

4. Occupied Bandwidth

4.1. Limit

CFR 47, Section FCC §2.1049 and IC RSS-Gen Issue 5 6.7.

4.2. Test Procedure

FCC

The test follows section 5.4.4 of ANSI C63.26-2015.

- a. The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be set wide enough to capture all modulation. products including the emission skirts (typically a span of $1.5 \times \text{OBW}$ is sufficient).
- b. The nominal IF filter 3 dB bandwidth (RBW) shall be in the range of 1 % to 5 % of the anticipated OBW, and the VBW shall be set $\geq 3 \times \text{RBW}$.
- c. Set the reference level of the instrument as required to prevent the signal amplitude from exceeding the maximum spectrum analyzer input mixer level for linear operation. See guidance provided in 4.2.3.
- d. Set the detection mode to peak, and the trace mode to max-hold.
- e. If the instrument does not have a 99 % OBW function, recover the trace data points and sum directly in linear power terms. Place the recovered amplitude data points, beginning at the lowest frequency, in a running sum until 0.5 % of the total is reached. Record that frequency as the lower OBW frequency. Repeat the process until 99.5 % of the total is reached and record that frequency as the upper OBW frequency. The 99 % power OBW can be determined by computing the difference these two frequencies.
- f. The OBW shall be reported and plot(s) of the measuring instrument display shall be provided with the test report. The frequency and amplitude axis and scale shall be clearly labeled. Tabular data can be reported in addition to the plot(s).

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A4(210 mm x 297 mm)

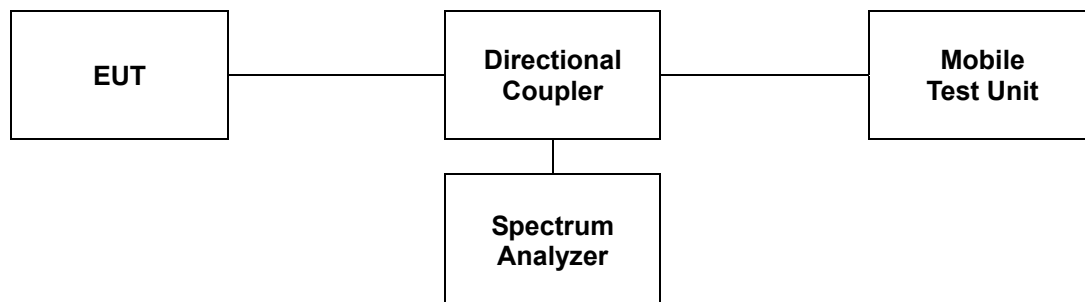
IC

The following conditions shall be observed for measuring the occupied bandwidth and x dB bandwidth:

- The transmitter shall be operated at its maximum carrier power measured under normal test conditions.
- The span of the spectrum analyzer shall be set large enough to capture all products of the modulation process, including the emission skirts, around the carrier frequency, but small enough to avoid having other emissions (e.g. on adjacent channels) within the span.
- The detector of the spectrum analyzer shall be set to "Sample". However, a peak, or peak hold, may be used in place of the sampling detector since this usually produces a wider bandwidth than the actual bandwidth (worst-case measurement). Use of a peak hold (or "Max Hold") may be necessary to determine the occupied / x dB bandwidth if the device is not transmitting continuously.
- The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the actual occupied / x dB bandwidth and the video bandwidth (VBW) shall not be smaller than three times the RBW value. Video averaging is not permitted.

Note: It may be necessary to repeat the measurement a few times until the RBW and VBW are in compliance with the above requirement.

For the 99% emission bandwidth, the trace data points are recovered and directly summed in linear power level terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached, and that frequency recorded. The process is repeated for the highest frequency data points (starting at the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded. The difference between the two recorded frequencies is the occupied bandwidth (or the 99% emission bandwidth).



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4.3 Test Results

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

Band	Mode	Frequency (MHz)	Occupied Bandwidth (MHz)
2 (1.4 MHz)	QPSK	1 850.7	1.107
		1 880.0	1.107
		1 909.3	1.111
2 (1.4 MHz)	16QAM	1 850.7	1.103
		1 880.0	1.107
		1 909.3	1.111
2 (3 MHz)	QPSK	1 851.5	2.692
		1 880.0	2.692
		1 908.5	2.692
2 (3 MHz)	16QAM	1 851.5	2.692
		1 880.0	2.683
		1 908.5	2.692
2 (5 MHz)	QPSK	1 852.5	4.515
		1 880.0	4.530
		1 907.5	4.501
2 (5 MHz)	16QAM	1 852.5	4.501
		1 880.0	4.515
		1 907.5	4.530
2 (10 MHz)	QPSK	1 855.0	8.944
		1 880.0	8.973
		1 905.0	8.973
2 (10 MHz)	16QAM	1 855.0	8.944
		1 880.0	8.973
		1 905.0	8.973
2 (15 MHz)	QPSK	1 857.5	13.502
		1 880.0	13.632
		1 902.5	13.546
2 (15 MHz)	16QAM	1 857.5	13.589
		1 880.0	13.589
		1 902.5	13.546
2 (20 MHz)	QPSK	1 860.0	17.945
		1 880.0	18.003
		1 900.0	18.003
2 (20 MHz)	16QAM	1 860.0	17.945
		1 880.0	18.061
		1 900.0	17.945

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Band	Mode	Frequency (MHz)	Occupied Bandwidth (MHz)
4 (1.4 MHz)	QPSK	1 710.7	1.103
		1 732.5	1.103
		1 754.3	1.098
4 (1.4 MHz)	16QAM	1 710.7	1.116
		1 732.5	1.094
		1 754.3	1.103
4 (3 MHz)	QPSK	1 711.5	2.700
		1 732.5	2.700
		1 753.5	2.692
4 (3 MHz)	16QAM	1 711.5	2.692
		1 732.5	2.683
		1 753.5	2.683
4 (5 MHz)	QPSK	1 712.5	4.515
		1 732.5	4.515
		1 752.5	4.501
4 (5 MHz)	16QAM	1 712.5	4.515
		1 732.5	4.515
		1 752.5	4.530
4 (10 MHz)	QPSK	1 715.0	8.973
		1 732.5	8.944
		1 750.0	8.944
4 (10 MHz)	16QAM	1 715.0	8.944
		1 732.5	8.944
		1 750.0	8.973
4 (15 MHz)	QPSK	1 717.5	13.589
		1 732.5	13.459
		1 747.5	13.546
4 (15 MHz)	16QAM	1 717.5	13.546
		1 732.5	13.546
		1 747.5	13.546
4 (20 MHz)	QPSK	1 720.0	18.003
		1 732.5	17.945
		1 745.0	17.945
4 (20 MHz)	16QAM	1 720.0	18.003
		1 732.5	18.003
		1 745.0	18.003

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Band	Mode	Frequency (MHz)	Occupied Bandwidth (MHz)
5 (1.4 MHz)	QPSK	824.7	1.103
		836.5	1.098
		848.3	1.103
5 (1.4 MHz)	16QAM	824.7	1.103
		836.5	1.098
		848.3	1.111
5 (3 MHz)	QPSK	825.5	2.692
		836.5	2.692
		847.5	2.683
5 (3 MHz)	16QAM	825.5	2.683
		836.5	2.683
		847.5	2.683
5 (5 MHz)	QPSK	826.5	4.530
		836.5	4.515
		846.5	4.501
5 (5 MHz)	16QAM	826.5	4.515
		836.5	4.501
		846.5	4.515
5 (10 MHz)	QPSK	829.0	8.944
		836.5	8.973
		844.0	8.944
5 (10 MHz)	16QAM	829.0	8.944
		836.5	8.973
		844.0	8.944

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A4(210 mm x 297 mm)

Band	Mode	Frequency (MHz)	Occupied Bandwidth (MHz)
12 (1.4 MHz)	QPSK	699.7	1.098
		707.5	1.094
		715.3	1.098
12 (1.4 MHz)	16QAM	699.7	1.103
		707.5	1.107
		715.3	1.107
12 (3 MHz)	QPSK	700.5	2.692
		707.5	2.692
		714.5	2.683
12 (3 MHz)	16QAM	700.5	2.692
		707.5	2.692
		714.5	2.683
12 (5 MHz)	QPSK	701.5	4.515
		707.5	4.515
		713.5	4.486
12 (5 MHz)	16QAM	701.5	4.501
		707.5	4.515
		713.5	4.530
12 (10 MHz)	QPSK	704.0	8.915
		707.5	8.944
		711.0	9.001
12 (10 MHz)	16QAM	704.0	8.944
		707.5	8.973
		711.0	8.973

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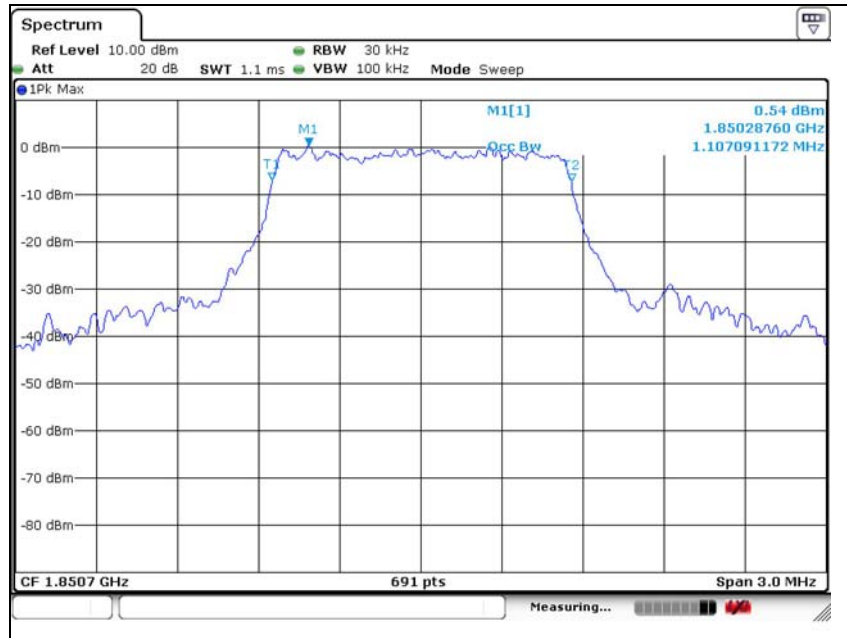
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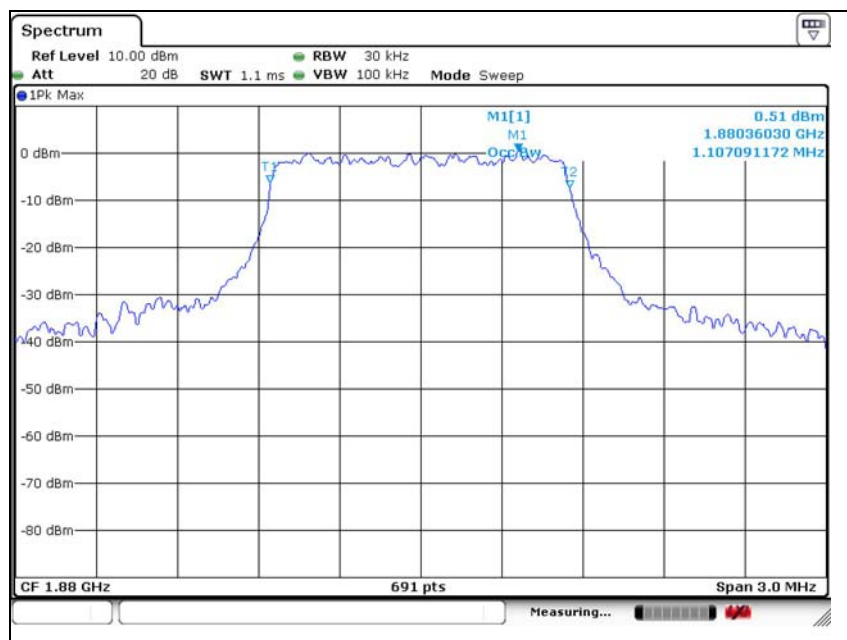
A4(210 mm x 297 mm)

LTE band 2 (1.4 MHz - QPSK)

Low Channel



Middle Channel



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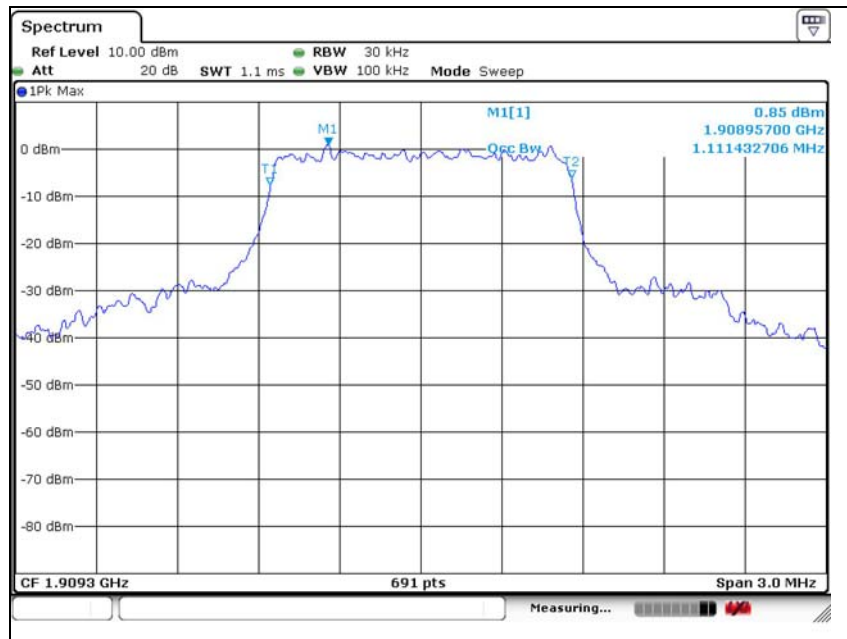
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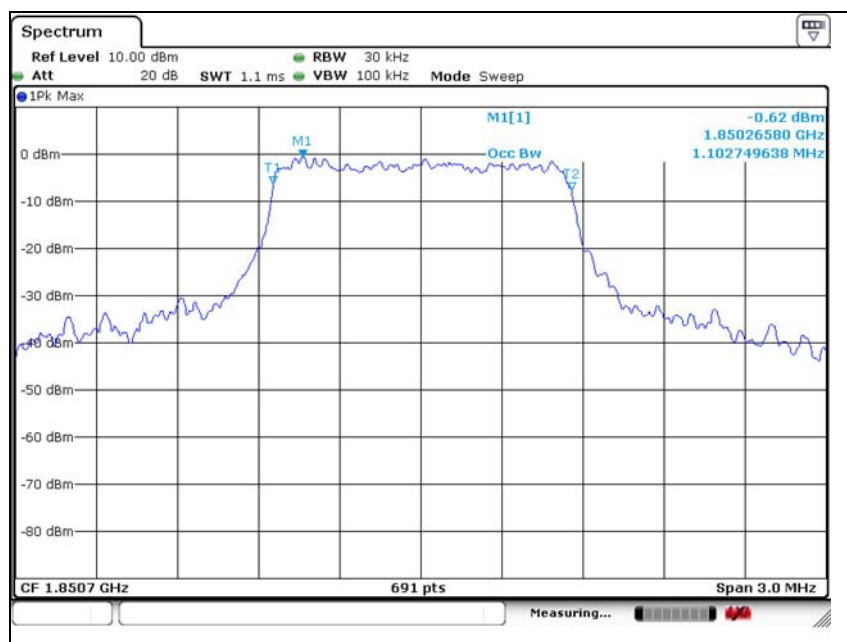
A4(210 mm x 297 mm)

High Channel



LTE band 2 (1.4 MHz - 16QAM)

Low Channel



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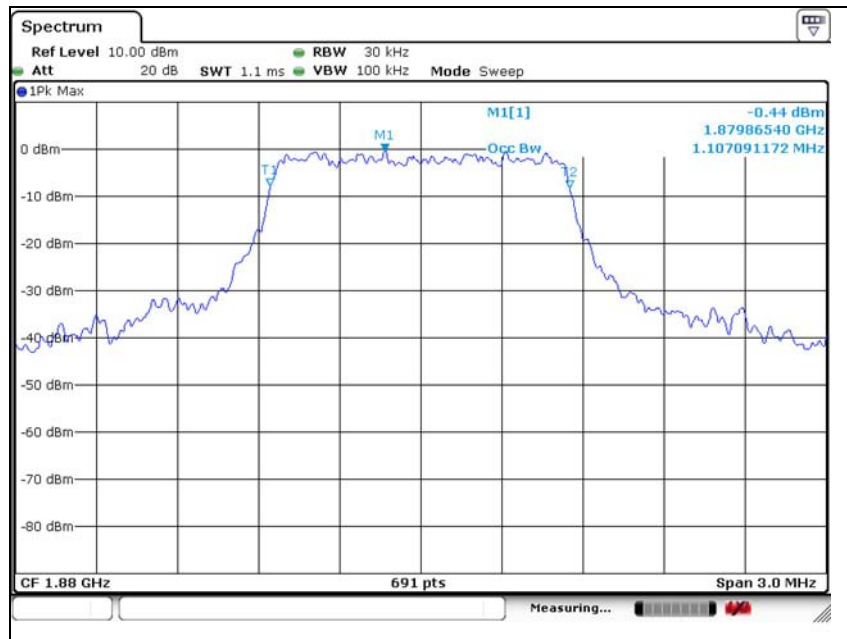
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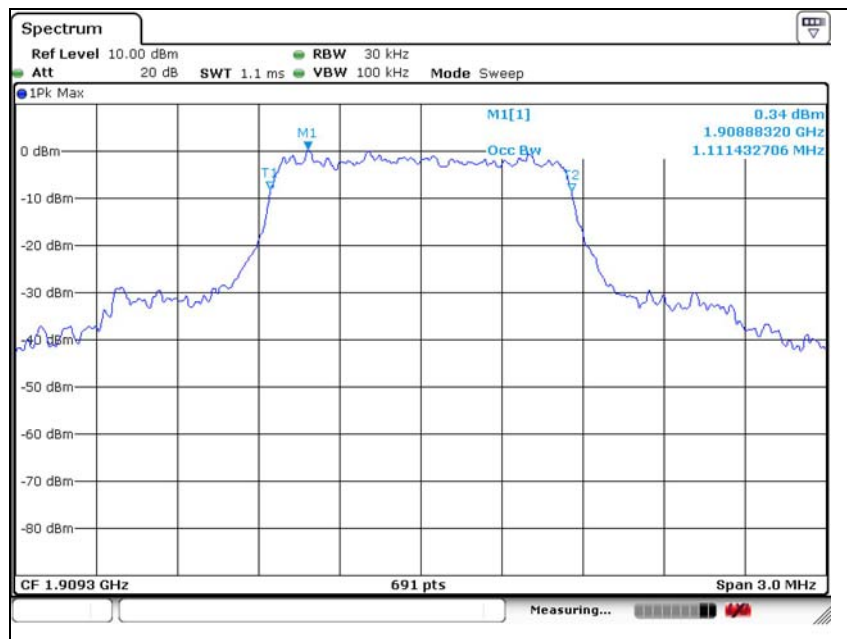
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A4(210 mm x 297 mm)

Middle Channel



High Channel



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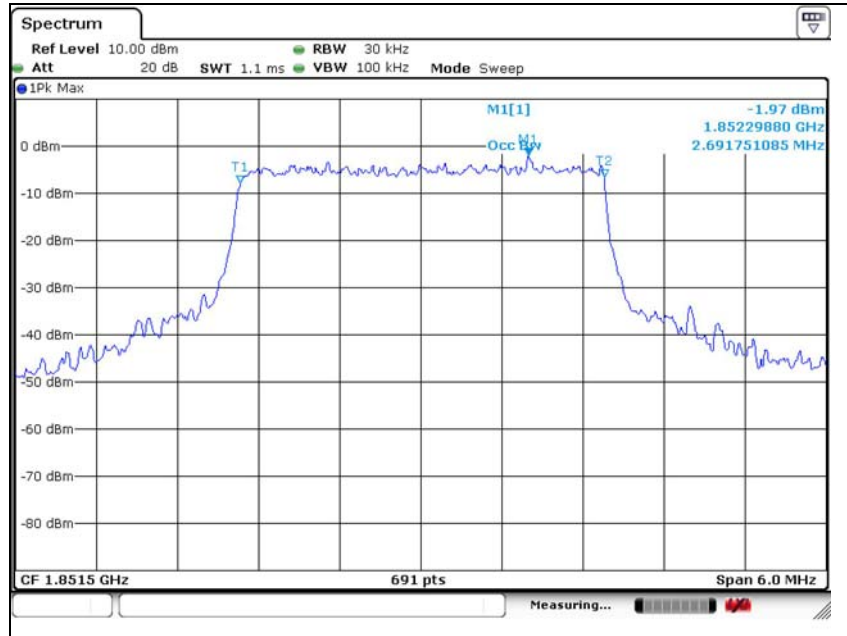
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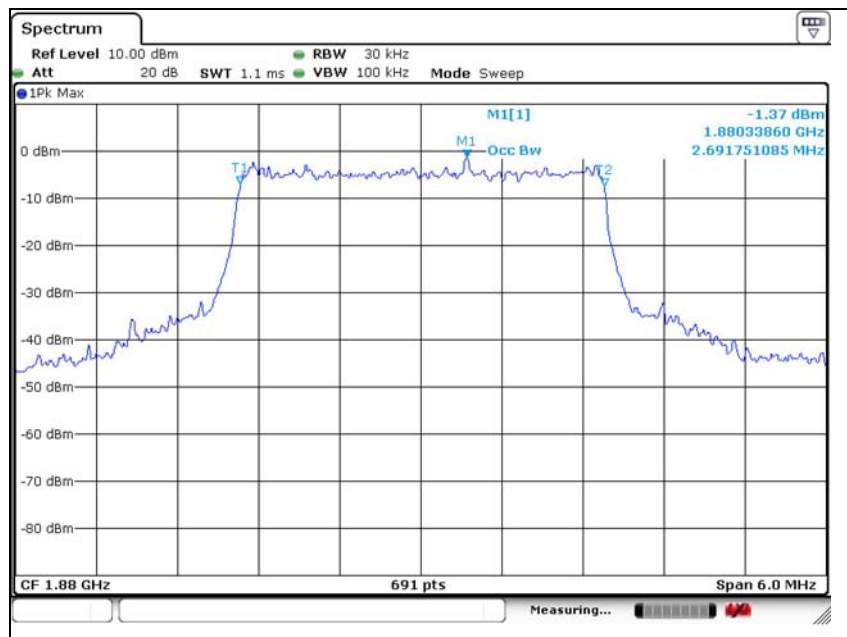
A4(210 mm x 297 mm)

LTE band 2 (3 MHz - QPSK)

Low Channel



Middle Channel



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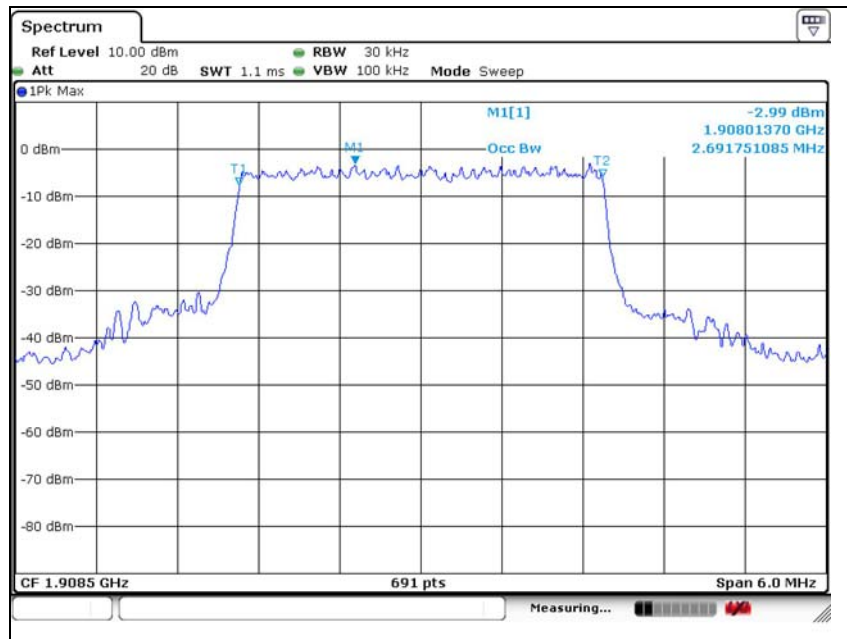
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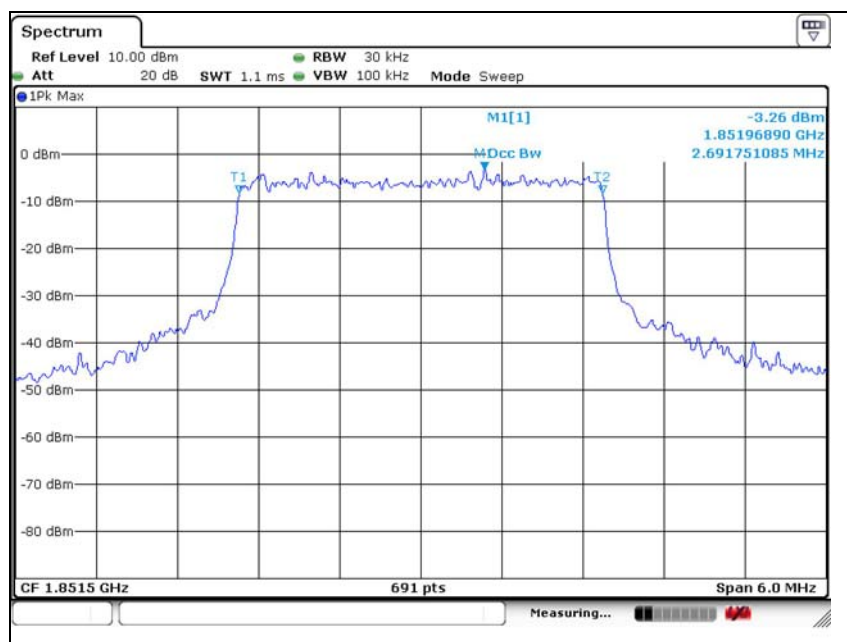
A4(210 mm x 297 mm)

High Channel



LTE band 2 (3 MHz - 16QAM)

