

Technician Licensing Class

Antennas

Presented by

The image shows the cover of a book titled 'TECHNICIAN CLASS' in large yellow letters. Below the title, it says 'FCC Element 2 Amateur Radio License Preparation'. At the top, there are three tabs: 'TECHNICIAN CLASS' (which is selected), 'GENERAL CLASS', and 'EXTRA CLASS'. The cover features three small photographs: a man with a radio antenna, a man and a woman talking, and a man in a suit pointing. Below the photos, it says 'Contains the complete 394-question FCC Element 2 question pool effective July 1, 2010 to June 30, 2014 by GORDON WEST, WB6DCA'. There is a circular logo for 'ARRL' (American Radio Relay League) on the left. At the bottom, there is a list of features:

- Fully-illustrated Text Aids Learning
- Questions Reorganized for Logical Easy Learning
- Highlighted Key Words in Answer Explanations
- Enhanced Explanations Teach You Ham Radio
- Over 125 Addresses of Helpful Educational Websites
- Frequency Allocations Showing Privileges
- Chapter on Learning Morse Code
- List of VEC Examinators

At the bottom right, there is a photo of a man and a woman looking at a radio. Below the photo, it says 'Includes BONUS COURSE!' and 'FREE Q MAGAZINE TRIAL SUBSCRIPTION FREE BONUS WITH ARRRL MEMBERSHIP DISCOUNT ON YOUR FIVE 7 RADIO!'.

Amateur Radio Technician Class Element 2 Course Presentation

➤ **ELEMENT 2 SUB-ELEMENTS** (Groupings)

- **About Ham Radio**
- **Call Signs**
- **Control**
- **Mind the Rules**
- **Tech Frequencies**
- **Your First Radio**
- **Going On The Air!**
- **Repeaters**
- **Emergency!**
- **Weak Signal Propagation**

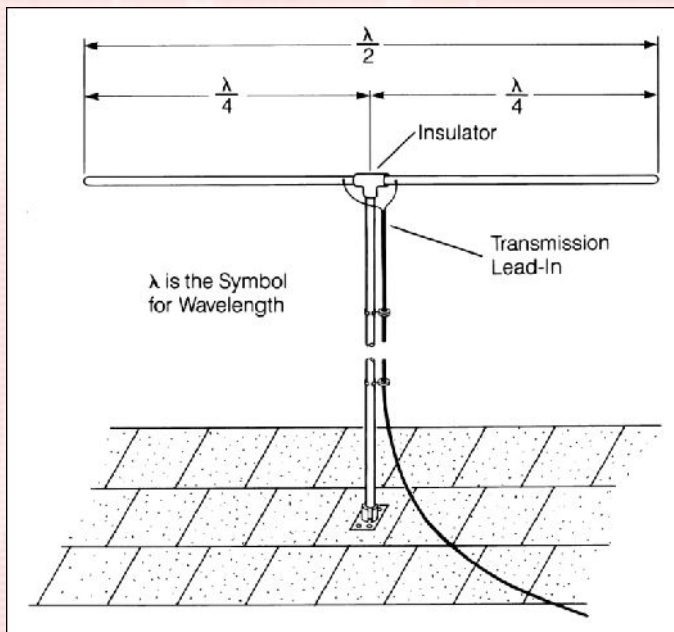
Amateur Radio Technician Class Element 2 Course Presentation

➤ **ELEMENT 2 SUB-ELEMENTS** (Groupings)

- **Talk to Outer Space!**
- **Your Computer Goes Ham Digital!**
- **Multi-Mode Radio Excitement**
- **Run Some Interference Protection**
- **Electrons - Go With the Flow!**
- **It's the Law, per Mr. Ohm!**
- **Go Picture These!**
- **Antennas**
 - **Feed Me with Some Good Coax!**
 - **Safety First!**

Antennas

- T9A3 A simple dipole mounted so the conductor is parallel to the Earth's surface is a horizontally polarized antenna.
 - Polarization is referenced to the Earth's surface
 - Horizontal or Vertical



