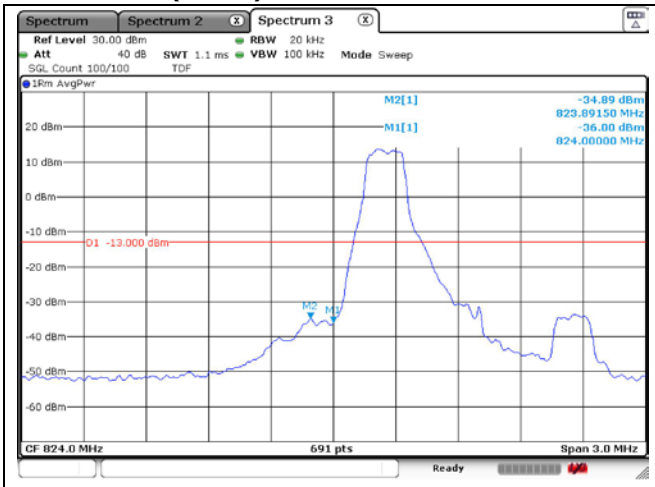
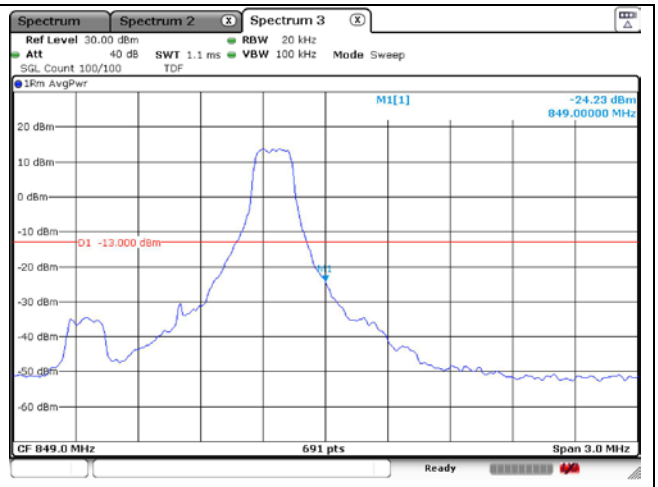
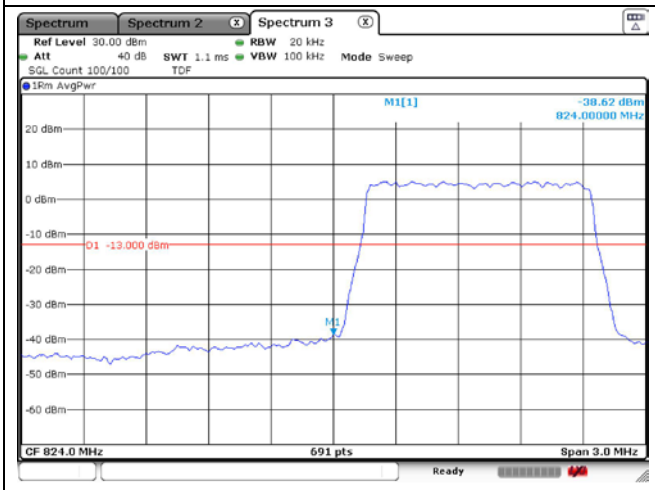
LTE band 5 (1.4 ㎒)



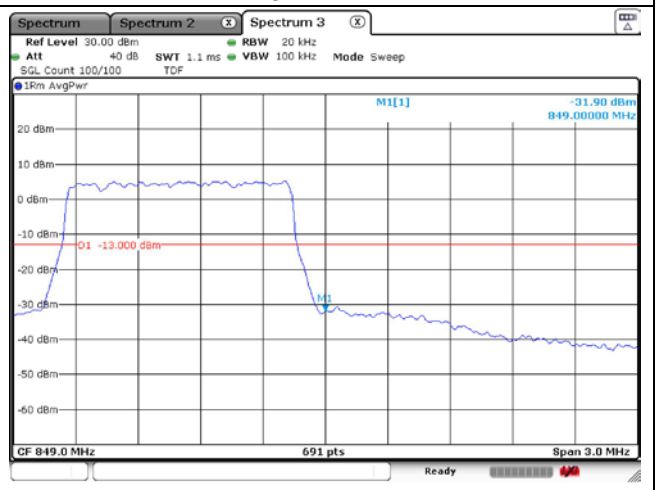
QPSK Low Channel - 1 RB



QPSK High Channel - 1 RB

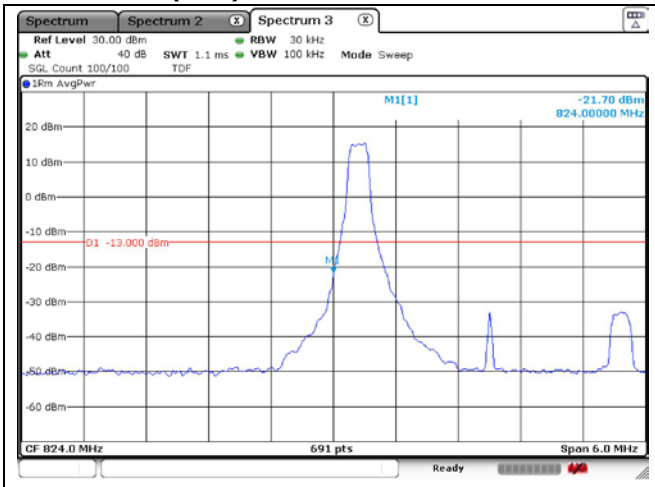


QPSK Low Channel - Full RB

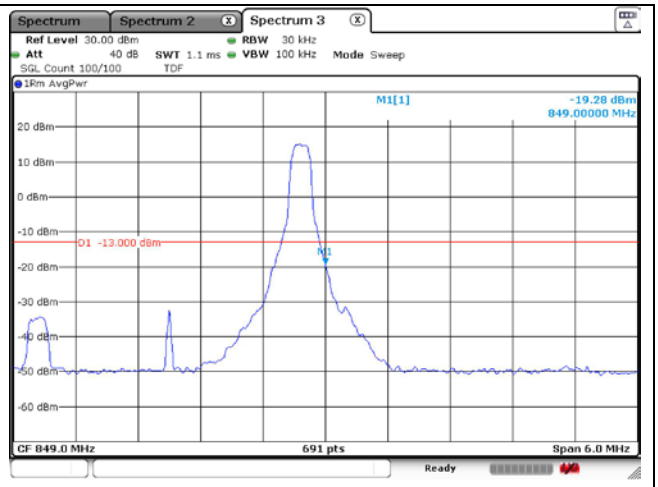


QPSK High Channel - Full RB

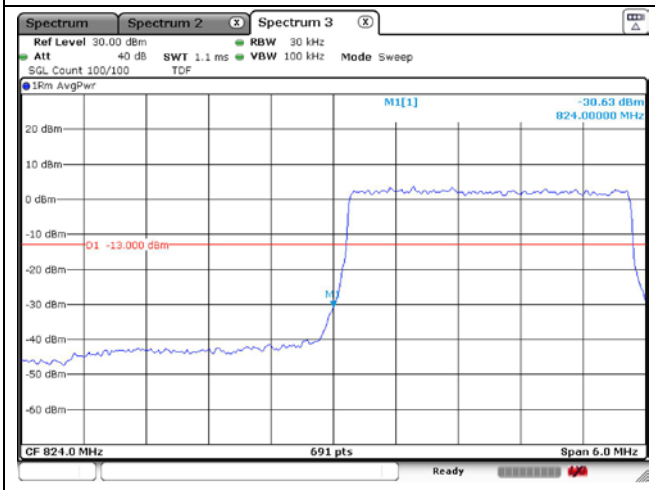
LTE band 5 (3 ㎒)



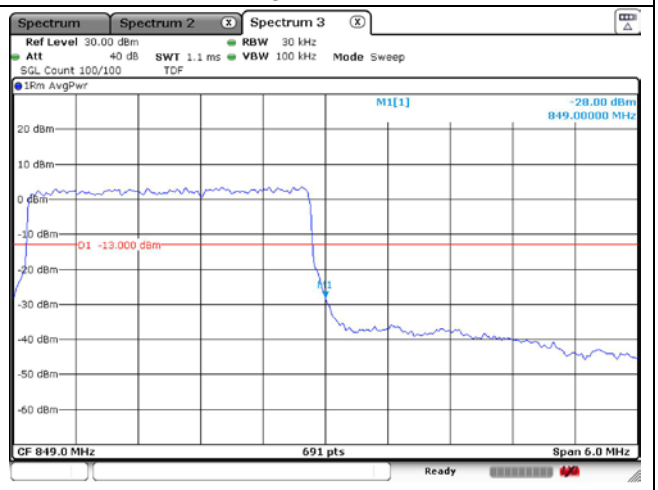
QPSK Low Channel - 1 RB



QPSK High Channel - 1 RB

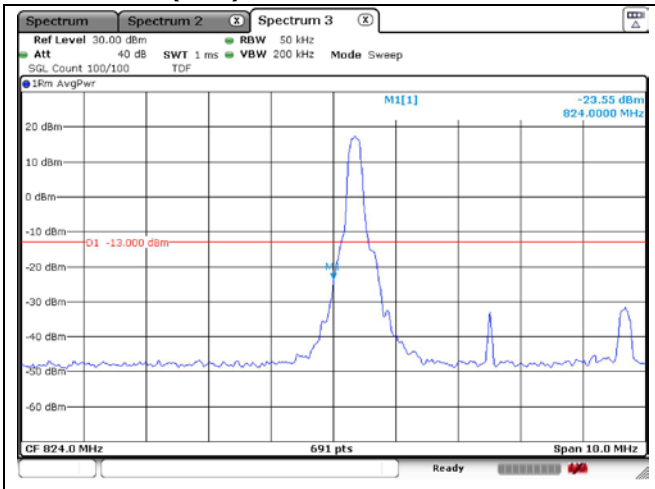


QPSK Low Channel - Full RB

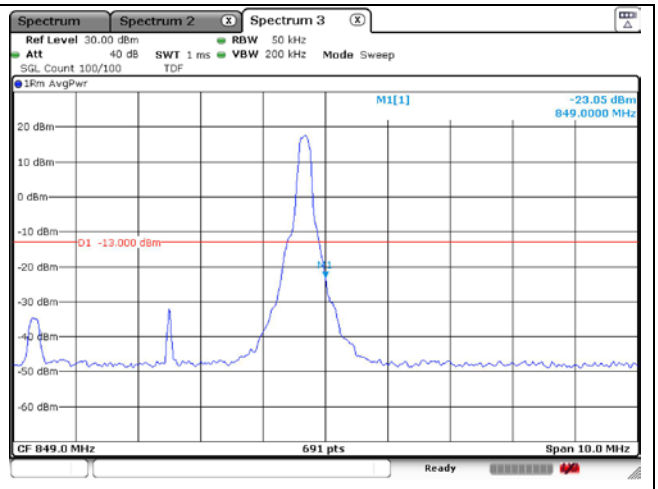


QPSK High Channel - Full RB

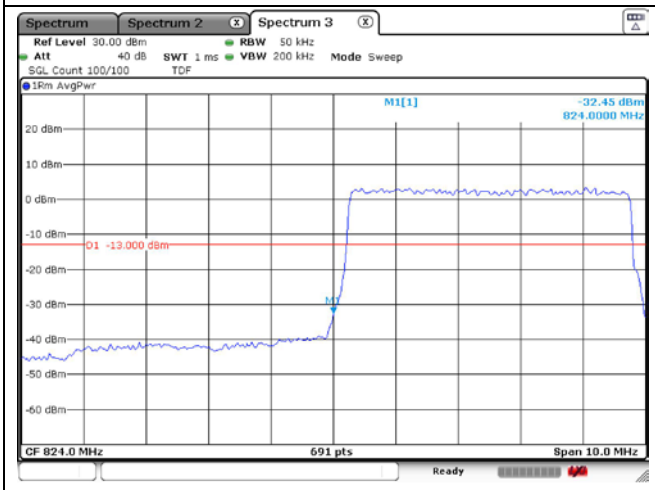
LTE band 5 (5 ㎒)



