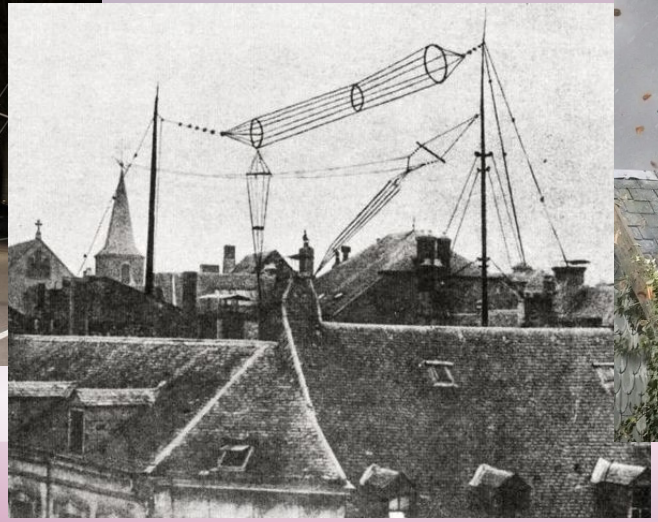
WSPR – Weak Signal Propgation Reporter

Ok so you've built your antenna... now what?

- How can we find out where your signal is being heard?
- How can we easily make a change to our setup and see if there is any improvement?



Option 1 – Build a model based on your contacts E.g. FT8 etc

- Sounds like a lot of work which is going to take time. Any change will require recalculation
- Doesn’t show what might be possible – you only get information on where you are currently being heard not where you might be able to be heard.

Option 2 – Use the RBN

- Can see where your signal is being heard in close to real-time.
- Only around 250 Skimmers in the network.
- Contributing to the RBN is non-trivial – requires hardware/software.
- Limited information.
- Can search on Sender or Receiver.
- Using the RBN keeps Gerard happy.

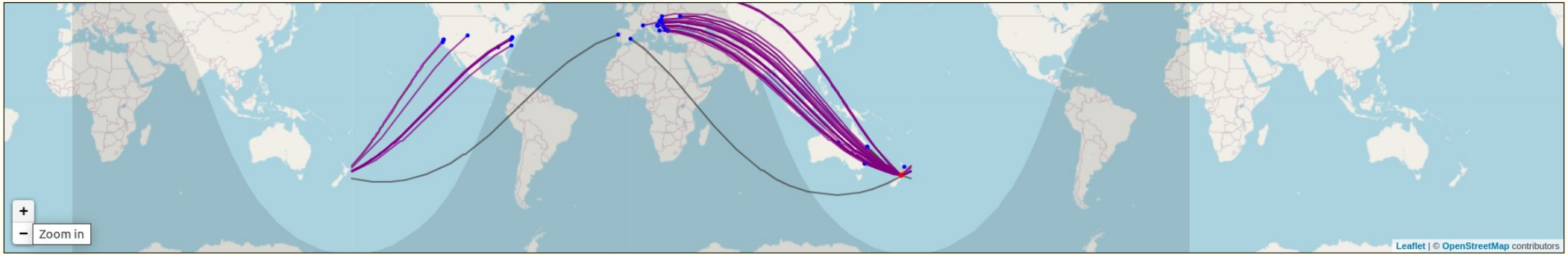
REVERSE BEACON NETWORK

Hosted by
www.dxwatch.com

SSN:121 SFI:149 A:6 K:1

DxWatch Callsign Lookup:

welcome | main | dx spots | nodes | FT8 | downloads | about | contact us



630m 160m 80m 60m 40m 30m 20m 17m 15m 12m 10m 6m 4m 2m

cw rtty psk31 psk63

CQ DX BCN /B NCDXF

Unfreeze Zoom

Max rows: 50 Max age: 3 Hours

New spots: 0

Show Spotters Advanced Mode

CW Speed: Min all Max all

Copy URL to Clipboard

Show Elements:
map
distance mi
distance km
freq
mode
type
snr
speed
time
seen

● Spotter (de) ● Spotted (dx)

callsign ZL2KS spotted-callsign[,spotted-callsign]

● spotter	● spotted	distance km	freq	mode	type	snr	speed	time	seen
ZL2KS	HA7GNH	17924 km	14027.2	CW	CQ	5 dB	32 wpm	2357z 26 May	now
ZL2KS	YT2T	17710 km	14003.1	CW	CQ	10 dB	33 wpm	2356z 26 May	74 seconds ago
ZL2KS	NY4A	13973 km	14019.4	CW	CQ	7 dB	36 wpm	2355z 26 May	2 minutes ago
ZL2KS	OM3KAP	17825 km	14032.0	CW	CQ	13 dB	33 wpm	2355z 26 May	2 minutes ago
ZL2KS	HA5JI	17905 km	14018.0	CW	CQ	15 dB	31 wpm	2354z 26 May	3 minutes ago
ZL2KS	9A5D	18023 km	14034.9	CW	CQ	9 dB	32 wpm	2354z 26 May	3 minutes ago
ZL2KS	UW5Y	16996 km	14026.7	CW	CQ	6 dB	37 wpm	2354z 26 May	3 minutes ago
ZL2KS	E7DX	18138 km	14029.0	CW	CQ	20 dB	37 wpm	2353z 26 May	4 minutes ago
ZL2KS	RG2A	16627 km	14010.4	CW	CQ	9 dB	32 wpm	2353z 26 May	4 minutes ago
ZL2KS	HA3LN	18007 km	14038.0	CW	CQ	13 dB	26 wpm	2353z 26 May	4 minutes ago
ZL2KS	K3CCR	14174 km	14023.5	CW	CQ	7 dB	26 wpm	2351z 26 May	6 minutes ago
ZL2KS	HA7G	17924 km	14027.3	CW	CQ	4 dB	30 wpm	2351z 26 May	6 minutes ago
ZL2KS	HA8A	17856 km	14022.5	CW	CQ	10 dB	31 wpm	2351z 26 May	6 minutes ago
ZL2KS	YT3X	17803 km	14030.7	CW	CQ	13 dB	35 wpm	2350z 26 May	7 minutes ago
ZL2KS	CR6K	19795 km	21033.9	CW	CQ	10 dB	39 wpm	2349z 26 May	8 minutes ago
ZL2KS	ND3D	14208 km	14016.0	CW	CQ	7 dB	12 wpm	2348z 26 May	9 minutes ago
ZL2KS	E77EA	18099 km	14029.0	CW	CQ	19 dB	34 wpm	2344z 26 May	13 minutes ago
ZL2KS	W6SC	10916 km	21033.0	CW	CQ	5 dB	31 wpm	2343z 26 May	14 minutes ago

REVERSE BEACON NETWORK

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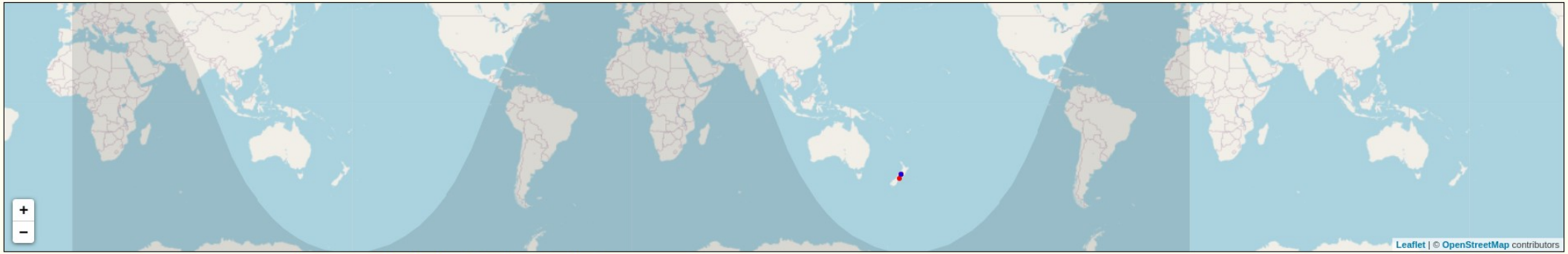
www.dxwatch.com

