

PSK31

Andrew, W5AWS
Tulsa Amateur Radio Club
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PSK31 Overview

- Radio equivalent of an acoustic MODEM
 - MODulator-DEModulator
 - A computer hardware device that converts data from a digital format into a format suitable for an analog transmission medium such as telephone or radio.



PSK31 Overview

- A MODEM transmits data by modulating one or more carrier wave signals to encode digital information, while the receiver demodulates the signal to recreate the original digital information.
- The goal is to produce a signal that can be transmitted easily and decoded reliably.

PSK31 Characteristics

- Like CW, PSK31 signals are very narrow, energy and spectrum efficient
- Can be decoded under very poor conditions
- One of the first weak-signal digital modes introduced in the year 2000 by Peter Martinez, G3PLX
- Takes advantage of PC sound-card technology
- Facilitates free-form exchange of text messages
- PSK is an abbreviation for Phase Shift Keying
- 31 is the bit-rate, which is really 31.25

PSK31 Characteristics

- Uses Digital Signal Processing (DSP)
- Shifts phase angle 180° in sync with the 31.25 bits-per-second data stream
- A 0-bit generates a phase-shift; a 1-bit doesn't
 - Results in two phase angles 0° & 180°
 - Binary Phase-Shift Keying (BPSK)

PSK31 Characteristics

- Narrow bandwidth, efficient DSP algorithm, and synchronized sampling facilitates reception at very low signal levels
- Despite good performance, PSK31 is vulnerable to interference
- Frequency stability of transmission and reception is very important
- To reduce errors G3PLX added a second BPSK carrier with a 90° phase difference: Quarternary Phase Shift Keying (QPSK)

PSK31 Characteristics

- QPSK gives 100% copy under most conditions
 - Tuning is twice as critical for QPSK compared with BPSK.
 - Received tuning accuracy less than 4 Hz
 - Wider bandwidth
- Other forms of PSK31 that use higher data rates
 - Higher the speed the wider the signal
- Most operators use BPSK31

PSK31 Characteristics

- Which sideband?
 - BPSK works with either USB or LSB
 - Tx and Rx can be on opposite sidebands
 - QPSK most operators use USB though LSB will work
 - Both Tx and Rx must be on the same sideband
- PSK31 contacts at less than 100 Hz separation
- Audio bandwidth is 2.5 kHz
 - Can support at least 20 simultaneous contacts
 - Important to avoid over-driving the audio

