ARRL The national association for AMATEUR RADIO®

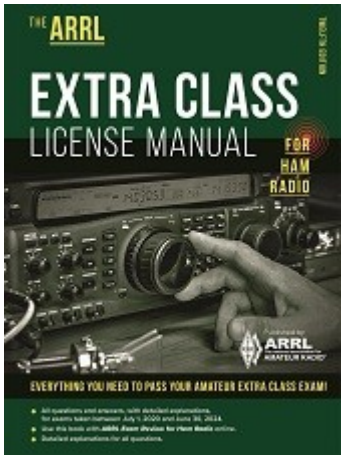
The ARRL Extra Class License Course

All You Need to Pass Your Extra Class Exam

LEVEL 3: Extra

For use with *The ARRL Extra Class License Manual*, 12th Edition

Extra License Manual and other resources



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What is the approximate maximum separation measured along the surface of the Earth between two stations communicating by EME?

A. 500 miles, if the moon is at perigee

B. 2000 miles, if the moon is at apogee

C. 5000 miles, if the moon is at perigee

D. 12,000 miles, if the moon is visible by both stations

E3A01 ECLM Page (10 - 17)

What is the approximate maximum separation measured along the surface of the Earth between two stations communicating by EME?

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(D) E3A01 ECLM Page (10 - 17)

What characterizes libration fading of an EME signal?

A. A slow change in the pitch of the CW signal

B. A fluttery irregular fading

C. A gradual loss of signal as the sun rises

D. The returning echo is several hertz lower in frequency than the transmitted signal

E3A02 ECLM Page (10 - 17)

What characterizes libration fading of an EME signal?

A. A slow change in the pitch of the CW signal

B. A fluttery irregular fading

C. A gradual loss of signal as the sun rises

D. The returning echo is several hertz lower in frequency than the transmitted signal

(B) E3A02 ECLM Page (10 - 17)

When scheduling EME contacts, which of these conditions will generally result in the least path loss?

A. When the moon is at perigee

B. When the moon is full

C. When the moon is at apogee

D. When the MUF is above 30 MHz

E3A03 ECLM Page (10 - 17)

When scheduling EME contacts, which of these conditions will generally result in the least path loss?

A. When the moon is at perigee

B. When the moon is full

C. When the moon is at apogee

D. When the MUF is above 30 MHz

(A) E3A03 ECLM Page (10 - 17)

What do Hepburn maps predict?

A. Sporadic E propagation

B. Locations of auroral reflecting zones

C. Likelihood of rain scatter along cold or warm fronts

D. Probability of tropospheric propagation

E3A04 ECLM Page (10 - 12)

What do Hepburn maps predict?

A. Sporadic E propagation

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C. Likelihood of rain scatter along cold or warm fronts

D. Probability of tropospheric propagation

(D) E3A04 ECLM Page (10 - 12)

Tropospheric propagation of microwave signals often occurs in association with what phenomenon?

A. Grayline

B. Lightning discharges

C. Warm and cold fronts

D. Sprites and jets

E3A05 ECLM Page (10 - 12)

Tropospheric propagation of microwave signals often occurs in association with what phenomenon?

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(C) E3A05 ECLM Page (10 - 12)

What might help to restore contact when DX signals become too weak to copy across an entire HF band a few hours after sunset?

A. Switch to a higher frequency HF band

B. Switch to a lower frequency HF band

C. Wait 90 minutes or so for the signal degradation to pass

D. Wait 24 hours before attempting another communication on the band

E3A06 ECLM Page (10 - 7)

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(B) E3A06 ECLM Page (10 - 7)

Atmospheric ducts capable of propagating microwave signals often form over what geographic feature?

A. Mountain ranges

B. Forests

C. Bodies of water

D. Urban areas

E3A07 ECLM Page (10 - 12)

Atmospheric ducts capable of propagating microwave signals often form over what geographic feature?

A. Mountain ranges

B. Forests

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(C) E3A07 ECLM Page (10 - 12)

When a meteor strikes the Earth's atmosphere, a cylindrical region of free electrons is formed at what layer of the ionosphere?

A. The E layer

B. The F1 layer

C. The F2 layer

D. The D layer

E3A08 ECLM Page (10 - 16)

When a meteor strikes the Earth's atmosphere, a cylindrical region of free electrons is formed at what layer of the ionosphere?

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C. The F2 layer

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(A) E3A08 ECLM Page (10 - 16)

Which of the following frequency ranges is most suited for meteor-scatter communications?

