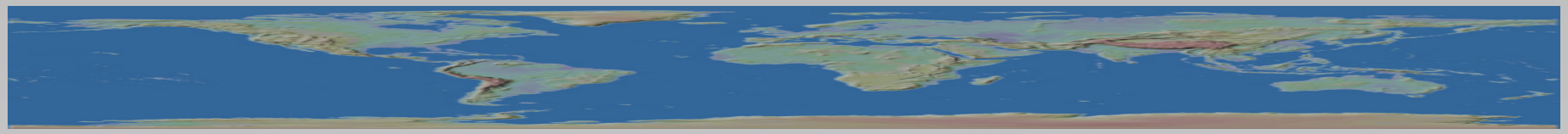
Technician Licensing Class

Lesson 1

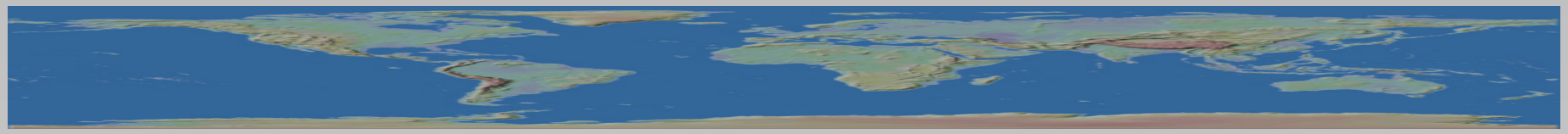
presented by the

Arlington Radio Public Service Club
Arlington County, Virginia



FCC Rules

Sub element T1



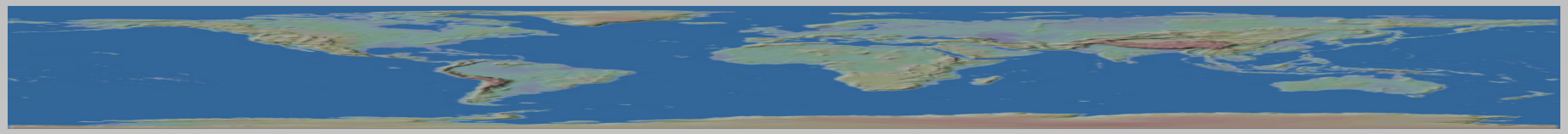
Why Amateur Radio?

The basis & purpose of the amateur service consists of five principles:

A) Recognition and enhancement of the value of the amateur service to the public as a *voluntary non-commercial communication service*, particularly with respect to providing *emergency communications*.

B) Continuation and extension of the amateur's proven ability to contribute to the *advancement of the radio art*.

C) Encouragement and improvement of the amateur service through rules which provide for *advancing skills* in both the communication and technical phases of the art.



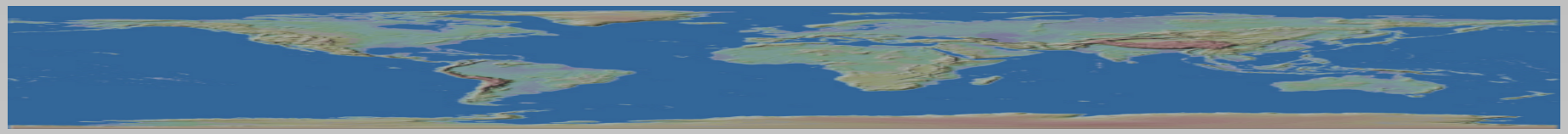
Why Amateur Radio? (Cont'd)

D) *Expansion of the existing reservoir* within the amateur radio service of trained operators, technicians and electronics experts.

E) Continuation and extension of the amateur's unique ability to *enhance international goodwill*.

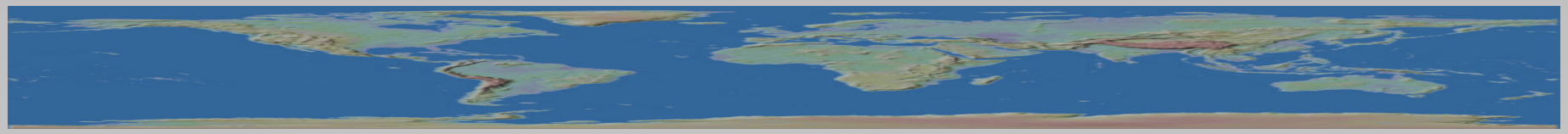
Amateur Radio Licenses

- Technician
- Technician w/ Morse Code
- General
- Amateur Extra



Amateur Radio Licenses (Cont'd)

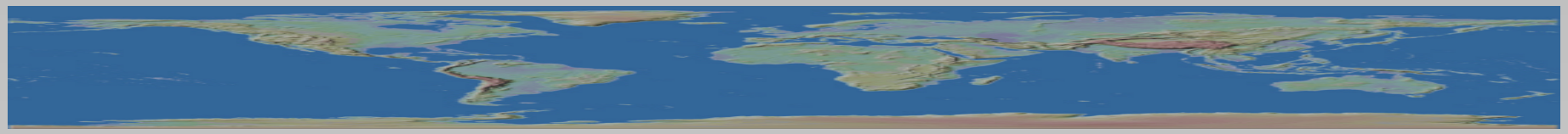
- The FCC must grant you an operator / primary station license before you can operate
- As soon as your license appears in the database you may transmit
- Ten Year Term
- Renew no more than 90 days before expiration
- Two Year Grace Period for renewal after expiration
- Renewals / Changes on FCC Form 605



VHF/UHF Amateur Bands

Frequency Limits in ITU Region 2:

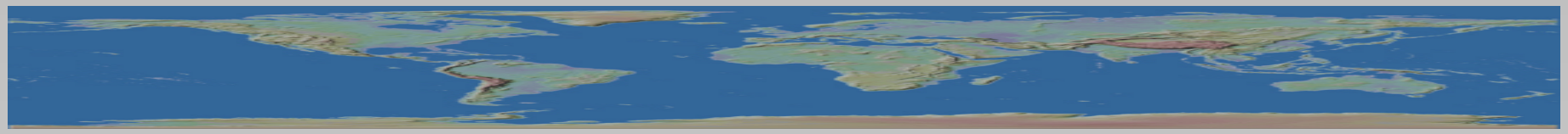
6 Meter Band:	50.0 to 54.0 MHz
2 Meter Band:	144.0 to 148.0 MHz
1.25 Meter Band:	222.0 to 225.0 MHz
70 CM Band:	420.0 to 450.0 MHz
33 CM Band	902 to 928 MHz
23 CM Band	1240 to 1300 MHz
13 CM Band	2300 to 2310 MHz
	and 2390 to 2450 MHz



