



# Run Report

Taka Yasuda

Vancouver Workshop  
June 2005

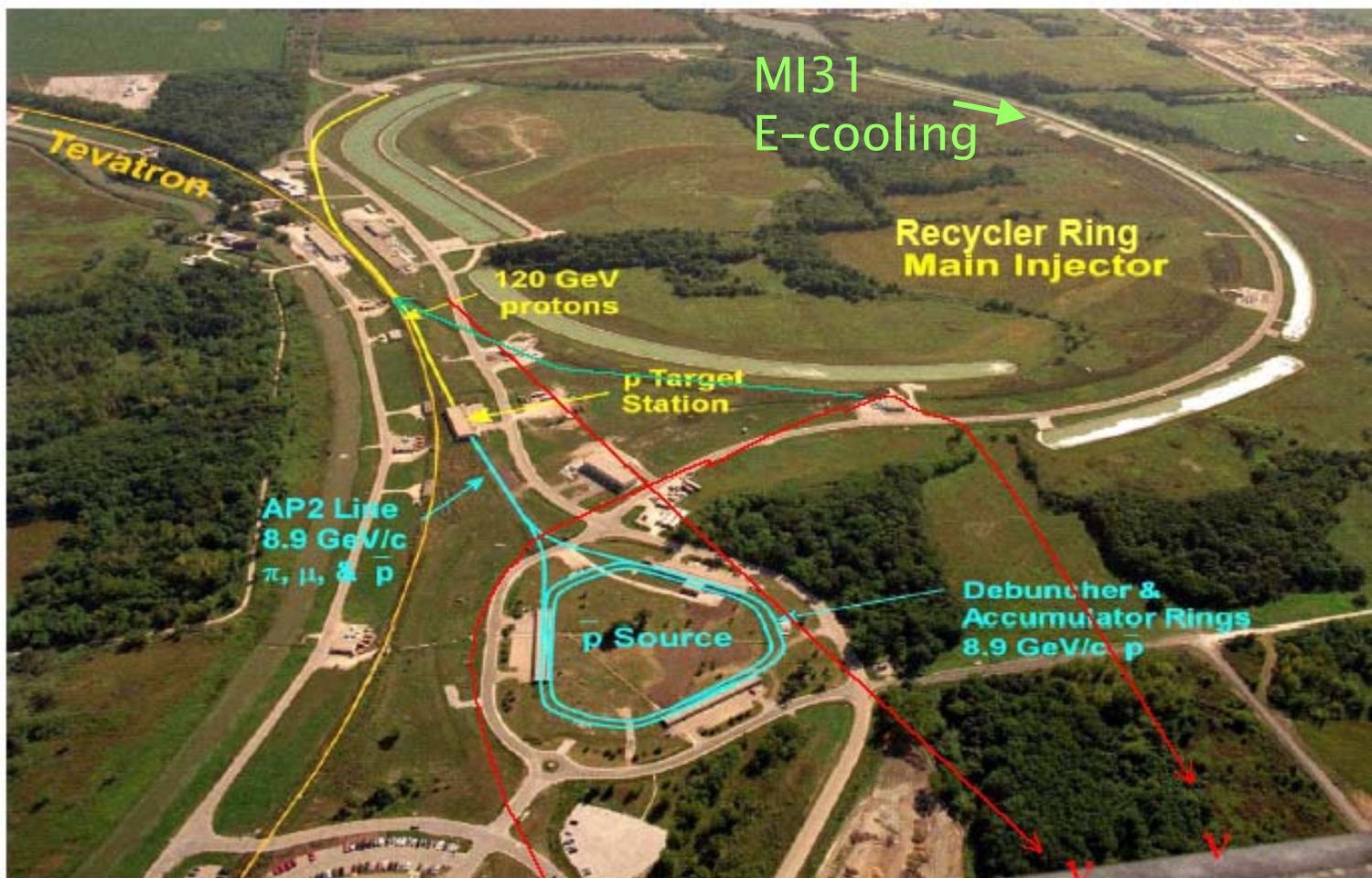


# Outline

- Accelerator Plans and Status
- D0 Detector Status
- D0 Detector Operations



# Accelerator Plans and Status

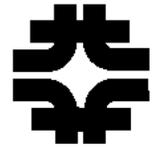


June 2005

T. Yasuda, Fermilab

# Plans for FY05

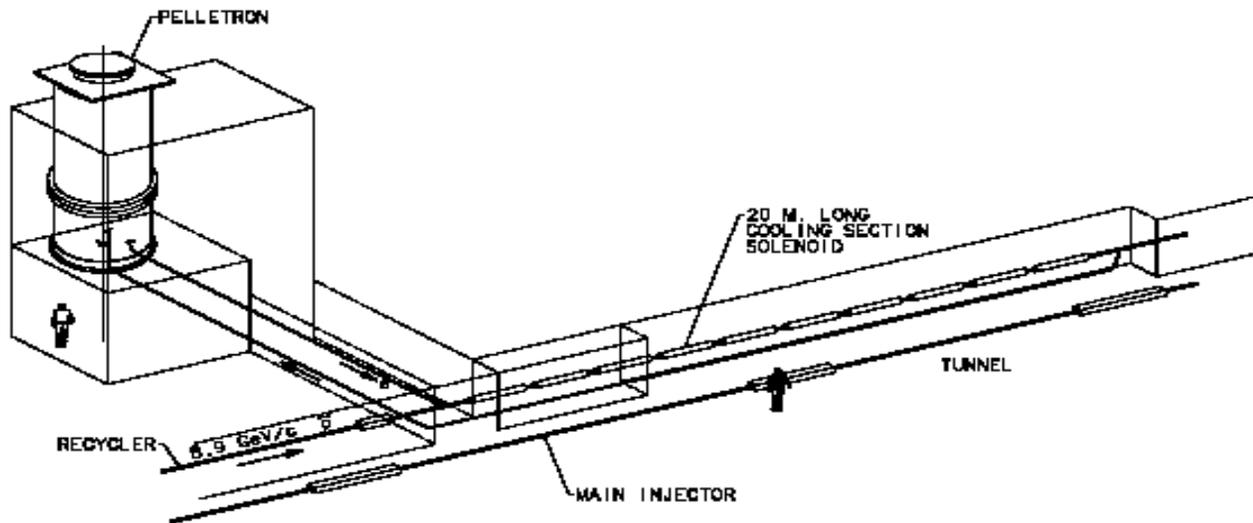
---



- Install electron cooling in the Recycler in Fall '04 shutdown
- Run Slip Stacking at  $8 \times 10^{12}$  protons/pulse every 2 secs
- Increase the pbar production aperture by 25%
