

## Emission Bandwidth (26 dB down and 99%)

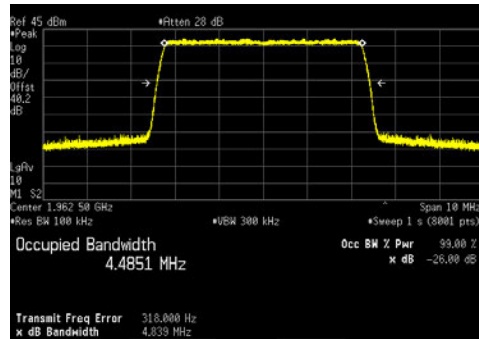
Emission bandwidth measurements were made at antenna port 2 on the middle channel with maximum RF output power. All available LTE modulations (QPSK, 16QAM, 64QAM and 256QAM) were used. All available LTE channel bandwidths (5MHz, 10MHz, 15MHz, and 20MHz) were used. The results are provided in the following table. The largest emission bandwidths in each channel type are highlighted.

LTE Channel Bandwidth	Modulation Type							
	QPSK		16QAM		64QAM		256QAM	
	26dB (MHz)	99% (MHz)	26dB (MHz)	99% (MHz)	26dB (MHz)	99% (MHz)	26dB (MHz)	99% (MHz)
5M	<b>4.839</b>	4.4851	4.826	4.4758	4.827	4.4909	4.832	<b>4.4924</b>
10M	9.643	8.9693	9.634	<b>8.9816</b>	<b>9.648</b>	8.9717	9.644	8.9692
15M	14.434	13.4556	14.449	<b>13.4812</b>	14.468	13.4529	<b>14.477</b>	13.4671
20M	19.221	17.9297	19.208	<b>17.9644</b>	19.292	17.9372	<b>19.320</b>	17.9332

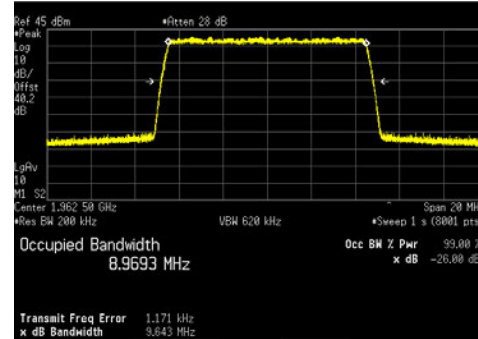
Emission bandwidth measurement data are provided in the following pages.

## LTE5 and LTE10 Emission Bandwidth Plots on the Middle Channel for Antenna Port 2:

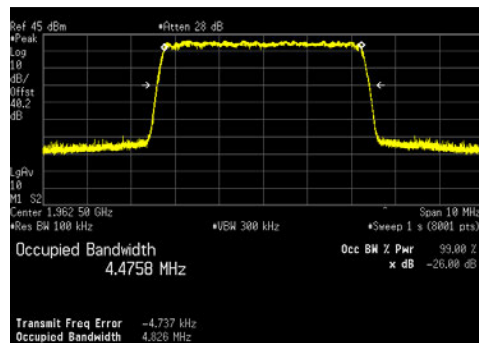
LTE5\_QPSK



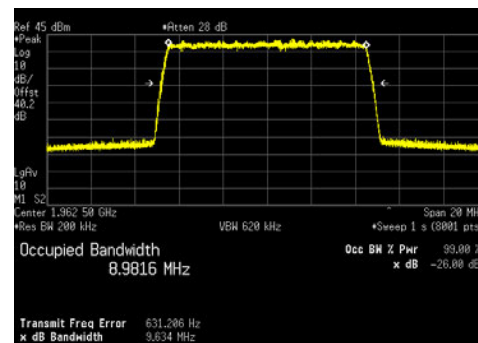
LTE10\_QPSK



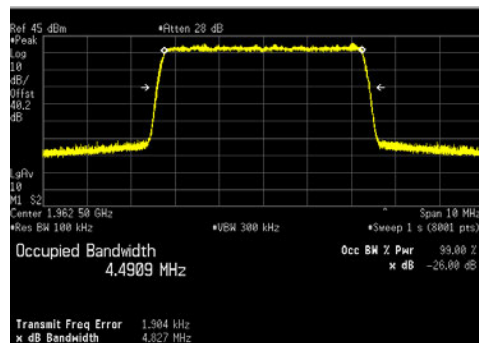
LTE5\_16QAM



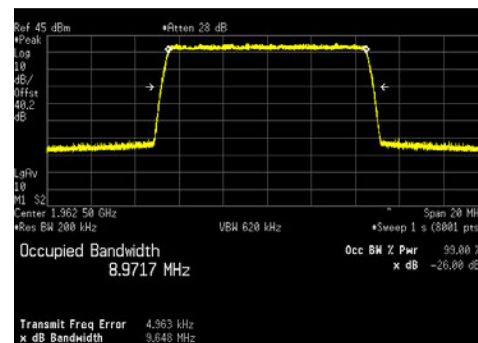
LTE10\_16QAM



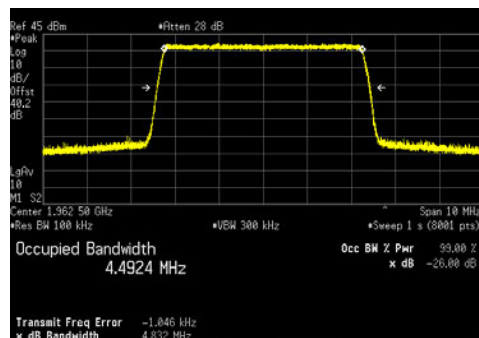
LTE5\_64QAM



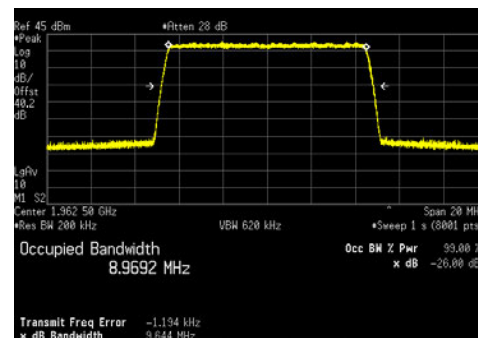
LTE10\_64QAM

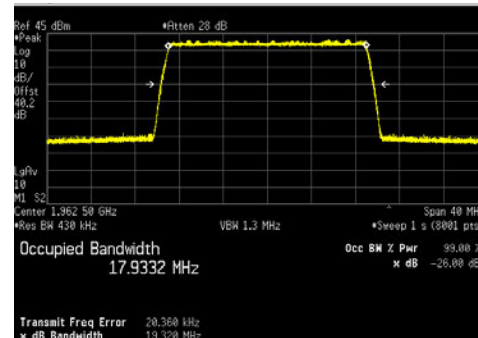


LTE5\_256QAM



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 and 256QAM) for 5MHz, 10MHz, 15MHz and 20MHz LTE bandwidths.

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.

Measurements were performed with the spectrum analyzer in the RMS average mode over 100 traces. In the 1MHz bands outside and adjacent to the frequency block, a resolution bandwidth of 1% of the emission bandwidth was used. In the 1 to 2MHz frequency range outside the band edge (i.e.: 1928 to 1929MHz and 1996 to 1997MHz bands) the RBW was again reduced to 1% of the emission bandwidth and the power integrated over 1MHz. In the 2 to 5MHz frequency range outside the band edge (i.e.: 1925 to 1928MHz and 1997 to 2000MHz bands) a 1MHz RBW and 3MHz VBW was used. An additional measurement was performed for the dual LTE5 cases to show compliance at the upper and lower band edges.

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

LTE Bandwidth	LTE - QPSK		LTE - 16QAM		LTE - 64QAM		LTE - 256QAM	
	Bottom Channel	Top Channel	Bottom Channel	Top Channel	Bottom Channel	Top Channel	Bottom Channel	Top Channel
5M	-22.369	-21.028	-22.373	-21.478	-21.874	-21.415	-21.751	-20.654
10M	-24.101	-23.204	-24.040	-23.119	-23.686	-23.093	-23.855	-22.991
15M	-24.395	-23.664	-24.570	-24.104	-24.592	-24.006	-24.245	-23.844
20M	-24.605	-24.649	-24.769	-24.793	-25.246	-24.691	-25.238	-24.566
Dual 5M	-22.031	-20.888	-21.810	-21.136	-22.299	-21.389	-22.041	-20.926

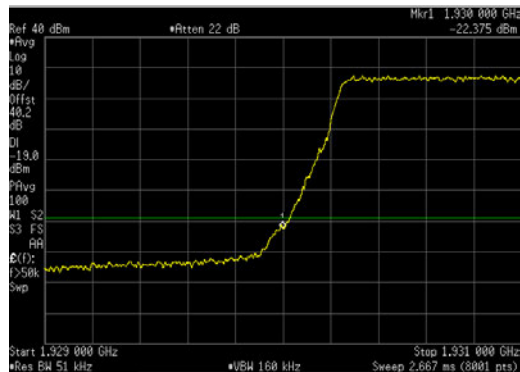
The total measurement RF path loss of the test setup (attenuator and test cables) was 40.2 dB and is accounted for by the spectrum analyzer reference level offset. The display line on the plots reflects the required limit.

Conducted band edge measurements are provided in the following pages.

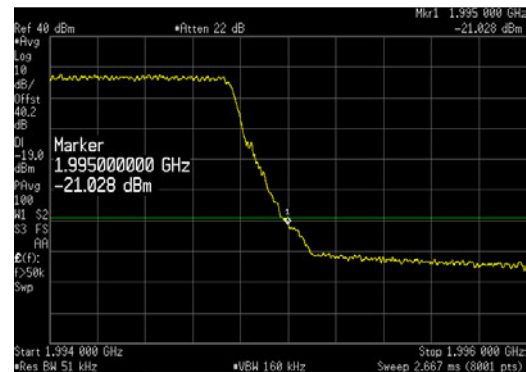


LTE5 Band Edge Plots for Antenna Port 2 and QPSK Modulation:

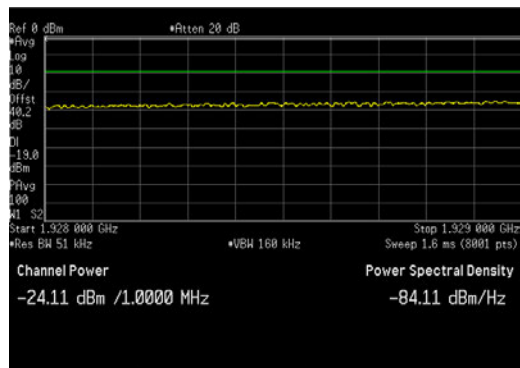
LTE5\_Bottom Channel\_LBE\_1929 to 1931MHz



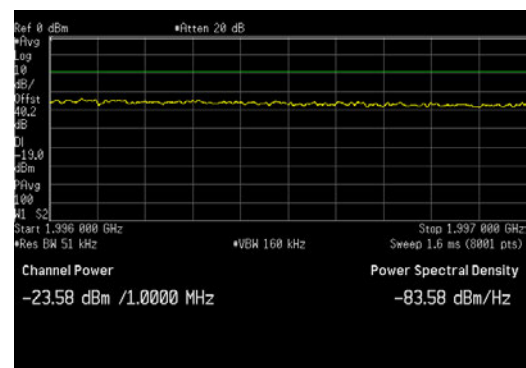
LTE5\_Top Channel\_UBE\_1994 to 1996MHz



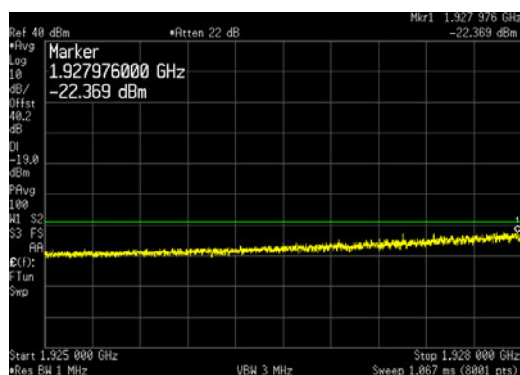
LTE5\_Bottom Channel\_LBE\_1928 to 1929MHz



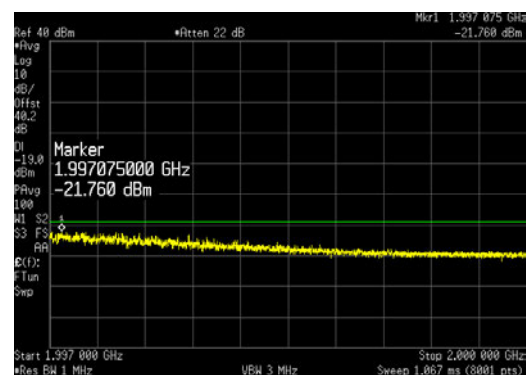
LTE5\_Top Channel\_UBE\_1996 to 1997MHz



LTE5\_Bottom Channel\_LBE\_1925 to 1928MHz

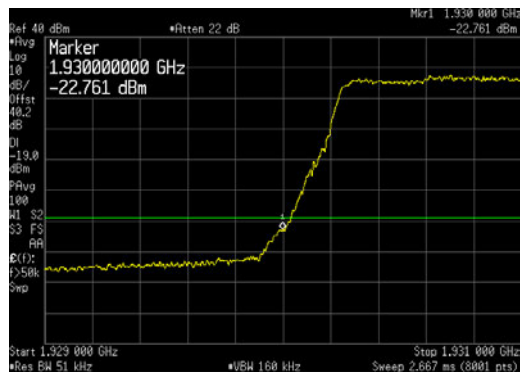


LTE5\_Top Channel\_UBE\_1997 to 2000MHz

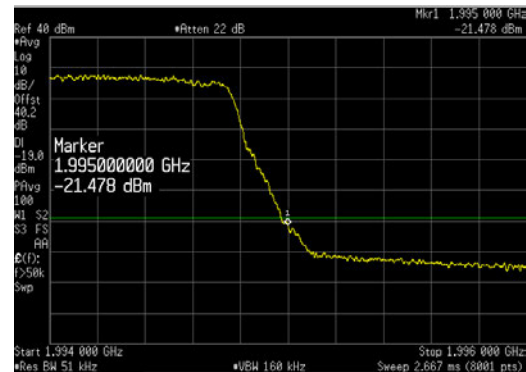


LTE5 Band Edge Plots for Antenna Port 2 and 16QAM Modulation:

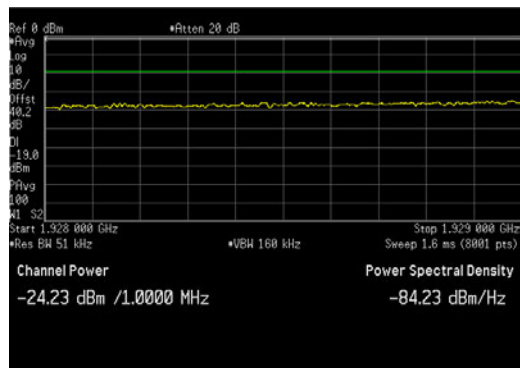
LTE5\_Bottom Channel\_LBE\_1929 to 1931MHz



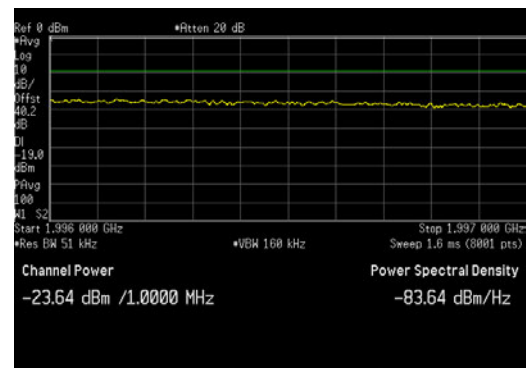
LTE5\_Top Channel\_UBE\_1994 to 1996MHz



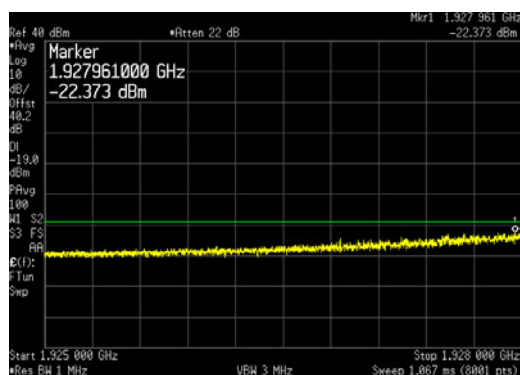
LTE5\_Bottom Channel\_LBE\_1928 to 1929MHz



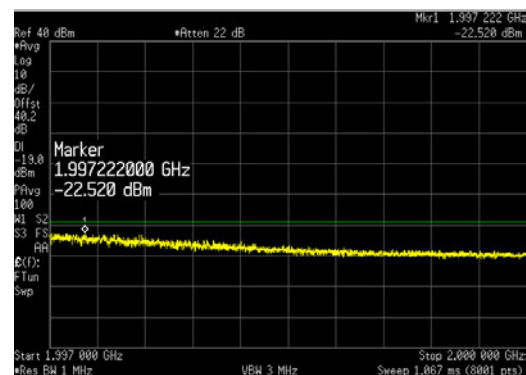
LTE5\_Top Channel\_UBE\_1996 to 1997MHz



LTE5\_Bottom Channel\_LBE\_1925 to 1928MHz

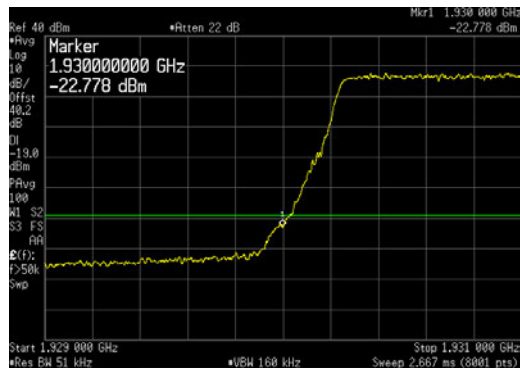


LTE5\_Top Channel\_UBE\_1997 to 2000MHz

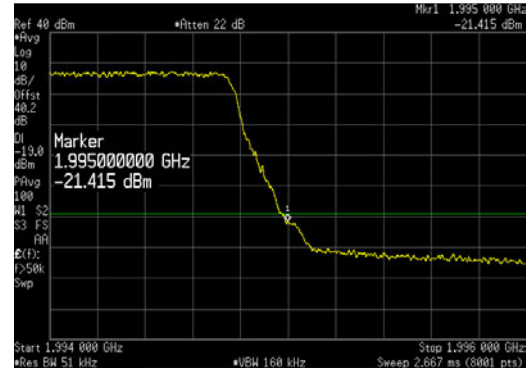


LTE5 Band Edge Plots for Antenna Port 2 and 64QAM Modulation:

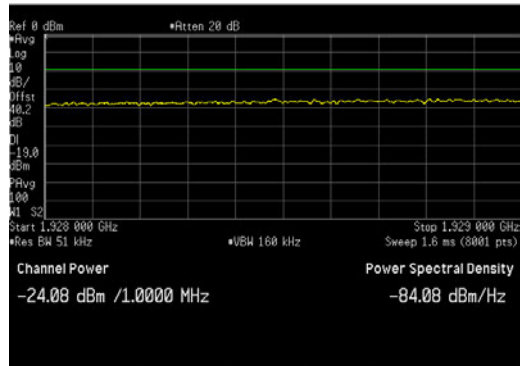
LTE5\_Bottom Channel\_LBE\_1929 to 1931MHz



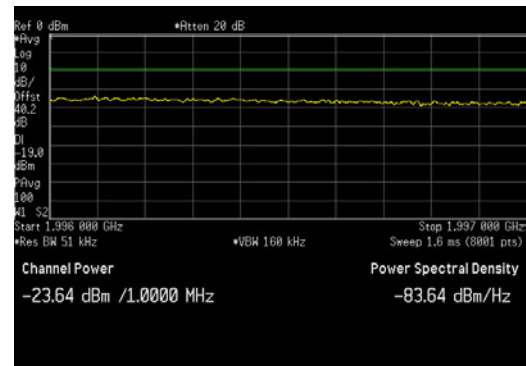
LTE5\_Top Channel\_UBE\_1994 to 1996MHz



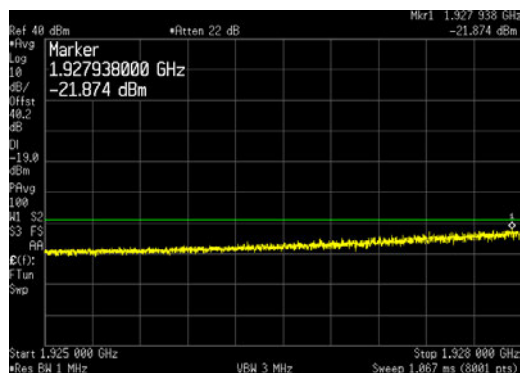
LTE5\_Bottom Channel\_LBE\_1928 to 1929MHz



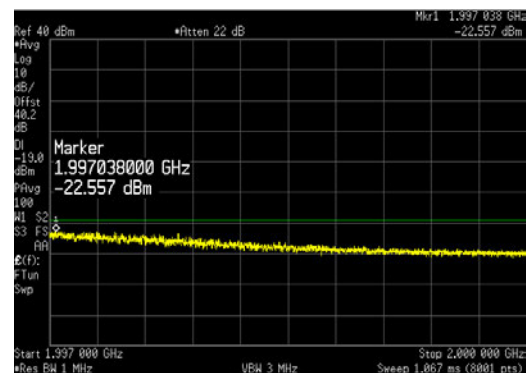
LTE5\_Top Channel\_UBE\_1996 to 1997MHz



LTE5\_Bottom Channel\_LBE\_1925 to 1928MHz

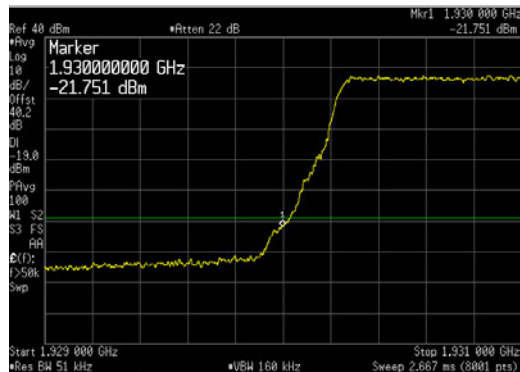


LTE5\_Top Channel\_UBE\_1997 to 2000MHz

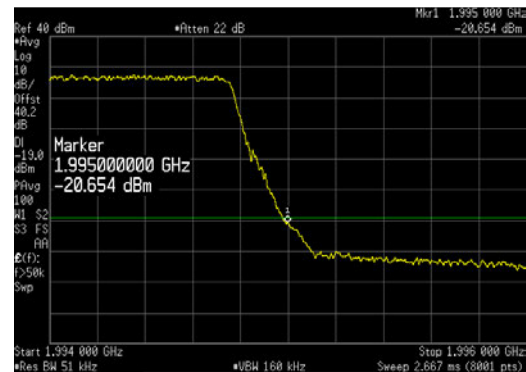


LTE5 Band Edge Plots for Antenna Port 2 and 256QAM Modulation:

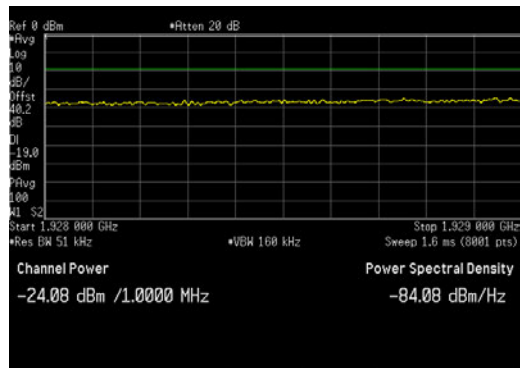
LTE5\_Bottom Channel\_LBE\_1929 to 1931MHz



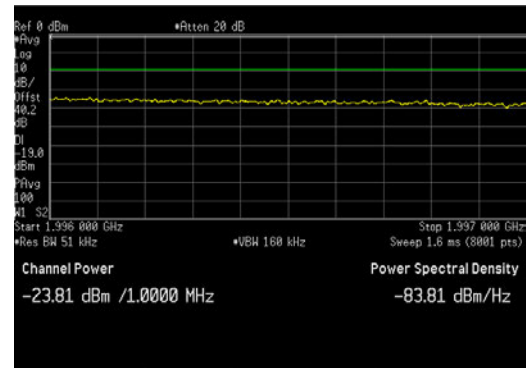
LTE5\_Top Channel\_UBE\_1994 to 1996MHz



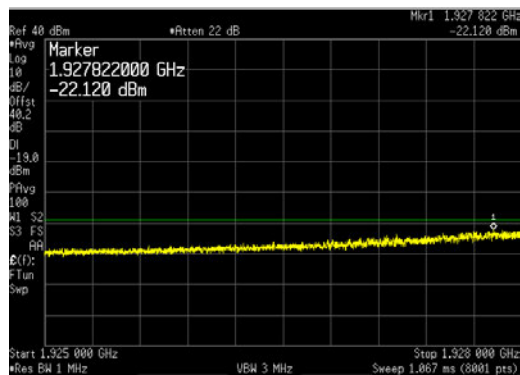
LTE5\_Bottom Channel\_LBE\_1928 to 1929MHz



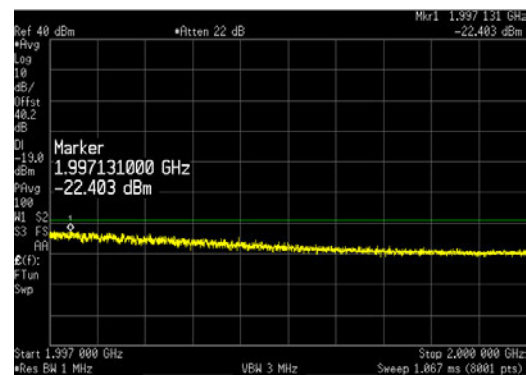
LTE5\_Top Channel\_UBE\_1996 to 1997MHz



LTE5\_Bottom Channel\_LBE\_1925 to 1928MHz



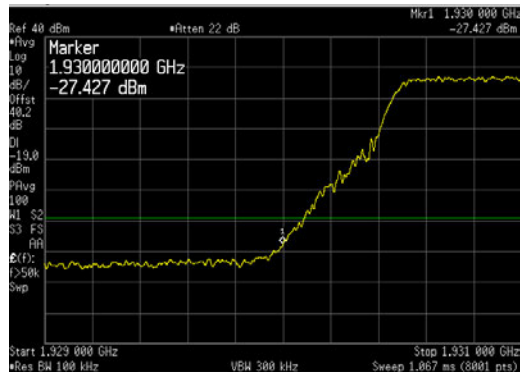
LTE5\_Top Channel\_UBE\_1997 to 2000MHz



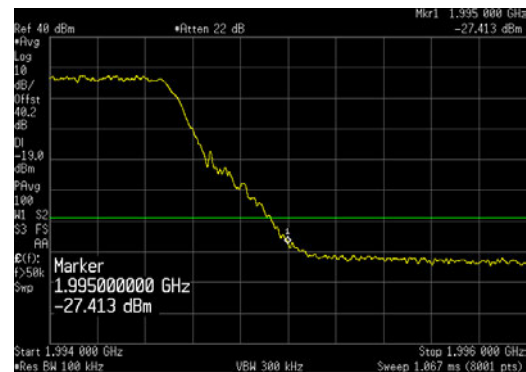


LTE10 Band Edge Plots for Antenna Port 2 and QPSK Modulation:

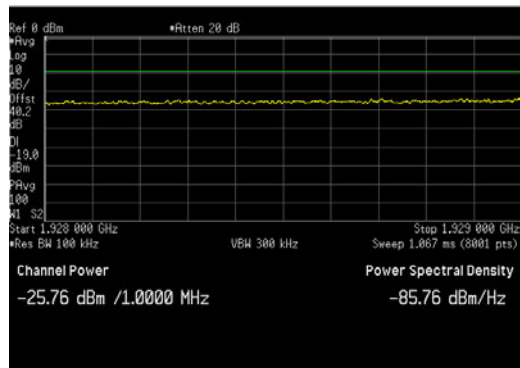
LTE10\_Bottom Channel\_LBE\_1929 to 1931MHz



