HINS RFQ Initial Beam Measurements

Vic Scarpine for the HINS Collaboration

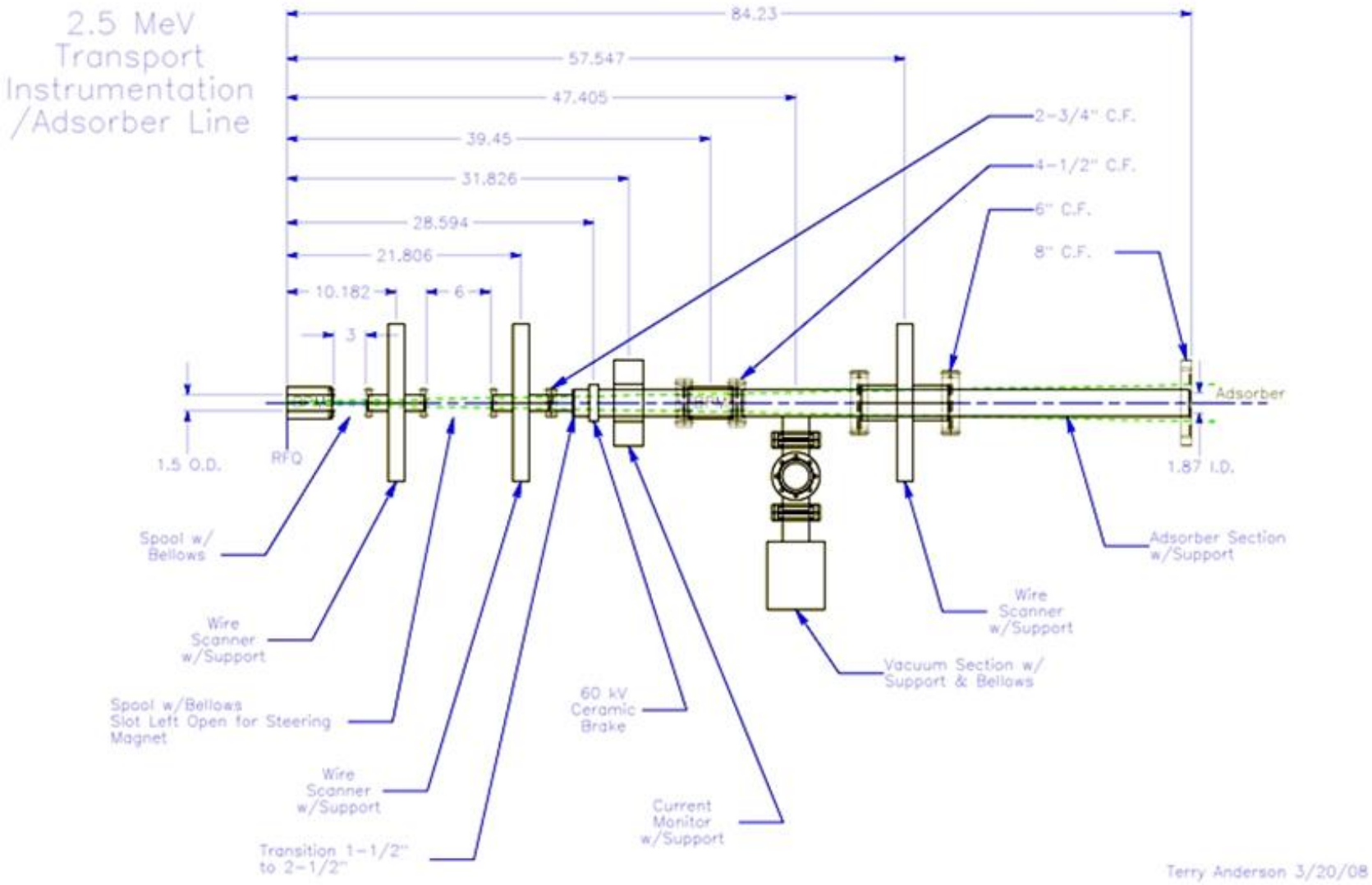
HINS Weekly Meeting

Jan. 21, 2010

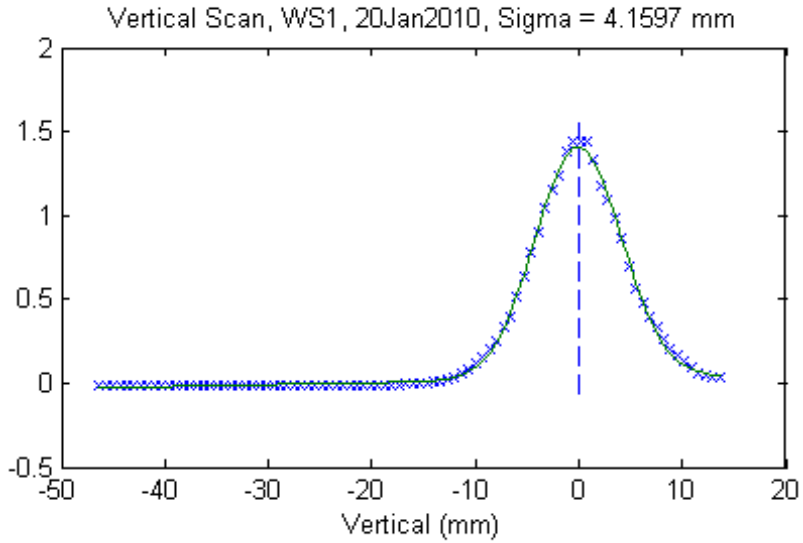
HINS RFQ Beam Results

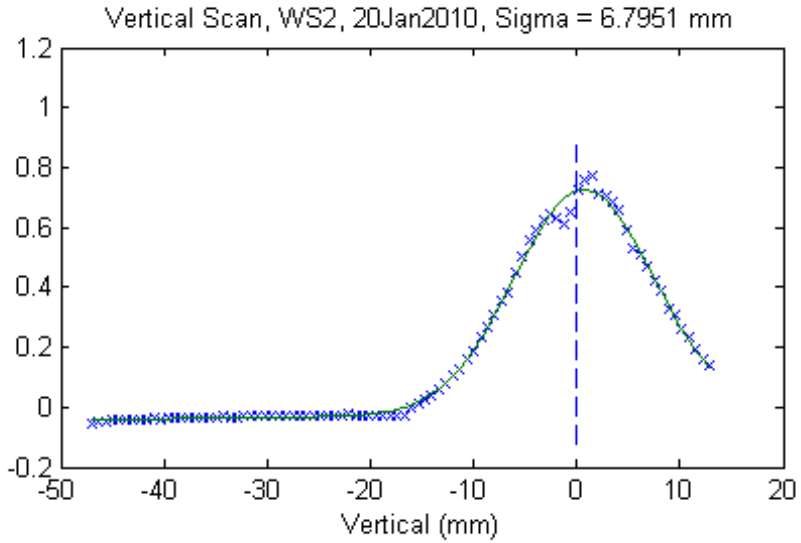
- First proton beam through RFQ
- Beam parameters:
  - Ion source: 500 usec @ 1 Hz
  - RF: 50 usec @ 0.5 Hz
- Ion Source Toriod ~ 15-20 ma
  - ~50%?? protons; ~50%?? other (H2+, H3+)
- RFQ Output Toriod Current ~ 3-4 ma
- *Profiles and Energy Measurements*

