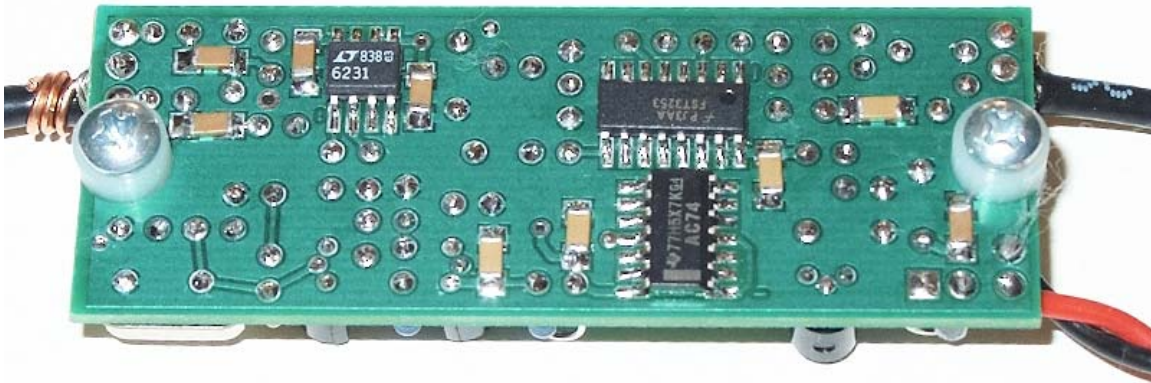


Testing of Softrock Lite II RX 30M Model

Tony Parks sent me the new Lite II RX built for 30M. Below are the top and bottom views of the board:



RX testing was with (2) HP 8657A signal generators combined into a Ten-Tec model 651 Splitter/Combiner (-6dB outputs).

RX testing used a Tek 2465 oscilloscope, a Tek 495P spectrum analyzer to measure the oscillator center frequency feed-through.

All RX testing used PowerSDR-sr40 modified by PE1NNZ (Guido).

Audio card for I/Q is EMU-1212M and baseband input/output is Realtek HD (on motherboard, built-in audio).

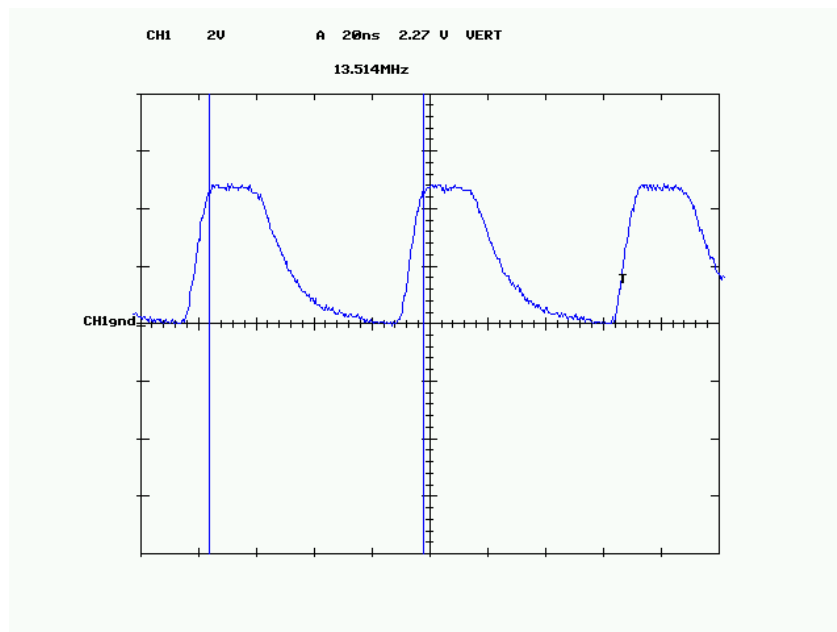
1. Power Requirements:

25.5mA @12V DC

2. Freq Calibration

Setting the signal generator to 10.1MHz, I adjusted the PowerSDR /Hardware Config/ Fixed XO Center Freq to force the signal on the panadapter to line up at exactly 10.1 MHz. The resulting entered frequency was: 10.1231 MHz.