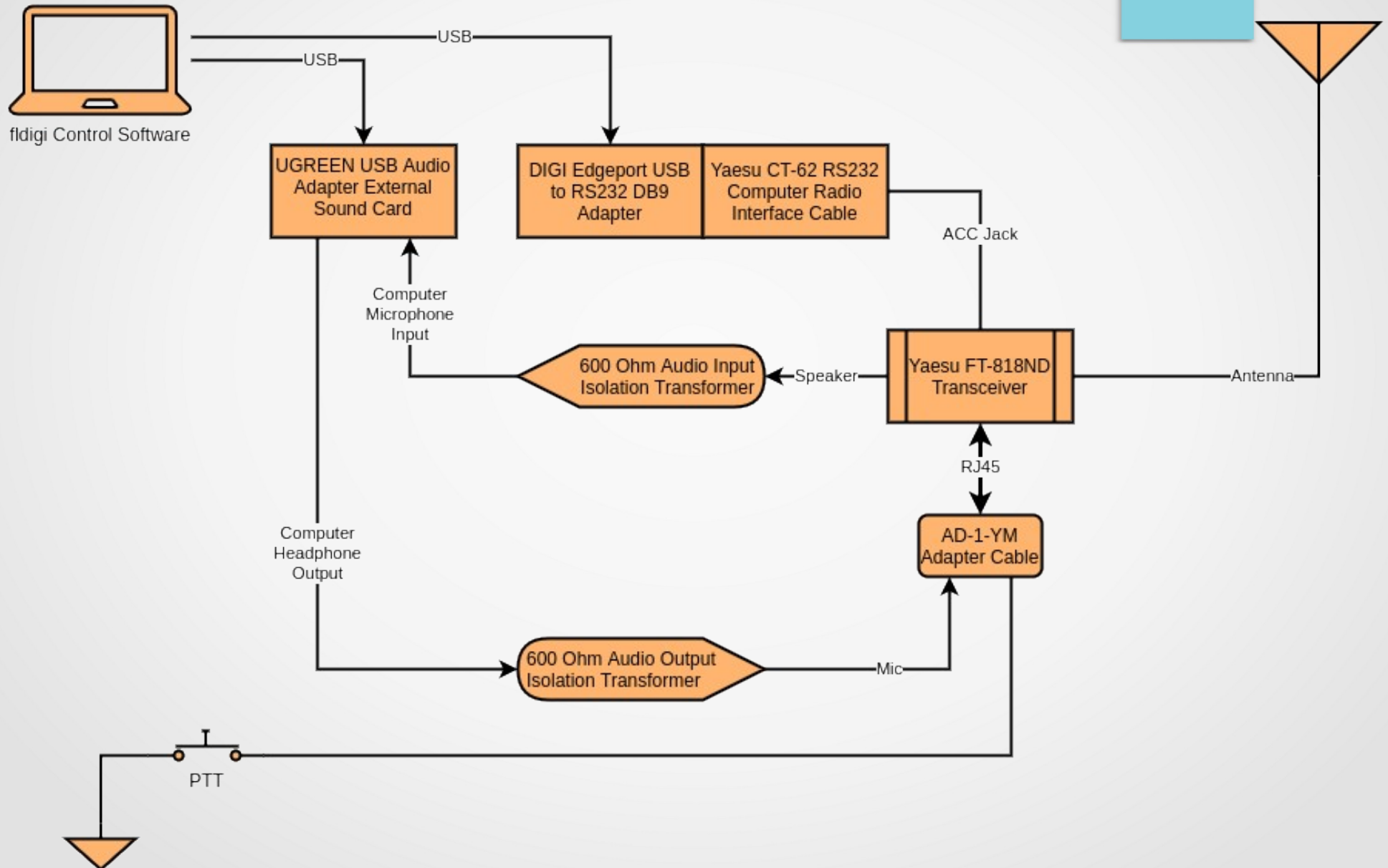
PSK31 Frequencies

- 1.838 MHz
- 3.580 MHz
- 7.070 MHz
- 10.142 MHz
- 14.070 MHz
- 18.097 MHz
- 21.080 MHz
- 24.920 MHz
- 28.120 MHz
- 50.290 MHz
- 144.144 MHz
- 222.07 MHz
- 432.2 MHz
- 909 MHz

PSK31 Station Hardware

- Three Digital Mode Interface (DMI) options:
 - Ad-hoc
 - RIGblaster Advantage
 - Digirig Mobile
- Complicated to easy

