6. Spurious Emissions at Antenna Terminal

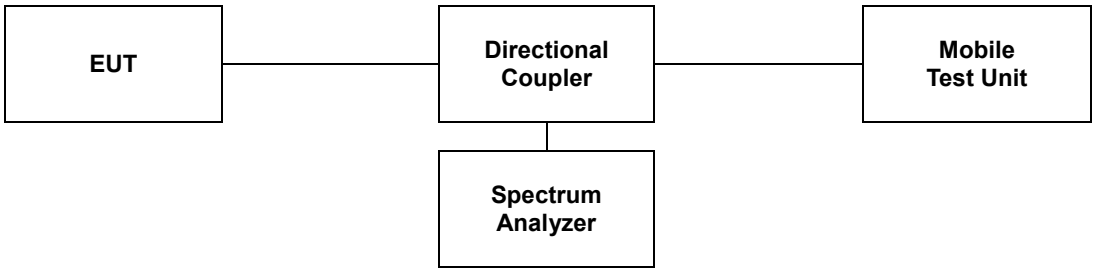
6.1. Limit

FCC §22.917(a), the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10log(P) dB.
FCC §24.238(a), the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.
FCC §27.53(c), For operations in the 746-758 ㎒ band and the 776-788 ㎒ band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:
(2) On any frequency outside the 776-788 ㎒ band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB.
FCC §27.53(h)(1), Except as otherwise specified below, for operations in the 1 695-1 710 ㎒, 1 710-1 755 ㎒, 1 755-1 780 ㎒, 1 915-1 920 ㎒, 1 995-2 000 ㎒, 2 000-2 020 ㎒, 2 110-2 155 ㎒, 2 155-2 180 ㎒, and 2 180-2 200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least 43 + 10 $\log_{10}$ (P) dB.

6.2. Test Procedure

The test follows section 6.0 of FCC KDB publication 971168 v02r02.

1. Start frequency was set to 30 ㎒ and stop frequency was set to at least 10* the fundamental frequency.
2. Detector = RMS.
3. Trace mode = max hold.
4. Sweep time = auto couple.
5. The trace was allowed to stabilize.
6. Please see notes below for RBW and VBW settings.
7. For plots showing conducted spurious emissions from 30 ㎒ to 20 ㎓, all path loss of wide frequency range was investigated and compensated to spectrum analyzer as TDF function.



Notes;

Compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 100 ㎑ or greater for part 22, part 27 and 1 ㎒ or greater for part 24. However, in the 1 ㎒ bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two point, one below the carrier center frequency and one above the carrier center frequency, outside of which all emission are attenuated at least 26 dB below the transmitter power.

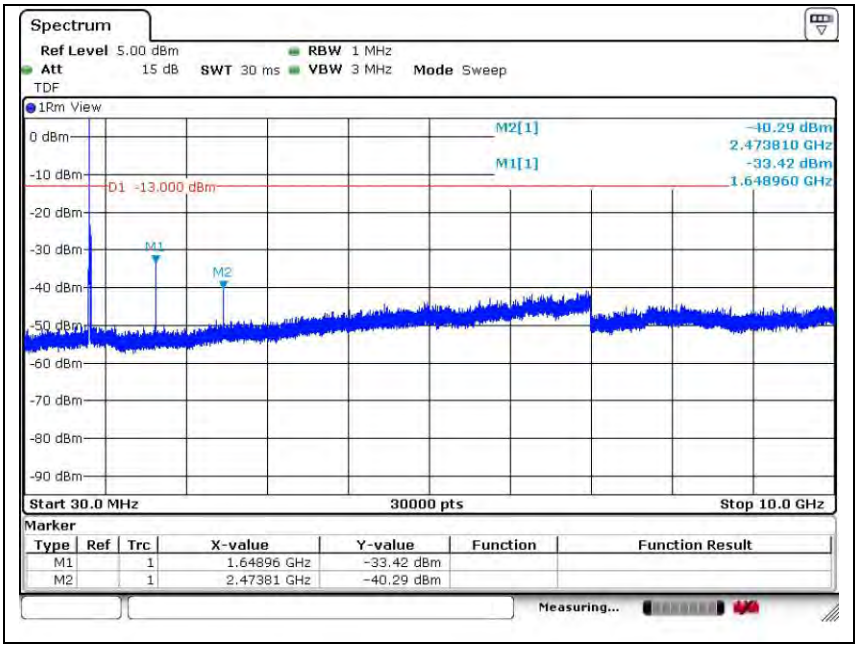
6.3. Test Results

Ambient temperature	:	(23 ± 1) ℃
Relative humidity	:	47 % R.H.

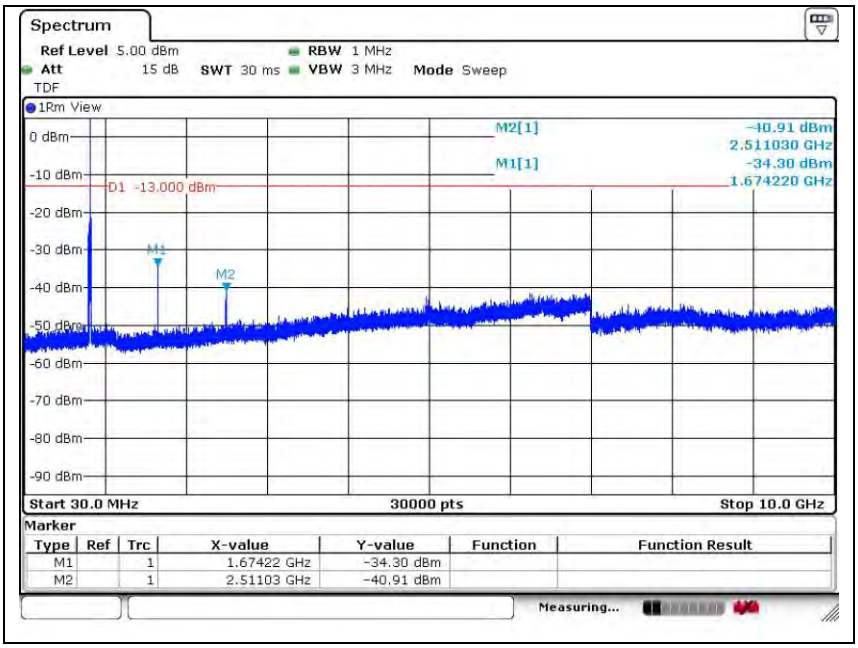
Please refer to the following plots.

