WSJT Digital Modes

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Connections

- Need at least one connection between radio and computer
- Icom uses audio and CIV connection in older models
- IC-7300 and IC-7610 uses only one USB cable
- Kenwoods use an audio connection (SignaLink) and a Serial-USB cable (FTDI)
- Kenwood TS590 uses single USB cable

Connections

- Facebook groups are very helpful in solving connection questions
- Software specific groups
- Hardware specific groups
- K0PIR YouTube videos

WSJT

- WSJT: Weak Signal Joe Taylor
- Created by Dr. Joe Taylor, K1JT
  - 1993 Nobel Prize in Physics
  - Discovered Dual Pulsars

Operating systems

- WSJT and WSJT-X will run on:
- Windows
- Mac OS
- Several flavors of Linux

WSJT

- Originally created for EME (Moon Bounce)
- Previously needed very high power and large antenna arrays.
- You needed to hear your CW signal return from the moon.
- 239,000 miles one way path on 2m!

WSJT

- With computer algorithms, WSJT decodes the signal and prints out the exchange on the computer screen.
- Signal reports are given in dBs relative to the noise level. -07 is a typical report for WSJT modes.
- Weak Signal mode but normally also low power compared to other ham radio modes.
- Average power 50-60 watts.

WSJT-X

- Created as an experimental mode to introduce other modes into WSJT.
- JT4, JT9, JT65, QRA64, ISCAT, MSK144, FT8, and WSPR
- The WSJT-X exchanges are very structured, not a conversational mode.
- WSJT-X 2.2.1 GA is the current release.

WSJTX

- JT65 and QRA64 are designed for EME
- JT9 is optimized for LF, MF and HF use and is 2 dB more sensitive than JT65.
- JT4 and QRA64 are designed for microwave EME work.
- WSPR is a low power mode used to test propagation. (Where is my 5w signal being heard?)

WSJT-X

- FT8 (Franke-Taylor 8) is designed for contest use on HF and VHF.
- Created by Steven Franke K9AN and K1JT.
- This mode was introduced in July 2017.
- Currently the most popular WSJT mode.
- FT4 is designed for contest use and is twice as fast as FT8.

