

Kicker Simulations

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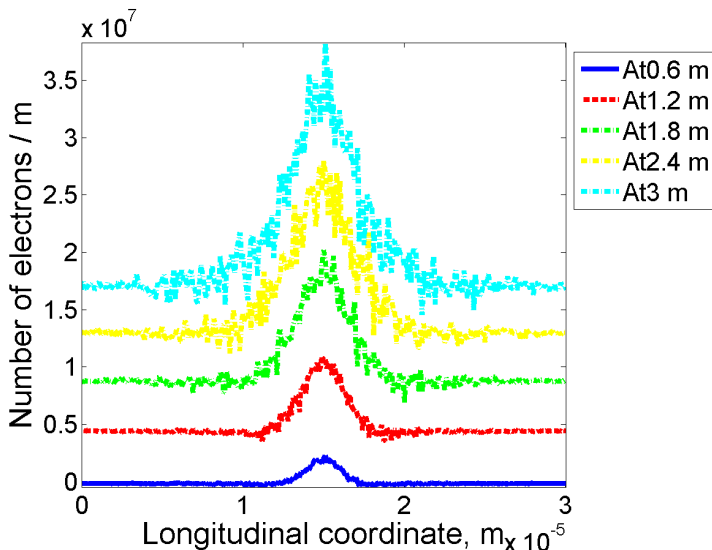
2017.9.14

Modulator

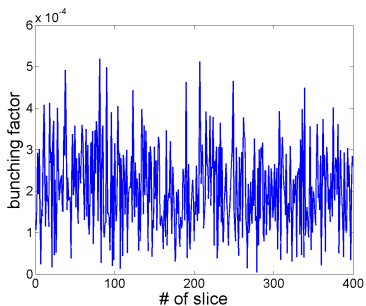
Run one slice in modulator simulations

- slice length = $3e-5$ m
- Peak current = 31 A

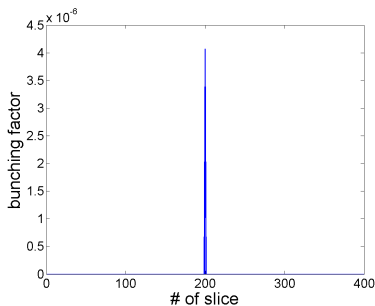
Longitudinal density modulation



Bunching factor in FEL at beginning

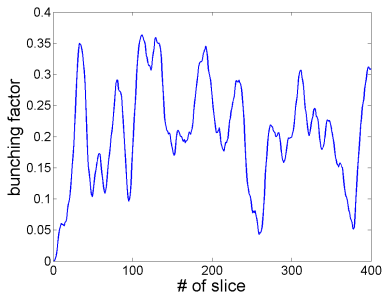


(a) Background

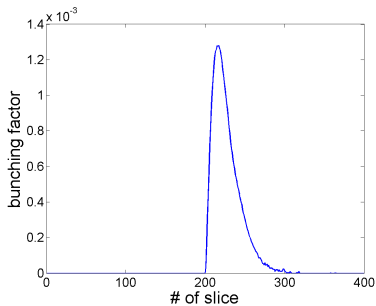


(b) Signal

Bunching factor in FEL at end



(a) Background



(b) Signal

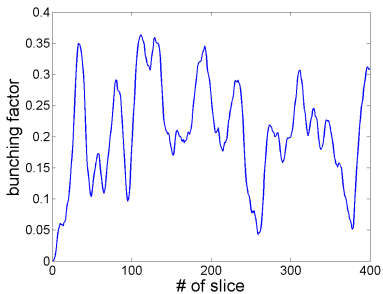
Ion in FEL

- Ion slips forward in FEL section, the slip distance is

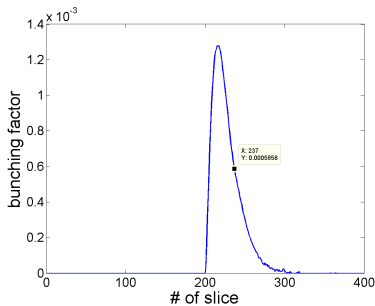
$$\frac{a_w^2}{1+a_w^2} N_{wigg} \lambda_{wigg}$$

