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Week in Review: 1/06/03 -1/12/03

Ron Moore – FNAL

- Store Summary
- Studies Highlights
- First Pbars from Recycler to Tevatron
- Strategy for Recovery from Shutdown

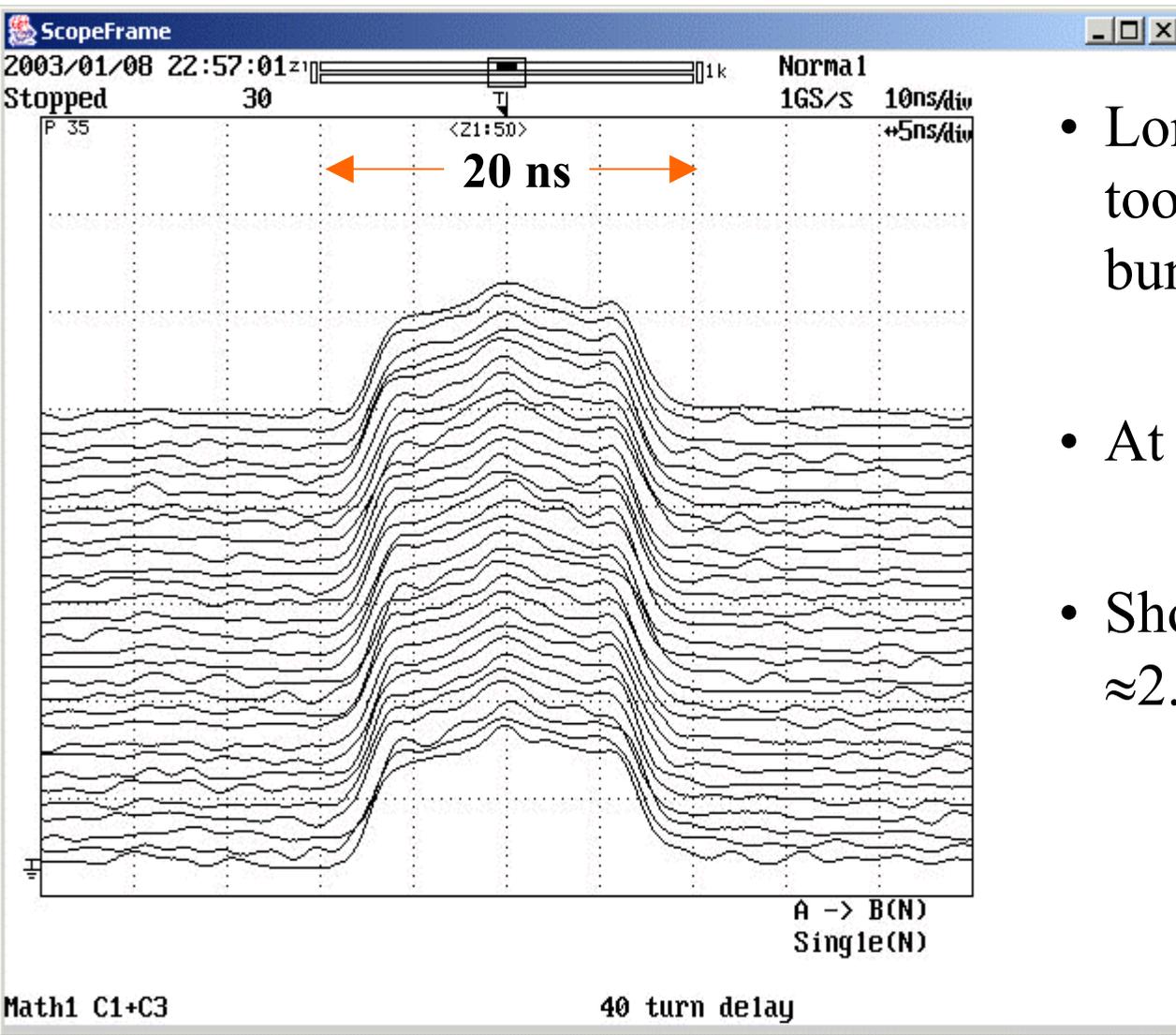


Store Summary

Store	Initial Lumi	Deliv'd Lumi	Termination	Comments
2146	22.5	747	Quench	1 bad pbar transfer; Proton length blow-up; A2 CC tripped off
2150	28.5	104	Quench	1 bad pbar transfer; A3 VFC failure after 60 minutes
2153	26.4	1197	Intentional	Lost 1 pbar transfer, another was bad
2155	29.7	1328	Intentional	New MI RPOS switch – pbar transfers OK

