First look at the RunII D0 data

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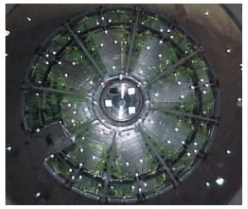
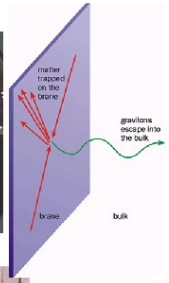
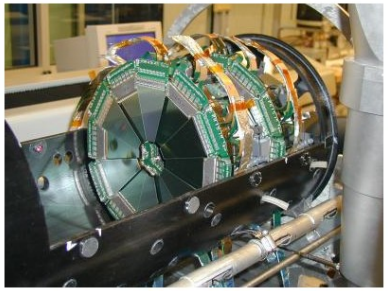
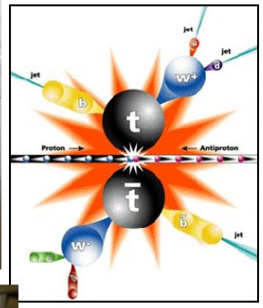
On behalf of the collaboration

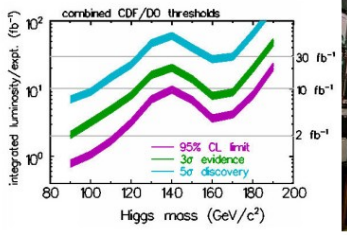
- *RunII: introduction*
- *D0 upgrades*
- *Detector status*
- *First look at the data*

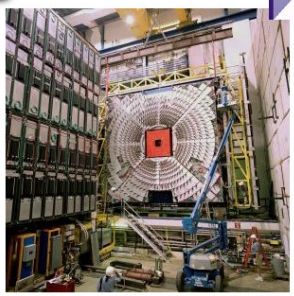




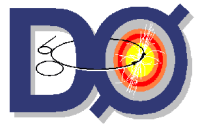








The RunII detector upgrade

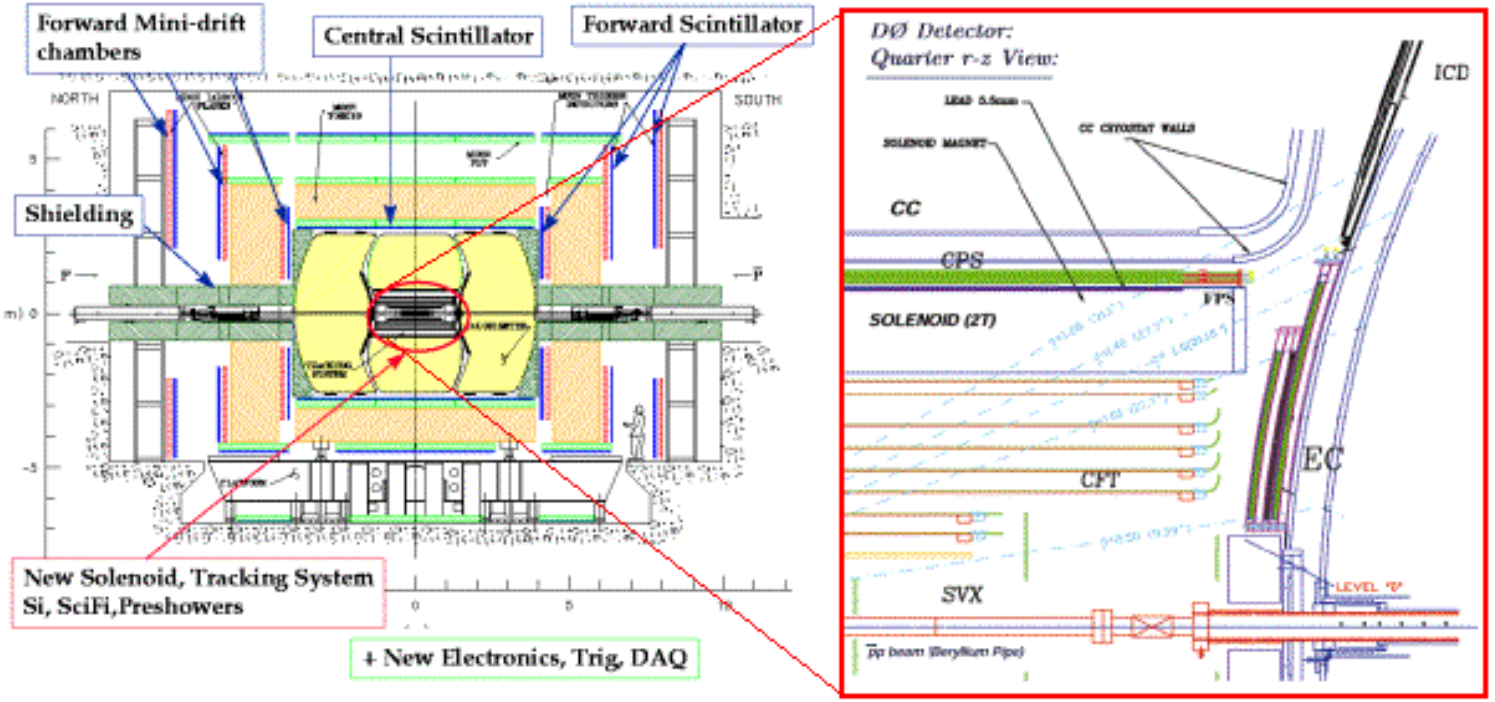


- *RunII physics goals* :
  - Investigate EW symmetry breaking
  - Precision top and W mass measurements
  - Search for new phenomena
  - QCD studies
  - *b*- physics

- *Tevatron upgrade* :
  - Higher $\sqrt{(s)}$: 1.8 TeV ⟶ 1.96 TeV
  - Increased luminosity (2 fb^{-1} in RunIIa , 15 fb^{-1} in RunIIb)