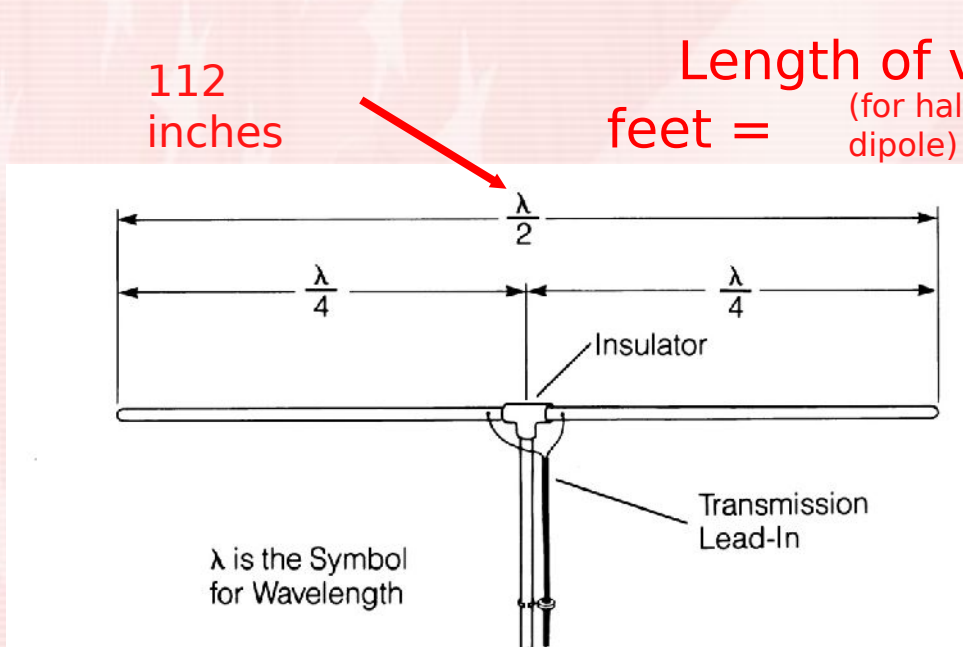
Simple Dipole



Three element beam

Antennas

- T9A10 The strongest radiation from a half-wave dipole antenna in free space is broadside to the antenna.
- T9A9 The approximate length of a 6 meter 1/2-wavelength wire dipole antenna is 112 inches.



112
inches

Length of vertical in
feet = (for half-wave
dipole)

