CeC Physics

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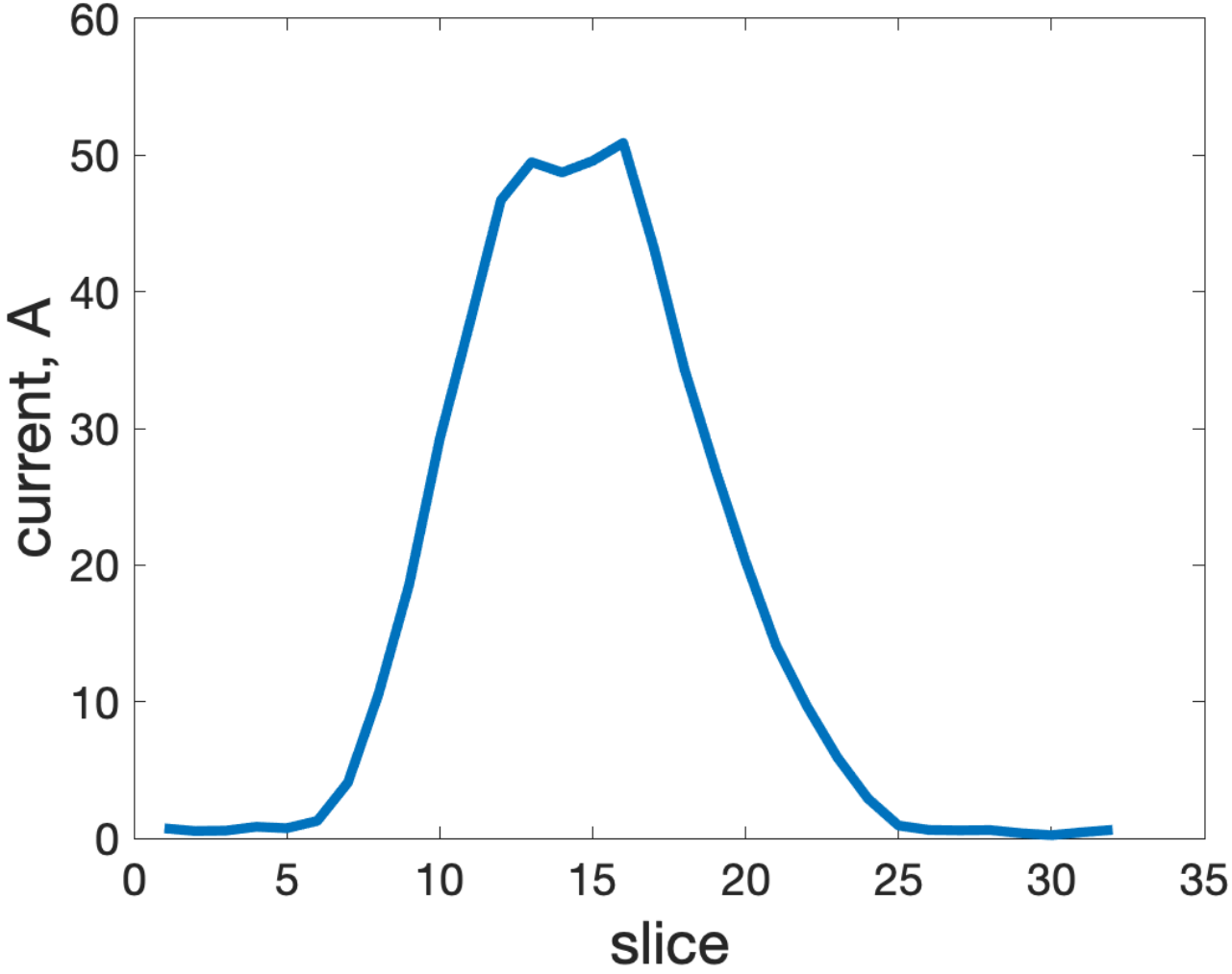
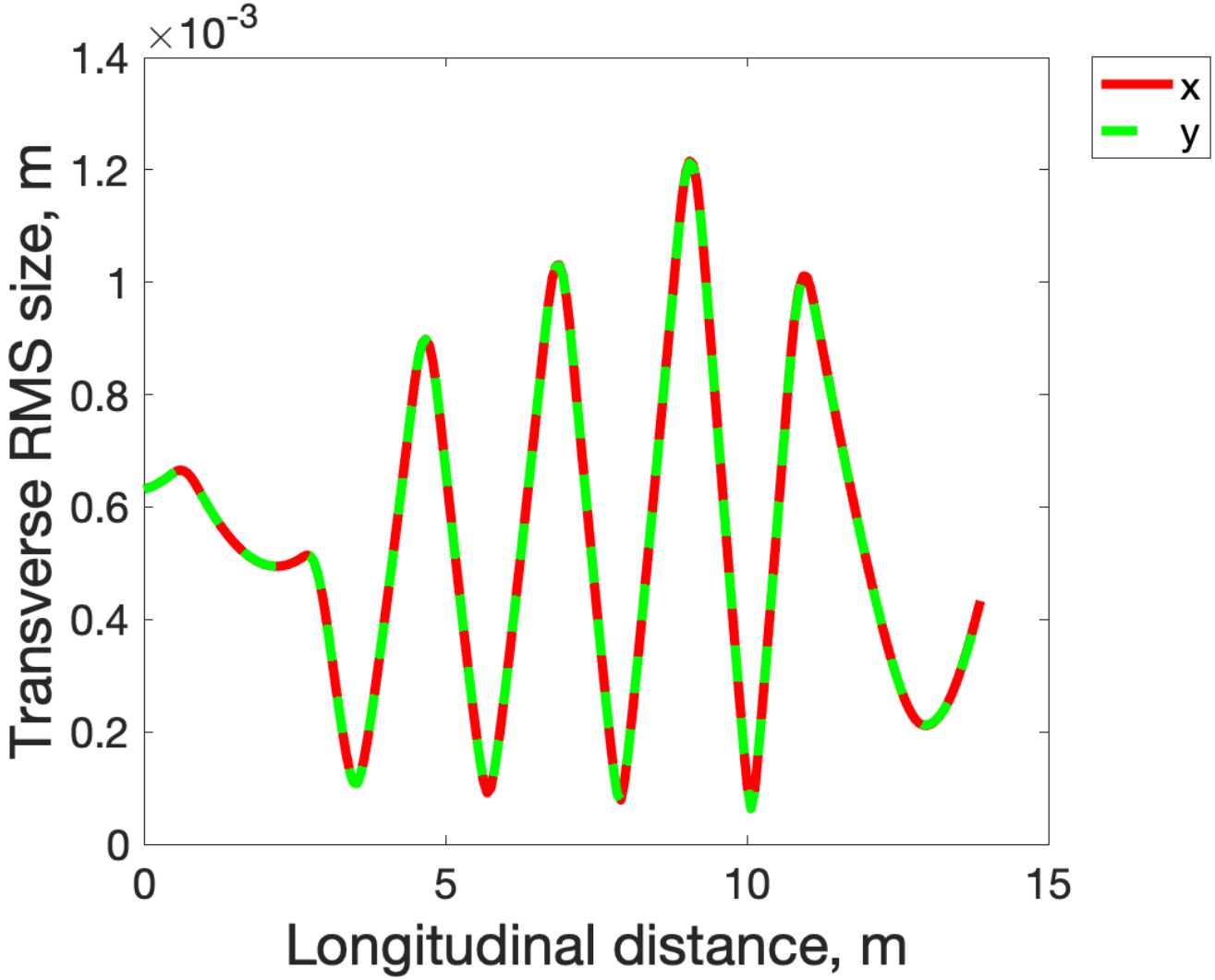