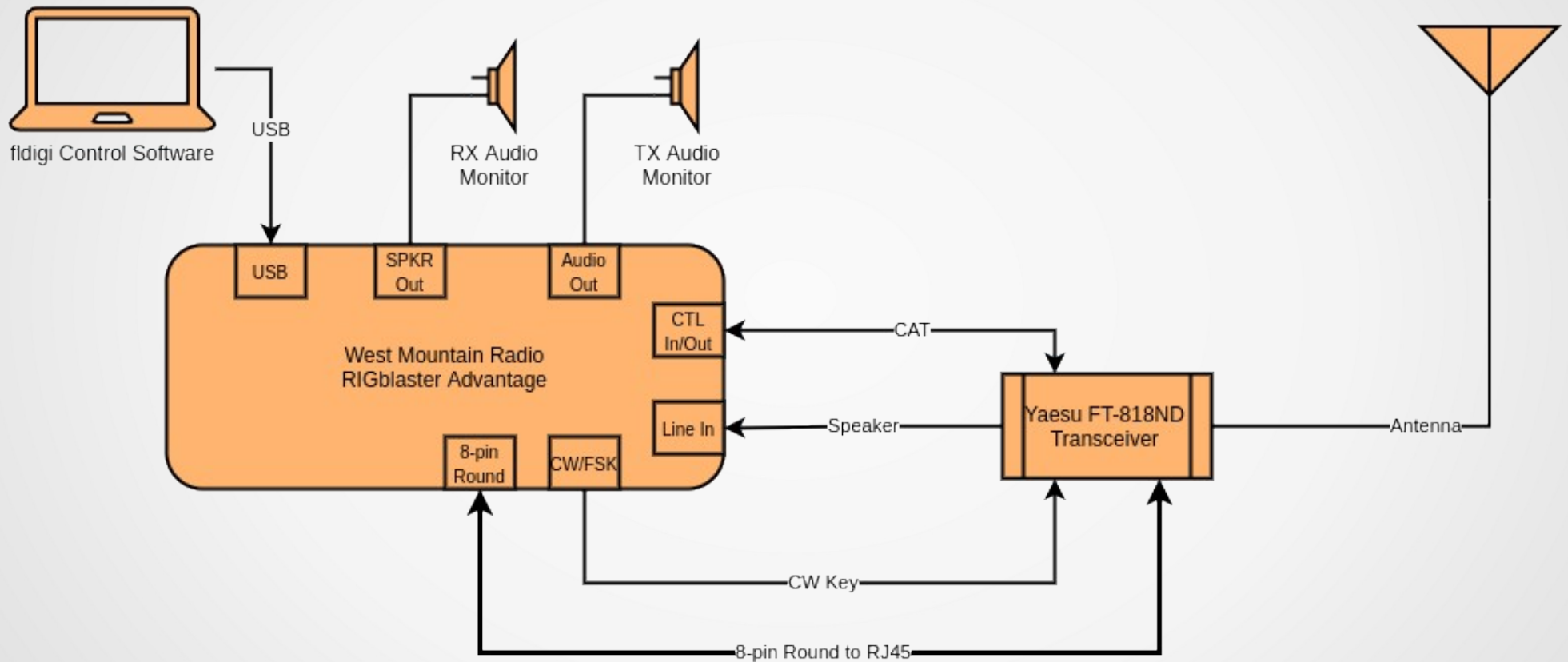
PSK31 Ad-hoc DMI



PSK31 Ad-hoc DMI

- UGREEN audio adapter external control card
 - Separates computer microphone input and speaker output
 - Avoids possible transmission of computer system audio
- Audio isolation transformers
 - Prevent interference caused by grounding loops between computer and external equipment
- AD-1-YM adapter cable
 - Separates radio mic. and PTT control lines on RJ45
- DIGI Edgeport USB-RS232 DB9 adapter
 - Permits CAT control of transceiver via interface cable

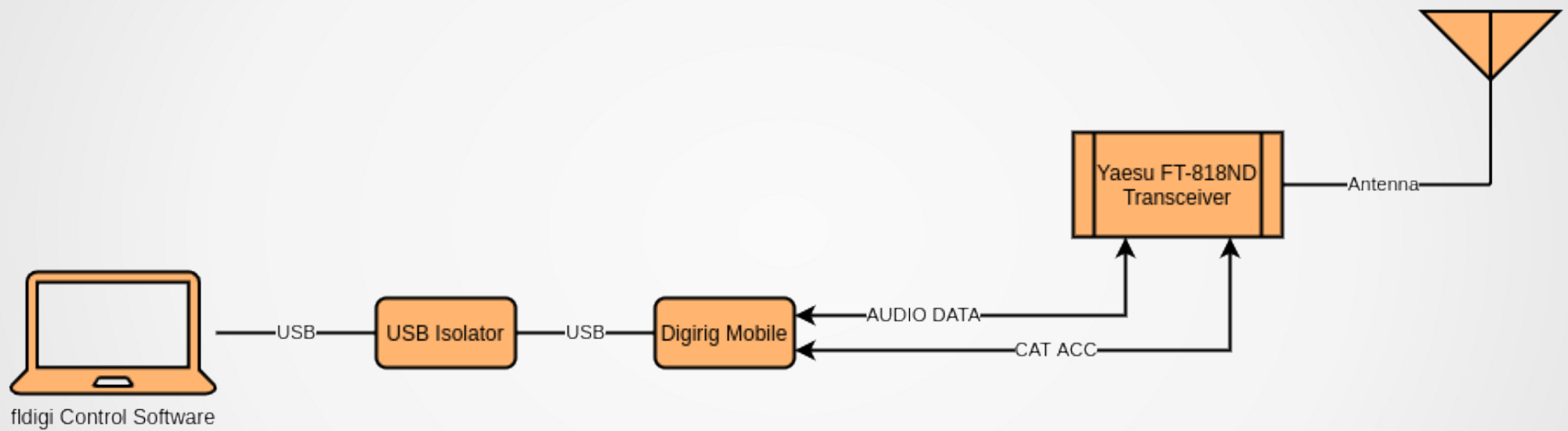
PSK31 RIGblaster Advantage DMI



PSK31 RIGblaster Advantage DMI

- Simplifies connection, control, and operation of a transceiver
- Operator adjustment of transmit and receive audio via potentiometers on the front panel
 - Saves trawling through menus on the computer looking for volume control