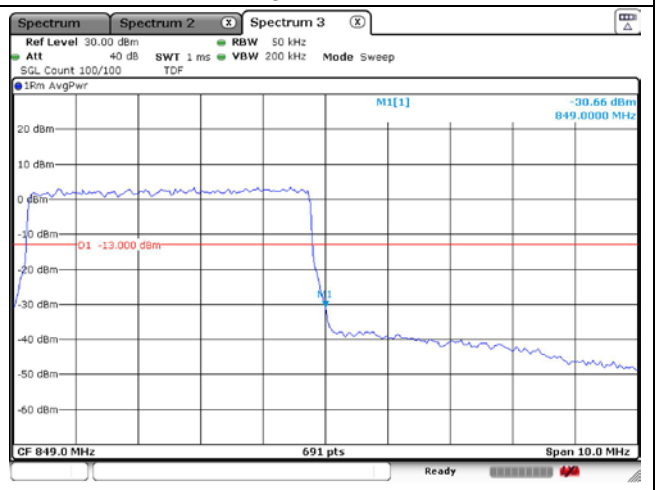
QPSK Low Channel - 1 RB



QPSK High Channel - 1 RB

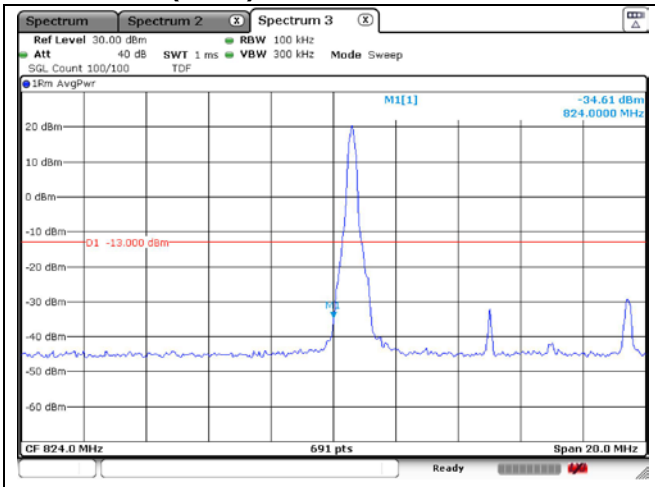


QPSK Low Channel - Full RB

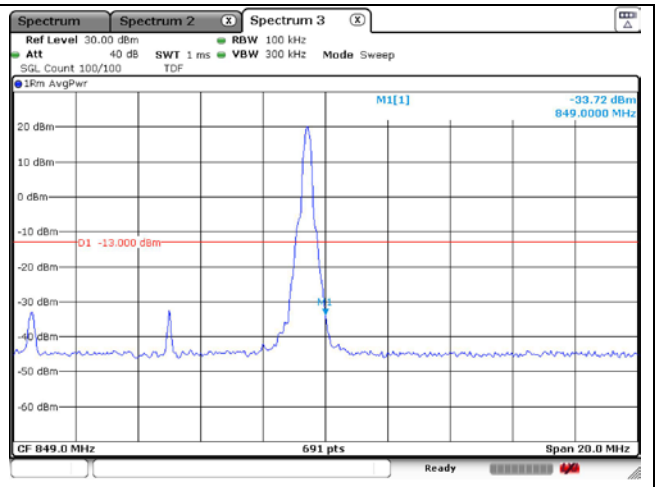


QPSK High Channel - Full RB

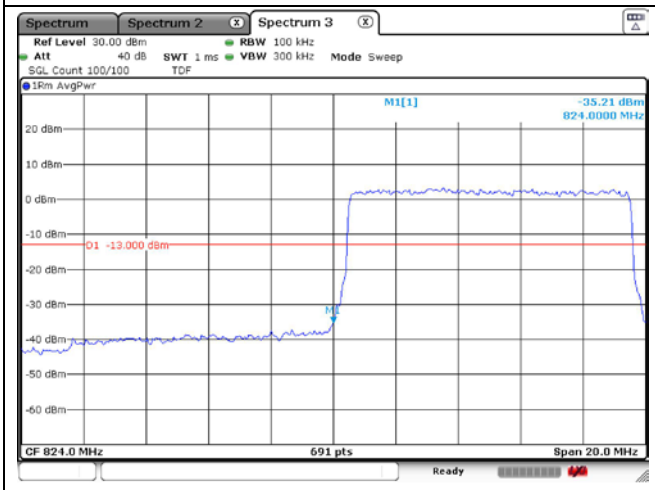
LTE band 5 (10 ㎒)



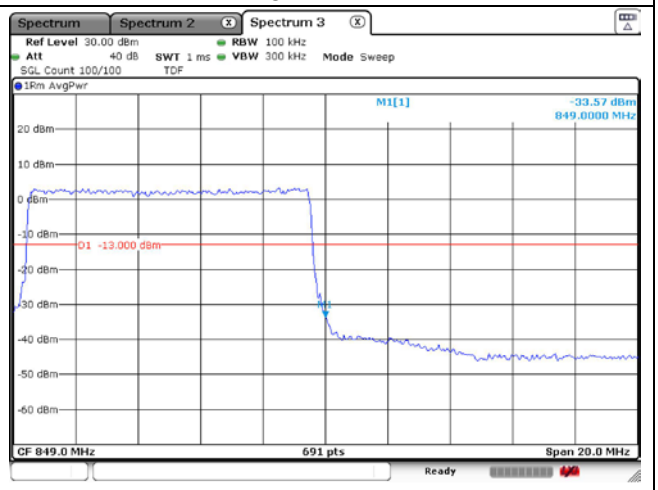
QPSK Low Channel - 1 RB



QPSK High Channel - 1 RB

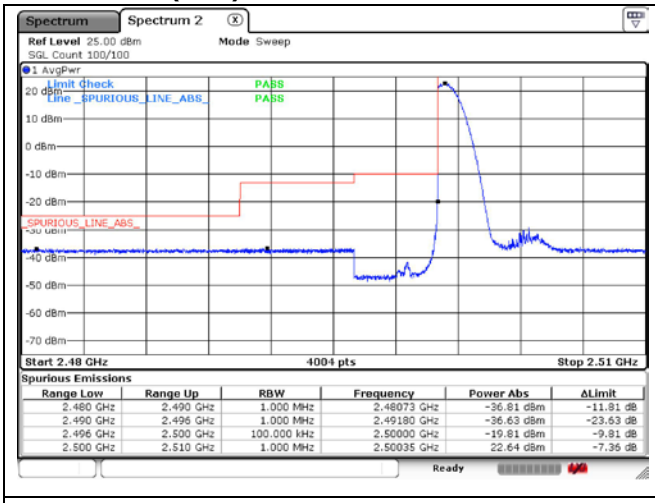


QPSK Low Channel - Full RB

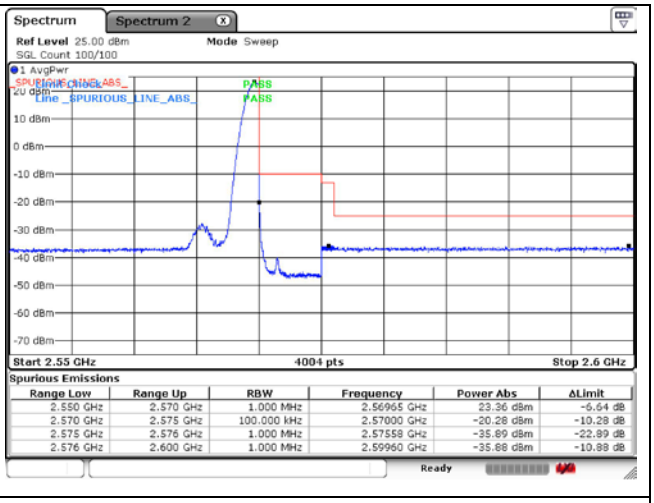


QPSK High Channel - Full RB

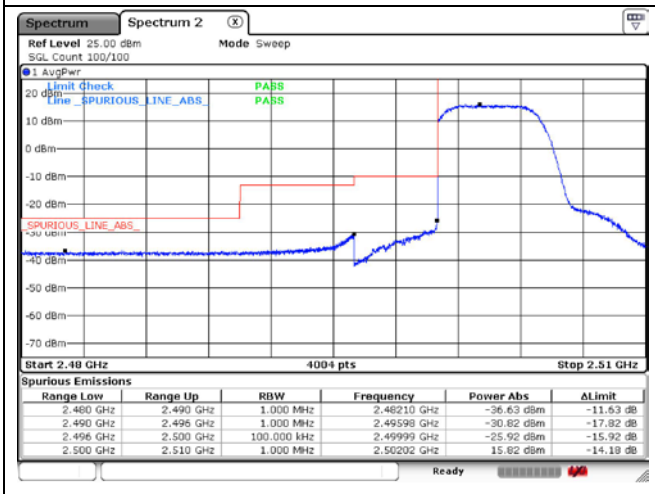
LTE band 7 (5 ㎒)



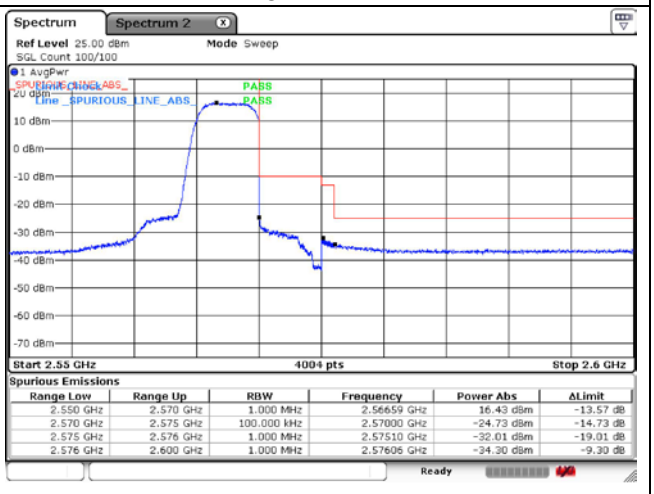
QPSK Low Channel - 1 RB



QPSK High Channel - 1 RB

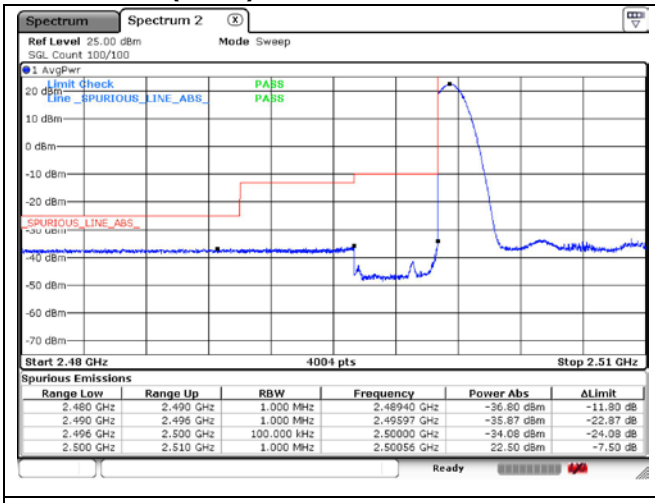


QPSK Low Channel - Full RB

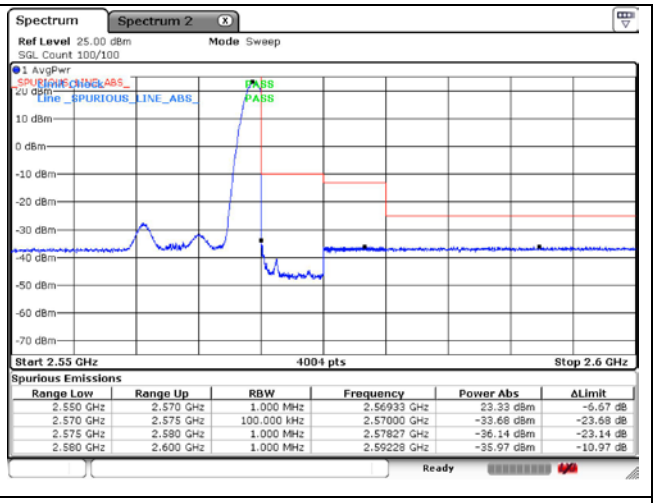


QPSK High Channel - Full RB

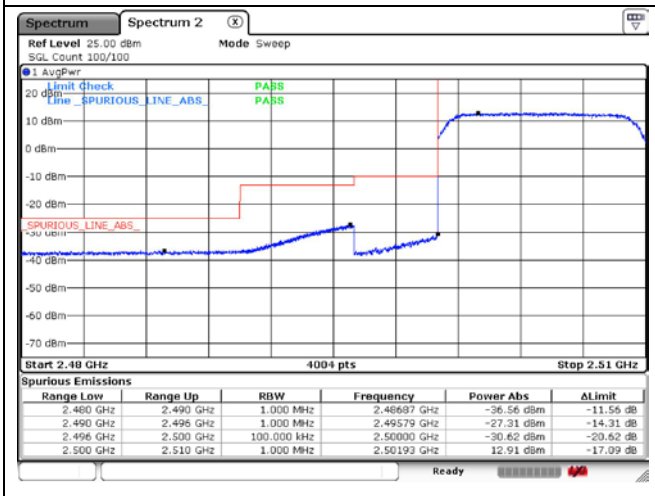
LTE band 7 (10 ㎒)