HF Amateur Bands

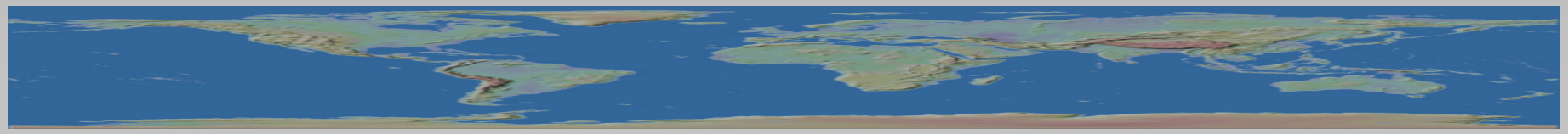
Frequency Limits for Technician Operators with Morse Code in ITU Region 2:

80 Meter Band	3675 to 3725 kHz
40 Meter Band	7100 to 7150 kHz
15 Meter Band	21.100 to 21.200 MHz
10 Meter Band	28.100 to 28.500 MHz



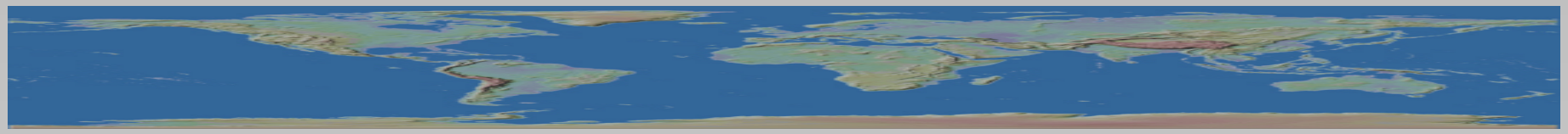
Qualifying for a License

- Anyone can become an amateur licensee except a representative of a foreign government.
- There are no minimum or maximum age limits
- Element 2, a 35 question multiple choice exam, must be passed for a Technician amateur license.



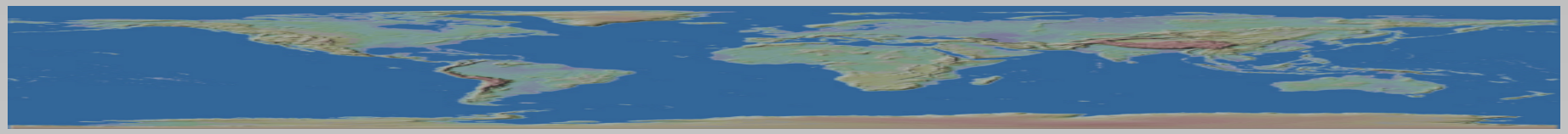
Testing

- A Volunteer Examiner (VE) is a an amateur, accredited by a Volunteer Examiner Coordinator (VEC), who volunteers to administer amateur license exams.
- A Certificate of Successful Completion of Examination (CSCE) is issued for each exam element you pass.
- The 5 WPM Morse code test is called Element 1.



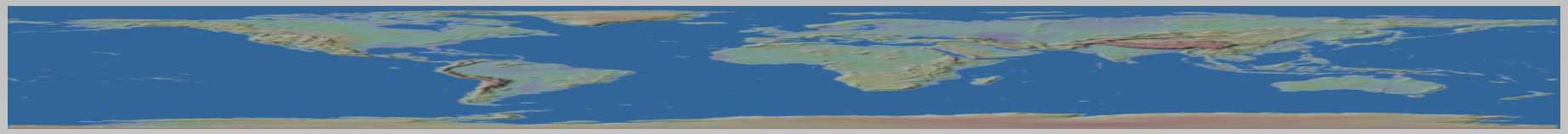
More Testing!

- A CSCE for Element 1 is only valid for 365 days for upgrade purposes.
- A disabled applicant could take Element 1 by using a vibrating surface or flashing light.
- Keep CSCEs in a safe place, particularly for Element 1. It is the only document showing authorization to use frequencies below 30 Mhz for a Technician licensee.