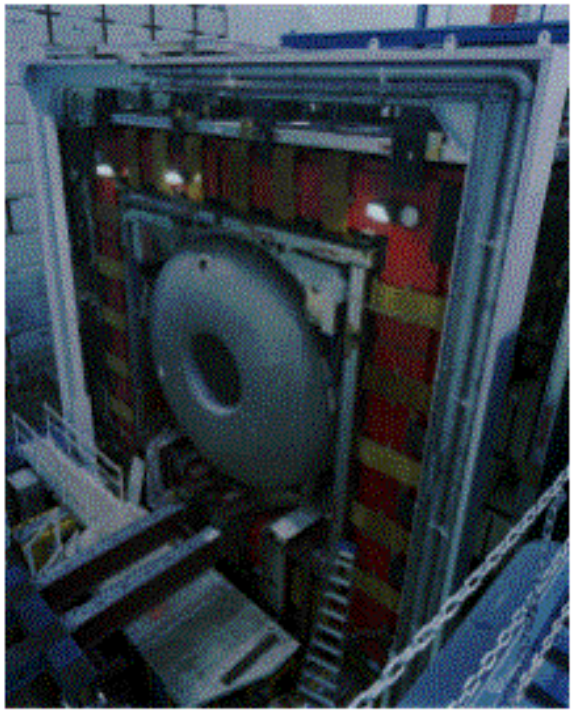
- *Build on strengths of RunI detector* :
  - State of the art calorimetry, hermetic detector
  - Lepton ID over large rapidity range

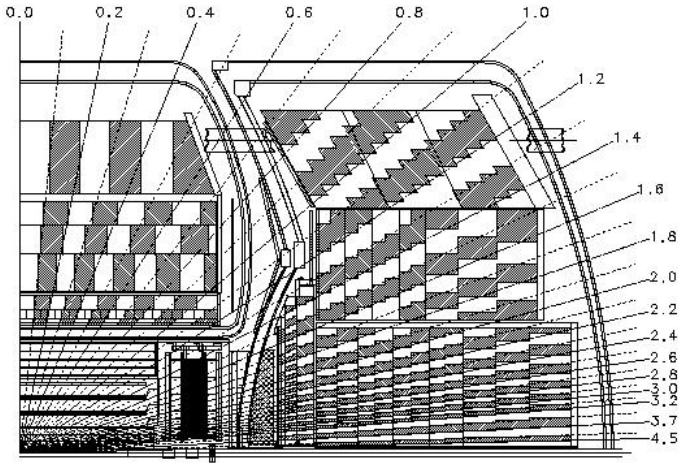
- 2T superconducting solenoid
- Inner tracker (silicon microstrips, scintillating fibers)
- Preshower detectors
- Increased shielding, upgraded muon system
- Faster readout electronics
- New trigger and DAQ



Calorimeter

- 55K channels U/LAr calorimeter, fine segmentation, uniform response, rad hard, good energy resolution
- Replace readout electronics
- Fully operational (0.1% bad channels)
- Preliminary calibration
- Preshower detectors, ICD

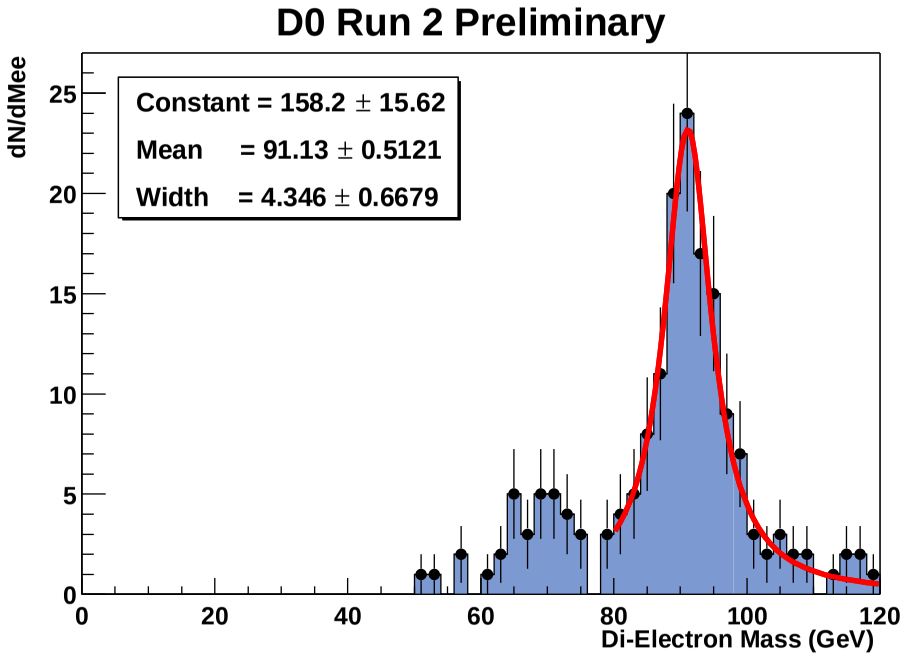


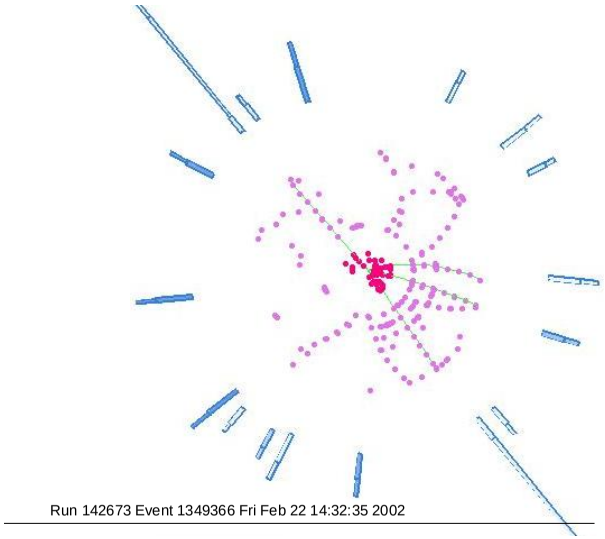


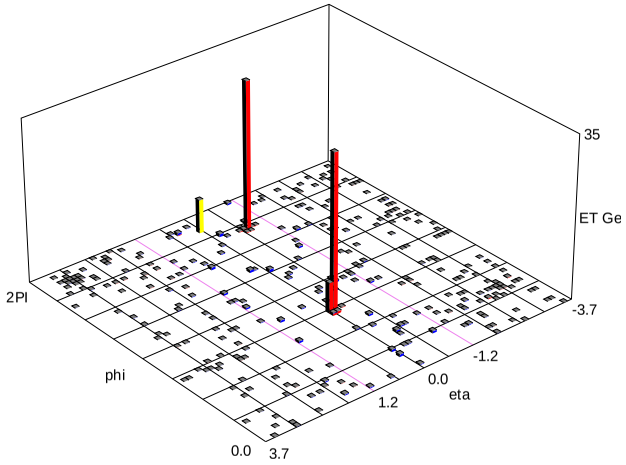
Z decays into electrons

- Calorimeter calibration
- Mass peak: absolute energy scale
- Z width: energy resolution