CDMA850 1xRTT

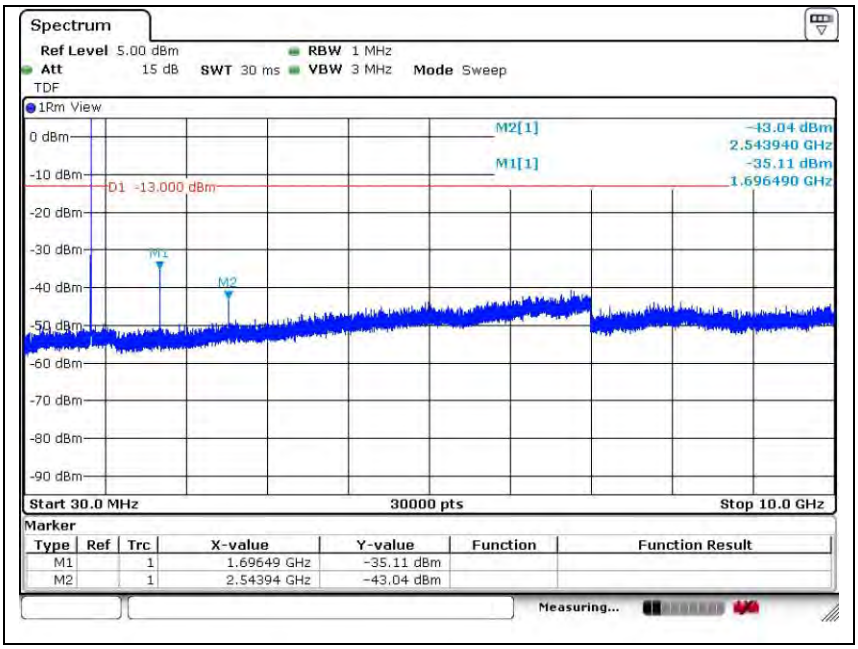
Low Channel



Middle Channel

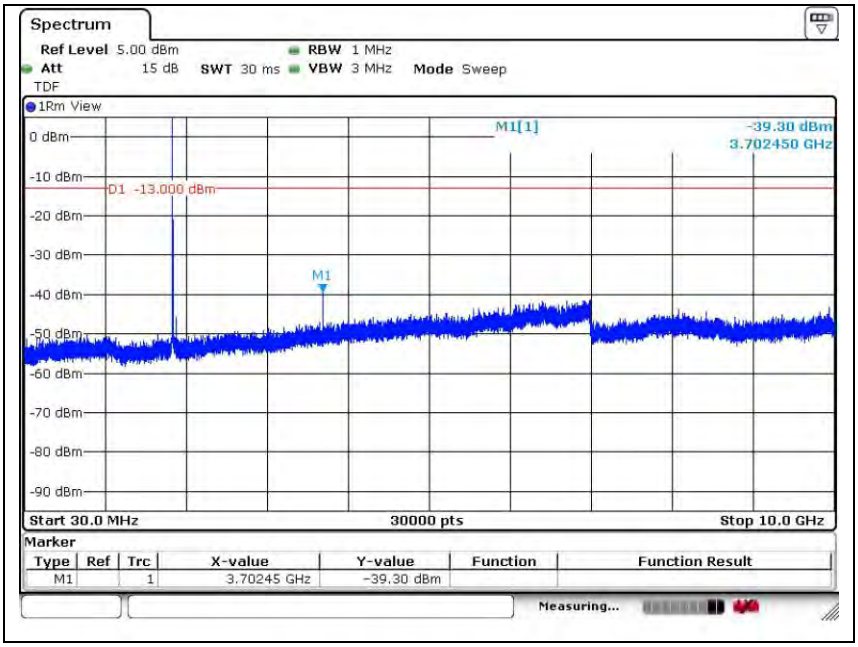


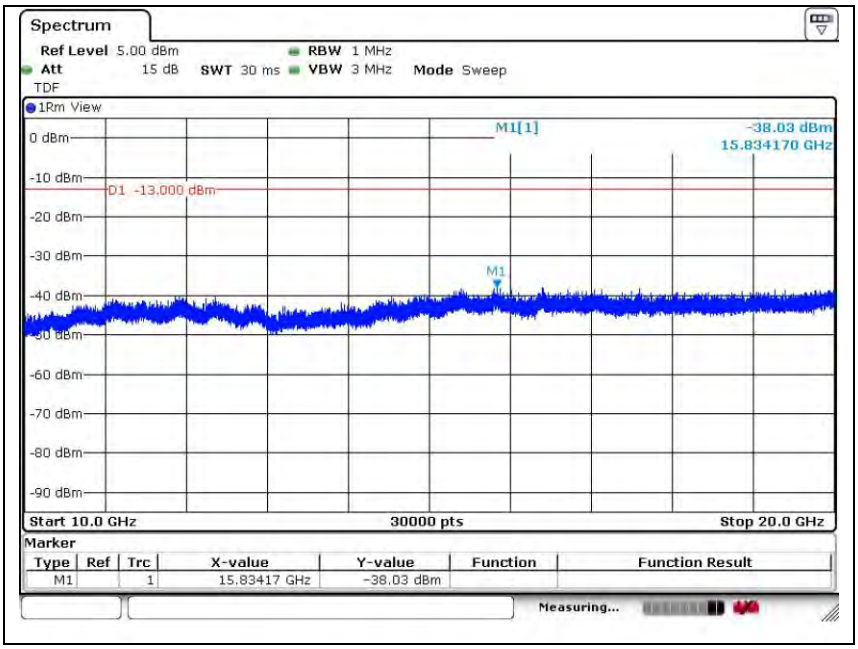
High Channel



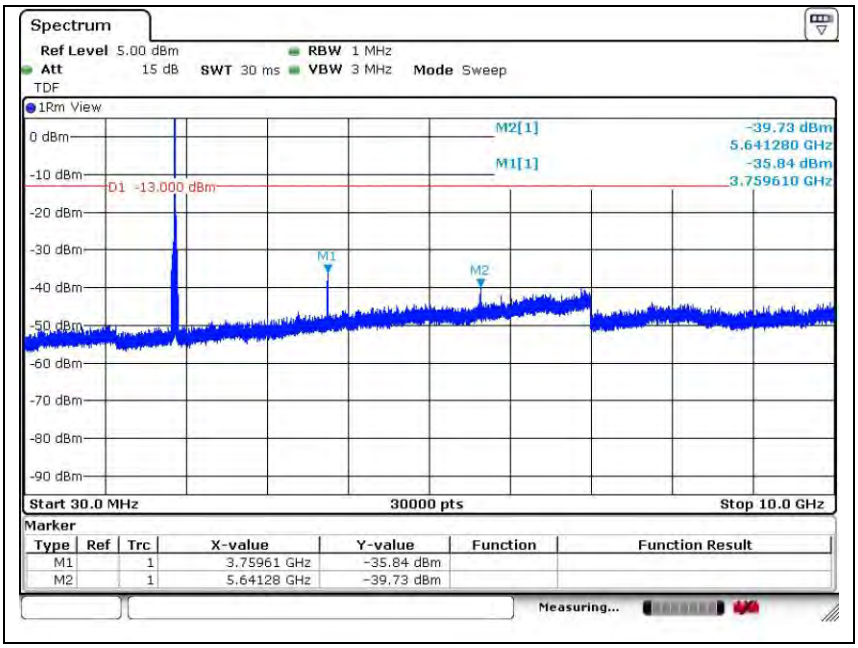
CDMA1 900 1xRTT

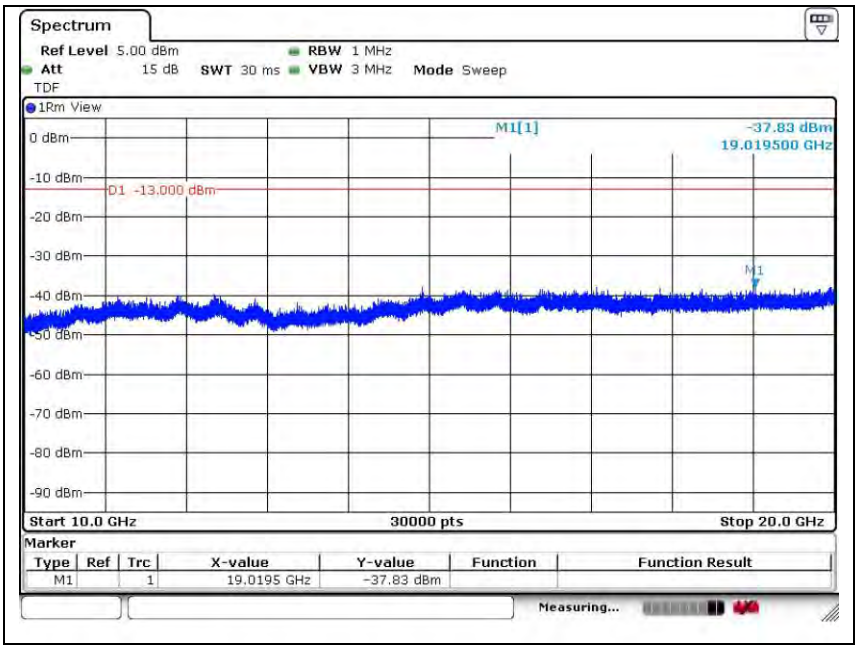
Low Channel



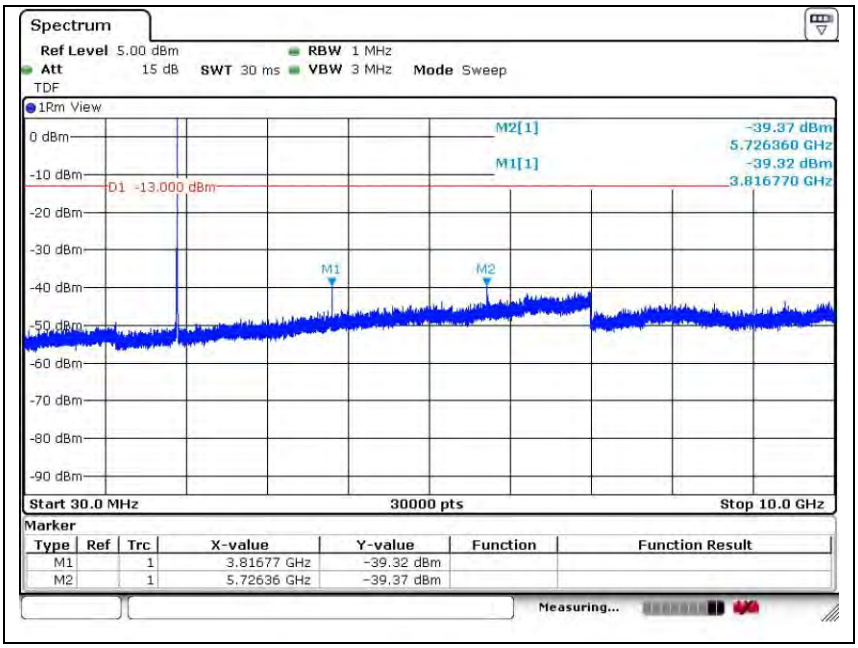


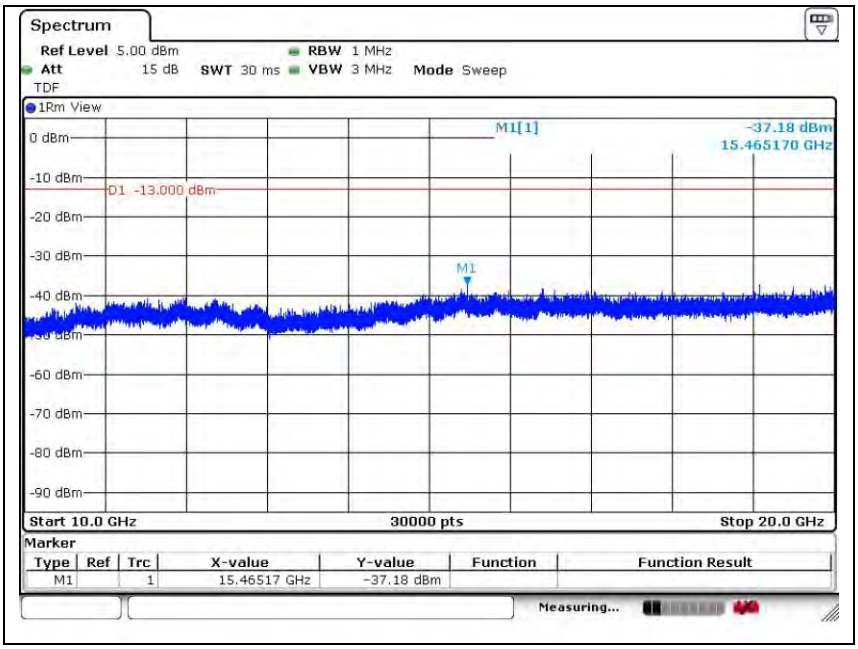
Middle Channel





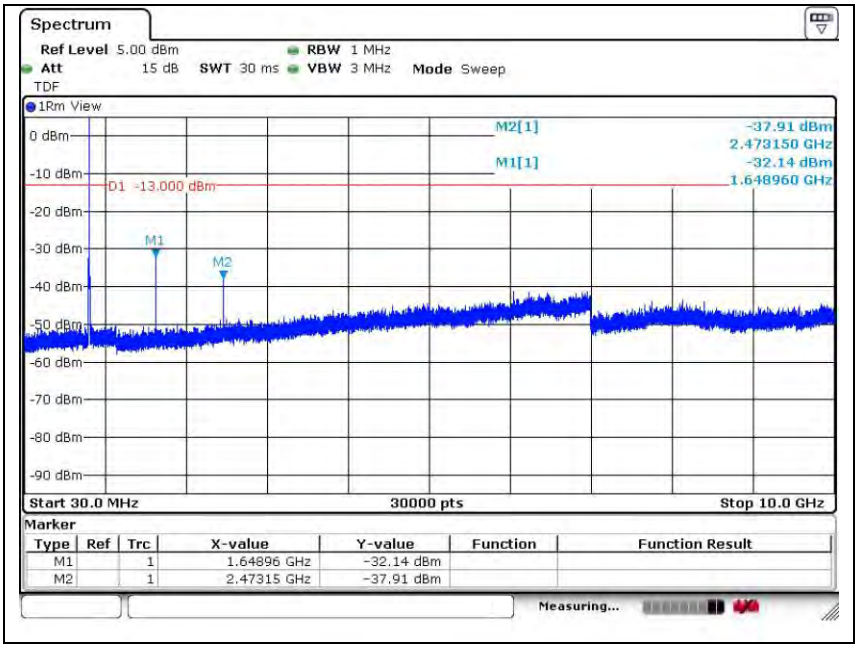
High Channel



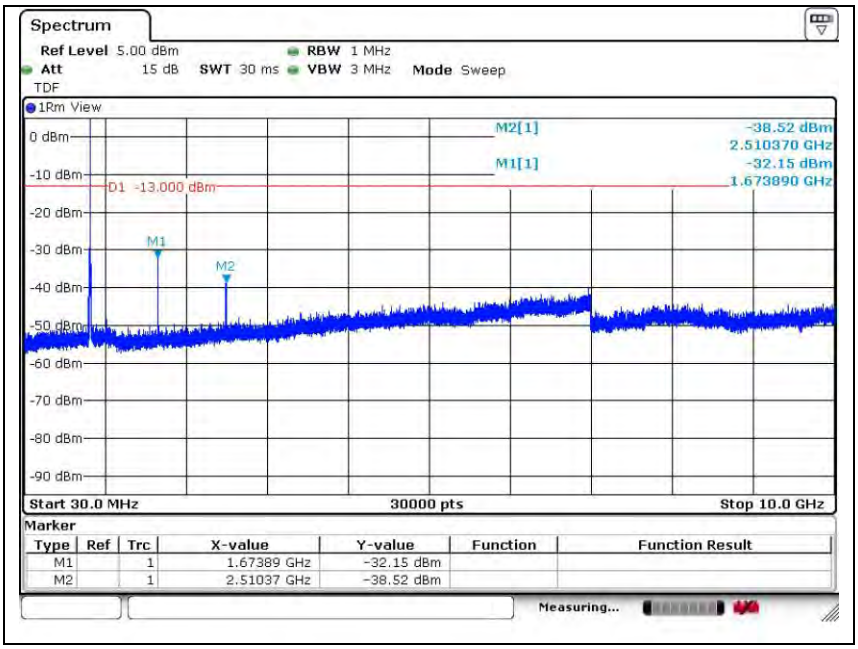


CDMA850 1xEV-DO

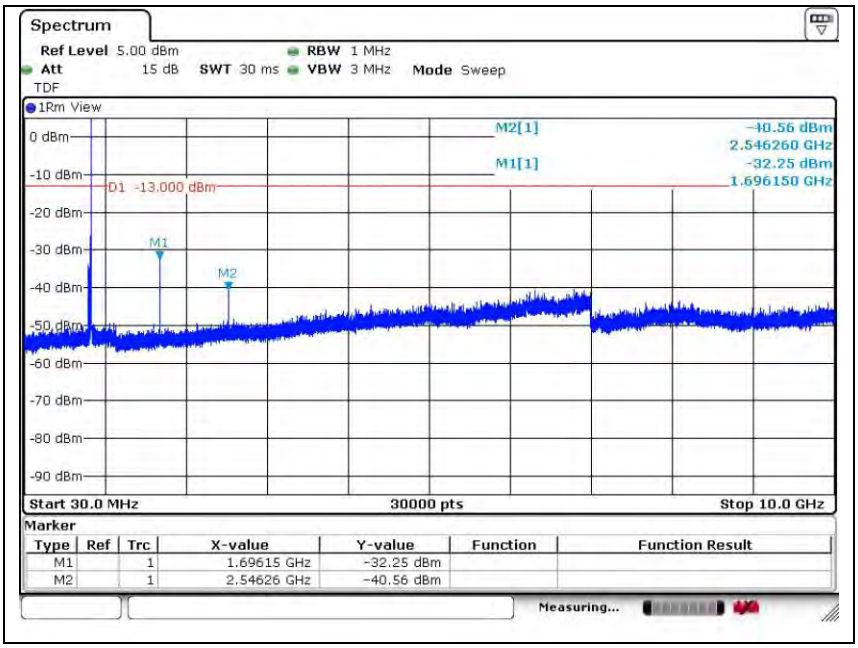
Low Channel



Middle Channel

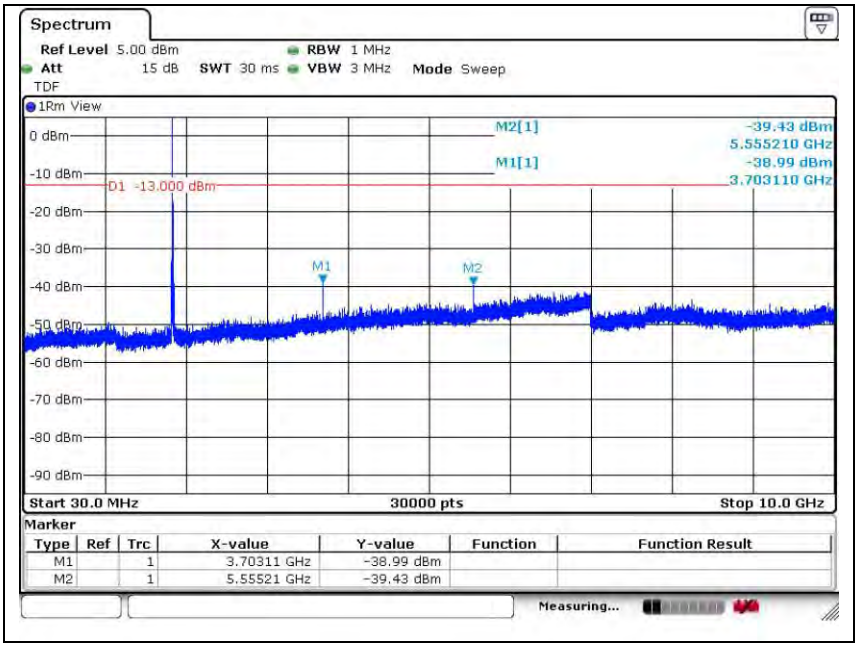


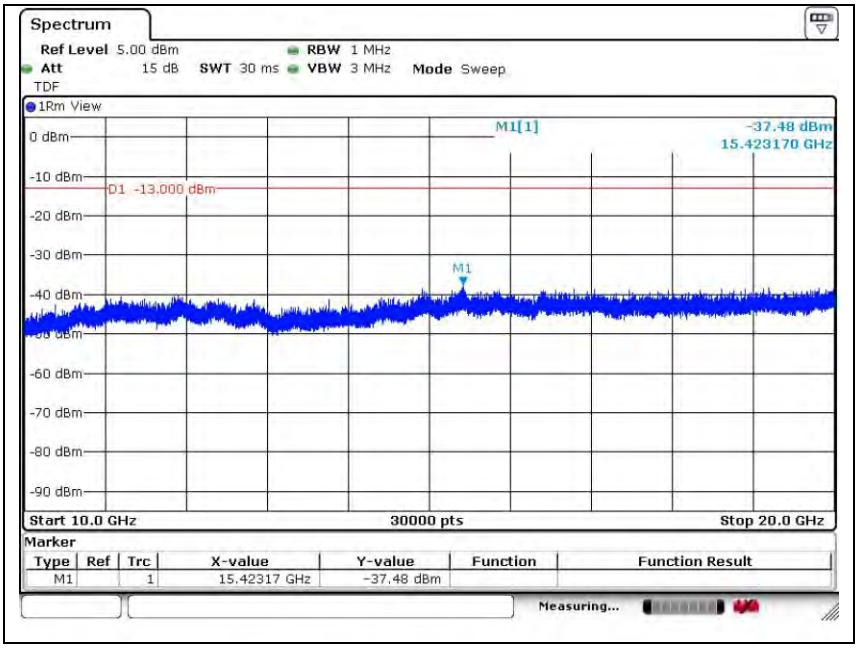
High Channel



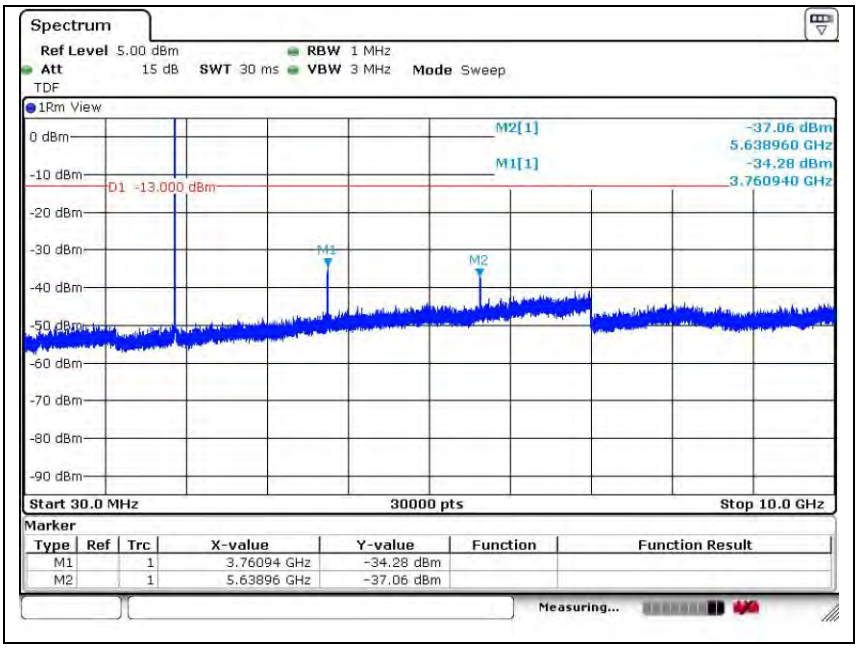
CDMA1 900 1xEV-DO

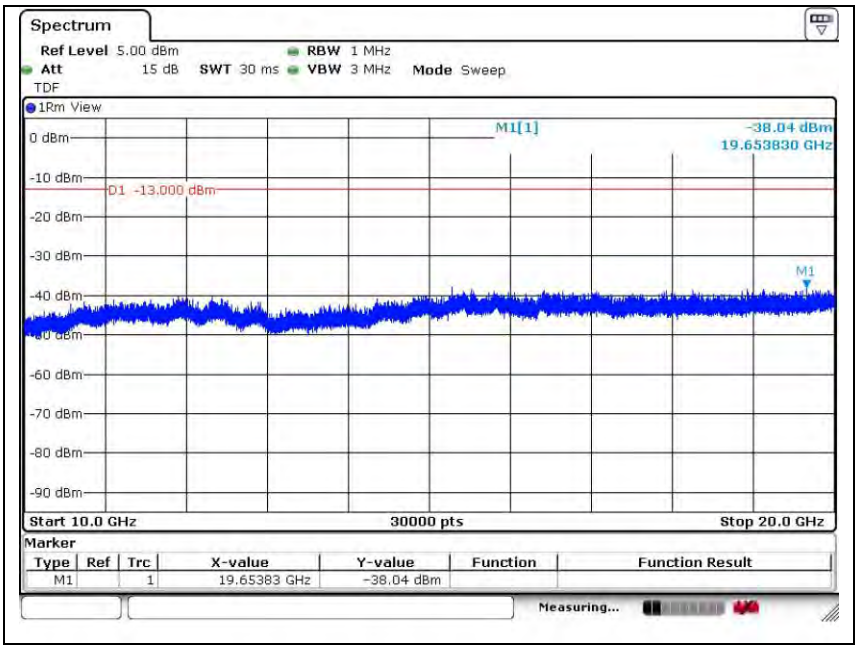
Low Channel



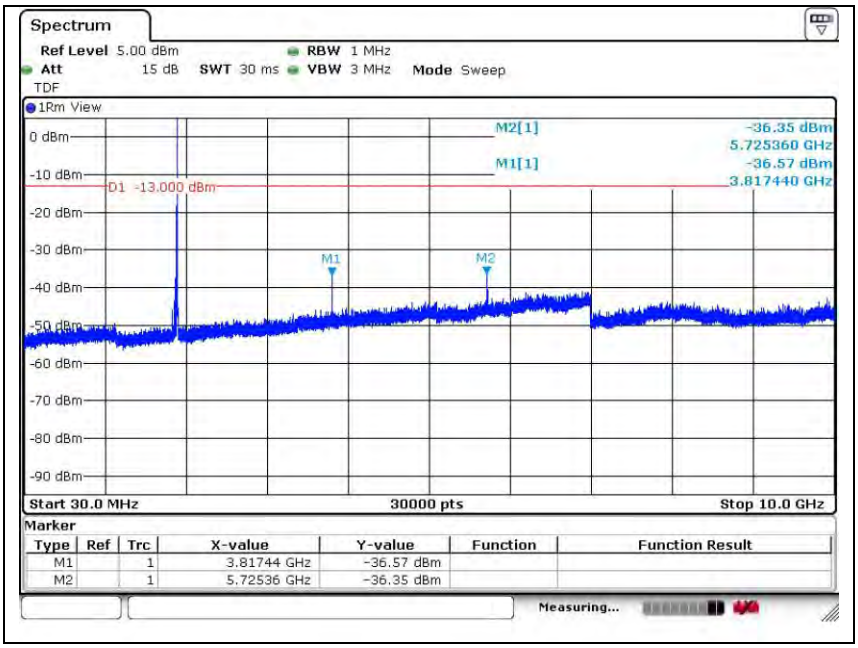


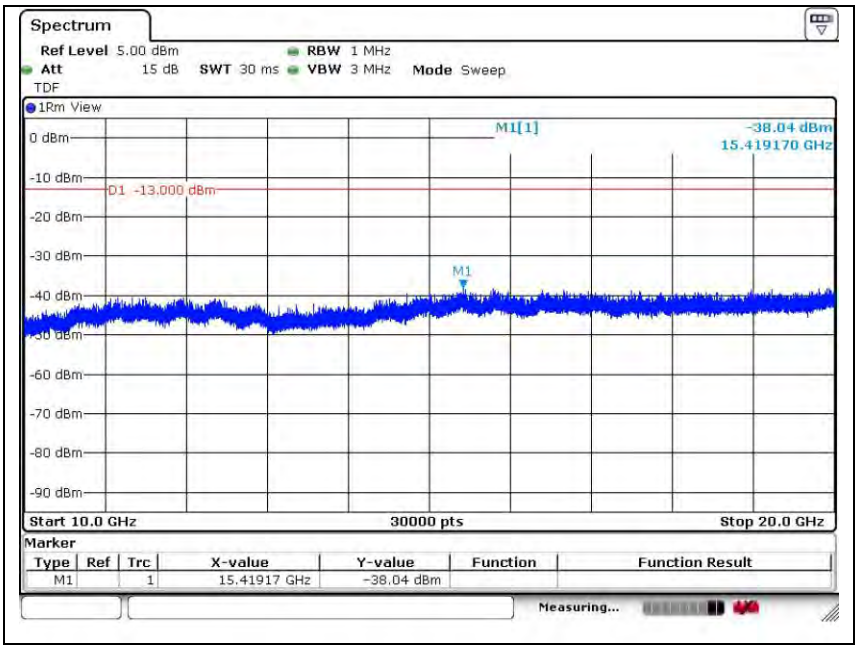
Middle Channel





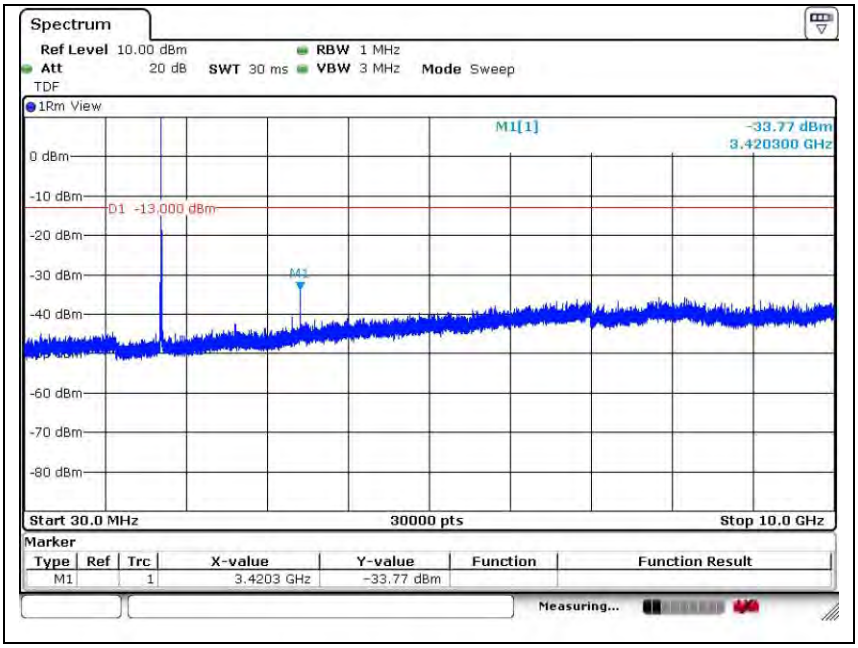
High Channel

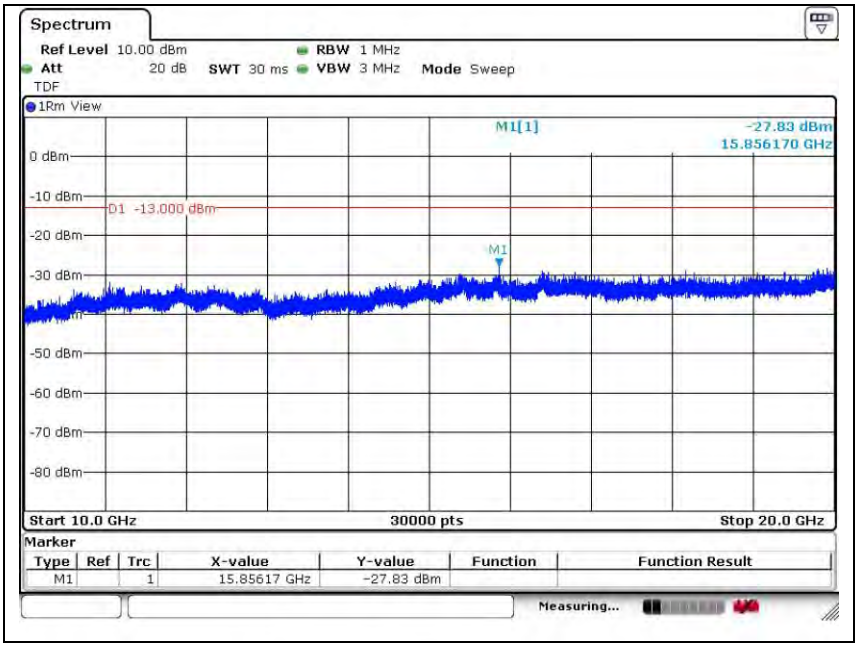




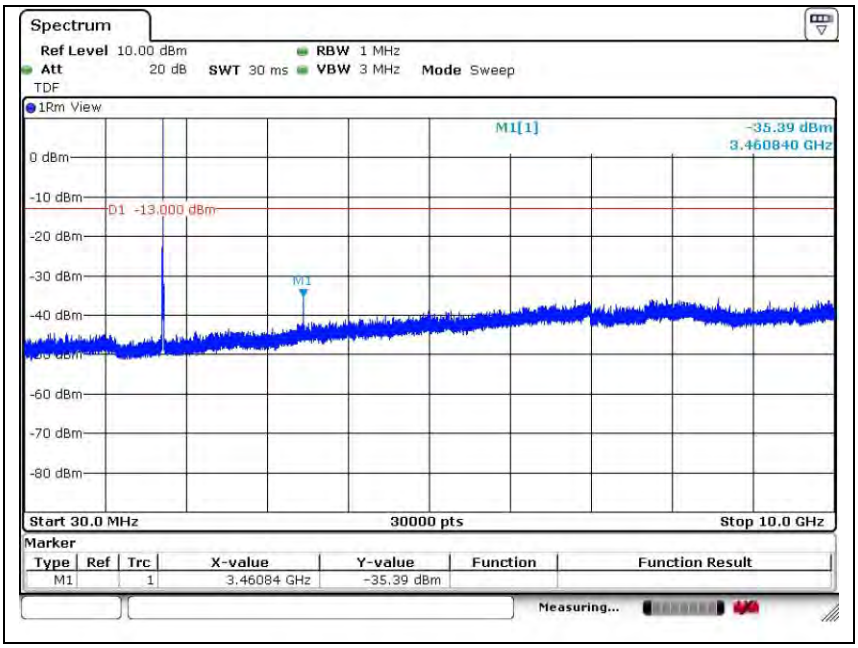
LTE band 4 (5 ㎒ – QPSK_RB 1_Offset 0)

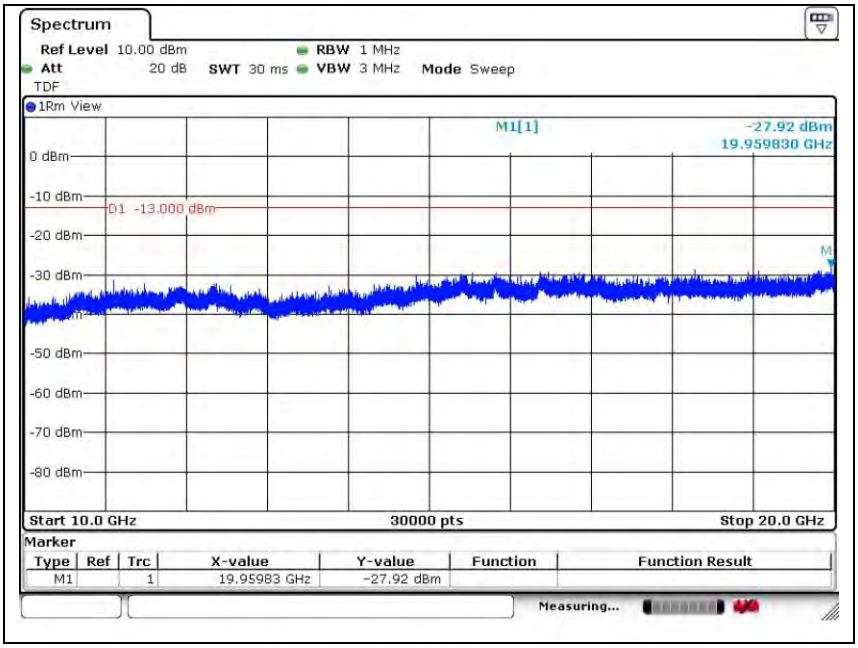
Low Channel



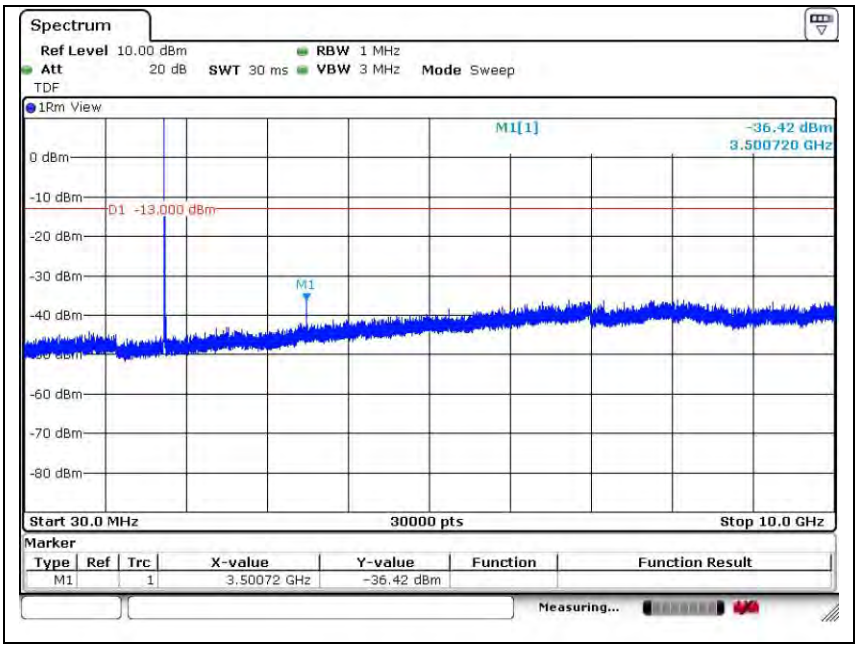


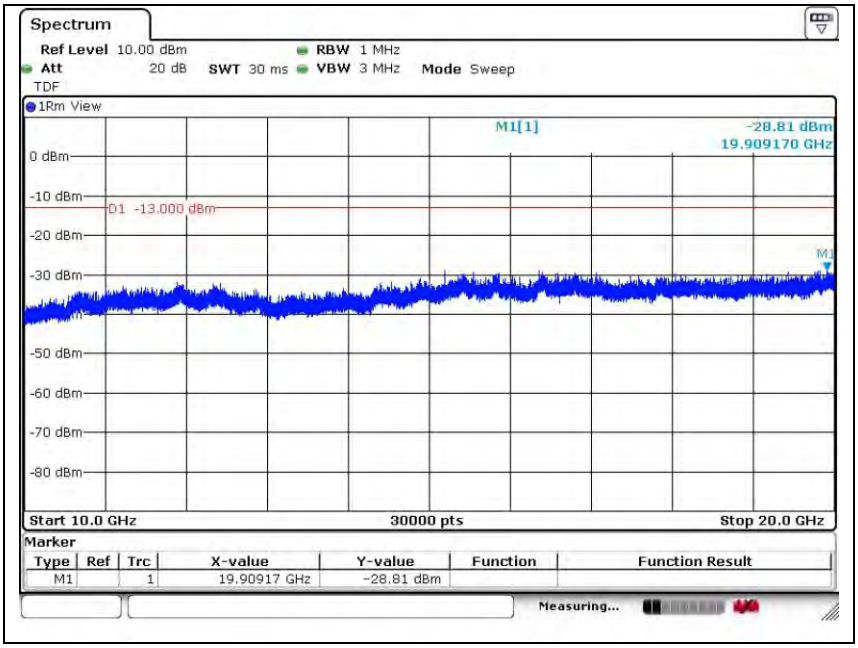
Middle Channel





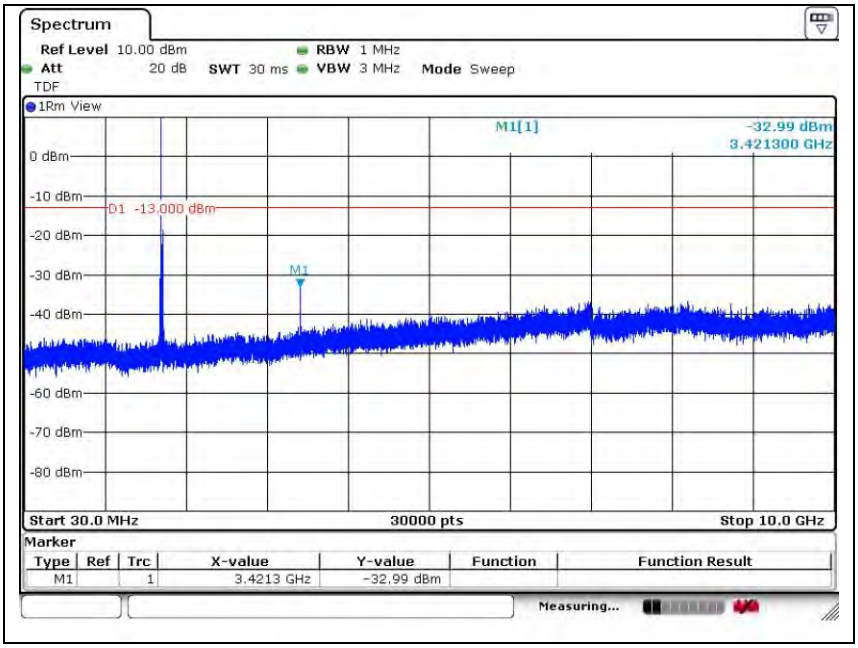
High Channel

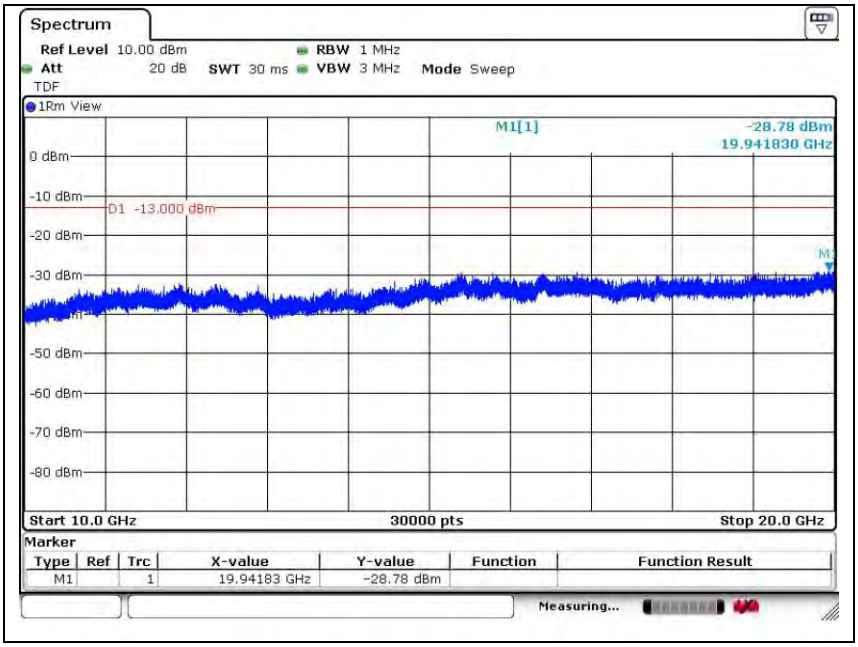




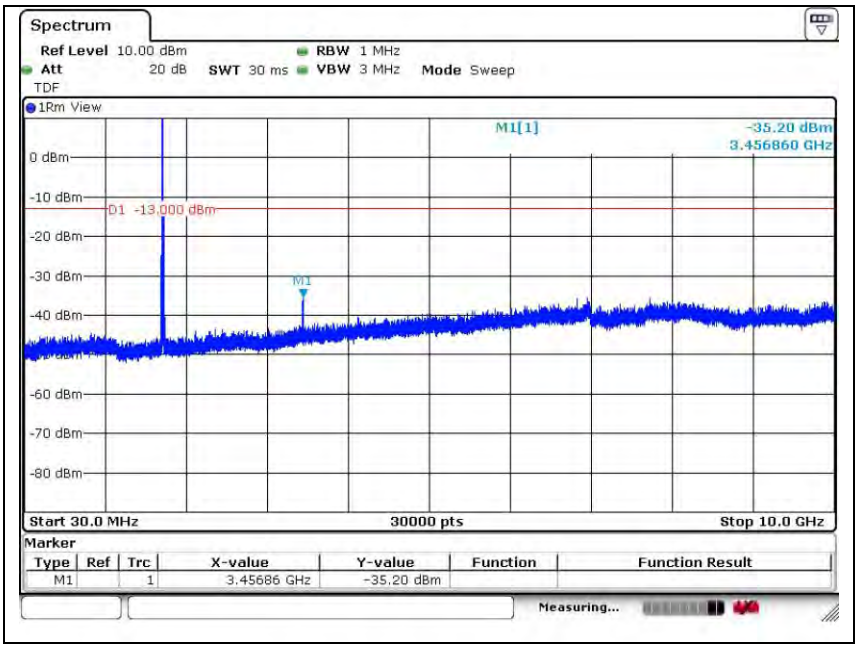
LTE band 4 (10 ㎒ – QPSK_RB 1_Offset 0)

