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The ARRL Extra Class License Course

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LEVEL 3: Extra

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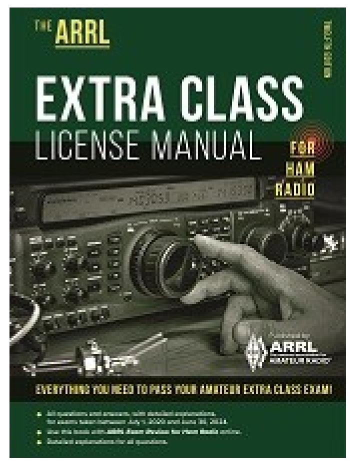

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What is an isotropic antenna?

A. A grounded antenna used to measure Earth conductivity

B. A horizontally polarized antenna used to compare Yagi antennas

C. A theoretical, omnidirectional antenna used as a reference for antenna gain

D. A spacecraft antenna used to direct signals toward the Earth

E9A01 ECLM Page (9 - 3)

What is an isotropic antenna?

A. A grounded antenna used to measure Earth conductivity

B. A horizontally polarized antenna used to compare Yagi antennas

C. A theoretical, omnidirectional antenna used as a reference for antenna gain

D. A spacecraft antenna used to direct signals toward the Earth

(C) E9A01 ECLM Page (9 - 3)

What is the effective radiated power relative to a dipole of a repeater station with 150 watts transmitter power output, 2 dB feed line loss, 2.2 dB duplexer loss, and 7 dBd antenna gain?

A. 1977 watts

B. 78.7 watts

C. 420 watts

D. 286 watts

E9A02 ECLM Page (9 - 24)

What is the effective radiated power relative to a dipole of a repeater station with 150 watts transmitter power output, 2 dB feed line loss, 2.2 dB duplexer loss, and 7 dBd antenna gain?

A. 1977 watts

B. 78.7 watts

C. 420 watts

D. 286 watts

(D) E9A02 ECLM Page (9 - 24)

What is the radiation resistance of an antenna?

A. The combined losses of the antenna elements and feed line

B. The specific impedance of the antenna

C. The value of a resistance that would dissipate the same amount of power as that radiated from an antenna

D. The resistance in the atmosphere that an antenna must overcome to be able to radiate a signal

E9A03 ECLM Page (9 - 5)

What is the radiation resistance of an antenna?

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B. The specific impedance of the antenna

C. The value of a resistance that would dissipate the same amount of power as that radiated from an antenna

D. The resistance in the atmosphere that an antenna must overcome to be able to radiate a signal

(C) E9A03 ECLM Page (9 - 5)

Which of the following factors affect the feed point impedance of an antenna?

A. Transmission line length

B. Antenna height

C. The settings of an antenna tuner at the transmitter

D. The input power level

E9A04 ECLM Page (9 - 6)

Which of the following factors affect the feed point impedance of an antenna?

A. Transmission line length

B. Antenna height

C. The settings of an antenna tuner at the transmitter

D. The input power level

(B) E9A04 ECLM Page (9 - 6)

What is included in the total resistance of an antenna system?

A. Radiation resistance plus space impedance

B. Radiation resistance plus transmission resistance

C. Transmission-line resistance plus radiation resistance

D. Radiation resistance plus loss resistance

E9A05 ECLM Page (9 - 5)

What is included in the total resistance of an antenna system?

A. Radiation resistance plus space impedance

B. Radiation resistance plus transmission resistance

C. Transmission-line resistance plus radiation resistance

D. Radiation resistance plus loss resistance

(D) E9A05 ECLM Page (9 - 5)

What is the effective radiated power relative to a dipole of a repeater station with 200 watts transmitter power output, 4 dB feed line loss, 3.2 dB duplexer loss, 0.8 dB circulator loss, and 10 dBd antenna gain?

A. 317 watts

B. 2000 watts

C. 126 watts

D. 300 watts

E9A06 ECLM Page (9 - 24)

What is the effective radiated power relative to a dipole of a repeater station with 200 watts transmitter power output, 4 dB feed line loss, 3.2 dB duplexer loss, 0.8 dB circulator loss, and 10 dBd antenna gain?

A. 317 watts

B. 2000 watts

C. 126 watts

D. 300 watts

(A) E9A06 ECLM Page (9 - 24)

What is the effective isotropic radiated power of a repeater station with 200 watts transmitter power output, 2 dB feed line loss, 2.8 dB duplexer loss, 1.2 dB circulator loss and 7 dBi antenna gain?