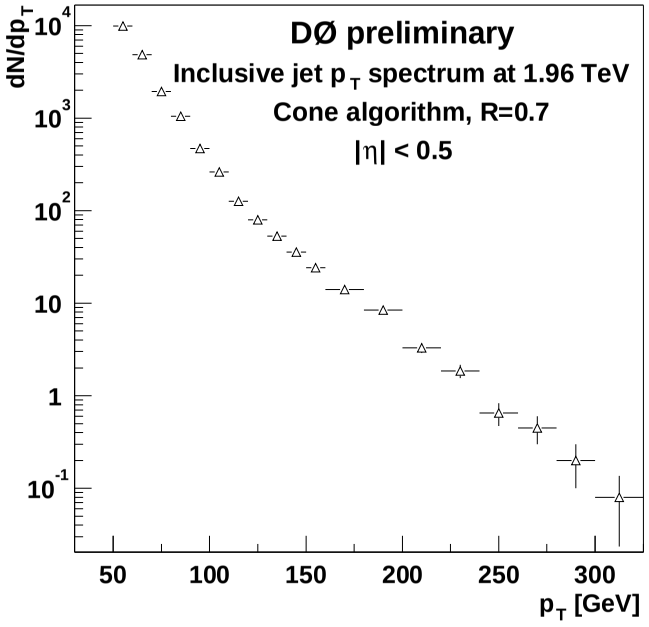
- Electroweak physics





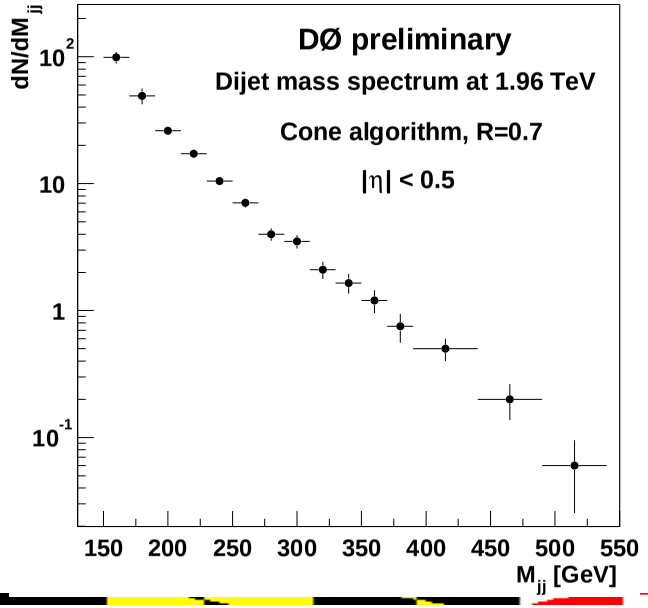


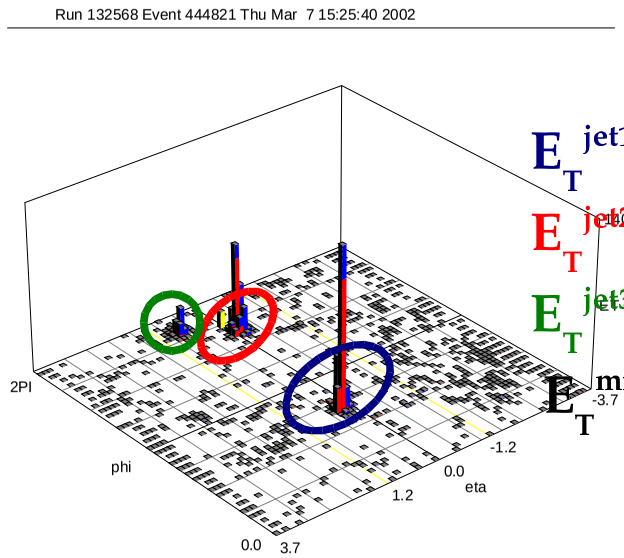
First QCD studies



- Relative E scale of hadronic calorimete measured with photon + jet events
- No trigger efficiency corrections
- Preliminary energy scale

