Comparing Four WSPRDAEMON Antennas

DXE RSEAV1, N6GN High-Z SAS, N6GN Med-Z SAS, n6gn Med-Z double gain SAS

Care and Feeding thereof

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TAPR Director and WebStore manager

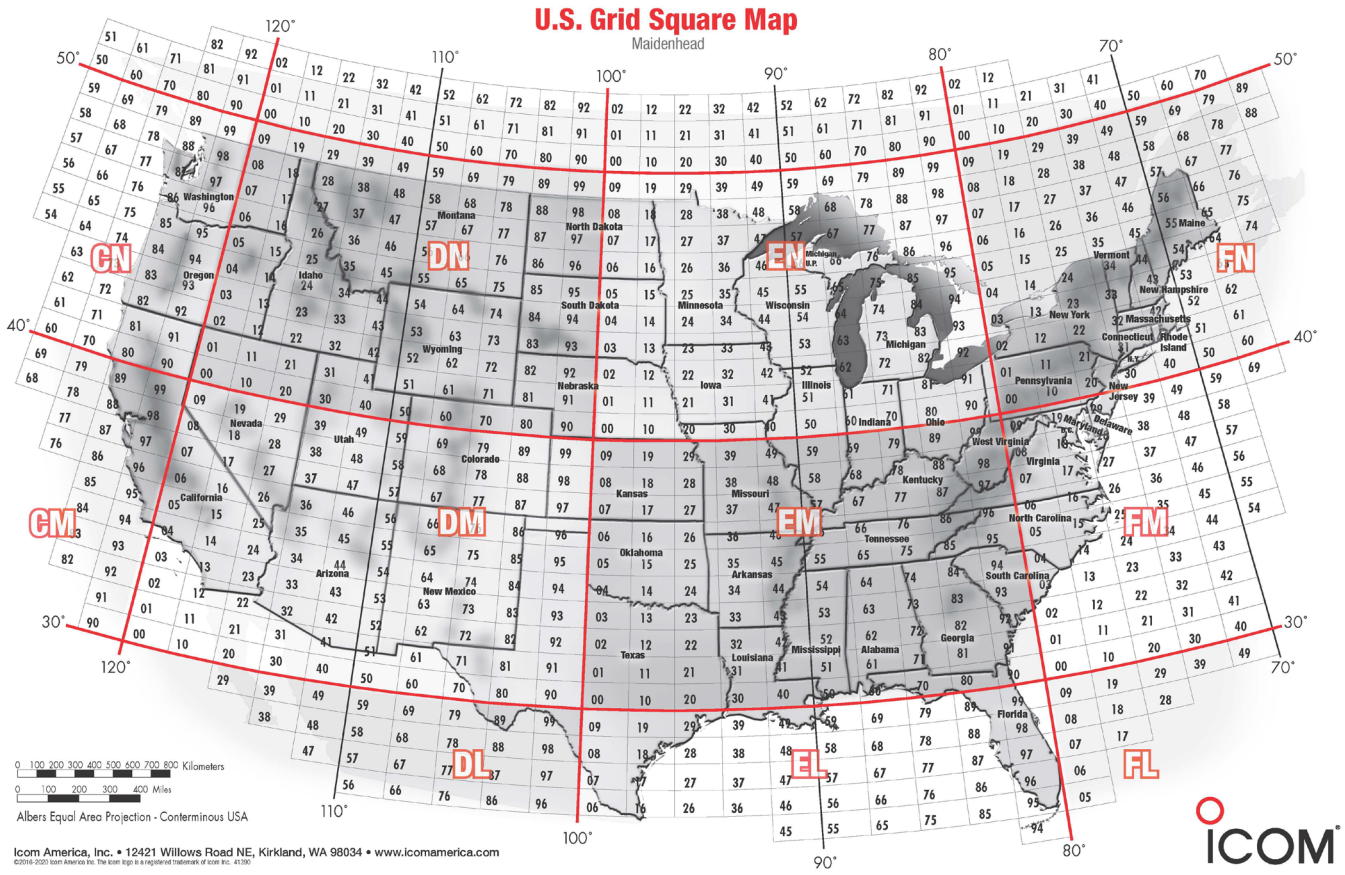
The Antennas

- DXE RSEAV1 using AVA-3 preamp
  - 100 KHz thru 30 MHz if DC coupled (really also receives 6m)
  - Used without bias-t
- N6GN High-Z SAS
  - Normal 2x gain
- N6GN Med-Z SAS
  - Normal 2x gain
- N6GN Med-Z SAS double gain preamp
  - 4x gain

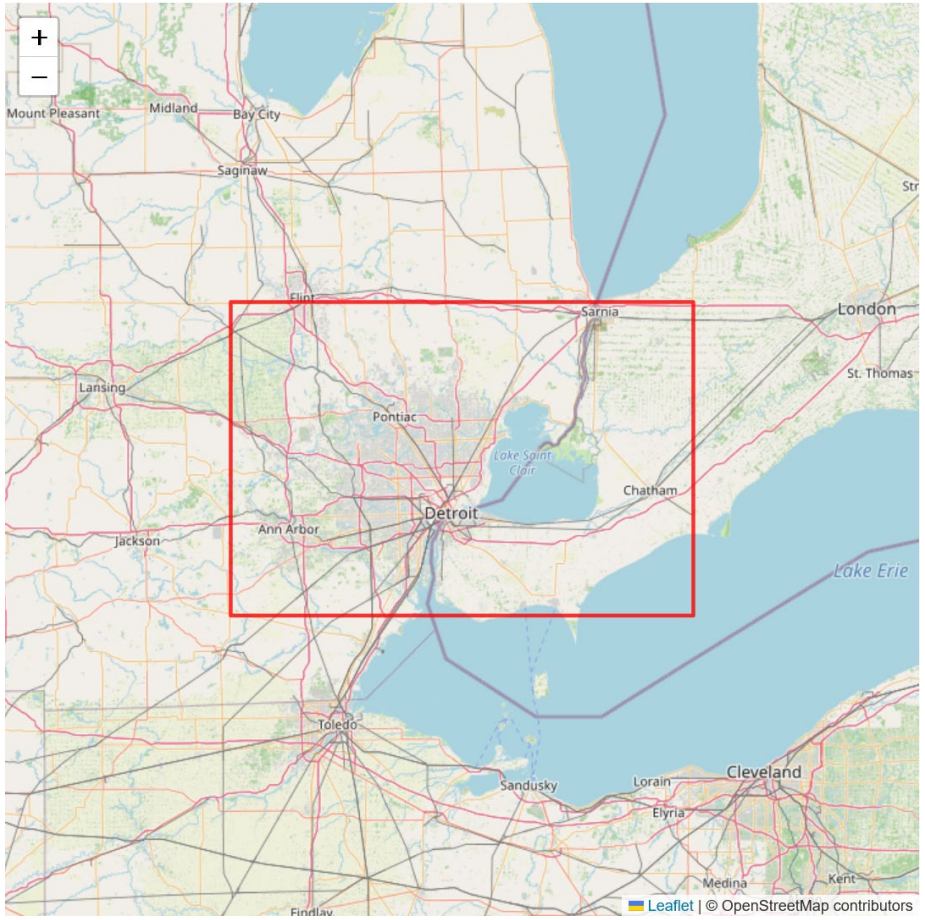
My Site Challenges in EN82bi

- I am located in a semi-rural area, about 10 miles NW of Ann Arbor, MI
- Glacial era Huron River bank at some point, high water level.
  - Very poor ground conductivity
  - Sand and gravel
  - Perks great!
- Major Power lines .5-mile S (seemingly of little to no consequence)
- 1.5 MW ERP FM station WUOM 91.7 MHz.
  - You can see spurs from mixing products of that and 129.6 MHz
- Closest AM station 15+ miles away and NOT high power
  - The stations in Detroit are 40+ miles away
- Really a pretty quiet place RF-wise to be. Pretty much qualifies ITU-R P.372-16 "Quiet Rural"
- It’s in ‘fly-over country’…

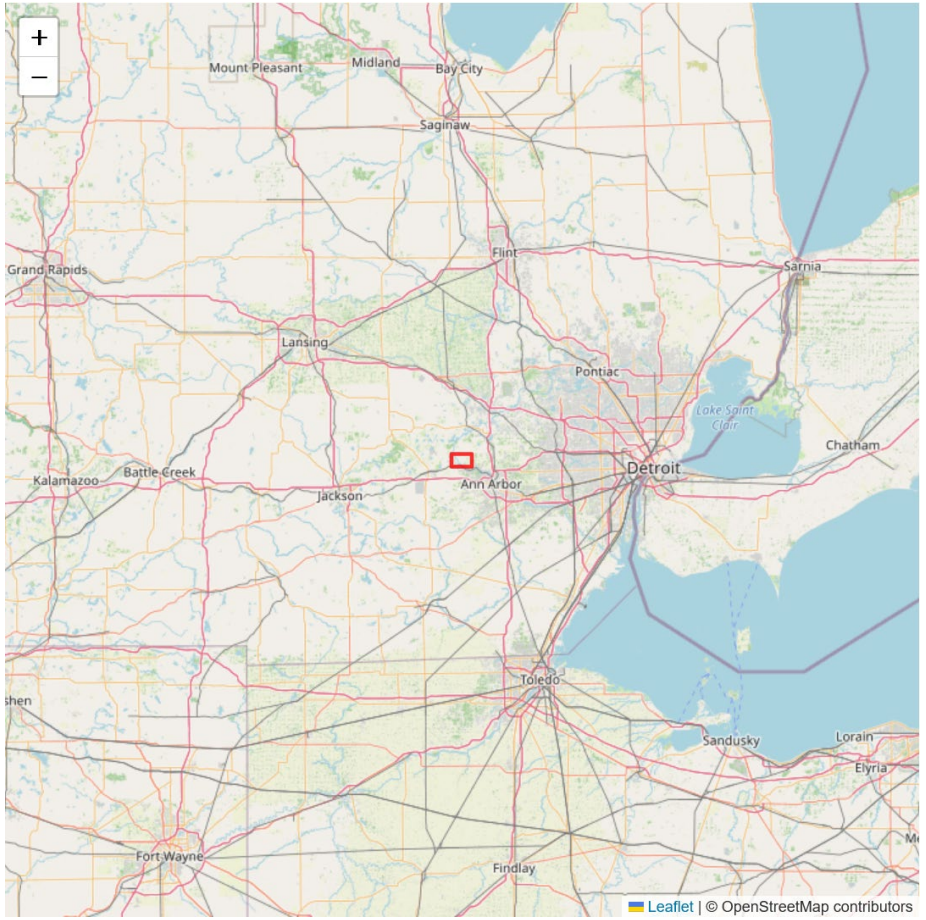
Maidenhead Grid Square Map -- USA



EN82bi is where?



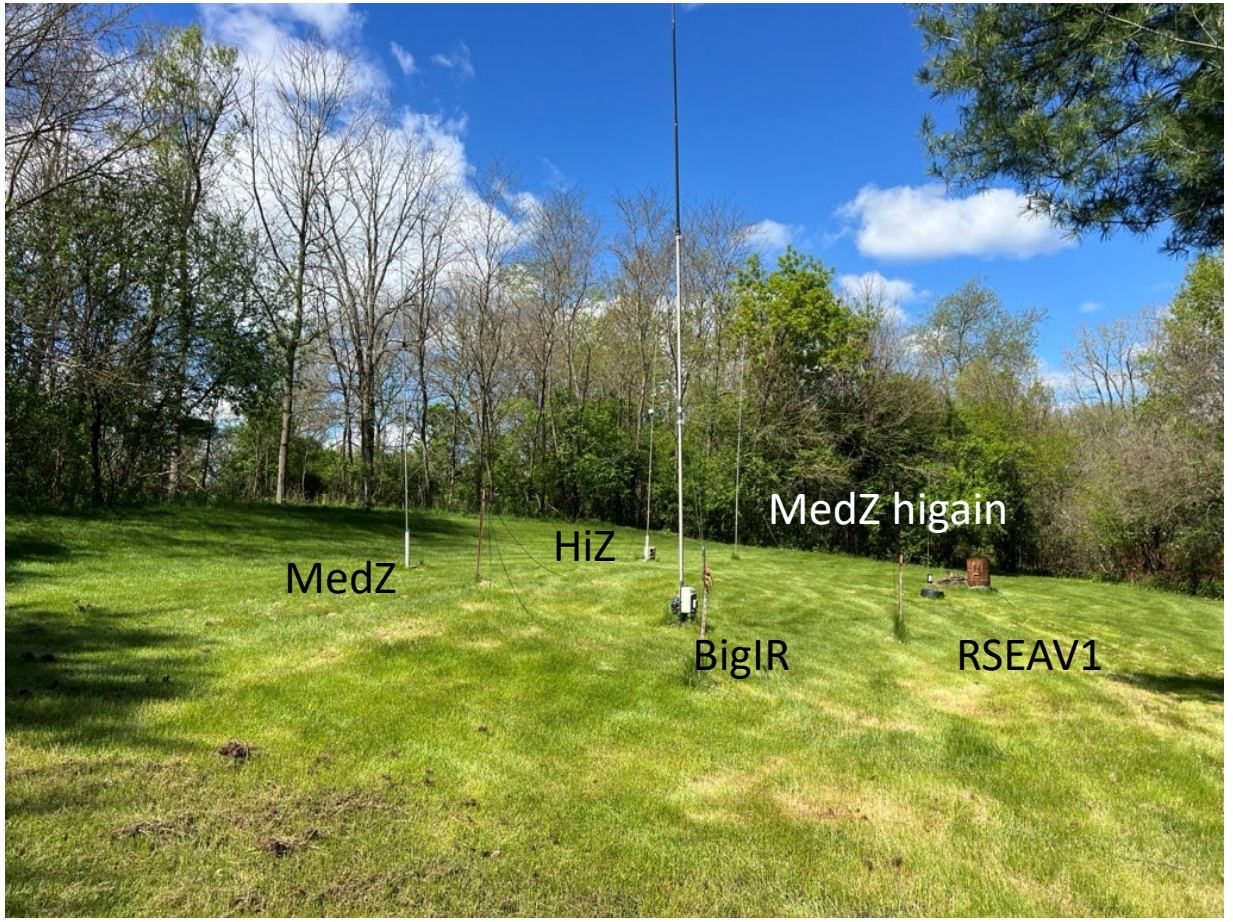
EN82 – includes some of Ontario, Canada



EN82bi

Antenna ‘field of dreams’

Another view



SAS

Preamp on mast. My box

Old patio furniture umbrella base

Wooden sled used to relocate antenna

DXE RSEAV1

- https://www.dxengineering.com/parts/dxe-rseav-1
- Mine is battery fed, battery at the antenna. Year-round.
- Yes, I live in EN82, and it gets cold here in the winter
- At 25 mA/hr or less, a 50 Ah LiFePo lasts a long time
- I use a quick-change device so I can swap batteries on-line
- No bias-T because it introduces transformers and noise
  - LF performance not as good
  - Bias-T units inevitably add noise
  - They also add additional unexpected ground paths
- Has an 8.5 foot whip. K3LR has experimented with 16'+
- My ground rod isn't as shiny as the catalog photo…

photo: dxe website

DXE RSEAV1

- Uses the AVA-3 preamp, for which there seems to be no published schematic
- Claimed frequency range is 100 KHz thru 30 MHz
- Strong evidence that it receives WSPR signals on 50 MHz on par with the next group of antennas.
- Run at max-gain setting on the AVA-3
- Use RG-11 coax (about 100’)
- In the shack:
  - A 5.7 db loss 75 to 50 ohm impedance matcher
  - An LPF-60 filter
  - An RX888 SDR device

DXE RSEAV1

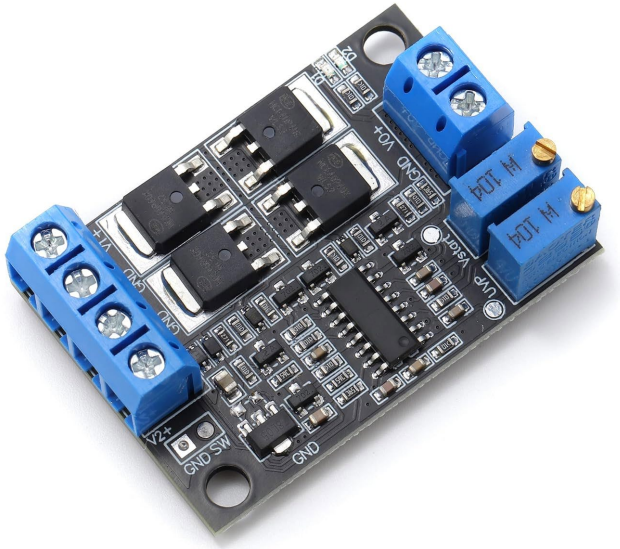
- Really, REALLY, needs a good ground AT THE ANTENNA
  - Had problems initially due to my poor ground conductivity
    - I hesitate to call it ‘soil conductivity’, because it isn’t really soil!
  - Adding Epsom salts and water can improve things (temporarily)
  - You know you have this kind of a problem if the antenna performs ‘better’ on a rainy day.

