All Experimenter's Meeting

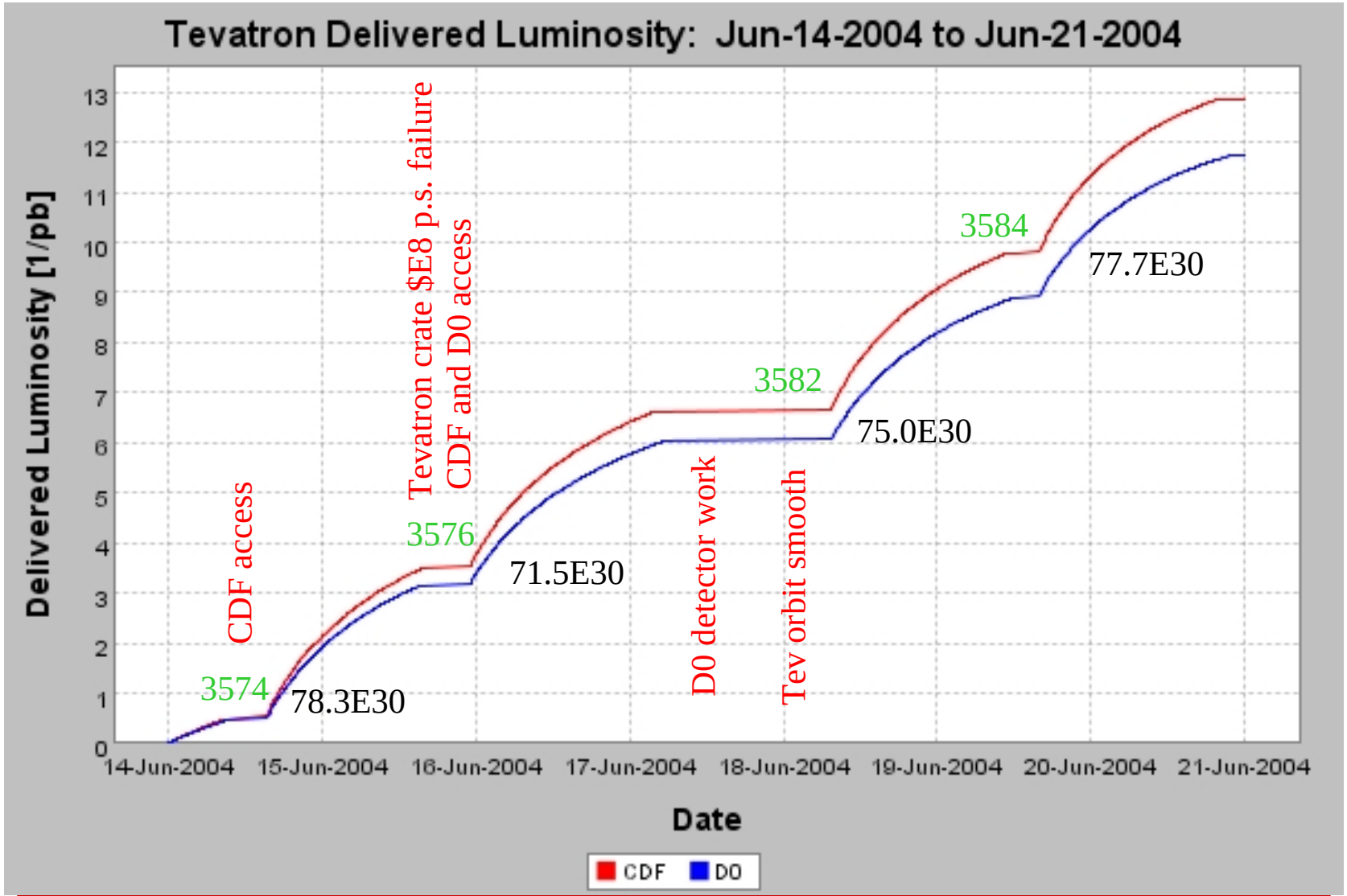
Dave McGinnis

June 21, 2004

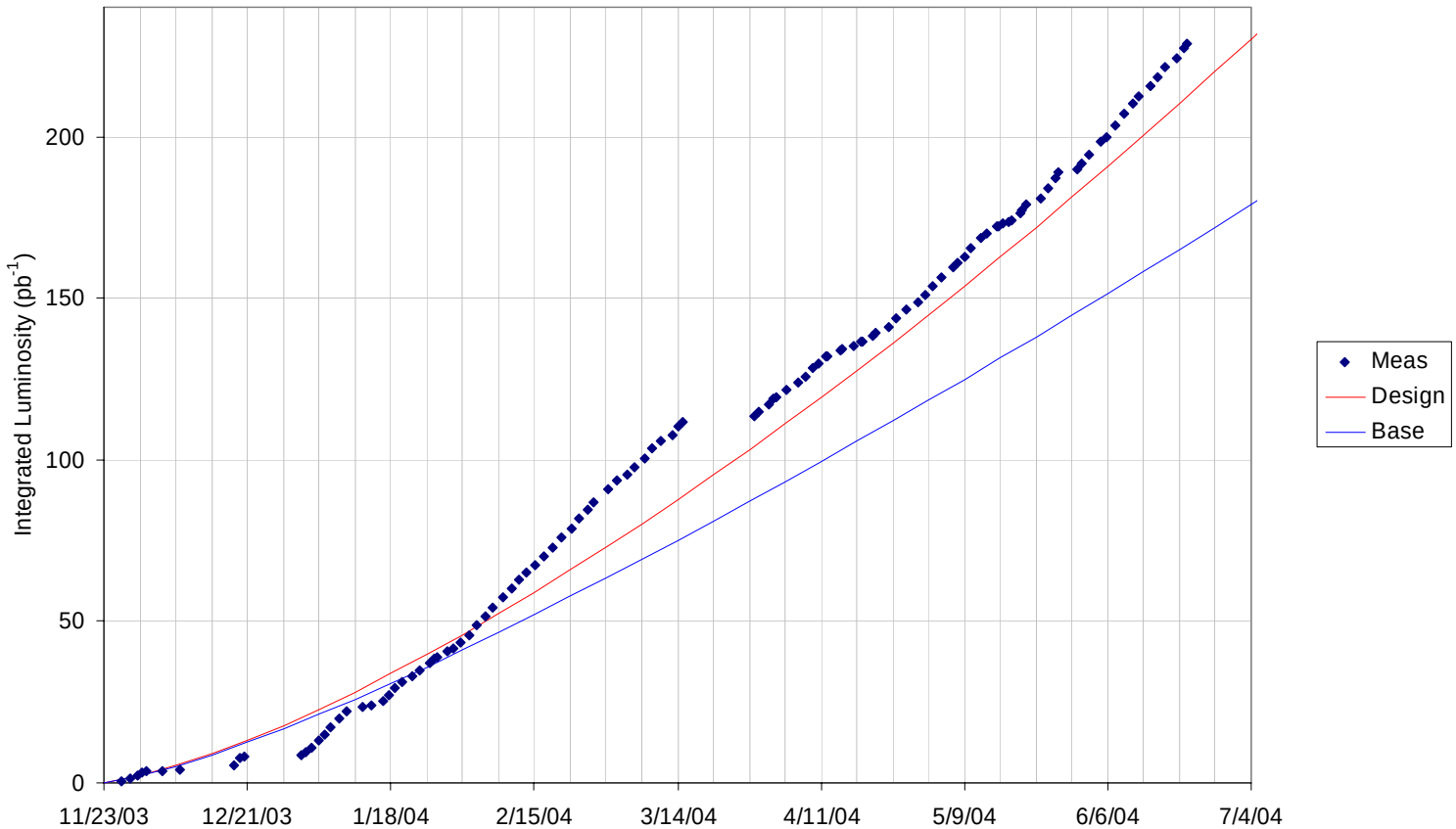
Store Summary

Store	Initial Lum. (E30)	Deliv'd Lum. (nb^{-1})	Termination	Time (hr)	Stack Size (E10)	Comments
3574	78.3	3,026	Loss of store	24.4	184.5	Record initial luminosity, quench resulting from CAMAC crate $E8 power supply failure
3576	71.5	3,136	Planned	30.0	165.7	High CDF proton losses at start
3582	75.0	3,140	Planned	27.2	189.7	High CDF proton losses at start
3584	77.7	3,107	Planned	30.2	180.3	High CDF proton losses at start

