

Frequently Asked Questions

1. What is an antenna?
 - a. How long should an antenna be?
 - b. How should an antenna be placed?

An antenna (or aerial) is an electrical device that converts electrical signals into radio waves and vice versa. It is usually used with a radio transmitter or radio receiver. The impedance (resistance to signals) of an antenna varies with the length of the antenna because of physical laws. A resonant antenna has low impedance is often used and performs well. Its length determines antenna resonance. An antenna over a ground plane (like earth) should be $\frac{1}{4}$ wavelength to resonate. For the 20-meter radio band this corresponds to 5 meters in length. Since radio waves travel through the atmosphere, antennas should be placed as high as possible to intercept as much of the radio signal as possible.

2. How do radio waves propagate?

Radio waves are a form of electromagnetic radiation similar to light waves. Radio waves at different frequencies propagate in different ways due to the environment surrounding the earth. Twenty-meter band signals can propagate nearly all over the world under certain conditions.

3. What is the difference between audible and inaudible signals?

Audible means “hearable” to average person, while inaudible means the opposite.

4. Why is power important?

The intensity or power level of a radio signal is important because high-level signals are easier to discern from noise.

5. What is noise?

Noise is comprised of unwanted radio signals; usually signals generated by natural sources (like lightening) as well as man made signals like radar or electrical appliances that interfere with our primary signal.

6. How does noise interfere with signals?

Since most radio receivers use some form of level detection, noise makes it very difficult to receive weak primary signals particularly when their signal levels are nearly the same as noise.

7. What is a radio path?

Since there are electrons and ions in varying density in our atmosphere, radio signals are affected due to the interaction of the signal with them. A special region in the upper atmosphere called the ionosphere is affected by the sun causing ionization (generation of ions) thereby affecting propagation. The degree of ionization affects radio propagation for different wavelengths. Hence radio signals follow specific paths based on their wavelength. Radio propagation is a very complicated subject and all aspects of it are not known. For example, cosmic rays may affect the ionosphere. Hopefully the WSPR project may help shed more light on this process.

8. What affects a radio path?

See 7 above...

9. How does WSPR work when there is noise?

A WSPR radio signal uses a code that helps distinguish it from noise. Noise has little or no correlation whereas the WSPR signal has large correlation. This property can be used to discern WSPR signals from noise even if the levels are similar.

10. What are sunspots?

Intense magnetic activity on the sun causes a temporary phenomenon on the photosphere of the sun that appears visibly as dark spots compared to surrounding regions. Sunspot populations quickly rise and more slowly fall on an irregular cycle of 11 years. They are known to affect radio propagation. As sunspot numbers increase, the sun causes more ionization in our atmosphere.

11. What is the ionosphere?

See 7 above

12. What are coordinates?

Coordinates are a way of defining position. In geography, latitude (North and South) and longitude (East and West) define position. They show an exact place on the map and are expressed in degrees, minutes, seconds.

13. Do we have coordinates on earth to tell us where we are?

See 12 above

14. What is a maidenhead coordinate?

The Maidenhead Locator System is a geographic coordinate system used by amateur radio operators. It uses a string of characters to represent latitude and longitude.

15. What is universal coordinated time (UTC)?

Coordinated Universal Time (UTC) is the primary time standard by which the world coordinates time.

16. What is distance?

Distance is a numerical description of how far apart objects are usually specified in metric units like kilometers or English units like miles.

17. What is the difference between a kilometer and a mile?

Both are units of distance. Kilometers belong to metric system. One kilometer is 0.621 miles.

18. Why should teachers be interested in the WSPR project?

- a. We get to use it to find out all kinds of interesting things.
- b. Some students may want to become HAM radio operators because they have been introduced to this subject. Others may just find the information that they discover to be interesting and valuable to know.