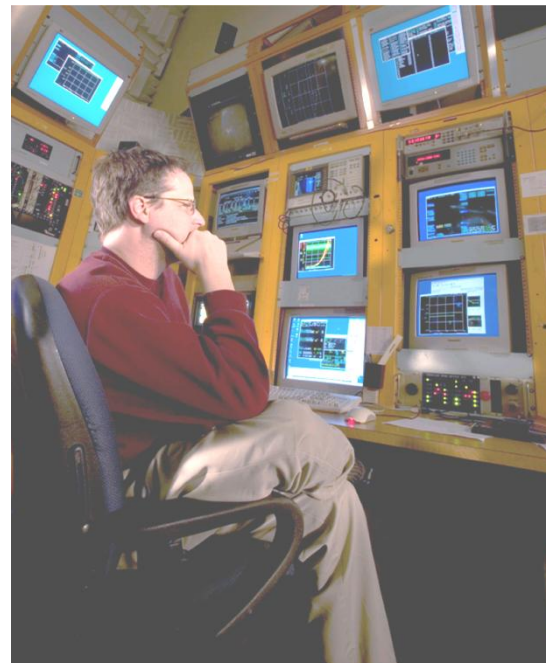
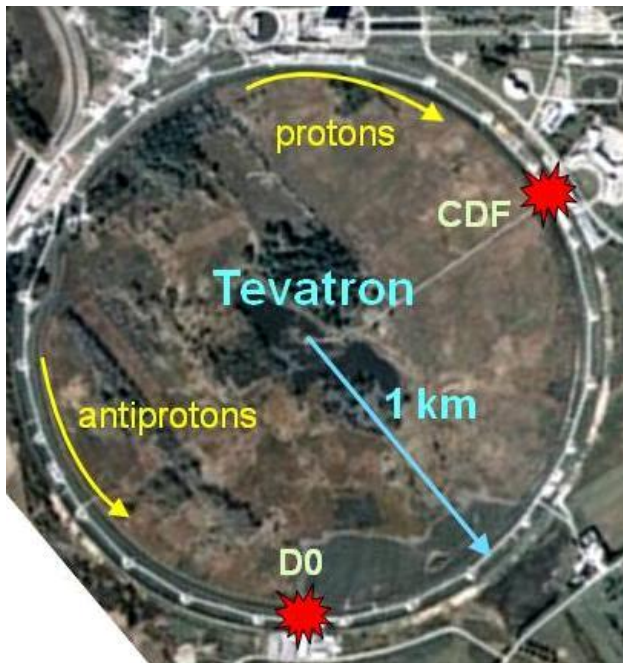




