

# Radio Merit Badge

## Boy Scouts of America



### Module 1 - Radio Basics

2005

Requirement 1

# Key Topics in This Module

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- **What is Radio?**
- **Types of Radio Services**
- **Call Signs & Identification**
- **Regulations**
- **Phonetic Alphabet**
- **Electromagnetic Spectrum**
- **Propagation**

# What is Radio ?



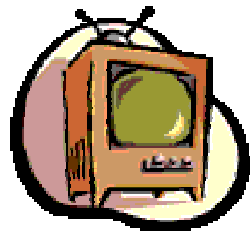
- **Radio** is a way to electronically communicate from one place to another without wires.
- **Radio** is used in broadcast receivers, two way radios, televisions, cellular telephones, wireless LANs, garage door openers, car locks, EZPass, satellites, pagers, radar, microwave ovens, etc, etc.



# What is Broadcast Radio ?

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- **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)

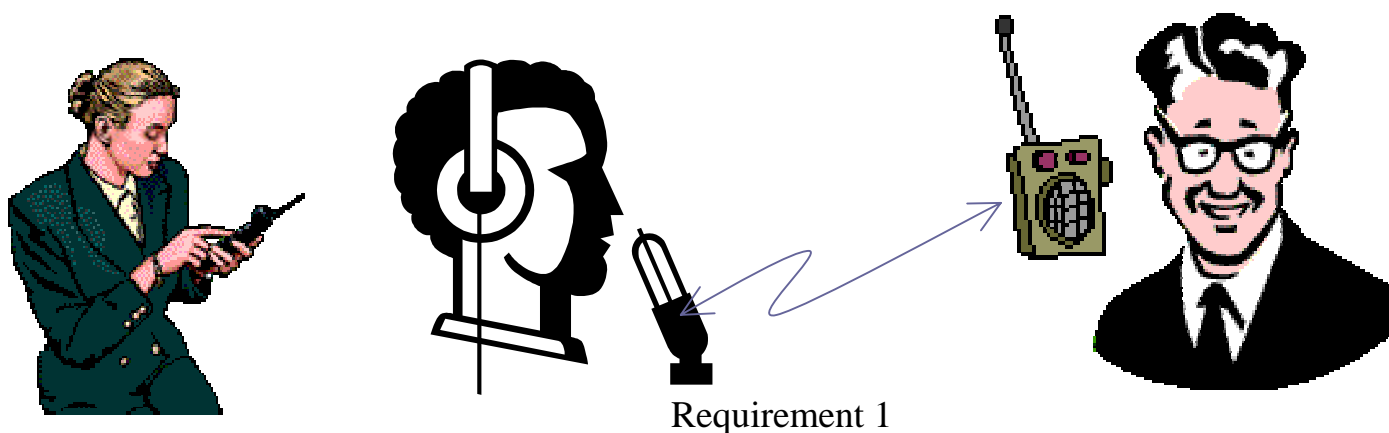


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# What is Two-Way Radio ?

- **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?

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- A type of two-way 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!

# Why does the FCC has an Amateur Radio Service?

- **Volunteer service** - (community service and disaster help). A Scout does a good turn daily - here's another way.
- **International goodwill** - A great way to talk to people in far away lands.
- **Experimentation** - If you want, you can build your own radio equipment, and many hams build their own antennas. Some hams have come up with new inventions, such as FM, SSB, Packet Radio, Automatic Position Reporting Systems.
- **Communication skills** - Because only one person can talk at a time, you learn how to listen!
- **Self-training** - You can learn by doing.

# Radio Call Signs

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- **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

# Some Call Sign Prefixes

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- 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

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## Broadcasters

- Once per **hour**.

## Amateurs

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

# Regulation of Radio

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- 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.
- Enforces Radio Laws.

# 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)

# Frequencies

**(One Hertz is one change of direction per second)**

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- 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?