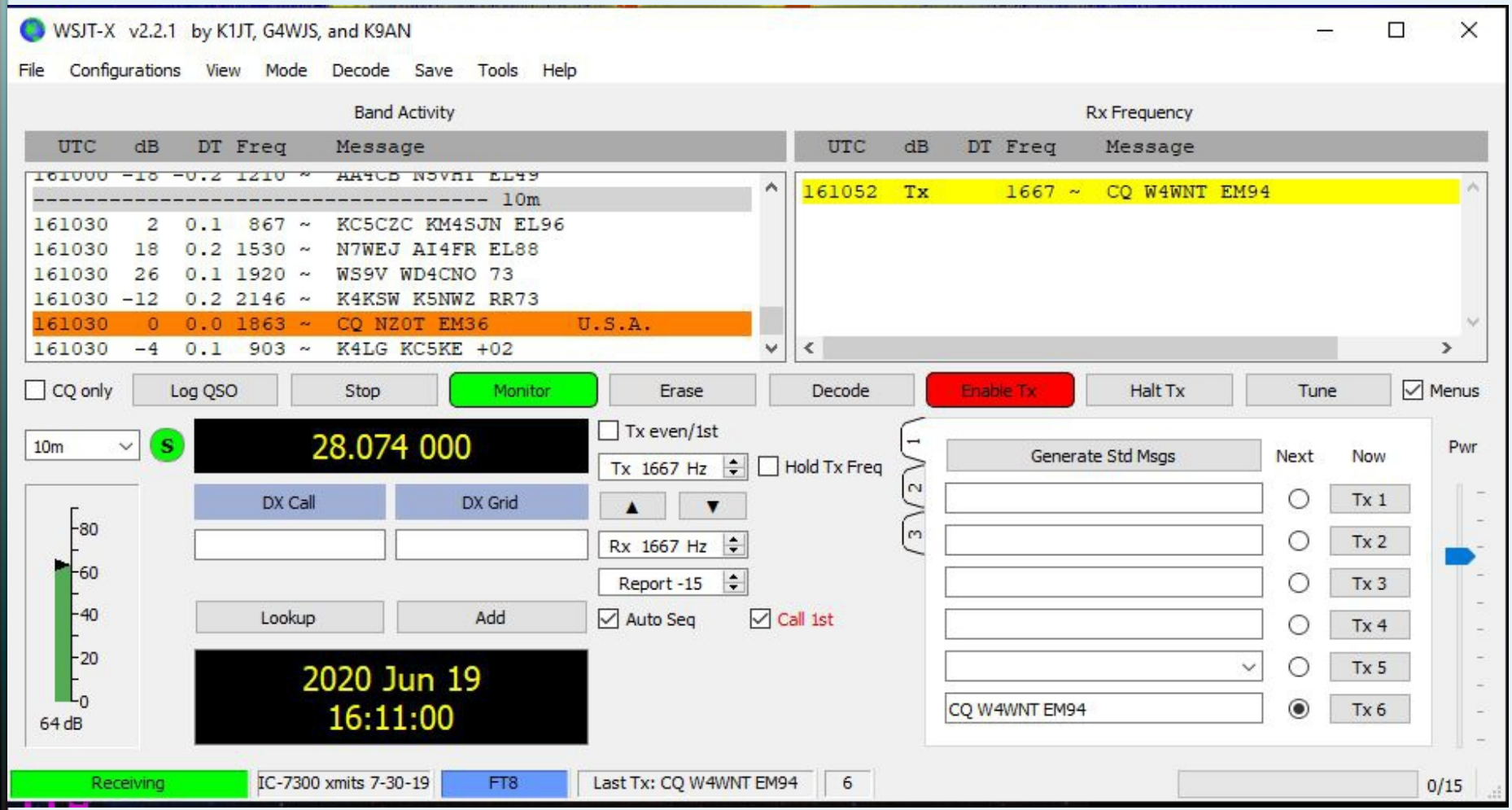
FT8

- Runs in 15 second intervals, RX and TX
- Formatted exchange
- Has an Auto Sequence feature
- Operating frequencies are in a table
- Timing is critical, use Dimension4 from Thinkman.com or Meinberg NTP to sync your clock for Windows OS

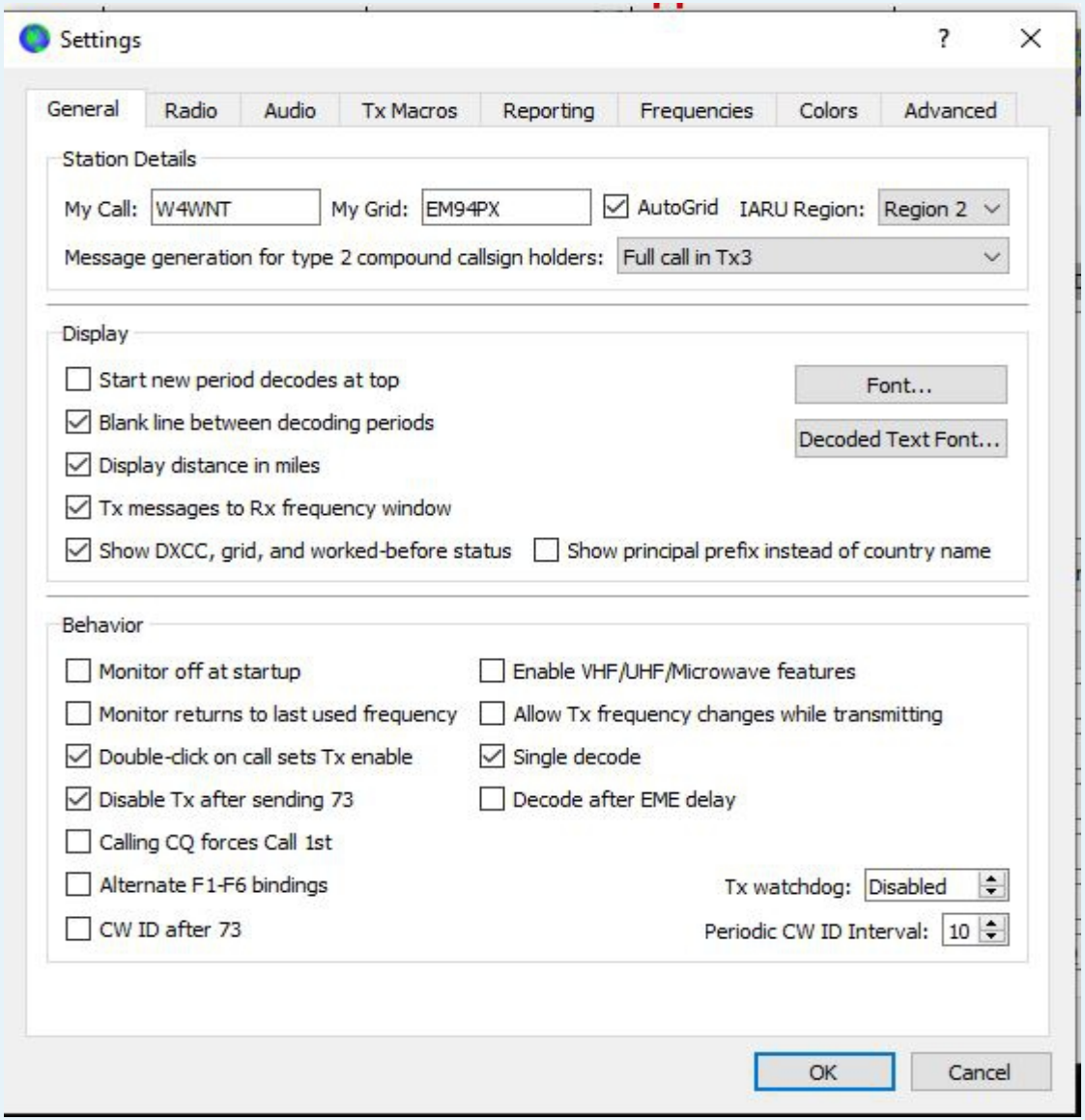
FT8

- dB measured Signal to noise ratio (S/N)
- dT time offset relative to your computer clock
- Signals visible at -26 dB
- Signals audible at -15 dB
- 50 Hz bandwidth, 12.6 sec Tx duration
- 15 sec TX, 15 sec Rx

