

The Differences Between Operating 2m FM and HF SSB



Rich Joerger
WB4EHG
2020/01/02

Topics

- Introduction
- Background: how we differ from other services
- About Sub Bands
- About VHF/UHF Modes
- Lets talk about channels
- Lets talk about channels on FM
- Operating HF what you need to know
- Logging contacts
- Computer control of your radio
- References

Introduction

(Why I am telling you this)

- ❑ 2m FM is very different than HF Phone (any of the voice modes: SSB, AM, FM are called “Phone”)
- ❑ Operating FM on any of the VHF/UHF bands are the same
- ❑ When you start operating phone on any HF bands, you need to know how to do it
- ❑ Operating the “weak signal” modes on VHF/UHF is the same as on HF
- ❑ This topic is part of our introduction to HF operating.

How we differ from other radio services

- ❑ Commercial radio services are AM/FM/TV broadcast, Aircraft, Marine, Industrial, Business, Commercial, Cellular, CB, FRMS, GMRS
 - [Full list here](#)

- ❑ These stations are licensed with very specific parameters:
 - Specific frequency or frequencies; they may NOT use other frequencies

 - Exact amount of power they may use

 - Specific modulation type they must use

 - Must use commercial radios that are “Type Accepted” for their use.



Ham stations on the other hand:

- ❑ Ham stations are licensed with looser requirements:
 - We are given a range of frequencies within many bands
 - Example: 40m band starts at 7.0MHz and ends at 7.3MHz
 - We are given a maximum amount of power we can use but are encouraged to use less
 - Example: 1,500 Watts with limits on some bands that we share with other services
 - We have a range of modulation types we can use
 - Commercial Ham radios must be “Type Accepted”
BUT we can modify commercial radios for our use and we can build our own radios – we do have to meet several parameters



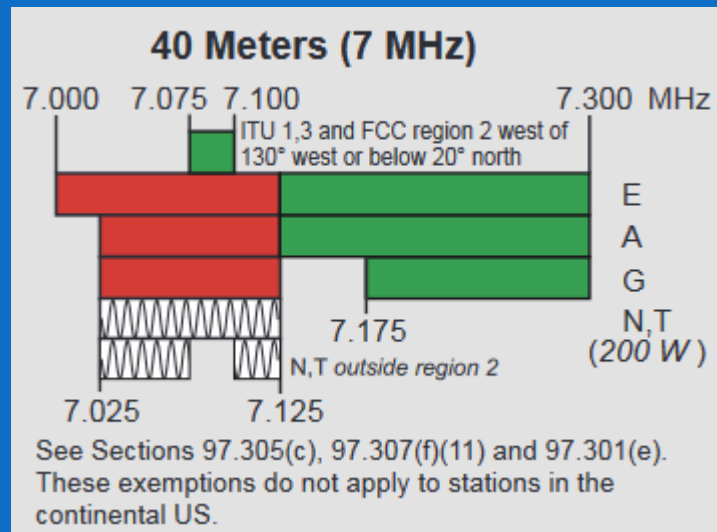
Ham stations on the other hand:

- ❑ We are the **ONLY** radio service that can change:
 - Frequency
 - Staying within our bands
 - Modulation type (aka Mode)
 - Within those that we are allowed for that band and sub band
 - Power
 - Up to the maximum for that band
 - Build our own transmitters
 - As long as we meet the FCC requirements for spurious emissions and signal bandwidth

About Sub Bands

- ❑ Sub Bands are ranges of frequencies within our bands:
 - Sub bands are specified by the FCC
 - The division is where CW and data type modulation can be used; this sub-band is for small bandwidth signals only
 - The second division is where Phone & Image modulation can be used
 - Here's an example:

You can download and print Frequency Charts from the ARRL: [Link here](#)



	= RTTY and data
	= phone and image
	= CW <i>only</i>
	= SSB phone
	= USB phone, CW, RTTY, and data
	= Fixed digital message forwarding systems <i>only</i>

E	= Amateur Extra
A	= Advanced
G	= General
T	= Technician
N	= Novice

About “Sub Sub Bands” aka Band Plans

- ❑ The ARRL has further divided these sub bands
 - These are smaller frequency ranges for specific modulation types
 - We are not required to follow these, consider them suggestions
 - Sub-Bands exist for all of our bands.
 - Here’s a [link to the list](#), all are also in the ARRL’s “Repeater Directory”
 - Here’s an example:

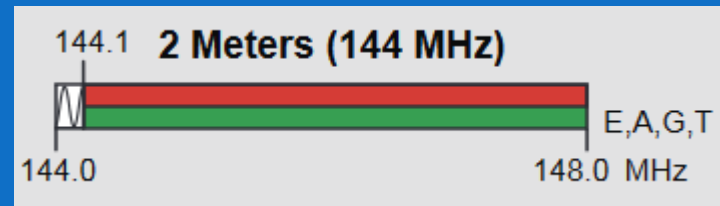
40 Meters (7.0-7.3 MHz)

7.040	RTTY/Data DX
7.080-7.125	RTTY/Data
7.171	SSTV
7.290	AM calling frequency

About VHF/UHF Modes

□ Here's the FCC band plan for 2m

- Notice that we can operate modulation types phone, image, RTTY & data from 144.100 to 148.999



	= RTTY and data
	= phone and image
	= CW <i>only</i>
	= SSB phone
	= USB phone, CW, RTTY, and data
	= Fixed digital message forwarding systems <i>only</i>

E	= Amateur Extra
A	= Advanced
G	= General
T	= Technician
N	= Novice

□ The ARRL has created “sub bands” within the all of our bands

- These sub band plans are adhered to by “Gentlemen's agreement”

About VHF/UHF Modes

❑ Here's the ARRL Band Plan for 2m

- These sub band plans are adhered to by "Gentlemen's agreement"
- FM is the most popular mode on 2m.

❑ Other modes on 2m

- There are stations that operate on 2m SSB & CW
 - We have some in our area.
 - You need a radio that operates on 2m SSB
 - 144.100 is the place to start out listening
- There are stations that have QSO's by bouncing their signal off of the moon
 - Called EME
 - Pete N8PR is our local expert
- Meteor Scatter

2 Meters (144-148 MHz)

144.00-144.05	EME (CW)
144.05-144.10	General CW and weak signals
144.10-144.20	EME and weak-signal SSB
144.200	National calling frequency
144.200-144.275	General SSB operation
144.275-144.300	Propagation beacons
144.30-144.50	New OSCAR subband
144.50-144.60	Linear translator inputs
144.60-144.90	FM repeater inputs
144.90-145.10	Weak signal and FM simplex (145.01,03,05,07,09 are widely used for packet)
145.10-145.20	Linear translator outputs
145.20-145.50	FM repeater outputs
145.50-145.80	Miscellaneous and experimental modes
145.80-146.00	OSCAR subband
146.01-146.37	Repeater inputs
146.40-146.58	Simplex
146.52	National Simplex Calling Frequency
146.61-146.97	Repeater outputs
147.00-147.39	Repeater outputs
147.42-147.57	Simplex
147.60-147.99	Repeater inputs

Notes: The frequency 146.40 MHz is used in some areas as a repeater input. This band plan has been proposed by the ARRL VHF-UHF Advisory Committee.

Let's talk about "Channels"

- ❑ Channels are very specific frequencies that we must operate on
 - ❖ An example is CB radio which is exclusively channelized
 - ❖ We are only channelized by the FCC on 60m
 - ❖ There is confusion about this by hams that start operating on HF after extensive experience with FM repeater operation on 2m
 - ❖ Excluding FM repeater use, You DO NOT have to set your VFO to an exact frequency such as 7.205MHz on 40m. You can set it to the frequency that makes the station you are talking to sound the best.

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	26.965 MHz	11	27.085 MHz	21	27.215 MHz	31	27.315 MHz
2	26.975 MHz	12	27.105 MHz	22	27.225 MHz	32	27.325 MHz
3	26.985 MHz	13	27.115 MHz	23	27.255 MHz	33	27.335 MHz
4	27.005 MHz	14	27.125 MHz	24	27.235 MHz	34	27.345 MHz
5	27.015 MHz	15	27.135 MHz	25	27.245 MHz	35	27.355 MHz
6	27.025 MHz	16	27.155 MHz	26	27.265 MHz	36	27.365 MHz
7	27.035 MHz	17	27.165 MHz	27	27.275 MHz	37	27.375 MHz
8	27.055 MHz	18	27.175 MHz	28	27.285 MHz	38	27.385 MHz
9	27.065 MHz	19	27.185 MHz	29	27.295 MHz	39	27.395 MHz
10	27.075 MHz	20	27.205 MHz	30	27.305 MHz	40	27.405 MHz

Let's talk about "Channels" on FM

- ❑ We are channelized on VHF/UHF FM because the repeater we are using is set to receive a specific frequency
- ❑ Changing from that frequency will move us out of the receiver's passband and will only repeat a portion of our transmitted audio. The received audio will be distorted.
- ❑ This effect is caused by using a repeater. If you are not using a repeater you can use any frequency that is within the FCC band plan for your specific transmission mode

