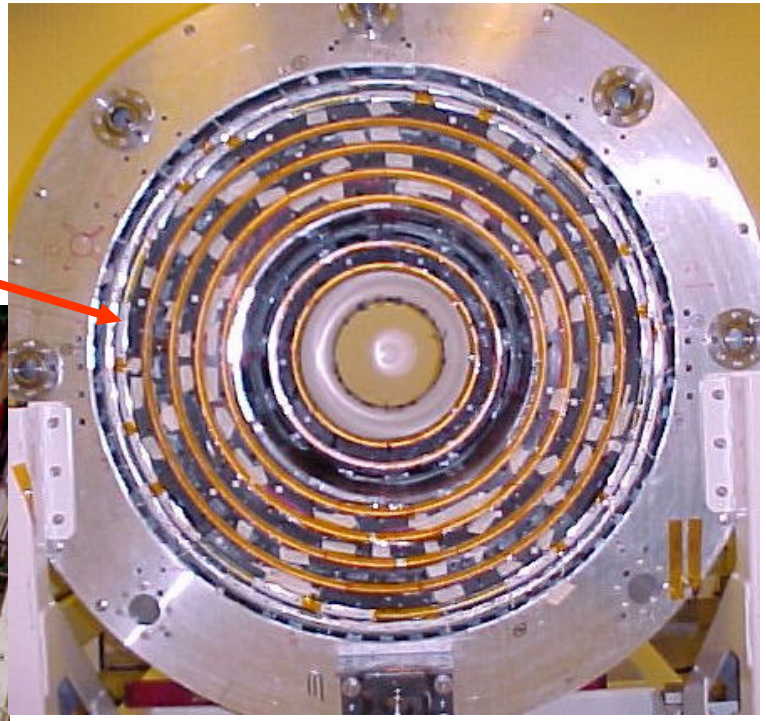
shielding

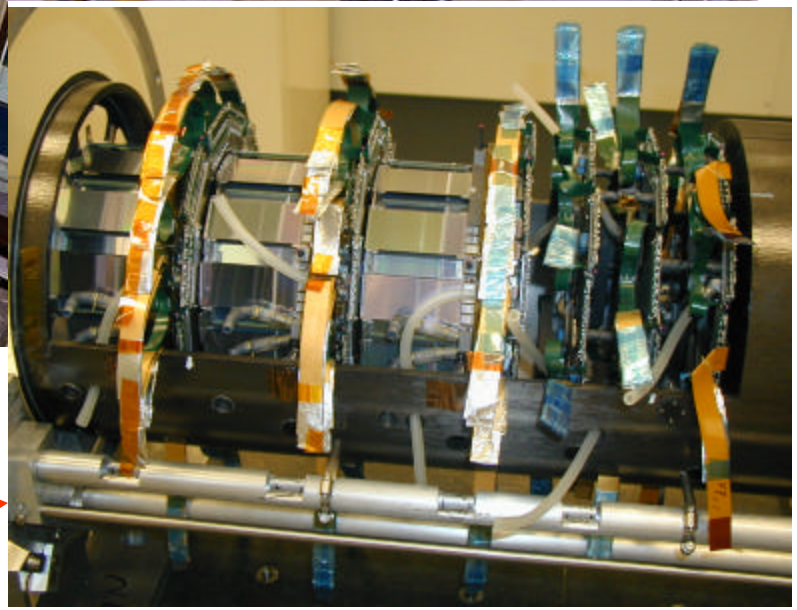
DØ Detector

Fiber Tracker

Solenoid





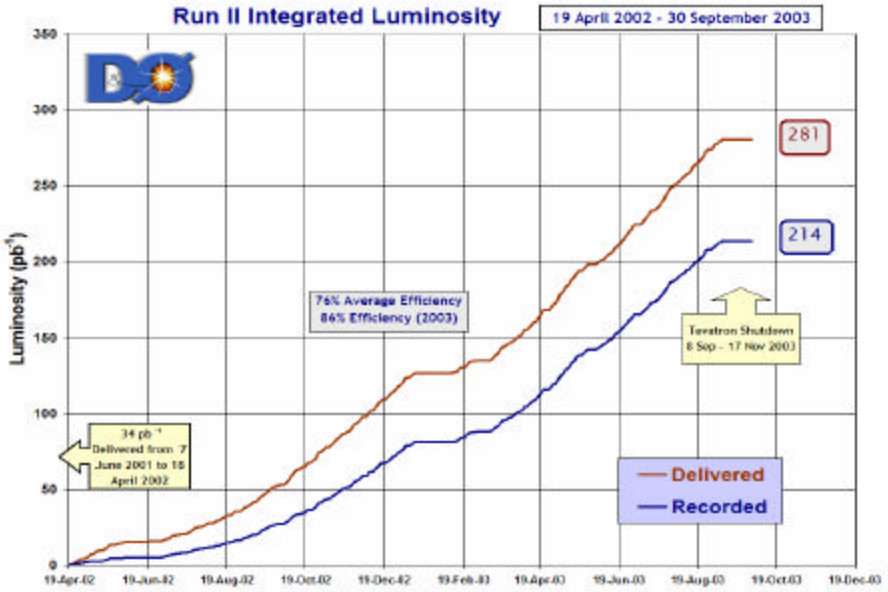


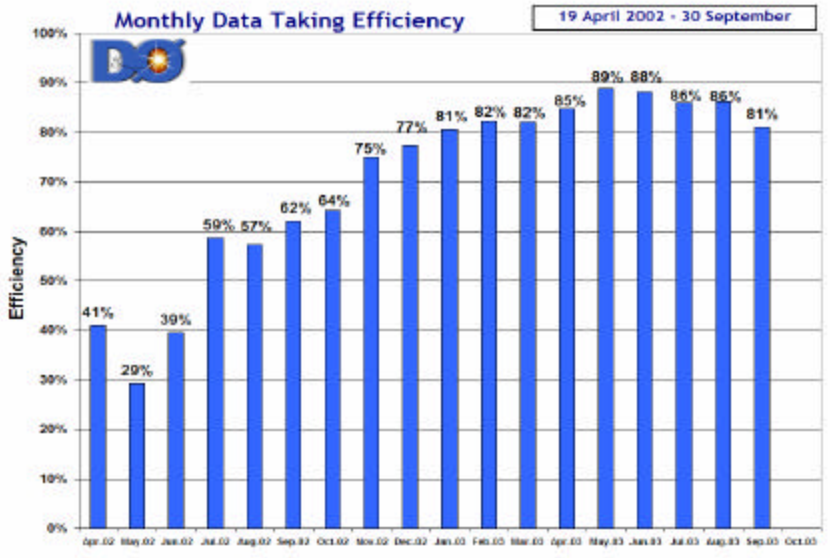
Central Calorimeter

Silicon

Run 2 and our Physics Program

- Started March 2001
  - E_{cm}=1.96 TeV
  - Peak L = $3.6 \cdot 10^{31}$
  - Delivered ~ 281 pb^{-1}
- Detector working well
- Physics results from ~130 pb^{-1} at new E_{cm}
- Physics Program
  - Top, W, Higgs
  - New Phenomena
  - B-physics
  - QCD





TIFR Group in DØ (Run 1)

- Joined in 1990.
- Participated in the design of the central muon scintillator detector.
- Fabrication of 120 muon scintillator detectors with fiber readout.
