SUBELEMENT T3

Radio wave characteristics: properties of radio waves; propagation modes

[3 Exam Questions]

PREPPERNET

T3A01

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

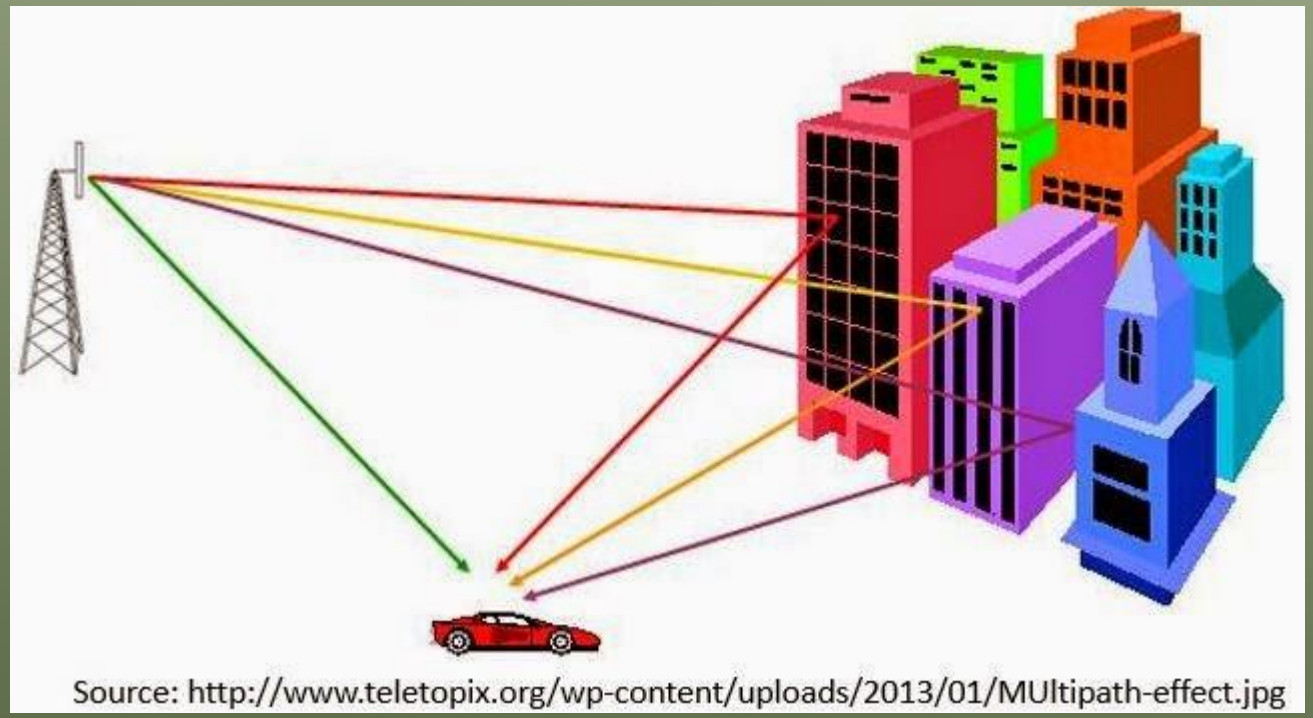
C. Ask the other operator to adjust his squelch control

D. Try moving a few feet or changing the direction of your antenna if possible, as reflections may be causing multi-path distortion

PREPPERNET

Radio waves deflect off hard surfaces, particularly metallic surfaces, at different distances and angles from one another. This causes the signals to arrive at its target at different times causing distortion. We call this "multi-pathing". However, the angle in which your signal is deflected can change as you move slightly to the side.

Likewise, objects that are out of sight can block your intended signal. Moving slightly to the side can sometimes be all that is needed for your signal to reach its intended target without obstruction or increased multi-pathing.



Source: http://www.teletopix.org/wp-content/uploads/2013/01/MUltipath-effect.jpg

PREPPERNET

T3A02
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

Vegetation is typically porous and contains water.

Because of this, the denser vegetation of the Spring & Summer over a distance, can degrade a radio signal. The higher the signal, the more absorption takes place…hence HF signals are not nearly affected as 2m and 70cm signals!!!

A clue to answering this question is that the answer is the only one that clearly correlates with winter…

PREPPERNET

T3A03

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

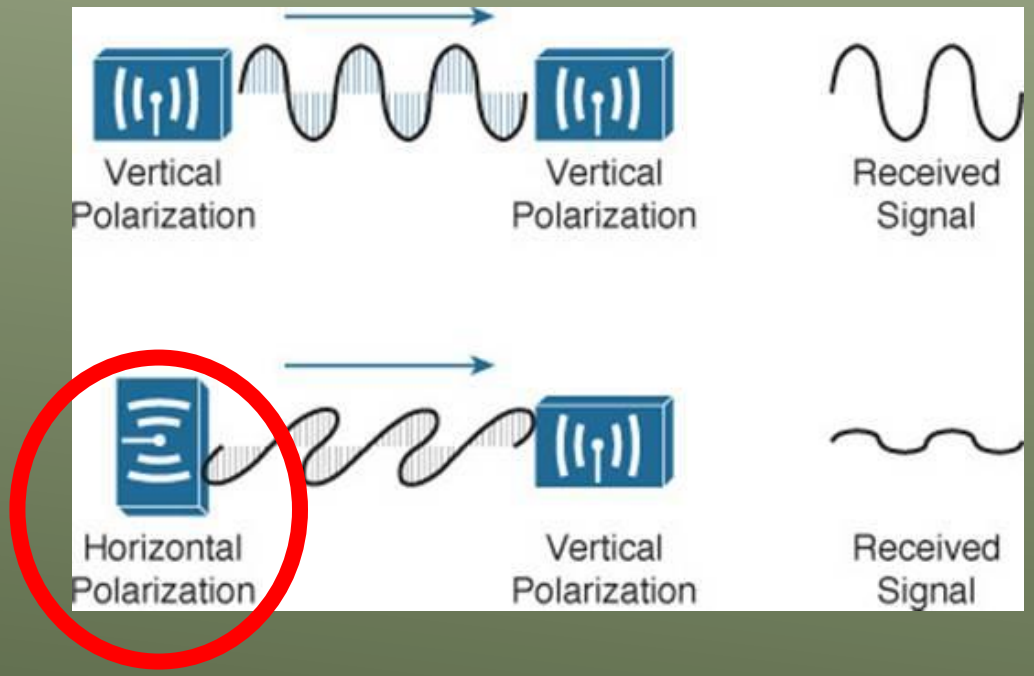
D. Vertical

PREPPERNET

If VHF and UHF signals are "ground wave"…and potential obstructions to your signal are most likely going to be at a fixed location <u>on the ground</u>…

To remember this, just think that long distance implies "over the horizon"...

You can send the signals in any polarization you care to, but if you want to make contact with other HAMs in other states or countries trying to contact you, with low power, you should use the same polarization they are using to get the strongest signal. It is merely an agreed-on convention or method.



PREPPERNET

T3A04

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

You may have played with polarized glasses sometime and found that if you hold two pair in line with each other and then rotate one 90 degrees that they darken or block light from coming through.

Some 3-D movies have you wear polarized glasses where one eye is vertically polarized and the other eye is horizontally polarized so that each eye can receive a different image projected from the two projectors.

With radio we can have vertically or horizontally polarized antennas. The receiver must have the same polarization in order to pick up the maximum amount of the signal transmitted. If they are not matched they may only detect a small portion and be significantly weaker than it should be.

PREPPERNET

T3A05

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

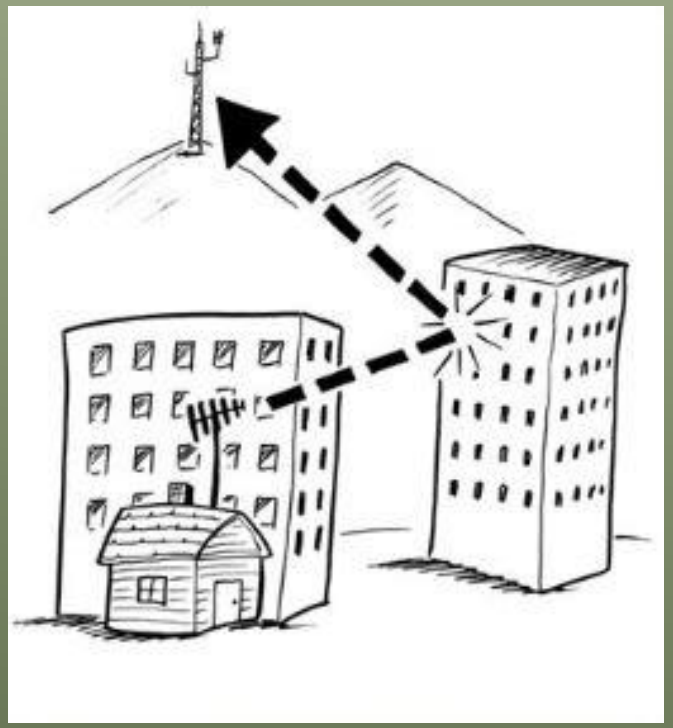
C. Try the long path

D. Increase the antenna SWR

PREPPERNET

Often is the case with ground waves…there is an obstruction beyond your scope of vision that blocks your signal.

Because a "Directional" Antenna signal is tightly focused, moving side to side may help a little, but simply pointing your antenna at a different angle can allow you to reflect your signal off of a surface in the distance to hit the repeater you are intending.