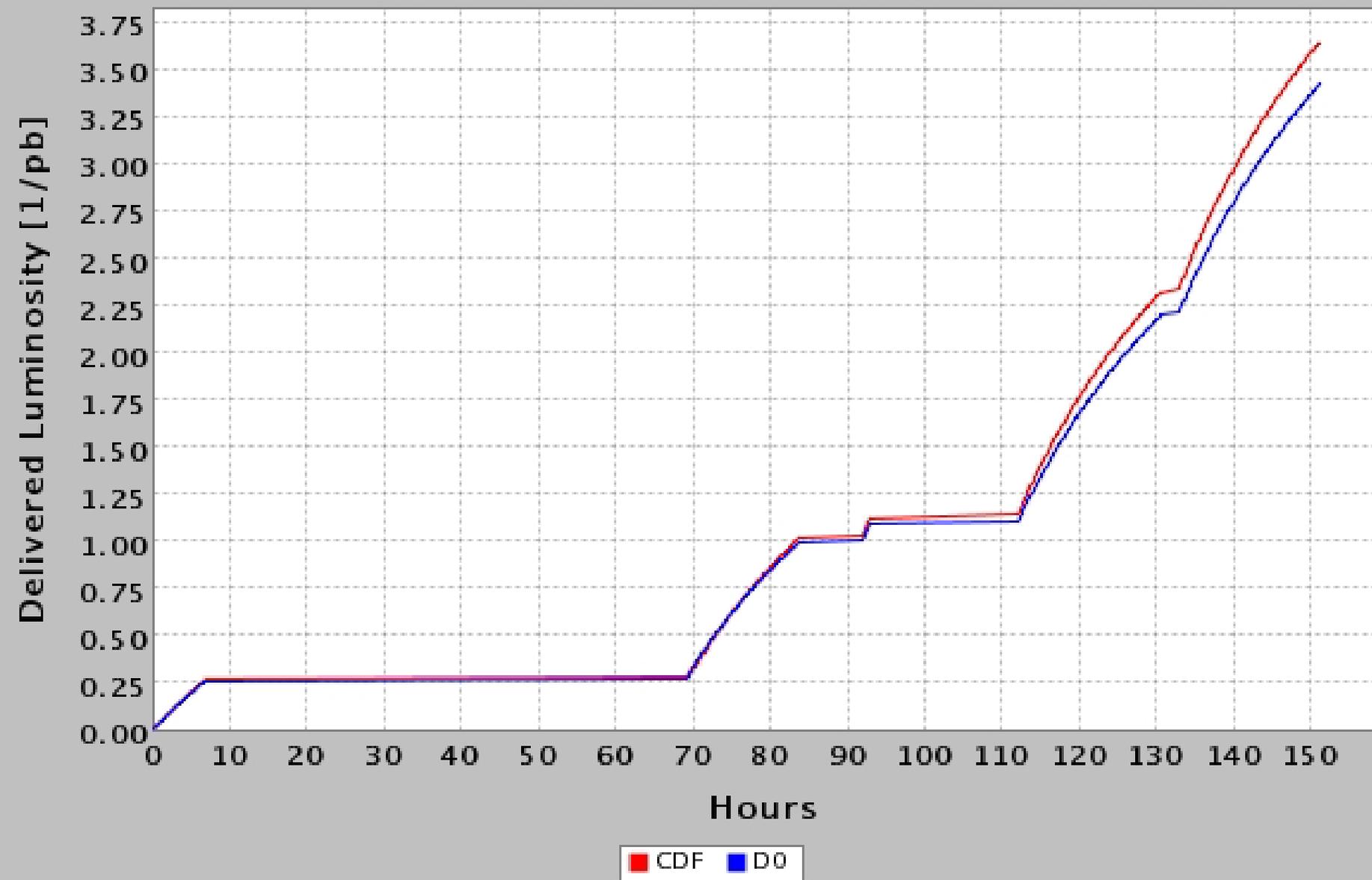
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Store #2146 Proton Length Blow-Up

