
# P150 line and MI test program

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The problem: how stable and how gaussian is the beam ?

- Measure transverse and longitudinal beam profile in Main Injector
- Study an existing transfer line (P150)
  - Measure transverse beam profile and tails
  - Measure $\Delta p/p$ ??
  - Test power supply stability
  - Test prototype of NuMI 'beam extraction' permit system
- Extrapolate to NuMI conditions

Many of these tests can be conducted parasitically


# P150 and NuMI beam lines

- P150 is a partial turn extraction beam line from the Main Injector used to transport
  - 150 GeV/c protons to the Tevatron
  - 120 GeV/c protons to the pbar target
    - intensities ≈ 4 $10^{12}$ (1 batch)
    - narrow $\Delta t$ required (short bunch length)

- NuMI is a single turn extraction beam line
  - 5 (and possibly all 6) batches extracted
  - narrow $\Delta p/p$ required
  - lattice functions quite different from P150

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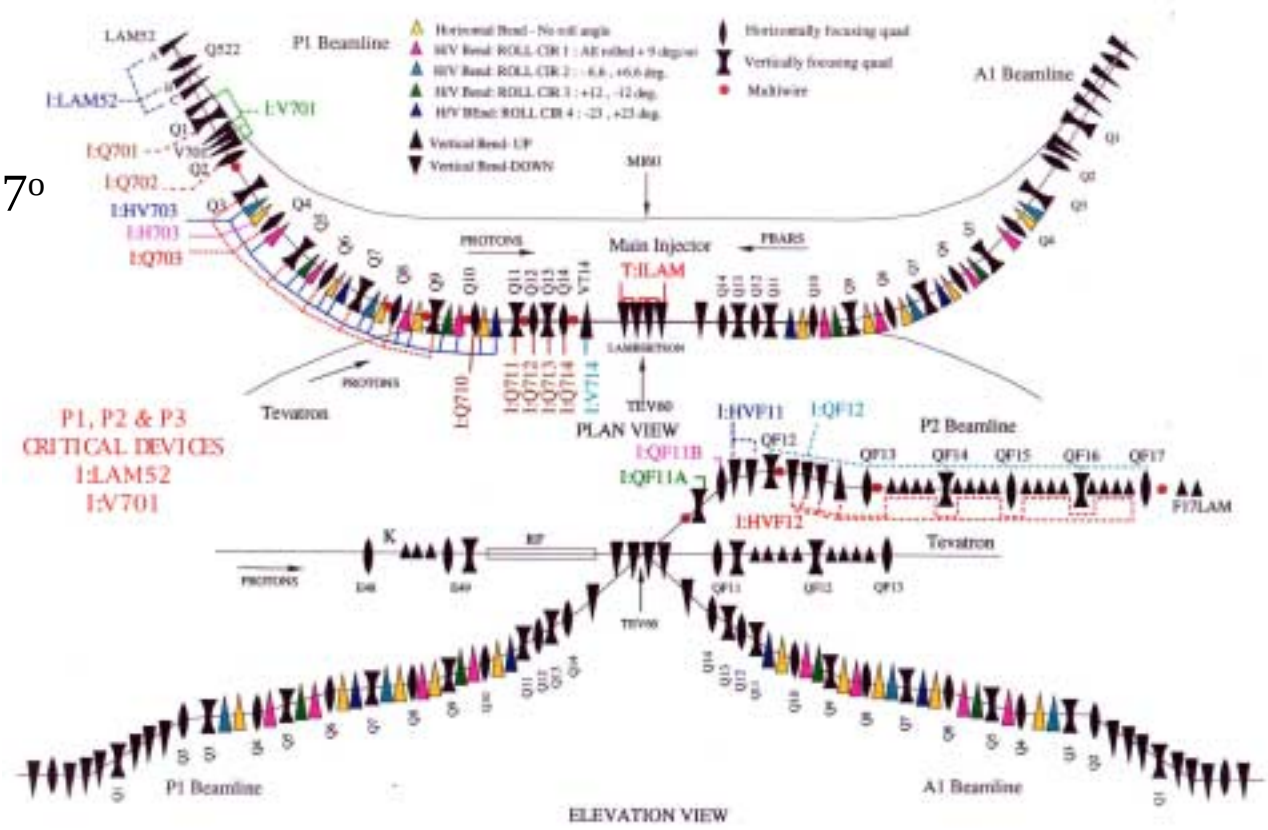
# P150 line