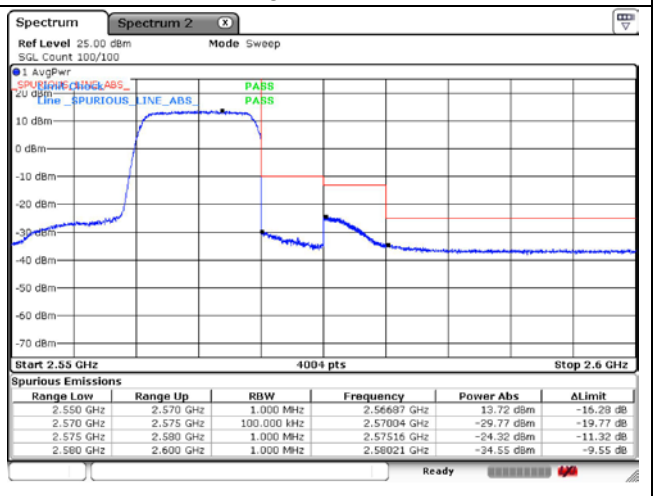
QPSK Low Channel - 1 RB



QPSK High Channel - 1 RB

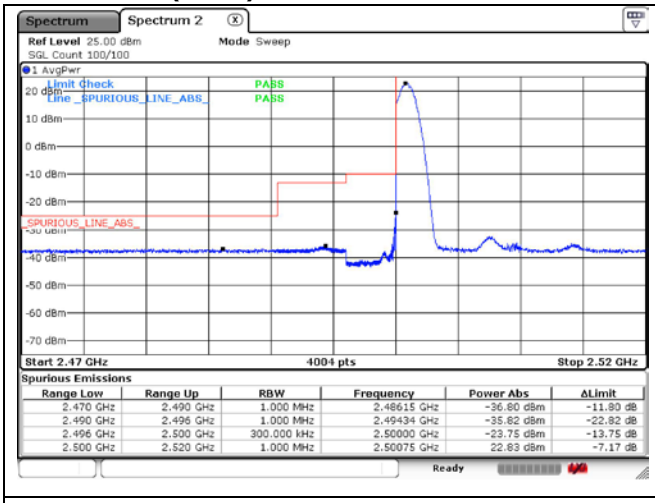


QPSK Low Channel - Full RB

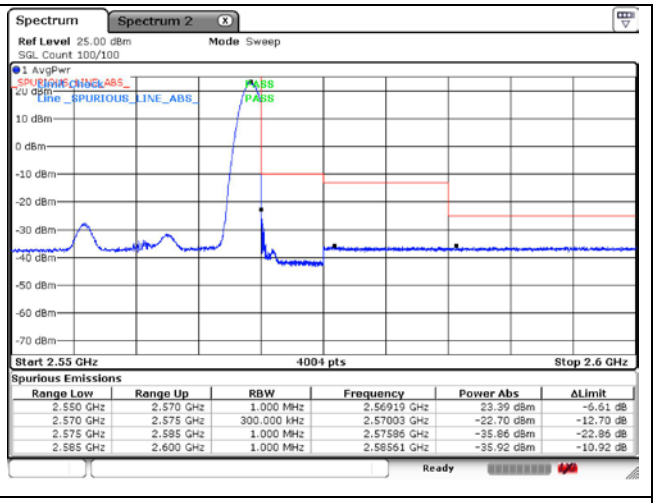


QPSK High Channel - Full RB

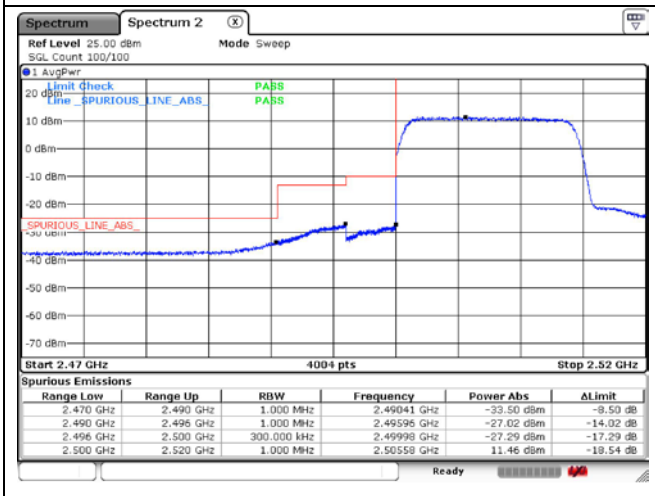
LTE band 7 (15 ㎒)



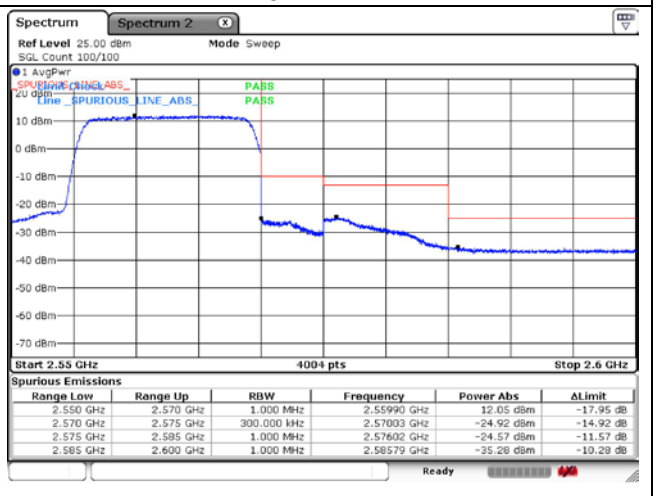
QPSK Low Channel - 1 RB



QPSK High Channel - 1 RB

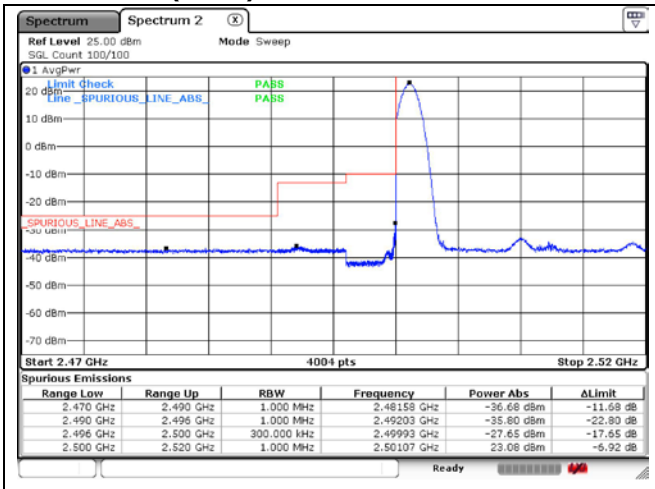


QPSK Low Channel - Full RB

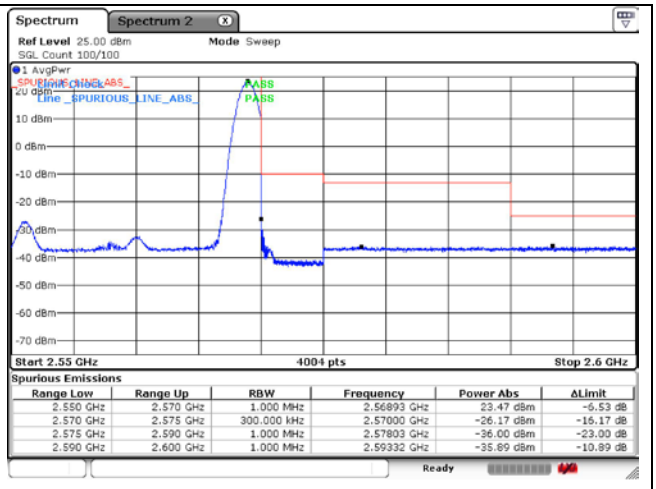


QPSK High Channel - Full RB

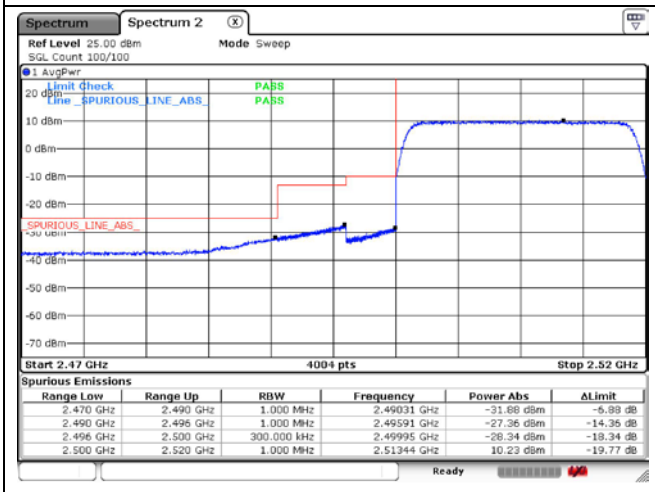
LTE band 7 (20 ㎒)



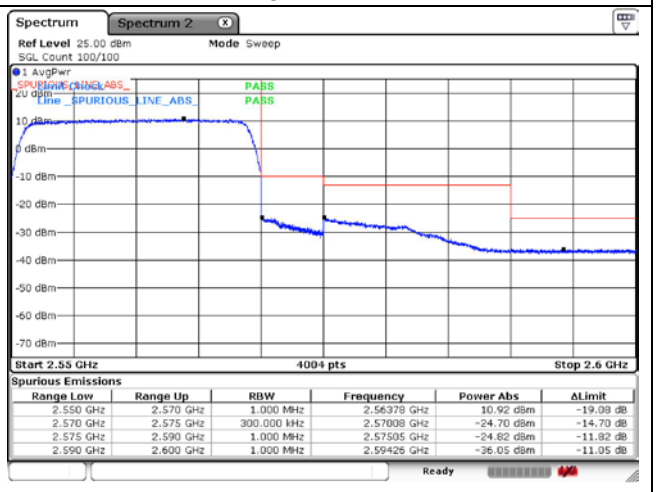
QPSK Low Channel - 1 RB



QPSK High Channel - 1 RB

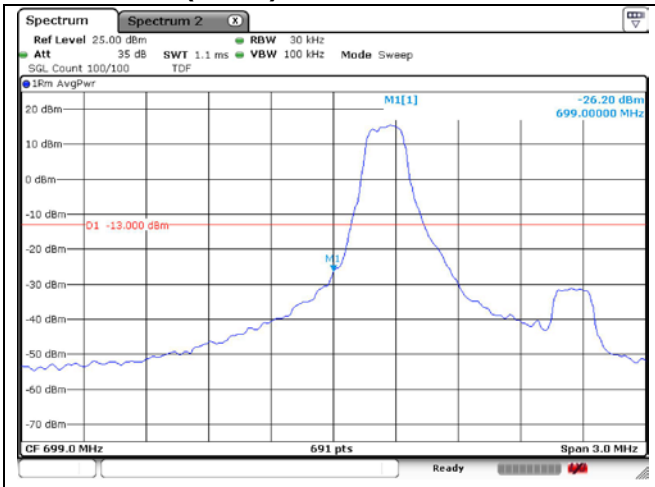


QPSK Low Channel - Full RB

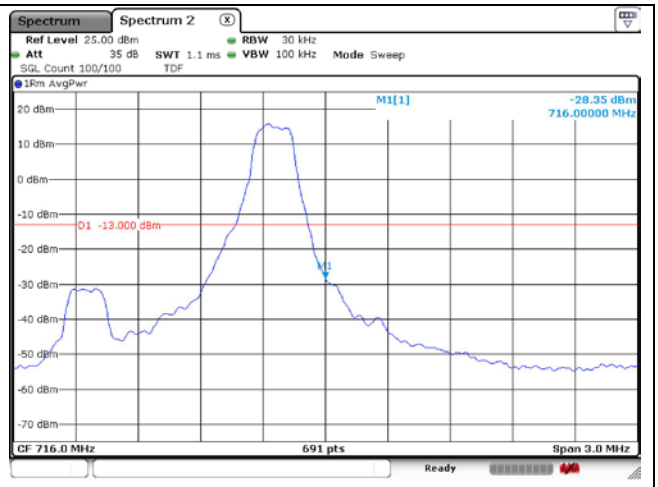


QPSK High Channel - Full RB

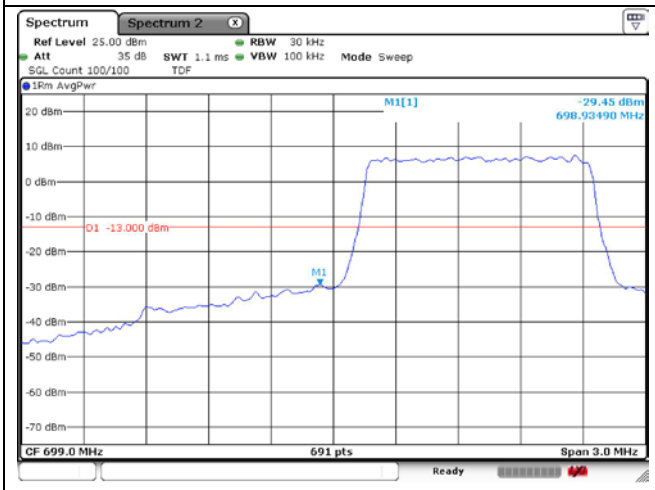
LTE band 12 (1.4 ㎒)