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- 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

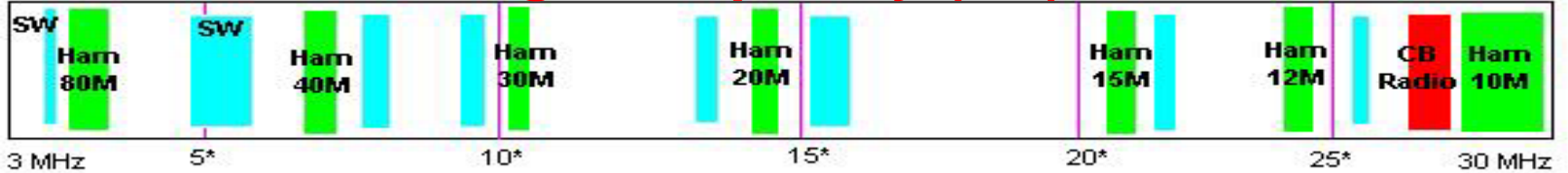
Freq (MHz)= 300/meters

# The Electromagnetic Spectrum

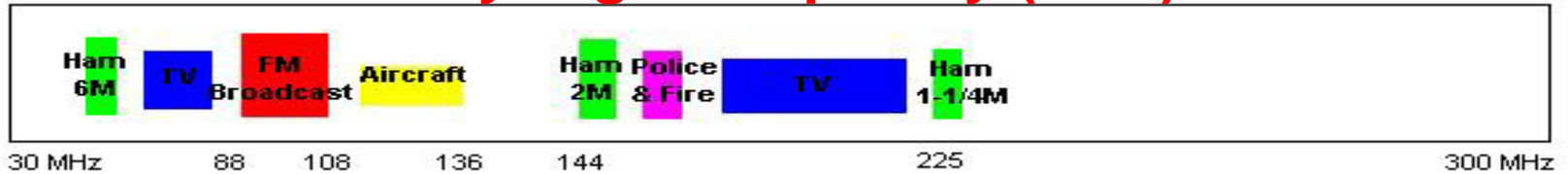
## Medium Frequency (MF)



## High Frequency (HF)



## Very High Frequency (VHF)



## Ultra High Frequency (UHF)



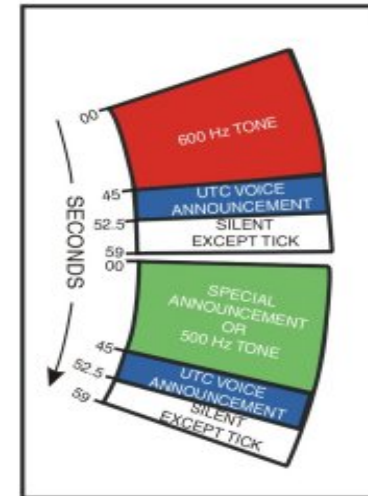
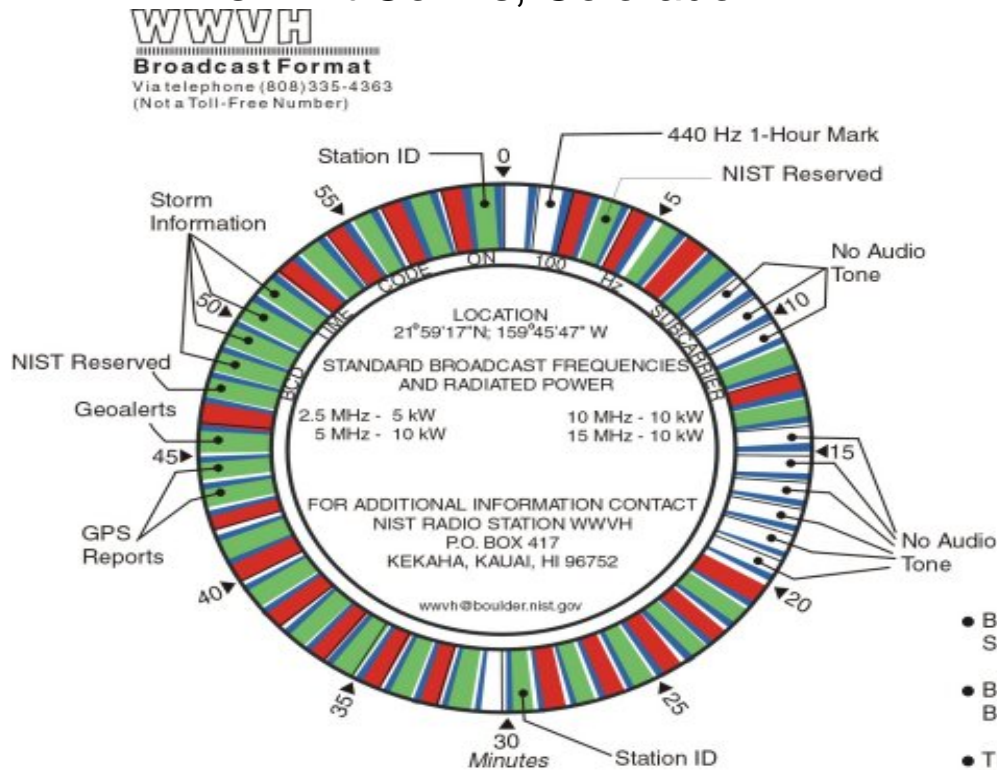
# WWV

- Provides accurate frequencies, time, and HF propagation forecasts.

