FT8 Introduction

PARC Meeting – February 19, 2025

Chuck Nunnelly – N4AVC

FT8 (short for Frank-Taylor design, 8-FSK modulation) is a frequency shift keying *digital mode of radio communication* used by amateur radio operators worldwide.

Following release on June 29, 2017, by its creators Joe Taylor, K1JT, and Steve Franke, K9AN, along with the software package WSJT, FT8 was adopted rapidly, becoming the most popular digital mode recorded by automatic spotting networks such as PSK Reporter within 2 years.[1]

[1] Wikipedia contributors. (2024, November 12). FT8. In Wikipedia, The Free Encyclopedia. Retrieved 15:03, February 14, 2025, from https://en.wikipedia.org/w/index.php?title=FT8&oldid=1257012331

FT8 is a popular form of digital weak signal communication used primarily by amateur radio operators to communicate on amateur radio bands with a majority of traffic occurring on the HF amateur bands.

The mode offers operators the ability to communicate despite unfavorable conditions such as during low solar activity, high RF noise, or with low transmit power.

With advances in signal processing technology, software can decode FT8 signals with a signal-to-noise ratio as low as −20 dB in a 2500 Hz bandwidth, which is significantly lower than conventional CW or SSB transmissions.[2]

[2] Wikipedia contributors. (2024, November 12). FT8. In Wikipedia, The Free Encyclopedia. Retrieved 15:03, February 14, 2025, from https://en.wikipedia.org/w/index.php?title=FT8&oldid=1257012331

FT8 is a digital mode used in amateur radio for weak-signal communication. It’s part of the WSJT-X suite of protocols created by Joe Taylor (K1JT) and others. FT8 allows operators to send short messages (usually 13 characters) in an efficient and highly automated manner, making it ideal for contacting stations under poor conditions, such as during low solar activity or with weak signals.

The mode uses 8-frequency tones (hence the "8" in FT8) and is capable of decoding signals that are too weak for other modes, even down to the noise floor. FT8 is particularly popular for making contacts over long distances (DX) and is commonly used in contests and daily operations. It requires minimal bandwidth and can work in conditions where traditional voice communication would fail.

Key features of FT8 include:

Short transmissions: Each exchange takes only about 15 seconds.
Automated messaging: The process is highly automated, requiring minimal manual intervention.
Error correction: The protocol includes strong error correction to decode weak signals.
Many operators use FT8 for logging contacts, making it one of the most popular modes in amateur radio today.

(ChatGPT, personal communication, February 14, 2025)

Equipment needed for FT8 Operation

- SSB rig
- Antenna
- Sound card (internal or external)
- Computer
- WSJT-X or similar Software
- Accurate time sync of computer clock (ntp server, GPS….)

- SignaLink USB
  - https://tigertronics.com/slusbmain.htm

- FCC Class B Certified
- Built-in Low-noise Sound Card
- Simple Installation and Setup
- Complete Radio Isolation
- USB Port Powered
- Works with virtually ALL Radios
- Uses Mic, Data, or Accy Port
- Supports virtually All Sound Card Digital and Voice Modes

- digirig
  - https://digirig.net/

There are now several models of Digirig interface – each optimized for a range of use cases. Here we'll go over features and differences making it easier for you to choose a perfect match for your typical operating scenarios.

- USB Soundcard
  - https://www.amazon.com/gp/product/B00IRVQ0F8/ref=ppx_yo_dt_b_search_asin_title?ie=UTF8&th=1

Software

WSJT-X Software

- http://wsjt.sourceforge.io/wsjtx.html (main page)
- http://wsjt.sourceforge.io/refs.html (reference page)
- FT8, JT4, JT9, JT65, QRA64, ISCAT, MSK144, and WSP

JTDX Software

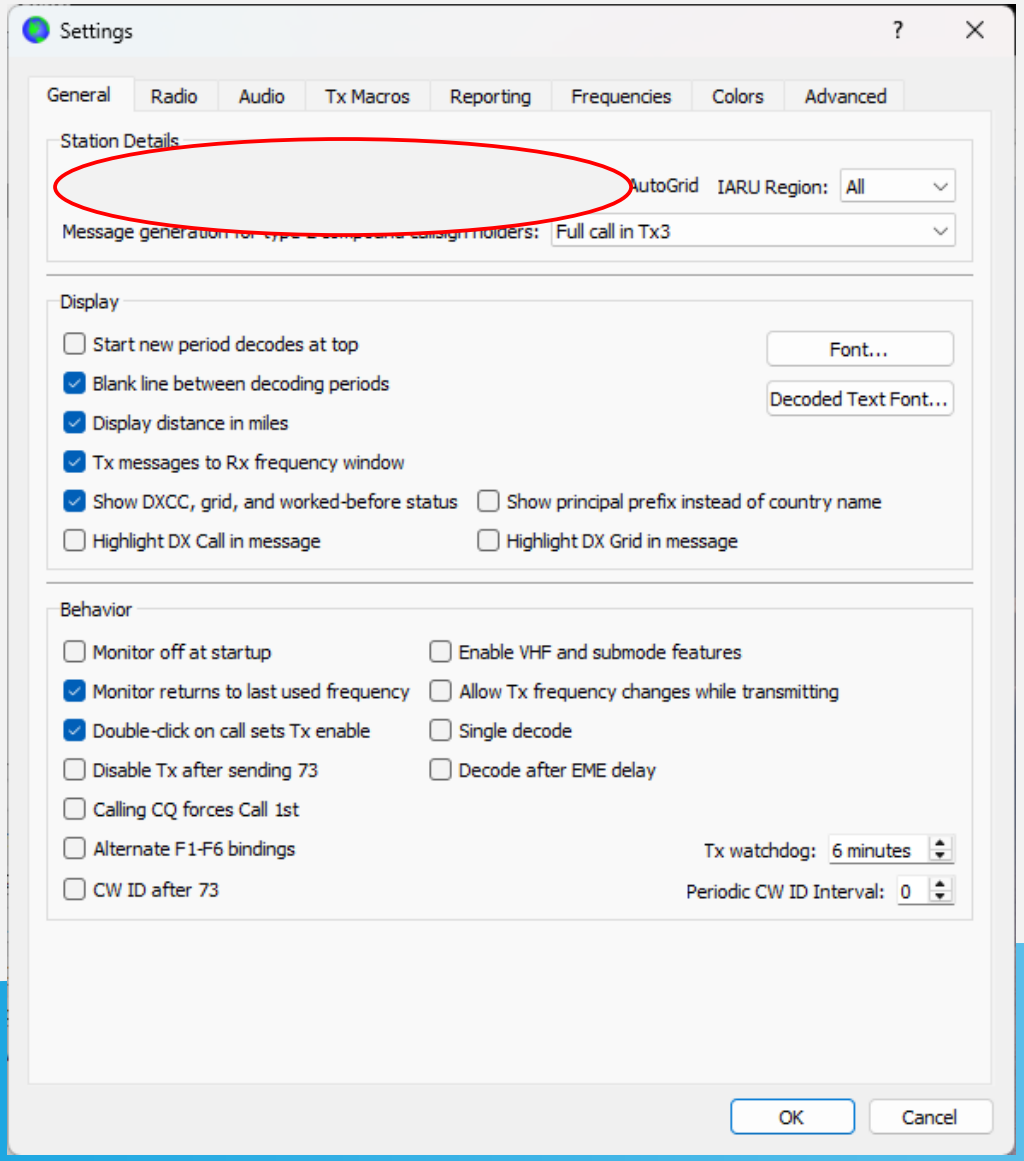
- https://sourceforge.net/projects/jtdx/