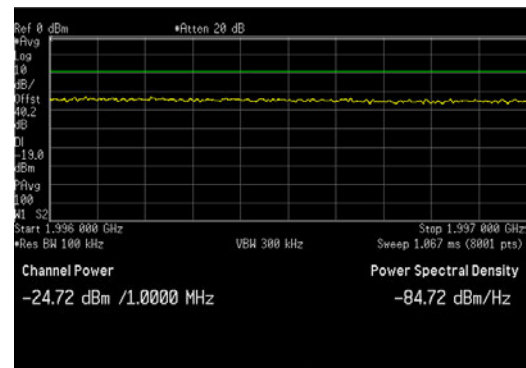
LTE10\_Top Channel\_UBE\_1994 to 1996MHz



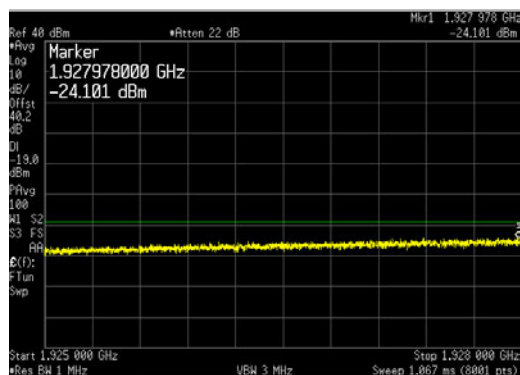
LTE10\_Bottom Channel\_LBE\_1928 to 1929MHz



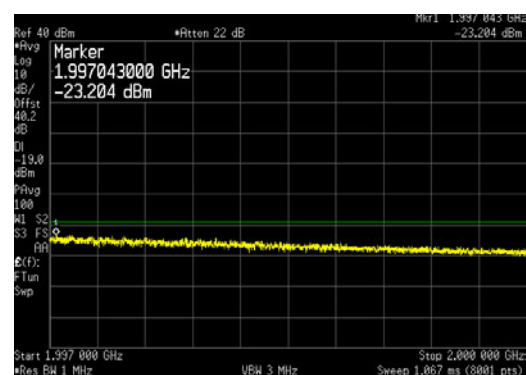
LTE10\_Top Channel\_UBE\_1996 to 1997MHz



LTE10\_Bottom Channel\_LBE\_1925 to 1928MHz

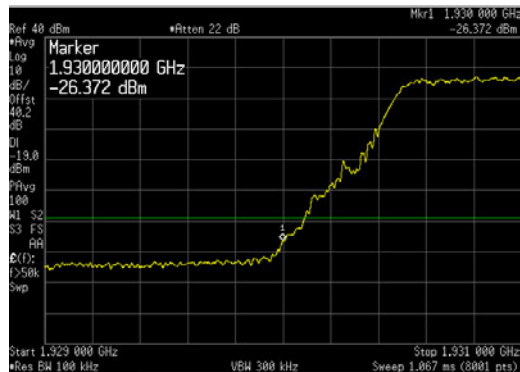


LTE10\_Top Channel\_UBE\_1997 to 2000MHz

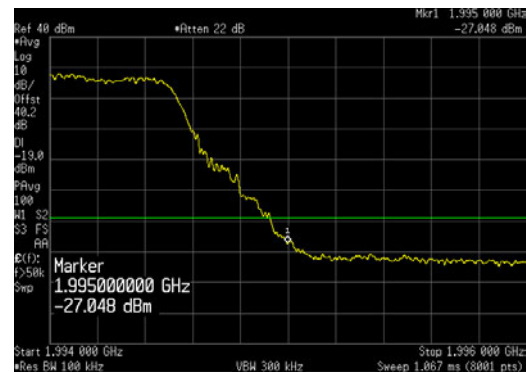


## LTE10 Band Edge Plots for Antenna Port 2 and 16QAM Modulation:

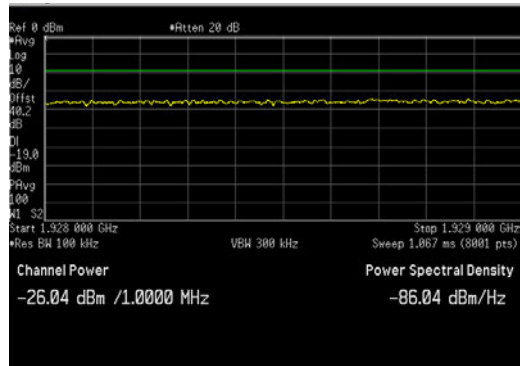
LTE10\_Bottom Channel\_LBE\_1929 to 1931MHz



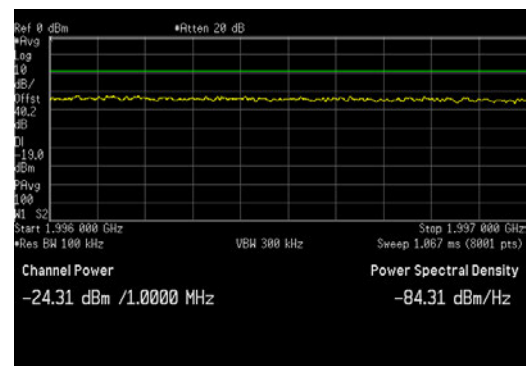
LTE10\_Top Channel\_UBE\_1994 to 1996MHz



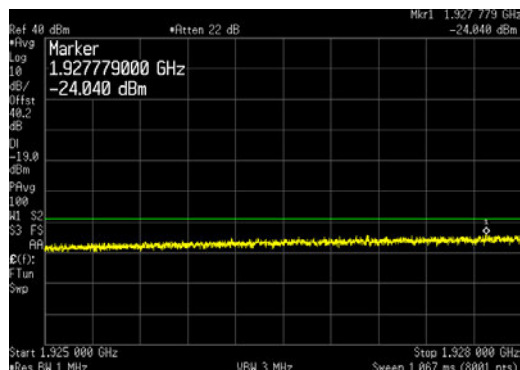
LTE10\_Bottom Channel\_LBE\_1928 to 1929MHz



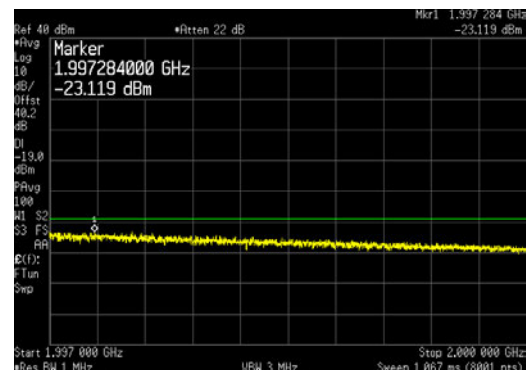
LTE10\_Top Channel\_UBE\_1996 to 1997MHz



LTE10\_Bottom Channel\_LBE\_1925 to 1928MHz

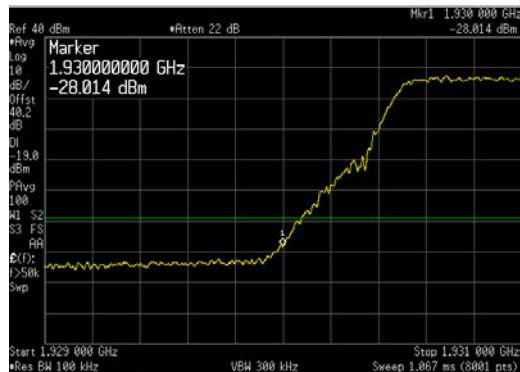


LTE10\_Top Channel\_UBE\_1997 to 2000MHz

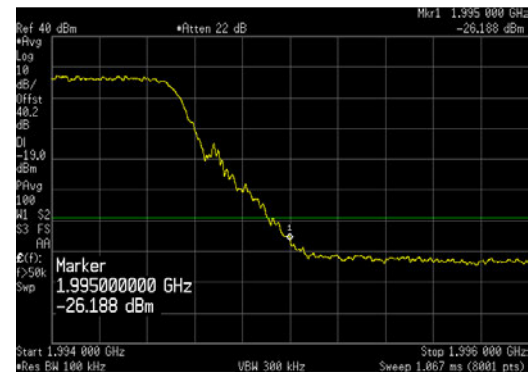


## LTE10 Band Edge Plots for Antenna Port 2 and 64QAM Modulation:

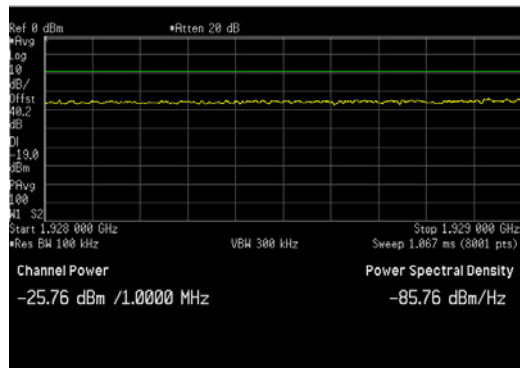
LTE10\_Bottom Channel\_LBE\_1929 to 1931MHz



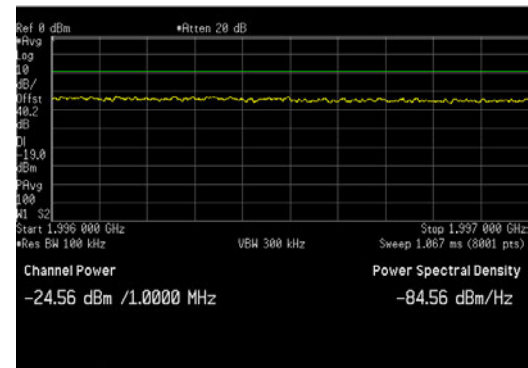
LTE10\_Top Channel\_UBE\_1994 to 1996MHz



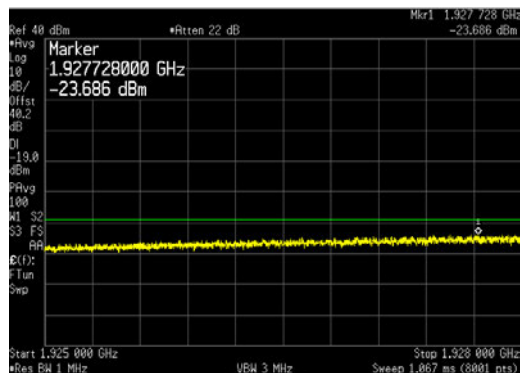
LTE10\_Bottom Channel\_LBE\_1928 to 1929MHz



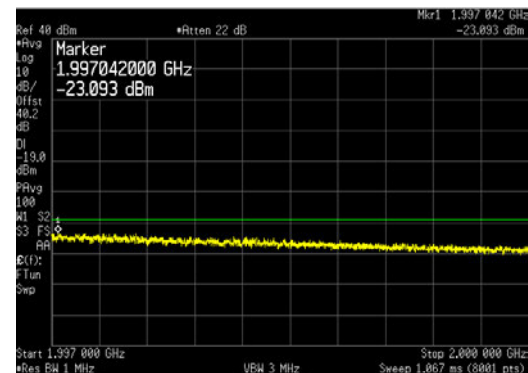
LTE10\_Top Channel\_UBE\_1996 to 1997MHz



LTE10\_Bottom Channel\_LBE\_1925 to 1928MHz

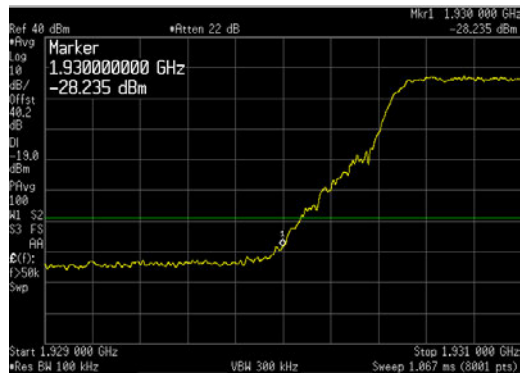


LTE10\_Top Channel\_UBE\_1997 to 2000MHz

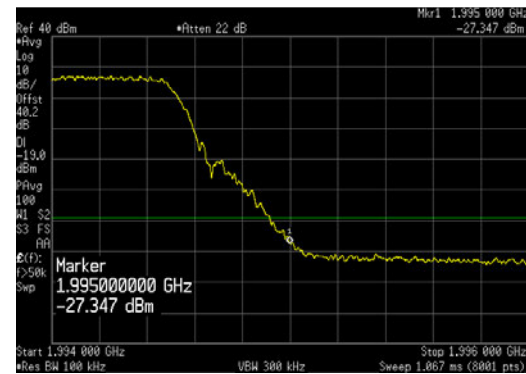


LTE10 Band Edge Plots for Antenna Port 2 and 256QAM Modulation:

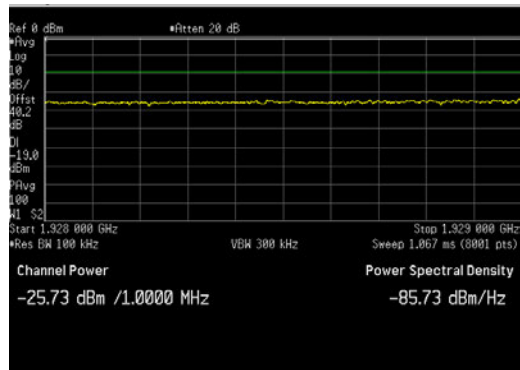
LTE10\_Bottom Channel\_LBE\_1929 to 1931MHz



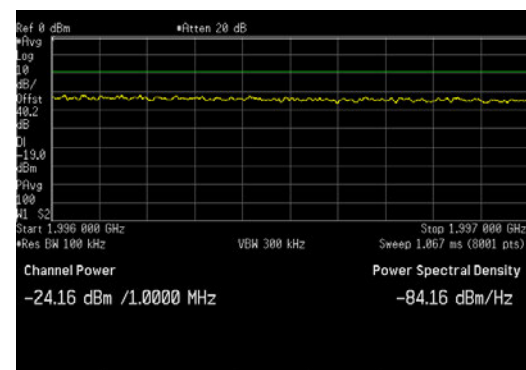
LTE10\_Top Channel\_UBE\_1994 to 1996MHz



