

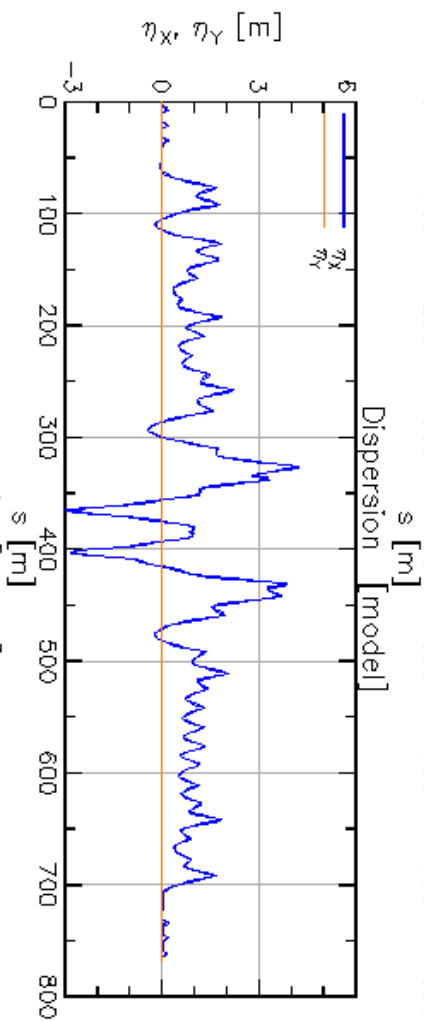
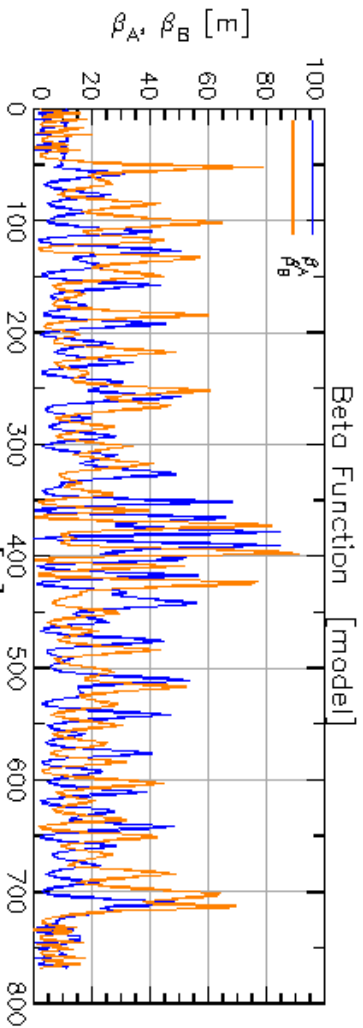
OSC simulation update

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1. $\Delta S = Z_{\text{kick}} - Z_{\text{pickup}}$ problem
Solved. Due to round-off errors in “track_a_drift” bmad routine
2. DLR 1GeV bypass CHESS-U lattice v2

7/3/2018

/home/dlr/lat/des/osc/mpe/bmad_2nm_24nm_20180627.lat



m51: 1.5462E-03 m52: -1.6065E-02
m56: 3.3138E-03 m56_t: 1.0526E-04

Damping ratio: $\lambda_x/\lambda_s=30.5$

Cooling range:

$\epsilon_{x_max} = 24.1E-09$ $\delta p/p_{max} = 2.9092E-03$
 $n_x = 3.33$ $n_z = 7.15$

Radiation damping time ~ 0.5s

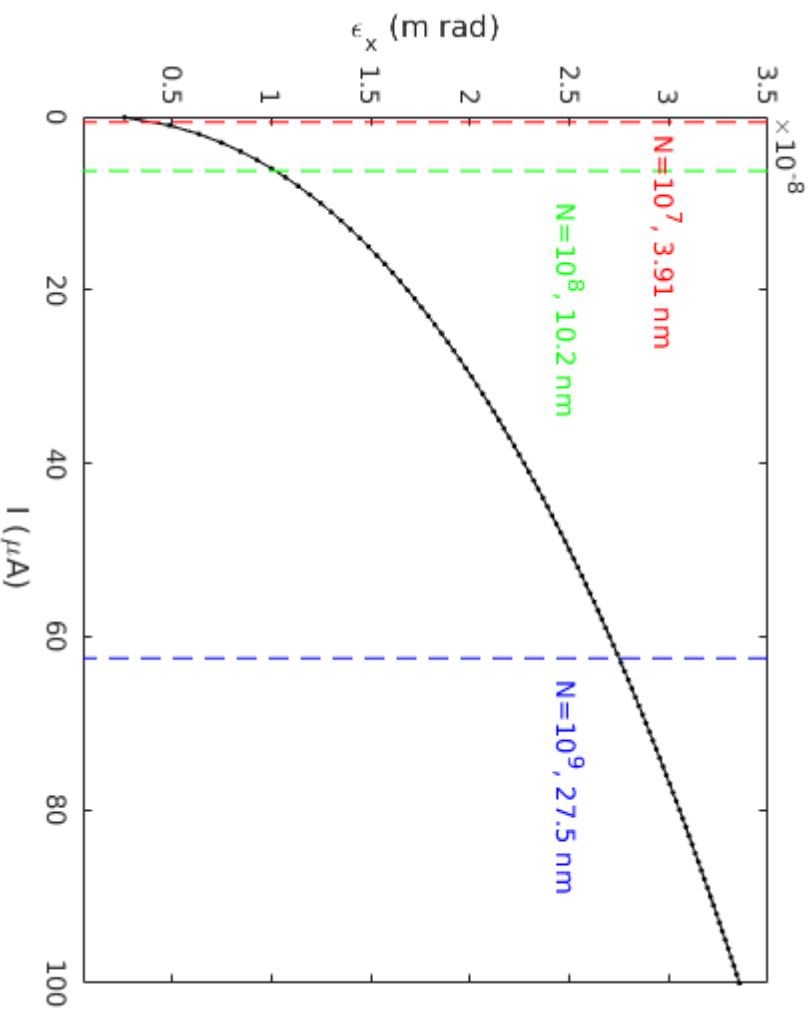
	X	Y	
Q	16.5933	13.4136	! Tune
Chrom	1.0210	1.1047	! dQ/(dE/E)
J_damp	1.0348	1.0005	! Damping Partition #
Emitance	2.164E-09	6.032E-14	! Meters
Alpha_damp	5.326E-06	5.149E-06	! Damping per turn