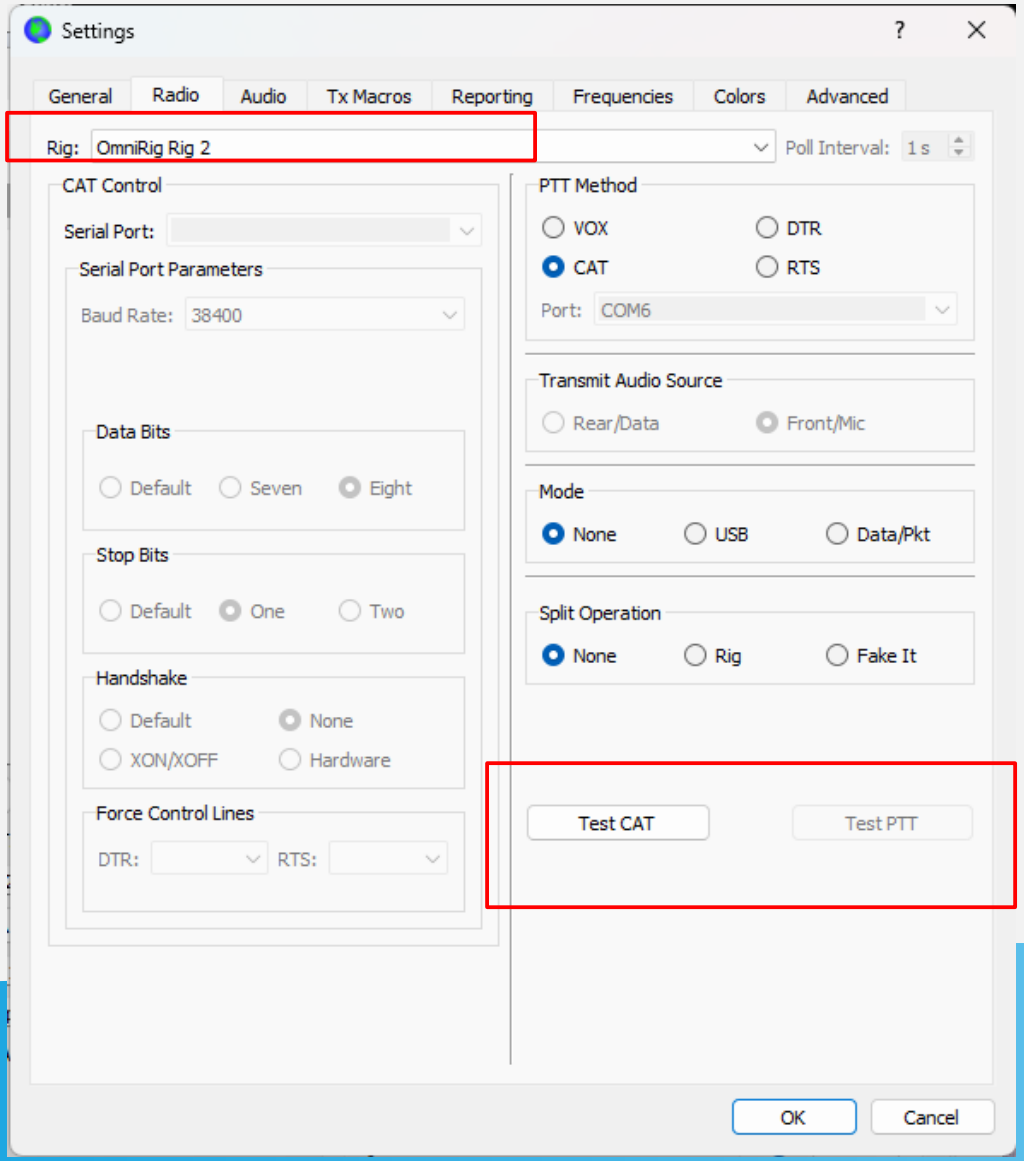
Android and Apple Apps

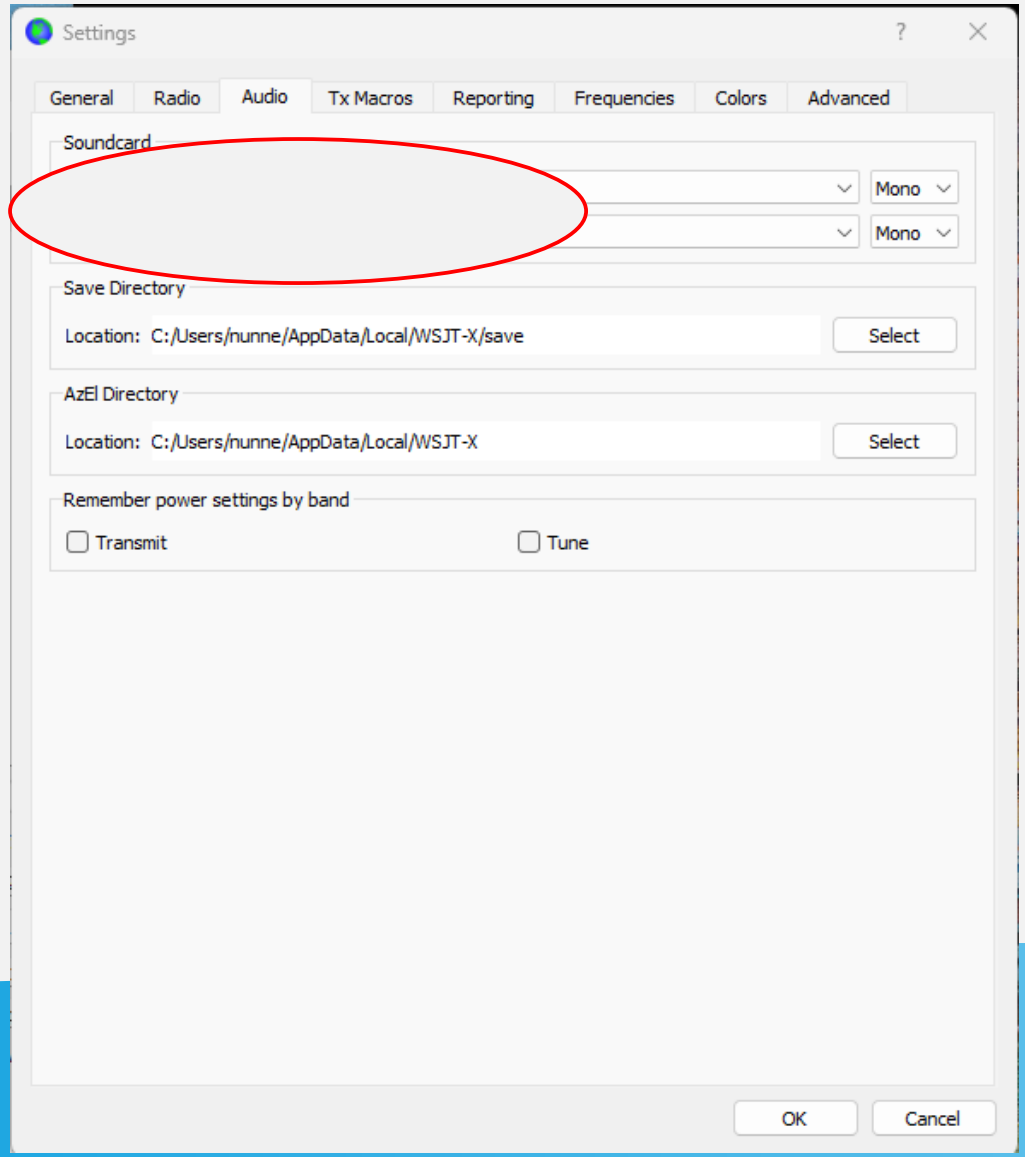
- All are Free

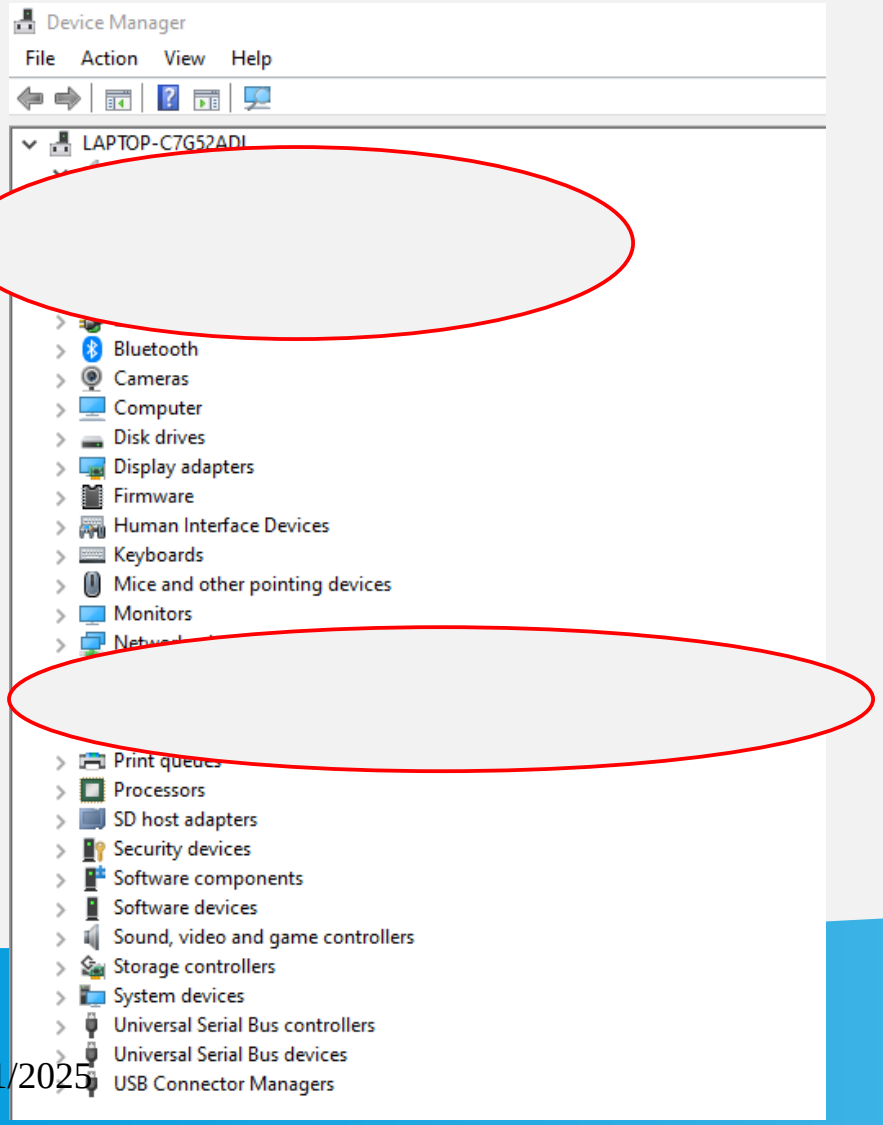
- WSJT-X User Guide