A. 159 watts

B. 252 watts

C. 632 watts

D. 63.2 watts

E9A07 ECLM Page (9 - 24)

What is the effective isotropic radiated power of a repeater station with 200 watts transmitter power output, 2 dB feed line loss, 2.8 dB duplexer loss, 1.2 dB circulator loss and 7 dBi antenna gain?

A. 159 watts

B. 252 watts

C. 632 watts

D. 63.2 watts

(B) E9A07 ECLM Page (9 - 24)

What is antenna bandwidth?

A. Antenna length divided by the number of elements

B. The frequency range over which an antenna satisfies a performance requirement

C. The angle between the half-power radiation points

D. The angle formed between two imaginary lines drawn through the element ends

E9A08 ECLM Page (9 - 8)

What is antenna bandwidth?

A. Antenna length divided by the number of elements
B. The frequency range over which an antenna satisfies a performance requirement
C. The angle between the half-power radiation points
D. The angle formed between two imaginary lines drawn through the element ends
(B) E9A08 ECLM Page (9 - 8)

What is antenna efficiency?

A. Radiation resistance divided by transmission resistance

B. Radiation resistance divided by total resistance

C. Total resistance divided by radiation resistance

D. Effective radiated power divided by transmitter output

E9A09 ECLM Page (9 - 6)

What is antenna efficiency?

A. Radiation resistance divided by transmission resistance

B. Radiation resistance divided by total resistance

C. Total resistance divided by radiation resistance

D. Effective radiated power divided by transmitter output

(B) E9A09 ECLM Page (9 - 6)

Which of the following improves the efficiency of a ground-mounted quarter-wave vertical antenna?

A. Installing a radial system

B. Isolating the coax shield from ground

C. Shortening the radiating element

D. All these choices are correct

E9A10 ECLM Page (9 - 8)

Which of the following improves the efficiency of a ground-mounted quarter-wave vertical antenna?

A. Installing a radial system

B. Isolating the coax shield from ground

C. Shortening the radiating element

D. All these choices are correct

(A) E9A10 ECLM Page (9 - 8)

Which of the following factors determines ground losses for a ground-mounted vertical antenna operating in the 3 MHz to 30 MHz range?

A. The standing wave ratio

B. Distance from the transmitter

C. Soil conductivity

D. Take-off angle

E9A11 ECLM Page (9 - 8)

Which of the following factors determines ground losses for a ground-mounted vertical antenna operating in the 3 MHz to 30 MHz range?

A. The standing wave ratio

B. Distance from the transmitter

C. Soil conductivity

D. Take-off angle

(C) E9A11 ECLM Page (9 - 8)

How much gain does an antenna have compared to a 1/2-wavelength dipole when it has 6 dB gain over an isotropic antenna?

A. 3.85 dB

B. 6.0 dB

C. 8.15 dB

D. 2.79 dB

E9A12 ECLM Page (9 - 3)

How much gain does an antenna have compared to a 1/2-wavelength dipole when it has 6 dB gain over an isotropic antenna?

A. 3.85 dB

B. 6.0 dB

C. 8.15 dB

D. 2.79 dB

(A) E9A12 ECLM Page (9 - 3)

What term describes station output, taking into account all gains and losses?

A. Power factor

B. Half-power bandwidth

C. Effective radiated power

D. Apparent power

E9A13 ECLM Page (9 - 23)

What term describes station output, taking into account all gains and losses?

A. Power factor

B. Half-power bandwidth

C. Effective radiated power

D. Apparent power

(C) E9A13 ECLM Page (9 - 23)

In the antenna radiation pattern shown in Figure E9-1, what is the beamwidth?

A. 75 degrees

B. 50 degrees

C. 25 degrees

D. 30 degrees

E9B01 ECLM Page (9 - 5)

In the antenna radiation pattern shown in Figure E9-1, what is the beamwidth?

A. 75 degrees

B. 50 degrees

C. 25 degrees

D. 30 degrees

(B) E9B01 ECLM Page (9 - 5)

In the antenna radiation pattern shown in Figure E9-1, what is the front-to-back ratio?

A. 36 dB

B. 18 dB

C. 24 dB

D. 14 dB

E9B02 ECLM Page (9 - 5)

In the antenna radiation pattern shown in Figure E9-1, what is the front-to-back ratio?

A. 36 dB

B. 18 dB

C. 24 dB

D. 14 dB

(B) E9B02 ECLM Page (9 - 5)

In the antenna radiation pattern shown in Figure E9-1, what is the front-to-side ratio?

A. 12 dB

B. 14 dB

C. 18 dB

D. 24 dB

E9B03 ECLM Page (9 - 5)

In the antenna radiation pattern shown in Figure E9-1, what is the front-to-side ratio?