- High p_T triggers are not prescaled





E_T^{jet1}: 310 GeV

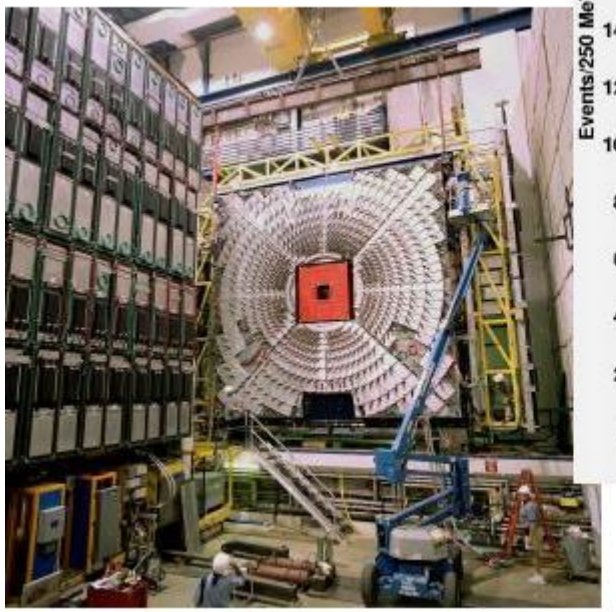
E_T^{jet2}: 240 GeV

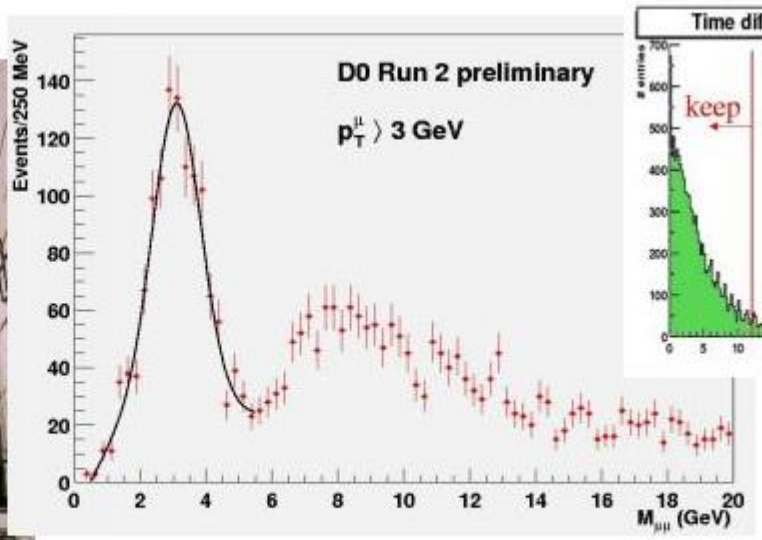
E_T^{jet3}: 110 GeV

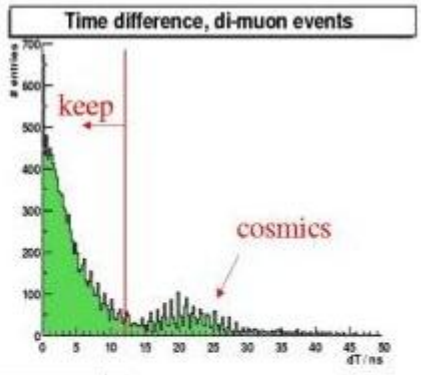
E_T^{mis}: 8 GeV

Muon detectors

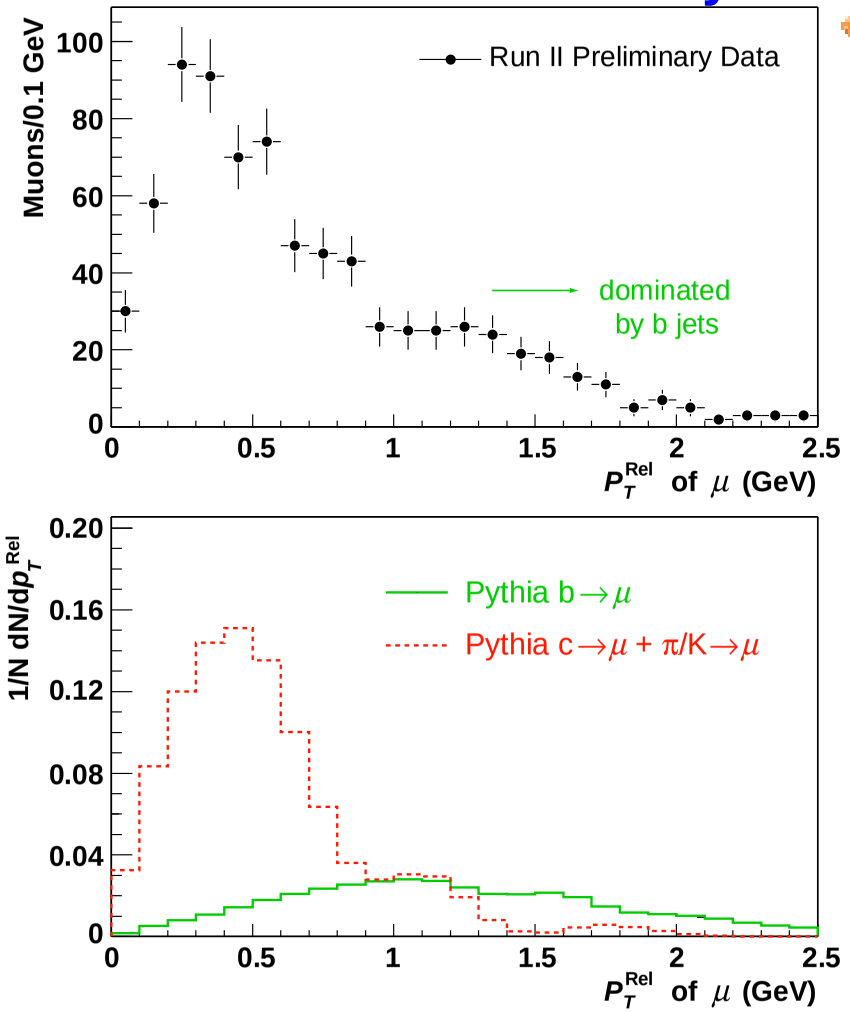
- Increased shielding close to beam
- Central region: reuse RunI PDT, faster gas, additional layer of scintillator counters (triggering, veto cosmics), new electronics
- Completely new forward system: 3 layers of mini drift tubes and scintillator pixel counters
- Fully operational, low backgrounds