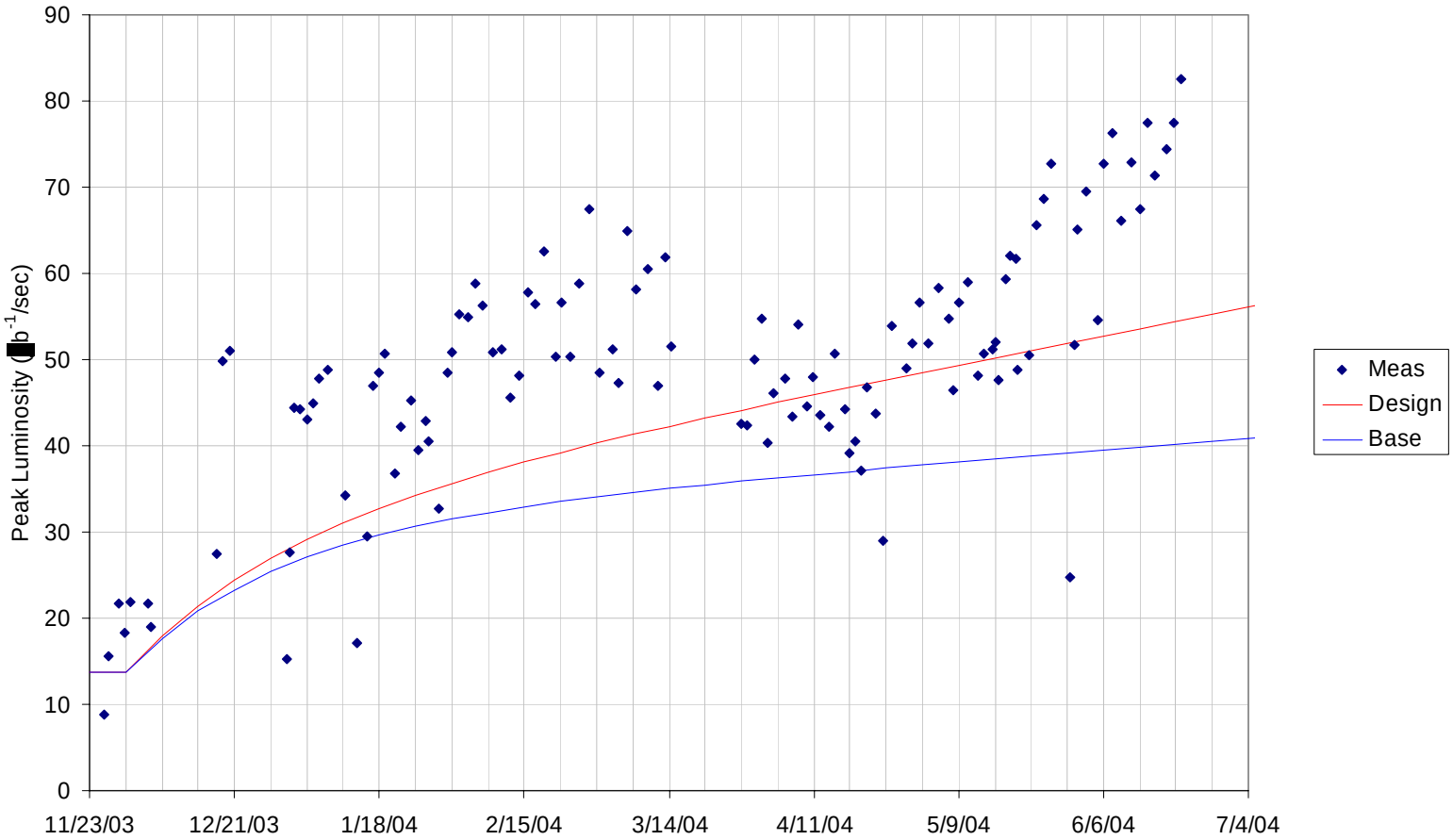
Store Summary



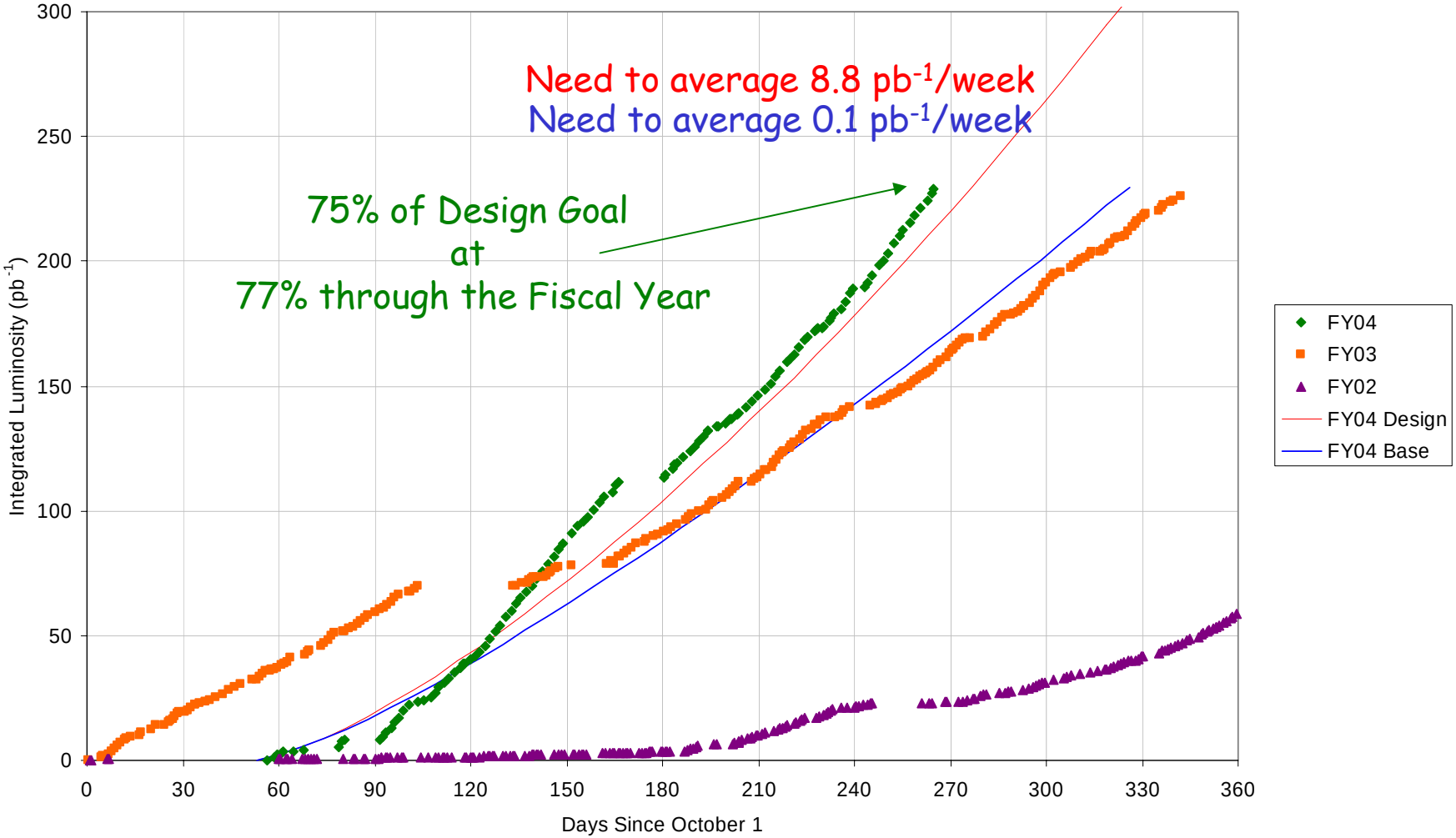
FY04 Integrated Luminosity



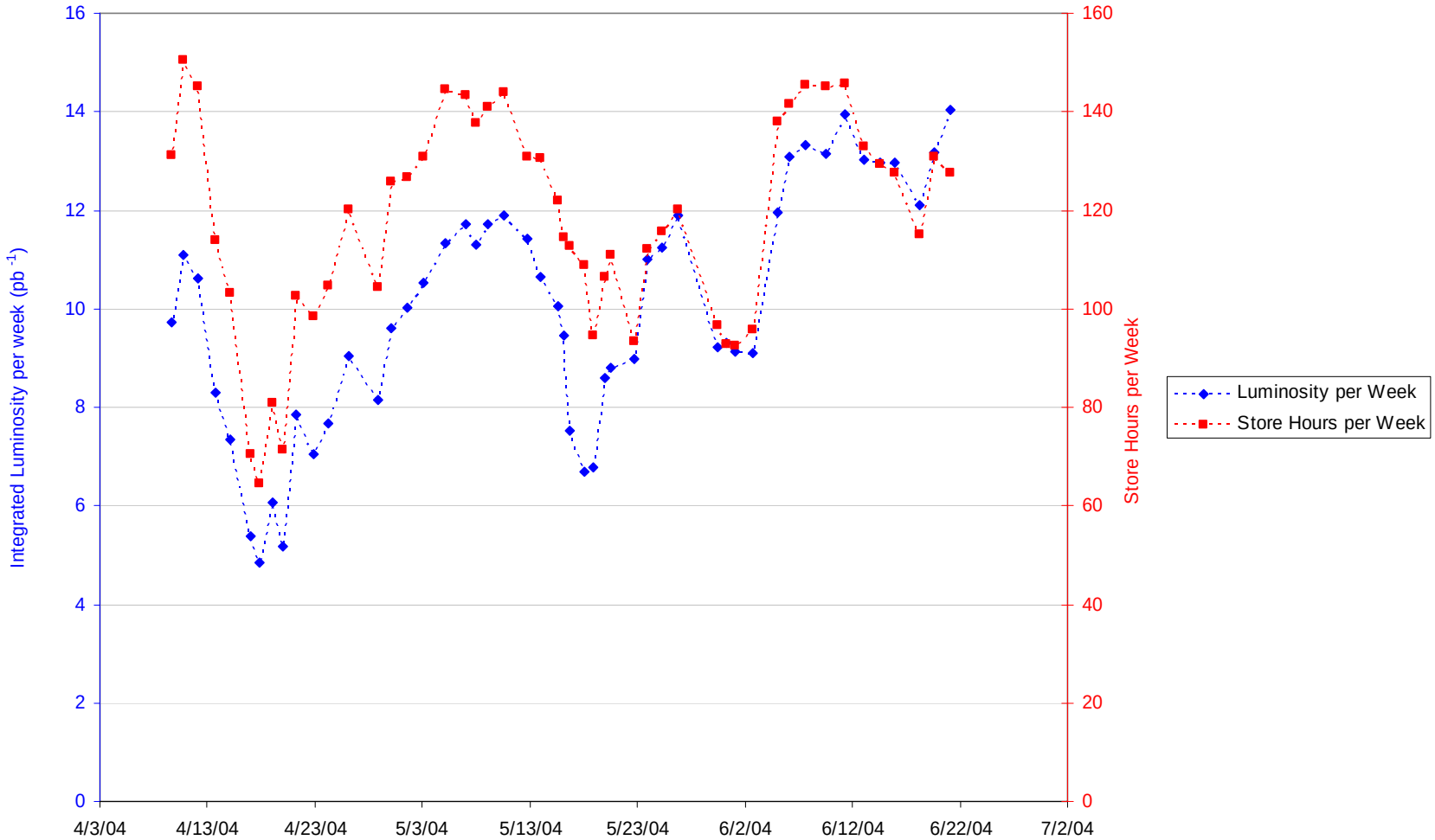
FY04 Peak Luminosity



Integrated Luminosity

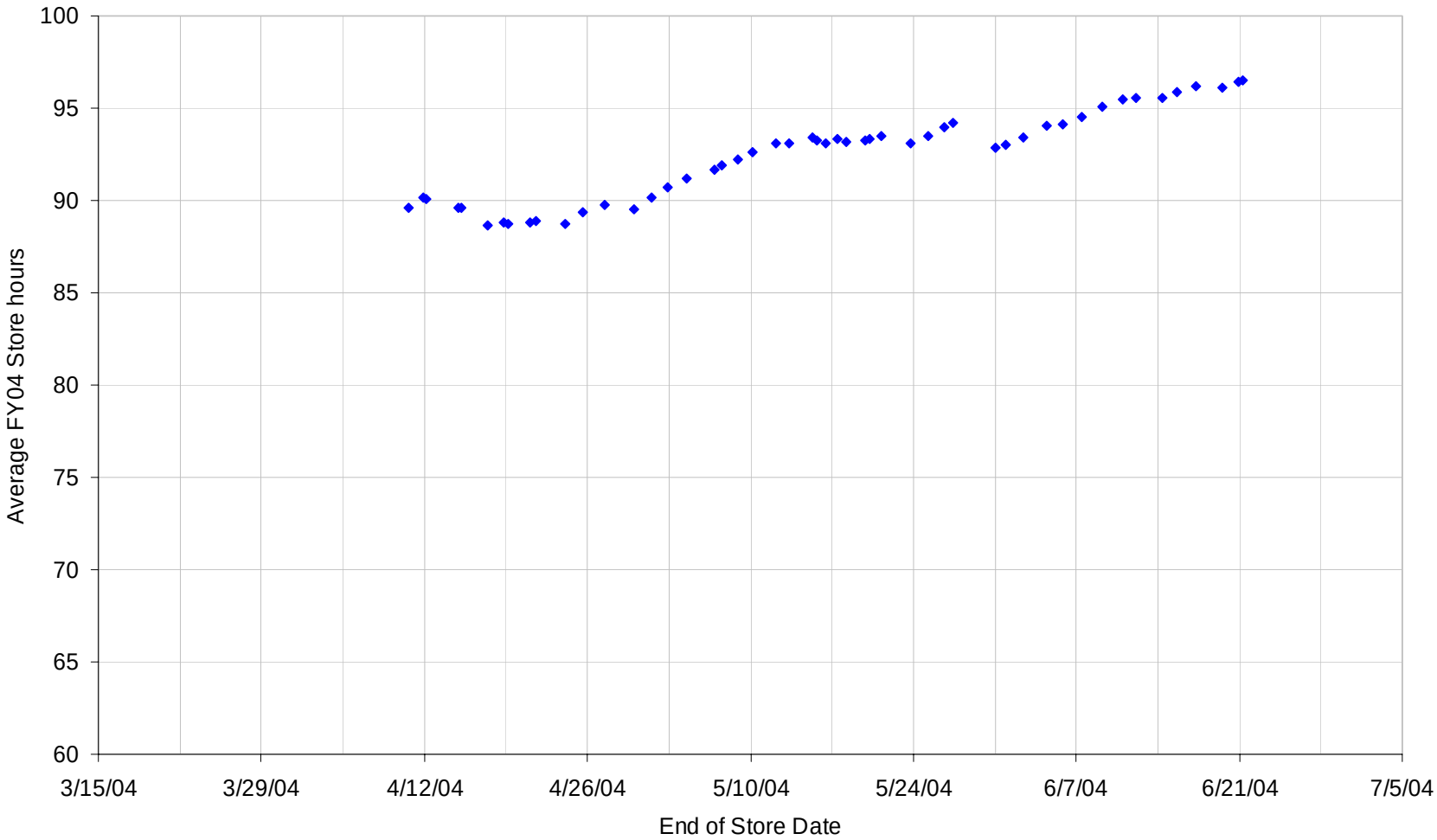