Amateur Radio Call Signs

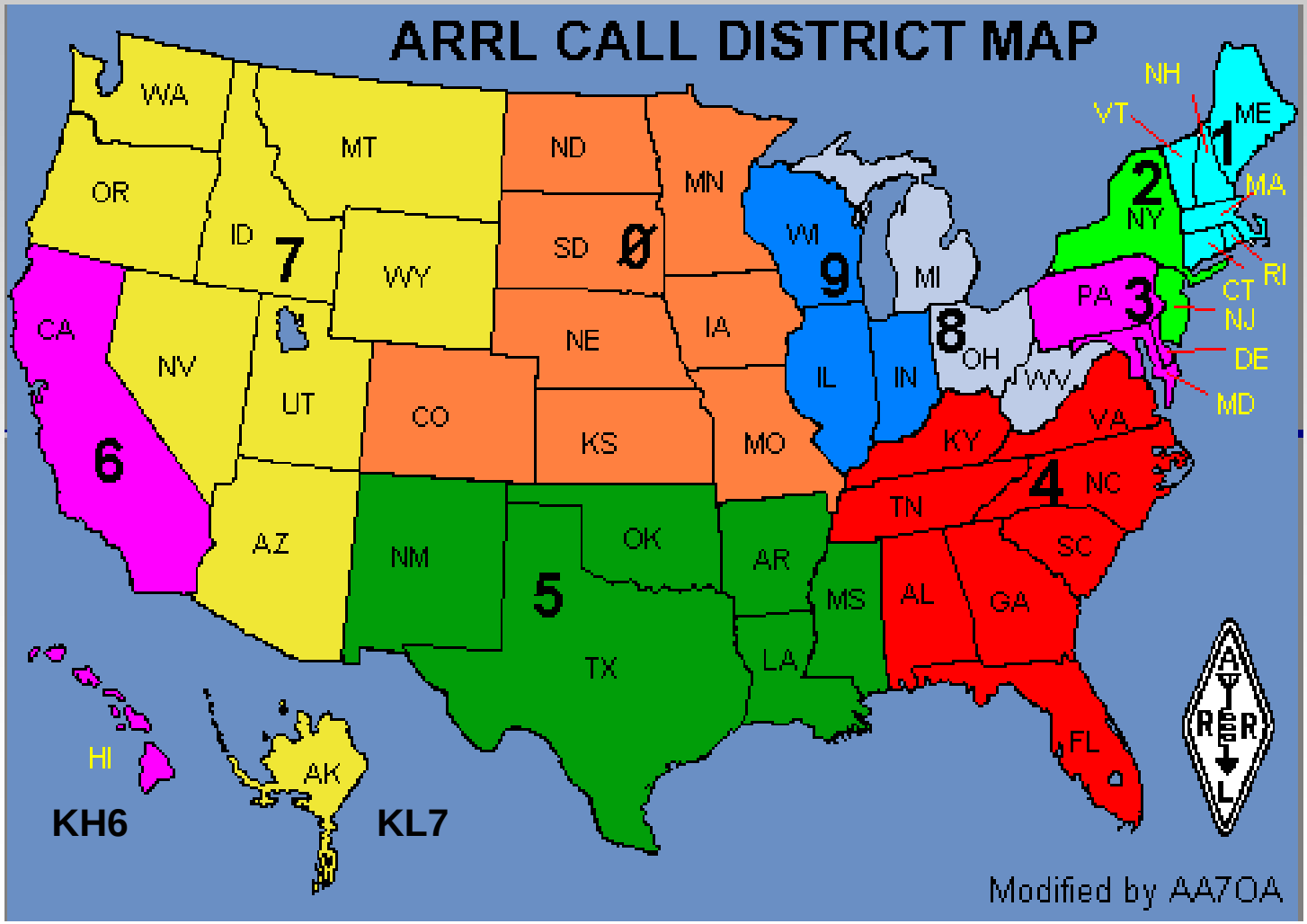
- Your call sign must be transmitted to identify your amateur station.
- The FCC assigns call signs by the ITU prefix letters, call district numeral, and a suffix in alphabetic order.
- In the U.S. call signs begin with A, K, N, or W and have a single digit between 0 and 9
- Typical valid call signs: KB3TMJ, K5RS, N5UGH, WB5GVE, AA1B

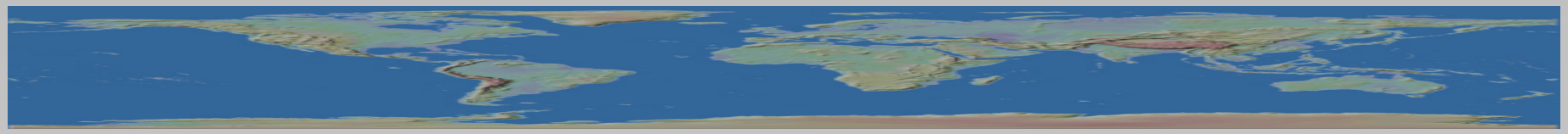


More on Call Signs

- Technician Class operators receive Group C and D format calls, i.e. 1-by-3 and 2-by-3
- You may request a special call, for example your initials, under the Vanity call sign program
- Any FCC licensed amateur may request a Special Event call sign with a 1-by-1 format

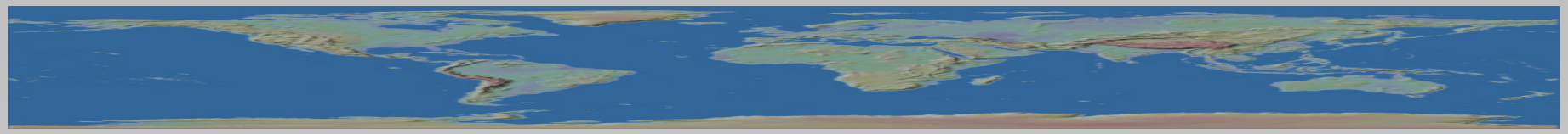
U.S. Call Districts





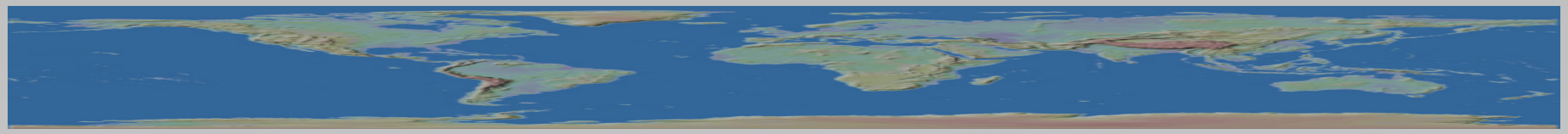
Some Common Sense Rules

- No music (except from NASA)
- No payment may be accepted
- No profanity or obscenity allowed
  - Offensive
  - Young children may be listening
  - Specifically prohibited in the rules
- No codes or ciphers may be used
- No false or deceptive signals may be transmitted
- If your license expires you may no longer transmit



Broadcasting

- Defined as “transmissions intended for reception by the general public”
- Is not allowed in the amateur service



Sometimes we have to share!

- The amateur service is a secondary user on some bands. On those bands amateurs can only transmit if they don't interfere with the primary user.
  - For example, the 23 cm band is shared. If you are interfering with a radiolocation station outside the U.S. you must stop operating or take steps to eliminate the interference.
- If two amateur stations want to use the same frequency they each have equal rights to that frequency.

