WebSDR Maasbree Low: 160m-15m High: 40m-10m 2m: 144-146MHz

User Manual WebSDR 2.1 v1.4

PAOSIM/PEOMJX



This manual is written specific for the Maasbree WebSDR GUI. The GUI is a modified version of the standard GUI.

WebSDR is a very strong concept developed and implemented by: PA3FWM Pieter-Tjerk de Boer More information: <u>http://www.websdr.org</u>

Technical information specific for the Maasbree WebSDR is available at: <u>http://www.websdrmaasbree.nl/</u>

© Copyrights Graphical User Interface (GUI) design of this WebSDR and this manual: PAOSIM and PEOMJX. Copying the GUI design partially or completely is allowed with proper source reference including a link to this WebSDR *for noncommercial WebSDR use only*.

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WebSDR page layout

The WebSDR



Starting at the top:

- Input for your call or name (sets a cookie e.g. for saving memories)
- Link to this Manual, links to the Low (160m-15m) or High (40m-10m) and 2mtr WebSDR
- Selections waterfalls, allowing keyboard input, Java or HTML5
- Waterfall (blue area)
- Frequency scale (black area)

Then from left to right three blocks:

- S-meter Toggle S-meter light/dark, update URL with settings Mute, Squelch, Notch Volume control Manual Squelch Hiboost, Noise Reduction
- Frequency input
 Fine tuning and checkbox for 1Hz steps
 Band select dual memory
 Waterfall control
 Header button
 Signal strength plot setting
- Modulation selection Bandpass settings APF and manual Notch filter Memories

<u>Note:</u> Browser zoom in and out: hold CTRL and press the + or - key to zoom in or out. Or change screen resolution!

1.1.1 Text colors on buttons

1.2

The text on buttons can have three colors: grey, yellow and green. Grey: button action not active Yellow: button can be clicked for action, color doesn't change Green: the button action is selected or toggled

Info of WebSDR users

This WebSDR is currently being used by 43 user(s) simultaneously: Compact view	
mobile 3635.00	
[∩] 3603.00 3635.11	
3603.00	
mobile 3635.00	
3603.00	3753.00
3635.00 PAO SIM 3630.00	
3635.00	
3630.00 pc1z 3630.00	
3635.00	
3635.00	
Radio Wind 3622.00	
3635.00 3635.02	
mobile 3603.00	mobile 3773.00
ix> 3603.00	
3603.00	
mobile 3635.00 3635.00	
mobile 3603.00 3635.00	
3635.00	
3400 3450 3500 3550 3600 3650 3700	3750 3800 3850
5357.00 5290 5300 5310 5320 5330 5340 5350 5360 5370 5380 5390 5400	5410 5420 5430 5440 5450 5460
XXXL 7038.00	
7144.00	
6850 6900 6950 7100 7150 7100 7150	7200 7250 7300
10060 10070 10080 10090 10100 10110 10120 10130 10140 10150 10160 10170 10	0180 10190 10200 10210 10220 10230 10240
14080.25	
14290.00	
PA 2 DP 14243.00 PD2TX 14233.60	
14175.00 mobile 14078.00	
13700 13750 13800 13850 13900 13950 14000 14050 14100 14150 14200 14250 14300	14350 14400 14450 14500 14550 14600 14650

On top the total number of users present on the WebSDR is displayed.

Each band has its own black field in which the users are shown at their frequency by call or name and tuned frequency. If no name or call is entered, only the tuned frequency is shown (instead of IP address). Length of name or call is limited to 8 characters.

Selecting *compact view* reduces the info to vertical lines reducing the size of this part of the WebSDR page.

1.3

WebSDR information



This part of the page shows some relevant links to WebSDR related information. The **Sysop messages** are used for updating users and informing about important changes.

2 Waterfall

The **blue** waterfall shows the spectrum of the band over time by scrolling upward. Noise level is dark blue. How dark depends on the present noise level on that band.

The stronger the signal the lighter the vertical lines it writes in the waterfall.

On e.g. 80m band, if fully zoomed in, the total width is 16kHz. The waterfall width is 1024 pixels, so each vertical line in the waterfall is 16kHz/1024=16Hz. If fully zoomed out the width is 512kHz and each vertical line is 500Hz. The smaller the bandwidth for each vertical line the less noise is captured and the better a weak signal will be visible in the waterfall.

