

# W S P R

**W**eak **S**ignal **P**ropagation **R**eporter

*An Overview*

John Leahy  
KK4ITX



# Questions on a Ragchew Net

4/3/2019

- How can I measure one antenna against another ?
- Which Bands are really open for me ?
- Which of my antennas will work for someplace ?
- Is my new design better or not ?
- Better RX or TX ?
- I don't hear anybody, is my system OK ?
- All of these questions may be answered with **WSPR**.



# WSPR

- Tonight I will cover WHAT **WSPR** is, not details how to use the various options.
- Use your current computer and HF/VHF/UHF rig, with or without a sound-card.
- Use a Raspberry Pi and an HF/VHF/UHF rig or NOT. (2)
- Use a SOTABEAM self contained unit, 20m/30m.(3)



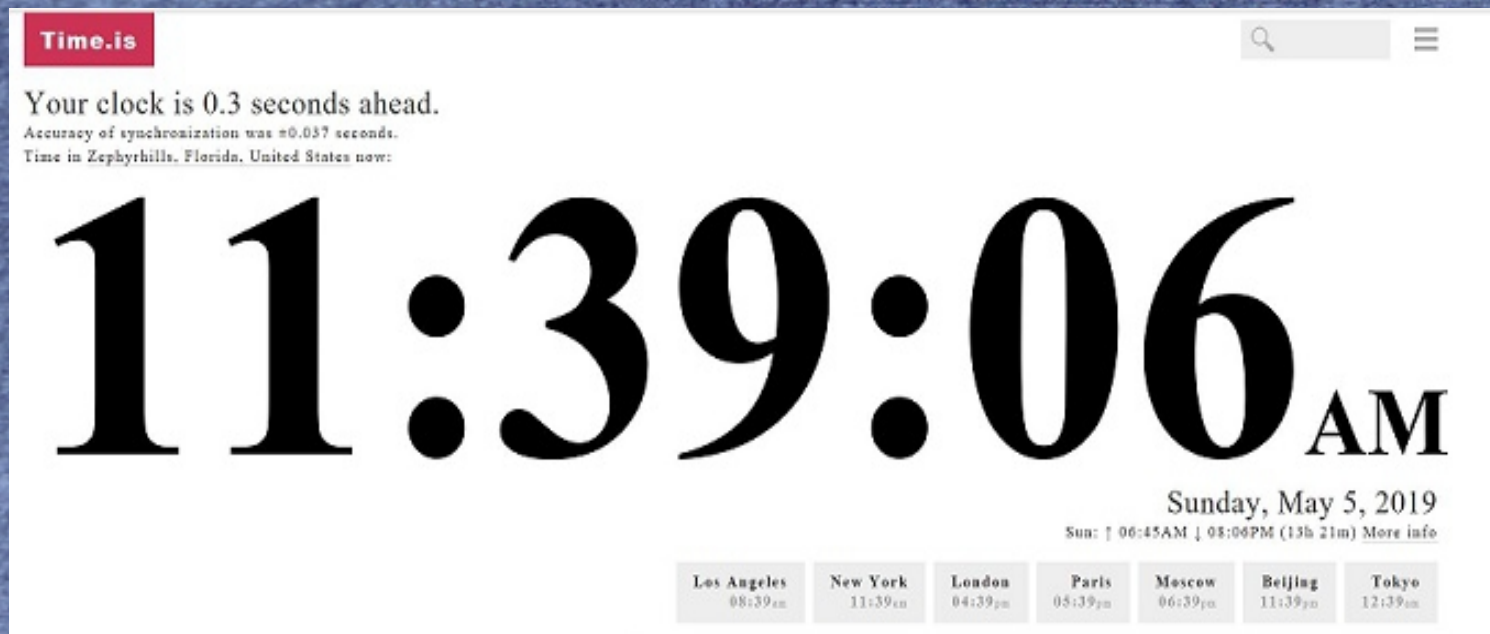
## How **WSPR** Works

- Joe Taylor (K1JT) (1) developed software and a unique digital protocol that evolved into:
- “a group of amateur radio operators using K1JT's MEPT\_JT digital mode to probe radio frequency propagation conditions using very low power (QRP/QRPP) transmissions.” **All around the world !**
- They were so successful, you need less than 5w to be heard thousands of miles away..... in minutes.
- Download the WSJT-X software to a Windows computer, put in some details about you and go !