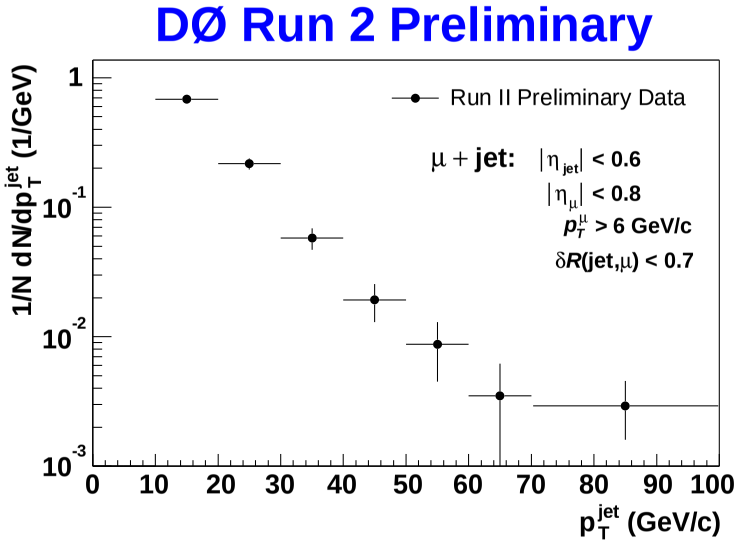




b physics with muons in jets

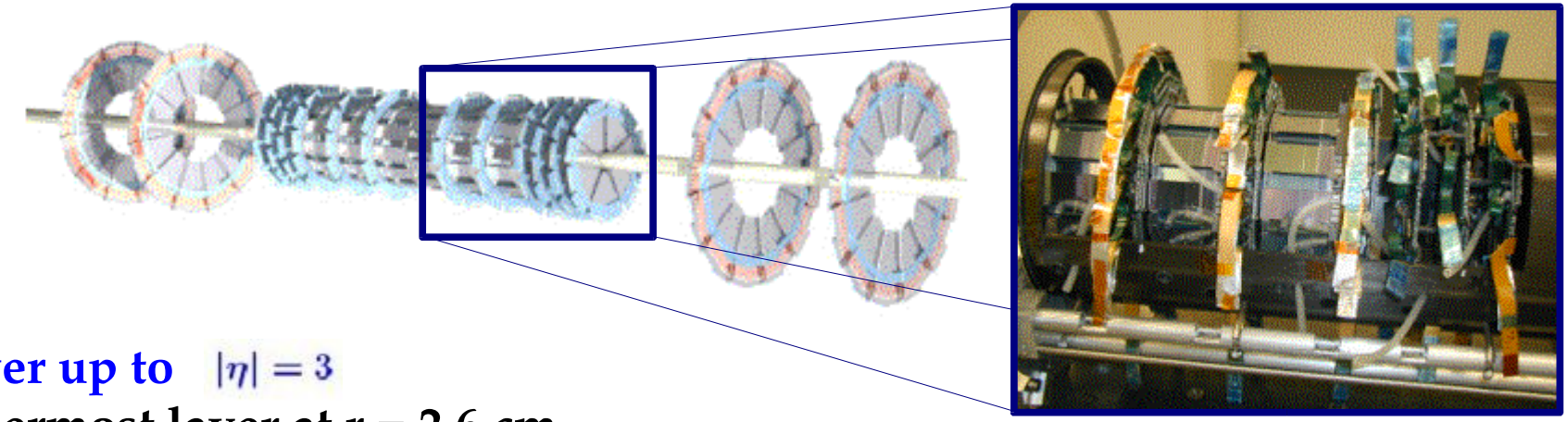


- Discriminate $b \to \mu$ and backgrounds using **transverse momentum** of **muons** relative to the jet axis



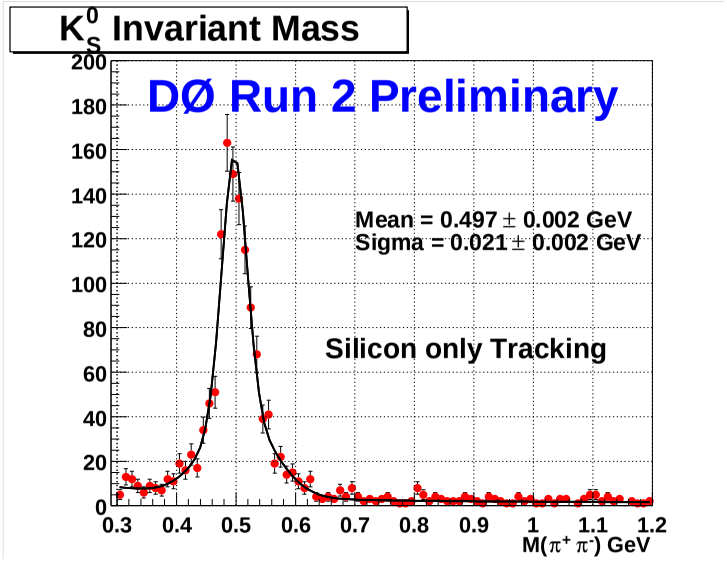
p_T^{rel} distribution consistent with RunI data

Silicon microstrips



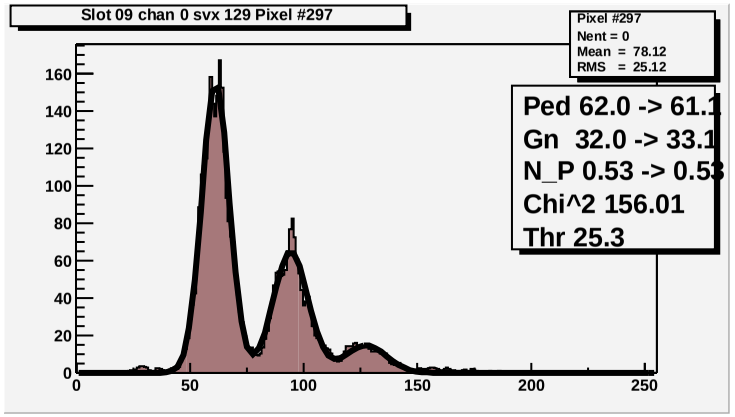
- cover up to $|\eta| = 3$
- innermost layer at r = 2.6 cm
- central region: 6 modules of 4 layers (SS and DS) plus 12 F disks (DS)
- forward region: 4 forward disks (SS)
- 800k channels
- rad hard up to 1 Mrad
- More than 90% operational

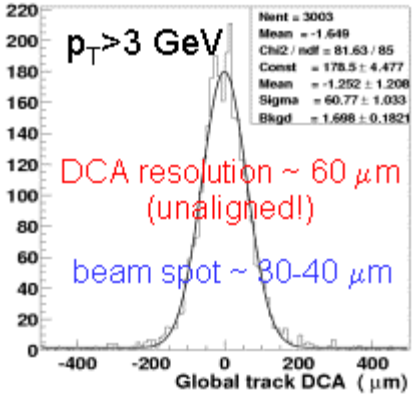
SS: single sided
DS: double sided

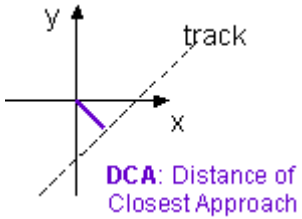


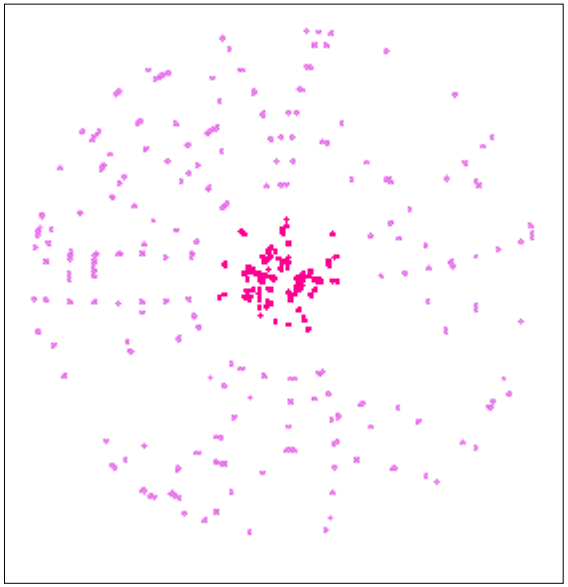
Fiber tracker

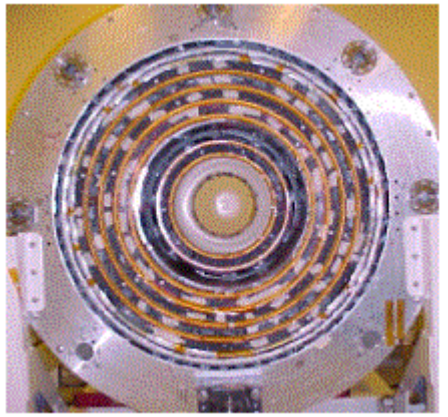
- cover up to $|\eta| = 1.7$
- 20 cm < r < 51 cm
- 8 double layers (2 axial, 2 stereo 2º)
- 74k 830 μm fibers readout with VLPC
- Operate at 9 K, 85% Q.E., good S/N
- readout: axial 100% installed, stereo 50%





