

Exercise 3

3.7

A plane wave at 900 MHz is incident from free space onto a material with relative dielectric constant of 4. What are the phase velocity and wave length of the refracted wave.

3.8

A transmitter and a receiver separated by 10 km operate at 400 MHz and are at the same height above the Earth. Relative to the transmitter, how much lower must an absorbing diffracting obstacle situated at the centre of the path be for negligible diffraction loss? Calculate the diffraction loss produced when the obstacle is increased to 10 m above the transmitter height.

3.10ed

A microwave link at 17 GHz is to be deployed in an urban area. The transmitter is located at 15 m above ground and the receiver will be a 5 m above ground. Determine the maximum possible height of a building at the centre of the path if the transmitter and receiver are separated by 5 km and no additional loss.

4.5

A 900 MHz base station antenna has a vertical dimension 2 m and horizontal dimension 35 cm. What is the maximum achievable gain? Given the antenna is required to have a 3 dB beamwidth in the horizontal direction 90° , estimate the vertical beamwidth.