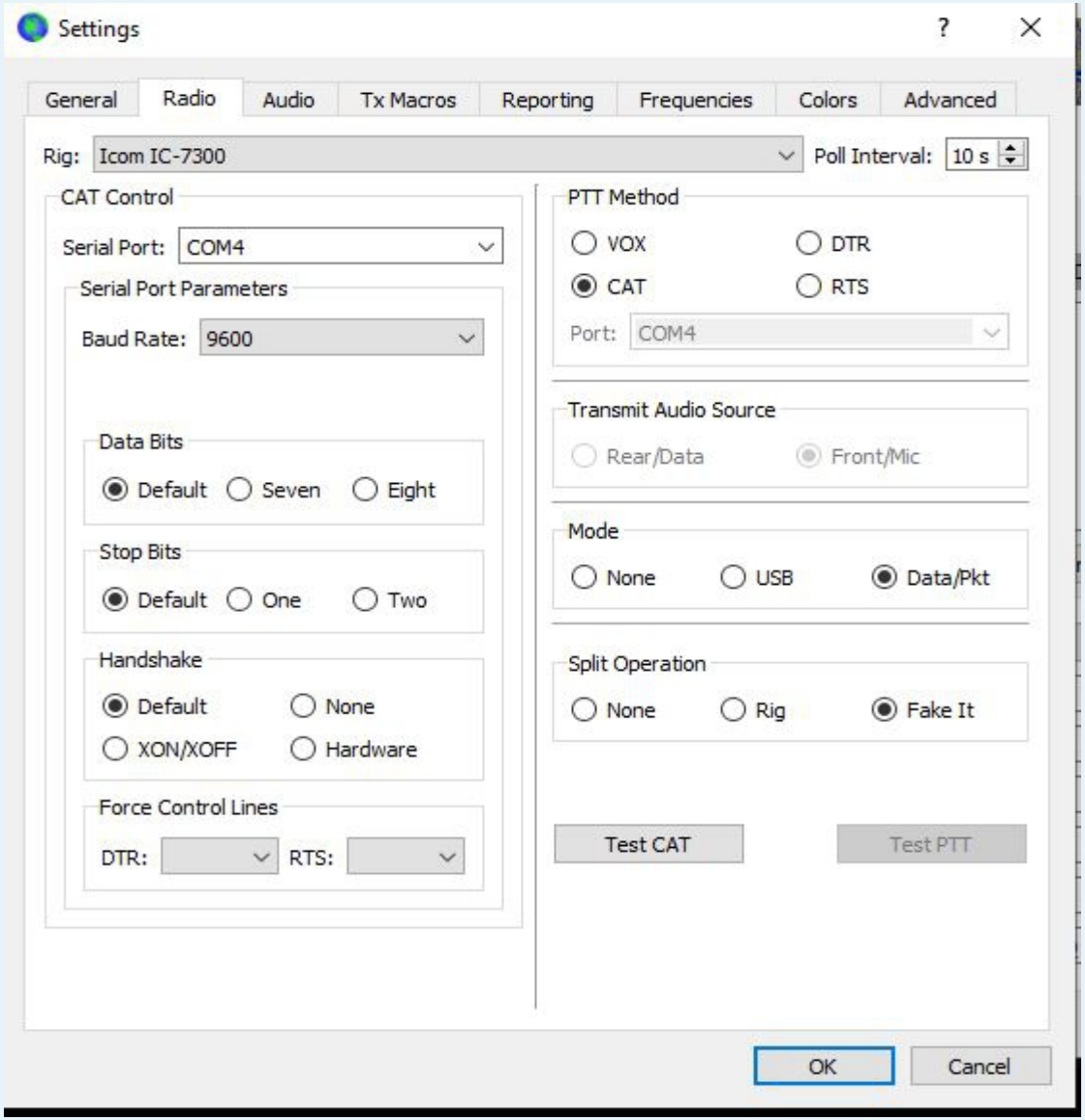
WSJT-X screen



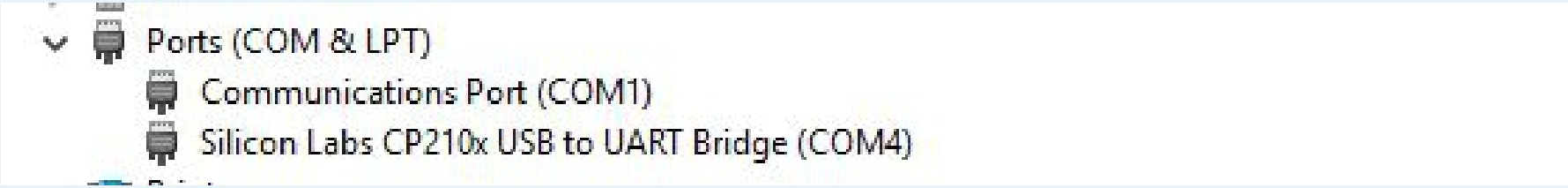
Settings-General



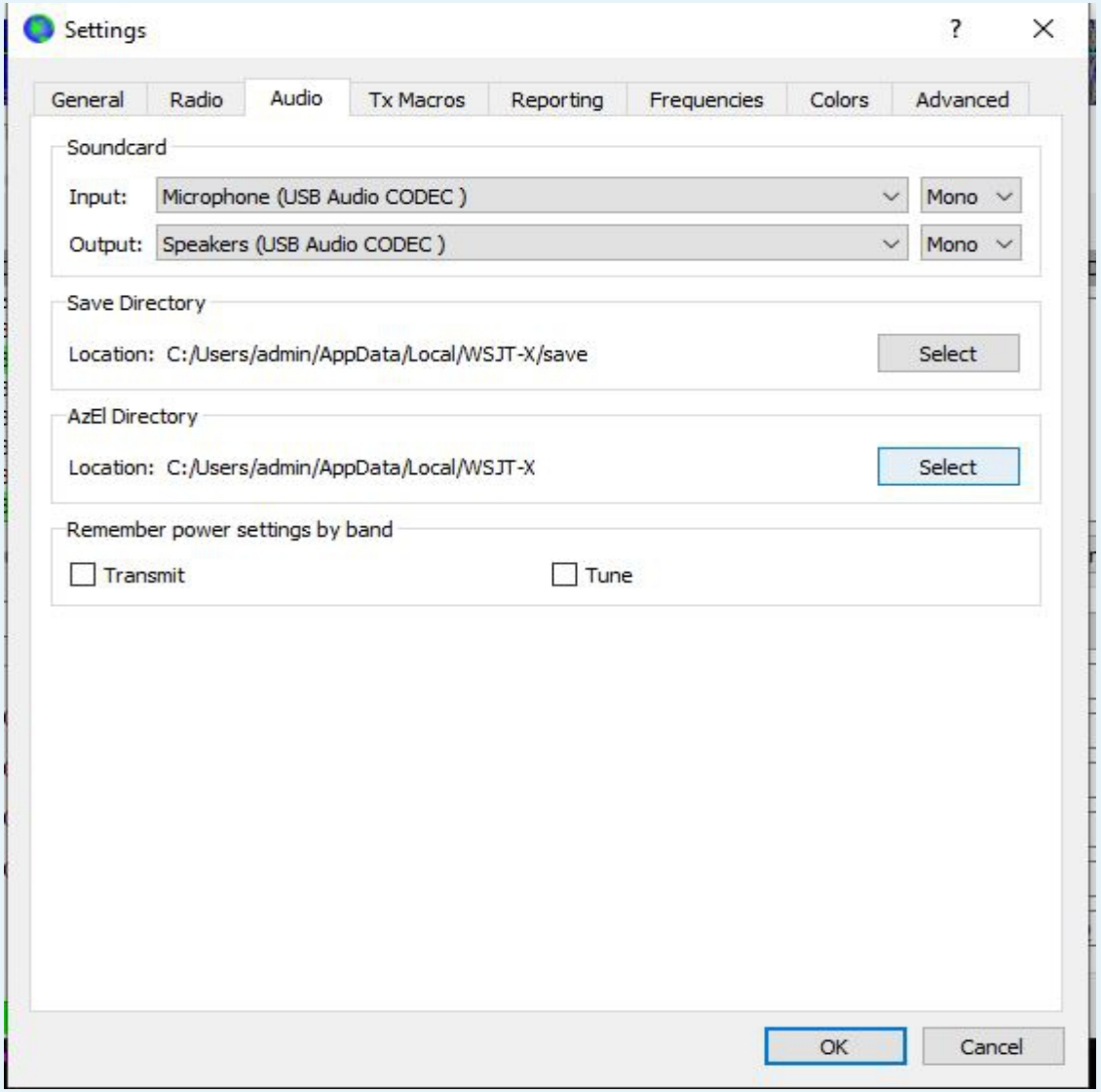