## How **WSPR** Works

- Fortunately all we need to use this mode, is the **FREE** software an HF/VHF/UHF radio with VOX or a sound-card and near perfect timing.
- **Time.Is** is a program that can help set your computer timing. Many others out there.



The screenshot shows the Time.is website interface. At the top left is the 'Time.is' logo. To the right are search and menu icons. The main content area displays the following text:

Your clock is 0.3 seconds ahead.  
Accuracy of synchronization was  $\pm 0.037$  seconds.  
Time in Zephyrhills, Florida, United States now:

# 11:39:06<sub>AM</sub>

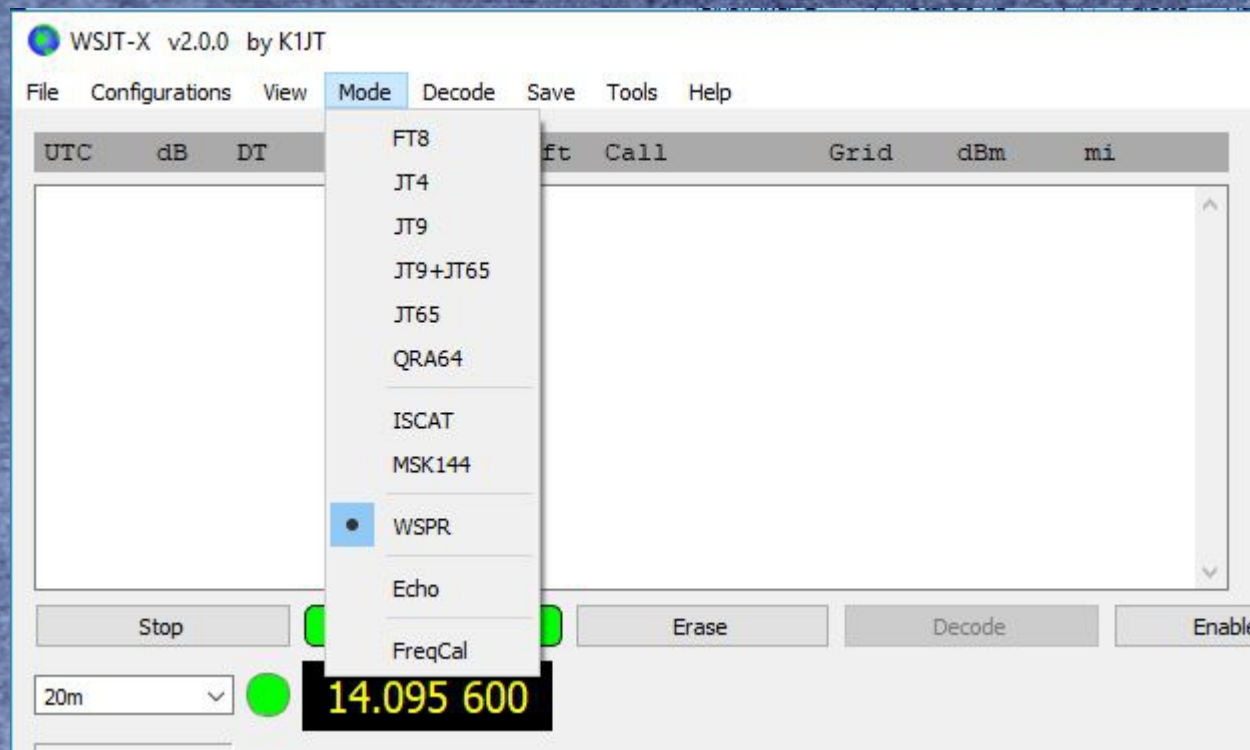
Sunday, May 5, 2019  
Sun: ↑ 06:45AM ↓ 08:08PM (13h 21m) [More info](#)

