Technician License Course
Chapter 2

Lesson Plan Module 2 –
Radio Waves & Signals

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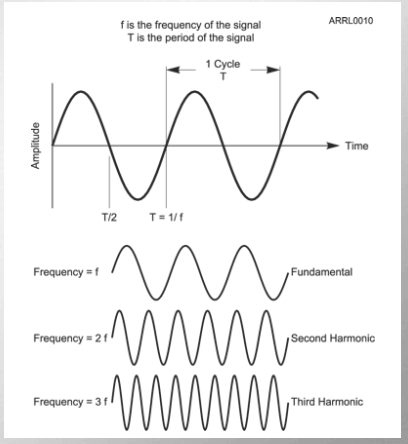
Wave Vocabulary

- Before we study radio, we need to learn some wave vocabulary.
  - *Amplitude*
  - *Frequency (hertz, Hz)*
  - *Period (seconds, s)*
  - *Fundamental*
  - *Harmonics*



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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.

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Electromagnetic Energy
A Demonstration

- What happens when you drop a magnet through a pipe made of non-magnetic conductive material, such as copper?

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Electromagnetic Waves

- You observed electromagnetic energy being exchanged between the magnet and electrons in the pipe:
  - The falling magnet creates a moving magnetic field, in turn causing electrons in the pipe to move.
  - The moving electrons create a magnetic field that opposes the magnet's motion.

Electromagnetic Waves

- If the magnet was moved back and forth repeatedly, the varying electric and magnetic fields would create a sustained *electromagnetic wave* spreading into space like a water ripple.
- 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.

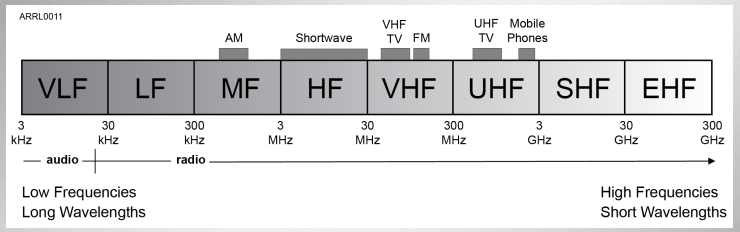
Electromagnetic Waves

- The same process works "backward," 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 that can be used for communication are called *radio waves*.

Radio Spectrum



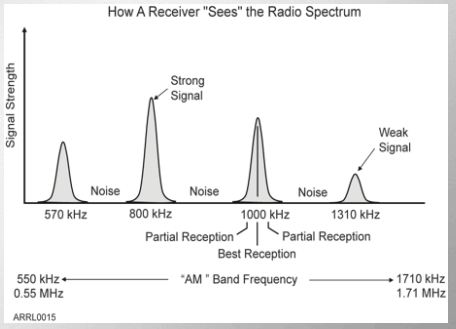
- The part of the electromagnetic spectrum composed of radio waves is called the *radio frequency* or *RF* spectrum.

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 of the same type for commercial services
- Hams share the band across many signals of different types

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 signal's 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 (50 MHz) or by wavelength (6 meters)