



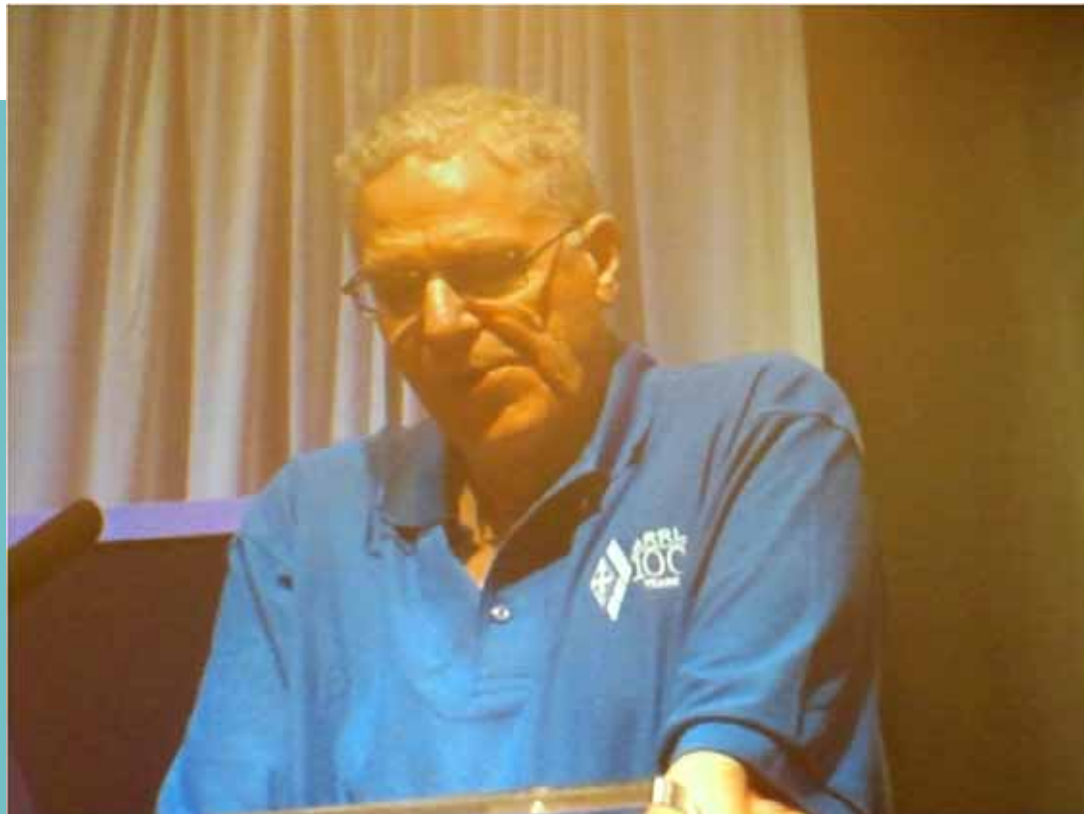
WORKING DX WITH JOE TAYLOR

By Pete Rimmel N8PR
Presented at the Miami Hamfest
DX Forum
January 31, 2015



Joe Taylor, K1JT, 1993 Nobel Prize Winner

Taylor became interested in radio astronomy after obtaining his Amateur Radio license as a teenager. Today Taylor is well known for his 1974 joint discovery with Russell Hulse, of the first pulsar star in a binary system. Taylor used the Arecibo Radio Telescope to conduct moonbounce contacts with amateurs around the world using voice, Morse code, and digital communications. He is also known for his weak signal communication.





<http://physics.princeton.edu/pulsar/k1jt/index.html>

WSJT Home Page

by K1JT

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Weak Signal Communication Software

WSJT, *MAP65*, *WSPR*, and *WSJT-X* are open-source programs designed for weak-signal digital communication by amateur radio. Normal usage requires a standard SSB transceiver and a personal computer with soundcard. SDR-style hardware including the SDR-IQ, Perseus, SoftRock, and FUNcube Dongle is supported by *MAP65* and *WSPR*. *SimJT* is a utility program that generates simulated signals for test purposes. Ready-to-run Windows versions of all programs are available for free download, and the programs (except *SimJT*) can also be compiled and used under Linux, OS X, and FreeBSD. For details about source code and operating systems other than Windows, see the [Program Development](#) page.

WSJT ("Weak Signal Communication, by K1JT") offers specific digital protocols optimized for EME (moonbounce), meteor scatter, and ionospheric scatter, at VHF/UHF, as well as for HF skywave propagation. The program can decode fraction-of-a-second signals reflected from ionized meteor trails and steady signals 10 dB below the audible threshold. Check the [WSJT](#) page and links therein for details about modes JTMS, FSK441, ISCAT, JT6M, JT65, and JT4.

WSJT-X implements JT9, a new mode optimized for weak-signal communication on the LF, MF, and HF bands. JT9 is about 2 dB more sensitive than JT65 and uses less than 10% of the bandwidth. A beta release of Version 1.4 of *WSJT-X* was released on October 1, 2014; further program enhancements are under active development. Plans call for the eventual inclusion of the other popular modes now supported in *WSJT*.

SOME OF JOE'S PROGRAMS

WSJT, MAP65, WSPR, and WSJT-X are all open-source programs designed for weak-signal digital communication by amateur radio.

Normal usage requires a standard SSB transceiver and a personal computer with soundcard. (More on this later)

SDR-style hardware including the SDR-IQ, Perseus, SoftRock, and FUNcube Dongle are supported by MAP65 (Wideband receive) and WSPR (Weak Signal Propagation Reporter).

SimJT is a utility program that generates simulated signals for test purposes.

Ready-to-run Windows versions of all programs are available for free download, and the programs (except SimJT) can also be compiled and used under Linux, OS X, and FreeBSD.

WSJT ("Weak Signal Communication, by K1JT") offers specific digital protocols optimized for:

VHF/UHF

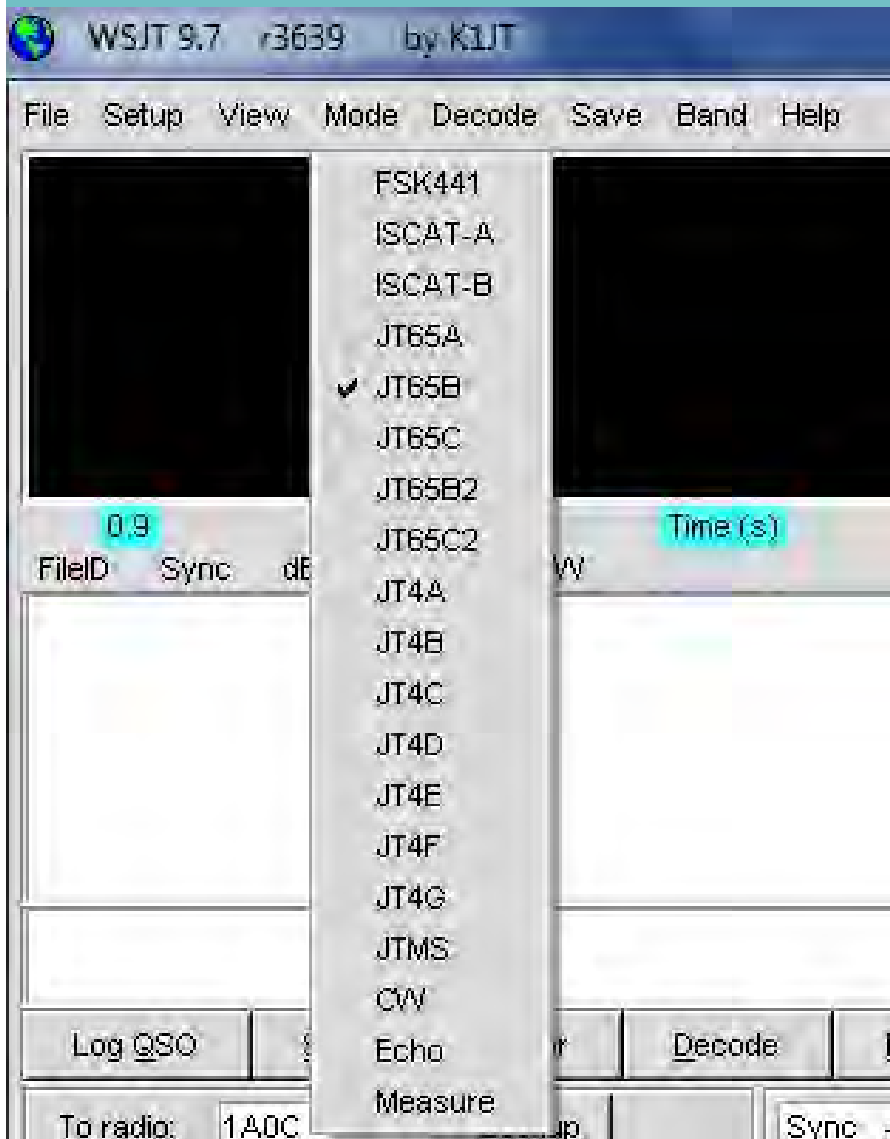
EME (moonbounce)
Meteor Scatter
Ionospheric Scatter,

HF

Skywave Propagation

The program can decode fraction-of-a-second signals reflected from ionized meteor trails and steady signals 10 dB below the audible threshold.

Check the WSJT pages and links at Joe's website for details about the many modes the program can produce:



WSJT for VHF can do many different modes. We will concentrate on JT65B for EME (Moonbounce) in this presentation.

Later we will talk about WSJT-X for HF communication.



WSJT

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Description

WSJT facilitates basic digital communication using protocols explicitly optimized for a number of different propagation modes:

- **JTMS, FSK441** for meteor scatter
- **ISCAT, JT6M** for ionospheric scatter
- **JT65** for EME at VHF/UHF, and for QRP operation at MF/HF
- **JT4**: for EME on the microwave bands

See the online [WSJT 10.0 User Guide](#) for details.

Downloads

Important note: in Vista, Windows 7, and Windows 8 install WSJT to a directory such as C:\WSJT or C:\HamRadio\WSJT rather than the default C:\Program Files\WSJT.

(Otherwise, you might need to set some read/write permissions explicitly.)