PREPPERNET

T3A06

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

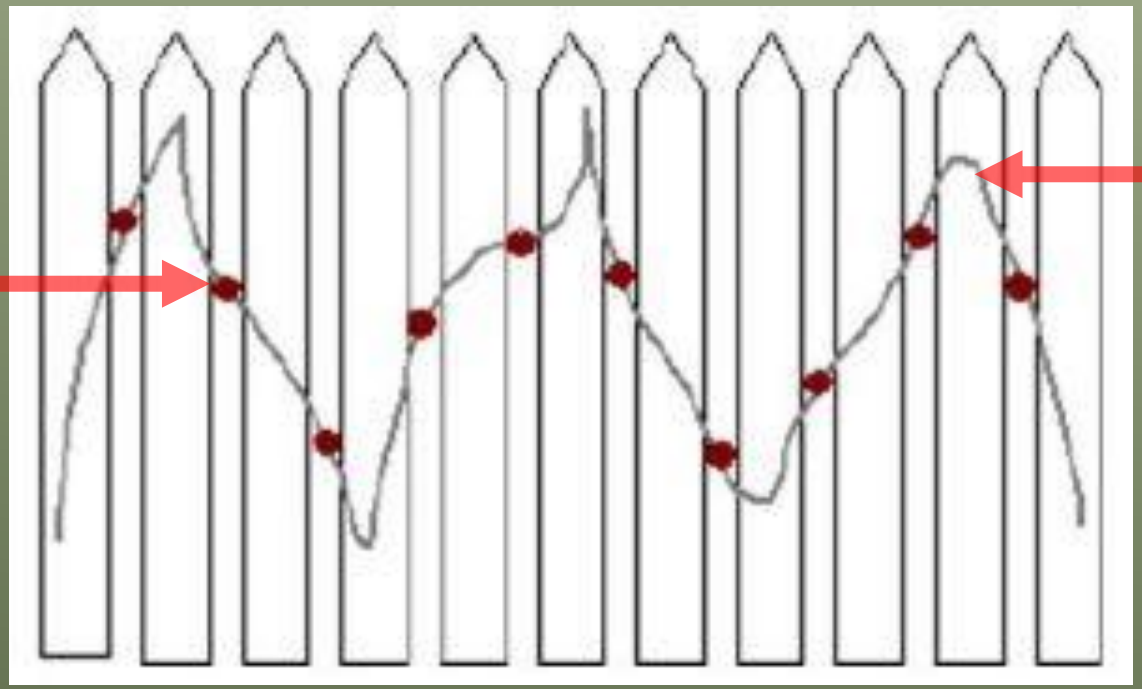
PREPPERNET

Radio signals that originate from a different location will get different results…

If the transmitter moves while transmitting, the potential of obstructions to block the signal are intermittent…thus giving the appearance of talk alongside a picket fence!

Part of the signal gets to its destination while others signals are reflected away…

Signal arrives at its intended destination….



This part of the signal gets reflected back so the listener never hears it…

PREPPERNET

T3A07
WHAT TYPE OF WAVE CARRIES RADIO SIGNALS BETWEEN TRANSMITTING AND RECEIVING STATIONS?

A. Electromagnetic

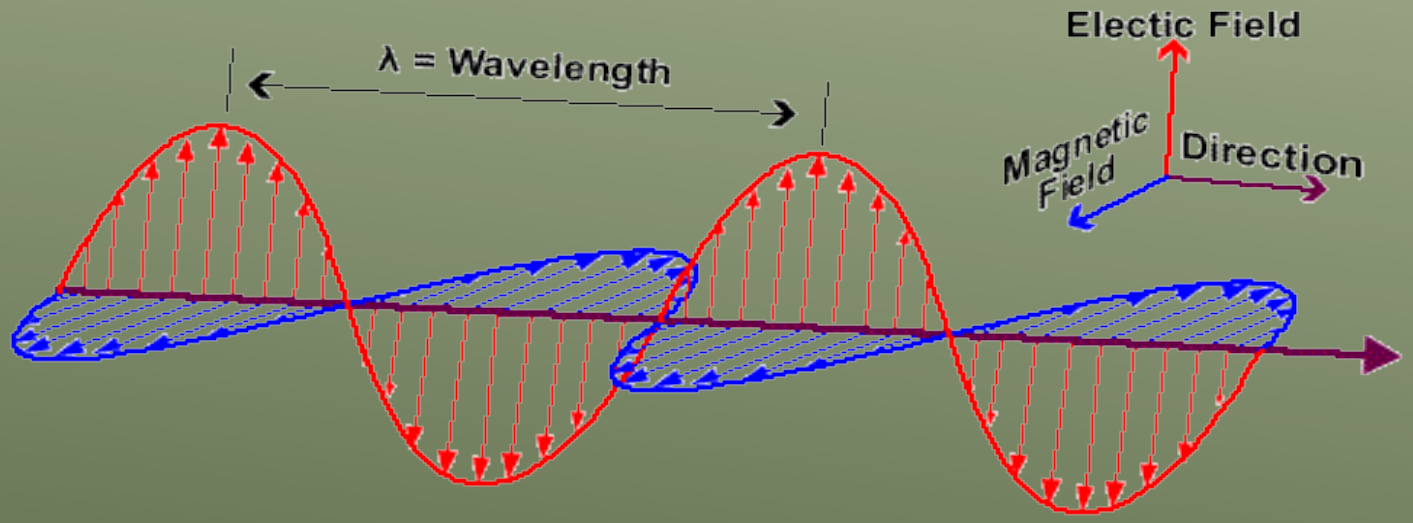
B. Electrostatic

C. Surface acoustic

D. Ferromagnetic

Radio waves are also known as Electromagnetic waves because they have both an electric and a magnetic field component to them. It's also important to note that radio waves can be found on the electromagnetic spectrum.

See *http://en.wikipedia.org/wiki/Electromagnetic_spectrum*



PREPPERNET

T3A08
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

PREPPERNET

A layer of the ionosphere can vary in density & polarization from another layer. Some signals will get slightly absorbed while others will fully reflect back to Earth.

This phenomena can cause the signal heard, to fade in and out.

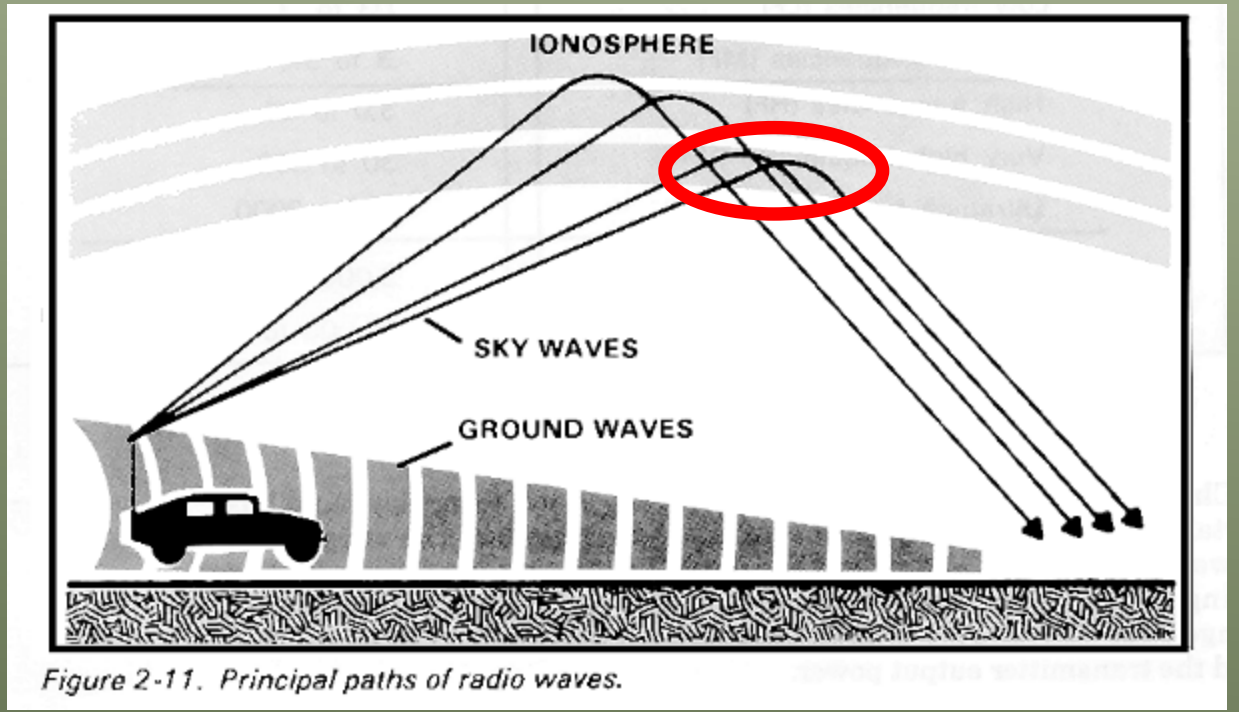


Figure 2-11. Principal paths of radio waves.

PREPPERNET

T3A09
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

PREPPERNET

Unlike VHF/UHF "ground wave" communications, antenna polarization is not quite so important.

Skip signals or skywave propagation can be used to communicate beyond the horizon, at intercontinental distances. It is mostly used in the shortwave frequency bands.

Elliptically polarized signals have a vertical and horizontal component, and thus that component can be received by either a horizontally or vertically polarized antenna.

If a signal were strictly horizontal, then receiving it on a vertical antenna would result in significant loss. The same when receiving a vertically polarized signal on a horizontal antenna.

PREPPERNET

T3A10
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

PREPPERNET

When the same signal propagates over multiple paths the different paths will generally be a slightly different distance and different angles. As a result, the signal arrives at the destination from multiple directions at multiple times. When the signal is a data signal, this distortion causes information loss leading to higher error rates.

A data signal will contain a "header bullet" that contains info on the sender, the intended receiver, and a checksum indicator. If the signal takes multiple paths to arrive, the message could potentially arrive in segmented pieces and no in a specific order.

