Report No. 310380-6

Test Report

Product	Digital Video Conference System with WLAN and BT
Name and address of the applicant	Cisco Systems, Inc. 170 West Tasman Drive San Jose, CA 95134, USA
Name and address of the manufacturer	Cisco Systems, Inc. 170 West Tasman Drive San Jose, CA 95134, USA
Model	TTC60-24
Rating	Mains (100-240V 50/60 Hz, 1.8A – 0.8A)
Trademark	Cisco
Serial number	/
Additional information	Bluetooth, 802.11a/b/g/n/ac
Tested according to	**FCC Part 15.407** Unlicensed National Information Infrastructure Devices (U-NII) **Industry Canada RSS-247, Issue 2** Licence-Exempt Local Area Network (LE-LAN) Devices
Order number	310380
Tested in period	2017.04.10 to 2017.04.11 and 2017.05.09
Issue date	2017.05.29
Name and address of the testing laboratory	Nemko Instituttveien 6 Kjeller, Norway FCC No: 994405 IC OATS: 2040D-1 TEL: +47 22 96 03 30 FAX: +47 22 96 05 50

Prepared by [Frode Sveinsen]	Approved by [G.Suhanthakumar]

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ENTERPRISE NUMBER NO974404532

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1 INFORMATION

1.1 Test Item

Name :	Cisco
Model :	TTC60-24
FCC ID :	LDK60241556
Industry Canada ID :	2461N-60241556
Serial number :	/
Hardware identity and/or version:	Rev. D
Software identity and/or version :	S01828-1.0.0 Alpha 10 (WiFi) CE9.0.0 (Bluetooth)
Frequency Ranges :	U-NII 1 : 5180 – 5240 MHz U-NII 2A : 5260 – 5320 MHz U-NII 2C : 5500 – 5700 MHz U-NII 3 : 5745 – 5825 MHz
Operating Modes :	802.11a 802.11n (HT20 / HT40) 802.11ac (HT80)
Type of Modulation :	Digital (OFDM - Orthogonal frequency-division multiplexing)
Conducted Output Power :	5180 – 5240 MHz: 26 mW (802.11a) 5190 – 5230 MHz: 25 mW (802.11n HT40) 5210 – 5210 MHz: 29 mW (802.11n HT80) 5260 – 5320 MHz: 85 mW (802.11n HT20) 5270 – 5310 MHz: 76 mW (802.11n HT40) 5290 – 5290 MHz: 39 mW (802.11n HT80) 5500 – 5700 MHz: 73 mW (802.11n HT20) 5510 – 5670 MHz: 72 mW (802.11n HT40) 5530 – 5530 MHz: 27 mW (802.11n HT80) 5745 – 5825 MHz: 82 mW (802.11n HT20) 5755 – 5795 MHz: 77 mW (802.11n HT40) 5775 – 5775 MHz: 29 mW (802.11n HT80)
Antenna Connector :	Internal Antennas connected to the PCB with U-FL connector
Number of Antennas :	2
Antenna Diversity Supported :	Yes
Smart Antennas Supported :	Yes
DFS/TPC :	Slave Device
Power Supply :	Mains powered (integral power supply)

Description of tested item

The EUT is a digital video conference system with WiFi and Bluetooth transceivers. The WiFi and Bluetooth transceivers are contained in a module from NVIDIA with single modular certification (FCC ID: VOB-P2180), however the antennas used in this EUT are not certified.

Cisco Spark Room 70S has a single video monitor whereas Cisco Spark Room 70D has a double monitor (two separate monitors mounted in one chassis). The radio part is the same for both systems and is fitted in one of the monitors.

All tests were performed on a Cisco Spark Room 70S.

1.2 Normal test conditions

Temperature:	**22.2 – 23.6 ºC**
Relative humidity:	**29 - 48 %**
Normal test voltage:	**120V 60Hz**

The values are the limit registered during the test period.

1.3 Test Engineer(s)

Frode Sveinsen
Kristian Osvoll (Power Line Conducted Test)

1.4 Description of modification for Modification Filing

Not applicable.

1.5 Family List Rational

Not Applicable.

1.6 Antenna Requirement

Is the antenna detachable? ☒ Yes ☐ No

If detachable, is the antenna connector non-standard? ☒ Yes ☐ No

Type of antenna connector: U-FL (The antennas are internal with connector on the PCB)

Ref. FCC §15.203

1.7 Worst-Case Configuration and Mode

Radiated Emissions and Power Line Conducted Emissions were performed with the EUT set to transmit at the channel with the highest output power as worst-case scenario.

The worst case data rates were:

802.11a mode: 6 Mbps
802.11n HT20 mode: MCS0
802.11n HT40 mode: MCS0
802.11n HT80 mode: MCS0

1.8 On Time and Duty Cycle Factors

Mode	On Time Burst (ms)	Period (msec)	Duty Cycle (linear)	Duty Cycle Correction: Power (dB)	Duty Cycle Correction: Voltage (dB)
802.11a CDD	1.428	1.528	0.9346	0.29	0.59
802.11n HT20 CDD	0.692	0.794	0.8715	0.60	1.19
802.11n HT40 CDD	0.356	0.455	0.7824	1.07	2.13
802.11n HT80 CDD	0.192	0.292	0.6575	1.82	3.64

The results above are from UL report no. 15U21878-E4V2

1.9 EUT Power Levels

Channel	Freq (MHz)	11a	11n HT20	11n HT40	11ac HT80	11ac HT160
36	5180	12.5	6.5			
40	5200	12.0	6.5			
44	5220	12.0	6.5			
48	5240	12.0	6.5			
52	5260	15.0	14.0			
56	5280	15.0	14.0			
60	5300	15.0	14.0			
64	5320	15.0	10.0			
100	5500	15.0	13.5			
104	5520	14.0	12.5			
108	5540	14.0	12.5			
112	5560	14.0	12.5			
116	5580	14.0	12.5			
120	5600	D	D			
124	5620	D	D			
128	5640	D	D			
132	5660	14.0	12.5			
136	5680	14.0	12.5			
140	5700	10.5	8.5			
144	5720	D	D			
149	5745	14.5	11.5			
153	5765	14.5	12.5			
157	5785	14.5	12.5			
161	5805	14.5	12.5			
165	5825	14.5	12.5			
38	5190			8.0		
46	5230			9.0		
54	5270			13.5		
62	5310			12.0		
102	5510			8.0		
110	5550			11.5		
118	5590			D		
126	5630			D		
134	5670			12.0		
142	5710			D		
151	5755			10.0		
159	5795			13.5		
42	5210				9.5	
58	5290				10.0	
106	5530				8.5	
122	5610				D	
138	5690				D	
155	5775				9.0	
50	5250					N/A
114	5550					N/A

D = Disabled / Not Used

Values in red are reduced levels from the values used by Nvidia.

1.10 EUT Operating Modes

Description of operating modes	Additional information
Continuous TX, 5 GHz Mode	Continuous traffic, WLAN 5GHz 20, 40 or 80 MHz with Special software version

1.11 Antenna Gain

The EUT has two antennas that are connected to the main PCB with a cable and connector. The values below are the antenna gain values provided by the manufacturer:

Frequency (MHz)	Max Gain Ant #0 (dBi)	Max Gain Ant #1 (dBi)
5150	3.59	5.04
5200	3.11	5.49
5250	5.18	5.83
5300	4.67	5.46
5350	3.49	6.71
5400	4.62	8.10
5450	4.57	8.13
5500	4.24	7.03
5550	4.10	5.11
5600	5.21	5.12
5650	4.99	4.78
5700	3.58	5.54
5750	3.71	4.66
5800	4.18	3.70
5850	3.79	4.55

1.12 Comments

This report covers only limited radiated tests to show compliance with the new antenna in this EUT. All other radio tests for 5GHz WLAN are covered by UL reports no. 15U21878-E4V2.

The measurements were done with the EUT powered by 115 V AC. It was checked that power variations between 85% and 115% did not have any influence on the measurements.

All ports were populated during spurious emission measurements.

2 TEST REPORT SUMMARY

2.1 General

All measurements are tracable to national standards.

The tests were conducted for the purpose of demonstrating compliance with FCC CFR 47 Part 15, paragraph 15.407 and Industry Canada RSS-247 Issue 2.

Tests were performed in accordance with ANSI C63.4-2014 and ANSI C63.10-2013, and with the latest versions of KDB 789033.

EIRP was calculated from field strength measurements using the method in KDB 412172 D01.

Antenna gain for MIMO mode was calculated using the procedures in KDB 662911, antenna gain with MIMO is the sum of the two antennas.

Radiated tests were performed in a semi-anechoic chamber at measuring distances of 3m and 10m.

A description of the test facility is on file with the FCC and Industry Canada.

☒ New Submission	☒ Production Unit
☐ Class II Permissive Change	☐ Pre-production Unit
NII Equipment Code	☒ Family Listing

THIS TEST REPORT APPLIES ONLY TO THE ITEM(S) AND CONFIGURATIONS TESTED.

Deviations from, additions to, or exclusions from the test specifications are described in “Summary of Test Data”.

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2.2 Test Summary

Name of test	FCC Part 15 reference	RSS-247, Issue 2 reference	Result
Supply Voltage Variations	15.31(e)	6.11 (RSS-GEN)	Complies[1]
Antenna Requirement	15.203	8.3 (RSS-GEN)	Complies
Power Line Conducted Emission	15.107(a) 15.207(a)	8.8 (RSS-GEN)	Complies
Maximum Output Power	15.407(a)	6.2	Complies
Power Spectral Density	15.407(a)	6.2	Complies
Unwanted Emissions	15.407(b)	6.2	Complies
Discontinuation of Transmission	15.407(c)	6.3	Complies[1]
Frequency Stability	15.407(g)	N/A	Complies[1]
Transmit Power Control	15.407(h)	6.2.3	Complies[1]
Radiated Emissions	15.205 15.209	8.9 (RSS-GEN)	Complies

[1] Covered by UL Test Report no. 15U21878-E4V2

Dynamic Frequency Selection

Name of test	FCC Part 15 reference	RSS-247, Issue 2 reference	Result
Non-Occupancy Period	15.407(h)	6.3	N/A[2]
DFS Detection Threshold	15.407(h)	6.3	N/A[2]
Channel Availability Check Time	15.407(h)	6.3	N/A[2]
U-NII Detection Bandwidth	15.407(h)	6.3	N/A[2]
Channel Closing Transmission Time	15.407(h)	6.3	Complies[3]
Channel Move Time	15.407(h)	6.3	Complies[3]

[2] The EUT is a Slave Device without radar detection.
[3] DFS tests for slave device are covered by UL report no. 15U21878-E5V1.

3 TEST RESULTS

3.1 Power Line Conducted Emissions

FCC Part 15.207 (a)

ISED RSS-GEN Issue 4, Clause 8.8

Test Performed By: Kristian Osvoll	Date of Test: 09-May-2017

Measurement procedure: ANSI C63.4-2014 using 50 µH/50 ohms LISN.

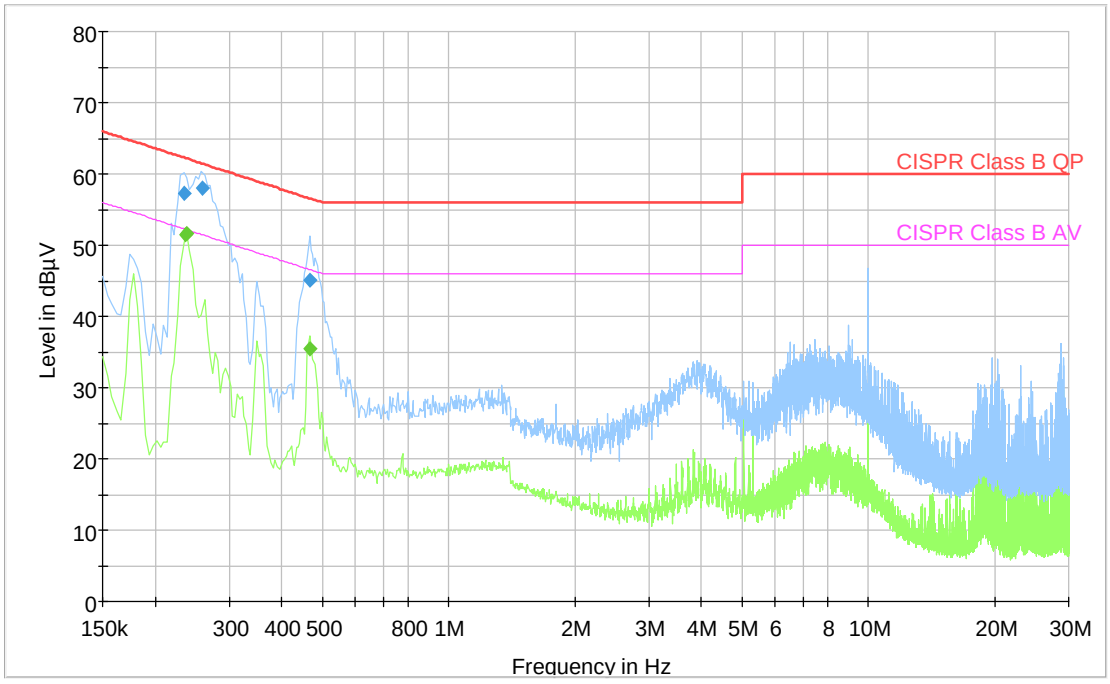
Test Results: Complies.

Measurement Data: See attached graph, (Peak detector).

Highest measured value (L1 and N):

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	PE	Corr. (dB)
0.234	57.26	---	62.31	5.04	1000	9	L1	GND	10.1
0.236	---	51.38	52.24	0.86	1000	9	N	GND	10.1
0.238	---	51.56	52.17	0.60	1000	9	L1	GND	10.1
0.260	57.96	---	61.43	3.48	1000	9	N	GND	10.1
0.468	---	35.44	46.55	11.11	1000	9	N	GND	10.1
0.468	45.01	---	56.55	11.54	1000	9	L1	GND	10.1

Full Spectrum



3.2 Maximum Output Power, EIRP

FCC 15.407 (a)

ISED RSS-247 Issue 2, Clause 6.2

Test Results: Complies

Measurement Data:

Ch. No.	Nominal Frequency (MHz)	Maximum E.I.R.P. (dBm)			
		802.11a	802.11n HT20	802.11n HT40	802.11n HT80
36	5180	**14.7**	**8.0**		
40	5200	14.1	11.7		
48	5240	14.5	13.8		
52	5260	18.2	22.6		
60	5300	16.7	20.8		
64	5320	**9.8**	**12.2**		
100	5500	**11.2**	**12.3**		
116	5580	16.4	20.3		
140	5700	**11.3**	**9.6**		
149	5745	**15.1**	**10.3**		
157	5785	19.0	22.2		
165	5825	**15.6**	**14.3**		
38	5190			**13.0**	
46	5230			15.7	
54	5270			20.9	
62	5310			**10.6**	
102	5510			**9.3**	
110	5550			19.9	
134	5670			**13.6**	
151	5755			**11.6**	
159	5795			**14.1**	
42	5210				**10.9**
58	5290				**11.7**
106	5530				**8.8**
155	5775				**9.4**

Measured values are corrected for Duty Cycle.
Values in boldface are measured values, all other values are calculated from UL report no. 15U21878-E4V2.

Measurements were performed radiated.

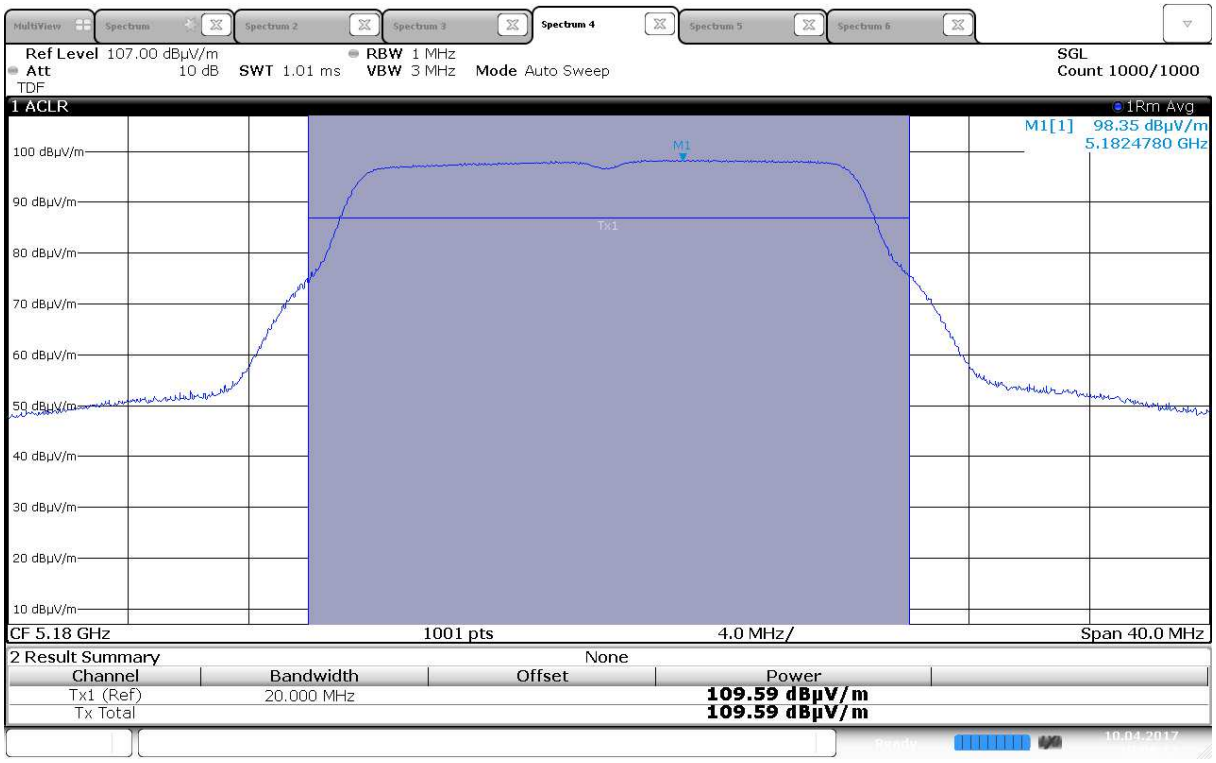
Power limits

Frequency Band	Power limit	
	FCC 15.407	**ISED RSS-247, Issue 2**
5150 – 5250 MHz	Master device: Less than 1 Watt Client device: Less than 250 mW	Less than the lesser of 200 mW or $10 + 10 \log_{10}B$ dBm[1]
5250 – 5350 MHz	Less than the lesser of 250 mW or 11 dBm + 10 log *B* dBm	Less than the lesser of 250 mW or 11 dBm + 10 log *B* dBm[1]
5470 – 5725 MHz		
5725 – 5825 MHz	Less than 1 Watt	Less than 1 Watt

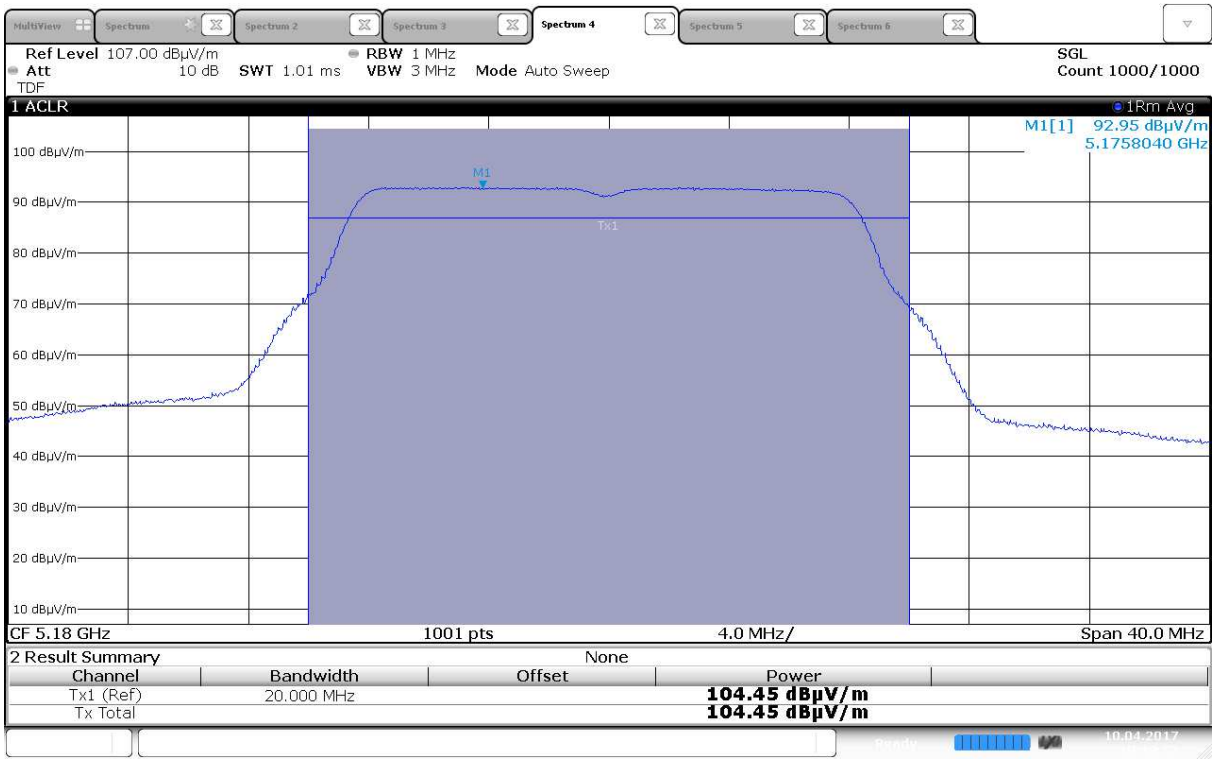
[1] Except OEM devices installed in vehicles

B is the 26 dB emission bandwidth in MHz

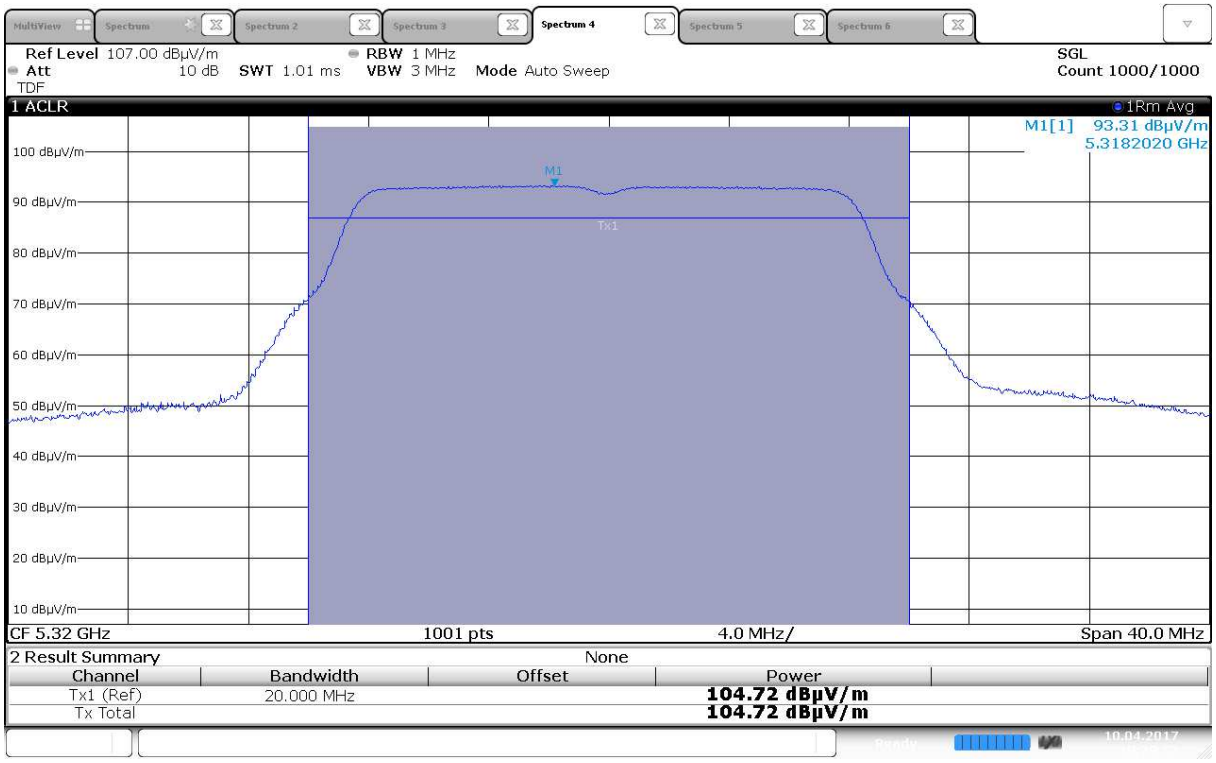
If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted output power from the intentional radiator shall be reduced below the stated value above by the amount in dB that the directional gain of the antenna exceeds 6 dBi.



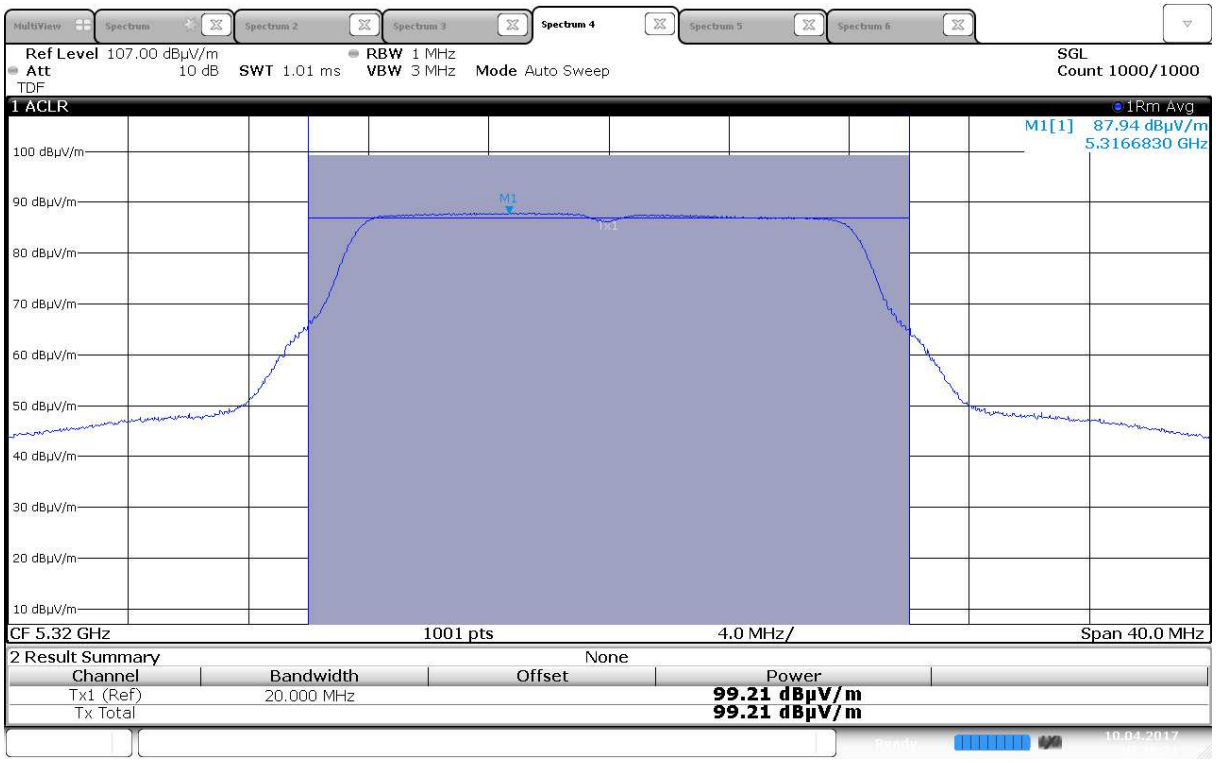
Maximum EIRP, 5180 MHz, 802.11a 6Mbps, Ant 0



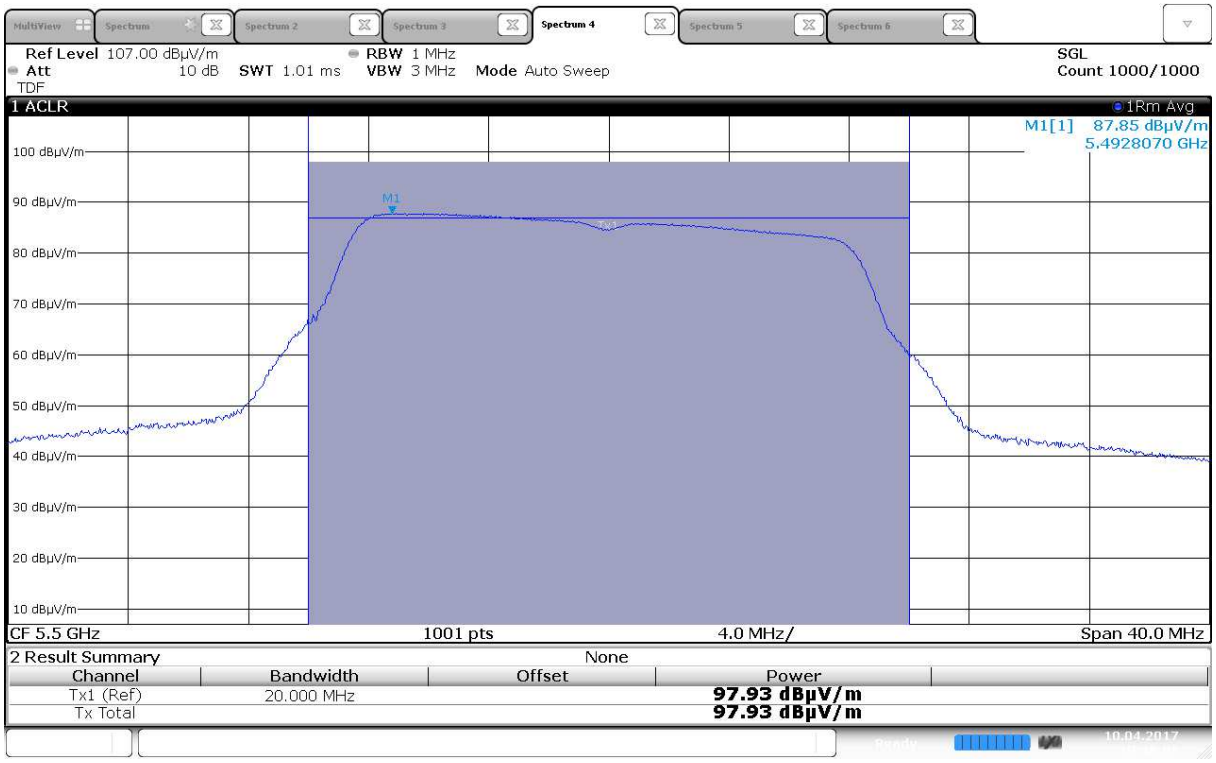
Maximum EIRP, 5180 MHz, 802.11a 6Mbps, Ant 1



