

Based on the results above, Port 2 had the highest RMS average power for Band 13 (represents the worst case) and therefore it was selected for all the remaining antenna port tests. Port 2 has the highest combined RMS average power for Band 5 + Band 13.

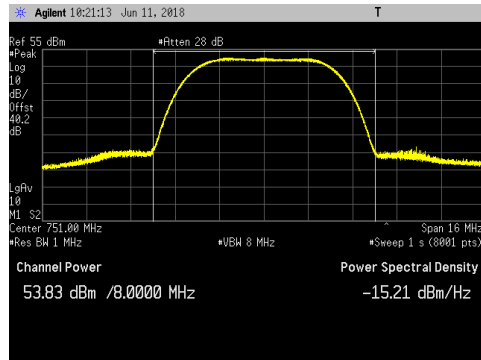
Subsequently output power levels on bottom, middle, and top channels in all 4 LTE channel bandwidths using 256QAM modulation type were tested only at Port 2 and the results presented below. The highest measured values are highlighted.

Antenna LTE Channel	LTE Bandwidth	LTE - 256QAM		
		Peak (dBm)	Ave (dBm)	PAPR (dB)
Port 2 Bottom Channel	5M	54.02	46.22	7.80
Port 2 Middle Channel	5M	53.95	46.14	7.81
	10M	54.07	46.05	8.02
Port 2 Top Channel	5M	53.98	46.14	7.84

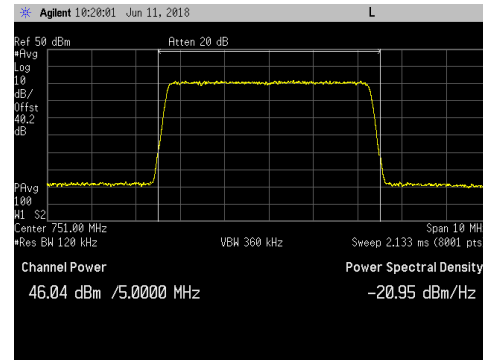
All measurement results are provided in the following pages. The total measurement RF path loss of the test setup (attenuator and test cables) was 40.2 dB and is accounted for by the spectrum analyzer reference level offset.

LTE5 Channel Power Plots at Middle Channel and 256QAM Modulation:

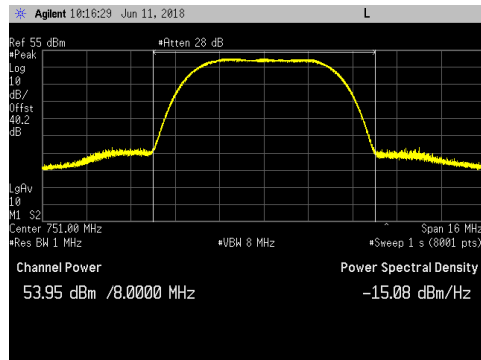
Port 1 - LTE5_ Middle Channel_Peak



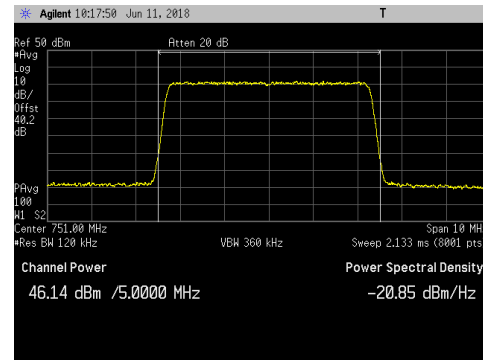
Port 1 - LTE5_ Middle Channel_Average



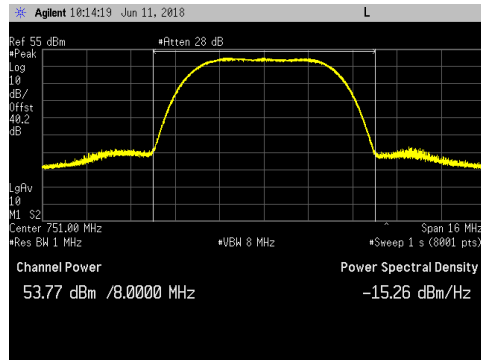
Port 2 - LTE5_ Middle Channel_Peak



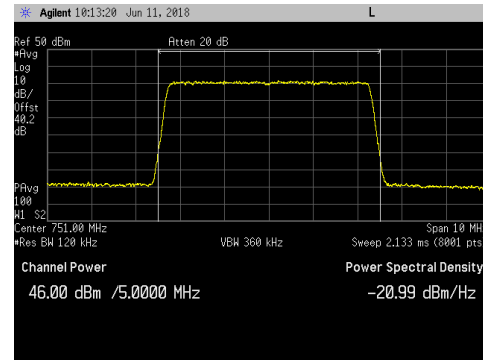
Port 2 - LTE5_ Middle Channel_Average



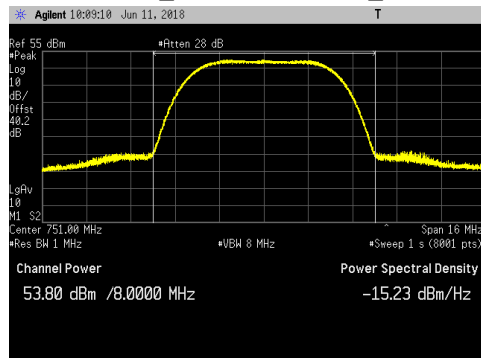
Port 3 - LTE5_ Middle Channel_Peak



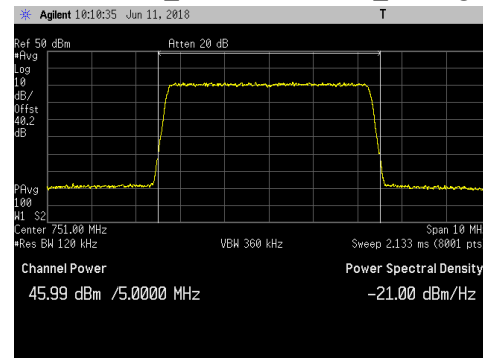
Port 3 - LTE5_ Middle Channel_Average



Port 4 - LTE5_ Middle Channel_Peak

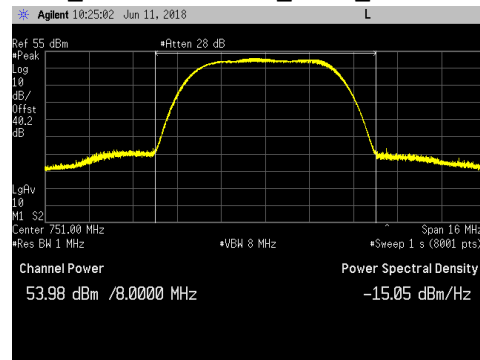


Port 4 - LTE5_ Middle Channel_Average

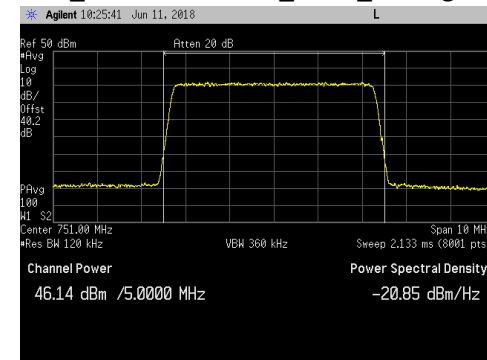


LTE5 Channel Power Plots for Antenna Port 2 at Middle Channel and all Modulation Types:

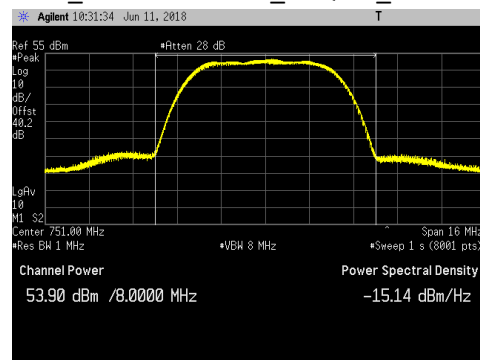
LTE5_Middle Channel_QPSK_Peak



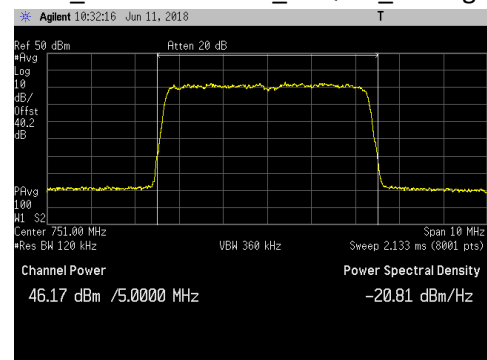
LTE5_Middle Channel_QPSK_Average



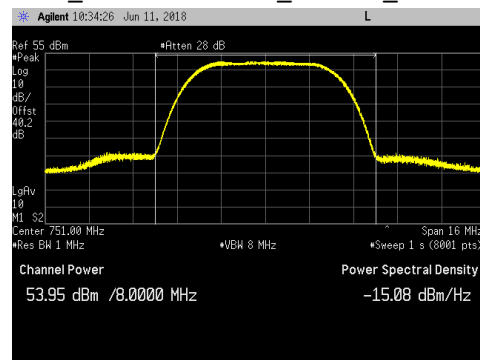
LTE5_Middle Channel_16QAM_Peak



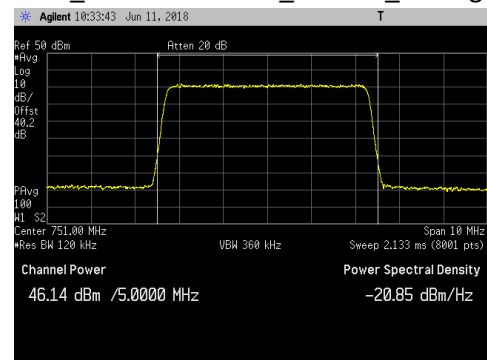
LTE5_Middle Channel_16QAM_Average



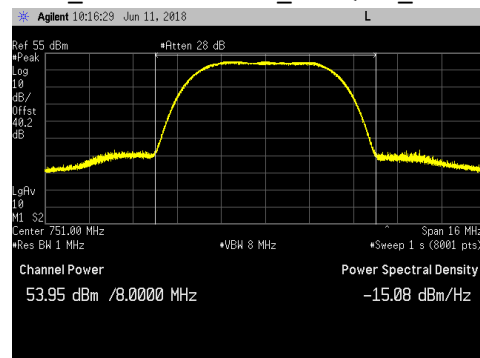
LTE5_Middle Channel_64QAM_Peak



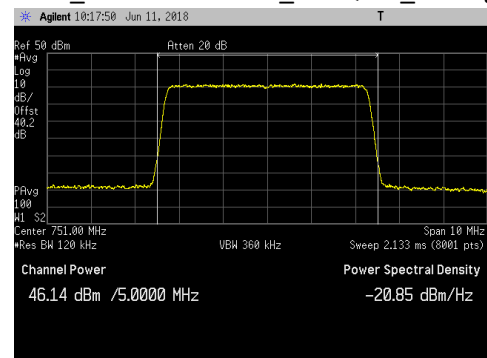
LTE5_Middle Channel_64QAM_Average



LTE5_Middle Channel_256QAM_Peak

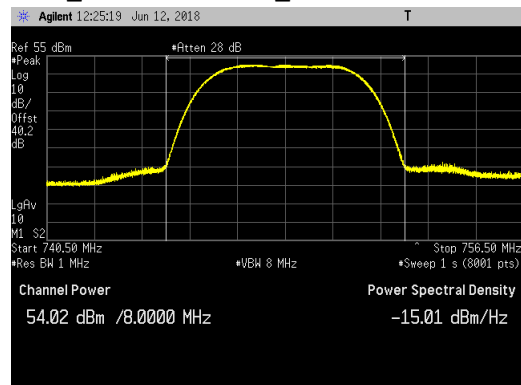


LTE5_Middle Channel_256QAM_Average

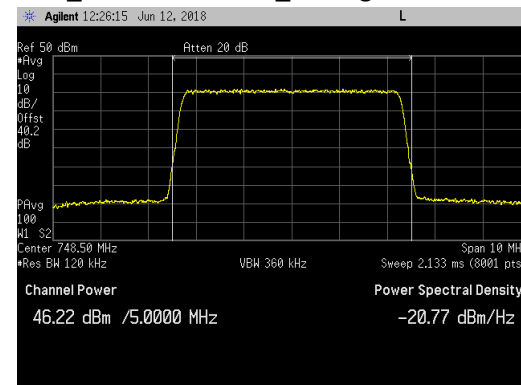


LTE5 Channel Power Plots for Antenna Port 2 and 256QAM Modulation:

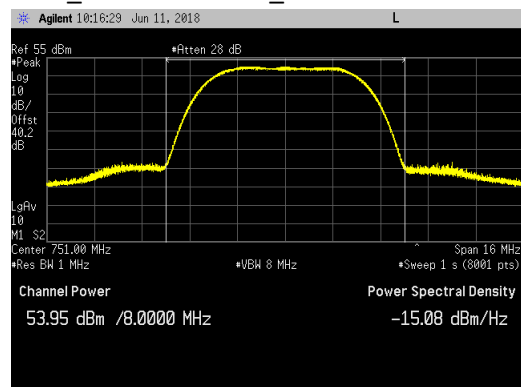
LTE5_Bottom Channel_Peak



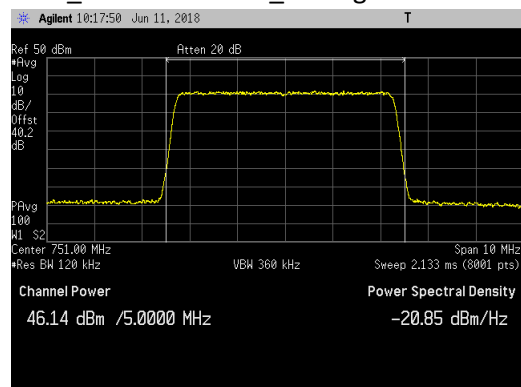
LTE5_Bottom Channel_Average



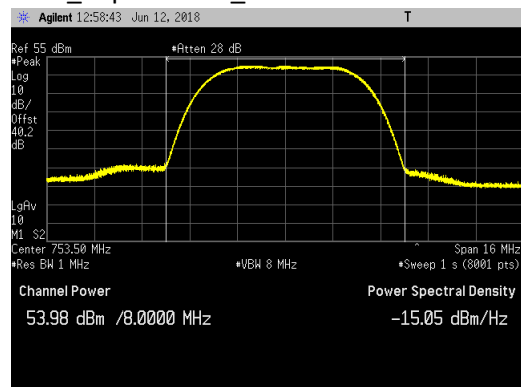
LTE5_Middle Channel_Peak



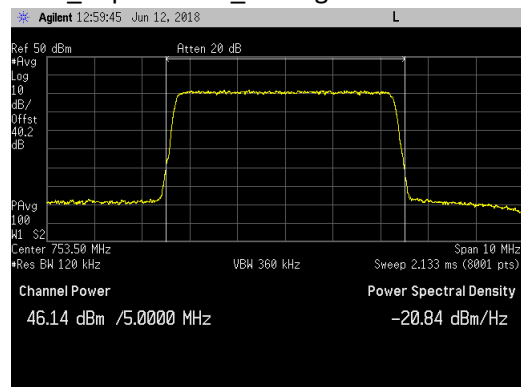
LTE5_Middle Channel_Average



LTE5_Top Channel_Peak

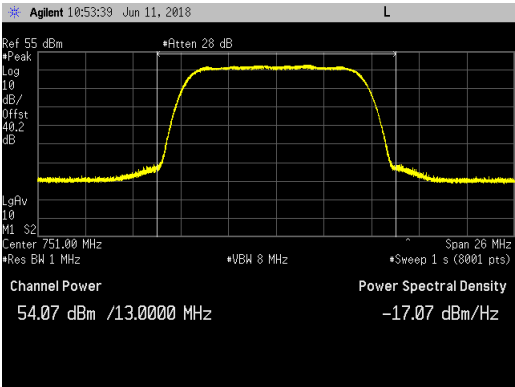


LTE5_Top Channel_Average

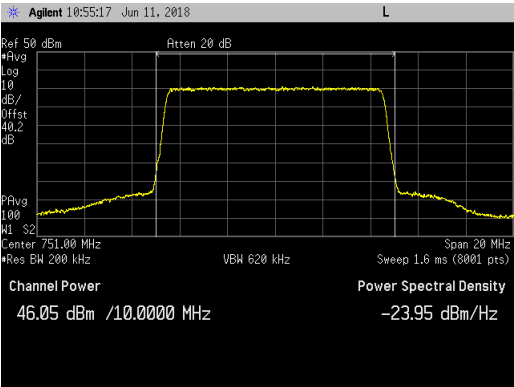


LTE10 Channel Power Plots for Antenna Port 2 and 256QAM Modulation:

LTE10_Bot_Mid_Top Channel_Peak



LTE10_Bot_Mid_Top Channel_Average



Emission Bandwidth (26 dB down and 99%)

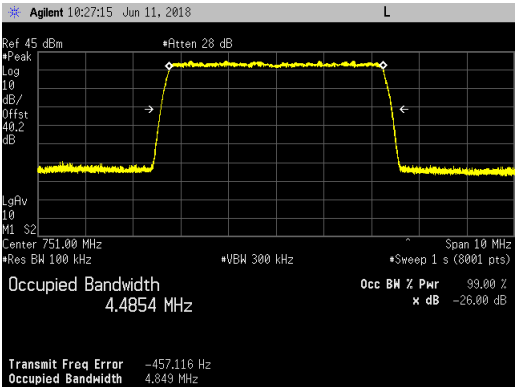
Emission bandwidth measurements were made at antenna port 2 on the middle channel with maximum RF output power. All available LTE modulations (QPSK, 16QAM, 64QAM, 256QAM) were used. All available LTE channel bandwidths (5MHz and 10MHz) were used. The results are provided in the following table (largest value in each channel type is highlighted).

LTE Ch BW	Modulation Type							
	QPSK		16QAM		64QAM		256QAM	
	26dB (MHz)	99% (MHz)	26dB (MHz)	99% (MHz)	26dB (MHz)	99% (MHz)	26dB (MHz)	99% (MHz)
5M	4.849	4.4854	4.829	4.4717	4.839	4.4938	4.845	4.4951
10M	9.650	8.9755	9.629	8.9922	9.672	8.9876	9.644	8.9726

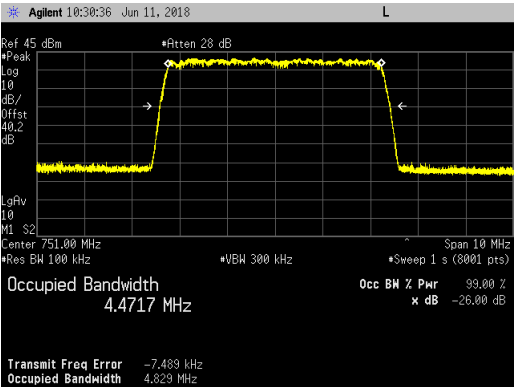
Emission bandwidth measurement data are provided in the following pages.

LTE5 Emission Bandwidth Plots on the Middle Channel for Antenna Port 2:

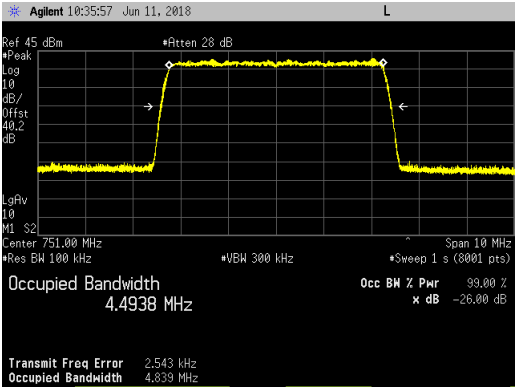
LTE5_QPSK



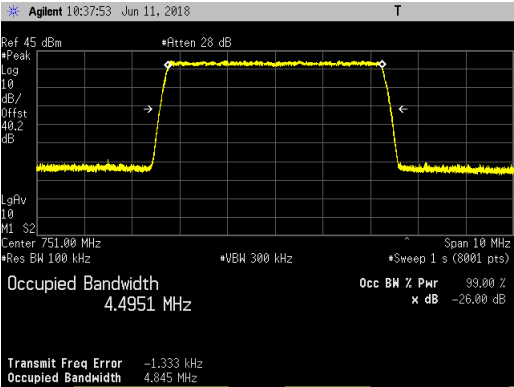
LTE5_16QAM



LTE5_64QAM

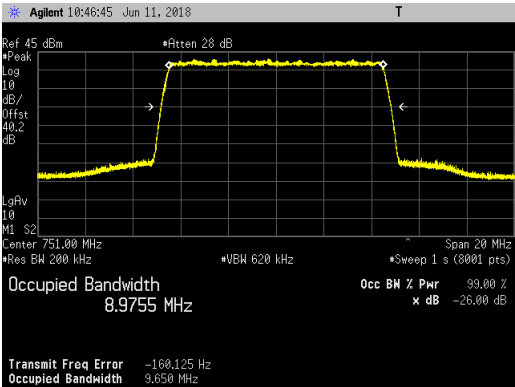


LTE5_256QAM

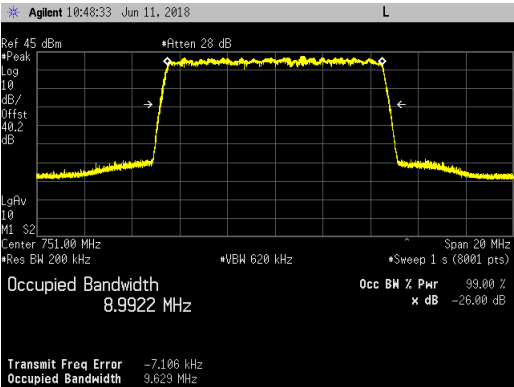


LTE10 Emission Bandwidth Plots on the Middle Channel for Antenna Port 2:

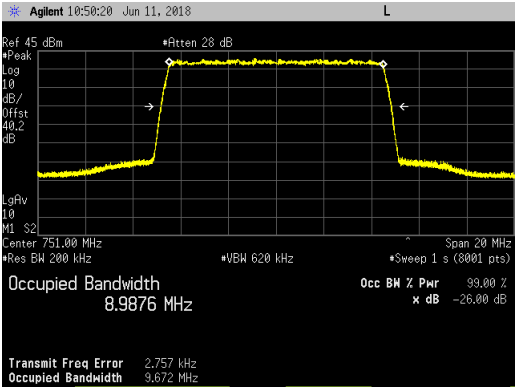
LTE10_QPSK



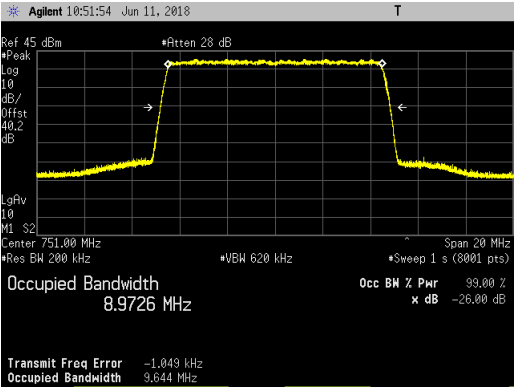
LTE10_16QAM



LTE10_64QAM



LTE10_256QAM



Antenna Port Conducted Band Edge

Conducted band edge measurements were made at RRH antenna port 2. The RRH was operated at the band edge frequencies with all modulation types (QPSK, 16QAM, 64QAM, 256QAM) for 5MHz and 10MHz LTE bandwidths. The AHBCA Band 13 configured for LTE10 may operate only on the middle channel since the operational bandwidth is 10MHz wide. The multicarrier test cases are based upon KDB 971168 D03v01 requirements using three carriers (Note that only two LTE5 carriers are available for Band 13).

