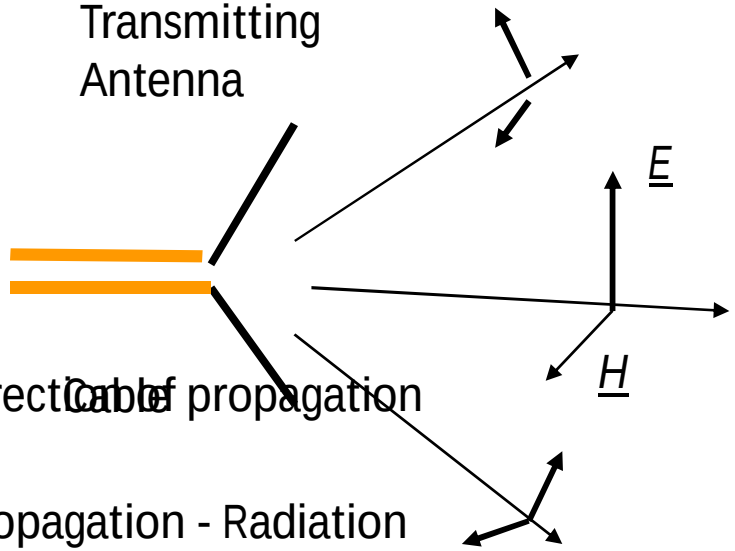
Antenna Performance

- 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

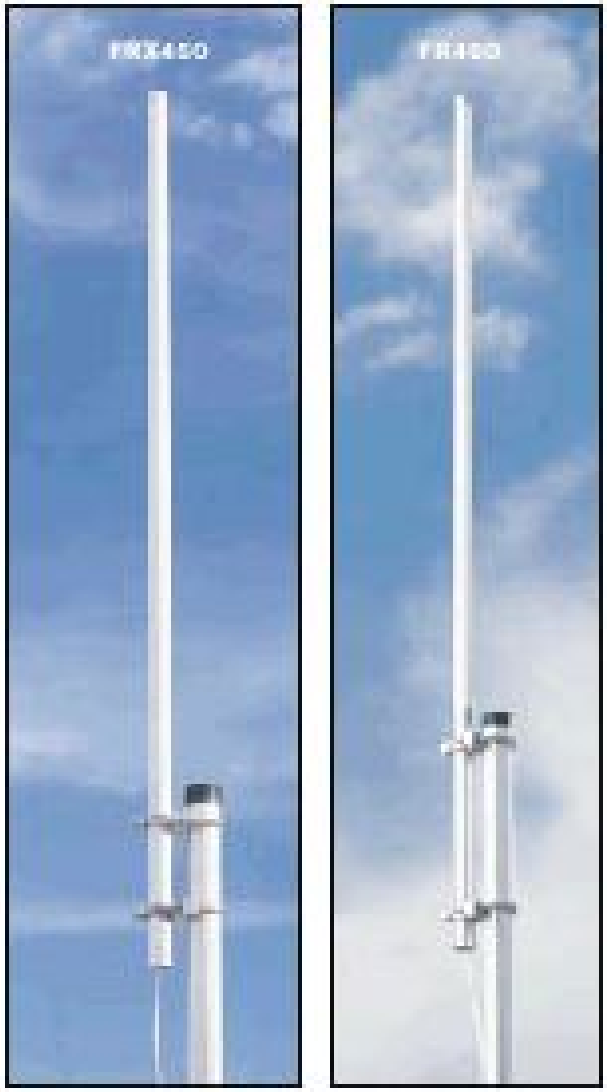
Simple wire

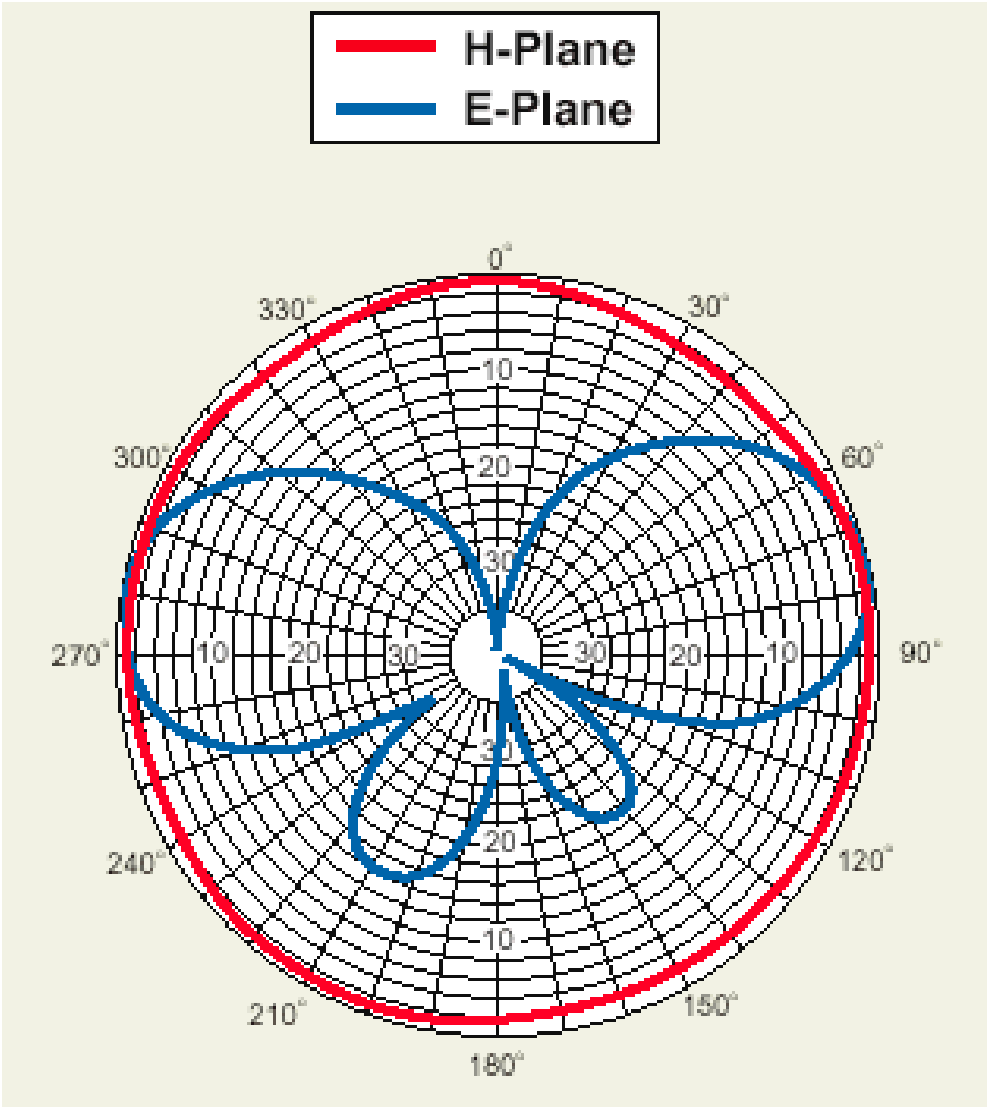
- Dipole
- Folded dipole
- Trap dipole
- Offset or Windom antenna