- Performance study for the preshower detector for electron identification.
- Online software for High Voltage Control.

Need for Scintillation Counters

Adding scintillation counters to the muon system have several advantages -

RunII - 3 msec -> 396 nsec -> 132 nsec

(shorter beam crossing time)

- To put time stamp on muons.
- To have muon trigger at L1.
- To discriminate against Cosmic muons.

Detector Fabrication

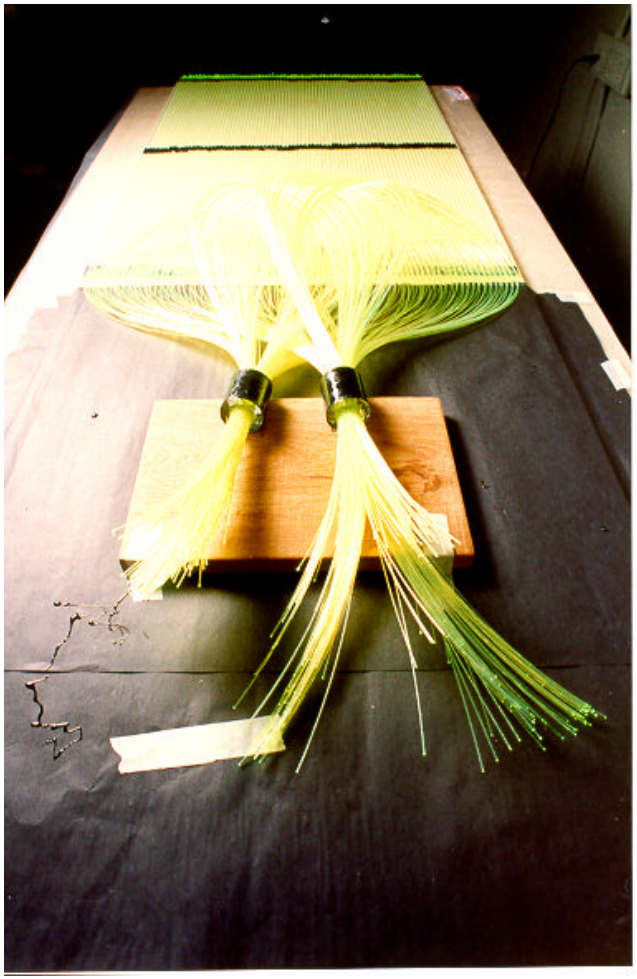
Insertion of light collecting fibres in scintillator grooves for muon detection

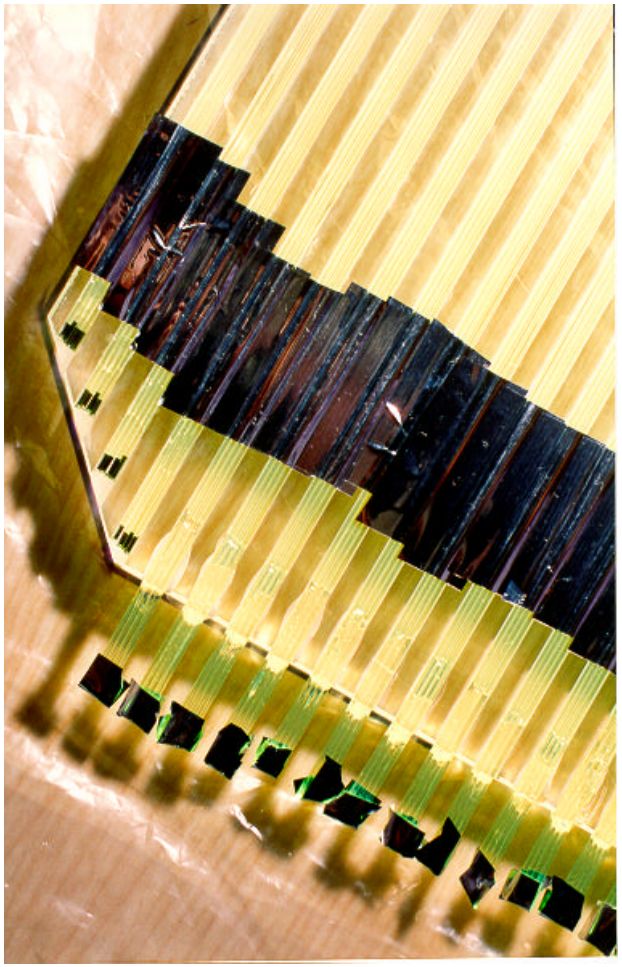
Detector Fabrication

The fibres are fixed in grooves in the scintillation counter with glue for stability

