Sherwood Engineering HF Test Results

Model QRP Labs QMX Serial # None Test Dates: 1/7/2025 – 1/12/2025

Filter bandwidth approximately 300 Hz @ –6 dB Ultimate not measured

Dynamic Range		
Dynamic Range 20 kHz	86*	dB
Dynamic Range 10 kHz		dB
Dynamic Range 5 kHz	85*	dB
Dynamic Range 3 kHz	?	dB

* Many spurious signals exist significantly stronger than the 3rd order IMD product. See notes on dynamic range.

Blocking above noise floor, -120 dBm signal, AGC On	110	dB^

^ See notes below on blocking.

Noise floor, 300 Hz, 14.2 MHz	-123	dBm

AGC threshold at -3 dB, reference -33 dBm (S9+40)	-117 dBm	0.3	uV

See lab notes below.

AGC threshold set to 1.	(default 8)
Slope rather flat at 50	(default 80)
Hang time 20	(default 80)

Other settings default

Blocked signal -120 dBm
Blocking signal -13 dBm
Blocking independent of frequency offset 25 to 100 kHz = 110 dB

The RMDR limitation is about equal to the gain compression.
Signal measured with the RMS meter neither went up nor down.
The blocked signal was easy to hear within the RMDR noise.
See spectrum analyzer screen shot.
True RMS meter was an HP 3400B

As the blocking signal was incremented in 1 kHz steps, a spur would at times end up on the frequency of the blocked signal, invalidating the data at that frequency offset. At levels much above -13 dBm the spur problem became dominate.

The blocked signal was wobbled in 100 Hz steps to be sure the real signal was being measured. This was not trivial due to the spur issue.

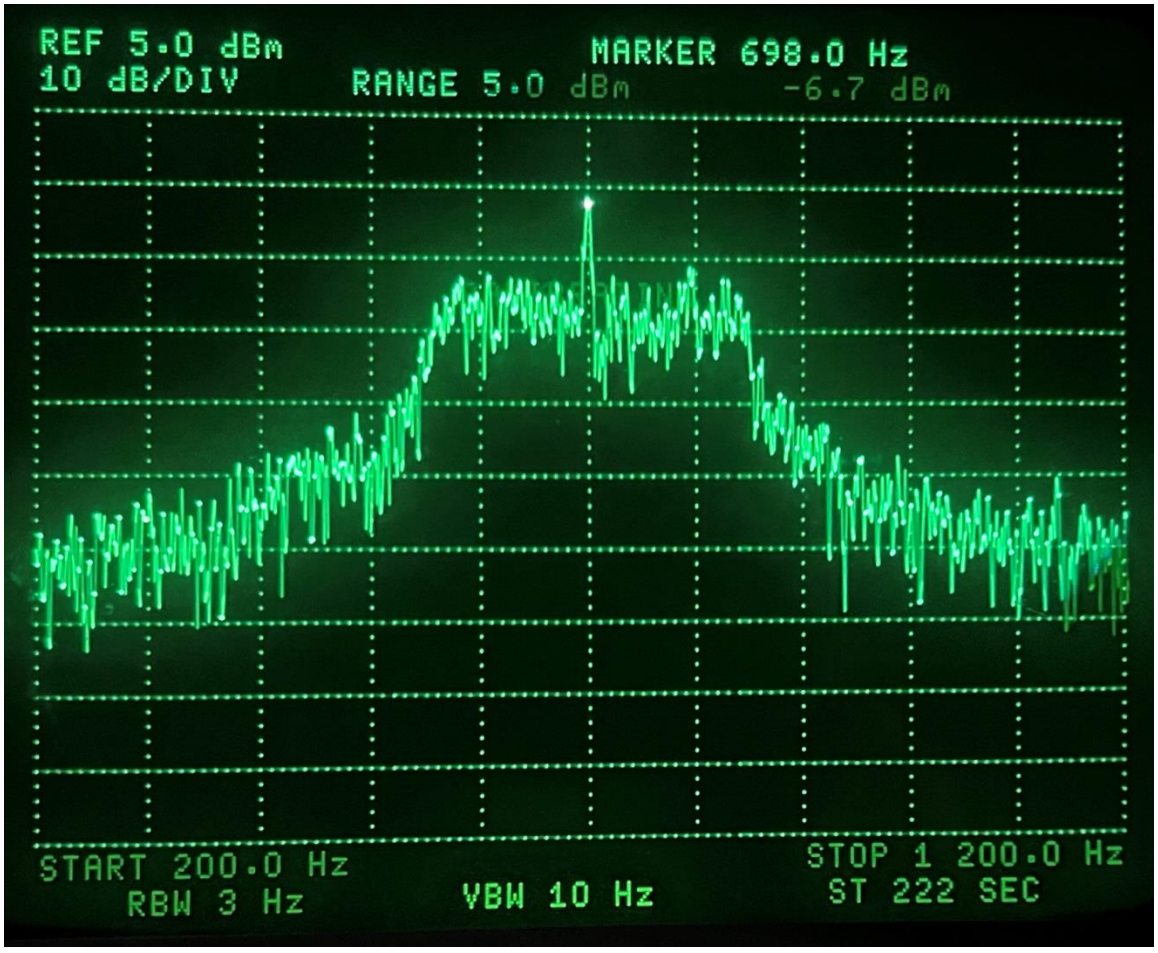
The -6 dB noise bandwidth of the CW filter is about 283 Hz, or about half the nominal 500-Hz bandwidth normally used for the noise floor or blocking bandwidth. It does not appear to be adjustable.