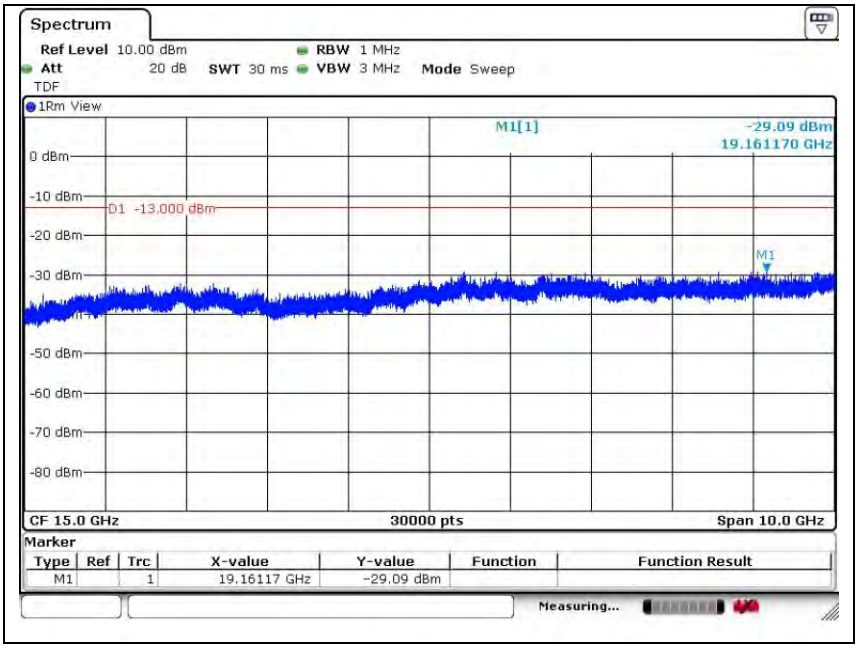
Low Channel



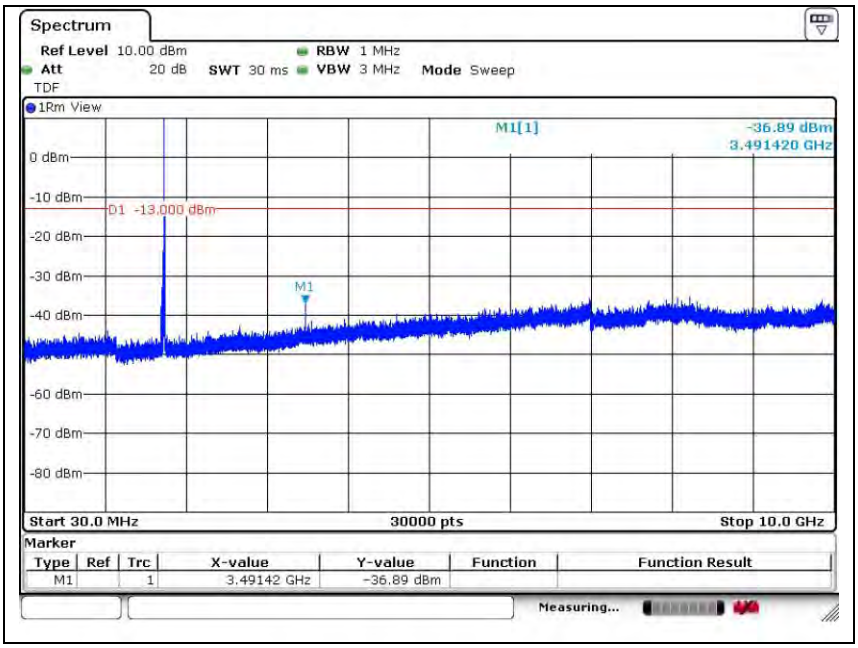


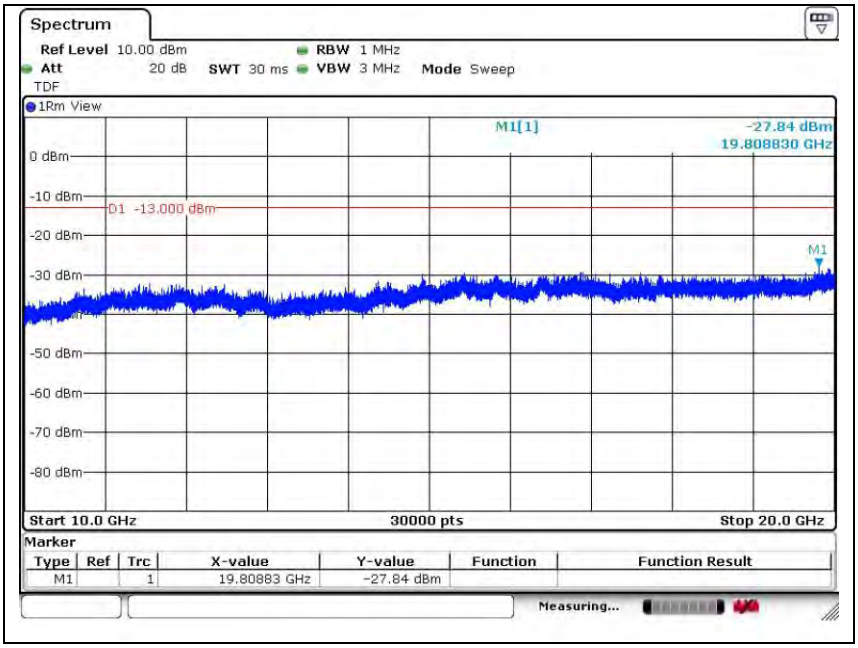
Middle Channel





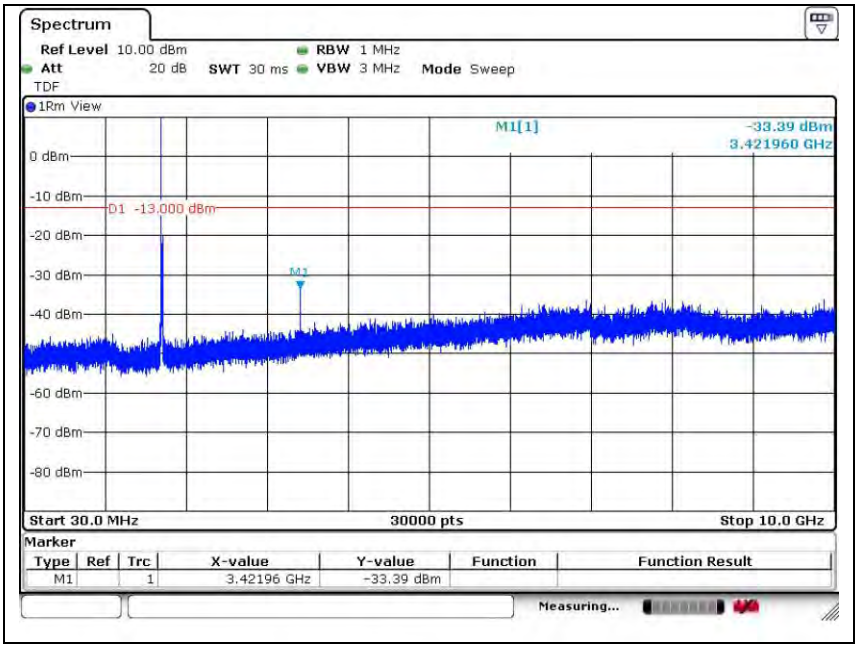
High Channel

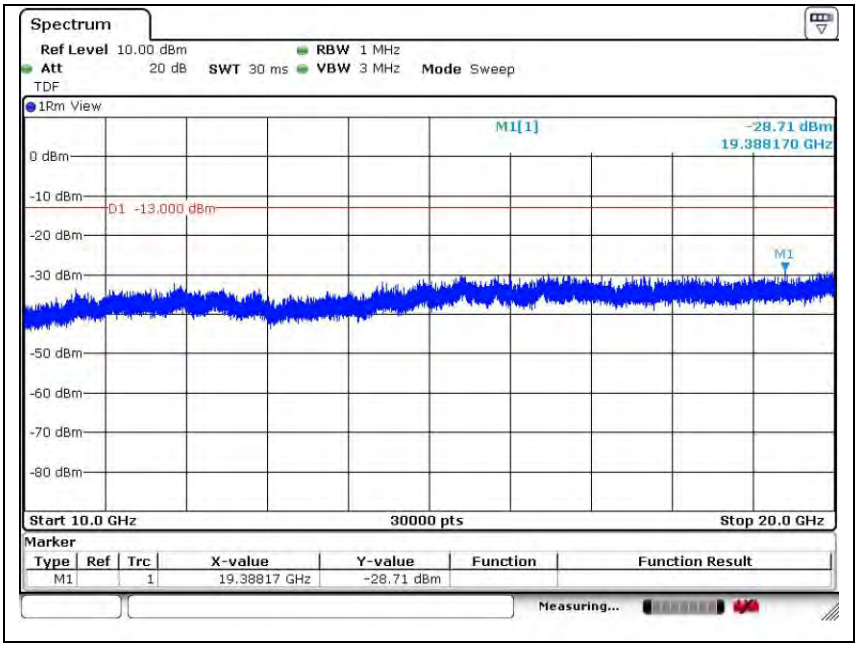




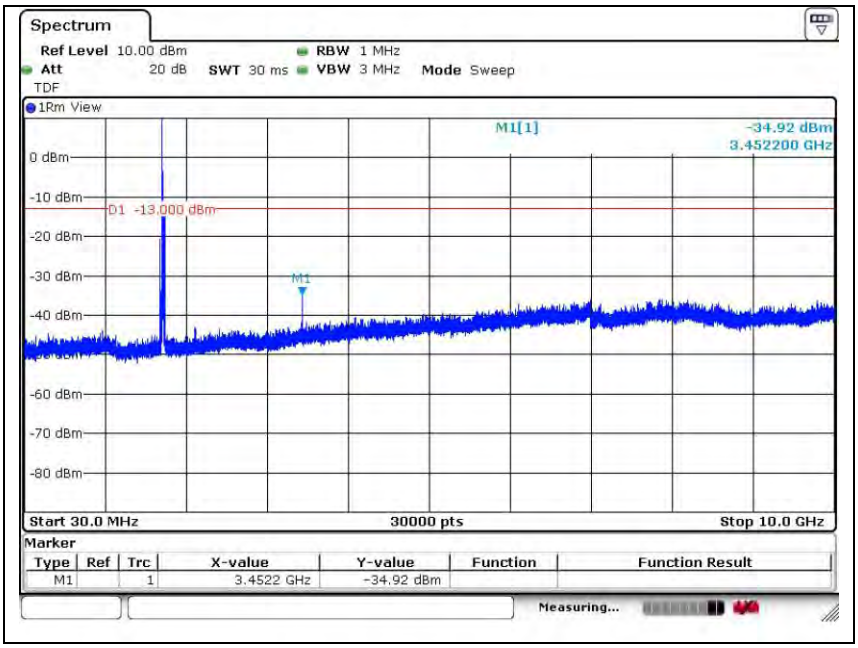
LTE band 4 (15 ㎒ – QPSK_RB 1_Offset 0)

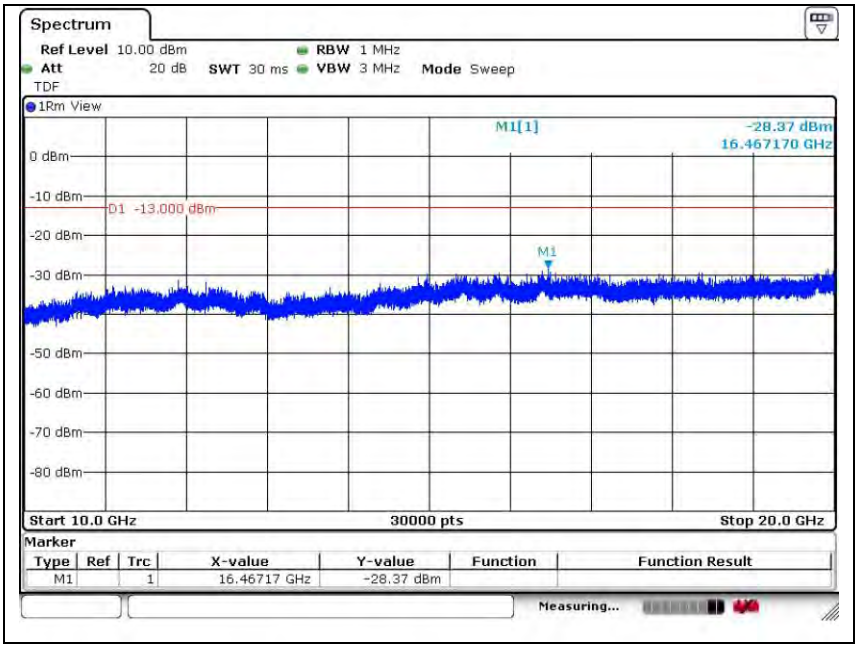
Low Channel



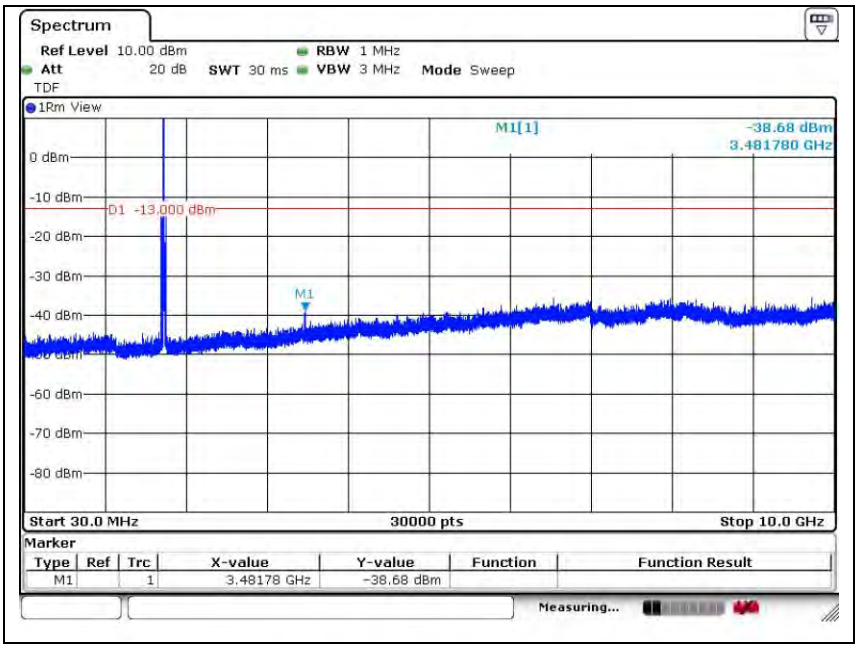


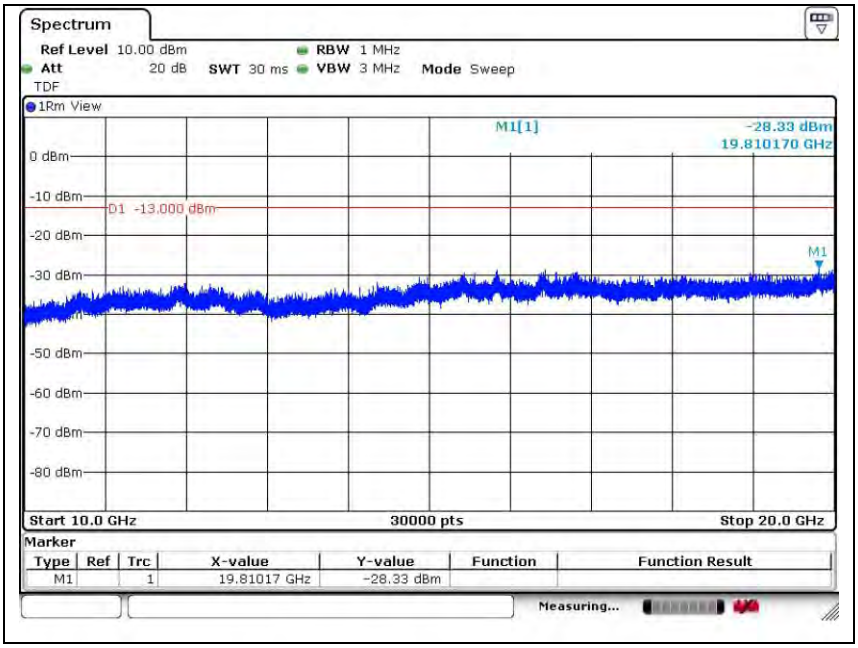
Middle Channel





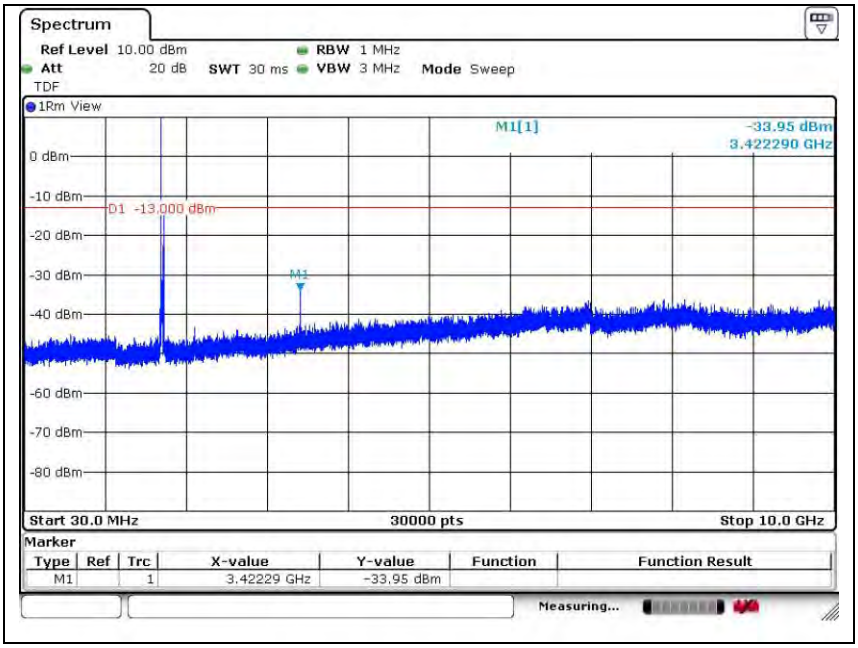
High Channel

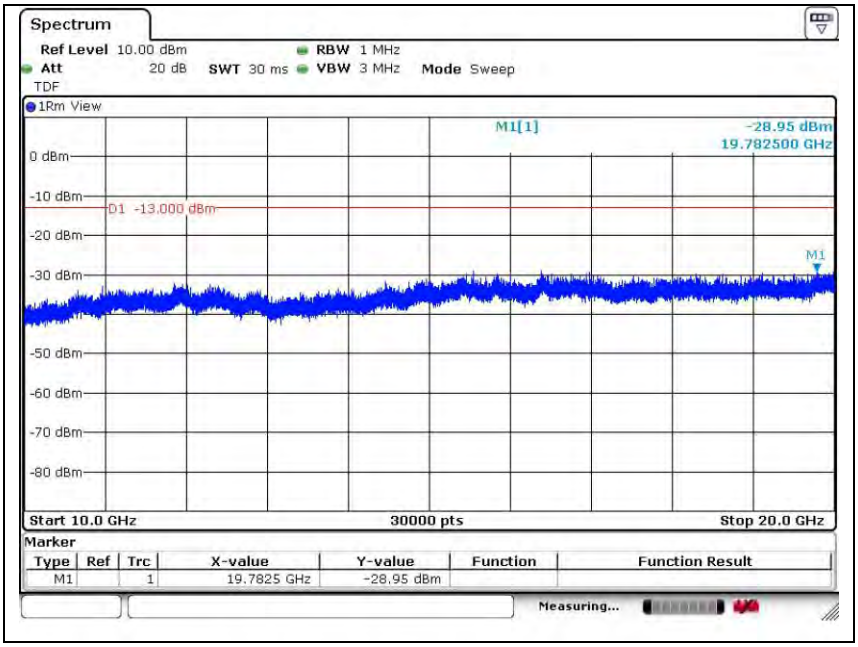




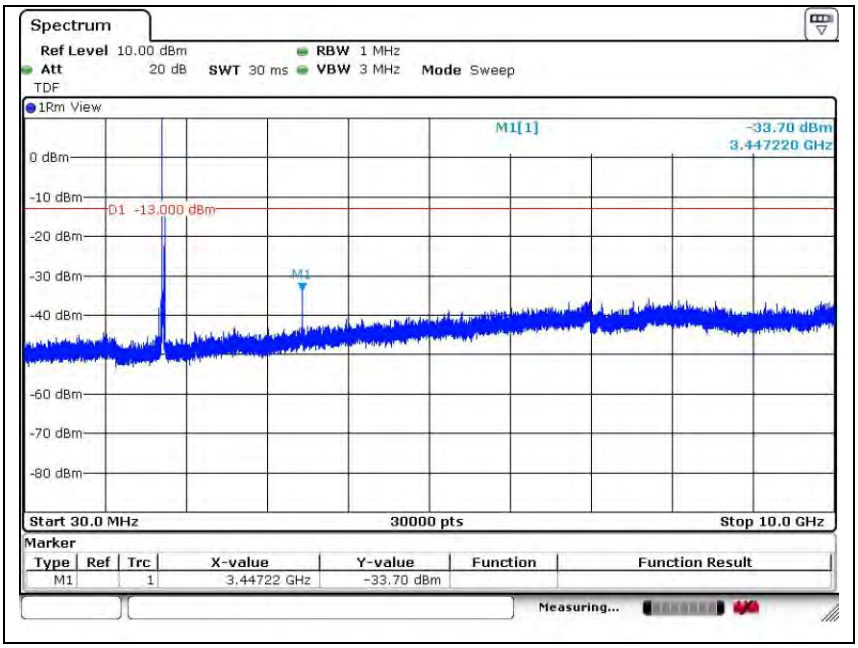
LTE band 4 (20 ㎒ – QPSK_RB 1_Offset 0)

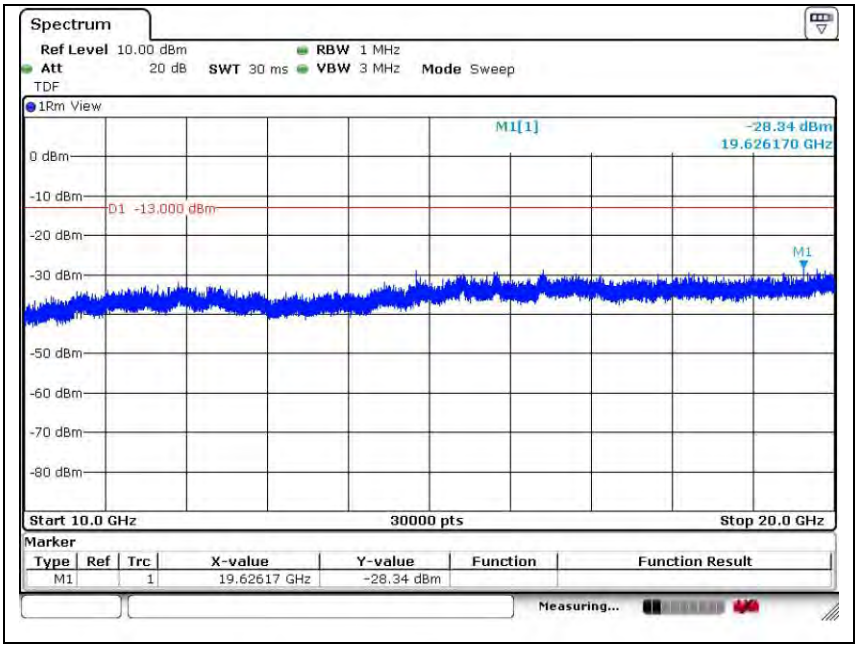
Low Channel



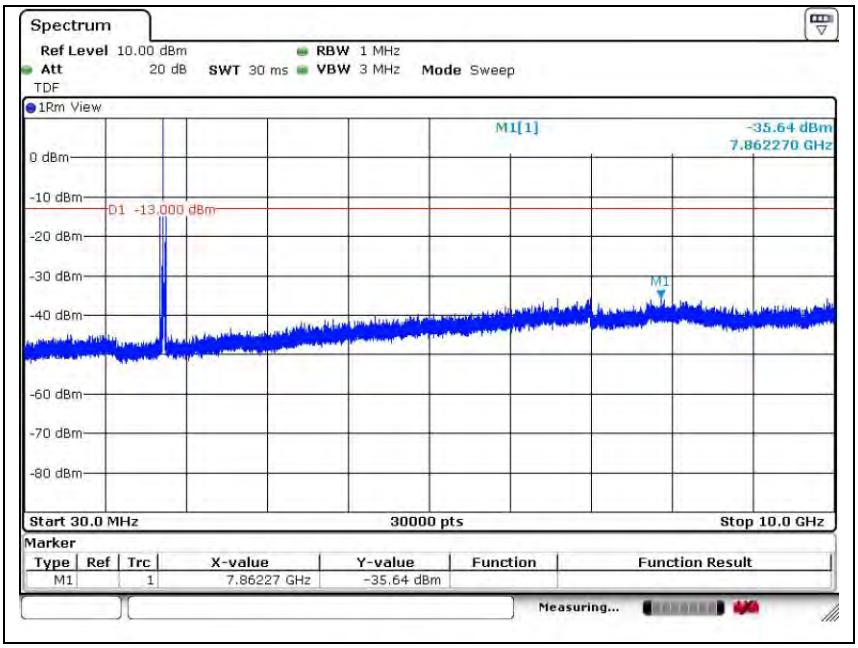


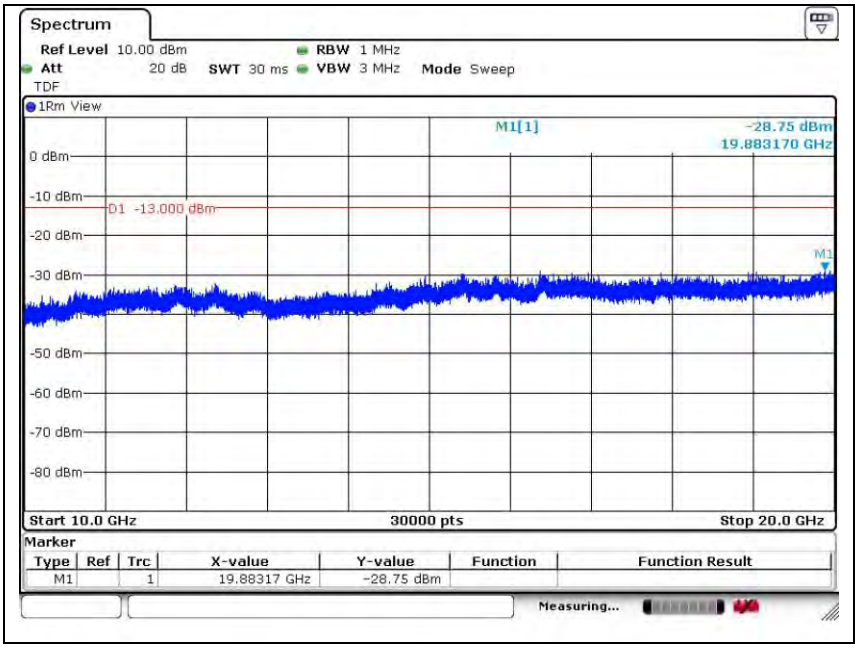
Middle Channel





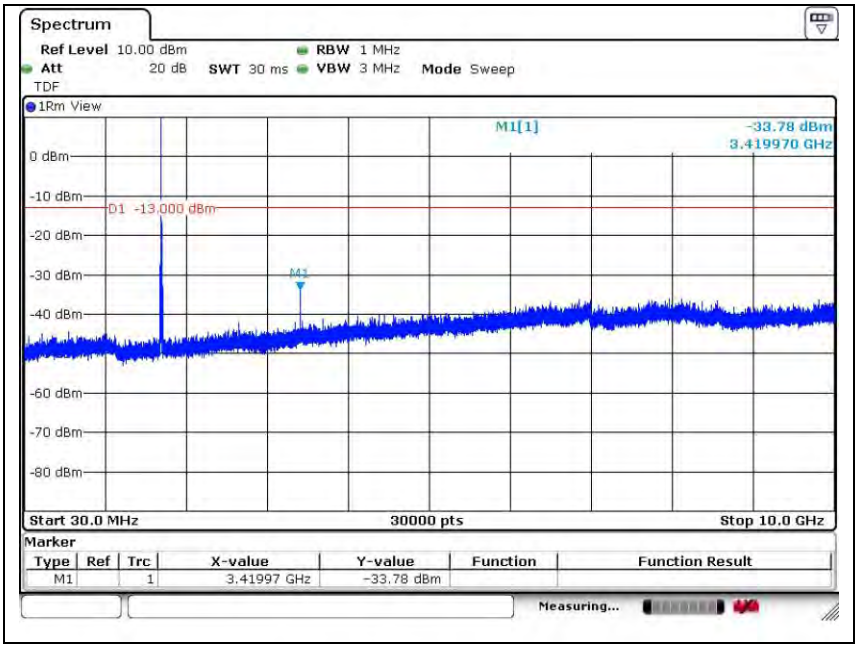
High Channel

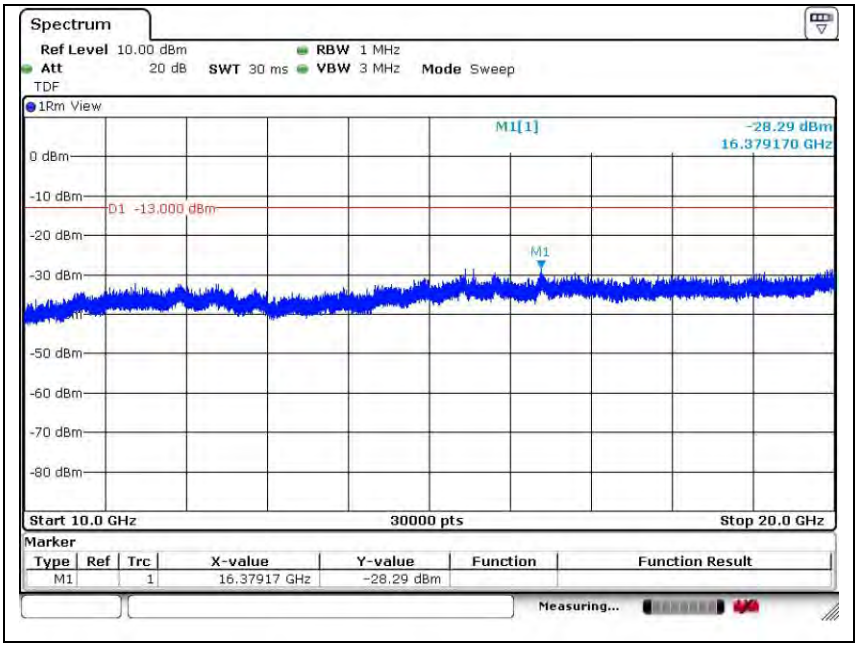




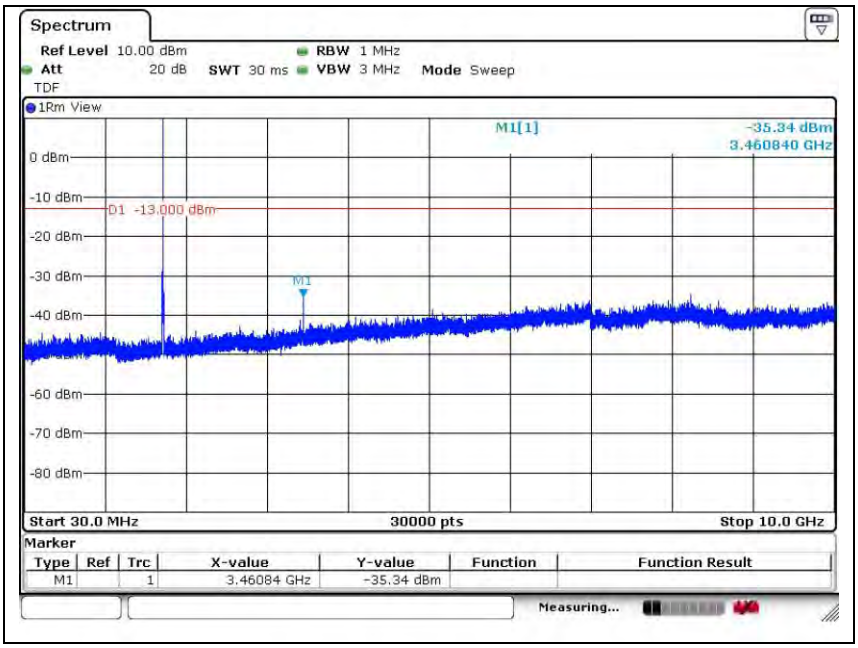
LTE band 4 (5 ㎒ – 16QAM_RB 1_Offset 0)