# Tevatron Accelerator Studies Workshop



Ron Moore

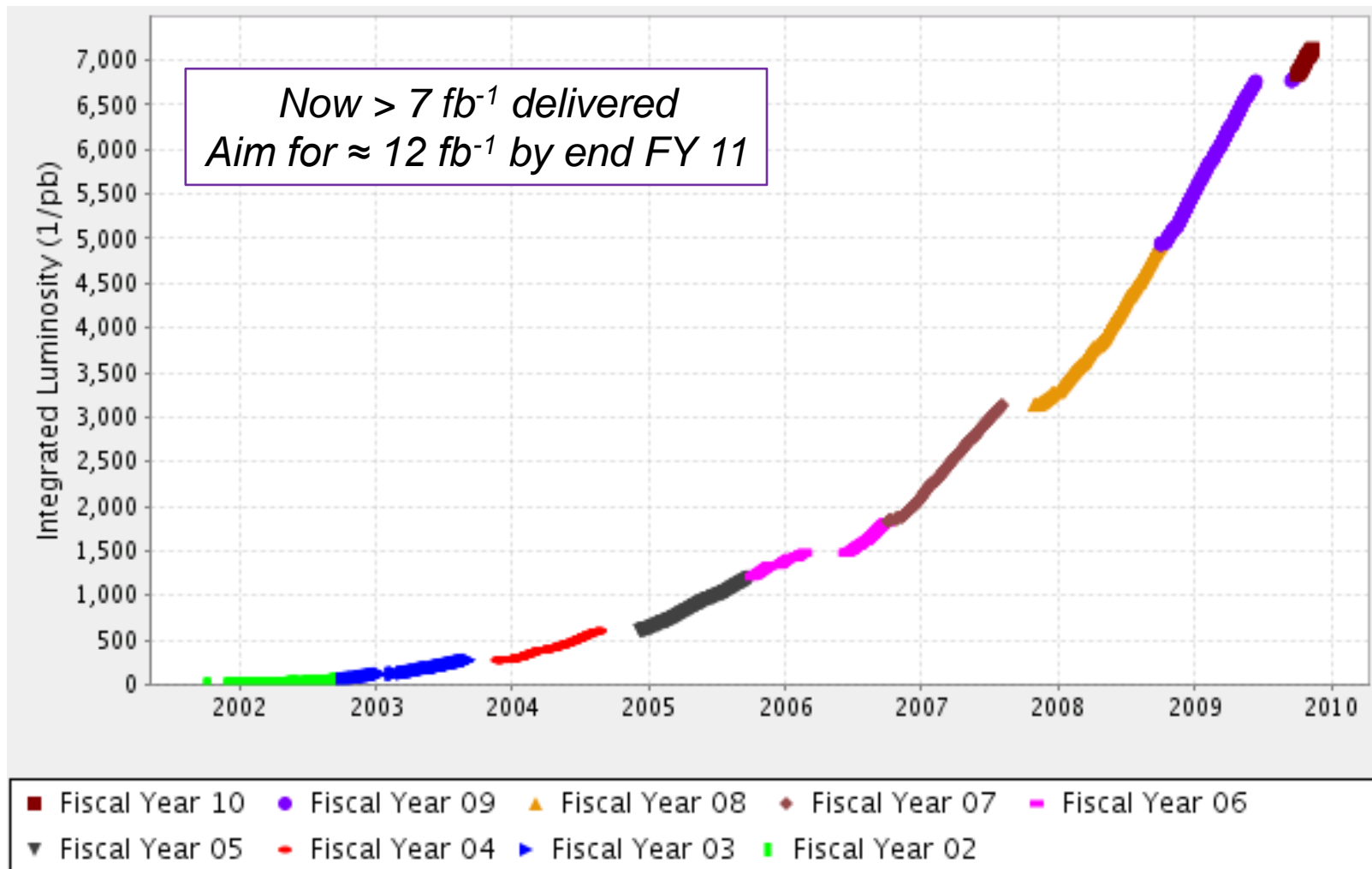
*Fermilab – AD / Tevatron Dept. Head*



# Tevatron's Day Job = Deliver Luminosity



## Run 2 Integrated Luminosity

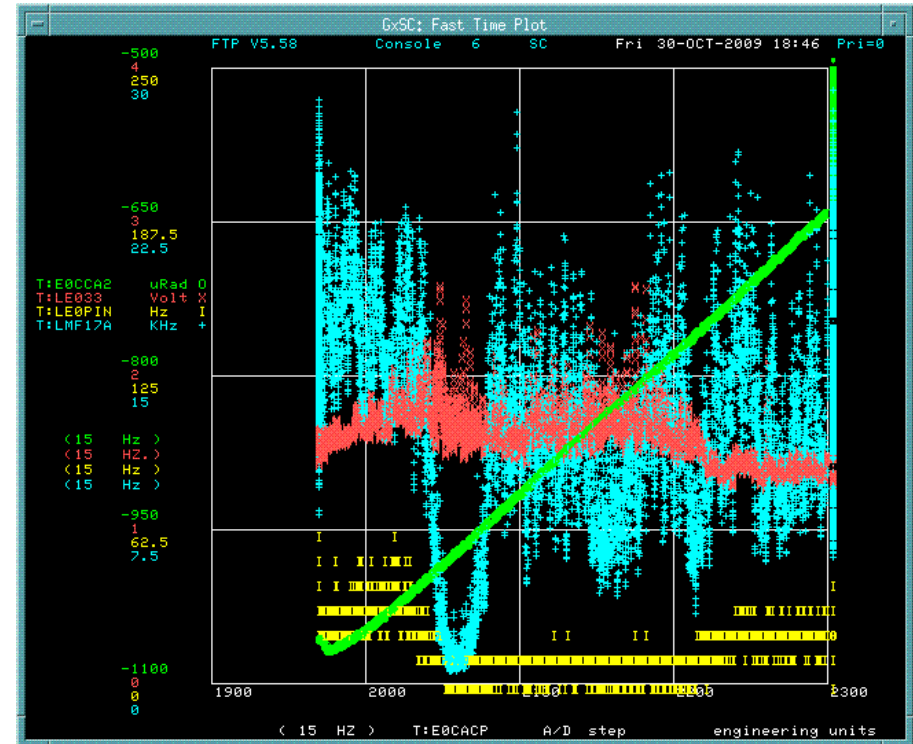




# Some Moonlighting for LARP



- Crystal collimators
  - T-980 test beam experiment
- 2 goniometers now installed in Tevatron (1 each plane)
- Occasional end-of-store studies





# What else can be done?



- Fermilab Directorate wants to gather interest on using the Tevatron for accelerator physics experiments
  - Get a sense of scale: # experiments, duration of such a program
  - A couple of days, several weeks, a few months?
  - Could be during collider operation, a dedicated run, or both?
  - Lots of flexibility at this point, but no promises
- I am to deliver a “white paper” to the Directorate several weeks before the April 2010 meeting of the FNAL AAC (Accelerator Advisory Committee)
  - Consider it an “expression of interest”



# Have a Workshop!



- Organizing “Tevatron Accelerator Studies Workshop” at FNAL to discuss initial study ideas, resources, needs, refinements
  - January 13-14, 2010 – just got formal approval
  
- Organizing Committee
  - Ron Moore (FNAL)
  - Wolfram Fischer (BNL)
  - Tom Markiewicz (SLAC)
  - Frank Schmidt (CERN)



# Program Guidelines



- Use Tevatron essentially “as-is” for collider operation
  - No major changes
  - Adding instrumentation / devices in existing warm straights feasible
  - But, it doesn’t hurt to ask!
  
