

Using SDR for very weak signals, by PA0EHG

For very weak signal communication I am using SDR software to detect and listen to the weak signals.

I have been working with Spectravue for a long time with very good experience.

My settings are: FFT/BLK 8192 which gives me a RBW of 12 Hz.

The FFT Ave setting is at 5 or 10 for CW signals and up to 50 for carriers.

Most of the time I have a Vscale setting of 1 or 0.5 dB/div.

When using the Combo mode which I usually do, than the scale is not corresponding to the setting. The actual scale is 2 times the setting; if the setting of Vscale is 1 dB/div then the scale is 2dB/div.

Spectravue is most used in Combo mode but has a very interesting mode which is ideal for EME on microwave.

In Continuum mode it measures the total power received in the bandwidth of the receiver. When we have no strong signals in the bandwidth it is a great toll to measure noise power. This can be done with scales at 0.1 dB/div and is very useful for measuring solar noise, ground noise or moon noise.

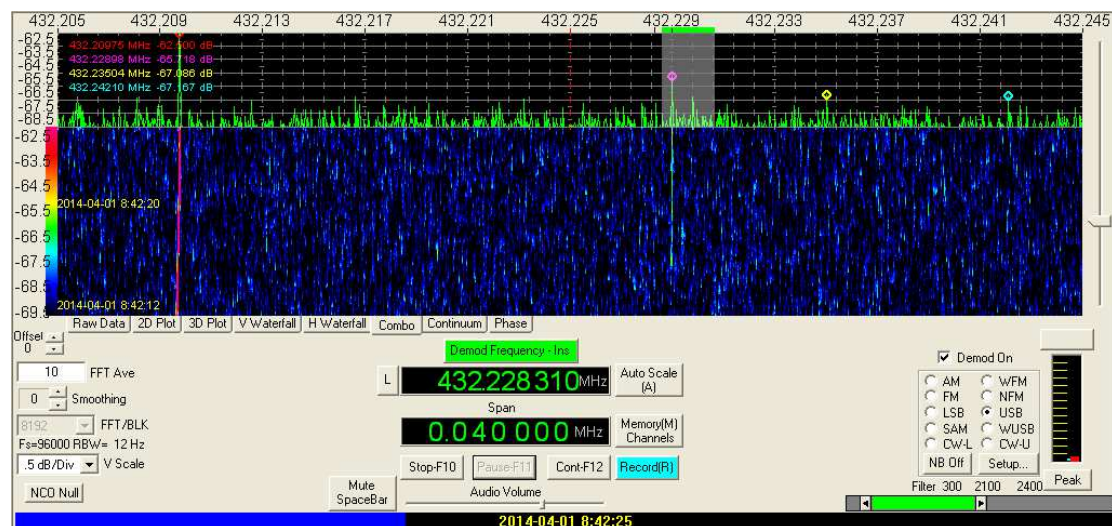
For detecting finding and listening too weak signals I use the combo mode of Spectravue with settings as above.

I have compared the performance of Spectravue with other SDR software to see which one is better in use than others.

SDR software I compared is HSDR and SDR console to Spectravue.

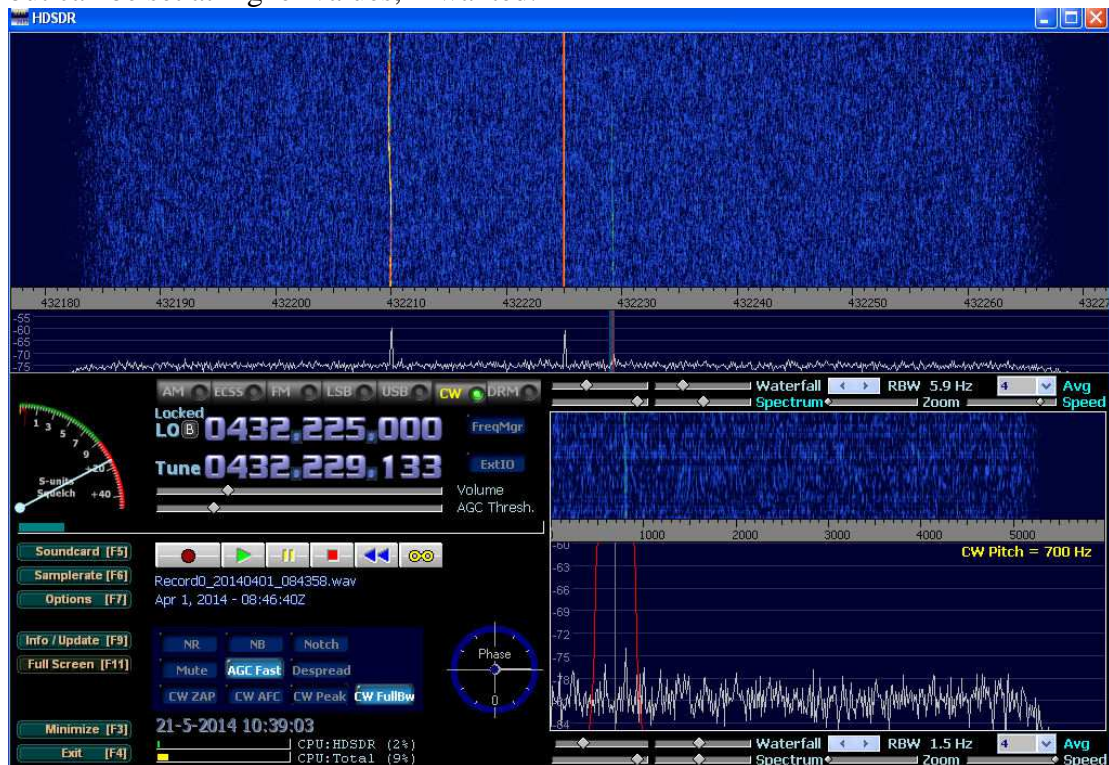
First a picture of the signal from G3WDG carrier, a 3 dB S/N in 12 Hz.