	Model	Design	
Z_tune:	2.702E-02	2.702E-02	! The design value is calculated with RF on
Sig_E/E:	4.066E-04	4.066E-04	
Sig_z:	1.097E-02	1.097E-02	! Only calculated when RF is on
Energy_Loss:	1.029E+04	1.029E+04	! Energy_Loss (eV / Turn)
J_damp:	1.965E+00	1.965E+00	! Longitudinal Damping Partition #
Alpha_damp:	1.011E-05	1.011E-05	! Longitudinal Damping per turn
Alpha_p:	5.953E-03	5.953E-03	! Momentum Compaction

Lattice:

/home/dlr/lat/des/osc/mppe/bmad_2nm_24nm_20180627.lat

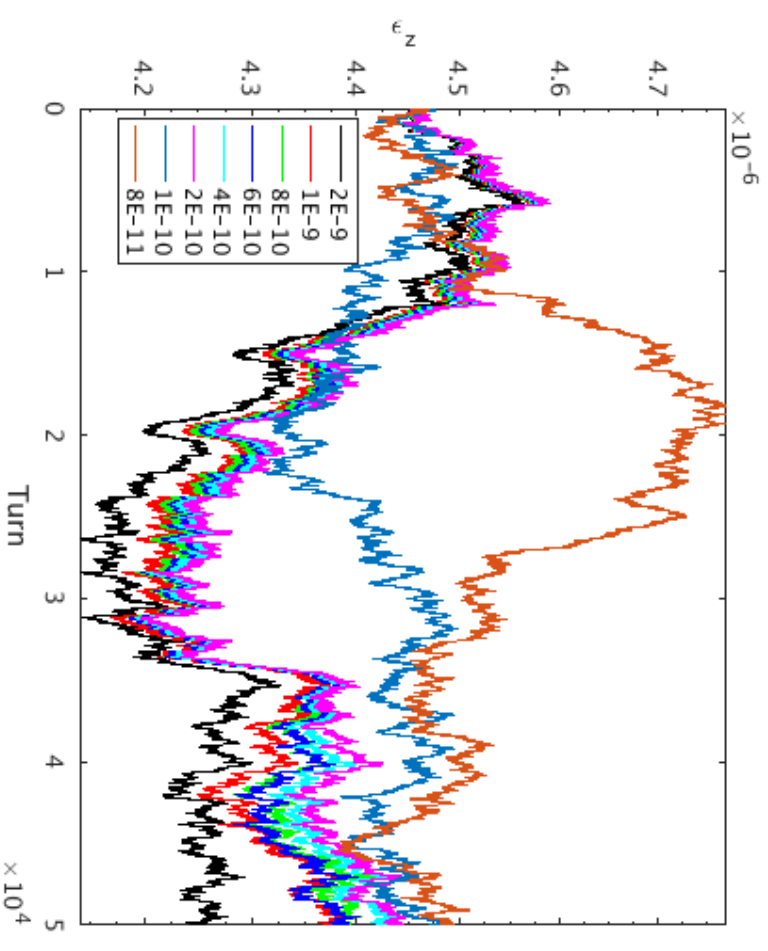
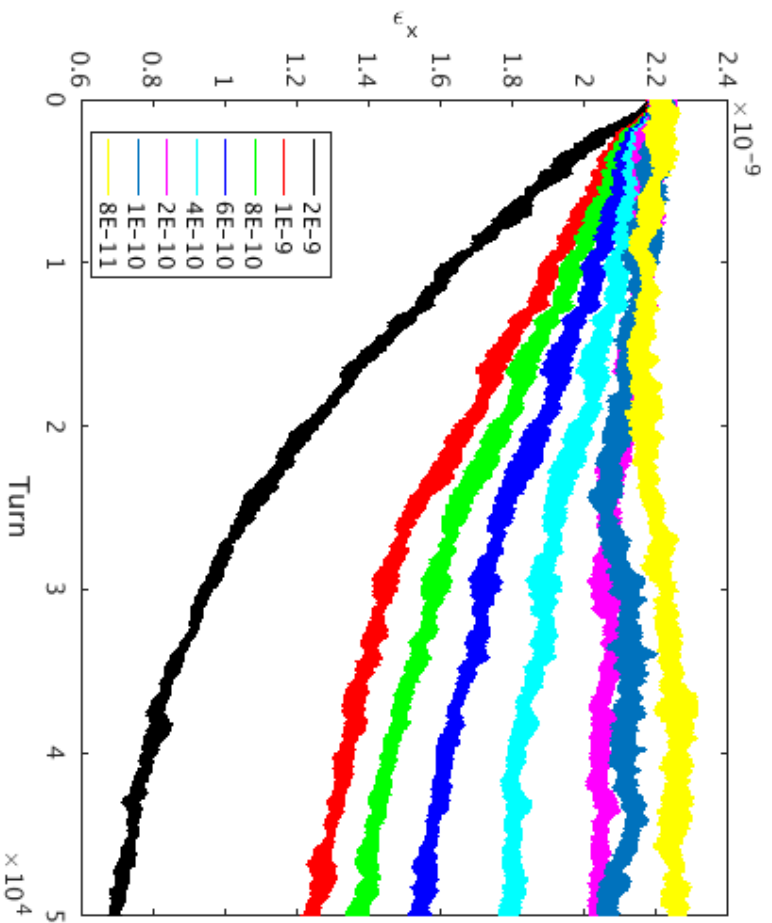
Set $V_{RF} = 6E5$ V, $\sigma_z \sim 11$ mm



