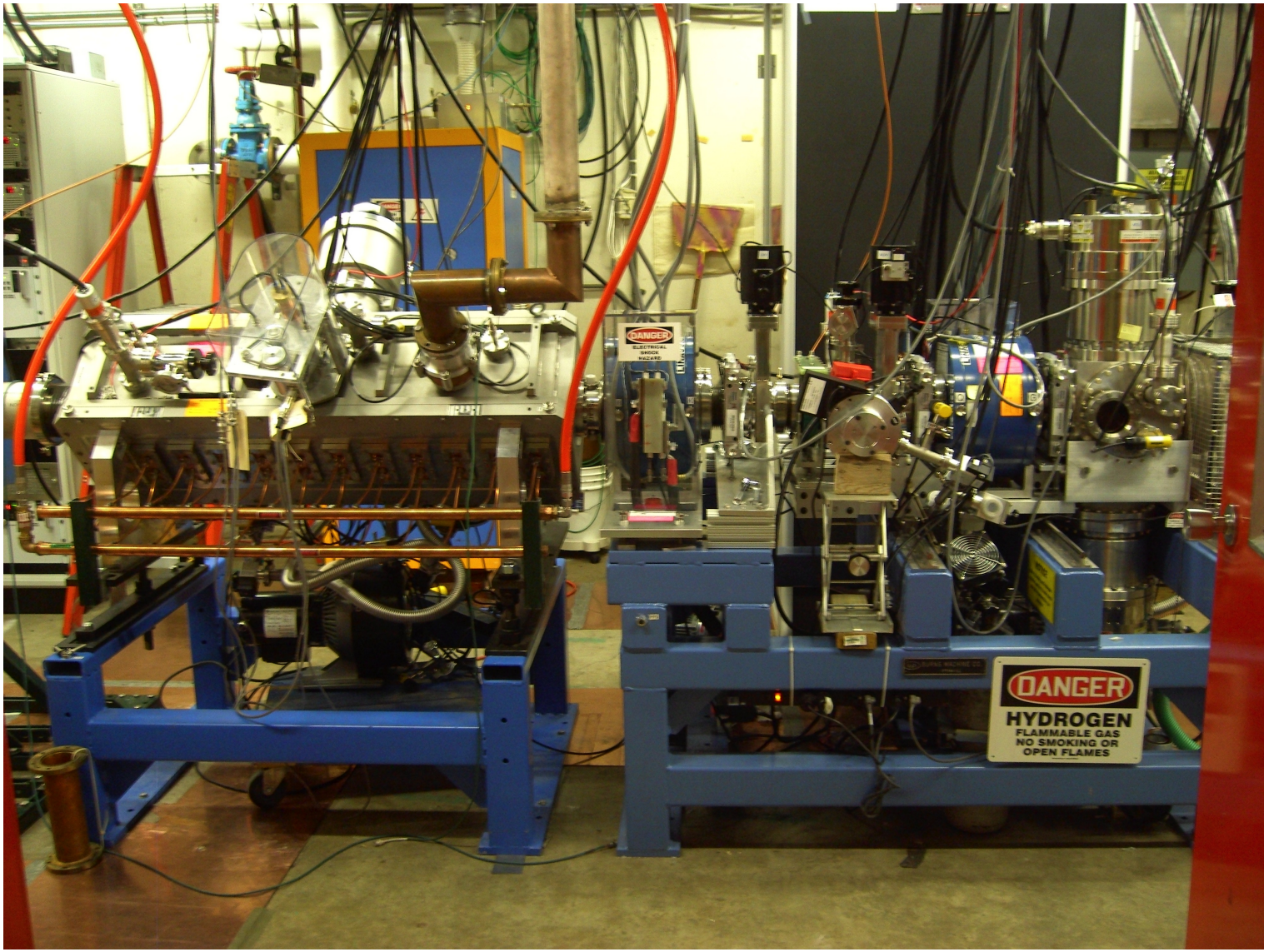
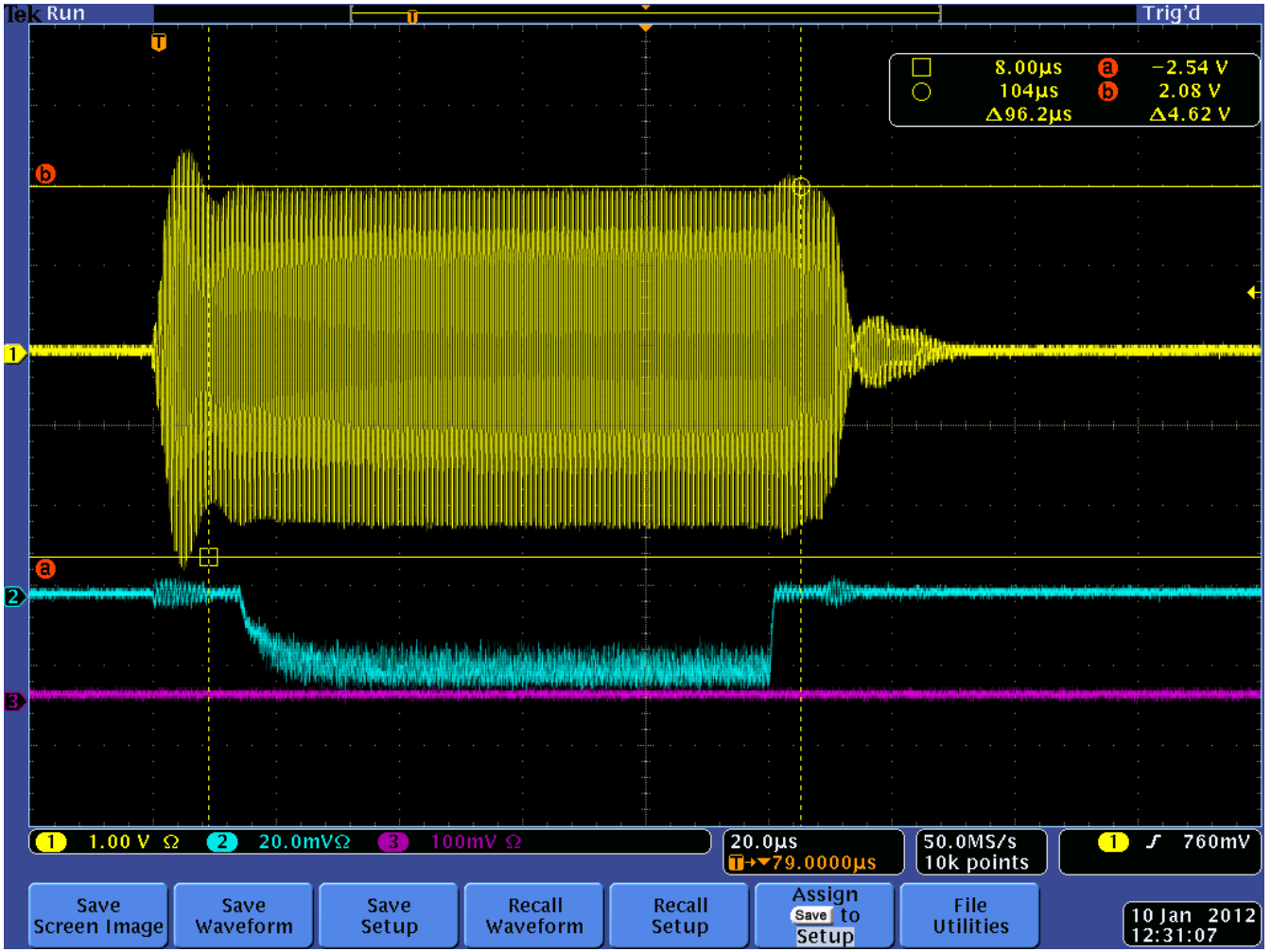
RFQ Beam Measurements