My RSEAV1 installation

- How I connect the Preamp to power:
- I use a short RG6Q (or RG11) jumper cable, 1-2 feet long, with connectors at each end. One screws onto the power port of the preamp. The other screws onto an F connector Chassis mount, as above, which is wired with a powerpole connector and red/black cable of a useful length. For me, this is a foot or so
- This plugs in to the Dual DC Power switching module's output
- I have this module wired with Powerpole connectors on short red/black cables, on the output and the two inputs
- On the primary input, I plug my 50Ah LiFePo battery.
- When I swap, I plug a 10 or 20 Ah LIFePo battery into the secondary input, then unplug the primary battery to take into the house and charge.
- When charged, I reverse the process. The preamp always has power, so the signal output is not interrupted
- If you use the bias-T method, remember: 100' of rg11 has about 19-20 ohms of resistance. The voltage drop for 25 mA is e=I *R, or .025 * 20, or .5v. Using a 13.6v power supply, such a drop is tolerated, still delivering 13v to the preamp.

Battery hot-swapping device

- https://www.amazon.com/dp/B0F5H9N42M Robot Dual DC Power Switching module (allows dual, continuous power, so battery swapping…)
- I added powerpole connectors
  - Both input (two pair) and output



RSEAV1 in pictures

Black tub, on insulating mat.
A less snowy time than some…

RSEAV1 with RG-11 and power

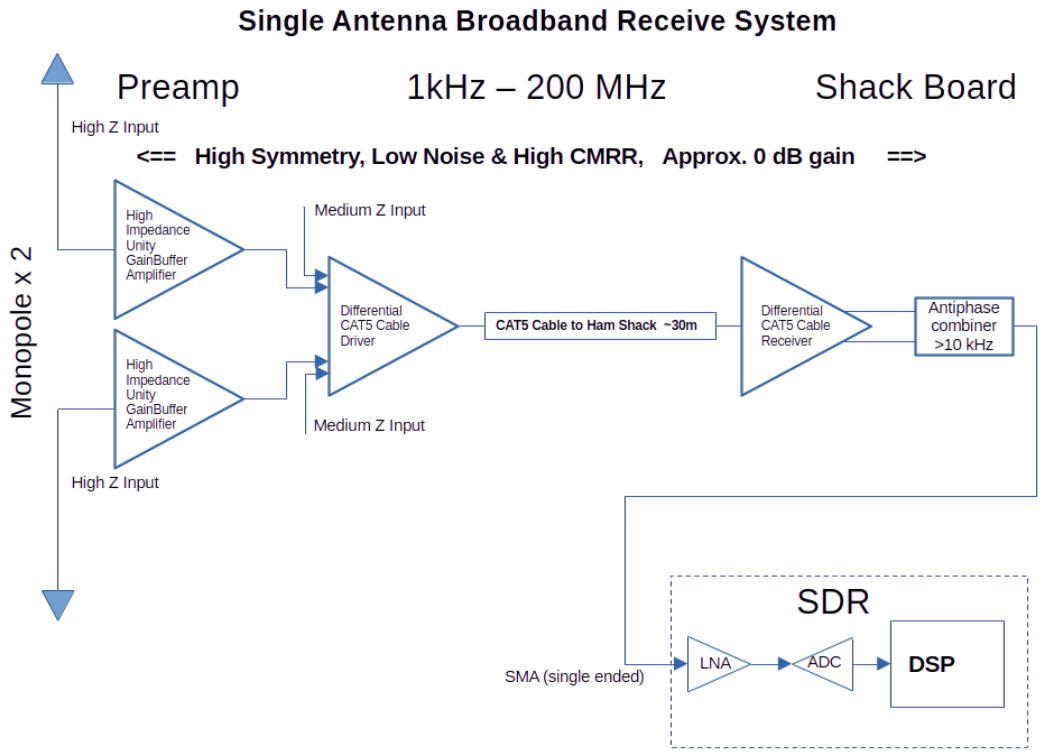
Battery hot-swap device

Under the black tub

Small battery is visible. Main battery under silver bubble insulation. Sits on black high density closed cell foam mat

N6GN SAS (Single Antenna System)

http://www.sonic.net/~n6gn/OSHW/BB/SA/SingleAntennaSystem.html



N6GN website

HighZ vs MedZ SaS

- **Two Options: High or Medium Impedance**
- **High Impedance Option: Broadest Bandwidth**
- In the high impedance option, a high CMRR preamplifier is mounted inside a 3D printed plastic housing located near the middle of an insulating fiberglass mast and fed with standard CAT5 cable as shown below. Operation from **Audio Frequencies through VHF** is achieved due to the very high impedance OpAmp unity gain input stages. Even though the attached dipole is electrically extremely short at the lowest frequency limit of the system, the high impedance allows relatively efficient transfer of the very small signal voltage at the buffer amplifier inputs while offering suitably low noise floor and acceptable distortion characteristics which permits approaching the targeted ITU regional limits at many locations It will not be able to reach the regional noise limit at upper HF in the quietest locations but may be completely adequate in typical City, Suburban and even many Rural locations.
- This system employs the SWTL model of a dipole and through the use of small .5mm diameter conductor elements (not shown) can allow a CAT5 feedline (also not shown) to run parallel along the mast for most of the monopole conductor's length before finally exiting near the base. This can be done without upsetting antenna balance and symmetry which might otherwise unbalance the structure and possibly raise common mode noise ingress and decrease capability. Additional measures are taken to route the feedline to avoid shadowing of the monopole's aperture which is located in the region of space near its tip.
- **Medium Impedance Option: Lower distortion & Traveling Wave antenna use**
- As noted above, the MediumZ option of the SAS does not have the same bandwidth nor exactly the same pattern as the HighZ one. Current is delivered to the SAS Preamp such that both mismatch loss and aperture and pattern are different. The Medium Impedance option can not provide the same very low frequency limit but it can still operate from **MF through VHF** while at the same time that elimination of thenoisier high impedance OpAmp buffer and use of only the quieter ADA4930 provides as much as 10 dB improvement in strong signal protection and lower noise. Input signals as large as 2 V p-p may be tolerated without generation of significant unwanted inter-modulation distortion (IMD). So when used with a 6m dipole it does not have coverage down to VLF but it is able to tolerate antennas and environments producing three times the signal voltage. The Medium Impedance option can operate with the same vertical dipole as the high impedance mode. Optimum dipole size will be determined by pattern, noise floor requirements, and the strong signal environment for a particular application.
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- This MediumZ option may also be ideal for use with Traveling Wave antennas such as the terminated Beverage, terminated dipole (balanced Beverage), Loop-on-Earth and some Vee antenna designs. These antennas may inherently exhibit a matched input impedance of approximately 2*377 ohms. All of these are inherently high-pass in nature so in practice the lack of VLF/LF response may not be a serious limitation.
- Because of these desirable characteristics, the MediumZ option may be preferable in many potentially quiet sites even in the presence of strong signals and when only operation from upper MW through HF is desired.

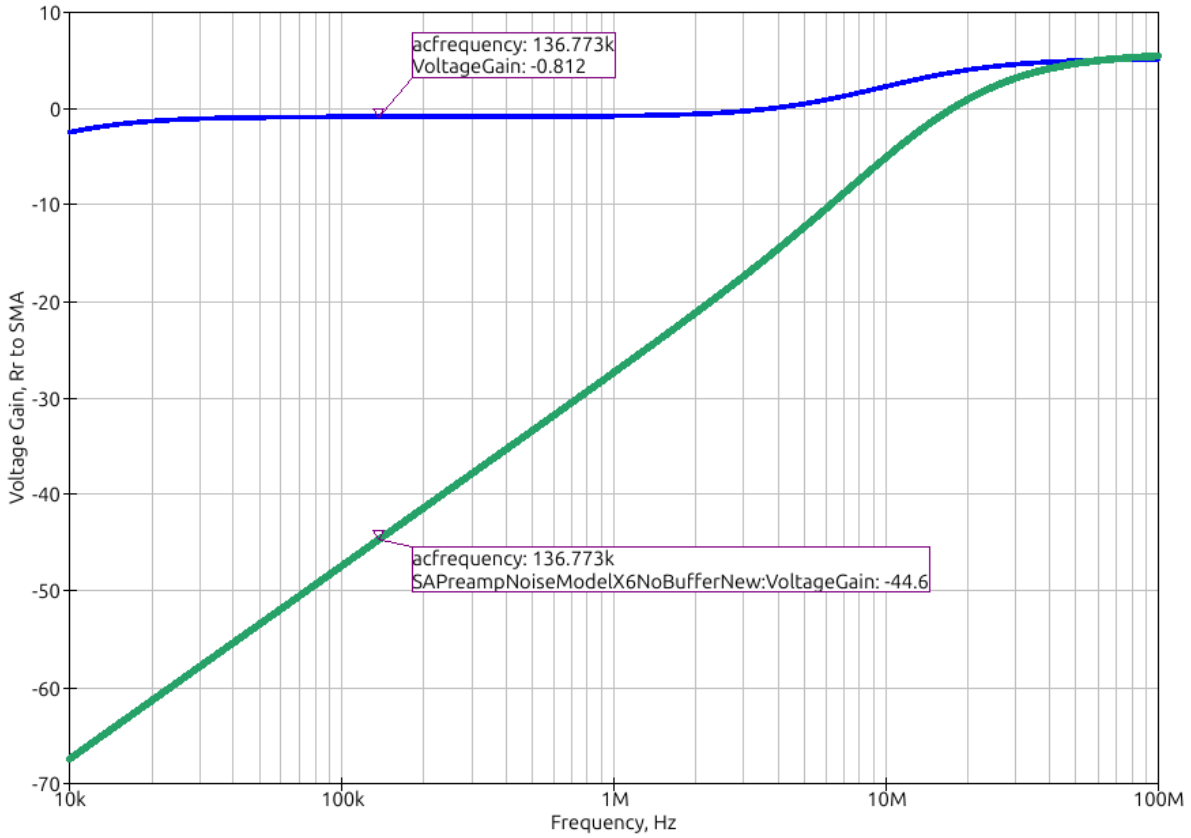
N6GN website

HighZ vs MedZ SaS, 2

The plots below compare the voltage gain from the dipole's reference resistance to the SMA output of the ShackBoard in the absence of the CAT5 cable. The HighZ option has approximately 5 dB of gain at 30 MHz sloping down about unity gain below 3 MHz. In contrast, the MediumZ option has about the same gain at 30 MHz but a great deal of slope due to the loading of the dipole's source impedance by the lower input impedance of the ADA4930 preamplifiers. This is approximately a highpass structure which protects against strong LF-MF signals while also providing lower system noise and higher signal handling capability. The markers demonstrate the almost 45 dB difference in response at the 2200m amateur band, a difference so great that propagated noise may not exceed system noise at this frequency and limit the MediumZ option to higher frequency uses. However down to below 1 MHz, this reduced response protects against IMD generation and can still meet the ITU targets even in the quietest locations.

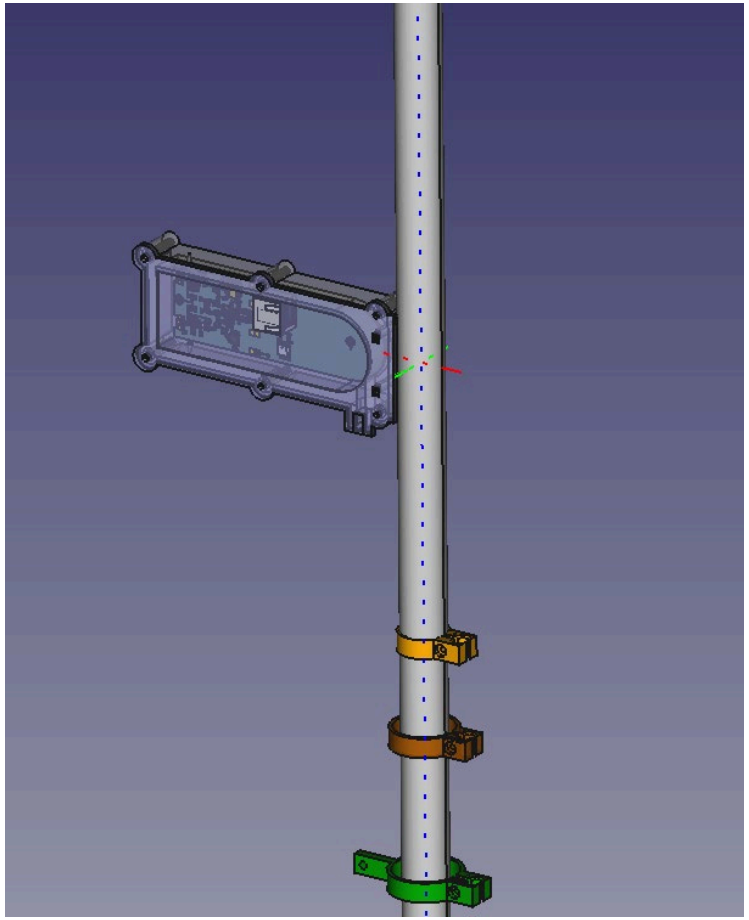
N6GN website

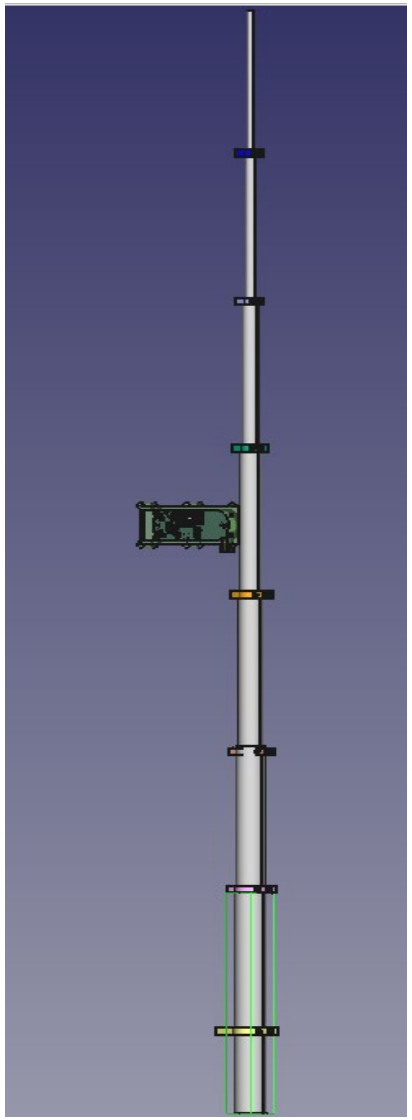
HighZ vs MedZ SaS, 3



N6GN website

SAS original preamp box
Typical mast installation





N6GN website

SaS Characteristics

- The SAPreamp PCB is mounted inside a 3D printed enclosure with antenna wires soldered to pads on the PCB. These wires exit through the enclosure walls, run along the mast through the clips and terminate at the top and near the bottom of the mast. The CAT5 cable exits downward from the enclosure bottom and is clamped by the enclosure cover which has a silicone rubber gasket. The result is a water-resistant housing for the electronics.
- The preamp design uses a ADA4930 in a transformerless output configuration to drive one pair of the CAT5 cable. The SAPreamp and Shack Boards are interconnected with standard CAT5 cable.

