



ANTENNAS , WAVE PROPAGATION &TV ENGG



Topics to be covered

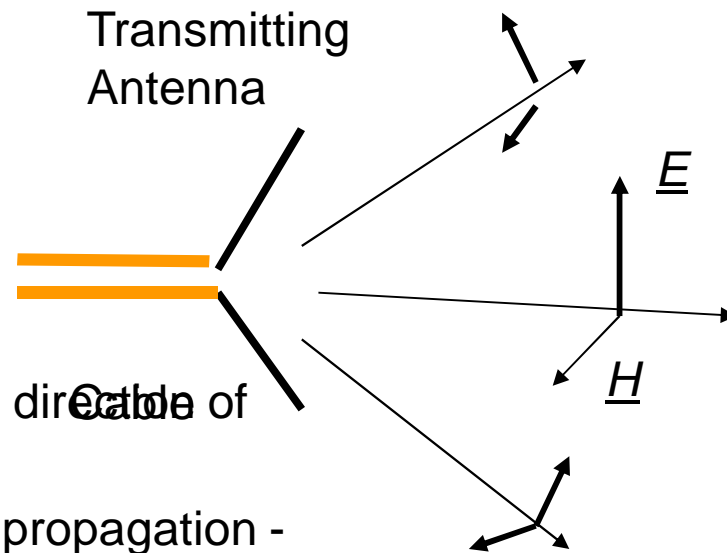
- Antenna Performance

Antenna Performance

- Channel Characteristics: *obstacles, distances temperature,...*
- Signal Frequency
- Antenna Dimensions

Antennas Radiate Electromagnetic Waves

- EM waves have:
 - Electric field \underline{E} (V/m)
 - Magnetic field \underline{H} (A/m)
- \underline{E} and \underline{H}
 - Perpendicular to each other and to direction of propagation - Polarization
 - Amplitude depends on direction of propagation - Radiation Pattern



Types of Antennas

- Wire antennas
- Aperture antennas
- Array antennas
- Reflector antennas
- Lens antennas
- Patch antennas