- Windows [WSJT 10.0](#) (beta release, v10.0 r4336)
- [WSJT 10.0 User Guide](#)

- Windows [WSJT 9.7](#) (v9.7, r3639)
- Linux [WSJT 9.0](#)
- WSJT 9.0 Supplement to User's Guide
 - [English](#)
 - [Italian](#)
 - [Portuquese](#)
- Archival releases of WSJT7
 - Windows [WSJT 7.07](#)
 - Linux [WSJT 7.06](#)
- Archival Windows release [WSJT 5.9.8](#)
- Archival Windows release [WSJT 4.9.8](#)

WSJT-X FOR HF and LF QSOs

Description

WSJT-X implements JT9, a new mode designed especially for the LF, MF, and HF bands, as well as the popular mode JT65. Both modes were designed for making reliable, confirmed QSOs under extreme weak-signal conditions. They use nearly identical message structure and source encoding. JT65 was designed for EME ("moonbounce") on the VHF/UHF bands and has also proved very effective for worldwide QRP communication at HF; in contrast, JT9 is optimized for HF and lower frequencies. JT9 is about 2 dB more sensitive than JT65A while using less than 10% of the bandwidth. With either mode, world-wide QSOs are possible with power levels of a few watts and compromise antennas. A 2 kHz slice of spectrum is essentially full when occupied by ten JT65 signals. As many as 100 JT9 signals can fit into the same space, without overlap.

WSJT-X offers a "bi-lingual" operating mode in which you can transmit and receive JT65 and JT9 signals, switching between modes automatically as needed. Displayed bandwidth can be as large as 5 kHz. If your receiver has an upper-sideband filter at least 4 kHz wide, you can have all the typical JT65 and JT9 activity on screen at once, available for making QSOs with a click of the mouse. Even with standard SSB-width IF filters, switching between JT65 and JT9 modes is quick and convenient.

A beta release of *WSJT-X* Version 1.4 is now available, offering many new features.

Future plans

Plans call for future versions of *WSJT-X* to include the other popular modes from *WSJT*.

Downloads

Be sure to refer to the online **WSJT-X User's Guide** for the relevant program version: either [Version 1.3](#) or the beta release, [Version 1.4](#).

Windows

- Beta release, Version 1.4: [wsjtx-1.4.0-rc2-win32.exe](#)
- Latest full release: [v1.3, r3673](#)

Linux

Installation instructions for version 1.4 can be found [here](#) in the User Guide. Download the package file appropriate for your system:

- Debian, Ubuntu, ... (32-bit): [wsjtx 1.4.0-rc2 i386.deb](#)
- Debian, Ubuntu, ... (64-bit): [wsjtx 1.4.0-rc2 amd64.deb](#)

WEAK SIGNAL S/N LIMITS

MODE

B/W=2500 Hz

SSB	~ +3 dB	#
FSK 441	-1	#
CW (ear and brain)	-15	#
ISCAT	-17 *	
JT4	-22 *	
JT65A	-24 *	
JT9	-26 *	
WSPR	-28 *	

These signals are just detectable -
NOT armchair copy !

* These signal levels are NOT detectable by ear, only by a
computer !

What is JT65-A, B or C?

- **A form of digital communications originally developed by Joe Taylor, K1JT, for Moonbounce applications where signals are extremely weak.**
- **Uses sophisticated digital signal processing**
- **Also relies on a 5:1 redundancy – it sends the encoded information with the powerful Reed Solomon code.**
- **The same sequence of tones never repeat, but the data is sent many times to allow for various types of QSB**

Many Different Tones

- A synchronizing tone is sent a fixed spacing above the carrier frequency of your transmitter on JT65 A-B-C (or varies on WSJT-X).
- You may see it anywhere in your receiver passband due to doppler shift.
- Those varied tones carry the information
- On the air it sounds like someone playing music



Timing is Everything

- **Each JT65 transmission lasts precisely 46.8 seconds.**
- **During transmission only a small amount of information is sent – about 13 characters**
- **Station clocks must agree within about 2 seconds**
- **As much as 80% of the transmission can be lost and still be decoded**

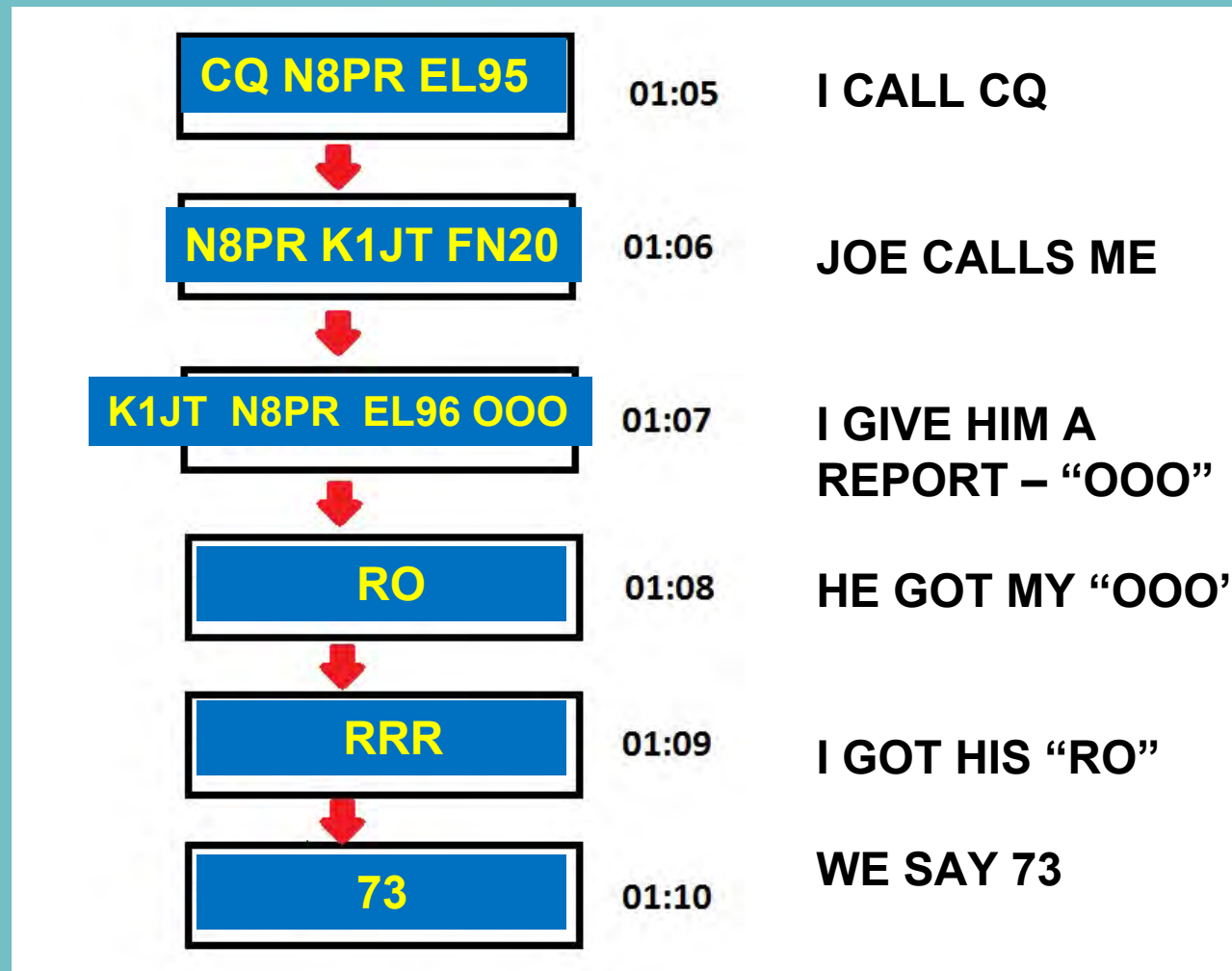
Taking Turns

- **Stations take turns transmitting**
- **Stations transmit on even or odd minutes, and then listen on the following minutes**
- **First Period = Even Minutes**
- **Second Period = Odd Minutes**

Just the Facts!

- **A JT65 contact is designed to exchange the bare minimum information needed to qualify as a “QSO”**
- **Call signs**
- **Signal Reports**
- **Grid Squares**

Transmitting and Receiving Sequence (VHF/EME):



Typical JT65B EME screen setup

Upper Left is a chat room window to talk to others on EME

Below it is the waterfall showing a QSO.

Upper Right is the data and QSO window

K9MRI N8PR EL96	<input type="radio"/>	Tx1
K9MRI N8PR EL96 000	<input type="radio"/>	Tx2
RO	<input type="radio"/>	Tx3
RRR	<input type="radio"/>	Tx4
73	<input checked="" type="radio"/>	Tx5
CQ N8PR EL96	<input type="radio"/>	Tx6

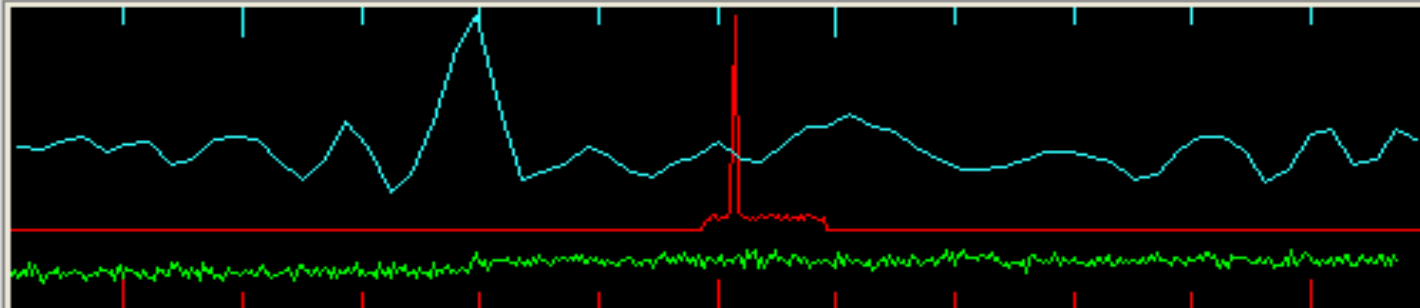
Receiving

These are the standard messages that are sent on JT65B for EME

Simple but containing all the data needed for a valid QSO



File Setup View Mode Decode Save Band Help



Moon
 Az: 187.57
 El: 44.59
 Dop: 45
 Dgrd: -6.5

37.2

Time (s)

Mon_150117_150300

FileID	Sync	dB	DT	DF	WV					
145600	0	-5	9.2	-487	3	#				
145700	0	-29	3.8	-73	23	*				
145700	0	-29	3.8	16	13	#				
145900	4	-20	2.0	16	3	#	N8PR K9MRI EN70	000	1	10
150100	6	-27		15	4	RRR				
150300	4	-18	1.9	13	3	*	TNX PETE 73		1	0

150300	1	3/5								
150300	2	4/9					TNX PETE 73		1	10

Log QSO Stop Monitor Decode Erase Clear Avg Include Exclude TxStop

To radio:

Grid:

Az: 346 1062 mi

2015 Jan 17
15:04:39

Dsec 0.0

Sync 0 Zap

Tol 50 AFC

Freeze

Tx First

K9MRI N8PR EL96 Tx1

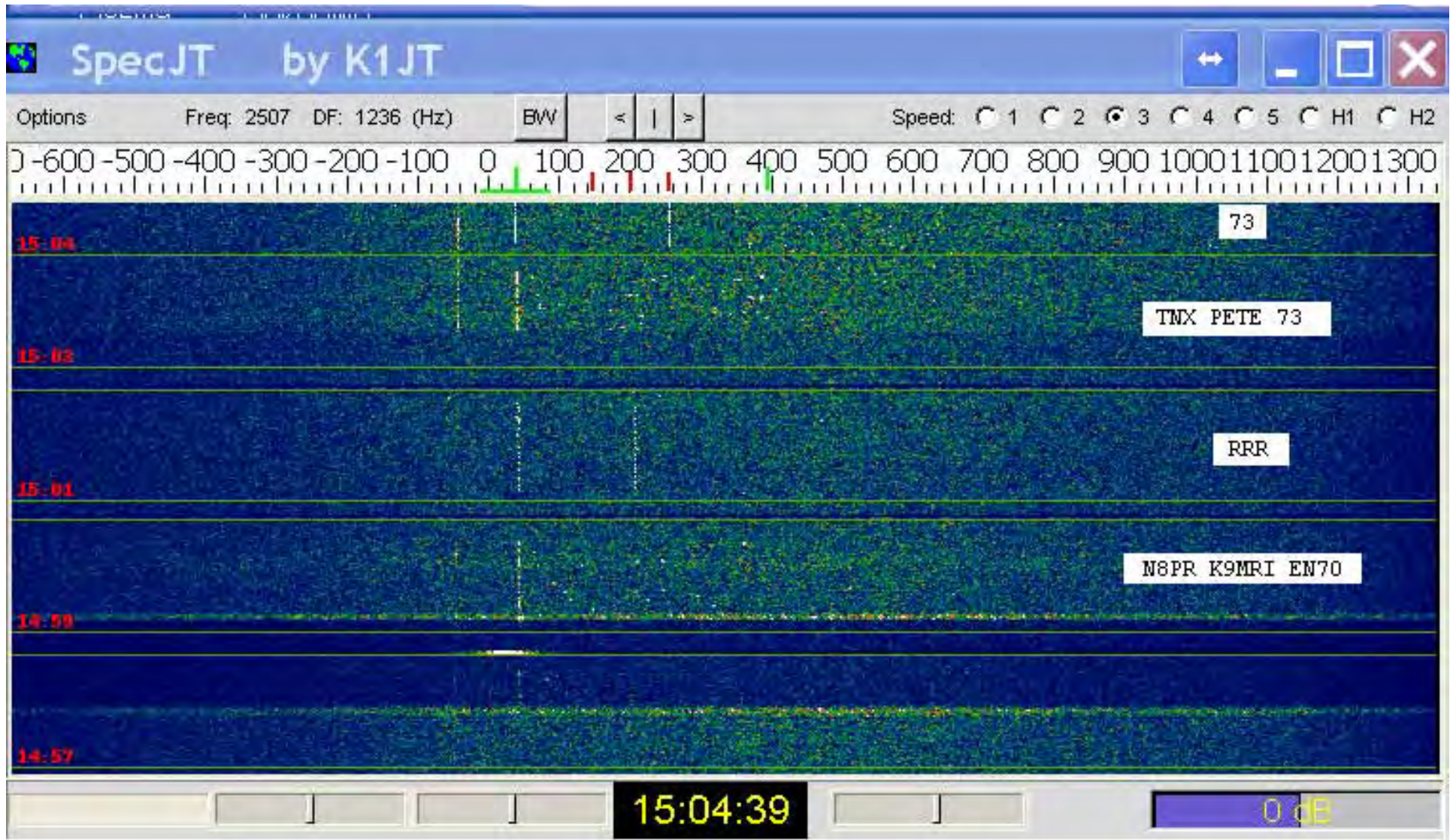
K9MRI N8PR EL96 000 Tx2

RO Tx3

RRR Tx4

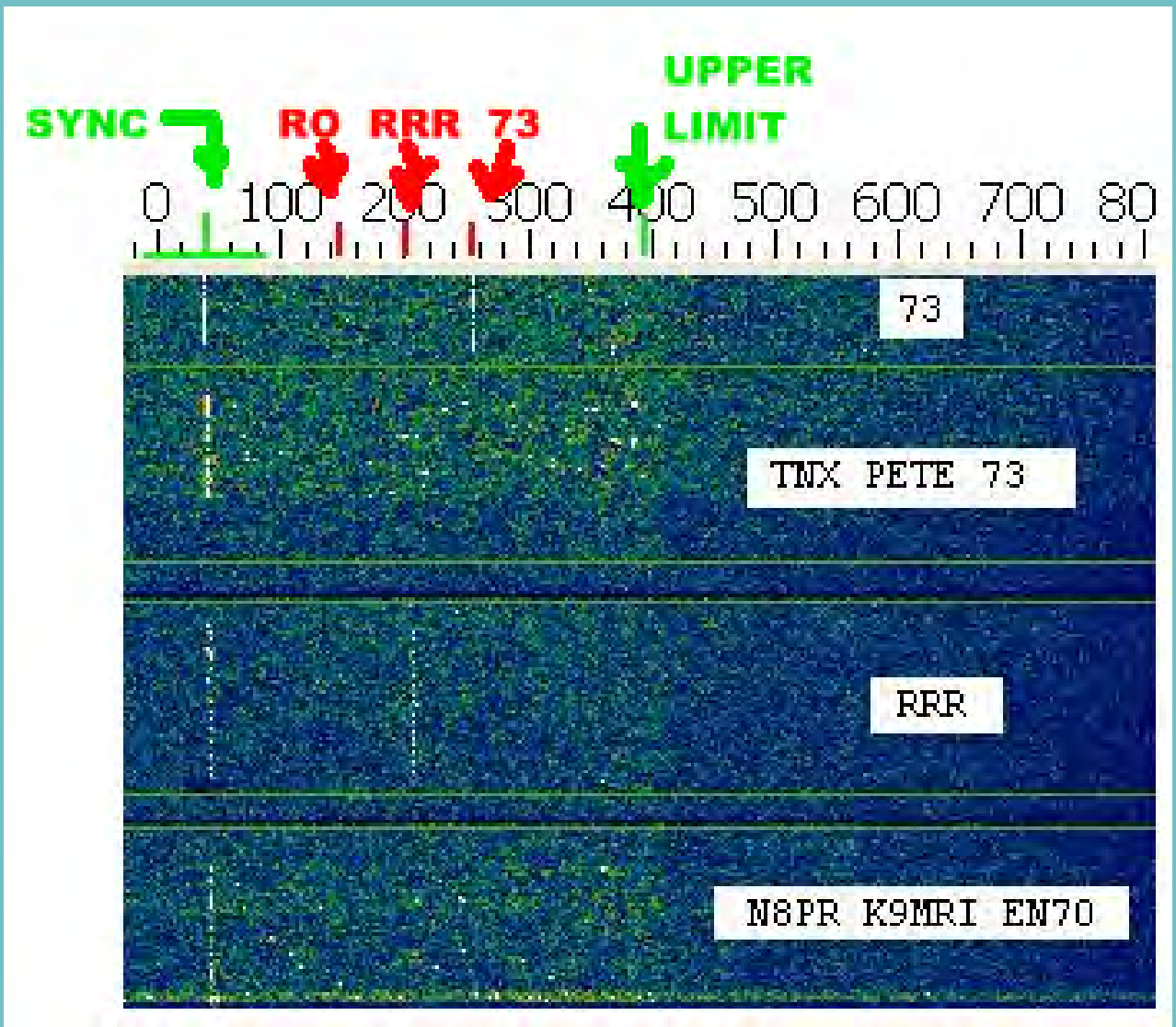
73 Tx5

CQ N8PR EL96 Tx6

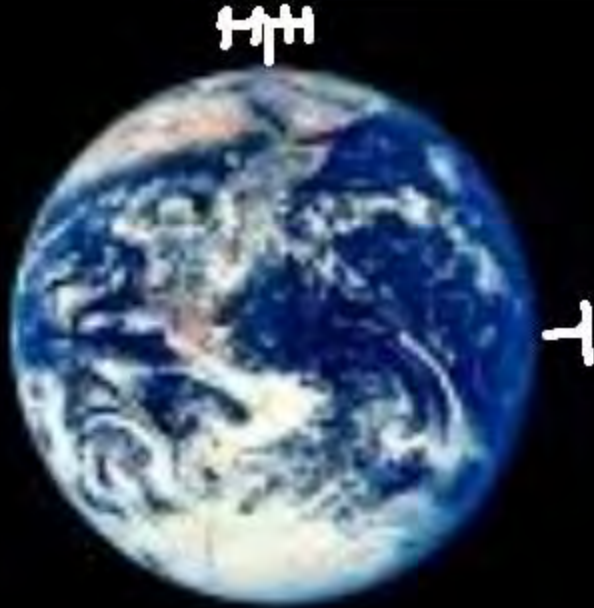


This is what I see on the waterfall during an EME QSO

With JT65 A,B,C Modes you can visually a message because of the simple tone spacing for reports.



384,000 km



12,740 km



3476 km

Not considering Faraday shifts and other signal effects, a horizontally polarized signal leaving Europe looks like a vertically polarized signal in the USA.

So, can I work DX on the VHF Bands With JT65 modes ?

Yes.

Many stations have DXCC on 2 Meters using JT65B on Moonbounce !

But, you do need a good antenna.

4x20 XP at N8PR



24 Yagi Array at KB8RQ



Original 2x9 array at N8PR



JT65 on HF

- The JT65 “revolution” on the HF bands is primarily due to Joe Large, W6CQZ.
- Joe wrote a piece of software called *JT65-HF* that makes it much easier to operate JT65 and make successful contacts.
- Since Oct, 2014, a newer program - *WSJT-X* has been used.
- *WSJT-X* is currently available for *Windows, Mac and Linux*.
- Excellent mode for low power or antenna restricted stations.

WSJT-X implements JT9, a new mode optimized for weak-signal communication on the LF, MF, and HF bands, as well as the popular mode JT65.

JT9 is about 2 dB more sensitive than JT65 and uses less than 10% of the bandwidth. As many as 100 JT9 signals can fit into the space of 10 JT65 signals, without overlap !

Both modes were designed for making reliable, confirmed QSOs under extreme weak-signal conditions.

They use nearly identical message structure and source encoding.

With either mode, world-wide QSOs are possible with power levels of a few watts and compromise antennas.

NOTE: That does not mean you **MUST** use QRP or small antennas on this mode, it only means that it is effective at low signal levels.

You still have to put out a signal that will be heard somewhere... **AND** hear the other guy.