N6GN website

SaS Characteristics

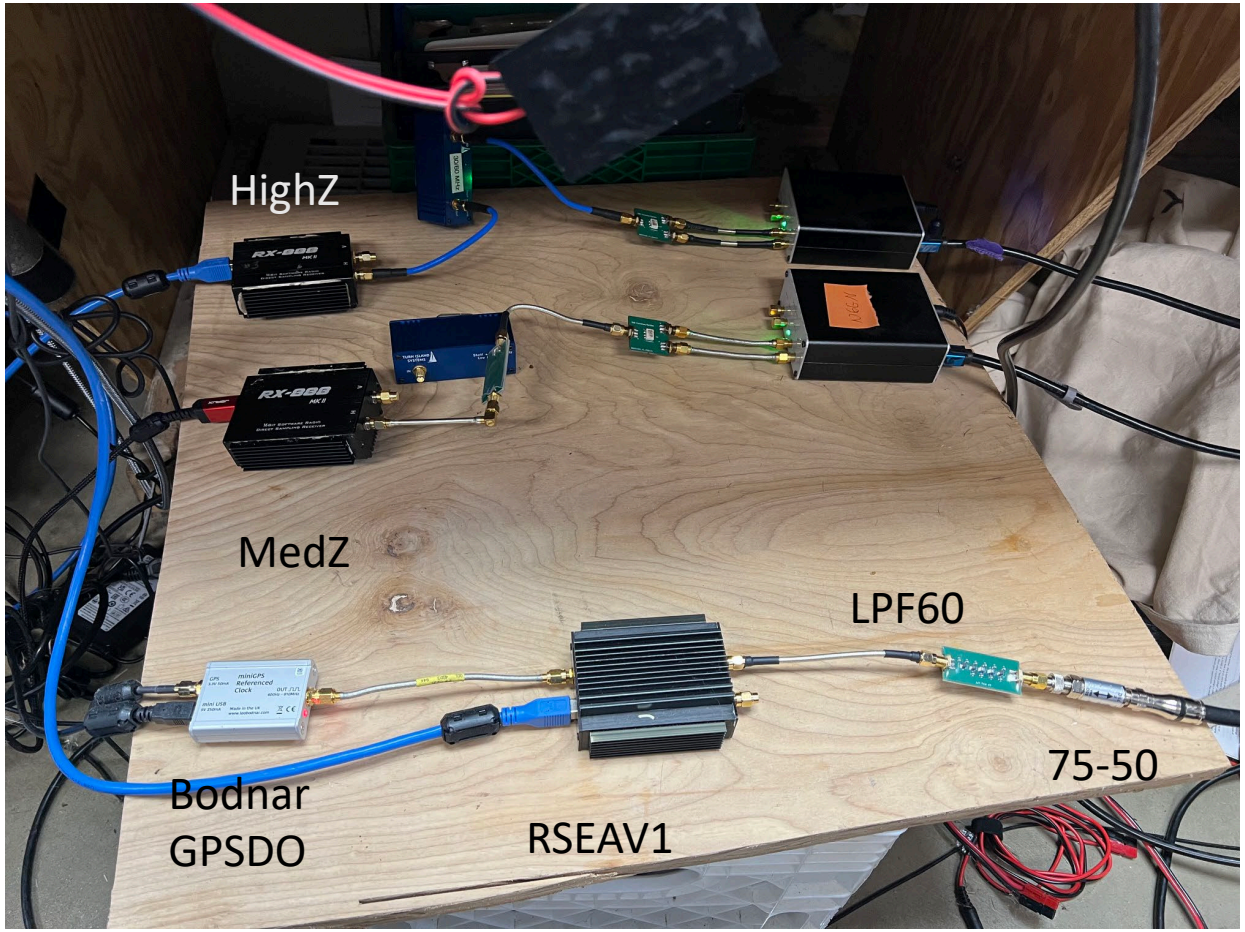
N6GN website

SaS Characteristics

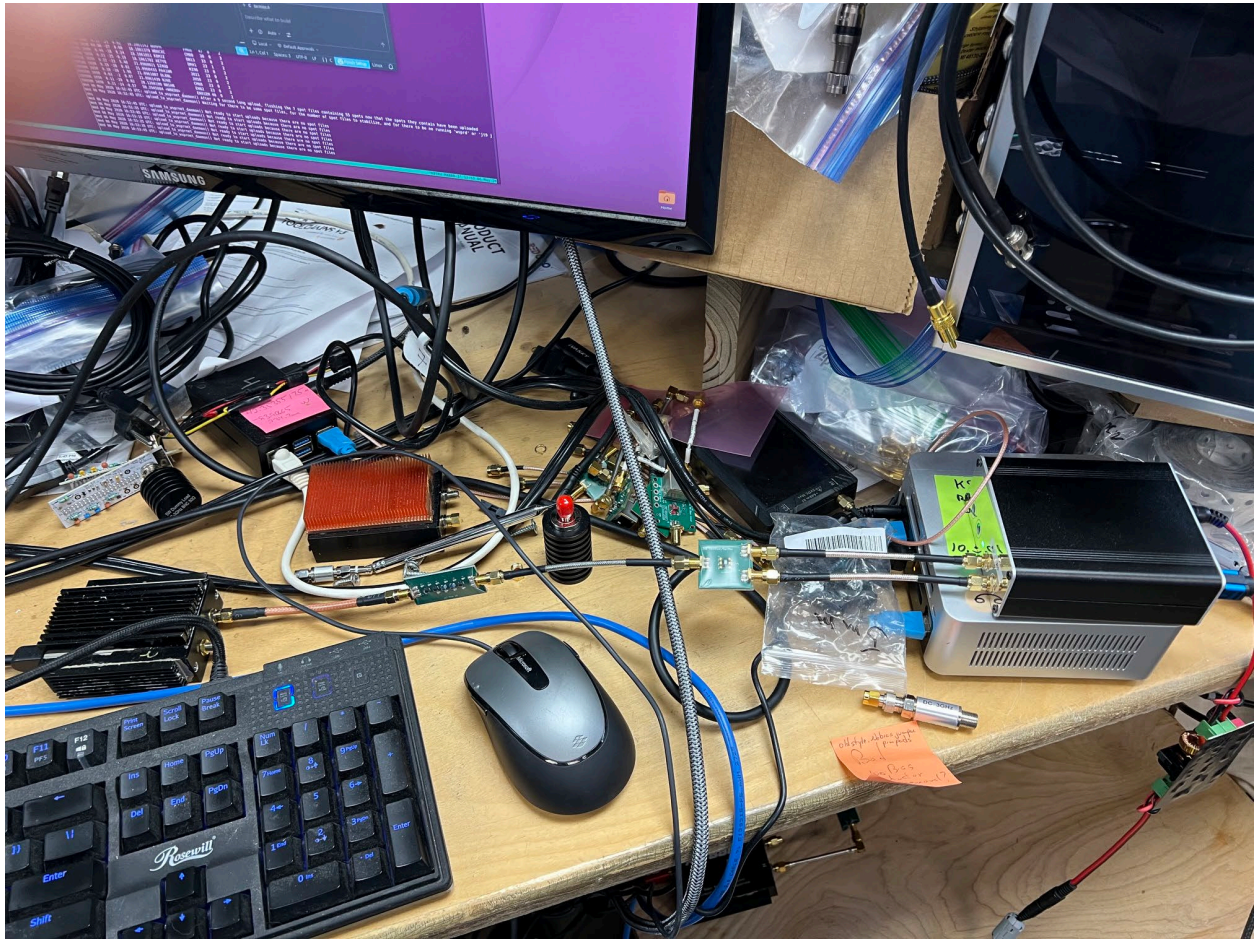
- With Rp = 2Mohm, Cp=27pF, Rc=2kohm for the high-Z option or direct input for medium-Z and G=2 for ADA4930 stages in the preamp and in the shack board, the nominal gain from the dipole connections to the SMA output using a calibrated 50 ohm VNA measures approximately unity or 0 dB . In high-Z mode when connected to the dipole, the capacitive reactance of the dipole in conjunction with these values creates frequency shaping to the overall response which can be used to adapt a system for a particular location in the presence of very strong signals that might otherwise overload it.
- Highly symmetric differential inputs and outputs
- CMRR as great as - 50 dB to 30 MHz (but also a function of antenna balance/symmetry).
- Connects to Shack Board for power, RF termination and CMRR verification
- optional high and medium impedance, high-Z and medium-Z, applications
- both options intended for use with 7m-10m fiberglass masts, ground mount and 3D printed mounting HW shown in the Material List
- High-Z Input referenced noise is 2 - 3 nV/rt(Hz), input buffer limited
- shaped gain to optimize noise floor with overload damage protection
- noise floor near -160dBm/Hz.
- Medium-Z (~755 ohms differential) input referenced noise as low as 1.2 nV/rt(Hz), CAT5 driver limited
- Use with 30m (nominal) length standard CAT5 cable, in many environments, greater length possible without degradation
- SAPreamp is used with associated Shack Board, 12VDC @ ~100mA
- The use of ADA4930 differential amplifiers in the SAS instead of transformers at both ends of the CAT5 cable allows coverage from AF well into VHF while also reducing cost and achieving very much greater CMRR, lower noise and excellent IMD performance.

N6GN website

RX888 setup: 4 Wsprdaemon systems

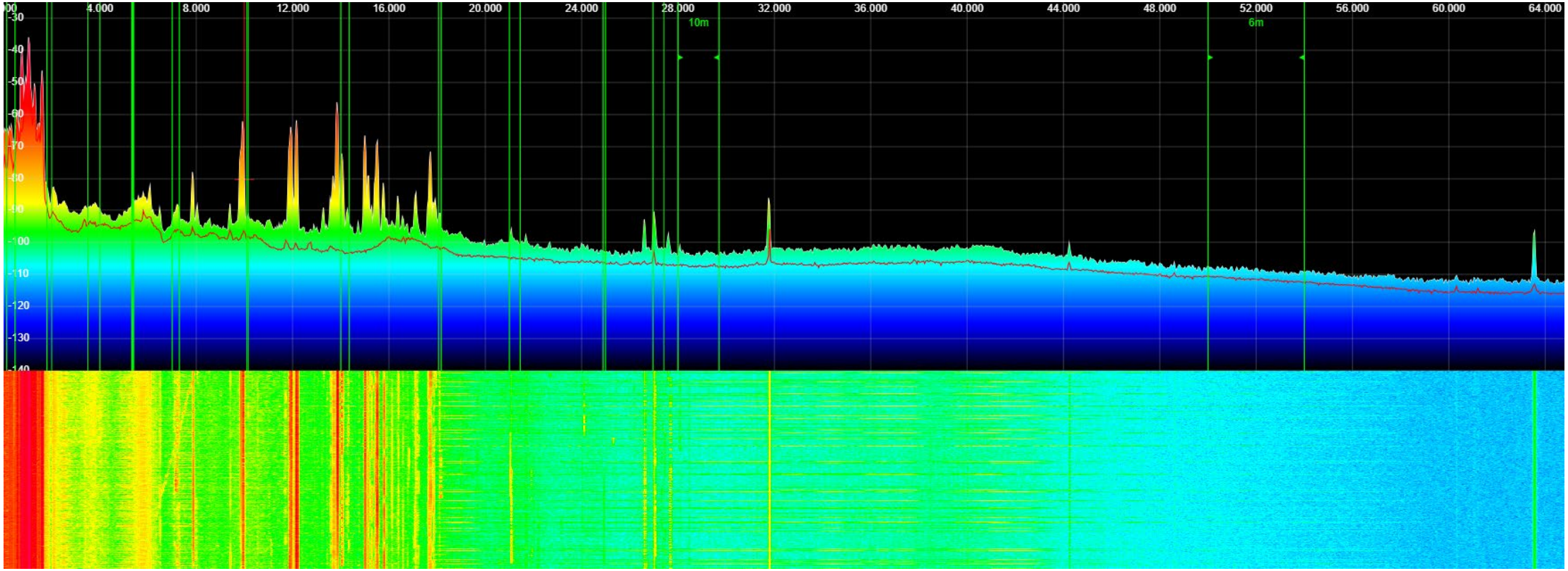


K9TRV-2, K9TRV, K9TRV-4. TIS3060 filter loose.



K9TRV-5 MedZ 4x gain. Noise not a problem

K9TRV-4 RAC=166 RSEAV1



Ka9q-web

K9TRV-4 RAC=166 RSEAV1

RF Gain: 13.5 dB

RF Atten: 0.0 dB

RF lev cal: 1.4 dB

RF AGC: enabled

A/D: -20.3 dBFS

N_0: -140.9 dBmJ, Noise power at BW 10,000: -100.9 dBm

Span (kHz): 0 to 64,800 width: 64,800 center: 32,400.000

WWV Flux=128, A=12, K=0.67. (2026 May 06 1805 UTC)

FFT average:

Spectrum average:

Bin width: 40,000 Hz, Zoom: 0

Bins: 1,620

SSRC: 1000

SNR: 13 dB

Decay: 1

Fs in: 129.600 MHz

14:54:11 GMT-0400 (Eastern Daylight Time)

Uptime: 27d 03:22:47

Overranges: 3,214,259,874

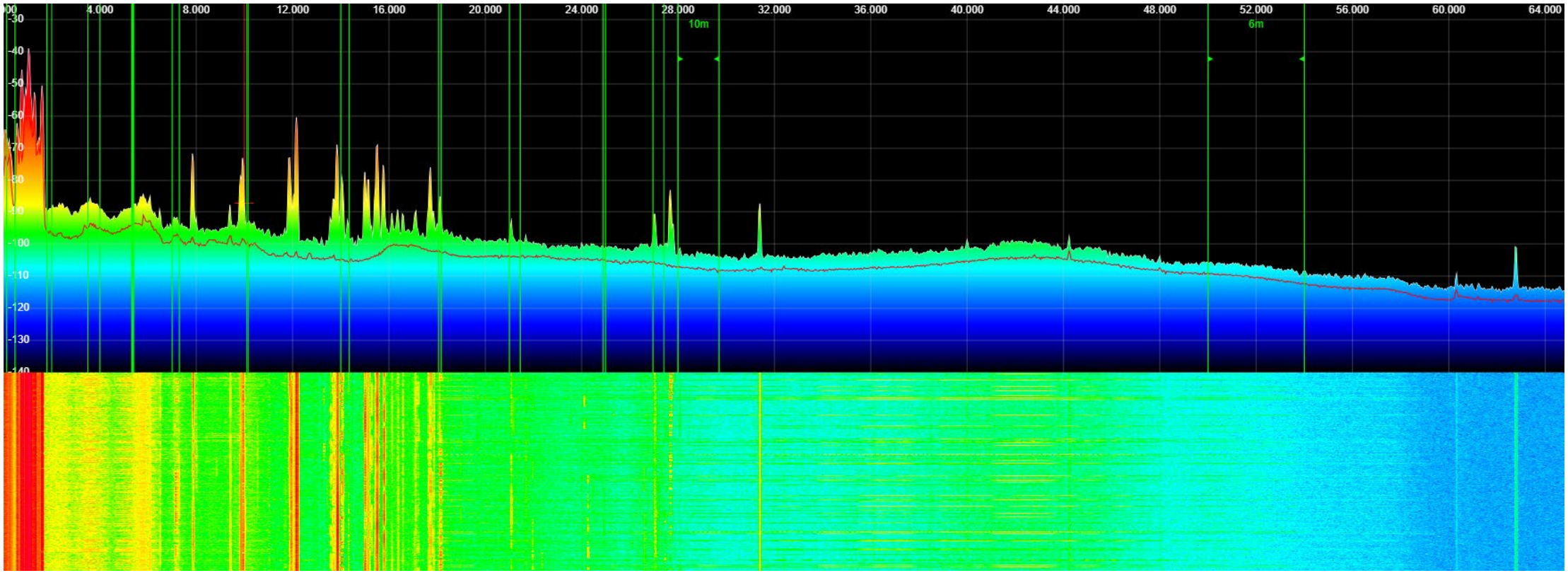
Last overrange: 00:01:57

Noise BW: 62760.1 Hz 2.0 dB

Tune: 10.000000 MHz: -80.3 dBm @bin: 250

RX rate: 117 kbps

K9TRV-2 RAC=139 HiZ SaS 5m



Ka9q-web

K9TRV-2 RAC=139 HiZ SaS 5m

RF Gain: 16.5 dB

RF Atten: 0.0 dB

RF lev cal: 1.4 dB

RF AGC: enabled

A/D: -20.8 dBFS

N_0: -141.8 dBmJ, Noise power at BW 10,000: -101.8 dBm

Span (kHz): 0 to 64,800 width: 64,800 center: 32,400.000

WWV Flux=128, A=12, K=0.67. (2026 May 06 1805 UTC)

FFT average:

Spectrum average:

Bin width: 40,000 Hz, Zoom: 0

Bins: 1,620

SSRC: 1000

SNR: 11 dB

Decay: 1

Fs in: 129.600 MHz

14:53:39 GMT-0400 (Eastern Daylight Time)