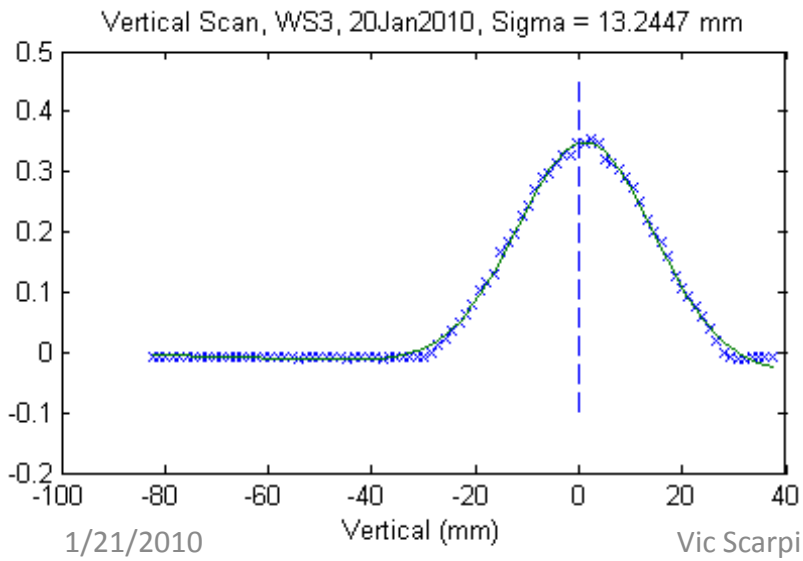
2.5 MeV Beam Diagnostics

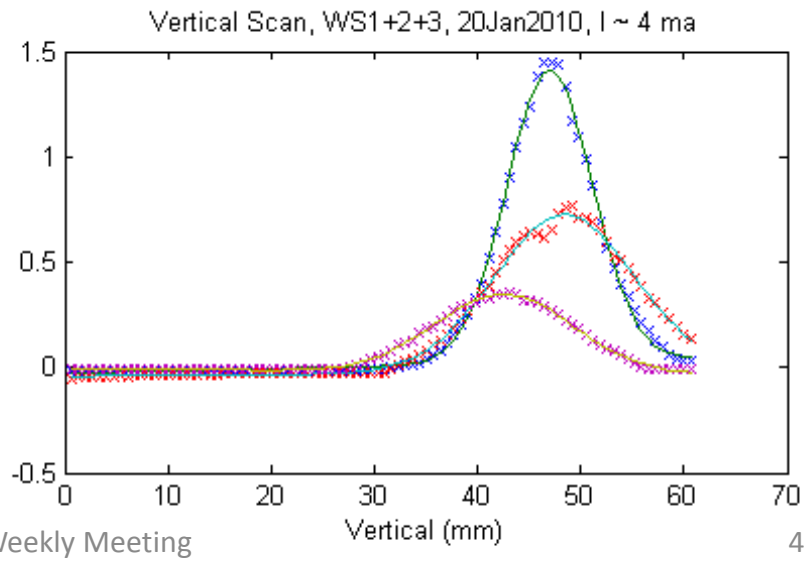


Vertical Profiles; I ~ 4 mA

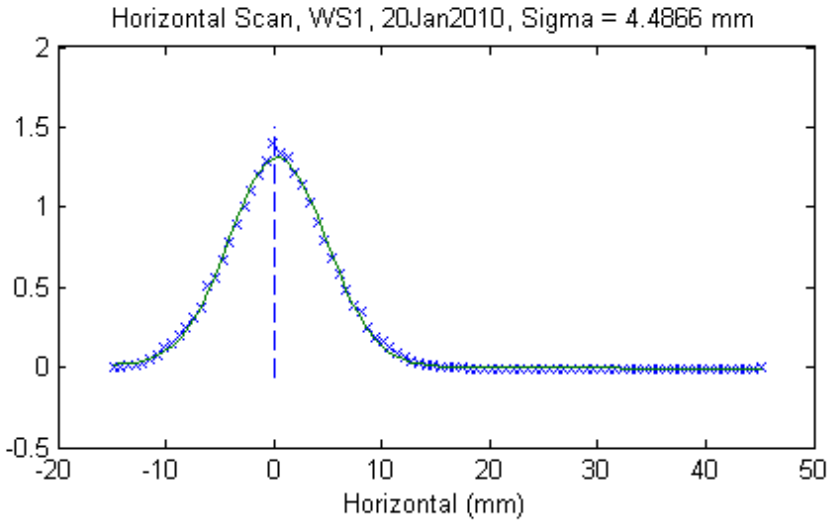


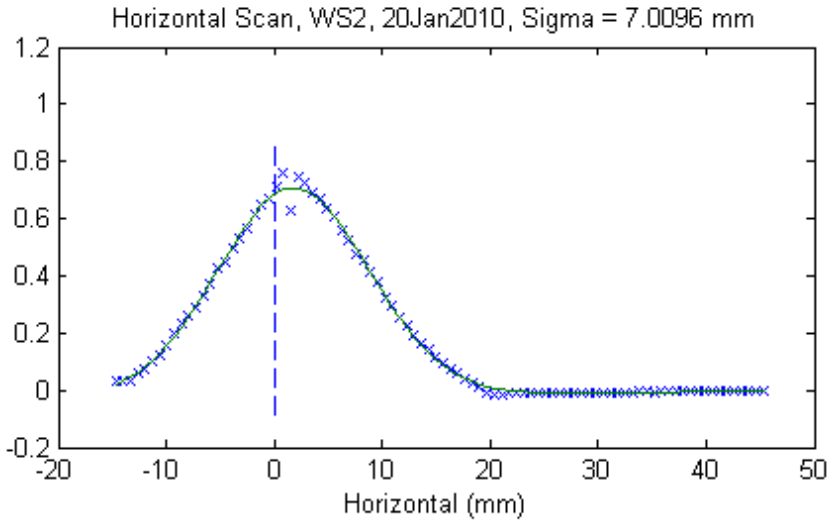


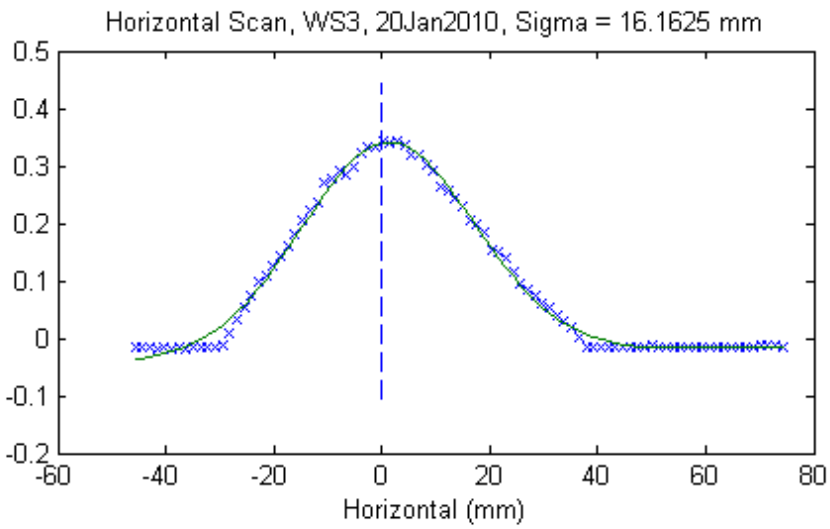