PSK31 Digirig Mobile DMI



PSK31 Digirig Mobile DMI

- After the last two iterations, this was must-have equipment reviewed in QST magazine by
 - Steve Ford, WB8IMY
- Available from
 - <https://digirig.net/store/>
- The USB isolator helps to eliminate ground loops
- Coiled connecting cables are neater and help suppress any EMI

PSK31 Control Software

- East light digital (fldigi)
 - Suite of free and open-source software that allows use of an ordinary computer sound-card as a simple two-way data modem
 - Cross-platform compatible
 - Windows
 - Linux
 - MacOS
 - Android
 - Free BSD

PSK31 fldigi Suite

- The *Fldigi Suite* consists of the fldigi modem and all extension programs
 - *flamp*—implements the Amateur Multicast Protocol
 - A tool for connectionless transferring of files to multiple users simultaneously without requiring any existing infrastructure
 - *flarq*—implements the ARQ specification
 - ARQ—Automatic Repeat Request
 - Transfers emails, text files, images, and binary files over radio
 - *flmsg*—allows users to send, receive, edit, and create pre-formatted forms
 - *flmsg* has a number of forms built-in including FEMA ICS forms, MARS reports & messages, Hospital ICS forms, Red Cross messages, IARU and NTS messages

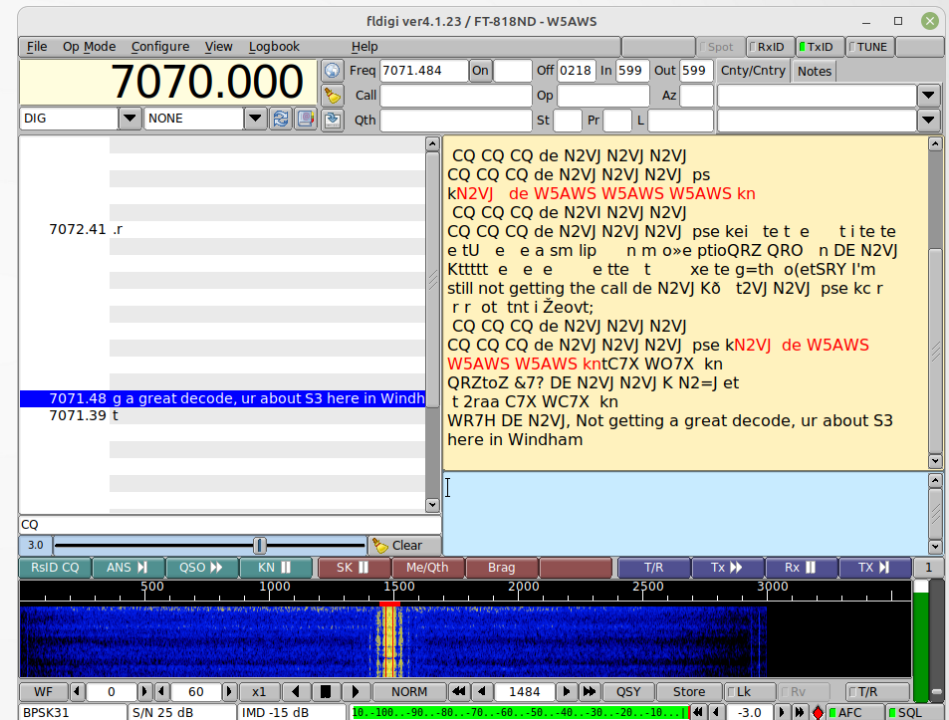
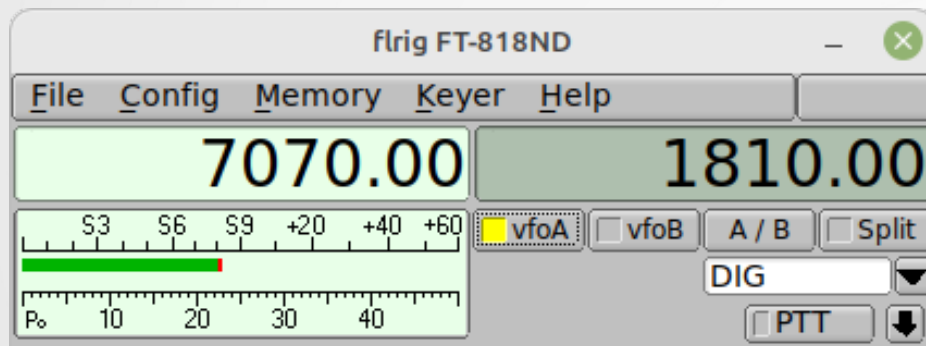
PSK31 fldigi Suite