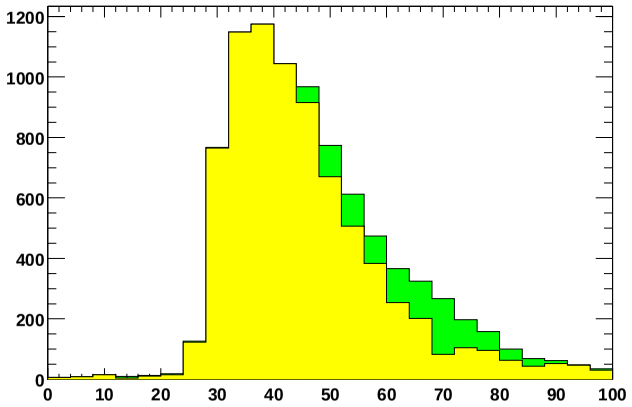


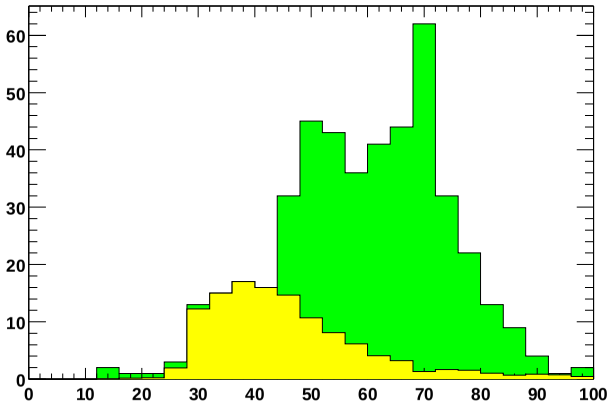




End view

Using the tracking information ....