In the frequency ranges below 746MHz, 756MHz to 763MHz, 775MHz to 793MHz and above 806MHz the limit of (-19dBm) is used for this testing per FCC 27.53(c) and RSS-130 4.6. 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 transmitter.

Measurements were performed with the spectrum analyzer in the RMS average mode over 100 traces. In the 100kHz bands outside and adjacent to the frequency block, a resolution bandwidth of 30kHz as allowed by FCC 27.53(f) and RSS-130 4.6 was used. Outside the 100kHz band edge noted above, 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. The worst case (highest) measurement is -21.988 dBm.

Frequency ranges below 746MHz, 756MHz to 763MHz, 775MHz to 793MHz and above 806MHz:

Frequency Ranges below 746MHz, 756MHz to 763MHz, 775MHz to 793MHz and above 806MHz									
Channel BW, Carrier Frequency, Carrier Power		QPSK (dBm)		16QAM (dBm)		64QAM (dBm)		256QAM (dBm)	
Band 5	Band 13	Bottom	Top	Bottom	Top	Bottom	Top	Bottom	Top
Carrier Off	LTE5, BC & TC, 40W	-26.590	-26.955	-26.970	-26.366	-27.028	-25.707	-27.144	-26.296
Carrier Off	LTE10, MC, 40W	-29.351	-28.717	-29.039	-28.389	-28.751	-27.350	-29.440	-28.380
Carrier Off	Dual LTE5, BC & TC, 20W + 20W	-27.733	-27.346	-28.639	-27.838	-28.547	-27.550	-28.602	-27.703
Multicarrier LTE1.4, TC-1 & TC, 13W + 13W	LTE10, MC, 13W	-23.403	-21.988	-23.522	-22.649	-22.297	-23.562	-24.335	-23.035

Section 27.53(c)(3) and RSS-130 4.6.2 requires an emission limit of -46dBm for any 6.25 kHz bandwidth between frequency bands 763-775 MHz and 793-806MHz. Adjusting for the four port MIMO requirement the emission limit in these frequency ranges is -52dBm [i.e.: Limit = -46 dBm/6.25kHz (FCC/IC Limit) – 6dB (4 port MIMO)]. A RBW of 6.8kHz was used for these frequency ranges because a 6.25kHz bandwidth was not available on the spectrum analyzer (a RBW>6.25kHz was selected). Measurements were performed with the spectrum analyzer in the RMS average mode over 100 traces. The results are summarized in the following table.

The worst case (highest) measurement is -55.329 dBm.

Frequency ranges of 763MHz to 775MHz and 793MHz to 806MHz:

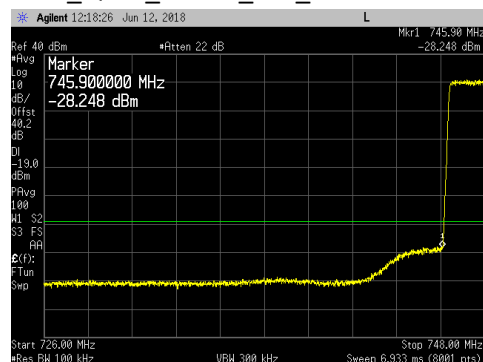
Frequency Ranges of 763MHz to 775MHz and 793MHz to 806MHz									
Channel BW, Carrier Frequency, Carrier Power		QPSK (dBm)		16QAM (dBm)		64QAM (dBm)		256QAM (dBm)	
Band 5	Band 13	763MHz to 775MHz	793MHz to 806MHz	763MHz to 775MHz	793MHz to 806MHz	763MHz to 775MHz	793MHz to 806MHz	763MHz to 775MHz	793MHz to 806MHz
Carrier Off	LTE5, BC & TC, 40W	-61.534	-66.573	-62.160	-66.543	-61.622	-66.396	-61.322	-66.459
Carrier Off	LTE10, MC, 40W	-56.964	-66.715	-56.682	-66.614	-56.849	-68.064	-56.767	-66.726
Carrier Off	Dual LTE5, BC & TC, 20W + 20W	-55.676	-66.535	-55.737	-66.563	-55.435	-66.464	-55.329	-66.665
Multicarrier LTE1.4, TC-1 & TC, 13W + 13W	LTE10, MC, 13W	-58.966	-66.777	-59.565	-66.568	-58.969	-66.463	-58.759	-67.028

The total measurement RF path loss of the test setup (attenuator and test cables) was 40.2 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.

Band 13 LTE5 40W Carrier Lower Band Edge Plots for Antenna Port 2:

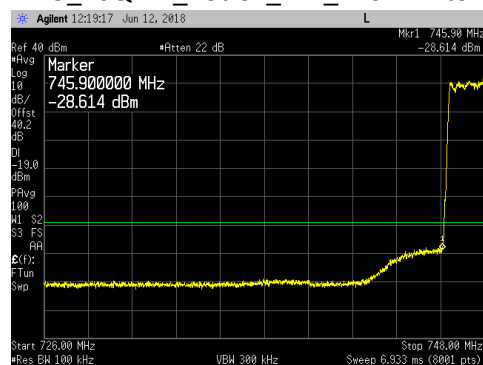
LTE5_QPSK_Bot Ch_LBE_726MHz to 748MHz



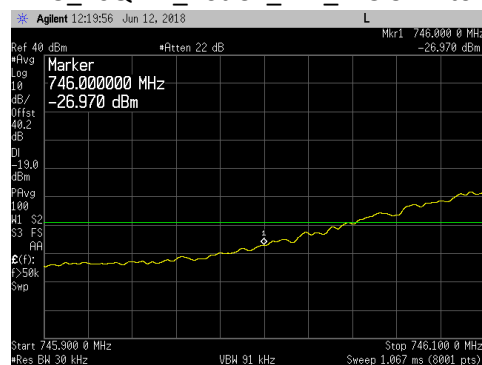
LTE5_QPSK_Bot Ch_LBE_745.9Mz to 746.1MHz



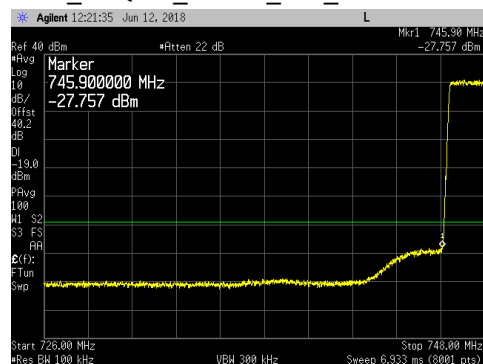
LTE5_16QAM_Bot Ch_LBE_726MHz to 748MHz



LTE5_16QAM_Bot Ch_LBE_745.9Mz to 746.1MHz



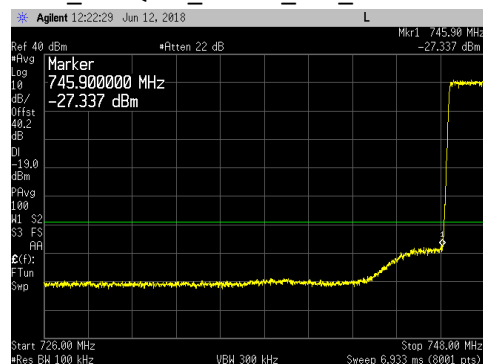
LTE5_64QAM_Bot Ch_LBE_726MHz to 748MHz



LTE5_64QAM_Bot Ch_LBE_745.9Mz to 746.1MHz



LTE5_256QAM_Bot Ch_LBE_726MHz to 748MHz

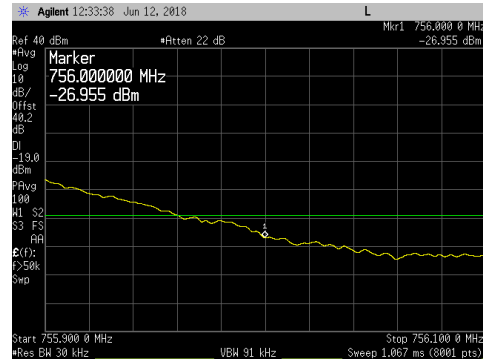


LTE5_256QAM_Bot Ch_LBE_745.9Mz to 746.1MHz

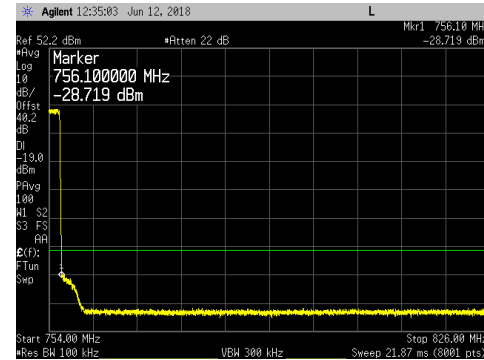


Band 13 LTE5 40W Carrier Upper Band Edge Plots for Antenna Port 2:

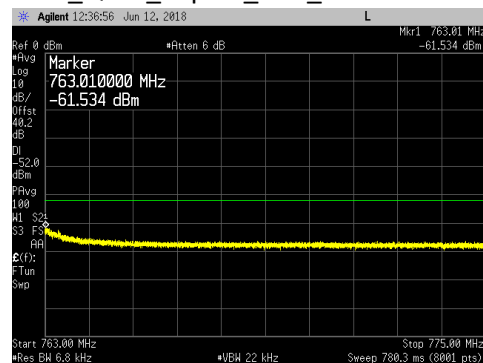
LTE5_QPSK_Top Ch_UBE_755.9MHz to 756.1MHz



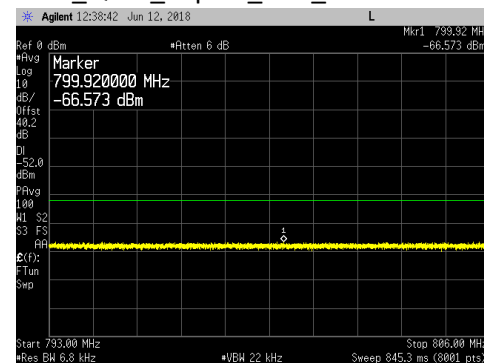
LTE5_QPSK_Top Ch_UBE_754MHz to 826MHz



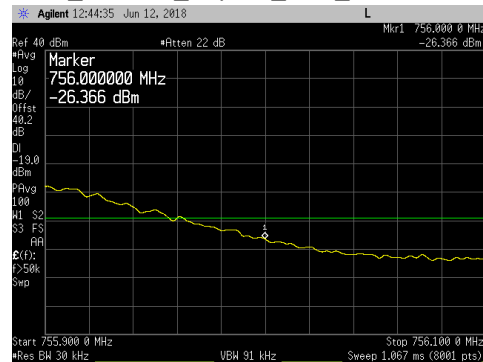
LTE5_QPSK_Top Ch_UBE_763MHz to 775MHz



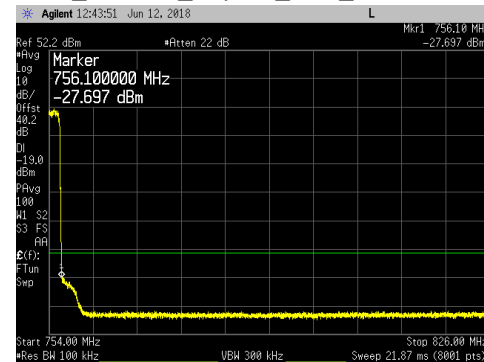
LTE5_QPSK_Top Ch_UBE_793MHz to 806MHz



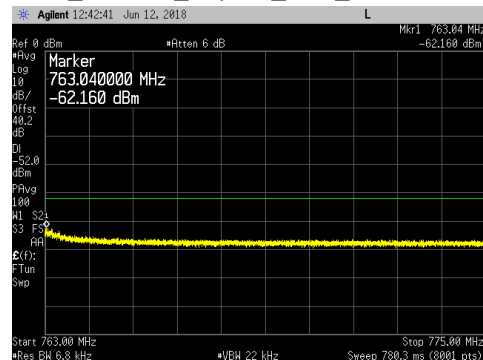
LTE5_16QAM_Top Ch_UBE_755.9MHz to 756.1MHz



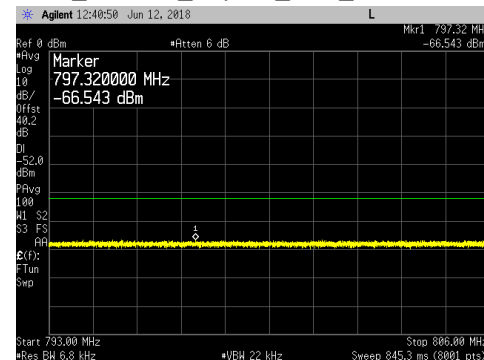
LTE5_16QAM_Top Ch_UBE_754MHz to 826MHz



LTE5_16QAM_Top Ch_UBE_763MHz to 775MHz

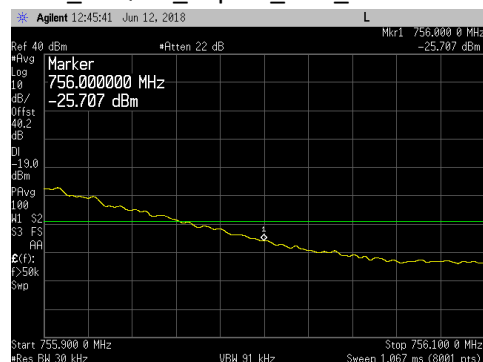


LTE5_16QAM_Top Ch_UBE_793MHz to 806MHz



Band 13 LTE5 40W Carrier Upper Band Edge Plots for Antenna Port 2:

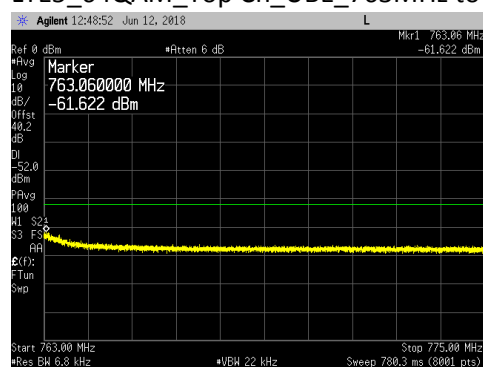
LTE5_64QAM_Top Ch_UBE_755.9MHz to 756.1MHz



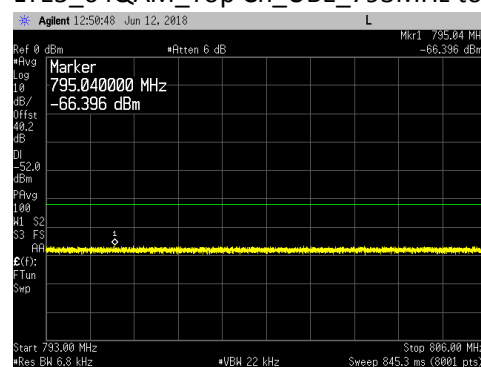
LTE5_64QAM_Top Ch_UBE_754MHz to 826MHz



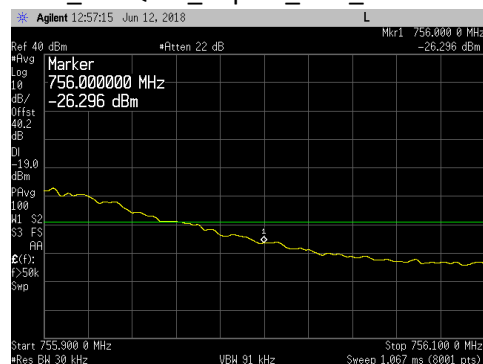
LTE5_64QAM_Top Ch_UBE_763MHz to 775MHz



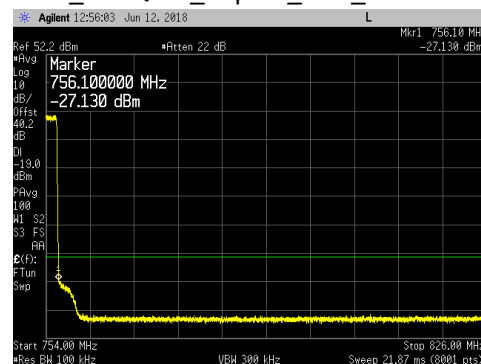
LTE5_64QAM_Top Ch_UBE_793MHz to 806MHz



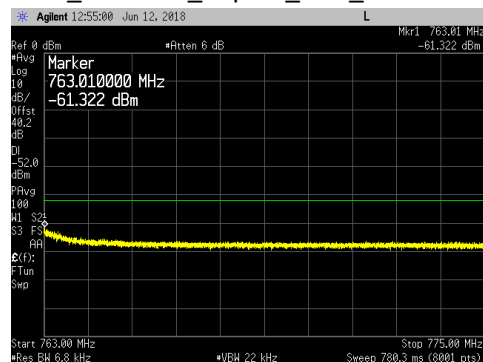
LTE5_256QAM_Top Ch_UBE_755.9MHz to 756.1MHz



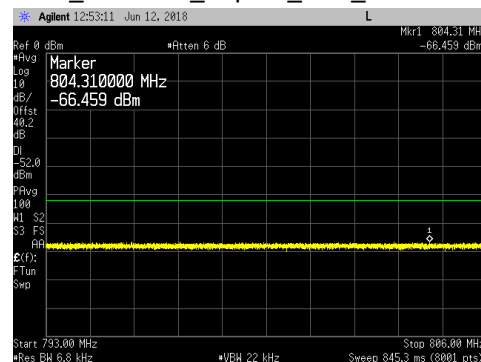
LTE5_256QAM_Top Ch_UBE_754MHz to 826MHz



LTE5_256QAM_Top Ch_UBE_763MHz to 775MHz

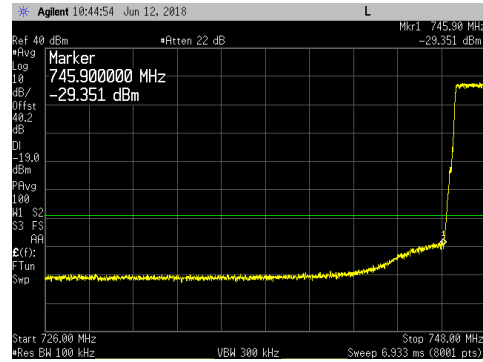


LTE5_256QAM_Top Ch_UBE_793MHz to 806MHz

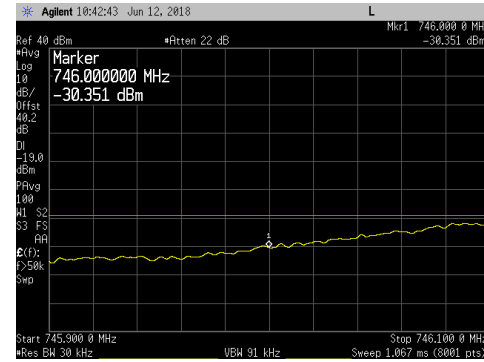


Band 13 LTE10 40W Carrier Lower Band Edge Plots for Antenna Port 2:

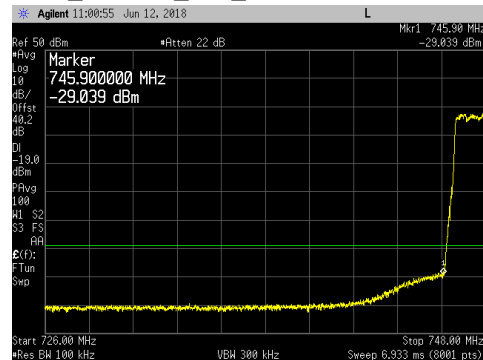
LTE10_QPSK_LBE_726MHz to 748MHz



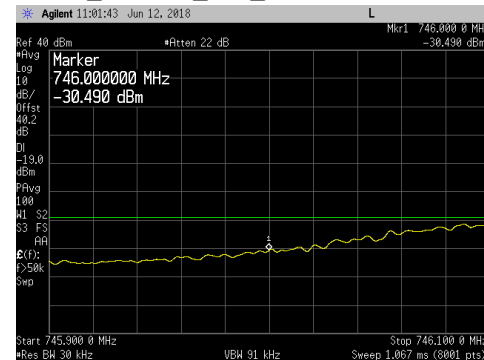
LTE10_QPSK_LBE_745.9MHz to 746.1MHz



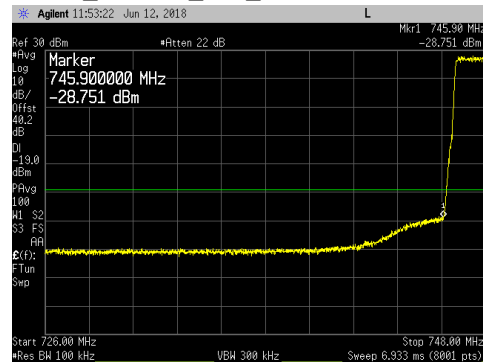
LTE5_16QAM_LBE_726MHz to 748MHz



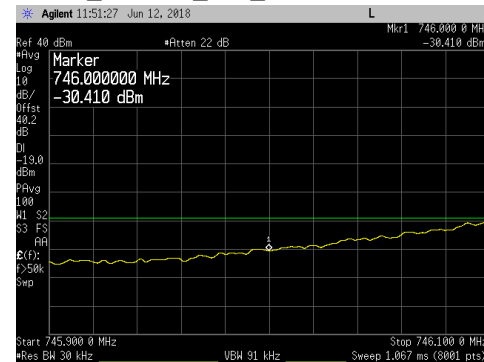
LTE10_16QAM_LBE_745.9MHz to 746.1MHz



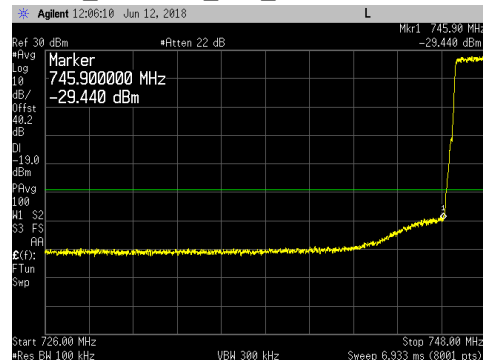
LTE10_64QAM_LBE_726MHz to 748MHz



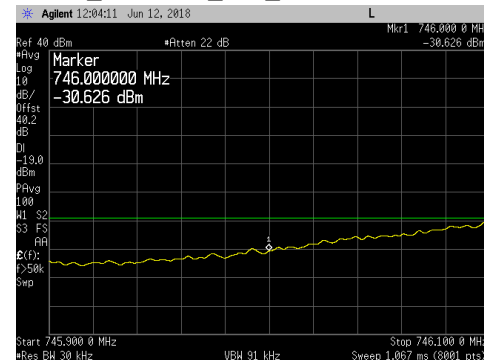
LTE10_64QAM_LBE_745.9MHz to 746.1MHz



LTE10_256QAM_LBE_726MHz to 748MHz

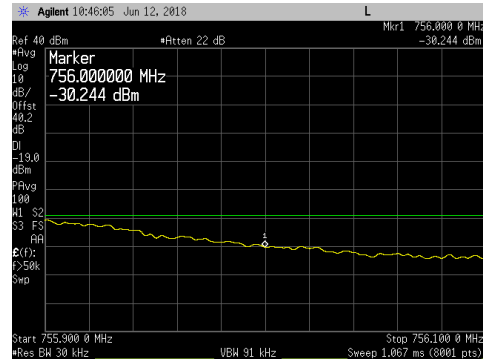


LTE10_256QAM_LBE_745.9MHz to 746.1MHz

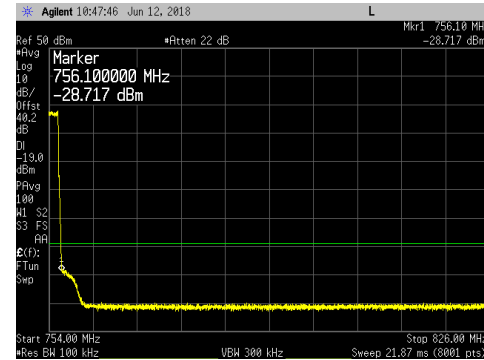


Band 13 LTE10 40W Carrier Upper Band Edge Plots for Antenna Port 2:

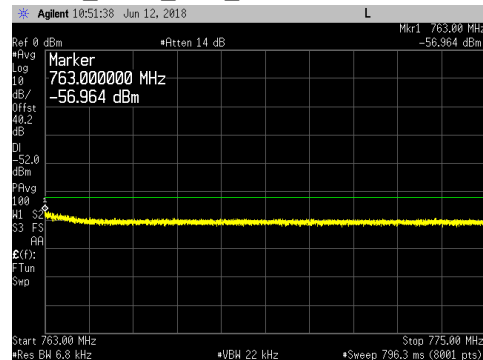
LTE10_QPSK_UBE_755.9MHz to 756.1MHz



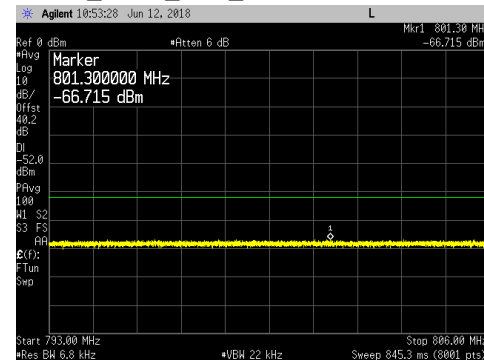
LTE10_QPSK_UBE_754MHz to 826MHz



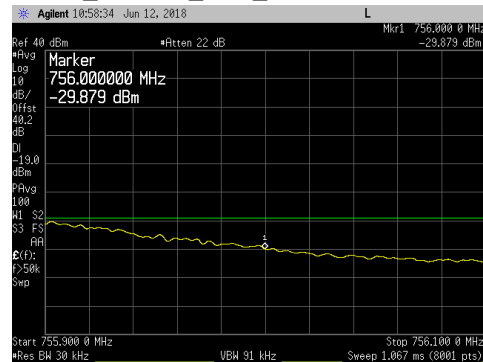
LTE10_QPSK_UBE_763MHz to 775MHz



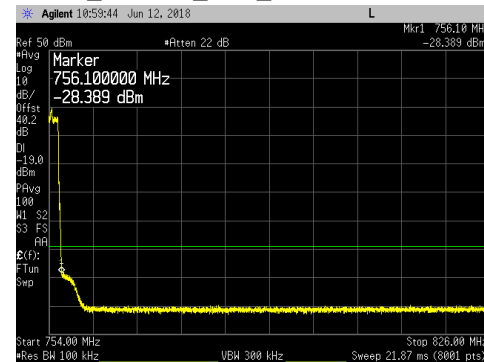
LTE10_QPSK_UBE_793MHz to 806MHz



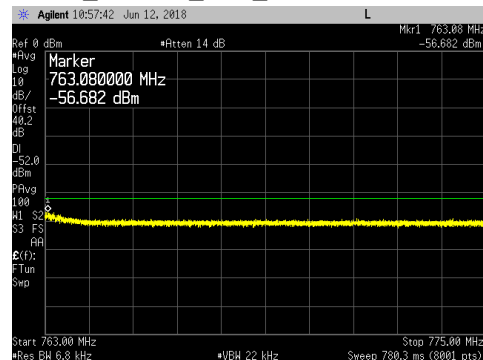
LTE10_16QAM_UBE_755.9MHz to 756.1MHz



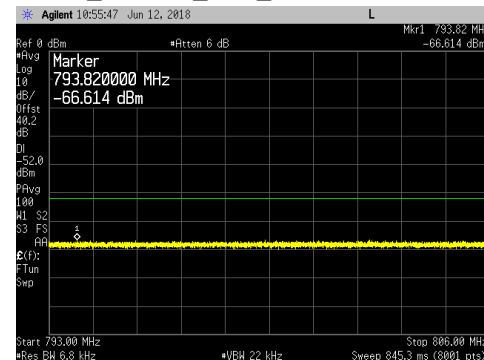
LTE10_16QAM_UBE_754MHz to 826MHz



LTE10_16QAM_UBE_763MHz to 775MHz

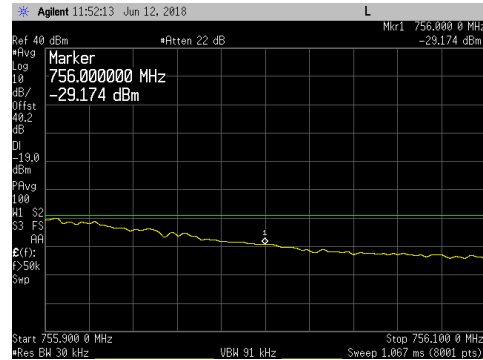


LTE10_16QAM_UBE_793MHz to 806MHz

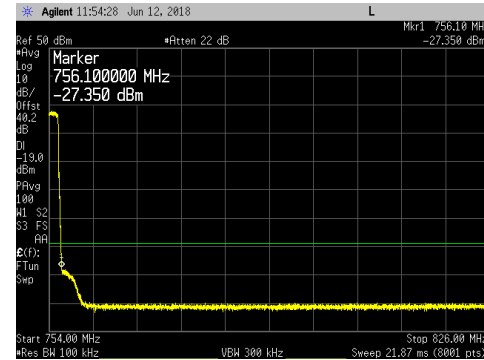


Band 13 LTE10 40W Carrier Upper Band Edge Plots for Antenna Port 2:

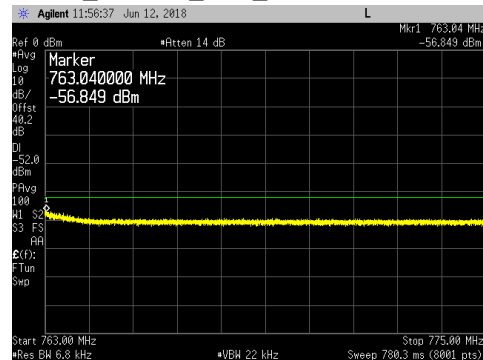
LTE10_64QAM_UBE_755.9MHz to 756.1MHz



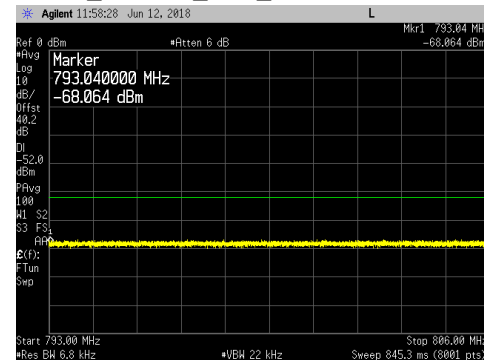
LTE10_64QAM_UBE_754MHz to 826MHz



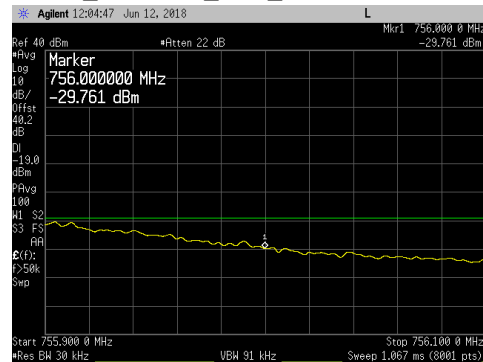
LTE10_64QAM_UBE_763MHz to 775MHz



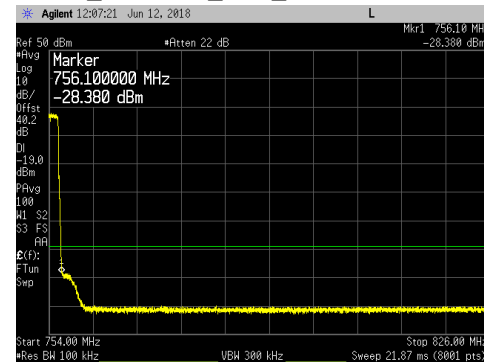
LTE10_64QAM_UBE_793MHz to 806MHz



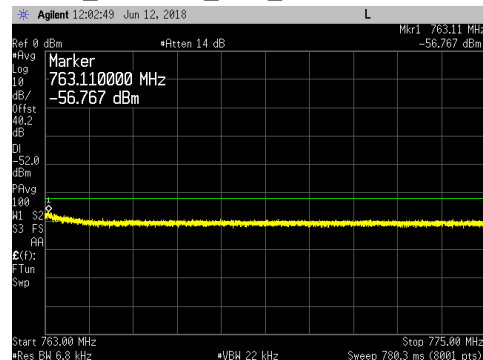
LTE10_256QAM_UBE_755.9MHz to 756.1MHz



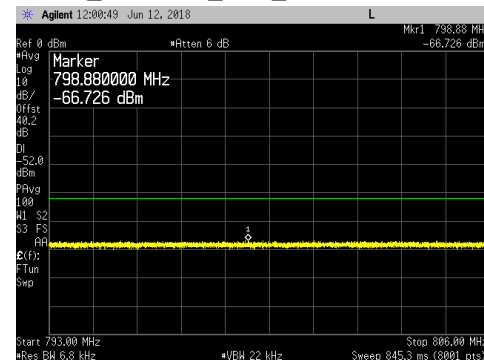
LTE10_256QAM_UBE_754MHz to 826MHz



LTE10_256QAM_UBE_763MHz to 775MHz

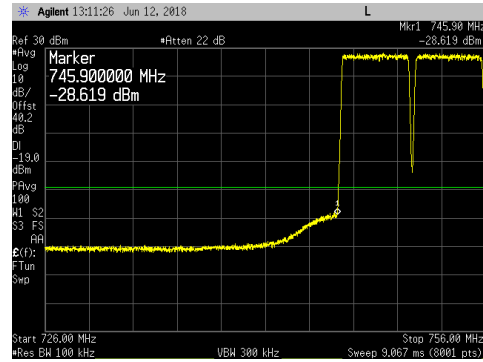


LTE10_256QAM_UBE_793MHz to 806MHz



Band 13 Dual LTE5 20W + 20W Carriers Lower Band Edge Plots for Antenna Port 2:

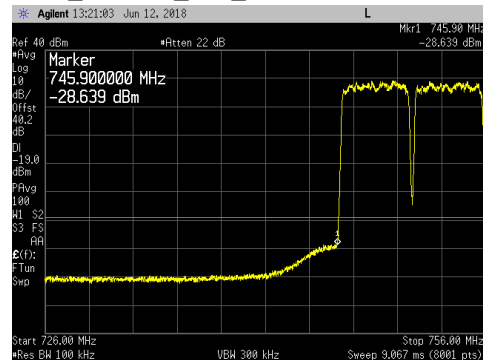
LTE5_QPSK_LBE_726MHz to 756MHz



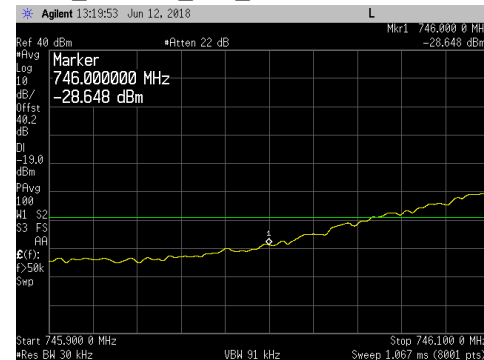
LTE5_QPSK_LBE_745.9MHz to 746.1MHz



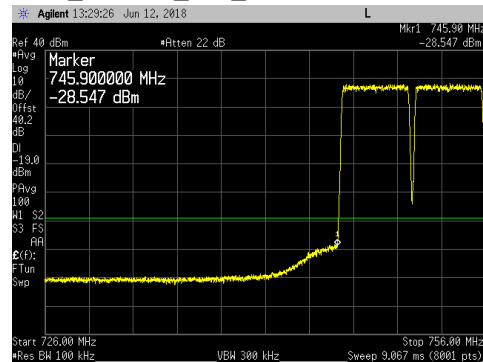
LTE5_16QAM_LBE_726MHz to 756MHz



LTE5_16QAM_LBE_745.9MHz to 746.1MHz



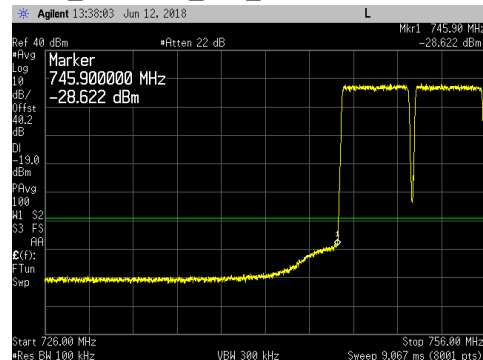
LTE5_64QAM_LBE_726MHz to 756MHz



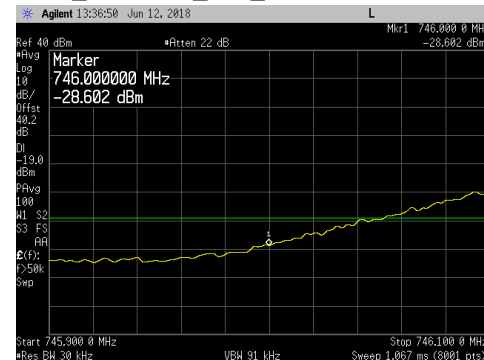
LTE5_64QAM_LBE_745.9MHz to 746.1MHz



LTE5_256QAM_LBE_726MHz to 756MHz



LTE5_256QAM_LBE_745.9MHz to 746.1MHz

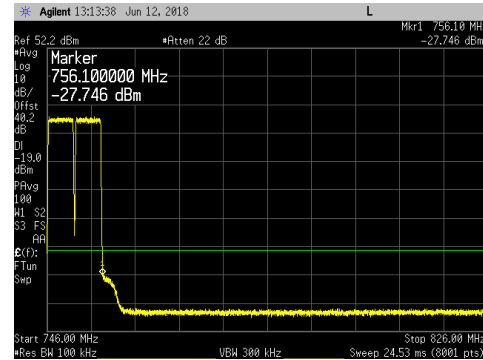


Band 13 Dual LTE5 20W + 20W Carriers Upper Band Edge Plots for Antenna Port 2:

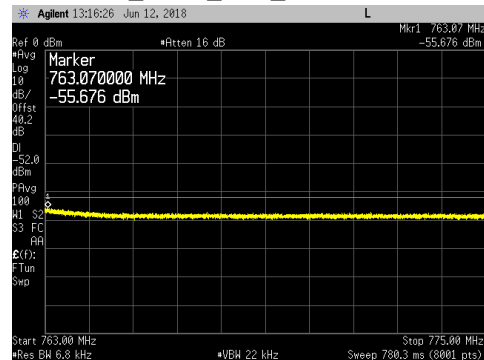
Dual LTE5_QPSK_UBE_755.9-756.1MHz



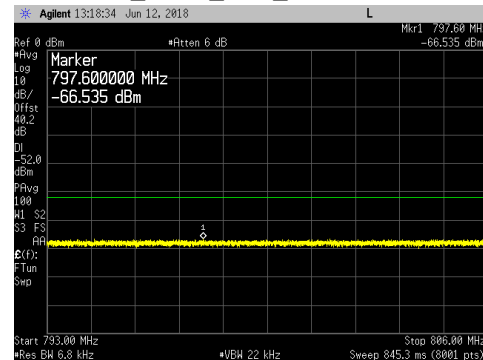
Dual LTE5_QPSK_UBE_746MHz to 826MHz



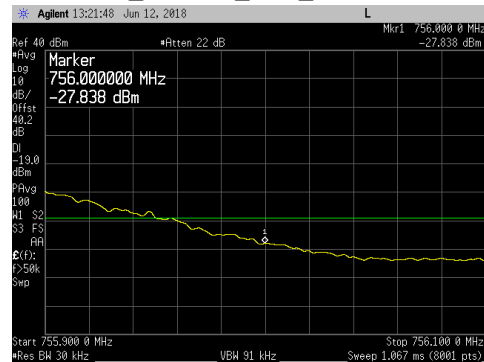
Dual LTE5_QPSK_UBE_763MHz to 775MHz



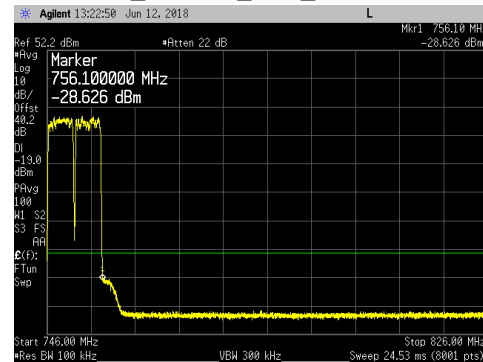
Dual LTE5_QPSK_UBE_793MHz to 806MHz



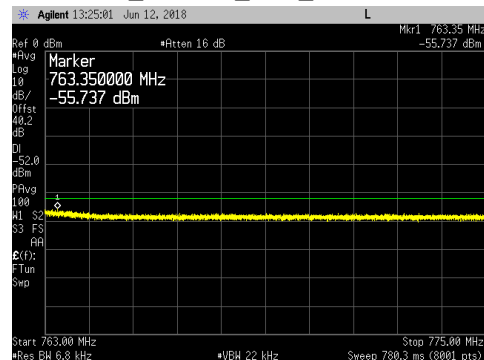
Dual LTE5_16QAM_UBE_755.9-756.1MHz



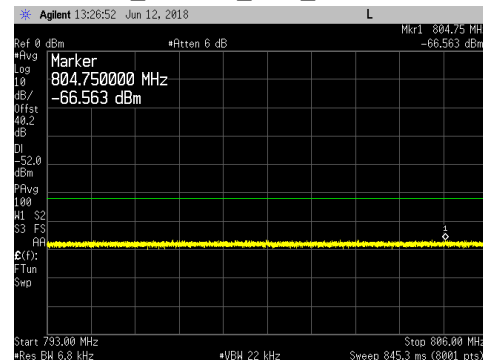
Dual LTE5_16QAM_UBE_746MHz to 826MHz



Dual LTE5_16QAM_UBE_763MHz to 775MHz

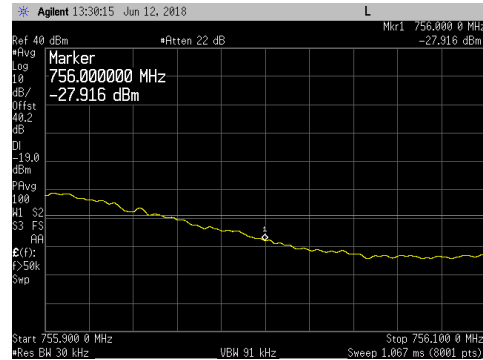


Dual LTE5_16QAM_UBE_793MHz to 806MHz

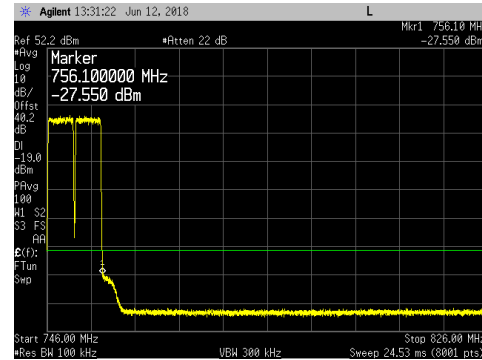


Band 13 Dual LTE5 20W + 20W Carriers Upper Band Edge Plots for Antenna Port 2:

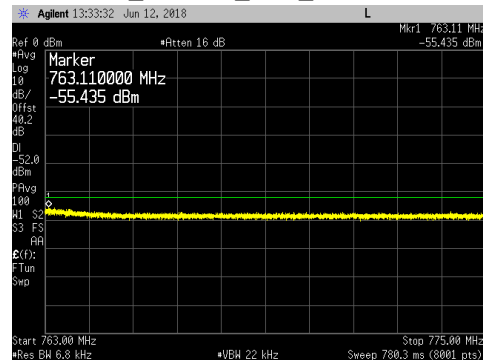
Dual LTE5_64QAM_UBE_755.9-756.1MHz



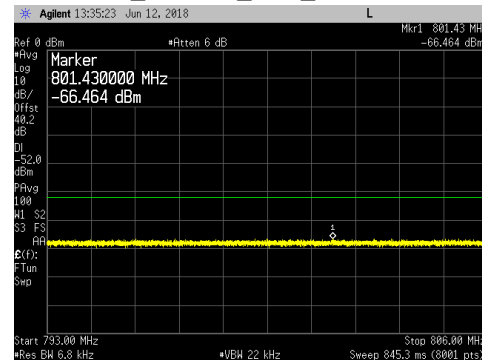
Dual LTE5_64QAM_UBE_746MHz to 826MHz



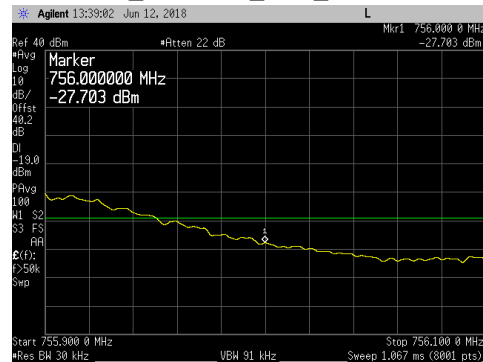
Dual LTE5_64QAM_UBE_763MHz to 775MHz



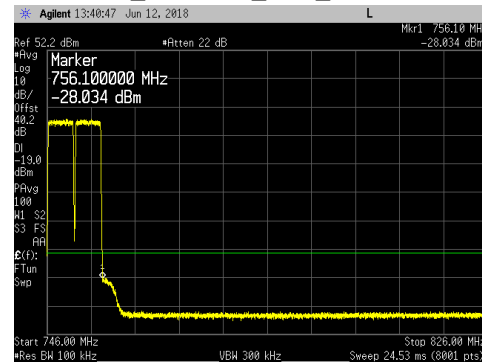
Dual LTE5_64QAM_UBE_793MHz to 806MHz



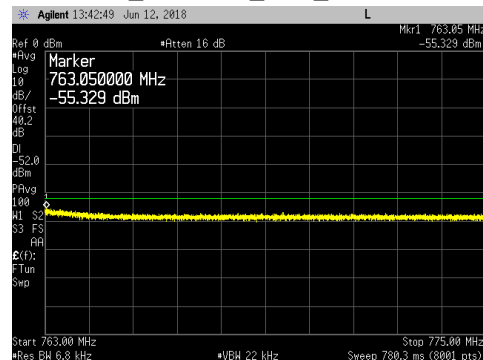
Dual LTE5_256QAM_UBE_755.9-756.1MHz



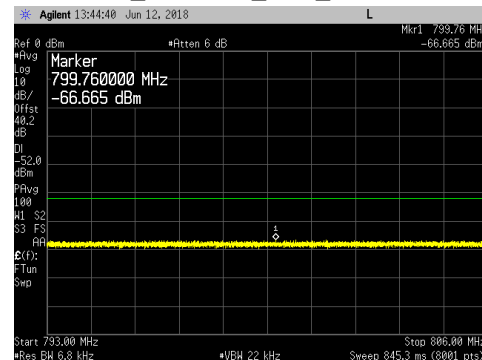
Dual LTE5_256QAM_UBE_746MHz to 826MHz



Dual LTE5_256QAM_UBE_763MHz to 775MHz

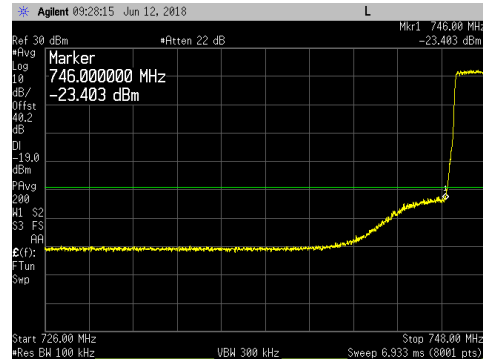


Dual LTE5_256QAM_UBE_793MHz to 806MHz

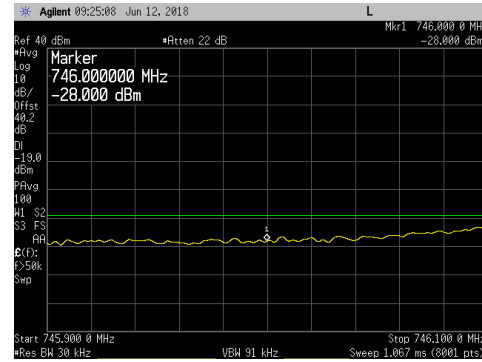


Band 5 LTE1.4 13W + 13W Carriers and Band 13 LTE10 13W Carrier Lower Band Edge Plots for Ant Port 2:

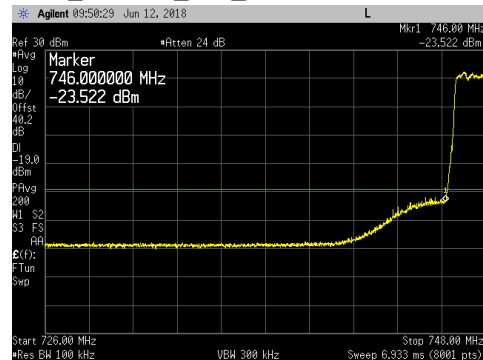
LTE10_QPSK_LBE_726MHz to 748MHz



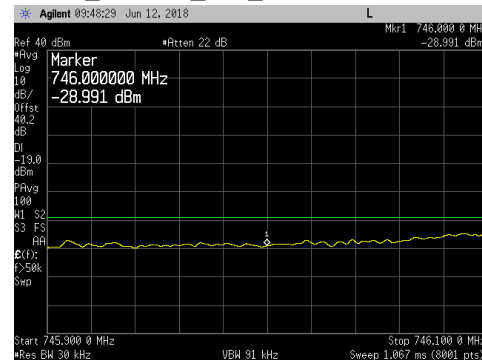
LTE10_QPSK_LBE_745.9MHz to 746.1MHz



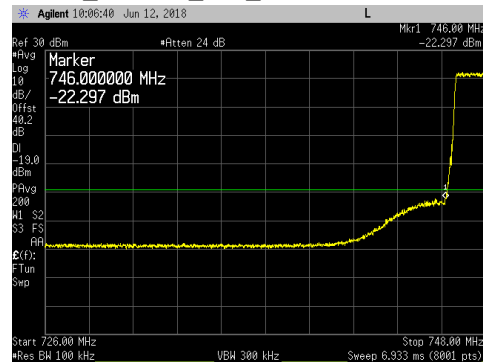
LTE5_16QAM_LBE_726MHz to 748MHz



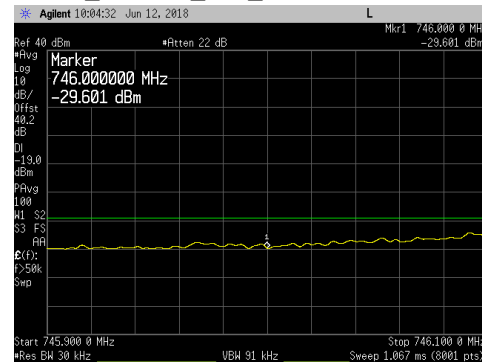
LTE10_16QAM_LBE_745.9MHz to 746.1MHz



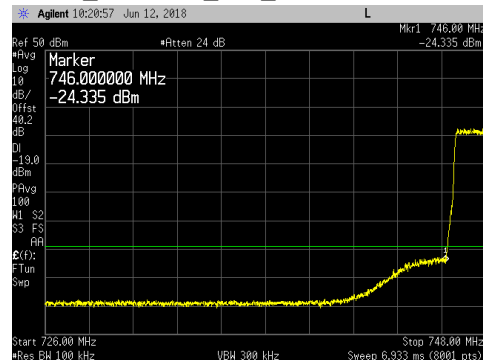
LTE10_64QAM_LBE_726MHz to 748MHz



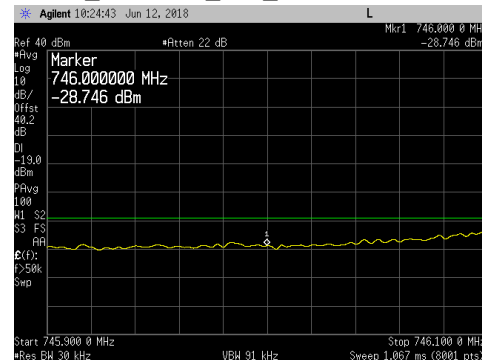
LTE10_64QAM_LBE_745.9MHz to 746.1MHz



LTE10_256QAM_LBE_726MHz to 748MHz

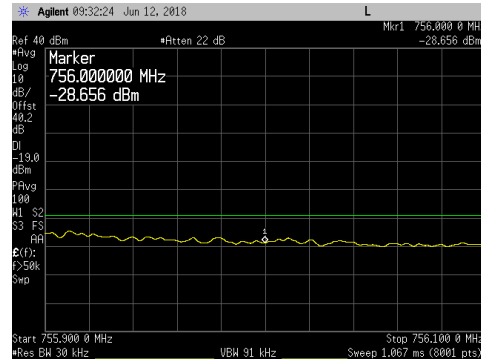


LTE10_256QAM_LBE_745.9MHz to 746.1MHz

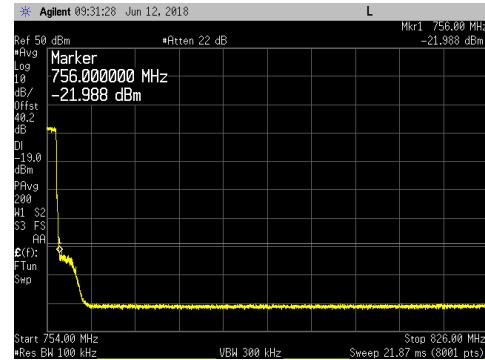


Band 5 LTE1.4 13W + 13W Carriers and Band 13 LTE10 13W Carrier Upper Band Edge Plots for Ant Port 2:

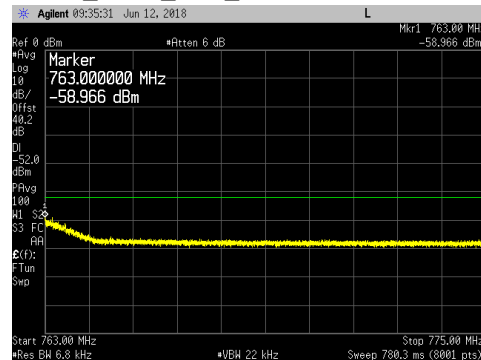
LTE10_QPSK_UBE_755.9MHz to 756.1MHz



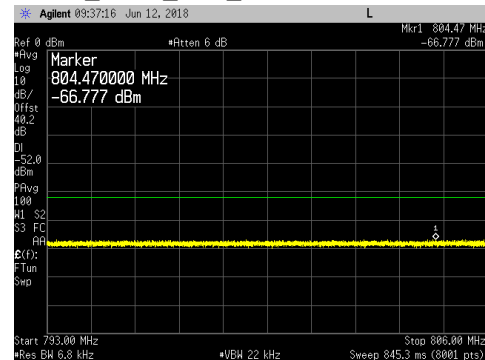
LTE10_QPSK_UBE_754Mhz to 826MHz



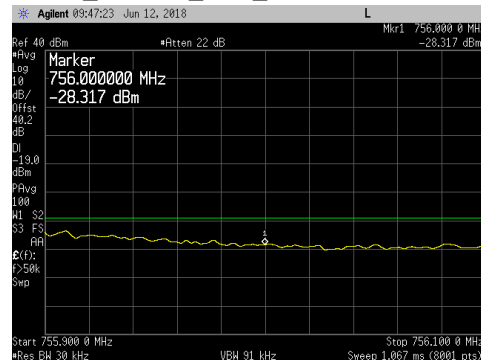
LTE10_QPSK_UBE_763MHz to 775MHz



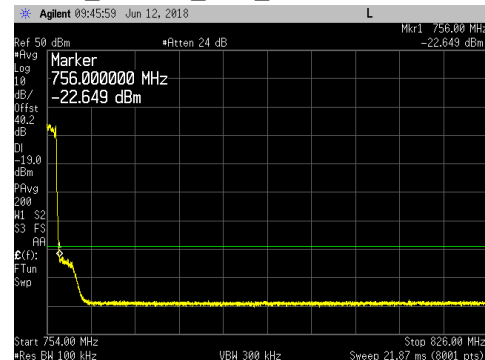
LTE10_QPSK_UBE_793MHz to 806MHz



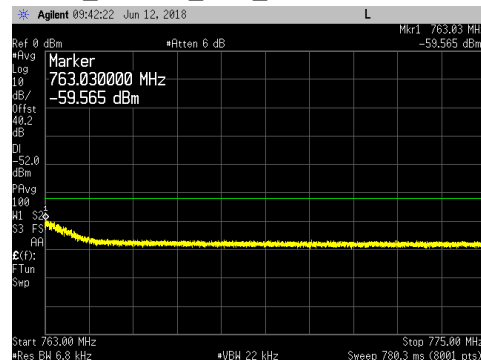
LTE10_16QAM_UBE_755.9MHz to 756.1MHz



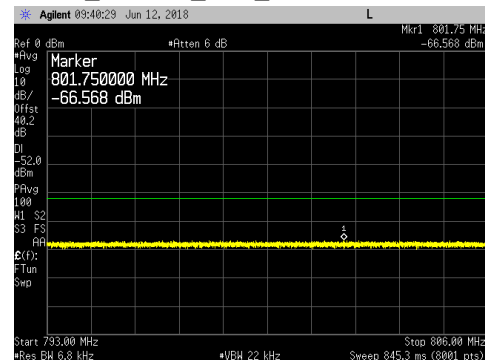
LTE10_16QAM_UBE_754Mhz to 826MHz



LTE10_16QAM_UBE_763MHz to 775MHz

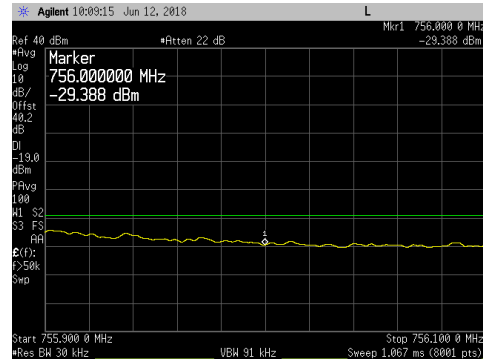


LTE10_16QAM_UBE_793MHz to 806MHz

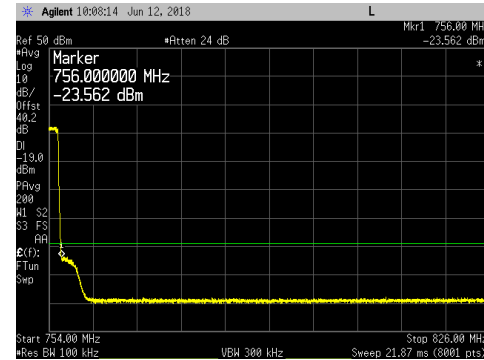


Band 5 LTE1.4 13W + 13W Carriers and Band 13 LTE10 13W Carrier Upper Band Edge Plots for Antenna Port 4:

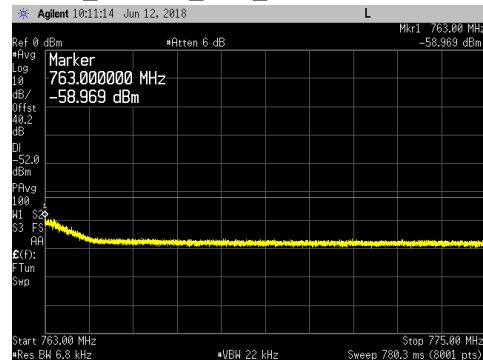
LTE10_64QAM_UBE_755.9MHz to 756.1MHz



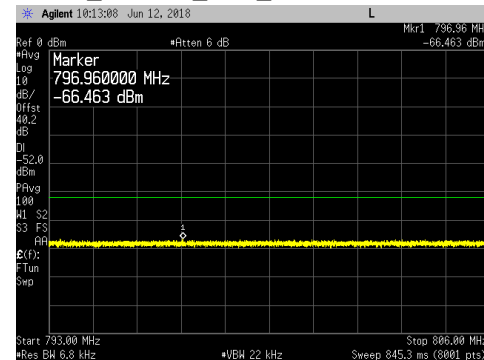
LTE10_64QAM_UBE_754MHz to 826MHz



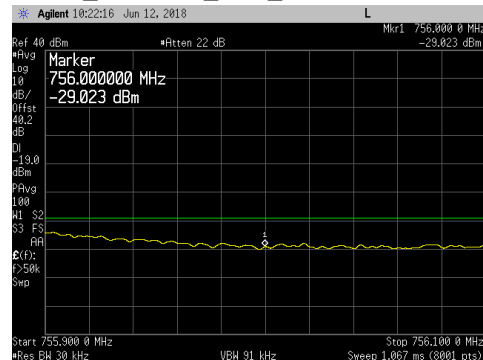
LTE10_64QAM_UBE_763MHz to 775MHz



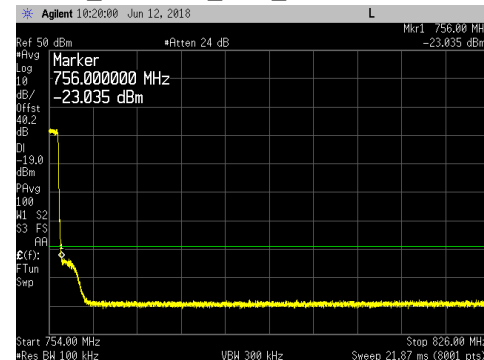
LTE10_64QAM_UBE_793MHz to 806MHz



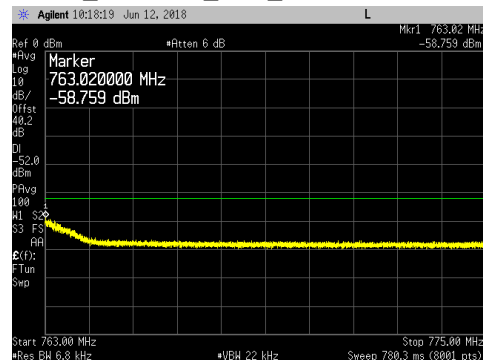
LTE10_256QAM_UBE_755.9MHz to 756.1MHz



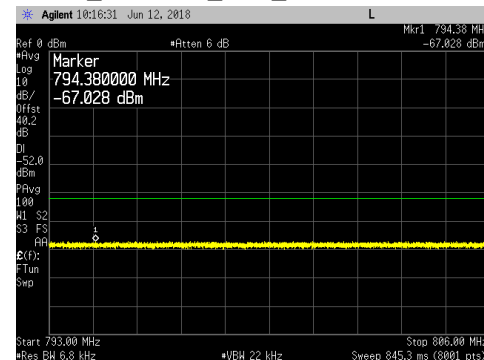
LTE10_256QAM_UBE_754MHz to 826MHz



LTE10_256QAM_UBE_763MHz to 775MHz



LTE10_256QAM_UBE_793MHz to 806MHz



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. Two test configurations are needed for conducted spurious emission measurements to prove compliance for the 3GPP Band 13 transmitters. The first test will be single band operation where the 3GPP Band 13 transmitters are enabled at 40 watts per carrier on the middle channel (the 3GPP Band 5 transmitters will not be enabled). The second test will be with the 3GPP Band 5 and the 3GPP Band 13 transmitters enabled simultaneously at 40 watts/antenna port. The multicarrier test cases are based upon KDB 971168 D03v01 requirements using three carriers (Note that only two LTE5 carriers are available for Band 13).

The RRH was operated (on Band 5 and Band 13) with all LTE modulation types (QPSK, 16QAM, 64QAM and 256QAM) for all available LTE bandwidths (Band 5: 1.4MHz, 3MHz, 5MHz and 10MHz; Band 13: 5MHz and 10MHz). The same LTE bandwidth was used for both frequency bands when available. If the same LTE bandwidth for both bands was not available then the smallest LTE bandwidth was used.

The test configuration parameters are provided below:

3GPP Band 5 Transmission Parameters			3GPP Band 13 Transmission Parameters		
Carrier Frequency	Channel Bandwidth	Carrier Power	Carrier Frequency	Channel Bandwidth	Carrier Power
881.5MHz (Mid Ch)	N/A	0 Watts	751MHz (Mid Ch)	LTE5	40 Watts
881.5MHz (Mid Ch)	N/A	0 Watts	751MHz (Mid Ch)	LTE10	40 Watts
881.5MHz (Mid Ch)	N/A	0 Watts	748.5 and 735.5 (BC and TC)	LTE5 and LTE5	20+20 Watts
881.5MHz (Mid Ch)	LTE1.4	20 Watts	751MHz (Mid Ch)	LTE5	20 Watts
881.5MHz (Mid Ch)	LTE3	20 Watts	751MHz (Mid Ch)	LTE5	20 Watts
881.5MHz (Mid Ch)	LTE5	20 Watts	751MHz (Mid Ch)	LTE5	20 Watts
881.5MHz (Mid Ch)	LTE10	20 Watts	751MHz (Mid Ch)	LTE10	20 Watts
892.9 and 893.3MHz (TC-1 and TC)	LTE1.4	13+13 Watts	751MHz (Mid Ch)	LTE10	13 Watts

Note that the conducted spurious emission plots/measurement results for the second test with the 3GPP Band 5 and the 3GPP Band 13 carriers enabled simultaneously are in Appendix A.

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 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 max hold over 50 sweeps (except for the 700MHz to 1100MHz frequency range). Measurements for the 700MHz to 1100MHz 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.: $-39\text{dBm} = -19\text{dBm} - 10\log(100\text{kHz}/1\text{kHz})$]. The required limit of -19dBm with a RBW of $\geq 100\text{kHz}$ was used for all other frequency ranges. The spectrum analyzer settings that were used for this test are summarized in the following table.

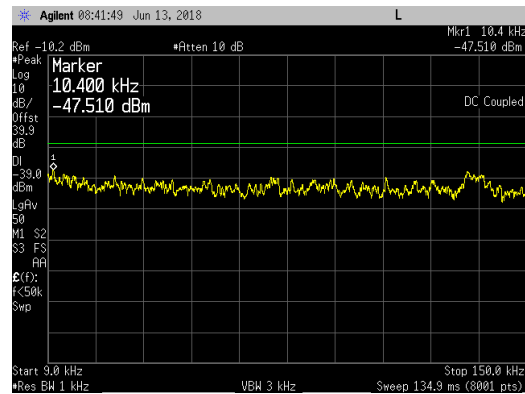
Frequency Range	RBW	VBW	Number of Data Points	Detector	Sweep Time	Max Hold over	Offset Note 1
9kHz to 150kHz	1kHz	3kHz	8001	Peak	Auto	50 Sweeps	39.9dB
150kHz to 20MHz	100kHz	300kHz	8001	Peak	Auto	50 Sweeps	40.0dB
20MHz to 700MHz	300kHz	910kHz	8001	Peak	Auto	50 Sweeps	40.2dB
700MHz to 1.1GHz	100kHz	300kHz	8001	Average	Auto	Note 2	40.2dB
1.1GHz to 9GHz	2MHz	6MHz	8001	Peak	Auto	50 Sweeps	22.5dB
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.

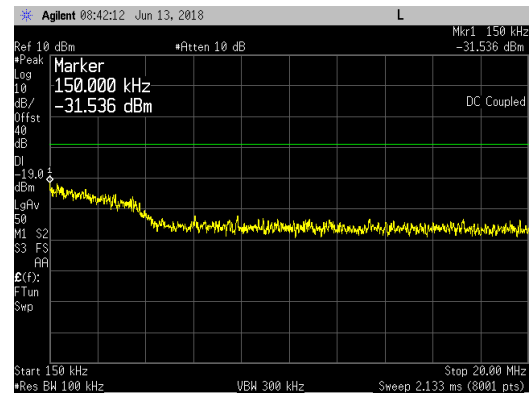
Conducted spurious emission plots/measurements are provided in the following pages.

