Week in Review: 02/10/03 –02/16/03

Ron Moore – FNAL

- Store Summary – first stores after shutdown
- Schedule for Week

Store Summary

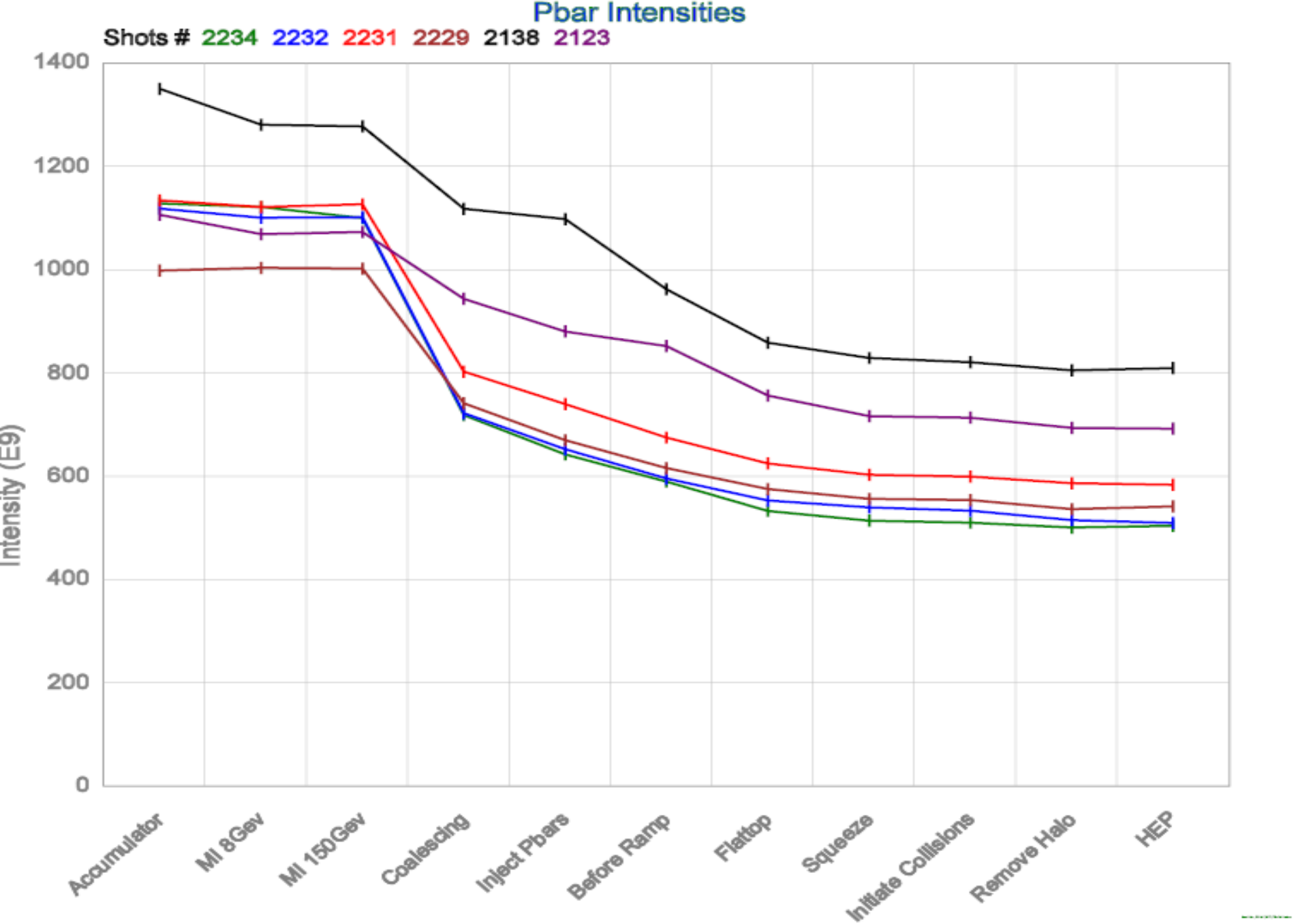
Store	Initial Lumi	Deliv'd Lumi	Termination	Comments
2194	4.5	-	Quench	Abort kicker prefire(?) after 35 min
2208	17.3	167	Quench	A2 UPS fried, dropped QPM link after 3 hrs
2213	20.9	698	Intentional	
2229	18.5	536	Intentional	Limiting proton intensity; no dampers
2231	18.9	630	Quench	F3 CC tripped few minutes before termination
2232	16.8	556	Intentional	Limiting proton intensity; no dampers
2234	15.9	514	Intentional	Limiting proton intensity; no dampers

