

Radio Merit Badge

Boy Scouts of America



Module 1 - Radio Basics

2009

Key Topics in This Module

- **What is Radio?**
- **Types of Radio Services**
- **Radio Call Signs & Identification**
- **The Phonetic Alphabet**
- **Radio Wave Propagation**
- **WWV & WWVH**
- **The FCC & ITU**
- **The Electromagnetic Spectrum**

What is Radio ?

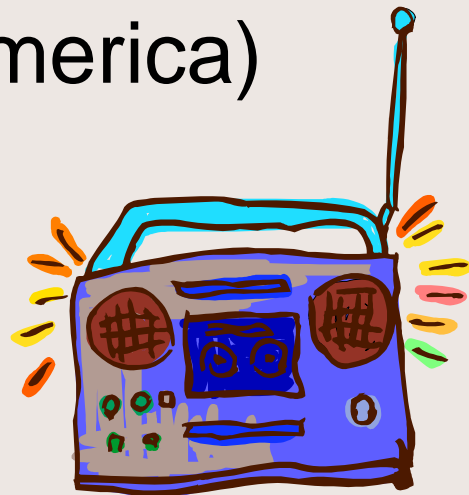


- **Radio** is a way to electronically communicate from one place to another without wires.
- **Radio** is used in broadcast receivers, two way radios, televisions, cellular telephones, wireless LANs, garage door openers, car locks, EZPass, satellites, pagers, radar, microwave ovens, etc, etc.



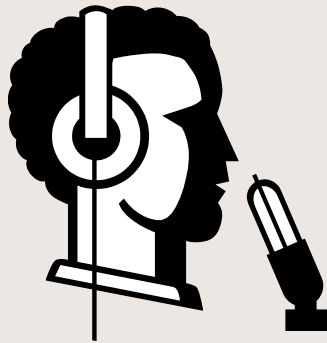
What is Broadcast Radio ?

- **Broadcast** - **One-way** transmissions to the public. Could be **commercial** (music, news, sports with advertisements) or **non-commercial** (National Public Radio, school radio stations, Voice of America)



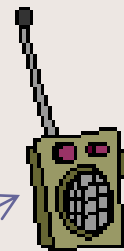
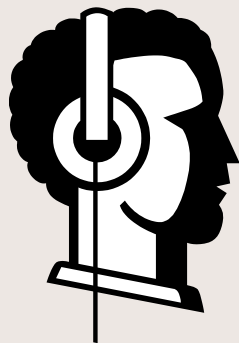
What is Hobby Radio ?

- **Use of the radio by the public to communicate with others or to control models. Amateur radio is a licensed type of Hobby Radio**



What is Two-Way Communications ?

- **Two Way** – Radios that both send (transmit) and receive messages. This includes walkie-talkies, Amateur Radio, cell phones, fire and police, aviation, ships, military, etc.



What is Amateur Radio?

- A type of two-way hobby radio
- A place to learn about radio!
- Called the “*Amateur* Radio Service” because it can’t be used for profit.
- Also known as “Ham Radio”.
- An important part of disaster response.
- A lot of fun!

Radio Call Signs

- **Call Signs** are a short method to **show you have a license** to transmit.
- **Broadcast Call Signs**
 - WHO, KDKA, KORA, WNBC
- **Ham Call Signs**
 - WW3Y, KB3BOY, WW9Y, N3YVH, JA1ABC
- **Your Imaginary Call Sign**
 - Pick K, N or W, then a number, then your initials.

Some Call Sign Prefixes

- W, K, N, A
- VE, VO, XJ
- XE
- PY
- G
- F
- I
- 4X, 4Z
- JA
- ZL
- United States
- Canada
- Mexico
- Brazil
- Great Britain
- France
- Italy
- Israel
- Japan
- New Zealand

Station Identification Rules

Broadcasters

- Once per **hour**.

Amateurs

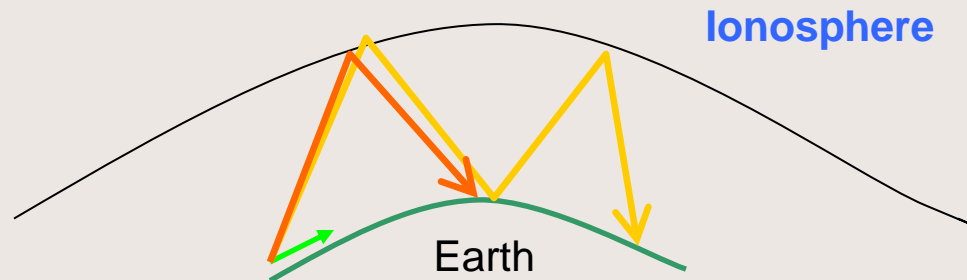
- Every **ten minutes** and at end of a conversation.