Detector Fabrication

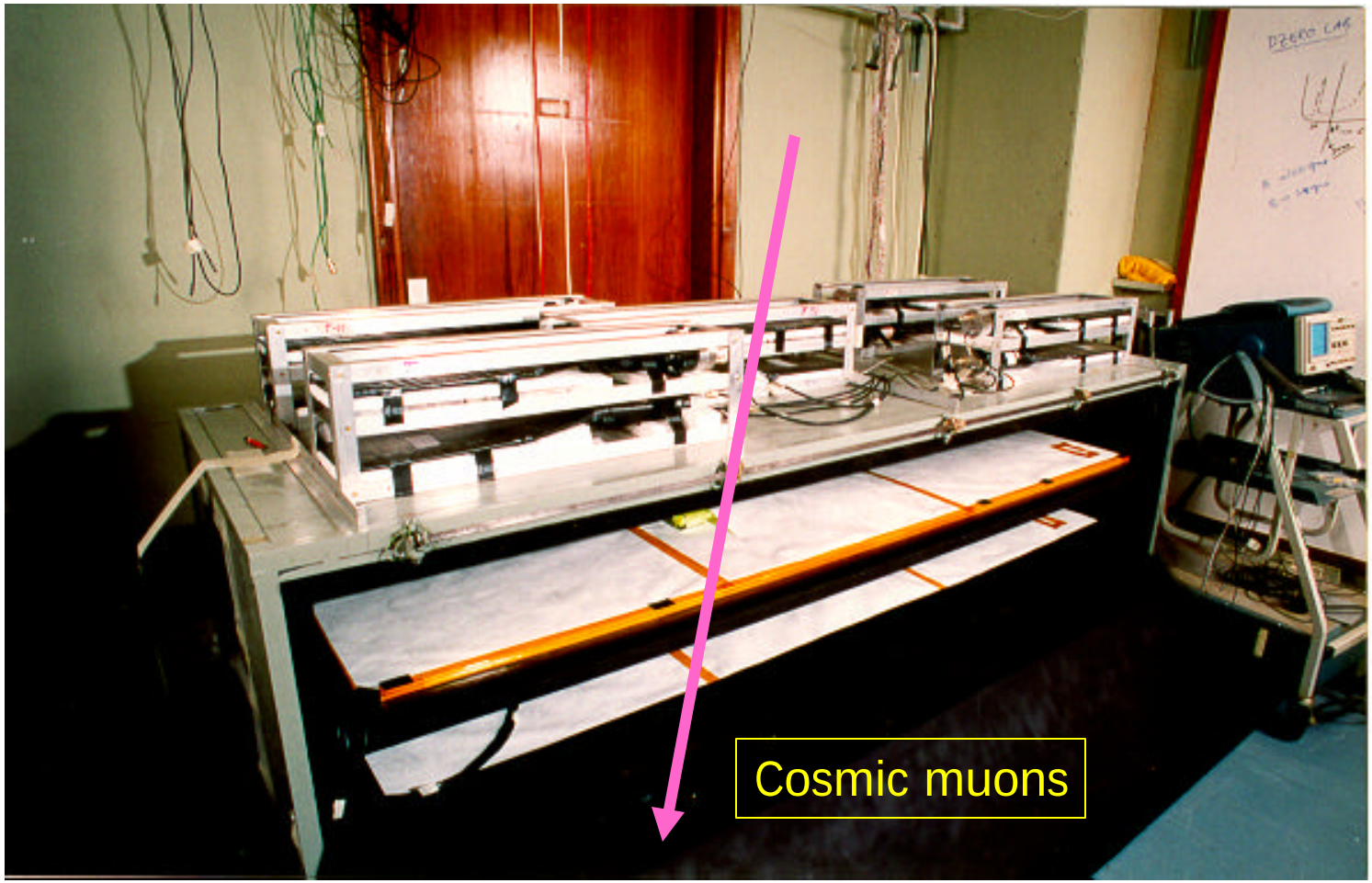
Fibres are grouped together and ready to be polished.
After polishing each bunch is interfaced with a photomultiplier tube for signal collection