C.Y. Tan, D. Bollinger, P. Karns, B. Schupbach
18 Jan 2012

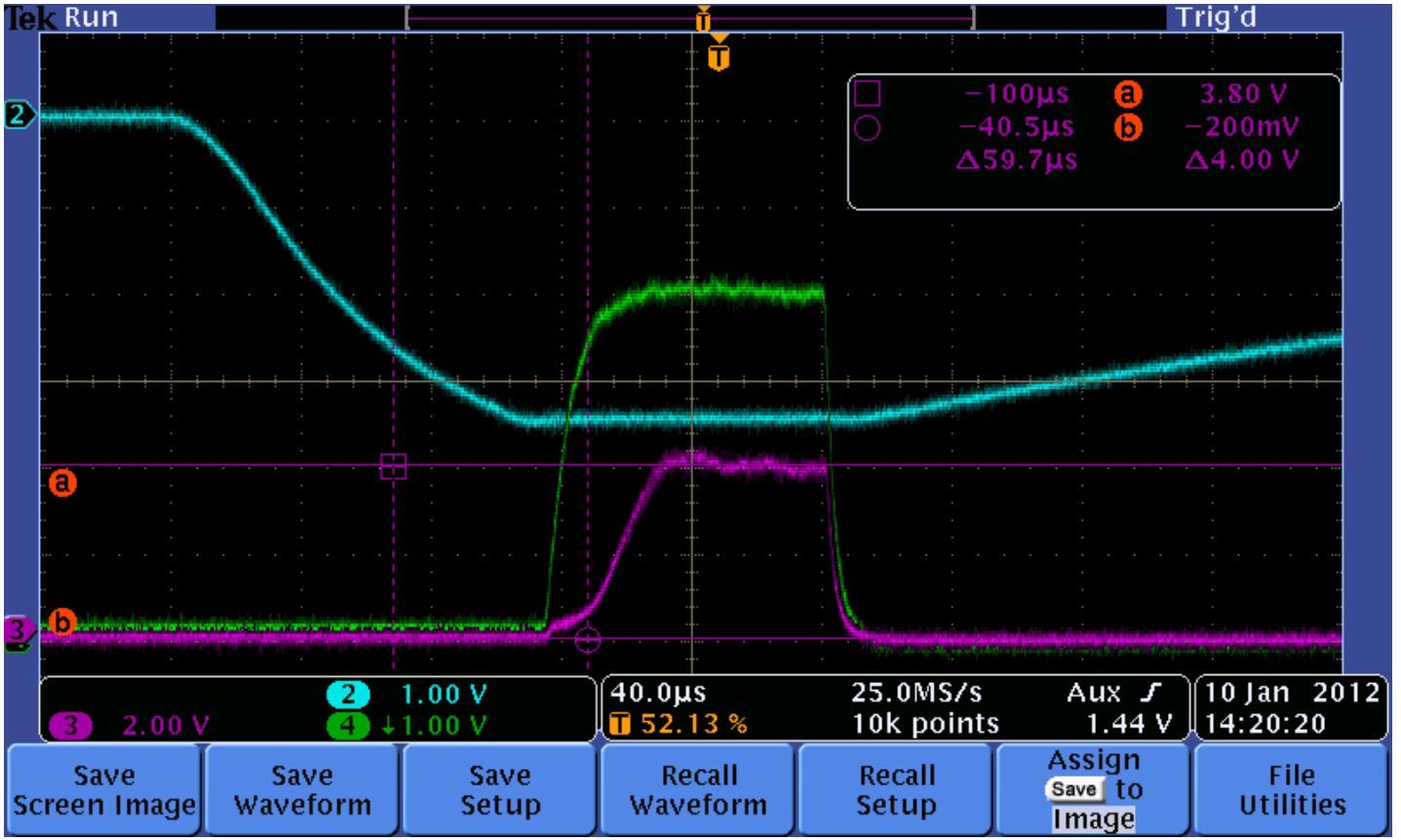
RFQ Setup