Uptime: 5d 06:59:33

Overranges: 781,845,531

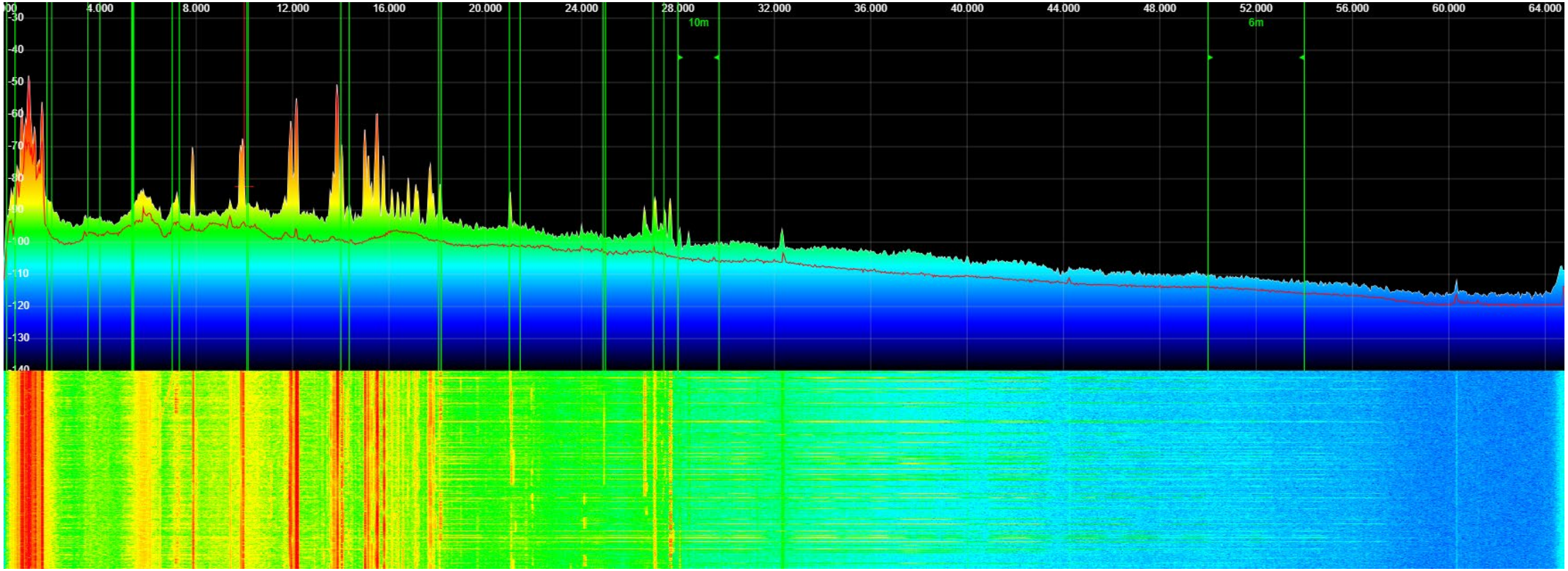
Last overrange: 00:00:30

Noise BW: 62760.1 Hz 2.0 dB

Tune: 10.000000 MHz: -87.2 dBm @bin: 250

RX rate: 117 kbps

K9TRV-5 5.5m MedZ double gain SaS rac 173



Ka9q-web

RF Gain: 22.3 dB

RF Atten: 0.0 dB

RF lev cal: 1.4 dB

RF AGC: enabled

A/D: -22.4 dBFS

N_0: -137.1 dBmJ, Noise power at BW 10,000: -97.1 dBm

Span (kHz): 0 to 64,800 width: 64,800 center: 32,400.000

WWV Flux=128, A=12, K=0.67. (2026 May 06 1805 UTC)

FFT average:

Spectrum average:

Bin width: 40,000 Hz, Zoom: 0

Bins: 1,620

SSRC: 1000

SNR: 7 dB

Decay: 1

Fs in: 129.600 MHz

14:54:01 GMT-0400 (Eastern Daylight Time)

Uptime: 5d 03:08:15

Overranges: 337,155,668

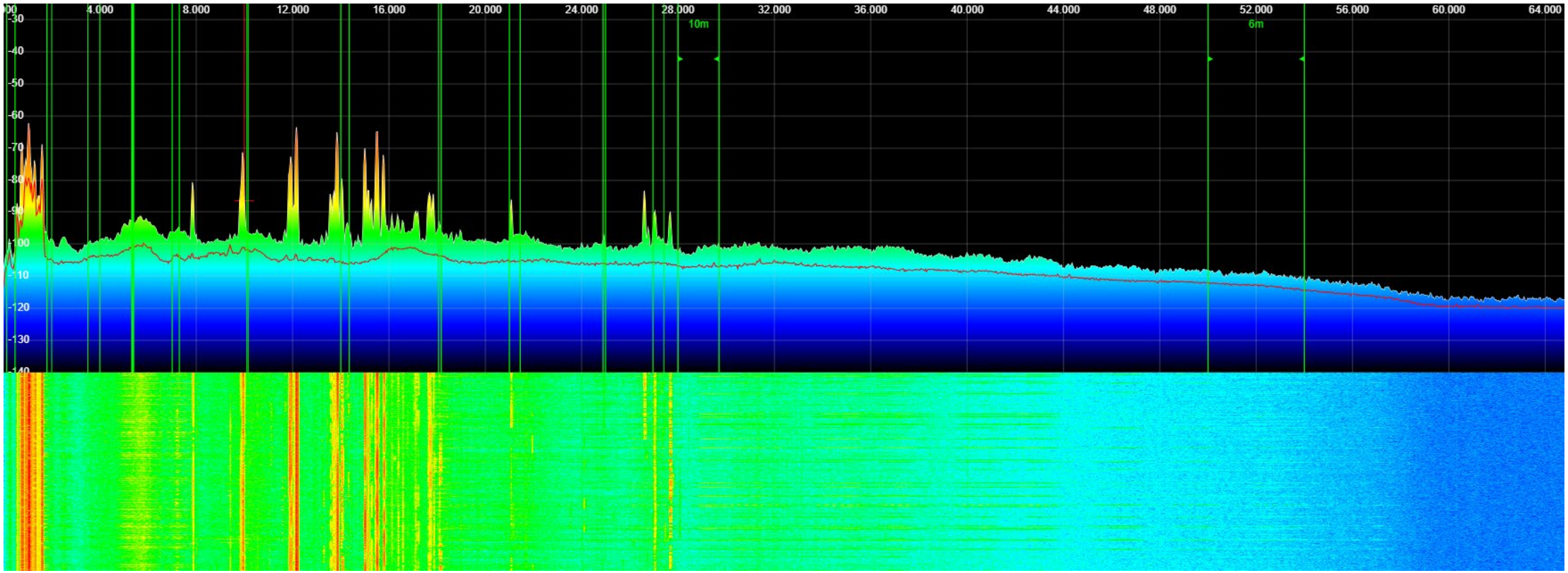
Last overrange: 00:02:30

Noise BW: 62760.1 Hz 2.0 dB

Tune: 10.000000 MHz: -82.5 dBm @bin: 250

RX rate: 116 kbps

K9TRV RAC163 MedZ SaS 5m



Ka9q-web

K9TRV RAC163 MedZ SaS 5m

RF Gain: 33.8 dB

RF Atten: 0.0 dB

RF lev cal: 1.4 dB

RF AGC: enabled

A/D: -21.5 dBFS

N_0: -144.9 dBmJ, Noise power at BW 10,000: -104.9 dBm

Span (kHz): 0 to 64,800 width: 64,800 center: 32,400.000

WWV Flux=128, A=12, K=0.67. (2026 May 06 1805 UTC)

FFT average:

Spectrum average:

Bin width: 40,000 Hz, Zoom: 0

Bins: 1,620

SSRC: 1000

SNR: 14 dB

Decay: 1

Fs in: 129.600 MHz

14:53:53 GMT-0400 (Eastern Daylight Time)

Uptime: 5d 23:48:28

Overranges: 458,690,648

Last overrange: 00:01:56

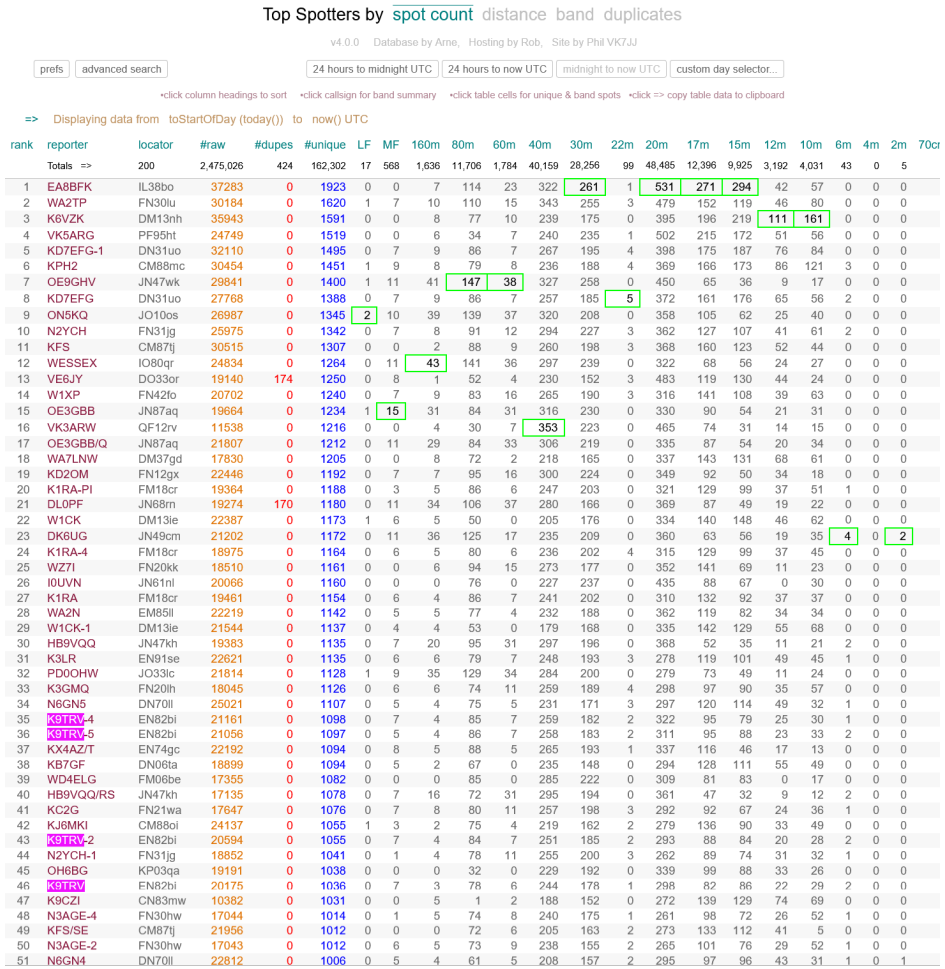
Noise BW: 62760.1 Hz 2.0 dB

Tune: 10.000000 MHz: -86.4 dBm @bin: 250

RX rate: 123 kbps

Where the l33t people get spot data

- https://wspr.rocks/topspotters/index.html
- Thanks to Phil VK7JJ
- My ranking varies day-to-day
- This one shows ‘since midnight UTC’ (current day)
- MidWest sucks for propagation…
- The people in F (east coast)
  - Hear much more Europe/Asia
  - Have higher counts an hour before I do
  - Because that’s what the Sun does
  - Have salt water
- The people in C (west coast)
  - Hear more Asia
  - Get counts ‘later’ in the day
  - Also have salt water nearby



Top Spotters by spot count distance band duplicates

v4.0.0 Database by Arne, Hosting by Rob, Site by Phil VK7JJ

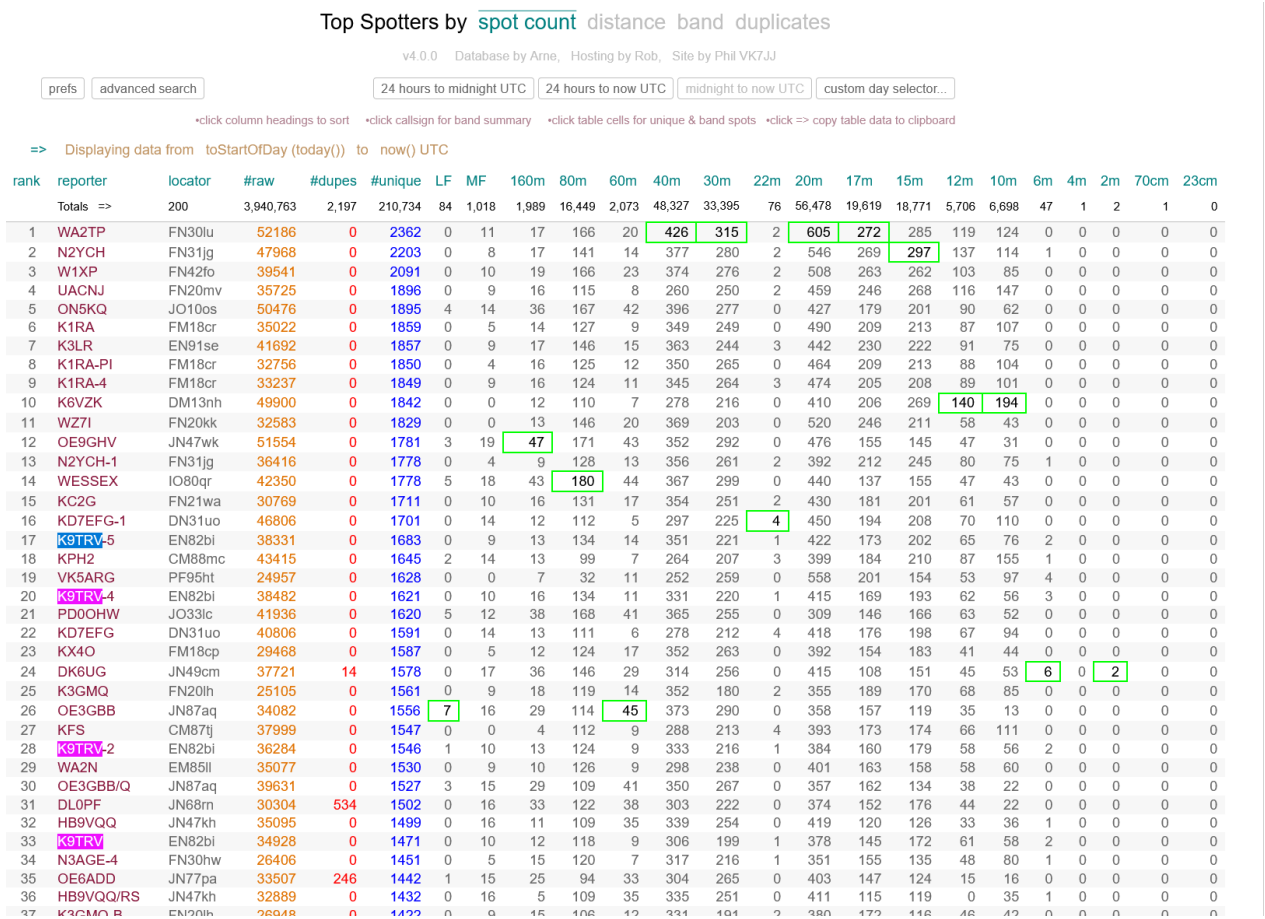
prefs | advanced search | 24 hours to midnight UTC | 24 hours to now UTC | midnight to now UTC | custom day selector...

•click column headings to sort •click callsign for band summary •click table cells for unique & band spots •click => copy table data to clipboard