Emittance due to IBS:

$N=1E7$, $I \sim 0.625$ μA , $\epsilon_x \sim 3.9$ nm
 $N=1E8$, $I \sim 6.25$ μA , $\epsilon_x \sim 10.2$ nm
 $N=1E9$, $I \sim 62.5$ μA , $\epsilon_x \sim 27.5$ nm

$\epsilon_x=2.2\text{nm}$ design emittance, damping and excitation turned on, **with incoherent kicks**

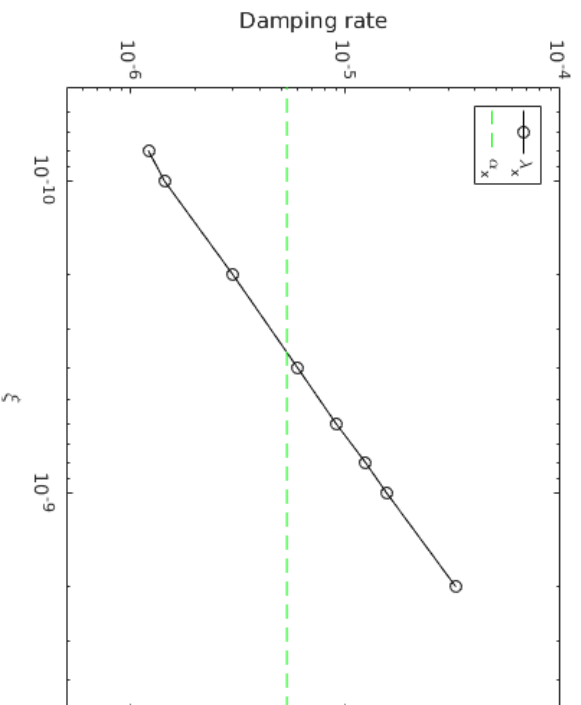
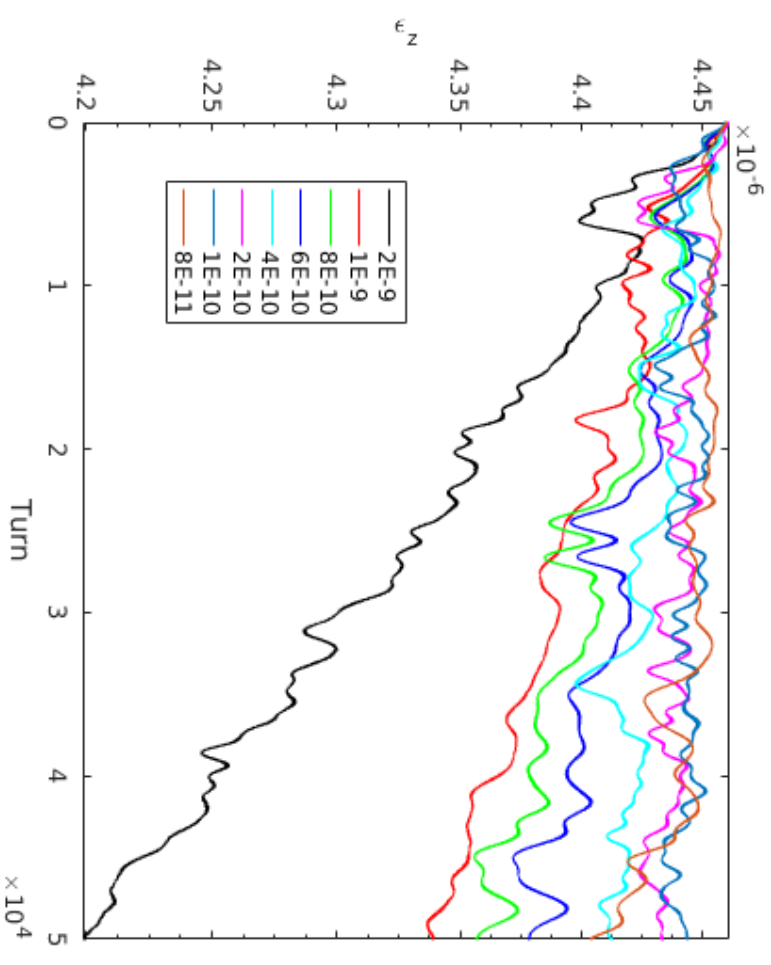
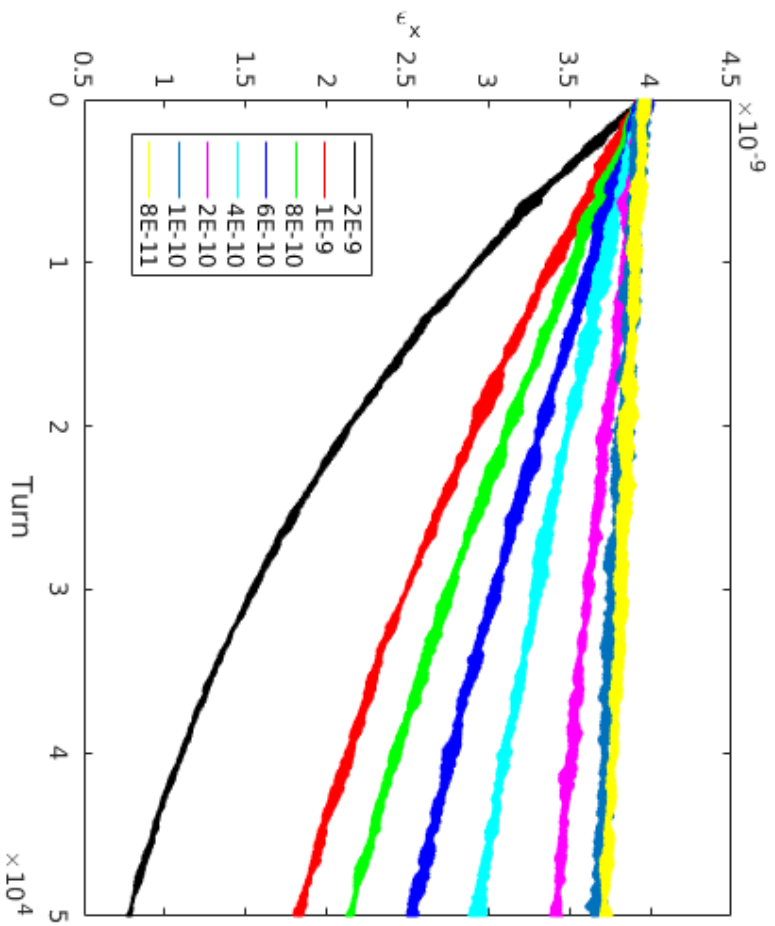