Los Angeles	New York	London	Paris	Moscow	Beijing	Tokyo
08:39 <sub>AM</sub>	11:39 <sub>AM</sub>	04:39 <sub>PM</sub>	05:39 <sub>PM</sub>	06:39 <sub>PM</sub>	11:39 <sub>PM</sub>	12:39 <sub>AM</sub>



## How WSPR Works

- **TIME IS** very important. Set your computer to one of the Time Servers like: <https://time.is>
- Load up WSJT-X software, go to File & Settings and fill in the blanks.
- On the working screen you'll see.





## How WSPR Works

- (1) Mode to WSPR (2) Set Volume about mid scale (3) Tune your radio to Frequency indicated (4) Check "Upload Spots" (5) Click on Monitor

The screenshot shows the WSJT-X v2.0.1 software interface. The main window displays a table of received WSPR spots with the following columns: UTC, dB, DT, Freq, Drift, Call, Grid, dBm, and mi. The table contains 15 rows of data. Below the table are several control buttons: Stop, Monitor (highlighted in green), Erase, Decode, Enable Tx, Halt Tx, and Tune. A checkbox for 'Menus' is also visible. On the left side, there is a volume control slider set to 52 dB. In the center, the frequency 14.095 600 is displayed in a large yellow font. On the right side, there are settings for Tx (1455 Hz), Tx Pct (100 %), and a power level of 37 dBm 5 W. A 'Schedule ...' button is also present. At the bottom left, a green bar indicates 'Receiving' and a pink bar indicates 'WSPR'. The date and time '2019 May 05 15:30:06' are displayed in a black box. The bottom right corner shows '6/120'.

UTC	dB	DT	Freq	Drift	Call	Grid	dBm	mi
1520	-28	1.0	14.097099	0	WB2CPU	FN42	23	1167
1522	-7	2.8	14.097019	0	<W7CRK>	DM43EG	37	1783
1522	-14	0.5	14.097062	0	WD9EPF	EN61	33	956
1522	-17	0.5	14.097085	0	K4HAS	FM09	20	799
1522	-27	2.0	14.097119	0	WP4BQV	FM18	37	769
1522	-21	0.3	14.097146	-1	W4NSF	EM85	37	505
1524	-17	-0.8	14.096994	2	PA0NKK	JO22	30	4590
1524	-24	0.3	14.097058	0	<...>	EN42BA	37	1098
1524	-10	0.3	14.097066	0	<...>	EN42BA	37	1098
1524	-11	0.7	14.097097	0	VE3GEN	EN96	33	1263
1528	-19	0.4	14.097056	0	W8APS	EN82	20	986
1528	-20	0.4	14.097110	1	VE2TCK	FN35	37	1294



- Once loaded you can either RX (suggested) or TX.
- Like anything there is a learning curve but the JT software is easy to figure out.
- There are a lot of Modes to choose from but select **WSPR** for now.
- Note that the FREQUENCY is shown for the BAND you have selected..... be sure to use only it. Works for all modes and Bands be sure your radio is tuned.
- After you set your HF Rig to the FREQUENCY you should start to see Calls, Signals, Distances and Times on the Rolling Log.