This will create errors because the receiving station is not intelligent enough to "piece" together the signal as it was transmitted.

PREPPERNET

T3A11
WHICH PART OF THE ATMOSPHERE ENABLES THE PROPAGATION OF RADIO SIGNALS AROUND THE WORLD?

A. The stratosphere

B. The troposphere

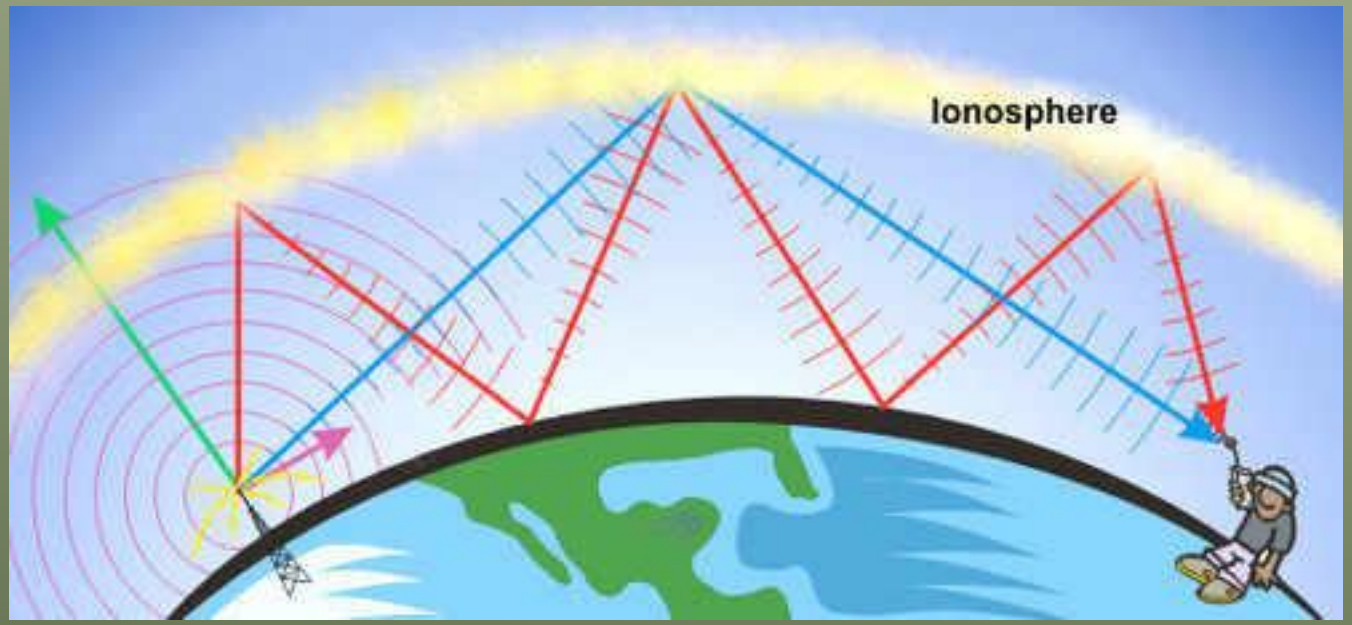
C. The ionosphere

D. The magnetosphere

PREPPERNET

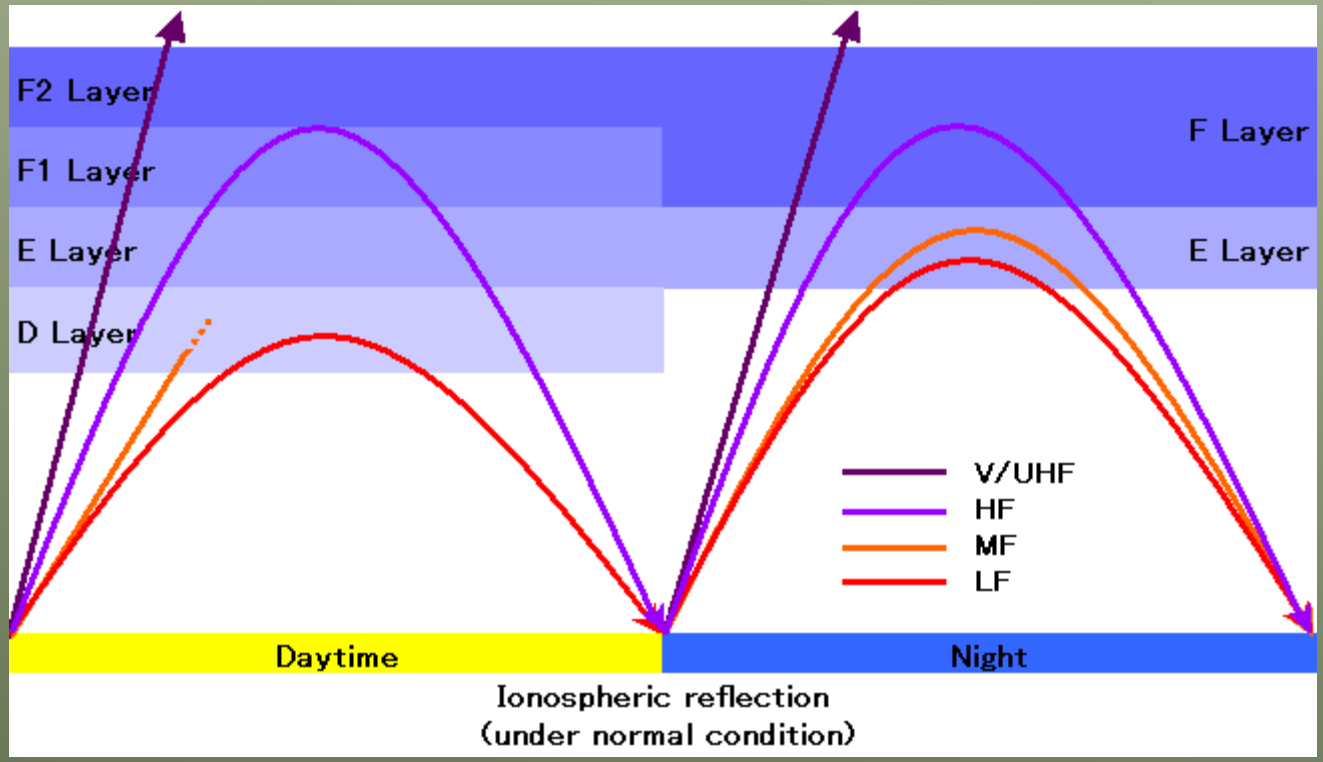
The Ionosphere contains charged ions of varying density depending on the layer.

Depending on the frequency and the first ionosphere layer that a signal encounters, the signal could pass through the layer or reflect back to earth.



PREPPERNET

The charged ions of the ionosphere helps neutralize much of the sun's radiation so at the height of the day, there will be more ionosphere layers present than at night. The layer closest to earth (the D Layer) will the least dense of these layers…so the higher the frequency, the more layers the signal will burn through.



PREPPERNET

T3A12
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

Wind, air temperature, and water content of the atmosphere can combine in many ways. A certain combination can cause radio signals to be heard hundreds of miles beyond the ordinary...

Conversely, a different combination can cause such attenuation of the signal that it may not be heard even over a normally satisfactory path.

Air moisture attenuates (absorbs) some frequency signals more than others. The higher the frequency, the more susceptible a signal's RF energy is to being absorbed by moisture.

PREPPERNET

T3A13
WHAT WEATHER CONDITION WOULD DECREASE RANGE AT MICROWAVE FREQUENCIES?

A. High winds

B. Low barometric pressure

C. Precipitation

D. Colder temperatures

The main thing to remember is that the higher the frequency, the more RF energy is absorbed (and converted into heat) by water and solids.

Since microwaves are Extremely High Frequency or greater, the weather condition that would decrease range at microwave frequencies would be precipitation. None of the other options have any significant effect.

The easiest way to remember this is your microwave oven. The microwave oven is a microwave oven because the oven microwave frequency used is optimized for getting absorbed by and thus heating the water in your food. Microwaves getting absorbed by water and converted into heat is good for ovens, not good for signal transmissions.

PREPPERNET

T3B01

WHAT IS THE NAME FOR THE DISTANCE A RADIO WAVE TRAVELS DURING ONE COMPLETE CYCLE?

A. Wave speed

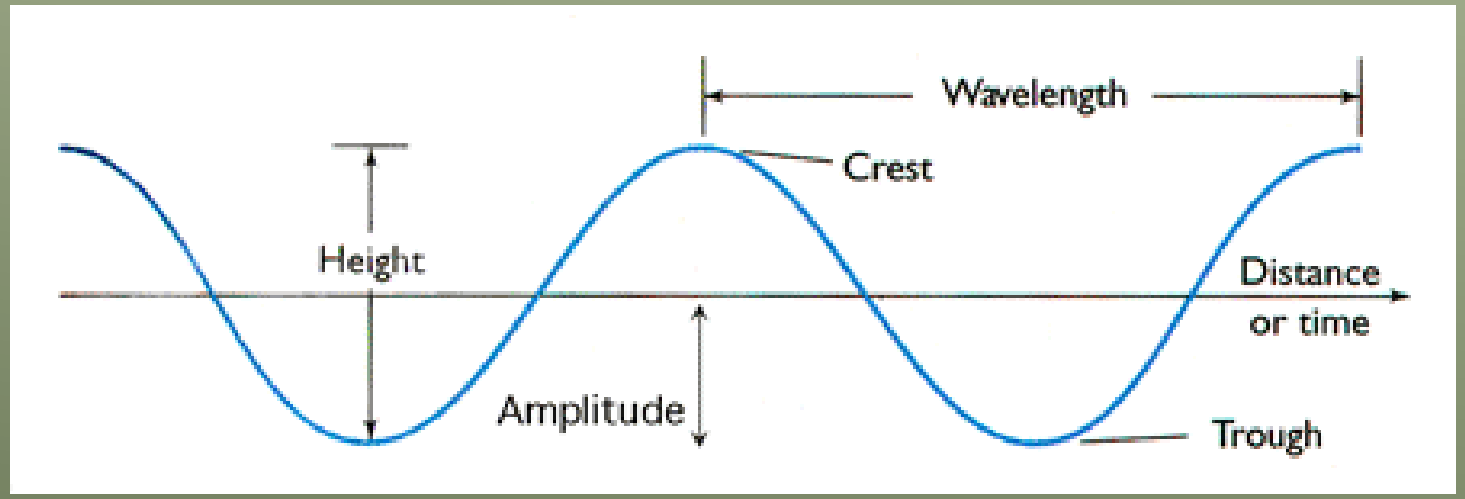
B. Waveform

C. Wavelength

D. Wave spread

PREPPERNET

The distance a radio wave travels during one complete cycle can be thought of as the length of the wave, or the wavelength.