Frequency	Offset	Tone In / Out	Location
146.7300	-0.6 MHz	103.5	Fort Lauderdale
146.7900	-0.6 MHz	NAC 88.5 / 88.5	Fort Lauderdale, Port Everglades
146.9100	-0.6 MHz	110.9	Fort Lauderdale
147.3300	+0.6 MHz	103.5	Fort Lauderdale
224.4000	-1.6 MHz	110.9	Fort Lauderdale
224.7600	-1.6 MHz	110.9 / 110.9	Fort Lauderdale

Operating on HF: What You Need to Know

- ❑ Except for 60m, you can set your VFO on any frequency within the sub band where your mode is allowed.
 - For most new to HF this will be the SSB phone mode
 - On 80 & 40m using Lower Side Band (LSB) is the custom
 - On 30m you may **only use CW, RTTY & data modes, no Phone**
 - On 20m, 17m, 15m, 12m, 10m and frequencies above
 - ✓ Using Upper Side Band (USB) is the custom
 - ✓ CW operation is permitted on any band
- ❑ Separating the CW, data modes from the phone modes is done because the bandwidth of CW & data modes is narrower than that of the phone modes so more stations can operate within that band.

Operating on VHF: What You Need to Know

- ❑ Looking for someone to talk to
 - When you want to talk to someone on a repeater, you make a simple announcement like: “This WB4EHG, Listening”
 - Every station listening to that repeater hears you repeated through the repeater’s transmitter.
 - They do not hear you direct, they hear you from the repeater’s transmitter.
 - You do not need to make multiple calls, almost no one is tuning through the repeaters listing for someone to call
 - Do NOT call “CQ” through a repeater, you will be ignored or ridiculed
 - You can have QSO’s without using a repeater
 - This is called “Simplex” operating
 - Our national 2m FM calling frequency is 146.520
 - After finding a station to talk to you should move to a different simplex frequency: 146.400 to 146.580: 146.550 & 146.580 are popular

Operating on HF: What You Need to Know

- ❑ When looking for someone to talk to on HF (except for when using a HF repeater)
 - You find a clear frequency
 - Remember to stay within the band limits for your class of license and your operating mode
 - Before calling CQ, some hams will ask if the frequency is in use
 - They do this because due to propagation you may not hear a station that is in QSO with a station you can hear. Your calling CQ will interfere with a QSO in progress
 - You call CQ
 - CQ CQ Calling CQ this is WB4EHG Whiskey Bravo Four Echo Hotel Golf
 - You listen for a response and if none you call CQ again.
 - Some radios have built in memories where you can store this once and play it when needed.

Logging Contacts

❑ Logging your contacts

- ❖ When I was first licensed, we were required to log every transmission we made
 - For a QSO we had just one log entry listing the time the QSO started and the time it ended
- ❖ We no longer must log for the FCC
- ❖ Many of us do log our contacts, excluding VHF/UHF FM
 - We may want to submit these entries for awards
- ❖ Some people keep written logs, most keep software logs
 - The logging program can talk to your HF rig and get frequency and mode
 - It gets the date and time from your computer
 - It gets details about the other station from one of the on-line web sites such as www.qrz.com (they have subscription levels, the basic account is free)



Logging Contacts

❑ Logging Contact Information

- Minimal information that is logged is:
 - Date
 - Time on (QSO started)
 - His call sign
 - Signal report
 - Yours from him
 - Yours to him
 - Frequency or band
 - Mode
 - Your transmit power
 - Time ended (not used very much)

Software You Need

❑ Logging program

- There are free and pay logging only programs, here are two
 - [Log4OM](#)
 - [N3FJP](#)
- There are free and pay logging suites that do many other things, here are two
 - [Ham Radio Deluxe](#)
 - [Logger32](#)

Software You Need - Example

Log4OM

- ❖ A free logging program
- ❖ Very capable, I like it
- ❖ Downloads from popular on-line loggers
- ❖ Tracks QSLs
- ❖ Tracks awards
- ❖ Integrated spotting
- ❖ Usable for all modes

Log4OM [User Profile: na4dc first session] [Solar data info K: 1 A: 3 SFI: 66 Sunspot: 0]

File QSO Manager QSL tools Radio Utilities Settings Help

Call sign: [] Name: [] Sent: 59 Rcvd: 59

QSO info (F1) Country IOTA SOTA (F2) Club and Awards (F3) Contest (F4) Extended info & QSL (F5) SAT/Prop (F6)

