ANTENNA AND WAVE PROPAGATION

UNIT-3

The Loop Antenna

A loop antenna is a radio antenna consisting of a loop (or loops) of wire, tubing, or other electrical conductor with its ends connected to a balanced transmission line. Within this physical description there are two very distinct antenna designs: the small loop (or magnetic loop) with a size much smaller than a wavelength, and the resonant loop antenna with a circumference approximately equal to the wavelength.

Application of Loop Antennas

- They are used as radio receivers. They are used for aircraft receivers.
- For finding directions.
- As UHF transmitters

Horn Antennas

A horn antenna or microwave horn is an antenna that consists of a flaring metal waveguide shaped like a horn to direct radio waves in a beam. Horns are widely used as antennas at UHF and microwave frequencies, above 300 MHz.They are used as feeders (called feed horns) for larger antenna structures such as parabolic antennas, as standard calibration antennas to measure the gain of other antennas, and as directive antennas for such devices as radar guns, automatic door openers, and microwave radiometers.

Helical Antennas

A helical antenna is an antenna consisting of a conducting wire wound in the form of a helix. In most cases, helical antennas are mounted over a ground plane. The feed line is connected between the bottom of the helix and the ground plane. Helical antennas can operate in one of two principal modes: normal mode or axial mode.

Log-Periodic Antenna

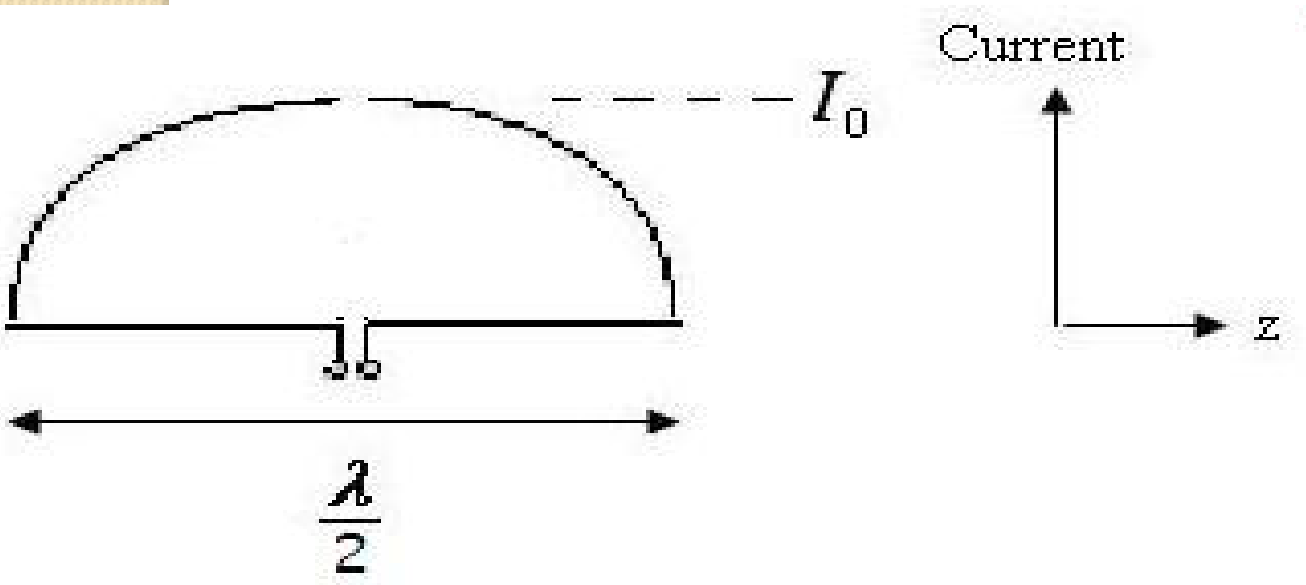
A log-periodic antenna (LP), also known as a log-periodic array or aerial, is a multi-element, directional, narrow-beam antenna that operates over a broad band of frequencies. The antenna normally consists of a series of dipoles positioned along the antenna axis, spaced at intervals following a logarithmic function of the frequency. It is normal to drive alternating elements with 180° (π radians) of phase shift from one another. LP antennas are widely used with television receivers, especially in the VHF band. LP's are also used for UHF, but have more recently been increasingly replaced by the Grey-Hoverman antenna and similar designs.