While the 3rd order dynamic range looks impressive, spurs between the 20 kHz test tones, plus spurs within 25 kHz below the lower frequency IMD product, and within 25 kHz above the higher frequency IMD product far exceeded the 3rd order product. In addition wideband noise around the higher frequency IMD product covered up the IMD product. The noise eventually disappeared around 25 kHz above that product.

Note: My regular 20 kHz test frequencies are 14.205 MHz and 14.225 MHz.

The 3rd order dynamic range measurement a 5 kHz was 1 dB lower than at 20 kHz.
At 3 kHz there was some kind of beating signal making the meter swing around in level.
At 2 kHz dynamic range could not be measured due to filter leakage or a spur.

I did not hear an audio spur, and it did not show up in the blocking screen capture.



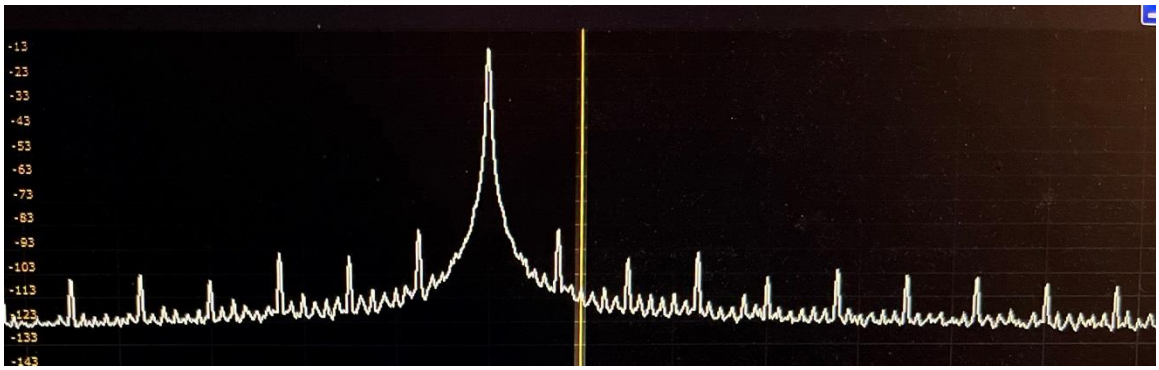
Transmit composite noise

TX noise is dominate by major spurs every 1.5 kHz.
Minor spurs dominate over actual broadband noise.

CN values in dBc/Hz are actually low level spurs.

2 kHz	-118
5 kHz	-124
10 kHz	-129
20 kHz	-132
50 kHz	-132
100 kHz	-132

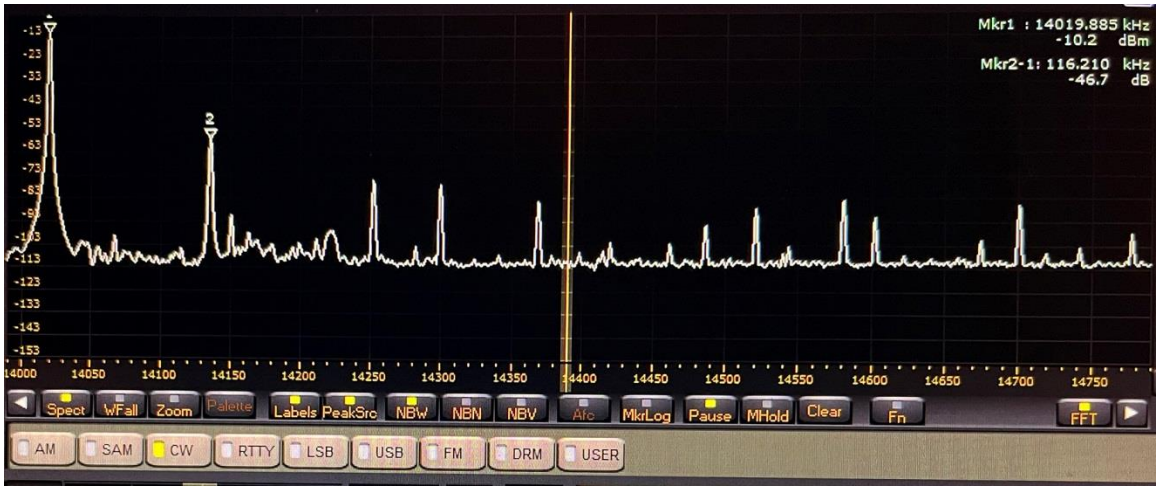
Spectrum screen capture:



The center line is offset 2 kHz from the TX frequency.
The major spurs every 1.5 kHz exceed the minor spurs by about 15 dB.
The closer-in major spurs are down approximately 75 dB from the carrier.