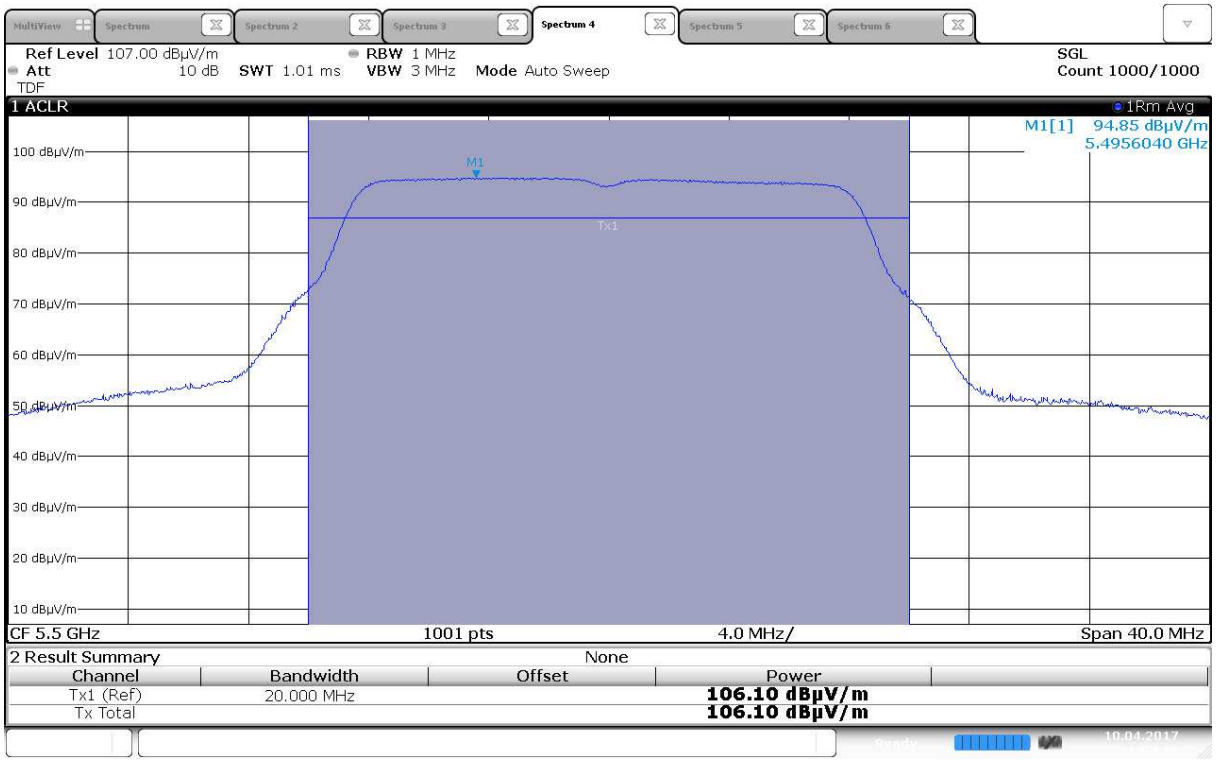
Maximum EIRP, 5320 MHz, 802.11a 6Mbps, Ant 0



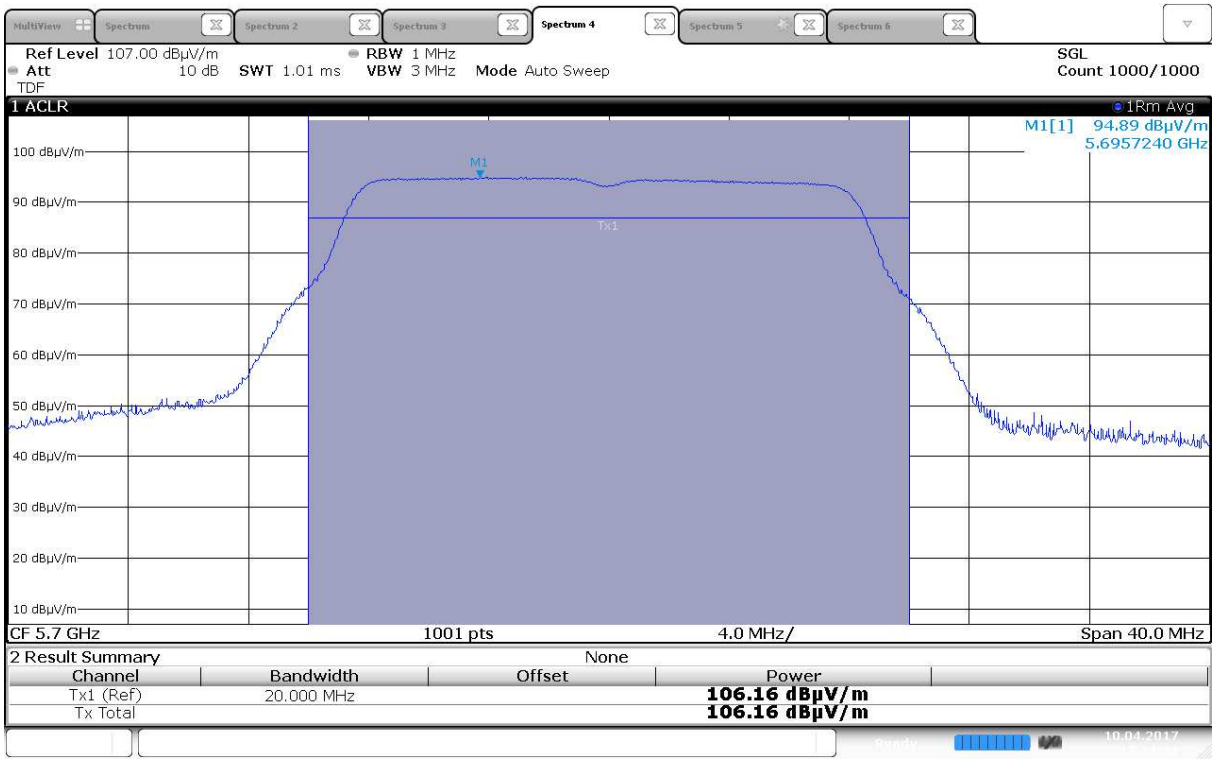
Maximum EIRP, 5320 MHz, 802.11a 6Mbps, Ant 1



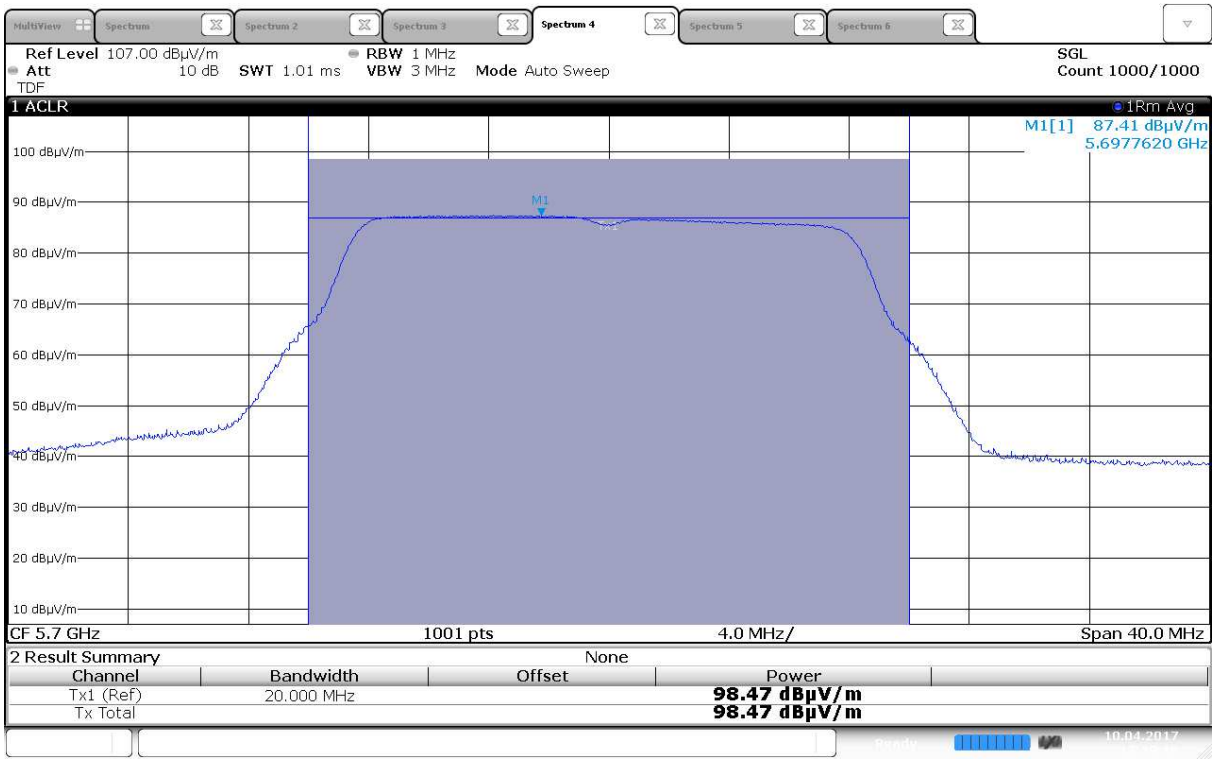
Maximum EIRP, 5500 MHz, 802.11a 6Mbps, Ant 0



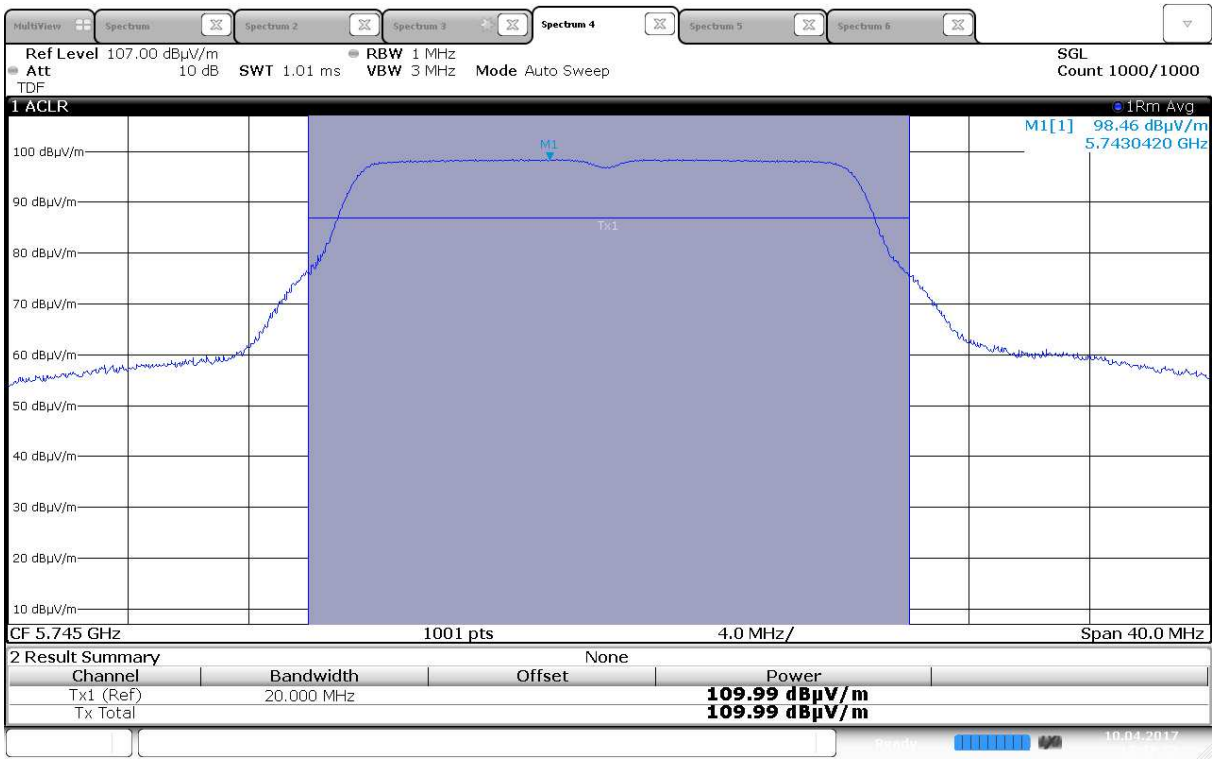
Maximum EIRP, 5500 MHz, 802.11a 6Mbps, Ant 1



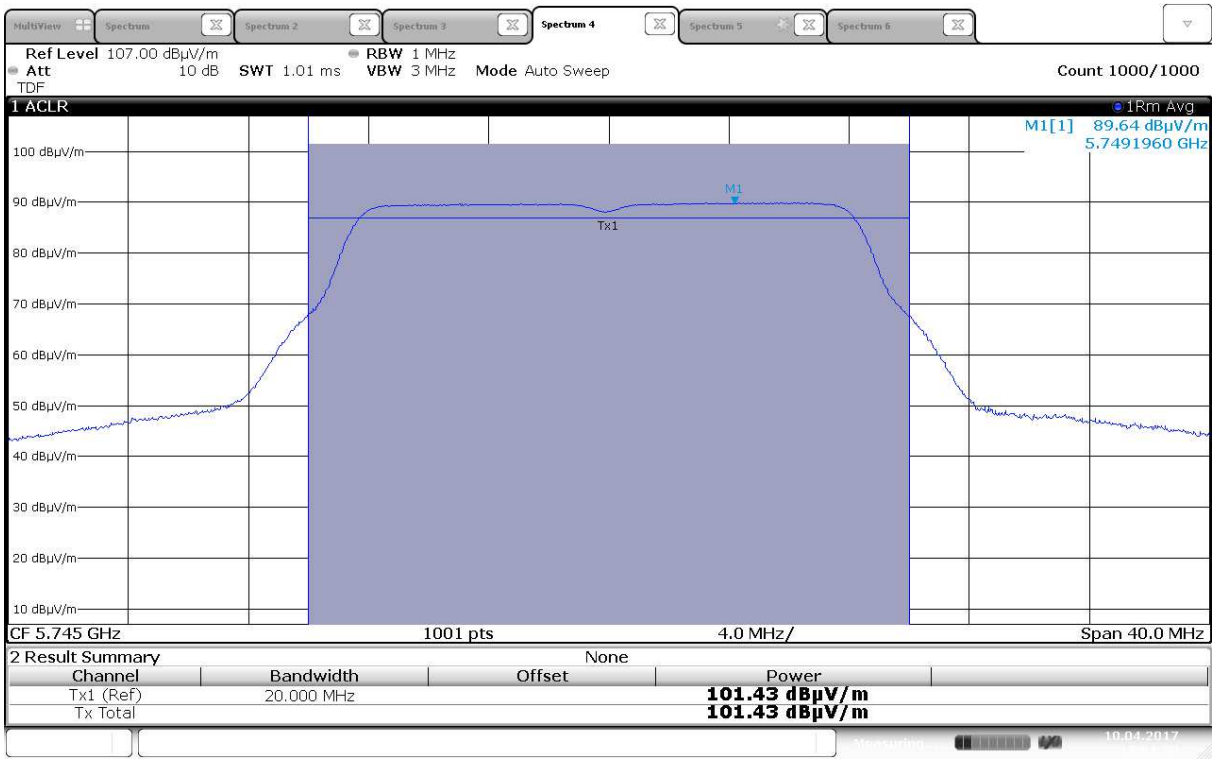
Maximum EIRP, 5700 MHz, 802.11a 6Mbps, Ant 0



Maximum EIRP, 5700 MHz, 802.11a 6Mbps, Ant 1



Maximum EIRP, 5745 MHz, 802.11a 6Mbps, Ant 0



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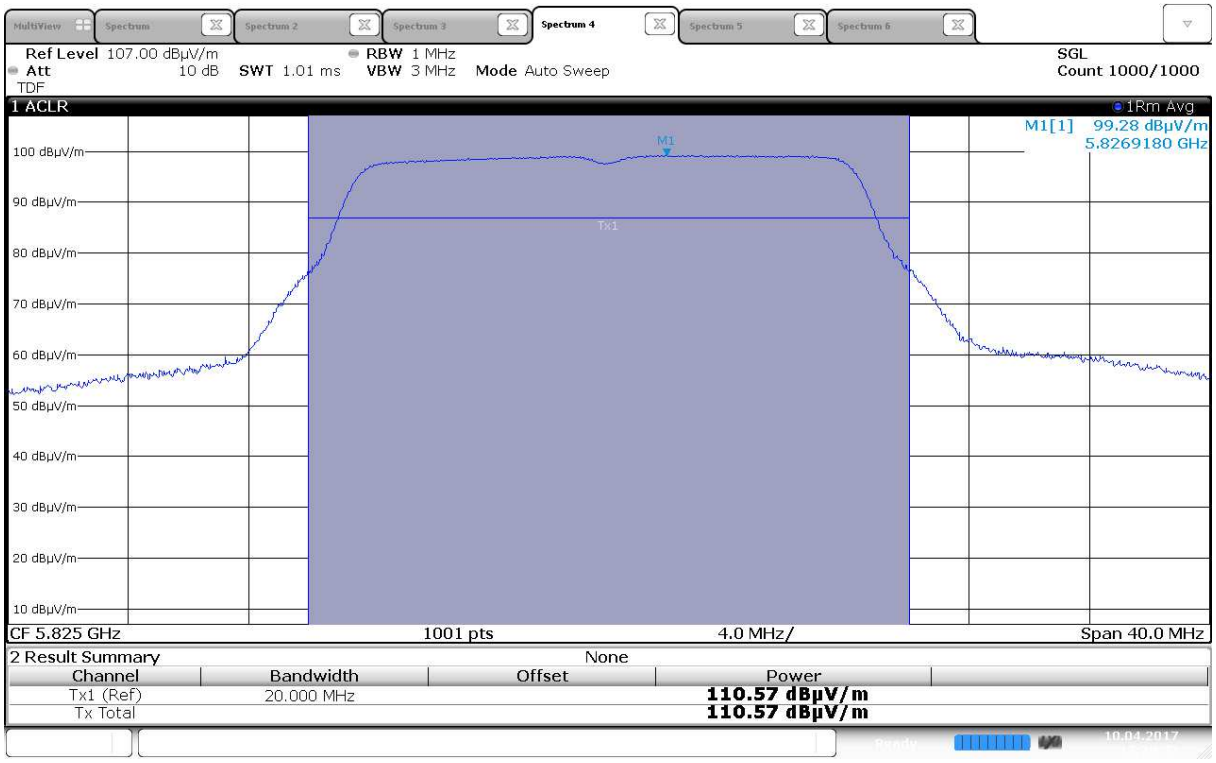

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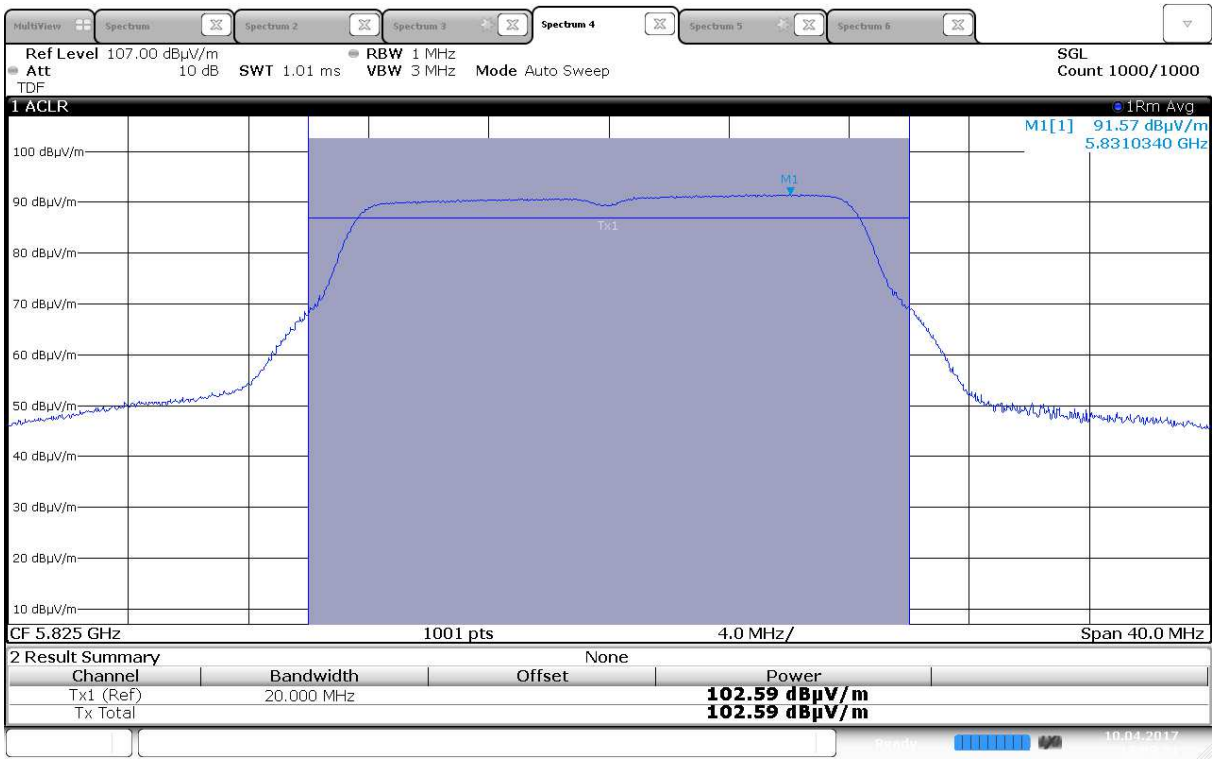

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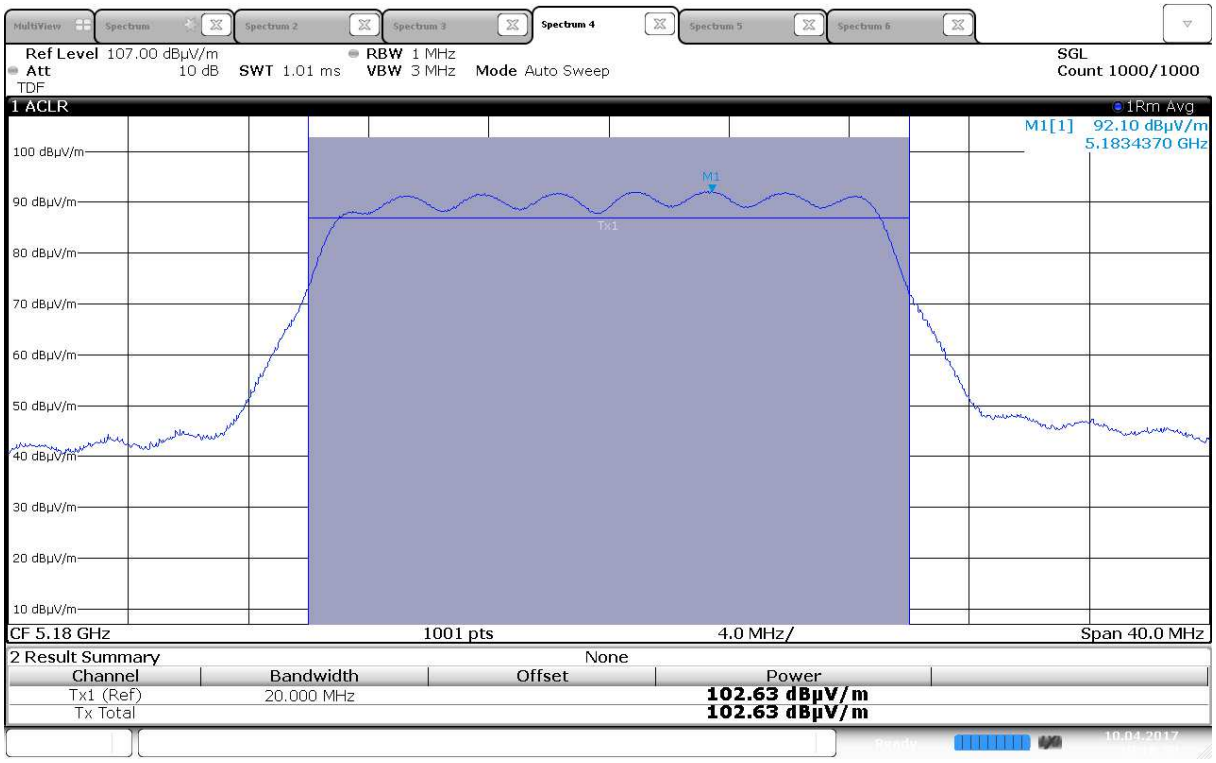
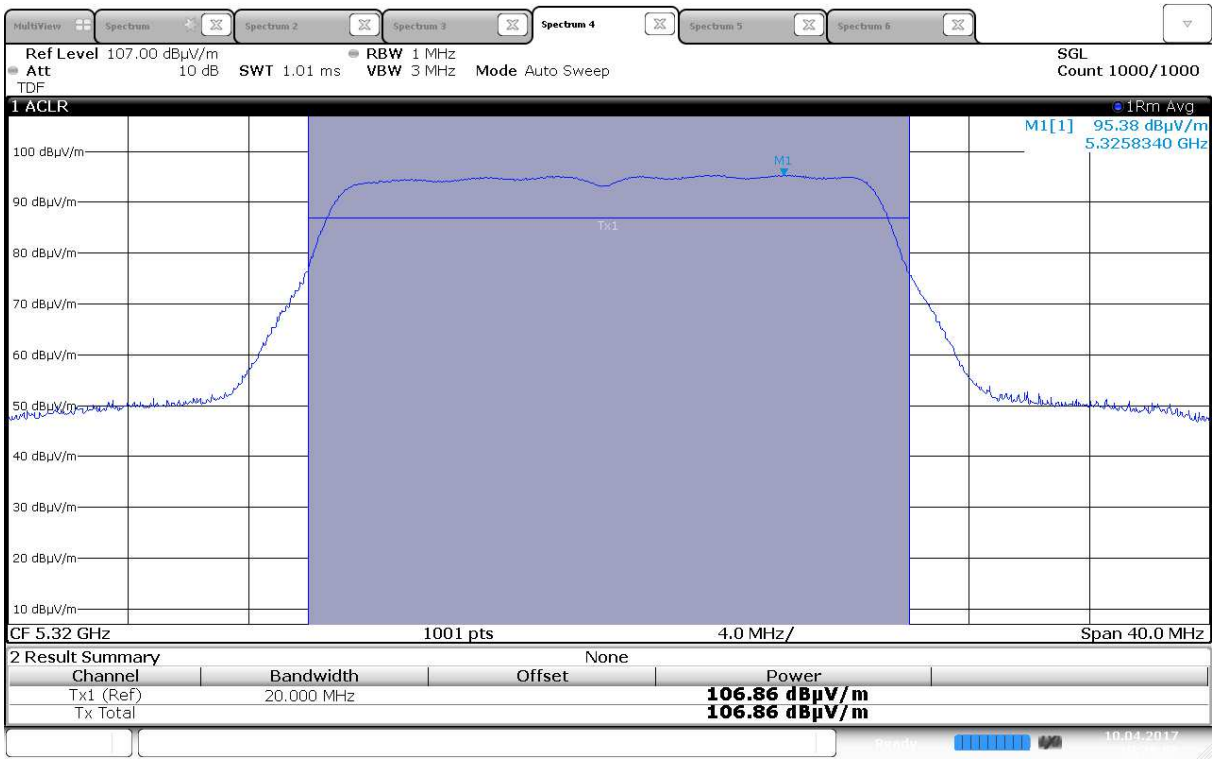
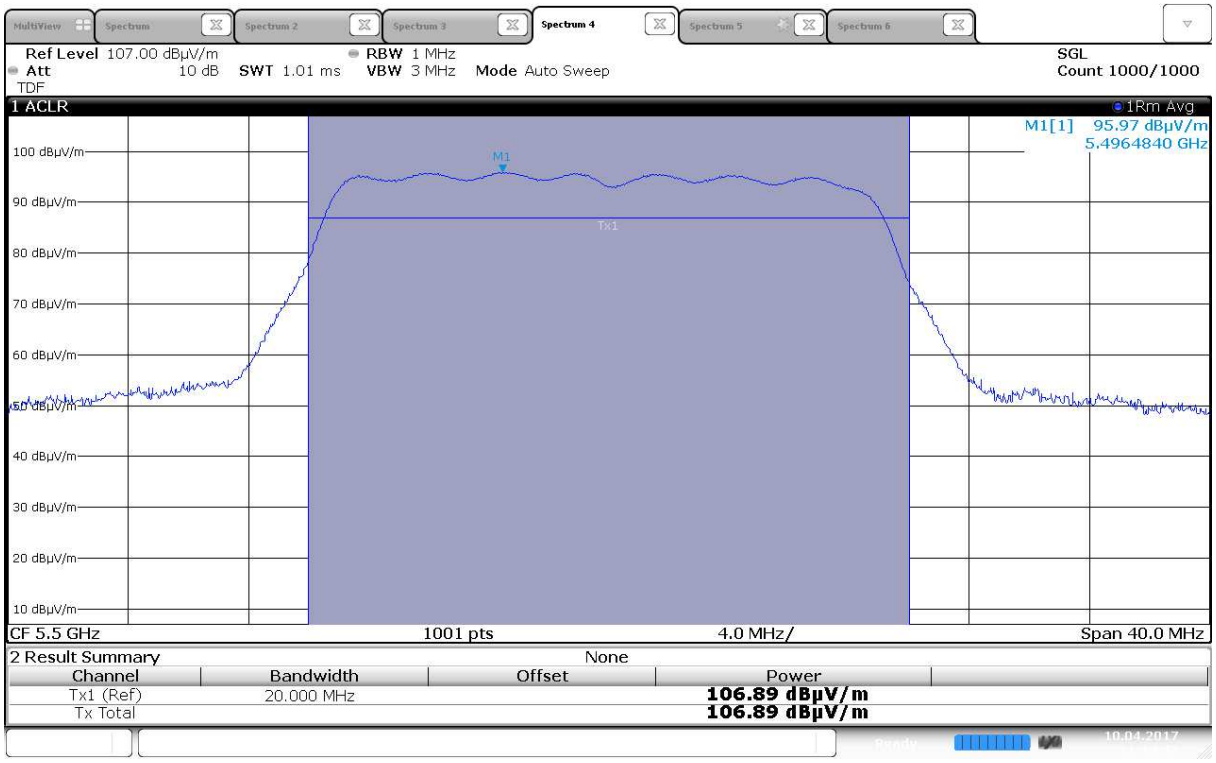


