6. ANTENNAS AND FEEDLINES

Chapter 9.2
Practical Antennas

ARRL Amateur Extra Class

Practical antennas

- Dipoles and variations
- Whips, mobile antennas
- Long antennas
- Arrays
- Antennas for space communication
- Small loops

Dipoles

Standard ½ λ dipole

- 73 Ohm impedance in the middle
- High impedance at the ends

OCFD – Off Center Fed Dipole

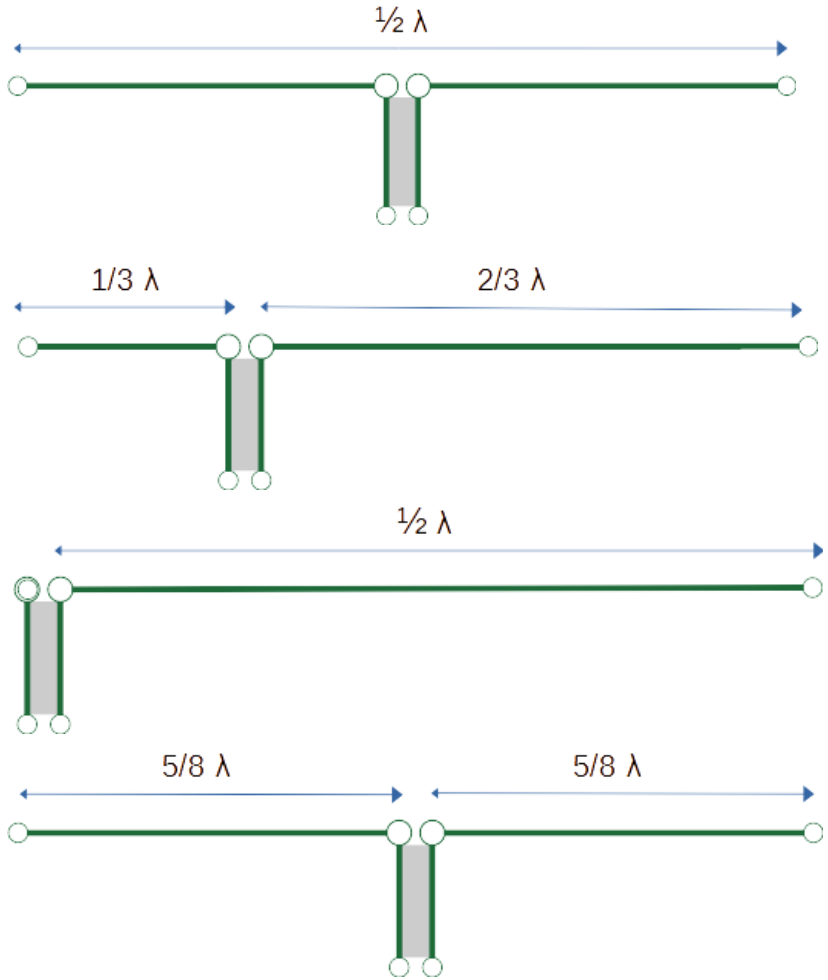
- Move feedpoint to about 1/3 of length
- Impedance ~150-300 Ohm (4:1 or 6:1)
- Tuned on multiple bands

