

# MEBT Doublets

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# Comparing my sim to Schempp's numbers

## Input Numbers

$$\alpha_{x,y} = 1.5$$

$$\beta_{x,y} = 5.1 \text{ cm/rad}$$

$$\epsilon_{x,y} = 0.021 \text{ pi cm rad}$$

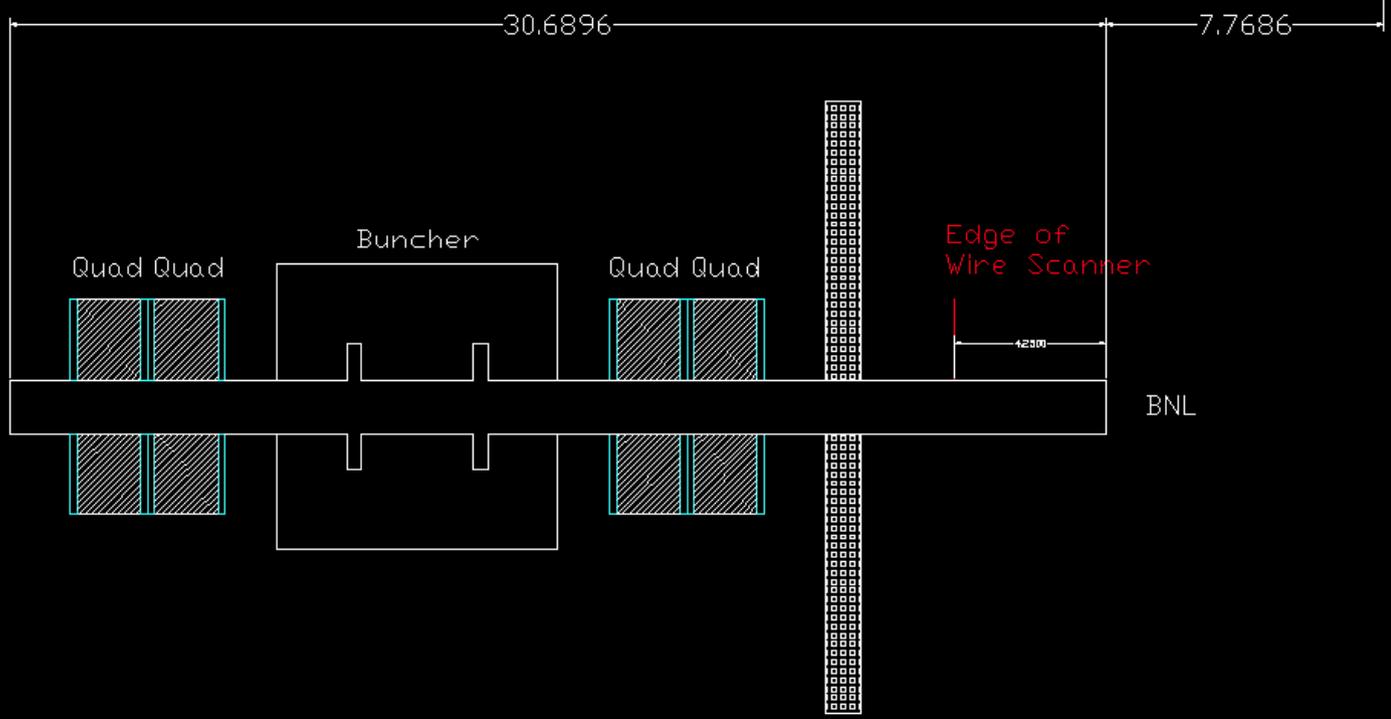
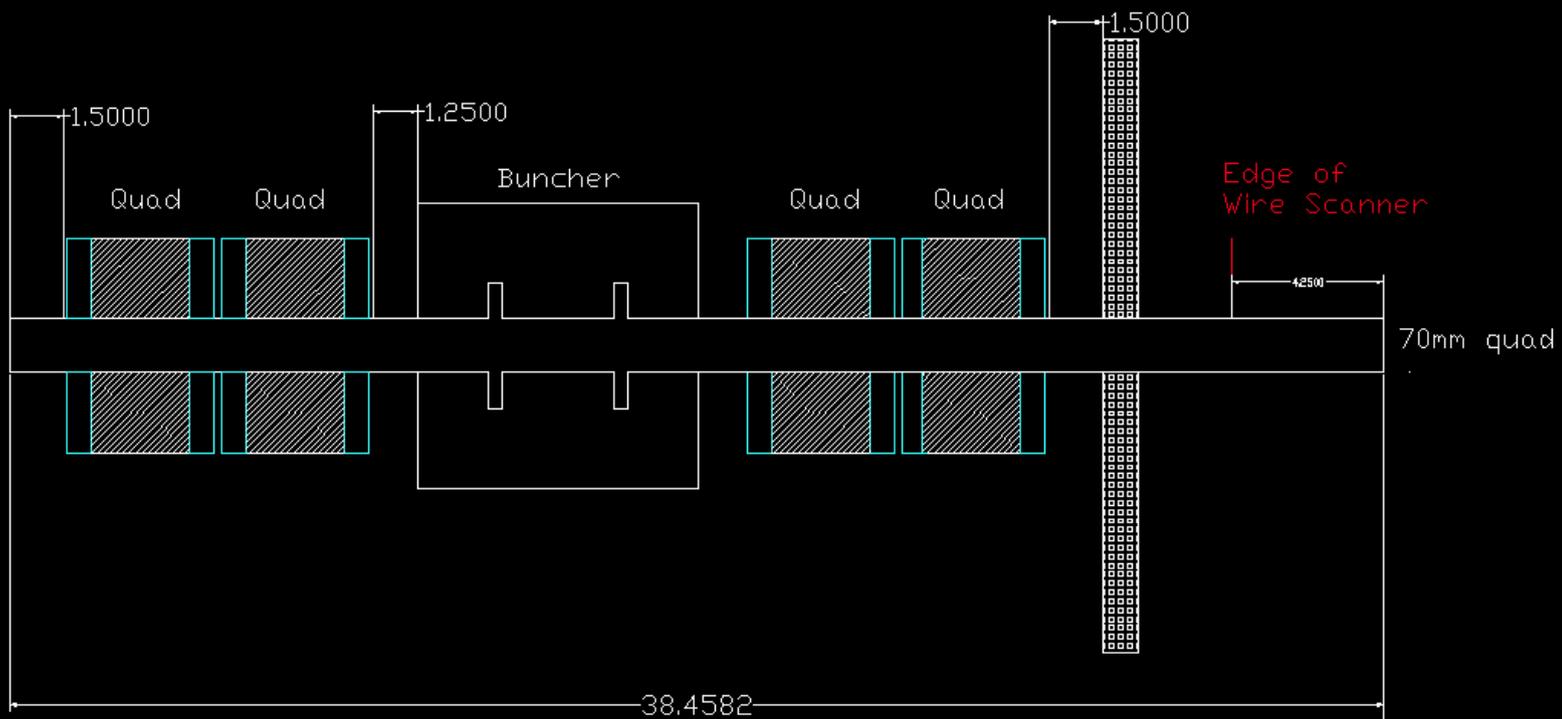
unnormalised

