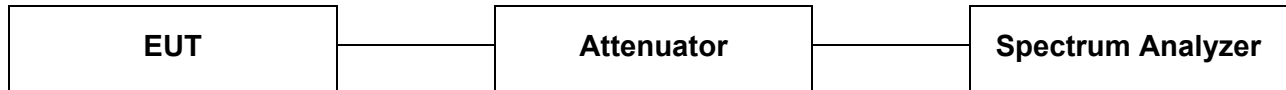


3. 26 dB Bandwidth & 99 % Bandwidth

3.1. Test Setup



3.2. Limit

None; for reporting purpose only.

3.3. Test Procedure

All data rates and modes were investigated for this test. The full data for the worst case data rate are reported in this section.

3.3.1. 26 dB Bandwidth

1. This measurement settings are specified in section II.C.1 of KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
2. Set RBW = approximately 1 % of the emission bandwidth.
3. Set the VBW > RBW.
4. Detector = Peak.
5. Trace mode = max hold.
6. Measure the maximum width of the emission that is 26 dB down from the peak of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1 %.

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A4(210 mm x 297 mm)

3.2.2. 99 % Bandwidth

3.2.2.1 FCC

1. This measurement settings are specified in section II.D of KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
2. Set center frequency to the nominal EUT channel center frequency.
3. Set span = 1.5 times to 5.0 times the OBW.
4. Set RBW = 1 % to 5 % of the OBW.
5. Set VBW $\geq 3 \times$ RBW.
6. Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.
7. Use the 99 % power bandwidth function of the instrument (if available).
8. If the instrument does not have a 99 % power bandwidth function, the trace data points are recovered and directly summed in power units. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5 % of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5 % of the total is reached; that frequency is recorded as the upper frequency. The 99 % occupied bandwidth is the difference between these two frequencies.

In the result,

- DFS requirements are not applicable in the 5 150 MHz ~ 5 250 MHz.

Remark;

In case of band crossing channels 138, 142 and 144, the measurement is complied with section III.A of KDB 789033 D02 General UNII Test Procedures New Rules v02r01.

3.2.2.2 IC

- 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.

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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A4(210 mm x 297 mm)

3.4. Test Result

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

Test mode: 11a

Band	Frequency (MHz)	Ch.	Data Rate (Mbps)	26 dB Bandwidth (MHz)	99 % Bandwidth (MHz)
U-NII 1	5 180	36	6	21.360	16.961
	5 220	44		21.245	16.961
	5 240	48		21.129	17.019
U-NII 2A	5 260	52		20.897	17.019
	5 300	60		20.955	17.019
	5 320	64		20.955	17.019
U-NII 2C	5 500	100		21.013	17.019
	5 580	116		21.129	17.019
	5 720	144		21.071	17.019
U-NII 3	5 745	149		20.839	17.019
	5 785	157		20.955	17.019
	5 825	165		21.013	17.019

Test mode: 11ac_VHT20

Band	Frequency (MHz)	Ch.	Data Rate (Mbps)	26 dB Bandwidth (MHz)	99 % Bandwidth (MHz)
U-NII 1	5 180	36	MCS0	21.476	18.119
	5 220	44		21.476	18.177
	5 240	48		21.360	18.119
U-NII 2A	5 260	52		21.360	18.119
	5 300	60		21.534	18.119
	5 320	64		21.418	18.177
U-NII 2C	5 500	100		21.476	18.119
	5 580	116		21.418	18.119
	5 720	144		21.708	18.119
U-NII 3	5 745	149		21.245	18.119
	5 785	157		21.187	18.177
	5 825	165		21.534	18.119

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Test mode: 11ac_VHT40

Band	Frequency (MHz)	Ch.	Data Rate (Mbps)	26 dB Bandwidth (MHz)	99 % Bandwidth (MHz)
U-NII 1	5 190	38	MCS0	40.058	36.237
	5 230	46		40.289	36.237
U-NII 2A	5 270	54		40.174	36.353
	5 310	62		40.289	36.237
U-NII 2C	5 510	102		40.289	36.237
	5 550	110		40.174	36.237
	5 710	142		40.174	36.353
U-NII 3	5 755	151		40.174	36.353
	5 795	159		40.289	36.237

Test mode: 11ac_VHT80

Band	Frequency (MHz)	Ch.	Data Rate (Mbps)	26 dB Bandwidth (MHz)	99 % Bandwidth (MHz)
U-NII 1	5 210	42	MCS1	81.968	75.716
U-NII 2A	5 290	58		81.968	75.716
U-NII 2C	5 530	106		82.200	75.716
	5 690	138		81.737	75.716
U-NII 3	5 775	155		82.431	75.716

Band-crossing channel

Mode	Frequency (MHz)	Ch.	Data Rate (Mbps)	26 dB Bandwidth (MHz)
11a	5 720	144	6	15.593
11ac_VHT20	5 720	144	MCS0	15.825
11ac_VHT40	5 710	142	MCS0	35.140
11ac_VHT80	5 690	138	MCS1	75.520

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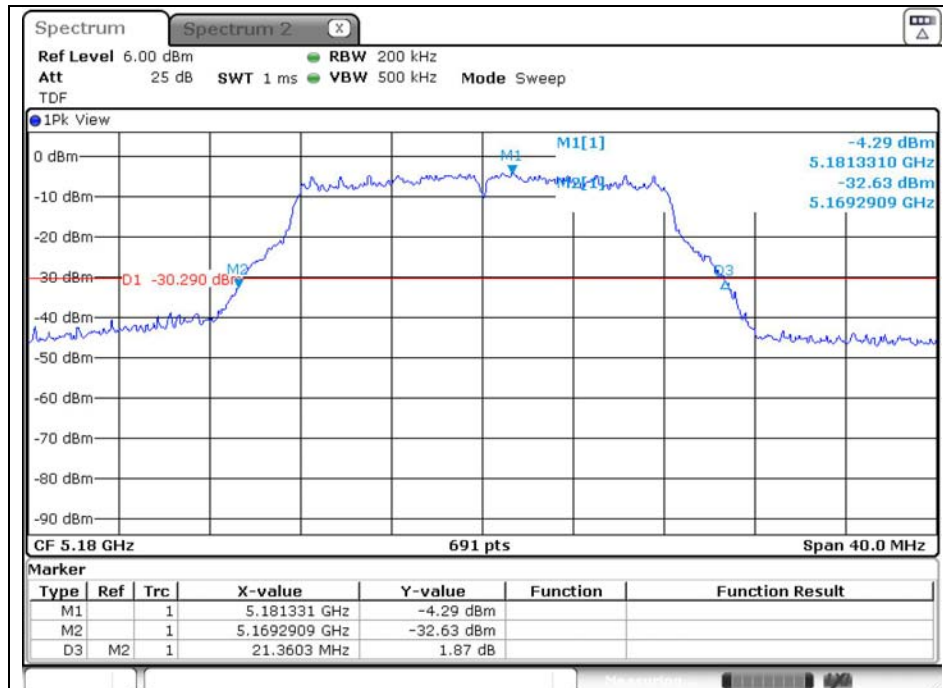
A4(210 mm x 297 mm)

- Test plots

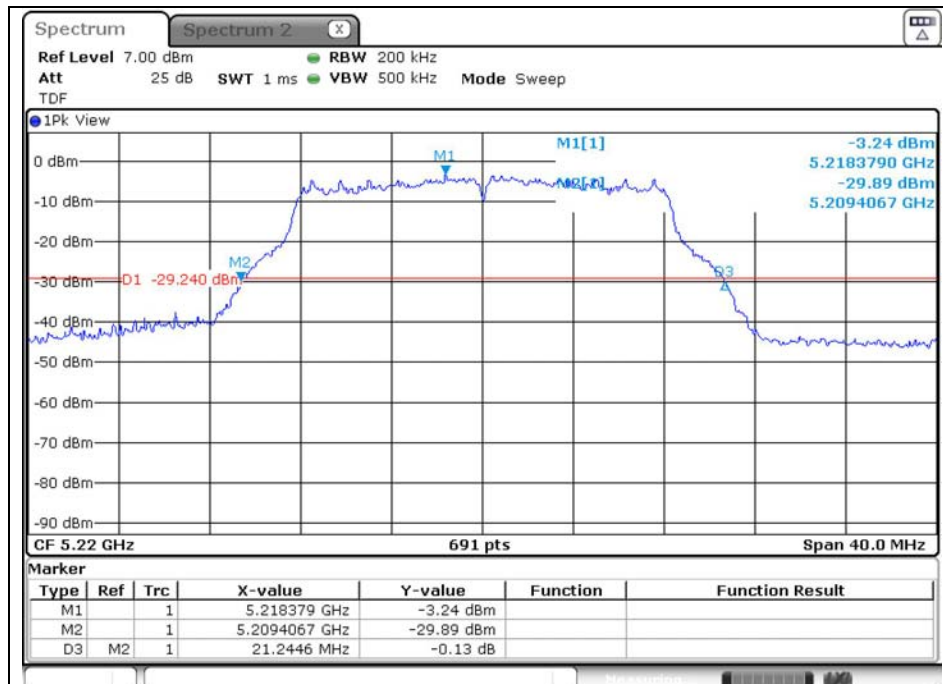
26 dB Bandwidth

802.11a (Band 1)

Low Channel (5 180 MHz)



Middle Channel (5 220 MHz)



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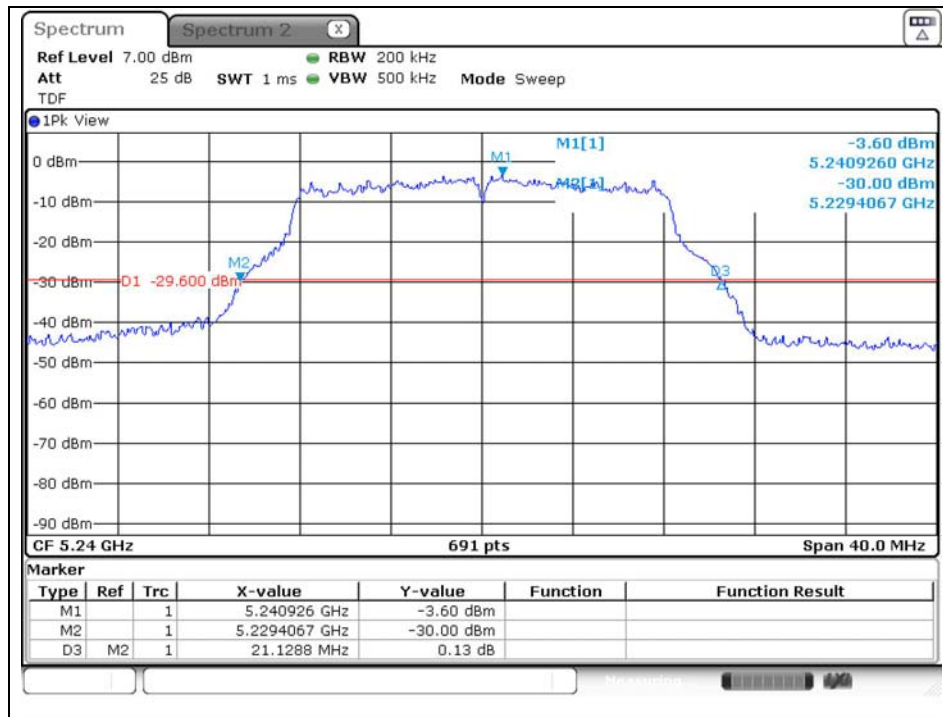
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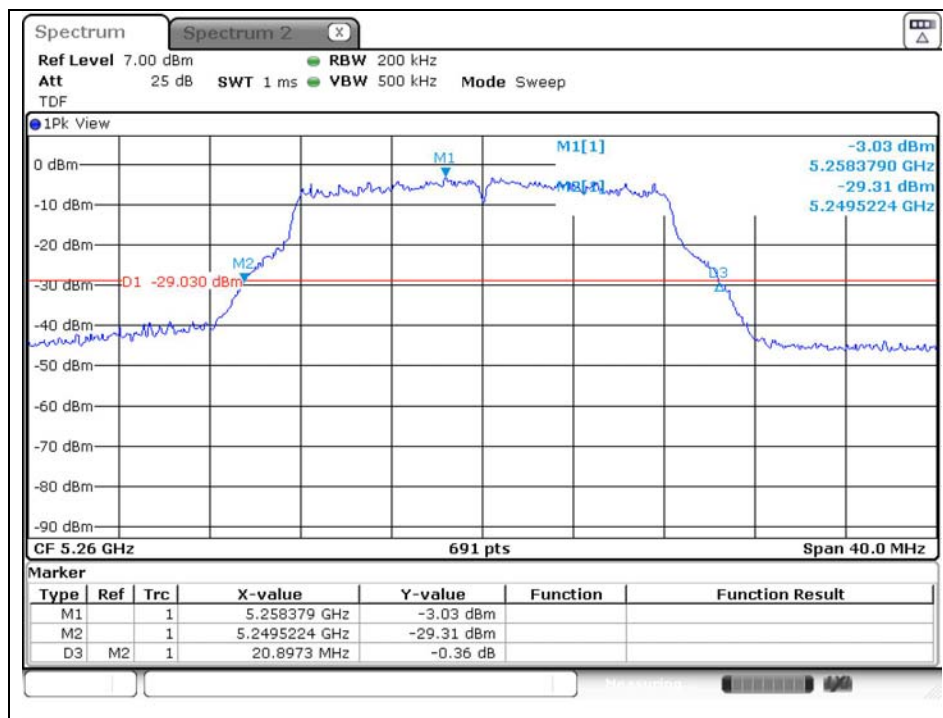
A4(210 mm x 297 mm)

High Channel (5 240 MHz)



802.11a (Band 2A)

Low Channel (5 260 MHz)



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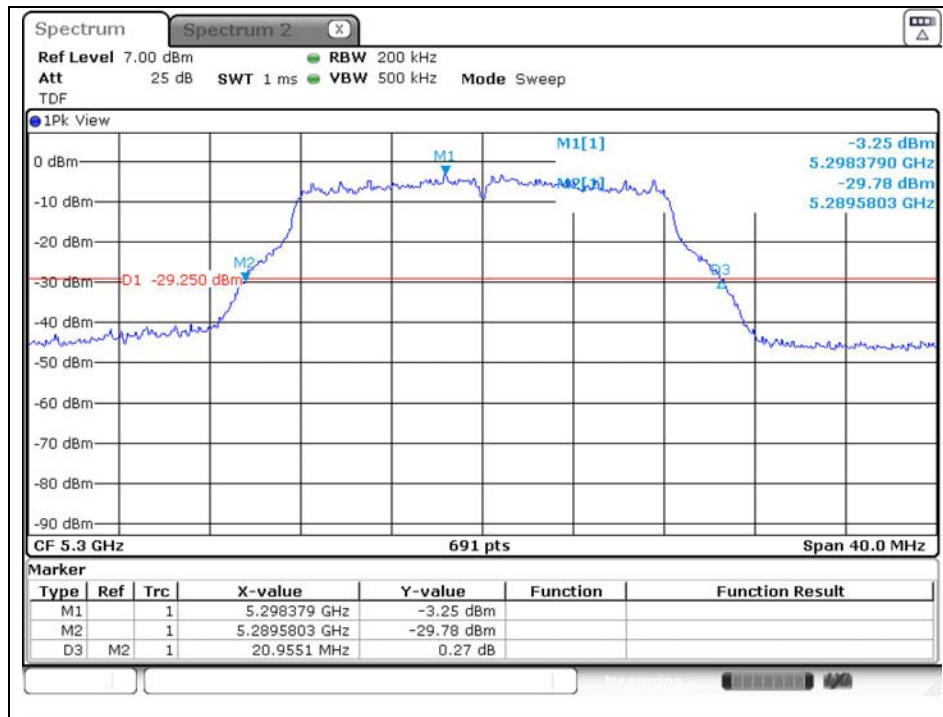
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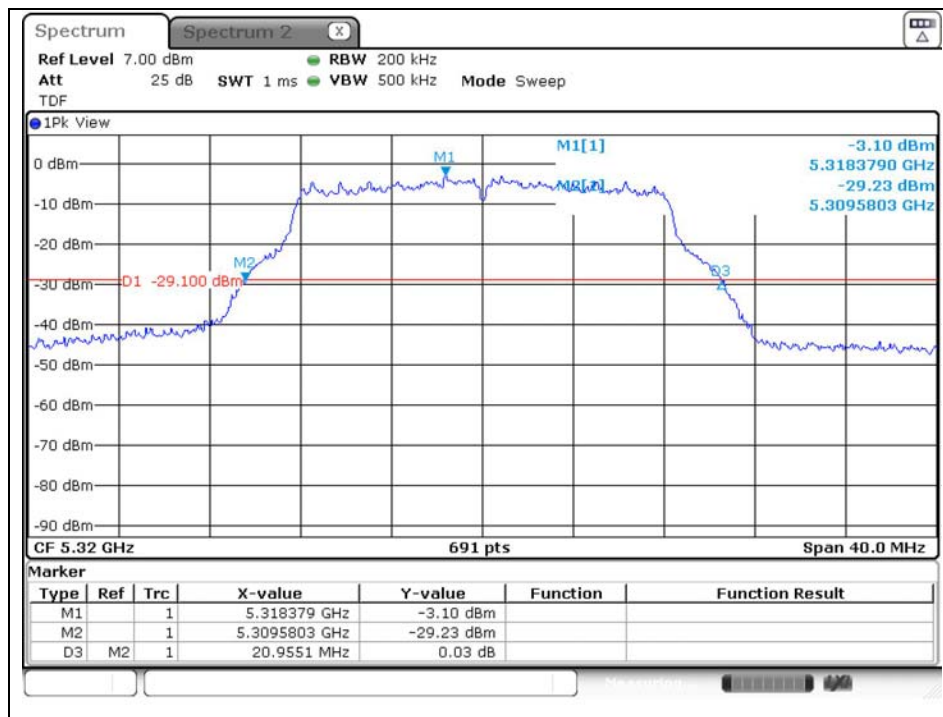
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A4(210 mm x 297 mm)

Middle Channel (5 300 MHz)



High Channel (5 320 MHz)



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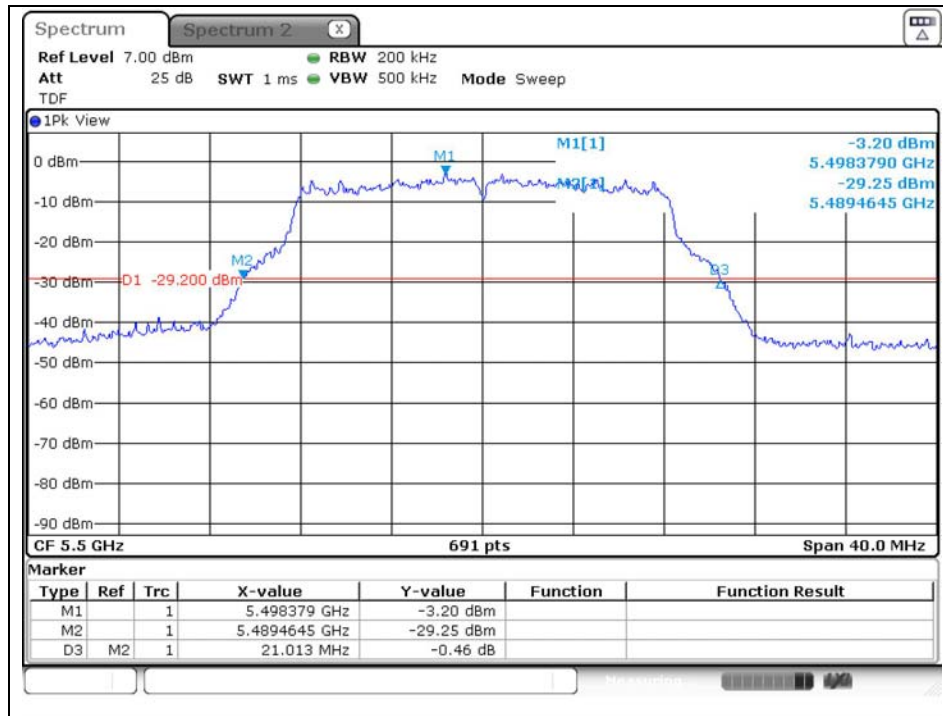
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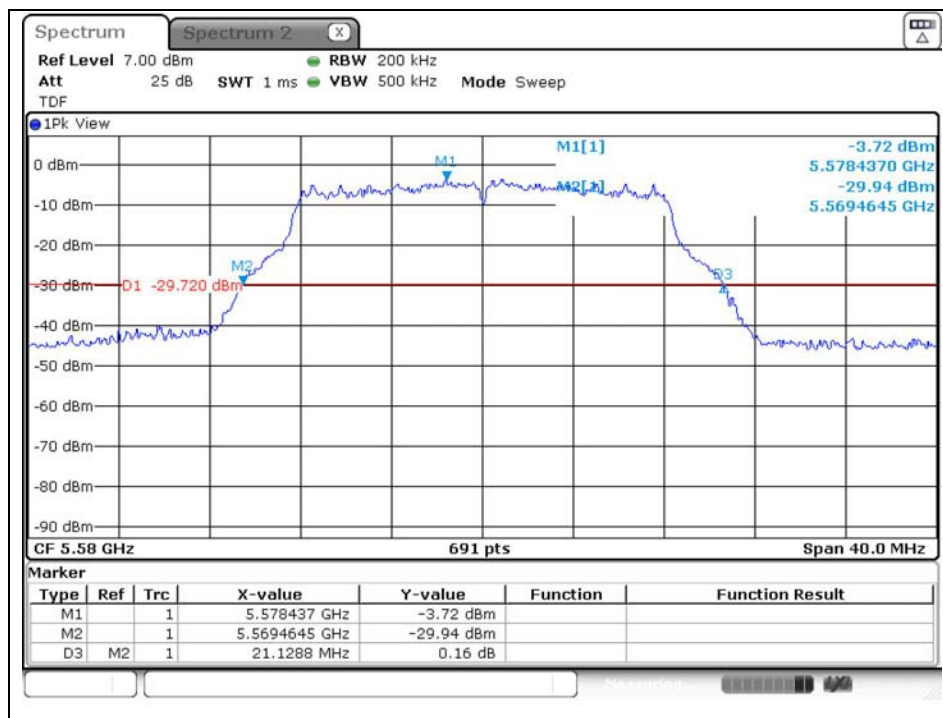
A4(210 mm x 297 mm)