Zepp antenna

- ½ λ wire fed at the end
- High impedance, use feedline to match

Extended Zepp

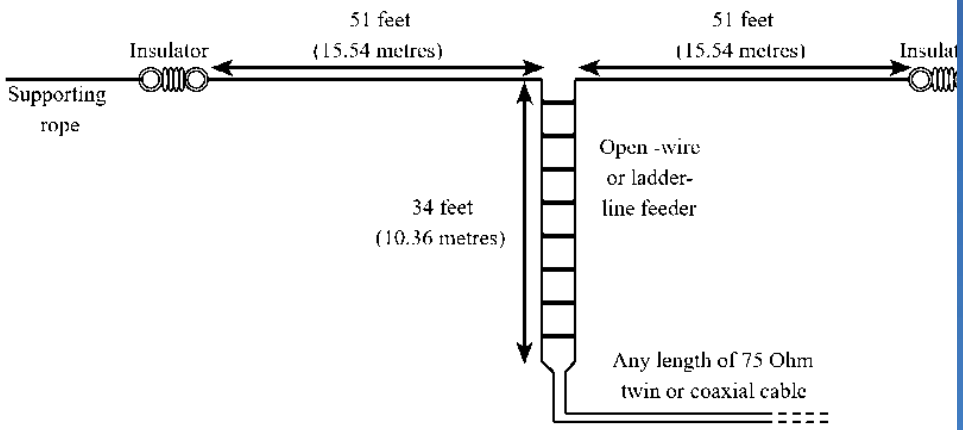
- Two 5/8's wires, effectively an array



More dipole variants

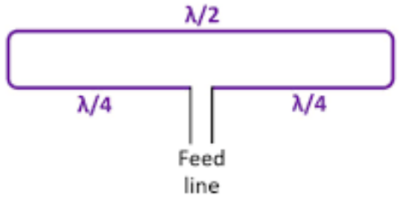
G5RV / ZS6BKW

- Multiband
- Use feedline (window line) to match
- Slightly less directional than standard dipc



Folded dipole

- Same pattern as standard dipole
- Wider SWR bandwidth
- 4x impedance at feedpoint, ~300 Ohm



Whip antennas

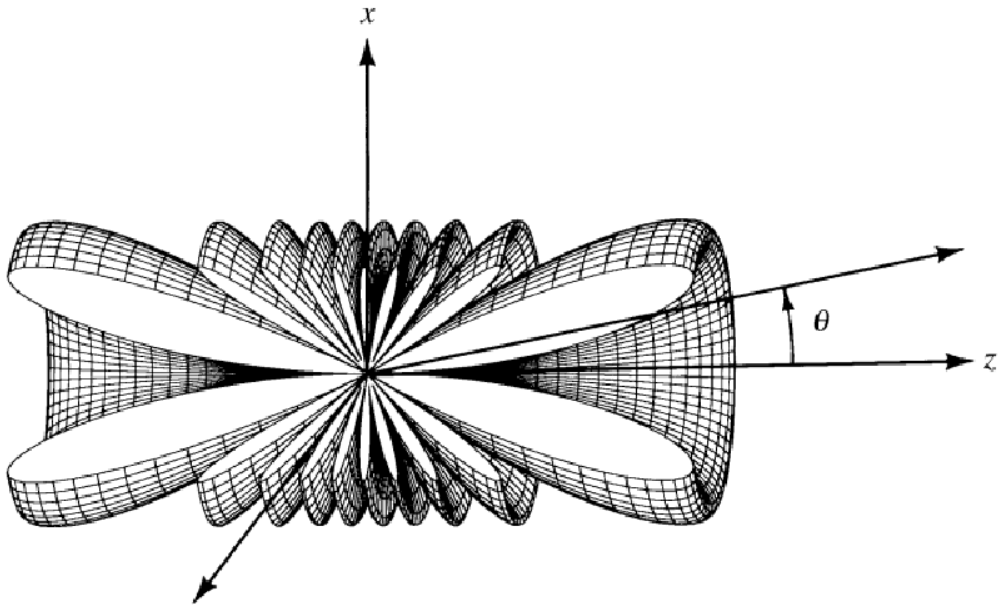
Mobile vertical (whip) antennas

- Uses vehicle as ground plane
- Full size whip ~36 Ohm
- ¼ λ at 10m = 8.1ft – not practical at longer λ
- **Loading** makes the antenna electrically longer
- High Q coil
  Higher up –> lower impedance
  ..but need bigger coil = bigger losses
- Capacitive hat
  helps reducing the size of the coil

