Out of band emission compliance 420 - 450 MHz request for file number 0756-EX-CN-2026

The license requested is to support demonstrations of a developmental radar system. The hardware and controlling software are not yet 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 with only two of the planned 8 antenna tiles available. 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 allowed bandwidth about the center frequency is defined by

B(-40) = 64/20 = 3.2 MHz

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

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

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

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

The allowed bandwidth at the -60 dBc point is then 10^.6667 x 3.2 = 14.8 MHz

Figure 1 shows the assessed measured bandwidths for the 1M20Q1N pulse at Fc= 450 MHz. The value at the -20 dBc point complies with the RSEC mask. The measured value of ~3 MHz at the -40 dBc point complies with the allowed mask value. The measured value of 13 MHz complies with the -60 dBc RSEC mask.

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 1.1 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 Fc, or up to 6 MHz total bandwidth. This is greater than the measured -35 dBc bandwidth of 2.5 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.

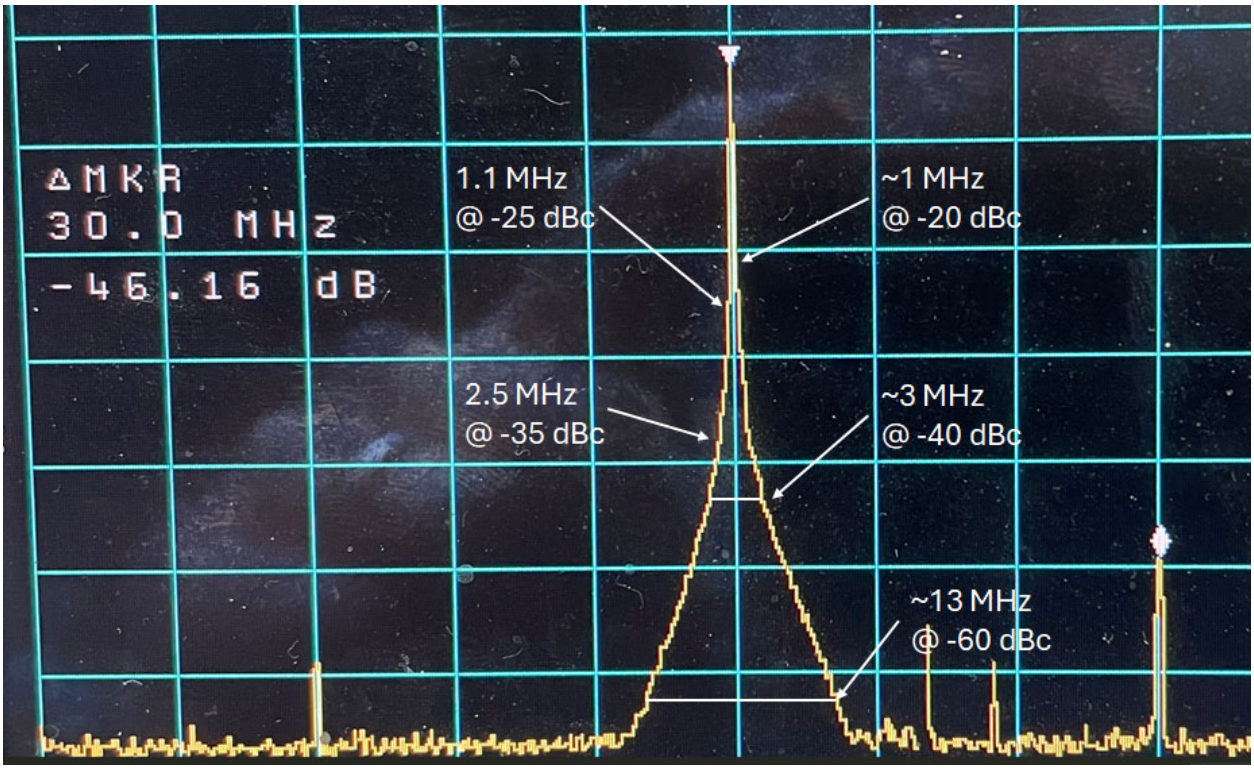

Figure 1. Bandwidths as displayed on a spectrum analyzer plot of the 450 MHz Fc pulse.