802.11a (Band 2C)

Low Channel (5 500 MHz)



Middle Channel (5 580 MHz)



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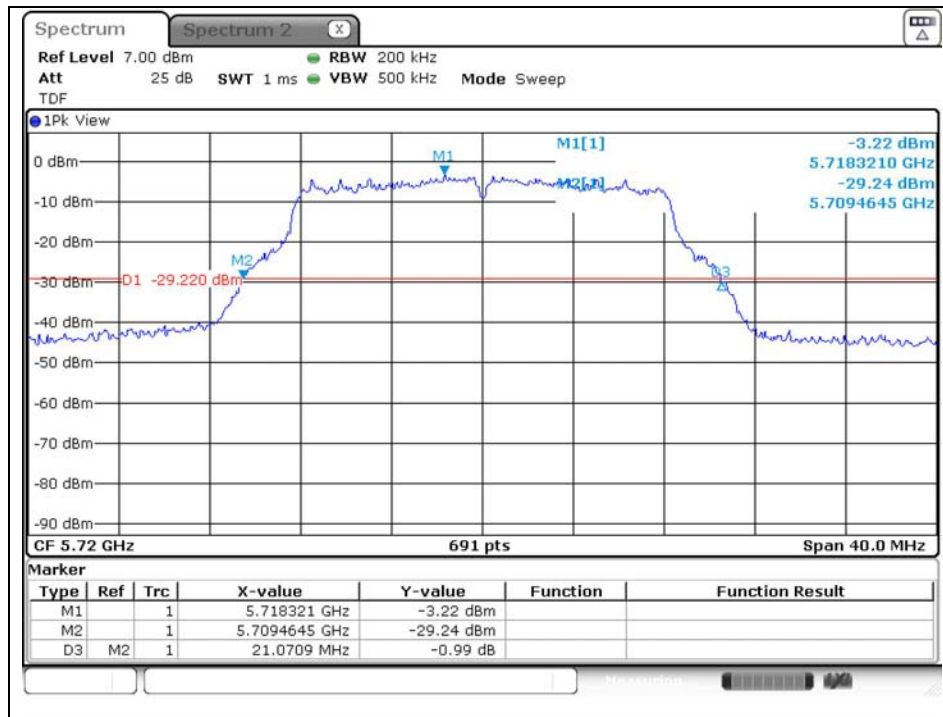
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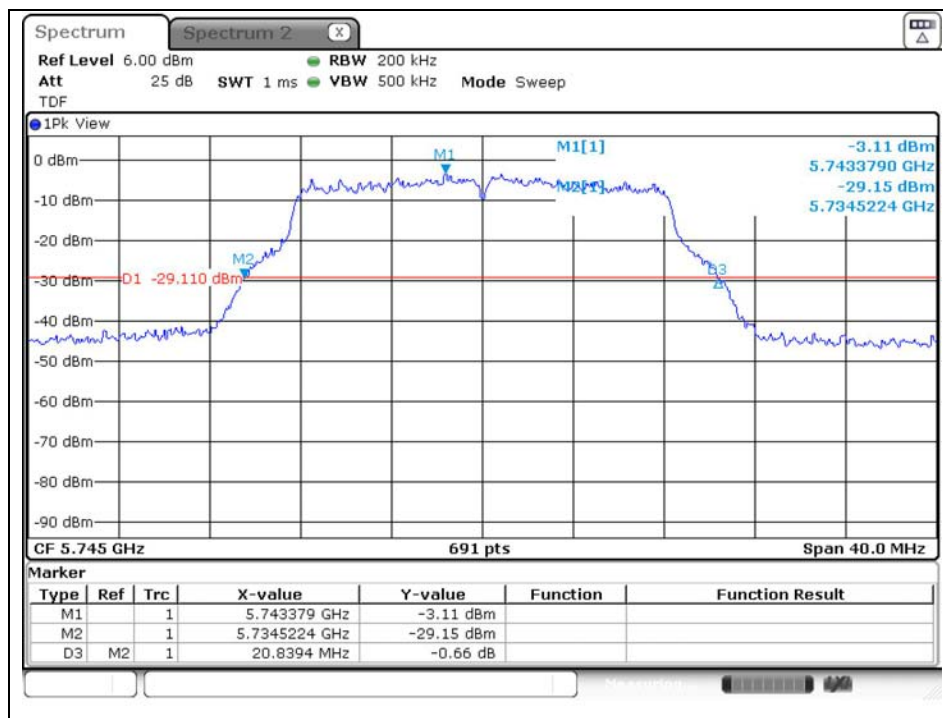
A4(210 mm x 297 mm)

High Channel (5 720 MHz)



802.11a (Band 3)

Low Channel (5 745 MHz)



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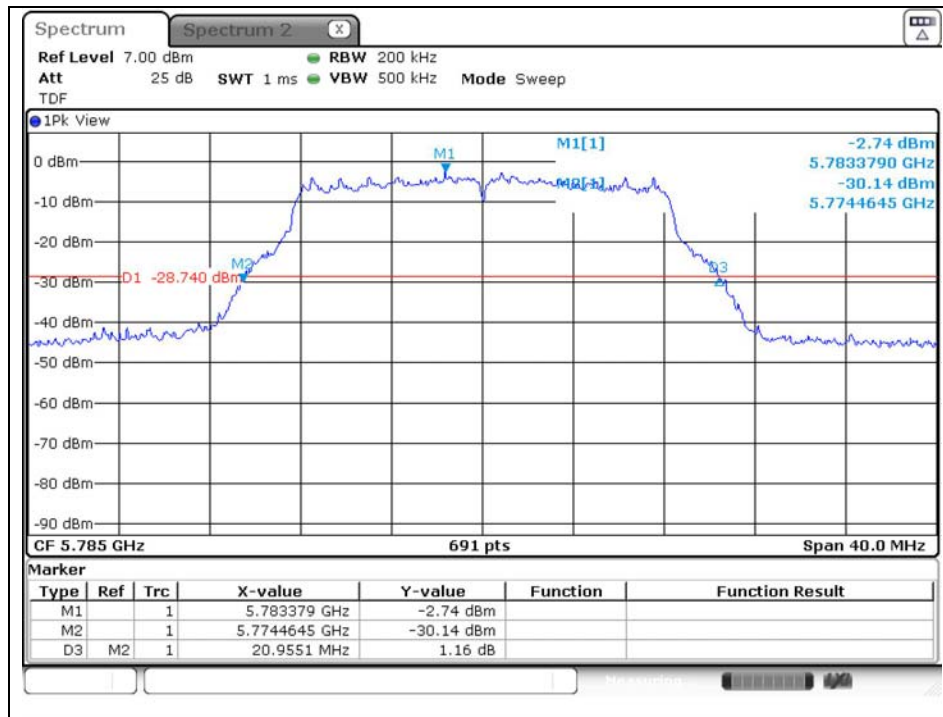
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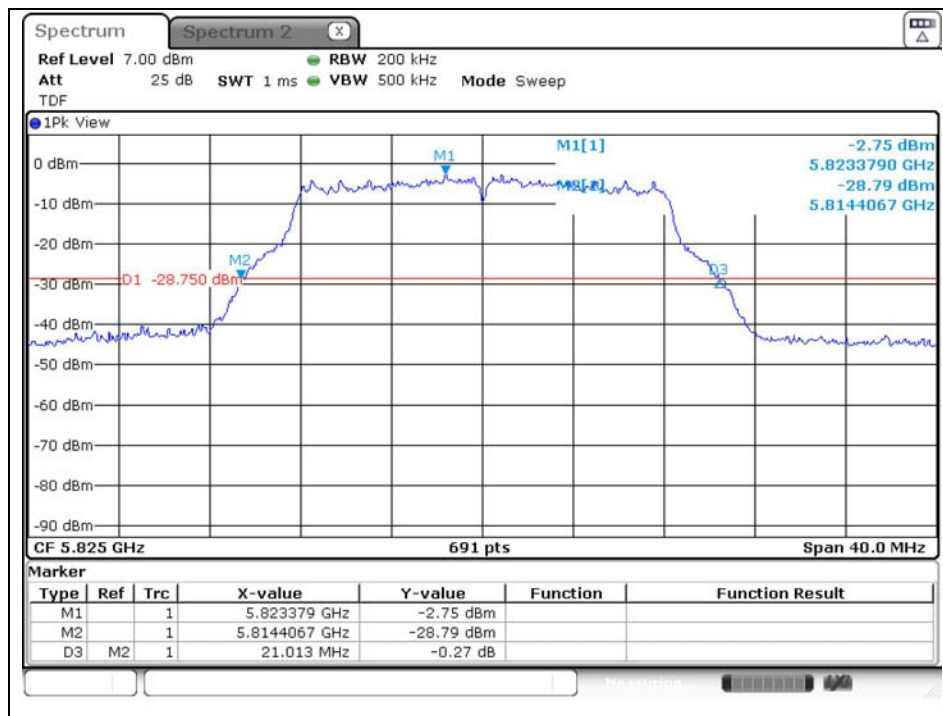
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A4(210 mm x 297 mm)

Middle Channel (5 785 MHz)



High Channel (5 825 MHz)



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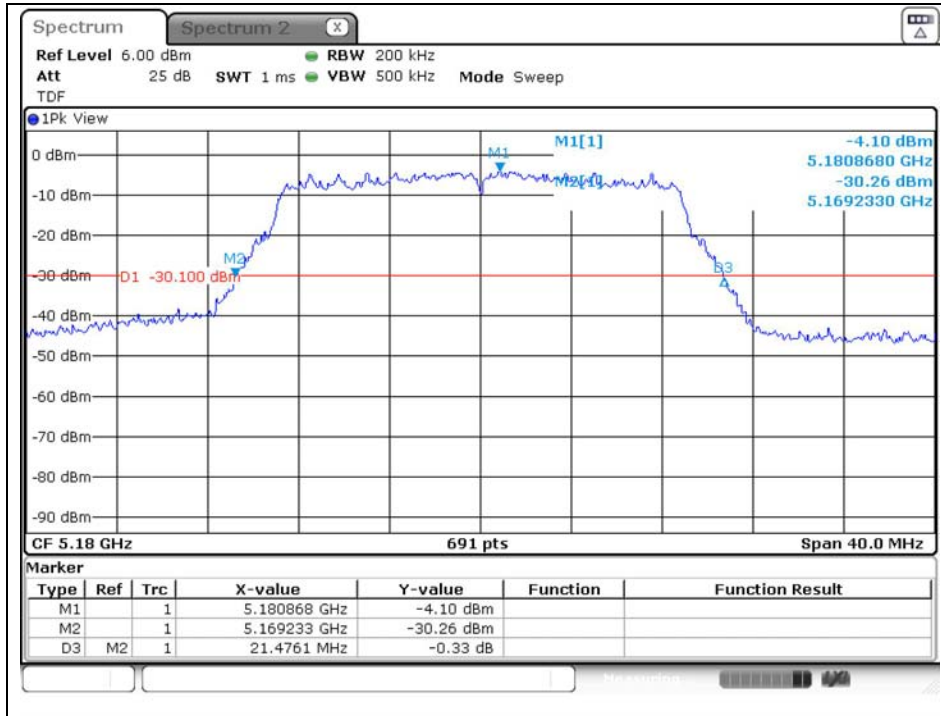
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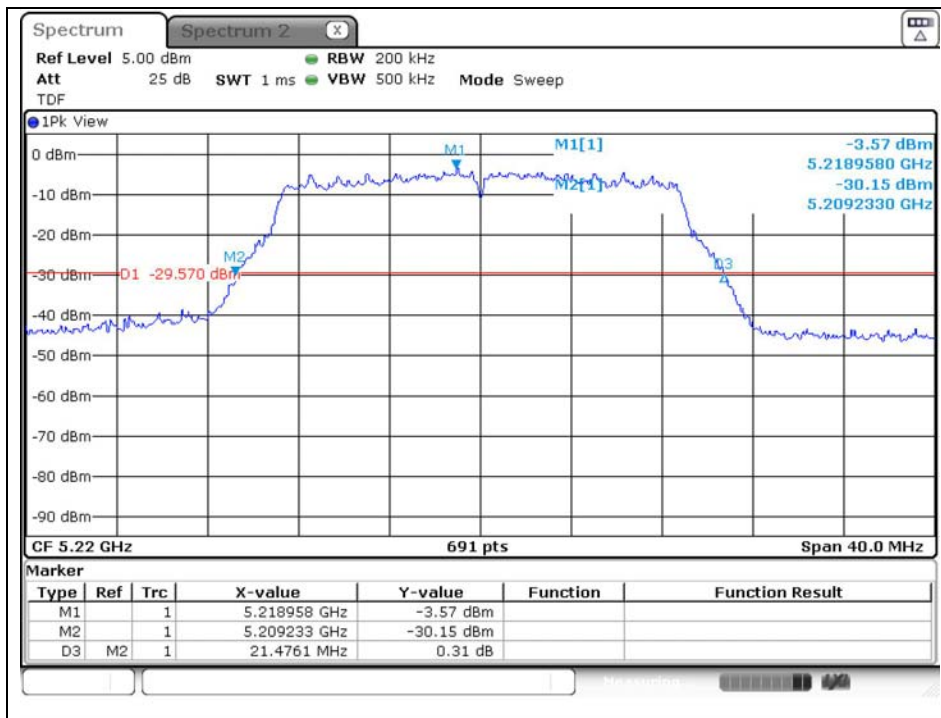
A4(210 mm x 297 mm)

802.11ac_VHT20 (Band 1)

Low Channel (5 180 MHz)



Middle Channel (5 220 MHz)



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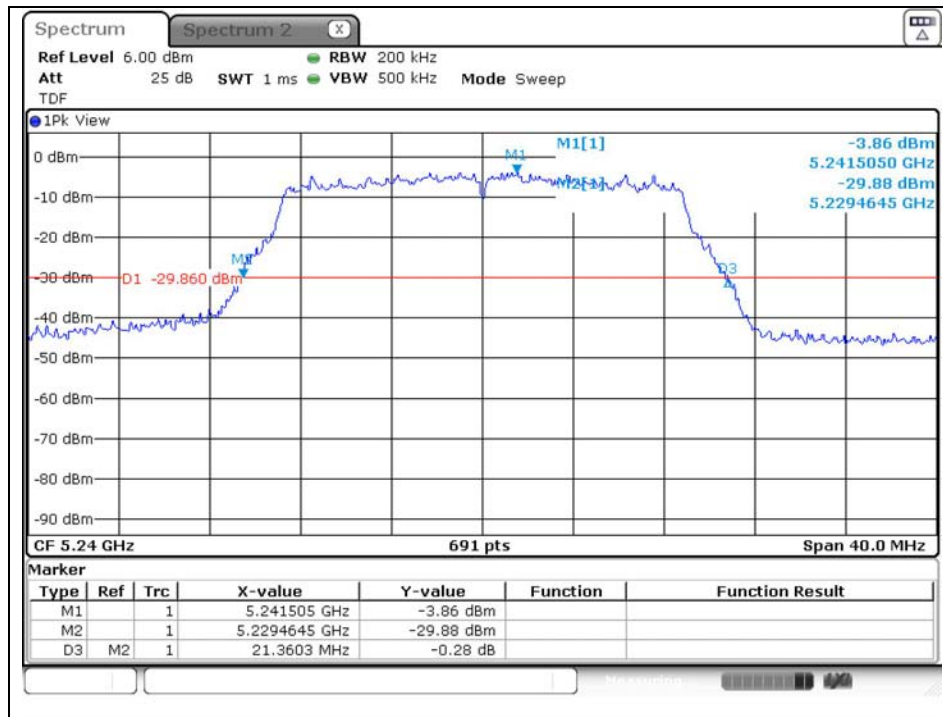
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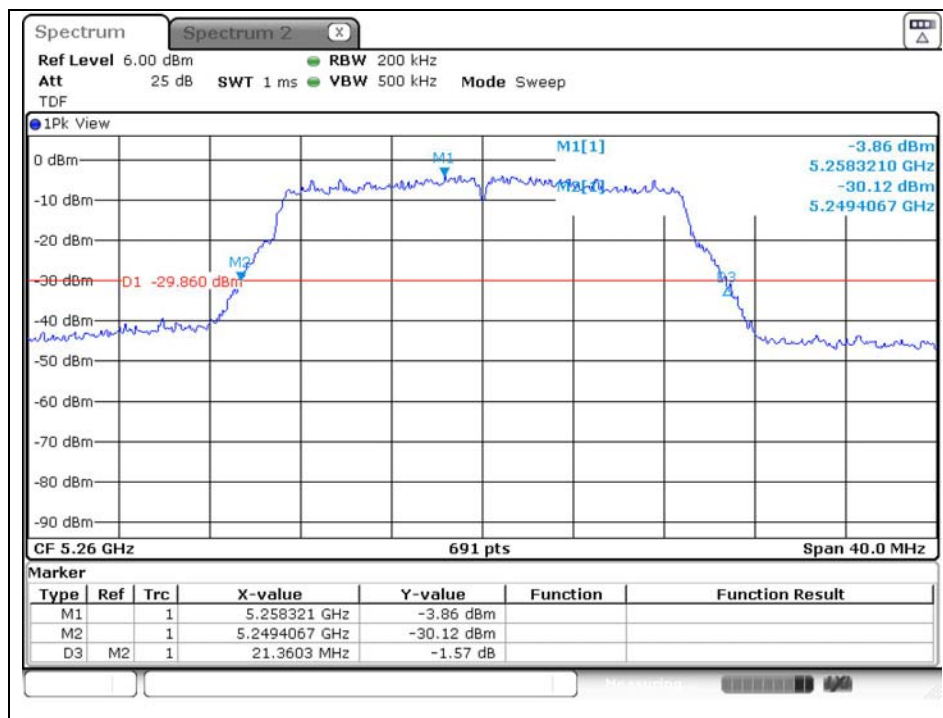
A4(210 mm x 297 mm)

High Channel (5 240 MHz)



802.11ac_VHT20 (Band 2A)

Low Channel (5 260 MHz)



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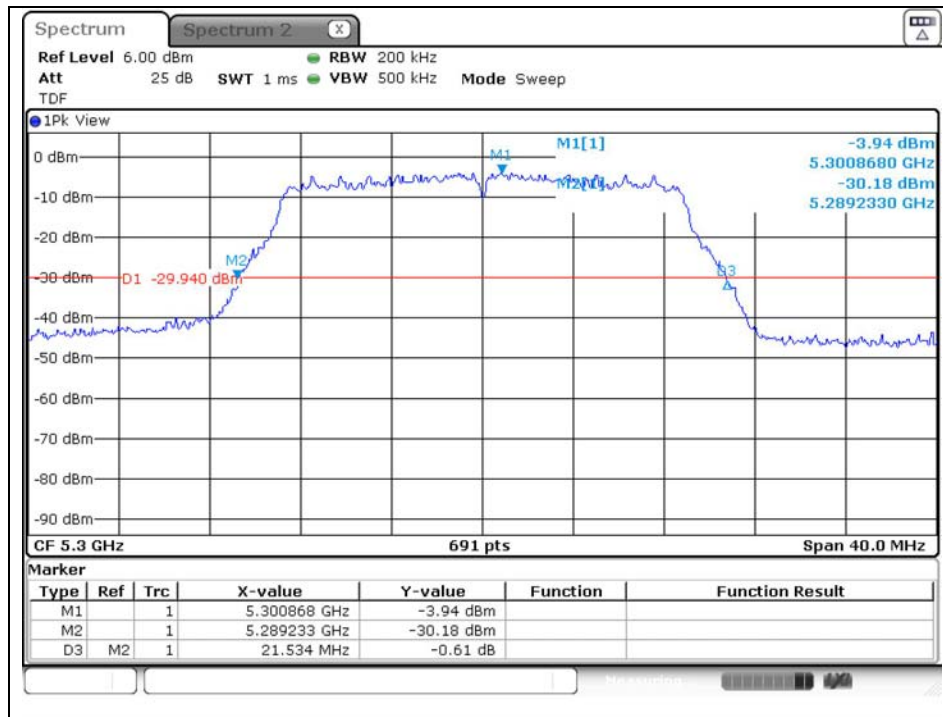
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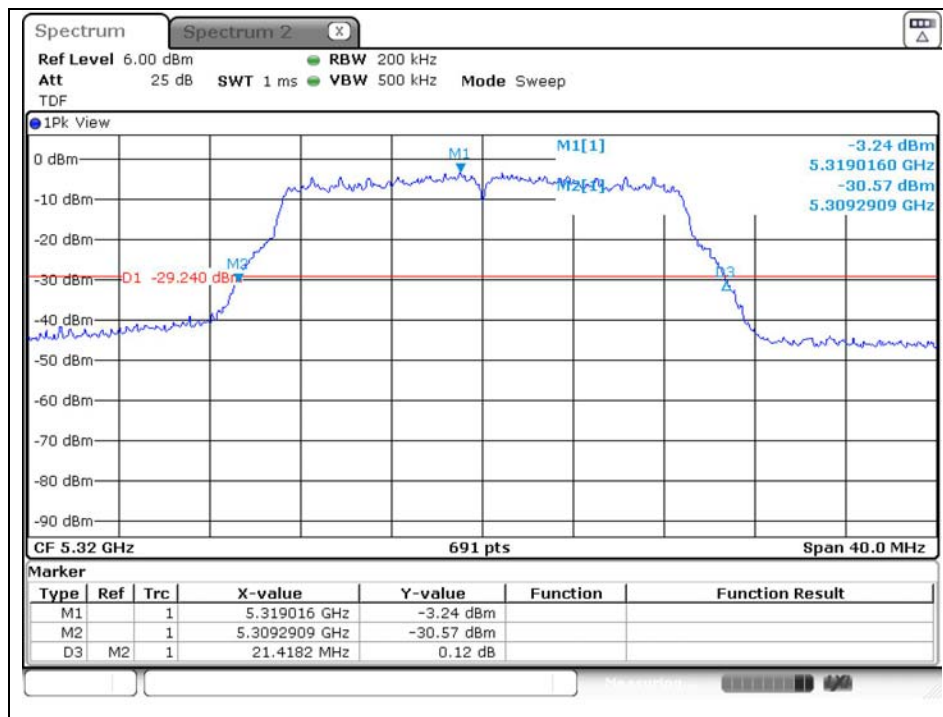
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A4(210 mm x 297 mm)

