

Problem 7.5 A wave radiated by a source in air is incident upon a soil surface, whereupon a part of the wave is transmitted into the soil medium. If the wavelength of the wave is 60 cm in air and 20 cm in the soil medium, what is the soil's relative permittivity? Assume the soil to be a very low-loss medium.

Solution: From $\lambda = \lambda_0 / \sqrt{\epsilon_r}$,

$$\epsilon_r = \left(\frac{\lambda_0}{\lambda} \right)^2 = \left(\frac{60}{20} \right)^2 = 9.$$