Operations

- Booster tuned up well
  - ~4.4 E12 protons per pulse on pbar target
  - MiniBoone 2 E16 prot/hr with 7 turns @ 1.75 Hz
- Stacking well
  - Max stacking rate ~ 10 mA/hr
  - Rate dropping more quickly with stack size
    - Stacktail cooling needs optimization
- Operationally stable putting in stores
  - Luminosity isn't great, but stores are going in smoothly and being ended intentionally
  - Losses are acceptable
  - Proton and pbar lifetimes at 150 GeV slightly better than before shutdown, even without new helix and dampers

Why is luminosity so low?

- Before shutdown, typical ☹ = high 20's – low 30's
  - ☹ only in the teens now ⇒ lower proton and pbar intensities
- Why fewer pbars?
  - Shooting from smaller stacks (120 mA vs 140 mA) since ☹ low
  - ARF 4 cavity used in unstacking can cause poor coalescing in MI
  - ~30% fewer pbars at collisions than pre-shutdown
- Why fewer protons?
  - Quenching at B38 early in ramp
  - Related to chromaticity and/or DC beam being lost there?
  - Aperture scan showed no restriction
  - To get through the weekend, limited proton intensity and used TEL to remove DC beam injecting pbars
  - ~20-25% fewer protons at collisions than pre-shutdown

