

Microwaves

Series 6

Problem 1

Determine the dimensions of a quarter wave transformer made in microstrip line technology, which will allow matching a $12.5\ \Omega$ line to a line having a characteristic impedance of $50\ \Omega$. The frequency of the signal is 3.8 GHz, and we use a dielectric substrate having a thickness of 0.6 mm and a relative permittivity $\epsilon_r=9.5$.

Problem 2

A microstrip line has a characteristic impedance of $50\ \Omega$ and a width of 1.8 mm. The permittivity of the substrate is 3. What is the frequency corresponding to the limit of apparition of radiation? Do we need to correct for dispersion at this frequency?

Problem 3

In a waveguide (either circular or rectangular, it does not matter) where a given single mode is excited, a 5 GHz signal has a wavelength $\lambda_g = 8\text{ cm}$. We fill this waveguide with a lossless liquid, and see that the wavelength is now of 6.8 cm. What is the relative dielectric permittivity of the liquid ?