$$\frac{468}{f \text{ (MHz)}}$$

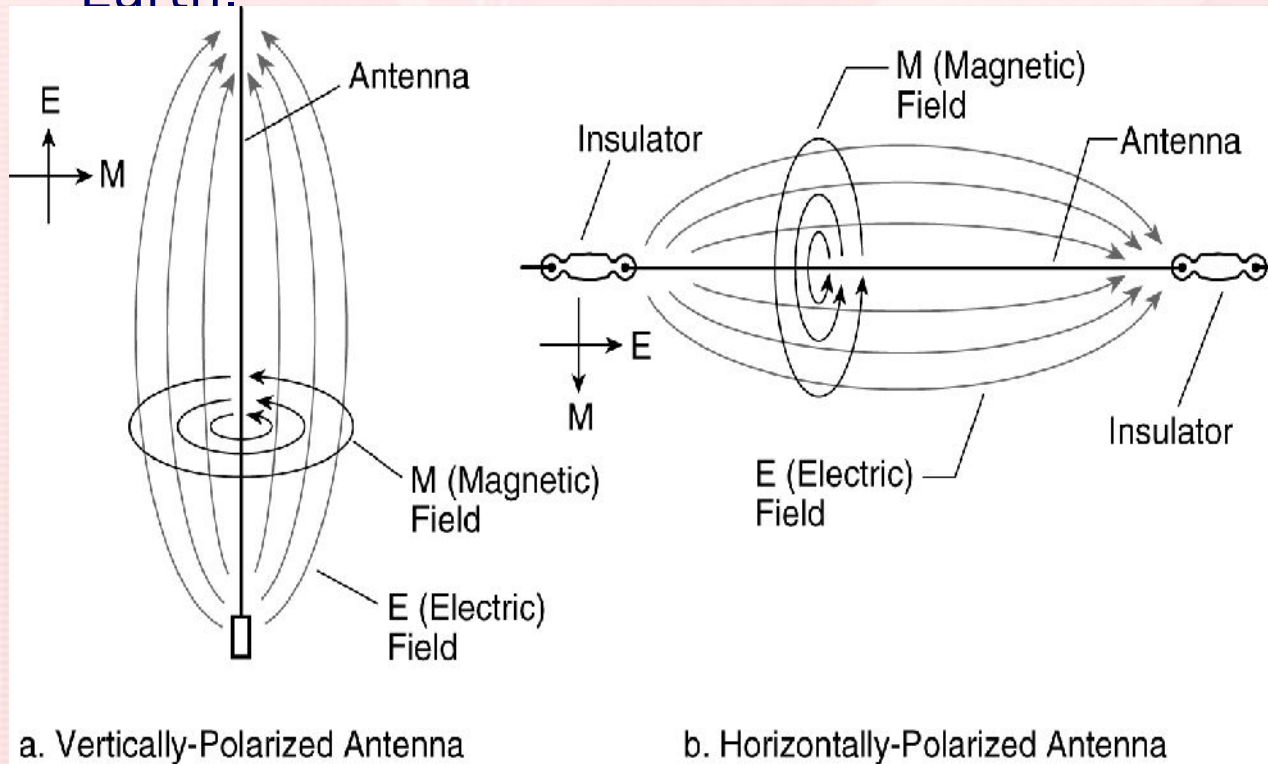
$$\text{Feet} = 468/50 = 9.36$$

$$9.36 \times 12 = 112.3 \text{ inches}$$

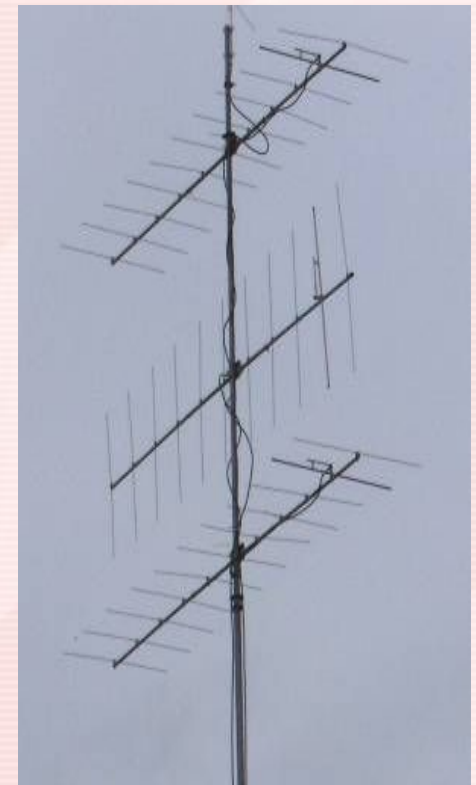
Six Meter $\frac{1}{2}$ Wavelength Dipole

Antennas

- T9A5 You would change a dipole antenna to make it resonant on a higher frequency by making it shorter.
- T9A2 The electric field of vertical antennas is perpendicular to the Earth.