  - Setup and Operation Instructions
    - https://wsjt.sourceforge.io/wsjtx-doc/wsjtx-main-2.6.1.html

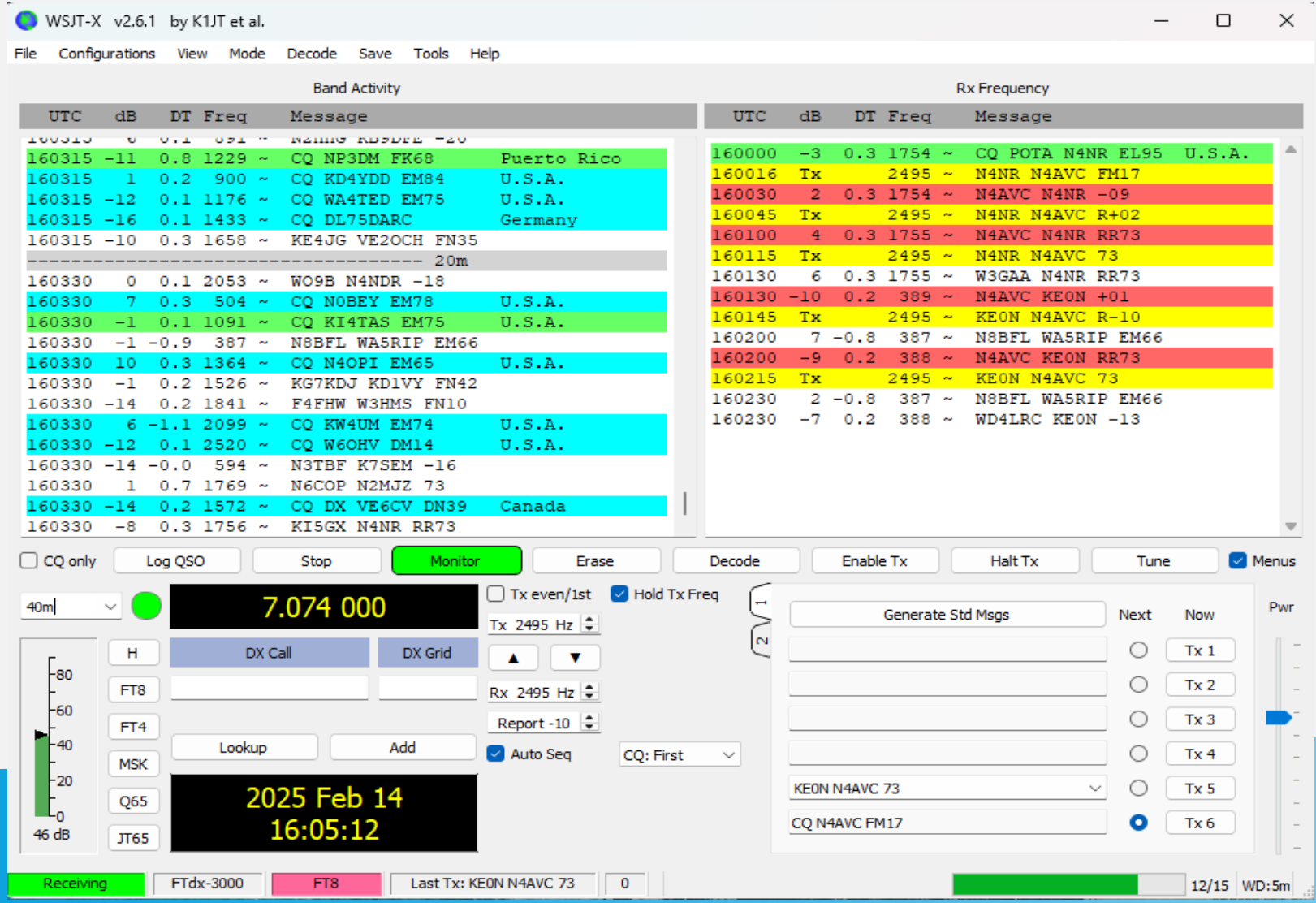
- Search FT8 on the Internet
  - Thousands of Web Pages and How-to Videos

