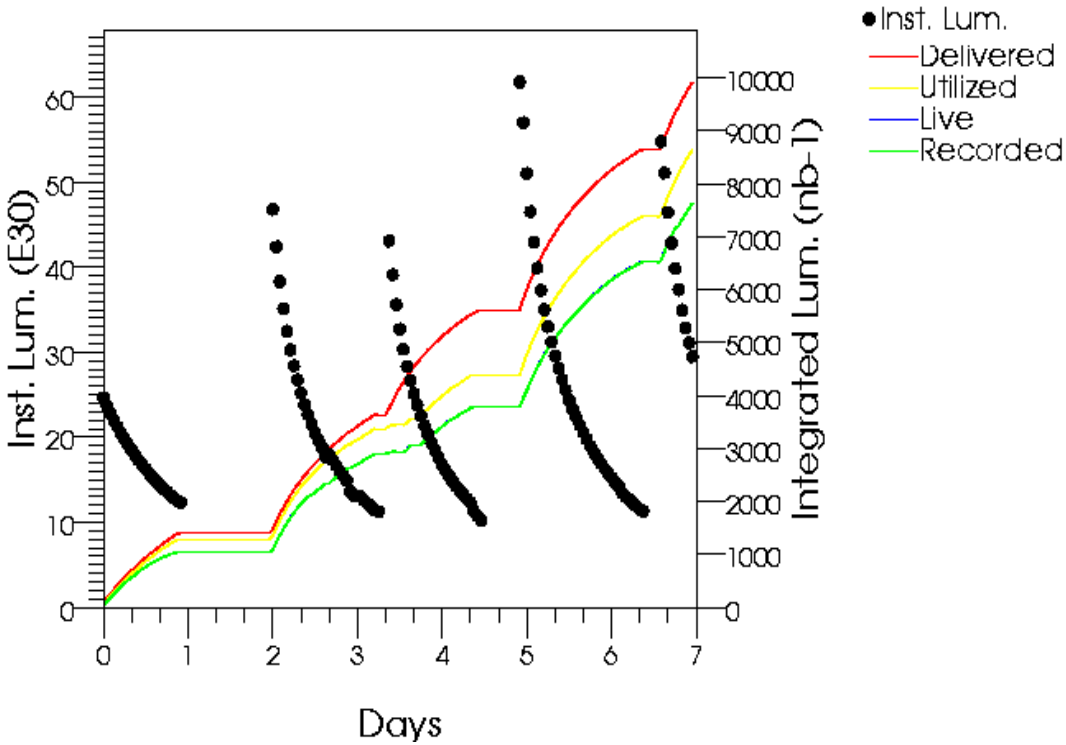
D0 Data Taking Summary: March 1 to March 7

- Luminosity
  - Delivered 9.9pb-1
  - Recorded 7.6pb-1
- Data taking efficiency
  - 77% weekly
- Backgrounds
  - P and pbar halo are within specs
- Beam position
  - Within specs
- Number of events collected
  - 14mln



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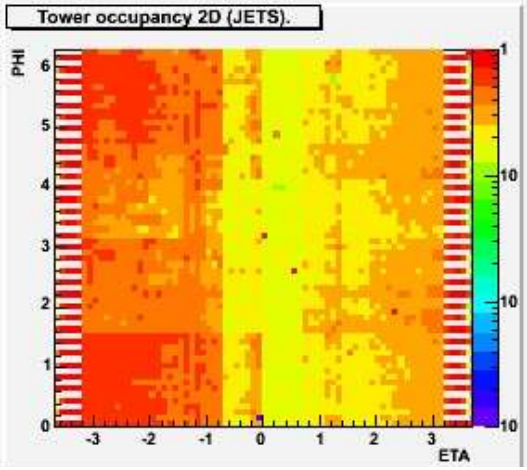
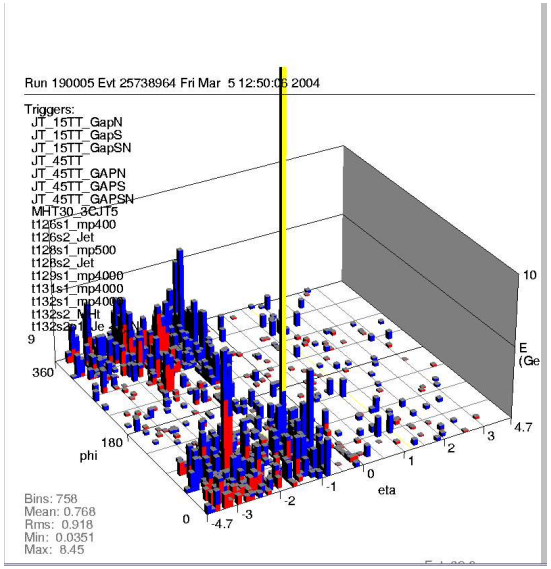
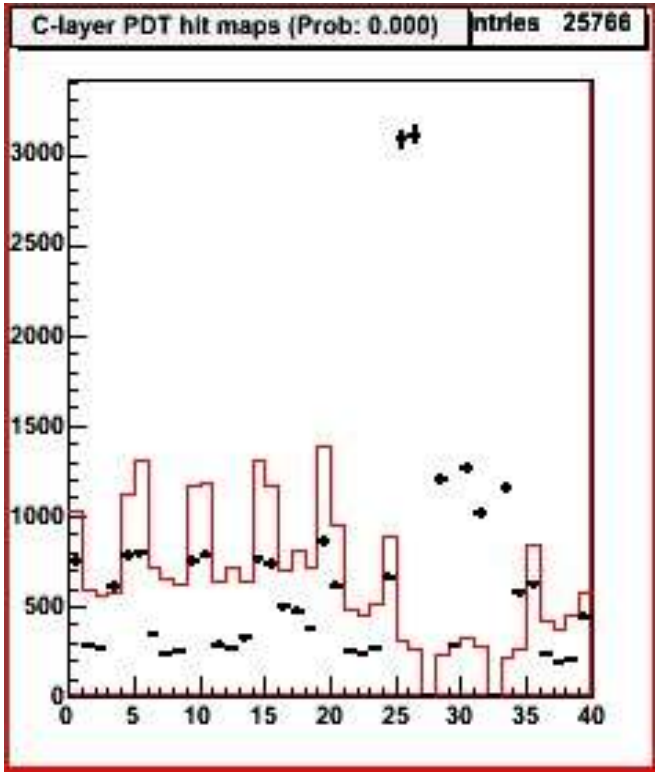
Calorimeter and Muon Noise