Settings - Radio



Audio settings
in Device Manager



WSJT-X Audio Screen



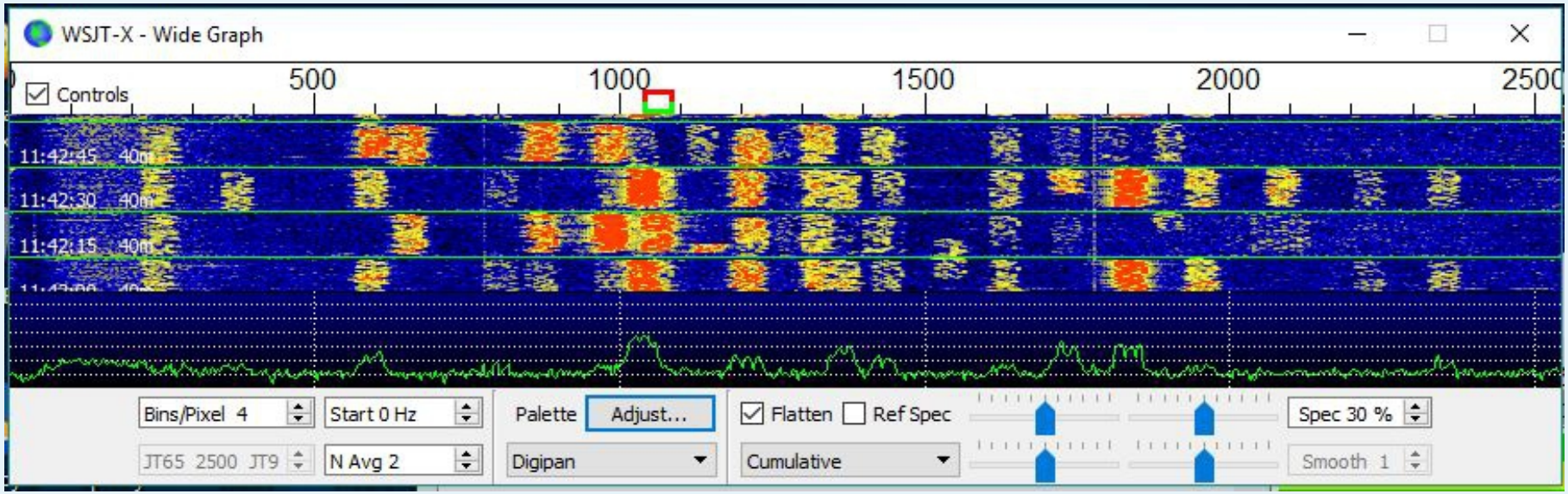
Other “Rigs”