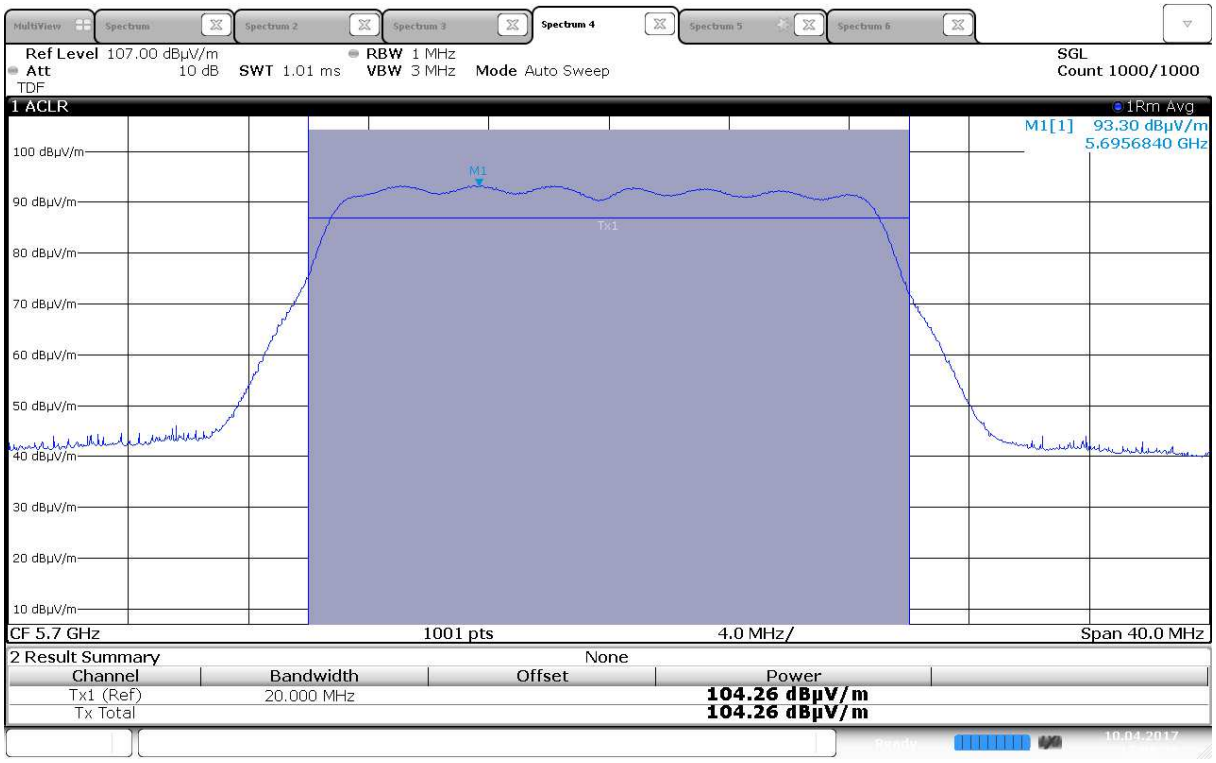
Maximum EIRP, 5180 MHz, 802.11n HT20, MIMO



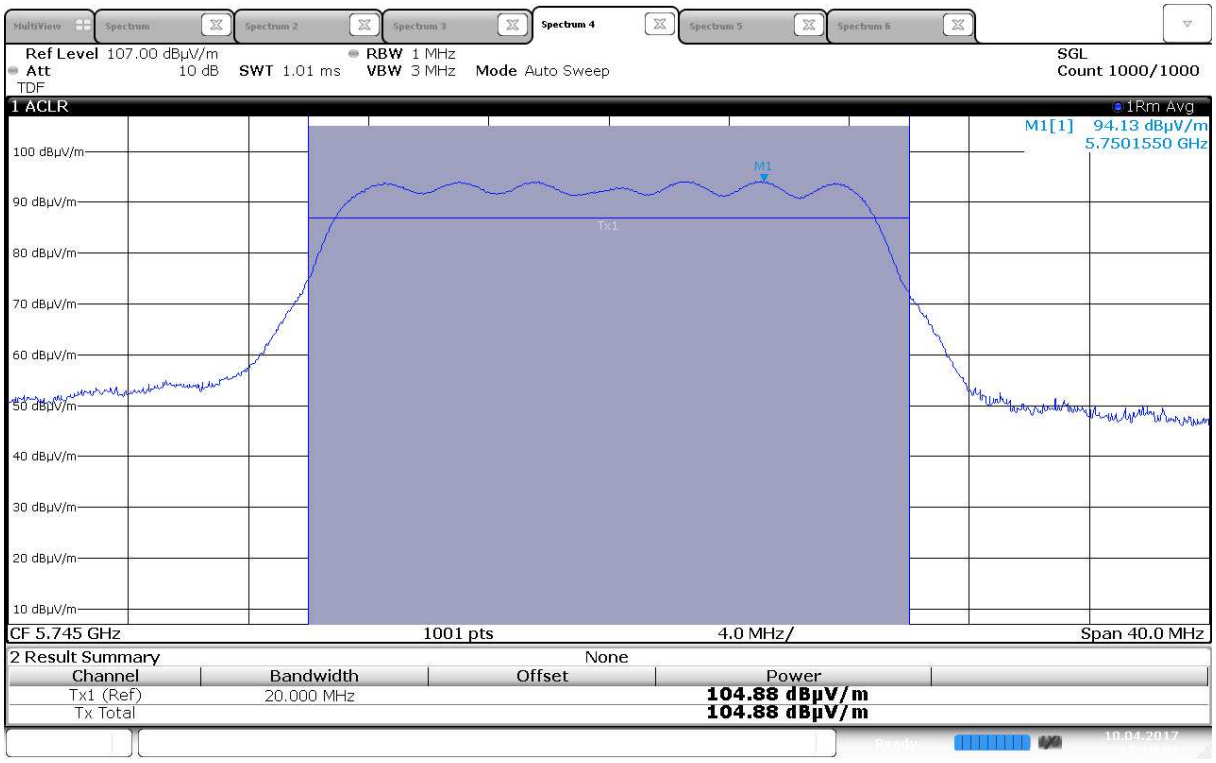
Maximum EIRP, 5320 MHz, 802.11n HT20, MIMO



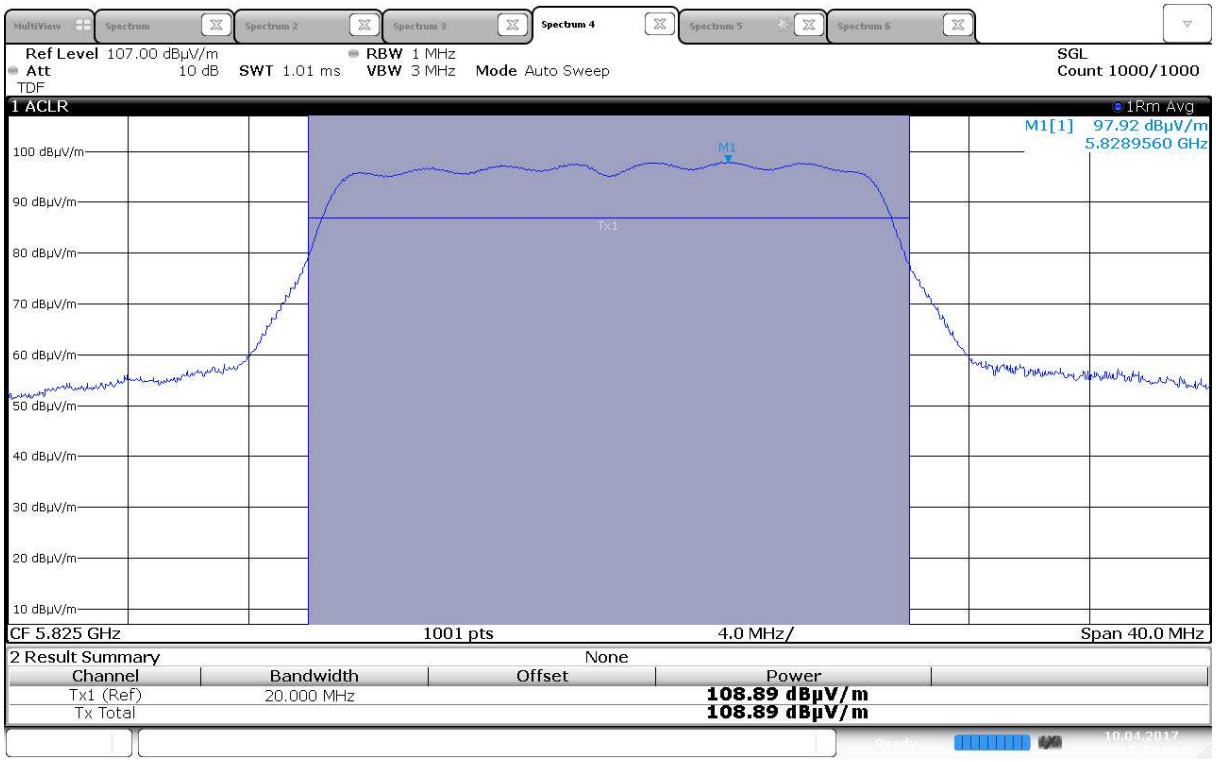
Maximum EIRP, 5500 MHz, 802.11n HT20, MIMO



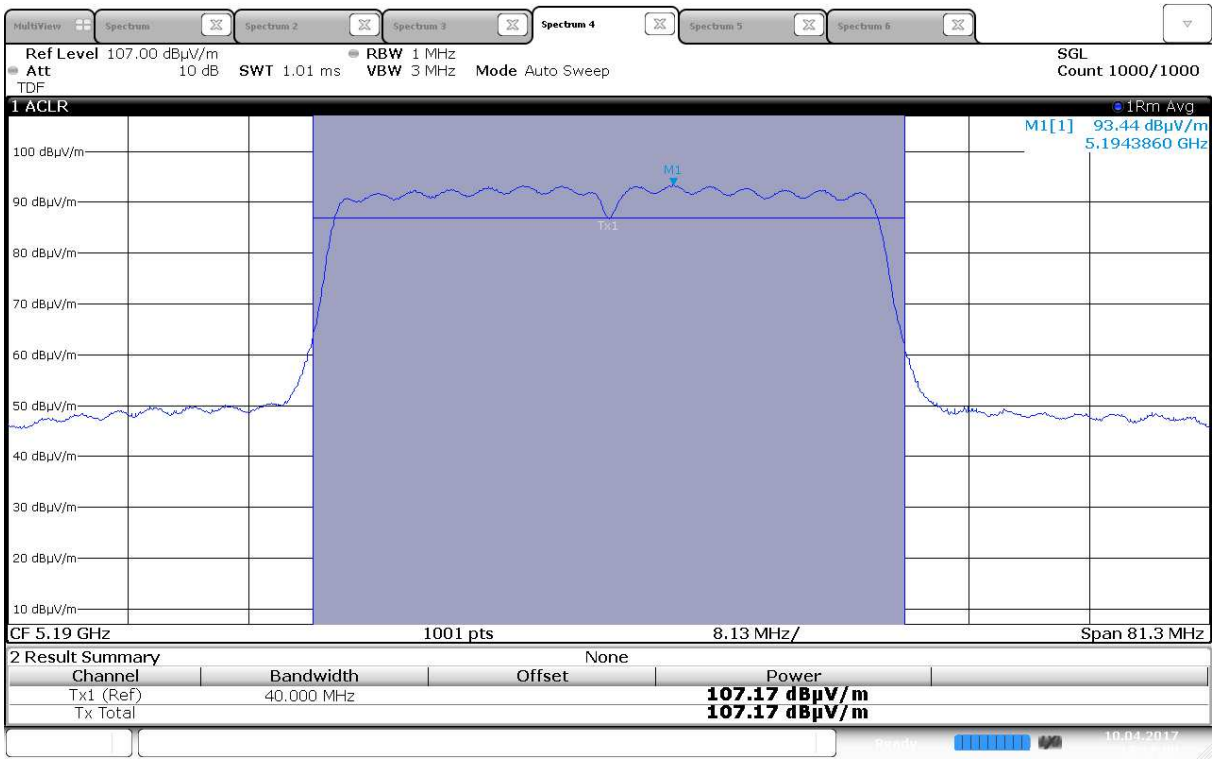
Maximum EIRP, 5700 MHz, 802.11n HT20, MIMO



Maximum EIRP, 5745 MHz, 802.11n HT20, MIMO



Maximum EIRP, 5825 MHz, 802.11n HT20, MIMO



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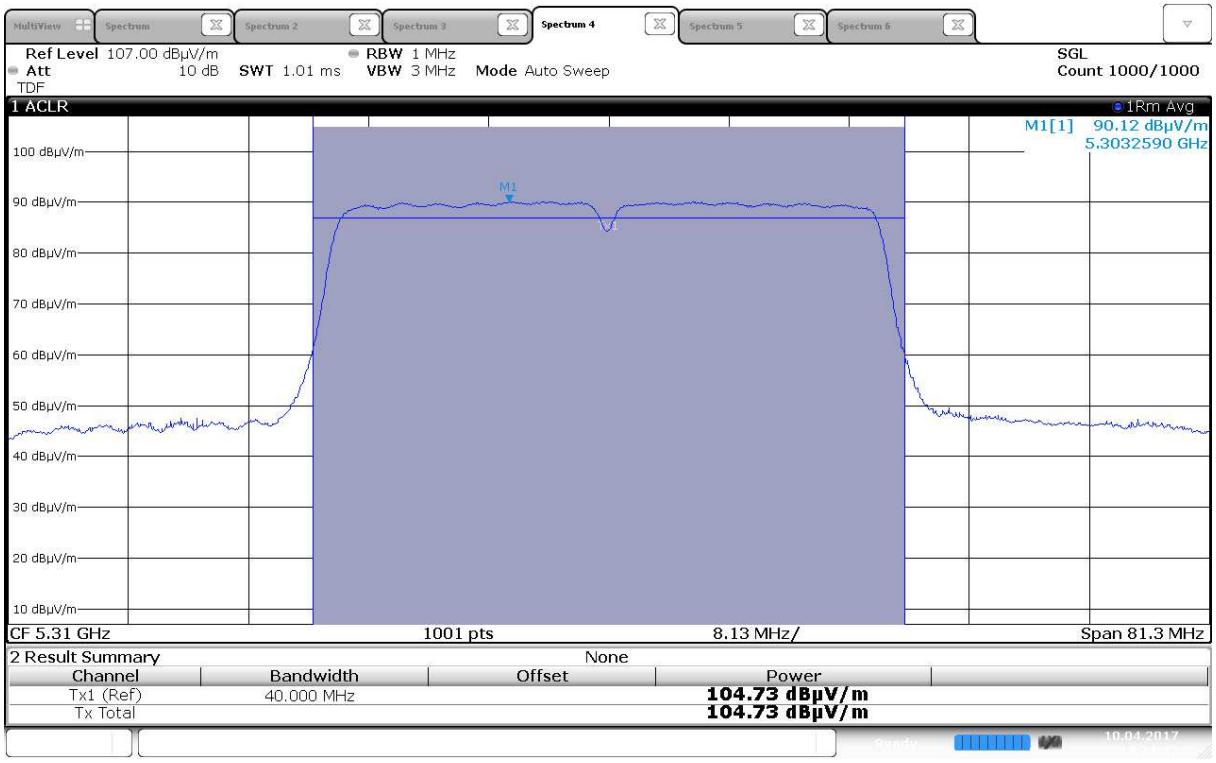

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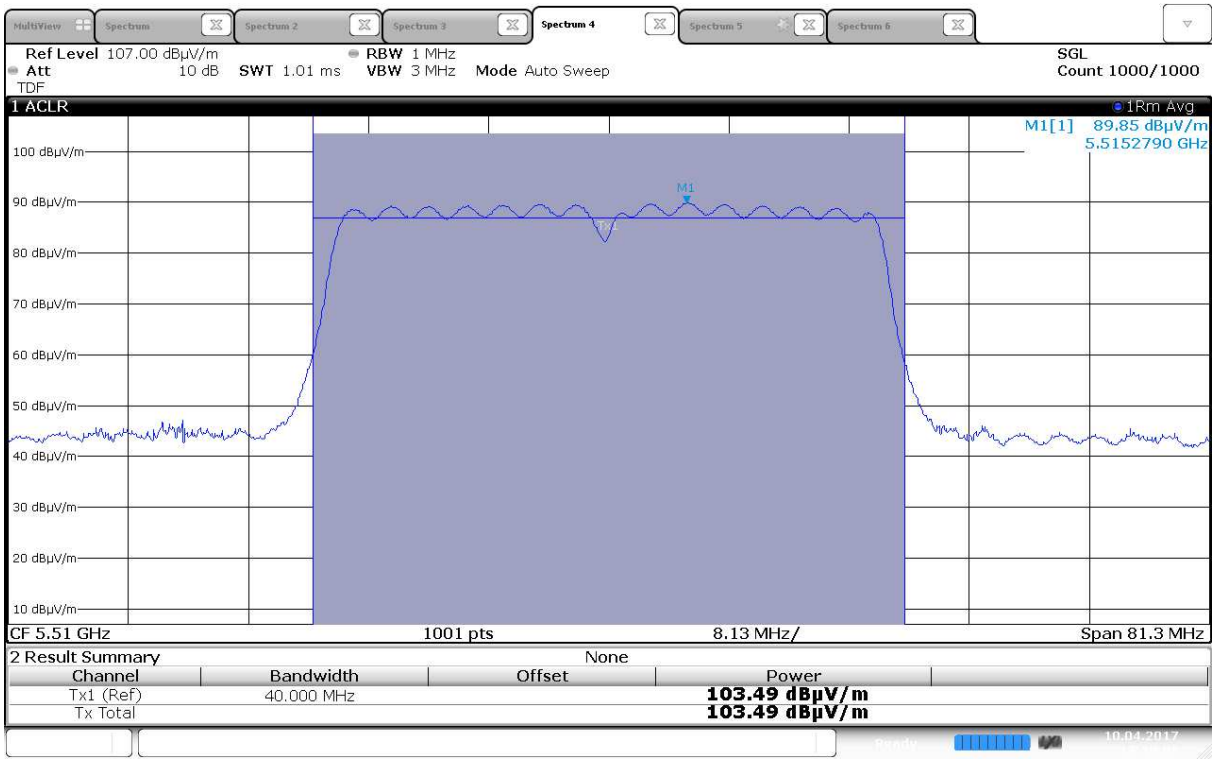
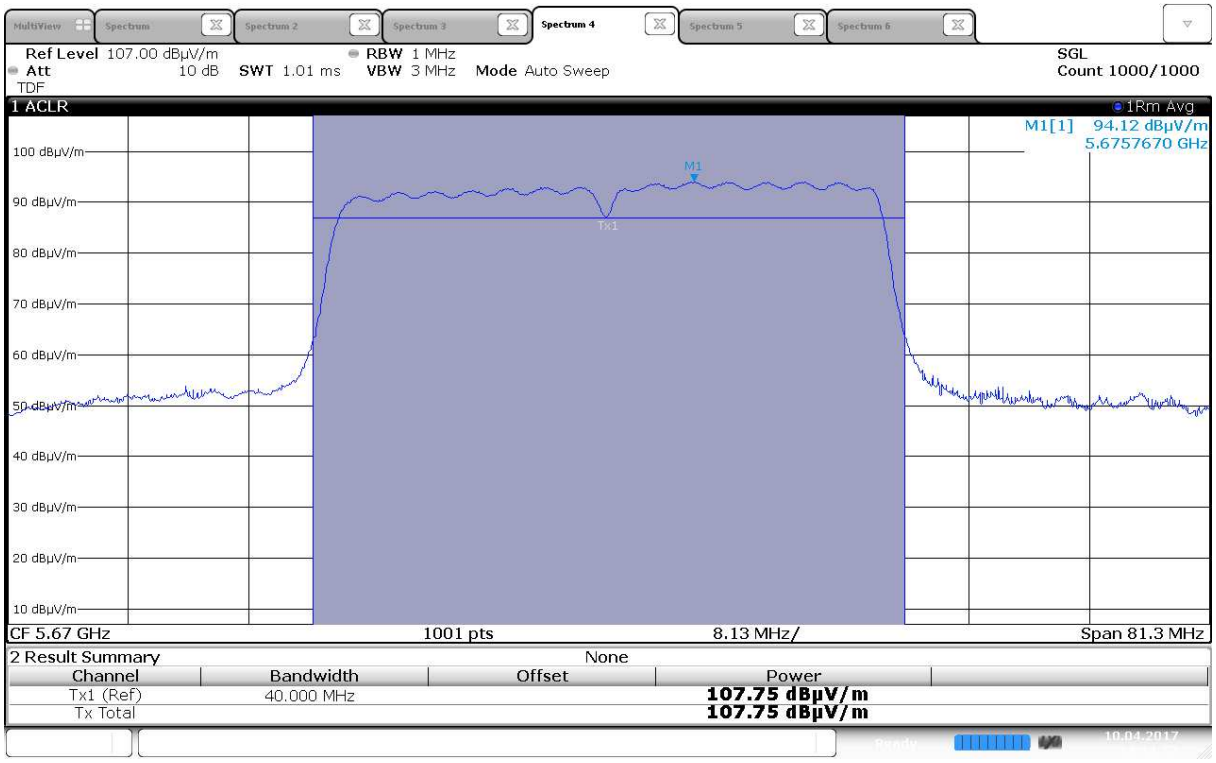
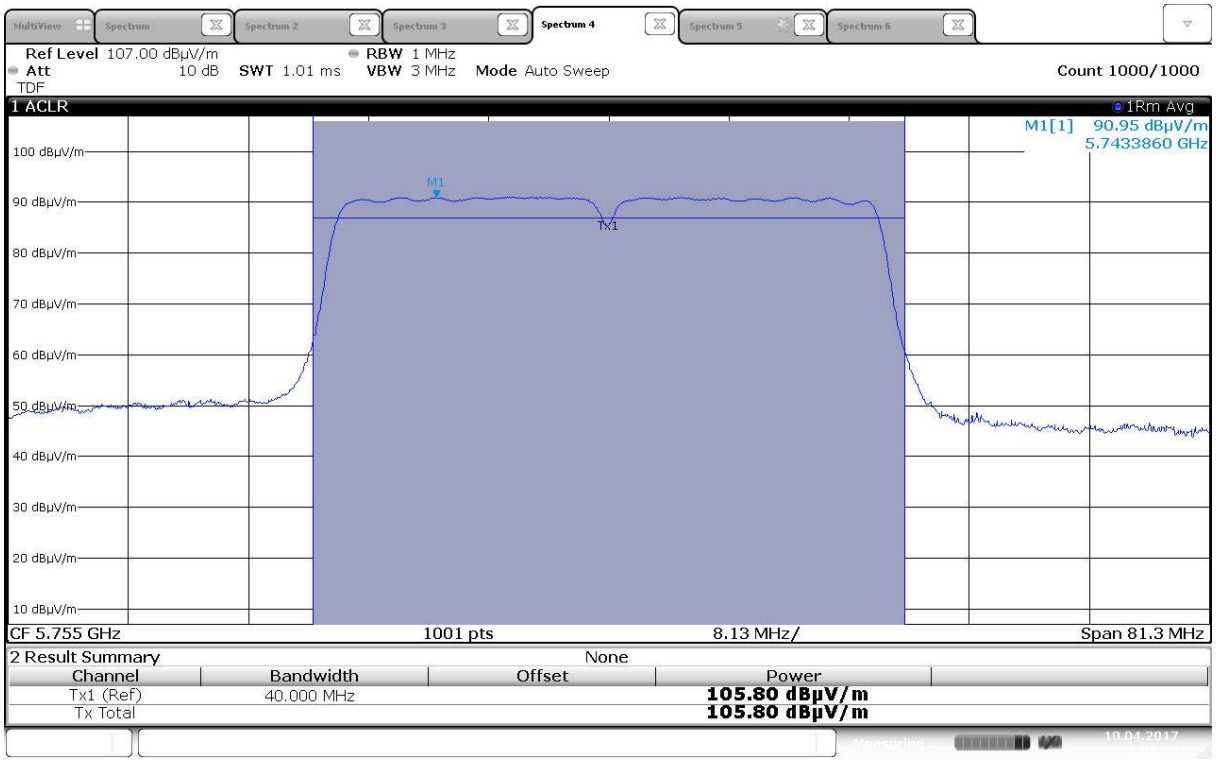


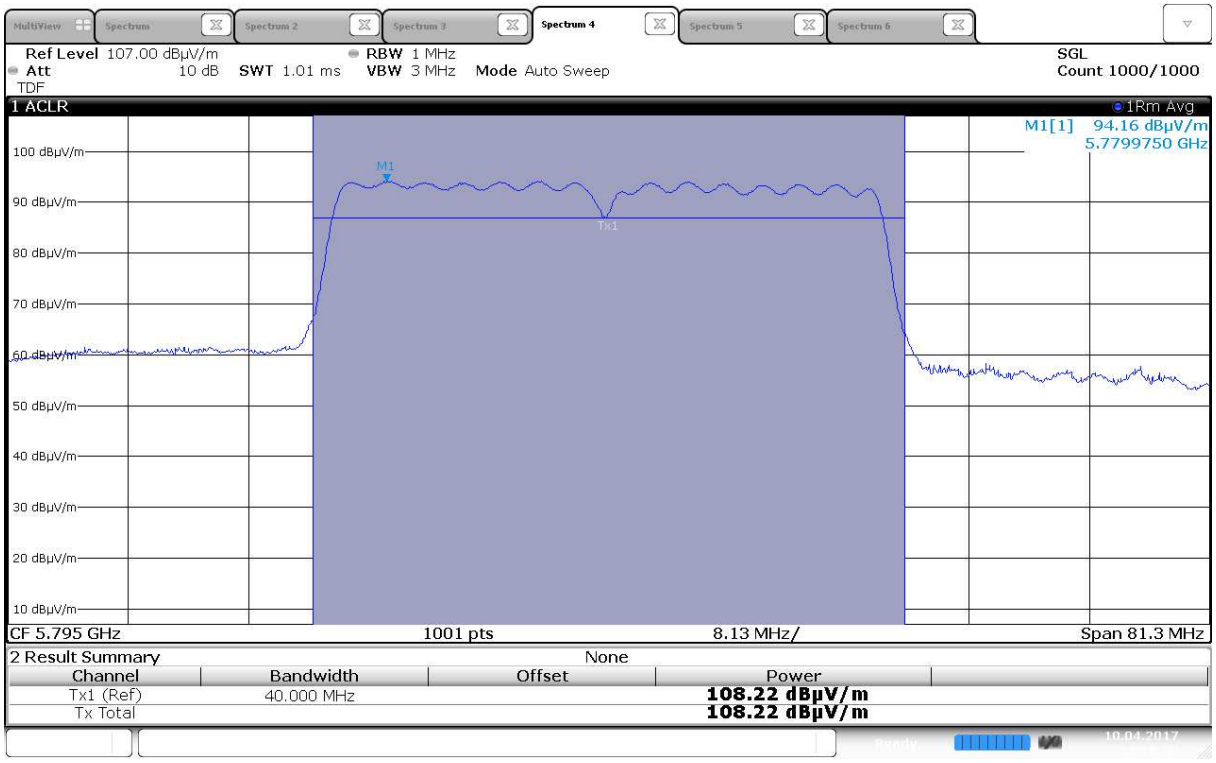
Maximum EIRP, 5510 MHz, 802.11n HT40, MIMO