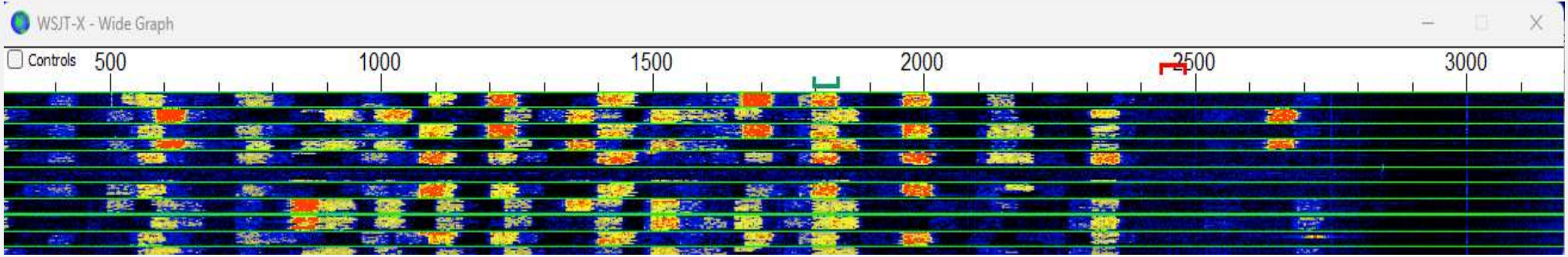

Settings
General
Radio
Audio
Tx Macros
Reporting
Frequencies
Colors
Advanced
Station Details
AutoGrid
IARU Region:
All
Message generation for type 2 compound callsign holders:
Full call in Tx3
Display
Start new period decodes at top
Font...
Blank line between decoding periods
Decoded Text Font...
Display distance in miles
Tx messages to Rx frequency window
Show DXCC, grid, and worked-before status
Show principal prefix instead of country name
Highlight DX Call in message
Highlight DX Grid in message
Behavior
Monitor off at startup
Enable VHF and submode features
Monitor returns to last used frequency
Allow Tx frequency changes while transmitting
Double-click on call sets Tx enable
Single decode
Disable Tx after sending 73
Decode after EME delay
Calling CQ forces Call 1st
Alternate F1-F6 bindings
Tx watchdog:
6 minutes
CW ID after 73
Periodic CW ID Interval:
0
OK
Cancel


Settings
General
Radio
Audio
Tx Macros
Reporting
Frequencies
Colors
Advanced
Rig: OmniRig Rig 2
Poll Interval: 1 s
CAT Control
Serial Port:
Serial Port Parameters
Baud Rate: 38400
Data Bits
Default
Seven
Eight
Stop Bits
Default
One
Two
Handshake
Default
None
XON/XOFF
Hardware
Force Control Lines
DTR:
RTS:
PTT Method
VOX
DTR
CAT
RTS
Port: COM6
Transmit Audio Source
Rear/Data
Front/Mic
Mode
None
USB
Data/Pkt
Split Operation
None
Rig
Fake It
Test CAT
Test PTT
OK
Cancel


Settings
General
Radio
Audio
Tx Macros
Reporting
Frequencies
Colors
Advanced
Soundcard
Mono
Mono
Save Directory
Location: C:/Users/nunne/AppData/Local/WSJT-X/save
Select
AzEl Directory
Location: C:/Users/nunne/AppData/Local/WSJT-X
Select
Remember power settings by band
Transmit
Tune
OK
Cancel


Device Manager
File
Action
View
Help
LAPTOP-C7G52ADL
Bluetooth
Cameras
Computer
Disk drives
Display adapters
Firmware
Human Interface Devices
Keyboards
Mice and other pointing devices
Monitors
Processors
SD host adapters
Security devices
Software components
Software devices
Sound, video and game controllers
Storage controllers
System devices
Universal Serial Bus controllers
Universal Serial Bus devices
USB Connector Managers