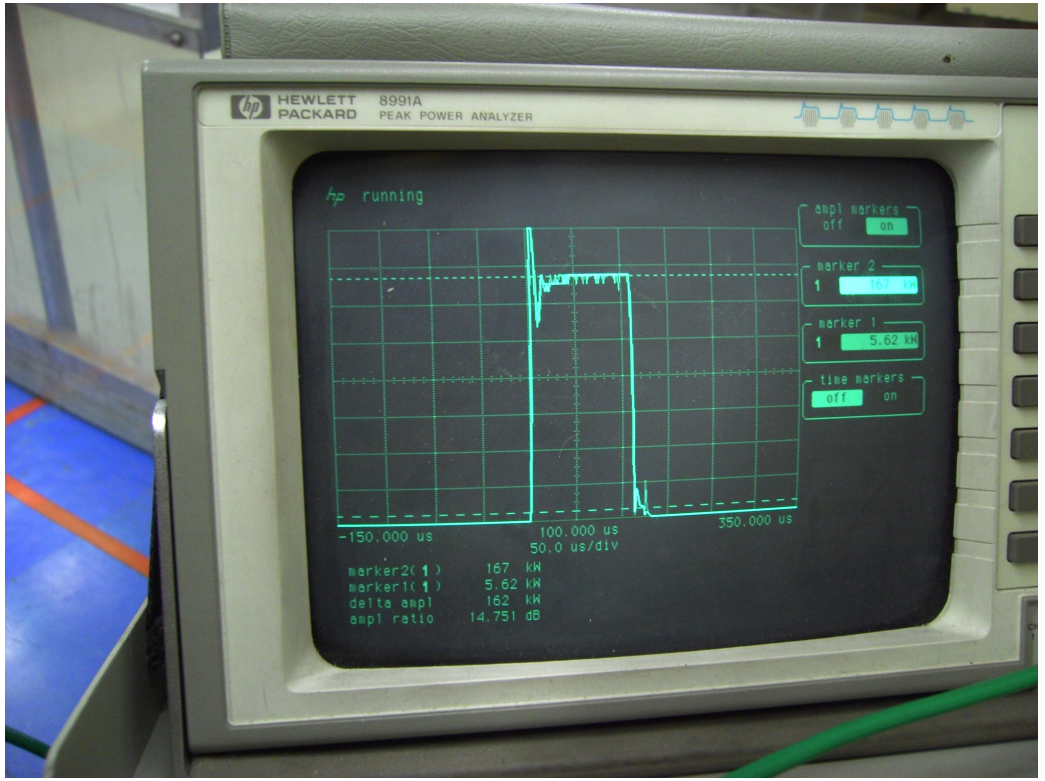
Timed Pulse to be within RF pulse

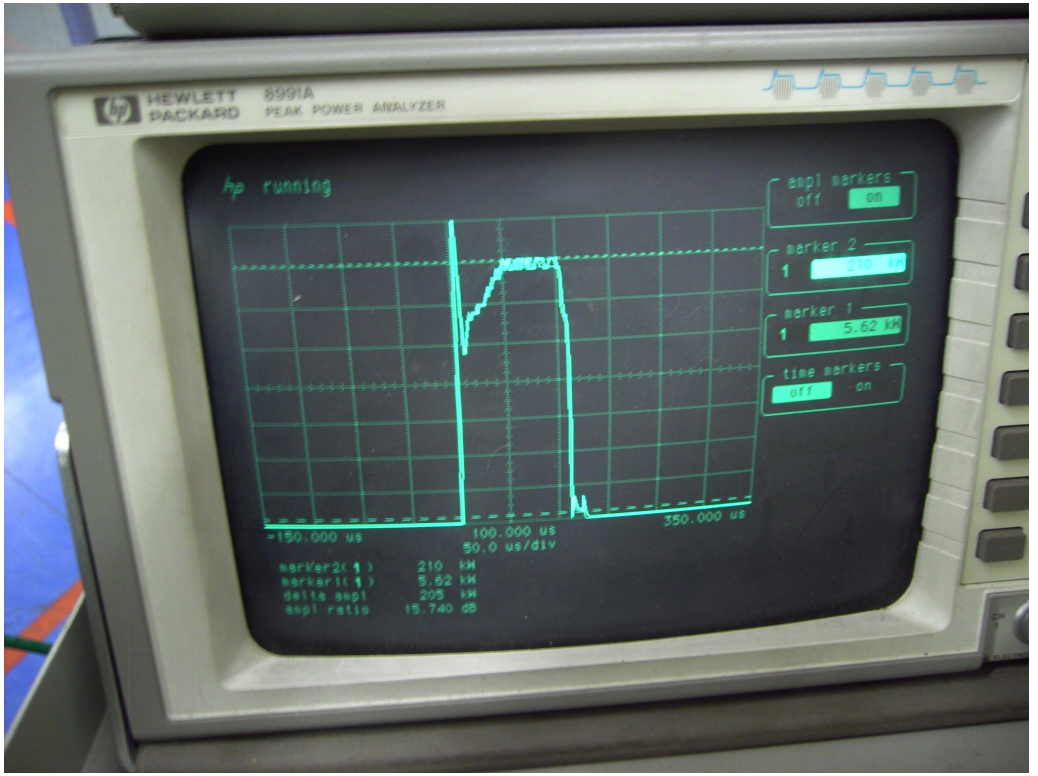


40 mA of beam!