- Phased dipoles
- Vertical or horizontal (both)
- Beverage wave antenna

Types of Antennas

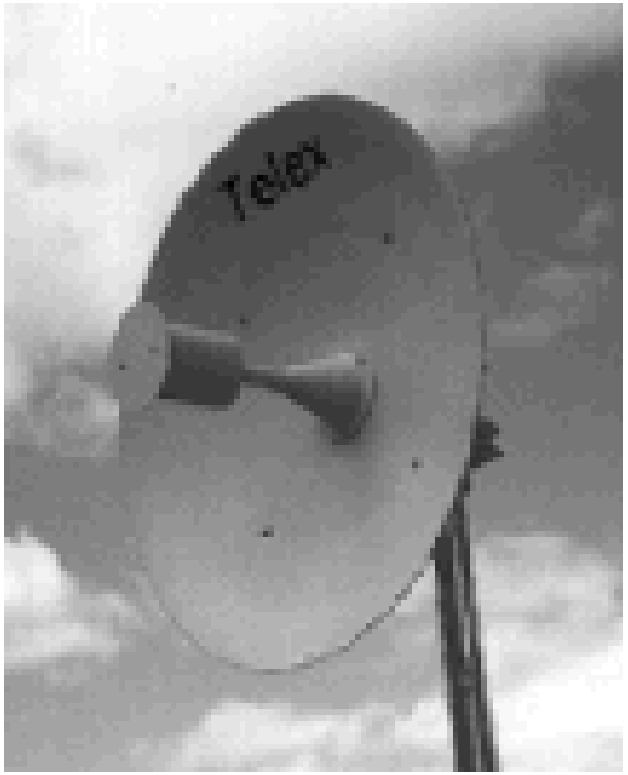
- Metal
- Vertical
- Yagi
- Trap Yagi
- Phased arrays
- Loops
- Vertical or Horizontal
- Horns for super ultra high frequencies
- Mobile antennas