- WWV & WWVH transmit on 5, 10, 15 and 20 MHz

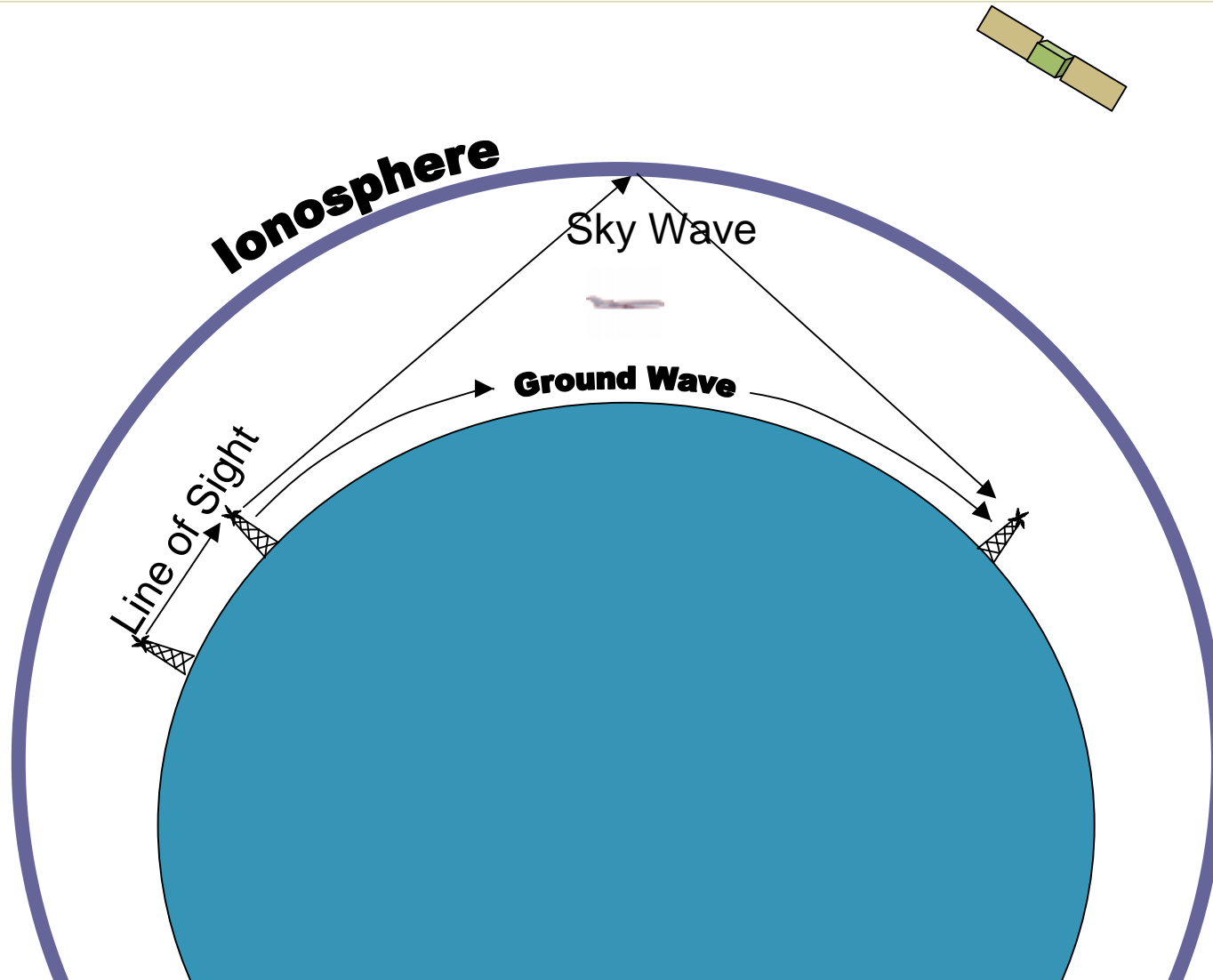
- WWV is in Ft Collins, Colorado.