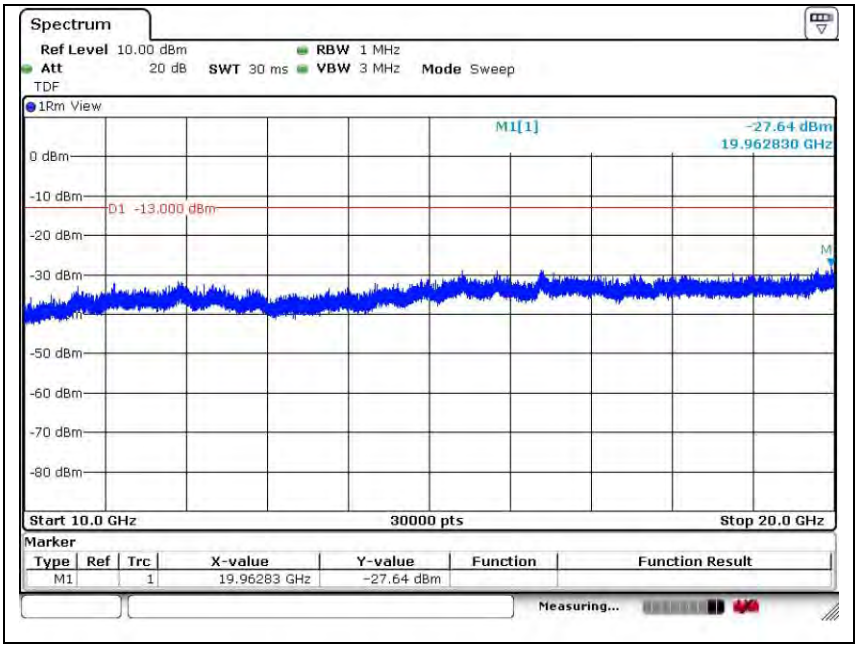
Low Channel



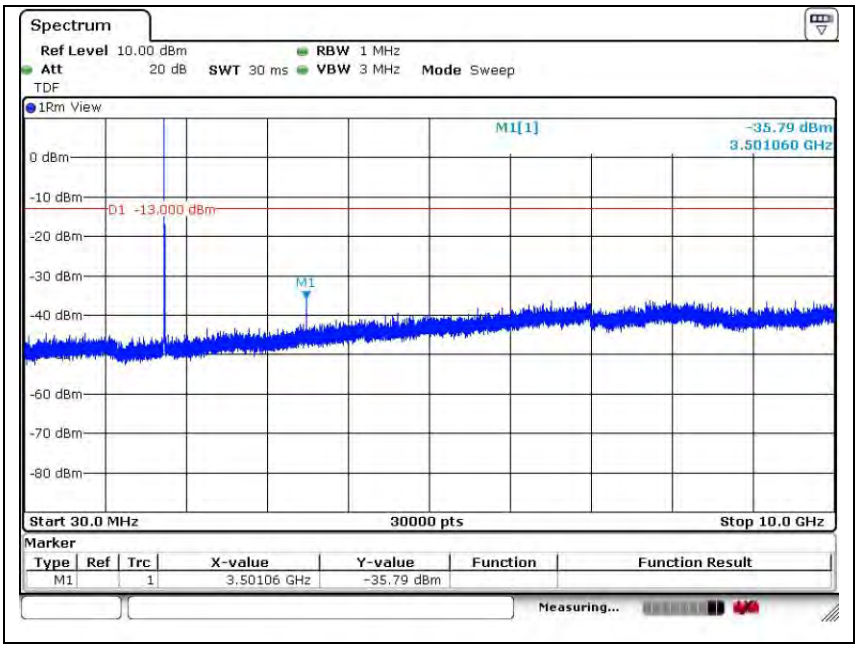


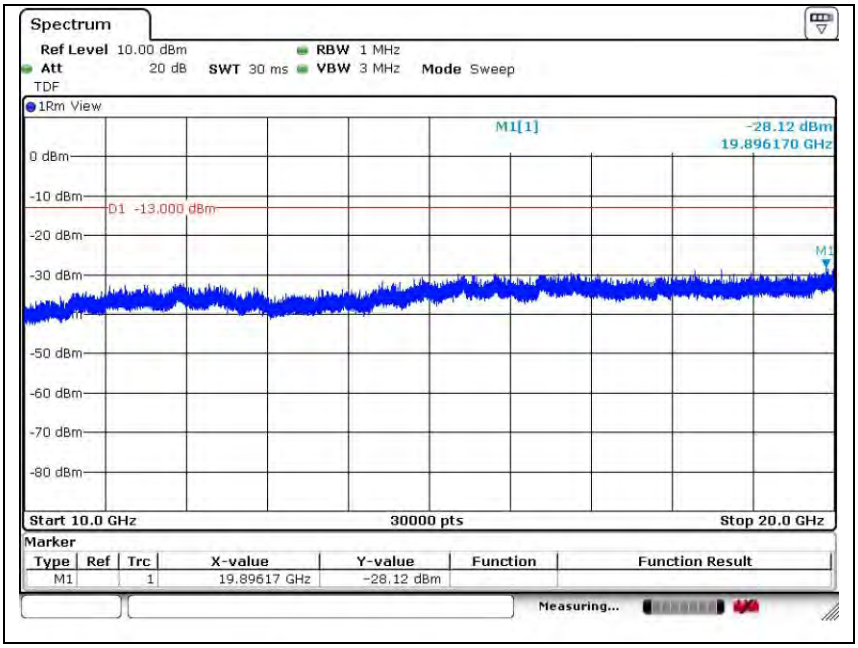
Middle Channel





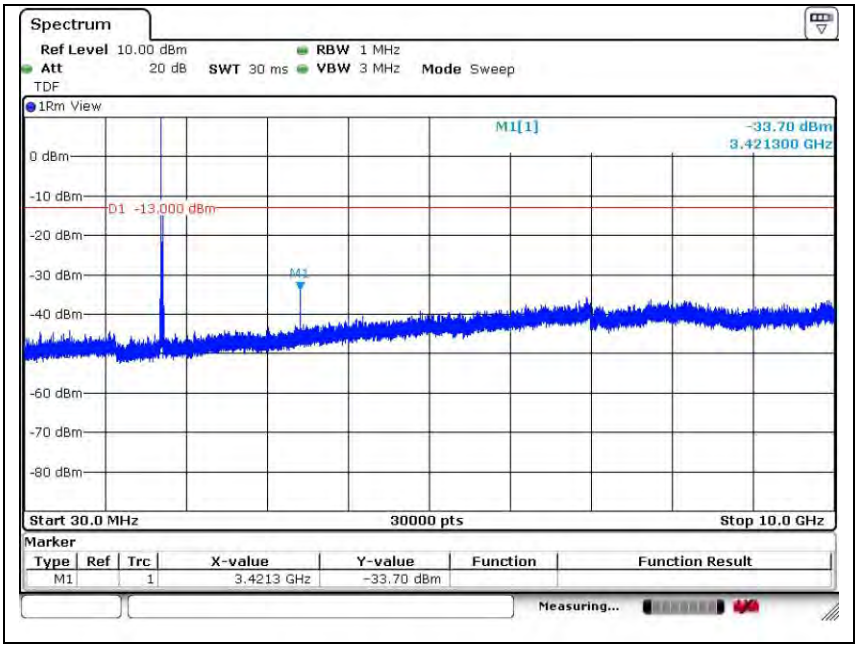
High Channel

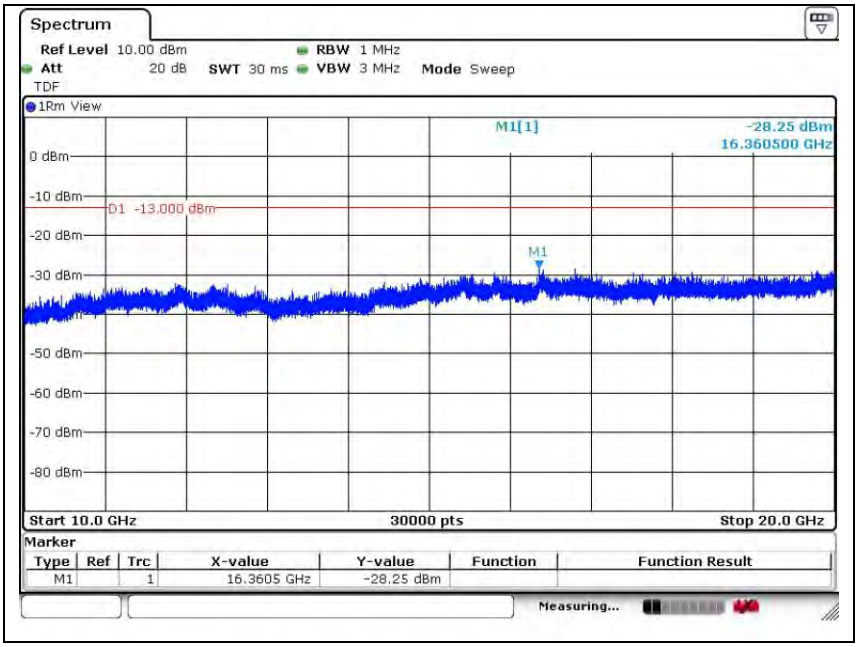




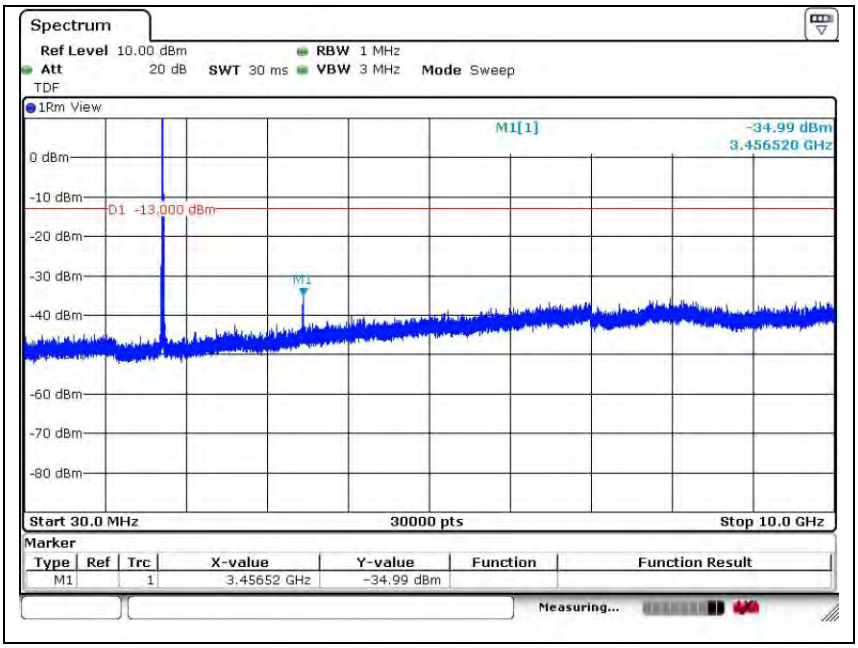
LTE band 4 (10 ㎒ – 16QAM_RB 1_Offset 0)

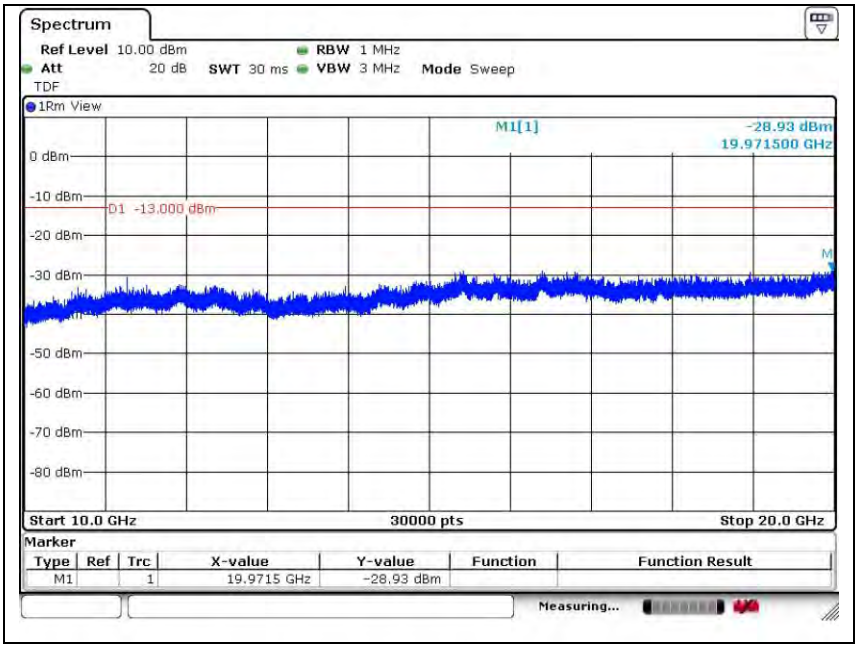
Low Channel



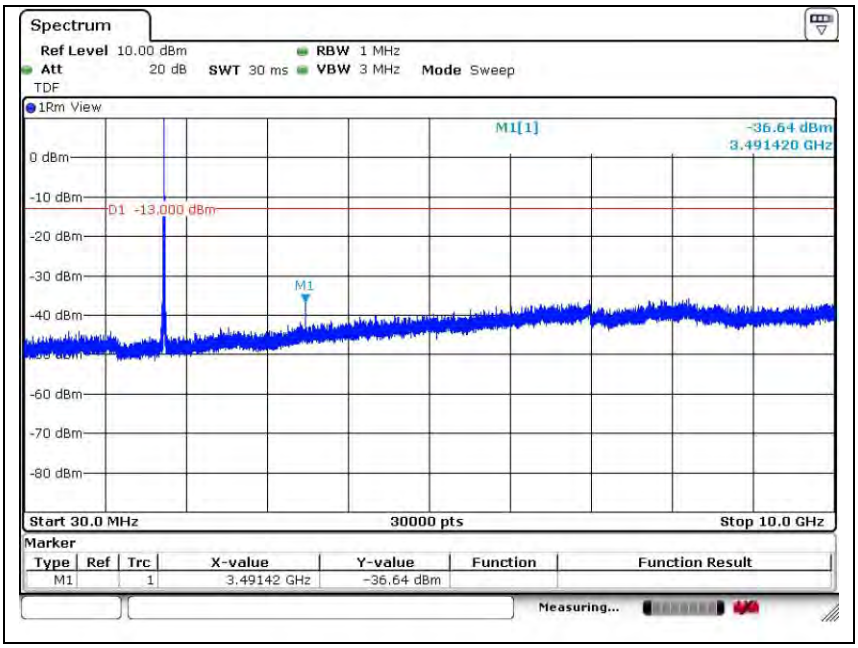


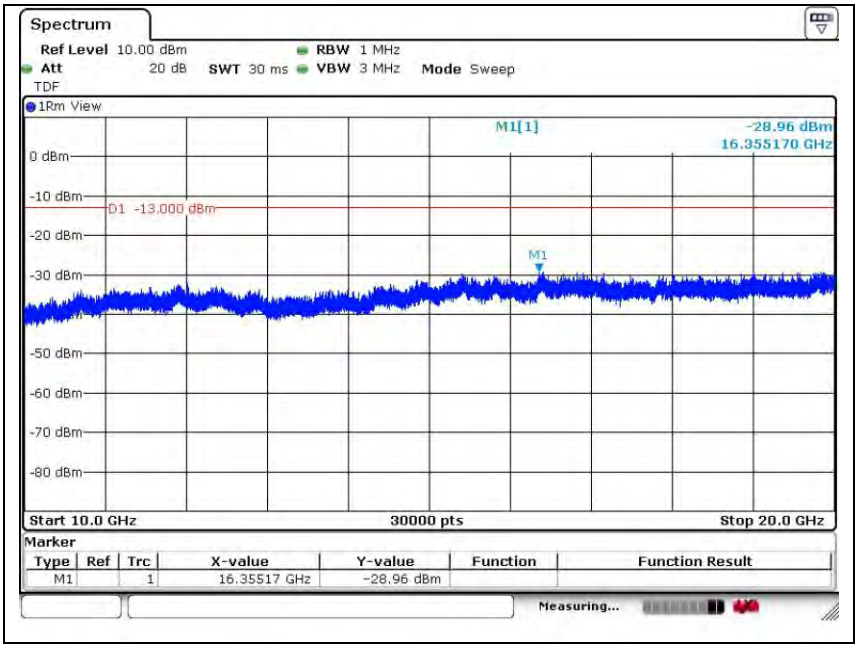
Middle Channel





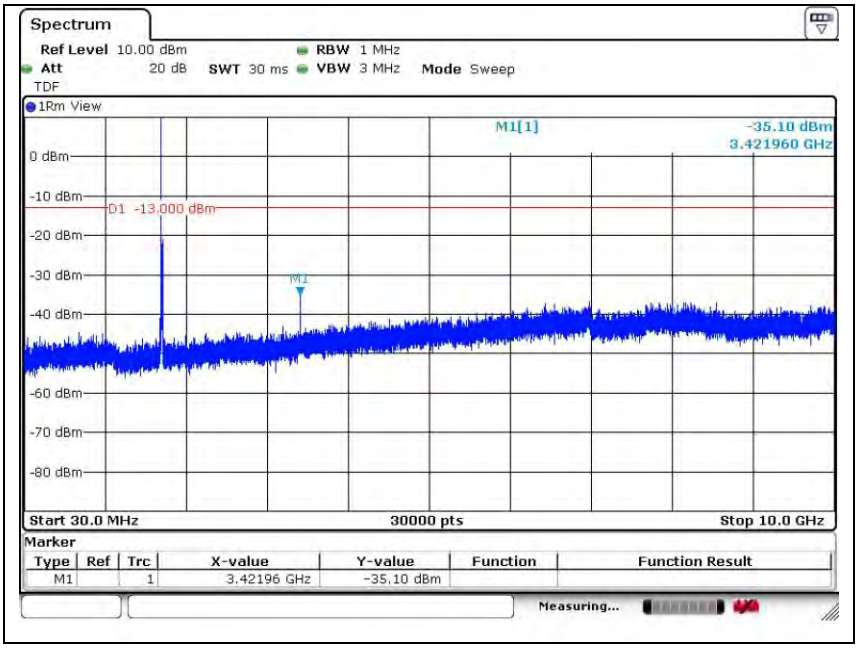
High Channel

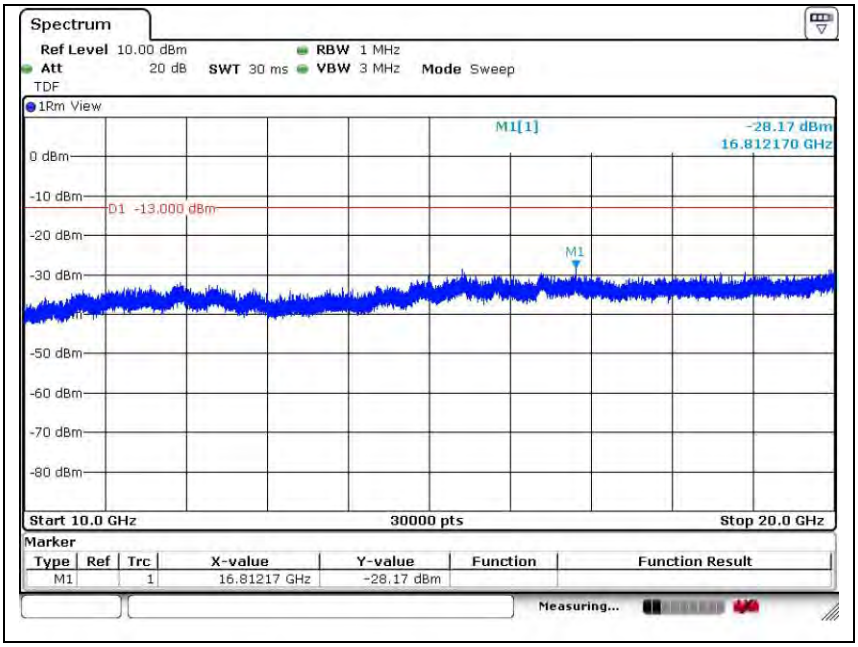




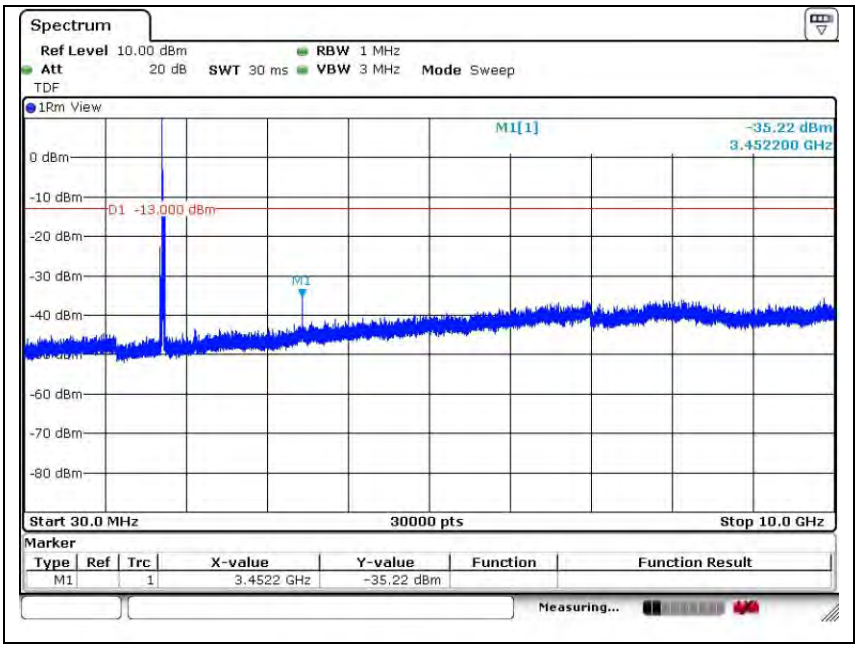
LTE band 4 (15 ㎒ – 16QAM_RB 1_Offset 0)