Low Channel



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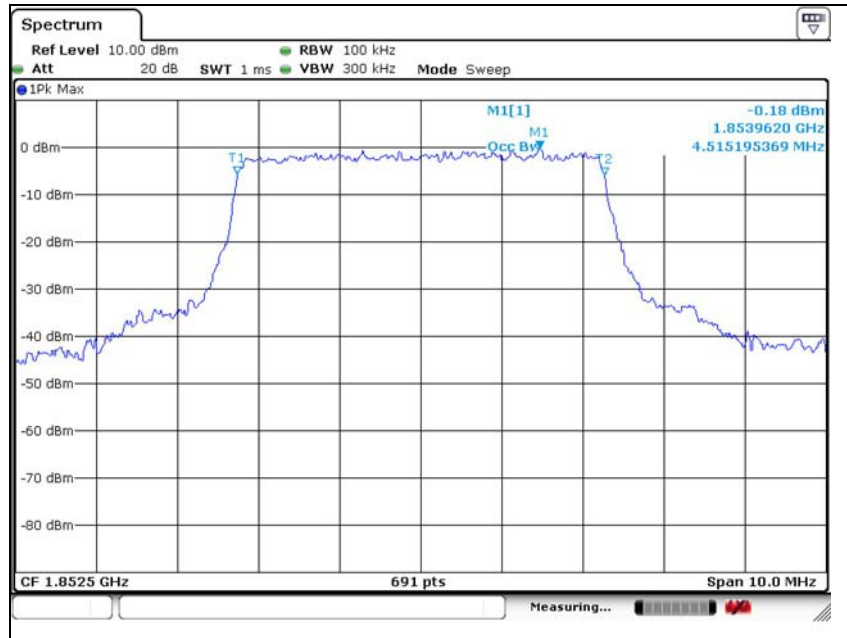
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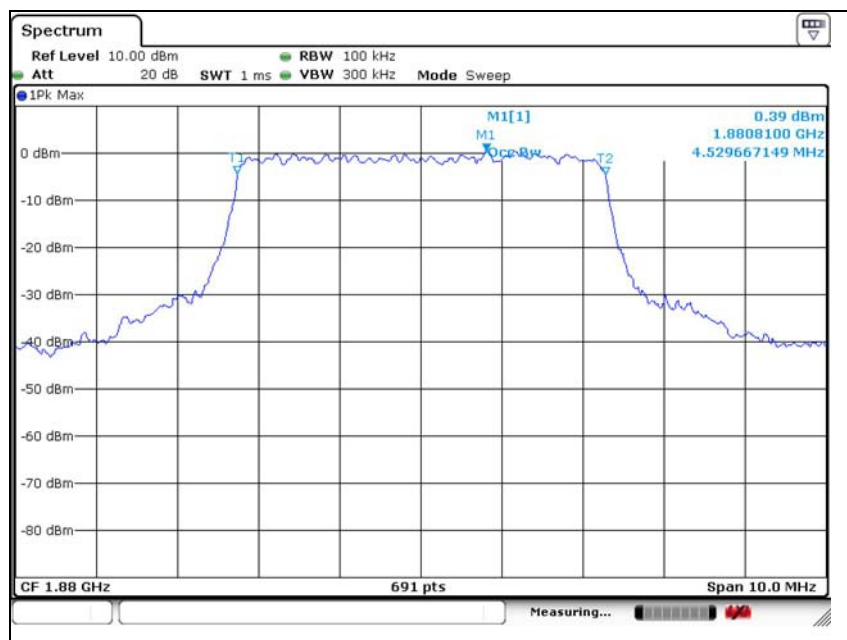
A4(210 mm x 297 mm)

LTE band 2 (5 MHz - QPSK)

Low Channel



Middle Channel



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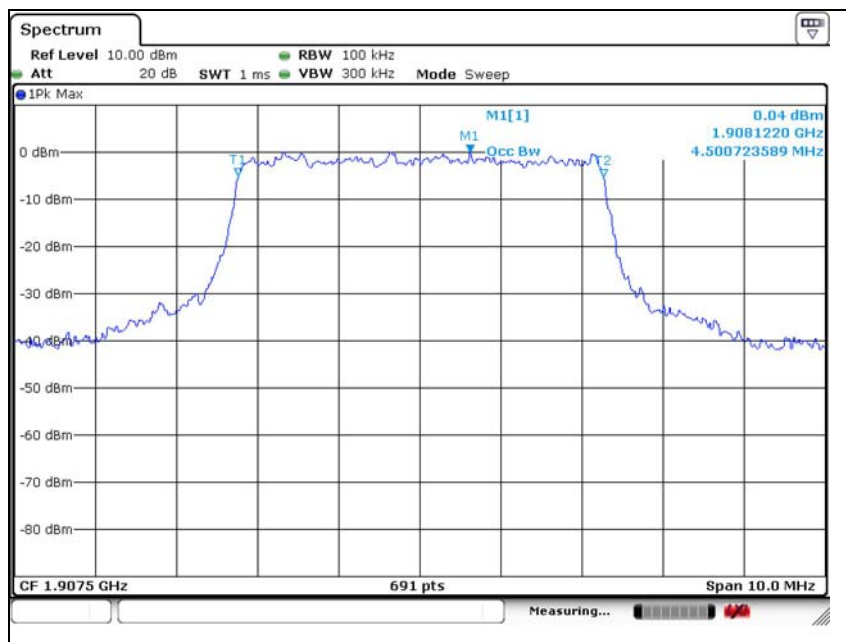
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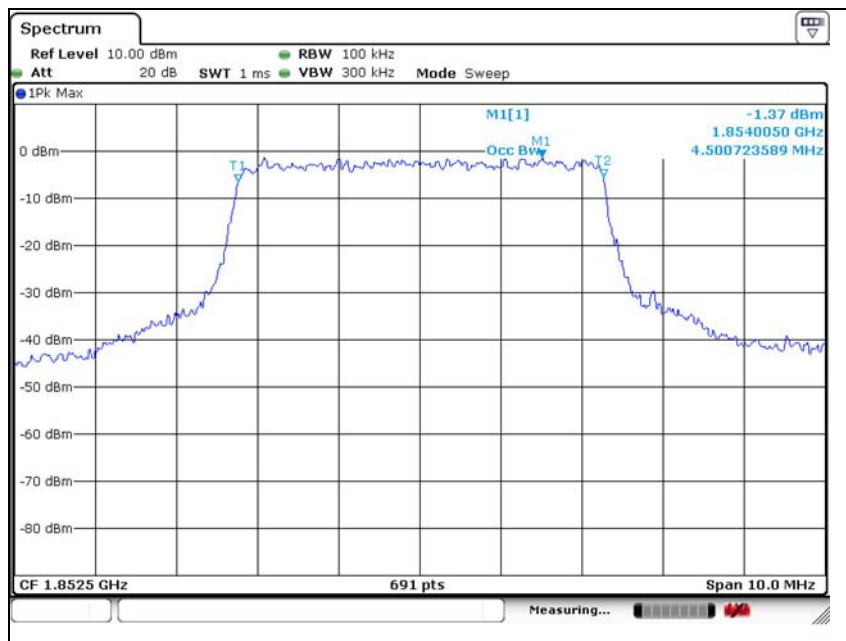
A4(210 mm x 297 mm)

High Channel



LTE band 2 (5 MHz - 16QAM)

Low Channel



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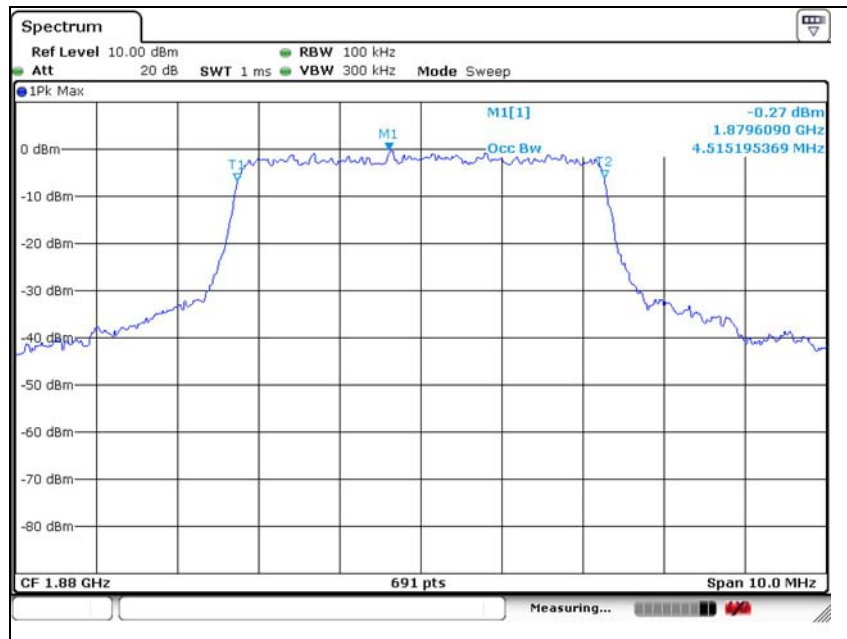
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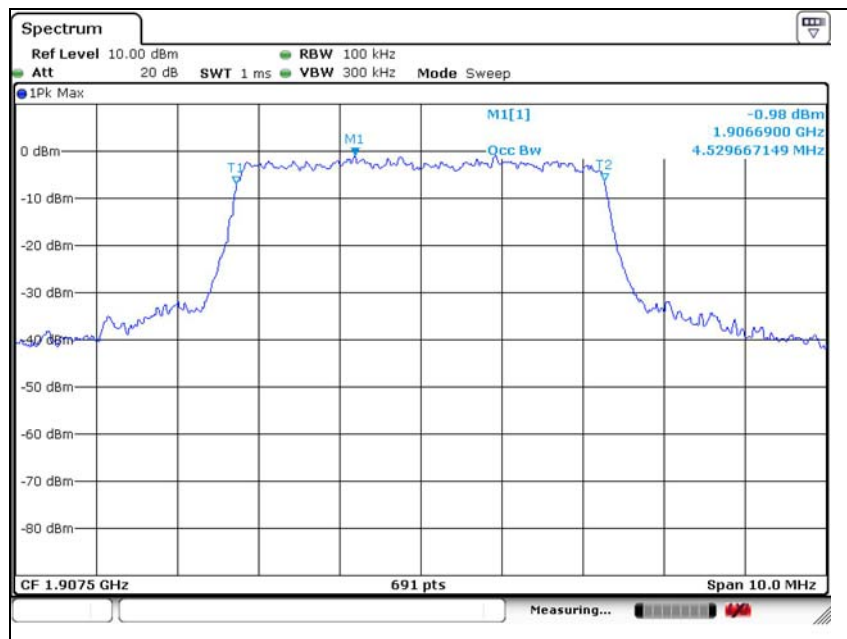
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Middle Channel



High Channel



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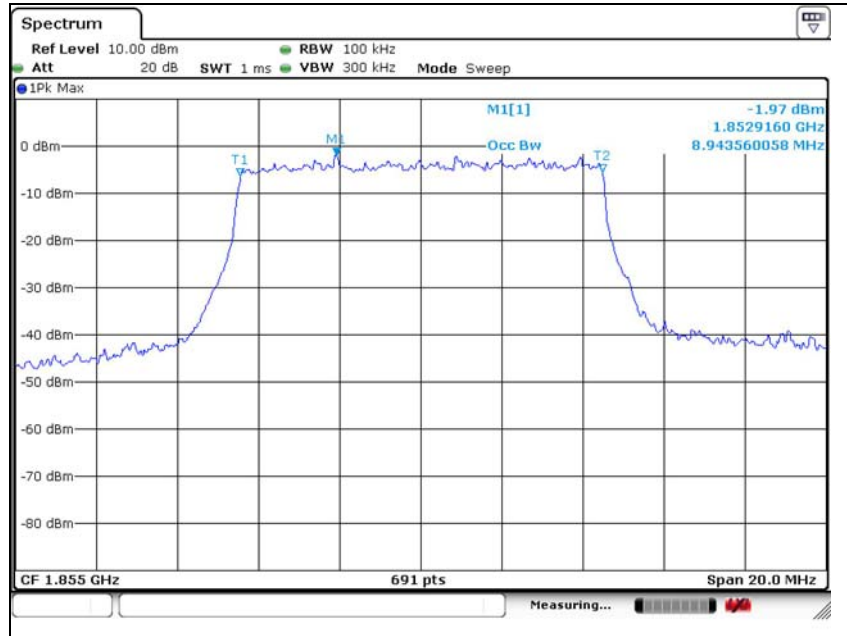
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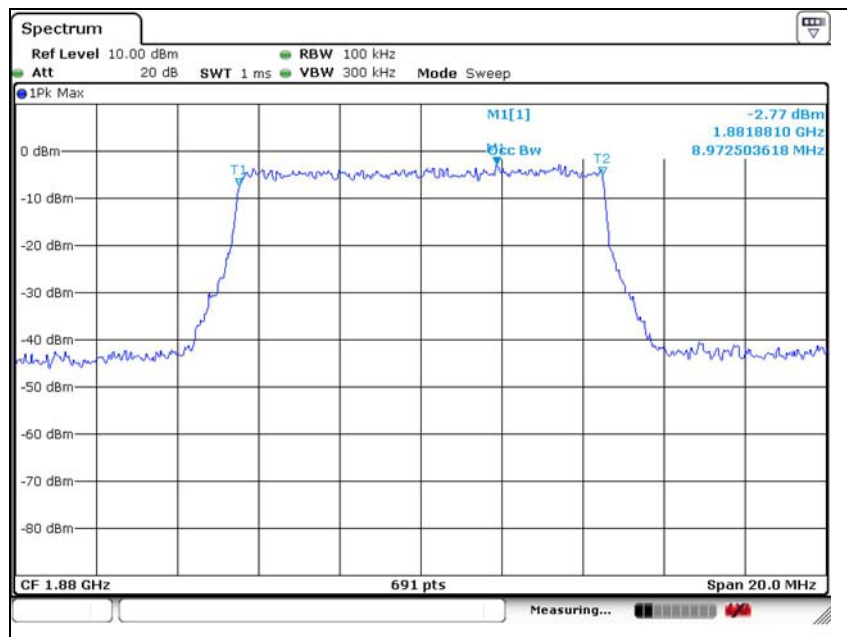
A4(210 mm x 297 mm)

LTE band 2 (10 MHz - QPSK)

Low Channel



Middle Channel



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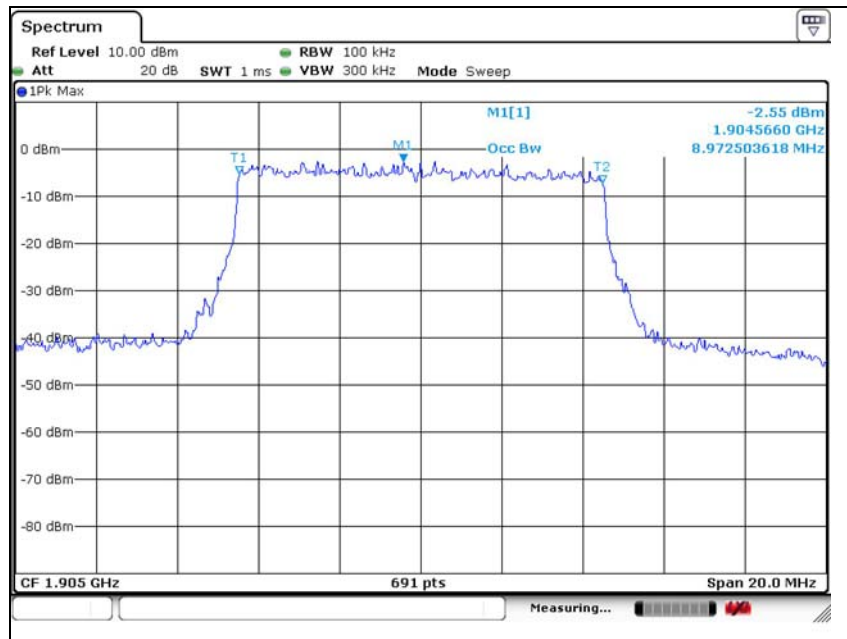
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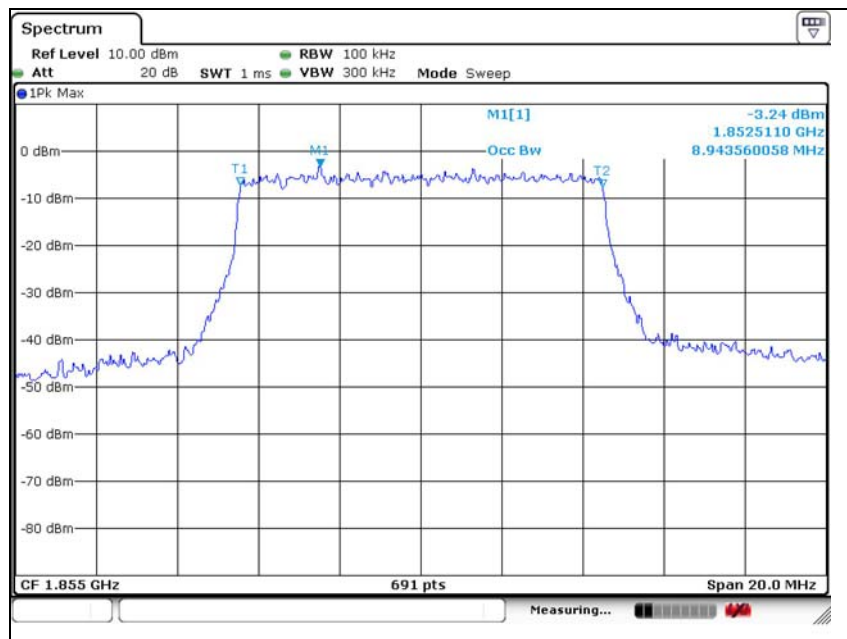
A4(210 mm x 297 mm)

High Channel



LTE band 2 (10 MHz - 16QAM)

Low Channel



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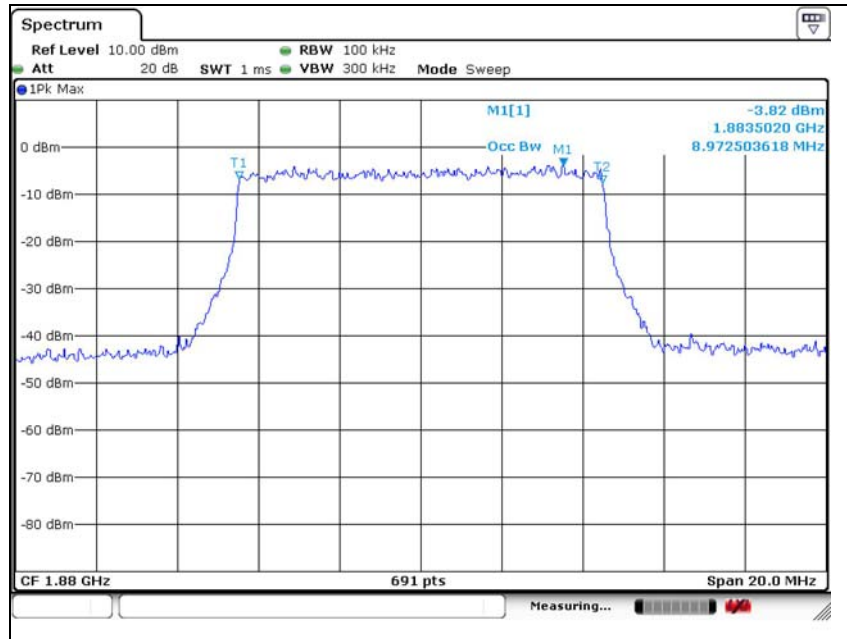
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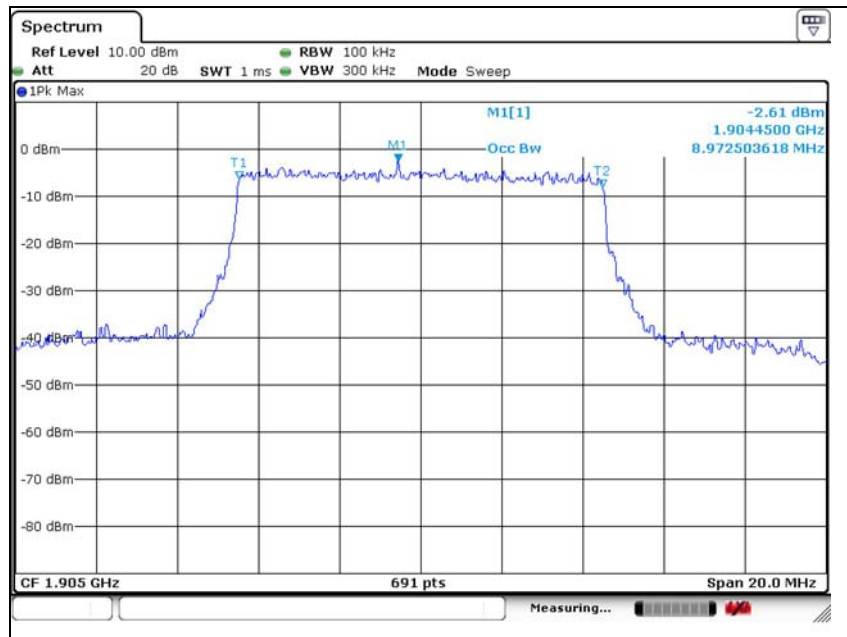
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A4(210 mm x 297 mm)

Middle Channel



High Channel



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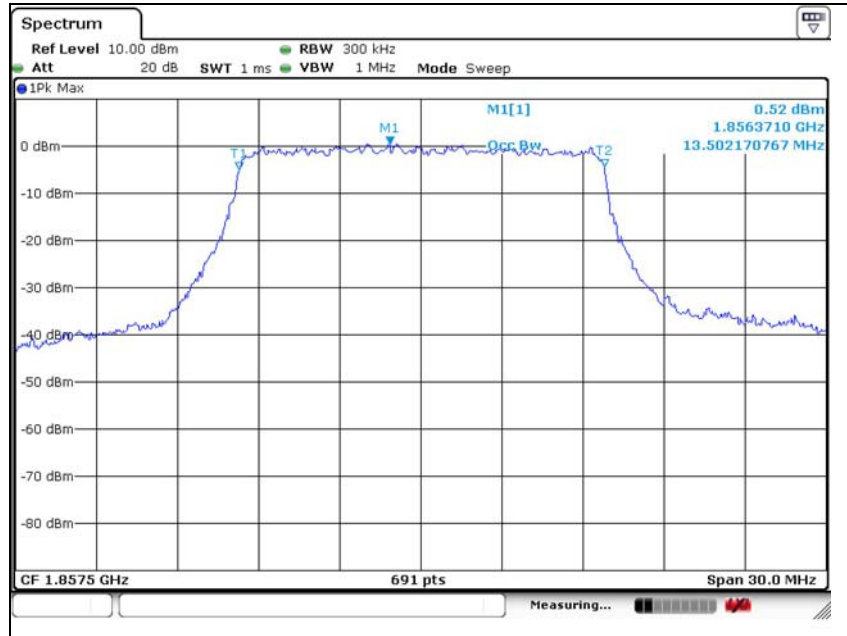
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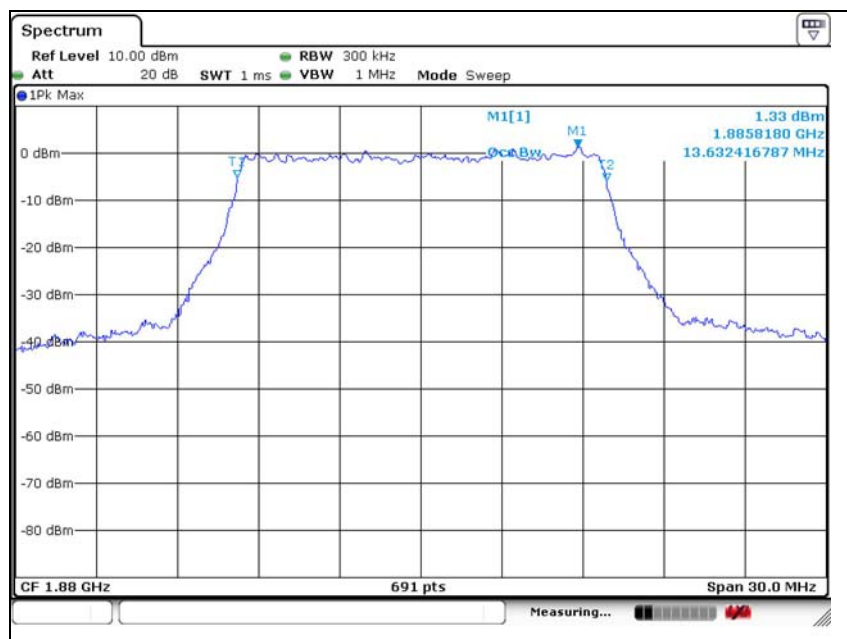
A4(210 mm x 297 mm)

LTE band 2 (15 MHz - QPSK)