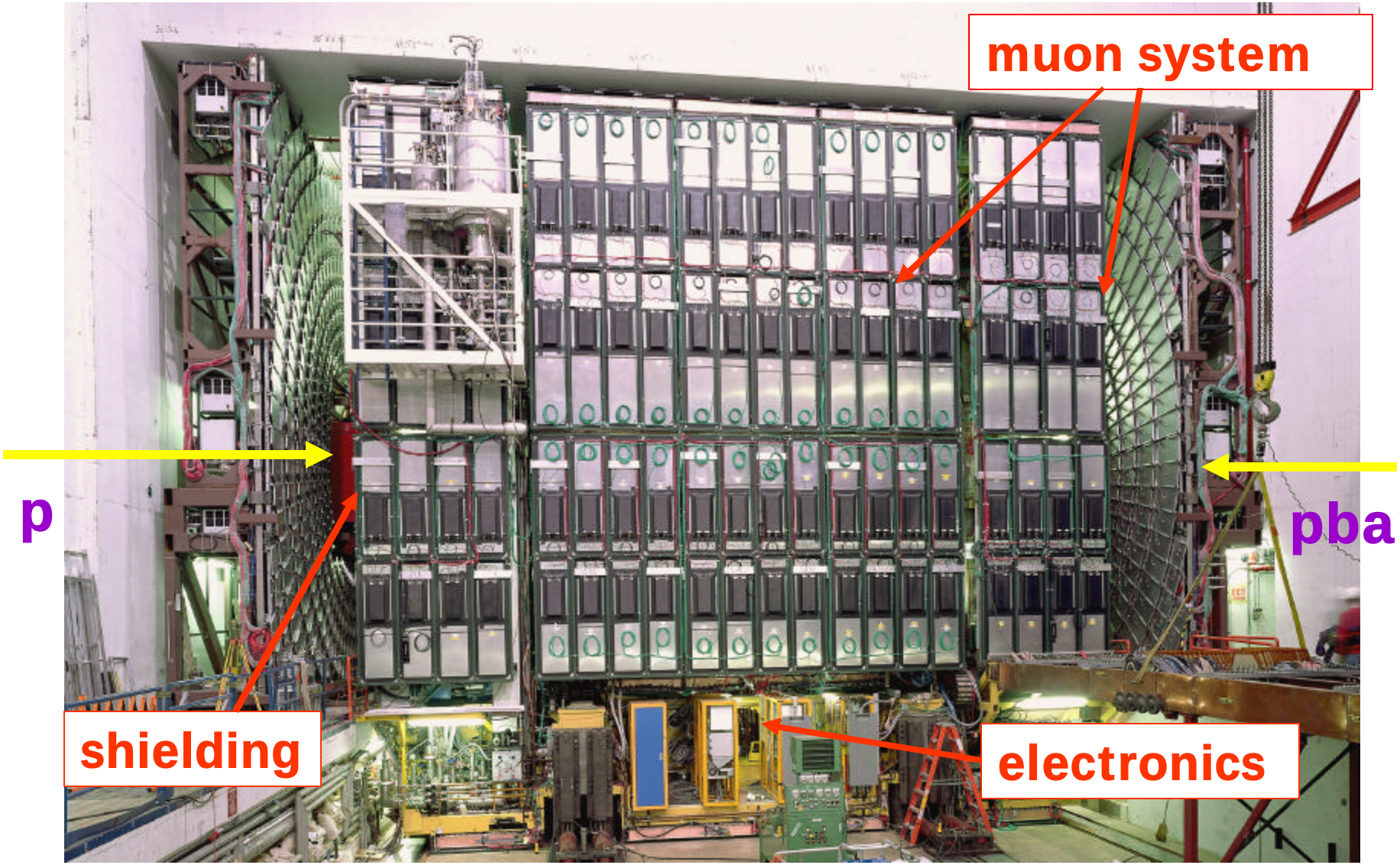


Detector Testing

Scintillator counters are tested with cosmic muons after fabrication.
Signal from each counter has to be above a certain threshold.



Central Muon Detector



Additional Run II Hardware

More detectors were made for RunII.

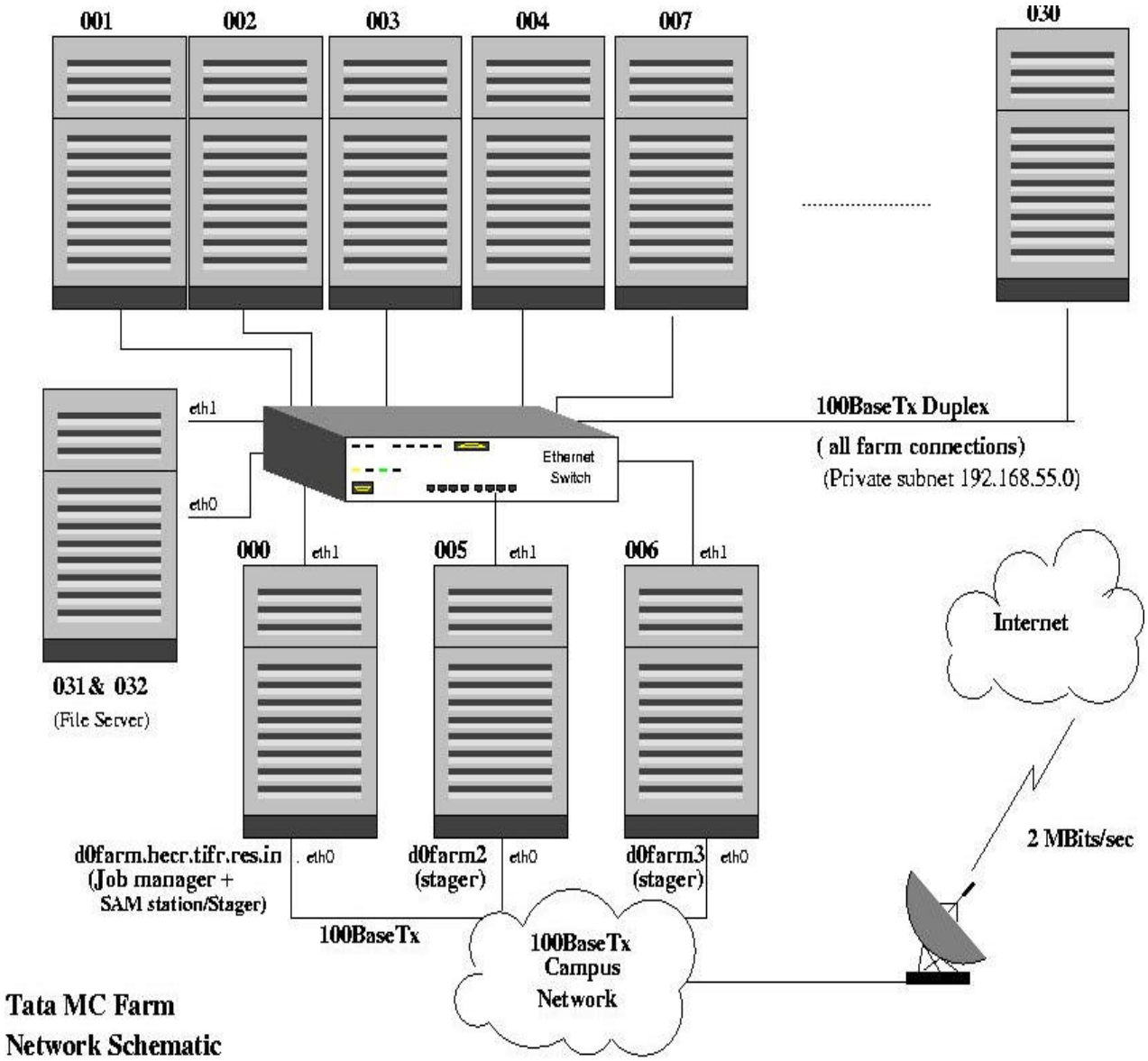
- Additional 44 scintillation counters to cover completely the bottom and sides.
- Development of fully automatic software dominated system to test muon fanout cards.
- Callibration of scintillator PMTs using LED.
- Commissioning and testing of the central muon system.