Middle Channel (5 300 MHz)



High Channel (5 320 MHz)



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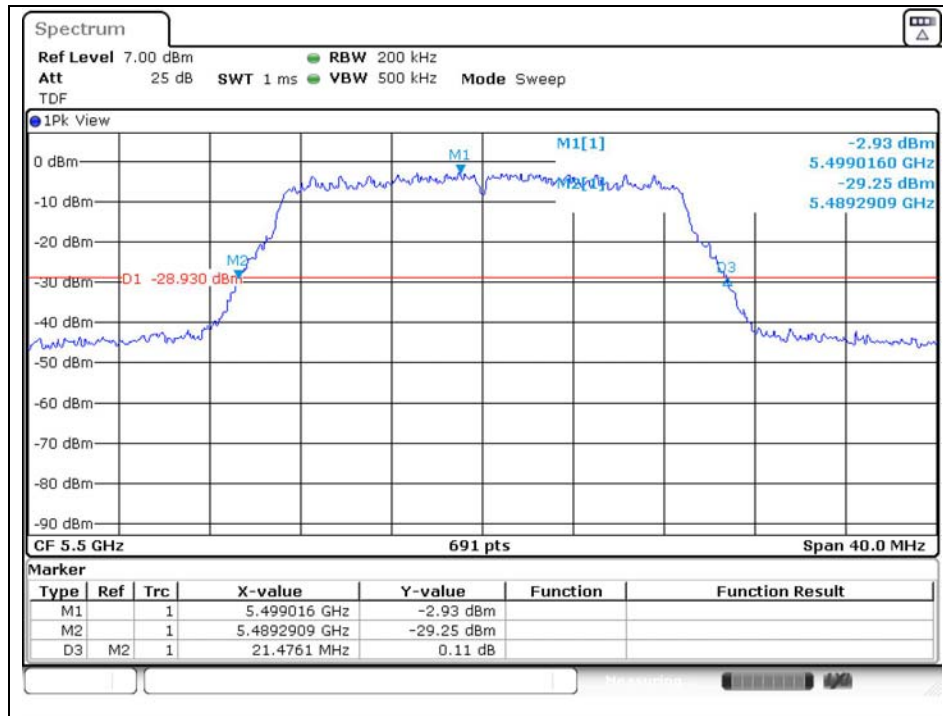
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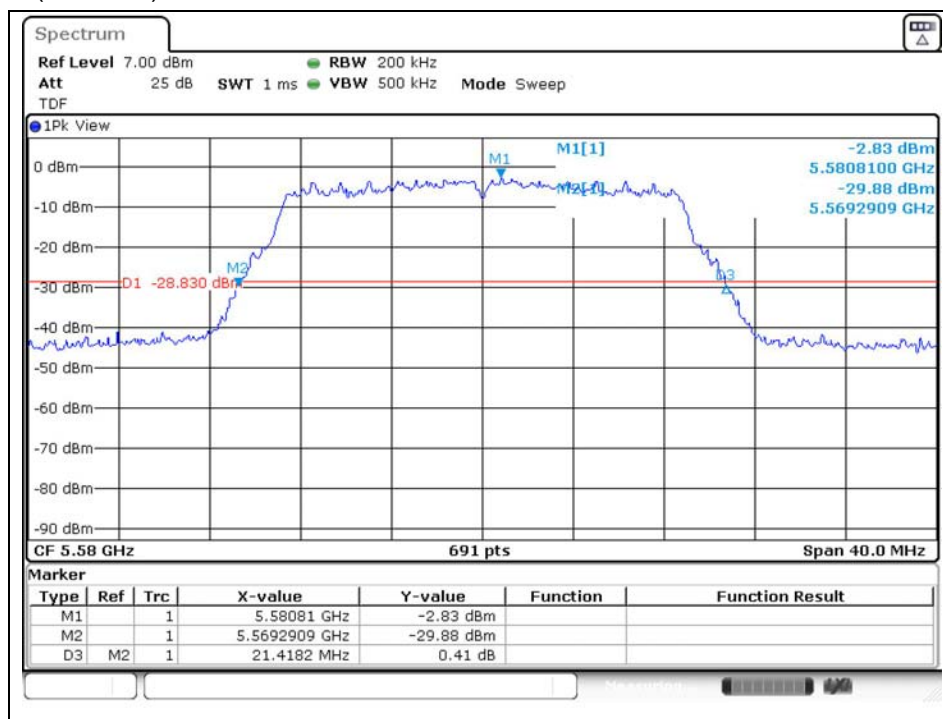
A4(210 mm x 297 mm)

802.11ac_VHT20 (Band 2C)

Low Channel (5 500 MHz)



Middle Channel (5 580 MHz)



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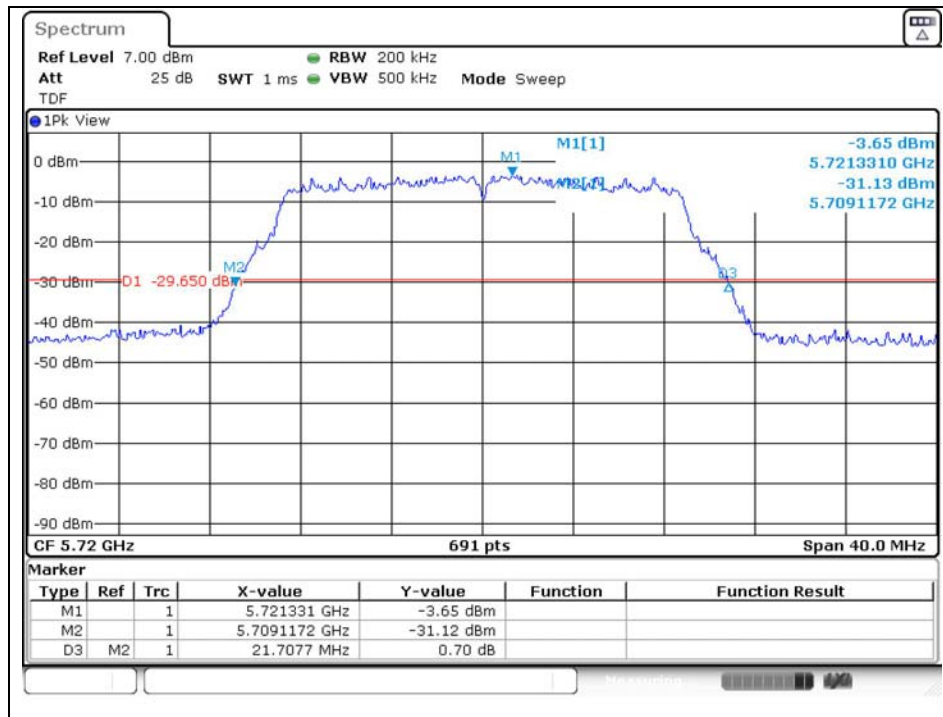
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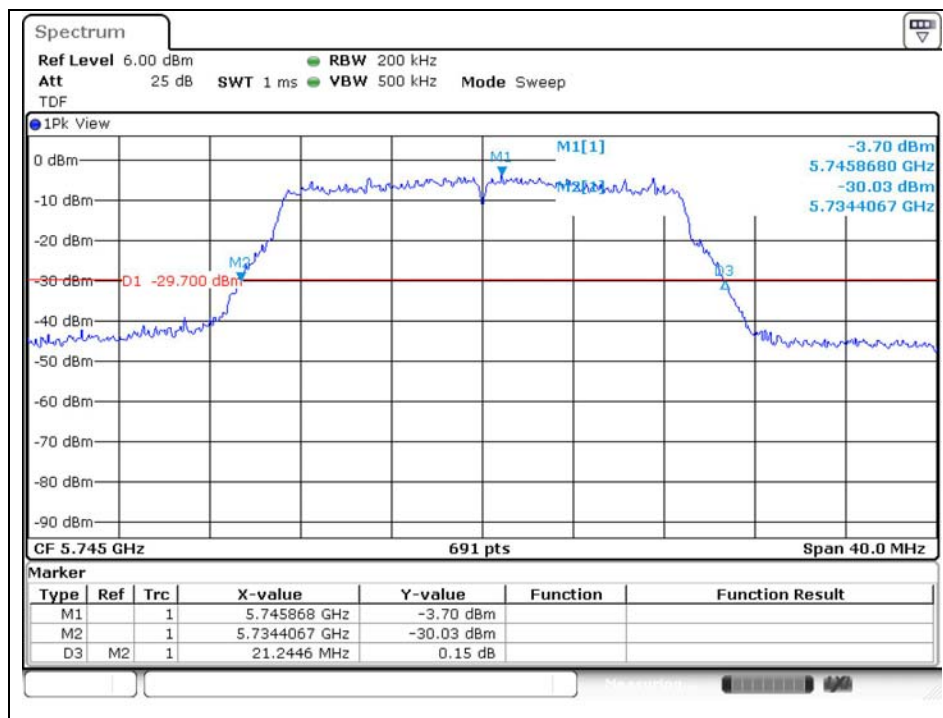
A4(210 mm x 297 mm)

High Channel (5 720 MHz)



802.11ac_VHT20 (Band 3)

Low Channel (5 745 MHz)



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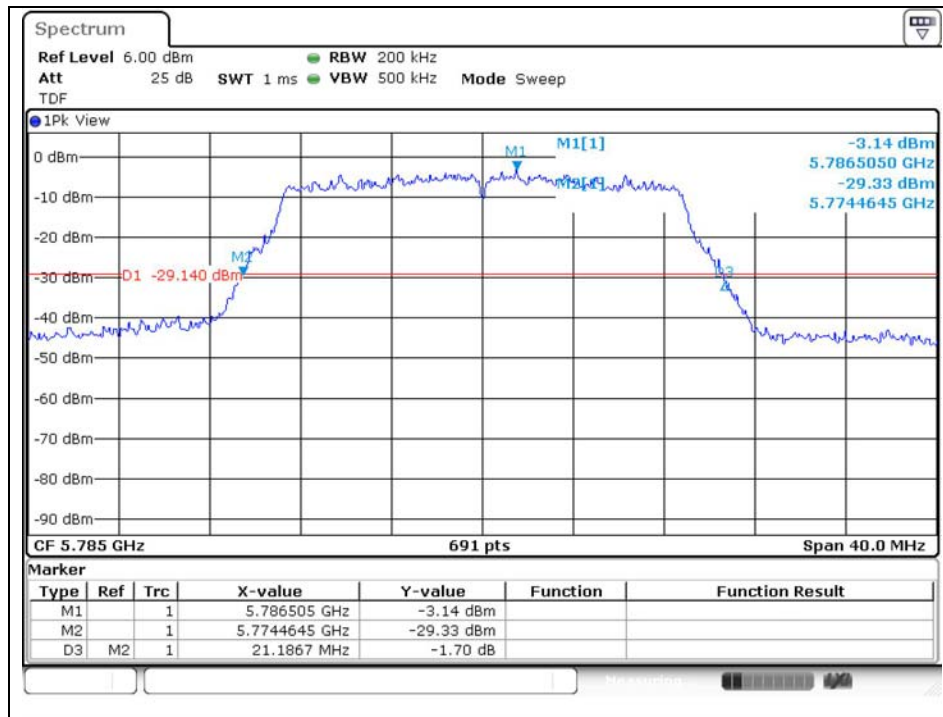
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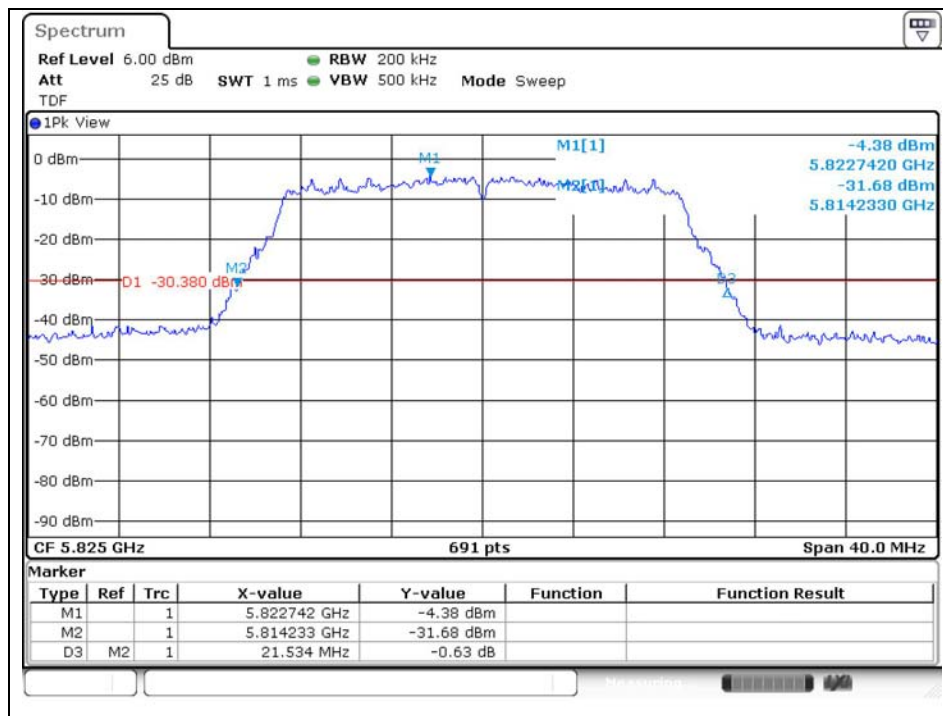
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A4(210 mm x 297 mm)

Middle Channel (5 785 MHz)



High Channel (5 825 MHz)



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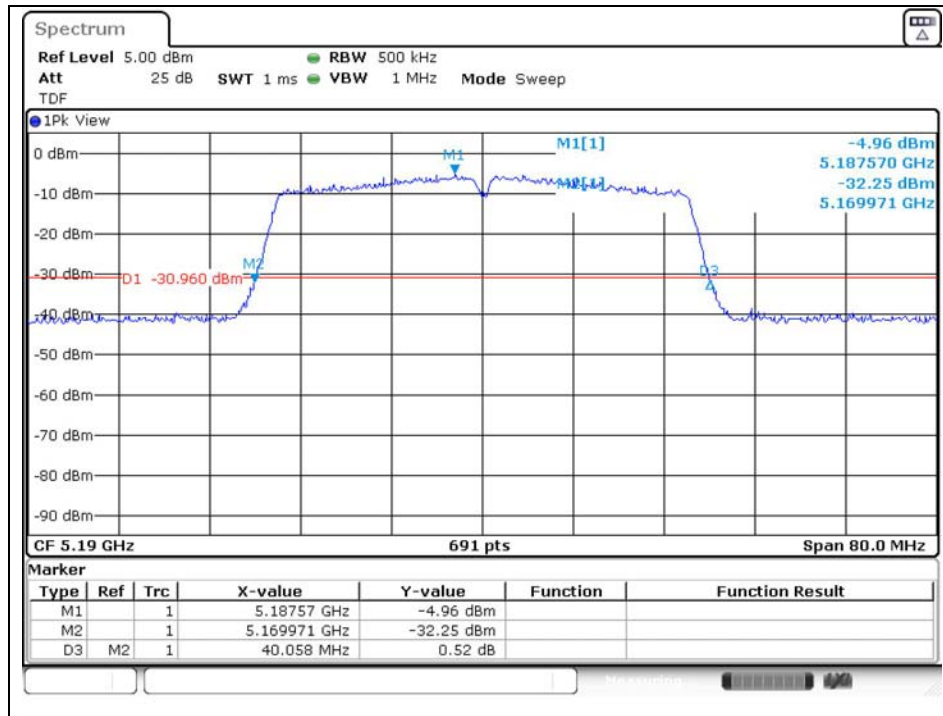
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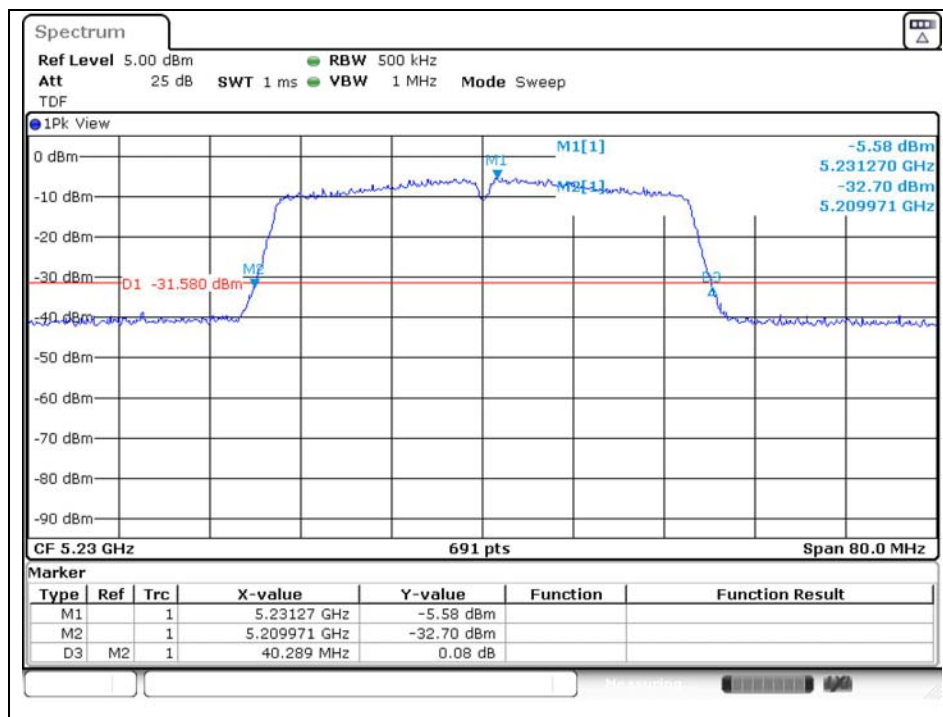
A4(210 mm x 297 mm)

802.11ac_VHT40 (Band 1)

Low Channel (5 190 MHz)



High Channel (5 230 MHz)

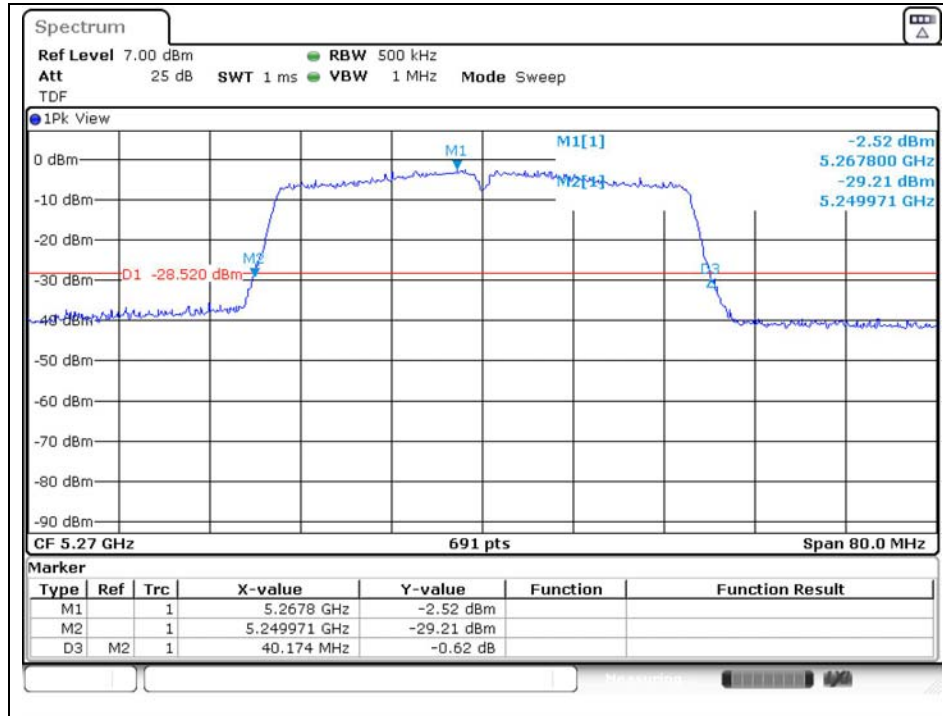


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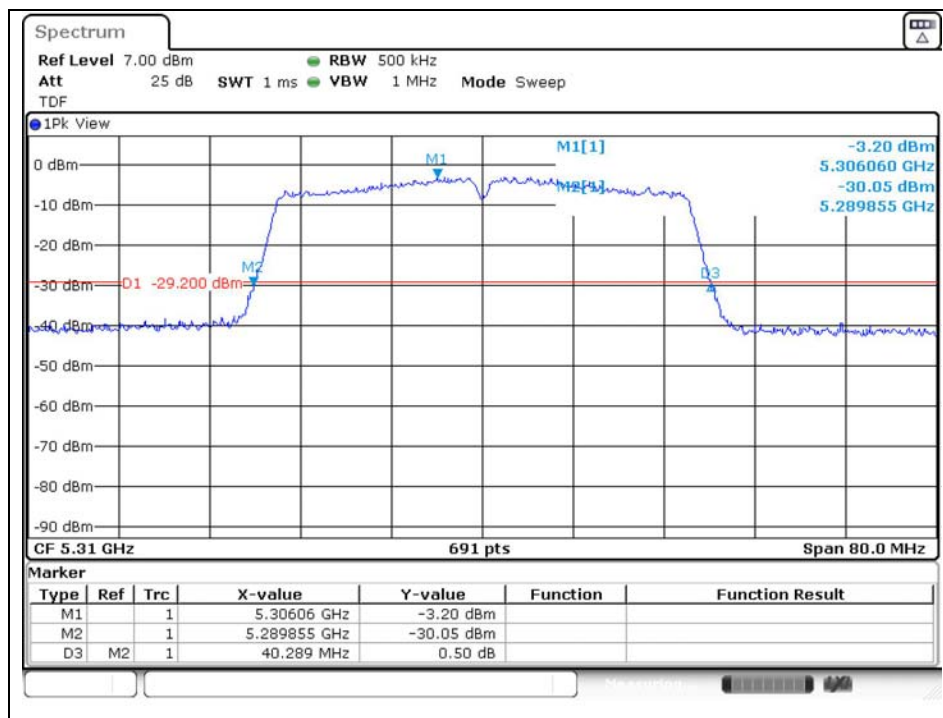
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802.11ac_VHT40 (Band 2A)

