OSC simulation update

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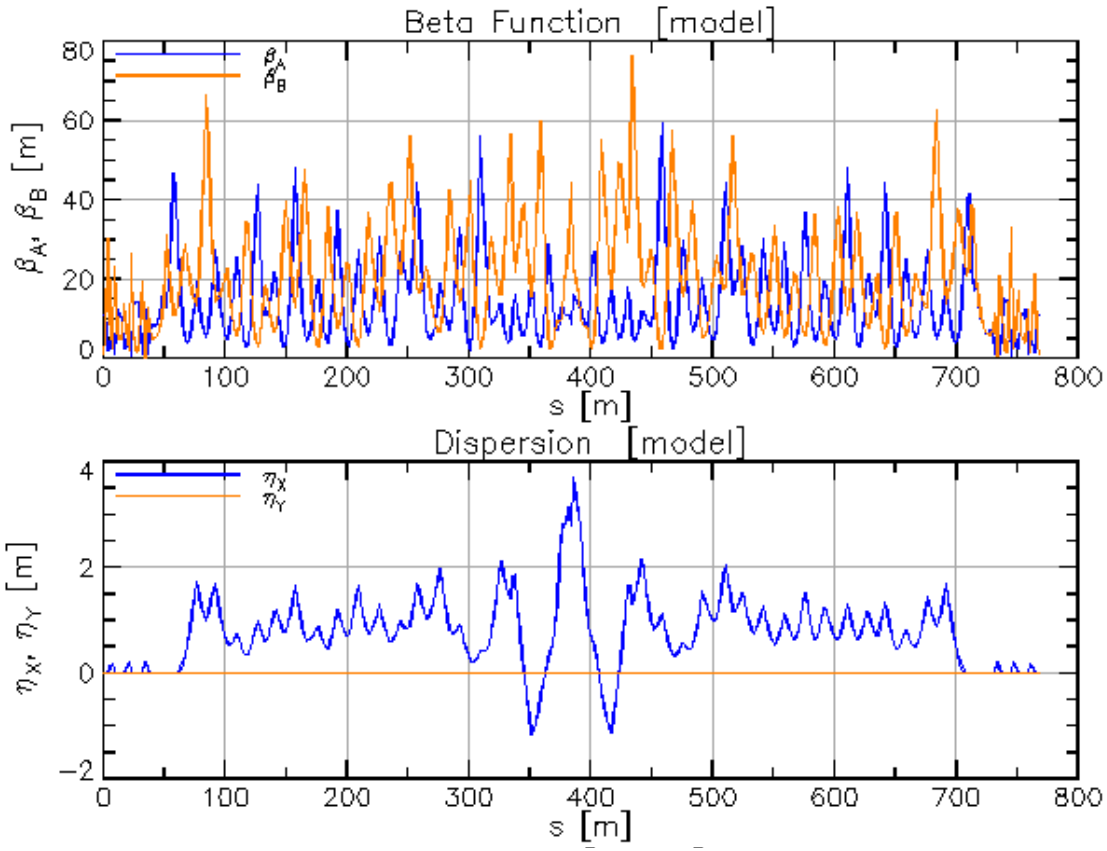
1. MPE bypass V6, 1.0 GeV CHESS-U lattice

5/22/2018

/nfs/acc/temp/ehrlichm/oc/Desktop/OSC/tao/ambi-/13cm-middle-route/step3-nonlinearities/bmad.lat



	X		Y		
	Model	Design	Model	Design	
Q	16.4268	16.4268	12.7823	12.7823	! Tune
Chrom	1.0001	1.0001	0.9999	0.9999	! dQ/(dE/E)
J_damp	1.0338	1.0338	1.0005	1.0005	! Damping Partition #
Emittance	1.262E-09	1.262E-09	8.798E-14	8.798E-14	! Meters
Alpha_damp	5.353E-06	5.353E-06	5.180E-06	5.180E-06	! Damping per turn

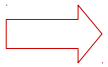
	Model	Design	
Z_tune:	0.0000	0.0000	! The design value is calculated with RF on
Sig_E/E:	4.056E-04	4.056E-04	
Sig_z:	1.000E+30	1.000E+30	! Only calculated when RF is on
Energy Loss:	1.035E+04	1.035E+04	! Energy_Loss (eV / Turn)
J_damp:	1.966E+00	1.966E+00	! Longitudinal Damping Partition #
Alpha_damp:	1.018E-05	1.018E-05	! Longitudinal Damping per turn
Alpha_p:	5.785E-03	5.785E-03	! Momentum Compaction

