



Cornell Laboratory for
Accelerator-Based Sciences
and Education (CLASSE)

**40 cm Bypass in TTOSC mode w/
10 nm x 10 nm emittance beams:
% particles in dampable envelope**

Michael Ehrlichman



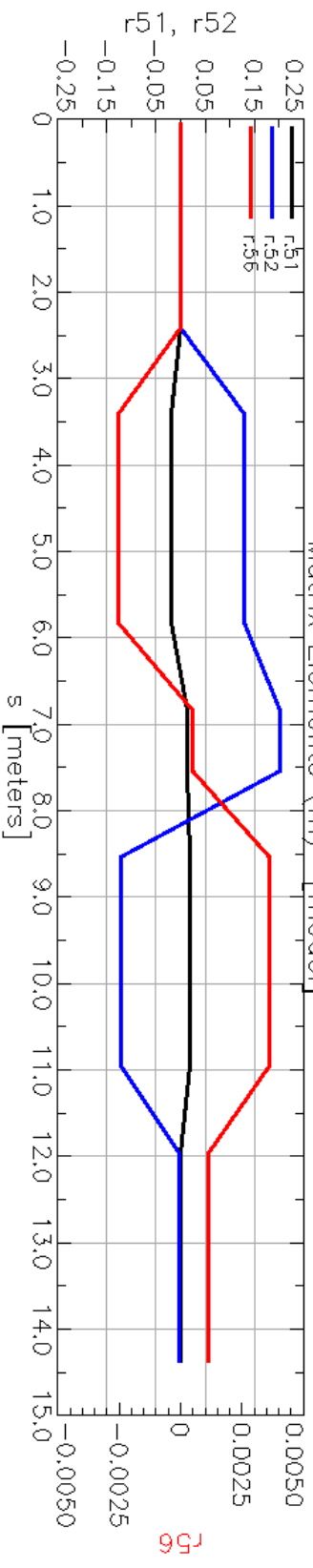
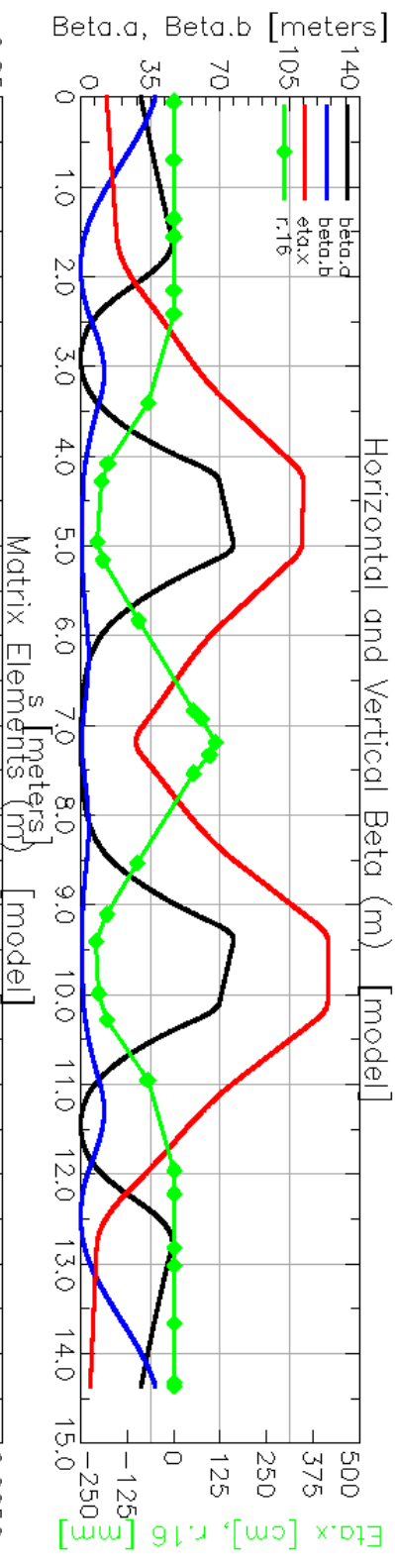
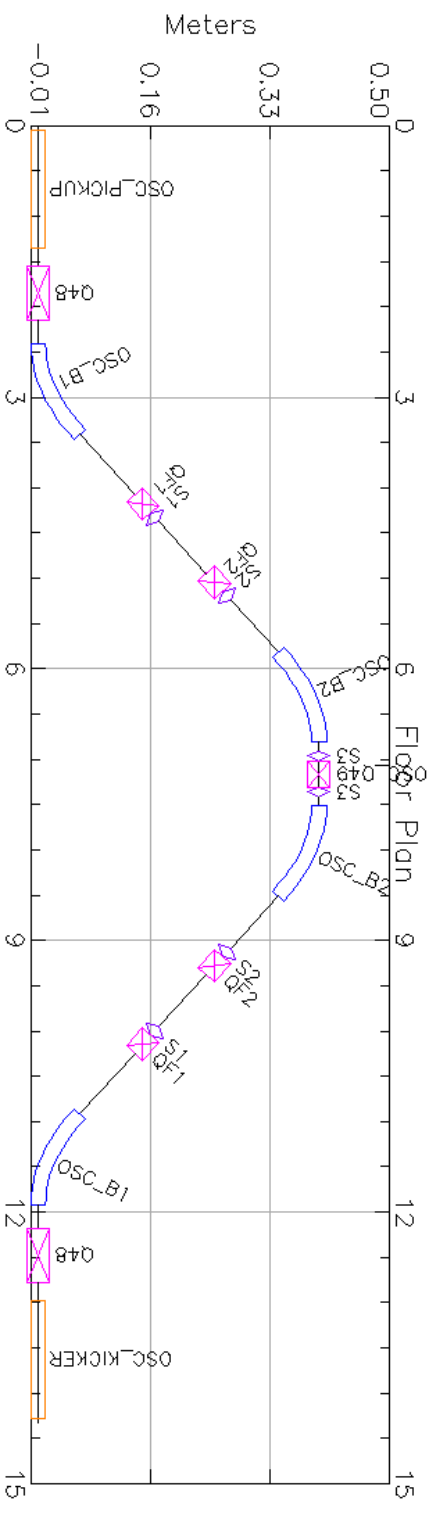
Reminder: Layout & Optics