Low Channel



Middle Channel



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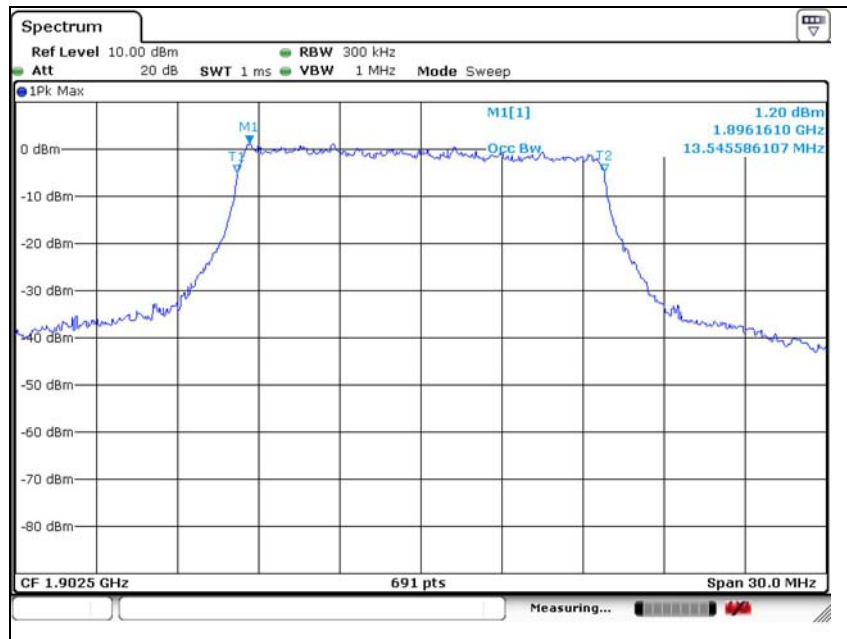
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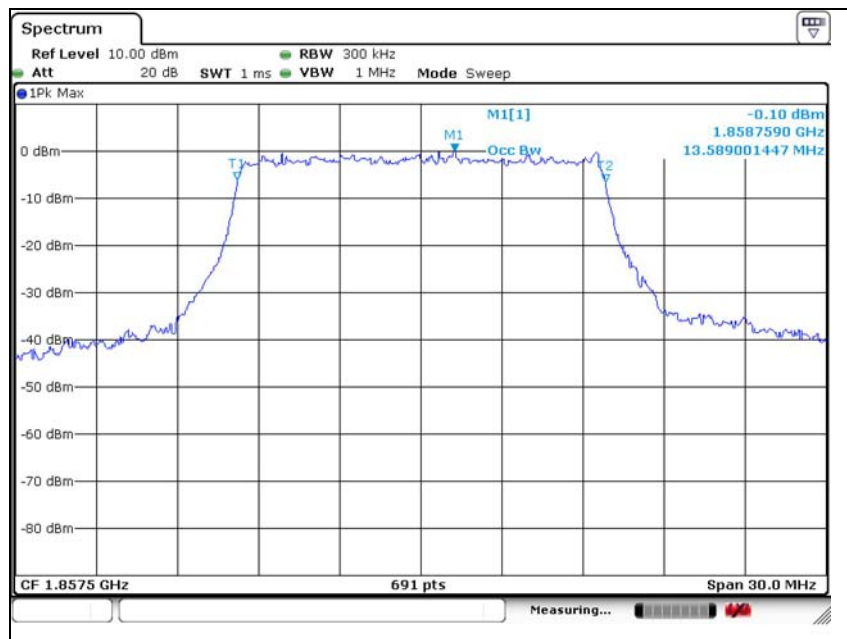
A4(210 mm x 297 mm)

High Channel



LTE band 2 (15 MHz - 16QAM)

Low Channel



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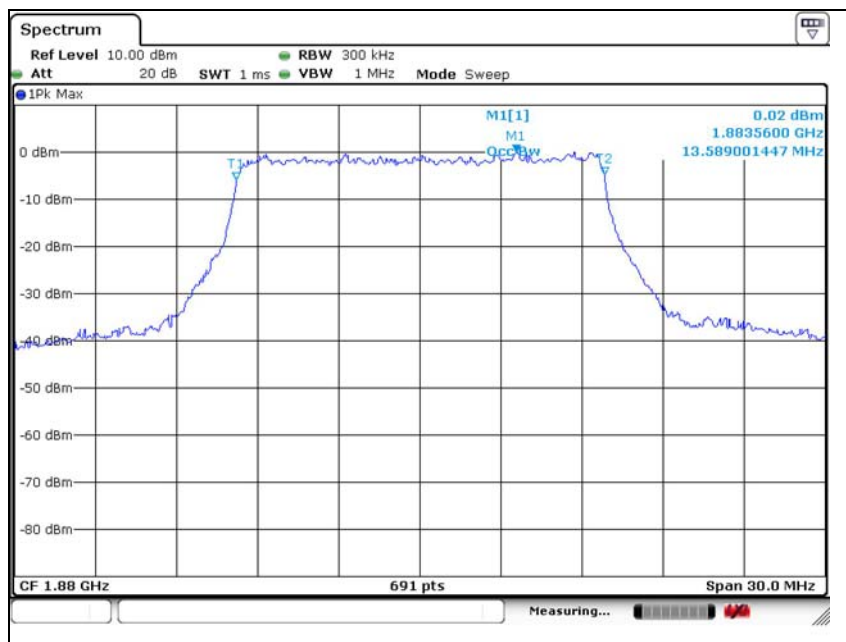
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-19(2019.04.24)(1)

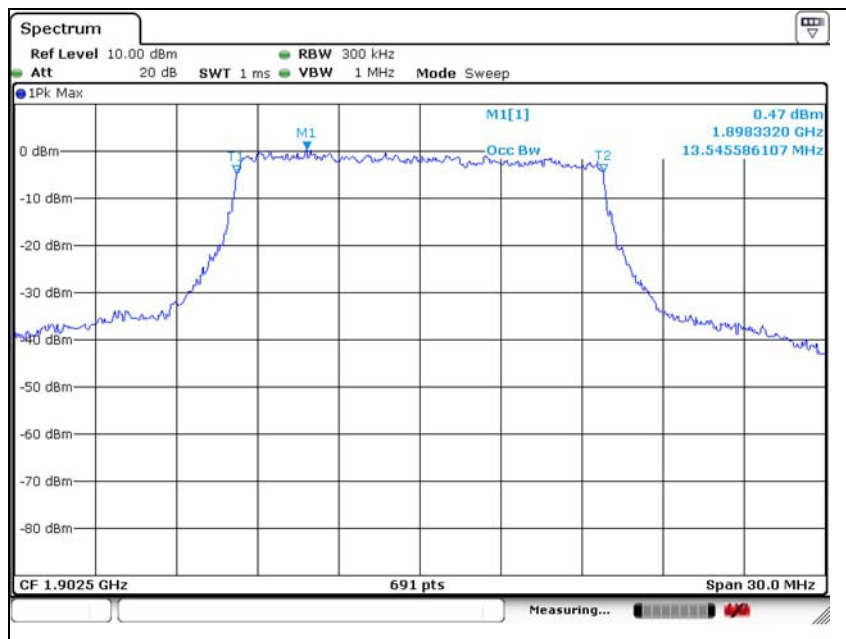
Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

Middle Channel



High Channel



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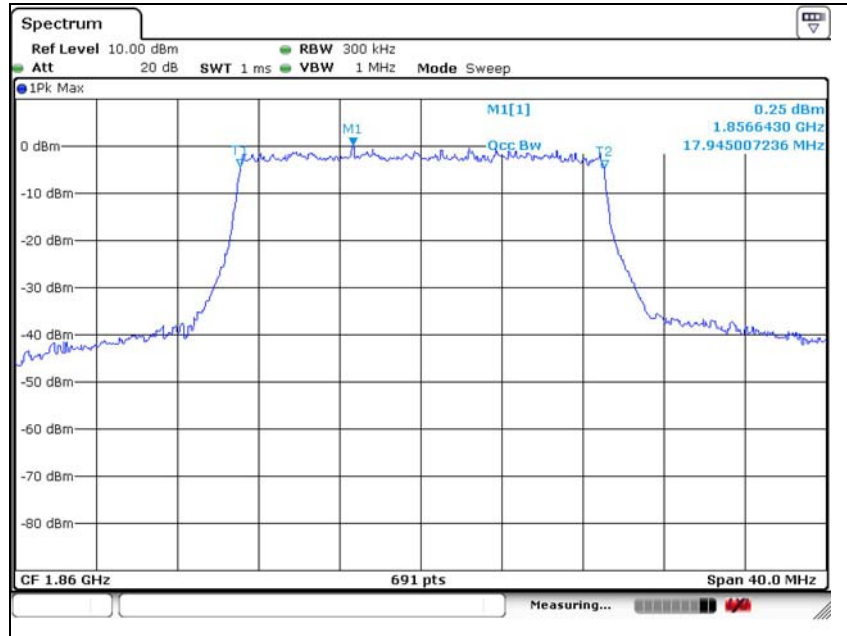
RTT5041-19(2019.04.24)(1)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

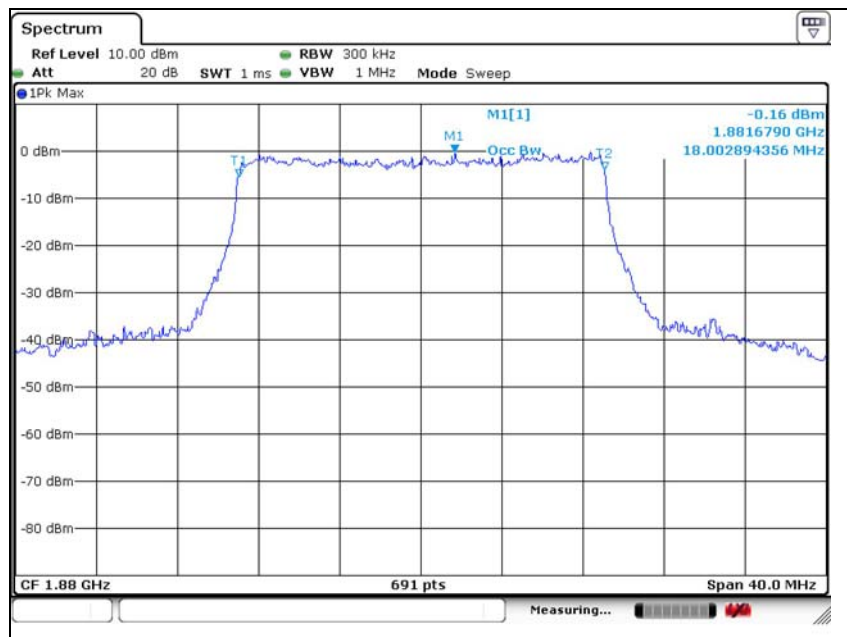
A4(210 mm x 297 mm)

LTE band 2 (20 MHz - QPSK)

Low Channel



Middle Channel



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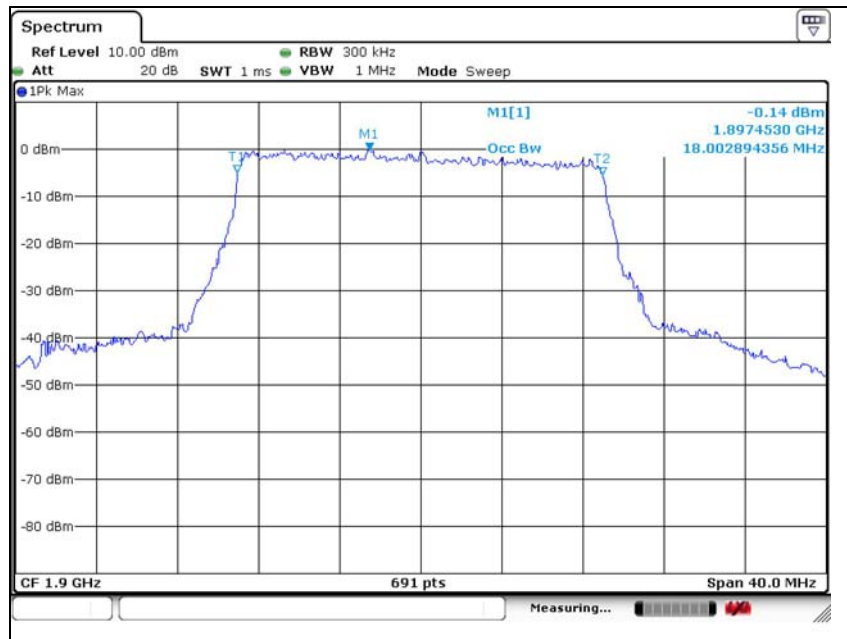
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-19(2019.04.24)(1)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

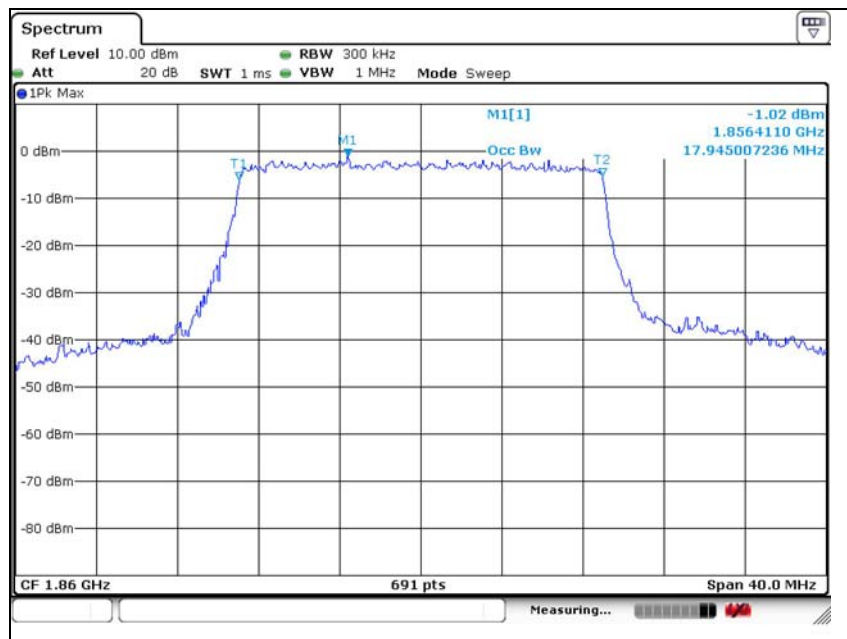
A4(210 mm x 297 mm)

High Channel



LTE band 2 (20 MHz - 16QAM)

Low Channel



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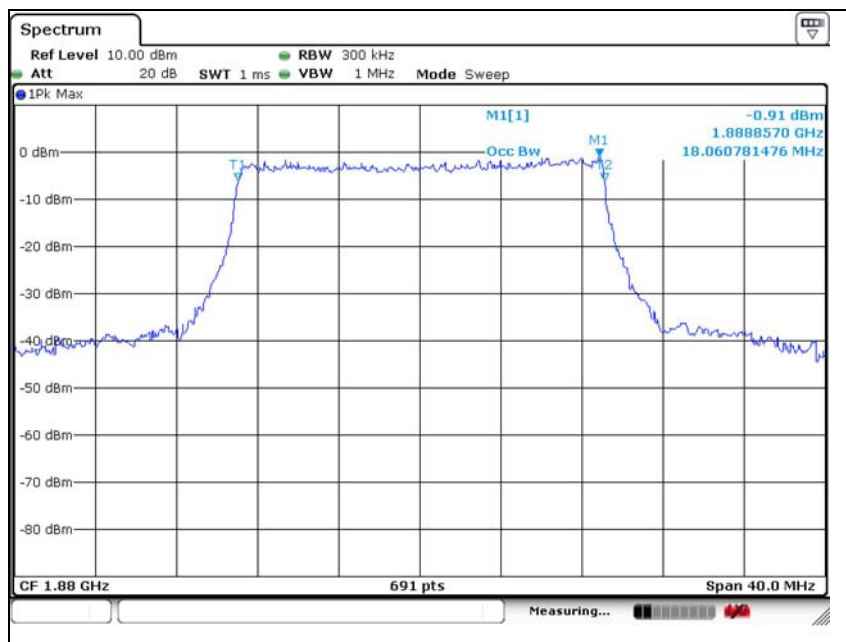
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-19(2019.04.24)(1)

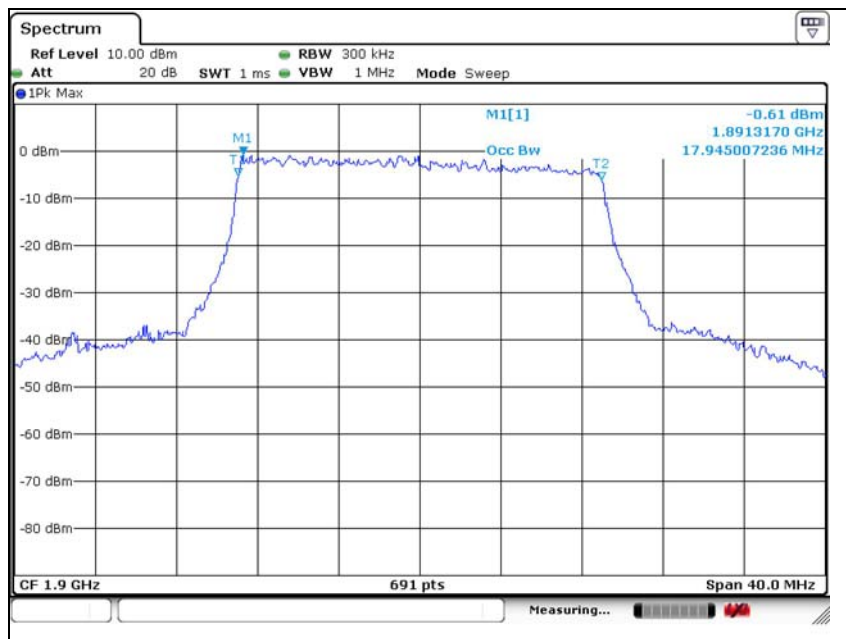
Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

Middle Channel



High Channel



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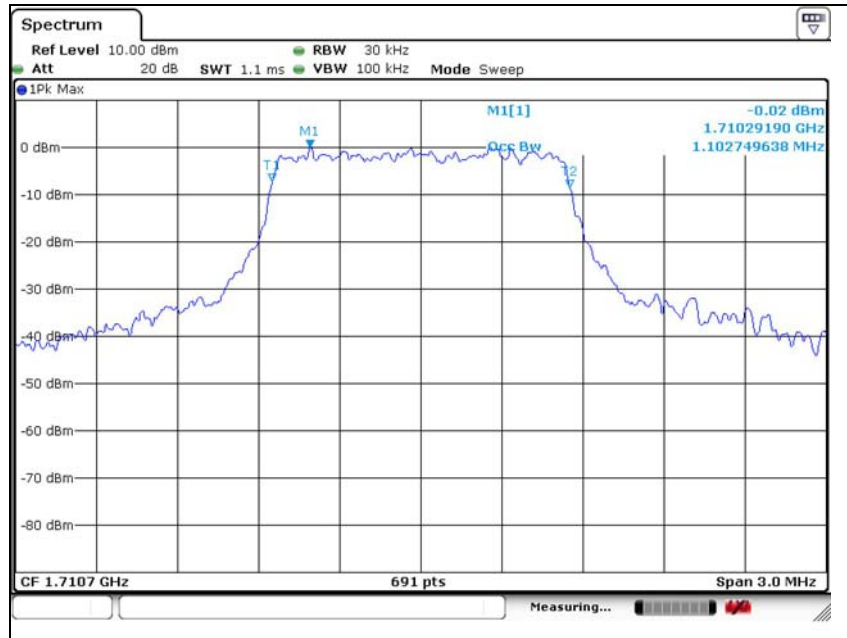
RTT5041-19(2019.04.24)(1)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

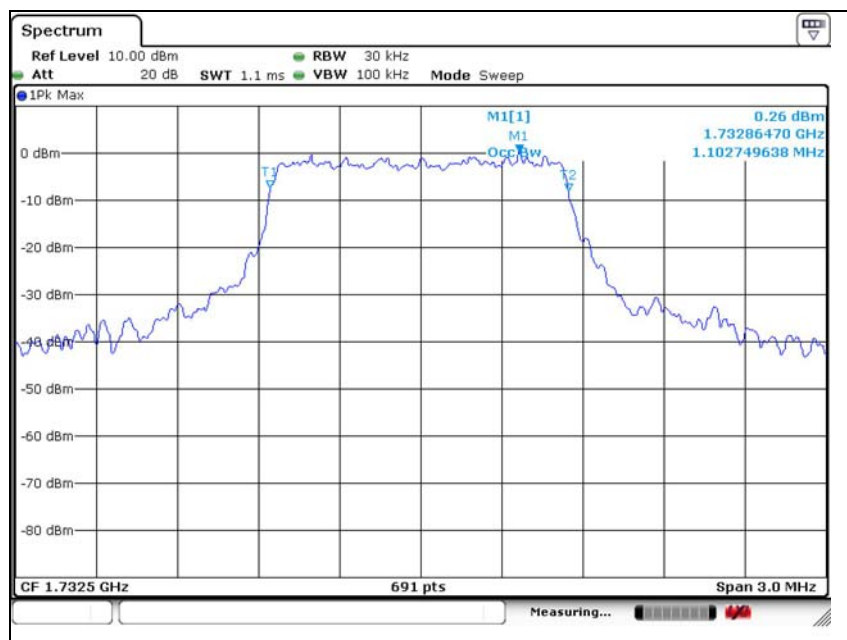
A4(210 mm x 297 mm)

LTE band 4 (1.4 MHz - QPSK)

Low Channel



Middle Channel



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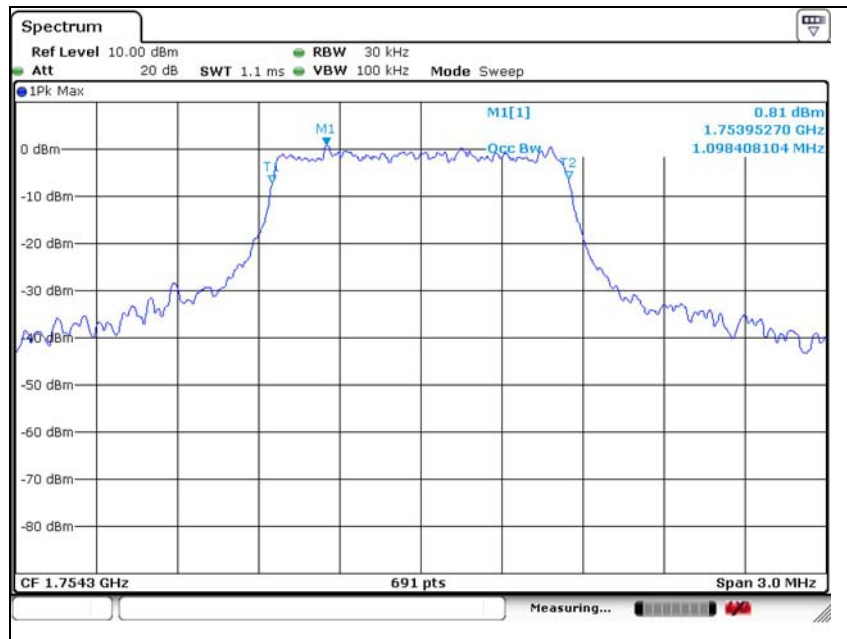
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

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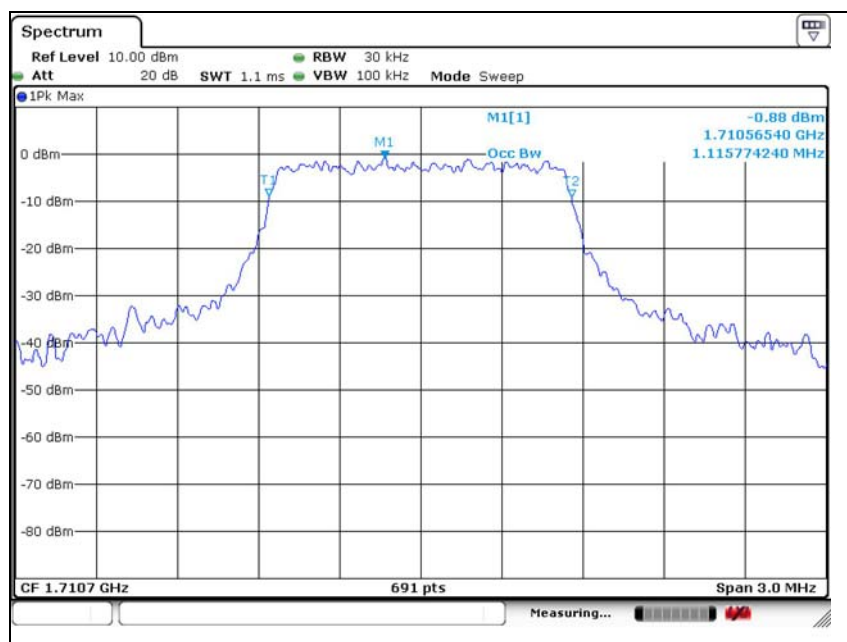
A4(210 mm x 297 mm)

High Channel



LTE band 4 (1.4 MHz - 16QAM)

Low Channel



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RTT5041-19(2019.04.24)(1)

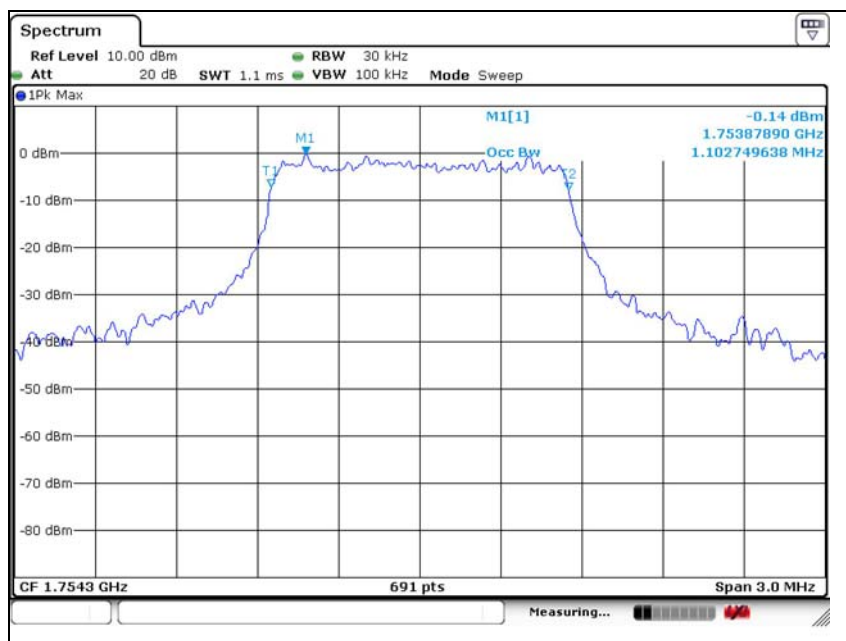
Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

Middle Channel



High Channel



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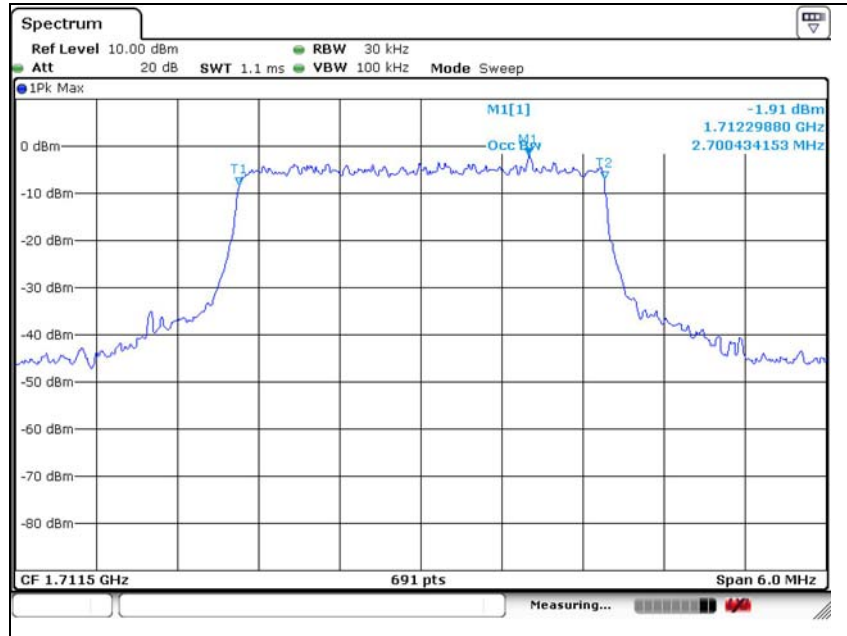
RTT5041-19(2019.04.24)(1)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