OSC bypass parameters

λ=0.8 μm

σ_z=10.8 mm, $\sigma_{E\,rf}$=7.1E-3

m51 = -2.8198E-03
m52 = -6.9153E-13
m56 = 8.0307E-03
m56_t = 2.6065E-05



$\varepsilon_{x\,max}$ = 9.4511E-10 $\sigma_{p\,max}$ = 1.1748E-02

$n_x = sqrt(\varepsilon_{xmax}/\varepsilon_x) = 0.86$, $n_s = \sigma_{p\,max}/\sigma_E = 29$

λ_x/λ_s=307.1

p_mark:

β_x = 12.478, α_x = 1.4753, γ_x = 0.25458

η_x = 2.8387, η_{px} = -0.20622, ϕ_x = 50.929

k_mark:

β_x = 13.612, α_x = -1.0376, γ_x = 0.15256

η_x = 2.9664, η_{px} = 9.9687E-2, ϕ_x = 51.981

$\Delta\phi_x$=1.0523, phase difference between p_mark and k_mark

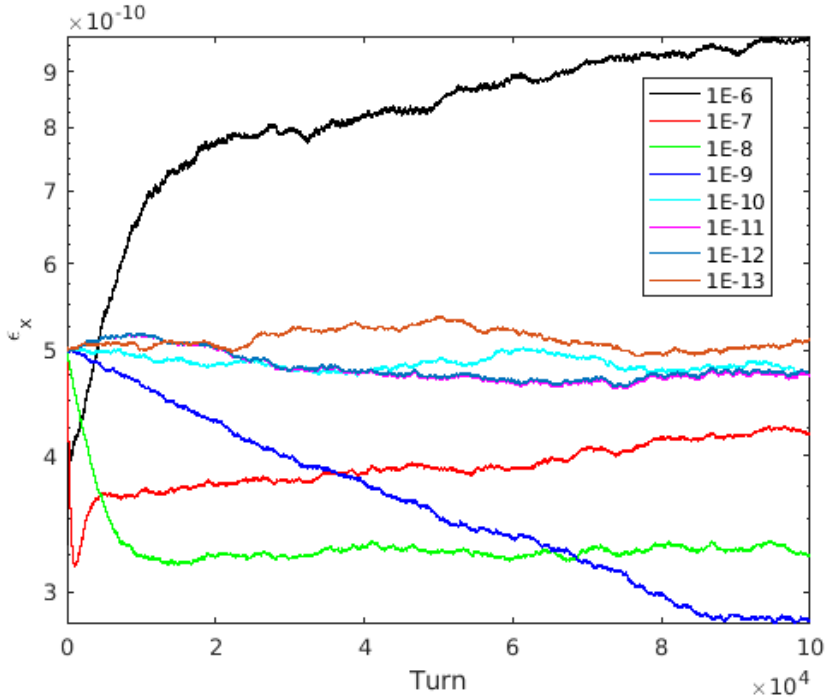
For simulation, ε_x=0.5 nm or 0.1 nm using map method