Spectravue:



The same signal in HSDR

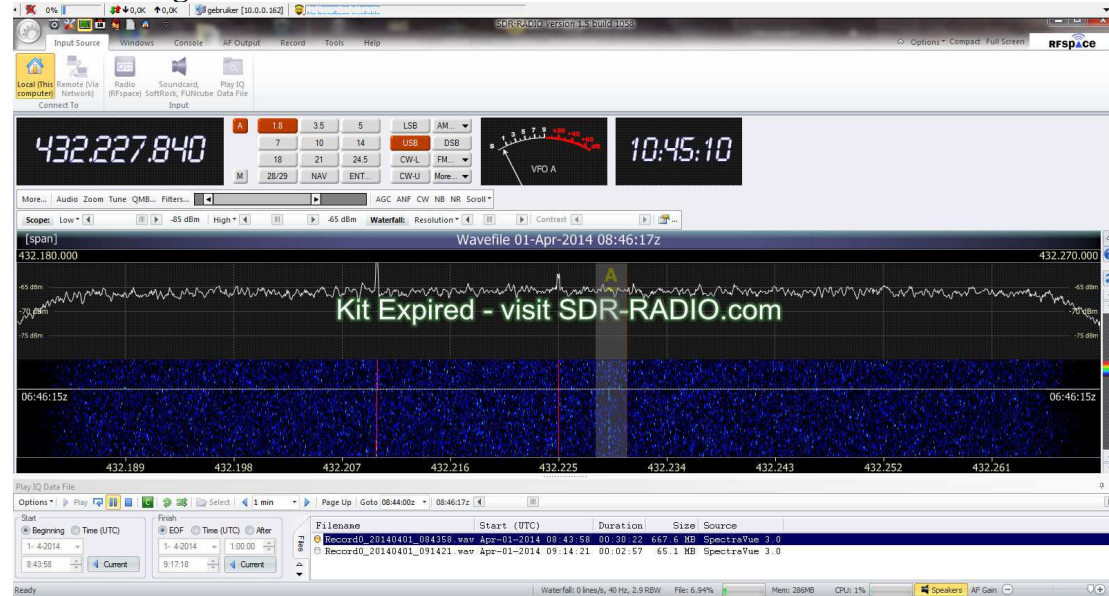
In HSDR the setting of AVG is similar to FFT Ave in Spectravue. I did set this at 4 but can be set at higher values, if wanted.



The signal can be found in the waterfall, but is quite weak and can be missed. The spectrum view is best in the small box on the right but then you have to know the frequency where the signal will be. The overall spectrum view shows the weak signal when the vertical scale is expanded to the most but it is not easy to see, and disturbed by the line showing the centre frequency.

Once the signal is found it's probably just as good to listen to as other SDR software.

The same signal in SDR console:



In SDR console I have not found a setting for averaging, perhaps it's somewhere but I did not find it yet.

The spectrum view cannot be expanded in the way of Spectravue.

SDR console in my opinion is not showing the very weak signals well.

Advantages of Spectravue,

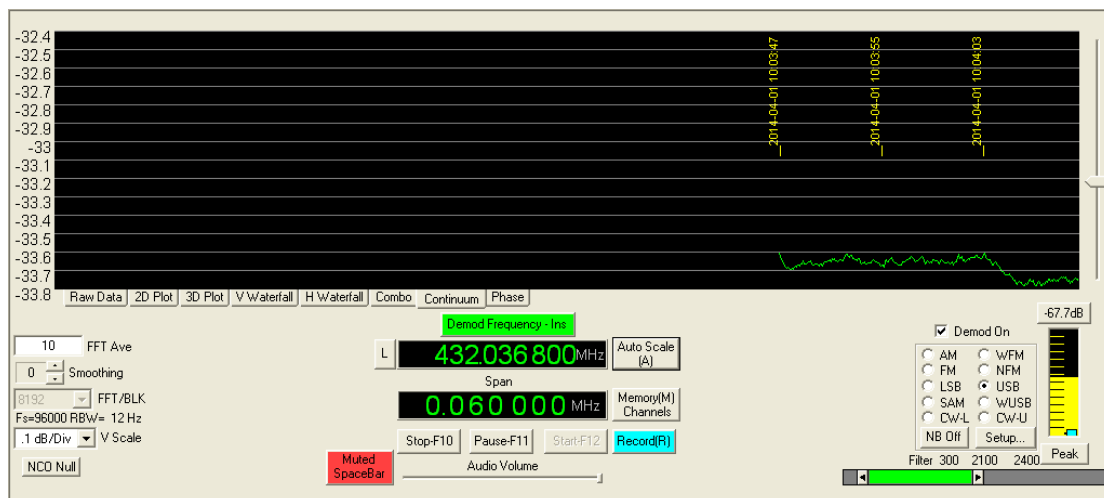
Easy setting of vertical scale with even 0.01 dB/div. Never used that but sometimes I use 0.1 dB/div.