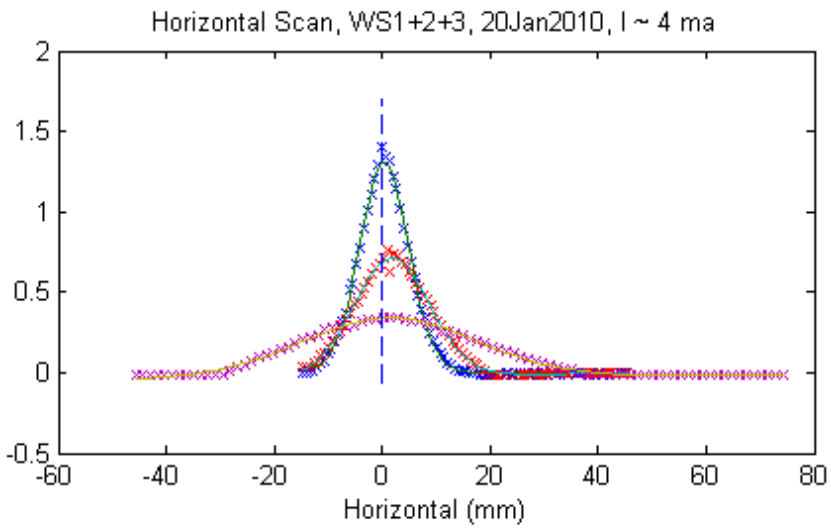


Horizontal Profiles ; I ~ 4 mA

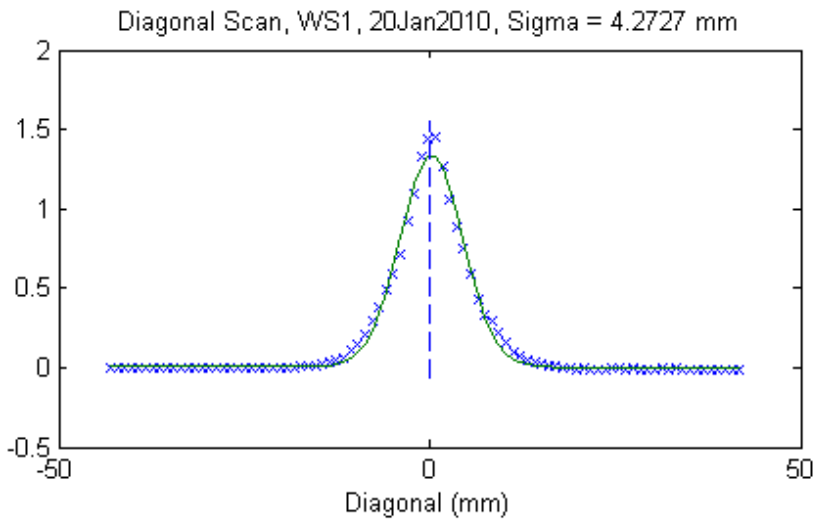


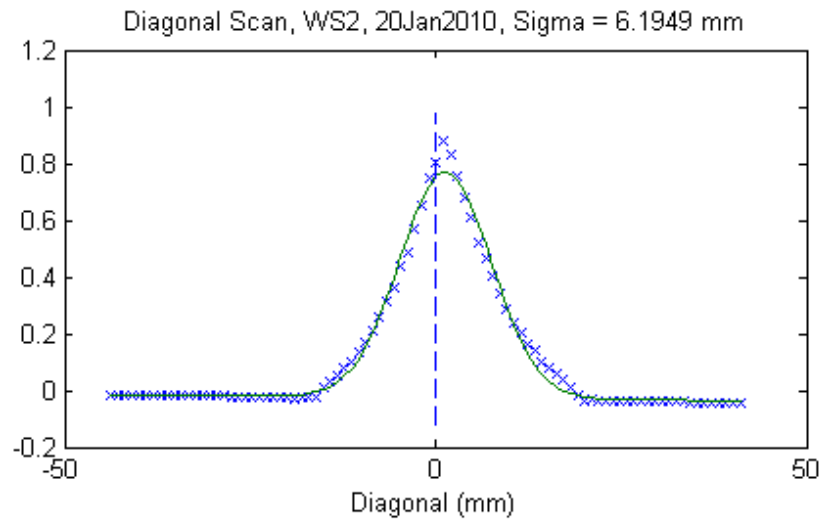


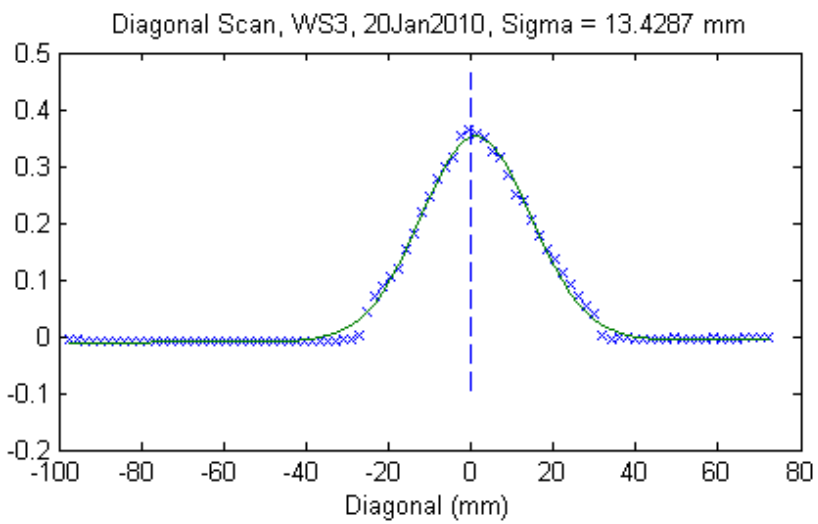


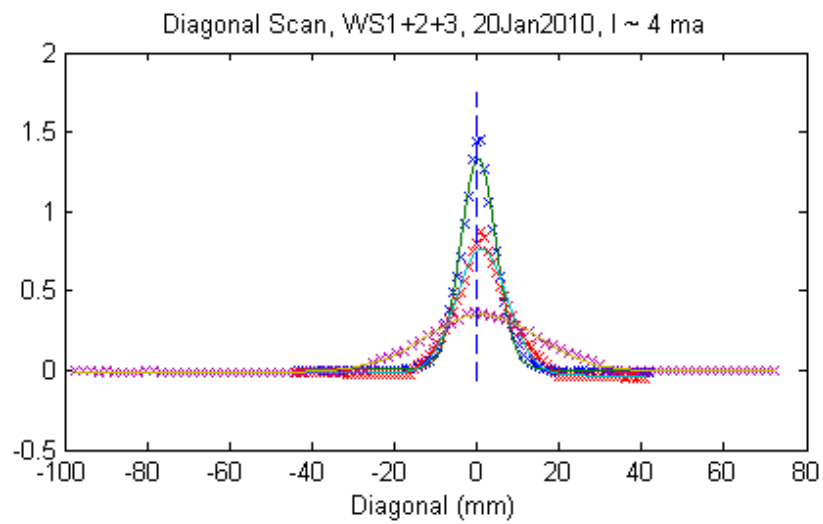


