

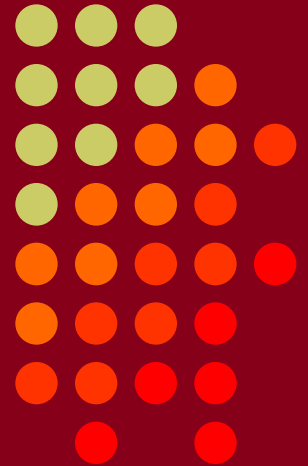
CTU Presents

FT8 and the WSJT-X 2.0 Software Suite for 6 Meter Contesting

Joel Harrison, W5ZN

• CTU •
CONTEST
UNIVERSITY

ICOM®

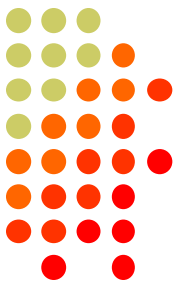


Session Objective



- We're not going to discuss or debate contest rules. They are what they are....follow them or change them
- We're not going to debate FT8 as a mode compared to CW, SSB, AM or Spark
 - We will discuss how to implement it into your station
- FT8 is simply a “Disruptive Technology”!

Disruptive Technology



- Technology that is new and constantly innovating
- Initially only appeals to a small group
- They disrupt by creating new users and challenging existing technology
- Examples
 - Email & social media transformed the way we communicate
 - Cell phones disrupted the telecom industry
 - Notebook computers & tablets created a mobile workforce
 - FT8 has transformed amateur digital communications



BREAKING NEWS



FT4

More on this later

First – A Bit of History



- Created by Dr. Joe Taylor, K1JT
 - Astrophysicist & Nobel Laureate
 - Nobel Prize in Physics - 1993
 - Discovered new type of pulsar that has opened up new possibilities for the study of gravitation.
- WSJT Originally Released in 2001
 - Has undergone major revisions since then
 - Became “Open Source” in 2005
 - Original version up through “WSJT7” contained 16 different modes

WSJT-X 2.0 Modes



- 9 Different Protocols or Modes
- FT8, JT4, JT9, JT65, QRA64, ISCAT, MSK144, WSPR and Echo
- First 5 are for making reliable QSOs under extreme weak signal conditions
 - All use nearly identical message structure and source encoding.

WSJT-X 2.0 Modes



- JT65 and QRA64 were designed for EME (moonbounce) on the VHF/UHF bands
 - Also proven very effective for worldwide QRP communications on HF
- MSK144 and ISCAT are “fast” protocols designed for ionized meteor trails, aircraft scatter and other types of scatter propagation

WSJT-X 2.0 Modes



- WSPR (pronounced Whisper) stands for “Weak Signal Propagation Reporter”
 - Designed for probing potential propagation paths using low-power transmissions.
- Echo mode allows you to detect and measure your own station’s echoes from the moon, even if they are below the audible threshold

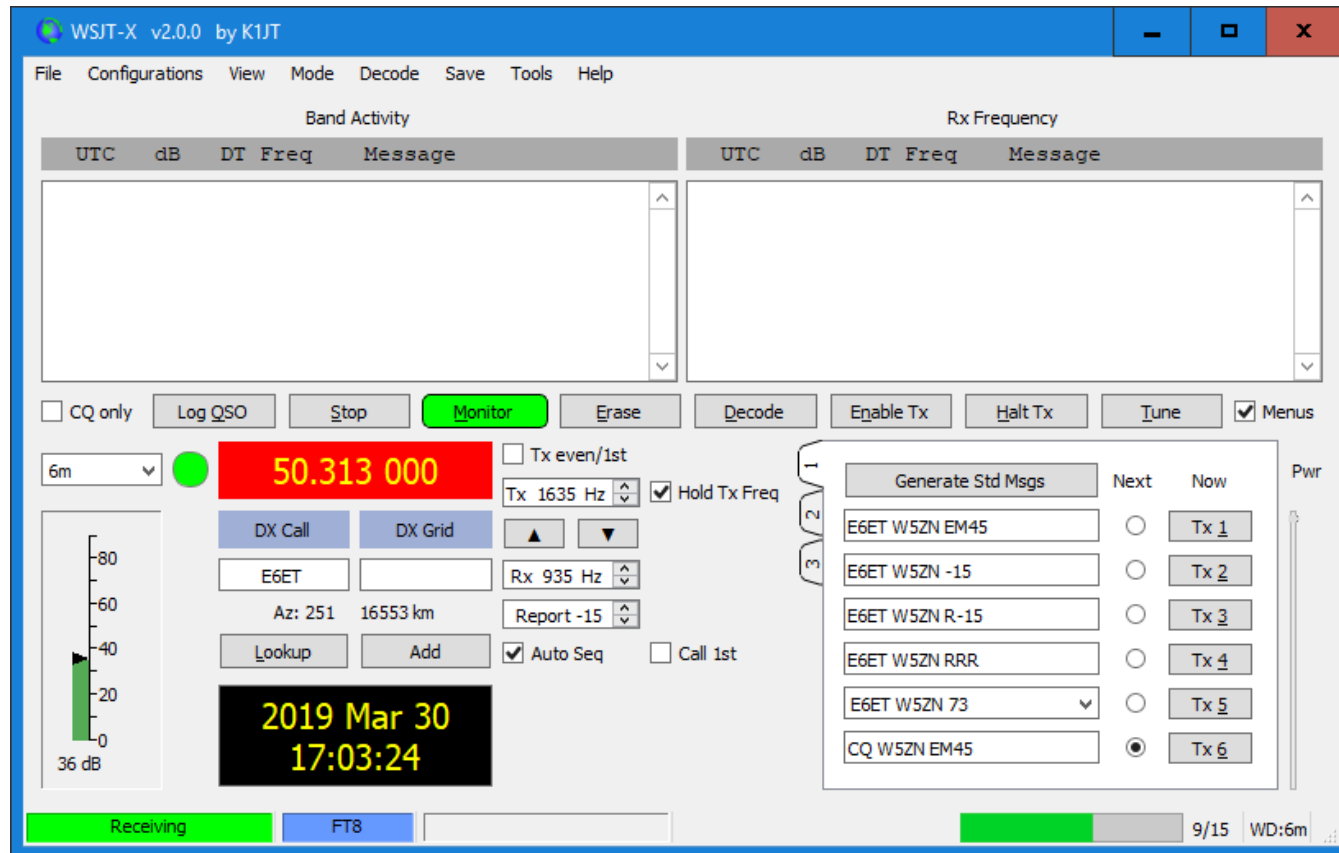
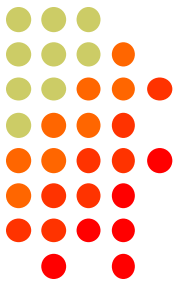
WSJT-X 2.0 Modes



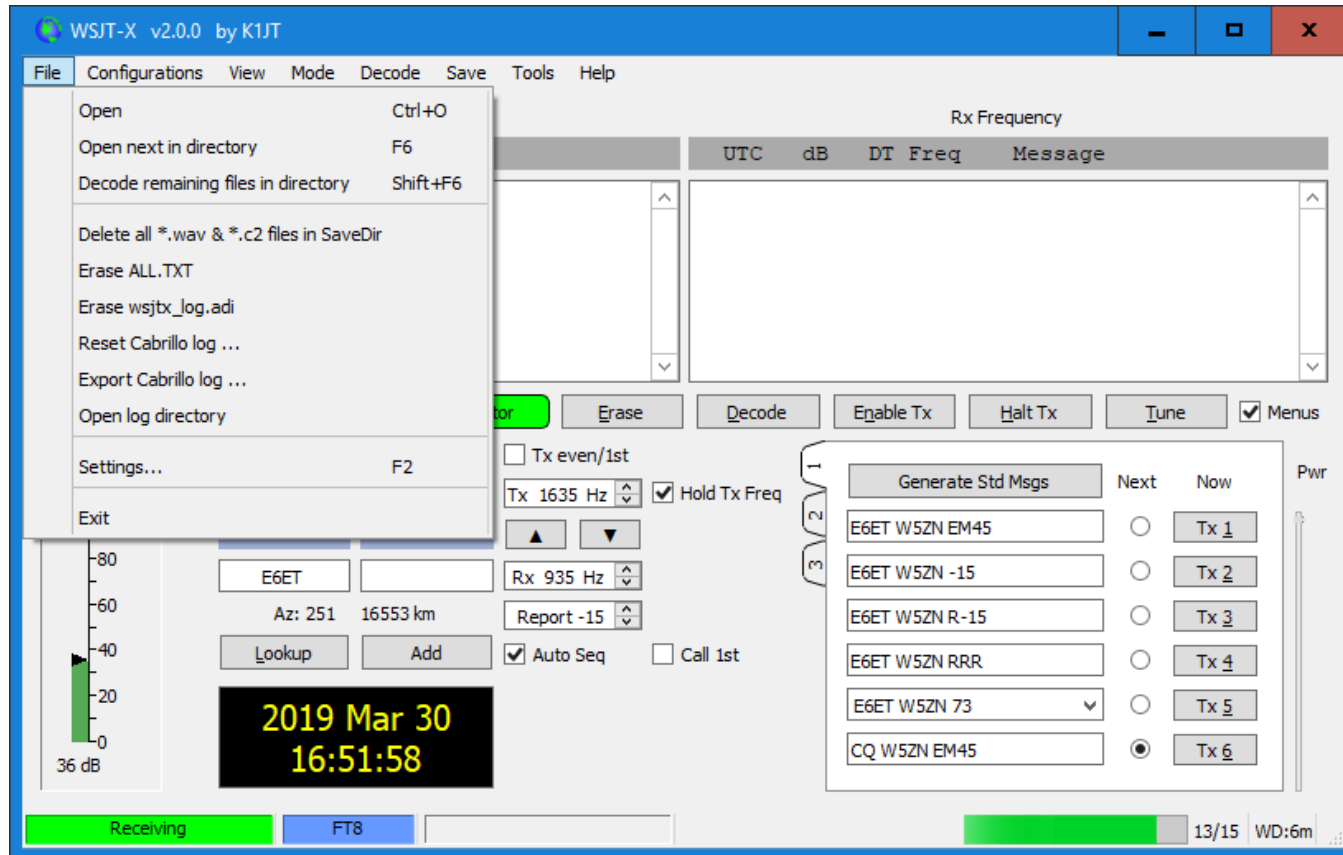
- Free software & documentation
- Download from WSJT “Home” is at:

<https://www.physics.princeton.edu/pulsar/K1JT/>

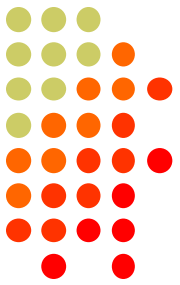
WSJT-X 2.0 Modes



WSJT-X 2.0 Modes



WSJT-X 2.0 Modes



Settings

General Radio Audio Tx Macros Reporting Frequencies Colors Advanced

Station Details

My Call: My Grid: ☐ AutoGrid IARU Region:

Message generation for type 2 compound callsign holders:

Display

☐ Blank line between decoding periods

☒ Display distance in miles

☒ Tx messages to Rx frequency window

☐ Show DXCC, grid, and worked-before status

☐ Show principal prefix instead of country name

Behavior

☐ Monitor off at startup ☐ Enable VHF/UHF/Microwave features

☐ Monitor returns to last used frequency ☐ Allow Tx frequency changes while transmitting

☒ Double-click on call sets Tx enable ☐ Single decode

☒ Disable Tx after sending 73 ☐ Decode after EME delay

☐ CW ID after 73 Tx watchdog:

Periodic CW ID Interval:

WSJT-X 2.0 Modes



Settings

General Radio Audio Tx Macros Reporting Frequencies Colors Advanced

Rig: Elecraft K3/KX3 Poll Interval: 1 s

CAT Control

Serial Port: COM11

Serial Port Parameters

Baud Rate: 38400

Data Bits

☐ Default ☐ Seven ☒ Eight

Stop Bits

☐ Default ☒ One ☐ Two

Handshake

☐ Default ☒ None

☐ XON/XOFF ☐ Hardware

Force Control Lines

DTR: RTS:

PTT Method

☐ VOX ☐ DTR

☐ CAT ☒ RTS

Port: COM11

Transmit Audio Source

☐ Rear/Data ☒ Front/Mic

Mode

☐ None ☐ USB ☒ Data/Pkt

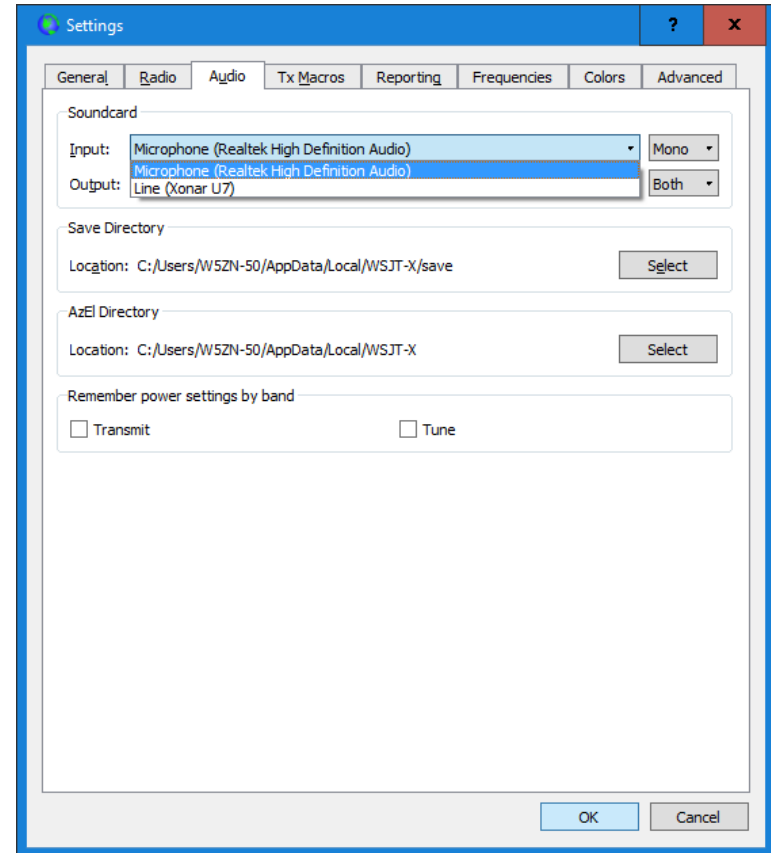
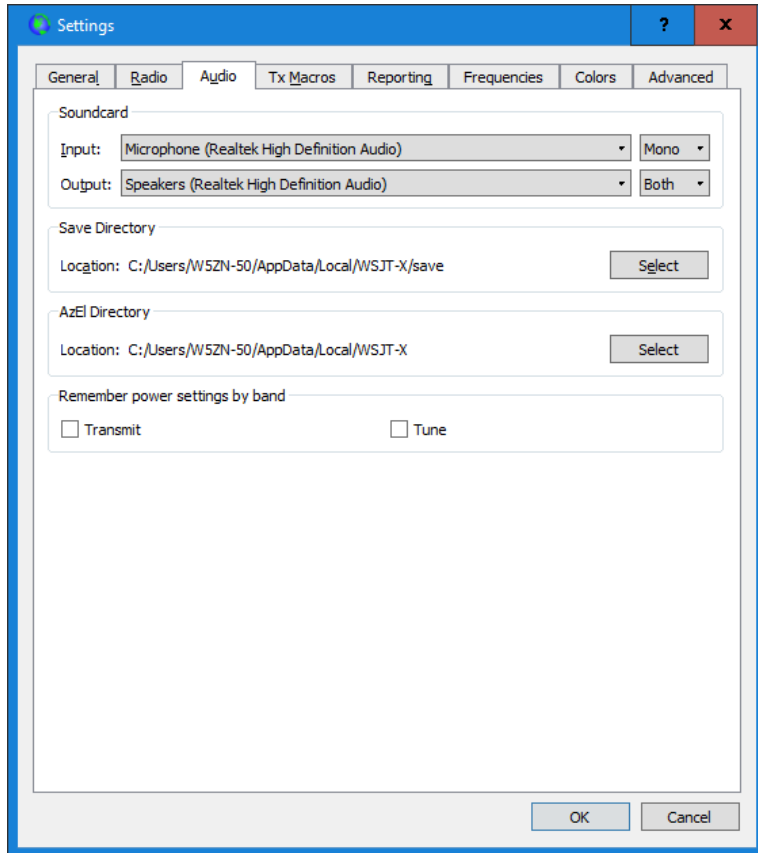
Split Operation

☒ None ☐ Rig ☐ Fake It

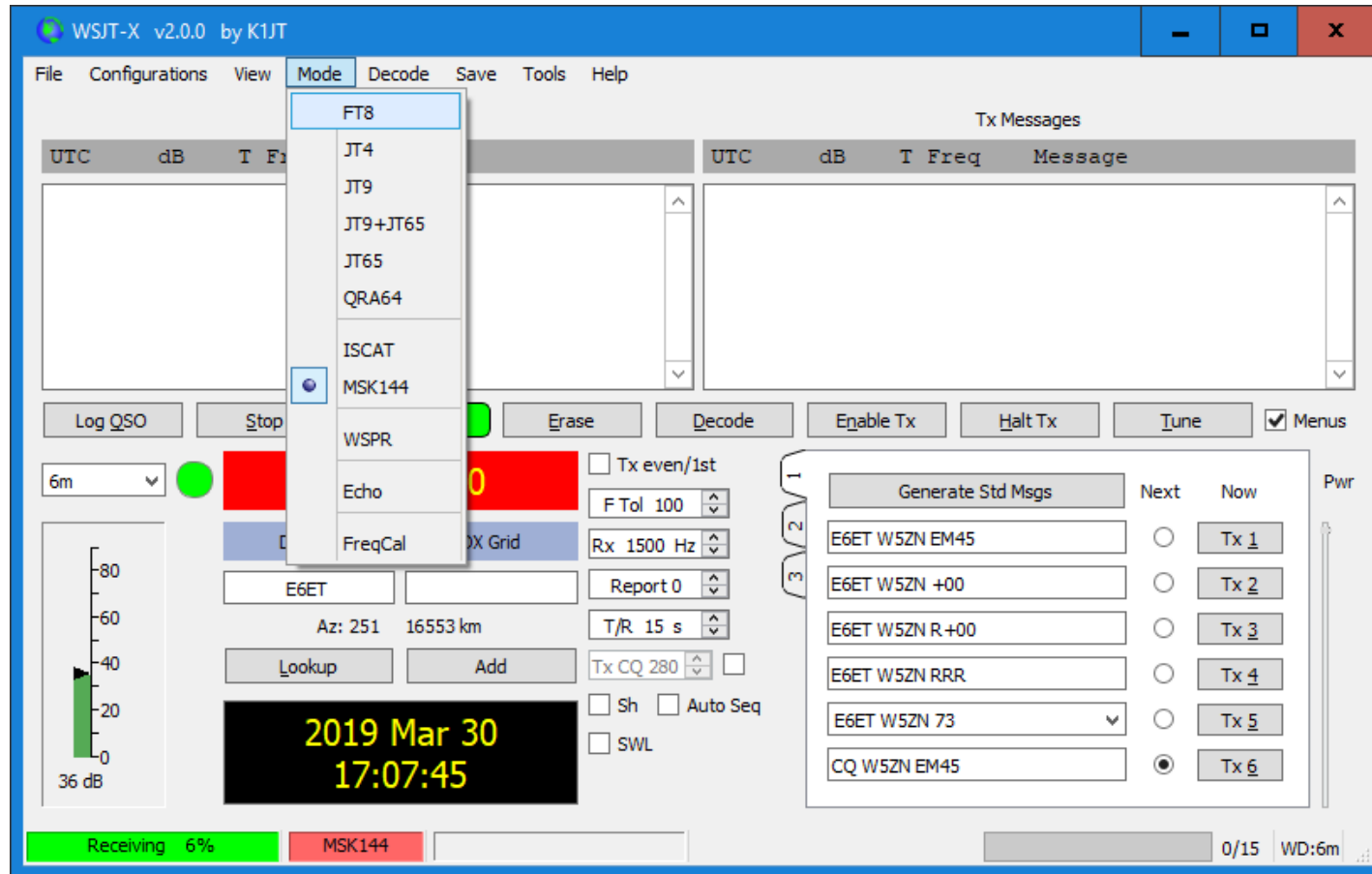
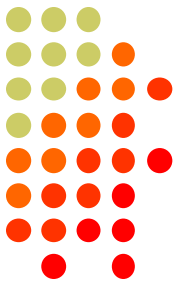
Test CAT Test PTT