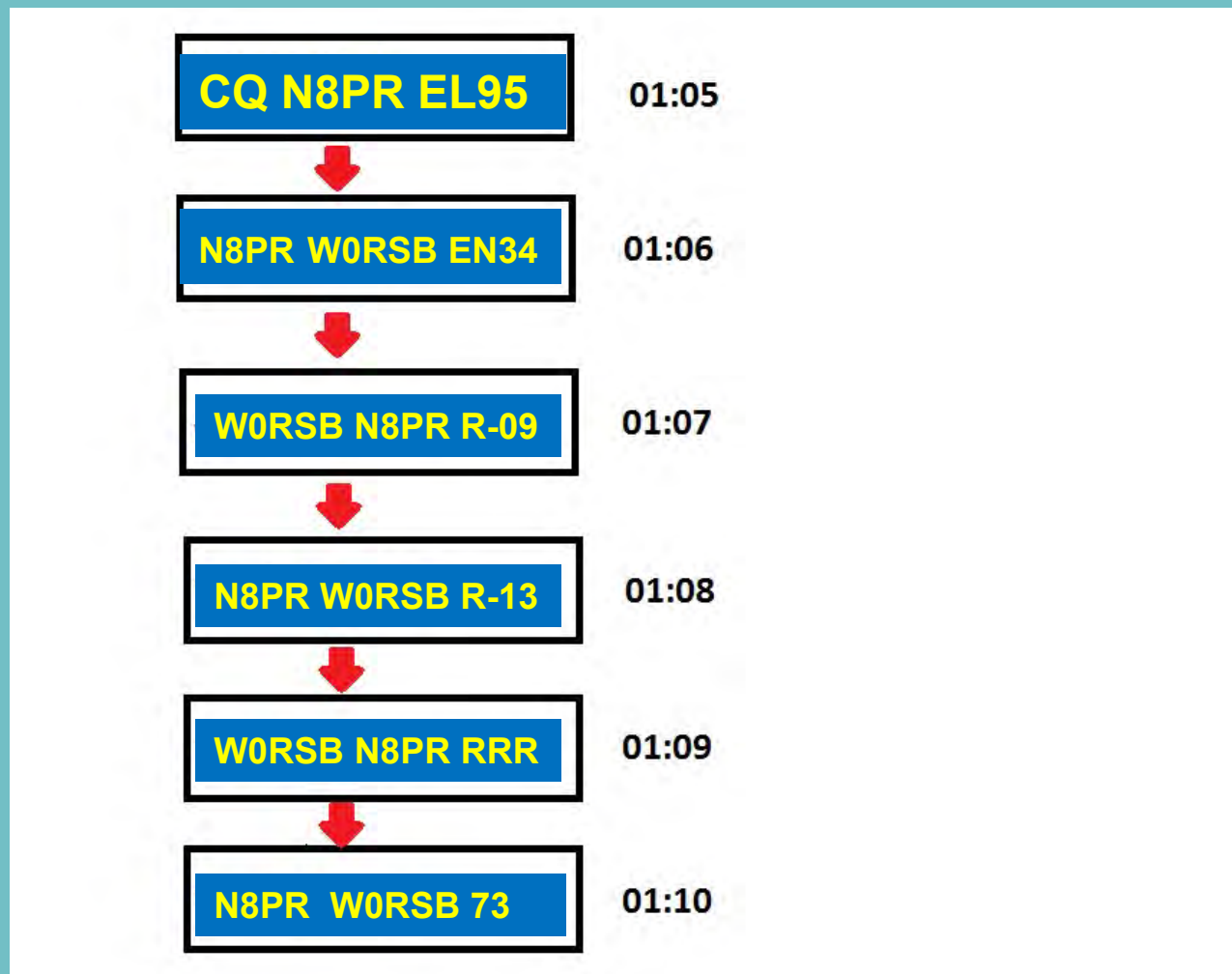
WSJT-X offers a "bi-lingual" operating mode in which you can transmit and receive JT65 and JT9 signals, switching between modes automatically as needed.

If your receiver has an upper-sideband filter at least 4 kHz wide, you can have all the typical JT65 and JT9 activity on screen at once, available for making QSOs with a click of the mouse.

Contacts by the “Colors”

- *WSJT-X* (and *JT65-HF*) uses color highlighting to indicate which stations are **calling CQ**, which stations are in contact with each other, and which stations **are transmitting to you**.
- The program also has preformatted responses that you can send by simply double clicking on the appropriate line.

Transmitting and Receiving Sequence (HF):



This is an earlier version of JT65-HF – It will still work, but the latest Version, WSJT-X is easier to use.

JT65-HF Version 1.0.6 [de WB8IMY]

Audio Input Levels: L 5, R 5
 Optimum input level is 0 with only background noise present.
 Digital Audio Gain: L: 0, R: 0

2011-Feb-01
 01:53:12

Left click waterfall to set TX CF, Right click sets RX CF. Current Operation: Transmitting RX/TX Progress

Color-map: Blue, Brightness, Contrast, Speed: 5, Gain: 0, Smooth

Transmitting: UX3IV WB8IMY R-11
 TX Text (13 Characters) **TX IN PROGRESS**
 Enable TX Halt TX
 TX Generated UX3IV WB8IMY R-11 TX Even TX Odd

Double click an entry in list to begin a QSO. Right click copies to clipboard.

UTC	Sync	dB	DT	DF	Exchange
01:52	6	-11	-1.8	-75	B WB8IMY UX3IV -20
01:48	8	-10	-1.0	829	B K0RCJ WA4RG -05
01:48	9	-10	9.5	285	B CQ KB0NAZ EN41
01:48	5	-9	-1.8	54	B CQ YV6EJI FJ79
01:48	4	-13	-1.7	-73	B CQ UX3IV KN98
01:47	3	-16	-1.1	70	B YV6EJI WB2LMV 73
01:47	7	-7	-1.5	-864	B KB8RTB W7DRO 73
01:46	12	-9	-1.2	829	B K0RCJ WA4RG -05
01:46	6	-10	-1.8	264	B KF5JJH N7MQ CN84
01:46	9	-6	-1.9	46	B TNXQSLOTW.73

Use buttons below to call CQ and answer callers.
 Call CQ Answer Caller Send RRR

Use buttons below when answering CQ. Send 73
 Answer CQ Send Report

TX DF: -75, RX DF: -75, TX DF = RX DF checked, TX to Call Sign: UX3IV, Rpt (-#): -11

Single Decoder BW: 100, AFC, Noise Blank
 Multi Decoder Spacing: 100, Enable Multi

Log QSO, Restore Defaults, Dial QRG KHz: 0

Clear Decodes Raw Decoder Station Setup Decode Again

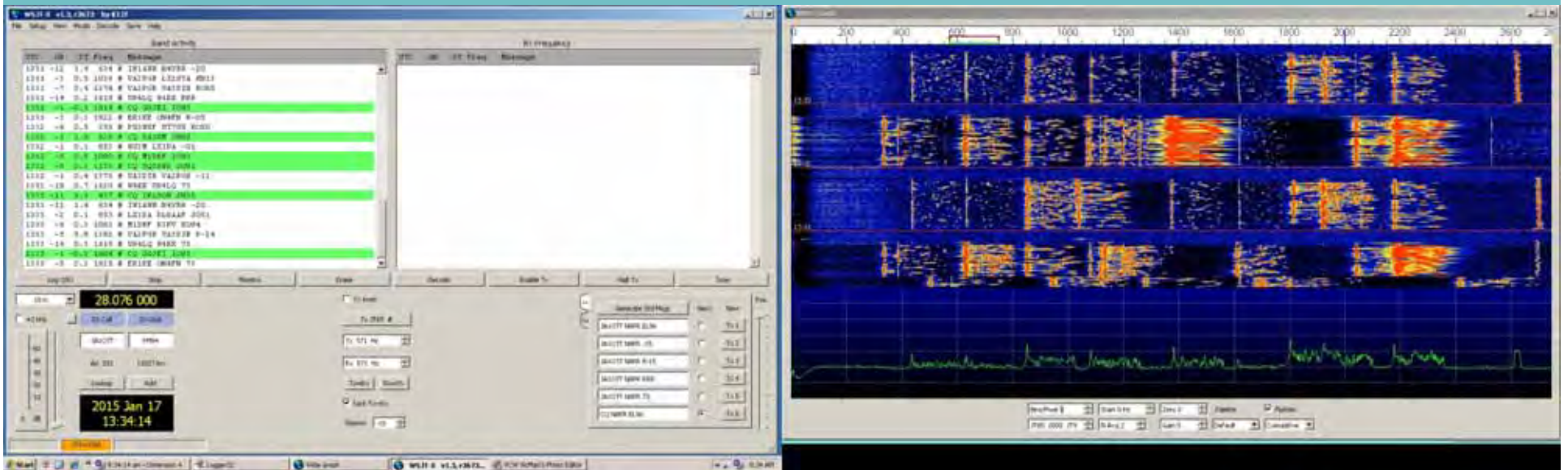
Enable RB, Enable PSKR, Right Click for Menu

WHEN WSJT-X IS RUNNING YOU WILL SEE TWO WINDOWS:

THE DATA WINDOW WHICH HAS ALL THE QSO INFORMATION

AND THE WATERFALL WHICH SHOWS ALL THE STATIONS IN YOUR RECEIVER PASSBAND.

WSJT-X WILL DECODE BOTH JT65 AND JT9 SIMULTANEOUSLY.