A. 1.8 MHz - 1.9 MHz

B. 10 MHz - 14 MHz

C. 28 MHz - 148 MHz

D. 220 MHz - 450 MHz

E3A09 ECLM Page (10 - 16)

Which of the following frequency ranges is most suited for meteor-scatter communications?

A. 1.8 MHz - 1.9 MHz

B. 10 MHz - 14 MHz

C. 28 MHz - 148 MHz

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(C) E3A09 ECLM Page (10 - 16)

Which type of atmospheric structure can create a path for microwave propagation?

A. The jet stream

B. Temperature inversion

C. Wind shear

D. Dust devil

E3A10 ECLM Page (10 - 12)

Which type of atmospheric structure can create a path for microwave propagation?

A. The jet stream

B. Temperature inversion

C. Wind shear

D. Dust devil

(B) E3A10 ECLM Page (10 - 12)

What is a typical range for tropospheric propagation of microwave signals?

A. 10 miles to 50 miles

B. 100 miles to 300 miles

C. 1200 miles

D. 2500 miles

E3A11 ECLM Page (10 - 12)

What is a typical range for tropospheric propagation of microwave signals?

A. 10 miles to 50 miles

B. 100 miles to 300 miles

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(B) E3A11 ECLM Page (10 - 12)

What is the cause of auroral activity?

A. The interaction in the F2 layer between the solar wind and the Van Allen belt

B. An extreme low-pressure area in the polar regions

C. The interaction in the E layer of charged particles from the Sun with the Earth's magnetic field

D. Meteor showers concentrated in the extreme northern and southern latitudes

E3A12 ECLM Page (10 - 14)

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(C) E3A12 ECLM Page (10 - 14)

Which of these emission modes is best for auroral propagation?

A. CW

B. SSB

C. FM

D. RTTY

E3A13 ECLM Page (10 - 14)

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A. CW

B. SSB

C. FM

D. RTTY

(A) E3A13 ECLM Page (10 - 14)

What is meant by circularly polarized electromagnetic waves?

A. Waves with an electric field bent into a circular shape

B. Waves with a rotating electric field

C. Waves that circle the Earth

D. Waves produced by a loop antenna

E3A14 ECLM Page (10 - 3)

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(B) E3A14 ECLM Page (10 - 3)

What is transequatorial propagation?

A. Propagation between two mid-latitude points at approximately the same distance north and south of the magnetic equator

B. Propagation between points located on the magnetic equator

C. Propagation between a point on the equator and its antipodal point

D. Propagation between points at the same latitude

E3B01 ECLM Page (10 - 13)

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(A) E3B01 ECLM Page (10 - 13)

What is the approximate maximum range for signals using transequatorial propagation?

A. 1000 miles

B. 2500 miles

C. 5000 miles

D. 7500 miles

E3B02 ECLM Page (10 - 14)

What is the approximate maximum range for signals using transequatorial propagation?

A. 1000 miles

B. 2500 miles

C. 5000 miles

D. 7500 miles

(C) E3B02 ECLM Page (10 - 14)

What is the best time of day for transequatorial propagation?

A. Morning

B. Noon

C. Afternoon or early evening

D. Late at night

E3B03 ECLM Page (10 - 14)

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A. Morning

B. Noon

C. Afternoon or early evening

D. Late at night

(C) E3B03 ECLM Page (10 - 14)

What is meant by the terms "extraordinary" and "ordinary" waves?

A. Extraordinary waves describe rare long skip propagation compared to ordinary waves which travel shorter distances

B. Independent waves created in the ionosphere that are elliptically polarized

C. Long path and short path waves

D. Refracted rays and reflected waves

E3B04 ECLM Page (10 - 7)

What is meant by the terms "extraordinary" and "ordinary" waves?

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(B) E3B04 ECLM Page (10 - 7)

Which amateur bands typically support long-path propagation?

A. Only 160 meters to 40 meters

B. Only 30 meters to 10 meters

C. 160 meters to 10 meters

D. 6 meters to 2 meters

E3B05 ECLM Page (10 - 9)

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C. 160 meters to 10 meters

D. 6 meters to 2 meters

(C) E3B05 ECLM Page (10 - 9)

Which of the following amateur bands most frequently provides long-path propagation?

A. 80 meters

B. 20 meters

C. 10 meters

D. 6 meters

E3B06 ECLM Page (10 - 9)

Which of the following amateur bands most frequently provides long-path propagation?

