WSPR in the Northwoods

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What is WSPR & Why?

- Weak Signal Propagation Reporter
- Active worldwide

- Aid Hams and other radio operators in determining real-time propagation
- Aid the scientific community through HamSci
  - https://hamsci.org/publications/high-resolution-wspr-transmissions-ionospheric-research
  - Data used from the recent eclipse

WSPR Specifications & Characteristics from the ARRL

- From arrl.org/wspr:
  - narrowband digital transmission protocol called MEPT_JT on the HF and MF frequency bands.
  - 1. Transmitted message: callsign + 4-character-locator + dBm Example: "K1JT FN20 30"
  - 2. Message length after lossless compression: 28 bits for callsign, 15 for locator, 7 for power level ==> 50 bits total.
  - 3. Forward error correction (FEC): long-constraint convolutional code, K=32, r=1/2.
  - 4. Number of channel symbols: nsym = (50+K-1)*2 = 162.
  - 5. Keying rate: 12000/8192 = 1.46 baud.
  - 6. Modulation: continuous phase 4-FSK. Tone separation 1.46 Hz.
  - 7. Synchronization: 162-bit pseudo-random sync vector.
  - 8. Data structure: each channel symbol conveys one sync bit and one data bit.
  - 9. Duration of transmission: 162*8192/12000 = 110.6 s.
  - 10. Transmissions start two seconds into an even UTC minute: i.e., at hh:00:02, hh:02:02, ...
  - 11. Occupied bandwidth: about 6 Hz
  - 12. Minimum S/N for reception: around -27 dB on the WSJT scale (2500 Hz reference bandwidth).