Horizontal cooling when $\xi > 2\text{E-}10$

Did not observe longitudinal cooling within $5\text{E}4$ turns

1E7 particles

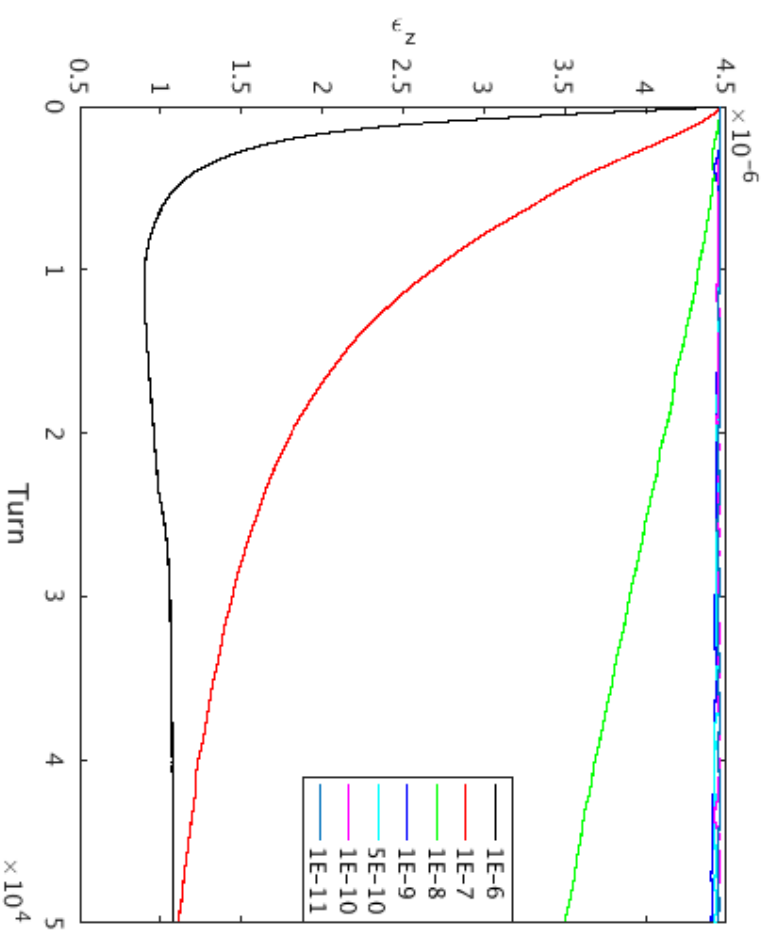
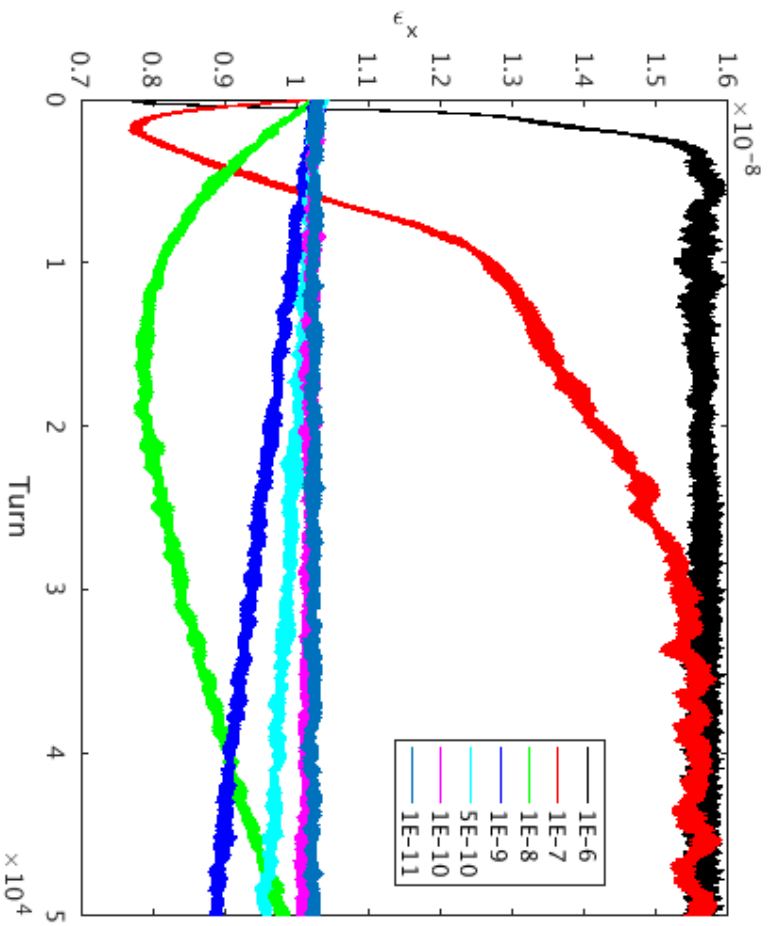
$\epsilon_x = 3.9$ nm, damping and excitation turned off, **with incoherent kicks**