DATA AND QSO WINDOW

WSJT-X v1.3, r3673 by K1JT

File Setup View Mode Decode Save Help

Band Activity

UTC	dB	DT	Freq	Message
1331	-12	1.4	634	# IW1AWH N4VBR -20
1331	-3	0.5	1036	# VA2PGB LZ2STA KN13
1331	-7	0.4	1374	# VA2PGB UA3DIB KO85
1331	-14	0.2	1619	# UR4LQ W4KK RRR
1331	-1	-0.1	1814	# CQ GOJEI IO93
1331	-3	0.3	1922	# EK1KE ON4FN R-05
1332	-6	0.5	335	# PU3WSF UT7UU KO50
1332	-1	1.0	628	# CQ 9A3SM JN85
1332	-1	0.1	853	# WU2M LX1DA -01
1332	-6	0.5	1080	# CQ M1DBF IO93
1332	-8	0.3	1133	# CQ SQ3SWD JO61
1332	-1	0.4	1373	# UA3DIB VA2PGB -11
1332	-19	0.7	1620	# W4KK UR4LQ 73
1333	-11	1.1	437	# CQ IK1SOW JN35
1333	-11	1.4	634	# IW1AWH N4VBR -20
1333	-2	0.1	853	# LX1DA DL8AAP JO51
1333	-6	0.3	1083	# M1DBF R3PV KO94
1333	-5	5.8	1383	# VA2PGB UA3DIB R-24
1333	-14	0.3	1615	# UR4LQ W4KK 73
1333	-1	-0.0	1804	# CQ GOJEI IO93
1333	-5	0.2	1925	# EK1KE ON4FN 73

Rx Frequency

UTC	dB	DT	Freq	Message

Log QSO
Stop
Monitor
Erase
Decode
Enable Tx
Halt Tx
Tune

10 m 28.076 000

+2 kHz DX Call DX Grid

JA1OTT PM94
Az: 333 11027 km
Lookup Add

2015 Jan 17
13:34:14

JT9+JT65

Tx even

Tx JT65 #

Tx 571 Hz

Rx 571 Hz

Tx=Rx Rx=Tx

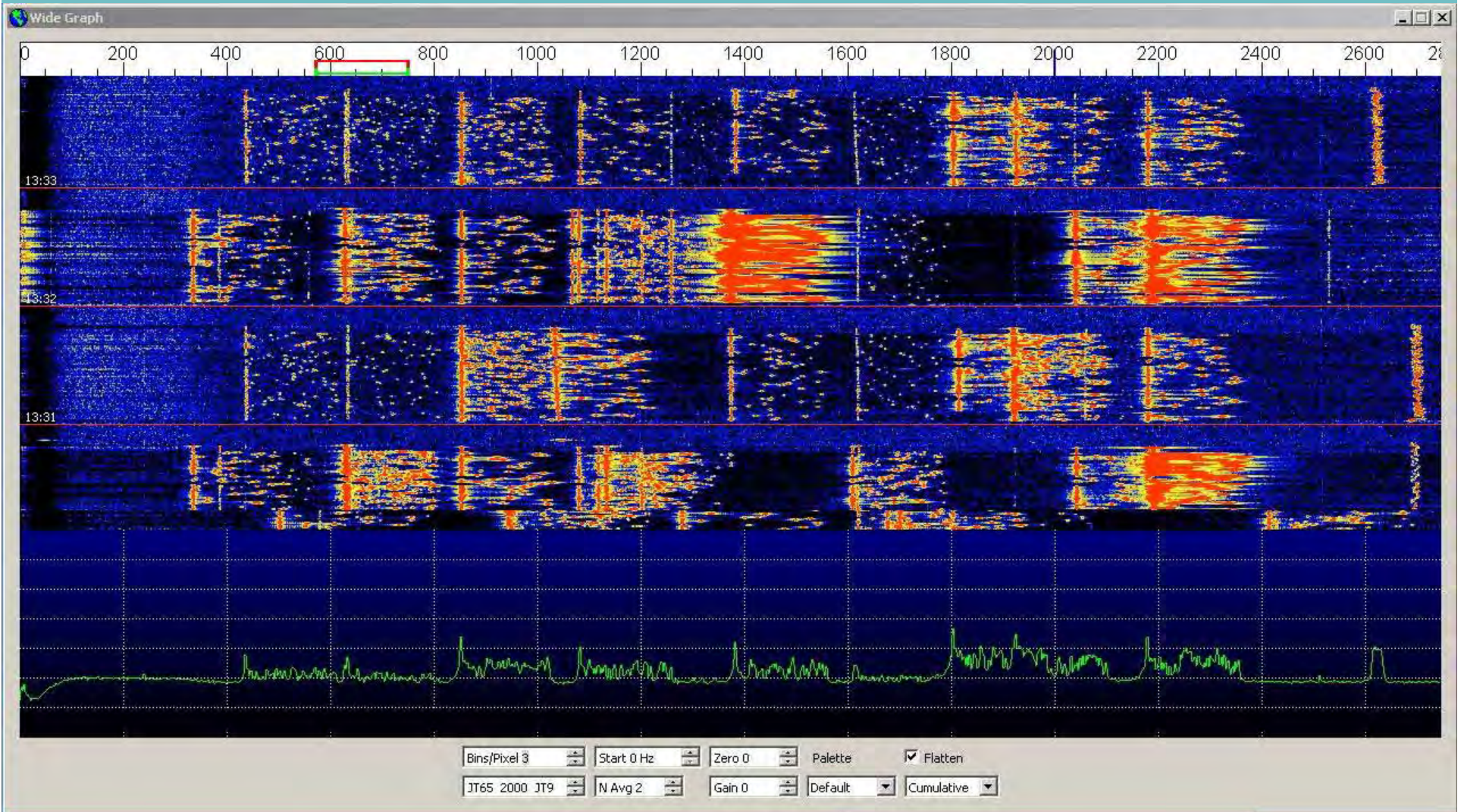
Lock Tx=Rx

Report: -15

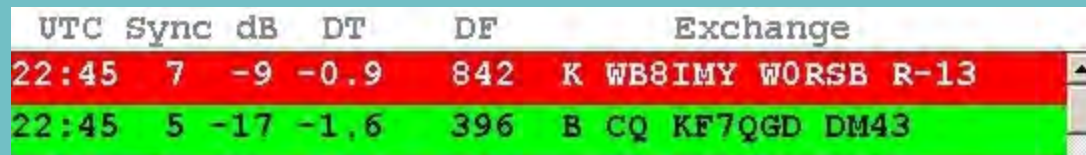
Generate Std Msgs

Next	Now
<input type="radio"/> JA1OTT N8PR EL96	<input type="radio"/> Tx 1
<input type="radio"/> JA1OTT N8PR -15	<input type="radio"/> Tx 2
<input type="radio"/> JA1OTT N8PR R-15	<input type="radio"/> Tx 3
<input type="radio"/> JA1OTT N8PR RRR	<input type="radio"/> Tx 4
<input type="radio"/> JA1OTT N8PR 73	<input type="radio"/> Tx 5
<input checked="" type="radio"/> CQ N8PR EL96	<input type="radio"/> Tx 6

WATERFALL WINDOW



Understanding the WSJT-X and JT65-HF Decoding Screen



UTC	Sync	dB	DT	DF	Exchange
22:45	7	-9	-0.9	842	K WB8IMY W0RSB R-13
22:45	5	-17	-1.6	396	B CQ KF7QGD DM43

- **UTC** – When the signal was received.
- **Sync** – A measure of how well the synchronizing tone is being received. Higher is better.
- **dB** – The signal to noise ratio of the received signal in dB. Higher is better. 0 is the upper limit.
- **DT** – The calculated offset of the received signal from your local clock. Values of .3 to 1.9 are typical.
- **DF** – Offset in Hz from the center point (0).

Here is a 3 minute recording on the WSJT-X waterfall.

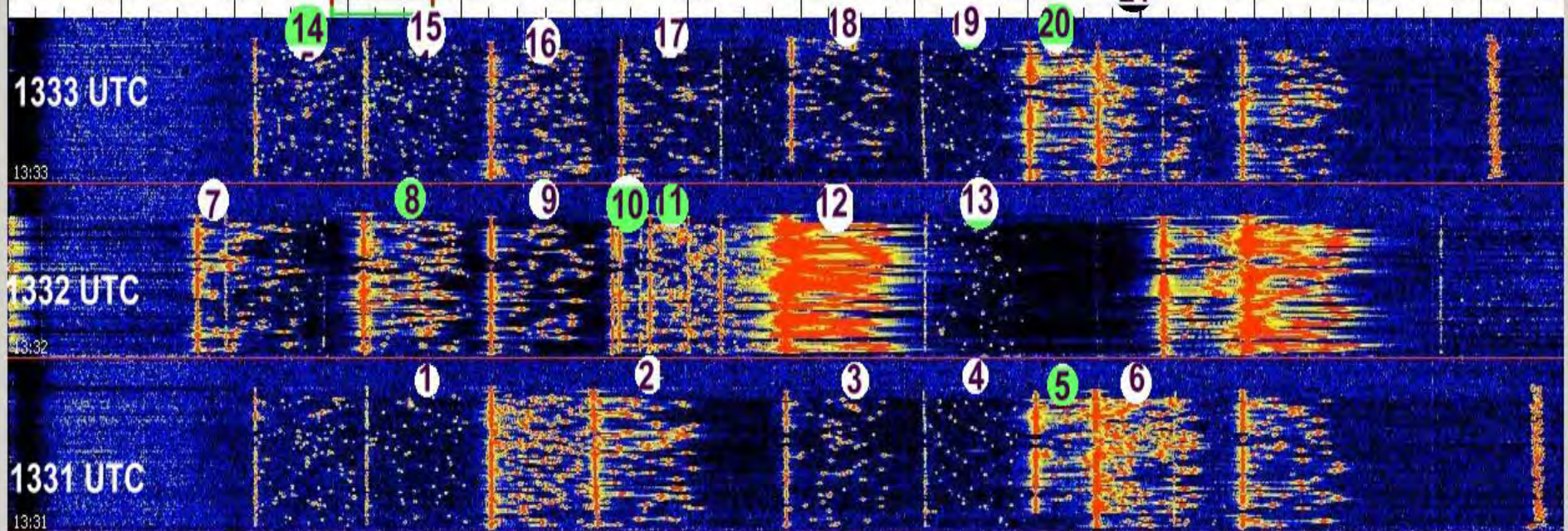
Notice how many signals there are.

Some are very strong and others weak.

If you are TOO STRONG you may distort and not decode

The following was taken at 8:30 AM on a Saturday Morning on 10 meters using a 3 element tri-bander 40 feet high pointed at 045 degrees (at Europe).

0 200 400 600 800 1000 1200 1400 1600 1800 2000 2200 2400 2600 2800



UTC	dB	DT	Freq	Message	
1331	-12	1.4	634	# IW1AWH N4VBR -20	1
1331	-3	0.5	1036	# VA2PGB LZ2STA KN13	2
1331	-7	0.4	1374	# VA2PGB UA3DIB KO85	3
1331	-14	0.2	1619	# UR4LQ W4KK RRR	4
1331	-1	-0.1	1814	# CQ GOJEI IO93	5
1331	-3	0.3	1922	# EK1KE ON4FN R-05	6
1332	-6	0.5	335	# PU3WSF UT7UU KO50	7
1332	-1	1.0	628	# CQ 9A3SM JN85	8
1332	-1	0.1	853	# WU2M LX1DA -01	9
1332	-6	0.5	1080	# CQ M1DBF IO93	10
1332	-8	0.3	1133	# CQ SQ3SWD JO81	11
1332	-1	0.4	1373	# UA3DIB VA2PGB -11	12
1332	-19	0.7	1620	# W4KK UR4LQ 73	13
1333	-11	1.1	437	# CQ IK1SOW JN35	14
1333	-11	1.4	634	# IW1AWH N4VBR -20	15
1333	-2	0.1	853	# LX1DA DL8AAP JO51	16
1333	-6	0.3	1083	# M1DBF R3PV KO94	17
1333	-5	5.8	1383	# VA2PGB UA3DIB R-24	18
1333	-14	0.3	1615	# UR4LQ W4KK 73	19
1333	-1	-0.0	1804	# CQ GOJEI IO93	20
1333	-5	0.2	1925	# EK1KE ON4FN 73	21

Let's Follow an Actual Contact, Step by Step

This contact was made from WB8IMY while running just 5W on 20 meters using two Hamstick mobile antennas connected together as a dipole.



