Application of MI BPM Data in Beam Study

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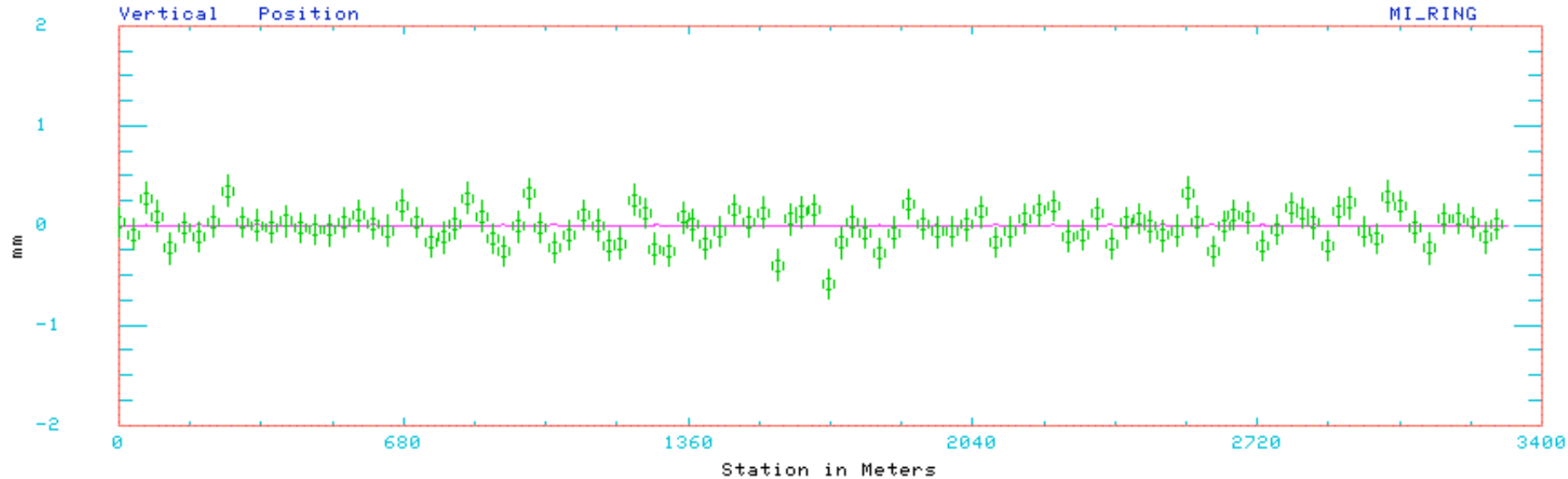
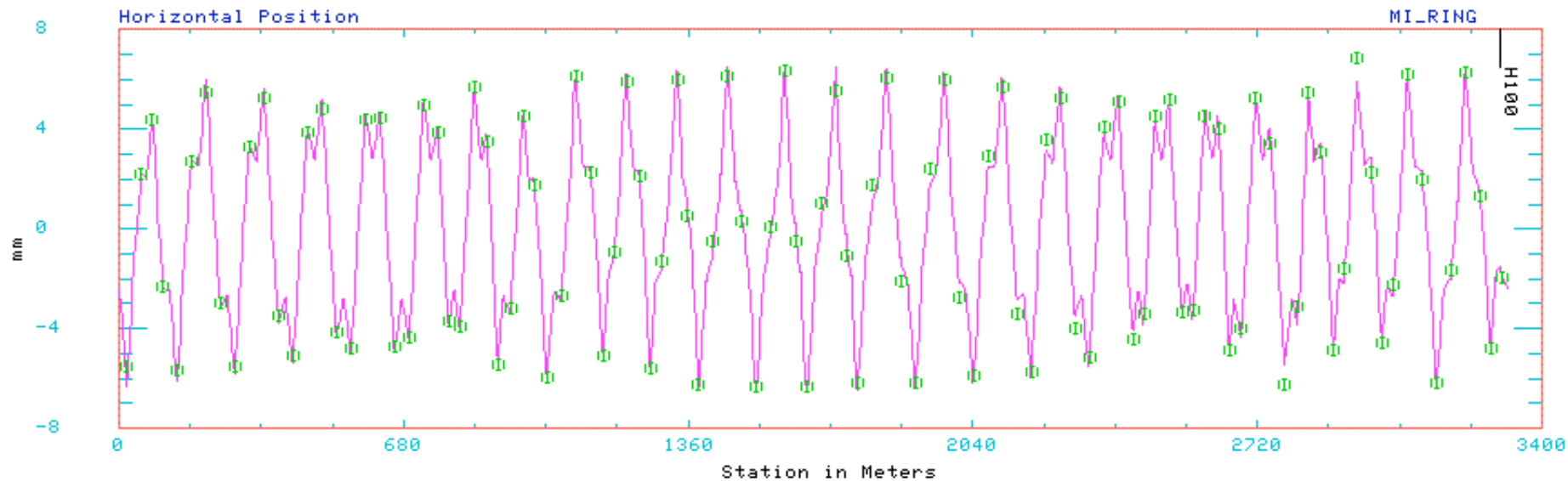
Orbit data

- Lattice measurement
  - Closed orbit.
  - Dispersion function.
- Injection optics matching
  - 1st turn flash orbit.

