

Out of band emission compliance 902 – 928 MHz request for file number 0757-EX-CN-2026

The license requested is to support demonstrations of a developmental radar system. The hardware and controlling software are not mature. System Calibrations are still being developed to sharpen the output of the transmissions. Spectrum analyzer plots were captured of the resulting waveform pulse at the best resolution and dynamic range possible given the limited system transmit power currently capable from only two of the 8 planned transmit antenna panels. The license applications are based on predicted maximum transmit power.

NGMS will restrict the transmit center frequency as directed by the FCC to limit harm to out of band licensees.

From NTIA manual section 5.5.4 for non-hopping non-FM pulsed radars, the mask (allowed frequency bandwidth) is defined by:

The -40 dB bandwidth equation for **Criteria C** radars using non-FM pulsed waveforms is:

$$Eq. 4b: B(-40dB) = \frac{6.2}{\sqrt{t_r t}} \text{ or } \frac{64}{t}$$

whichever is less.

This radar has a rise and fall time of 100 nanoseconds or .1 microseconds, with a pulse width of 20 microsecond. So the -40 dBc bandwidth about the center frequency is defined by

$$B(-40) = 64/20 = 3.2 \text{ MHz}$$

At -60 dBc, the allowed bandwidth is given by (para 5.5.3.1):

$$\text{and : } B(-XdB) = (10^\alpha) B(-40dB)$$

$$\text{where } \alpha = \frac{X - 40}{S}$$

S is the roll-off in dB/decade, which for this system is 30. Alpha is (60-40)/30 = .66667

The bandwidth at the -60 dBc point is then $10^{.6667} \times 3.2 = 14.8 \text{ MHz}$

Figure 1 shows the assessed measured bandwidths for the 1M20Q1N pulse at $F_c = 928 \text{ MHz}$. The value at the -20 dBc point complies with the RSEC mask. The measured value of ~4.5 MHz at the -40 dBc point appears to be slightly greater than the allowed mask value. The spectrum plot has insufficient dynamic range to display the -60 dBc bandwidth.

In addition, from 47 CFR section 25.202, the system is in compliance with the -25 and -35 dBc bandwidths.

At -25 dBc, the allowed bandwidth is from 50% to 100% of the emission designator bandwidth (1.2 MHz) either side of the center frequency, or a bandwidth of 2.4 MHz. This is greater than the measured bandwidth of 1 MHz, with the proposed system in compliance.

At -35 dBc, the allowed bandwidth is from 100% to 250% of the emission designator bandwidth on either side of F_c , or up to 6 MHz total bandwidth. This is greater than the measured -35 dBc bandwidth of 3 MHz, again with the proposed system in compliance.

Beyond 6 MHz frequency bandwidth, the attenuation drops to 43 dB plus the dBW value of the power below the peak, or 85.7 dBc below peak. The dynamic range available with the spectrum analyzer and the transmit power of the system falls well short of this level. As noted above the bandwidth measured at the -60 dBc point is 13 MHz, which exceeds the 250% (6 MHz) limit from section 25.202, but is in compliance with the NTIA RSEC.