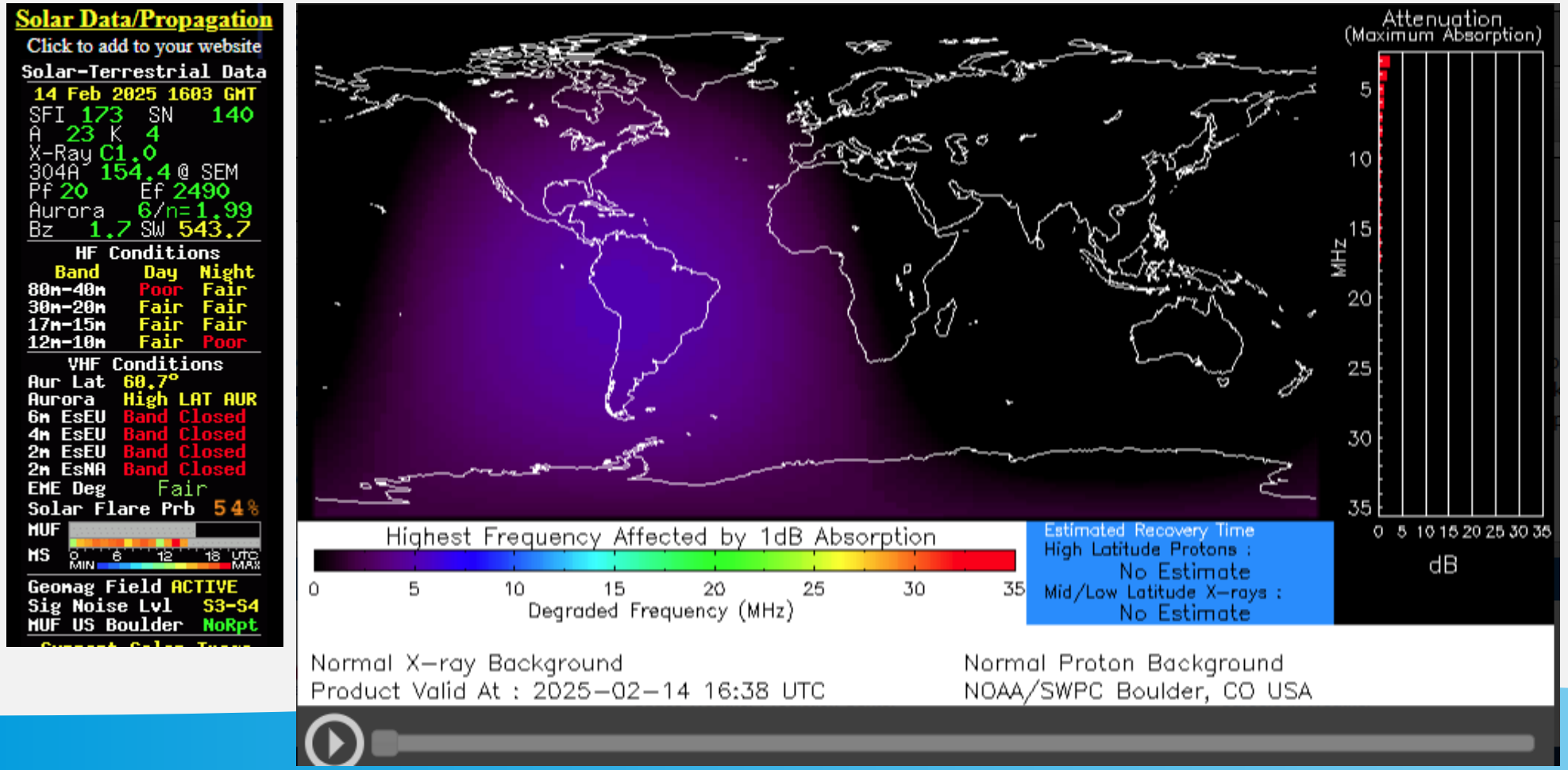

WSJT-X v2.6.1 by K1JT et al.
File Configurations View Mode Decode Save Tools Help
Band Activity
UTC dB DT Freq Message
160315 -11 0.8 1229 ~ CQ NP3DM FK68 Puerto Rico
160315 1 0.2 900 ~ CQ KD4YDD EM84 U.S.A.
160315 -12 0.1 1176 ~ CQ WA4TED EM75 U.S.A.
160315 -16 0.1 1433 ~ CQ DL75DARC Germany
160315 -10 0.3 1658 ~ KE4JG VE2OCH FN35
---------- 20m
160330 0 0.1 2053 ~ WO9B N4NDR -18
160330 7 0.3 504 ~ CQ N0BEY EM78 U.S.A.
160330 -1 0.1 1091 ~ CQ KI4TAS EM75 U.S.A.
160330 -1 -0.9 387 ~ N8BFL WA5RIP EM66
160330 10 0.3 1364 ~ CQ N4OPI EM65 U.S.A.
160330 -1 0.2 1526 ~ KG7KDJ KD1VY FN42
160330 -14 0.2 1841 ~ F4FHW W3HMS FN10
160330 6 -1.1 2099 ~ CQ KW4UM EM74 U.S.A.
160330 -12 0.1 2520 ~ CQ W6OHV DM14 U.S.A.
160330 -14 -0.0 594 ~ N3TBF K7SEM -16
160330 1 0.7 1769 ~ N6COP N2MJZ 73
160330 -14 0.2 1572 ~ CQ DX VE6CV DN39 Canada
160330 -8 0.3 1756 ~ KI5GX N4NR RR73
Rx Frequency
UTC dB DT Freq Message
160000 -3 0.3 1754 ~ CQ POTA N4NR EL95 U.S.A.
160016 Tx 2495 ~ N4NR N4AVC FM17
160030 2 0.3 1754 ~ N4AVC N4NR -09
160045 Tx 2495 ~ N4NR N4AVC R+02
160100 4 0.3 1755 ~ N4AVC N4NR RR73
160115 Tx 2495 ~ N4NR N4AVC 73
160130 6 0.3 1755 ~ W3GAA N4NR RR73
160130 -10 0.2 389 ~ N4AVC KE0N +01
160145 Tx 2495 ~ KE0N N4AVC R-10
160200 7 -0.8 387 ~ N8BFL WA5RIP EM66
160200 -9 0.2 388 ~ N4AVC KE0N RR73
160215 Tx 2495 ~ KE0N N4AVC 73
160230 2 -0.8 387 ~ N8BFL WA5RIP EM66
160230 -7 0.2 388 ~ WD4LRC KE0N -13
CQ only
Log QSO
Stop
Monitor
Erase
Decode
Enable Tx
Halt Tx
Tune
Menus
40m
7.074 000
Tx even/1st
Hold Tx Freq
Tx 2495 Hz
H
DX Call
DX Grid
FT8
FT4
MSK
Q65
JT65
Rx 2495 Hz
Report -10
Lookup
Add
Auto Seq
CQ: First
2025 Feb 14
16:05:12
80
60
40
20
0
46 dB
Generate Std Msgs
Next
Now
Pwr
Tx 1
Tx 2
Tx 3
Tx 4
Tx 5
Tx 6
KE0N N4AVC 73
CQ N4AVC FM17
Receiving
FTdx-3000
FT8
Last Tx: KE0N N4AVC 73
0
12/15
WD:5m


WSJT-X - Wide Graph
Controls
500
1000
1500
2000
2500
3000

UTC	dB	DT	Freq		Message	
160315	-11	0.8	1229	~	CQ NP3DM FK68	Puerto Rico
160315	1	0.2	900	~	CQ KD4YDD EM84	U.S.A.
160315	-12	0.1	1176	~	CQ WA4TED EM75	U.S.A.
160315	-16	0.1	1433	~	CQ DL75DARC	Germany
160315	-10	0.3	1658	~	KE4JG VE2OCH FN35	
----------					20m	
160330	0	0.1	2053	~	WO9B N4NDR -18	
160330	7	0.3	504	~	CQ NOBEY EM78	U.S.A.
160330	-1	0.1	1091	~	CQ KI4IAS EM75	U.S.A.
160330	-1	-0.9	387	~	N8BFL WA5RIP EM66	
160330	10	0.3	1364	~	CQ N4OPI EM65	U.S.A.
160330	-1	0.2	1526	~	KG7KDJ KD1VY FN42	
160330	-14	0.2	1841	~	F4FHW W3HMS FN10	
160330	6	-1.1	2099	~	CQ KW4UM EM74	U.S.A.
160330	-12	0.1	2520	~	CQ W6OHV DM14	U.S.A.
160330	-14	-0.0	594	~	N3TBF K7SEM -16	
160330	1	0.7	1769	~	N6COP N2MJZ 73	
160330	-14	0.2	1572	~	CQ DX VE6CV DN39	Canada
160330	-8	0.3	1756	~	KI5GX N4NR RR73	