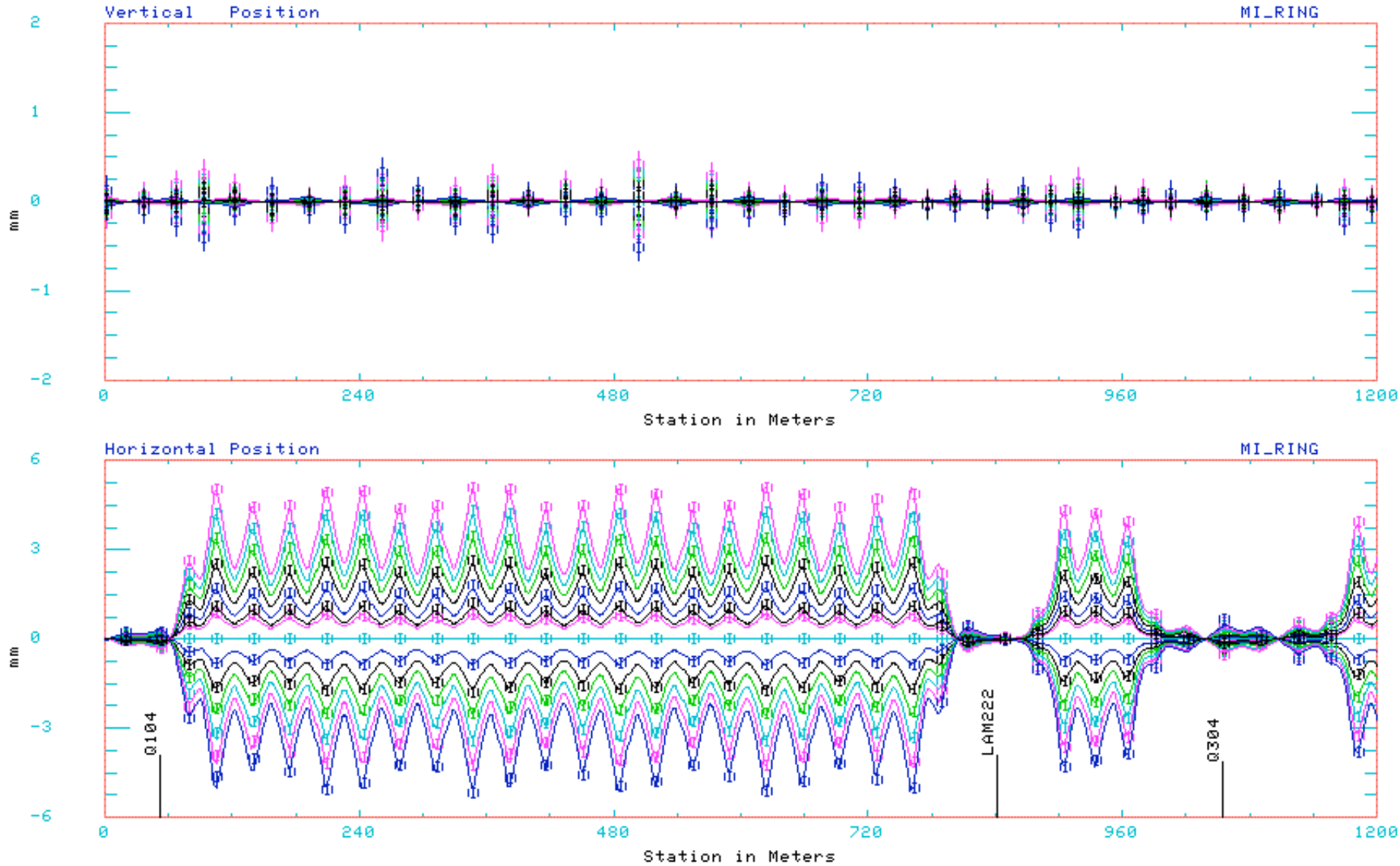
1-bump closed orbit with H100





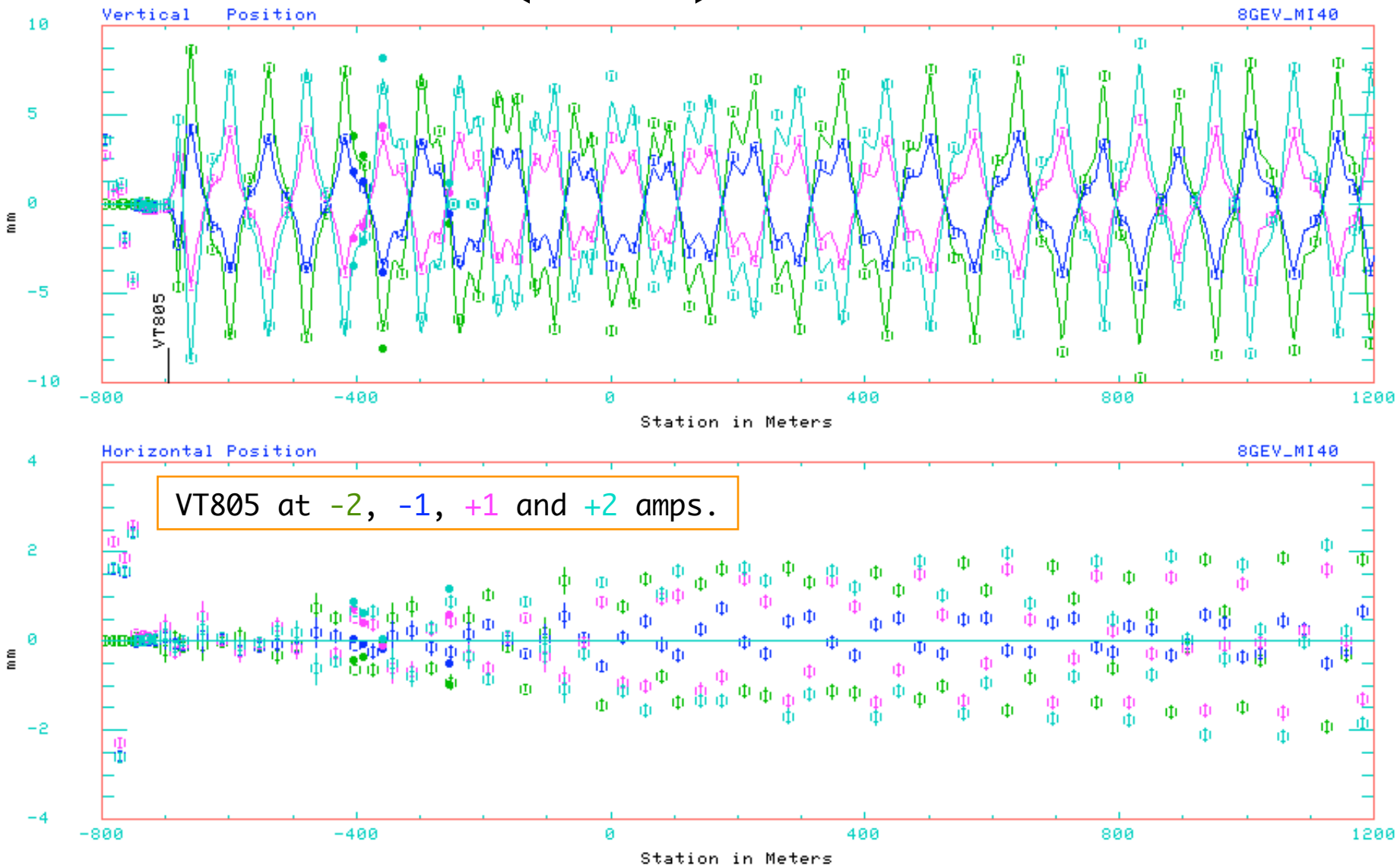
Dispersion data, from MI10 to MI30

Data set for various Δp/p setting