(a) Current

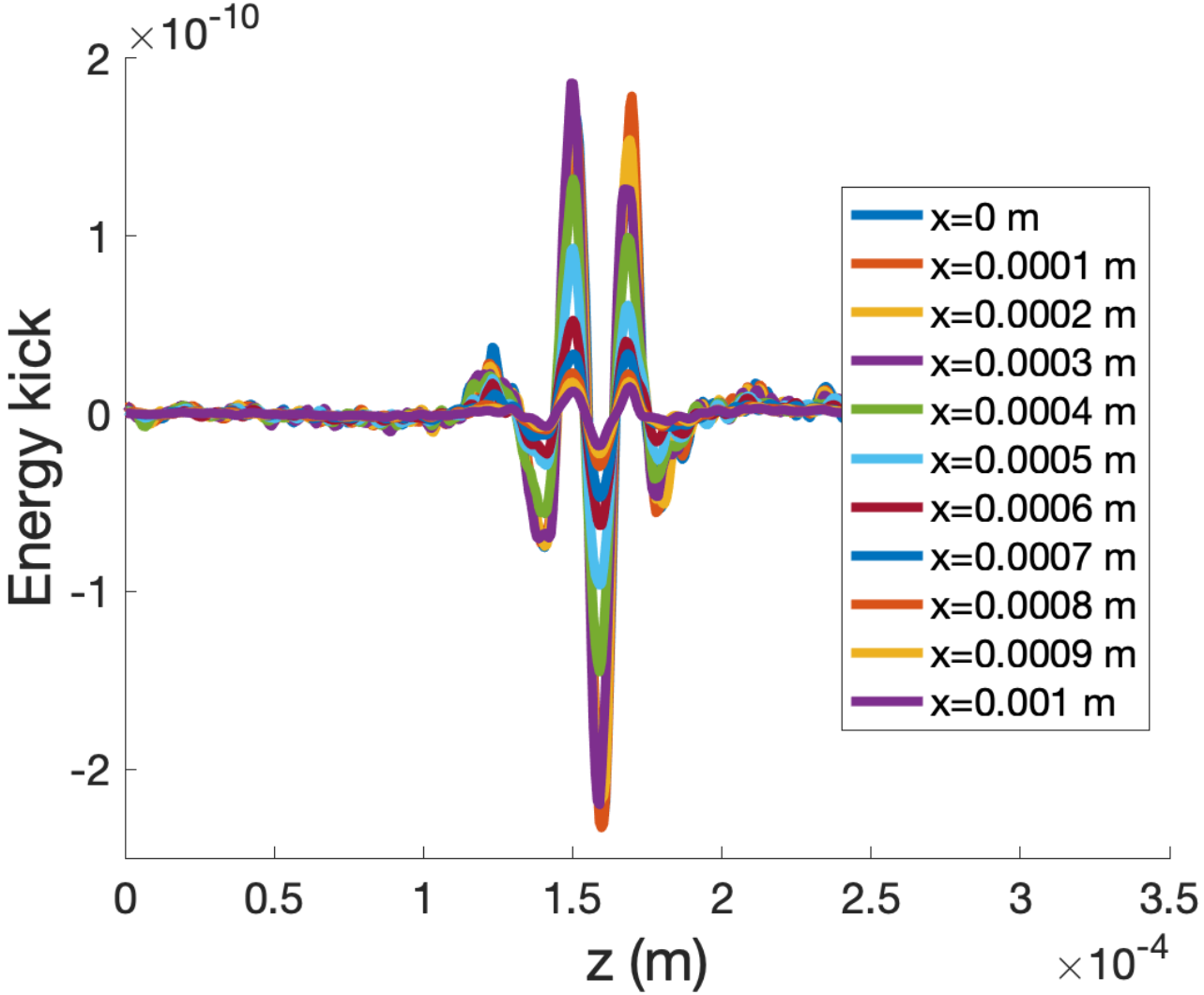
- Slice 13, $I = 49.49A, \delta E/E = 1.22e-4, \varepsilon_{norm} = 2.19\mu m, \beta = 5.18m, \alpha = -0.25, \gamma = 28.51$
- Slice 14, $I = 48.73A, \delta E/E = 1.37e-4, \varepsilon_{norm} = 1.83\mu m, \beta = 5.09m, \alpha = -0.25, \gamma = 28.50$
- Slice 15, $I = 49.58A, \delta E/E = 1.45e-4, \varepsilon_{norm} = 1.72\mu m, \beta = 4.85m, \alpha = -0.22, \gamma = 28.51$
- Slice 16, $I = 50.90A, \delta E/E = 1.36e-4, \varepsilon_{norm} = 1.80\mu m, \beta = 4.75m, \alpha = -0.21, \gamma = 28.48$