- Stack at small stacks with a rate of  $24 \times 10^{10}$  pbars/hr
- Run the complex in Combined Shots operations
  - Assume the gain from Combined Shots operations is “break-even” (pessimistic?)
- Demonstrate electron cooling of antiprotons by the end of FY05
  - 25% Pbar Tax is still in effect
- Integrate  $470 \text{pb}^{-1}$  in 34 weeks (average  $\sim 14 \text{pb}^{-1}/\text{week}$ )
- Commission NUMI by early Spring

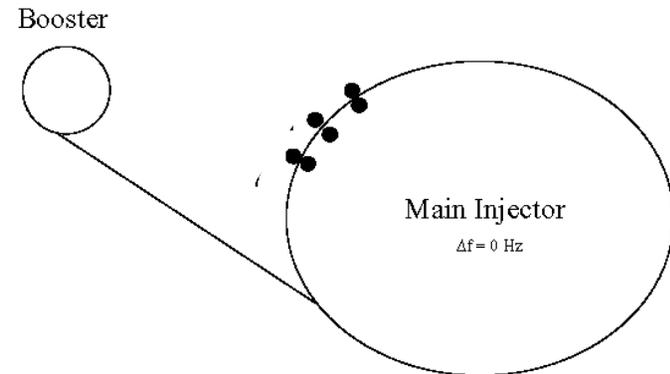
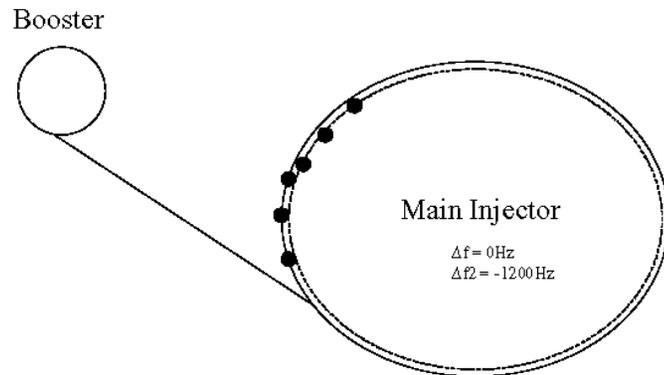
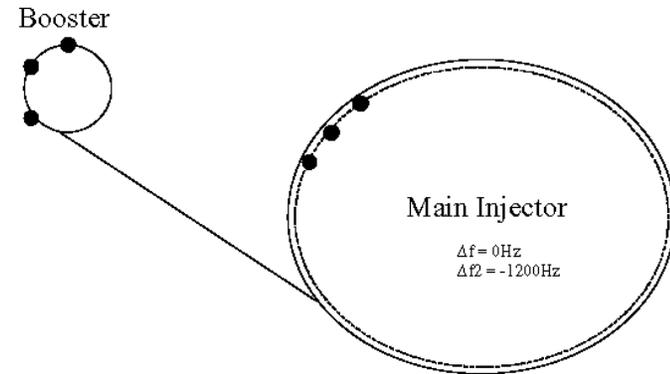
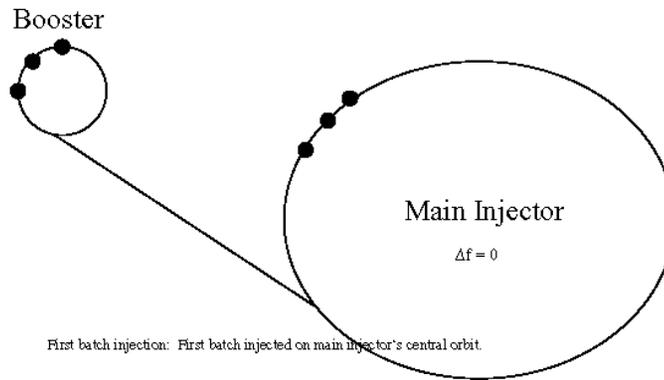