OK Cancel

WSJT-X 2.0 Modes



WSJT-X 2.0 Modes



WSJT-X 2.0 Special Operating



Settings

General Radio Audio Tx Macros Reporting Frequencies Colors Advanced

JT65 VHF/UHF/Microwave decoding parameters

Random erasure patterns: 6

Aggressive decoding level: 0

☒ Two-pass decoding

Miscellaneous

Degrade S/N of .wav file: 0.0 dB

Receiver bandwidth: 2500 Hz

Tx delay: 0.2 s

Tone spacing

☐ x 2 ☐ x 4

☒ Special operating activity: Generation of FT8 and MSK144 messages

☐ Fox ☐ Hound

☒ NA VHF Contest ☐ ARRL Field Day

☐ EU VHF Contest ☐ ARRL RTTY Roundup

FD Exch:

RTTY RU Exch:

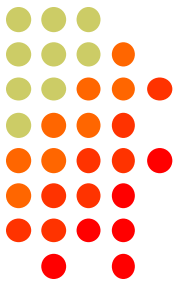
OK Cancel

WSJT-X 2.0 Modes



- WHAT TIME IS IT????????????????????
 - Your computer's time **MUST** be accurate
 - How you do dat?
 - Do NOT rely on the Windows time sync service
 - Time.is will identify your computers discrepancy
 - Dimension 4 is my recommendation

FT-8



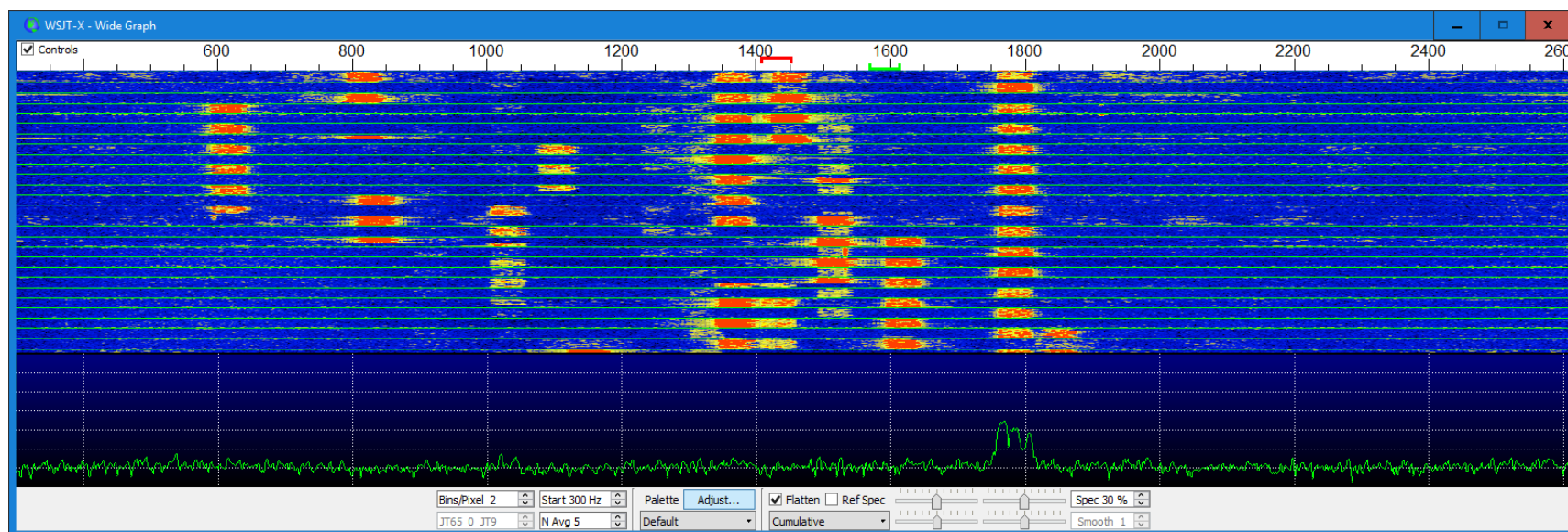
- Outgrowth of JT65
- Shorter transmit-receive cycle
 - Faster contacts – up to 4 times faster
 - Can complete within 1 minute
- Sensitivity down to -20 dB
- Uses 8-Frequency Shift Keying format

FT-8 Six Meter Advantages



- Excellent for multi-hop sporadic E
 - Deep QSB often times impacts normal mode Q's
- Operation centered on 50.313

FT-8 Wide Graph



FT-8 Main Screen



WSJT-X v1.8.0 by K1JT

File Configurations View Mode Decode Save Tools Help

UTC	dB	DT	Freq	Message
005545	1	0.2	1764	~ AA0MZ N8NM -12
005545	6	-0.2	1105	~ CQ K6EID EM73
005545	0	-0.1	1404	~ 7 BND TNX 73
005545	-4	0.1	1496	~ OK7GU WX4G 73
005600	-6	0.1	921	~ MM0HVU W1UJ FN42
005600	4	0.5	992	~ CQ AA7A DM52
005600	1	0.2	1315	~ N8NM AA0MZ R+05
005600	-2	0.4	1411	~ KB8OTK N2ADV 73

UTC	dB	DT	Freq	Message
005545	1	0.2	1764	~ AA0MZ N8NM -12
005600	4	0.5	992	~ CQ AA7A DM52
005628	Tx		992	~ AA7A W5ZN EM45

Log QSO Stop Monitor Erase Decode Enable Tx Halt Tx Tune Menus

60m 5.357 000

☐ Tx even/1st
 DX Call AA7A DX Grid DM52
 Az: 264 1693 km
 Tx 992 Hz Rx 992 Hz
 Tx ← Rx Rx ← Tx
☐ Hold Tx Freq
 Report 4
☒ Auto Seq ☐ Call 1st
☐ NA VHF Contest

2018 Apr 02 00:56:35

Generate Std Msgs
 AA7A W5ZN EM45
 AA7A W5ZN +04
 AA7A W5ZN R+04
 AA7A W5ZN RRR
 AA7A W5ZN 73
 CQ W5ZN EM45

Next Now
 Tx 1
 Tx 2
 Tx 3
 Tx 4
 Tx 5
 Tx 6

Receiving FT8 Last Tx: AA7A W5ZN EM45 5/15 WD:6m

FT-8 Main Screen



WSJT-X v1.8.0 by K1JT

File Configurations View Mode Decode Save Tools Help

UTC	dB	DT	Freq	Message
005630	-10	0.2	1648	~ CQ OK7GU JN69
005700	3	0.5	992	~ KB8OTK AA7A -01
005700	1	0.3	1411	~ CQ N2ADV FN23
005715	3	-0.1	986	~ AA7A KB8OTK R-15
005730	5	0.5	992	~ KB8OTK AA7A RR73
005730	-2	0.3	1411	~ CQ N2ADV FN23
005800	2	0.5	992	~ W5ZN AA7A +10
005800	2	0.4	1411	~ CQ N2ADV FN23

UTC	dB	DT	Freq	Message
005655	Tx		992	~ AA7A W5ZN EM45
005700	3	0.5	992	~ KB8OTK AA7A -01
005715	3	-0.1	986	~ AA7A KB8OTK R-15
005730	5	0.5	992	~ KB8OTK AA7A RR73
005746	Tx		992	~ AA7A W5ZN EM45
005800	2	0.5	992	~ W5ZN AA7A +10
005815	Tx		992	~ AA7A W5ZN R+02

Log QSO Stop Monitor Erase Decode **Enable Tx** Halt Tx Tune ☒ Menus

60m **5.357 000** ☐ Tx even/1st

DX Call DX Grid Tx 992 Hz Tx ← Rx
 AA7A DM52 Rx 992 Hz Rx ← Tx

Az: 264 1693 km ☐ Hold Tx Freq

Lookup Add Report 2 ☒ Auto Seq ☐ Call 1st
☐ NA VHF Contest

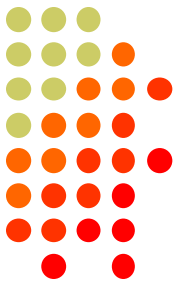
2018 Apr 02 00:58:20

Generate Std Msgs Next Now Pwr

AA7A W5ZN EM45	<input type="radio"/>	Tx 1
AA7A W5ZN +02	<input type="radio"/>	Tx 2
AA7A W5ZN R+02	<input checked="" type="radio"/>	Tx 3
AA7A W5ZN RRR	<input type="radio"/>	Tx 4
AA7A W5ZN 73	<input type="radio"/>	Tx 5
CQ W5ZN EM45	<input type="radio"/>	Tx 6

Tx: AA7A W5ZN R+02 FT8 Last Tx: AA7A W5ZN EM45 5/15 WD:6m

FT-8 Main Screen



WSJT-X v1.8.0 by K1JT

File Configurations View Mode Decode Save Tools Help

UTC	dB	DT	Freq	Message
005700	1	0.3	1411 ~	CQ N2ADV FN23
005715	3	-0.1	986 ~	AA7A KB8OTK R-15
005730	5	0.5	992 ~	KB8OTK AA7A RR73
005730	-2	0.3	1411 ~	CQ N2ADV FN23
005800	2	0.5	992 ~	W5ZN AA7A +10
005800	2	0.4	1411 ~	CQ N2ADV FN23
005830	5	0.5	992 ~	W5ZN AA7A RR73
005830	3	0.3	1411 ~	CQ N2ADV FN23

UTC	dB	DT	Freq	Message
005715	3	-0.1	986 ~	AA7A KB8OTK R-15
005730	5	0.5	992 ~	KB8OTK AA7A RR73
005746	Tx		992 ~	AA7A W5ZN EM45
005800	2	0.5	992 ~	W5ZN AA7A +10
005815	Tx		992 ~	AA7A W5ZN R+02
005830	5	0.5	992 ~	W5ZN AA7A RR73
005845	Tx		992 ~	AA7A W5ZN 73

