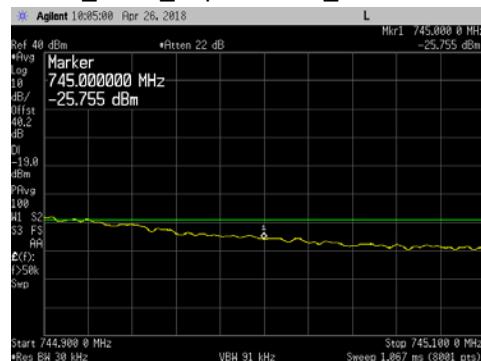
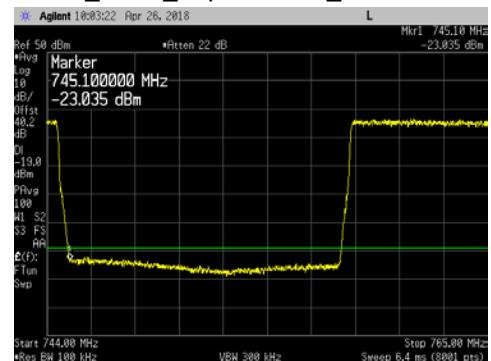


Dual Band (Band 12 LTE10 + Band 14 LTE10) 40W + 40W Carriers Upper Band Edge Plots for Antenna Port 1:

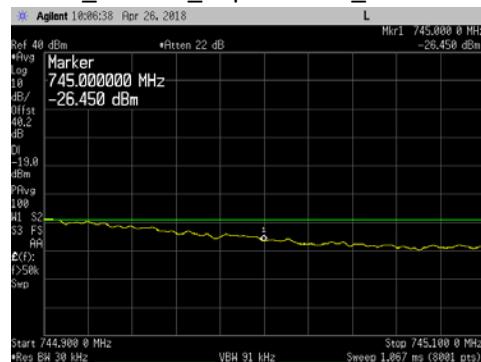
LTE10_QPSK_Top Channel_744.9 to 745.1MHz



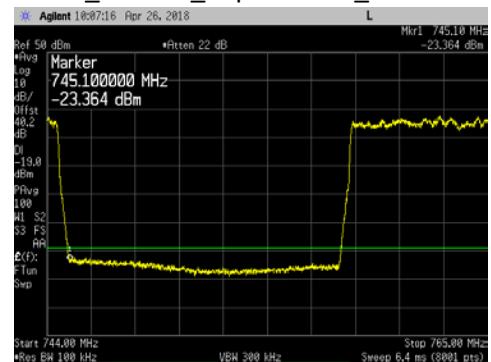
LTE10_QPSK_Top Channel_744 to 765MHz



LTE10_16QAM_Top Channel_744.9 to 745.1MHz



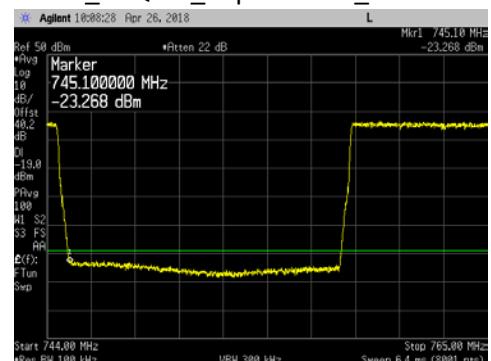
LTE10_16QAM_Top Channel_744 to 765MHz



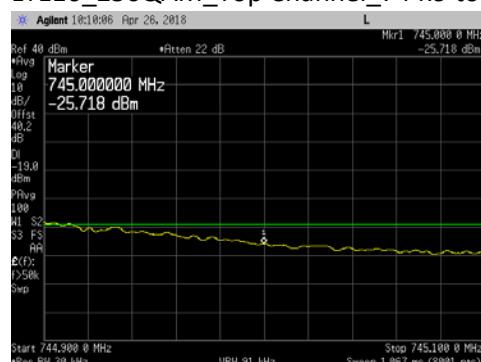
LTE10_64QAM_Top Channel_744.9 to 745.1MHz



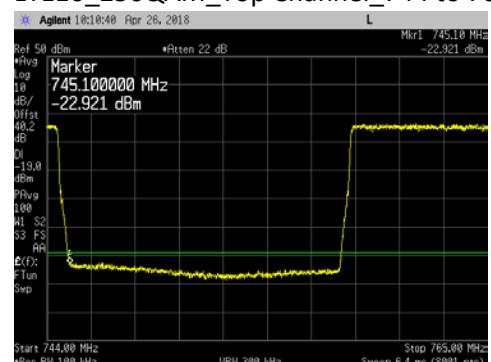
LTE10_64QAM_Top Channel_744 to 765MHz



LTE10_256QAM_Top Channel_744.9 to 745.1MHz



LTE10_256QAM_Top Channel_744 to 765MHz



Transmitter Antenna Port Conducted Emissions

Transmitter conducted emission measurements were made at RRH antenna port 1. Measurements were performed over the 9kHz to 8GHz frequency range. Two test configurations are needed for conducted spurious emission measurements to prove compliance for the 3GPP Band 12 transmitters. The first test will be with the 3GPP Band 12 transmitters enabled at 80 watts per carrier (the 3GPP Band 14 transmitters will not be enabled). The second test will be with the 3GPP Band 12 and the 3GPP Band 14 transmitters enabled simultaneously at 40 watts per carrier (or 80 watts/antenna port).

The RRH was operated on the Band 12 middle channel (737.0MHz) and Band 14 middle channel (763.0MHz) simultaneously with all LTE modulation types (QPSK, 16QAM, 64QAM and 256QAM) for all available LTE bandwidths (Band 12: 5MHz and 10MHz; Band 14: 5MHz and 10MHz). The same LTE bandwidth was used for both frequency bands.

The parameters of the first test configuration are provided below:

3GPP Band 12 Transmission Parameters			3GPP Band 14 Transmission Parameters		
Carrier Frequency	Channel Bandwidth	Carrier Power	Carrier Frequency	Channel Bandwidth	Carrier Power
737.0MHz (Mid Ch)	LTE5	80 Watts	Carrier Idle/Off	N/A	0 Watts
737.0MHz (Mid Ch)	LTE10	80 Watts	Carrier Idle/Off	N/A	0 Watts

The parameters of the second test configuration are provided below:

3GPP Band 12 Transmission Parameters			3GPP Band 14 Transmission Parameters		
Carrier Frequency	Channel Bandwidth	Carrier Power	Carrier Frequency	Channel Bandwidth	Carrier Power
737.0MHz (Mid Ch)	LTE5	40 Watts	763.0MHz (Mid Ch)	LTE5	40 Watts
737.0MHz (Mid Ch)	LTE10	40 Watts	763.0MHz (Mid Ch)	LTE10	40 Watts

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 9kHz to 150kHz, 150kHz to 20MHz and 400MHz to 800MHz frequency ranges). Measurements for the 9kHz to 150kHz, 150kHz to 20MHz and 400MHz to 800MHz frequency ranges 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	Average	Auto	Note 2	40.1dB
150kHz to 20MHz	100kHz	300kHz	8001	Average	Auto	Note 2	40.2dB
20MHz to 700MHz	1MHz	3MHz	8001	Peak	Auto	50 Sweeps	39.9dB
700MHz to 1.1GHz	100kHz	300kHz	8001	Average	Auto	Note 2	40.2dB
1.1GHz to 8GHz	2MHz	6MHz	8001	Peak	Auto	50 Sweeps	17.5dB

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.

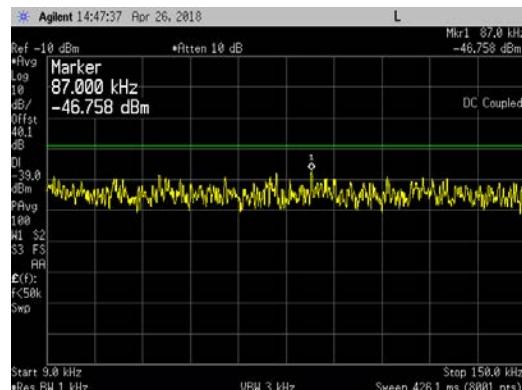
Note 2: Max Hold not used and instead measurements were performed with the spectrum analyzer in the RMS average mode over 100 traces.

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.

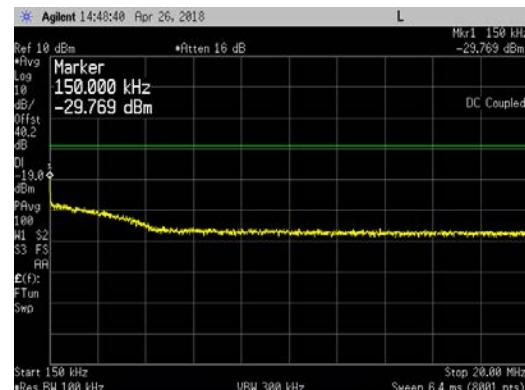
Conducted spurious emission plots/measurements are provided in the following pages.

Band 12 LTE5 Ch BW _ QPSK _ Middle Channel (737.0MHz) at 80 watts/carrier:

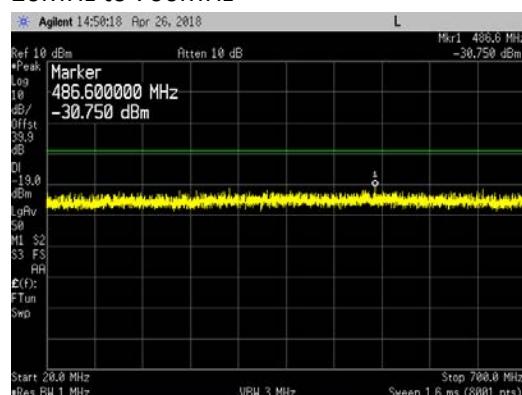
9kHz to 150kHz



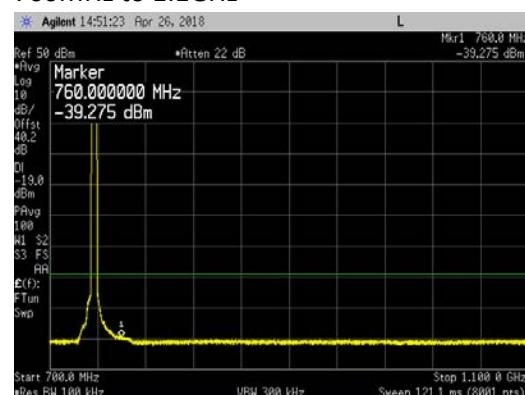
150kHz to 20MHz



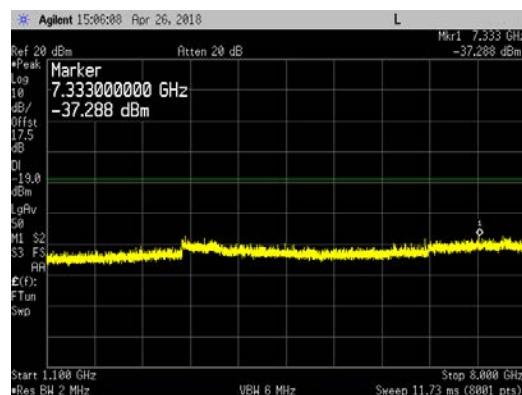
20MHz to 700MHz



700MHz to 1.1GHz



1.1GHz to 8GHz

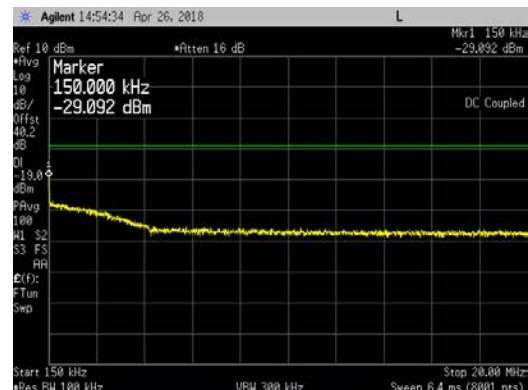


Band 12 LTE5 Ch BW _ 16QAM _ Middle Channel (737.0MHz) at 80 watts/carrier:

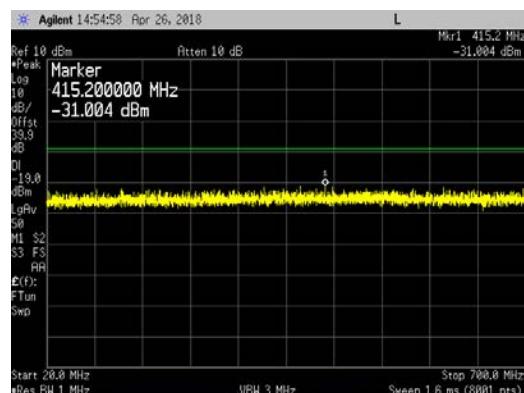
9kHz to 150kHz



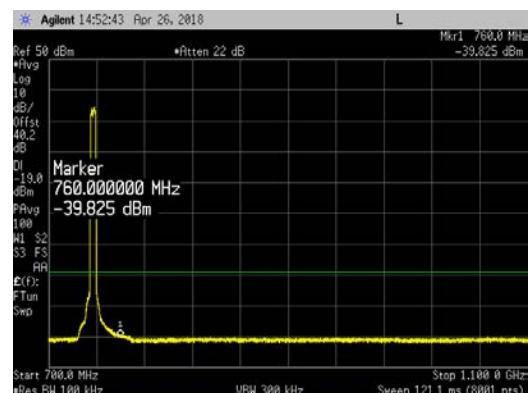
150kHz to 20MHz



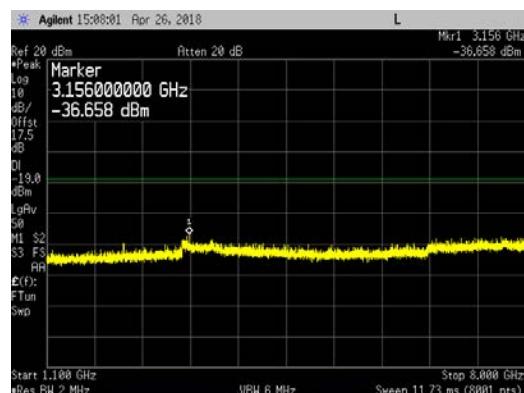
20MHz to 700MHz



700MHz to 1.1GHz



1.1GHz to 8GHz

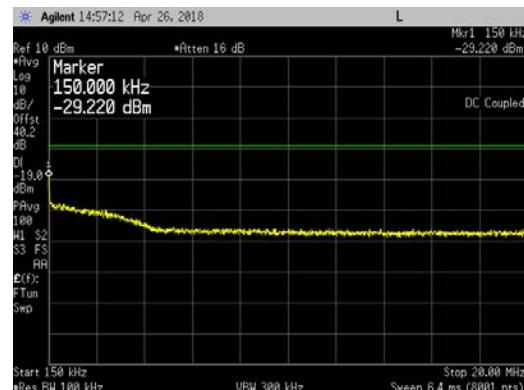


Band 12 LTE5 Ch BW _ 64QAM _ Middle Channel (737.0MHz) at 80 watts/carrier:

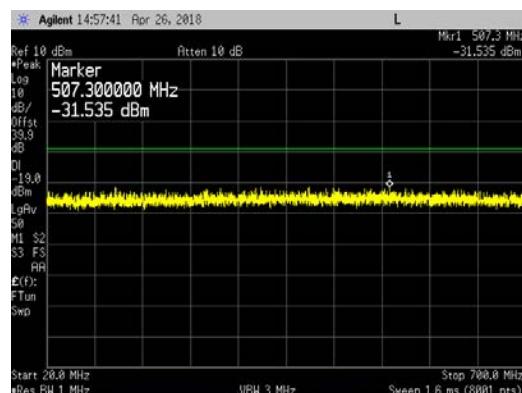
9kHz to 150kHz



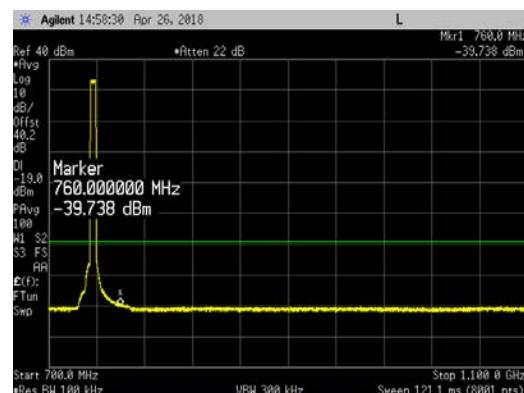
150kHz to 20MHz



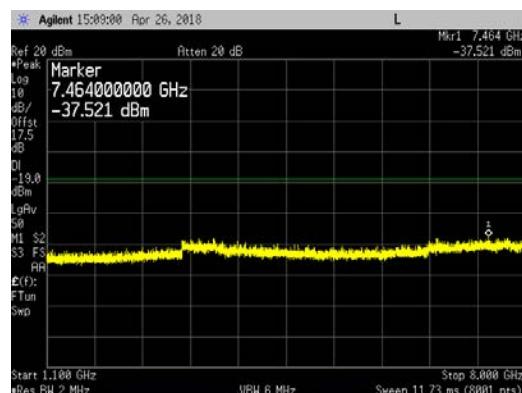
20MHz to 700MHz



700MHz to 1.1GHz



1.1GHz to 8GHz

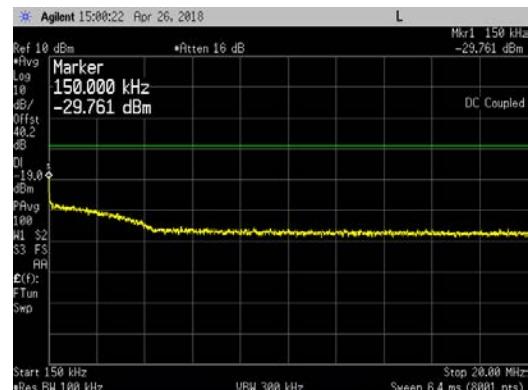


Band 12 LTE5 Ch BW _ 256QAM _ Middle Channel (737.0MHz) at 80 watts/carrier:

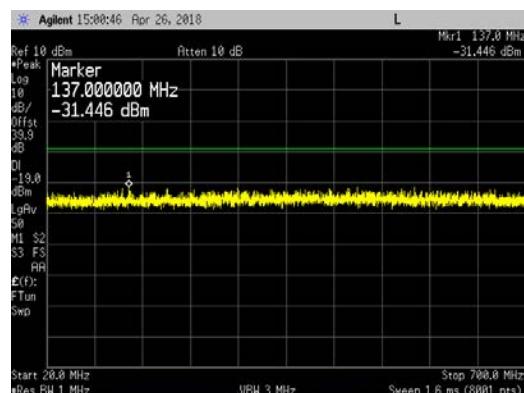
9kHz to 150kHz



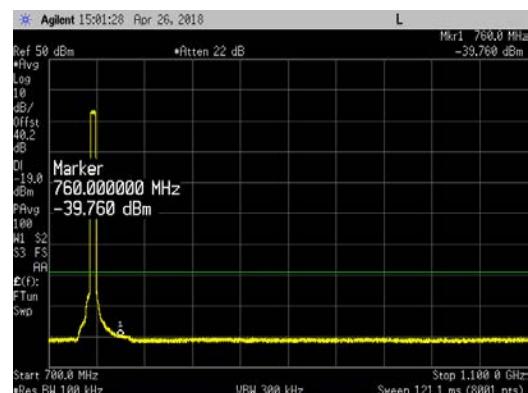
150kHz to 20MHz



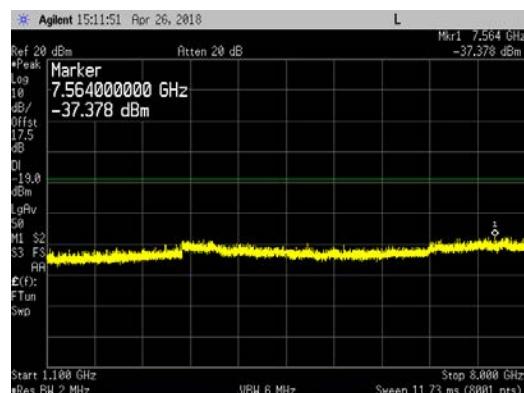
20MHz to 700MHz



700MHz to 1.1GHz



1.1GHz to 8GHz

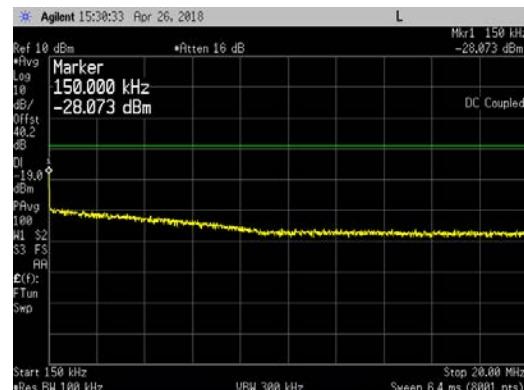


Band 12 LTE10 Ch BW _ QPSK _ Middle Channel (737.0MHz) at 80 watts/carrier:

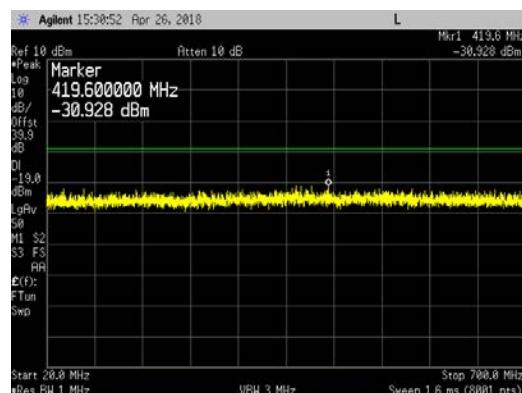
9kHz to 150kHz



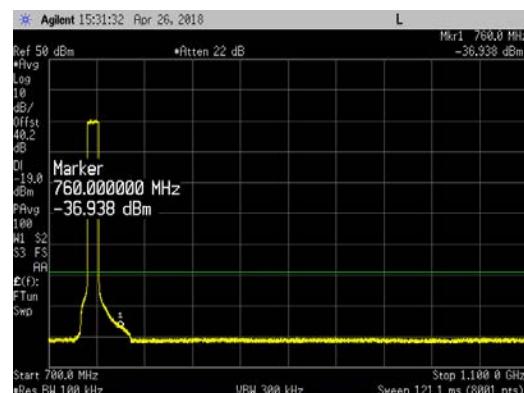
150kHz to 20MHz



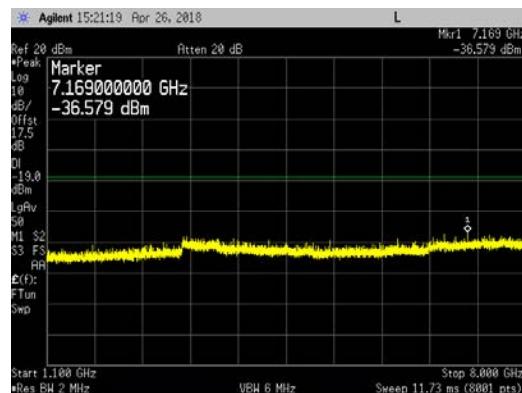
20MHz to 700MHz



700MHz to 1.1GHz



1.1GHz to 8GHz

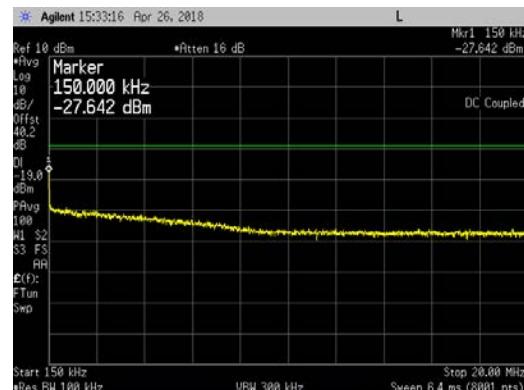


Band 12 LTE10 Ch BW _ 16QAM _ Middle Channel (737.0MHz) at 80 watts/carrier:

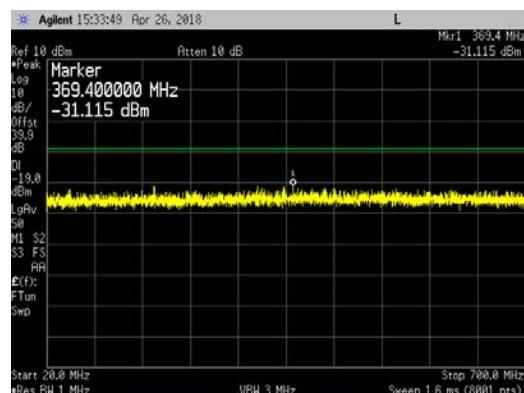
9kHz to 150kHz



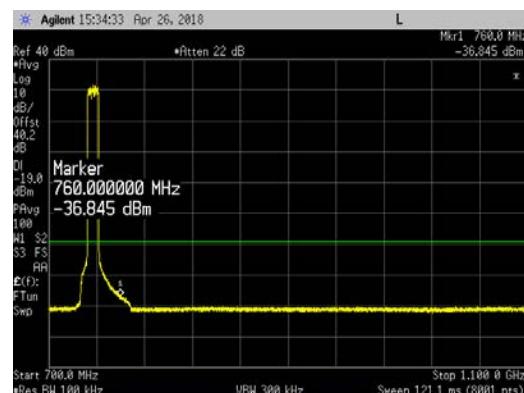
150kHz to 20MHz



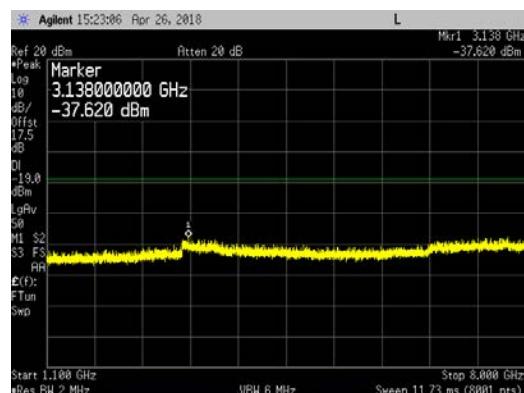
20MHz to 700MHz



700MHz to 1.1GHz



1.1GHz to 8GHz

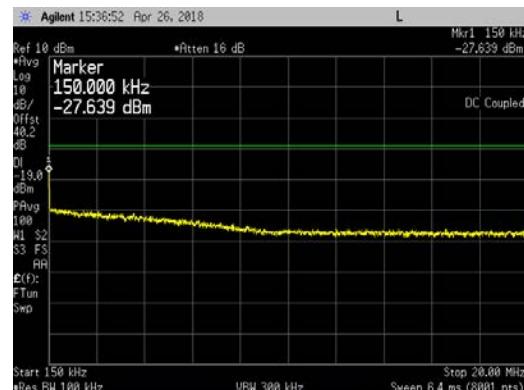


Band 12 LTE10 Ch BW _ 64QAM _ Middle Channel (737.0MHz) at 80 watts/carrier:

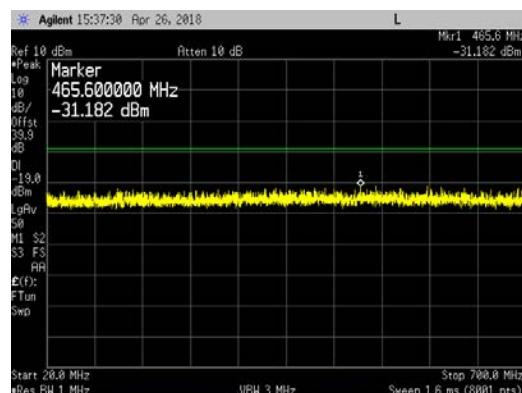
9kHz to 150kHz



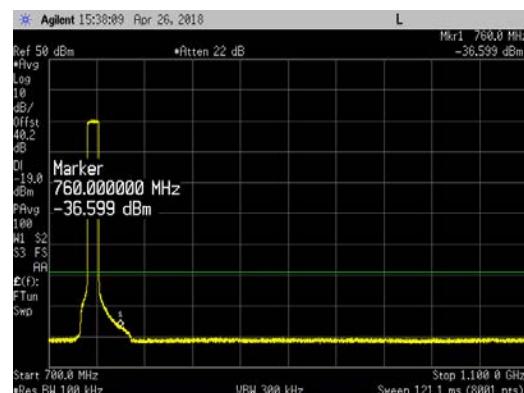
150kHz to 20MHz



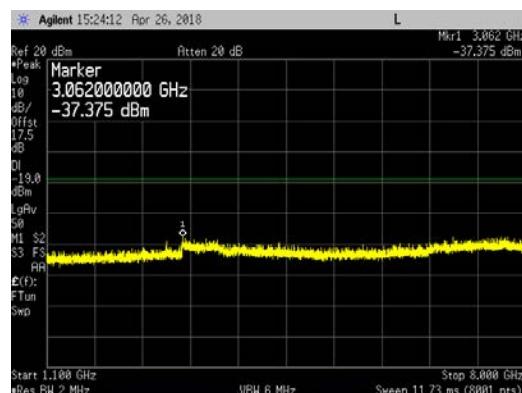
20MHz to 700MHz



700MHz to 1.1GHz

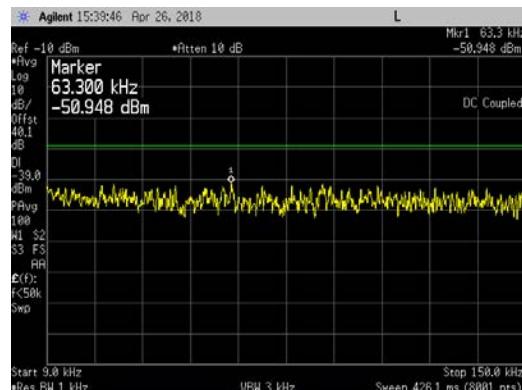


1.1GHz to 8GHz

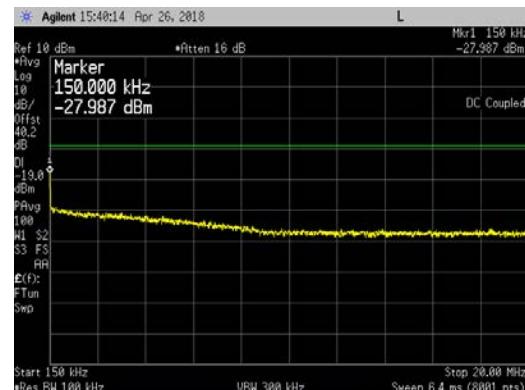


Band 12 LTE10 Ch BW _ 256QAM _ Middle Channel (737.0MHz) at 80 watts/carrier:

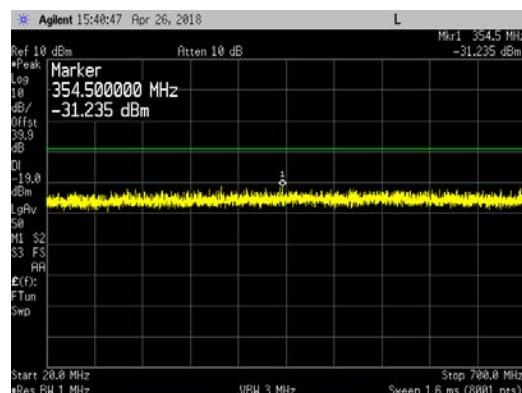
9kHz to 150kHz



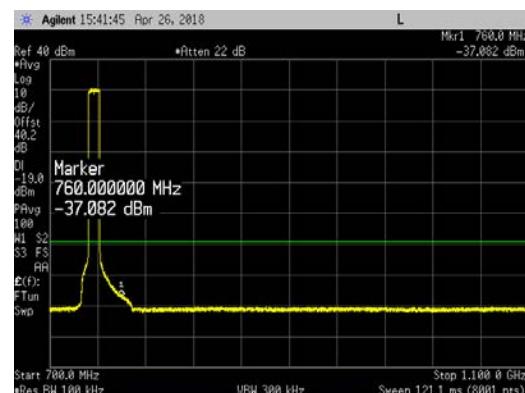
150kHz to 20MHz



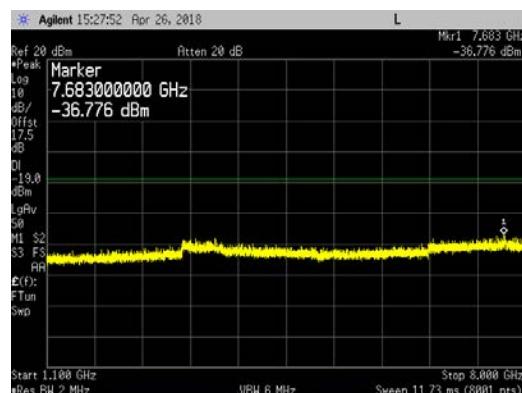
20MHz to 700MHz



700MHz to 1.1GHz

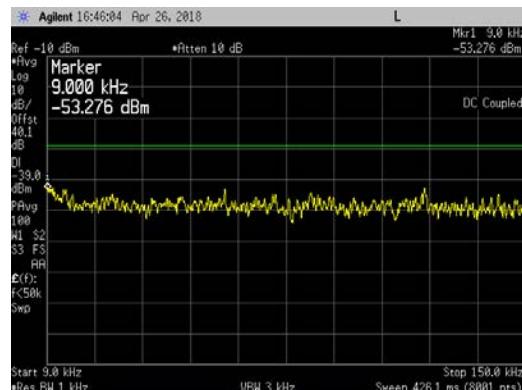


1.1GHz to 8GHz

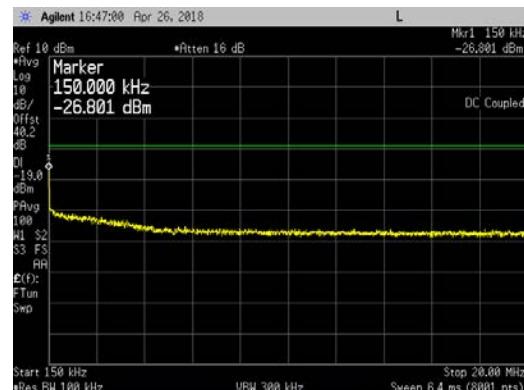


LTE5 & LTE5 Ch BWs _ QPSK _ Middle Channels (737 MHz and 763MHz) at 40 watts/carrier:

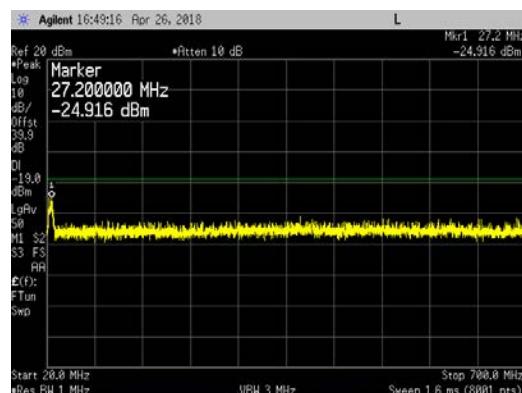
9kHz to 150kHz



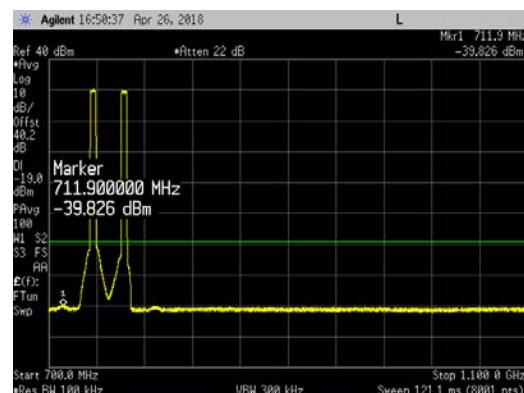
150kHz to 20MHz



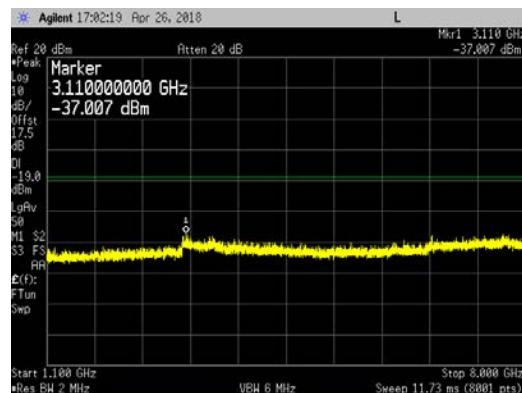
20MHz to 700MHz



700MHz to 1.1GHz

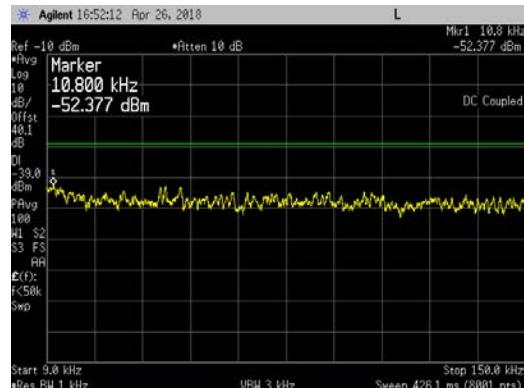


1.1GHz to 8GHz

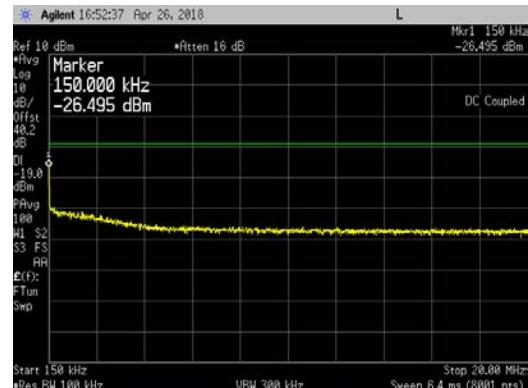


LTE5 & LTE5 Ch BWs _ 16QAM _ Middle Channels (737 MHz and 763MHz) at 40 watts/carrier:

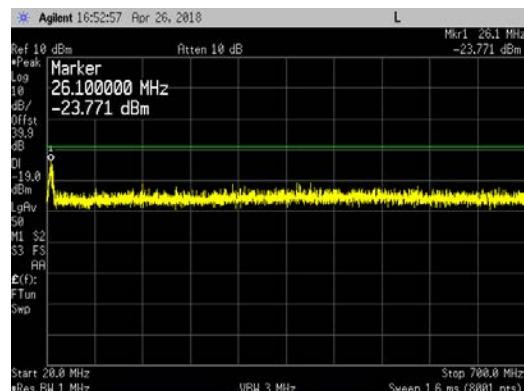
9kHz to 150kHz



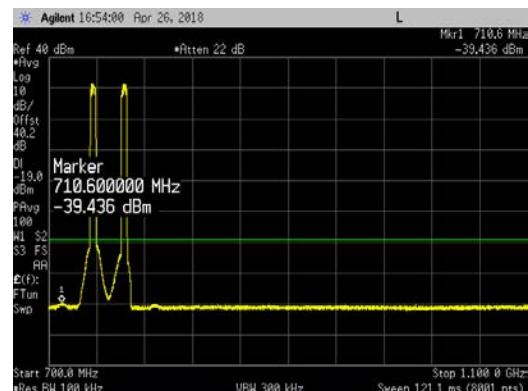
150kHz to 20MHz



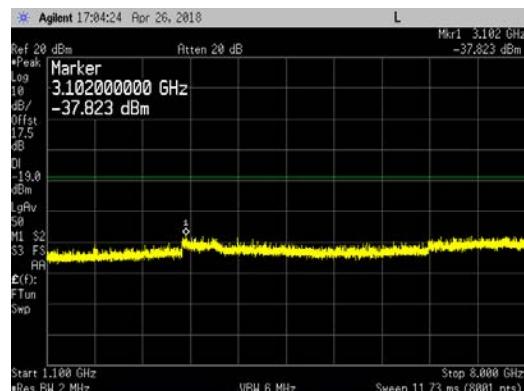
20MHz to 700MHz



700MHz to 1.1GHz



1.1GHz to 8GHz

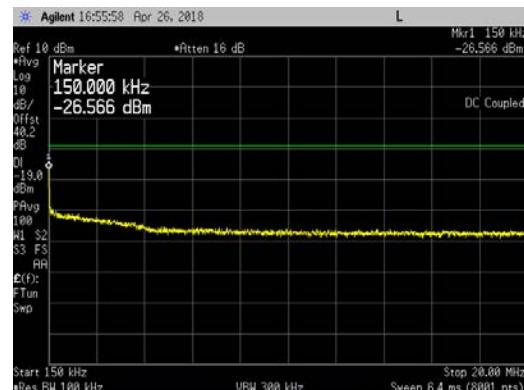


LTE5 & LTE5 Ch BWs _ 64QAM _ Middle Channels (737 MHz and 763MHz) at 40 watts/carrier:

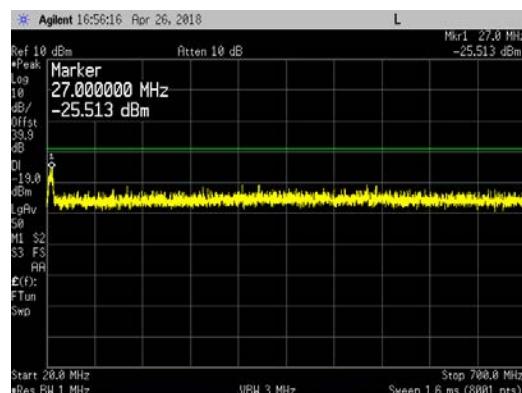
9kHz to 150kHz



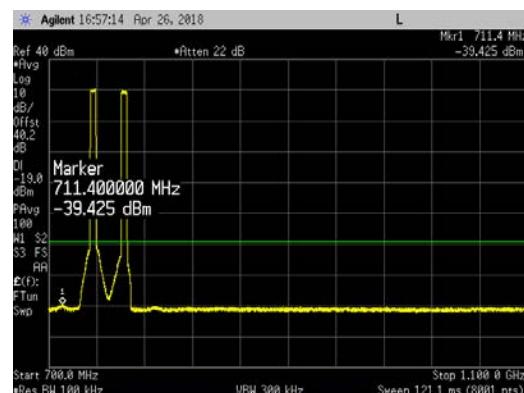
150kHz to 20MHz



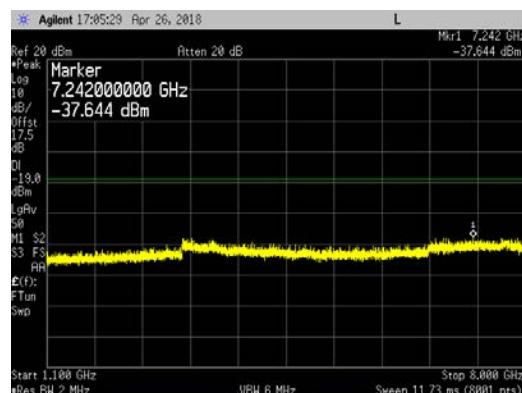
20MHz to 700MHz



700MHz to 1.1GHz

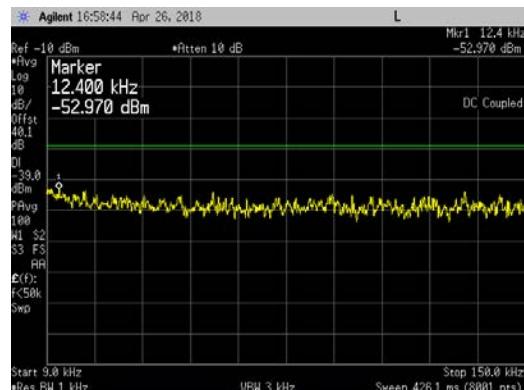


1.1GHz to 8GHz

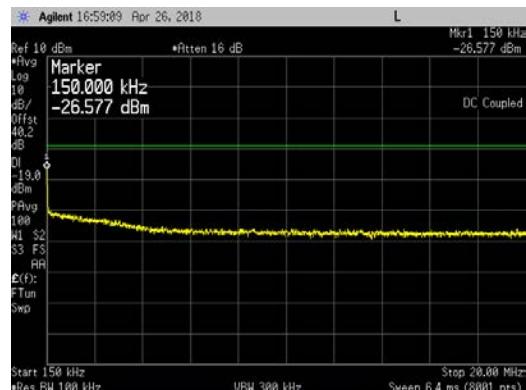


LTE5 & LTE5 Ch BWs _ 256QAM _ Middle Channels (737 MHz and 763MHz) at 40 watts/carrier:

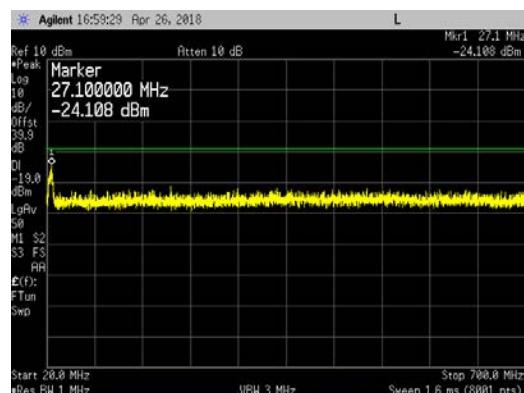
9kHz to 150kHz



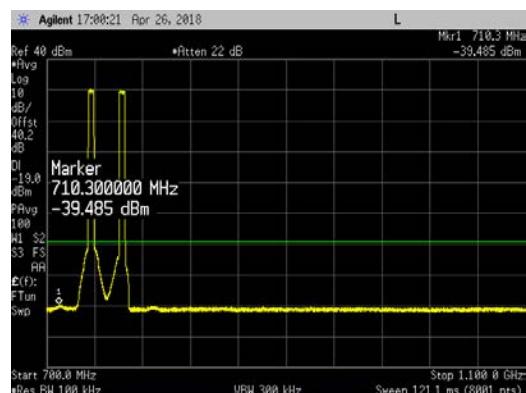
150kHz to 20MHz



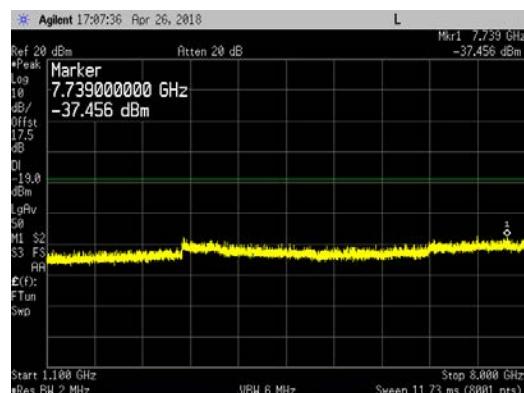
20MHz to 700MHz



700MHz to 1.1GHz

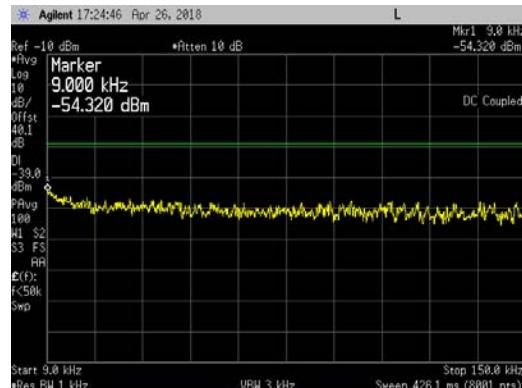


1.1GHz to 8GHz

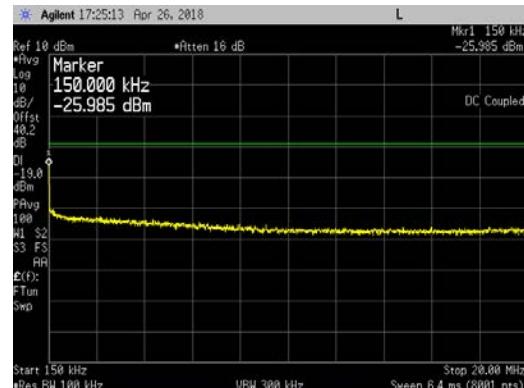


LTE10 & LTE10 Ch BWs _ QPSK _ Middle Channels (737 MHz and 763MHz) at 40 watts/carrier:

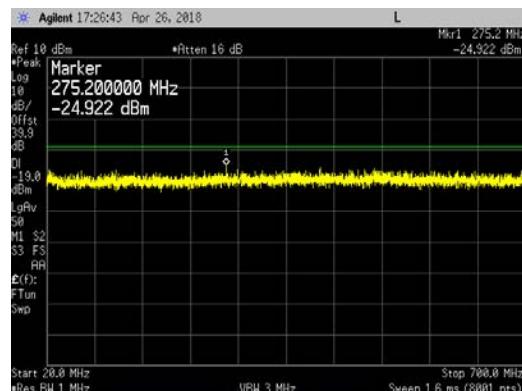
9kHz to 150kHz



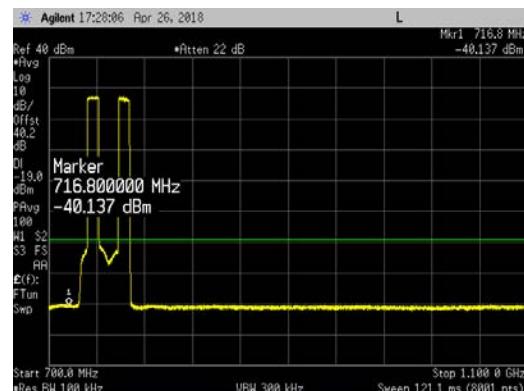
150kHz to 20MHz



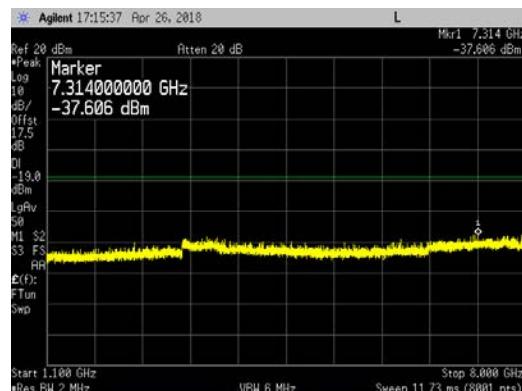
20MHz to 700MHz



700MHz to 1.1GHz

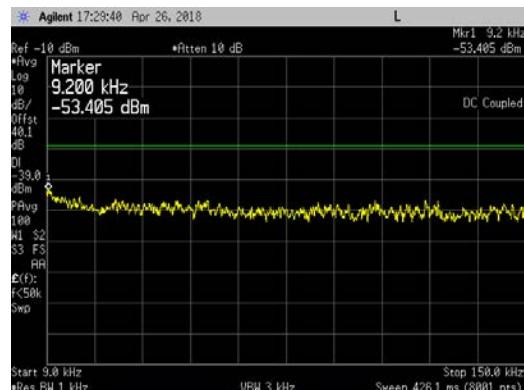


1.1GHz to 8GHz

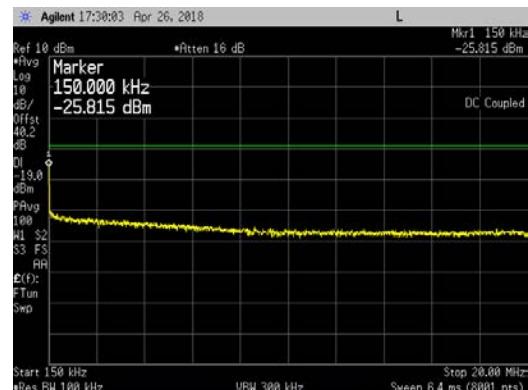


LTE10 & LTE10 Ch BWs _ 16QAM _ Middle Channels (737 MHz and 763MHz) at 40 watts/carrier:

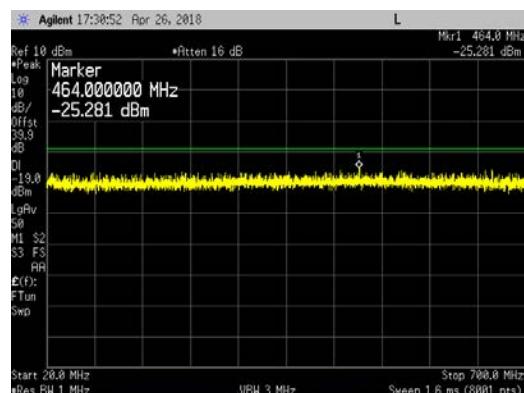
9kHz to 150kHz



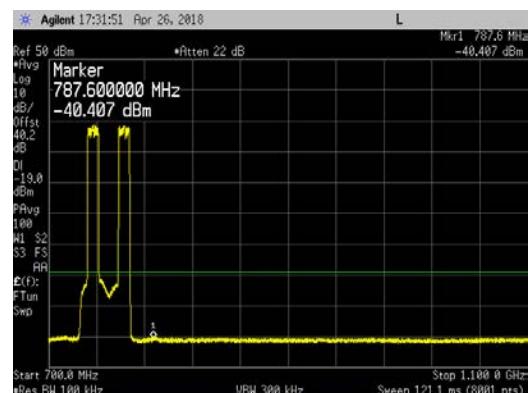
150kHz to 20MHz



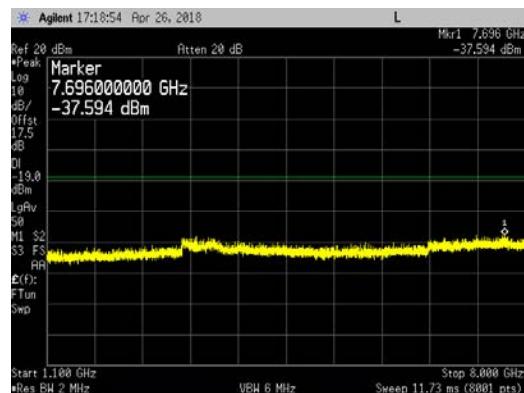
20MHz to 700MHz



700MHz to 1.1GHz



1.1GHz to 8GHz

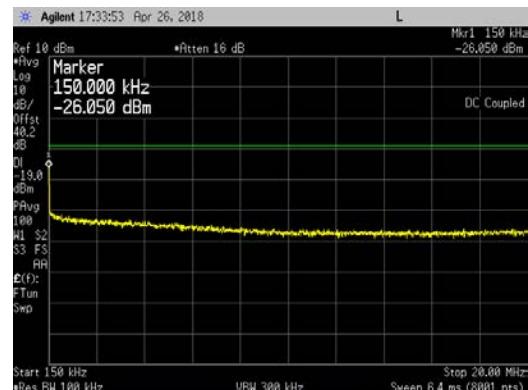


LTE10 & LTE10 Ch BWs _ 64QAM _ Middle Channels (737 MHz and 763MHz) at 40 watts/carrier:

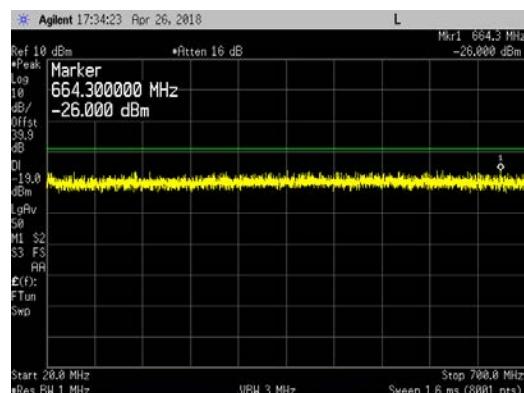
9kHz to 150kHz



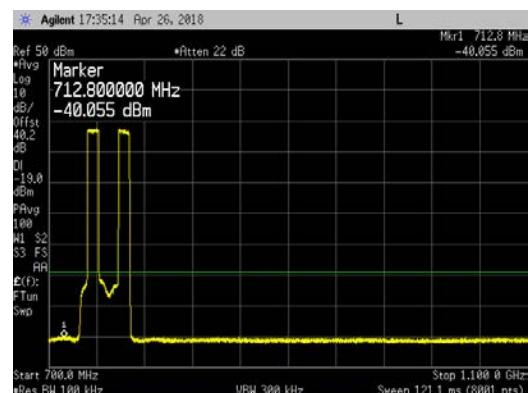
150kHz to 20MHz



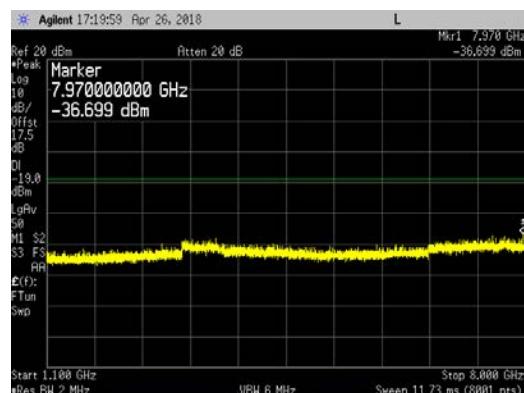
20MHz to 700MHz



700MHz to 1.1GHz



1.1GHz to 8GHz

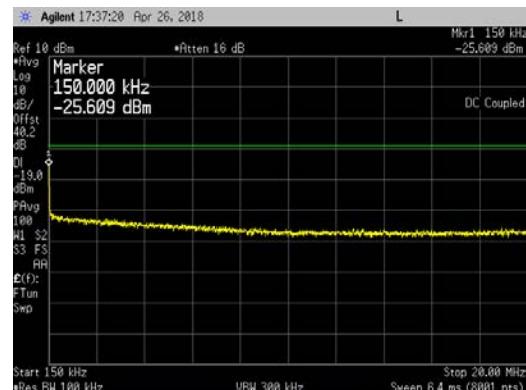


LTE10 & LTE10 Ch BWs _ 256QAM _ Middle Channels (737 MHz and 763MHz) at 40 watts/carrier:

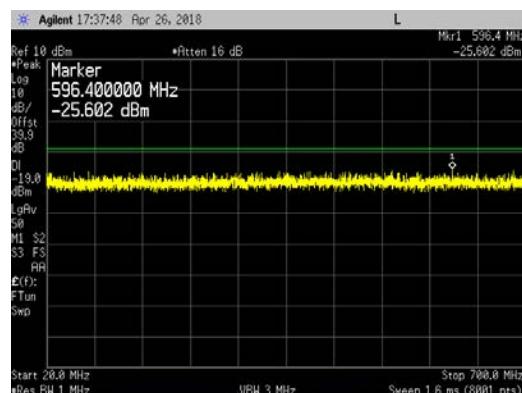
9kHz to 150kHz



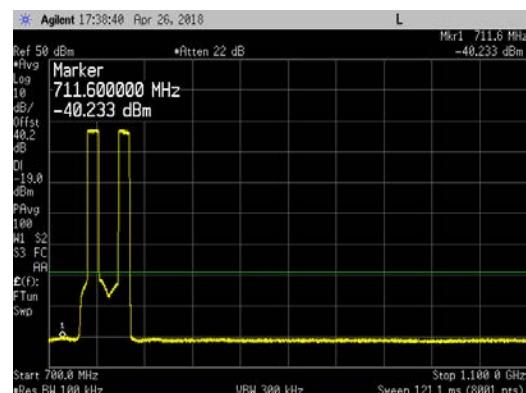
150kHz to 20MHz



20MHz to 700MHz



700MHz to 1.1GHz

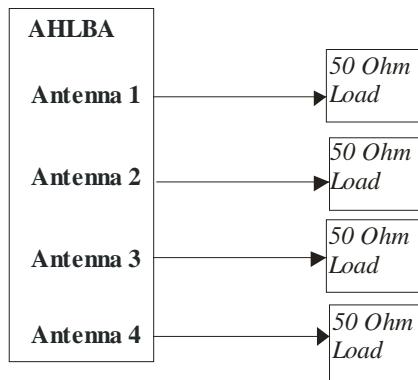


1.1GHz to 8GHz



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 – 8GHz frequency range.