Comment: [] Note: [] Mode: SSB TX Power: 100.000 Band: 20m

Start: 10/23/2019 21:18:43 End: 21:18:43

QSO Information (F7) Recent QSO (F8) Cluster (F9) Cluster Scanner (F10) Browser (F11)

Call sign	QSO date	QSO start time	Band	Mode	Country	State	RST sent	RST rcvd	Operator
4L8A	10/20/2019	18:53:00	20m	FT8	Georgia		-09	-14	WB4EHG
KD2QPU	10/20/2019	18:40:15	20m	FT8	United States	NY	+00	+01	WB4EHG
EA8AFB	10/20/2019	18:30:00	20m	FT8	Canary Is.		-18	-09	WB4EHG
W3KM	10/20/2019	18:24:00	20m	FT8			-03	-04	WB4EHG
ND8G	10/20/2019	18:14:00	20m	FT8	United States	KY	-14	-02	WB4EHG
EA3EW	10/20/2019	18:13:00	20m	FT8	Spain		-18	-11	WB4EHG
AB2EZ	10/20/2019	18:06:30	20m	FT8	United States	NJ	-11	+03	WB4EHG
PD1EVP	10/20/2019	17:59:00	20m	FT8	Netherlands		-16	-04	WB4EHG
EA7ZY	10/20/2019	17:57:45	20m	FT8	Spain		-09	-08	WB4EHG
M0URL	10/20/2019	17:54:30	20m	FT8	England		-14	-04	WB4EHG
KC3AHR	10/20/2019	17:46:00	20m	FT8	United States	PA	-03	+01	WB4EHG
KD8MEY	10/20/2019	17:40:00	20m	FT8	United States	MI	-09	-11	WB4EHG
EA5GDY	10/20/2019	17:20:00	20m	FT8	Spain		-08	-19	WB4EHG
F5RMK	10/20/2019	17:17:15	20m	FT8	France		-08	-24	WB4EHG
IK8WJZ	10/20/2019	17:12:00	20m	FT8	Italy		-03	-16	WB4EHG
KA2KAR	10/20/2019	17:09:00	20m	FT8	United States	NJ	-01	+01	WB4EHG
N3NVA	10/20/2019	17:07:15	20m	FT8	United States	PA	+05	-06	WB4EHG
OO8O	10/20/2019	16:58:15	20m	FT8	Belgium		-11	-19	WB4EHG
W3KM	10/20/2019	16:49:15	20m	FT8	United States	PA	+02	-08	WB4EHG
TI2LX	10/20/2019	16:33:15	20m	FT8	Costa Rica	AI	-09	-09	WB4EHG
RA1AOB	10/20/2019	16:12:00	20m	FT8	European Russia		+02	-09	WB4EHG

Distance: 0 Mi

SP: [] Country: [] LP: []

Locator: [] IOTA: []

Ext. Browser: [Lookup](#) [WebSite](#)

Latest spots: Digital CW Phone

5K0K	28440.0
J6/KM2L	10109.0 Saint Lucia
VR6R	21023.0 Pitcairn Is.
*SQ9KFZ	144174.0 Poland
*KG5TBI	14310.0 United States
5K0K	18100.0
*K5LBJ	14265.0 United States
KF5CRF	14290.0 United States
II4MNU	7021.0 Italy
D68CCC	7113.0 Comoros
*JA8DKJ	14074.0 Japan
5K0K	14093.9
PA3BIY	144174.0 Netherlands
EV1P	3573.0 Belarus
DG4AZ	144324.8 Fed. Republic
*KN4BBD	7253.0 United States
VR6R	21023.0 Pitcairn Is.
W7U	14250.0 United States
OX1AA	10111.1 Greenland
*VK7XX	14074.0 Australia
KM4RE	7238.0 United States
*SV9RNG	10123.0 Crete
N8TUW	7210.0 United States

Layout Refresh Search Parameters Records found: 119 Detach Grid Display limit (0 = all) 5000