Low Channel (5 270 MHz)



High Channel (5 310 MHz)



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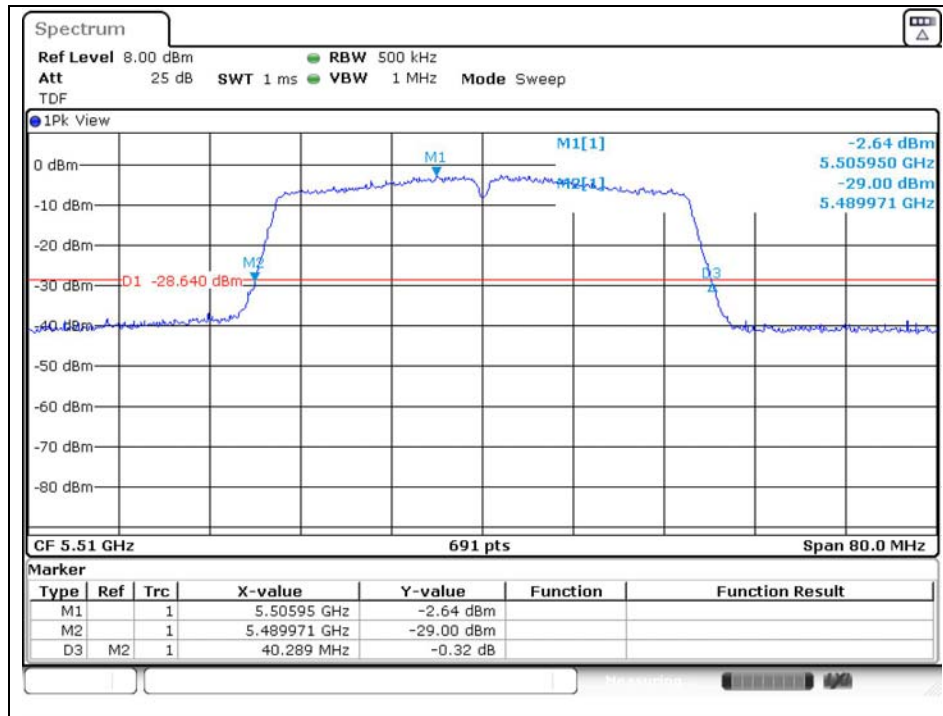
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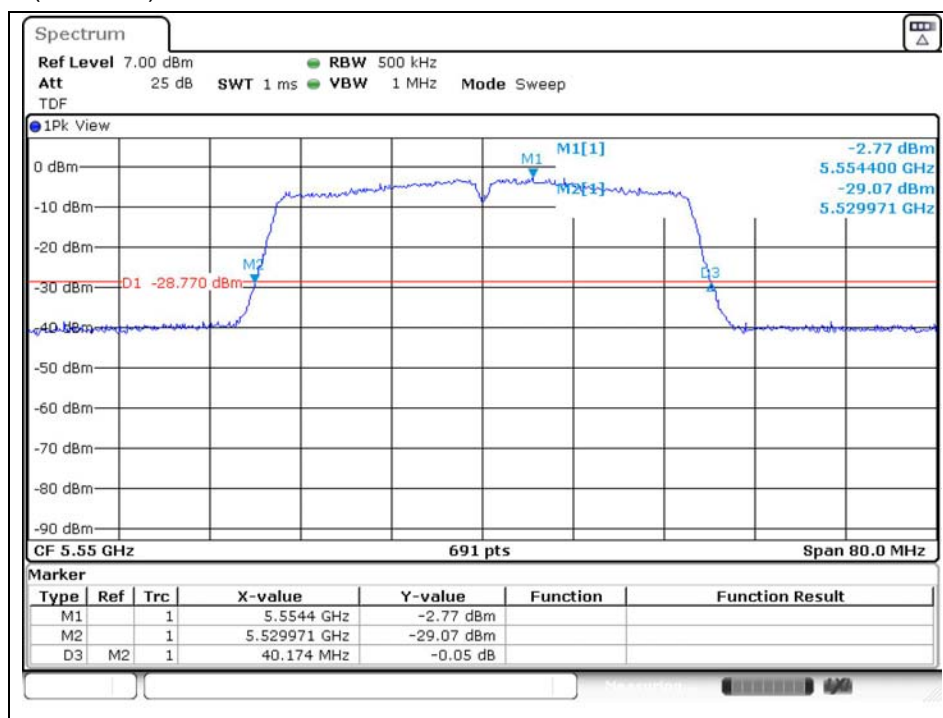
A4(210 mm x 297 mm)

802.11ac_VHT40 (Band 2C)

Low Channel (5 510 MHz)



Middle Channel (5 550 MHz)



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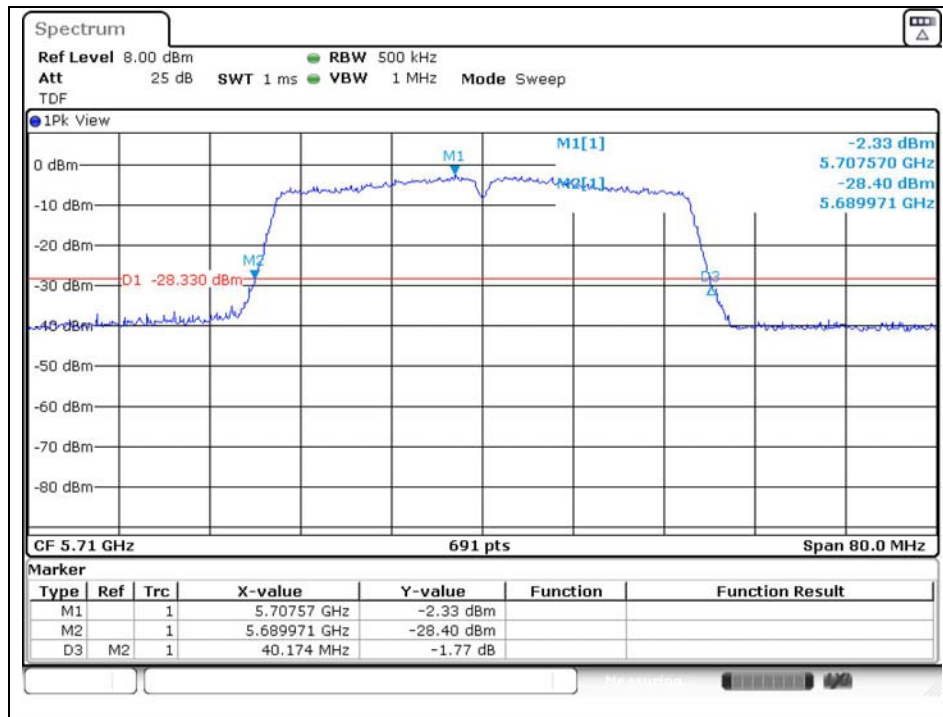
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-19(2019.04.24)(1)

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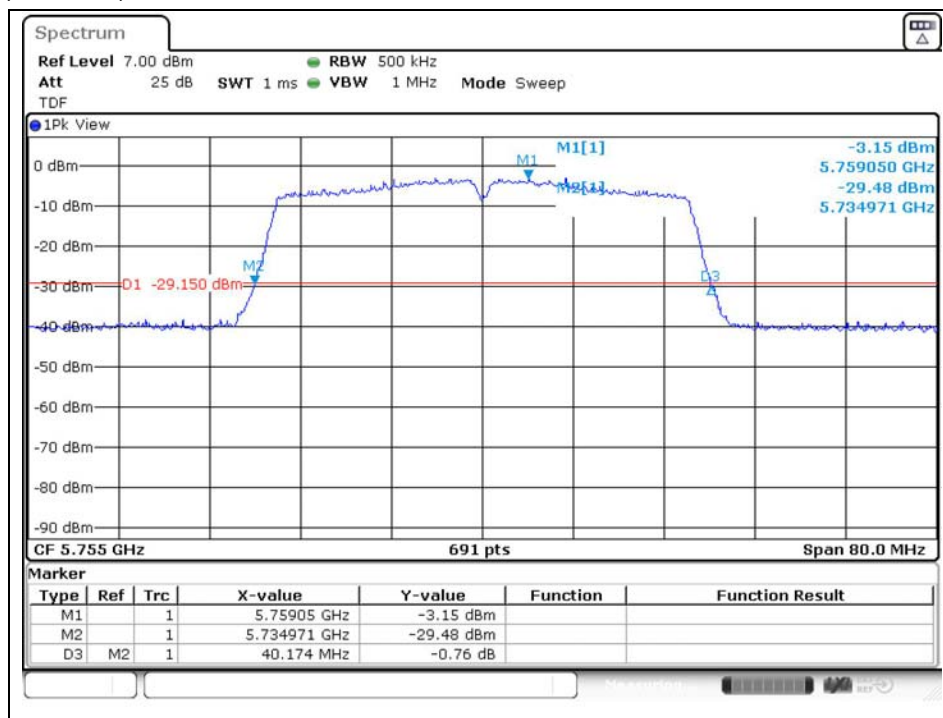
A4(210 mm x 297 mm)

High Channel (5 710 MHz)



802.11ac_VHT40 (Band 3)

Low Channel (5 755 MHz)



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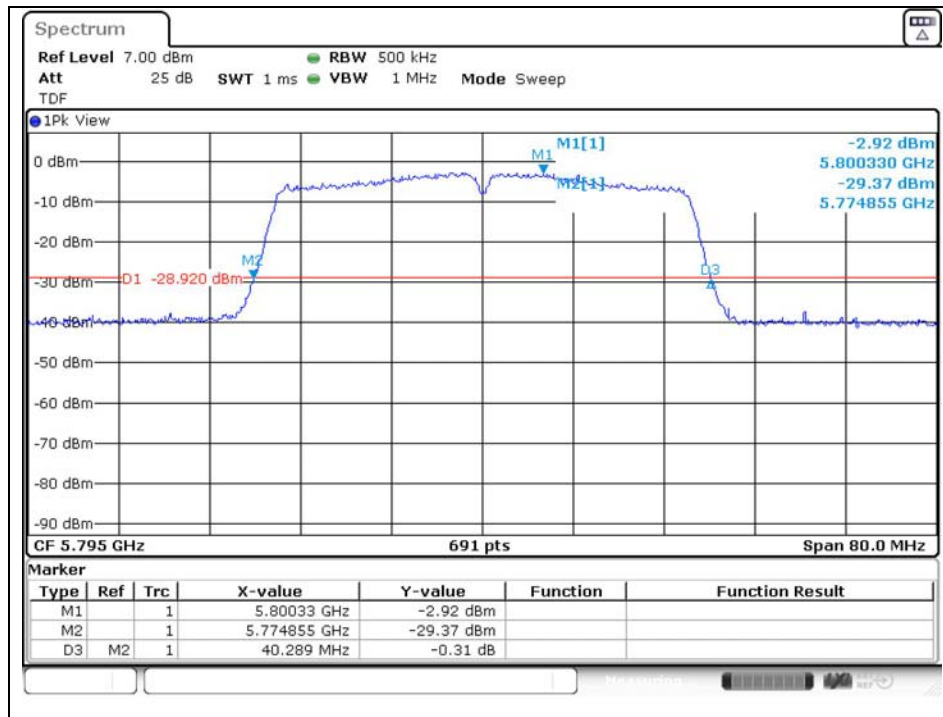
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-19(2019.04.24)(1)

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

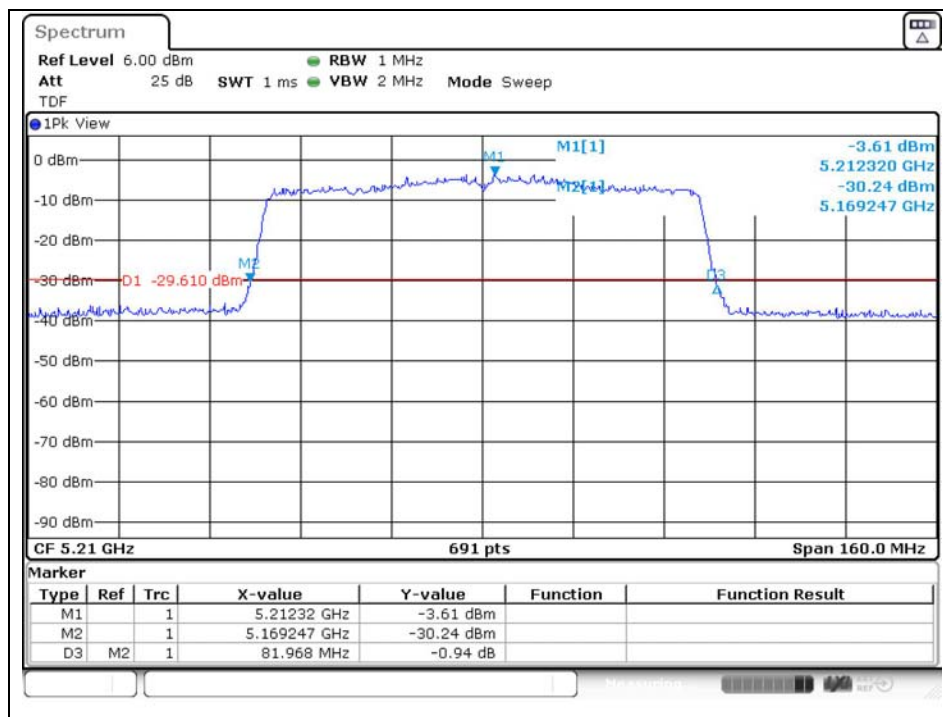
A4(210 mm x 297 mm)

High Channel (5 795 MHz)



802.11ac_VHT80 (Band 1)

Middle Channel (5 210 MHz)



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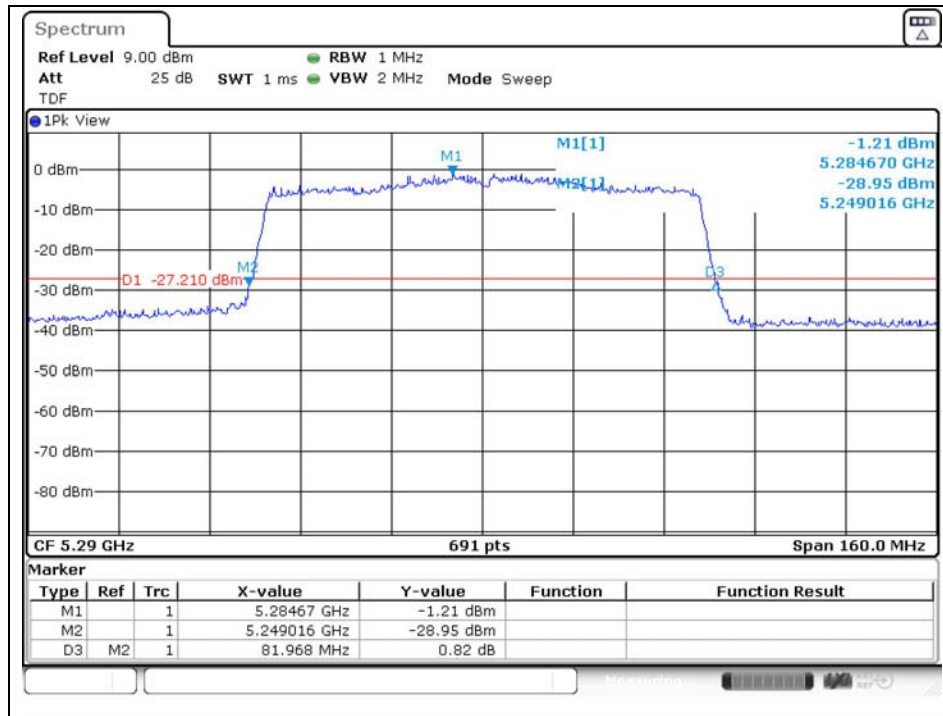
RTT5041-19(2019.04.24)(1)

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

A4(210 mm x 297 mm)

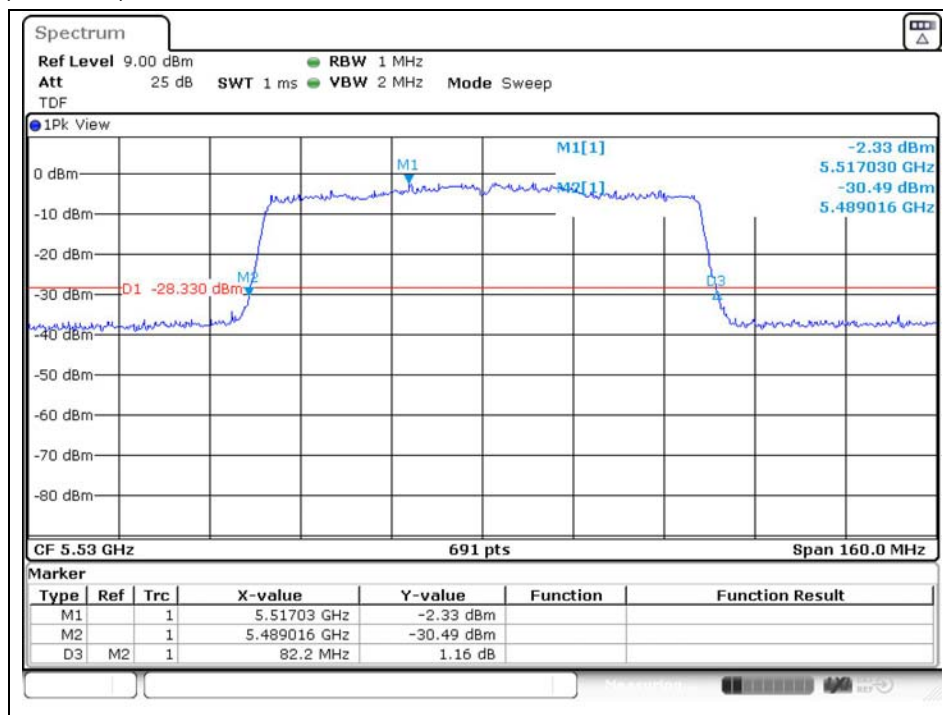
802.11ac_VHT80 (Band 2A)

Middle Channel (5 290 MHz)



802.11ac_VHT80 (Band 2C)

Low Channel (5 530 MHz)



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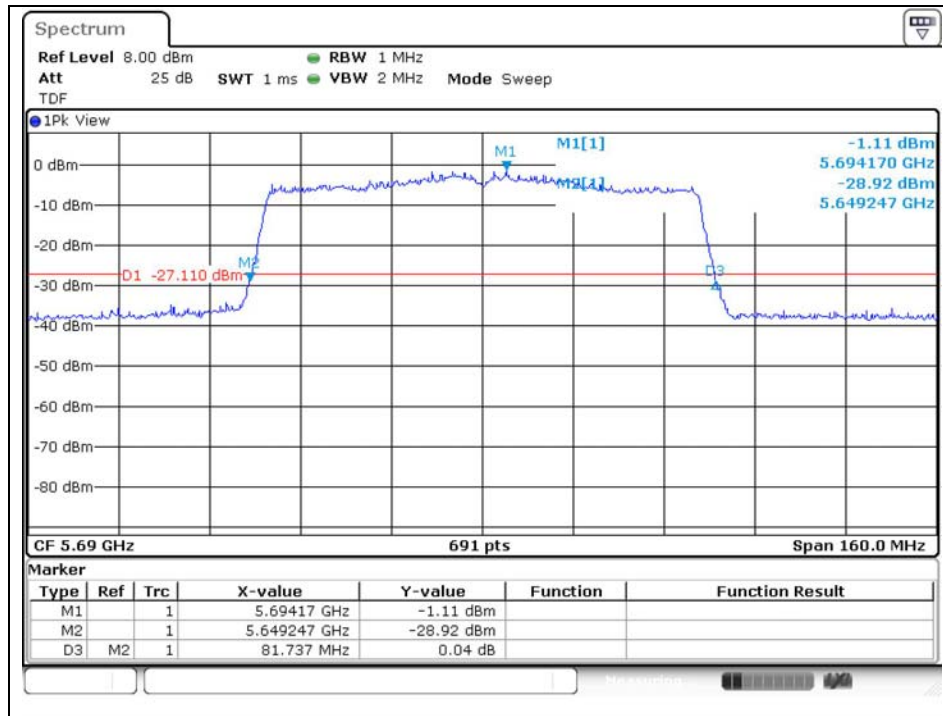
RTT5041-19(2019.04.24)(1)

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

A4(210 mm x 297 mm)