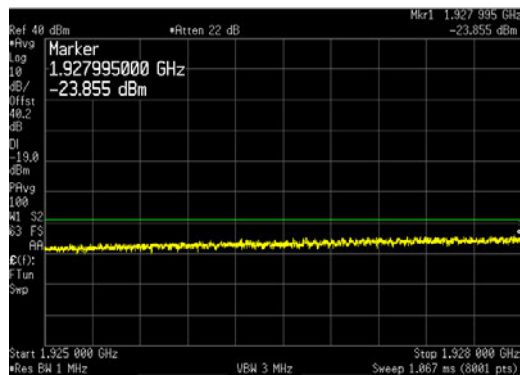
LTE10\_Bottom Channel\_LBE\_1928 to 1929MHz



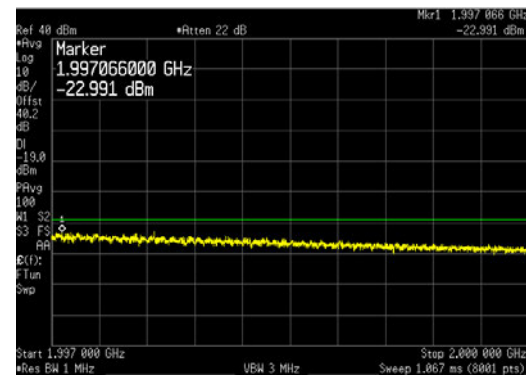
LTE10\_Top Channel\_UBE\_1996 to 1997MHz



LTE10\_Bottom Channel\_LBE\_1925 to 1928MHz

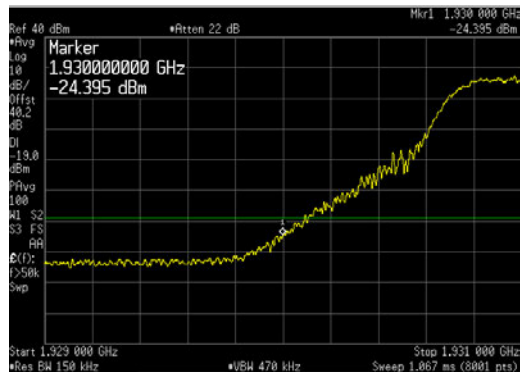


LTE10\_Top Channel\_UBE\_1997 to 2000MHz

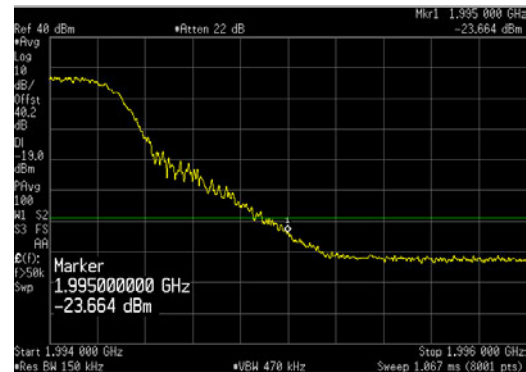


LTE15 Band Edge Plots for Antenna Port 2 and QPSK Modulation:

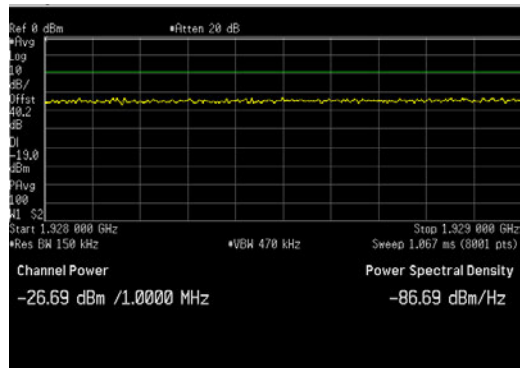
LTE15\_Bottom Channel\_LBE\_1929 to 1931MHz



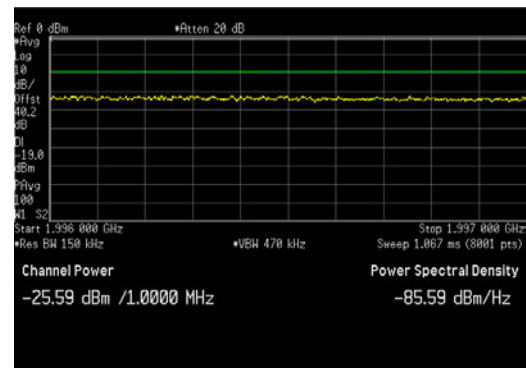
LTE15\_Top Channel\_UBE\_1994 to 1996MHz



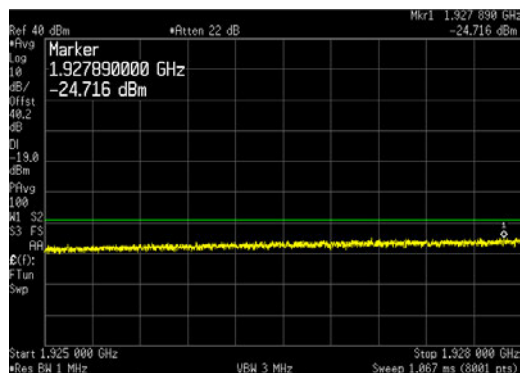
LTE15\_Bottom Channel\_LBE\_1928 to 1929MHz



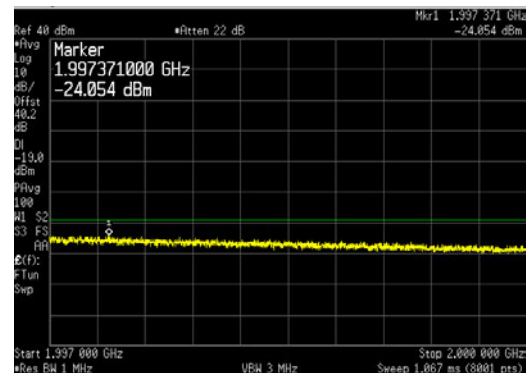
LTE15\_Top Channel\_UBE\_1996 to 1997MHz



LTE15\_Bottom Channel\_LBE\_1925 to 1928MHz



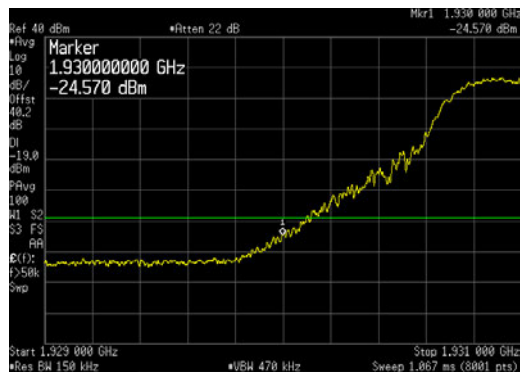
LTE15\_Top Channel\_UBE\_1997 to 2000MHz



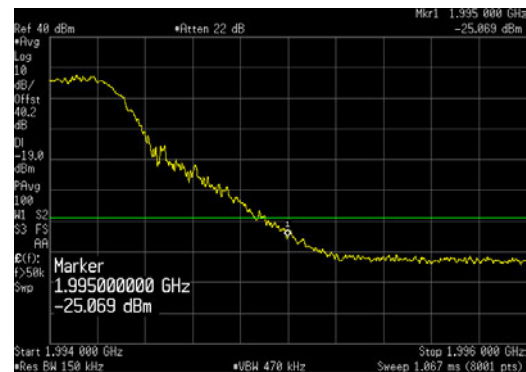


## LTE15 Band Edge Plots for Antenna Port 2 and 16QAM Modulation:

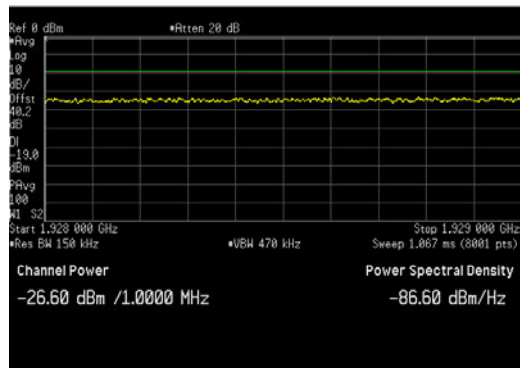
LTE15\_Bottom Channel\_LBE\_1929 to 1931MHz



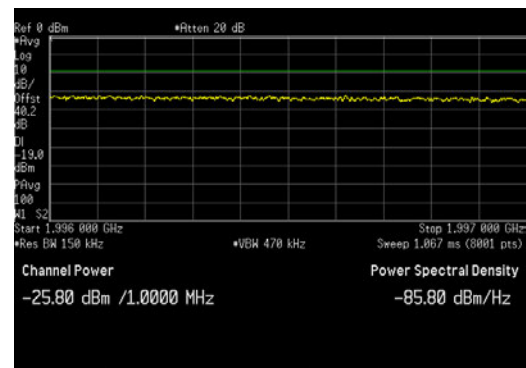
LTE15\_Top Channel\_UBE\_1994 to 1996MHz



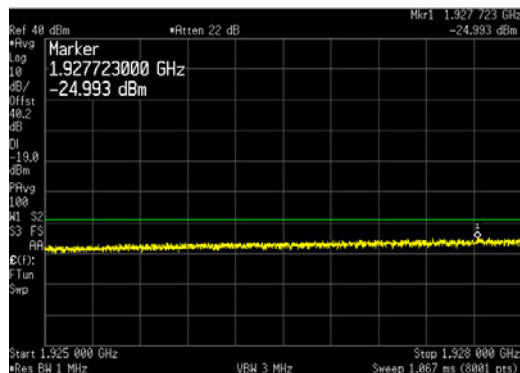
LTE15\_Bottom Channel\_LBE\_1928 to 1929MHz



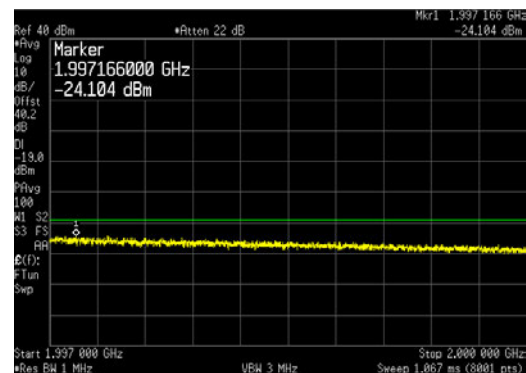
LTE15\_Top Channel\_UBE\_1996 to 1997MHz



LTE15\_Bottom Channel\_LBE\_1925 to 1928MHz

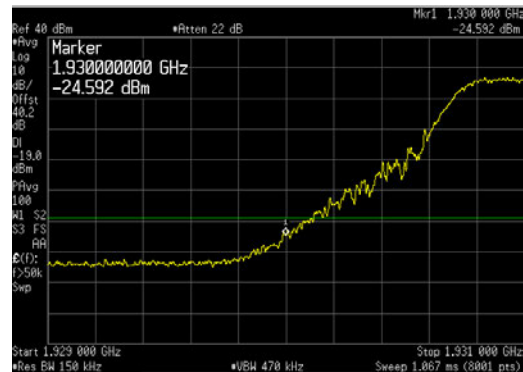


LTE15\_Top Channel\_UBE\_1997 to 2000MHz

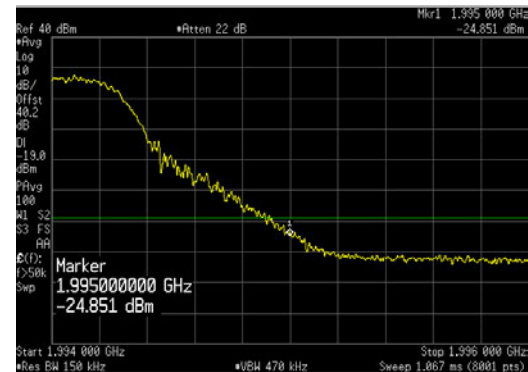


## LTE15 Band Edge Plots for Antenna Port 2 and 64QAM Modulation:

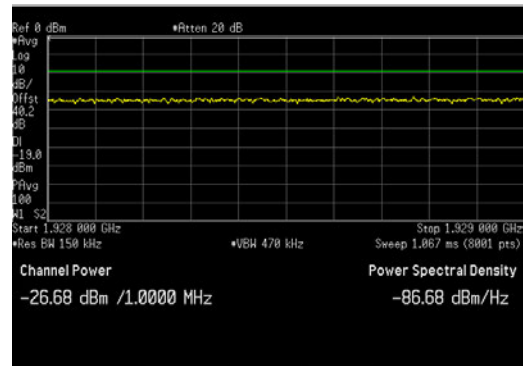
LTE15\_Bottom Channel\_LBE\_1929 to 1931MHz



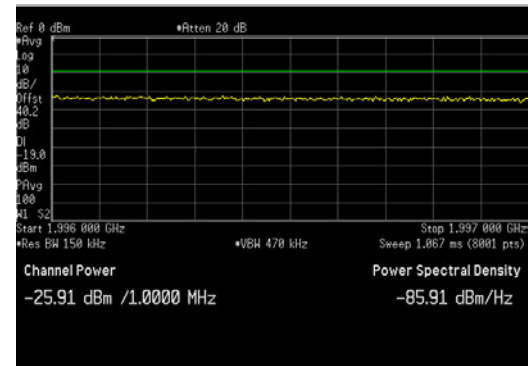
LTE15\_Top Channel\_UBE\_1994 to 1996MHz



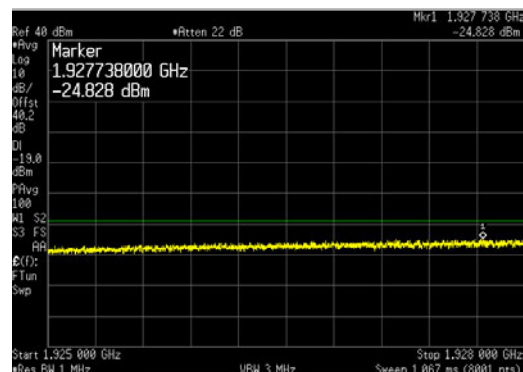
LTE15\_Bottom Channel\_LBE\_1928 to 1929MHz