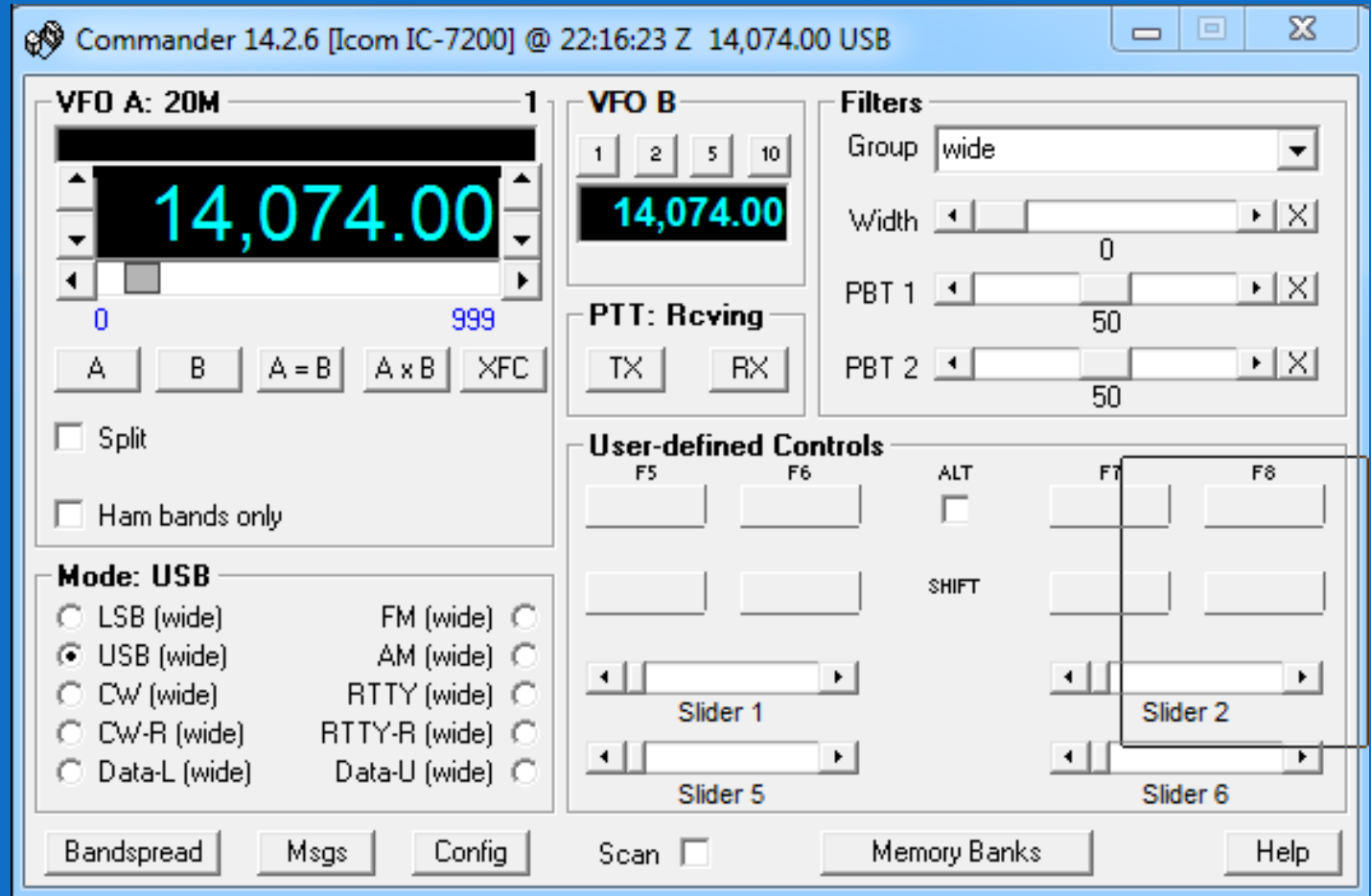
QSO: 119 CAT status | HRDLog ON AIR | Cluster | Super Cluster | WinKeyer

C:\Users\default.DESKTOP-VRF2EI6\Documents\NA4DC Log4OM database.SQLite Hide >>

205 x 818 x 24 BPP 4/7 100 % 137.00 KB / 2.82 MB 10/23/2019 / 17:20:26

Computer Control of Your Station

- ❑ DX Labs Commander
 - ❖ A free CAT program
 - ❖ Supports many radios
 - ❖ Lets you control your radio from your computer
 - ❖ !! May be optional for FT8 operating
- ❑ DX Labs also has a free logging program



CAT is computer control of your radio. The amount of control depends on the radio manufacturer. Newer radios have more controllability

References

- ❑ The ARRL Operating Manual has everything you need to know
 - [Link to book on ARRL site](#)
 - [Link to book on Amazon](#)

- ❑ Operating tips
 - [ARRL](#)

- ❑ [ARRL Band Plan](#)

- ❑ A New Ham's Guide
 - [How to Use Amateur \(Ham Radio\) Repeaters by N4UJW](#)

- ❑ [ARRL's Buying your first radio](#)

- ❑ [ARRL Repeater Directory \(has band plans\)](#)

Questions?

