

Microwaves

Series 4

Problem 1

The cutoff frequency of a waveguide mode is of 2 GHz, and the frequency of the signal is of 3 GHz. Give the wavelength, the phase and group velocities and the wave impedance for

- a) a TE mode
- b) a TM mode

Problem 2

Consider two waveguides, the first of section 20mm x 12 mm and the second of section 16mm x 12mm.

- a) what are the cutoff frequencies of the dominant mode for these waveguides ?
- b) what is the first higher order mode and what is its cutoff frequency for both waveguides ?
- c) We connect the two guides together. What will be the reflection coefficient at the interface for a signal having a frequency of 10 GHz ?

Problem 3

We use a square waveguide filled with air, having a side dimension of 5 cm, in order to transmit a signal at a frequency of 6.2 GHz. How many TE modes can propagate at this frequency ? For each mode, what is the time taken for a modulated pulse to travel through a guide 100m long ?