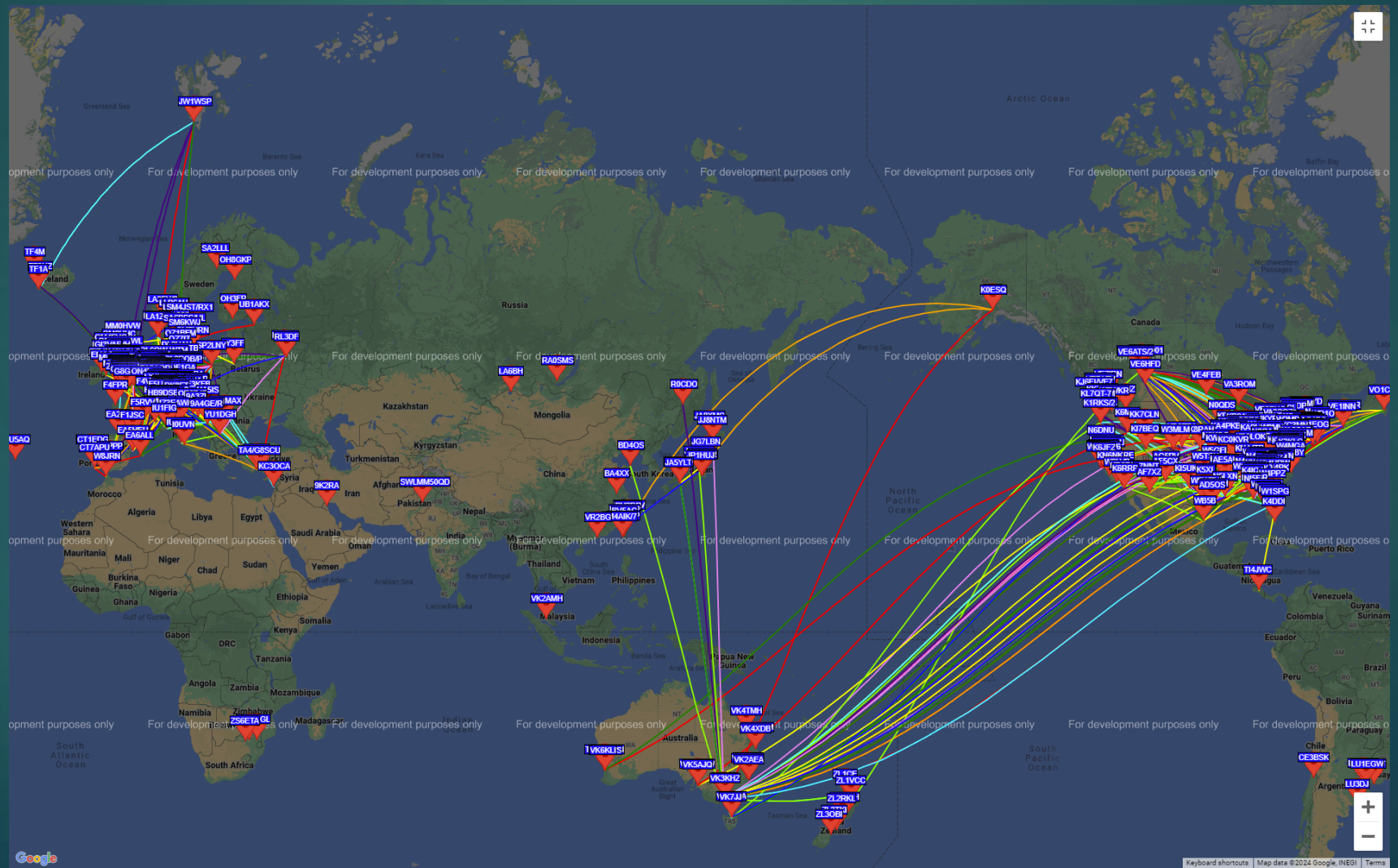
WSPR Frequencies

- USB dial (MHz):
- 2200m: 0.136
- 630m: 0.4742
- 160m: 1.8366
- 80m: 3.5686
- 60m: 5.2872, 5.3647
- 40m: 7.0386
- 30m: 10.1387
- 20m: 13.5539, 14.0956
- 17m: 18.1046
- 15m: 21.0946
- 12m: 24.9246
- 10m: 28.1246
- 6m: 50.293
- 4m: 70.091
- 2m: 144.489
- 70cm: 432.300
- 23cm: 1296.500

