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$$\int_0^{L_x}\int_0^{L_y} \cos\left(\frac{q\pi}{L_x}x\right)\cos\left(\frac{k\pi}{L_x}x\right)\cos\left(\frac{r\pi}{L_y}y\right)\cos\left(\frac{m\pi}{L_y}y\right)dx\,dy$$

$$\int_0^{L_x}\int_0^{L_y} \cos\left(\frac{q\pi}{L_x}x\right)\cos\left(\frac{k\pi}{L_x}x\right)$$

$$\underbrace{\int_0^{L_x} \cos\left(\frac{q\pi}{L_x}x\right)\cos\left(\frac{k\pi}{L_x}x\right)dx}_{\delta}\ \underbrace{\int_0^{L_y} \cos\left(\frac{r\pi}{L_y}y\right)\cos\left(\frac{m\pi}{L_y}y\right)dy}_{\gamma}$$

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$\delta_{00} = L_x \quad \delta_{11} = \frac{L_x}{2}, \quad \gamma_{00} = L_y, \gamma_{mm} = \frac{L_y}{2}$

$l=0, m=5 \Rightarrow I = L_x \frac{L_y}{2}$

So

$$\delta_{lm} = \begin{cases} L_x L_y, & l=m=0 \\ L_x L_y/2, & m=0, l\geq 1 \;;\; l=0, m\geq 1 \\ L_x L_y/4, & m>0, l>0 \end{cases}$$

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Resonance Frequencies for Three Dimensional Rectangular Cavity.

$$k_z L_z = n\pi \qquad n = 0, 1, \ldots$$

$$\sqrt{\left(\frac{\omega}{c}\right)^2 - \left(\frac{l\pi}{L_x}\right)^2 - \left(\frac{m\pi}{L_y}\right)^2}\; L_z = n\pi$$

$$\left(\frac{\omega}{c}\right)^2 = \left(\frac{n\pi}{L_z}\right)^2 + \left(\frac{l\pi}{L_x}\right)^2 + \left(\frac{m\pi}{L_y}\right)^2$$

$$f_{l,m,n} = \frac{c}{2\pi}\sqrt{\left(\frac{l\pi}{L_x}\right)^2 + \left(\frac{m\pi}{L_y}\right)^2 + \left(\frac{n\pi}{L_z}\right)^2} \quad \text{Hz}$$