# Electron Cooling



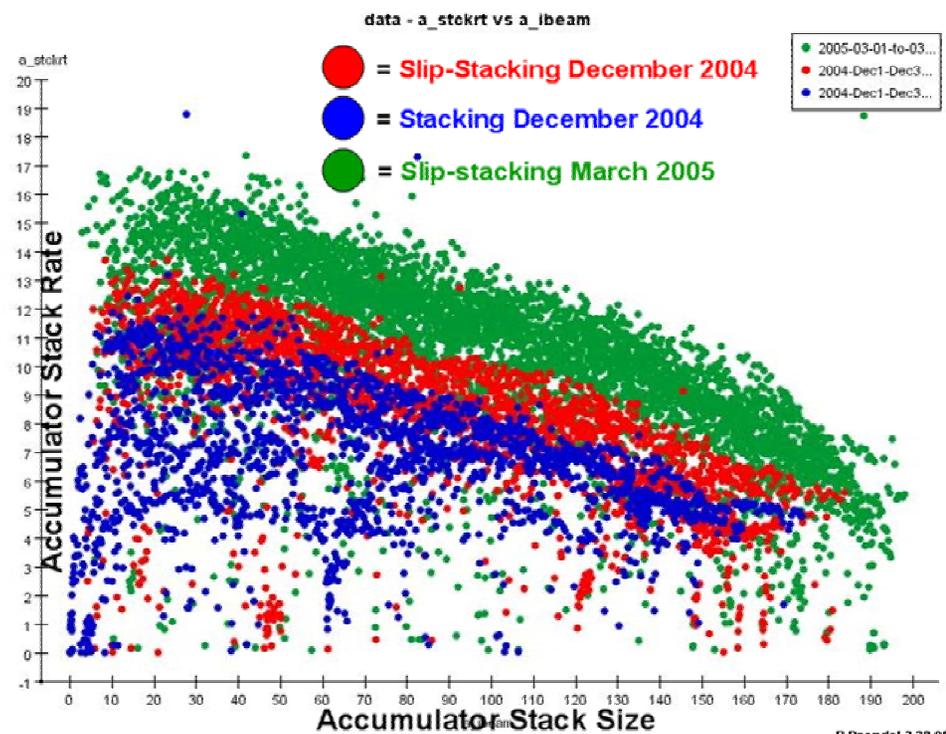
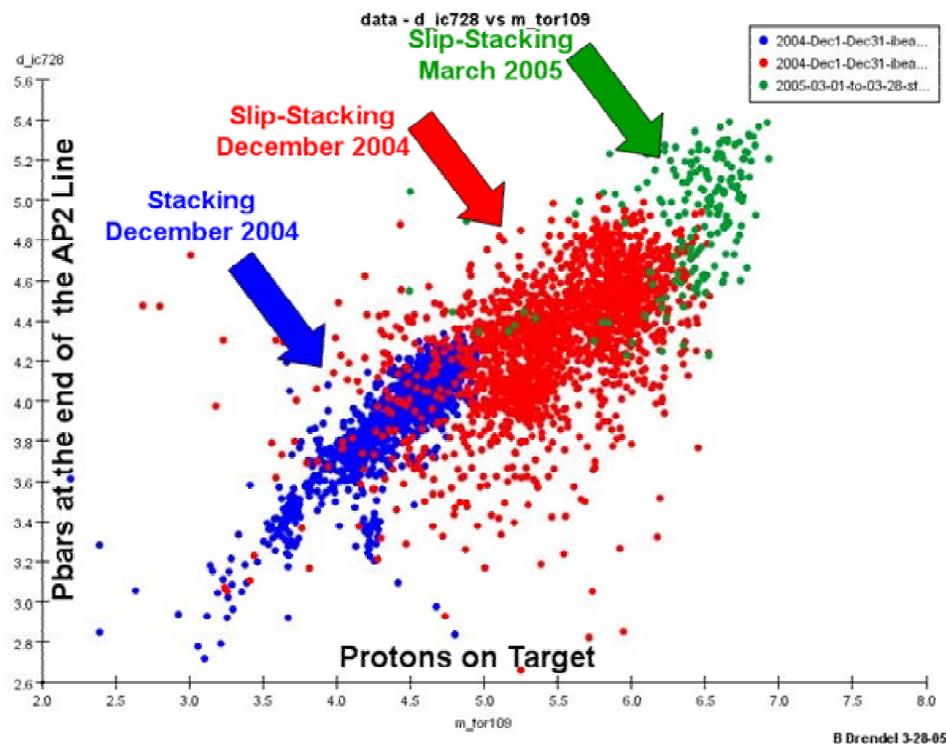
- The maximum antiproton stack size in the Recycler is limited by
  - Stacking Rate
  - Longitudinal cooling in the Recycler
- Longitudinal stochastic cooling of 8 GeV antiprotons in the Recycler is to be replaced by Electron Cooling
  - Electron beam: 4.34 MeV – 0.5 Amps DC – 200 $\mu$ rad beam spread – 99% recirculation efficiency

# Slip Stacking Process





# Slip Stacking



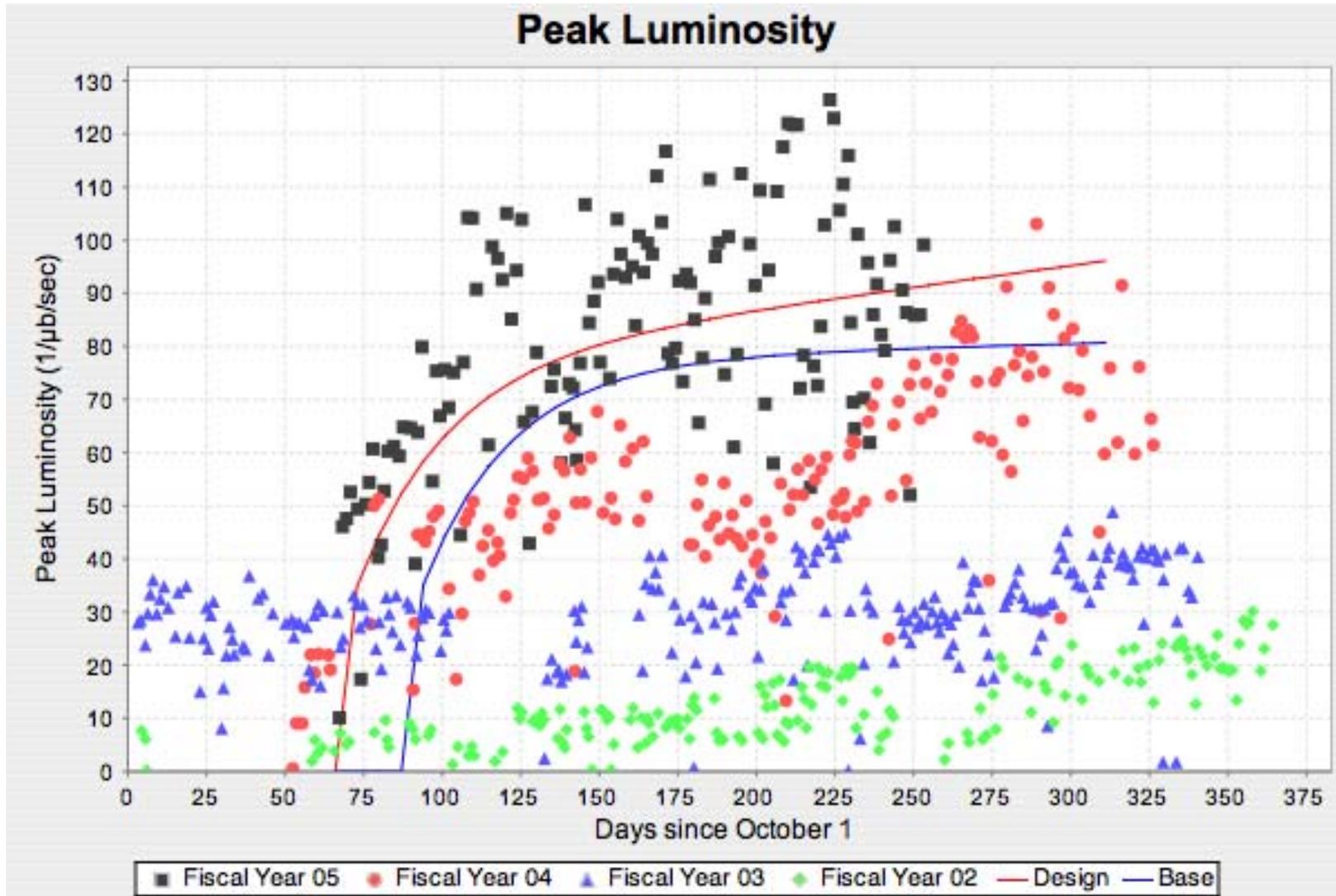
- Most Pbars accumulated in one hour:  $16.2E10$ , March 24 2005