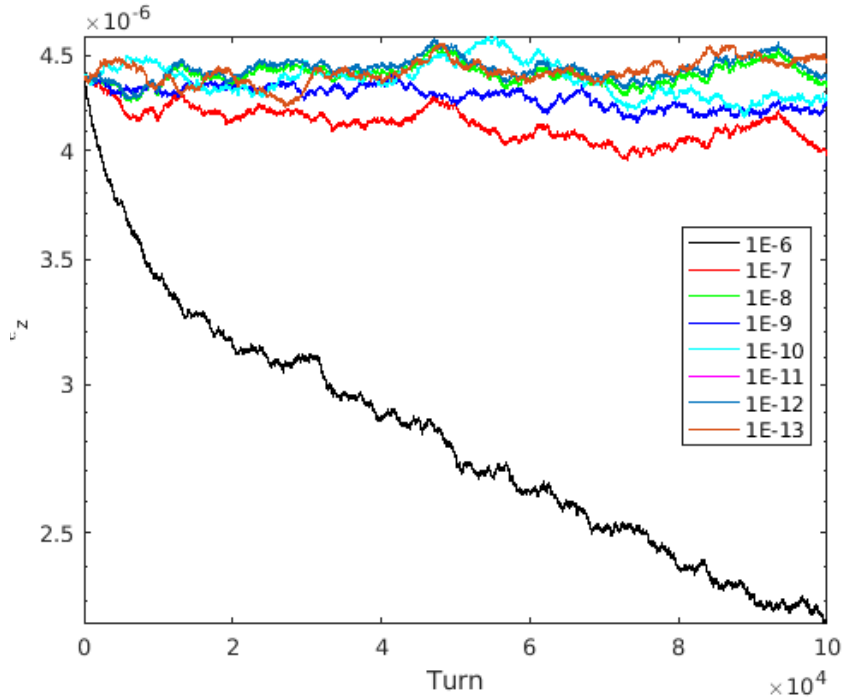
Track 1000 particles fro 1E5 turns

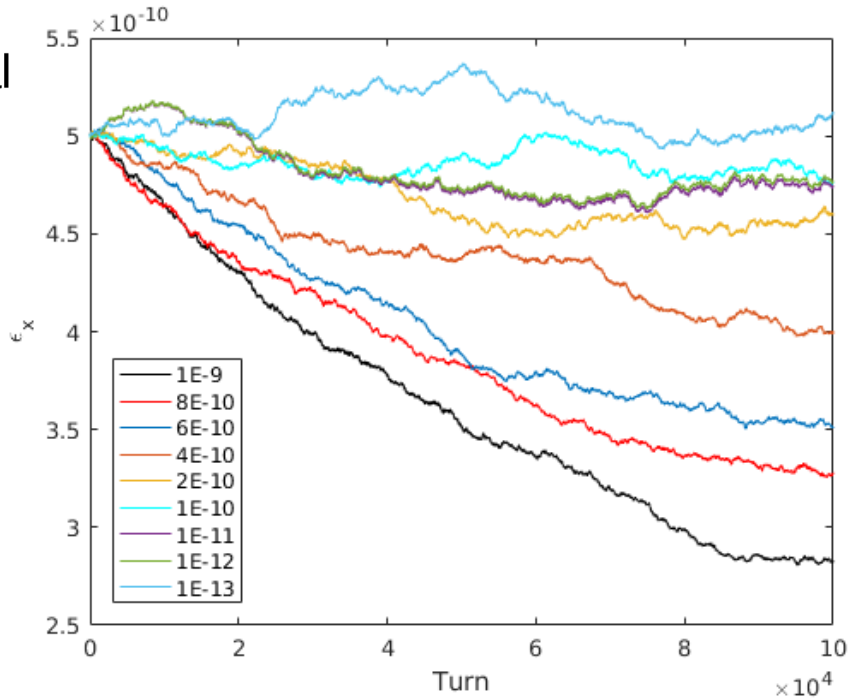
ε_x=0.5 nm, without incoherent kicks

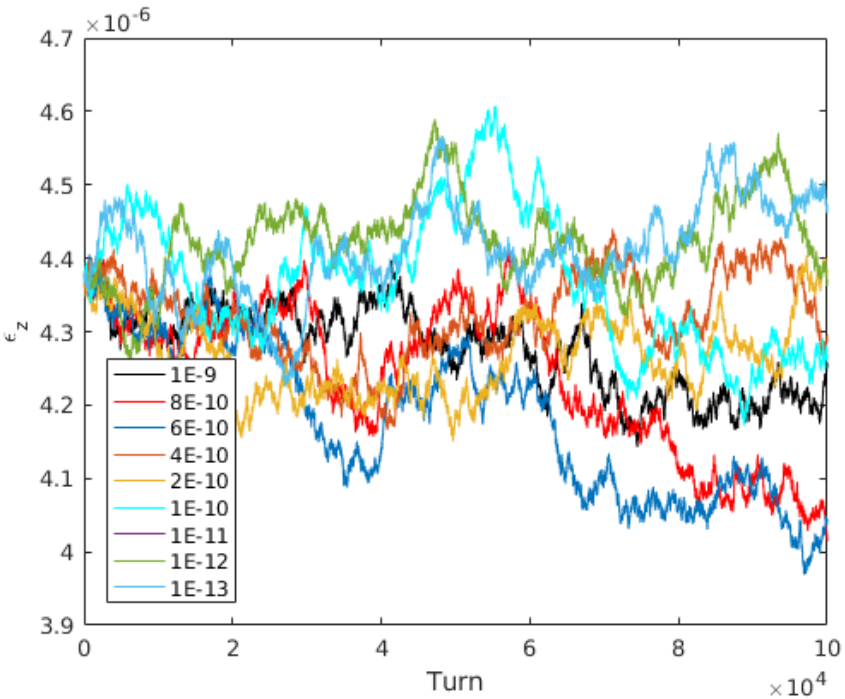
