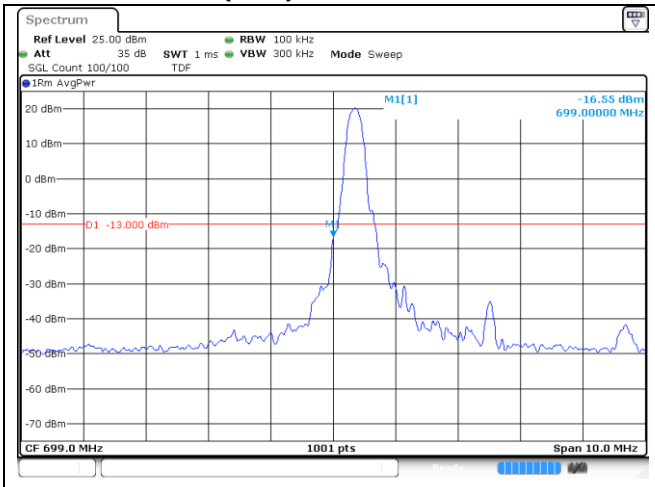
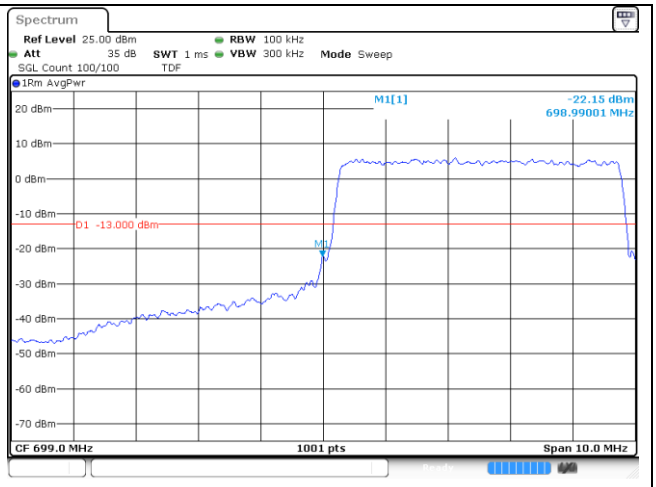
LTE band 12/17 (5 ㎒)

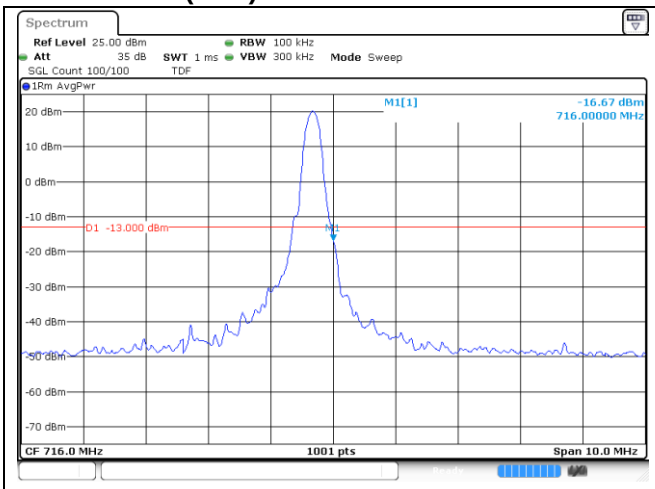


16QAM Low Channel - 1 RB

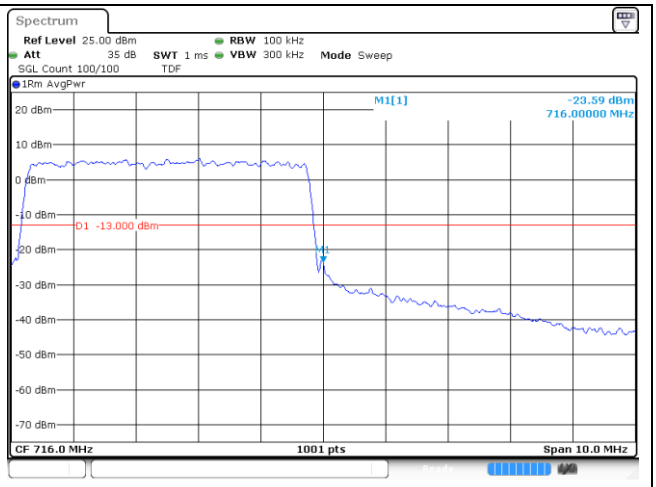


16QAM Low Channel - Full RB

LTE band 12 (5 ㎒)

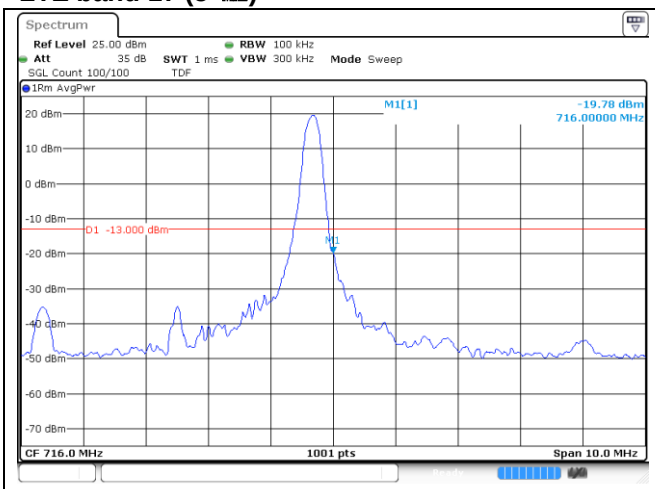


16QAM High Channel - 1 RB

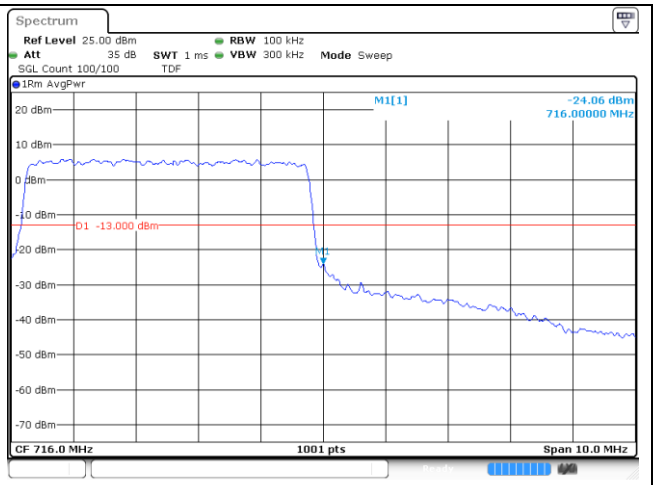


16QAM High Channel - Full RB

LTE band 17 (5 ㎒)

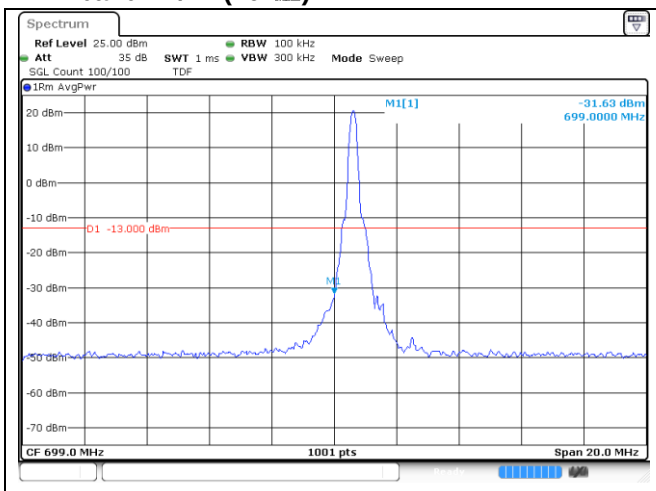


16QAM High Channel - 1 RB

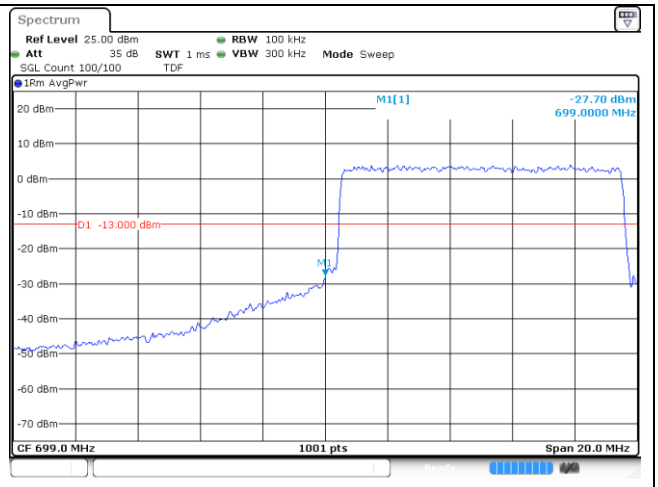


16QAM High Channel - Full RB

LTE band 12/17 (10 ㎒)

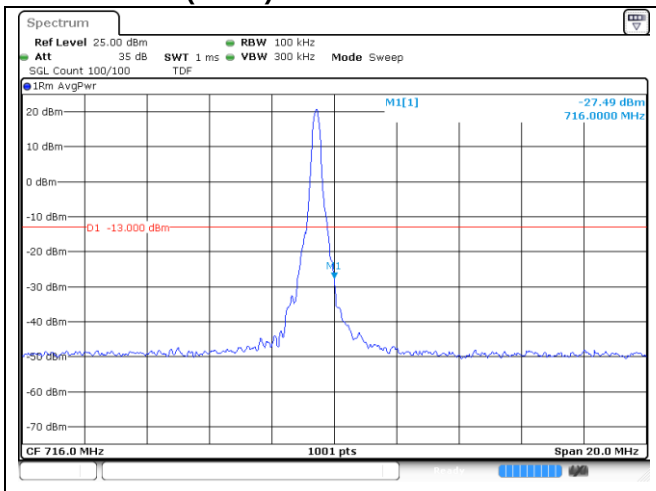


QPSK Low Channel - 1 RB

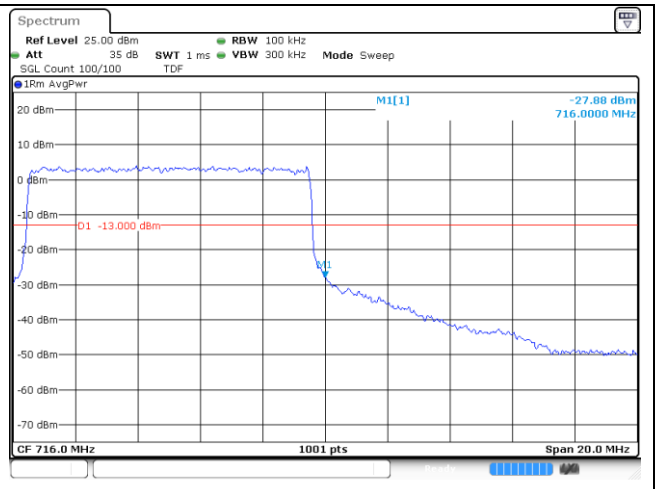


QPSK Low Channel - Full RB

LTE band 12 (10 ㎒)

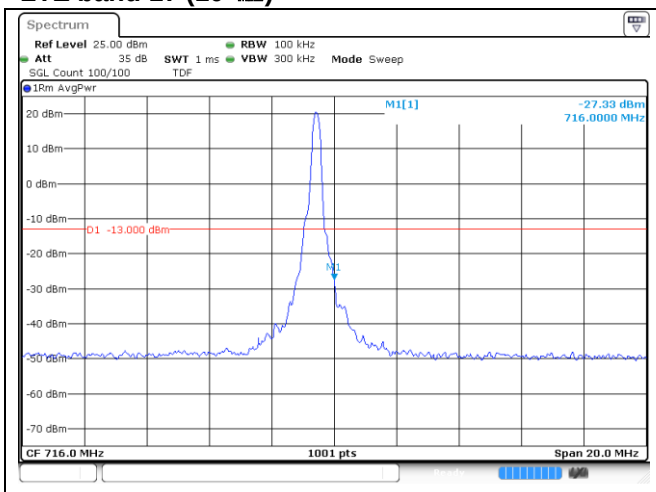


QPSK High Channel - 1 RB

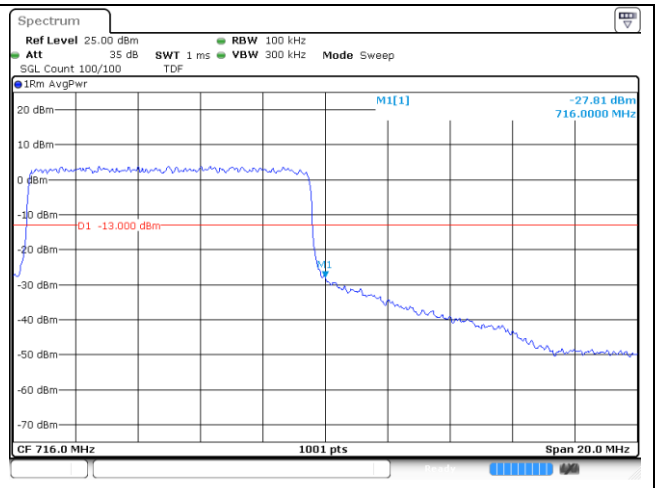


QPSK High Channel - Full RB

LTE band 17 (10 ㎒)

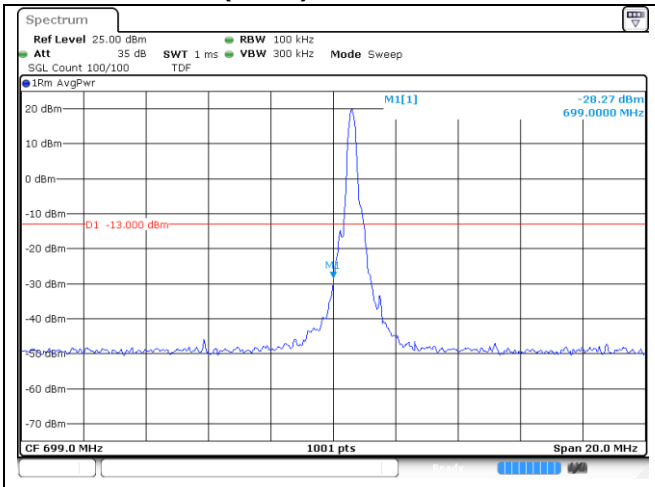


QPSK High Channel - 1 RB

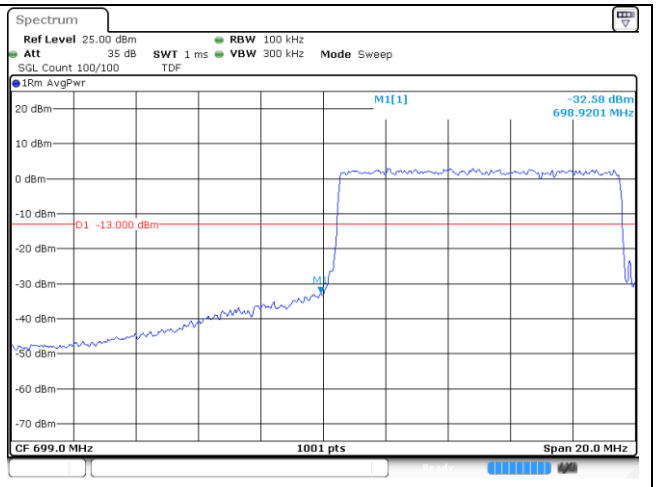


QPSK High Channel - Full RB

LTE band 12/17 (10 ㎒)

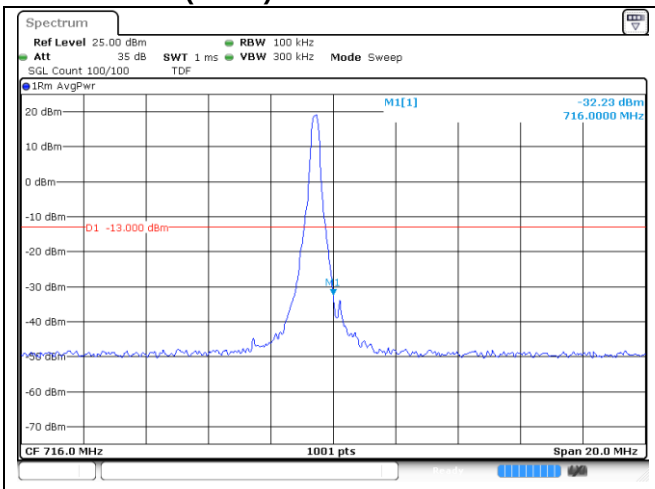


16QAM Low Channel - 1 RB

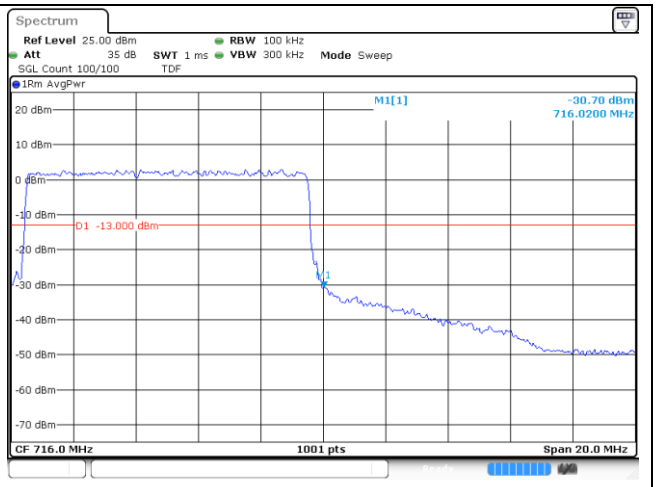


16QAM Low Channel - Full RB

LTE band 12 (10 ㎒)