=> Displaying data from toStartOfDay (today()) to now() UTC

rank	reporter	locator	#raw	#dupes	#unique	LF	MF	160m	80m	60m	40m	30m	22m	20m	17m	15m	12m	10m	6m	4m	2m	70cr
	Totals =>	200	2,475,026	424	162,302	17	568	1,636	11,706	1,784	40,159	28,256	99	48,485	12,396	9,925	3,192	4,031	43	0	5	
1	EA8BFK	IL38bo	37283	0	1923	0	0	7	114	23	322	261	1	531	271	294	42	57	0	0	0	
2	WA2TP	FN30lu	30184	0	1620	1	7	10	110	15	343	255	3	479	152	119	46	80	0	0	0	
3	K6VZK	DM13nh	35943	0	1591	0	0	8	77	10	239	175	0	395	196	219	111	161	0	0	0	
4	VK5ARG	PF95ht	24749	0	1519	0	0	6	34	7	240	235	1	502	215	172	51	56	0	0	0	
5	KD7EFG-1	DN31uo	32110	0	1495	0	7	9	86	7	267	195	4	398	175	187	76	84	0	0	0	
6	KPH2	CM88mc	30454	0	1451	1	9	8	79	8	236	188	4	369	166	173	86	121	3	0	0	
7	OE9GHV	JN47wk	29841	0	1400	1	11	41	147	38	327	258	0	450	65	36	9	17	0	0	0	
8	KD7EFG	DN31uo	27768	0	1388	0	7	9	86	7	257	185	5	372	161	176	65	56	2	0	0	
9	ON5KQ	JO10os	26987	0	1345	2	10	39	139	37	320	208	0	358	105	62	25	40	0	0	0	
10	N2YCH	FN31jg	25975	0	1342	0	7	8	91	12	294	227	3	362	127	107	41	61	2	0	0	
11	KFS	CM87tj	30515	0	1307	0	0	2	88	9	260	198	3	368	160	123	52	44	0	0	0	
12	WESSEX	IO80qr	24834	0	1264	0	11	43	141	36	297	239	0	322	68	56	24	27	0	0	0	
13	VE6JY	DO33or	19140	174	1250	0	8	1	52	4	230	152	3	483	119	130	44	24	0	0	0	
14	W1XP	FN42fo	20702	0	1240	0	7	9	83	16	265	190	3	316	141	108	39	63	0	0	0	
15	OE3GBB	JN87aq	19664	0	1234	1	15	31	84	31	316	230	0	330	90	54	21	31	0	0	0	
16	VK3ARW	QF12rv	11538	0	1216	0	0	4	30	7	353	223	0	465	74	31	14	15	0	0	0	
17	OE3GBB/Q	JN87aq	21807	0	1212	0	11	29	84	33	306	219	0	335	87	54	20	34	0	0	0	
18	WA7LNW	DM37gd	17830	0	1205	0	0	8	72	2	218	165	0	337	143	131	68	61	0	0	0	
19	KD2OM	FN12gx	22446	0	1192	0	7	7	95	16	300	224	0	349	92	50	34	18	0	0	0	
20	K1RA-PI	FM18cr	19364	0	1188	0	3	5	86	6	247	203	0	321	129	99	37	51	1	0	0	
21	DL0PF	JN68rn	19274	170	1180	0	11	34	106	37	280	166	0	369	87	49	19	22	0	0	0	
22	W1CK	DM13ie	22387	0	1173	1	6	5	50	0	205	176	0	334	140	148	46	62	0	0	0	
23	DK6UG	JN49cm	21202	0	1172	0	11	36	125	17	235	209	0	360	63	56	19	35	4	0	2	
24	K1RA-4	FM18cr	18975	0	1164	0	6	5	80	6	236	202	4	315	129	99	37	45	0	0	0	
25	WZ7I	FN20kk	18510	0	1161	0	0	6	94	15	273	177	0	352	141	69	11	23	0	0	0	
26	I0UVN	JN61nl	20066	0	1160	0	0	0	76	0	227	237	0	435	88	67	0	30	0	0	0	
27	K1RA	FM18cr	19461	0	1154	0	6	4	86	7	241	202	0	310	132	92	37	37	0	0	0	
28	WA2N	EM85ll	22219	0	1142	0	5	5	77	4	232	188	0	362	119	82	34	34	0	0	0	
29	W1CK-1	DM13ie	21544	0	1137	0	4	4	53	0	179	168	0	335	142	129	55	68	0	0	0	
30	HB9VQQ	JN47kh	19383	0	1135	0	7	20	95	31	297	196	0	368	52	35	11	21	2	0	0	
31	K3LR	EN91se	22621	0	1135	0	6	6	79	7	248	193	3	278	119	101	49	45	1	0	0	
32	PD0OHW	JO33lc	21814	0	1128	1	9	35	129	34	284	200	0	279	73	49	11	24	0	0	0	
33	K3GMQ	FN20lh	18045	0	1126	0	6	6	74	11	259	189	4	298	97	90	35	57	0	0	0	
34	N6GN5	DN70ll	25021	0	1107	0	5	4	75	5	231	171	3	297	120	114	49	32	1	0	0	
35	K9TRV-4	EN82bi	21161	0	1098	0	7	4	85	7	259	182	2	322	95	79	25	30	1	0	0	
36	K9TRV-5	EN82bi	21056	0	1097	0	5	4	86	7	258	183	2	311	95	88	23	33	2	0	0	
37	KX4AZ/T	EN74gc	22192	0	1094	0	8	5	88	5	265	193	1	337	116	46	17	13	0	0	0	
38	KB7GF	DN06ta	18899	0	1094	0	5	2	67	0	235	148	0	294	128	111	55	49	0	0	0	
39	WD4ELG	FM06be	17355	0	1082	0	0	0	85	0	285	222	0	309	81	83	0	17	0	0	0	
40	HB9VQQ/RS	JN47kh	17135	0	1078	0	7	16	72	31	295	194	0	361	47	32	9	12	2	0	0	
41	KC2G	FN21wa	17647	0	1076	0	7	8	80	11	257	198	3	292	92	67	24	36	1	0	0	
42	KJ6MKI	CM88oi	24137	0	1055	1	3	2	75	4	219	162	2	279	136	90	33	49	0	0	0	
43	K9TRV-2	EN82bi	20594	0	1055	0	7	4	84	7	251	185	2	293	88	84	20	28	2	0	0	
44	N2YCH-1	FN31jg	18852	0	1041	0	1	4	78	11	255	200	3	262	89	74	31	32	1	0	0	
45	OH6BG	KP03qa	19191	0	1038	0	0	0	32	0	229	192	0	339	99	88	33	26	0	0	0	
46	K9TRV	EN82bi	20175	0	1036	0	7	3	78	6	244	178	1	298	82	86	22	29	2	0	0	
47	K9CZI	CN83mw	10382	0	1031	0	0	5	1	2	188	152	0	272	139	129	74	69	0	0	0	
48	N3AGE-4	FN30hw	17044	0	1014	0	1	5	74	8	240	175	1	261	98	72	26	52	1	0	0	
49	KFS/SE	CM87tj	21956	0	1012	0	0	0	72	6	205	163	2	273	133	112	41	5	0	0	0	
50	N3AGE-2	FN30hw	17043	0	1012	0	6	5	73	9	238	155	2	265	101	76	29	52	1	0	0	
51	N6GN4	DN70ll	22812	0	1006	0	5	4	61	5	208	157	2	295	97	96	43	31	1	0	1	

Wspr.rocks ‘midnight-to-now UTC’



Top Spotters by spot count distance band duplicates

v4.0.0 Database by Arne, Hosting by Rob, Site by Phil VK7JJ

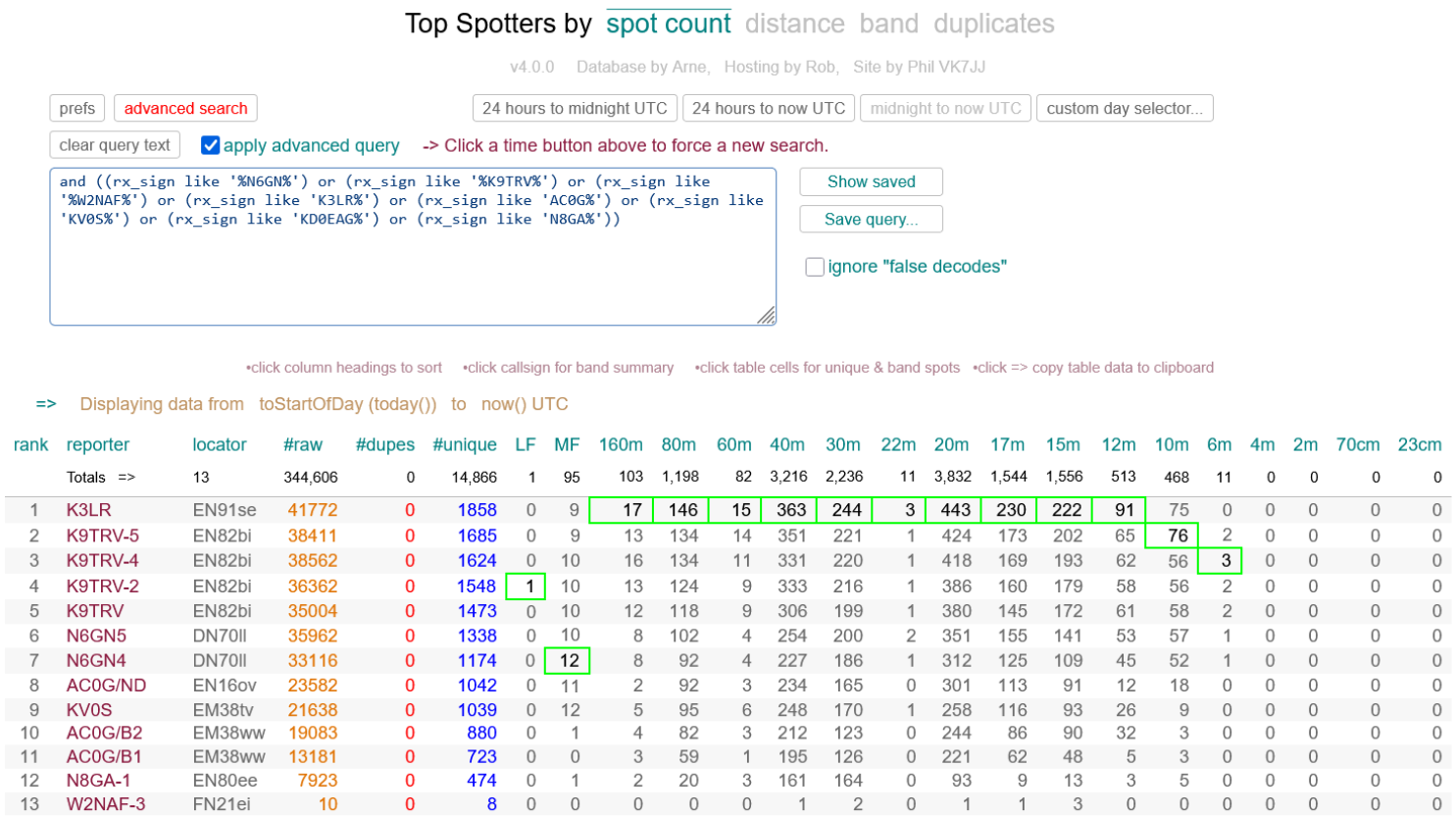
prefs | advanced search | 24 hours to midnight UTC | 24 hours to now UTC | midnight to now UTC | custom day selector...

•click column headings to sort •click callsign for band summary •click table cells for unique & band spots •click => copy table data to clipboard

=> Displaying data from toStartOfDay (today()) to now() UTC

rank	reporter	locator	#raw	#dupes	#unique	LF	MF	160m	80m	60m	40m	30m	22m	20m	17m	15m	12m	10m	6m	4m	2m	70cm	23cm
	Totals =>	200	3,940,763	2,197	210,734	84	1,018	1,989	16,449	2,073	48,327	33,395	76	56,478	19,619	18,771	5,706	6,698	47	1	2	1	0
1	WA2TP	FN30lu	52186	0	2362	0	11	17	166	20	426	315	2	605	272	285	119	124	0	0	0	0	0
2	N2YCH	FN31jg	47968	0	2203	0	8	17	141	14	377	280	2	546	269	297	137	114	1	0	0	0	0
3	W1XP	FN42fo	39541	0	2091	0	10	19	166	23	374	276	2	508	263	262	103	85	0	0	0	0	0
4	UACNJ	FN20mv	35725	0	1896	0	9	16	115	8	260	250	2	459	246	268	116	147	0	0	0	0	0
5	ON5KQ	JO10os	50476	0	1895	4	14	36	167	42	396	277	0	427	179	201	90	62	0	0	0	0	0
6	K1RA	FM18cr	35022	0	1859	0	5	14	127	9	349	249	0	490	209	213	87	107	0	0	0	0	0
7	K3LR	EN91se	41692	0	1857	0	9	17	146	15	363	244	3	442	230	222	91	75	0	0	0	0	0
8	K1RA-PI	FM18cr	32756	0	1850	0	4	16	125	12	350	265	0	464	209	213	88	104	0	0	0	0	0
9	K1RA-4	FM18cr	33237	0	1849	0	9	16	124	11	345	264	3	474	205	208	89	101	0	0	0	0	0
10	K6VZK	DM13nh	49900	0	1842	0	0	12	110	7	278	216	0	410	206	269	140	194	0	0	0	0	0
11	WZ7I	FN20kk	32583	0	1829	0	0	13	146	20	369	203	0	520	246	211	58	43	0	0	0	0	0
12	OE9GHV	JN47wk	51554	0	1781	3	19	47	171	43	352	292	0	476	155	145	47	31	0	0	0	0	0
13	N2YCH-1	FN31jg	36416	0	1778	0	4	9	128	13	356	261	2	392	212	245	80	75	1	0	0	0	0
14	WESSEX	IO80qr	42350	0	1778	5	18	43	180	44	367	299	0	440	137	155	47	43	0	0	0	0	0
15	KC2G	FN21wa	30769	0	1711	0	10	16	131	17	354	251	2	430	181	201	61	57	0	0	0	0	0
16	KD7EFG-1	DN31uo	46806	0	1701	0	14	12	112	5	297	225	4	450	194	208	70	110	0	0	0	0	0
17	K9TRV-5	EN82bi	38331	0	1683	0	9	13	134	14	351	221	1	422	173	202	65	76	2	0	0	0	0
18	KPH2	CM88mc	43415	0	1645	2	14	13	99	7	264	207	3	399	184	210	87	155	1	0	0	0	0
19	VK5ARG	PF95ht	24957	0	1628	0	0	7	32	11	252	259	0	558	201	154	53	97	4	0	0	0	0
20	K9TRV-4	EN82bi	38482	0	1621	0	10	16	134	11	331	220	1	415	169	193	62	56	3	0	0	0	0
21	PD0OHW	JO33lc	41936	0	1620	5	12	38	168	41	365	255	0	309	146	166	63	52	0	0	0	0	0
22	KD7EFG	DN31uo	40806	0	1591	0	14	13	111	6	278	212	4	418	176	198	67	94	0	0	0	0	0
23	KX4O	FM18cp	29468	0	1587	0	5	12	124	17	352	263	0	392	154	183	41	44	0	0	0	0	0
24	DK6UG	JN49cm	37721	14	1578	0	17	36	146	29	314	256	0	415	108	151	45	53	6	0	2	0	0
25	K3GMQ	FN20lh	25105	0	1561	0	9	18	119	14	352	180	2	355	189	170	68	85	0	0	0	0	0
26	OE3GBB	JN87aq	34082	0	1556	7	16	29	114	45	373	290	0	358	157	119	35	13	0	0	0	0	0
27	KFS	CM87tj	37999	0	1547	0	0	4	112	9	288	213	4	393	173	174	66	111	0	0	0	0	0
28	K9TRV-2	EN82bi	36284	0	1546	1	10	13	124	9	333	216	1	384	160	179	58	56	2	0	0	0	0
29	WA2N	EM85ll	35077	0	1530	0	9	10	126	9	298	238	0	401	163	158	58	60	0	0	0	0	0
30	OE3GBB/Q	JN87aq	39631	0	1527	3	15	29	109	41	350	267	0	357	162	134	38	22	0	0	0	0	0
31	DL0PF	JN68rn	30304	534	1502	0	16	33	122	38	303	222	0	374	152	176	44	22	0	0	0	0	0
32	HB9VQQ	JN47kh	35095	0	1499	0	16	11	109	35	339	254	0	419	120	126	33	36	1	0	0	0	0
33	K9TRV	EN82bi	34928	0	1471	0	10	12	118	9	306	199	1	378	145	172	61	58	2	0	0	0	0
34	N3AGE-4	FN30hw	26406	0	1451	0	5	15	120	7	317	216	1	351	155	135	48	80	1	0	0	0	0
35	OE6ADD	JN77pa	33507	246	1442	1	15	25	94	33	304	265	0	403	147	124	15	16	0	0	0	0	0
36	HB9VQQ/RS	JN47kh	32889	0	1432	0	16	5	109	35	335	251	0	411	115	119	0	35	1	0	0	0	0
37	K3GMQ-B	FN20lh	26948	0	1422	0	9	15	106	12	331	191	2	380	172	116	46	42	0	0	0	0	0

A custom query including sites I check



Top Spotters by spot count distance band duplicates

v4.0.0 Database by Arne, Hosting by Rob, Site by Phil VK7JJ

prefs | advanced search | 24 hours to midnight UTC | 24 hours to now UTC | midnight to now UTC | custom day selector...

clear query text | apply advanced query | -> Click a time button above to force a new search.

```
and ((rx_sign like '%N6GN%') or (rx_sign like '%K9TRV%') or (rx_sign like
'%W2NAF%') or (rx_sign like 'K3LR%') or (rx_sign like 'AC0G%') or (rx_sign like
'KV0S%') or (rx_sign like 'KD0EAG%') or (rx_sign like 'N8GA%'))
```

Show saved | Save query... | ignore "false decodes"

•click column headings to sort •click callsign for band summary •click table cells for unique & band spots •click => copy table data to clipboard

=> Displaying data from toStartOfDay (today()) to now() UTC

rank	reporter	locator	#raw	#dupes	#unique	LF	MF	160m	80m	60m	40m	30m	22m	20m	17m	15m	12m	10m	6m	4m	2m	70cm	23cm
	Totals =>	13	344,606	0	14,866	1	95	103	1,198	82	3,216	2,236	11	3,832	1,544	1,556	513	468	11	0	0	0	0
1	K3LR	EN91se	41772	0	1858	0	9	17	146	15	363	244	3	443	230	222	91	75	0	0	0	0	0
2	K9TRV-5	EN82bi	38411	0	1685	0	9	13	134	14	351	221	1	424	173	202	65	76	2	0	0	0	0
3	K9TRV-4	EN82bi	38562	0	1624	0	10	16	134	11	331	220	1	418	169	193	62	56	3	0	0	0	0
4	K9TRV-2	EN82bi	36362	0	1548	1	10	13	124	9	333	216	1	386	160	179	58	56	2	0	0	0	0
5	K9TRV	EN82bi	35004	0	1473	0	10	12	118	9	306	199	1	380	145	172	61	58	2	0	0	0	0
6	N6GN5	DN70ll	35962	0	1338	0	10	8	102	4	254	200	2	351	155	141	53	57	1	0	0	0	0
7	N6GN4	DN70ll	33116	0	1174	0	12	8	92	4	227	186	1	312	125	109	45	52	1	0	0	0	0
8	AC0G/ND	EN16ov	23582	0	1042	0	11	2	92	3	234	165	0	301	113	91	12	18	0	0	0	0	0
9	KV0S	EM38tv	21638	0	1039	0	12	5	95	6	248	170	1	258	116	93	26	9	0	0	0	0	0
10	AC0G/B2	EM38ww	19083	0	880	0	1	4	82	3	212	123	0	244	86	90	32	3	0	0	0	0	0
11	AC0G/B1	EM38ww	13181	0	723	0	0	3	59	1	195	126	0	221	62	48	5	3	0	0	0	0	0
12	N8GA-1	EN80ee	7923	0	474	0	1	2	20	3	161	164	0	93	9	13	3	5	0	0	0	0	0
13	W2NAF-3	FN21ei	10	0	8	0	0	0	0	0	1	2	0	1	1	3	0	0	0	0	0	0	0