- In our case, $a_w = 0.5$, $\lambda_{wigg} = 0.04\text{m}$, total FEL length is 7.5m, so the slip distance is 1.5m, i.e., 37.5 slices
- At the entrance of FEL, ion is located at the center of 200th slice
- At the exit of FEL, ion is located at the edge between 237th slice and 238th slice

Bunching factor in FEL at end



(a) Background

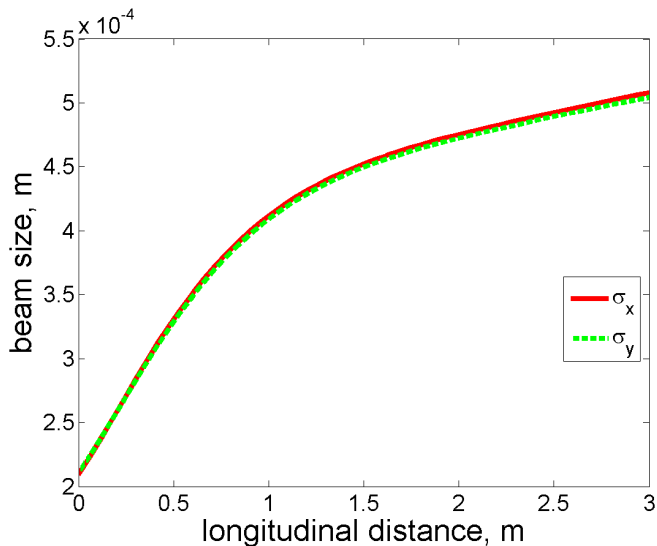


(b) Signal

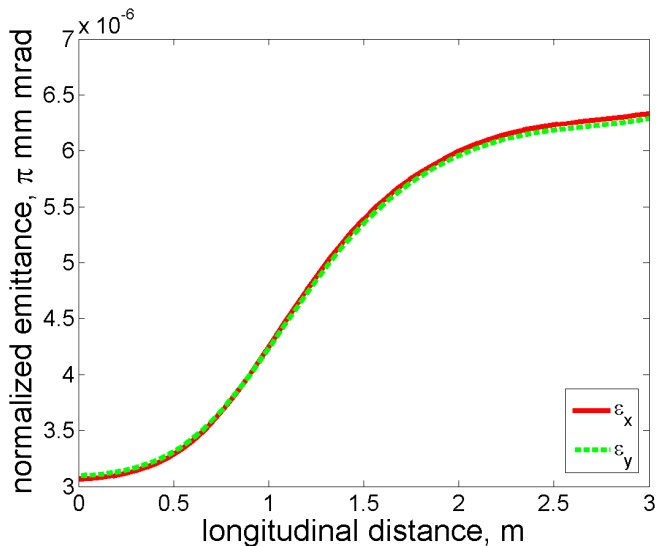
Kicker

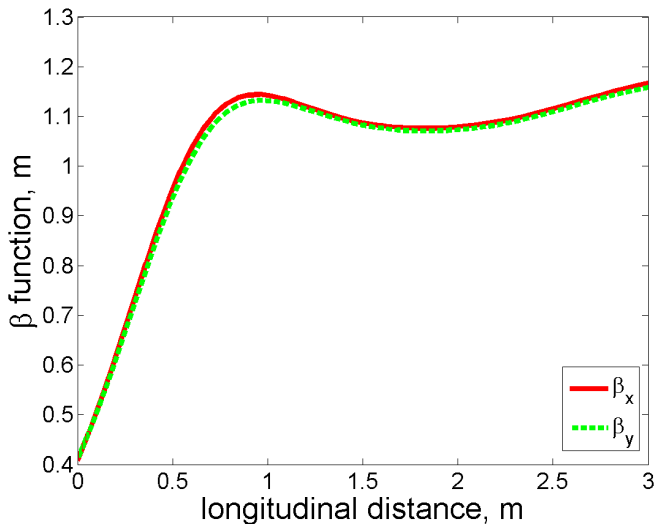
- Take 5 slices at the exit of FEL (235th - 239th) as the input of kicker
- Put the ion at the edge between 237th slice and 238th slice
- Track the ion in the kicker
- Background up to 3 m, signal up to 0.9 m

