Compare Simulation Data with Theory

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Analytical Results

The theory assumes Kappa-2 distribution of background electrons’ velocities and uniform spatial density. Electrons’ line number density distribution due to the modulation reads

\[
\lambda_1(z) = \int_0^{\omega_{pl}} d\tau \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} n(\vec{x}, \tau) \, dx \, dy = \frac{Z_i}{\pi a_z} \int_0^{\omega_{pl}} \frac{\tau \sin(\tau)}{(\vec{z} + \vec{v}_z \tau)^2 + \tau^2} d\tau
\]

For \( v_z = 0 \), above formula reduces to \( \lim_{t \to \infty} \lambda_1(z) = \frac{Z_i}{2a_z} \exp\left( -\frac{|z|}{a_z} \right) \)

Move simulation data up by 10
Superposition of ions?

Superposition of multiple ions does not seem to explain the discrepancy between theory and simulation.
Velocity Modulation

Super-position of multiple ions give better agreement on the overall shape, but the amplitude is off...
... by a factor of 2.5?

Need to understand where this factor may come from...