When using FFT Ave it averages the noise and signal pops out of the noise.

Signals of 3 dB in 12 Hz BW are easy to find.

In my experience using this in EME and in AS on 23 cm signals must be 6 dB in 12 Hz to be able to copy the CW. Calculating this to a signal in 3 kHz bandwidth it means a signal with -18 dB in 3 kHz is already strong enough to copy in CW.

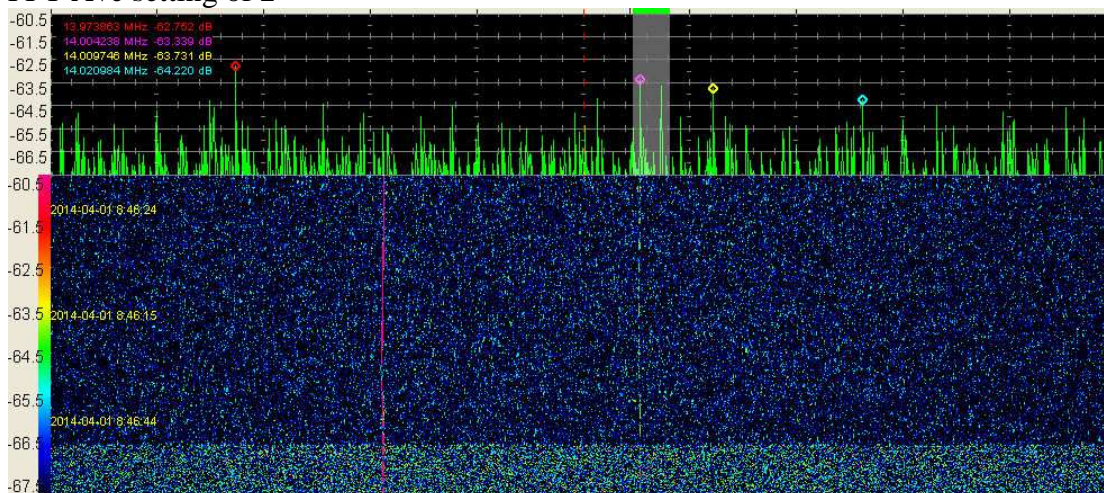
Big advantage of Spectravue compared to other is the continuum mode to measure noise power. I used this to measure the 0.1 dB moonnoise with my 50 cm dish.



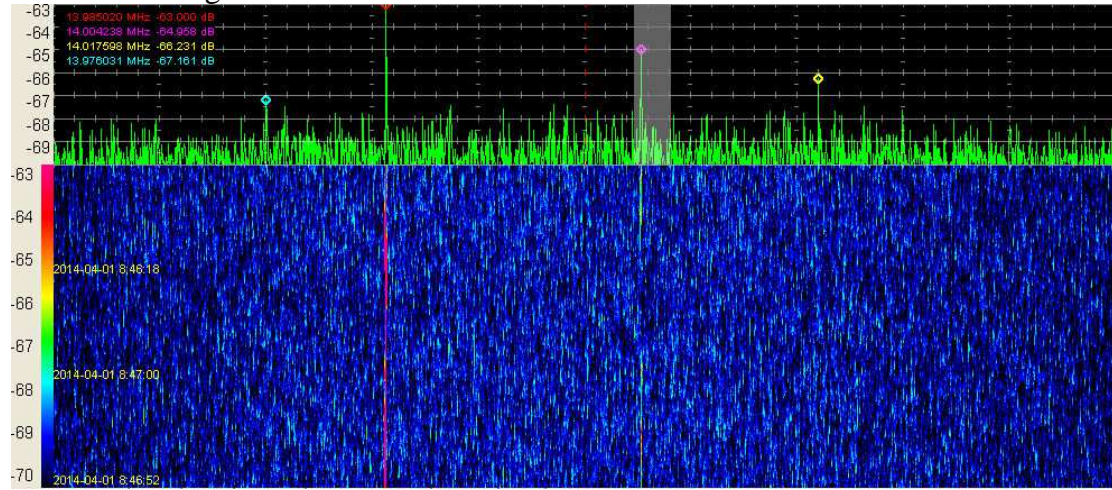
The effect of the FFT Ave setting in Spectravue

Signal from G3WDG in Spectravue, signal is too weak to copy CW

FFT Ave setting of 2



FFT Ave setting of 10



FFT Ave setting of 50