WB8IMY is Calling CQ...

JT65-HF Version 1.0.7 [RB Enabled, online mode. Logged In. QRG = 14076 KHz] [de WB8IMY]

Setup Rig Control Raw Decoder Stations Heard Transmit Log About JT65-HF

Audio Input Levels
L: 7
R: -20
Optimum input level is 0 with only background noise present.
Digital Audio Gain
L: -2
R: -6

2011-Jul-23
22:42:07

Left click waterfall to set TX CF, Right click sets RX CF. Current Operation: Transmitting RX/TX Progress

Transmitting: CQ WB8IMY FN31
TX Text (13 Characters) TX IN PROGRESS
TXN 5W MOBILE Enable TX Halt TX
TX Generated TX Even TX Odd
CQ WB8IMY FN31

Double click an entry in list to begin a QSO. Right click copies to clipboard.

UTC	Sync	dB	DT	DF	Exchange
22:41	4	-22	-0.8	740	K G6XDI VK7XX RRR
22:41	6	-4	1.0	269	B WA1QIK KW7E -08
22:41	7	-7	-0.8	-323	B CQ UT3UA K050
22:41	7	-13	-1.9	-668	B CQ WB0ZPW EM28
22:41	2	-16	-0.9	-826	B WB90TX SV7LWV RRR
22:41	11	-8	-0.6	-999	B SP3IY K4JJQ 73
22:40	6	-7	-1.2	740	B VK7XX G6XDI R-19
22:40	6	-13	-1.2	563	B KE1F ON4CDJ RRR
22:40	4	-23	-1.0	269	B KW7E WA1QIK FN44
22:40	8	-10	-1.4	-334	B IK2EKO NK9B EN70
22:40	7	-8	-0.9	-826	B SV7LWV WB90TX R-07
22:39	12	-8	-0.8	563	B ON4CDJ KE1F R-18

Color-map Brightness Contrast Speed Gain
Blue Smooth

Use buttons below to call CQ and answer callers.
Call CQ Answer Caller Send RRR
Use buttons below when answering CQ.
Answer CQ Send Report Send 73

TX DF 830 RX DF 830 TX DF = RX DF TX to Call Sign M6AVL Rpt (-#) -10
Zero Zero Log QSO

Single Decoder BW 100 AFC Noise Blank
Restore Defaults

Enable Multi-decoder Reports Sent
Enable RB 53
Enable PSKR 38
Dial QRG KHz 14076
Right Click for Menu

Clear Decodes Decode Again



W0RSB Has Answered. WB8IMY Is Replying with a Signal Report Note the top line with the **RED** background

The screenshot shows the JT65-HF software interface. The top window title is "JT65-HF Version 1.0.7 [RB Enabled, online mode. Logged In. QRG = 14076 KHz] [de WB8IMY]". The interface includes a waterfall plot at the top, audio input levels on the left, and a list of received messages in the center. The top line of the list is highlighted in red, indicating a signal report from WB8IMY to W0RSB. The interface also shows various controls for transmission and reception, including a "TX IN PROGRESS" indicator and a "Dial QRG KHz" field set to 14076.

2011-Jul-23
22:44:07

Left click waterfall to set TX CF, Right click sets RX CF. Current Operation: Transmitting RX/TX Progress

Transmitting: W0RSB WB8IMY -04

TX Text (13 Characters) **TX IN PROGRESS**

TXN 5W MOBILE Enable TX Halt TX

TX Generated

W0RSB WB8IMY -04 TX Even TX Odd

Use buttons below to call CQ and answer callers.

Call CQ Answer Caller Send RRR

Use buttons below when answering CQ. Send 73

Answer CQ Send Report

TX DF RX DF TX to Call Sign Rpt (-#)

842 842 TX DF = RX DF W0RSB -04

Log QSO

Single Decoder BW AFC

100 Noise Blank

Restore Defaults

Enable Multi-decoder

Reports Sent

Enable RB 59

Enable PSKR 38

Dial QRG KHz

14076

Right Click for Menu

UTC	Sync	dB	DT	DF	Exchange
22:43	5	-4	-1.1	842	B WB8IMY W0RSB EN34
22:43	5	-8	-0.5	269	B WA1QIK KW7E RRR
22:43	2	-17	-1.4	-339	B NK9B IK2EKO RRR
22:43	3	-11	-1.2	-598	K CQ ON5UN JO11
22:43	5	-13	-1.4	-668	B CQ K9JKM EN52
22:43	12	-10	-1.0	-999	B CQ K4JJQ FM18
22:41	4	-22	-0.8	740	K G6XDI VK7XX RRR
22:41	6	-4	1.0	269	B WA1QIK KW7E -08
22:41	7	-7	-0.8	-323	B CQ UT3UA KO50
22:41	7	-13	-1.9	-668	B CQ WB0ZPW EM28
22:41	2	-16	-0.9	-826	B WB9OTX SV7LWV RRR
22:41	11	-8	-0.6	-999	B SP3IY K4JJQ 73

Clear Decodes Decode Again

W0RSB Confirms My Report and Gives a Report of -13 dB. WB8IMY Replies "RRR"

2011-Jul-23
22:46:04

Left click waterfall to set TX CF, Right click sets RX CF. Current Operation: Transmitting RX/TX Progress

Transmitting: W0RSB WB8IMY RRR
TX IN PROGRESS

TX Text (13 Characters) TX IN PROGRESS
TXN 5W MOBILE Enable TX Halt TX

TX Generated
W0RSB WB8IMY RRR ← REPLY

Use buttons below to call CQ and answer callers.
Call CQ Answer Caller Send RRR

Use buttons below when answering CQ.
Answer CQ Send Report Send 73

UTC	Sync	dB	DT	DF	Exchange
22:45	7	-9	-0.9	842	K WB8IMY W0RSB R-13
22:45	5	-17	-1.6	396	B CQ KF7QGD DM43
22:45	6	-12	-0.3	269	B TU 4EQSLS 73
22:45	5	-8	-0.3	191	B RW0SR M6AVL RRR
22:45	3	-22	-0.8	-229	K ND4X HB9JNM JN47
22:45	5	-14	-1.2	-342	B NK9B IK2EKO 73
22:45	2	-10	-0.9	-641	B CQ KF6H CM87
22:45	5	-13	-1.0	-826	B CQ SV7LWV KN20
22:45	9	-9	-1.0	-1001	B WB0ZPW K4JJQ -12
22:43	5	-4	-1.1	842	B WB8IMY W0RSB EN34
22:43	5	-8	-0.5	269	B WA1QIK KW7E RRR
22:43	2	-17	-1.4	-339	B NK9B IK2EKO RRR

TX DF 842 RX DF 842 TX DF = RX DF TX to Call Sign W0RSB Rpt (-#) -09

Single Decoder BW 100 AFC Noise Blank

Enable Multi-decoder Enable RB 67 Enable PSKR 46

Dial QRG KHz 14076

Reports Sent 67

Right Click for Menu

Signal report
----->

Previously Received Transmission →

W0RSB sends 73 and WB8IMY does the same

JT65-HF Version 1.0.7 [RB Enabled, online mode. Logged In. QRG = 14076 KHz] [de WB8IMY]

Setup Rig Control Raw Decoder Stations Heard Transmit Log About JT65-HF

Audio Input Levels
 L7
 R-20
 Optimum input level is 0 with only background noise present.
 Digital Audio Gain
 L: -2
 R: -8

2011-Jul-23
 22:48:03

Left click waterfall to set TX CF, Right click sets RX CF. Current Operation: Transmitting RX/TX Progress

Color-map Brightness Contrast Speed Gain
 Blue 5 0 Smooth

Transmitting: W0RSB WB8IMY 73
 TX Text (13 Characters) **TX IN PROGRESS**
 TNX 5W MOBILE
 TX Generated TX Even TX Odd
 W0RSB WB8IMY 73 **←REPLY**

Double click an entry in list to begin a QSO. Right click copies to clipboard.

UTC	Sync	dB	DT	DF	Exchange
22:47	5	-7	-1.0	842	B WB8IMY W0RSB 73
22:47	6	-11	-1.6	396	B CQ KF7QGD DM43
22:47	7	-12	-0.3	188	B RW0SR M6AVL 73
22:47	7	-18	-0.8	-229	B ND4X HB9JNM JN47
22:47	3	-12	6.2	-651	B UT3UA WB9OTX EM79
22:47	4	-11	-0.8	-821	B NK9B SV7LWV -12
22:47	5	-9	-0.8	-1001	B WB0ZPW K4JJQ -12
22:45	7	-9	-0.9	842	K WB8IMY W0RSB R-13
22:45	5	-17	-1.6	396	B CQ KF7QGD DM43
22:45	6	-12	-0.3	269	B TU 4EQSLS 73
22:45	5	-8	-0.3	191	B RW0SR M6AVL RRR
22:45	3	-22	-0.8	-229	K ND4X HB9JNM JN47

Use buttons below to call CQ and answer callers.

Use buttons below when answering CQ.

TX DF 842 842 TX DF = RX DF TX to Call Sign W0RSB Rpt (-#) -07

Single Decoder BW 100 AFC Noise Blank
 Enable Multi-decoder

Reports Sent 14076
 Enable RB 74
 Enable PSKR 46

73
 ----->

You Can Also Send Short Text Messages. The White Text is UR3CTB Telling that he is Running 30W to a Dipole Antenna (top gray line)

JT65-HF Version 1.0.7 [RB Enabled, online mode. Logged In. QRG = 14076 KHz] [de WB8IMY]

Setup Rig Control Raw Decoder Stations Heard Transmit Log About JT65-HF

Audio Input Levels: L -3, R -20. Optimum input level is 0 with only background noise present. Digital Audio Gain: L: -2, R: -6.