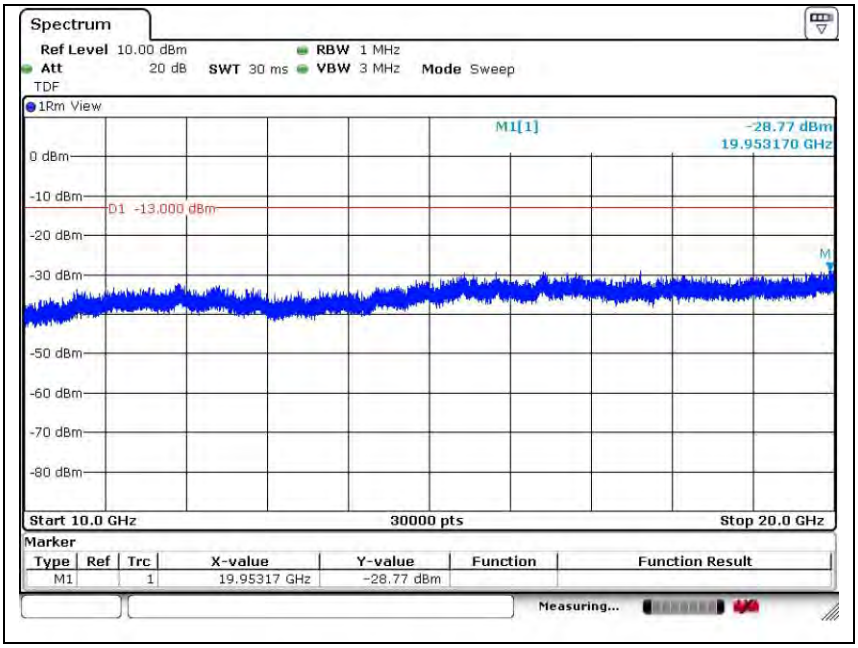
Low Channel



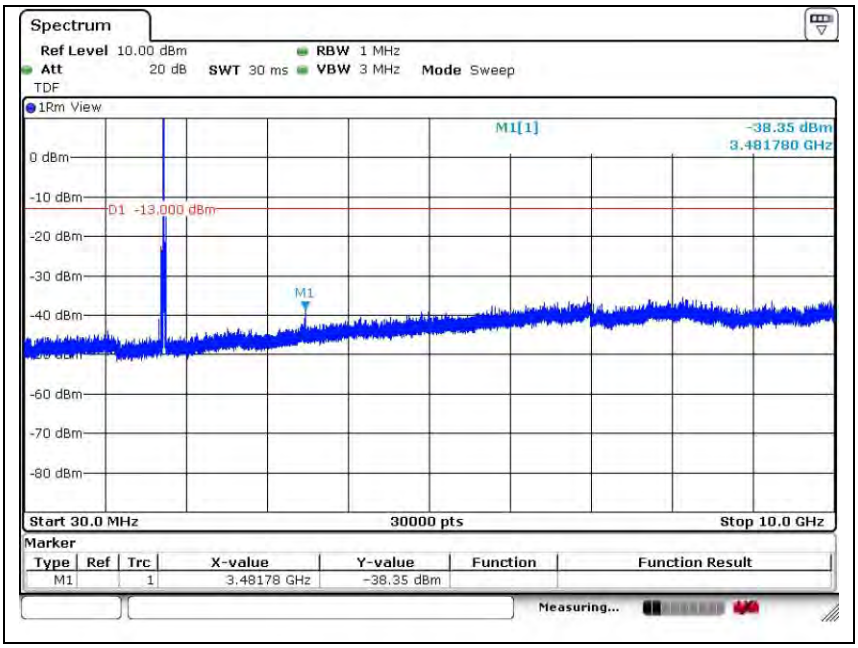


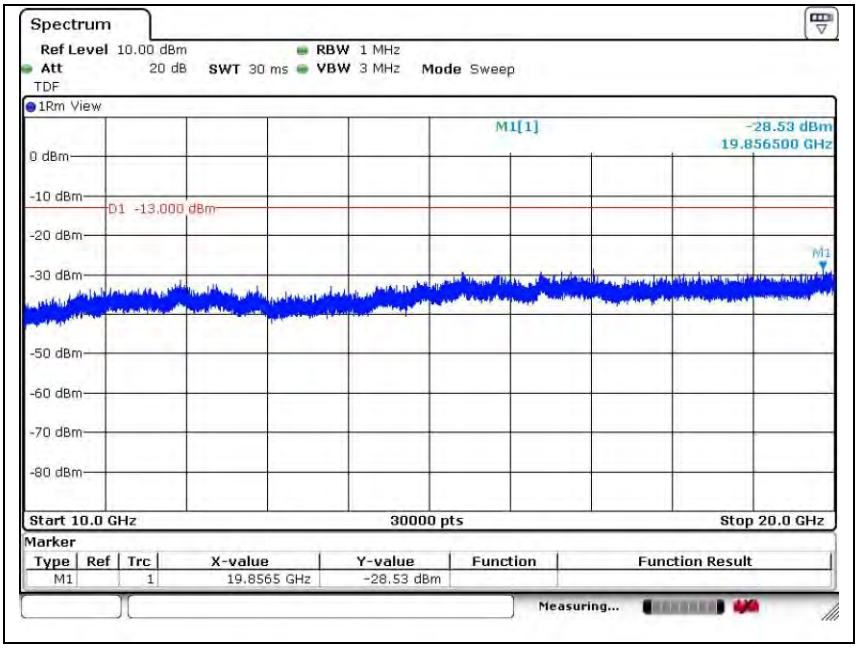
Middle Channel





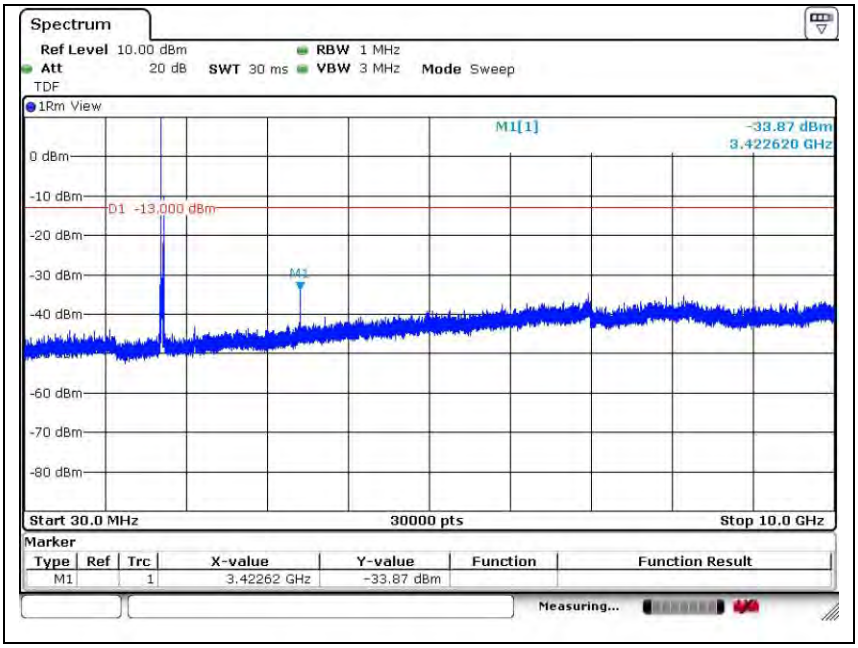
High Channel

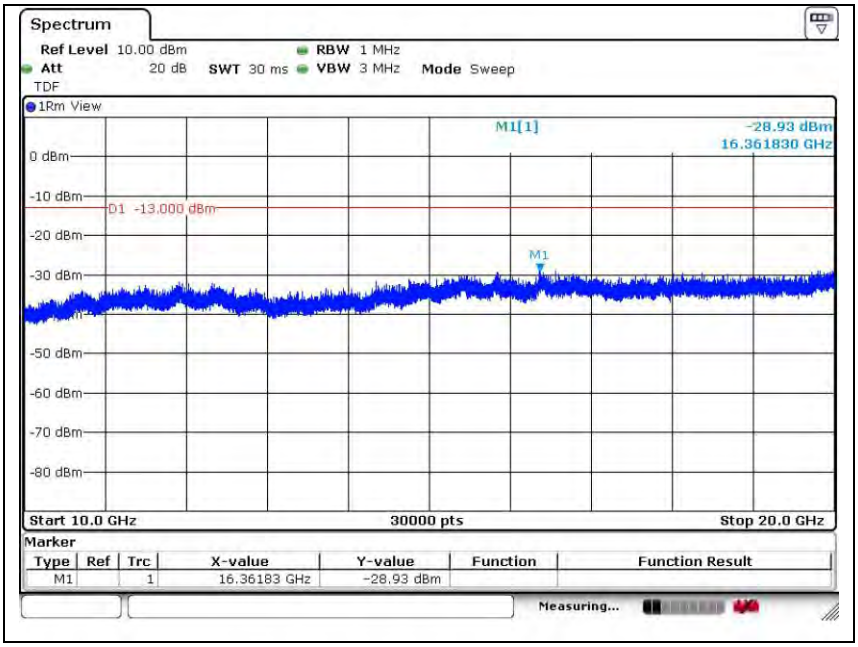




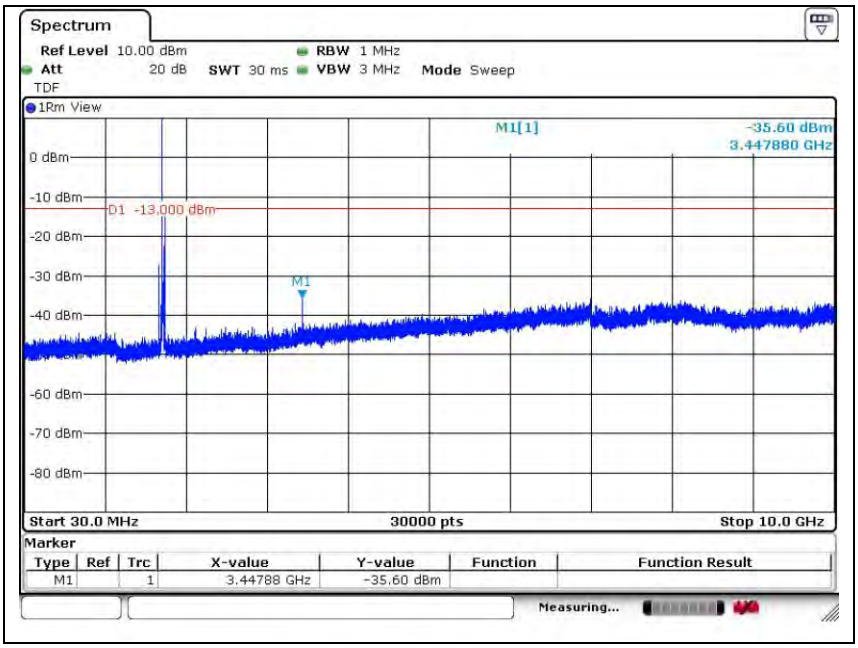
LTE band 4 (20 ㎒ – 16QAM_RB 1_Offset 0)

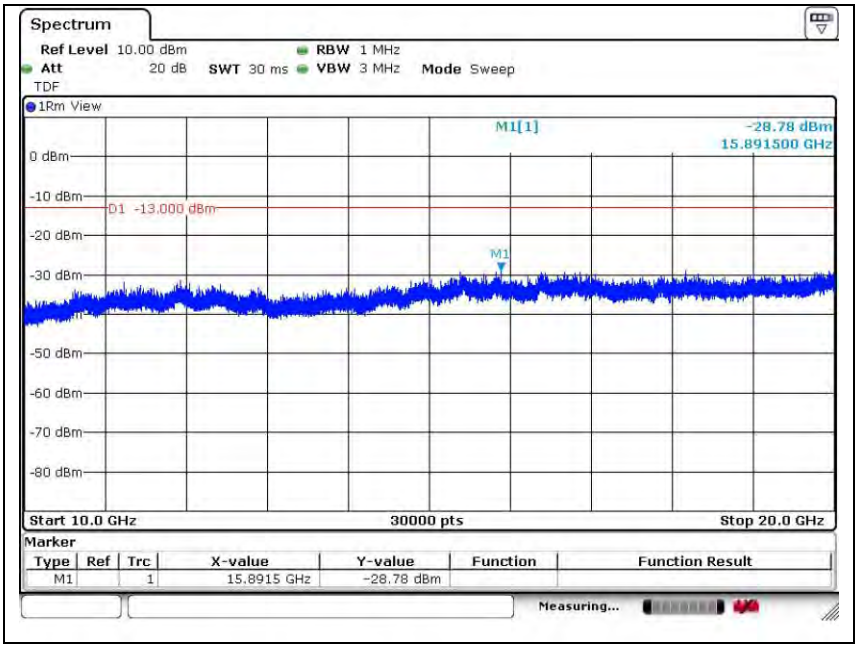
Low Channel



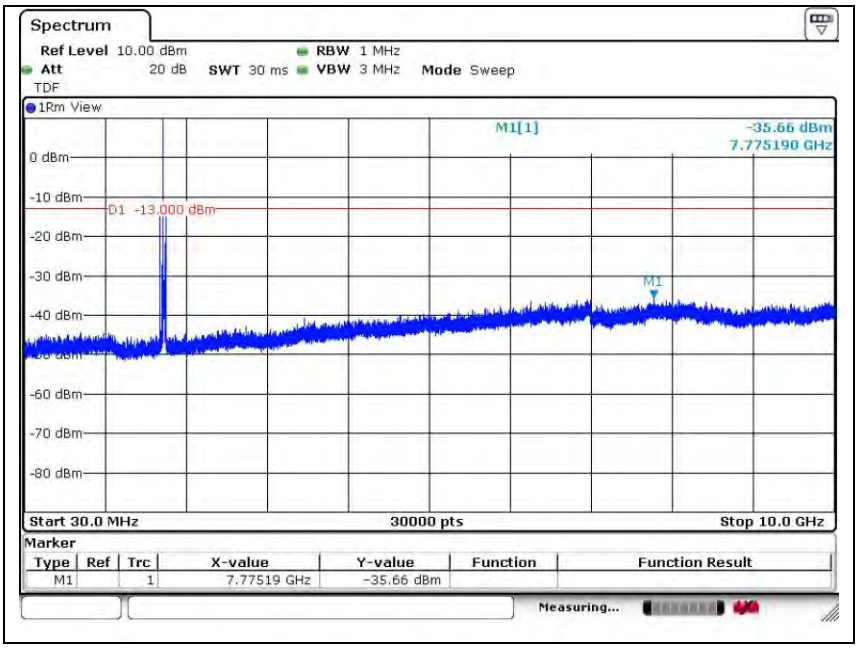


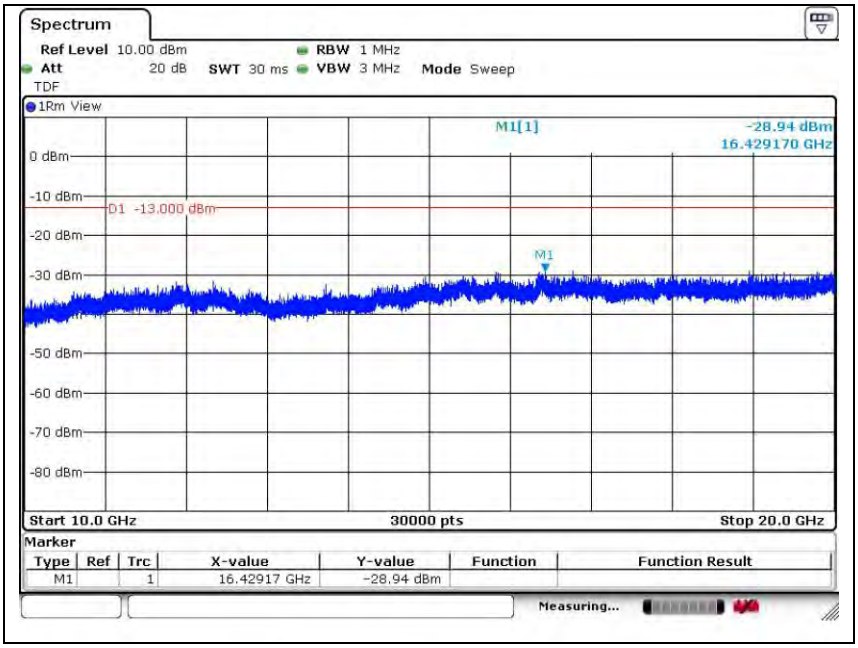
Middle Channel





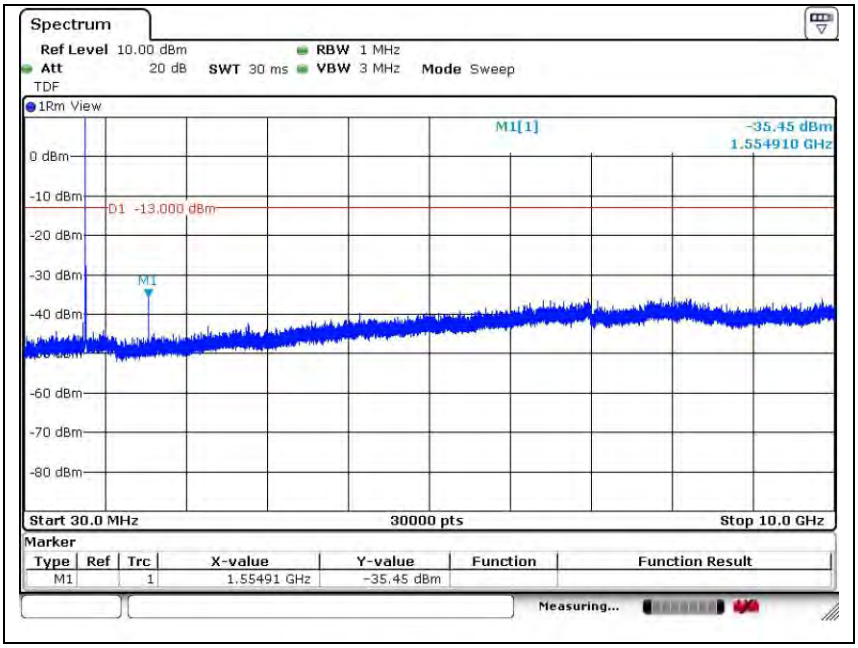
High Channel



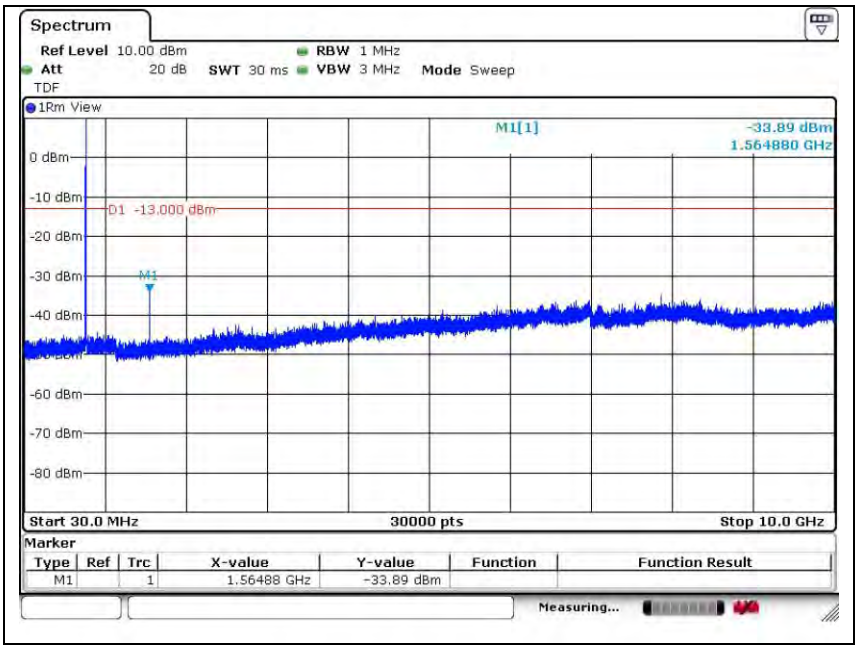


LTE band 13 (5 ㎒ – QPSK_RB 1_Offset 0)

Low Channel

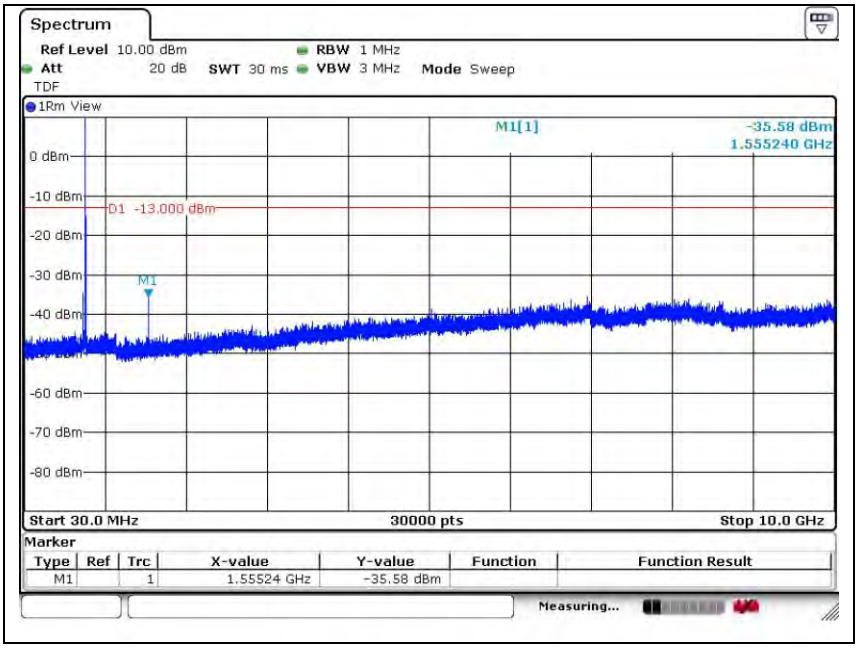


High Channel



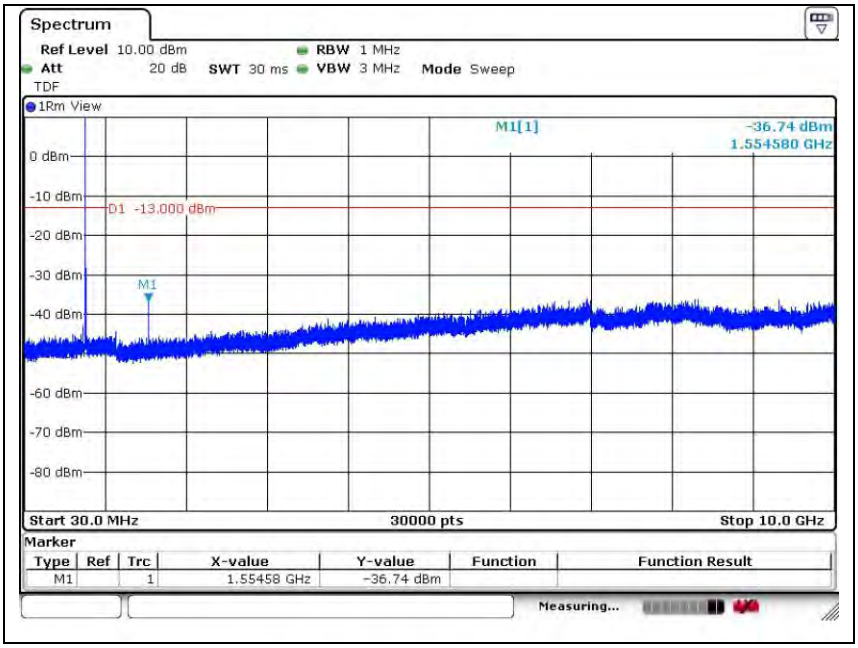
LTE band 13 (10 ㎒ – QPSK_RB 1_Offset 0)

Middle Channel

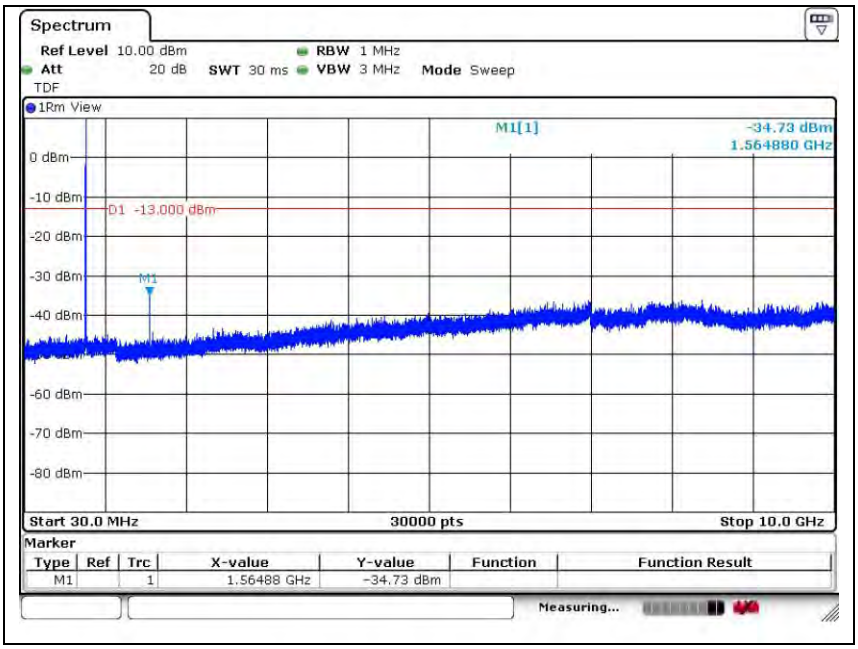


LTE band 13 (5 ㎒ – 16QAM_RB 1_Offset 0)

Low Channel

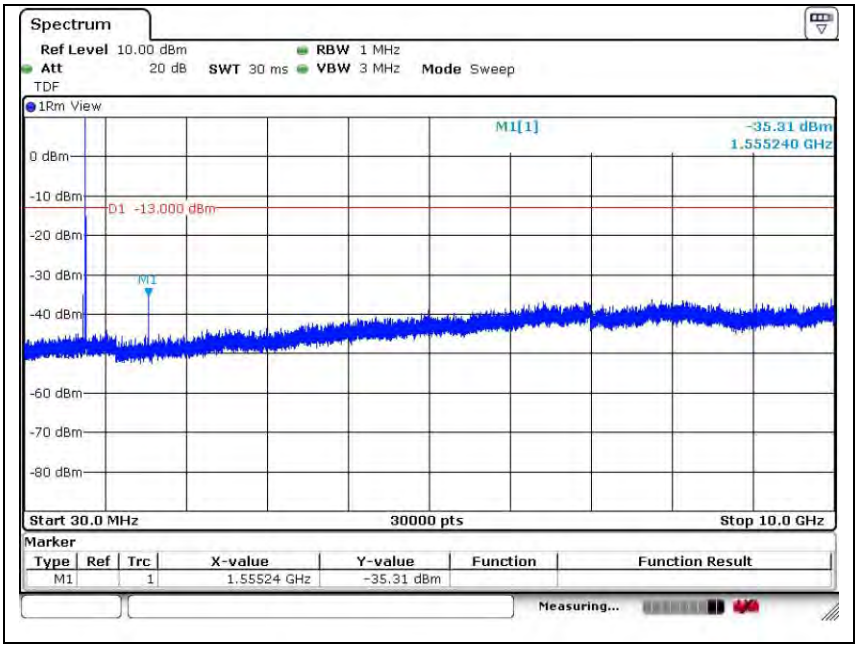


High Channel



LTE band 4 (10 ㎒ – 16QAM_RB 1_Offset 0)

Middle Channel



7. Band Edge

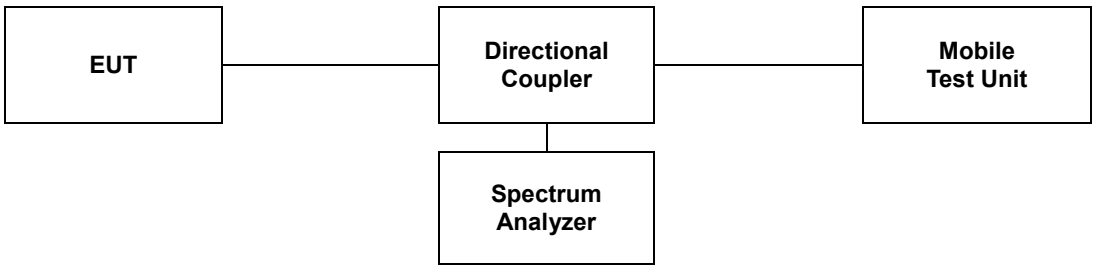
7.1. Limit

FCC §22.917(a), the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10log(P) dB.
FCC §24.238(a), the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.
FCC §27.53(c), For operations in the 746-758 MHz band and the 776-788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:
(2) On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB.
(4) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations.
FCC §27.53(h)(1), Except as otherwise specified below, for operations in the 1 695-1 710 MHz, 1 710-1 755 MHz, 1 755-1 780 MHz, 1 915-1 920 MHz, 1 995-2 000 MHz, 2 000-2 020 MHz, 2 110-2 155 MHz, 2 155-2 180 MHz, and 2 180-2 200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least 43 + 10 $\log_{10}$ (P) dB.

7.2. Test Procedure

The test follows section 6.0 of FCC KDB publication 971168 v02r02.

1. Start and stop frequency were set such that the band edge would be placed in the center of the plot.
2. Span was set large enough so as to capture all out of band emissions near the band edge.
3. RBW ≥ 1 % of OBW.
4. VBW ≥ RBW.
5. Detector = RMS.
6. Trace mode = max hold.
7. Sweep time = auto couple.
8. The trace was allowed to stabilize.
9. All path loss of frequency range was investigated and compensated to spectrum analyzer as TDF function.



7.3. Test Results

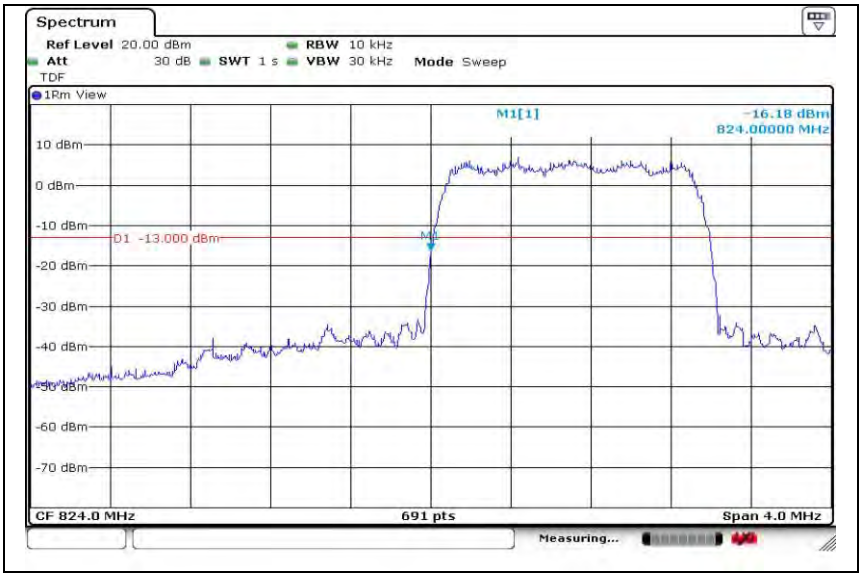
Ambient temperature	:	(24 ± 1) ℃
Relative humidity	:	47 % R.H.

Please refer to the following plots.