PREPPERNET

T3B02
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

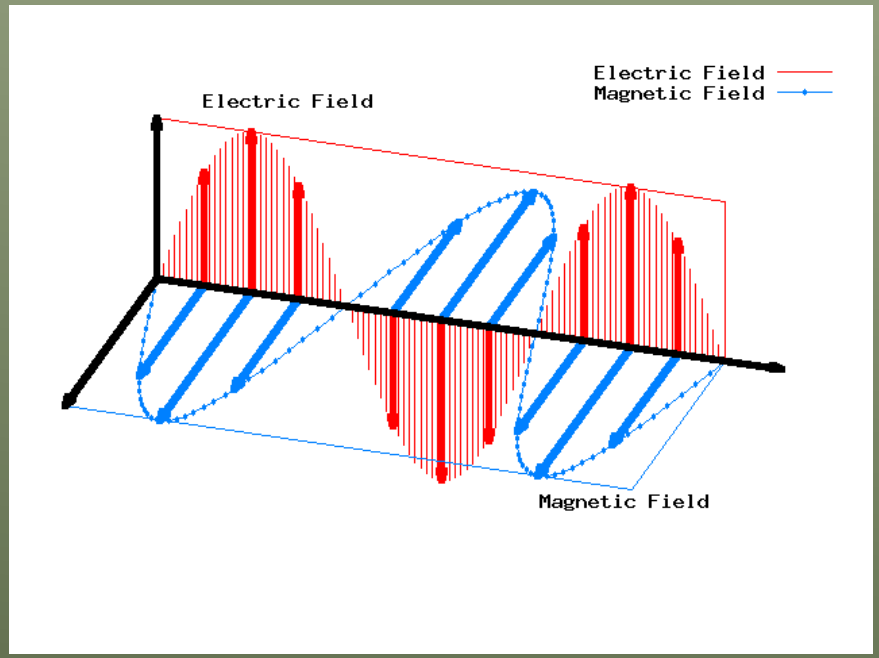
C. The ratio of the energy in the magnetic field to the energy in the electric field

D. The ratio of the velocity to the wavelength

PREPPERNET

Since there's always a magnetic and electric field to a radio wave, and they're oriented 90 degrees to each other, you could use either magnetic or electric to define polarization, but it's conventional to use the electric field (not the magnetic field, or a ratio).

Polarization has nothing to do with the velocity of a radio wave, hence the ratio of velocity to wavelength has nothing to do with polarization.



PREPPERNET

T3B03
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

PREPPERNET

Radio waves are also sometimes referred to as electromagnetic waves because they are made up of both electric and magnetic fields.

For this reason a capacitor (which stores energy in an electric field) and an inductor (which stores energy in a magnetic field) can both be used to help tune an antenna.

Ionizing and non-ionizing radiation is probably the most confusing distractor but don't fall for it - that's not it either =]

PREPPERNET

T3B04
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

PREPPERNET

All electric, magnetic, and electromagnetic waves travel <u>at the same speed</u>.

This includes light waves, radio waves, electrical waves, and magnetic waves.

Sound waves are a different story.

Just remember that radio waves and light waves are actually not all that different when it comes down to it; they're just a different frequency.

They travel at the same speed.

PREPPERNET

T3B05
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

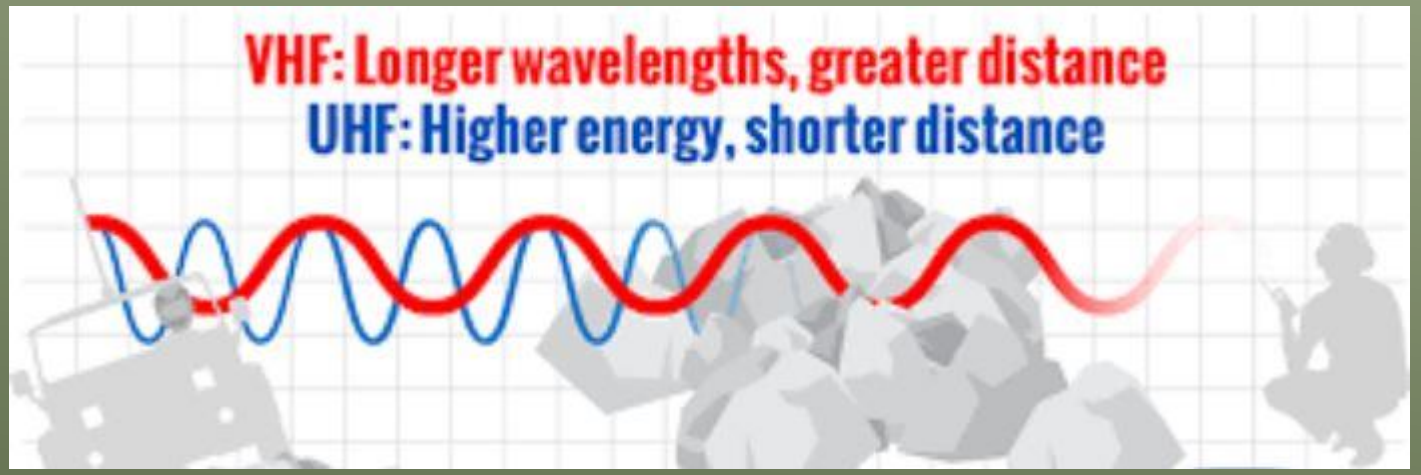
PREPPERNET

Think about how you would graph a wave…

The distance left to right represents time

the distance from one peak of the wave to the next is the wavelength and each time you reach the peak again is one cycle.

The frequency is the number of cycles per second; thus, if you have more cycles in the same distance (higher frequency), the distance between peaks (wavelength) will be shorter.



PREPPERNET

T3B06
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

PREPPERNET

Wavelength in meters equals 300 divided by frequency in megahertz.

$$\lambda_{(\text{meters})} = \frac{300}{f_{(\text{MHz})}}$$

Knowing this will help you with quite a few of the problems in the Technician class question pool!

For example, if you see the frequency 150 MHz and need to know what band it is in, divide the speed of light by the frequency. MHz cancels out, which leaves you with $\frac{300}{150MHz}$ *= 2 meters!*

The 150 MHz frequency is exactly in the middle of the 2-meter band. If your number is not quite on (e.g. $\frac{300}{144MHz}$ *= 2.08 meters) that's okay, because the bands have a little play both above and below the "wavelength" number.*

PREPPERNET

If you can remember that the speed of a radio wave is 300,000,000 meters per second and MEGA is the same a MILLION (6 zeros)…you can quickly see why we divide 300 by the band to obtain the MEGAhertz.

PREPPERNET

T3B07
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

This is a common part of Ham vocabulary.

For instance, you'll hear something like: "I was talking on the 2-meter band last night..", which actually means they were talking somewhere between 144Mhz and 148Mhz.

The approximate wavelength for a frequency between 144MHz and 148MHz is

2 meters long…

PREPPERNET

T3B08
WHAT ARE THE FREQUENCY LIMITS OF THE VHF SPECTRUM?

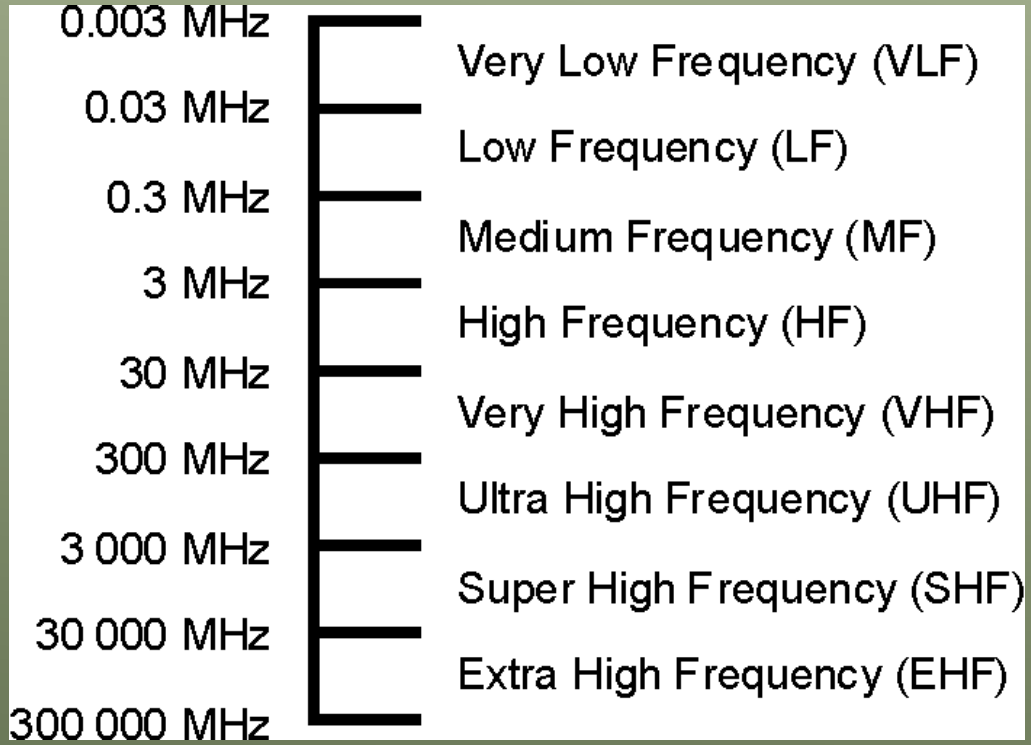
A. 30 to 300 kHz

B. 30 to 300 MHz

C. 300 to 3000 kHz

D. 300 to 3000 MHz

One thing that often confuses new hams is that the terms "HF", "VHF', and "UHF" actually refer to different parts of the spectrum, with "HF" or "High Frequency" actually referring to frequencies that are the lowest commonly used by radio operators.