Vertical and Horizontal
Polarization



H & V Polarized Antennas

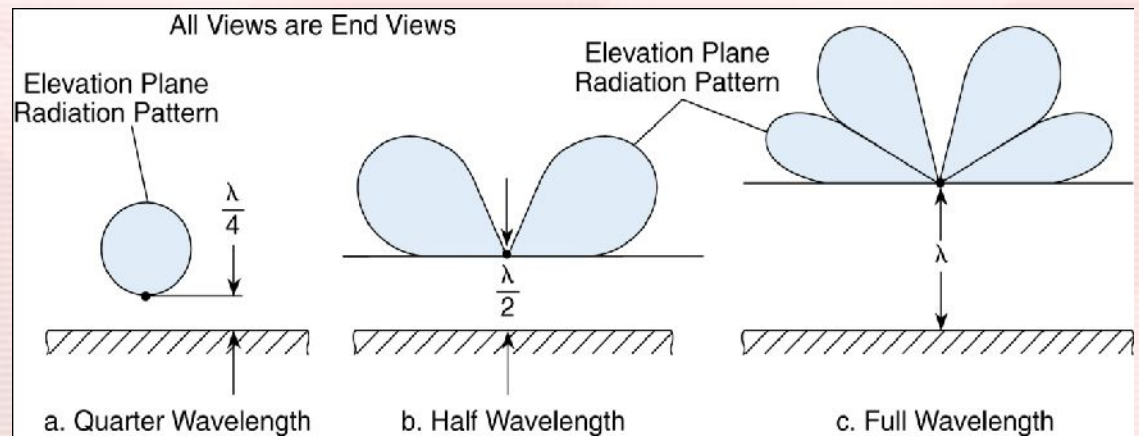
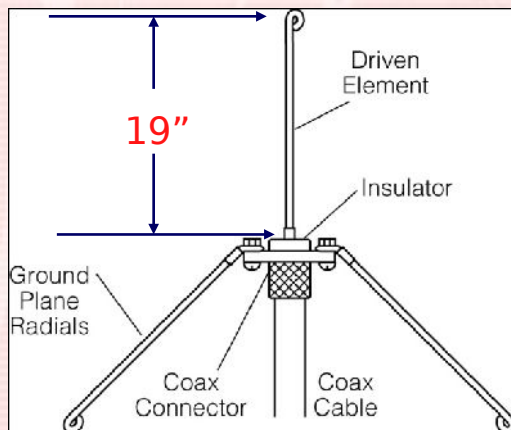
Antennas

- T9A8 The approximate length of a quarter-wavelength vertical antenna for 146 MHz is 19 inches.

$$\text{Length of vertical in feet} = \frac{234}{f \text{ (MHz)}}$$

(for quarter-wave dipole)
(2-meters is 144-148 MHz)

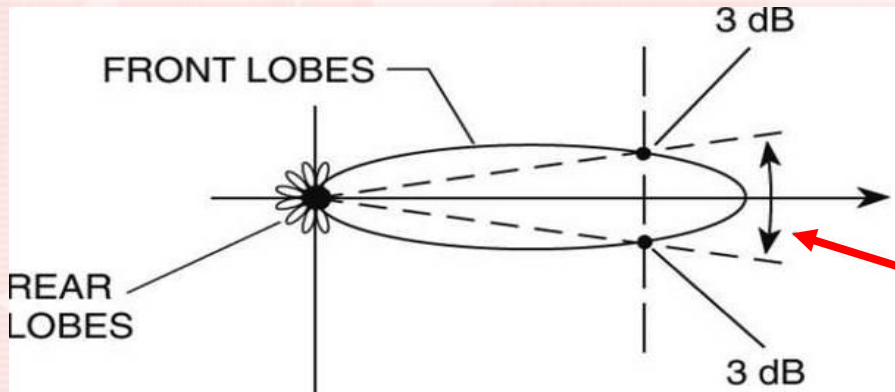
$$\text{Feet} = 234/146 = 1.6$$
$$1.6 \times 12 = 19 \text{ inches}$$



Radiation Pattern of an Antenna Changes as Height Above Ground is Varied

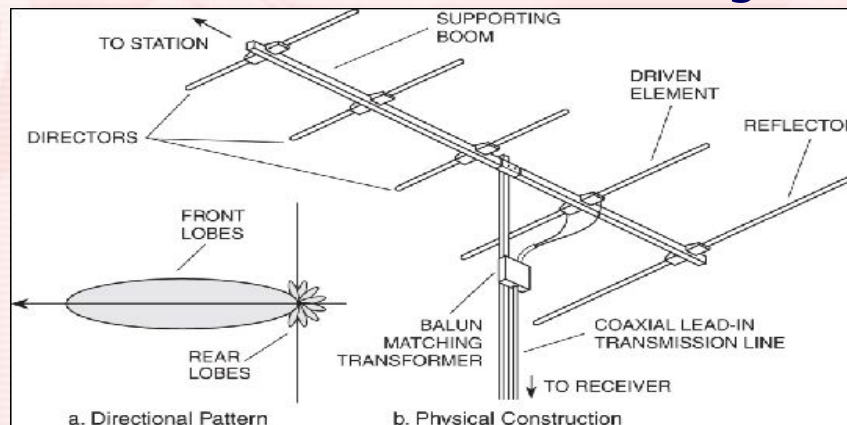
Antennas

- T9A6 Directional antennas are the quad, Yagi, and dish.