Tek Run
Trig'd
−100µs
−40.5µs
Δ59.7µs
3.80 V
−200mV
Δ4.00 V
2 1.00 V
3 2.00 V
4 ↓1.00 V
40.0µs
T 52.13 %
25.0MS/s
10k points
Aux
1.44 V
10 Jan 2012
14:20:20
Save Screen Image
Save Waveform
Save Setup
Recall Waveform
Recall Setup
Assign Save to Image
File Utilities

Forward power with and without beam



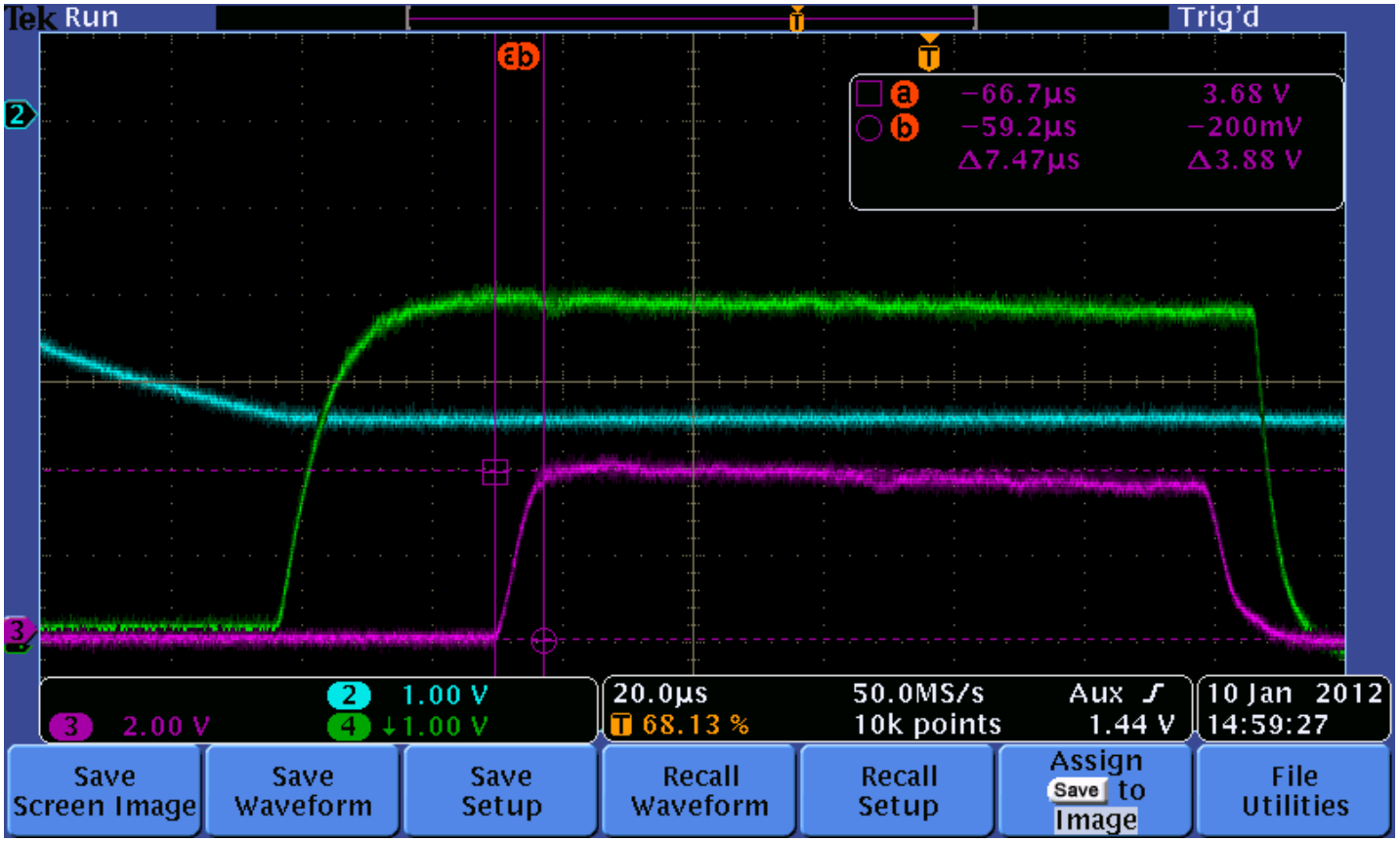


167 kW no beam

210 kW with beam

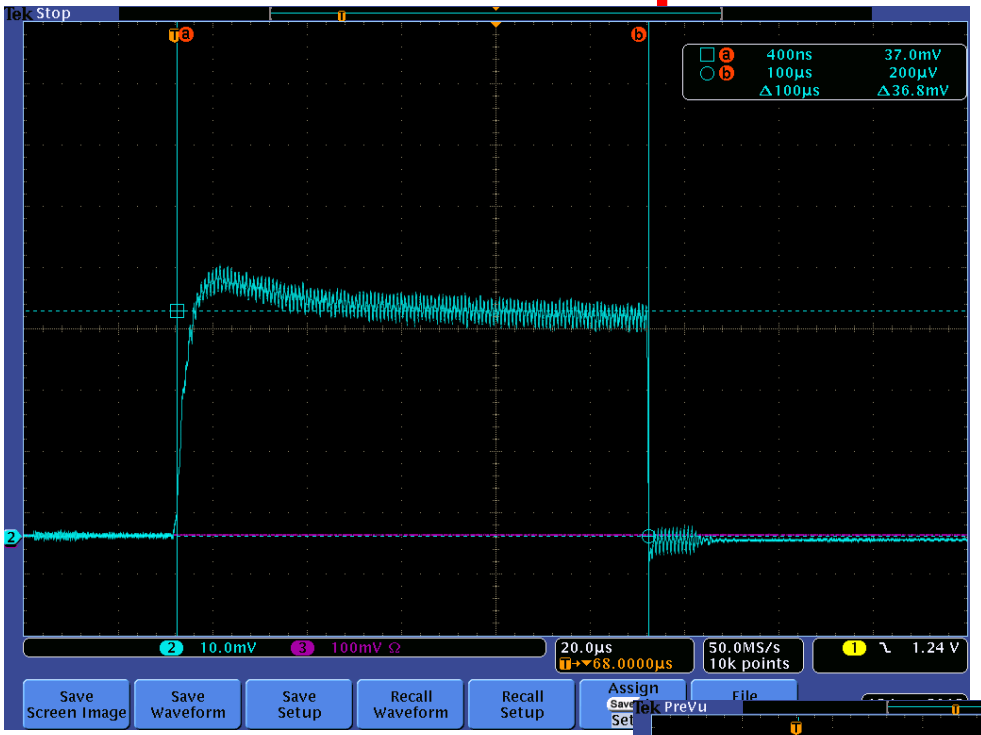
Cavity impedance change?

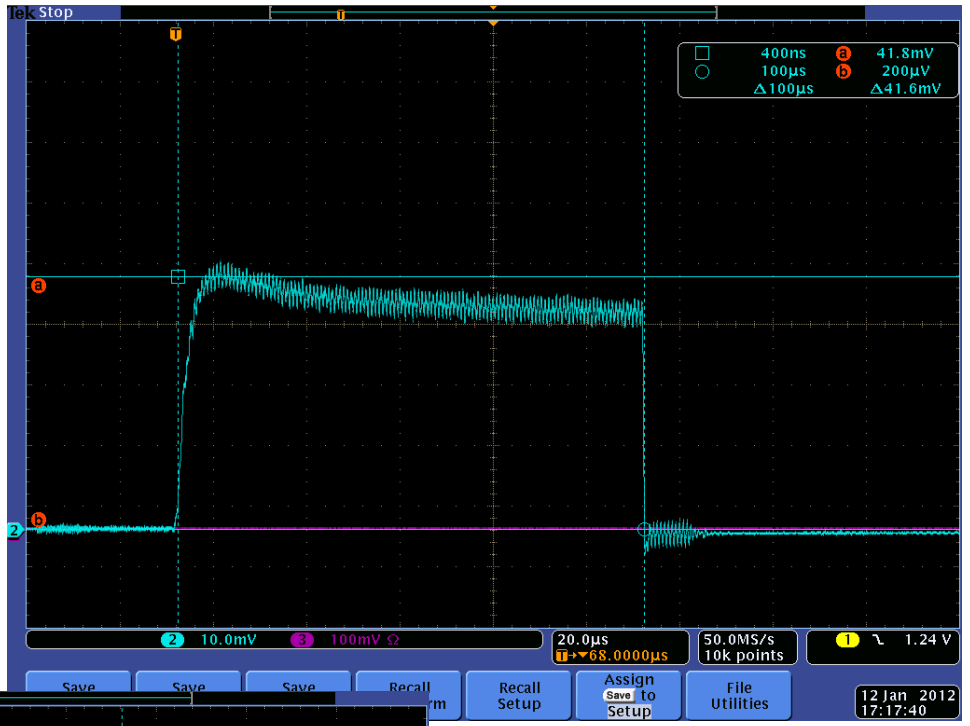
Beam pulse longer than RF pulse

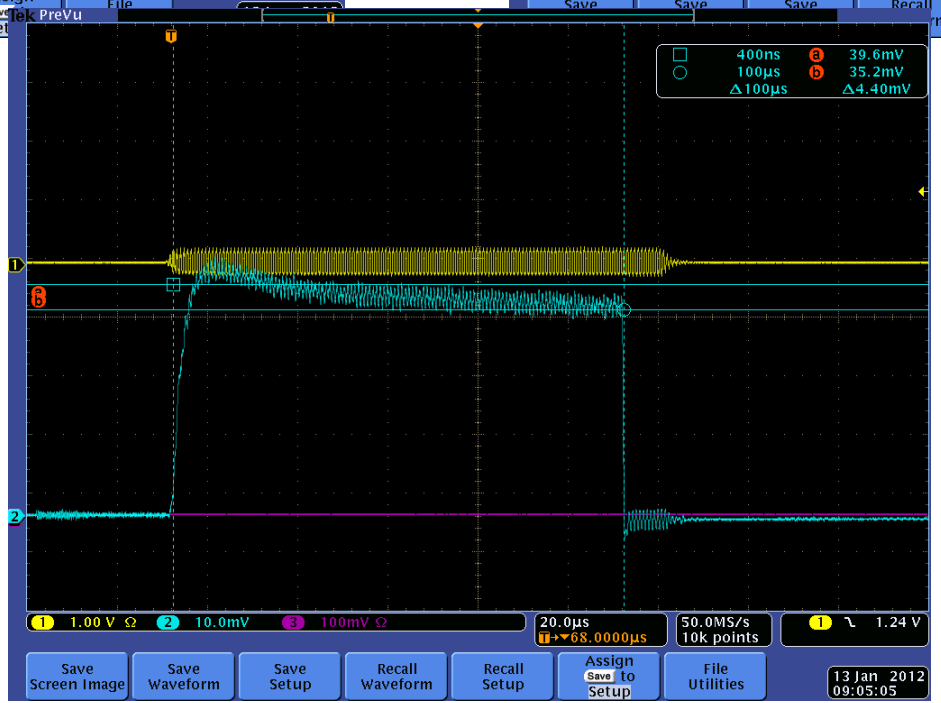


This gives hope that the Einzel lens chopper will work!

