



North Shore Radio Club

WSJT-X & FT-8 Update

October 10, 2017

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WSJT-X Software

- Updated version of WSJT, by Joe Taylor, K1JT
- Vastly improved user interface from prior version.
- Beta version during testing through July & August 2017.
- “Production” version released in September.
- Roughly 5,000 active users in a typical week.



WSJT-X

- Runs JT-65, JT-9, FT-8 and WSPR (among others)
 - Not “conversational” modes, but do have “free text”
- Point and click operation
- Split screen mode for JT65 & JT-9
- Needs time sync (Dimension 4 or similar)
 - Within 1 second is OK
- Same sound card setup as other digital modes
- Windows, Linux, Mac OS
- Articles in October & November 2017 QST
 - “Fast” modes – see November issue

WSJT-X Main Panel



WSJT-X v1.8.0-rc2 by K1JT

File Configurations View Mode Decode Save Tools Help

Band Activity					Rx Frequency				
UTC	dB	DT	Freq	Message	UTC	dB	DT	Freq	Message
024915	-20	-0.8	1784	~ 4X1QQ KN4FHP FM05	024145	-13	-0.4	1671	~ KC9IL W7AUF R-11
024915	6	-0.8	2207	~ NA6L MW0JZE -03	024215	-11	-0.5	1671	~ KC9IL W7AUF R-11
024915	-16	-0.8	996	~ CQ PY7ZZ HI21	024245	-10	-0.5	1672	~ KC9IL W7AUF 73
024915	-17	-1.0	1036	~ CQ NS7B DN41	024345	-14	-0.9	1672	~ KC9IL AC6JA CM97
024945	-10	-1.0	1674	~ KC9IL KOLFV 73	024415	-24	-0.9	1673	~ KC9IL AC6JA R-12
024945	-18	-0.3	479	~ W6NIF K5CD RRR	024645	-10	-1.1	1673	~ KC9IL NJ9R EN62
024945	-1	-0.4	695	~ KP4/K6DIT AF6SA	024715	-9	-1.1	1674	~ KC9IL NJ9R R-09
024945	-14	-0.8	995	~ CQ PY7ZZ HI21	024745	-10	-1.1	1675	~ KC9ILW 73
024945	-22	-0.7	1958	~ CQ XE2JS DL68	024845	-9	-1.0	1675	~ KC9IL KOLFV EN26
024945	3	-0.8	2207	~ NA6L MW0JZE -06	024915	-8	-1.0	1674	~ KC9IL KOLFV R-19
024945	-7	-0.9	742	~ W6MSB AC4CA EM00	024945	-10	-1.0	1674	~ KC9IL KOLFV 73

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

40m **7.074 000**

DX Call: KOLFV DX Grid: EN26
Az: 313 458 mi

2017 Sep 20 02:50:20

Tx 1674 Hz Rx 1674 Hz Lock Tx=Rx

Calling CQ: CQ, Answering CQ: Grid, dB, R+dB, RRR, 73

CQ KC9IL EN62 Gen msg

Receiving FT8 Last Tx: KOLFV KC9IL 73 5/15 WD:10m



WSJT-X Modes

Software
based modes

- **More recent modes:**



- JT-65 – weak & varying signals using 65 tones and FEC. Meteor scatter and moonbounce. (2003)

