Wiggler Simulations

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2016.7.7
Beam parameters

- Number density: $5.59e + 17/m^3$
- Energy spread: $1e - 3$
- Domain size: 10 Debye Length
- Boundary: periodic in 3D
Density modulation

![Graph showing density modulation](image)

rep=1, at 3 m

- Simulation
- Theory

# of electrons per Debye length

1/ Debye length

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Wiggler Simulations
Velocity modulation

Average range 6.83e-4m

- Theory
- Simulation

average velocity, m/s

1/ Debye length
Magnetic field of dipoles

- \( B_x(s) = B_0 \sin(k_w \cdot s) \)
- \( B_y(s) = -B_0 \cos(k_w \cdot s) \)
- \( k_w = \frac{2\pi}{\lambda_w} \)
- \( \lambda_w = 4\,cm \)
- \( B_0 = 0.2\,T \)
Simulation results

![Graph showing simulation results before and after dipoles.](image-url)
Beam parameters

- 1/10 number density
- 10 times larger computational domain
- open boundary in 3D
Density modulation

![Graph showing density modulation](image_url)
Velocity modulation

![Graph showing velocity modulation over 1/Debye length](image-url)
Three-pole wiggler
Simulation results

![Graph showing simulation results before and after a wiggler. The x-axis represents the longitudinal distance in meters, ranging from 1 to 2 x 10^{-3}, and the y-axis represents the number of electrons per meter, ranging from -5 to 1.5 x 10^4. The graph compares the number of electrons before and after the wiggler.](image)
Beam parameters

- Number of computational particles decreases from $3.2 \times 10^7$ to $8 \times 10^3$
- Representing number increases from 1 to $4 \times 10^3$
Density modulation

![Graph showing the number of electrons per Debye length against the reciprocal of Debye length. The graph has a linear scale on the x-axis and a linear scale on the y-axis, with values ranging from -0.06 to 0.06. The y-axis is labeled as "# of electrons per Debye length" and the x-axis is labeled as "1 / Debye length." At 3 m, there is a significant spike in the graph.]
Velocity modulation

![Graph showing velocity modulation over 1/Debye length](image_url)