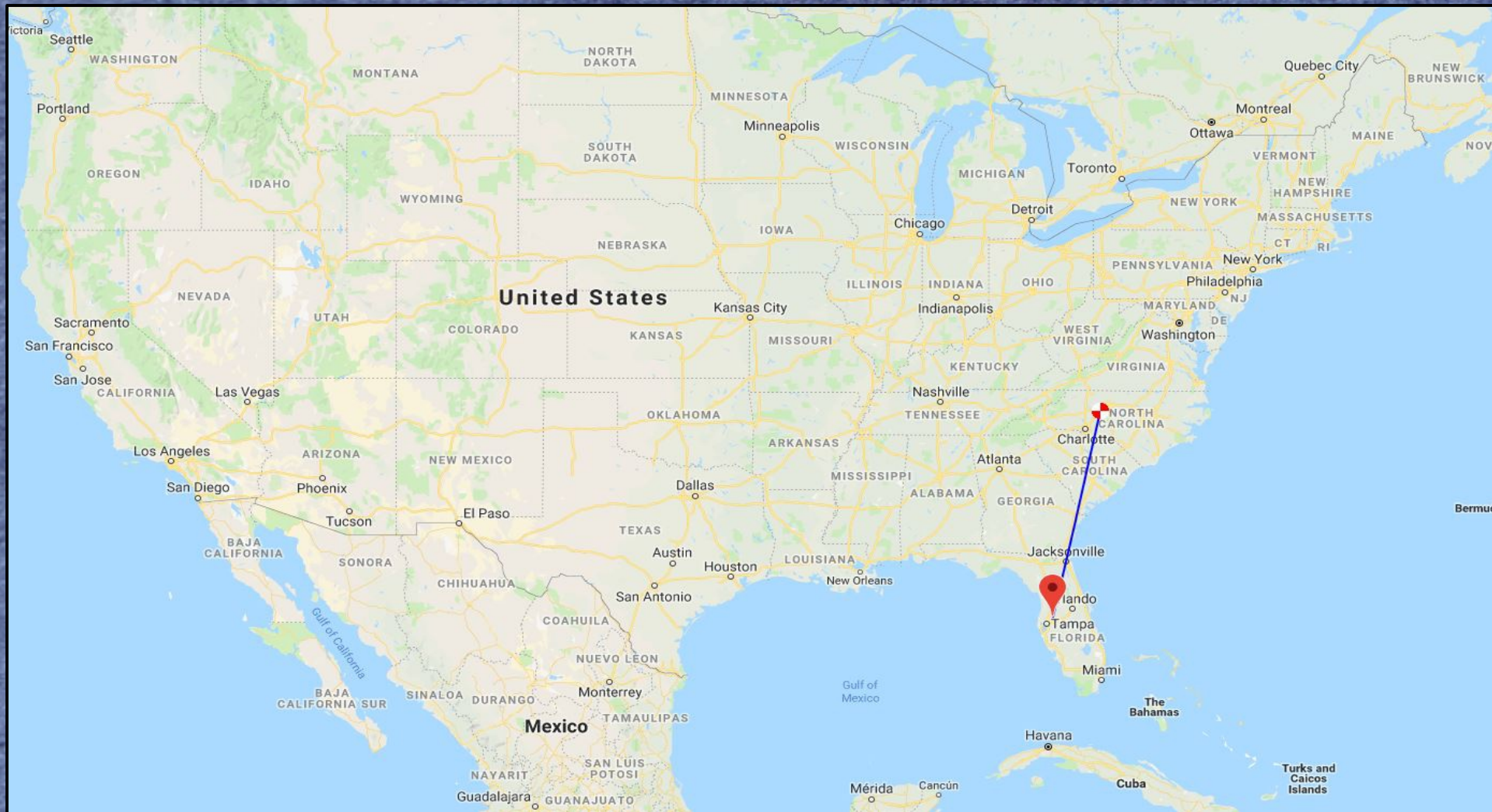
## How **WSPR** Works

- Many programs are available to see how you are transmitting by the use of SKIMMERS.
- Reverse Beacon Network (CW) had 53 Skimmers in the USA on (May 5), 22 had no Spots in previous hour.
- You not only need to know CW but it must be sent fairly cleanly to be picked up and reported by the Skimmer.
- I worked CW for 20 mins on Apr. 5 before AA4VV in NC decoded me. Some of it was probably poor CW on my part ?
- A few minutes later after running a single 2 minute sequence of WSPR, 28 stations spotted me at the same 5w, as the next few slides show.