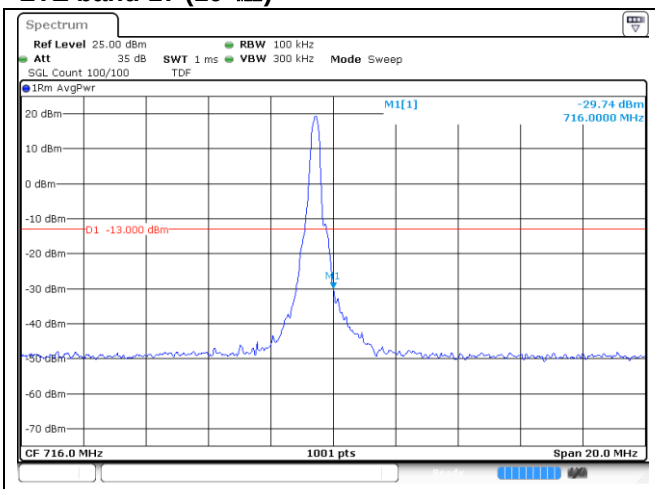


16QAM High Channel - 1 RB

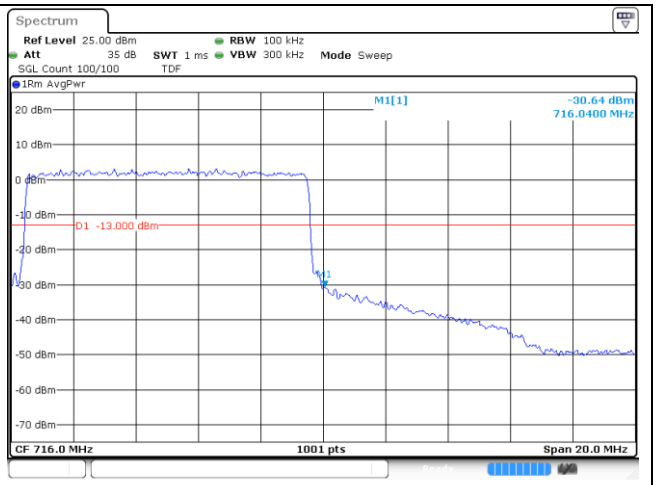


16QAM High Channel - Full RB

LTE band 17 (10 ㎒)

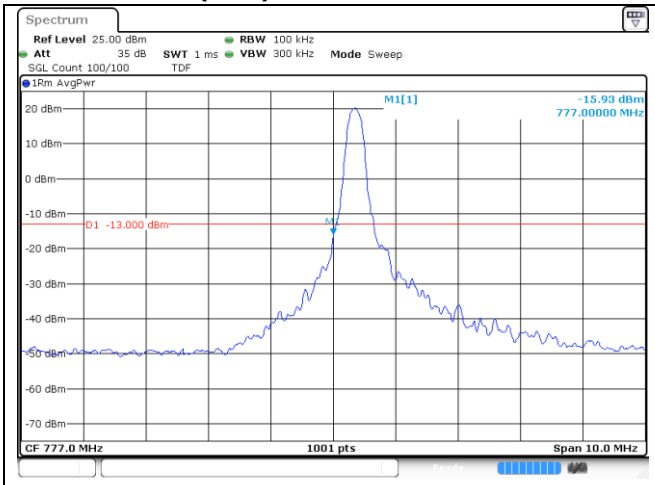


16QAM High Channel - 1 RB

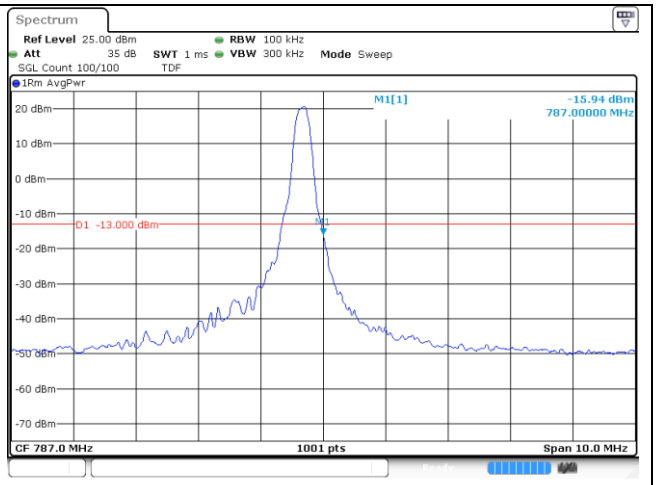


16QAM High Channel - Full RB

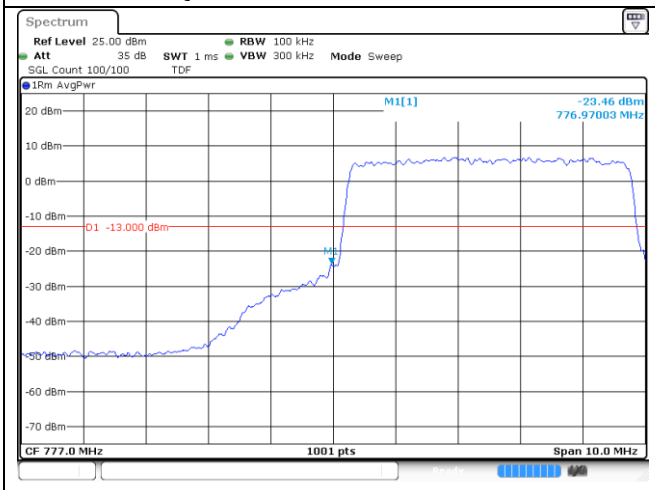
LTE band 13 (5 ㎒)



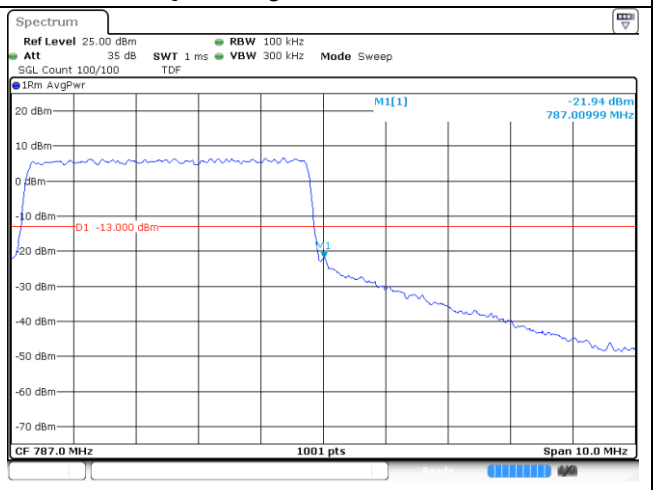
QPSK Low Channel - 1 RB



QPSK High Channel - 1 RB

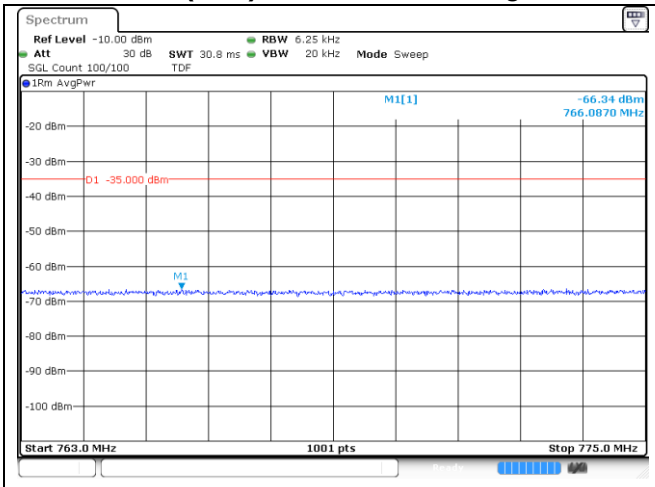


QPSK Low Channel - Full RB

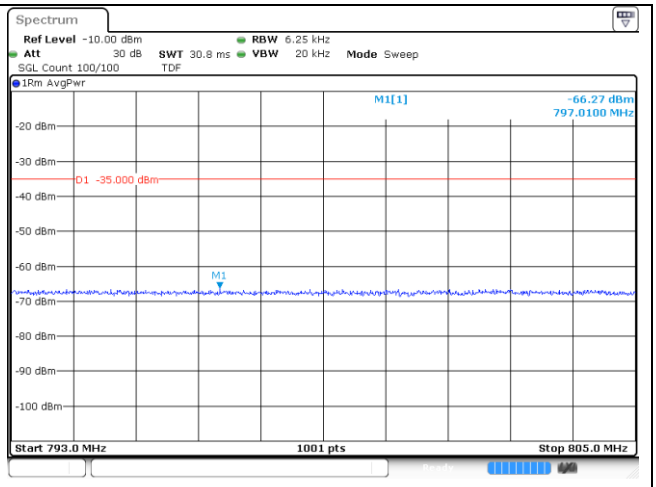


QPSK High Channel - Full RB

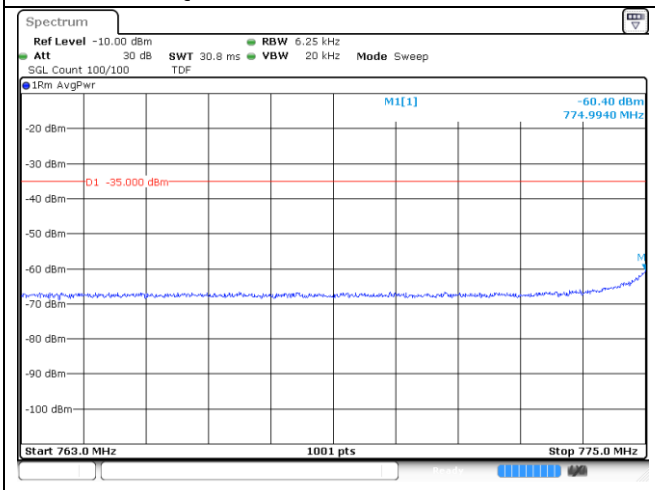
LTE band 13 (5 ㎒)_Extended Band edge



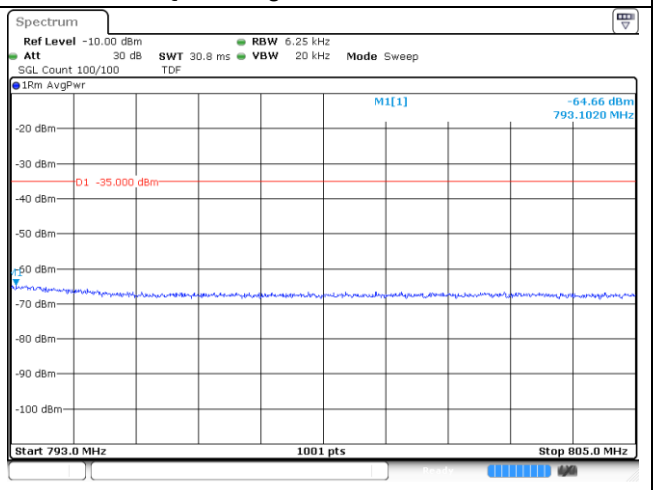
QPSK Low Channel - 1 RB



QPSK High Channel - 1 RB

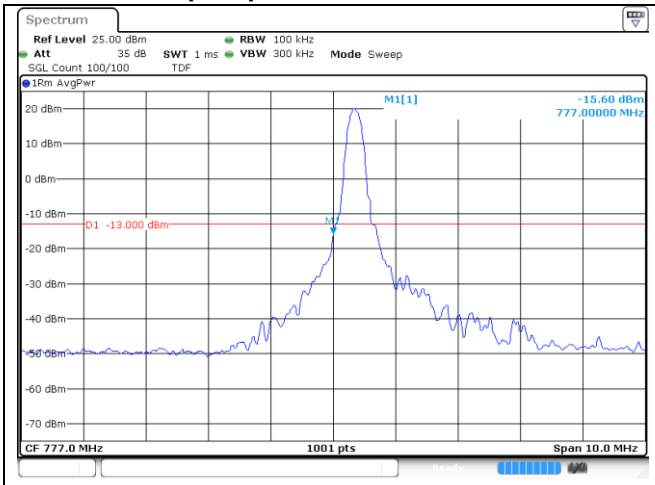


QPSK Low Channel - Full RB

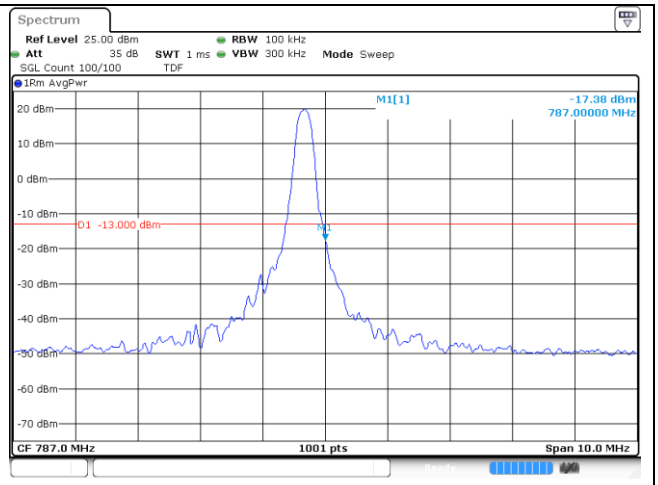


QPSK High Channel - Full RB

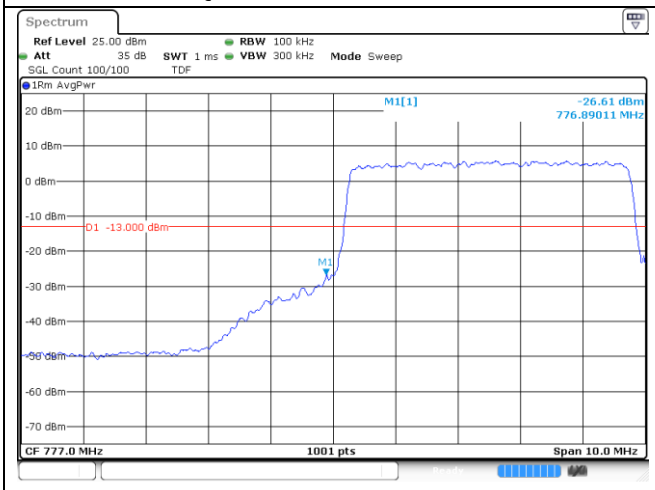
LTE band 13 (5 ㎒)