Run II Software

- Development of a fast M.C. package for D0 calorimeter simulation.
- Development of tools for electron and Tau Id using neural net.
- Physics simulation for Run II involving contact interaction, SUSY, TOP and B-decay.
- Major contribution to World-wide D0 Farm computing.

DØ Computing Farm at TIFR

DØ Computing Farm at TIFR

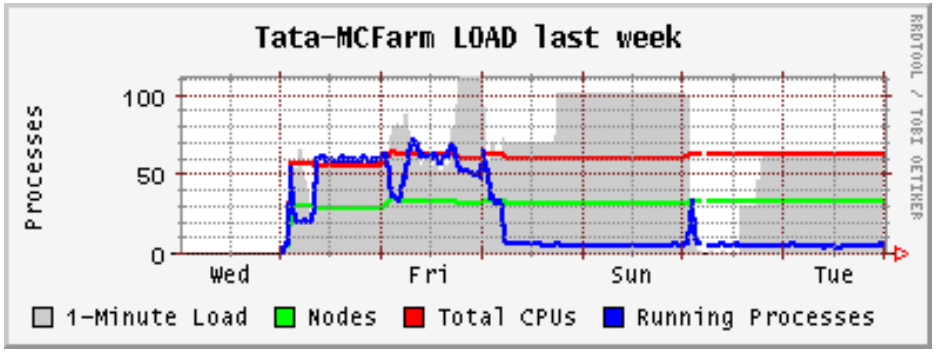


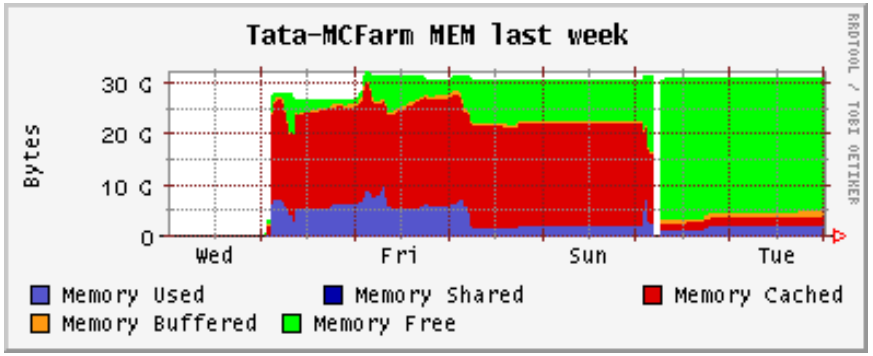
Generation time : 3-4 minutes per event in one processor

Grid Report for Wed, 16 Apr 2003 00:15:37 -0500

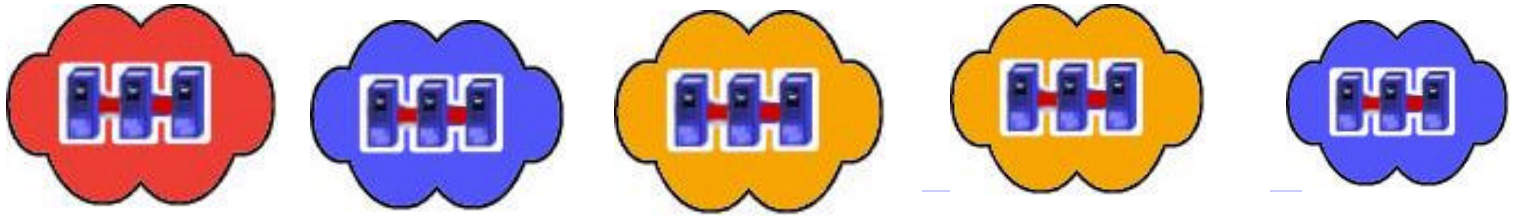
Ganglia Cluster Toolkit
http://ganglia.sourceforge.net