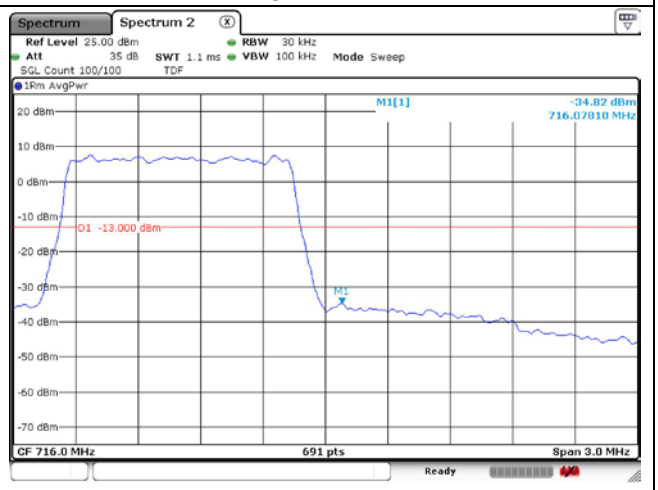
QPSK Low Channel - 1 RB



QPSK High Channel - 1 RB

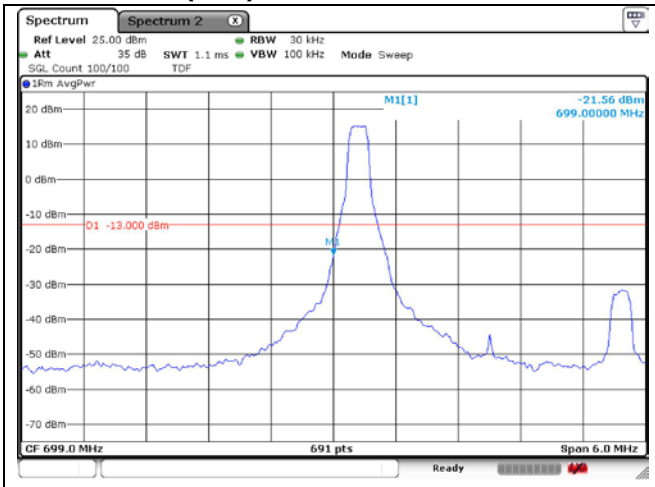


QPSK Low Channel - Full RB

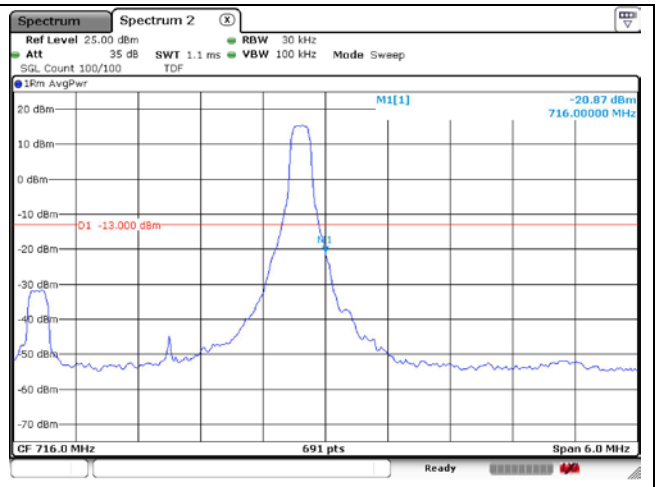


QPSK High Channel - Full RB

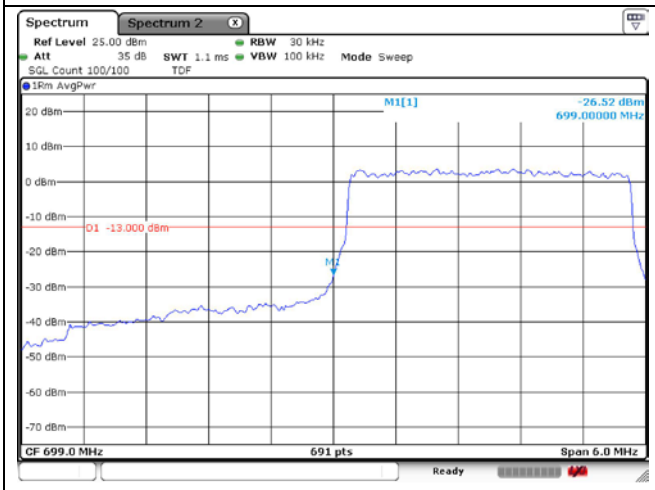
LTE band 12 (3 ㎒)



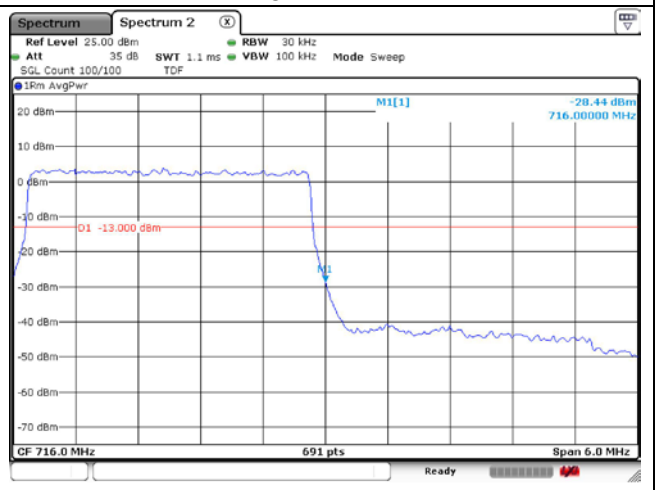
QPSK Low Channel - 1 RB



QPSK High Channel - 1 RB

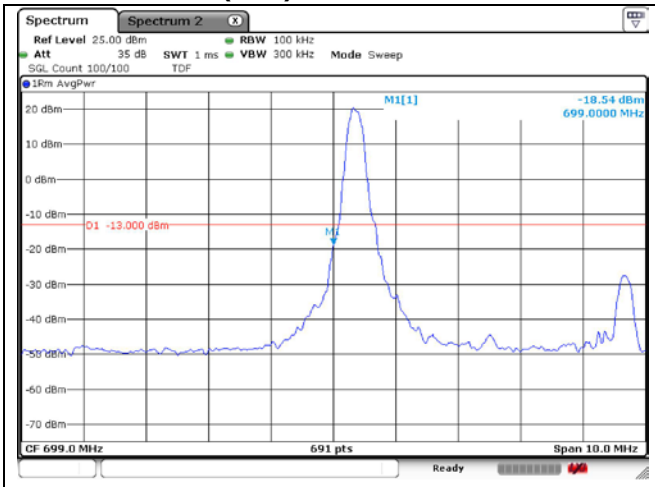


QPSK Low Channel - Full RB



QPSK High Channel - Full RB

LTE band 12/17 (5 ㎒)



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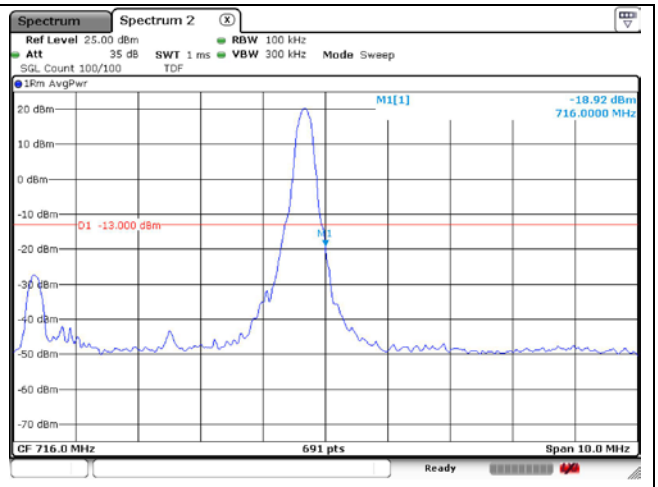
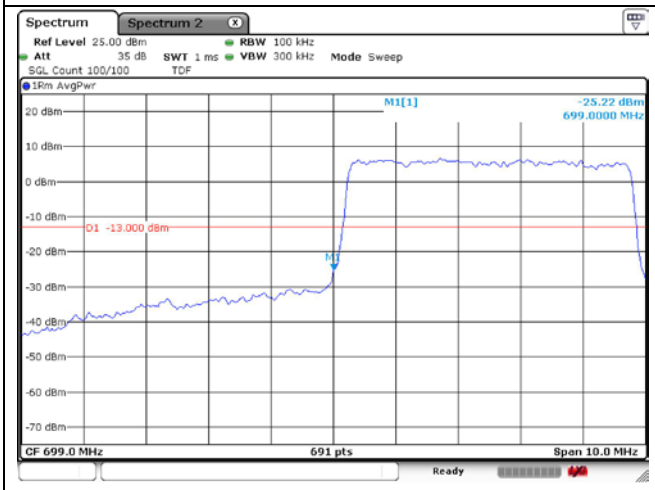
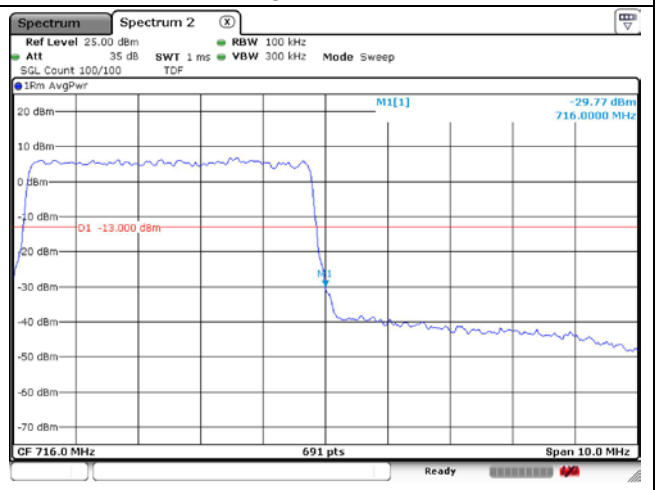


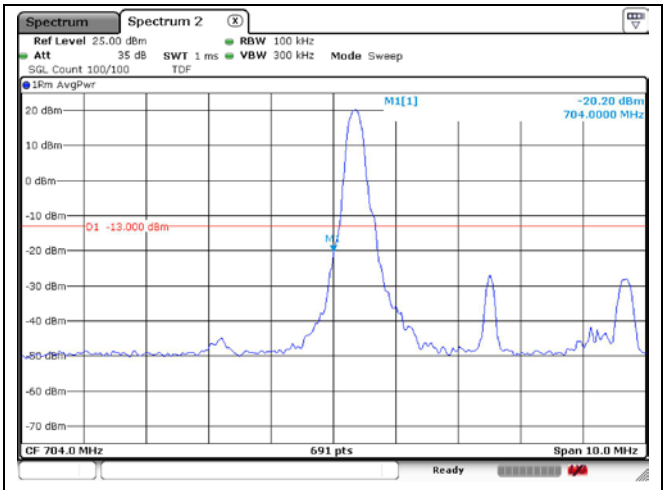
QPSK High Channel - 1 RB



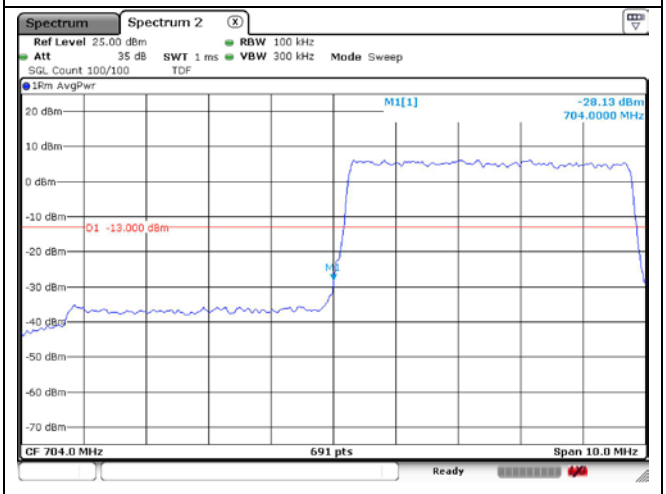
QPSK Low Channel - Full RB



QPSK High Channel - Full RB

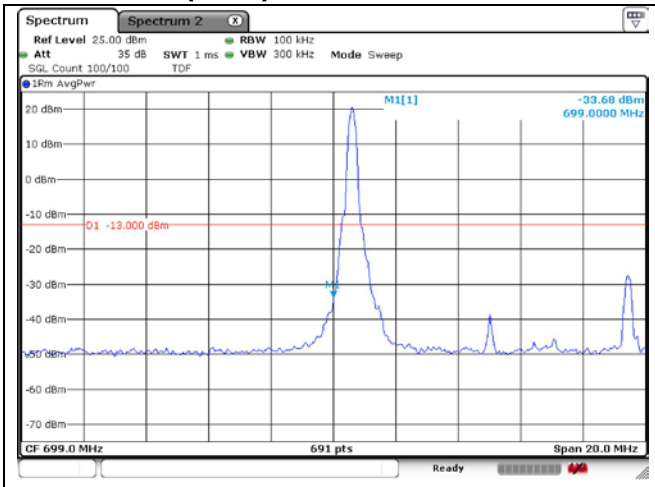


QPSK Low Channel - 1 RB

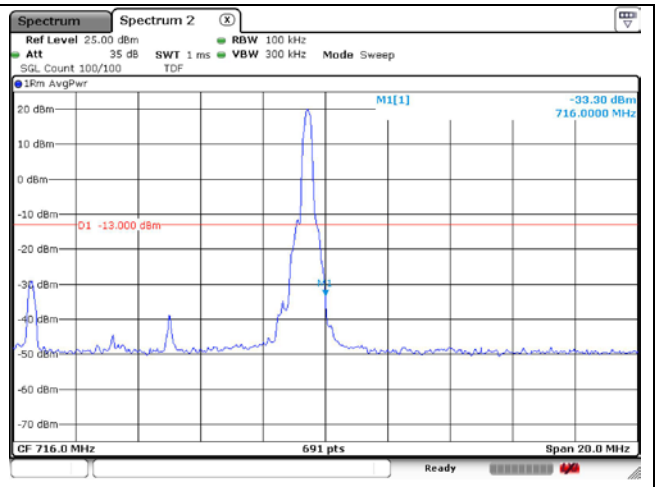


QPSK Low Channel - Full RB

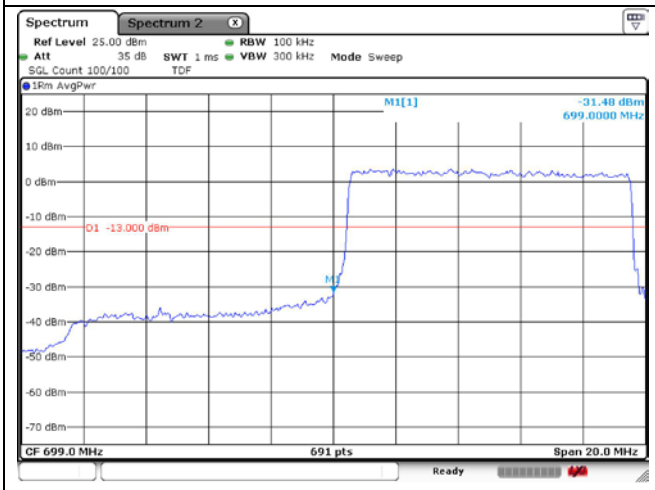
LTE band 12 (10 ㎒)