Micro strip Antennas- A micro strip antenna is a narrowband, wide-beam antenna fabricated by etching the antenna element pattern in metal trace bonded to an insulating dielectric substrate, such as a printed circuit board, with a continuous metal layer bonded to the opposite side of the substrate which forms a ground plane.

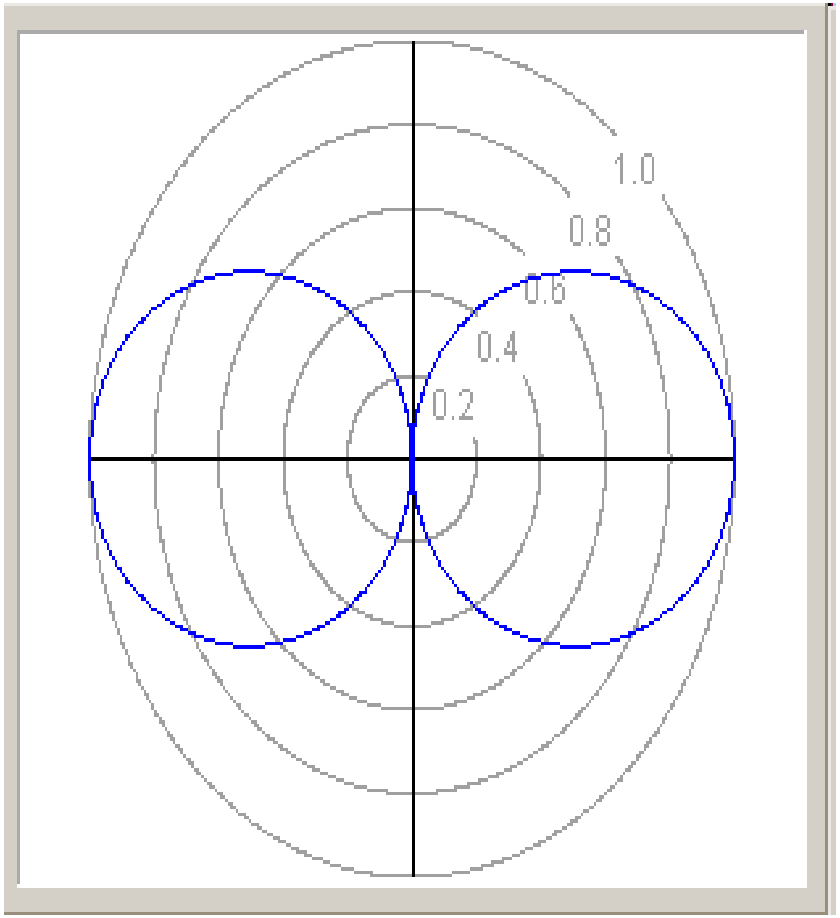
HALF WAVE DIPOLE ANTENNA

- The **half-wave dipole antenna** is just a special case of the dipole antenna.
- Half-wave term means that the length of this dipole antenna is equal to a half-wavelength at the frequency of operation.
- The dipole antenna, is the basis for most antenna designs, is a balanced component, with equal but opposite voltages and currents applied at its two terminals through a balanced transmission line.

- To make it crystal clear, if the antenna is to radiate at 600 MHz, what size should the half-wavelength dipole be?
- One wavelength at 600 MHz is $= c / f = 0.5$ meters. Hence, the half-wavelength dipole antenna's length is 0.25 meters.
- The half-wave dipole antenna is as you may expect, a simple half-wavelength wire fed at the center as shown in Figure


Current
I_0
z
$\frac{\lambda}{2}$

- Dipoles have an radiation pattern, doughnut symmetrical about the axis of the dipole. The radiation is maximum at right angles to the dipole, dropping off to zero on the antenna's axis.



Slot Antennas

Slot antennas are used typically at frequencies between 300 MHz and 24 GHz. The slot antenna is popular because they can be cut out of whatever surface they are to be mounted on, and have radiation patterns that are roughly omnidirectional