A. 80 meters

B. 20 meters

C. 10 meters

D. 6 meters

(B) E3B06 ECLM Page (10 - 9)

What happens to linearly polarized radio waves that split into ordinary and extraordinary waves in the ionosphere?

A. They are bent toward the magnetic poles

B. They become depolarized

C. They become elliptically polarized

D. They become phase-locked

E3B07 ECLM Page (10 - 7)

What happens to linearly polarized radio waves that split into ordinary and extraordinary waves in the ionosphere?

A. They are bent toward the magnetic poles

B. They become depolarized

C. They become elliptically polarized

D. They become phase-locked

(C) E3B07 ECLM Page (10 - 7)

E3B08 - The question has been withdrawn.

At what time of year is sporadic E propagation most likely to occur?

A. Around the solstices, especially the summer solstice

B. Around the solstices, especially the winter solstice

C. Around the equinoxes, especially the spring equinox

D. Around the equinoxes, especially the fall equinox

E3B09 ECLM Page (10 - 13)

At what time of year is sporadic E propagation most likely to occur?

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(A) E3B09 ECLM Page (10 - 13)

Why is chordal hop propagation desirable?

A. The signal experiences less loss compared to multi-hop using Earth as a reflector

B. The MUF for chordal hop propagation is much lower than for normal skip propagation

C. Atmospheric noise is lower in the direction of chordal hop propagation

D. Signals travel faster along ionospheric chords

E3B10 ECLM Page (10 - 6)

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D. Signals travel faster along ionospheric chords

(A) E3B10 ECLM Page (10 - 6)

At what time of day can sporadic E propagation occur?

A. Only around sunset

B. Only around sunset and sunrise

C. Only in hours of darkness

D. Any time

E3B11 ECLM Page (10 - 13)

At what time of day can sporadic E propagation occur?

A. Only around sunset

B. Only around sunset and sunrise

C. Only in hours of darkness

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(D) E3B11 ECLM Page (10 - 13)

What is the primary characteristic of chordal hop propagation?

A. Propagation away from the great circle bearing between stations

B. Successive ionospheric refractions without an intermediate reflection from the ground

C. Propagation across the geomagnetic equator

D. Signals reflected back toward the transmitting station

E3B12 ECLM Page (10 - 6)

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(B) E3B12 ECLM Page (10 - 6)

What does the radio communication term “ray tracing” describe?

A. The process in which an electronic display presents a pattern

B. Modeling a radio wave's path through the ionosphere

C. Determining the radiation pattern from an array of antennas

D. Evaluating high voltage sources for x-rays

E3C01 ECLM Page (10 - 8)

What does the radio communication term “ray tracing” describe?

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(B) E3C01 ECLM Page (10 - 8)

What is indicated by a rising A or K index?

A. Increasing disruption of the geomagnetic field

B. Decreasing disruption of the geomagnetic field

C. Higher levels of solar UV radiation

D. An increase in the critical frequency

E3C02 ECLM Page (10 - 5)

What is indicated by a rising A or K index?

A. Increasing disruption of the geomagnetic field

B. Decreasing disruption of the geomagnetic field

C. Higher levels of solar UV radiation

D. An increase in the critical frequency

(A) E3C02 ECLM Page (10 - 5)

Which of the following signal paths is most likely to experience high levels of absorption when the A index or K index is elevated?

A. Transequatorial

B. Polar

C. Sporadic E

D. NVIS

E3C03 ECLM Page (10 - 8)

Which of the following signal paths is most likely to experience high levels of absorption when the A index or K index is elevated?

A. Transequatorial

B. Polar

C. Sporadic E

D. NVIS

(B) E3C03 ECLM Page (10 - 8)

What does the value of Bz (B sub Z) represent?

A. Geomagnetic field stability

B. Critical frequency for vertical transmissions

C. Direction and strength of the interplanetary magnetic field

D. Duration of long-delayed echoes

E3C04 ECLM Page (10 - 5)

What does the value of Bz (B sub Z) represent?

A. Geomagnetic field stability

B. Critical frequency for vertical transmissions

C. Direction and strength of the interplanetary magnetic field

D. Duration of long-delayed echoes

(C) E3C04 ECLM Page (10 - 5)

What orientation of Bz (B sub z) increases the likelihood that incoming particles from the sun will cause disturbed conditions?

A. Southward

B. Northward

C. Eastward

D. Westward

E3C05 ECLM Page (10 - 5)

What orientation of Bz (B sub z) increases the likelihood that incoming particles from the sun will cause disturbed conditions?

