

Antenna Port Conducted Band Edge

Conducted band edge measurements were made at RRH antenna port 2.

Single Carrier Test Cases

The RRH was operated at the Band 5 band edge channels with all modulation types (QPSK, 16QAM, 64QAM, 256QAM) for all available 5G NR bandwidths (5MHz and 10MHz). The Band 5 carriers were enabled at maximum power (40 watts/port and 40 watts/carrier). The band 29 carriers were not enabled.

The limit of -19dBm was used in the certification testing. The limit is adjusted to -19dBm [-13dBm -10 log (4)] per FCC KDB 662911D01 v02r01 because the BTS may operate as a 4 port MIMO Band n5 transmitter.

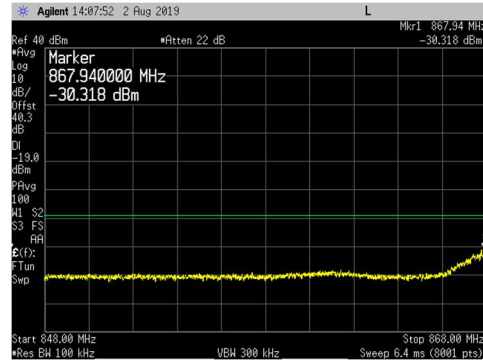
Measurements were performed with the spectrum analyzer in the RMS average mode over 100 traces. In the 1MHz bands outside and adjacent to the frequency block, a resolution bandwidth of 1% of the emission bandwidth was used. In the 1 to 21MHz frequency range outside the band edge (i.e.: 848 to 868MHz and 895 to 915MHz bands) a 100kHz RBW and 300kHz VBW was used. The results are summarized in the following table. The highest (worst case) emissions from the measurement data are provided.

Ch BW, Car Freq, Car Pwr	QPSK (dBm)		16QAM (dBm)		64QAM (dBm)		256QAM (dBm)	
Band 5	LBE	UBE	LBE	UBE	LBE	UBE	LBE	UBE
5G-NR 5M, BC, 40W	-27.417	N/A	-25.589	N/A	-26.931	N/A	-26.117	N/A
5G-NR 10M, BC, 40W	-23.578	N/A	-24.189	N/A	-25.172	N/A	-24.916	N/A
5G-NR 5M, TC, 40W	N/A	-26.707	N/A	-26.297	N/A	-25.646	N/A	-26.783
5G-NR 10M, TC, 40W	N/A	-25.791	N/A	-25.478	N/A	-26.516	N/A	-25.699

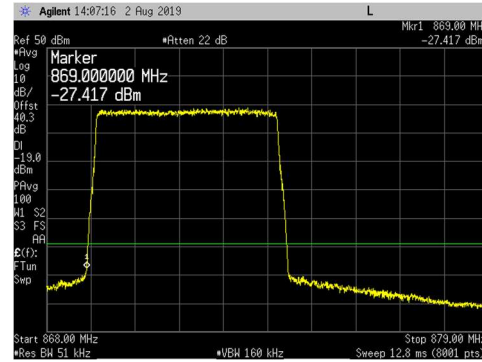
The total measurement RF path loss of the test setup (attenuator and test cables) was 40.3 dB and is accounted for by the spectrum analyzer reference level offset. The display line on the plots reflects the required limit. Conducted band edge measurements are provided in the following pages.

5G NR_ 5MHz Channel Bandwidth_ Lower Band Edge Plots for Antenna Port 2:

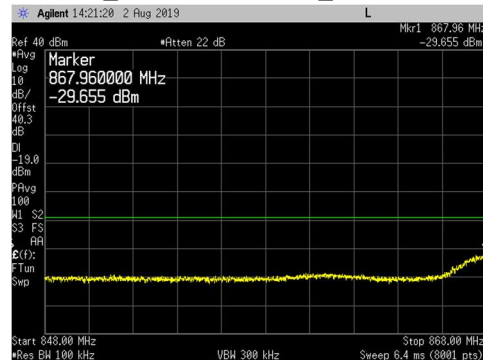
QPSK_ Bottom Channel_ 848 to 868MHz



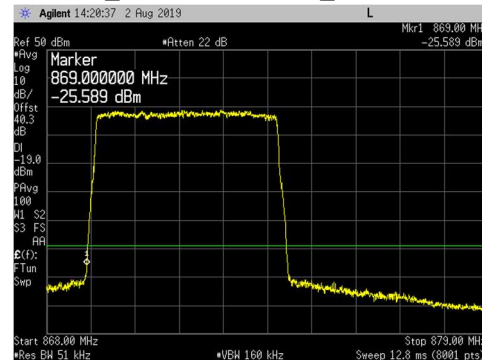
QPSK_ Bottom Channel_ 868 to 879MHz



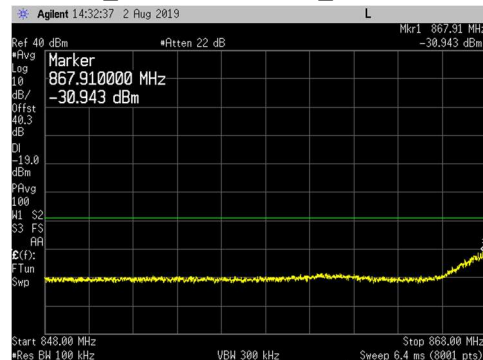
16QAM_ Bottom Channel_ 848 to 868MHz



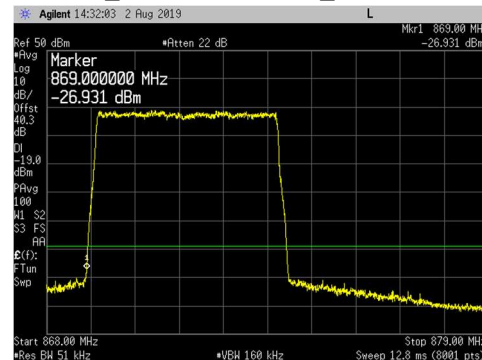
16QAM_ Bottom Channel_ 868 to 879MHz



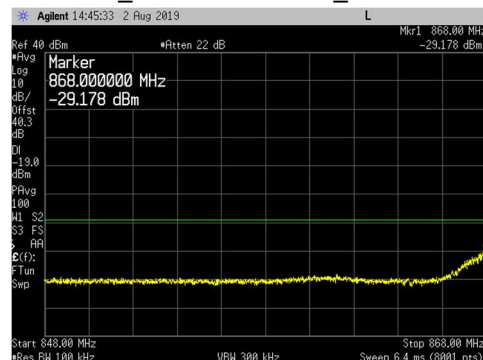
64QAM_ Bottom Channel_ 848 to 868MHz



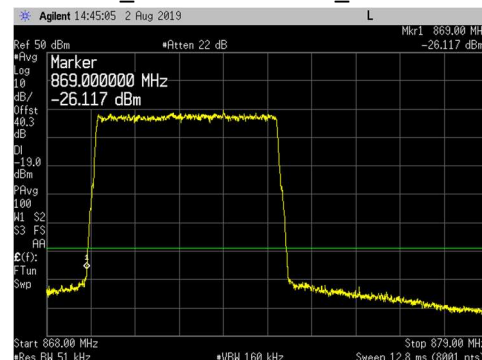
64QAM_ Bottom Channel_ 868 to 879MHz



256QAM_ Bottom Channel_ 848 to 868MHz

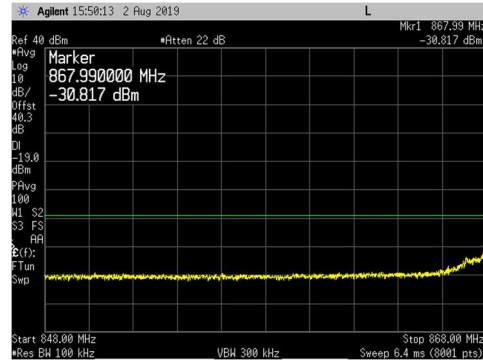


256QAM_ Bottom Channel_ 868 to 879MHz

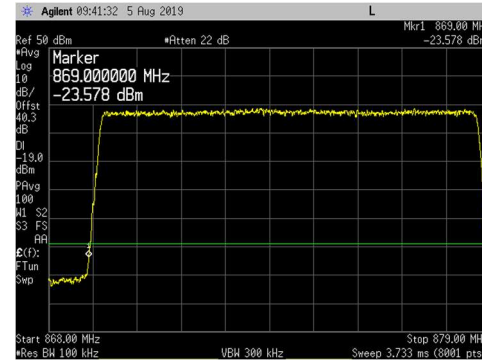


5G NR_ 10MHz Channel Bandwidth_ Lower Band Edge Plots for Antenna Port 2:

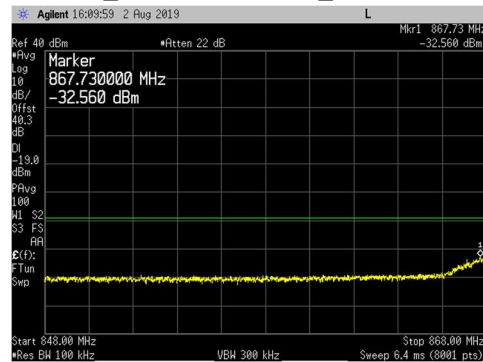
QPSK_ Bottom Channel_ 848 to 868MHz



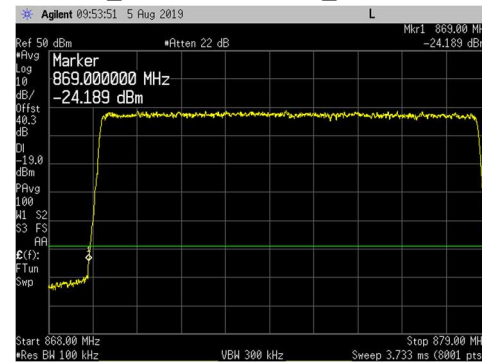
QPSK_ Bottom Channel_ 868 to 879MHz



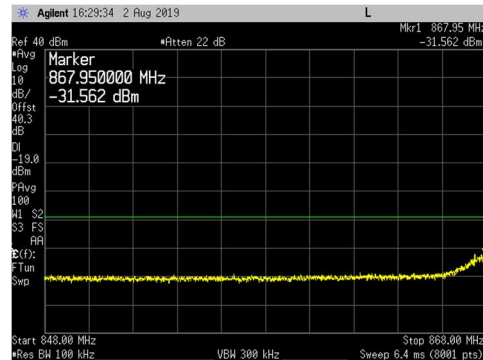
16QAM_ Bottom Channel_ 848 to 868MHz



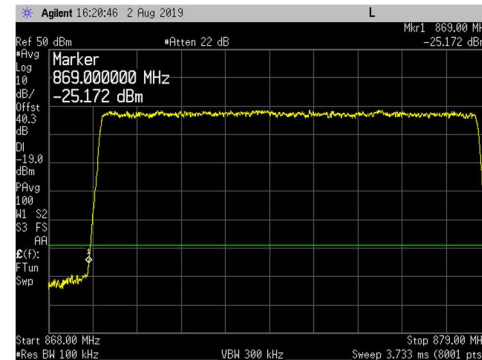
16QAM_ Bottom Channel_ 868 to 879MHz



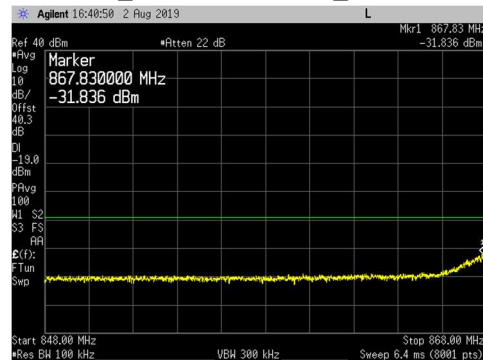
64QAM_ Bottom Channel_ 848 to 868MHz



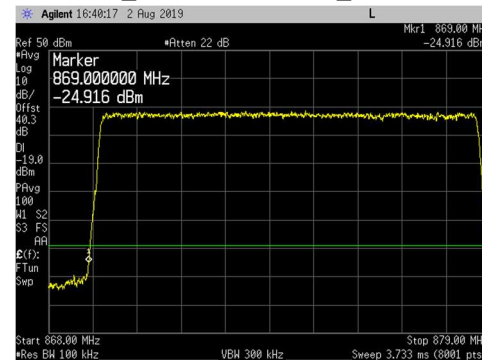
64QAM_ Bottom Channel_ 868 to 879MHz



256QAM_ Bottom Channel_ 848 to 868MHz

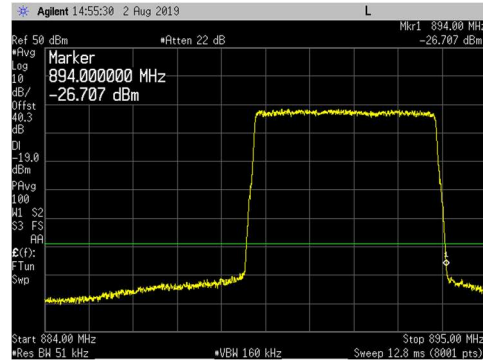


256QAM_ Bottom Channel_ 868 to 879MHz

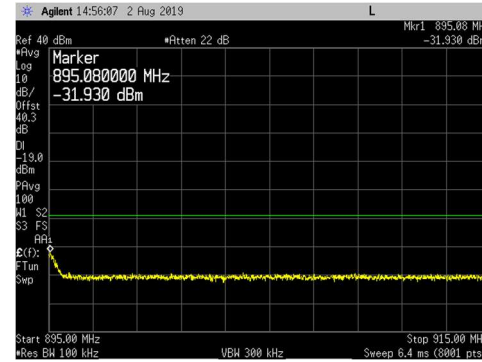


5G NR_ 5MHz Channel Bandwidth_ Upper Band Edge Plots for Antenna Port 2:

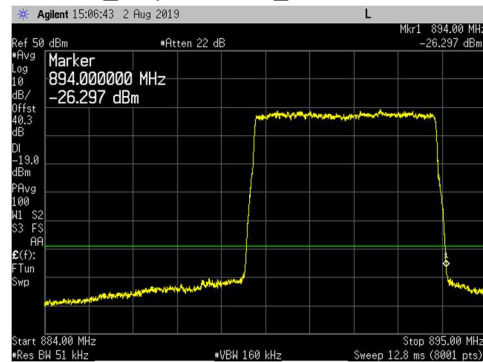
QPSK_ Top Channel_ 884 to 895MHz



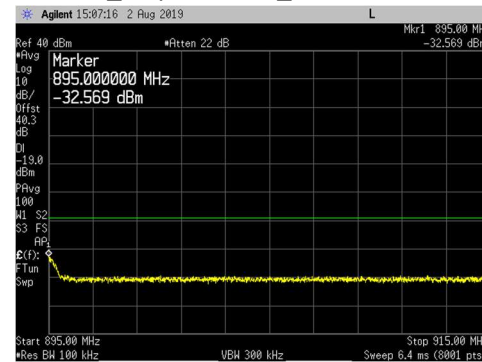
QPSK_ Top Channel_ 895 to 915MHz



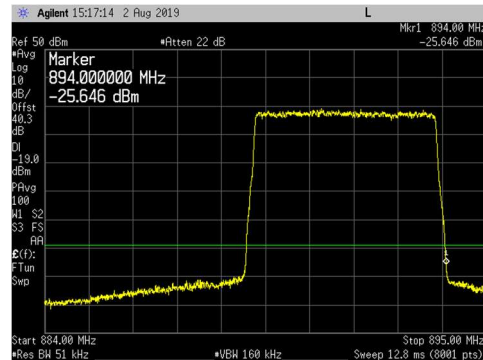
16QAM_ Top Channel_ 884 to 895MHz



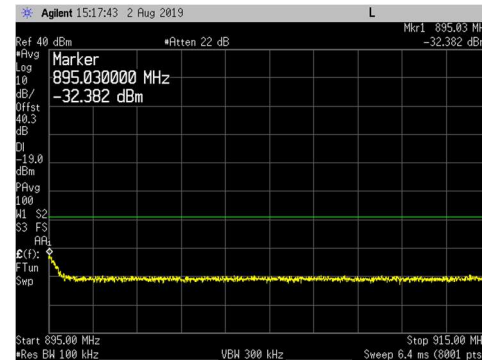
16QAM_ Top Channel_ 895 to 915MHz



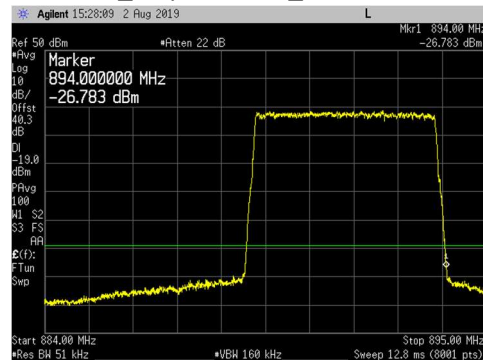
64QAM_ Top Channel_ 884 to 895MHz



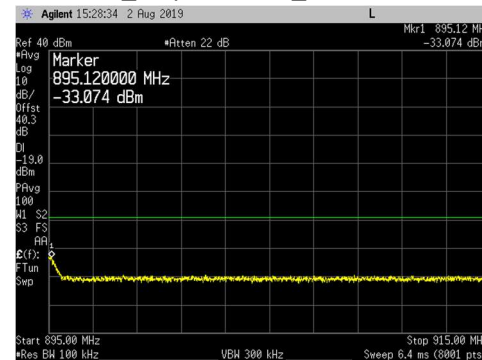
64QAM_ Top Channel_ 895 to 915MHz



256QAM_ Top Channel_ 884 to 895MHz

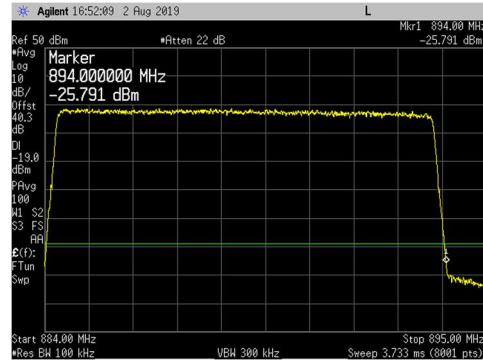


256QAM_ Top Channel_ 895 to 915MHz

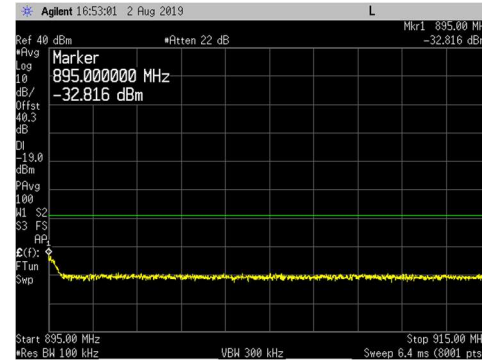


5G NR_ 10MHz Channel Bandwidth_ Upper Band Edge Plots for Antenna Port 2:

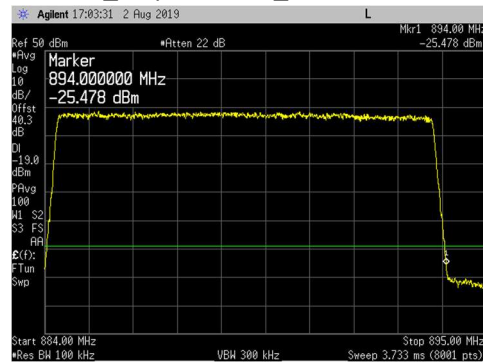
QPSK_ Top Channel_ 884 to 895MHz



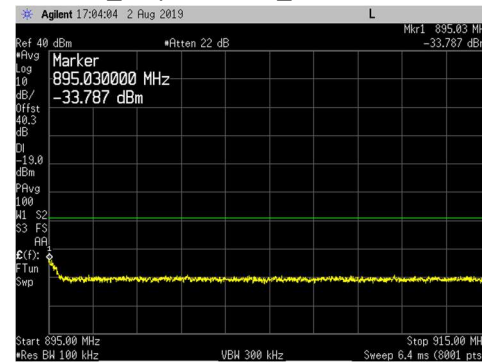
QPSK_ Top Channel_ 895 to 915MHz



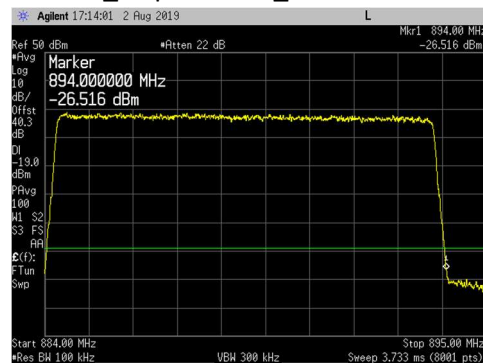
16QAM_ Top Channel_ 884 to 895MHz



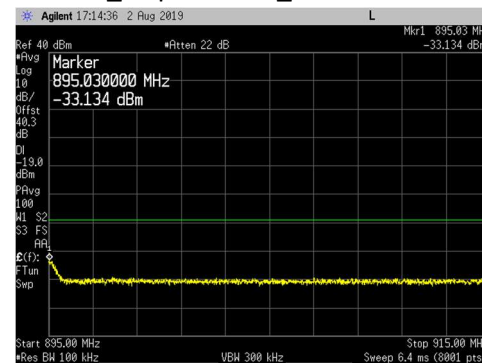
16QAM_ Top Channel_ 895 to 915MHz



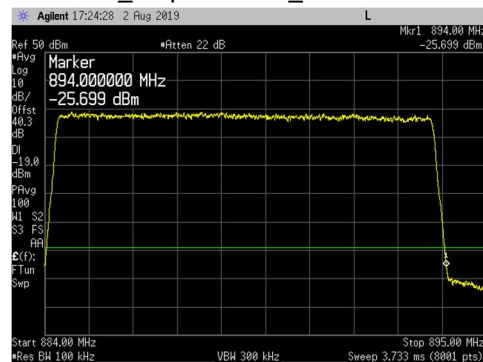
64QAM_ Top Channel_ 884 to 895MHz



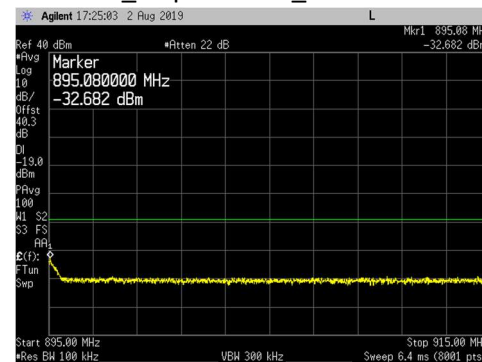
64QAM_ Top Channel_ 895 to 915MHz



256QAM_ Top Channel_ 884 to 895MHz



256QAM_ Top Channel_ 895 to 915MHz



Transmitter Antenna Port Conducted Emissions

Transmitter conducted emission measurements were made at RRH antenna port 2. Measurements were performed over the 9kHz to 9GHz frequency range.

The RRH was operated on the Band n5 middle channel (881.5MHz) with all 5G NR modulation types (QPSK, 16QAM, 64QAM and 256QAM) for all available bandwidths (Band n5: 5MHz and 10MHz). The Band n5 carriers were enabled at maximum power (40 watts/port and 40 watts/carrier). The band 29 carriers were not enabled.

The limit of -19dBm was used in the certification testing. The limit is adjusted to -19dBm [-13dBm -10 log (4)] per FCC KDB 662911D01 v02r01 because the BTS may operate as a 4 port MIMO Band n5 transmitter. The required measurement parameters include a 100kHz bandwidth with power measured in average value (since transmitter power was measured in average value).

Measurements were performed with a spectrum analyzer using a peak detector with maximum hold over 50 sweeps (except for the 700MHz to 1100MHz frequency range). The measurements for the 700MHz to 1.1GHz frequency range were performed with the spectrum analyzer in the RMS average mode over 100 traces.

The limit for the 9kHz to 150kHz frequency range was adjusted to -39dBm to correct for a spectrum analyzer RBW of 1kHz versus required RBW of 100kHz [i.e.: -39dBm = -19dBm -10log(100kHz/1kHz)]. The limit for the 150kHz to 20MHz frequency range was adjusted to -29dBm to correct for a spectrum analyzer RBW of 10kHz versus required RBW of 100kHz [i.e.: -29dBm = -19dBm -10log(100kHz/10kHz)]. The required limit of -19dBm with a RBW of ≥ 100 kHz was used for all other frequency ranges. The spectrum analyzer settings that were used for this test are summarized in the following table.

Frequency Range	RBW	VBW	Number of Data Points	Detector	Sweep Time	Max Hold over	Offset Note 1
9kHz to 150kHz	1kHz	3kHz	8001	Peak	Auto	50 Sweeps	40.0dB
150kHz to 20MHz	10kHz	30kHz	8001	Peak	Auto	50 Sweeps	39.9dB
20MHz to 700MHz	200kHz	600kHz	8001	Peak	Auto	50 Sweeps	40.3dB
700MHz to 1.1GHz	100kHz	300kHz	8192	Average	Auto	Note 2	40.3dB
1.1GHz to 9GHz	2MHz	6MHz	8192	Peak	Auto	50 Sweeps	25.0dB

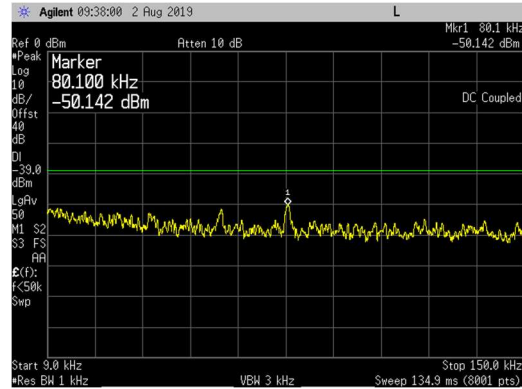
Note 1: The total measurement RF path loss of the test setup (attenuators, filters and test cables) is accounted for by the spectrum analyzer reference level offset.

Note 2: Max Hold not used and instead measurements were performed with the spectrum analyzer in the RMS average mode over 100 traces.

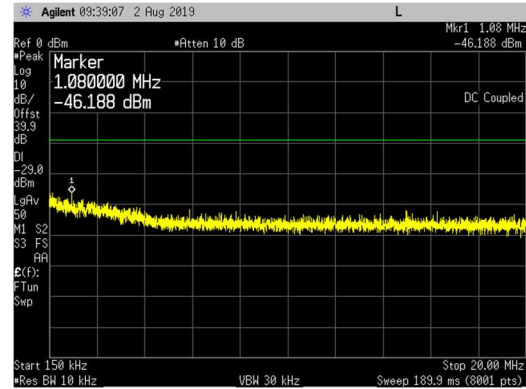
A high pass filter was used to reduce measurement instrumentation noise floor for the frequency ranges above 1100MHz. The total measurement RF path loss of the test setup (attenuators, high pass filter and test cables) as shown in the table is accounted for by the spectrum analyzer reference level offset. The display line on the plots reflects the required limit. Conducted spurious emission plots/measurements are provided in the following pages.