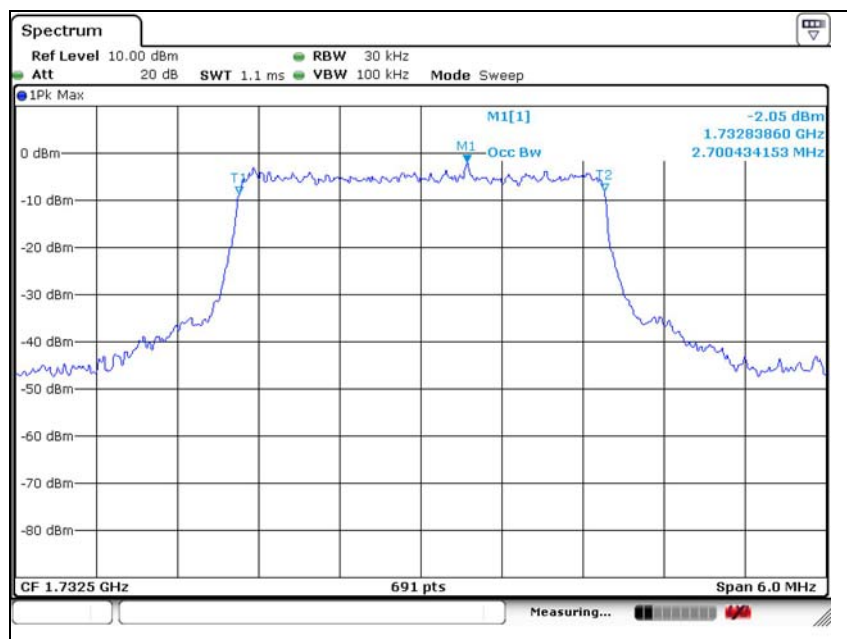
A4(210 mm x 297 mm)

LTE band 4 (3 MHz - QPSK)

Low Channel



Middle Channel



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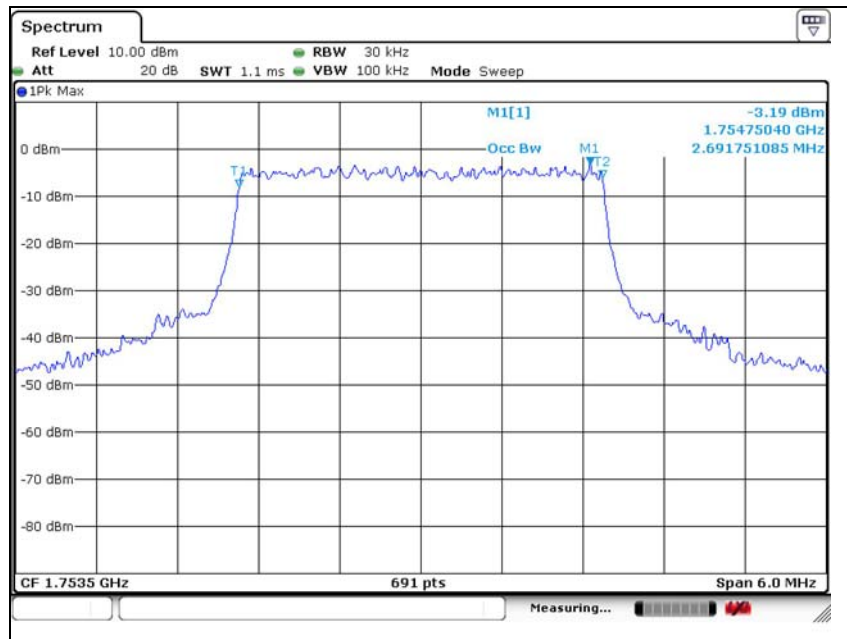
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

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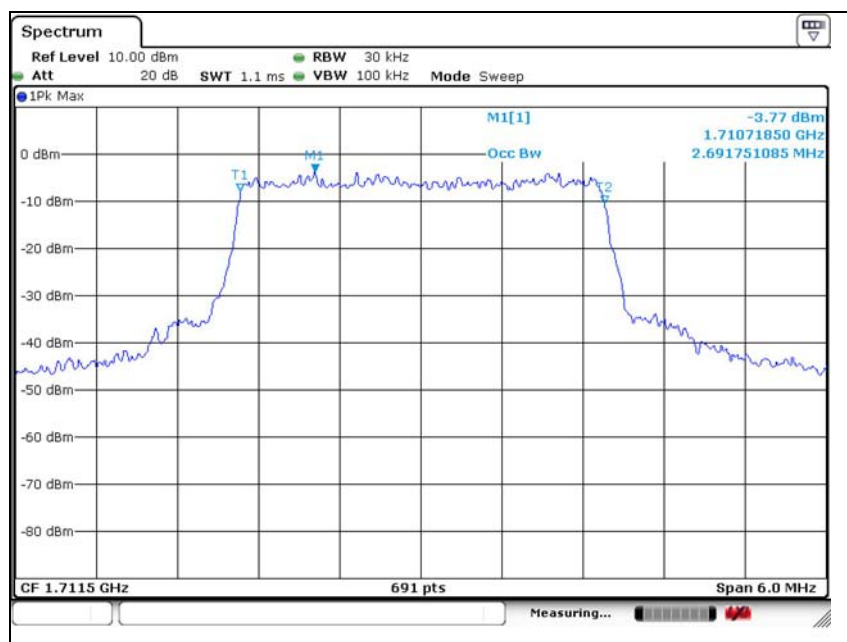
A4(210 mm x 297 mm)

High Channel



LTE band 4 (3 MHz - 16QAM)

Low Channel



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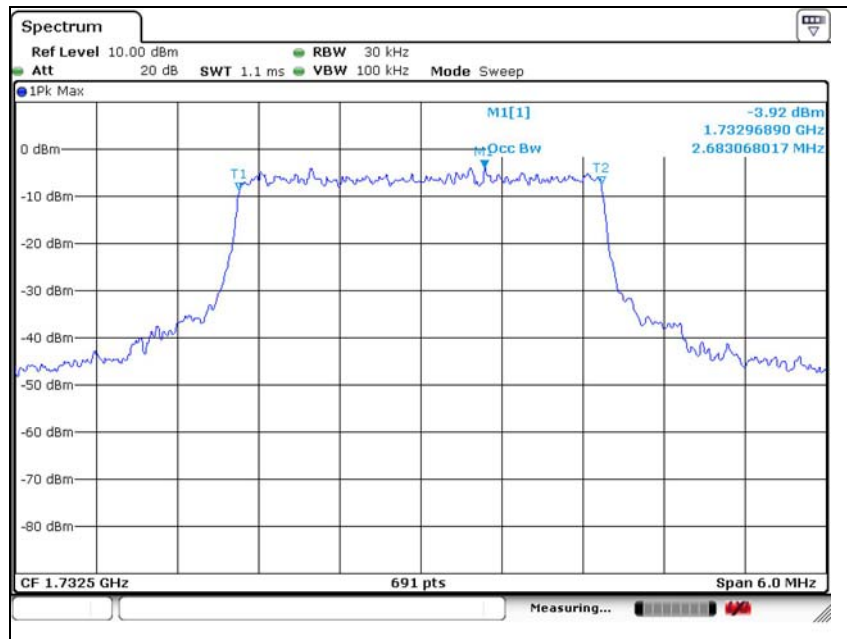
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-19(2019.04.24)(1)

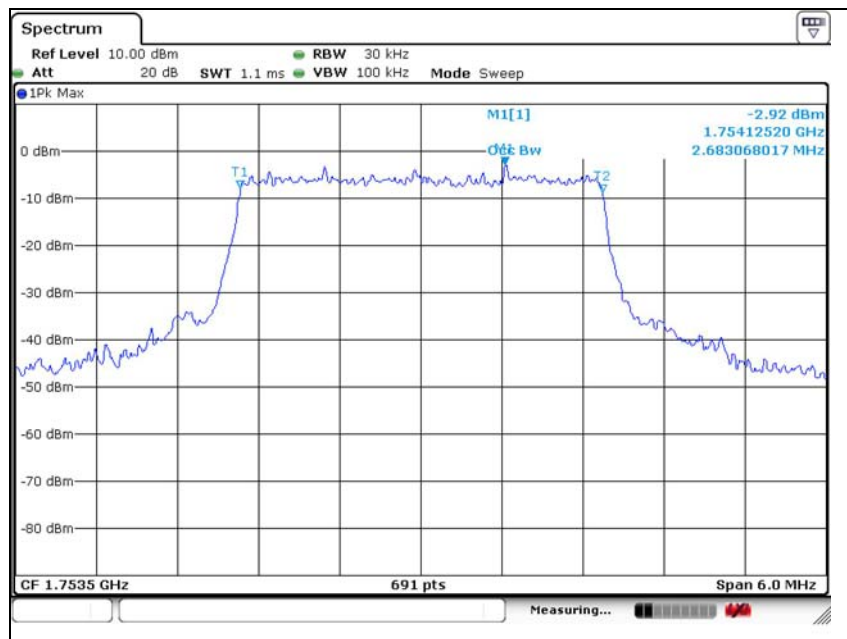
Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

Middle Channel



High Channel



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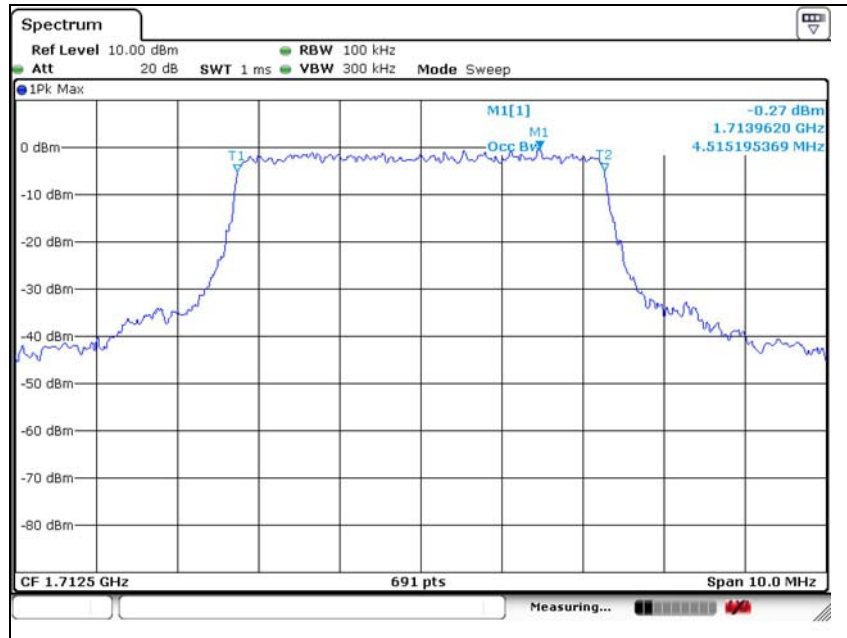
RTT5041-19(2019.04.24)(1)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

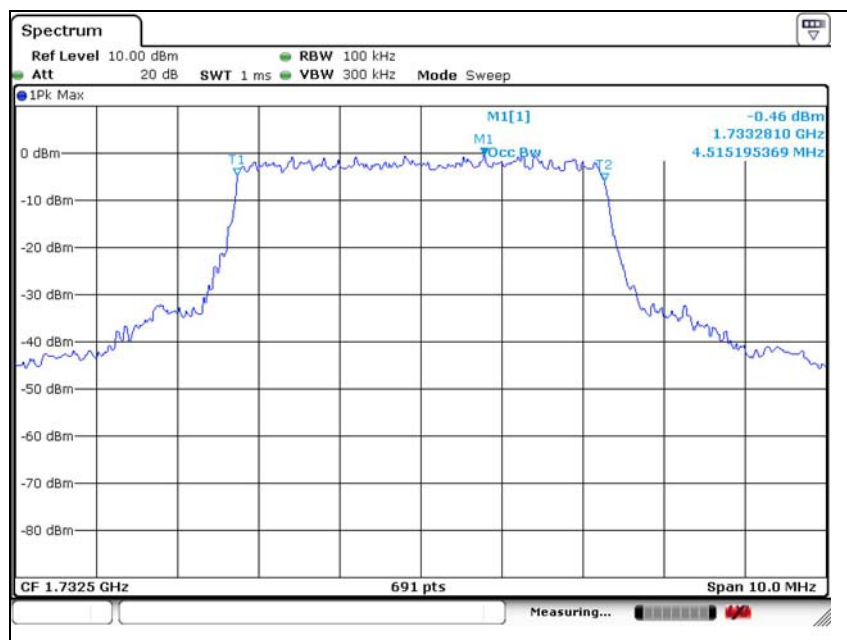
A4(210 mm x 297 mm)

LTE band 4 (5 MHz - QPSK)

Low Channel



Middle Channel



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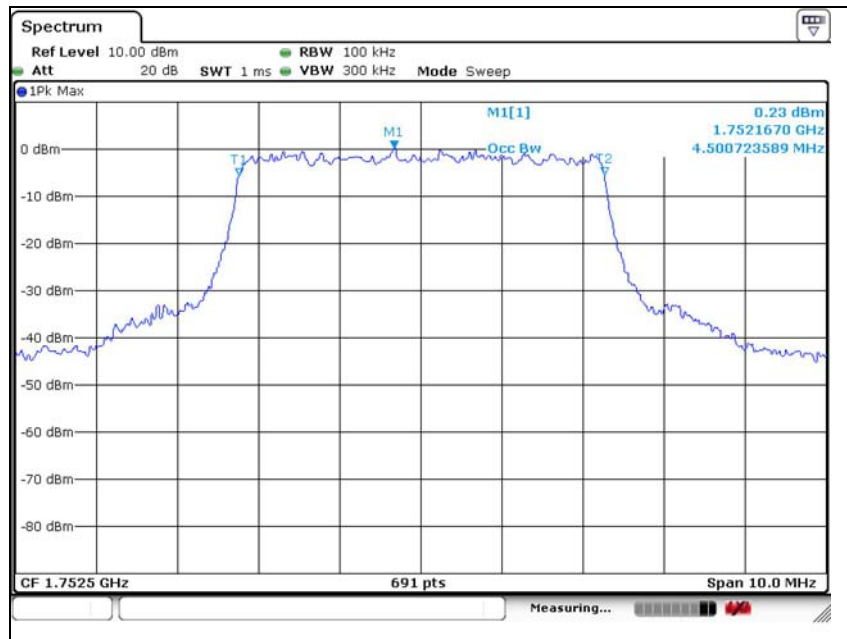
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

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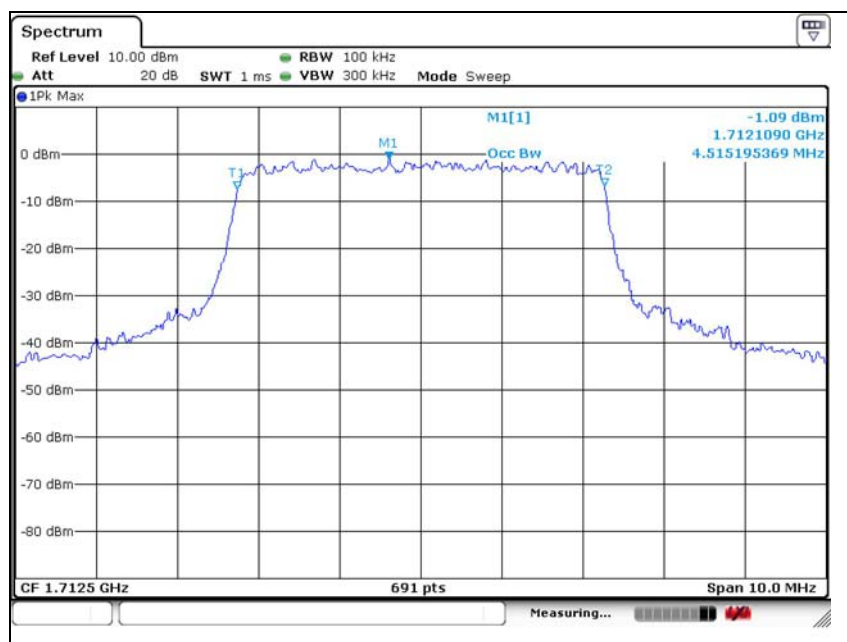
A4(210 mm x 297 mm)

High Channel



LTE band 4 (5 MHz - 16QAM)

Low Channel



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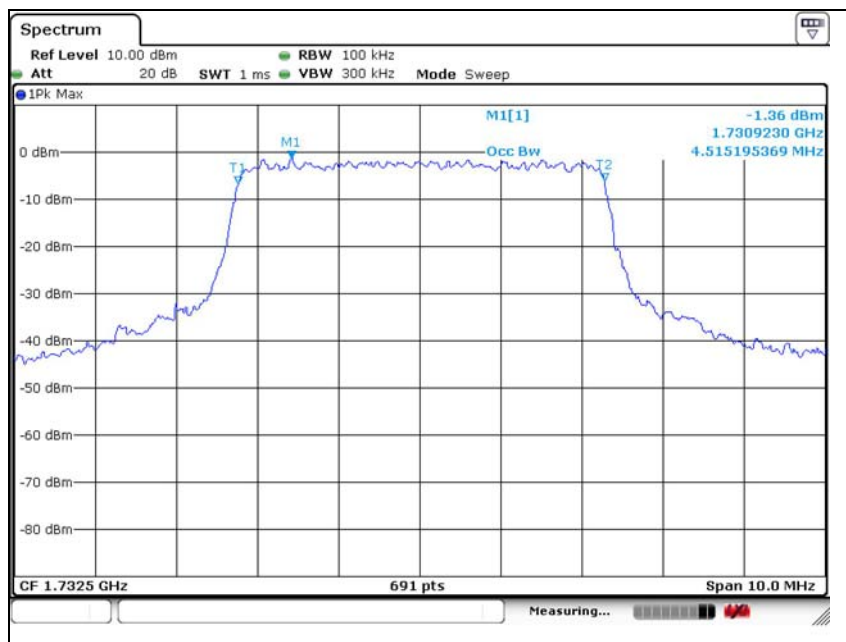
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-19(2019.04.24)(1)

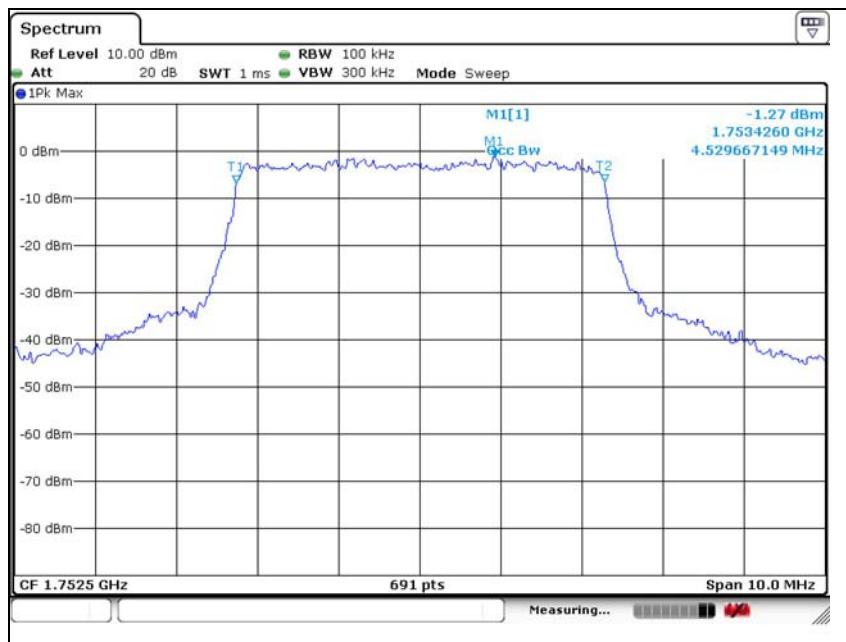
Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

Middle Channel



High Channel



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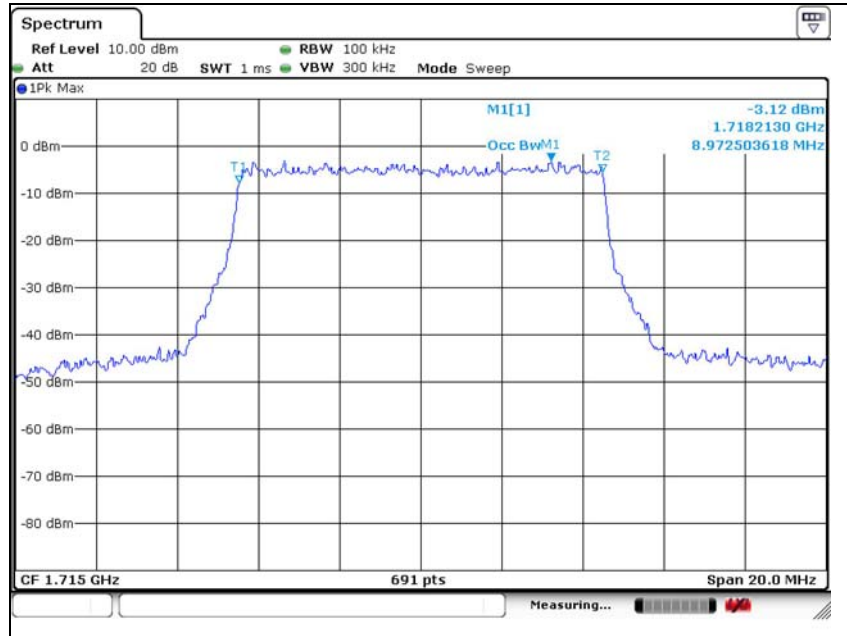
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Tel. +82 31 428 5700 / Fax. +82 31 427 2370

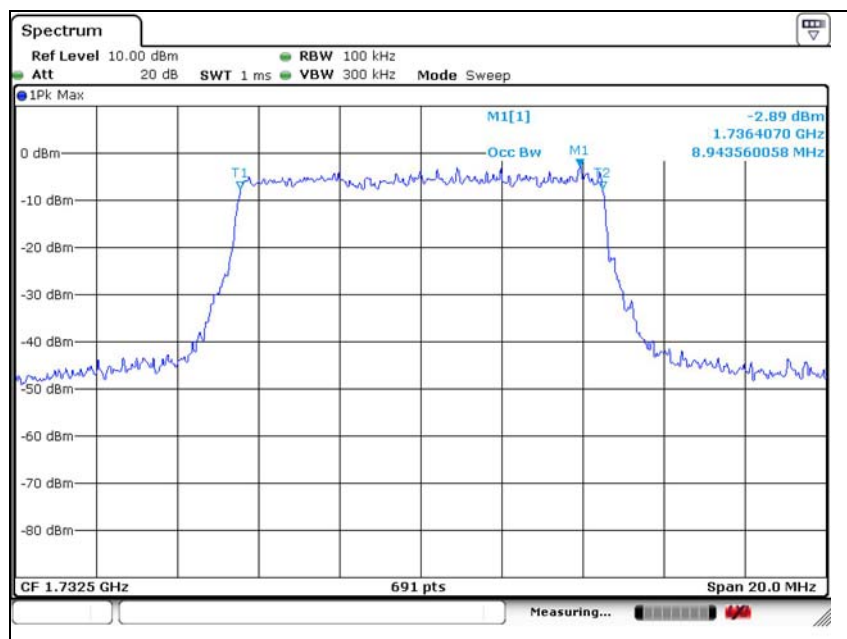
A4(210 mm x 297 mm)

LTE band 4 (10 MHz - QPSK)

Low Channel



Middle Channel



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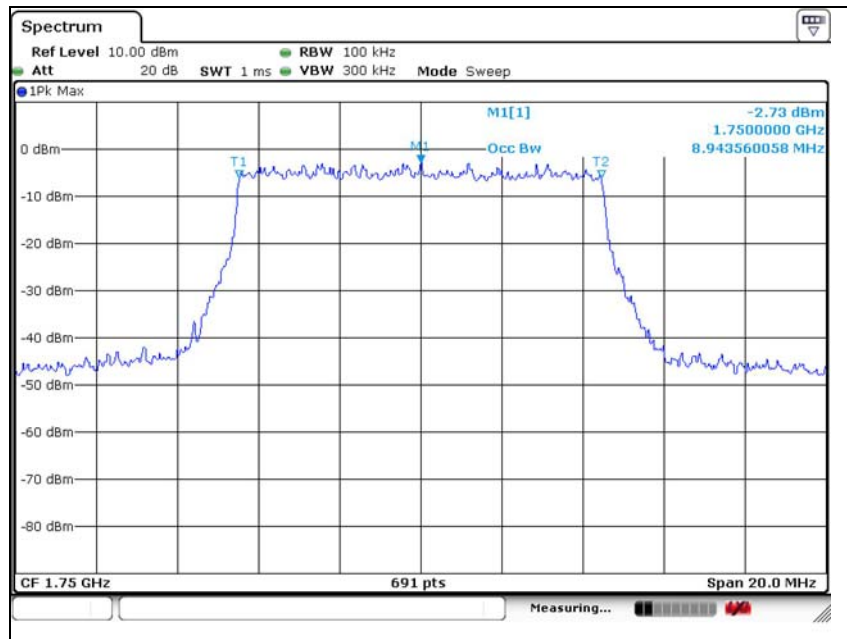
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