SSN:121 SFI:149 A:6 K:1

DxWatch Callsign Lookup:

welcome | main | dx spots | nodes | FT8 | downloads | about | contact us



630m 160m 80m 60m 40m 30m 20m 17m 15m 12m 10m 6m 4m 2m

cw rtty psk31 psk63

CQ DX BCN /B NCDXF

Unfreeze Zoom

Max rows: 50 Max age: 14 Days

New spots: 50

Show Spotters Advanced Mode

CW Speed: Min all Max all

Copy URL to Clipboard

Show Elements:
- map
- distance mi
- distance km
- freq
- mode
- type
- snr
- speed
- time
- seen

	Spotter (de)	Spotted (dx)
callsign	spotter-callsign	ZL2GVA

spotter	spotted	distance km	freq	mode	type	snr	speed	time	seen
ZL2KS	ZL2GVA	0 km	7033.3	CW	CQ	3 dB	22 wpm	1053z 21 May	5 days ago
ZL2KS	ZL2GVA	0 km	7034.4	CW	CQ	0 dB	21 wpm	1053z 21 May	5 days ago
ZL2KS	ZL2GVA	0 km	7062.1	CW	CQ	6 dB	22 wpm	1044z 21 May	5 days ago
ZL2KS	ZL2GVA	0 km	7022.5	CW	CQ	2 dB	22 wpm	1044z 21 May	5 days ago
ZL2KS	ZL2GVA	0 km	14063.4	CW	CQ	5 dB	22 wpm	1044z 21 May	5 days ago
ZL2KS	ZL2GVA	0 km	7058.8	CW	CQ	4 dB	22 wpm	1044z 21 May	5 days ago
ZL3X	ZL2GVA	224 km	3520.1	CW	CQ	38 dB	21 wpm	1036z 21 May	5 days ago
ZL2KS	ZL2GVA	0 km	3529.8	CW	CQ	5 dB	21 wpm	1035z 21 May	5 days ago
ZL2KS	ZL2GVA	0 km	7064.1	CW	CQ	3 dB	20 wpm	1035z 21 May	5 days ago
ZL2KS	ZL2GVA	0 km	7007.7	CW	CQ	2 dB	21 wpm	1023z 21 May	5 days ago
ZL2KS	ZL2GVA	0 km	3502.2	CW	CQ	0 dB	20 wpm	1023z 21 May	5 days ago
ZL2KS	ZL2GVA	0 km	21062.2	CW	CQ	2 dB	21 wpm	1023z 21 May	5 days ago
ZL2KS	ZL2GVA	0 km	7009.2	CW	CQ	3 dB	20 wpm	1022z 21 May	5 days ago
ZL2KS	ZL2GVA	0 km	7008.5	CW	CQ	6 dB	20 wpm	1022z 21 May	5 days ago
ZL2KS	ZL2GVA	0 km	21063.1	CW	CQ	5 dB	21 wpm	1022z 21 May	5 days ago
ZL2KS	ZL2GVA	0 km	3530.2	CW	CQ	6 dB	23 wpm	1015z 21 May	5 days ago
ZL2KS	ZL2GVA	0 km	14066.5	CW	CQ	5 dB	23 wpm	1014z 21 May	5 days ago
ZL2KS	ZL2GVA	0 km	3533.6	CW	CQ	6 dB	23 wpm	0956z 21 May	5 days ago

Option 3 - What is WSPR?

- WSPR is a digital mode (sorry) created by Joe Taylor.
- Uses frequency-shift keying
- Designed to decode signals with a signal to noise ratio as low as -28dB in a 2500Hz bandwidth (occupied bandwidth is 6Hz).
- Each transmission takes 110.6s
- Transmissions nominally start one second into an even UTC minute: e.g., at hh:00:01, hh:02:01, etc.

The WSPR message

The standard message is

<callsign> + <4 character locator> + <dBm transmit power>;

for example “ZL2NEB RE68xl 37” is a signal from station ZL2NEB in Maidenhead grid cell “RE68xl”, sending 37 dBm, or about 5.0 W

- Standard message components after lossless compression:

  28 bits for callsign,

  15 bits for locator,

  7 bits for power level,

  total: 50 bits.

WSPR

- Close to real-time reporting.
- Around 1500 reporting stations.
- WSPR reporters can be setup easily – minimal hardware.
- WSPR reports provide slightly more information than the RBN and greater accuracy.
- Good data visualisation tools exist.

WSPR Frequencies

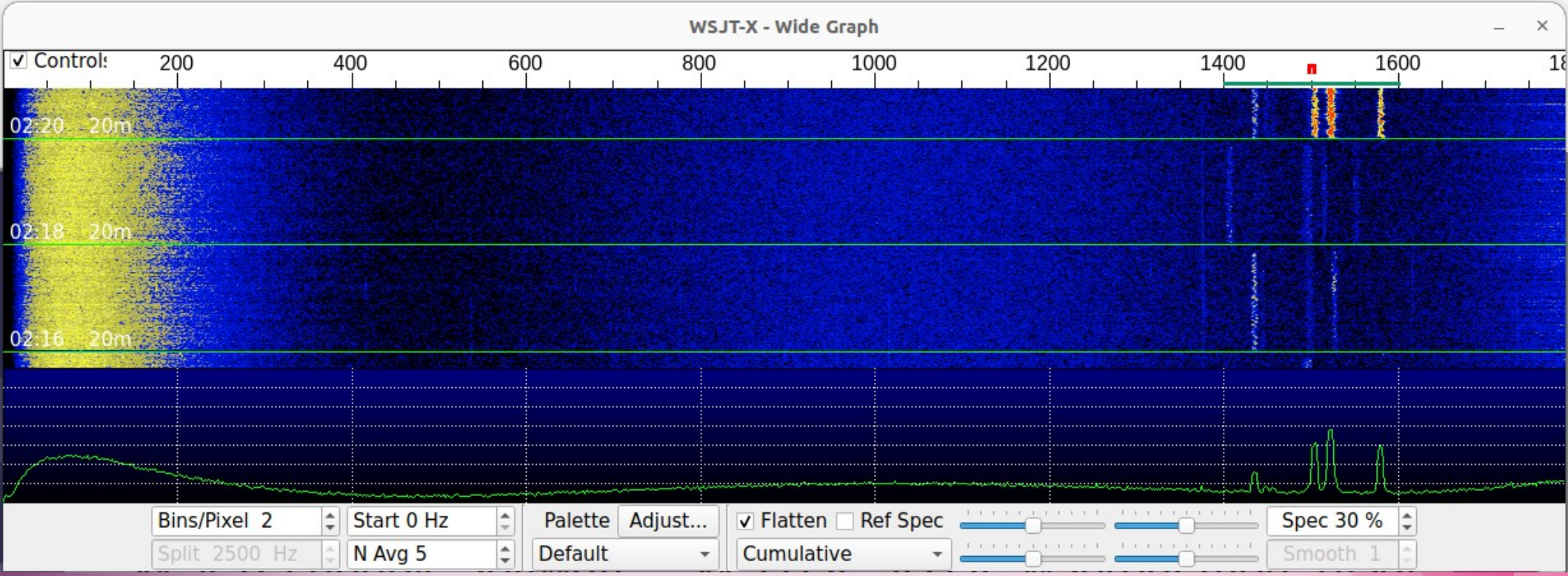
- Note that all channels use the upper sideband.

