



A HamSCI Experiment

NVARC and the Eclipse

Join us!

Background

Pepperell MA, 20 April 2017. The Nashoba Valley ARC (NVARC) was hosted for its April meeting by member Dr Phil Erickson, W1PJE, at the MIT Haystack Observatory. Highlights of the meeting included a talk on E-skip by club member Joe Dzekevich, K1YOW, discussions with 25 visiting students from the University of Pennsylvania, and a tour of the Haystack radiotelescope.

Also at the meeting Dr Erickson and Stan Pozerski, KD1LE, announced a new cooperative arrangement between NVARC and Haystack which will encompass (among other things yet to be proposed) mutual outreach to youth, the possibility of joint EME activities, **and the conduct of “HamSCI” experiments.**



An Exciting Association



What is this HamSCI all about?

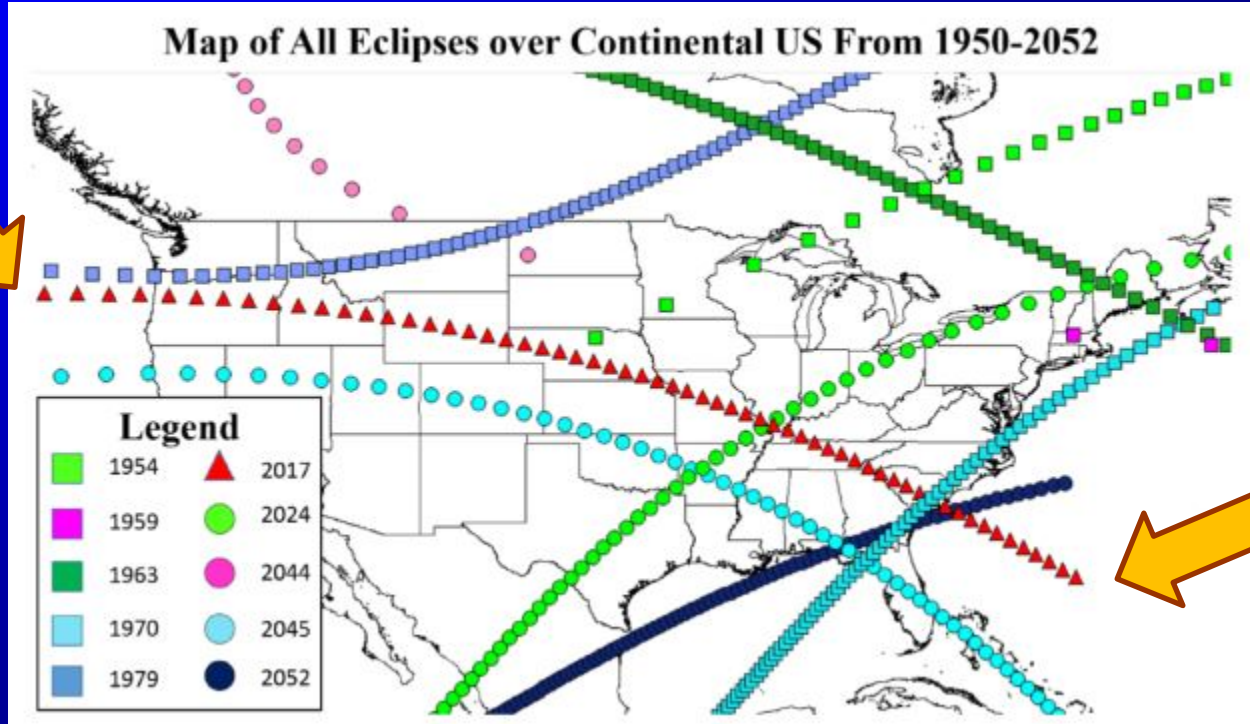
The logo for HamSCI, featuring the text "HamSCI" in a white, serif font with diacritical marks (dots and lines) under the letters, set against a dark rectangular background.

The HamSCI (Ham Radio Science Citizen Investigation, www.hamsci.org/) goal is to advance the field of radio science.

An upcoming experiment is a collaboration between HamSCI, ARRL, and the scientific community to collect data to advance the understanding of D- and E-layer propagation.