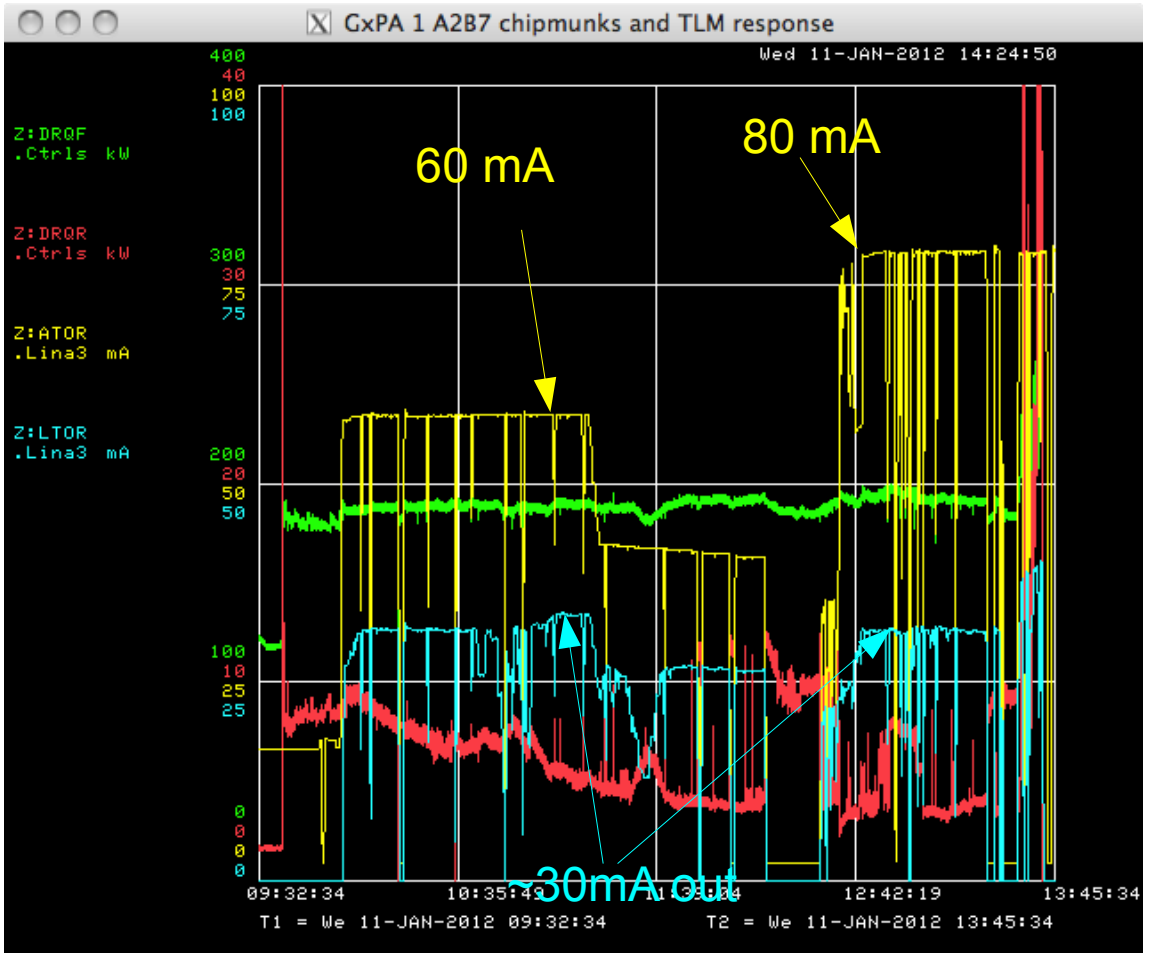
Slope in beam current





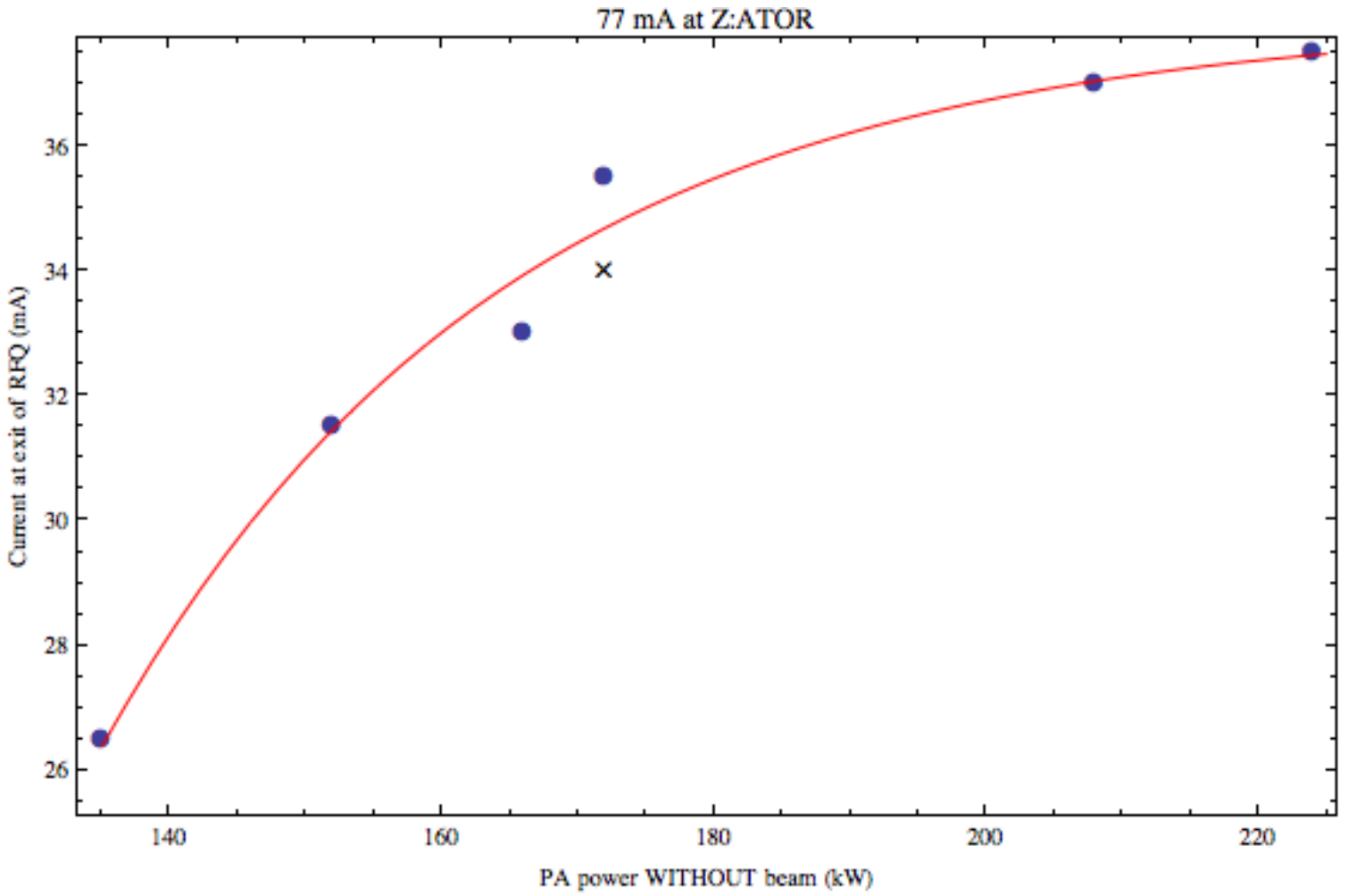


Lowering source current increases transmission efficiency