Band (Mtr)	Dial Frequency (MHz)	Lower Band Pass Frequency (MHz)	Upper Band Pass Frequency (MHz)	Band Width (Hz)
33400m	0.0072	0.0087	0.0089	200
2200m	0.1360	0.1374	0.1376	200
600m	0.4742	0.4756	0.4758	200
160m	1.8366	1.8380	1.8382	200
80m	3.5926	3.5940	3.5942	200
60m	5.2872	5.2886	5.2888	200
40m	7.0386	7.0400	7.0402	200
30m	10.1387	10.1401	10.1403	200
20m	14.0956	14.0970	14.0972	200
17m	18.1046	18.1060	18.1062	200
15m	21.0946	21.0960	21.0962	200
12m	24.9246	24.9260	24.9262	200
10m	28.1246	28.1260	28.1262	200
6m	50.2930	50.2944	50.2946	200
4m	70.0910	70.0924	70.0926	200
2m	144.4890	144.4904	144.4906	200

What do we need to send or receive WSPR?

- Receiver or Transceiver.
- A computer*.
- WSPR capable software – WSJTX, JDTX, wsprdaemon, rtlsdr-wsprd etc.
- An internet connection.
- Accurate time.

WSJTX & WSPR?


WSJT-X - Wide Graph
Controls
200
400
600
800
1000
1200
1400
1600
02:20 20m
02:18 20m
02:16 20m
Bins/Pixel 2
Start 0 Hz
Split 2500 Hz
N Avg 5
Palette
Adjust...
Default
Flatten
Ref Spec
Cumulative
Spec 30 %
Smooth 1

File Configurations View Mode Decode Save Tools Help

UTC	dB	DT	Freq	Drift	Call	Grid	dBm	km
								20m
0204	-25	-0.1	14.097014	0	EK6ODA	LN20	23	15787
0204	-17	-0.7	14.097035	0	W4WLO	EM50	30	12732
0204	-25	0.1	14.097091	0	<...>	KM18ME	23	17519
0204	-23	0.1	14.097100	0	HA6QL	JN97	33	17927
0204	-12	3.2	14.097165	1	VK2ZJ	QF56	23	2205
								20m
0206	-24	0.3	14.097148	0	G4HSB	IO94	23	18511
								20m
0208	-18	6.2	14.097035	0	W4WLO	EM50	30	12732
								20m
0210	-18	3.8	14.097038	-1	3D2UR	RH91	23	2600
0210	6	0.1	14.097122	0	VK3QN	QF22	37	2515
0210	0	0.1	14.097180	0	VK3MO	QF22	37	2515
								20m
0212	-18	-0.7	14.097035	0	W4WLO	EM50	30	12732
0212	-12	0.3	14.097098	0	VK7TW	QE37	37	2223
0212	-27	-0.0	14.097145	0	EK6ODA	LN20	23	15787
								20m
0214	-15	0.6	14.097097	1	VK2ZJ	QF56	23	2205
								20m
0216	-17	-0.8	14.097035	0	W4WLO	EM50	30	12732
0216	-19	-0.0	14.097126	0	VK4AFU	QG61	37	2385
								20m
0218	-23	0.3	14.097097	-1	WA9FIO	EN43	37	13362
0218	-25	0.3	14.097115	0	G4HSB	IO94	23	18511
0218	-26	0.2	14.097151	0	VK6KOZ	OF77	23	5237
								20m
0220	-18	-0.8	14.097035	0	W4WLO	EM50	30	12732
0220	-27	0.2	14.097048	0	K5XL	EM12	33	12247
0220	-28	0.0	14.097057	0	EK6ODA	LN20	23	15787
0220	-3	-0.1	14.097104	0	VK2AAA	QF56	37	2205
0220	6	0.1	14.097123	0	VK3QN	QF22	37	2515
0220	-2	0.1	14.097179	-1	VK3MO	QF22	37	2515

Stop | Monitor | Erase | Decode | Enable Tx | Halt Tx | Tune | ☑ Menus

20m 14.095 600

Pwr

80
60
40
20
0
59 dB

2023 May 28
02:22:23

Tx 1500 Hz ☑ Upload spots
Tx Pct 20 % ☑ Prefer Type 1 messages
☐ Band Hopping ☐ No own call decodes
Schedule ... Tx Next
37 dBm 5 W

Receiving | WSPR | 23/120

UTC	dB	DT	Freq	Drift	Call	Grid	dBm	km	
									20m
0204	-25	-0.1	14.097014	0	EK6ODA	LN20	23	15787	
0204	-17	-0.7	14.097035	0	W4WLO	EM50	30	12732	
0204	-25	0.1	14.097091	0	<...>	KM18ME	23	17519	
0204	-23	0.1	14.097100	0	HA6QL	JN97	33	17927	
0204	-12	3.2	14.097165	1	VK2ZJ	QF56	23	2205	
									20m
0206	-24	0.3	14.097148	0	G4HSB	IO94	23	18511	
									20m
0208	-18	6.2	14.097035	0	W4WLO	EM50	30	12732	
									20m
0210	-18	3.8	14.097038	-1	3D2UR	RH91	23	2600	
0210	6	0.1	14.097122	0	VK3QN	QF22	37	2515	
0210	0	0.1	14.097180	0	VK3MO	QF22	37	2515	
									20m
0212	-18	-0.7	14.097035	0	W4WLO	EM50	30	12732	
0212	-12	0.3	14.097098	0	VK7TW	QE37	37	2223	
0212	-27	-0.0	14.097145	0	EK6ODA	LN20	23	15787	
									20m
0214	-15	0.6	14.097097	1	VK2ZJ	QF56	23	2205	
									20m
0216	-17	-0.8	14.097035	0	W4WLO	EM50	30	12732	
0216	-19	-0.0	14.097126	0	VK4AFU	QG61	37	2385	
									20m
0218	-23	0.3	14.097097	-1	WA9FIO	EN43	37	13362	
0218	-25	0.3	14.097115	0	G4HSB	IO94	23	18511	
0218	-26	0.2	14.097151	0	VK6KOZ	OF77	23	5237	
									20m
0220	-18	-0.8	14.097035	0	W4WLO	EM50	30	12732	
0220	-27	0.2	14.097048	0	K5XL	EM12	33	12247	
0220	-28	0.0	14.097057	0	EK6ODA	LN20	23	15787	
0220	-3	-0.1	14.097104	0	VK2AAA	QF56	37	2205	
0220	6	0.1	14.097123	0	VK3QN	QF22	37	2515	
0220	-2	0.1	14.097179	-1	VK3MO	QF22	37	2515	

What information are we seeing?