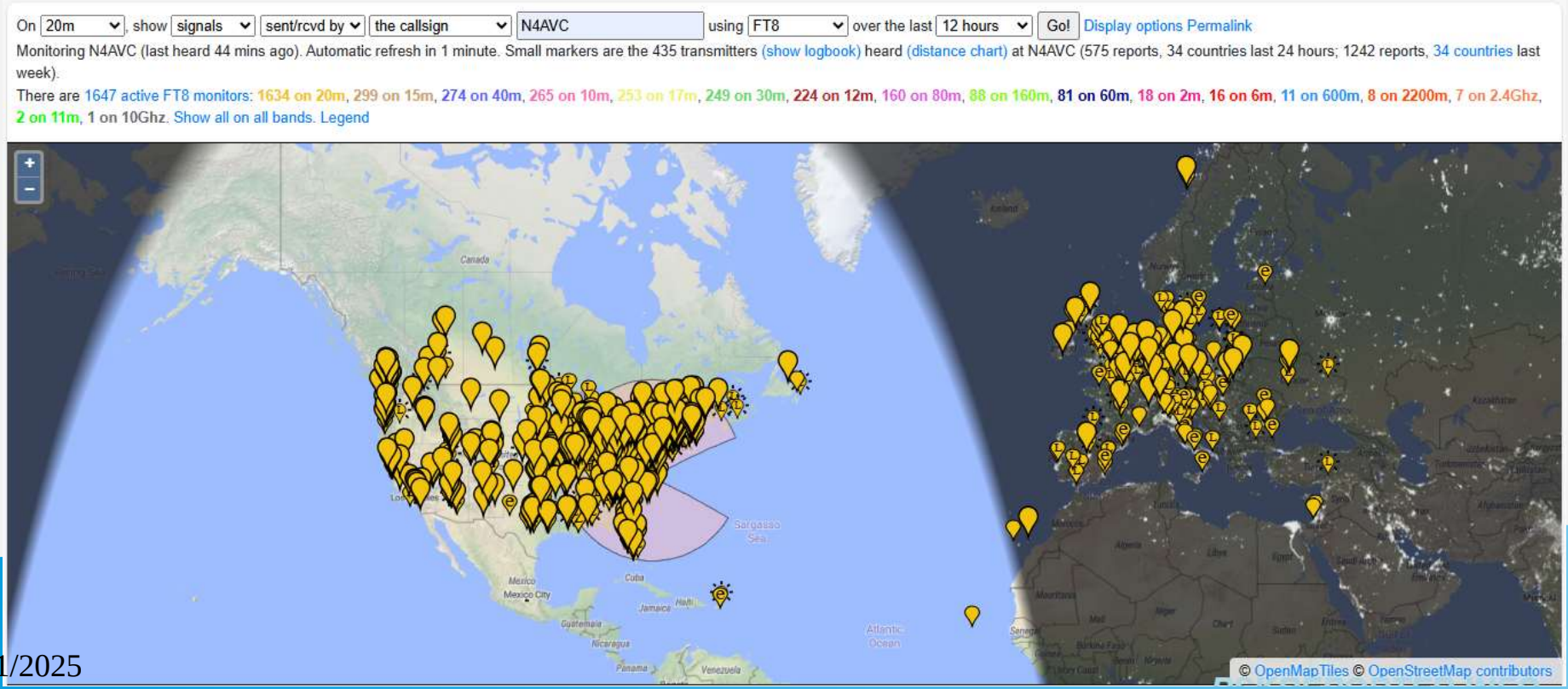
Rx Frequency

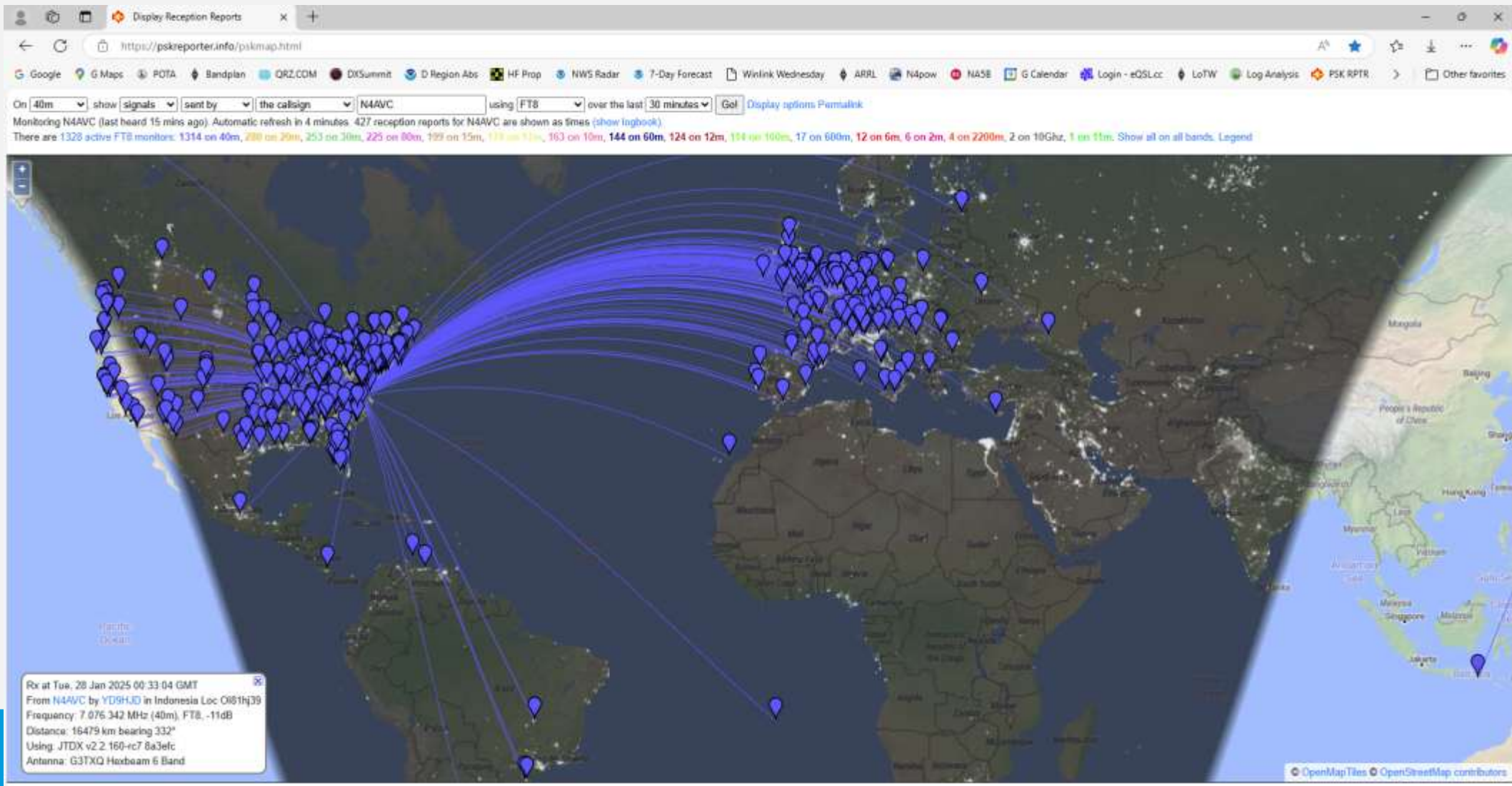
UTC	dB	DT	Freq		Message
160000	-3	0.3	1754	~	CQ POTA N4NR EL95 U.S.A.
160016	Tx		2495	~	N4NR N4AVC FM17
160030	2	0.3	1754	~	N4AVC N4NR -09
160045	Tx		2495	~	N4NR N4AVC R+02
160100	4	0.3	1755	~	N4AVC N4NR RR73
160115	Tx		2495	~	N4NR N4AVC 73
160130	6	0.3	1755	~	W3GAA N4NR RR73
160130	-10	0.2	389	~	N4AVC KE0N +01
160145	Tx		2495	~	KE0N N4AVC R-10
160200	7	-0.8	387	~	N8BFL WA5RIP EM66
160200	-9	0.2	388	~	N4AVC KE0N RR73
160215	Tx		2495	~	KE0N N4AVC 73
160230	2	-0.8	387	~	N8BFL WA5RIP EM66
160230	-7	0.2	388	~	WD4LRC KE0N -13