Integrated Luminosity and Store Hours per Week

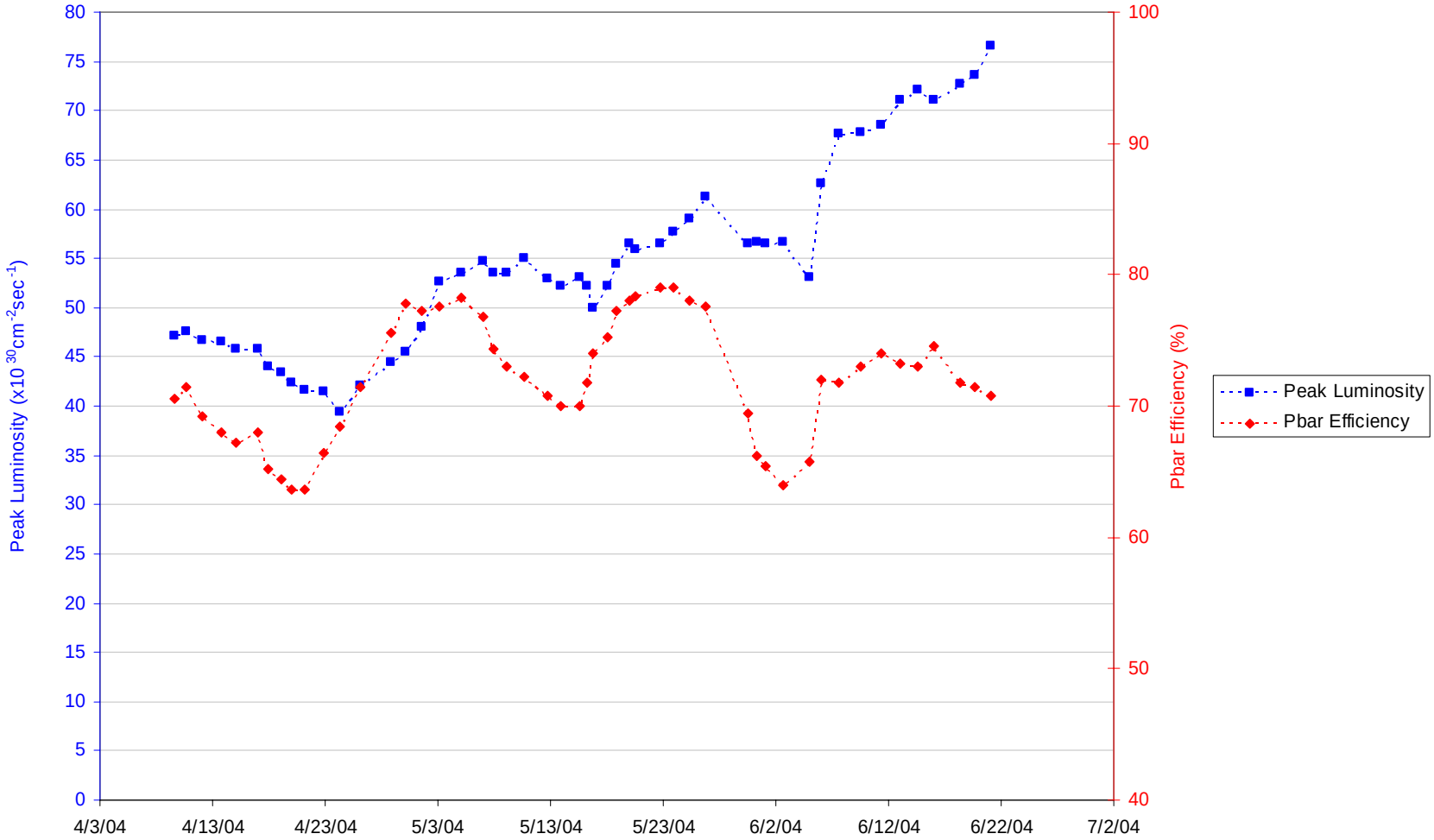


5 Store Running Average

FY04 Average Store Hours per Week



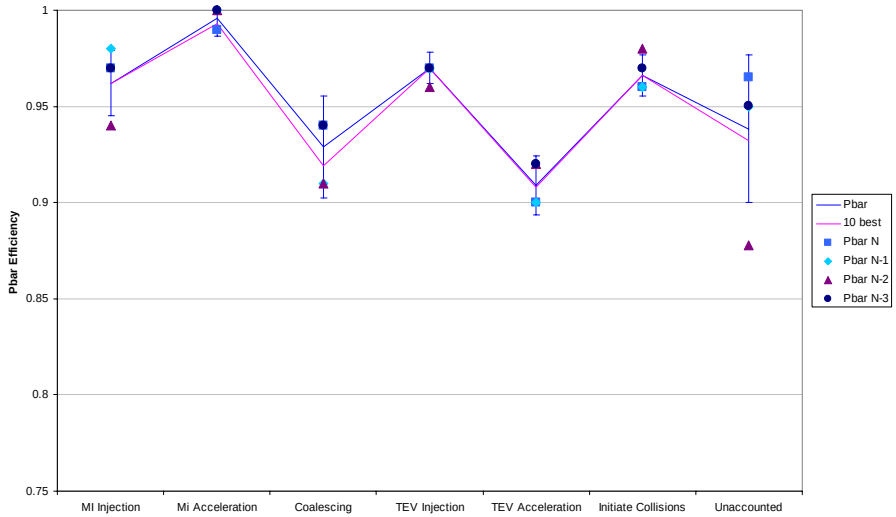
Peak Luminosity and Pbar Efficiency

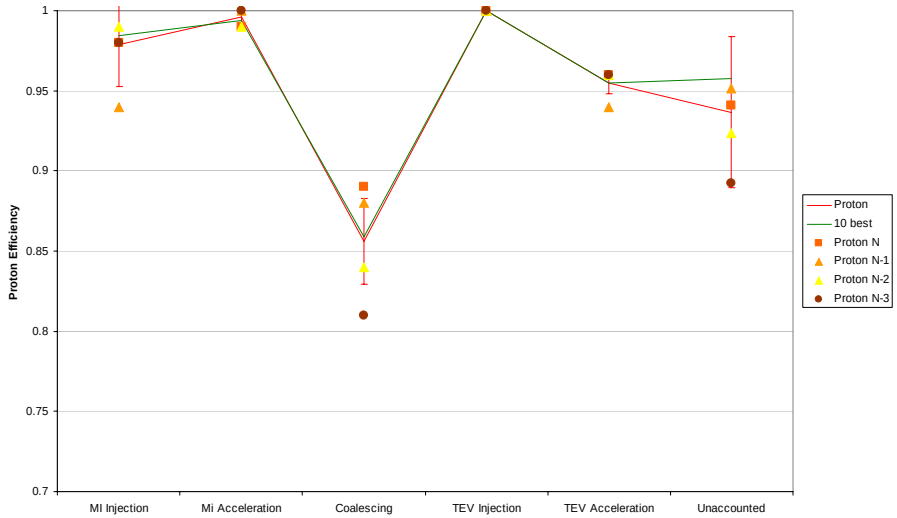


5 Store Running Average

Collider Transmission Efficiency*

- Peak Luminosity up by 19%
  - Unstacked Pbars up by 16%
    - Store Length up by 96%
  - Pbar Transfer efficiency down by 10%
  - Protons per bunch is down by 5%
  - Effective Emittance down by 20%
  - Stacking Rate is down 26%