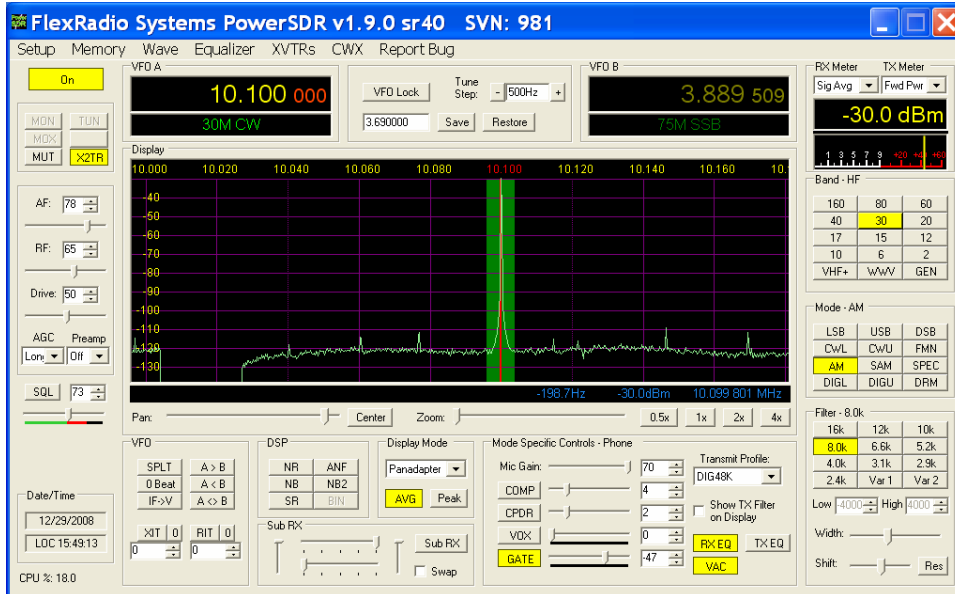
The XTAL freq was marked 13.5MHz on the 30M model under test. Below is the clean output of the oscillator on R17:



As expected the rise time is fairly fast because of the active drive from transistor Q2. The fall time is slightly slower because of the passive pulldown R17. The oscillator freq was measured on a frequency counter (more accurate than the scope markers) at 13.4974MHz. With subharmonic sampling the center freq should be $13.4974 * \frac{3}{4} = 10.12305$ which closely matches the calibration step using the signal generator.

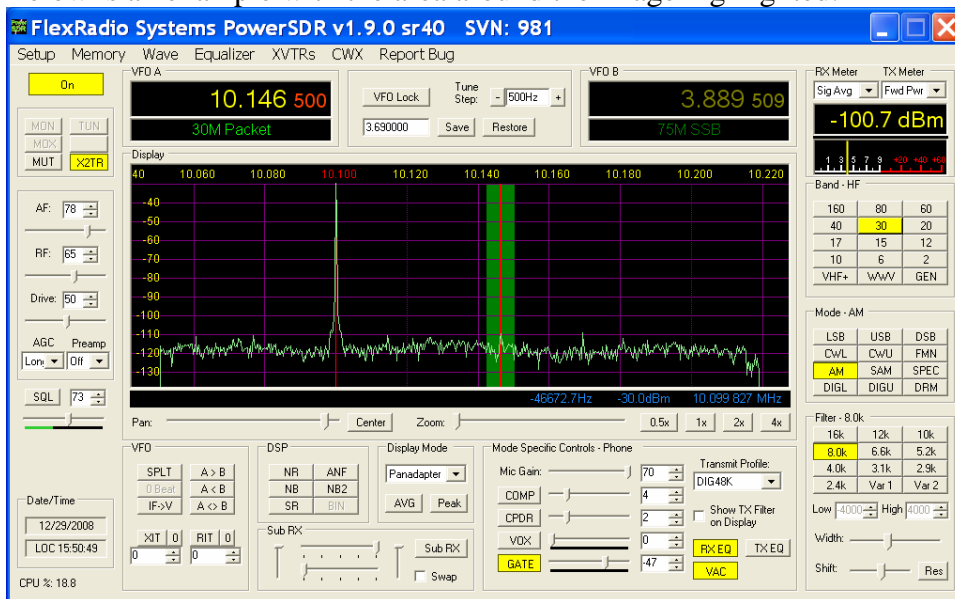
3. Amplitude Calibration

To calibrate the PowerSDR signal strength on the meter and panadapter, the General/ Calibration/ Level Cal was entered for the 10.1MHz signal at -30dBm. This gives makes the RX very nice for signal strength measurements:



4. Image Rejection

I was fairly easy to get > 70dB image rejection using manual phase and gain adjustments. Below is an example with the area around the image highlighted:

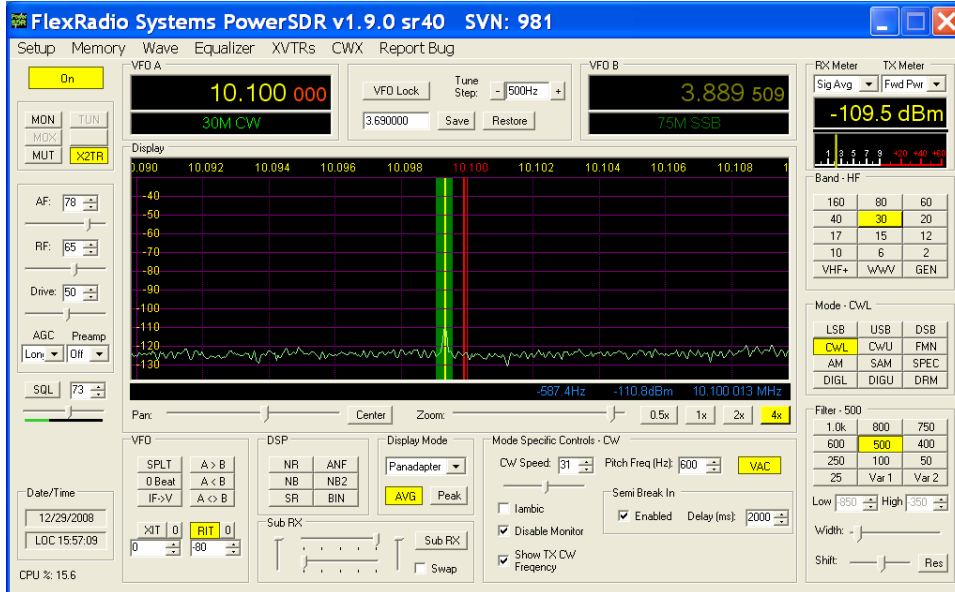


5. MDS Testing

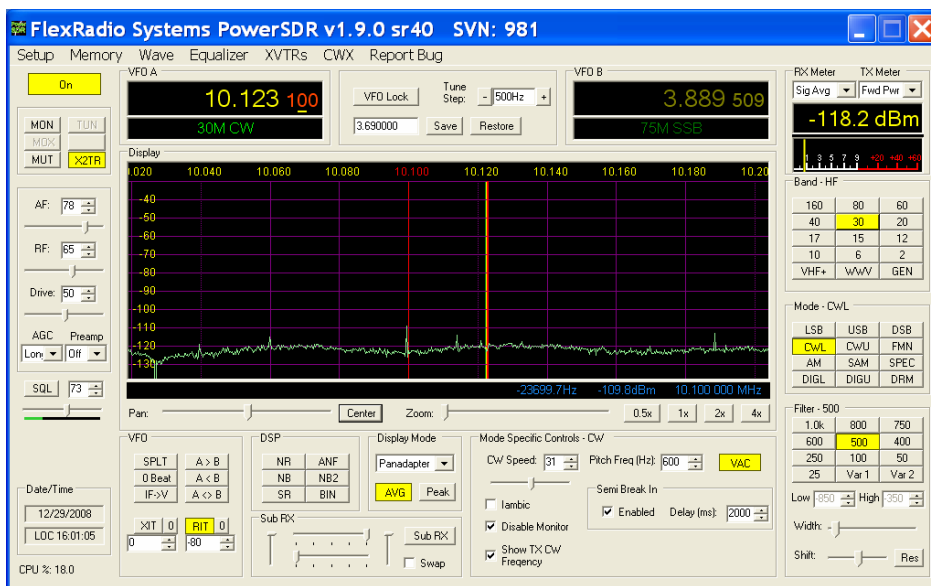
Signal Generator was set at 10.1 Mhz.

Measured MDS at 500Hz BW of -114 dBm was typical. The noise profile across the entire 128KHz spectrum (sampling at 192Ksps) is very flat.

Below is the panadapter screen with a -110dBm input signal and it is very easy to see/hear:



Largest spurs were even lower than the -110 input signal. Below is the full spectrum with the center freq highlighted.