The **black** part of the waterfall is the **frequency scale**. It shows the frequency and the labels. The tuned frequency is indicated by the vertical yellow line and by the yellow bandwidth symbol.

Green labels are the memories and the orange labels the preset band limits.

The mouse can be used to tune the frequency, the bandpass filter and to select labels by clicking.

Frequency tuning

The WebSDR supports multiple methods for tuning the frequency and selecting band.

3.1

3.3

3

Using the mouse on the frequency scale

3400 3450 3500 3	3550	3600 3650	3700 3750 38	00 3850
		5		
2	BUIFI	NTC	Am Berg	

Frequency can be changed by:

• Clicking with the Left Mouse Button (LMB) on the black part of the scale.

The frequency is set by clicking with the Left Mouse Button (LMB) at the location of the frequency. The frequency is selected when the LMB is released. *Double click rounds the frequency to the nearest kHz or nearest 500Hz for CW.*

• Dragging the cursor

By holding the LMB and moving the mouse the frequency is changed by dragging.

Rotating the scroll wheel

By rotating the mouse wheel up or down the frequency shifts up or down. The frequency step is 50Hz for AM(FM), 31.25Hz for SSB and 10Hz for CW.

3.2 Direct input in frequency field



The numerical keyboard can be used to input the frequency directly.

The **DWN** and **UP** buttons are for fine tuning. A single 10Hz step up or down is made by a short click on a button. When keeping the button pressed the frequency changes with increasing step size.

Band selection buttons

Note: step is 1Hz for all modes when enabling the 1Hz checkbox.



Each band selection button has two memories containing for example frequency and mode. De default settings are a SSB and a CW frequency. Clicking on the button toggles between both memories. The frequency, mode and zoom factor are the frequency, mode and zoom factor used on that band/memory when leaving.

The "update URL" button (chapter 16) stores the band button memory settings in the URL.

3.4				Memories			
	Iemori	es:					
	recall	erase	store	3567.02 kHz CW QRQ			
	recall	erase	store	3692.01 kHz LSB Am Berg			
	recall	erase	store	3563.01 kHz CW AGCW			
	recall	erase	store	3555.58 kHz CW beacon			
	recall	erase	store	(new)			

Frequency, mode and bandpass settings can be stored in memories. Memories can also be used e.g. to store different bandpass settings for a single mode.

3.5 Labels in waterfall



Each memory has a corresponding label with the same name in the waterfall having a **green** color. Clicking on that label recalls the memory. *However when clicking on a label the current setting of the bandpass is maintained*.

3.6 Using the keyboard

The use of keyboard shortcuts can be allowed by selecting by ticking "**Allow keyboard**" just above the waterfall. It is a fast and convenient way of controlling the WebSDR. The following shortcuts are available:

jk←→	frequency down/up
	step size is <u>10Hz</u> steps
	combined with Shift step size is <u>500Hz</u>
	combines with CTRL or ALT step size is <u>2.5kHz</u>
b B	band up/down
ulcaf	USB/LSB/CW/AM/FM
z Z	center/zoom waterfall
g	enter frequency
m s n	toggle mute/squelch/notch
r	toggles between normal and inverse manual squelch
	(inverse squelch: audio volume of weak signals is enhanced)

4 WebSDR tuning step 31.25Hz => 1Hz

The basic WebSDR frequency tuning step is 31.25Hz. The frequency can be set much more accurate, but the WebSDR does not follow smaller steps. The 31.25Hz step is fixed by the Fast Fourier Transform (FFT) processing in the WebSDR. This step also applies to the bandpass filter settings (chapter 8). <u>Updated to 1Hz tuning step, see chapter 21.</u>

5

Waterfall settings and header button

Waterfall:	
zoom out	zoom in Header
max out	max in
medium v S medium v S	Speed waterfall v View

Zoom out for a larger part of the spectrum.Zoom in for a smaller part of the spectrum.Max out shows the full bandwidth of the amateur band.Max in is the maximum zoom possible on that band.

Rolling **speed**: very slow, slow, medium and fast. **Size**: small, medium, large, larger and off. **View**: spectrum, waterfall, weak signal waterfall and strong signal waterfall.

