

Modulator Simulations

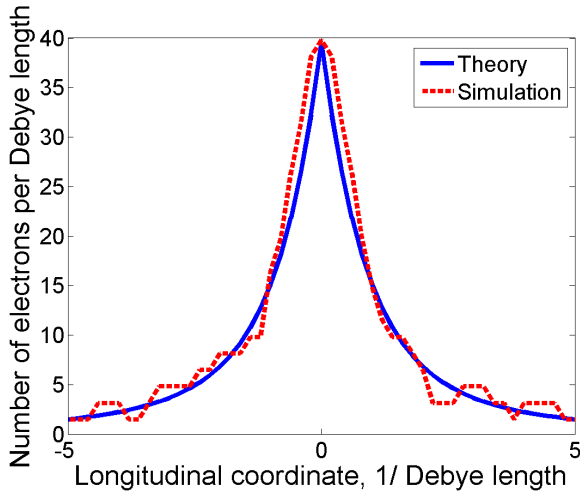
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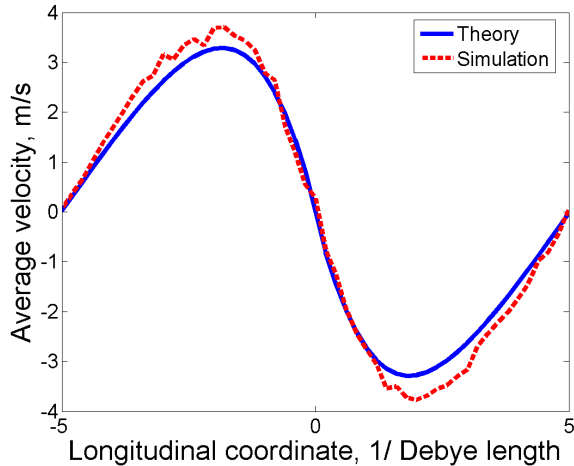
2016.9.15

- Uniform distribution without focusing field, periodic boundary
- Gaussian distribution with continuous focusing field, open boundary
- Gaussian distribution with quadrupoles focusing field, open boundary