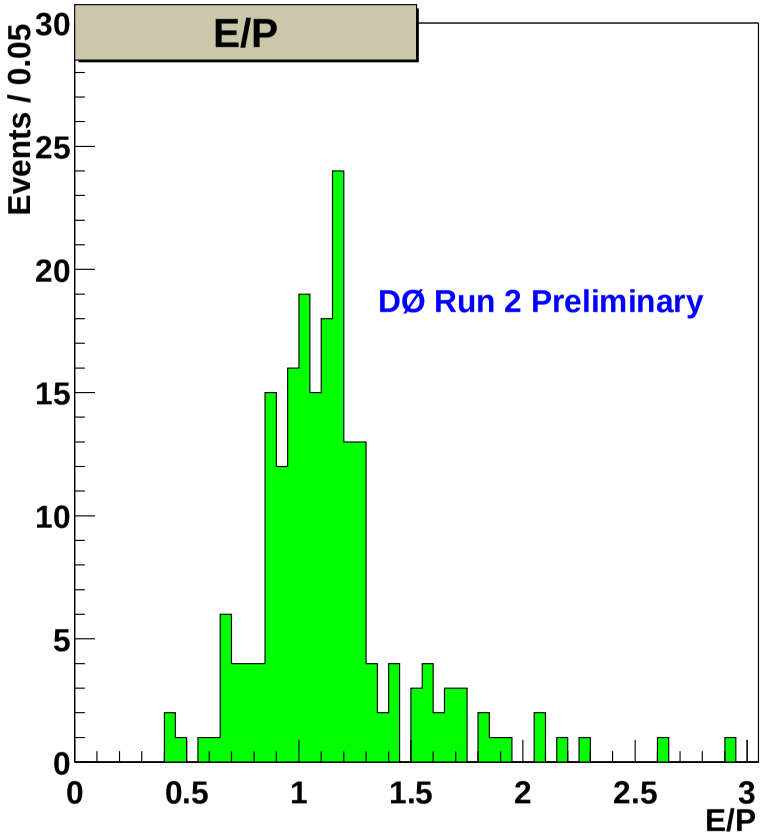




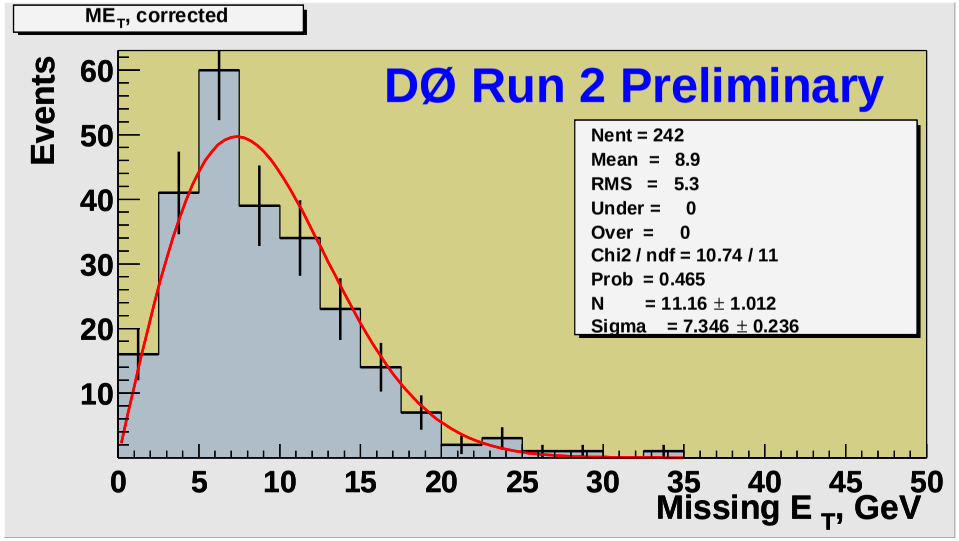
Add tracking information

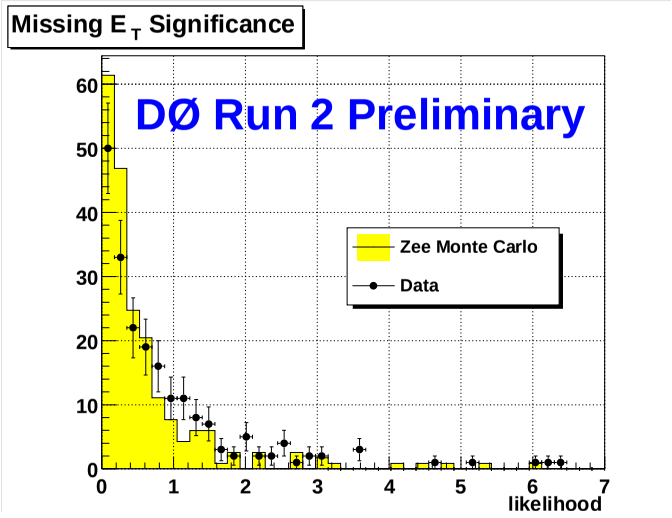
QCD background obtained from data

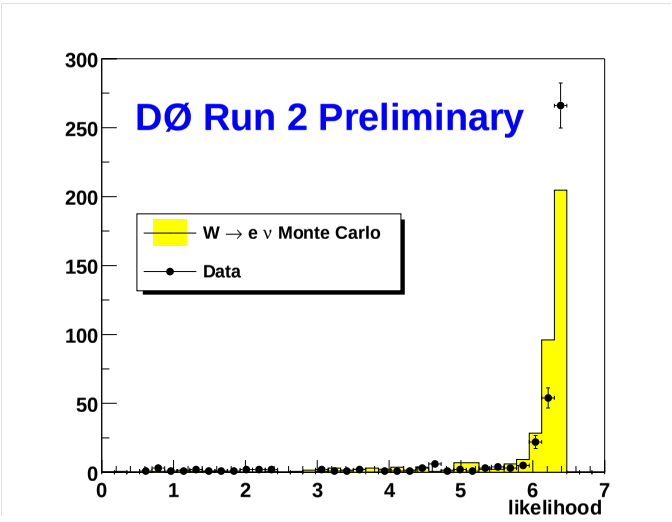
E/p for electrons in W decays:
not used in event selection