PREPPERNET

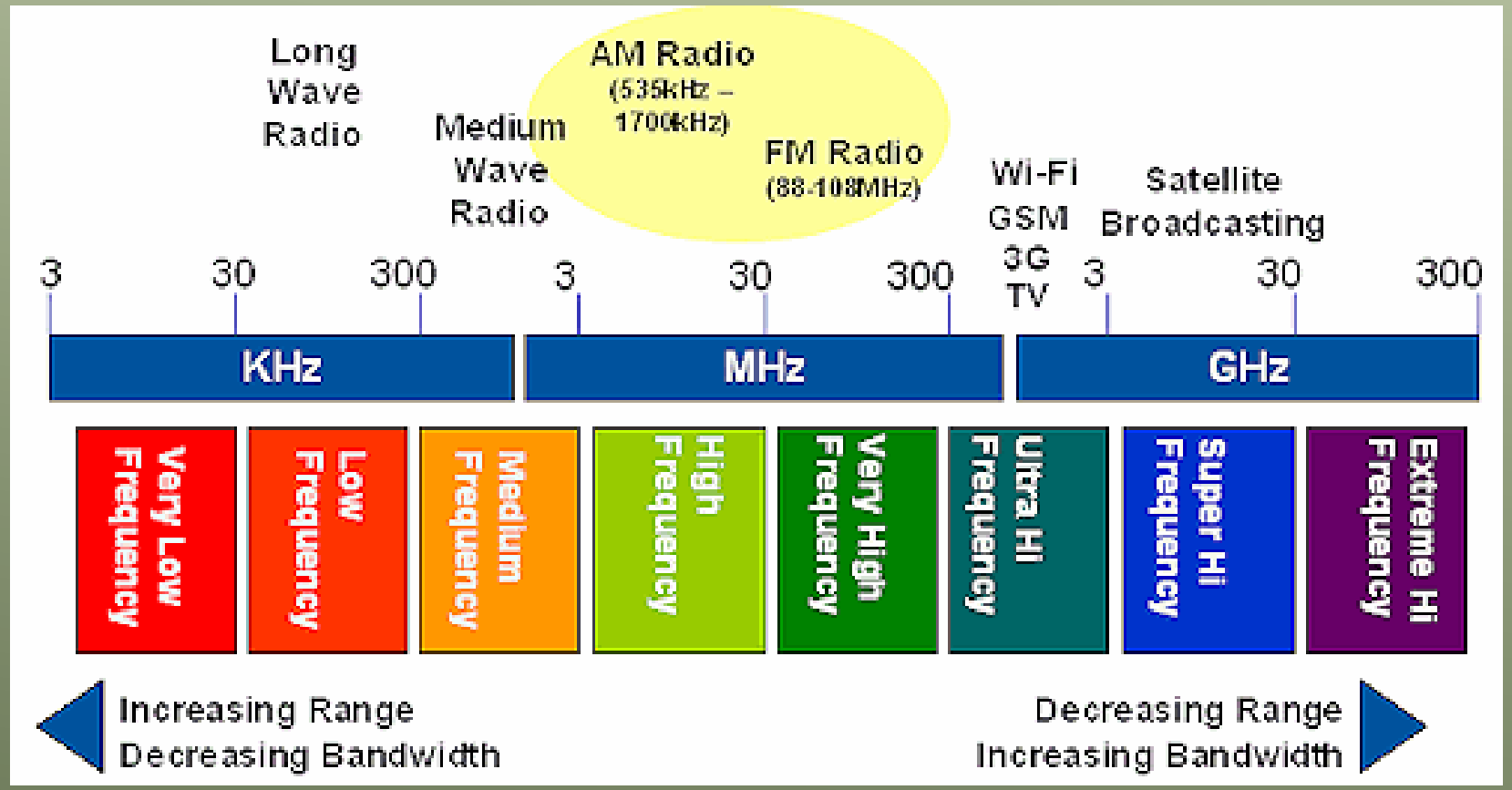
T3B09
WHAT ARE THE FREQUENCY LIMITS OF THE UHF SPECTRUM?

A. 30 to 300 kHz

B. 30 to 300 MHz

C. 300 to 3000 kHz

D. 300 to 3000 MHz


Long Wave Radio
Medium Wave Radio
AM Radio
(535kHz – 1700kHz)
FM Radio
(88-108MHz)
Wi-Fi
GSM
3G
TV
Satellite Broadcasting
3
30
300
3
30
300
3
30
300
KHz
MHz
GHz
Very Low Frequency
Low Frequency
Medium Frequency
High Frequency
Very High Frequency
Ultra Hi Frequency
Super Hi Frequency
Extreme Hi Frequency
Increasing Range
Decreasing Bandwidth
Decreasing Range
Increasing Bandwidth

PREPPERNET

T3B10
WHAT FREQUENCY RANGE IS REFERRED TO AS HF?

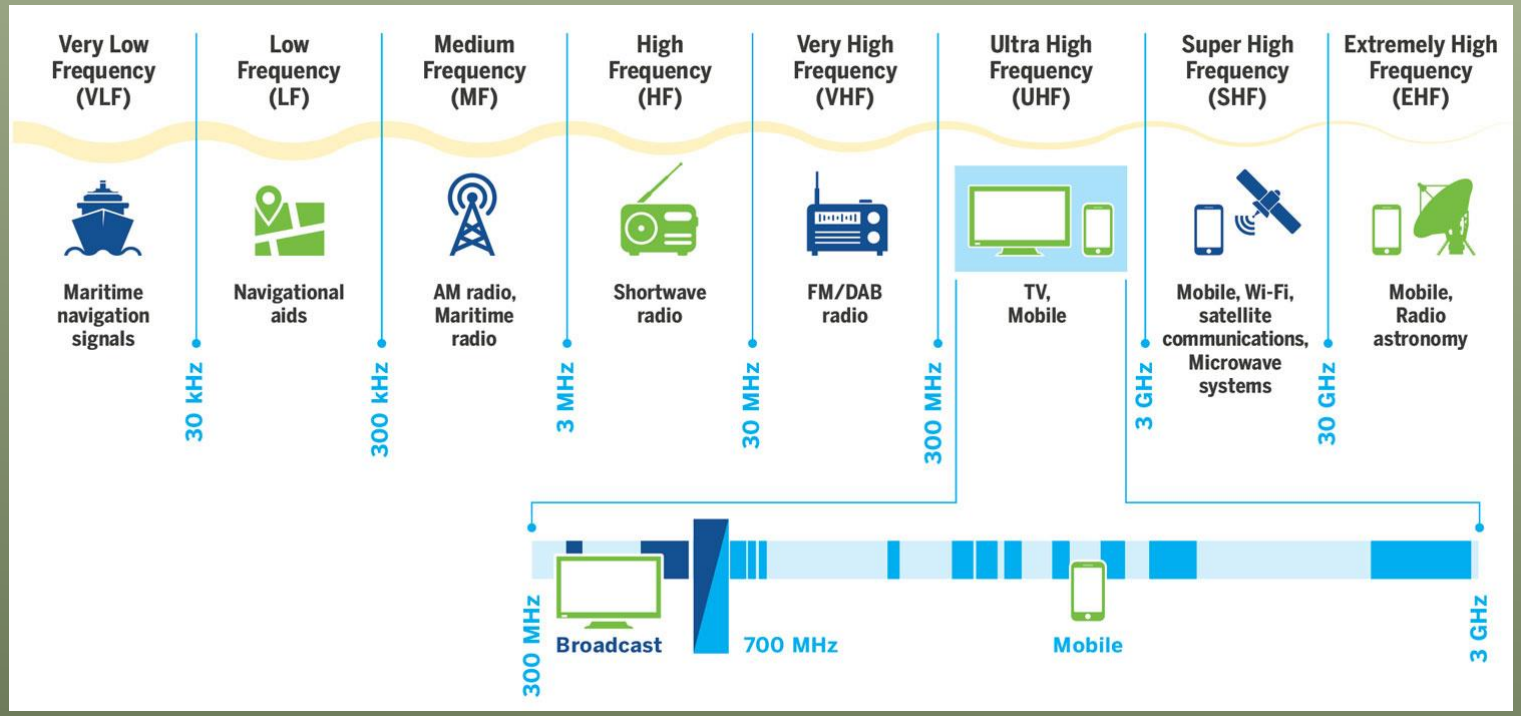
A. 300 to 3000 MHz

B. 30 to 300 MHz

C. 3 to 30 MHz

D. 300 to 3000 kHz

One thing that often confuses new hams is that the terms "HF", "VHF', and "UHF" actually refer to different parts of the spectrum, with "HF" or "High Frequency" actually referring to frequencies that are the lowest commonly used by radio operators.



PREPPERNET

T3B11
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

PREPPERNET

This is a useful number to know; it is, of course, the speed of light.