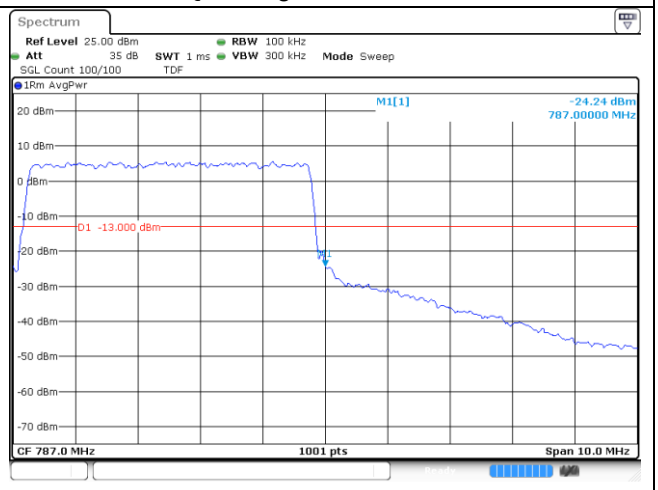
16QAM Low Channel - 1 RB



16QAM High Channel - 1 RB

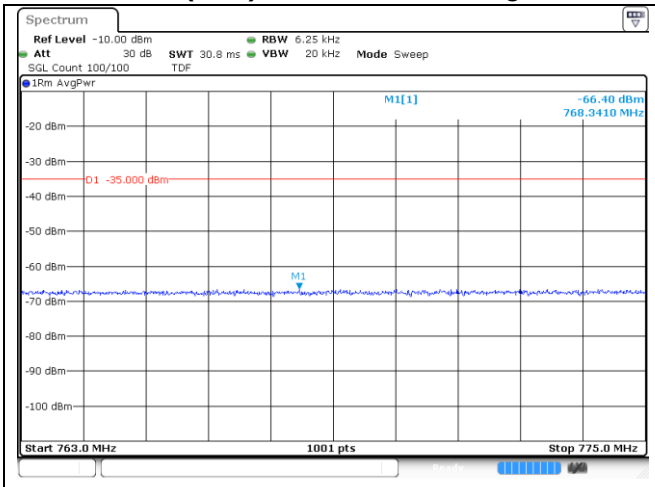


16QAM Low Channel - Full RB

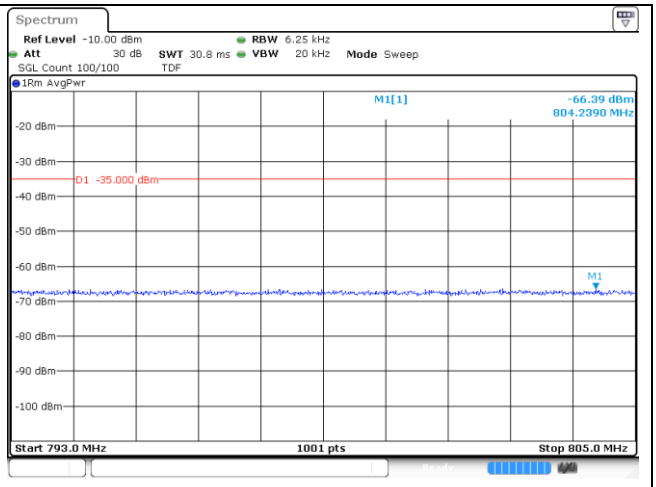


16QAM High Channel - Full RB

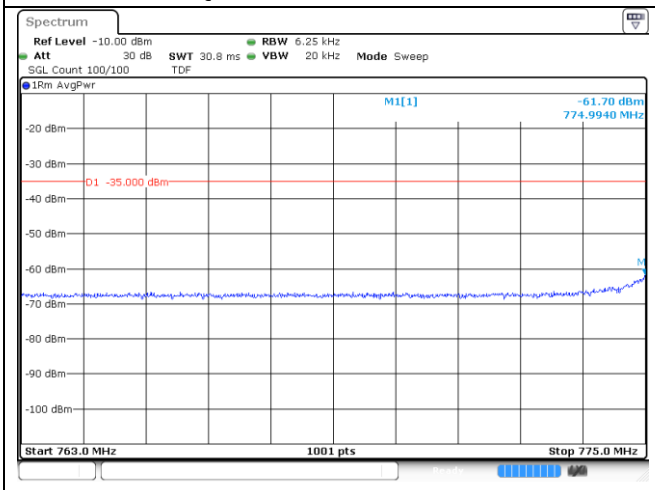
LTE band 13 (5 ㎒)_Extended Band edge



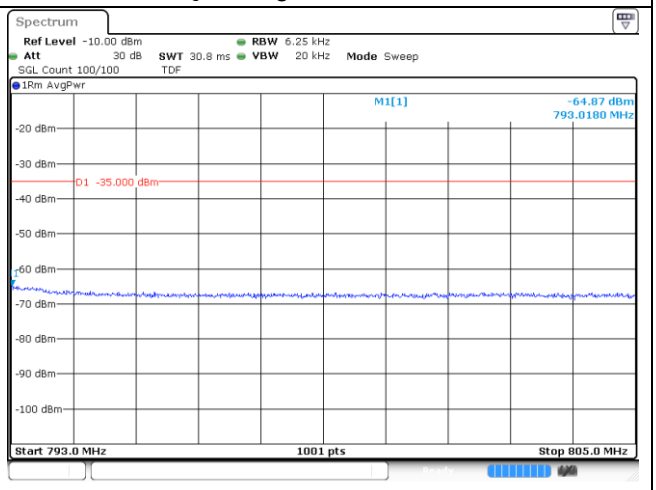
16QAM Low Channel - 1 RB



16QAM High Channel - 1 RB

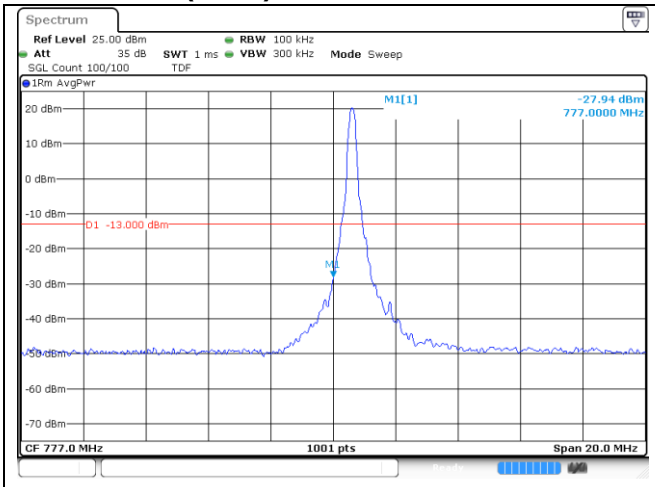


16QAM Low Channel - Full RB

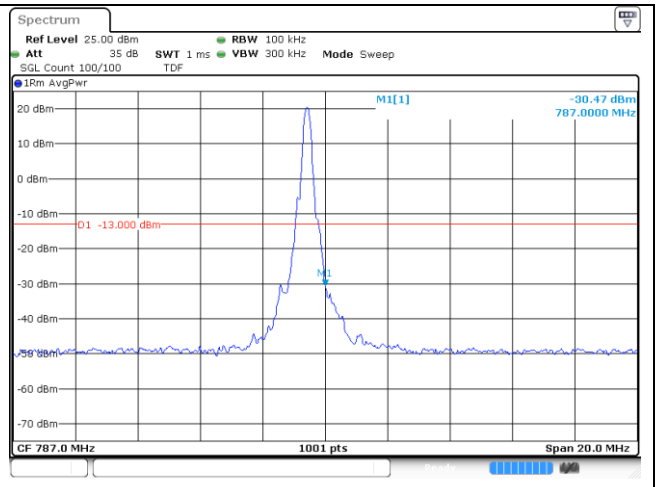


16QAM High Channel - Full RB

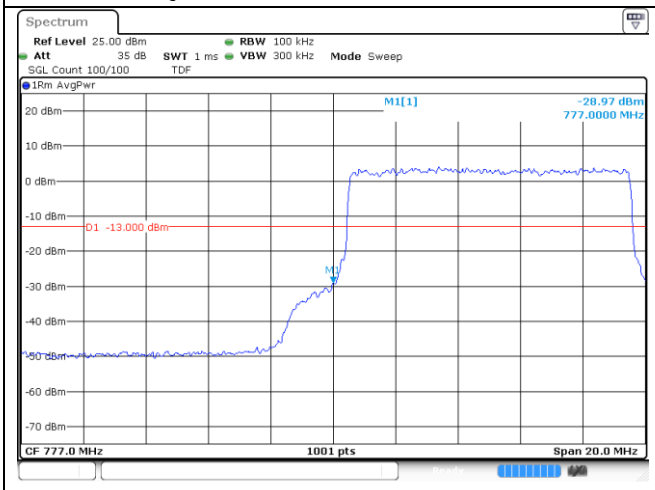
LTE band 13 (10 ㎒)



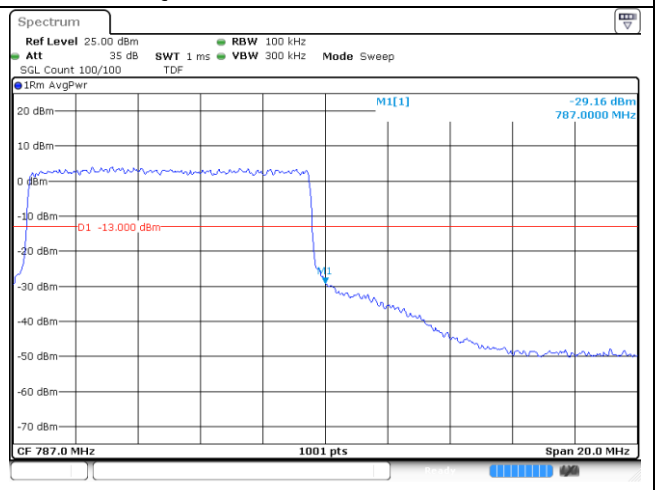
QPSK Middle Channel - 1 RB



QPSK Middle Channel - 1 RB

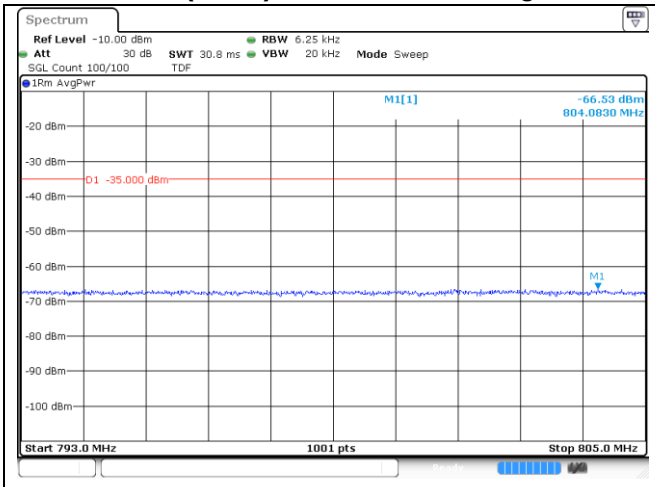


QPSK Middle Channel - Full RB

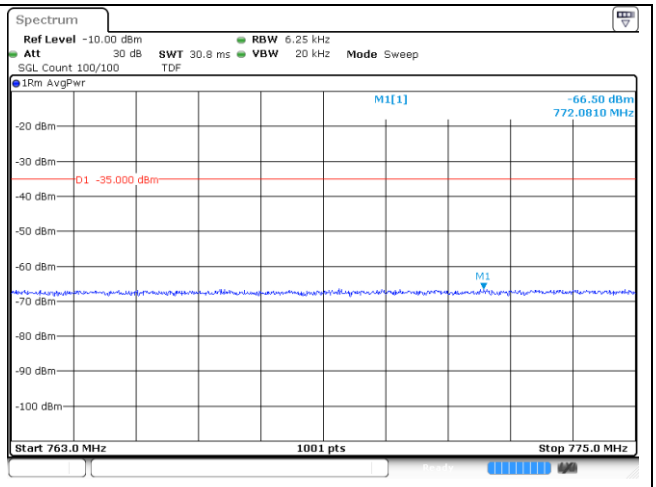


QPSK Middle Channel - Full RB

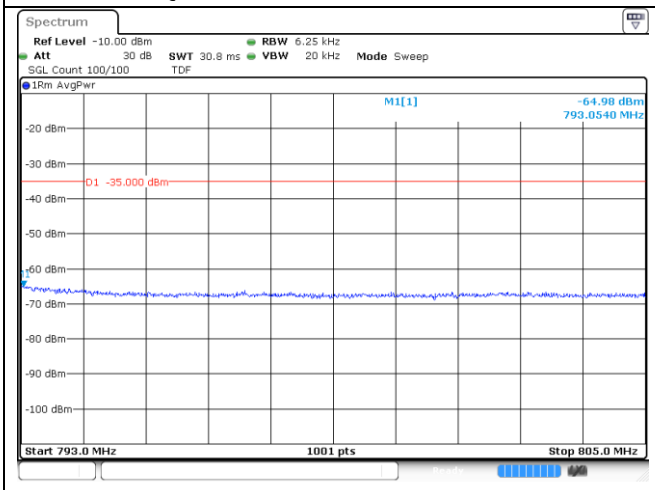
LTE band 13 (10 ㎒)_Extended Band edge



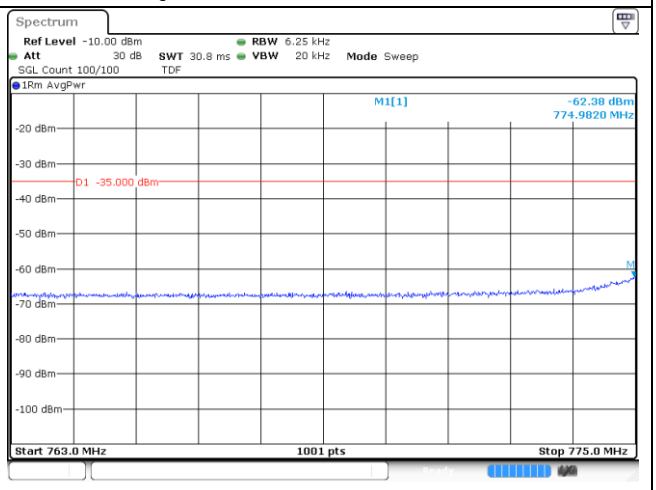
QPSK Middle Channel - 1 RB



QPSK Middle Channel - 1 RB

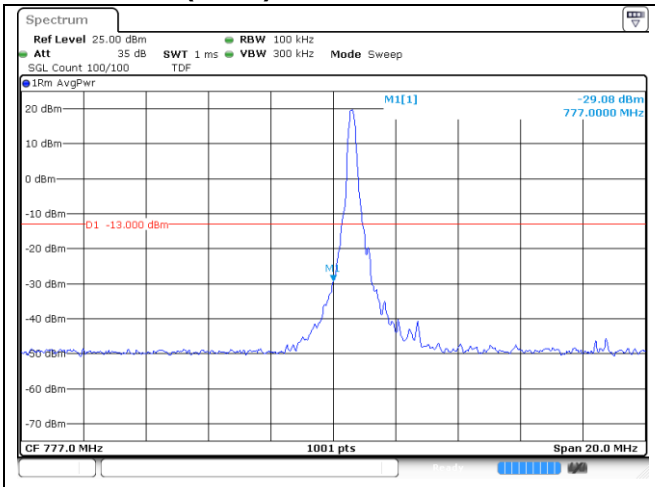


QPSK Middle Channel - Full RB

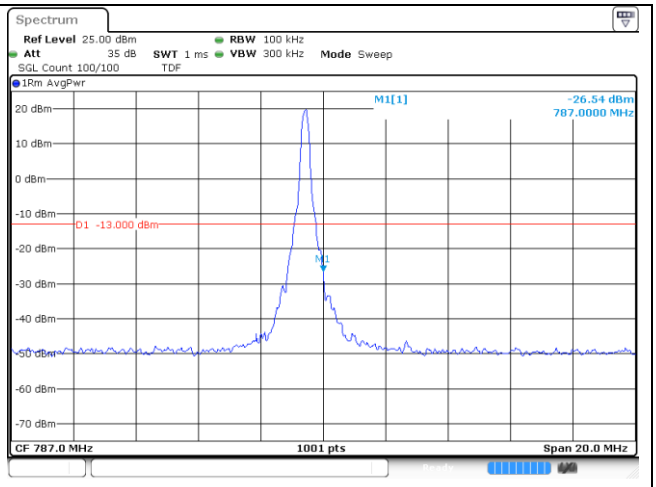


QPSK Middle Channel - Full RB

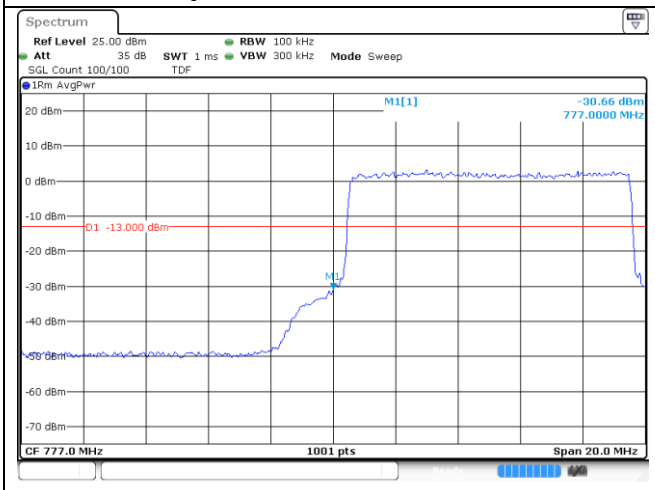
LTE band 13 (10 ㎒)



