

FCC Exam Element 2 Question Pool for Technician Class  
Effective 7/01/2018-6/30/2022

**SUBELEMENT T3** - Radio wave characteristics: properties of radio waves; propagation modes - [3 Exam Questions - 3 Groups]

T3A - Radio wave characteristics: how a radio signal travels; fading; multipath; polarization; wavelength vs absorption; antenna orientation

T3A01 (D)

**What should you do if another operator reports that your station's 2 meter signals were strong just a moment ago, but now they are weak or distorted?**

- A. Change the batteries in your radio to a different type
- B. Turn on the CTCSS tone
- C. Ask the other operator to adjust his squelch control
- D. Try moving a few feet or changing the direction of your antenna if possible, as reflections may be causing multi-path distortion

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T3A02 (B)

**Why might the range of VHF and UHF signals be greater in the winter?**

- A. Less ionospheric absorption
- B. Less absorption by vegetation
- C. Less solar activity
- D. Less tropospheric absorption

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T3A03 (C)

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

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

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T3A04 (B)

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

- 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

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T3A05 (B)

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

- 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

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T3A06 (B)

**What term is commonly used to describe the rapid fluttering sound sometimes heard from mobile stations that are moving while transmitting?**

- A. Flip-flopping
- B. Picket fencing
- C. Frequency shifting
- D. Pulsing

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T3A07 (A)

**What type of wave carries radio signals between transmitting and receiving stations?**

- A. Electromagnetic
- B. Electrostatic
- C. Surface acoustic
- D. Ferromagnetic

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T3A08 (C)

**Which of the following is a likely cause of irregular fading of signals received by ionospheric reflection?**

- A. Frequency shift due to Faraday rotation
- B. Interference from thunderstorms
- C. Random combining of signals arriving via different paths
- D. Intermodulation distortion

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T3A09 (B)

**Which of the following results from the fact that skip signals refracted from the ionosphere are elliptically polarized?**

- A. Digital modes are unusable
- B. Either vertically or horizontally polarized antennas may be used for transmission or reception
- C. FM voice is unusable
- D. Both the transmitting and receiving antennas must be of the same polarization

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T3A10 (D)

**What may occur if data signals arrive via multiple paths?**

- A. Transmission rates can be increased by a factor equal to the number of separate paths observed
- B. Transmission rates must be decreased by a factor equal to the number of separate paths observed
- C. No significant changes will occur if the signals are transmitted using FM
- D. Error rates are likely to increase

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T3A11 (C)

**Which part of the atmosphere enables the propagation of radio signals around the world?**

- A. The stratosphere
- B. The troposphere
- C. The ionosphere
- D. The magnetosphere

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T3A12 (B)

**How might fog and light rain affect radio range on the 10 meter and 6 meter bands?**

- A. Fog and rain absorb these wavelength bands
- B. Fog and light rain will have little effect on these bands
- C. Fog and rain will deflect these signals
- D. Fog and rain will increase radio range

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T3A13 (C)

**What weather condition would decrease range at microwave frequencies?**

- A. High winds
- B. Low barometric pressure
- C. Precipitation
- D. Colder temperatures

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T3B - Radio and electromagnetic wave properties: the electromagnetic spectrum; wavelength vs frequency; nature and velocity of electromagnetic waves; definition of UHF, VHF, HF bands; calculating wavelength

T3B01 (C)

**What is the name for the distance a radio wave travels during one complete cycle?**

- A. Wave speed
- B. Waveform
- C. Wavelength
- D. Wave spread

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T3B02 (A)

**What property of a radio wave is used to describe its polarization?**

- A. The orientation of the electric field
- B. The orientation of the magnetic field
- C. The ratio of the energy in the magnetic field to the energy in the electric field
- D. The ratio of the velocity to the wavelength

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T3B03 (C)

**What are the two components of a radio wave?**

- A. AC and DC
- B. Voltage and current
- C. Electric and magnetic fields
- D. Ionizing and non-ionizing radiation

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T3B04 (A)

**How fast does a radio wave travel through free space?**

- A. At the speed of light
- B. At the speed of sound
- C. Its speed is inversely proportional to its wavelength
- D. Its speed increases as the frequency increases

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T3B05 (B)

**How does the wavelength of a radio wave relate to its frequency?**

- A. The wavelength gets longer as the frequency increases
- B. The wavelength gets shorter as the frequency increases
- C. There is no relationship between wavelength and frequency
- D. The wavelength depends on the bandwidth of the signal

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T3B06 (D)