A. 12 dB

B. 14 dB

C. 18 dB

D. 24 dB

(B) E9B03 ECLM Page (9 - 5)

What is the front-to-back ratio of the radiation pattern shown in Figure E9-2?

A. 15 dB

B. 28 dB

C. 3 dB

D. 38 dB

E9B04 ECLM Page (9 - 7)

What is the front-to-back ratio of the radiation pattern shown in Figure E9-2?

A. 15 dB

B. 28 dB

C. 3 dB

D. 38 dB

(B) E9B04 ECLM Page (9 - 7)

What type of antenna pattern is shown in Figure E9-2?

A. Elevation

B. Azimuth

C. Radiation resistance

D. Polarization

E9B05 ECLM Page (9 - 7)

What type of antenna pattern is shown in Figure E9-2?

A. Elevation

B. Azimuth

C. Radiation resistance

D. Polarization

(A) E9B05 ECLM Page (9 - 7)

What is the elevation angle of peak response in the antenna radiation pattern shown in Figure E9-2?

A. 45 degrees

B. 75 degrees

C. 7.5 degrees

D. 25 degrees

E9B06 ECLM Page (9 - 7)

What is the elevation angle of peak response in the antenna radiation pattern shown in Figure E9-2?

A. 45 degrees

B. 75 degrees

C. 7.5 degrees

D. 25 degrees

(C) E9B06 ECLM Page (9 - 7)

How does the total amount of radiation emitted by a directional gain antenna compare with the total amount of radiation emitted from a theoretical isotropic antenna, assuming each is driven by the same amount of power?

A. The total amount of radiation from the directional antenna is increased by the gain of the antenna

B. The total amount of radiation from the directional antenna is stronger by its front to back ratio

C. They are the same

D. The radiation from the isotropic antenna is 2.15 dB stronger than that from the directional antenna

E9B07 ECLM Page (9 - 3)

How does the total amount of radiation emitted by a directional gain antenna compare with the total amount of radiation emitted from a theoretical isotropic antenna, assuming each is driven by the same amount of power?

A. The total amount of radiation from the directional antenna is increased by the gain of the antenna

B. The total amount of radiation from the directional antenna is stronger by its front to back ratio

C. They are the same

D. The radiation from the isotropic antenna is 2.15 dB stronger than that from the directional antenna

(C) E9B07 ECLM Page (9 - 3)

What is the far field of an antenna?

A. The region of the ionosphere where radiated power is not refracted
B. The region where radiated power dissipates over a specified time period
C. The region where radiated field strengths are constant
D. The region where the shape of the antenna pattern is independent of distance

E9B08 ECLM Page (9 - 2)

What is the far field of an antenna?

A. The region of the ionosphere where radiated power is not refracted
B. The region where radiated power dissipates over a specified time period
C. The region where radiated field strengths are constant
D. The region where the shape of the antenna pattern is independent of distance

(D) E9B08 ECLM Page (9 - 2)

What type of computer program technique is commonly used for modeling antennas?

A. Graphical analysis

B. Method of Moments

C. Mutual impedance analysis

D. Calculus differentiation with respect to physical properties

E9B09 ECLM Page (9 - 40)

What type of computer program technique is commonly used for modeling antennas?

A. Graphical analysis

B. Method of Moments

C. Mutual impedance analysis

D. Calculus differentiation with respect to physical properties

(B) E9B09 ECLM Page (9 - 40)

What is the principle of a Method of Moments analysis?

A. A wire is modeled as a series of segments, each having a uniform value of current

B. A wire is modeled as a single sine-wave current generator

C. A wire is modeled as a single sine-wave voltage source

D. A wire is modeled as a series of segments, each having a distinct value of voltage across it

E9B10 ECLM Page (9 - 40)

What is the principle of a Method of Moments analysis?

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C. A wire is modeled as a single sine-wave voltage source

D. A wire is modeled as a series of segments, each having a distinct value of voltage across it

(A) E9B10 ECLM Page (9 - 40)

What is a disadvantage of decreasing the number of wire segments in an antenna model below 10 segments per half-wavelength?

A. Ground conductivity will not be accurately modeled

B. The resulting design will favor radiation of harmonic energy

C. The computed feed point impedance may be incorrect

D. The antenna will become mechanically unstable

E9B11 ECLM Page (9 - 41)

What is a disadvantage of decreasing the number of wire segments in an antenna model below 10 segments per half-wavelength?