# Combined Shots

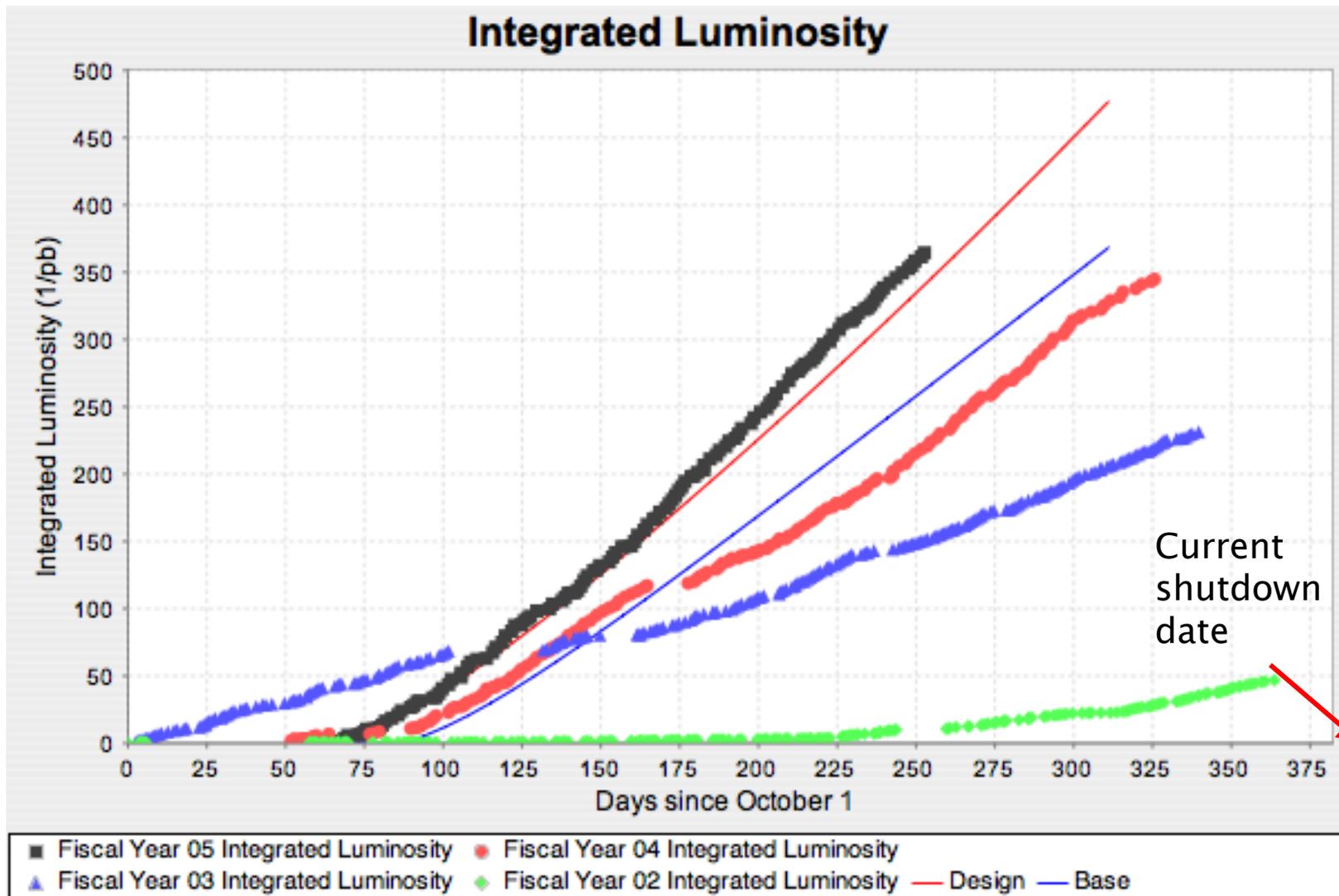


- Extracting pbars from both the Accumulator and Recycler for the same store
- Luminosity enhancement – larger amount of pbars for smaller emittances
  - Accumulator stack size limited to  $<200$  mA
    - Stacking Rate
    - Transverse emittance vs Stack Size
- There is a price to pay (inefficiency) when sending pbars to the Recycler.