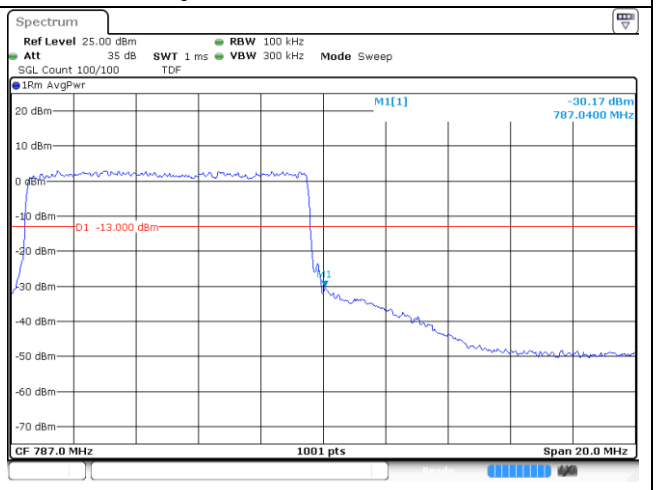
16QAM Middle Channel - 1 RB



16QAM Middle Channel - 1 RB

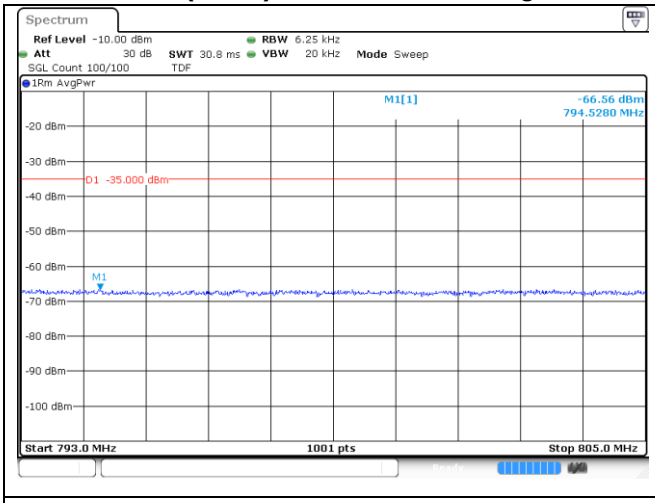


16QAM Middle Channel - Full RB

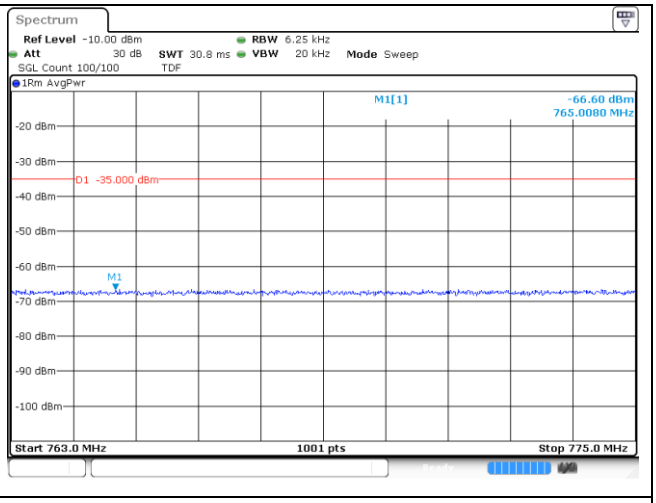


16QAM Middle Channel - Full RB

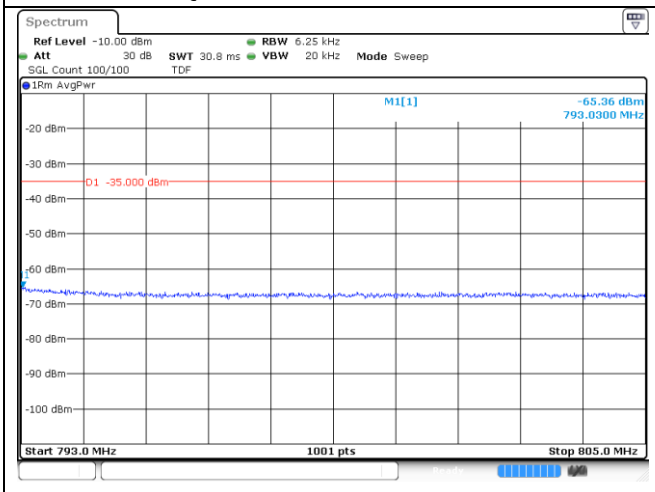
LTE band 13 (10 ㎒)_Extended Band edge



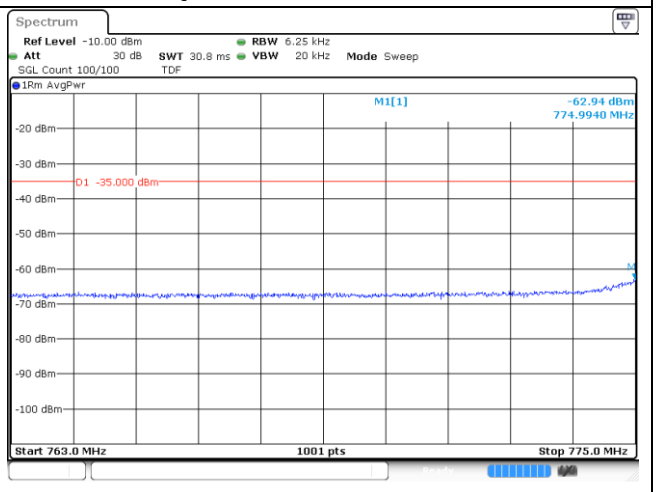
16QAM Middle Channel - 1 RB



16QAM Middle Channel - 1 RB

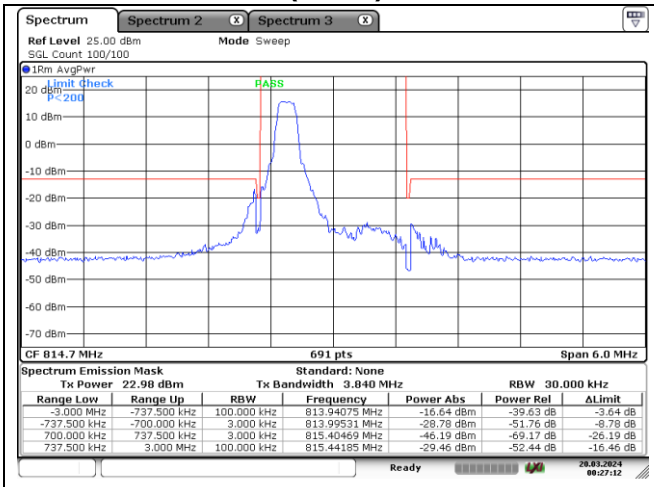


16QAM Middle Channel - Full RB

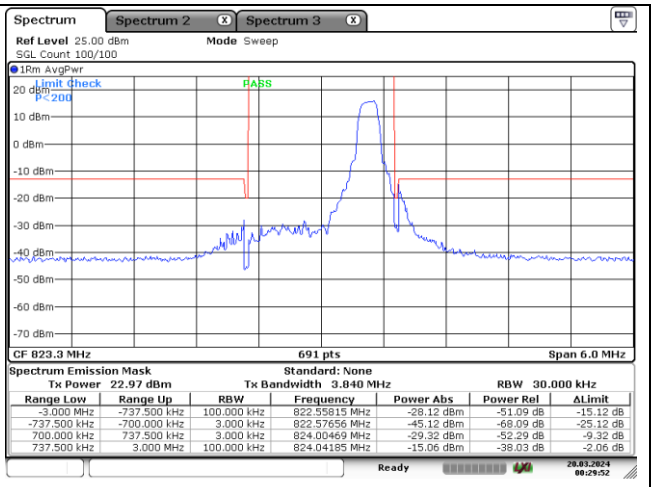


16QAM Middle Channel - Full RB

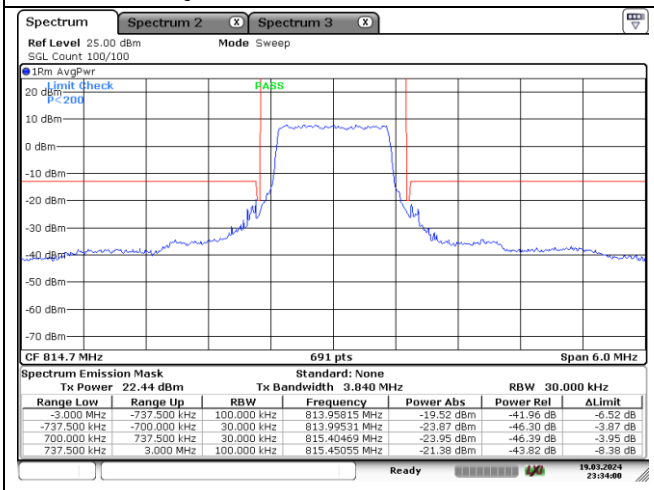
LTE band 26_Part 90 (1.4 ㎒)



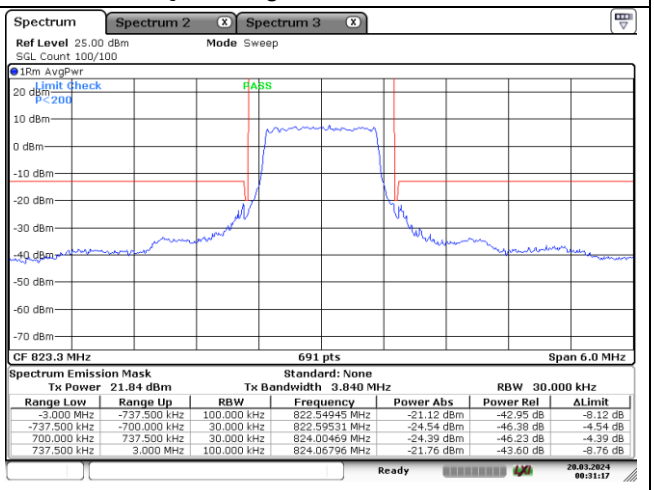
QPSK Low Channel - 1 RB



QPSK High Channel - 1 RB

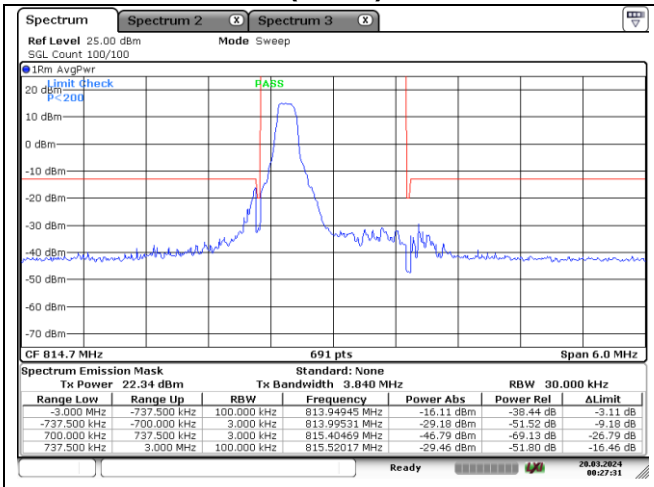


QPSK Low Channel - Full RB

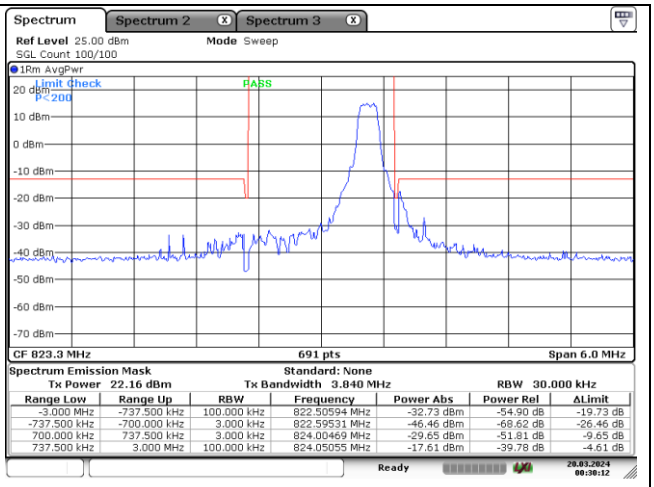


QPSK High Channel - Full RB

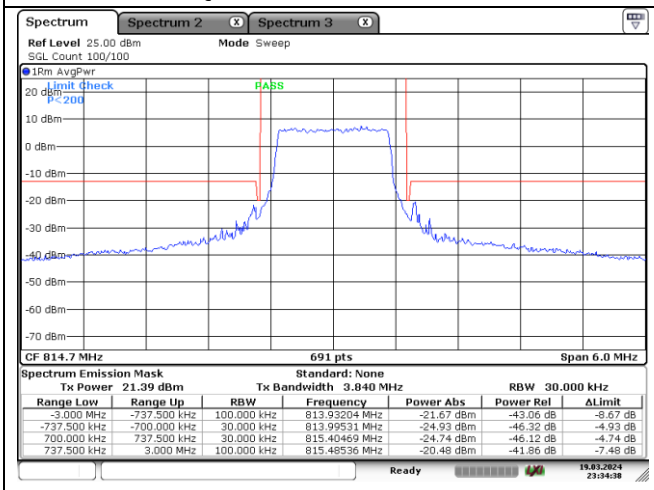
LTE band 26_Part 90 (1.4 ㎒)



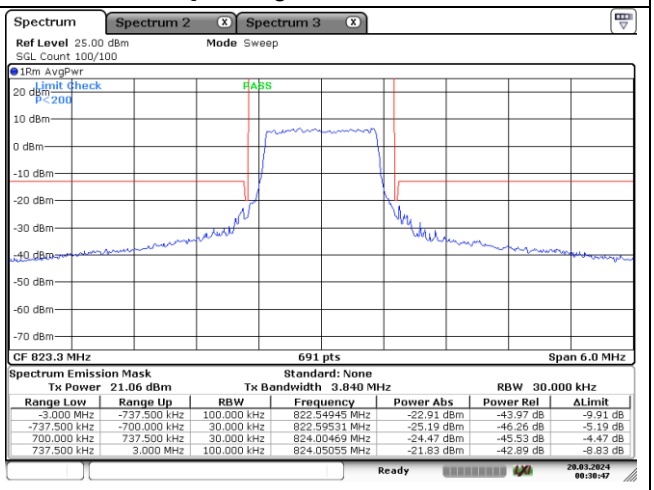
16QAM Low Channel - 1 RB



16QAM High Channel - 1 RB

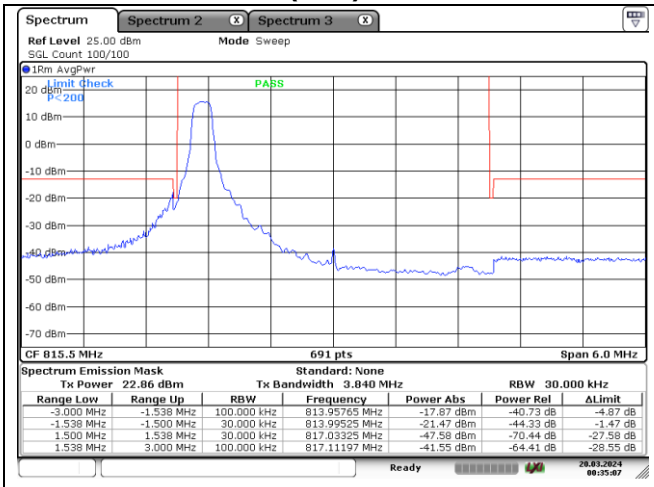


16QAM Low Channel - Full RB

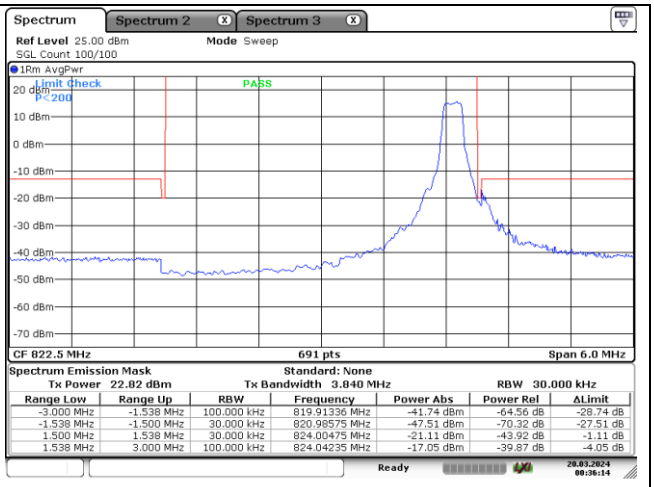


16QAM High Channel - Full RB

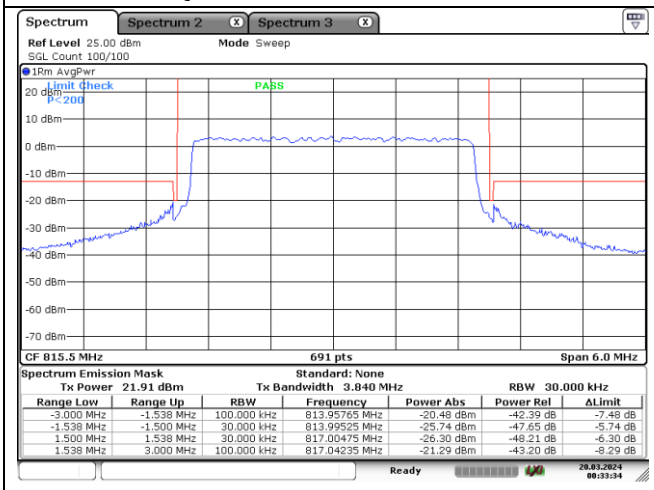
LTE band 26_Part 90 (3 ㎒)



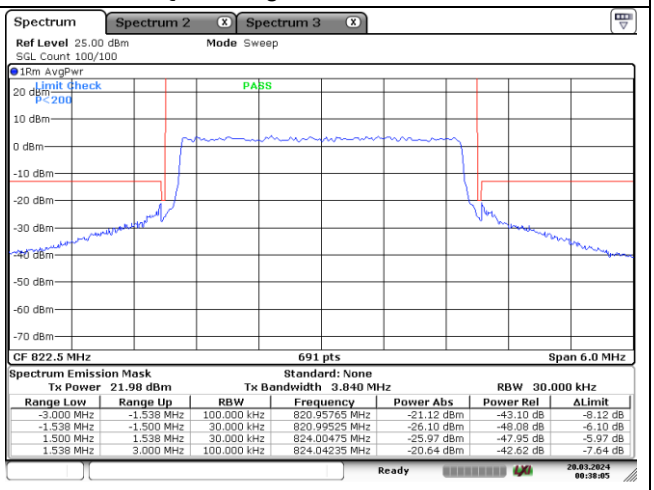
QPSK Low Channel - 1 RB



QPSK High Channel - 1 RB

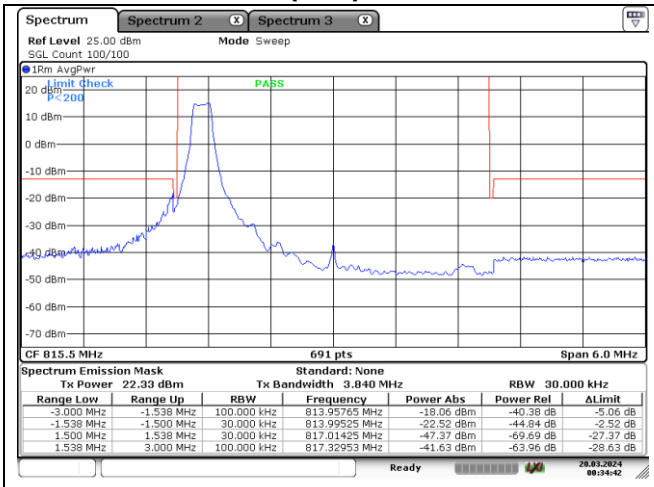


QPSK Low Channel - Full RB

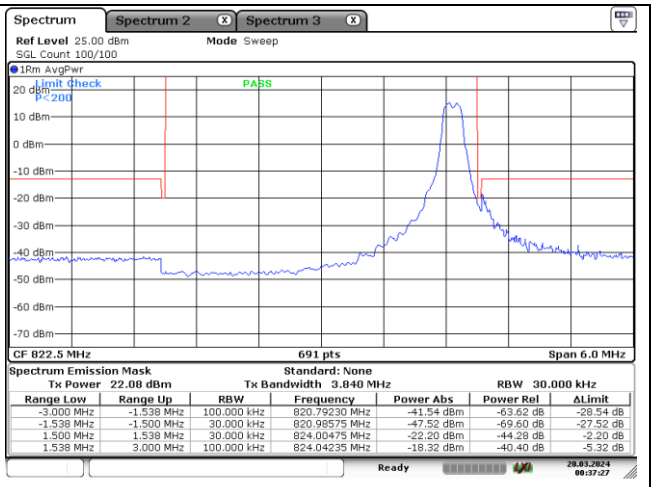


QPSK High Channel - Full RB

LTE band 26_Part 90 (3 ㎒)