- The Radio Screen also has
  - Ham Radio Deluxe
  - Omnirig
- See the Instruction Manual (F1) under Section 4.2 for more info.
- Test CAT and Test PTT buttons on Radio Screen

Windows Snipping Tool

- Used to save screen prints.
- Created the screen slides here.
- When you have the software running, use this tool to save the parameters that work.
- Windows updates mess with audio settings and com ports. Save parameters.
- If a screw up occurs, restart the computer to ensure that the update has completed.
- Only then look at your parameters for changes.

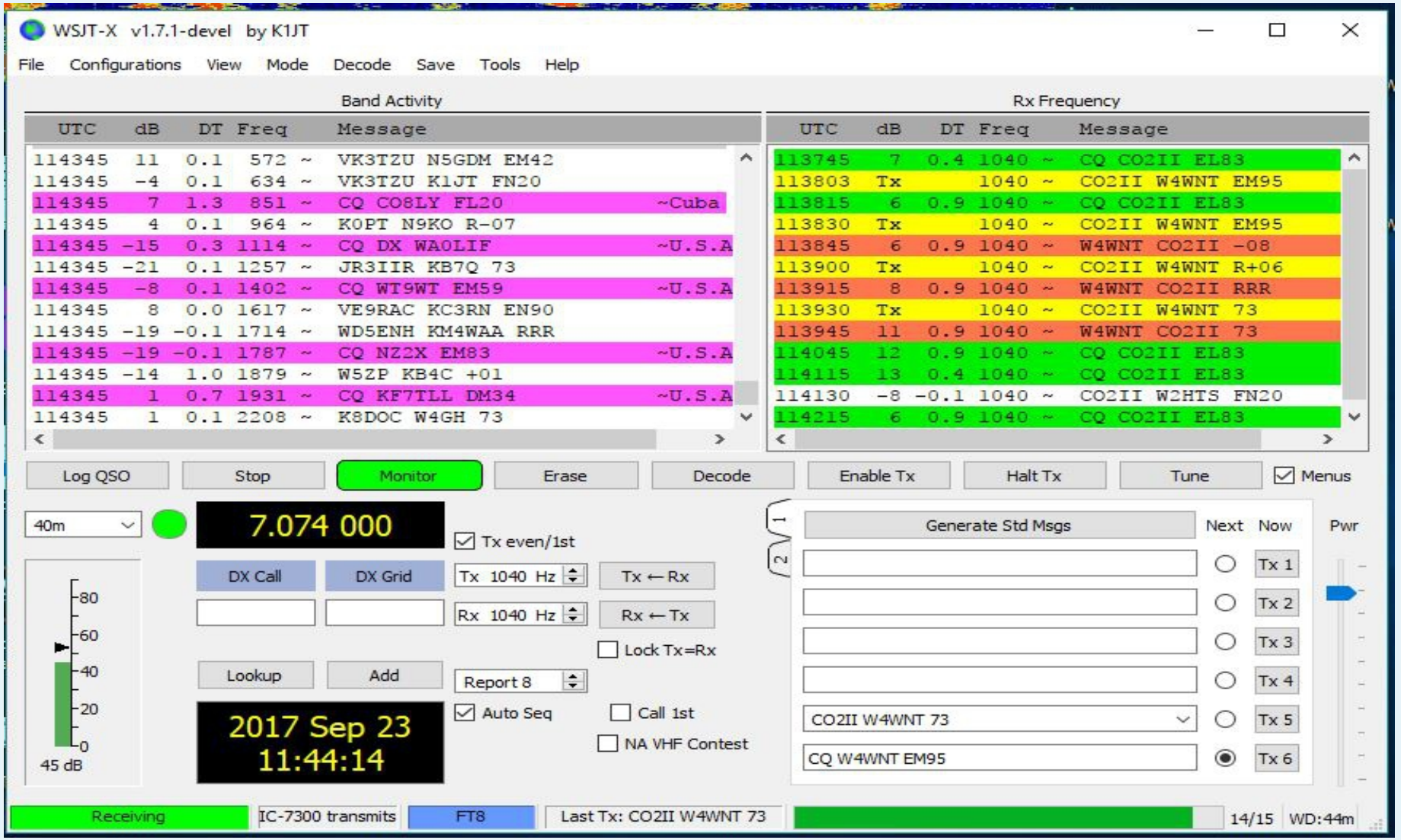
Wide Graph (Waterfall)



Wide Graph

- Use the widest filter setting on rig
- No DSP, Noise Reduction or Noise Blanking
- Control the image with sound card/RF gain
- Wide Graph also has controls to optimize the data presentation
- Strongest TX output between 1500 and 2000 Hz