UTC	dB	DT	Freq	Drift	Call	Grid	dBm	km	
0206	-24	0.3	14.097148	0	G4HSB	IO94	23	18511	
---	---	---	---	---	---	---	---	---	20m
0208	-18	6.2	14.097035	0	W4WLO	EM50	30	12732	
---	---	---	---	---	---	---	---	---	20m

UTC: Time from your computer

dB: Received signal to noise in dB

DT: Delta time – an indication of the senders time accuracy

Frequency

Drift: Drift of the transmitted signal in Hz

Call: Sending station callsign

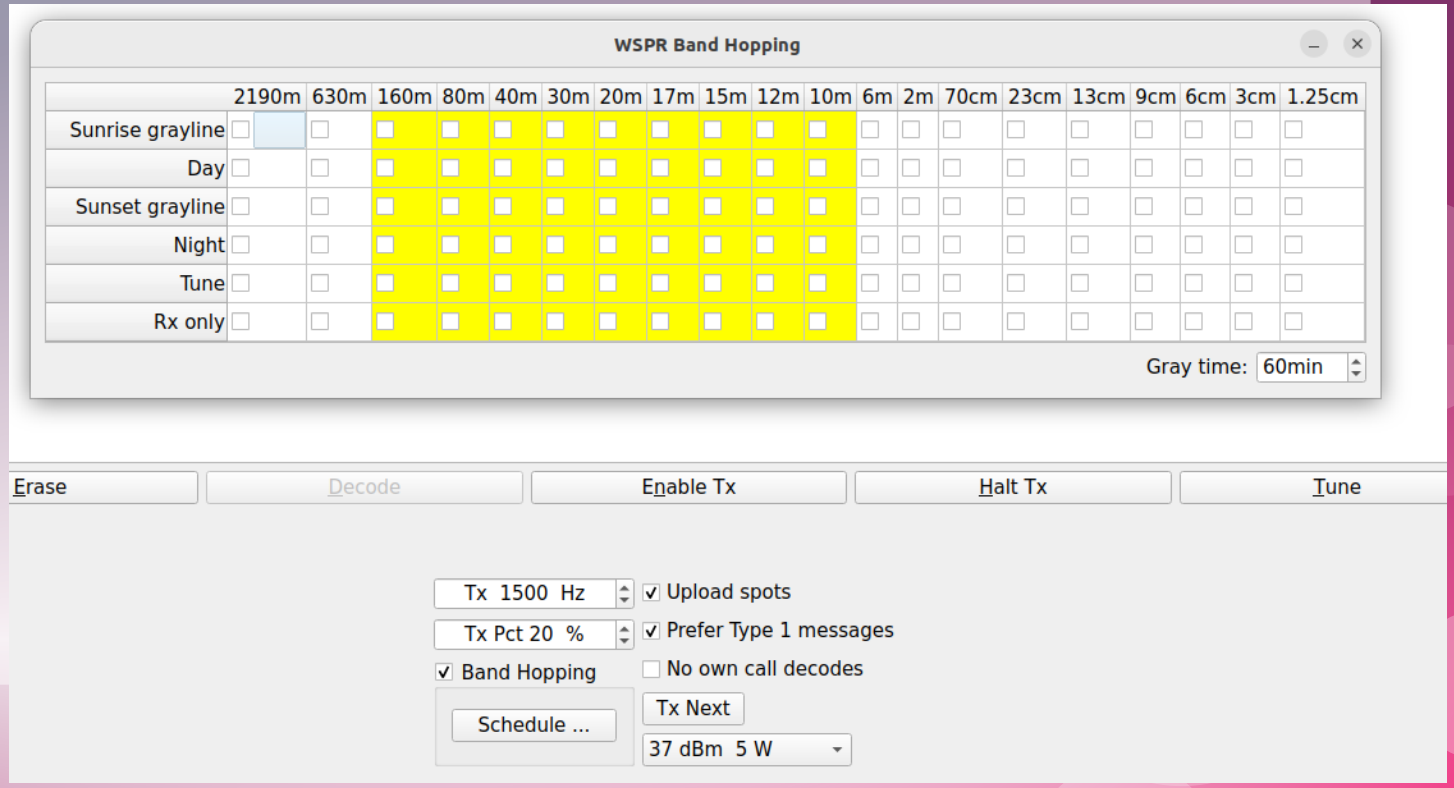
Grid: Sending station grid reference

dBm: Power reported by transmitting station

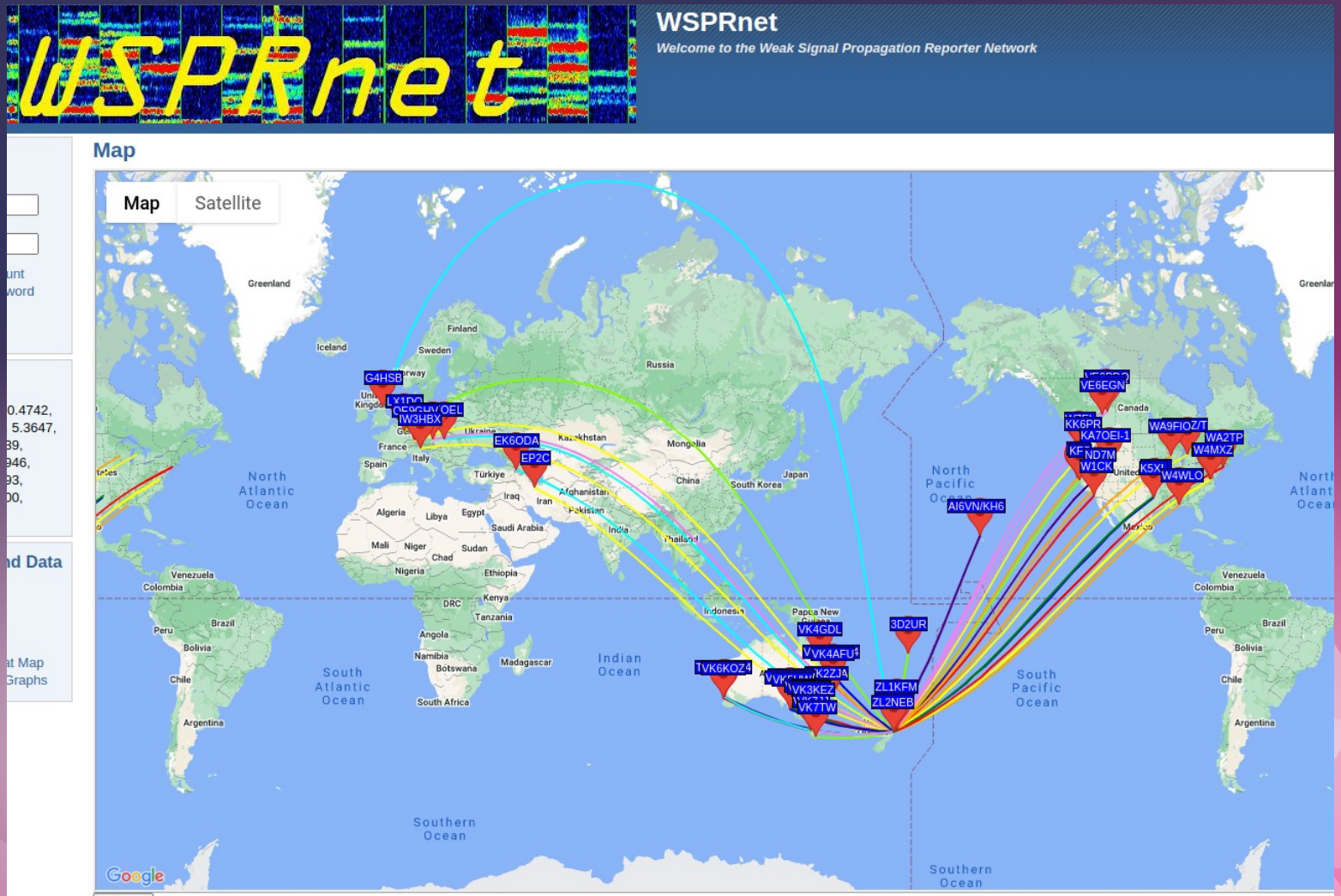
km: Distance between your receiving grid reference and the transmitting stations grid reference.