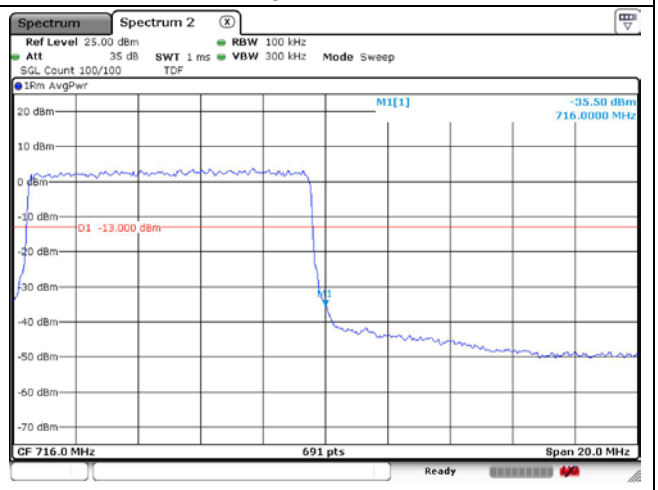
QPSK Low Channel - 1 RB



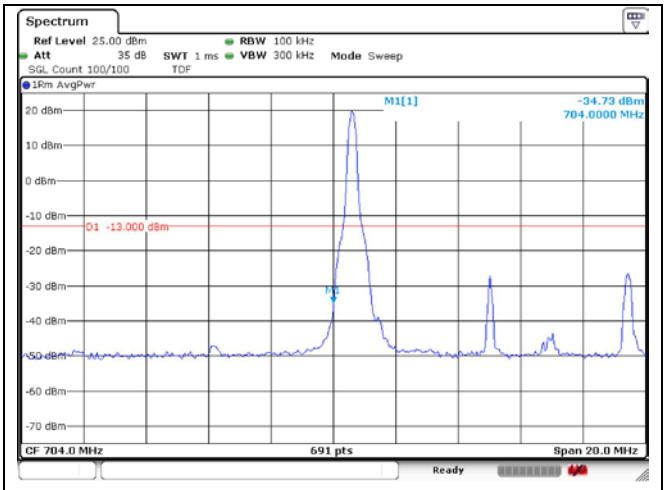
QPSK High Channel - 1 RB



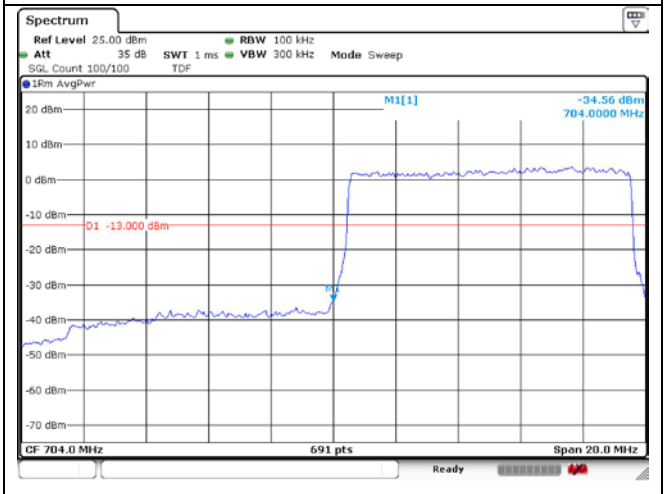
QPSK Low Channel - Full RB



QPSK High Channel - Full RB

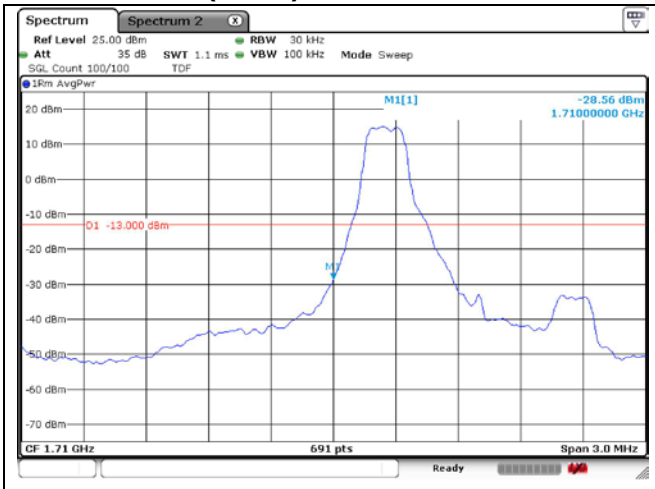


QPSK Low Channel - 1 RB

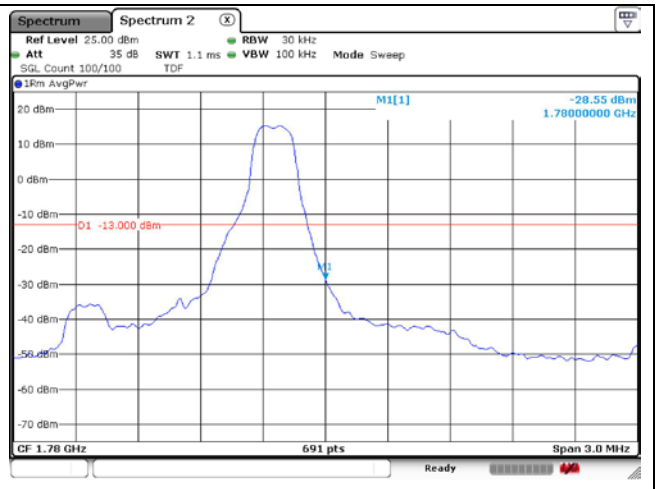


QPSK Low Channel - Full RB

LTE band 66/4 (1.4 ㎒)



QPSK Low Channel - 1 RB



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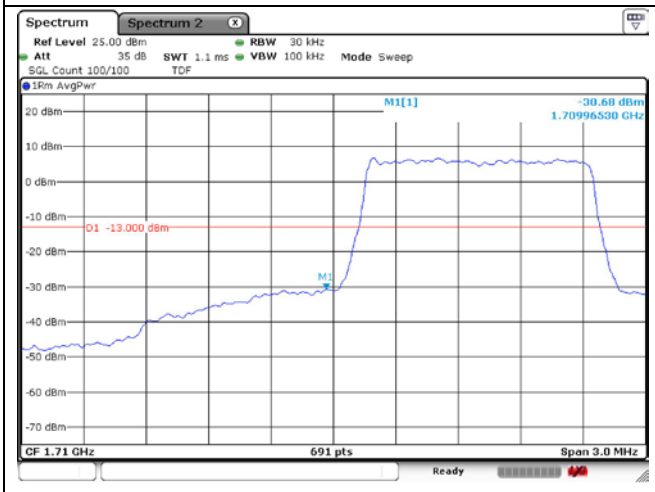
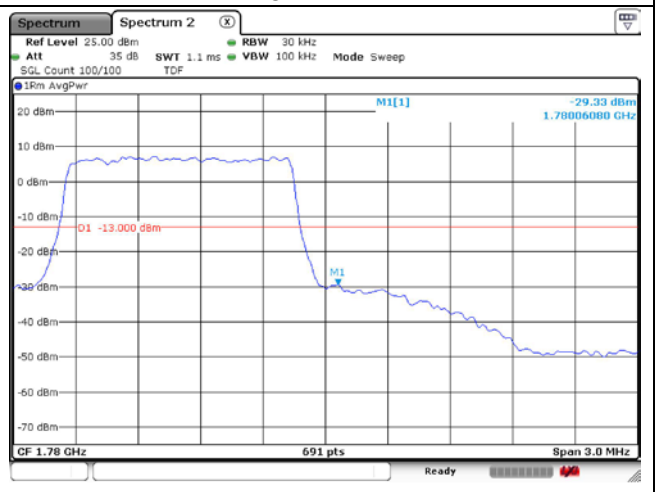
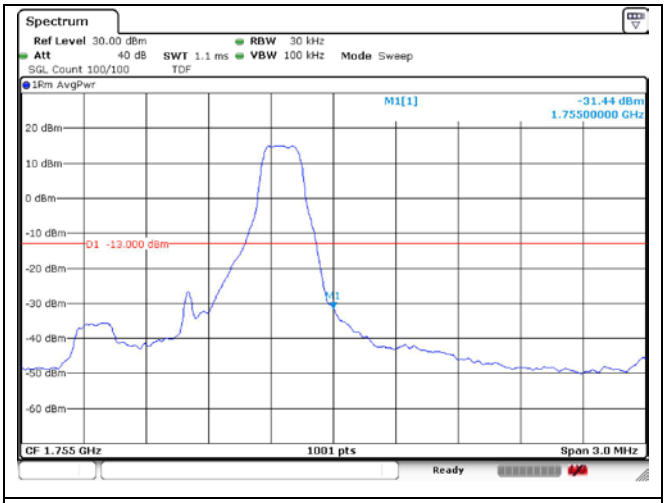


QPSK Low Channel - Full RB



QPSK High Channel - Full RB



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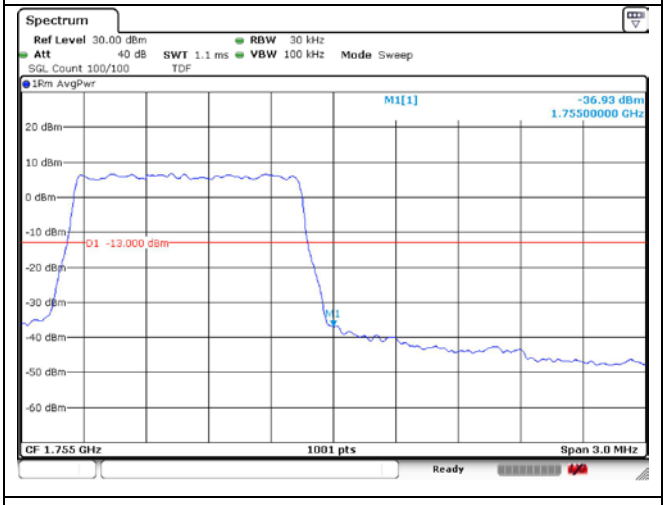
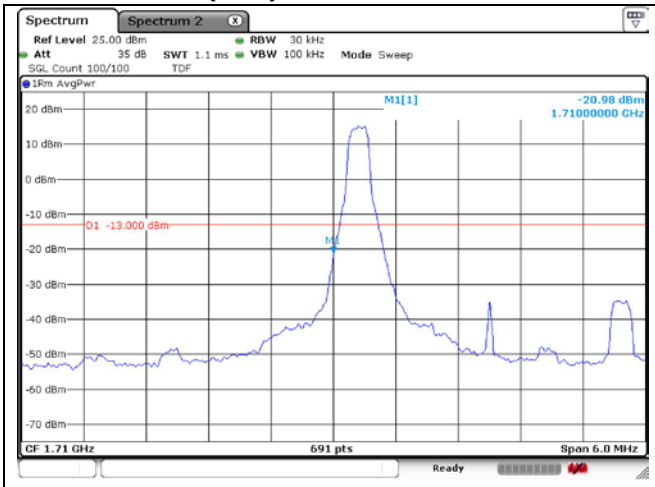
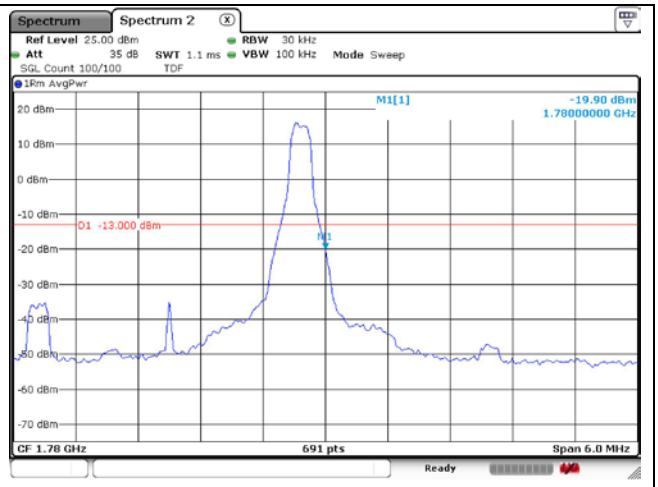