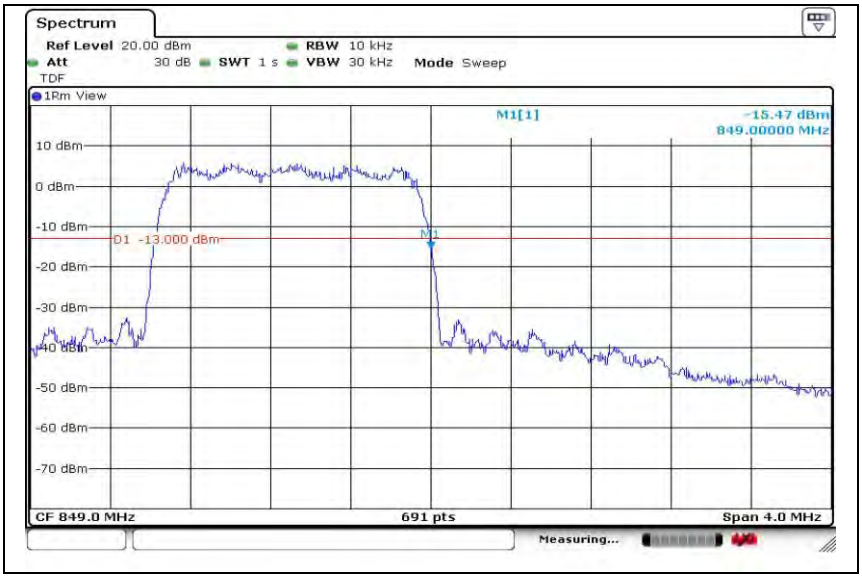
Band edge

CDMA850 1xRTT

Low Channel

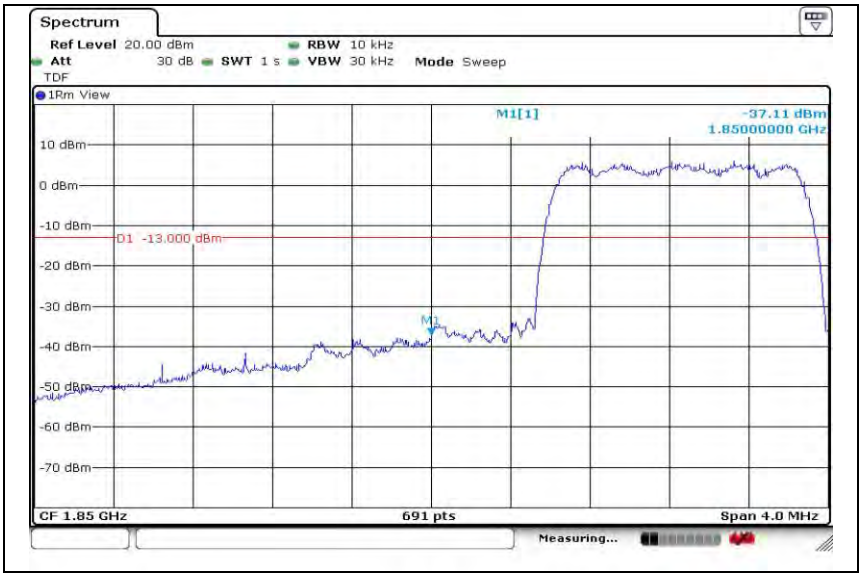


High Channel

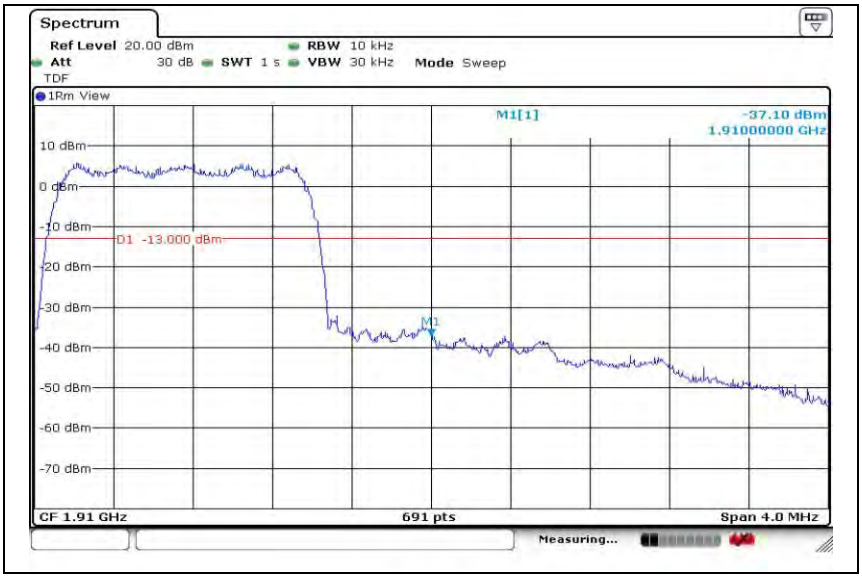


CDMA1 900 1xRTT

Low Channel



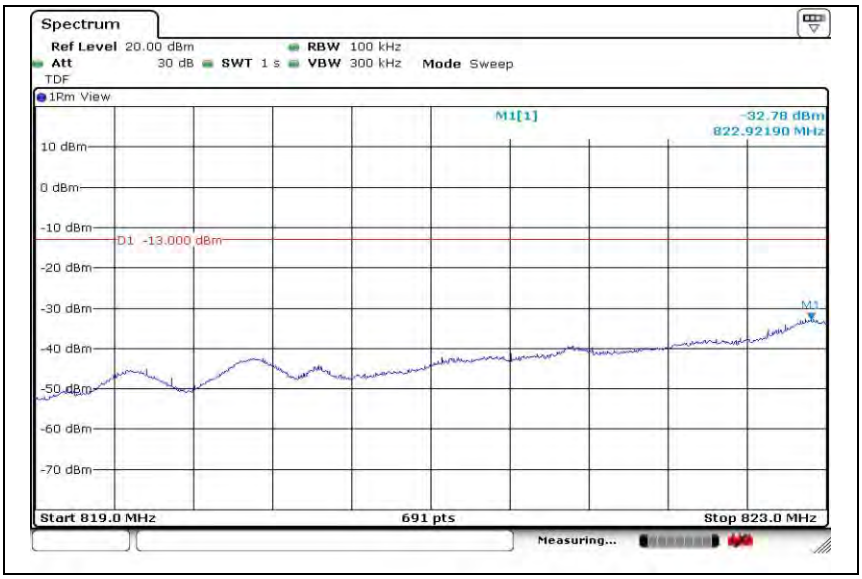
High Channel



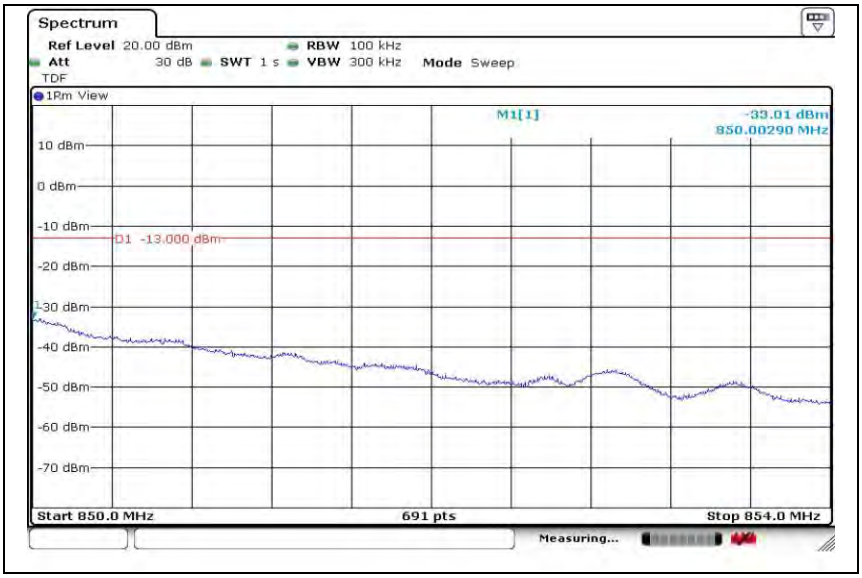
4 ㎒ SPAN

CDMA850 1xRTT

Low Channel

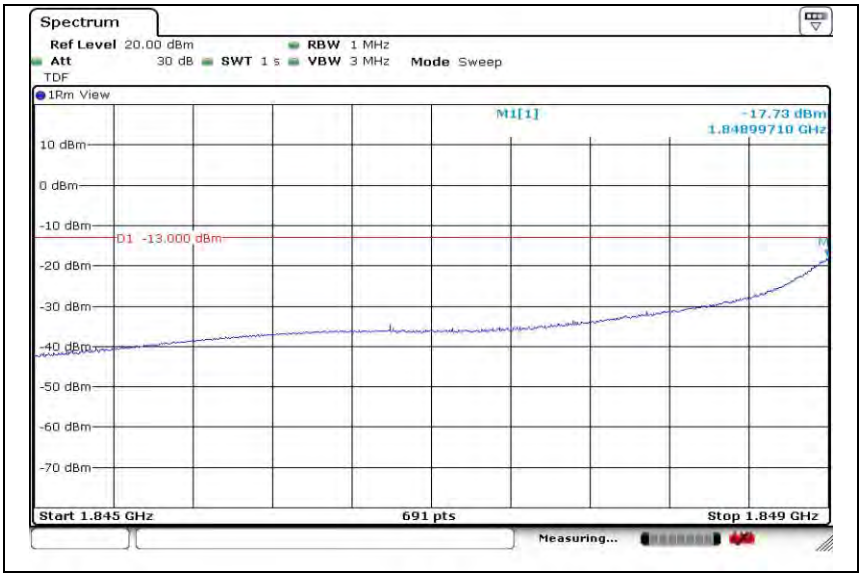


High Channel

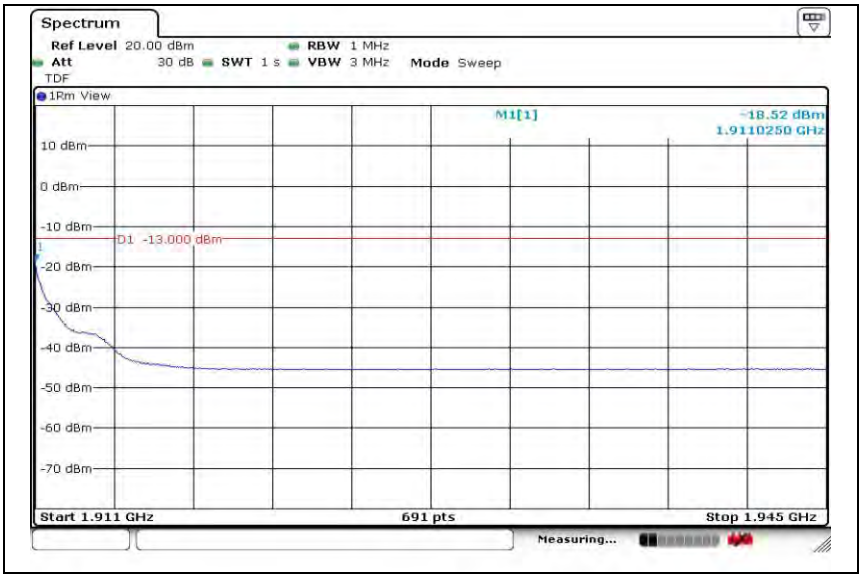


CDMA1 900 1xRTT

Low Channel



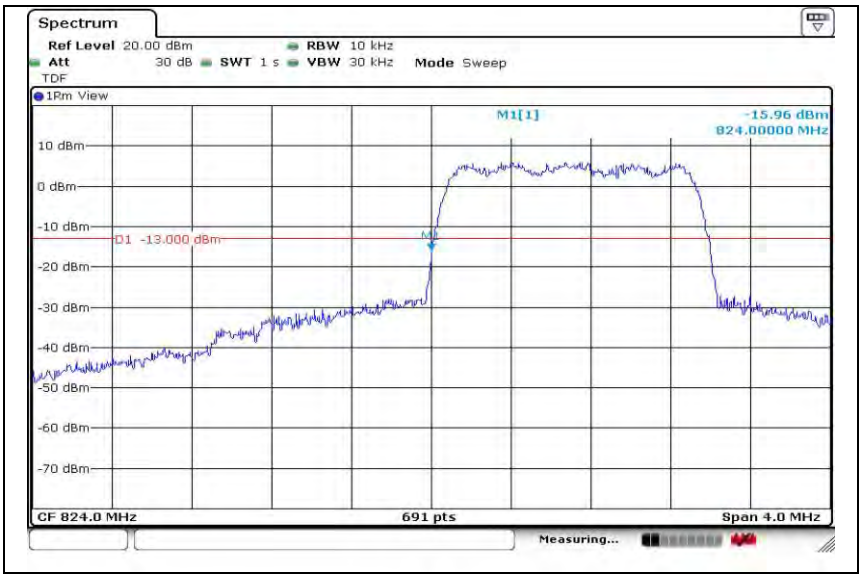
High Channel



Band edge

CDMA850 1xEV-DO

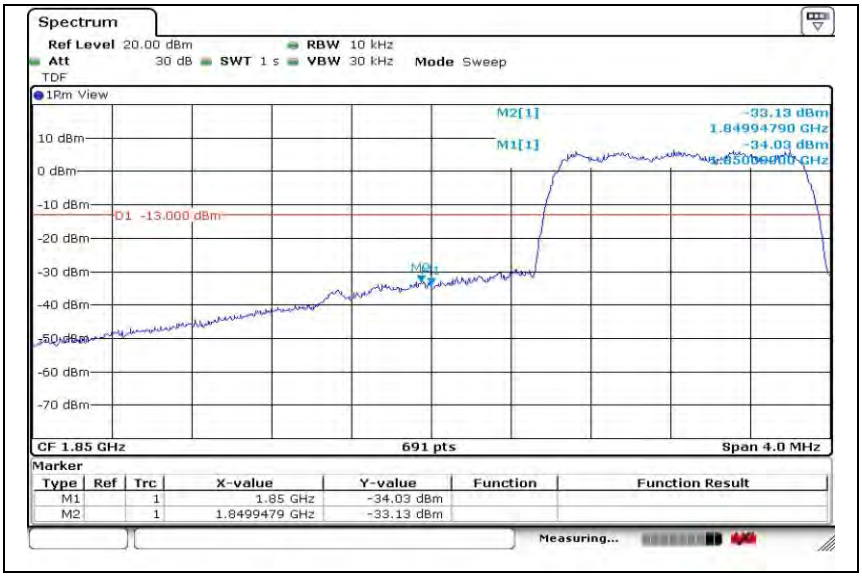
Low Channel



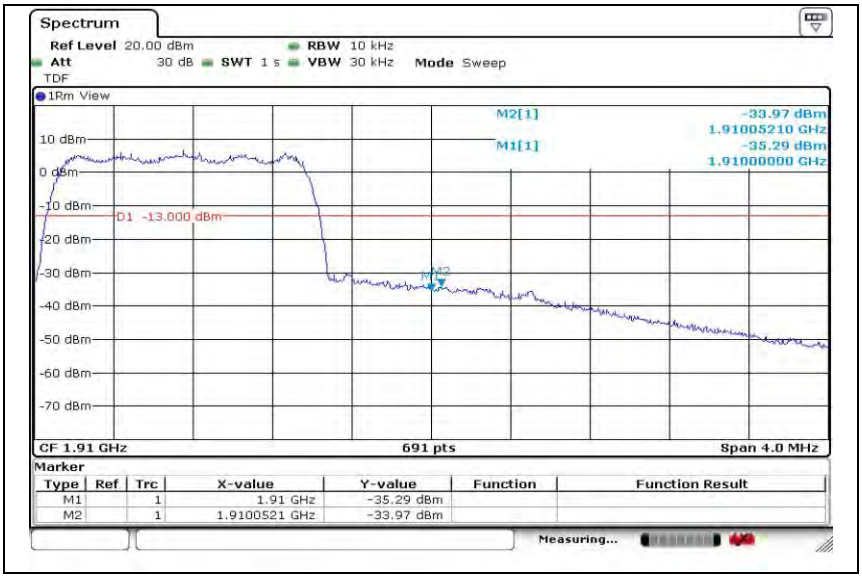
High Channel

CDMA1 900 1xEV-DO

Low Channel



High Channel

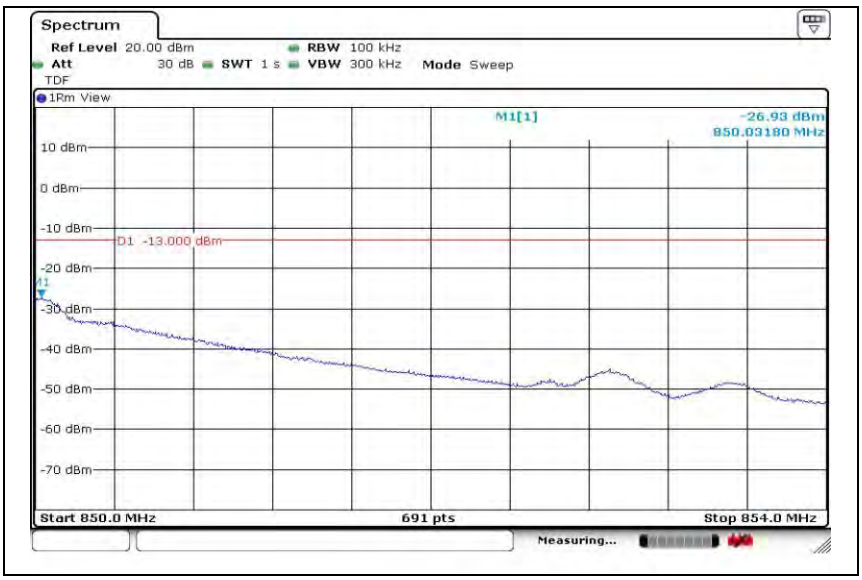


4 ㎒ SPAN

CDMA850 1xEV-DO

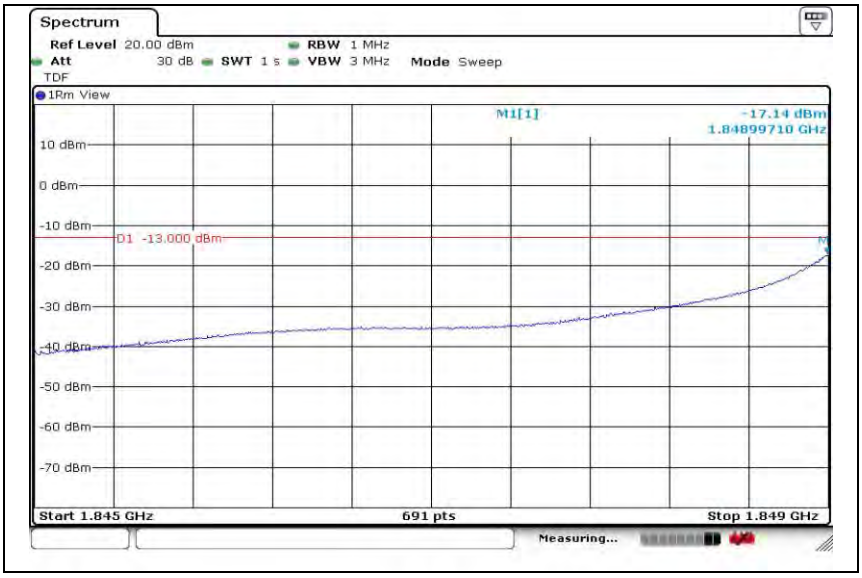
Low Channel

High Channel

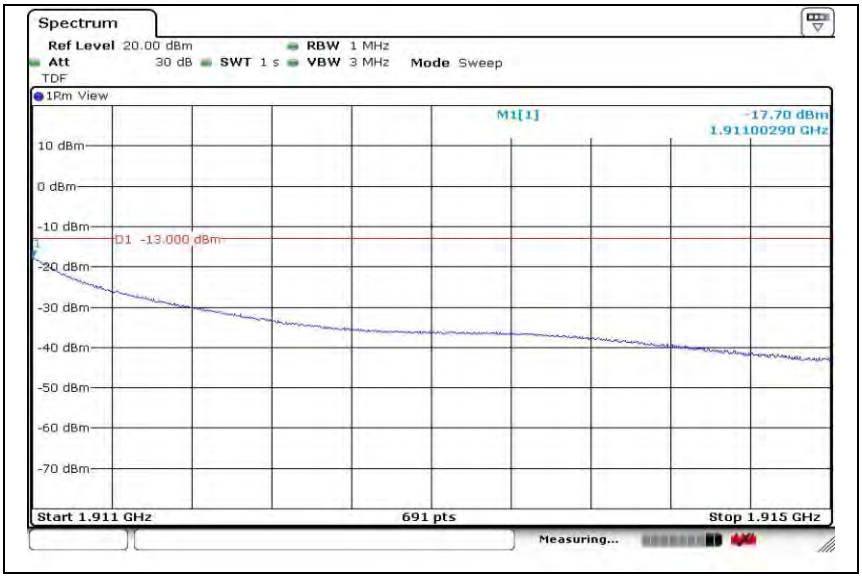


CDMA1 900 1xEV-DO

Low Channel



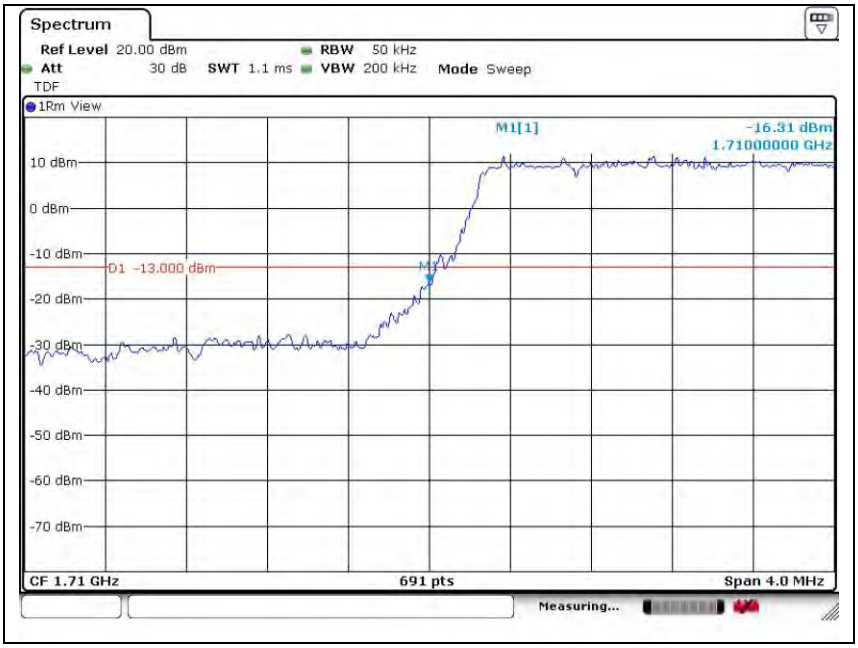
High Channel



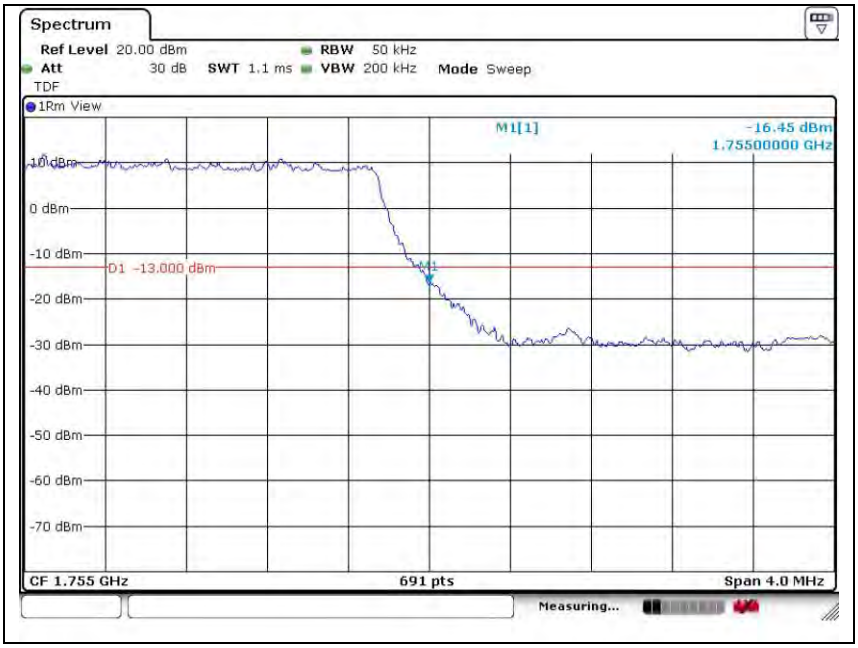
Band edge

LTE band 4 (5 ㎒ – QPSK_RB 25)

Low Channel



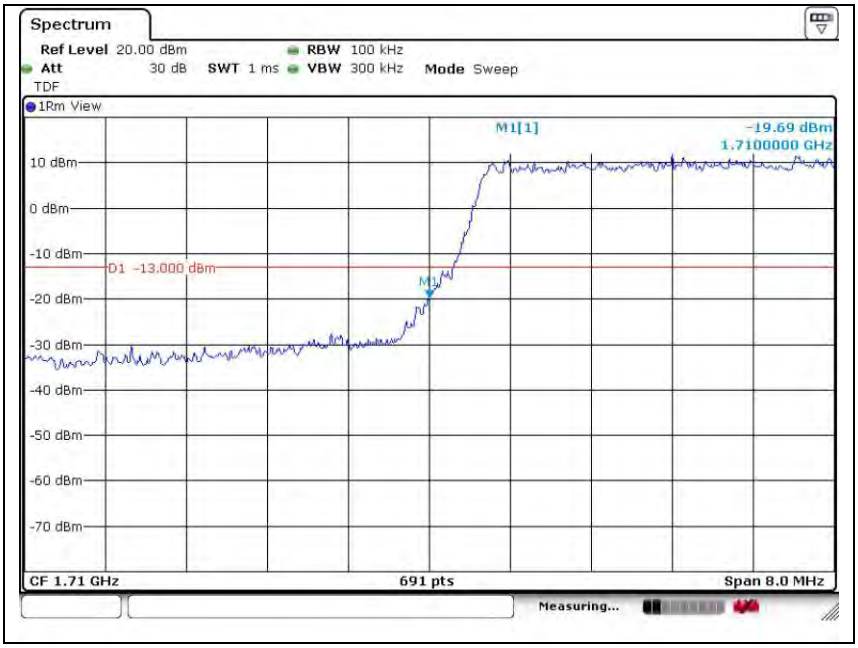
High Channel



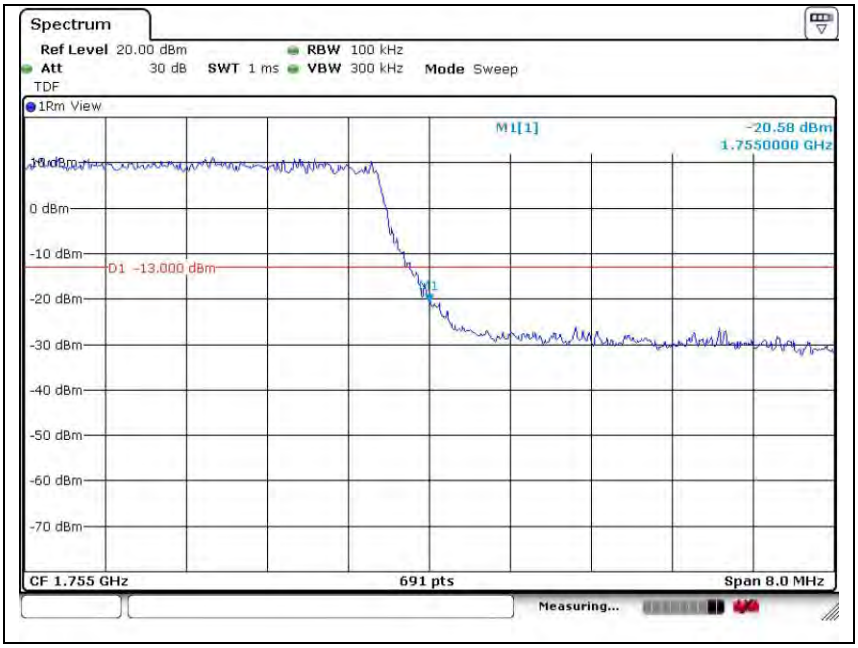
Band edge

LTE band 4 (10 ㎒ – QPSK_RB 50)