Slice 13



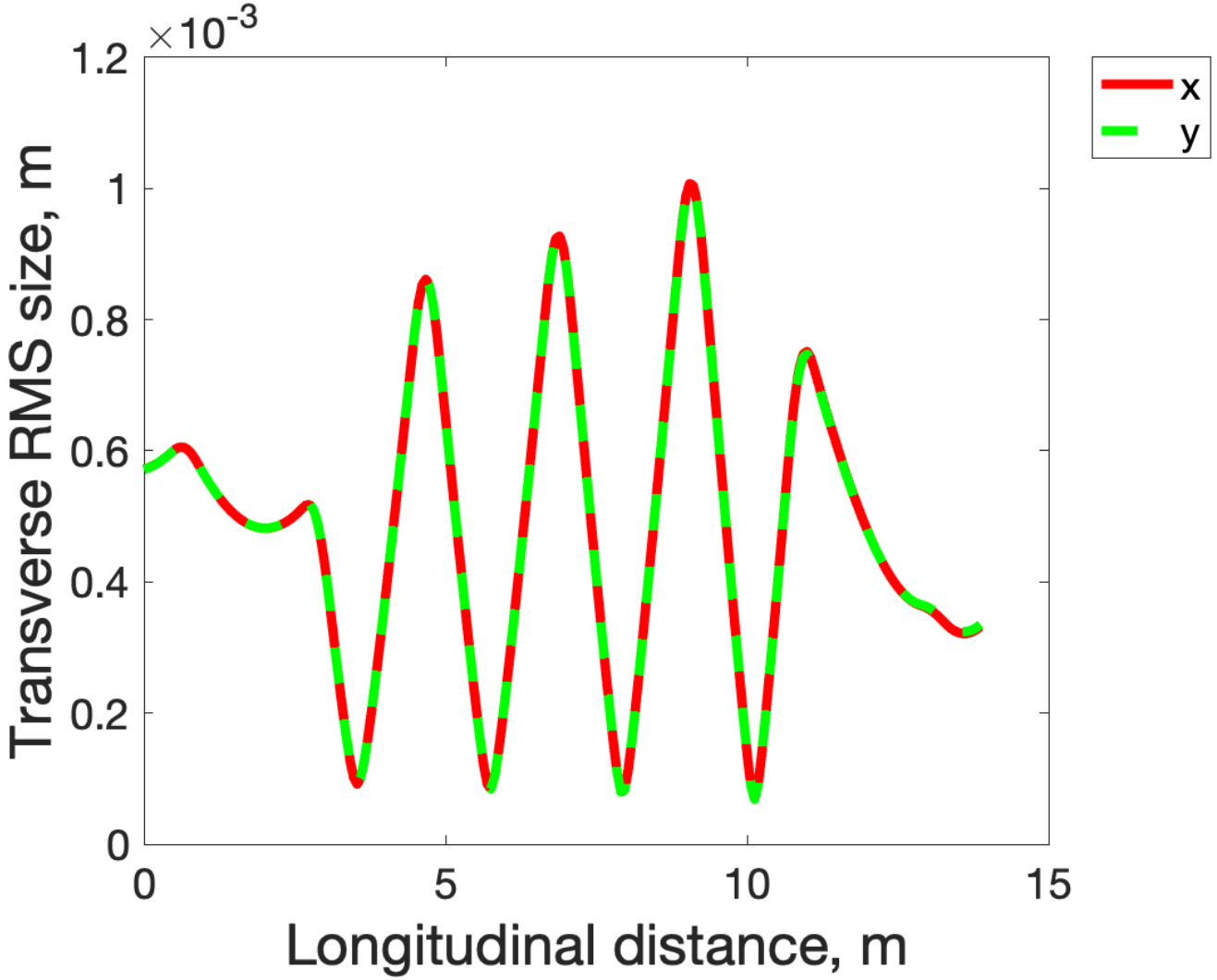
(a) Beam size

Slice 13



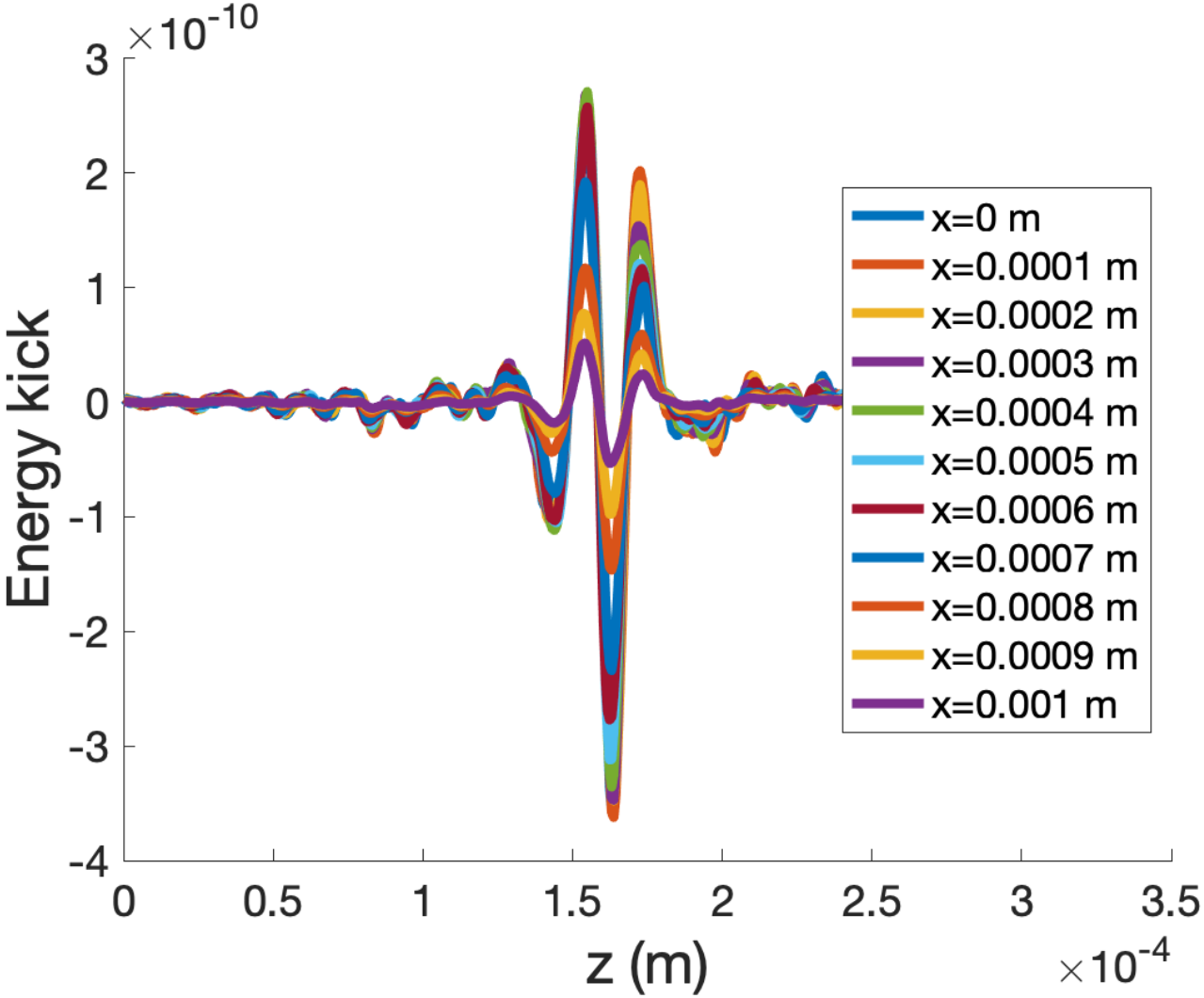
(a) Cooling

Slice 14



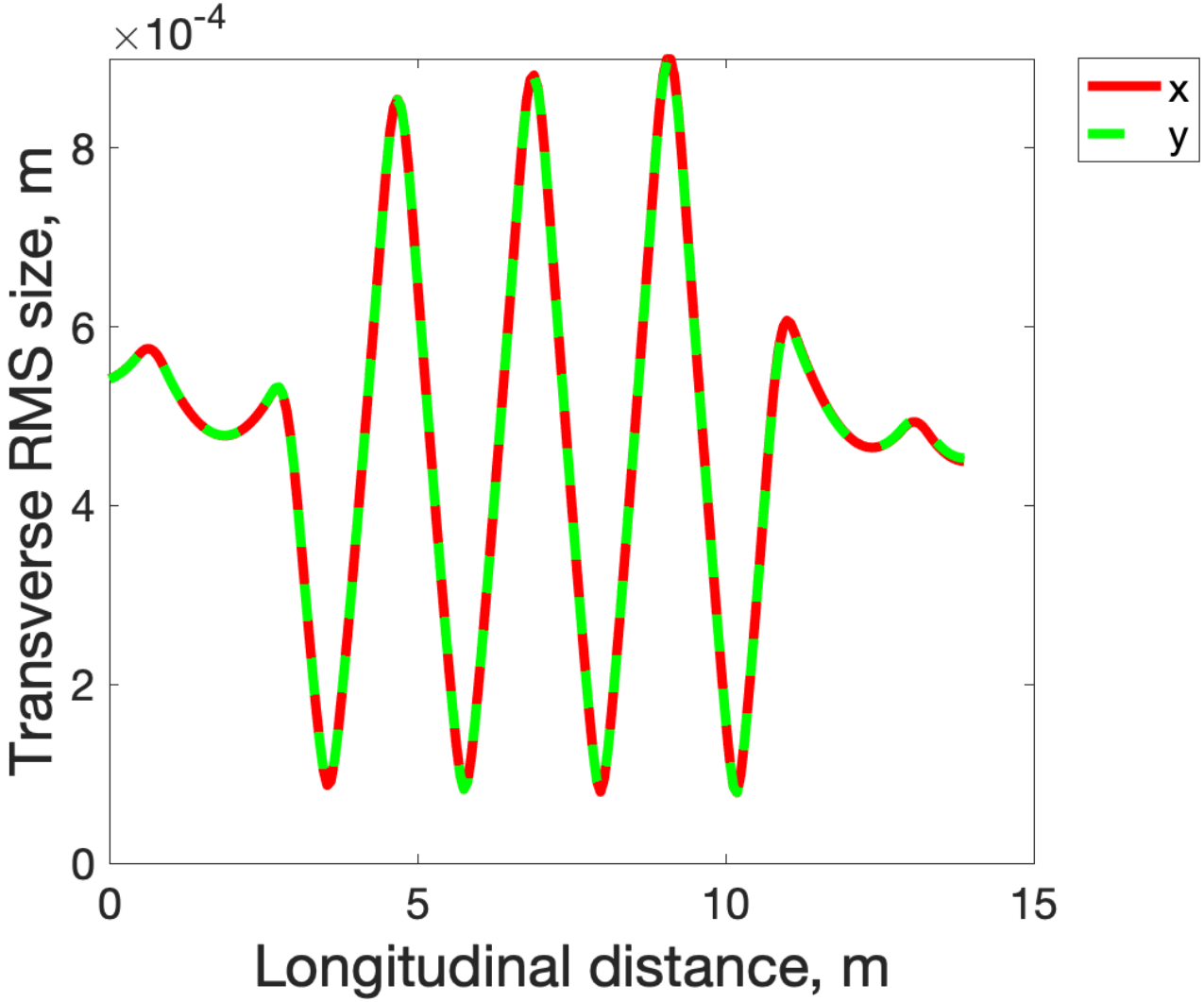
(a) Beam size

Slice 14