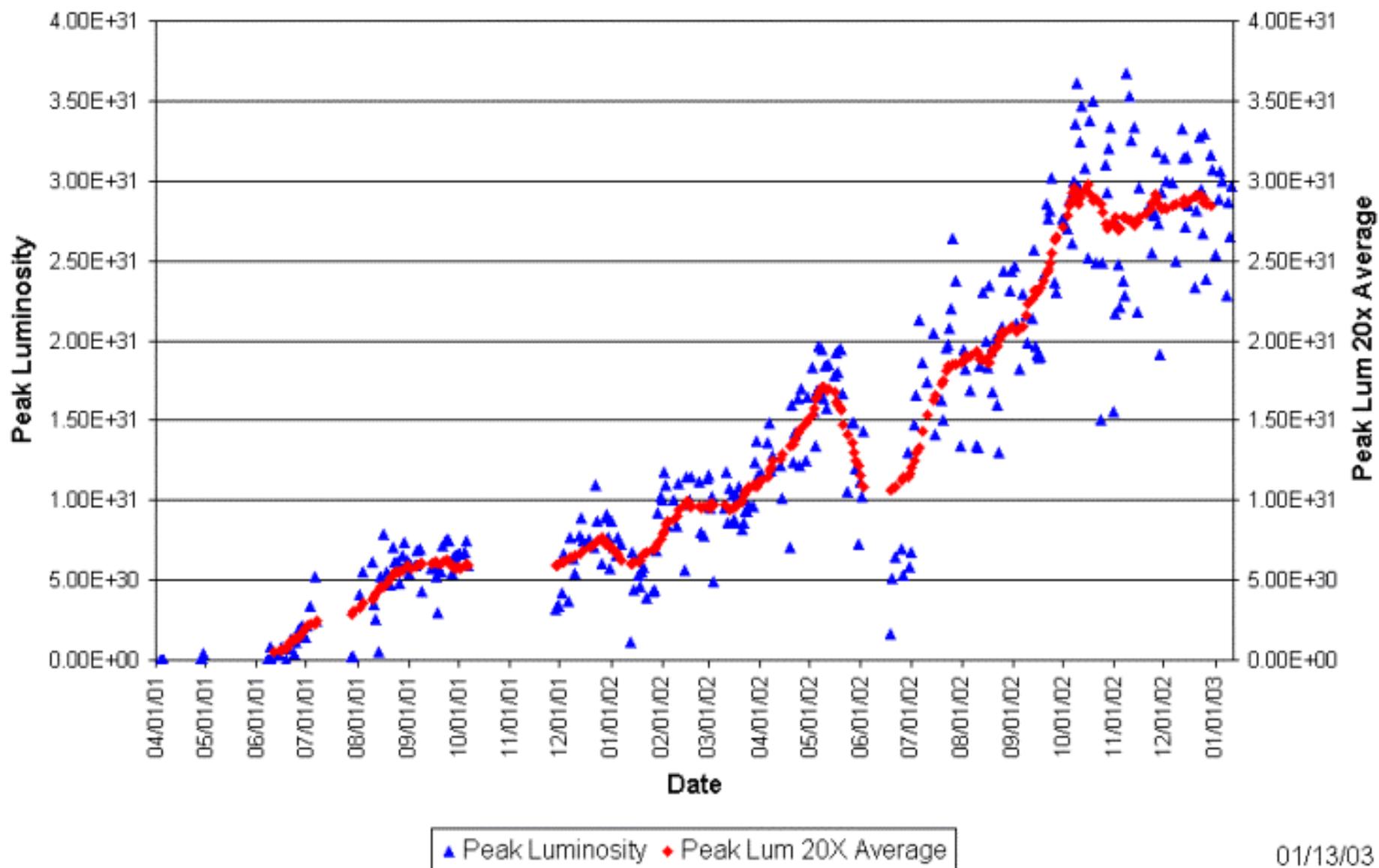


- Longitudinal damper gain too high – caused proton bunch length blow-up
- At left, P35 after blow-up
- Should be Gaussian with ≈ 2.0 ns sigma