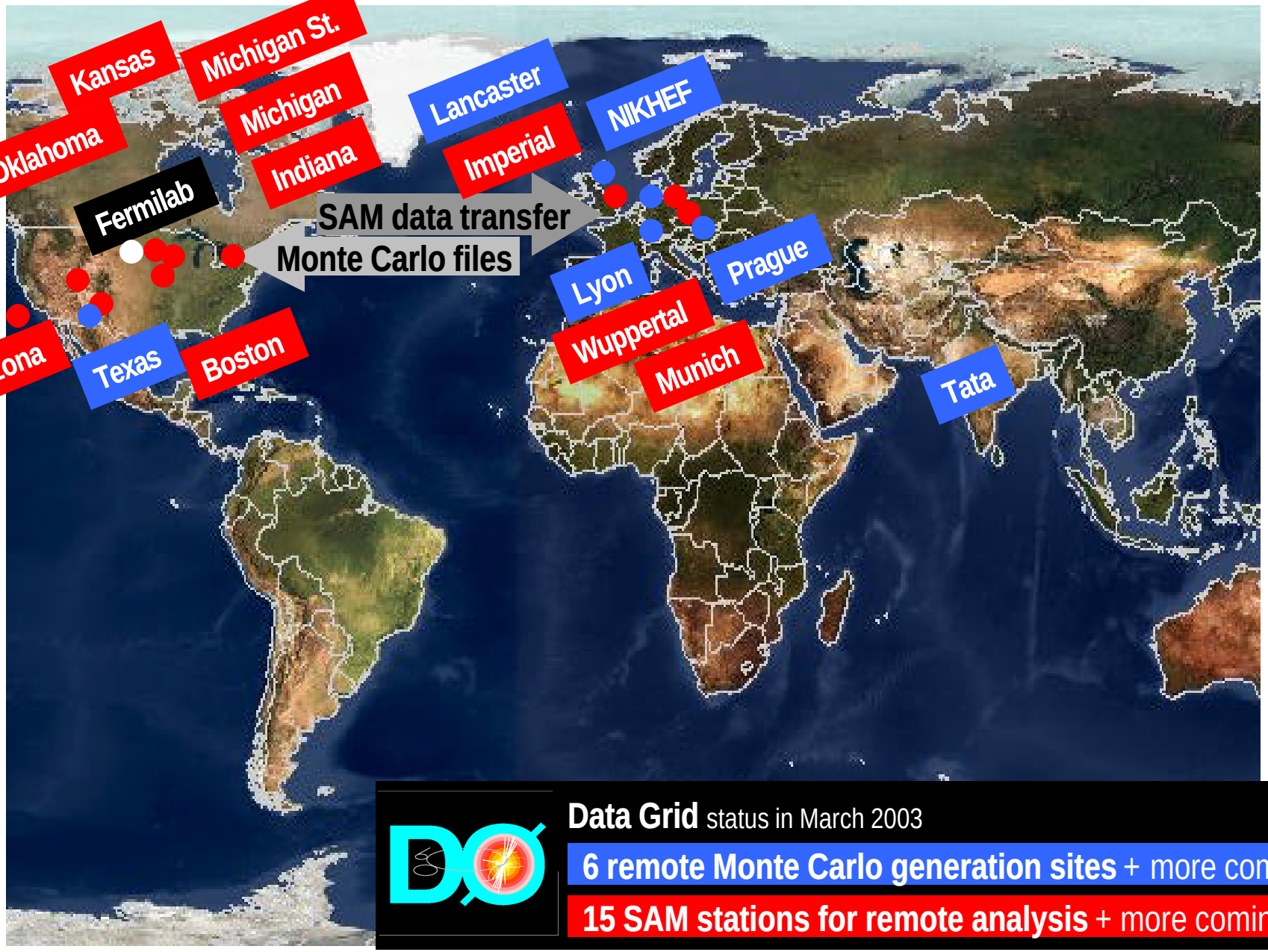
Metric Last Sorted





CSE-FARM **LTU Physics** **OUHEP** **SWIFT-FARM** **Tata-MCFarm**





Data Grid status in March 2003

6 remote Monte Carlo generation sites + more coming

15 SAM stations for remote analysis + more coming

Fermi News, January 31, 2003

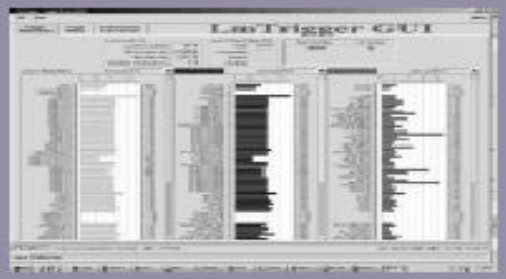
New

monitoring system

allows serving

control room shifts

as far away as India



DZero Goes Global

by Mike Perricone

On Friday, January 3 at about 5 a.m. Central Standard Time, Onne Peters was on a control room shift for Fermilab's DZero detector when he saw something that wasn't right: hot cells, or excess jets, appearing in the detector's calorimeter. He immediately notified the shift captain, who alerted the calorimeter expert on shift, and the problem was solved.

It might sound like particle physics business as usual in the predawn of a winter morning, but there was a big difference: Peters was serving his DZero control room shift from a computer at NIKHEF, the National Institute for Nuclear Physics and High Energy Physics in Amsterdam, Holland. Some 4,000 miles and an ocean away from the chilly predawn in Batavia, Illinois, Peters was hooked into DZero's new Global Monitoring System.