With radiation damping and excitation turned off, observe both horizontal and longitudinal cooling

1E8 particles

$\epsilon_x=10.2$ nm, damping and excitation turned off, **without incoherent kicks**

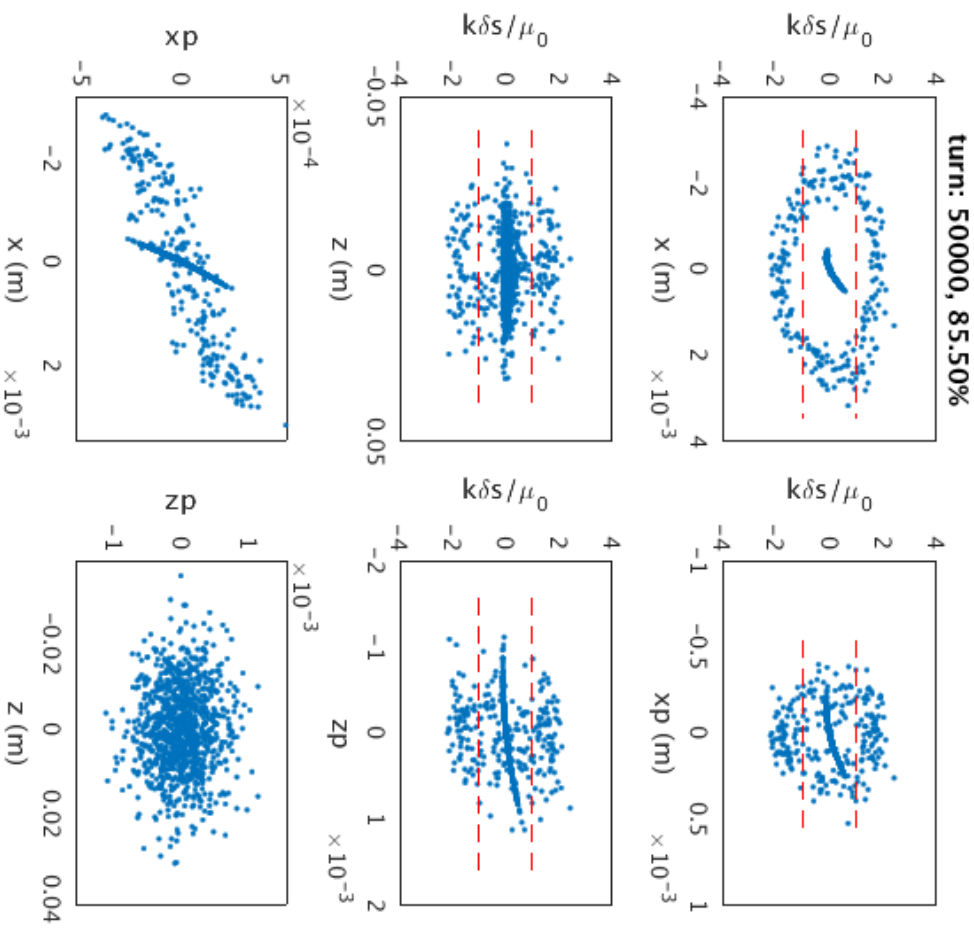


With radiation damping and excitation turned off and no incoherent kicks,
observe both horizontal and longitudinal cooling at $\xi=1E-10$

