

$$\omega^2 = \frac{k^2 C_D^2}{(1 + k^2 \lambda_D^2)};$$

where,  $C_D = \left[ \frac{\left( \frac{T_i}{m_d} \right) \varepsilon Z^2}{1 + \left( \frac{T_i}{T_e} \right) (1 - \varepsilon Z)} \right]^{1/2}$

$$\lambda_D^{-2} = \lambda_{De}^{-2} + \lambda_{Di}^{-2} \quad \text{and} \quad \varepsilon = \frac{n_d}{n_i}$$