Longterm baseline IOTA simulations in Synergia

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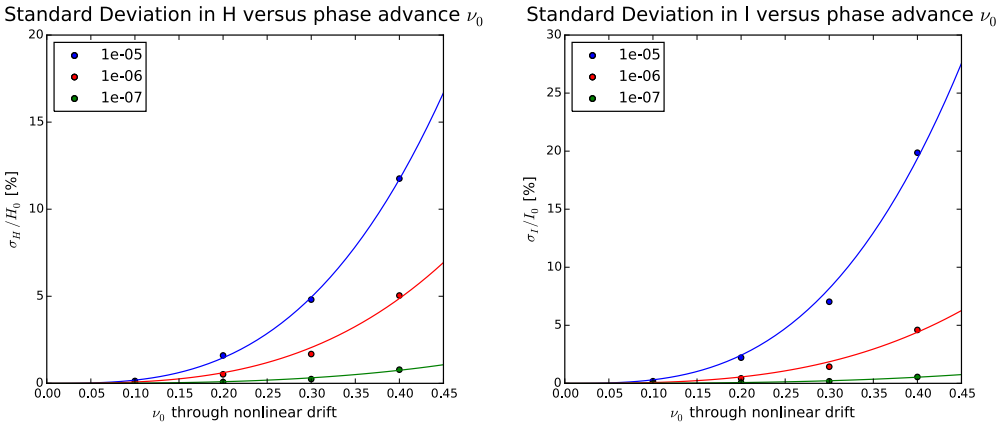
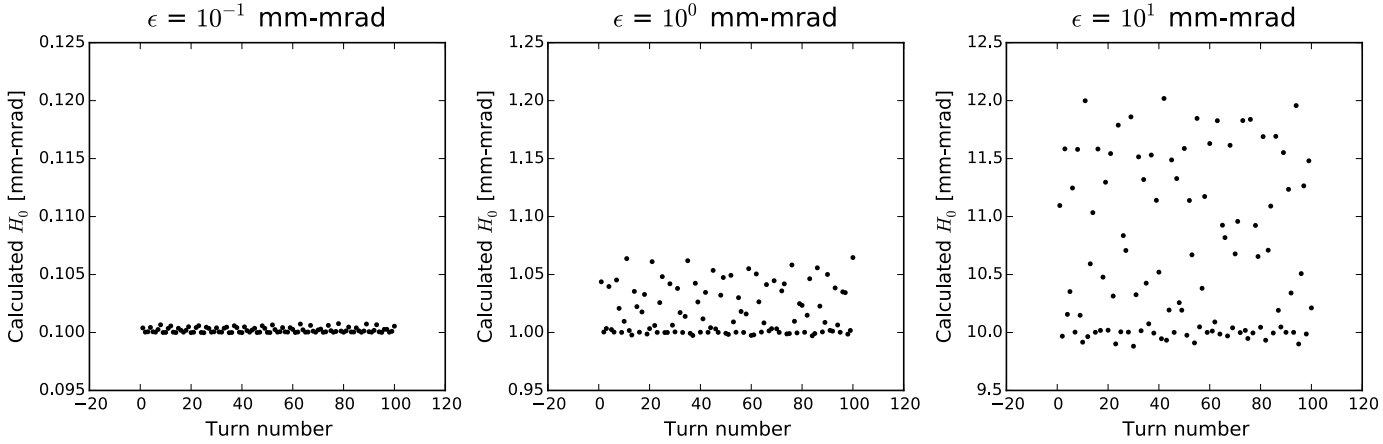
IOTA Physics Telecon

Last Time - Variation in the first invariant - H_0

- *Examined variation in H from the first order estimate H_0*
  - *Correction to invariant H_0 scales with ν_0^3*



  - *Variation in H_0 scales with beam emittance/H_0*



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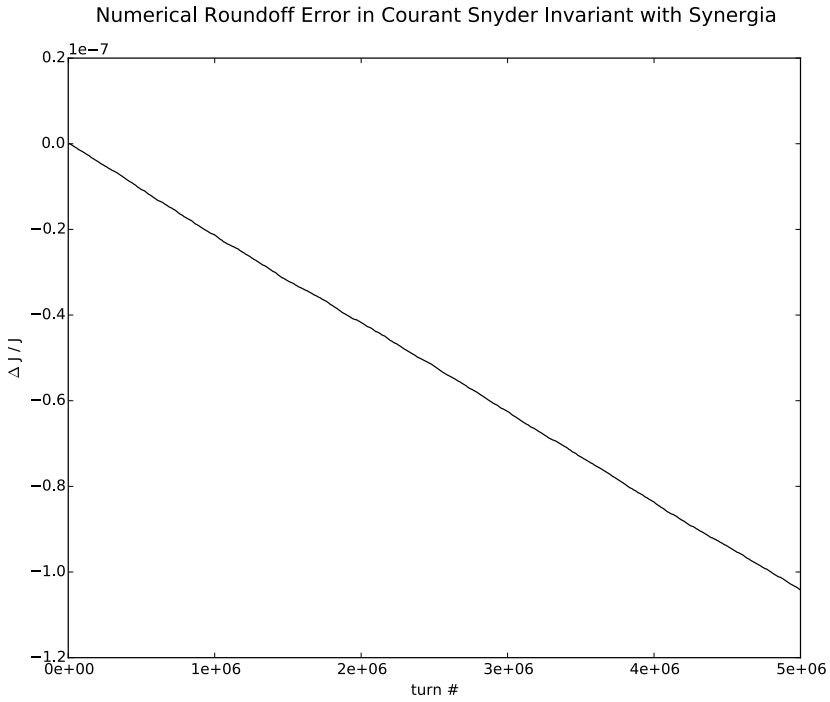
Synergia Longterm Performance