Phonetic Alphabet

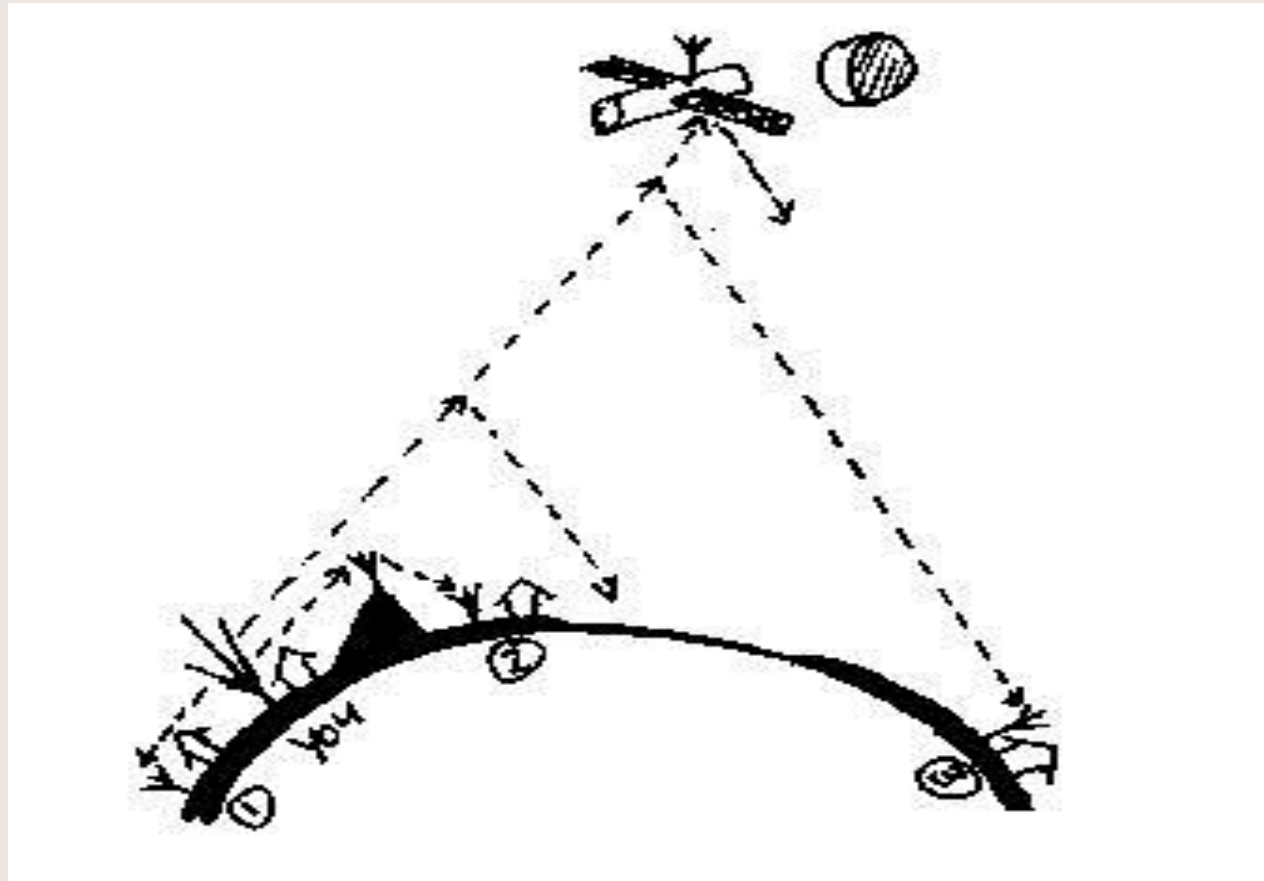
| Letter | Pronunciation | Letter | Pronunciation |
|--------|-----------------------|--------|------------------------|
| A | Alfa (AL fah) | N | November (no VEM ber) |
| B | Bravo (BRAH VOH) | O | Oscar (OSS cah) |
| C | Charlie (CHAR lee) | P | Papa (pah PAH) |
| D | Delta (DELL tah) | Q | Quebec (keh BECK) |
| E | Echo (ECK oh) | R | Romeo (ROW me oh) |
| F | Foxtrot (FOKS trot) | S | Sierra (see AIR rah) |
| G | Golf (GOLF) | T | Tango (TANG go) |
| H | Hotel (hoh TELL) | U | Uniform (YOU nee form) |
| I | India (IN dee ah) | V | Victor (VIK tah) |
| J | Juliatt (JEW lee ETT) | W | Whiskey (WISS key) |
| K | Kilo (KEY loh) | X | X Ray (ECKS RAY) |
| L | Lima (LEE mah) | Y | Yankee (YANG key) |
| M | Mike (MIKE) | Z | Zulu (ZOO loo) |