ITU Regions

Where is:

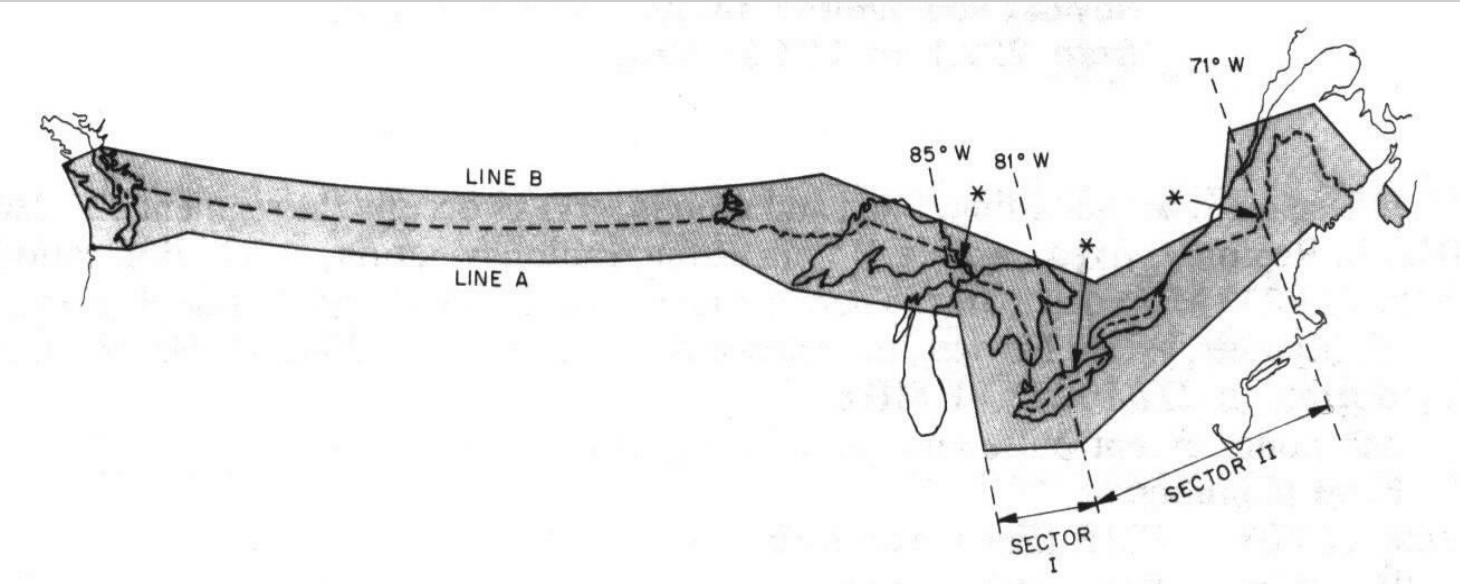
Alaska

Region 2

Guam

Region 3

70 cm Band Restriction



The frequency limits north of “Line A” are 430 – 450 Mhz (vs. 420 – 450 Mhz elsewhere). Line A is approximately 50 miles south of the Canadian border.

Amateur Space Station

- An amateur space station is an amateur station located more than 50 km above the Earth.
- An amateur space station may transmit unidentified communications.

T1A03
What is the definition of an amateur station?

A. A station in a public radio service used for telecommunications

B. A station using radio communications for for a commercial purpose

C. A station using equipment for training new broadcast operators and technicians

D. A station in the Amateur Radio service used for radio communications.

T1A13

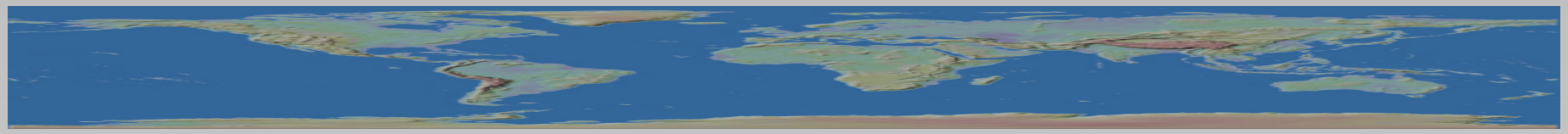
What is a transmission called that disturbs other communications?