- Since late Sunday, February 29th (should not we skip February 29ths ?)
  - New never before seen type of noise affected D0 calorimeter and muon system

Calorimeter On-line plots







Muon Hits Plot

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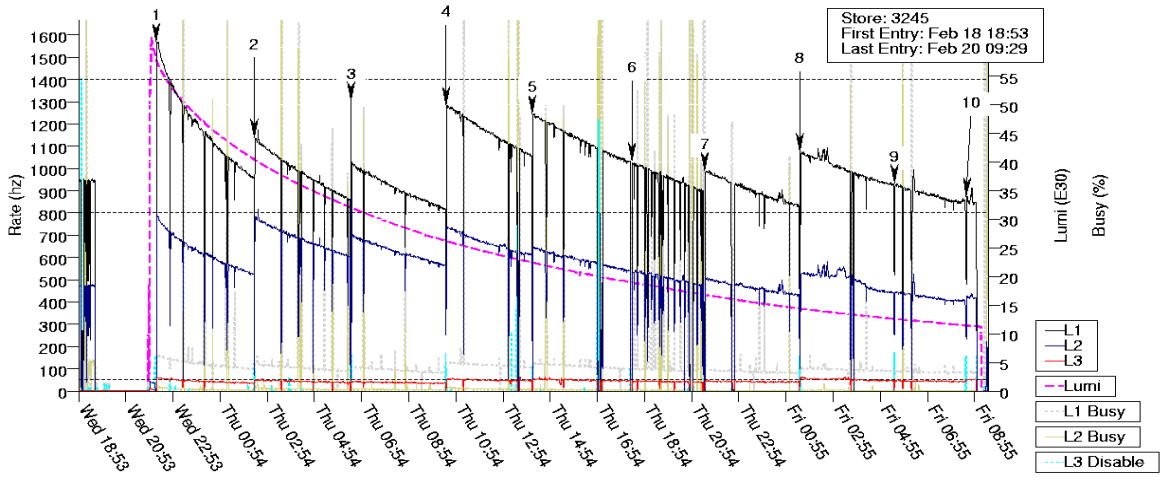
Source of Noise?

- The noise have been detected quickly and by Monday we learned
  - Physics data taking is badly affected
    - Considerable number of events have clear signature of noise
  - Noise is correlated with toroid magnet been turned ON or OFF
    - Noise starts at ~250A current in toroid coils
      - Nominal current is 1500A
    - Noise is coming from noisy power supply?
    - Noise is coming from failed power supply filtering capacitors?
    - Noise is coming from another D0 component which is affected by fringe magnetic field?

Data Taking

- Mostly stable physics data taking without major problems
- Largest sources of downtime
  - Fast dump of solenoid magnet on Tuesday
    - Operator mistake, lost ~1.5 hours – long term resolved
  - Problems during Sunday morning store start
    - Level 2 muon system issues, ~1 hour lost – plan for long term solution in place
  - All other issues been resolved on a time scale of below ~20 minutes
    - 129 hours in stores
    - 124 hours of data taking
- One access request
  - Forward proton detector power supply failure - fixed



Do D0 Detectors Observe Radiation Aging?