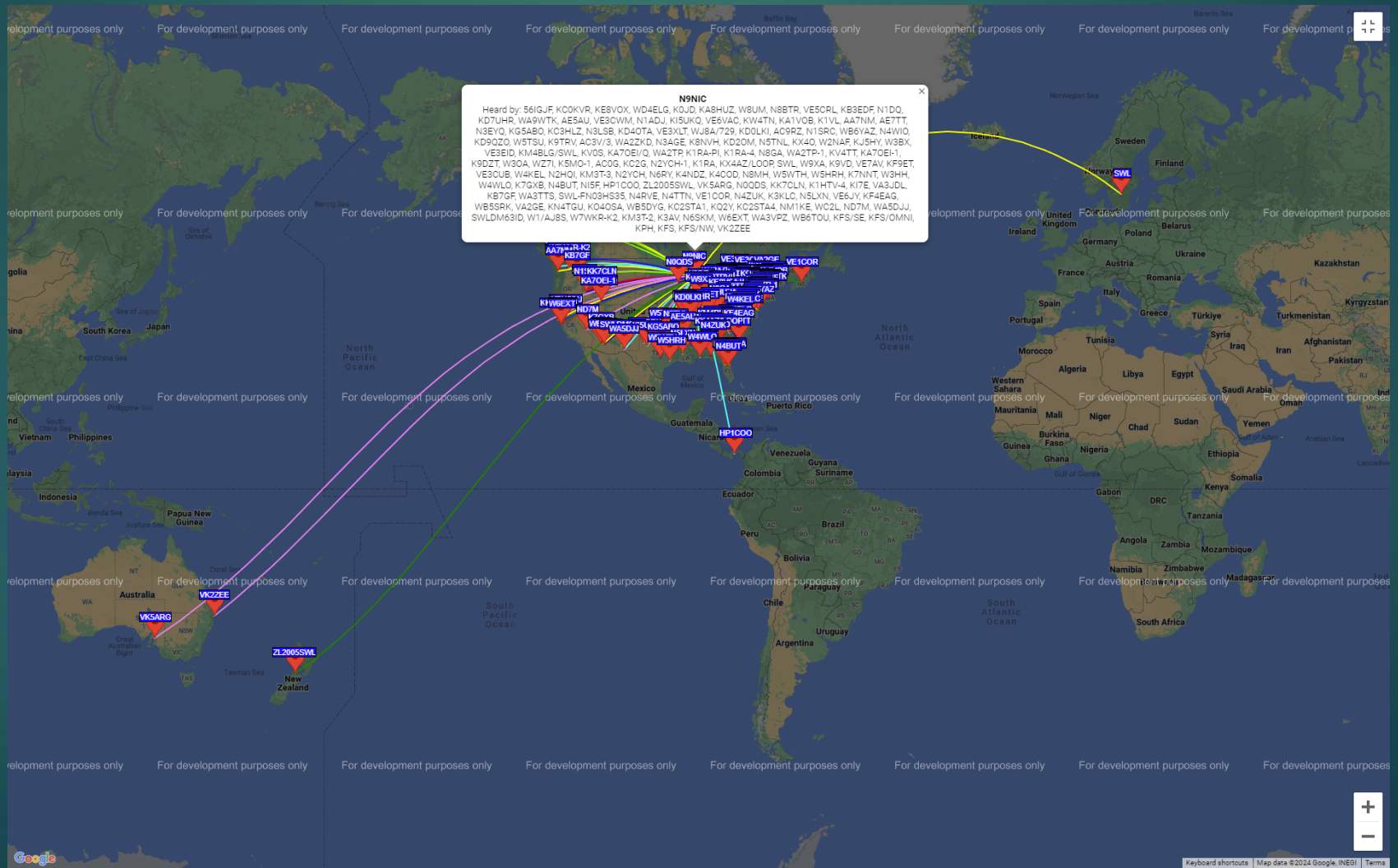
Where is WSPR Data

- WSPR Net: https://wsprnet.org
- WSPR Rocks!: https://wspr.rocks
- WSJT-X Software: https://wsjt.sourceforge.io/wsjtx.html

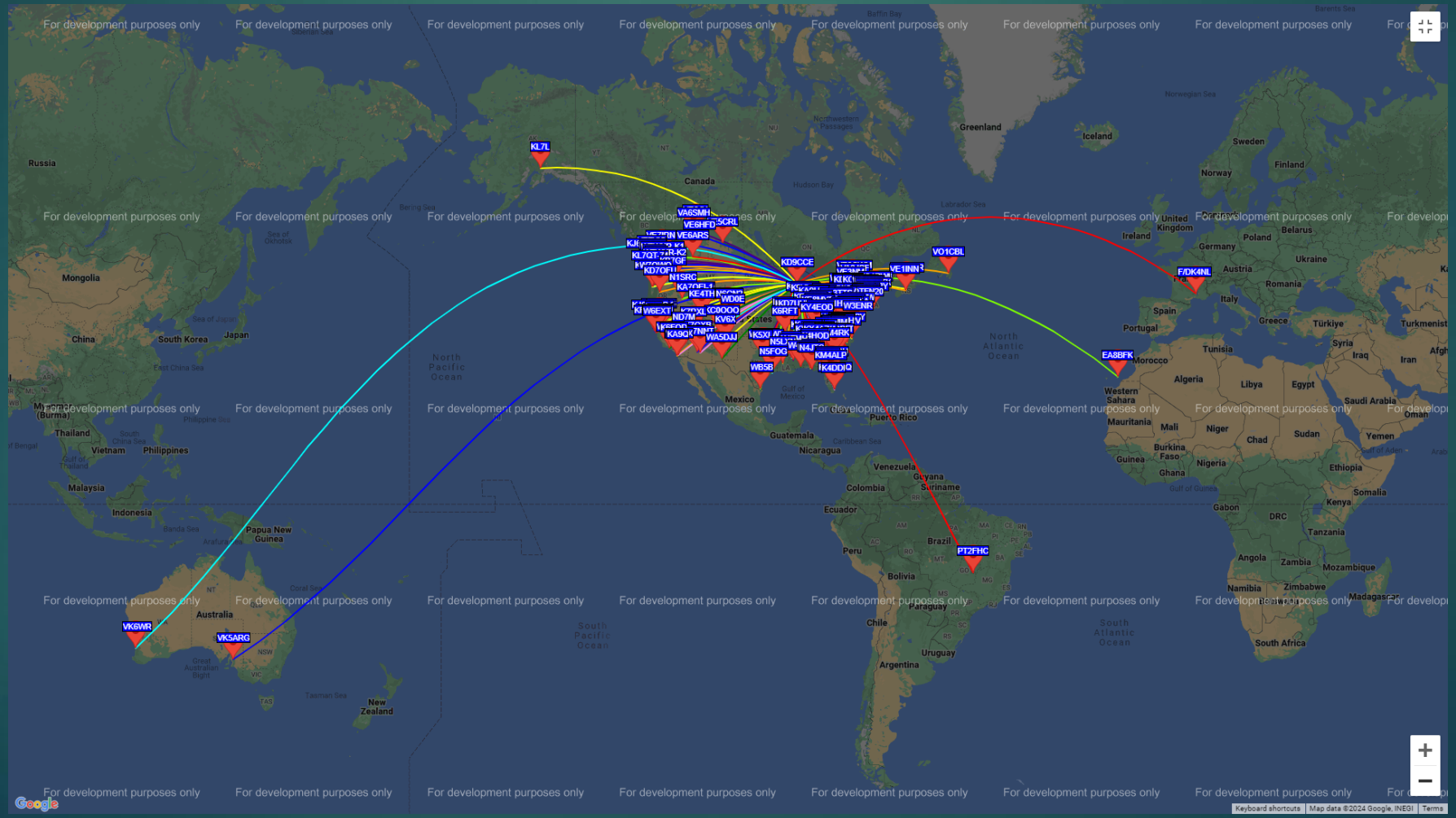
WSPRNet – All Stations - 20 meters (1hr period 5/24/204 @8am Wisconsin time)