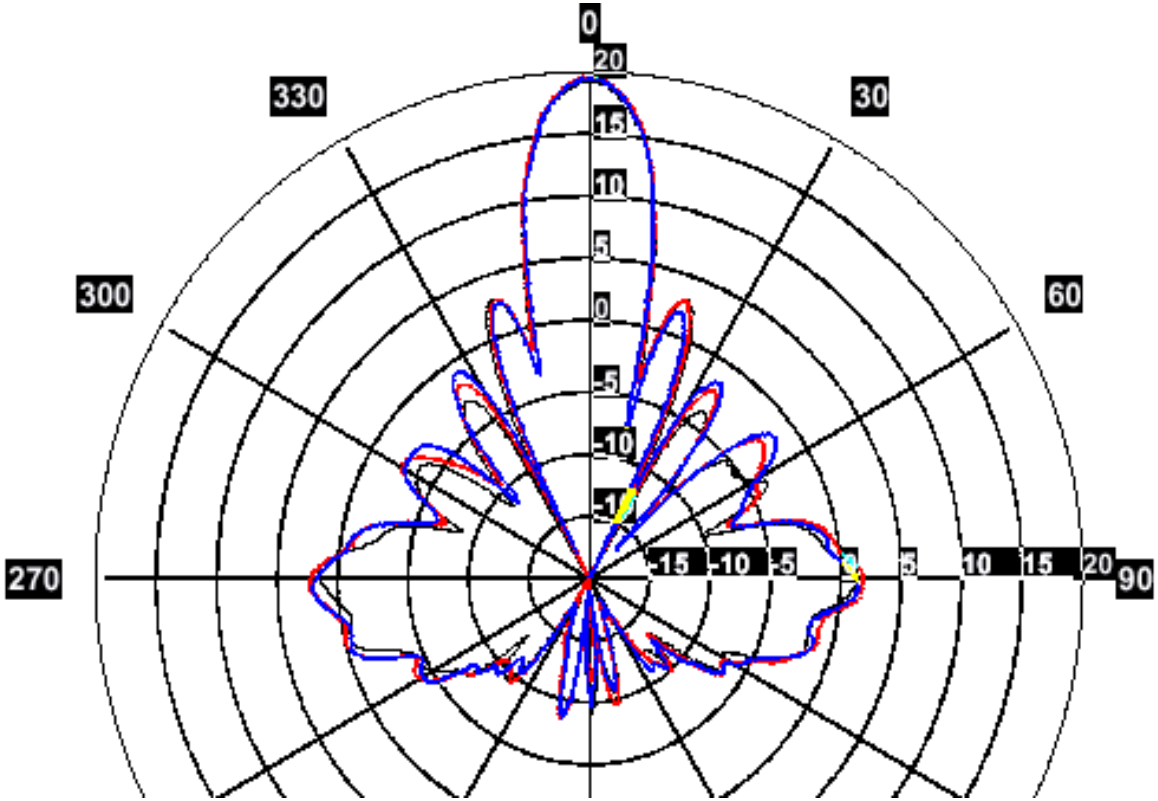
Omnidirectional Antennas



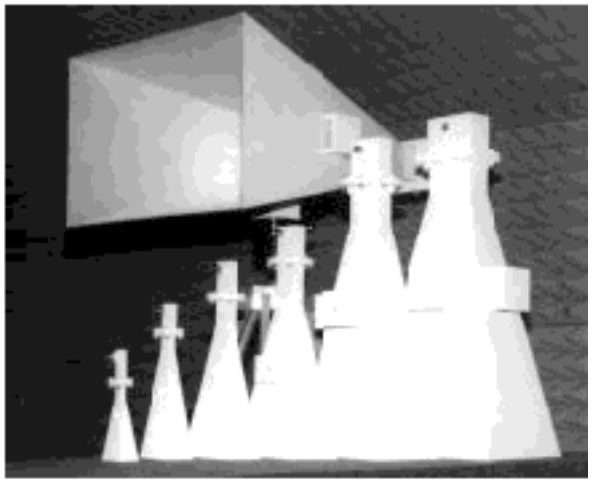


Parabolic Reflector Antenna





