Beam dynamics and synchrotron radiation effects in bunch compressors and undulators

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Synchrotron Radiation Effects

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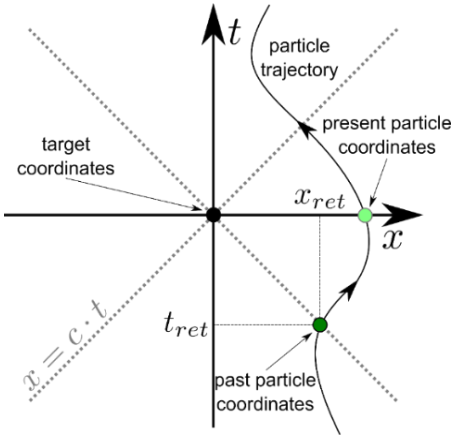
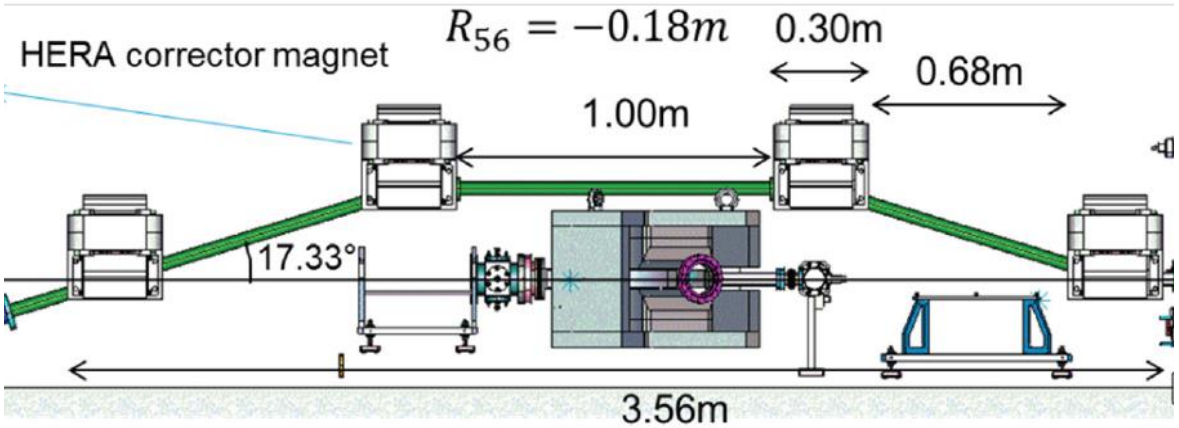
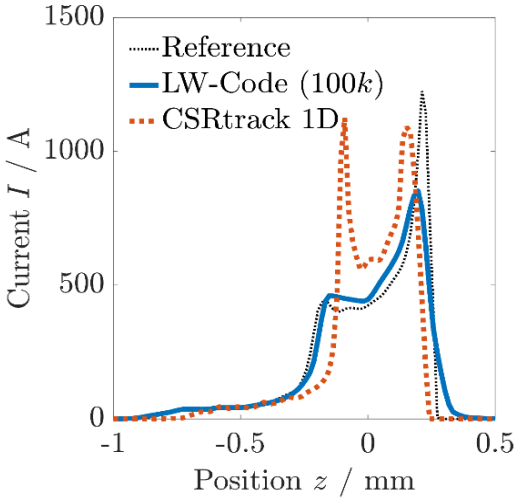
Magnetic bunch compressor @PITZ:

- Max. 1% rel. energy spread; compression to 6 ps
- Space-charge dominated beam dynamics
- CSR effects are important
- Accurate modeling with conventional tools not possible
- Novel/efficient 3D space-charge tracking based on LW







Synchrotron Radiation Effects

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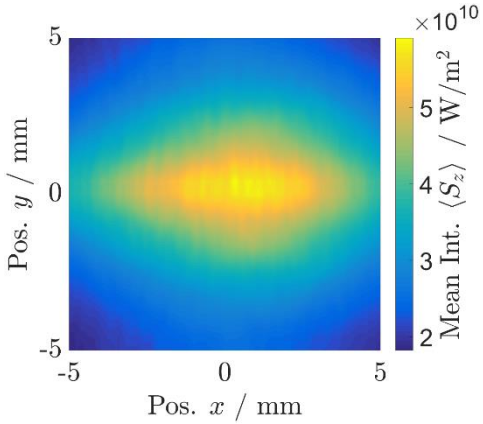
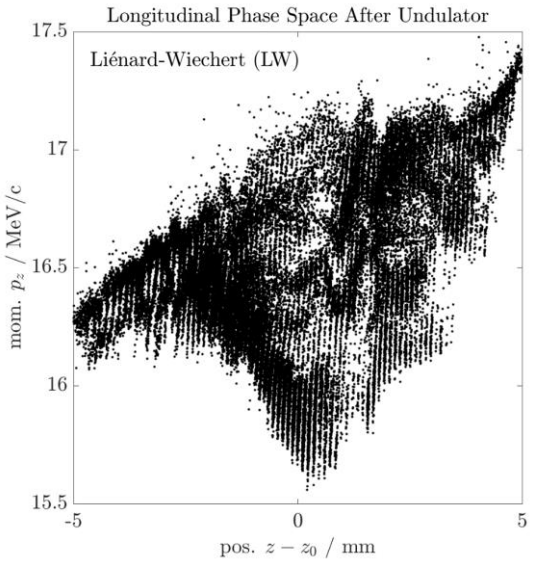
High power, tunable THz SASE FEL @PITZ:

- THz radiation at λ~100 µm, ~ 6 µs pulse length, ~ 38 MW peak power
- Transport of SC dominated beam (4nC/17MeV bunches) through undulator?
- Beam dynamics/microbunching?
- Characterization of THz radiation?

simulated THz radiation patterns





$$\lambda_{THz} = \frac{\lambda_U}{2\,\gamma^2}\left(1 + \frac{K^2}{2}\right) \approx 105\ \mu\text{m}$$

microbunching simulated by LW