

Longitudinal Emittance Measurements in the Collider Complex

- Goal: Measure RMS and 95% longitudinal emittance at well-defined specific points along the ramp for each machine using
 - a common analysis technique
 - A. Tollestrup's constant phase space expansion
 - Cable dispersion and scope response de-convolution
 - Baseline detection
 - similar hardware
 - Resistive wall detector
 - TEK 7000 series segmented memory scopes
 - Calibrated Cavity fanbacks
 - Synchronous phase angle detectors
- Specific points along the ramp can be
 - States
 - Injection, transition, extraction, etc.
 - Periodic

Near Term Work (completed by January 04)

- Investigate the constant phase space expansion technique for sensitivities due to:
 - Multi-modes
 - Number of sample points
 - Large synchronous phase angles (?)
- Come up with schemes for
 - Averaging
 - Bunch center detection
- Come up with common computer (C ?) code algorithms for constant phase space expansion technique
- Install constant phase space expansion technique in present measurement systems for:
 - Pbar extraction (AP1 wall monitor program)
 - MI Pbar Injection
 - MI - after coalescing
 - TEV injection - (average of all 36 bunches or each individual bunch ?)
 - TEV flattop-(average of all 36 bunches or each individual bunch?)

Longer Term Work (completed by May 04)

- Define measurement states for each machine
 - MI stacking, MI coalescing, TEV injection, TEV, Flattop
 - Parameters - Number of bunches, synch freq, bunch intensity, etc..
 - Outputs - each bunch, measurement frequency
 - Should be completed by December '03
- Build a Main Injector Longitudinal Emittance monitor as a prototype for other machines
 - Crucial need for stacking
 - Has many different modes of operation
 - Should be completed by February '04
- Build similar monitors for
 - Booster
 - Pbar
 - TEV
 - Should be completed by May '04