*Of the past 10 stores w.r.t the FY04 Goals

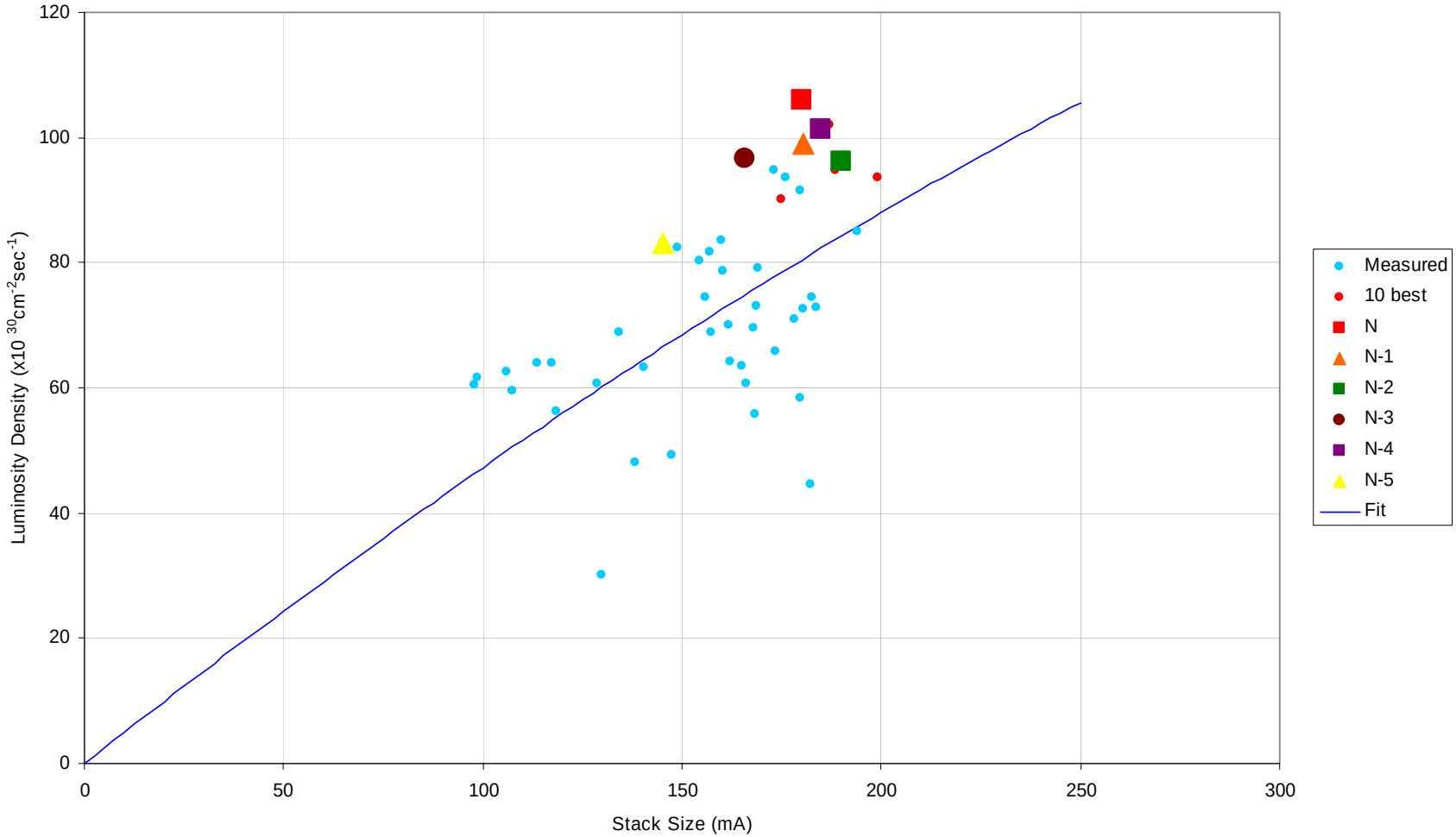
Data Summary Table

				Store Parameters					
Parameter	Last Store	Best Store	Last 10 stores Average	Best 10 stores Average	FY04 Average	End of FY03	FY04 (End) Design	FY04 (End) Base	
Initial Luminosity (Average)	82.5	82.5	73.8	74.7	55.8	36.1	61.9	43.3	$x10^{30}cm^{-2}sec^{-1}$
Integrated Luminosity per Store (Averaged)	1618	1618	2890	3012	2021	1089	2000	1300	nb^{-1}
Luminosity per week (Averaged)	-	-	13.1	-	9.7	6.4	11.3	7.4	pb^{-1}
Store Length	7.5	7.5	29.4	29.6	23.3	14.9	15.0	15.0	Hours
Store Hours per week	-	-	129	-	111	88	85	84	Hours
Shot Setup Time	2.3	2.3	2.6	2.4	2.4	2.3	2.2	2.2	Hours

				TEVATRON Parameters					
Parameter	Last Store	Best Store	Last 10 stores Average	Best 10 stores Average	FY04 Average	End of FY03	FY04 (End) Design	FY04 (End) Base	
Protons per bunch	255	255	248	249	244	237	260	260	$x10^{9}$
Antiprotons per bunch	33	33	32	33	28	22	31	25	$x10^{9}$
Proton Efficiency to Low Beta	78	78	75	77	75	58	-	-	%
Pbar Transfer efficiency to Low Beta	73	73	72	70	72	63	80	77	%
HourGlass Factor	0.72	0.72	0.72	0.72	0.72	0.70	0.65	0.65	
Initial Luminosity Lifetime	6.1	6.1	5.8	6.5	6.9	9.5	8.3	7.0	hours
Asymptotic Luminosity Lifetime	19.1	19.1	19.9	22.3	23.2	25.1	25.0	25.0	hours
Effective Emittance	15.8	15.8	16.8	16.8	19.2	21.6	21.0	23.0	π-mm-mrad

				Antiproton Parameters					
Parameter	Last Store	Best Store	Last 10 stores Average	Best 10 stores Average	FY04 Average	End of FY03	FY04 (End) Design	FY04 (End) Base	
Zero Stack Stack Rate	12.4	12.4	13.2	13.2	12.3	11.5	18.0	13.7	$x10^{10}$/hour
Normalized Zero Stack Stack Rate	2.3	2.3	2.4	2.5	2.4	2.3	3.6	2.7	$x10^{-2}$/hour
Average Stacking Rate	7.2	7.2	5.7	6.0	5.9	7.1	9.3	7.6	$x10^{10}$/hour
Stacking Time Line Factor	87	87	68	72	76	88	75	75	%
Stack Size at Zero Stack Rate	299	299	305	307	295	300	300	300	$x10^{10}$
Protons on Target	5.4	5.4	5.4	5.4	5.2	5.0	5.0	5.0	$x10^{12}$
Start Stack	180	180	177	184	159	144	155	130	$x10^{10}$
End Stack	19	19	16	17	19	16	15	15	$x10^{10}$
Unstacked Pbars	161	161	162	167	140	128	140	115	$x10^{10}$

