

The lowest TM mode has  $m = 0, n = 1, p = 0$ , and so is designated  $\text{TM}_{0,1,0}$ . Its resonance frequency is

$$\omega_{010} = \frac{2.405}{\sqrt{\mu\epsilon}R}$$

The explicit expressions for the fields are

$$\left. \begin{aligned} E_z &= E_0 J_0\left(\frac{2.405\rho}{R}\right) e^{-i\omega t} \\ H_\phi &= -i\sqrt{\frac{\epsilon}{\mu}} E_0 J_1\left(\frac{2.405\rho}{R}\right) e^{-i\omega t} \end{aligned} \right\} \quad (8.82)$$

The resonant frequency for this mode is independent of  $d$ . Consequently simple tuning is impossible.