Horizontal bend ≈ 17°

Vertical bend ≈ 1°



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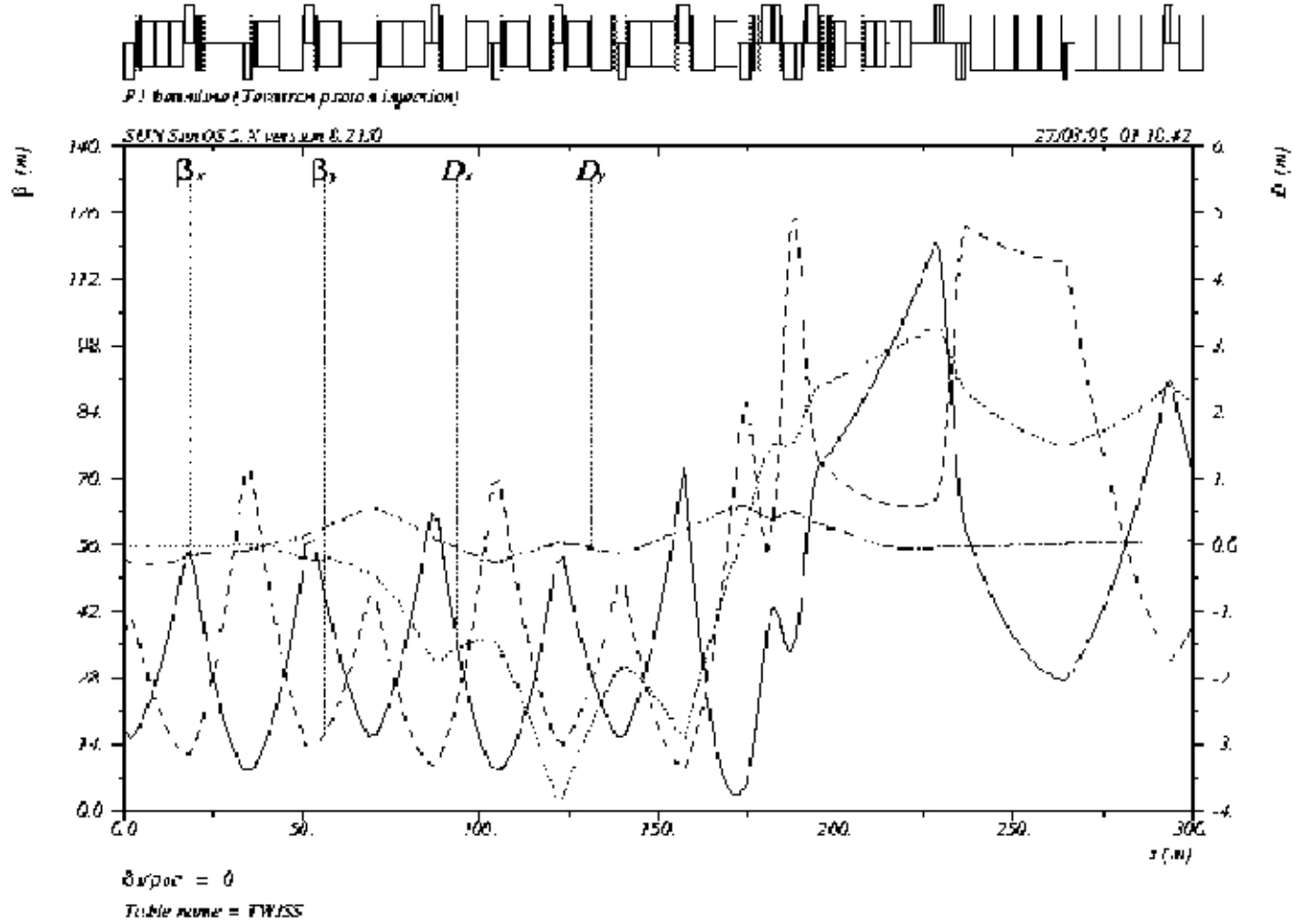
# P150 lattice function