A. Interrupted CW

B. Harmful Interference

C. Transponder signals

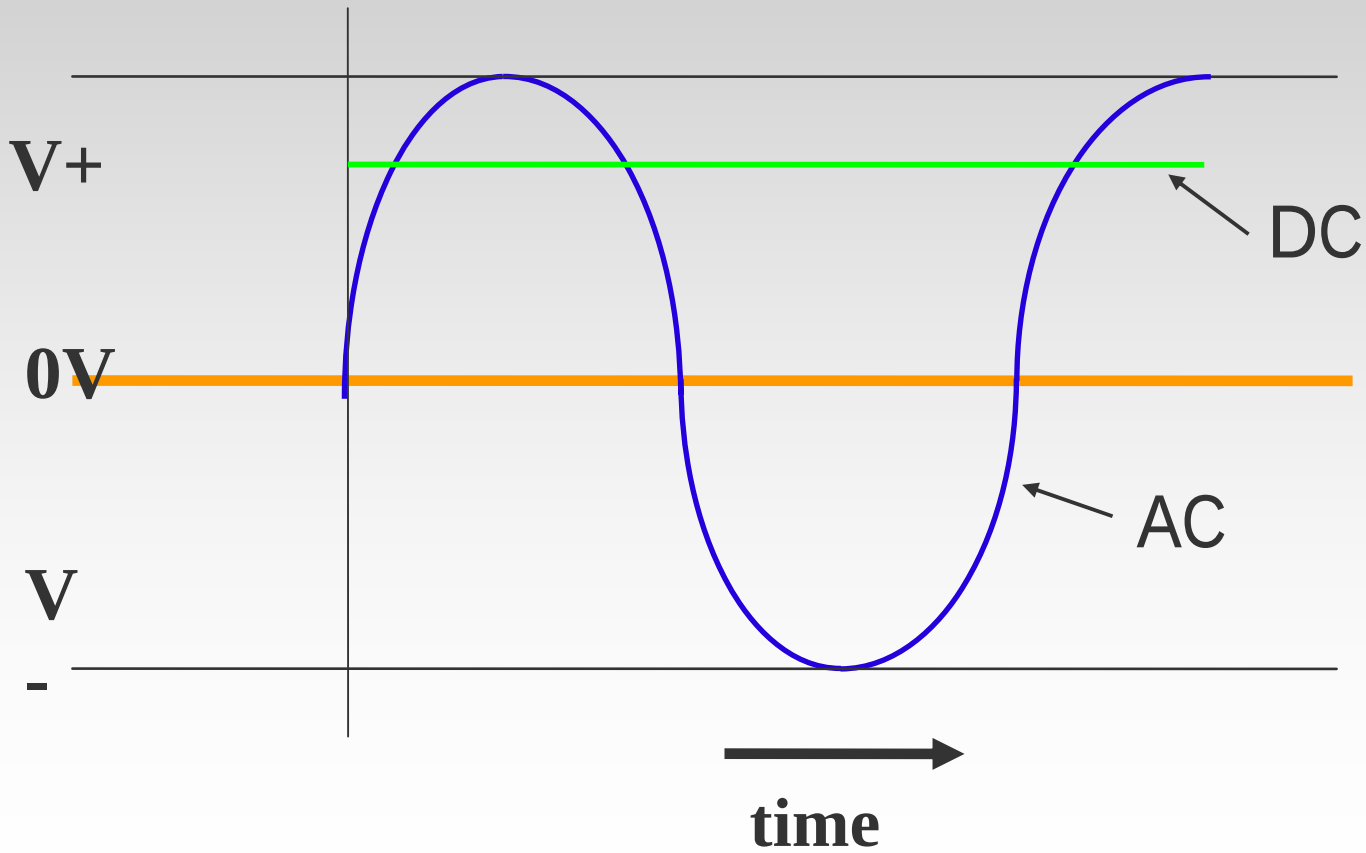
D. Unidentified transmissions



Methods of Communication

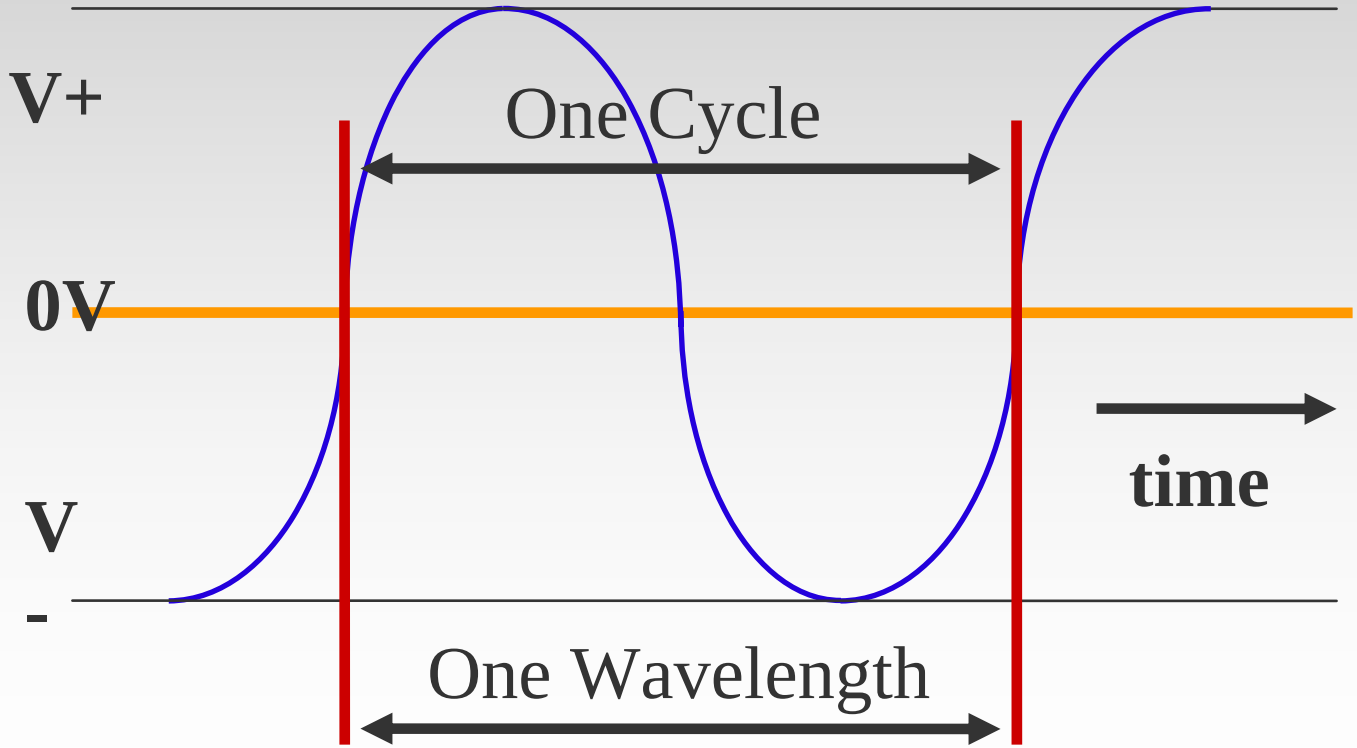
Subelement T2

Alternating & Direct Current

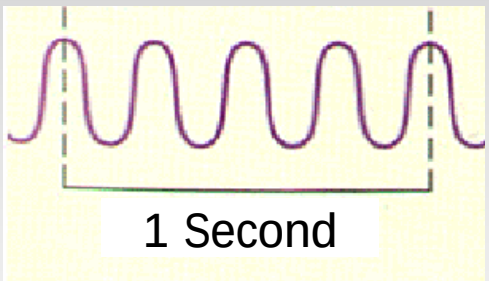


The Relationship of Frequency and Wavelength

The distance a radio wave travels in one cycle is called wavelength.



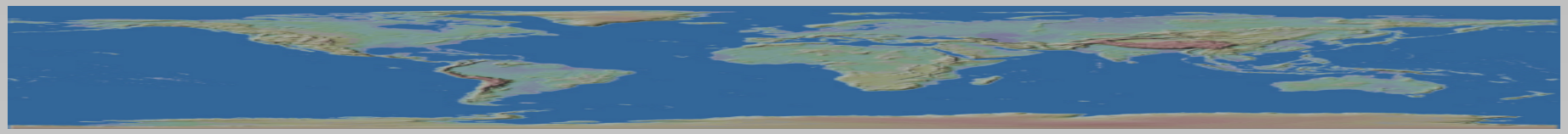
Frequency



Is a measure of the number of times (cycles) per second that an alternating current flows back and forth.