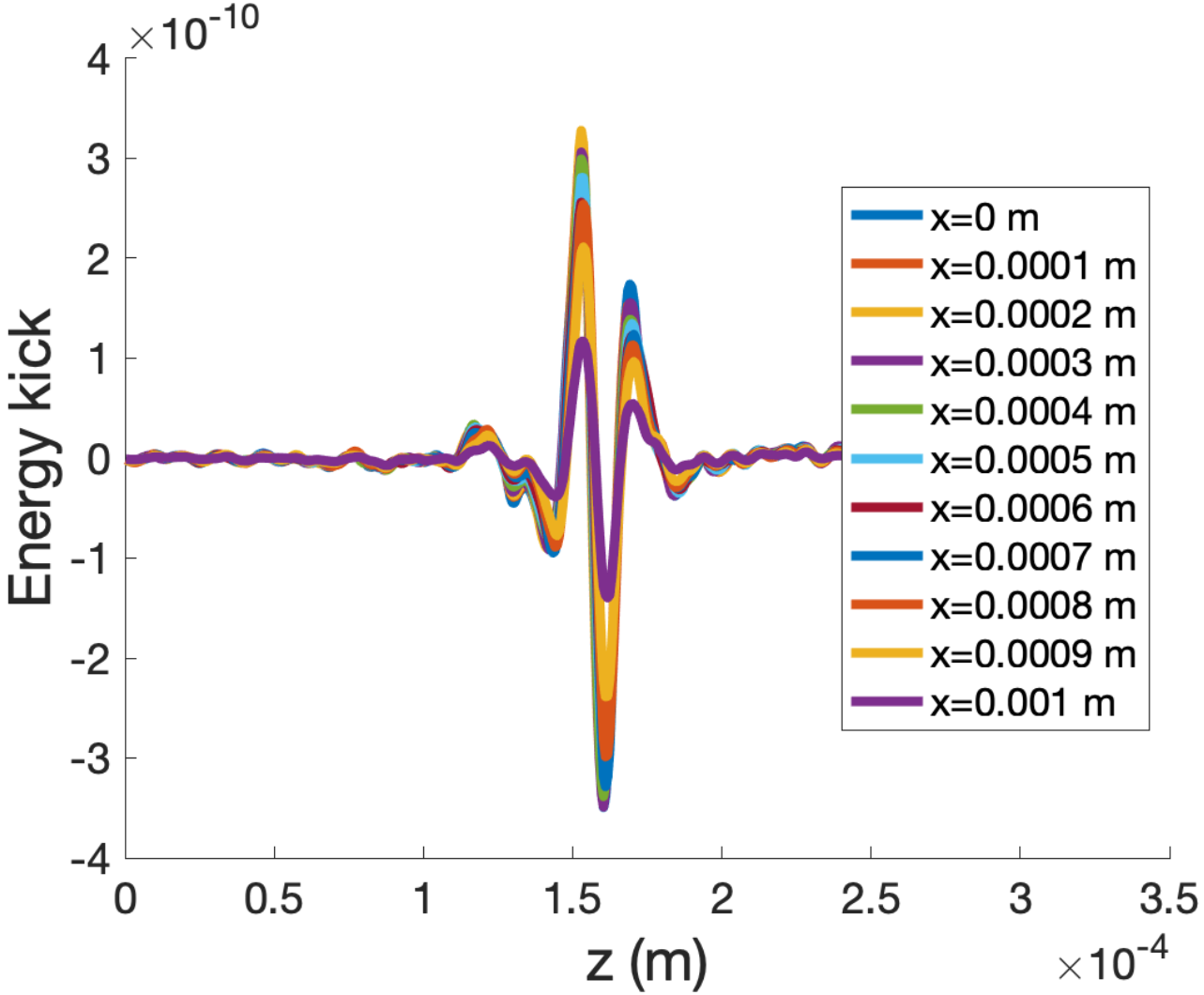
(a) Cooling

Slice 15



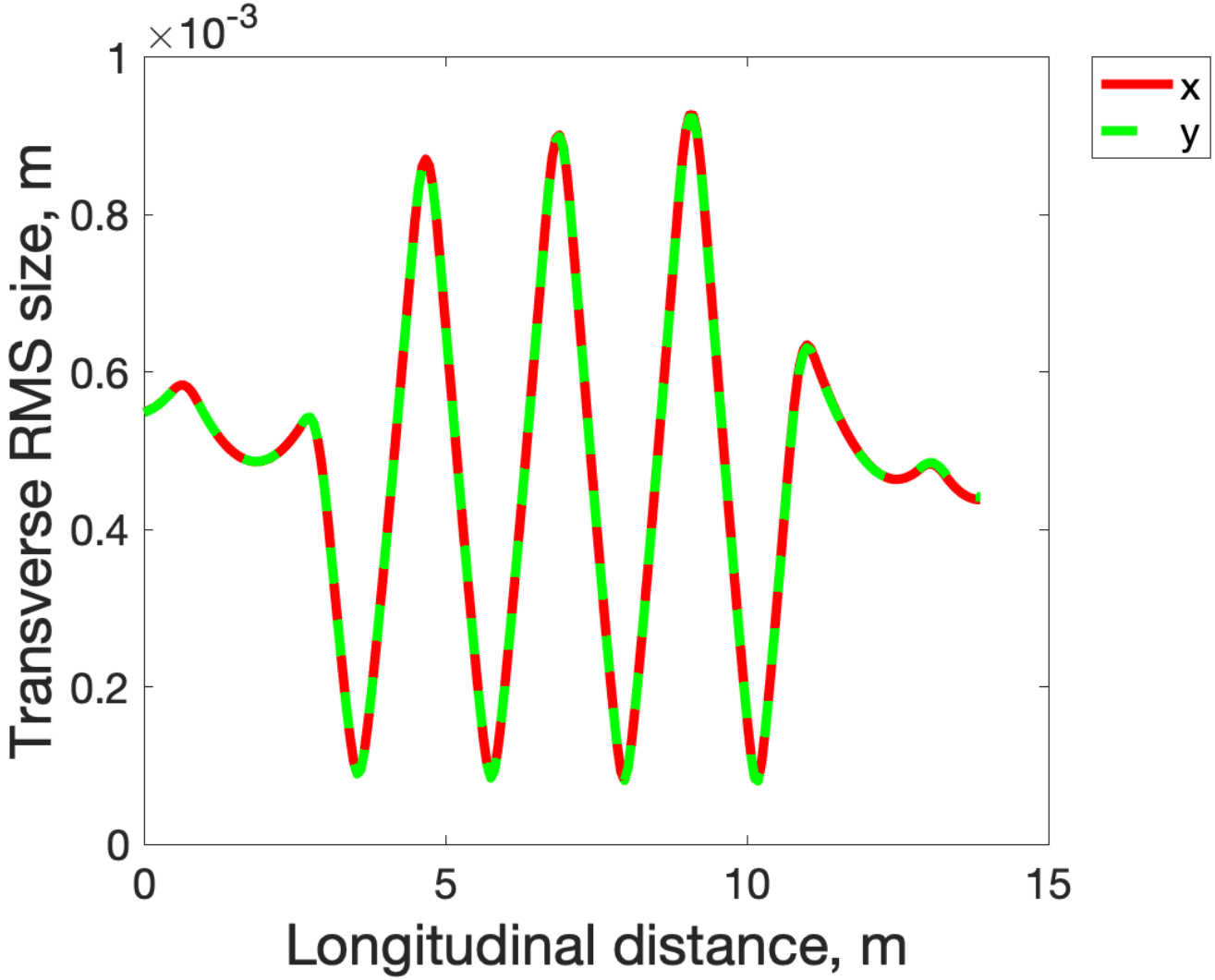
(a) Beam size

Slice 15



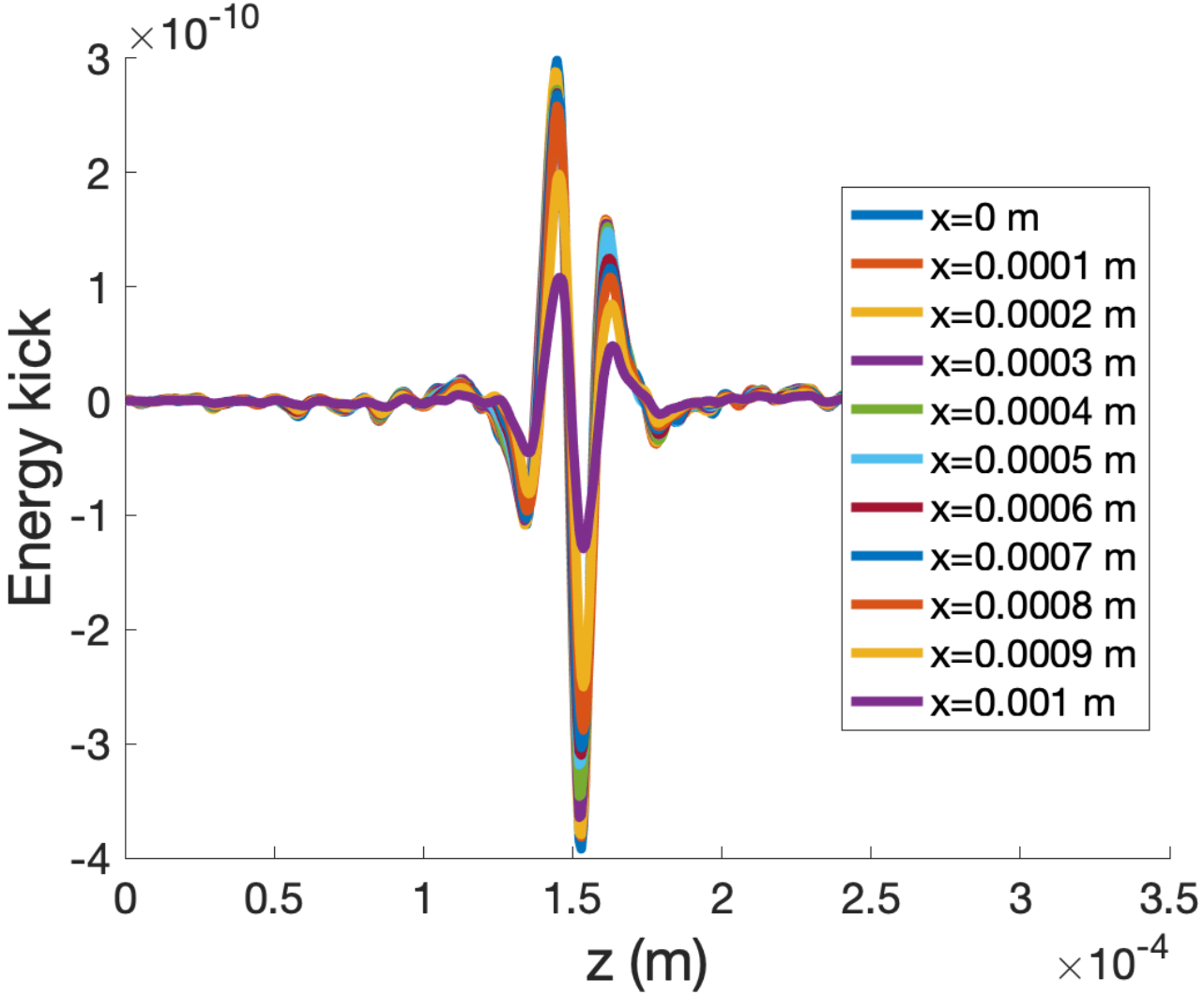
(a) Cooling

Slice 16



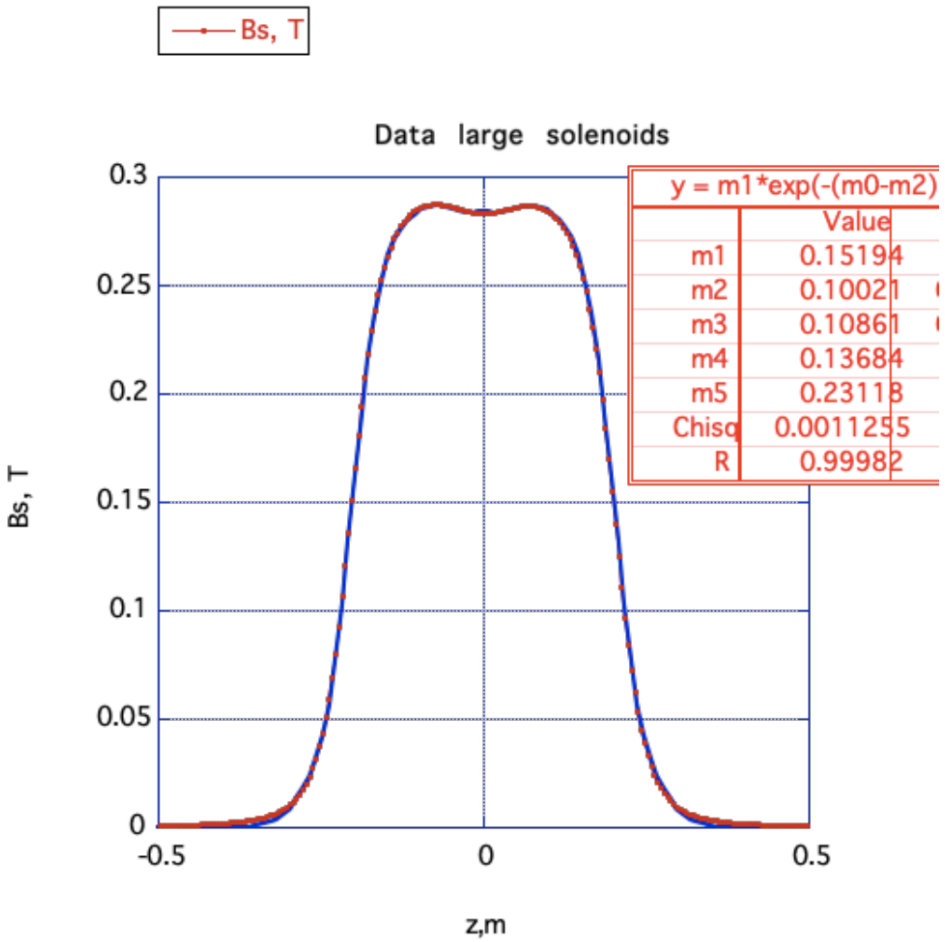