Main screen


WSJT-X v1.7.1-devel by K1JT
File Configurations View Mode Decode Save Tools Help
Band Activity
UTC dB DT Freq Message
114345 11 0.1 572 ~ VK3TZU N5GDM EM42
114345 -4 0.1 634 ~ VK3TZU K1JT FN20
114345 7 1.3 851 ~ CQ CO8LY FL20 ~Cuba
114345 4 0.1 964 ~ K0PT N9KO R-07
114345 -15 0.3 1114 ~ CQ DX WA0LIF ~U.S.A
114345 -21 0.1 1257 ~ JR3IIR KB7Q 73
114345 -8 0.1 1402 ~ CQ WT9WT EM59 ~U.S.A
114345 8 0.0 1617 ~ VE9RAC KC3RN EN90
114345 -19 -0.1 1714 ~ WD5ENH KM4WAA RRR
114345 -19 -0.1 1787 ~ CQ NZ2X EM83 ~U.S.A
114345 -14 1.0 1879 ~ W5ZP KB4C +01
114345 1 0.7 1931 ~ CQ KF7TLL DM34 ~U.S.A
114345 1 0.1 2208 ~ K8DOC W4GH 73
Rx Frequency
UTC dB DT Freq Message
113745 7 0.4 1040 ~ CQ CO2II EL83
113803 Tx 1040 ~ CO2II W4WNT EM95
113815 6 0.9 1040 ~ CQ CO2II EL83
113830 Tx 1040 ~ CO2II W4WNT EM95
113845 6 0.9 1040 ~ W4WNT CO2II -08
113900 Tx 1040 ~ CO2II W4WNT R+06
113915 8 0.9 1040 ~ W4WNT CO2II RRR
113930 Tx 1040 ~ CO2II W4WNT 73
113945 11 0.9 1040 ~ W4WNT CO2II 73
114045 12 0.9 1040 ~ CQ CO2II EL83
114115 13 0.4 1040 ~ CQ CO2II EL83
114130 -8 -0.1 1040 ~ CO2II W2HTS FN20
114215 6 0.9 1040 ~ CQ CO2II EL83
Log QSO
Stop
Monitor
Erase
Decode
Enable Tx
Halt Tx
Tune
Menus
40m
7.074 000
Tx even/1st
DX Call
DX Grid
Tx 1040 Hz
Tx ← Rx
Rx 1040 Hz
Rx ← Tx
Lock Tx=Rx
Lookup
Add
Report 8
Auto Seq
Call 1st
NA VHF Contest
2017 Sep 23
11:44:14
80
60
40
20
0
45 dB
Generate Std Msgs
Next
Now
Pwr
Tx 1
Tx 2
Tx 3
Tx 4
CO2II W4WNT 73
Tx 5
CQ W4WNT EM95
Tx 6
Receiving
IC-7300 transmits
FT8
Last Tx: CO2II W4WNT 73
14/15
WD:44m

Main Screen

- dB column: received signal relative to noise level
- dT column: time difference between you and the station you are decoding
- Time sync software keeps dT to a minimum
- Windows OS needs time sync software

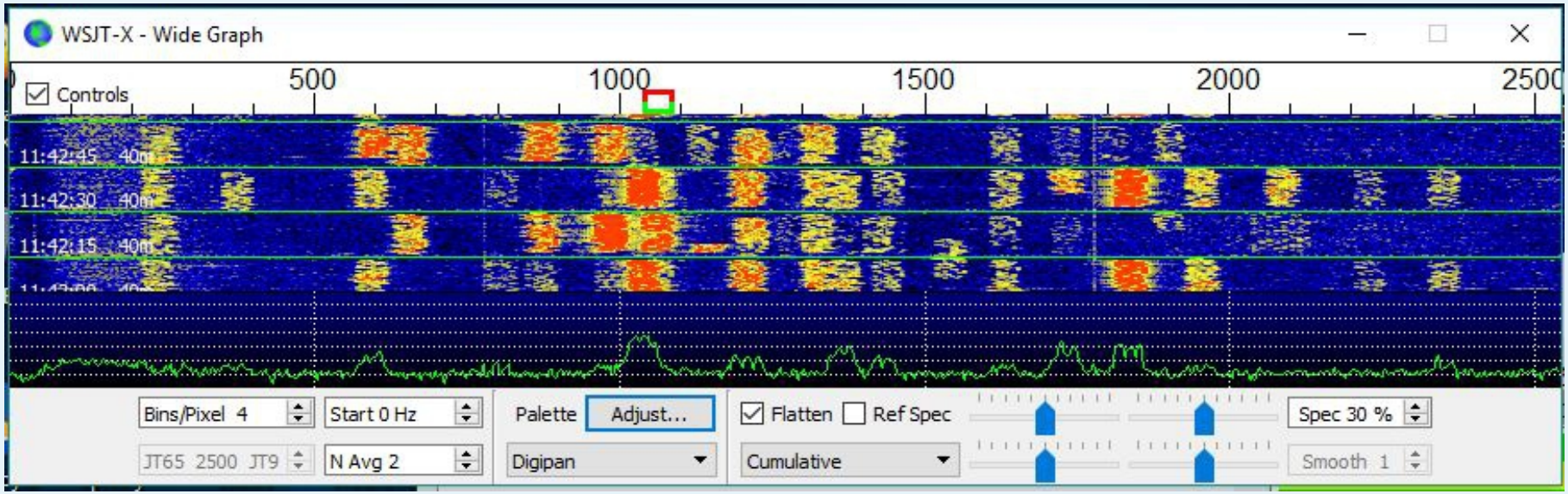
FT8 Frequencies

- 3.573, 7.074, 10.136, 14.074, 21074, 28.074, 50.313
- USB or USB-Data mode
- Power: normally low power 5-30 watts, but can use higher power (under 100watts)
- 2 kHz band at listed frequencies
- Eg: 7.074-7.076 Wide Graph 0-2000Hz
- JT65 7.076-7.078, JT9 7.078-7.080

Power or not?