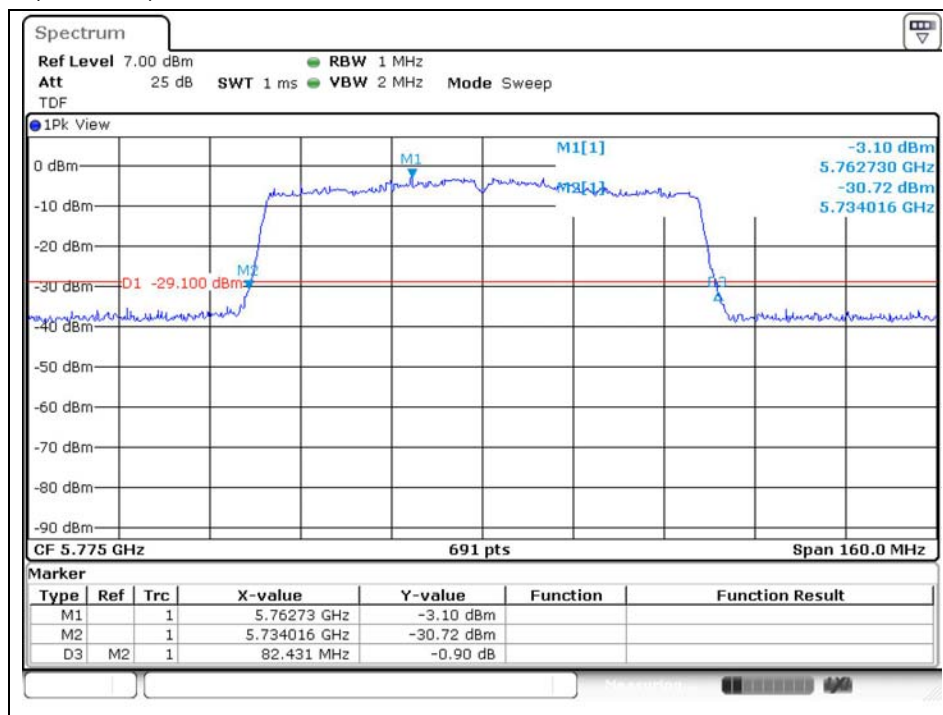
802.11ac_VHT80 (Band 2C)

High Channel (5 690 MHz)



802.11ac_VHT80 (Band 3)

Middle Channel (5 775 MHz)



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RTT5041-19(2019.04.24)(1)

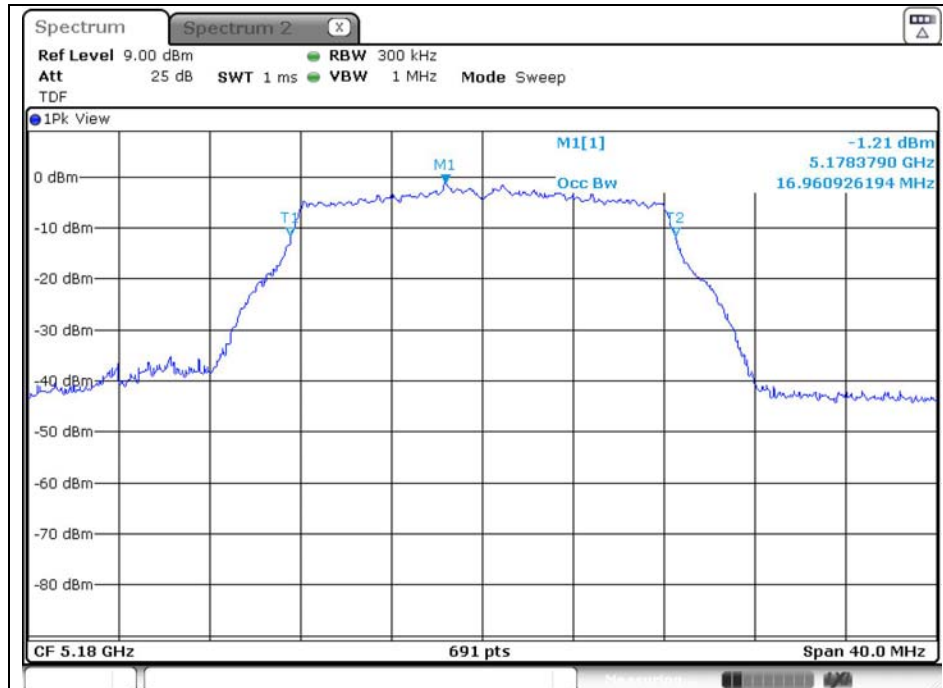
Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

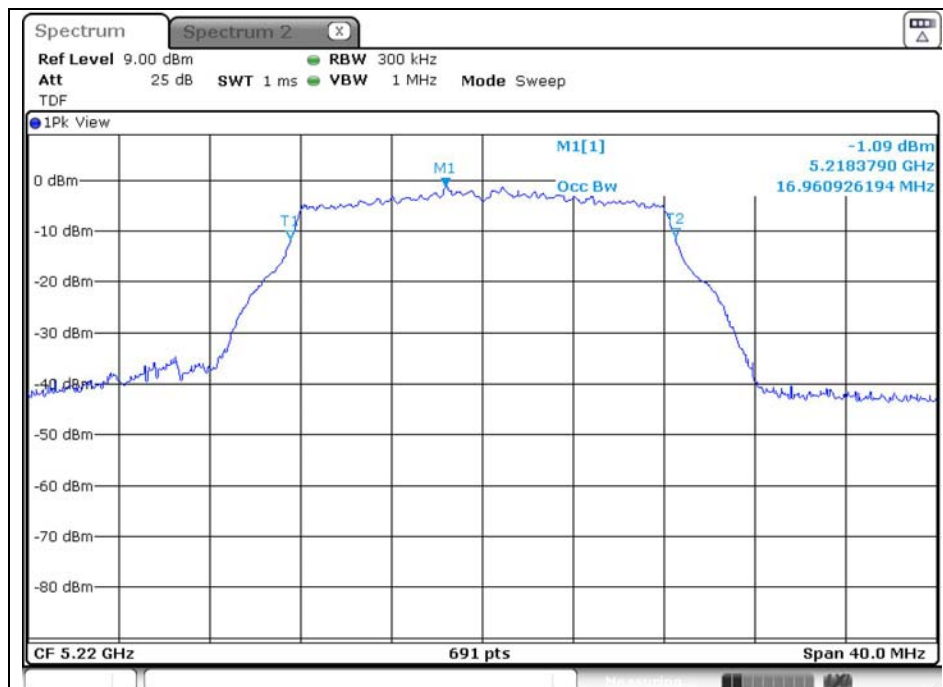
99 % Bandwidth

802.11a (Band 1)

Low Channel (5 180 MHz)



Middle Channel (5 220 MHz)



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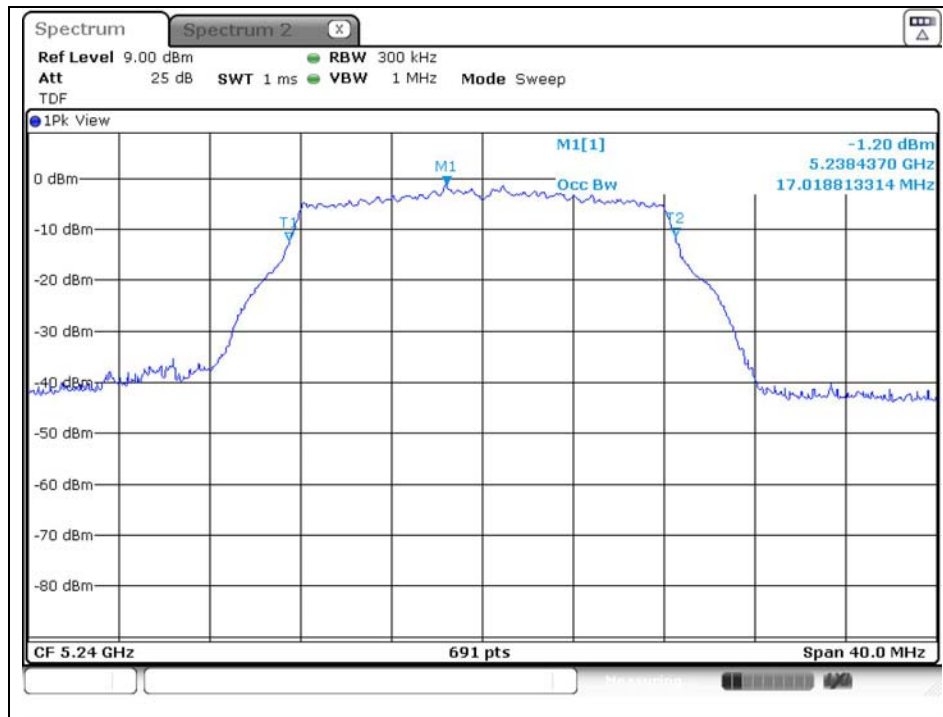
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

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

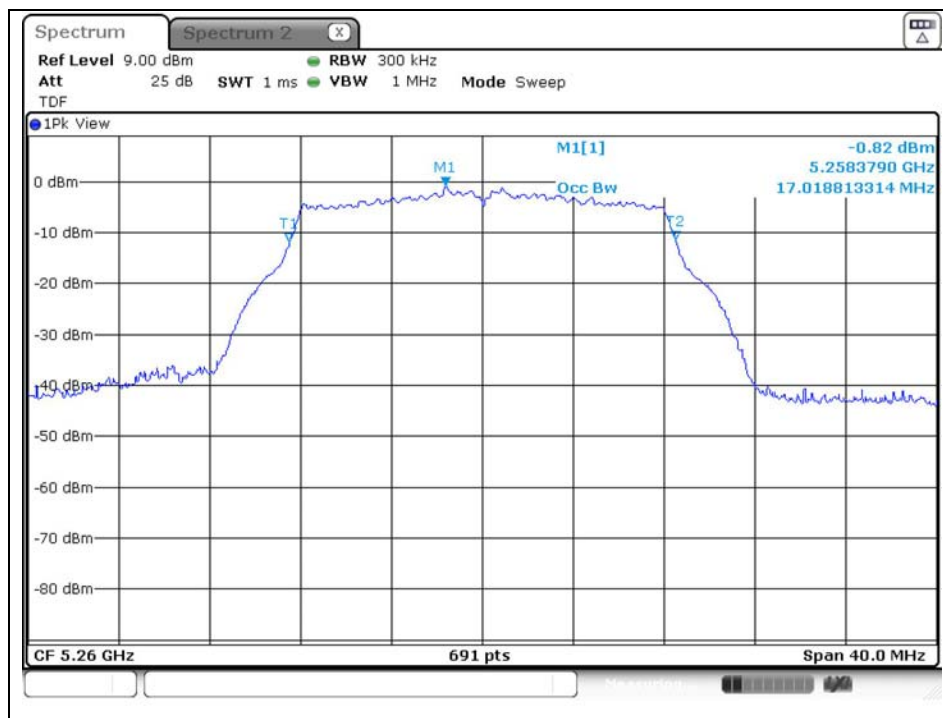
A4(210 mm x 297 mm)

High Channel (5 240 MHz)



802.11a (Band 2A)

Low Channel (5 260 MHz)



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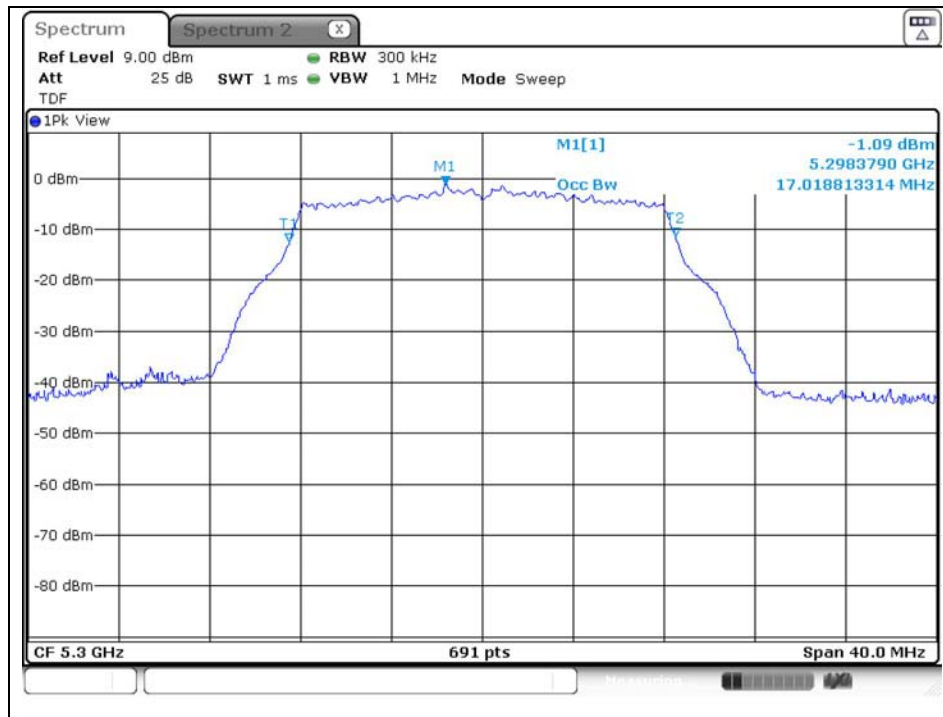
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-19(2019.04.24)(1)

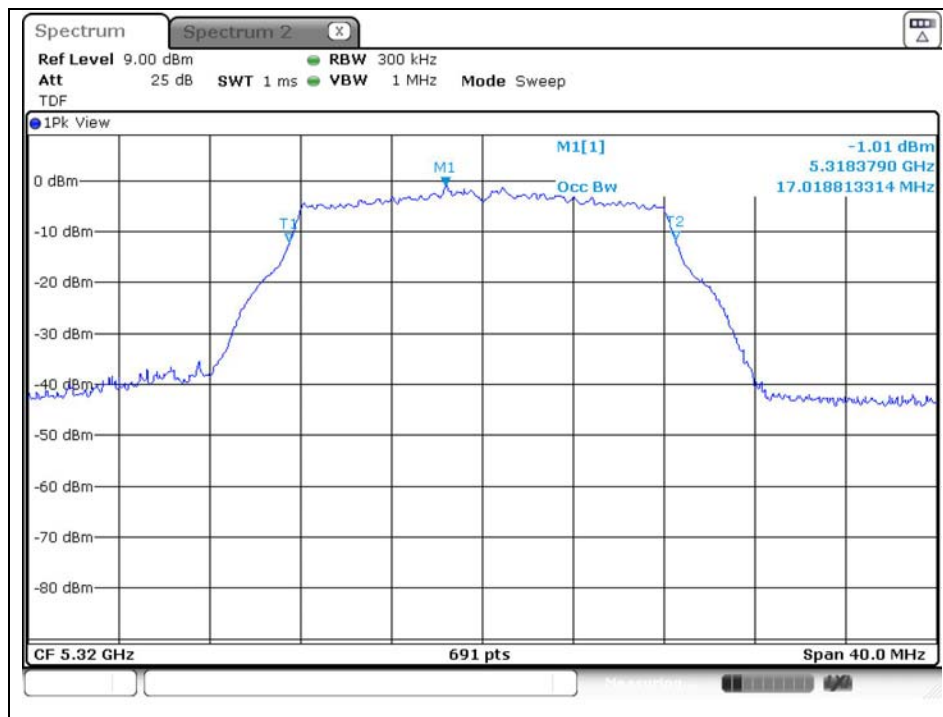
Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

Middle Channel (5 300 MHz)



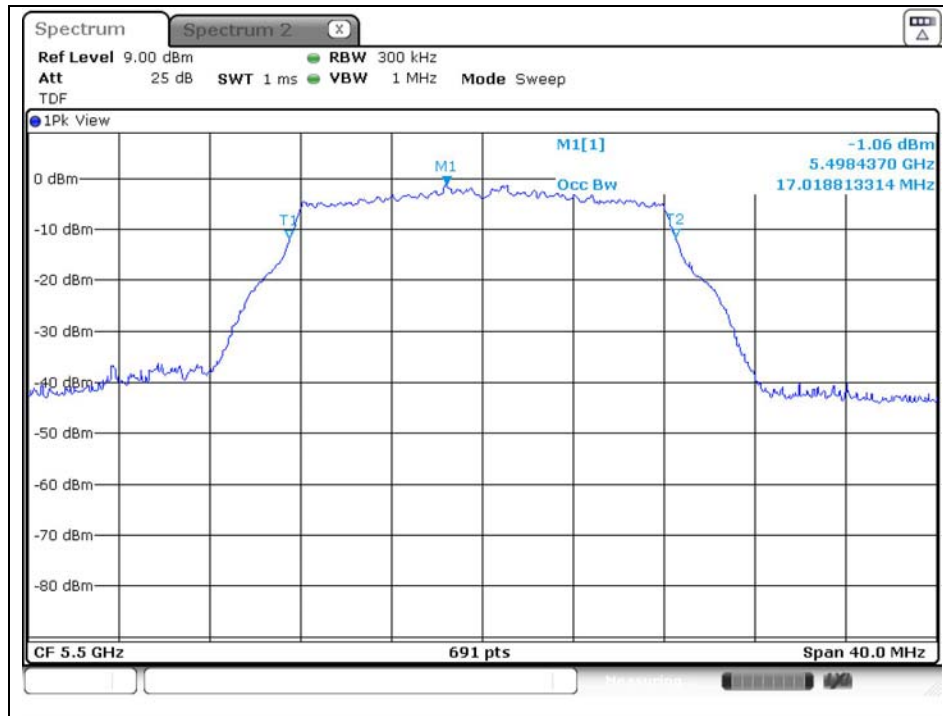
High Channel (5 320 MHz)



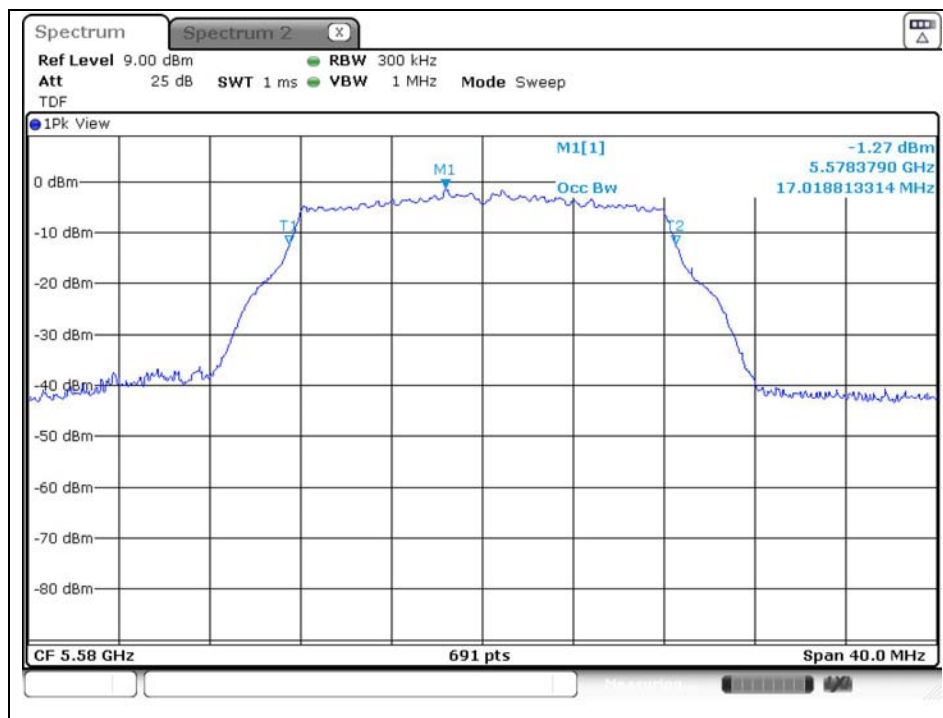
The results of this test report are effective only to the items tested. The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test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

802.11a (Band 2C)

Low Channel (5 500 MHz)



Middle Channel (5 580 MHz)



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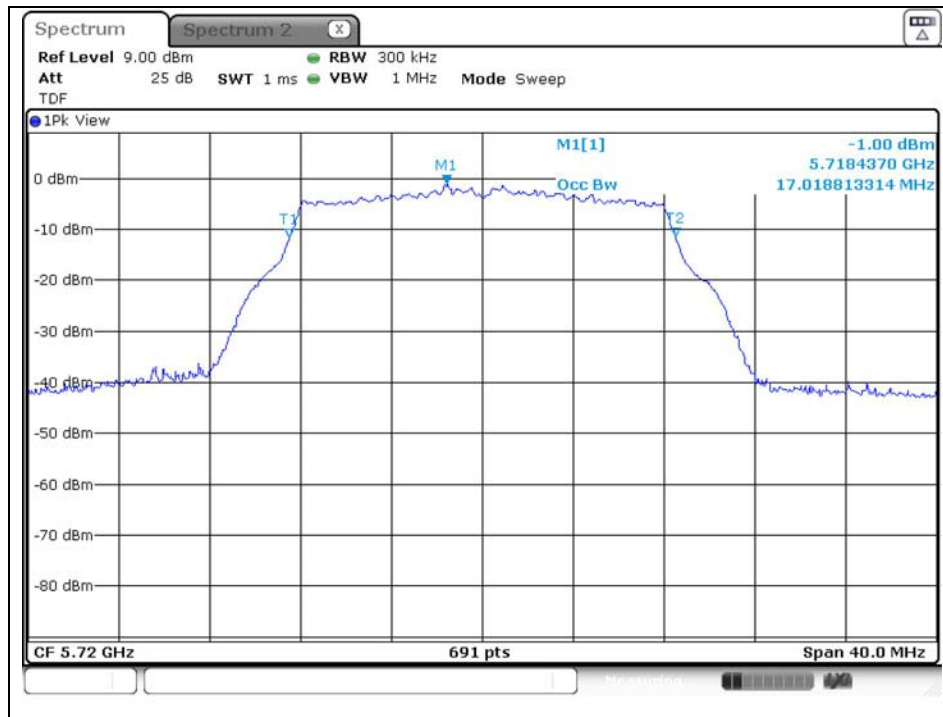
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