Low Channel



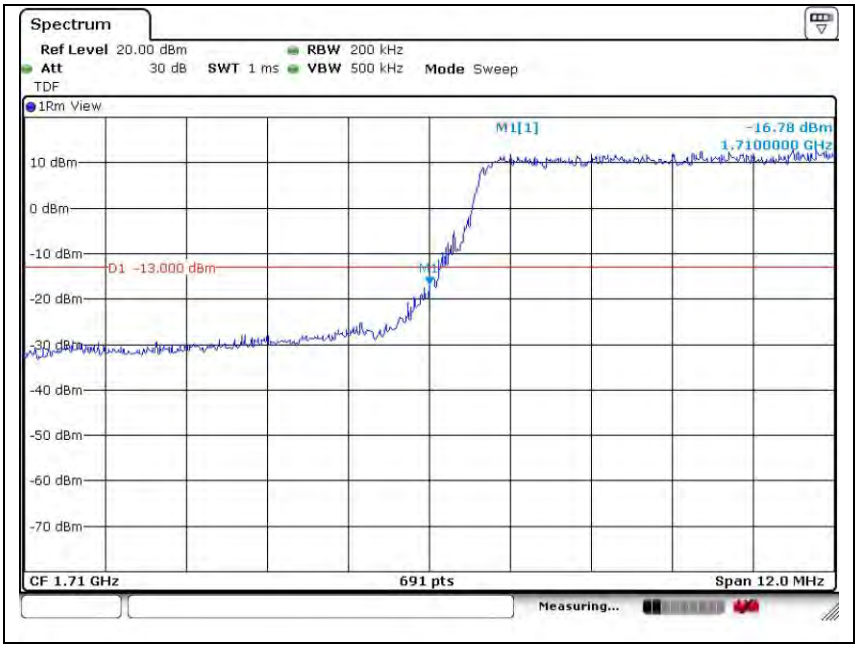
High Channel



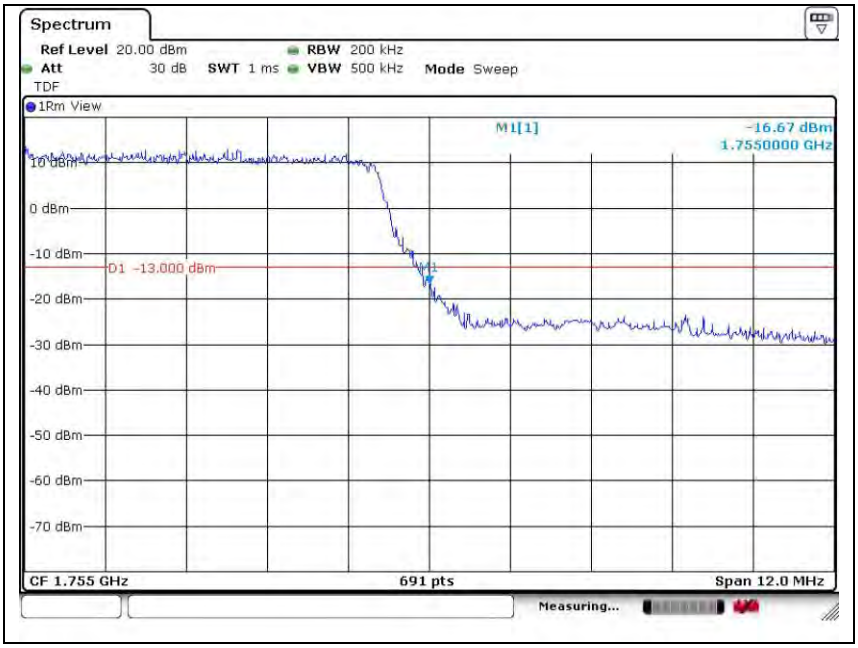
Band edge

LTE band 4 (15 ㎒ – QPSK_RB 75)

Low Channel



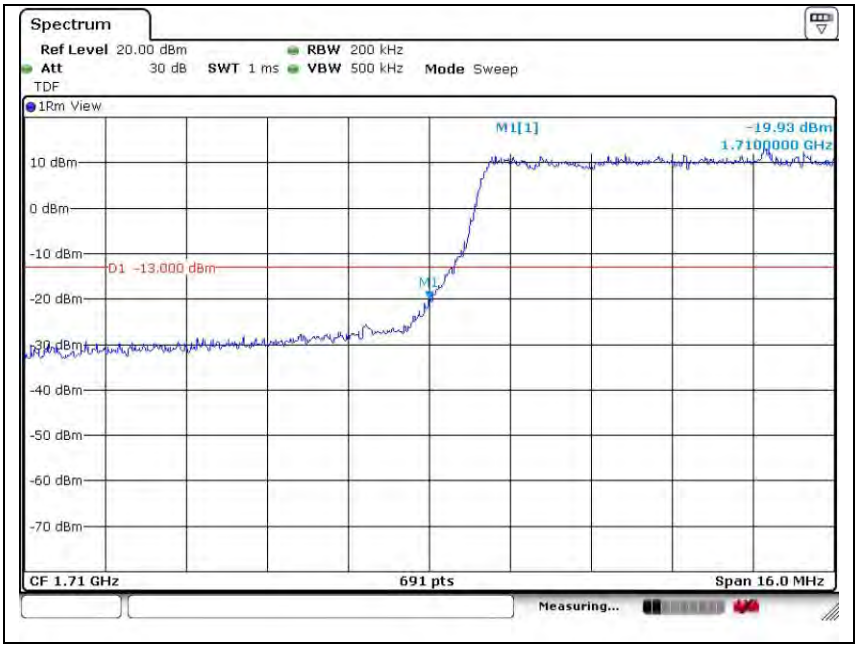
High Channel



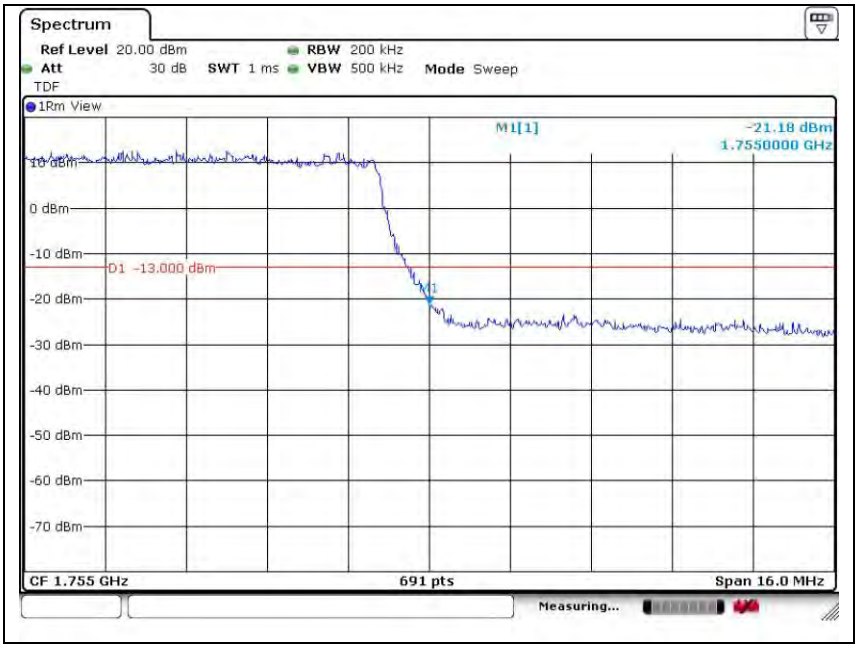
Band edge

LTE band 4 (20 ㎒ – QPSK_RB 100)

Low Channel



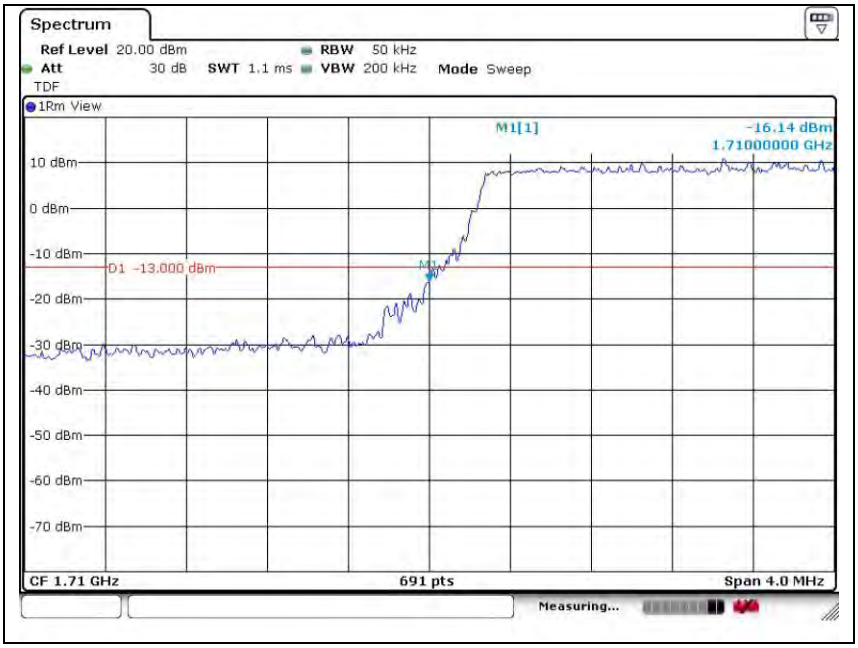
High Channel



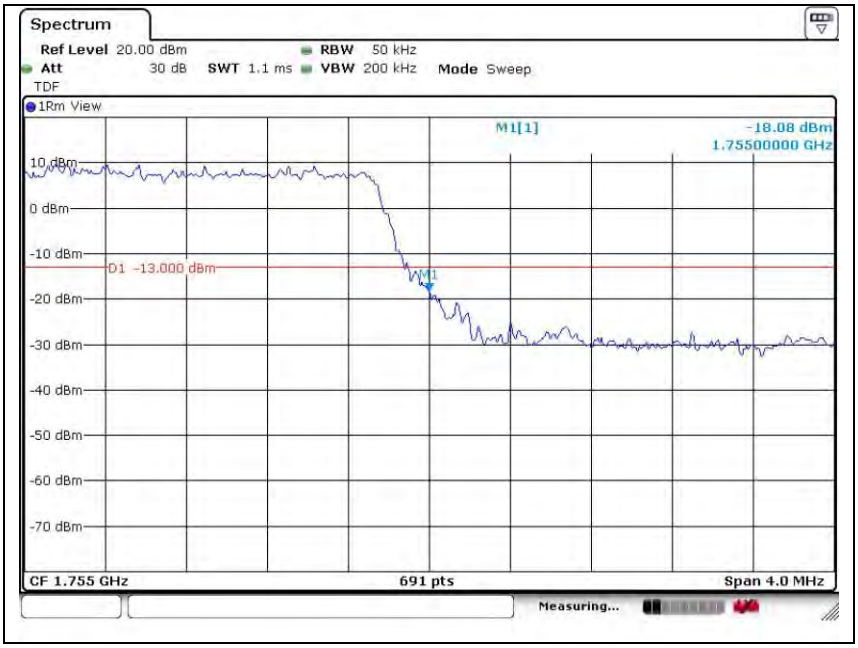
Band edge

LTE band 4 (5 ㎒ – 16QAM_RB 25)

Low Channel



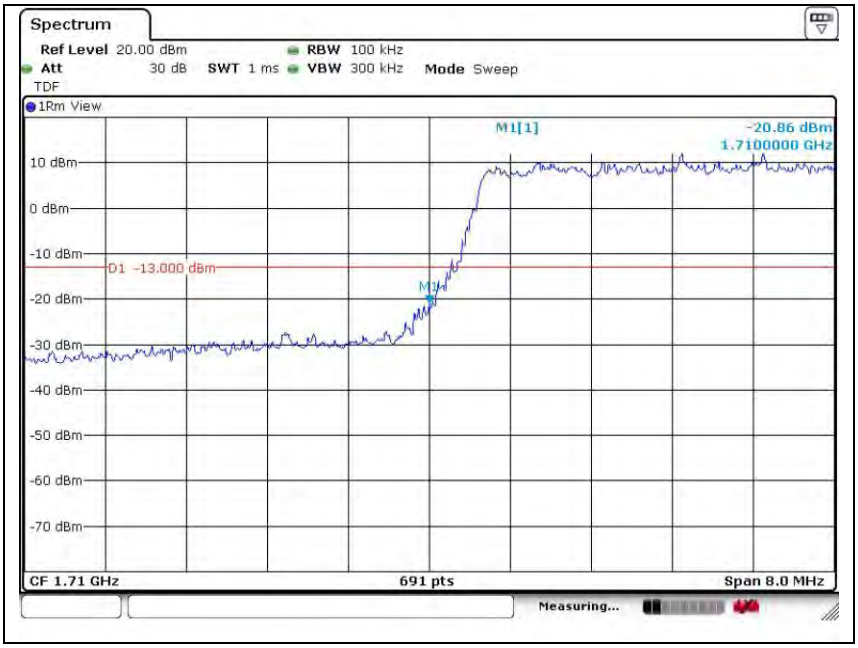
High Channel



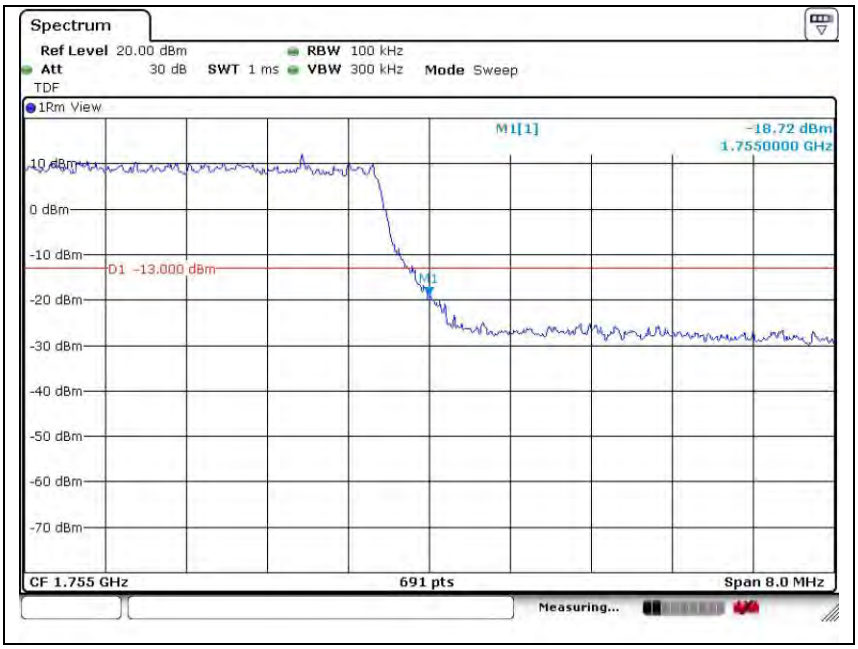
Band edge

LTE band 4 (10 ㎒ – 16QAM_RB 50)

Low Channel



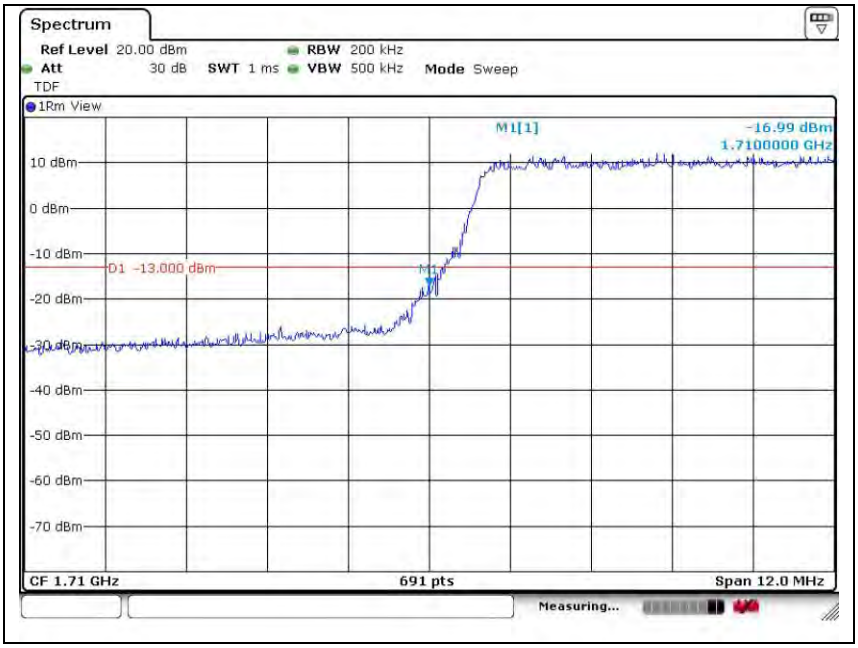
High Channel



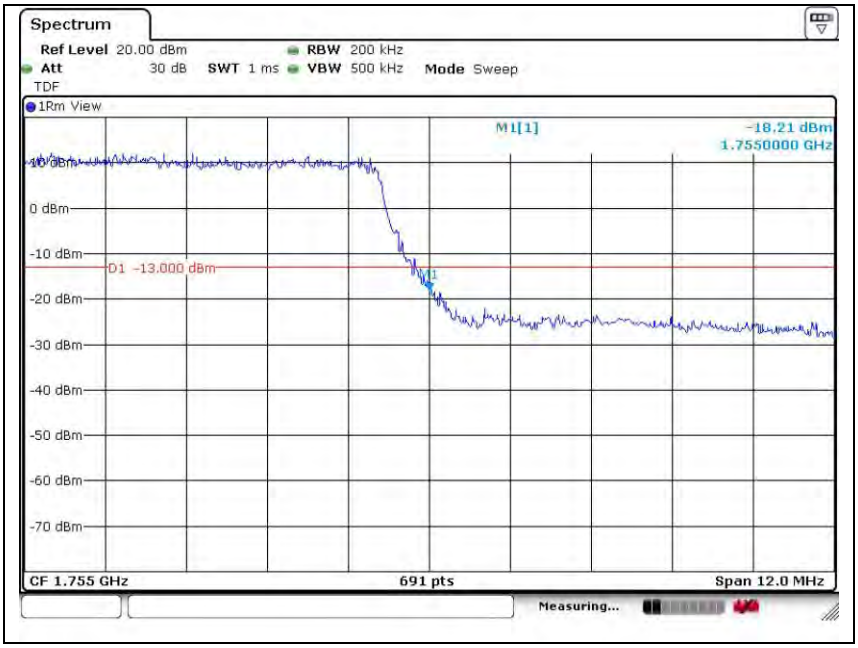
Band edge

LTE band 4 (15 ㎒ – 16QAM_RB 75)

Low Channel



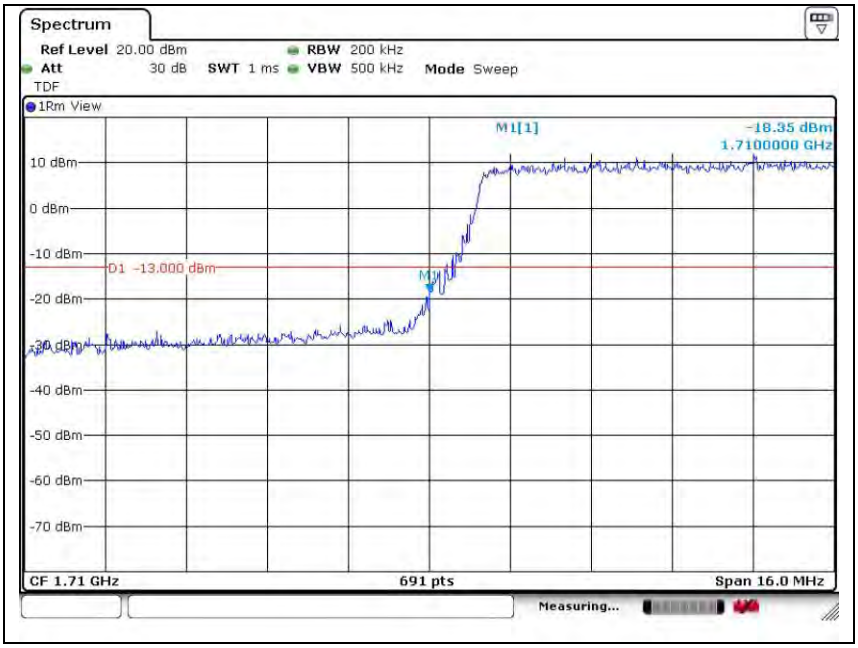
High Channel



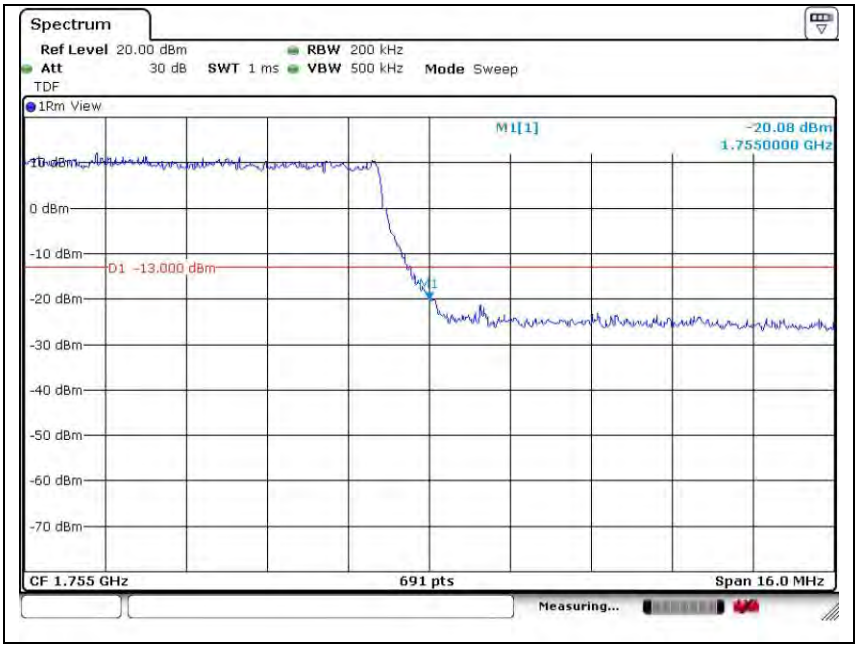
Band edge

LTE band 4 (20 ㎒ – 16QAM_RB 100)

Low Channel



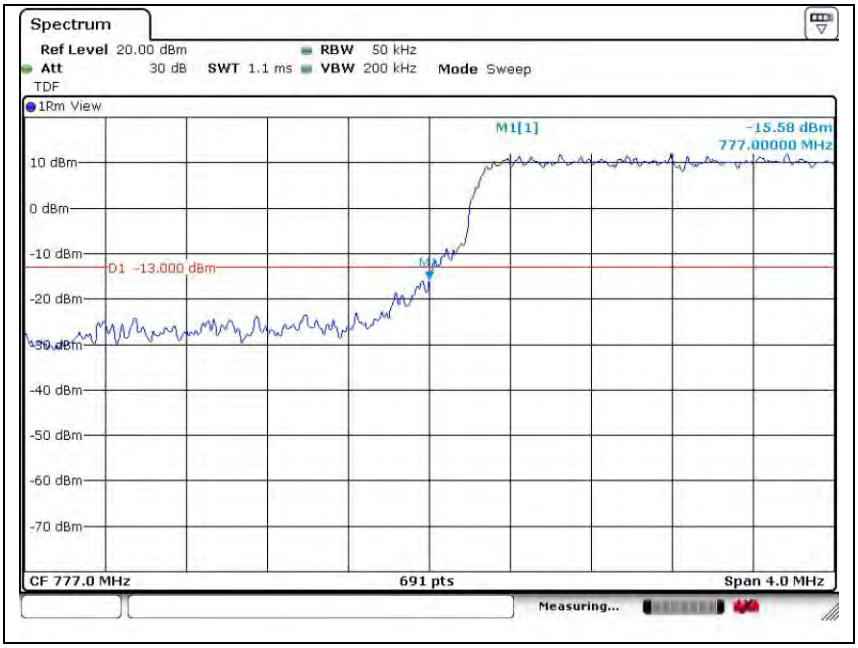
High Channel



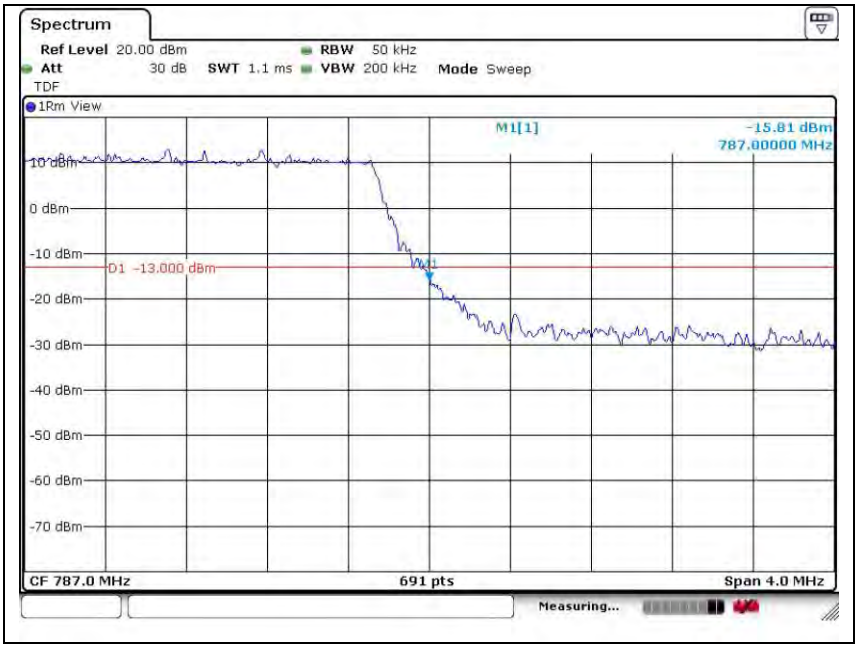
Band edge

LTE band 13 (5 ㎒ – QPSK_RB 25)

Low Channel

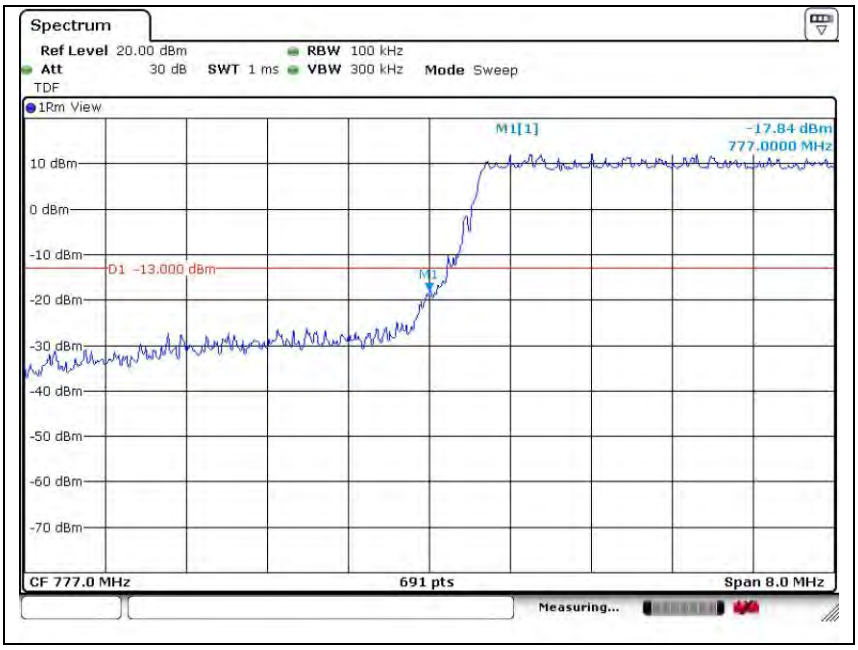


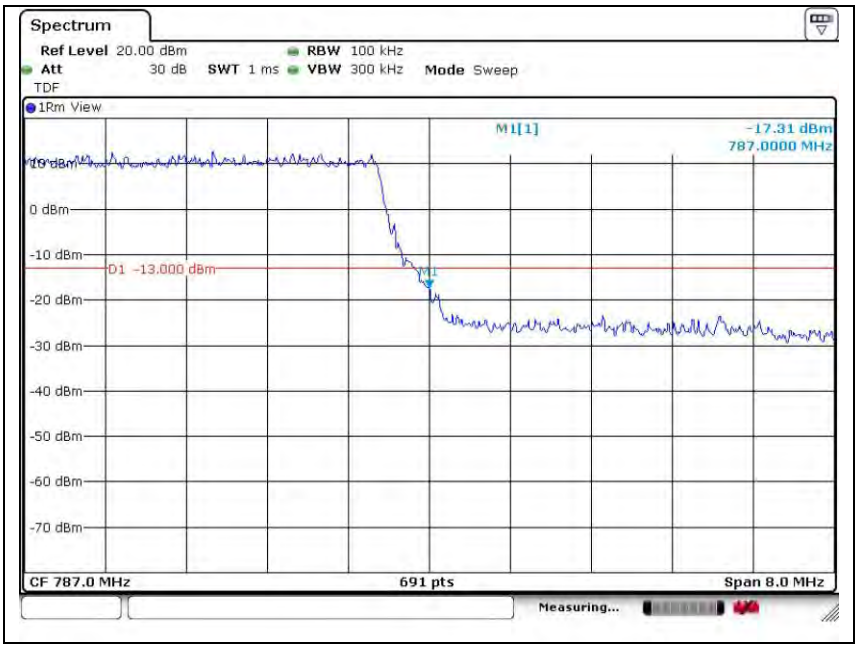
High Channel



LTE band 13 (10 ㎒ – QPSK_RB 50)