WSPRNet - N9NIC transmitter (1hr period 5/24/204 @8am Wisconsin time)



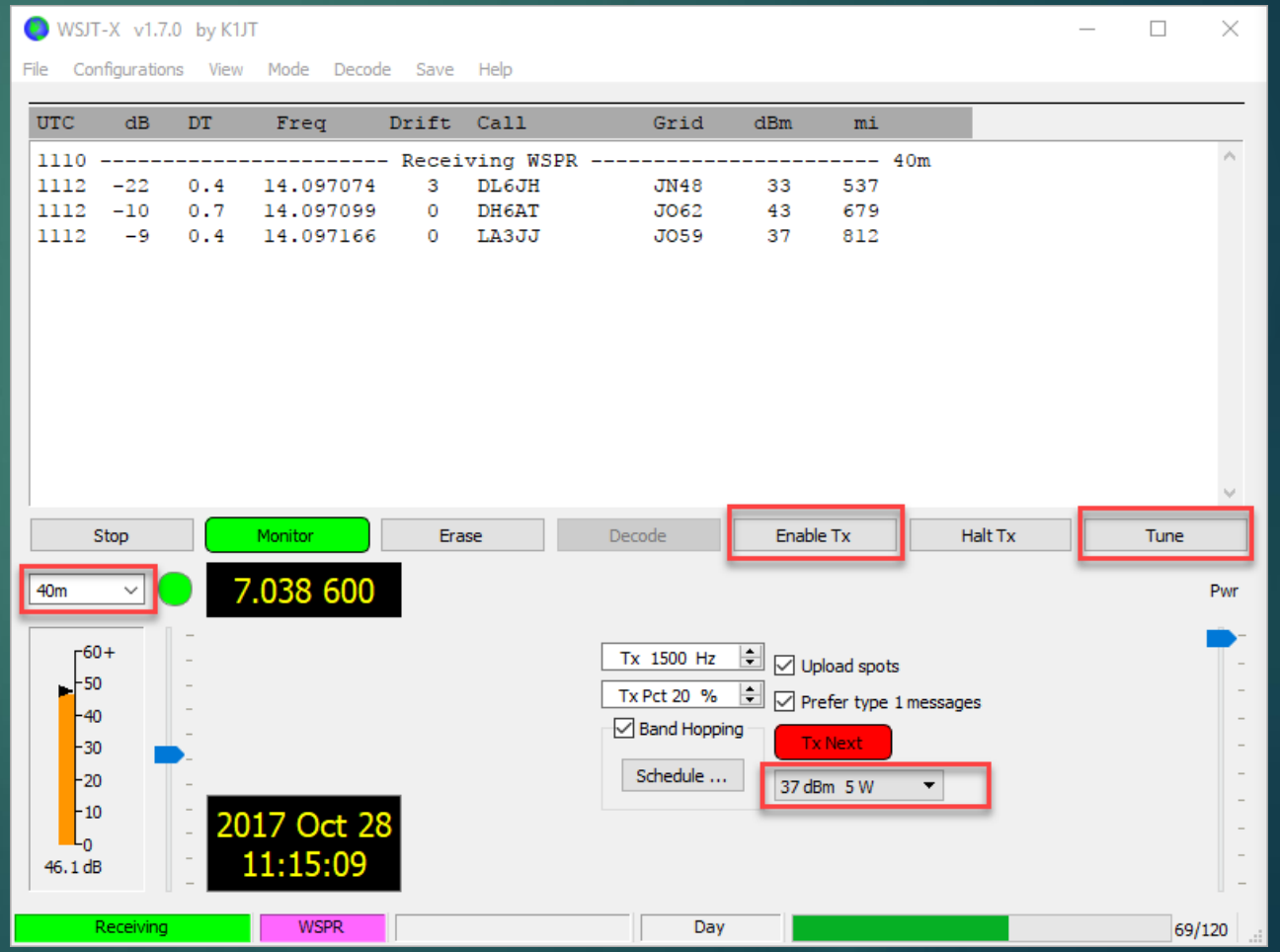
WSPRNet - KD9CCE Receiver (24hr period - 5/31/2024)