# How WSPR Works

- Reverse Beacon Network result..... 20 mins: CQ CQ CQ DE KK4ITX KK4ITX K



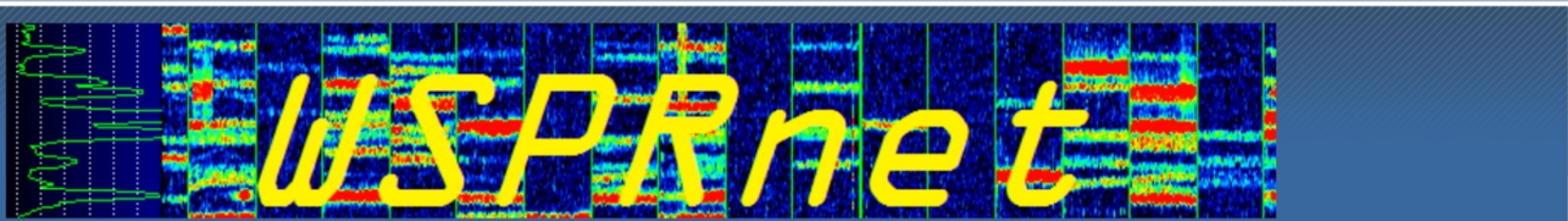


# April 5, 2019 – TX Single Run (WSPRnet Report)

13:49 Fri Apr 5 98%

wsprnet.org

.. sa... vk3ye dot... Checkout WSPRnet |... Invoice Su... POTA Spot... MFJ Enter... wspr WSPRn... | WSP... h - Bing



## WSPRnet

Welcome to the Weak Signal Propagation Reporter Network

Chat | Activity | Map | Database | Stats | Forum | Downloads

My account | Log out

### Frequencies

USB dial (MHz): 0.136, 0.4742, 1.8366, 3.5686, 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

### Spot Count

1,387,014,231 total spots  
1,152,975 in the last 24 hours  
59,176 in the last hour

### Navigation

- ▶ Add content
- ▶ Forums

### 3rd Party Maps and Data

The Weak Signal Propagation Reporter Network is a group of amateur radio operators using K1JT's MEPT\_JT digital mode to probe radio frequency propagation conditions using very low power (QRP/QRPP) transmissions. The software is open source, and the data collected are available to the public through this site.

Submitted by W1GJM  
on Fri, 2018/09/14 - 16:12

### Please note 80m frequency change to 3.5686 MHz (USB)

**Forums:**  
General

Please note, the WSPRNet site has been updated to reflect the change to the 80m WSPR frequency which is now 3.568600 MHz USB.