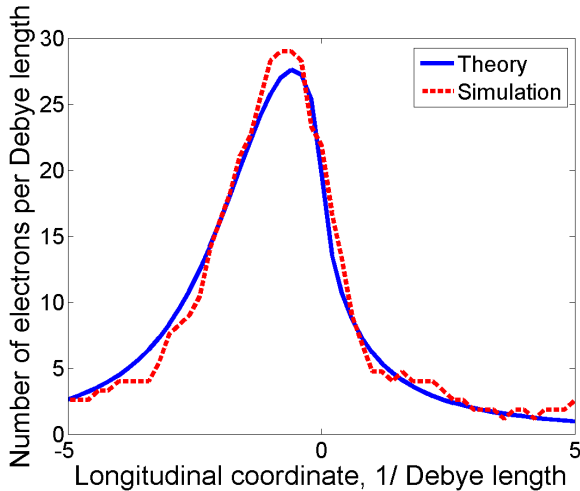
Density modulation



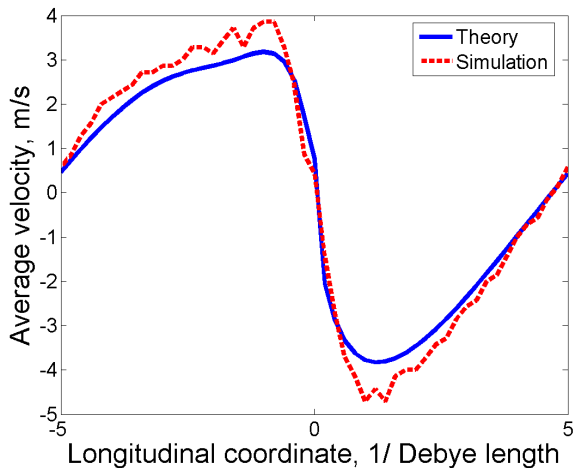
Velocity modulation



Density modulation



Velocity modulation



Focusing field

$$E_x = k_0 \cdot x$$

$$E_y = k_0 \cdot y$$

$$H_x = (mv_x^2 + kx^2)/2$$

$$H_y = (mv_y^2 + ky^2)/2$$

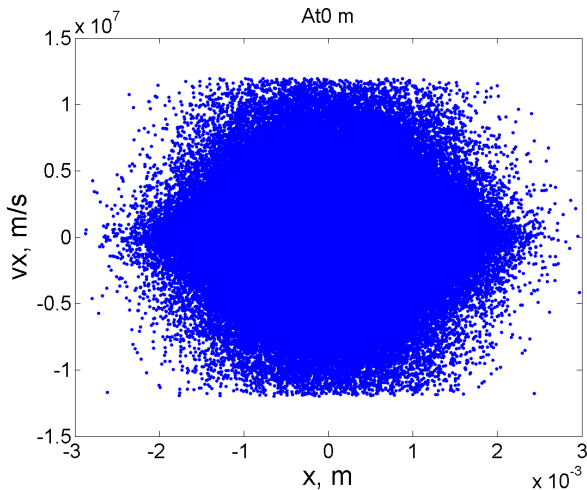
where

$$F_x = -kx = -E_x q = -k_0 x q$$

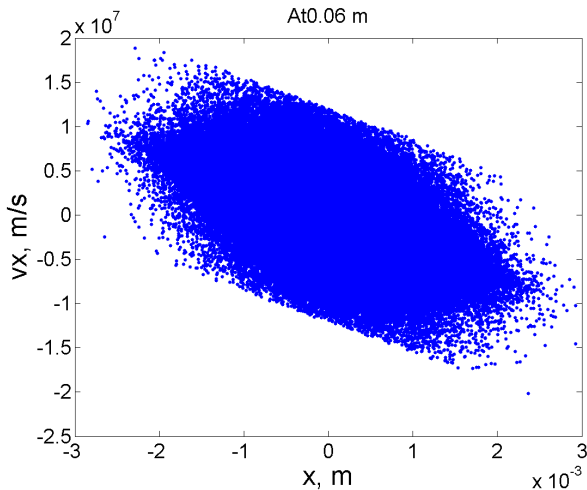
$$k = k_0 q$$

- Generate a set of H_x obeying normal distribution with σ_{H_x} , where σ_{H_x} is computed using σ_x and σ_{vx}
- θ is randomly chosen obeying uniform distribution between 0 and 2π
- $v_x = \sqrt{2H_x/m} \cdot \cos \theta$ and $x = \sqrt{2H_x/k} \cdot \sin \theta$

