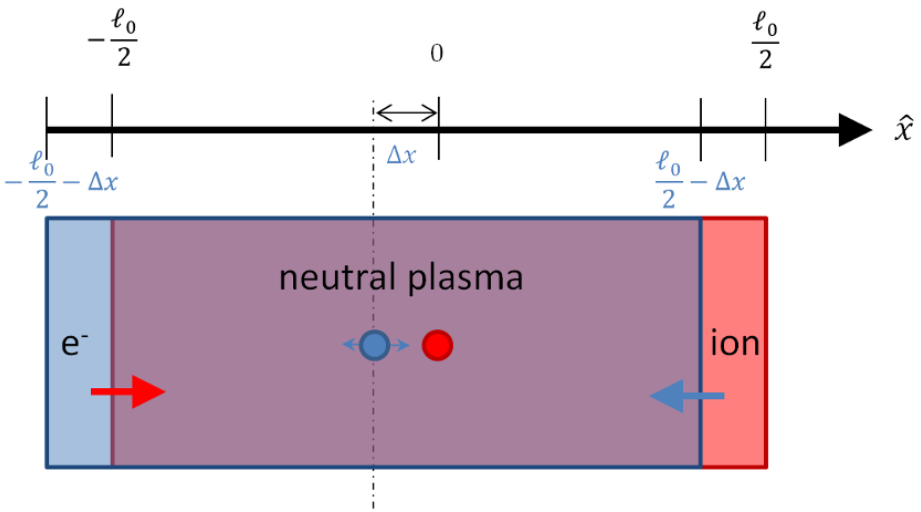
Plasma Oscillations



- Outside agency (e.g. EM wave) cause all of the electrons to be displaced by the very small amount of Δx.
- Equation of motion: $m_{tot}\frac{d^2}{dt^2}\Delta x = q_{tot}E$, where $m_{tot} = m_e n_0 V$.
- Integral form of the Gauss law: $EA = \frac{en_0 A\Delta x}{\epsilon_0}$ gives: $E = \frac{en_0}{\epsilon_0}\Delta x$.
- Then: $m_e n_0 V\frac{d^2}{dt^2}\Delta x = -en_0 V\frac{en_0}{\epsilon_0}\Delta x$, typical LHO form with oscillation at **electron plasma frequency** $\omega_{pe} = \sqrt{\frac{e^2 n_0}{m_e \epsilon_0}}$.

credit:[Conrad Schiff@underthehood.blogwyrm, 2016]


Conrad Schiff@underthehood.blogwyrm (2016). Plasma oscillations. http://underthehood.blogwyrm.com/?p=886. [Online; accessed 1-January-2019].