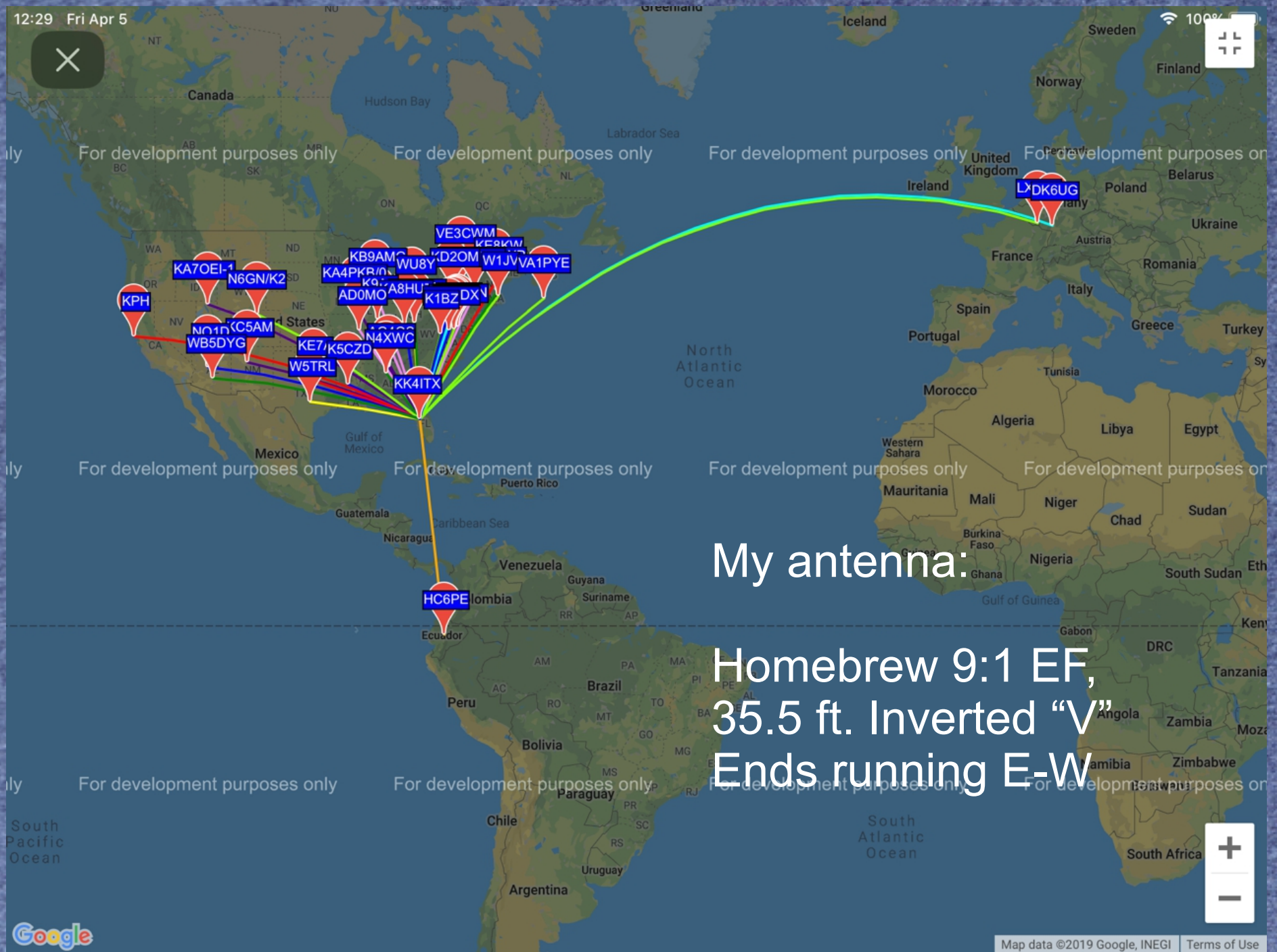
Thank you to K1JT and G4ZFQ for pointing this out.

73 Gary W1GJM

[Read more](#) [15 comments](#) [1 new comment](#) [Add new comment](#)



# April 5, 2019 – TX Single Run (WSPRnet Report)



My antenna:

Homebrew 9:1 EF,  
35.5 ft. Inverted "V"  
Ends running E-W




# How WSPR Works

- This is a FREE App by Peter Marks ( VK2TPM), for the Ipad. It also has TX capabilities..... be sure that you are on **correct frequency if you TX** !
- Uses info from WSPRnet and presents data for the Ipad/Iphone.

Safari 13:48 Fri Apr 5 98%

[← Today](#)




## WSPR watch

Simple utility to show spots

[OPEN](#)

4.9 ★★★★★ 4+

15 Ratings Age



---

### What's New

Can narrow to search for a selected callsign within current data.