5.1 Zooming and dragging the waterfall with the mouse

The waterfall can be zoomed in and out by rotating the mouse wheel while keeping the cursor over the waterfall. By holding the LMB and moving the mouse the waterfall can be dragged.

5.2 Header button

The **Header** button toggles the header part of the page (*with sysop messages!*) minimizing the need for scrolling.

Selecting Mode



The button with the green text indicates the selected mode.



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Bandpass display



As a visible check the bandpass filter is displayed in **yellow** on the frequency scale just below the waterfall. It shows the passband and carrier frequency (the vertical line). For CW, instead of the carrier/BFO frequency, the receiving frequency is displayed in the middle of the passband assisting "zero beat" tuning. The WebSDR supports dragging the filter slopes using the mouse, **but this is not the recommended way**!

Bandpass but					
andpass:					
0.50 kH	Iz@-6dB P	itch: 650	Hz		
narrower	wider	<shift<< td=""><td>>shift></td><td></td></shift<<>	>shift>		

lower

8

The bandwidth is controlled by the **narrow** and **wider** button. Slope step is 31.25Hz. The **shift** buttons shift the pass band filter over frequency. The **lower** buttons shift only the lower frequency slope of the pass band. The **upper** buttons shift only the upper frequency slope of the pass band.

upper

The resulting -6dB bandwidth (kHz) and CW pitch (Hz) is displayed.

uppe

The step size is made mode dependent to minimize the number of clicks needed. *Changed Bandpass settings are stored for each mode and for the duration of the session.* Switching between modes doesn't reset Bandpass settings.

9 Audio settings

9.1 Mute

Mutes the audio. Space bar and Enter key toggle muting.

9.2 Squelch

Mutes the audio when no signal is present. Space bar and Enter key toggle the squelch.

9.3 Notch

Automatically filters out interfering carriers. Space bar and Enter key toggle the notch action.

9.4 Volume

Controls the audio volume. After the control dot is clicked the level can be changed using the arrow keys. With the cursor over de control the mouse wheel can be used also to change the level (Firefox only).

9.5 Manual Squelch

Slider sets the threshold in S-units for manual squelch. Audio is attenuated (not muted) for noise and signal levels lower than the threshold. Squelching is slower for CW. Mainly intended for CW and crowded bands.

Signal strength S-meter



The S-meter displays the signal strength. The "S meter" button toggles between a *light* and *dark* S meter.

The <u>peak</u> signal strength in dBm and in S-units are displayed at the bottom of the S-meter. Displaying in S-units supports reading the S-meter for signal reports.

S-units are 6dB according IARU.

All Japanese transceivers use 3dB per S-unit below S9. 6dB is a more logical choice at quiet locations. A consequence of the 3dB/S-unit, as on the Japanese transceivers, the S-meter reading drops below S0 on quiet bands. For signal levels S9 and higher the S-meter indications are equal for both settings.

The WebSDR S-meter is not a RMS meter. Subtract about 5dB for RMS noise levels.

The S-meter indication is set on all bands as if the antenna has an antenna factor **AF=-9dB**. The antenna is not (yet) calibrated. Instead computer simulation/calculation is used.

11 Signal strength plot



Plots the signal level (dBm) over time. Total plot time can be None, 50 seconds, 5 minutes, 15 minutes or 1 hour.



CW settings

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The WebSDR uses *lower sideband* CW. In CW mode the receiving frequency is the center frequency of the passband. The frequency is indicated by a vertical yellow line on the frequency scale in the middle of the passband assisting "zero beat" tuning. By shifting the pitch using the he **shift** buttons to -750Hz, *higher sideband CW* can be set.

12.1 Pitch setting for CW

CW pitch can be set by the **shift** buttons in 10Hz steps. When using the **lower** and **upper** buttons the pitch steps in 10/2=5Hz. See also chapter Bandpass display for visual feedback and chapter Tuning step. 750Hz is the default CW pitch.

The memories store all CW settings. Recalling a memory sets also the pitch. Clicking on CW labels behaves differently. The current setting of the pitch(/shift) is maintained.

12.2 Using the squelch for CW

The **Squelch** can be used for CW, but needs a >800Hz bandwidth to work properly.

