Technician License Course

KE6HEC February 11, 2021

Technician License Course

Chapter 2

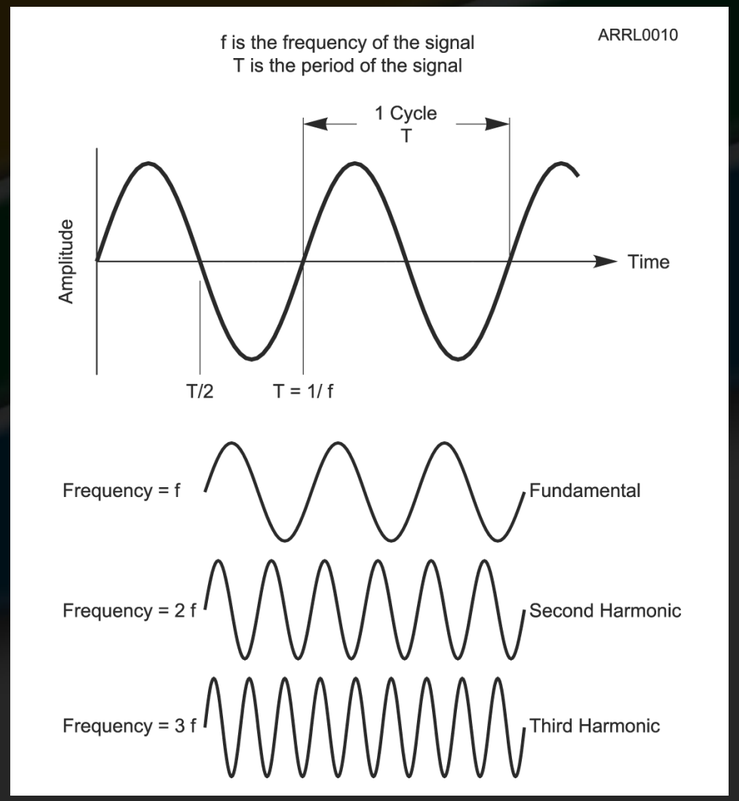
Lesson Plan Module - 2

Radio Waves & Signals

Wave Vocabulary

Before we study radio, we need to learn some wave vocabulary.

- Amplitude
- Frequency (hertz, Hz)
- Period (seconds, s)
- Fundamental
- Harmonics



Electromagnetic Waves

- Electromagnetic waves are made up of electric and magnetic energy. (fields)
- The electric and magnetic fields vary in the pattern of a sine wave.
- Electromagnetic waves travel at the speed of light.

Electromagnetic Waves

- Moving electrons in an antenna take the place of the moving magnet.

-A signal from a transmitter can make the electrons in an antenna move, transferring energy from the signal to electromagnetic waves.

Electromagnetic Waves

- The same process works “backwards” too.
- Electromagnetic waves encountering an antenna make its electrons move in sync with the wave.
- Electromagnetic energy is transferred from the wave to the electrons.
- The moving electrons create a signal that can be detected by a receiver.