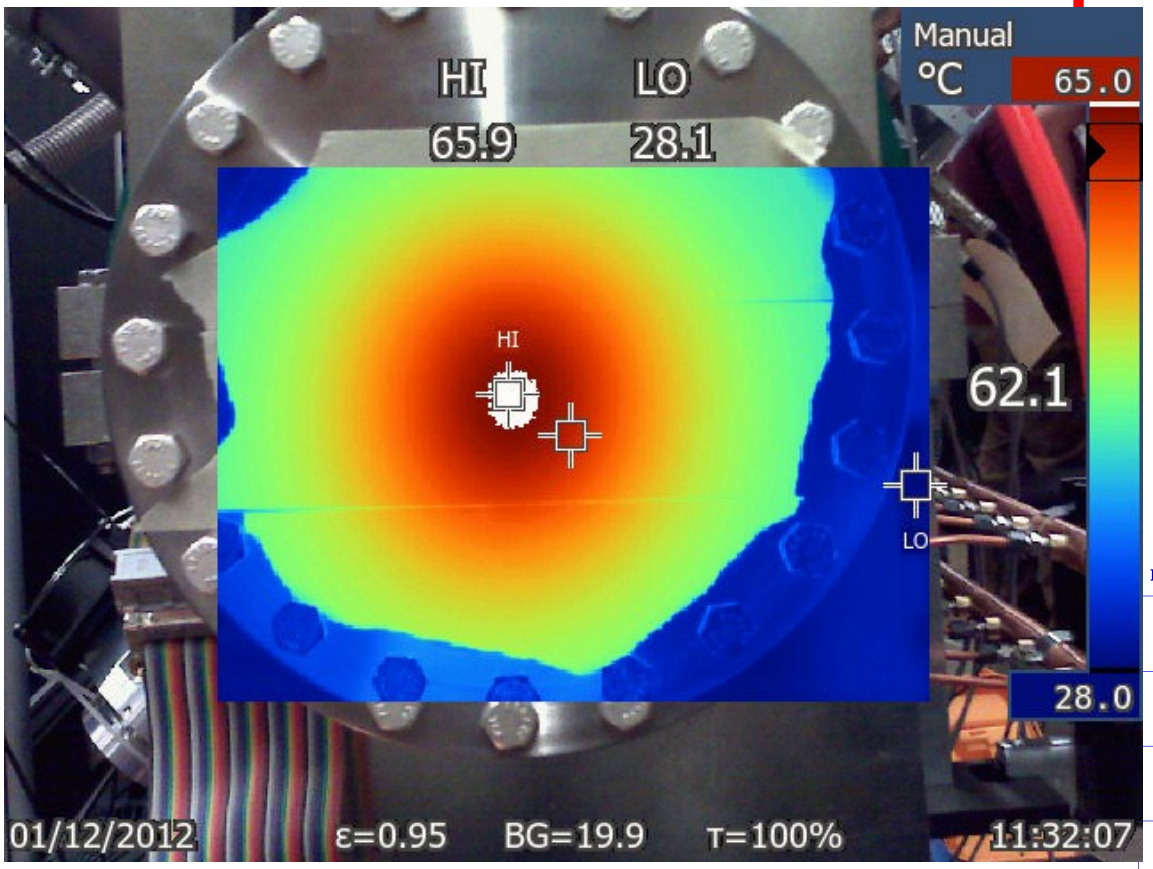


Lowering source current from 80mA to 60mA gives same transmission efficiency for the same RF power.