Parameter	Schempp	Mine(17Nov 2010)	Units
$\alpha_x$	-0.18	-0.0389	
$\beta_x$	12.5	12.7	cm/rad
$\epsilon_x$	0.37	0.379	$\pi$ mm mrad (rms norm)
$\alpha_y$	0.07	-0.0813	
$\beta_y$	5.5	5.57	cm/rad
$\epsilon_y$	0.35	0.356	$\pi$ mm mrad (rms norm)
$\alpha_z$	0.21	0.25	
$\beta_z$	1170	1110	deg/MeV
$\epsilon_z$	0.14	0.14	$\pi$ MeV deg (rms unnorm)

Must set to adjust modulation only (to produce the same acceleration efficiency as 2-term potential) in PARI to match Schempp's numbers

# Compare FNAL quads to BNL quads

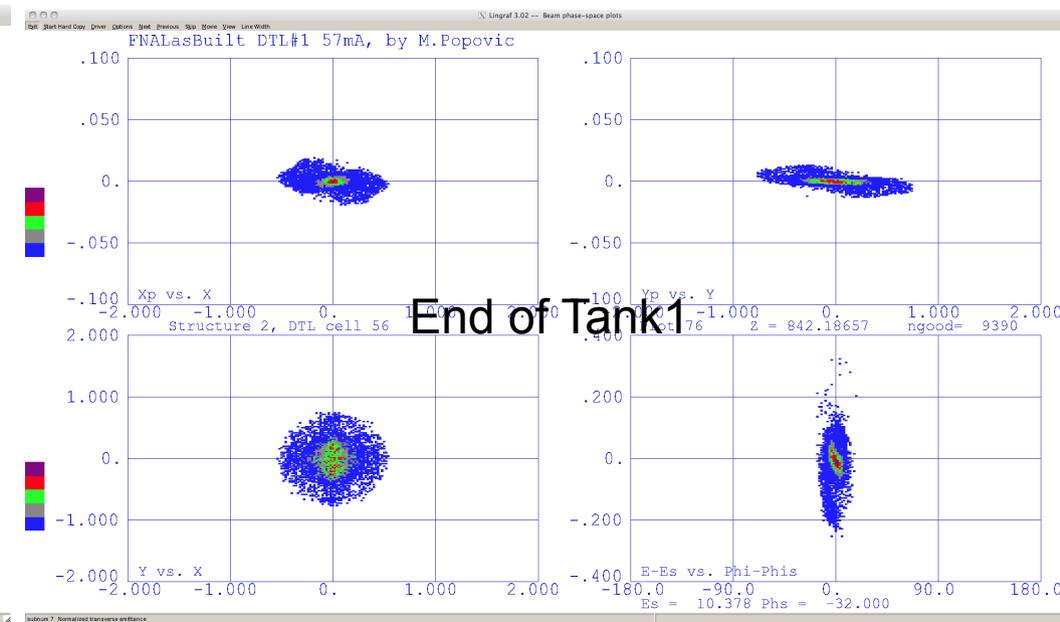
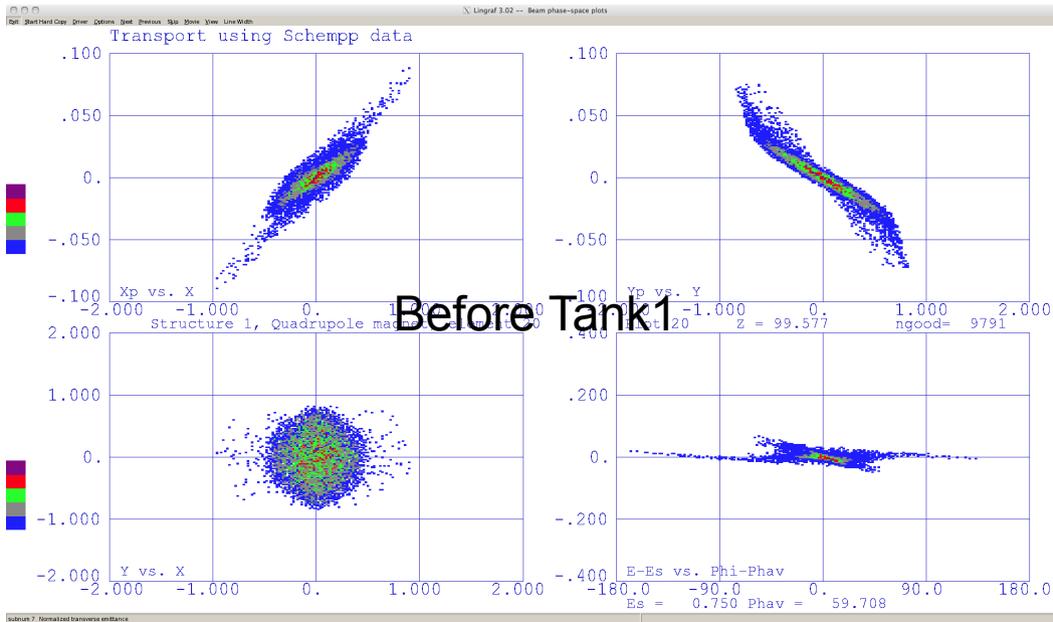
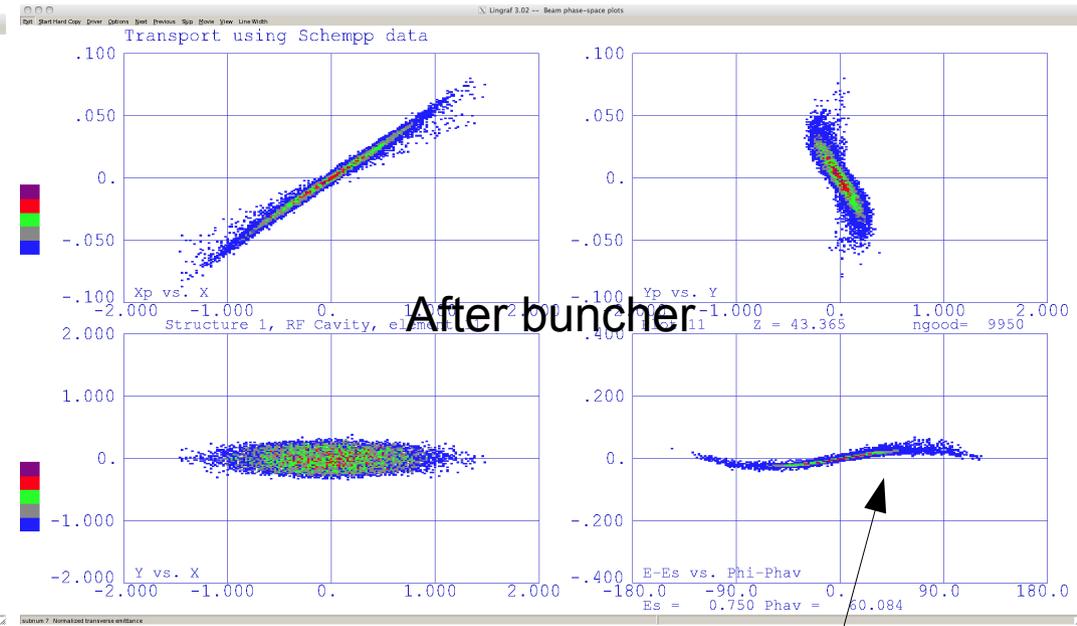
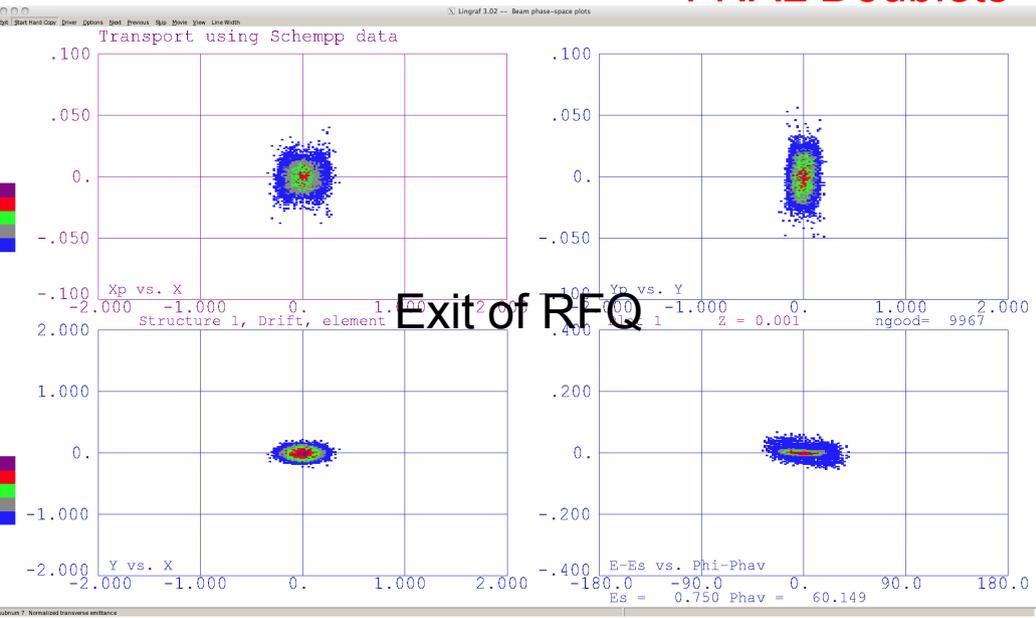
- The FNAL quads are much longer
  - 105mm physical length
- BNL quads ~55mm physical length (guess)
- See how FNAL doublets perform w.r.t. BNL doublets.