There's an Eclipse Coming



On 21 August 2017, a total solar eclipse will cause the shadow of the moon to traverse the United States from Oregon to South Carolina in just over 90 minutes.

NEXT CHANCE – SEVEN YEARS AWAY!



The 21 August Experiment

- HamSCI will collect a large data set from the larger “citizen population” that would not otherwise be available for the Ham and Scientific Community.
- There is no specific theory or premise supposed here.
- This data will be used to advance our understanding of D- and E- layer propagation.



The Experiment

- Behind the experiment is the challenge to take data from a variety of “semi-scientific” sources and combine it into useful information for analysis
- The sources here are the Solar Eclipse QSO Party contact logs, the Reverse Beacon Network, and the WSPRnet database



Many Ways to Participate

- 1. (EASIEST) Get on the air and make contacts on 160 to 6 meters 1400 – 2200z (but not 60m or the WARC bands).**
 - Modes include CW, Digital and phone. In digital modes send data to PSKReporter if it is an option
 - Transmission format “CQ CQ TEST DE callsign” for best automated receiving. The exchange is receiving callsign, signal report, six character grid locator, your callsign. Actual Signal strength preferred but 59 or 599 OK
 - Log in software that supports SEQP or ARRL VHF contest exchange. More on SEQP website.
 - Submit a log of your contacts



Many Ways to Participate

2. (EASY) Set up WSPR on any sound card configured radio and computer. Monitor (receive only) and report.

- No CAT, antenna switching, or tuning issues
- An advantage of WSPR is it runs continuously so more data will be collected
- With an Internet connection WSPR data can be automatically uploaded to the WSPRnet database
- But you won't get any QSL cards.



Many Ways to Participate

3. (MORE CHALLENGING) Activate a WSPR beacon

- Any band(s), 160 to 6 meters (but not 60m)
- Automatically upload reports
- You'll be both a signal and an information source!

4. (WICKED) An even more complex way is to build and operate a multi-band beacon like the QRP Labs Ultimate3. And add a monitor station... And get on the air, too...

5. (AWESOME) Help others get set up.



How to Create Data

- **Set up as many Internet-connected monitor stations as possible.**
- **Put the most stations on the air from 1546Z ^{1146L} to 2104Z ^{1704L} on 21 August.**
 - Better if WSPR beacon stations were on for at least a few hours before and after that time.
 - Even better a day either side of that date for reference.
- **Coordinate our activity so we are not all doing the same thing (band or mode)**



How to Best Support

- **Run WSPR in a single band mode. This gives the finest data resolution over time. (WSPR operates on a 2 minute period which may be transmit or receive starting on the even minutes)**
- **Set up on a band 160-6 meters.**
 - **40, 20, and 10 meters have the most current activity so try activating other bands.**
- **Use a power setting of five watts or less**



Conclusion

- ☞ **Join in! Identify a local coordinator. Let Phil or HamSCI know you're participating.**
 - Participation can be simple by just making contacts and submitting your log.
- ☞ **There should be a level that everyone can participate and contribute.**

***My personal goal is for NVARC to run 15 WSPR stations.
We have twelve WSPR and one QRPLabs beacon committed.***



References and Links

- ☞ Solar Eclipse Project <http://hamsci.org/eclipse>
- ☞ Solar Eclipse QSO Party (<http://hamsci.org/seqp>)
- ☞ WSPRnet homepage <http://wsprnet.org/drupal/>
- ☞ Source for WSPR
<https://physics.princeton.edu/pulsar/k1jt/wspr.html>