Stack Size Potential



Studies

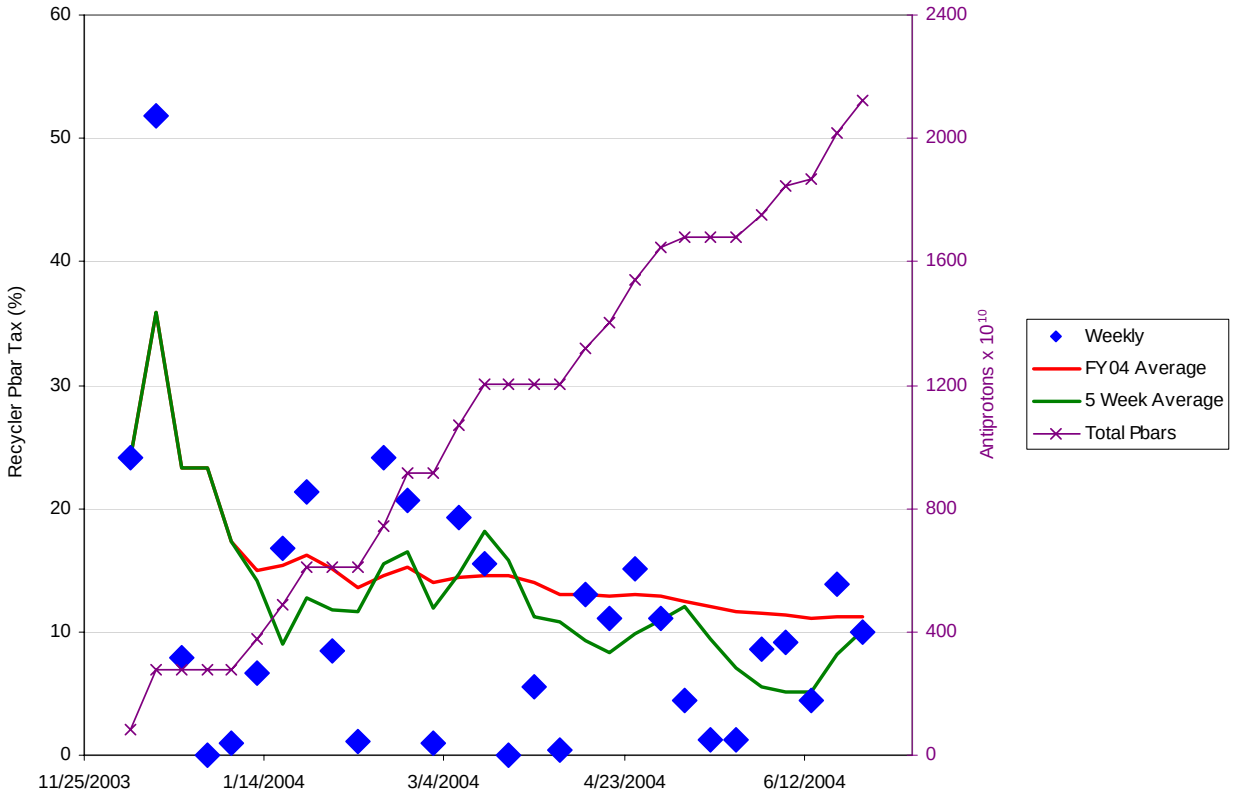
Pbar Studies

Date	Duration (Hr)	Description
6/14/2004	1.8	Accumulator tunes across aperture plus lost pbars
6/16/2004	6.4	Reverse protons, apertures and chromaticity plus lost pbars
6/19/2004	3.1	Stacktail measurements
	11.3	Sum for Week
	449.6	Sum for Year
	15.7	Average Per Week

TEV Studies

Date	Duration (Hr)	Description
6/14/2004	0.6	Wet squeeze to verify orbits
6/15/2004	0.9	Wet squeeaze to verify ready for operations
6/15/2004	2.6	Abort gap monitor calibration
6/16/2004	0.8	Abort gap monitor
6/17/2004	6.9	Orbit smooth and beam check-out
6/19/2004	1.5	Tunes and abort gap
6/20/2004	2.0	Tunes, collimator alignment and abort gap
	15.3	Sum for Week
	513.8	Sum for Year
	17.8	Average per Week

