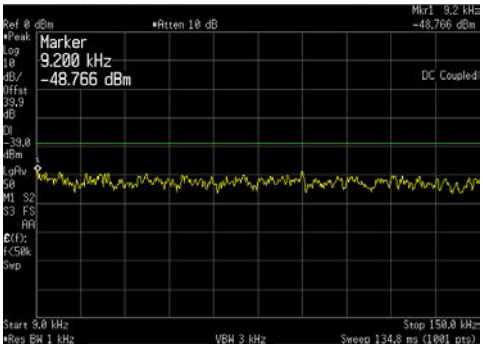
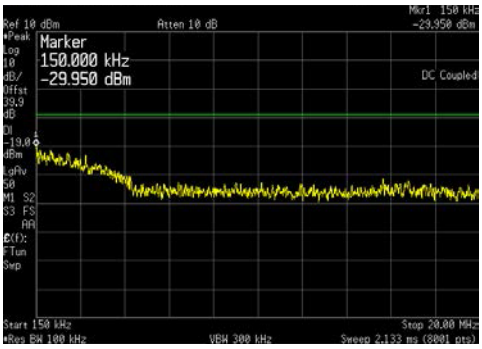
LTE3 & LTE5 Ch BWs _ QPSK _ Middle Channels (751MHz and 881.5MHz) at 40 watts/carrier:

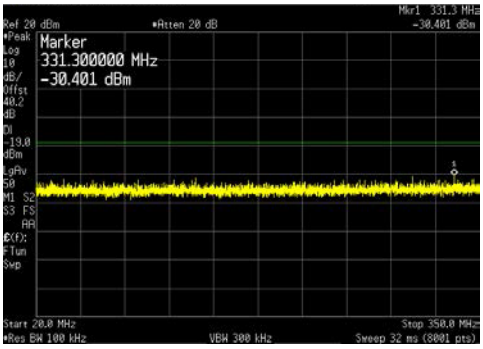
9kHz to 150kHz



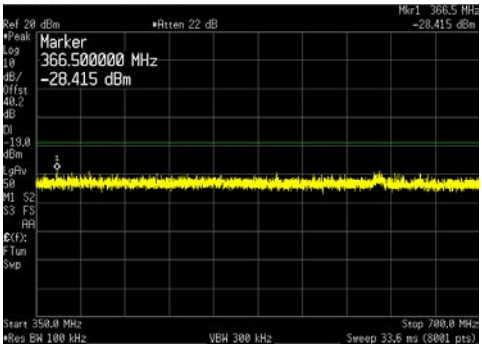
150kHz to 20MHz



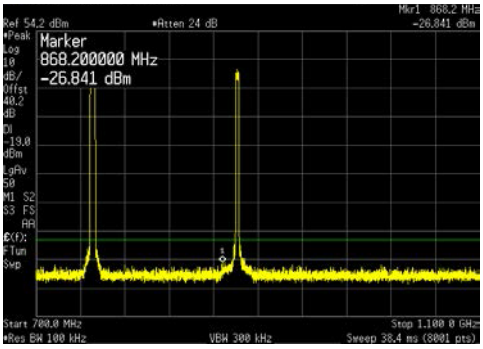
20MHz to 350MHz



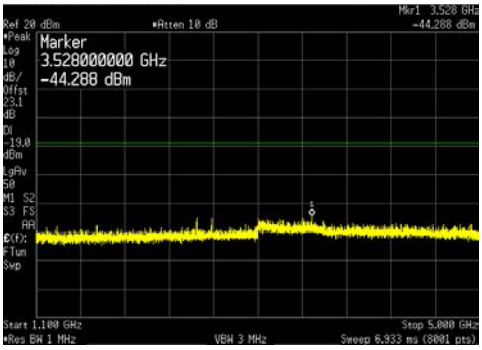
350MHz to 700MHz



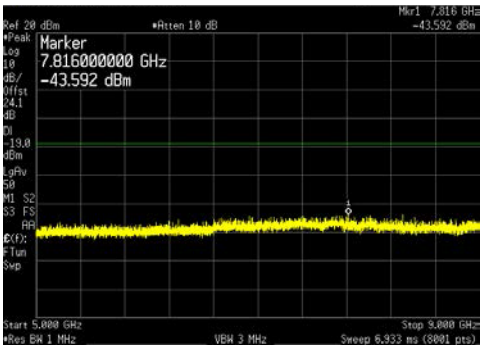
700MHz to 1.1GHz



1.1GHz to 5GHz

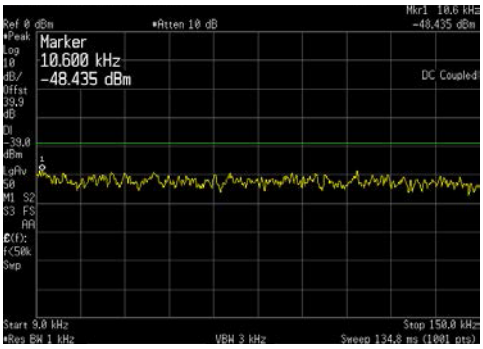


5GHz to 9GHz

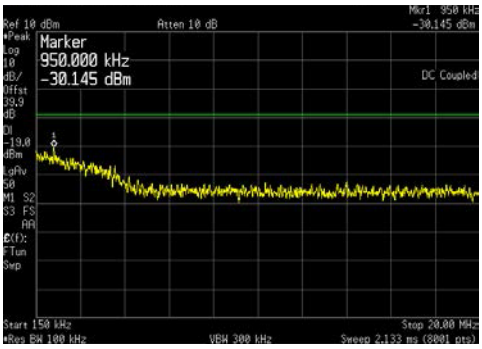


LTE3 & LTE5 Ch BWs _ 16QAM _ Middle Channels (751MHz and 881.5MHz) at 40 watts/carrier:

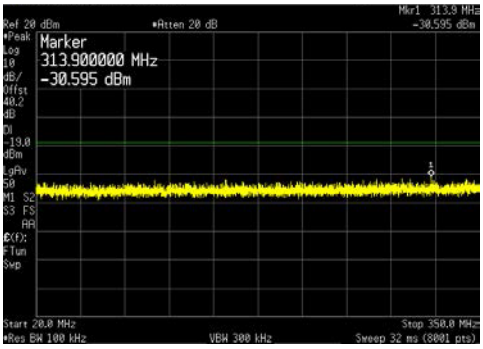
9kHz to 150kHz



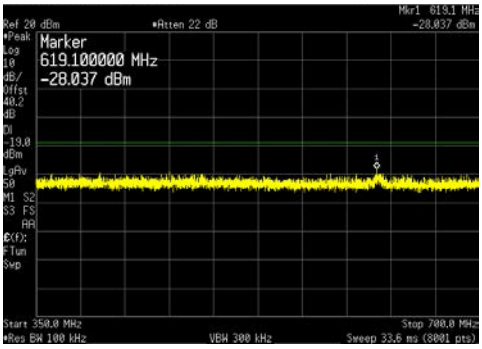
150kHz to 20MHz



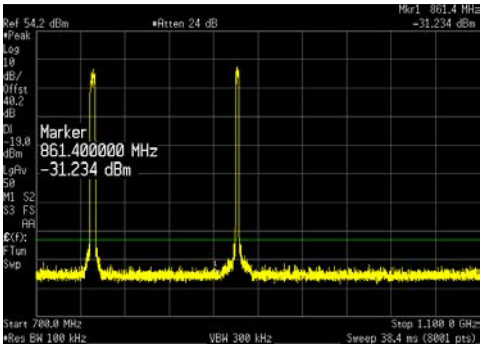
20MHz to 350MHz



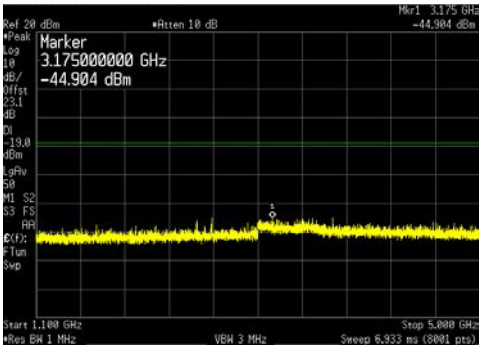
350MHz to 700MHz



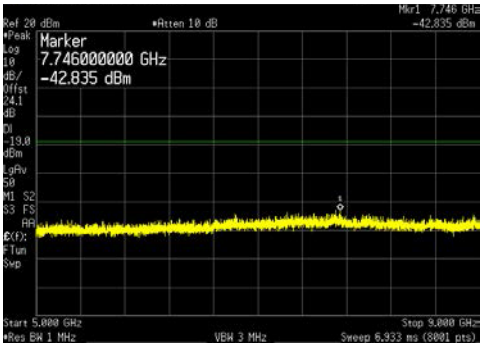
700MHz to 1.1GHz



1.1GHz to 5GHz

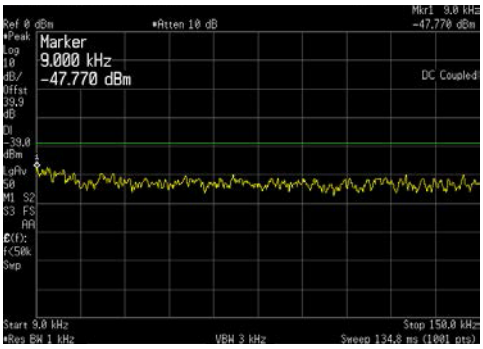


5GHz to 9GHz

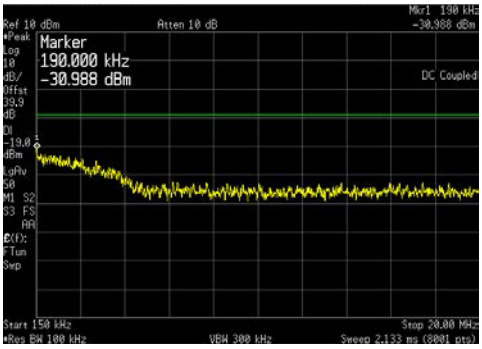


LTE3 & LTE5 Ch BWs _ 64QAM _ Middle Channels (751MHz and 881.5MHz) at 40 watts/carrier:

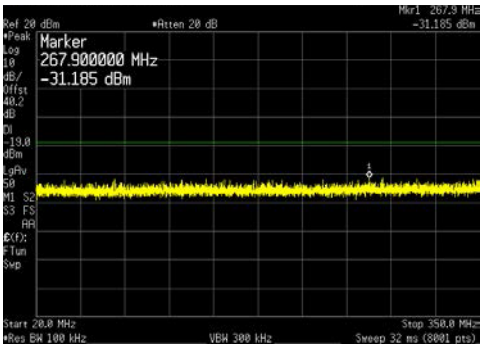
9kHz to 150kHz



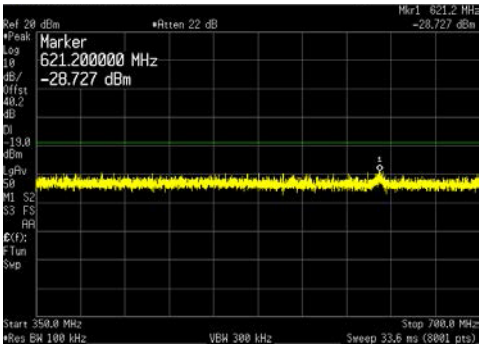
150kHz to 20MHz



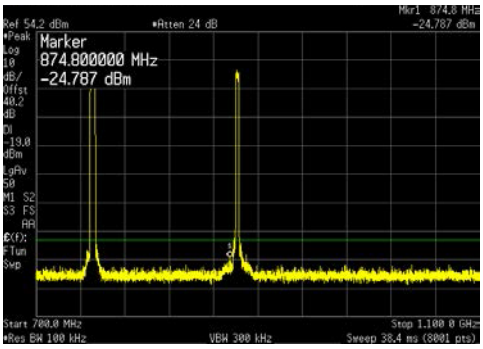
20MHz to 350MHz



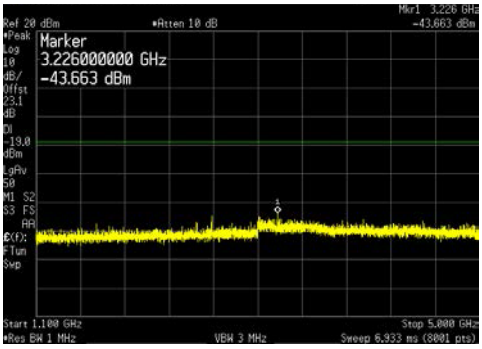
350MHz to 700MHz



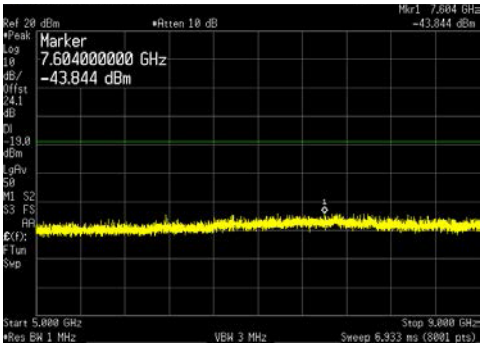
700MHz to 1.1GHz



1.1GHz to 5GHz

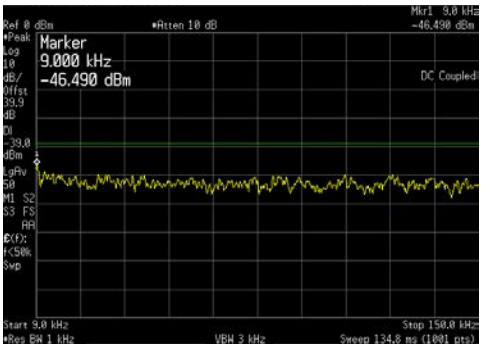


5GHz to 9GHz

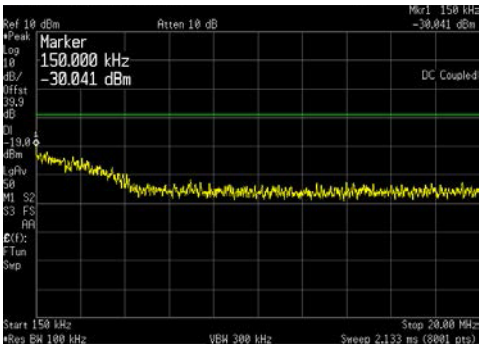


LTE3 & LTE5 Ch BWs _ 256QAM _ Middle Channels (751MHz and 881.5MHz) at 40 watts/carrier:

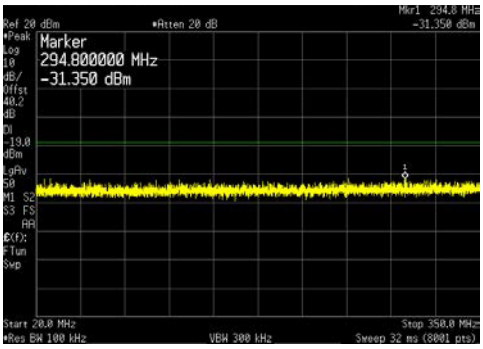
9kHz to 150kHz



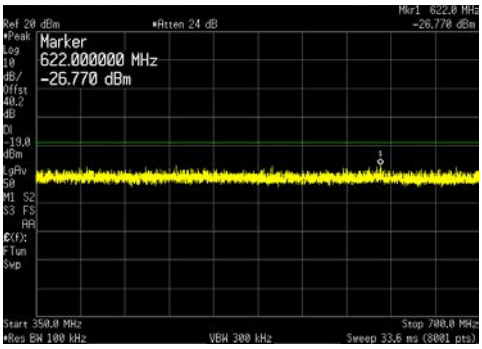
150kHz to 20MHz



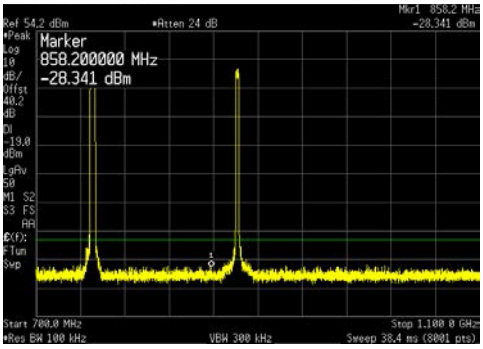
20MHz to 350MHz



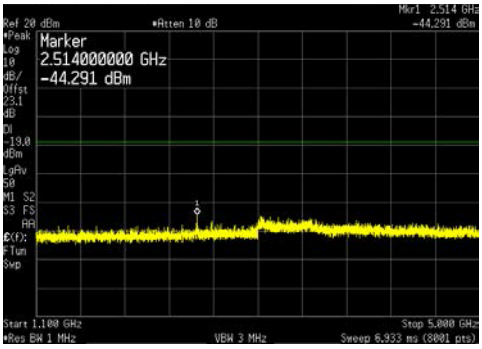
350MHz to 700MHz



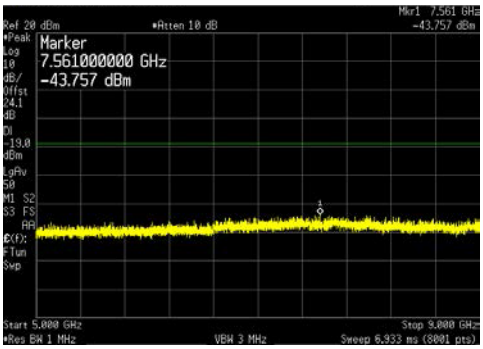
700MHz to 1.1GHz



1.1GHz to 5GHz

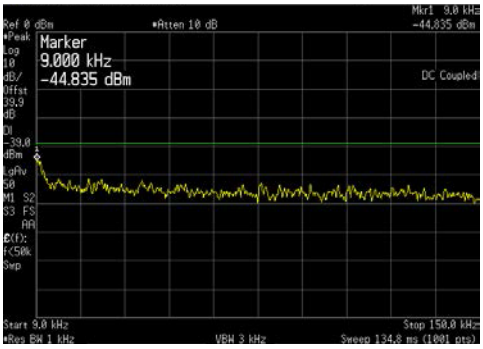


5GHz to 9GHz

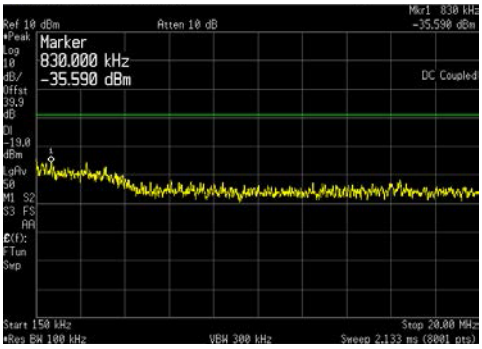


LTE5 & LTE5 Ch BWs _ QPSK _ Middle Channels (751MHz and 881.5MHz) at 40 watts/carrier:

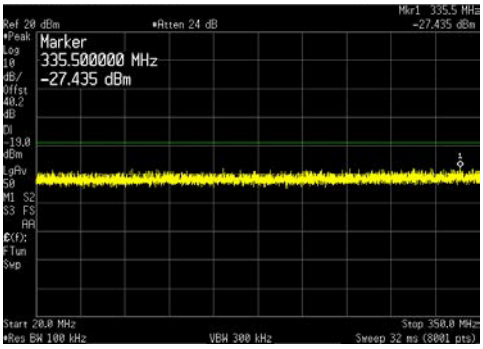
9kHz to 150kHz



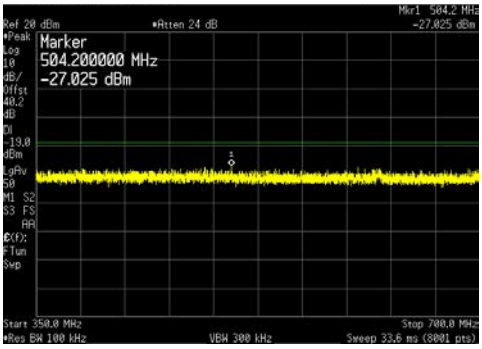
150kHz to 20MHz



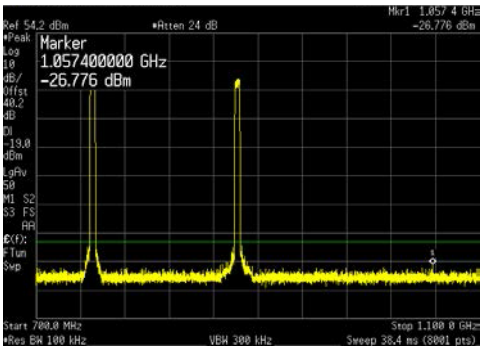
20MHz to 350MHz



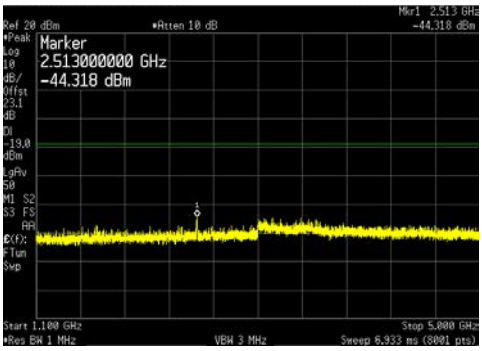
350MHz to 700MHz



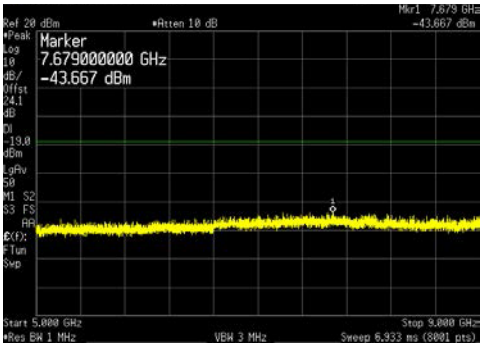
700MHz to 1.1GHz



1.1GHz to 5GHz

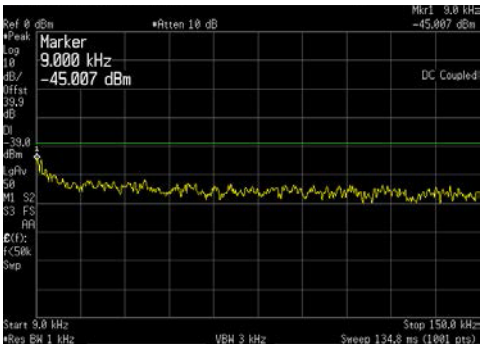


5GHz to 9GHz

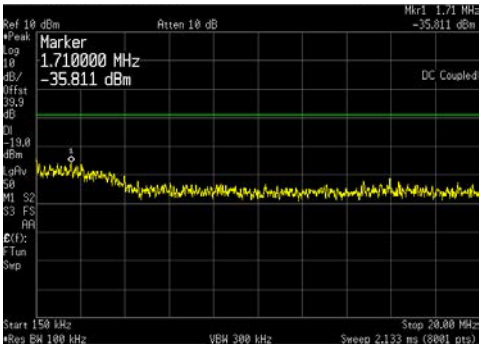


LTE5 & LTE5 Ch BWs _ 16QAM _ Middle Channels (751MHz and 881.5MHz) at 40 watts/carrier:

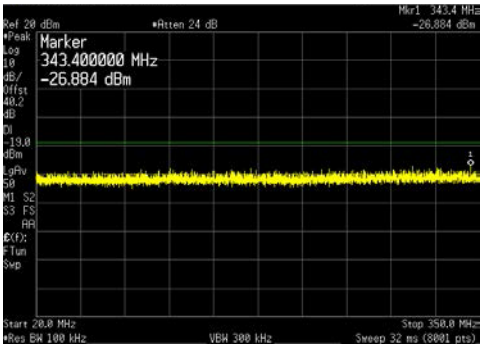
9kHz to 150kHz



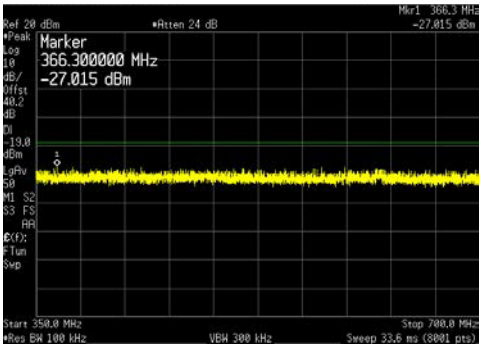
150kHz to 20MHz



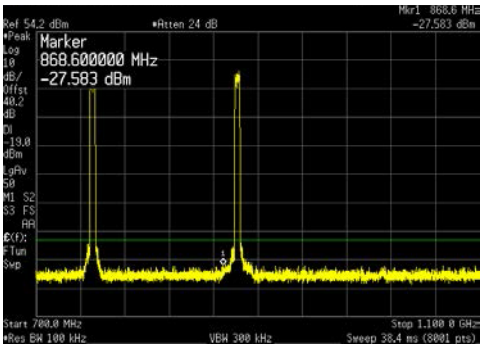
20MHz to 350MHz



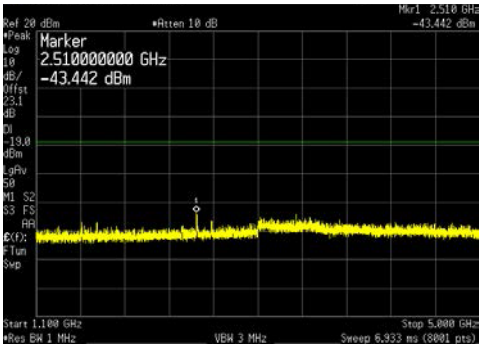
350MHz to 700MHz



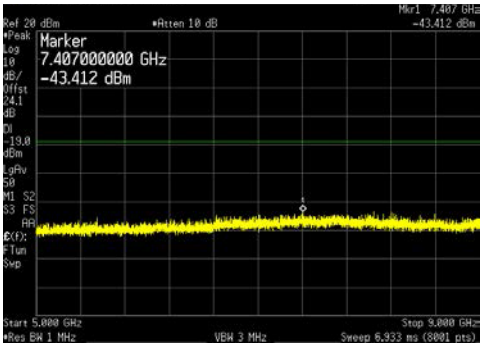
700MHz to 1.1GHz



1.1GHz to 5GHz

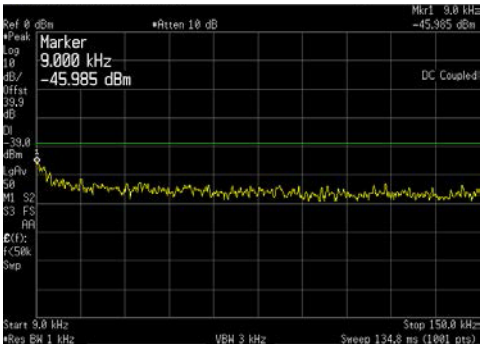


5GHz to 9GHz

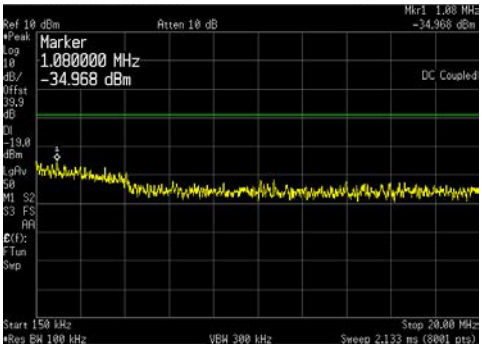


LTE5 & LTE5 Ch BWs _ 64QAM _ Middle Channels (751MHz and 881.5MHz) at 40 watts/carrier:

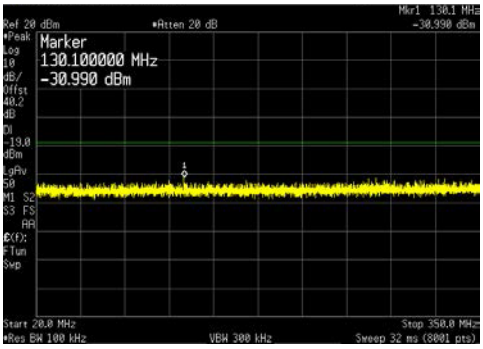
9kHz to 150kHz



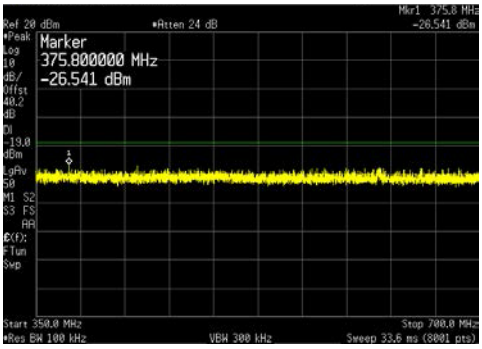
150kHz to 20MHz



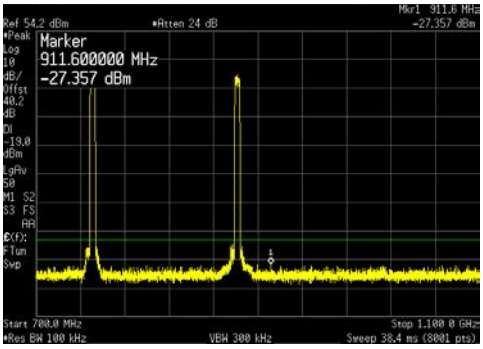
20MHz to 350MHz



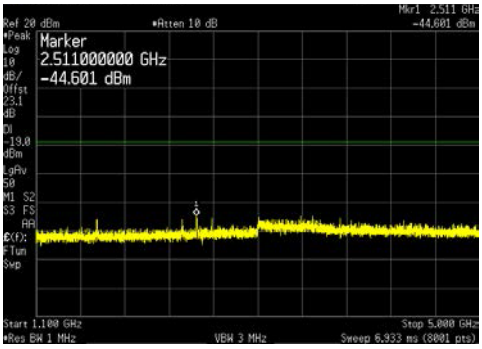
350MHz to 700MHz



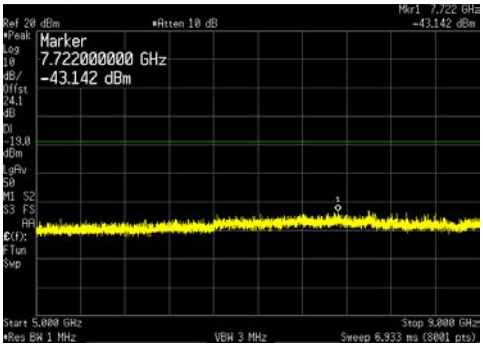
700MHz to 1.1GHz



1.1GHz to 5GHz

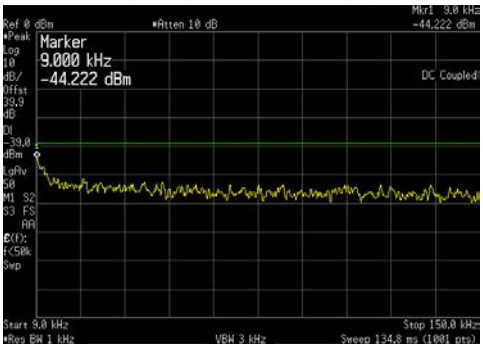


5GHz to 9GHz

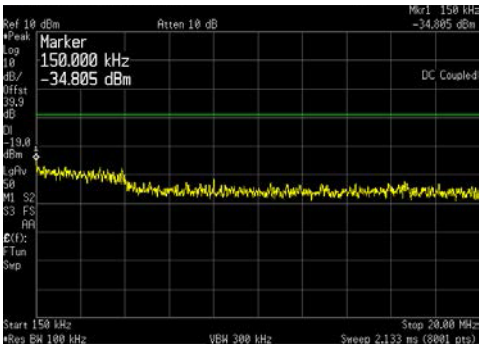


LTE5 & LTE5 Ch BWs _ 256QAM _ Middle Channels (751MHz and 881.5MHz) at 40 watts/carrier:

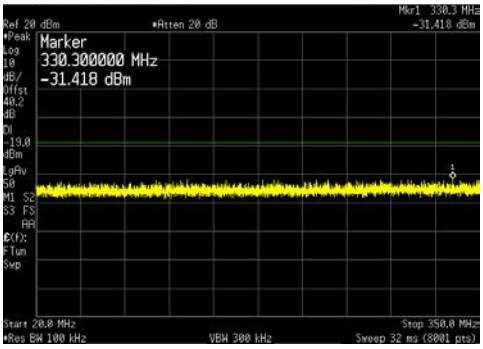
9kHz to 150kHz



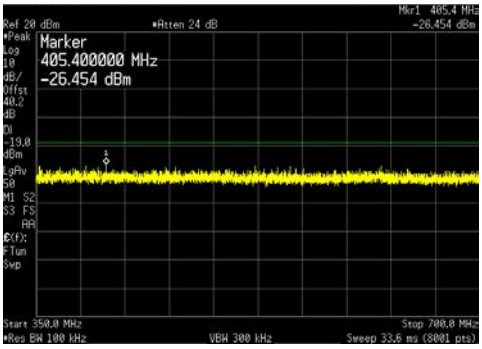
150kHz to 20MHz



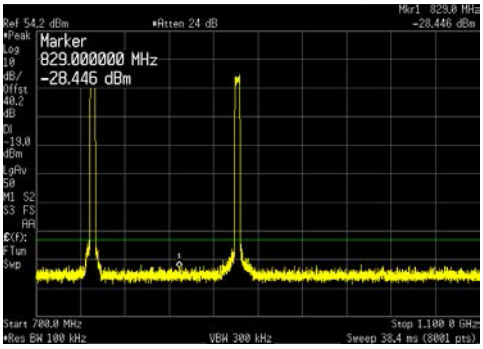
20MHz to 350MHz



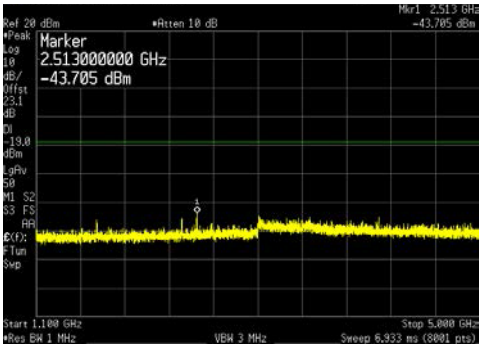
350MHz to 700MHz



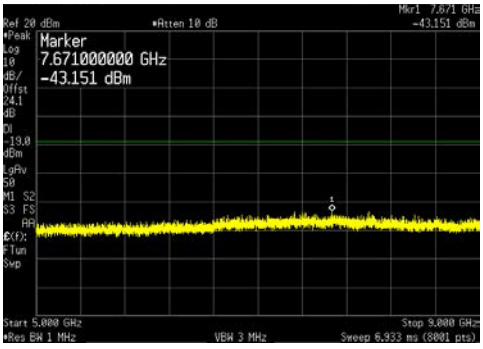
700MHz to 1.1GHz



1.1GHz to 5GHz

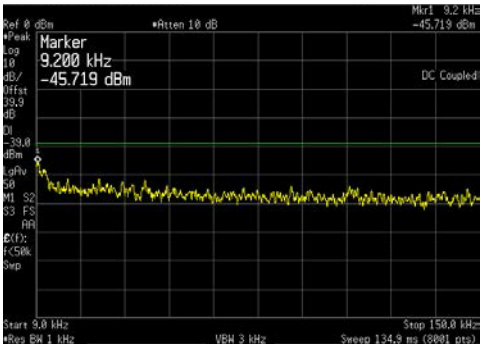


5GHz to 9GHz

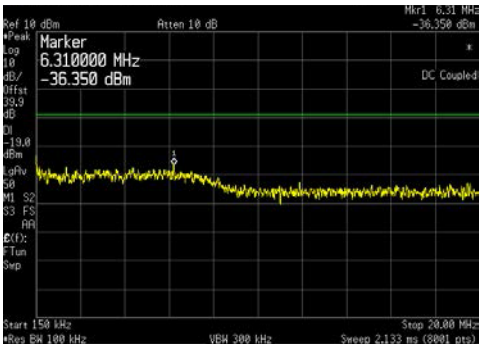


LTE10 & LTE10 Ch BWs _ QPSK _ Middle Channels (751MHz and 881.5MHz) at 40 watts/carrier:

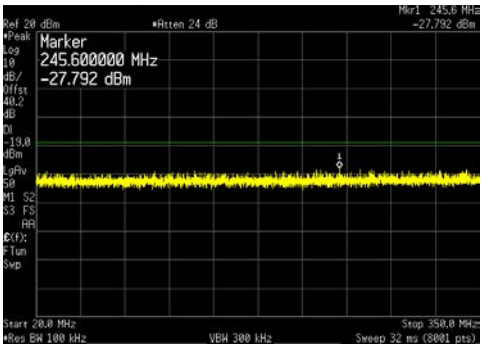
9kHz to 150kHz



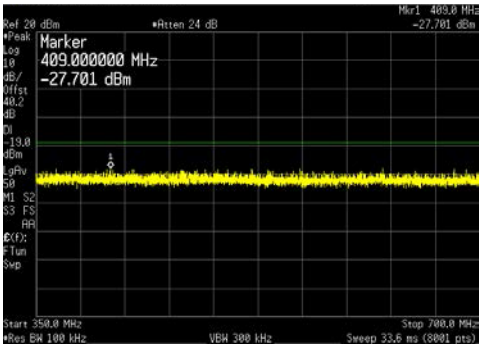
150kHz to 20MHz



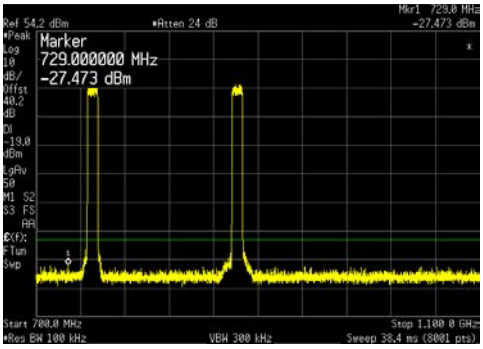
20MHz to 350MHz



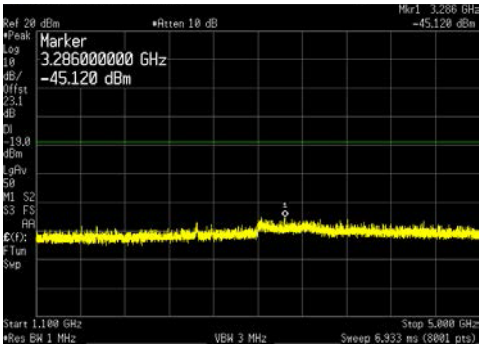
350MHz to 700MHz



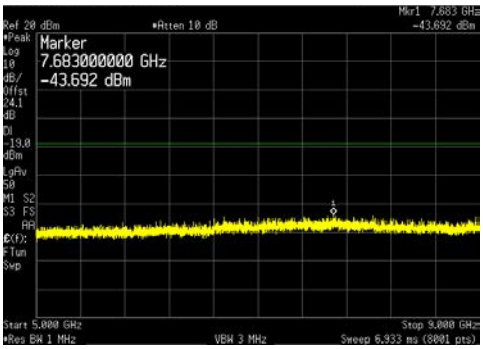
700MHz to 1.1GHz



1.1GHz to 5GHz

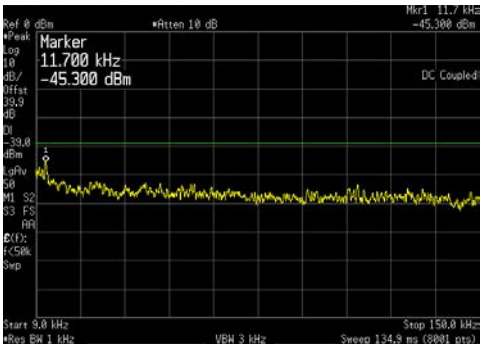


5GHz to 9GHz

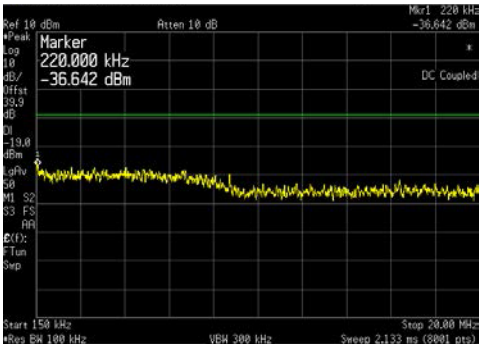


LTE10 & LTE10 Ch BWs _ 16QAM _ Middle Channels (751MHz and 881.5MHz) at 40 watts/carrier:

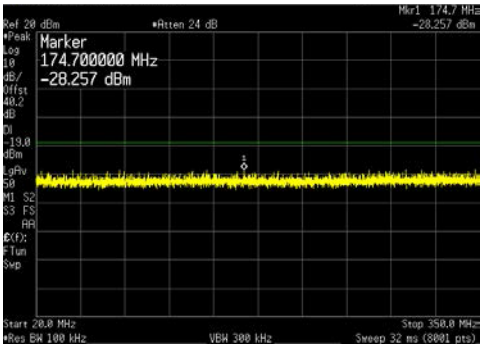
9kHz to 150kHz



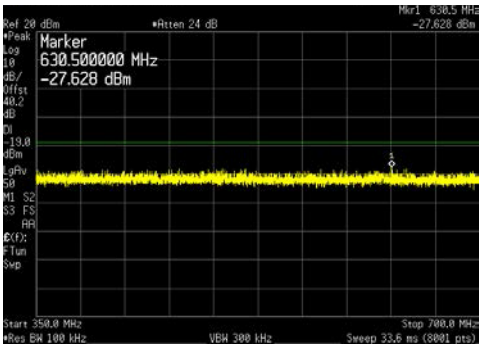
150kHz to 20MHz



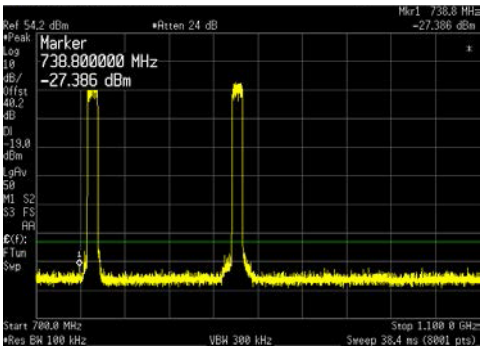
20MHz to 350MHz



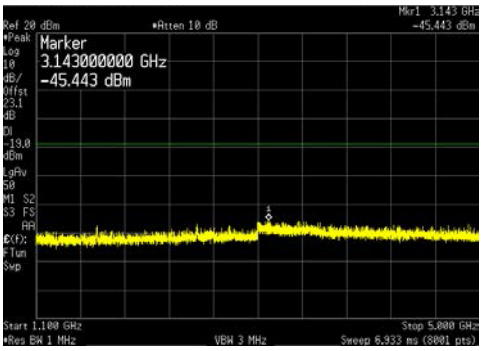
350MHz to 700MHz



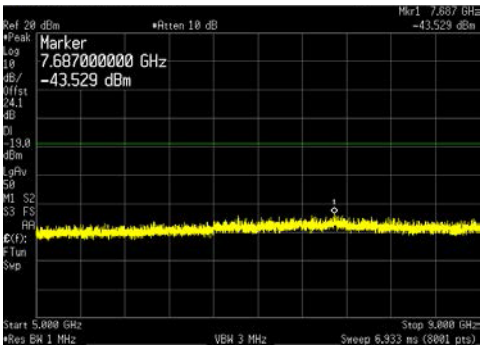
700MHz to 1.1GHz



1.1GHz to 5GHz

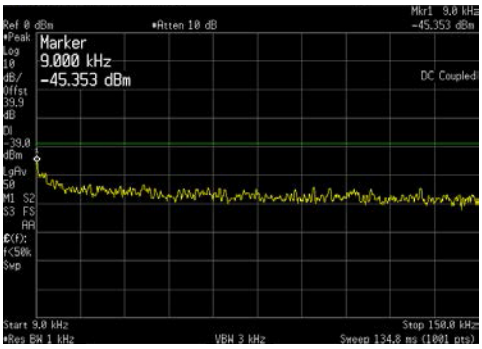


5GHz to 9GHz

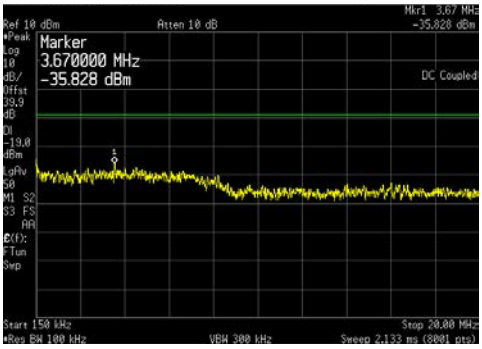


LTE10 & LTE10 Ch BWs _ 64QAM _ Middle Channels (751MHz and 881.5MHz) at 40 watts/carrier:

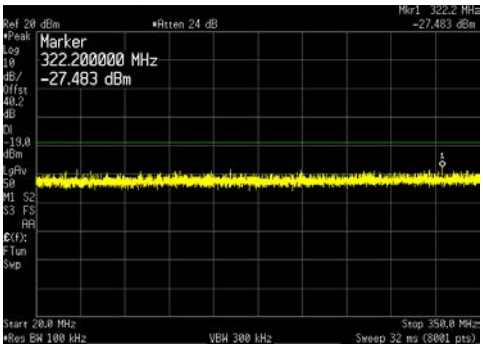
9kHz to 150kHz



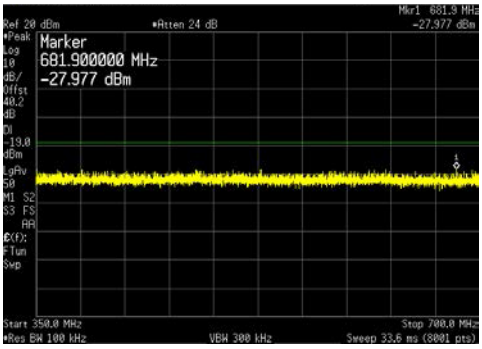
150kHz to 20MHz



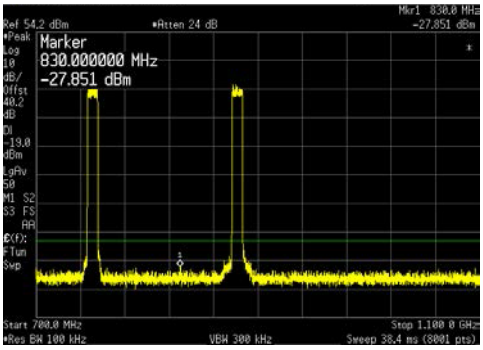
20MHz to 350MHz



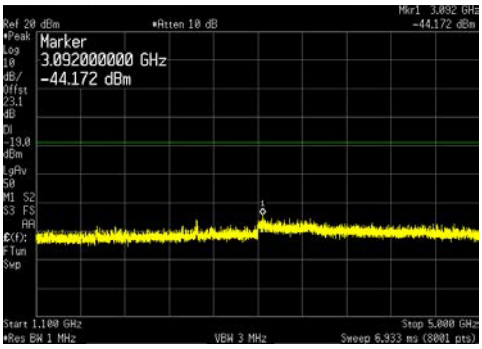
350MHz to 700MHz



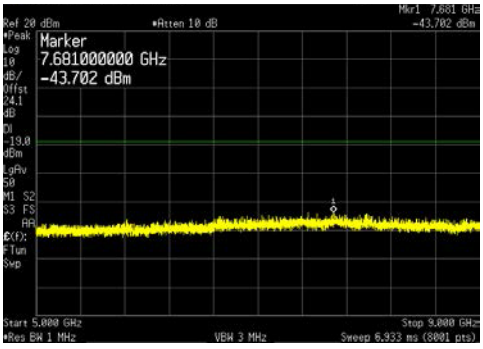
700MHz to 1.1GHz



1.1GHz to 5GHz

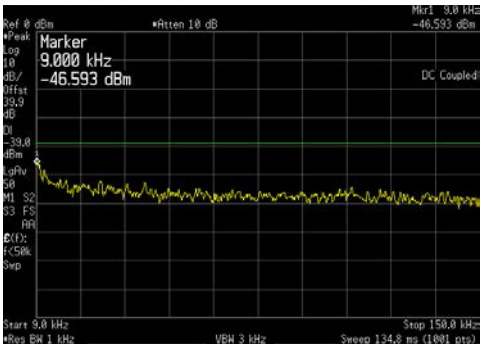


5GHz to 9GHz

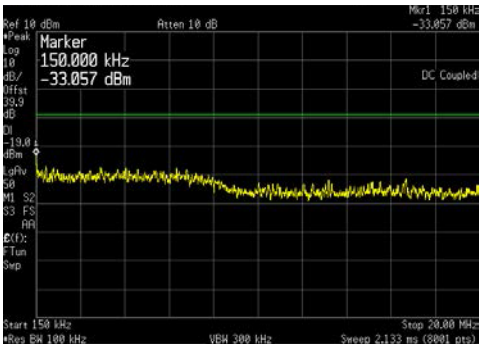


LTE10 & LTE10 Ch BWs _ 256QAM _ Middle Channels (751MHz and 881.5MHz) at 40 watts/carrier:

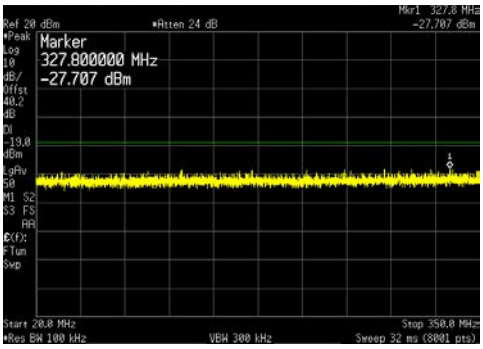
9kHz to 150kHz



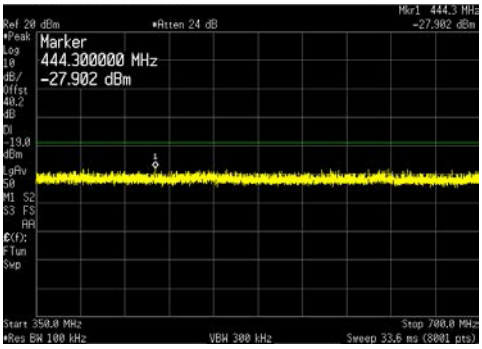
150kHz to 20MHz



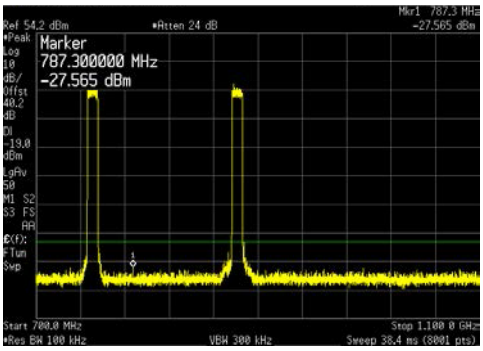
20MHz to 350MHz



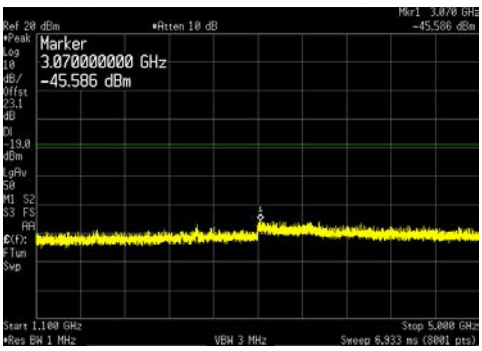
350MHz to 700MHz



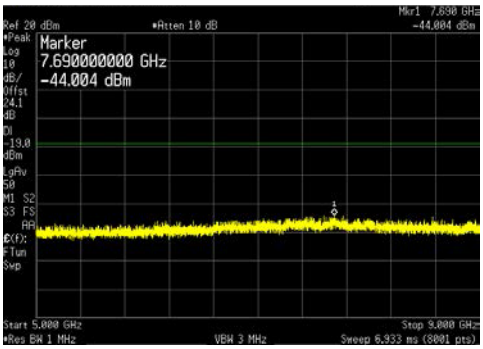
700MHz to 1.1GHz



1.1GHz to 5GHz

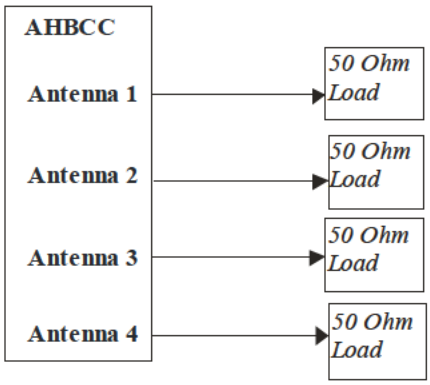


5GHz to 9GHz



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. One radiated emission test configuration (with the external cooling fan) is needed to prove compliance for both 3GPP Band 5 and the 3GPP Band 13 frequency bands. The 3GPP Band 5 and the 3GPP Band 13 transmitters were enabled simultaneously at maximum power (40 watts per carrier and 80 watts per port) on all four ports for this test. The bottom, middle and top frequency channels for each band were enabled. The AHBCC 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.

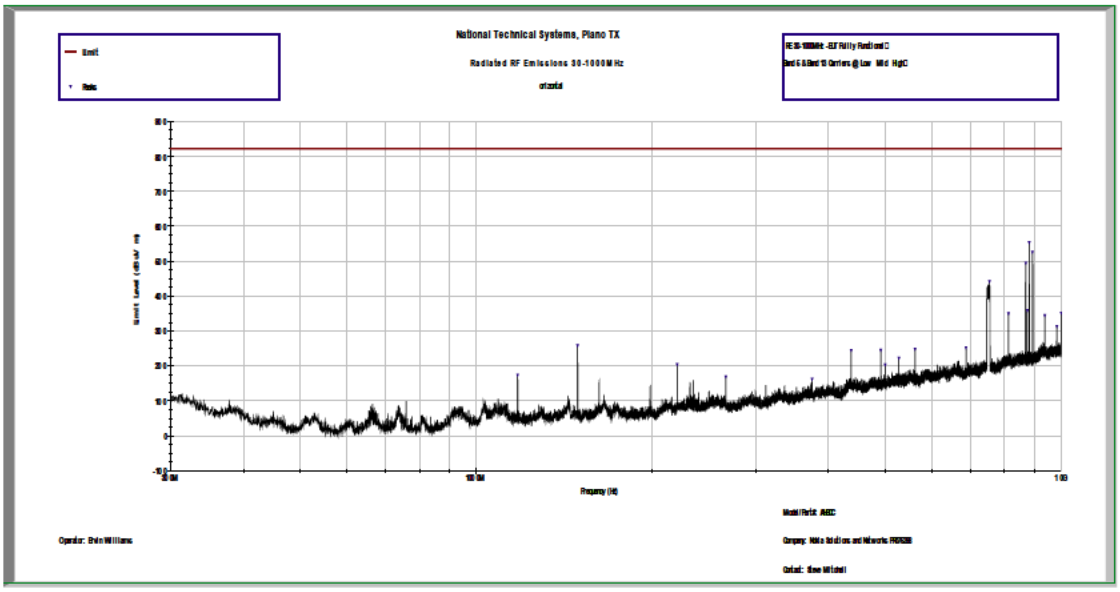
Frequency Band	Antenna Port	RF Bandwidth	EARFCN	Transmit Frequency
Band 5	1	1.4 MHz	2407 (Bottom Channel)	869.7 MHz
Band 5	2	1.4 MHz	2525 (Middle Channel)	881.5 MHz
Band 5	3	1.4 MHz	2525 (Middle Channel)	881.5 MHz
Band 5	4	1.4 MHz	2643 (Top Channel)	893.3 MHz
Band 13	1	10 MHz	5230 (Middle Channel)	751.0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

Band 5 & Band 13 Carriers Enabled Simultaneously at Maximum Power

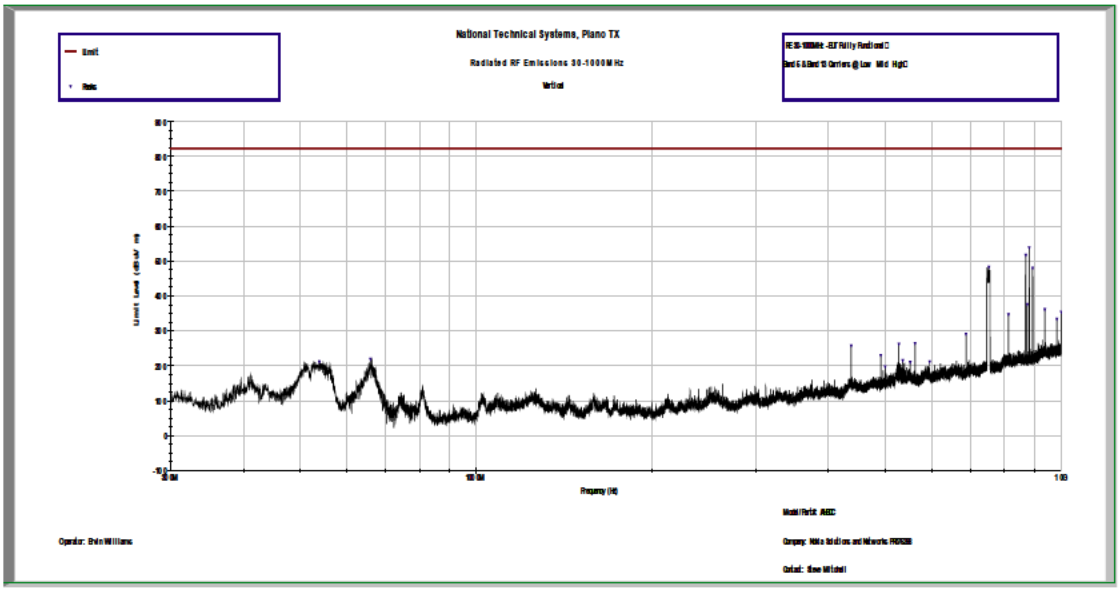
RE Data

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
3932.04	H	44.9	32.58	-32.199	4.966	50.247	82.2	-31.953	200	17
3932.17	V	41.511	32.579	-32.199	4.966	46.858	82.2	-35.342	100	178.1
5898.25	V	35.564	34.16	-31.827	6.465	44.362	82.2	-37.838	156.1	0.9
2949.13	H	44.313	29.588	-33.732	4.173	44.338	82.2	-37.862	200.1	19.4
8973.8	V	28.949	37.81	-31.721	8.038	43.076	82.2	-39.124	200.1	-0.1
7850.5	V	31.926	36.709	-31.921	6.214	42.928	82.2	-39.272	200.1	-0.1
875.02	V	46.161	24.198	-36.162	3.365	37.561	82.2	-44.639	98.9	188.7
3525.46	H	34.022	31.265	-32.912	4.602	36.975	82.2	-45.225	200	-0.2
937.51	V	42.554	25.7	-36.041	3.895	36.106	82.2	-46.094	98.1	57.9
875.02	H	44.459	24.198	-36.162	3.365	35.86	82.2	-46.34	205	81
812.51	H	43.79	24.6	-36.198	2.806	34.998	82.2	-47.202	241.1	210
812.51	V	43.466	24.6	-36.198	2.806	34.674	82.2	-47.526	99.9	81
937.52	H	40.894	25.7	-36.041	3.895	34.446	82.2	-47.754	213.2	73
983.02	V	39.401	25.6	-35.88	4.167	33.286	82.2	-48.914	154	175.9
1812.46	H	36.741	26.846	-34.654	3.24	32.171	82.2	-50.029	200.1	208
983.03	H	37.443	25.6	-35.88	4.167	31.328	82.2	-50.872	197.1	49.1
687.51	V	41.779	21.3	-36.218	2.228	29.088	82.2	-53.112	119.8	76.1
149.05	H	53.251	8.605	-37.463	0.902	25.294	82.2	-56.906	233.8	1