Diagonal Profiles ; I ~ 4 mA









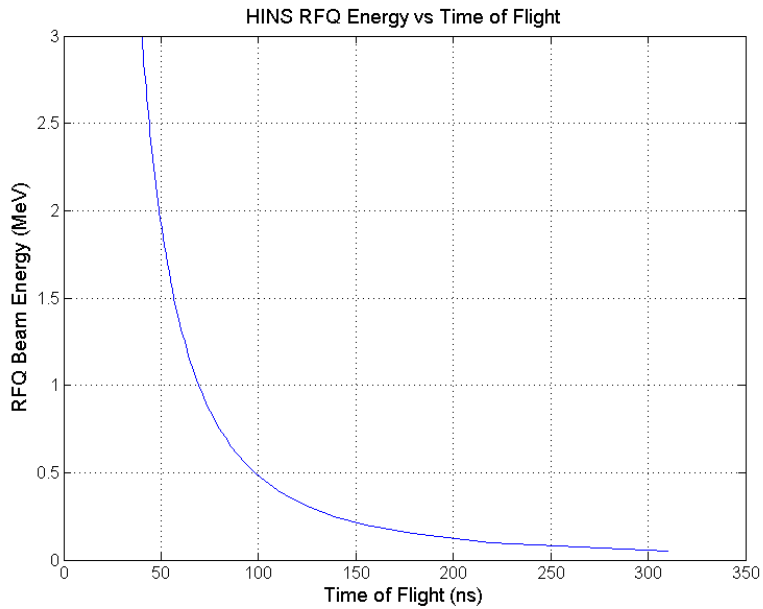
Profile Sigmas and Integrals ; I ~ 4 mA

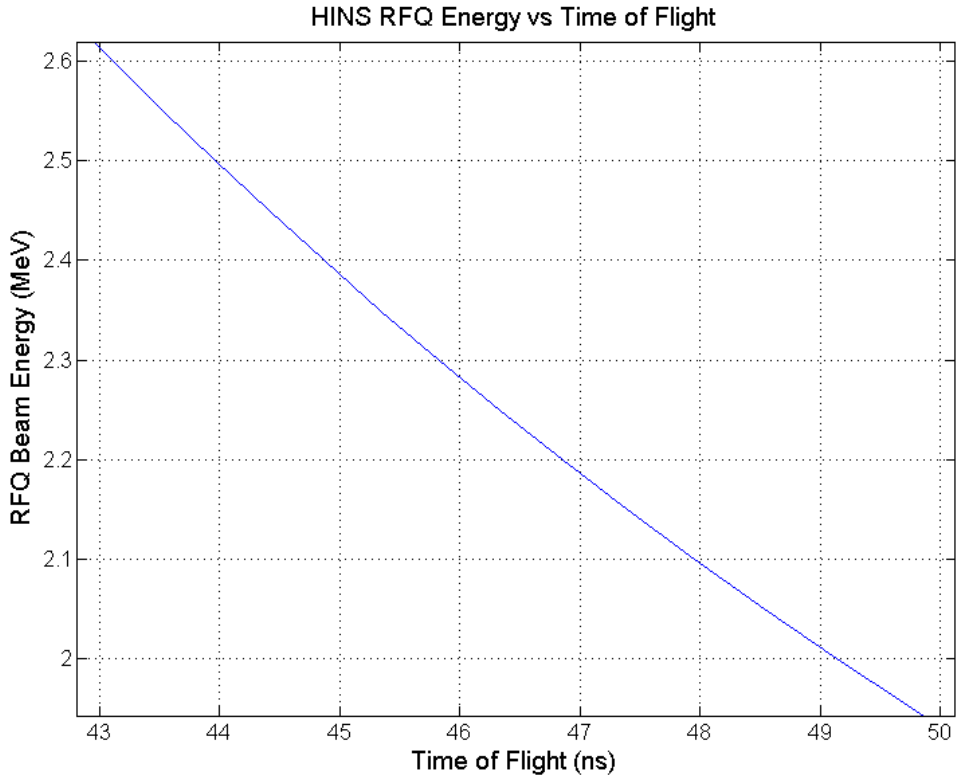
Sigmas	Horizontal	Vertical	Diagonal
Scanner 1	4.5 mm	4.2 mm	4.3 mm