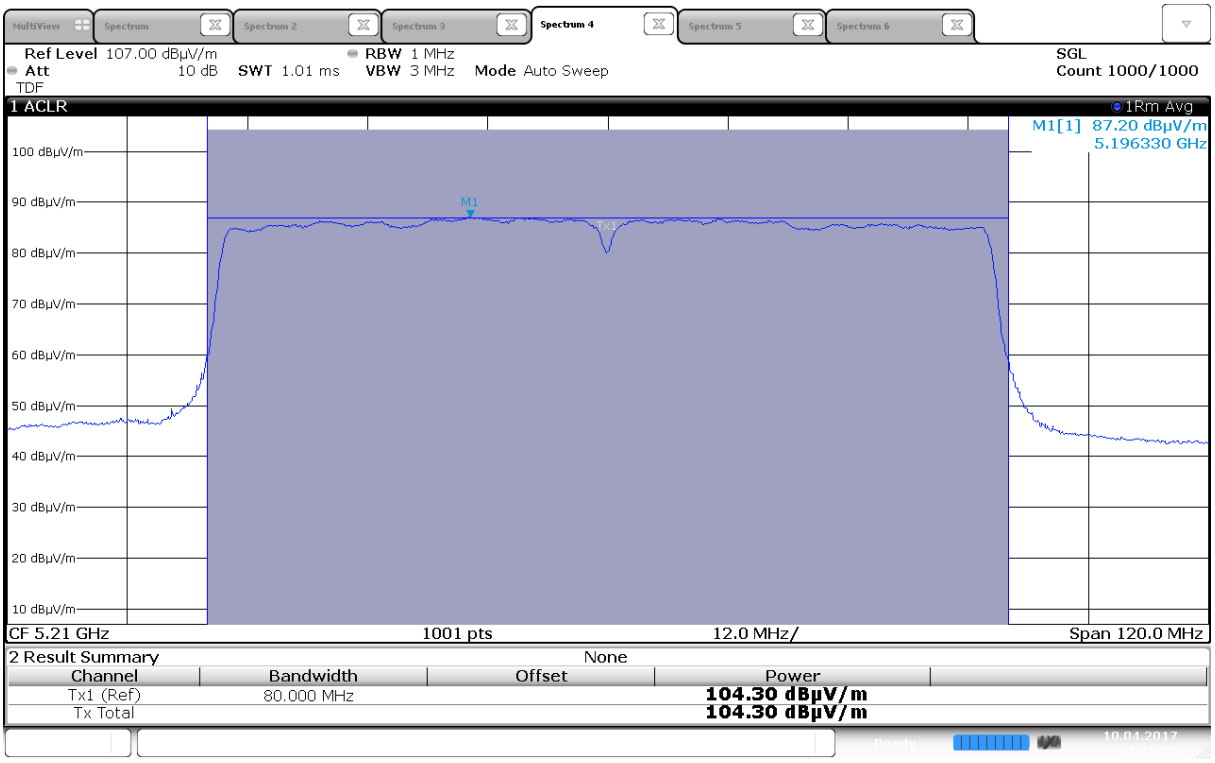
Maximum EIRP, 5670 MHz, 802.11n HT40, MIMO



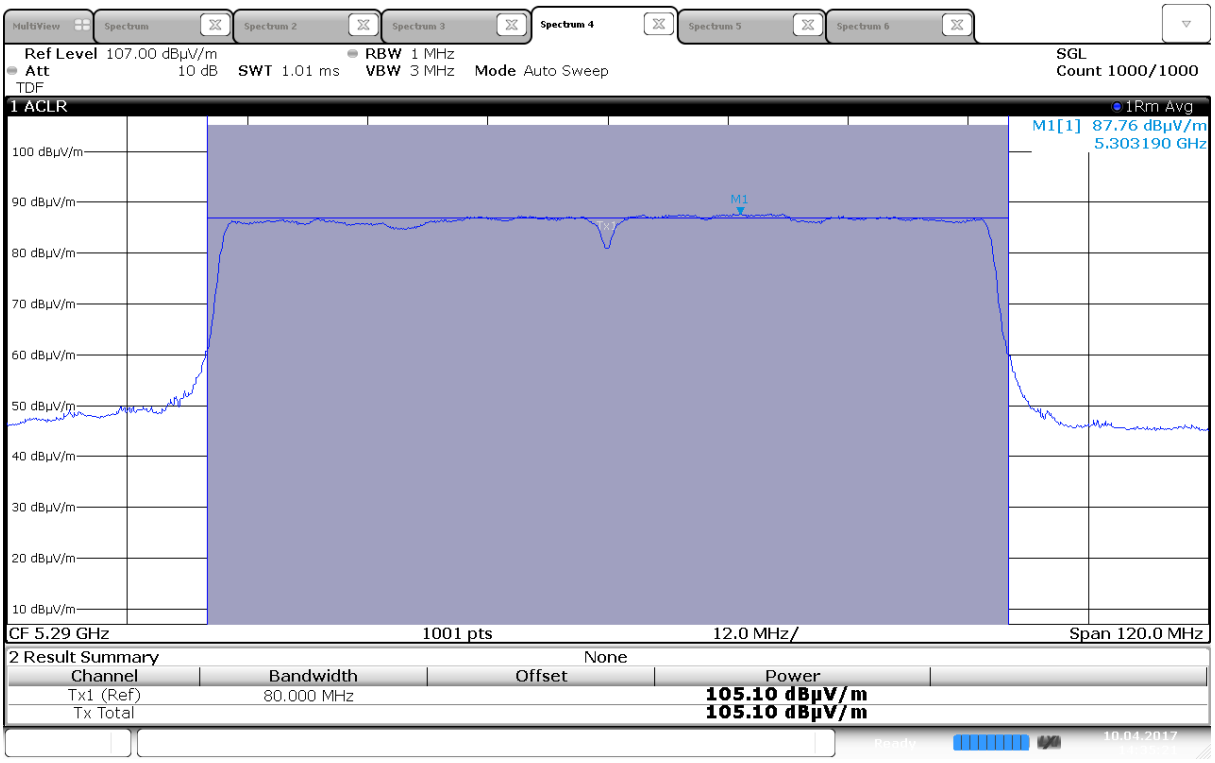
Maximum EIRP, 5755 MHz, 802.11n HT40, MIMO



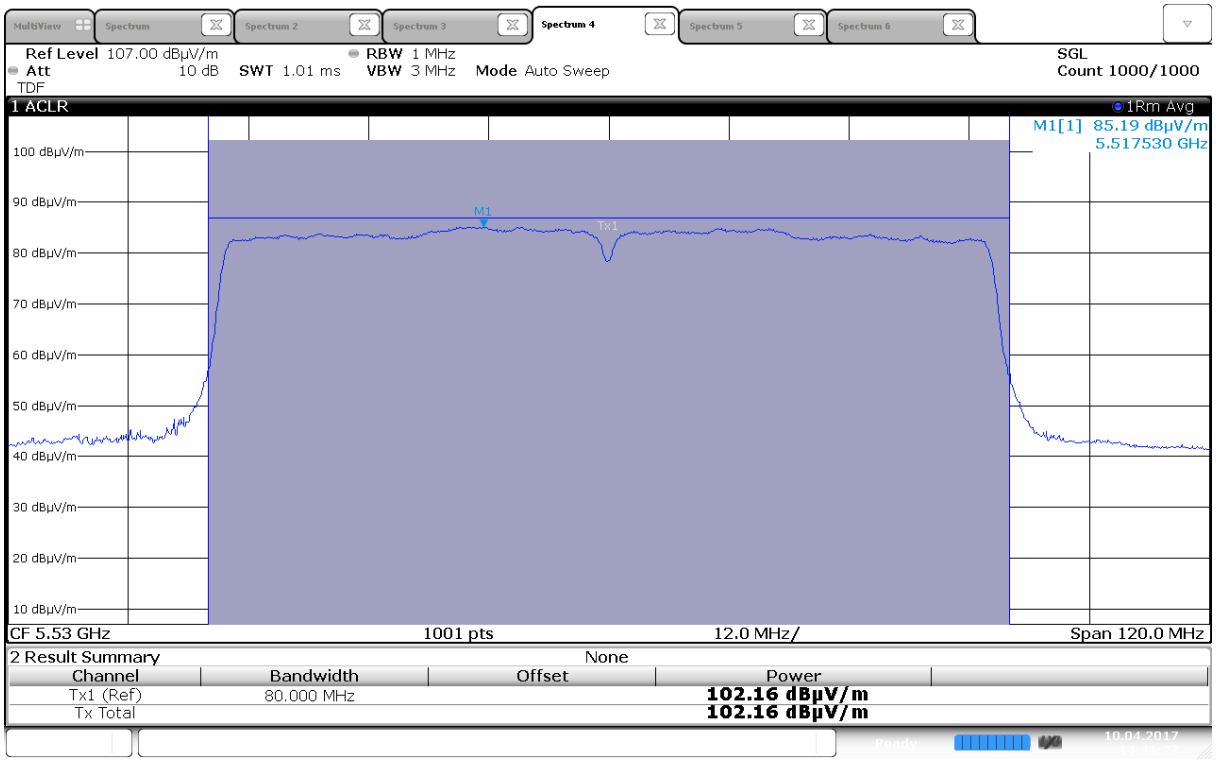
Maximum EIRP, 5795 MHz, 802.11n HT40, MIMO



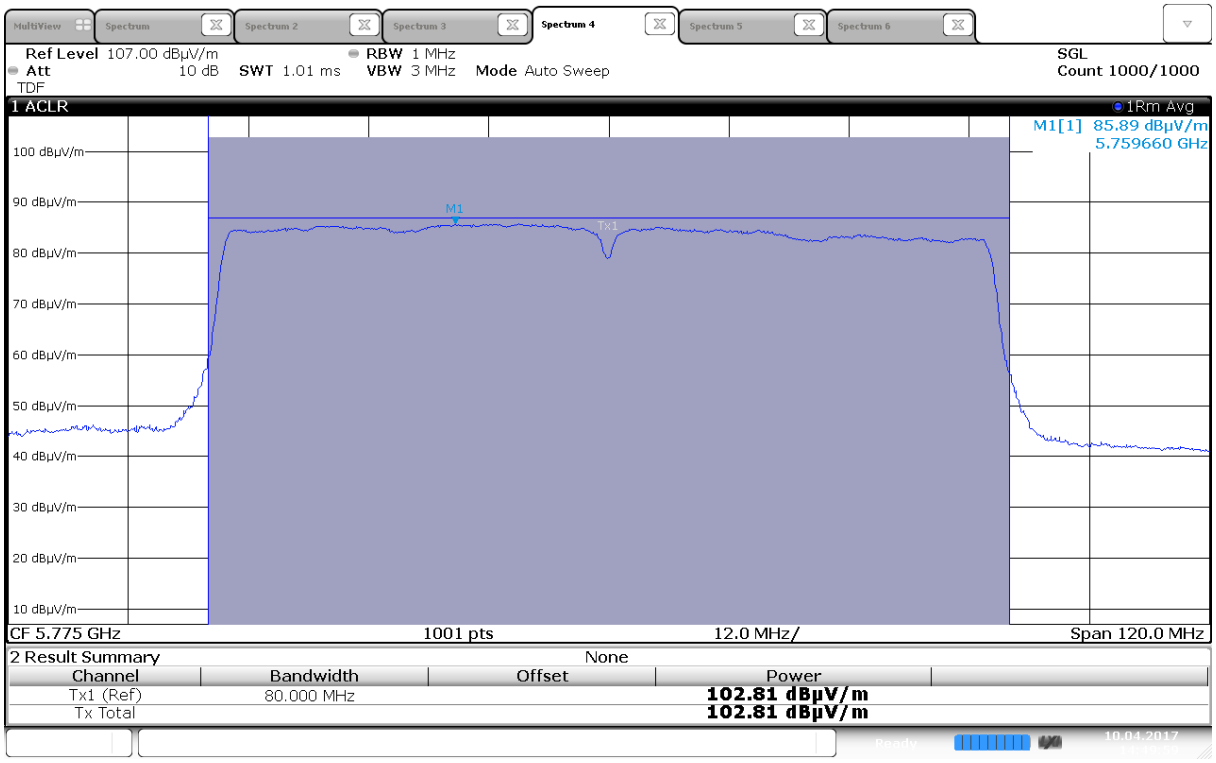
Maximum EIRP, 5210 MHz, 802.11n HT80, MIMO



Maximum EIRP, 5290 MHz, 802.11n HT80, MIMO



Maximum EIRP, 5530 MHz, 802.11n HT80, MIMO



Maximum EIRP, 5775 MHz, 802.11n HT80, MIMO

3.3 Emission Bandwidth *B*

Para. No.: 15.407(a)

ISED RSS-GEN, Issue 4, Clause 6.6

Test Results: Complies

Measurement Data:

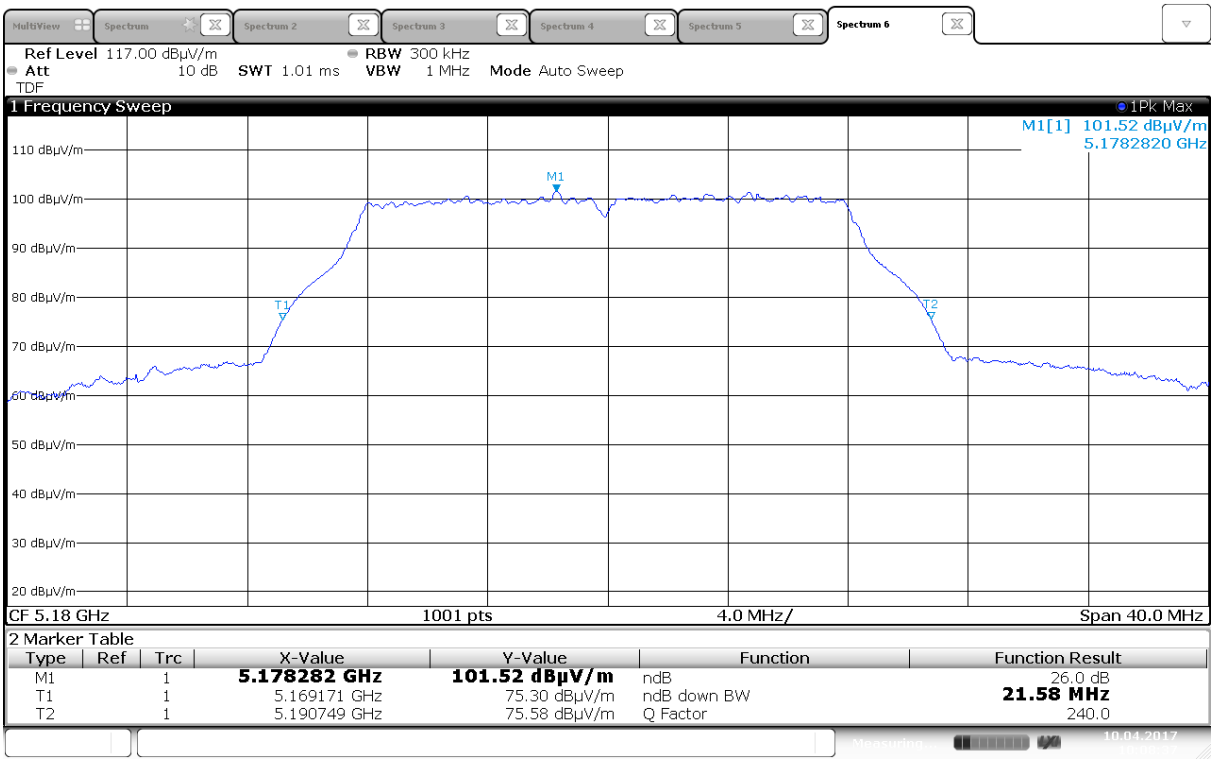
Ch. No.	Nominal Frequency (MHz)	26dB Bandwidth (MHz)			
		802.11a	802.11n HT20	802.11n HT40	802.11n HT80
36	5180	**21.7**	**21.9**		
40	5200	21.1	21.2		
48	5240	22.0	21.0		
52	5260	20.8	20.9		
60	5300	21.3	21.3		
64	5320	**21.6**	**21.9**		
100	5500	**21.5**	**21.9**		
116	5580	20.6	21.2		
140	5700	**21.6**	**21.9**		
149	5745	**21.7**	**21.9**		
157	5785	/	/		
165	5825	**21.7**	**21.9**		
38	5190			**40.1**	
46	5230			38.7	
54	5270			39.2	
62	5310			**40.4**	
102	5510			**40.2**	
110	5550			38.9	
134	5670			**40.0**	
151	5755			**40.4**	
159	5795			**40.8**	
42	5210				**81.2**
58	5290				**81.8**
106	5530				**80.9**
155	5775				**80.9**

Values in boldface are measured values, all other values are from UL report no. 15U21878-E4V2.

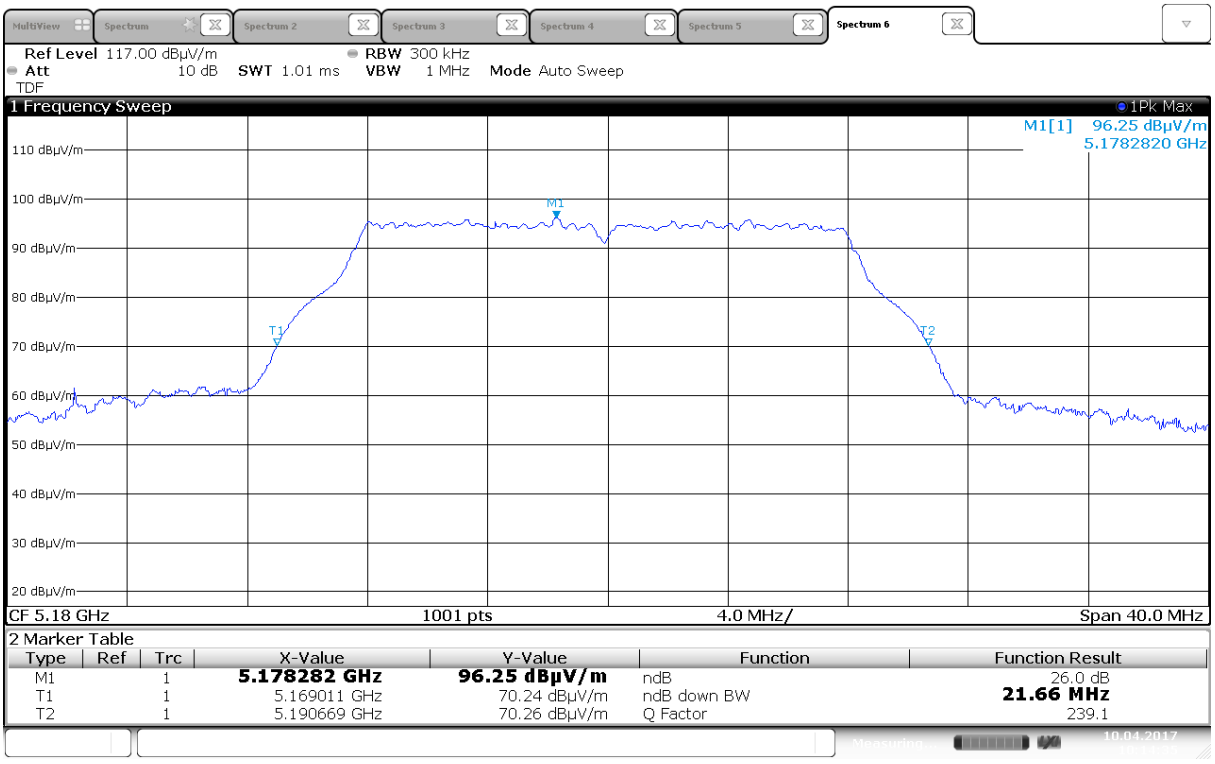
Measurements were performed radiated.

Limit:

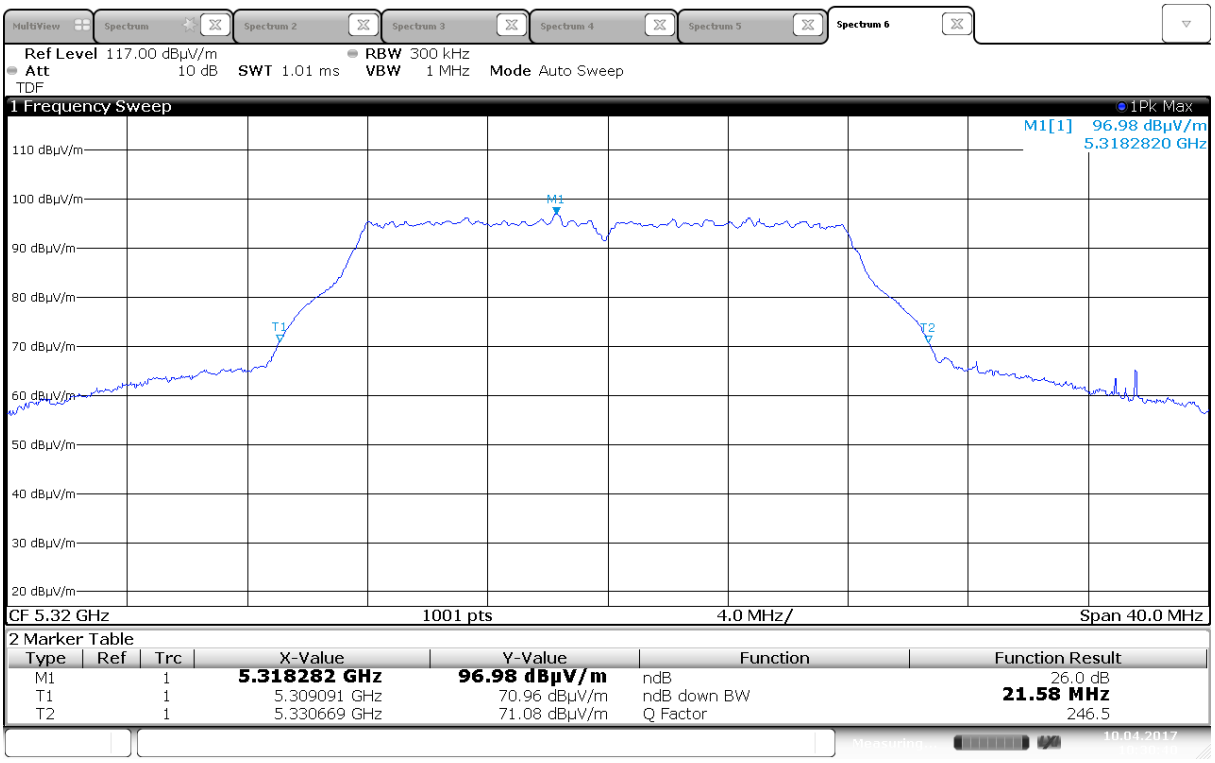
No requirements as long as the emissions are within the band-edges.



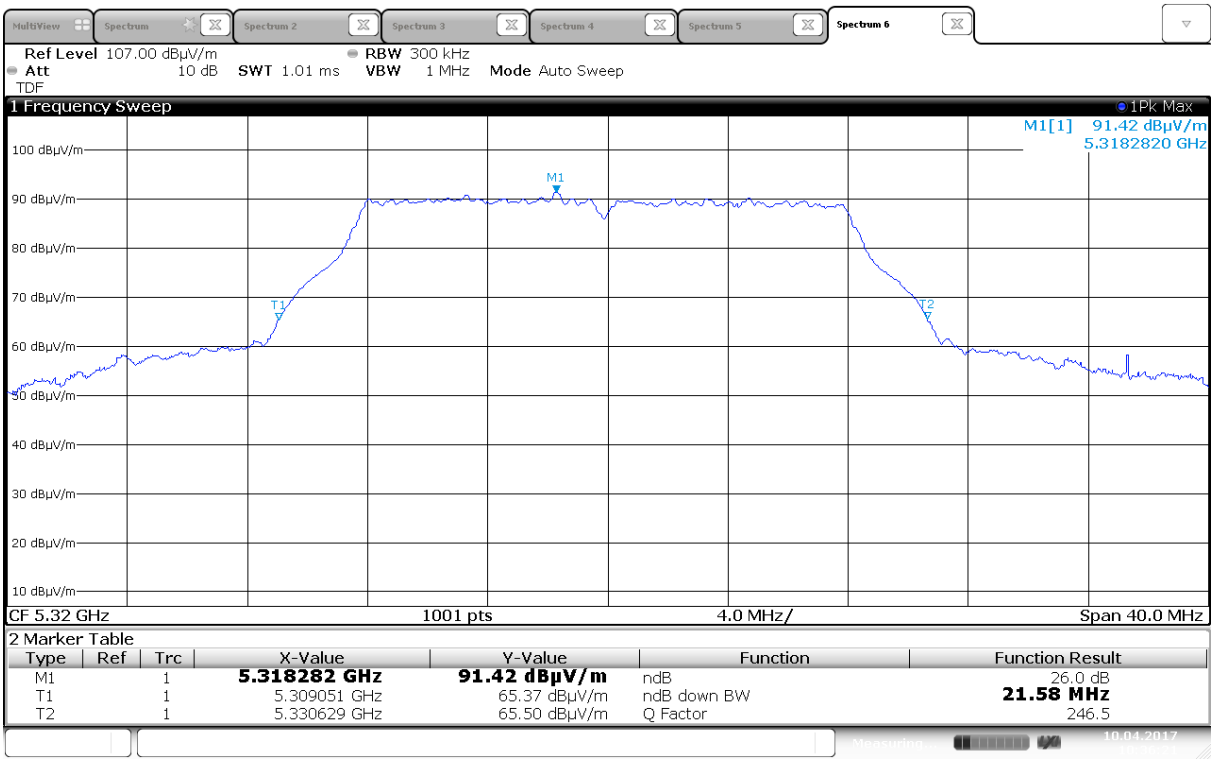
Emission Bandwidth *B*, 5180 MHz, 802.11a 6Mbps, Ant 0



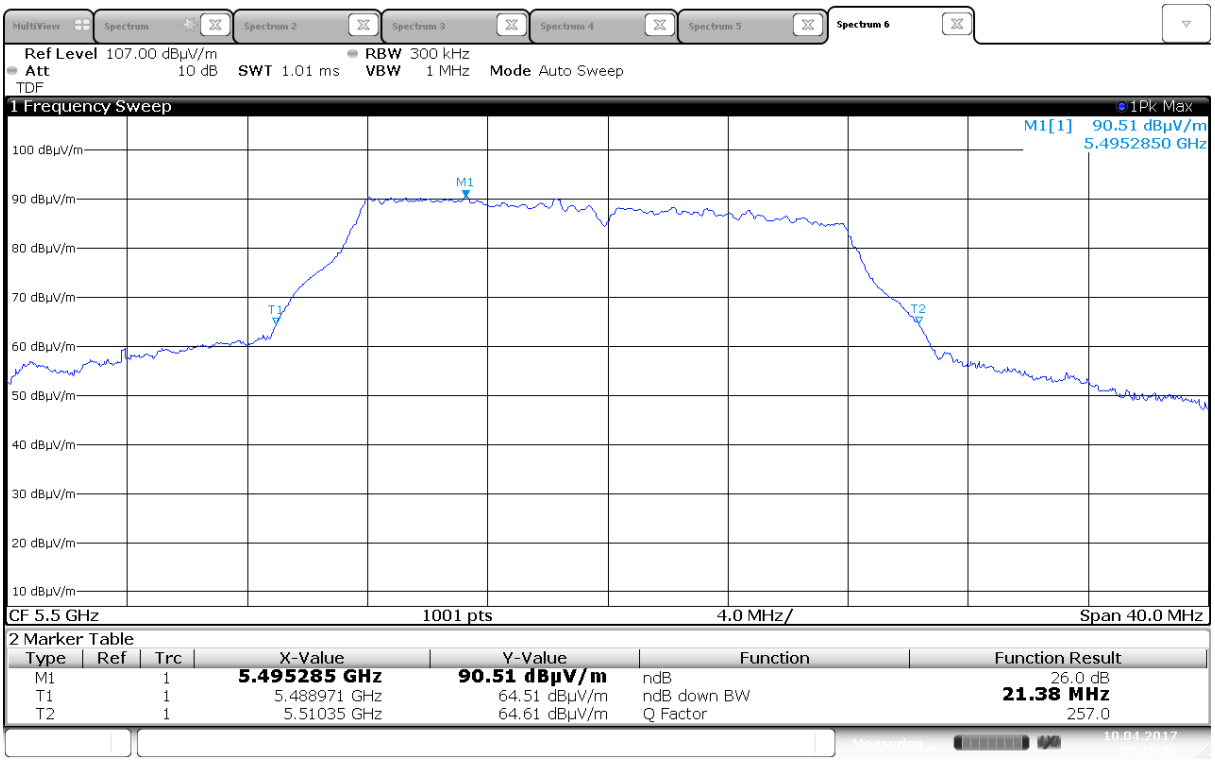
Emission Bandwidth *B*, 5180 MHz, 802.11a 6Mbps, Ant 1