WWVH is in Kauai, Hawaii

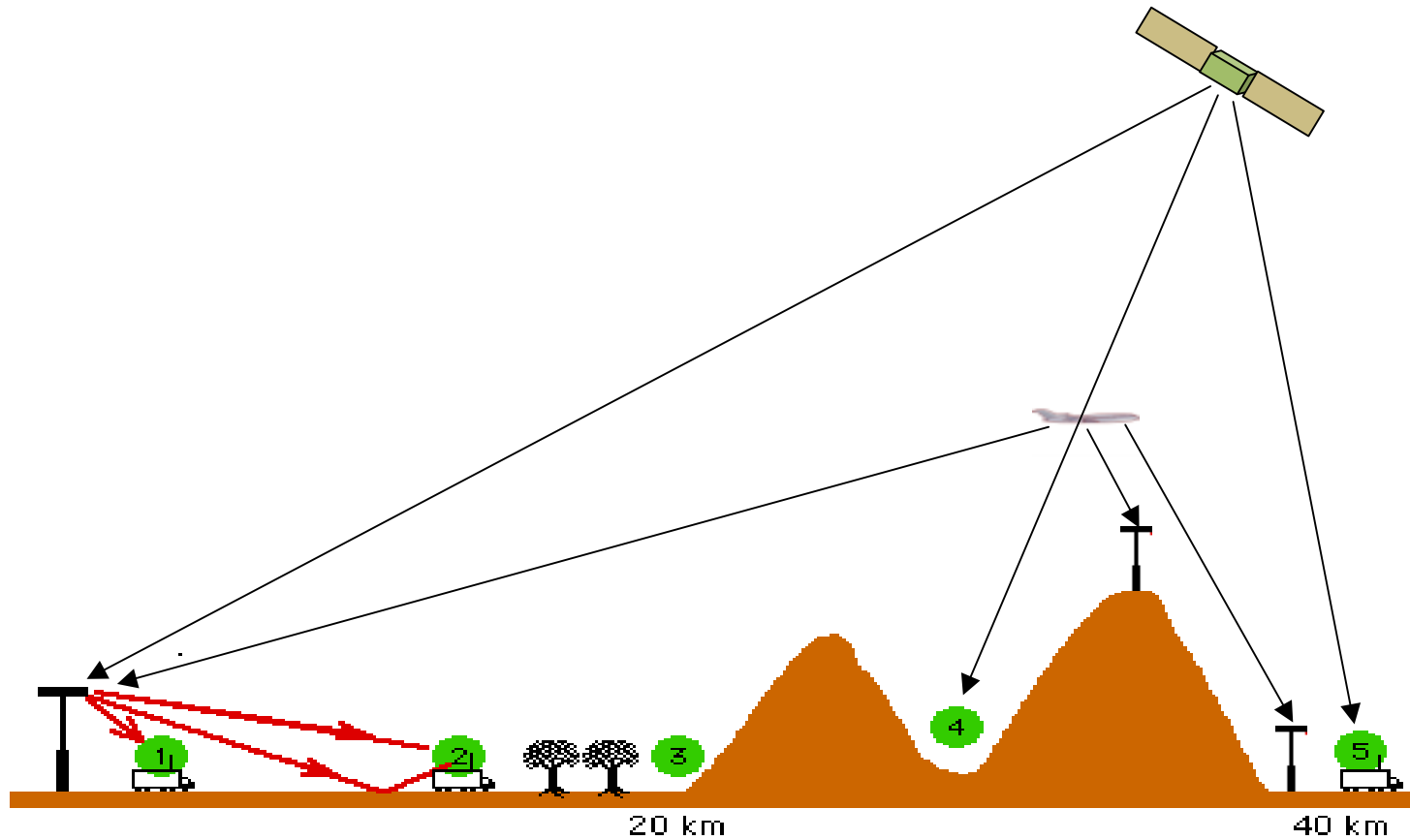


- BEGINNING OF EACH HOUR IS IDENTIFIED BY 0.8 SECOND LONG, 1500 Hz TONE.
- BEGINNING OF EACH MINUTE IDENTIFIED BY 0.8 SECOND LONG, 1200 Hz TONE.
- THE 29TH AND 59TH SECOND PULSES OF EACH MINUTE ARE OMITTED.
- 440 Hz TONE IS OMITTED DURING FIRST HOUR OF EACH DAY.

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



# How VHF & UHF Radio Waves Travel



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