16QAM Low Channel - 1 RB



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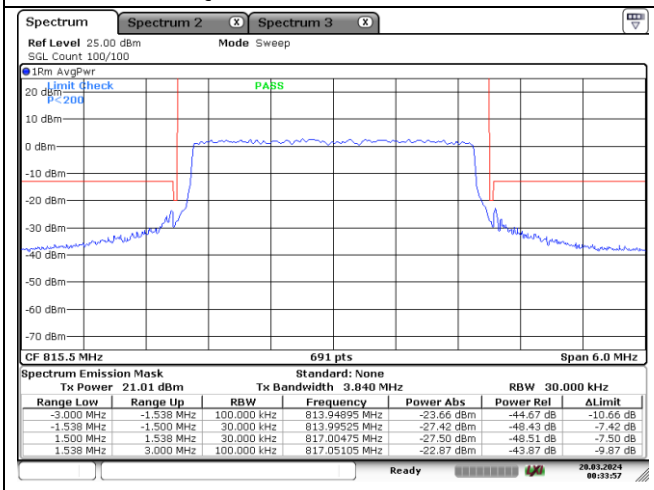
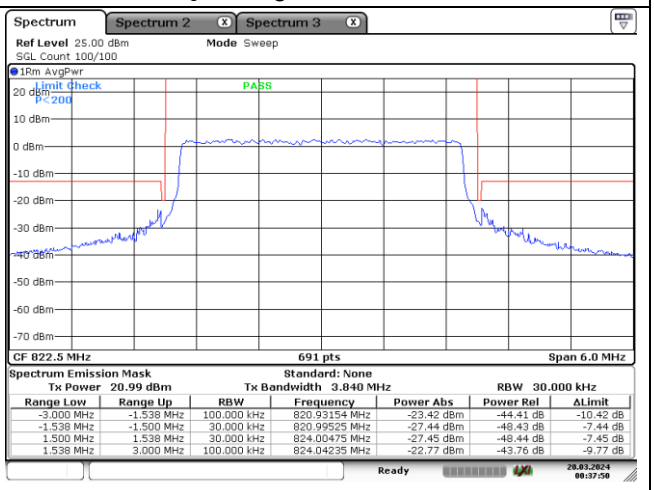
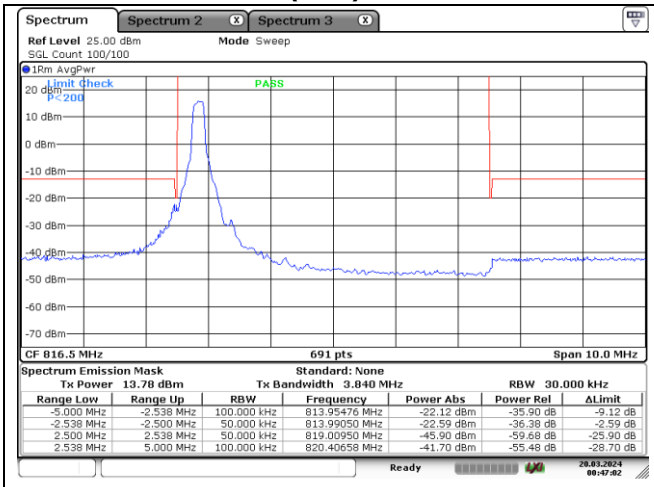


16QAM Low Channel - Full RB

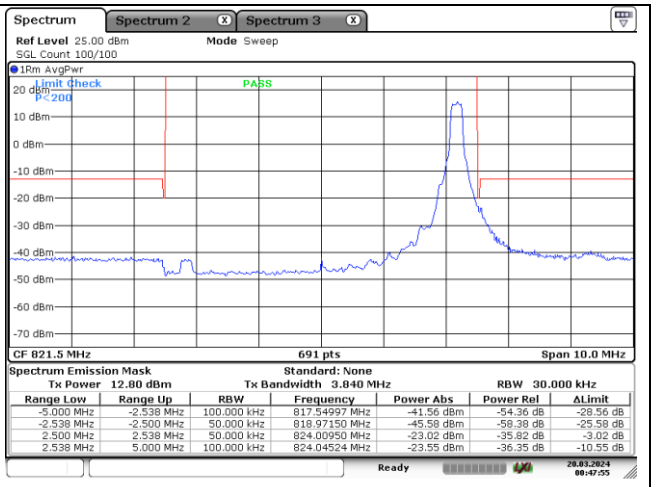


16QAM High Channel - Full RB

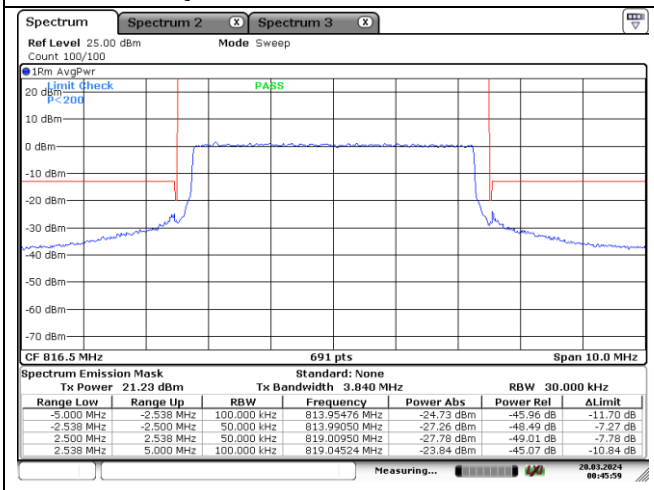
LTE band 26_Part 90 (5 ㎒)



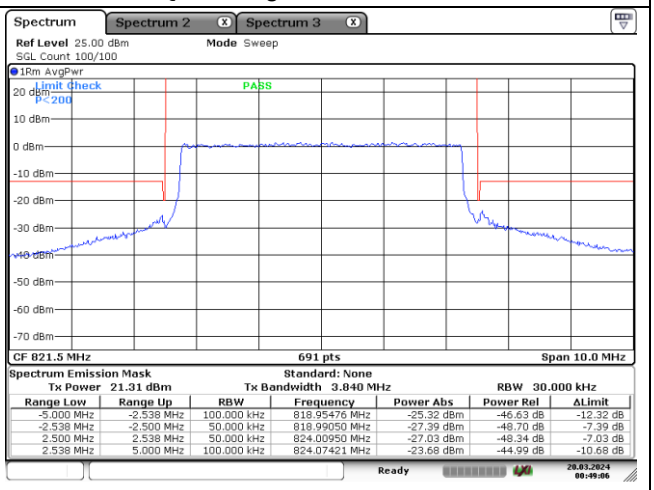
QPSK Low Channel - 1 RB



QPSK High Channel - 1 RB

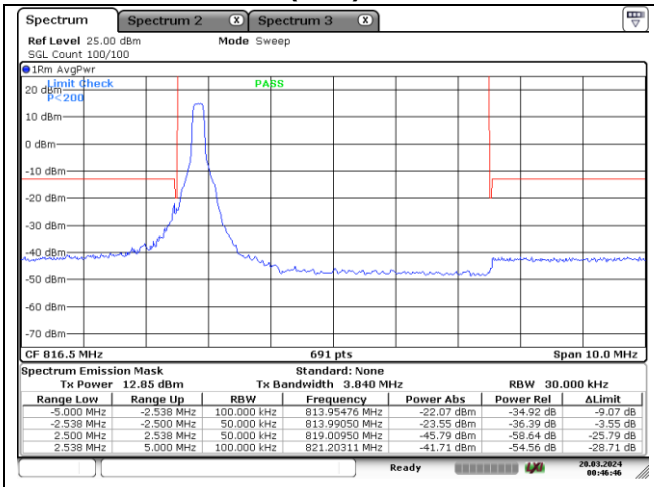


QPSK Low Channel - Full RB



QPSK High Channel - Full RB

LTE band 26_Part 90 (5 ㎒)



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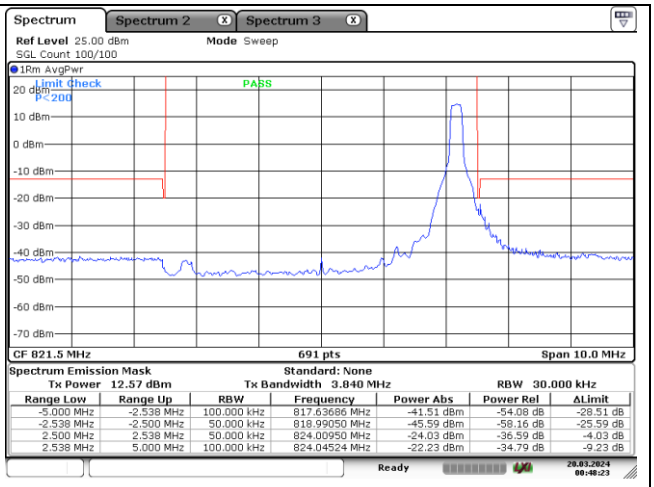

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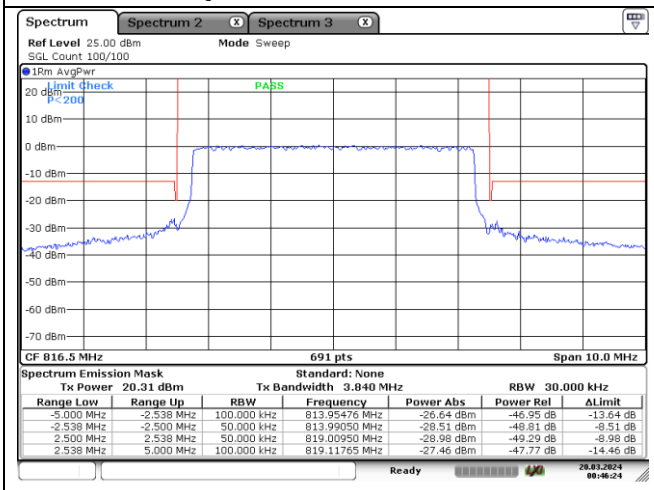

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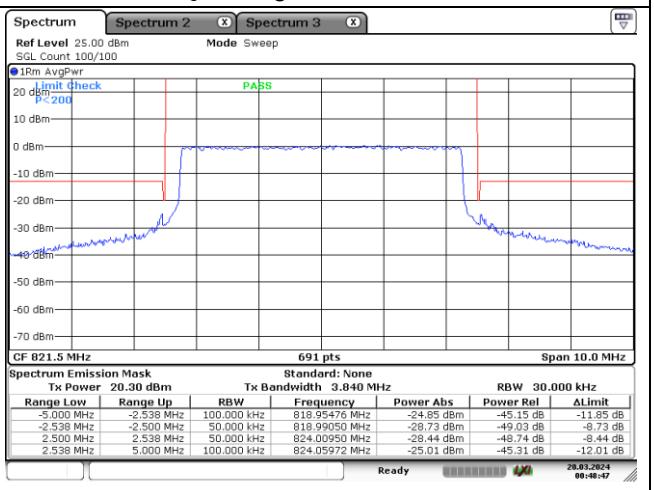
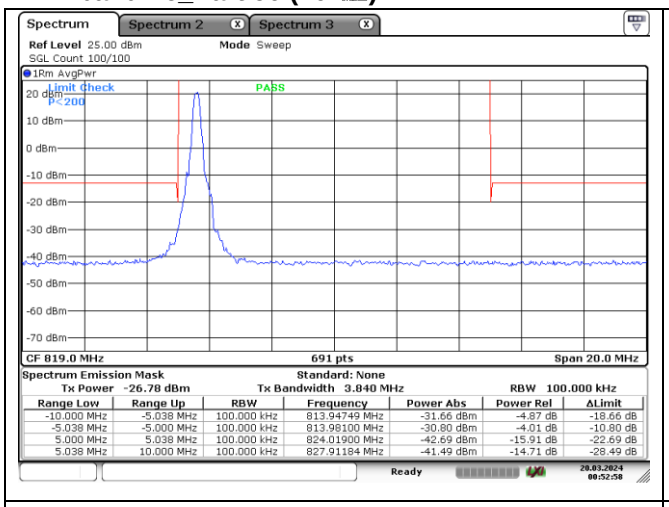
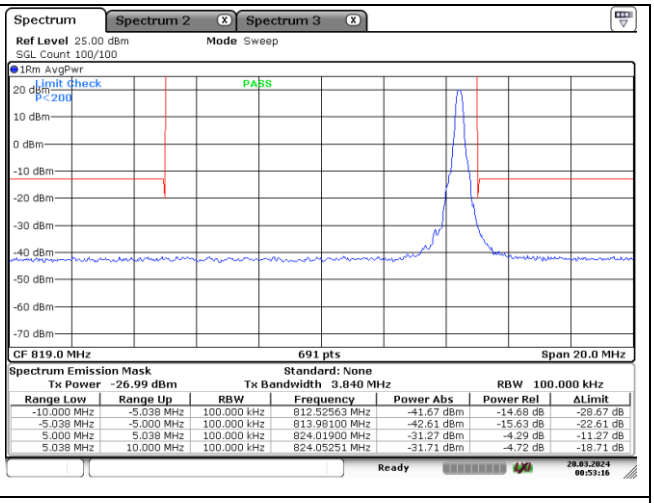


16QAM High Channel - Full RB

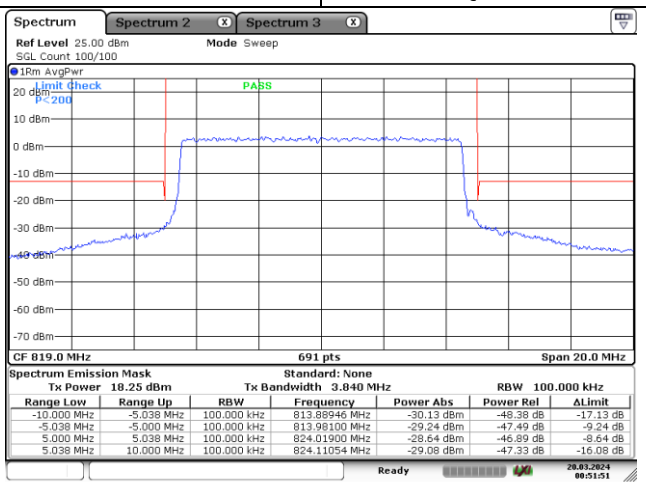
LTE band 26_Part 90 (10 ㎒)



QPSK Low Channel - 1 RB Low

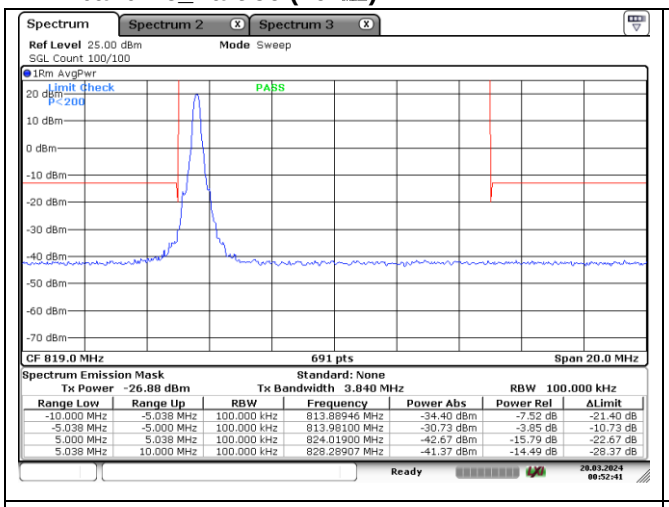


QPSK Low Channel - 1 RB High

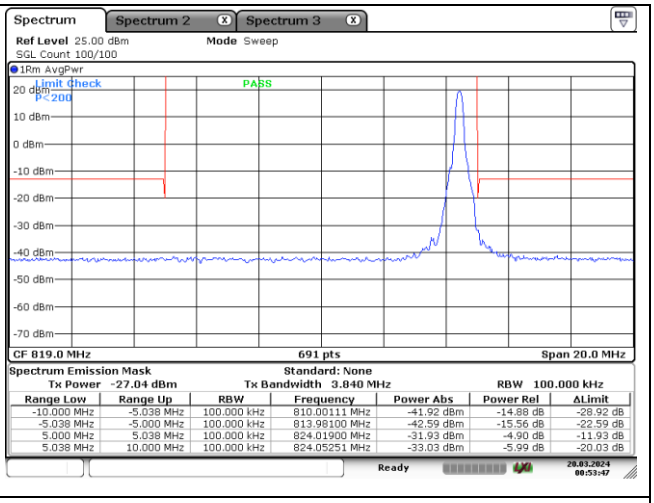


QPSK Low Channel - Full RB

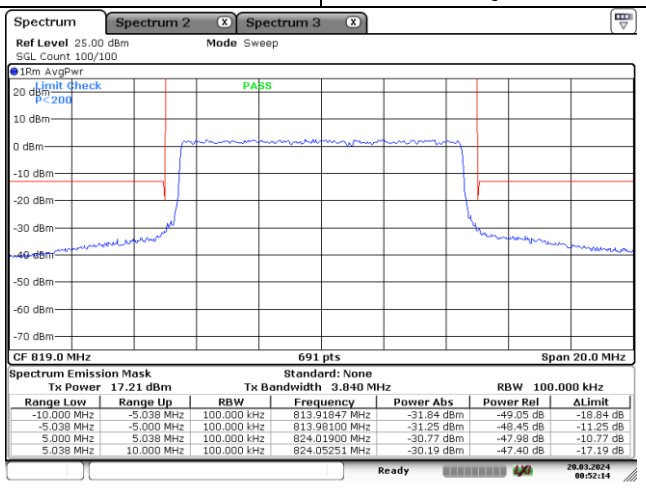
LTE band 26_Part 90 (10 ㎒)