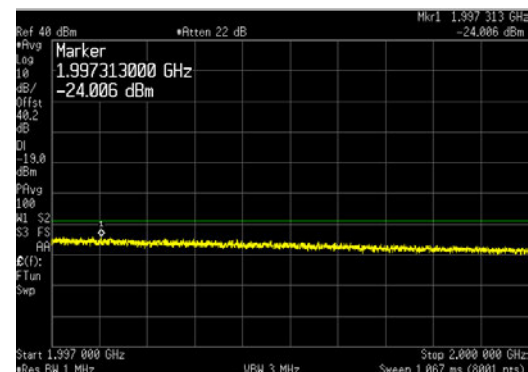
LTE15\_Top Channel\_UBE\_1996 to 1997MHz



LTE15\_Bottom Channel\_LBE\_1925 to 1928MHz

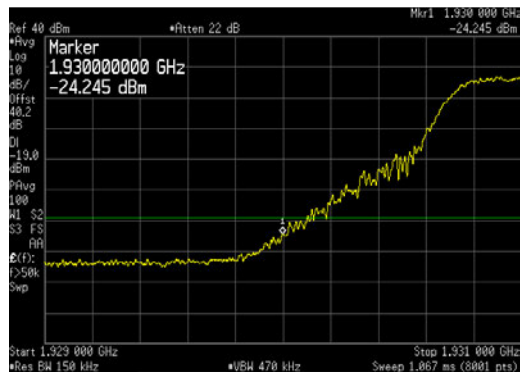


LTE15\_Top Channel\_UBE\_1997 to 2000MHz

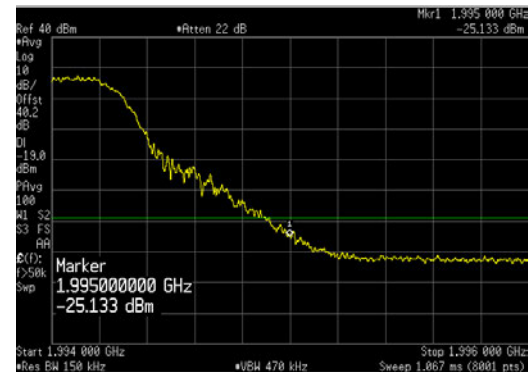


LTE15 Band Edge Plots for Antenna Port 2 and 256QAM Modulation:

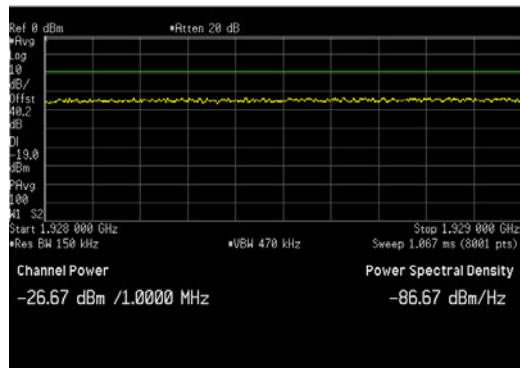
LTE15\_Bottom Channel\_LBE\_1929 to 1931MHz



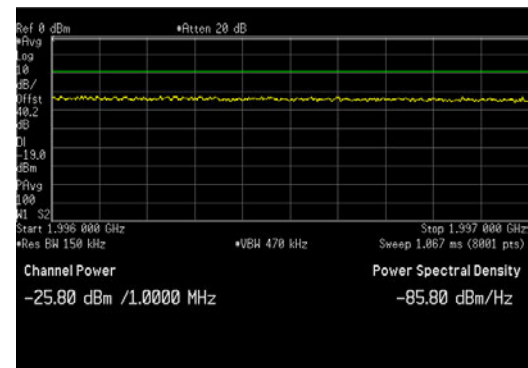
LTE15\_Top Channel\_UBE\_1994 to 1996MHz



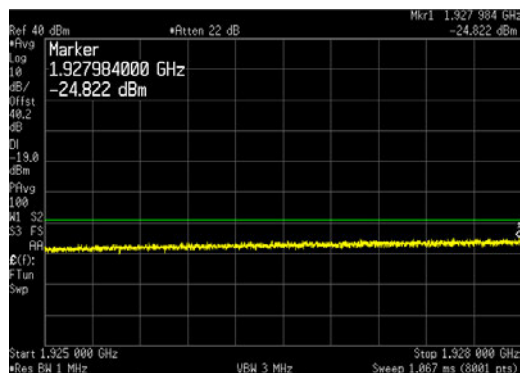
LTE15\_Bottom Channel\_LBE\_1928 to 1929MHz



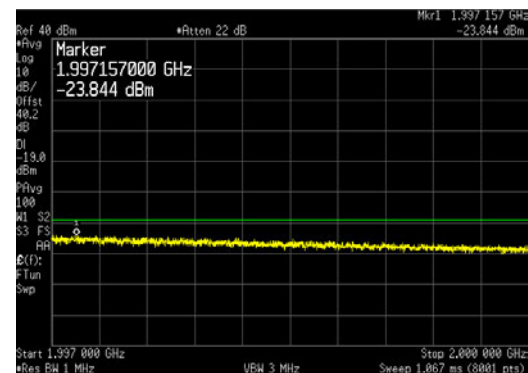
LTE15\_Top Channel\_UBE\_1996 to 1997MHz



LTE15\_Bottom Channel\_LBE\_1925 to 1928MHz

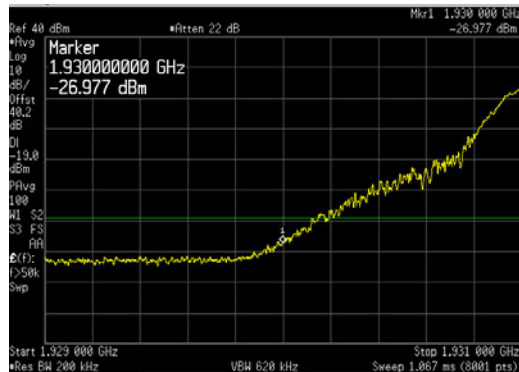


LTE15\_Top Channel\_UBE\_1997 to 2000MHz

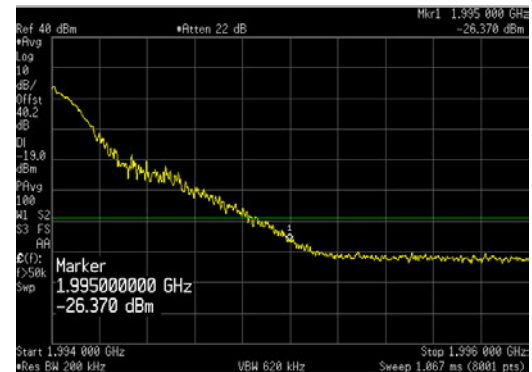


LTE20 Band Edge Plots for Antenna Port 2 and QPSK Modulation:

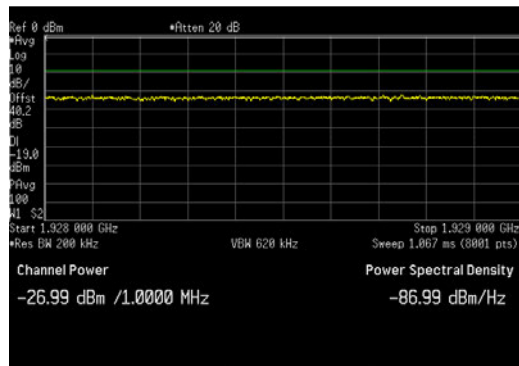
LTE20\_Bottom Channel\_LBE\_1929 to 1931MHz



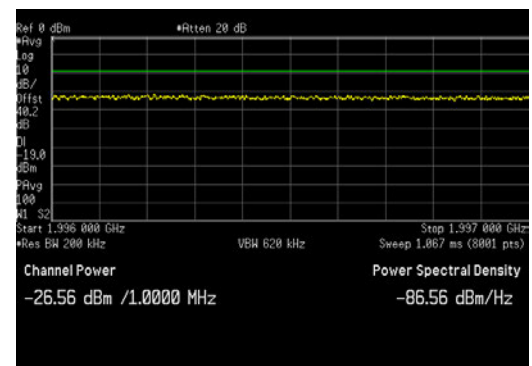
LTE20\_Top Channel\_UBE\_1994 to 1996MHz



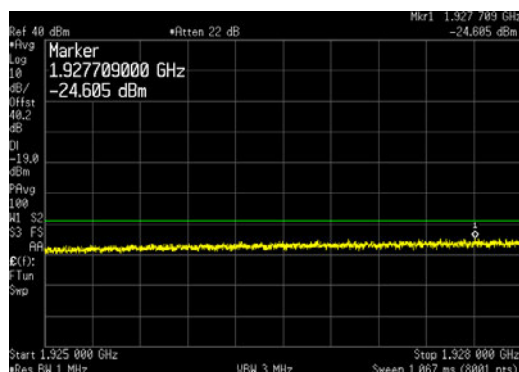
LTE20\_Bottom Channel\_LBE\_1928 to 1929MHz



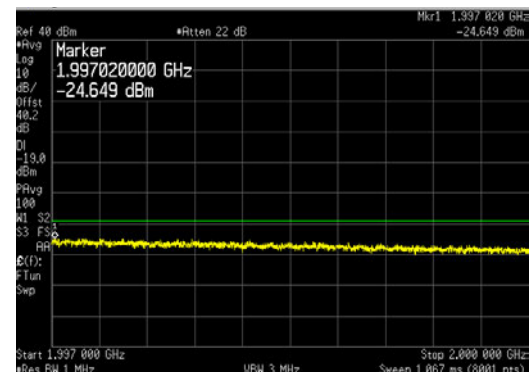
LTE20\_Top Channel\_UBE\_1996 to 1997MHz



LTE20\_Bottom Channel\_LBE\_1925 to 1928MHz

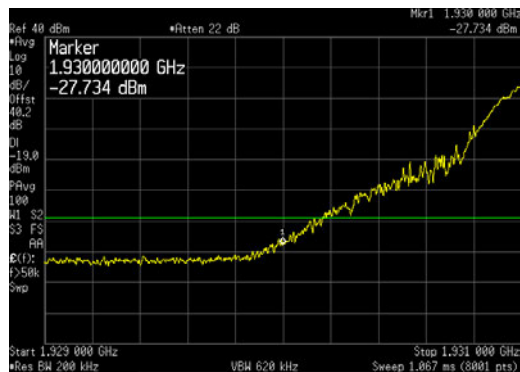


LTE20\_Top Channel\_UBE\_1997 to 2000MHz

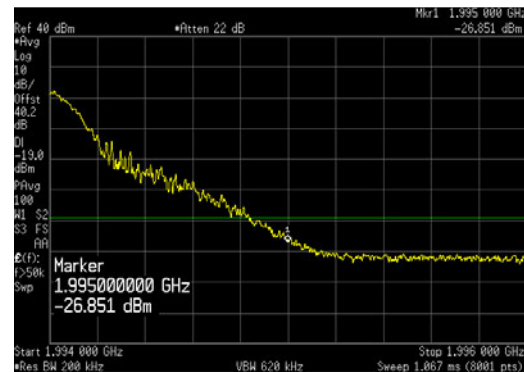


LTE20 Band Edge Plots for Antenna Port 2 and 16QAM Modulation:

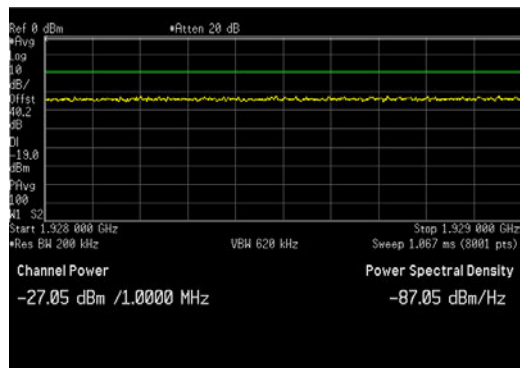
LTE20\_Bottom Channel\_LBE\_1929 to 1931MHz



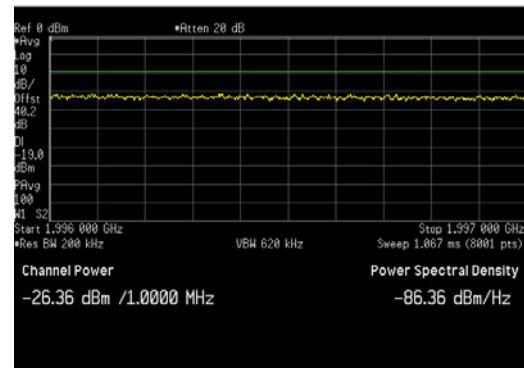
LTE20\_Top Channel\_UBE\_1994 to 1996MHz



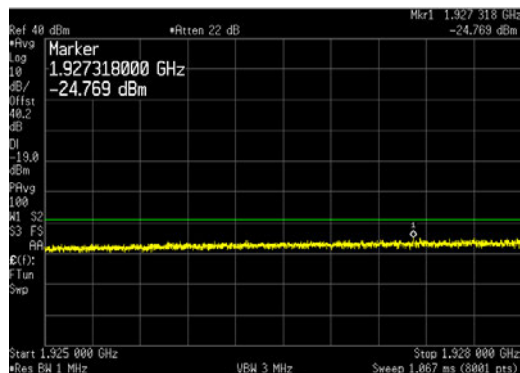
LTE20\_Bottom Channel\_LBE\_1928 to 1929MHz



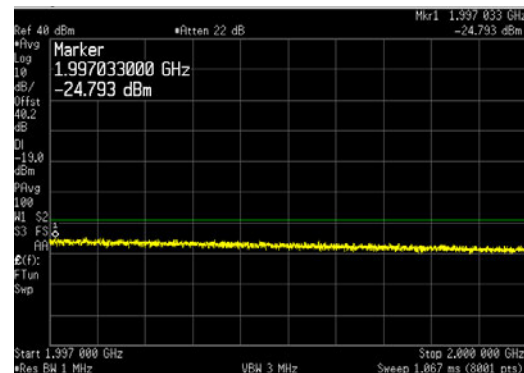
LTE20\_Top Channel\_UBE\_1996 to 1997MHz