**What is the formula for converting frequency to approximate wavelength in meters?**

- A. Wavelength in meters equals frequency in hertz multiplied by 300
- B. Wavelength in meters equals frequency in hertz divided by 300
- C. Wavelength in meters equals frequency in megahertz divided by 300
- D. Wavelength in meters equals 300 divided by frequency in megahertz

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T3B07 (A)

**What property of radio waves is often used to identify the different frequency bands?**

- A. The approximate wavelength
- B. The magnetic intensity of waves
- C. The time it takes for waves to travel one mile
- D. The voltage standing wave ratio of waves

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T3B08 (B)

**What are the frequency limits of the VHF spectrum?**

- A. 30 to 300 kHz
- B. 30 to 300 MHz
- C. 300 to 3000 kHz
- D. 300 to 3000 MHz

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T3B09 (D)

**What are the frequency limits of the UHF spectrum?**

- A. 30 to 300 kHz
- B. 30 to 300 MHz
- C. 300 to 3000 kHz
- D. 300 to 3000 MHz

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T3B10 (C)

**What frequency range is referred to as HF?**

- A. 300 to 3000 MHz
- B. 30 to 300 MHz
- C. 3 to 30 MHz
- D. 300 to 3000 kHz

T3B11 (B)

**What is the approximate velocity of a radio wave as it travels through free space?**

- A. 150,000 kilometers per second
- B. 300,000,000 meters per second
- C. 300,000,000 miles per hour
- D. 150,000 miles per hour

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T3C - Propagation modes: line of sight; sporadic E; meteor and auroral scatter and reflections; tropospheric ducting; F layer skip; radio horizon

T3C01 (C)

**Why are direct (not via a repeater) UHF signals rarely heard from stations outside your local coverage area?**

- A. They are too weak to go very far
- B. FCC regulations prohibit them from going more than 50 miles
- C. UHF signals are usually not reflected by the ionosphere
- D. UHF signals are absorbed by the ionospheric D layer

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T3C02 (C)

**Which of the following is an advantage of HF vs VHF and higher frequencies?**

- A. HF antennas are generally smaller
- B. HF accommodates wider bandwidth signals
- C. Long distance ionospheric propagation is far more common on HF
- D. There is less atmospheric interference (static) on HF

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T3C03 (B)

**What is a characteristic of VHF signals received via auroral reflection?**

- A. Signals from distances of 10,000 or more miles are common
- B. The signals exhibit rapid fluctuations of strength and often sound distorted
- C. These types of signals occur only during winter nighttime hours
- D. These types of signals are generally strongest when your antenna is aimed west

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T3C04 (B)

**Which of the following propagation types is most commonly associated with occasional strong over-the-horizon signals on the 10, 6, and 2 meter bands?**

- A. Backscatter
- B. Sporadic E
- C. D layer absorption
- D. Gray-line propagation

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T3C05 (A)

**Which of the following effects might cause radio signals to be heard despite obstructions between the transmitting and receiving stations?**

- A. Knife-edge diffraction
- B. Faraday rotation
- C. Quantum tunneling
- D. Doppler shift

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T3C06 (A)

**What mode is responsible for allowing over-the-horizon VHF and UHF communications to ranges of approximately 300 miles on a regular basis?**

- A. Tropospheric ducting
- B. D layer refraction
- C. F2 layer refraction
- D. Faraday rotation

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T3C07 (B)

**What band is best suited for communicating via meteor scatter?**

- A. 10 meter band
- B. 6 meter band
- C. 2 meter band
- D. 70 centimeter band

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T3C08 (D)

**What causes tropospheric ducting?**

- A. Discharges of lightning during electrical storms
- B. Sunspots and solar flares
- C. Updrafts from hurricanes and tornadoes
- D. Temperature inversions in the atmosphere

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T3C09 (A)

**What is generally the best time for long-distance 10 meter band propagation via the F layer?**

- A. From dawn to shortly after sunset during periods of high sunspot activity
- B. From shortly after sunset to dawn during periods of high sunspot activity
- C. From dawn to shortly after sunset during periods of low sunspot activity
- D. From shortly after sunset to dawn during periods of low sunspot activity

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T3C10 (A)

**Which of the following bands may provide long distance communications during the peak of the sunspot cycle?**

- A. 6 or 10 meter bands
- B. 23 centimeter band
- C. 70 centimeter or 1.25 meter bands
- D. All of these choices are correct

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T3C11 (C)

**Why do VHF and UHF radio signals usually travel somewhat farther than the visual line of sight distance between two stations?**

- A. Radio signals move somewhat faster than the speed of light
- B. Radio waves are not blocked by dust particles
- C. The Earth seems less curved to radio waves than to light
- D. Radio waves are blocked by dust particles

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