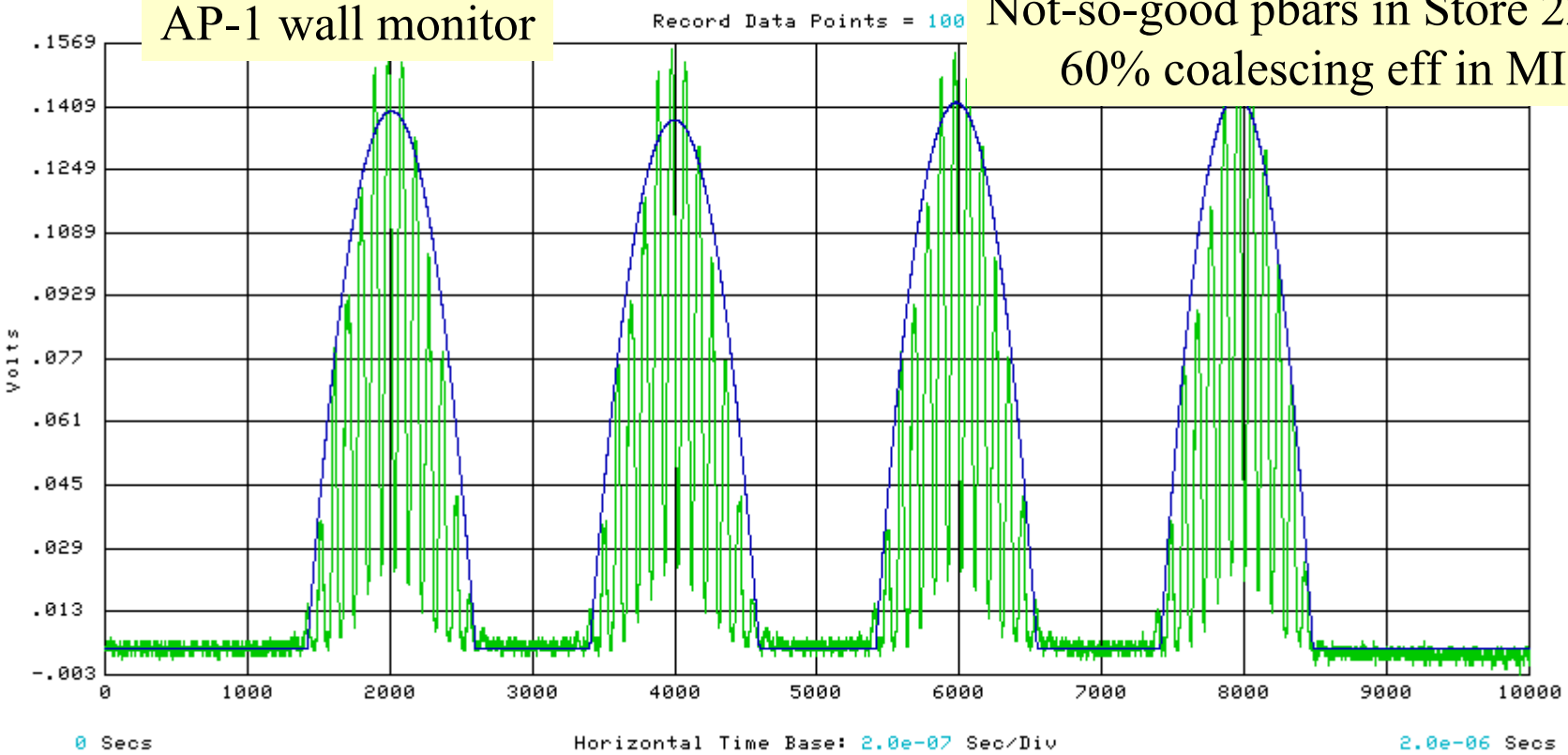

Pbar Intensities
Shots # 2234 2232 2231 2229 2138 2123
Intensity (E9)
1400
1200
1000
800
600
400
200
0
Accumulator
MI 8Gev
MI 150Gev
Coalescing
Inject Pbars
Before Ramp
Flattop
Squeeze
Initiate Collisions
Remove Halo
HEP

GxPC 1: AP-1 Beamline Wall Current Monitor Scope Trace Data

Title: Store: 1145Shot: 1 16-FEB-03 06:11:46
Record Num: 40

AP-1 wall monitor

Not-so-good pbars in Store 2232
60% coalescing eff in MI



Bunch Parameters	Bunch 1	Bunch 2	Bunch 3	Bunch 4		Totals	Units
Calculation Status:	Good	Good	Good	Good		----	
Number of Bunches:	14	14	13	12	Total:	53	
2.5 MHz Emit:	3.57	3.58	3.26	2.83	Total:	13.24	eV-sec
2.5 MHz Fit:	3.26	3.29	3.05	2.78	Total:	12.38	eV-sec
2.5 MHz BL:	236.48	238.06	227.13	214.50	Average:	229.04	nsec
53 MHz Emit:	2.99	2.88	2.81	2.69	Total:	11.38	eV-sec
53 MHz Fit:	3.07	3.13	2.89	2.73	Total:	11.82	eV-sec
53 MHz Max Emit:	0.29	0.29	0.30	0.29	Average:	0.29	eV-sec
53 Mhz BL:	13.43	13.60	13.56	13.78	Average:	13.59	nsec
Bunched Beam:	5.60	5.56	5.49	5.31	Total:	21.96	mA

Acnet Devices

A:IBEAMB:	119.787	mA	A:LONG4T:	14.874	eV-sec
A:FUPPC:	628900.69	Hz	A:LONG4E:	2.483	eV-sec
A:FLOWPC:	628932.81	Hz	A:RCBKAM:	1.012	eV-sec

