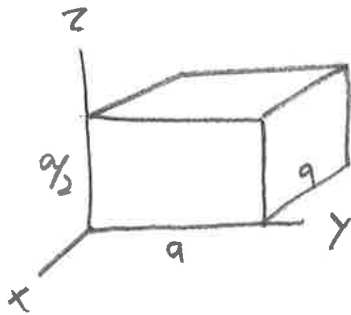


BB 5.7

Copper box resonator



$$\left. \begin{aligned} E_z &= E_0 \sin(k_x x) \sin(k_y y) \sin(\omega t) \\ E_x &= E_y = 0 \end{aligned} \right\} \text{possible solution of wave eqn.}$$

a) find lowest resonance frequency ω , and λ ,

$$\omega_0(m, n, p) = \pi c \sqrt{\left(\frac{m}{a}\right)^2 + \left(\frac{n}{a}\right)^2 + \left(\frac{2p}{a}\right)^2}$$

$$\omega_0(1, 1, 0) = \pi c \sqrt{\frac{2}{a^2}} = \sqrt{2} \frac{\pi c}{a}$$

$$\lambda(1, 1, 0) = \frac{2\pi}{k} = \frac{2\pi c}{\omega} = \frac{2\pi c a}{\sqrt{2} \pi c} = \sqrt{2} a$$

b) next lowest.

$$\omega_0(1, 0, 1) = \pi c \sqrt{\frac{1}{a^2} + \frac{1}{a^2}} = \sqrt{2} \frac{\pi c}{a}$$

$$\lambda(1, 0, 1) = \frac{2\pi c a}{\sqrt{2} \pi c} = \frac{2}{\sqrt{2}} a = \sqrt{2} a$$