Band 13 LTE5 Ch BW _ QPSK _ Middle Channel (751MHz) at 40 watts/carrier:

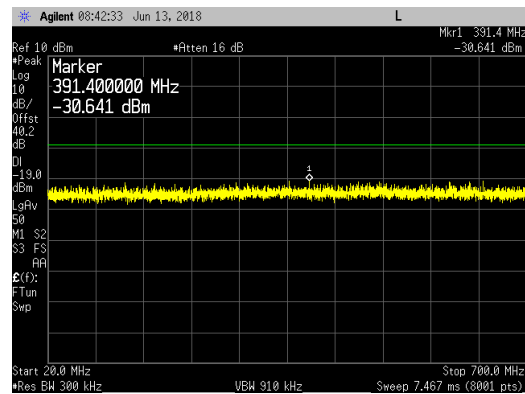
9kHz to 150kHz



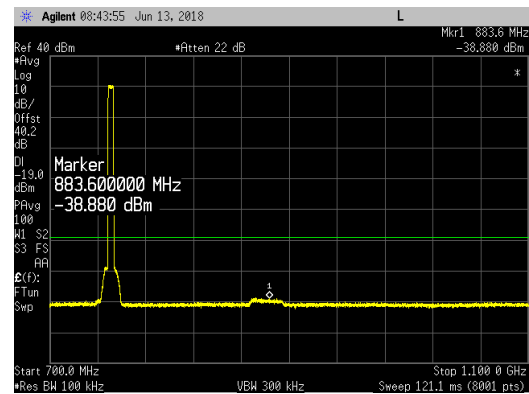
150kHz to 20MHz



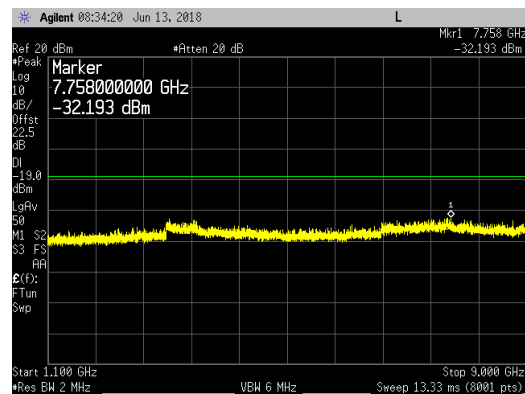
20MHz to 700MHz



700MHz to 1.1GHz

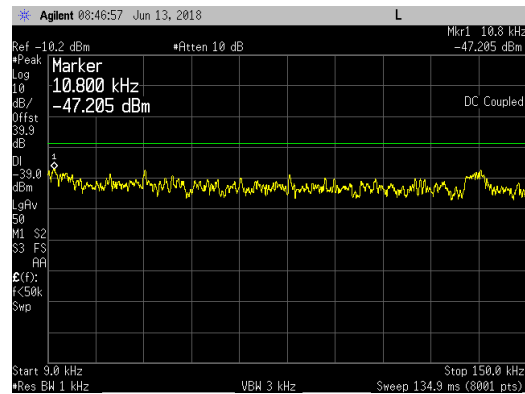


1.1GHz to 9GHz

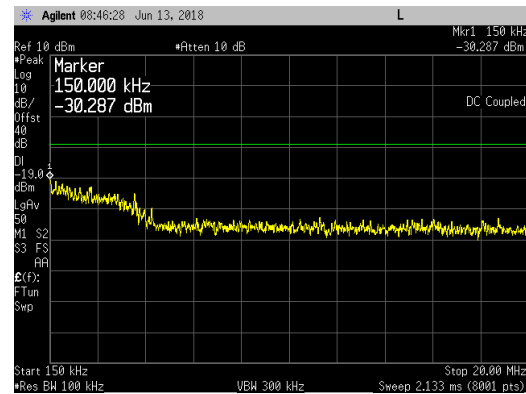


Band 13 LTE5 Ch BW _ 16QAM _ Middle Channel (751MHz) at 40 watts/carrier:

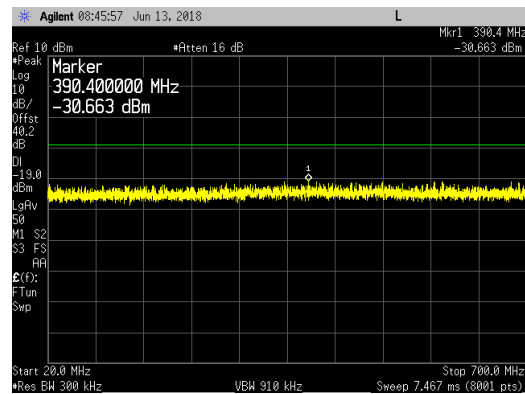
9kHz to 150kHz



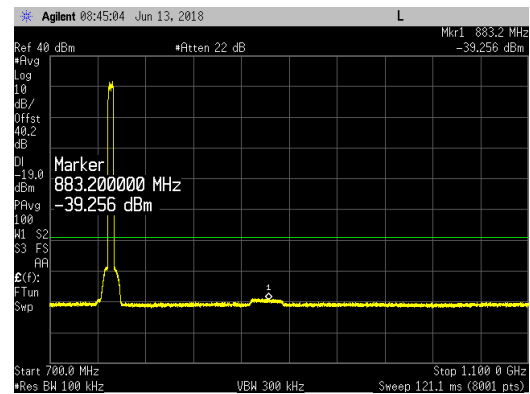
150kHz to 20MHz



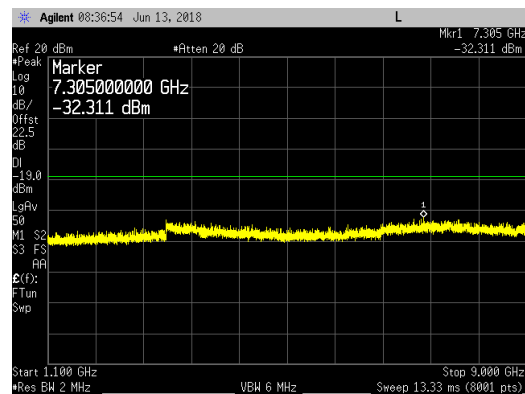
20MHz to 700MHz



700MHz to 1.1GHz

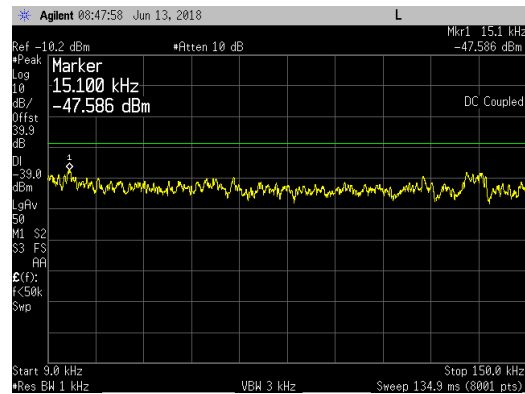


1.1GHz to 9GHz

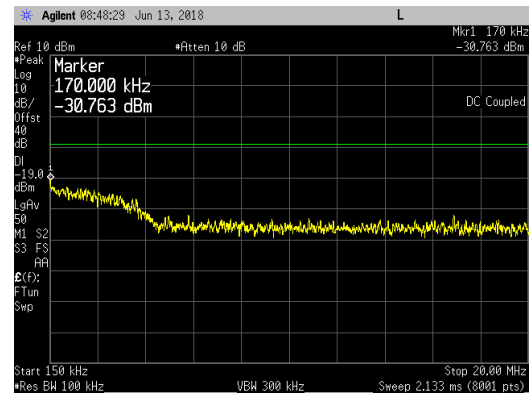


Band 13 LTE5 Ch BW _ 64QAM _ Middle Channel (751MHz) at 40 watts/carrier:

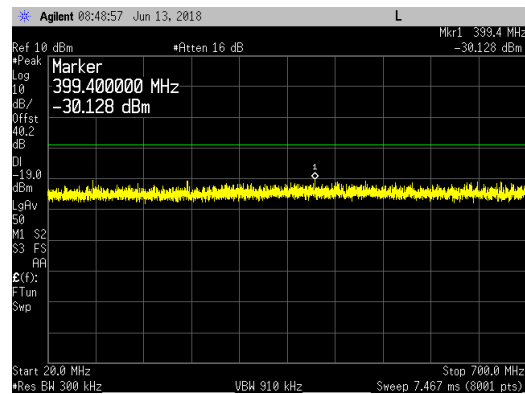
9kHz to 150kHz



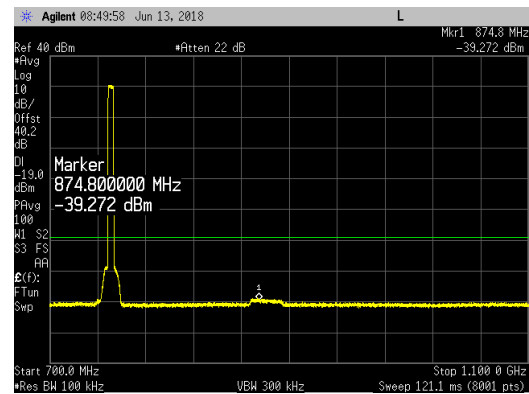
150kHz to 20MHz



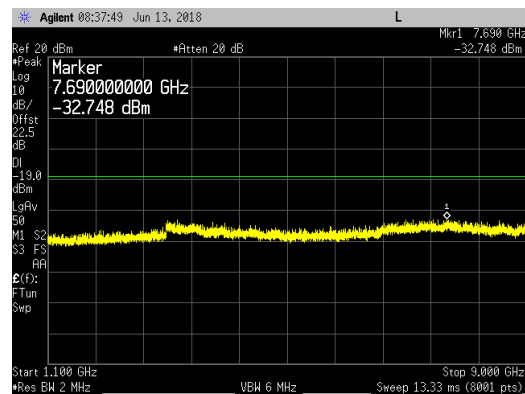
20MHz to 700MHz



700MHz to 1.1GHz

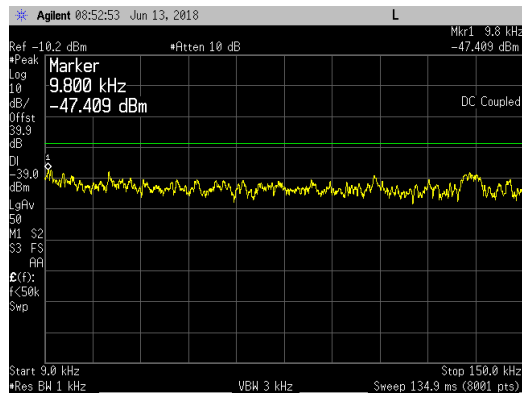


1.1GHz to 9GHz

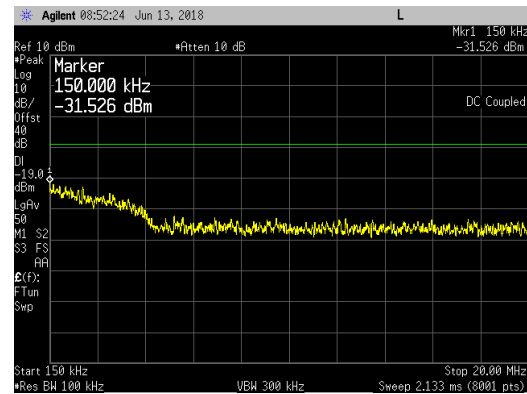


Band 13 LTE5 Ch BW _ 256QAM _ Middle Channel (751MHz) at 40 watts/carrier:

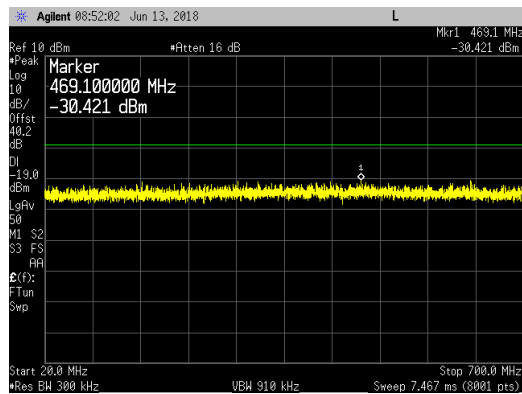
9kHz to 150kHz



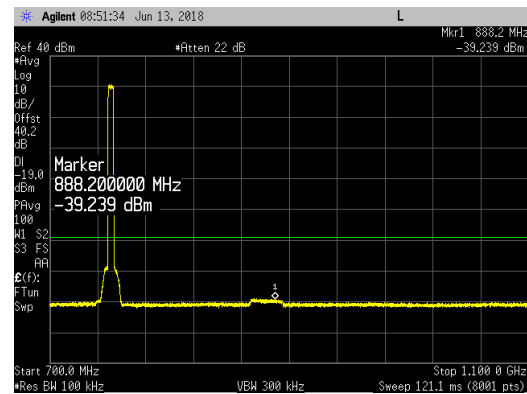
150kHz to 20MHz



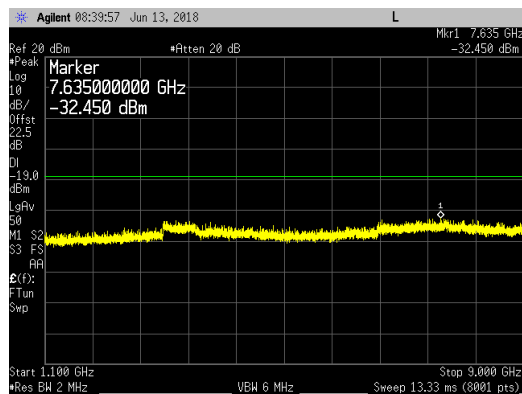
20MHz to 700MHz



700MHz to 1.1GHz

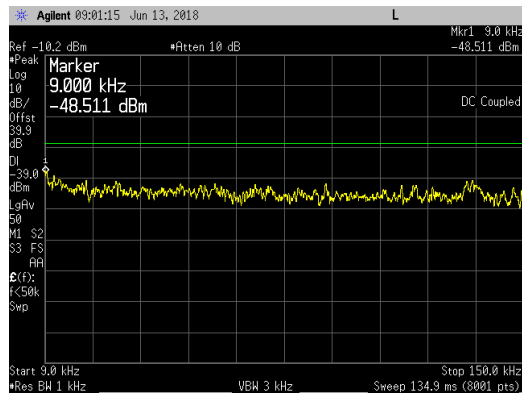


1.1GHz to 9GHz

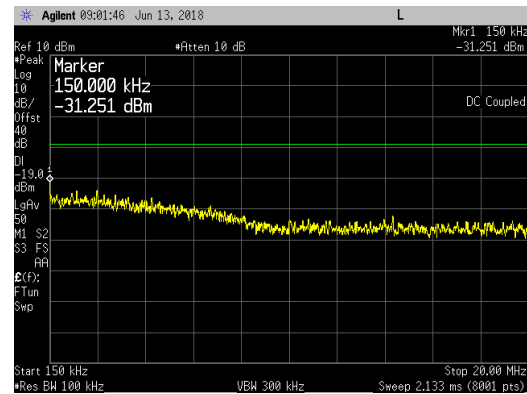


Band 13 LTE10 Ch BW _ QPSK _ Middle Channel (751MHz) at 40 watts/carrier:

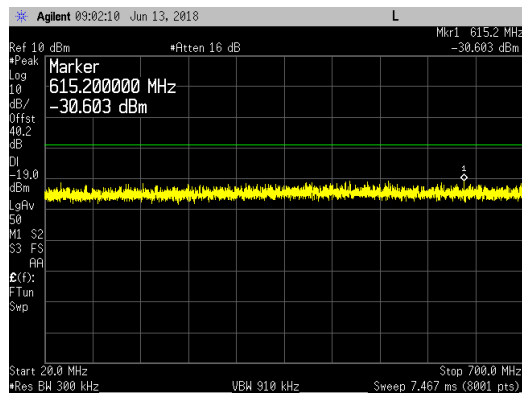
9kHz to 150kHz



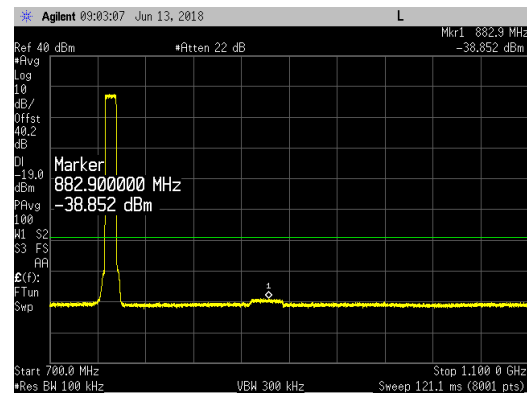
150kHz to 20MHz



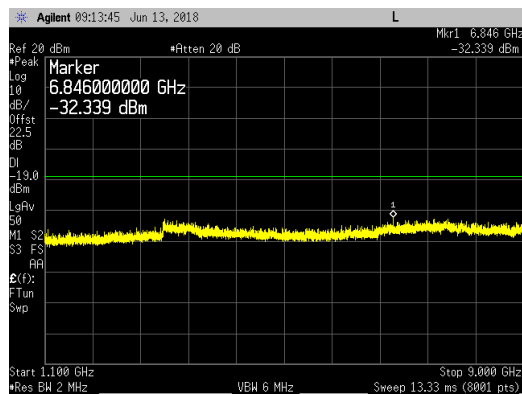
20MHz to 700MHz



700MHz to 1.1GHz

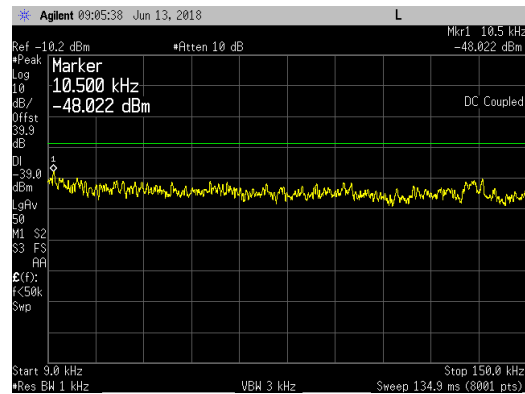


1.1GHz to 9GHz

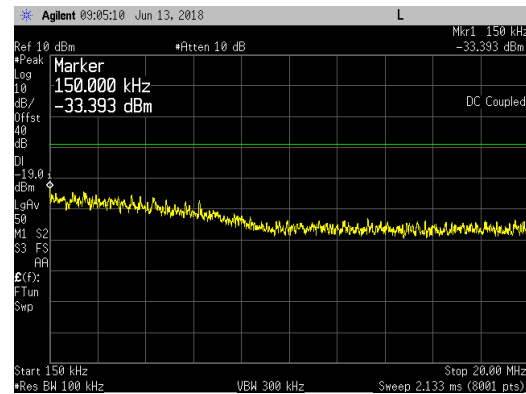


Band 13 LTE10 Ch BW _ 16QAM _ Middle Channel (751MHz) at 40 watts/carrier:

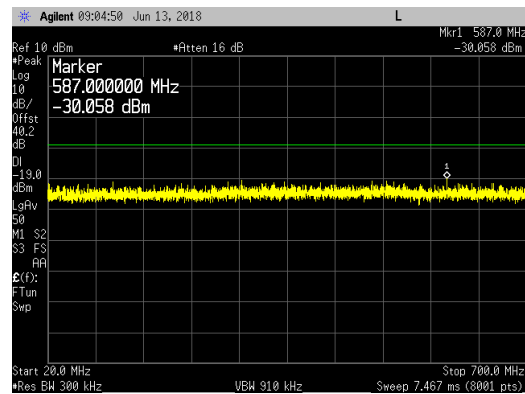
9kHz to 150kHz



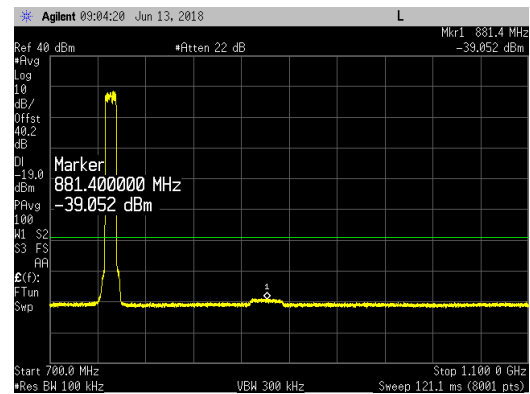
150kHz to 20MHz



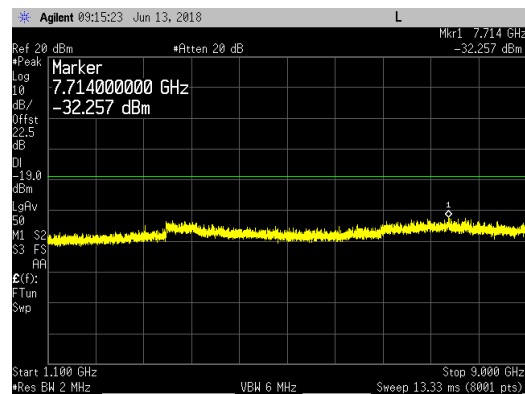
20MHz to 700MHz



700MHz to 1.1GHz

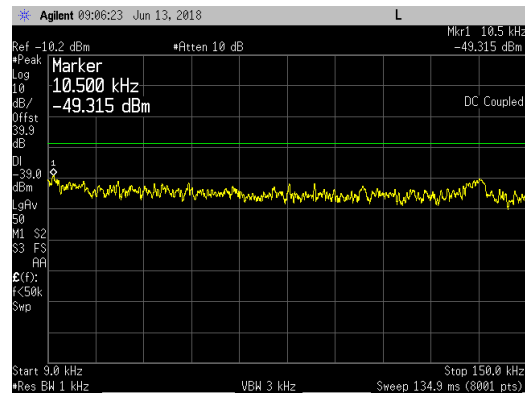


1.1GHz to 9GHz

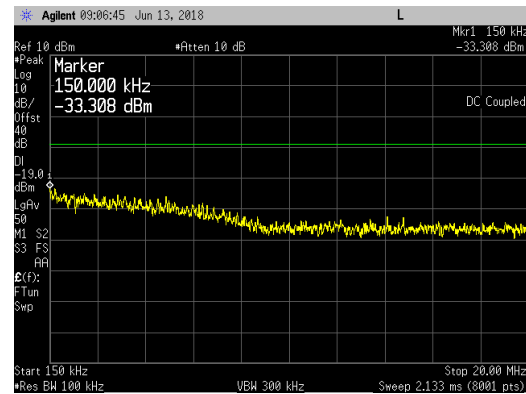


Band 13 LTE10 Ch BW _ 64QAM _ Middle Channel (751MHz) at 40 watts/carrier:

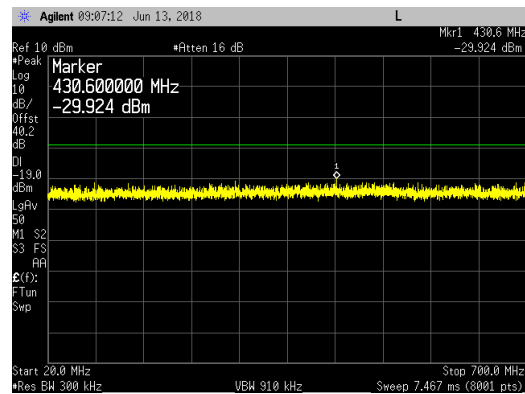
9kHz to 150kHz



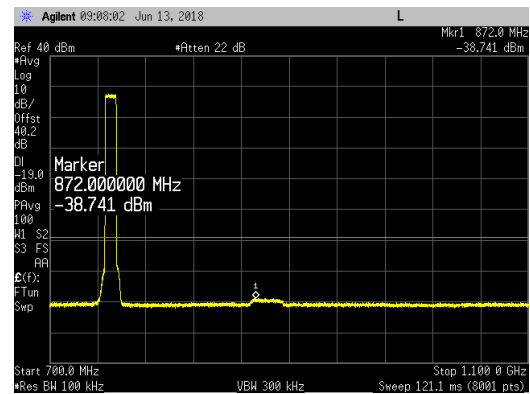
150kHz to 20MHz



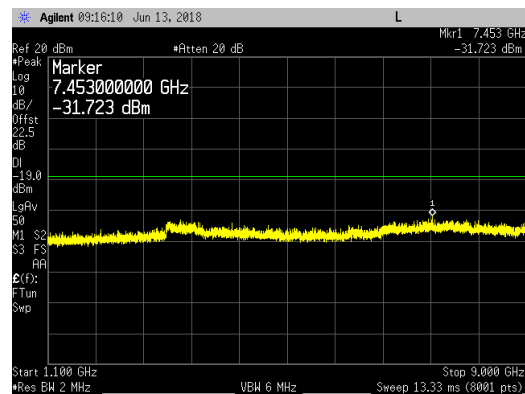
20MHz to 700MHz



700MHz to 1.1GHz

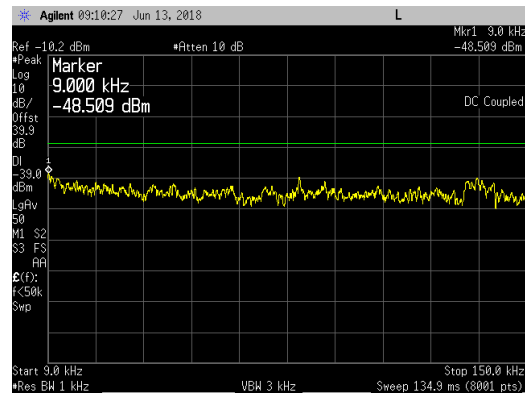


1.1GHz to 9GHz

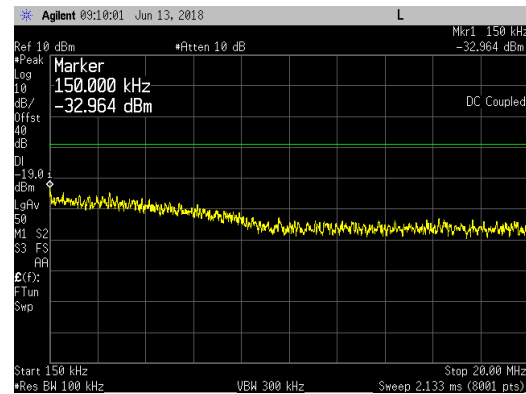


Band 13 LTE10 Ch BW _ 256QAM _ Middle Channel (751MHz) at 40 watts/carrier:

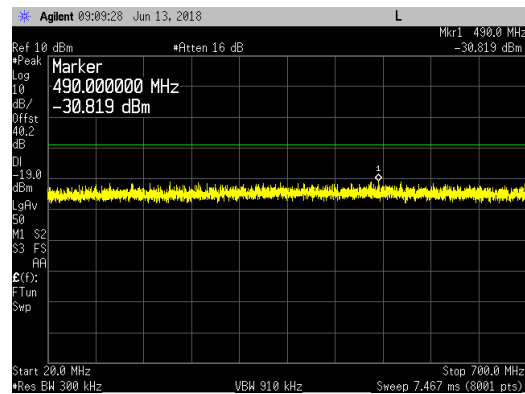
9kHz to 150kHz



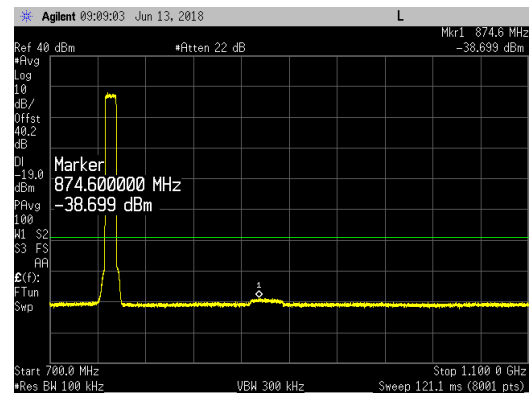
150kHz to 20MHz



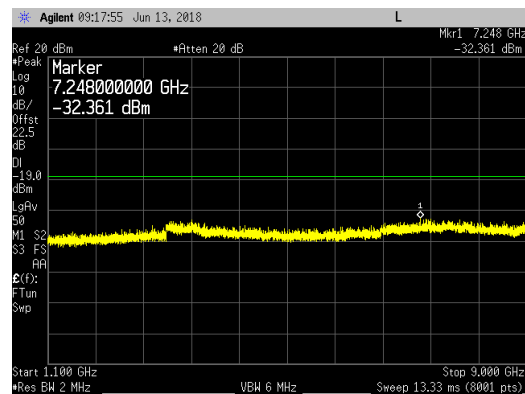
20MHz to 700MHz



700MHz to 1.1GHz

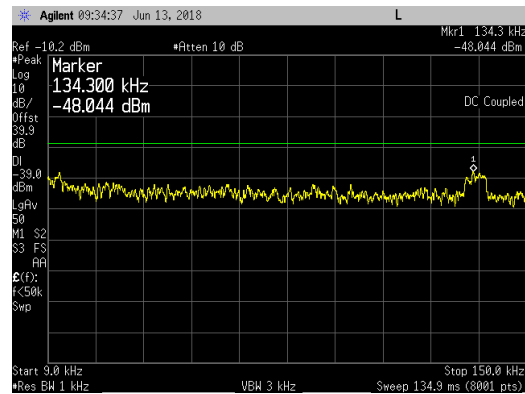


1.1GHz to 9GHz

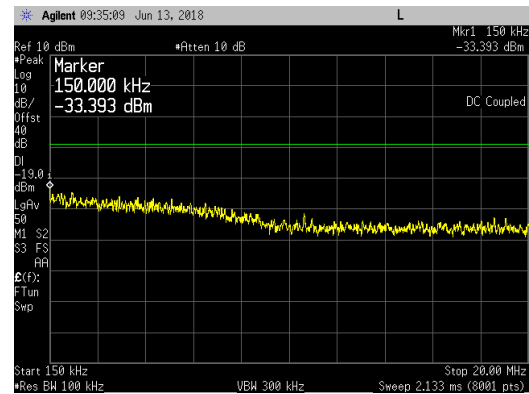


Band 13 LTE5 Ch BW _ QPSK _ BC & TC (748.5 & 753.5MHz) at 20 watts/carrier:

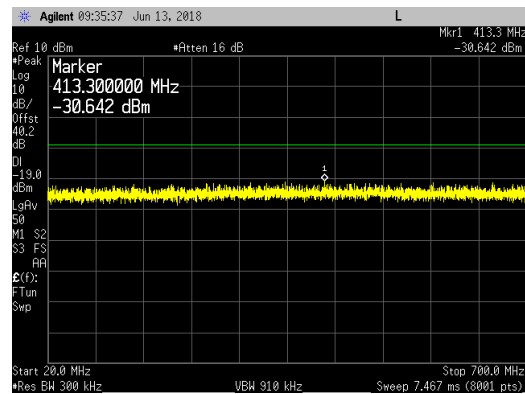
9kHz to 150kHz



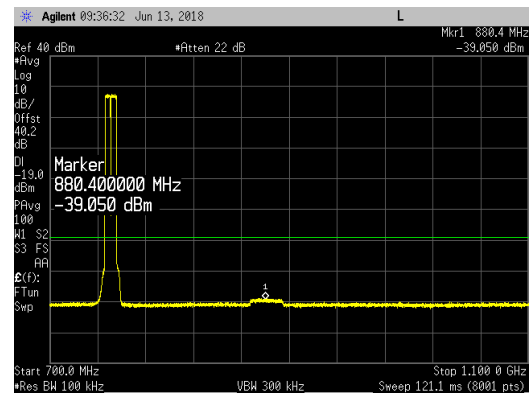
150kHz to 20MHz



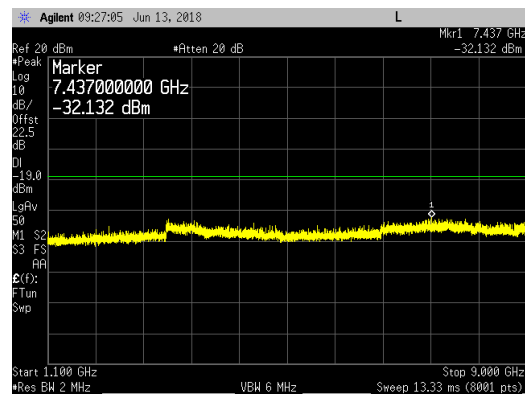
20MHz to 700MHz



700MHz to 1.1GHz

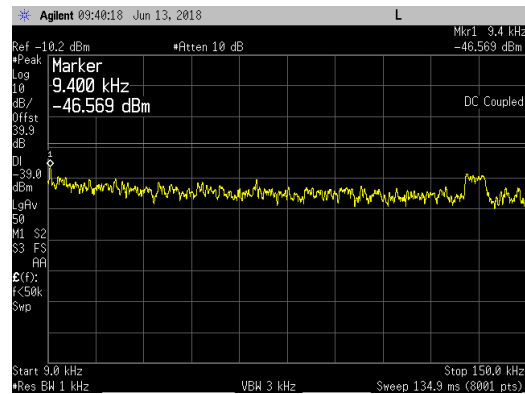


1.1GHz to 9GHz

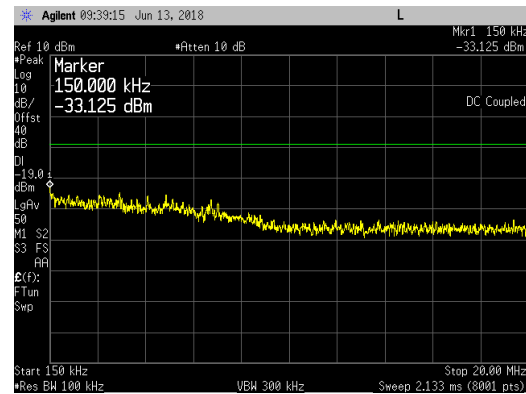


Band 13 LTE5 Ch BW _ 16QAM_BC & TC (748.5 & 753.5MHz) at 20 watts/carrier:

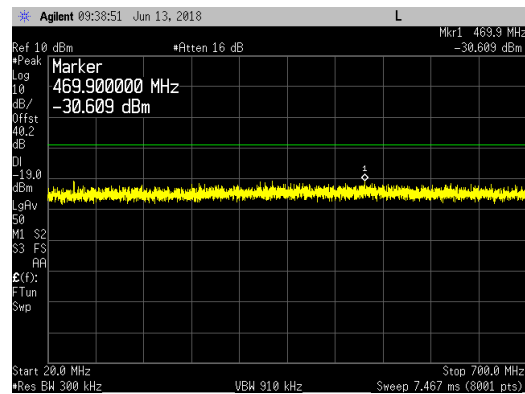
9kHz to 150kHz



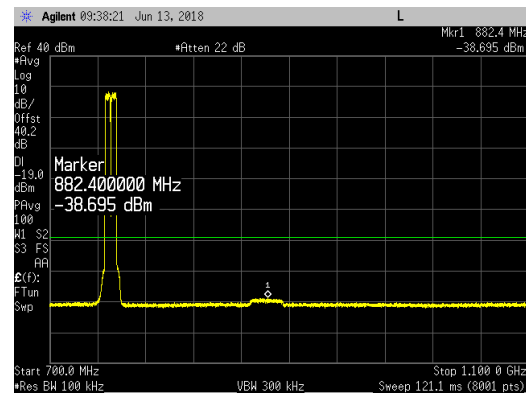
150kHz to 20MHz



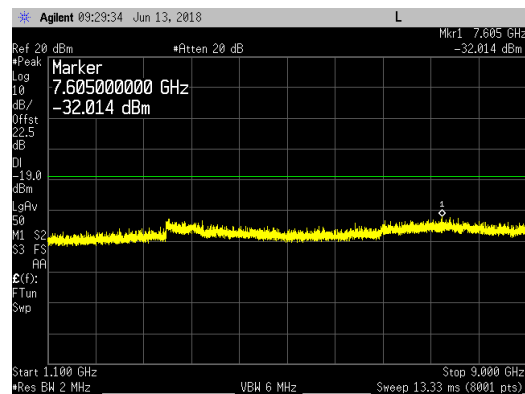
20MHz to 700MHz



700MHz to 1.1GHz

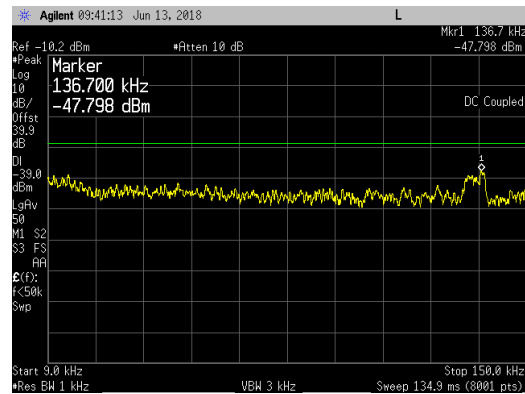


1.1GHz to 9GHz

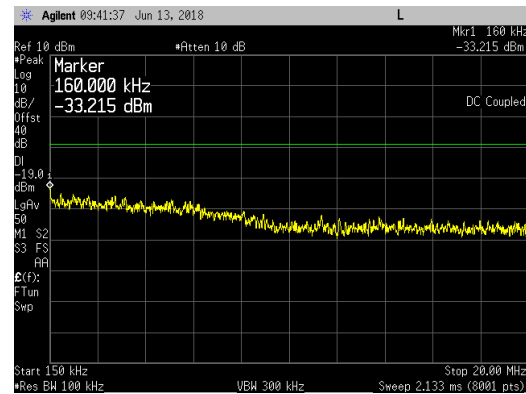


Band 13 LTE5 Ch BW _ 64QAM _ BC & TC (748.5 & 753.5MHz) at 20 watts/carrier:

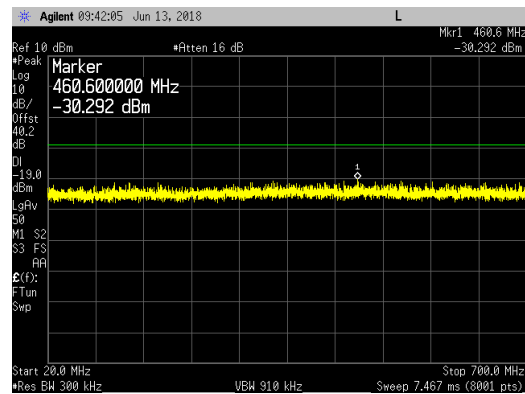
9kHz to 150kHz



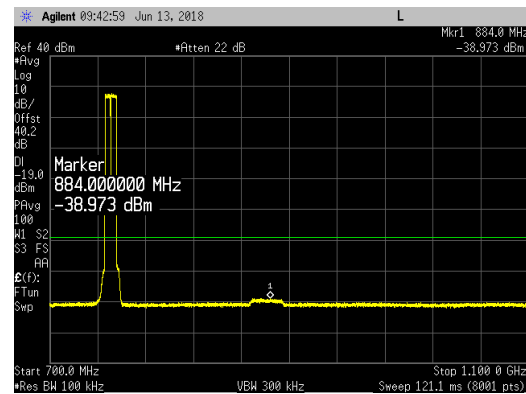
150kHz to 20MHz



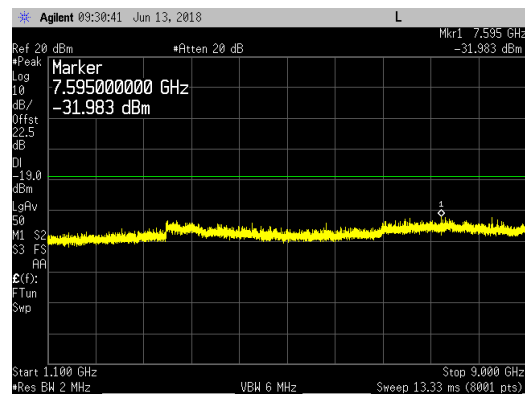
20MHz to 700MHz



700MHz to 1.1GHz

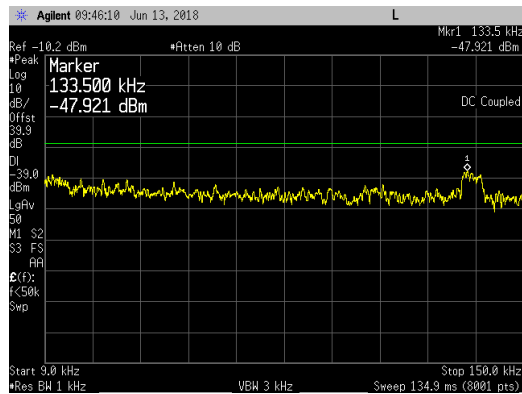


1.1GHz to 9GHz

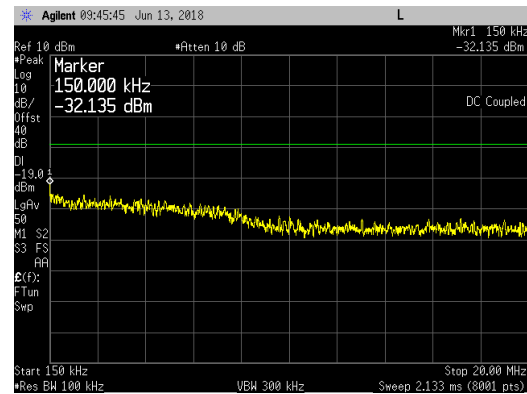


Band 13 LTE5 Ch BW _ 256QAM _ BC & TC (748.5 & 753.5MHz) at 20 watts/carrier:

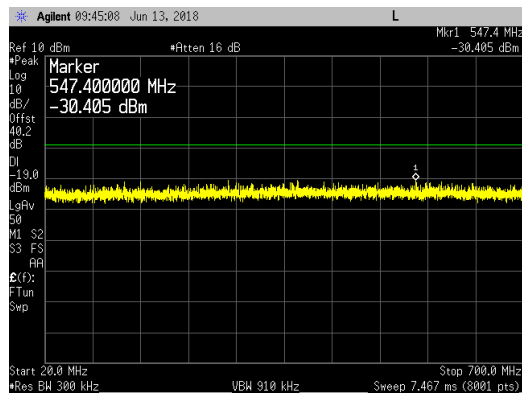
9kHz to 150kHz



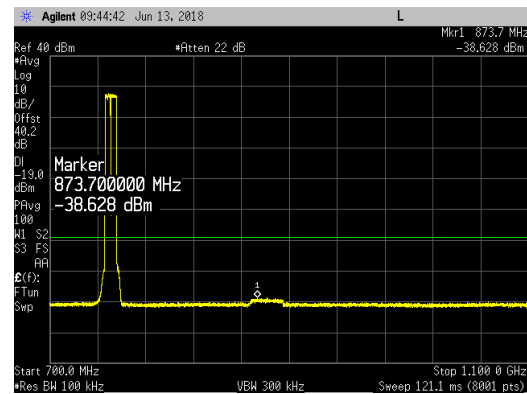
150kHz to 20MHz



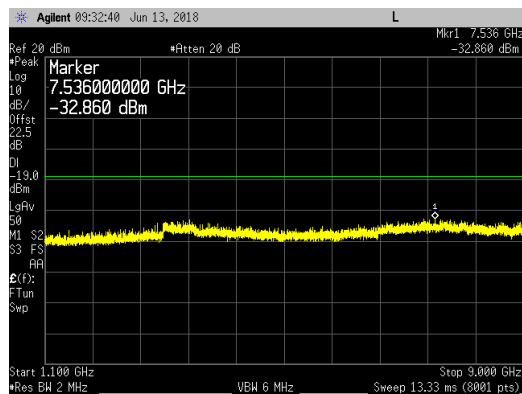
20MHz to 700MHz



700MHz to 1.1GHz



1.1GHz to 9GHz



Transmitter Antenna Port Conducted Emissions in 1559MHz to 1610MHz Frequency Range

Conducted emissions in the frequency range 1559MHz to 1610MHz were measured. The EIRP limit in this band is -70dBW/MHz for wideband signals and -80dBW for discrete emissions of bandwidths less than 700Hz as shown in FCC 27.53(f) and RSS-130 section 4.6.2(b). This equates to an EIRP of -40dBm/MHz for wideband emissions and -50dBm/MHz for discrete emissions.

The limit is adjusted to -46 dBm [-40 dBm -10 log (4)] for wideband signals and -56dBm [-50 dBm -10 log (4)] for discrete emissions per FCC KDB 662911D01 v02r01 because the BTS may operate as a 4 port MIMO transmitter.

Measurements were made at AHBCA antenna port 2. Tests were conducted with carriers at maximum power (40W/antenna port) with single and dual band operation. The RRH was operated with all LTE modulation types (QPSK, 16QAM, 64QAM and 256QAM) for all available LTE bandwidths (Band 5: 1.4MHz, 3MHz, 5MHz and 10MHz; Band 13: 5MHz and 10MHz). The same LTE bandwidth was used for both frequency bands when available. If the same LTE bandwidth for both bands was not available then the smallest LTE bandwidth was used.

Measurements were also made on the Band 13 bottom and top channels for LTE bandwidths of 5MHz and 10MHz (The dual carrier Band 13 LTE5 case was also measured). The AHBCA configured for Band 13 LTE10 may operate only on the middle channel since the operational bandwidth is 10MHz wide.

Measurements were performed with the spectrum analyzer in the RMS average mode over 100 traces. A 1MHz RBW and 3MHz VBW was used for all measurements. A 1GHz high pass filter was used to block the carrier fundamental frequency to reduce the measurement instrumentation noise floor level. The total measurement RF path loss of the test setup (attenuators, filters and test cables) of 20.1dB is accounted for by the spectrum analyzer reference level offset.