Scanner 2	7.0 mm	6.8 mm	6.2 mm
Scanner 3	16.2 mm	13.2 mm	13.4 mm

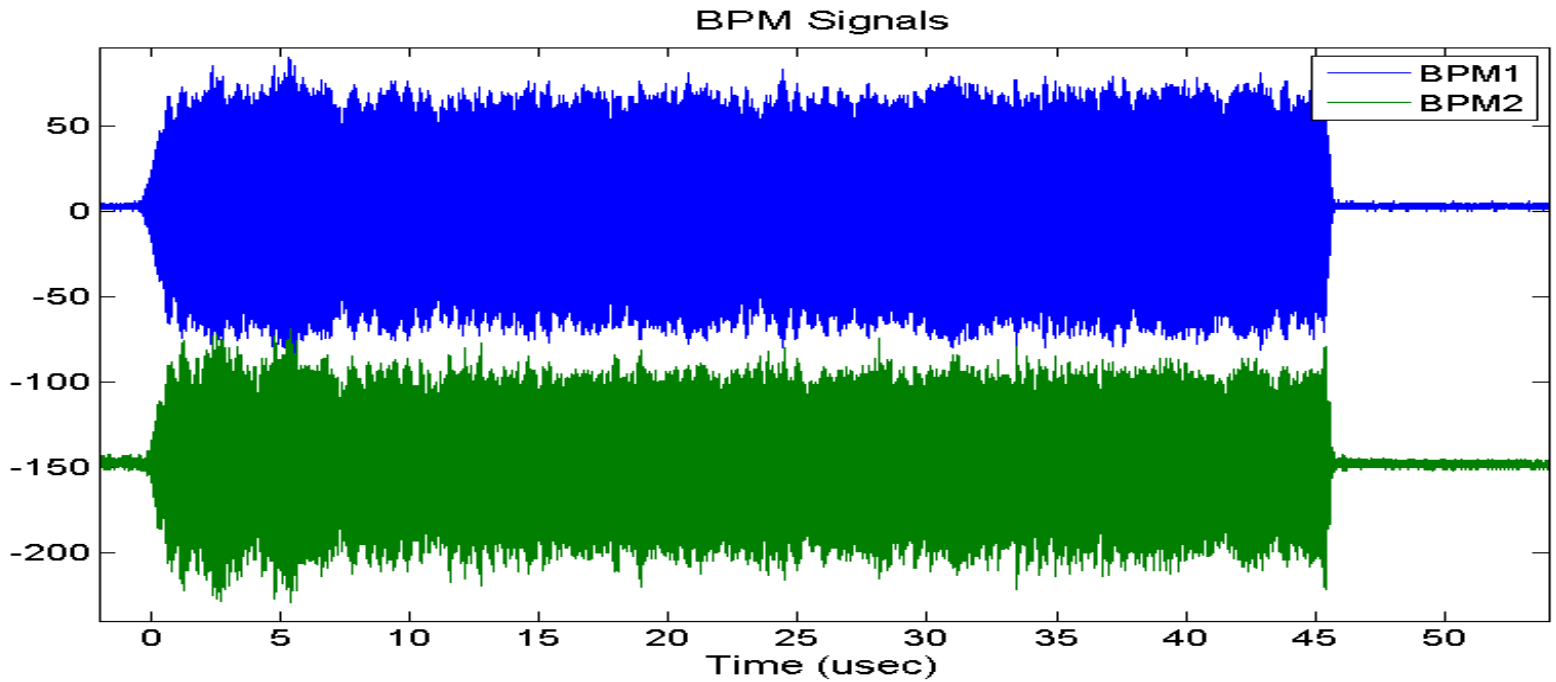
Integrals	Horizontal	Vertical	Diagonal
Scanner 1	14.8 V*mm	14.9 V*mm	14.7 V*mm
Scanner 2	11.8 V*mm	10.5 V*mm	10.2 V*mm
Scanner 3	11.6 V*mm	10.1 V*mm	10.7 V*mm