# The geometry

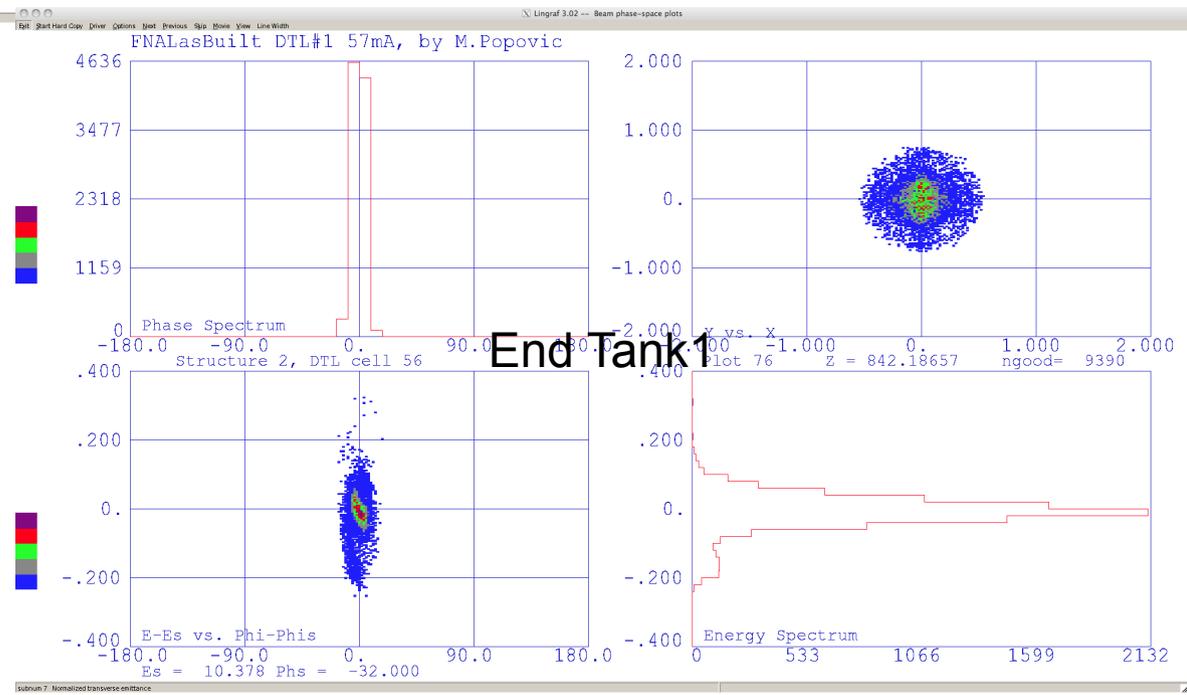
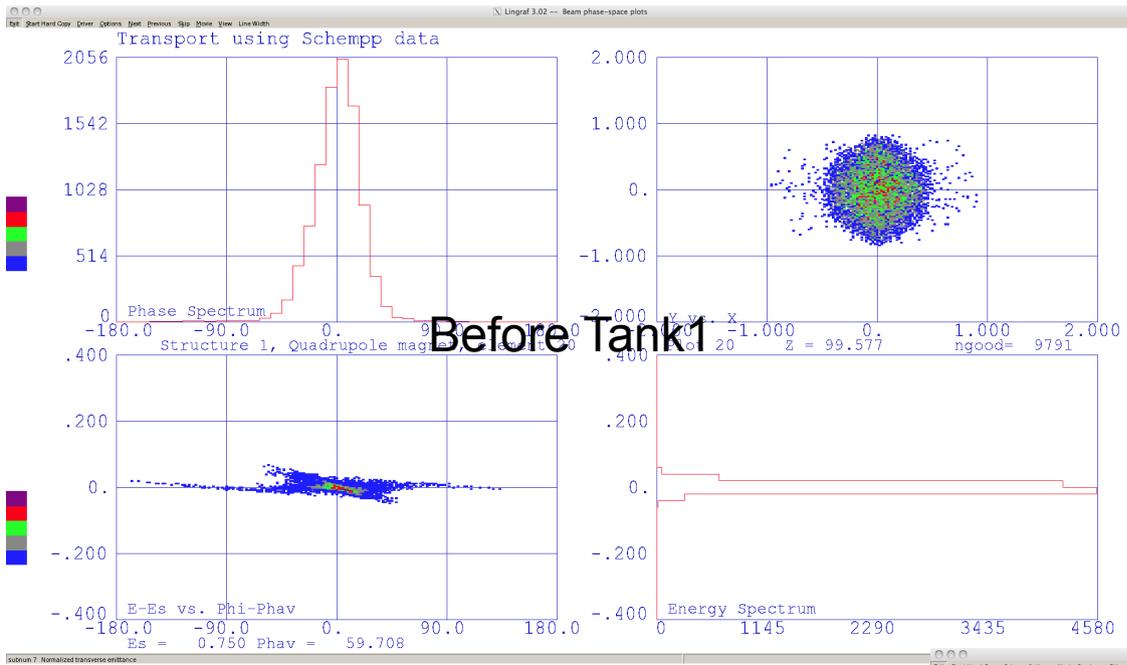
- Because the beam output from the RFQ is nearly round, doublets will mimic the performance of the solenoid in previous design.
- Simulations show that the capture at the end of tank 1:
  - BNL quad doublets: 97.5%
  - FNAL quad doublets: 94.2%
- Simulations say that performance is within 5% between the 2 designs.
  - There is definitely more tails which get lost in the FNAL doublet design.