Types of Antennas

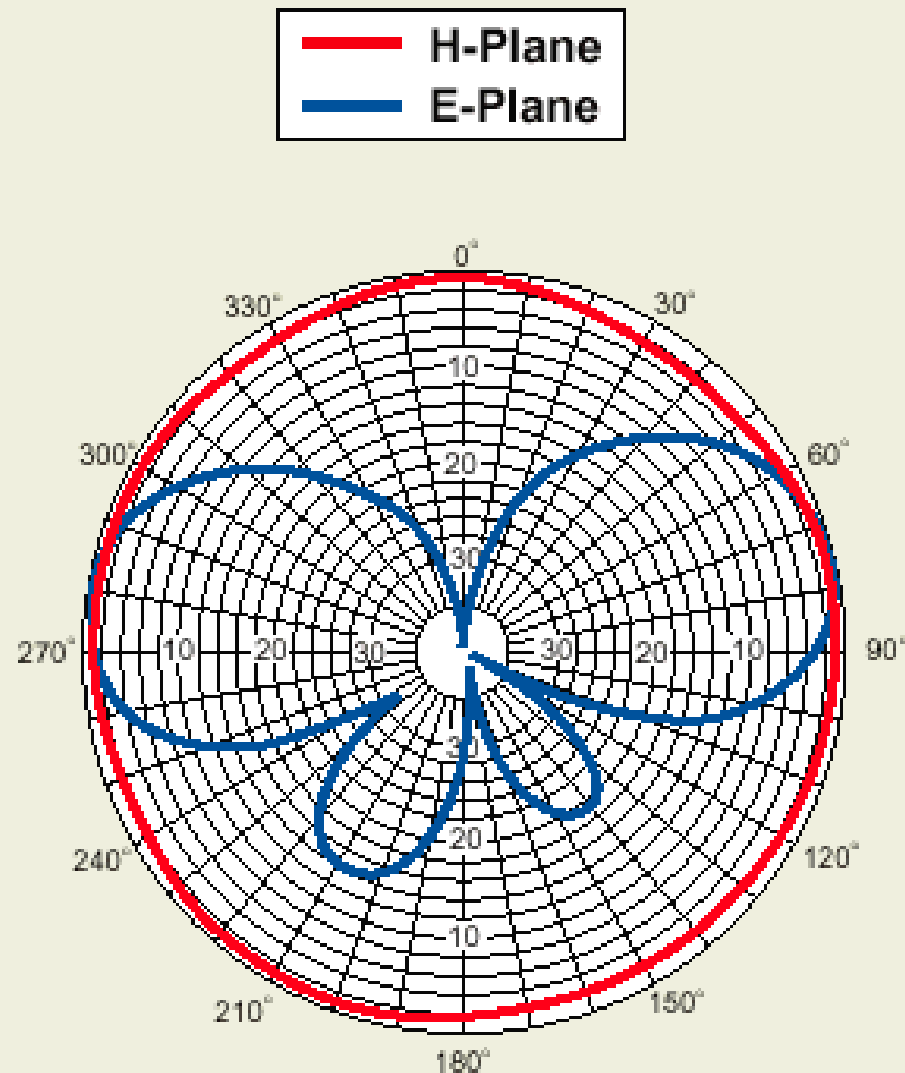
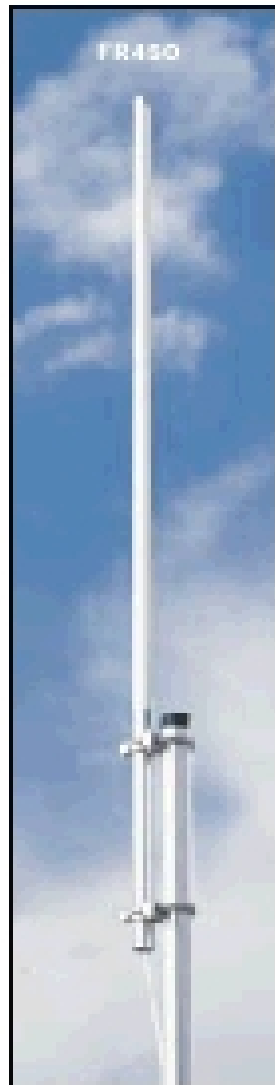
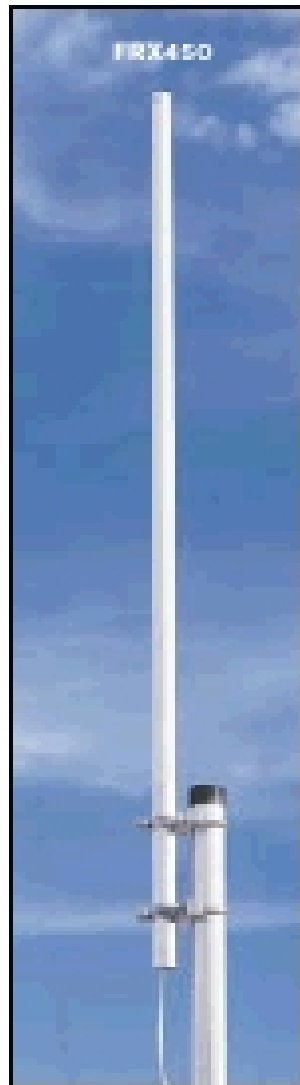
Simple wire

- Dipole
- Folded dipole
- Trap dipole
- Offset or Windom antenna
- Phased dipoles
- Vertical or horizontal (both)
- Beverage wave antenna