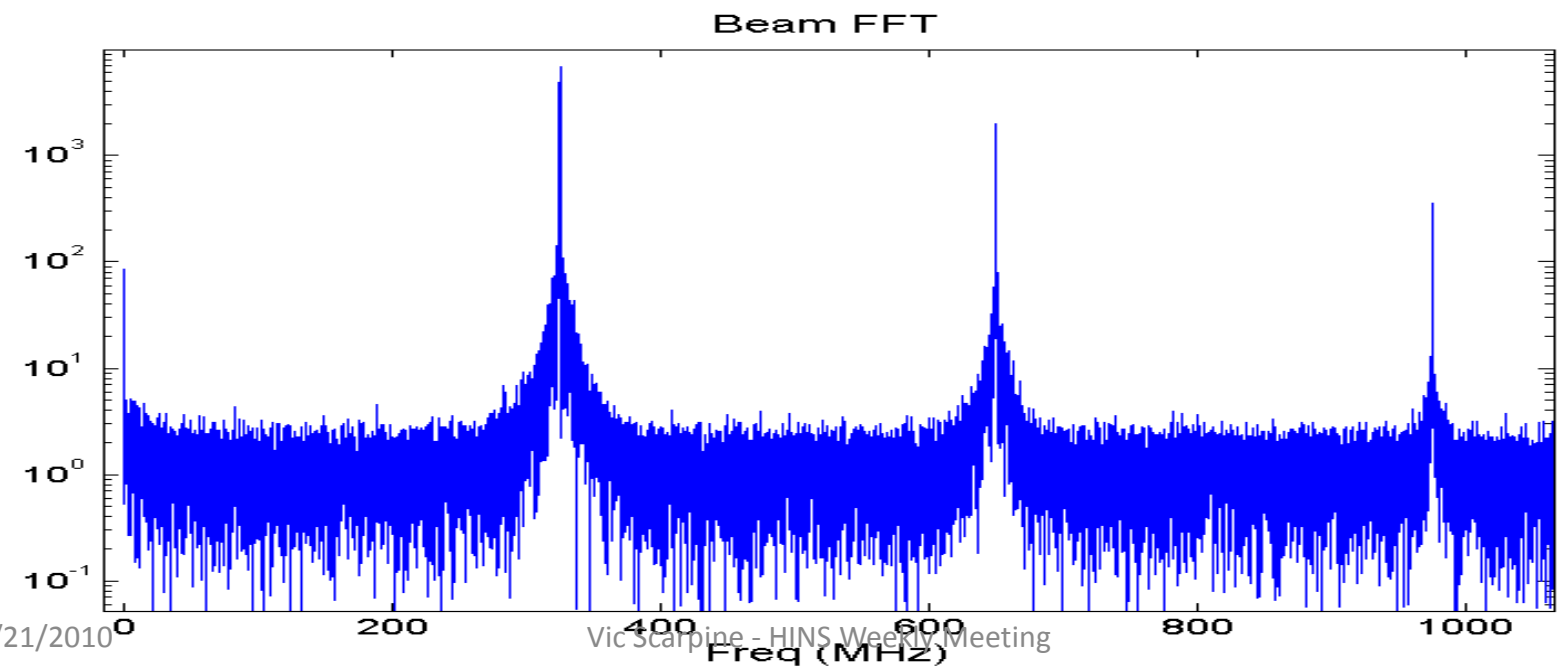
Energy Measurements

- Beam energy measurements by time-of-flight between BPMs
- BPM separation: 37.8” = 0.964 m
- @2.5 MeV -> 43.9 ns -> 14.3 RF cycles
- ~100 keV per ns @ ~2.5 MeV