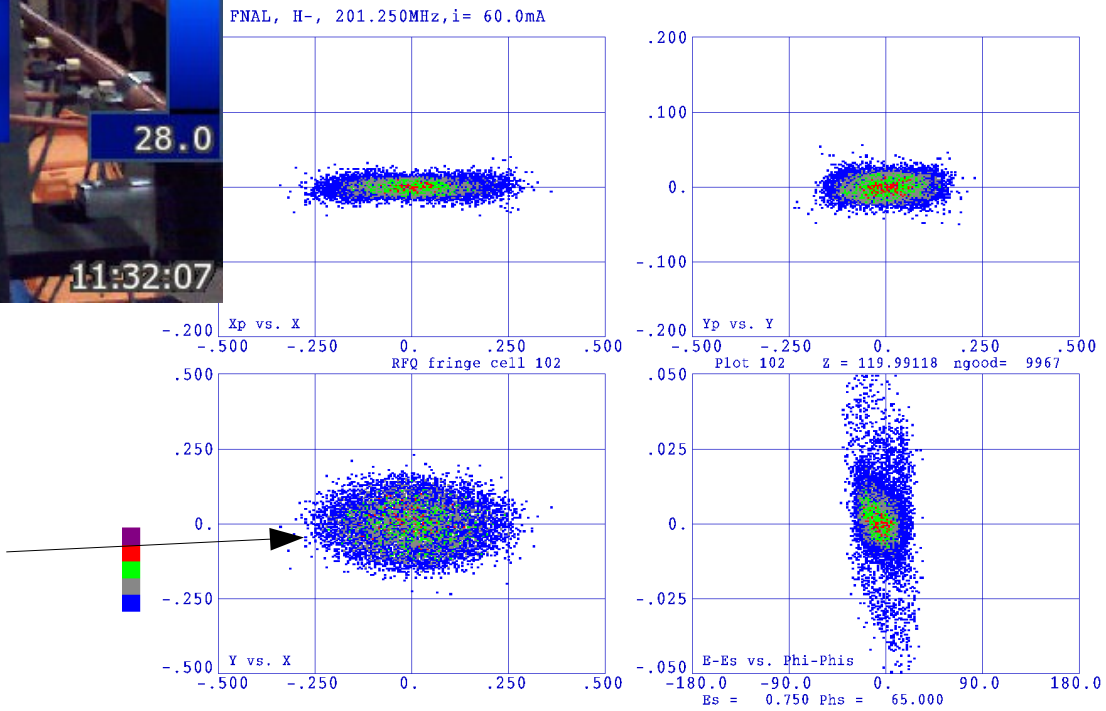
RF Power and Capture Efficiency



Temperature profile at the end of the dump.



Beam is not round at the end of the RFQ

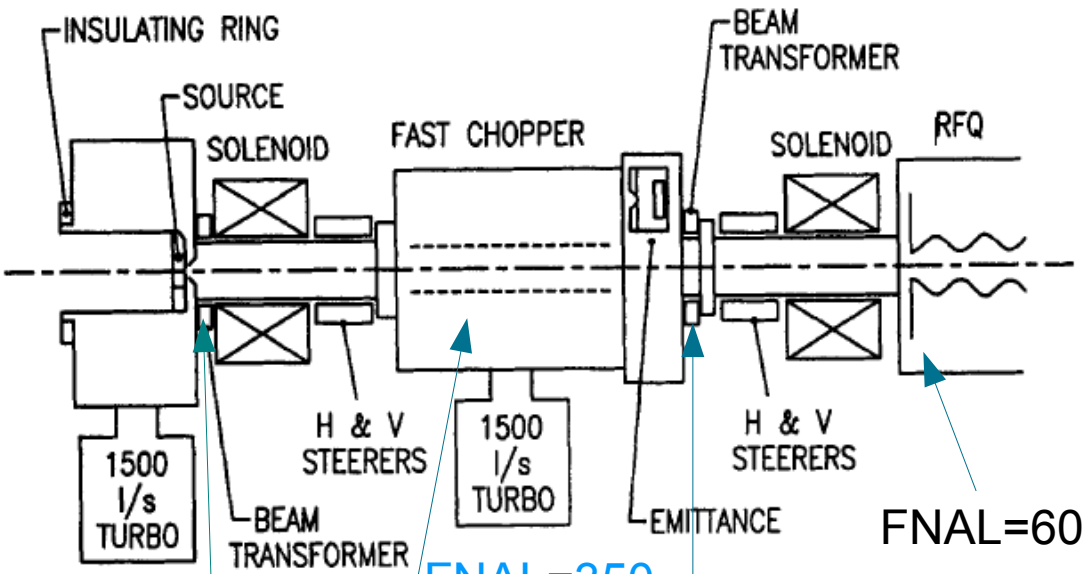


Why are we stuck at 40 mA?

- Bad LEBT vacuum?
  - Flat distribution is indication of hollow beam in phase space. Does over neutralization cause this?
    - New pumping should resolve this.
- Source emittance is too large?
  - We don't have a good measurement of the source emittance.
    - Will be measured with emittance probes when new slide is here.

Comparing with BNL

BNL = 4.5e-6 torr
FNAL=1.5e-6 torr



BNL=45 – 50 mA. (max 60 mA with source gap reduction)
FNAL= < 40 mA

FNAL=60mA

FNAL=350 L/s

BNL=65mA

BNL =55 mA
FNAL =75-80mA

BNL=1e-6 torr (Raparia, no Xe)
FNAL=8e-6 torr

RAL: 7.5e-8 torr, 2000 L/s turbo. 55 mA at RFQ