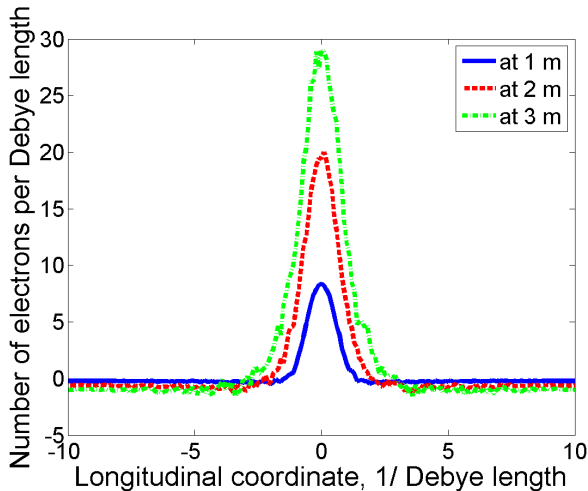
$x - vx$ plot



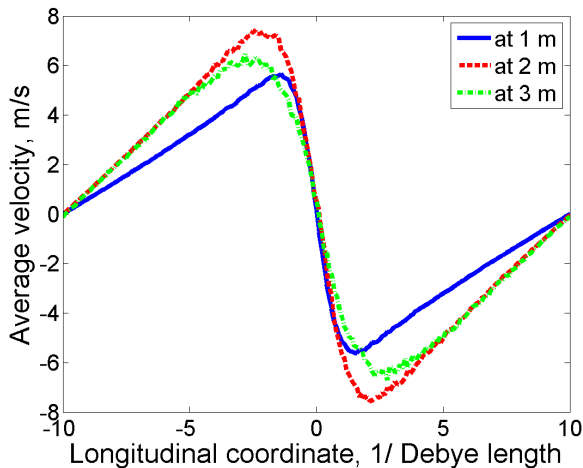
$x - vx$ plot



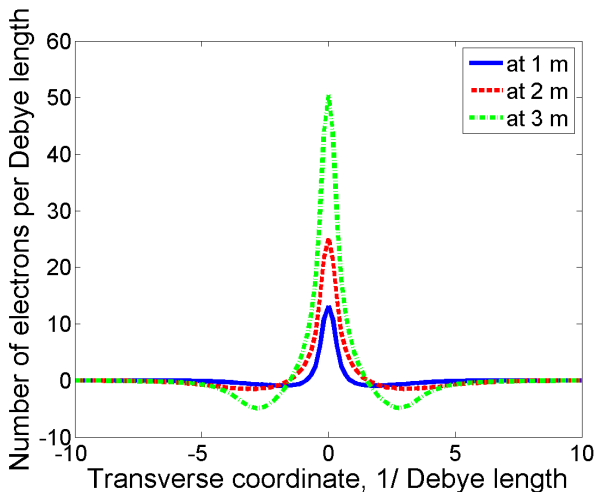
Longitudinal density modulation



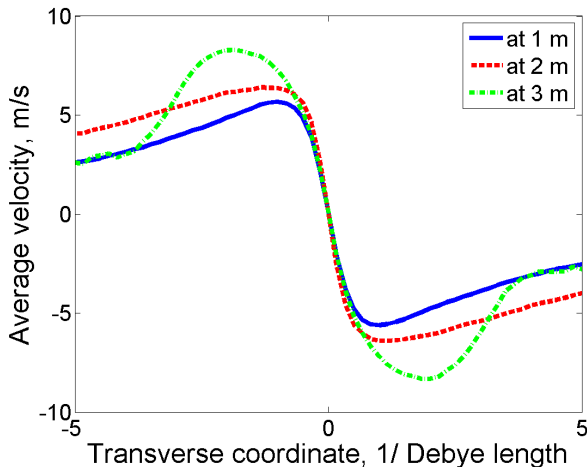
Longitudinal velocity modulation



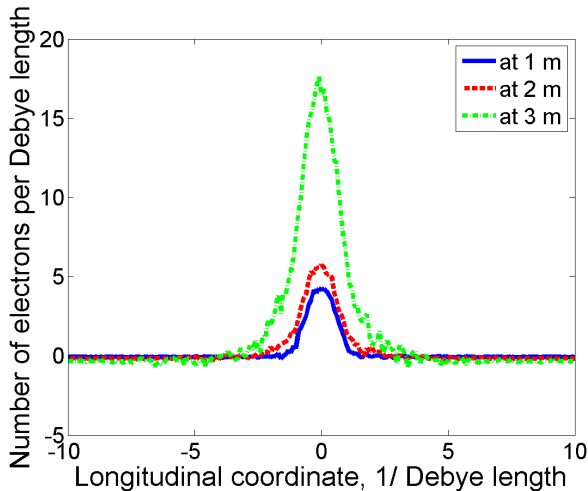
Transverse density modulation



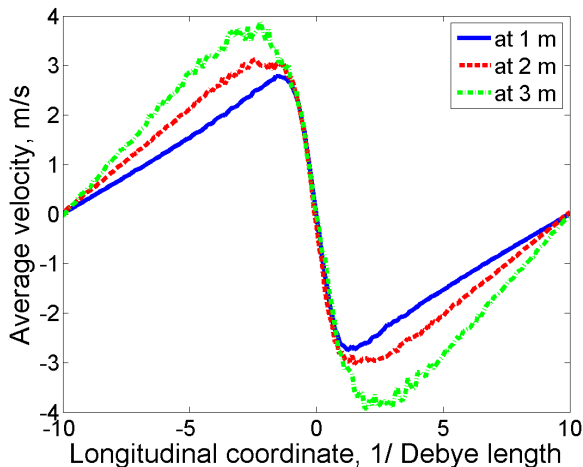
Transverse velocity modulation



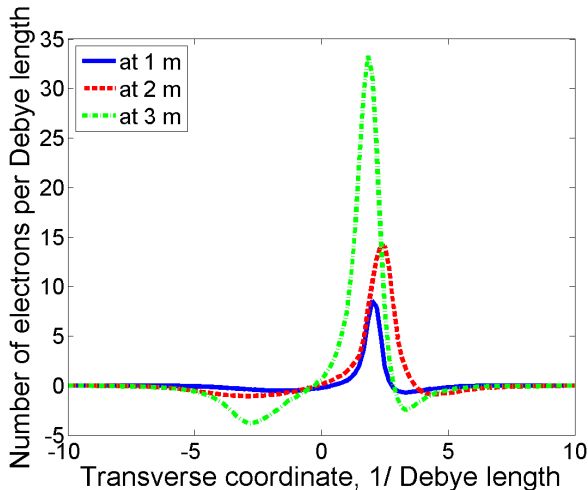
Longitudinal density modulation



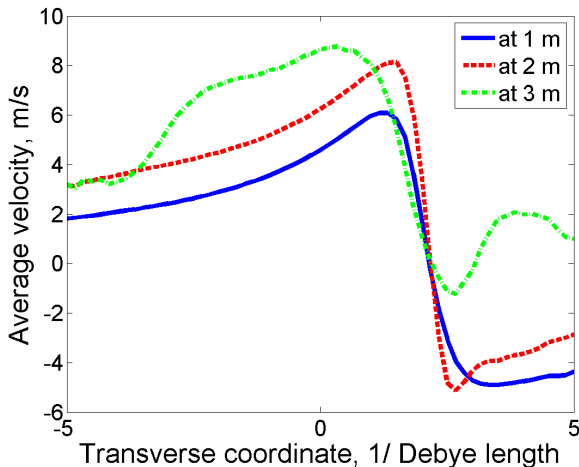
Longitudinal velocity modulation



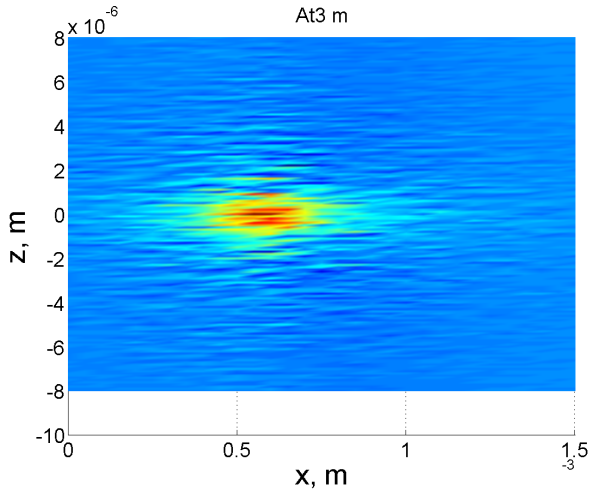
Transverse density modulation



Transverse velocity modulation



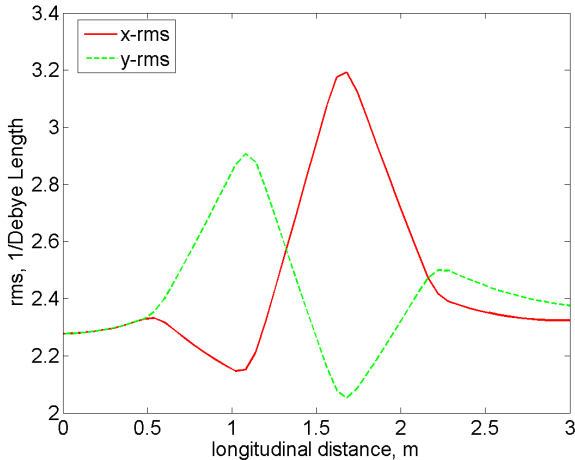