The basic or standard unit of frequency is the Hertz.

60 hertz (Hz) means 60 cycles per second.



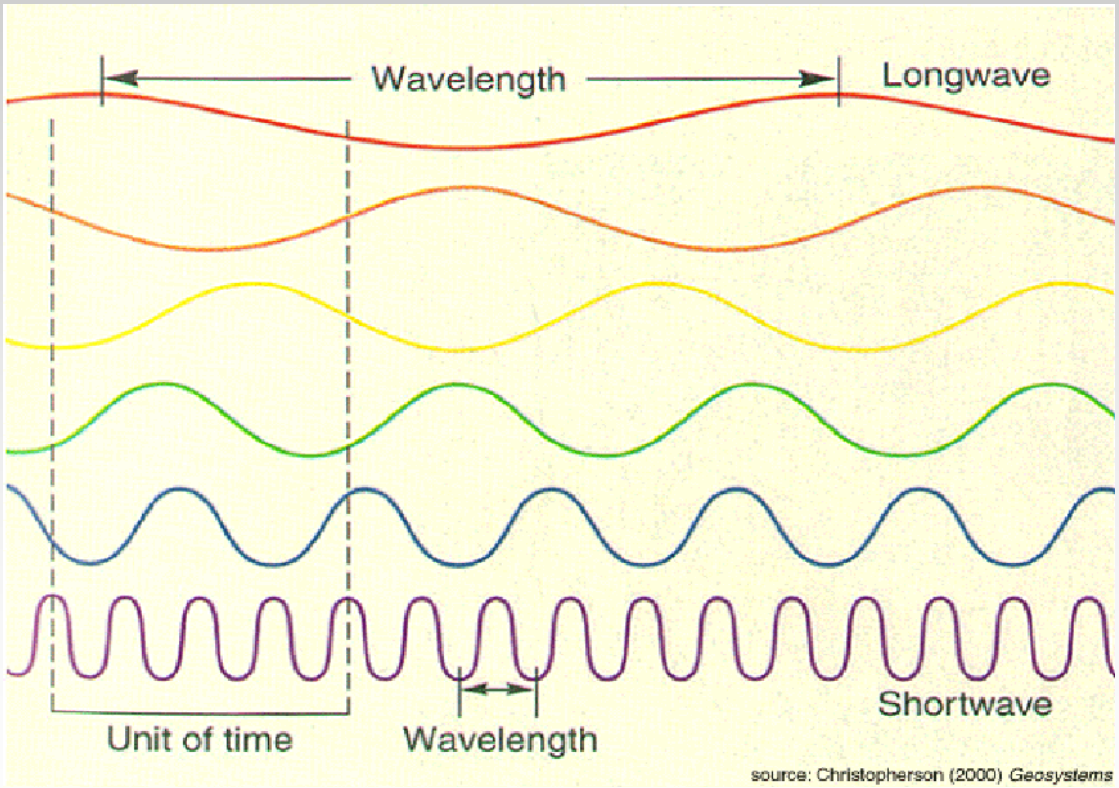
More Frequency !

A radio frequency (RF) wave is an electromagnetic oscillation or cycle that repeats more than 20,000 times per second. RF waves travel at the speed of light.

An audio-frequency signal is an electromagnetic oscillation or cycle that repeats between 20 and 20,000 times per second.

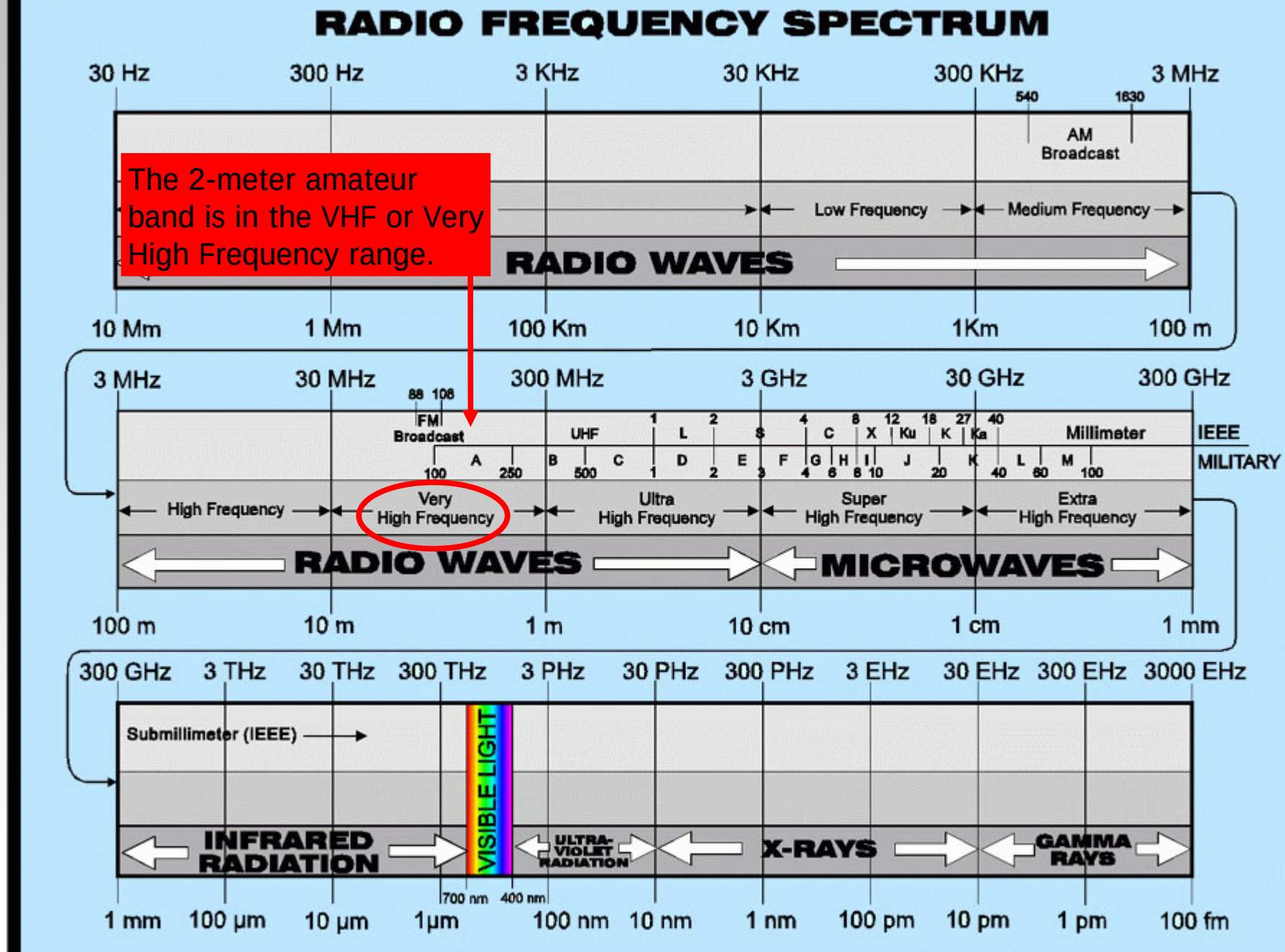
NOTE: SOUND WAVES ARE NOT ELECTROMAGNETIC!

