

An Introduction and My Experience Sam Howard KV4XY April 27, 2020

### Thanks to:

- K1JT, Joe Taylor
- KP4MD, Carol Milazzo
- KB9AMG, Mark Diedrich

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# Joe Taylor, K1JT



Nobel Prize in Physics Laureate Physics, Astronomy, Applied Mathematics Author of the WSJT software package for long distance low power weak signal communications (includes WSPR, JT65, and other modes)

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No. 6, 10.0         File           No. 6, 10.0         File	WSPR		

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WSJT-X WSJT

MAP65

WSPR SimJT

References

Support

Program Development

### Description

WSPR implements a protocol designed for probing potential propagation paths with low-power transmissions. Normal transmissions carry a station's callsign, Maidenhead grid locator, and transmitter power in dBm. The program can decode signals with S/N as low as -28 dB in a 2500 Hz bandwidth. Stations with internet access can automatically upload their reception reports to a central database called <u>WSPRnet</u>, which includes a mapping facility. To see a live version of the map pictured at top right, click <u>here</u>.

**WSJT-X** now includes WSPR among its many supported modes. Most operators will be best served by using WSJT-X for WSPR as well as for any of the two-way communication modes.

**WSPR 2** is showing its age but is still perfectly usable. It may be especially desirable if you need a lightweight program that runs on older computers. It features a user-friendly setup screen with drop-down selection of audio devices and rig-control parameters, support for compound callsigns, fine selection of the fractional time for transmitting, and a *Tune* button. A new *Advanced* setup screen offers optional CW identification and tools for frequency calibration and automated frequency corrections for your radio. Full details are presented in the <u>WSPR 2.0 User's Guide</u>. Binary installation package is made available for Ubuntu Linux (versions 8.10 and later), Debian 5.03, and other Debian-based 32-bit Linux distributions.

WSPR 2.11 and WSPR 2.12 include these enhancements over WSPR 2.0:

- Support for software-defined receivers and transceivers that use complex (I/Q) sampling, such as the popular SoftRock kits.
- FMT, a package of command-line programs designed for use in the ARRL Frequency Measuring Test and similar frequency-measuring tasks.

### **Downloads**

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### **KB9AMG's Top WSPR Spots**

2-way WSPR Reports - March 2020

WSPR Spots Stats - March 2020

WSPR Grids - Archive

TX Summaries - RX Summaries

Band Reports - Maximum km - Unique

Top km/Watt - <u>LF MF 160m 80m 60m 40m 30m 20m</u> Top km/Watt - <u>17m 15m 12m 10m 6m 4m 2m 70cm 23cm</u>

Propagation - <u>LF MF 160m 80m 60m 40m 30m 20m</u> Propagation - <u>17m 15m 12m 10m 6m 4m 2m 70cm 23cm</u>

2-way WSPR Reports - 1 -- February 2020-- 3456789101112

WSPR Spots Stats - February 2020

Top WSPR Spots - <u>February 2020</u> Top WSPR Spotters - <u>February 2020</u>

WSPRnet Home - <u>wsprnet.org</u> WSPR Challenge - <u>wspr.pe1itr.com</u> M0XDK Real-time WSPR Map - <u>wspr.aprsinfo.com</u> VK7JJ Real-time WSPR Map and Charts - <u>wspr.vk7jj.com</u> WA2ZKD Real-time WSPR Spot Analysis - <u>www.wa2zkd.net:8088</u>



## WSPR Purpose

Purpose – to probe potential radio propagation paths using low-power beacon-like transmissions.
Transmission format – call sign + grid square + power level (dBm) e.g. "KP4MD CM98 37"

### Maidenhead Locator Fields AA-RR

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AR	BR	CR	DR	ER	FR.	GR-	HR	IR	JR	KR	LR	MR	NR	OR	PR	QR	RR
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AA	-BA	CA	DA	EA	FA	GA	HA	IA	JA	KA	LA	MA	NA	OA	PA	QA <sub>bs</sub>	JPSERF



# dBm to Watts equivalents

dBm	W	mW
0	0.001	1
10	0.01	10
20	0.1	100
30	1	1,000
40	10	10,000
50	100	100,000



## WSPR Mode

Modulation - compressed data format with strong forward error correction and narrow-band 4-FSK modulation. (6 Hz bandwidth)
The protocol is effective at signal-to-noise ratios as low as -28 dB in a 2500 Hz bandwidth.

WSPR



## Relative sensitivity of modes

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Mode	S/N Required	Power example
WSPR	-27dB	5W
Olivia	-17dB	50W
PSK31	-7dB	500W
RTTY	+5dB	8,000W
SSB	+10dB	25,000W



### WSPR

Receiving stations with internet access automatically upload reception reports to a central database at http://wsprnet.org

# http://wsprnet.org/drupal/wsprnet /spot



#### **User login**

online.