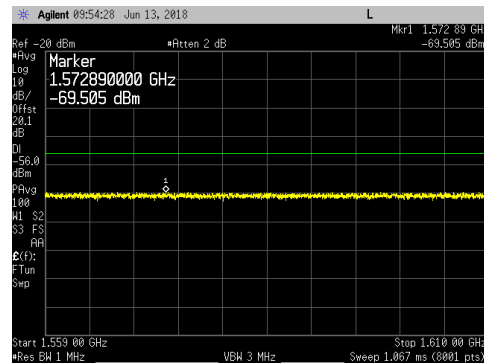
All readings were at the measurement instrumentation noise floor. The highest (worst case) emission from the measurement data was -69.138 dBm or -99.138 dBW. The results are summarized in the following table.

Channel BW, Ch Frequency, Carrier Power		Conducted Emissions in 1559MHz to 1610MHz Frequency Range (dBm)			
Band 5	Band 13	QPSK	16QAM	64QAM	256QAM
Carrier Off	LTE5, BC, 40 Watts	-69.505	-69.232	-69.245	-69.404
Carrier Off	LTE5, MC, 40 Watts	-69.354	-69.564	-69.388	-69.591
Carrier Off	LTE5, TC, 40 Watts	-69.341	-69.840	-69.201	-69.523
Carrier Off	LTE10, MC, 40 Watts	-69.509	-69.138	-69.208	-69.397
Carrier Off	Dual LTE 5, BC & TC, 20W + 20W	-69.495	-69.225	-69.528	-69.471
LTE1.4, MC, 20 Watts	LTE5, MC, 20 Watts	-69.456	-69.459	-69.316	-69.390
LTE3, MC, 20 Watts	LTE5, MC, 20 Watts	-69.513	-69.488	-69.387	-69.316
LTE5, MC, 20 Watts	LTE5, MC, 20 Watts	-69.466	-69.431	-69.520	-69.387
LTE10, MC, 20 Watts	LTE10, MC, 20 Watts	-69.649	-69.583	-69.466	-69.633
LTE1.4, TC-1 & TC, 13W+13W	LTE10, MC, 13 Watts	-69.145	-69.539	-69.573	-69.395

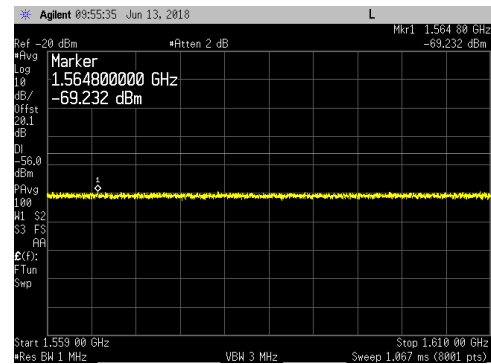
Conducted emission plots/measurements for the 1559MHz to 1610MHz frequency range are provided in the following pages. The display line on the plots reflects the required worse case limit (-56dBm).

Band 13 LTE5 40W Carrier at Bottom Channel (748.5MHz):

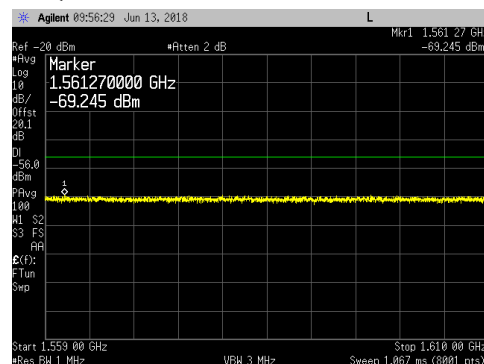
QPSK



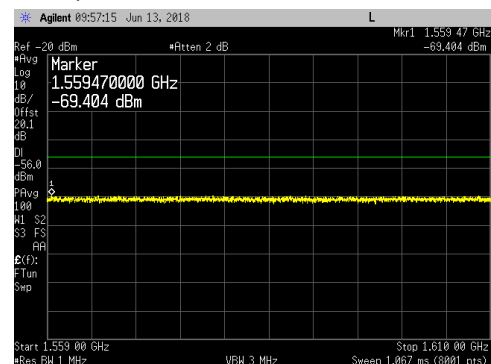
16QAM



64QAM

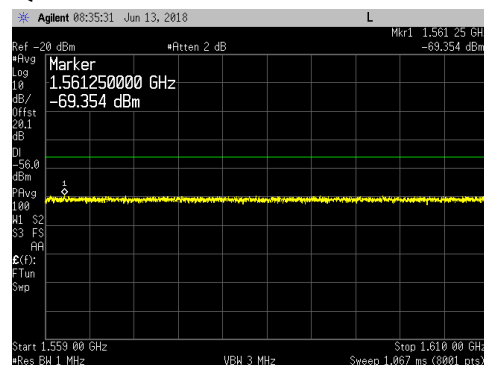


256QAM

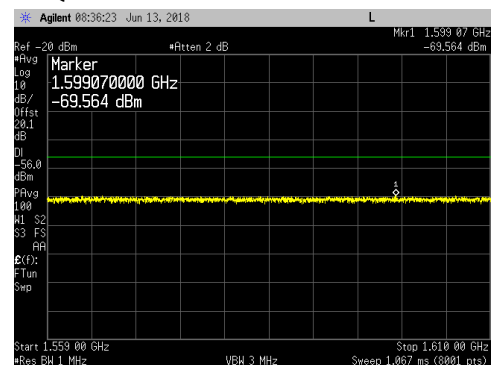


Band 13 LTE5 40W Carrier at Middle Channel (751.0MHz):

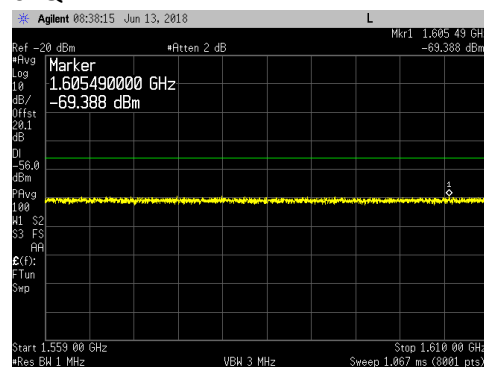
QPSK



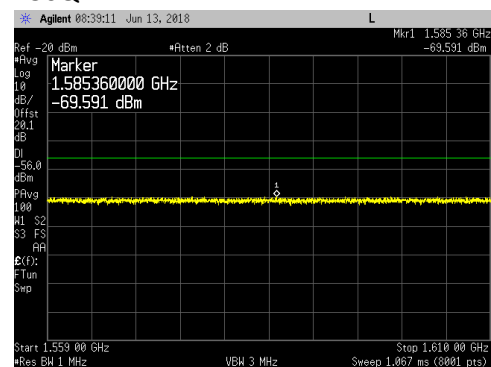
16QAM



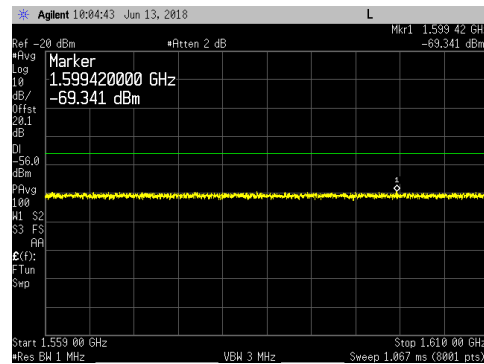
64QAM



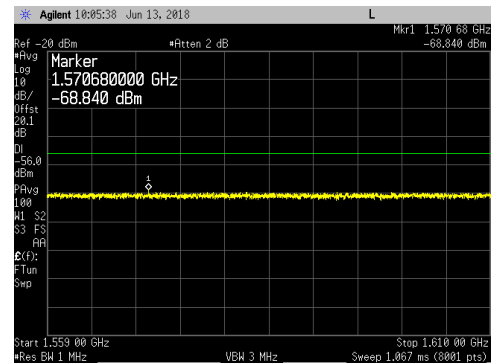
256QAM



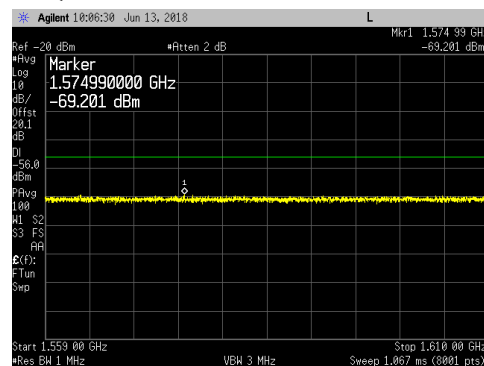
Band 13 LTE5 40W Carrier at Top Channel (753.5MHz): QPSK



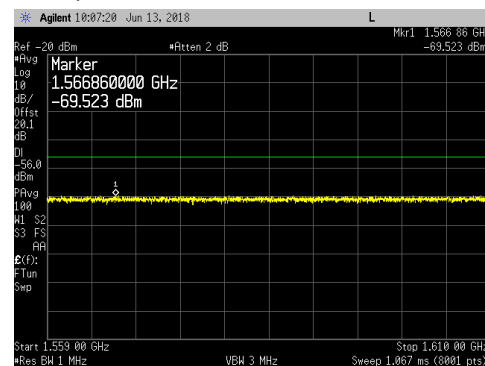
16QAM



64QAM

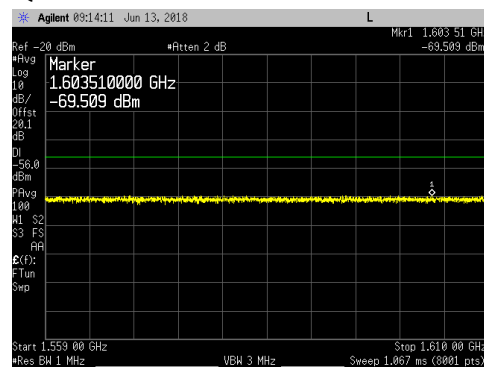


256QAM

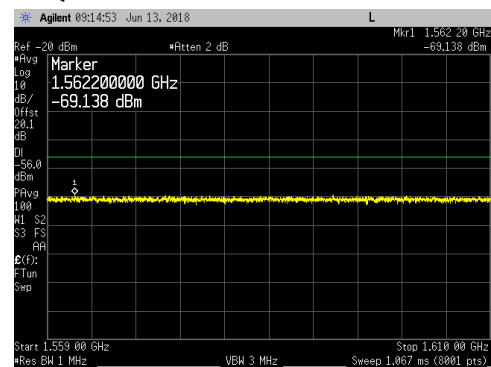


Band 13 LTE10 40W Carrier at Middle Channel (751.0MHz):

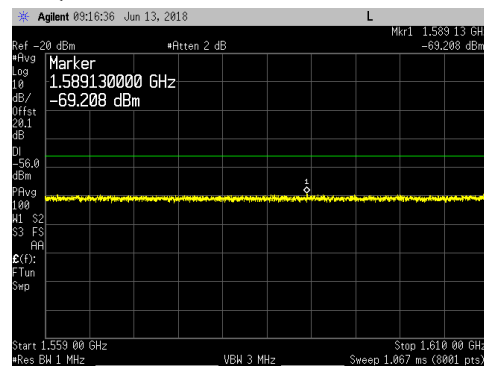
QPSK



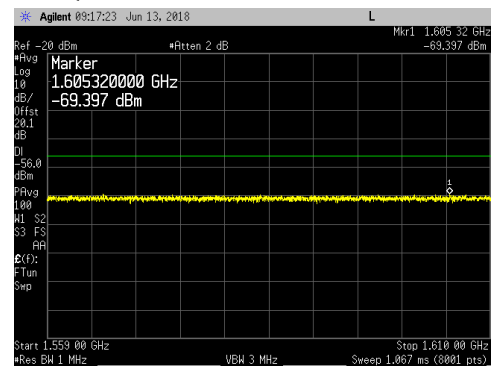
16QAM



64QAM

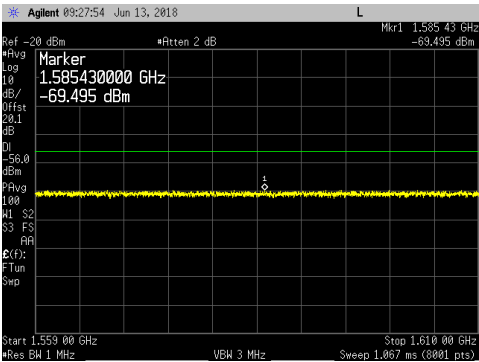


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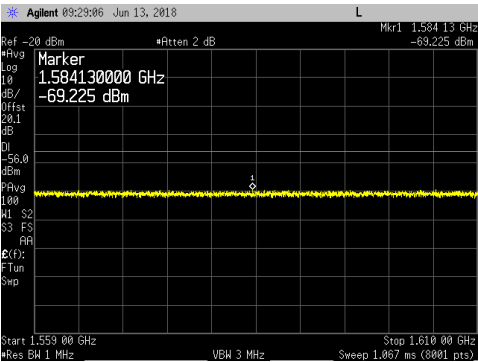


Band 13 Dual LTE5 20W+20W Carriers at BC & TC (748.5MHz & 753.5MHz):

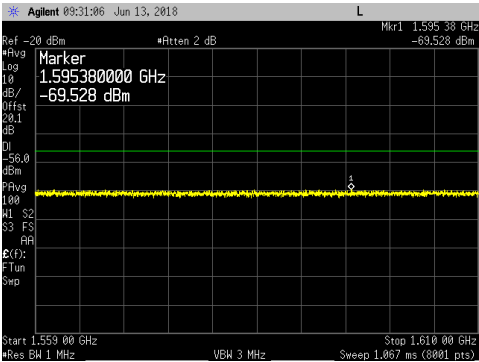
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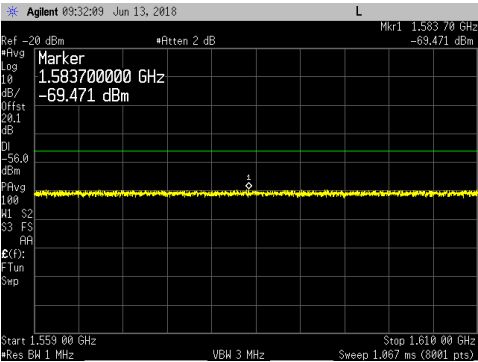
16QAM



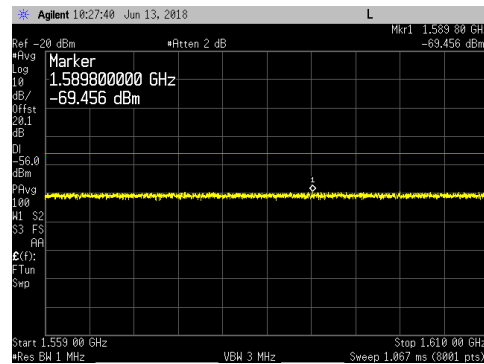
64QAM



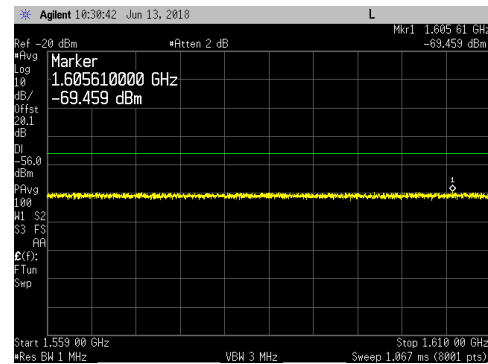
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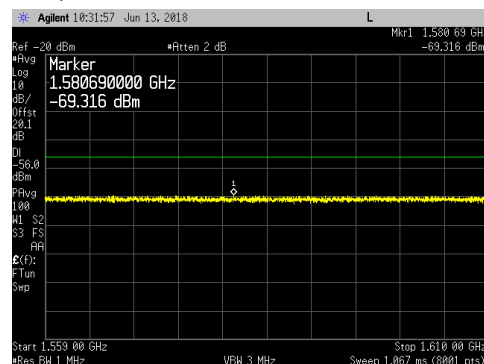
Band 5_LTE1.4 at Middle Channel (881.5MHz) & Band 13_LTE5 at Middle Channel (751MHz):
QPSK



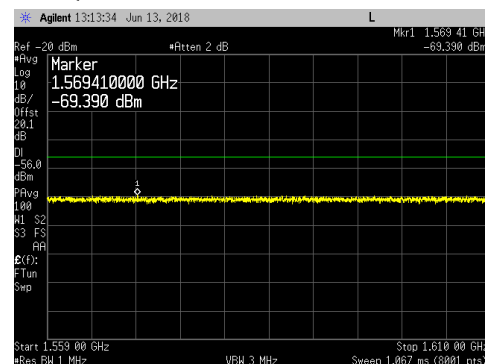
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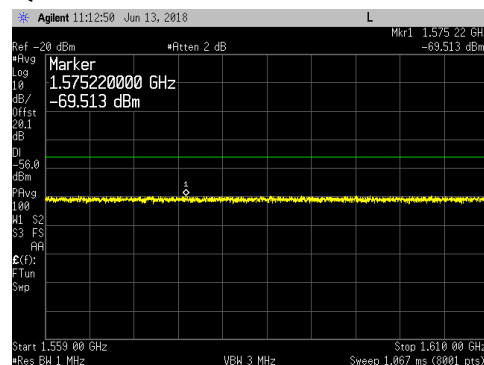
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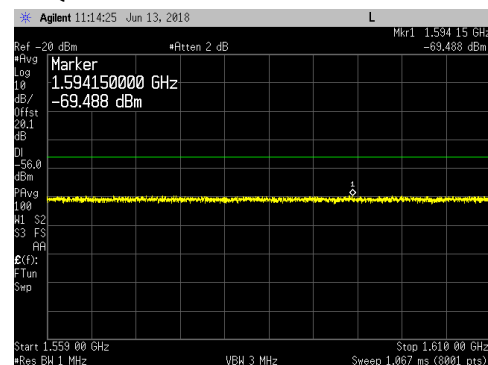
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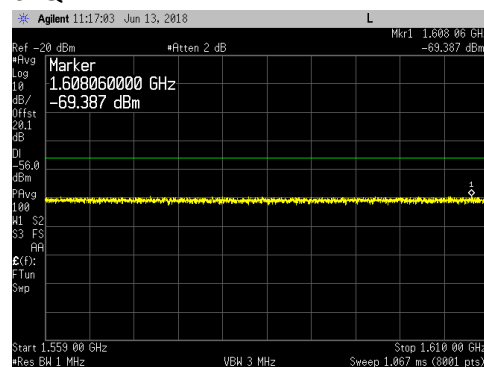
Band 5_LTE3 at Middle Channel (881.5MHz) & Band 13_LTE5 at Middle Channel (751MHz):
QPSK



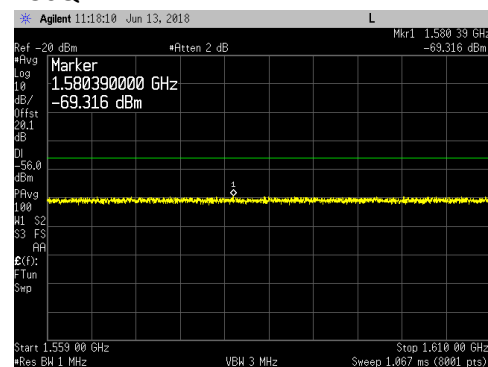
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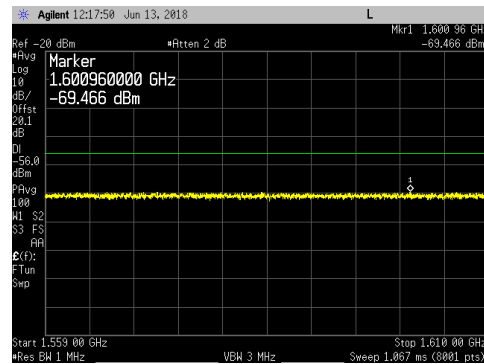
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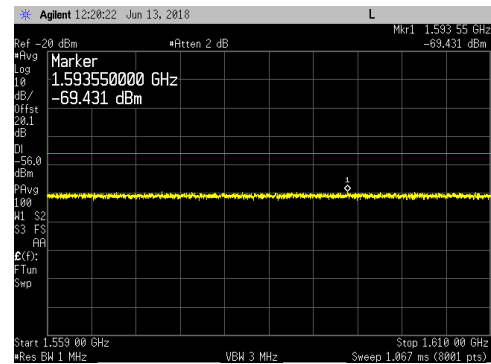
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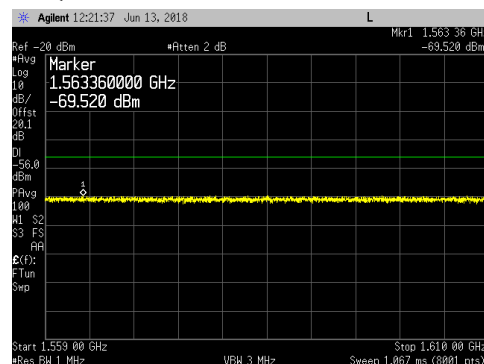
Band 5_LTE5 at Middle Channel (881.5MHz) & Band 13_LTE5 at Middle Channel (751MHz):
QPSK



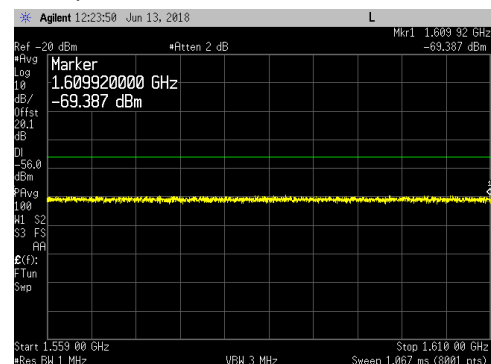
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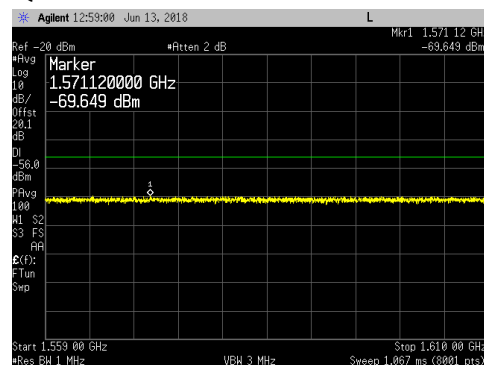
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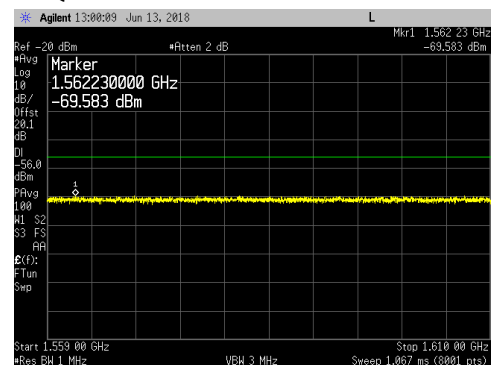
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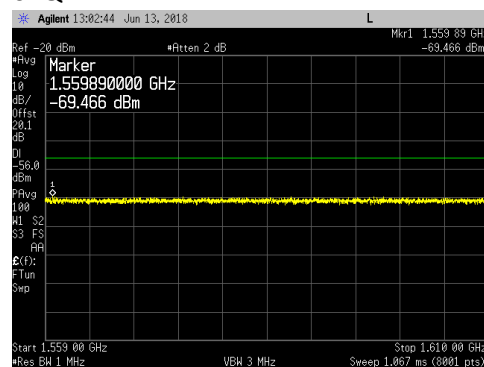
Band 5_LTE10 at Middle Channel (881.5MHz) & Band 13_LTE10 at Middle Channel (751MHz):
QPSK