2011-Jul-23 22:56:27

Left click waterfall to set TX CF, Right click sets RX CF. Current Operation: Transmitting RX/TX Progress

Transmitting: UR3CTB WB8IMY RRR

TX Text (13 Characters) **TX IN PROGRESS**

TXN 5W MOBILE Enable TX Halt TX

TX Generated UR3CTB WB8IMY RRR TX Even TX Odd

Use buttons below to call CQ and answer callers. Call CQ Answer Caller Send RRR Send 73

Use buttons below when answering CQ. Answer CQ Send Report

TX DF 840 RX DF 840 TX DF = RX DF TX to Call Sign UR3CTB Rpt (-#) -15

Single Decoder BW 100 AFC Noise Blank

Enable Multi-decoder Reports Sent 101

Dial QRG KHz 14076

Clear Decodes Decode Again

UTC	Sync	dB	DT	DF	Exchange
22:55	4	-17	-1.8	840	B 30W DIP 73GL
22:55	14	-6	-0.6	-54	B CQ DX KE1F
22:55	3	-20	-0.8	-229	K ND4X HB9JNM R-18
22:55	12	-14	-1.4	-307	B KD8EZS M6KLO 73
22:55	5	-9	-1.1	-595	B CQ ON5UN JO11
22:55	6	-8	-0.9	-851	B KG4Q SV7LWV -14
22:53	2	-15	-1.8	840	B WB8IMY UR3CTB R-18
22:53	5	-7	0.8	563	B CQ LU8EX GF05
22:53	5	-19	5.4	215	B CQ KF7JGF CN84
22:53	8	-6	-0.6	-156	B CQ DX KE1F
22:53	7	-17	-1.4	-307	K KD8EZS M6KLO -12
22:53	8	-11	-1.6	-544	B VE3DV KF7QGD -17

JT65 Contacts Are Valid For Most Awards

- DXCC (Digital or Mixed mode)
- Worked All States (Digital, Mixed or JT65)
- Worked All Continents (Digital or Mixed)
- CQ WPX and other awards
- Also supported by ARRL's Logbook of The World

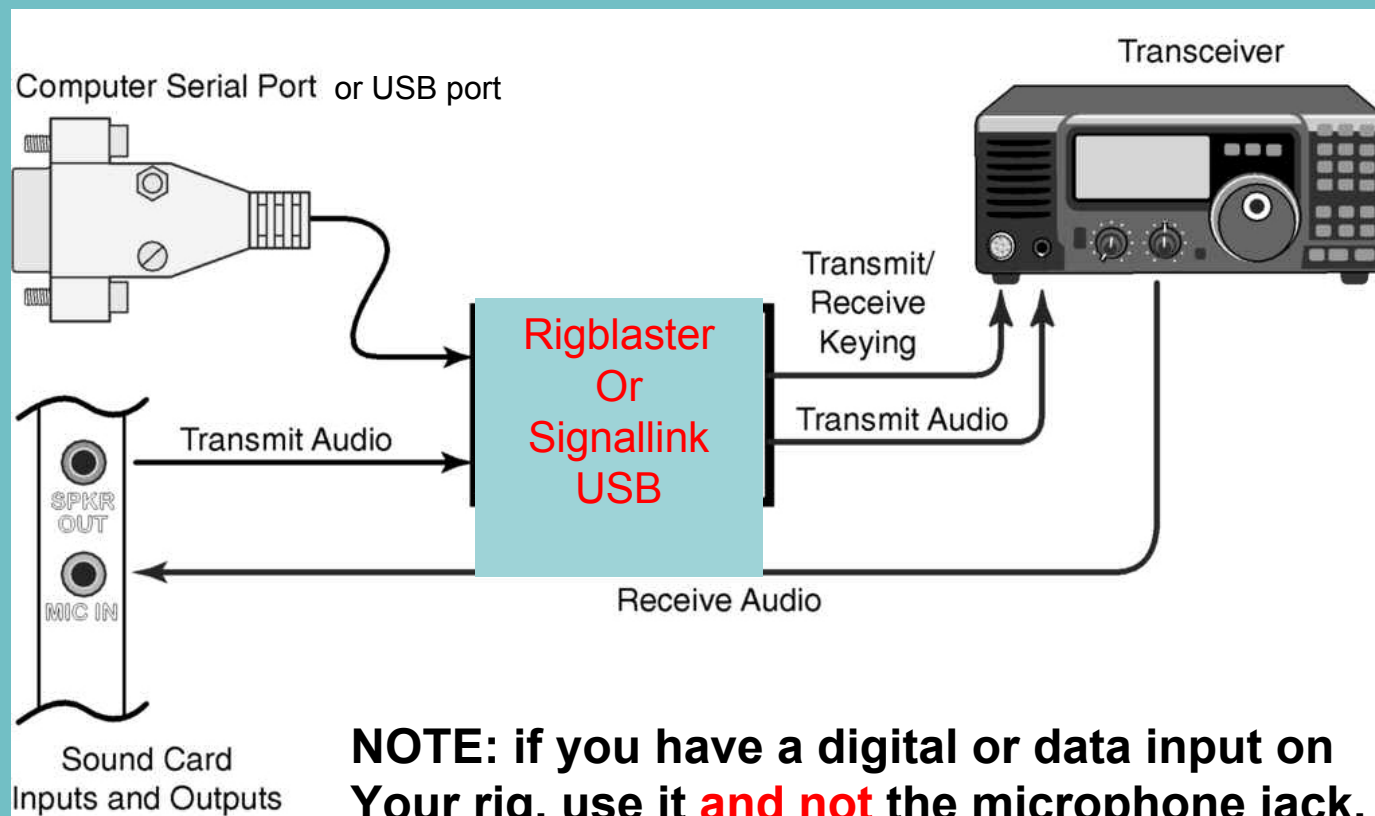
What Do You Need to Try JT65 on HF?

- SSB Transceiver and antenna
- Computer with sound card (in and out)
- Sound Card Interface between the two



Typical Installation

- This installation will work the same as for other sound-card based digital modes like AFSK or PSK31 (MMTTY)
- Your interface can key the rig through a COM/USB port or you can use VOX to key the rig.



Configure the Software First

Configuration

Station Setup | Rig Control/PTT | Heard List/PSKR Setup/RB Setup | Macros | Si570 USB Control | Colors | Diagnostics

Callsign **Prefix** **Suffix**

Grid (4 or 6 Characters). Required value.

Note: Suffix/Prefix is suggested to only be used in situations where you have a legal requirement to do so. You may define a suffix OR a prefix but not both. Suffix/prefix support in the JT65 protocol is a (very) complex issue. My suggestion is to avoid its use if at all possible. Suffix/prefix support in JT65-HF is, at best, incomplete.

Sound Input Device **Sound Output Device**

RX Sample Rate **TX Sample Rate** **Enable Automatic RX/TX Sample Rate Correction.**

Automatic adjustment may cause some initial skewing of spectrum display until SR settles. This is harmless. In most cases it is suggested that Automatic sample rate correction be enabled.

Disable TX after sending same message 15 times. (Runaway TX watchdog)

Disable Multidecoder while in QSO. Suggested unless you have a fast CPU (>1.5GHz).

Enable Multidecoder after 2 minutes of no TX (if disabled by option above).

Restore defaults sets Multidecoder On

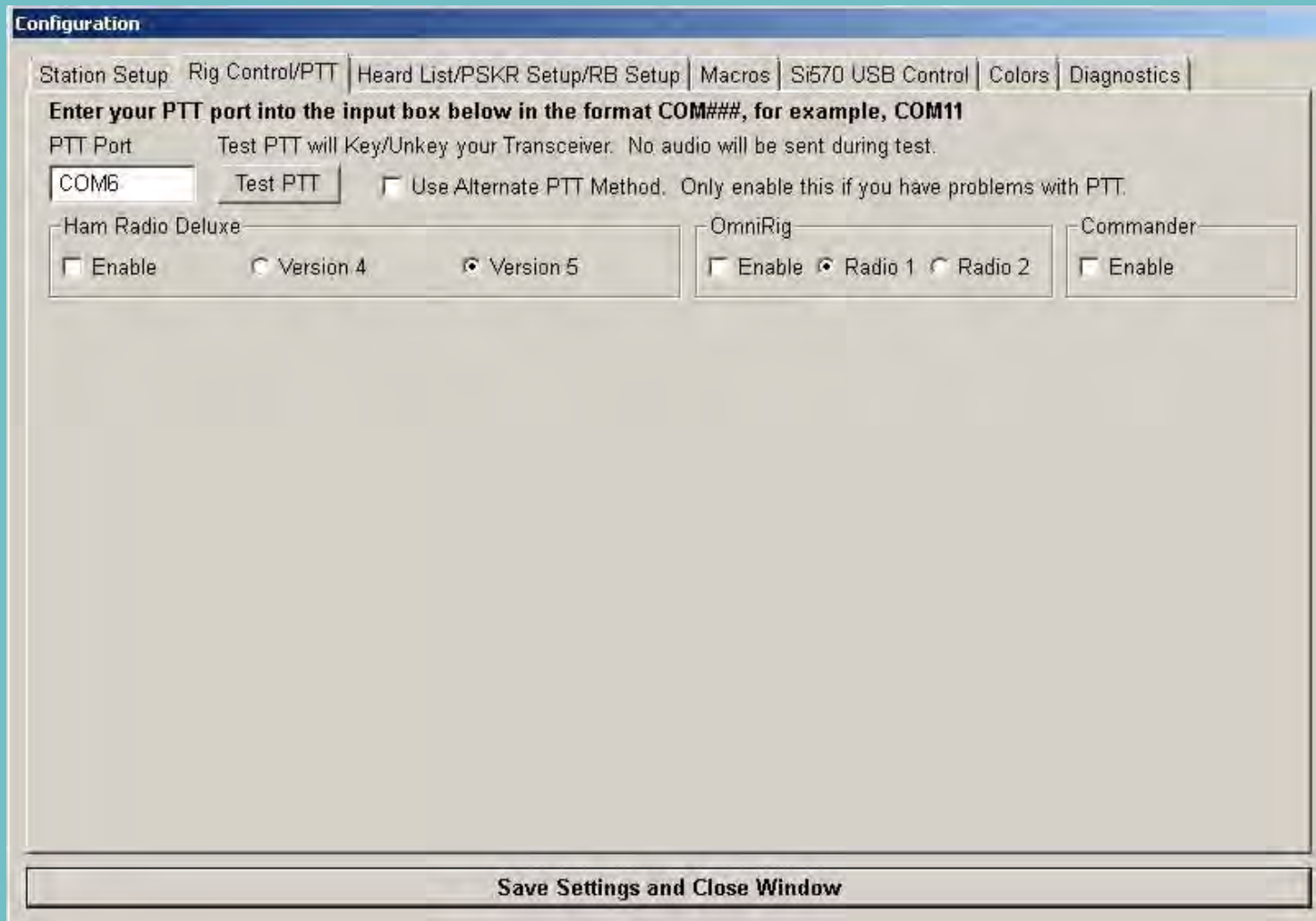
Send CW ID With 73 or Free Text Message

Save text of decodes and transmissions to file.

Location of RX/TX history file (JT65hf-log.csv)

Save Settings and Close Window

“Tell” *JT65-HF* Which COM Port is Used for T/R Switching



Accurate Time is Important

- If you have an Internet connection, update your time in *Windows* Control Panel before you start operating. Some say the *Windows* time synchronization isn't adequate for *JT65-HF*, but that hasn't been my experience.
- If you are running *Windows XP*, try *Dimension4*. This program will sync your clock automatically.
- <http://www.thinkman.com/dimension4/>

What's Your Grid Square?