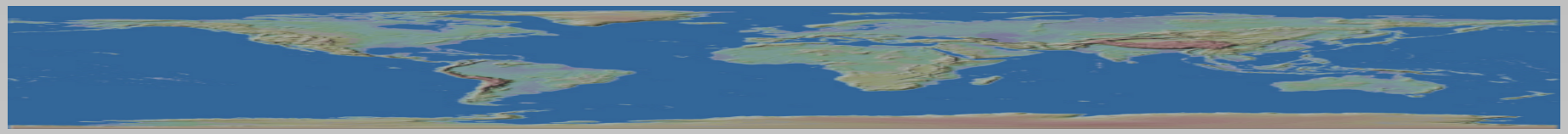
Frequency & Wavelength



The distance an AC signal travels in one complete cycle is its wavelength.

As the frequency increases the wavelength gets shorter.


RADIO FREQUENCY SPECTRUM
30 Hz
300 Hz
3 KHz
30 KHz
300 KHz
3 MHz
540
1630
AM Broadcast
The 2-meter amateur band is in the VHF or Very High Frequency range.
Low Frequency
Medium Frequency
RADIO WAVES
10 Mm
1 Mm
100 Km
10 Km
1Km
100 m
3 MHz
30 MHz
300 MHz
3 GHz
30 GHz
300 GHz
88 108
FM Broadcast
UHF
L
S
C
X
Ku
K
Ka
Millimeter
IEEE
MILITARY
A
B
C
D
E
F
G
H
I
J
K
L
M
High Frequency
Very High Frequency
Ultra High Frequency
Super High Frequency
Extra High Frequency
RADIO WAVES
MICROWAVES
100 m
10 m
1 m
10 cm
1 cm
1 mm
300 GHz
3 THz
30 THz
300 THz
3 PHz
30 PHz
300 PHz
3 EHz
30 EHz
300 EHz
3000 EHz
Submillimeter (IEEE)
INFRARED RADIATION
VISIBLE LIGHT
ULTRA-VIOLET RADIATION
X-RAYS
GAMMA RAYS
700 nm
400 nm
1 mm
100 µm
10 µm
1µm
100 nm
10 nm
1 nm
100 pm
10 pm
1 pm
100 fm

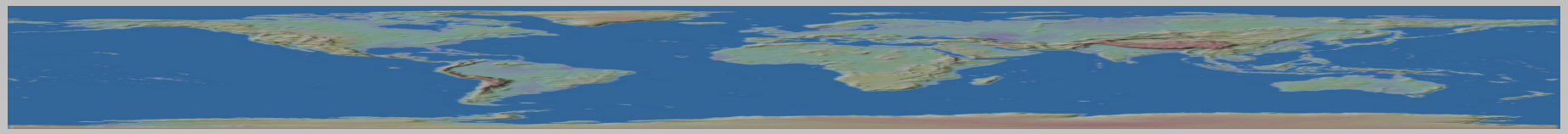


Wavelength Formula

To convert from frequency to wavelength:

$$\text{Wavelength (m)} = \frac{300}{\text{freq (MHz)}}$$

Wavelength and Frequency are Inversely Proportional. As one goes up, the other must go down.

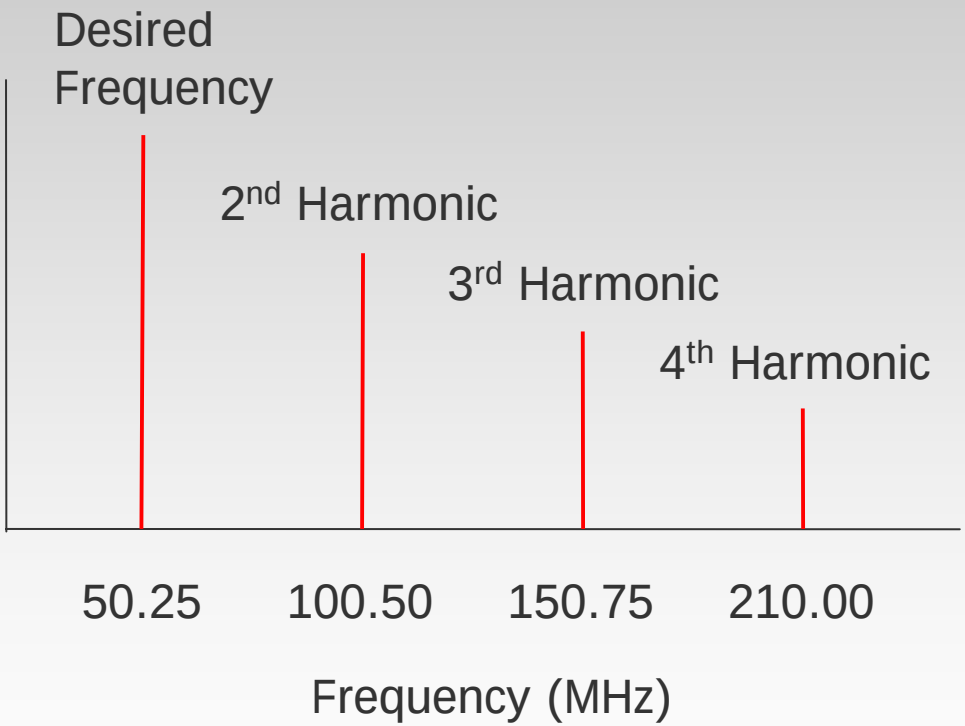


Radio Frequency

A radio frequency wave may be identified by:

- Its Wavelength
- Its corresponding Frequency
- The Radio Band in which it is transmitted or received, i.e. MF, HF, VHF, UHF, etc.