RF Voltages

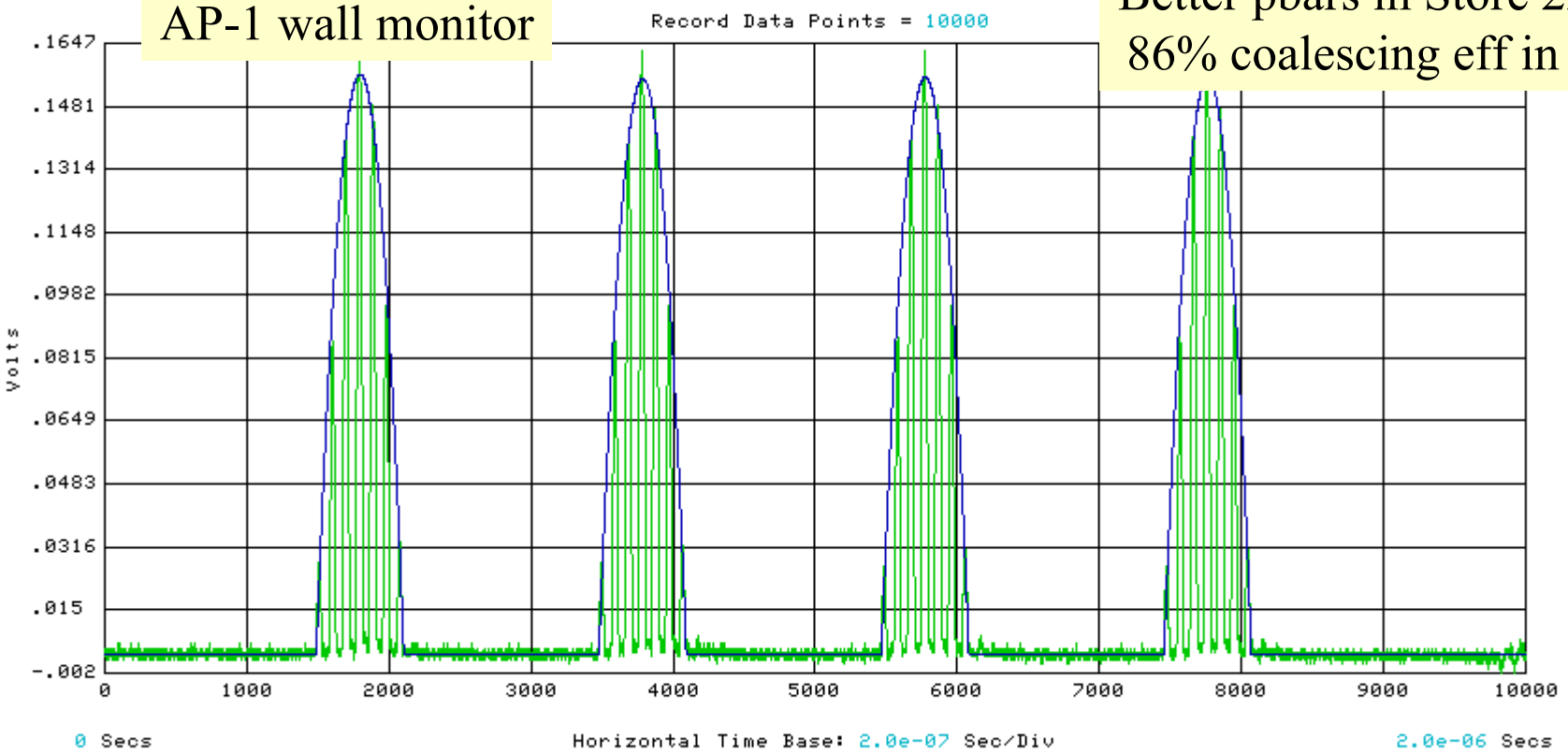
ARF-1 Volts:	56.5	kV
ARF-4 Volts:	2184.2	Volts
Rev Freq:	628724	Hz