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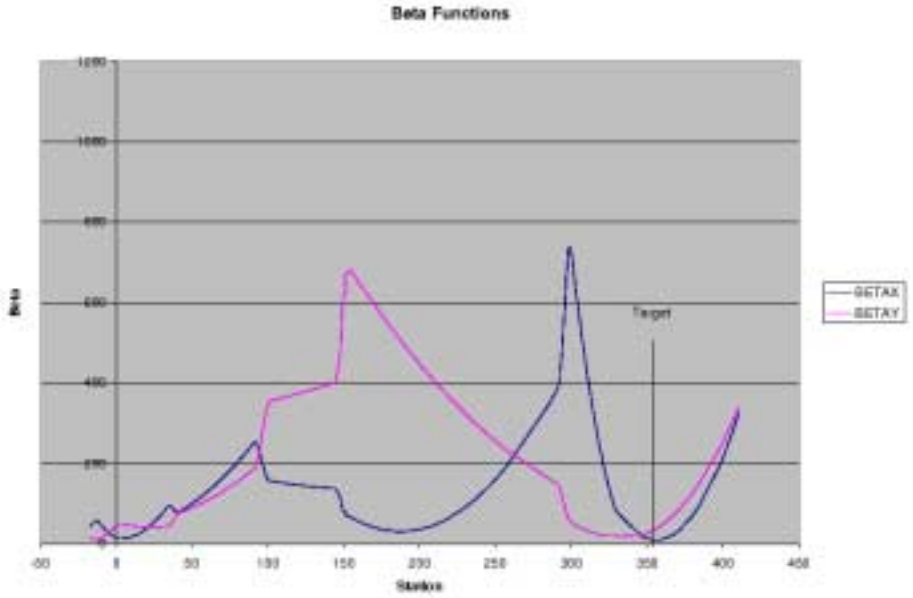
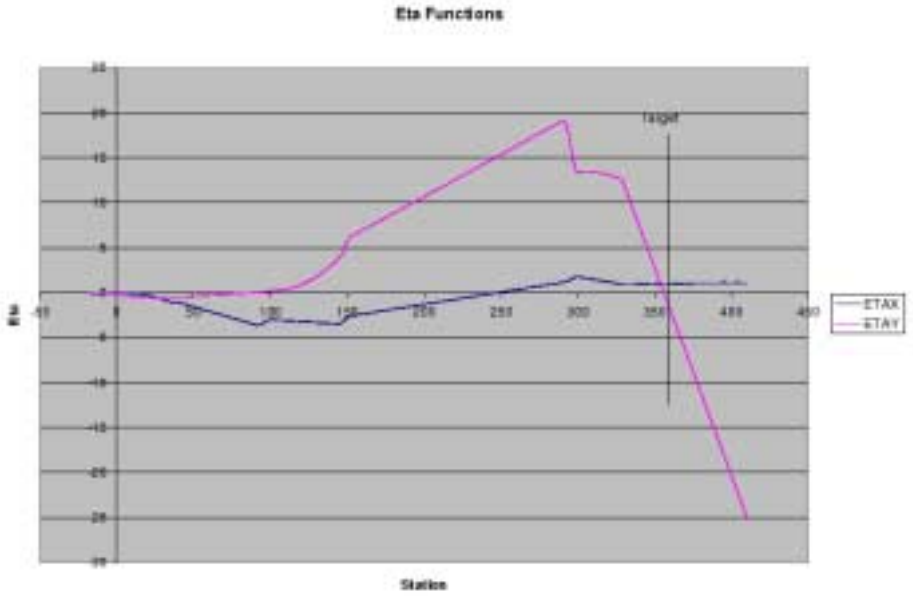
# NUMI lattice functions



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# Main Injector test program

- Study
  - Flying Wire profile
  - Ionization Profile monitor (IPM)
  - Crawling wire ??
- Monitor
  - Beam Toroids
  - Beam Loss Monitors (BLM)
  - Beam Position Monitor (BPM) in front of Kicker
  - Bunch Length Monitor (from Resistive Wall Monitors)
  - Transverse Emittance ??
- Test prototype beam extraction permit system
- Dedicated time needed to study beam profiles with
  - multi-batch configuration
  - appropriate bunch rotation to minimize $\Delta p/p$