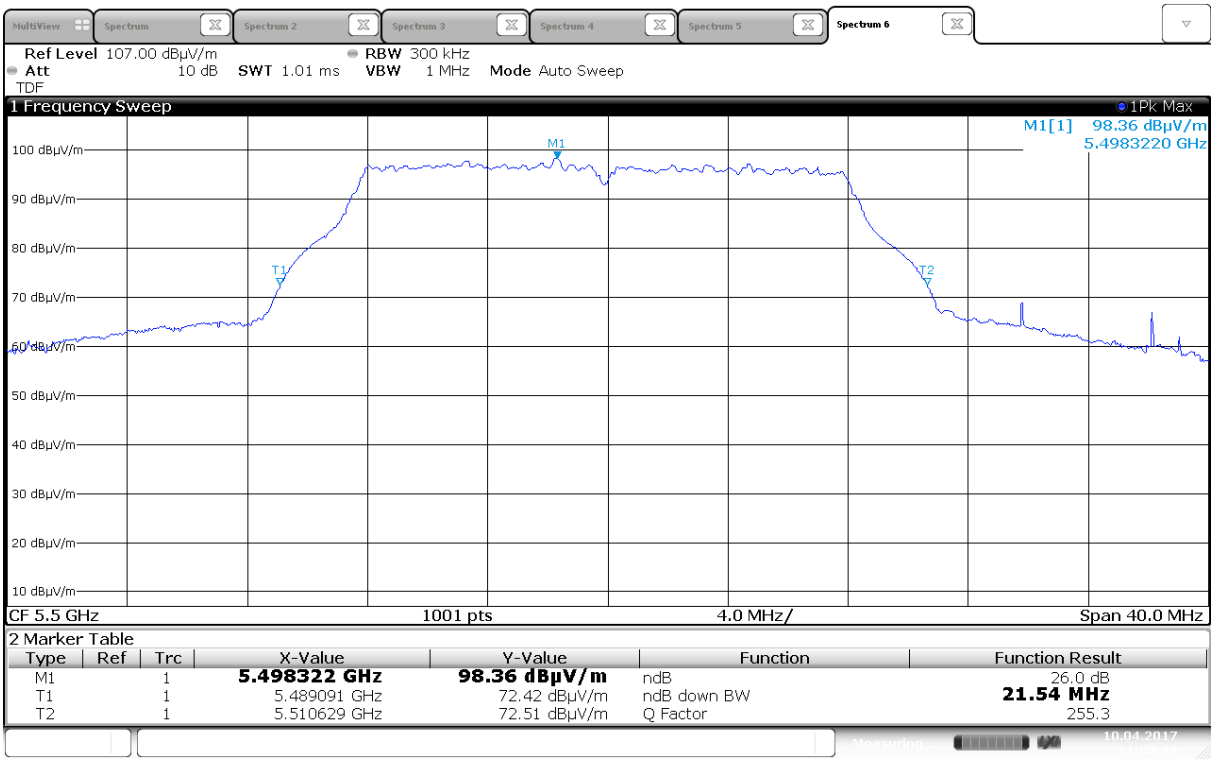
Emission Bandwidth *B*, 5320 MHz, 802.11a 6Mbps, Ant 0



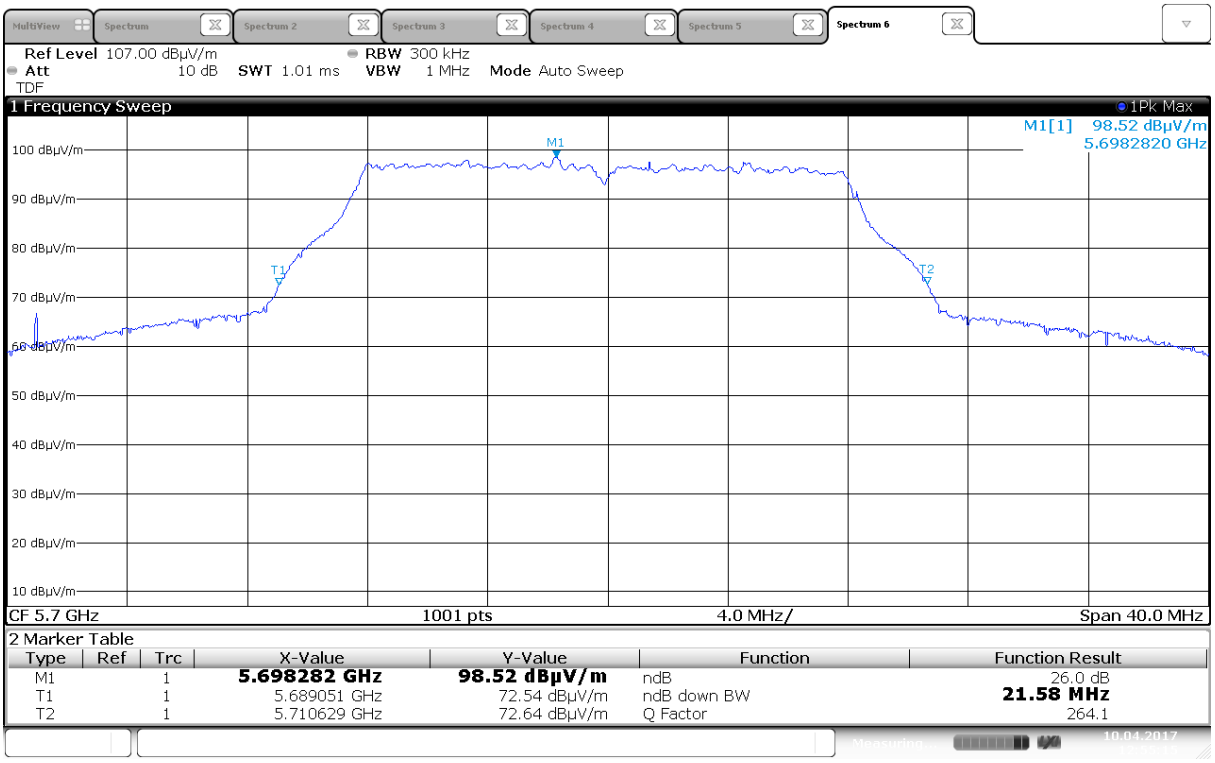
Emission Bandwidth *B*, 5320 MHz, 802.11a 6Mbps, Ant 1



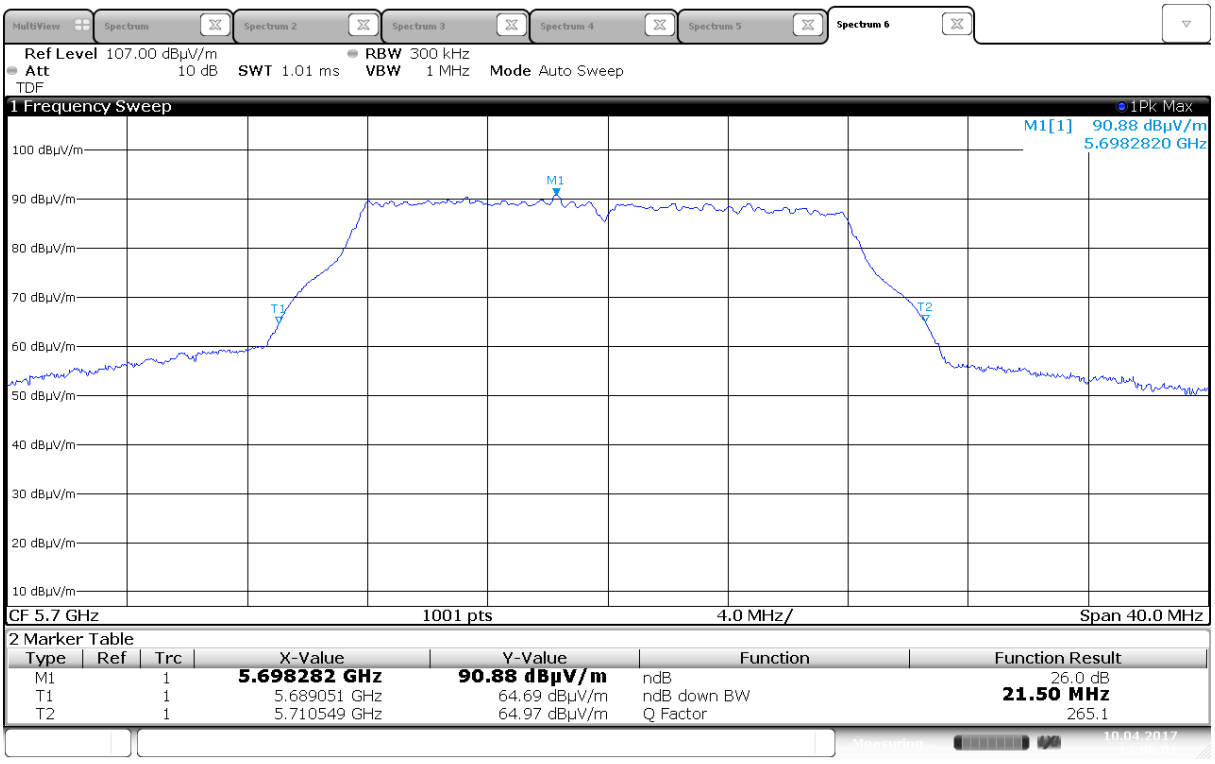
Emission Bandwidth *B*, 5500 MHz, 802.11a 6Mbps, Ant 0



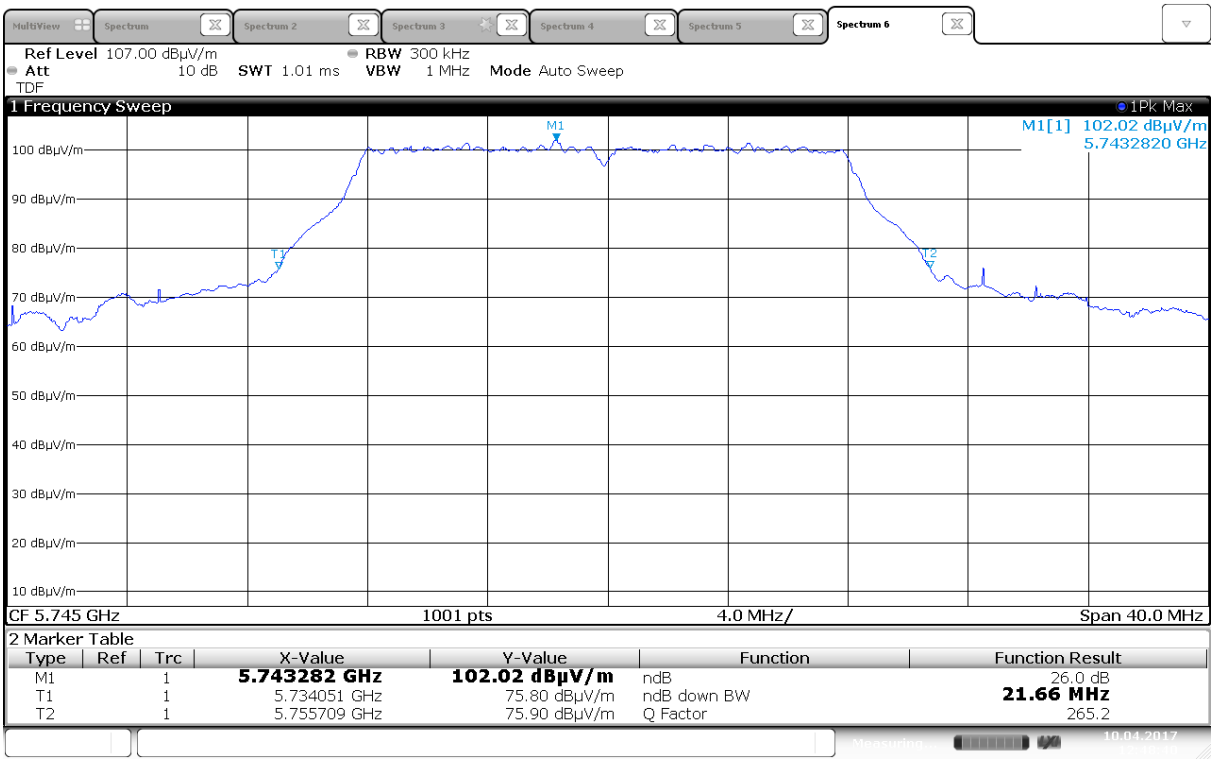
Emission Bandwidth *B*, 5500 MHz, 802.11a 6Mbps, Ant 1



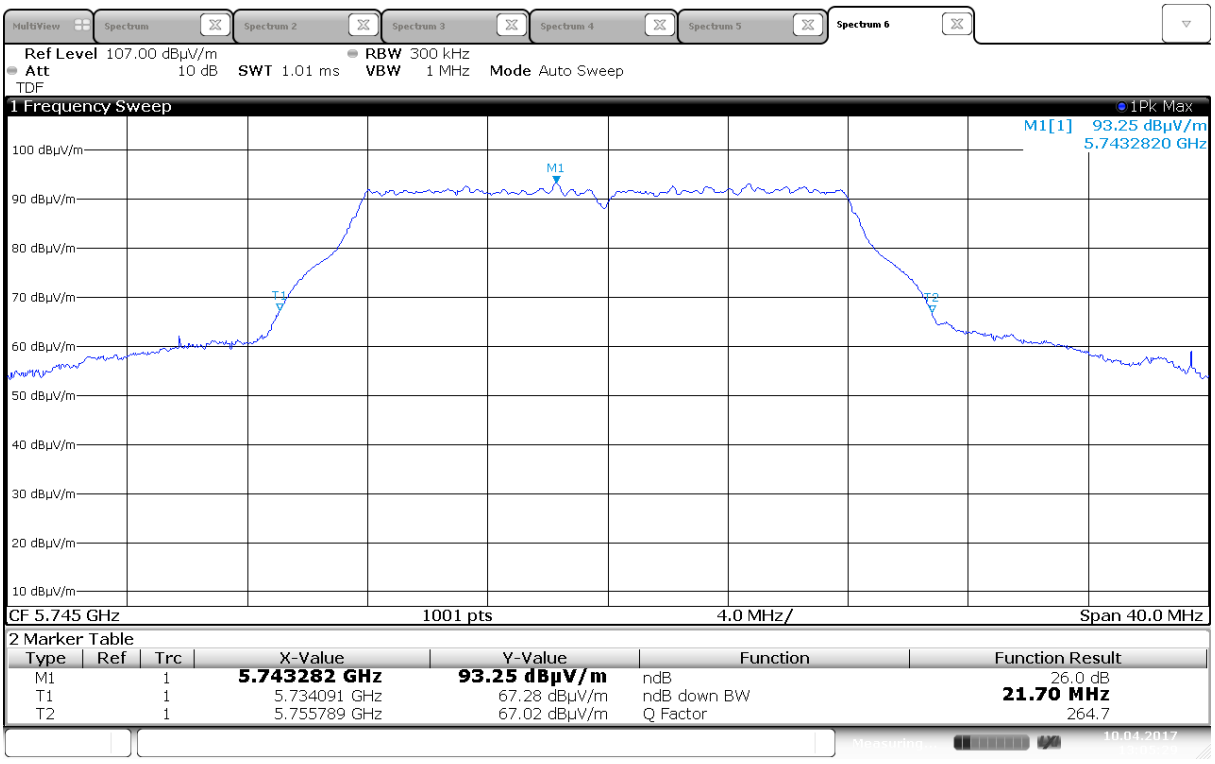
Emission Bandwidth *B*, 5700 MHz, 802.11a 6Mbps, Ant 0



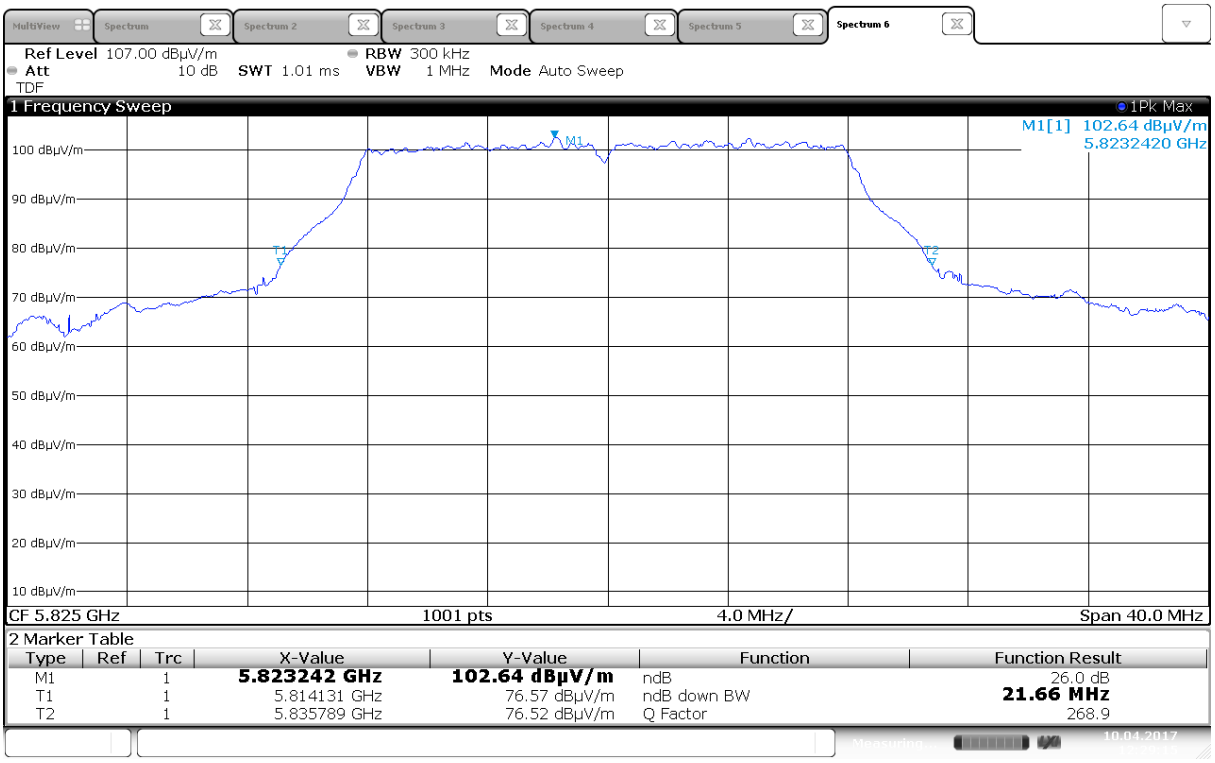
Emission Bandwidth *B*, 5700 MHz, 802.11a 6Mbps, Ant 1



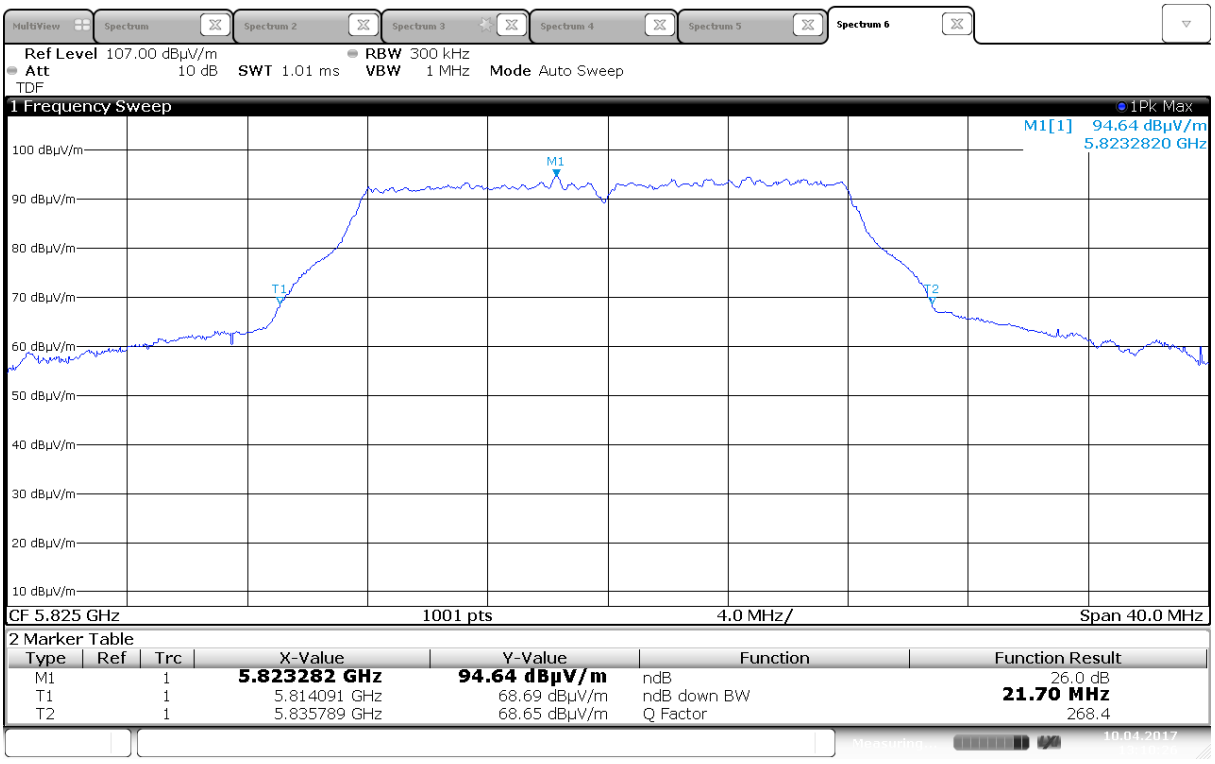
Emission Bandwidth *B*, 5745 MHz, 802.11a 6Mbps, Ant 0



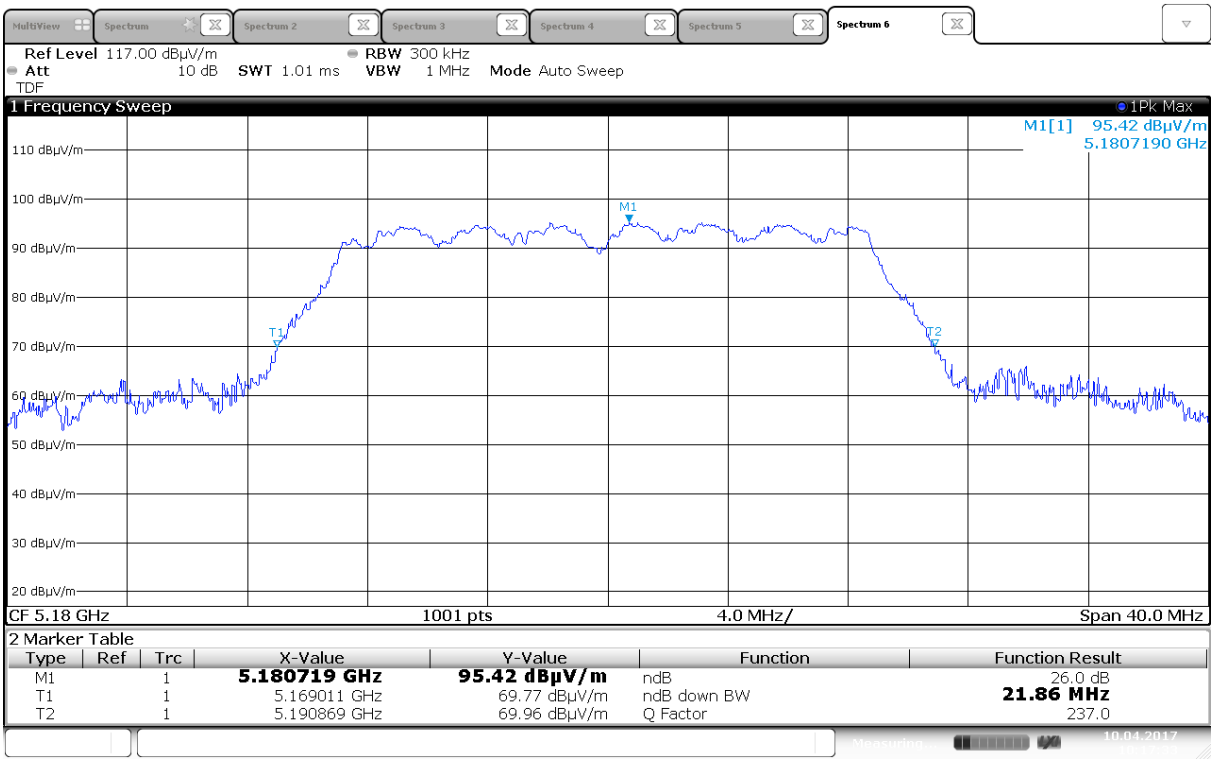
Emission Bandwidth *B*, 5745 MHz, 802.11a 6Mbps, Ant 1



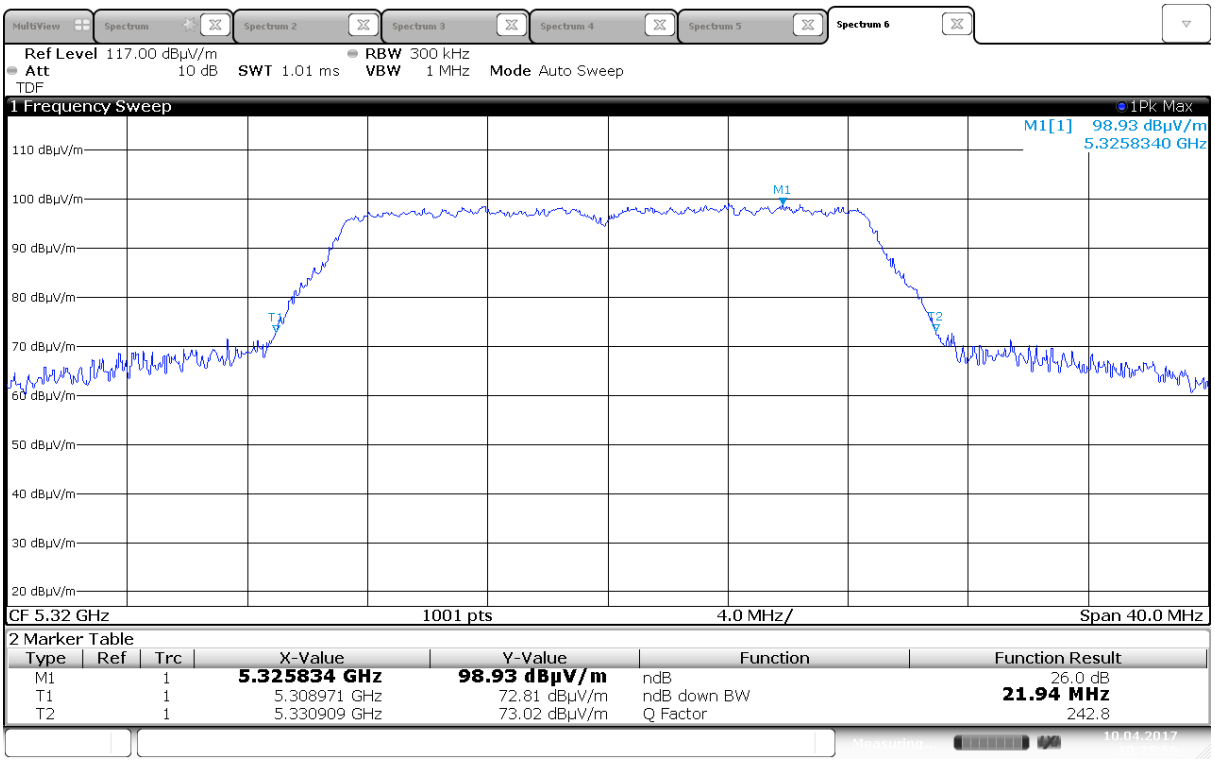
Emission Bandwidth *B*, 5825 MHz, 802.11a 6Mbps, Ant 0



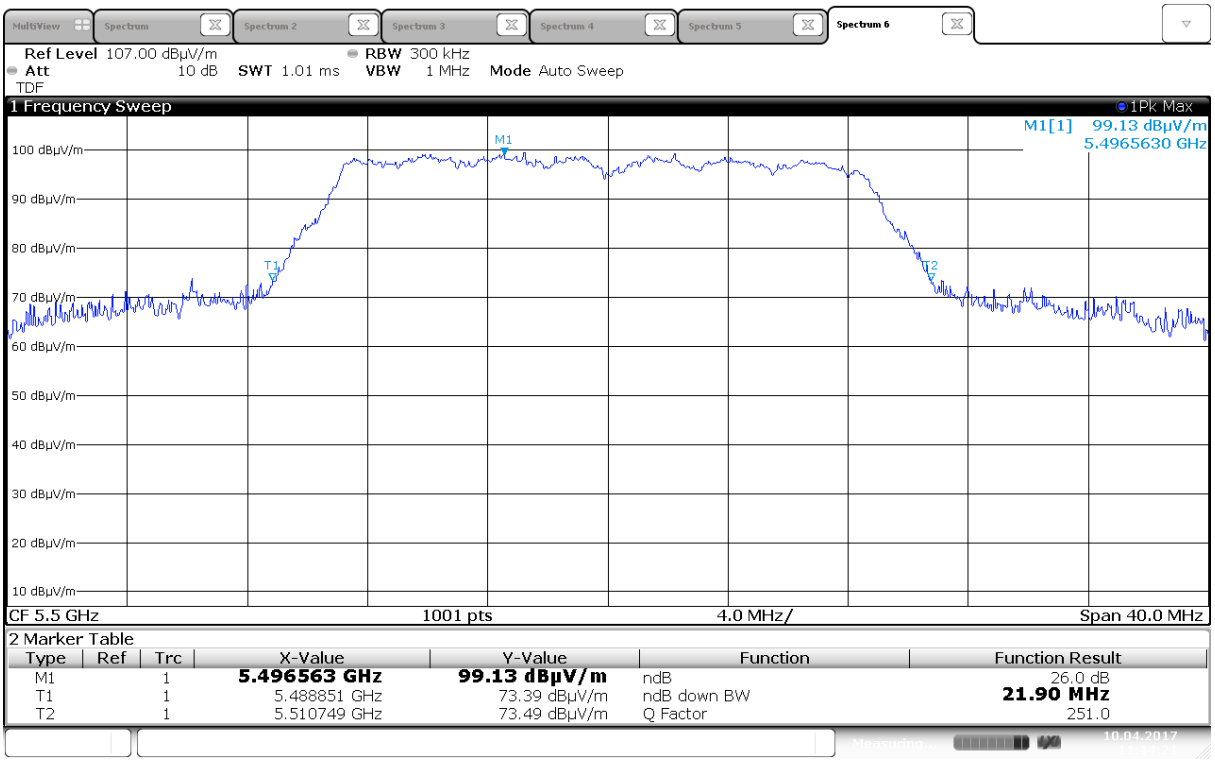
Emission Bandwidth *B*, 5825 MHz, 802.11a 6Mbps, Ant 1