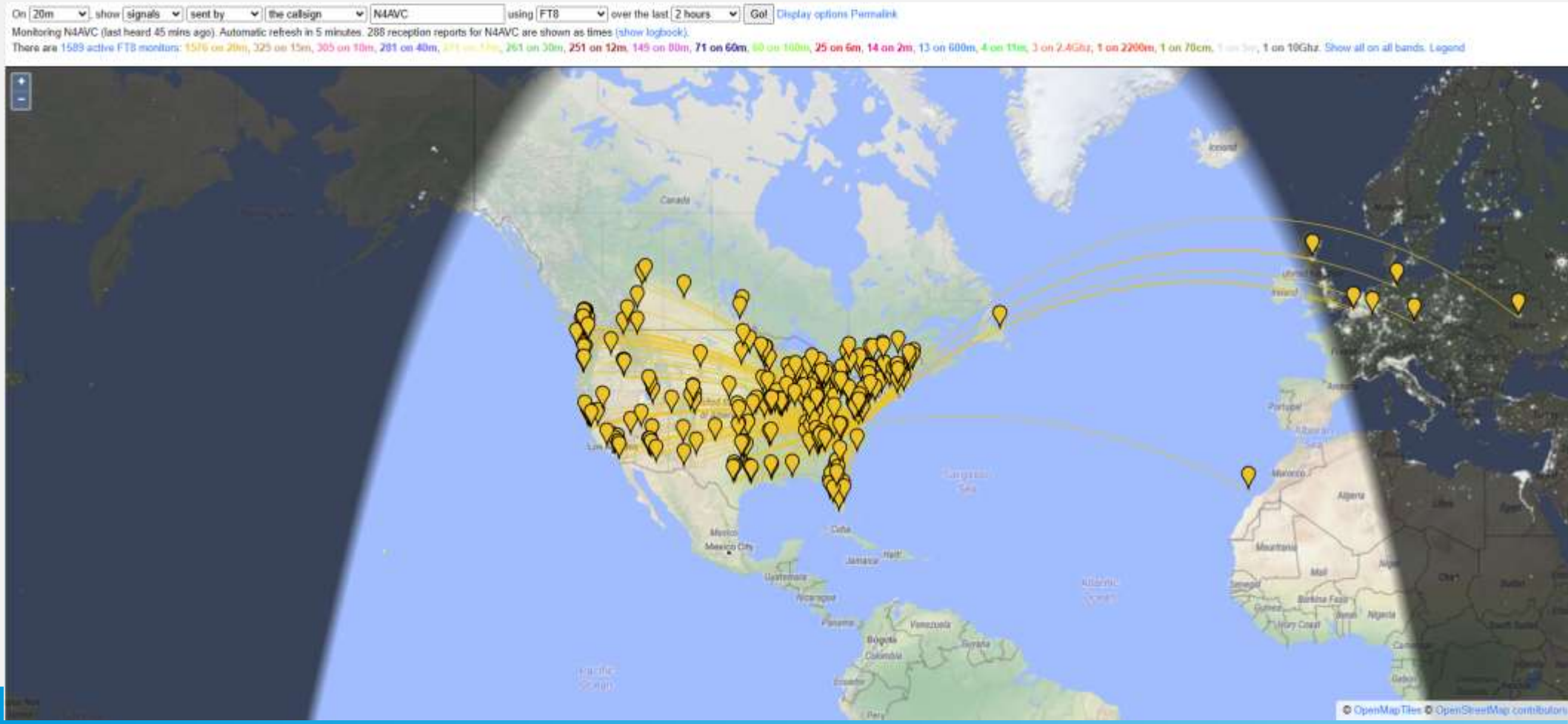

Solar Data/Propagation
Click to add to your website
Solar-Terrestrial Data
14 Feb 2025 1603 GMT
SFI 173 SN 140
A 23 K 4
X-Ray C1.0
304A 154.4 @ SEM
Pf 20 Ef 2490
Aurora 6/n=1.99
Bz 1.7 SW 543.7
HF Conditions
Band Day Night
80m-40m Poor Fair
30m-20m Fair Fair
17m-15m Fair Fair
12m-10m Fair Poor
VHF Conditions
Aur Lat 60.7°
Aurora High LAT AUR
6m EsEU Band Closed
4m EsEU Band Closed
2m EsEU Band Closed
2m EsNA Band Closed
EME Deg Fair
Solar Flare Prb 54%
MUF
MS
0 6 12 18 UTC
MIN MAX
Geomag Field ACTIVE
Sig Noise Lvl S3-S4
MUF US Boulder NoRpt
Attenuation
(Maximum Absorption)
MHz
5 10 15 20 25 30 35
0 5 10 15 20 25 30 35
dB
Highest Frequency Affected by 1dB Absorption
0 5 10 15 20 25 30 35
Degraded Frequency (MHz)
Estimated Recovery Time
High Latitude Protons :
No Estimate
Mid/Low Latitude X-rays :
No Estimate
Normal X-ray Background
Product Valid At : 2025-02-14 16:38 UTC
Normal Proton Background
NOAA/SWPC Boulder, CO USA

