
Rapid Transfer Automation
and
P1, 2, AP1, 3 BPMs

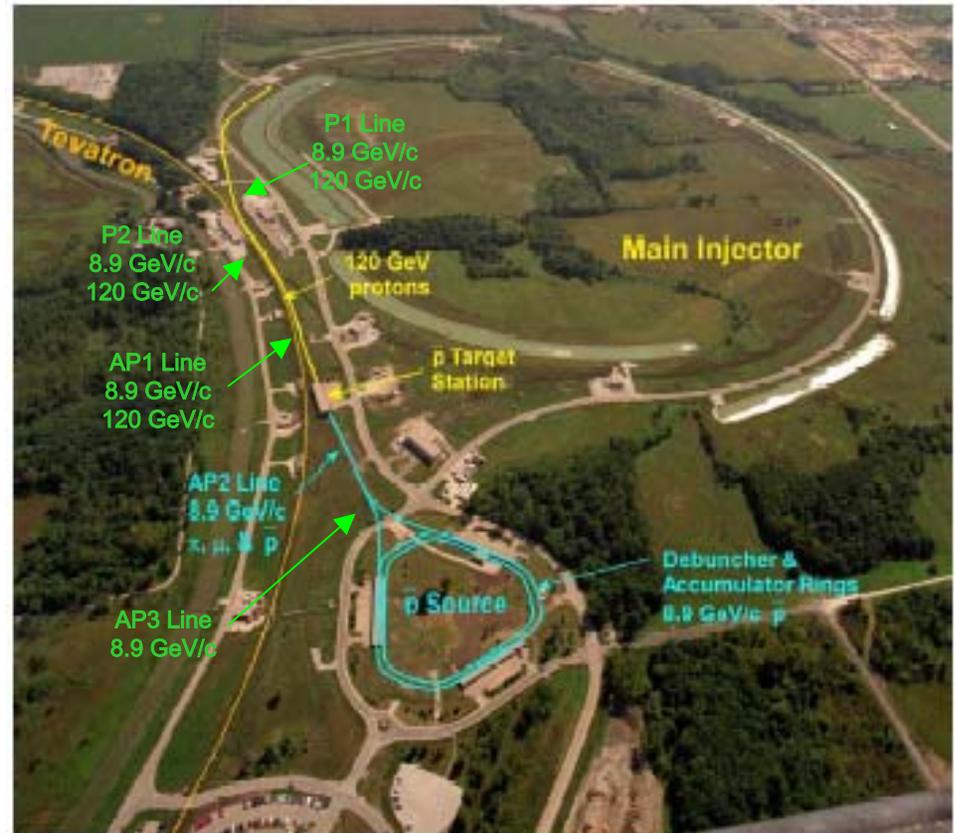
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Rapid Transfers/Beam line BPM's

- Introduction
- Software
- Instrumentation
- Summary

Rapid Transfers/Beam line BPM's - Introduction

- Pbar Transfers Explained
 - Stacking halted
 - Accumulator lattice switched
 - P1/P2/AP1/AP3 tuned up for optimum performance at 8 GeV with reverse protons
 - Pbars unstacked from the Accumulator core and accelerated to the extraction orbit
 - Pbars extracted and transported to MI/RR via AP3/AP1/P2/P1 beam lines at 8 GeV
 - Stacking resumes: P1/P2/AP1 operate at 120 GeV for stacking



Rapid Transfers/Beam line BPM's - Introduction

- Current set-up time
 - ~2 hours to load the Tevatron
 - ~1 hour to set up and send pbars to the Recycler
- Motivation for speeding process
 - Increased stacking rates only possible by not building a core - empty the Accumulator when it 'fills up'
 - Maintain as high an average stacking rate as possible - minimal impact on stacking
- Expected set-up time
 - move from shot set up to automated transfers
 - transfers occur on clock event now, but steps leading to transfers are a combination of manual and automatic processes
 - Unstack/transfer time now ~30 seconds per transfer, driven by time to adiabatically bunch, accelerate, and extract pbars from the Accumulator

Rapid Transfers/Beam line BPM's - Introduction

■ Requirements

➤ Time

- Empty stack every 30 minutes
- Transfers of order one minute - driven by 30-second unstack time

➤ Stack size

- 40 E10 or less

➤ Emittances

- Transverse: 10π mm-mrad (95% normalized)
- Longitudinal: 10 eV-s
- Up to 50% dilution allowable

Rapid Transfers/Beam line BPM's - Introduction

- Differences from current scheme
 - Remain on stacking lattice
 - Interrupt stacking only to transfer pbars
 - No cooling time
 - No reverse proton tune up
 - Beam line tune up only when transmission degrades
 - Reconfiguration minimized - timers, cooling gains and delays, etc.
- Build on experience from Runs I & II
 - Beam line tune is reproducible
 - Unstacking process is mature and stable

- 1.3.6.3.3 Orbit correction
 - Reverse proton tune-up no longer occurs except as transfer performance dictates
 - Application needed to read/use beam line BPM data for pbars to make corrections
- 1.3.6.3.4 Lattice measurement
 - Parasitic/rapid beam measurements and correction as needed of beam line lattice will be needed
 - Reading BPM's for pbars will ease burden of relying on studies with reverse protons

Rapid Transfers/Beam line BPM's - Instrumentation

- 1.3.6.5.1 Beam line BPM upgrade
 - BPM current use
 - Reverse protons
 - Minimum 30 uniform 53 MHz bunches
 - A few E11 intensity
 - Beam conditions purposely varied during shot set up to minimize necessary intensity
 - currently no pbar beam line BPM data
 - Reverse proton data sufficient for good pbar transmission
 - Electronics limitations
 - Low intensity
 - bunch structure
 - Outdated DAQ
 - Difficult to integrate with existing software
 - Rapid Transfers - no routine reverse proton tuneup for rapid transfers
 - Use pbars to monitor beam line performance
 - Use data to feedback to beam lines tune

Rapid Transfers/Beam line BPM's - Instrumentation

- Available diagnostics for pbars
 - SEM grids
 - AP3 & AP1
 - Multiwires
 - P1 & P2
 - Toroids
 - All beam lines
 - Miscellaneous
 - Schottky monitors
 - Flying wires
 - Drawbacks
 - Inconsistent along entire length
 - Lack of coverage
 - Invasive - scatter beam, emittance dilution

Rapid Transfers/Beam line BPM's - Instrumentation

■ 1.3.6.5.1 Beam line BPM upgrade

➤ Scope of work

- P1, P2, AP1, AP3, A1
- Use existing BPM pickups (53 MHz)
- Upgrade electronics to support all expected beam modes
- Modernize DAQ
- Develop applications software to meet beam monitoring and tuning needs

➤ Status

- Project scheduled for CY04
- Estimated M&S
- Estimated labor
- Full electronics/DAQ requirements to be developed
- Application requirements to be developed

Rapid Transfers/Beam line BPM's - Summary

- Collider operation with the Recycler will require a fully automated scheme to transfer antiprotons from the Accumulator to the Recycler
- P1, P2, AP1, AP3, A1 BPM upgrade essential to see pbars during automated transfers
- Benefit both routine operation and studies periods
- Upgrade planned for CY04