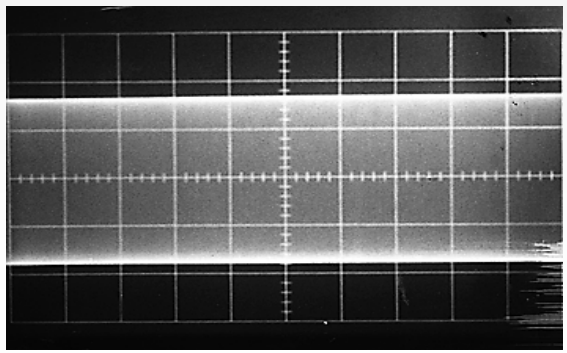
Harmonic Frequencies

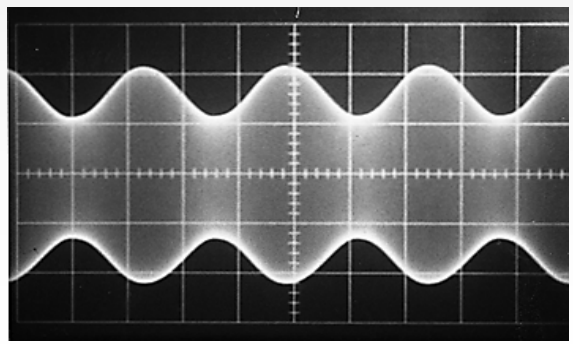


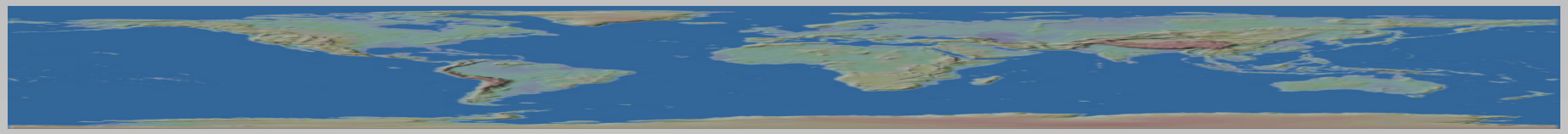
The frequency of a harmonic is exactly two, or three, or more times the desired frequency.

Radio Communications

- The basic principle of radio communications is combining a radio wave with an information signal and transmitting it. A receiver separates the two.
- Combining an information signal with a radio signal is called “Modulation”.





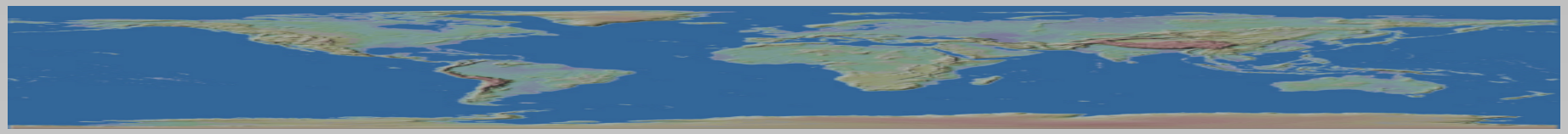


FCC Emission Types

- CW
- Phone
  - AM (Amplitude Modulation)
  - SSB (Single-sideband Modulation)
  - FM (Frequency Modulation)
- Data
  - PSK31
  - RTTY
  - Other telemetry, telecommand, or computer communications

Phone Emissions

- The FCC calls all types of voice emissions “Phone”.
- Frequency modulated (FM) phone is most often used on VHF & UHF repeaters.
- Upper sideband (USB) phone is commonly used on the 10-meter phone band.
- Upper sideband phone is normally used for VHF & UHF SSB communications.

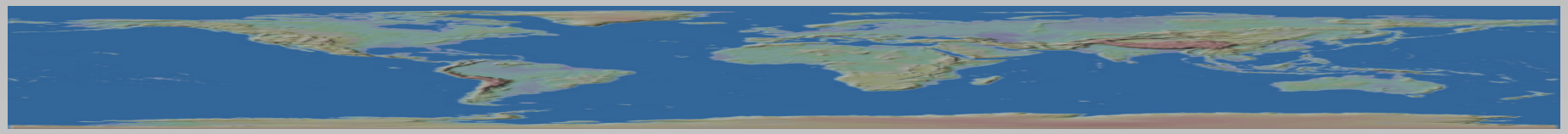


Data Emissions

- The FCC calls telemetry, Tele-command, or computer communications “Data” emissions.
- Some common data emissions are packet, PSK31, and radio teletype (RTTY).
- When using packet the term “connected” means sending data to only one receiving station and it replies the data is being received correctly.
- PSK31 has a typical bandwidth of 31 Hz.
- A Technician licensee is permitted to operate point-to-point digital message forwarding in the 219 – 220 MHz frequency range.

Technician w/Morse

- Allowed to operate only CW from 7100 to 7150 KHz (40m band)
- Allowed to operate CW and single-sideband phone from 28.3 to 28.5 MHz (10m band)
- Allowed a maximum of 200 watts PEP output power on the 10-meter band
- Frequency privileges on the 10 meter band limited to 28.100 – 28.500 MHz
- Frequency privileges on the 80 meter band limited to 3675 – 3725 kHz



Homework

- Study Sub elements T1 & T2 of the question pool.
  - **Read the *Question* and the *Answer* Three Times.**
- Read Chapters 1 & 2 in “Now You're Talking”.