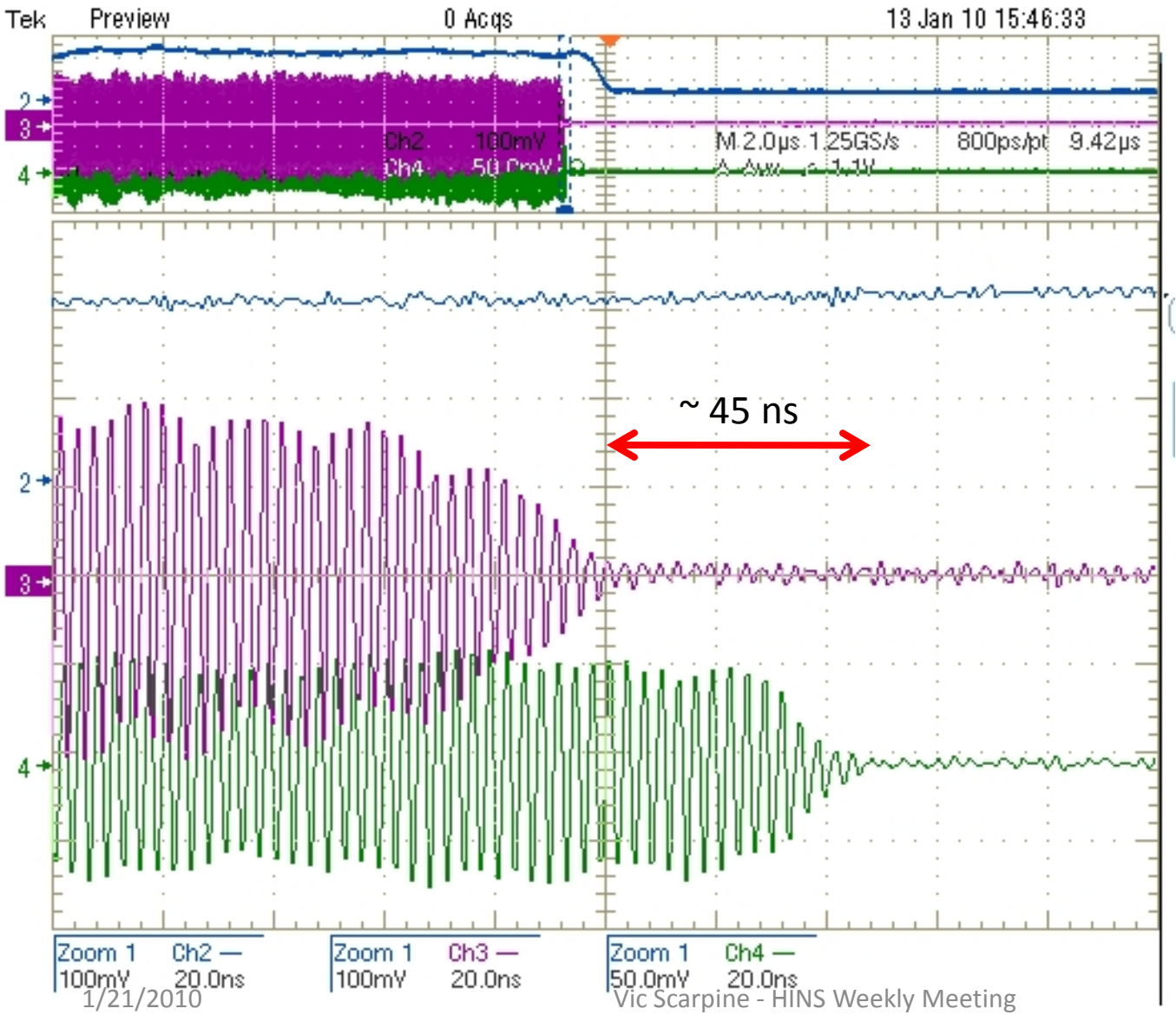





BPM Signals
BPM1
BPM2
50
0
-50
-100
-150
-200
0
5
10
15
20
25
30
35
40
45
50
Time (usec)


Beam FFT
10^3
10^2
10^1
10^0
10^{-1}
0
200
400
600
800
1000
Freq (MHz)