- ...continued
 - *flwrap*—a tool for the sending of files using a simplified drag and drop interface
 - Data compression is available also, which reduces data transfer times
 - *flnet*—assists net control operators in keeping track of multiple station check-ins
 - *fllog*—logging
 - *flwkey*—interface to Winkeyer
 - *flcluster*—telnet client to remote DX cluster servers
 - Real-time reporting of stations heard transmitting
 - Does not connect to *fldigi*

PSK31 fldigi Suite

- ...continued
 - *flaa*—control program for use with the RigExpert AA-xxxx series of antenna analyzers
 - Does not connect to *fldigi*
 - *flrig*—enables computer aided control of various radios using a serial or USB connection
 - Used in combination with *fldigi*
 - *pskmail*—community extension to send and receive on-internet e-mail over a remote radio connection

PSK31 Operations



PSK31 Ant. ML Vert. NW—SW

Display Reception Reports — Mozilla Firefox

Startpage - Private Search E X Display Reception Reports x +

https://pskreporter.info/pskmap?callsign=w5aws&search=Find

On all bands show signals sent/rcvd by the callsign w5aws using all modes over the last 12 hours Go! Display options

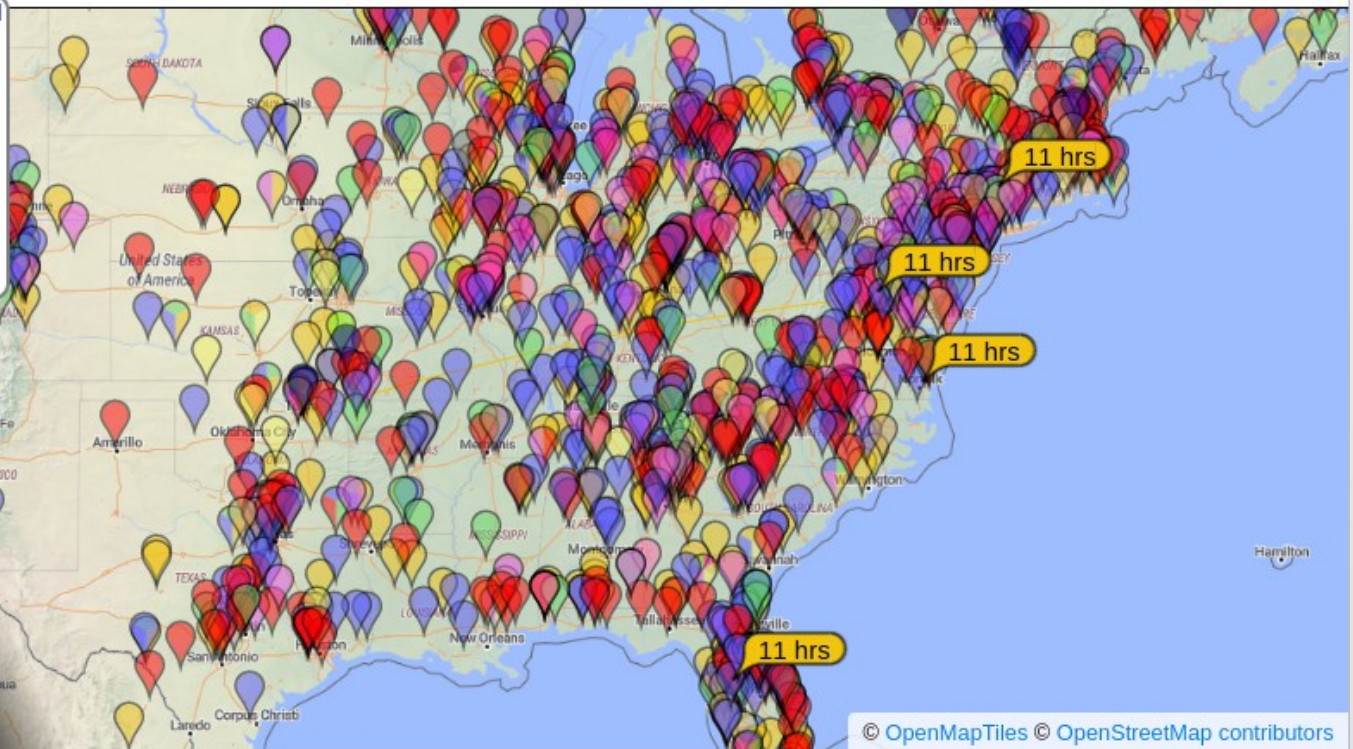
[Permalink](#)