Directional Radiation Pattern of a Yagi Beam

- T9A1 A beam antenna concentrates signals in one direction



A Beam Antenna - The Yagi

Antennas

- T8C1 Radio direction finding methods are used to locate sources of noise interference or jamming.



2-element Yagi DF
Antenna



3-element Quad DF
Antenna

Antennas

- T8C2 A directional antenna would be useful for a hidden transmitter hunt.

Hidden
Transmitter Hunts
are called Fox
Hunting

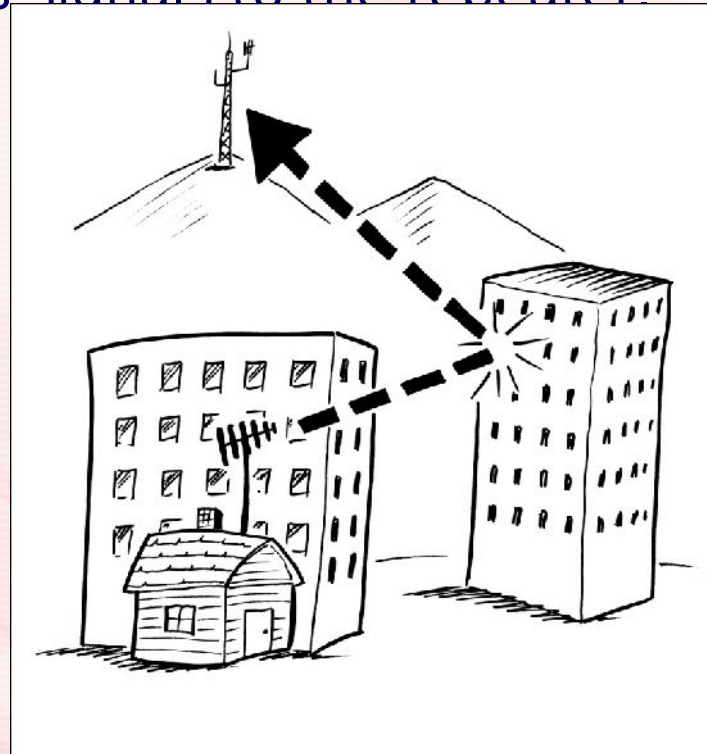


All ages participate in a Fox Hunt

Antennas

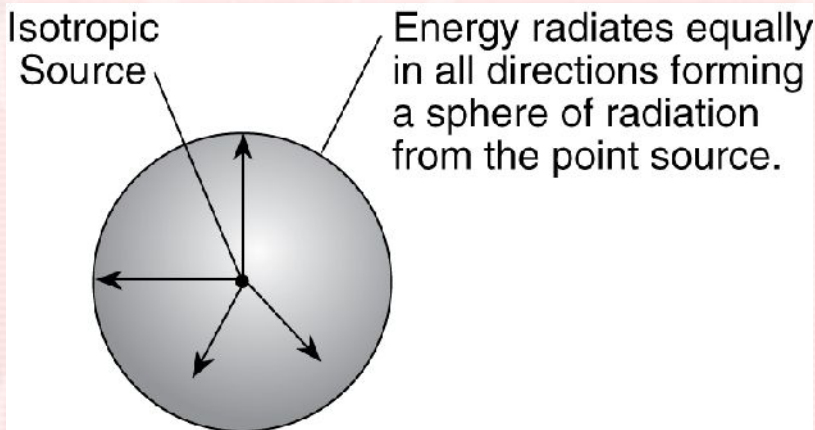
- T3A5 When using a directional antenna, your station might be able to access a distant repeater if buildings or obstructions are blocking the direct line of sight path by finding a path that reflects signals to the repeater.