13 Using Space bar and Enter key

Hitting the **space bar** clicks or toggles the last clicked button. The Mute, Squelch, Notch, Label and 6dB/3dB S unit button can be toggle using the space bar. But also e.g. the Zoom in, Narrow and Shift button can be click with the space bar. The **enter key** also clicks, but holding it repeats the clicking.

14 Java or HTML5

Nowadays most browsers use the preferred HTML5 and a selection for Java will not be necessary.

15 Audio start button for browsers



Firefox, like Chrome, now also needs enabling audio.

All browser will show the **Audio start** button. Clicking this button starts audio.

You can changing the Autoplay Firefox settings for the WebSDR: <u>Autoplay Firefox setting</u>, or by: <u>Other Autoplay Firefox settings</u>

User preferred settings with bookmarks

Bookmarks make it possible for the user of the Maasbree WebSDR to start with his own preferred settings.

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The WebSDR starts with default settings. Most users however will change settings according their preference. Each time a user starts the WebSDR, the same changes have to be done again and again. That is not very convenient.

Frequency and mode already can be added to the default URL and saved as a bookmark. For the Maasbree WebSDR this is extended to support much more settings.

As long as it is about a few settings, a user could add them manually. But there are many settings users would like to change to their personal preferences. That will be difficult and it is easy to make errors. Apart from the fact it will take too much time to do it manually. To support starting the WebSDR with preferred settings the **UPDATE URL button** is added to the WebSDR GUI below the S-meter:



This button updates the URL in the address bar of the browser with the current settings of the WebSDR. The updated URL can be saved as a bookmark with an appropriate name. *Multiple different preferred settings can be saved in an easy and fast way.* When selecting one of the saved bookmarks, the WebSDR will use the corresponding settings. The bookmark can also be dragged to the desktop to be available as shortcut.

The extra settings for the Maasbree WebSDR are after the mandatory + in the URL. (the defaults are between brackets)

freque	ncy in kHz	(3630)
mode		(Isb)
+		
w	waterfall view	0-3 (1)
n	noise reduction	0-5 (0)
h	header	0/1 (1)
s	squelch	0/1 (0)
z	zoom	0-5/6 (0)
а	APF frequency	300-1000 (750)
m	manual squelch	0-9 (0)
v	volume	-20 -> 6 (0)
fl/fh	bandpass settings (bandwidth and shift	/pitch)
FLA	bandpass low freq for all modes	mode 1-5, frequency*1000
FHA	bandpass hi freq for all modes	mode 1-5, frequency*1000
MS	selected active memory for each band	1 or 2
BM	settings band memories	A/B 1-2, band, mode 1-5 and frequency
M7	zoom settings in band memories	

Note: frequency and mode in the URL are kept compatible to the standard websdr. All settings are in pairs of one or two characters and a number. Pairs can have any order, however BM has to be at the end.

CW example:

http://sdr.websdrmaasbree.nl:8901/?tune=7033.00CW+w2n2h0s0z5a675m3.5v0fl-875fh-475FLA1-875FHA1-475FLA2-2800FHA2-190FLA3190FHA32800FLA4-4455FHA44455FLA5-4955FHA54955MS11211111BM1011833.00BM1113563.00BM1215352.50BM1317033.00BM 14110123.00BM15114033.00BM16118083.00BM17121033.00BM2011828.00BM2113558.00 BM2215353.00BM2317028.00BM24110118.00BM25114028.00BM26118077.00BM27121028 .00MZ145454546MZ245454546

waterfall view	weak sigs
noise reduction	medium
header	no header
squelch	no squelch
zoom	max in
APF freq.	675Hz
manual squelch	3.5 S-unit
volume	0
pitch	675Hz
bandwidth	490Hz

For all modes the bandpass settings and the contents of the band button memories, including zoom, is stored in de URL.

17 Receiver bandwidth

Bandwidth settings are for the Ham bands only. That minimizes possible ADC overloading. On some bands the setting is wider if we think no very strong signals will be present in that bandwidth.

18 Noise blanking

The WebSDR in Maasbree receives multiple electric fence pulses which are very annoying. Noise blanking is being applied on the **80m** and **40m** band. The noise blanker is programmed in GNUradio companion and operates between the RSP1a driver and the WebSDR software. For more info: <u>WebSDR Maasbree Noise Blanking</u>

19 WebSDR time out

A time out of 4 hours is used to stop non-active users from using the WebSDR.