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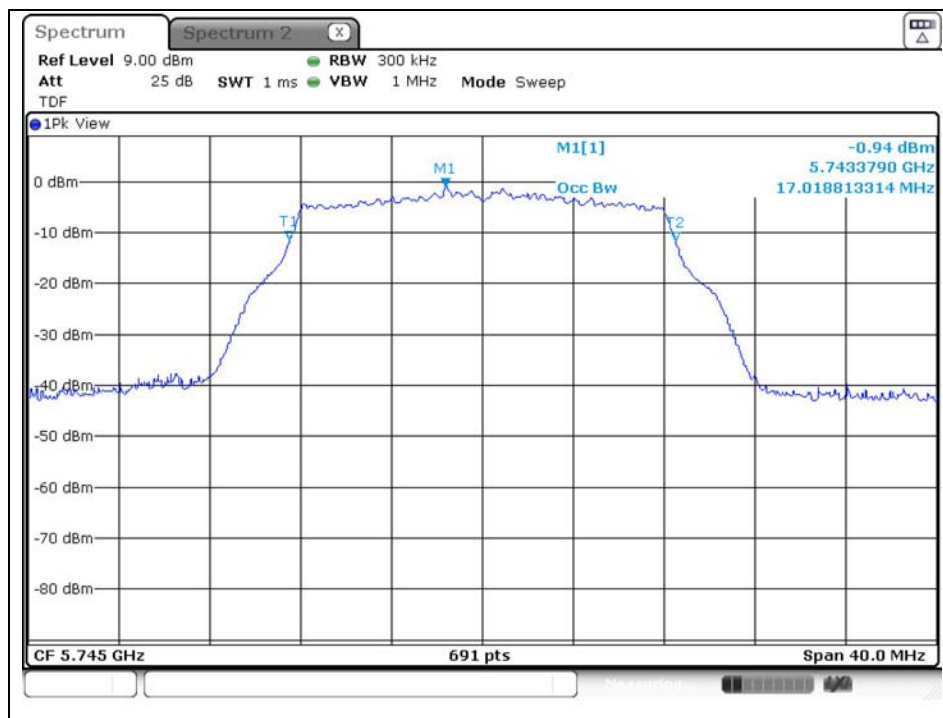
A4(210 mm x 297 mm)

High Channel (5 720 MHz)



802.11a (Band 3)

Low Channel (5 745 MHz)



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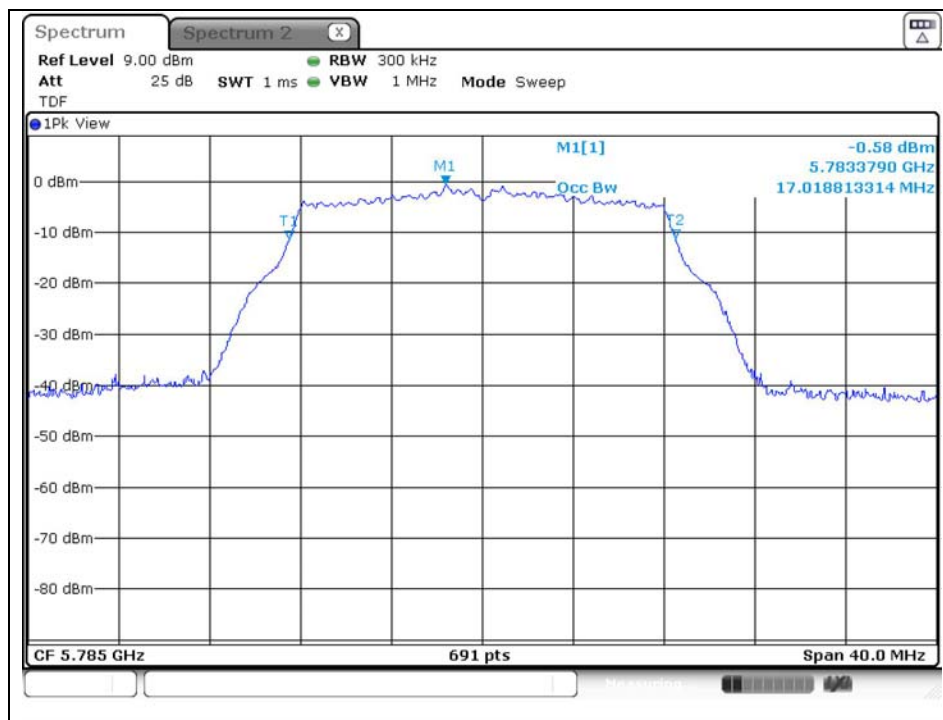
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-19(2019.04.24)(1)

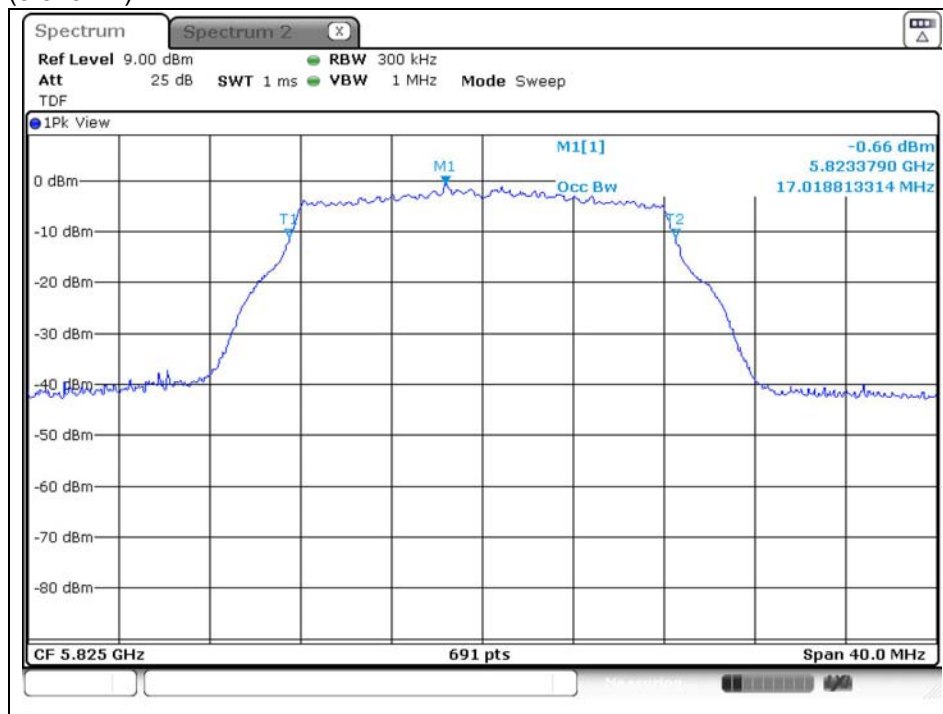
Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

Middle Channel (5 785 MHz)

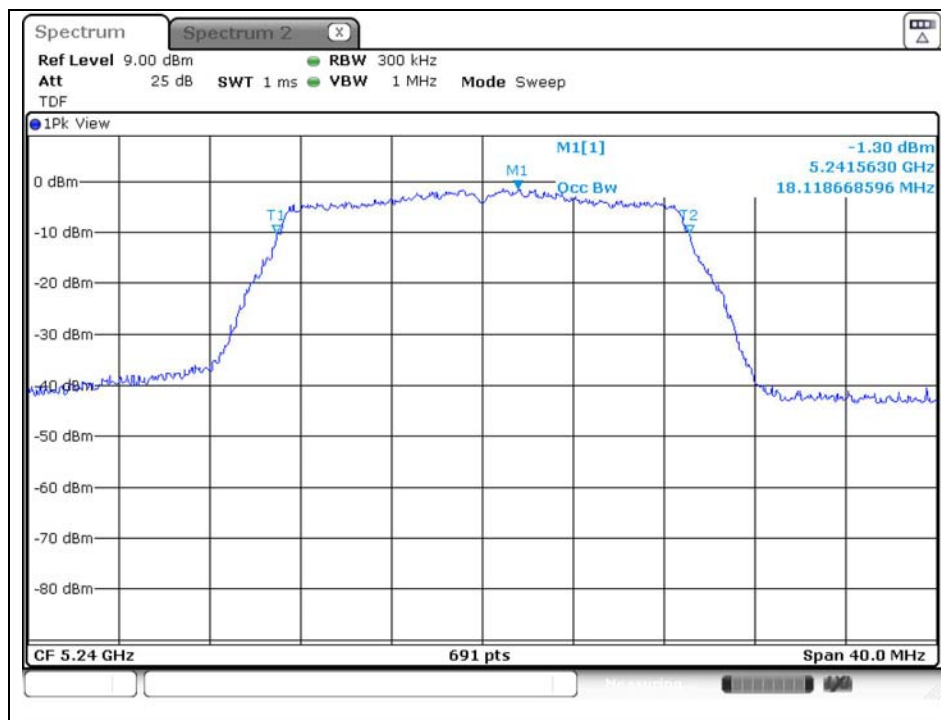


High Channel (5 825 MHz)



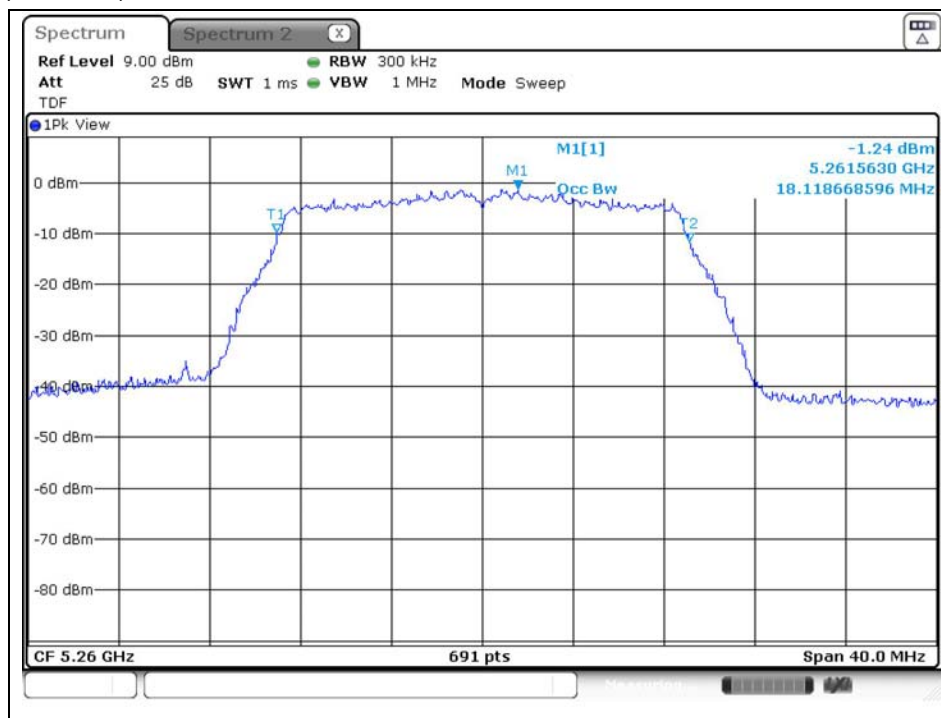
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High Channel (5 240 MHz)



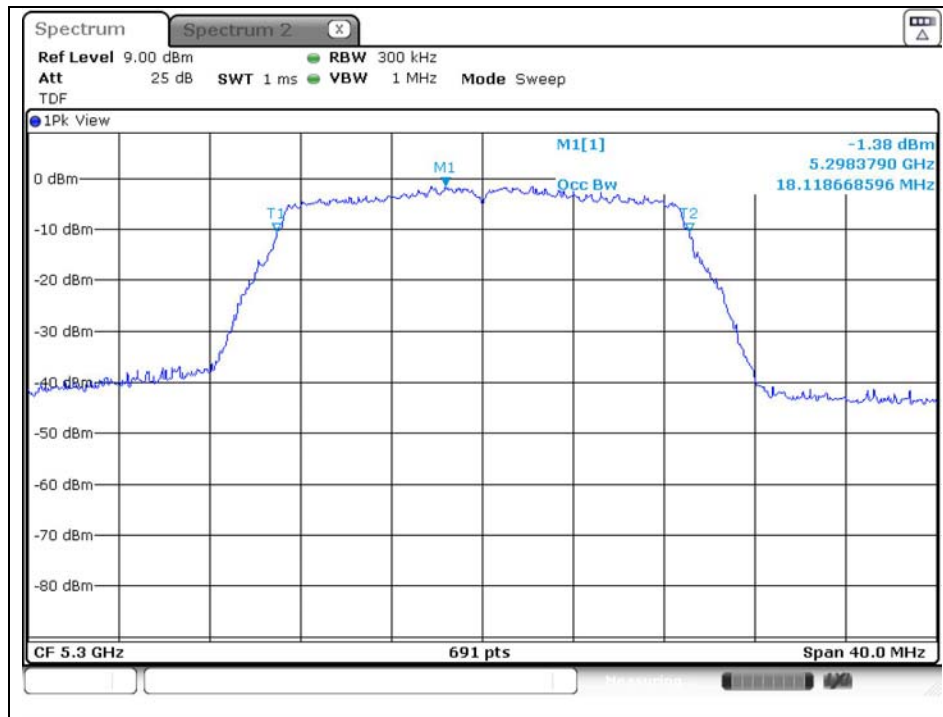
802.11ac_VHT20 (Band 2A)

Low Channel (5 260 MHz)

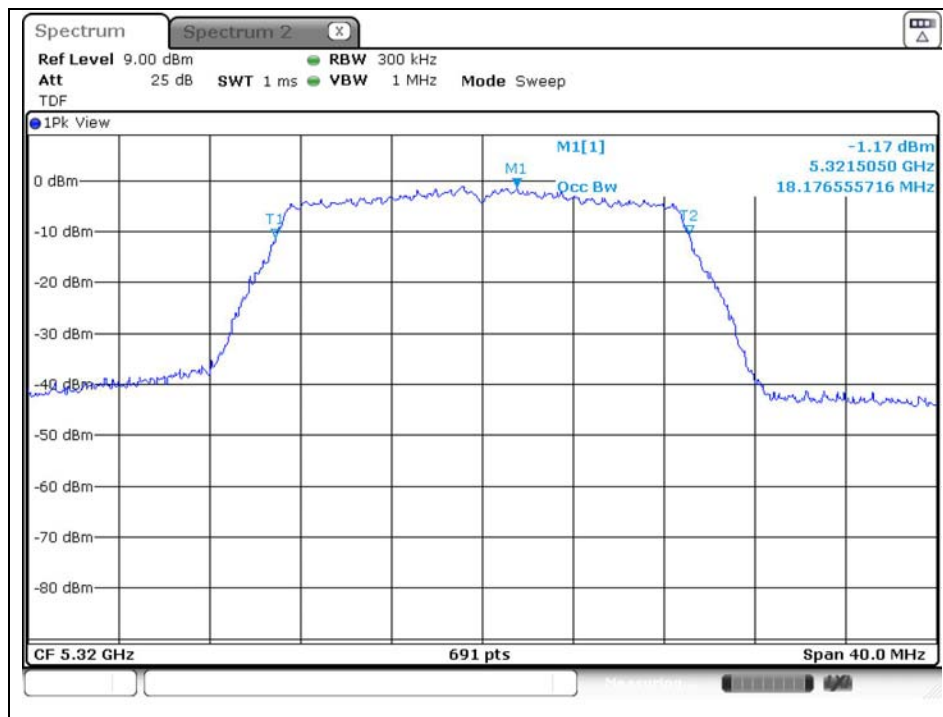


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Middle Channel (5 300 MHz)



High Channel (5 320 MHz)



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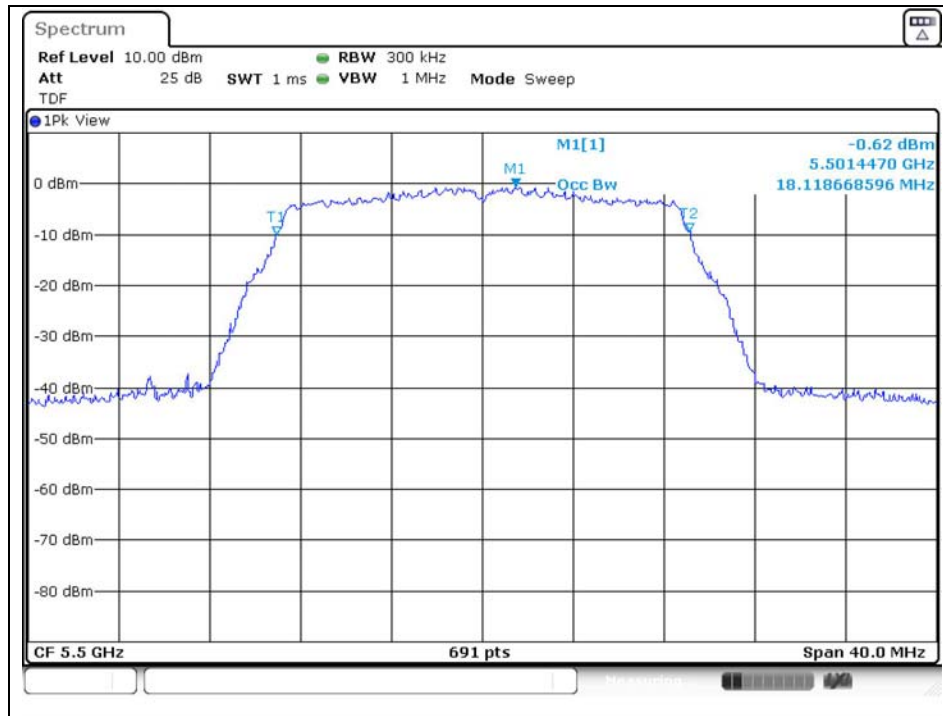
RTT5041-19(2019.04.24)(1)

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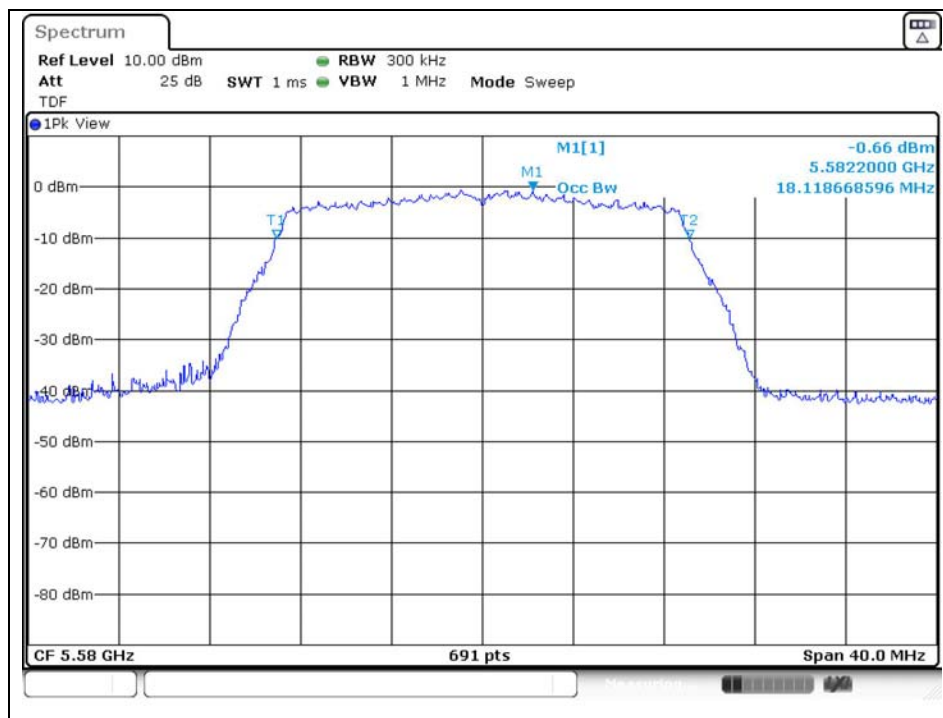
A4(210 mm x 297 mm)

802.11ac_VHT20 (Band 2C)

Low Channel (5 500 MHz)



Middle Channel (5 580 MHz)



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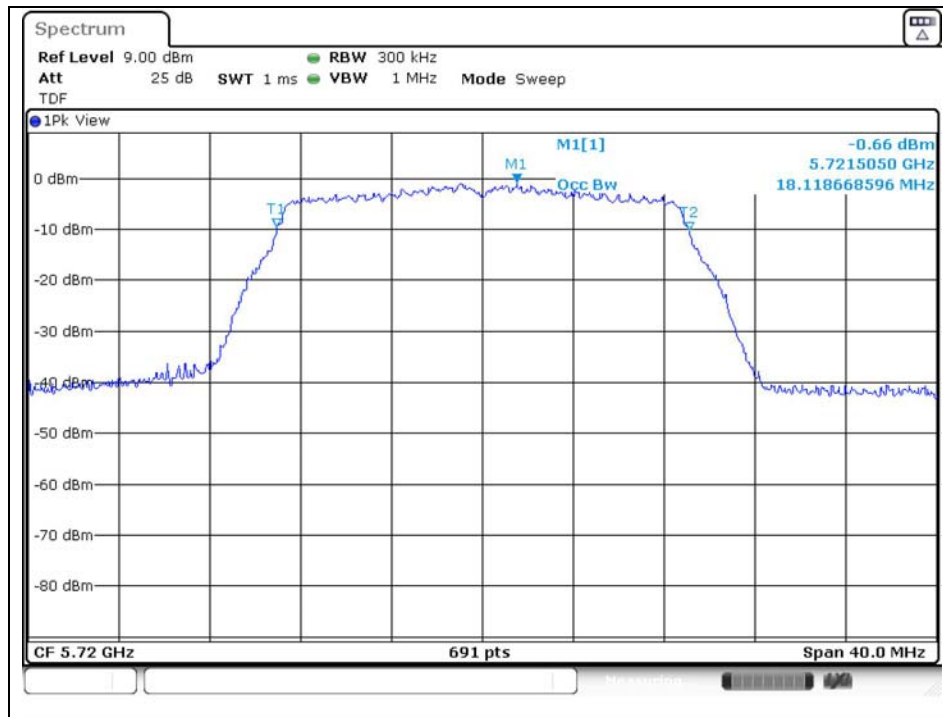
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