- According to Jim Shaver, N2ADV, adding power without a well tuned amplifier can make you unpopular on FT8. Remember the FT8 section is only 2kHz wide.
- Doubling your power is a 3dB increase and since the increase is logarithmic, even going to 1500 watts does not do a great deal to your signal.
- An amplifier will not turn a -24 signal into a +24 signal!

Wide Graph (Waterfall)



Weak Signal Mode

Antenna

- When I moved to my present home in a new HOA, I decided to stay low key and operate with an indoor antenna. The antenna is an EARCHI End Fed strung around the walls of the radio room. Following are some examples of stations worked with that set up.

Weak Signal Mode
40w 17m 30 ft End Fed Indoor Antenna

Rx Frequency

UTC	dB	DT	Freq		Message
164100	2	0.1	1445	~	CQ MIOLLG IO65
164118	Tx		1445	~	MIOLLG W4WNT EM94
164130	5	0.1	1444	~	W4WNT MIOLLG -15
164145	Tx		1445	~	MIOLLG W4WNT R+05
164200	1	0.1	1444	~	W4WNT MIOLLG -15
164215	Tx		1445	~	MIOLLG W4WNT R+01
164230	-1	0.1	1444	~	W4WNT MIOLLG RRR
164245	Tx		1445	~	MIOLLG W4WNT 73
164300	-2	0.1	1443	~	W4WNT MIOLLG 73

Weak Signal
40w 17m Indoor End Fed

Rx Frequency

UTC	dB	DT	Freq	Message
170615	14	0.1	431 ~	CQ KP4EJ FK67
170630	Tx		431 ~	KP4EJ W4WNT EM94
170645	15	0.1	431 ~	W4WNT KP4EJ +11
170700	Tx		431 ~	KP4EJ W4WNT R+15
170715	13	0.1	431 ~	W4WNT KP4EJ RRR
170730	Tx		431 ~	KP4EJ W4WNT 73
170745	15	0.1	432 ~	W4WNT KP4EJ 73

No one needs an amp!

One more example: 519 miles
60m 5w Indoor End Fed Antenna
Danville, IL

```
001345  Tx          1600 ~  CQ W4WNT EM94
001400   7 -0.0 1600 ~  W4WNT WA9EIC EN60
001415  Tx          1600 ~  CQ W4WNT EM94
001445  Tx          1600 ~  CQ W4WNT EM94
001515  Tx          1600 ~  CQ W4WNT EM94
001545  Tx          1600 ~  WA9EIC W4WNT +07
001600   8 -0.1 1001 ~  W4WNT WA9EIC EN60
001615  Tx          1600 ~  WA9EIC W4WNT +08
001630   3 -0.0 1001 ~  W4WNT WA9EIC R-15
001645  Tx          1600 ~  WA9EIC W4WNT RRR
001715  Tx          1600 ~  WA9EIC W4WNT 73
```