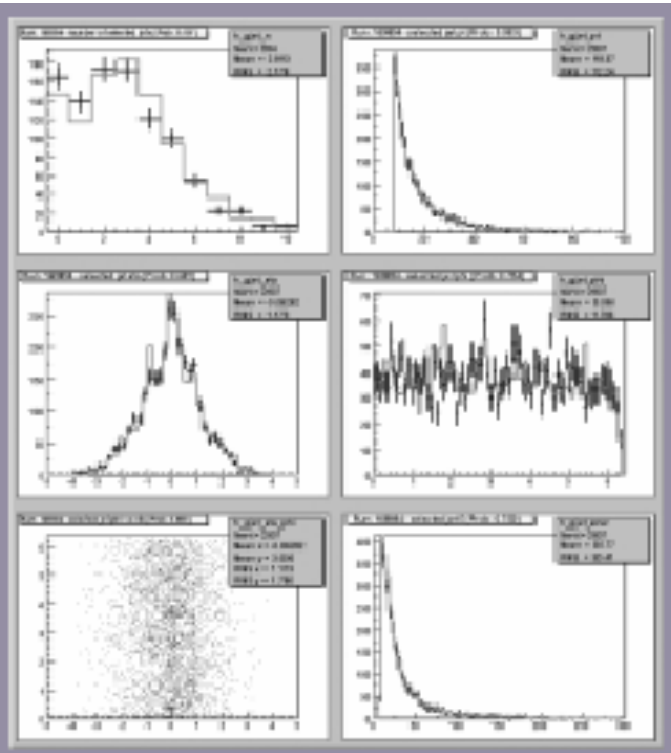
DZero has seen the future, and it works.

It works as far away as NIKHEF in Holland; the Saclay laboratory of CEA, the French Atomic Energy Commission; and the Tata Institute of Fundamental Research in Mumbai, India, where experimenters have taken "virtual" shifts in the DZero control room through the Global Monitoring System.

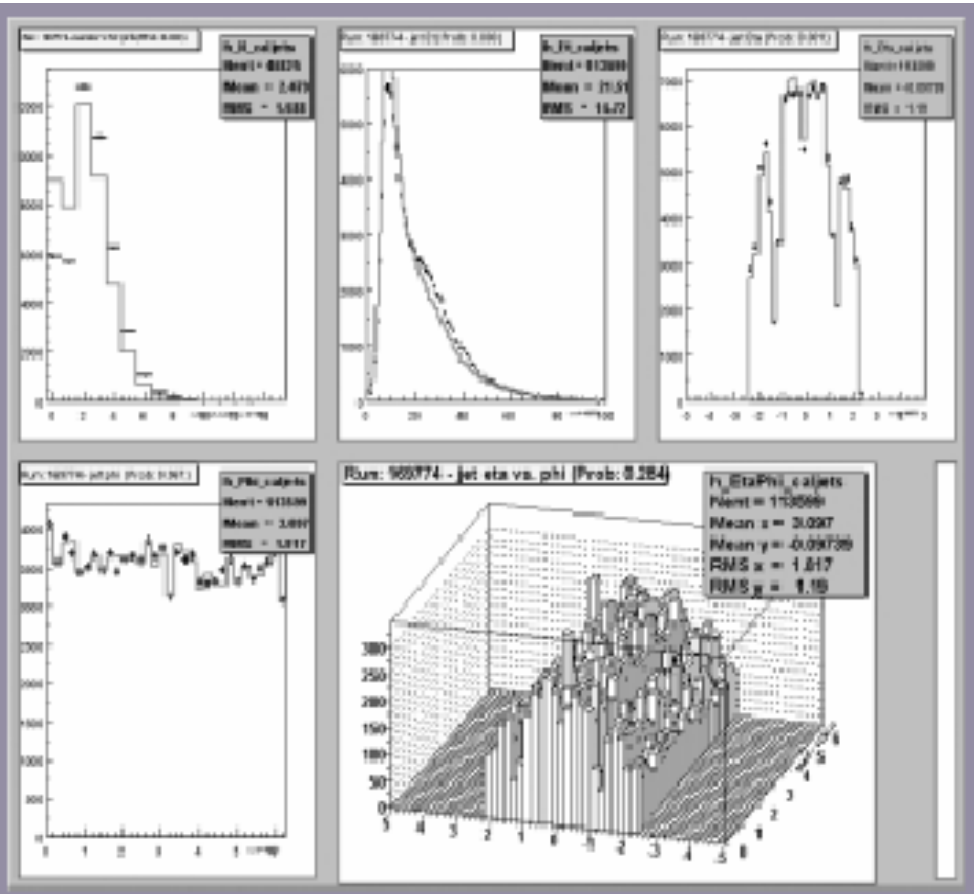
"This is absolutely the wave of the future," said Peters. "With increasingly international collaborations, it is just not feasible to expect people to be available on-site for a large amount of time. This is a trend we see with remote computing, the remote analysis stations, as well, and I certainly foresee that these projects will benefit high-energy physics greatly."

DZero cospokesperson John Womersley also sees future applications when the Large Hadron Collider begins operations at CERN, the European Particle Physics Laboratory.

Global Monitoring Shifts



Here's a sample of what Bhat and remote shifters like Onne Peters are viewing simultaneously: Plots of some basic characteristics such as number per event, transverse and total energies, pseudo-rapidity and azimuthal angle for hadronic jets satisfying set selection criteria after reconstruction on-line. The crosses are the data being recorded at the time; the histograms are the reference distributions used as standards for comparisons.



Left: Plots from Physics Examined Data.
Above: Plots from Trigger Examined Data.