June 2005

T. Yasuda, Fermilab



June 2005

T. Yasuda, Fermilab



## From Kristian Harder's Operations Report on SMT



- SMT group is putting lots of effort in
  - More stable (+more automatic) operation
    - Heart beat trigger replacing pulsers
    - HV operations should be simplified
  - Dead time reduction
    - Faster VRB hardware+firmware
    - Faster sequencer firmware
    - SMT VME create switched to 64 bit transfers
    - Fixed time readout abort
  - Preparation for L0
    - Test module in the collision hall and readout
  - Recovery of bad channels
    - 117 disabled HDIs (66B+19F+32H)
  - Performance monitoring and problem diagnosis



## From Jadzia Warchol's Operations Report on CFT



- No problems with power supplies
- No readout errors
- All AFEs are enabled
- No stereo cps and fps discriminator outputs from 6-Jan-05 to 3-Feb-05 because of wrong SCLR in Sequencer Controller. These outputs are used for Test of L2 so do not impact data.
- Trip of AFE Power Supply #9 causes loss of 10 % of CFT channels for 24 hrs, burnt fuse caused the trip. (Runs 204753 - 204764)
- LED calibration run taken
  - Need to take more runs during the store to see luminosity dependence.
    - Waiting for a major part of the detector to break down.
- 53 MHz readout with AFE II to reduce deadtime.
  - 16 boards will be installed during the shutdown.



# Dead Fibers (Occupancy <40%)

( Unresponsive VLPCs constitute about 50% of dead fibers )



Number of Dead Fibers :		Axial	Stereo	Total
15-Aug-03				311
2003 Autumn Shutdown Catastrophic Event				
25-June-04	194504	694	995	1689
2004 Autumn Shutdown EAST cryostat warms up to room, intensive drying				
3-Dec-04	201537	826	827	1653
31-Dec-04	202471	862	830	1692
3-Jan-05 both cryostats warm up to 56 K				
6-Jan-05	202759	842	819	1661
7-Jan-05 WEST cryostat warms up to 69K, EAST to 48K				
10-Jan-0	202904	813	744	1557
22-Feb-05	204011	809	744	1553 (2%)
18-March-05	204803	812	743	1555 (2%)
9-June-05	207292	808	757	1565 (2%)

# Overall Operation

- Operation has been quite smooth since shutdown
- Only 4 runs marked “bad” for calorimeter (+ 2 runs due to harness problem)
  - 1 run pedestals didn't properly download (1 hr run)
  - 1 run pedestals for 1 crate had problem (short run)
  - 2 runs were lost due to calorimeter “noon” noise
- BLS power supply (crate 10) died twice (during accesses)
- 2 ADC cards have died – 1 in shot setup, 1 during store
- 2 pulser supply failures – no impact on data taking
- 1 noisy fanout (caused bad pedestals once) replaced
- 2 preamp supplies switched to secondary
  - both due to 1553 – not likely problem with supply
- occasional LV PS trips, generally handled quickly
- L3 issue complicating pedestal calibrations
- 1-2 cards (SCA/BLS) require fixing on average per access

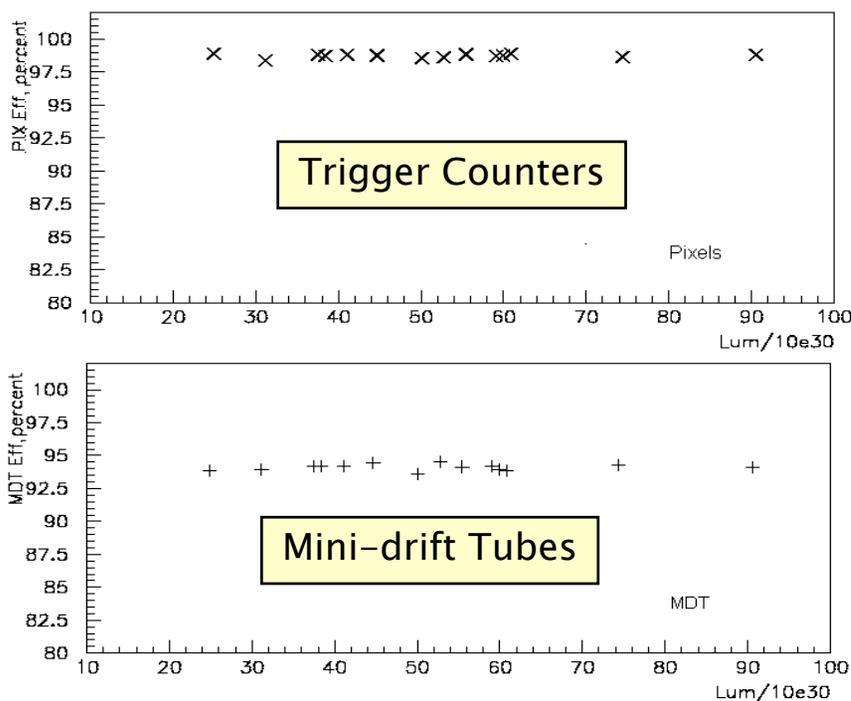
From Norm Buchanan's Operations Report on Calorimeter



# From Dmitri Denisov's Operations Report on Forward Muon system



## Efficiency of the forward muon detectors vs luminosity



- During data collection many parameters of the mini-drift tubes are monitored
  - high voltage values and currents
    - all 50,000 wires operates at the same high voltage of 3.25kV
  - individual planes efficiency using reconstructed muon segments
    - typical efficiency is in the range above 99%
  - plane coordinate accuracy using reconstructed segments
- Reliability
  - total number of disabled wires
    - 0.3% after commissioning
      - dead or noisy
    - increase in number of disabled wires is less then 0.1% per year of operation



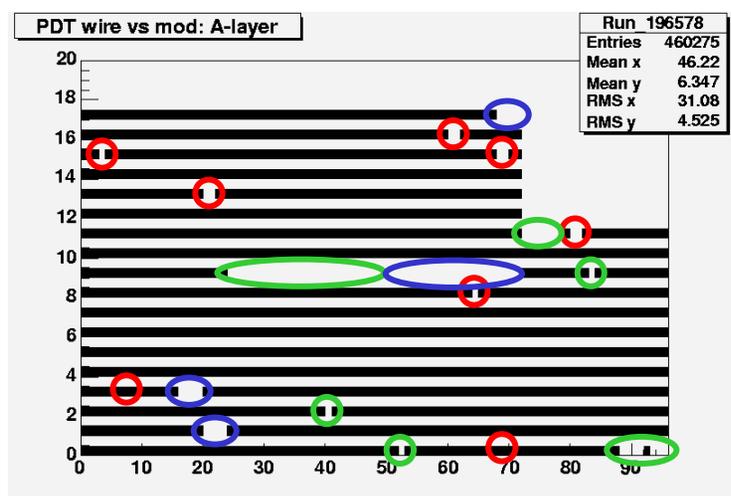
# From Gaston Gutierrez's Operations Report on Central Muon System