One really useful thing about this number is that it comes out to the same range as "Mega" (6 zeros after 300), so it can be used as a quick way to calculate wavelength in MegaHz (MHz).

PREPPERNET

T3C01
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

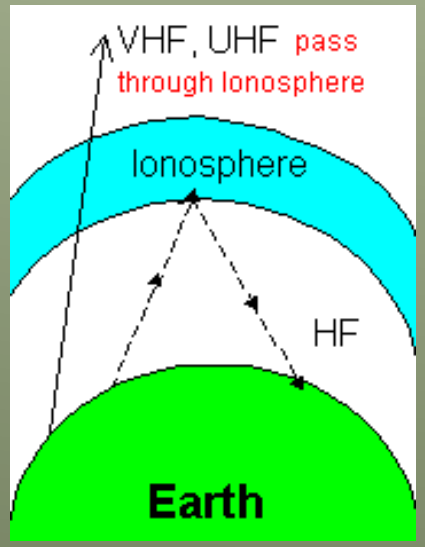
C. UHF signals are usually not reflected by the ionosphere

D. UHF signals are absorbed by the ionospheric D layer

PREPPERNET

Signals in the UHF spectrum have such a narrow wavelength that they don't bounce off the ionosphere at all -- they pass right through it into outer space.

(This is why higher frequencies are ideal for communicating with satellites).



Thus, if you hear a signal in the UHF band, it's safe to assume the source of that signal is nearby.

PREPPERNET

T3C02
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

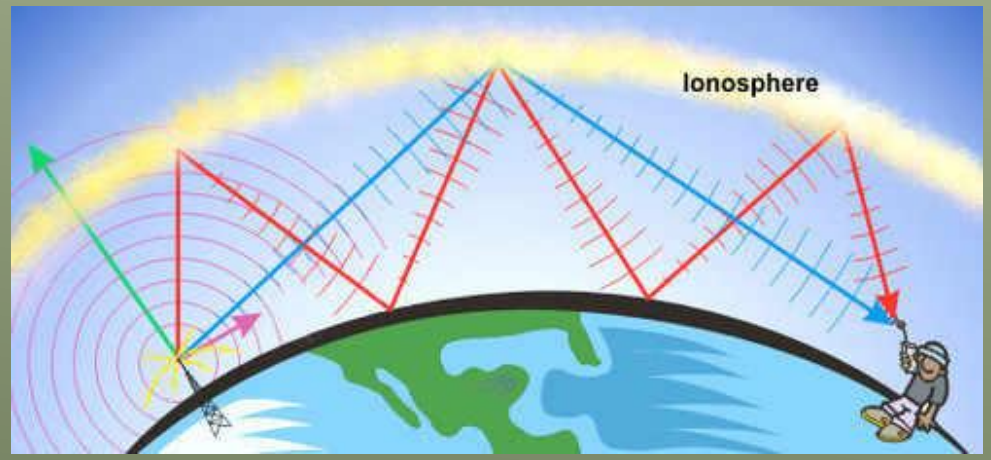
D. There is less atmospheric interference (static) on HF

PREPPERNET

Think of VHF as very sharp waves that poke right through the atmosphere.

Whereas, HF has very dull waves that bounce off the atmosphere.

So VHF is mostly line of sight and HF is long distance.



In this answer the only true option is long distance communications.

PREPPERNET

T3C03

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

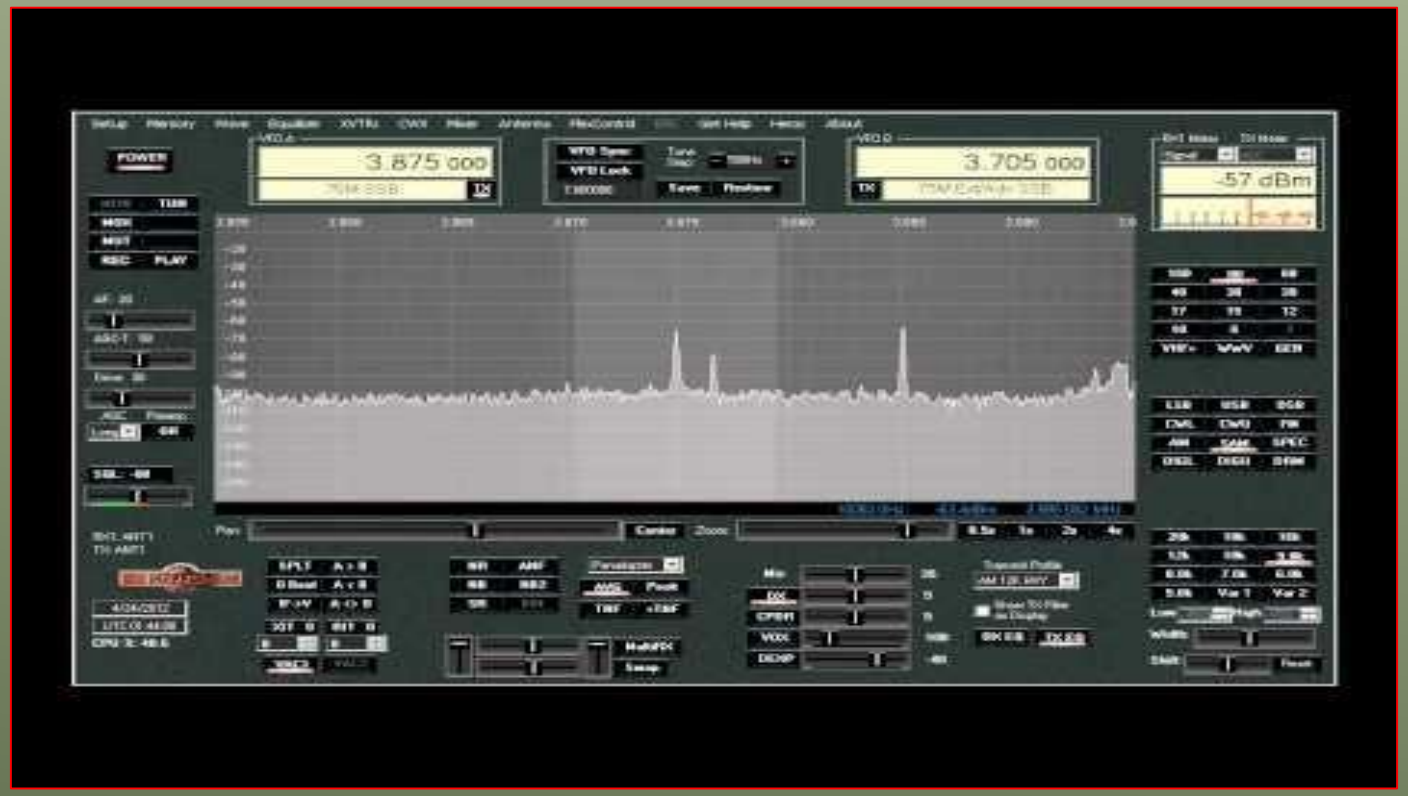
D. These types of signals are generally strongest when your antenna is aimed west

There is a lot going on here for a quick explanation…

The best way to understand what is happening is to think of throwing a rock in a small pond and then shining a flashlight on the water. The beam is dancing around on the ripples and waves. The radio waves are doing the same thing in the atmosphere that being excited by the energy causing the auroral phenomenon and just about as quickly.

PREPPERNET

Here is an audio example of a signal which is rapidly fluctuating in strength and is distorted because of the phenomenon known as "Auroral Reflection"…



PREPPERNET

T3C04

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

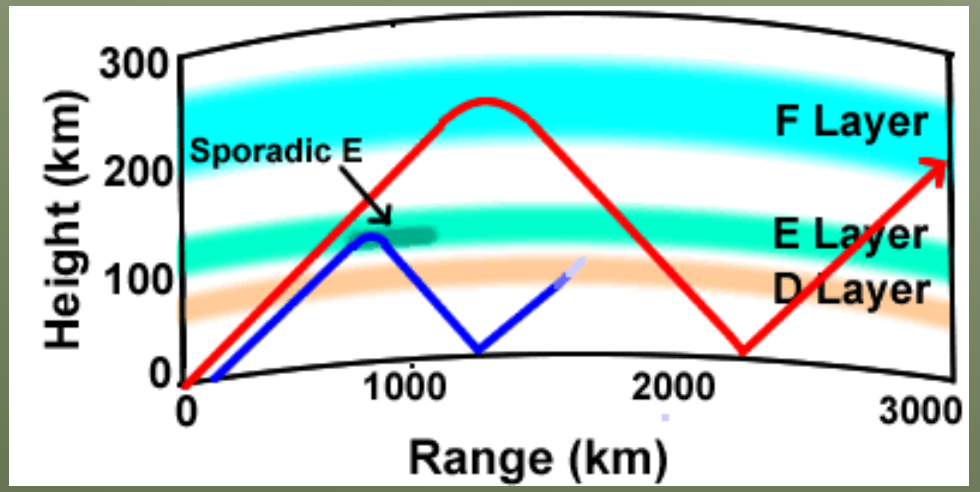
D. Gray-line propagation

The higher the frequency the more likely that the RF energy is going to be absorbed before it gets very far.

However, every now and then a type of propagation opens up that carries the RF energy within a range of frequencies quite a long distance refracting it in just the right way over and over.

This phenomenon occurs from highly dense, ionized patches of gas during the Summer months in the 'E' layer of the ionosphere.

The E-layer quickly disappears at night when the sun's radiation is at its lowest point.