Log QSO Stop Monitor Erase Decode Enable Tx Halt Tx Tune ☒ Menus

60m 5.357 000 ☐ Tx even/1st

Az: 264 1693 km ☐ Hold Tx Freq

☒ Auto Seq ☐ Call 1st

☐ NA VHF Contest

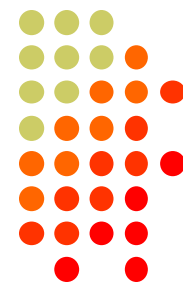
Generate Std Msgs

	Next	Now
AA7A W5ZN EM45	<input type="radio"/>	<input type="radio"/> Tx 1
AA7A W5ZN +05	<input type="radio"/>	<input type="radio"/> Tx 2
AA7A W5ZN R+05	<input type="radio"/>	<input type="radio"/> Tx 3
AA7A W5ZN RRR	<input type="radio"/>	<input type="radio"/> Tx 4
AA7A W5ZN 73	<input checked="" type="radio"/>	<input type="radio"/> Tx 5
CQ W5ZN EM45	<input type="radio"/>	<input type="radio"/> Tx 6

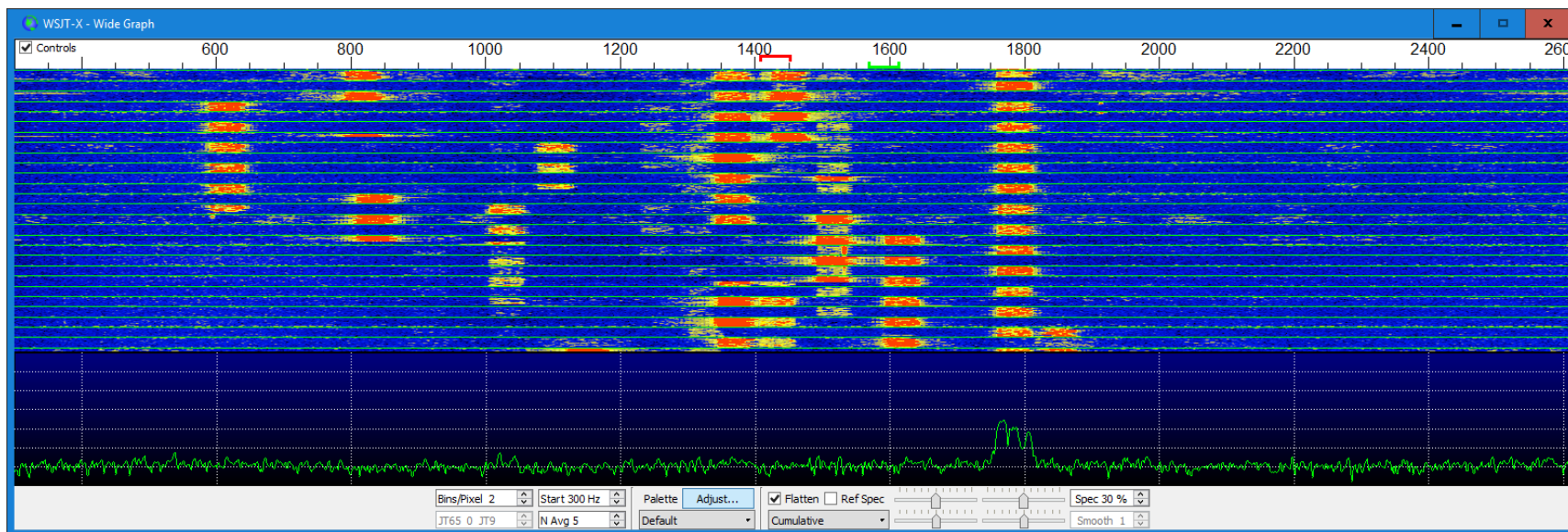
Pwr

Tx: AA7A W5ZN 73 FT8 Last Tx: AA7A W5ZN R+02 0/15 WD:6m

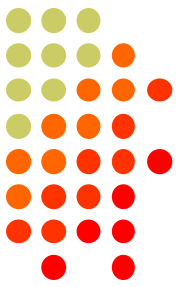
FT-8 What Freq Am I On?



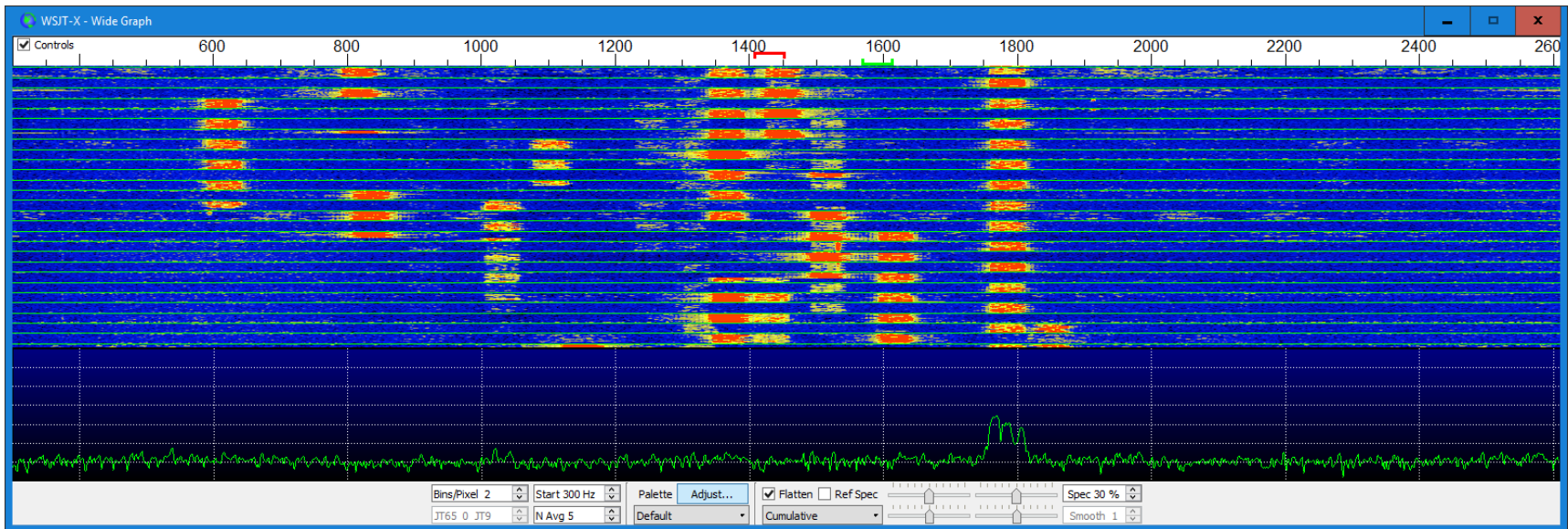
My dial says 14080.0 but the station was spotted on 14081.7



FT-8 Bandwidth



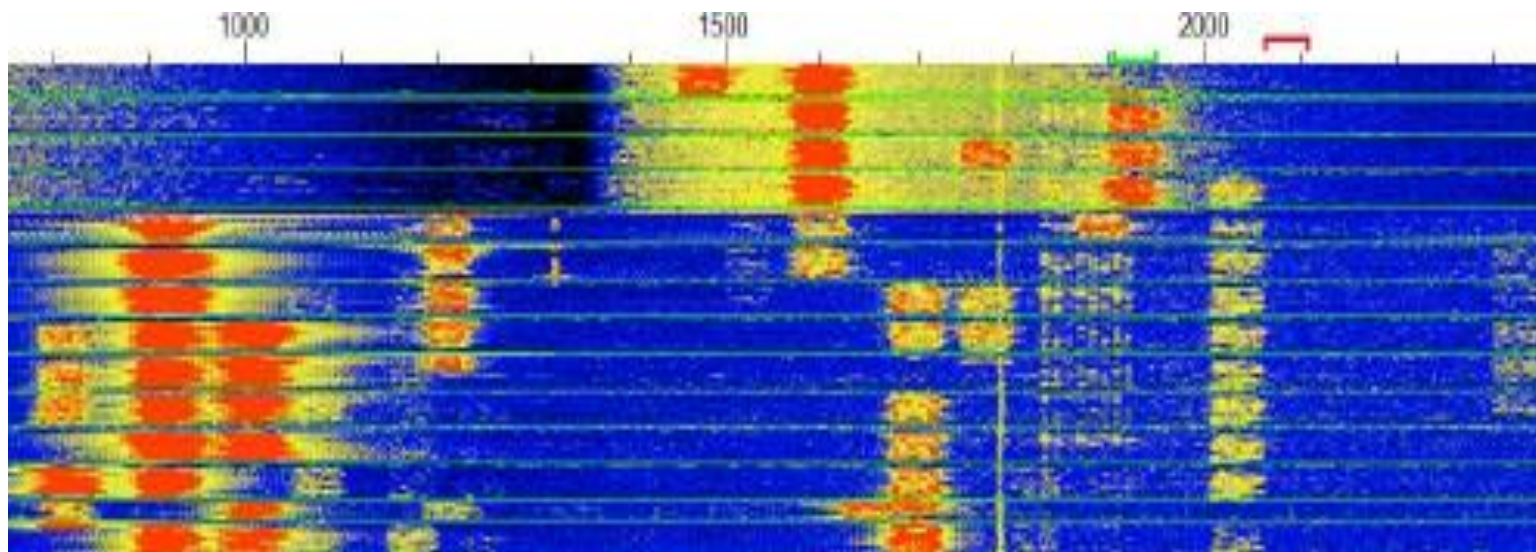
An FT8 Signal has a 50 Hz bandwidth.
Should I use my CW filter to narrow my
receivers bandwidth?



FT-8 Narrow RX Filters

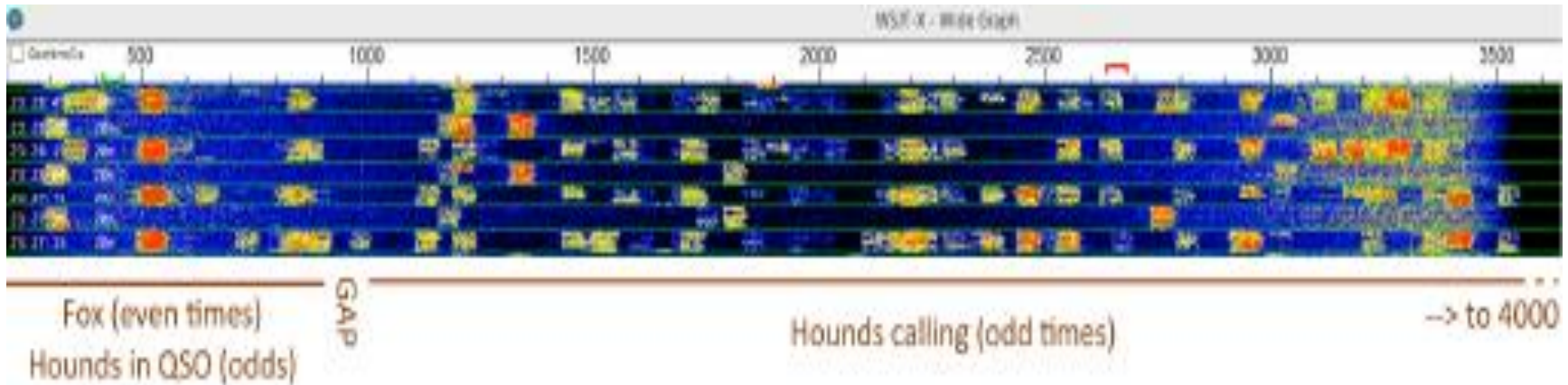


Narrowing your receivers bandwidth
“may” improve the RX conditions.