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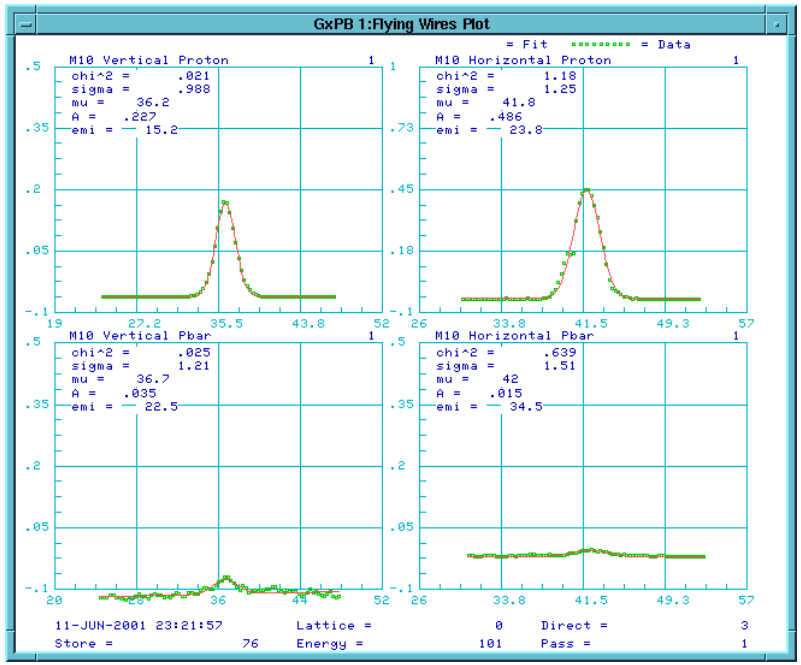
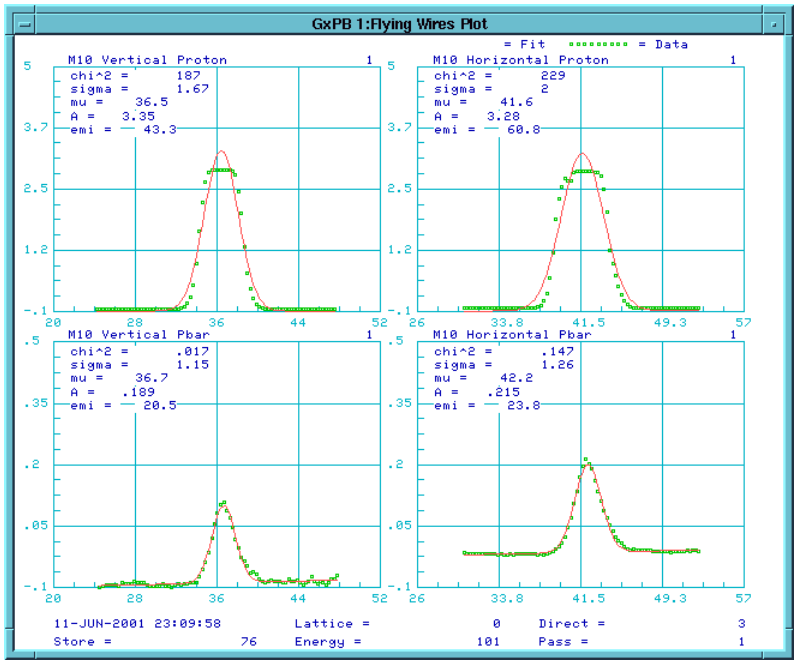
# Flying wire in MI