A. Ground conductivity will not be accurately modeled

B. The resulting design will favor radiation of harmonic energy

C. The computed feed point impedance may be incorrect

D. The antenna will become mechanically unstable

(C) E9B11 ECLM Page (9 - 41)

What is the radiation pattern of two 1/4-wavelength vertical antennas spaced 1/2-wavelength apart and fed 180 degrees out of phase?

A. Cardioid

B. Omni-directional

C. A figure-8 broadside to the axis of the array

D. A figure-8 oriented along the axis of the array

E9C01 ECLM Page (9 - 18)

What is the radiation pattern of two 1/4-wavelength vertical antennas spaced 1/2-wavelength apart and fed 180 degrees out of phase?

A. Cardioid

B. Omni-directional

C. A figure-8 broadside to the axis of the array

D. A figure-8 oriented along the axis of the array

(D) E9C01 ECLM Page (9 - 18)

What is the radiation pattern of two 1/4-wavelength vertical antennas spaced 1/4-wavelength apart and fed 90 degrees out of phase?

A. Cardioid

B. A figure-8 end-fire along the axis of the array

C. A figure-8 broadside to the axis of the array

D. Omni-directional

E9C02 ECLM Page (9 - 18)

What is the radiation pattern of two 1/4-wavelength vertical antennas spaced 1/4-wavelength apart and fed 90 degrees out of phase?

A. Cardioid

B. A figure-8 end-fire along the axis of the array

C. A figure-8 broadside to the axis of the array

D. Omni-directional

(A) E9C02 ECLM Page (9 - 18)

What is the radiation pattern of two 1/4-wavelength vertical antennas spaced 1/2-wavelength apart and fed in phase?

A. Omni-directional

B. Cardioid

C. A Figure-8 broadside to the axis of the array

D. A Figure-8 end-fire along the axis of the array

E9C03 ECLM Page (9 - 18)

What is the radiation pattern of two 1/4-wavelength vertical antennas spaced 1/2-wavelength apart and fed in phase?

A. Omni-directional

B. Cardioid

C. A Figure-8 broadside to the axis of the array

D. A Figure-8 end-fire along the axis of the array

(C) E9C03 ECLM Page (9 - 18)

What happens to the radiation pattern of an unterminated long wire antenna as the wire length is increased?

A. The lobes become more perpendicular to the wire

B. The lobes align more in the direction of the wire

C. The vertical angle increases

D. The front-to-back ratio decreases

E9C04 ECLM Page (9 - 14)

What happens to the radiation pattern of an unterminated long wire antenna as the wire length is increased?

A. The lobes become more perpendicular to the wire

B. The lobes align more in the direction of the wire

C. The vertical angle increases

D. The front-to-back ratio decreases

(B) E9C04 ECLM Page (9 - 14)

Which of the following is a type of OCFD antenna?

A. A dipole fed approximately 1/3 the way from one end with a 4:1 balun to provide multiband operation

B. A remotely tunable dipole antenna using orthogonally controlled frequency diversity

C. A folded dipole center-fed with 300-ohm transmission line

D. A multiband dipole antenna using one-way circular polarization for frequency diversity

E9C05 ECLM Page (9 - 12)

Which of the following is a type of OCFD antenna?

A. A dipole fed approximately 1/3 the way from one end with a 4:1 balun to provide multiband operation

B. A remotely tunable dipole antenna using orthogonally controlled frequency diversity

C. A folded dipole center-fed with 300-ohm transmission line

D. A multiband dipole antenna using one-way circular polarization for frequency diversity

(A) E9C05 ECLM Page (9 - 12)

What is the effect of adding a terminating resistor to a rhombic antenna?

A. It reflects the standing waves on the antenna elements back to the transmitter

B. It changes the radiation pattern from bidirectional to unidirectional

C. It changes the radiation pattern from horizontal to vertical polarization

D. It decreases the ground loss

E9C06 ECLM Page (9 - 15)

What is the effect of adding a terminating resistor to a rhombic antenna?

A. It reflects the standing waves on the antenna elements back to the transmitter
B. It changes the radiation pattern from bidirectional to unidirectional
C. It changes the radiation pattern from horizontal to vertical polarization
D. It decreases the ground loss

(B) E9C06 ECLM Page (9 - 15)

What is the approximate feed point impedance at the center of a two-wire folded dipole antenna?

A. 300 ohms

B. 72 ohms

C. 50 ohms

D. 450 ohms

E9C07 ECLM Page (9 - 10)

What is the approximate feed point impedance at the center of a two-wire folded dipole antenna?

A. 300 ohms

B. 72 ohms

C. 50 ohms

D. 450 ohms

(A) E9C07 ECLM Page (9 - 10)

What is a folded dipole antenna?