FT-8 Special Applications

Fox/Hound Mode



FT-8 Special Applications



Fox/Hound Mode

- If you cannot copy the fox, **DO NOT CALL HIM** as you will simply create QRM and aggravation.
- Even if by some miracle he responds to you, you won't see his response and someone else may miss out on a QSO as he tries to contact you in vain.
- Simply be patient, watching the screen, poised to pounce like a hawk (hound) when you do see decodes from him.

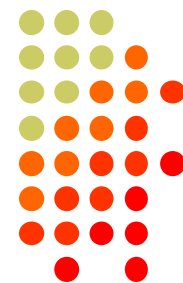
FT-8 Special Applications



Fox/Hound Mode

- In DXpedition mode, a special hard-coded timer automatically disables your transmissions after 2 minutes without a response
- During this time the fox may have put you in the queue.

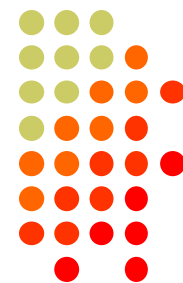
FT-8 Special Applications



Fox/Hound Mode

If the fox responds to you later, after your DXpedition mode timer has timed out and before you re-start transmissions, your Tx will automatically be re-enabled to send him his report, completing the QSO when he acknowledges it with his RR73 message back to you

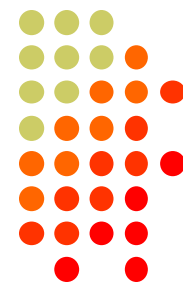
FT-8 Special Applications



Fox/Hound Mode

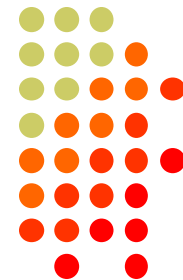
- If the fox responds to your call with his Tx 2 message (your callsign and report), your system will automatically QSY your Tx to a frequency below 1000 Hz to send him your Tx 3 message (both callsigns, R and his report).
- If you don't have CAT control, you must QSY manually below 1,000 to make the QSO unless the DXpedition op is around and manually completes it.

FT-8 Contest Disadvantage



- QSO rates can be larger on other modes during big Sporadic E Openings
 - While a quick FT-8 contact can be completed in 1 minute, SSB or CW rates can be 5 to 10 times that
- On 6 meters, too many stations sit on 50.313 when the band opens and closes quickly on CW & SSB Frequencies!

FT-8 HF Operating Guide



Gary Hinson, ZL2IFB, has a detailed operating guide at:

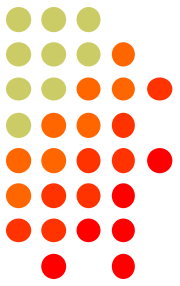
https://www.g4ifb.com/FT8_Hinson_tips_for_HF_DXers.pdf

Meteor Scatter



- The earth is bombarded by a constant stream of small particles, remnants of comets that when entering the earth's atmosphere can ionize a column of atoms in the E region at approximately 100km (~60 miles) above the surface of the earth which can reflect radio waves in the VHF region of the spectrum

Meteor Scatter



- There are seasonal variations in the number of sporadic meteors
 - Relative rate increases noticeably in May, peaking in July and August then tailing off into October and November.
- There is also an hourly variation in the relative rate of meteors peaking
 - around dawn local time with the minimum late afternoon before the ramp up begins again late evening.
 - The hourly relative rate is due to the fact that the earth's rotation is head on so to speak in the morning into the path of the particles and therefore there is an increase in the relative velocity of a particle entering the earth's atmosphere.

Meteor Scatter



- The length of time of the ionization, or burst duration, is related to meteor velocity and increase in relative velocity results in longer ionization times.

Meteor Scatter

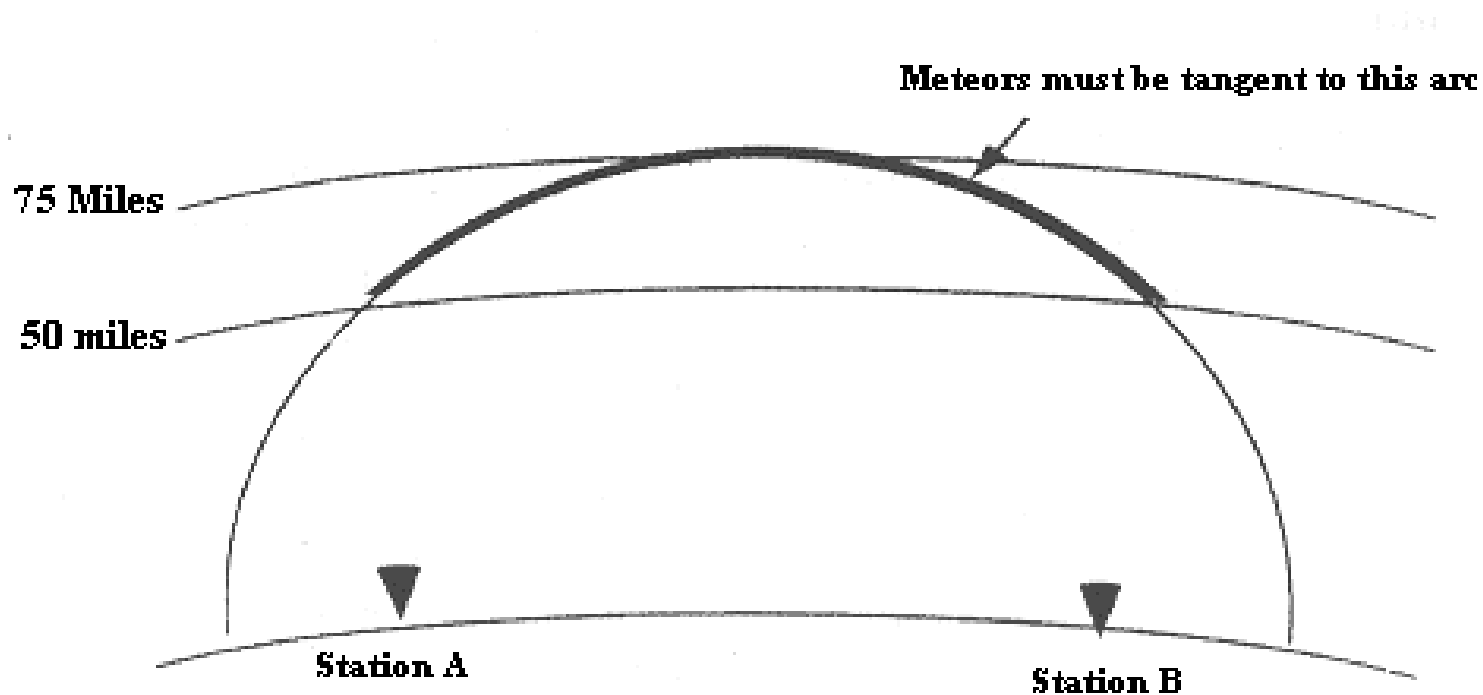


- Most particles entering the earth's atmosphere are the size of a grain of sand resulting in ionization lasting only a fraction of a second
 - much too short to convey any meaningful information using SSB or even high speed CW.
- The digital modes of FSK441 and MSK144 were designed to compress a limited amount of information in a packet and transmit that packet in a very short period of time.
 - In the case of MSK144 the information packet, with a transmission length 0.072 seconds, is repeated over and over again during the duration of the selected transmit interval of 5, 10, 15 or 30 seconds.

Meteor Scatter



Reflection will occur when the trail is oriented as shown



Meteor Scatter



- Excellent for 50 MHz
- Very Predictable Paths
 - Best times between midnight & approx 9 AM
 - Peak during “showers” – Anytime with high speed procedures like **WSJT**

Meteor Scatter

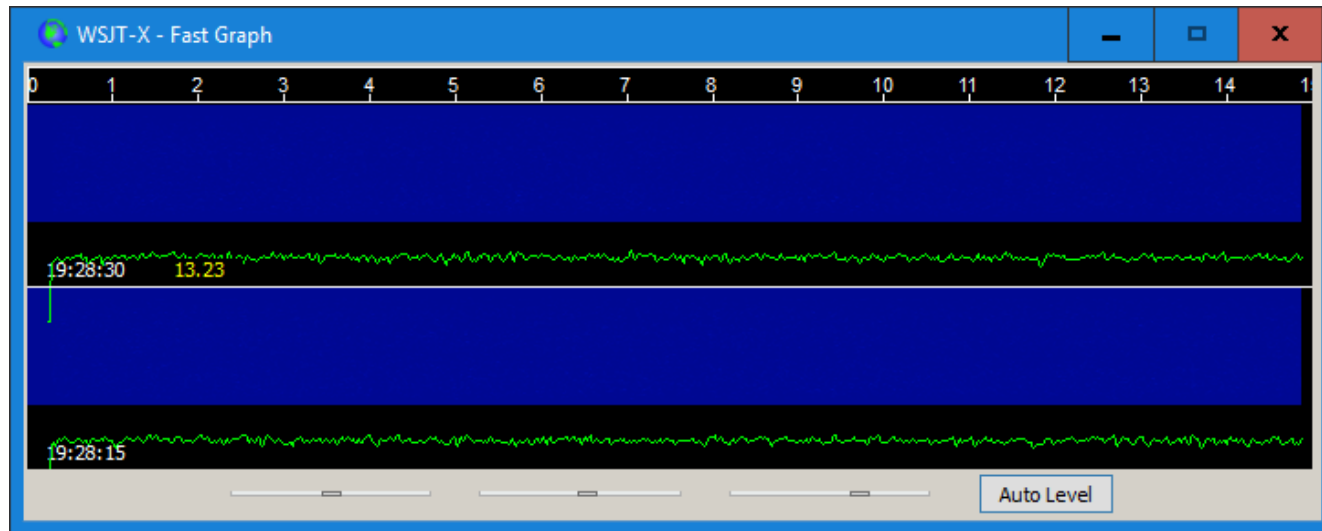


- Very Good for 144 MHz
- Very Predictable Paths
 - Best times between midnight & approx 9 AM
 - Peak during “showers” – Anytime with high speed procedures like **WSJT**