Horizontal Cooling
ξ < 1E-6

Longitudinal cooling is slow



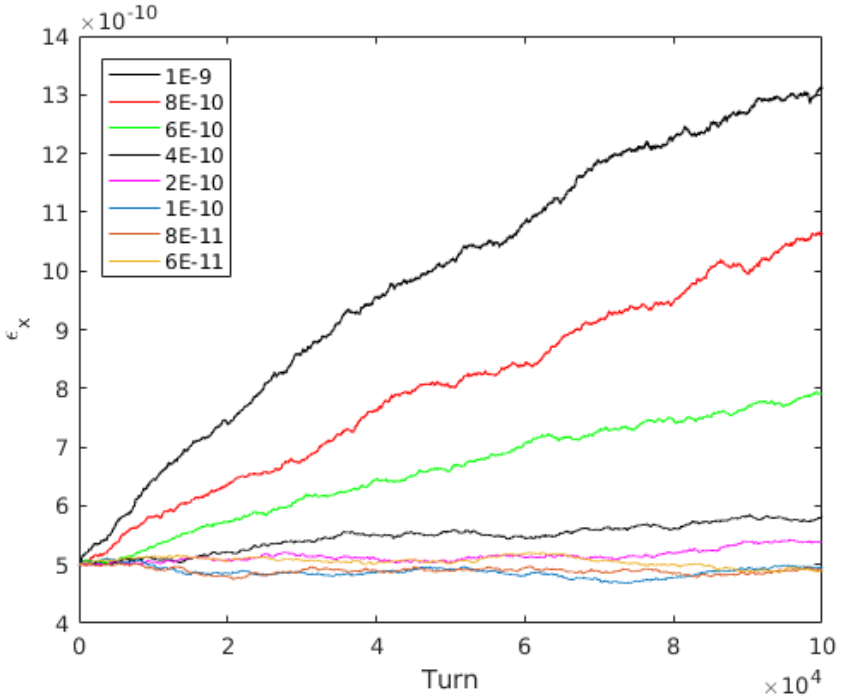


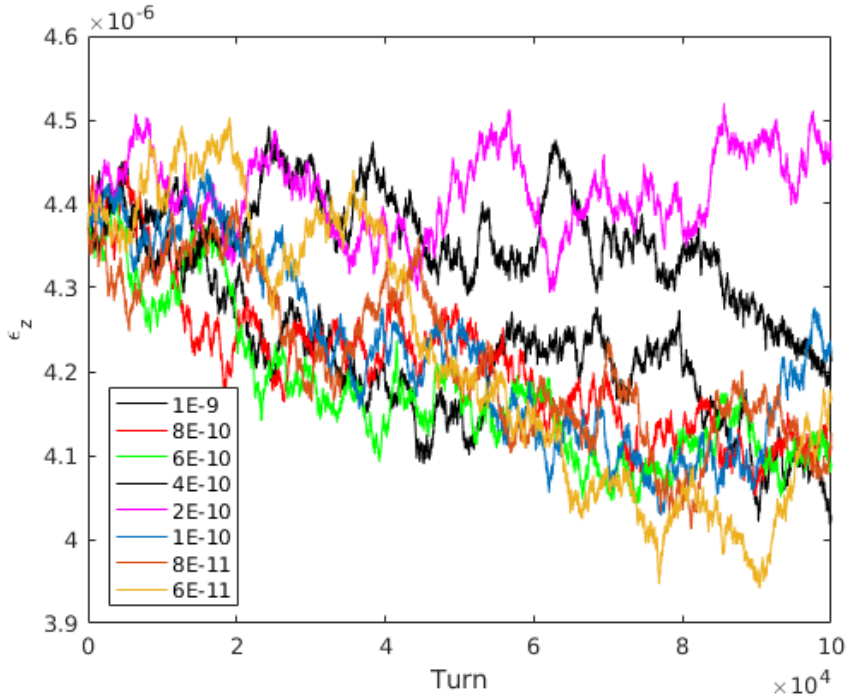




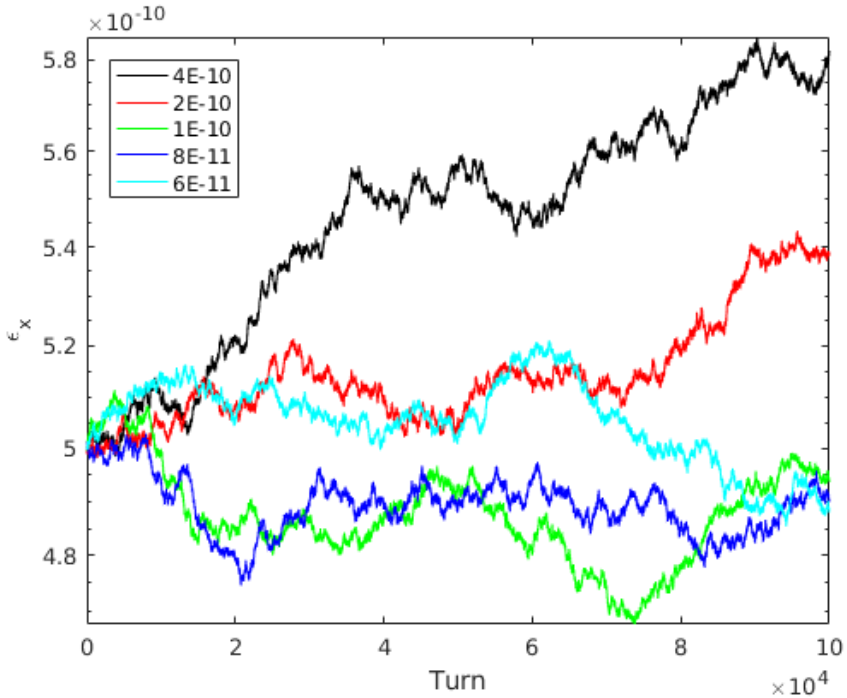
ε_x=0.5 nm, with incoherent kicks