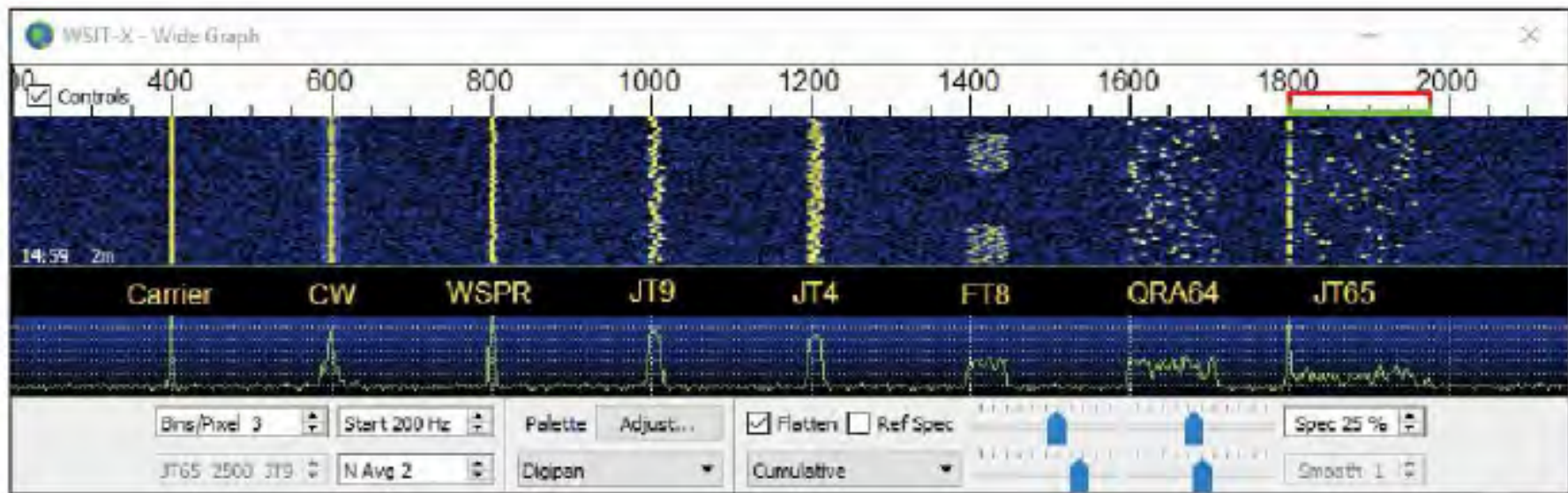


- JT-9 – Refinement of the JT-65 mode with much narrower bandwidth and slightly improved sensitivity. Offers longer cycles at greater sensitivity (5 minutes up to 30 minutes). (2012)

- WSPR – Weak Signal Propagation Reporter. Not for QSO's but can be used to test stations. (2008)