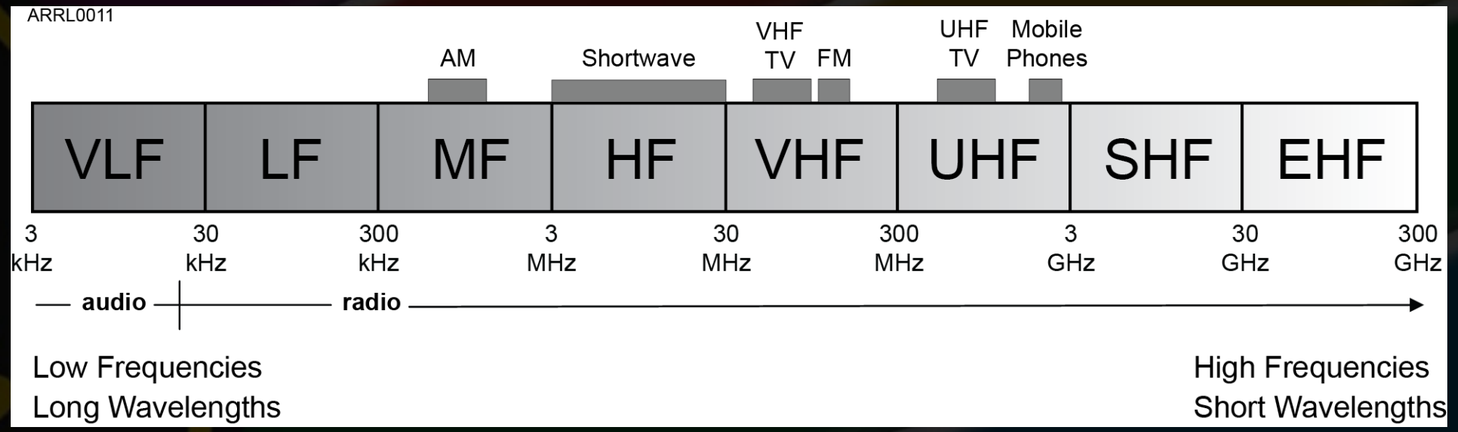
Electromagnetic Spectrum

- The electromagnetic spectrum is divided into ranges of frequencies in which electromagnetic waves behave similarly.

- Each range or segment has a different name.

- Waves with a certain range of frequencies which can be used for communication are called radio waves.

Radio Spectrum



- The part of the electromagnetic spectrum Composed of radio waves is called the *Radio Frequency* or *RF* spectrum

Radio Spectrum

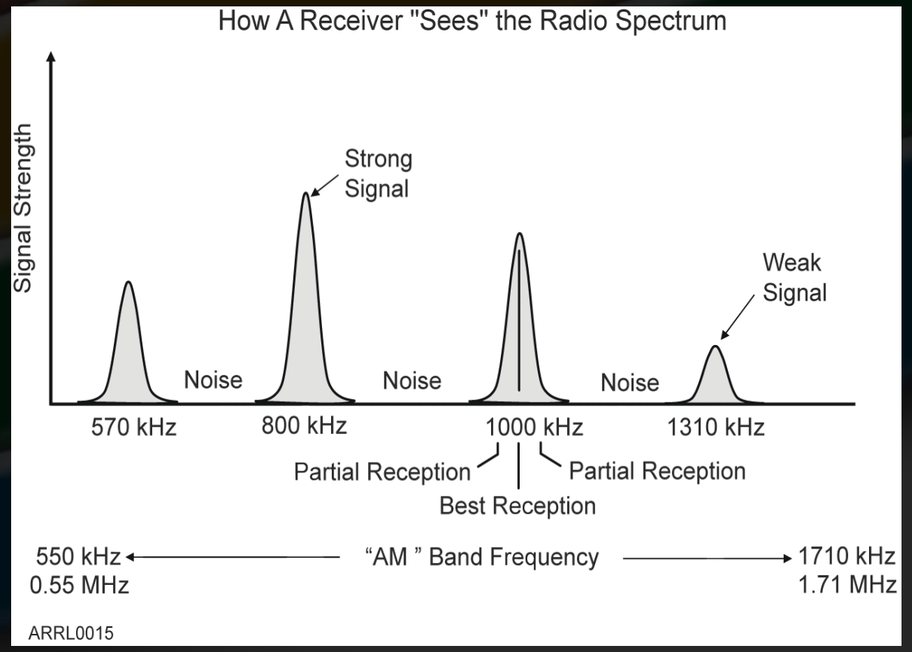
- Parts of the spectrum allocated for a common purpose are called a *band,* such as the “AM Band” or “CB Band”.

- Signals in these bands are usually for a common purpose.

- Hams share bands across a wide range of frequencies and may use many different modes.