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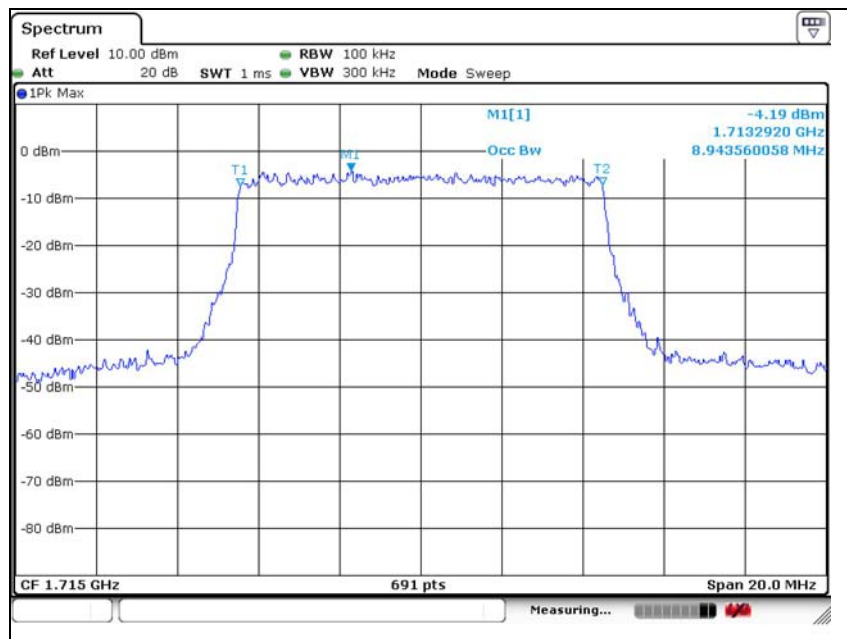
A4(210 mm x 297 mm)

High Channel



LTE band 4 (10 MHz - 16QAM)

Low Channel



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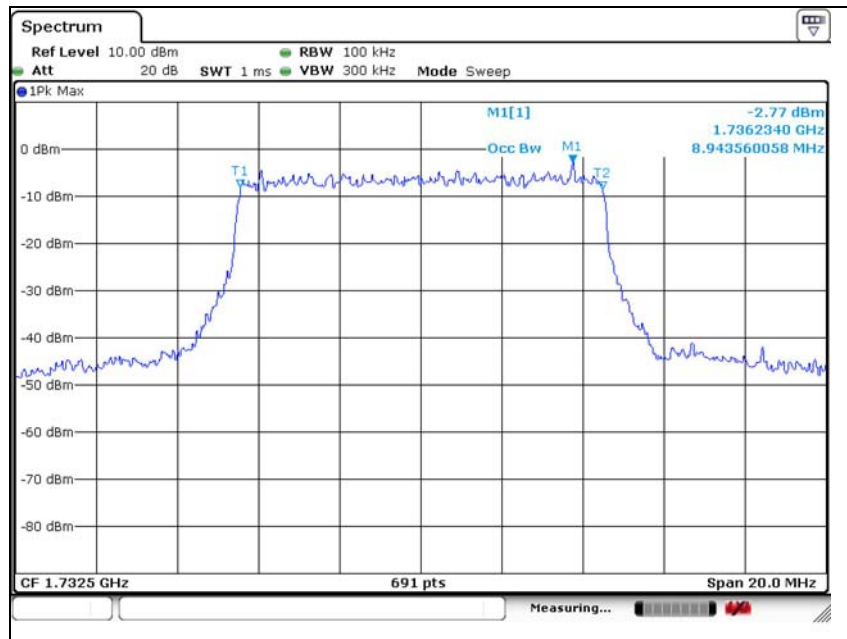
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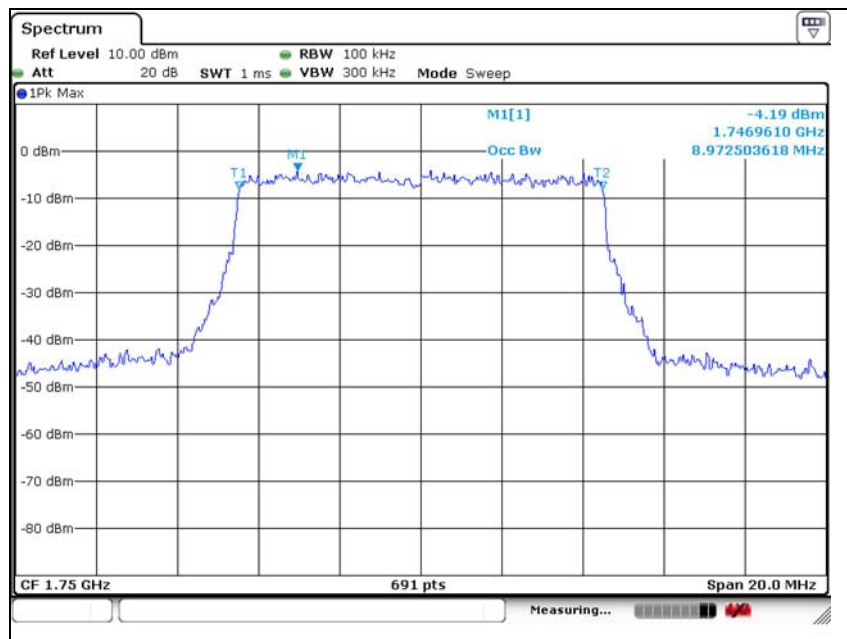
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A4(210 mm x 297 mm)

Middle Channel



High Channel



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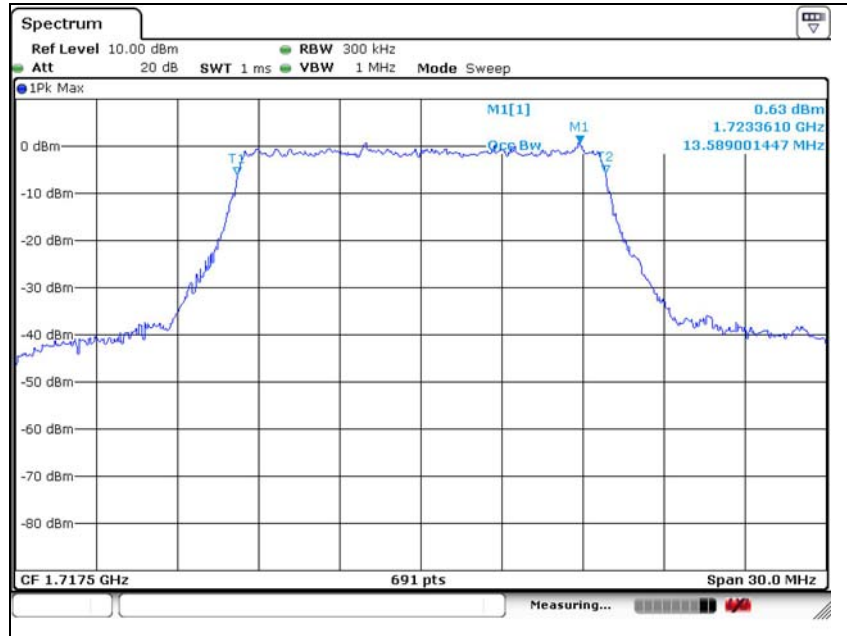
RTT5041-19(2019.04.24)(1)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

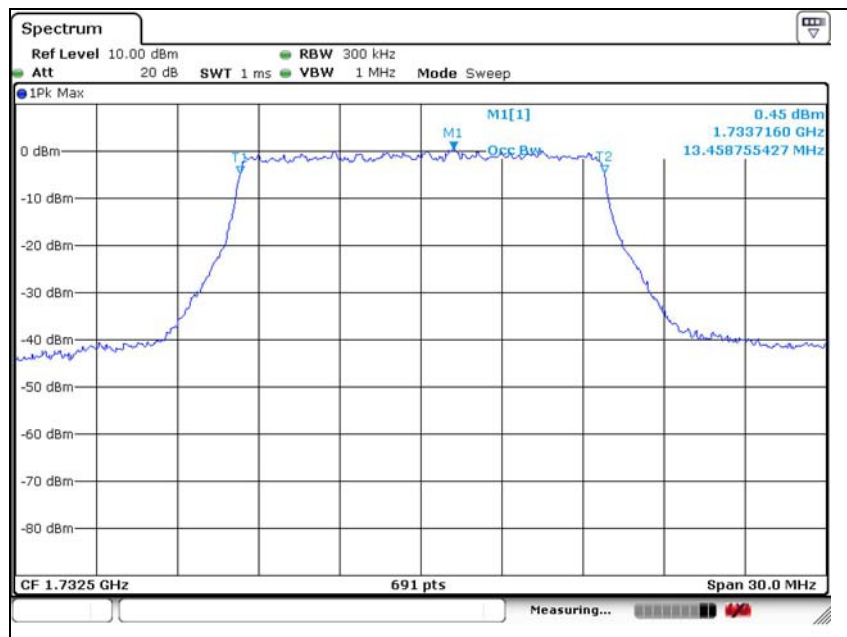
A4(210 mm x 297 mm)

LTE band 4 (15 MHz - QPSK)

Low Channel



Middle Channel



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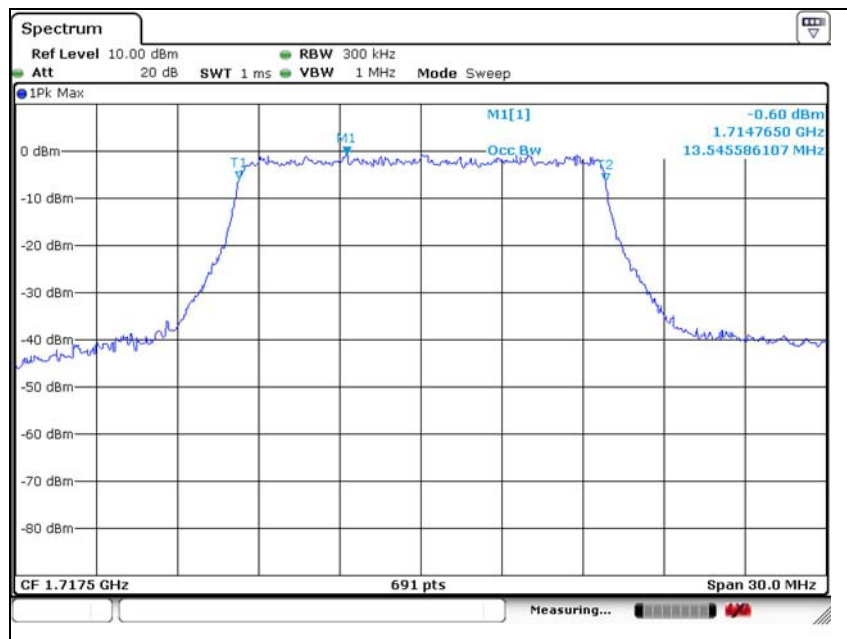
A4(210 mm x 297 mm)

High Channel



LTE band 4 (15 MHz - 16QAM)

Low Channel



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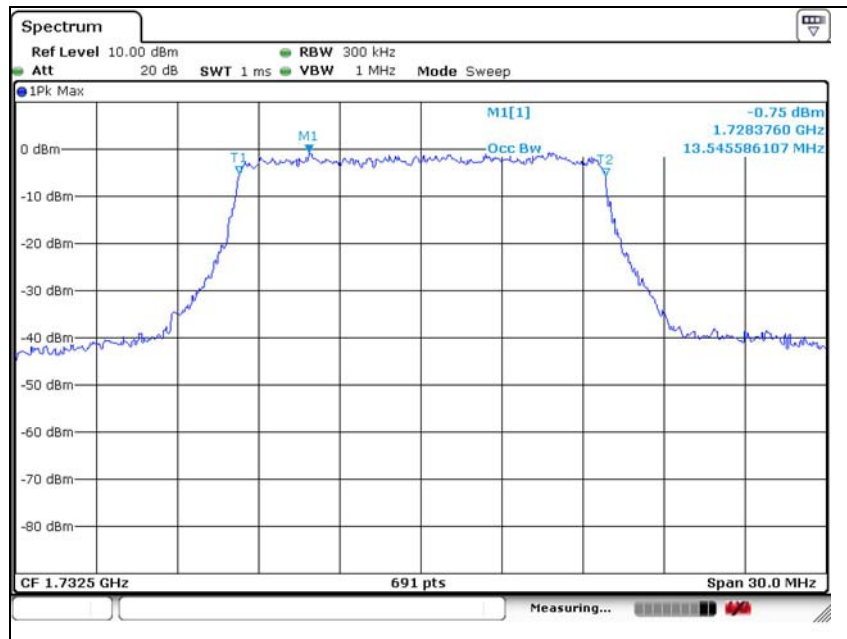
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-19(2019.04.24)(1)

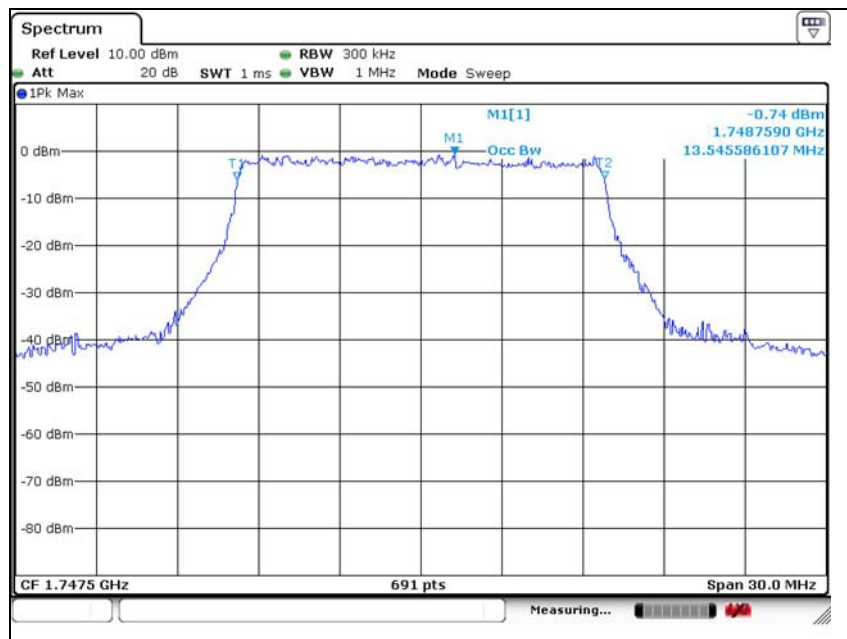
Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

Middle Channel



High Channel



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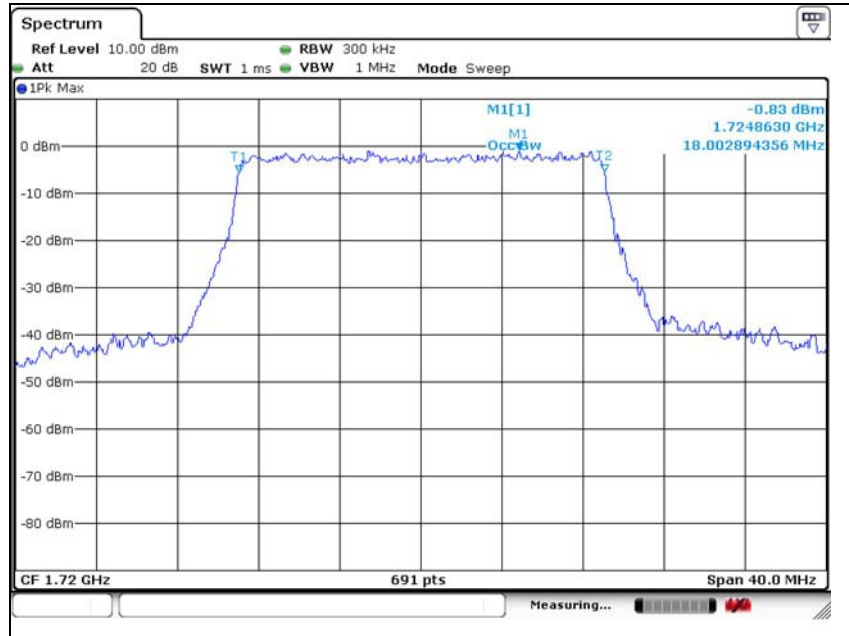
RTT5041-19(2019.04.24)(1)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

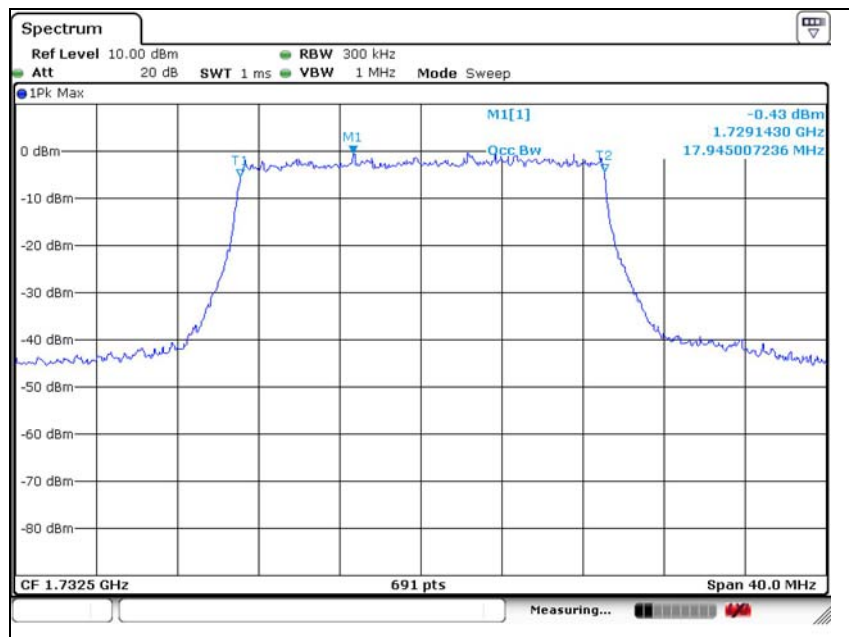
A4(210 mm x 297 mm)

LTE band 4 (20 MHz - QPSK)

Low Channel



Middle Channel



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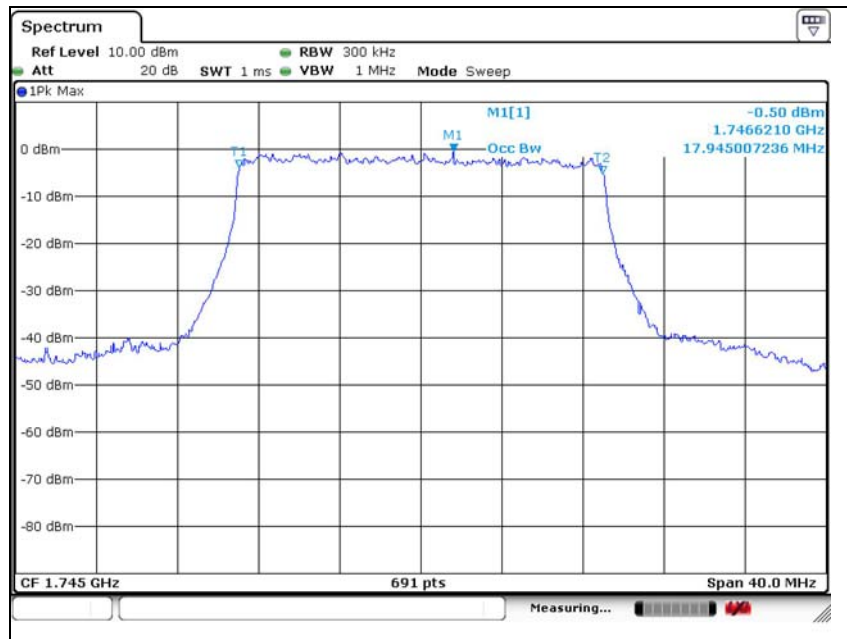
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-19(2019.04.24)(1)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

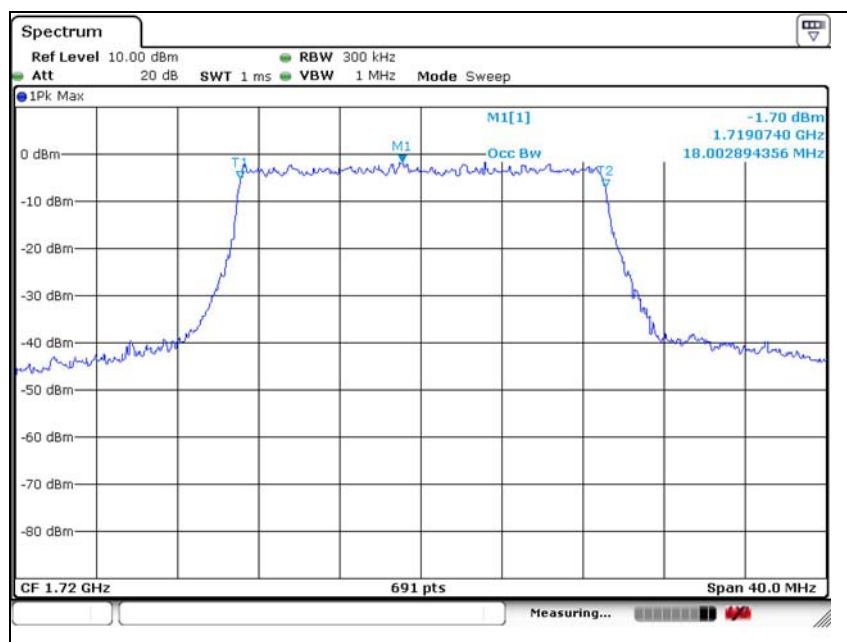
A4(210 mm x 297 mm)

High Channel



LTE band 4 (20 MHz - 16QAM)

Low Channel



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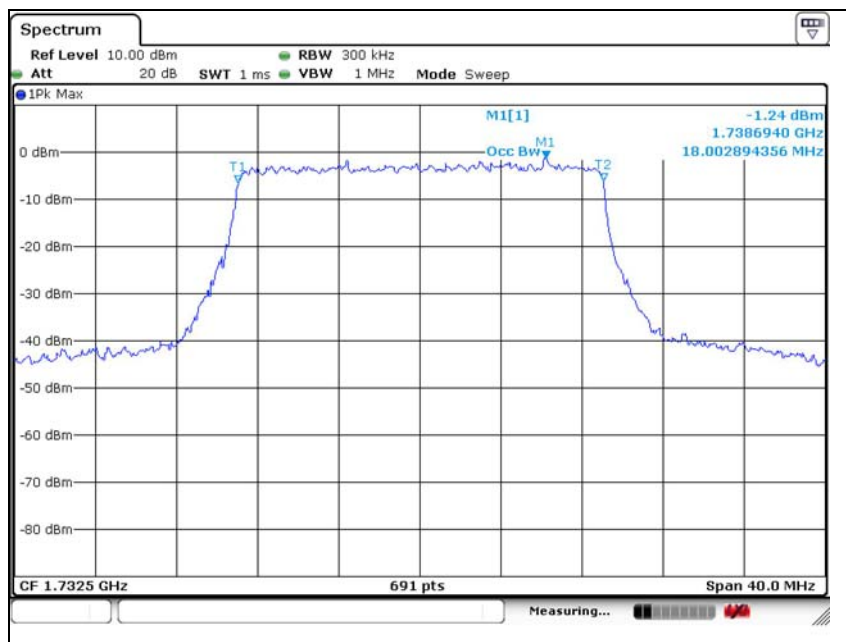
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-19(2019.04.24)(1)

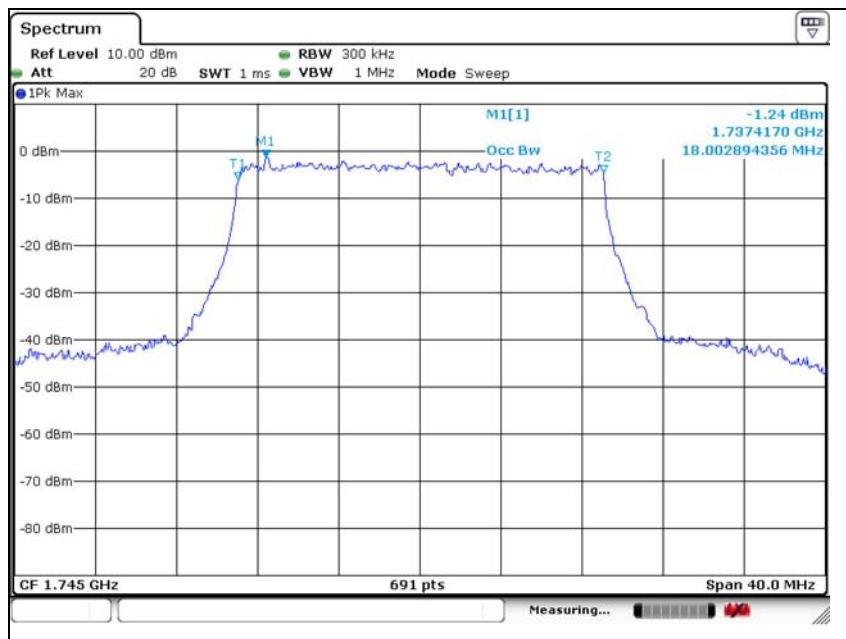
Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

Middle Channel



High Channel



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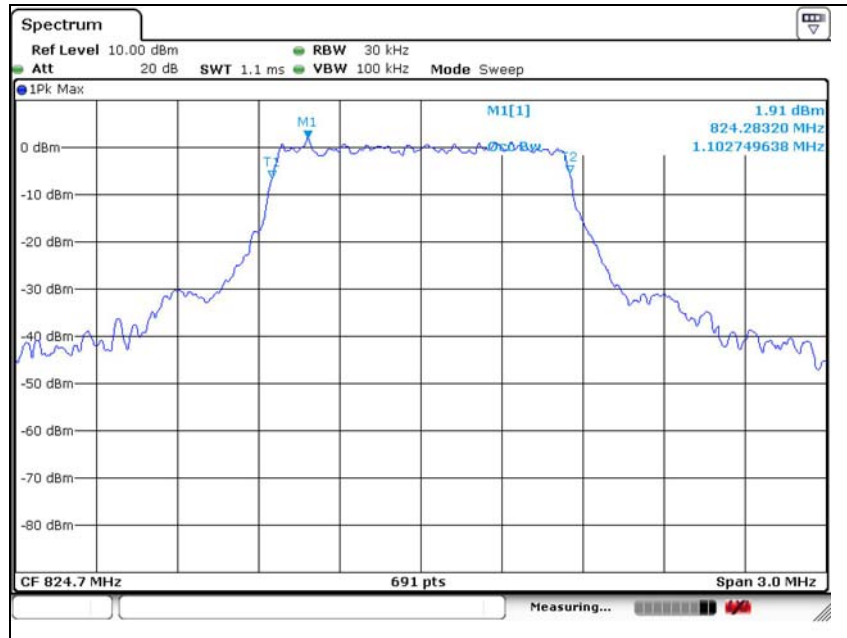
RTT5041-19(2019.04.24)(1)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