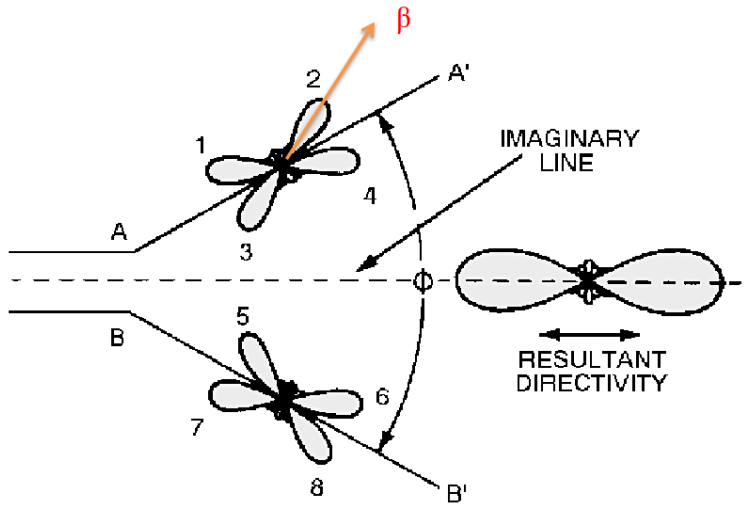
Long antennas

Traveling wave antennas

- More than 1 λ long
- More directional with longer wire



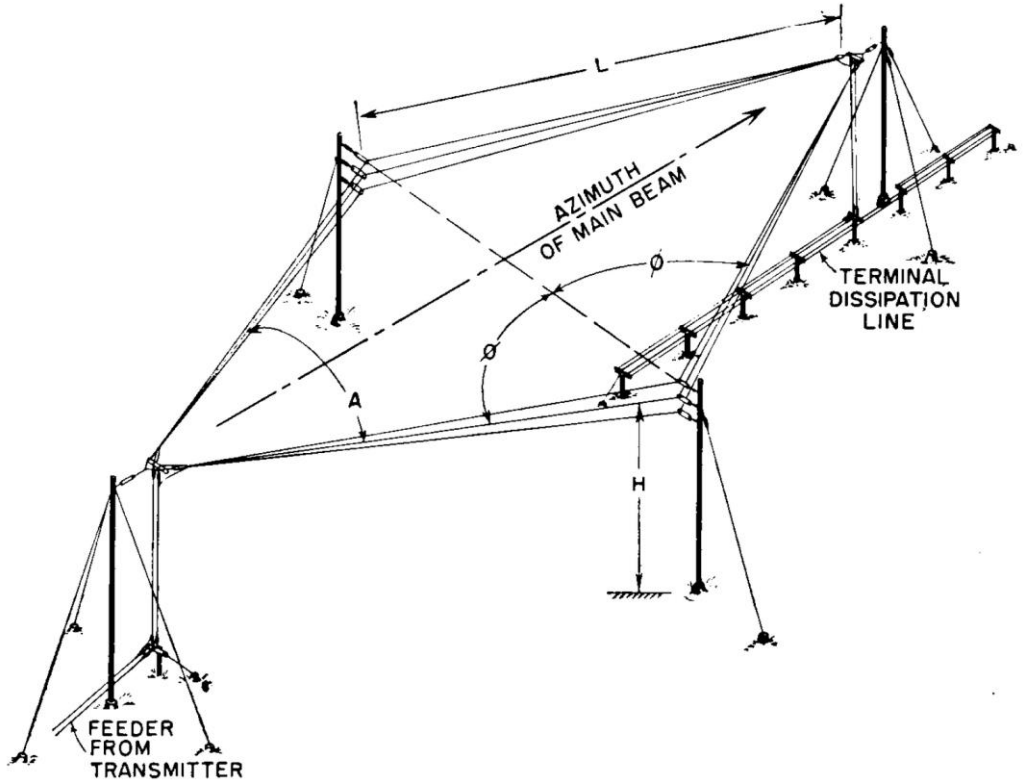
Can be combined in to ”Vee” for more gain