WSPRDAEMON

The WebSDR runs WSPRDAEMON on all bands using the call PEOMJX. Reported are WSPR and FST4W and noise levels.

WSPRDAEMON: http://wsprdaemon.org/index.html

FST4W spectrum spread:

https://wspr.live/gui/d/ecc19984-1a49-4106-b12d-7d376c5be8fd/spectral-spread-onpath?orgId=1&var-rxsite=PE0MJX&var-rxreceiver=KA9Q_WSP&var-txsite=G3ZIL&varband=30&var-gran=30&from=now-24h&to=now

Noise plots:

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https://wspr.live/gui/d/ereVvgn7z/station-noise-stats?orgId=1&refresh=1m&varsite=PE0MJX&var-receiver=All&var-band=All&var-type=c2_level&from=now-2d&to=now or:

http://wsprdaemon.org/graphs/PE0MJX/

<u>Note:</u> for accurate SNR reports by WSPR the AGC on your receiver has to be switched off: <u>http://www.pa0sim.nl/WSPR_AGC_impact.pdf</u>

For more info about comparing SNR using WSPR: <u>http://www.pa0sim.nl/Published%20Articles.htm</u> Or do it yourself: <u>https://wspr.live/gui/d/HM1HZwp4k/snr-comparison?orgId=1&var-station1=PD0OHW&var-station2=PE0MJX&var-mode=rx&var-target=%25&var-band=3&var-not_mode=tx&from=now-2d&to=now</u>

Note: the small "i" in the left upper corner of a plot shows what is being calculated.

Noise Reduction, APF and Manual Notch (Utah)

→ These are WebSDR functions implemented for the Utah WebSDR by Clint KA7OEI. They were kind enough to share the code with us. Thanks Clint! See for more info: <u>http://www.sdrutah.org/info/dspnr.html</u>

Adopted for the Maasbree WebSDR are:

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- a low pass filter to reduce aliasing
- DC removal minimizing popping (15Hz high-pass filter)
- CW peaking filter (APF) bandwidth set to 66Hz
- Reference tone generator for CW peaking filter (toggle mute for best checking)
- manual Variable Notch filter
- LMS noise reduction (NR)
- 6dB "high" boost (Hiboost)
- 1Hz frequency tuning step

Note: The Digital Signal Processing is performed on the audio <u>after AGC and passband filter</u>. That is fine for noise reduction. On a quiet band it is also fine for the APF. However signals outside the APF passband will modulate the AGC and so the signals strength within the passband. This can be minimized by reducing or shifting the passband bandwidth. With or without the variable notch, a strong notched carrier or CW signal will already have modulated the AGC. Advantage of the variable notch is that it will minimize a CW signal better than the automatic notch.

Turning on the APF and NR increases the latency with about 5msec respectively 10msec. *Note: this processing runs on your own computer and will increase your processor load!*

21.1 CW

Noise reduction and APF are very effective for CW. Noise reduction can be used very well for searching the band for weak CW signals or in a CW net, because it doesn't need accurate tuning like the APF. Noise reduction and APF perform better with a passband bandwidth setting larger than the default 300Hz, for instance **500Hz**. With a smaller passband bandwidth ringing increases. The noise reduction LMS filter needs more bandwidth to better find the filter coefficients. CW peaking filter (APF) has a constant bandwidth set to 66Hz, supporting higher CW speed. It needs accurate tuning of RX or APF frequency. **Note:** sliders, when selected, can be tuned by the arrow keys!

21.2 Speech

Hiboost enhances the higher frequencies >1500Hz. It can sometimes improve speech intelligibility especially in combination with noise reduction.

Hiboost NR: Off	APF 650 Hz Ref. Tone
Hiboost and Noise Reduction settings	Audio Peak Eilter (APE) Reference Tone ar

Audio Peak Filter (APF), Reference Tone and Variable Notch settings

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2mtr WebSDR Maasbree

The 2mtr GUI is a bit different and adapted for VHF. *Note: S-meter S9 is -93dBm.*

22.1 Low and high band

The 2m band is split in a low band (144MHz-145MHz) and a high band (145-146MHz). The low band uses a horizontal polarized omnidirectional big wheel antenna. The high band a vertical Diamond300. No low noise amplifiers at the antennas, only coax cable to the RSP1a's.

