1. \( N_i N_j - N^2 S_{ij} + C_{ij} = 0 \) in general
   (i) resonance is necessary (but not sufficient) condition for electrostatic wave.
   no resonance (see Qn 2) \( \rightarrow \) not electrostatic

2. Rewrite \( N_i^2 = \frac{z e^2 \omega^2}{V_c^2 c^2} \left( 1 - \frac{5 \alpha^2}{z^2} \right) \)
   No choice of \( C \) will lead \( N_i^2 \rightarrow \infty \).
   Thus there is no resonance.

3. Easily see what at \( \omega^2 = 5 \alpha^2 \):
   \( \omega^2 > 5 \alpha^2 \) normal propagation (\( N_i^2 > 0 \))
   \( \omega^2 < 5 \alpha^2 \) must have \( N_i^2 < 0 \).
   Crossover between propagation and attenuation gives cutoff.