Impractical long antennas

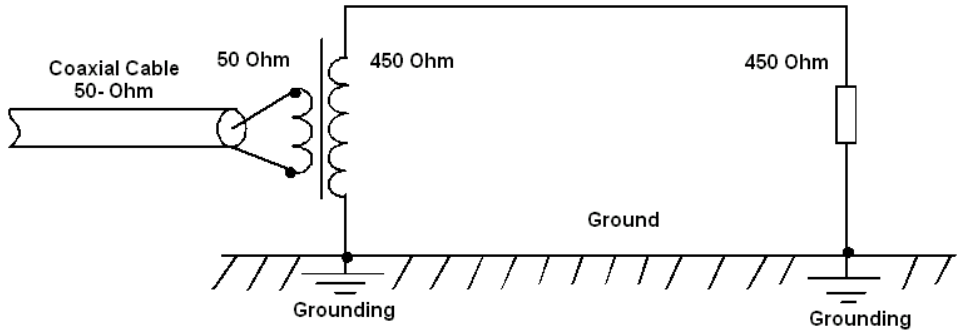
Rhombic antenna

- Each side 1 λ
- Bidirecional
- Unidirectional by adding termination resistor



Beverage antenna

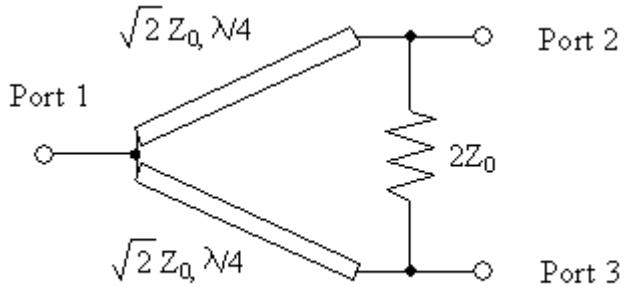
- More than 1 λ
- Lossy, but very directional