Two test configurations (with the RRH fan assembly) are needed for radiated spurious emission measurements to prove compliance in the 3GPP Band 12 frequency range. The first test is with 3GPP Band 12 carriers operating at 80W/carrier (3GPP Band 14 carriers are not enabled). The second test is with the 3GPP Band 12 carriers and 3GPP Band 14 carriers operating simultaneously (at 40 watts per carrier and total carrier power of 80 watts per antenna port).

The bottom, middle and top frequency channels for each band are enabled. The AHLBA band 14 transmitters are configured for LTE10 and may operate only on the middle channel since the operational bandwidth is 10MHz wide (the band 14 carrier covers the entire downlink band). The carrier configurations for the radiated emission testing are provided below. Final maximized radiated emissions are measured in these modes.

Frequency Band	Antenna Port	RF BW	EARFCN	Transmit Frequency	Carrier Power
Band 12	1	5 MHz	5035 (Bottom Channel)	731.5 MHz	80 Watts
Band 12	2	5 MHz	5090 (Middle Channel)	737.0 MHz	80 Watts
Band 12	3	5 MHz	5090 (Middle Channel)	737.0 MHz	80 Watts
Band 12	4	5 MHz	5145 (Top Channel)	742.5 MHz	80 Watts
Band 14	1	10 MHz	5330 (B, M, T Channels)	763.0 MHz	0 Watts
Band 14	2	10 MHz	5330 (B, M, T Channels)	763.0 MHz	0 Watts
Band 14	3	10 MHz	5330 (B, M, T Channels)	763.0 MHz	0 Watts
Band 14	4	10 MHz	5330 (B, M, T Channels)	763.0 MHz	0 Watts

Band 12 at Maximum (80W/carrier) and Band 14 Carriers not Enabled

Frequency Band	Antenna Port	RF BW	EARFCN	Transmit Frequency	Carrier Power
Band 12	1	5 MHz	5035 (Bottom Channel)	731.5 MHz	40 Watts
Band 12	2	5 MHz	5090 (Middle Channel)	737.0 MHz	40 Watts
Band 12	3	5 MHz	5090 (Middle Channel)	737.0 MHz	40 Watts
Band 12	4	5 MHz	5145 (Top Channel)	742.5 MHz	40 Watts
Band 14	1	10 MHz	5330 (B, M, T Channels)	763.0 MHz	40 Watts
Band 14	2	10 MHz	5330 (B, M, T Channels)	763.0 MHz	40 Watts
Band 14	3	10 MHz	5330 (B, M, T Channels)	763.0 MHz	40 Watts
Band 14	4	10 MHz	5330 (B, M, T Channels)	763.0 MHz	40 Watts

Band 12 and Band 14 Carriers Enabled Simultaneously (40W/carrier)

RE Data – Band 12

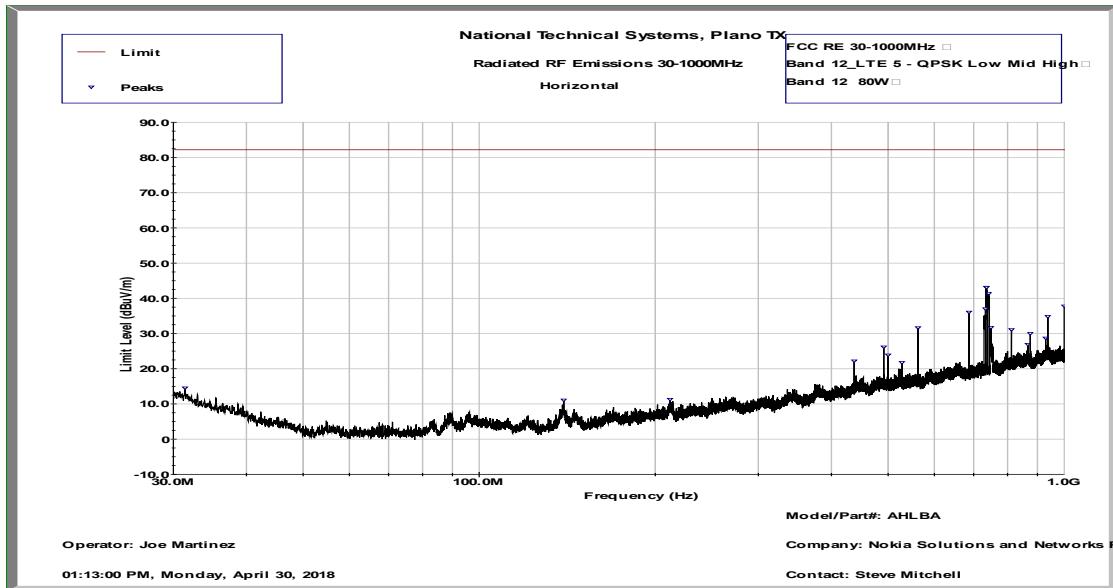
Frequency	Polarity	Peaks Raw	Antenna	Pre Amp	Cables	Peaks	Limit	Margin	Tower	Turntable
MHz	V/H	dBuV/m	dB	dB	dB	dBuV/m	dBuV/m	dB	cm	Degrees
3932.02	V	39.843	32.64	-36.953	4.967	40.496	82.2	-41.704	112	187
3932.12	H	38.585	32.64	-36.953	4.967	39.238	82.2	-42.962	100.2	356.9
6881.51	V	34.407	35.455	-37.465	6.488	38.886	82.2	-43.314	200	358
937.50	V	45.913	25.7	-37.002	3.755	38.371	82.2	-43.829	113	54
2948.99	V	40.943	29.565	-37.32	4.492	37.68	82.2	-44.52	200.1	1
687.51	V	49.196	21.3	-36.485	2.596	36.607	82.2	-45.593	175	54.1
687.50	H	48.621	21.3	-36.485	2.596	36.032	82.2	-46.168	299.9	198
937.48	H	42.324	25.7	-37.002	3.755	34.781	82.2	-47.419	100.1	224.1
875.02	V	43.519	24.198	-36.781	3.651	34.588	82.2	-47.612	99.9	-0.2
7863.86	V	29.014	36.69	-38.113	6.094	33.686	82.2	-48.514	200	358.1
812.49	V	42.376	24.6	-36.698	3.232	33.51	82.2	-48.69	148.1	34
5898.30	V	29.889	34.344	-37.161	5.567	32.638	82.2	-49.562	99.9	358.9
562.50	H	46.338	20.2	-36.924	1.98	31.595	82.2	-50.605	142.1	358.1
8542.66	H	27.379	37.366	-38.238	4.857	31.366	82.2	-50.834	200	1
2949.40	H	34.42	29.567	-37.32	4.492	31.159	82.2	-51.041	200.1	357.9
7865.63	H	25.819	36.693	-38.12	6.091	30.485	82.2	-51.715	200.1	1.1
491.50	V	45.385	19.1	-36.775	2.186	29.897	82.2	-52.303	300.1	347.8
5898.17	H	27.026	34.344	-37.161	5.567	29.774	82.2	-52.426	100.1	151.8
874.98	H	38.671	24.2	-36.781	3.651	29.741	82.2	-52.459	114.2	231
6882.68	H	24.048	35.456	-37.468	6.489	28.526	82.2	-53.674	99.7	1
9347.06	V	25.68	37.848	-38.8	3.403	28.131	82.2	-54.069	200	358
749.08	H	38.446	23.208	-36.666	2.845	27.834	82.2	-54.366	131	135
562.49	V	41.664	20.2	-36.924	1.98	26.92	82.2	-55.28	300.1	160.8
437.50	H	38.307	18.55	-36.704	2.028	22.181	82.2	-60.019	148.9	185

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.

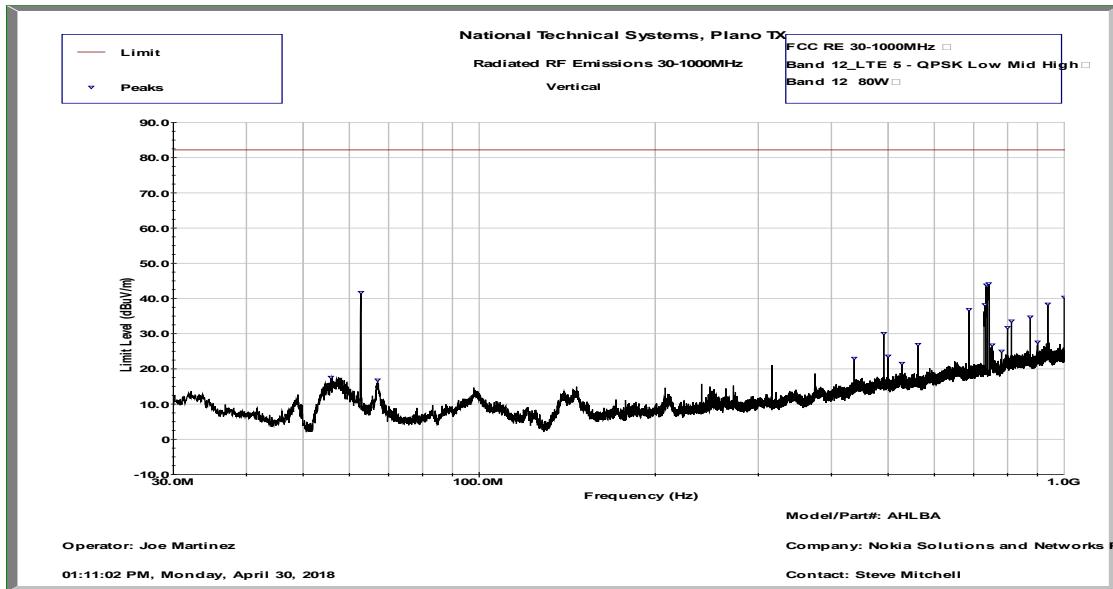
RE Data – Band 12 & 14 Simultaneously

Frequency	Polarity	Peaks Raw	Antenna	Pre Amp	Cables	Peaks	Limit	Margin	Tower	Turntable
MHz	V/H	dBuV/m	dB	dB	dB	dBuV/m	dBuV/m	dB	cm	Degrees
937.51	V	45.692	25.7	-37.002	3.755	38.149	82.2	-44.051	112.8	53
687.50	V	50.292	21.3	-36.485	2.596	37.703	82.2	-44.497	183.9	64
8589.77	V	33.16	37.406	-38.39	4.687	36.865	82.2	-45.335	200	-0.1
2949.25	V	39.766	29.566	-37.32	4.492	36.504	82.2	-45.696	200.1	0.9
687.49	H	48.966	21.3	-36.485	2.596	36.377	82.2	-45.823	127	192.9
3932.04	H	35.453	32.64	-36.953	4.967	36.106	82.2	-46.094	164.1	291.1
875.01	V	44.147	24.199	-36.781	3.651	35.217	82.2	-46.983	100	-0.1
812.49	V	43.909	24.6	-36.698	3.232	35.044	82.2	-47.156	186.1	169
937.49	H	42.459	25.7	-37.002	3.755	34.917	82.2	-47.283	100.1	225.2
6881.10	H	30.423	35.455	-37.464	6.488	34.903	82.2	-47.297	200.1	359.9
7863.22	V	29.311	36.688	-38.111	6.095	33.985	82.2	-48.215	200	-0.1
7865.80	H	27.86	36.693	-38.12	6.091	32.525	82.2	-49.675	199.9	312.1
3931.87	V	30.948	32.64	-36.953	4.967	31.601	82.2	-50.599	126.9	168
562.50	H	46.21	20.2	-36.924	1.98	31.466	82.2	-50.734	135	358
874.99	H	40.282	24.2	-36.781	3.651	31.353	82.2	-50.847	300	230.2
491.52	V	46.352	19.1	-36.775	2.186	30.863	82.2	-51.337	106	358
6881.04	V	26.347	35.455	-37.464	6.488	30.827	82.2	-51.373	200.1	-0.2
2947.57	H	32.635	29.56	-37.32	4.492	29.366	82.2	-52.834	200.1	0
5898.87	H	25.614	34.346	-37.16	5.567	28.367	82.2	-53.833	200	360
562.48	V	41.115	20.2	-36.924	1.98	26.371	82.2	-55.829	99.7	247.9
5898.10	V	23.055	34.343	-37.161	5.567	25.803	82.2	-56.397	200.1	-0.2
5235.07	H	22.797	33.777	-36.906	4.34	24.008	82.2	-58.192	200.1	360
749.04	H	34.532	23.204	-36.666	2.845	23.915	82.2	-58.285	99.9	359.1
437.51	H	38.108	18.551	-36.704	2.028	21.983	82.2	-60.217	156	180