Beam size in kicker

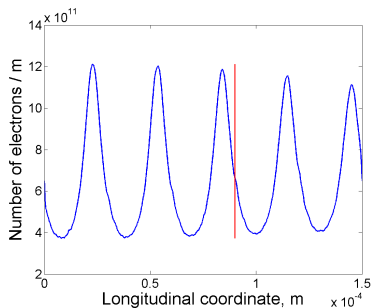


Emittance in kicker

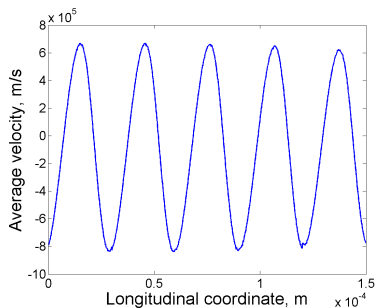


β function in kicker

Background at beginning

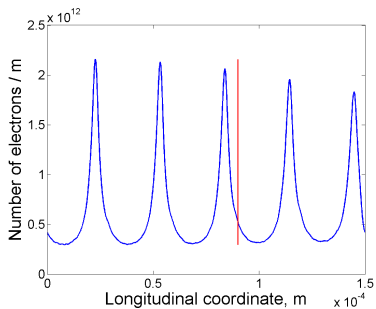


(a) Density

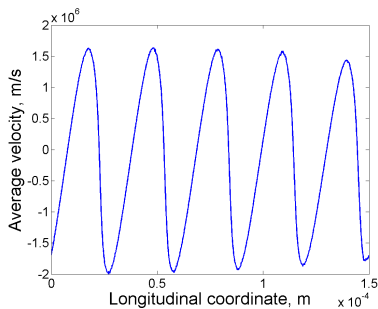


(b) Velocity

Background at 0.3 m

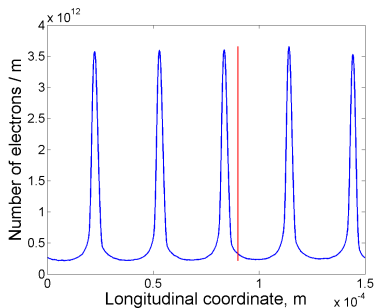


(a) Density

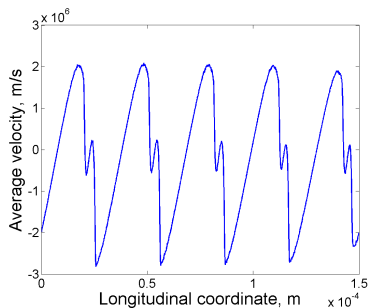


(b) Velocity

Background at 0.6 m

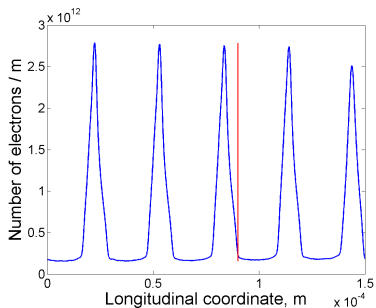


(a) Density

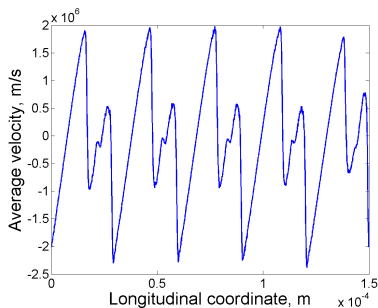


(b) Velocity

Background at 0.9 m

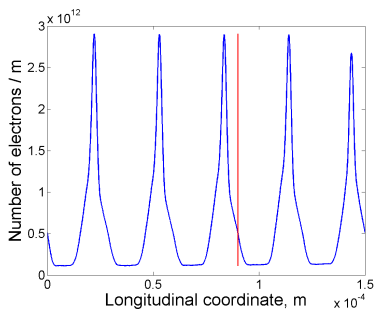


(a) Density