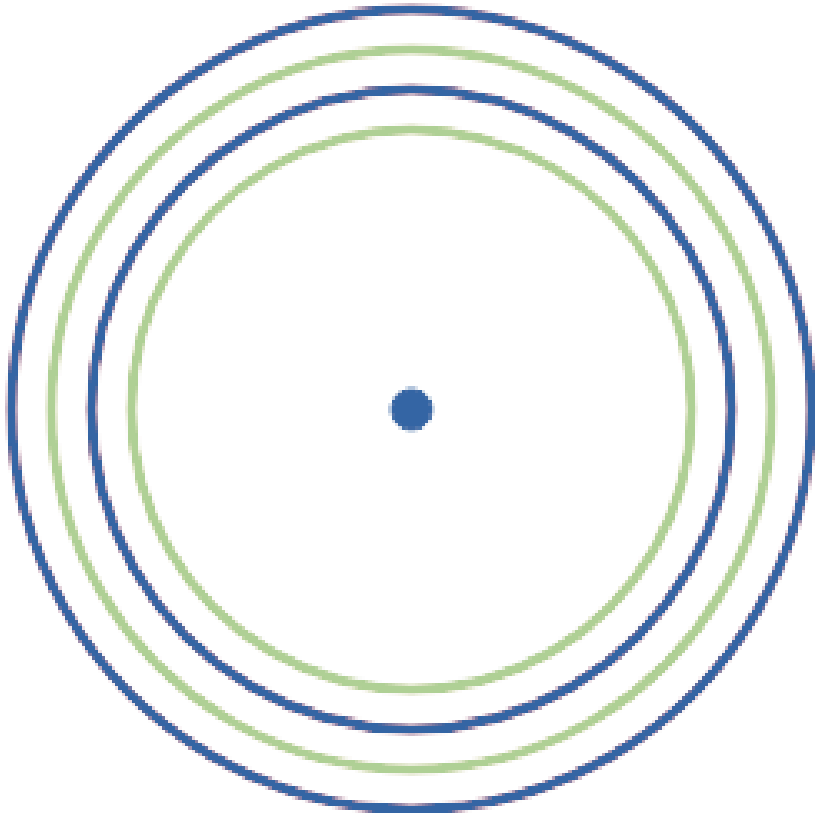
Phased Arrays

Sending same signal to two antennas

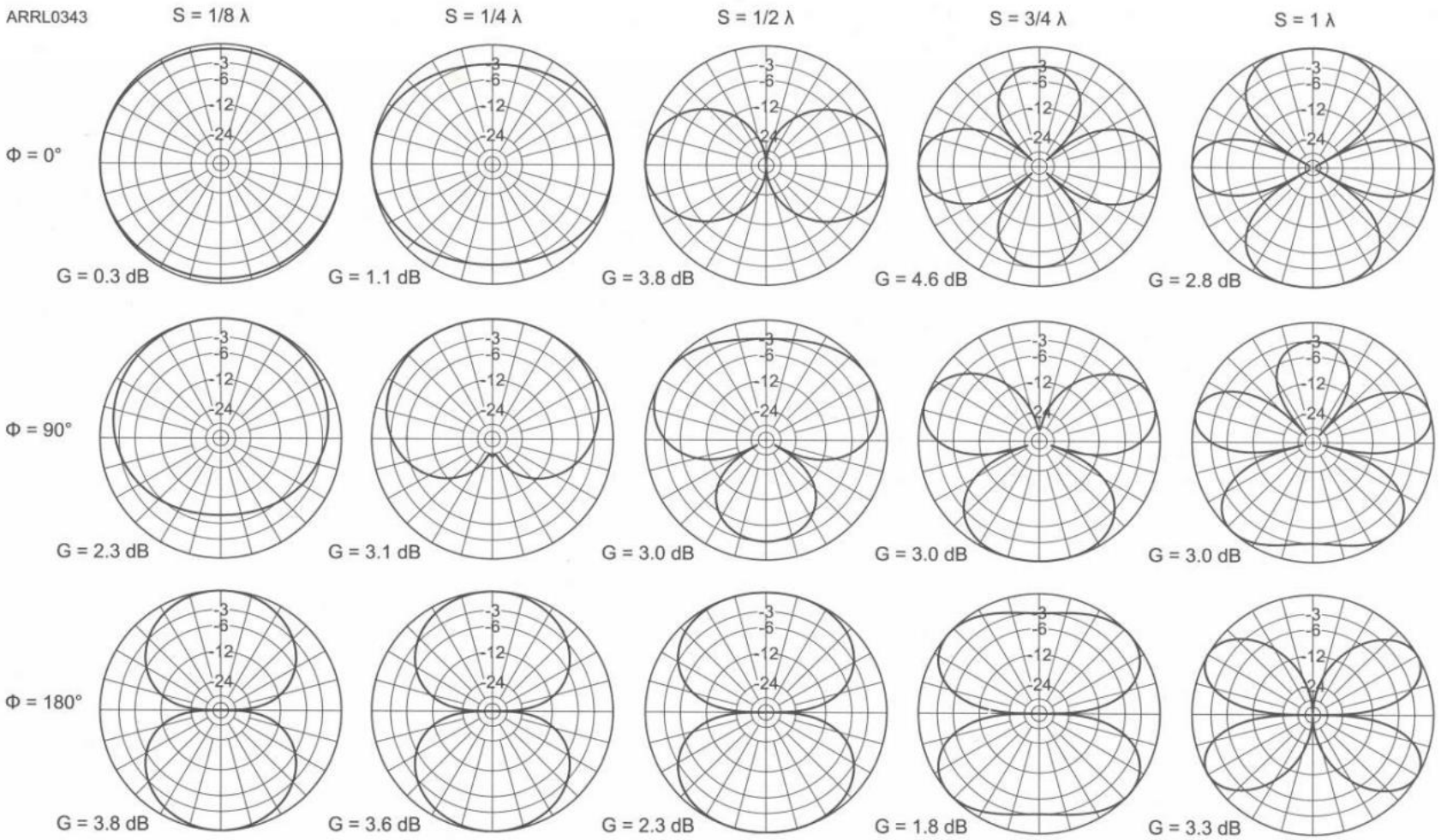
Wilkinson divider



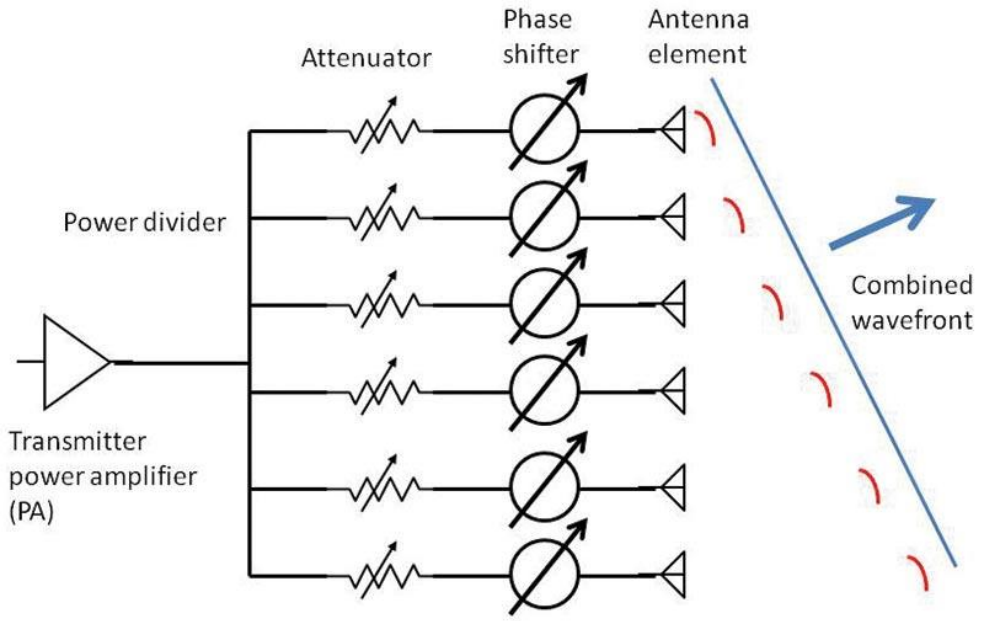
Phasing lines: delay signal to one antenna