QPSK High Channel - Full RB

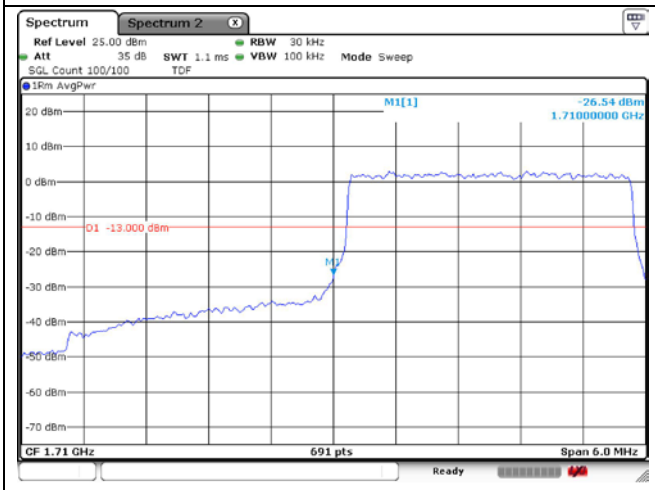
LTE band 66/4 (3 ㎒)



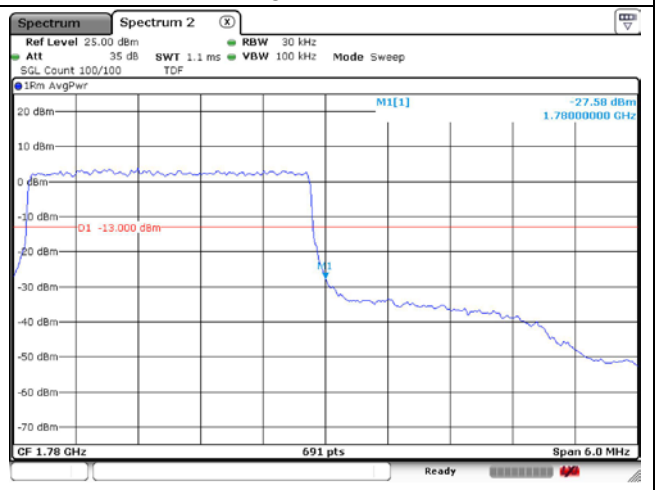
QPSK Low Channel - 1 RB



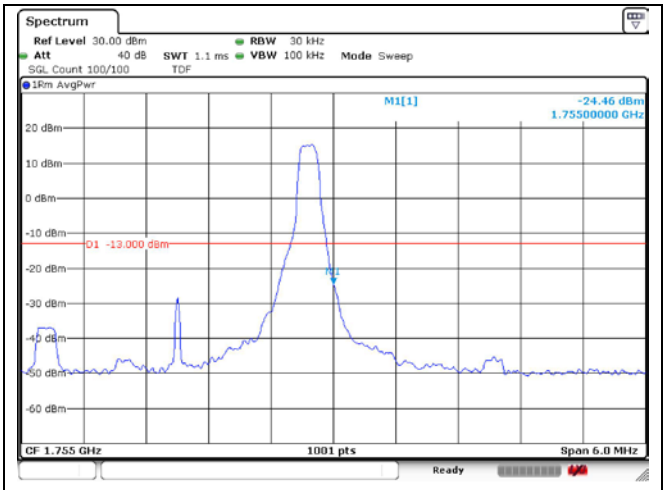
QPSK High Channel - 1 RB



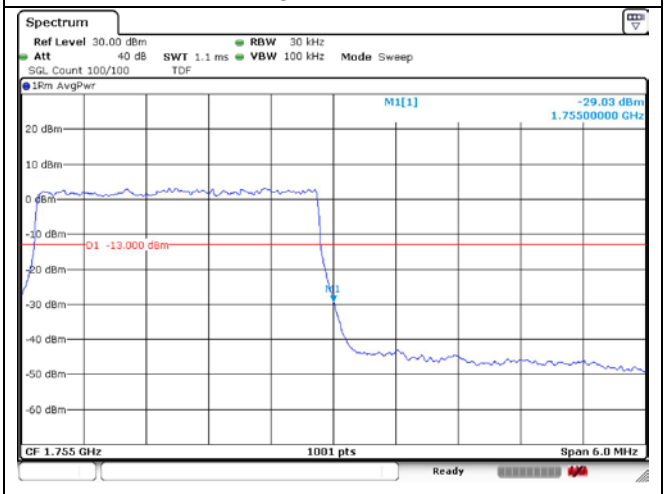
QPSK Low Channel - Full RB



QPSK High Channel - Full RB

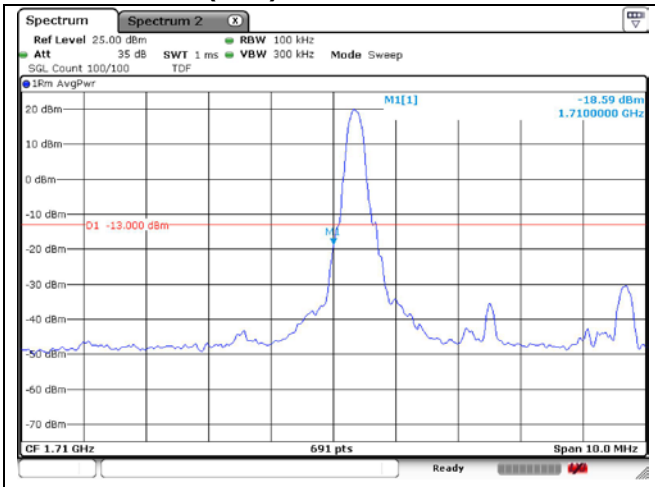


QPSK High Channel - 1 RB

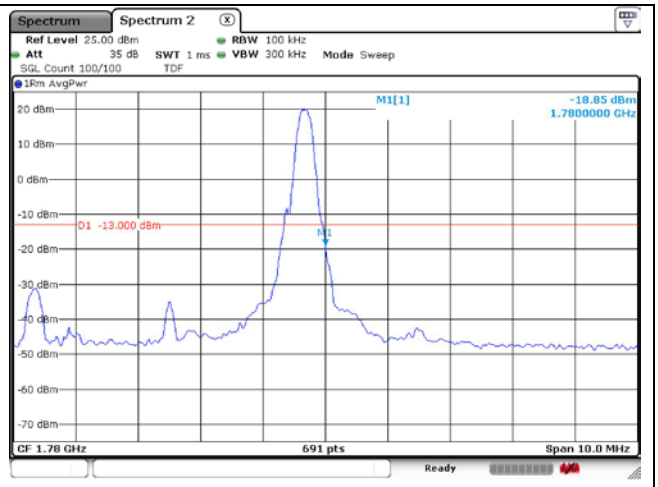


QPSK High Channel - Full RB

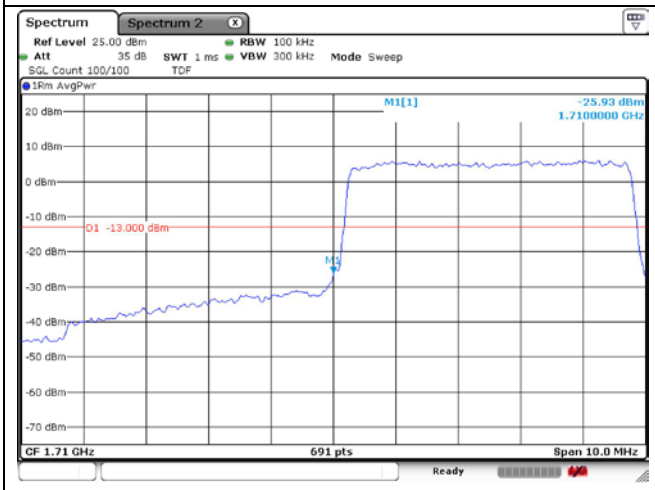
LTE band 66/4 (5 ㎒)