WSJT-X Modes



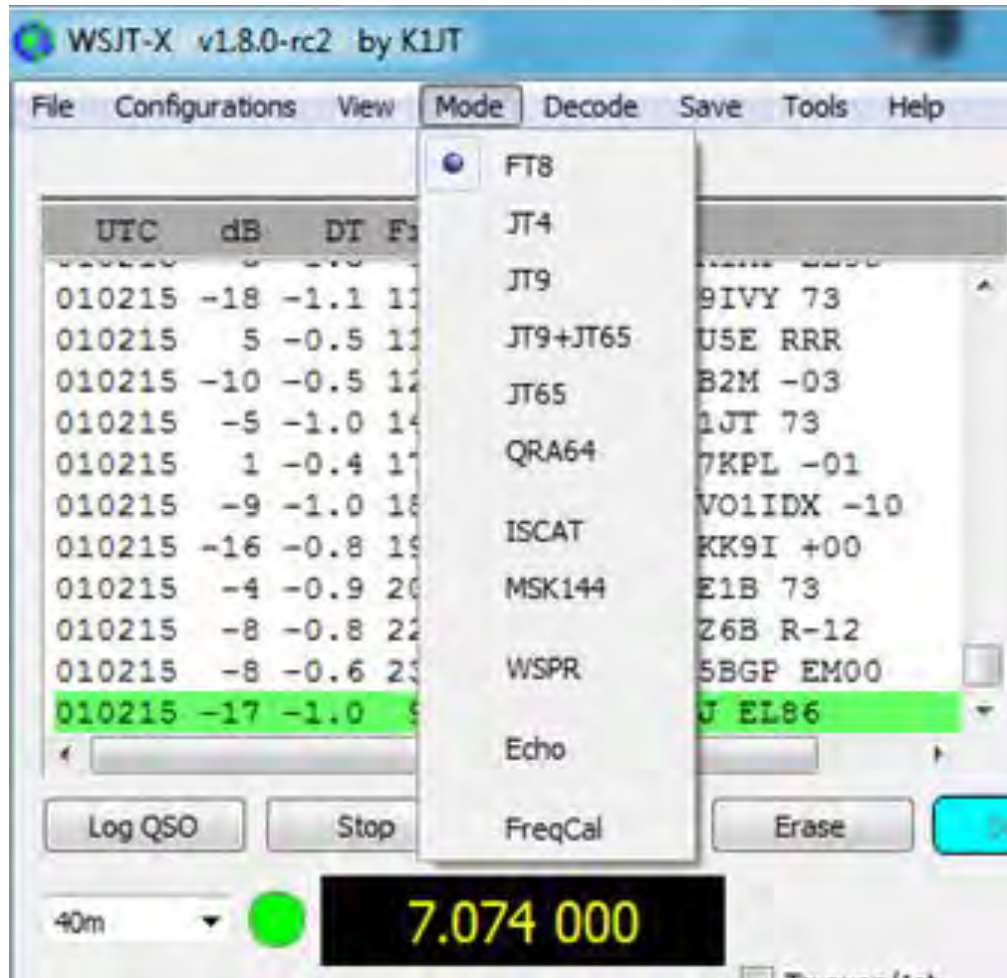


How the Modes compare

Mode	Lowest SNR @ 3KHz	Avg Speed (WPM)	Bandwidth (Hz)	Error Correction
RTTY	-5.5 dB	60	300	None
PSK31	-11.5 dB	51	80	None
FSQ-4	-15 dB	25	300	None
JT-65	-25 dB	2.2	178	FEC
JT-9	-27 dB	2.2	16	FEC
WSPR	-28 dB	1.1	6	FEC



Other WSJT-X Modes



Various other modes optimized for VHF, meteor scatter, etc:

- JT-4 & QRA-64 – EME
- MSK-144 – Meteor Scatter
- ISCAT – Aircraft Scatter
- Echo – Detecting Lunar Echoes
- Freq Cal – calibrate using WWV, CHU, Broadcast stations



Why Another “JT” Mode?

- JT-65 and JT-9 had 60 second TX/RX cycles
- Complete QSO takes 5 minutes
 - Band conditions could change
- JT-65 and JT-9 require heavy CPU resources
 - All decoding done after transmission
 - Sometimes miss next cycle
- Users wanted something quicker
 - Decode *during* the transmission?



FT-8



- Refinement of JT-9 protocol developed by Joe Taylor, K1JT and Steve Franke, K9AN.
- Released in July 2017. Acceptance has been incredible.
- *Comparable sensitivity to JT-65, but operates 4x faster (15 second cycles). Better in fading and sporadic conditions.*
- *Approximately 47 Hz wide, compared to approx. 178 Hz for JT-65 and 16 Hz for JT-9.*
- Implemented in WSJT-X software.
- Also uses time sync. (Dimension 4 or similar)



FT-8 Technical Specs

- T/R sequence length – 15 seconds
- Transmission length – 13.48 seconds
- Decodes *during* transmission (not all at the end)
 - Requires much less CPU ~ 1.5 GHz or better
- Modulation: 8 FSK, tone spacing 5.86 Hz
- Bandwidth – 47 Hz
- Decoding threshold -24 dB (K1JT says -20dB)
- Multi decoder finds all signals in the passband
- Features Auto-sequencing after QSO starts
- Has 3 extra bits to allow for future growth.



FT-8 Standard QSO

CQ K1ABC FN42

G0XYZ K1ABC -19

G0XYZ K1ABC RRR

K1ABC G0XYZ I091

K1ABC G0XYZ R-22

K1ABC G0XYZ 73

#K1ABC calls CQ

#G0XYZ answers

#K1ABC sends report

#G0XYZ sends R+report

#K1ABC sends RRR

#G0XYZ sends 73



FT-8 Frequencies

Table 1
Conventional Dial Frequencies for FT8, JT65, JT9, and WSPR on the HF Bands

Band (m)	Frequencies (MHz)			
	FT8	JT65	JT9	WSPR
160	1.840	1.838	1.839	1.8366
80	3.573	3.570	3.572	3.5686*
40	7.074	7.076	7.078	7.0386
30	10.136	10.138	10.140	10.1387
20	14.074	14.076	14.078	14.0956
17	18.100	18.102	18.104	18.1046
15	21.074	21.076	21.078	21.0946
12	24.915	24.917	24.919	24.9246
10	28.074	28.076	28.078	28.1246
6	50.313	50.310†	50.312	50.2930