Username \*

Passw

#### Spot Database

#### Specify query parameters

200 spots:

Password *	Timestamp	Call	MHz	SNR	Drift	Grid	Pwr	Reporter	RGrid	km	az
	2020-03-18 19:28	KV4XY	14.097046	-17	0	EM75vu	5	KPH	CM88mc	3426	286
Create new account	2020-03-18 19:28	KV4XY	14.097044	0	0	EM75vu	5	WD0E	DM79qm	1838	289
Request new password	2020-03-18 19:28	KV4XY	14.097047	-23	0	EM75vu	5	ND7M	DM16xf	2849	280
	2020-03-18 19:28	KV4XY	14.097046	-26	0	EM75vu	5	IZ6198SWL	JN61vq	8031	51
Log in	2020-03-18 19:28	KV4XY	14.097075	-10	-1	EM75vu	5	N1ZPY	FN64cq	1699	50
	2020-03-18 19:28	KV4XY	14.097047	-10	0	EM75vu	5	N6GN/K	DN70II	1887	292
Fraguanaiaa	2020-03-18 19:28	KV4XY	14.097048	-27	0	EM75vu	5	DJ9PC	JN59po	7415	45
Frequencies	2020-03-18 19:28	KV4XY	14.097046	-16	0	EM75vu	5	KK6PR	CN94ik	3262	299
USB dial (MHz): 0.136, 0.4742,	2020-03-18 18:42	KV4XY	7.040048	-24	0	EM75vu	5	N8TWX	EN82bw	788	2
1.8366, 3.5686, 5.2872, 5364.7,	2020-03-18 18:42	KV4XY	7.040080	-9	0	EM75vu	5	K4JOP	EM72go	379	198
7.0386, 10.1387, 14.0956,	2020-03-18 18:42	KV4XY	7.040039	-6	0	EM75vu	5	AD0MO	EM48	672	298
18.1046, 21.0946, 24.9246,	2020-03-18 18:42	KV4XY	7.040037	-16	0	EM75vu	5	WA2ZKD	FN13ed	987	33
20.1240, 50.295, 70.091,	2020-03-18 18:42	KV4XY	7.040036	-22	0	EM75vu	5	K2JY	EM40	872	229
144.403, 432.300, 1230.300	2020-03-18 18:42	KV4XY	7.040060	-18	0	EM75vu	5	K5CZD	EM32vn	821	246
	2020-03-18 18:42	KV4XY	7.040021	-27	0	EM75vu	5	WB1BQE	FN42ht	1345	51
Navigation	2020-03-18 18:42	KV4XY	7.040035	-19	0	EM75vu	5	KG5ZDA	EM12qw	1184	258
Forume	2020-03-18 18:42	KV4XY	7.040036	-20	0	EM75vu	5	KH6RD	EM71di	519	196
i oruma	2020-03-18 18:42	KV4XY	7.040062	-4	0	EM75vu	5	WS3W	FM19ng	749	57
	2020-03-18 18:42	KV4XY	7.040036	-17	0	EM75vu	5	W5TSU	EM15em	1211	272
3rd Party Maps and Data	2020-03-18 18:42	KV4XY	7.040044	-22	0	EM75vu	5	W2GNN	FN20qh	973	57
M0XDK Map	2020-03-18 18:42	KV4XY	7.040045	-26	0	EM75vu	5	WM1N	FN41sp	1353	57
KB9AMG Monthly Stats	2020-03-18 18:42	KV4XY	7.040022	-17	0	EM75vu	5	KC8JNV	EN11vd	1197	303
WA2ZKD Spot Analysis	2020-03-18 18:42	KV4XY	7.040035	-12	0	EM75vu	5	WO2S	FM05pv	496	88
	2020-03-18 18:42	KV4XY	7.040048	-17	0	EM75vu	5	N4TVC	FM18is	692	60
Who's online	2020-03-18 18:42	KV4XY	7.040035	-1	0	EM75vu	5	N8AUM	EM70em	607	193
who s online	2020-03-18 18:42	KV4XY	7.040130	-26	0	EM75vu	5	KD2LZI	FN22vt	1155	45
There are currently 87 users	2020-03-18 18:42	KV4XY	7.040032	-16	0	EM75vu	5	K3KQV	FN00	684	40
online.	2020-03-18 18:42	KV4XY	7.040037	-22	0	EM75vu	5	N4JJS	FM05on	490	92

# http://wsprnet.org/drupal/wsprnet /map





### **WSPR** Frequencies

The default USB dial frequencies (MHz): 0.136\*, 0.4742\*, 1.8366, 3.5926, 5.2872\*, 7.0386, 10.1387, 14.0956, 18.1046, 21.0946, 24.9246, 28.1246, 50.293, 70.091\*, 144.489, 432.300, 1296.500 200 Hz segment in each band \*frequencies not authorized in U.S.