- Notice sextupoles added S1, S2, & S3

$$\tilde{J} = 2.1 \cdot 10^{-7}$$

$$\tilde{M}_{56} = 1.1 \cdot 10^{-8}$$

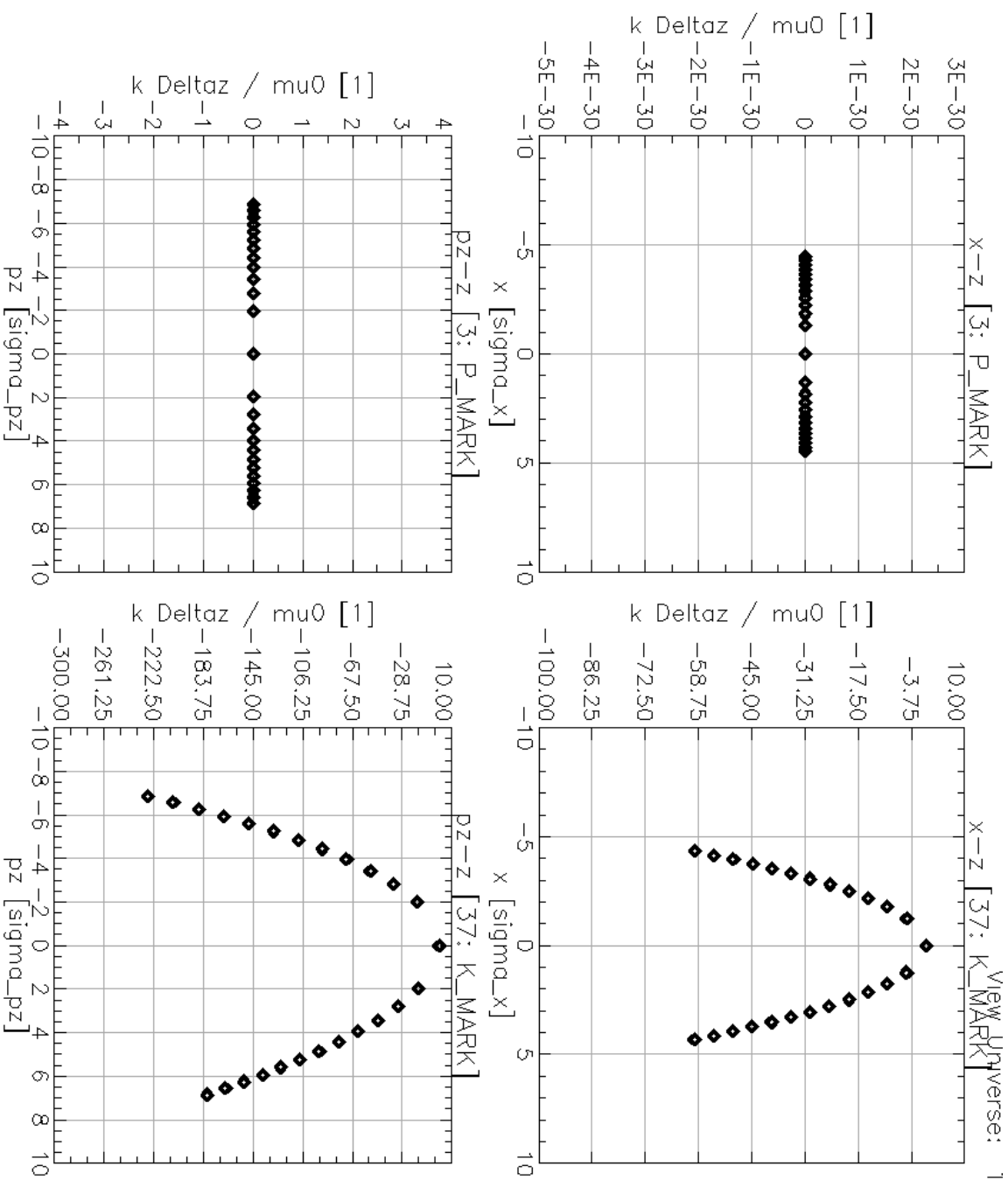
$$M_{56} = 1.1 \cdot 10^{-3}$$





Particle Tracking: No K_2 moments

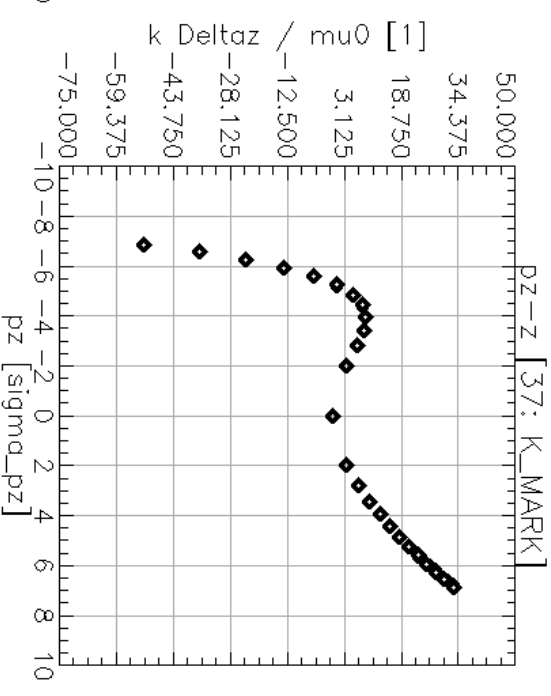
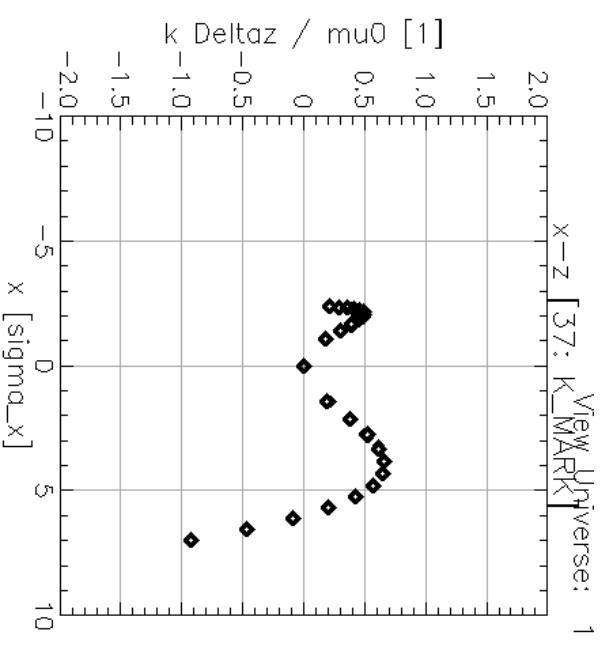