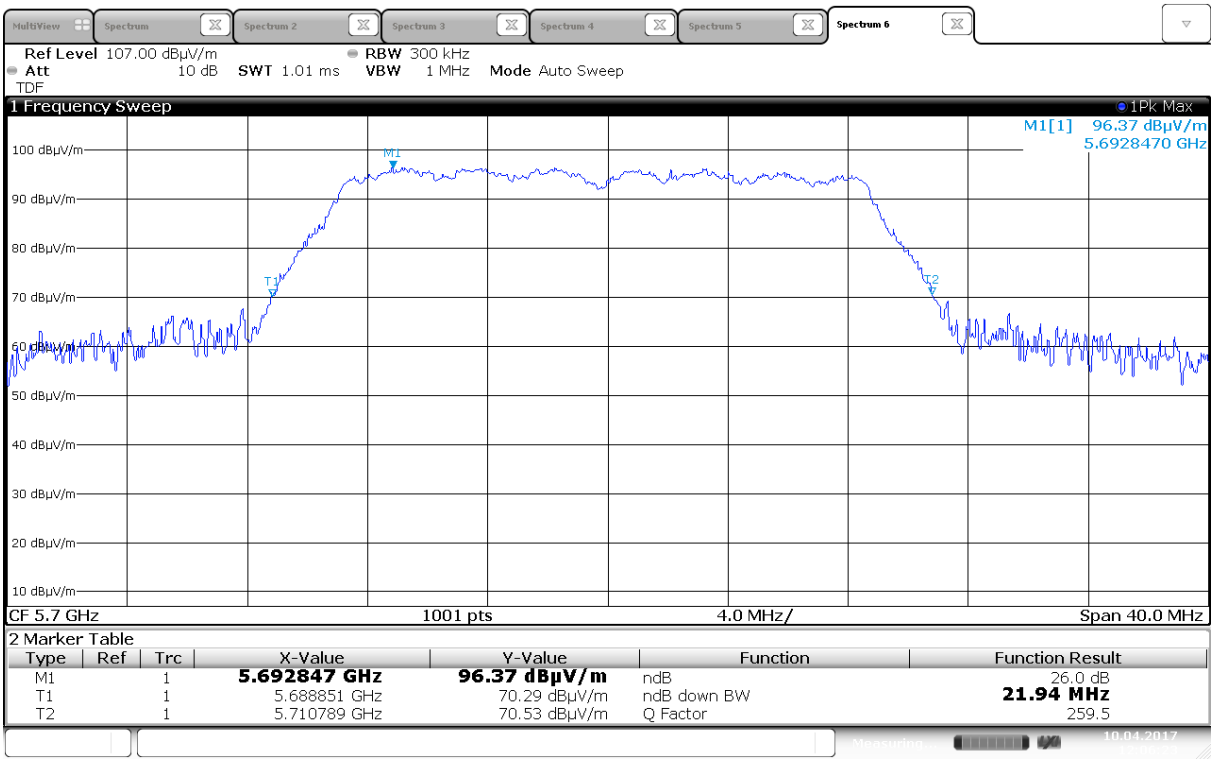
Emission Bandwidth *B*, 5180 MHz, 802.11n HT20, MIMO



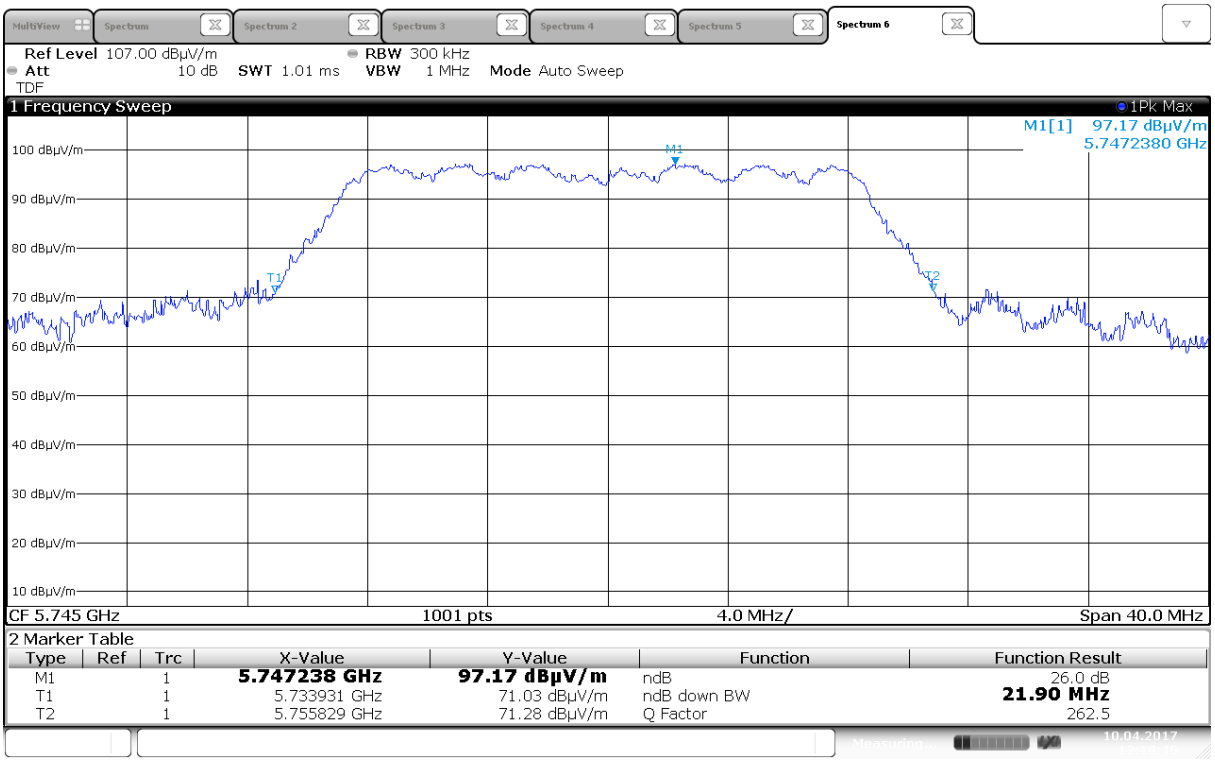
Emission Bandwidth *B*, 5320 MHz, 802.11n HT20, MIMO



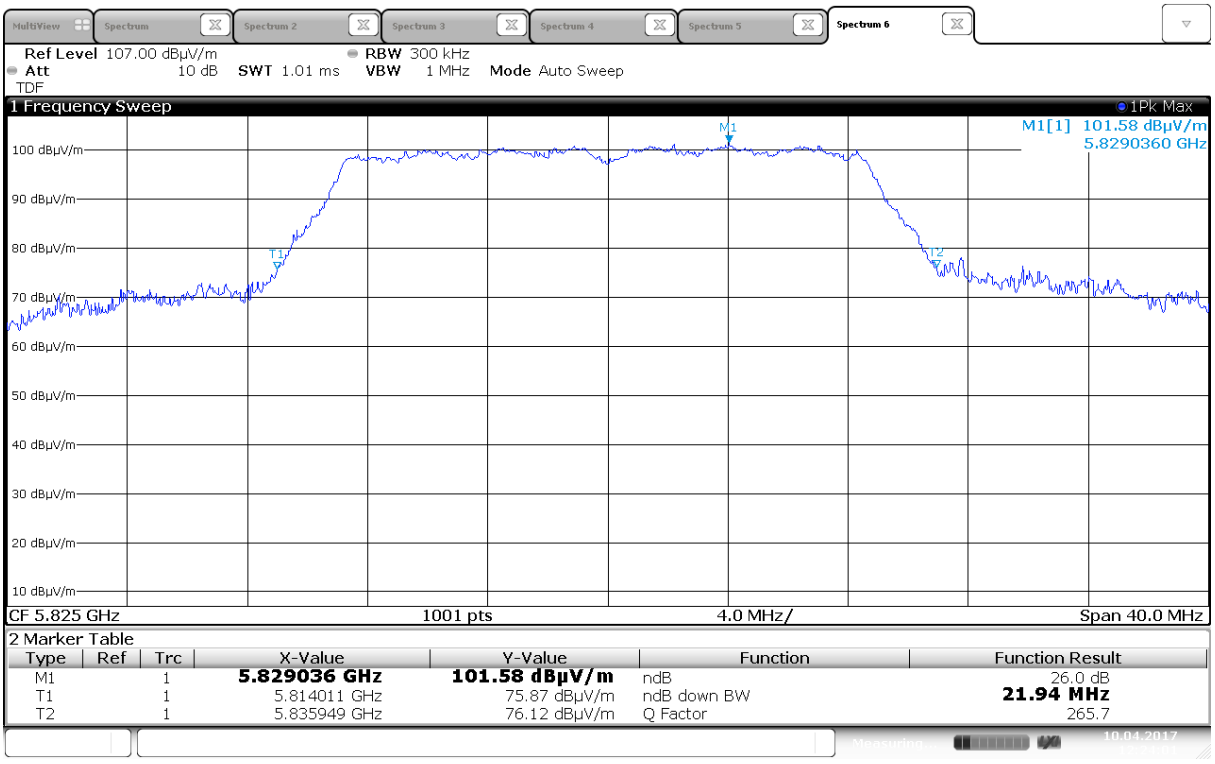
Emission Bandwidth *B*, 5500 MHz, 802.11n HT20, MIMO



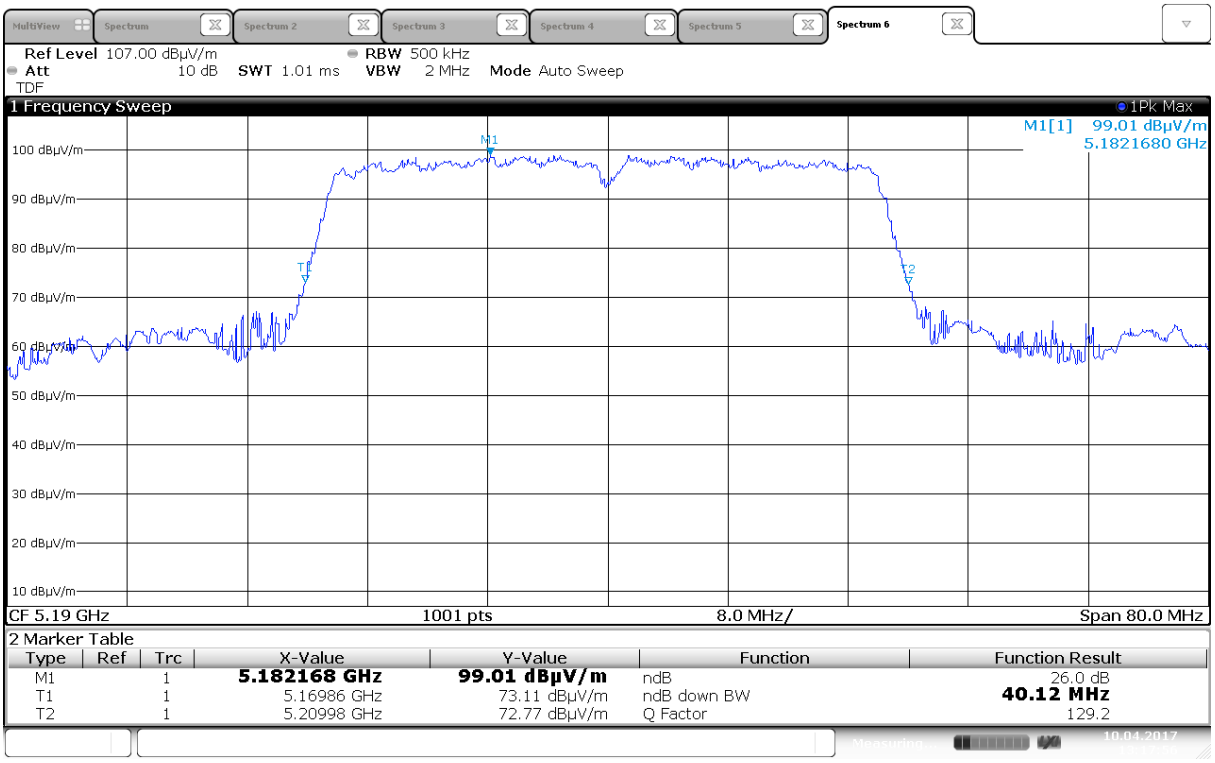
Emission Bandwidth *B*, 5700 MHz, 802.11n HT20, MIMO



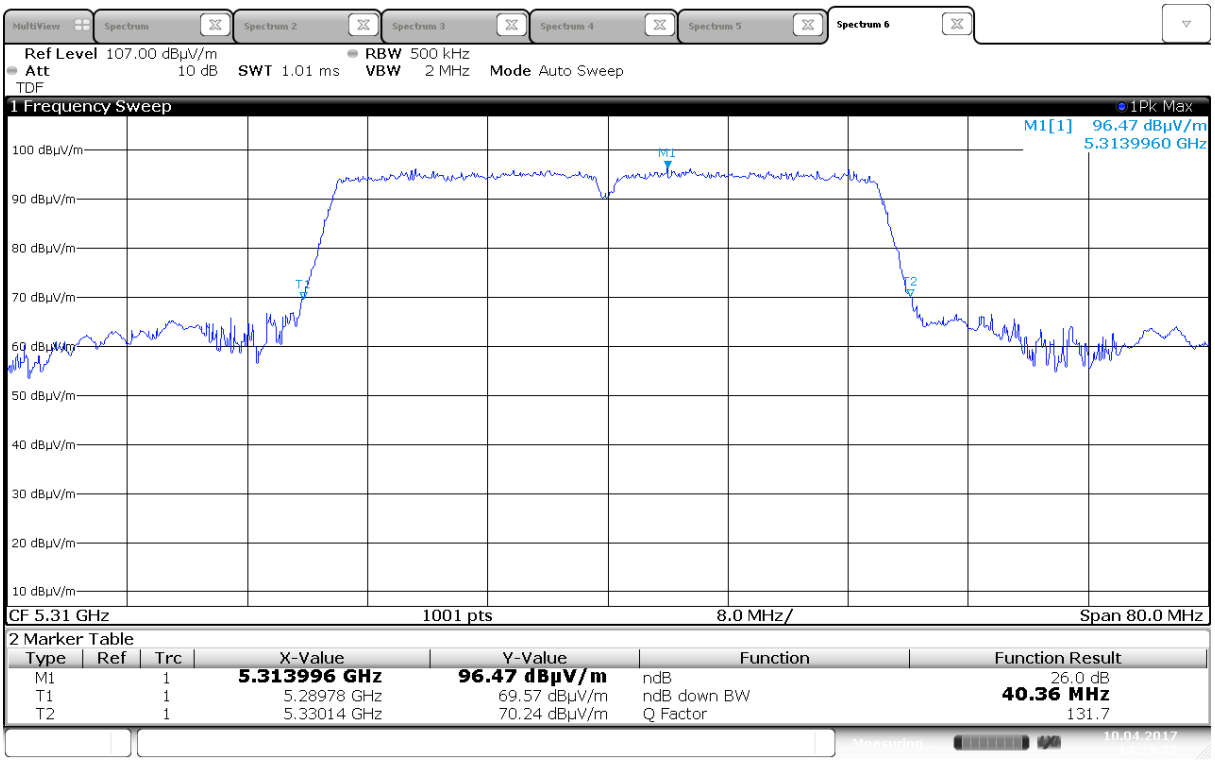
Emission Bandwidth *B*, 5745 MHz, 802.11n HT20, MIMO



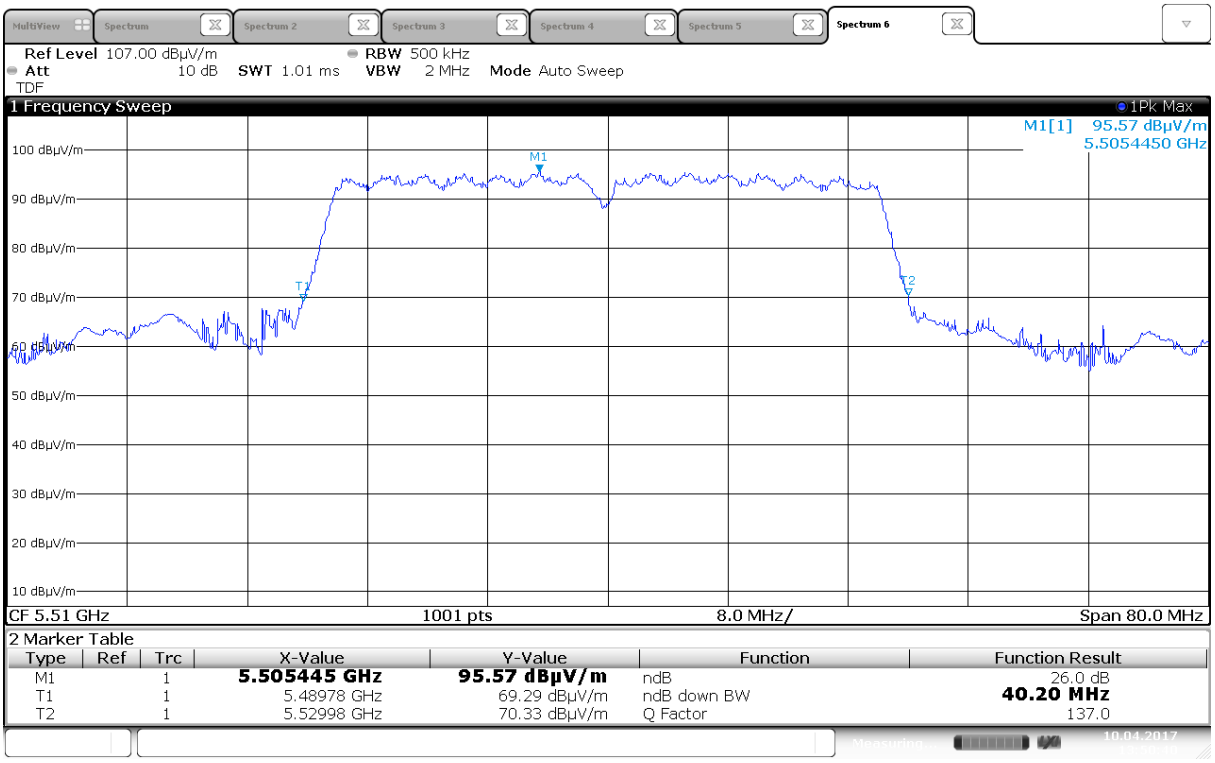
Emission Bandwidth *B*, 5825 MHz, 802.11n HT20, MIMO



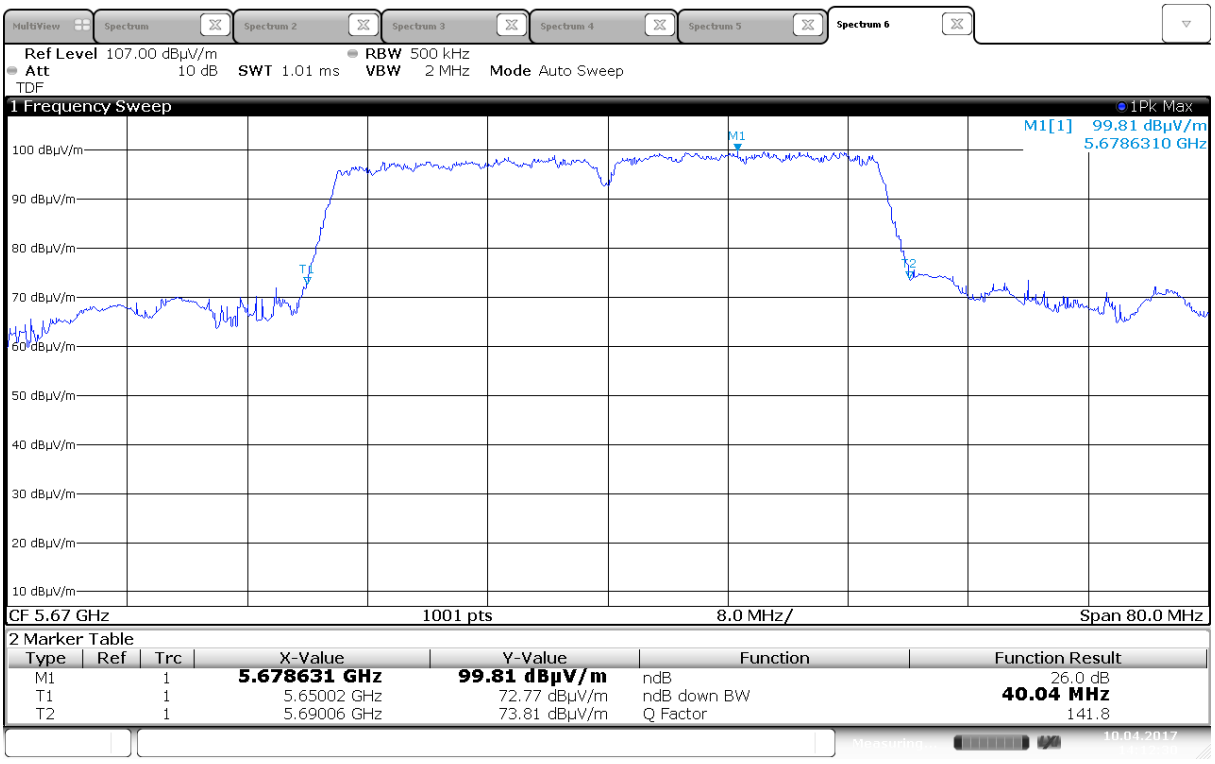
Emission Bandwidth *B*, 5190 MHz, 802.11n HT40, MIMO



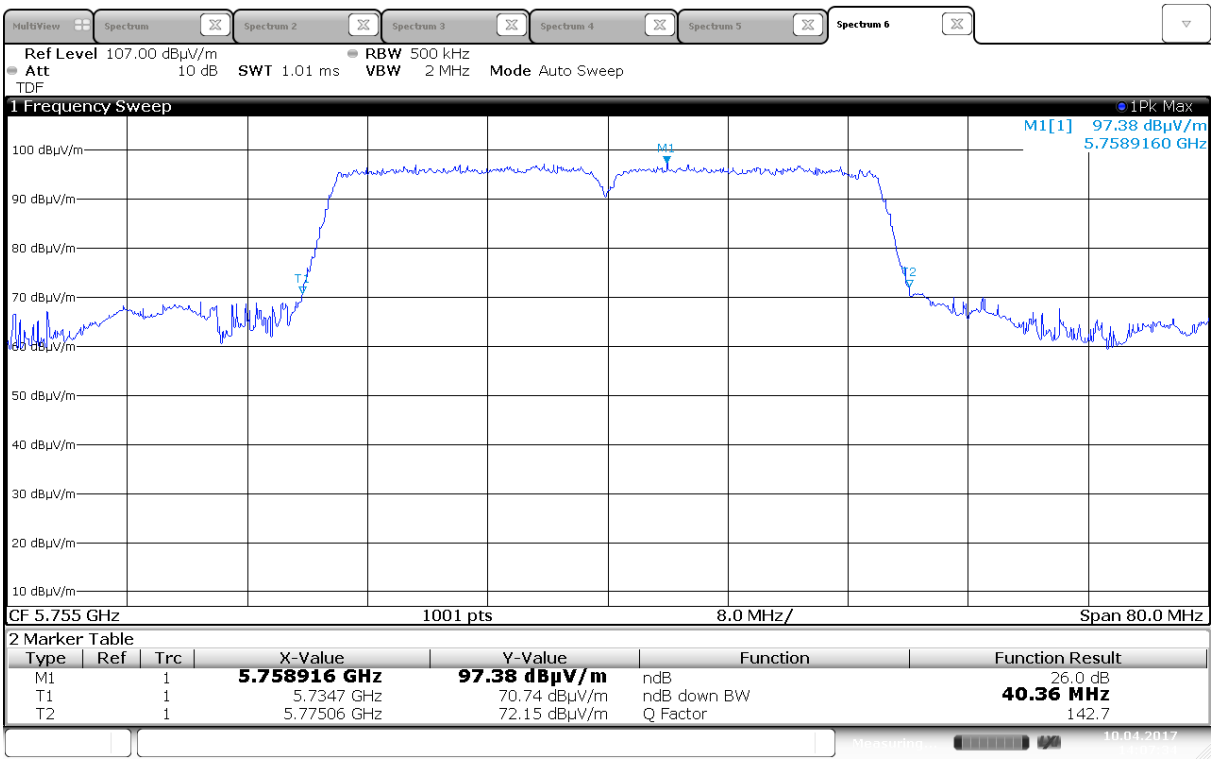
Emission Bandwidth *B*, 5310 MHz, 802.11n HT40, MIMO



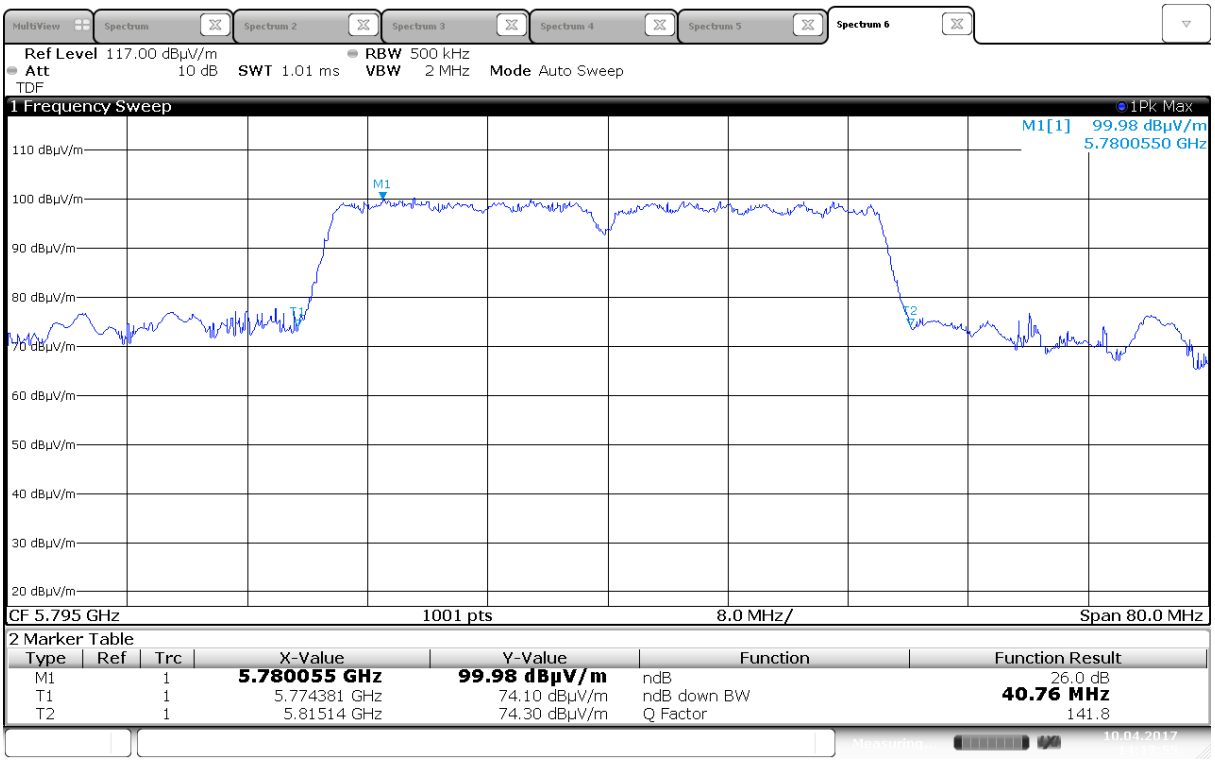
Emission Bandwidth *B*, 5510 MHz, 802.11n HT40, MIMO