Orbit from MI8 line into MI, VT805

MI8 transfer line ⟷ Main Injector first turn

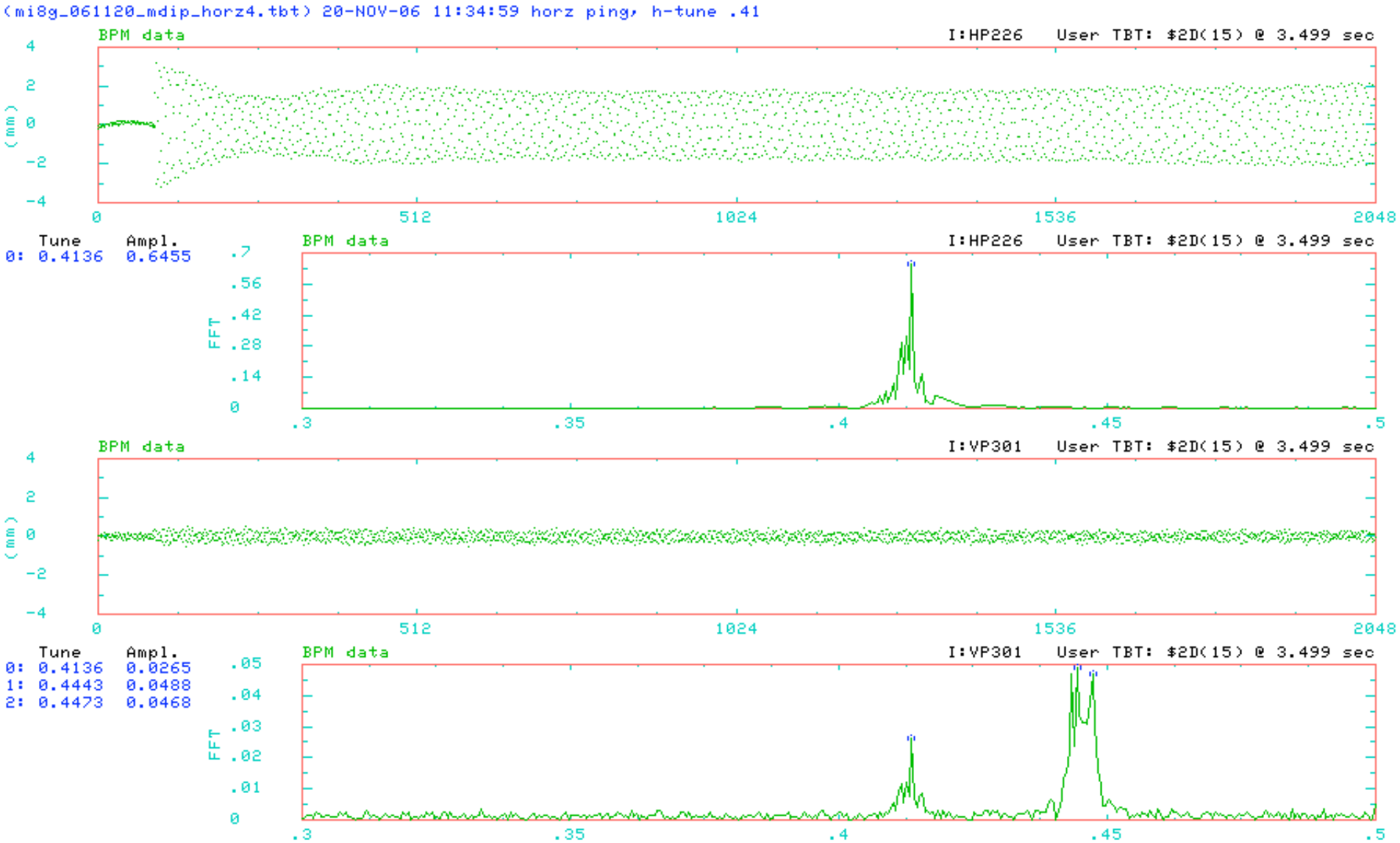


Turn-By-Turn data analysis