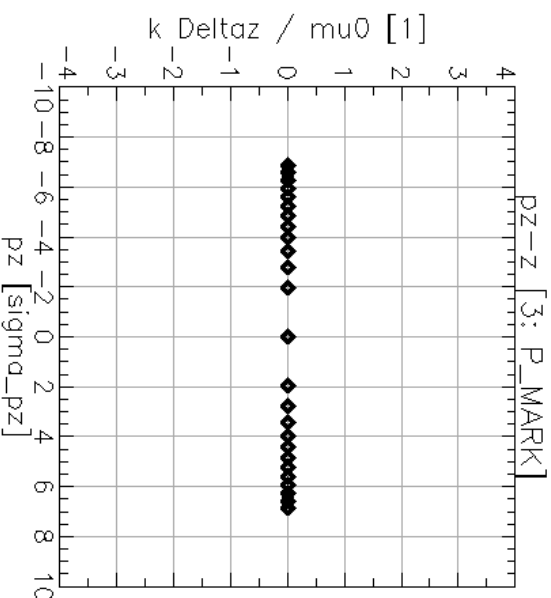
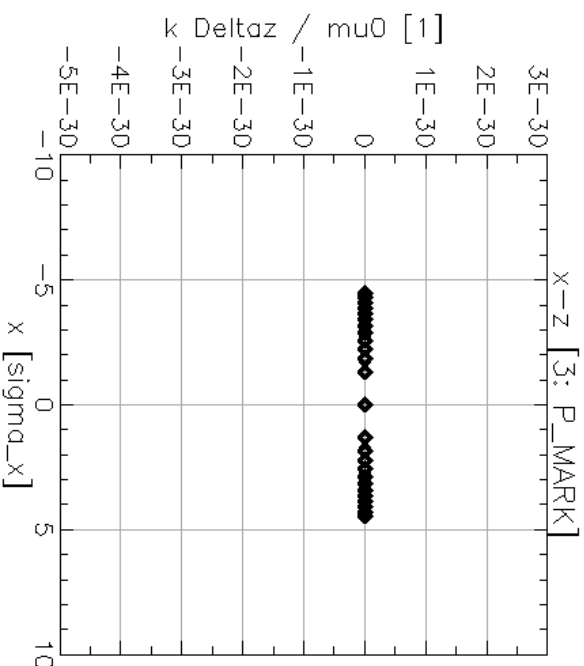
- Distribution at left is injected at middle of pickup.
- At right is Δz at kicker.
 - Normalized s.t. [-1, 1] is TTOSC envelope.
- Note linear dependence of Δz on p_z and x is small, as indicated by small J and M_{56} .





