CHAPTER OVERVIEW

10: Radiation by Relativistic Charges

The discussion of special relativity in the previous chapter enables us to revisit the analysis of the electromagnetic radiation by charged particles, now for arbitrary velocities. For a single point particle, we will be able to calculate the radiated wave fields in an explicit form, and analyze them for such important particular cases as the synchrotron radiation and the “Bremsstrahlung” (brake radiation). After that, we will discuss the apparently unrelated effect of the so-called Coulomb losses of energy by a particle moving in condensed matter, because this discussion will naturally lead us to such important phenomena as the Cherenkov radiation and the transitional radiation. At the end of the chapter, I will briefly review the effects of back action of the emitted radiation on the emitting particle, whose analysis reveals some limitations of classical electrodynamics.

Thumbnail: Illustration of a light cone. (Public Domain; Incnis Mrsi via Wikipedia)