Magnetic Stray Fields in the Long Transfer Line

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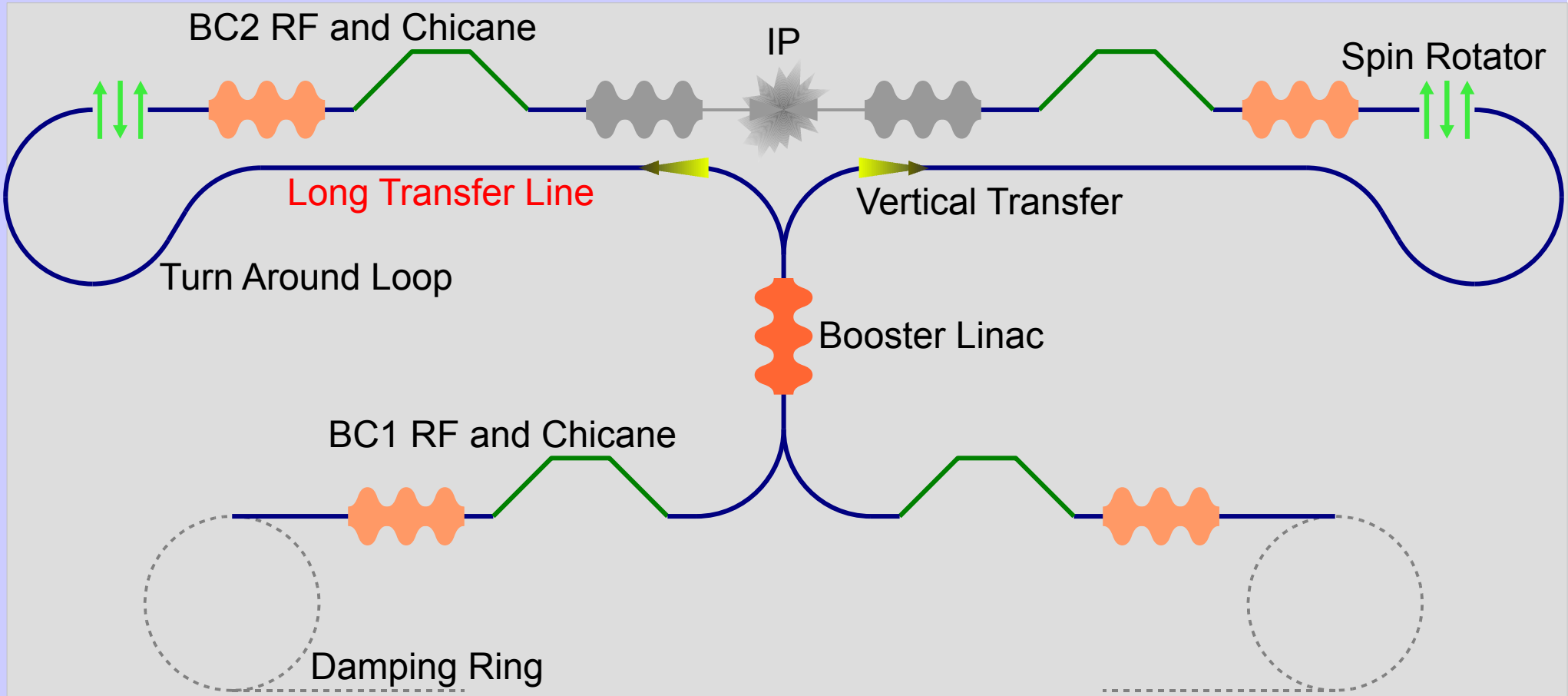
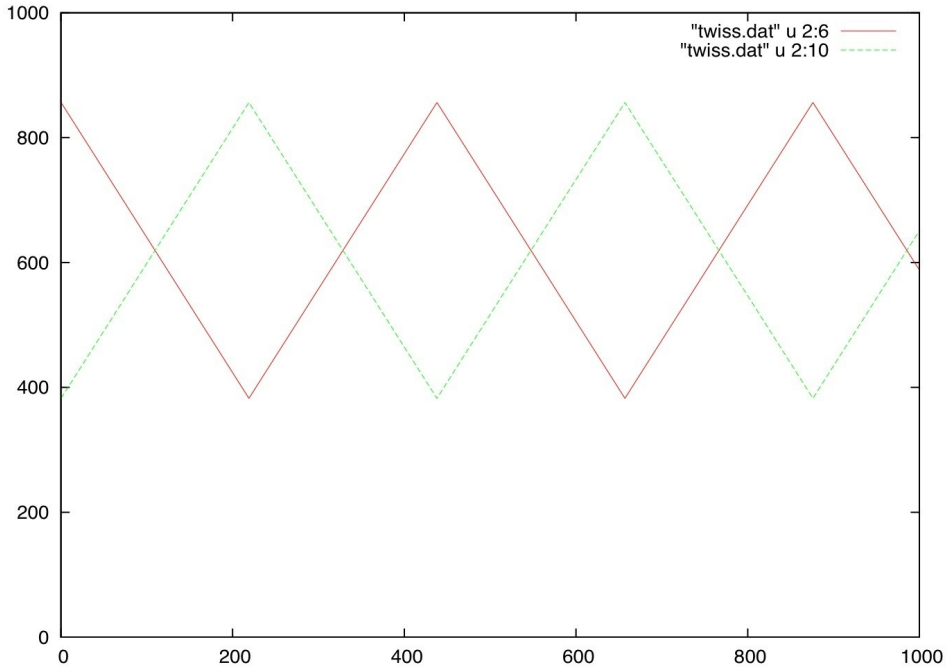
RTML