Intensity set at $10^{12}$




Intensity set at $10^{9}$



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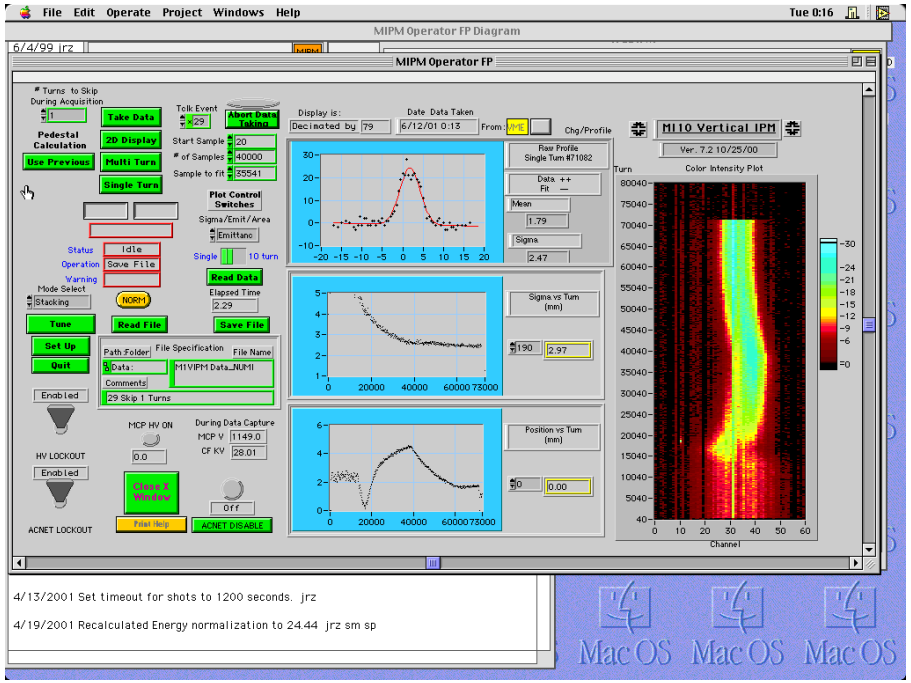
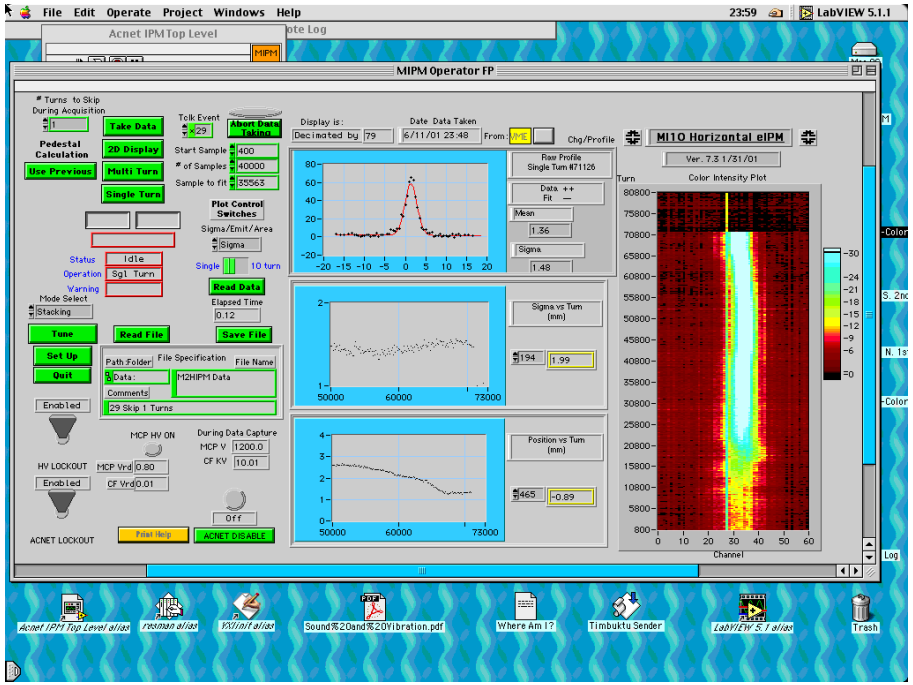
# IPM in MI