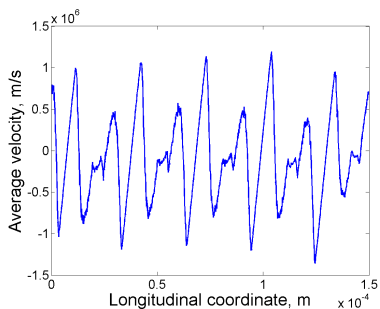


(b) Velocity

Background at 1.2 m

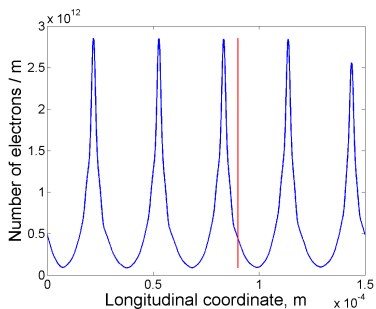


(a) Density

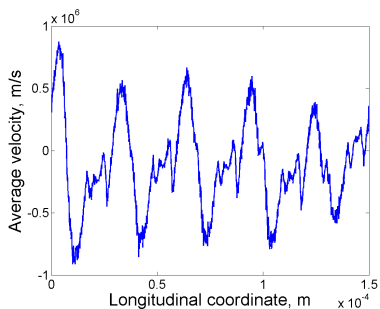


(b) Velocity

Background at 1.5 m

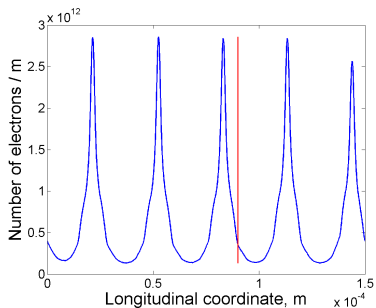


(a) Density

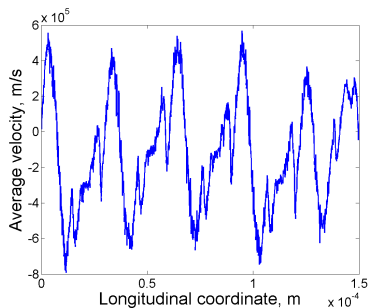


(b) Velocity

Background at 1.8 m

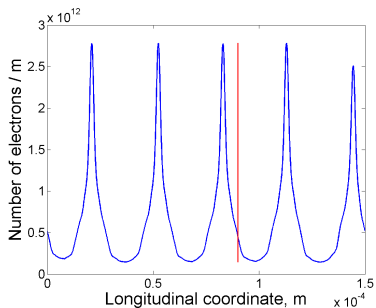


(a) Density

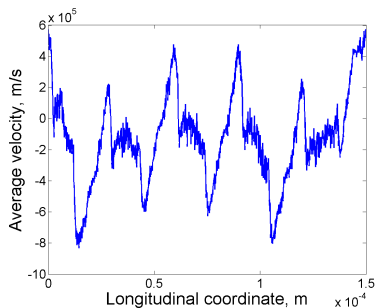


(b) Velocity

Background at 2.1 m

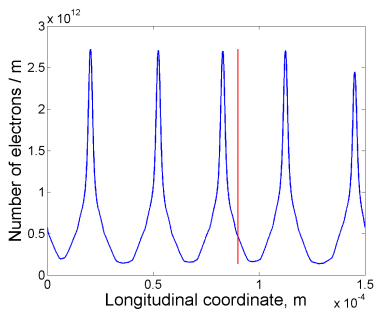


(a) Density

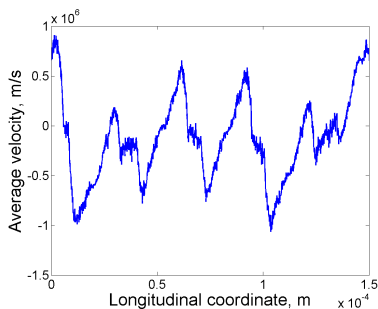


(b) Velocity

Background at 2.4 m

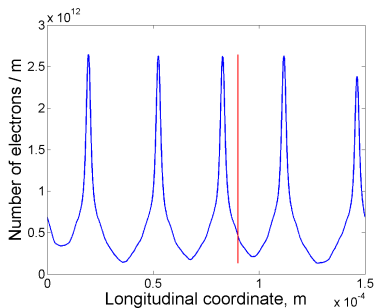