not shown: Diagnostics, Collimation, Coupling Correction, Dispersion Correction, Spectrometers and Dumps

Long transfer line

- FODO lattice
- cell length: 438 m
- 21 km (48 cells)
- Phase advance π/4
- σ_y = 5 nm
- β_{max} = 856 m



Magnetic stray fields

- Natural (earth, ore deposit)
- Technical field (RF cavities, power sources, etc.)
  - Worry about dynamic fields

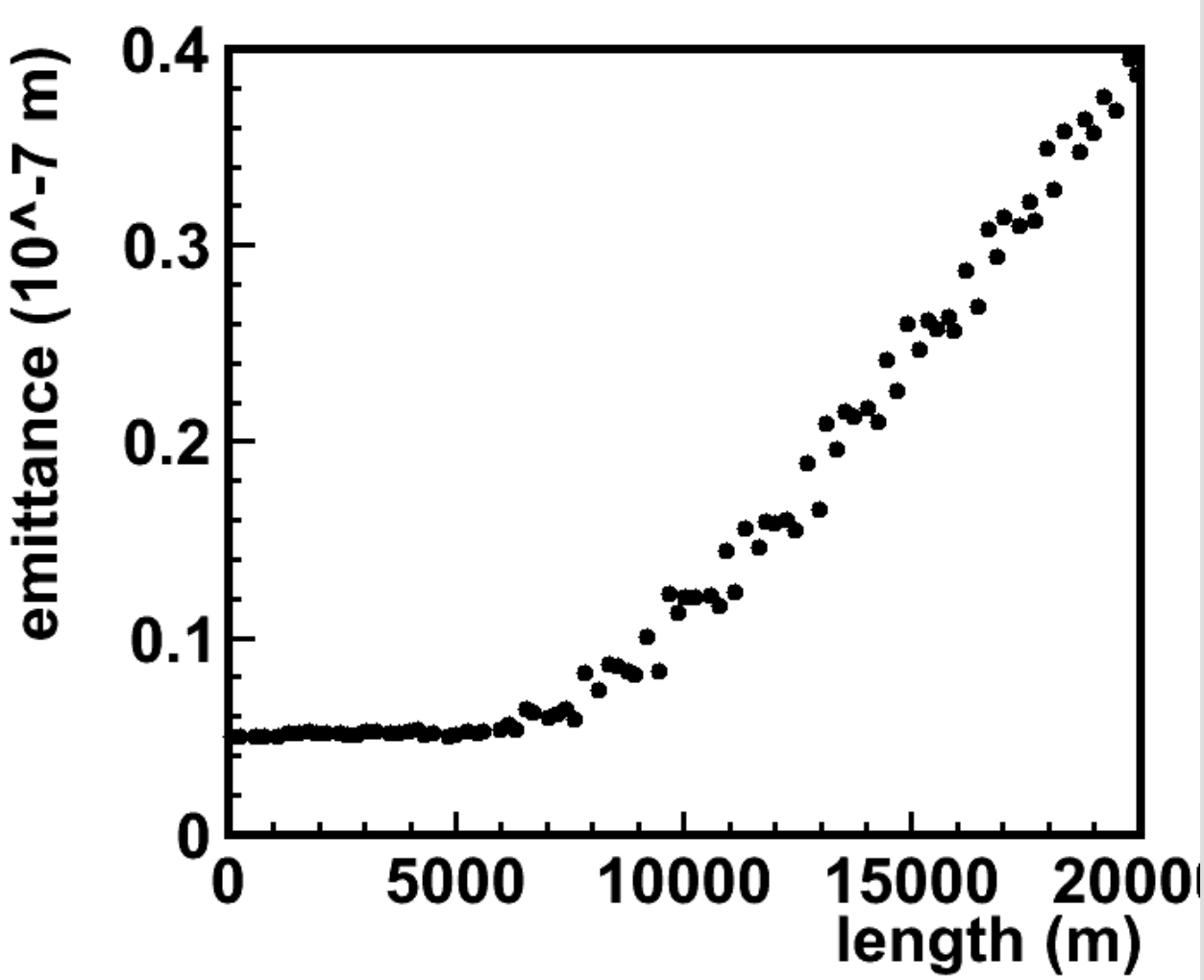
- N.B. CLIC main linac requirement:

  < 0.2 nT for $f > 1$ Hz

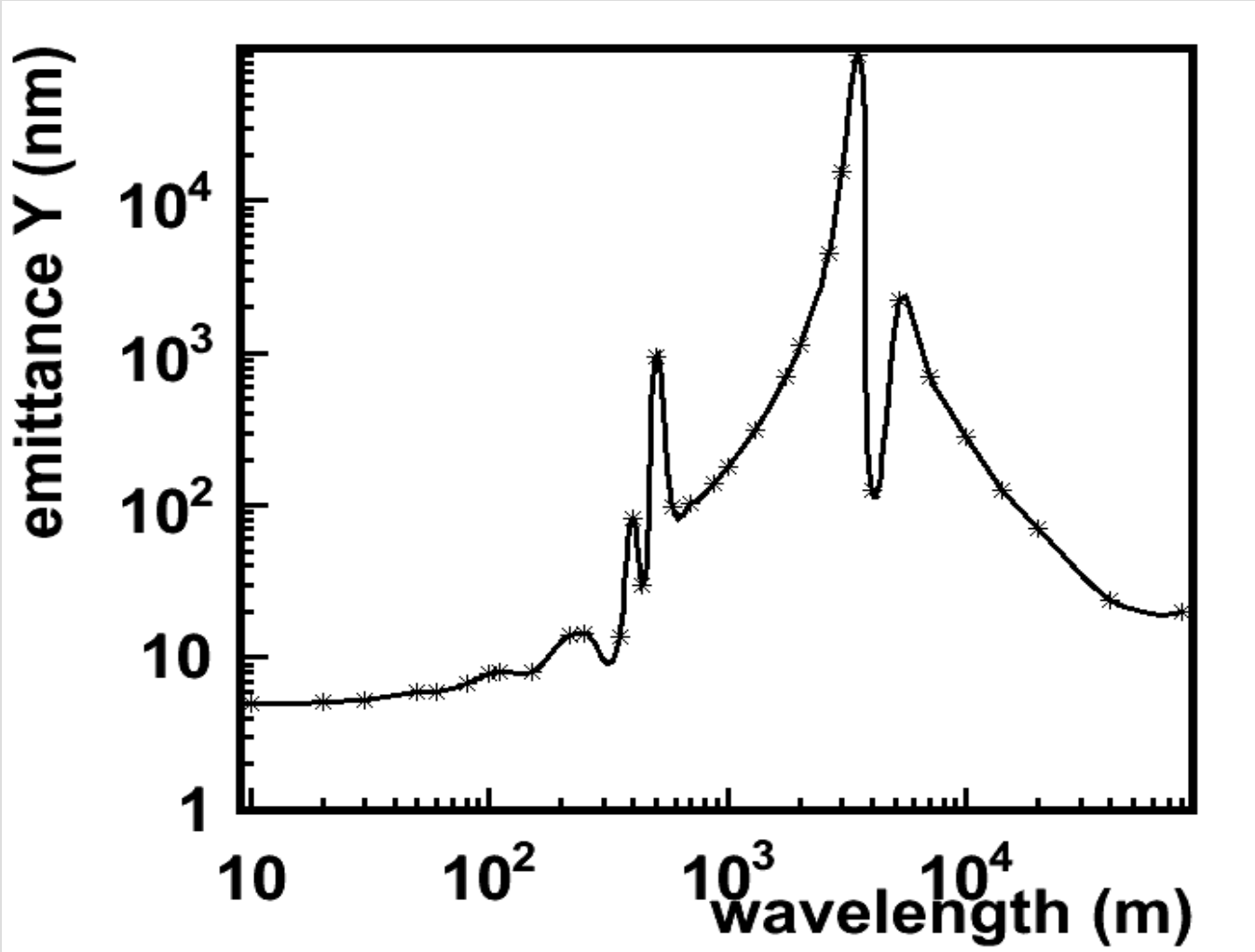
Simulation stray fields

- Grid of dipole kickers (1m distance)
  - White noise: Gaussian distribution
  - Sinusoidal: wavelength (m)