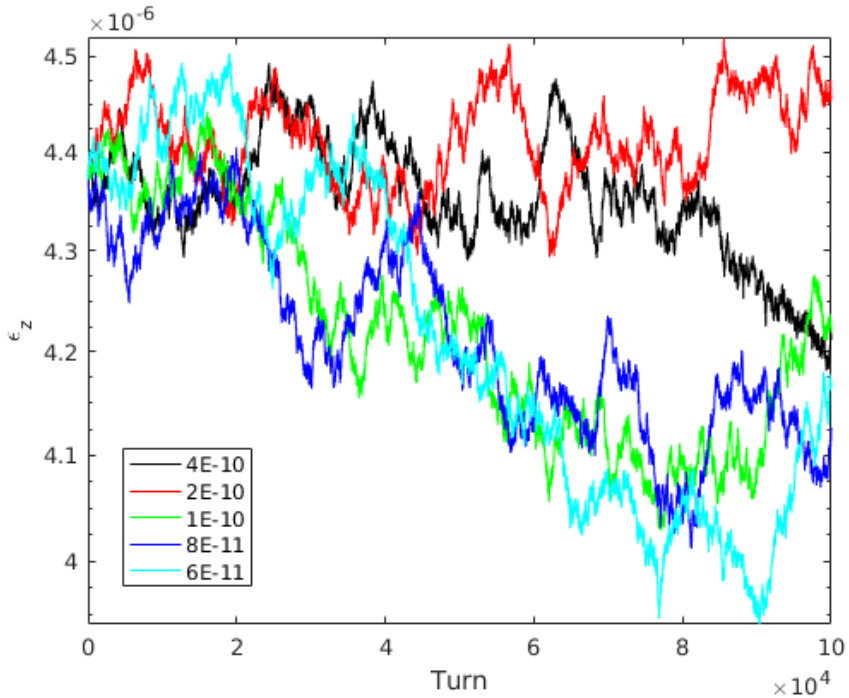
Heating
ξ > 2E-10





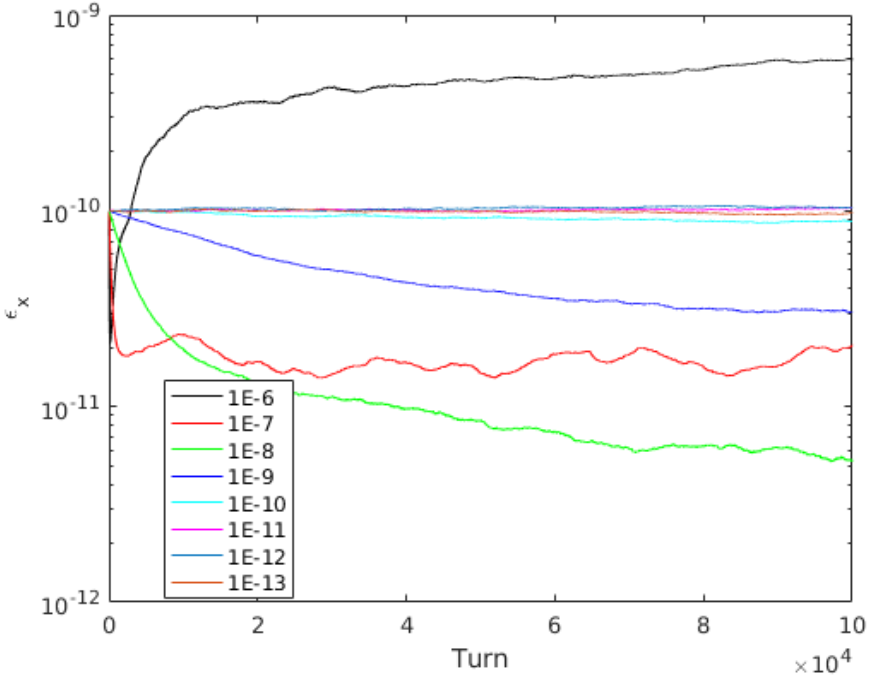
Not much
Cooling
ξ < 1E-10

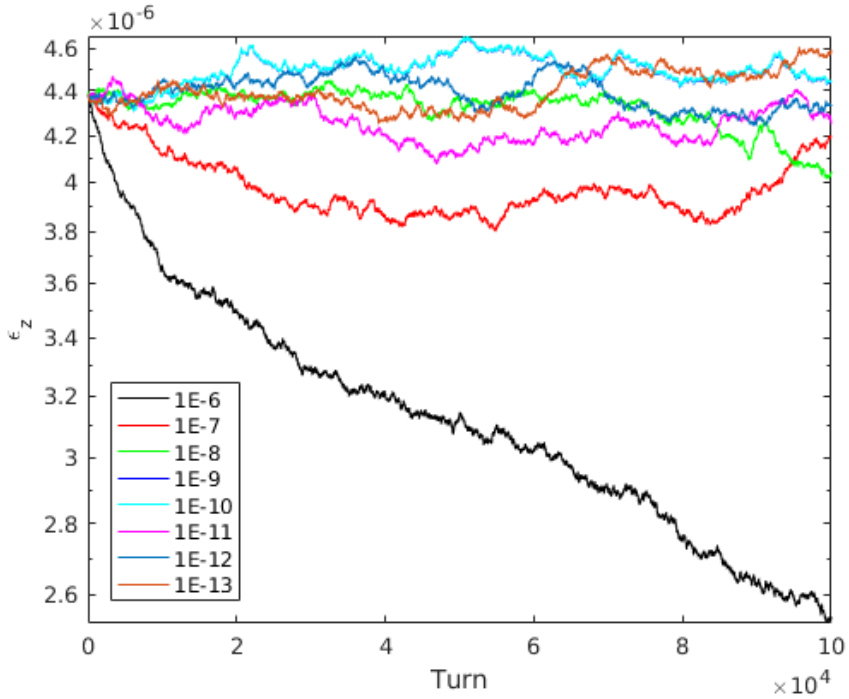