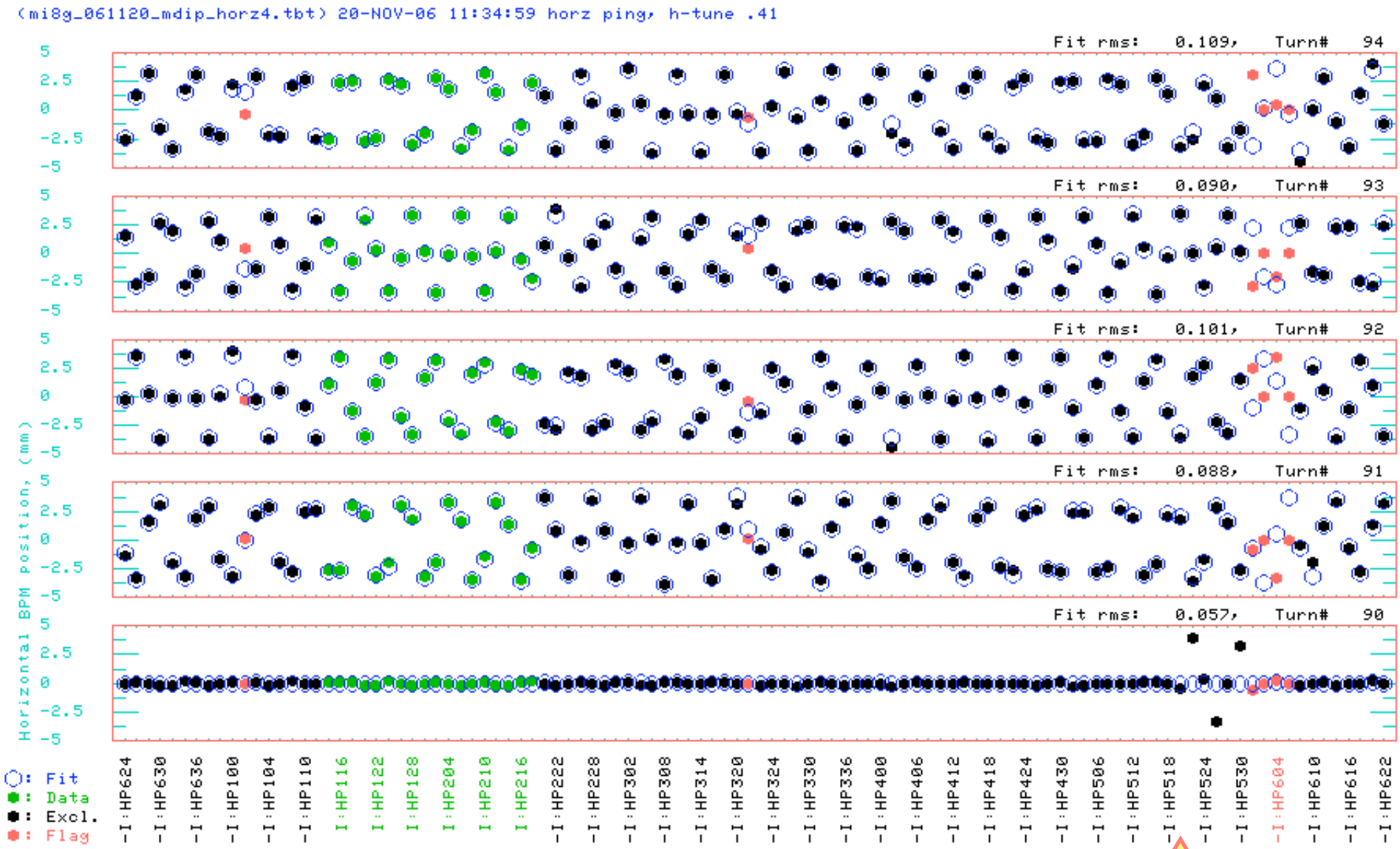
- FFT tune measurement
- Diagnostics.
  - TBT orbit
  - RMS errors
- Lattice measurement.
  - Phase space ellipse.
- BPM calibration
  - Relative gain.