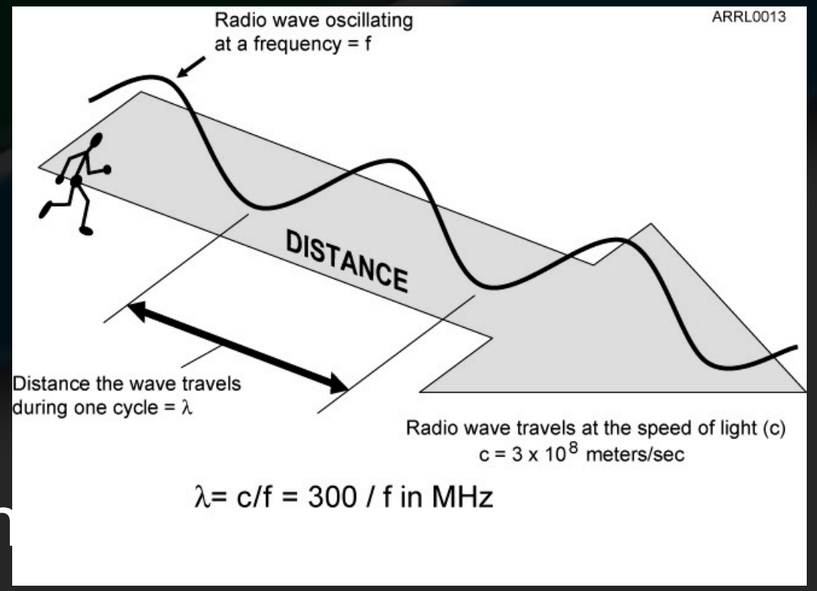
Radio Signals

- A radio wave carrying information is a *radio signal*.
- Each signal occupies a range of frequencies.
- Receivers “tune in” a signal by listening at the signals frequency.

