

Problem 9.1 A center-fed Hertzian dipole is excited by a current $I_0 = 20$ A. If the dipole is $\lambda/50$ in length, determine the maximum radiated power density at a distance of 1 km.

Solution: From Eq. (9.14), the maximum power density radiated by a Hertzian dipole is given by

$$\begin{aligned} S_0 &= \frac{\eta_0 k^2 I_0^2 l^2}{32\pi^2 R^2} = \frac{377 \times (2\pi/\lambda)^2 \times 20^2 \times (\lambda/50)^2}{32\pi^2 (10^3)^2} \\ &= 7.6 \times 10^{-6} \text{ W/m}^2 = 7.6 \text{ } (\mu\text{W/m}^2). \end{aligned}$$