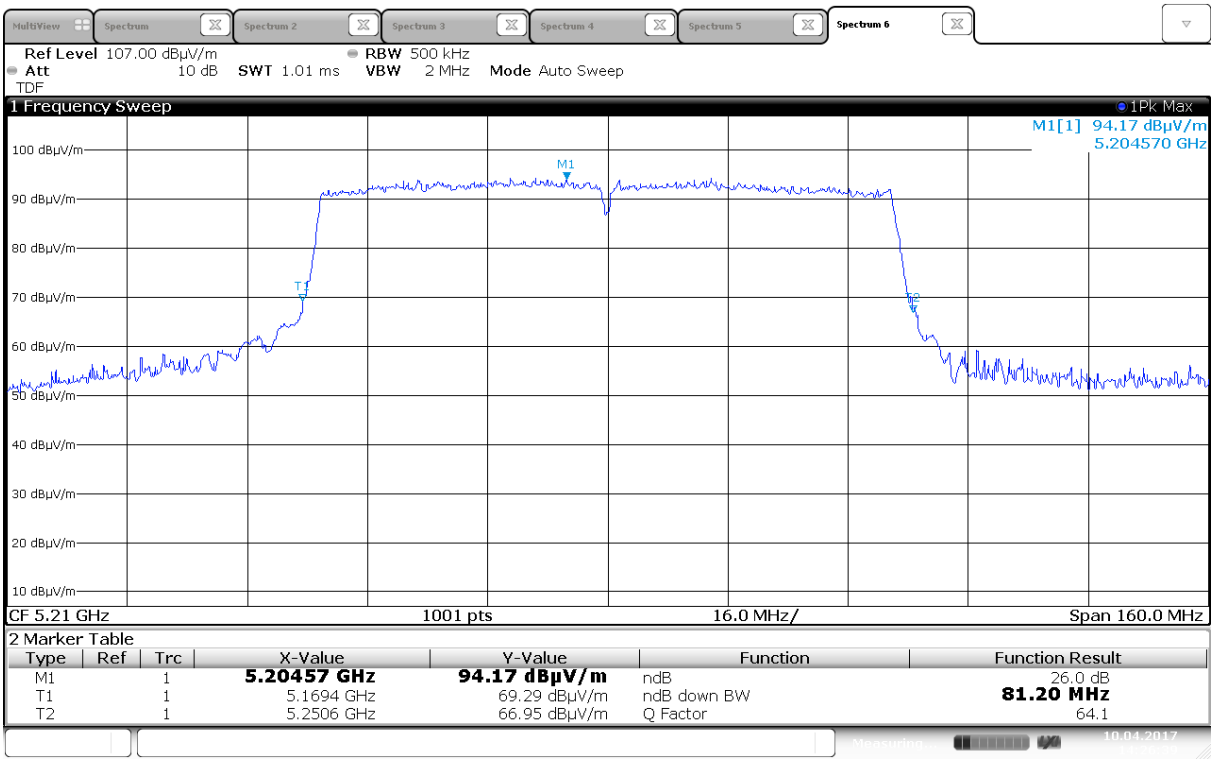
Emission Bandwidth *B*, 5670 MHz, 802.11n HT40, MIMO



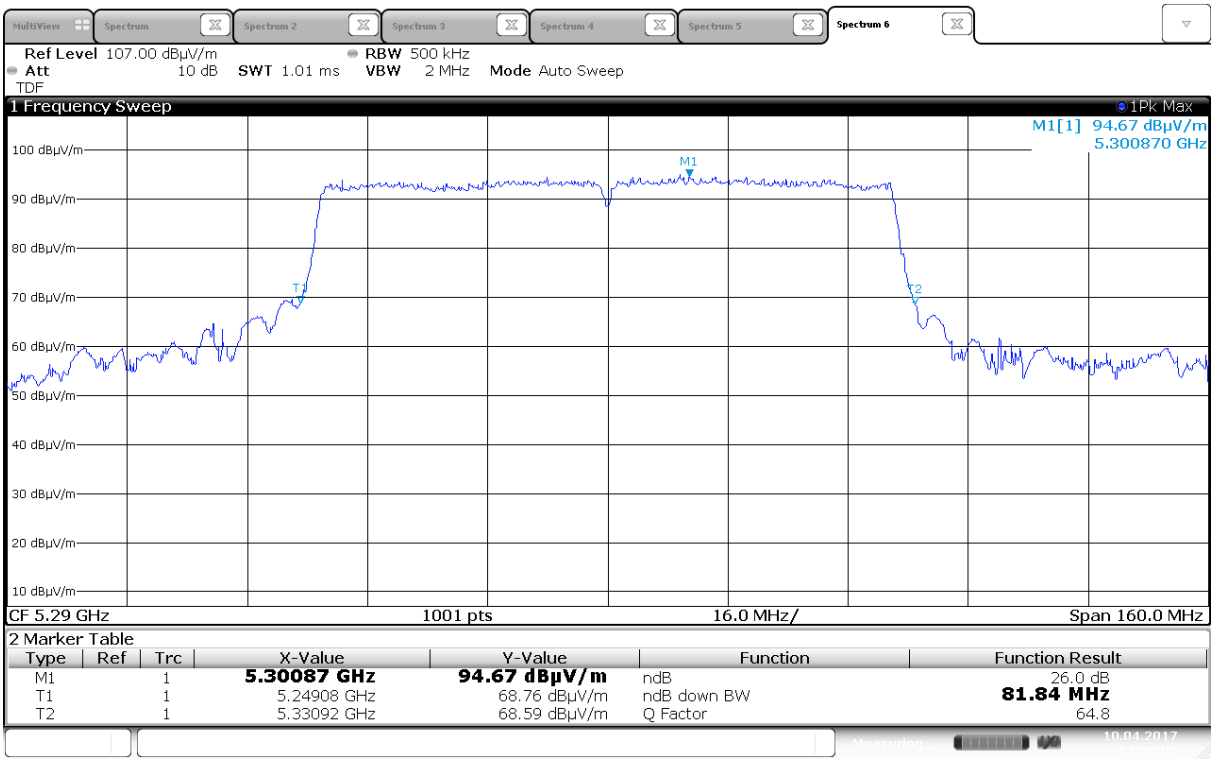
Emission Bandwidth *B*, 5755 MHz, 802.11n HT40, MIMO



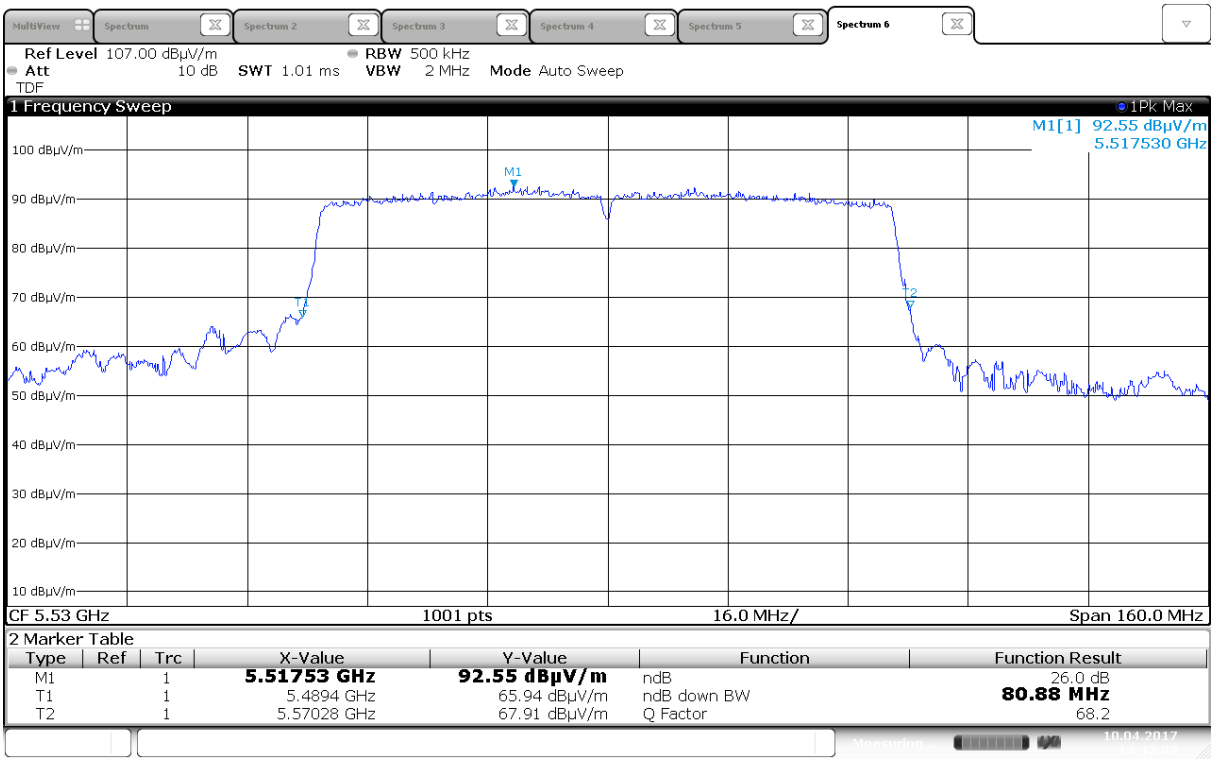
Emission Bandwidth *B*, 5795 MHz, 802.11n HT40, MIMO



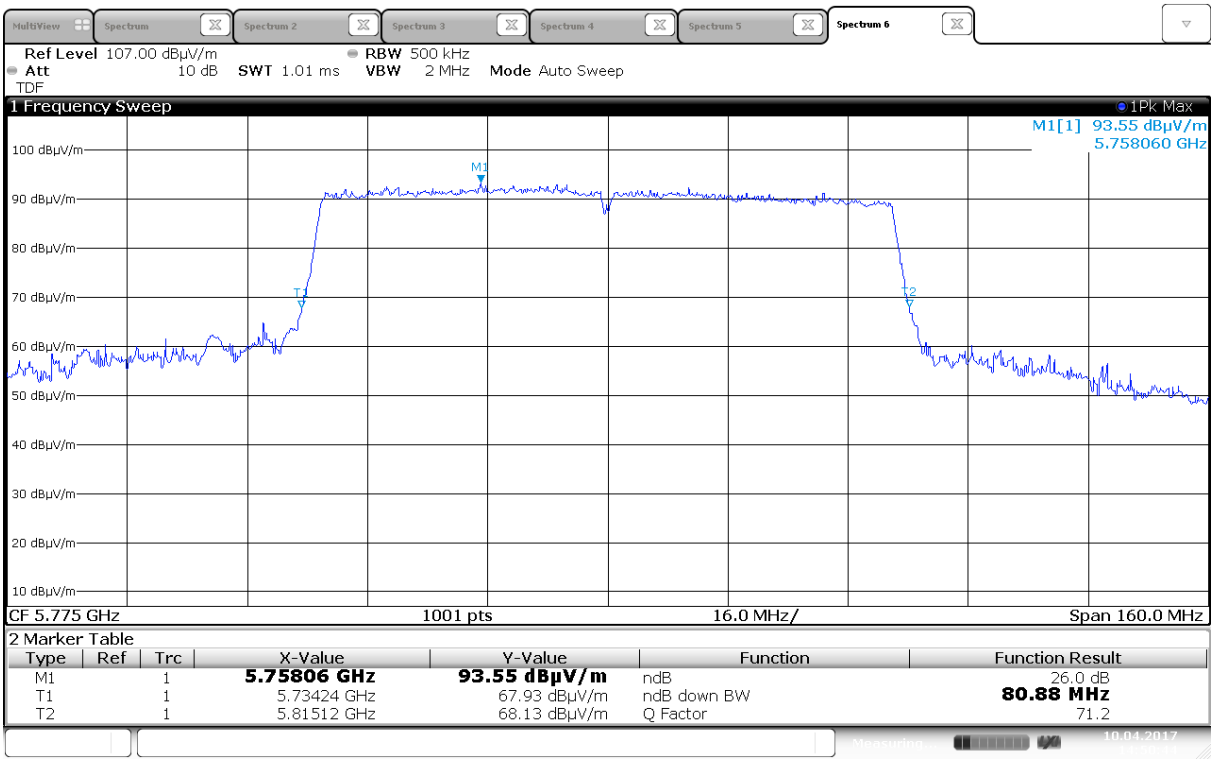
Emission Bandwidth *B*, 5210 MHz, 802.11n HT80, MIMO



Emission Bandwidth *B*, 5290 MHz, 802.11n HT80, MIMO



Emission Bandwidth *B*, 5530 MHz, 802.11n HT80, MIMO



Emission Bandwidth *B*, 5775 MHz, 802.11n HT80, MIMO

3.4 Peak Power Spectral Density, EIRP

FCC 15.407(a)

ISED RSS-247 Issue 2, Clause 6.2

Test Results: Complies

Measurement Data:

Ch. No.	Nominal Frequency (MHz)	PPSD EIRP (dBm/MHz)			
		802.11a	802.11n HT20	802.11n HT40	802.11n HT80
36	5180	**3.5**	**-2.6**		
40	5200	3.5	1.0		
48	5240	4.4	3.1		
52	5260	6.9	11.0		
60	5300	5.4	9.2		
64	5320	**-1.6**	**0.8**		
100	5500	**-0.1**	**0.7**		
116	5580	7.0	9.2		
140	5700	**0.0**	**-1.3**		
149	5745	**0.5**	**-2.5**		
157	5785	9.2	11.5		
165	5825	**1.3**	**0.8**		
38	5190			**-0.9**	
46	5230			2.7	
54	5270			6.7	
62	5310			**-3.9**	
102	5510			**-4.3**	
110	5550			6.7	
134	5670			**-1.2**	
151	5755			**-6.0**	
159	5795			**-2.8**	
42	5210				**-6.2**
58	5290				**-5.6**
106	5530				**-8.1**
155	5775				**-10.6**

* Values in U-NII Band 3 are dBm/500kHz

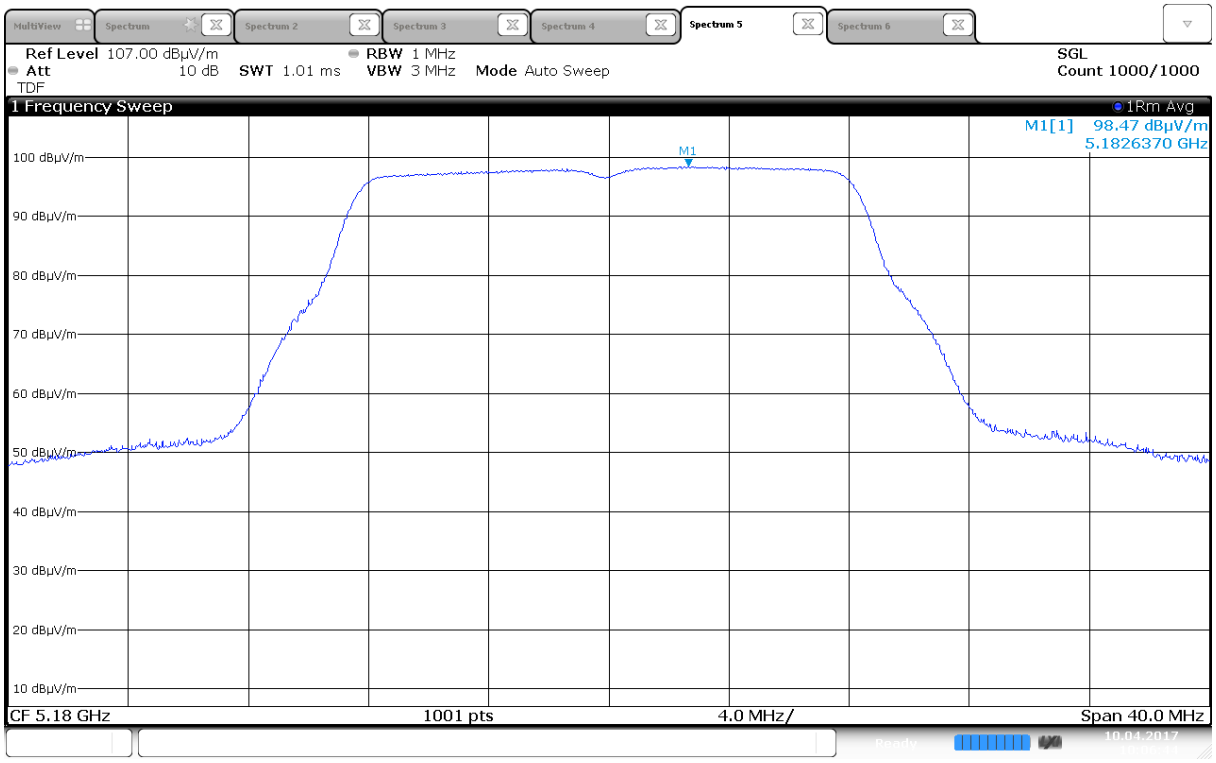
Values in boldface are measured values, all other values are calculated from values in UL report no. 15U21878-E4V2, and corrected for antenna gain.

Measurements were performed radiated.

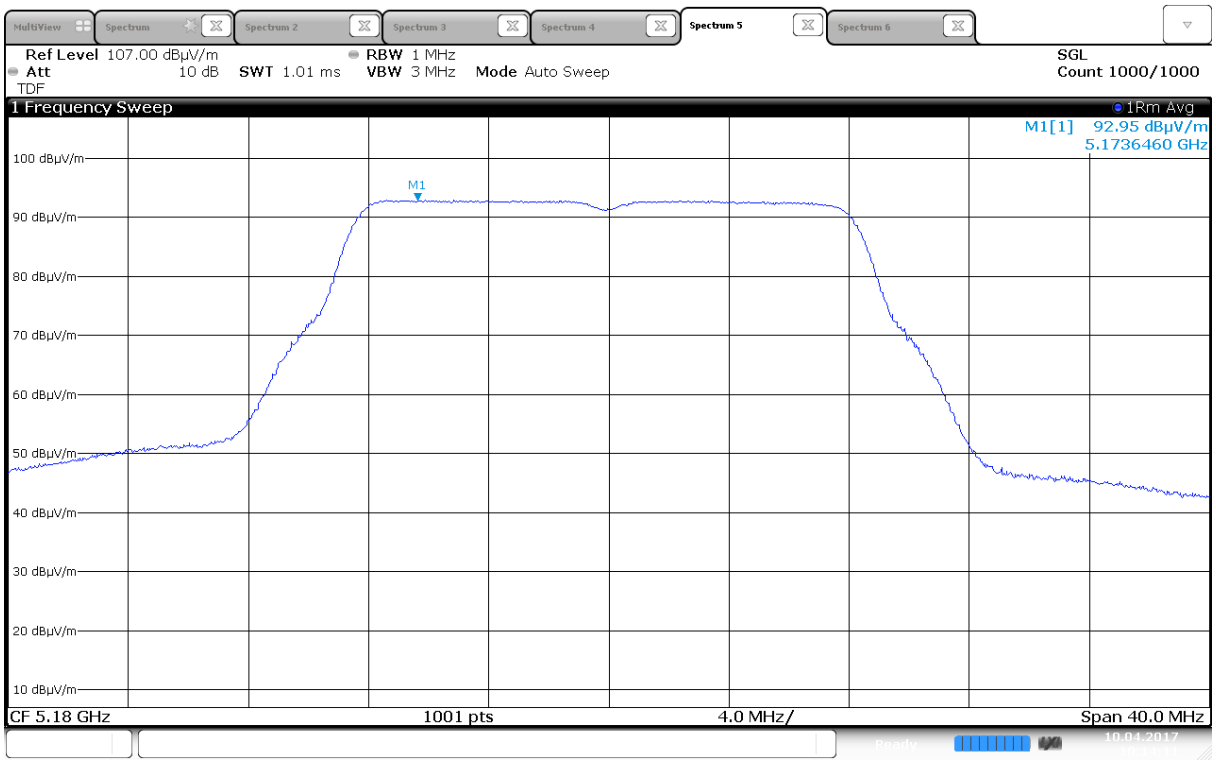
Power Spectral Density limits:

Frequency Band	**Max Conducted Power Spectral Density**	
	FCC 15.407(a)	**RSS-247 Issue 2**
5150 – 5250 MHz	17 dBm/MHz for master device 11 dBm/MHz for mobile/ portable client device	10 dBm/MHz (only indoor allowed)
5250 – 5350 MHz	11 dBm/MHz	The lesser of 30 dBm/MHz or $17 + 10\log_{10}B$ dBm/MHz (B is 99% BW in MHz)
5470 – 5725 MHz	11 dBm/MHz	The lesser of 30 dBm/MHz or $17 + 10\log_{10}B$ dBm/MHz (B is 99% BW in MHz)
5725 – 5825 MHz	30 dBm/500kHz	30 dBm/500kHz

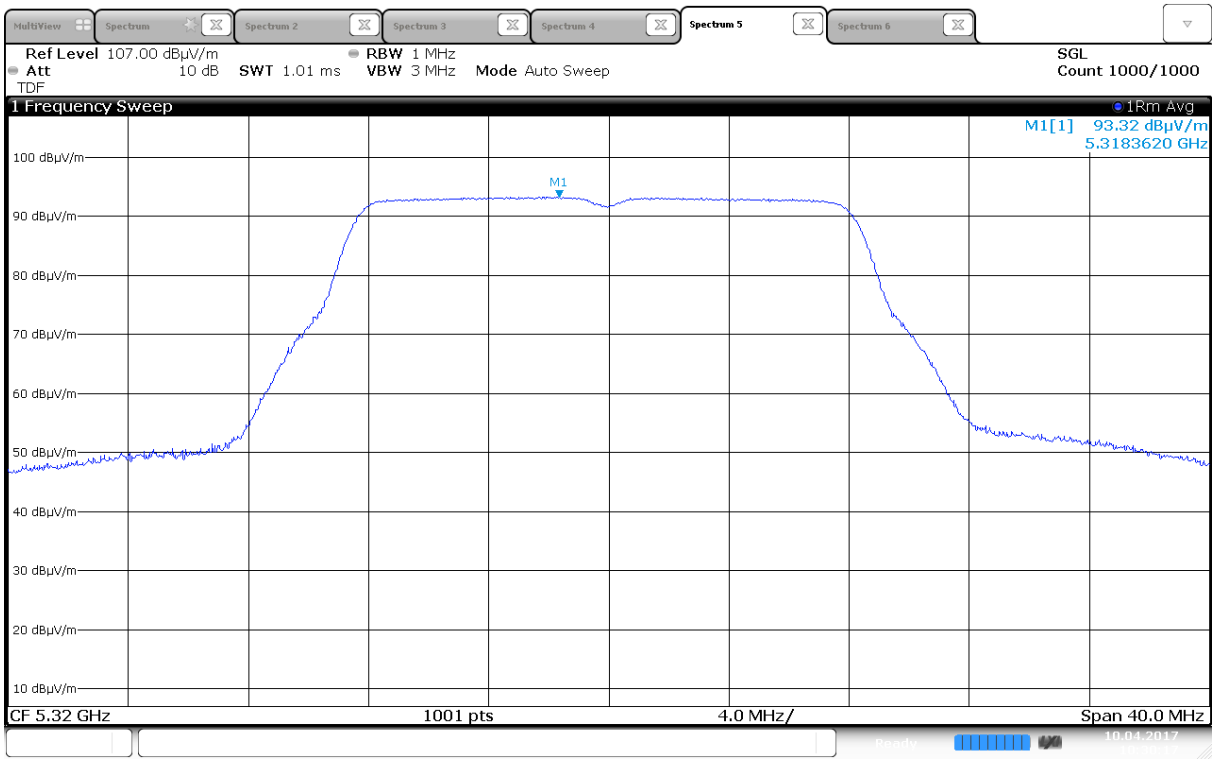
If transmitting antennas of directional gain greater than 6 dBi are used, the power spectral density from the intentional radiator shall be reduced below the stated value above by the amount in dB that the directional gain of the antenna exceeds 6 dBi.



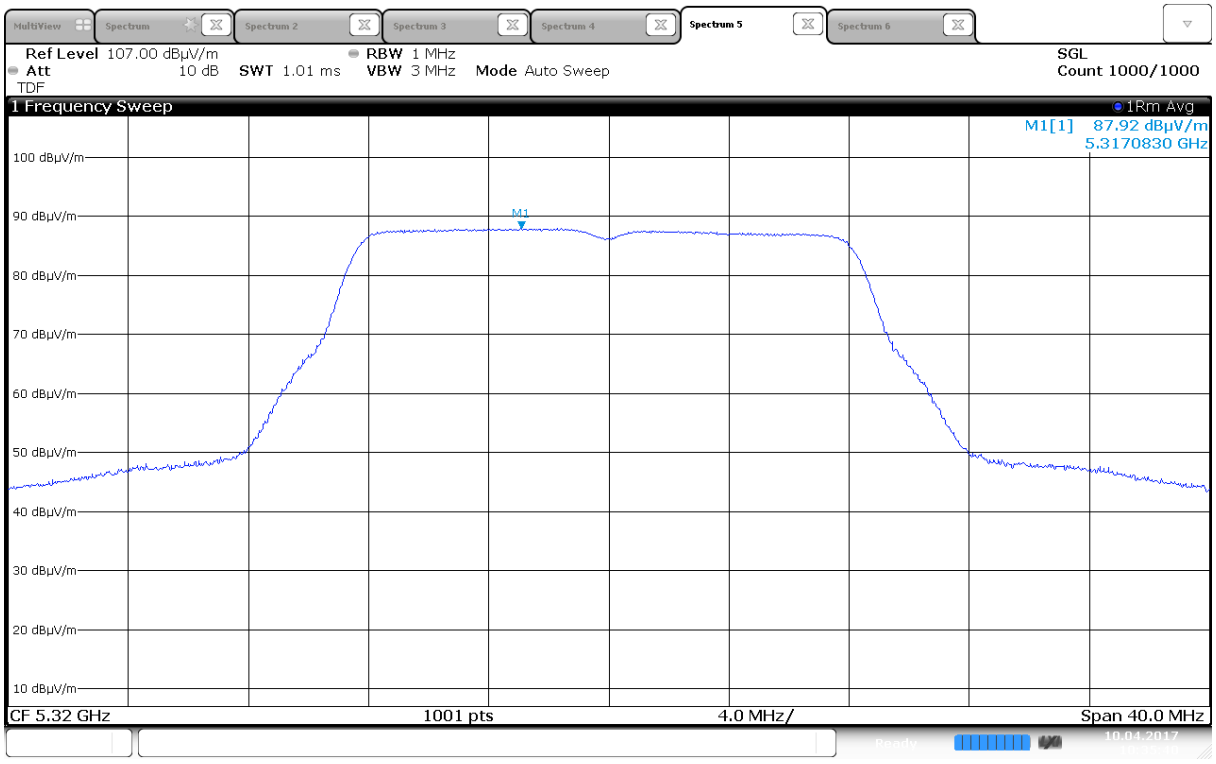
Power Spectral Density, 5180 MHz, 802.11a 6Mbps, Ant 0



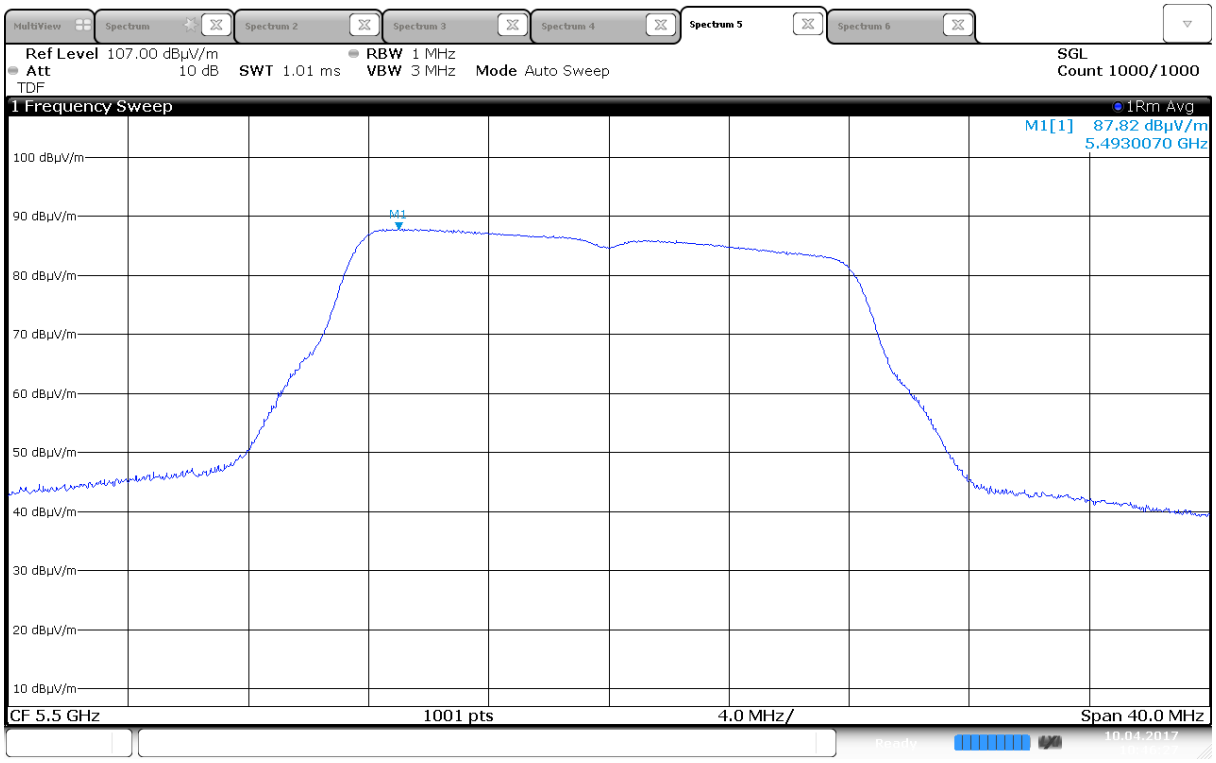
Power Spectral Density, 5180 MHz, 802.11a 6Mbps, Ant 1