A. Southward

B. Northward

C. Eastward

D. Westward

(A) E3C05 ECLM Page (10 - 5)

By how much does the VHF/UHF radio horizon distance exceed the geometric horizon?

A. By approximately 15 percent of the distance

B. By approximately twice the distance

C. By approximately 50 percent of the distance

D. By approximately four times the distance

E3C06 ECLM Page (10 - 10)

By how much does the VHF/UHF radio horizon distance exceed the geometric horizon?

A. By approximately 15 percent of the distance

B. By approximately twice the distance

C. By approximately 50 percent of the distance

D. By approximately four times the distance

(A) E3C06 ECLM Page (10 - 10)

Which of the following descriptors indicates the greatest solar flare intensity?

A. Class A

B. Class B

C. Class M

D. Class X

E3C07 ECLM Page (10 - 4)

Which of the following descriptors indicates the greatest solar flare intensity?

A. Class A

B. Class B

C. Class M

D. Class X

(D) E3C07 ECLM Page (10 - 4)

What does the space weather term "G5" mean?

A. An extreme geomagnetic storm

B. Very low solar activity

C. Moderate solar wind

D. Waning sunspot numbers

E3C08 ECLM Page (10 - 5)

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(A) E3C08 ECLM Page (10 - 5)

How does the intensity of an X3 flare compare to that of an X2 flare?

A. 10 percent greater

B. 50 percent greater

C. Twice as great

D. Four times as great

E3C09 ECLM Page (10 - 4)

How does the intensity of an X3 flare compare to that of an X2 flare?

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B. 50 percent greater

C. Twice as great

D. Four times as great

(B) E3C09 ECLM Page (10 - 4)

What does the 304A solar parameter measure?

A. The ratio of x-ray flux to radio flux, correlated to sunspot number

B. UV emissions at 304 angstroms, correlated to the solar flux index

C. The solar wind velocity at 304 degrees from the solar equator, correlated to solar activity

D. The solar emission at 304 GHz, correlated to x-ray flare levels

E3C10 ECLM Page (10 - 4)

What does the 304A solar parameter measure?

A. The ratio of x-ray flux to radio flux, correlated to sunspot number

B. UV emissions at 304 angstroms, correlated to the solar flux index

C. The solar wind velocity at 304 degrees from the solar equator, correlated to solar activity

D. The solar emission at 304 GHz, correlated to x-ray flare levels

(B) E3C10 ECLM Page (10 - 4)

What does VOACAP software model?

A. AC voltage and impedance

B. VHF radio propagation

C. HF propagation

D. AC current and impedance

E3C11 ECLM Page (10 - 8)

What does VOACAP software model?

A. AC voltage and impedance

B. VHF radio propagation

C. HF propagation

D. AC current and impedance

(C) E3C11 ECLM Page (10 - 8)

How does the maximum range of ground-wave propagation change when the signal frequency is increased?

A. It stays the same

B. It increases

C. It decreases

D. It peaks at roughly 14 MHz

E3C12 ECLM Page (10 - 6)

How does the maximum range of ground-wave propagation change when the signal frequency is increased?

A. It stays the same

B. It increases

C. It decreases

D. It peaks at roughly 14 MHz

(C) E3C12 ECLM Page (10 - 6)

What type of polarization is best for ground-wave propagation?

A. Vertical

B. Horizontal

C. Circular

D. Elliptical

E3C13 ECLM Page (10 - 6)

What type of polarization is best for ground-wave propagation?

A. Vertical

B. Horizontal

C. Circular

D. Elliptical

(A) E3C13 ECLM Page (10 - 6)

Why does the radio-path horizon distance exceed the geometric horizon?

A. E-region skip

B. D-region skip

C. Due to the Doppler effect

D. Downward bending due to density variations in the atmosphere

E3C14 ECLM Page (10 - 10)

Why does the radio-path horizon distance exceed the geometric horizon?

A. E-region skip

B. D-region skip

C. Due to the Doppler effect

D. Downward bending due to density variations in the atmosphere

(D) E3C14 ECLM Page (10 - 10)

What might be indicated by a sudden rise in radio background noise across a large portion of the HF spectrum?

A. A temperature inversion has occurred

B. A solar flare has occurred

C. Increased transequatorial propagation is likely

D. Long-path propagation is likely

E3C15 ECLM Page (10 - 8)

What might be indicated by a sudden rise in radio background noise across a large portion of the HF spectrum?

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(B) E3C15 ECLM Page (10 - 8)