(a) Density

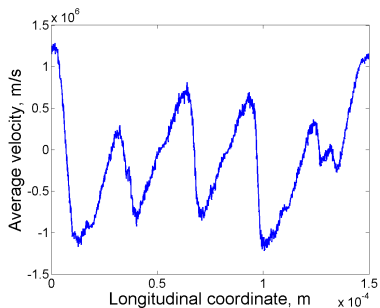


(b) Velocity

Background at 2.7 m

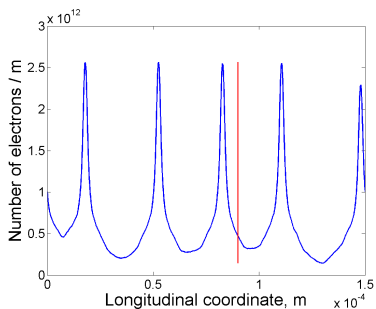


(a) Density

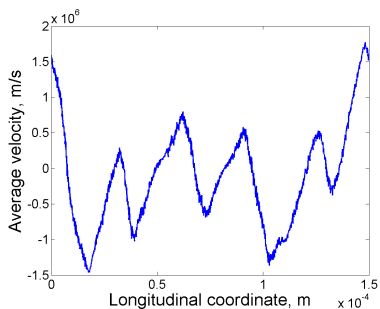


(b) Velocity

Background at 3 m

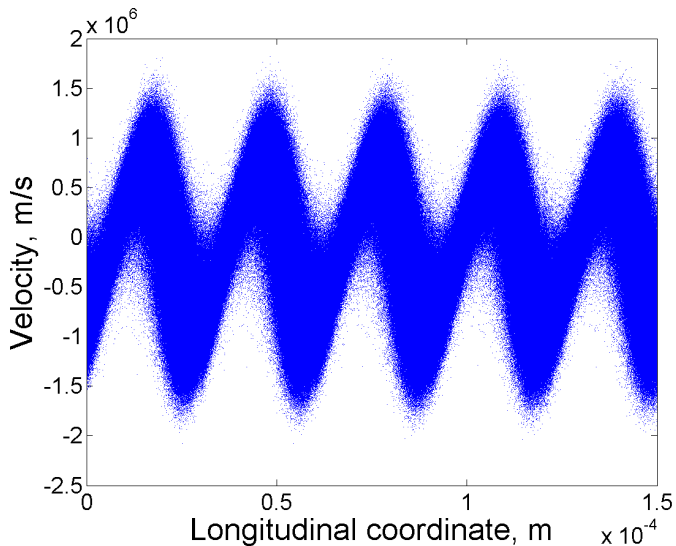


(a) Density

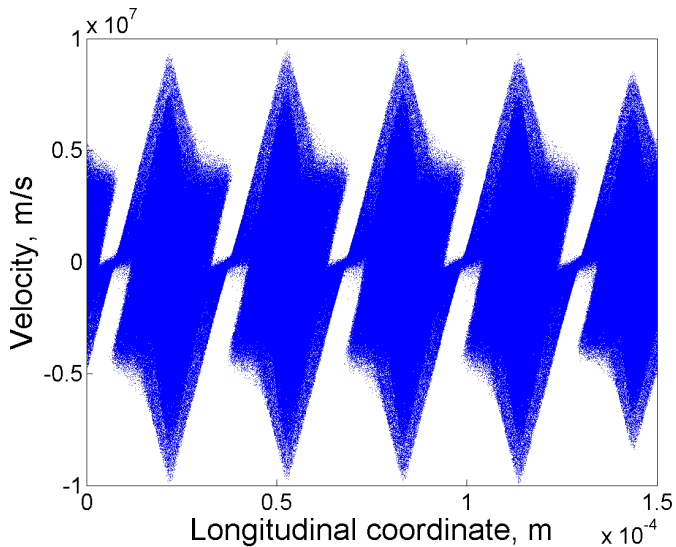


(b) Velocity

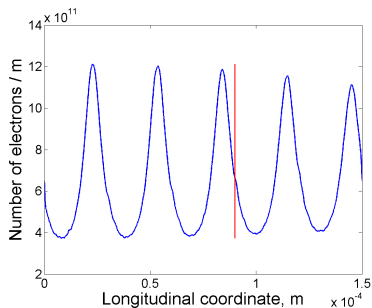
Background at beginning



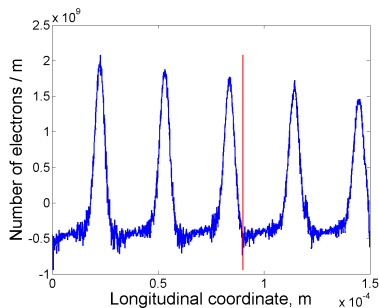
Background at 1.5 m



Longitudinal density distribution at beginning

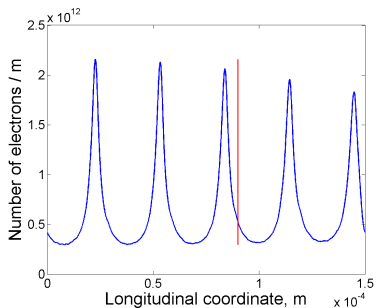


(a) Background

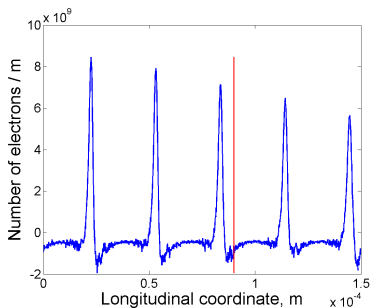


(b) Signal

