

CHAPTER OVERVIEW

9: Electromagnetic Waves

Chapter 9 treats the propagation of plane waves in vacuum and simple media, at planar boundaries, and in combinations confined between sets of planar boundaries, as in waveguides or cavity resonators. Chapter 10 then discusses how such waves can be generated and received by antennas and antenna arrays. More specifically, Section 9.1 explains how plane waves are reflected from planar boundaries at normal incidence, and Section 9.2 treats reflection and refraction when the waves are incident at arbitrary angles. Section 9.3 then explains how linear combinations of such waves can satisfy all boundary conditions when they are confined within parallel plates or rectangular cylinders acting as waveguides. By adding planar boundaries at the ends of such waveguides, waves can be trapped at the resonant frequencies of the resulting cavity, as explained in Section 9.4. Sections 9.5 then treat waves in anisotropic, dispersive, and ionized media, respectively.

[9.1: Waves at planar boundaries at normal incidence](#)

[9.2: Waves incident on planar boundaries at angles](#)

[9.3: Waves Guided within Cartesian Boundaries](#)

[9.4: Cavity resonators](#)

[9.5: Waves in complex media](#)

Thumbnail: Sinusoidal traveling plane wave entering a region of lower wave velocity at an angle, illustrating the decrease in wavelength and change of direction (refraction) that results. (CC BY-SA 3.0 Unported; Richard F. Lyon via Wikipedia)

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