Tevatron Delivered Luminosity: Jan-06-2003 to Jan-13-2003

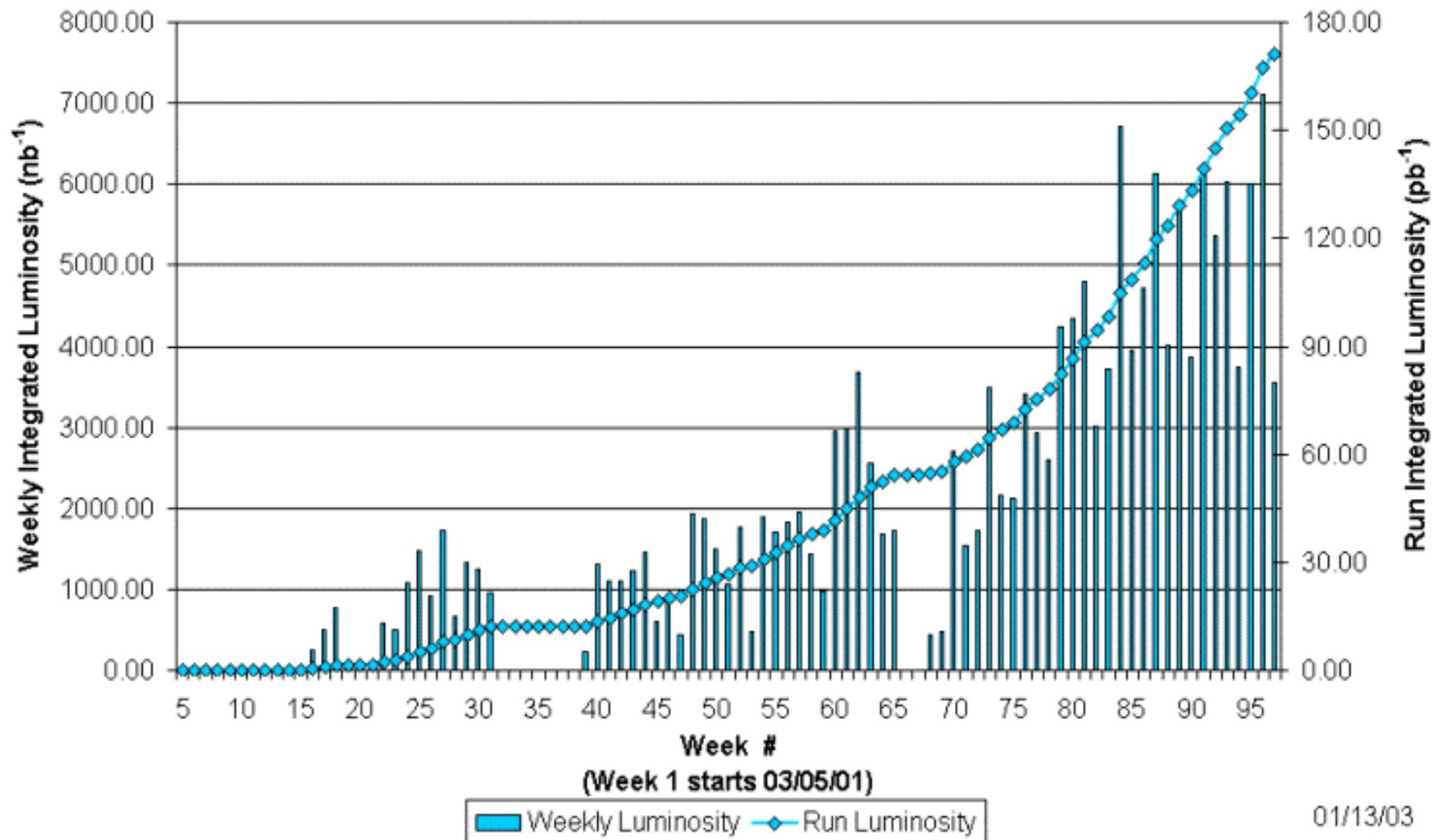


Collider Run IIA Peak Luminosity



01/13/03

Collider Run IIA Integrated Luminosity



01/13/03

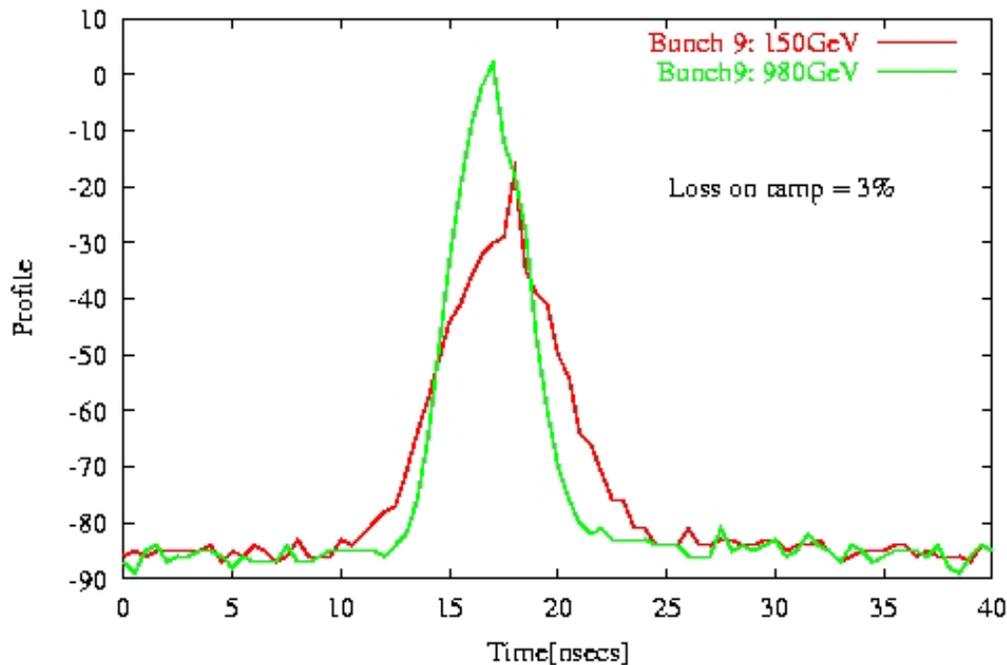
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1 Shift Access on Monday

- Tevatron – surveys for shutdown preparation
 - As-found CDF low betas to be shielded
 - Complete survey of “interesting” magnets in E-sector
 - As-found where NuMI magnets are stored above Tev
- Main Injector
 - Repair/check water leaks on RF 6, 9, 106 MHz cavity
 - Find vacuum leak in 600 section – no time to repair
 - Tours for shutdown preparation

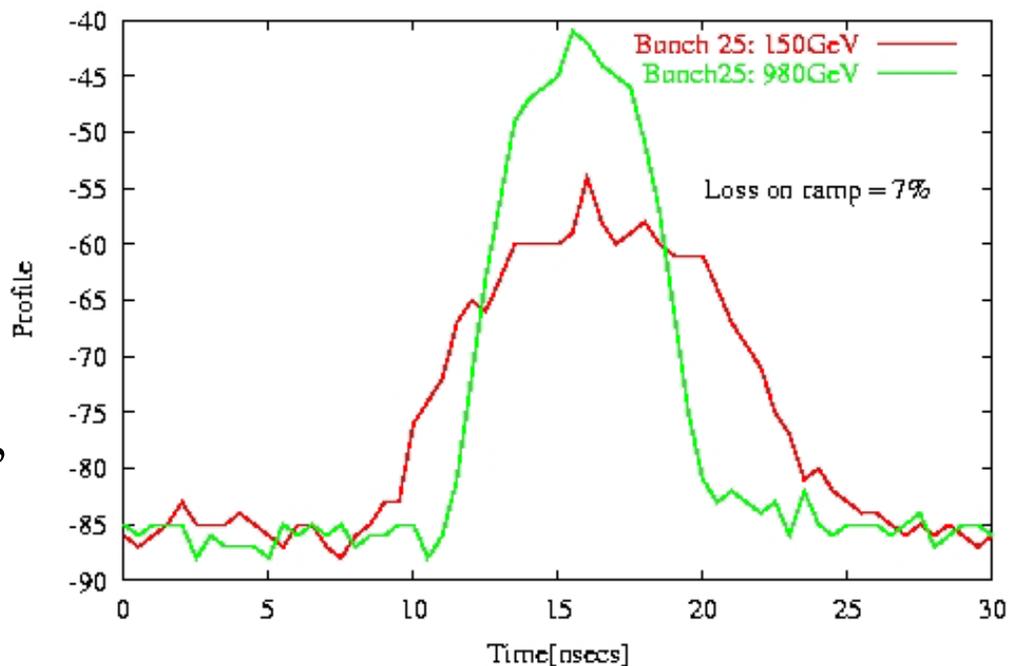
- Ramp proton bunches of various intensity/length
 - Correlate loss up ramp with bunch length/shape
 - Oscillating, non-Gaussian bunches lost 10%
 - Stable, Gaussian-like bunches lost few %
- Aperture scans for comparison after shutdown
- Test several modified BPMs (PSD boxes removed)
 - Position signal somewhat better without PSDs
 - Understand differences between coalesced/uncoalesced beam
 - Goal: obtain reliable orbit data in HEP stores to control drifts
- Check effect of RF phase noise on bunch lengthening
 - Opened RF phase feedback loops – obvious increases in growth rate and abort gap losses
 - Understand this effect on DC beam growth in stores

Longitudinal profiles on the proton helix (150 GeV)