  - (Field strength 330 nT)
- No corrections done
  - just looking at beam position and emittance growth
- Very preliminary results

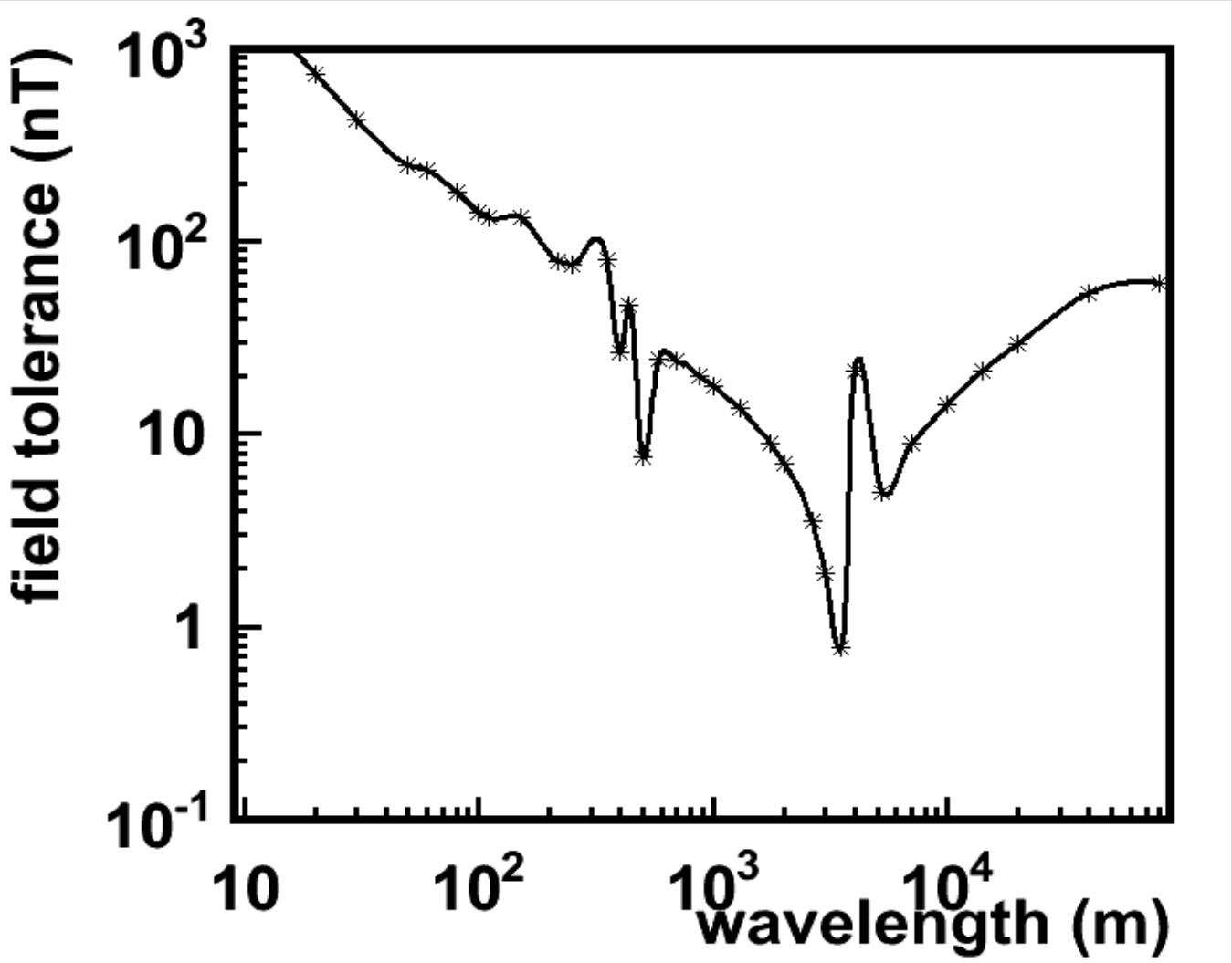
Emittance 'white noise'