Meteor Scatter – MSK144



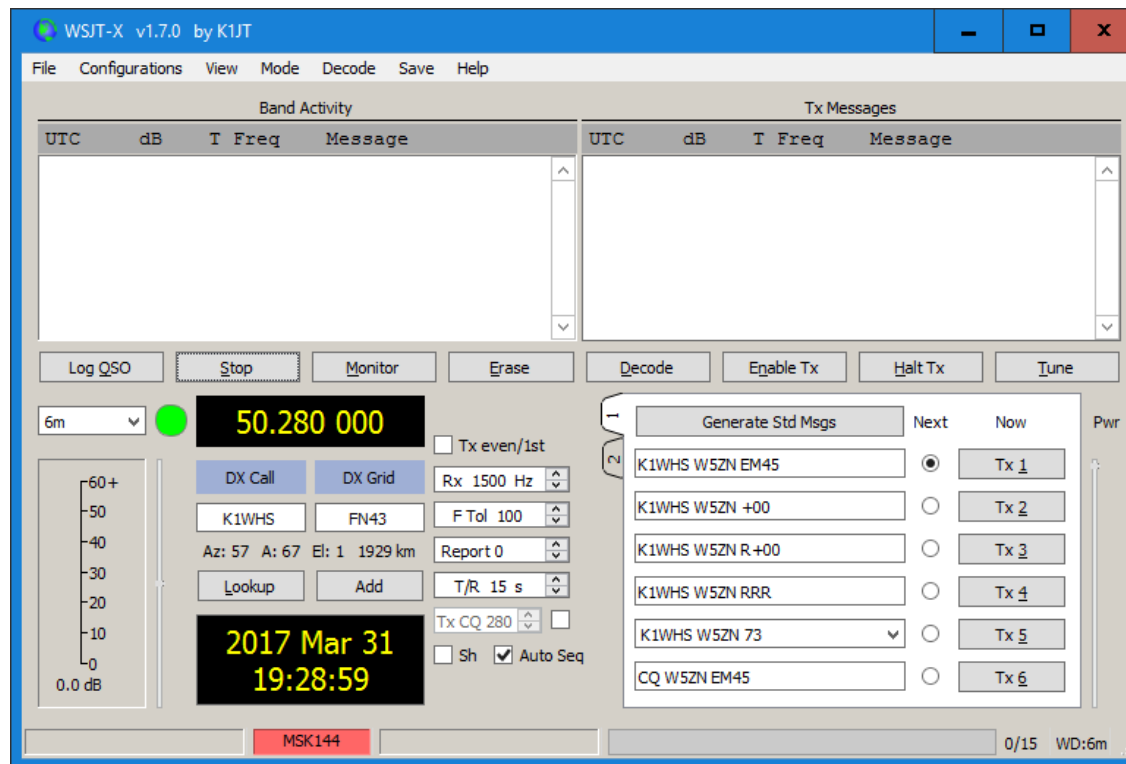
Signal display “Fast Graph”



Meteor Scatter – MSK144



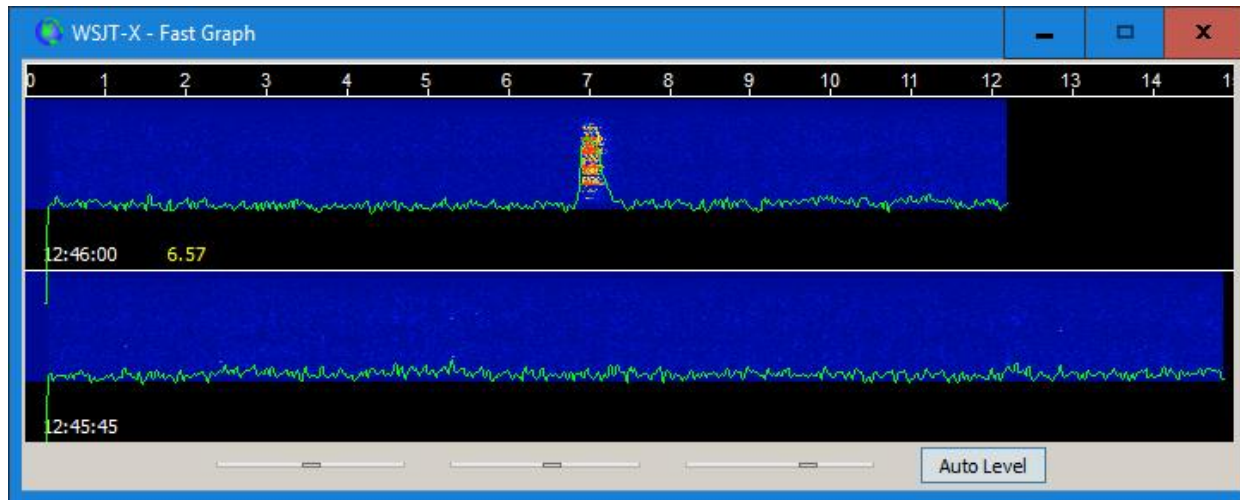
FSK441 Main Screen



Meteor Scatter – MSK144



Signal bursts appear in the “Fast Graph”



Meteor Scatter – MSK144



WSJT-X v1.7.0 by K1JT

File Configurations View Mode Decode Save Help

Band Activity					Tx Messages				
UTC	dB	T	Freq	Message	UTC	dB	T	Freq	Message
123930	-1	14.5	1437	& CQ WA8CLT EN80					
123945	-2	7.3	1433	& WA8CLT VE2DFO FN25					
123945	-1	7.4	1432	& WA8CLT VE2DFO FN25					
123945	1	8.2	1433	& WA8CLT VE2DFO FN25					

Log QSO Stop Monitor Erase Decode Enable Tx Halt Tx Tune

6m 50.280 000

60+
50
40
30
20
10
0
34.5 dB

DX Call K1WHS DX Grid FN43
Az: 57 B: 47 El: 1 1929 km
Lookup Add

2017 Apr 02 12:41:41

Tx even/1st Rx 1500 Hz F Tol 100 Report 0 T/R 15 s Tx CQ 280 Sh Auto Seq

Generate Std Msgs Next Now Pwr

Generate Std Msgs	Next	Now	Pwr
K1WHS W5ZN EM45	<input checked="" type="radio"/>	Tx 1	
K1WHS W5ZN +00	<input type="radio"/>	Tx 2	
K1WHS W5ZN R+00	<input type="radio"/>	Tx 3	
K1WHS W5ZN RRR	<input type="radio"/>	Tx 4	
K1WHS W5ZN 73	<input type="radio"/>	Tx 5	
CQ W5ZN EM45	<input type="radio"/>	Tx 6	

Receiving 15% MSK144 Last Tx: TUNE 11/15 WD:6m

Meteor Scatter – MSK144



WSJT-X v1.7.0 by K1JT

File Configurations View Mode Decode Save Help

Band Activity

UTC	dB	T	Freq	Message
123930	-1	14.5	1437	& CQ WA8CLT EN80
123945	-2	7.3	1433	& WA8CLT VE2DFO FN25
123945	-1	7.4	1432	& WA8CLT VE2DFO FN25
123945	1	8.2	1433	& WA8CLT VE2DFO FN25

Tx Messages

UTC	dB	T	Freq	Message
123930	-1	14.5	1437	& CQ WA8CLT EN80

Log QSO Stop Monitor Erase Decode Enable Tx Halt Tx Tune

6m 50.280 000

35.4 dB

WA8CLT EN80

Az: 49 B: 35 El: 9 895 km

Lookup Add

2017 Apr 02 12:42:09

Tx even/1st Rx 1500 Hz F Tol 100 Report -1 T/R 15 s Tx CQ 280 Sh Auto Seq

Generate Std Msgs

Next	Now
WA8CLT W5ZN EM45	Tx 1
WA8CLT W5ZN -01	Tx 2
WA8CLT W5ZN R-01	Tx 3
WA8CLT W5ZN RRR	Tx 4
WA8CLT W5ZN 73	Tx 5
CQ W5ZN EM45	Tx 6

Receiving 24% MSK144 Last Tx: TUNE 9/15 WD:6m

Meteor Scatter – MSK144



WSJT-X v1.7.0 by K1JT

File Configurations View Mode Decode Save Help

Band Activity

UTC	dB	T	Freq	Message
123930	-1	14.5	1437	& CQ WA8CLT EN80
123945	-2	7.3	1433	& WA8CLT VE2DFO FN25
123945	-1	7.4	1432	& WA8CLT VE2DFO FN25
123945	1	8.2	1433	& WA8CLT VE2DFO FN25

Tx Messages

UTC	dB	T	Freq	Message
123930	-1	14.5	1437	& CQ WA8CLT EN80
124215	Tx		1500	& WA8CLT W5ZN EM45

Log QSO Stop Monitor Erase Decode **Enable Tx** Halt Tx Tune

6m **50.280 000** Tx even/1st

WA8CLT EN80 Az: 49 B: 35 El: 9 895 km

Lookup Add

2017 Apr 02 12:42:28

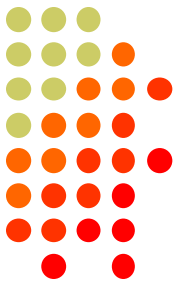
Tx CQ 280 Sh ☒ Auto Seq

Generate Std Msgs Next Now Pwr

Message	Next	Now
WA8CLT W5ZN EM45	<input checked="" type="radio"/>	Tx 1
WA8CLT W5ZN -01	<input type="radio"/>	Tx 2
WA8CLT W5ZN R-01	<input type="radio"/>	Tx 3
WA8CLT W5ZN RRR	<input type="radio"/>	Tx 4
WA8CLT W5ZN 73	<input type="radio"/>	Tx 5
CQ W5ZN EM45	<input type="radio"/>	Tx 6