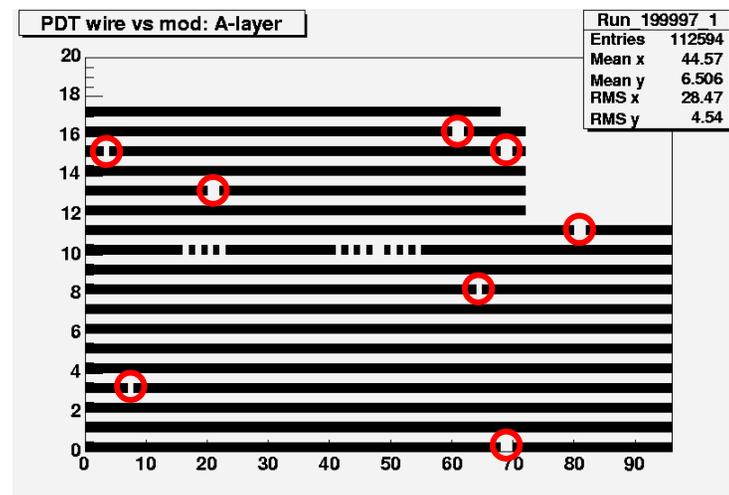
## Status after 2004 shutdown

- Layer A is quieter
- There are fewer masked+dead wires

**Before**



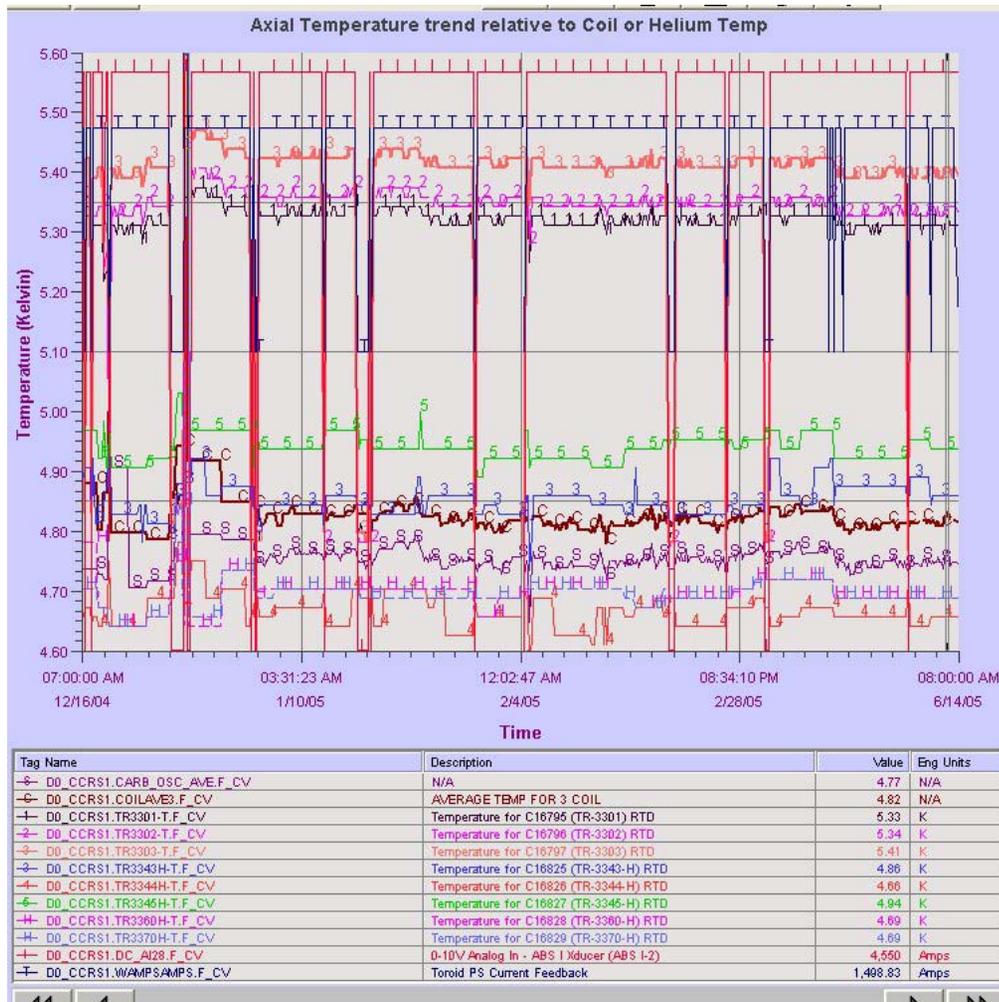
**After**



- But, we still have some dead wires we would like to fix. If there is a chance to open up the detector we will take it.