GxPC 1: AP-1 Beamline Wall Current Monitor Scope Trace Data

Title: Store: 1145Shot: 3 16-FEB-03 06:17:55
Record Num: 42

AP-1 wall monitor

Better pbars in Store 2232
86% coalescing eff in MI



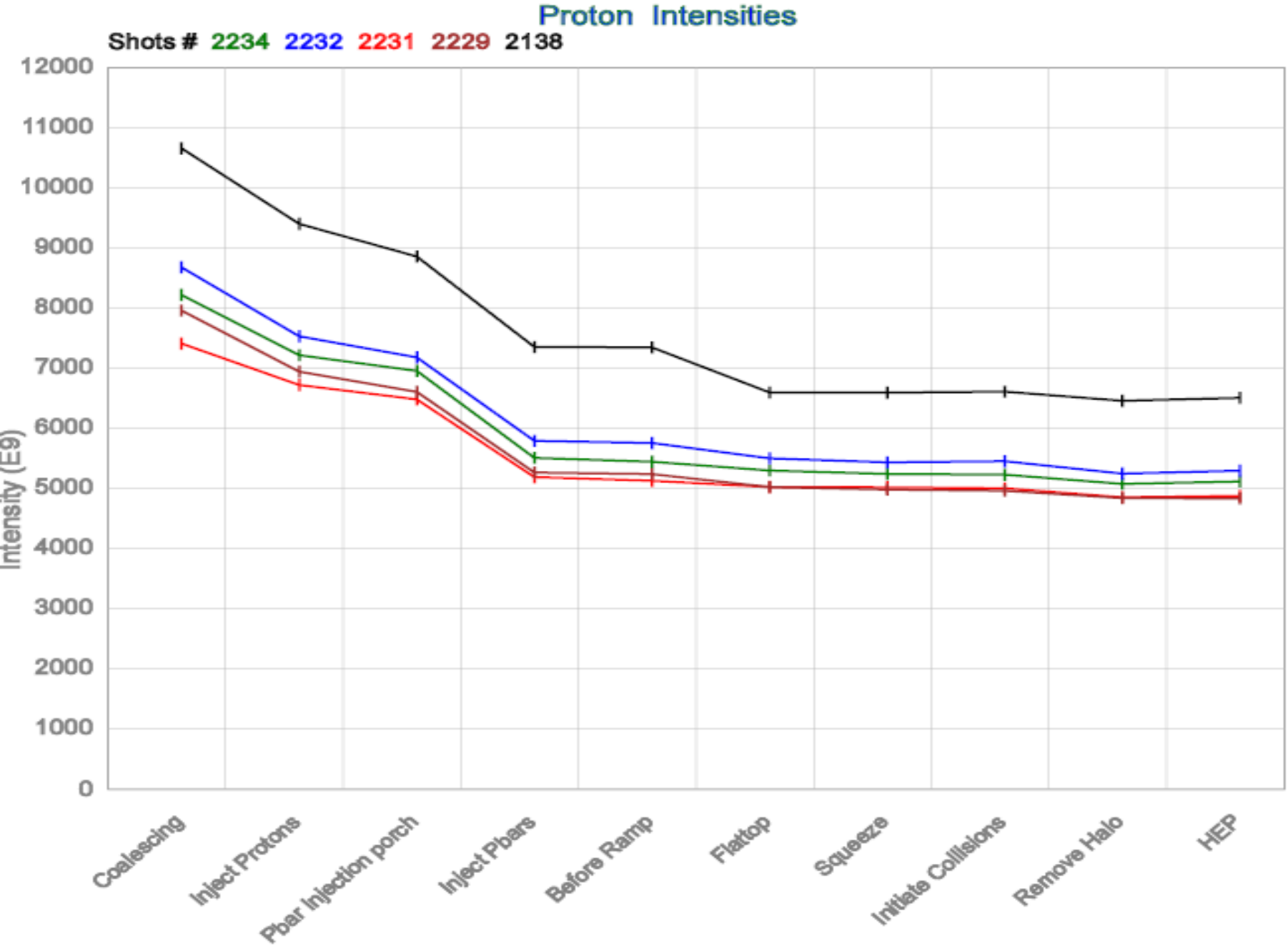
Bunch Parameters	Bunch 1	Bunch 2	Bunch 3	Bunch 4		Totals	Units
Calculation Status:	Good	Good	Good	Good		----	
Number of Bunches:	7	7	7	7	Total:	28	
2.5 MHz Emit:	0.78	0.79	0.79	0.79	Total:	3.14	eV-sec
2.5 MHz Fit:	0.80	0.80	0.80	0.80	Total:	3.19	eV-sec
2.5 MHz BL:	123.13	123.01	122.80	122.76	Average:	122.93	nsec
53 MHz Emit:	0.87	0.87	0.86	0.86	Total:	3.46	eV-sec
53 MHz Fit:	0.88	0.88	0.88	0.88	Total:	3.52	eV-sec
53 MHz Max Emit:	0.16	0.16	0.16	0.16	Average:	0.16	eV-sec
53 Mhz BL:	9.20	9.21	9.18	9.17	Average:	9.19	nsec
Bunched Beam:	2.17	2.16	2.15	2.14	Total:	8.63	mA