The noise signals from ambient or background signals present at the test site and not from the test system, as illustrated in figure 2. In addition, there is a spurious signal at +30 MHz with a power of -46 dBc; the source of this signal is under investigation for solution/removal.

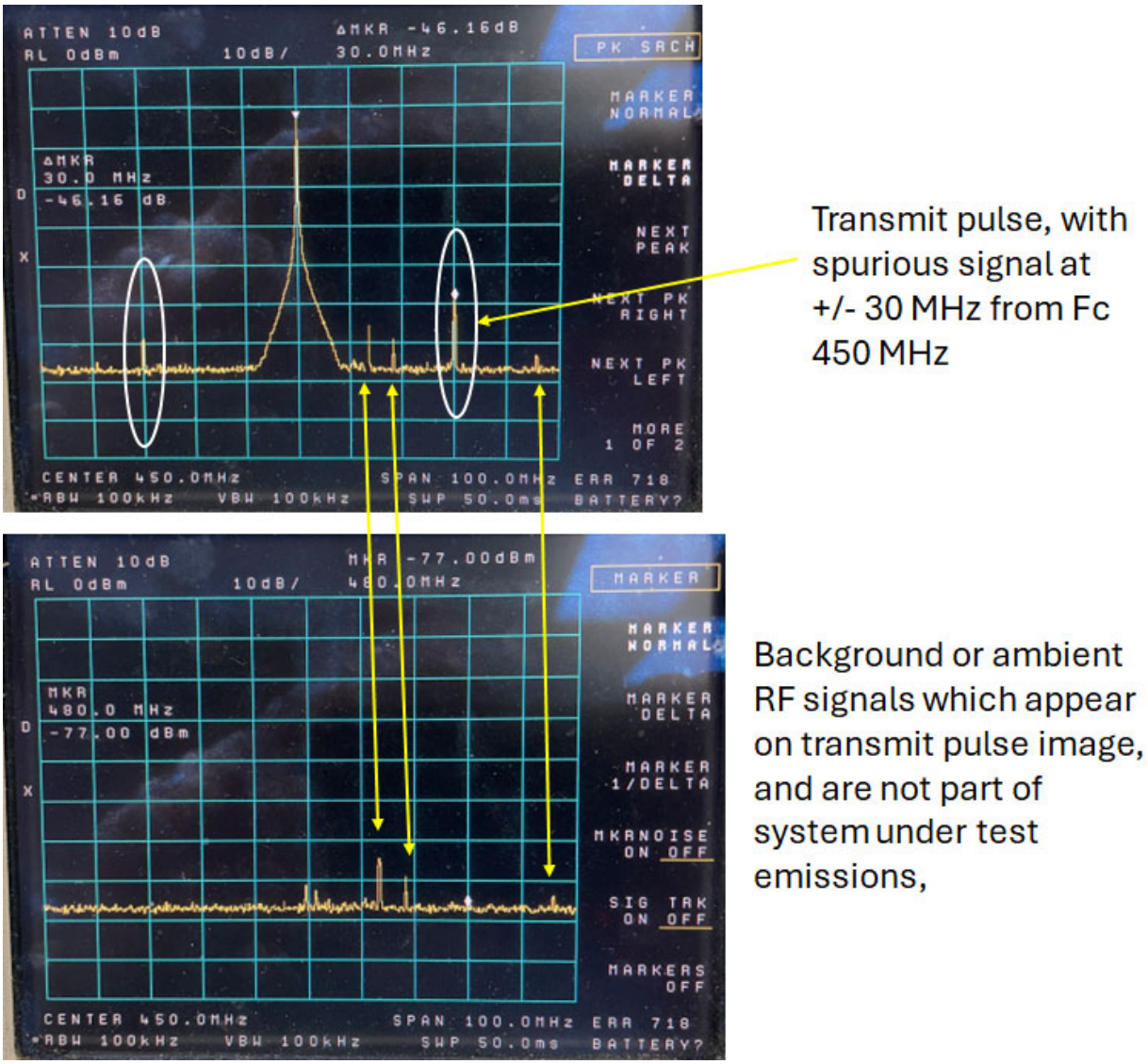

Figure 2. Background signals present with system under test not transmitting.