How High Frequency (HF) Radio Waves Travel (Propagation)

- Ground Wave
- Sky Wave
- Ionosphere
- Skip
- Local
- DX



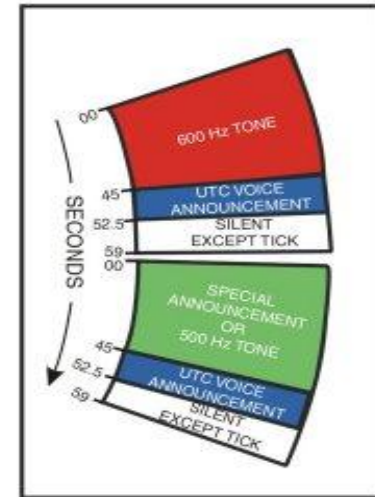
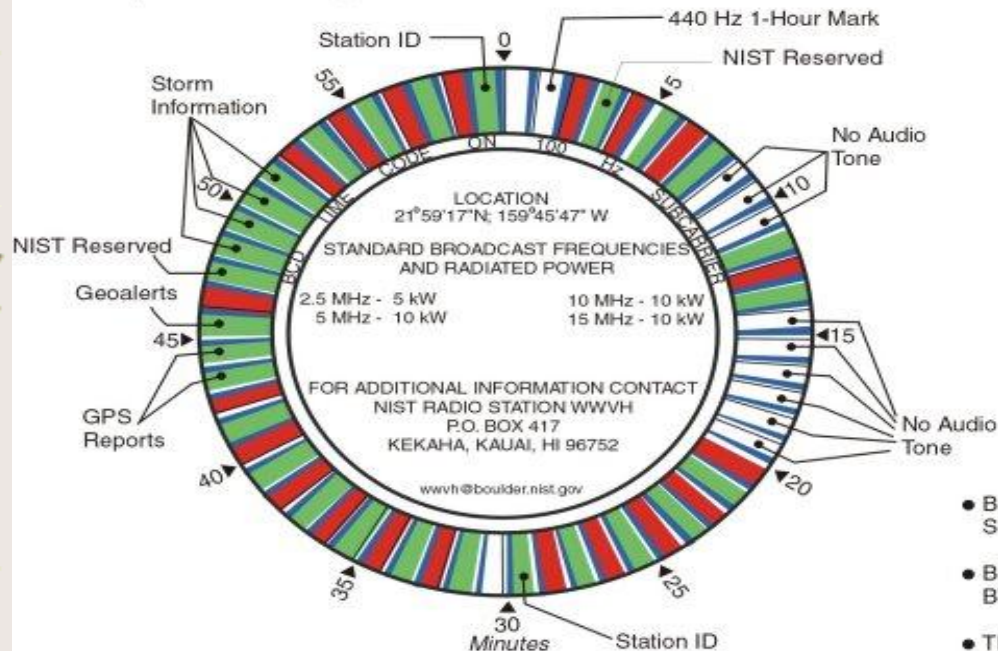
How VHF & UHF Radio Waves Travel



WWV

- Provides accurate frequencies, time, and HF propagation forecasts.
- WWV & WWVH transmit on 5, 10, 15 and 20 MHz
- WWV is in Ft Collins, Colorado. WWVH is in Kauai, Hawaii

WWVH
Broadcast Format
Via telephone (808) 335-4363
(Not a Toll-Free Number)



- BEGINNING OF EACH HOUR IS IDENTIFIED BY 0.8 SECOND LONG, 1500 Hz TONE.
- BEGINNING OF EACH MINUTE IDENTIFIED BY 0.8 SECOND LONG, 1200 Hz TONE.
- THE 29TH AND 59TH SECOND PULSES OF EACH MINUTE ARE OMITTED.
- 440 Hz TONE IS OMITTED DURING FIRST HOUR OF EACH DAY.