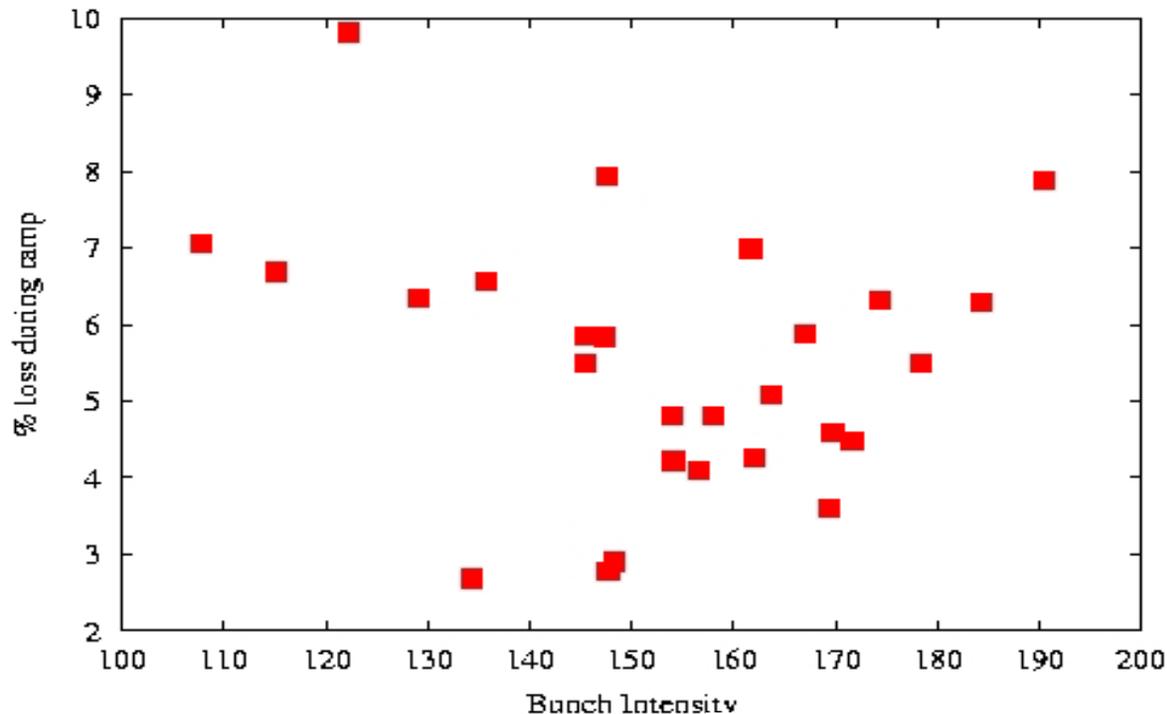
Example of “fairly Gaussian”
proton bunch

Longitudinal profiles on the proton helix (150 GeV)