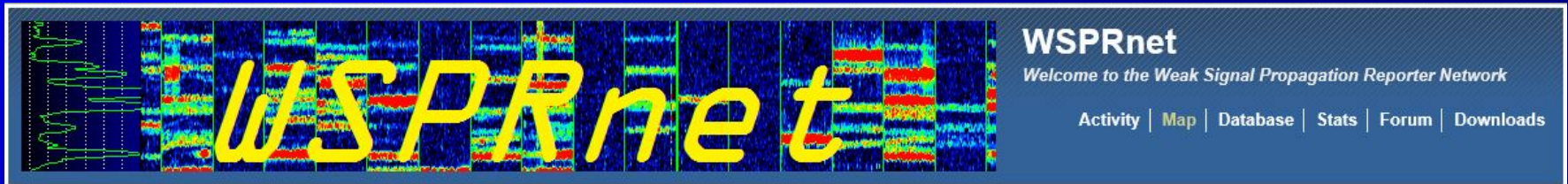
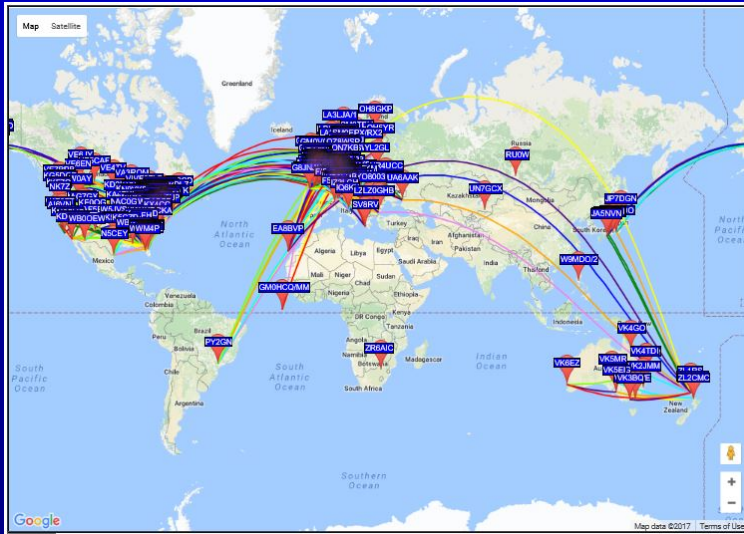
WSPR

- “Weak Signal Propagation Reporter”
- Probes radio frequency propagation conditions by using very low power (QRP/QRPp) transmissions
- WSPR receivers detect and decode, and can directly report to the Internet.
- You can beacon, or receive, or both.



WSPRnet

<http://wsprnet.org/drupal/>

Database

Specify query parameters

50 spots:

Timestamp	Call	MHz	SNR	Drift	Grid	Pwr	Reporter	RGrid	km	az
2017-08-08 20:36	OZ2JBR	7.040100	-5	0	JO65di	5	DF8OE	JO42jr	371	219
2017-08-08 20:36	OZ2JBR	7.040085	0	0	JO65di	5	DH5RAE	JN88qv	722	174
2017-08-08 20:36	K4AA	14.097155	-21	0	EL96wc	0.2	WB5HUP	EM50pm	973	302
2017-08-08 20:36	DF7AX	3.594118	-22	0	JO41wm	0.2	DF8OE	JO42jr	153	332
2017-08-08 20:36	EA5CYA	7.040059	-19	0	IM98xv	0.2	DH5RAE	JN88qv	1458	42
2017-08-08 20:36	PA3DSC	7.040102	-4	0	JO21sl	0.2	DK8UG	JN49cm	288	138
2017-08-08 20:36	DO9DV	3.584100	-20	0	JO31	0.2	DF8OE	JO42jr	187	41
2017-08-08 20:36	DK8JP	21.066200	-21	0	JO31gk	0.5	DK8JP/1	JO31gk	0	0
2017-08-08 20:36	M5LMY	7.040095	-2	0	IO81oi	5	DK8UG	JN49cm	699	104
2017-08-08 20:36	DC7JZB	7.040175	-20	0	JO62aj	5	DK8JP/1	JO31gk	480	260
2017-08-08 20:36	CK2SAM	10.140229	-21	0	JN99du	1	SM0EPX/RX2	JO89si	1057	358
2017-08-08 20:36	K4AA	14.097203	-24	0	EL96wc	0.2	VE3EP	FN13jv	1996	7
2017-08-08 20:36	DL2XLP	7.040199	-22	0	JN39vd	0.2	M8GQU	IO91tm	637	298
2017-08-08 20:36	VK4JWT	7.040121	+7	0	QG62nx	1	VK3AXF	QF33fn	1221	209
2017-08-08 20:36	EA9MH	10.140194	-21	1	IM85mg	0.001	HB9FZG	JN37tm	1620	30
2017-08-08 20:36	OK1FCX	7.040088	-17	0	JN79	0.5	G7RMG	IO80tu	1241	284
2017-08-08 20:36	DLOPBS	3.594010	-14	0	JO33	0.05	DF8OE	JO42jr	148	124
2017-08-08 20:36	G8LIK	7.040169	-28	0	IO83on	0.2	M8GQU	IO91tm	246	157
2017-08-08 20:36	OZ2JBR	7.040084	-3	0	JO65di	5	DK8UG	JN49cm	705	205
2017-08-08 20:36	DK8JP	7.040161	-21	0	JO31gk	0.5	DK8JP/1	JO31gk	0	0
2017-08-08 20:36	DF2UA	14.097120	-19	1	JN49hd	0.2	HB9ADJ	JN38li	334	202
2017-08-08 20:36	KG4KNB	14.097100	-10	0	EM55ol	5	KG5LBS	EM10bf	1029	238