PREPPERNET

T3C05

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

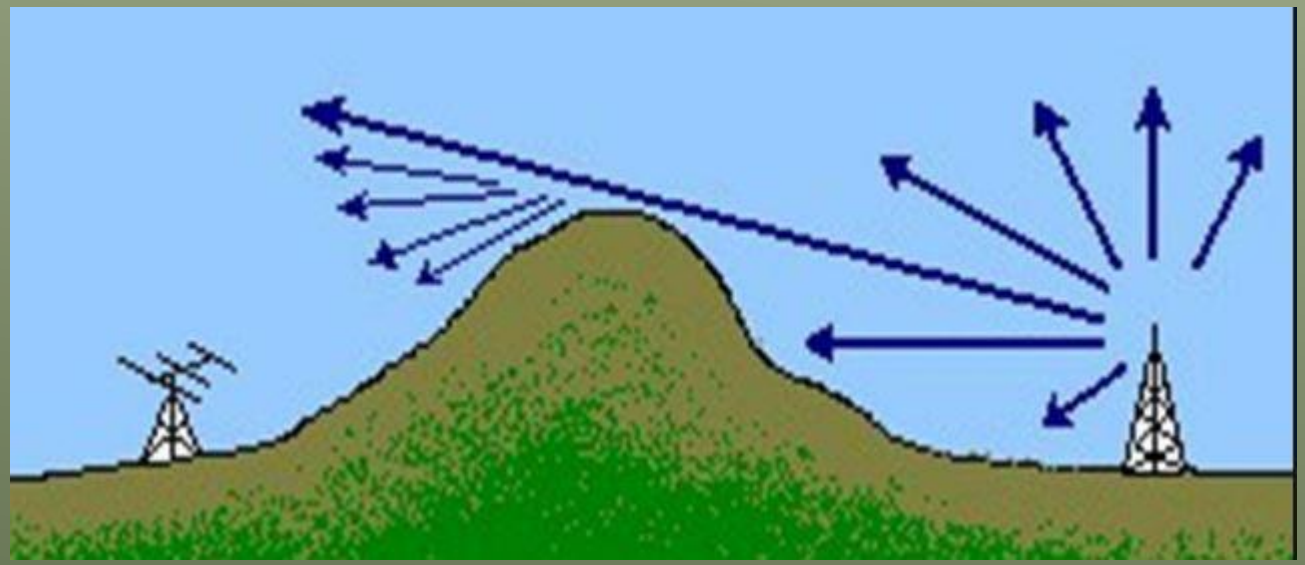
C. Quantum tunneling

D. Doppler shift

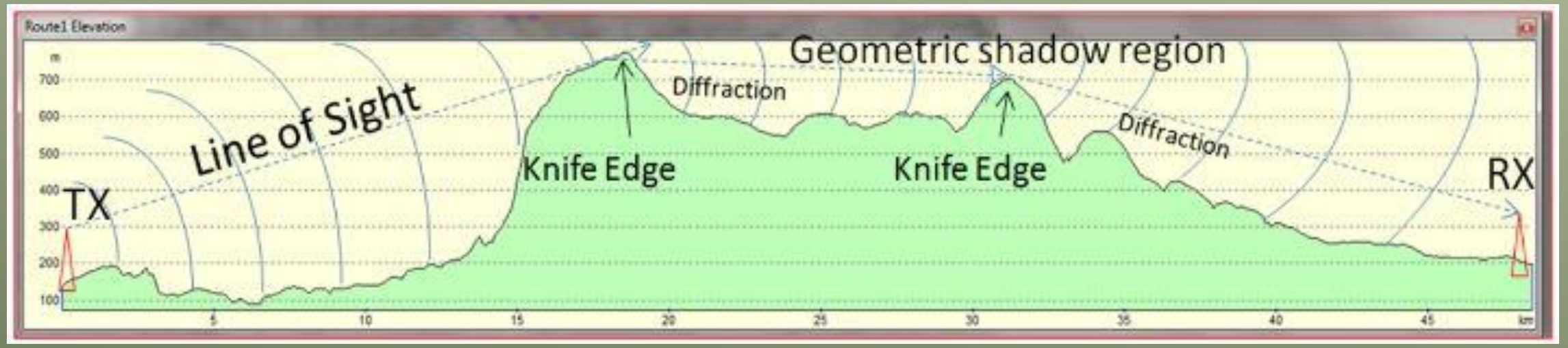
PREPPERNET

In general, radio signals don't penetrate dirt or rock very well at all. So if you're hearing a signal on the other side of a mountain, it's likely due to knife-edge diffraction, a physical phenomenon that occurs when waves hit a sharp edge.

Doppler Shift, although a topic that does appear in the Question Pool, has to do with the source of the signal moving toward or away from you, and has nothing to do with hearing a signal despite obstructions.



PREPPERNET


Route1 Elevation
m
700
600
500
400
300
200
100
5
10
15
20
25
30
35
40
45
km
Line of Sight
TX
Knife Edge
Diffraction
Geometric shadow region
Knife Edge
Diffraction
RX

PREPPERNET

T3C06

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

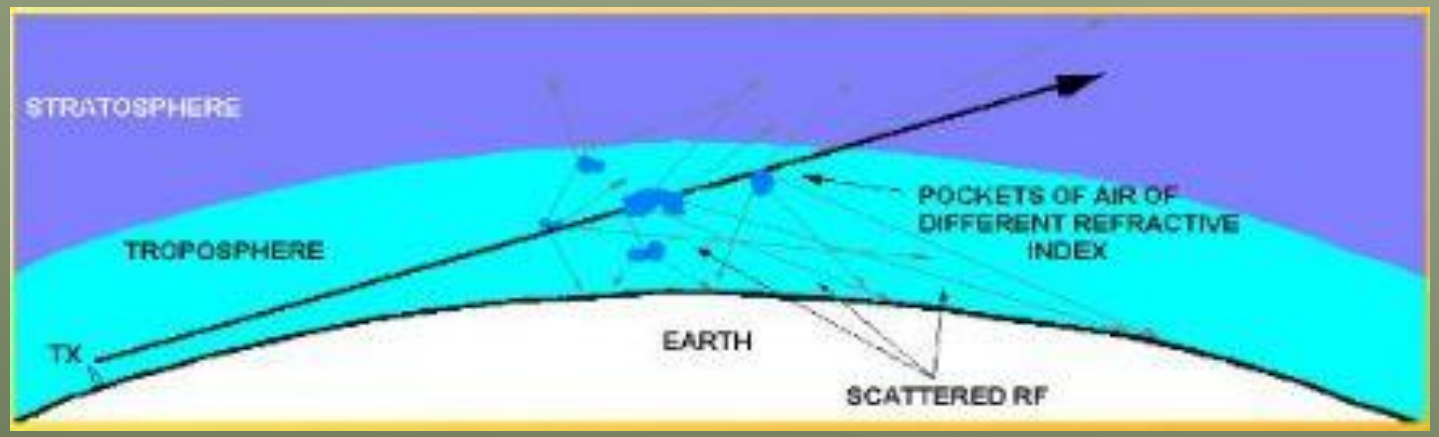
D. Faraday rotation

PREPPERNET

There are several modes that can allow communication that ranges "over-the- horizon" or beyond line-of-sight such as Ducting and Troposheric scatter. The key words to differentiate these two in this question is "regular basis".

Ducting requires specific atmospheric conditions such as a temperature inversion.

Tropospheric scatter works in the VHF, UHF and microwave frequencies where the signals are bent or reflected back to earth in a somewhat random manner to station a significant distance away on a regular basis.



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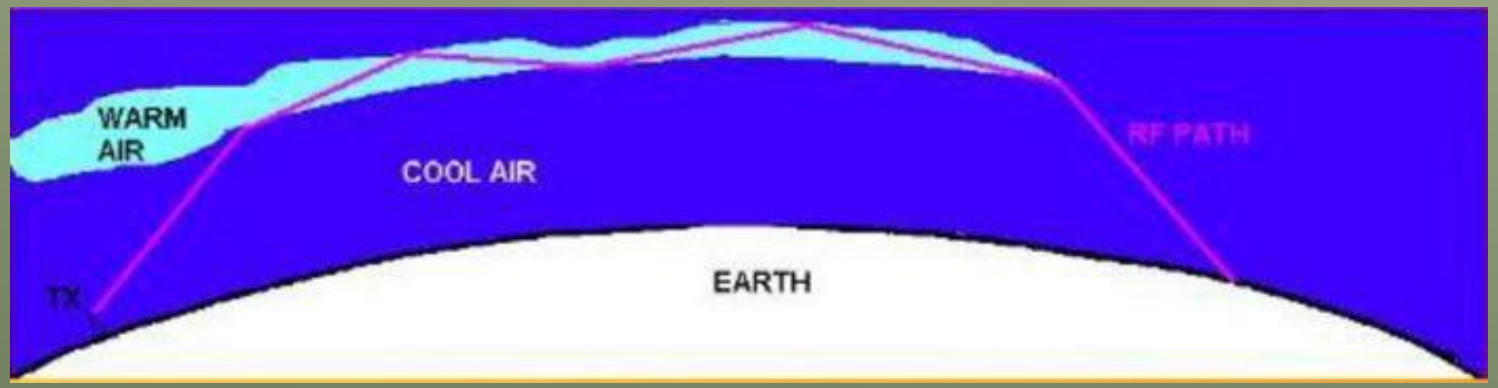
Cool dry air		Remainder of Troposphere
Duct – warm air		Up to 300m thick
Cool dry air	Ground wave	Up to 3 000m above the earth
	Up to 5000km between ground stations	



T3C07
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

Meteor scatter communication is done by reflecting radio waves off ionized particles in the ionosphere that were caused by meteors passing through.

The 6-meter band is excellent for meteor scatter due to its wavelength, and because it is a quiet band.

Wavelengths longer than 6 meters are not effectively reflected by meteor scatter; shorter wavelength bands, such as the 2-meter band, are not as quiet which makes it difficult to hear these weak signals from 500 to 1500 miles away.