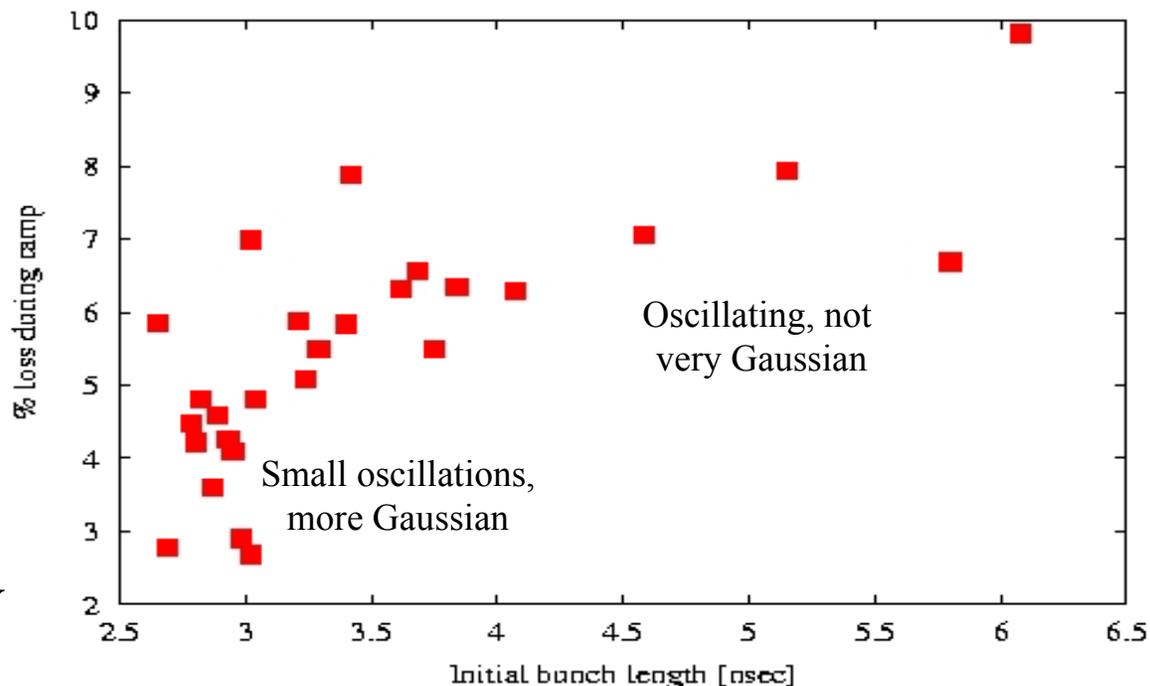


Example of a “not-so-Gaussian”
proton bunch

% loss of protons up ramp
vs intensity



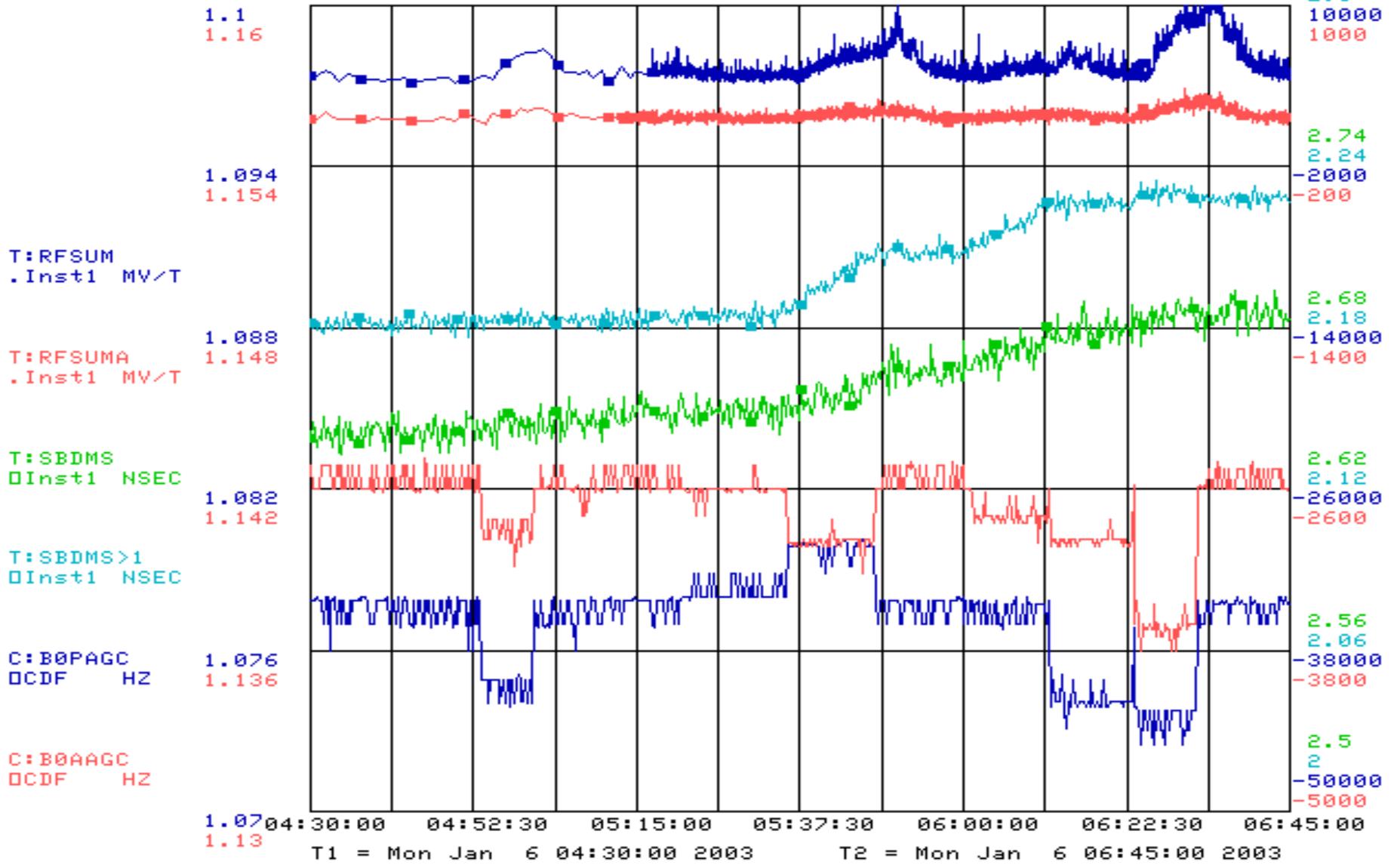
% loss of protons up ramp
vs “Gaussian sigma
bunch length” @ 150 GeV



- Tune scan with Tevatron Electron Lens
 - Move tune of single bunch with e-beam
 - Study beam lifetime versus tune
 - Compare to new “gaussian” TEL gun after shutdown
- Flying wire – sync light emittance comparison
 - Understand systematic differences
 - Scrape away 1 proton bunch with vertical collimator
 - Differences in scale, but sync-light and flying wires track well
- Effect of coupling on proton emittance at injection
 - Preliminary work demonstrates reduced emittances of coalesced protons ($23 \rightarrow 18 \pi$) by modifying skew quad circuits
 - Skew quad changes also change tune – need more time
 - Hopefully lead to reduced emittances of protons, pbars at 150 GeV

TEV RF noise – bunch length study

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Last Day Before Shutdown

- Lost pbar stack in shot-setup due to operator error
 - ⇒ *No TeV store yesterday*
- MP02 regulation problems
 - Experts came to replace regulator, tune-up extraction
- Could not prove stacking before turn-off
 - Tune changes likely from earlier mistake
 - No time to cycle busses before beam turned off
- First pbar transfer from Recycler to Tevatron!
- Shutdown of all machines began at noon on 1/12