Missing E_T



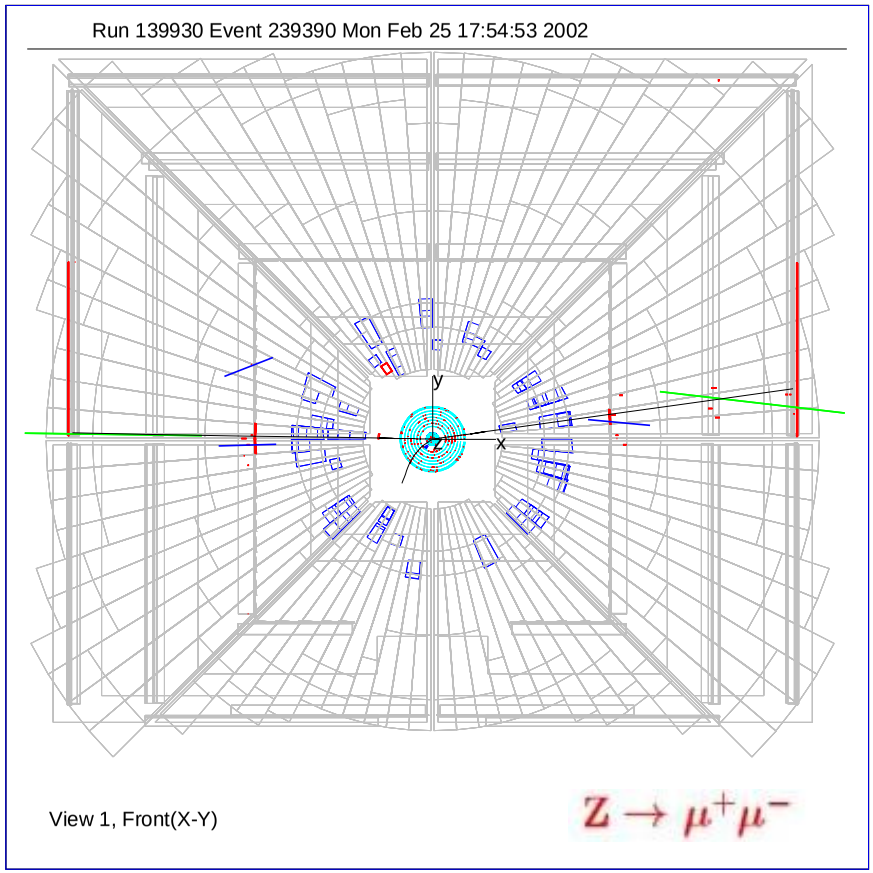


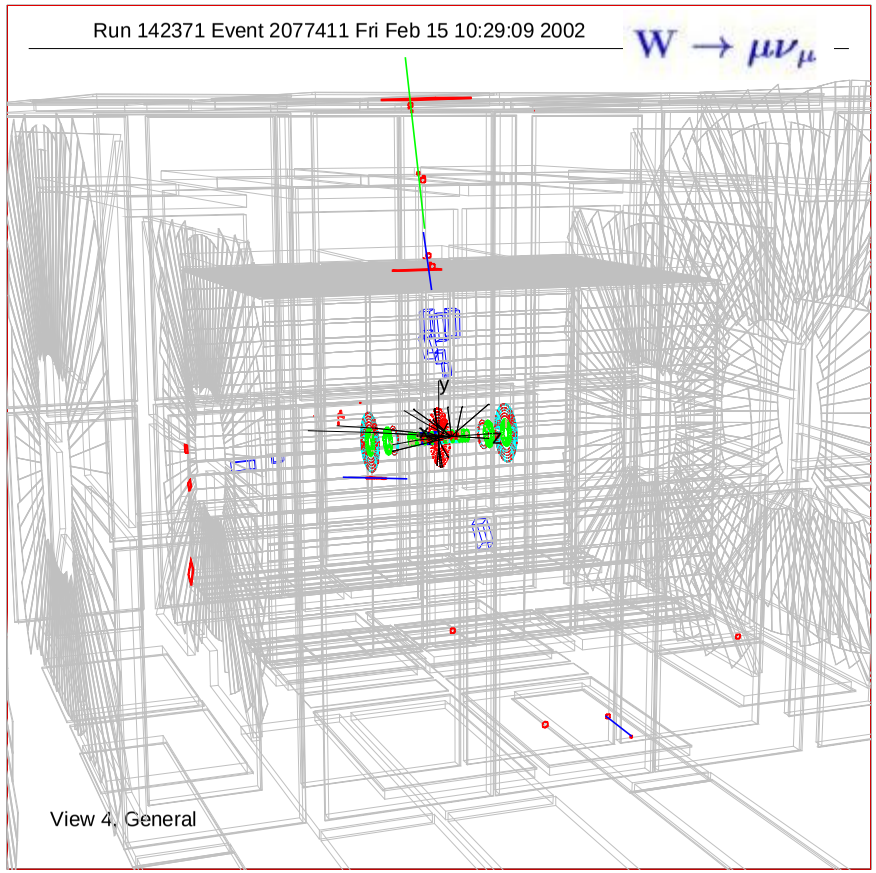


- Small non gaussian tails in Missing E_T distributions
- Build a quantity `Missing E_T significance' to account for event topology, reconstructed vertices, energy resolution
- Missing E_T significance (using errors from data) well described in MC

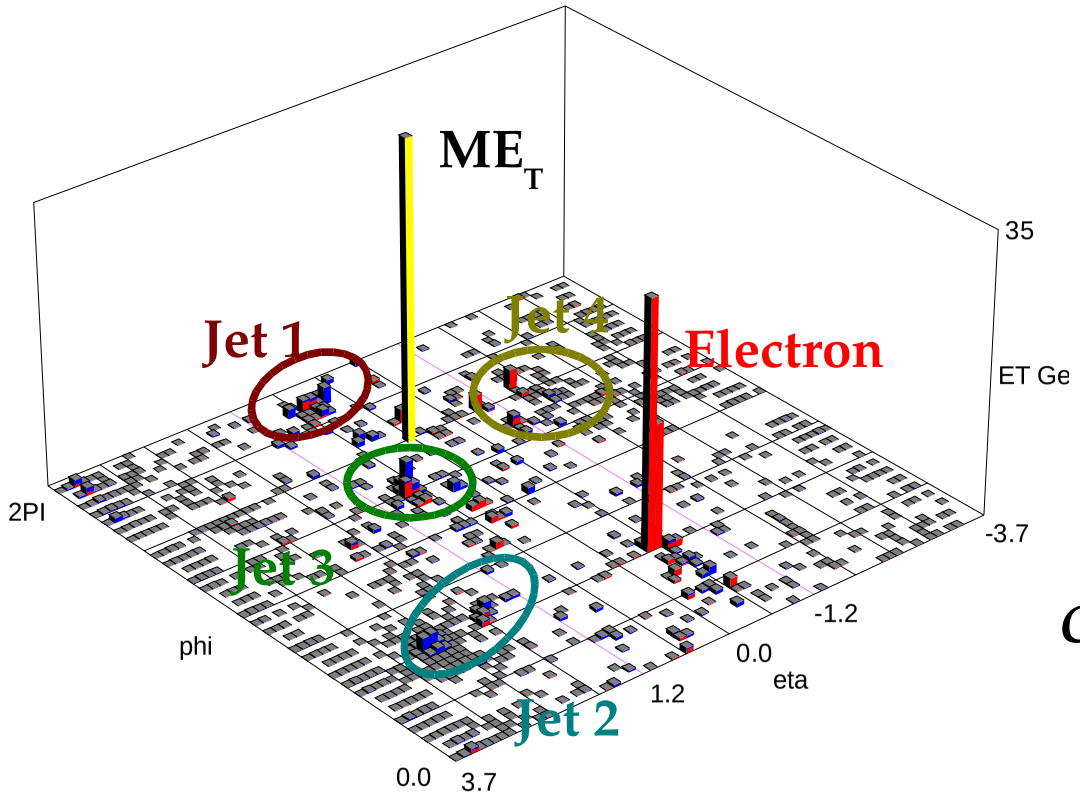
Linking central tracks with the muon detector

- Improve momentum resolution for muons





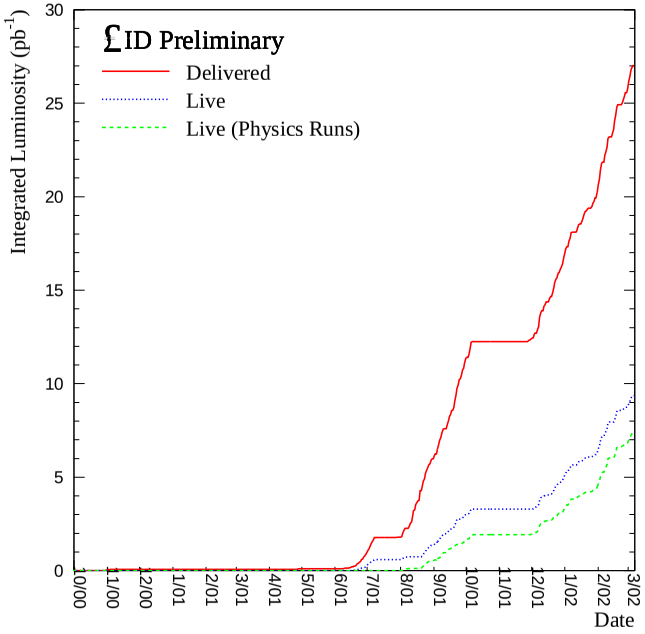
Interesting events ..... Stay tuned !!!



- **Electron: E_T = 52 GeV**
- **Jet 1: E_T = 28 GeV**
- **Jet 2: E_T = 24 GeV**
- **Jet 3: E_T = 21 GeV**
- **Jet 4: E_T = 20 GeV**
- **Missing E_T = 30 GeV**

Compatible with W+jets, QCD background, (top)

And of course we are looking at many other topologies ....

Outlook

- Tevatron RunII started march 2001, exciting physics program for the next years
- Enormous progress in understanding the detector performance
- Preliminary results indicate that with the upgraded *D0* detector we will be able to fully exploit the available physics opportunities
- Integrated luminosity delivered up to now 27 pb^{-1}
- Expect 300 pb^{-1} by the end of 2002