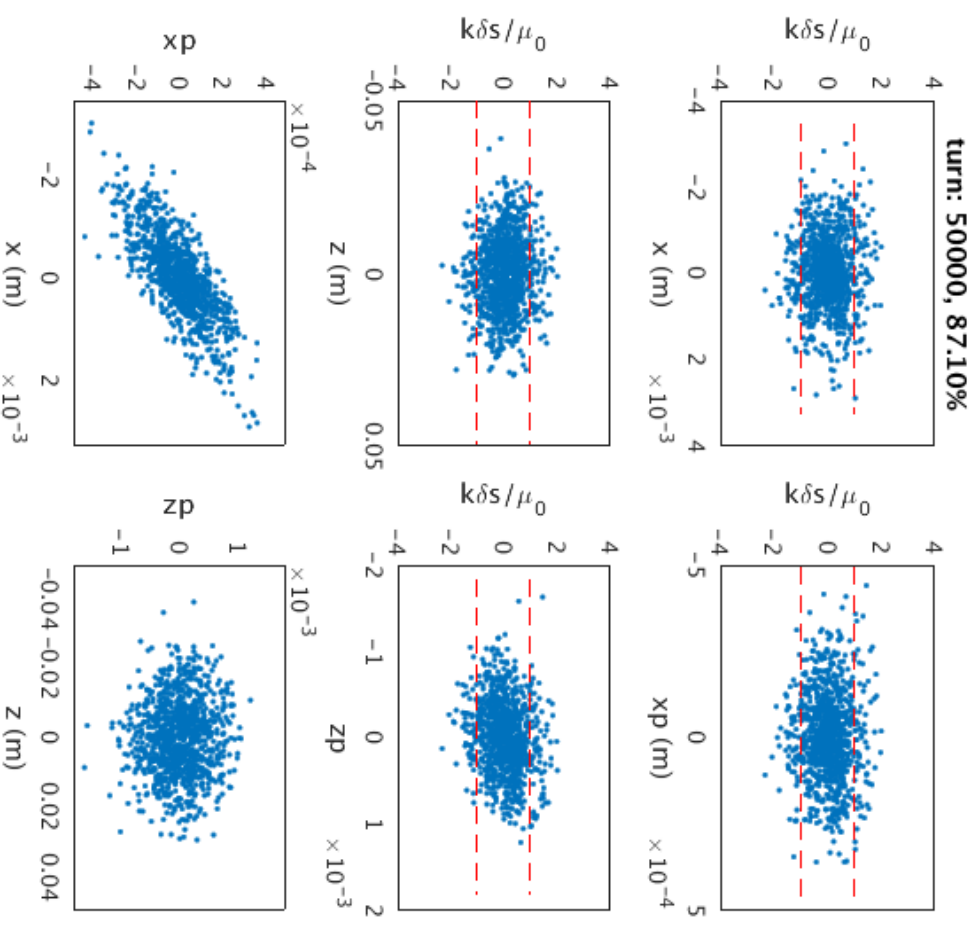
1E8 particles

$\epsilon_x=10.2$ nm, damping and excitation turned off, **without incoherent kicks**