Particle Tracking: w/ K_2 moments

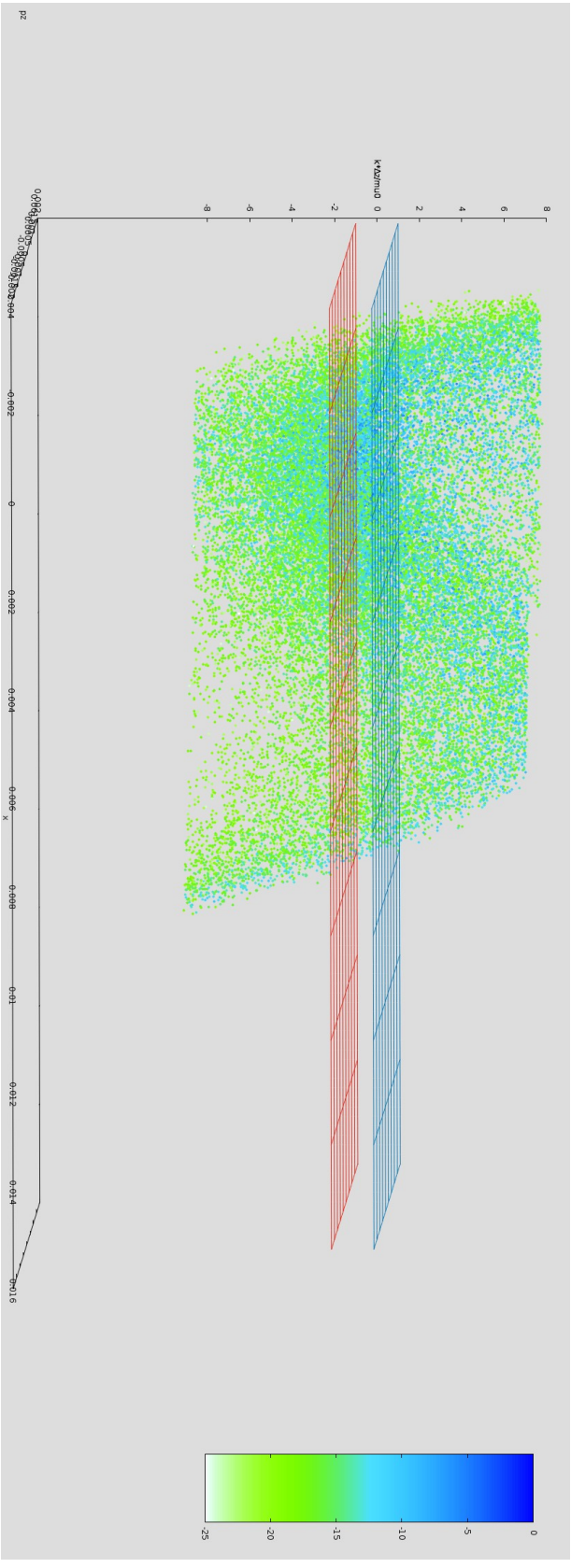
- K_2 in 10 cm sextupoles S_1 & S_2 is -55.5 m^{-3}
- K_2 in 10 cm sextupole S_3 is -100 m^{-3}
- S1 & S2 set by hand to fit x-dependence between -1 and 1.
- S3 set for demonstration purposes: values required to fit pz dependence are unfeasibly large.
- K2 elsewhere tried
 - Outside osc_b2
 - Before kicker
 - Center of Q49