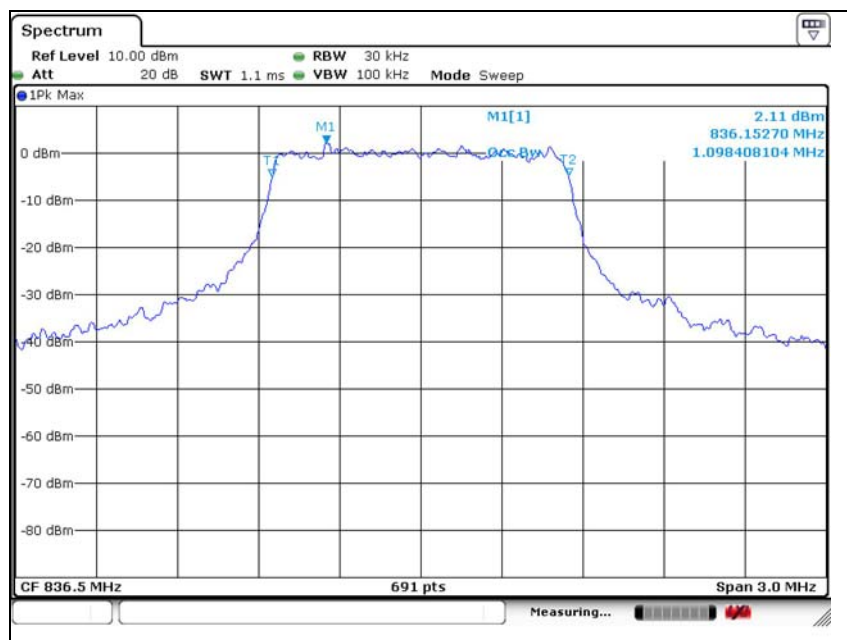
A4(210 mm x 297 mm)

LTE band 5 (1.4 MHz - QPSK)

Low Channel



Middle Channel



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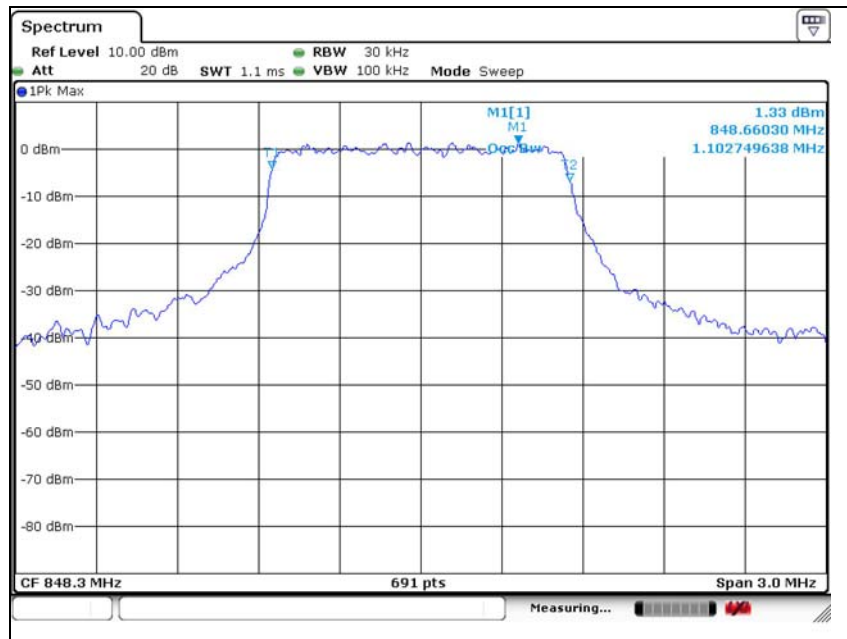
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

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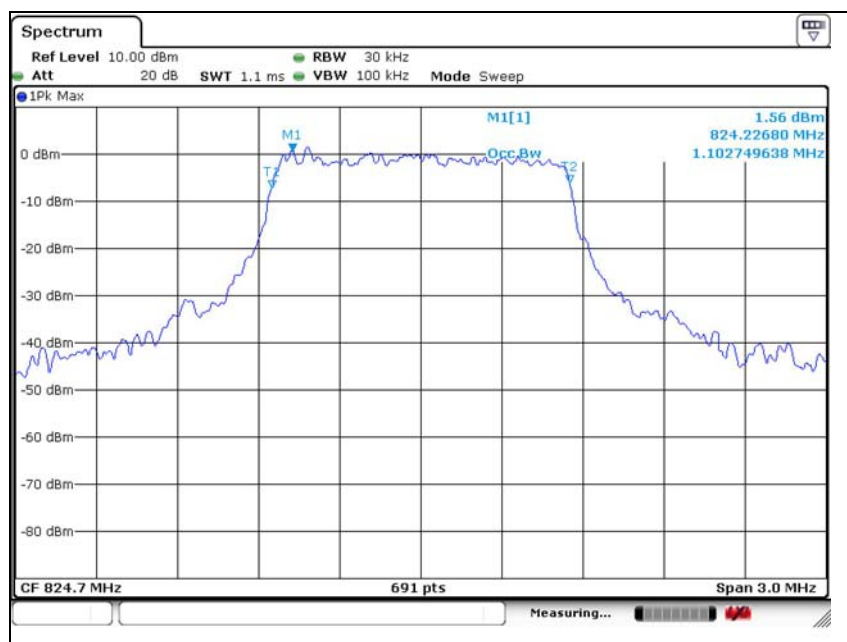
A4(210 mm x 297 mm)

High Channel



LTE band 5 (1.4 MHz - 16QAM)

Low Channel



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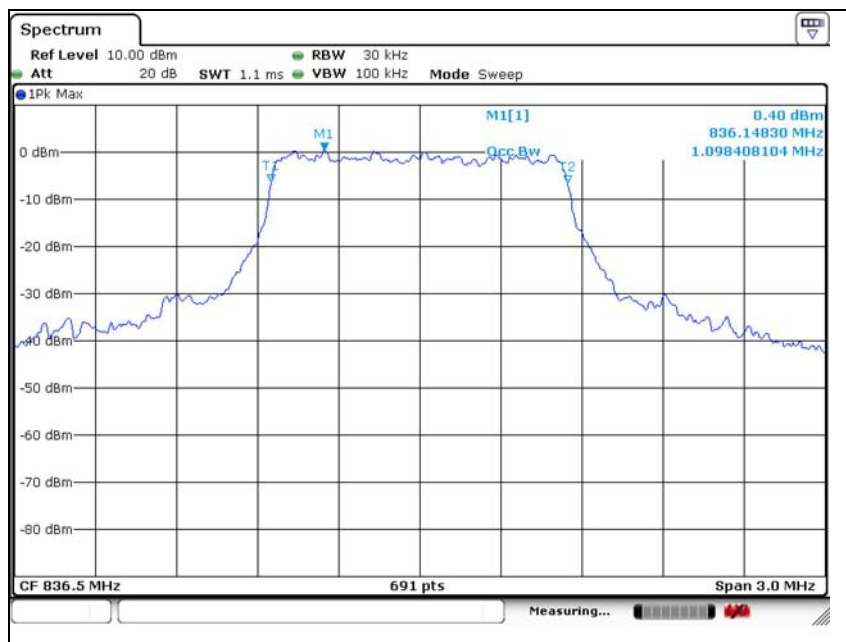
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-19(2019.04.24)(1)

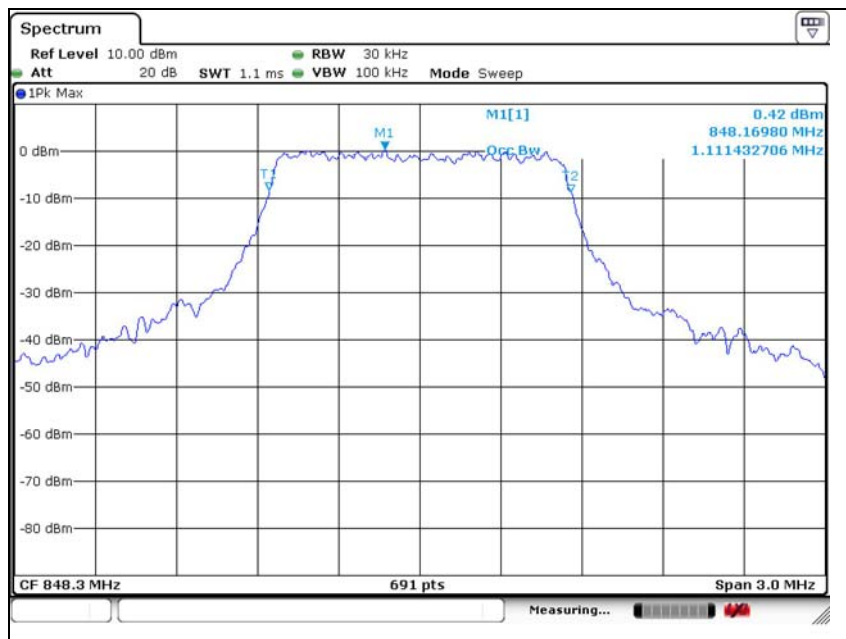
Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

Middle Channel



High Channel



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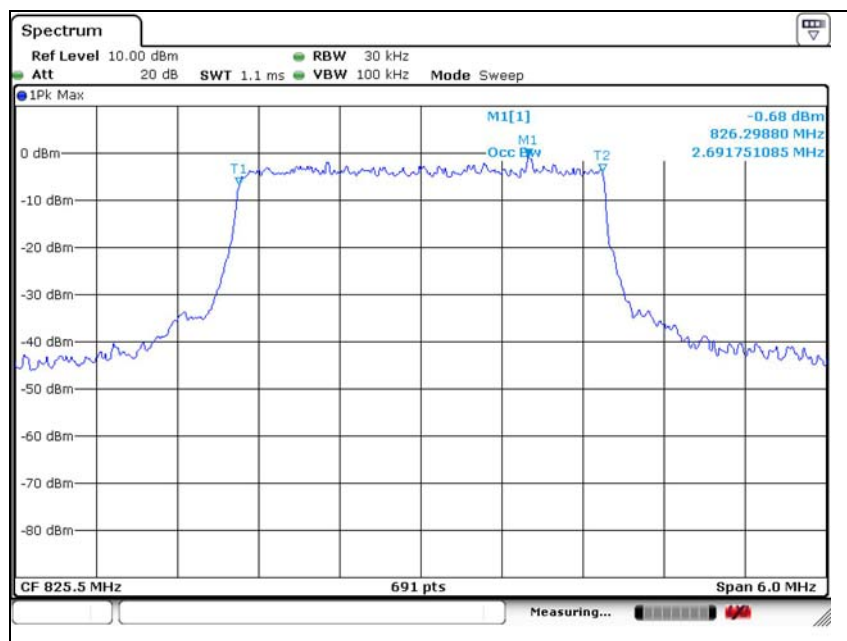
RTT5041-19(2019.04.24)(1)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

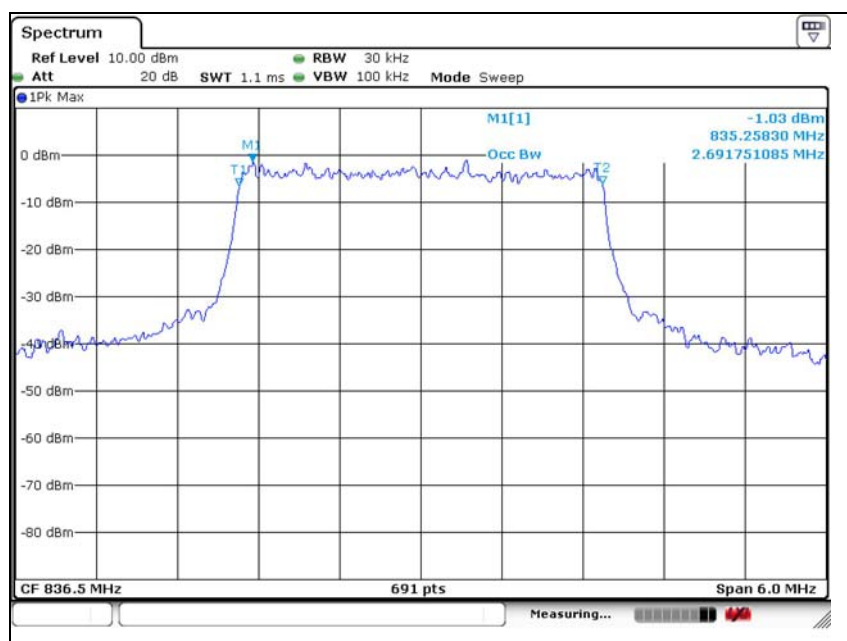
A4(210 mm x 297 mm)

LTE band 5 (3 MHz - QPSK)

Low Channel

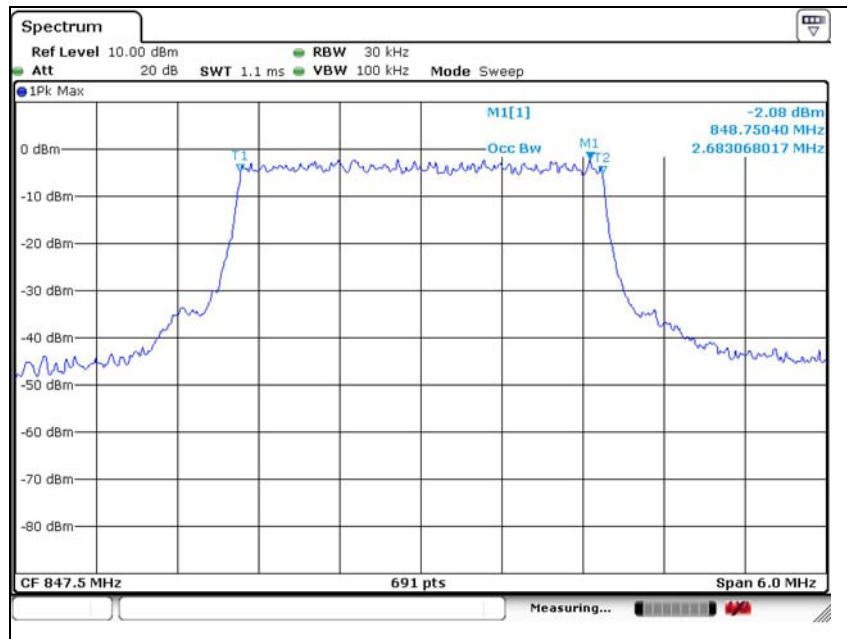


Middle Channel



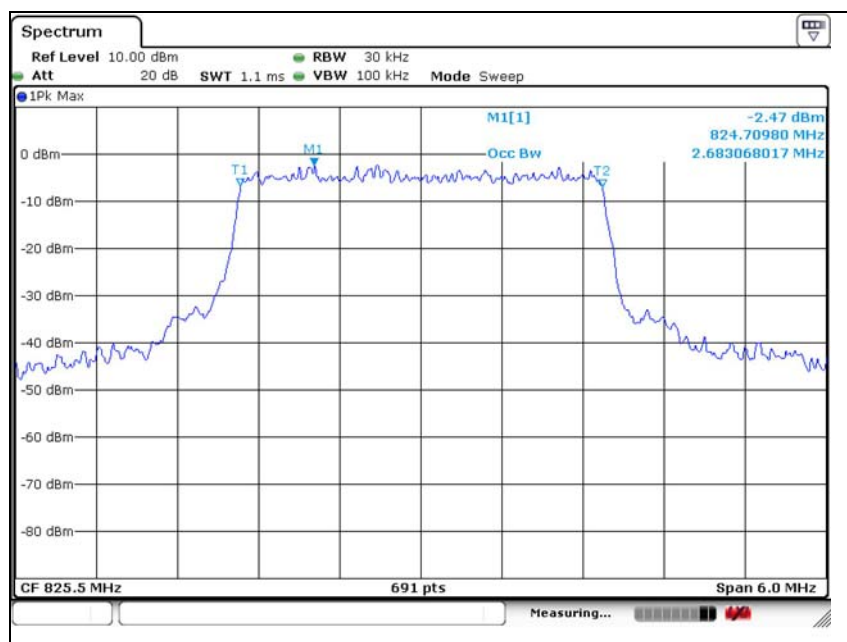
The results of this test report are effective only to the items tested. The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.

High Channel



LTE band 5 (3 MHz - 16QAM)

Low Channel



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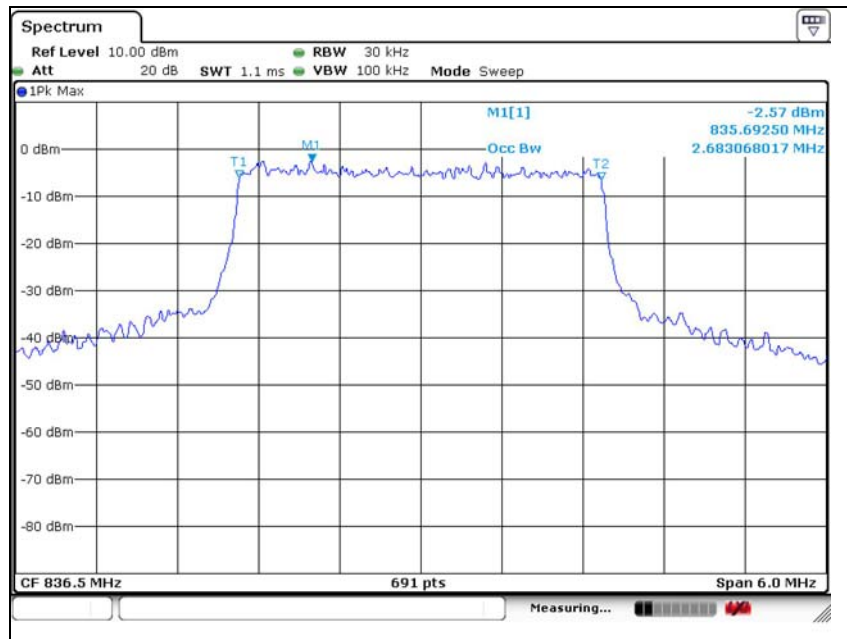
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-19(2019.04.24)(1)

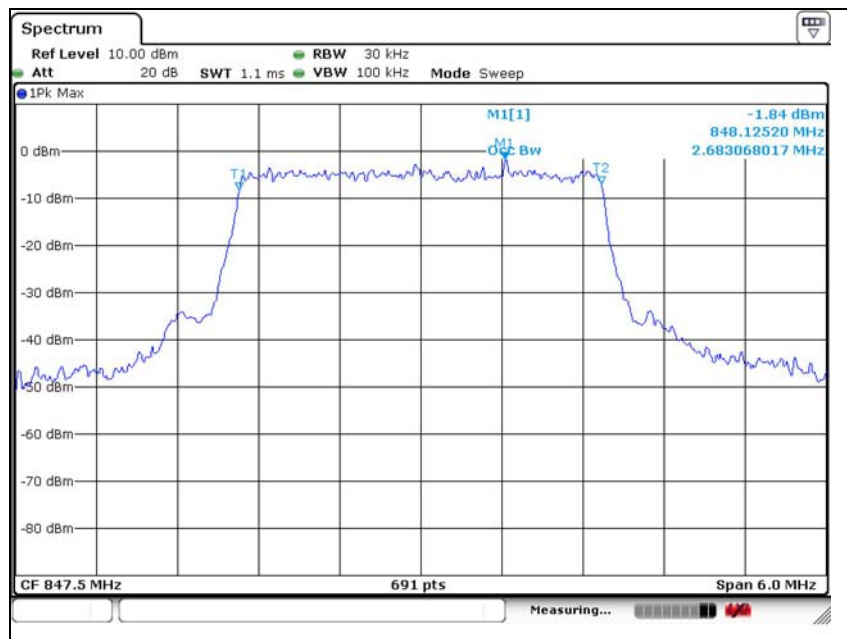
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A4(210 mm x 297 mm)

Middle Channel



High Channel



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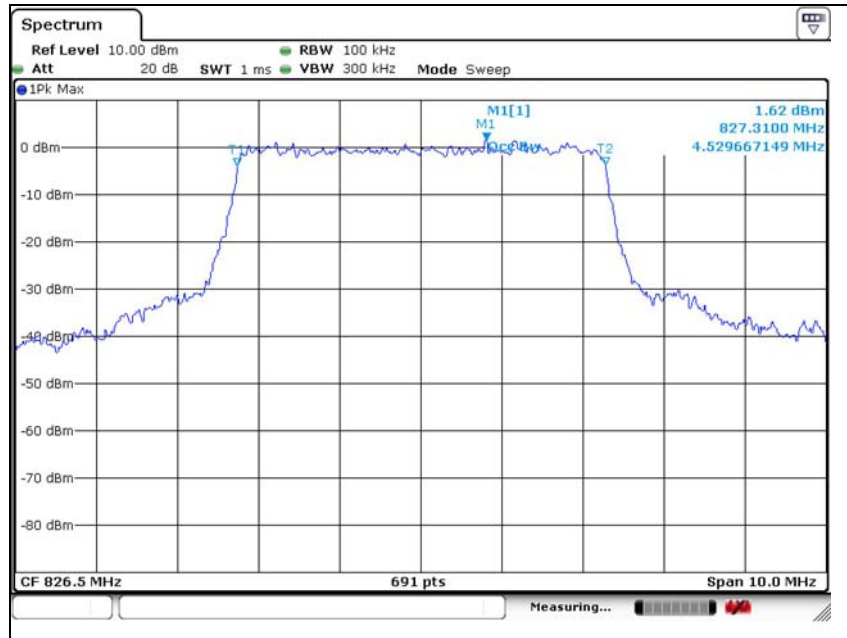
RTT5041-19(2019.04.24)(1)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

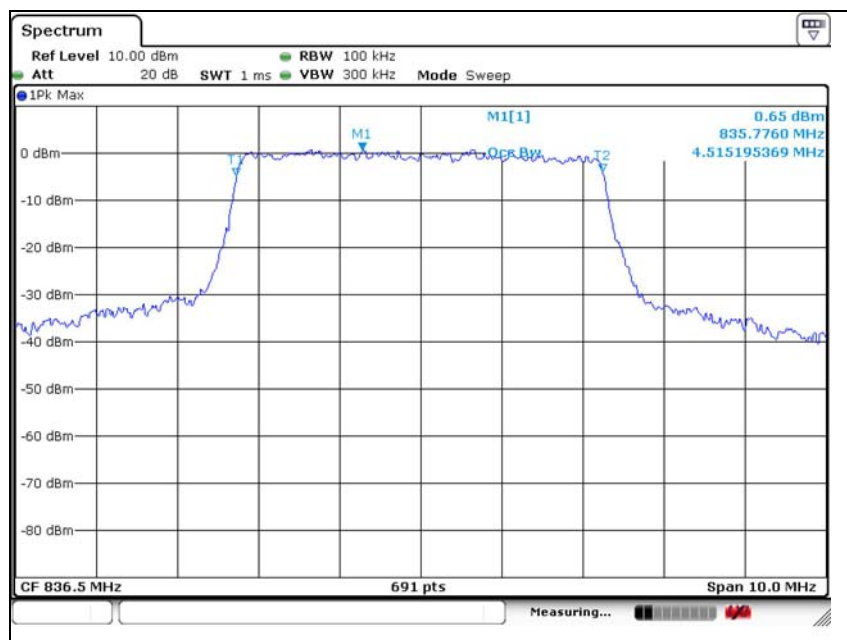
A4(210 mm x 297 mm)

LTE band 5 (5 MHz - QPSK)

Low Channel



Middle Channel



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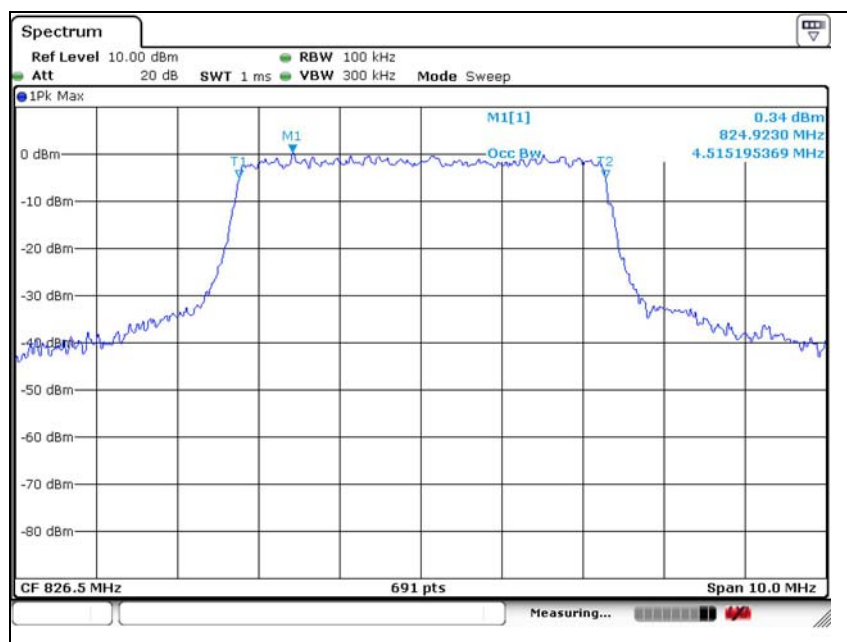
A4(210 mm x 297 mm)

High Channel



LTE band 5 (5 MHz - 16QAM)