# FNAL Doublets

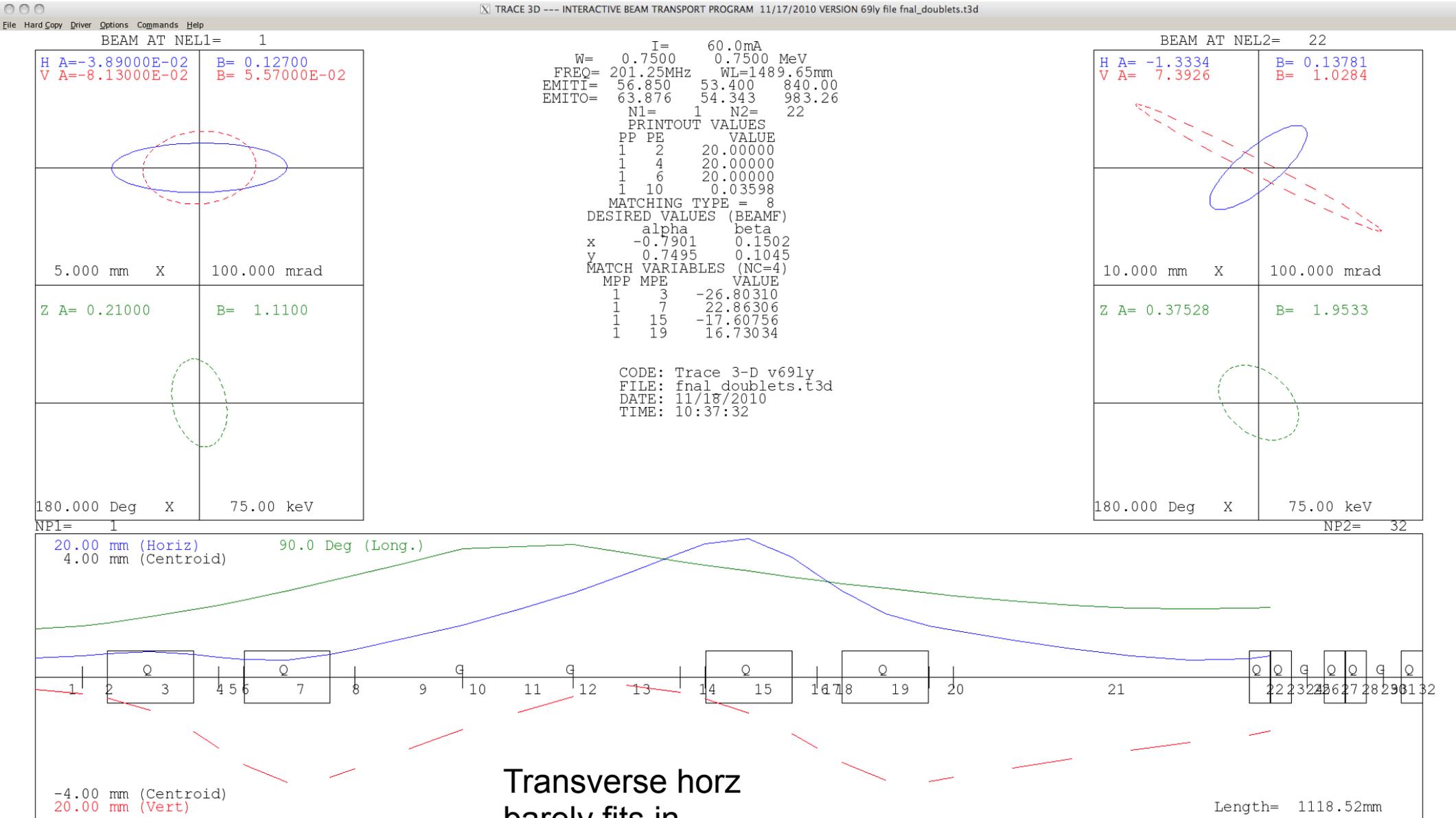


Capture is 94.2% at end of Tank 1

# Before and End of Tank 1 (FNAL doublets)

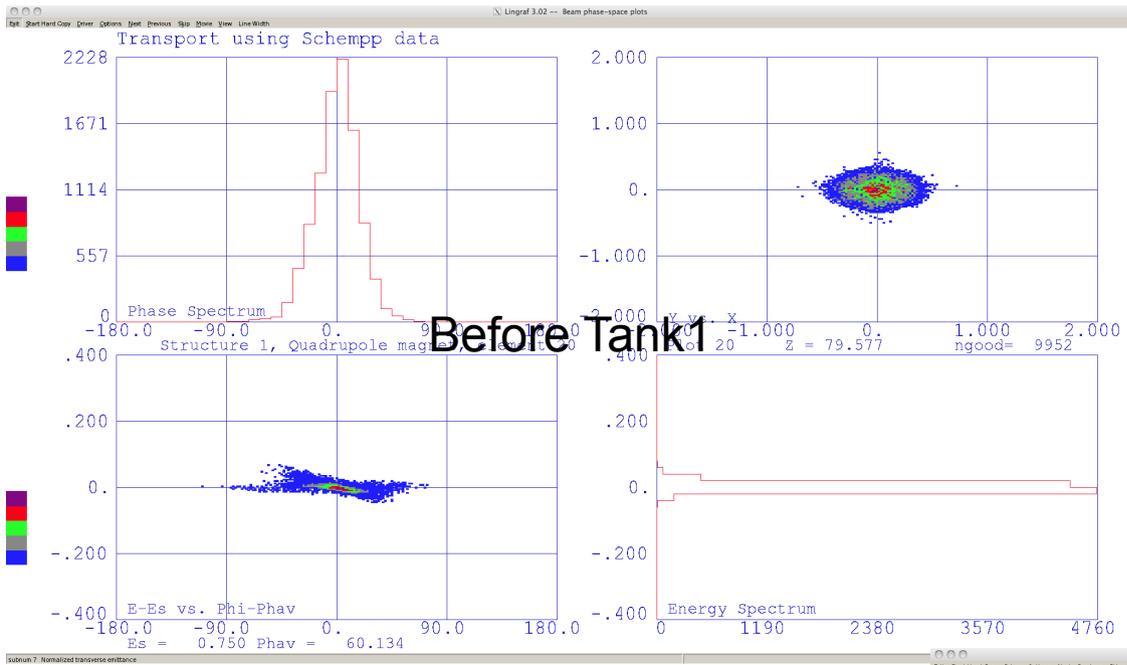


# FNAL Trace3D

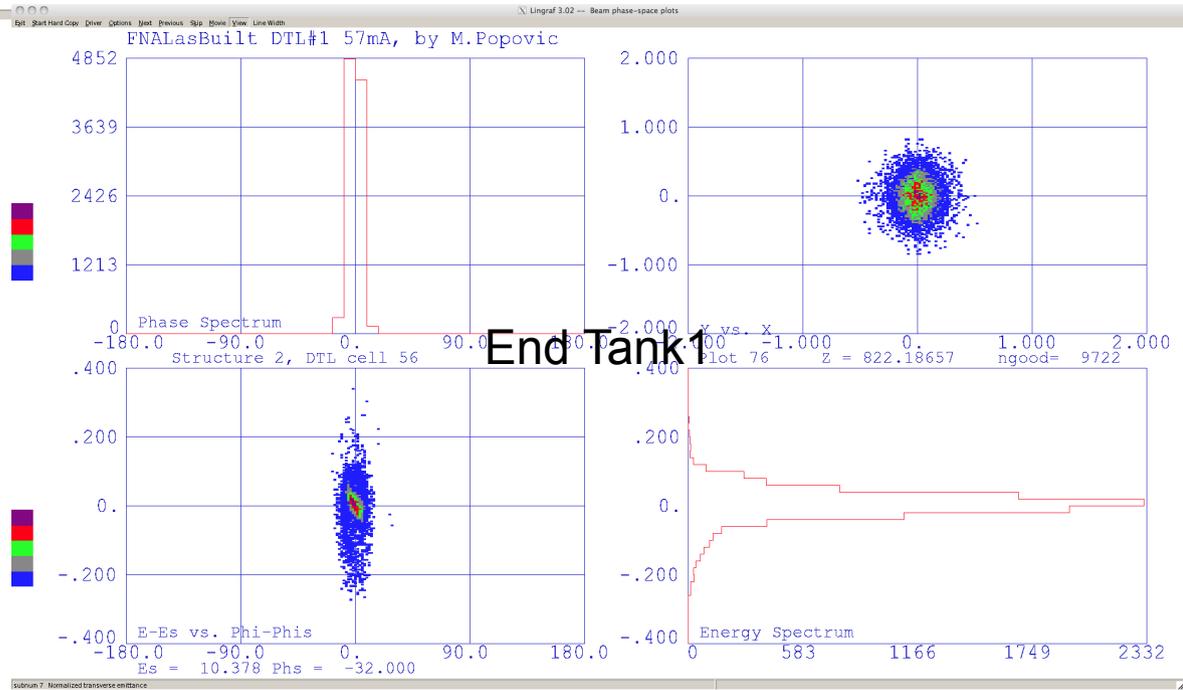