*Pending change from 3.5926, †Pending change from 50.276



WSJT-X Checklist

Before attempting your first QSO with WSJT-X:

- Your callsign and grid locator set to correct values
- PTT and CAT control (if used) properly configured and tested
- Computer clock properly synchronized to UTC within ± 1 s
- Audio input and output devices configured for sample rate 48000 Hz, 16 bits
- Radio set to **USB** (upper sideband) mode
- Radio filters centered and set to widest available passband (up to 5 kHz).



FT-8

- Seems to work as well as JT-65. Good for QRP or stealth! (3,245 miles/watt on QRP nite)

Mode	Lowest SNR @ 3KHz	Avg Speed (WPM)	Bandwidth (Hz)	Error Correction
RTTY	-5.5 dB	60	300	None
PSK31	-11.5 dB	51	80	None
FSQ-4	-15 dB	25	300	None
JT-65	-25 dB	2.2	178	FEC
JT-9-1	-27 dB	2.2	16	FEC
FT-8	-24 dB *	8.8	50	FEC

*** K1JT claims -20dB**

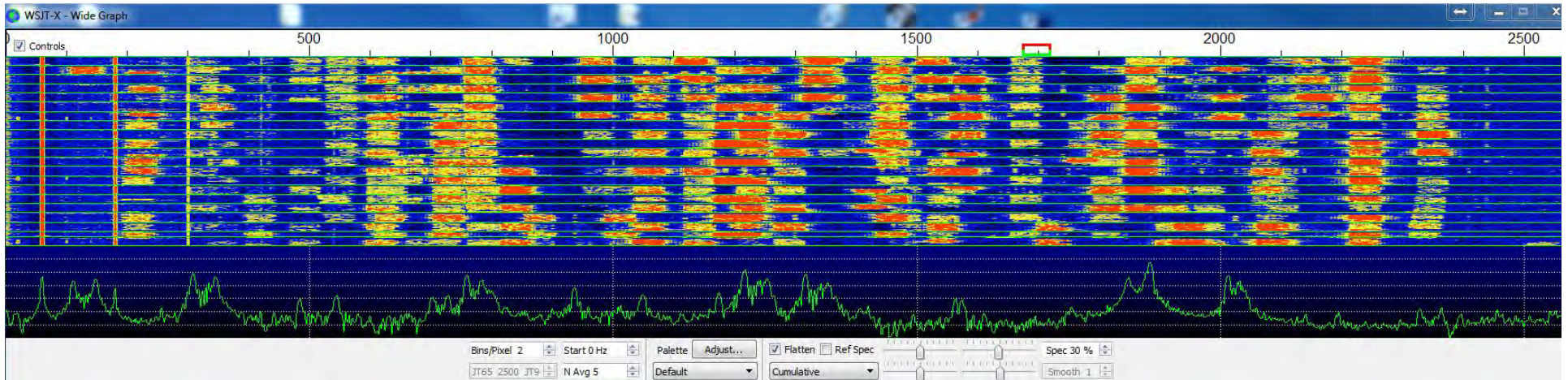


So, What About Activity Levels?

- HF bands are pretty dead lately
- Good news...FT-8 arrived at an appropriate time