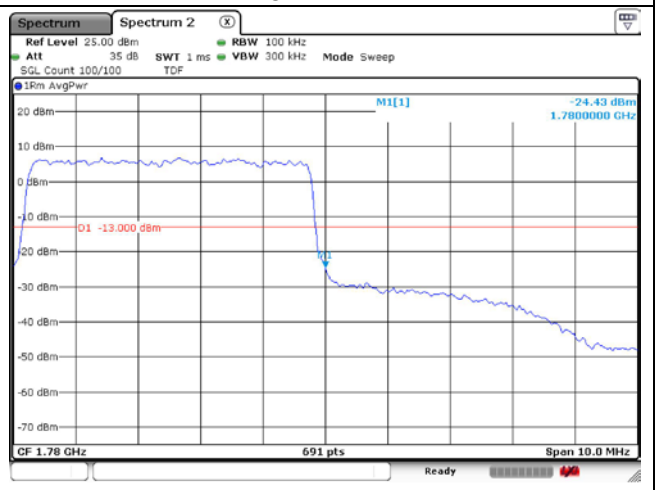
QPSK Low Channel - 1 RB



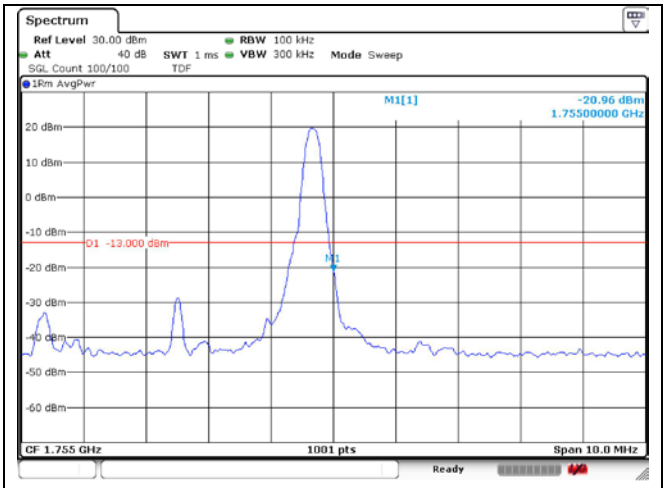
QPSK High Channel - 1 RB



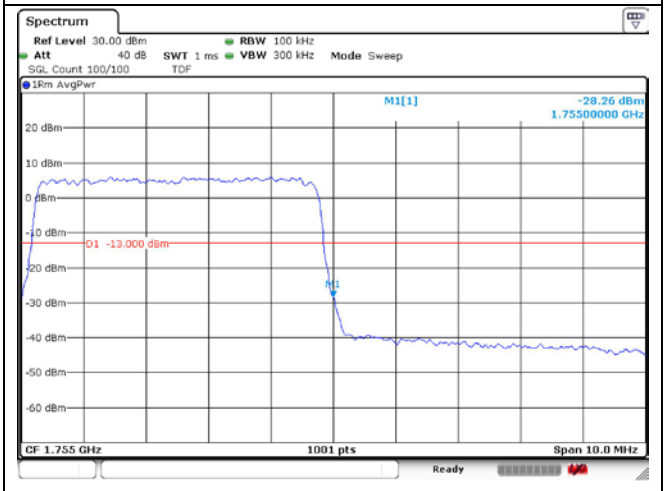
QPSK Low Channel - Full RB



QPSK High Channel - Full RB

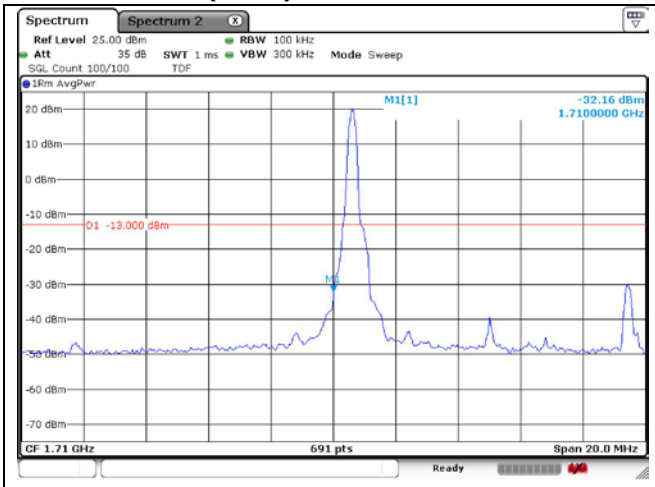


QPSK High Channel - 1 RB

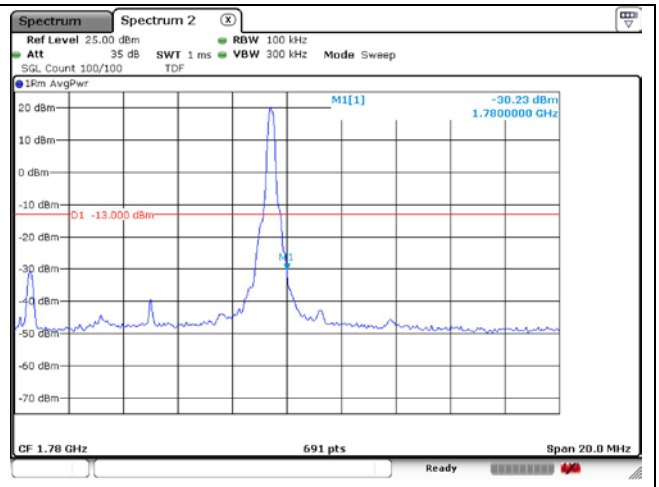


QPSK High Channel - Full RB

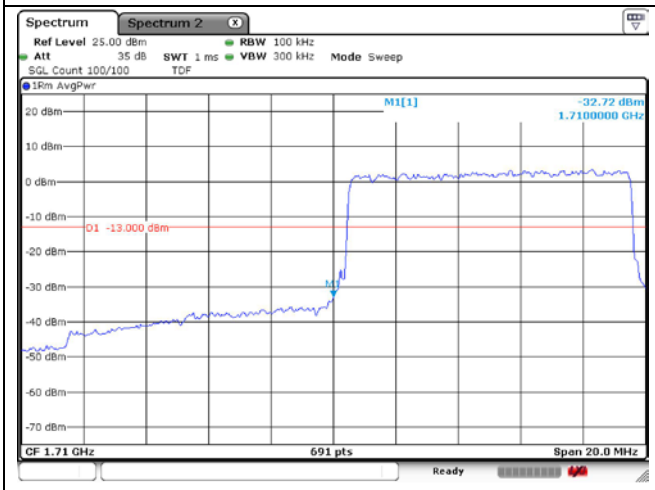
LTE band 66/4 (10 ㎒)



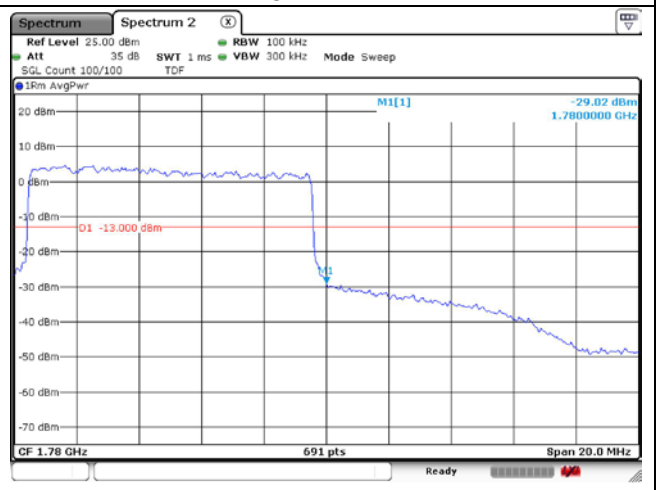
QPSK Low Channel - 1 RB



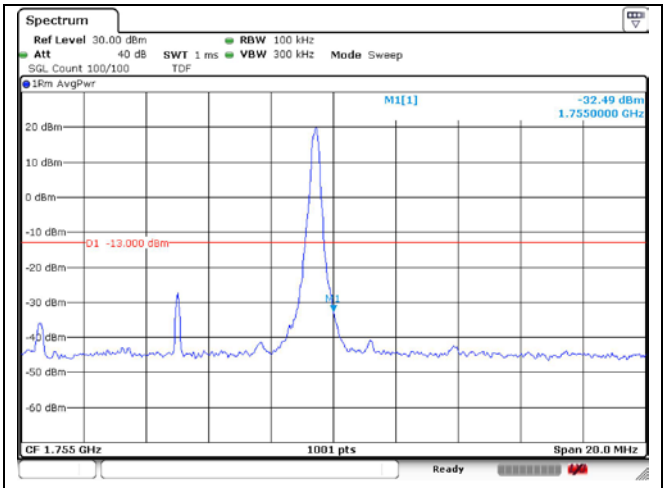
QPSK High Channel - 1 RB



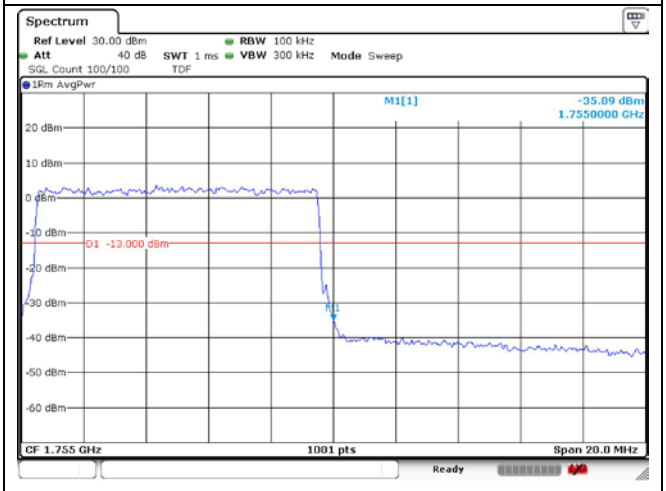
QPSK Low Channel - Full RB



QPSK High Channel - Full RB

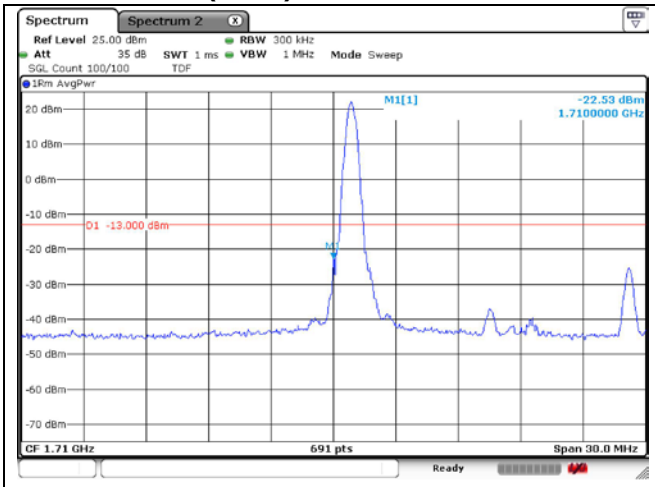


QPSK High Channel - 1 RB

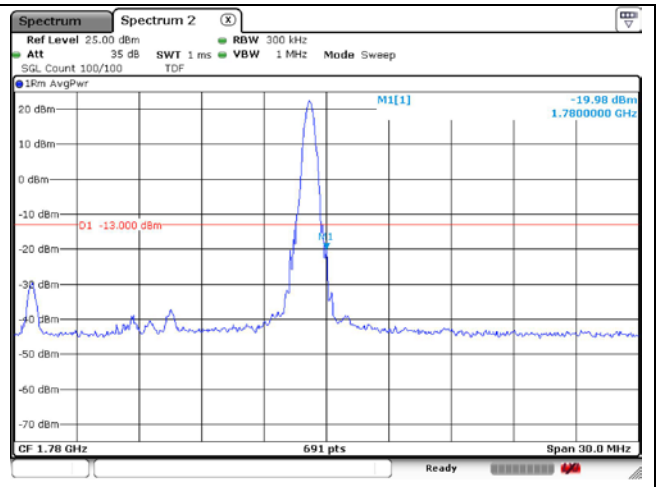


QPSK High Channel - Full RB

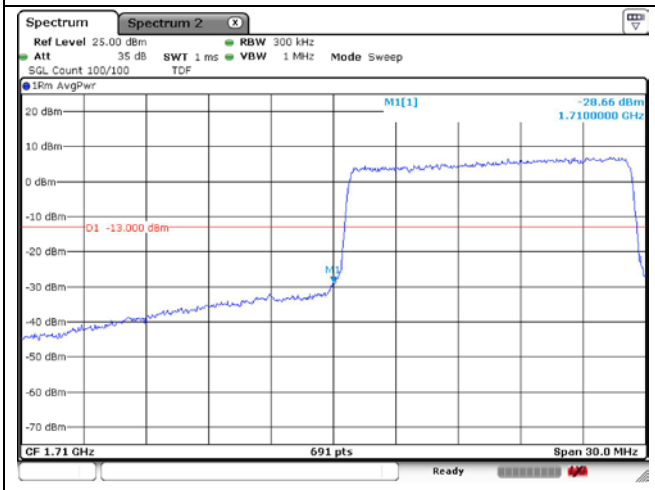
LTE band 66/4 (15 ㎒)