TBT FFT tune measurement

Pinged plane: horizontal

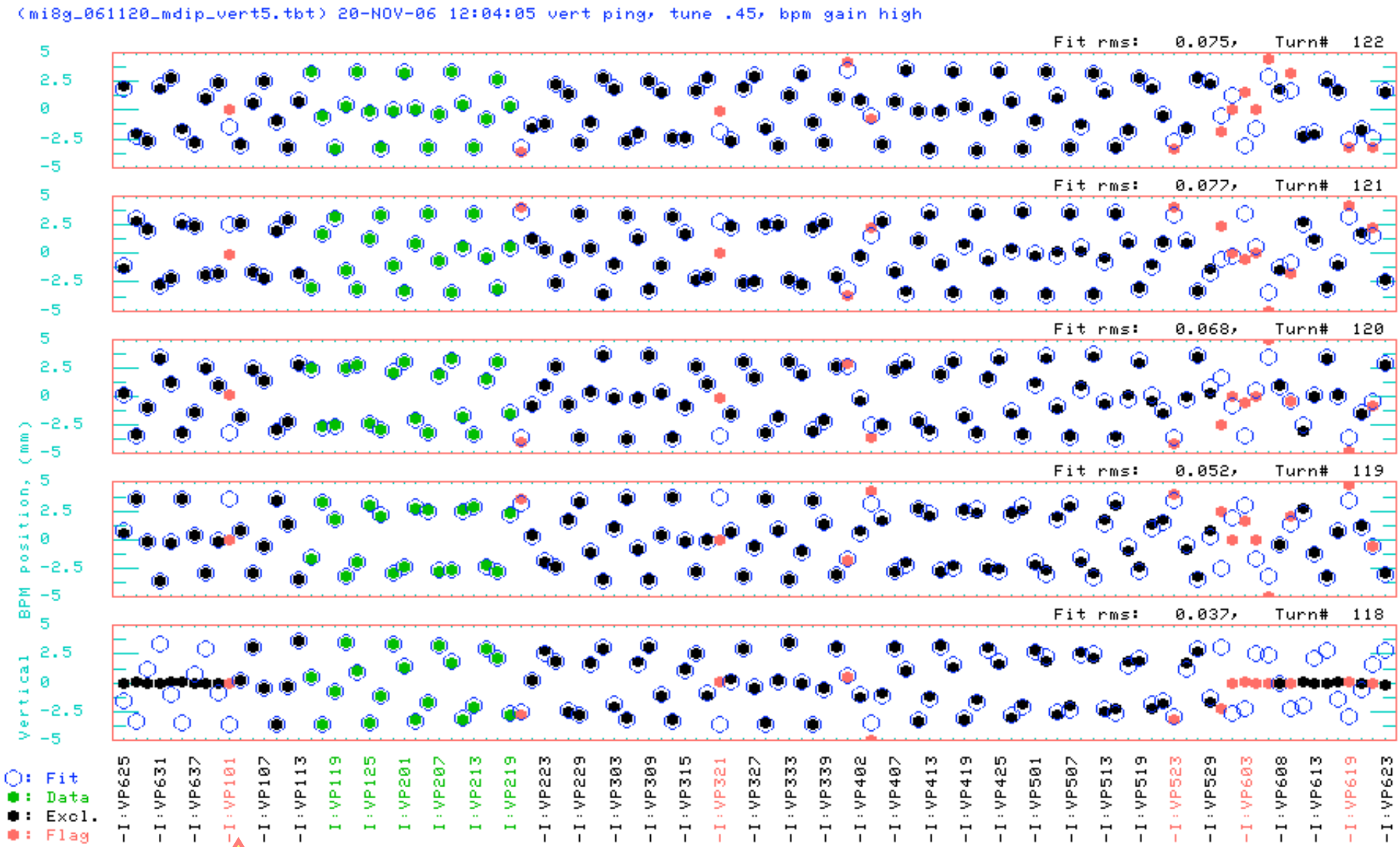


Horizontal TBT data, first 5 turns



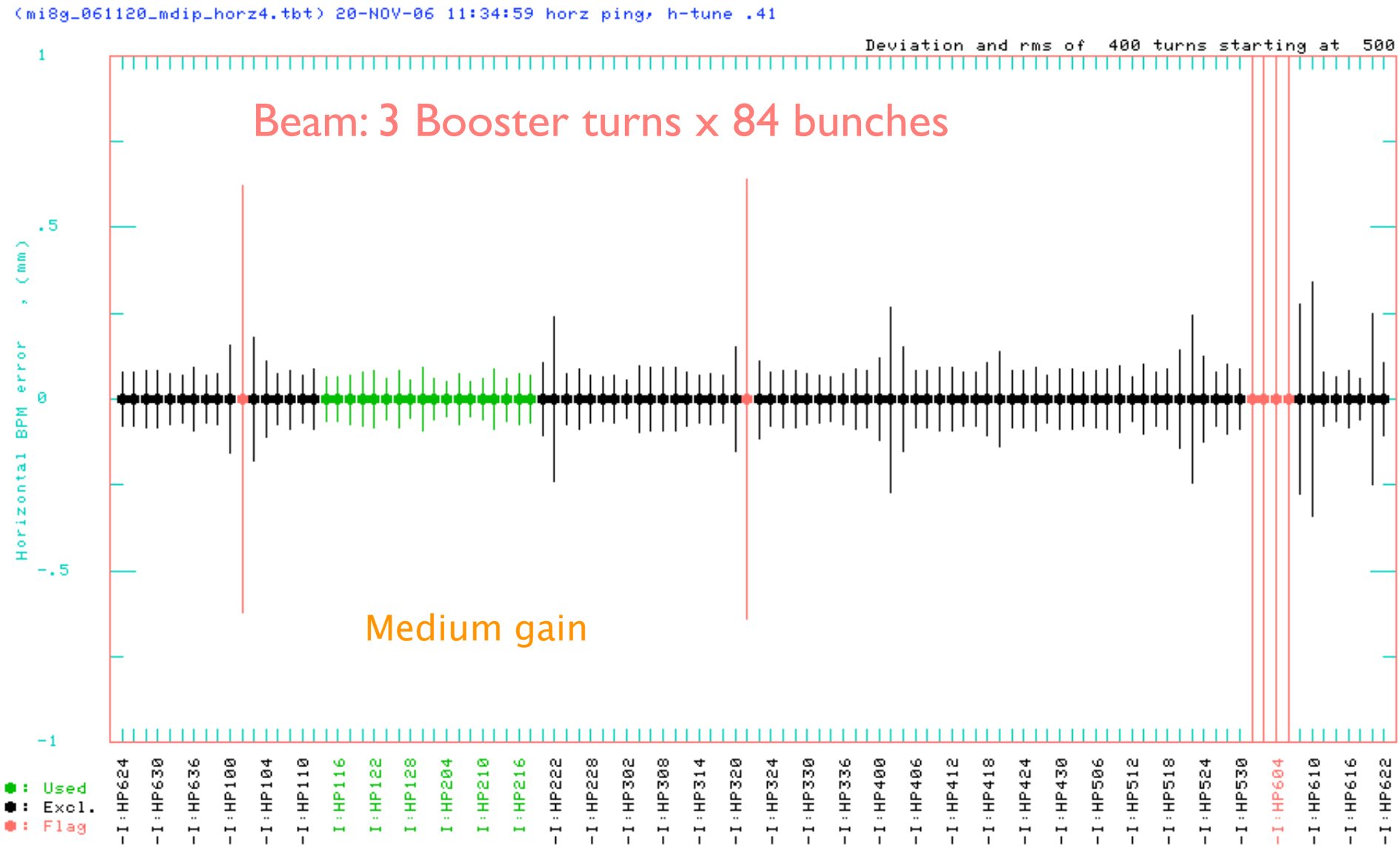
Pinged horizontally at MI-520

Vertical TBT orbit, first 5 turns