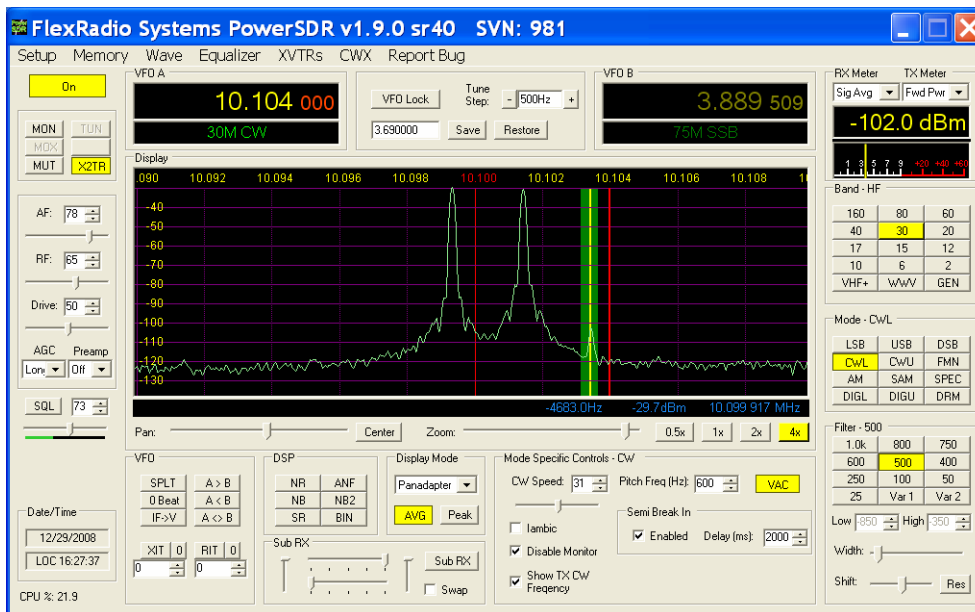
6. 1dB Output Compression Level

At -5.5dBm input level the Output was in 1dB compression. That make the CP1 Dynamic Range = $-5.5 - (-114 \text{ typical MDS}) = 108.5\text{dB}$

7. IMD Levels

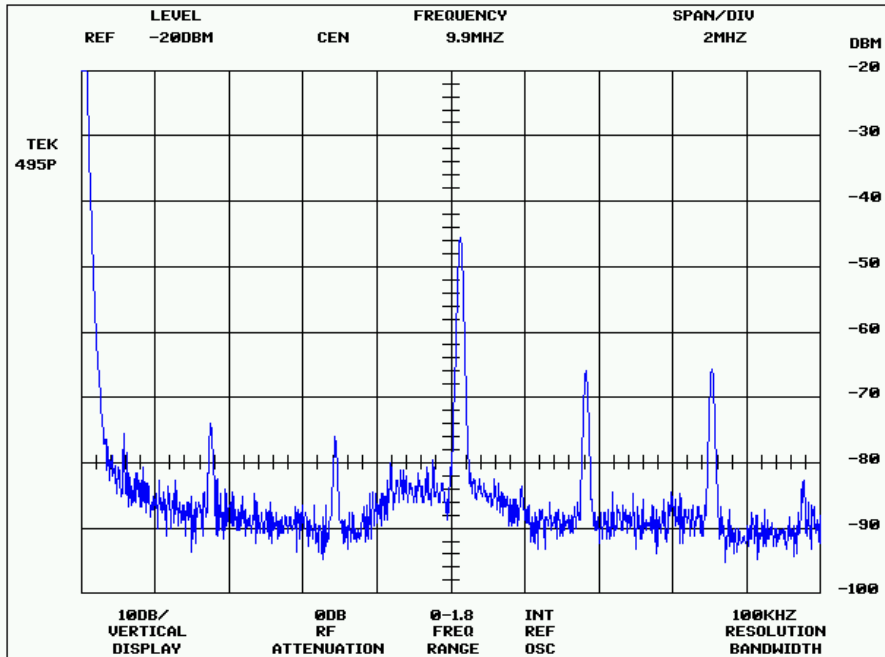
With two tone inputs at 10.100 and 10.12MHz the IMD level measured at 10.14Mhz was non-existent till the input tone level went over -26dBm each (total peak of -20dBm). The IMD level at that point was probably around -113dBm (87dB IMDR). The calculated IIP3 is then $(1.5 * \text{IMDR} + \text{IMD}) = 17.5\text{dBm}$. It should be noted that other mixing products were much higher level with this two tone input.

Two tone inputs at 10.100 and 10.102MHz were input with each tone set at -30dBm. With the filtering on PowerSDRs40 set at 4096 buffer size and Hanning Window the IMD level at 10.104MHz was -102dBm (72dB IMDR). The calculated IIP3 is: 6dBm. The IMD level at 10.098 was lower at -109dBm (79dB IMDR). The calculated IIP3 is: 9.5dBm. These input levels are about like two +40/S9 signals spaced at 2KHz and the IMD response is S2 to S4:



8. LO Feedthru

LO feedthru to antenna port is -45dBm at 10.5MHz. This is very good compared to earlier models. The 13.5MHz feedthru is -64dBm. Below is the spectrum on the ANT port:



9. Summary

- 1) Great performance for the buck !!
- 2) Good sensitivity even with sub-harmonic sampling. Most likely the atmospheric noise will be stronger.
- 3) Center freq is very balanced and never noticed it at all.
- 4) Very flat noise profile.

The Softrock Lite II is going to be another great product. Sure glad you are bringing this model for the average ham to experiment with SDR.

Thanks, Mike Collins KF4BQ