16QAM Low Channel - 1 RB Low

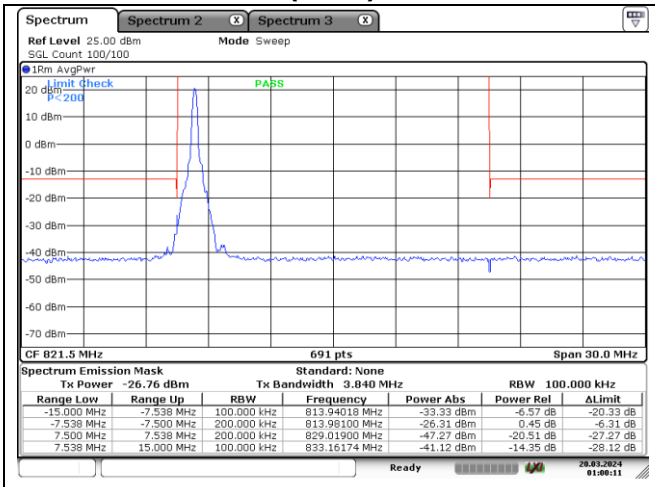


16QAM Low Channel - 1 RB High

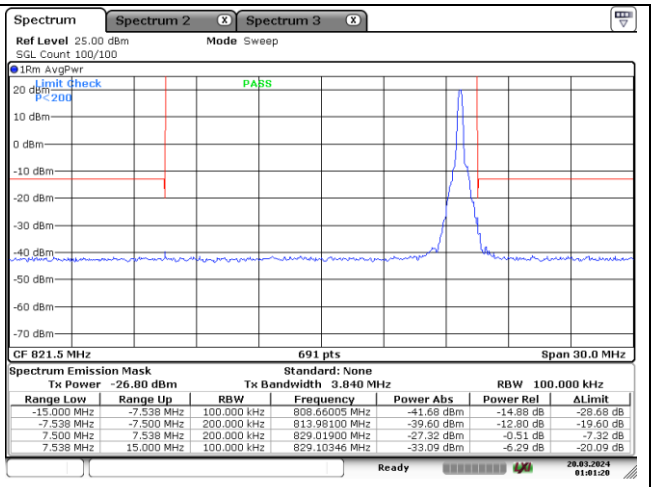


16QAM Low Channel - Full RB

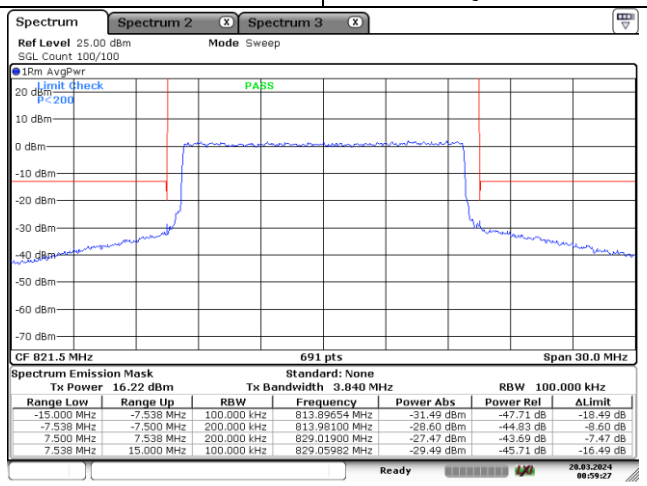
LTE band 26_Part 90 (15 ㎒)



QPSK Low Channel - 1 RB Low

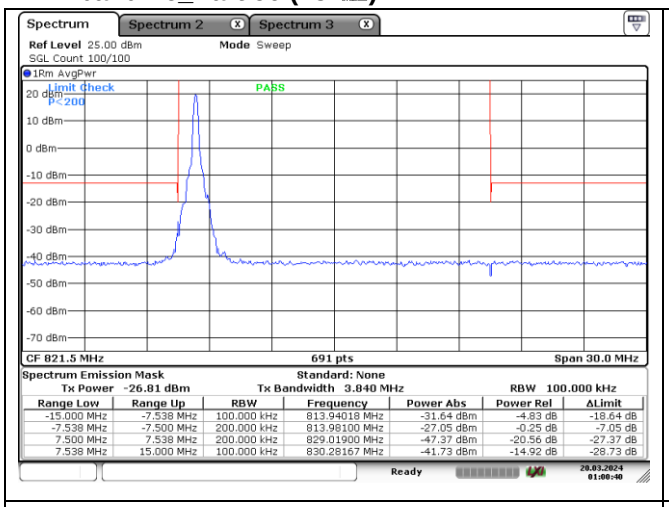


QPSK Low Channel - 1 RB High

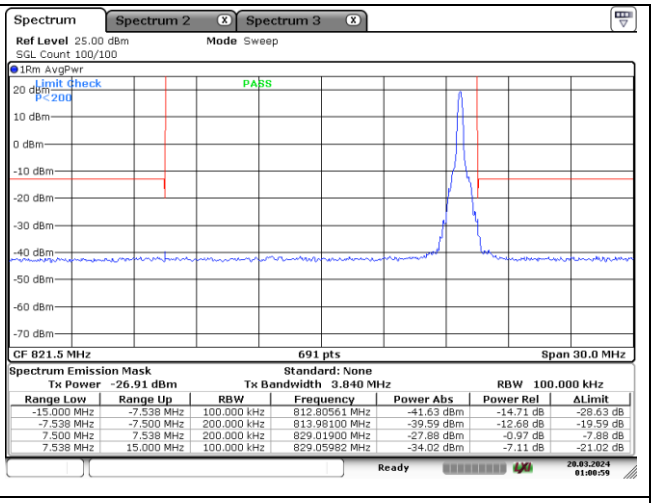


QPSK Low Channel - Full RB

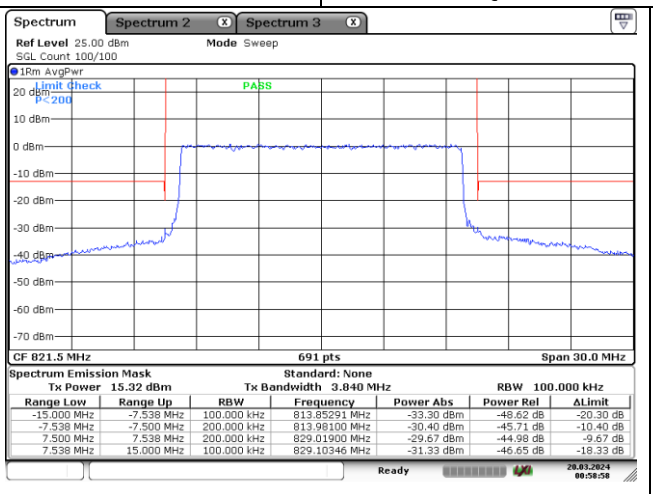
LTE band 26_Part 90 (15 ㎒)



16QAM Low Channel - 1 RB Low

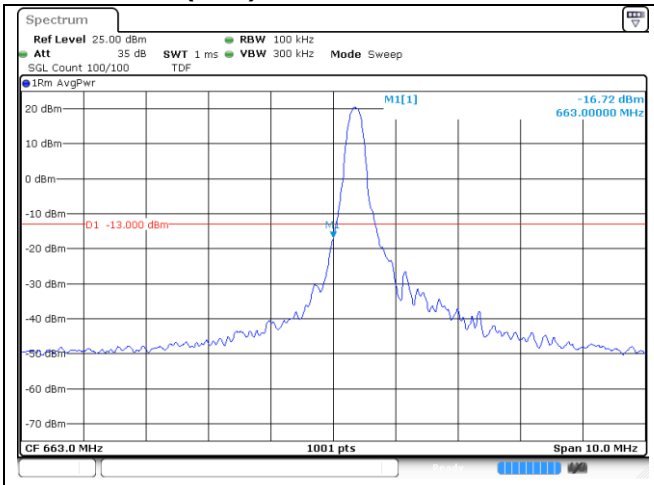


16QAM Low Channel - 1 RB High

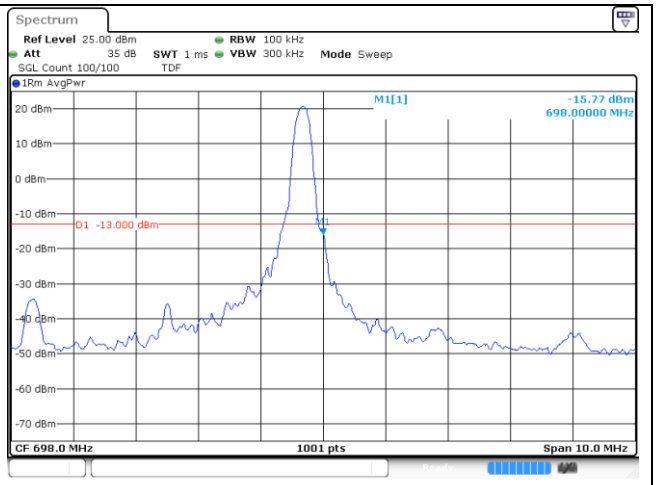


16QAM Low Channel - Full RB

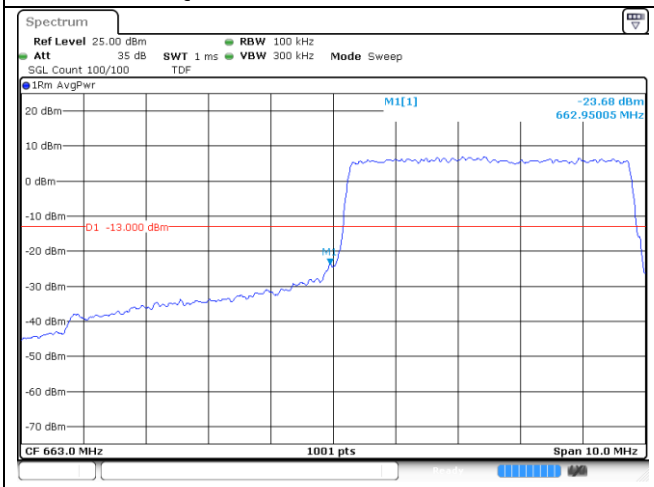
LTE band 71 (5 ㎒)



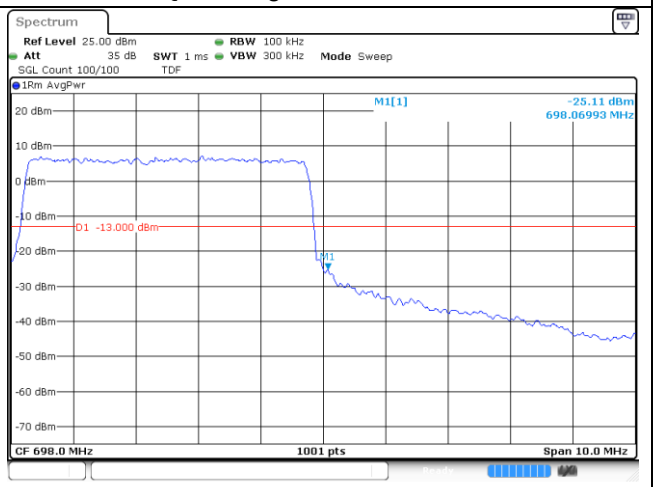
QPSK Low Channel - 1 RB



QPSK High Channel - 1 RB

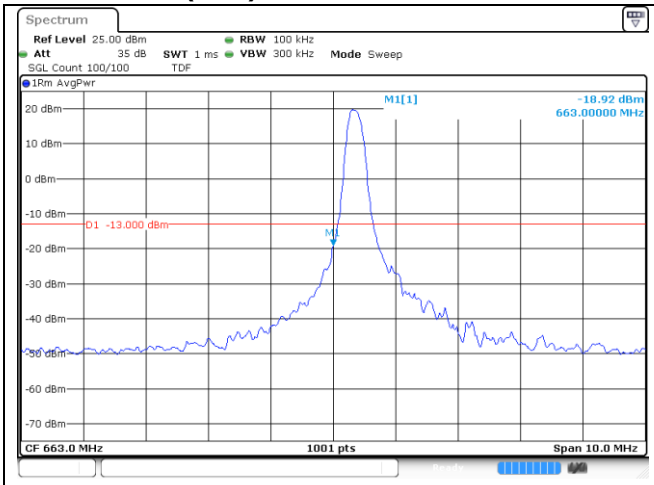


QPSK Low Channel - Full RB



QPSK High Channel - Full RB

LTE band 71 (5 ㎒)



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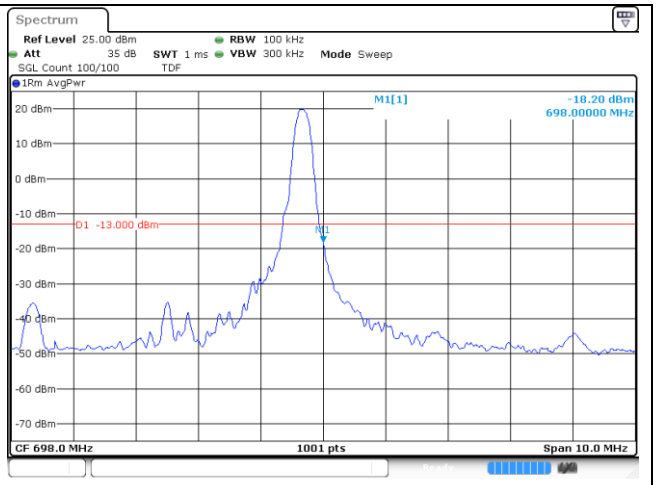
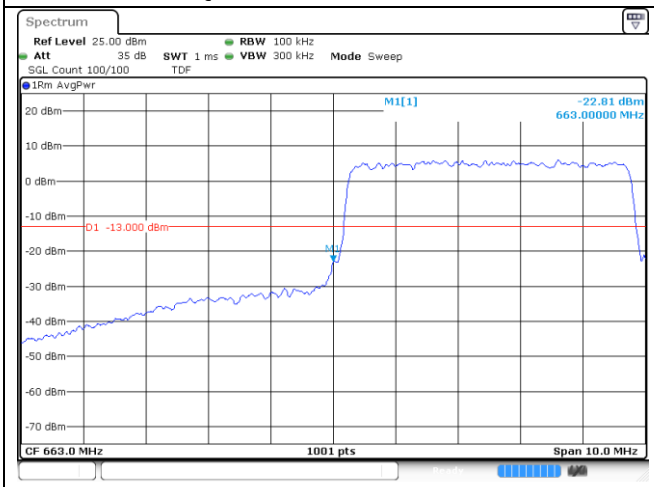
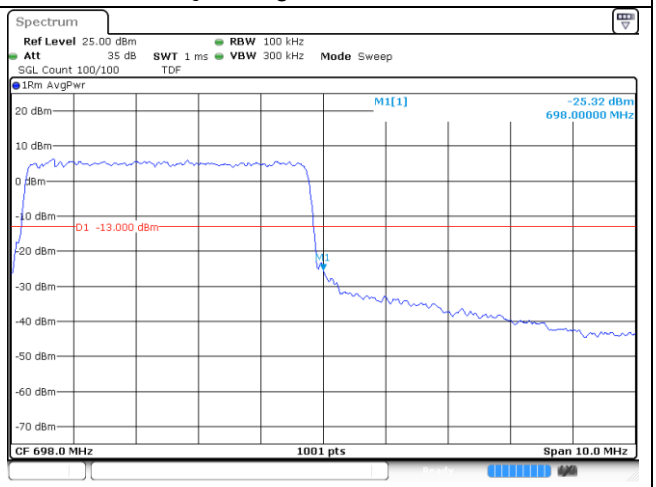