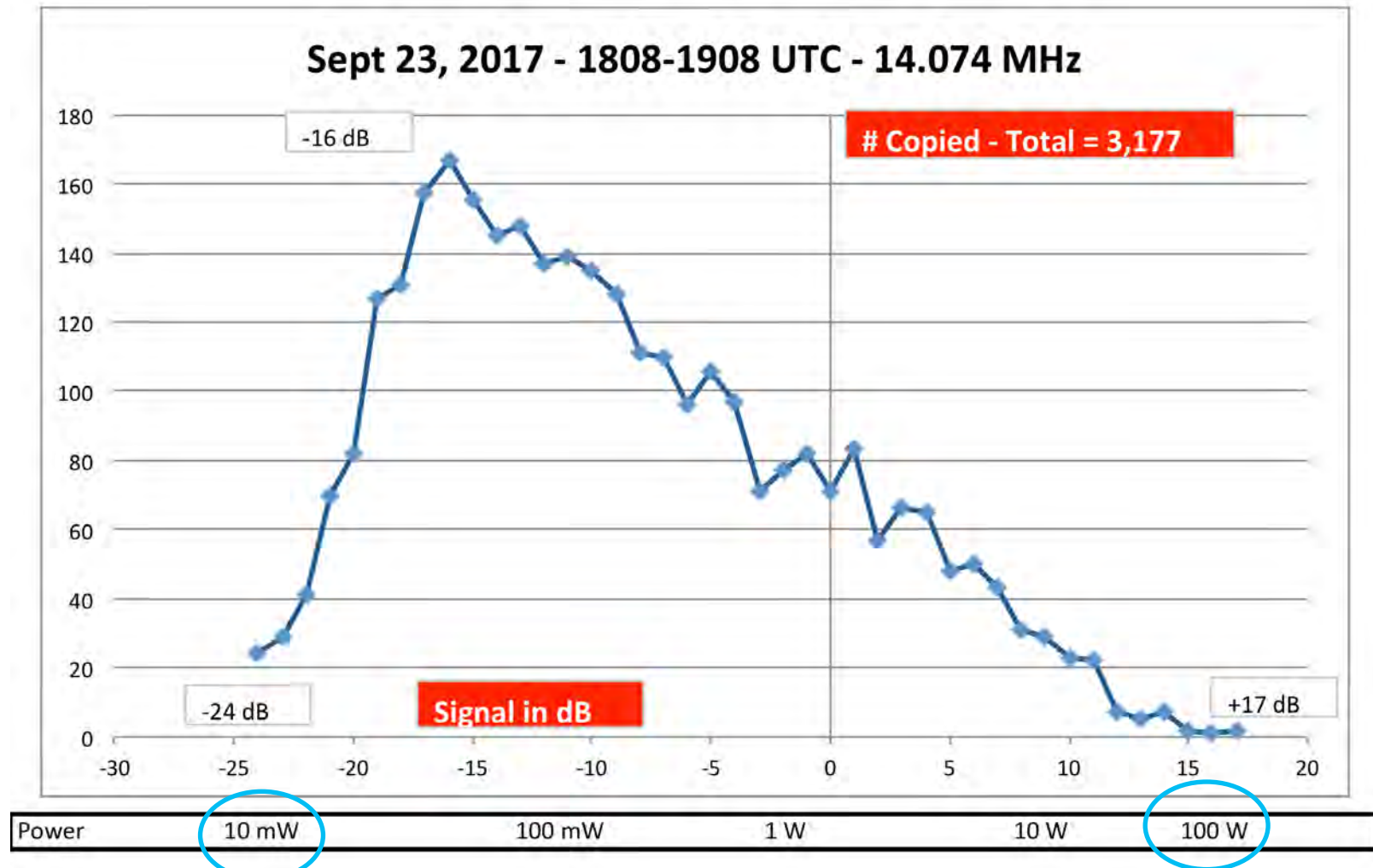
WSJT-X / FT-8



- Typical spectrum view on 40 meters in the evening or 20 meters on the weekend
- Roughly 20 - 30 QSO's going in 2.8 KHz