WSJT-X Software

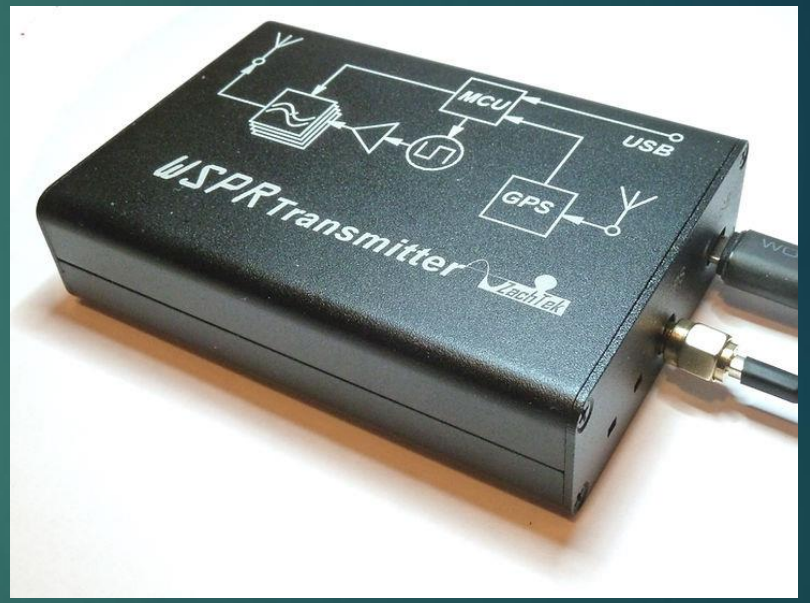
- Use your HF radio and computer
- Real-time visualization
- Allows for more control
- Operate in both transmit & receive modes

- Considerations:
  - Ties up expensive equipment or isn't online 24/7
  - Allows use of antenna tuner
  - If you can only put up one antenna this may be your only option