Multiple Bands?

- WSJTX supports a “band hopping” option



Ok – now what? WSPRNET



wspr.live

Search or jump to... ctrl+k

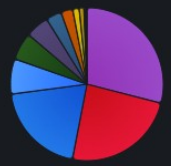
Sign in

Home › Dashboards › WSPR Station Information › Station activity

Last 7 days UTC

look for DK6UG | doing rx | on band 7 + 14

band activity



- 14 Value: 80977
- 7 Value: 67096
- 10 Value: 55410
- 3 Value: 20626
- 21 Value: 16125
- 18 Value: 13717
- 28 Value: 9057
- 5 Value: 6820

spots in timeframe (all bands)

277113

spots (selected bands)

148073

distinct stations (all bands)

2429

max distance (selected band and time) km

18836

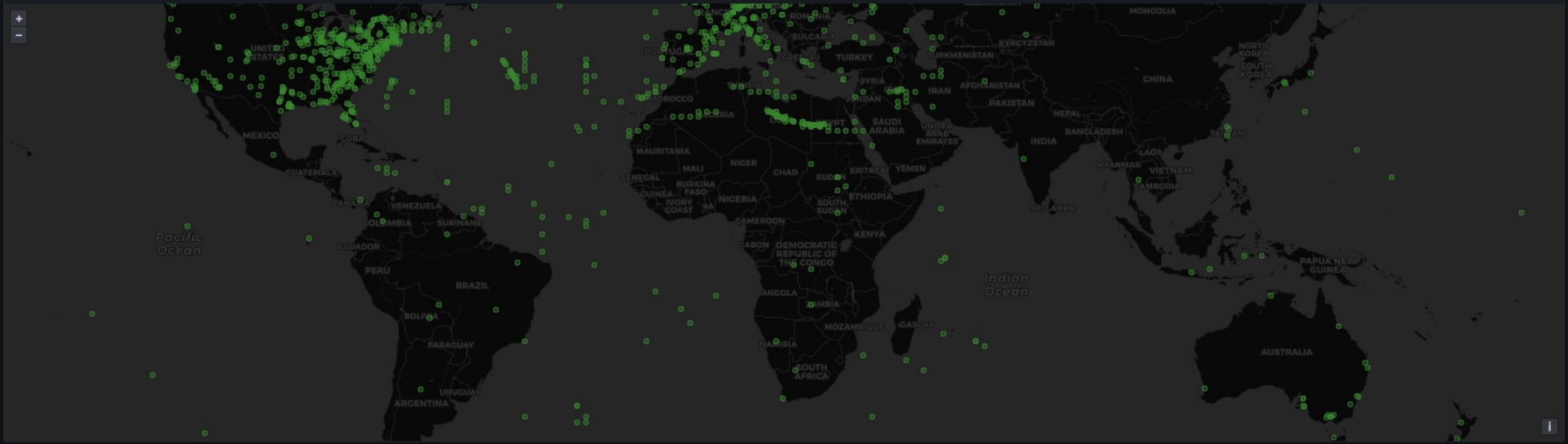
average distance (selected band and time) km

2315

dublicates in timeframe

859

tx by



spots total

distance (in km)

wspr.live

Search or jump to... ctrl+k

Sign in

Home › Dashboards › WSPR Station Information › Station activity

Last 10 months UTC

look for ZL2NEB | doing tx | on band 10

band activity

No data

spots in timeframe (all bands)

250010

spots (selected bands)

98325

distinct stations (all bands)

No data

max distance (selected band and time) km

19741

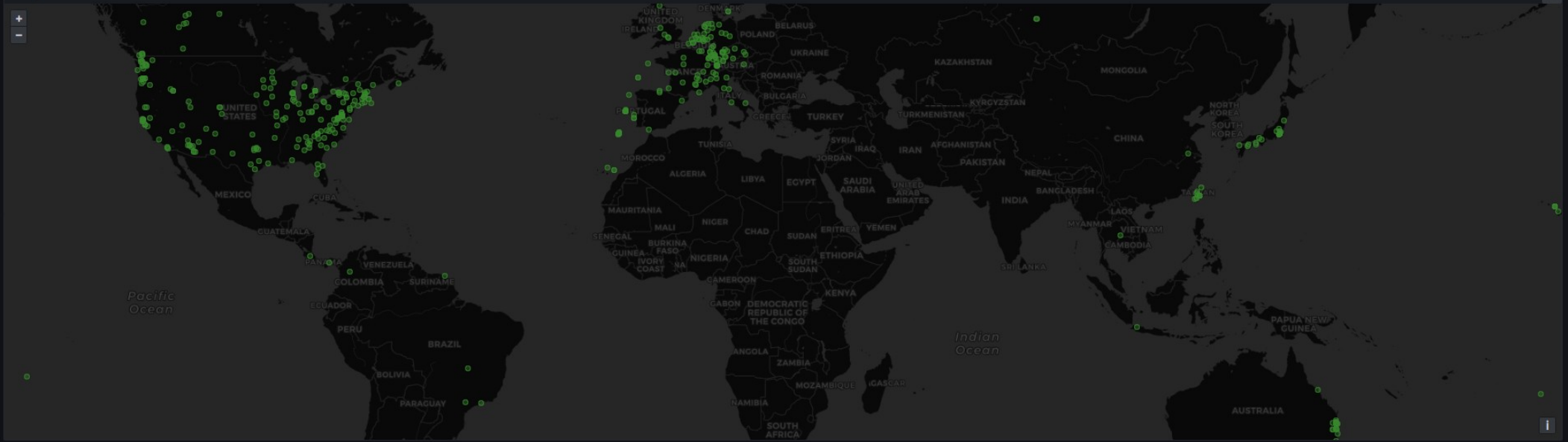
average distance (selected band and time) km

7266

dublicates in timeframe

36

rx by



spots total

distance (in km)