Directional Antenna
used to bounce
signal to reach
repeater blocked by
building

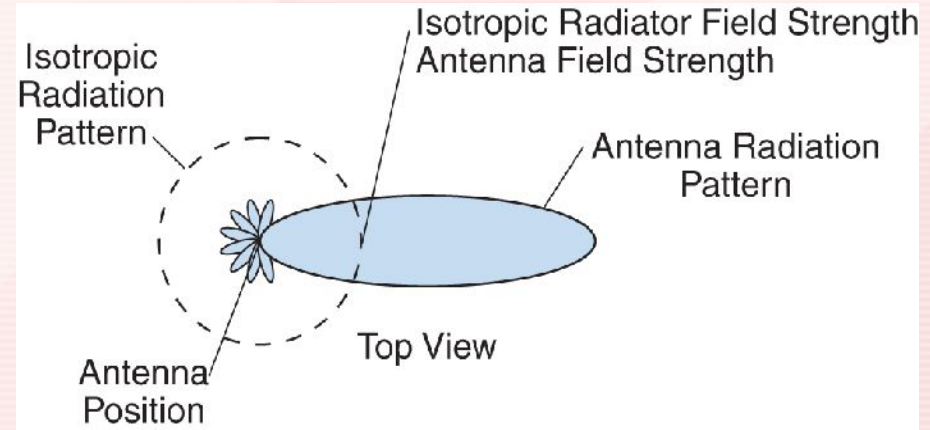


Antennas

- T9A11 The gain of an antenna is the increase in signal strength in a specified direction when compared to a reference antenna.