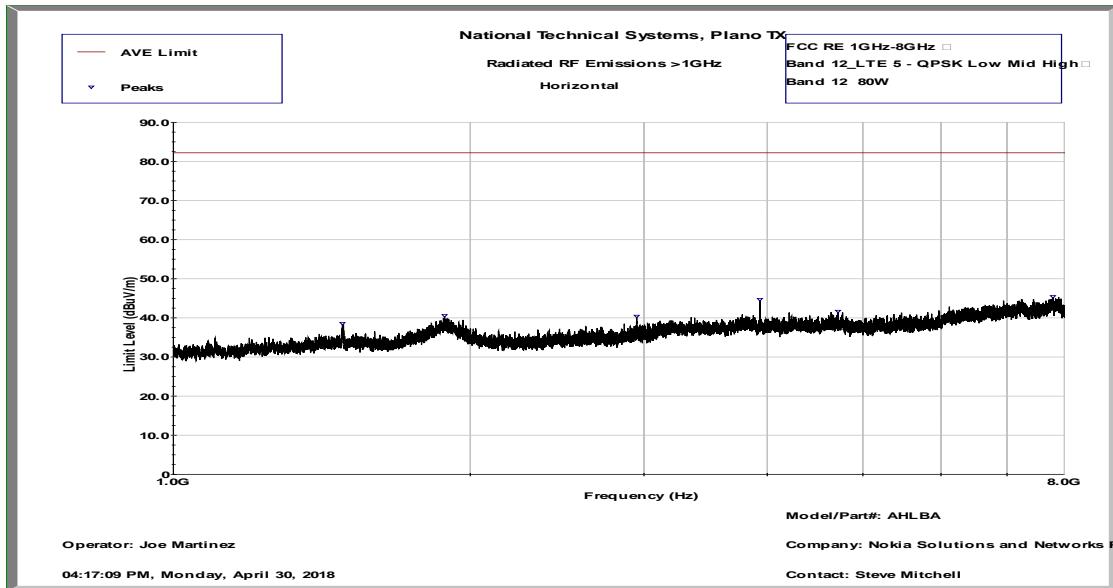
A three-meter measurement distance was used for radiated emission measurements. The highest radiated emissions detected were more than 20dB below the three-meter limit of 82.2dBuV/m (equivalent to -13dBm EIRP). Since all maximized measurements were more than 20dB below these levels, substitution measurements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



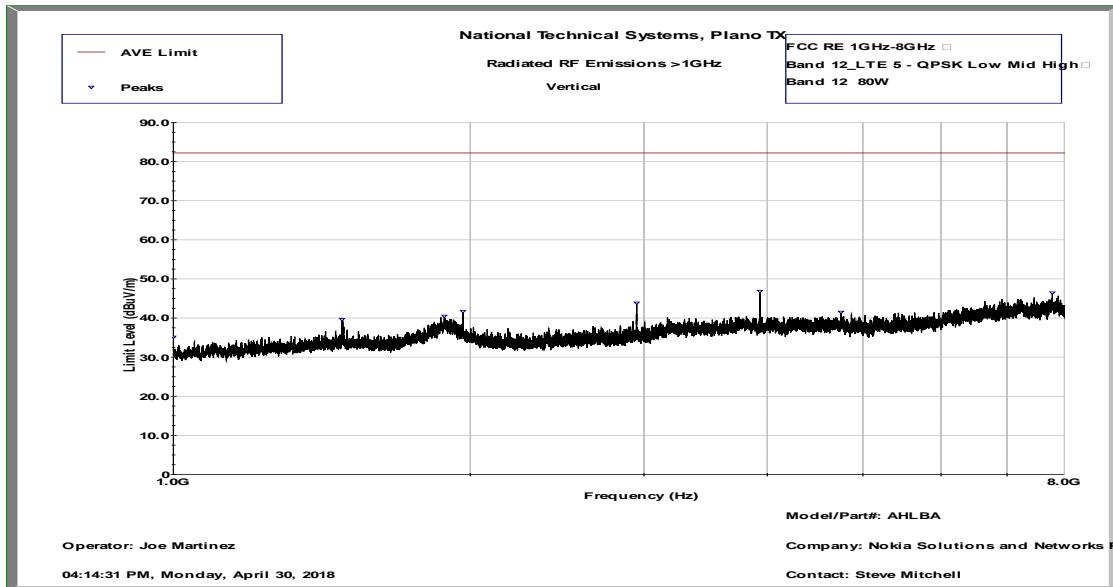
Radiated Spurious Emissions 30-1000MHz Horizontal - Band 12



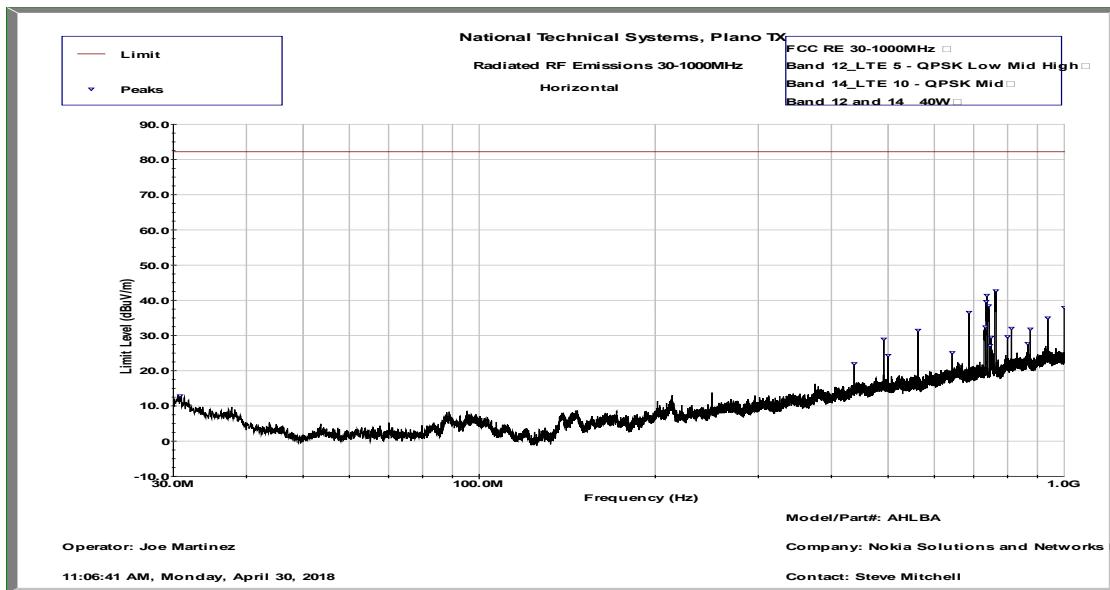
Radiated Spurious Emissions 30-1000MHz Vertical - Band 12



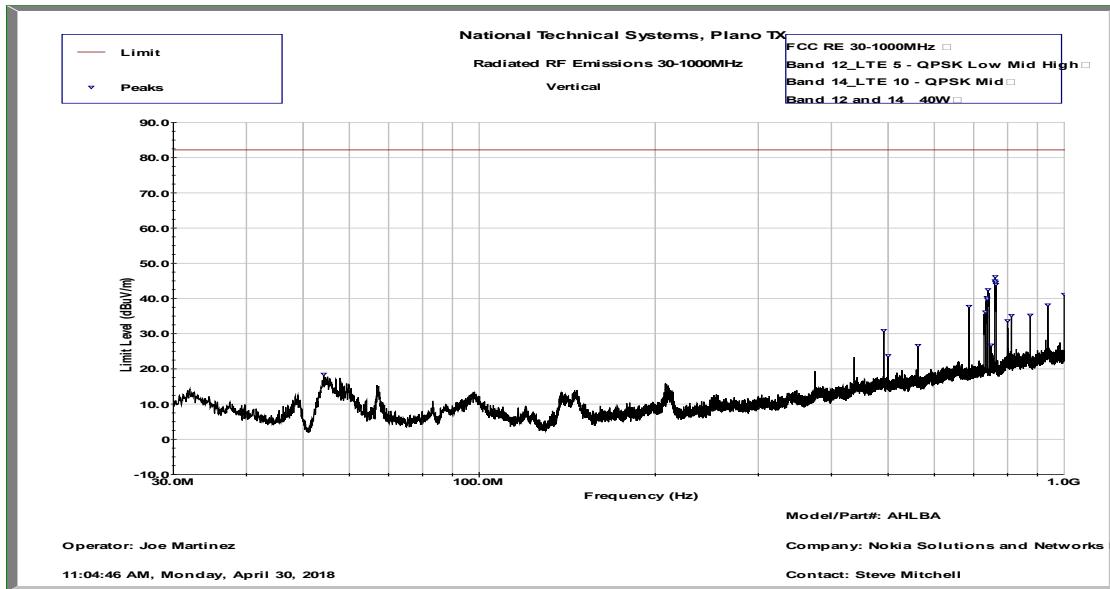
Radiated Spurious Emissions 1-8GHz Horizontal - Band 12



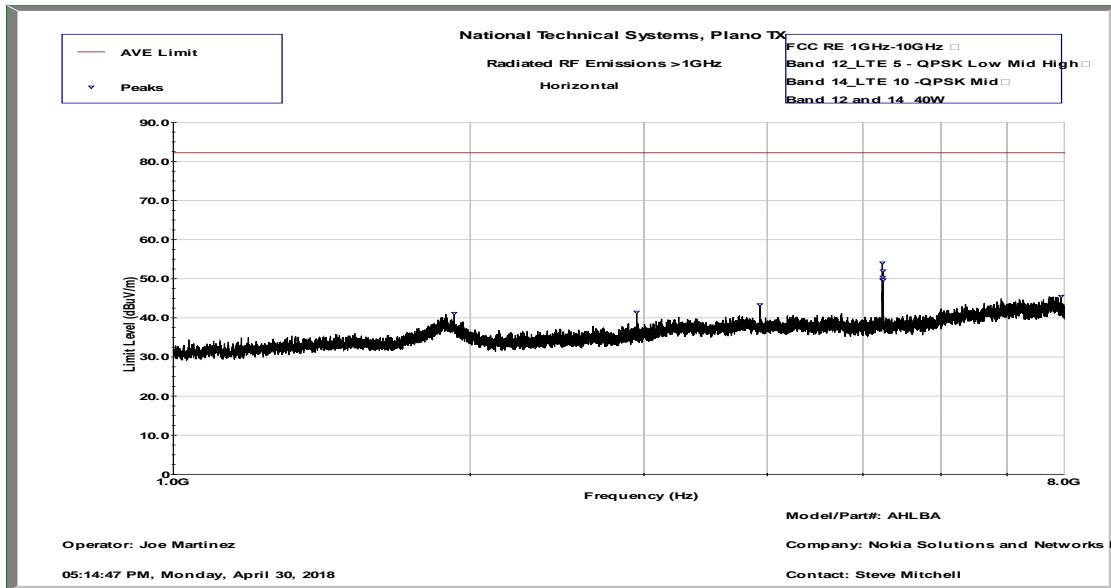
Radiated Spurious Emissions 1-8GHz Vertical - Band 12



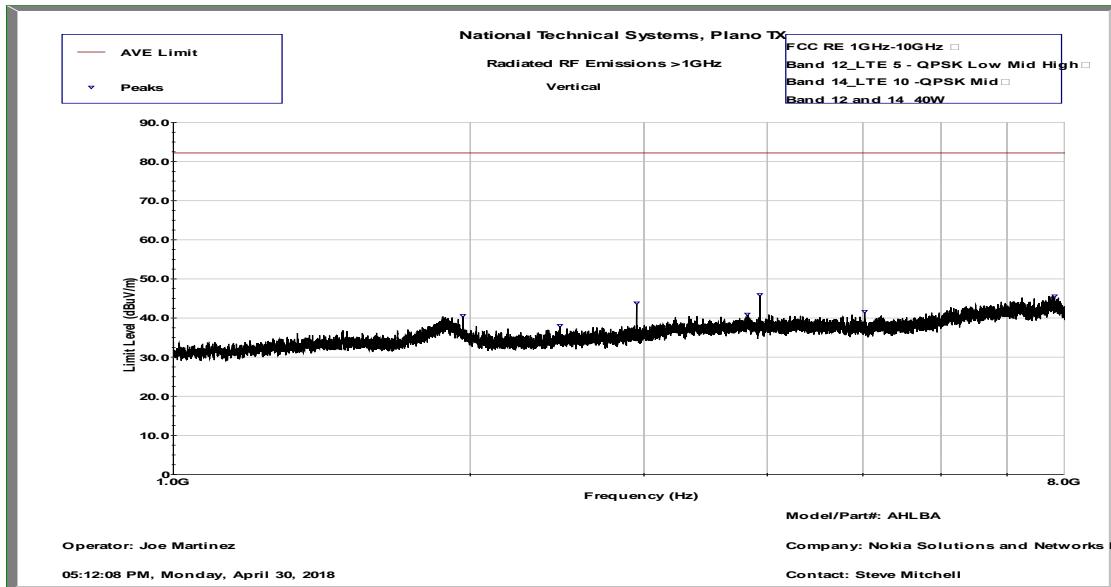
Radiated Spurious Emissions 30-1000MHz Horizontal - Band 12 & 14 Simultaneously



Radiated Spurious Emissions 30-1000MHz Vertical - Band 12 & 14 Simultaneously



Radiated Spurious Emissions 1-8GHz Horizontal - Band 12 & 14 Simultaneously



Radiated Spurious Emissions 1-8GHz Vertical - Band 12 & 14 Simultaneously

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 (737.0MHz) on port 1.
- (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	0.59
100%	48.0	0.63
115%	55.2	0.73

Extreme Temperatures:

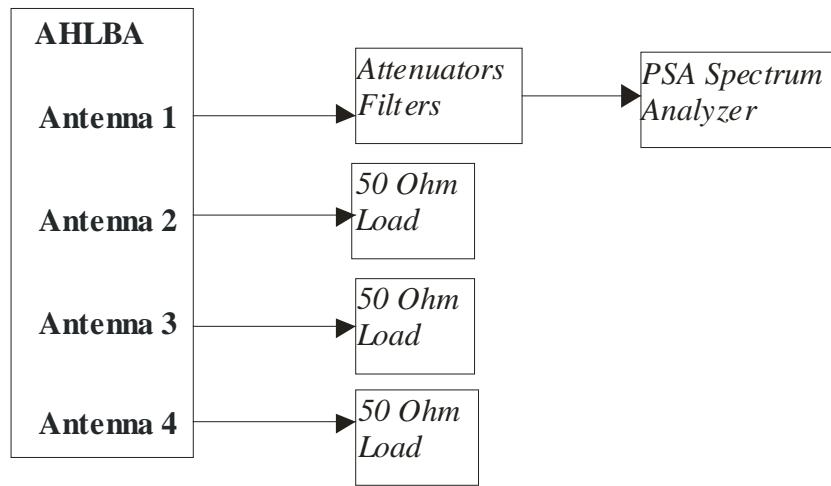
Temperature	Frequency Error (Hz) at 48VDC
-30 °C	0.65
-20 °C	0.78
-10 °C	0.71
0 °C	0.74
10 °C	0.56
20 °C	0.63
30 °C	0.73
40 °C	0.64
50 °C	0.64

Based on the results above, the highest recorded frequency error (0.78Hz or ~0.001 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.