# Before and End of Tank 1 (BNL doublets)

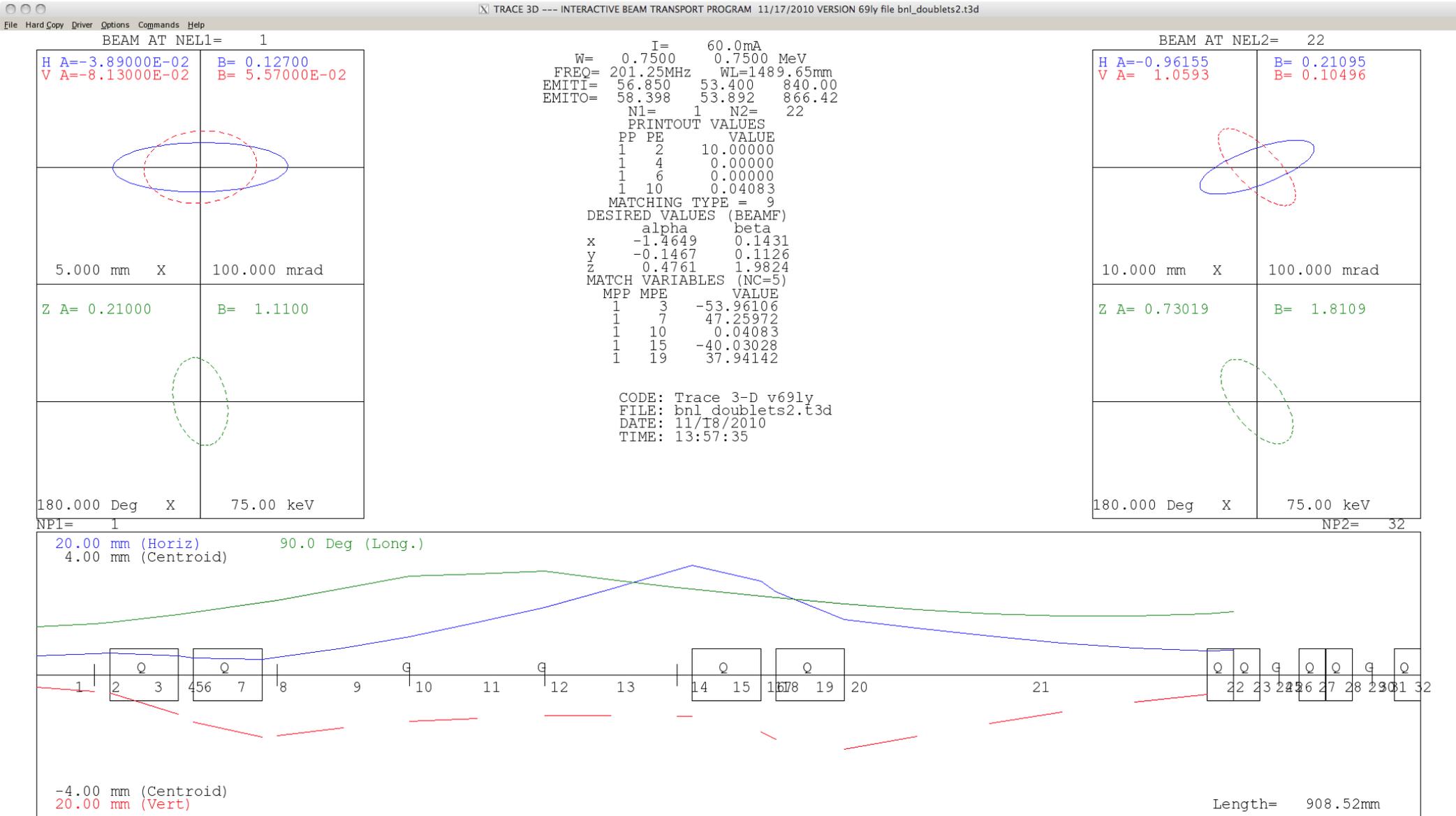


Before Tank 1



End Tank 1

# BNL Trace3D



# Quad strengths

- FNAL doublets

- Quad1: 26.8 T/m
- Quad2: 22.9 T/m
- Quad3: 17.6 T/m
- Quad4: 16.7 T/m

- BNL doublets

- Quad1: 54.0T/m
- Quad2: 47.3 T/m
- Quad3: 40.3 T/m
- Quad4: 37.9 T/m

# MEBT Quads (BNL)

- Spoke to Masahiro on 15 Nov
  - 45mm will be tested before end of the year.
  - Similar 70mm quads installed in EBIS
    - All hollow conductors
    - 5Hz, 100-200us pulse, 70T/m (~800A)
    - Temperature rise is minimal for flow rate of 1 litre/s.