Longitudinal density distribution at 0.3 m

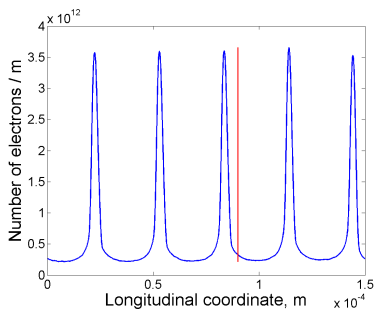


(a) Background

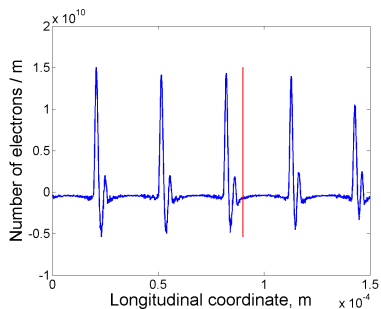


(b) Signal

Longitudinal density distribution at 0.6 m

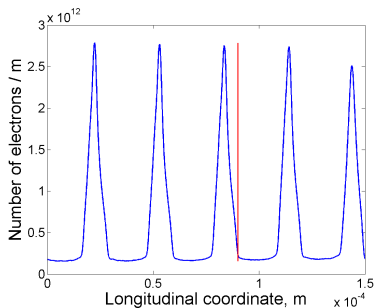


(a) Background

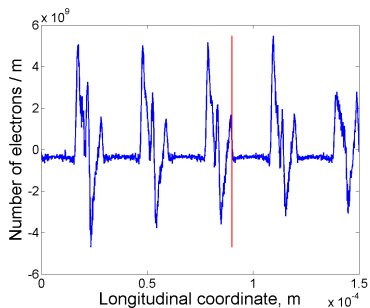


(b) Signal

Longitudinal density distribution at 0.9 m

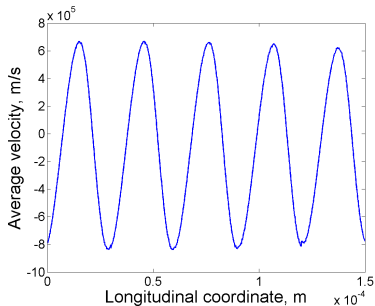


(a) Background

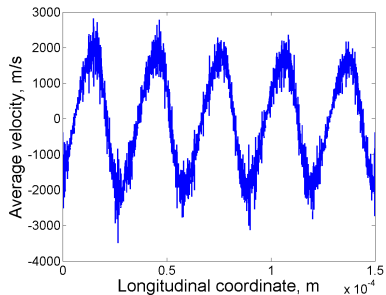


(b) Signal

Longitudinal velocity distribution at beginning

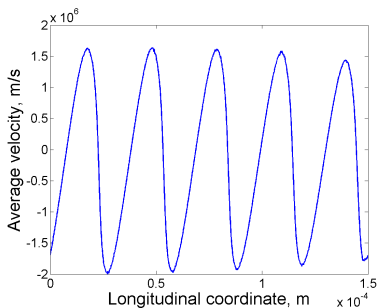


(a) Background

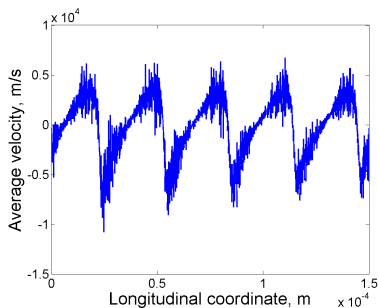


(b) Signal