Regulation of Radio

- ITU

- International Telecommunications Union
- Meets every few years.
- Sets International Frequency assignments.
- Assigns prefixes to countries.

- FCC

- Federal Communication Commission
- Set Frequency Assignments in US.
- Issues Licenses & Call Signs in US.
- Enforces Radio Laws in US.

Frequencies

(One Hertz is cycle per second)

- DC Power
- AC Power
- Audio (Sound)
- LF
- MF
- HF or Shortwave
- VHF
- UHF
- Microwave
- Visible Light
- 0 Hertz (goes in one direction only)
- 60 Hertz (Hz)
- 100 Hz to 20 KHz (100 - 20,000 Hz)
- 30-300 kHz (30,000-300,000)
- .3-3 MHz (300,000-3,000,000)
- 3-30 MHz (3,000,000-30,000,000)
- 30-300 MHz (30,000,000-300,000,000)
- 300-3,000 MHz (well, you get the idea)
- Frequencies above 500 MHz
- 400-800 THz (400,000,000- 800,000,000 MHz)

So, what frequencies are assigned to whom?

- AM Broadcast Radio • 540 - 1600 kHz
- FM Broadcast Radio • 88 - 108 MHz
- Short Wave Broadcast • 5 - 22 MHz
- Television Broadcast • Channel 2 = 54-60 MHz
- CB Radio • 27 MHz
- Police Radio • 450-470 MHz
- Amateur Radio • 3.5, 7.5, 10, 15, 20, 30, 50, 150 MHz
80, 40, 30, 20, 15, 10, 6, 2 meters

Freq=C/meters

C=300,000,000 or

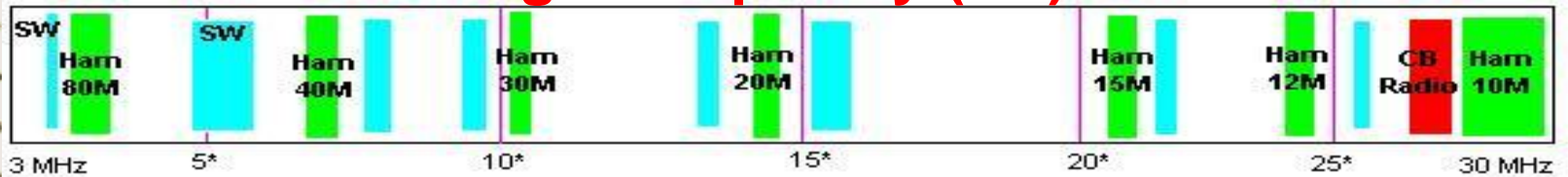
Freq (MHz)= 300/meters

The Electromagnetic Spectrum

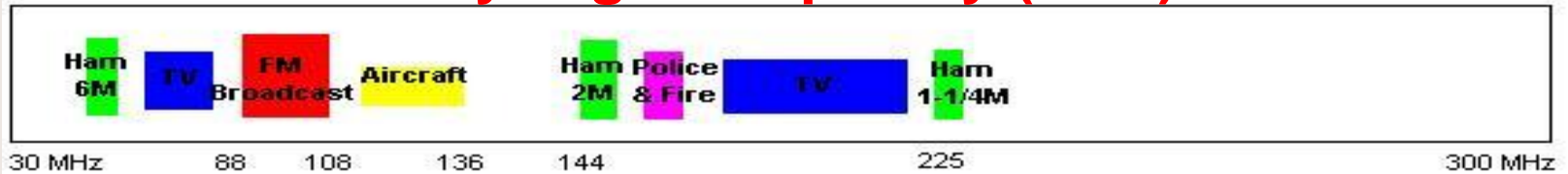
Medium Frequency (MF)



High Frequency (HF)



Very High Frequency (VHF)



Ultra High Frequency (UHF)