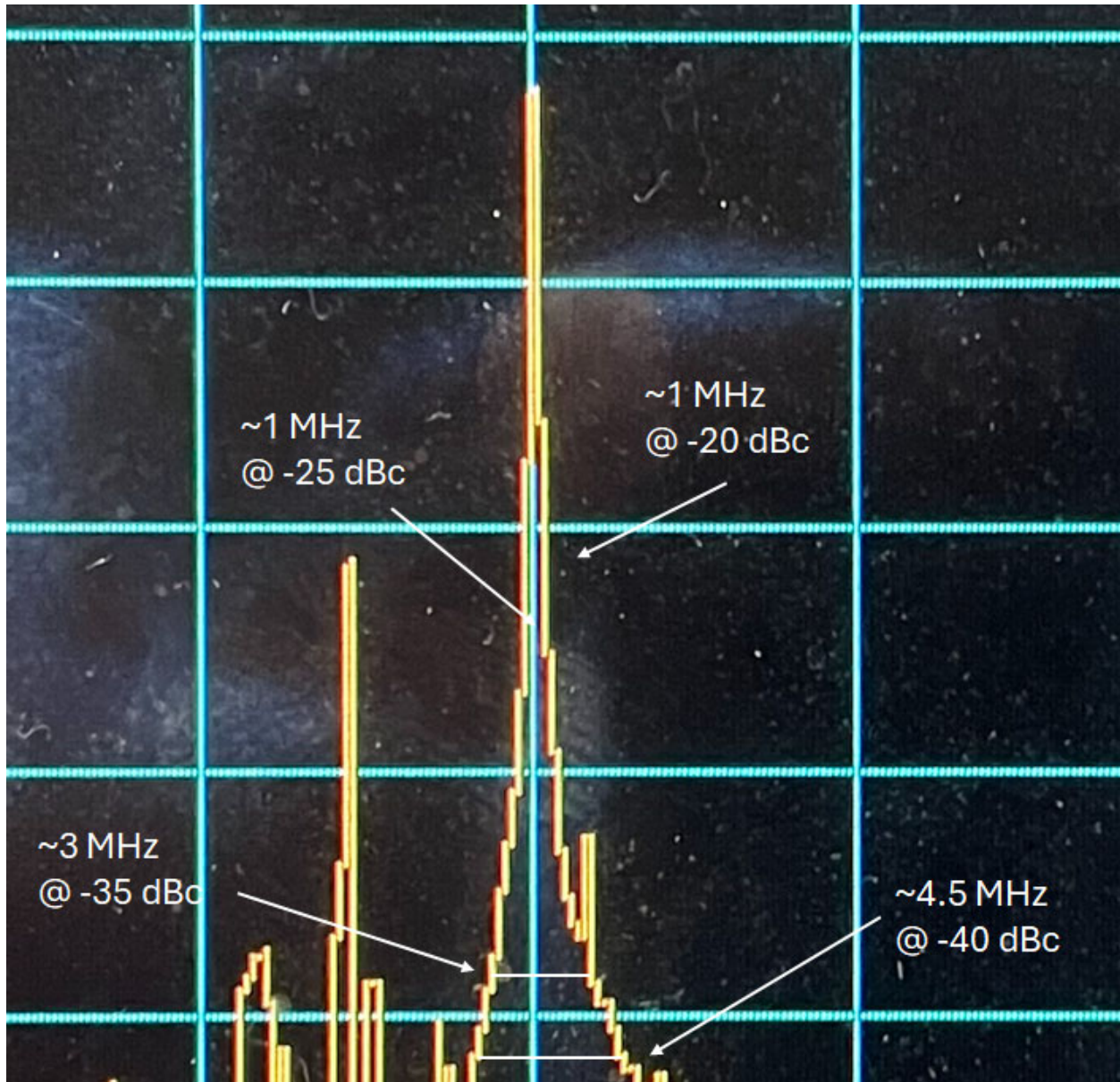


Figure 1. Bandwidths as displayed on a spectrum analyzer plot of the 928 MHz Fc pulse.

The significant noise signals outside of the displayed pulse are mostly from ambient or background signals present at the test site and not from the test system, as illustrated in figure 2, where the top image is of the pulse and noise, with the bottom image from background at the test location without the unit under test signal.

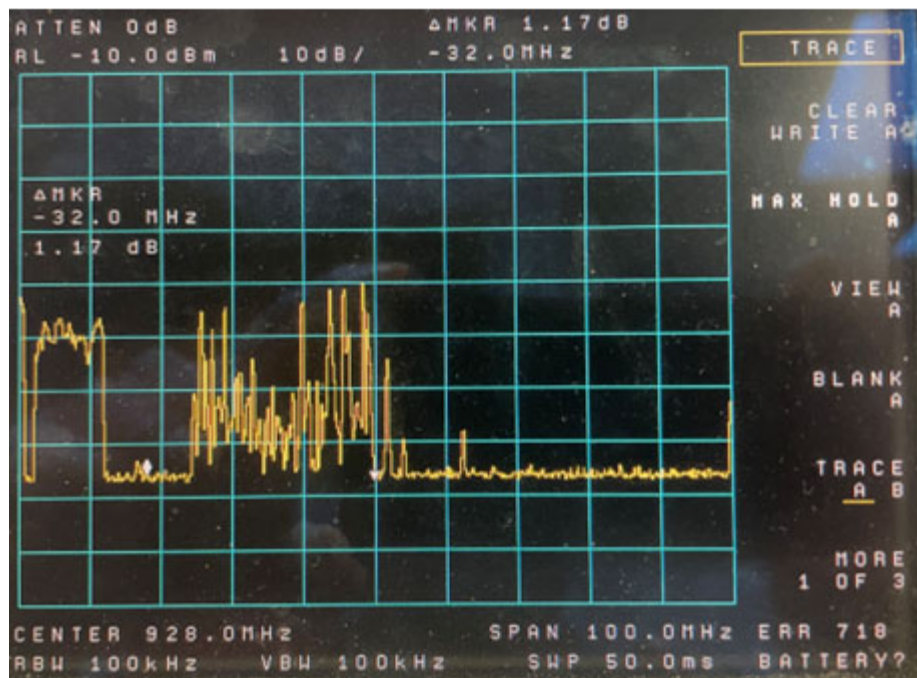
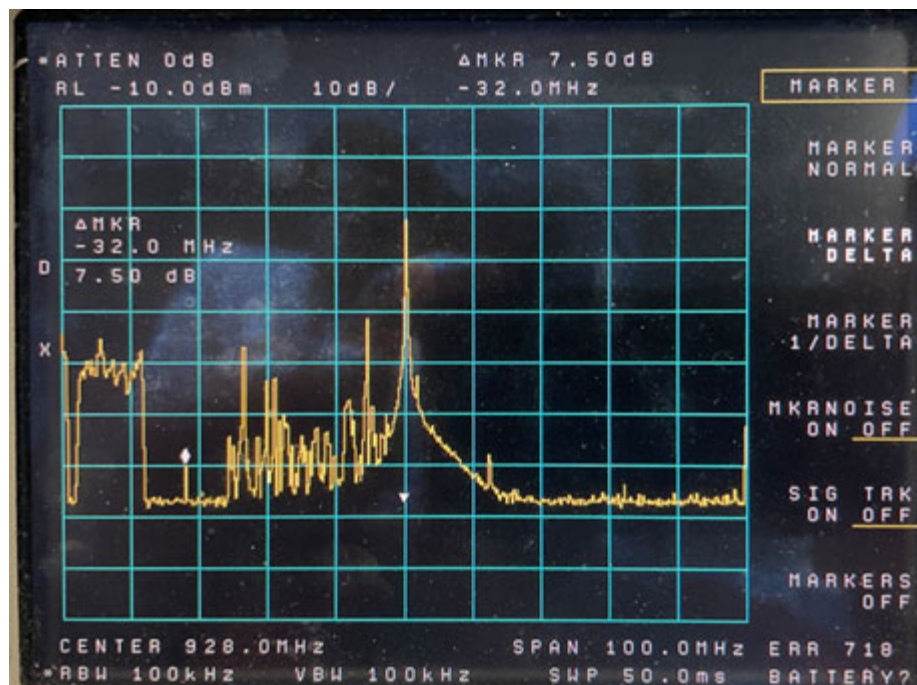


Figure 2. Background signals present with system under test not transmitting.