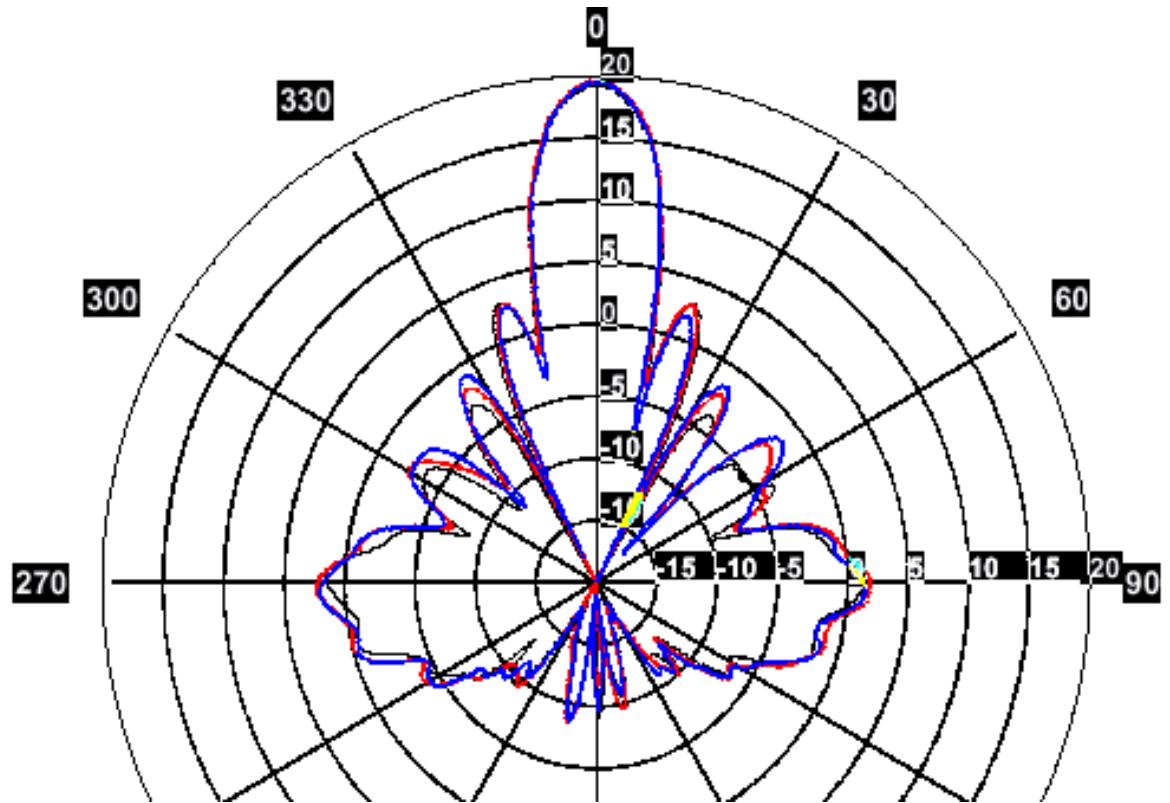
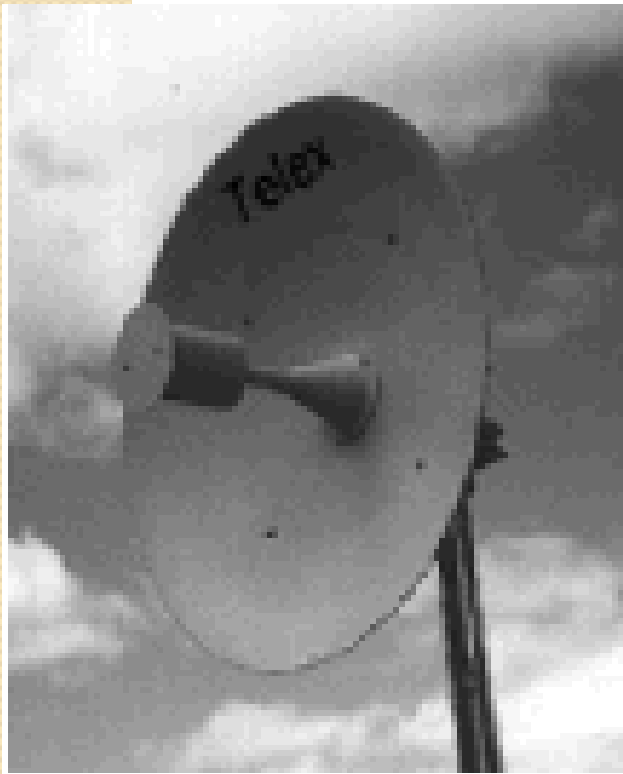
Types of Antennas