A. A dipole one-quarter wavelength long
B. A type of ground-plane antenna
C. A half-wave dipole with an additional parallel wire connecting its two ends
D. A dipole configured to provide forward gain

E9C08 ECLM Page (9 - 10)

What is a folded dipole antenna?

A. A dipole one-quarter wavelength long

B. A type of ground-plane antenna

C. A half-wave dipole with an additional parallel wire connecting its two ends

D. A dipole configured to provide forward gain

(C) E9C08 ECLM Page (9 - 10)

Which of the following describes a G5RV antenna?

A. A multi-band dipole antenna fed with coax and a balun through a selected length of open wire transmission line

B. A multi-band trap antenna

C. A phased array antenna consisting of multiple loops

D. A wide band dipole using shorted coaxial cable for the radiating elements and fed with a 4:1 balun

E9C09 ECLM Page (9 - 11)

Which of the following describes a G5RV antenna?

A. A multi-band dipole antenna fed with coax and a balun through a selected length of open wire transmission line

B. A multi-band trap antenna

C. A phased array antenna consisting of multiple loops

D. A wide band dipole using shorted coaxial cable for the radiating elements and fed with a 4:1 balun

(A) E9C09 ECLM Page (9 - 11)

Which of the following describes a Zepp antenna?

A. A dipole constructed from zip cord

B. An end fed dipole antenna

C. An omni-directional antenna commonly used for satellite communications

D. A vertical array capable of quickly changing the direction of maximum radiation by changing phasing lines

E9C10 ECLM Page (9 - 10)

Which of the following describes a Zepp antenna?

A. A dipole constructed from zip cord

B. An end fed dipole antenna

C. An omni-directional antenna commonly used for satellite communications

D. A vertical array capable of quickly changing the direction of maximum radiation by changing phasing lines

(B) E9C10 ECLM Page (9 - 10)

How is the far-field elevation pattern of a vertically polarized antenna affected by being mounted over seawater versus soil?

A. The low-angle radiation decreases

B. Additional higher vertical angle lobes will appear

C. Fewer vertical lobes will be present

D. The low-angle radiation increases

E9C11 ECLM Page (9 - 8)

How is the far-field elevation pattern of a vertically polarized antenna affected by being mounted over seawater versus soil?

A. The low-angle radiation decreases

B. Additional higher vertical angle lobes will appear

C. Fewer vertical lobes will be present

D. The low-angle radiation increases

(D) E9C11 ECLM Page (9 - 8)

Which of the following describes an Extended Double Zepp antenna?

A. A wideband vertical antenna constructed from precisely tapered aluminum tubing

B. A portable antenna erected using two push support poles

C. A center fed 1.25 wavelength antenna (two 5/8 wave elements in phase)

D. An end fed folded dipole antenna

E9C12 ECLM Page (9 - 11)

Which of the following describes an Extended Double Zepp antenna?

A. A wideband vertical antenna constructed from precisely tapered aluminum tubing

B. A portable antenna erected using two push support poles

C. A center fed 1.25 wavelength antenna (two 5/8 wave elements in phase)

D. An end fed folded dipole antenna

(C) E9C12 ECLM Page (9 - 11)

How does the radiation pattern of a horizontally polarized 3-element beam antenna vary with increasing height above ground?

A. The takeoff angle of the lowest elevation lobe increases

B. The takeoff angle of the lowest elevation lobe decreases

C. The horizontal beamwidth increases

D. The horizontal beamwidth decreases

E9C13 ECLM Page (9 - 9)

How does the radiation pattern of a horizontally polarized 3-element beam antenna vary with increasing height above ground?

A. The takeoff angle of the lowest elevation lobe increases

B. The takeoff angle of the lowest elevation lobe decreases

C. The horizontal beamwidth increases

D. The horizontal beamwidth decreases

(B) E9C13 ECLM Page (9 - 9)

How does the performance of a horizontally polarized antenna mounted on the side of a hill compare with the same antenna mounted on flat ground?

A. The main lobe takeoff angle increases in the downhill direction

B. The main lobe takeoff angle decreases in the downhill direction

C. The horizontal beamwidth decreases in the downhill direction

D. The horizontal beamwidth increases in the uphill direction

E9C14 ECLM Page (9 - 9)

How does the performance of a horizontally polarized antenna mounted on the side of a hill compare with the same antenna mounted on flat ground?

A. The main lobe takeoff angle increases in the downhill direction

B. The main lobe takeoff angle decreases in the downhill direction

C. The horizontal beamwidth decreases in the downhill direction

D. The horizontal beamwidth increases in the uphill direction

(B) E9C14 ECLM Page (9 - 9)