$\xi=1E-8$



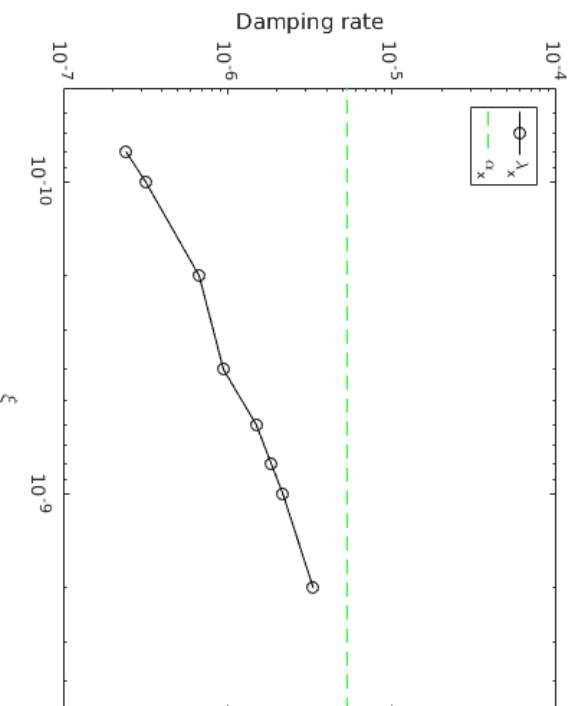
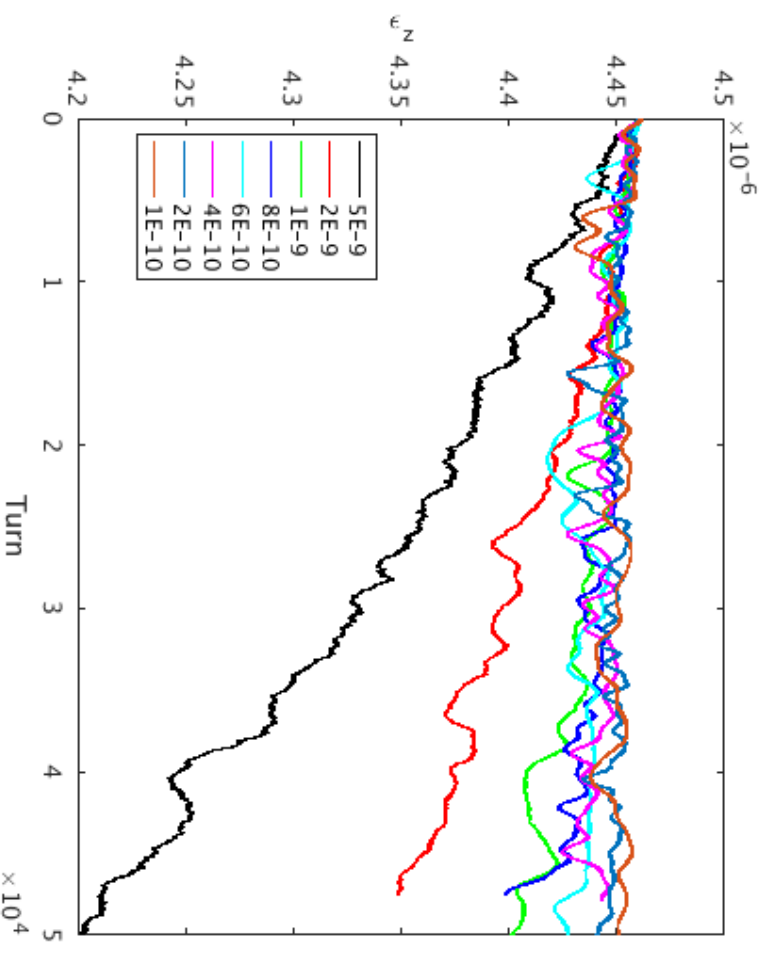
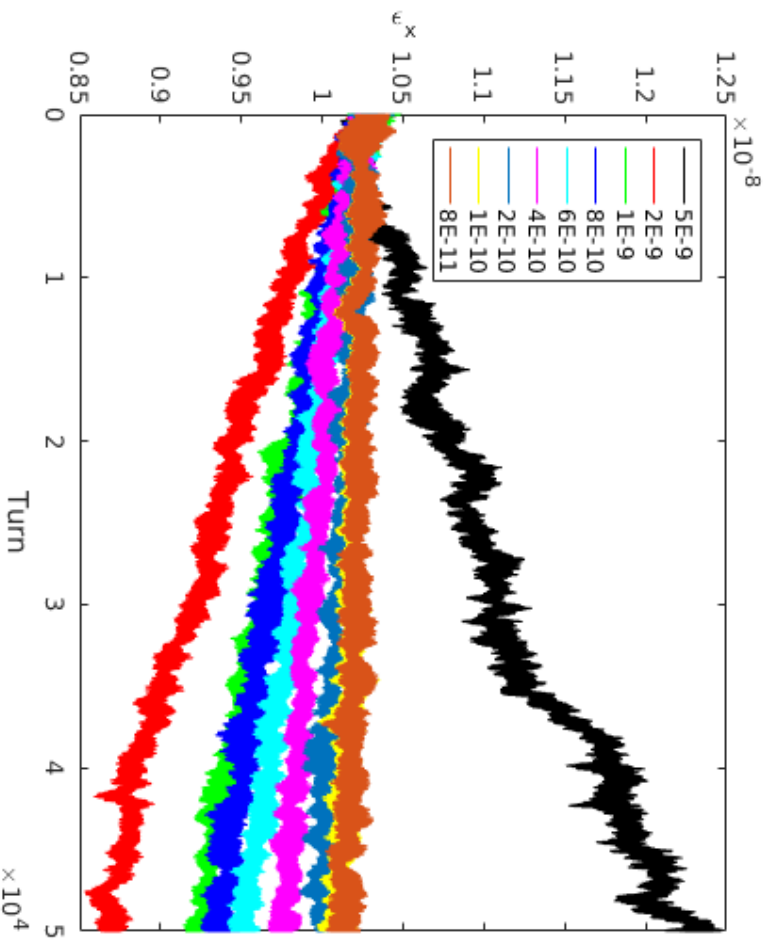
$\xi=5E-10$



Observe non-Gaussian profiles

1E8 particles

$\epsilon_x = 10.2$ nm, damping and excitation turned off, **with incoherent kicks**