Isotropic Radiator Pattern

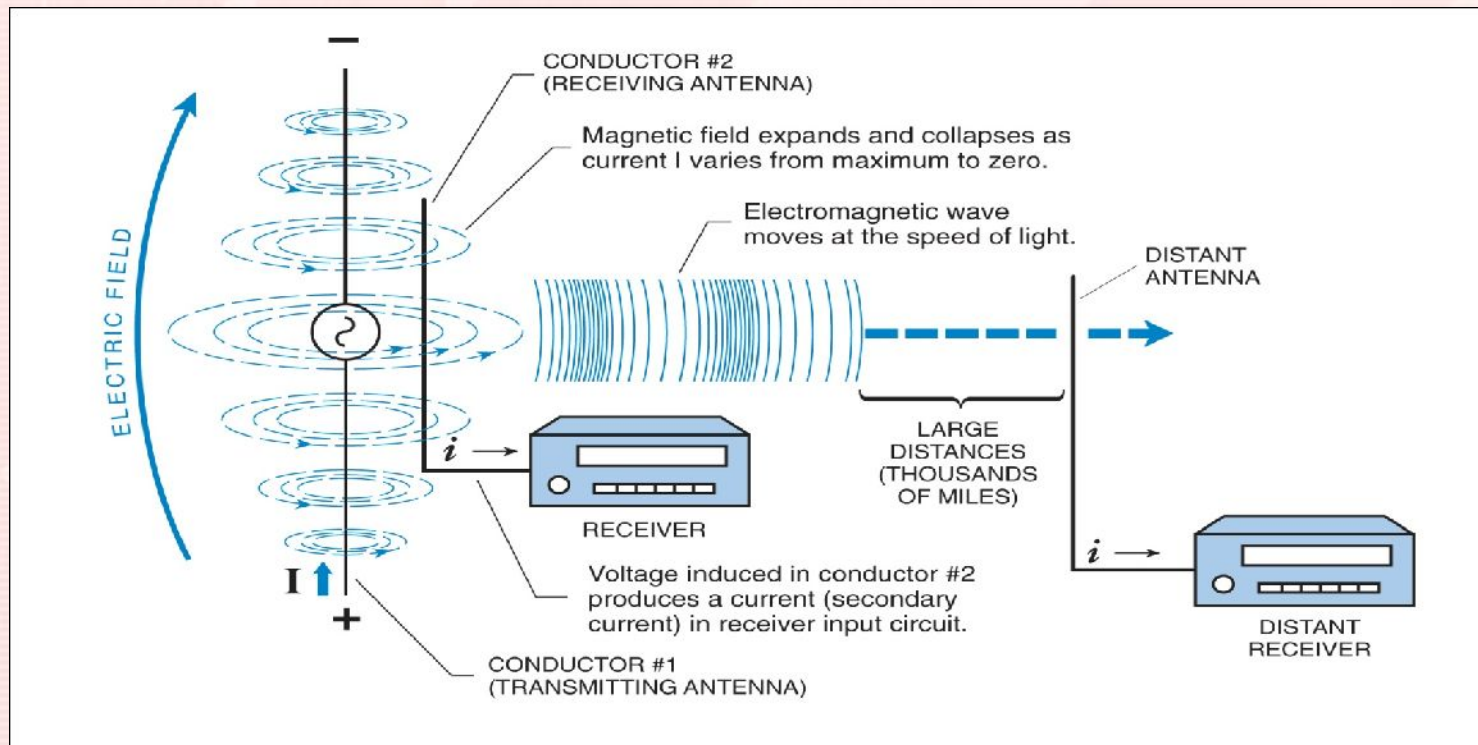


“Gain” of an antenna

- T3A3 Horizontal antenna polarization is normally used for long-distance weak-signal CW and SSB contacts using the VHF and UHF bands.

Antennas

- T3A4 Signals could be significantly weaker if the antennas at opposite ends of a VHF or UHF line of sight radio link are not using the same polarization.



Transmitter to Receiver - Radio waves from transmitting antennas induce signals in receiving antennas as they pass by

Element 2 Technician Class Question Pool

Antennas

Valid July 1, 2010

Through

June 30, 2014



T9A03
simple
parallel

Which of the following describes a dipole mounted so the conductor is to the Earth's surface?

- A. A ground wave antenna
- B. A horizontally polarized antenna
- C. A rhombic antenna
- D. A vertically polarized antenna

T9A10

In which direction is the radiation strongest from a half-wave dipole antenna in free space?

- A. Equally in all directions
- B. Off the ends of the antenna
- C. Broadside to the antenna
- D. In the direction of the feedline

T9A09

wire

What is the approximate length, in inches, of a 6 meter 1/2-wavelength dipole antenna?

- A. 6
- B. 50
- C. 112
- D. 236

19A05 How would you change a dipole antenna to make it resonant on a higher frequency?

- A. Lengthen it
- B. Insert coils in series with radiating wires
- C. Shorten it
- D. Add capacity hats to the ends of the radiating wires

T9A02

Which of the following is true regarding vertical antennas?

- A. The magnetic field is perpendicular to the Earth
- B. The electric field is perpendicular to the Earth
- C. The phase is inverted
- D. The phase is reversed

T9A08
inches,
antenna

What is the approximate length, in
of a quarter-wavelength vertical
for 146 MHz?

- A. 112
- B. 50
- C. 19
- D. 12

T9A06
Yagi,

What type of antennas are the quad,
and dish?

- A. Non-resonant antennas
- B. Loop antennas
- C. Directional antennas
- D. Isotropic antennas

T9A01 What is a beam antenna?

- A. An antenna built from aluminum I-beams
- B. An omnidirectional antenna invented by Clarence Beam
- C. An antenna that concentrates signals in one direction
- D. An antenna that reverses the phase of received signals

T8C01 Which of the following methods is used to locate sources of noise interference or jamming?

- A. Echolocation
- B. Doppler radar
- C. Radio direction finding
- D. Phase locking

T8C02
for a

Which of these items would be useful
hidden transmitter hunt?

- A. Calibrated SWR meter
- B. A directional antenna
- C. A calibrated noise bridge
- D. All of these choices are correct

T3A05

station
path?

When using a directional antenna, how might your
be able to access a distant repeater if buildings or
obstructions are blocking the direct line of sight

- A.** Change from vertical to horizontal polarization
- B.** Try to find a path that reflects signals to the repeater
- C.** Try the long path
- D.** Increase the antenna SWR

T9A11 What is meant by the gain of an antenna?

- A. The additional power that is added to the transmitter power
- B. The additional power that is lost in the antenna when transmitting on a higher frequency
- C. The increase in signal strength in a specified direction when compared to a reference antenna
- D. The increase in impedance on receive or transmit compared to a reference antenna

T3A03
used
SSB

What antenna polarization is normally used for long-distance weak-signal CW and contacts using the VHF and UHF bands?

- A. Right-hand circular
- B. Left-hand circular
- C. Horizontal
- D. Vertical

T3A04

sight
polarization?

What can happen if the antennas at opposite ends of a VHF or UHF line of radio link are not using the same

- A. The modulation sidebands might become inverted
- B. Signals could be significantly weaker
- C. Signals have an echo effect on voices
- D. Nothing significant will happen