HINT: The "6" in 6 meters looks like a meteor with a curved tail

T3C08
WHAT CAUSES TROPOSPHERIC DUCTING?

A. Discharges of lightning during electrical storms

B. Sunspots and solar flares

C. Updrafts from hurricanes and tornadoes

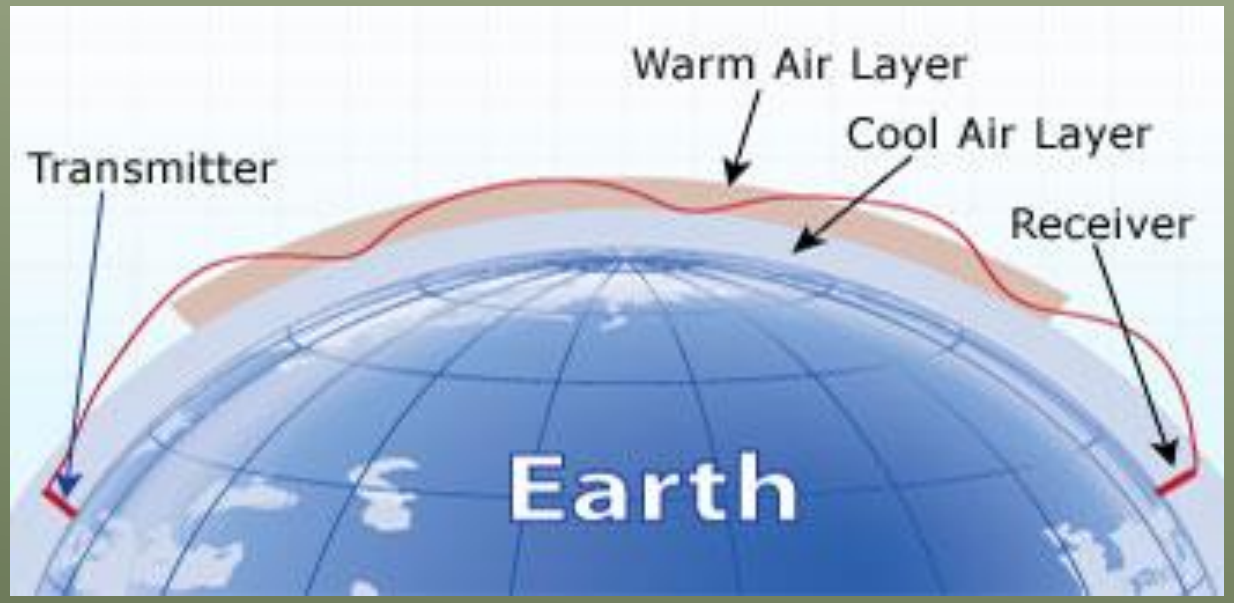
D. Temperature inversions in the atmosphere

PREPPERNET

Tropospheric ducting is an atmospheric effect caused by a differential temperature layer that causes reflection or refraction of radio wave. These reflective layers can form a radio wave "duct", much like the ducts that are used to duct warm or cool air through our homes.

These ducts are often caused by thermal inversions and other weather phenomena.

The troposphere is the lowest level of the atmosphere and is where temperature inversions occur; understanding this relationship will help you choose the correct answer.



PREPPERNET

T3C09
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

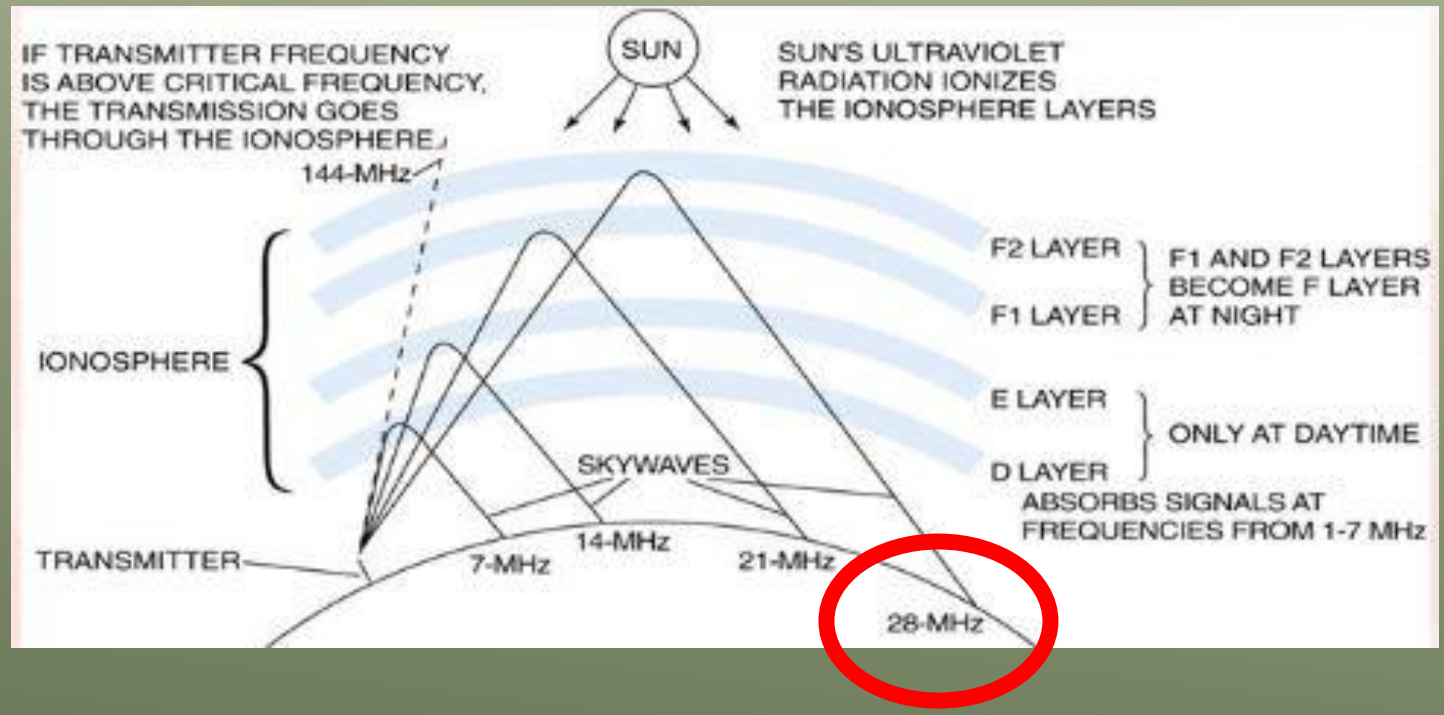
B. From shortly after sunset to dawn during periods of high sunspot activity

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

Remember that 10 meters follows the sun and thus is best in daylight hours.

The 10 meter band is best during daylight hours due to the nature of this wavelength and how it refracts through or reflects off of the F2 layer of the ionosphere.



PREPPERNET

T3C10
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

Since they're talking about sunspot cycle, they're talking about ionospheric refraction.

But 23 centimeters and 70 centimeters have wavelengths that are too short to be reflected or refracted by the ionosphere - they pass right through without enough bending to make it back to earth.

Six and ten meters are refracted somewhat, but only when we have high sunspot activity is there enough ultraviolet radiation to bend a signal all the way back down to the earth - without the high ultraviolet, the signal bends, but not enough to get it back to earth.

PREPPERNET

T3C11
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

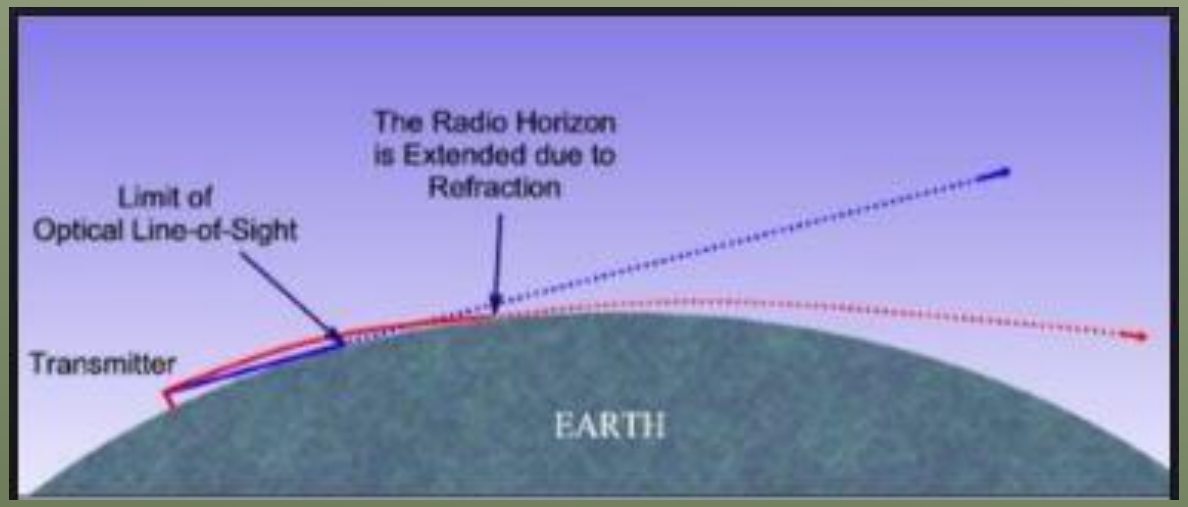
D. Radio waves are blocked by dust particles

PREPPERNET

When we talk about radio wave propagation we often say that it is "line of sight".

VHF and UHF can bend somewhat around the curvature of the Earth and thus travel further than we can see provided there are not other significant obstacles that may block the signal such as buildings, trees and hills.

This is also called the "radio horizon", or the distance where the radio signal between two points is blocked by the curvature of the Earth.



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END of SUBELEMENT 3

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