- Possibly during collider operation, a dedicated run, or both
  - End of HEP store studies like crystal collimator
  - Proton-only studies between HEP stores

# Draft 2010-13 Fermilab Accelerator Experiments' Run Schedule

Typically Revised Annually - This Version from October, 2009

Calendar Year	2010	2011	2012	2013
<b>Tevatron Collider</b>	CDF & DZero	CDF & DZero	OPEN	OPEN
<b>Neutrino Program</b>	<b>B</b>	MiniBooNE	MiniBooNE	OPEN
		OPEN	OPEN	MicroBooNE
	<b>MI</b>	MINOS	MINOS	OPEN
		MINERvA	MINERvA	MINERvA
		ArgoNeuT		
			NOvA	NOvA
<b>SY 120</b>	<b>MT</b>	Test Beam	Test Beam	Test Beam
	<b>MC</b>	OPEN	OPEN	OPEN
	<b>NM4</b>	E-906/Drell-Yan	E-906/Drell-Yan	E-906/Drell-Yan

This draft schedule is meant to show the general outline of the Fermilab accelerator experiments schedule, including unscheduled periods.

Major components of the schedule include shutdowns:

In Calendar 2010, a 4-8 week shutdown for maintenance is shown.

In Calendar 2011, no shutdown for maintenance is shown.

A 2012-3 11-month shutdown is shown to upgrade the proton source and change the NuMI beam to the Medium Energy (ME) config.

	RUN/DATA
	STARTUP/COMMISSIONING
	INSTALLATION
	M&D (SHUTDOWN)

19-Oct-09

- Tevatron Collider Run 2 expected to continue through FY11
- Few months “available” for dedicated running before major shutdown begins in 2012



# Possible Study Topics



- Wrap-up of Collider Run 2 studies
- Collimation (crystals, hollow e-beam)
- Beam-beam compensation (have 2 electron lenses)
- Electron cloud
- Studies related to (re)using Tevatron for fixed-target physics?
- Test new instrumentation
- *Insert your ideas here...*





# Tevatron 101



- Injection energy = 150 GeV, Top energy = 980 GeV
- 1 km radius, 21.1  $\mu\text{s}$  revolution time
- RF = 53.1 MHz, 8 Cu cavities, 1113 buckets around the ring
- Collider = 36  $\times$  36 proton  $\times$  antiproton bunches in single pipe
  - 3 trains of 12 bunches each, 396 ns (7 bucket) bunch separation
  - 2 collision points with 28 cm  $\beta^*$  (CDF & D0 detectors)
- Typical collider bunch intensities for good running
  - Protons:  $310 \times 10^9$  injected,  $280 \times 10^9$  start of HEP
  - Pbars:  $90 \times 10^9$  injected,  $83 \times 10^9$  start of HEP
- Quench recovery  $\approx$  3 hours



# Devices and Instrumentation



- Flying wires
- Sync-light monitor
- BPMs, BLMs (both can do turn-by-turn)
- AC Dipole
- 21 MHz and 1.7 GHz Schottky systems
- Ionization Profile Monitor
- Intensity pickups (DCCT, Resistive Wall Monitor)
- SBD (Sampled Bunch Display) for intensity, bunch lengths
- FBI (Fast Bunch Integrator) for intensities
- Tune and chromaticity trackers
- Couple of stripline pickups (used for dampers, noise sources)



# Controls & DAQ



- Controls are FNAL home-grown ACNET system
- C and Java applications
- FTPs (plotting of live device data) up to 15 Hz for many devices
- Datalogging available – most devices up to 1 Hz
  - Make plots
  - Export data in text, Excel formats for offline analysis



# Initial Questions to Answer for a Study



- Can the Tevatron do this or that?
- Colliding beams or proton-only?
- Needed instrumentation?
- Anything to install in tunnel?
- Estimated duration?
- *I will create a web site to provide interested parties with more info about the accelerator complex and to submit ideas*



# Summary



- FNAL Directorate wants to learn about interest in using the Tevatron for a possible experimental accelerator physics program
- Hope for interest from national labs, LARP, etc.
- Planning “Tevatron Accelerator Studies Workshop” @ FNAL
  - January 13-14, 2010
- For more details or sign up for workshop email list, contact me
  - Email: [ronmoore@fnal.gov](mailto:ronmoore@fnal.gov)
  - Call: 1 630 840 6466
- We look forward to your enthusiasm and ideas!