- Metal
- Vertical
- Yagi
- Trap Yagi
- Phased arrays
- Loops
- Vertical or Horizontal
- Horns for super ultra high frequencies
- Mobile antennas

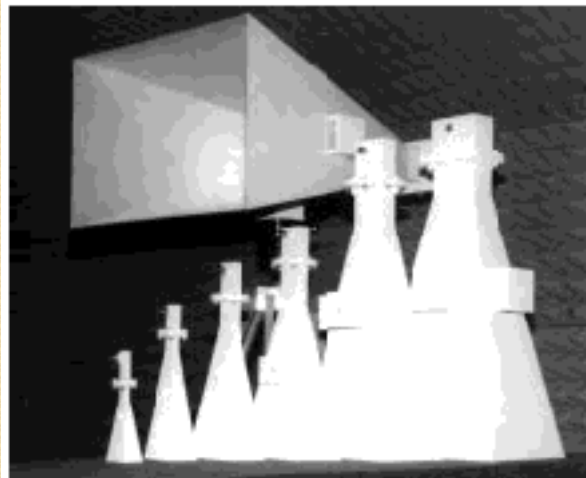
Omnidirectional Antennas



Parabolic Reflector Antenna



Horn Antennas



MWH ANTENNAS

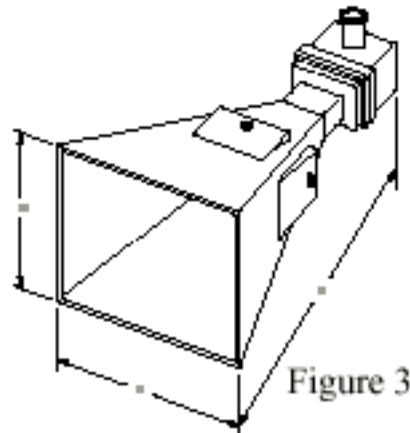
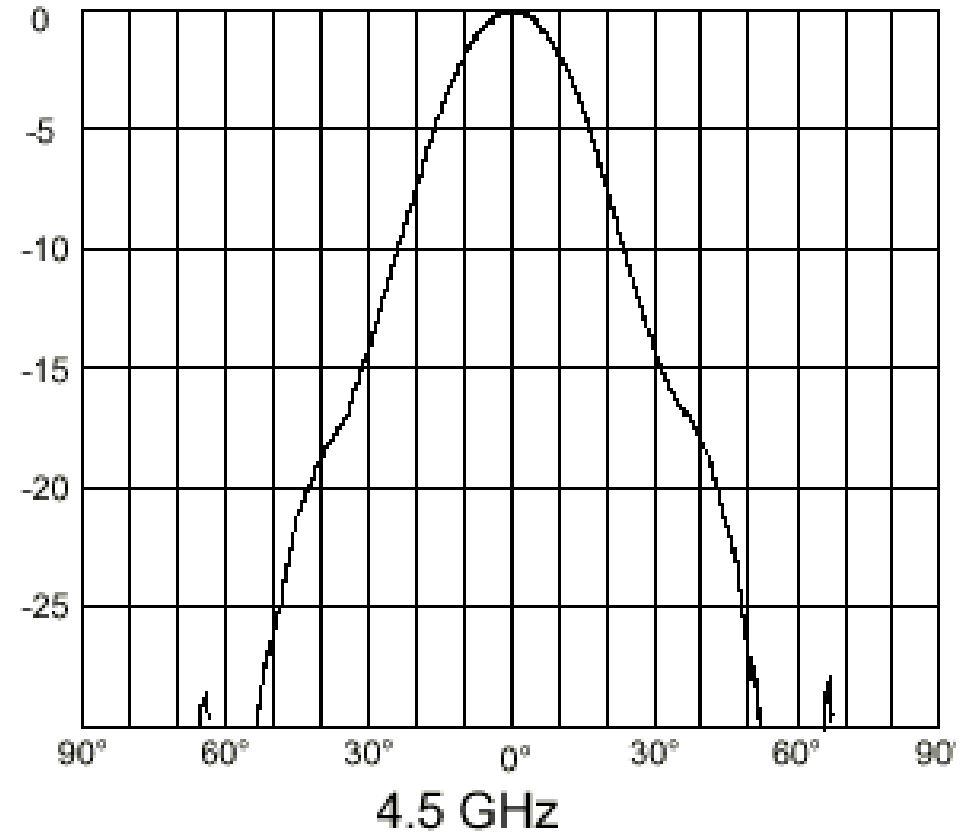