Tx: WA8CLT W5ZN EM45 MSK144 Last Tx: WA8CLT W5ZN EM45 13/15 WD:6m

Meteor Scatter – MSK144



WSJT-X v1.7.0 by K1JT

File Configurations View Mode Decode Save Help

Band Activity

UTC	dB	T	Freq	Message
124215	7	3.8	1432	& K4GYD W3IP FM19
124215	3	6.0	1425	& WA5ZFP W8KEN +07
124245	1	1.4	1437	& K4GYD W3IP FM19
124245	2	1.5	1435	& K4GYD W3IP FM19
124245	3	1.9	1430	& WA5ZFP W8KEN +07
124245	3	14.0	1438	& K4GYD W3IP FM19
124315	3	10.8	1409	& K4GYD AA4PB FM18

Tx Messages

UTC	dB	T	Freq	Message
124330	Tx		1500	& CQ W5ZN EM45

Log QSO Stop Monitor Erase Decode **Enable Tx** Halt Tx Tune

6m **50.280 000** ☒ Tx even/1st

DX Call **DX Grid** Rx 1500 Hz F Tol 100 Report 8 T/R 15 s Tx CQ 280 ☐ Sh ☒ Auto Seq

K4GYD EM57 Az: 38 A: 56 El: 18 285 km Lookup Add

2017 May 13 12:43:32

Generate Std Msgs Next Now Pwr

Message	Next	Now
K4GYD W5ZN EM45	<input type="radio"/>	Tx 1
K4GYD W5ZN +08	<input type="radio"/>	Tx 2
K4GYD W5ZN R+08	<input type="radio"/>	Tx 3
K4GYD W5ZN RRR	<input type="radio"/>	Tx 4
K4GYD W5ZN 73	<input type="radio"/>	Tx 5
CQ W5ZN EM45	<input checked="" type="radio"/>	Tx 6

Tx: CQ W5ZN EM45 MSK144 Last Tx: CQ W5ZN EM45 2/15 WD:6m

Meteor Scatter – MSK144



WSJT-X v1.7.0 by K1JT

File Configurations View Mode Decode Save Help

Band Activity

UTC	dB	T	Freq	Message
124415	2	8.0	1441	& W5ZN W3IP FM19
124415	4	8.9	1444	& W5ZN K8LEE EM79
124415	5	9.2	1440	& W5ZN K8LEE EM79
124415	5	9.7	1442	& W5ZN W3IP FM19
124415	4	10.0	1445	& W5ZN K8LEE EM79
124415	5	10.2	1440	& W5ZN W3IP FM19
124415	2	12.9	1443	& W5ZN K8LEE EM79

Tx Messages

UTC	dB	T	Freq	Message
124430	Tx		1500	& CQ W5ZN EM45
124400	Tx		1500	& CQ W5ZN EM45
124430	Tx		1500	& CQ W5ZN EM45
124415	5	9.7	1442	& W5ZN W3IP FM19
124431	Tx		1500	& W3IP W5ZN +05

Log QSO Stop Monitor Erase Decode Enable Tx Halt Tx Tune

6m 50.280 000 Tx even/1st

DX Call DX Grid W3IP FM19 Rx 1500 Hz F Tol 100 Report 5 T/R 15 s Tx CQ 280 Sh Auto Seq

Az: 66 B: 55 El: 5 1313 km

Lookup Add

2017 May 13 12:44:37

Generate Std Msgs Next Now Pwr

Generate Std Msgs	Next	Now
W3IP W5ZN EM45	<input type="radio"/>	Tx 1
W3IP W5ZN +05	<input checked="" type="radio"/>	Tx 2
W3IP W5ZN R+05	<input type="radio"/>	Tx 3
W3IP W5ZN RRR	<input type="radio"/>	Tx 4
W3IP W5ZN 73	<input type="radio"/>	Tx 5
CQ W5ZN EM45	<input type="radio"/>	Tx 6

Tx: W3IP W5ZN +05 MSK144 Last Tx: W3IP W5ZN +05 7/15 WD:6m

Meteor Scatter – MSK144



WSJT-X v1.7.0 by K1JT

File Configurations View Mode Decode Save Help

UTC	dB	T	Freq	Message
124415	9	13.8	1438	& W5ZN W8KEN EN91
124415	10	14.0	1437	& W5ZN W8KEN EN91
124445	5	0.6	1441	& W5ZN W8KEN EN91
124445	2	1.9	1436	& W5ZN K1SIX FN43
124445	0	2.1	1439	& W5ZN W8KEN EN91
124445	7	3.5	1444	& W5ZN W3IP R+09
124445	7	5.9	1436	& W5ZN W8KEN EN91

UTC	dB	T	Freq	Message
124330	Tx		1500	& CQ W5ZN EM45
124400	Tx		1500	& CQ W5ZN EM45
124430	Tx		1500	& CQ W5ZN EM45
124415	5	9.7	1442	& W5ZN W3IP FM19
124431	Tx		1500	& W3IP W5ZN +05
124445	7	3.5	1444	& W5ZN W3IP R+09

Log QSO Stop Monitor Erase Decode Enable Tx Halt Tx Tune

6m 50.280 000 Tx even/1st

DX Call DX Grid Rx 1500 Hz W3IP FM19 F Tol 100 Az: 66 B: 55 El: 5 1313 km Report 7 T/R 15 s Tx CQ 280 Sh Auto Seq

2017 May 13 12:44:53

Generate Std Msgs Next Now Pwr

W3IP W5ZN EM45	<input type="radio"/>	Tx 1
W3IP W5ZN +07	<input type="radio"/>	Tx 2
W3IP W5ZN R+07	<input type="radio"/>	Tx 3
W3IP W5ZN RRR	<input checked="" type="radio"/>	Tx 4
W3IP W5ZN 73	<input type="radio"/>	Tx 5
CQ W5ZN EM45	<input type="radio"/>	Tx 6

Receiving 13% MSK144 Last Tx: W3IP W5ZN +05 8/15 WD:6m

Meteor Scatter – MSK144



WSJT-X v1.7.0 by K1JT

File Configurations View Mode Decode Save Help

Band Activity

UTC	dB	T	Freq	Message
124445	5	0.6	1441	& W5ZN W8KEN EN91
124445	2	1.9	1436	& W5ZN K1SIX FN43
124445	0	2.1	1439	& W5ZN W8KEN EN91
124445	7	3.5	1444	& W5ZN W3IP R+09
124445	7	5.9	1436	& W5ZN W8KEN EN91
124445	-1	9.6	1433	& W5ZN K1IED FN31
124445	-4	13.2	1440	& W5ZN W8KEN EN91

Tx Messages

UTC	dB	T	Freq	Message
124330	Tx		1500	& CQ W5ZN EM45
124400	Tx		1500	& CQ W5ZN EM45
124430	Tx		1500	& CQ W5ZN EM45
124415	5	9.7	1442	& W5ZN W3IP FM19
124431	Tx		1500	& W3IP W5ZN +05
124445	7	3.5	1444	& W5ZN W3IP R+09
124500	Tx		1500	& W3IP W5ZN RRR

Log QSO Stop Monitor Erase Decode Enable Tx Halt Tx Tune

6m 50.280 000 Tx even/1st

DX Call DX Grid Rx 1500 Hz F Tol 100 Report 7 T/R 15 s Tx CQ 280 Sh Auto Seq

W3IP FM19 Az: 66 B: 55 El: 5 1313 km Lookup Add

2017 May 13 12:45:06

Generate Std Msgs Next Now Pwr

Generate Std Msgs	Next	Now	Pwr
W3IP W5ZN EM45	<input type="radio"/>	Tx 1	
W3IP W5ZN +07	<input type="radio"/>	Tx 2	
W3IP W5ZN R+07	<input type="radio"/>	Tx 3	
W3IP W5ZN RRR	<input checked="" type="radio"/>	Tx 4	
W3IP W5ZN 73	<input type="radio"/>	Tx 5	
CQ W5ZN EM45	<input type="radio"/>	Tx 6	

Tx: W3IP W5ZN RRR MSK144 Last Tx: W3IP W5ZN RRR 6/15 WD:6m

Meteor Scatter – MSK144



WSJT-X v1.7.0 by K1JT

File Configurations View Mode Decode Save Help

UTC	dB	T	Freq	Message
124545	5	2.0	1448	& KF5MDY K8LEE EM79
124545	6	2.1	1446	& KF5MDY K8LEE EM79
124545	12	8.2	1441	& W5ZN K1SIX FN43
124545	3	9.1	1444	& W5ZN W3IP 73
124545	3	9.8	1440	& W5ZN W8KEN EN91
124545	2	11.4	1444	& W5ZN W3IP 73
124545	7	13.9	1450	& KF5MDY K8LEE EM79

UTC	dB	T	Freq	Message
124431	Tx		1500	& W3IP W5ZN +05
124445	7	3.5	1444	& W5ZN W3IP R+09
124500	Tx		1500	& W3IP W5ZN RRR
124530	Tx		1500	& W3IP W5ZN RRR
124545	3	9.1	1444	& W5ZN W3IP 73
124545	2	11.4	1444	& W5ZN W3IP 73
124600	Tx		1500	& W3IP W5ZN 73

Log QSO Stop Monitor Erase Decode **Enable Tx** Halt Tx Tune

6m ● **50.280 000** ☒ Tx even/1st

Rx 1500 Hz
 F Tol 100
 Az: 66 B: 55 El: 5 1313 km Report 2
 T/R 15 s
 Tx CQ 280 ☐ Sh ☒ Auto Seq

2017 May 13 12:46:00

Generate Std Msgs

	Next	Now
W3IP W5ZN EM45	<input type="radio"/>	<input type="radio"/> Tx 1
W3IP W5ZN +02	<input type="radio"/>	<input type="radio"/> Tx 2
W3IP W5ZN R+02	<input type="radio"/>	<input type="radio"/> Tx 3
W3IP W5ZN RRR	<input type="radio"/>	<input type="radio"/> Tx 4
W3IP W5ZN 73	<input checked="" type="radio"/>	<input type="radio"/> Tx 5
CQ W5ZN EM45	<input type="radio"/>	<input type="radio"/> Tx 6