Setting up WSPR

- Very easy to set up on a radio/computer configured for sound card mode operation
- Pull down and install WSPR from <https://physics.princeton.edu/pulsar/k1jt/wspr.htm>
- For the basic set-up you only need to enter your call sign, grid square (4 or 6 character), the audio input and output sources and power level in dBm (from a chart in the instructions)

Station parameters

Call:	KD1LE
Grid:	FN42fp
Audio In:	1 Microphone (SoundMAX Integrated)
Audio Out:	4 Speakers (SoundMAX Integrated D)
Power (dBm):	37
PTT method:	VOX
PTT port:	None
<input type="checkbox"/> Enable CAT	
CAT port:	None
Rig number:	214 Kenwood TS-2000
Serial rate:	4800
Data bits:	8
Stop bits:	2
Handshake:	None

Your WSPR Station

- Connect an appropriate antenna for the band you wish to operate on.
- Set your transmitter to an appropriate (about 5w) power level.
- Choose the band/frequency in WSPR and set the radio to the indicated frequency.
- Set the “% transmit” slider (20% default).
- Uncheck the “idle” box.



WSPR Operating Screen

The screenshot shows the WSPR 2.0 software interface. At the top, there is a menu bar with 'File', 'Setup', 'View', 'Save', 'Band', and 'Help'. Below the menu bar is a waterfall plot showing frequency bands from 20.40 to 20.52 MHz. To the right of the plot is a vertical scale from 0 to 200. A list of received stations is displayed on the right side of the interface, including W4CKA, CF3UAL, W2RCL, KC3AAT, EA1FBU, WA4DT, K3EA, and VE3DXK. Below the plot, there are controls for 'Upload spots' (checked), '987 Hz' bandwidth, and 'Band Map'. The 'Frequencies (MHz)' section shows 'Dial: 7.038600' and 'Tx: 7.040100'. The 'Tx fraction (%)' section has a slider set to 0. The 'Special' section has an 'Idle' checkbox and a 'Tune' button. A table of received spots is shown below, with columns for UTC, dB, DT, Freq, and Drift. A date and time display shows '2017 Jun 05 20:54:14'. The 'Rx Noise: 0 dB' is shown at the bottom left, and a 'Receiving' status indicator is at the bottom right.

UTC	dB	DT	Freq	Drift
2044	-4	0.6	7.040029	0
2044	-21	0.7	7.040087	0
2044	-1	1.4	7.040135	1
2046	-24	1.2	7.040002	0
2046	-23	0.7	7.040050	0
2046	-9	0.6	7.040173	-1
2048	-18	0.6	7.040054	0
2048	6	1.6	7.040115	0
2050	1	1.5	7.040114	0
2052	-18	1.3	7.040087	0
2052	3	0.6	7.040152	0



WSPR – on the air

- Your computer clock needs to be accurate.
 - By default, Windows syncs to an NTP server once a week (or 604,800 sec).
 - Once a day is better. *Reg SpecialPollInterval 86400 sec.*
- Based on two minute periods WSPR will transmit your information or listen for other WSPR signals. More complicated if you want to know?
- Under the “file” pulldown “save user settings”