wspr.live

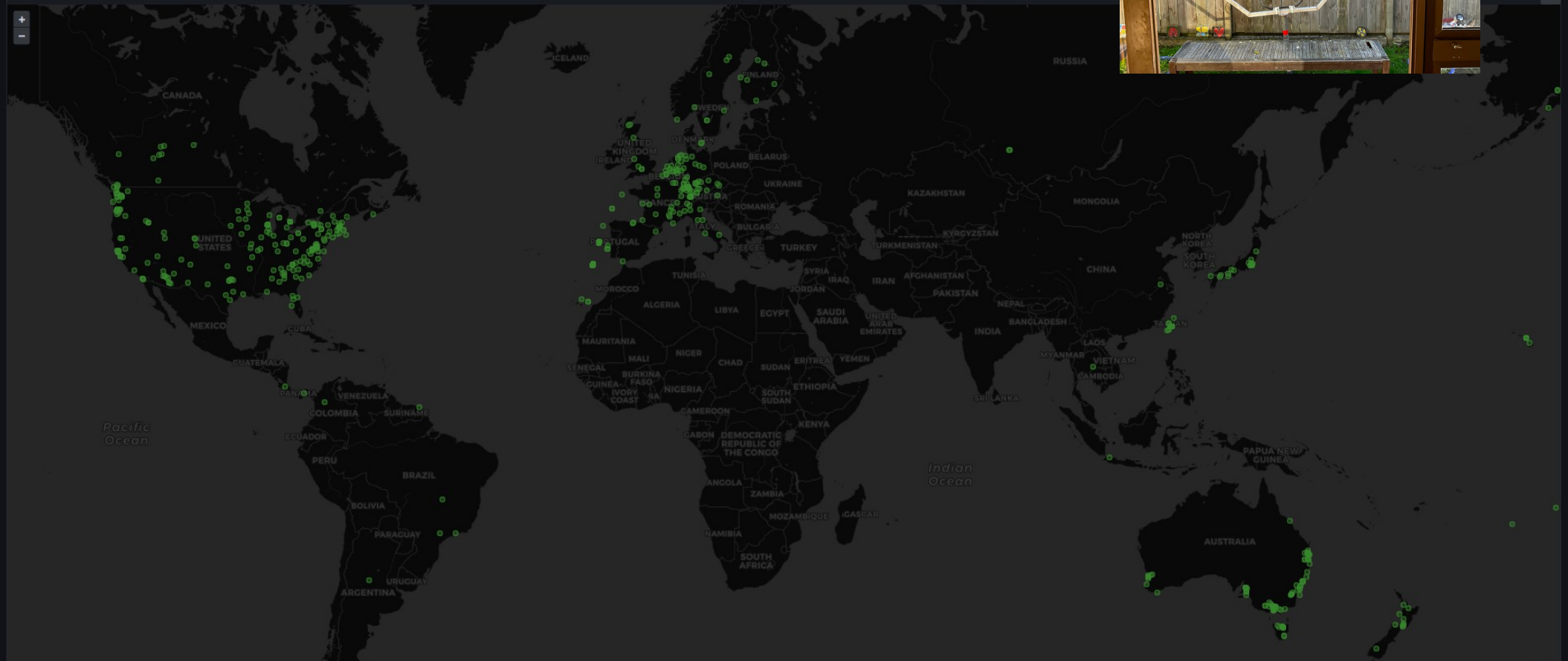
Search or jump to... ctrl+k

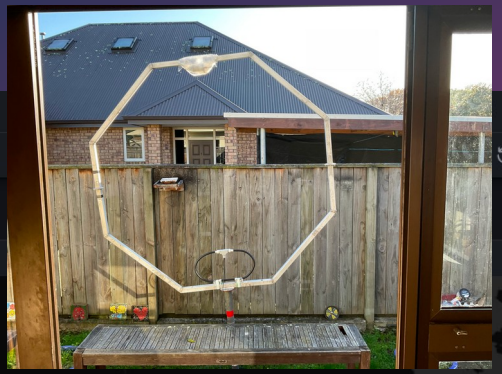
Sign in

Home › Dashboards › WSPR Station Information › Station activity › View panel

look for ZL2NEB | doing tx | on band 10

rx by





wspr.live

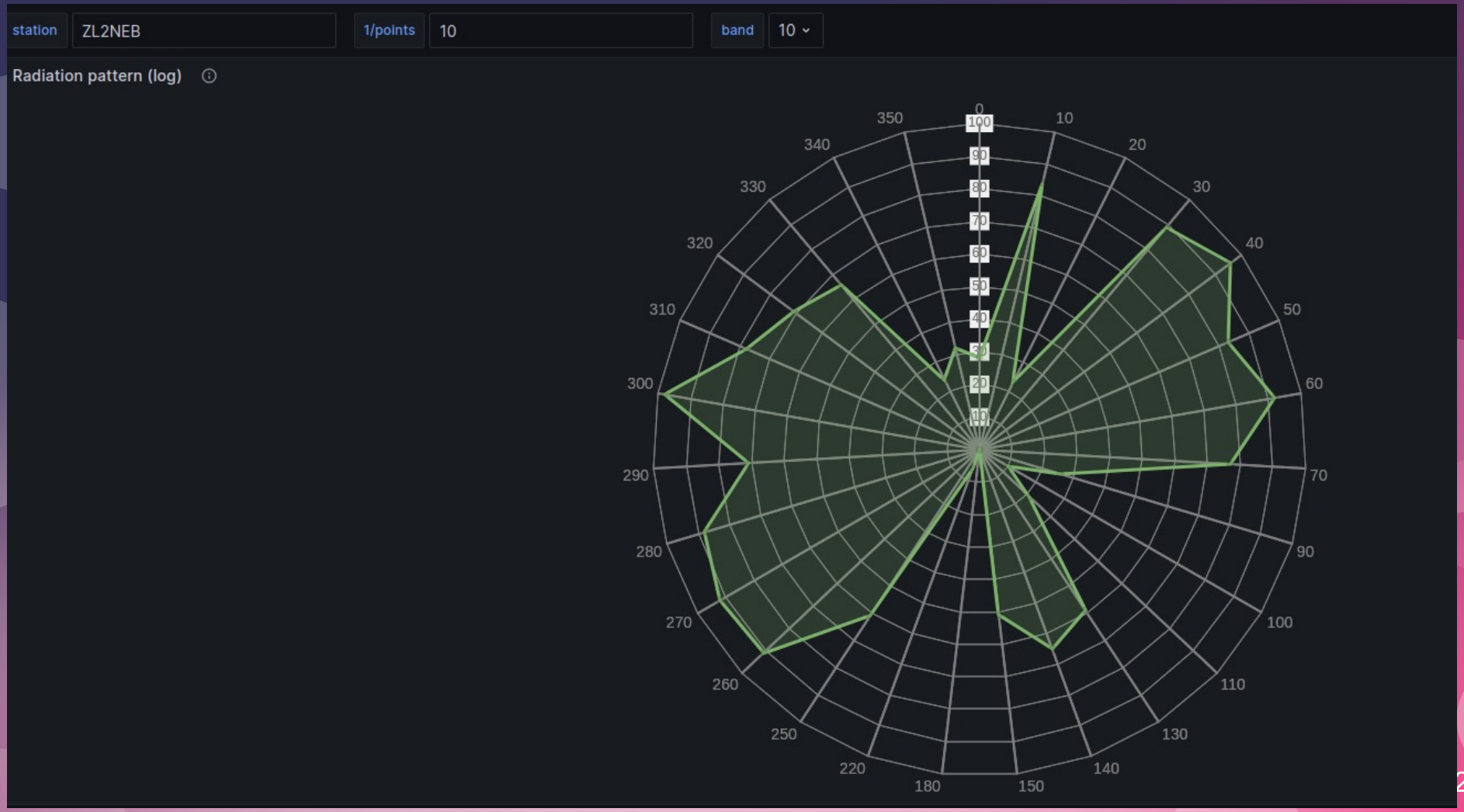
Search or jump to... ctrl+k

Home › Dashboards › WSPR Station Information › Station activity › View panel

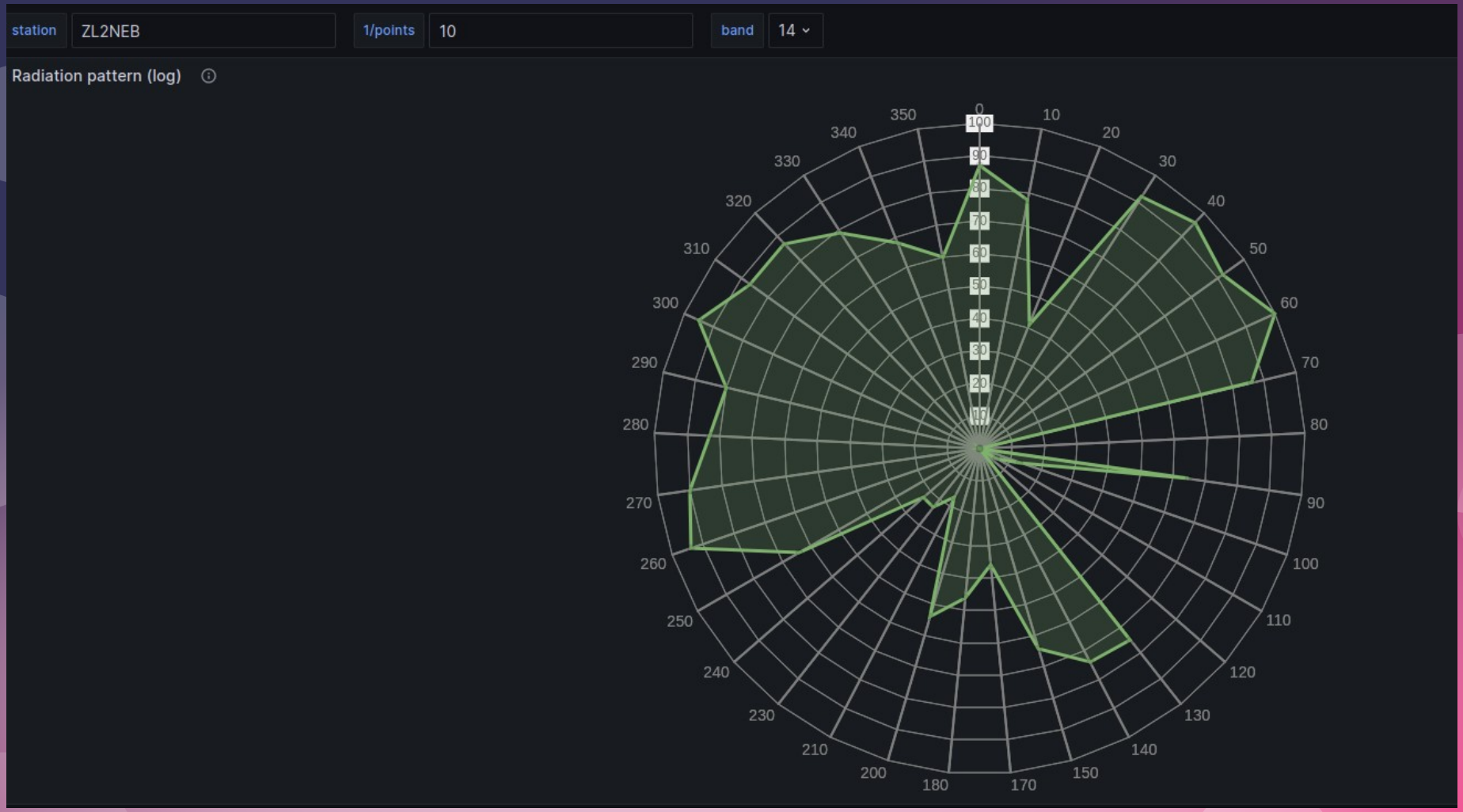
look for ZL2NEB | doing tx | on band 14

rx by

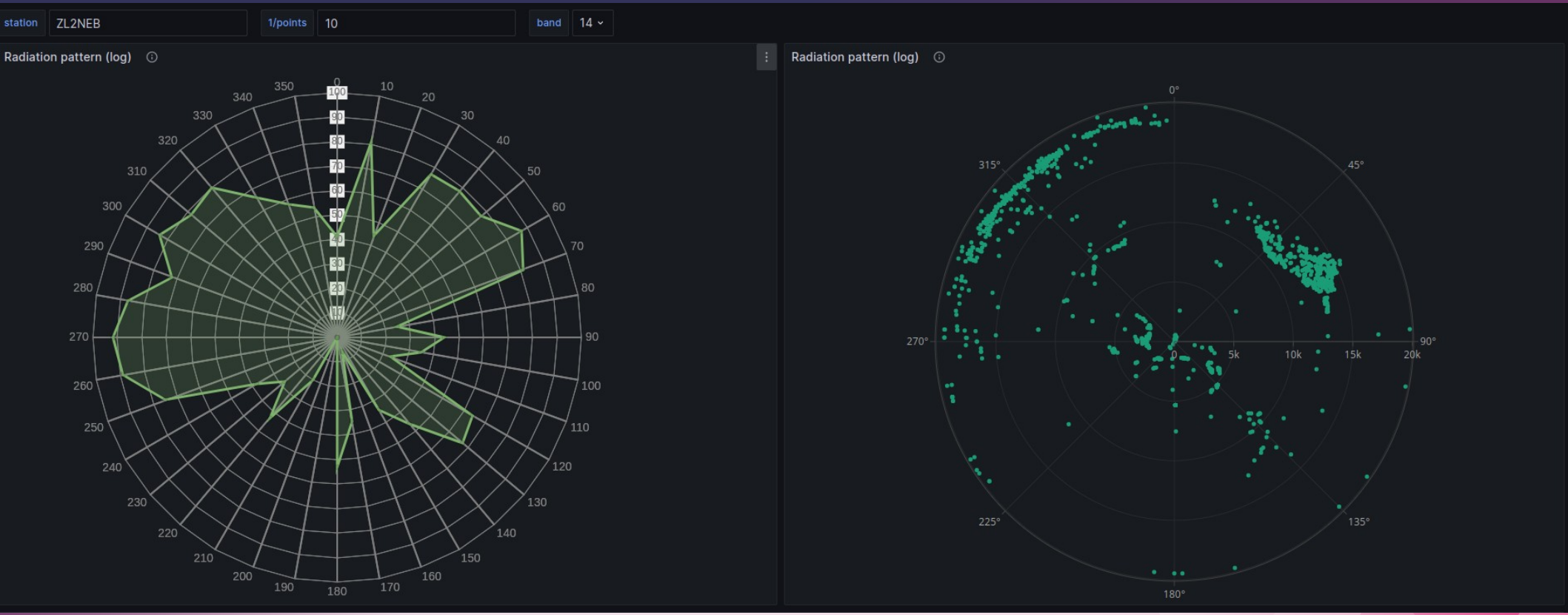
wspr.live 30m TX



wspr.live 20m TX



wspr.live 20m RX



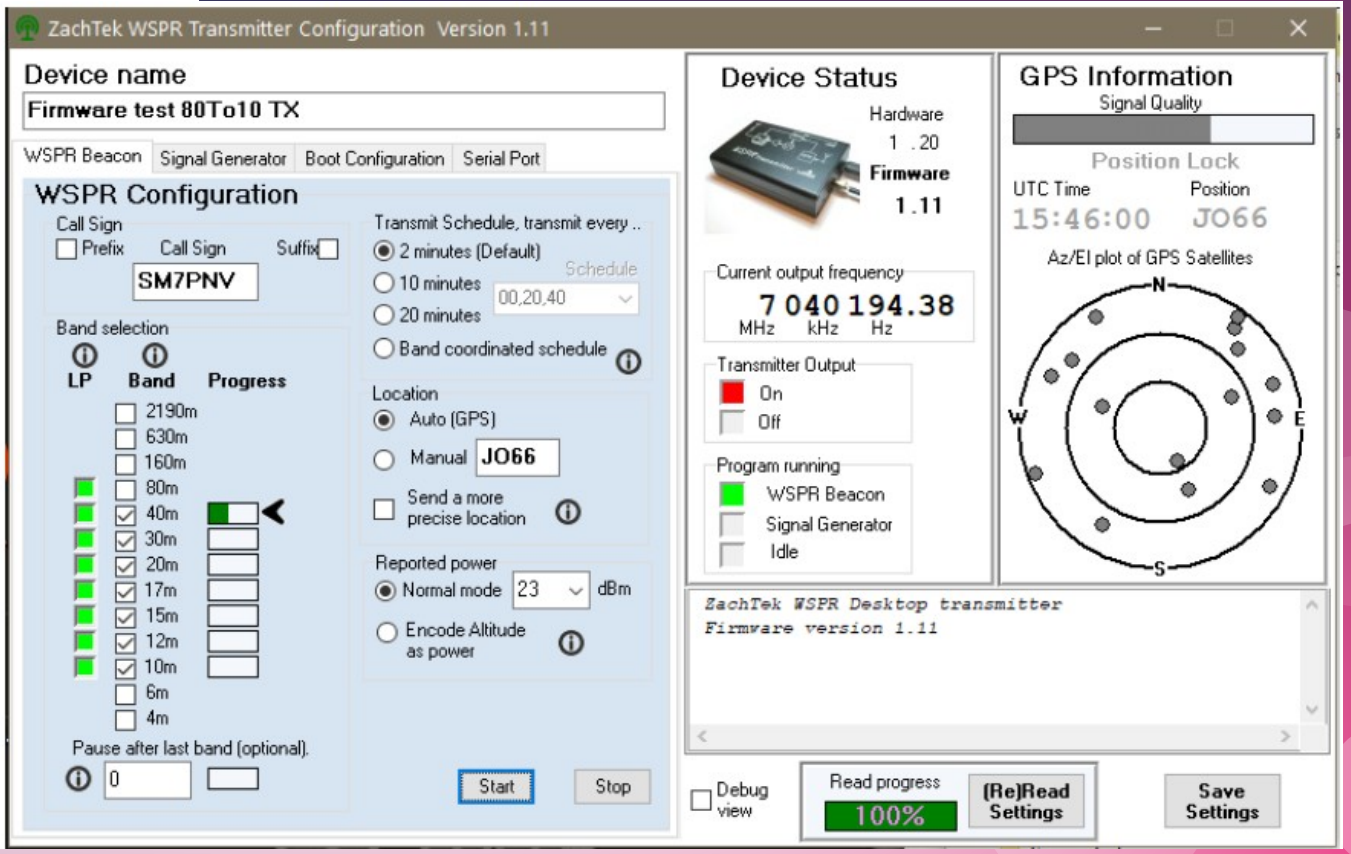
wspr.live dealing with real numbers

You can pull data directly from the data base for your own analysis

wget -q -O - "http://db1.wspr.live/?query=SELECT * FROM wspr.rx where time > subtractHours(now(), 12) and tx_sign='ZL2NEB' ORDER by time;"

```
nick@newton:~$ wget -q -O - "http://db1.wspr.live/?query=SELECT * FROM wspr.rx where time > subtractHours(now(), 12) and tx_sign='ZL2NEB' ORDER by time;"
5846510531      2023-05-27 15:32:00     14      ZL2RKL  -41.521 173.958 RE68xl  ZL2NEB  -41.521 173.958 RE68xl  0       0       0       14097173        23      -2      0       2.1.2     1
5846511630      2023-05-27 15:32:00     14      VK5ARG  -34.187 138.625 PF95ht  ZL2NEB  -41.521 173.958 RE68xl  3183    273     115     14097146        23      -25     0       spyserver_