Finding everyone in EN82, for example

Top Spotters by spot count distance band duplicates

v4.0.0 Database by Arne, Hosting by Rob, Site by Phil VK7JJ

prefs | advanced search | 24 hours to midnight UTC | 24 hours to now UTC | midnight to now UTC | custom day selector...

clear query text | apply advanced query | Query: own MH square

```
and substring(rx_loc,1,4) in ['EN82']
```

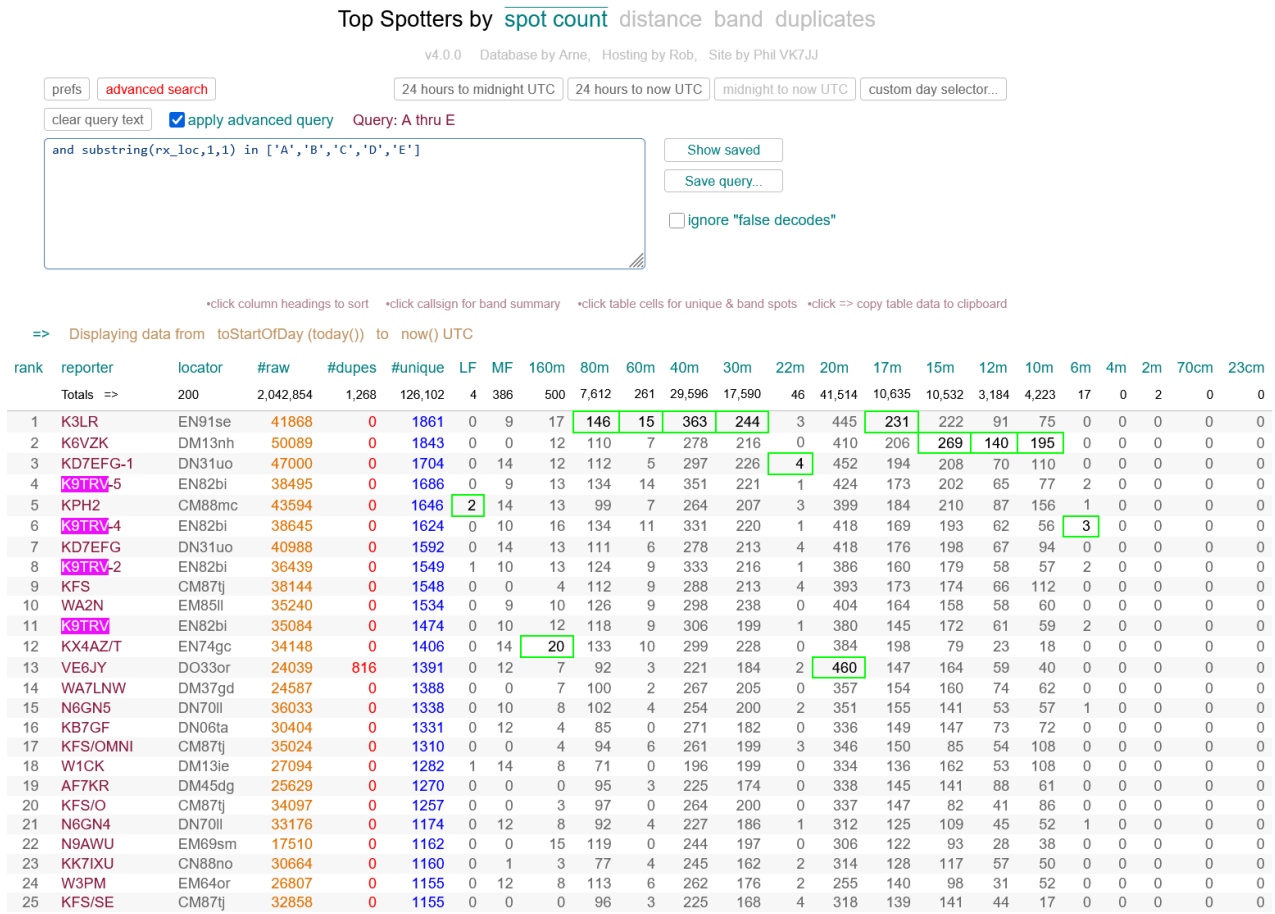
Show saved | Save query... | ignore "false decodes"

•click column headings to sort •click callsign for band summary •click table cells for unique & band spots •click => copy table data to clipboard

> Displaying data from toStartOfDay (today()) to now() UTC

reporter	locator	#raw	#dupes	#unique	LF	MF	160m	80m	60m	40m	30m	22m	20m	17m	15m	12m	10m	6m	4m	2m	70cm	23cm
Totals =>	13	168,174	0	8,707	1	39	68	651	44	1,973	888	4	2,815	716	898	265	335	10	0	0	0	0
K9TRV-5	EN82bi	38495	0	1686	0	9	13	134	14	351	221	1	424	173	202	65	77	2	0	0	0	0
K9TRV-4	EN82bi	38645	0	1624	0	10	16	134	11	331	220	1	418	169	193	62	56	3	0	0	0	0
K9TRV-2	EN82bi	36439	0	1549	1	10	13	124	9	333	216	1	386	160	179	58	57	2	0	0	0	0
K9TRV	EN82bi	35084	0	1474	0	10	12	118	9	306	199	1	380	145	172	61	59	2	0	0	0	0
N8HKU	EN82ee	3554	0	568	0	0	10	65	0	177	0	0	236	0	67	0	12	1	0	0	0	0
KB8RCO	EN82cd	3504	0	490	0	0	0	53	0	197	0	0	211	0	28	0	1	0	0	0	0	0
K8NVH	EN82lm	4060	0	416	0	0	2	6	1	79	0	0	164	69	54	18	23	0	0	0	0	0
VE3MNX	EN82ve	4426	0	351	0	0	0	0	0	0	0	0	351	0	0	0	0	0	0	0	0	0
K8NVH-K0	EN82lm	2293	0	267	0	0	2	7	0	80	32	0	138	0	0	0	8	0	0	0	0	0
KF8ETQ	EN82mm	1311	0	170	0	0	0	10	0	73	0	0	87	0	0	0	0	0	0	0	0	0
W8UM/1	EN82dh	219	0	71	0	0	0	0	0	46	0	0	20	0	3	1	1	0	0	0	0	0
WB8ILI	EN82pq	111	0	33	0	0	0	0	0	0	0	0	0	0	0	0	33	0	0	0	0	0
WD8EBZ	EN82jg	33	0	8	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0

Everyone in North America, except east coast (Maidenhead Ax thru Ex) current day



Top Spotters by spot count distance band duplicates

v4.0.0 Database by Arne, Hosting by Rob, Site by Phil VK7JJ

prefs | advanced search | 24 hours to midnight UTC | 24 hours to now UTC | midnight to now UTC | custom day selector...

clear query text | apply advanced query | Query: A thru E

```
and substring(rx_loc,1,1) in ['A','B','C','D','E']
```

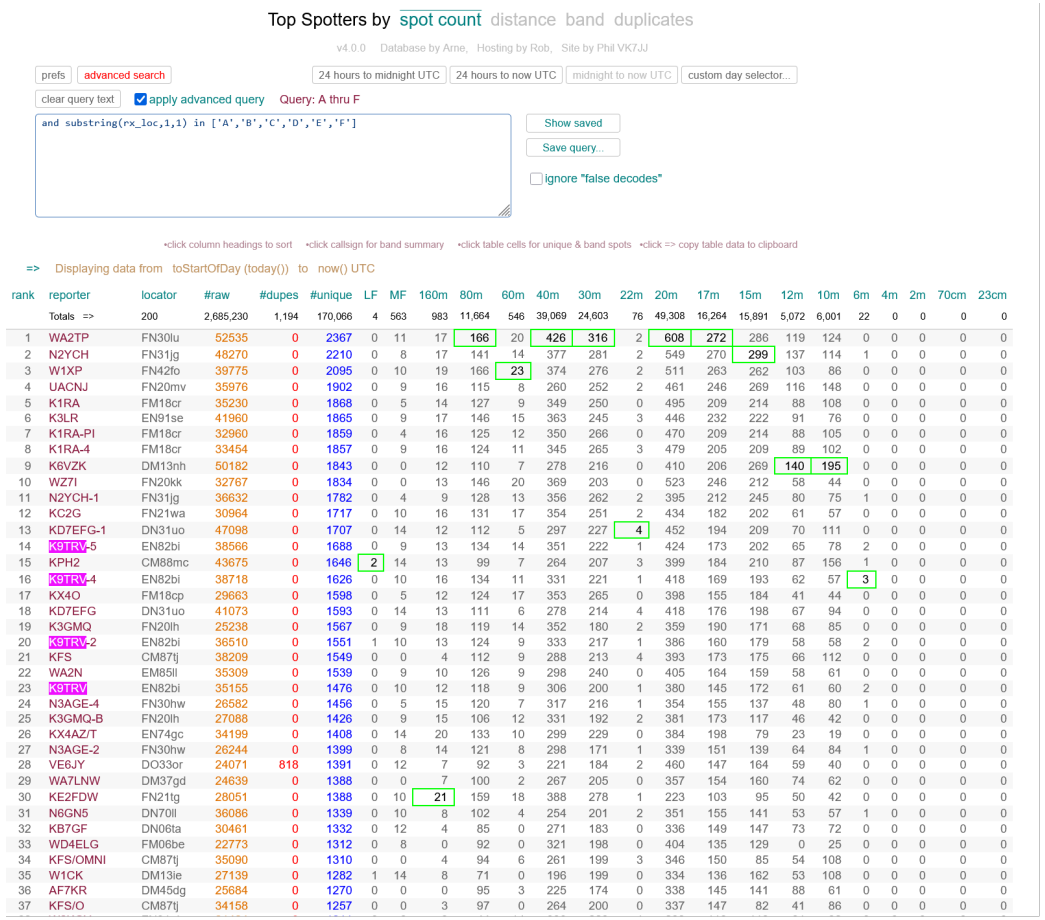
Show saved | Save query... | ignore "false decodes"

•click column headings to sort •click callsign for band summary •click table cells for unique & band spots •click => copy table data to clipboard

=> Displaying data from toStartOfDay (today()) to now() UTC

rank	reporter	locator	#raw	#dupes	#unique	LF	MF	160m	80m	60m	40m	30m	22m	20m	17m	15m	12m	10m	6m	4m	2m	70cm	23cm
	Totals =>	200	2,042,854	1,268	126,102	4	386	500	7,612	261	29,596	17,590	46	41,514	10,635	10,532	3,184	4,223	17	0	2	0	0
1	K3LR	EN91se	41868	0	1861	0	9	17	146	15	363	244	3	445	231	222	91	75	0	0	0	0	0
2	K6VZK	DM13nh	50089	0	1843	0	0	12	110	7	278	216	0	410	206	269	140	195	0	0	0	0	0
3	KD7EFG-1	DN31uo	47000	0	1704	0	14	12	112	5	297	226	4	452	194	208	70	110	0	0	0	0	0
4	K9TRV-5	EN82bi	38495	0	1686	0	9	13	134	14	351	221	1	424	173	202	65	77	2	0	0	0	0
5	KPH2	CM88mc	43594	0	1646	2	14	13	99	7	264	207	3	399	184	210	87	156	1	0	0	0	0
6	K9TRV-4	EN82bi	38645	0	1624	0	10	16	134	11	331	220	1	418	169	193	62	56	3	0	0	0	0
7	KD7EFG	DN31uo	40988	0	1592	0	14	13	111	6	278	213	4	418	176	198	67	94	0	0	0	0	0
8	K9TRV-2	EN82bi	36439	0	1549	1	10	13	124	9	333	216	1	386	160	179	58	57	2	0	0	0	0
9	KFS	CM87tj	38144	0	1548	0	0	4	112	9	288	213	4	393	173	174	66	112	0	0	0	0	0
10	WA2N	EM85ll	35240	0	1534	0	9	10	126	9	298	238	0	404	164	158	58	60	0	0	0	0	0
11	K9TRV	EN82bi	35084	0	1474	0	10	12	118	9	306	199	1	380	145	172	61	59	2	0	0	0	0
12	KX4AZ/T	EN74gc	34148	0	1406	0	14	20	133	10	299	228	0	384	198	79	23	18	0	0	0	0	0
13	VE6JY	DO33or	24039	816	1391	0	12	7	92	3	221	184	2	460	147	164	59	40	0	0	0	0	0
14	WA7LNW	DM37gd	24587	0	1388	0	0	7	100	2	267	205	0	357	154	160	74	62	0	0	0	0	0
15	N6GN5	DN70ll	36033	0	1338	0	10	8	102	4	254	200	2	351	155	141	53	57	1	0	0	0	0
16	KB7GF	DN06ta	30404	0	1331	0	12	4	85	0	271	182	0	336	149	147	73	72	0	0	0	0	0
17	KFS/OMNI	CM87tj	35024	0	1310	0	0	4	94	6	261	199	3	346	150	85	54	108	0	0	0	0	0
18	W1CK	DM13ie	27094	0	1282	1	14	8	71	0	196	199	0	334	136	162	53	108	0	0	0	0	0
19	AF7KR	DM45dg	25629	0	1270	0	0	0	95	3	225	174	0	338	145	141	88	61	0	0	0	0	0
20	KFS/O	CM87tj	34097	0	1257	0	0	3	97	0	264	200	0	337	147	82	41	86	0	0	0	0	0
21	N6GN4	DN70ll	33176	0	1174	0	12	8	92	4	227	186	1	312	125	109	45	52	1	0	0	0	0
22	N9AWU	EM69sm	17510	0	1162	0	0	15	119	0	244	197	0	306	122	93	28	38	0	0	0	0	0
23	KK7IXU	CN88no	30664	0	1160	0	1	3	77	4	245	162	2	314	128	117	57	50	0	0	0	0	0
24	W3PM	EM64or	26807	0	1155	0	12	8	113	6	262	176	2	255	140	98	31	52	0	0	0	0	0
25	KFS/SE	CM87tj	32858	0	1155	0	0	0	96	3	225	168	4	318	139	141	44	17	0	0	0	0	0

Everyone in North America (Maidenhead Ax thru Fx)



Top Spotters by spot count distance band duplicates

v4.0.0 Database by Arne, Hosting by Rob, Site by Phil VK7JJ

prefs | advanced search | 24 hours to midnight UTC | 24 hours to now UTC | midnight to now UTC | custom day selector...

clear query text | apply advanced query | Query: A thru F

```
and substring(rx_loc,1,1) in ['A','B','C','D','E','F']
```