Acnet Devices

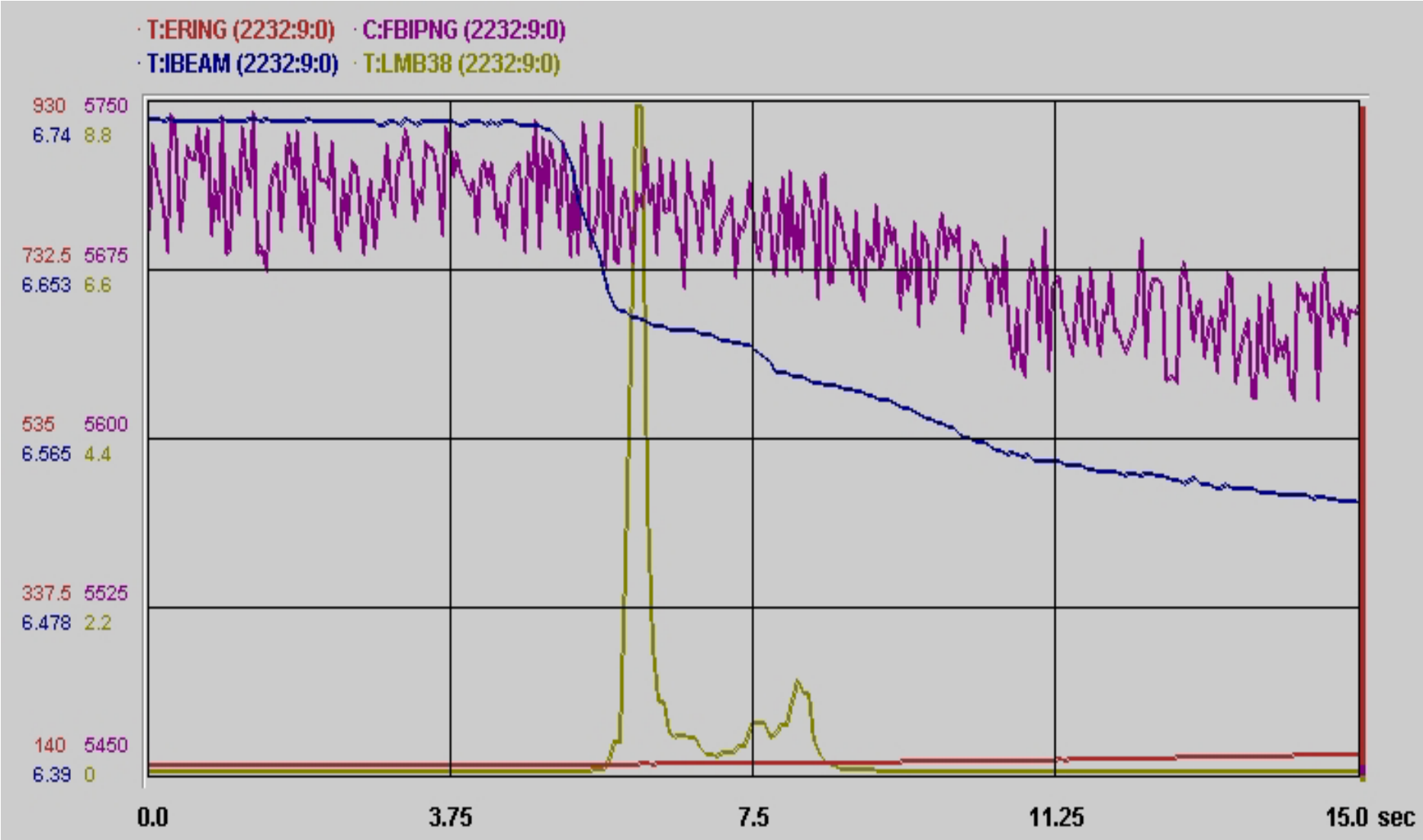
A:IBEAMB:	88.387	mA	A:LONG4T:	10.823	eV-sec
A:FUPPC:	628912.38	Hz	A:LONG4E:	1.714	eV-sec
A:FLOWPC:	628935.81	Hz	A:RCBKAM:	0.795	eV-sec