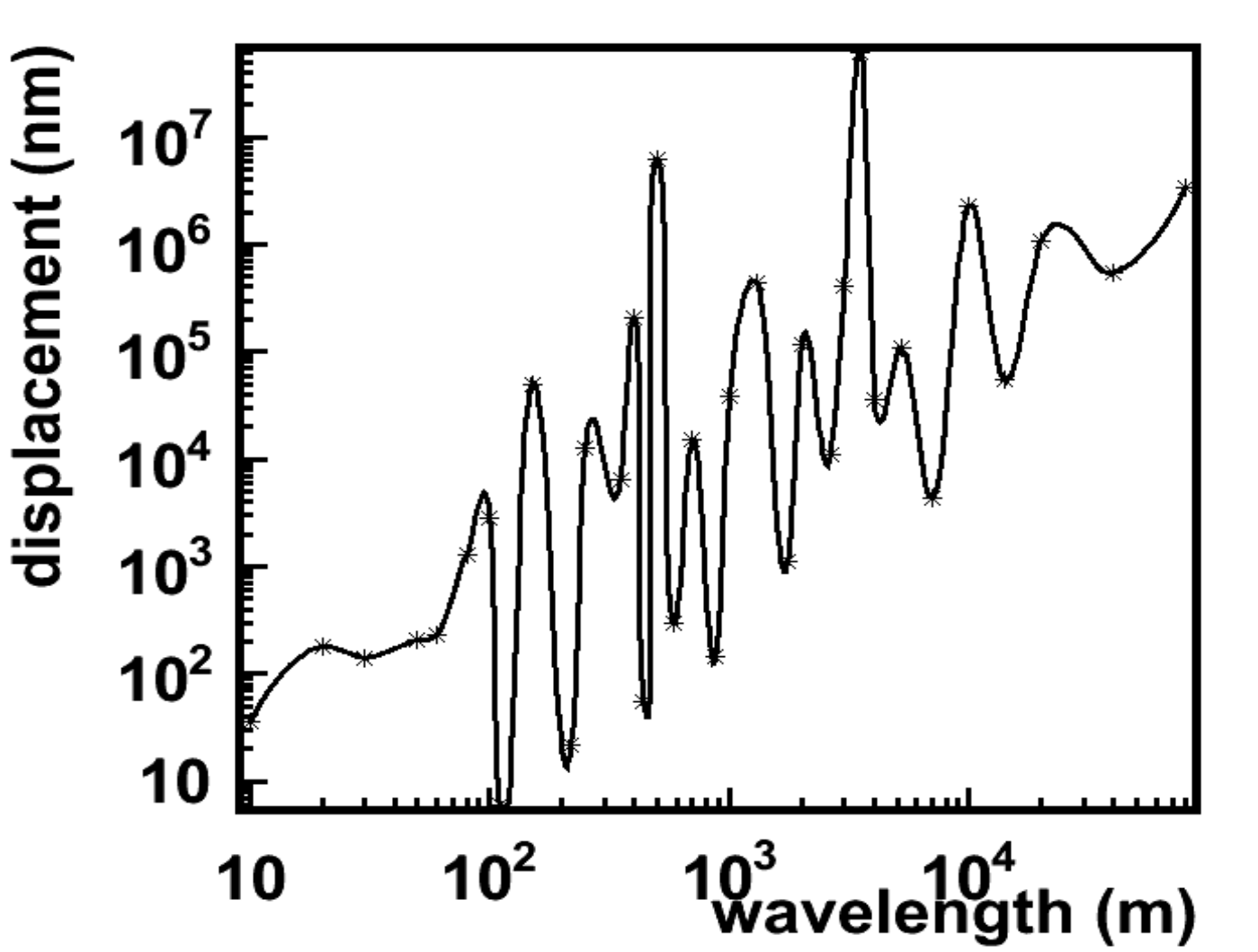
Emittance growth



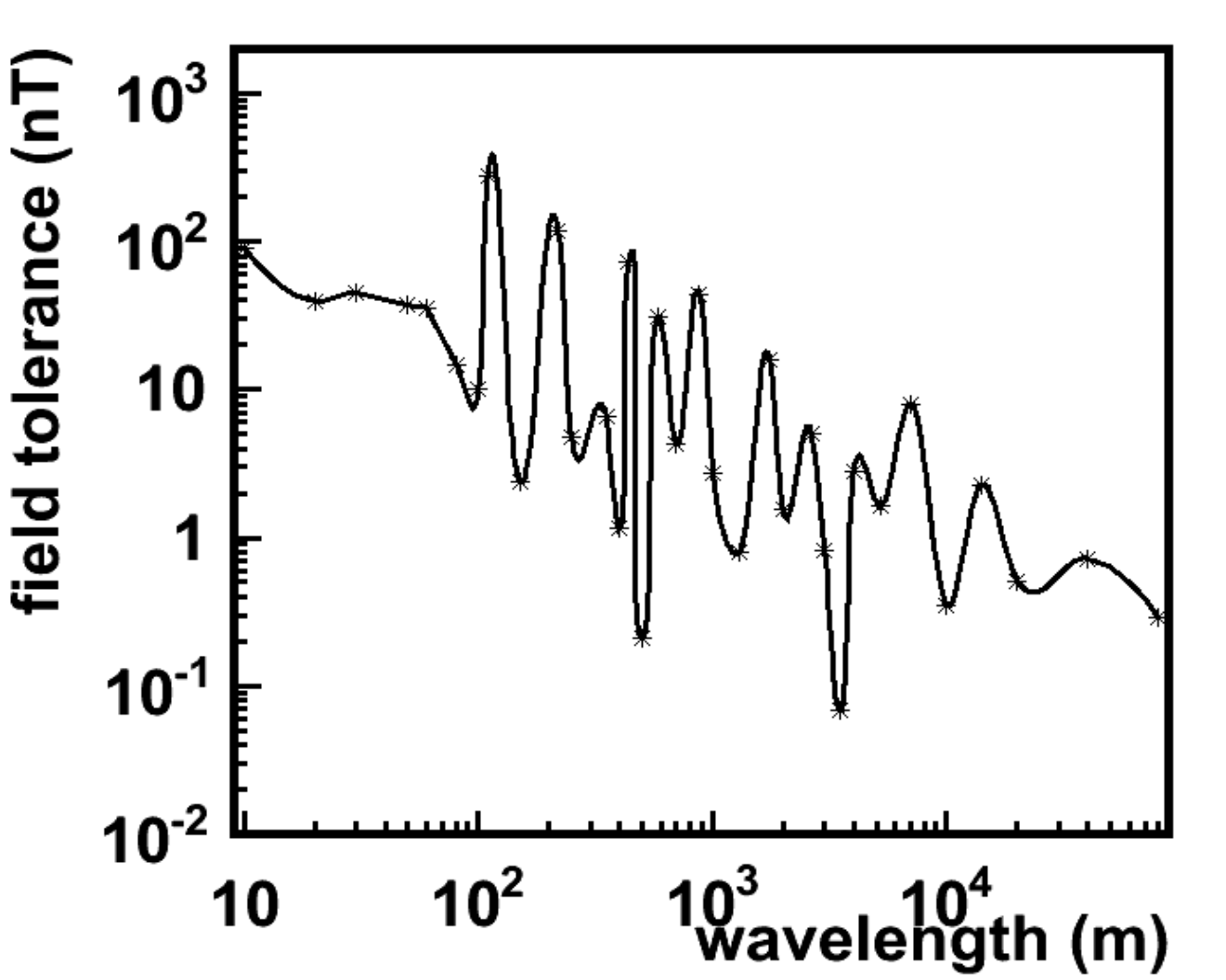
Field Tolerance (10% emitt. growth)



Beam displacement



Field Tolerance
(10% beam displ. growth)



Conclusions & Outlook

- First look at sensitivity of transfer line beam wrt dynamic stray fields
  - Due to large FODO length and low phase advance, sensitive for large wavelengths
  - Resonances sensitive to ~0.1 nT stray fields
- Outlook:
  - Jitter on position of quadrupoles
  - Redo study for main linac
    - Include feedback stabilisation system
  - Integrated simulation studies