

1.

$$\begin{aligned}
 S_{1,0} &= \frac{1}{2} \frac{\omega k a^2 \mu}{\pi^2} H_0^2 \sin^2 \frac{\pi x}{a} \\
 P_{1,0} &= \frac{1}{4} \frac{\omega k a^3 b \mu}{\pi^2} H_0^2 \\
 -\frac{dP}{dz} &= \frac{1}{2\sigma\delta} \int |\vec{n} \times \vec{H}|^2 dl \\
 &= \frac{H_0^2}{4\sigma\delta} \left(2b + a + \frac{k^2 a^3}{\pi^2} \right) \\
 \beta_{1,0} &= \frac{\pi^2}{2\mu_0 k a^3 b \sqrt{2\mu_c \sigma \omega}} \left(2b + a + \frac{k^2 a^3}{\pi^2} \right) \\
 &= \frac{\pi^2}{2\mu_0 a^3 b \sqrt{2\mu_c \mu \varepsilon \sigma \omega (\omega^2 - \omega_{1,0}^2)}} \left(2b + a + \frac{\mu \varepsilon (\omega^2 - \omega_{1,0}^2) a^3}{\pi^2} \right)
 \end{aligned}$$

2.

$$\begin{aligned}
 B_z &= B_0 \cos \frac{\pi x}{a} \sin \frac{\pi z}{d} e^{-i\omega t} \\
 B_x &= -\frac{a}{d} B_0 \sin \frac{\pi x}{a} \cos \frac{\pi z}{d} e^{-i\omega t} \\
 E_y &= i \frac{\omega a}{\pi} B_0 \sin \frac{\pi x}{a} \sin \frac{\pi z}{d} e^{-i\omega t} \\
 U &= \frac{a^2 d}{8\mu} \left(B_0^2 + B_0^2 \frac{a^2}{d^2} + \mu \varepsilon \frac{\omega^2 a^2}{\pi^2} B_0^2 \right) \\
 &= \frac{a^2 d B_0^2}{4\mu} \left(1 + \frac{a^2}{d^2} \right) \\
 P &= \frac{B_0^2 a^2}{2\mu^2 \sigma \delta} \left(\frac{d}{a} + \frac{a^2}{d^2} + \frac{a}{2d} \right) \\
 Q &= \omega \frac{U}{P} \\
 &= \frac{\mu \sigma \delta \omega d}{2} \left(1 + \frac{a^2}{d^2} \right) \left(\frac{d}{a} + \frac{a^2}{d^2} + \frac{a}{2d} \right)^{-1}
 \end{aligned}$$

3.