Horn Antennas



MWH ANTENNAS

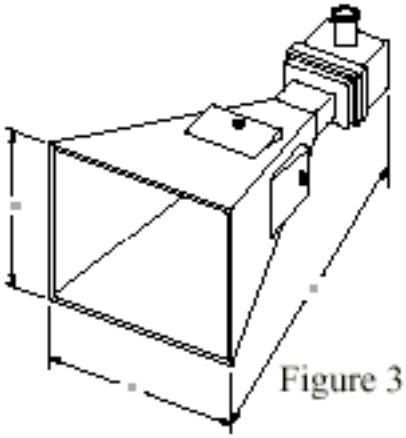
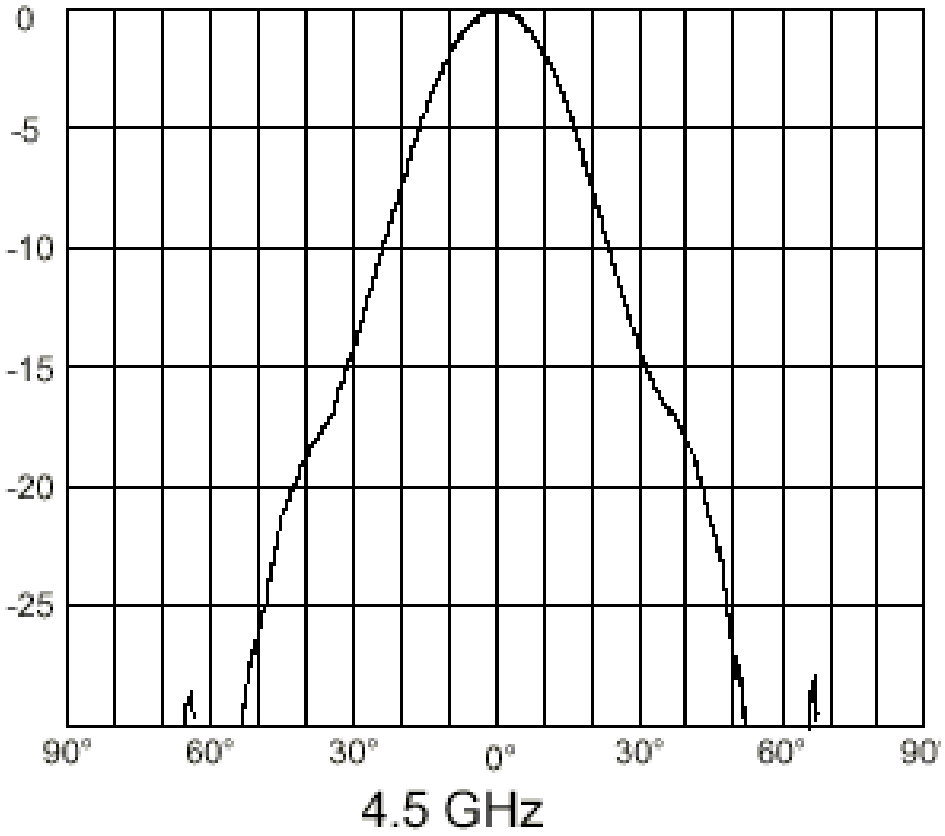
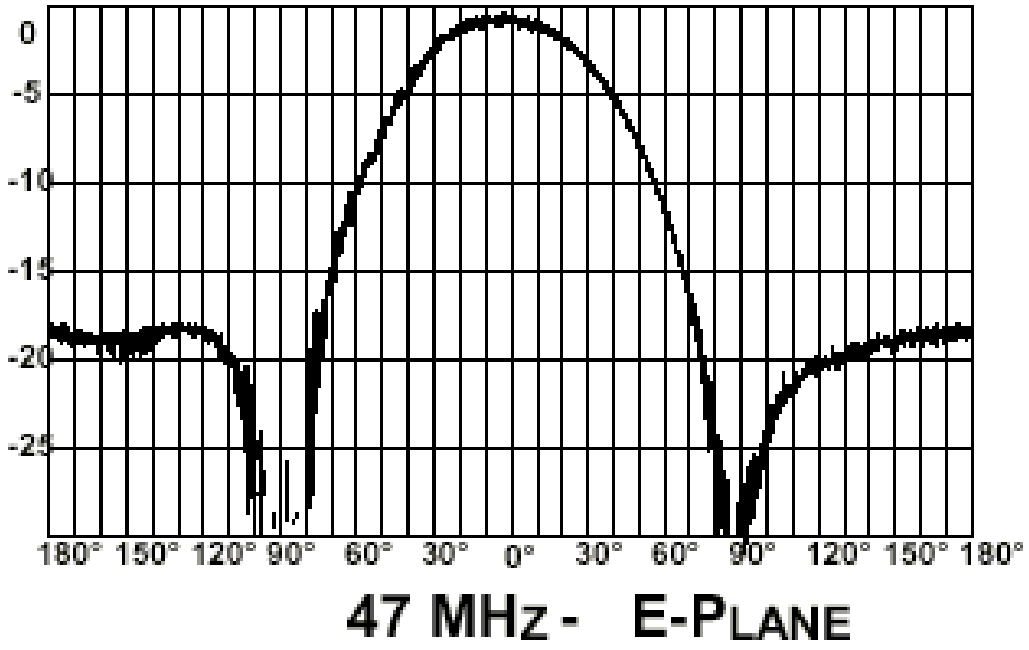