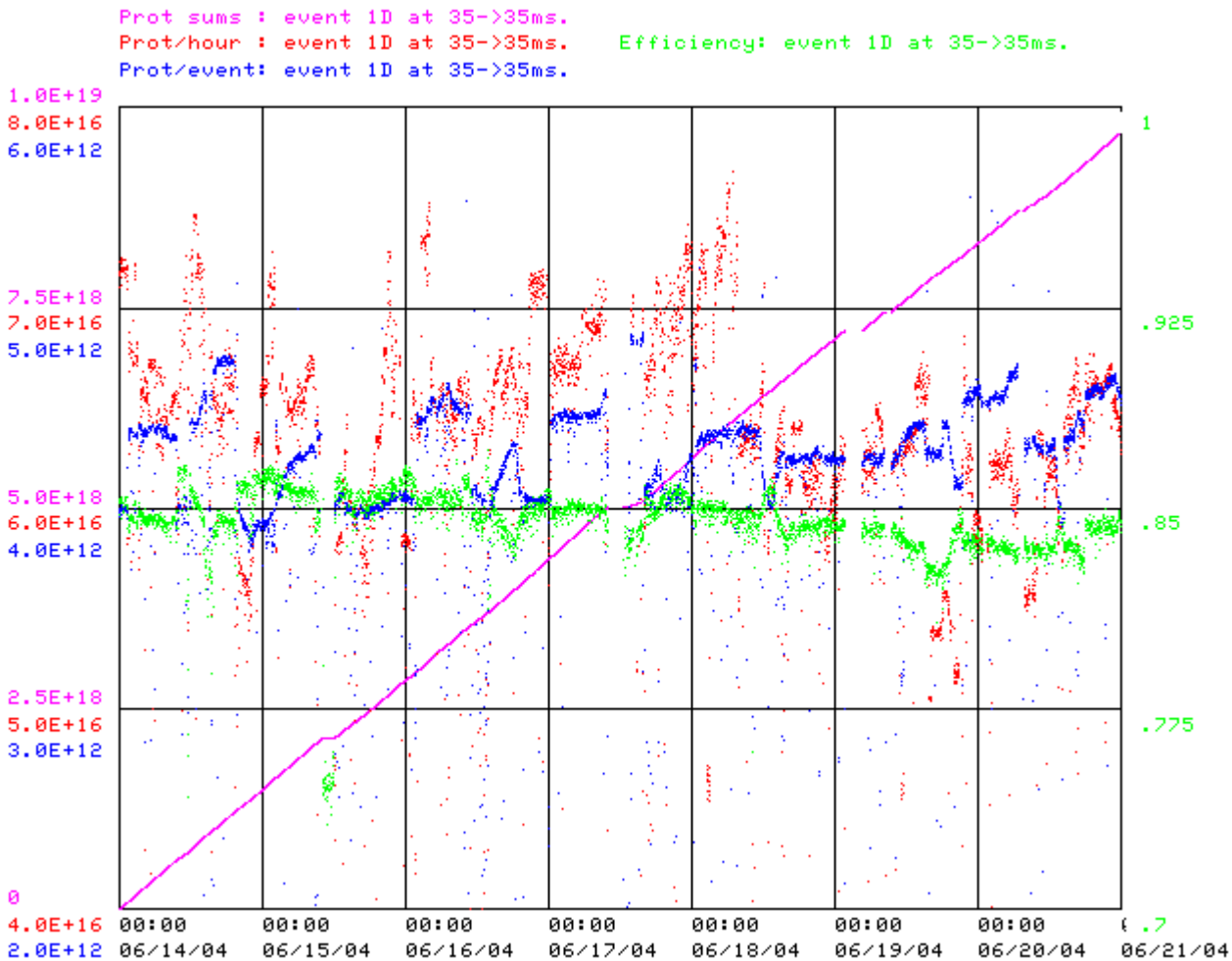
Recycler Pbar Tax



MiniBoone

5.8e16/hour average

Up 29% from last week

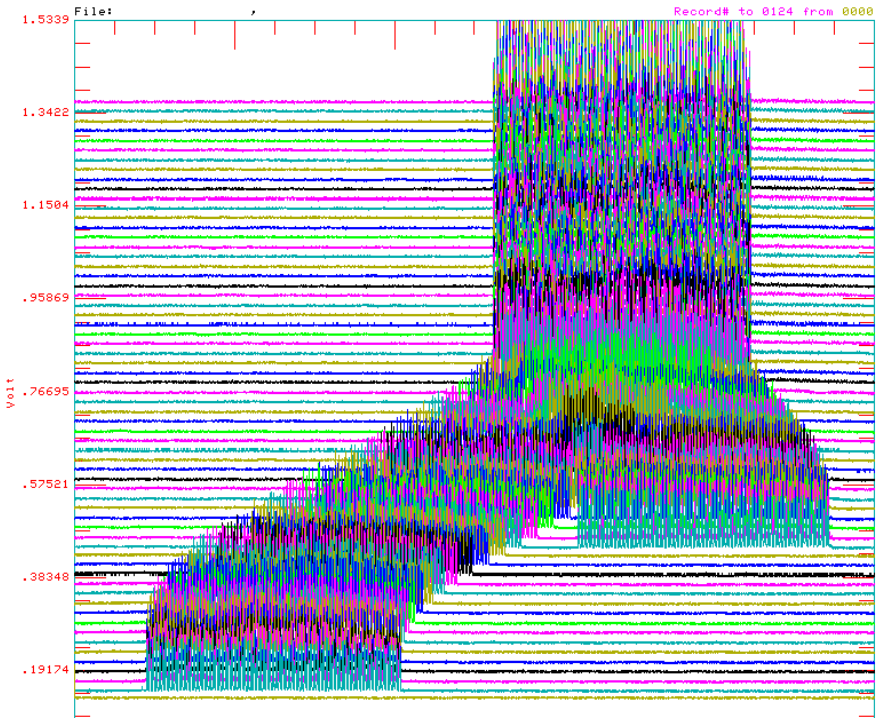


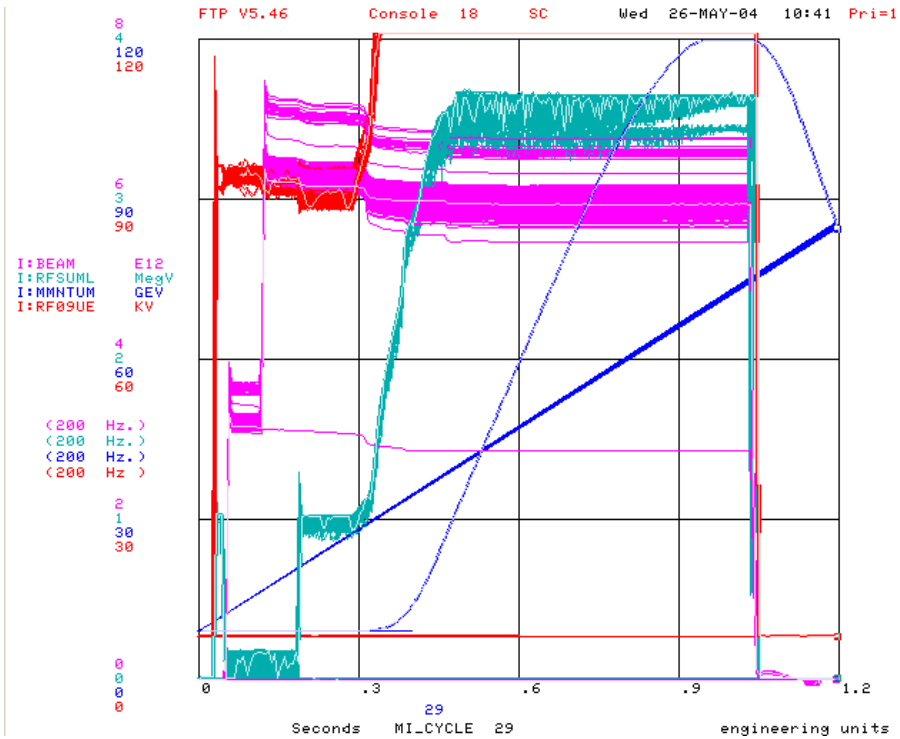
Major Accomplishments over the past month

- Proton Source
  - Running at higher rep. rates (5 Hz) with lower turns – better efficiency
  - Record intensities> 6.0×10^{12} protons/pulse
  - Record Efficiencies > 85%
  - Record Throughput
    - > 9.7×10^{18} protons/week
    - > 6.0×10^{16} protons/hour
  - Cogging "operational" enough to support Slip Stacking and NUMI studies
- Mixed Pbar Source Shot – Antiproton Source, Recycler, Main Injector
  - Store 3564
    - Two transfers taken from the Recycler (22.3×10^{10} pbars)
    - Eight transfers taken from the Accumulator (159.8×10^{10} pbars)
    - Initial Luminosity $67 \times 10^{30} x m^{-2} sec^{-1}$
  - Highlights
    - Dual injection energy level ramps for the Main Injector
    - Mechanics
      - Some minor problems encountered but corrected during shot
    - Almost Automatic
  - Areas for more work
    - Protocol for determining from each source
      - The amount of pbars
      - The number of bunches
      - The transfer order (interleaving transfers?)
    - Mechanics and timelines
    - Sequencer automation
  - Next attempt within two weeks

Major Accomplishments over the past month

- Main Injector
  - Slip Stacking for Pbar Stacking 6.5×10^{12} protons on target
  - Bunch length < 1.5nS
- Tevatron
  - Record Luminosity at $83 \times 10^{30} cm^{-2} sec^{-1}$
  - New Abort gap monitor commissioned





Issues for Next Month

- Proton Source
  - Operational intensity limit
- Main Injector
  - Accesses for
    - Slip Stacking beam loading compensation
    - NUMI
  - Mixed Pbar Shots
    - Coalescing efficiency vs longitudinal emittance
- Antiproton Source
  - Mixed Pbar Shots
  - Zero Stack Stacking Studies
- Recycler
  - Mixed Pbar Shots
    - Momentum mining with 1,2,3, or 4 transfers
- Tevatron
  - Control of losses at the beginning of stores
  - Determine if A48 collimator is too short to shield CDF from abort kicker pre-fires
    - We are proceeding on the assumption that it is and we are preparing to install a 1.5 meter spare collimator – will require CDF to remove some of its Roman pots
    - Before we install the longer collimator we need to verify that it is too short with:
      - Beam Measurements
      - Calculations