(a) Beam size

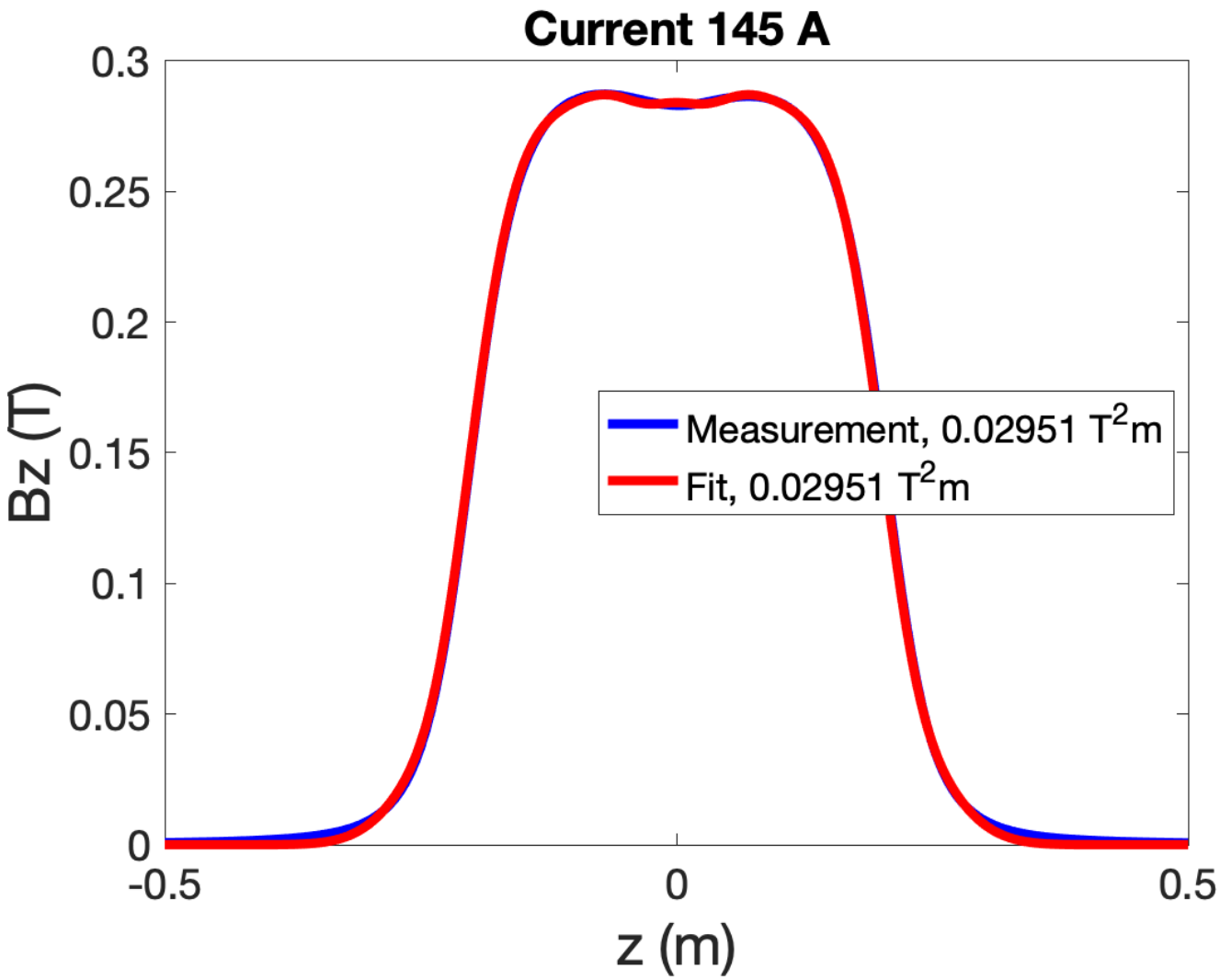
Slice 16



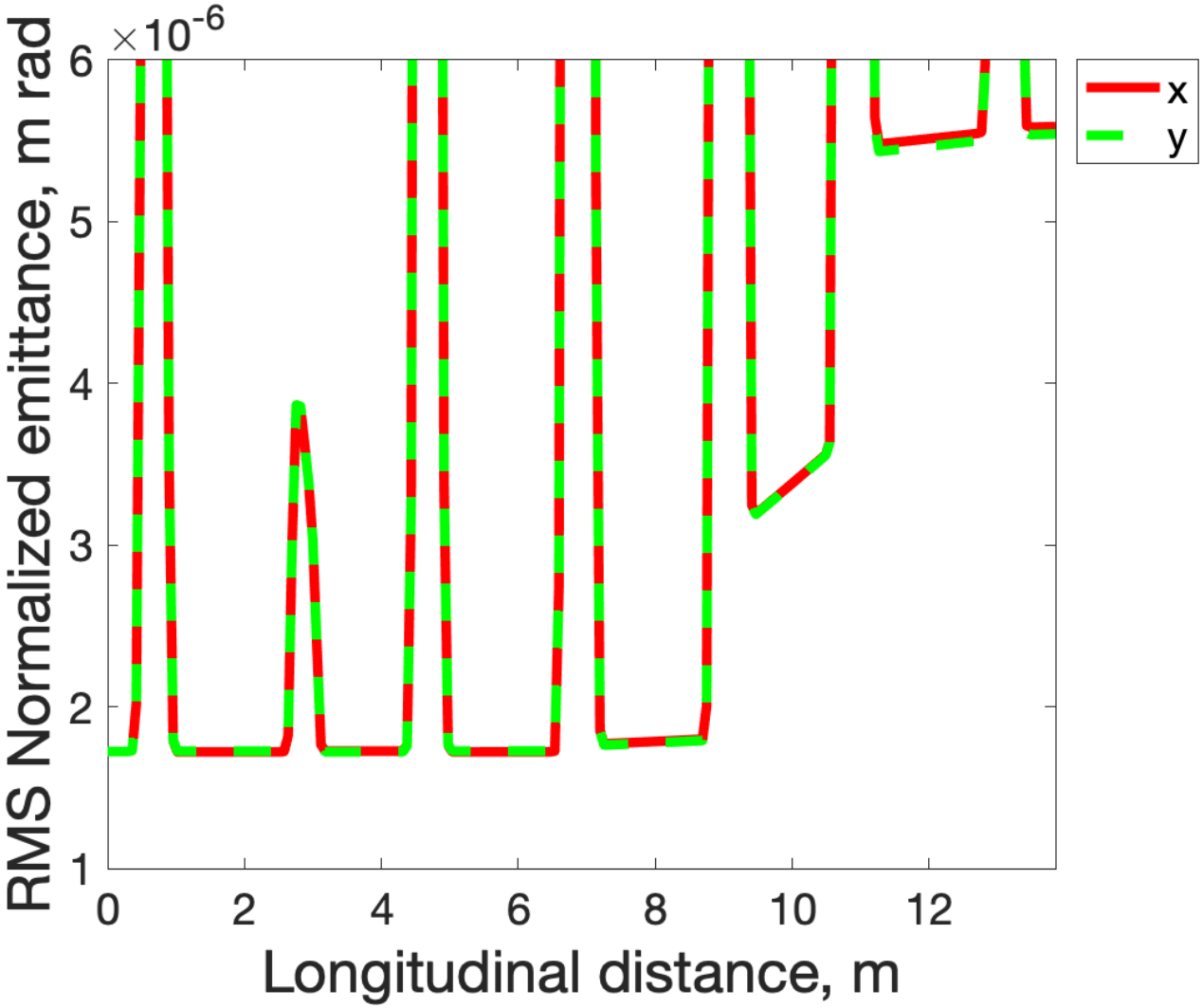
(a) Cooling

$$B_o(z) = m1 \cdot \left(\exp\left(-\left(\frac{z - m2}{m3} \right)^4 \right) + \exp\left(-\left(\frac{z + m2}{m3} \right)^4 \right) \right) + m4 \cdot \exp\left(-\left(\frac{z}{m5} \right)^4 \right)$$




Current 145 A
0.3
0.25
0.2
0.15
0.1
0.05
0
Bz (T)
-0.5
0
0.5
z (m)
Measurement, 0.02951 T^{2}m
Fit, 0.02951 T^{2}m

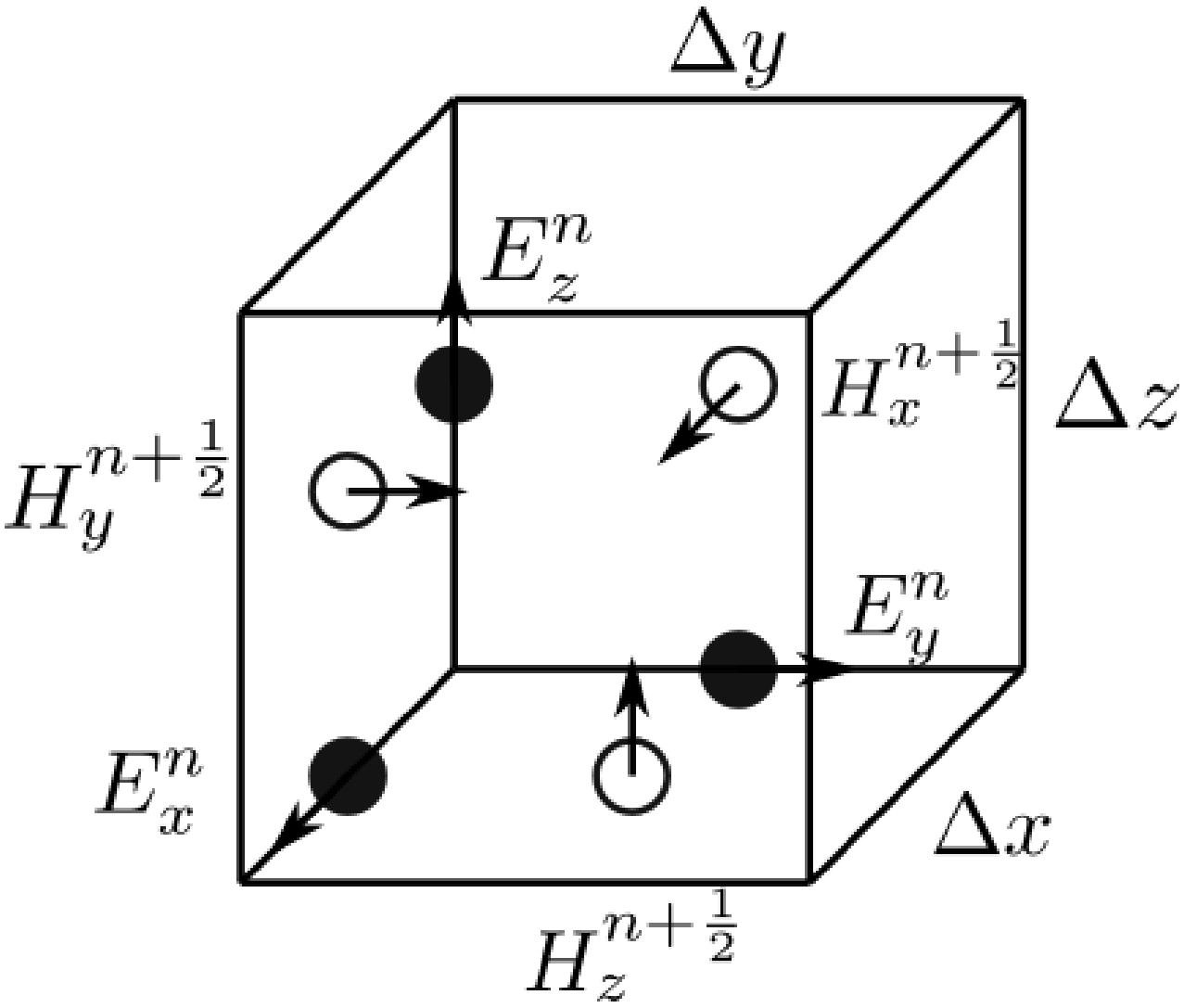
(a)


×10^-6
6
5
4
3
2
1
0
2
4
6
8
10
12
RMS Normalized emittance, m rad
Longitudinal distance, m
x
y

(a)

Applying 5σ-cut-off to the initial Gaussian distribution improves final emittance by 10%.