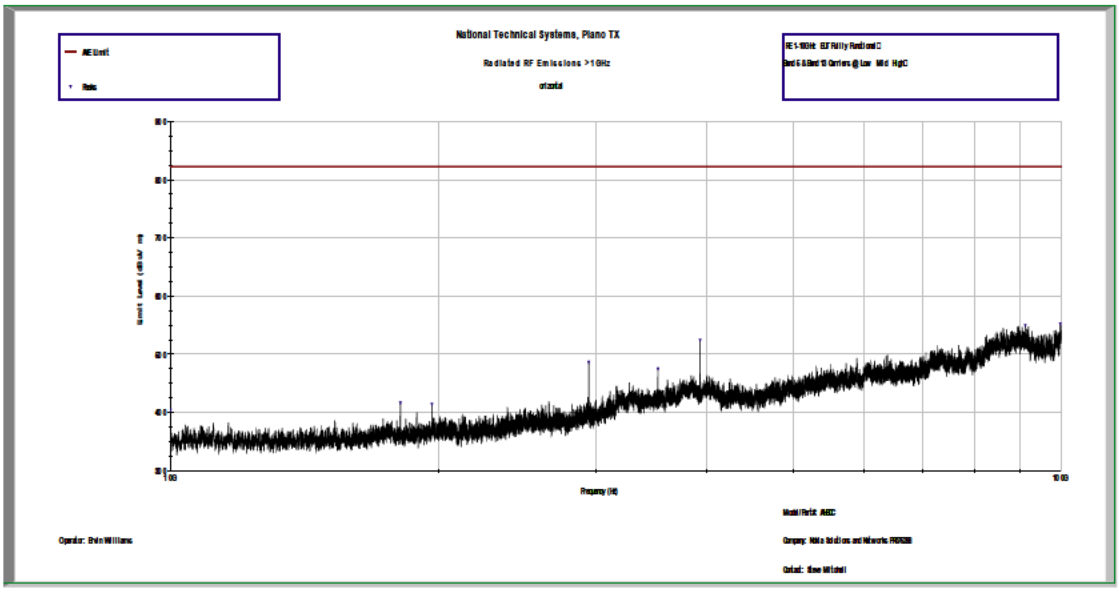
A three meter measurement distance was used for radiated emission measurements. The highest radiated emissions detected were more than 20dB below the three meter limit of 82.2dBuV/m (equivalent to -13dBm EIRP). Since all maximized measurements were more than 20dB below these levels, substitution measurements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



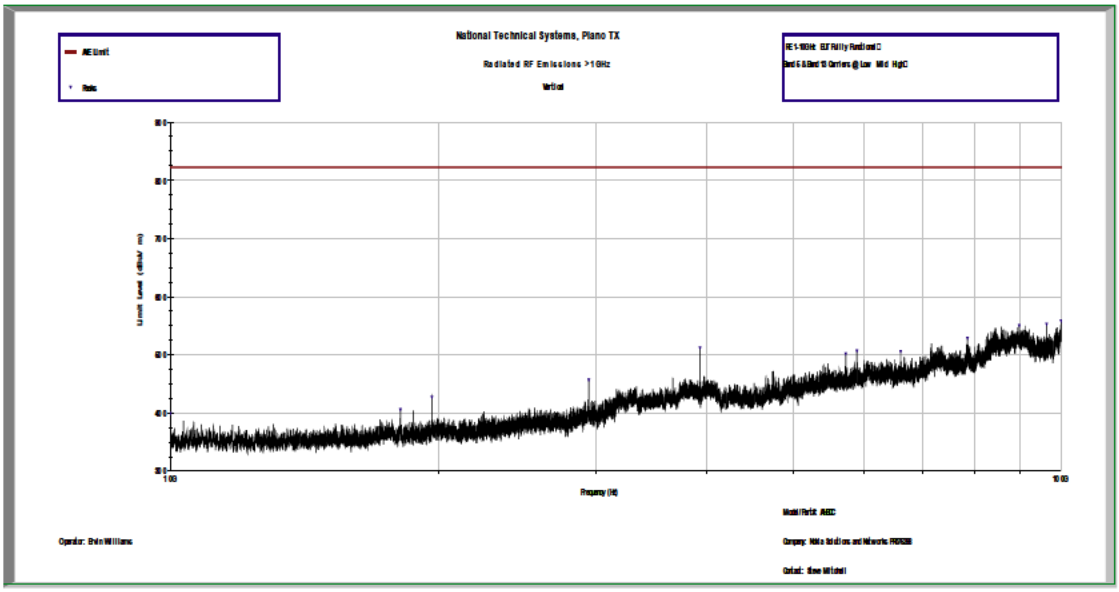
Bands 5 & 13 Carriers 30-1000MHz – Horizontal at 3m



Bands 5 & 13 Carriers 30-1000MHz – Vertical at 3m



Bands 5 & 13 Carriers 1-10GHz – Horizontal at 3m



Bands 5 & 13 Carriers 1-10GHz – Vertical at 3m

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 (881.5MHz) on port 4.
(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)	Maximum Frequency Error (Hz) at 20°C
85%	40.8	1.24
100%	48.0	1.10
115%	55.2	1.30

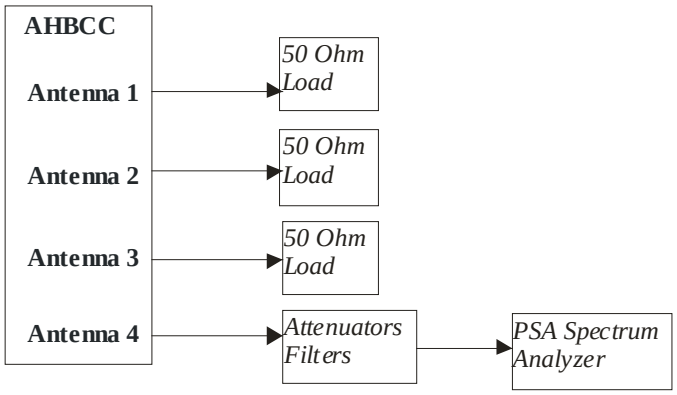
Extreme Temperatures:

Temperature	Maximum Frequency Error (Hz) at 48VDC
-30 °C	1.25
-20 °C	1.37
-10 °C	1.12
0 °C	1.08
10 °C	**1.40**
20 °C	1.10
30 °C	1.25
40 °C	1.08
50 °C	1.02

The highest recorded frequency error is 1.40Hz or ~0.0016 ppm. The deviation limit is defined as ± 1.5 ppm in section FCC 22.355 and RSS 132 5.3. The allowable deviation is ± 1322.3 Hz at the center channel (EARFCN 2525: 881.5 MHz).
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 13 (746-756MHZ)

All conducted RF measurements for this test effort in this section were made at AHBCC antenna ports for Band 13 measurements. The test setup used is provided below.



Test Setup Used for Conducted RF Measurements on AHBCC

RF Output Power

RF output power has been measured in both Peak and RMS Average terms for each Band 13 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	53.19	45.77	7.42
Port 2 Middle Channel	5M	53.28	45.78	7.50
Port 3 Middle Channel	5M	53.37	45.79	7.58
Port 4 Middle Channel	5M	53.35	45.87	7.48

The variation in RMS output power levels between the antenna ports is 0.10 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 4 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 4 Middle Channel LTE5	53.48	45.88	53.32	45.90	53.41	45.89	53.35	45.87

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 0.03dB for the data snapshot provided. The variation of peak power output versus modulation type is 0.16dB 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 4 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 4 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 4 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 4 Bottom Channel	5M	52.86	45.55	7.31
Port 4 Middle Channel	5M	53.35	45.87	7.48
	10M	**53.88**	**46.14**	**7.74**
Port 4 Top Channel	5M	52.76	45.42	7.34

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.