Phased Arrays



Phased Arrays

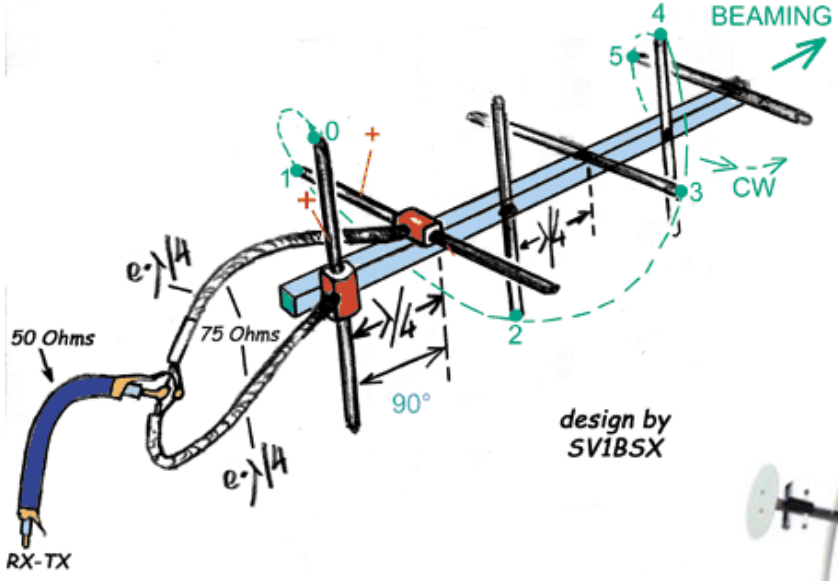


Dish/satellite antennas for space communication

Satellites require circular polarization

Two Yagis

- 90 degree rotated
- Fed 90 degrees out of phase



Dish antennas

Need to be more than ½ λ in diameter

Double diameter = 6dB gain

Small Loop antennas

Mostly for receive

Magnetic antennas

- Shielding reduces E-field

1/10th λ circumference

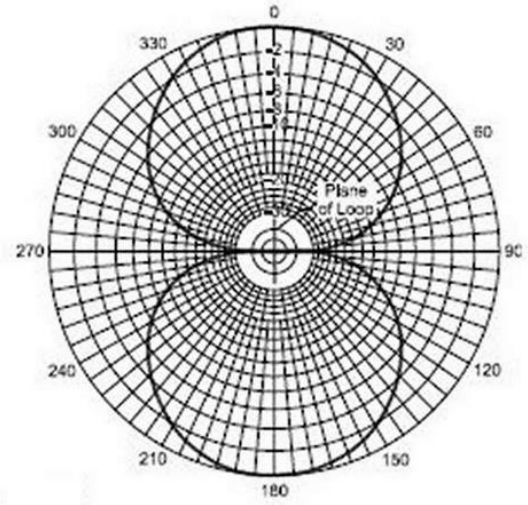
More turns = higher gain

Sharp nulls perpendicular to the loop plane

RDF – Receiving Directivity Factor

- Ratio between forward gain and gain in all other directions

Used in **RDF** – Radio Direction Finding



QUESTIONS?

ONLINE EXAM REVIEW AND PRACTICE QUESTIONS:

http://www.arrl.org/examreview