Tx: W3IP W5ZN 73 MSK144 Last Tx: W3IP W5ZN 73 0/15 WD:6m

Meteor Scatter – MSK144



WSJT-X v1.7.0 by K1JT

File Configurations View Mode Decode Save Help

Band Activity

UTC	dB	T	Freq	Message
124645	3	1.0	1439	& CQ NZ3M FN10
124645	4	1.6	1439	& CQ NZ3M FN10
124645	-2	3.4	1445	& W5ZN K1IED R+02
124645	0	5.3	1450	& KF5MDY K8LEE EM79
124645	3	5.4	1451	& KF5MDY K8LEE EM79
124645	5	5.7	1445	& KF5MDY K8LEE EM79
124645	7	7.4	1445	& W5ZN K1IED R+02

Tx Messages

UTC	dB	T	Freq	Message
124545	3	9.1	1444	& W5ZN W3IP 73
124545	2	11.4	1444	& W5ZN W3IP 73
124600	Tx		1500	& W3IP W5ZN 73
124445	-1	9.6	1433	& W5ZN K1IED FN31
124630	Tx		1500	& K1IED W5ZN -01
124645	-2	3.4	1445	& W5ZN K1IED R+02
124645	7	7.4	1445	& W5ZN K1IED R+02

Log QSO Stop Monitor Erase Decode Enable Tx Halt Tx Tune

6m 50.280 000 Tx even/1st

DX Call DX Grid K1IED FN31 Az: 62 B: 52 El: 3 1701 km Report 7 T/R 15 s Tx CQ 280 Sh Auto Seq

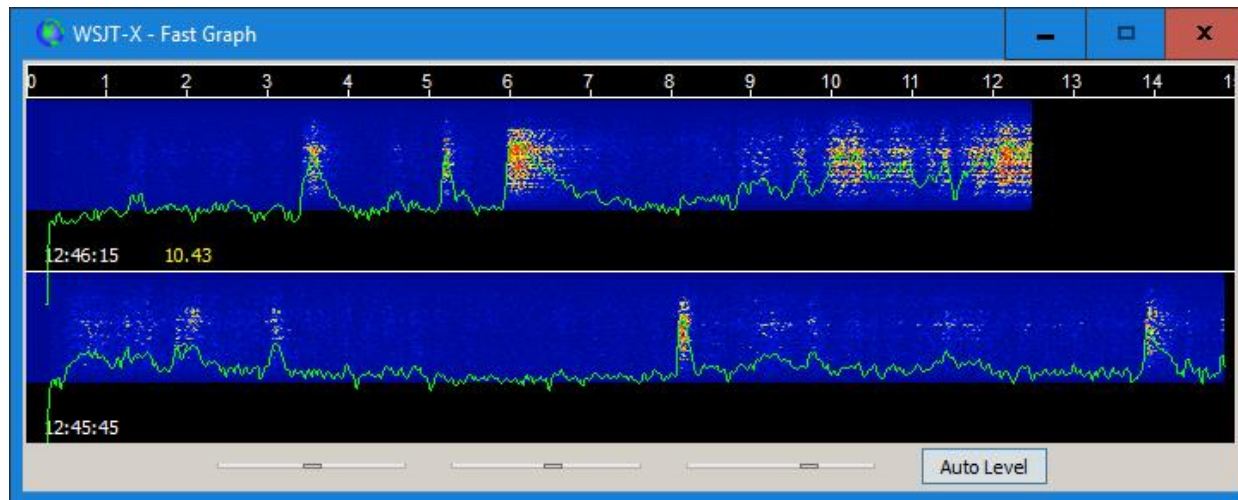
2017 May 13 12:46:55

Generate Std Msgs Next Now Pwr

K1IED W5ZN EM45	<input type="radio"/>	Tx 1
K1IED W5ZN +07	<input type="radio"/>	Tx 2
K1IED W5ZN R+07	<input type="radio"/>	Tx 3
K1IED W5ZN RRR	<input checked="" type="radio"/>	Tx 4
K1IED W5ZN 73	<input type="radio"/>	Tx 5
CQ W5ZN EM45	<input type="radio"/>	Tx 6

Receiving 16% MSK144 Last Tx: K1IED W5ZN -01 10/15 WD:6m

Meteor Scatter – MSK144



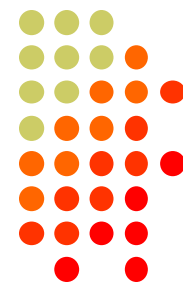
Meteor Scatter – MSK144



K8ZR Test Results

- **Contest QSO Non-Contest QSO**
- **Tx Time:**
- 15 sec. CQ N8JX EN64
- 15 sec. N8JX K8ZR EN91
- 15 sec. K8ZR N8JX R EN64
- 15 sec. N8JX K8ZR RRR
- 15 sec. K8ZR N8JX 73
- Total time: 75 seconds
- **Non-Contest QSO**
- **Tx Time:**
- 15 sec. CQ WB4JWM EM83
- 15 sec. WB4JWM K8ZR EN91
- 15 sec. K8ZR WB4JWM +05
- 15 sec. WB4JWM K8ZR R+07
- 15 sec. K8ZR WB4JWM RRR
- 15 sec. WB4JWM K8ZR 73
- Total time: 90 seconds

Meteor Scatter – MSK144



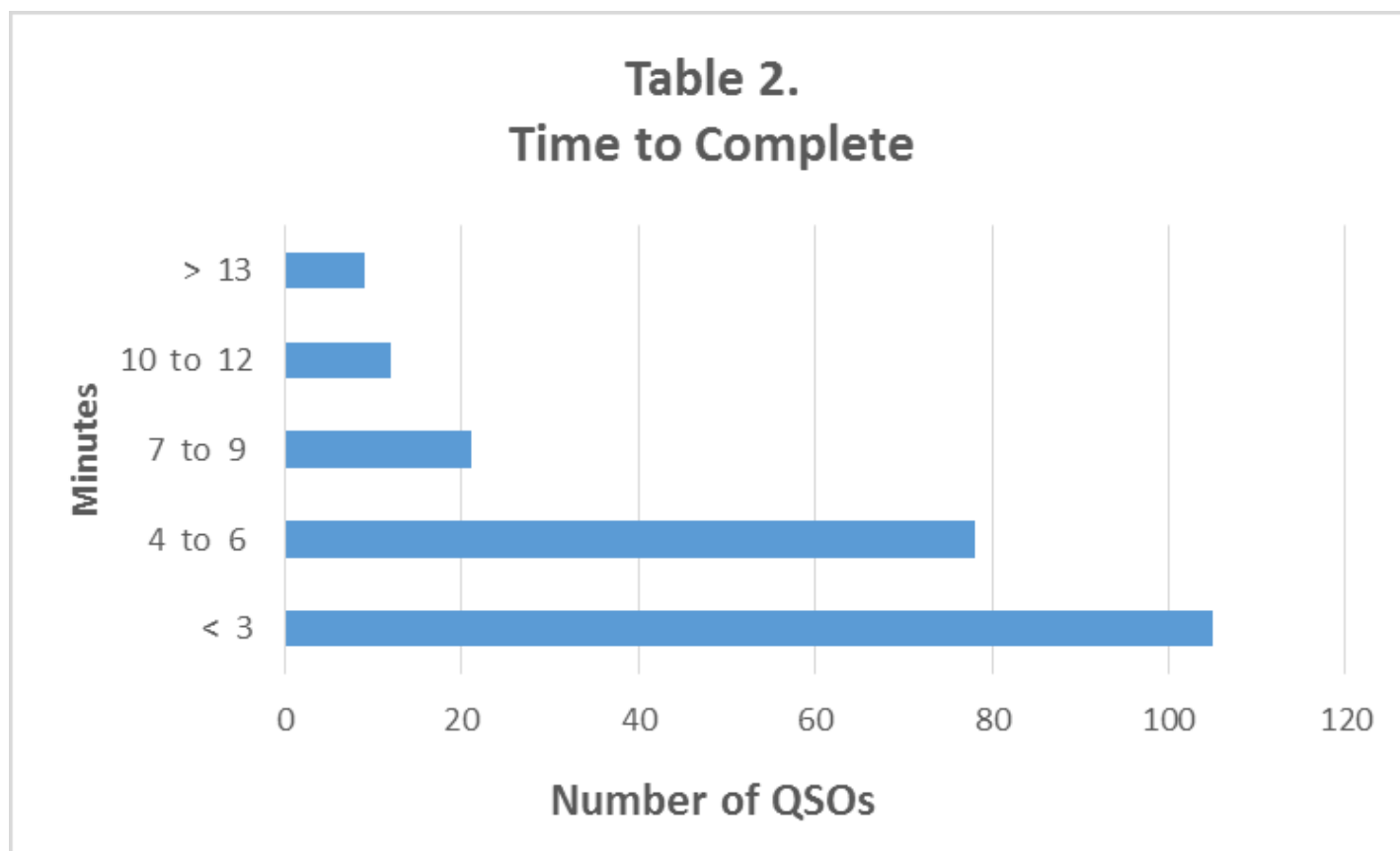
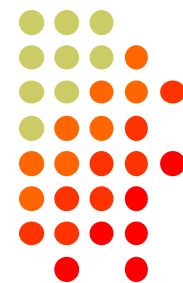
K8ZR Test Results

50 MHz MSK144 QSO Summary

● Period January 23rd- March 13th:	50 days
● Number of 50 MHz MSK144 QSOs:	225
● Average number of minutes to complete a QSO:	4.6
● Number of unique callsigns worked:	50
● Number of unique callsigns decoded:	98
● Number of States worked:	22
● Number of unique Grids worked:	42
● Number of 90 second QSOs:	10
● Best DX K5DOG EM00wh:	1,223 miles

Meteor Scatter – MSK144

K8ZR Test Results



FT4



- **Designed for digital contesting**
- **Message formats same as FT8**
 - **Same low density parity check**
- **2.5 times faster than FT8**
 - **TR sequences are 6 seconds –vs- 15 secs FT8**
 - **Message Length: FT4=4.48 secs FT8=12.64 secs**
- **Occupies a 90 Hz bandwidth**
- **Slightly less sensitive than FT8**
 - **10 dB better than RTTY and uses less bandwidth**

FT4



- Does not require accurate time
 - Can occur during any time sequence
- Modulation uses 4-tone frequency-shift keying
 - Approx. 23.4 baud, with tones separated by the baud rate
- ***STILL IN DEVELOPMENT!!!!!!***

WSJT-X 2.0 Modes



Or During the 3:15 PM Digital Contesting
Discussion in this room