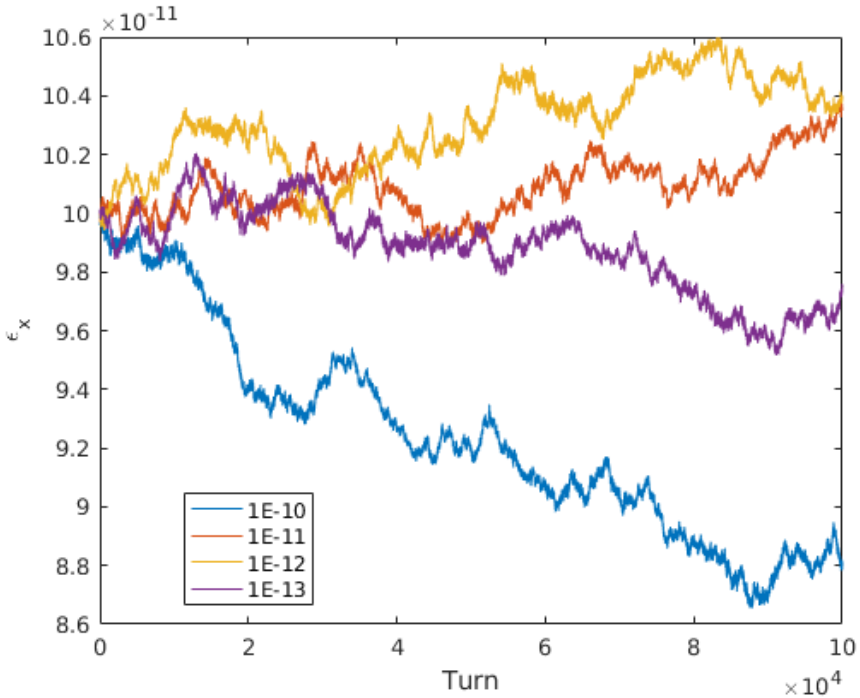
ε_x=0.1 nm, without incoherent kicks

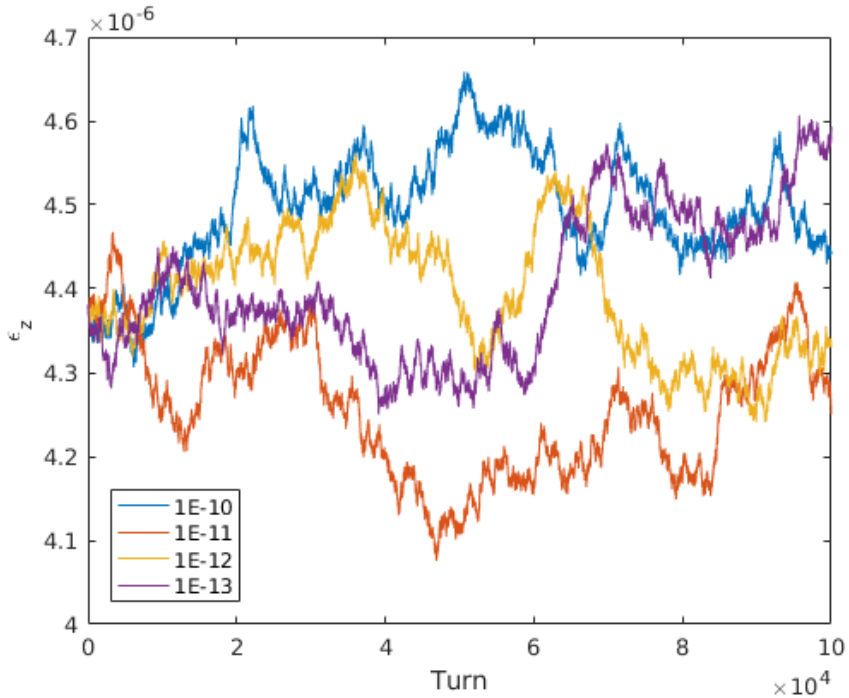
Horizonta Cooling
ξ < 1E-6





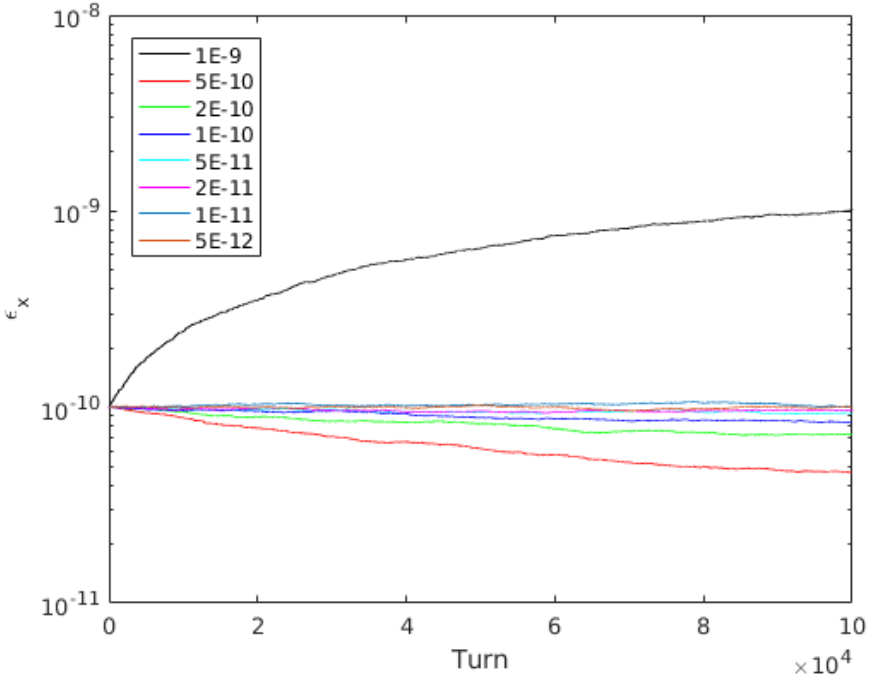
Longitudir cooling is slow