Low Channel



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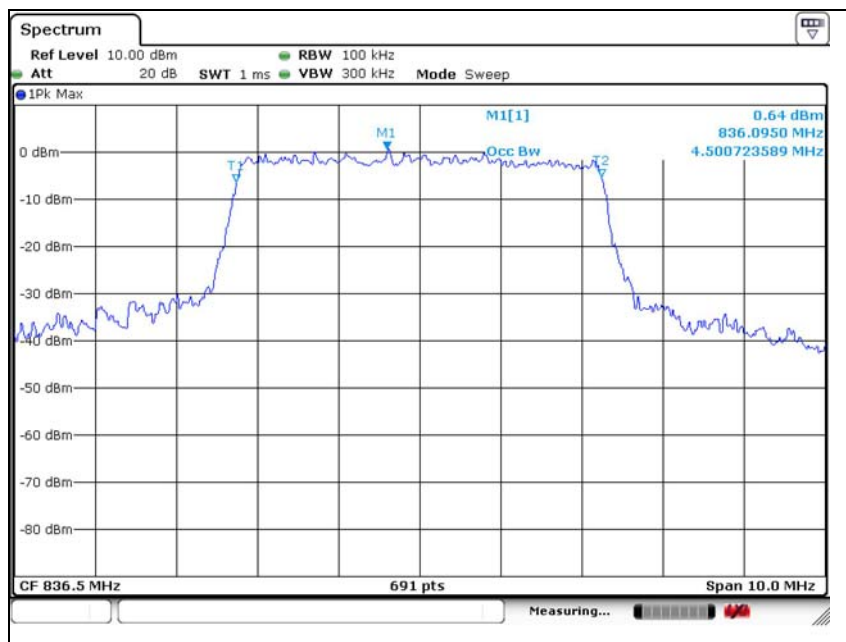
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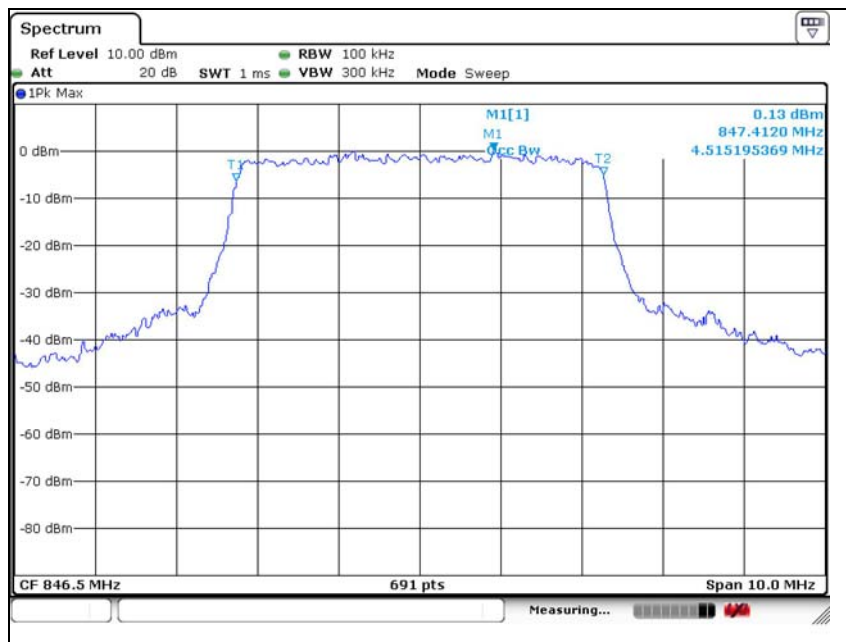
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A4(210 mm x 297 mm)

Middle Channel



High Channel



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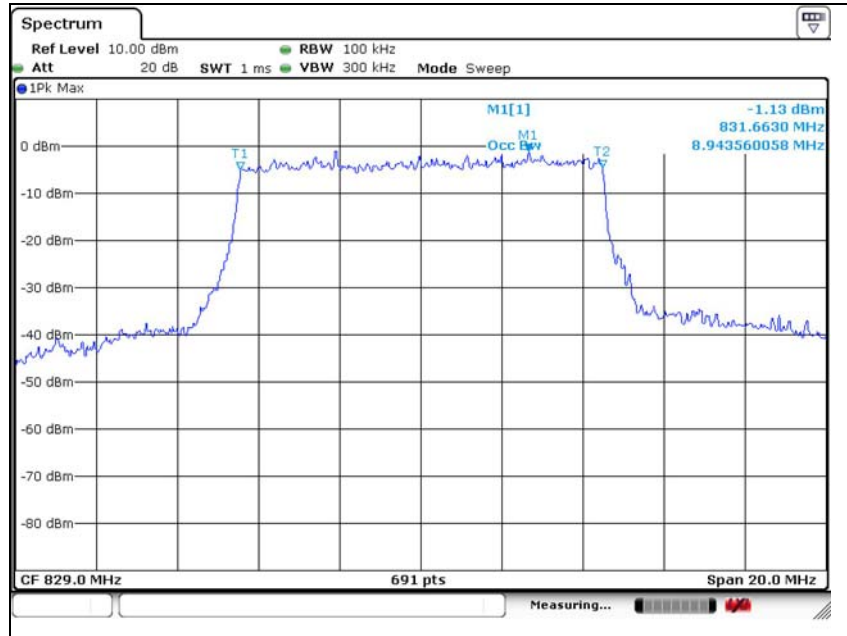
RTT5041-19(2019.04.24)(1)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

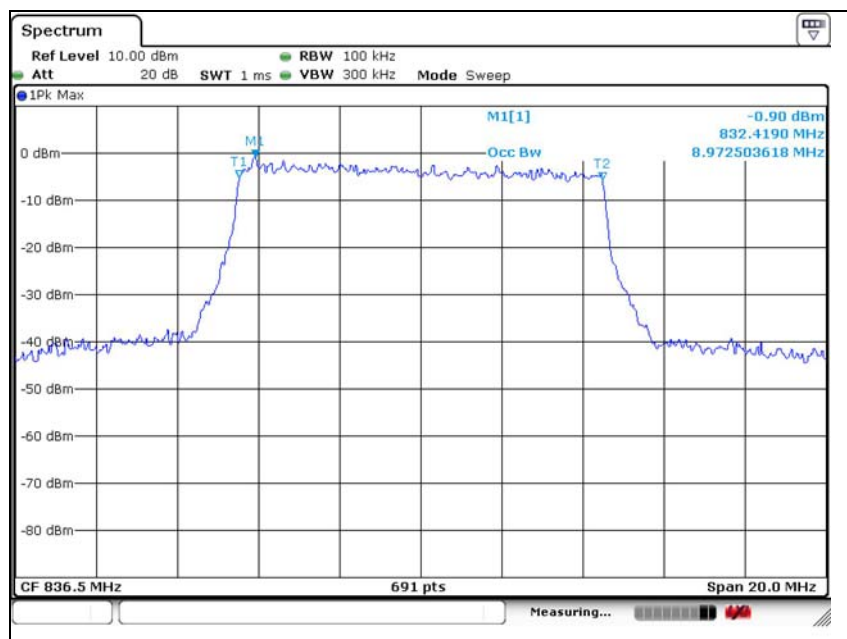
A4(210 mm x 297 mm)

LTE band 5 (10 MHz - QPSK)

Low Channel



Middle Channel



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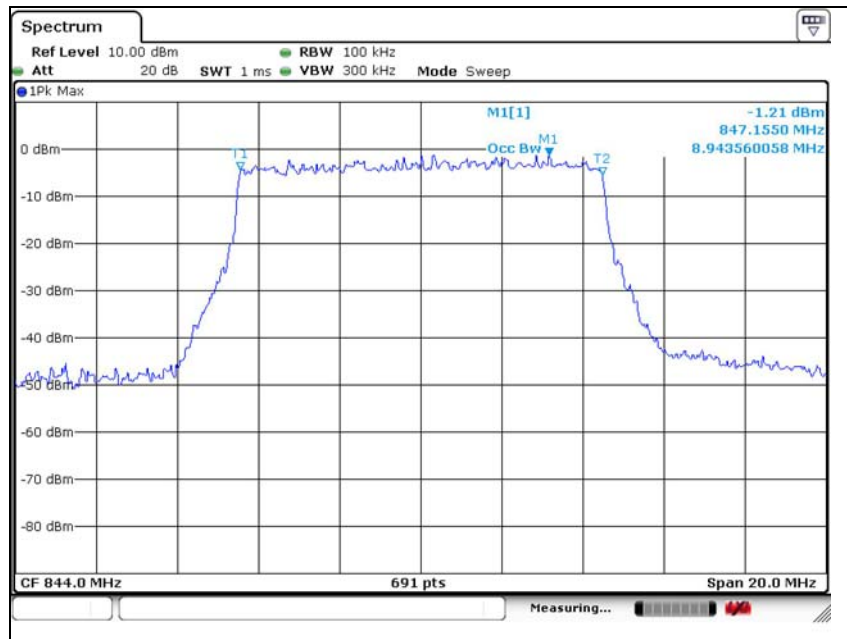
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

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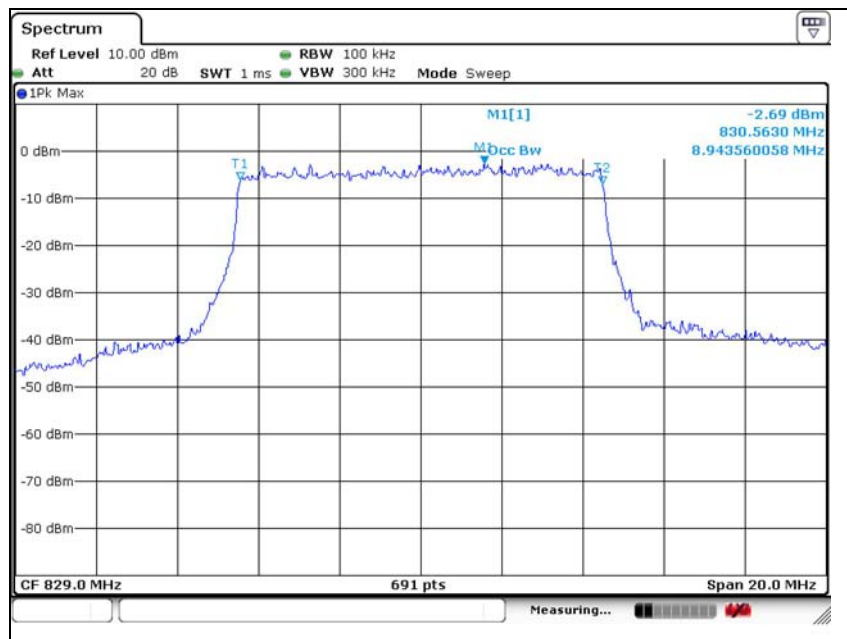
A4(210 mm x 297 mm)

High Channel



LTE band 5 (10 MHz - 16QAM)

Low Channel



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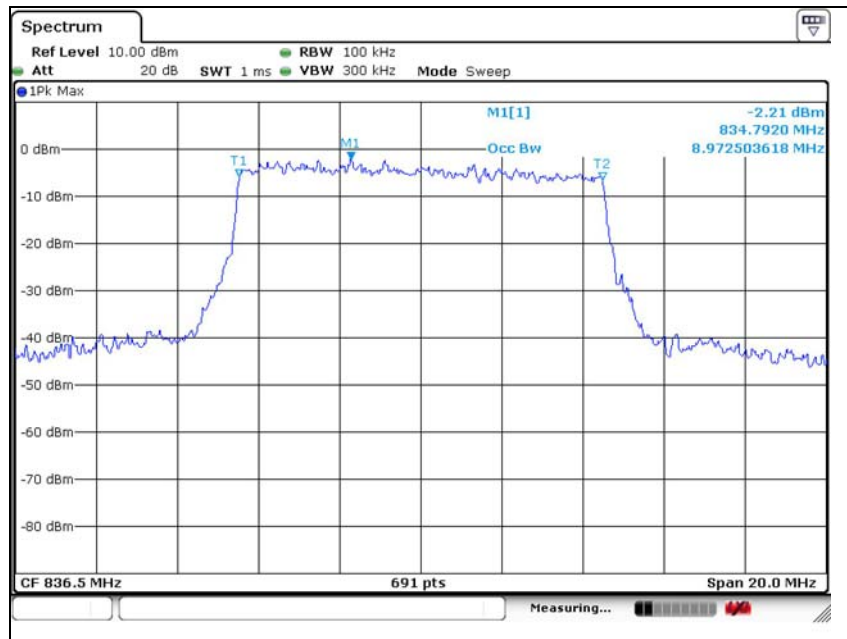
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

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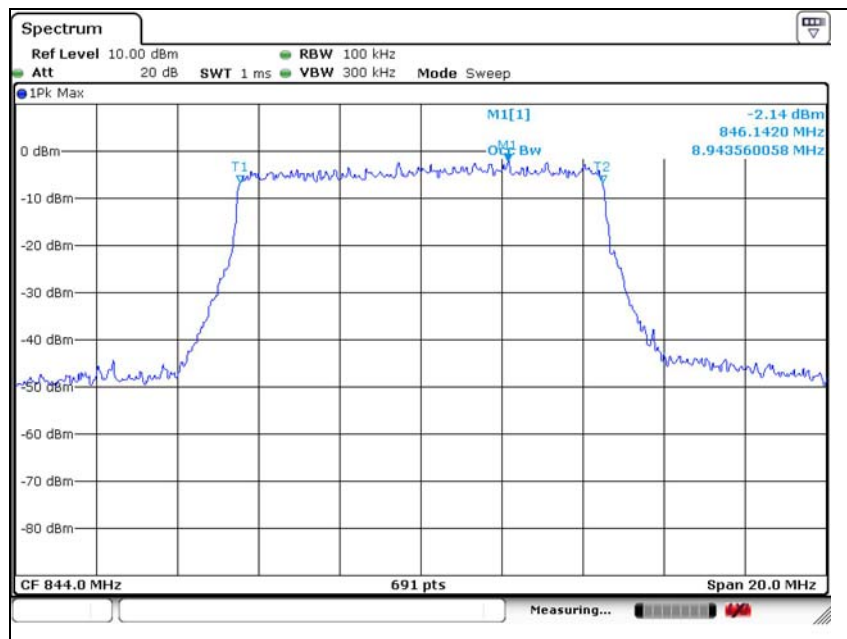
Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

Middle Channel



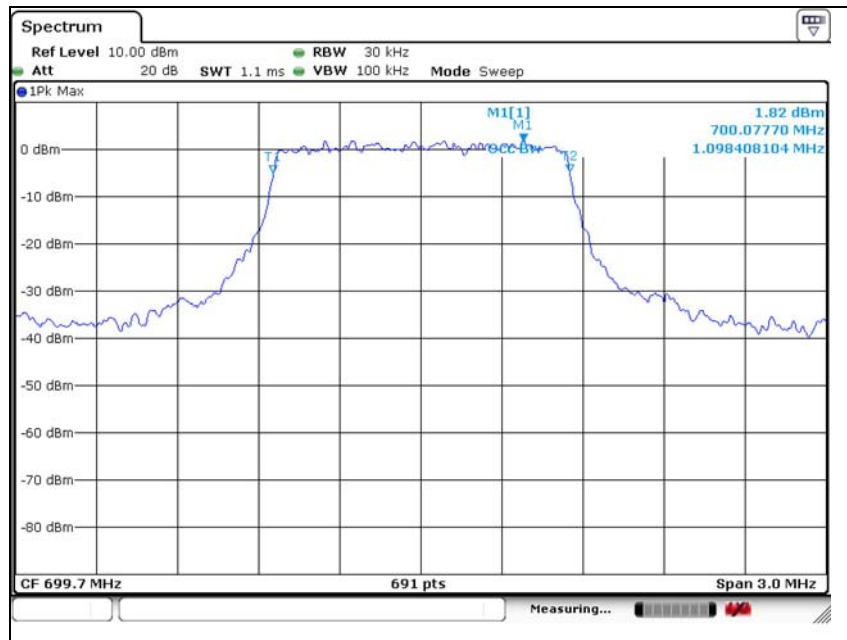
High Channel



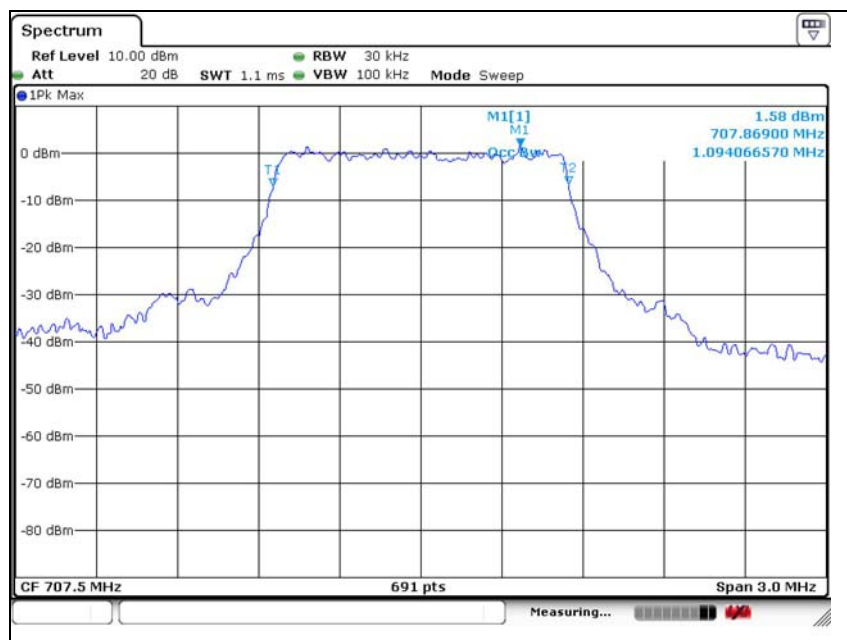
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LTE band 12 (1.4 MHz - QPSK)

Low Channel



Middle Channel



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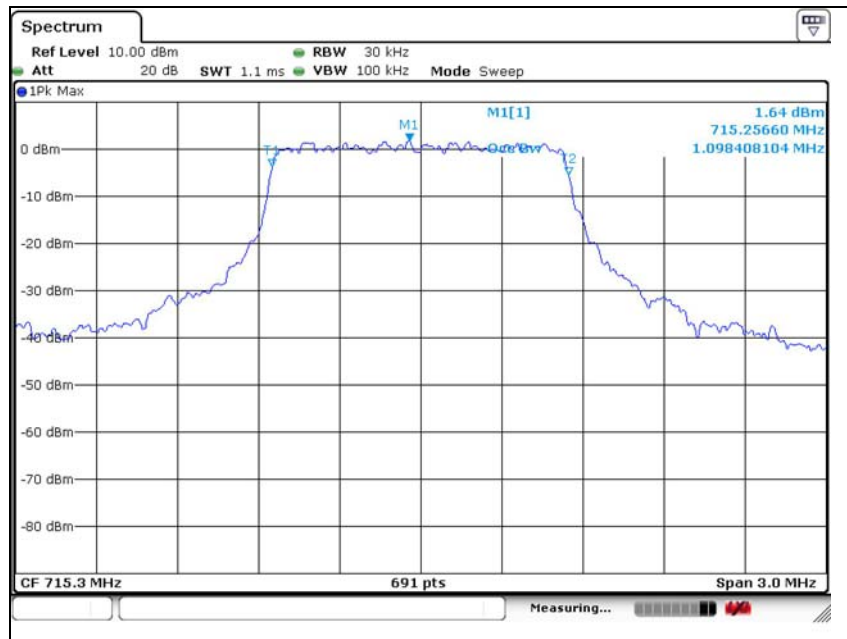
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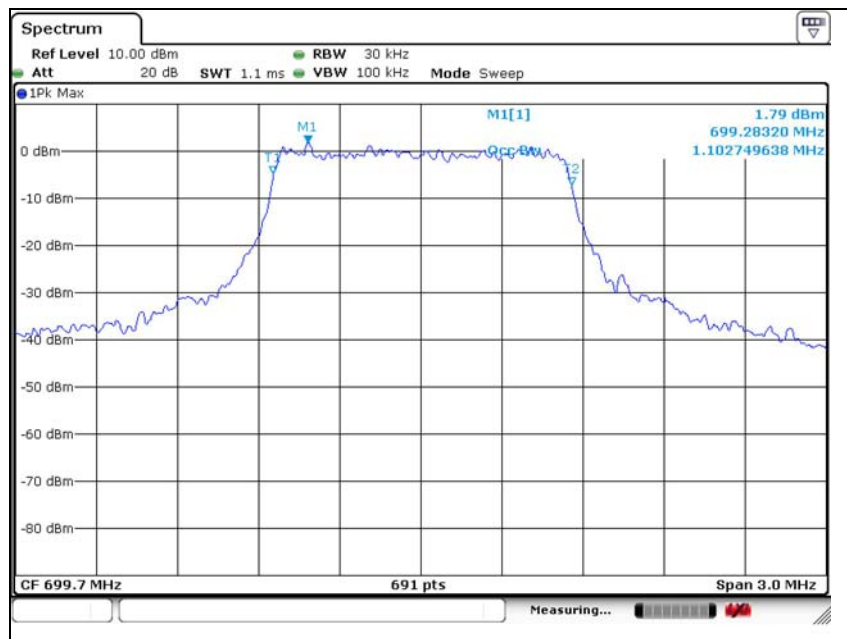
A4(210 mm x 297 mm)

High Channel



LTE band 12 (1.4 MHz - 16QAM)

Low Channel



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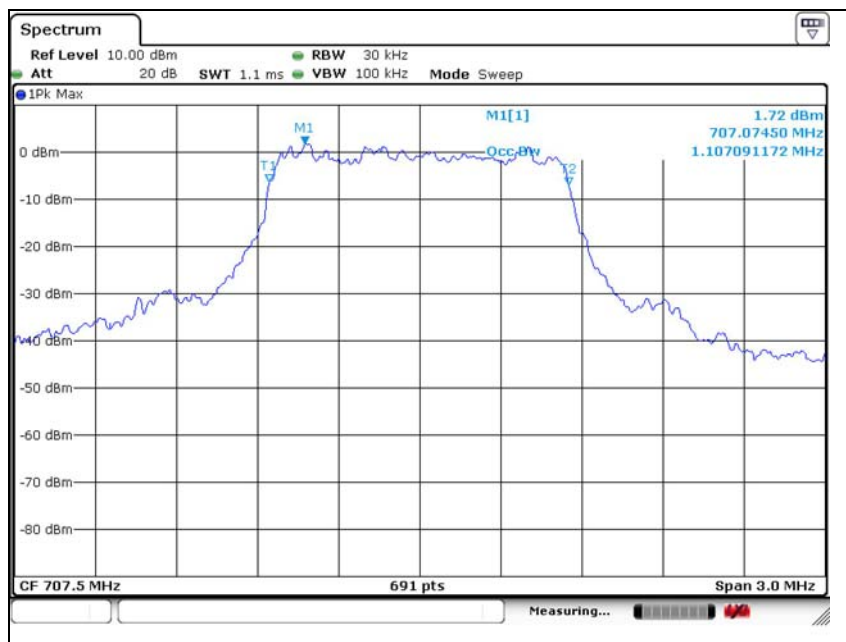
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

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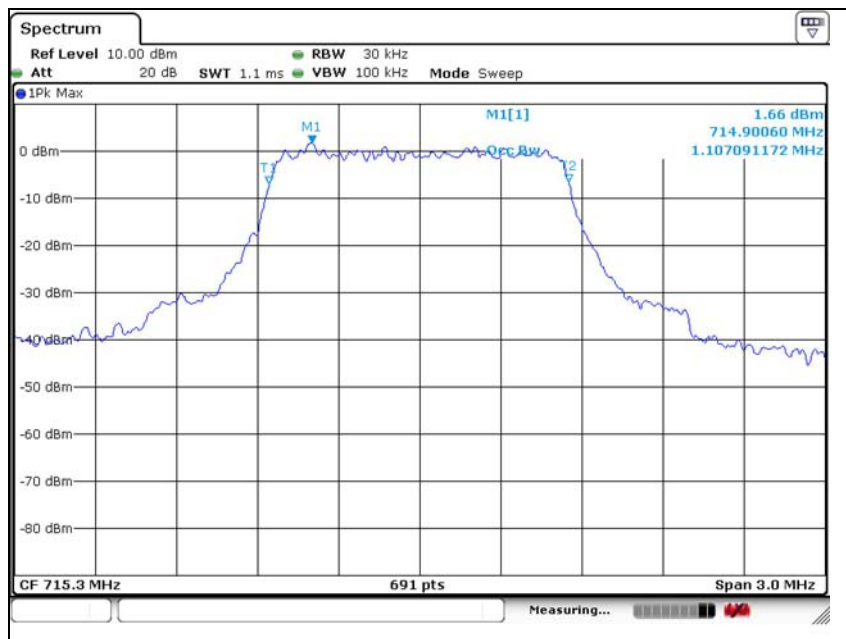
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A4(210 mm x 297 mm)

Middle Channel



High Channel



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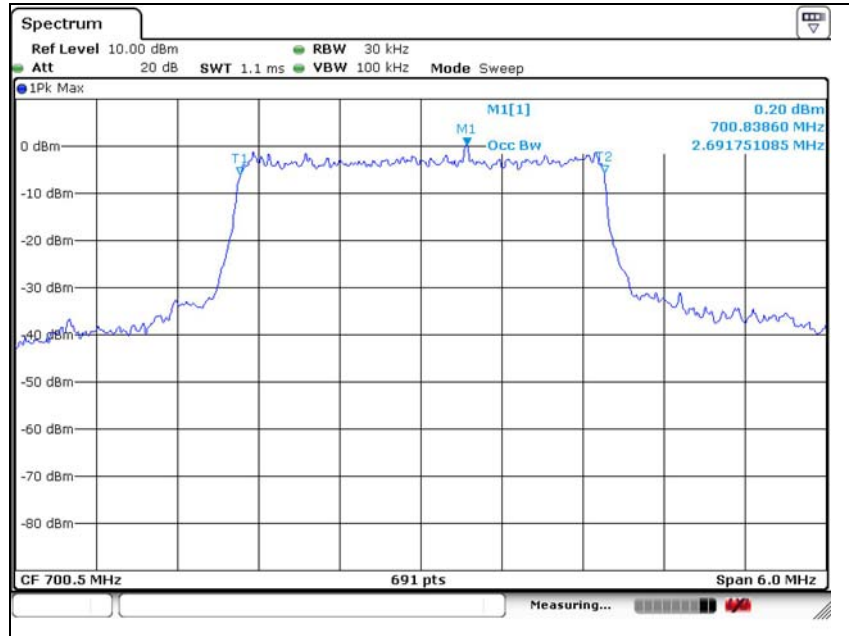
RTT5041-19(2019.04.24)(1)