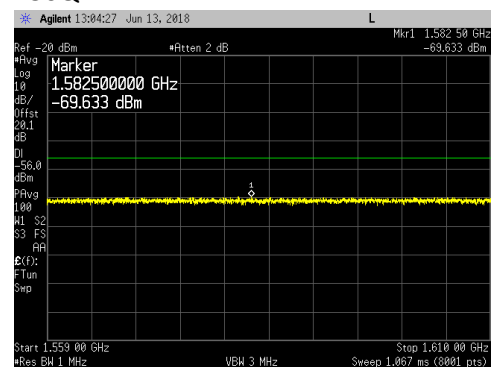
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64QAM

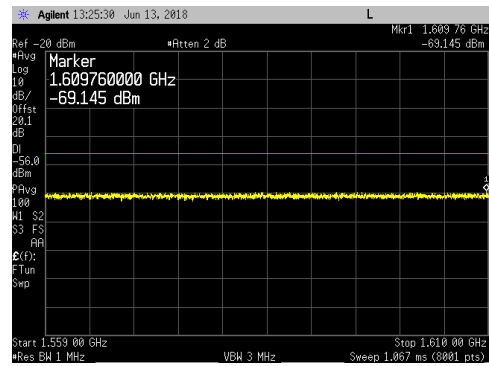


256QAM

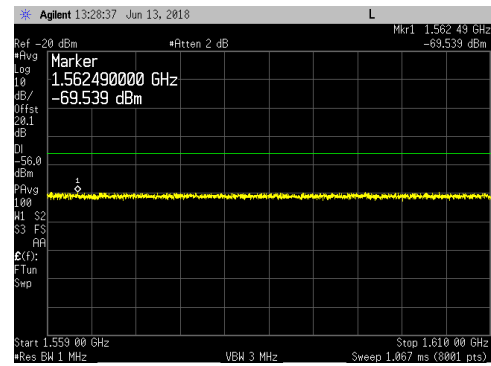


Band 5_LTE1.4 at TC-1(891.9MHz) & TC(893.3MHz) and Band 13_LTE10 at MC (751MHz):

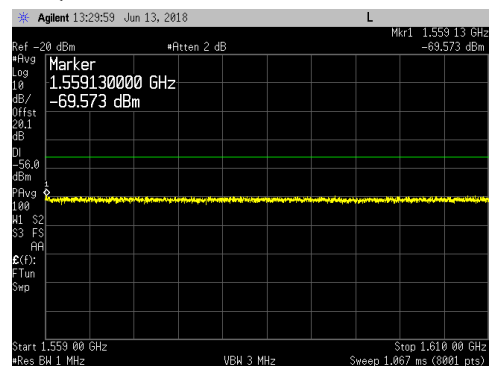
QPSK



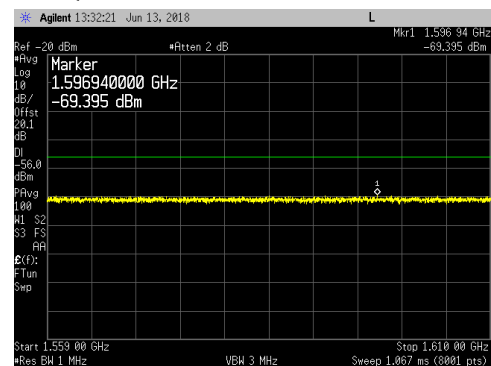
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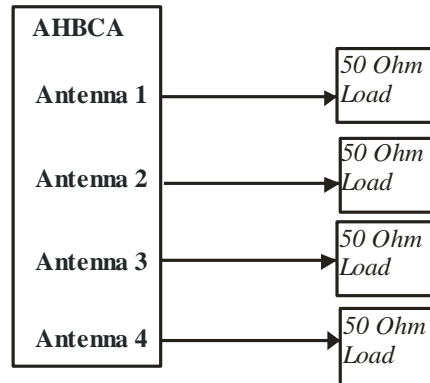


256QAM



Transmitter Radiated Spurious Emissions

During radiated emission testing all antenna ports of the base station were terminated with 50ohm termination blocks as shown in the diagram below.



Based on antenna port conducted spurious emissions tests results, preliminary scans for radiated spurious emissions were performed in 30MHz – 9GHz frequency range.

Two radiated emission test configurations (with the RRH fan assembly) are needed to prove compliance for the 3GPP Band 13 transmitters. The first test is with the 3GPP Band 13 carriers operating at 40W/carrier (3GPP Band 5 carriers are not enabled). The second test is with the 3GPP Band 5 and the 3GPP Band 13 carriers enabled simultaneously (20 watts per carrier and 40 watts per port) on all four ports.

The bottom, middle and top frequency channels for each band were enabled. The AHBCA band 13 configured for LTE10 may operate only on the middle channel since the operational bandwidth is 10MHz wide (The band 13 carrier covers the entire downlink band). The carrier configurations for the radiated emission testing are provided below. Final maximized radiated emissions were measured in these modes.

Frequency Band	Antenna Port	RF Bandwidth	EARFCN	Transmit Frequency	Carrier Power
Band 5	1	1.4 MHz	2407 (Bottom Channel)	869.7 MHz	0 Watts
Band 5	2	1.4 MHz	2525 (Middle Channel)	881.5 MHz	0 Watts
Band 5	3	1.4 MHz	2525 (Middle Channel)	881.5 MHz	0 Watts
Band 5	4	1.4 MHz	2643 (Top Channel)	893.3 MHz	0 Watts
Band 13	1	10 MHz	5230 (Middle Channel)	751.0 MHz	40 Watts
Band 13	2	10 MHz	5230 (Middle Channel)	751.0 MHz	40 Watts
Band 13	3	10 MHz	5230 (Middle Channel)	751.0 MHz	40 Watts
Band 13	4	10 MHz	5230 (Middle Channel)	751.0 MHz	40 Watts

Band 13 Carriers at Maximum Power (40W/carrier) and Band 5 Carriers not Enabled

Frequency Band	Antenna Port	RF Bandwidth	EARFCN	Transmit Frequency	Carrier Power
Band 5	1	1.4 MHz	2407 (Bottom Channel)	869.7 MHz	20 Watts
Band 5	2	1.4 MHz	2525 (Middle Channel)	881.5 MHz	20 Watts
Band 5	3	1.4 MHz	2525 (Middle Channel)	881.5 MHz	20 Watts
Band 5	4	1.4 MHz	2643 (Top Channel)	893.3 MHz	20 Watts
Band 13	1	10 MHz	5230 (Middle Channel)	751.0 MHz	20 Watts
Band 13	2	10 MHz	5230 (Middle Channel)	751.0 MHz	20 Watts
Band 13	3	10 MHz	5230 (Middle Channel)	751.0 MHz	20 Watts
Band 13	4	10 MHz	5230 (Middle Channel)	751.0 MHz	20 Watts

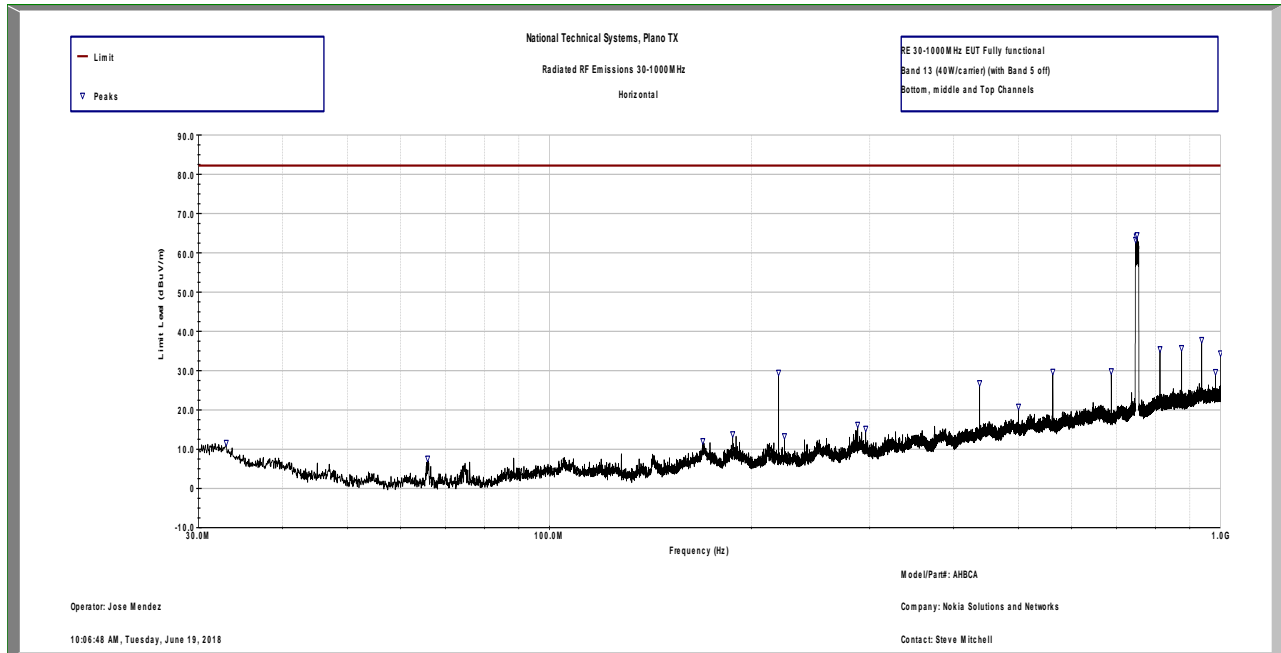
Band 5 and Band 13 Carriers Enabled Simultaneously (20W/carrier)

Note that the radiated spurious emission plots/measurement results for the second test with the 3GPP Band 5 and the 3GPP Band 13 carriers enabled simultaneously at 20 watts per carrier (or 40 watts/antenna port) are in Appendix A.

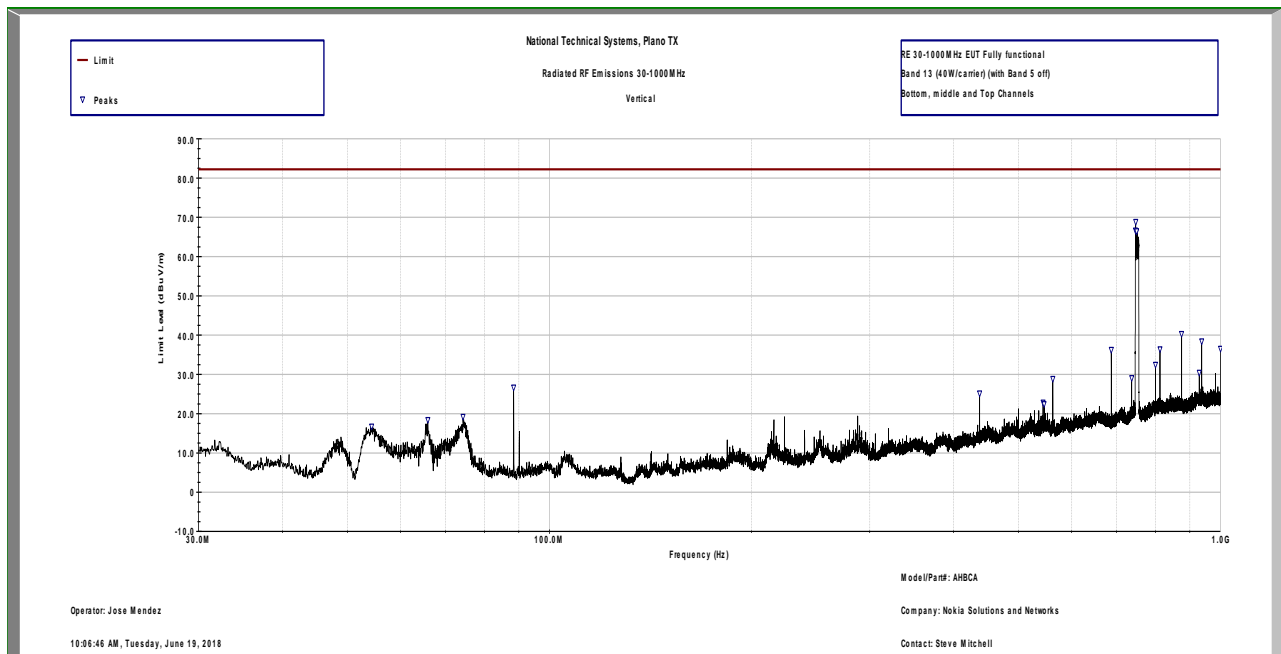
RE Data for Band 13 (40W/carrier) (with Band 5 off)

Frequency MHz	Peaks Raw dBuV/m	Antenna dB	Pre Amp dB	Cables dB	Peaks dBuV/m	Limit dBuV/m	Margin dB	Tower cm	Turntable Degrees	Polarity H/V
5898.320	38.669	34.08	-37.161	5.567	41.154	82.2	-41.046	119	-0.2	V
874.984	48.294	24.2	-36.162	3.808	40.14	82.2	-42.06	300	33.9	V
7798.290	33.695	36.395	-37.876	6.2	38.415	82.2	-43.785	100	0.1	V
2949.040	41.411	29.716	-37.32	4.492	38.299	82.2	-43.901	200	14.2	V
937.476	44.201	25.7	-36.041	3.938	37.796	82.2	-44.404	100.3	186	H
812.486	44.602	24.6	-36.198	3.37	36.373	82.2	-45.827	113.1	97	V
687.481	48.288	21.3	-36.218	2.722	36.092	82.2	-46.108	100	2	V
874.976	43.876	24.2	-36.162	3.808	35.721	82.2	-46.479	300.1	109	H
812.491	43.661	24.6	-36.198	3.37	35.433	82.2	-46.767	139.1	0.9	H
8528.800	28.73	37.334	-38.193	4.907	32.778	82.2	-49.422	99.8	0	V
7237.620	26.882	36.006	-37.319	6.595	32.164	82.2	-50.036	100	0	V
562.494	43.877	20.2	-36.5	2.097	29.674	82.2	-52.526	300	102	H
562.485	42.926	20.2	-36.5	2.097	28.723	82.2	-53.477	106	96.1	V
3781.710	27.601	32.475	-37.074	5.028	28.03	82.2	-54.17	200	360	H
219.548	52.277	11.655	-37.491	1.459	27.9	82.2	-54.3	99.9	1	H
8385.490	23.306	37.132	-38.055	5.36	27.743	82.2	-54.457	200	359.2	H
7727.380	22.612	36.355	-37.718	6.315	27.565	82.2	-54.635	200	359.9	H
437.492	43.025	18.549	-36.876	2.123	26.821	82.2	-55.379	127.9	30.9	H
437.466	40.828	18.547	-36.876	2.123	24.621	82.2	-57.579	100.1	31.2	V
3003.300	26.857	30.099	-37.297	4.5	24.157	82.2	-58.043	200	360	H
2260.950	22.273	27.596	-37.786	4.425	16.508	82.2	-65.692	200.1	289.2	H

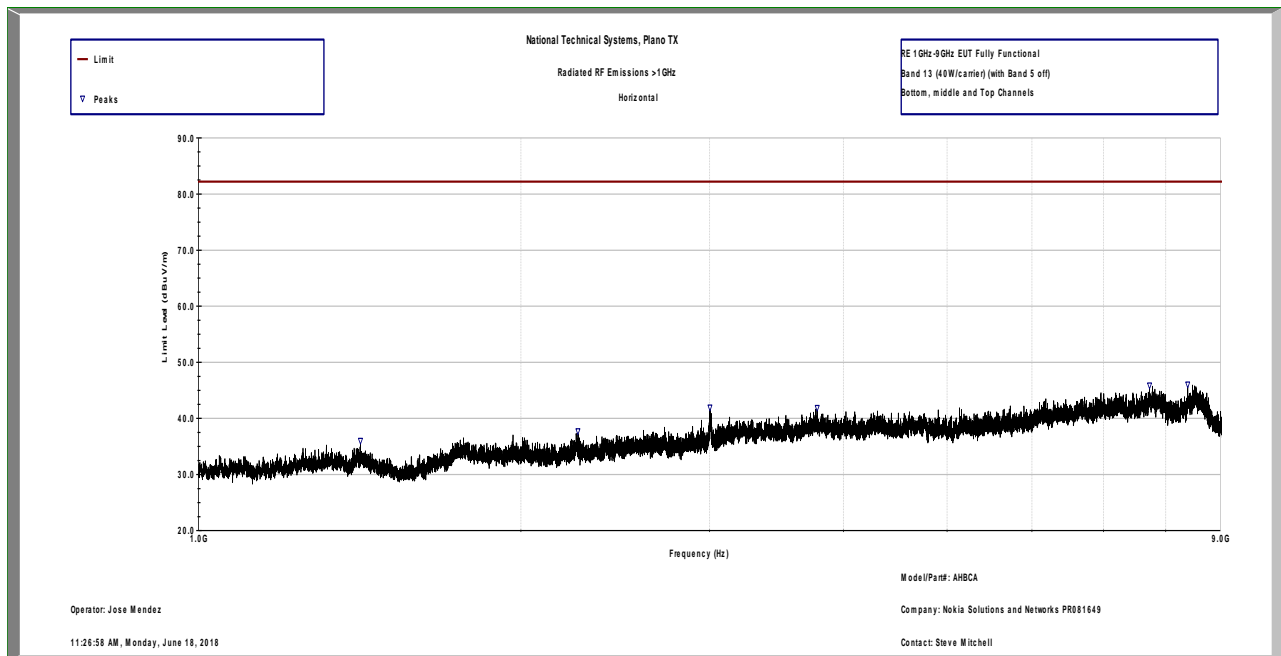
A three-meter measurement distance was used for radiated emission measurements. The highest radiated emissions detected were more than 20dB below the three-meter limit of 82.2dBuV/m (equivalent to -13dBm EIRP). Since all maximized measurements were more than 20dB below these levels, substitution measurements were not performed. TILE software was used for all preliminary scans and plots that are included on the following pages.



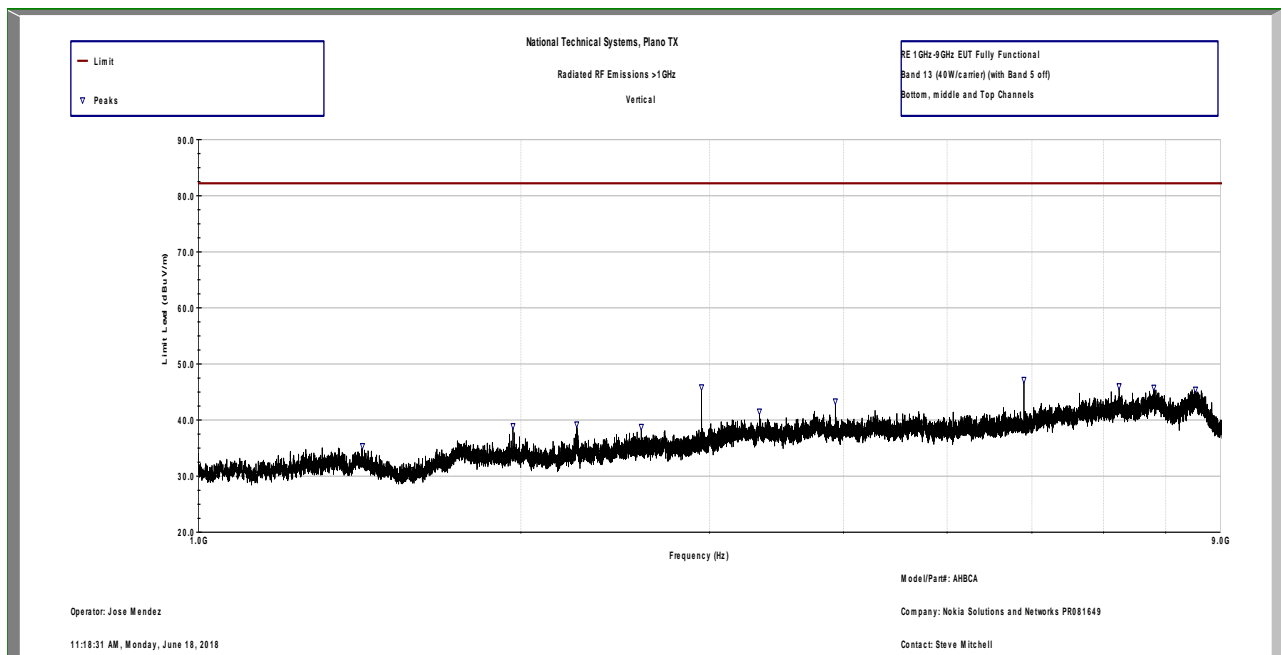
Radiated Spurious Emissions 30-1000 MHz Horizontal – Band 13



Radiated Spurious Emissions 30-1000 MHz Vertical – Band 13



Radiated Spurious Emissions 1-9 GHz Horizontal – Band 13



Radiated Spurious Emissions 1-9 GHz Vertical – Band 13

Frequency Stability/Accuracy

Carrier frequency stability of the EUT at extreme temperatures and voltages was measured. The frequency error was measured as follows:

- (1) EUT transmitting in 5MHz-QPSK-LTE mode at center channel (751.0MHz) on port 2.
- (2) The EUT temperature was stabilized at each temperature step (for a minimum of 30 minutes) prior to frequency accuracy measurement.

Nominal operating voltage of the product is declared as 48VDC.

Frequency error results are listed below for extreme voltages and temperatures.

Extreme Voltages:

Percentage of Rated Supply	DC Voltage (VDC)	Frequency Error (Hz) at 20°C
85%	40.8	0.97
100%	48.0	0.98
115%	55.2	0.74

Extreme Temperatures:

Temperature	Frequency Error (Hz) at 48VDC
-30 °C	0.93
-20 °C	1.10
-10 °C	1.12
0 °C	0.87
10 °C	0.73
20 °C	0.98
30 °C	0.78
40 °C	1.37
50 °C	0.77

Based on the results above, highest recorded frequency error (1.37 Hz or ~0.002 ppm) ensures that the transmitted signal remains in its authorized frequency block at extreme voltages and temperatures.

The results above are deemed sufficient to demonstrate carrier frequency stability for all other channel bandwidth modes and modulations since all carriers are controlled by the same frequency stabilization circuitry that was subjected to the extreme conditions under this test.

End of Report