OSCILLATING DIPOLE - Study Material

UHF half–wave dipole

Dipole antenna used by the radar altimeter in an airplane

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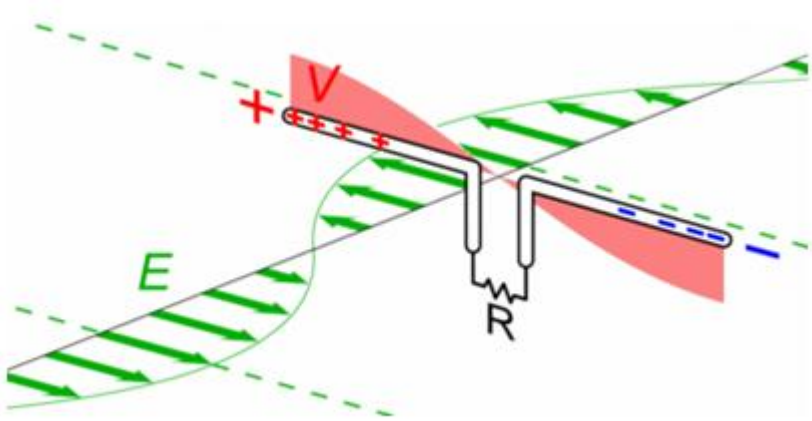

A half-wave dipole antenna receiving a radio signal. The incoming radio wave *(*whose electric field is shown as **E**, green arrows*)* causes an oscillating electric current within the antenna elements (black arrows), alternately charging the two sides of the antenna positively (+) and negatively (−). Since the antenna is one half a wavelength long at the radio wave's frequency, the voltage (shown as ***V***, *red bands*) and current in the antenna form a standing wave. This oscillating current flows down the antenna's transmission line through the radio receiver (represented by resistor **R**).

In radio and telecommunications a **dipole antenna** or **doublet** is the simplest and most widely used class of antenna. The dipole is any one of a class of antennas producing a radiation pattern approximating that of an elementary electric dipole with a radiating structure supporting a line current so energized that the current has only one node at each end. A dipole antenna commonly consists of two identical conductive elements such as metal wires or rods. The driving current from the transmitter is applied, or for receiving antennas the output signal to the receiver is taken, between the two halves of the antenna. Each side of the feedline to the transmitter or receiver is connected to one of the conductors. This contrasts with a monopole antenna, which consists of a single rod or conductor with one side of the feedline connected to it, and the other side connected to some type of ground. A common example of a dipole is the "rabbit ears" television antenna found on broadcast television sets.

The dipole is the simplest type of antenna from a theoretical point of view. Most commonly it consists of two conductors of equal length oriented end-to-end with the feedline connected between them. Dipoles are frequently used as resonant antennas. If the feedpoint of such an

antenna is shorted, then it will be able to resonate at a particular frequency, just like a guitar string that is plucked. Using the antenna at around that frequency is advantageous in terms of feedpoint impedance (and thus standing wave ratio), so its length is determined by the intended wavelength (or frequency) of operation. The most commonly used is the center-fed **half-wave dipole** which is just under a half-wavelength long. The radiation pattern of half-wave (or most other) dipoles is maximum perpendicular to the conductor, falling to zero in the axial direction, thus implementing an omni directional antenna if installed vertically, or (more commonly) a weakly directional antenna if horizontal.

Most antennas in use c

an be seen as based on the dipole. Although they may be used as standalone low-gain antennas, they are also employed as driven elements in more complex antenna designs such as the Yagi antenna and driven arrays. Dipole antennas (or such designs derived from them, including the monopole) are used to feed more elaborate directional antennas such as a horn antenna, parabolic reflector or corner reflector. Engineers analyze vertical (or other monopole) antennas on the basis of dipole antennas of which they are one half.