Monitoring W5AWS (last heard 11 hrs ago). Automatic refresh in 5 minutes. 4 reception reports for W5AWS are shown as times ([show logbook](#)).

There are 6420 active monitors: 1454 on 20m, 1034 on 40m, 975 on 15m, 886 on 6m, 470 on 17m, 388 on 2m, 336 on 30m, 272 on 10m, 212 on 12m, 127 on 80m, 61 on unknown, 57 on 11m, 26 on 70cm, 15 on 2200m, 12 on 4m, 9 on 60m, 6 on 23cm, 5 on uhf, 3 on 160m, 3 on 600m. Legend

Download (ADIF) last 24 hours, last week

Rcvr	Band	Mode	Distance	Time (UTC)
KA5BJC	20m	PSK31	1243 miles	01:07:33
K8GIS	20m	PSK31	1017 miles	01:07:31
KC3FL	20m	PSK31	939 miles	01:07:31
KN4ZXG	20m	PSK31	1093 miles	00:47:06



PSK31 Ant. ML Horizontal

Display Reception Reports — Mozilla Firefox

Startpage - Private Search E X Display Reception Reports X +



https://pskreporter.info/pskmap?band=all&sig=all&ttrx=all&what=callsign&callsig



On show sent/rcvd by w5aws using over the last [Display options](#)

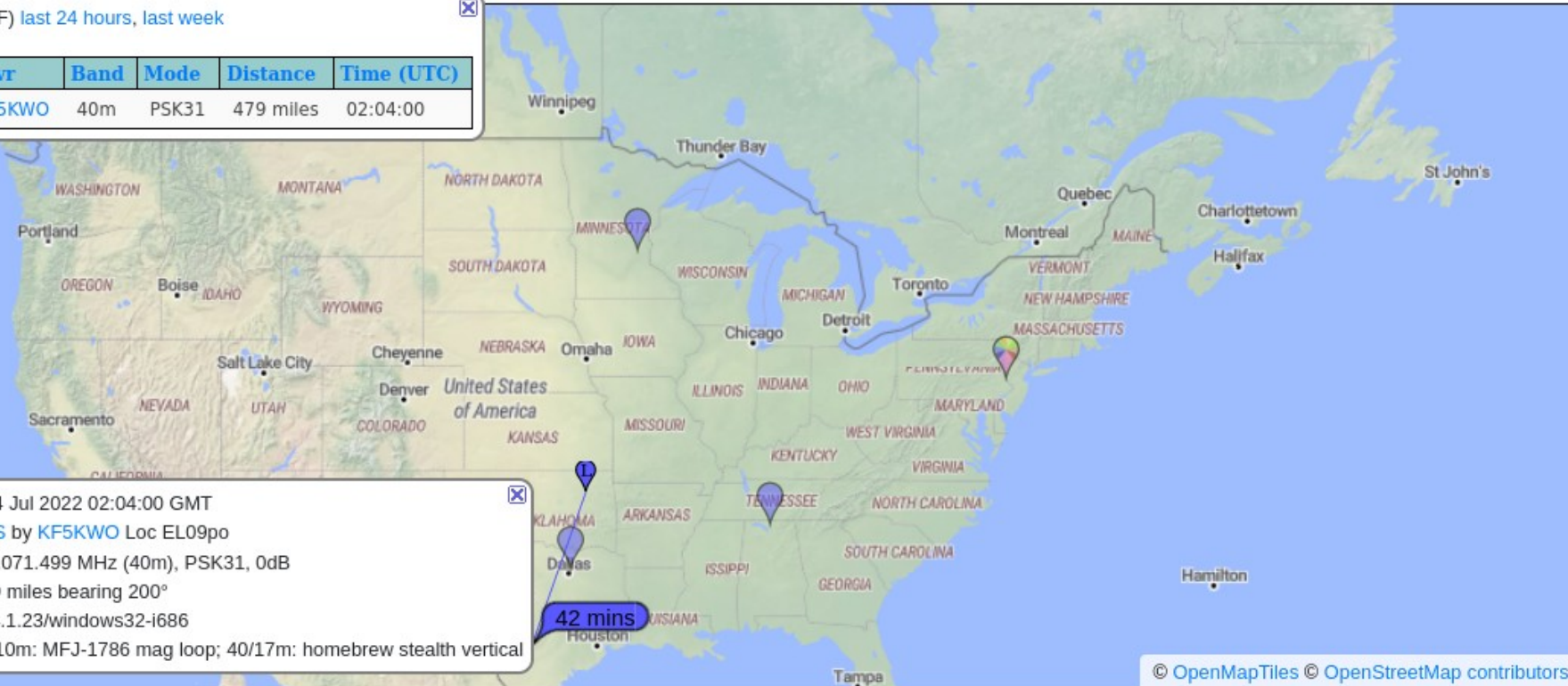
[Permalink](#)

