

8.12 A plane wave of unknown frequency is normally incident in air upon the surface of a perfect conductor. Using an electric-field meter, it was determined that the total electric field in the air medium is always zero when measured at a distance of 3 m from the conductor surface. Moreover, no such nulls were observed at distances closer to the conductor. What is the frequency of the incident wave?

Solution: The electric field of the standing wave is zero at the conductor surface, and the standing wave pattern repeats itself every $\lambda/2$. Hence,

$$\frac{\lambda}{2} = 3 \text{ m}, \quad \text{or } \lambda = 6 \text{ m},$$

in which case

$$f = \frac{c}{\lambda} = \frac{3 \times 10^8}{6} = 5 \times 10^7 = 50 \text{ MHz}.$$