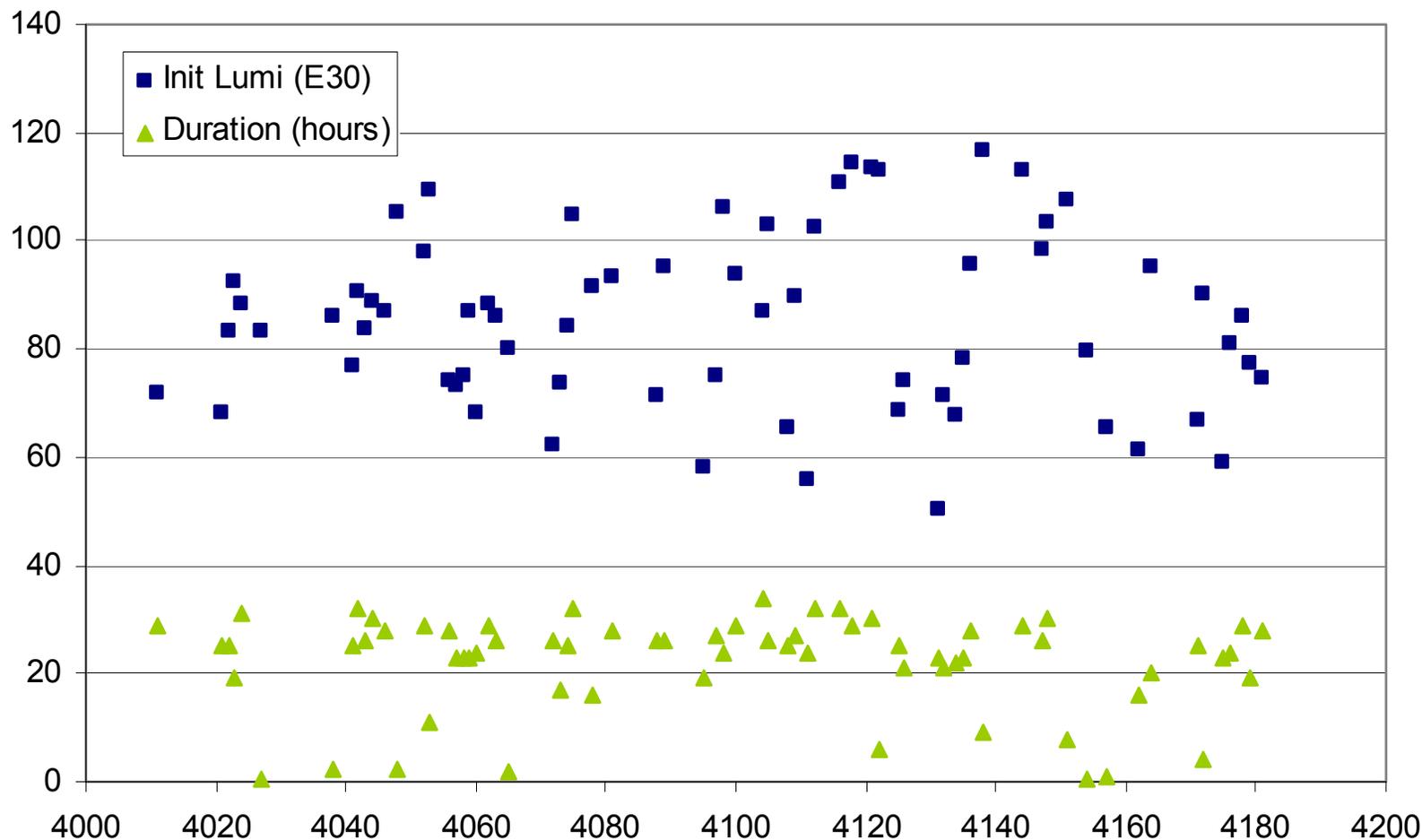
# Solenoid



- Solenoid operation has been stable.
- We had not de-energized the Solenoid very often.
- South axial temperature sensors show 0.6K higher than north and stable.