- After 3 years of data taking and ~10% of expected Run II luminosity delivered it is time to (re)evaluate situation with radiation aging
  - Should not get missed among multiple other tasks D0 is performing
- D0 has experienced painful muon drift chambers aging issues during Run I
  - ~50% of chambers not used for physics analysis
    - Use of un-tested organic materials during construction
    - Aging effects seen with charges as low as ~1mC/cm
  - Closest to the interaction region chambers have electrodes replaced (~20%) for Run II
  - Other chambers have higher flow rate and gas filtering in re-circulation system
    - Run II shielding reduced particle fluxes by factor of ~10 per unit of delivered luminosity
  - Fast heating of the wires method is developed to "clean" the wires
- Lessons (D0 plus other detectors)
  - Radiation aging is very dangerous – you can damage your detector badly
  - There are un-expected issues with detectors aging which are very difficult (impossible?) to test before real data taking
    - Neutron doses vs gamma doses, etc.
  - We have to constantly monitor for signs of "aging" and act well in advance before problems become severe

Radiation Aging

- Major questions to be answered
  - What is currently total integrated dose for the "hottest" part of the sub-detector?
    - Could be in rads, or in charge/unit of wire for gas detectors
    - Should be normalized by total delivered luminosity
    - Direct measurements (TLDs, currents) or MC simulation
  - What are doses when detector performance expected to start to deteriorate
    - Based on manufacturers specs
    - Based on studies
    - Are we getting close?
  - Do we actually observe any changes in detectors performance – critical!
    - For example
      - Number of phe per mip in the case of fiber tracker
- Will have a series of presentations from D0 about detailed status of radiation aging starting from silicon detector next week

D0 Detectors Radiation Aging Summary

Detector	Expected (measured) dose, worst location, per fb^{-1}	Dose when signal reduction expected	Systematic monitoring of aging effects	Radiation aging effects observed	Comments
Luminosity scintillation counters	~0.3 Mrad	~10% light reduction at 0.5fb-1	Not yet	No	Annealing, later scintillator replacement
Silicon	~0.2 Mrad	Deplition voltage increase at ~0.4Mrad or 2fb-1	Yes	Yes, leakage currents increase No, depletion voltage increase	Many studies been done
Fiber tracker	~15 krad	~15 krad or 1 fb^{-1} (10% light reduction)	Started	No	Annealing?
Calorimeter	~1 Mrad	>10 Mrad or 10 fb^{-1}	Not yet	No	LAr
Muon trigger scintillation counters	~0.5 krad	~20 krad or 40 fb^{-1} (~20% light output reduction)	Yes	No	
Forward muon tracker	~20 mC/cm	>2 C/cm or 100 f b^{-1}	Yes	No	Gas CF_4(90%)+CH_4(10%)
Central muon tracker	~3mC/cm	~10% amplitude drop at 0.5 fb^{-1}	Started	?	Ar(84%)+CH_4(8%)+CF_4(8%) “cleaning” procedure been developed

To be added: preshowers, FPD

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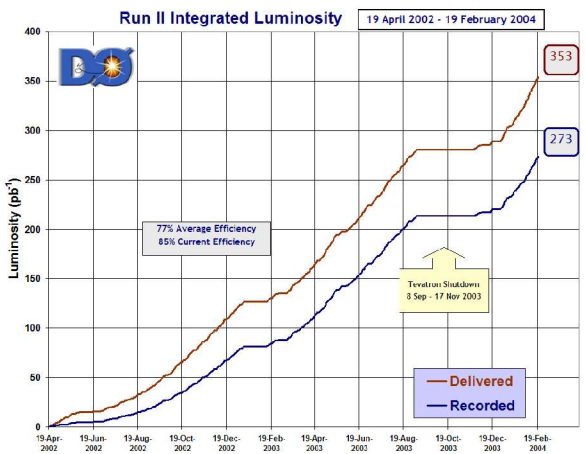
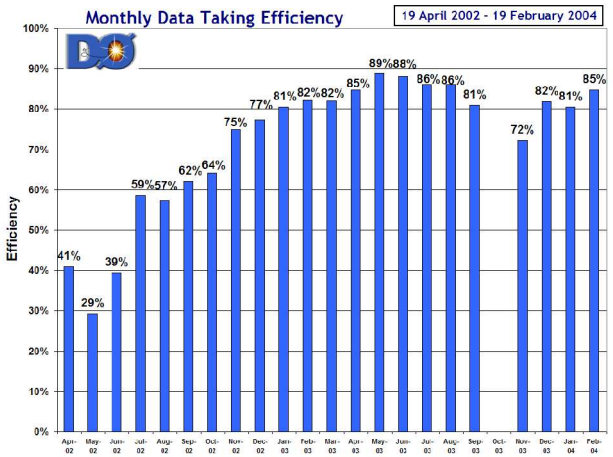
D0 Summary

- Smoothly collecting physics data
  - Data taking efficiency last week is good ~87%
    - Almost 10 pb-1 recorded
    - Best day in terms of recorded luminosity – during record store on Thursday
  - Problems affected data taking are all understood and resolved

- This week is D0 collaboration meeting (at Fermilab)
  - Major focus is physics analysis for coming winter and summer conferences
  - Data samples well above Run I
  - Detectors are more complex then in Run I – more time/efforts needed to understand them well
  - Many interesting results are coming
    - 66 talks during Sunday –Tuesday D0 Physics Workshop this week!