Longitudinal velocity distribution at 0.3 m

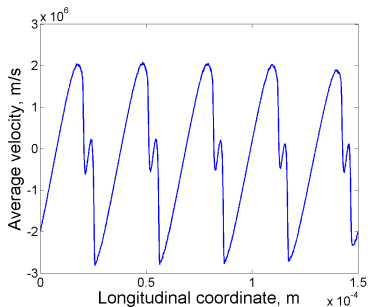


(a) Background

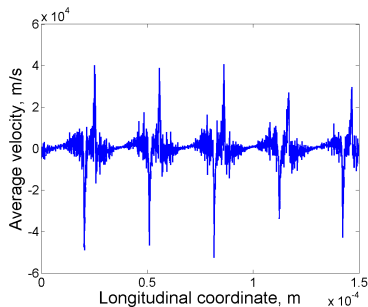


(b) Signal

Longitudinal velocity distribution at 0.6 m

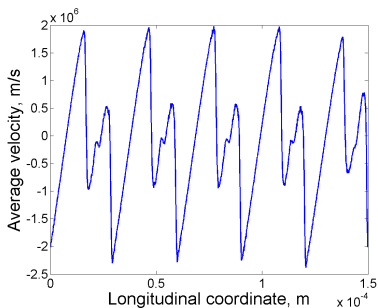


(a) Background

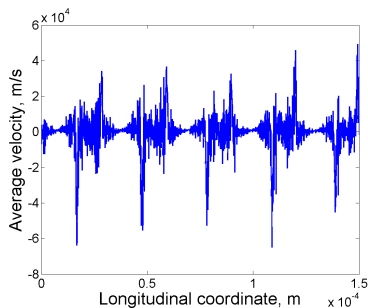


(b) Signal

Longitudinal velocity distribution at 0.9 m

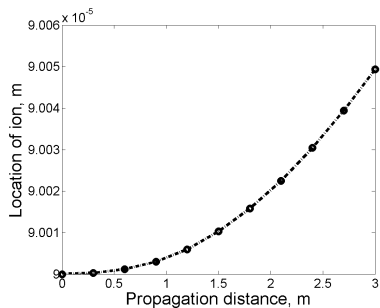


(a) Background

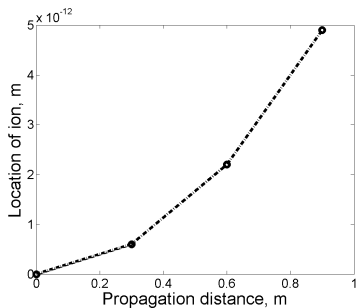


(b) Signal

Ion's position

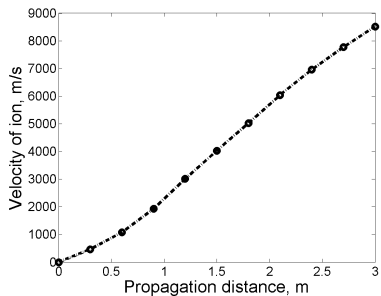


(a) Background

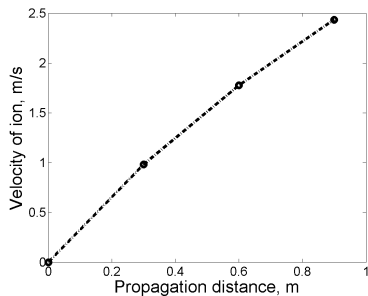


(b) Signal

Ion's velocity



(a) Background



(b) Signal