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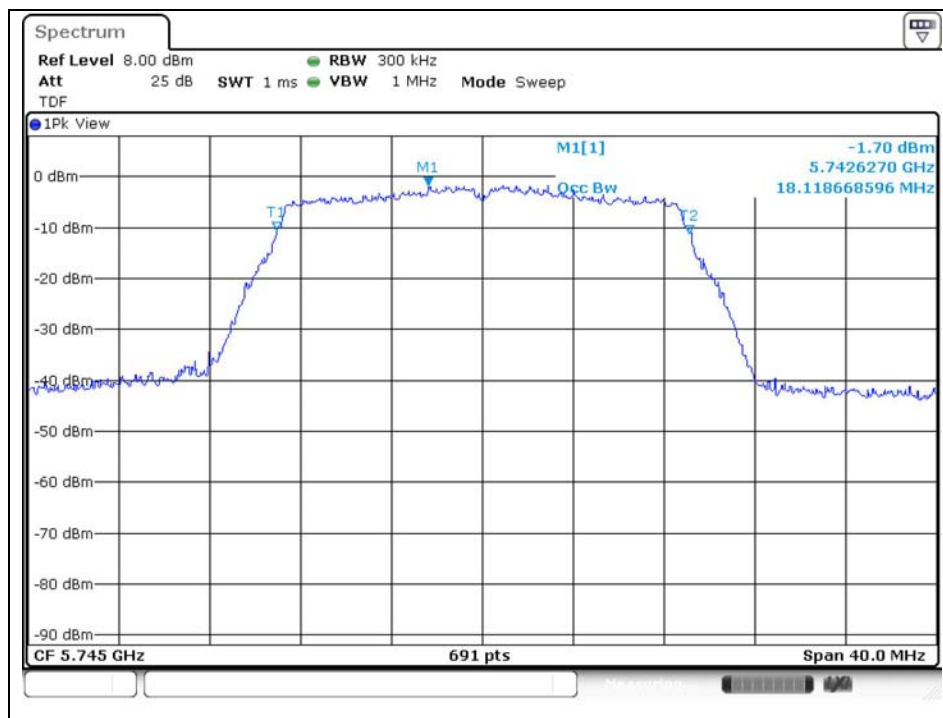
A4(210 mm x 297 mm)

High Channel (5 720 MHz)



802.11ac_VHT20 (Band 3)

Low Channel (5 745 MHz)



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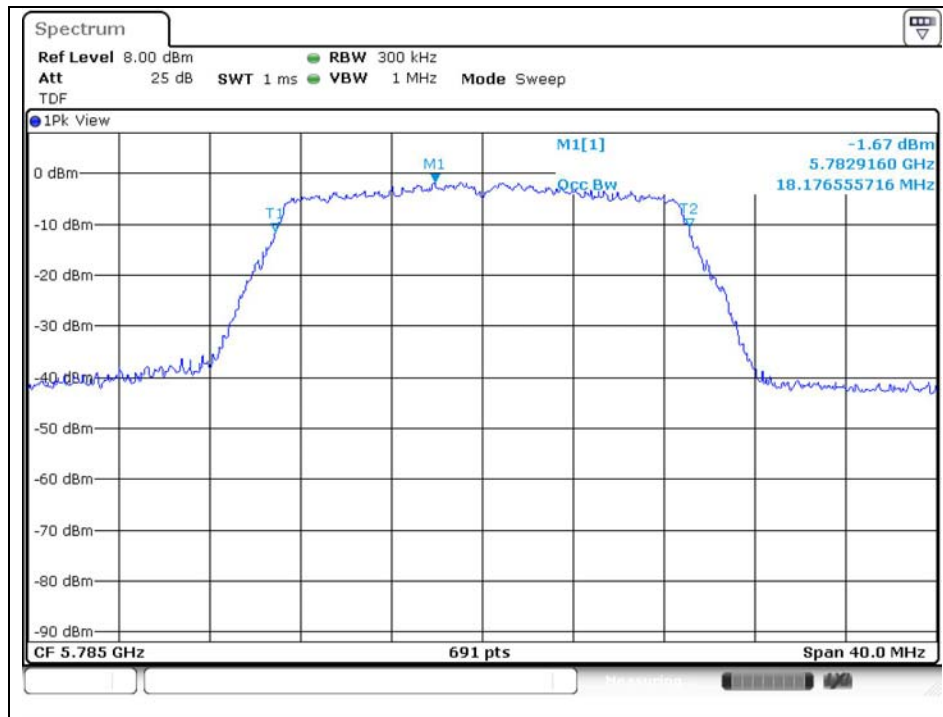
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-19(2019.04.24)(1)

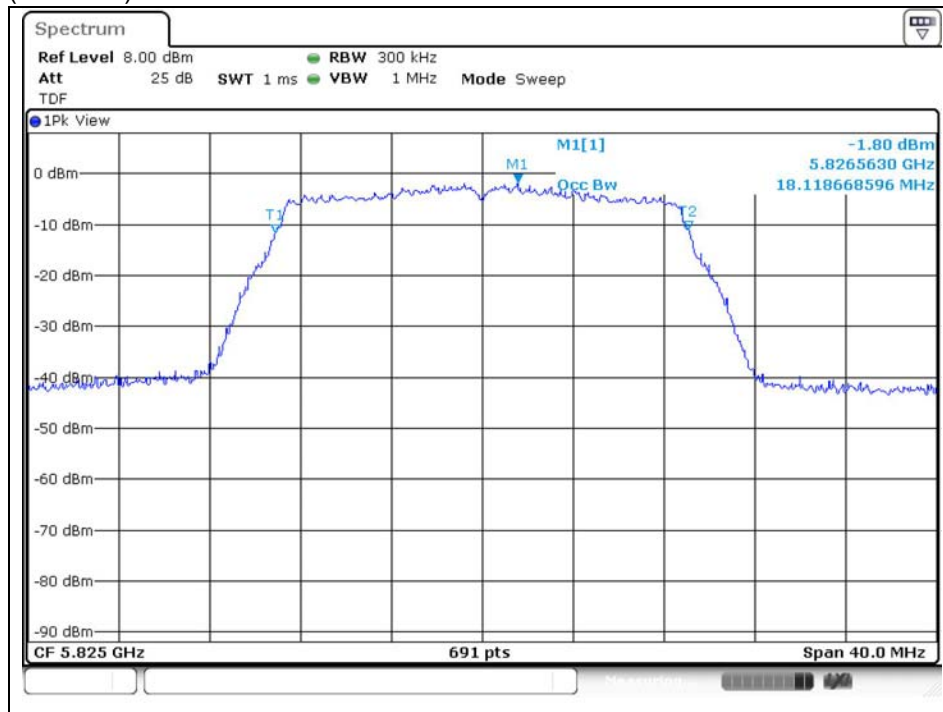
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A4(210 mm x 297 mm)

Middle Channel (5 785 MHz)



High Channel (5 825 MHz)



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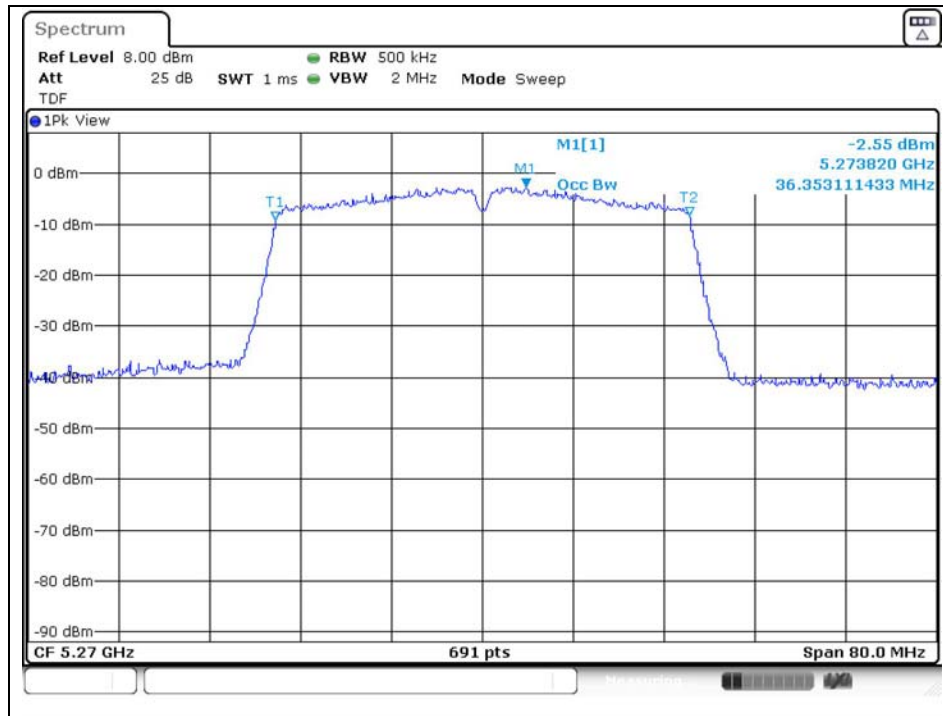
RTT5041-19(2019.04.24)(1)

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

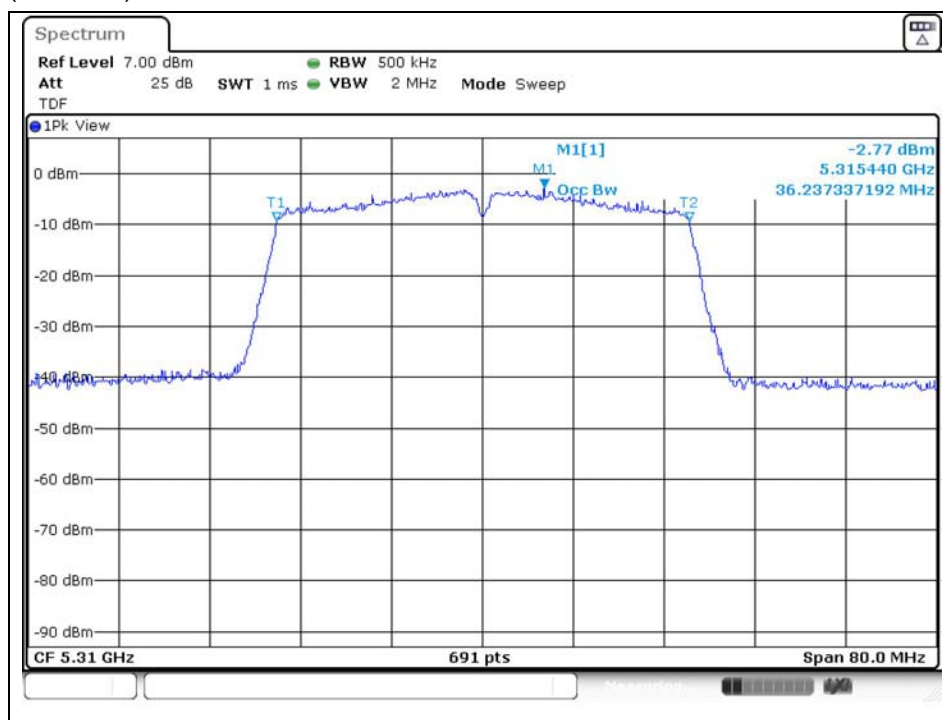
A4(210 mm x 297 mm)

802.11ac_VHT40 (Band 2A)

Low Channel (5 270 MHz)



High Channel (5 310 MHz)



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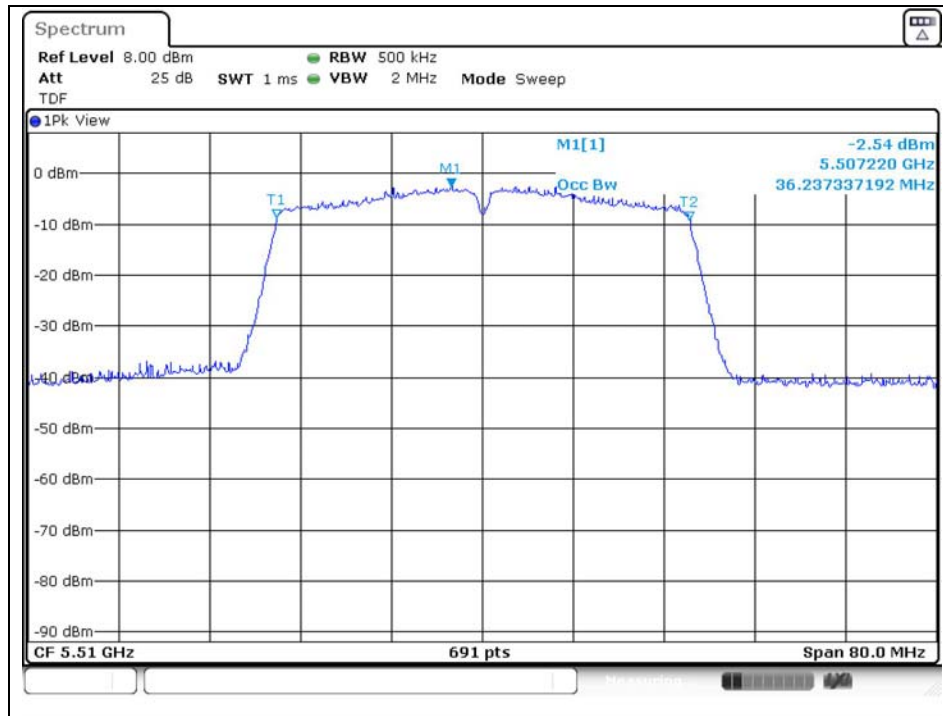
RTT5041-19(2019.04.24)(1)

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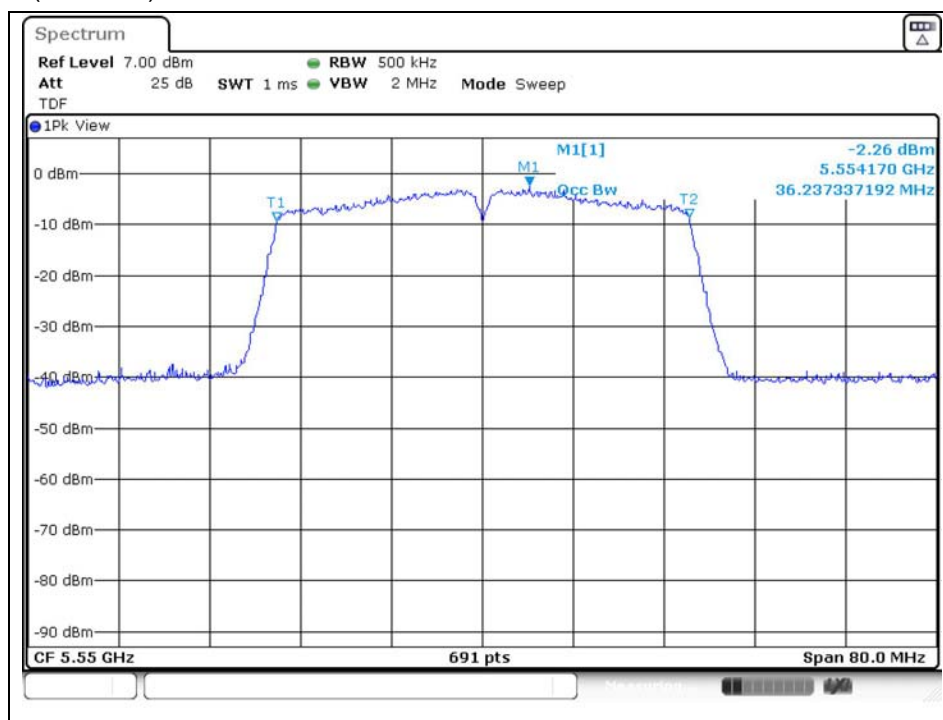
A4(210 mm x 297 mm)

802.11ac_VHT40 (Band 2C)

Low Channel (5 510 MHz)



Middle Channel (5 550 MHz)



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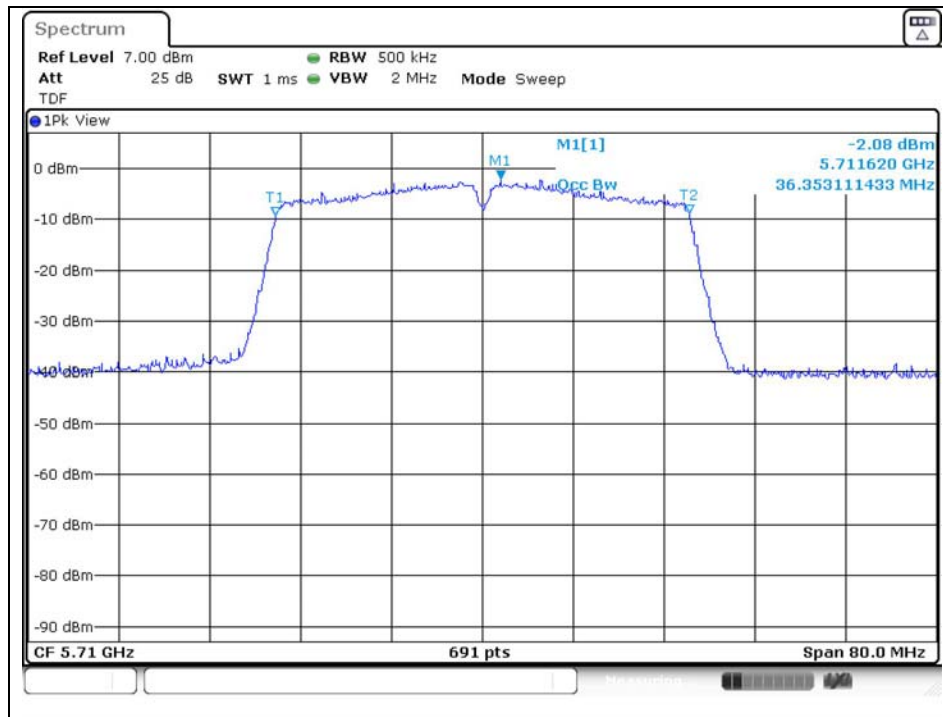
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-19(2019.04.24)(1)

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

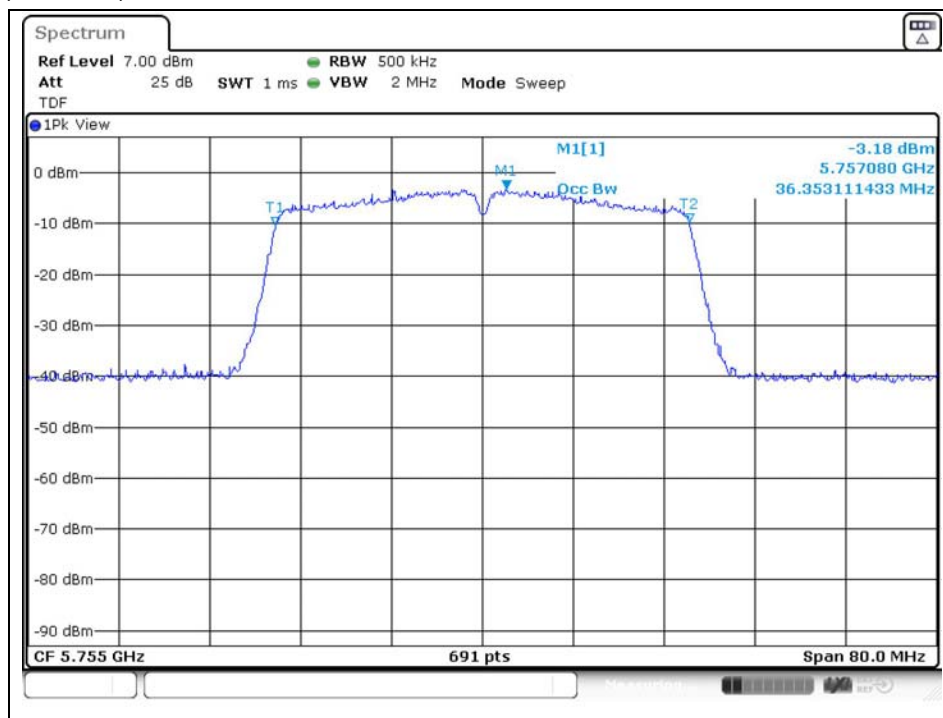
A4(210 mm x 297 mm)

High Channel (5 710 MHz)



802.11ac_VHT40 (Band 3)

Low Channel (5 755 MHz)