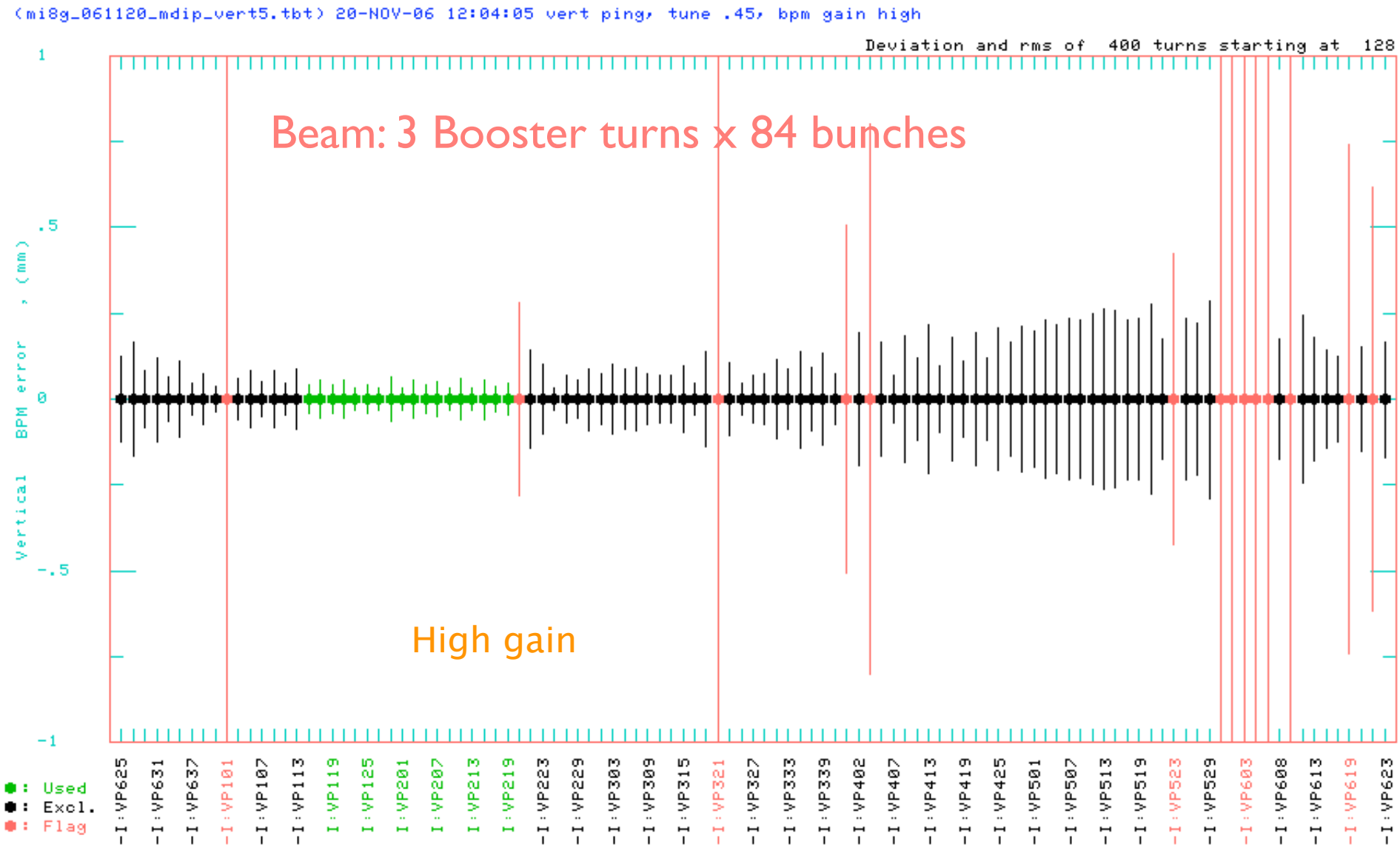


Pinged vertically at MI-103 on turn# 118

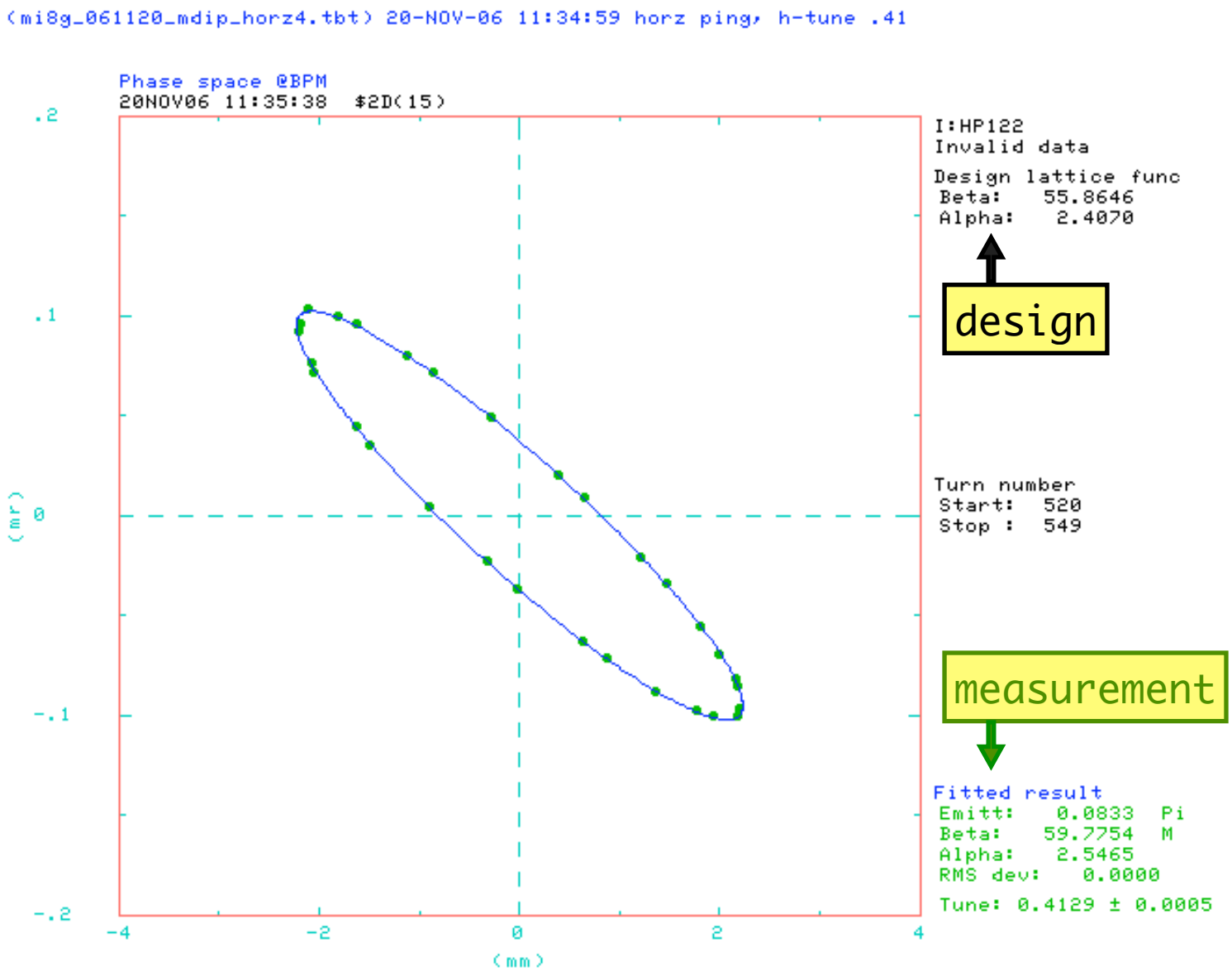
Horizontal RMS errors, 400 turns



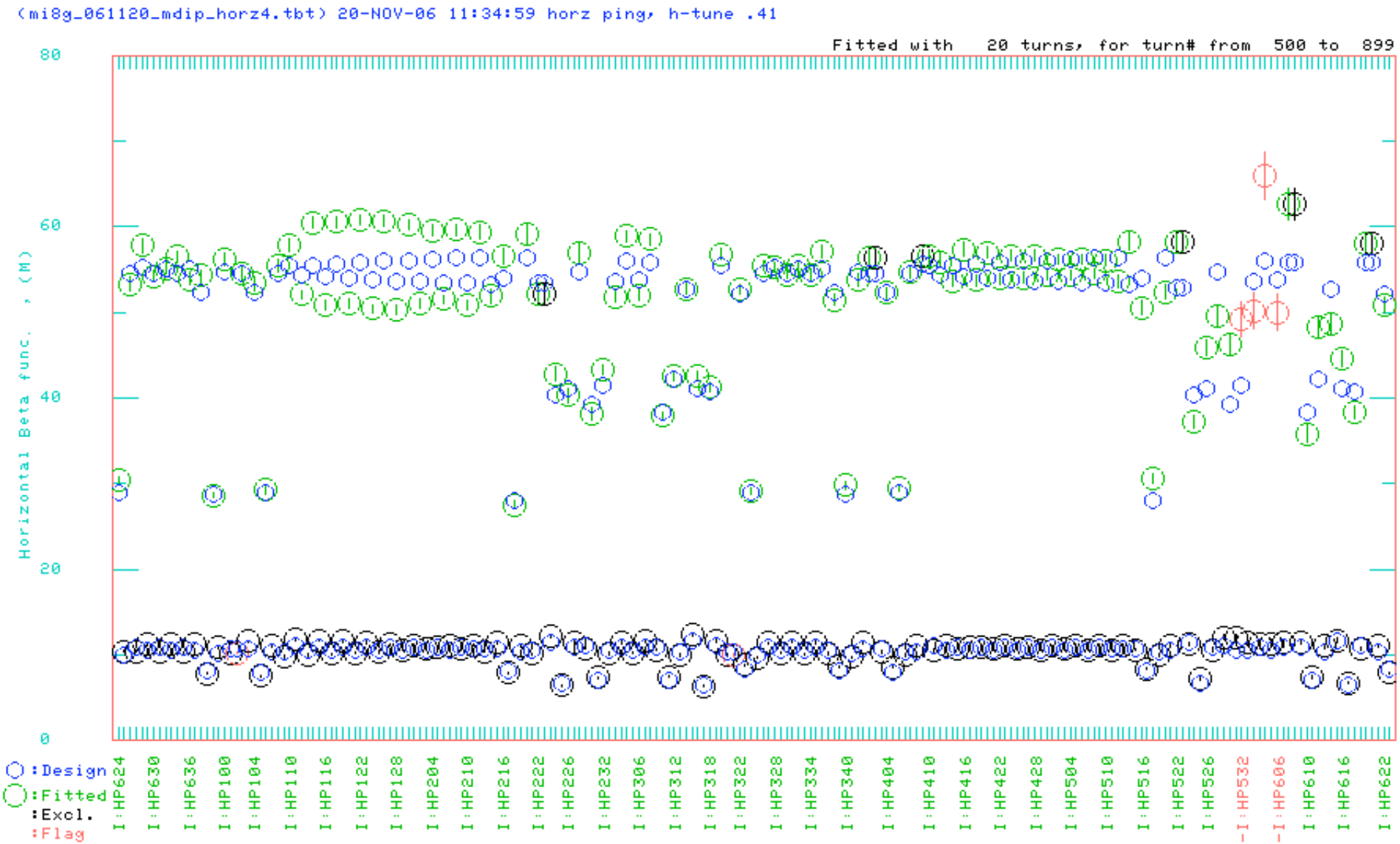
Vertical RMS errors, 400 turns