Monitoring W5AWS (last heard 22 mins ago). Automatic refresh in 4 minutes. 1 reception reports for W5AWS are shown as times ([show logbook](#)).

There are 5 active PSK31 monitors on 40m. [Show all PSK31 on all bands](#). [Show all on all bands](#). [Legend](#)

Download (ADIF) [last 24 hours](#), [last week](#)

Txmtr	Rcvr	Band	Mode	Distance	Time (UTC)
W5AWS	KF5KWO	40m	PSK31	479 miles	02:04:00



Rx at Mon, 04 Jul 2022 02:04:00 GMT
From W5AWS by KF5KWO Loc EL09po
Frequency: 7.071.499 MHz (40m), PSK31, 0dB
Distance: 479 miles bearing 200°
Using: fldigi-4.1.23/windows32-i686
Antenna: 30-10m: MFJ-1786 mag loop; 40/17m: homebrew stealth vertical

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PSK31 Signal Reporting

- http://www.w1hkj.com/FldigiHelp/rst_rsq_page.html
- RST is the traditional Readability, Strength, Tone reporting system used for CW operations for nearly as long as amateurs have enjoyed the airwaves.
- RSQ is appropriate for digital modes, but especially BPSK and QPSK
 - Readability, Strength, Quality

PSK31 Signal Reporting

- Readability
 1. 0% undecipherable
 2. 20% occasional words distinguishable
 3. 40% considerable difficulty, many missed characters
 4. 80% practically no difficulty, occasional missed characters
 5. 95%+ perfectly readable

PSK31 Signal Reporting

- Strength
 1. Barely perceptible trace
 2. n/a
 3. Weak trace
 4. n/a
 5. Moderate trace
 6. n/a
 7. Strong trace
 8. n/a
 9. Very strong trace

PSK31 Signal Reporting

- Quality
 1. Splatter over much of the visible waterfall
 2. n/a
 3. Multiple visible pairs
 4. n/a
 5. One easily visible pair
 6. n/a
 7. One barely visible pair
 8. n/a
 9. Clean signal — no visible unwanted sidebar pairs

PSK31 Demonstration

- PreciseRF SOTA Loop
- Yaesu FT-818ND transceiver
- Laptop computer
- Digirig Mobile Digital Mode Interface

PSK31 References

- Get on the Air with HF Digital (2nd Edition)
 - by Steve Ford, WB8IMY
 - [Used book via biblio.com](#)
 - Unavailable in ARRL store
- Wikipedia
 - <https://en.wikipedia.org/wiki/PSK31>
 - <https://en.wikipedia.org/wiki/Fldigi>
- W1HKJ fldigi Software
 - <http://www.w1hkj.com/>
- Digirig Mobile Interface
 - <https://digirig.net/product/digirig-mobile/>
- Using fldigi
 - <https://www.youtube.com/user/K4REF>

PSK31 References

- Digimode Automatic Propagation Reporter
 - PSK Reporter
 - <https://pskreporter.info/>
- fldigi help
 - <http://www.w1hkj.com/FldigiHelp/index.html>

PSK31

Questions?

PSK31

73 QRT