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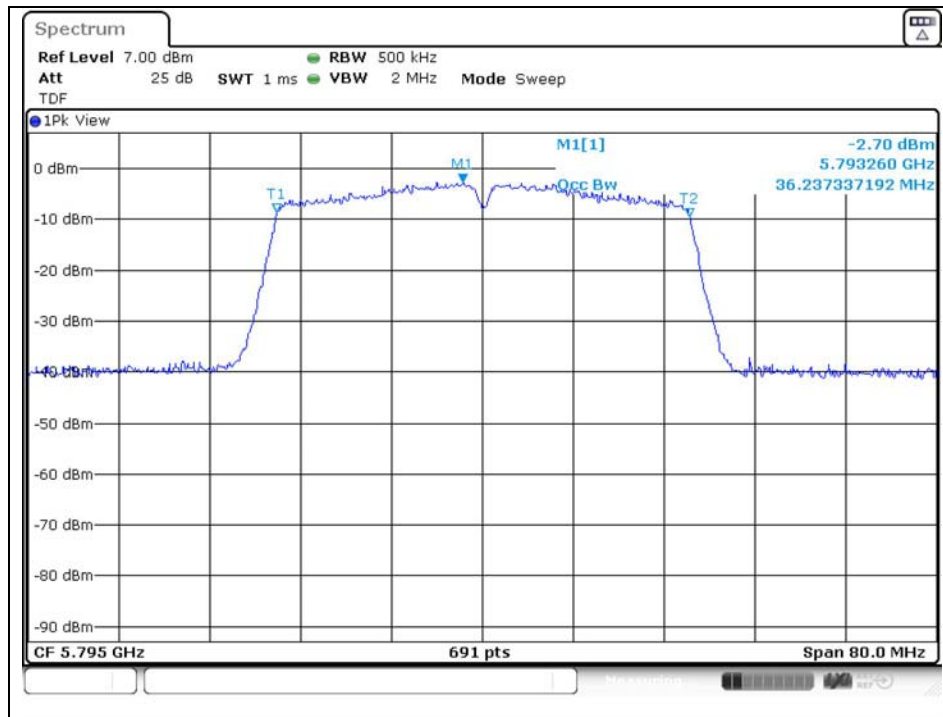
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-19(2019.04.24)(1)

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

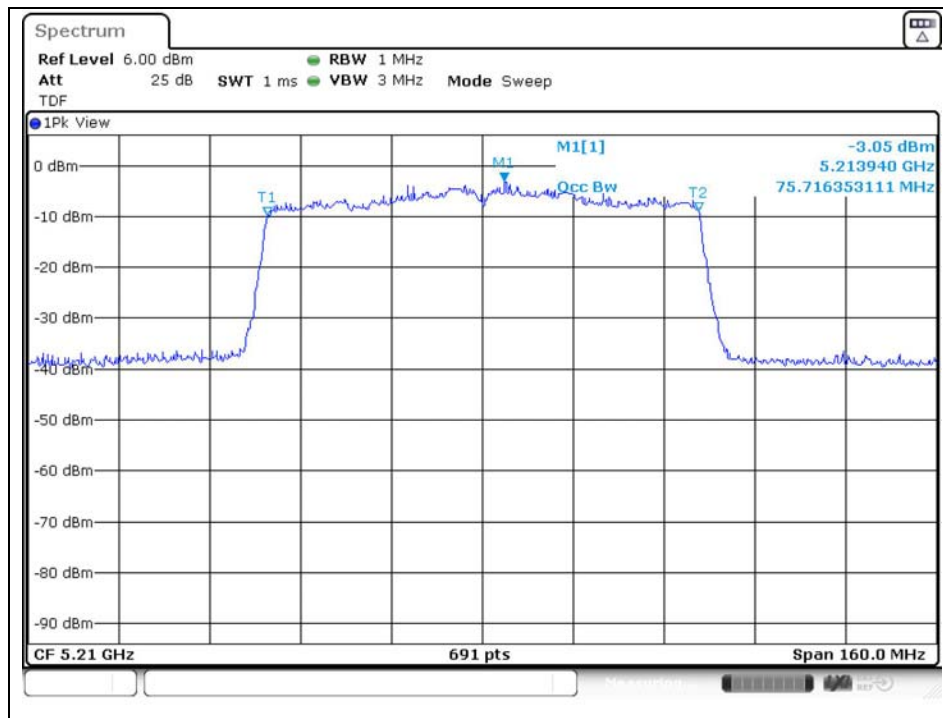
A4(210 mm x 297 mm)

High Channel (5 795 MHz)



802.11ac_VHT80 (Band 1)

Middle Channel (5 210 MHz)



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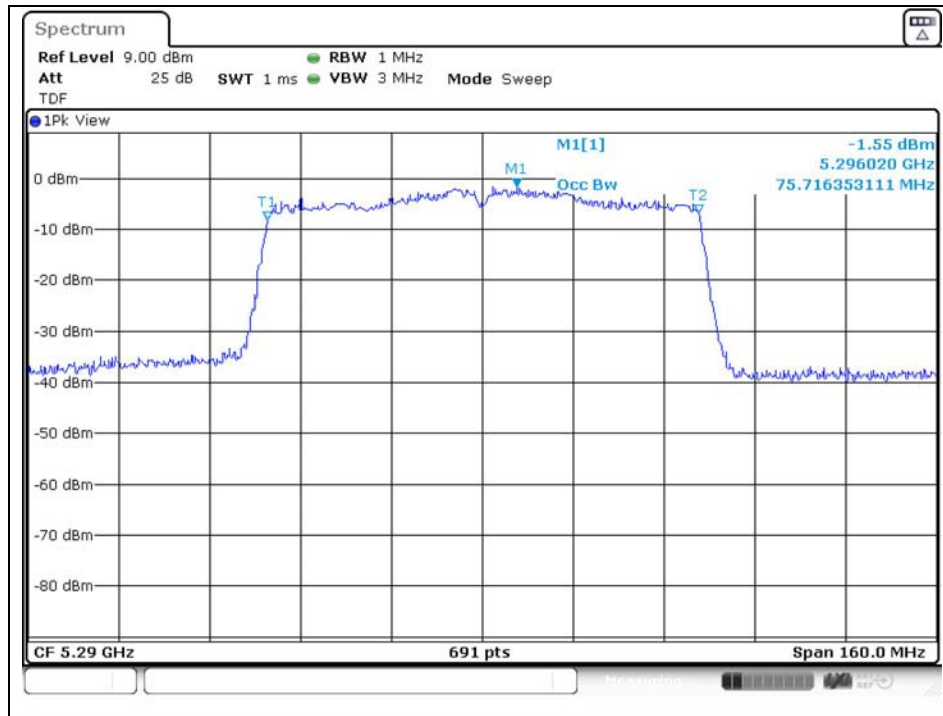
RTT5041-19(2019.04.24)(1)

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

A4(210 mm x 297 mm)

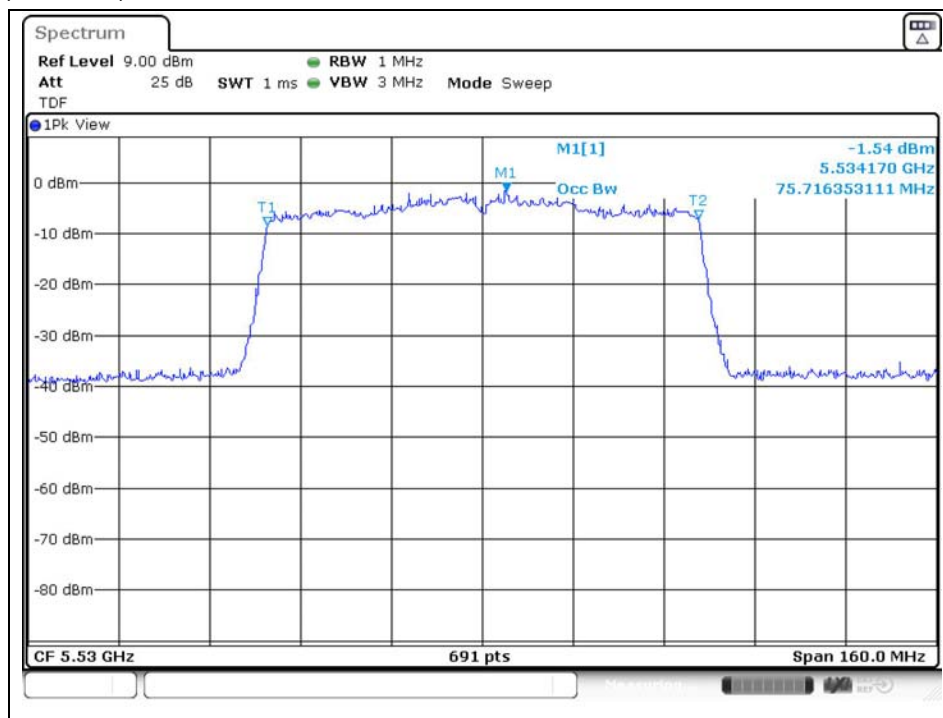
802.11ac_VHT80 (Band 2A)

Middle Channel (5 290 MHz)



802.11ac_VHT80 (Band 2C)

Low Channel (5 530 MHz)



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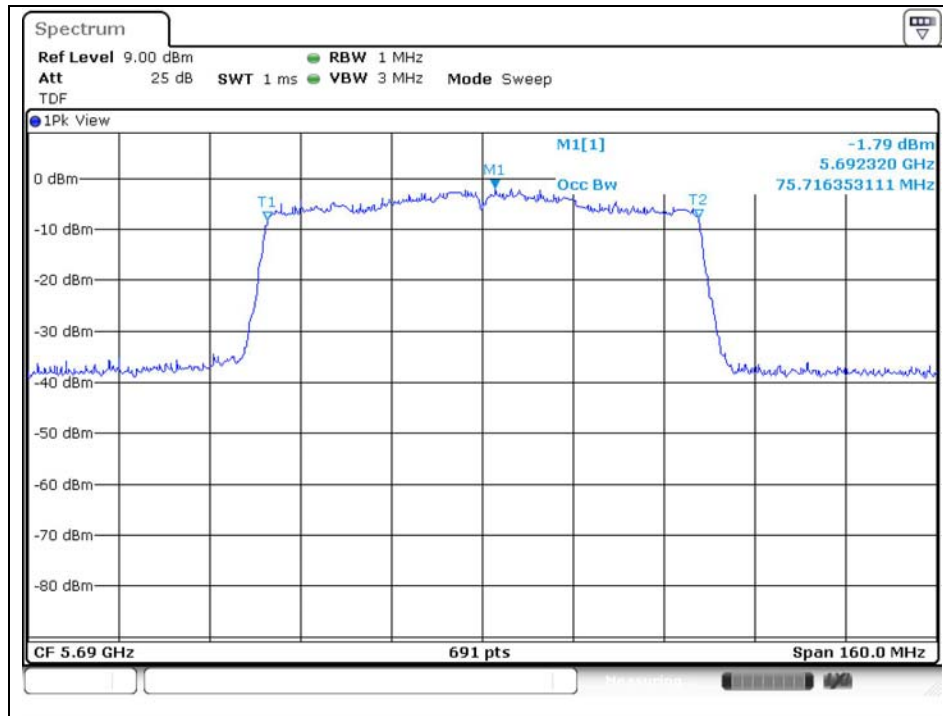
RTT5041-19(2019.04.24)(1)

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

A4(210 mm x 297 mm)

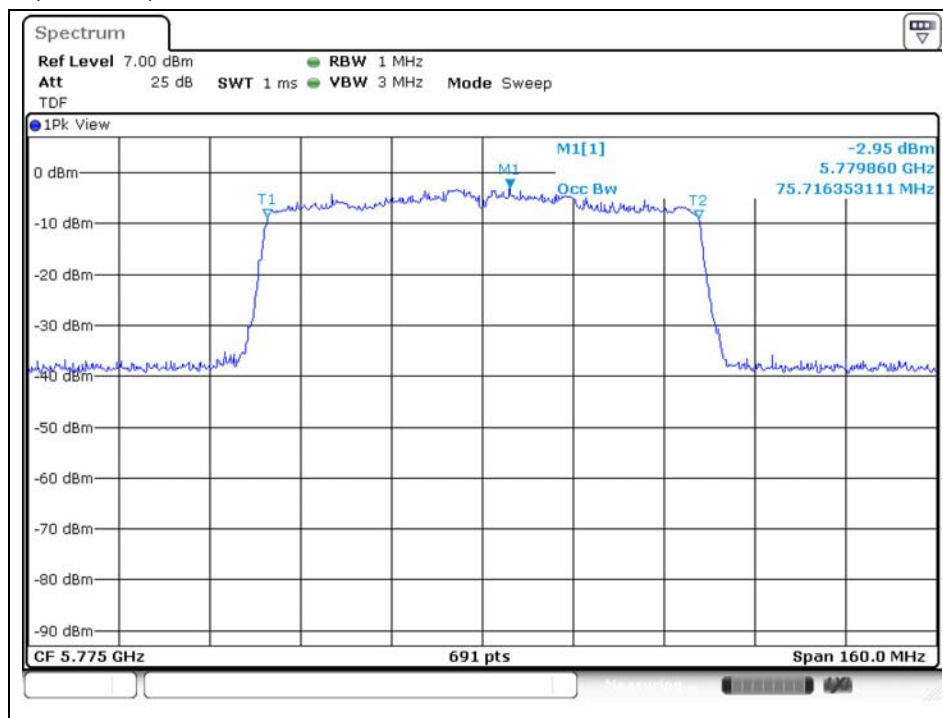
802.11ac_VHT80 (Band 2C)

High Channel (5 690 MHz)



802.11ac_VHT80 (Band 3)

Middle Channel (5 775 MHz)



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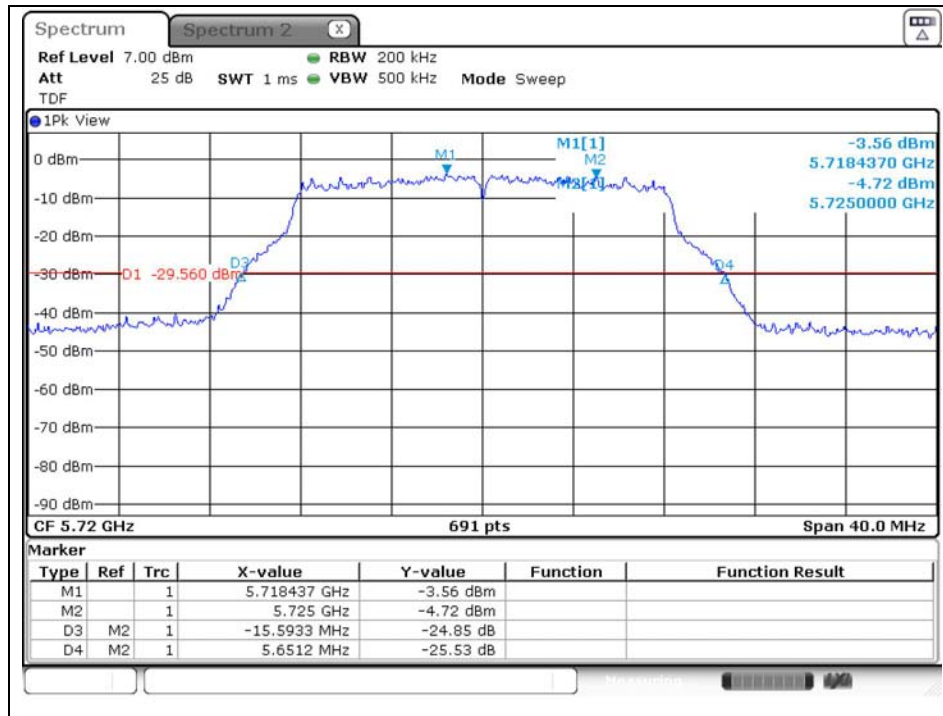
RTT5041-19(2019.04.24)(1)

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

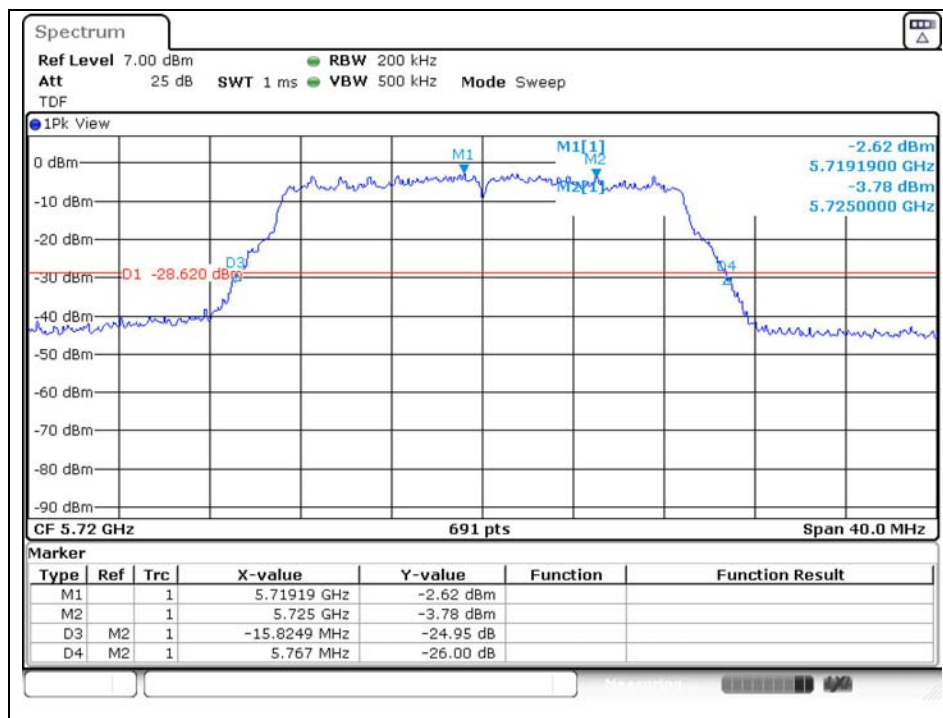
A4(210 mm x 297 mm)

Band-crossing channels

802.11a (5 720 MHz)



802.11ac_VHT20 (5 720 MHz)



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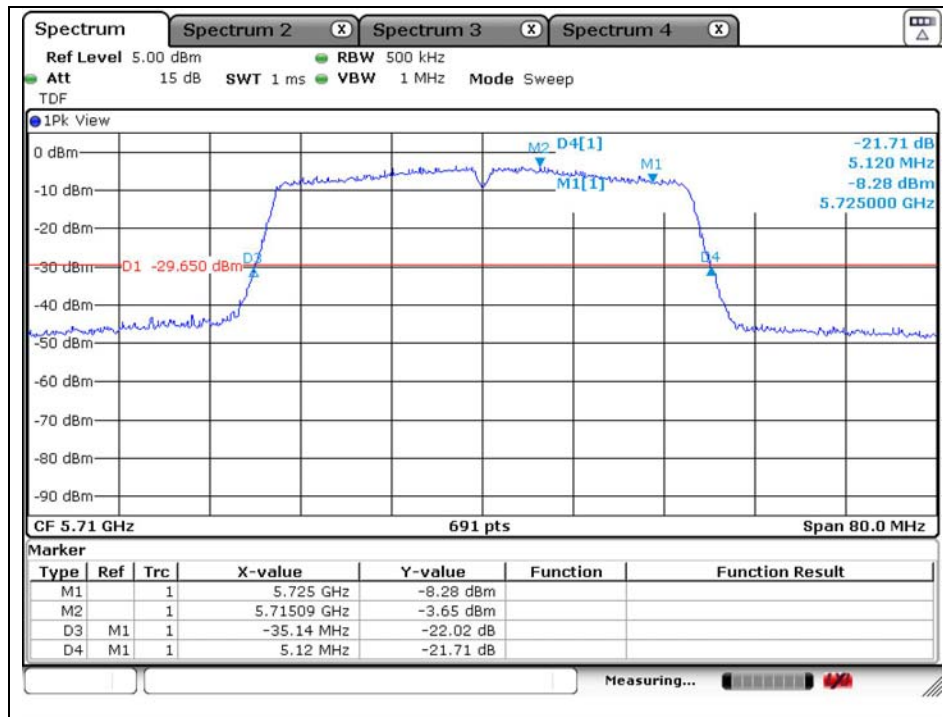
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

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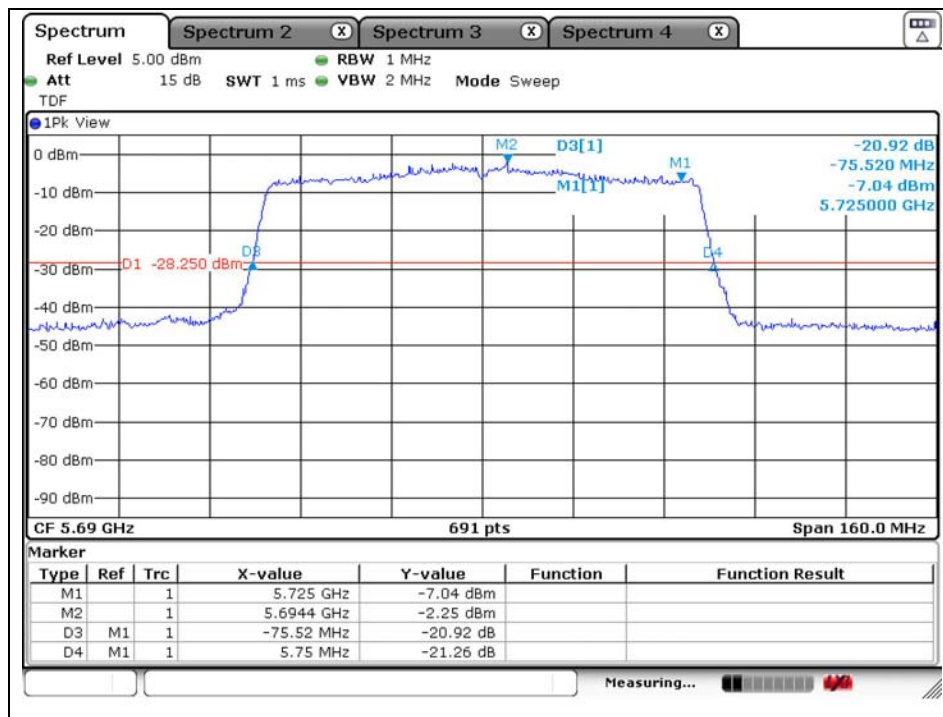
Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

802.11ac_VHT40 (5 710 MHz)



802.11ac_VHT80 (5 690 MHz)



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A4(210 mm x 297 mm)