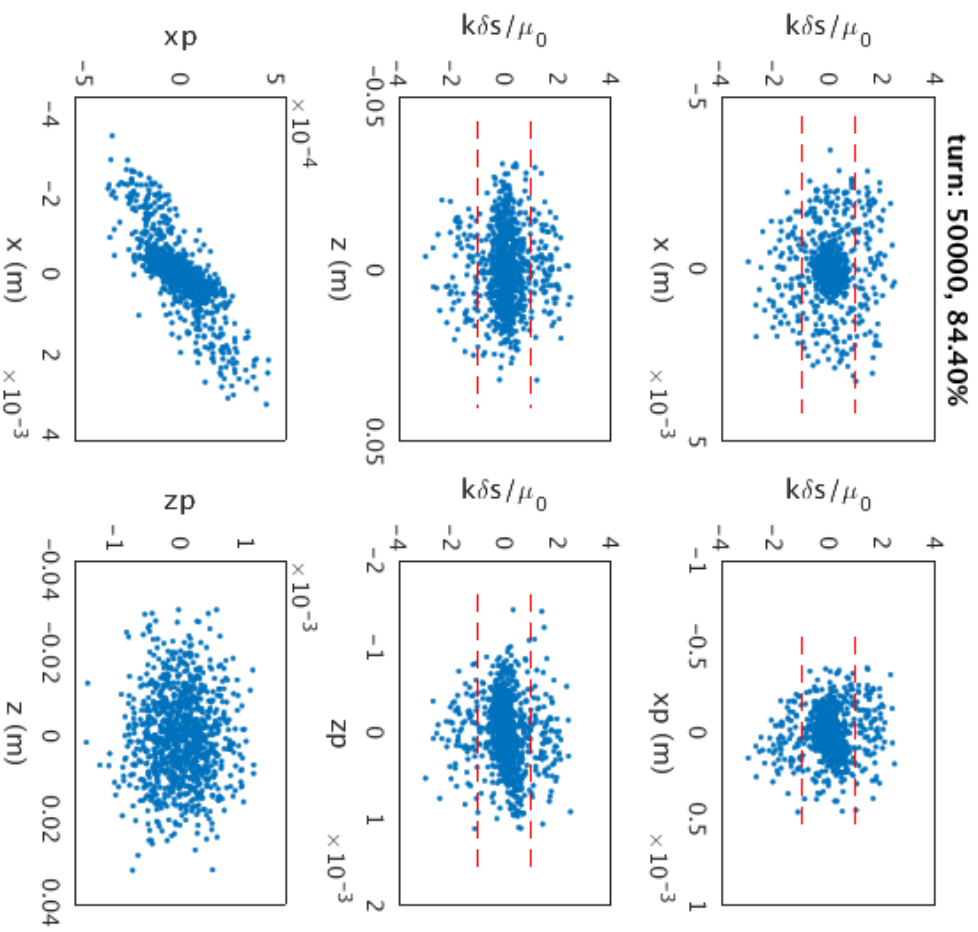


With radiation damping and excitation turned off and incoherent kicks, observe both horizontal and longitudinal cooling when ξ is between [1E-10 2E-9]

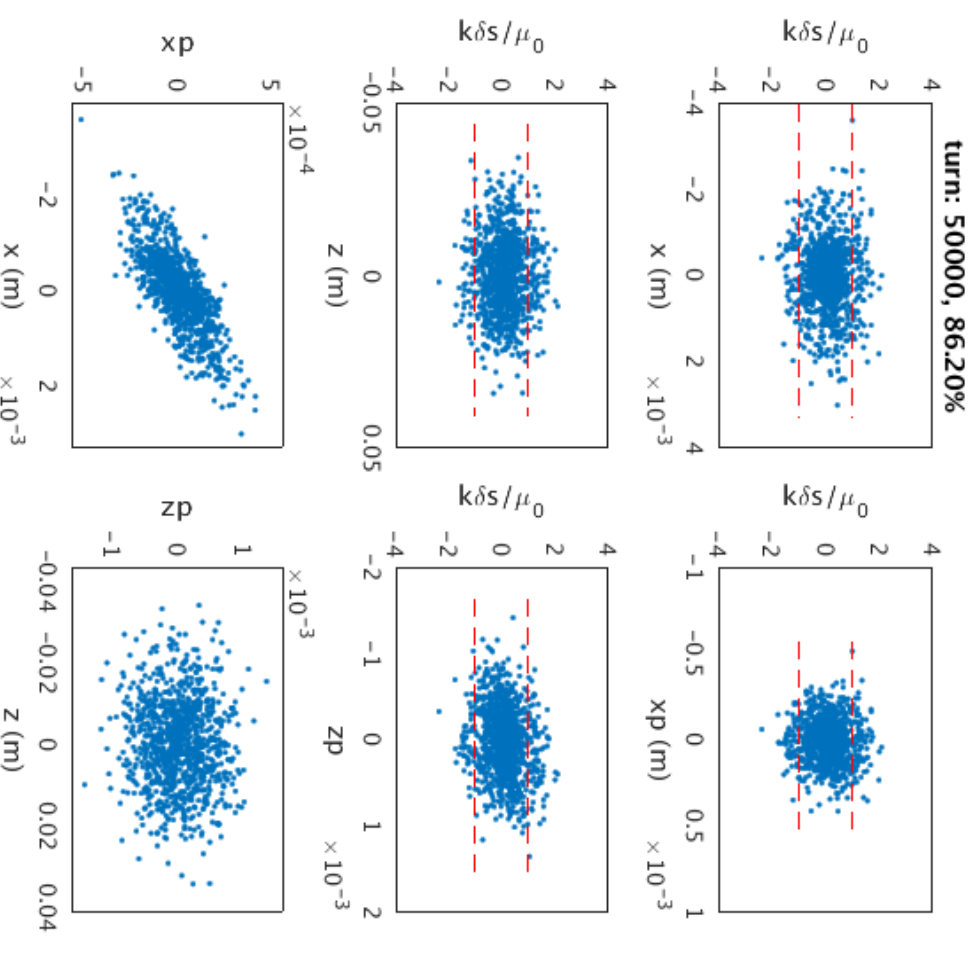
1E8 particles

$\epsilon_x=10.2$ nm, damping and excitation turned off, **with incoherent kicks**

$\xi=5E-9$



$\xi=6E-10$



Observe non-Gaussian profiles

Summary

- DLR 1GeV bypass lattice v2 is better
 - Observe both horizontal and longitudinal cooling with 1E8 particles in a bunch
 - Observe non-Gaussian x-profile
- Further investigation
 - Larger equilibrium emittance