Figure 3



Log Periodic Dipole Array

LPD-475



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
Wavelength (λ) = 300 / frequency

Frequency measured in megahertz
Wavelength measured in meters

Above 30 MHz, λ = 300/f metres or 984/f feet
For a half wave λ = 150/f metres or 492/f feet
Below 30 MHz λ = 286/f metres or 936/f feet (including the velocity factor 0f 0.95)
For a half wave λ = 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 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 earths surface

- Horizontal waves travel parallel to the earth's surface

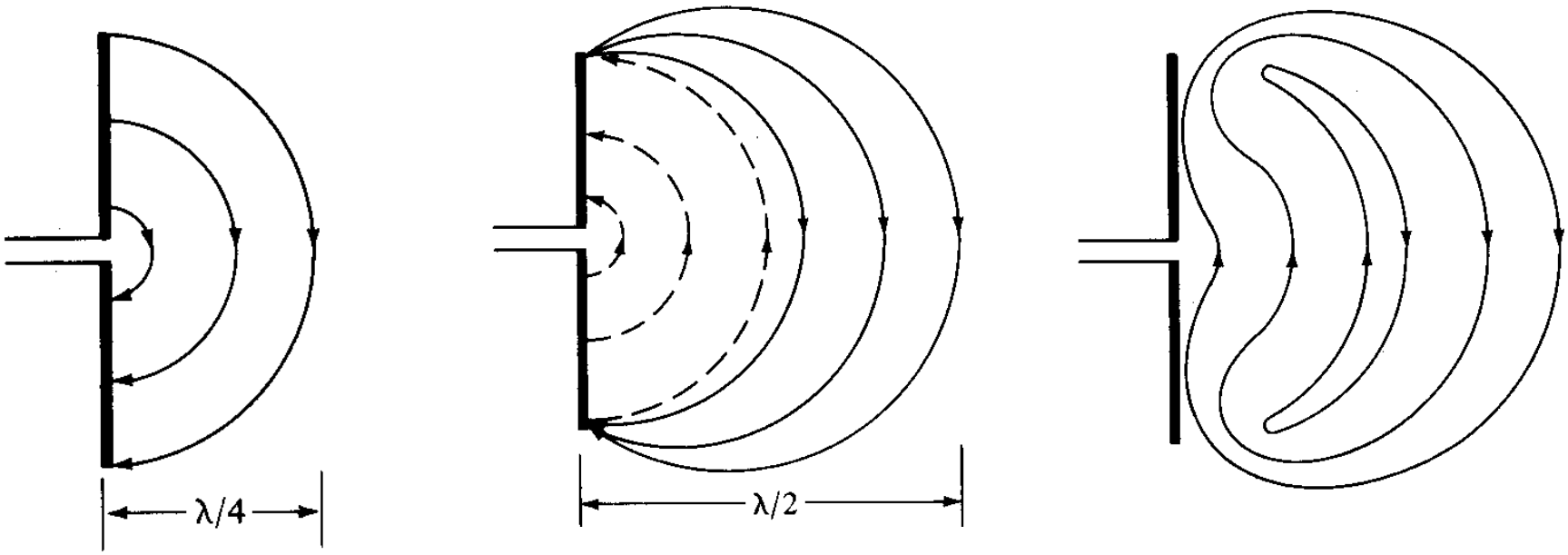
- Usually wire antennas are horizontal but an inverted 'V' dipole has a vertical component

- 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**