

# FII Simulation Progress

- Ion oscillation frequencies for uniform and Gaussian charge distributions consistent
- Small amplitudes
  - Near the beam axis, Gaussian is nearly uniform
  - Gaussian frequency equal to uniform frequency (with appropriate charge density)
- Large amplitudes
  - Far from the beam axis, Gaussian and uniform approach line charges
  - Gaussian frequency equal to uniform frequency

# Frequency Comparisons (CO<sup>+</sup>)

$$r_{beam} = 2 \text{ mm}, l_{bunch} = 1 \text{ cm}$$

$$N = 10^{10} e^-/\text{bunch}$$

$$\sigma_x = \sigma_y = 2 \text{ mm}, \sigma_z = 5 \text{ mm}$$

$$\text{Bunch spacing} = 14 \text{ ns}$$

		Small amplitude (1 $\mu\text{m}$ )	Large amplitude (1 cm)
Uniform (C++)	Solid	272,598 Hz	95,833 Hz
	Bunched	274,696	96,090
Uniform (Fortran)	Solid	272,598	95,833
	Bunched	274,696	96,090
Gaussian (Fortran)	Solid	272,599	94,242
	Bunched	274,686	94,501

# CO<sup>+</sup> Oscillation Frequency vs. Amplitude