Hardware - Transmitter

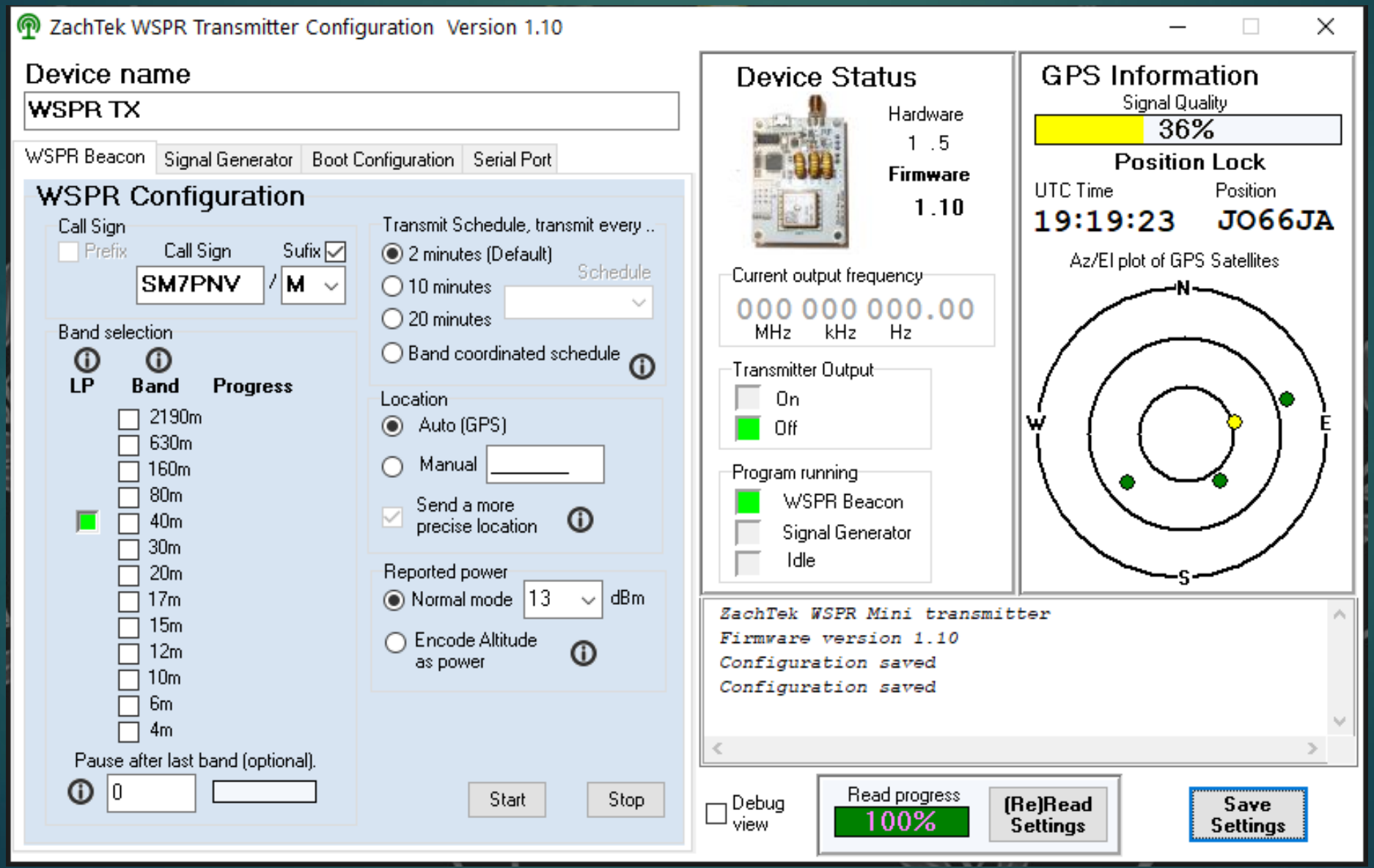
- https://zachtek.com
  - 80m thru 6m with automatic band switching
  - 200 milliwatts! – no need for big expensive coax
  - SMA connector
  - USB powered
  - Built-in CPU so no computer required
  - GPS and antenna – necessary for time synch and location although the location can be manually entered