Figure 3

Relative
Gain
(dBi)

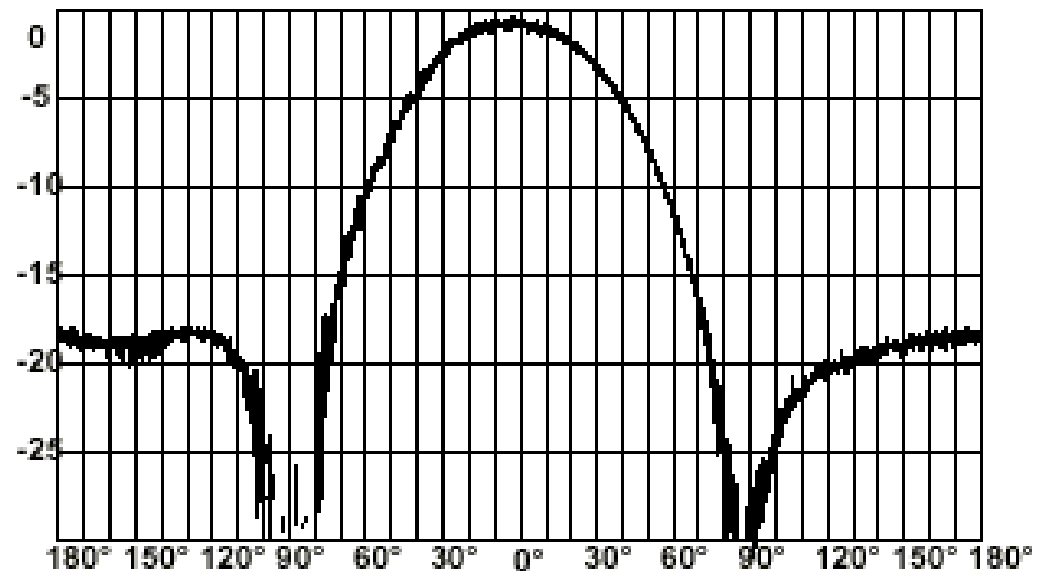


Log Periodic Dipole Array



LPD-475

RELATIVE
GAIN
(DBI)



47 MHz - E-PLANE

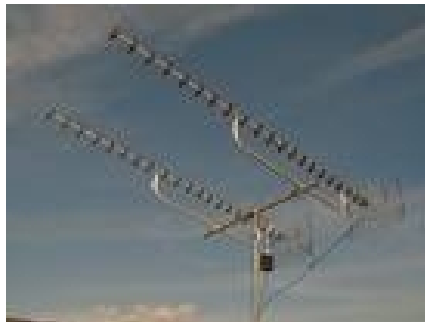
Antenna Basics

High Frequency

1.6 - 30 Mhz + 50 Mhz

160 - 6 metres

An antenna's size/length depends on the frequency
It's functionality largely depends on the height above ground, as well as the polarity and it's configuration



Some Math

Velocity of propagation 300,000,000 m/sec

For 1 wavelength, above 30 MHz

Frequency (f) = 300 / wavelength

Frequency measured in megahertz
Wavelength measured in meters

Wavelength (λ) = 300 / frequency

Above 30 MHz, $\lambda = 300/f$ metres or $984/f$ feet

For a half wave $\lambda = 150/f$ metres or $492/f$ feet

Below 30 MHz $\lambda = 286/f$ metres or $936/f$ feet (including the velocity factor of 0.95)