5G NR 5MHz Channel BW_ QPSK _ Middle Channel (881.5MHz) at 40 watts/carrier:

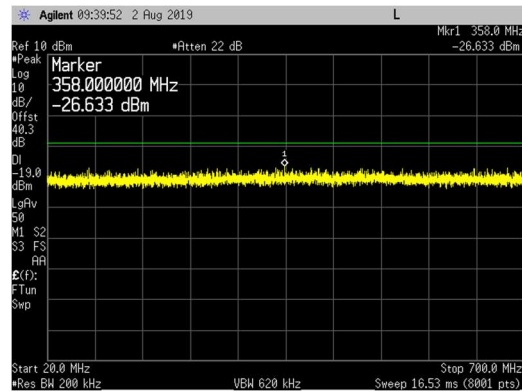
9kHz to 150kHz



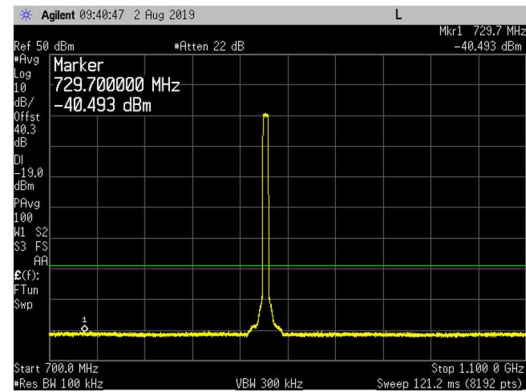
150kHz to 20MHz



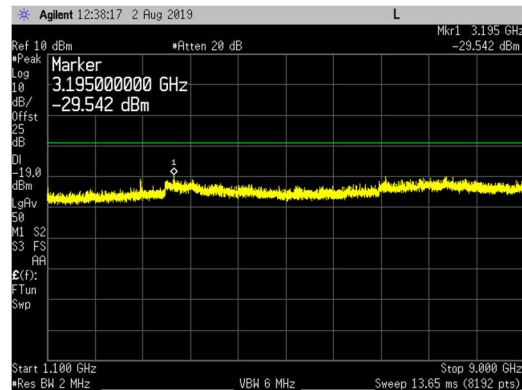
20MHz to 700MHz



700MHz to 1100MHz

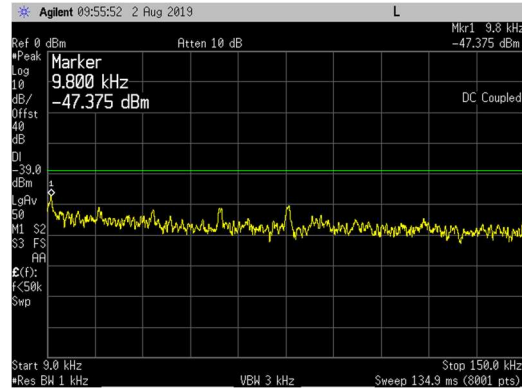


1.1GHz to 9GHz

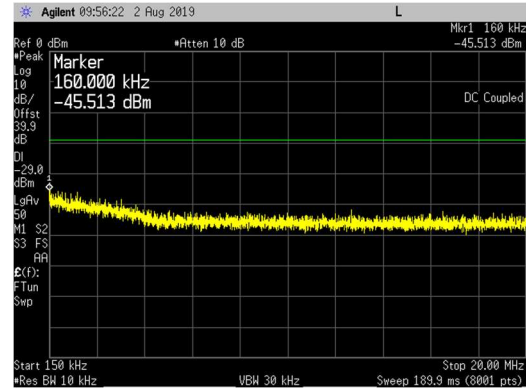


5G NR 5MHz Channel BW_ 16QAM _ Middle Channel (881.5MHz) at 40 watts/carrier:

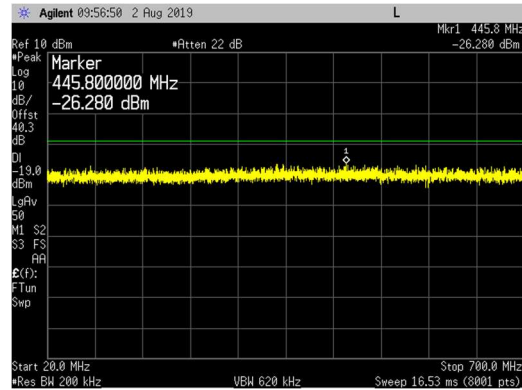
9kHz to 150kHz



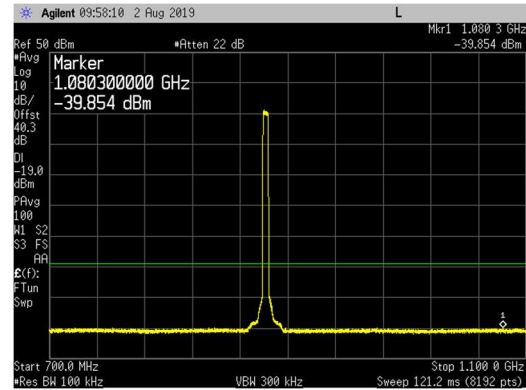
150kHz to 20MHz



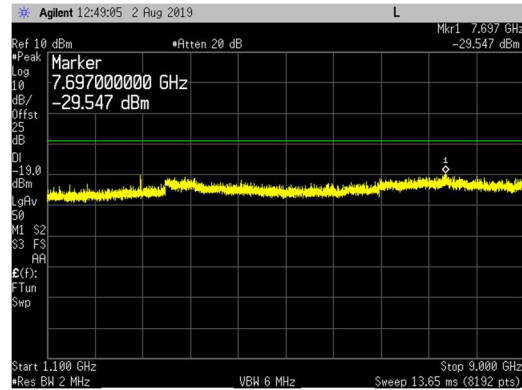
20MHz to 700MHz



700MHz to 1100MHz

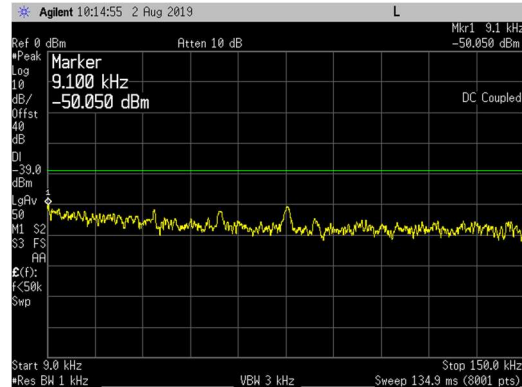


1.1GHz to 9GHz

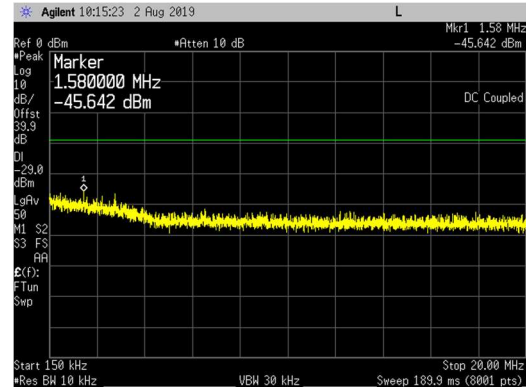


5G NR 5MHz Channel BW_ 64QAM _ Middle Channel (881.5MHz) at 40 watts/carrier:

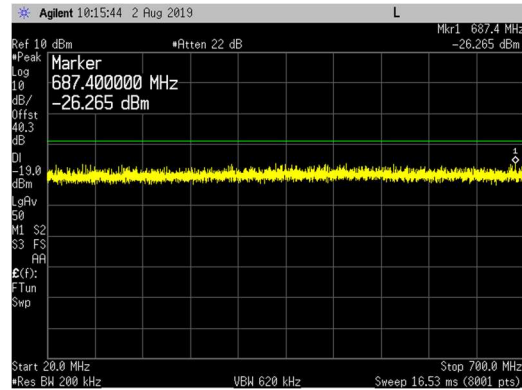
9kHz to 150kHz



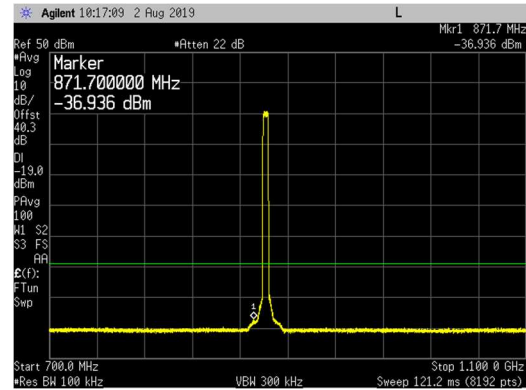
150kHz to 20MHz



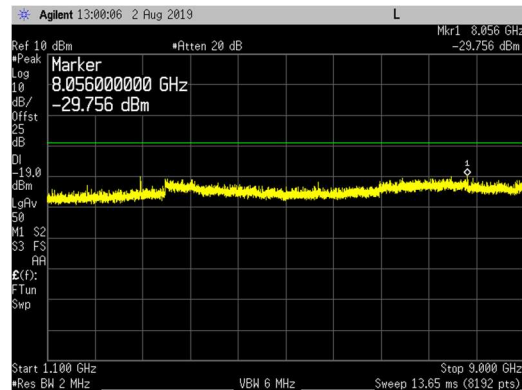
20MHz to 700MHz



700MHz to 1100MHz



1.1GHz to 9GHz

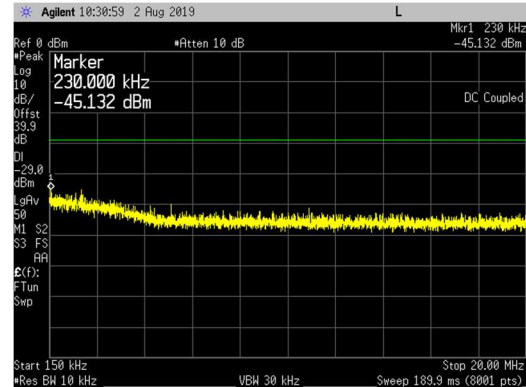


5G NR 5MHz Channel BW_ 256QAM_ Middle Channel (881.5MHz) at 40 watts/carrier:

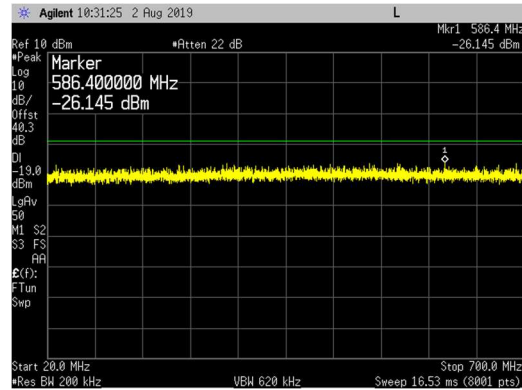
9kHz to 150kHz



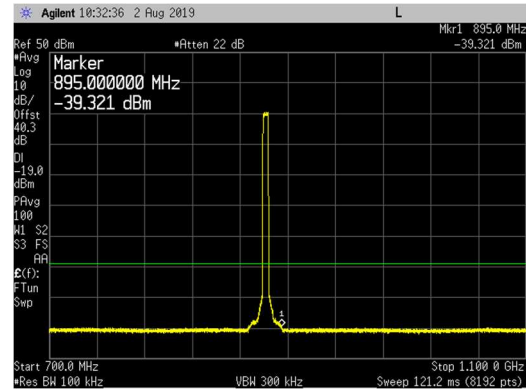
150kHz to 20MHz



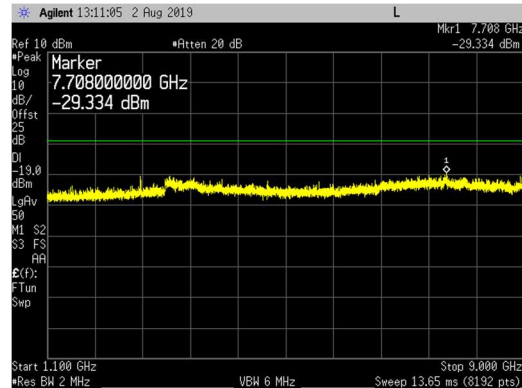
20MHz to 700MHz



700MHz to 1100MHz

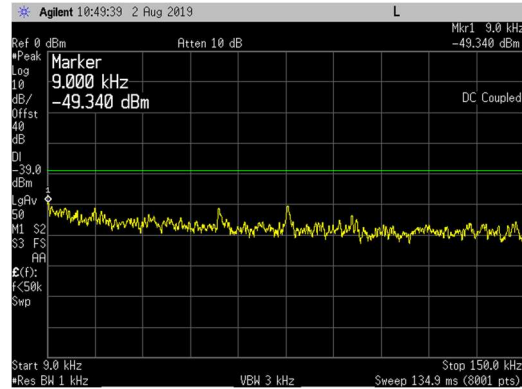


1.1GHz to 9GHz

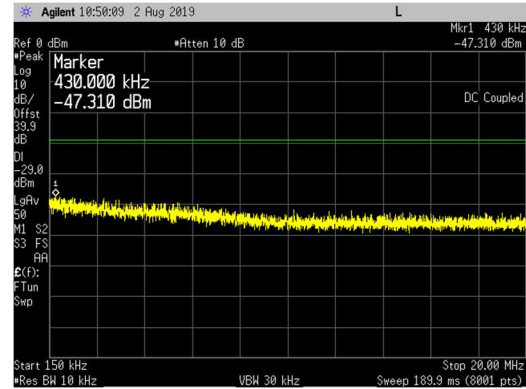


5G NR 10MHz Channel BW_ QPSK_ Middle Channel (881.5MHz) at 40 watts/carrier:

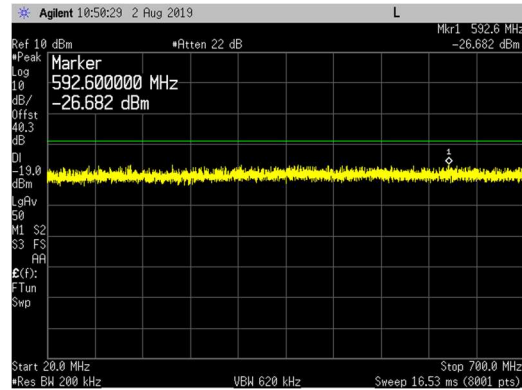
9kHz to 150kHz



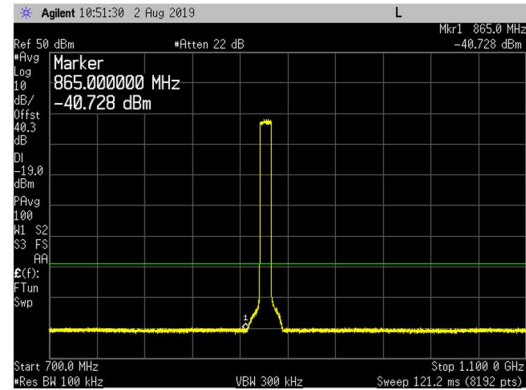
150kHz to 20MHz



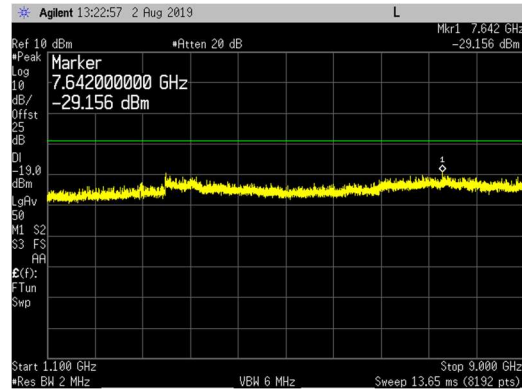
20MHz to 700MHz



700MHz to 1100MHz

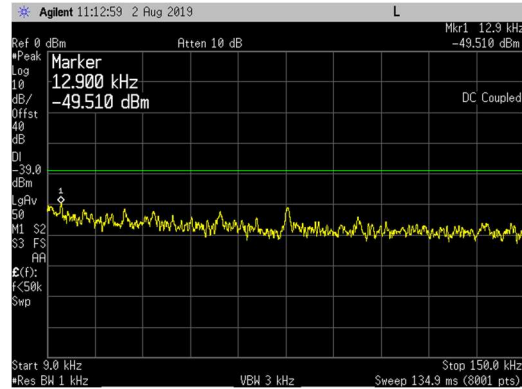


1.1GHz to 9GHz

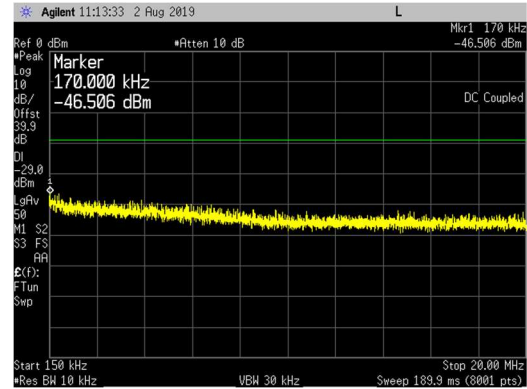


5G NR 10MHz Channel BW_ 16QAM _ Middle Channel (881.5MHz) at 40 watts/carrier:

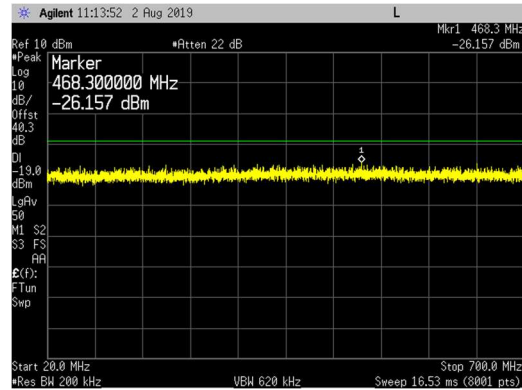
9kHz to 150kHz



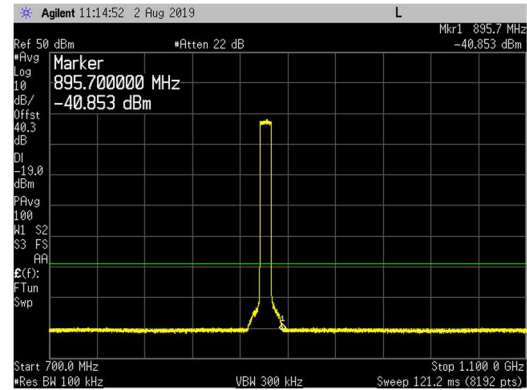
150kHz to 20MHz



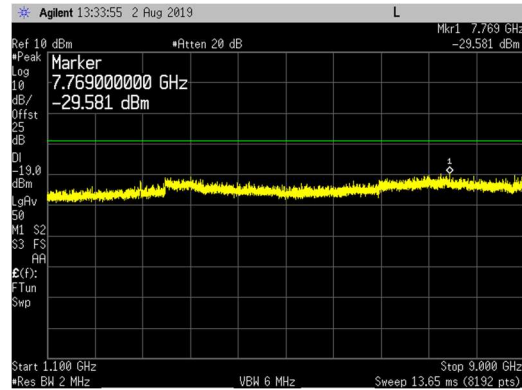
20MHz to 700MHz



700MHz to 1100MHz

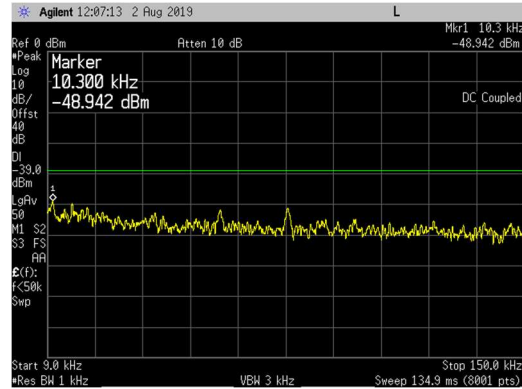


1.1GHz to 9GHz

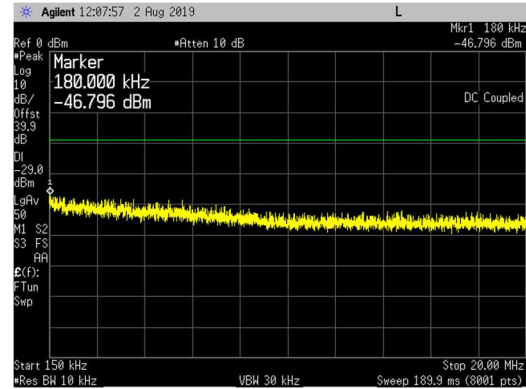


5G NR 10MHz Channel BW_ 64QAM _ Middle Channel (881.5MHz) at 40 watts/carrier:

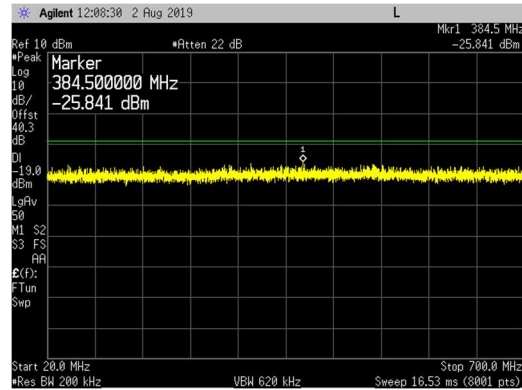
9kHz to 150kHz



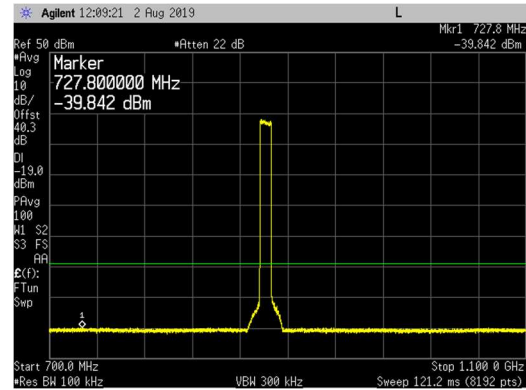
150kHz to 20MHz



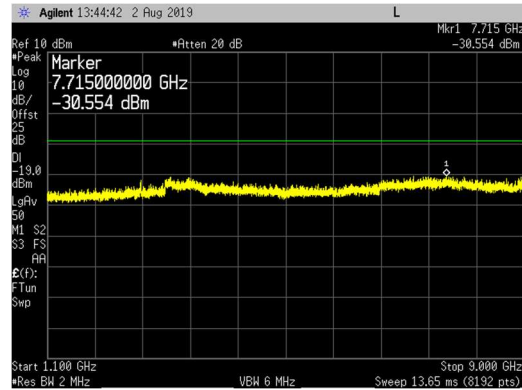
20MHz to 700MHz



700MHz to 1100MHz

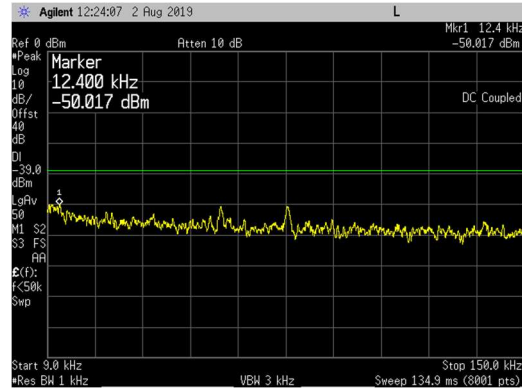


1.1GHz to 9GHz

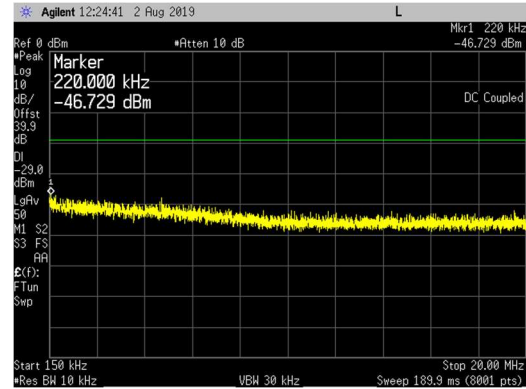


5G NR 10MHz Channel BW_ 256QAM_ Middle Channel (881.5MHz) at 40 watts/carrier:

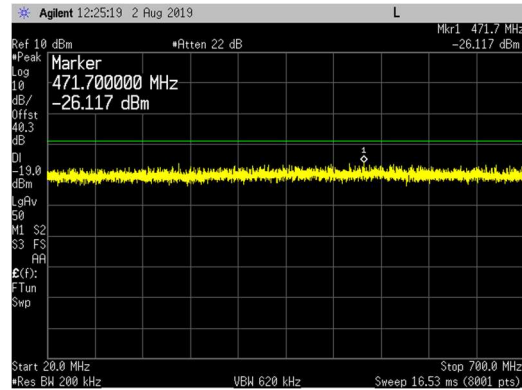
9kHz to 150kHz



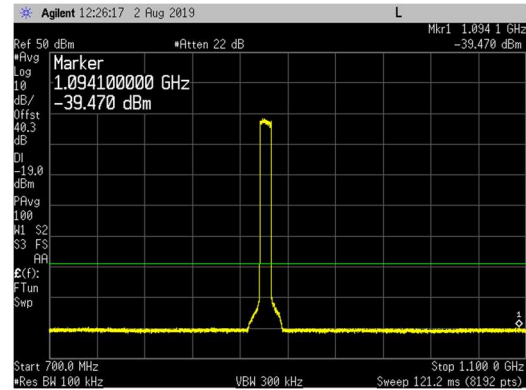
150kHz to 20MHz



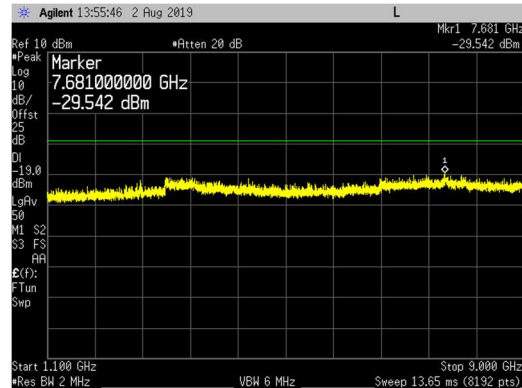
20MHz to 700MHz



700MHz to 1100MHz



1.1GHz to 9GHz





Transmitter Radiated Spurious Emissions

Radiated emission measurement results are in Appendix A.

Frequency Stability/Accuracy

Frequency Stability/Accuracy measurement results are in Appendix A.



END OF REPORT