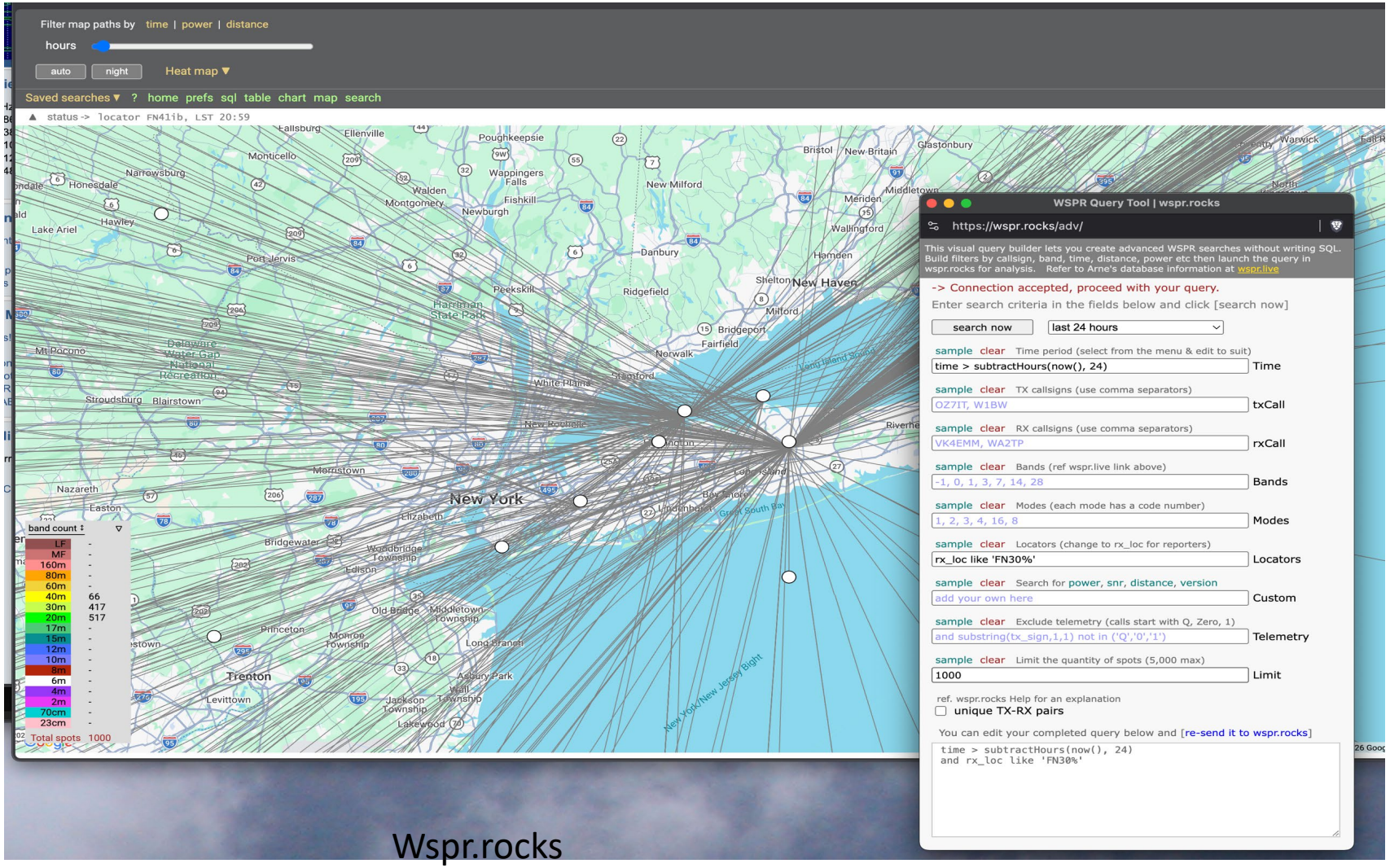
Show saved | Save query... | ignore "false decodes"

•click column headings to sort •click callsign for band summary •click table cells for unique & band spots •click => copy table data to clipboard

=> Displaying data from toStartOfDay (today()) to now() UTC

rank	reporter	locator	#raw	#dupes	#unique	LF	MF	160m	80m	60m	40m	30m	22m	20m	17m	15m	12m	10m	6m	4m	2m	70cm	23cm
	Totals =>	200	2,685,230	1,194	170,066	4	563	983	11,664	546	39,069	24,603	76	49,308	16,264	15,891	5,072	6,001	22	0	0	0	0
1	WA2TP	FN30lu	52535	0	2367	0	11	17	166	20	426	316	2	608	272	286	119	124	0	0	0	0	0
2	N2YCH	FN31jg	48270	0	2210	0	8	17	141	14	377	281	2	549	270	299	137	114	1	0	0	0	0
3	W1XP	FN42fo	39775	0	2095	0	10	19	166	23	374	276	2	511	263	262	103	86	0	0	0	0	0
4	UACNJ	FN20mv	35976	0	1902	0	9	16	115	8	260	252	2	461	246	269	116	148	0	0	0	0	0
5	K1RA	FM18cr	35230	0	1868	0	5	14	127	9	349	250	0	495	209	214	88	108	0	0	0	0	0
6	K3LR	EN91se	41960	0	1865	0	9	17	146	15	363	245	3	446	232	222	91	76	0	0	0	0	0
7	K1RA-PI	FM18cr	32960	0	1859	0	4	16	125	12	350	266	0	470	209	214	88	105	0	0	0	0	0
8	K1RA-4	FM18cr	33454	0	1857	0	9	16	124	11	345	265	3	479	205	209	89	102	0	0	0	0	0
9	K6VZK	DM13nh	50182	0	1843	0	0	12	110	7	278	216	0	410	206	269	140	195	0	0	0	0	0
10	WZ7I	FN20kk	32767	0	1834	0	0	13	146	20	369	203	0	523	246	212	58	44	0	0	0	0	0
11	N2YCH-1	FN31jg	36632	0	1782	0	4	9	128	13	356	262	2	395	212	245	80	75	1	0	0	0	0
12	KC2G	FN21wa	30964	0	1717	0	10	16	131	17	354	251	2	434	182	202	61	57	0	0	0	0	0
13	KD7EFG-1	DN31uo	47098	0	1707	0	14	12	112	5	297	227	4	452	194	209	70	111	0	0	0	0	0
14	K9TRV-5	EN82bi	38566	0	1688	0	9	13	134	14	351	222	1	424	173	202	65	78	2	0	0	0	0
15	KPH2	CM88mc	43675	0	1646	2	14	13	99	7	264	207	3	399	184	210	87	156	1	0	0	0	0
16	K9TRV-4	EN82bi	38718	0	1626	0	10	16	134	11	331	221	1	418	169	193	62	57	3	0	0	0	0
17	KX4O	FM18cp	29663	0	1598	0	5	12	124	17	353	265	0	398	155	184	41	44	0	0	0	0	0
18	KD7EFG	DN31uo	41073	0	1593	0	14	13	111	6	278	214	4	418	176	198	67	94	0	0	0	0	0
19	K3GMQ	FN20lh	25238	0	1567	0	9	18	119	14	352	180	2	359	190	171	68	85	0	0	0	0	0
20	K9TRV-2	EN82bi	36510	0	1551	1	10	13	124	9	333	217	1	386	160	179	58	58	2	0	0	0	0
21	KFS	CM87tj	38209	0	1549	0	0	4	112	9	288	213	4	393	173	175	66	112	0	0	0	0	0
22	WA2N	EM85ll	35309	0	1539	0	9	10	126	9	298	240	0	405	164	159	58	61	0	0	0	0	0
23	K9TRV	EN82bi	35155	0	1476	0	10	12	118	9	306	200	1	380	145	172	61	60	2	0	0	0	0
24	N3AGE-4	FN30hw	26582	0	1456	0	5	15	120	7	317	216	1	354	155	137	48	80	1	0	0	0	0
25	K3GMQ-B	FN20lh	27088	0	1426	0	9	15	106	12	331	192	2	381	173	117	46	42	0	0	0	0	0
26	KX4AZ/T	EN74gc	34199	0	1408	0	14	20	133	10	299	229	0	384	198	79	23	19	0	0	0	0	0
27	N3AGE-2	FN30hw	26244	0	1399	0	8	14	121	8	298	171	1	339	151	139	64	84	1	0	0	0	0
28	VE6JY	DO33or	24071	818	1391	0	12	7	92	3	221	184	2	460	147	164	59	40	0	0	0	0	0
29	WA7LNW	DM37gd	24639	0	1388	0	0	7	100	2	267	205	0	357	154	160	74	62	0	0	0	0	0
30	KE2FDW	FN21tg	28051	0	1388	0	10	21	159	18	388	278	1	223	103	95	50	42	0	0	0	0	0
31	N6GN5	DN70ll	36086	0	1339	0	10	8	102	4	254	201	2	351	155	141	53	57	1	0	0	0	0
32	KB7GF	DN06ta	30461	0	1332	0	12	4	85	0	271	183	0	336	149	147	73	72	0	0	0	0	0
33	WD4ELG	FM06be	22773	0	1312	0	8	0	92	0	321	198	0	404	135	129	0	25	0	0	0	0	0
34	KFS/OMNI	CM87tj	35090	0	1310	0	0	4	94	6	261	199	3	346	150	85	54	108	0	0	0	0	0
35	W1CK	DM13ie	27139	0	1282	1	14	8	71	0	196	199	0	334	136	162	53	108	0	0	0	0	0
36	AF7KR	DM45dg	25684	0	1270	0	0	0	95	3	225	174	0	338	145	141	88	61	0	0	0	0	0
37	KFS/O	CM87tj	34158	0	1257	0	0	3	97	0	264	200	0	337	147	82	41	86	0	0	0	0	0

Fancy maps are available, too!



Wspr.rocks

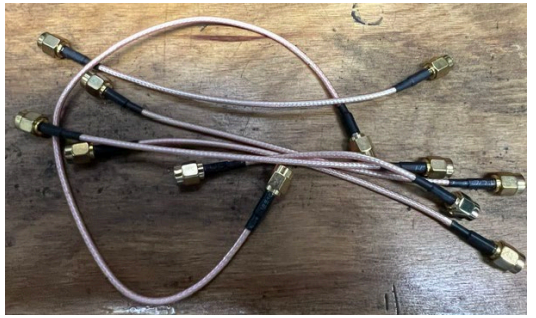
Outcome

- All four antennas receive 2200m thru 6m
- All are quite similar in terms of what they hear
- All require some on-going maintenance to keep operating well
- The RSEAV1 requires a GOOD GROUND at the antenna.
- The SaS antennas are fully balanced and not grounded at the mast.
- Coax (expensive) vs CAT7 cable (much less expensive)
- Current ranking:
  - K9TRV-5, MedZ double gain SAS
  - K9TRV-4, DXE RSEAV1
  - K9TRV-2, HighZ SAS
  - K9TRV, MedZ normal gain SAS
  - YOUR results will be different because your noise floor (and what noises you will tolerate) will be different from mine
  - Best for high noise environment: likely the MedZ normal gain SAS
- Future experiments:
  - Some longer vertical masts, so longer antenna wires. Can reach 36’ (11m) so likely can have 8m+ SAS

Sources

- DXE RSEAV1 from DX Engineering. Likely go to their booth and buy one…
- N6GN SaS is do-it-yourself via JLCPCB, or come see me at the TAPR booth. I provide them roughly ‘at cost’. I have all 3 variants of PreAmps and Shackboards at the booth, as well as the antiphase combiners and LPF60 60 MHz low pass filters.
- CAT7 cable: https://www.amazon.com/dp/B09CGP3ZCW
- Outdoor couplers: https://www.amazon.com/dp/B0D41RTM1S
- Windsock poles or flagpoles:
  - https://eezrvproducts.com/shop/ols/products/telescoping-wind-sock-pole-fiberglass
  - https://eezrvproducts.com/shop/ols/products/23ft-or-26ft-telescoping-fiberglass-flagpole
  - https://eezrvproducts.com/shop/ols/products/telescoping-wind-sock-extension-for-flag-poles-10-foot

Coax selection, or why I hate RG316 >



- Semi-rigid (RG402) and rigid cables offer much better screening than the braid on RG316 can provide
- Here is a 4" and 6" RG402 cable from Amazon https://www.amazon.com/uxcell-Right-Angle-RG402-0-33Ft/dp/B07VR1D8H9
- Or a 12" version https://www.amazon.com/BINGFU-RG402-0-141-Semi-Flexible-2-Pack/dp/B08RRXHDLS
- Or 1 meter https://www.amazon.com/POBADY-Coaxial-Cable-Pigtail-Extension/dp/B0CDGRF5RX
- 10 cm 10 pack https://www.amazon.com/10cm-Semi-Rigid-RG402-Cable-10Pack/dp/B0DDWXQ96K
- Many other lengths are available. These prices are even pretty good compared to the same/similar items on AliExpress.
- On eBay search for RG402 and many options are available. High quality cables in 2" length increments from https://www.ebay.com/itm/141569268413, from 2" thru 24", then every 6".
- I also use hardline and other rigid cables when possible.
- Avoid ‘pull tests’ on RG316 to qualify it. It only sets you up for failure shortly… Such small cable is difficult to make a secure crimp to.
- Prefer RG-11 to RG-6Quad or similar 75-ohm cable
- It is important to use a proper tool to tighten the SMA connectors. This gets the connector properly tight, without overtightening, using a 'torque release point' method. I use:
  - https://www.amazon.com/dp/B004UBHE5E
  - https://www.amazon.com/dp/B0BQYNFZF2?th=1
  - https://www.amazon.com/dp/B0BDM31F3N depending on the situation.
  - Yes, $35 is a lot for a tool, but the proper tool does a superior job, repeatedly, reliably.

Things you may encounter

- Note the deer hoofprint next to the cable
- Is it a bite or a hoof stomp?
  - Or squirrel or other varmint?
  - Or lawn mowing damage that finally failed?
    - I’d be the guilty party, then…
- Cable replaced, early winter, 24 Dec 2025

Other things you may encounter

- Ground loops. Lots of ground loops.
- Poor shielding. Just walk around your shack with an AM radio tuned to ‘no station’, and listen as you move it close to pieces of radio gear, test equipment, computers, monitors, lights.
- A bad light in your shower. LED. Produced lots of bad noise when on.
  - Discovered by accident when I was in my shack and wife took a shower
  - Not the dimmer. Conclusively the light fixture. Replaced. Problems vanished.
- Your house is ‘noisy’
  - When antennas were close to house, noise was high and very bad
    - But cables were ‘short’
  - Moved farther away, and ‘up hill’ (higher elevation) from the house.
  - Lots of articles, often by people with high-performing receivers on the wspr.rocks lists, with tips. See e.g. QST N2YCH article

Other things you may encounter, part deux

- Cables that go bad
  - Why I stopped using RG316
  - Why I started using semi-rigid and rigid cables
- Ground differential noise
  - You think your antenna ground is at the same potential as your house ground?
  - Think again! There is a positive resistance between the two. This can add noise to non-differential signals (think: RG-11 coax)
  - Saw such noise on the RSEAV1 over the winter.
    - It abated with warmer weather
    - You cannot control what your neighbor uses for HVAC equipment!
    - Nor whether it has been modified to suppress RF to your satisfaction…
    - Did NOT appear on any of the SAS antennas (all using balanced cables and signalling)

What other information do I collect?

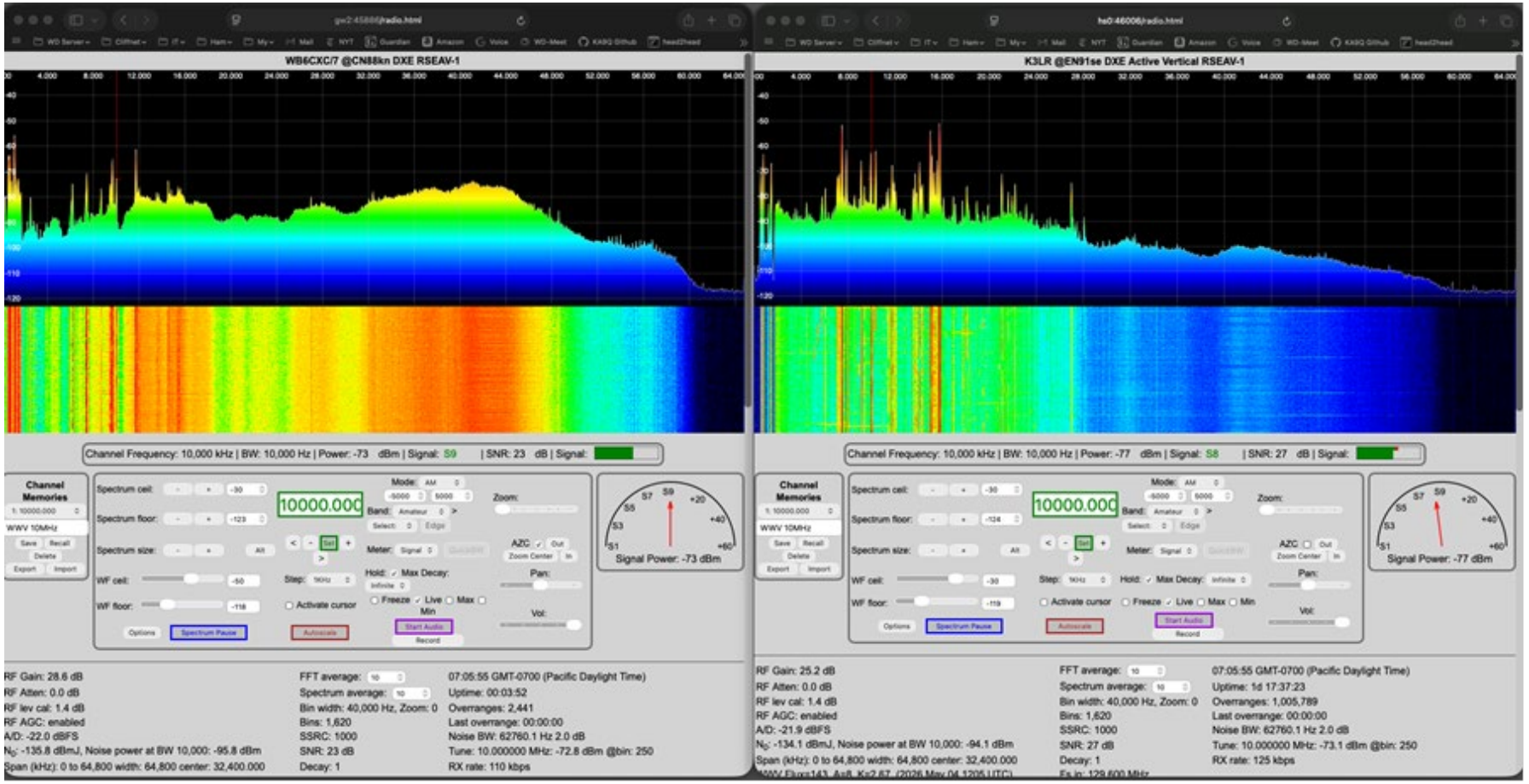
- Have a flightware ADSB beacon reporting site
  - You get flightaware pro for free as a contributing station
- Have a Dartmouth AM Doppler Receiver site AMD11
- Have a dual band Trimble GPS that reports TEC data to Haystack
  - Via a John N8UR project