Middle Channel

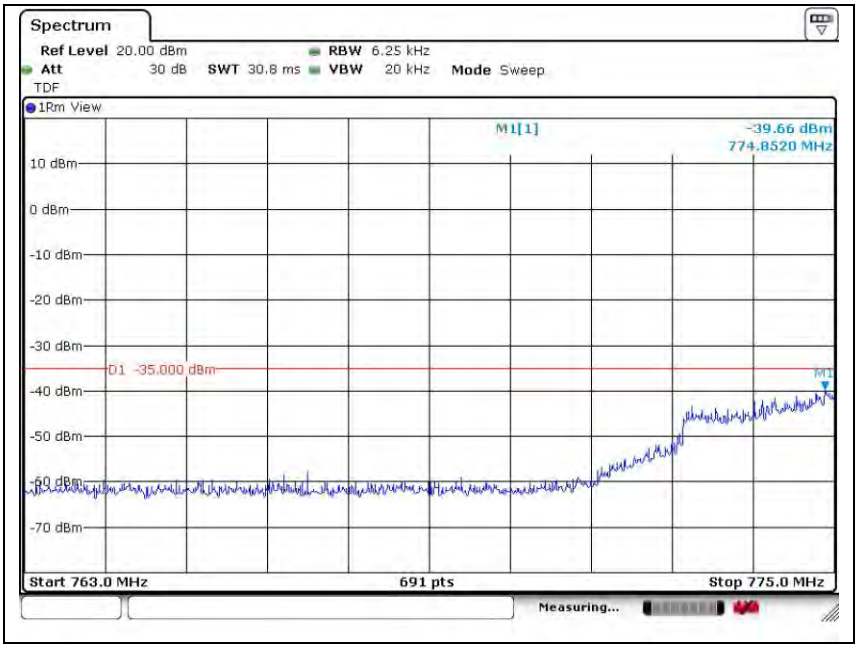




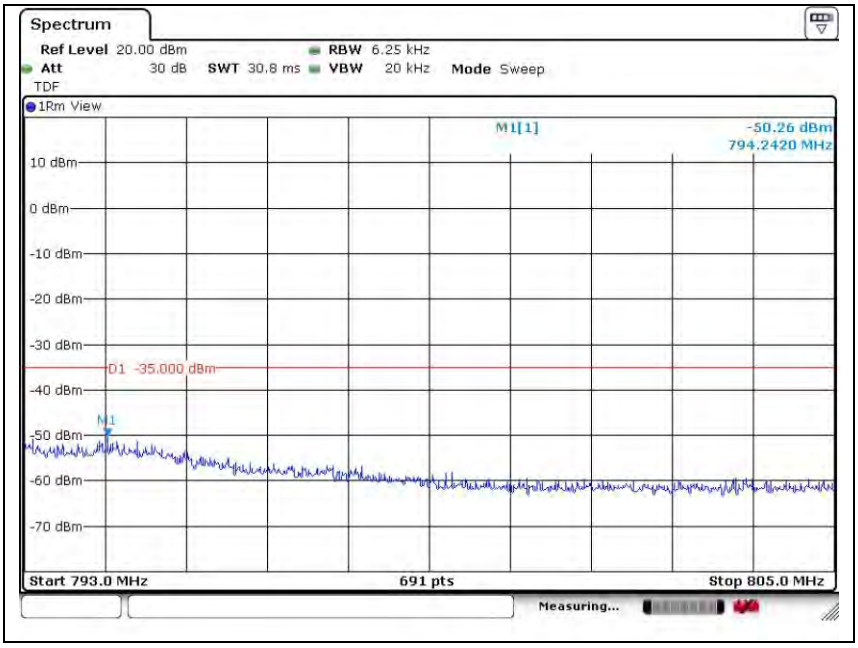
12 ㎒ SPAN

LTE band 13 (5 ㎒ – QPSK_RB 25)

Low Channel

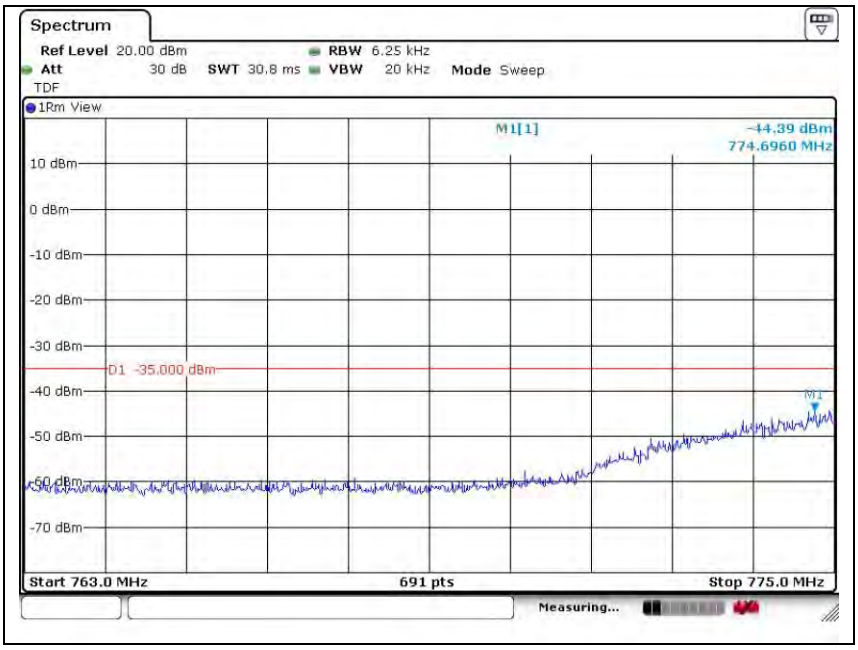


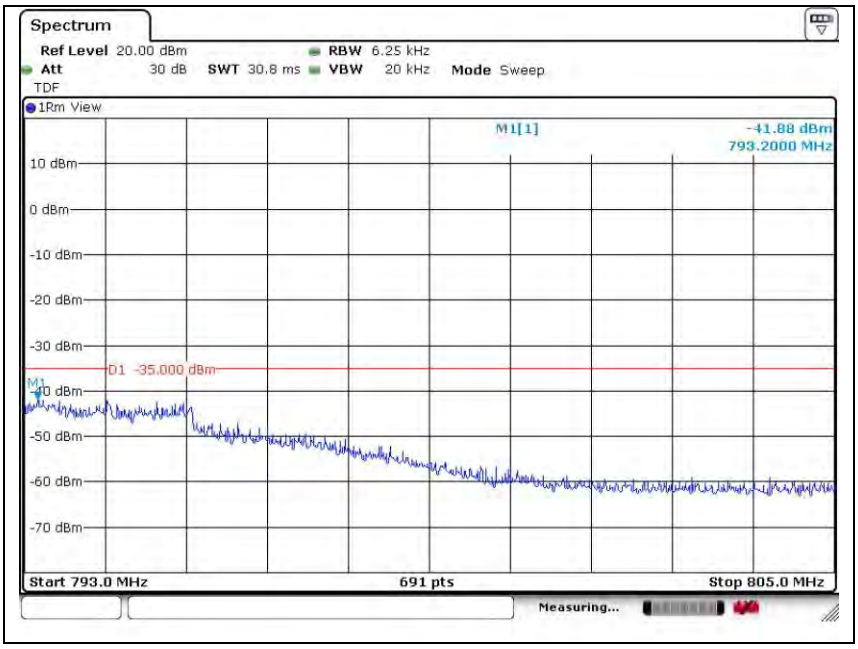
High Channel



LTE band 13 (10 ㎒ – QPSK_RB 50)

Middle Channel

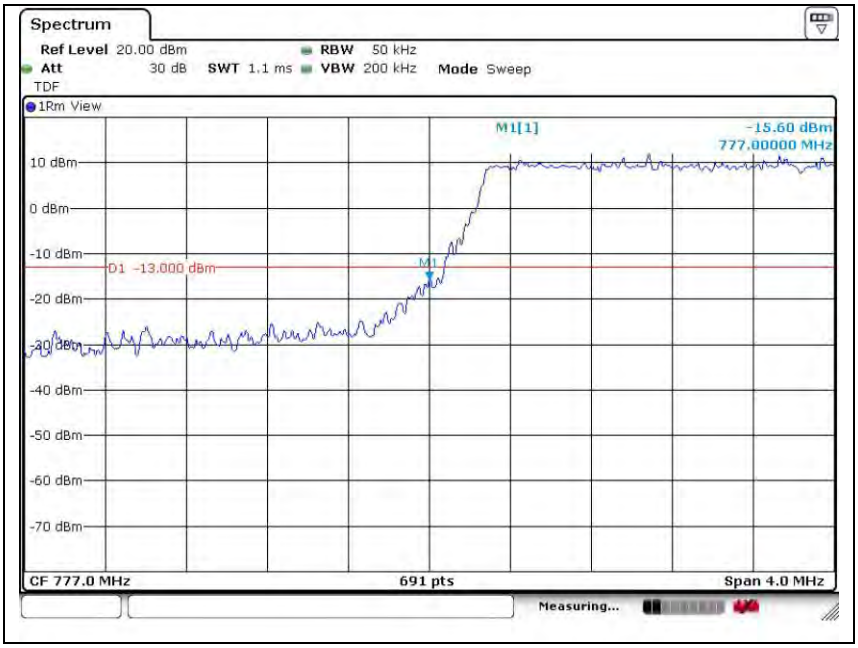




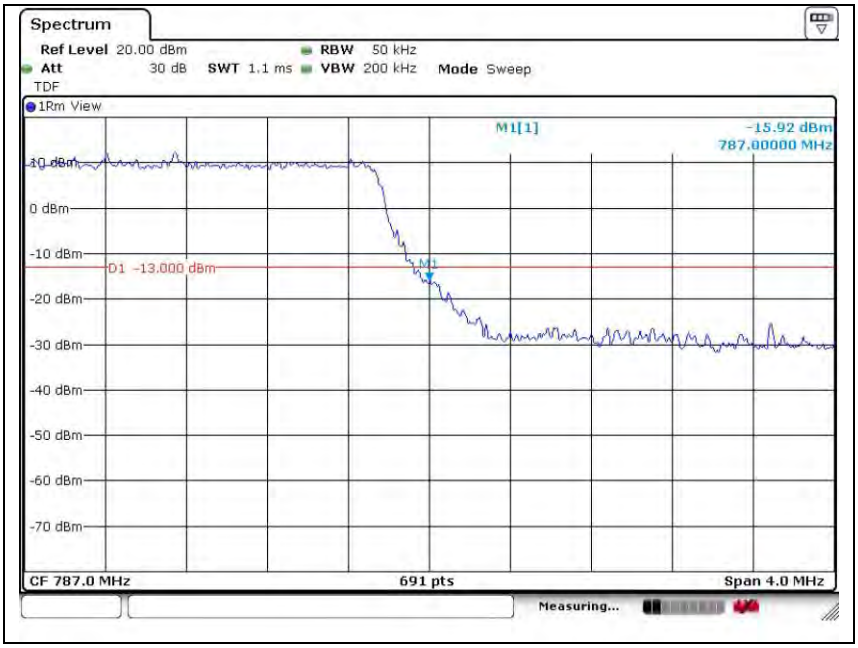
Band edge

LTE band 13 (5 ㎒ – 16QAM_RB 25)

Low Channel

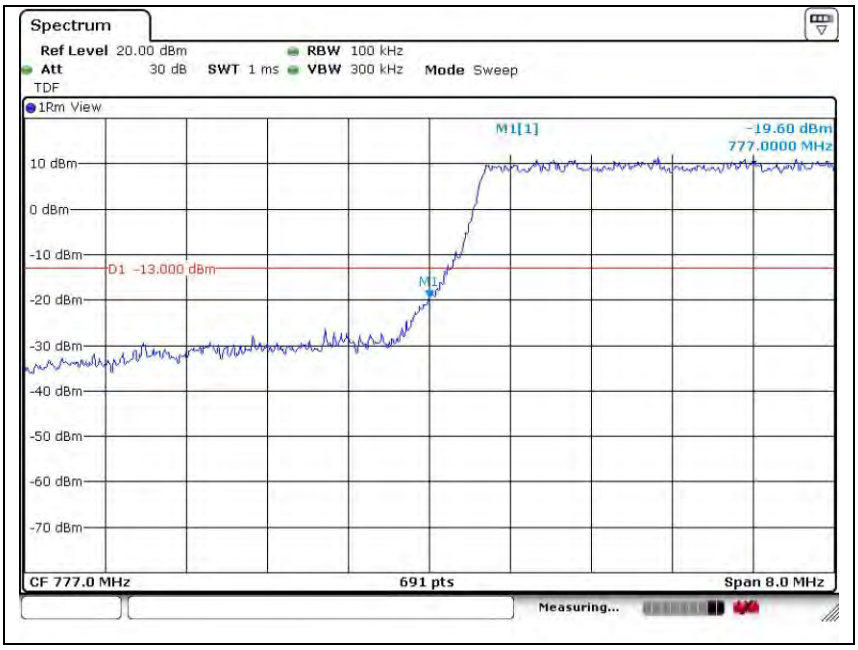


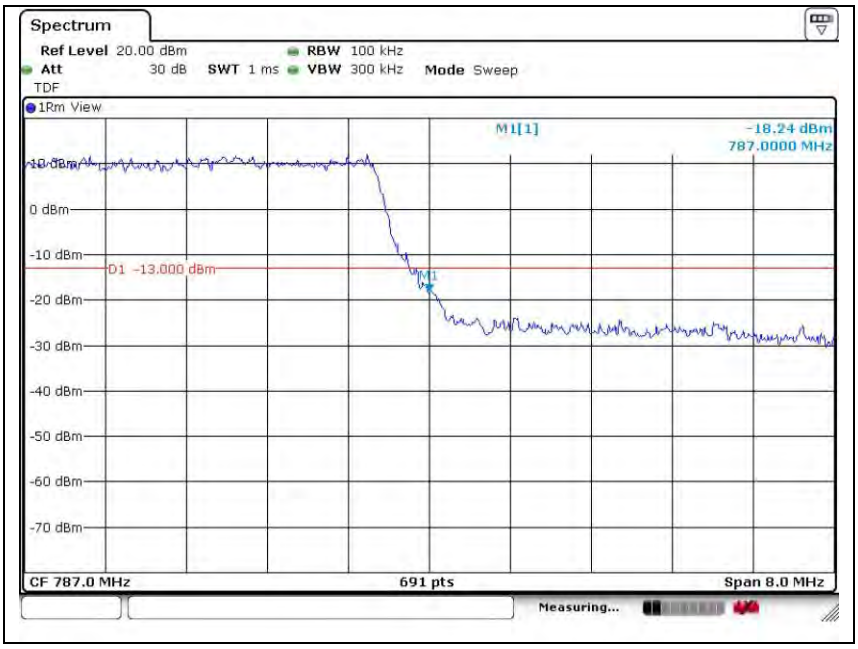
High Channel



LTE band 13 (10 ㎒ – 16QAM_RB 50)

Middle Channel

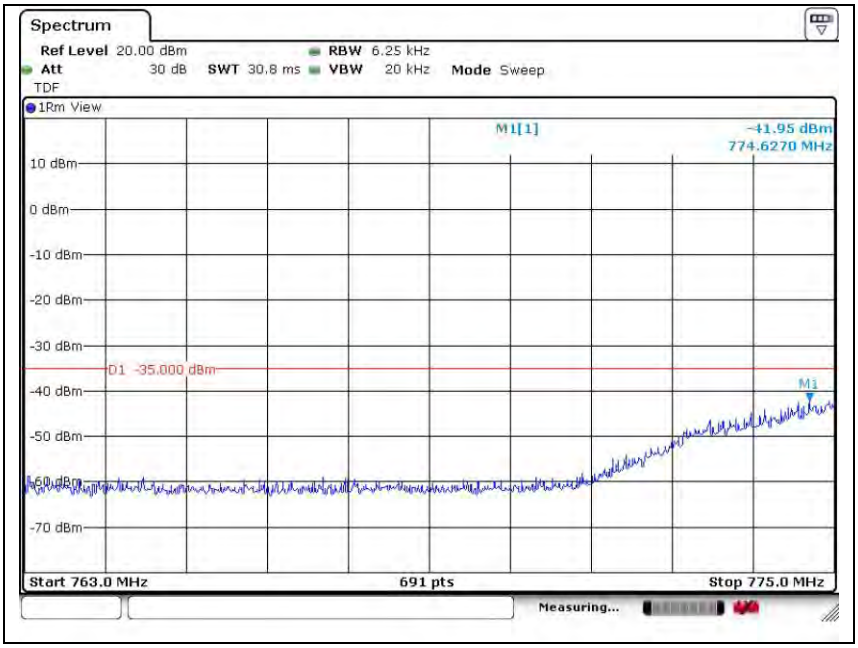




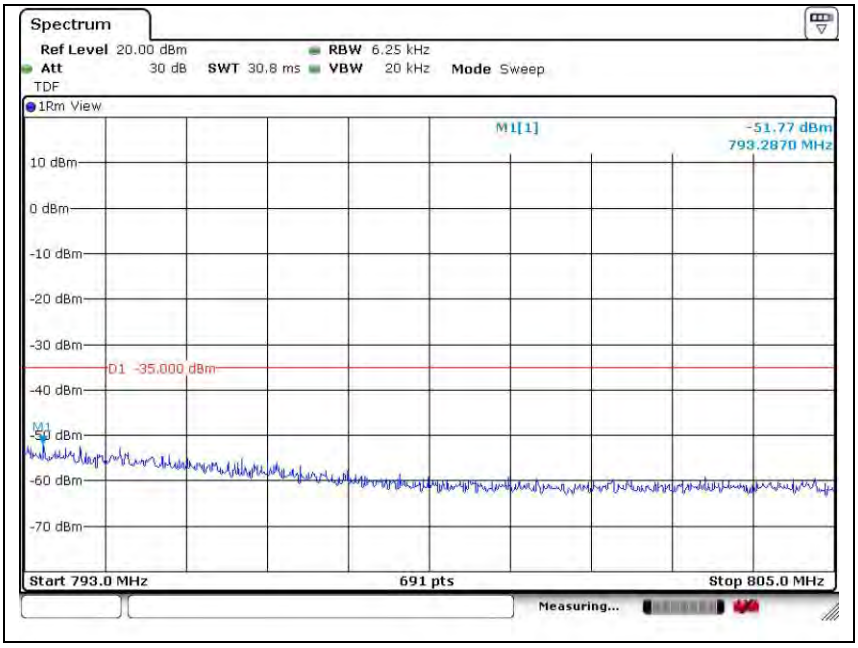
12 ㎒ SPAN

LTE band 13 (5 ㎒ – 16QAM_RB 25)

Low Channel

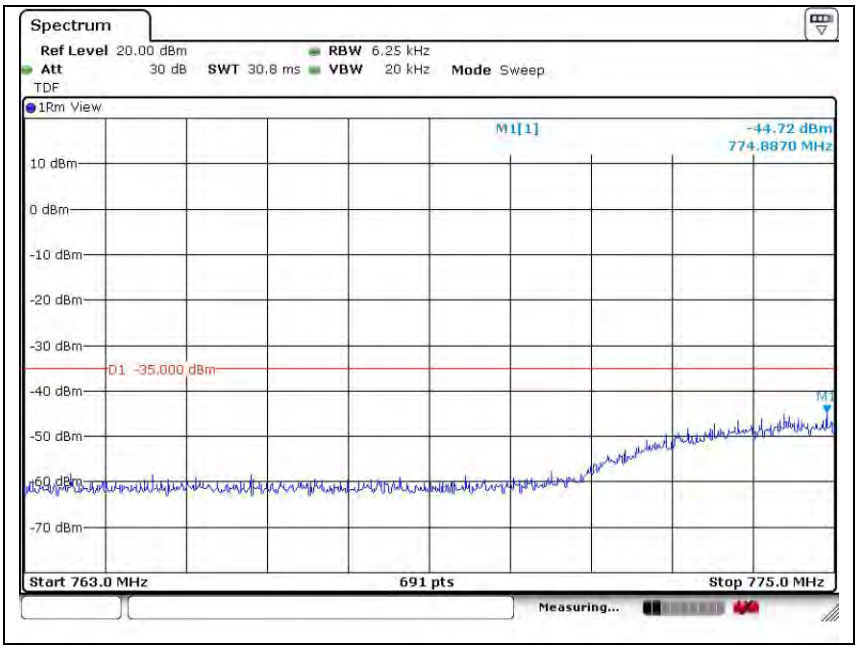


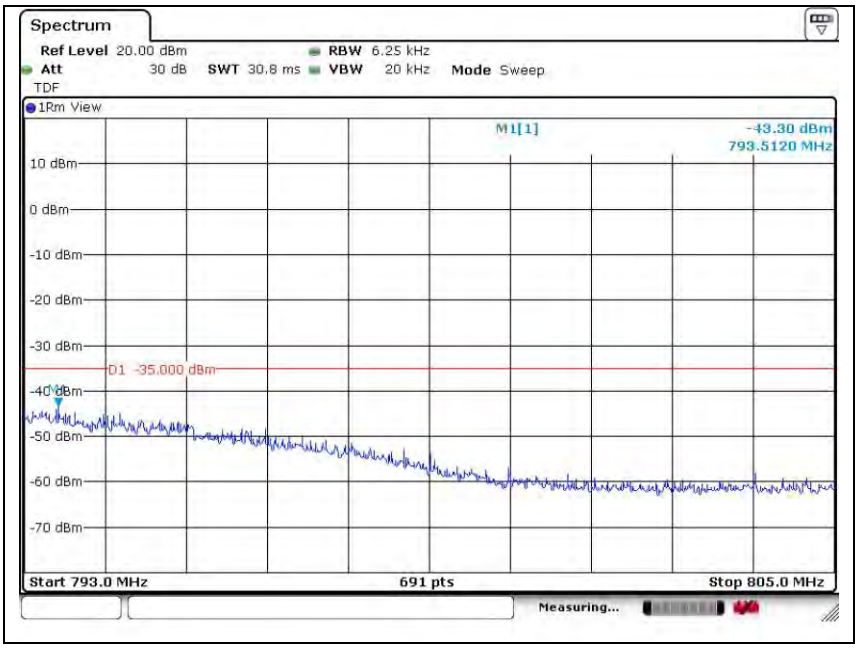
High Channel



LTE band 13 (10 ㎒ – 16QAM_RB 50)

Middle Channel





8. Frequency Stability

8.1. Limit

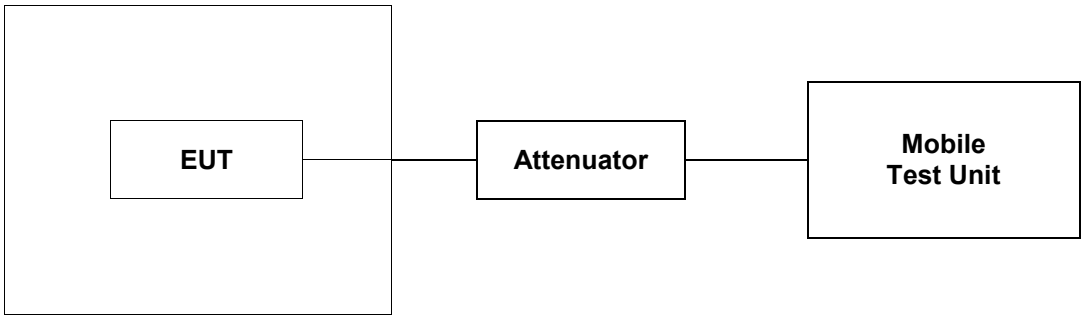
Requirements: FCC § 2.1055 (a), § 2.1055 (d) & following:
FCC §22.355, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances given in Table of this section.

For Mobile devices operating in the 824 to 849 ㎒ band at a power level less than or equal to 3 Watts, the limit specified in Table C-1 is +/- 2.5 ppm.

FCC §24.235, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.
FCC §27.54, the frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

8.2. Test Procedure

1. Frequency Stability vs. Temperature: The equipment under test was connected to an external DC power supply and the RF output was connected to a Mobile Test Unit via feed-through attenuators.
2. The EUT was placed inside the temperature chamber.
3. After the temperature stabilized for approximately 20 minutes, the frequency output was recorded from Mobile Test Unit.



8.3. Test Results

Ambient temperature : (24 ± 1) ℃
Relative humidity : 47 % R.H.

CDMA850 mode at middle channel

Reference Frequency: 836.52 ㎒			
Frequency Stability versus Temperature			
Environment Temperature (℃)	**Power Supplied (V_{dc})**	**Frequency Measure with Time Elapse**	
		Frequency Error (㎐)	**ppm**
-30	14.4	15	0.017 931
-20		-13	-0.015 541
-10		-11	-0.013 150
0		15	0.017 931
10		-14	-0.016 736
24		6	0.007 173
30		10	0.011 954
40		-13	-0.015 541
50		9	0.010 759
Frequency Stability versus power Supply			
Environment Temperature (℃)	**Power Supplied (V_{dc})**	**Frequency Measure with Time Elapse**	
		Frequency Error (㎐)	**ppm**
24	16.56 (+15 %)	11	0.013 150
	12.24 (-15 %)	3	0.003 586

CDMA1 900 mode at middle channel

Reference Frequency: 1 880.0 ㎒			
Frequency Stability versus Temperature			
Environment Temperature (℃)	**Power Supplied (V_{dc})**	**Frequency Measure with Time Elapse**	
		Frequency Error (㎐)	**ppm**
-30	14.4	16	0.008 511
-20		14	0.007 447
-10		-10	-0.005 319
0		10	0.005 319
10		-14	-0.007 447
24		-6	-0.003 191
30		-12	-0.006 383
40		6	0.003 191
50		3	0.001 596
Frequency Stability versus power Supply			
Environment Temperature (℃)	**Power Supplied (V_{dc})**	**Frequency Measure with Time Elapse**	
		Frequency Error (㎐)	**ppm**
24	16.56 (+15 %)	2	0.001 064
	12.24 (-15 %)	-5	-0.002 660

LTE band 4 at middle channel

Reference Frequency: 1 732.5 ㎒			
Frequency Stability versus Temperature			
Environment Temperature (℃)	**Power Supplied (V_{dc})**	**Frequency Measure with Time Elapse**	
		Frequency Error (㎐)	**ppm**
-30	14.4	5	0.002 886
-20		3	0.001 732
-10		-5	-0.002 886
0		-6	-0.003 463
10		-8	-0.004 618
24		-2	-0.001 154
30		-3	-0.001 732
40		-8	-0.004 618
50		-9	-0.005 195
Frequency Stability versus Power Supply			
Environment Temperature (℃)	**Power Supplied (V_{dc})**	**Frequency Measure with Time Elapse**	
		Frequency Error (㎐)	**ppm**
24	16.56 (+15 %)	-14	-0.008 081
	12.24 (-15 %)	-9	-0.005 195

LTE band 13 at middle channel

Reference Frequency: 782.0 ㎒			
Frequency Stability versus Temperature			
Environment Temperature (℃)	**Power Supplied (V_{dc})**	**Frequency Measure with Time Elapse**	
		Frequency Error (㎐)	**ppm**
-30	14.4	7	0.008 951
-20		13	0.016 624
-10		-15	-0.019 182
0		-6	-0.007 673
10		-8	-0.010 230
24		-12	-0.015 345
30		-23	-0.029 412
40		-18	-0.023 018
50		-19	-0.024 297
Frequency Stability versus Power Supply			
Environment Temperature (℃)	**Power Supplied (V_{dc})**	**Frequency Measure with Time Elapse**	
		Frequency Error (㎐)	**ppm**
24	16.56 (+15 %)	-14	-0.017 903
	12.24 (-15 %)	-9	-0.011 509