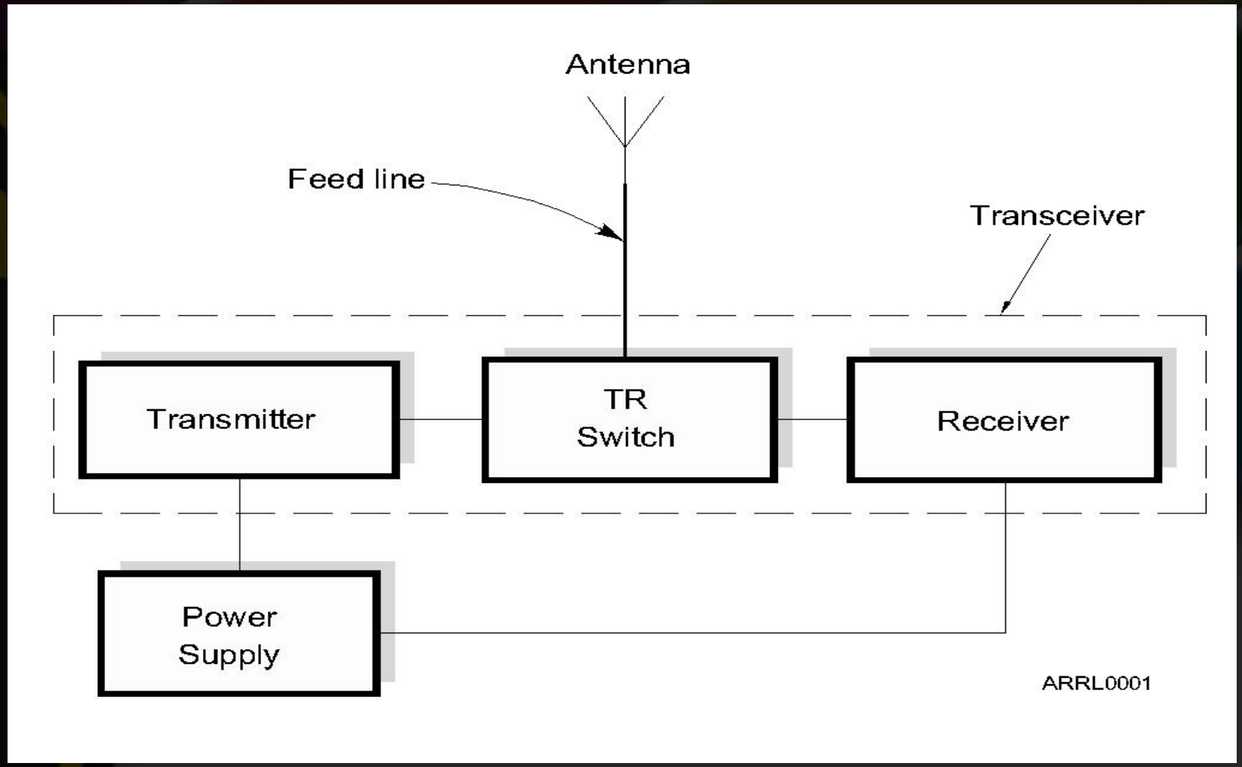


Wavelength

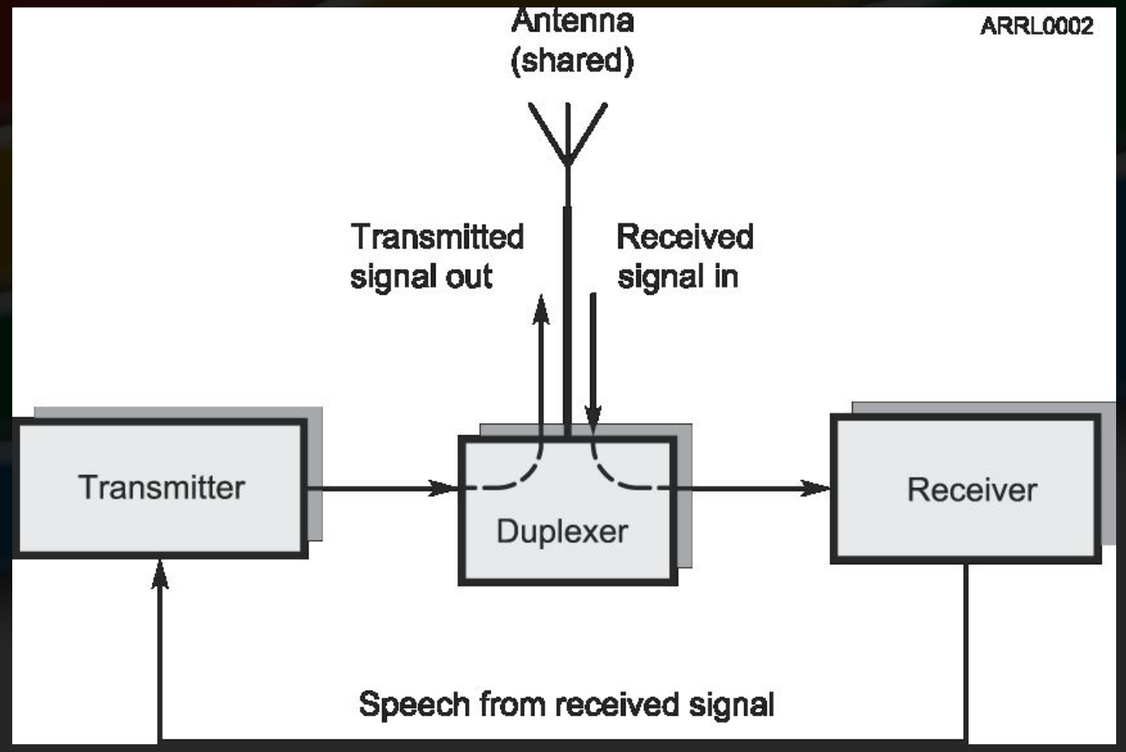
- *Wavelength* is the distance a radio wave travels during one cycle of the wave's electric and magnetic fields.
- λ (lambda) is the symbol for wavelength.
- Waves travel at the speed of light, *c*.
- Hams can refer to bands by frequency (50MHz) or wavelength (6 meters).



The Basic Radio Station



The Basic Repeater



The Basic Repeater

-The received signal is immediately retransmitted by the transmitter on a different frequency.

- The duplexer allows the transmitter and receiver to share a common antenna.

Practice Questions

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

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

Wavelength

How fast does a radio wave travel through free space?

How fast does a radio wave travel through free space?

At the speed of light

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

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

The wavelength gets shorter as the frequency increases

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

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Wavelength in meters equals 300 divided by frequency in megahertz

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

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

The approximate wavelength

What are the frequency limits of the VHF spectrum?

What are the frequency limits of the VHF spectrum?

30 to 300 MHz

What are the frequency limits of the UHF spectrum?

What are the frequency limits of the UHF spectrum?

300 to 3000 MHz

What frequency range is referred to as HF?

What frequency range is referred to as HF?

3 to 30 MHz

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

300,000,000 meters per second

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300,000,000 meters per second

What is the unit of frequency?

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Hertz

What does the abbreviation “RF” refer to?

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Radio frequency signals of all types

End of Module 2