- *Numerical roundoff error examined briefly*
- *Single particle run for 5 million turns in linear IOTA lattice*
  - *1st order map approximation - no full CHEF*
  - *Ideal single particle propagation*
- *Error propagation scales roughly as 10^{-6}% per million turns.*



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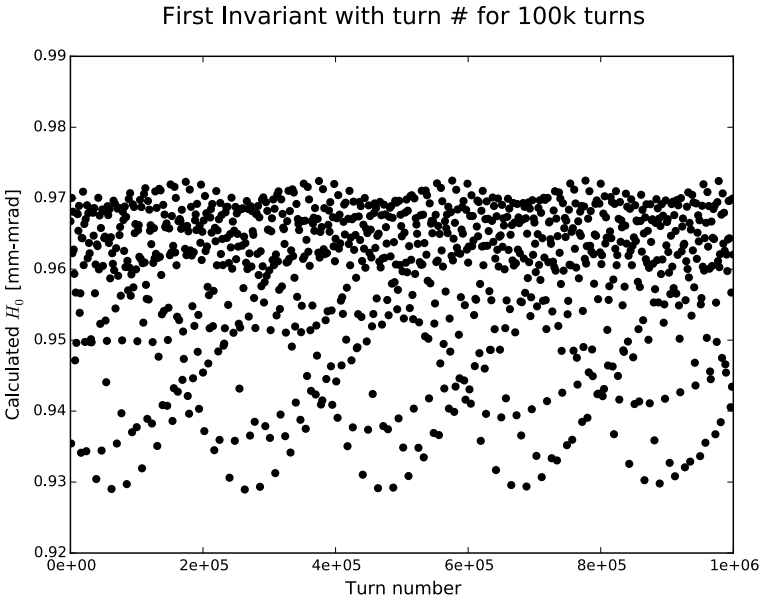
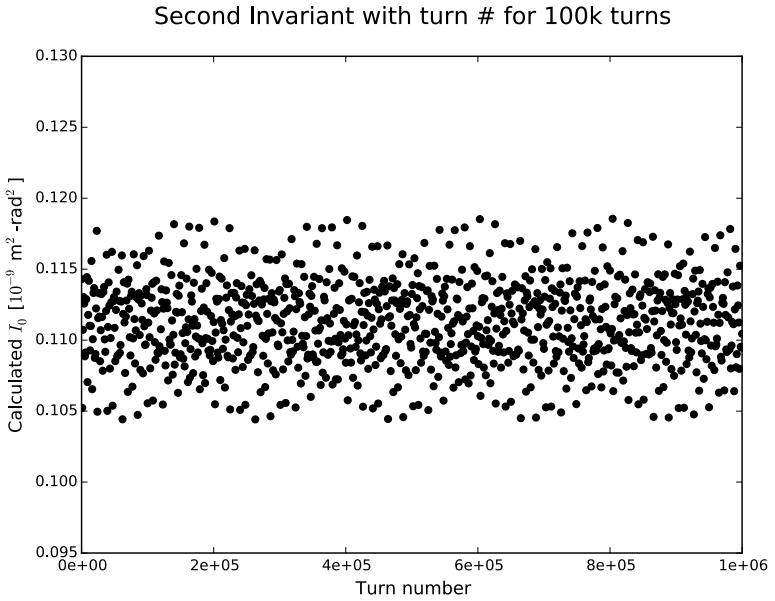
Longterm stability - 100k turns with NL element

- *Tracking matched proton bunch in 1IO lattice*
  - *Generalized KV distribution with $H_0 = 9.47 \times 10^{-6}$*
  - *$\varepsilon_X = 0.03$ mm-mrad normalized emittance*
  - *$\delta = 0\%$ — no variation in particle energy*
- *Resulting variation is consistent over 100k turns*
  - *$\sigma_H = 1.07\%$, $\sigma_I = 2.56\%$ for the particle shown below*
  - *Periodic variation which appears bounded*





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