APPENDIX B: ANTENNA PORT TEST DATA FOR BAND 14 (758-768MHZ)

All conducted RF measurements for this test effort in this section were made at AHLBA antenna ports for Band 14 measurements. The test setup used is provided below.



Test Setup Used for Conducted RF Measurements on AHLBA

RF Output Power

RF output power has been measured in both Peak and RMS Average terms for each Band 14 transmit chain at the middle channel for 256QAM modulation and LTE5 bandwidth. Peak to average power ratio (PAPR) has been calculated as described in Section 5.7.2 of KDB971168 D01 v02r02 and all results are presented in tabular form below.

Antenna	LTE Bandwidth	LTE - 256QAM		
		Peak (dBm)	Average (dBm)	PAPR (dB)
Port 1 Middle Channel	5M	56.52	48.80	7.72
Port 2 Middle Channel	5M	56.39	48.68	7.71
Port 3 Middle Channel	5M	56.45	48.74	7.71
Port 4 Middle Channel	5M	56.38	48.68	7.70

The variation in RMS output power levels between the antenna ports is 0.12 dB per data sample provided above. Pre-compliance testing (and testing of similar EUTs) shows that the output power variation between antenna ports is small (the output ports are essentially electrically identical).

Pre-compliance testing has shown that the output power variation between modulation types is small. Antenna port 1 power output measurements for the LTE5 bandwidth for all modulation types on the middle (center) channel are provided below.

	Modulation Type							
	QPSK		16QAM		64QAM		256QAM	
	Peak (dBm)	Ave (dBm)	Peak (dBm)	Ave (dBm)	Peak (dBm)	Ave (dBm)	Peak (dBm)	Ave (dBm)
Antenna Port 1 Middle Channel LTE5	56.54	48.89	56.45	48.90	56.52	48.90	56.52	48.80

The output power variation between modulation types is small in this measurement snapshot (and from past efforts on similar hardware as well). The variation of average power output versus modulation type is 0.10dB for the data snapshot provided. The variation of peak power output versus modulation type is 0.09dB for the data snapshot provided. All power measurements in this report (except the sample test noted above) were performed with the EUT operating with 256QAM modulation.

Based on the results above, Port 1 had the highest RMS average power for Band 14 (represents the worst case) and therefore it was selected for all the remaining antenna port tests. Port 1 has the highest combined RMS average power for Band 12 + Band 14.

Subsequently output power levels on bottom, middle, and top channels in all available LTE channel bandwidths using 256QAM modulation type were tested only at Port 1 and the results presented below. The AHLBA Band 14 configured for LTE10 may operate only on the middle channel since the operational bandwidth is 10MHz wide. The highest measured values are highlighted.

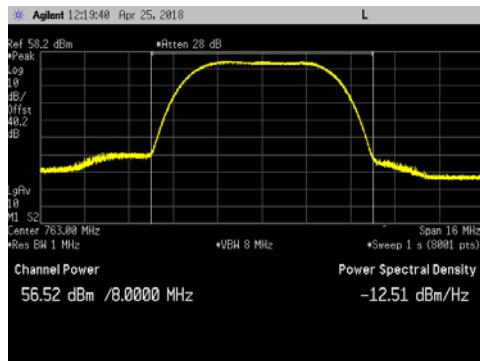
Antenna LTE Channel	LTE Bandwidth	LTE - 256QAM		
		Peak (dBm)	Ave (dBm)	PAPR (dB)
Port 1 Bottom Channel	5M	56.50	48.82	7.68
Port 1 Middle Channel	5M	56.52	48.80	7.72
	10M	56.59	48.74	7.85
Port 1 Top Channel	5M	56.44	48.73	7.71

The data provided in the table shows (and testing of similar EUTs) that the output RMS power variation between channel bandwidths at the center frequency channel is small (0.06dB).

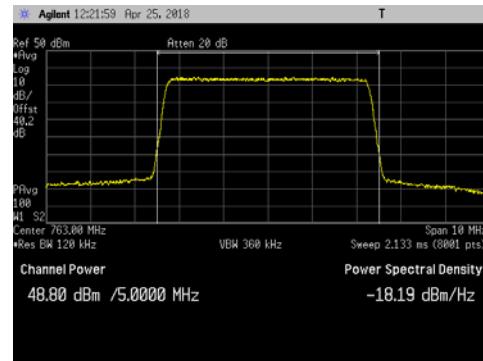
All measurement results are provided in the following pages. The total measurement RF path loss of the test setup (attenuator and test cables) was 40.2 dB and is accounted for by the spectrum analyzer reference level offset.

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

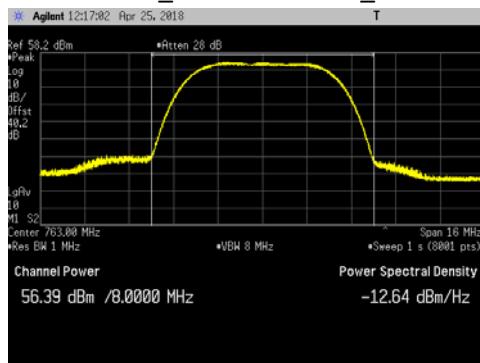
Port 1 - LTE5_Middle Channel_Peak



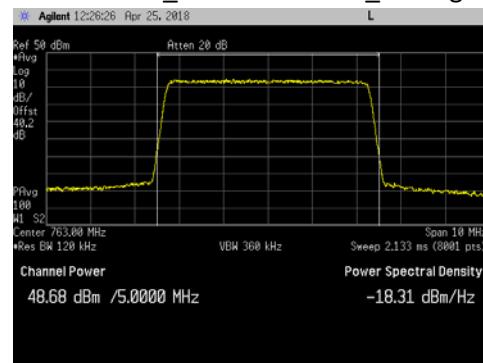
Port 1 - LTE5_Middle Channel_Average



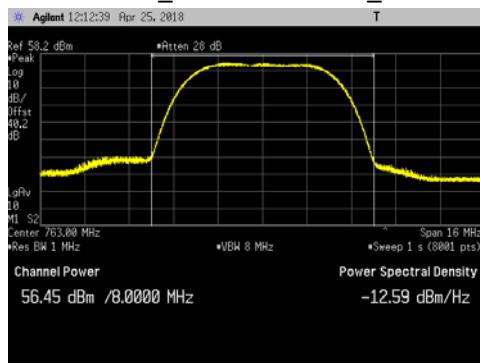
Port 2 - LTE5_Middle Channel_Peak



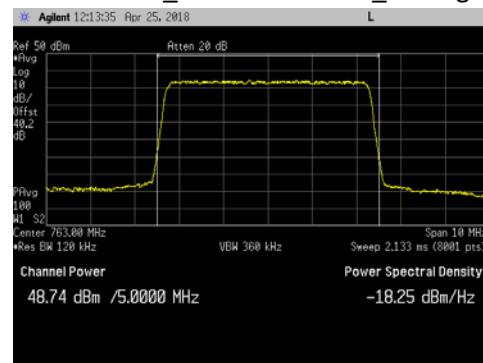
Port 2 - LTE5_Middle Channel_Average



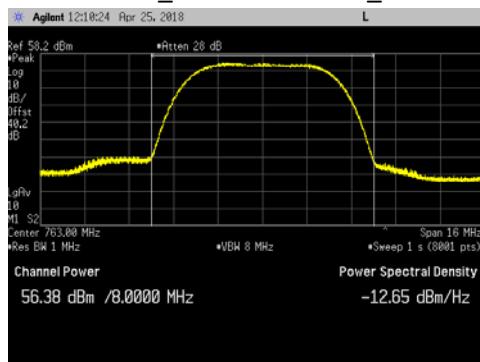
Port 3 - LTE5_Middle Channel_Peak



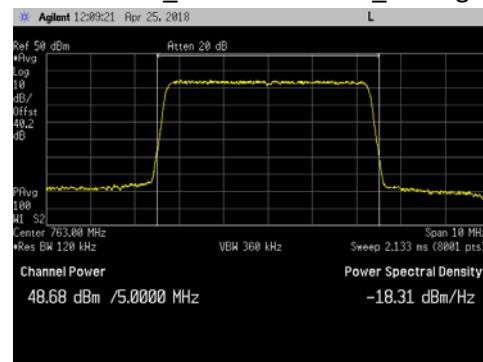
Port 3 - LTE5_Middle Channel_Average



Port 4 - LTE5_Middle Channel_Peak

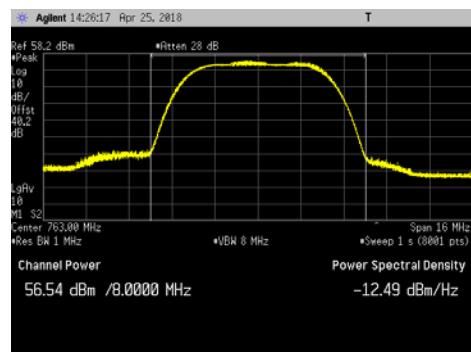


Port 4 - LTE5_Middle Channel_Average

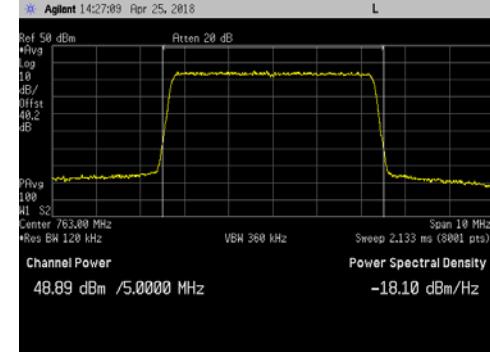


LTE5 Channel Power Plots for Antenna Port 1 at Middle Channel and all Modulation Types:

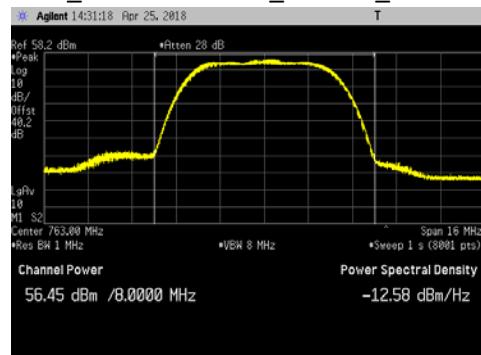
LTE5_Middle Channel_QPSK_Peak



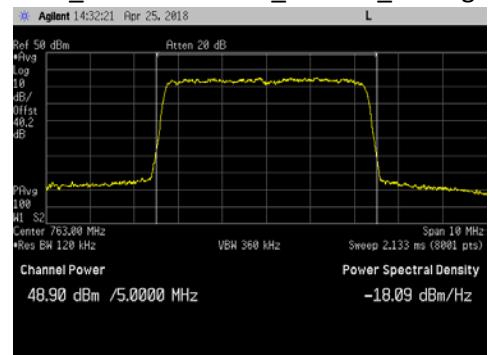
LTE5_Middle Channel_QPSK_Average



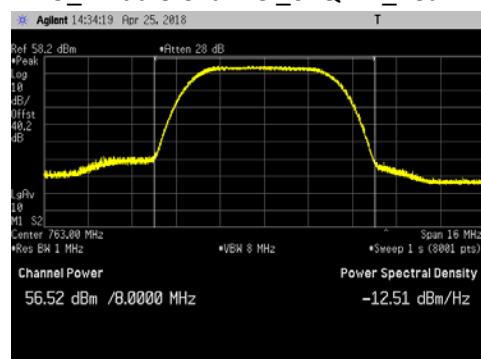
LTE5_Middle Channel_16QAM_Peak



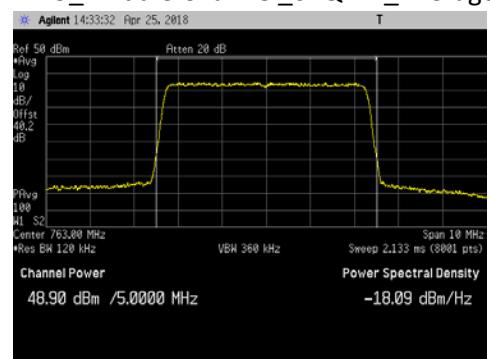
LTE5_Middle Channel_16QAM_Average



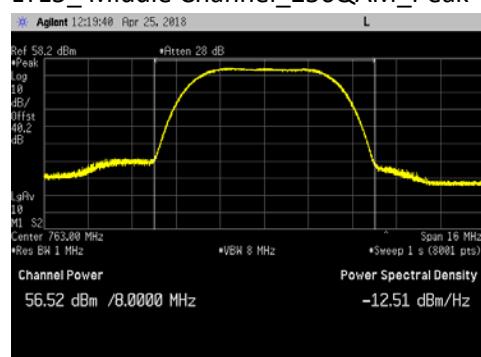
LTE5_Middle Channel_64QAM_Peak



LTE5_Middle Channel_64QAM_Average



LTE5_Middle Channel_256QAM_Peak

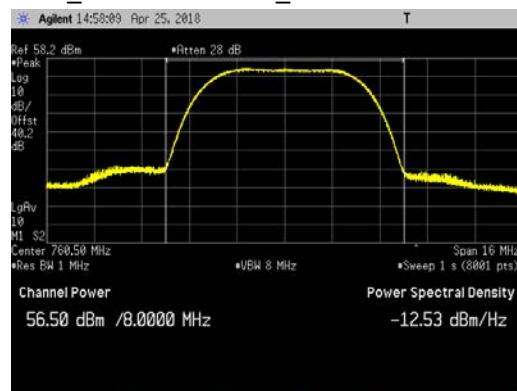


LTE5_Middle Channel_256QAM_Average

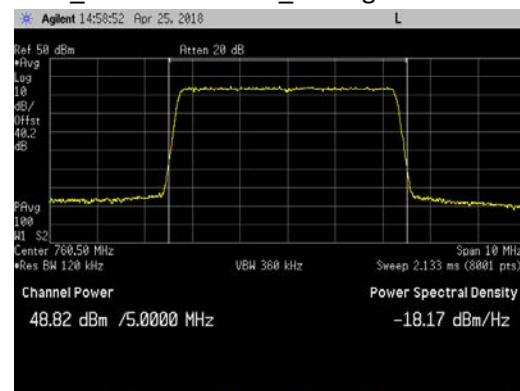


LTE5 Channel Power Plots for Antenna Port 1 and 256QAM Modulation:

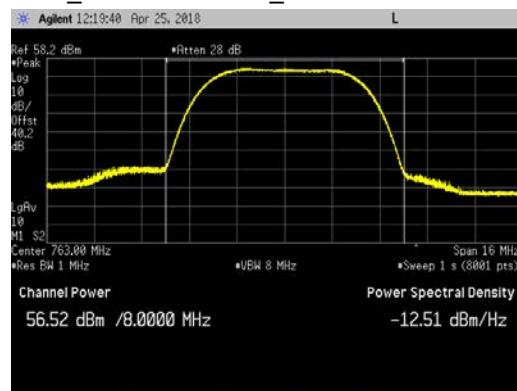
LTE5_Bottom Channel_Peak



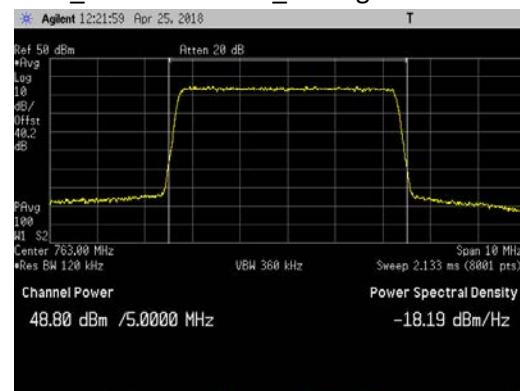
LTE5_Bottom Channel_Average



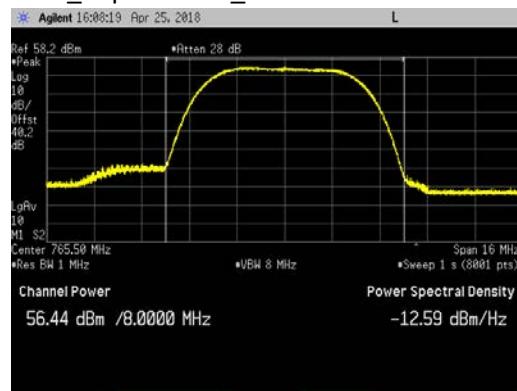
LTE5_Middle Channel_Peak



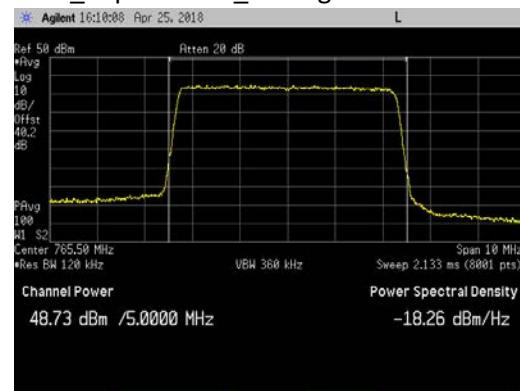
LTE5_Middle Channel_Average



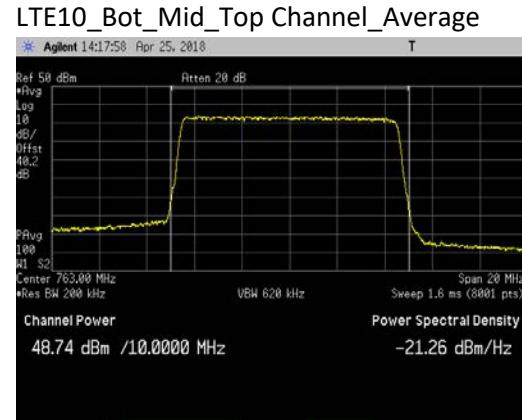
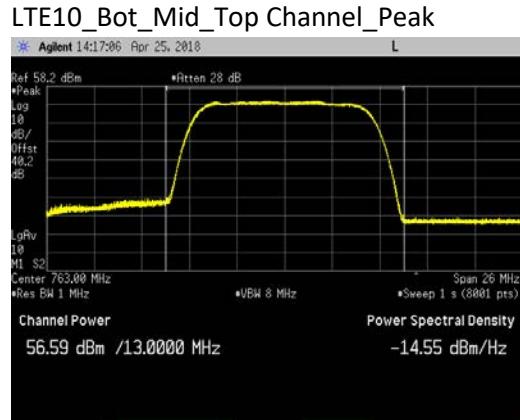
LTE5_Top Channel_Peak



LTE5_Top Channel_Average



LTE10 Channel Power Plots for Antenna Port 1 and 256QAM Modulation:



Emission Bandwidth (26 dB down and 99%)

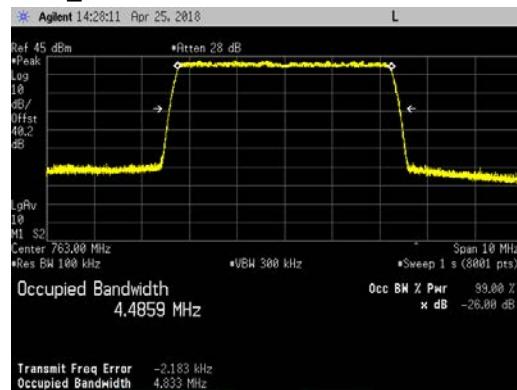
Emission bandwidth measurements were made at antenna port 1 on the middle channel with maximum RF output power. All available LTE modulations (QPSK, 16QAM, 64QAM, 256QAM) were used. All available LTE channel bandwidths (5MHz and 10MHz) were used. The results are provided in the following table (largest 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	4.833	4.4859	4.827	4.4804	4.842	4.4906	4.848	4.4910
10M	9.637	8.9654	9.645	8.9678	9.666	8.9755	9.634	8.9591

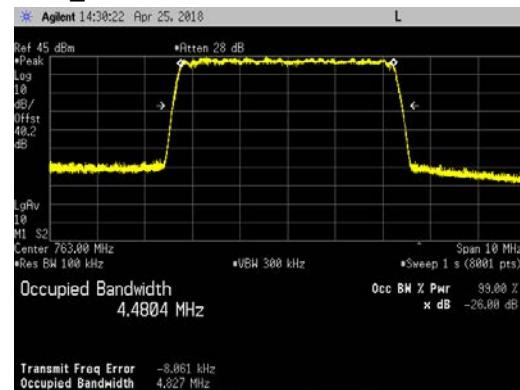
Emission bandwidth measurement data are provided in the following pages.

LTE5 Emission Bandwidth Plots on the Middle Channel for Antenna Port 1:

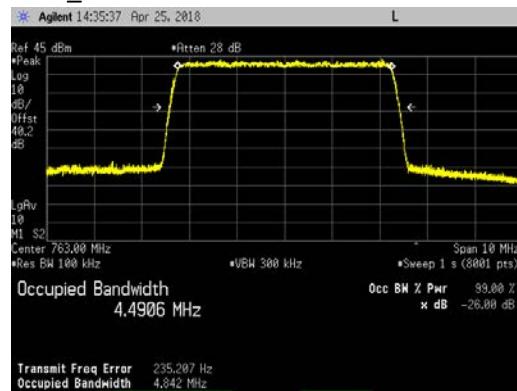
LTE5_QPSK



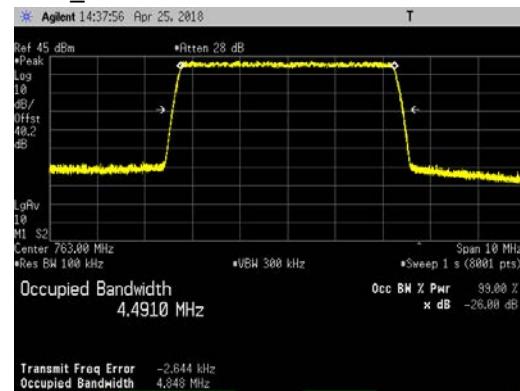
LTE5_16QAM



LTE5_64QAM

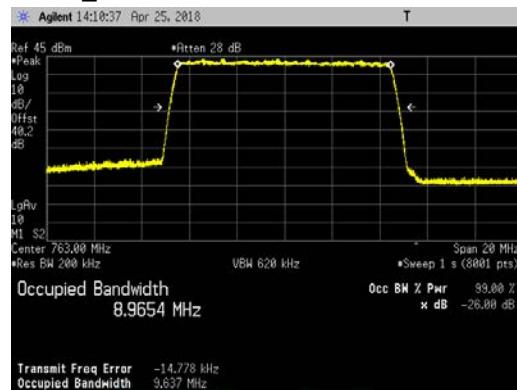


LTE5_256QAM

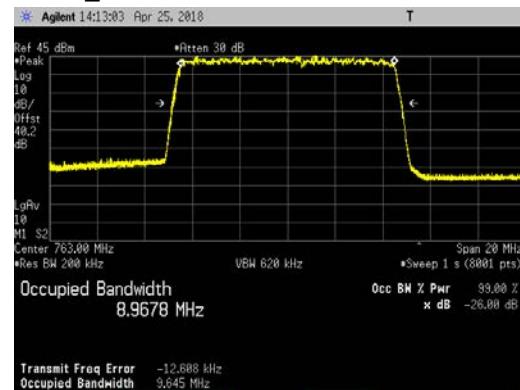


LTE10 Emission Bandwidth Plots on the Middle Channel for Antenna Port 1:

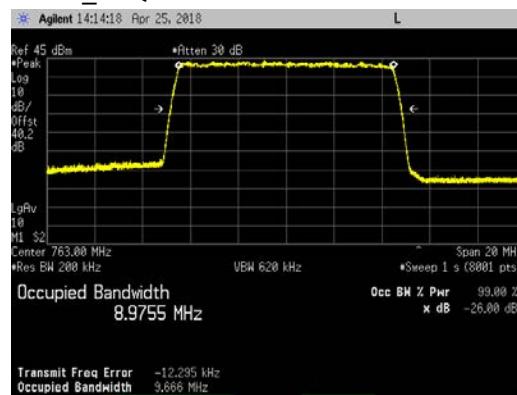
LTE10_QPSK



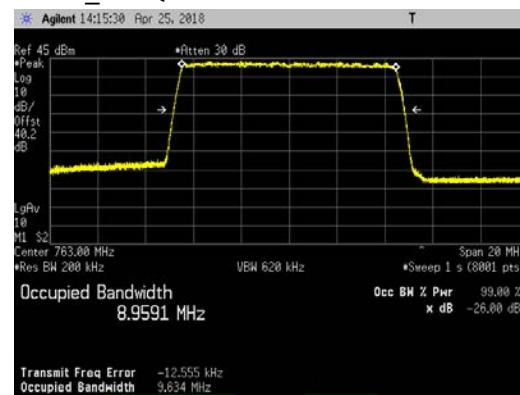
LTE10_16QAM



LTE10_64QAM



LTE10_256QAM



Antenna Port Conducted Band Edge

Conducted band edge measurements were made at RRH antenna port 1. The RRH was operated at the band edge frequencies with all modulation types (QPSK, 16QAM, 64QAM, 256QAM) for 5MHz and 10MHz LTE bandwidths. The AHLBA Band 14 configured for LTE10 may operate only on the middle channel since the operational bandwidth is 10MHz wide.

In the frequency ranges below 758MHz, 768MHz to 769MHz, 775MHz to 788MHz and above 805MHz the limit of (-19dBm) is used for this testing as required by FCC 90.543(e). 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 90.543(e)(5) was used. Outside the 100kHz band edge noted above, a 100kHz RBW and 300kHz VBW was used. Measurements were performed in the frequency range from the band edge to 20 MHz outside the lower band edge and 42 MHz outside the upper band edge (i.e.: 738 to 758MHz and 768 to 810MHz bands).

The results are summarized in the following table. The highest (worst case) emissions from the measurement data are provided.

Frequency ranges below 758MHz, 768MHz to 769MHz, 775MHz to 788MHz and above 805MHz:

Frequency Ranges below 758MHz, 768MHz to 769MHz, 775MHz to 788MHz and above 805MHz										
Channel BW, Carrier Frequency, Carrier Power		QPSK (dBm)		16QAM (dBm)		64QAM (dBm)		256QAM (dBm)		
Band 12	Band 14	Bottom	Top	Bottom	Top	Bottom	Top	Bottom	Top	
Carrier Off	LTE5, BC & TC, 80W	-23.350	-24.172	-23.641	-26.685	-24.367	-25.182	-22.714	-26.248	
Carrier Off	LTE10, MC, 80W	-25.843	-29.422	-25.831	-30.115	-25.930	-29.651	-26.002	-29.838	
Carrier Off	Dual LTE5, BC & TC, 40W + 40W	-24.102	-26.578	-23.844	-26.746	-24.073	-26.183	-23.744	-27.042	
LTE5, MC, 40W	LTE10, MC, 40W	-23.648	-29.188	-23.284	-29.619	-24.082	-28.882	-24.457	-29.540	
LTE10, MC, 40W	LTE10, MC, 40W	-23.673	-28.034	-22.720	-28.912	-23.519	-28.083	-23.154	-28.300	

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.

Section 90.543(e)(1) requires an emission limit of -46dBm for any 6.25 kHz bandwidth between frequency bands 769-775 MHz and 799-805MHz. 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 -57.087 dBm.

Frequency ranges of 769MHz to 775MHz and 799MHz to 805MHz:

Frequency Ranges of 769MHz to 775MHz and 799MHz to 805MHz									
Channel BW, Carrier Frequency, Carrier Power		QPSK (dBm)		16QAM (dBm)		64QAM (dBm)		256QAM (dBm)	
Band 12	Band 14	769MHz to 775MHz	799MHz to 805MHz						
Carrier Off	LTE5, TC, 80W	-58.493	-72.235	-59.457	-72.197	-59.085	-72.316	-59.679	-72.392
Carrier Off	LTE10, MC, 80W	-59.326	-72.251	-59.627	-72.229	-60.043	-72.127	-59.434	-72.266
Carrier Off	Dual LTE5, BC & TC, 40W + 40W	-58.698	-72.291	-59.358	-72.251	-59.247	-72.374	-58.624	-72.069
LTE5, MC, 40W	LTE10, MC, 40W	-57.962	-72.103	-58.664	-72.151	-58.488	-72.081	-59.567	-72.125
LTE10, MC, 40W	LTE10, MC, 40W	-57.087	-72.081	-57.490	-72.133	-57.299	-72.060	-57.485	-72.039

The total measurement RF path loss of the test setup (attenuator, Band 12 carrier blocking filter, Band 14 carrier blocking filter and test cables) is accounted for by an amplitude corrections table programmed into spectrum analyzer and is defined below.

Amplitude Corrections Table for Frequency Ranges of 769MHz to 775MHz and 799MHz to 805MHz														
Frequency (MHz)	769.0	769.1	769.2	769.3	769.4	769.5	769.8	770.0	770.5	771.0	775.0	776.0	798.0	805.0
Correction (dB)	47.0	46.3	45.7	45.2	44.9	44.6	44.1	43.7	43.1	42.6	42.2	41.9	41.2	41.2

The display line on the plots reflects the required limit. Conducted band edge measurements are provided in the following pages.