### WSPR – Station requirements

- SSB receiver or transceiver and antenna
- Computer running the Windows, Linux, FreeBSD, or OS X operating system.
- 1.5 GHz or faster CPU and at least 100 MB of available RAM
- Monitor with at least 800 x 600 resolution
- Sound card supported by your operating system and capable of 48 kHz sample rate

### WSPR – Station requirements

- If you will transmit as well as receive, an interface using a serial port to key your PTT line or a serial cable for CAT control. Alternatively, you can use VOX control.
- Audio connection(s) between receiver/transceiver and sound card
- A means for synchronizing your computer clock to UTC

## Sound Card Digital Modes



### **Receive only configuration**

Diagram courtesy West Mountain Radio

## Sound Card Digital Modes



This basic configuration is the same for all sound card digital modes – PSK31, WSPR, JT63, etc.

Diagram courtesy West Mountain Radio

### **Rigblaster Soundcard Interface**



Photo courtesy West Mountain Radio

## SignaLink Soundcard Interface





### Ultimate3S kit

Details Created: 12 May 2015 Last Updated: 30 October 2018 Hits: 222751



The Ultimate3S QRSS/WSPR Transmitter Kit is the new edition of the third version in the "Ultimate" QRSS/WSPR kit trilogy. It can produce QRSS, Hell, WSPR, Opera and Pl4 slow-signal modes anywhere from 2200m to 2m and even 222MHz bands. Plug-in LPF filters are available for all 16 HF/MF/LF/VHF bands from 2200m to 222MHz.

Click! Shop order \$33

The U3S kit was launched in January 2015. It is the new edition of the earlier U3 kit produced from November 2013 to December 2014. The U3S uses an Si5351A frequency synthesiser kit rather than the pre-built AD9850 DDS kit used in the earlier U3 kit. The AD9850 DDS kit prices are rising and they are becoming less easily available. The Si5351A frequency synthesiser kit was developed to ensure continued low cost of the Ultimate QRSS/WSPR kit series.

Please also see the original version Ultimate QRSS kit and Ultimate2 QRSS kit pages, and the earlier U3 kit page to appreciate the heritage. Much of the information in these earlier pages is still relevant and informative.

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# WSPR Raspberry Pi



# http://mardie4.100webspace.net/2 \_way\_wspr\_reports/KV4XY-EM75.html



Band	Reports	Rank		
LF/VLF				
160m				
8 Om				
60m				
4 Om	225	46		
30m	26	172		
20m	126	50		
17m				
<b>15m</b>				
<b>12m</b>				
1 Om				
6m				
<b>4m</b>				
2m				
$70\mathrm{cm}$				
23 cm				
Total =	= 377	Reports	 (Rank	61)
Number	of Grid	Squares	 158	

### https://maps.dj2ls.de/#band=14&#time=15&#grid=EM75vu





]	EM75 Mag	- <u>WSPR Grids</u> - <u>EM</u> - EM75	
I			
	Spots	Calls Reporter-Grid	
	28335 9733 6183 609 2270 162 45 27 207 30	3074 <u>KV4XY-EM75vu</u> (Mar 1-17) 798 <u>W4JRZ-EM75jd</u> (Mar 1,4-5,7-11) 272 <u>KW4KD-EM75jc</u> (Mar 3-5) 112 <u>W4PGM-EM75vu</u> (Mar 12) 86 <u>KU4XR-EM75xr</u> (Mar 1-2,5-9,11-12,16-17) 43 <u>WK9M-EM75us</u> (Mar 1) 37 <u>WA4MXF-EM75us</u> (Mar 1) 25 <u>KN4TFR-EM75wr</u> (Mar 5,15) 16 <u>KU4XR/15-EM75xr</u> (Mar 1-2,5-9,16) 4 <u>KU4XR-15-EM75xr</u> (Mar 16-17) <b>v</b>	
י ר	Top WSPR S	otters - EM75 - FEB 1-29 2020	
	Spots	Calls Reporter-Grid	
	31242 1561 5861 353 77 25 20 25 11	<pre>4138 KV4XY-EM75vu (Feb 1-29) 187 W4JRZ-EM75jd (Feb 2-4,29) 133 KU4XR-EM75xr (Feb 1,3-6,10-16,20-21,23,27-28 109 WK9M-EM75us (Feb 1-2) 33 WA4GLH-EM75jd (Feb 8,11) 21 KK4DBN-EM75wo (Feb 10) 17 KN4TFR-EM75ww (Feb 1) 16 AC62M-EM75ur (Feb 2) 1 KU4XR/15-EM75xr (Feb 27)</pre>	;)







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