

**8.46** Measurement of the TE<sub>101</sub> frequency response of an air-filled cubic cavity revealed that its  $Q$  is 4802. If its volume is 64 mm<sup>3</sup>, what material are its sides made of? [Hint: See Appendix B.]

**Solution:**

According to Eq. (8.121), the TE<sub>101</sub> resonant frequency of a cubic cavity is given by

$$f_{101} = \frac{3 \times 10^8}{\sqrt{2}a} = \frac{3 \times 10^8}{\sqrt{2} \times 4 \times 10^{-3}} = 53.0 \text{ GHz.}$$

Its  $Q$  is given by

$$Q = \frac{a}{3\delta_s} = 4802,$$

which gives  $\delta_s = 2.78 \times 10^{-7}$  m. Applying

$$\delta_s = \frac{1}{\sqrt{\pi f_{101} \mu_0 \sigma_c}},$$

and solving for  $\sigma_c$  leads to

$$\sigma_c \simeq 6.2 \times 10^7 \text{ S/m.}$$

According to Appendix B, the material is silver.

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