Density modulation



Previous setting

- 0m - 0.4715m : Drift
- 0.4715m - 0.6285m : Q1, $K1=-2.102$
- 0.6285m - 1.0215m : Drift
- 1.0215m - 1.1785m : Q2, $K1=6.713$
- 1.1785m - 1.5715m : Drift
- 1.5715m - 1.7285m : Q3, $K1=-7.661$
- 1.7285m - 2.1215m : Drift
- 2.1215m - 2.2785m : Q4, $K1=3.383$
- 2.2785m - 3m : Drift

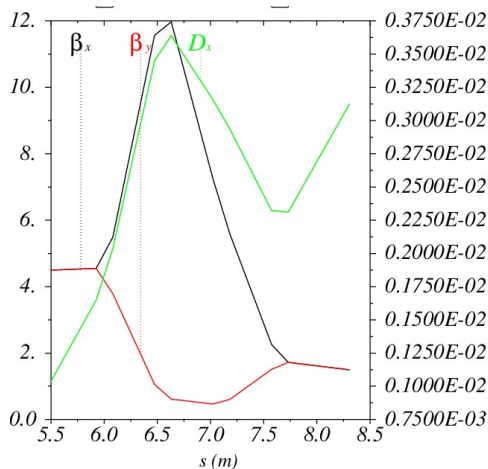
RMS change



New setting

- 0m - 0.4245m : Drift
- 0.4245m - 0.5815m : Q1, $K1=-7.56277$
- 0.5815m - 0.9745m : Drift
- 0.9745m - 1.1315m : Q2, $K1=8.50925$
- 1.1315m - 1.5245m : Drift
- 1.5245m - 1.6815m : Q3, $K1=0.698665$
- 1.6815m - 2.0745m : Drift
- 2.0745m - 2.2315m : Q4, $K1=-8.30714$
- 2.2315m - 3m : Drift

Theory β change



Simulation β change