Many thanks to… (in no particular order)

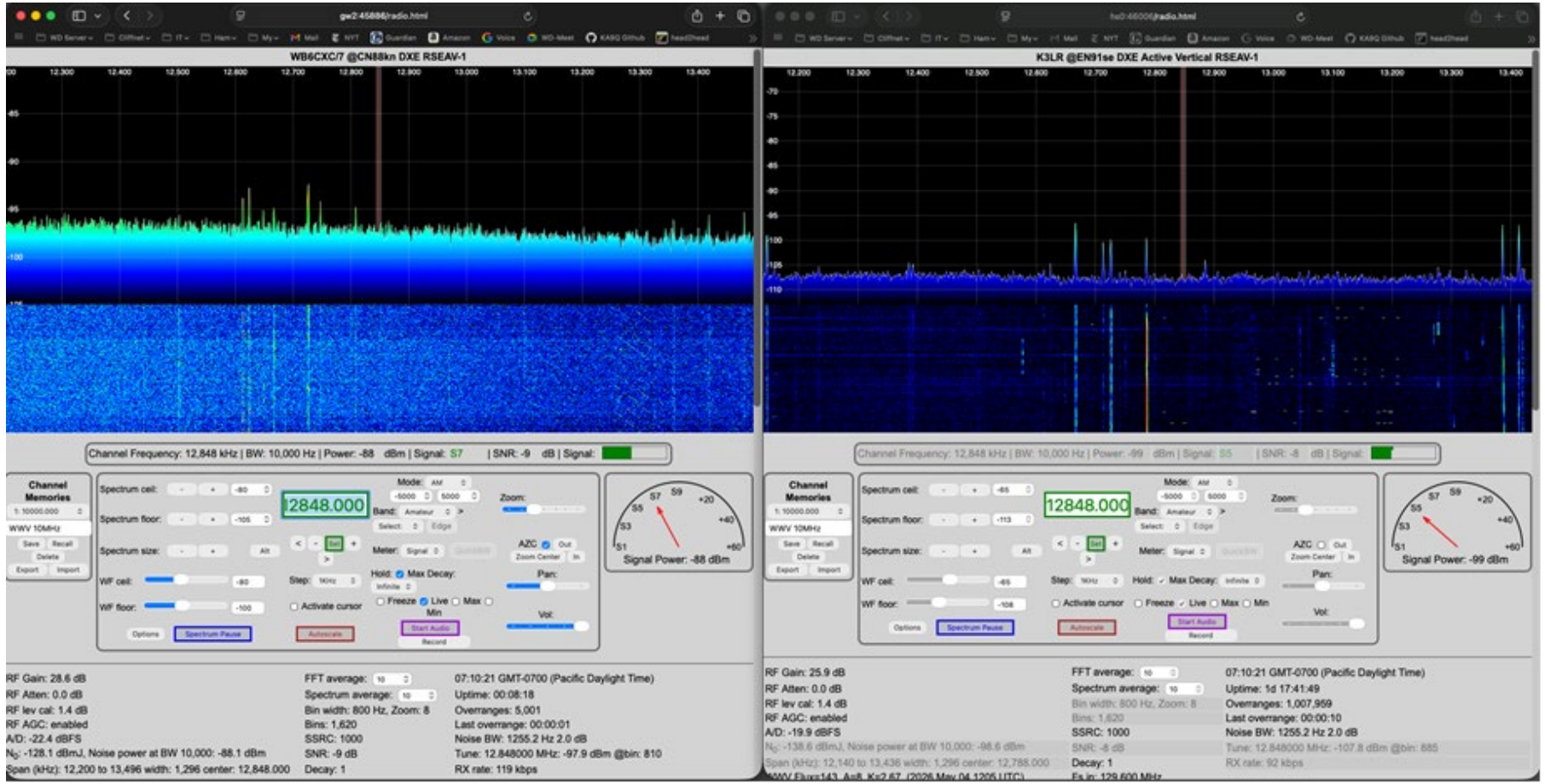
- Glenn Elmore N6GN
- Rob Robinett AI6VN
- Phil Karn KA9Q
- John Ackermann N8UR
- Nathaniel Frissell W2NAF
- Paul Elliott WB6CXC
- Michael Hauan AC0G
- Elmer Musser N3AGE
- Tim Duffy K3LR
- And MANY, MANY others… (Clinton Turner, Bret Anderson, Scott Newell, Gary Mikitin, David Witten, Mel Whitten, Mooneer Salem)

Appendix: case study in noise identification

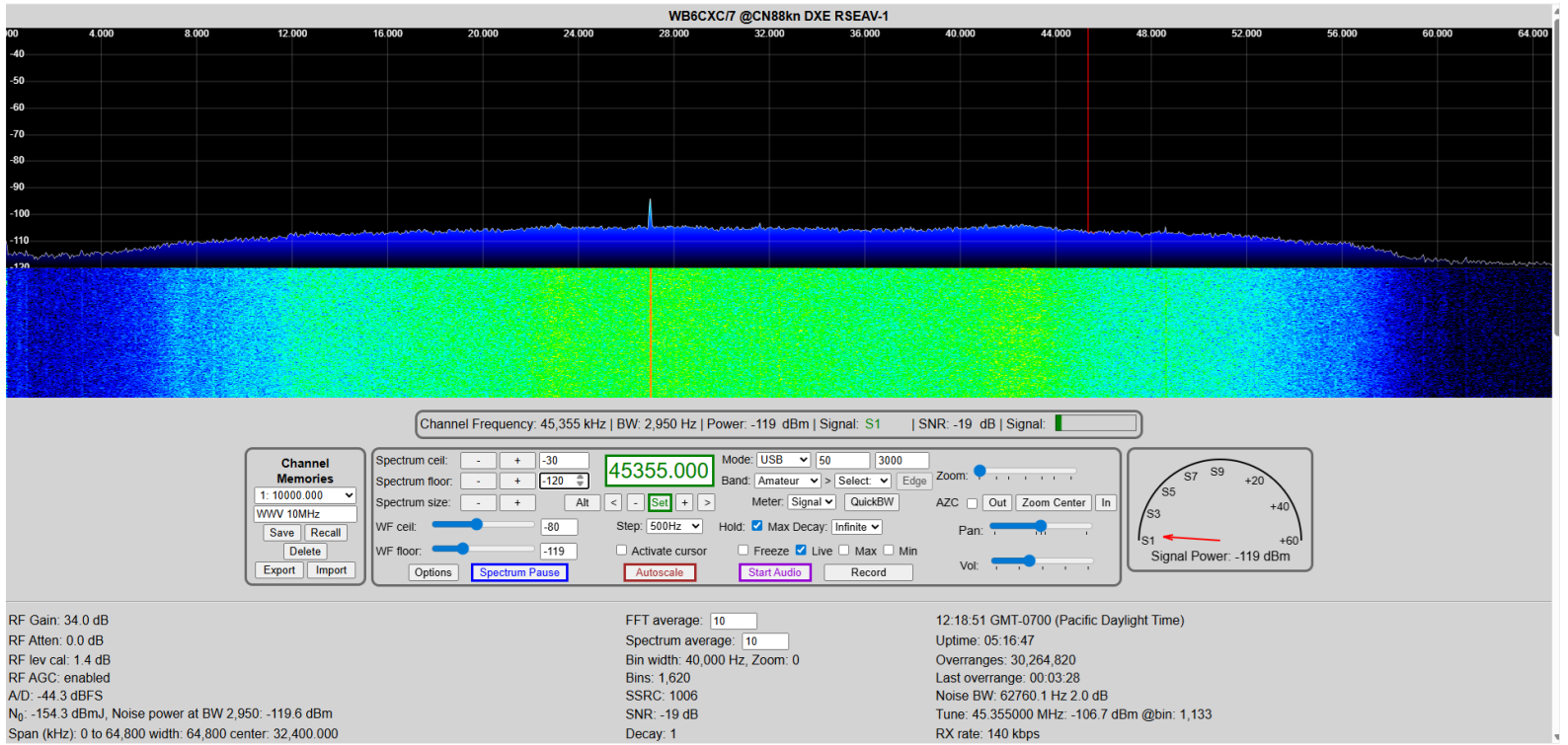
I think there are still EMI problems with your installation. Note the differences with Tim Duffy's installation



Zooming in, I see your broadband background noise level is 10 dB higher than K3LR. Is your LNA active? If so, perhaps you could take it out and run with only a 60 MHz LPF



Here is the "terminal grounded" test

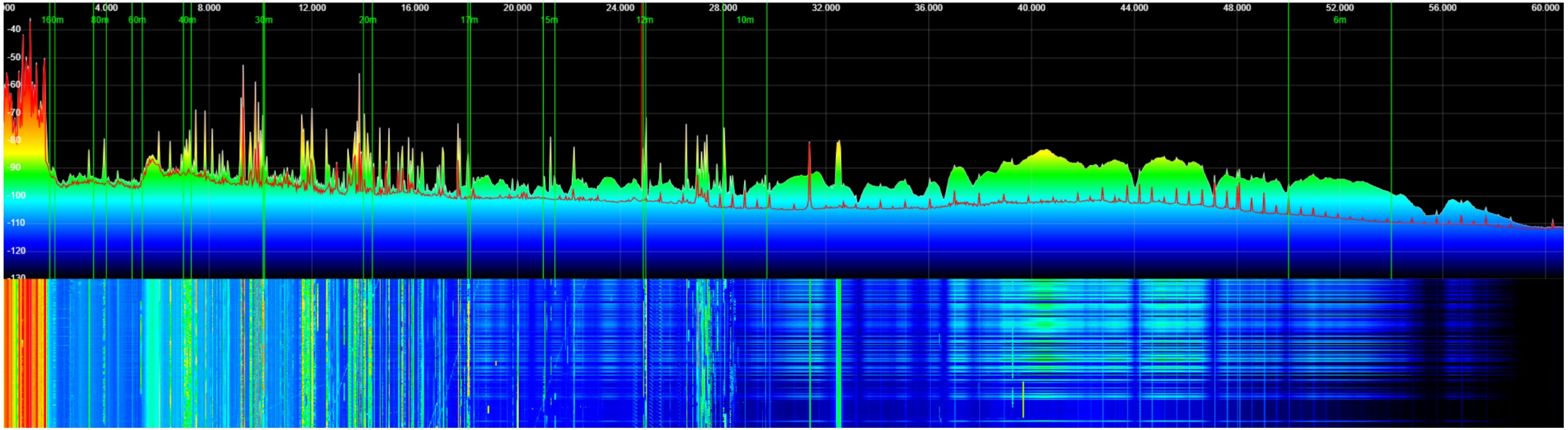


So the amp at the antenna raised No from -164 to -154 which suggests the antenna amp is the dominant source of noise in the system.

That would be a good result except that now that the antenna is connected, the spectrum shows -90 dBm switcher RFI lines above 30 MHz while RF AGC is at +34 dB which may suggest low antenna sensitivity .

A demon I chased

K9TRV-2 RAC=139 HiZ SaS 5m

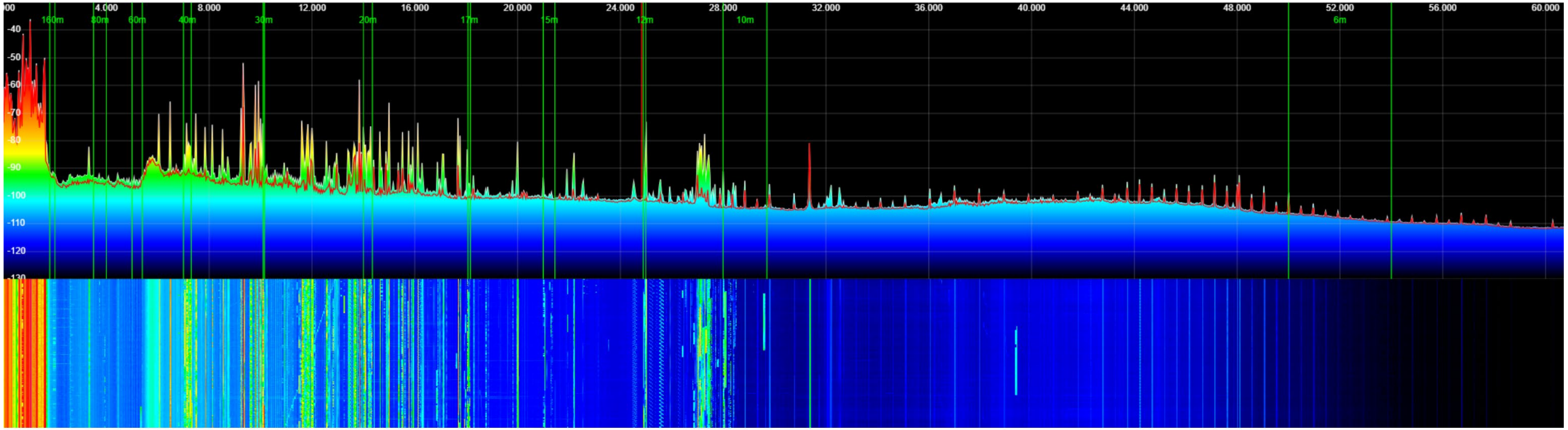


RF Gain: 10.0 dB	FFT average:	17:07:01 GMT-0400 (Eastern Daylight Time)
RF Atten: 0.0 dB	Bin width: 40,000 Hz, Zoom: 0	Uptime: 05:28:31
RF lev cal: -1.4 dB	Bins: 1,620	Overranges: 2,765
RF AGC: enabled	SSRC: 1000	Last overrange: 00:00:08
A/D: -25.0 dBFS	SNR: -4 dB	Blocks/poll: 5
N_0: -143.6 dBmJ, Noise power at BW 10,000: -103.6 dBm	Decay: 1.0001	Tune: 24.828000 MHz: -97.7 dBm @bin: 620
Span (kHz): 0 to 64,800 width: 64,800 center: 32,400.000	Fs in: 129.600 MHz	RX rate: 140 kbps

WWV Flux=149, A=18, K=1.00. (2025 Oct 20 1810 UTC)

Was gone 4 minutes later!

K9TRV-2 RAC=139 HiZ SaS 5m



RF Gain: 10.0 dB
RF Atten: 0.0 dB
RF lev cal: -1.4 dB
RF AGC: enabled
A/D: -25.1 dBFS
N_0: -147.2 dBmJ, Noise power at BW 10,000: -107.2 dBm
Span (kHz): 0 to 64,800 width: 64,800 center: 32,400.000

FFT average:
Bin width: 40,000 Hz, Zoom: 0
Bins: 1,620
SSRC: 1000
SNR: -∞ dB
Decay: 1.0001
Fs in: 129.600 MHz

17:11:44 GMT-0400 (Eastern Daylight Time)
Uptime: 05:33:14
Overranges: 2,766
Last overrange: 00:04:40
Blocks/poll: 5
Tune: 24.828000 MHz: -101.5 dBm @bin: 620
RX rate: 141 kbps

WWV Flux=140, A=10, K=1.33. (2025 Oct 20 2105 UTC)

Yet those spikes above 24 MHz, especially near 44-48 MHz are ugly

It’s a constant game of ‘whack-a-mole’

- This repeats any number of times.
  - Simplify your system and see what happens
  - Add something back in
    - No change? Really? Keep adding…
    - A change for the worse
      - How could it be conducted signal?
      - What are the new ground loops introduced by the changes?
      - How is noise now different? (that AM receiver…, use your TinySA and a loop or probe)
- How good is good enough for you?
  - Only you know
  - It can change with time
  - A man with two watches only wants a third watch, to know which is the better watch? Or is it now the ‘best watch’, and of course you need a fourth.
    - Yes, I’m a very low-grade time nut; I only have Rubidium. And only one.
    - I have friends who are much more serious about it

Other actions taken

- Cable from my Ubiquiti networking gear to the cable modem replaced with fiberoptic. (it's a 100' run…)
- Connection from one 24 port switch to another replaced with Fiber
- Try to eliminate or at least control/limit use of PoE (known to generate noise in many cases. Same problem as using a Bias-T, essentially)
- A number of DC filters were distributed about
- Switched TVs from wired ethernet to WiFi
  - Reduces number of ground loops… (already power + RG6Q cable: a ground loop)
  - May make things worse by using radiated (WiFi) vs wired ('Ethernet')
  - Switched one TV from RG6Q to WiFi (cable box to Xumo exchange: still a power ground loop!)