First pbars from Recycler into Tevatron

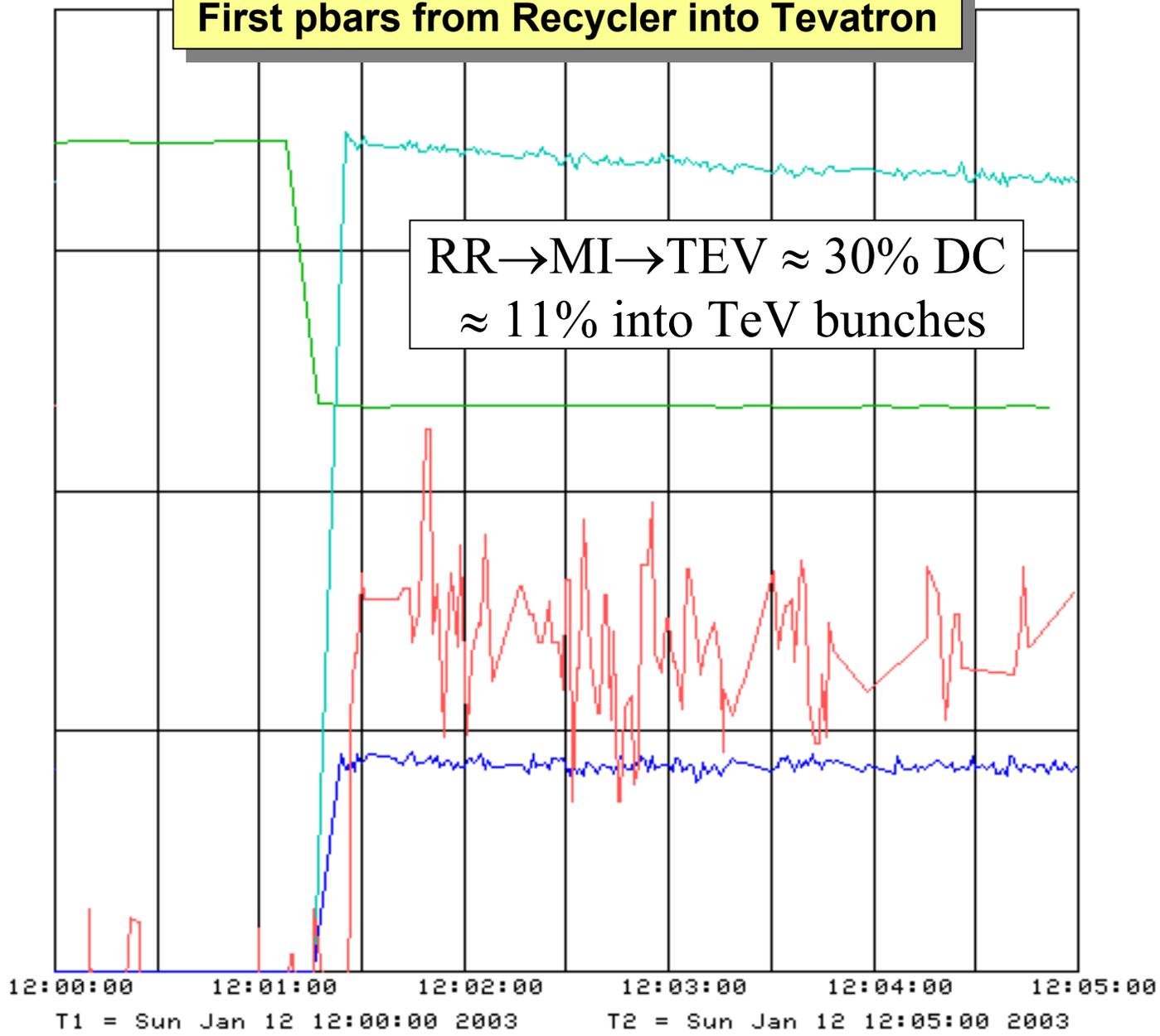
RR DC beam (E11) 2
20
20

TEV DC beam (E10) 1.5
1.5
15
15

TEV FBI bunch (E9)