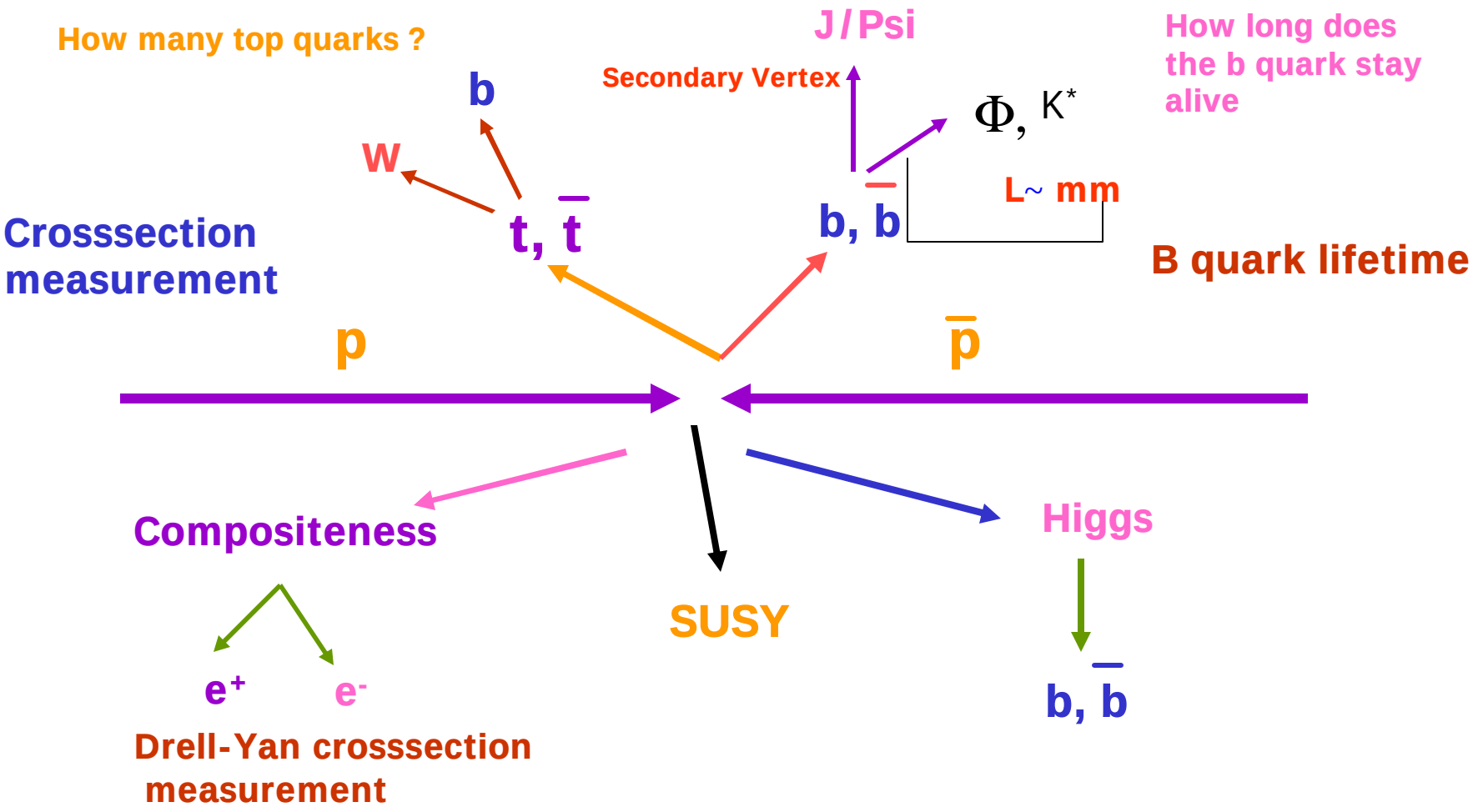
Physics Analysis using Run 1 Data

- Search for Supersymmetric particles using leptons.
- Search for R-parity violating SUSY using electrons.
- Search for R-parity violating SUSY using muons.
- Search for quark lepton compositeness.
- Search for Extra dimension at TeV scale using dielectron data.
- Search for new particles decaying to t-tbar.

Four students received Ph.D. degrees through participation in these analysis. Group members were fully responsible for PRL publications from these analysis.

Participation in Run 2 Physics

4 faculty members and 6 grad students



Panjab University in DØ

Detector Hardware:

- Joined in 1989.
- Worked on the central muon scintillation cover at Fermilab.
- Proposed to fabricate part of the forward muon scintillator pixel counters.
- Worked on the design of the scintillator pixel counters.
- Developed and tested prototype detectors at P.U. Lab.

Software:

- DAQ Software development.
- Event Display.
- Muon Hit library.
- Data monitoring software.

Panjab University in DØ

Physics Analysis:

- Active presence in Run 1 Top group.
- Involved in the top mass measurement using conventional and multivariate techniques.
- Inclusive jet cross section measurement.
- Developing new techniques to reduce the uncertainties in top mass measurement in D0.

Remote Shifts:

- Taking remote SAM shifts.

Current strength of the group:

3 Faculty, 1 SRF and 2 students.

No of students received Ph.D. so far is 2 + 2*

Delhi University in DØ

- Strong presence in QCD Physics group.
  - Run 1 ananysis:
    - Transverse Energy and Cone Size Dependence of the Inclusive Jet Cross Section.
  - Present Involvement:
    - Monte Carlo Simulation Work on Direct Photon Physics.
  - Run 2 Activities:
    - Intend to participate in the Software and Data Analysis and also the service work in hardware maintenance (Si microstrip detector preferably).