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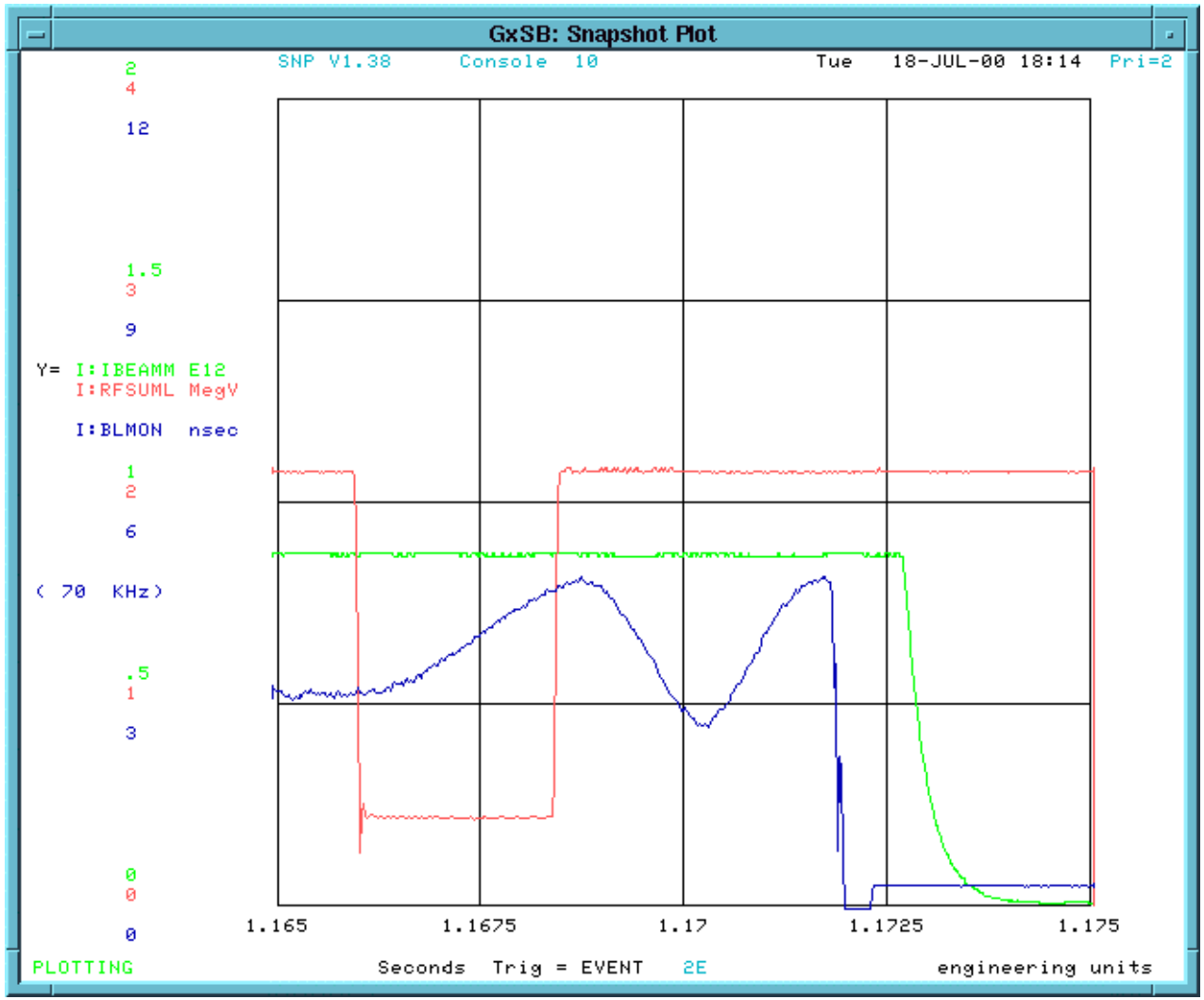
# Bunch Length in MI




# P150 test program

- Study
  - Multi-Wire profiles
  - Scanning target ? (Tungsten, 0.25 mm thick, 10 mm in beam direction)
- Monitor
  - Beam Toroids
  - Beam Loss Monitors (need to be calibrated and to measure sensitivity)
  - Beam Position Monitors
  - Power Supplies stability
- Install
  - Scanning Target ?
  - new NuMI BPM electronics ?
  - Total Loss Monitors (Scintillator Monitors ? )
- Test prototype beam extraction permit system
- Dedicated study time is needed to
  - Operate MW's, scanning target
  - extract beam to P150 with 'NuMI' bunch rotation

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# Conclusions

- We are in the process of setting up systematic tests on beam stability and shape in MI and P150
- Some preliminary tests already conducted
- We plan to be fully operational after the accelerator shutdown in the fall
- Priorities:
  - Calibration and assessment of sensitivities of BLM's
  - Data logging of the relevant quantities