

CHAPTER OVERVIEW

7: Electromagnetic Wave Propagation

This (rather extensive) chapter focuses on the most important effect that follows from the time-dependent Maxwell equations, namely the electromagnetic waves, at this stage avoiding a discussion of their origin, i.e. the radiation process – which will be the subject of Chapters 8 and 10. The discussion starts from the simplest, plane waves in uniform and isotropic media, and then proceeds to nonuniform systems, bringing up such effects as reflection and refraction. Then we will discuss the so-called guided waves, propagating along various long transmission lines – such as coaxial cables, waveguides, and optical fibers. Finally, the end of the chapter is devoted to final-length fragments of such lines, serving as resonators, and to effects of energy dissipation in transmission lines and resonators.

[7.1: Plane Waves](#)

[7.2: Attenuation and Dispersion](#)

[7.3: Reflection](#)

[7.4: Refraction](#)

[7.5: Transmission Lines- TEM Waves](#)

[7.6: Waveguides- H and E Waves](#)

[7.7: Dielectric Waveguides, Optical Fibers, and Paraxial Beams](#)

[7.8: Resonators](#)

[7.9: Energy Loss Effects](#)

[7.10: Exercise Problems](#)

Thumbnail: Animation of a half-wave dipole antenna transmitting radio waves, showing the electric field lines. (Public Domain; Chetvorno via Wikipedia)

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