16QAM High Channel - 1 RB

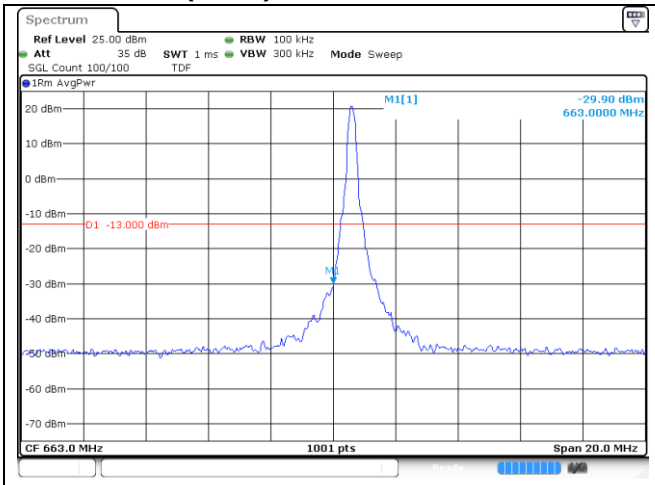


16QAM Low Channel - Full RB

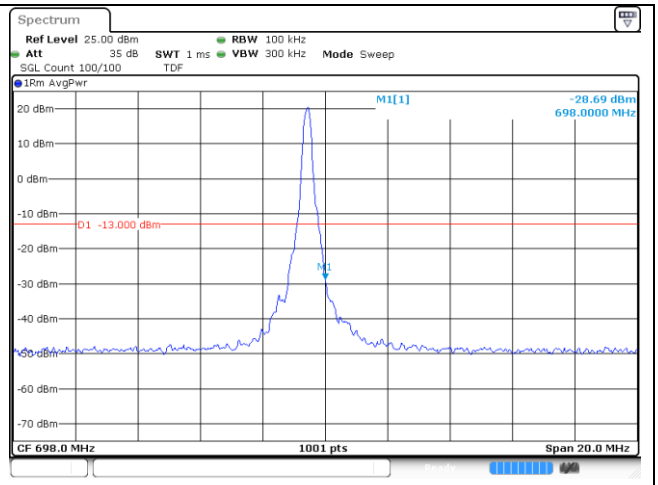


16QAM High Channel - Full RB

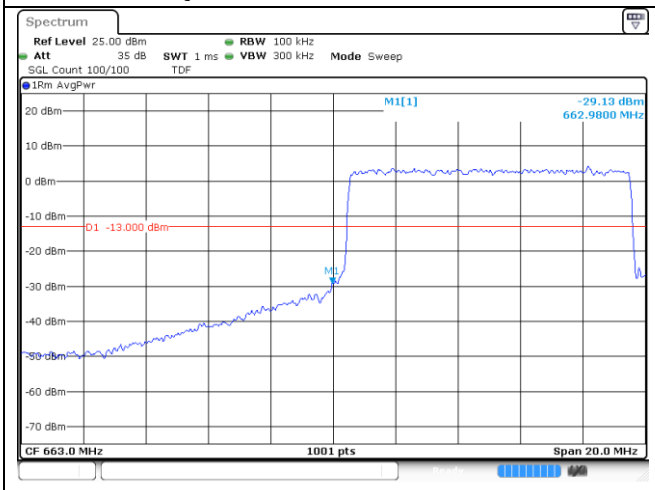
LTE band 71 (10 ㎒)



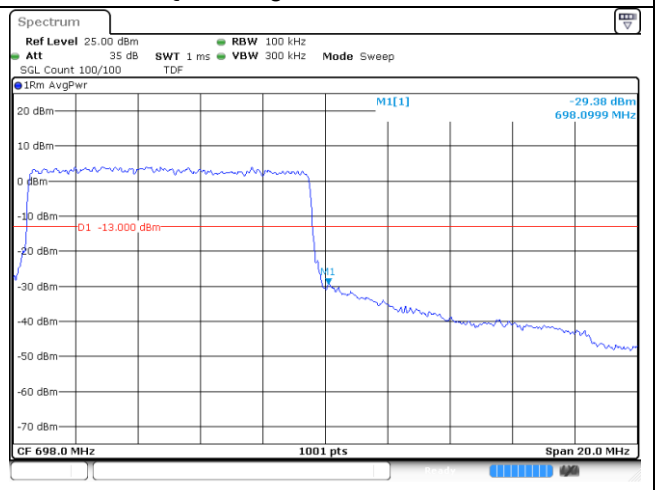
QPSK Low Channel - 1 RB



QPSK High Channel - 1 RB

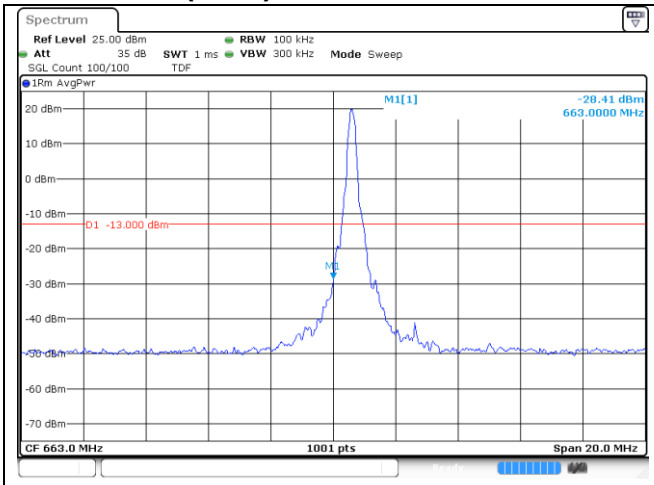


QPSK Low Channel - Full RB

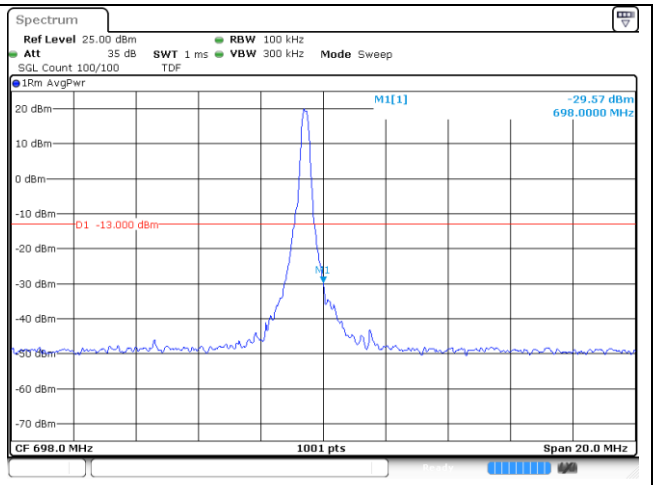


QPSK High Channel - Full RB

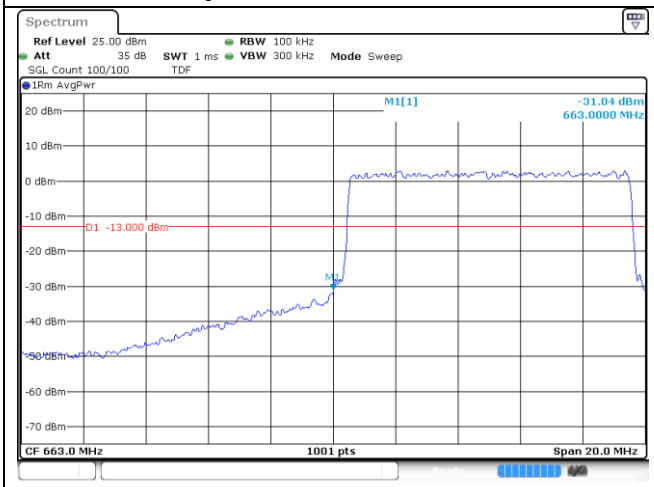
LTE band 71 (10 ㎒)



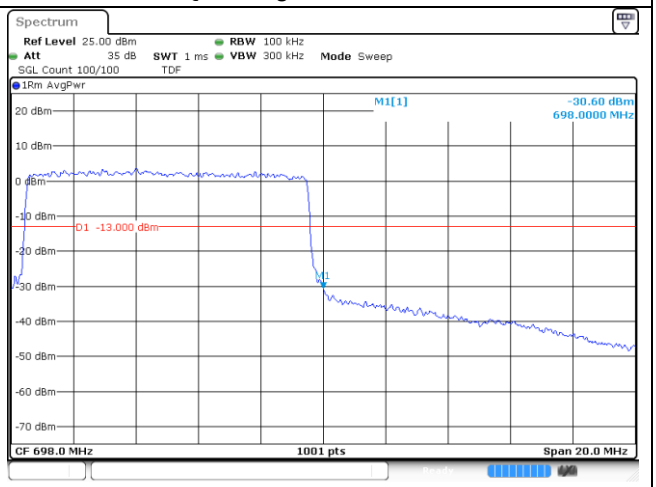
16QAM Low Channel - 1 RB



16QAM High Channel - 1 RB

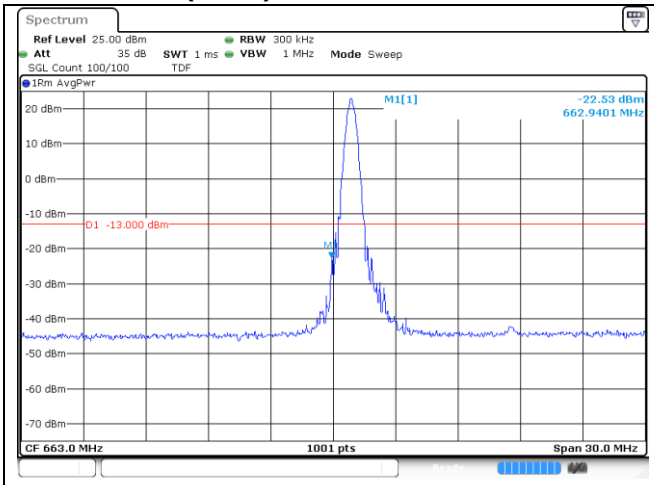


16QAM Low Channel - Full RB



16QAM High Channel - Full RB

LTE band 71 (15 ㎒)



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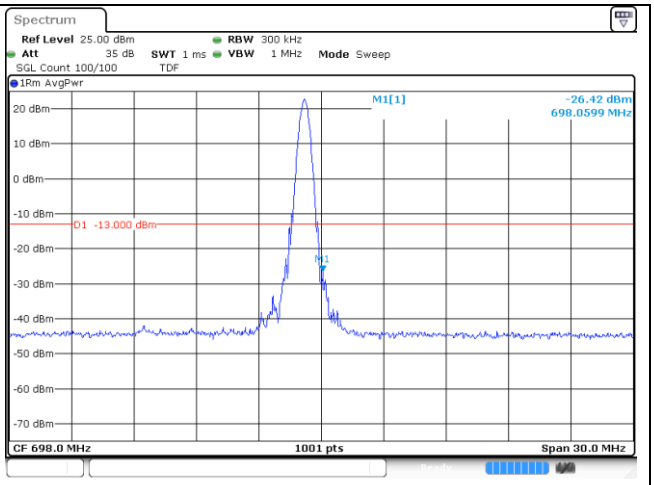

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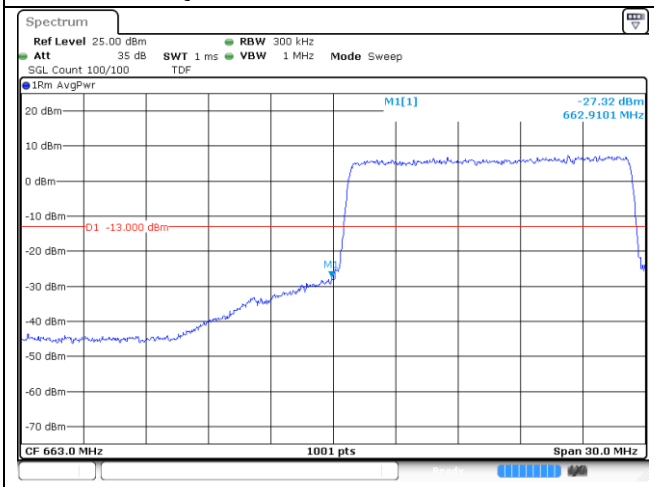
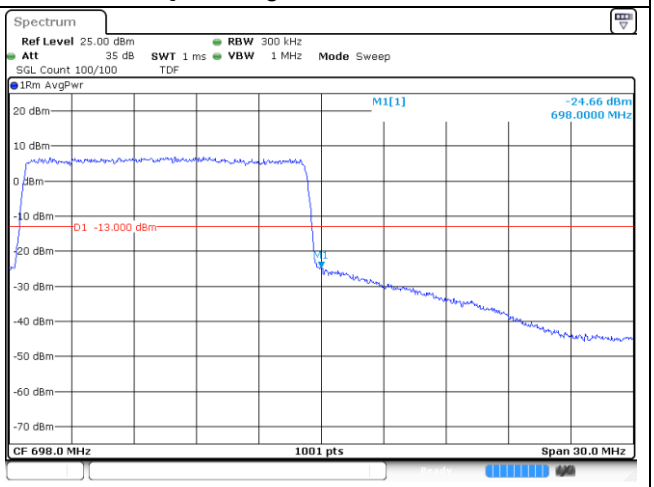
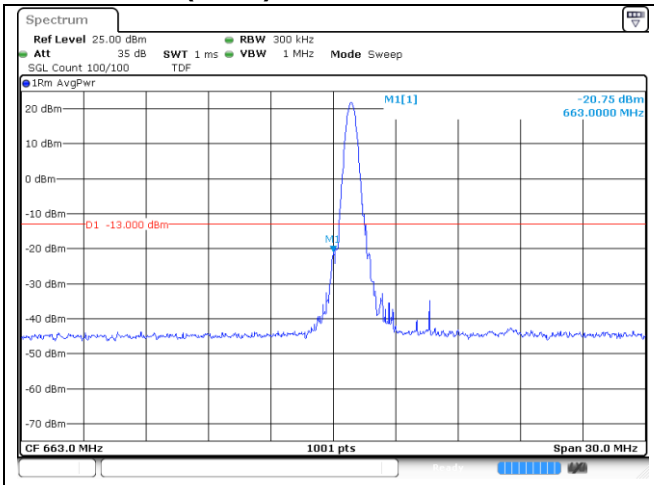


QPSK Low Channel - Full RB

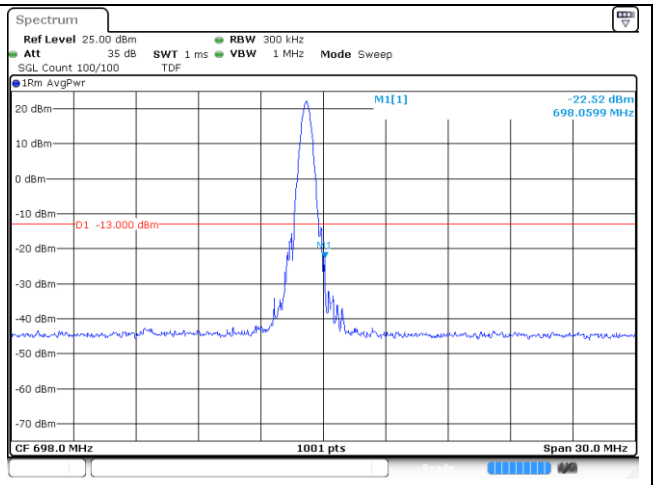


QPSK High Channel - Full RB

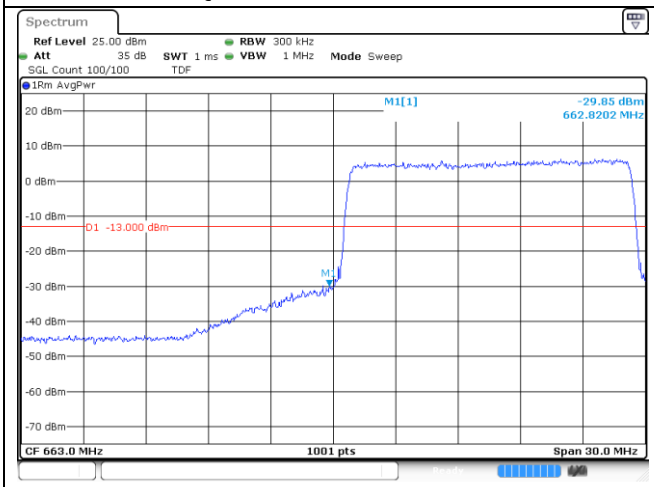
LTE band 71 (15 ㎒)