LTE20\_Bottom Channel\_LBE\_1925 to 1928MHz



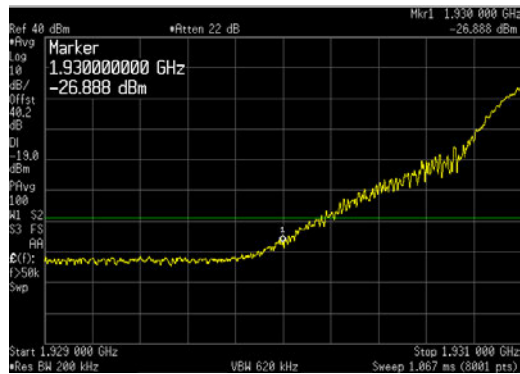
LTE20\_Top Channel\_UBE\_1997 to 2000MHz



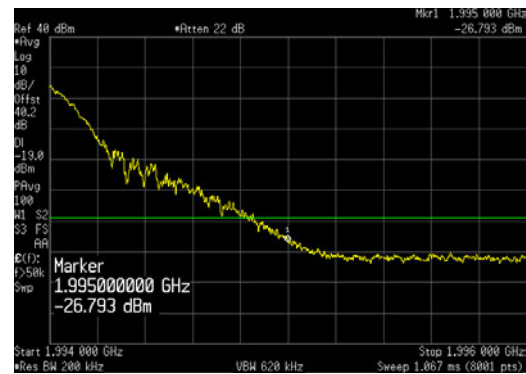


## LTE20 Band Edge Plots for Antenna Port 2 and 64QAM Modulation:

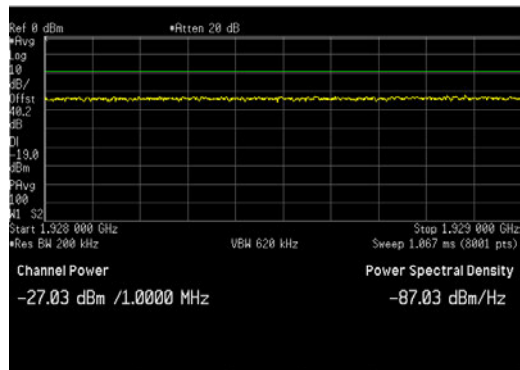
LTE20\_Bottom Channel\_LBE\_1929 to 1931MHz



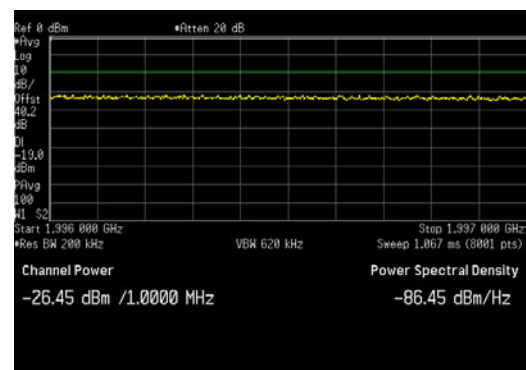
LTE20\_Top Channel\_UBE\_1994 to 1996MHz



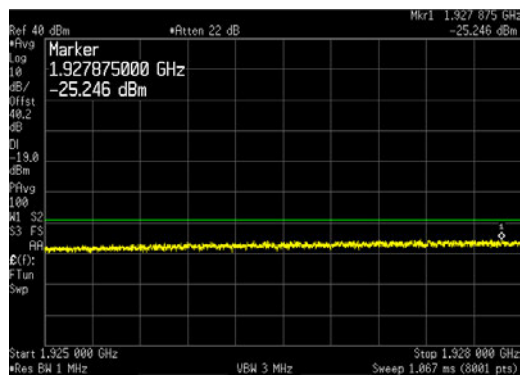
LTE20\_Bottom Channel\_LBE\_1928 to 1929MHz



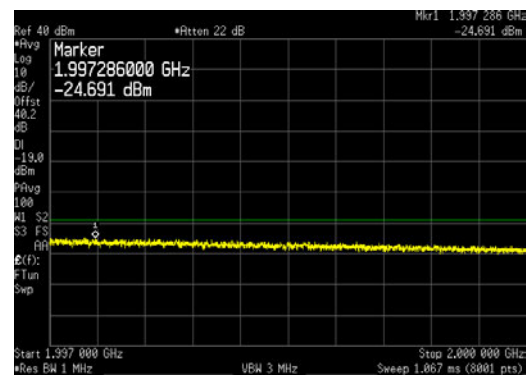
LTE20\_Top Channel\_UBE\_1996 to 1997MHz



LTE20\_Bottom Channel\_LBE\_1925 to 1928MHz

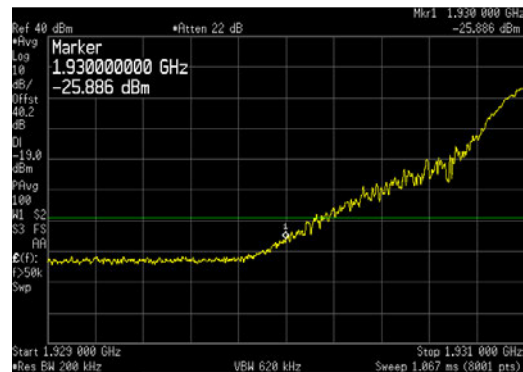


LTE20\_Top Channel\_UBE\_1997 to 2000MHz

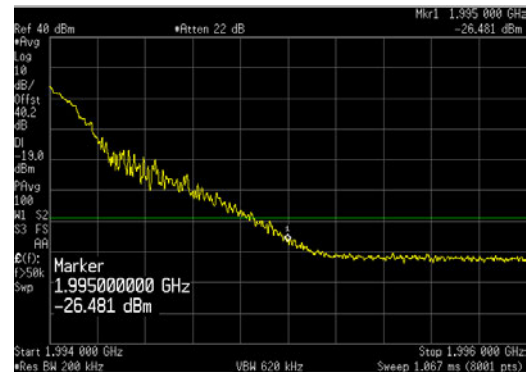


LTE20 Band Edge Plots for Antenna Port 2 and 256QAM Modulation:

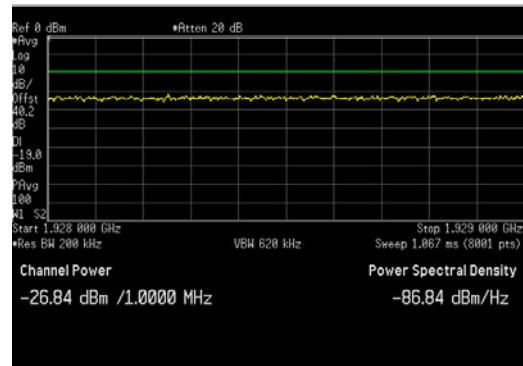
LTE20\_Bottom Channel\_LBE\_1929 to 1931MHz



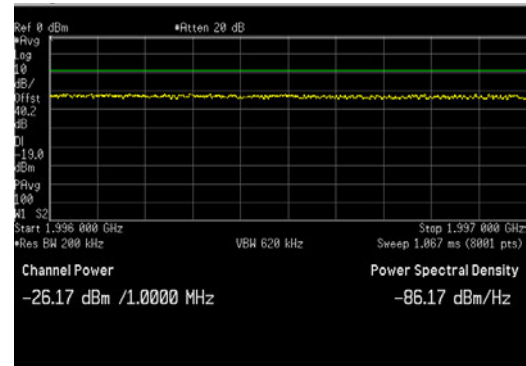
LTE20\_Top Channel\_UBE\_1994 to 1996MHz



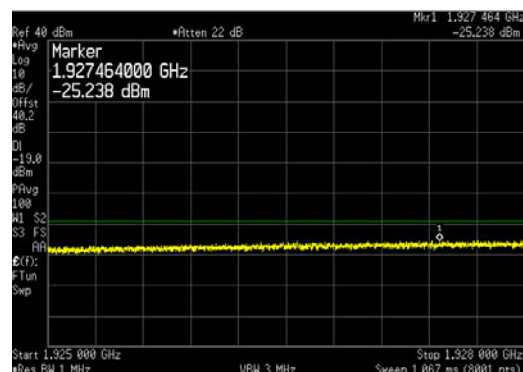
LTE20\_Bottom Channel\_LBE\_1928 to 1929MHz



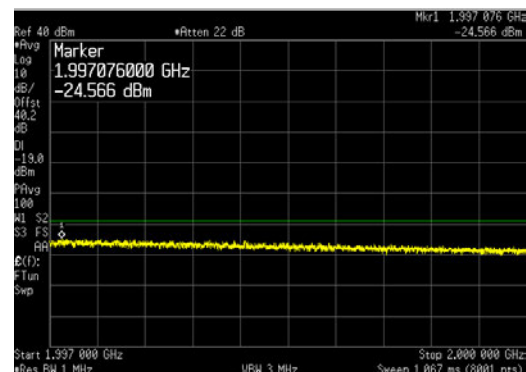
LTE20\_Top Channel\_UBE\_1996 to 1997MHz



LTE20\_Bottom Channel\_LBE\_1925 to 1928MHz

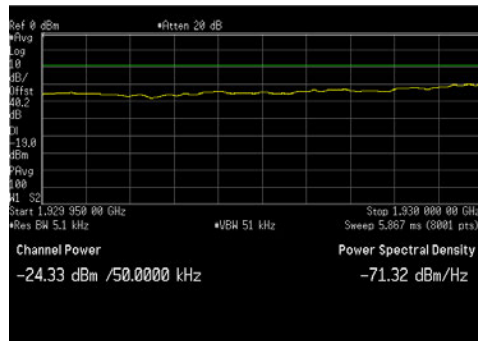


LTE20\_Top Channel\_UBE\_1997 to 2000MHz

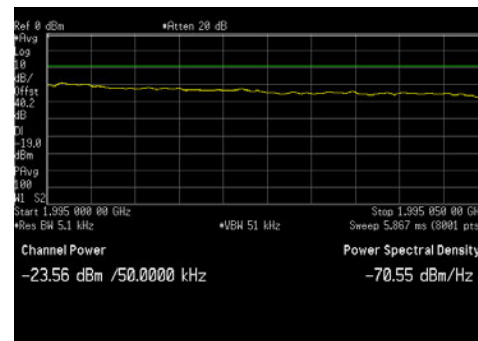


## Dual LTE5\_Band Edge Plots for Antenna Port 2 and QPSK Modulation:

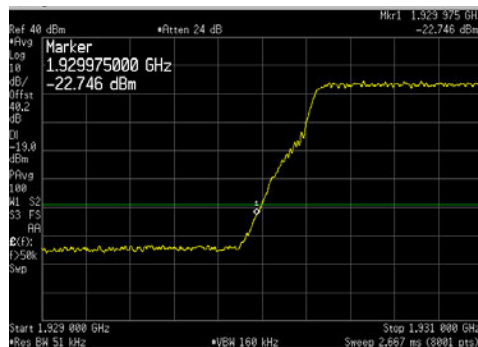
Dual LTE5\_Bot Ch\_LBE\_1929.95 to 1930.00MHz



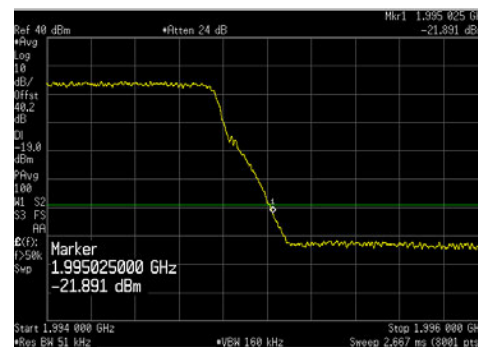
Dual LTE5\_Top Ch\_UBE\_1995.00 to 1995.05MHz



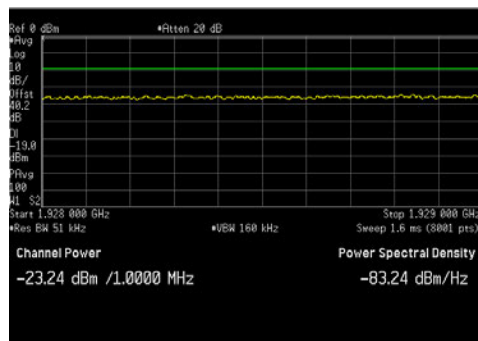
Dual LTE5\_Bot Ch\_LBE\_1929 to 1931MHz



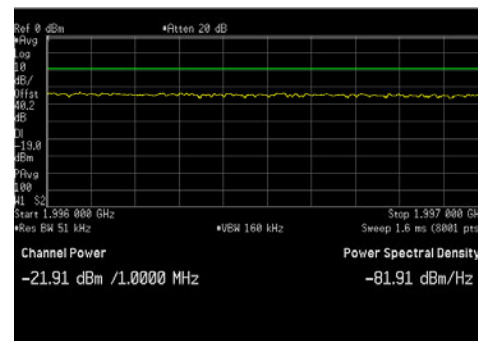
Dual LTE5\_Top Ch\_UBE\_1994 to 1996MHz



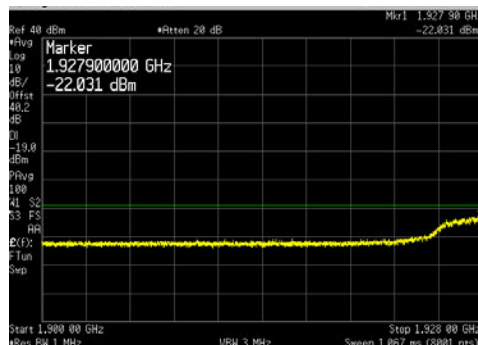
Dual LTE5\_Bot Ch\_LBE\_1928 to 1929MHz



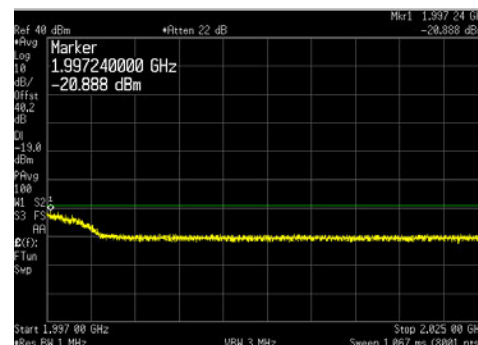
Dual LTE5\_Top Ch\_UBE\_1996 to 1997MHz



Dual LTE5\_Bot Ch\_LBE\_1900 to 1928MHz

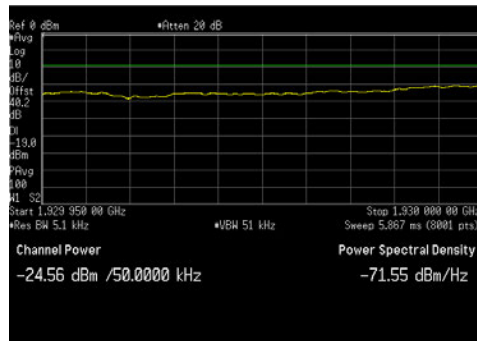


Dual LTE5\_Top Ch\_UBE\_1997 to 2025MHz

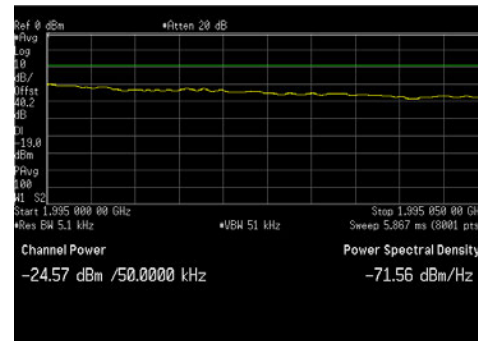


Dual LTE5\_Band Edge Plots for Antenna Port 2 and 16QAM Modulation:

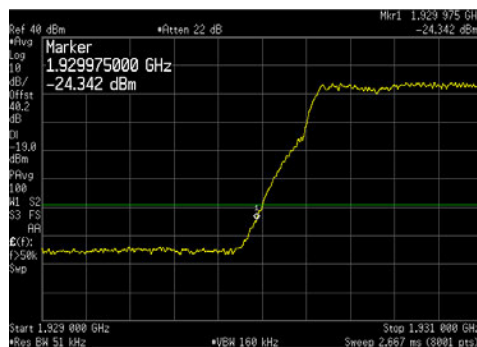
Dual LTE5\_Bot Ch\_LBE\_1929.95 to 1930.00MHz



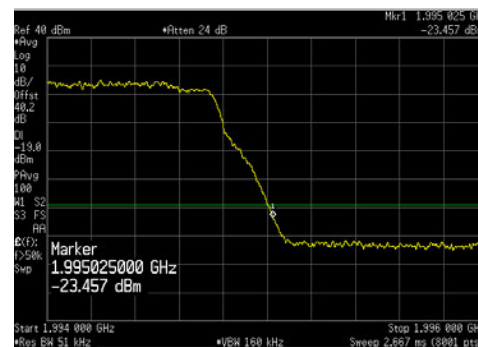
Dual LTE5\_Top Ch\_UBE\_1995.00 to 1995.05MHz



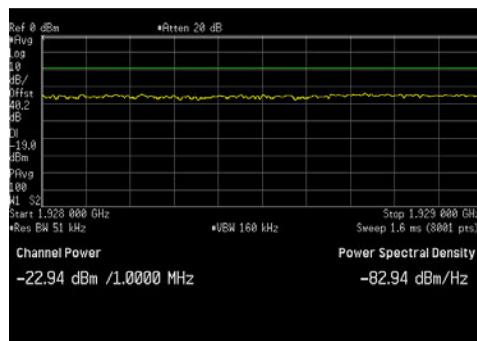
Dual LTE5\_Bot Ch\_LBE\_1929 to 1931MHz



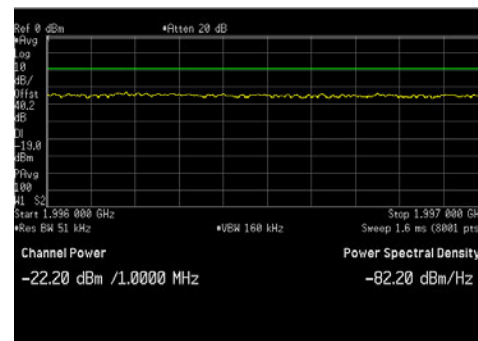
Dual LTE5\_Top Ch\_UBE\_1994 to 1996MHz



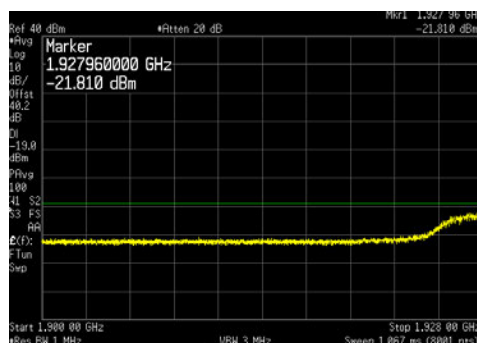
Dual LTE5\_Bot Ch\_LBE\_1928 to 1929MHz



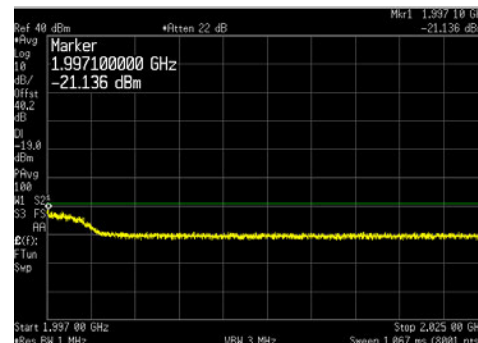
Dual LTE5\_Top Ch\_UBE\_1996 to 1997MHz



Dual LTE5\_Bot Ch\_LBE\_1900 to 1928MHz

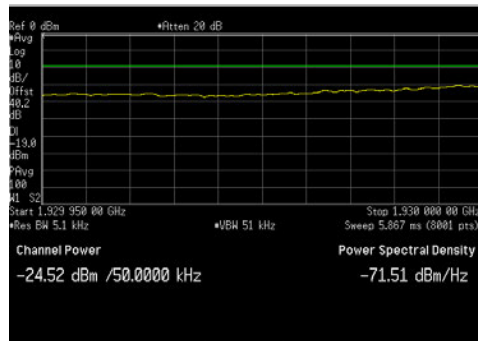


Dual LTE5\_Top Ch\_UBE\_1997 to 2025MHz

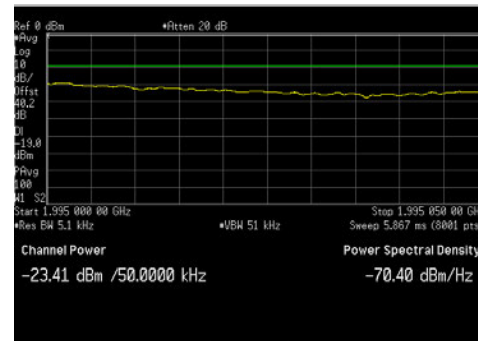


Dual LTE5\_Band Edge Plots for Antenna Port 2 and 64QAM Modulation:

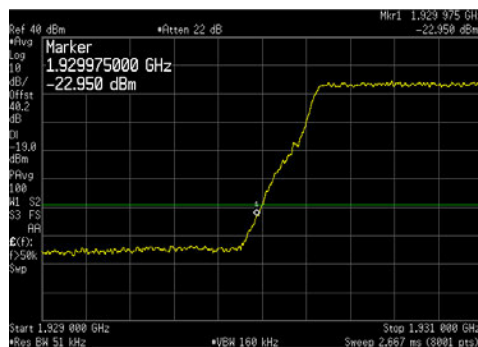
Dual LTE5\_Bot Ch\_LBE\_1929.95 to 1930.00MHz



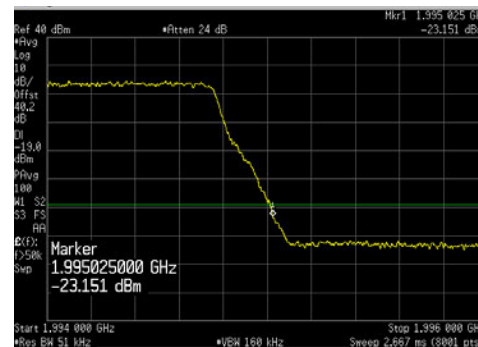
Dual LTE5\_Top Ch\_UBE\_1995.00 to 1995.05MHz



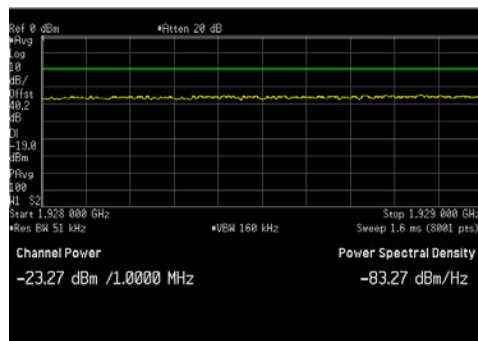
Dual LTE5\_Bot Ch\_LBE\_1929 to 1931MHz



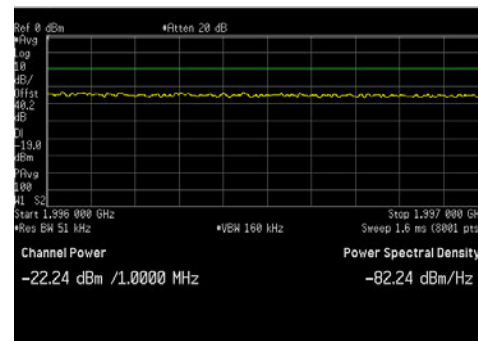
Dual LTE5\_Top Ch\_UBE\_1994 to 1996MHz



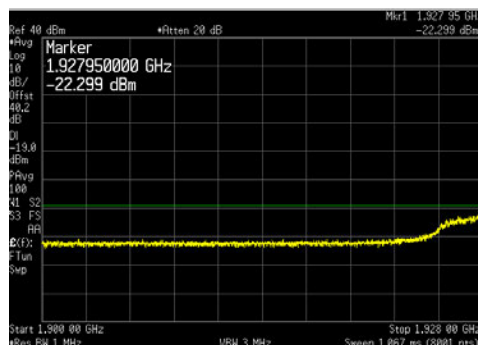
Dual LTE5\_Bot Ch\_LBE\_1928 to 1929MHz



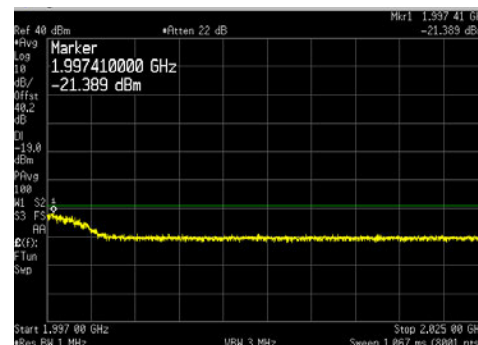
Dual LTE5\_Top Ch\_UBE\_1996 to 1997MHz



Dual LTE5\_Bot Ch\_LBE\_1900 to 1928MHz



Dual LTE5\_Top Ch\_UBE\_1997 to 2025MHz



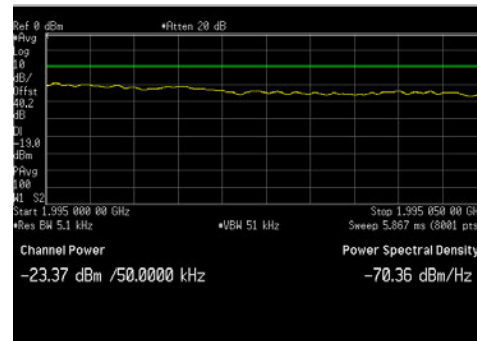


Dual LTE5\_Band Edge Plots for Antenna Port 2 and 256QAM Modulation:

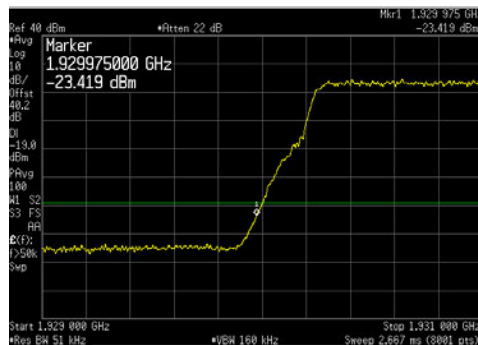
Dual LTE5\_Bot Ch\_LBE\_1929.95 to 1930.00MHz



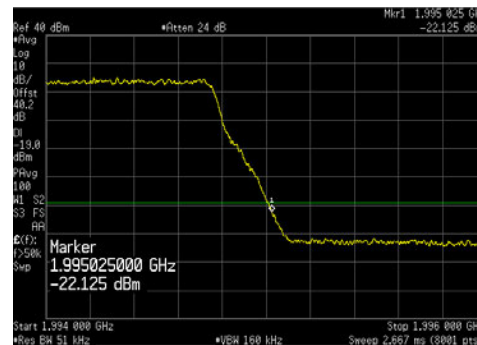
Dual LTE5\_Top Ch\_UBE\_1995.00 to 1995.05MHz