- Use K2DSL's Web page to determine your grid square from your street address.
- http://www.levinecentral.com/ham/grid_square.php



JT65 HF Frequencies (All USB)

- 1838 kHz
- 3576 kHz
- 7076 kHz (European stations often use 7039 kHz)
- 14076 kHz
- 10139 kHz
- 18102 kHz
- 21076 kHz
- 24920 kHz
- 28076 kHz
- These are shown and can be selected on the JT65-X screen

But I am only a Tech Class Licensee -- Can I work DX with JT65-X?

YES!

**You can get DXCC on
2, 6 or 10 Meters !**

**Joe Taylor's programs will allow you to
get on the digital modes on all of these:**

6 & 2 Meters and above...

Tropo

Meteor Scatter

Moonbounce (EME)

Aurora

Satellite

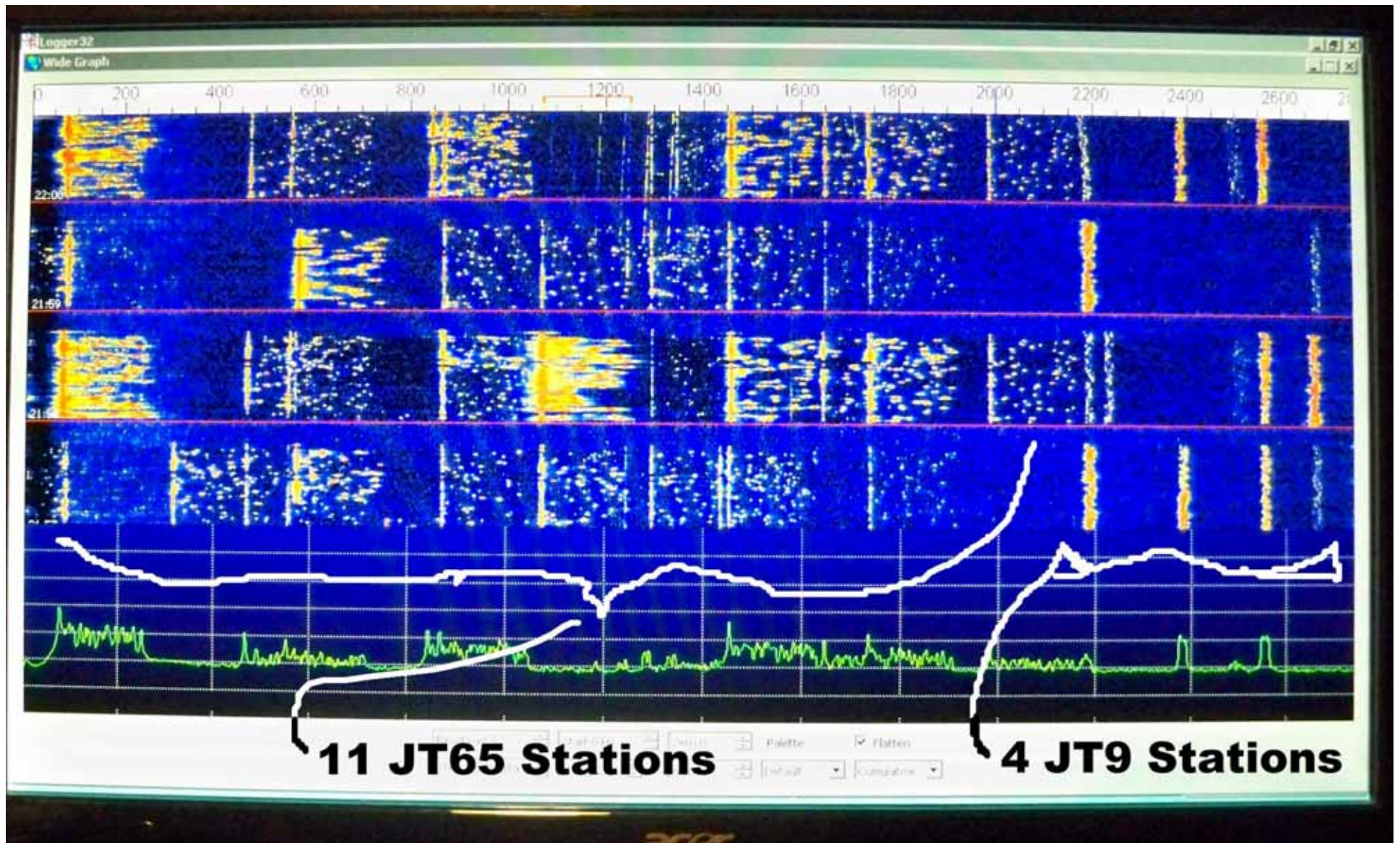
Novice and Technician classes:

28.000-28.300 MHz: CW, RTTY/Data--

Maximum power 200 watts PEP



JT-65 Operators Spotted at 5 PM on Dec. 4, 2014 on 10 meters



A typical afternoon on 10 meter Digital modes –
JT65 and JT9
Saturday - December 20. 2014

Here are a few of the stations
I have in my log at N8PR

Notice VK6 on 80 Meters,
Japan on 40 Meters.

I was heard in Namibia on 160,
But I did not hear him. I was
Running 1000 watts on JT65-X !

DATE	TIME ON	BAND	MODE	CALL	CQZ	FREQ	NAME	QSL VIA	Route	QSL se
17 Oct 13	07:26:00	2M	JT65	YJ0HP	32	144144.00	Hermann	DL2NUD		13 Jan
21 Oct 13	12:05:00	2M	JT65	JH8CMZ	25	144128.00	Take			
22 Oct 13	13:09:00	2M	JT65	JM1GSH	25	144108.00	Kony			
26 Oct 13	06:54:00	2M	JT65	SV9ANJ	20	144114.00	Xteam		DF2ZC	30 Oct
05 Nov 13	17:37:41	15M	JT65	DL8ZBA	14	21076.00				25 Jul 1
09 Dec 13	23:54:26	160M	JT65	C6ARU	08	1838.00			Bahamas - 80 M JT65	
10 Dec 13	00:07:04	160M	JT65	W7JW	03	1838.00				
10 Dec 13	00:16:47	160M	JT65	KG4Q	05	1838.00	Larry			
02 Jan 14	01:10:52	40M	JT65	VE3FMC	04	7076.00				
09 Jan 14	23:19:00	2M	JT65	W1AW/4	05	144113.00	Ric			
02 Feb 14	19:13:00	2M	JT65	W1AW/5	04	144135.00	George			
03 Feb 14	16:38:00	2M	JT65	ER5WU	16	144132.00	Anatol			
05 Feb 14	20:37:00	2M	JT65	W1AW/4	05	144107.00	Rav			
17 Jul 14	10:38:00	2M	JT65	KH8/ZL1RS	32	144138.00	Bob			24 Aug
02 Aug 14	04:41:27	160M	JT65	W5XZ	04	1838.50				
02 Aug 14	04:55:58	30M	JT65	OE2DMA	15	10138.00				
03 Aug 14	00:04:07	20M	JT65	IZ2MZL	15	14076.00				
03 Aug 14	18:46:17	12M	JT65	N6ORB	03	24917.00				
08 Aug 14	18:10:08	20M	JT65	KB1TJC	05	14076.00				
22 Aug 14	04:01:22	160M	JT65	W0PTI	04	1838.00				25 Sep
22 Aug 14	04:06:02	160M	JT65	KJ3N	05	1838.00				
23 Aug 14	04:28:41	160M	JT65	W5UN	04	1838.00	Dave			
23 Aug 14	04:37:33	160M	JT65	WA2GSX	05	1838.00				
23 Aug 14	05:03:26	160M	JT65	AB1OC	05	1838.00				
23 Aug 14	05:10:04	160M	JT65	N8DEA	04	1838.00				
30 Nov 14	20:41:05	2M	JT65	W1AW/3	05	144119.00	Jim	N1SZ		
04 Dec 14	08:40:00	2M	JT65	W1AW/1	05	144121.00	Dave			
11 Dec 14	04:01:39	2M	JT65	W1AW/9	04	144149.00				
20 Dec 14	21:40:06	12M	JT65	W1AW/KH6	31	24917.00			Hawaii 12 M JT65	
29 Dec 14	21:36:00	2M	JT65	1A0C	15	144143.00	Frank			11 Jan
06 Jan 15	11:57:00	80M	JT65	VK6IR	29	3574.00			Western Australia 80 M JT65	
06 Jan 15	12:20:00	40M	JT65	JA1OTT	25	7076.00			Japan 40 M JT-65	
14 Oct 14	17:06:47	10M	JT9	EA3NE	14	28076.00			Spain - 10 M JT-9	
19 Dec 14	20:54:18	12M	JT9	W1AW/KH6	31	24917.54				
21 Dec 14	21:46:21	10M	JT9	W1AW/KH6	31	28078.00				



N8PR Pete

K1JT Joe Taylor

W4AS Sebastian

***We met Joe at the ARRL Centennial Convention in Hartford, CT
this past summer (2014)***

2013-Dec-02
15:12:33

Current Operation: Receiving

Message To TX: No message entered.

TX OFF

TX Text (13 Characters)

TX Generated

TX Even TX O

Call CQ and answer callers

Call CQ Answer Caller Send RRR

Answering CQ

Answer CQ Send Report

UTC	Sync	dB	DT	DF	E
15:11	2	-6	-0.1	673	B NOV
15:10	6	-5	-1.2	673	B OH3BY
15:10	8	-6	-0.4	420	B CQ AJ4NN FM05
15:10	13	-4	-1.6	-735	B CQ W4CCH EM74
15:09	2	-5	-0.1	673	B N0VVV OH3BY RRR
15:08	7	-6	-1.2	673	B OH3BY N0VVV R-07
15:08	8	-6	-1.9	-735	B RN3YN W4CCH 73
15:07	2	-5	-0.4	875	B W5TTE AF6JO DM12
15:07	3	-9	-0.1	673	B N0VVV OH3BY -08
15:07	4	-6	-0.4	226	B N6NBN VE2KOT FN25
15:07	20	-10	-0.4	-498	B DL1NCH AJ4NN FM05
15:07	2	-17	0.3	-732	B W4CCH RN3YN 73

TX DF 145 RX DF 145 TX DF - RX DF TX to Call Sign

Single BW 100 Multi BW 100

RB/PSKR Counts:

Sound In: 01-Microphone (2- USB Audio CODEC)

Sound Out: 05-Speakers (2- USB Audio CODEC)

In case you think that this is a “Fast” operating mode, it is not !
Tim – N4UM – took this photo while operating as C6ARU in the Bahamas.



See You on JT65!

Thank you for your attention.

This presentation will be posted on the SFDXA web pages at:

<http://www.qsl.net/k4fk/presentations.htm>

OR- look for "Presentatons" on the SFDXA Home Page
at www.qsl.net/k4fk

Any Questions?