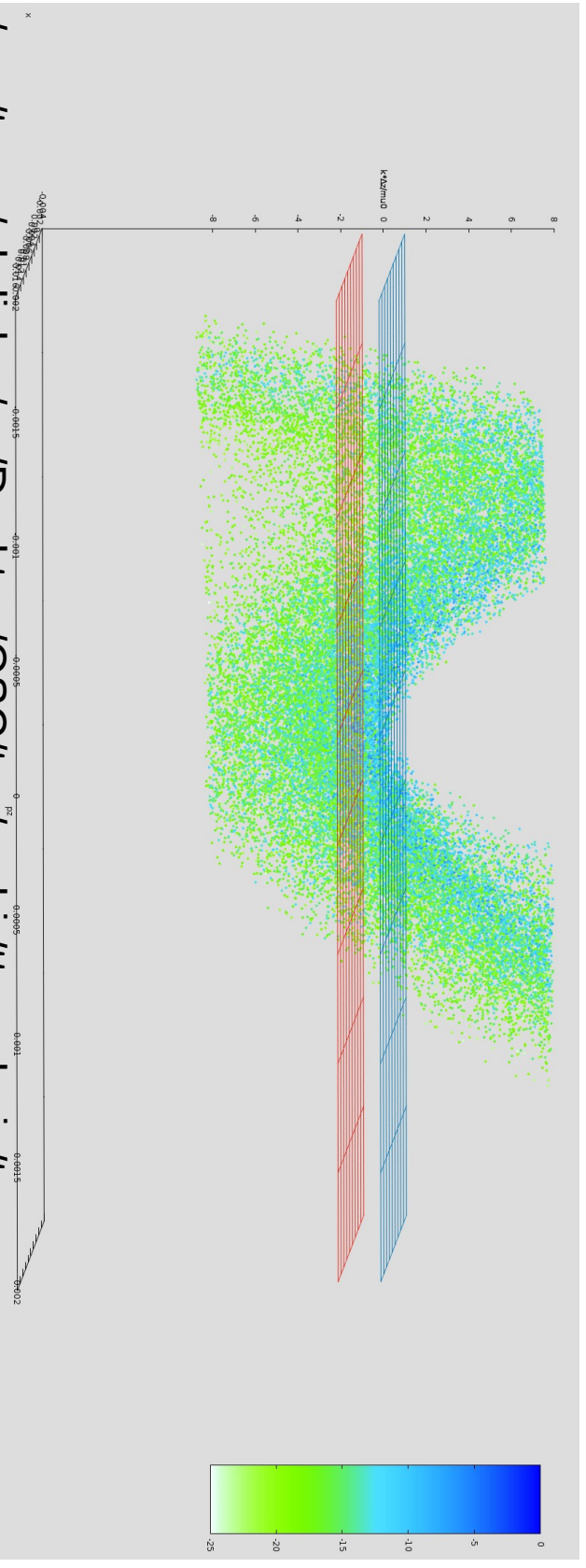


Particle Tracking: MC w/ K_2

- See live plots*.
- 41% in damping envelope.
- Without K_2 : 3.5% damped.



