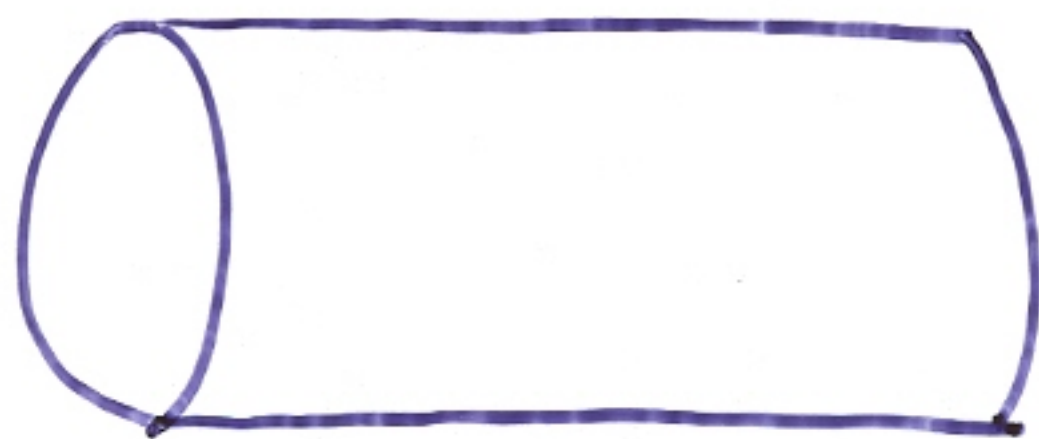


Resonating Cavities - Cylindrical



Travelling waves \Rightarrow normal solution:

TM solution

$$\mu_0 \epsilon_0 \omega^2 - k_z^2 = \chi_{mn}^2 = \frac{\chi_{mn}^2}{a^2}$$

where χ_{mn} = n^{th} zero of m^{th} Bessel function

any $\omega > \frac{\chi_{mn}}{\mu_0 \epsilon_0 a^2}$ is allowed

New Boundary conditions:

$$E_r = 0 \text{ at ends.}$$

$$E_r^{\vee}(z=0) = -E_r^{\vee}(z=0)$$

$$E_r^{\vee}(z=l) = -E_r^{\vee}(z=l)$$

$$\Rightarrow \sin(k_z l) = 0$$

$$\Rightarrow k_z = \frac{p\pi}{l} \quad p = \text{integer}$$

$$\Rightarrow \epsilon_0 \mu_0 \omega^2 = \frac{\chi_{mn}^2}{a^2} + \left(\frac{p\pi}{l}\right)^2$$

$$\omega^2 = \frac{1}{\mu_0 \epsilon_0} \left[\frac{\chi_{mn}^2}{a^2} + \left(\frac{p\pi}{l}\right)^2 \right]$$

only specific resonance frequencies are allowed!!