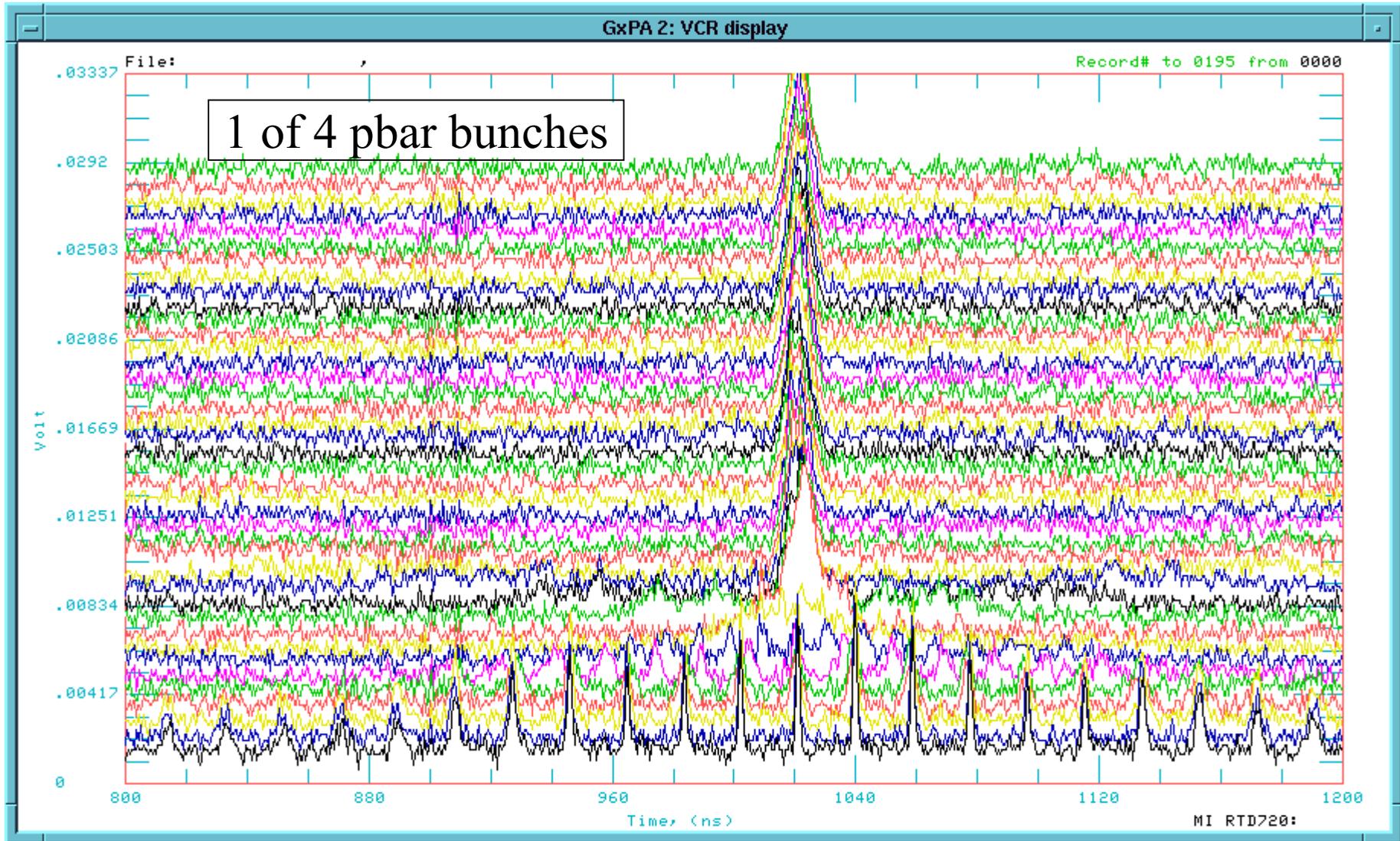
TEV SBD bunch (E9) 1
1
10
10

0
0
0
0



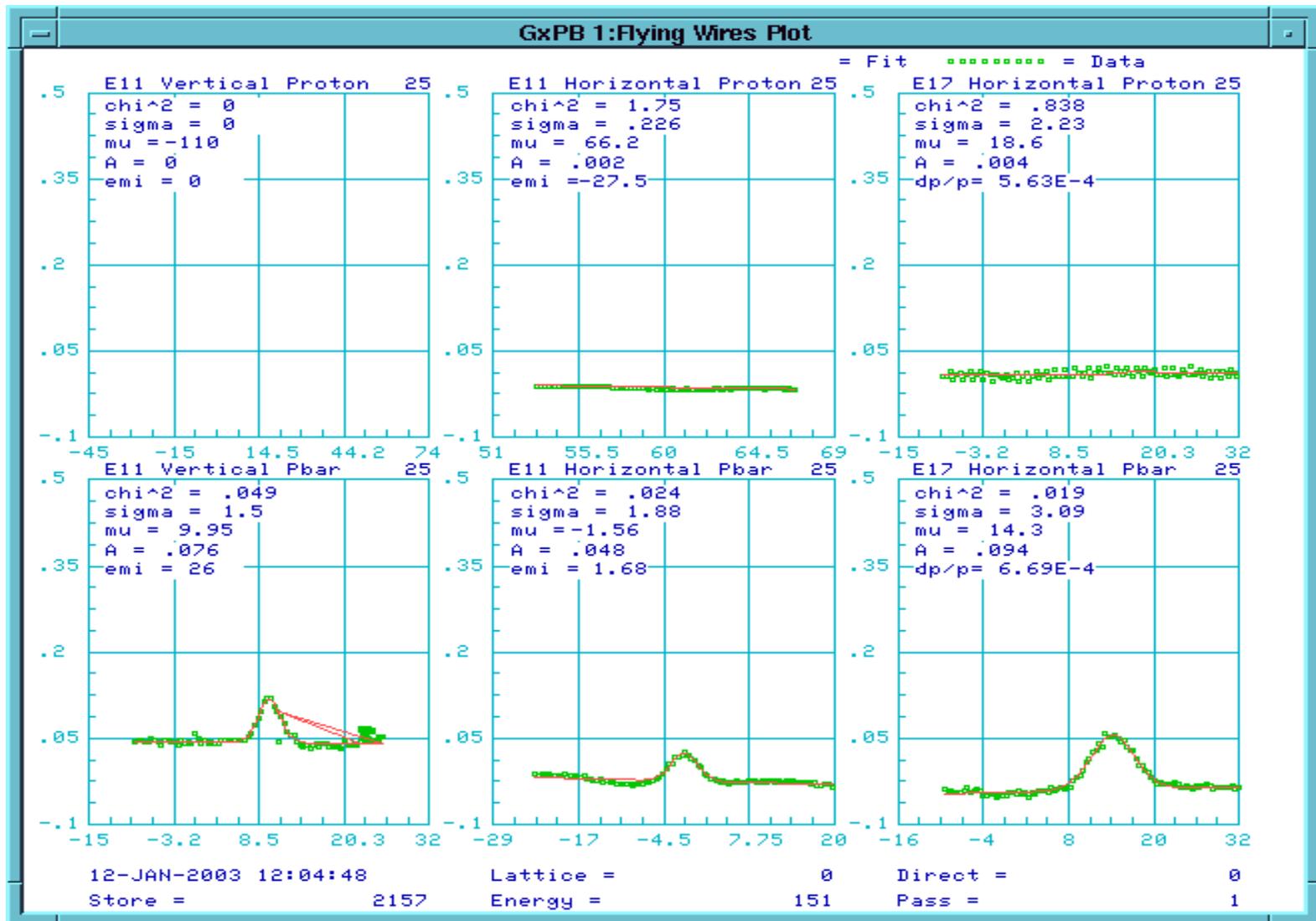
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Coalescing Recycler Pbars in MI



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Flying Wire Profile of A25 in Tev



f Recovering from 3.5 week shutdown

- Come up quickly to pre-shutdown performance
- What to do when Tev gets beam?
 - Get beam to circulate...
 - Aperture scans, especially @ B0, C0, E17 (2 shifts)
 - Fix orbits, tunes, chromaticities, coupling up ramp and through the squeeze (6 shifts)
 - Long p-only stores to check stability of C0 shunt (2 owl shifts?)
 - Do only necessary work to get machine up...optimize later.
- Try for first HEP store after 4 days with beam
- Stack & store for 1 week, then start dedicated studies aimed at exploiting larger C0 aperture
 - Optimize injection helix to improve lifetimes at 150 GeV...
 - Modifying helix means tedious effort to optimize feeddowns
- May need to realign CDF low beta quads after 4-6 weeks?

- Below average delivered luminosity: $\approx 3.5 \text{ pb}^{-1}$
 - 1 shift access, 5 shifts studies/maintenance, 1 lost store, 1 lost stack
- Encouraging results on reducing emittances of protons at injection into Tev by modifying coupling circuits
- Proof-of-principle: pbars extracted from Recycler and injected into the Tevatron!
- 3.5 week shutdown has begun – access everywhere