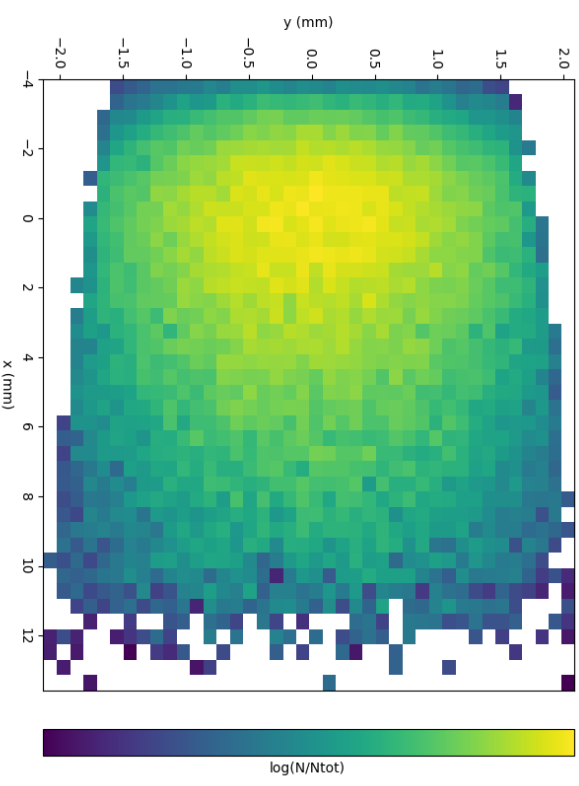
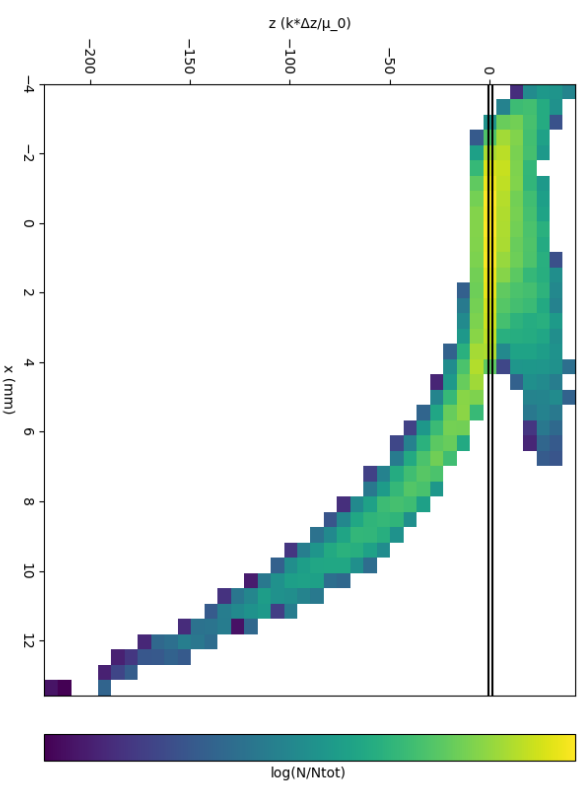
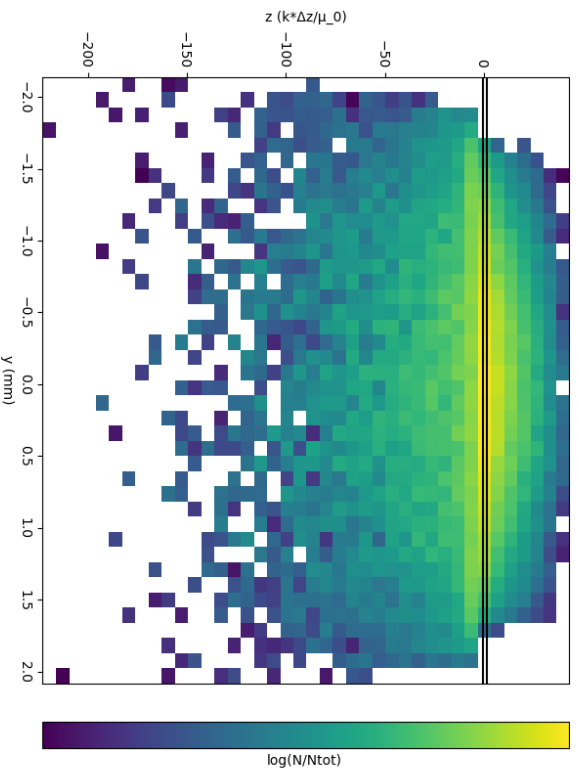
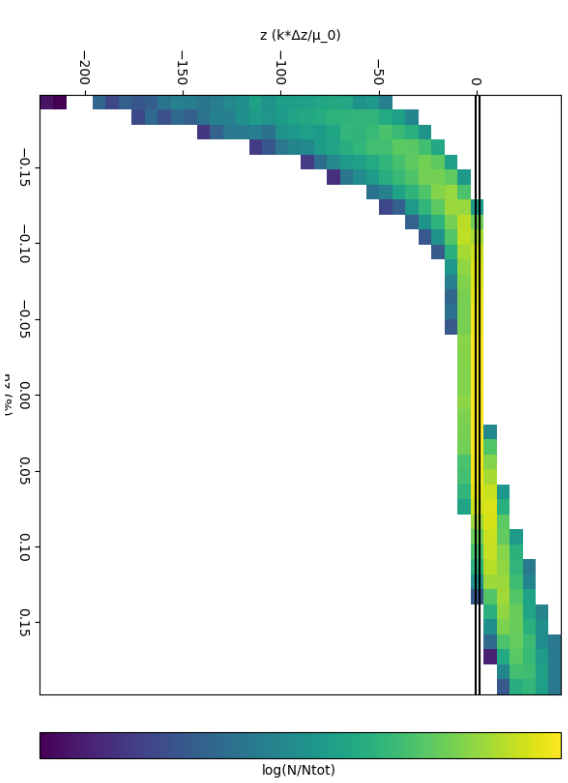
- With $K_{2,S3} = -600 \text{ m}^{-3}$: 58% damped.



*gnuplot /nfs/acc/temp/ehrichm/oc/Desktop/OSC/tao/ambi-/tt-analysis/toss_mc.gp



Particle Tracking: MC Histograms





Conclusions

- With reasonable sextupoles, ~50% of particles of 10nm x 10nm beam fit inside TTOSC envelope.
 - Accomplished by correcting nonlinear dependence of Δz on J .
 - Way of also correcting nonlinear dependence of Δz on p_z not yet found.
- Path forward: Match into CESR, run TTOSC simulation.
 - M_{56} is big, perhaps sufficient (as in, enough to be observed) damping will occur.
- Perhaps: Smaller 30 cm bypass + numerical optimization of K_2 will yield a more comfortable % in damping envelope.