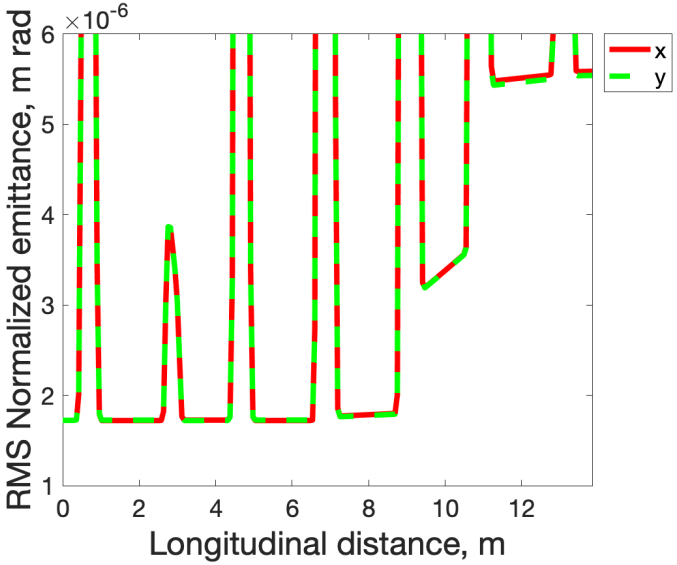
Finite-difference time-domain (FDTD) or Yee's method



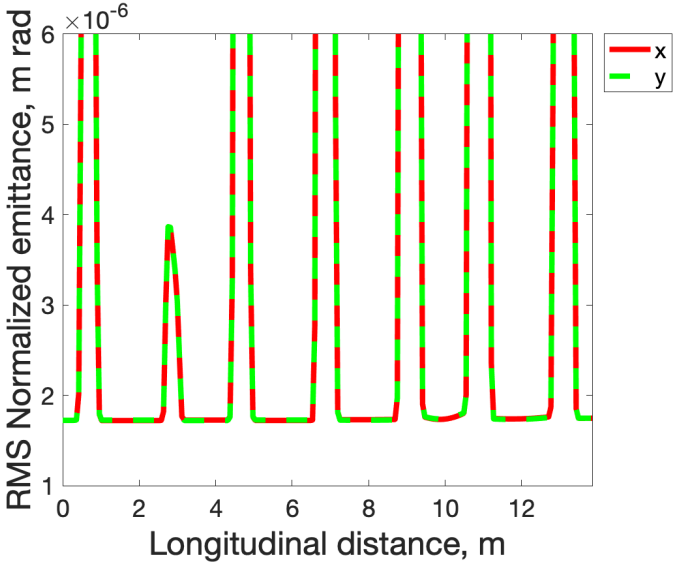
(a)

$$
\begin{aligned}
E_x^* &= \gamma E_x - \gamma\beta c B_y \\
E_y^* &= \gamma E_y + \gamma\beta c B_x \\
E_z^* &= E_z \\
B_x^* &= \gamma B_x + \frac{\gamma\beta}{c} E_y \\
B_y^* &= \gamma B_y - \frac{\gamma\beta}{c} E_x \\
B_z^* &= B_z
\end{aligned}
$$

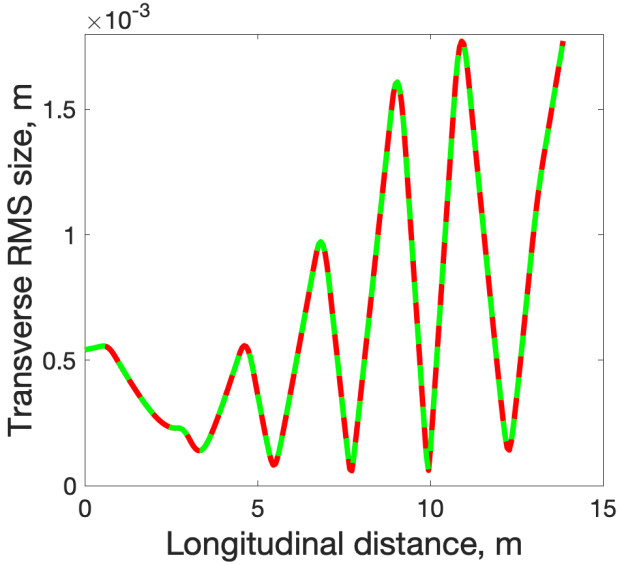
(a)



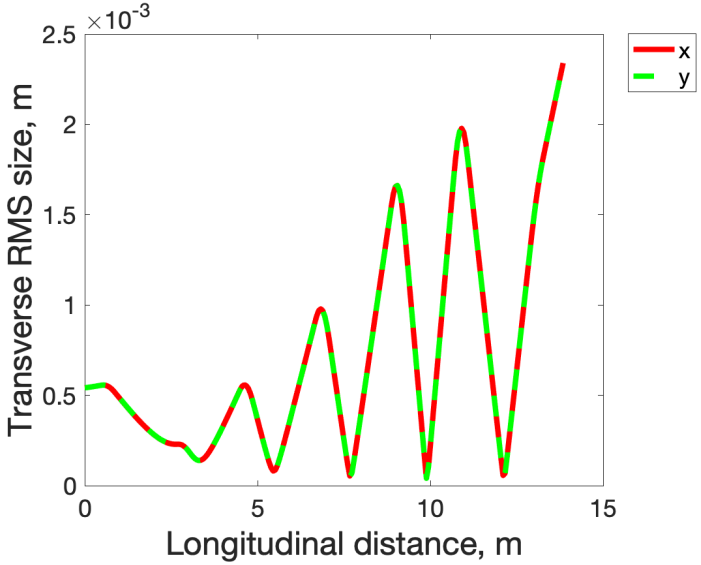
(a) Before



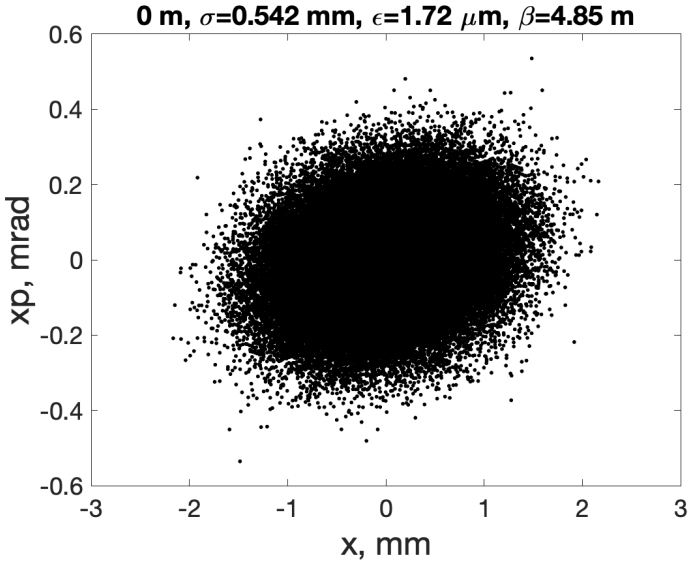
(b) After



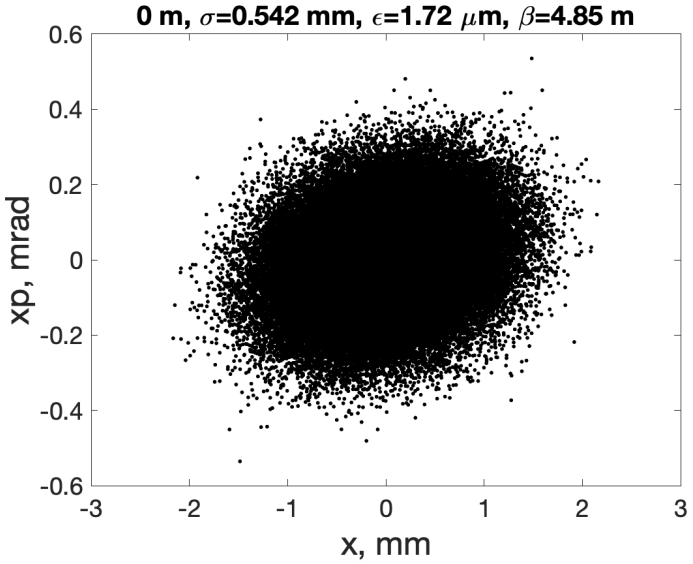
(a) Before



(b) After



(a) SPACE



(b) Matrix