Power as needed
60w 20m 9492 miles

Rx Frequency

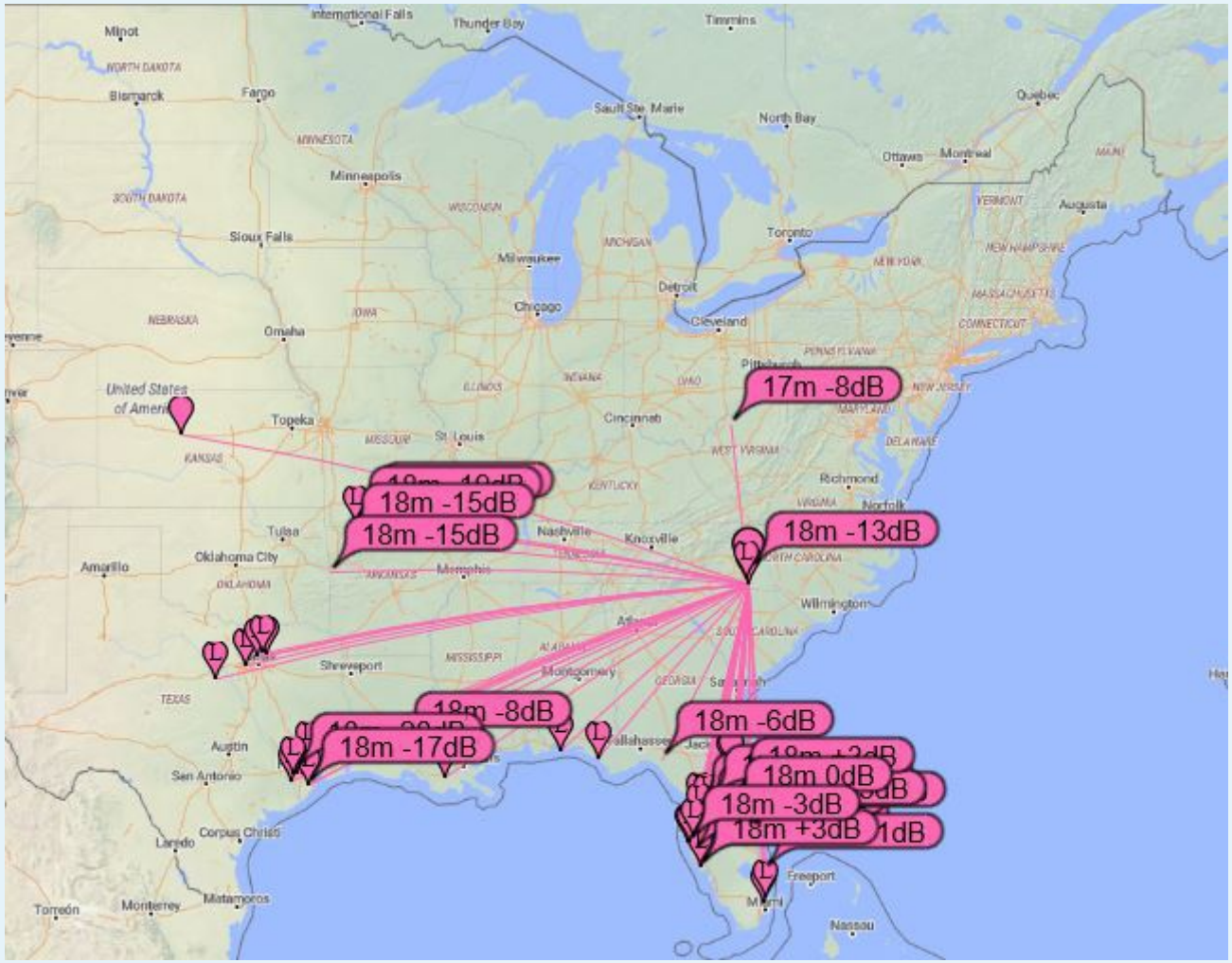
UTC	dB	DT	Freq		Message
211746	Tx		1909	~	VK2DDS W4WNT EM94
211800	-18	0.2	1909	~	W4WNT VK2DDS -15
211815	Tx		1909	~	VK2DDS W4WNT R-18
211845	Tx		1909	~	VK2DDS W4WNT R-18
211900	-14	0.2	1909	~	W4WNT VK2DDS -15
211915	Tx		1909	~	VK2DDS W4WNT R-14
211945	Tx		1909	~	VK2DDS W4WNT R-14
212000	-18	0.2	1908	~	K1BZ VK2DDS +05
212015	Tx		1909	~	VK2DDS W4WNT R-14
212045	Tx		1909	~	VK2DDS W4WNT R-14
212100	-13	0.2	1909	~	W4RJC VK2DDS -07
212115	Tx		1909	~	VK2DDS W4WNT R-14
212218	Tx		1909	~	VK2DDS W4WNT R-14
212245	Tx		1909	~	VK2DDS W4WNT R-14
212315	Tx		1909	~	VK2DDS W4WNT R-14
212330	-13	0.2	1908	~	W4WNT VK2DDS RR73
212345	Tx		1909	~	VK2DDS W4WNT 73

Auto Sequence

Rx Frequency

UTC	dB	DT	Freq		Message
002845	Tx		1600	~	K9NP W4WNT +08
002900	0	1.0	884	~	W4WNT K9NP R-09
002900	17	0.0	1602	~	W4WNT WB8ART EM79
002915	Tx		1600	~	K9NP W4WNT RRR
002930	7	1.0	885	~	W4WNT K9NP 73
002945	Tx		1600	~	K9NP W4WNT 73
002900	17	0.0	1602	~	W4WNT WB8ART EM79
003045	Tx		1600	~	WB8ART W4WNT +17
003115	Tx		1600	~	WB8ART W4WNT +17
003130	17	0.0	1687	~	W4WNT WB8ART R-19
003145	Tx		1600	~	WB8ART W4WNT RRR
003200	15	0.1	1687	~	W4WNT WB8ART 73
003215	Tx		1600	~	WB8ART W4WNT 73

PSK Reporter



DXPedition version

- Released in Beta February 2018
- Fox and Hound operation
- DXPedition = Fox, DXer = Hound
- Released on Joe's Princeton website
- Used by the Baker Island DXPedition in June 2018 and several others since.

References

WSJT Home Page:

http://physics.princeton.edu/pulsar/K1JT/index.html

The current accepted version is wsjt-x 2.2.1 GA

October and November 2017 QST articles by Joe Taylor, K1JT, Steven Franke, K9AN, and Bill Somerville, G4WJS

Time Sync software: (for Windows machines)

Dimension4: Thinkman.com

Meinberg:
www.meinbergglobal.com/english/sw/ntp.htm

Additional Resources

- IGC Grid Map:
- http://www.n1kdo.com/lotw-gridmapper/GridMapper.html
- Antenna: http://www.earchi.org/proj_homebrew.html
- PSK Reporter:
- https://www.pskreporter.info/pskmap.html

References

- Facebook:
- FT8/FT4/JT9: WSJT 2-Way Narrow Band Modes for Amateur Radio
- Yahoo: WSJT Group
- Ian Wade: G3NRW.net/IC-7300

  also has a TS590 family website
- Gary Hinson, ZL2IFB
- www.g4ifb.com/FT8_Hinson_tips_for_HF_DXers.pdf

- Thanks to Jim Shaver, N2ADV and Neil Zampella, KN3ILZ for their comments on this presentation.