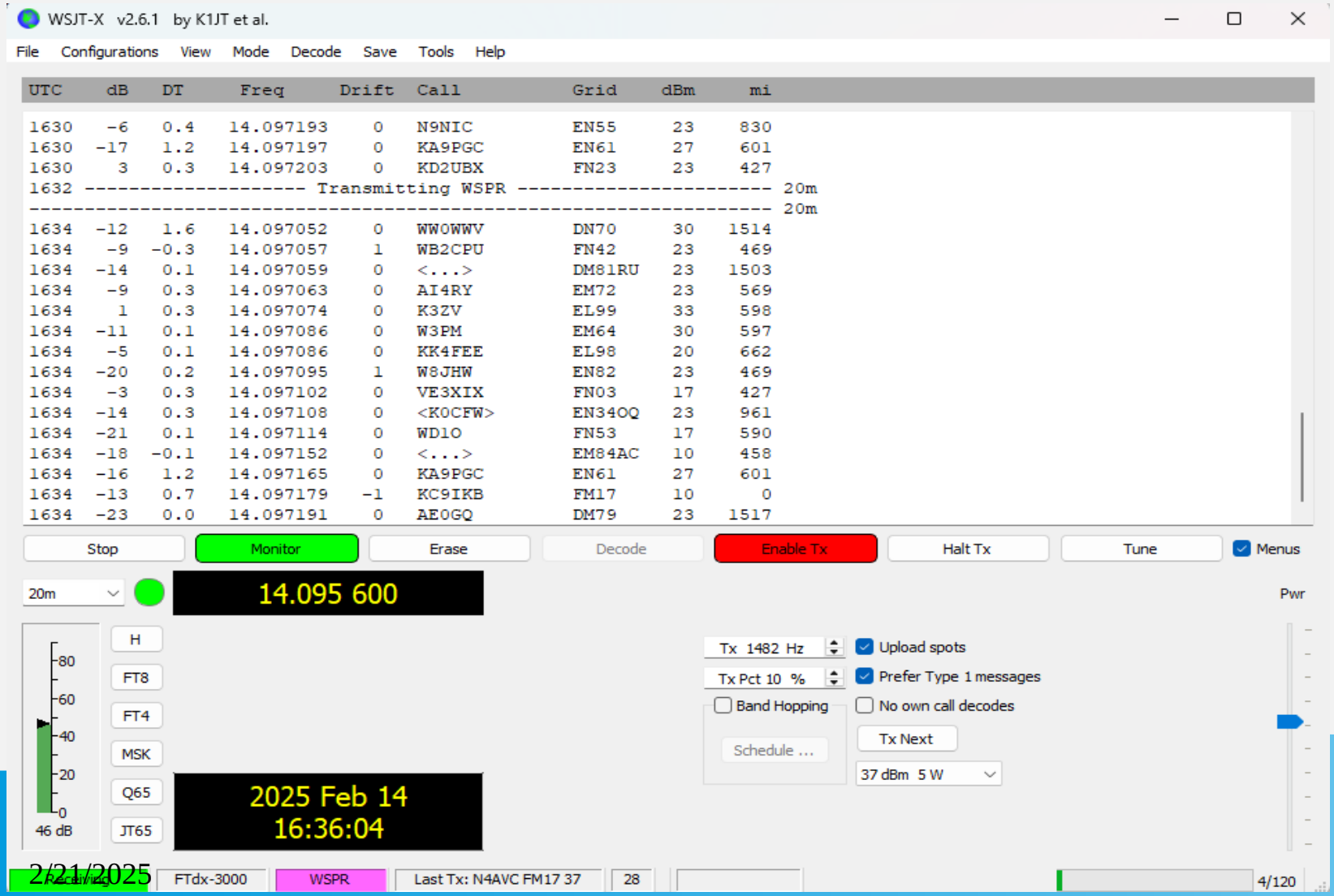
PSK Reporter

- https://pskreporter.info/pskmap.html

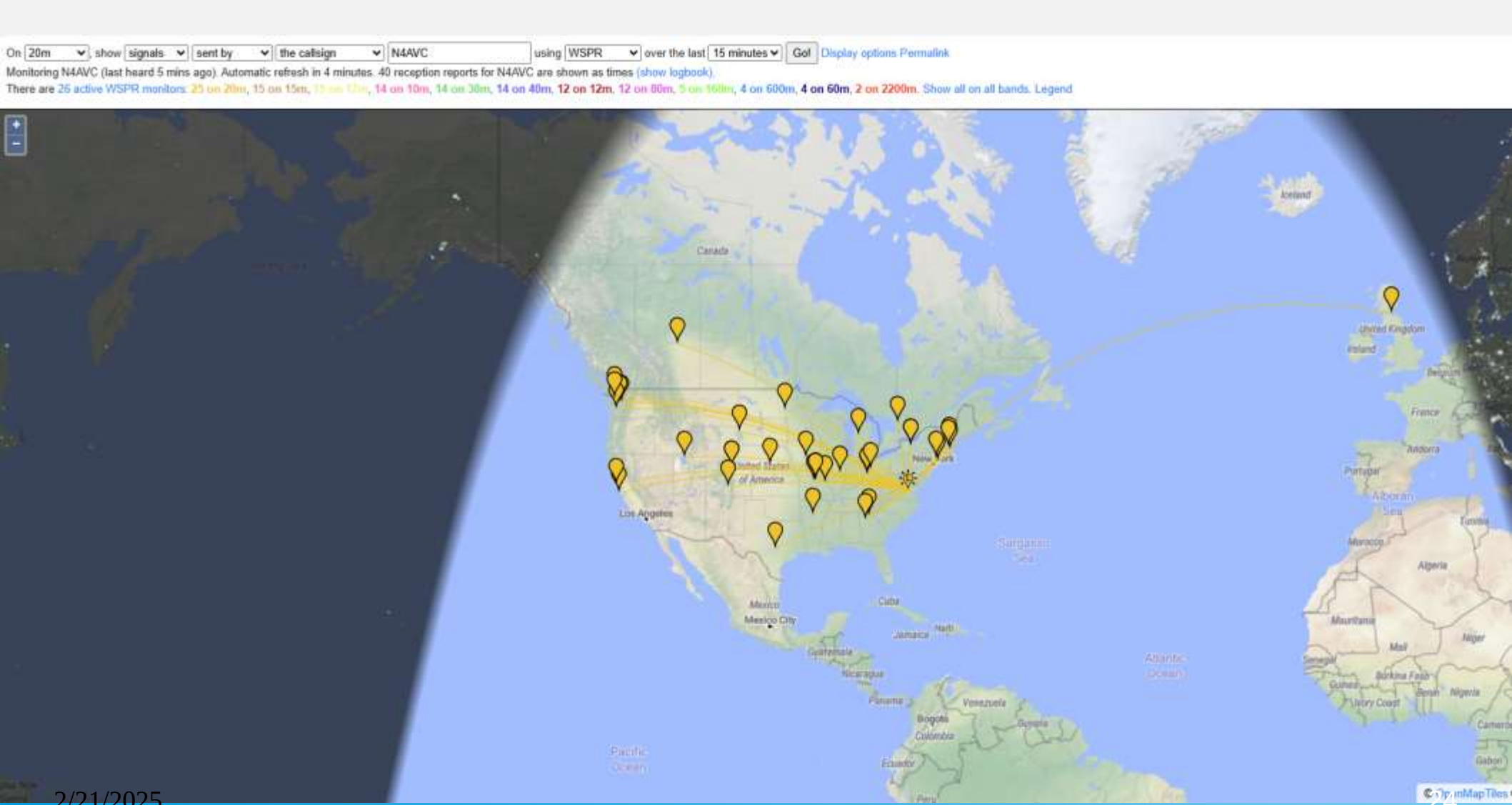



Display Reception Reports
https://pskreporter.info/pskmap.html
Google
G Maps
POTA
Bandplan
QRZ.COM
DXSummit
D Region Abs
HF Prop
NWS Radar
7-Day Forecast
Winlink Wednesday
ARRL
N4pow
NA5B
G Calendar
Login - eQSL.cc
LoTW
Log Analysis
PSK RPTR
Other favorites
On 40m show signals sent by the callsign N4AVC using FT8 over the last 30 minutes Go! Display options Permalink
Monitoring N4AVC (last heard 15 mins ago). Automatic refresh in 4 minutes. 427 reception reports for N4AVC are shown as times (show logbook)
There are 1328 active FT8 monitors: 1314 on 40m, 280 on 20m, 253 on 30m, 225 on 80m, 199 on 15m, 163 on 10m, 144 on 60m, 124 on 12m, 17 on 600m, 12 on 6m, 6 on 2m, 4 on 2200m, 2 on 10Ghz, 1 on 15m. Show all on all bands. Legend
Rx at Tue, 28 Jan 2025 00:33:04 GMT
From N4AVC by YD9HJD in Indonesia Loc OI81hj39
Frequency: 7.076.342 MHz (40m), FT8, -11dB
Distance: 16479 km bearing 332°
Using: JTDX v2.2.160-rc7 8a3efc
Antenna: G3TXQ Hexbeam 6 Band
© OpenMapTiles © OpenStreetMap contributors


On 20m show signals sent by the callsign N4AVC using FT8 over the last 2 hours Go! Display options Permalink
Monitoring N4AVC (last heard 45 mins ago). Automatic refresh in 5 minutes. 288 reception reports for N4AVC are shown as times (show logbook).
There are 1589 active FT8 monitors: 1576 on 20m, 325 on 15m, 305 on 10m, 281 on 40m, 261 on 30m, 251 on 12m, 149 on 80m, 71 on 60m, 25 on 6m, 14 on 2m, 13 on 600m, 4 on 11m, 3 on 2.4Ghz, 1 on 2200m, 1 on 70cm, 1 on 10Ghz. Show all on all bands. Legend
Canada
Mexico
Mexico City
Cuba
Jamaica
Haiti
Guatemala
Nicaragua
Panama
Venezuela
Bogota
Colombia
Ecuador
Peru
Iceland
Portugal
Morocco
Algeria
Mauritania
Mali
Senegal
Guinea
Burkina Faso
Ivory Coast
Nigeria
© OpenMapTiles © OpenStreetMap contributors



10 dBm	10 mW
13 dBm	20 mW
17 dBm	50 mW
20 dBm	100 mW
23 dBm	200 mW
27 dBm	500 mW
30 dBm	1 W
33 dBm	2 W
37 dBm	5 W


On 20m, show signals, sent by, the callsign, N4AVC, using WSPR, over the last 15 minutes, Go!, Display options Permalink
Monitoring N4AVC (last heard 5 mins ago). Automatic refresh in 4 minutes. 40 reception reports for N4AVC are shown as times (show logbook).
There are 26 active WSPR monitors: 25 on 20m, 15 on 15m, 14 on 10m, 14 on 30m, 14 on 40m, 12 on 12m, 12 on 80m, 5 on 160m, 4 on 600m, 4 on 60m, 2 on 2200m. Show all on all bands. Legend
Canada
Iceland
United Kingdom
Ireland
France
Andorra
Portugal
Morocco
Algeria
Tunisia
Mauritania
Mali
Niger
Nigeria
Senegal
Burkina Faso
Guinea
Ivory Coast
Benin
Cameroon
Gabon
United States of America
Los Angeles
New York
Mexico
Mexico City
Cuba
Haiti
Jamaica
Guatemala
Nicaragua
Panama
Venezuela
Bogotá
Colombia
Guyana
Ecuador
Peru
Sargasso Sea
Atlantic Ocean
Pacific Ocean
© OpenMapTiles