[Version History](#)

2w ago

Version 3.4.1

---

### Preview

Carrier: WSPR Watch

Dec 28 02:30 - 10 mins ago  
VK2RG VK2TPM 14.097040  
2015.12.28 02:30, 2148km, -20dB, 21W

ZL3DMH VK2TPM 14.097177  
2015.12.28 02:30, 2148km, -9dB, 430uW

Dec 28 02:24 - 16 mins ago  
ZL3DMH VK2TPM 14.097176  
2015.12.28 02:24, 2148km, -17dB, 430uW

Dec 28 02:22 - 18 mins ago  
VK2TPM VK5AR 14.097047  
2015.12.28 02:22, 1132km, -7dB, 565uW

VK2TPM ZL4JW 14.097751  
2015.12.28 02:22, 1956km, -14dB, 998uW

VK2TPM ZL3DMH 14.097052  
2015.12.28 02:22, 2148km, -22dB, 1074uW

VK2TPM ZL3DMH 14.097052  
2015.12.28 02:22, 2148km, -22dB, 1074uW

VK2TPM VK5AR 14.097047  
2015.12.28 02:22, 1132km, -7dB, 565uW

VK2TPM ZL4JW 14.097751  
2015.12.28 02:22, 1956km, -14dB, 998uW

Dec 28 02:16 - 24 mins ago  
ZL3DMH VK2TPM 14.097176  
2015.12.28 02:16, 2148km, -15dB, 430uW

Dec 28 02:14 - 26 mins ago  
ZL2AS VK2TPM 14.097082  
2015.12.28 02:14, 2344km, -27dB, 1172uW

Dec 28 02:12 - 28 mins ago  
VK2SRD VK2TPM 14.097060  
2015.12.28 02:12, 180km, -10dB, 40W

Dec 28 02:10 - 30 mins ago  
VK2RG VK2TPM 14.097041

Carrier: WSPR Watch

Reported by: VK2TPM

Heard: VK2RG

Date: 2015-12-28 02:30

Frequency: 14.097040

SNR: -28

Drift: -1

Grid: QF56nc

dBm: 30.000000

Watts: 1

Location: QF56of

Km: 21

M: 13.048791

Km/W: 21

Carrier: WSPR Watch

Dec 28 02:30 - 10 mins ago  
VK2RG VK2TPM 14.097040  
2015.12.28 02:30, 2148km, -20dB, 21W

ZL3DMH VK2TPM 14.097177  
2015.12.28 02:30, 2148km, -9dB, 430uW

Dec 28 02:24 - 16 mins ago  
ZL3DMH VK2TPM 14.097176  
2015.12.28 02:24, 2148km, -17dB, 430uW

Dec 28 02:22 - 18 mins ago  
VK2TPM VK5AR 14.097047  
2015.12.28 02:22, 1132km, -7dB, 565uW

VK2TPM ZL4JW 14.097751  
2015.12.28 02:22, 1956km, -14dB, 998uW

VK2TPM ZL3DMH 14.097052  
2015.12.28 02:22, 2148km, -22dB, 1074uW

VK2TPM ZL3DMH 14.097052  
2015.12.28 02:22, 2148km, -22dB, 1074uW

VK2TPM VK5AR 14.097047  
2015.12.28 02:22, 1132km, -7dB, 565uW

VK2TPM ZL4JW 14.097751  
2015.12.28 02:22, 1956km, -14dB, 998uW

Dec 28 02:16 - 24 mins ago  
ZL3DMH VK2TPM 14.097176  
2015.12.28 02:16, 2148km, -15dB, 430uW

Dec 28 02:14 - 26 mins ago  
ZL2AS VK2TPM 14.097082  
2015.12.28 02:14, 2344km, -27dB, 1172uW

Dec 28 02:12 - 28 mins ago  
VK2SRD VK2TPM 14.097060  
2015.12.28 02:12, 180km, -10dB, 40W

Dec 28 02:10 - 30 mins ago  
VK2RG VK2TPM 14.097041

Today
 Games
 Apps
 Updates 7
 Search







# April 5, 2019 – TX Single Run (Ipad Report)

13:46 Fri Apr 5

99%

kk4itx → 20m 12h 28 spots



Search spots

Cancel

2019-04-05 16:04 (1:42 ago)