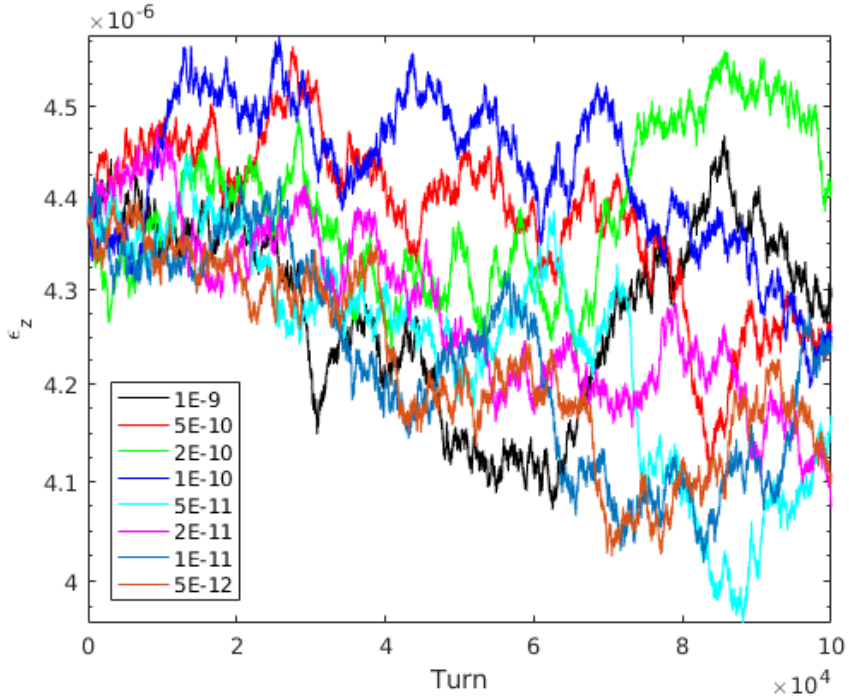




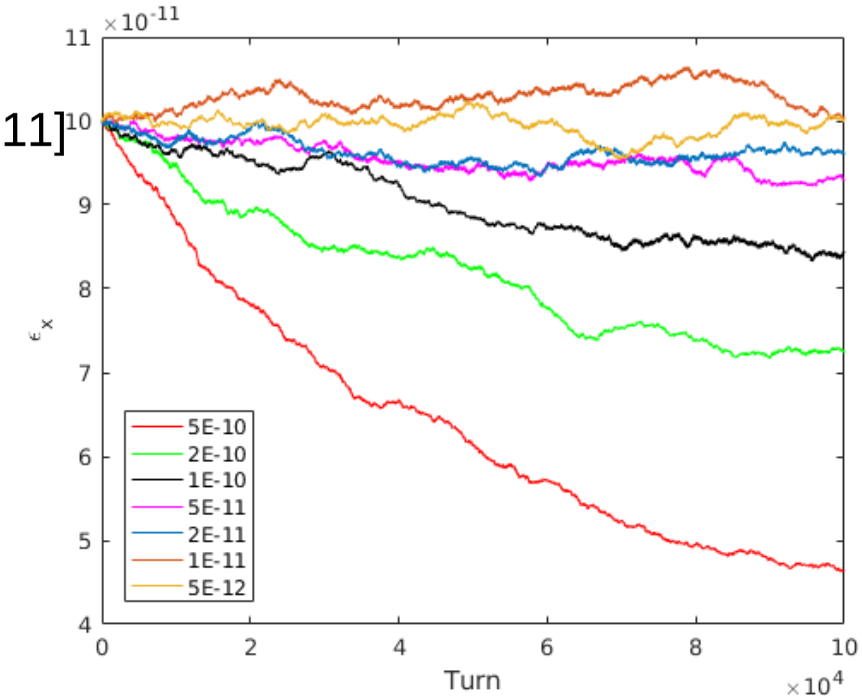
ε_x=0.1 nm, with incoherent kicks

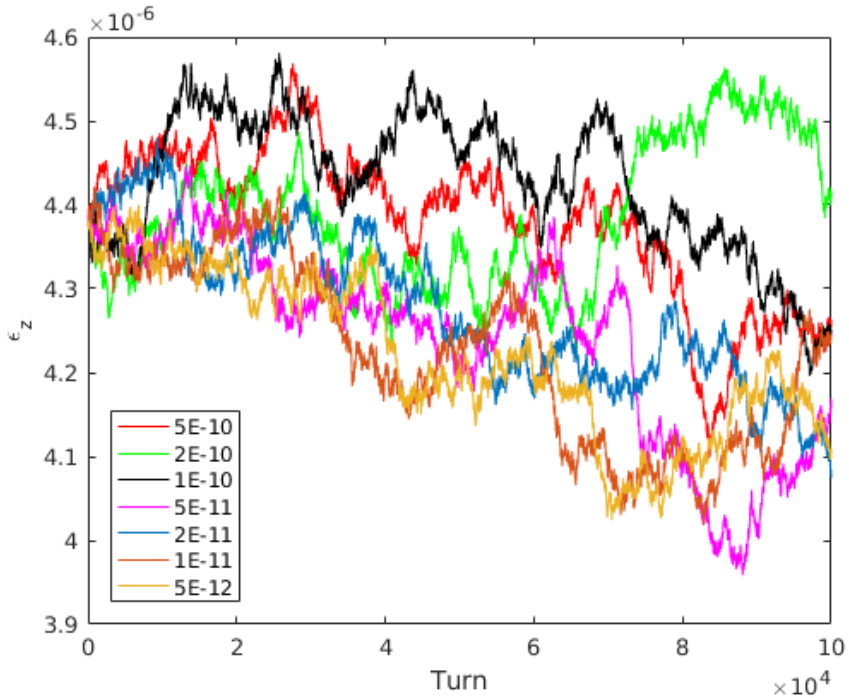
Heating
ξ >= 1E-9





Cooling
ξ < 1E-9
[5E-10, 5E-11]





Summary

- Evaluate MPE bypass design v6
- Observe cooling with 1E9 particles in a bunch when the emittance accepatance ε_{xmax} is 10 times larger than the equilibrium emittance ε_x