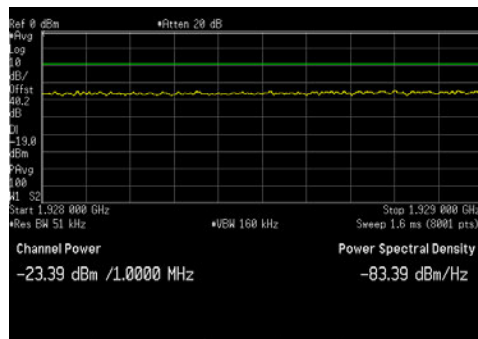
Dual LTE5\_Bot Ch\_LBE\_1929 to 1931MHz



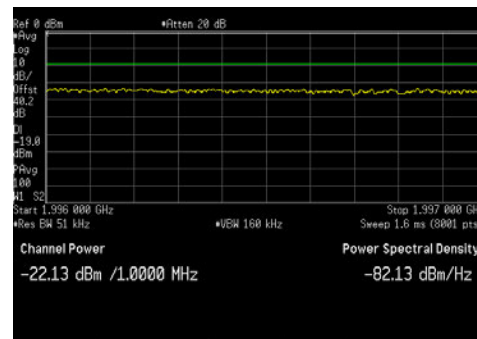
Dual LTE5\_Top Ch\_UBE\_1994 to 1996MHz



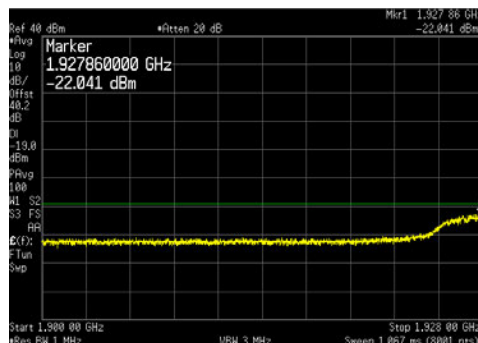
Dual LTE5\_Bot Ch\_LBE\_1928 to 1929MHz



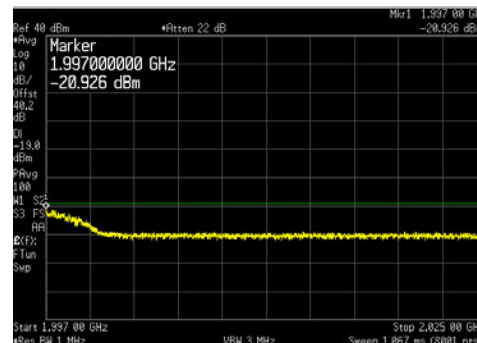
Dual LTE5\_Top Ch\_UBE\_1996 to 1997MHz



Dual LTE5\_Bot Ch\_LBE\_1900 to 1928MHz



Dual LTE5\_Top Ch\_UBE\_1997 to 2025MHz



### Transmitter Antenna Port Conducted Emissions

Transmitter conducted emission measurements were made at RRH antenna port 2. Measurements were performed over the 9kHz to 22GHz frequency range. The RRH was operated on the PCS middle channel (1962.5MHz) and AWS middle channel (2155.0MHz) simultaneously with all LTE modulation types (QPSK, 16QAM, 64QAM and 256QAM) for LTE bandwidths of 5MHz, 10MHz, 15MHz and 20MHz.

The limit of -19dBm was used in the certification testing. The limit is adjusted to -19dBm  $[-13\text{dBm} - 10 \log(4)]$  per FCC KDB 662911D01 v02r01 because the BTS may operate as a 4 port MIMO transmitter. The required measurement parameters include a 1MHz 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 20MHz to 3GHz frequency range). Measurements for the 20MHz to 3GHz 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 -49dBm to correct for a spectrum analyzer RBW of 1kHz versus required RBW of 1MHz [i.e.:  $-49\text{dBm} = -19\text{dBm} - 10\log(1\text{MHz}/1\text{kHz})$ ]. The limit for the 150kHz to 20MHz frequency range was adjusted to -29dBm to correct for a spectrum analyzer RBW of 100kHz versus required RBW of 1MHz [i.e.:  $-29\text{dBm} = -19\text{dBm} - 10\log(1\text{MHz}/100\text{kHz})$ ]. The required limit of -19dBm with a RBW of 1MHz 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	28.0dB
150kHz to 20MHz	100kHz	300kHz	8001	Peak	Auto	50 Sweeps	28.0dB
20MHz to 3GHz	1MHz	3MHz	8001	Average	Auto	Note (2)	40.2dB
3GHz to 6GHz	1MHz	3MHz	8001	Peak	Auto	50 Sweeps	40.0dB
6GHz to 10GHz	1MHz	3MHz	8001	Peak	Auto	50 Sweeps	30.6dB
10GHz to 14GHz	1MHz	3MHz	8001	Peak	Auto	50 Sweeps	32.5dB
14GHz to 18GHz	1MHz	3MHz	8001	Peak	Auto	50 Sweeps	34.0dB
18GHz to 22GHz	1MHz	3MHz	8001	Peak	Auto	50 Sweeps	39.5dB

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

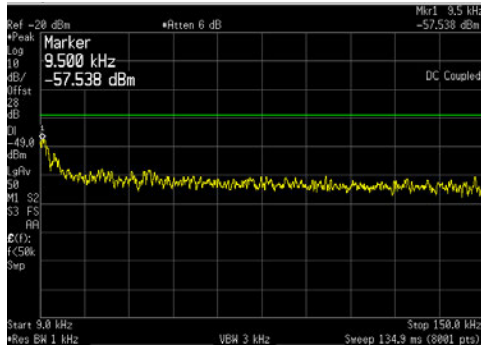
Note 2: Max Hold not used and instead measurements were performed with the spectrum analyzer in the RMS average mode over 100 traces.

A low pass filter was used to reduce measurement instrumentation noise floor for the frequency ranges less than 20MHz. A high pass filter was used to reduce measurement instrumentation noise floor for the frequency ranges above 6GHz. The total measurement RF path loss of the test setup (attenuators, low pass filter, 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.

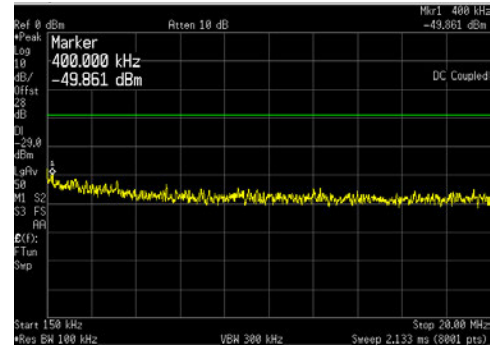
Conducted spurious emission plots/measurements are provided in the following pages.

LTE5 Channel Bandwidth \_ QPSK \_ Middle Channels (1962.5MHz and 2155MHz) Simultaneously:

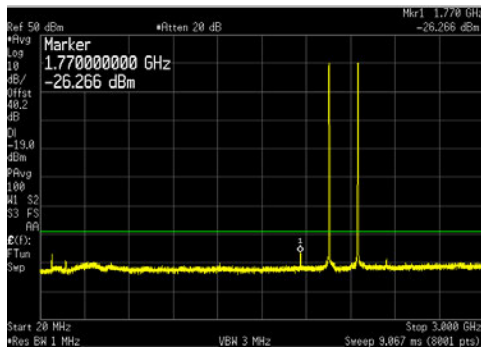
9kHz to 150kHz



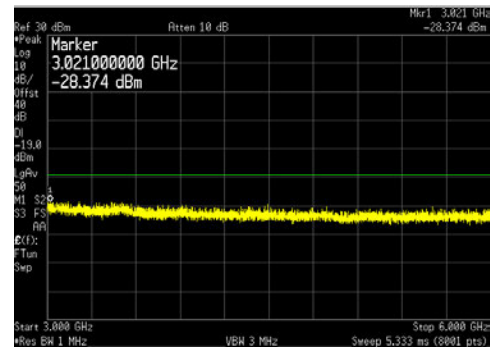
150kHz to 20MHz



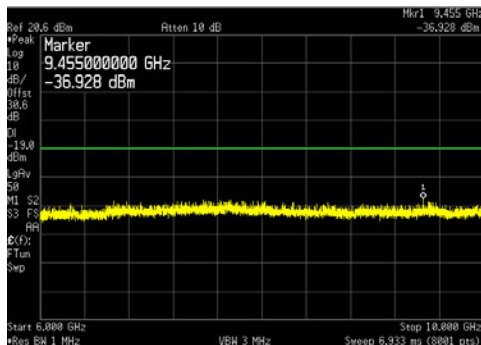
20MHz to 3GHz



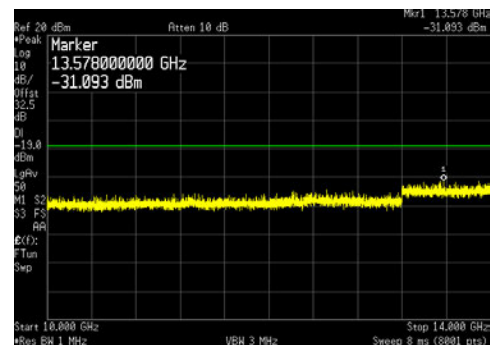
3GHz to 6GHz



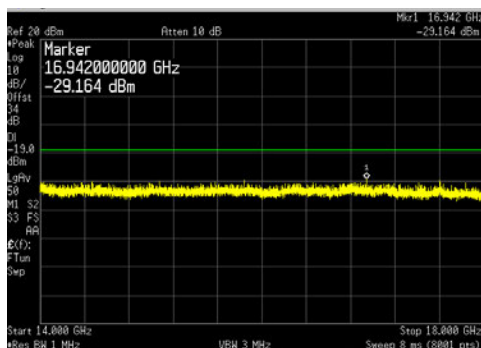
6GHz to 10GHz



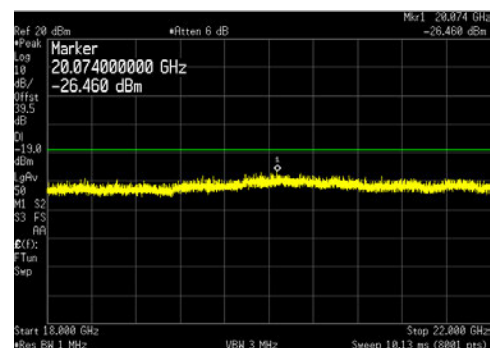
10GHz to 14GHz



14GHz to 18GHz



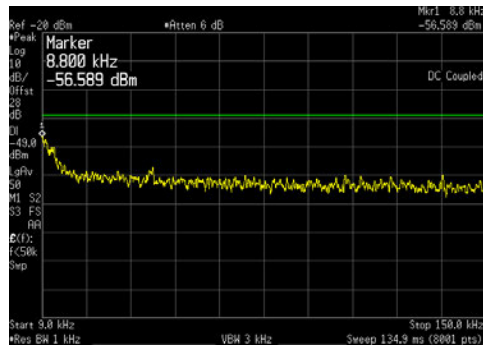
18GHz to 22GHz



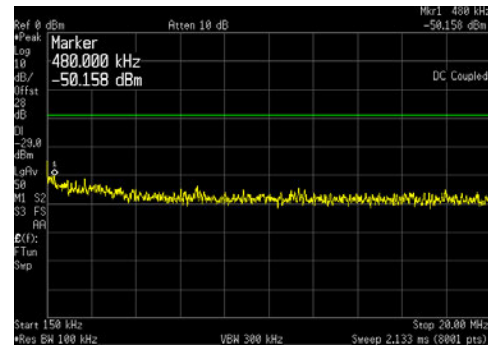


LTE5 Channel Bandwidth \_ 16QAM \_ Middle Channels (1962.5MHz and 2155MHz) Simultaneously:

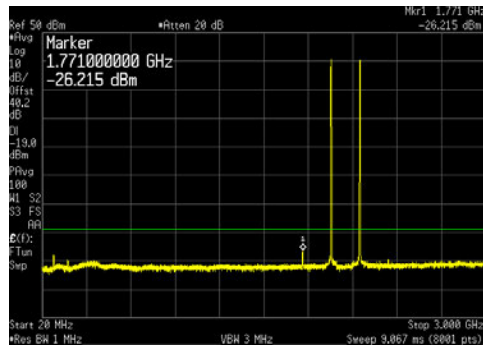
9kHz to 150kHz



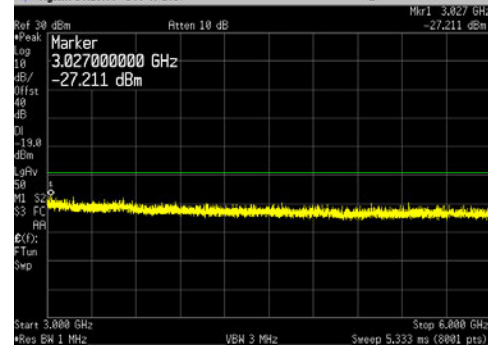
150kHz to 20MHz



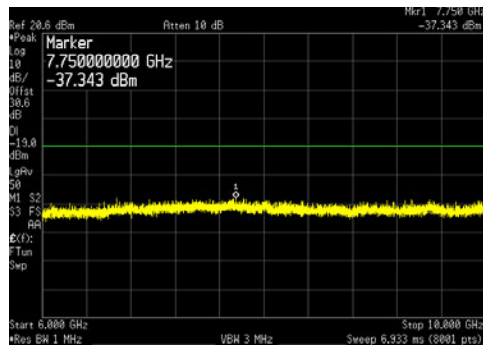
20MHz to 3GHz



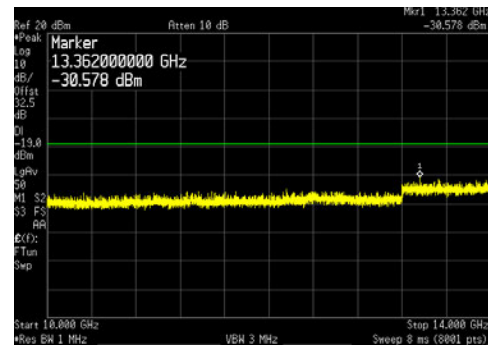
3GHz to 6GHz



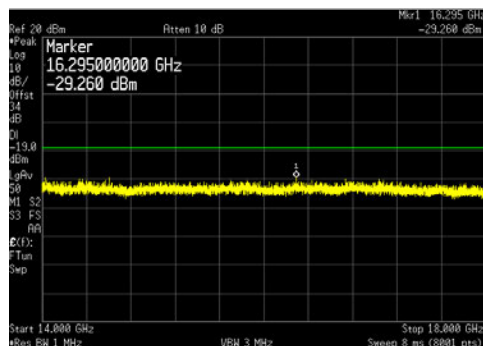
6GHz to 10GHz



10GHz to 14GHz



14GHz to 18GHz



18GHz to 22GHz