RF Voltages

ARF-1 Volts:	58.8	kV
ARF-4 Volts:	1348.1	Volts
Rev Freq:	628724	Hz


Proton Intensities
Shots # 2234 2232 2231 2229 2138
Intensity (E9)
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
Coalescing
Inject Protons
Pbar Injection porch
Inject Pbars
Before Ramp
Flattop
Squeeze
Initiate Collisions
Remove Halo
HEP

B38 Loss Up Ramp- Store 2232



Maintenance / Studies This Week

- 5 shifts of dedicated maintenance/studies
  - Get back to pre-shutdown proton and pbar intensities!
- Pbar
  - Access tomorrow to partially retreat on ARF 4 cavity impedance increase made in shutdown
  - Other minor repairs
- Tevatron
  - Understand the B38 loss
  - Measure proton instabilities – lower chromaticity
  - Commission E17 Schottky
  - Test, but not implement, new injection helix

Weekly Schedule

Update 2/17/03 3:02 PM (3)	MONDAY 2/17/03	TUESDAY 2/18/03	WEDNESDAY 2/19/03	THURSDAY 2/20/03	FRIDAY 2/21/03	SATURDAY 2/22/03	SUNDAY 2/23/03
Owls **0000** **to** **0800**		**Store** **0700-1100 Pbar Access**	Tevatron New Helix Tests Pbar - Stacking	**Shot Setup** **Shot** **Store**	Stack, store and react as necessary	→	→
DAYS **0800** **to** **1600**	**NTF-PT** Separator Scans Terminate Store CDF/D0 Access (~2 hrs)	**NTF – PT** Terminate Store ICW Leak Repair Starts (1-3 days) Tevatron - B38 Loss Problem Pbar - Access - Prove Stacking - Rev Protons	Tevatron - E17 Schottky - Proton instability measurements Pbar - Stacking	**NTF-PT** Stack store and react as necessary	→	→	→
EVES **1600** **to** **2400**	**Shot Setup** **Shot** **Store**	Tevatron - B38 Loss Problem - New Helix Tests Pbar - Acc. Aperture - Rev Protons AP2	Tevatron - B38 Tuneup Pbar - Stacking	Stack store and react as necessary	→	→	→

Schedule can be found at http://www-bd.fnal.gov/operations/schedules.html

Summary

- Resumed normal Collider operation after shutdown
- Stable operation for stacking and making stores, but luminosity ~ factor 1.5-2 low than pre-shutdown
  - Proton intensity 20-25% lower to prevent B38 quench on ramp
  - Pbar intensity ~30% lower due to diminished pbar coalescing efficiency (retreat on pbar unstacking cavity impedance change)
- 5 shifts of dedicated maintenance/studies this week
  - Lower ARF 4 impedance a bit to help improve pbar coalescing
  - Control proton loss @ B38 to increase proton intensity
- Resume "stack and store" through the weekend