Hardware - Transmitter Antenna

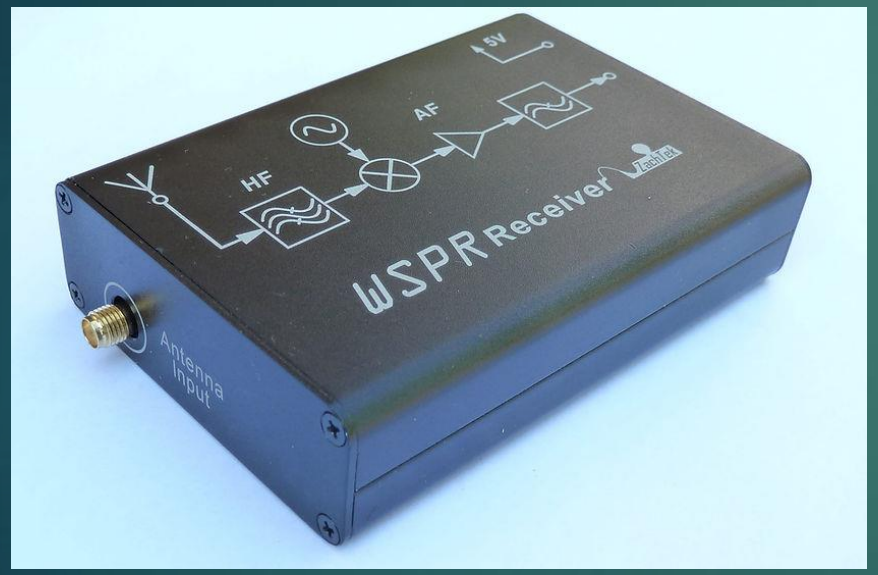
- Needs to be resonant on each band (can't use a tuner)
  - EFHW 80-10 (best choice – simple and effective)
    - https://myantennas.com/wp/product/efhw-8010/
    - https://www.vibroplex.com/contents/en-us/p3471.html
  - Mono band or trapped dipole
  - Mono band or Trapped Vertical
  - Fan Dipole

Zachtech software



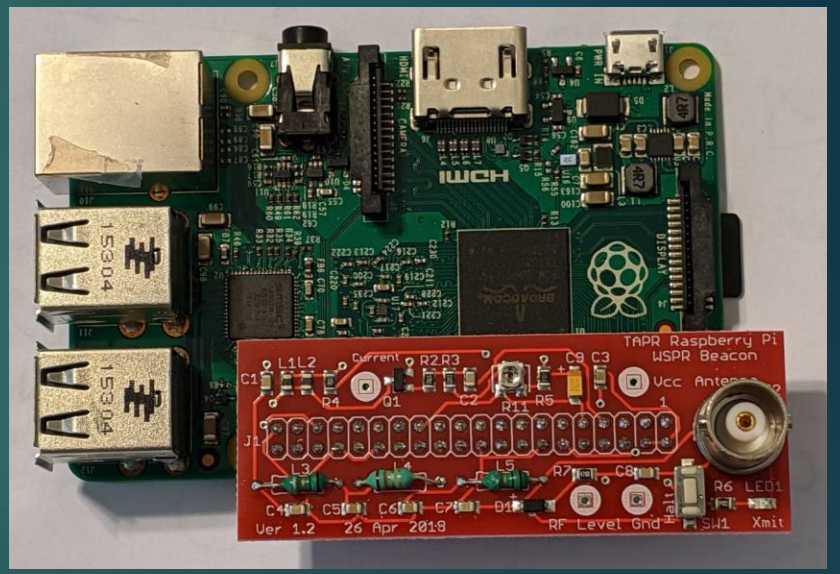
Hardware - Receiver

- WSPR Receiver | ZachTek, openWSPR receiver (remoteqth.com), or WSPR – TAPR



Single Band
Very narrow band pass filter
Needs a computer
$87

Multi-Band capable but operator must select
No special filtering, Fully automatic with built in computer
$135



Single Band kit with very narrow filter
User supplies Raspberry Pi and SD Card
Fully automatic but requires
$32

Hardware - Receiver Antenna

- Anything you want, but the longer the better.

Conclusion

WSPR is a great way to contribute to the Amateur Radio hobby and the scientific community on a 24/7 basis.