# Initial Luminosity and Store Duration



March

April

May

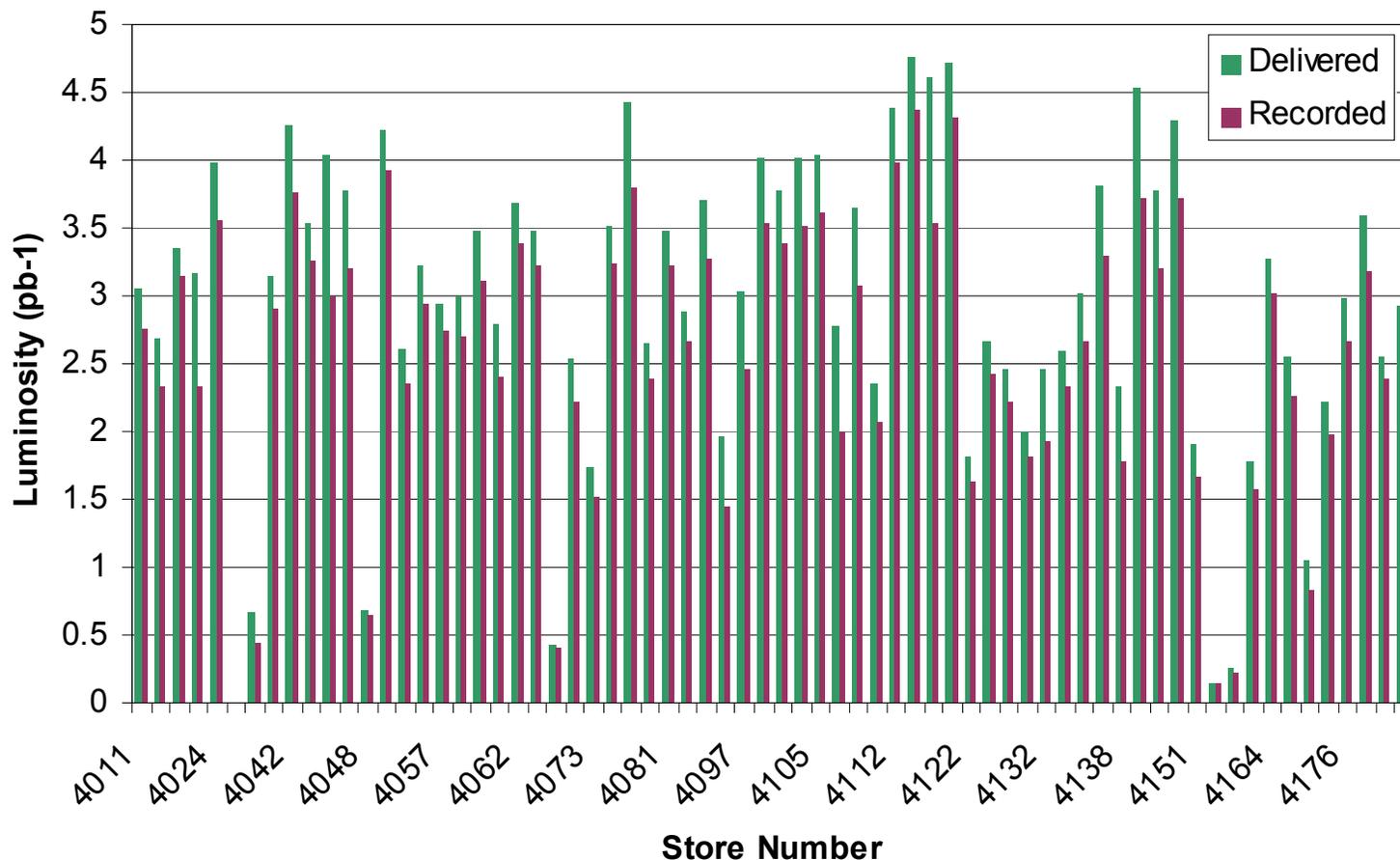
June 2005

T. Yasuda, Fermilab



# Store by Store Delivered and Recorded Luminosity

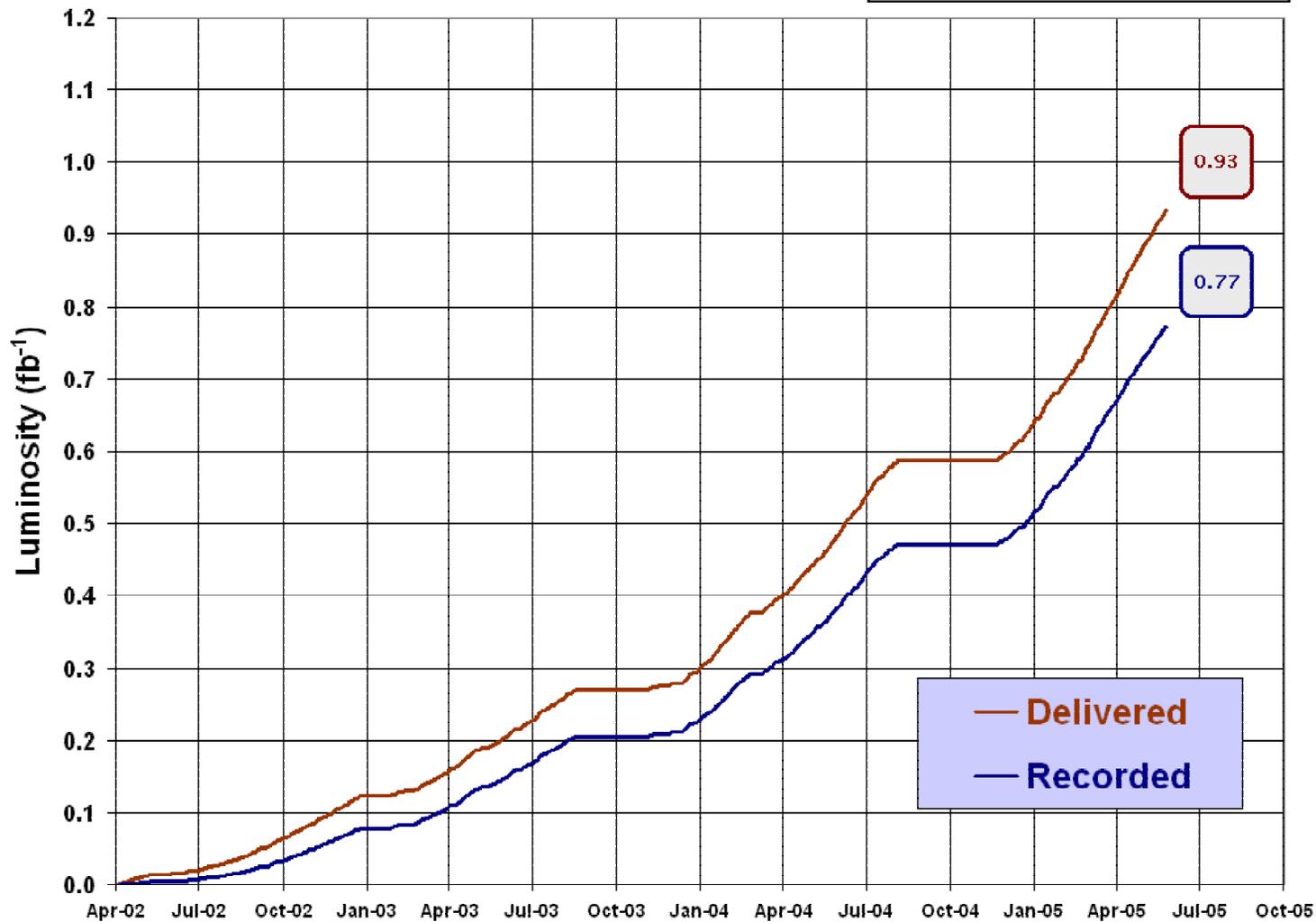
Recorded luminosity: 2.5–4 pb<sup>-1</sup>/store





## Run II Integrated Luminosity

19 April 2002 - 13 June 2005



June 2005

T. Yasuda, Fermilab



# Records

- Recorded luminosity
  - Best day: 5/1                      3.70 pb<sup>-1</sup>
  - Best week: 4/25–5/1      17.1 pb<sup>-1</sup>
  - Best month: April      59.4 pb<sup>-1</sup> (Eff = 87.8 %)
    - March: 57.4 pb<sup>-1</sup> (Eff = 88.4 %)
    - May: 58.1 pb<sup>-1</sup> (Eff = 87.6 %)
- Initial luminosity
  - Store 4138 on 5/12      117E30
- Delivered luminosity
  - Surpassed 900 pb<sup>-1</sup> on 5/27
- Recorded luminosity
  - Surpassed 750 pb<sup>-1</sup> on 5/30



## Summary

- Fermilab accelerator complex has been running well.
- D0 has been also running well.
  - Running with the efficiency of 88% for the last three months.
  - Many thanks to the detector operations crew, the detector experts, and the shifters.
- We will record  $1 \text{ fb}^{-1}$  of data on tape before the shutdown.