5846565829      2023-05-27 15:52:00     7       VK7JJ   -41.271 146.958 QE38lr  ZL2NEB  -41.521 173.958 RE68xl  2243    262     99      7040184 23      -14     0       2.5.0   1
5846566746      2023-05-27 15:52:00     7       VK5ARG  -34.187 138.625 PF95ht  ZL2NEB  -41.521 173.958 RE68xl  3183    273     115     7040183 23      -11     0       spyserver_1
5846566920      2023-05-27 15:52:00     7       ZL2BCI  -40.854 175.125 RE79nd  ZL2NEB  -41.521 173.958 RE68xl  123     53      232     7040181 23      -23     0       1.3 Kiwi 1
5846568820      2023-05-27 15:52:00     7       ZL2005SWL       -41.021 173.042 RE68mx  ZL2NEB  -41.521 173.958 RE68xl  95      306     126     7040181 23      -26     0       WD_3.0.8  1
5846568932      2023-05-27 15:52:00     7       AI6VN/KH6       20.979  -156.542        BL10rx  ZL2NEB  -41.521 173.958 RE68xl  7585    30      203     7040181 23      -24     0WD_3.0.8 1
5846570093      2023-05-27 15:52:00     7       VK3KHZ  -37.812 145.292 QF22pe  ZL2NEB  -41.521 173.958 RE68xl  2476    270     108     7040182 23      -16     0       1.4A Kiwi1
5846581838      2023-05-27 15:52:00     7       VK4EMM  -27.271 152.958 QG62lr  ZL2NEB  -41.521 173.958 RE68xl  2483    303     135     7040181 23      -20     0               -1
5846647408      2023-05-27 16:22:00     7       VK7JJ   -41.271 146.958 QE38lr  ZL2NEB  -41.521 173.958 RE68xl  2243    262     99      7040111 23      -9      0       2.5.0   1