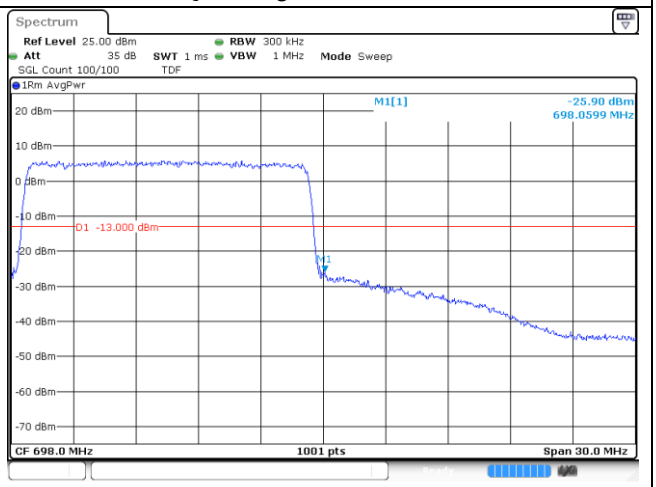
16QAM Low Channel - 1 RB



16QAM High Channel - 1 RB

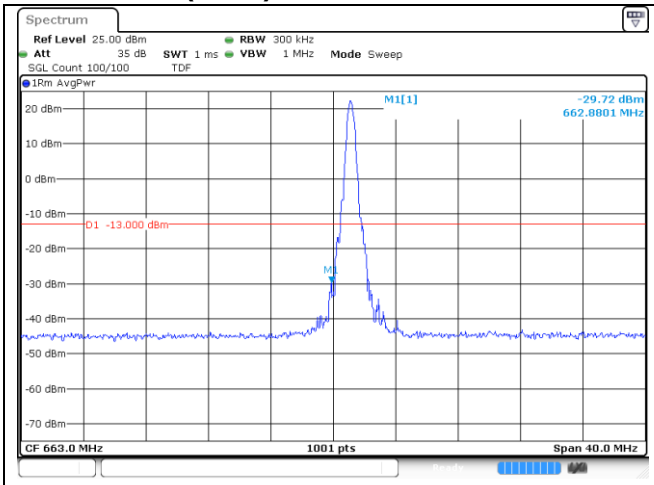


16QAM Low Channel - Full RB

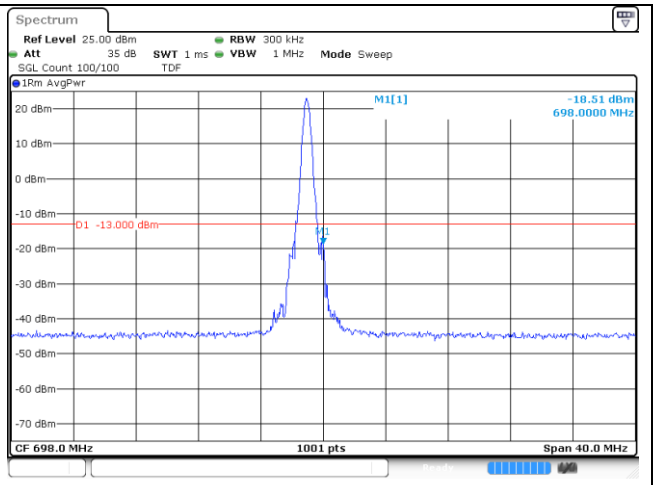


16QAM High Channel - Full RB

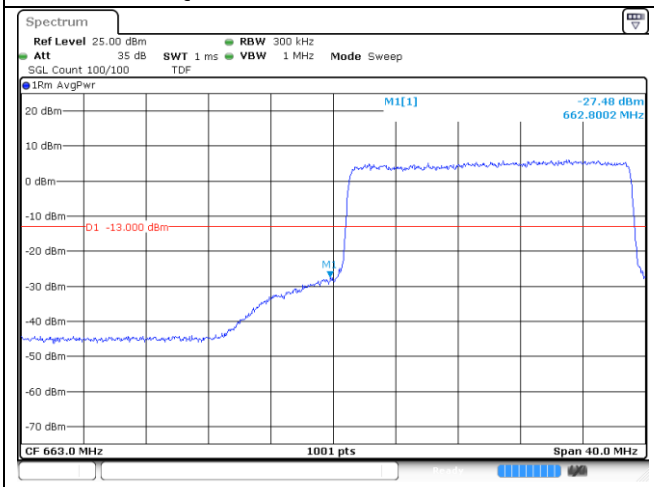
LTE band 71 (20 ㎒)



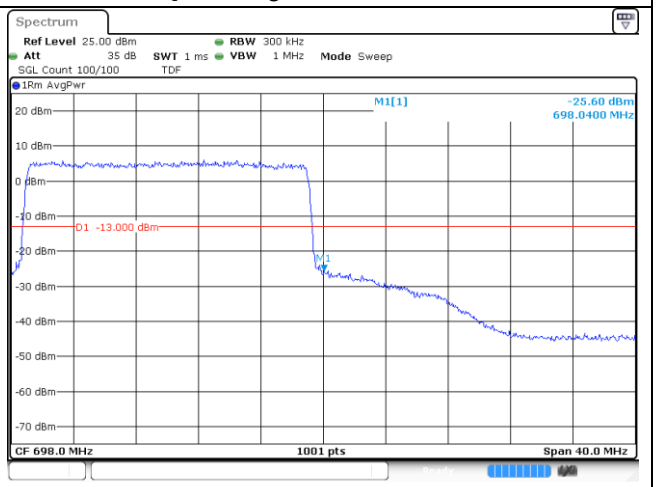
QPSK Low Channel - 1 RB



QPSK High Channel - 1 RB

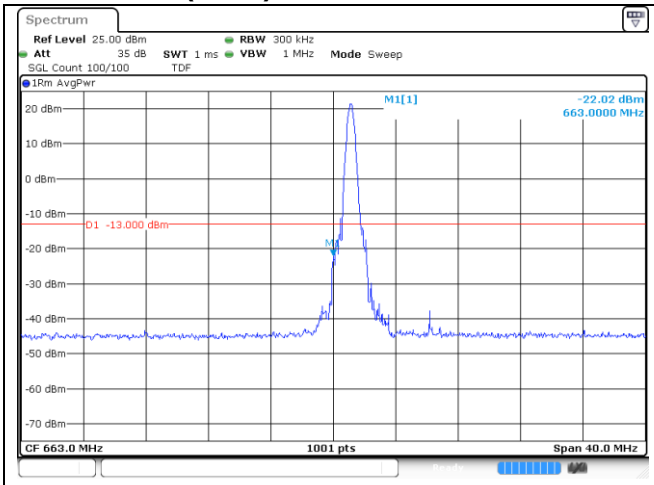


QPSK Low Channel - Full RB

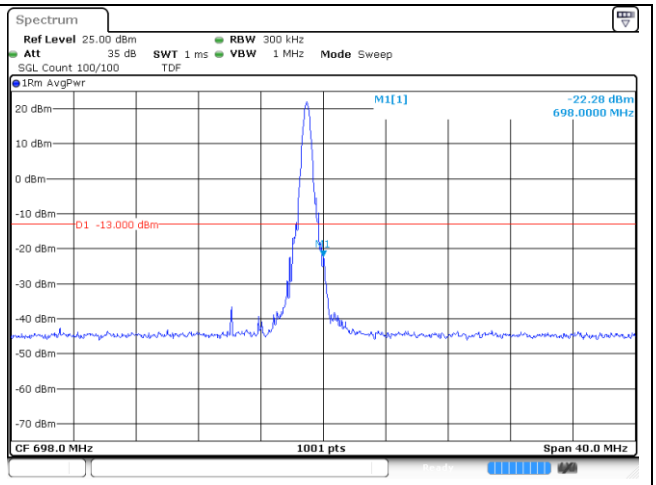


QPSK High Channel - Full RB

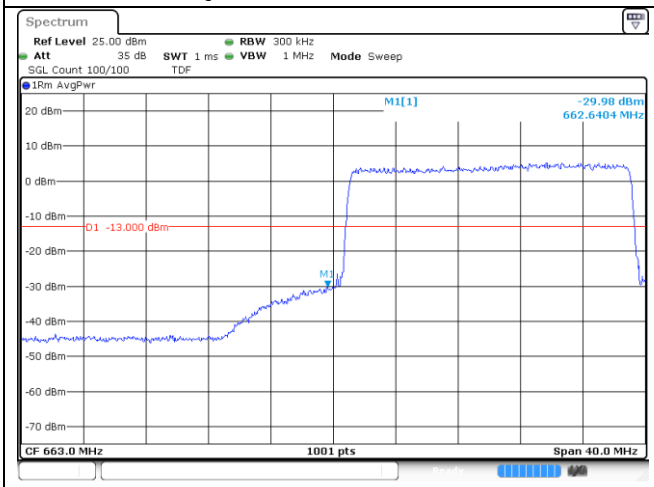
LTE band 71 (20 ㎒)



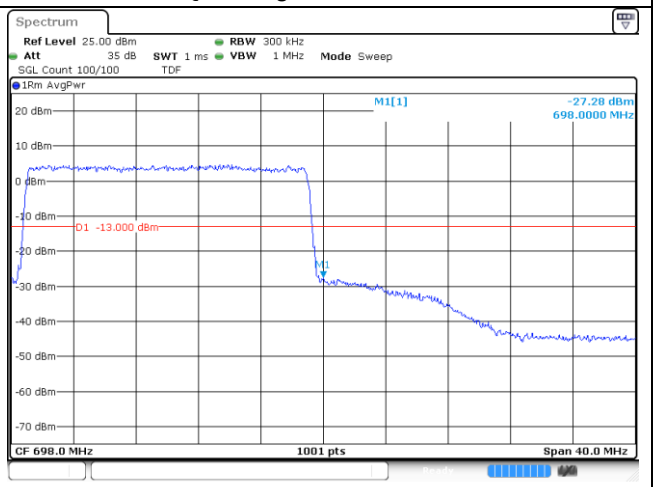
16QAM Low Channel - 1 RB



16QAM High Channel - 1 RB



16QAM Low Channel - Full RB



16QAM 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.

- §90.213, transmitters used in the services governed by this part must have a minimum frequency stability as specified in the following table.
For Mobile devices operating in the 809 to 824 ㎒ band at a power level 2 Watts or less, the limit specified in Table is +/- 2.5 ppm.

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 4
5.3, the frequency stability shall be sufficient to ensure that the occupied bandwidth stays within each of the sub-bands when tested at the temperature and supply voltage variations specified in RSS-Gen.

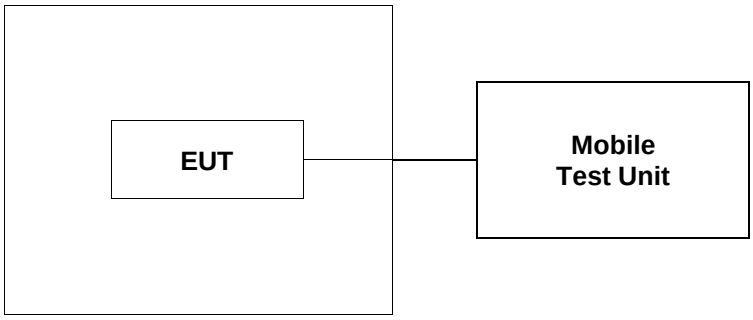
- RSS-133 Issue 6
6.3, the carrier frequency shall not depart from the reference frequency, in excess of ±2.5 ppm for mobile stations and ±1.0 ppm for base stations.

- RSS-139 Issue 4
5.4, the frequency stability shall be sufficient to ensure that the occupied bandwidth stays within the operating frequency block or frequency block group when tested to the temperature and supply voltage variations specified in RSS-Gen.

- RSS-199 Issue 4
5.4, the frequency stability shall be sufficient to ensure that the occupied bandwidth stays within the operating frequency block or frequency block group when tested to the temperature and supply voltage variations specified in RSS-Gen.

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.



Temperature Chamber

8.3. Test Results

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

WCDMA Ⅱ mode 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	4.10	-9.00	-0.004 84
40		6.00	0.003 14
30		-3.80	-0.002 07
20(Ref.)		0.10	-
10		-3.10	-0.001 70
0		13.20	0.006 97
-10		-4.20	-0.002 29
-20		16.50	0.008 72
-30		18.10	0.009 57
Frequency Stability versus Power Supply			
Environment Temperature (℃)	**Power Supplied (V)**	**Frequency Measure with Time Elapse**	
		Frequency Error (㎐)	**ppm**
20	3.49 (85%)	5.70	0.002 98
	4.72 (115%)	2.30	0.001 17

WCDMA Ⅴ mode at middle channel

Reference Frequency: 836.6 ㎒			
Frequency Stability versus Temperature			
Environment Temperature (℃)	**Power Supplied (V)**	**Frequency Measure with Time Elapse**	
		Frequency Error (㎐)	**ppm**
50	4.10	6.00	0.010 88
40		13.30	0.019 60
30		4.90	0.009 56
20(Ref.)		-3.10	-
10		1.10	0.005 02
0		8.60	0.013 99
-10		11.40	0.017 33
-20		7.60	0.012 79
-30		13.60	0.019 96
Frequency Stability versus Power Supply			
Environment Temperature (℃)	**Power Supplied (V)**	**Frequency Measure with Time Elapse**	
		Frequency Error (㎐)	**ppm**
20	3.49 (85%)	9.60	0.015 18
	4.72 (115%)	-5.80	-0.003 23

LTE band 25/2 at middle channel

Reference Frequency: 1 882.5 ㎒			
Frequency Stability versus Temperature			
Environment Temperature (℃)	**Power Supplied (V)**	**Frequency Measure with Time Elapse**	
		Frequency Error (㎐)	**ppm**
50	4.10	-11.90	-0.005 58
40		-6.00	-0.002 44
30		-6.20	-0.002 55
20(Ref.)		-1.40	-
10		10.70	0.006 43
0		7.30	0.004 62
-10		4.00	0.002 87
-20		11.10	0.006 64
-30		-1.10	0.000 16
Frequency Stability versus Power Supply			
Environment Temperature (℃)	**Power Supplied (V)**	**Frequency Measure with Time Elapse**	
		Frequency Error (㎐)	**ppm**
20	3.49 (85%)	-9.20	-0.004 14
	4.72 (115%)	1.70	0.001 65

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	4.10	-5.50	0.000 00
40		7.90	0.007 68
30		-3.40	0.001 20
20(Ref.)		-5.50	-
10		5.00	0.006 02
0		9.70	0.008 71
-10		-6.80	-0.000 74
-20		5.90	0.006 53
-30		12.00	0.010 03
Frequency Stability versus Power Supply			
Environment Temperature (℃)	**Power Supplied (V)**	**Frequency Measure with Time Elapse**	
		Frequency Error (㎐)	**ppm**
20	3.49 (85%)	8.20	0.007 85
	4.72 (115%)	-3.70	0.001 03

LTE band 26/5 at middle channel_Part 22

Reference Frequency: 836.5 ㎒			
Frequency Stability versus Temperature			
Environment Temperature (℃)	**Power Supplied (V)**	**Frequency Measure with Time Elapse**	
		Frequency Error (㎐)	**ppm**
50	4.10	-22.20	-0.020 56
40		-2.50	0.002 99
30		-0.60	0.005 26
20(Ref.)		-5.00	-
10		2.00	0.008 37
0		-5.00	0.000 00
-10		2.70	0.009 21
-20		5.00	0.011 95
-30		-1.20	0.004 54
Frequency Stability versus Power Supply			
Environment Temperature (℃)	**Power Supplied (V)**	**Frequency Measure with Time Elapse**	
		Frequency Error (㎐)	**ppm**
20	3.49 (85%)	11.30	0.019 49
	4.72 (115%)	-7.30	-0.002 75

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	4.10	13.90	0.004 50
40		-13.40	-0.006 27
30		-5.60	-0.003 20
20(Ref.)		2.50	-
10		0.80	-0.000 67
0		6.30	0.001 50
-10		0.80	-0.000 67
-20		1.20	-0.000 51
-30		-1.90	-0.001 74
Frequency Stability versus Power Supply			
Environment Temperature (℃)	**Power Supplied (V)**	**Frequency Measure with Time Elapse**	
		Frequency Error (㎐)	**ppm**
20	3.49 (85%)	3.60	0.000 43
	4.72 (115%)	1.50	-0.000 39

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	4.10	-4.90	-0.006 22
40		9.80	0.014 56
30		-0.90	-0.000 57
20(Ref.)		-0.50	-
10		-1.00	-0.000 71
0		-2.00	-0.002 12
-10		2.70	0.004 52
-20		3.90	0.006 22
-30		2.40	0.004 10
Frequency Stability versus Power Supply			
Environment Temperature (℃)	**Power Supplied (V)**	**Frequency Measure with Time Elapse**	
		Frequency Error (㎐)	**ppm**
20	3.49 (85%)	0.80	0.001 84
	4.72 (115%)	4.30	0.006 78

LTE band 13 at middle channel

Reference Frequency: 782 ㎒			
Frequency Stability versus Temperature			
Environment Temperature (℃)	**Power Supplied (V)**	**Frequency Measure with Time Elapse**	
		Frequency Error (㎐)	**ppm**
50	4.10	10.70	0.011 38
40		-5.70	-0.009 59
30		1.40	-0.000 51
20(Ref.)		1.80	-
10		17.00	0.019 44
0		-8.50	-0.013 17
-10		2.00	0.000 26
-20		4.40	0.003 32
-30		2.80	0.001 28
Frequency Stability versus Power Supply			
Environment Temperature (℃)	**Power Supplied (V)**	**Frequency Measure with Time Elapse**	
		Frequency Error (㎐)	**ppm**
20	3.49 (85%)	8.90	0.009 08
	4.72 (115%)	3.30	0.001 92

LTE band 26 at middle channel_Part 90

Reference Frequency: 819 ㎒			
Frequency Stability versus Temperature			
Environment Temperature (℃)	**Power Supplied (V)**	**Frequency Measure with Time Elapse**	
		Frequency Error (㎐)	**ppm**
50	4.10	-4.60	-0.024 66
40		3.90	-0.014 29
30		1.90	-0.016 73
20(Ref.)		15.60	-
10		7.20	-0.010 26
0		4.60	-0.013 43
-10		10.30	-0.006 47
-20		4.20	-0.013 92
-30		8.40	-0.008 79
Frequency Stability versus Power Supply			
Environment Temperature (℃)	**Power Supplied (V)**	**Frequency Measure with Time Elapse**	
		Frequency Error (㎐)	**ppm**
20	3.49 (85%)	4.70	-0.013 31
	4.72 (115%)	8.20	-0.009 04

LTE band 71 at middle channel

Reference Frequency: 680.5 ㎒			
Frequency Stability versus Temperature			
Environment Temperature (℃)	**Power Supplied (V)**	**Frequency Measure with Time Elapse**	
		Frequency Error (㎐)	**ppm**
50	4.10	7.90	0.015 87
40		5.20	0.011 90
30		-2.30	0.000 88
20(Ref.)		-2.90	-
10		2.10	0.007 35
0		8.60	0.016 90
-10		7.50	0.015 28
-20		4.00	0.010 14
-30		10.00	0.018 96
Frequency Stability versus Power Supply			
Environment Temperature (℃)	**Power Supplied (V)**	**Frequency Measure with Time Elapse**	
		Frequency Error (㎐)	**ppm**
20	3.49 (85%)	1.70	0.006 76
	4.72 (115%)	5.60	0.012 49

- End of the Test Report -