For a half wave $\lambda = 143/f$ metres or $468/f$ feet

The length of a half wave dipole for 3.65 MHz

The length of a half wave dipole for 3.65 MHz

$$L = 143/f = 143/3.65 = 39.18 \text{ metres}$$

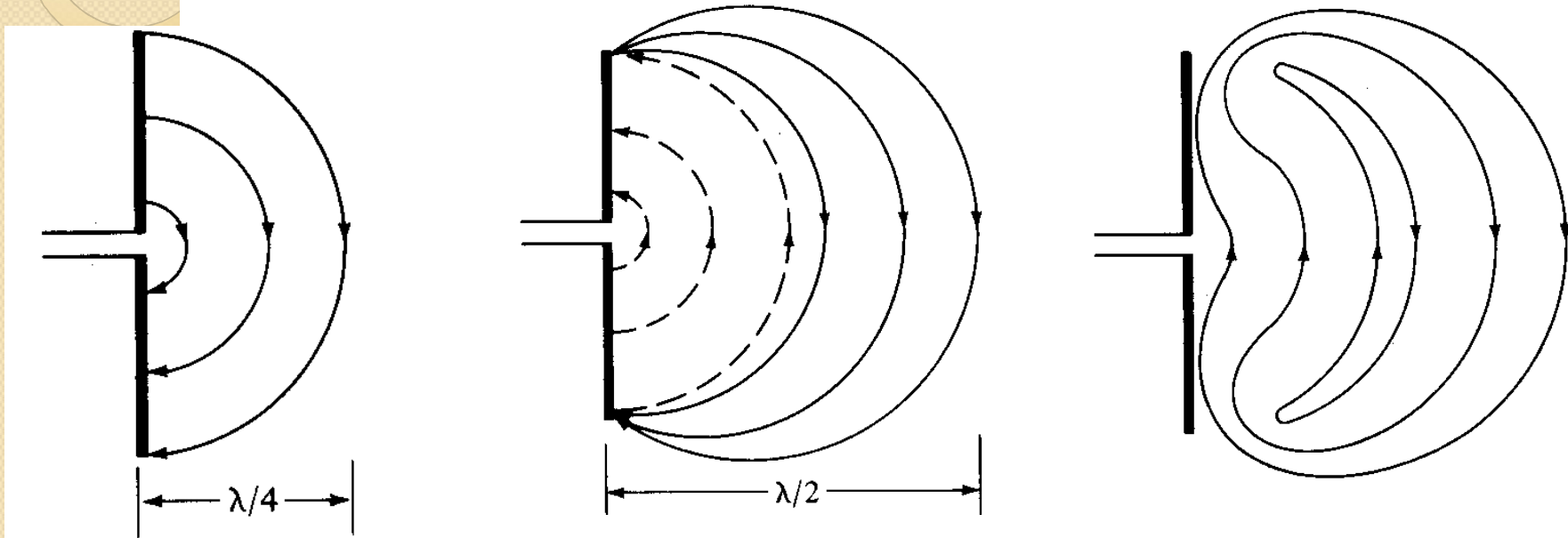
The higher the frequency the shorter the antenna

The lower the frequency the longer the antenna

Antenna Polarization

- Vertical or horizontal
- Electrical vs Magnetic radiation
(Diagram)
- Vertical waves travel @ 90° to the earth's surface
- Horizontal waves travel parallel to the earth's surface
- Usually wire antennas are horizontal but an inverted 'V' dipole has a vertical component
- Yagi type antennas can be either vertical or horizontal
Circular antennas can be both
- Usually, horizontally polarized antennas hear less noise

Radiation Mechanism





Antenna Parameters

- All antenna have important parameters common to all types of antenna irrespective of type of application listed below :
- Radiation pattern
- Radiation Power Density
- Radiation Intensity
- Gain, Directive gain

Antenna Parameters(cont...)

- Directivity, Power Gain
- Antenna Efficiency
- Effective Apperture
- Radiation Resistance
- Antenna Bandwidth
- Antenna Beam width
- Polarization
- Antenna Temperature
- Self Impedance
- Mutual Impedance

Types of Antennas

- 1. Isotropic antenna (idealized)**
 1. Radiates power equally in all directions
- 2. Dipole antennas**
 1. Half-wave dipole antenna (or Hertz antenna)
 2. Quarter-wave vertical antenna (or Marconi antenna)
- 3. Directional Antennas**
- 4. Reflective Antenna**