KK4ITX 2019-04-05 16:04	KD3FG	14.097029 1286km 5W -9dB
KK4ITX 2019-04-05 16:04	KE7A	14.097091 1528km 5W -6dB
KK4ITX 2019-04-05 16:04	K9AN	14.097088 1430km 5W -16dB
KK4ITX 2019-04-05 16:04	N2HQI	14.097106 1722km 5W -16dB
KK4ITX 2019-04-05 16:04	KC2STA1	14.097090 Drift -1 1787km 5W -24dB
KK4ITX 2019-04-05 16:04	DK6UG	14.097088 7685km 5W -29dB
KK4ITX 2019-04-05 16:04	N4XWC	14.097096 768km 5W -12dB
KK4ITX 2019-04-05 16:04	KA8HUZ	14.097106 1260km 5W -20dB
KK4ITX 2019-04-05 16:04	K3FOX	14.097089 1335km 5W -8dB
KK4ITX 2019-04-05 16:04	AD0MO	14.097094 1407km 5W -23dB
KK4ITX 2019-04-05 16:04	VA1PYE	14.097088 2246km 5W -14dB
KK4ITX 2019-04-05 16:04	WB5DYG	14.097118 2856km 5W -27dB
KK4ITX 2019-04-05 16:04	K5CZD	14.097099 1000km 5W -10dB

28 spots





## How **WSPR** Works

- If your “shack” is in a quiet area AND your rig has VOX you don't really need much else to make it all work. Set your radio to VOX and position your mic near the speakers and set volume to trip the transmitter. If you have Signal Link or another box it's better but it's not required.
- To hear (RX) your computer microphone should work OK, may have to adjust the Audio Settings.
- **WSPR** is a tool to help you see what bands are open and how you're system is working and lets you compare antennas easily.
- Competition with your neighbor ???



## How WSPR Works

- WSPRLITE is a product of SOTA Beam (Summits on the Air) and offers a self contained TX only on the 20m & 30m bands. Once programmed with your Call & Grid via computer simply supply 5v, connect your antenna and push the start button at 1 sec after an even minute.
- Program it to TX at 5 mw to 200 mw for 1 to 30 days
- Results are shown on WSPRnet, Ipad or the program by SOTABeam.

June 6, 2017 Minnesota to  
ZL1RS, Bob Sutton, New  
Zealand, **200 mw**, 8,052  
miles from a Minnesota valley  
on a 17ft telescope and Wolf  
River Coil.





## How **WSPR** Works

- **Raspberry Pi & WSPR**

A “Shield” to mount on your Raspberry Pi.

Produced by TAPR fully assembled and tested.

Around \$29 + Shipping

Raspberry Pi **NOT** included.





## How WSPR Works

- Sound Cards (boxes) are easy to hook up and allow for quiet operation. They are all priced about the same.





- Download the software and try WSPR yourself.
- We'll re-visit in the Fall, if you need additional help we can have a “session” prior to a meeting.
- Contest for fun ? Set up for the Fall.
- All at SAME time, frequency, TX, RX. Email data, and antenna info, compare and publish results on the Website/Blog.
- This would be a LEARNING Experience not for position.



# REFERENCES

- (1) WSPR Info.: <http://physics.princeton.edu/pulsar/K1JT/>
- (2) Raspberry Pi : [https://tapr.org/kits\\_20M-wspr-pi.html](https://tapr.org/kits_20M-wspr-pi.html)
- (3) SOTABEAMS: <https://www.sotabeams.co.uk/wsprlite-antenna-tester/>
- 
- WSJT-X Software: <https://sourceforge.net/projects/wsjt/>
- WSPRNet : <http://wsprnet.org/drupal/>
- Time : <https://time.is>
- West Mountain Rig Blaster: [www.westmountainradio.com](http://www.westmountainradio.com)
- MFJ: <https://www.mfjenterprises.com/>