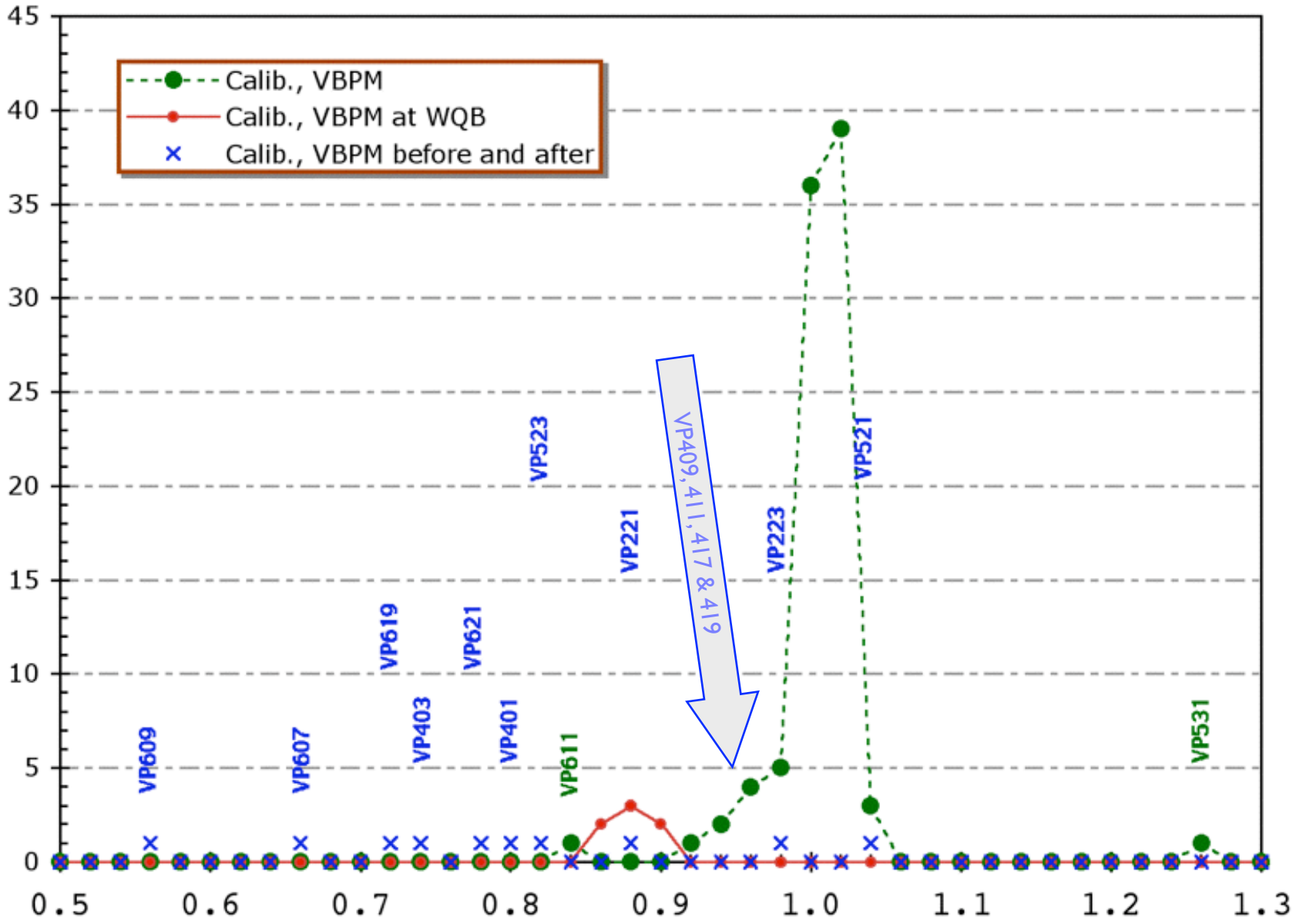
Lattice measurement



Measured horizontal beta



Relative BPM calibration, vertical



New BPM system performance

- Tested
  - Extensively during beam study
- Resolution
  - TBT data
    - 80 μm RMS or better.
  - Closed orbit data
    - Need to apply gain calibration correction.
- Calibration
  - Derived from TBT analysis
    - Identified BPMs with gain errors.
- Data quality
  - Good, and well appreciated.