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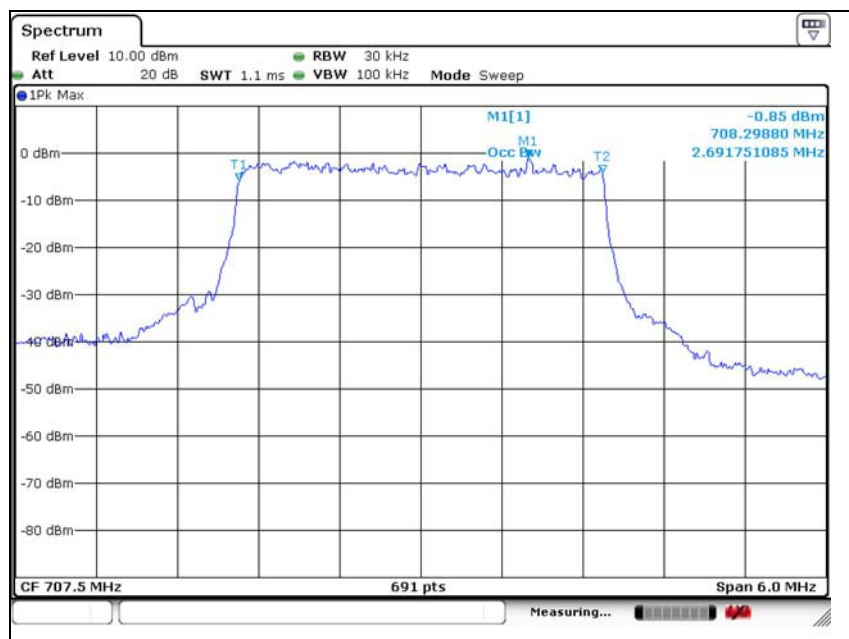
A4(210 mm x 297 mm)

LTE band 12 (3 MHz - QPSK)

Low Channel



Middle Channel



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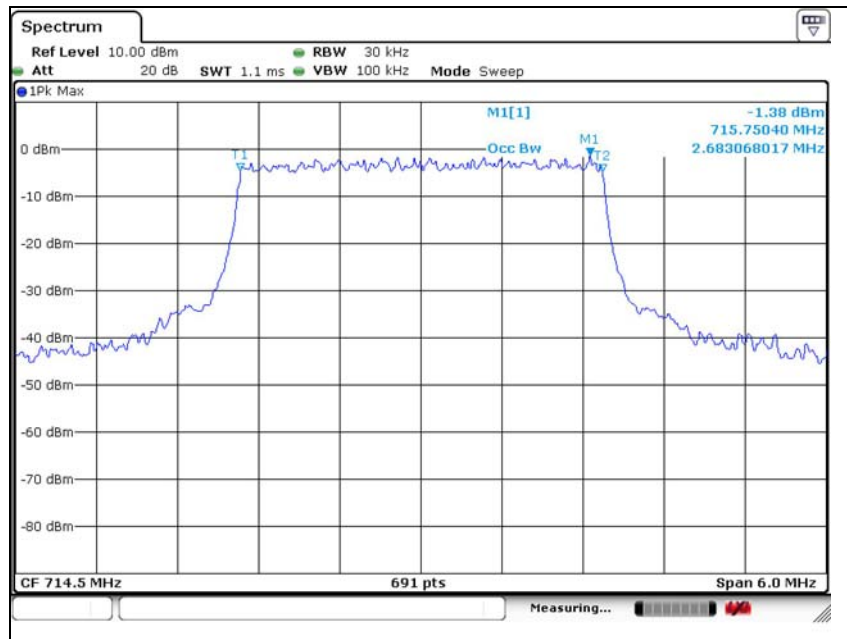
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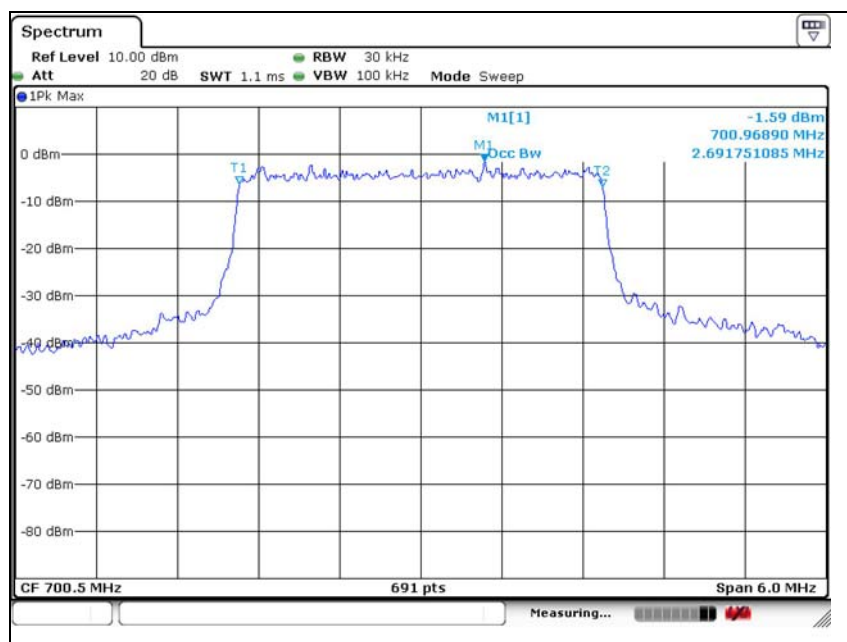
A4(210 mm x 297 mm)

High Channel



LTE band 12 (3 MHz - 16QAM)

Low Channel



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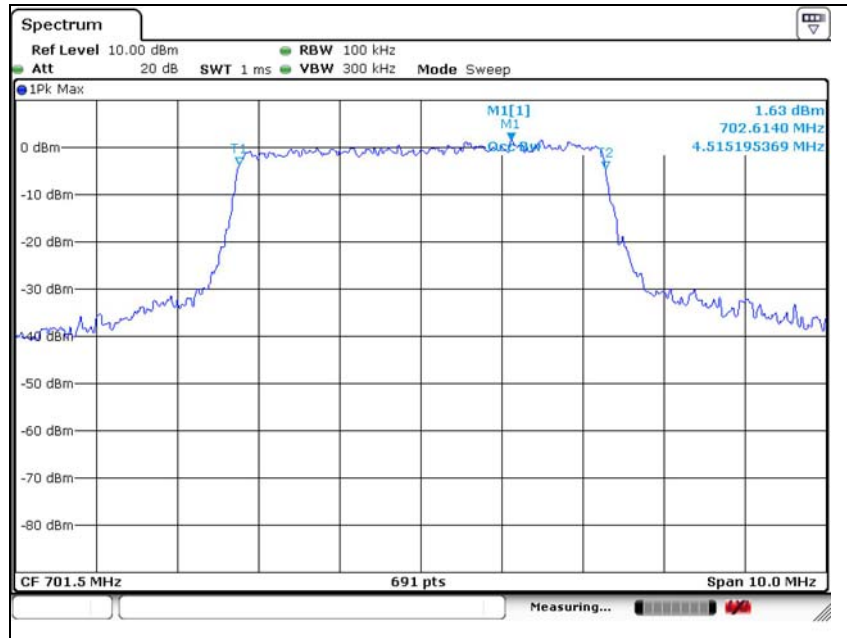
RTT5041-19(2019.04.24)(1)

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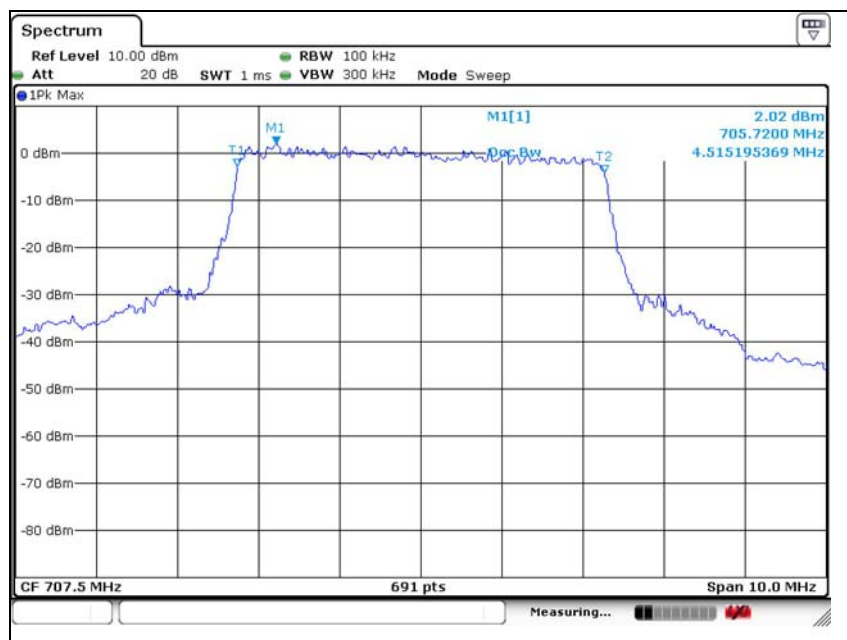
A4(210 mm x 297 mm)

LTE band 12 (5 MHz - QPSK)

Low Channel



Middle Channel



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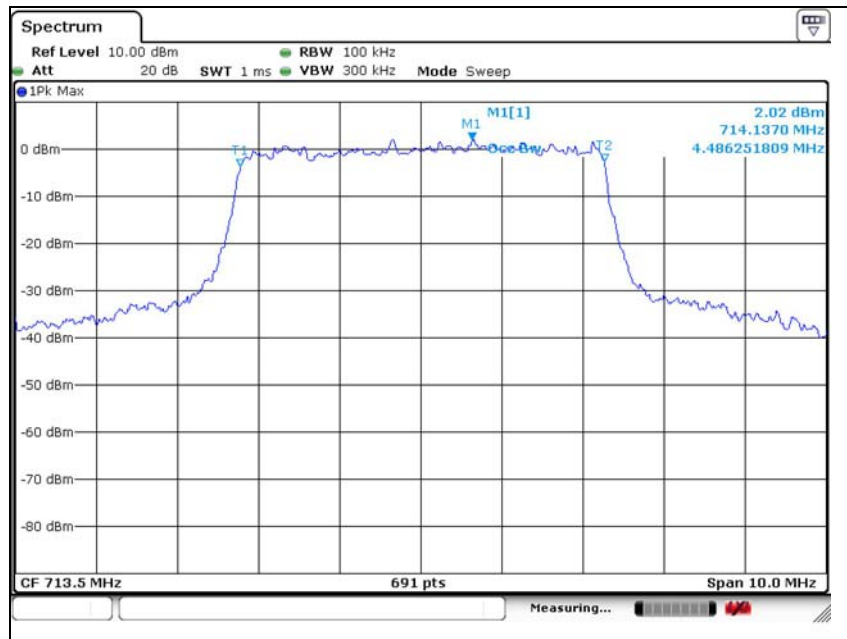
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

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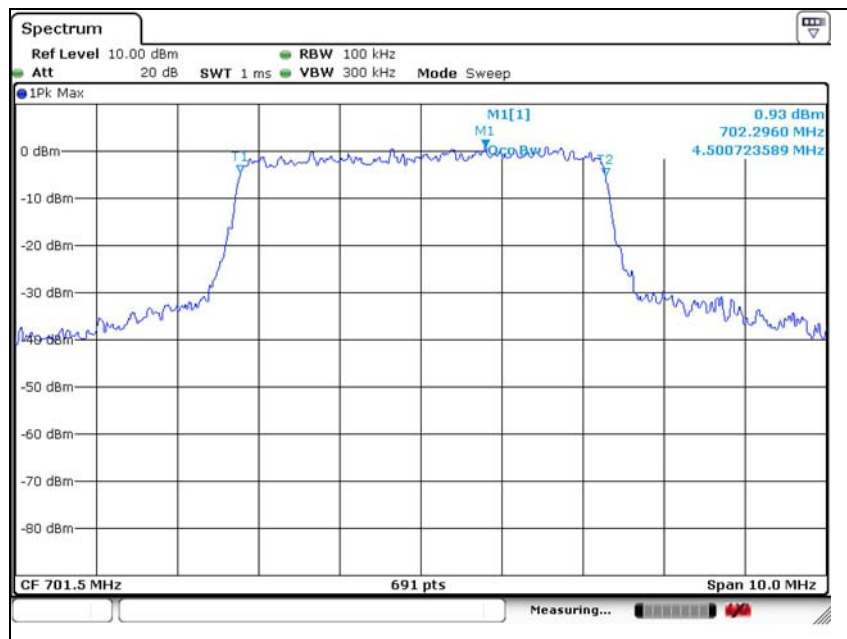
A4(210 mm x 297 mm)

High Channel



LTE band 12 (5 MHz - 16QAM)

Low Channel



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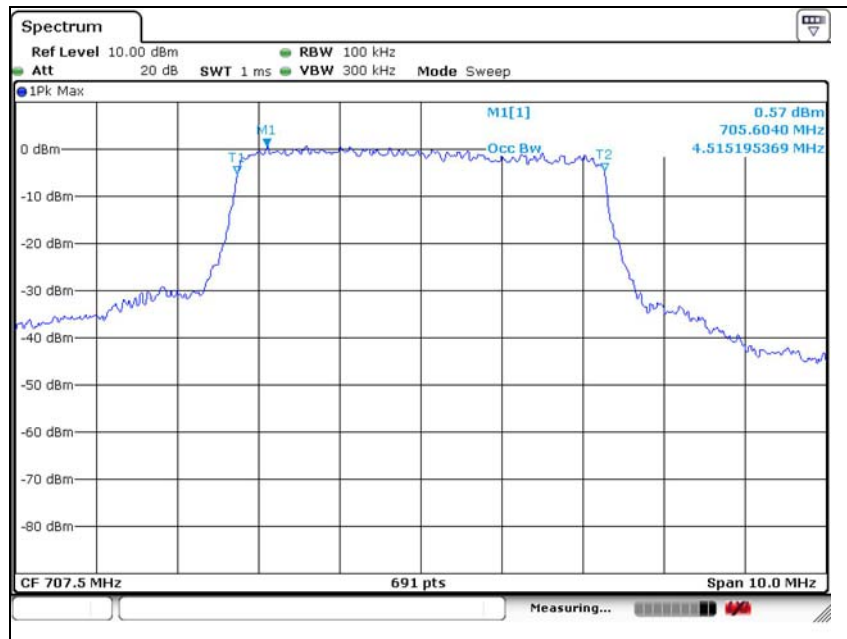
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-19(2019.04.24)(1)

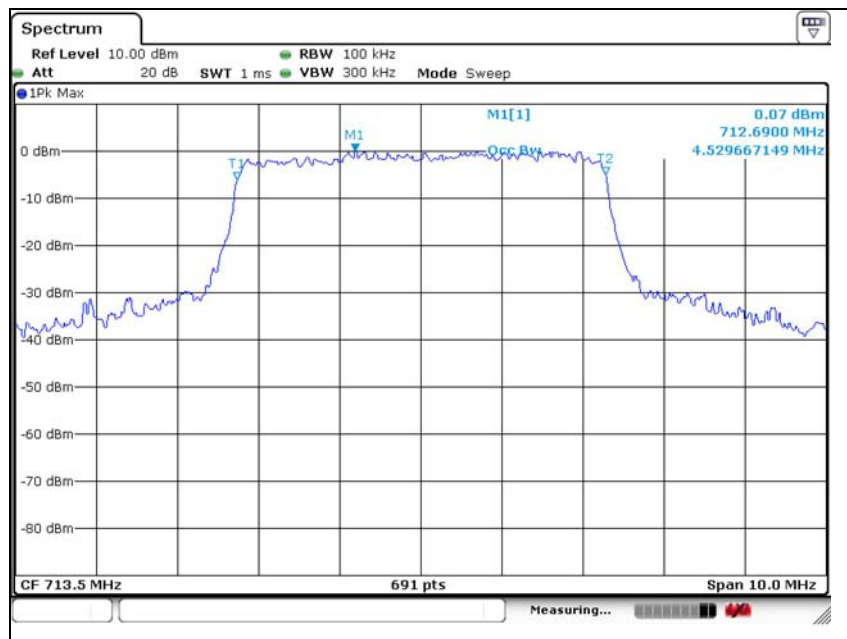
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A4(210 mm x 297 mm)

Middle Channel



High Channel



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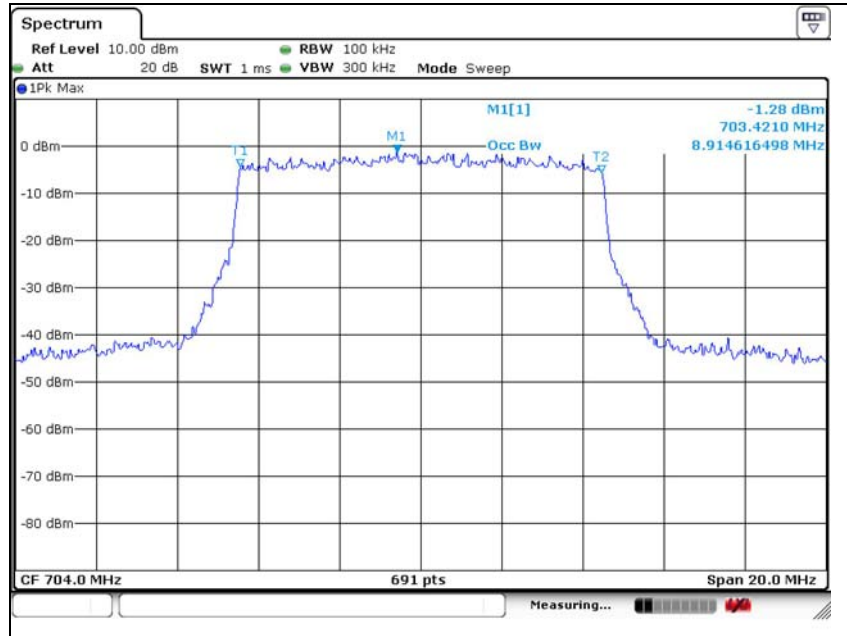
RTT5041-19(2019.04.24)(1)

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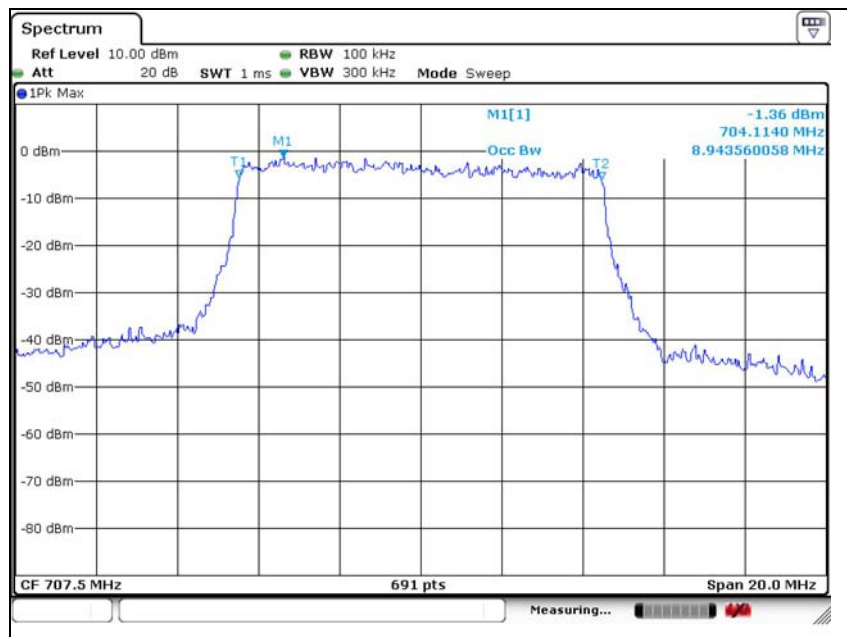
A4(210 mm x 297 mm)

LTE band 12 (10 MHz - QPSK)

Low Channel



Middle Channel



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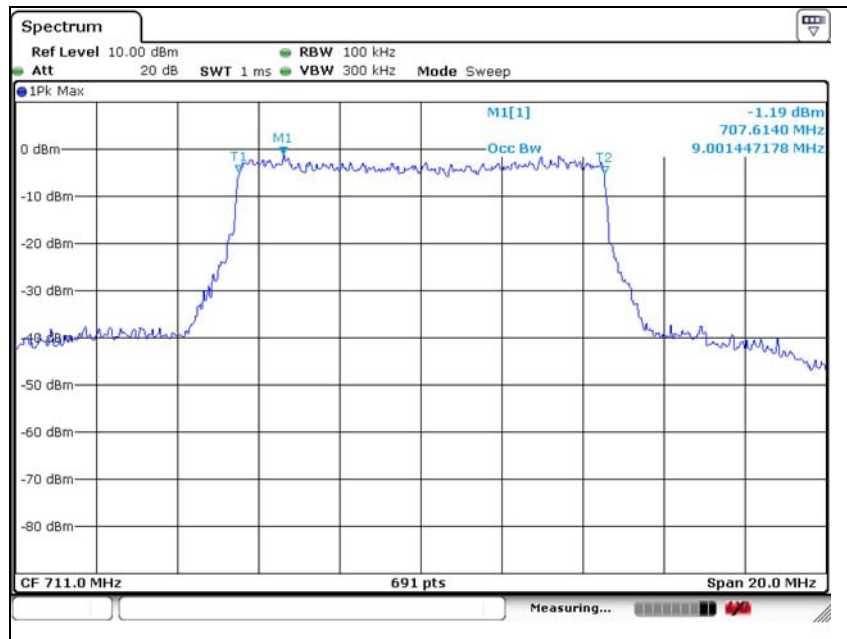
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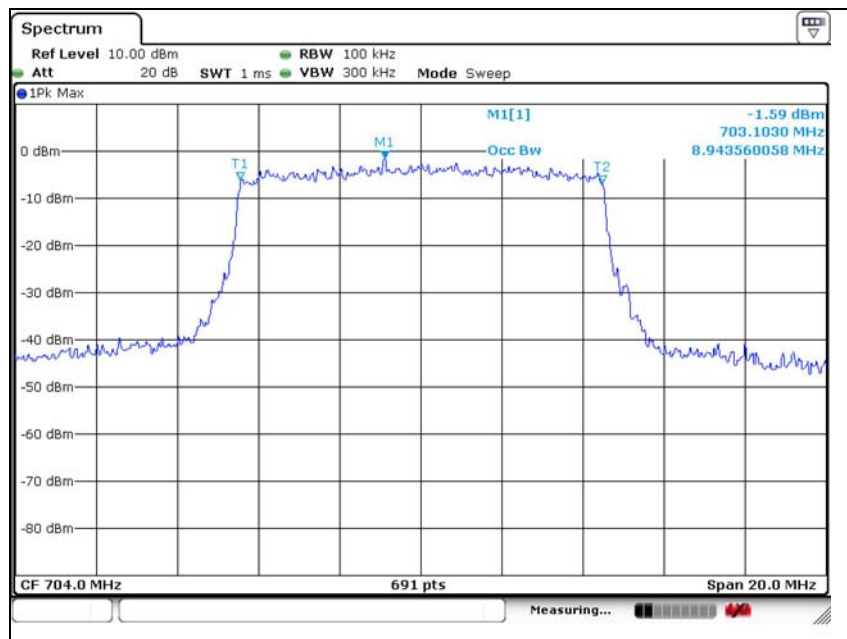
A4(210 mm x 297 mm)

High Channel



LTE band 12 (10 MHz - 16QAM)

Low Channel



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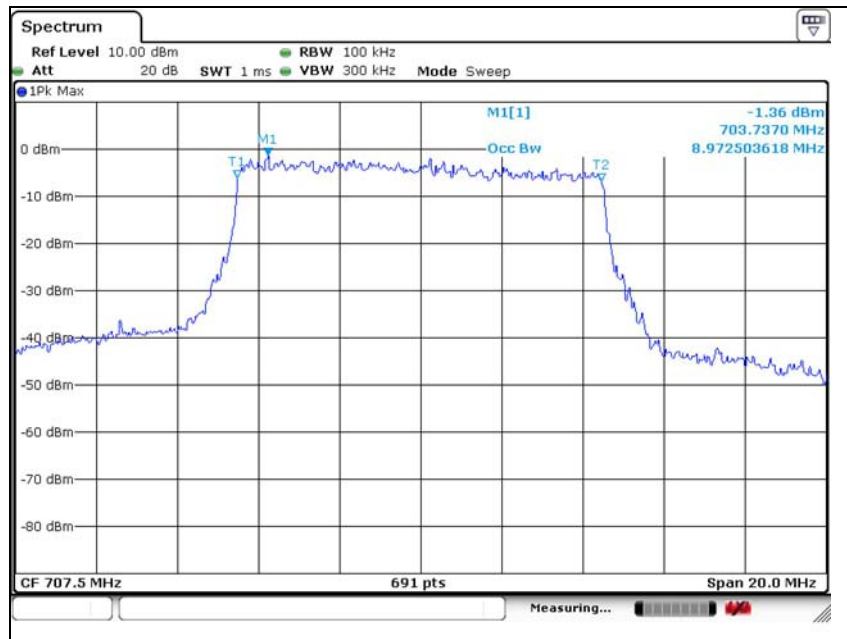
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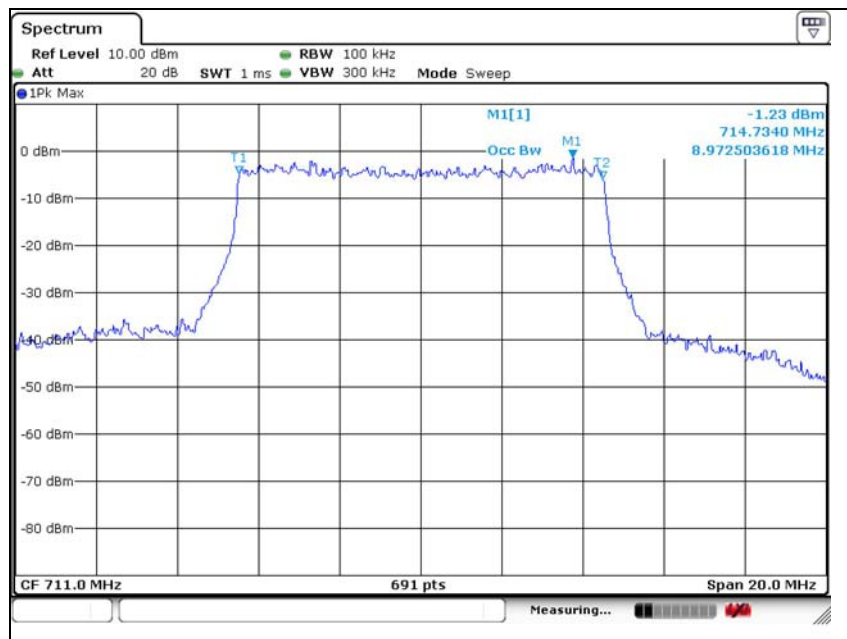
Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

Middle Channel



High Channel



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A4(210 mm x 297 mm)