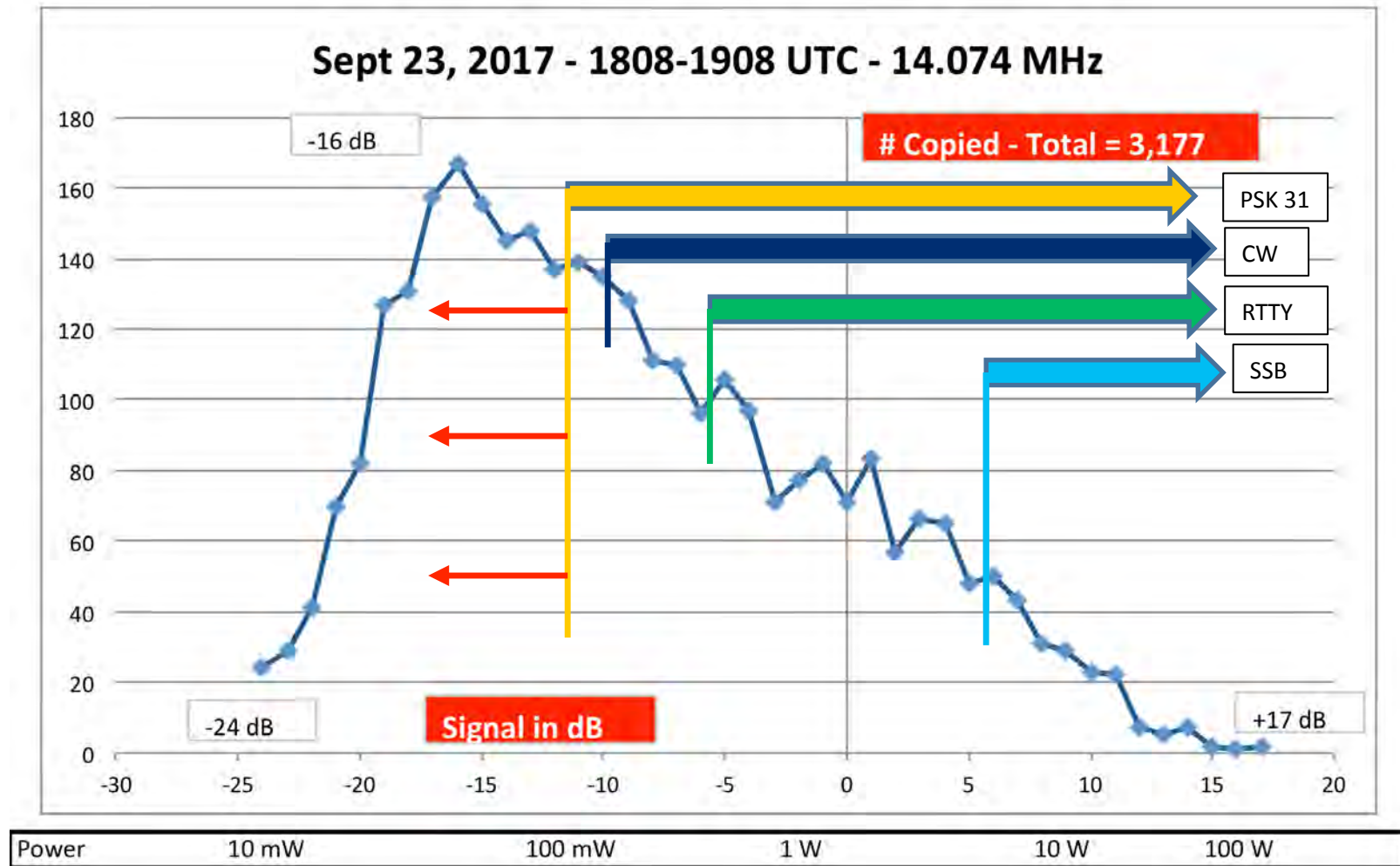


60 Minutes on 20 Meters





60 Minutes on 20 Meters





PSK Reporter

- Automatic Propagation Reporter
- Used to see how you are being heard.
- Software automatically sends received QSO information to Internet server
- <http://pskreporter.info>
- Used for many modes, not just FT-8
- Compatible with many software packages
 - HRD, FLDigi, MultiPSK, etc.



References:

- “Work the World with WSJT-X”, Parts 1 & 2, QST Magazine, October 2017 & November 2017
- WSJT-X User Guide, Joseph Taylor, Jr., K1JT
 - <http://physics.princeton.edu/pulsar/k1jt/wsjt-x-doc/wsjt-x-main-1.7.0.html>
- WSJT-X main web site
 - <http://physics.princeton.edu/pulsar/k1jt/wsjt-x.html>



Questions?



Demonstration

- FT-8 – 25 watts to a G5RV at approximately 40 feet.