5846648069      2023-05-27 16:22:00     7       VK3KHZ  -37.812 145.292 QF22pe  ZL2NEB  -41.521 173.958 RE68xl  2476    270     108     7040108 23      -17     0       1.4A Kiwi1
5846649128      2023-05-27 16:22:00     7       ZL1TJK  -38.229 175.875 RF71ws  ZL2NEB  -41.521 173.958 RE68xl  401     25      203     7040107 23      -17     0       2.2.2   1
5846649620      2023-05-27 16:22:00     7       VK5ARG  -34.187 138.625 PF95ht  ZL2NEB  -41.521 173.958 RE68xl  3183    273     115     7040110 23      -14     0       spyserver_1
5846665386      2023-05-27 16:22:00     7       VK4EMM  -27.271 152.958 QG62lr  ZL2NEB  -41.521 173.958 RE68xl  2483    303     135     7040108 23      -19     0               -1
5846678838      2023-05-27 16:32:00     14      ZL2RKL  -41.521 173.958 RE68xl  ZL2NEB  -41.521 173.958 RE68xl  0       0       0       14097045        23      -4      0       2.1.2     1
5846738550      2023-05-27 16:52:00     7       VK7JJ   -41.271 146.958 QE38lr  ZL2NEB  -41.521 173.958 RE68xl  2243    262     99      7040152 23      -12     0       2.5.0   1
5846738983      2023-05-27 16:52:00     7       ZL1TJK  -38.229 175.875 RF71ws  ZL2NEB  -41.521 173.958 RE68xl  401     25      203     7040147 23      -18     0       2.2.2   1
5846756386      2023-05-27 16:52:00     7       VK4EMM  -27.271 152.958 QG62lr  ZL2NEB  -41.521 173.958 RE68xl  2483    303     135     7040149 23      -18     0               -1
```

Transmitter options ZacTek



Transmitter options QRPLabs

Receiving options