

Estimate of electron collision frequency ν

$$\nu \approx n \sigma v_{Te} \quad \sigma \text{ is the cross section for scattering}$$

• Estimate σ using large angle scattering: impact parameters required
Will scale like the distance of closest approach b_0 , when kinetic energies
and potential energies are equal:

$$b_0 = \frac{e^2}{T_e}$$

$$\sigma \sim \pi b_0^2 \sim \frac{e^4}{T_e^2}$$

$$\Rightarrow \nu \sim \frac{n e^4}{T_e^2} \cdot \sqrt{\frac{T_e}{m_e}} \sim \frac{n e^4}{T_e^{3/2} m_e^{1/2}}$$

$$\frac{\nu}{\omega_{pe}} \approx \frac{n e^4}{T_e^{3/2} m_e^{1/2}} \cdot \frac{m_e^{1/2}}{n^{1/2} e} = \frac{n^{1/2} e^3}{T_e^{3/2}}$$

The plasma parameter $\Lambda = n \lambda_D^3 \approx n \cdot \left(\frac{T_e}{n e^2} \right)^{3/2} = \frac{T_e^{3/2}}{n^{1/2} e^3}$

$$\Rightarrow \frac{\nu}{\omega_{pe}} \sim \frac{1}{\Lambda}$$