Time of Flight – Sparked RFQ



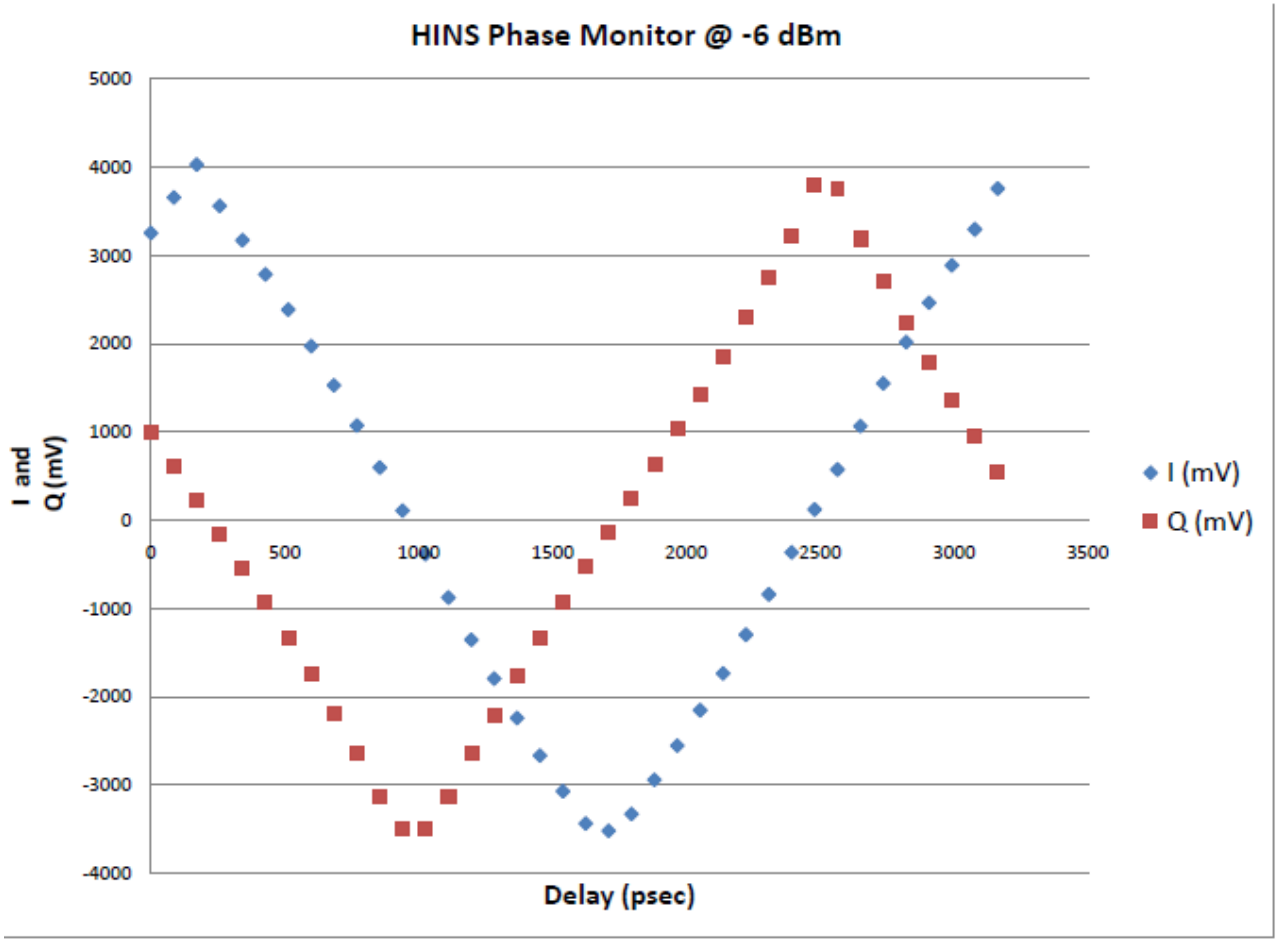
- Toriod
- Up BPM
- Down BPM

- Up BPM

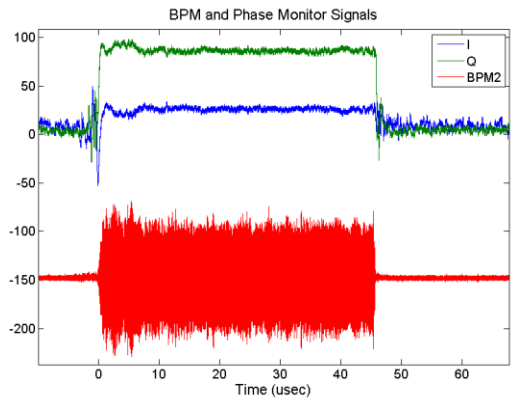
- Down BPM

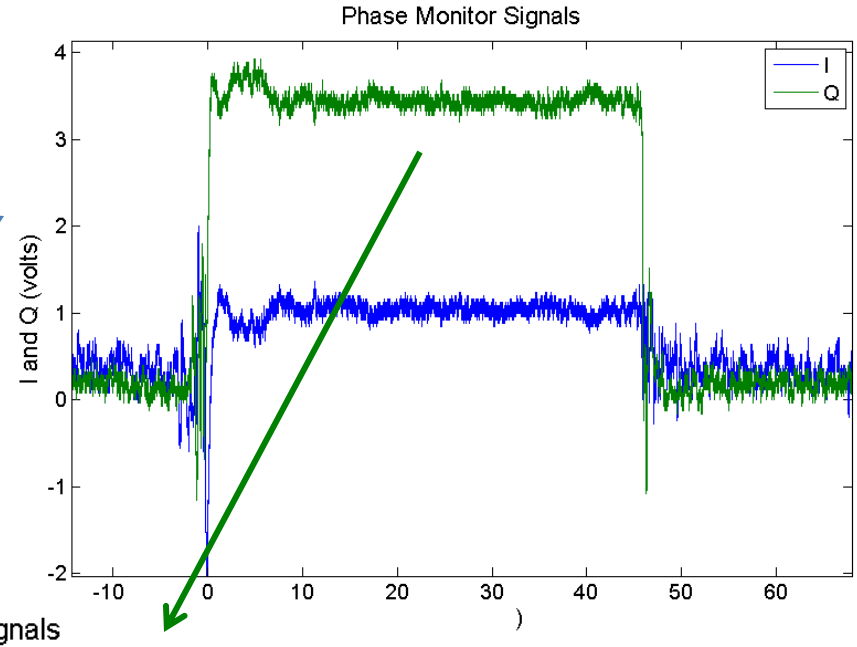
Phase Monitor

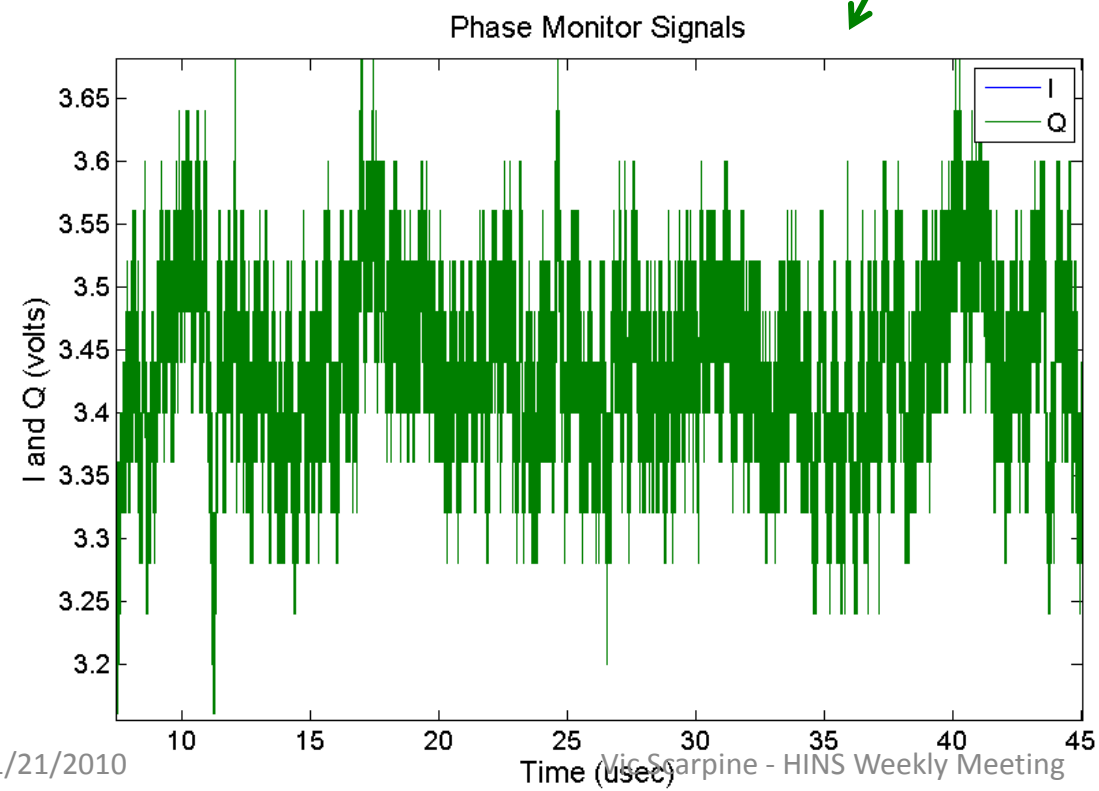
- Phase difference between two BPMs
- 4 volts ~ 90 degrees ~ 750 psec ~ 75 keV



Energy Stability







~ 8 keV