Composite noise test on next page:

Total TX noise appears to be dominated by AM noise not Phase Noise



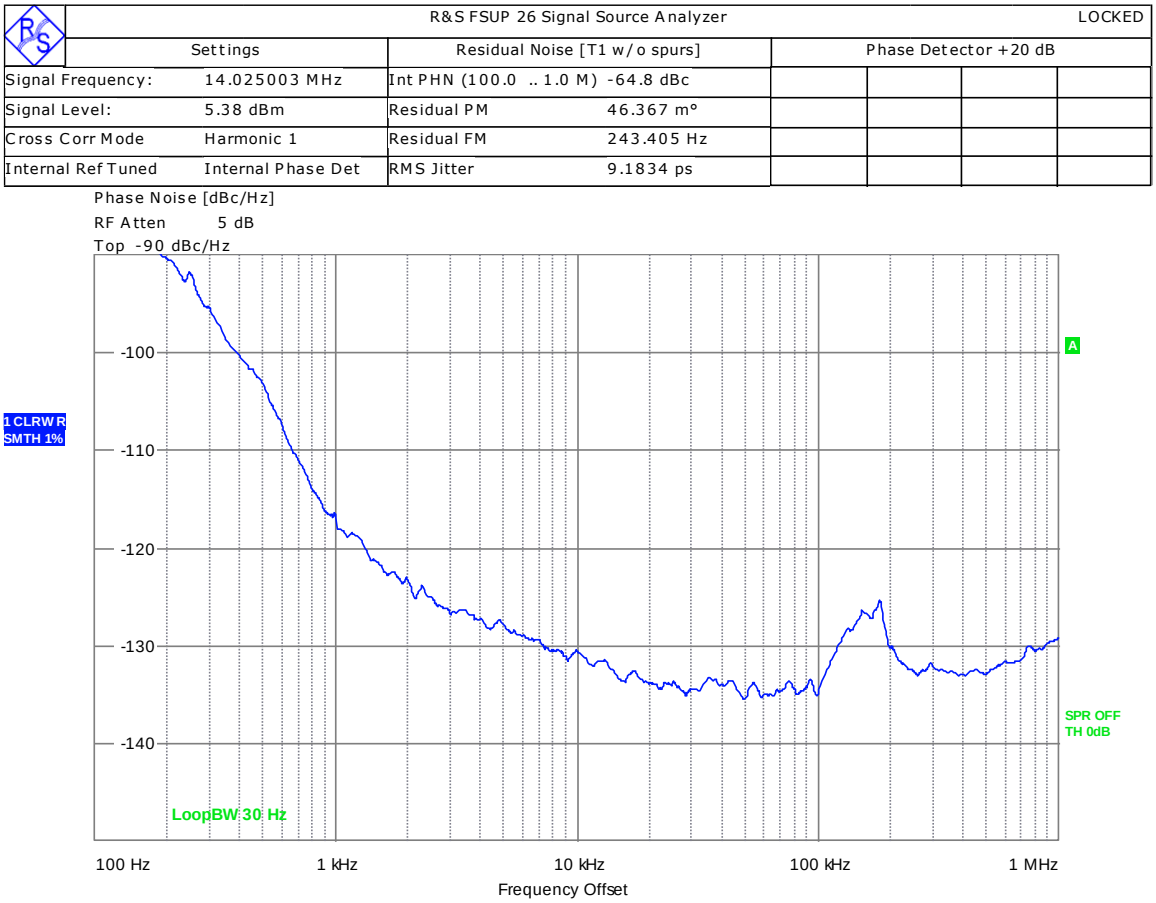
FFT details on the broadband test:

TX on 14.020 MHz positioned near the left edge of the spectrum screen capture.
Span is 800 kHz, similar to the ARRL 1000 kHz phase noise span.
Resolution bandwidth: 976 Hz.
The close-in marker #2 spur at 116 kHz offset is down 46.7 dB.
Overall noise spectra is flat

In comparison below is a Phase Noise only screen capture.

See next page.

ARRL Rohde & Schwarz FSUP Phase Noise screen capture



For SOTA and POTA operation spurs on RX and TX likely don't matter.

The bulk of the measurements aside from the noise floor are dominated by spurious signals. This includes blocking, third-order dynamic range and transmit composite noise.

For blocking at different offsets, a spur often ends up covering up the blocked signal.

For 3rd order dynamic range, there are a myriad of spurs far stronger than the IMD product that defines dynamic range.

Rev 1c