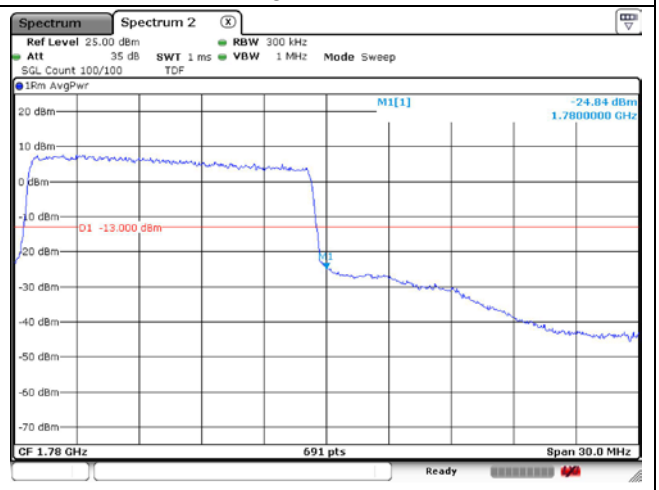
QPSK Low Channel - 1 RB



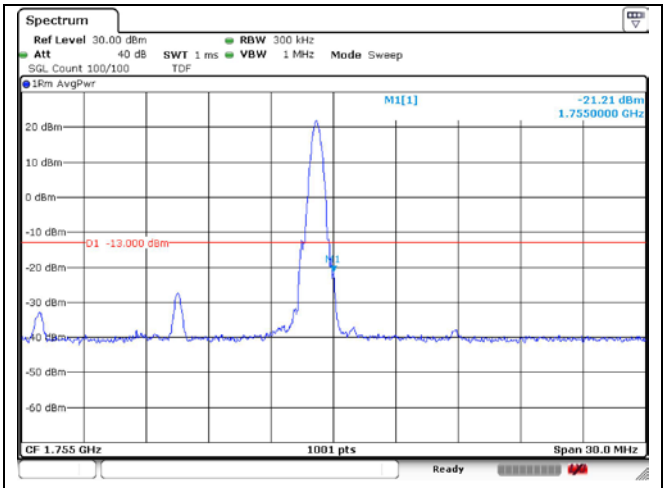
QPSK High Channel - 1 RB



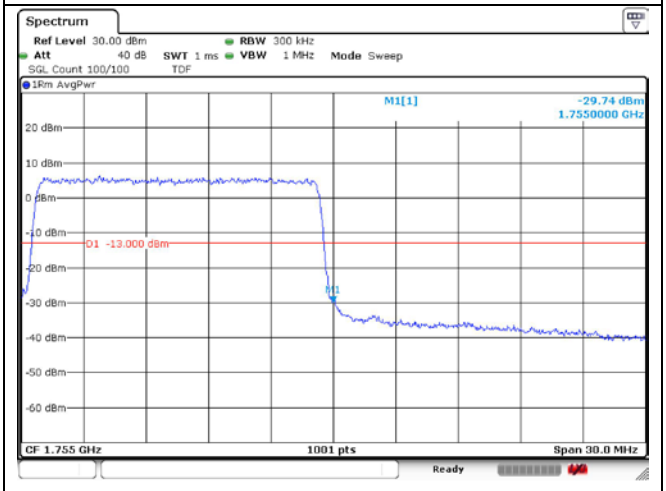
QPSK Low Channel - Full RB



QPSK High Channel - Full RB

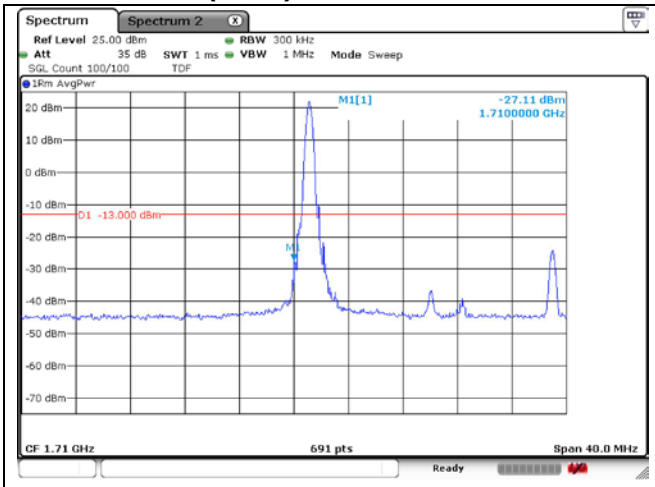


QPSK High Channel - 1 RB

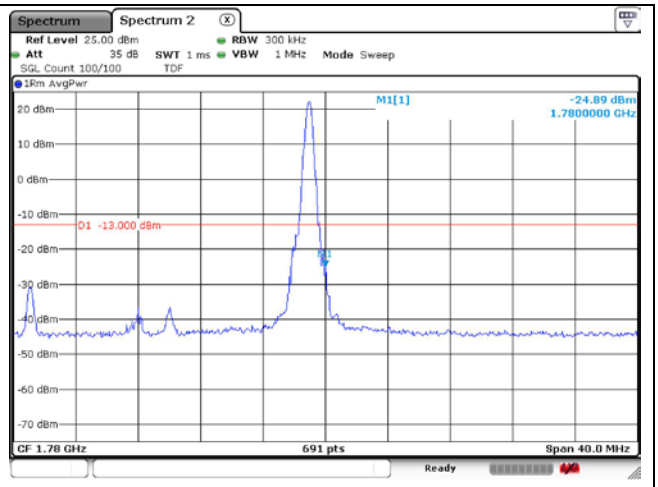


QPSK High Channel - Full RB

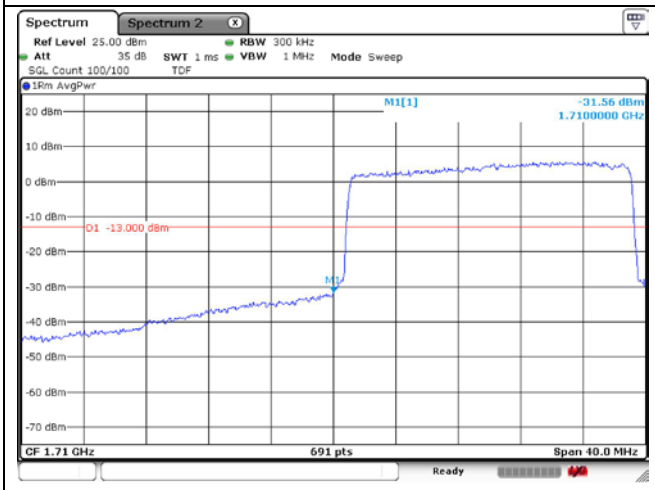
LTE band 66/4 (20 ㎒)



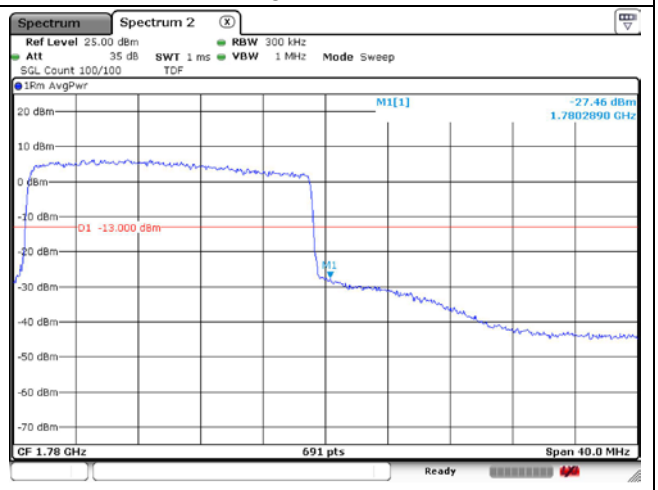
QPSK Low Channel - 1 RB



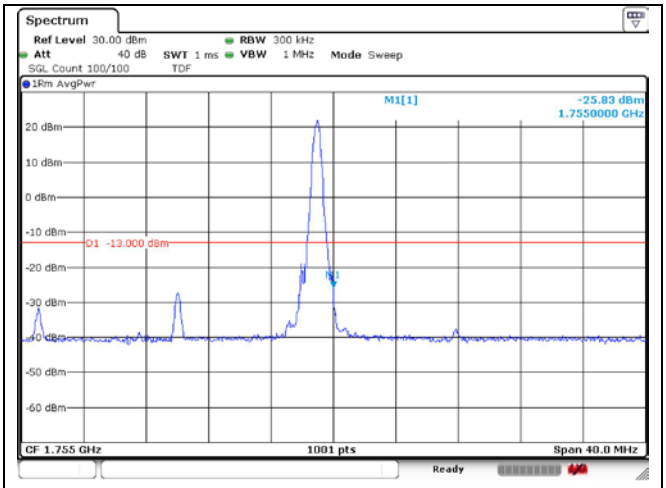
QPSK High Channel - 1 RB



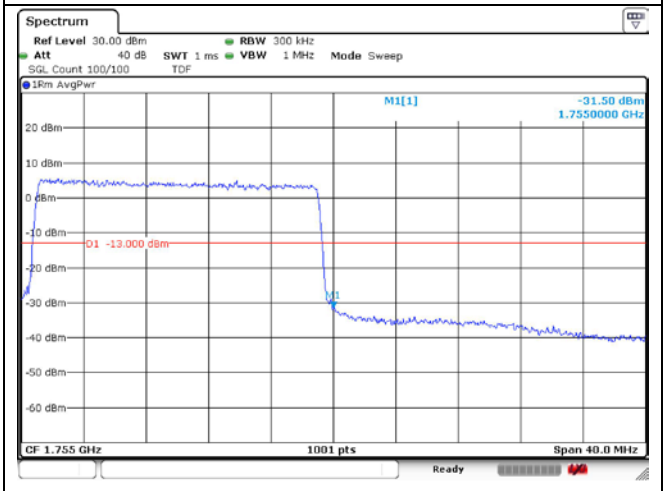
QPSK Low Channel - Full RB



QPSK High Channel - Full RB



QPSK High Channel - 1 RB



QPSK High Channel - Full RB

8. Frequency Stability

8.1. Limit

FCC
- § 2.1055 (a), § 2.1055 (d) & following:

- §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.

- §24.235, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

- §27.54, the frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

IC
- RSS-Gen Issue 5
6.11, for licensed devices, the following measurement conditions apply:
a. at the temperatures of -30°C (-22°F), +20°C (+68°F) and +50°C (+122°F), and at the manufacturer's rated supply voltage

- RSS-130 Issue 2
4.5, the transmitter frequency stability limit shall be determined as follows:

For equipment that is capable of transmitting numerous channels simultaneously for different applications (e.g. LTE and narrowband – internet of things (IoT)), the occupied bandwidth shall be the bandwidth representing the sum of the occupied bandwidths of these channels.

The frequency stability shall be sufficient to ensure that the occupied bandwidth remains within each frequency block range when tested at the temperature and supply voltage variations specified in RSS-Gen.

- RSS-132 Issue 3
5.3, the carrier frequency shall not depart from the reference frequency in excess of ±2.5 ppm for mobile stations and ±1.5 ppm for base stations.

- RSS-133 Issue 6
6.3, the carrier frequency shall not depart from the reference frequency, in excess of ±2.5 ppm for mobile stations and ±1.0 ppm for base stations.

- RSS-139 Issue 3
6.4, the frequency stability shall be sufficient to ensure that the occupied bandwidth stays within the operating frequency block when tested to the temperature and supply voltage variations specified in RSS-Gen.

- RSS-199 Issue 3
4.3, the transmitter frequency stability limit shall be determined as follows:

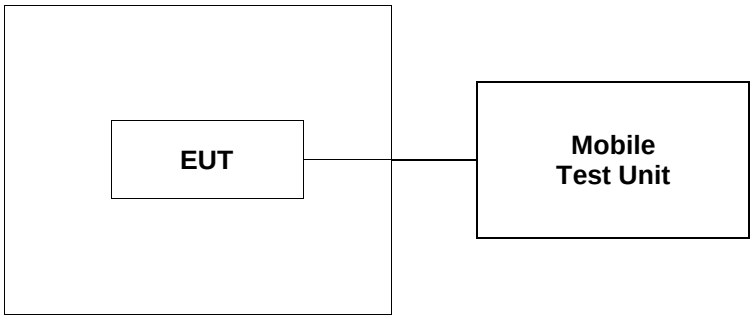
(a) the frequency offset shall be measured according to the procedure described in RSS-Gen and recorded.

(b) using a resolution bandwidth equal to that permitted within the 1 ㎒ band immediately outside the channel edge, as found in section 4.5, reference points will be selected at the unwanted emission limits, which comply with the attenuation specified in section 4.5 for the type of device under test, on the emission mask of the lowest and highest channels. The frequency at these points shall be recorded as f_L and f_H respectively.

The applicant shall ensure compliance with frequency stability requirements by showing that f_L minus the frequency offset and f_H plus the frequency offset is within the frequency range in which the equipment is designed to operate.

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

LTE band 2 at middle channel

Reference Frequency: 1 880.0 ㎒			
Frequency Stability versus Temperature			
Environment Temperature (℃)	**Power Supplied (V)**	**Frequency Measure with Time Elapse**	
		Frequency Error (㎐)	**ppm**
50	12.5	2.4	0.001 3
40		2.3	0.001 2
30		2.9	0.001 5
23		1.8	0.001 0
10		-1.8	-0.001 0
0		-2.3	-0.001 2
-10		2.0	0.001 1
-20		1.5	0.000 8
-30		1.0	0.000 5
Frequency Stability versus Power Supply			
Environment Temperature (℃)	**Power Supplied (V)**	**Frequency Measure with Time Elapse**	
		Frequency Error (㎐)	**ppm**
23	14.375	-1.3	-0.000 7
	10.625	-3.0	-0.001 6

LTE band 5 at middle channel

Reference Frequency: 836.5 ㎒			
Frequency Stability versus Temperature			
Environment Temperature (℃)	**Power Supplied (V)**	**Frequency Measure with Time Elapse**	
		Frequency Error (㎐)	**ppm**
50	12.5	2.0	0.002 4
40		-1.5	-0.001 8
30		-2.0	-0.002 4
23		1.6	0.001 9
10		2.4	0.002 9
0		3.1	0.003 7
-10		1.0	0.001 2
-20		3.8	0.004 5
-30		3.9	0.004 7
Frequency Stability versus Power Supply			
Environment Temperature (℃)	**Power Supplied (V)**	**Frequency Measure with Time Elapse**	
		Frequency Error (㎐)	**ppm**
23	14.375	2.1	0.002 5
	10.625	3.8	0.004 5

LTE band 7 at middle channel

Reference Frequency: 2 535.0 ㎒			
Frequency Stability versus Temperature			
Environment Temperature (℃)	**Power Supplied (V)**	**Frequency Measure with Time Elapse**	
		Frequency Error (㎐)	**ppm**
50	12.5	-3.3	-0.001 3
40		6.4	0.002 5
30		2.5	0.001 0
23		-2.2	-0.000 9
10		-1.4	-0.000 6
0		-3.1	-0.001 2
-10		-5.1	-0.002 0
-20		-3.2	-0.001 3
-30		5.3	0.002 1
Frequency Stability versus Power Supply			
Environment Temperature (℃)	**Power Supplied (V)**	**Frequency Measure with Time Elapse**	
		Frequency Error (㎐)	**ppm**
23	14.375	1.3	0.000 5
	10.625	5.2	0.002 1

LTE band 12/17 at middle channel

Reference Frequency: 707.5 ㎒			
Frequency Stability versus Temperature			
Environment Temperature (℃)	**Power Supplied (V)**	**Frequency Measure with Time Elapse**	
		Frequency Error (㎐)	**ppm**
50	12.5	1.3	0.001 8
40		-6.4	-0.009 0
30		1.1	0.001 6
23		3.2	0.004 5
10		-4.2	-0.005 9
0		-4.2	-0.005 9
-10		5.4	0.007 6
-20		1.3	0.001 8
-30		2.6	0.003 7
Frequency Stability versus Power Supply			
Environment Temperature (℃)	**Power Supplied (V)**	**Frequency Measure with Time Elapse**	
		Frequency Error (㎐)	**ppm**
23	14.375	4.3	0.006 1
	10.625	-3.2	-0.004 5

LTE band 66/4 at middle channel

Reference Frequency: 1 745.0 ㎒			
Frequency Stability versus Temperature			
Environment Temperature (℃)	**Power Supplied (V)**	**Frequency Measure with Time Elapse**	
		Frequency Error (㎐)	**ppm**
50	12.5	5.5	0.003 2
40		7.1	0.004 1
30		-2.3	-0.001 3
23		-1.5	-0.000 9
10		2.1	0.001 2
0		3.3	0.001 9
-10		-2.1	-0.001 2
-20		-4.4	-0.002 5
-30		-3.9	-0.002 2
Frequency Stability versus Power Supply			
Environment Temperature (℃)	**Power Supplied (V)**	**Frequency Measure with Time Elapse**	
		Frequency Error (㎐)	**ppm**
23	14.375	-4.4	-0.002 5
	10.625	1.5	0.000 9

- End of the Test Report -