22.2

Preselect frequency selection

2m-band:	Repeaters:	Beacons:				
145250 General QSO 2m FM V	145600 PI3SRT Venlo ctcss 71.9 V	144416	PI7CIS in Schevenin	gen 🗸	Header	
	145575 PI3UTR Utrecht ctcss 77.0		Madulations			
- 7 9 +20	145600 PI3SRT Venlo ctcss 71.9		Modulation:			
S 3 5 1 4 40 dB	145700 PI3EHV Eindhoven ctcss 71.9		CW LSB	USB	AM	FM
	145725 PI3ZLB Geleen ctcss 71.9		CW-n LSB-r	USB-n	AM-n	FM-n
-120.6 dBm 54.4	145750 PI2NMG Nijmegen ctcss 77.0		CW-vn LSB-v	ו USB-vn	AM-vn	FM-vn
	145612 DB0MG Moenchengladbach ctcss	94.8	Bandpass:			
S meter	145625 DB0WW Duisburg ctcss 88.5		10.00 kHz@-	Hz		
== 2m WebSDR Maasbree ==	145750 DB0XO Bergheim ctcss 88.5			uider 🖉	chifts	SchiftS
	145000 PI3SRT input frequency		narrower		STIIL S	SINC
Mute Squeich Notch	145687 ON0LTV Manhay ctcss 74.4		<lower lo<="" td=""><td>wer> <</td><td>upper</td><td>upper></td></lower>	wer> <	upper	upper>
Volume:	145787 PI1ASD Amsterdam ctcss 110.9		Or drag the passband edges	on the frequency sca	ile.	
	145750 PI3RAZ Zoetermeer ctcss 88.5		APF	'50 Hz R	ef. Tone	
Manual Squelch:			-	0		

On the 2mtr WebSDR the preselect buttons are implemented by 3 menu selections: **2m band**, **Repeaters** and **Beacons**.

Clicking on the displayed frequency, say 145250 General QSO 2m FM, will set the WebSDR frequency.

By holding de Left Mouse Button instead of clicking, other frequencies in a menu can be selected.

FM

22.3	Modulation	buttons

USB

- 1		LSD-II	056-11		FM-11		
- 1	CW-vn	LSB-vn	USB-vn	AM-vn	FM-vn		
						_	
_							6 1
F	or each m	node a <i>nc</i>	<i>irrow</i> and	l very nai	<i>row</i> ban	dpa	ss filter setting button is added.

AM

FM is of course also present.

Modulation:

CW LSB

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23 Using Audacity for recording

<u>Audacity</u> can be used to record the audio from the WebSDR directly when selecting "Windows WASAP":

<u>https://forum.audacityteam.org/t/how-to-record-streaming-from-a-website-solved/43829/3</u> After recording you can select, cut, etc. etc. and save in your format of choice.

24 Links

HF low WebSDR http://hf.websdrmaasbree.nl/ http://sdr.websdrmaasbree.nl:8901

HF high WebSDR http://hf-h.websdrmaasbree.nl/ http://sdr.websdrmaasbree.nl:8902

2mtr WebSDR http://2m.websdrmaasbree.nl/ http://sdr.websdrmaasbree.nl:8905

Technical info pages WebSDR http://www.websdrmaasbree.nl/

Files for the article "<u>QSK CW met een WebSDR</u>" Electron July 2020, pp 327-328 (Dutch)

For accurate SNR reports by WSPR the AGC on your receiver has to be switched off <u>http://www.pa0sim.nl/WSPR_AGC_impact.pdf</u>

For more info about comparing SNR using WSPR: <u>http://www.pa0sim.nl/Published%20Articles.htm</u> Or do it yourself: <u>https://wspr.live/gui/d/mTzRNYQGk/receiver-snr-comparison?orgId=1</u> **Update** link for WSPR SNR compare: <u>==> WSPR SNR compare <==</u>

See for more info on the Utah signal processing: <u>http://www.sdrutah.org/info/dspnr.html</u>