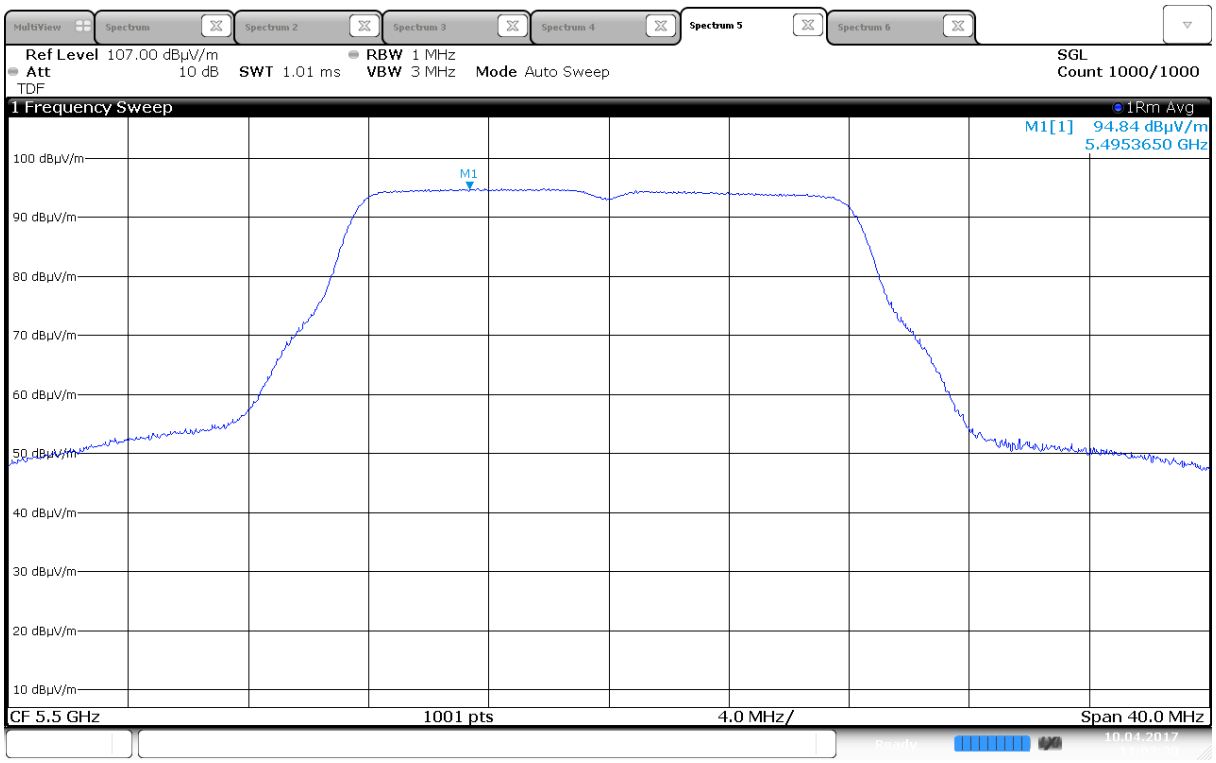
Power Spectral Density, 5320 MHz, 802.11a 6Mbps, Ant 0



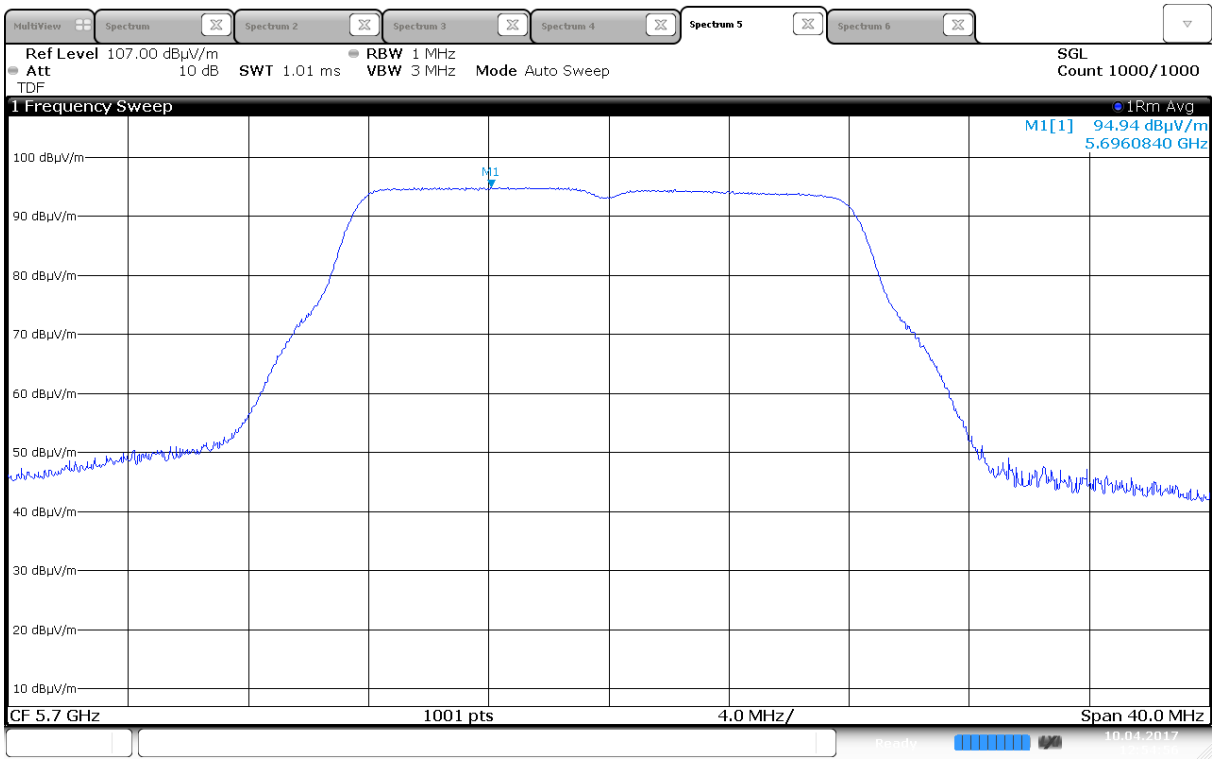
Power Spectral Density, 5320 MHz, 802.11a 6Mbps, Ant 1



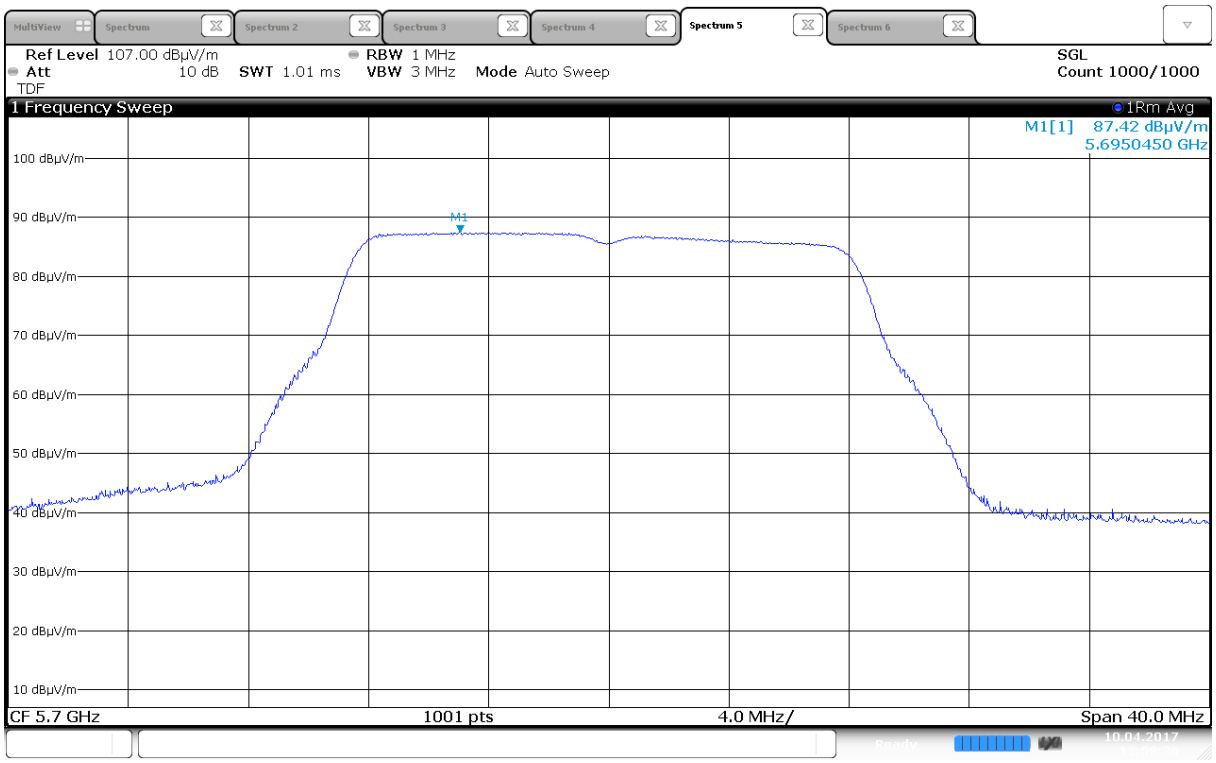
Power Spectral Density, 5500 MHz, 802.11a 6Mbps, Ant 0



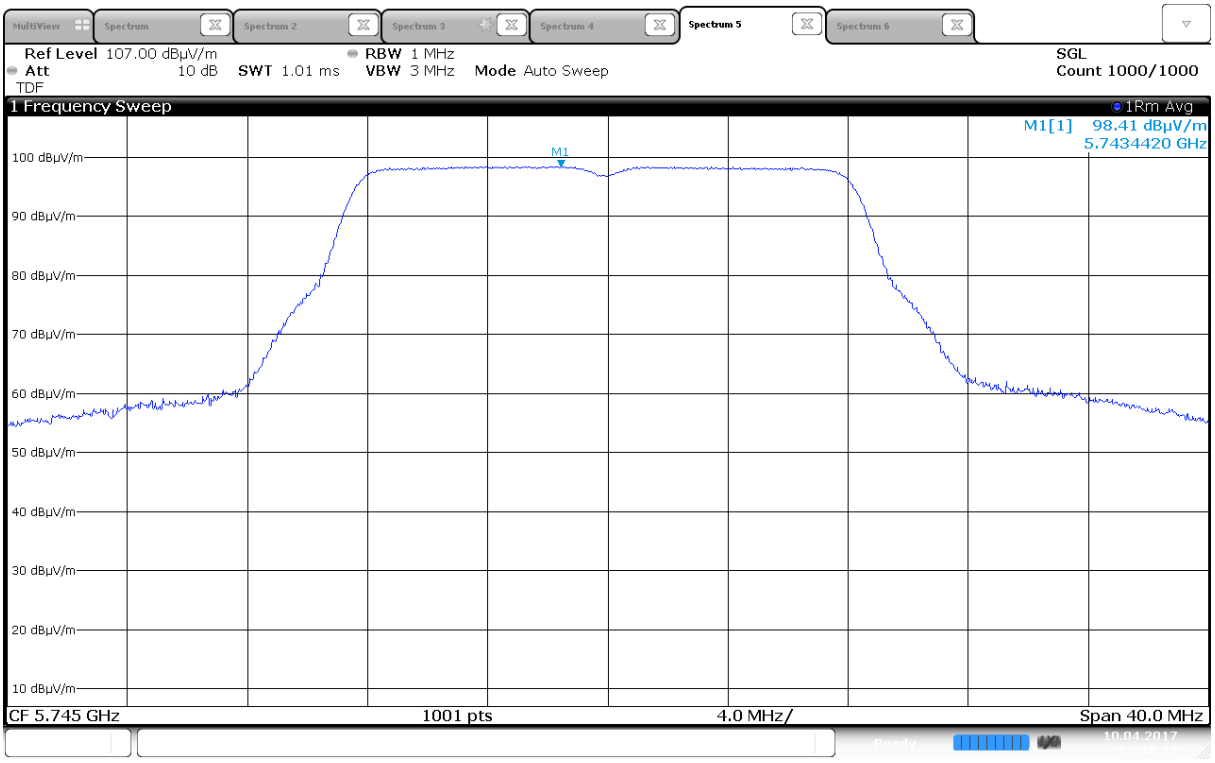
Power Spectral Density, 5500 MHz, 802.11a 6Mbps, Ant 1



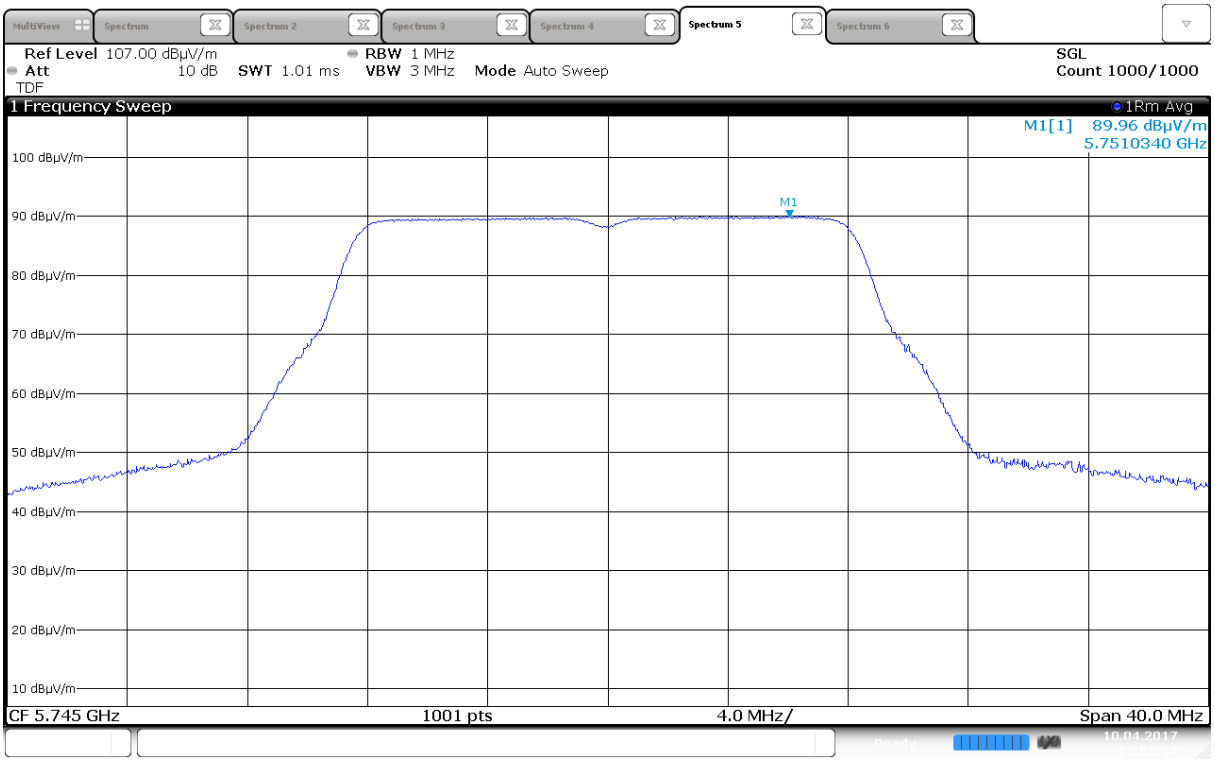
Power Spectral Density, 5700 MHz, 802.11a 6Mbps, Ant 0



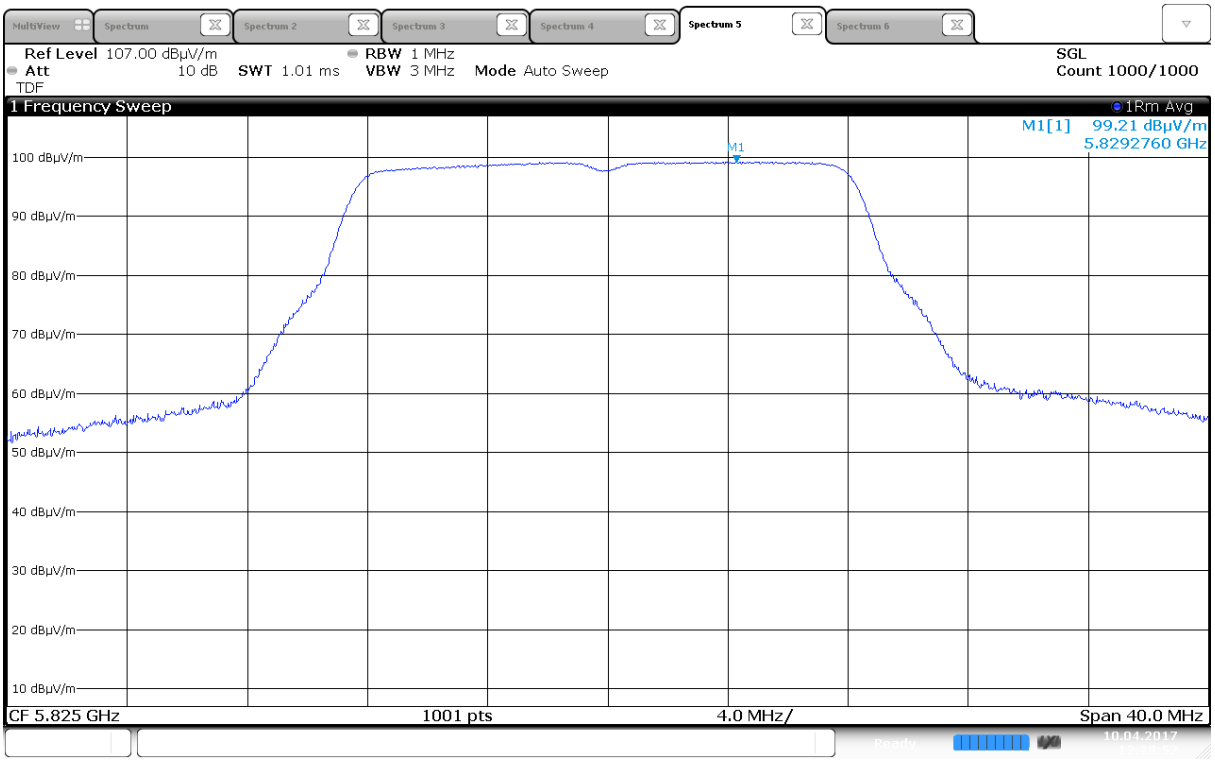
Power Spectral Density, 5700 MHz, 802.11a 6Mbps, Ant 1



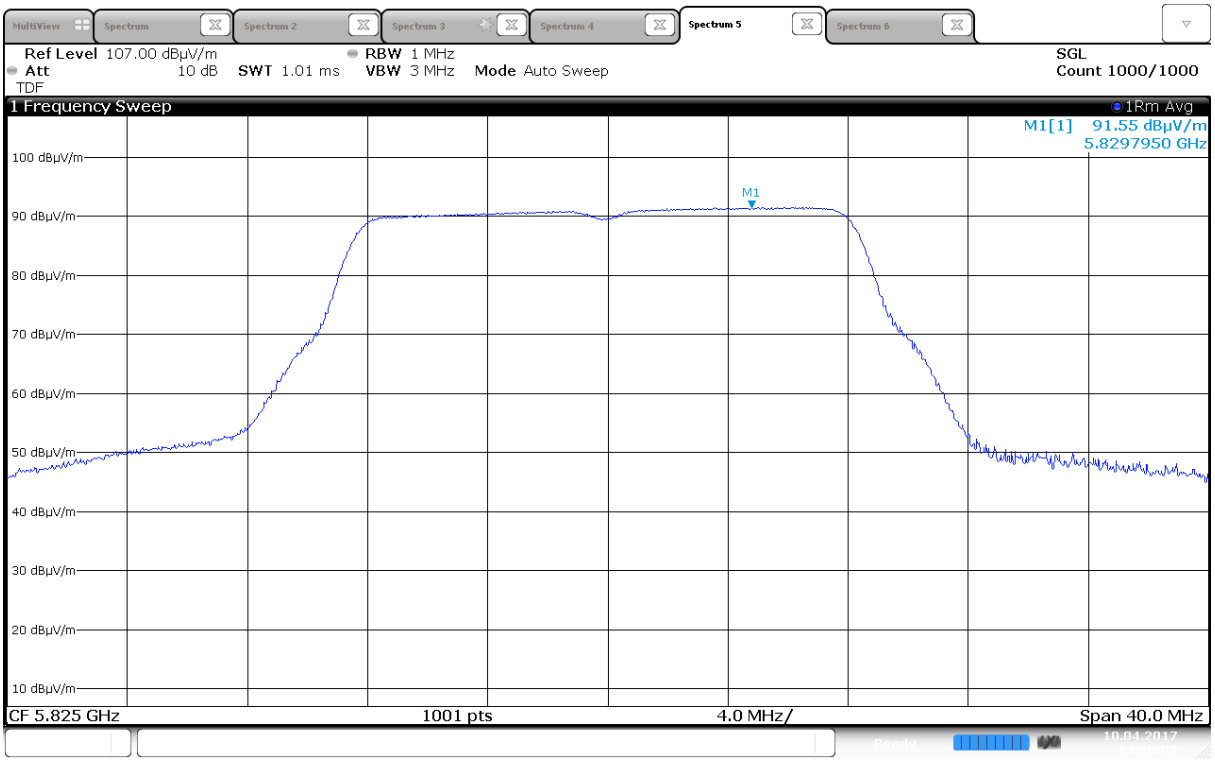
Power Spectral Density, 5745 MHz, 802.11a 6Mbps, Ant 0



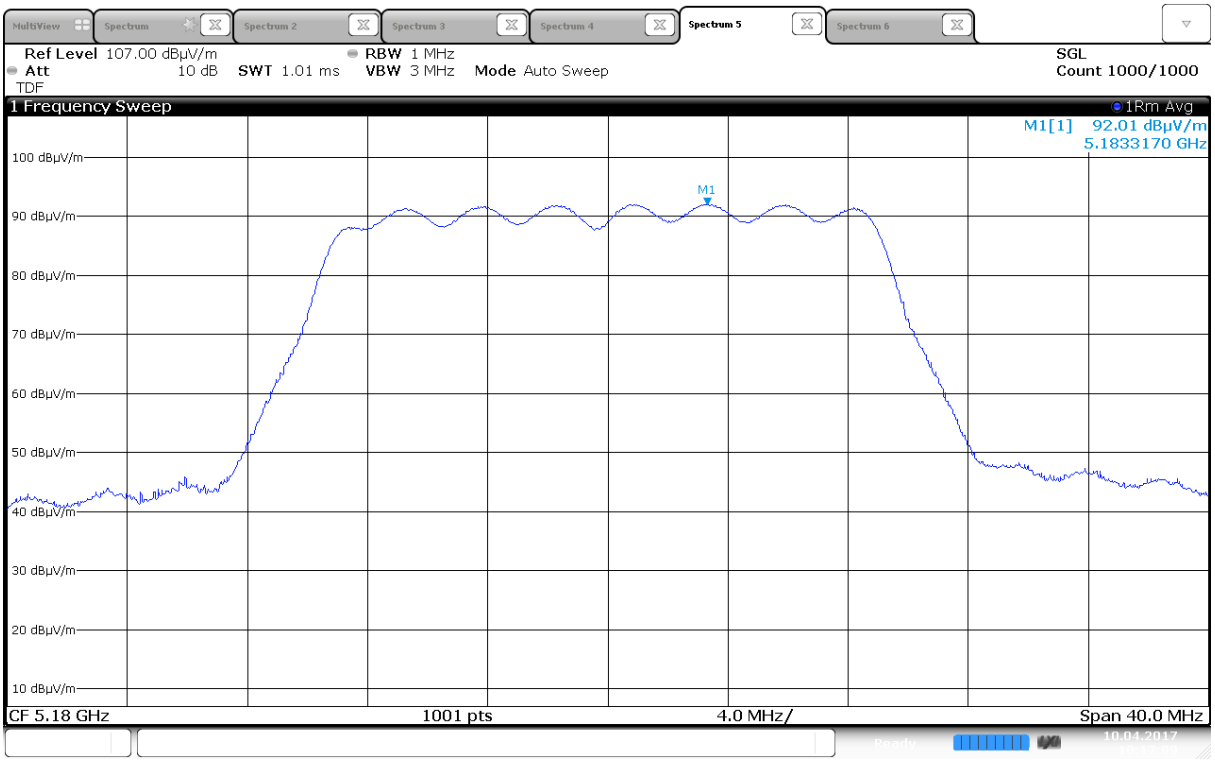
Power Spectral Density, 5745 MHz, 802.11a 6Mbps, Ant 1



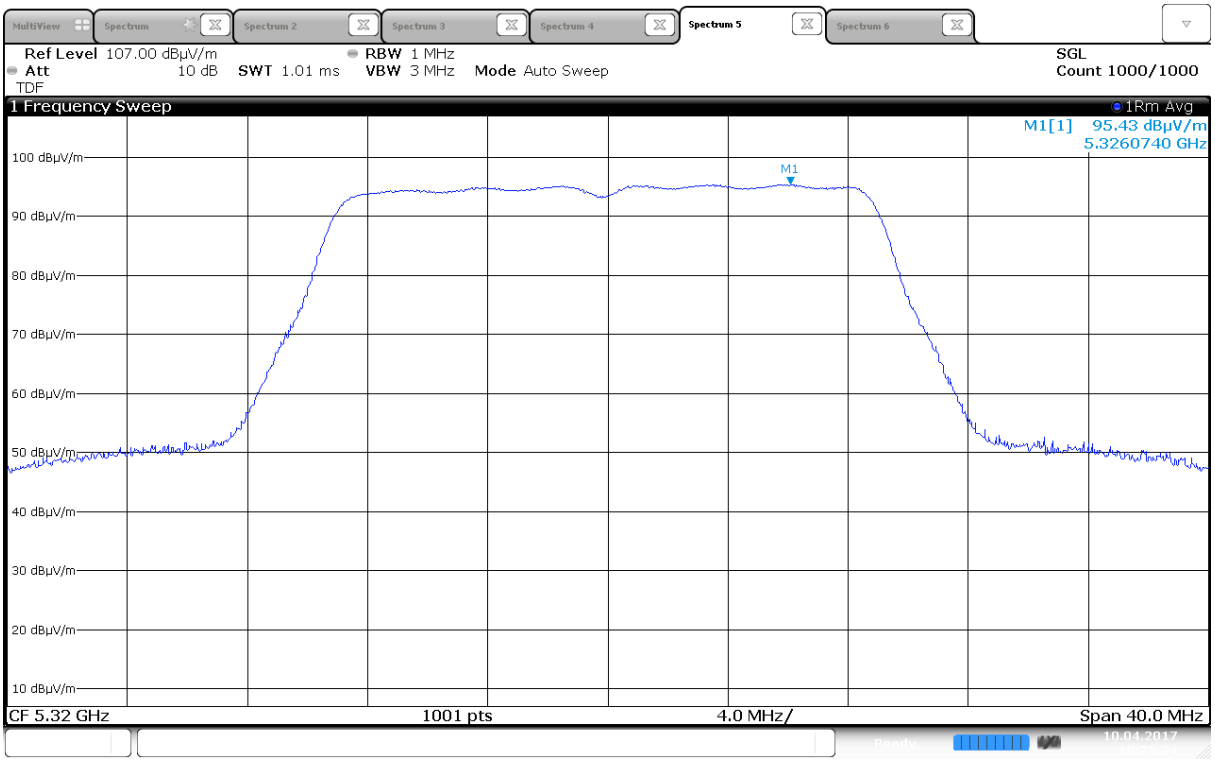
Power Spectral Density, 5825 MHz, 802.11a 6Mbps, Ant 0



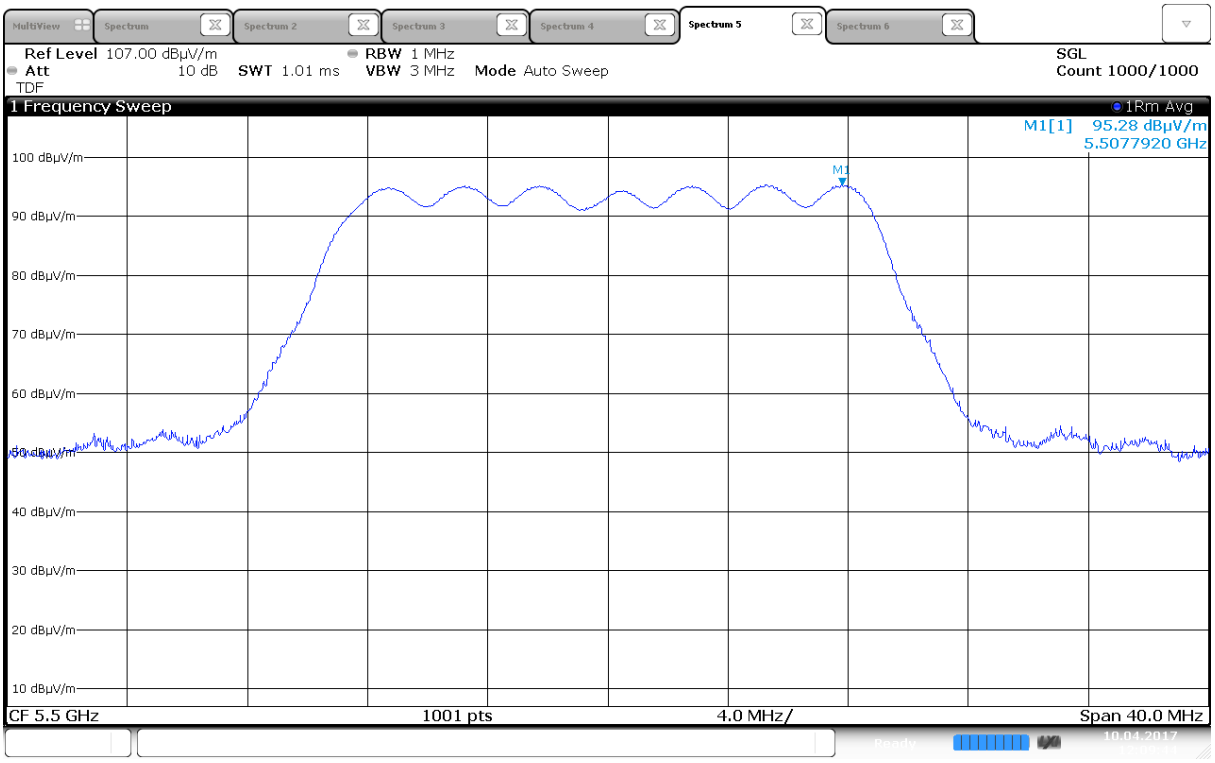
Power Spectral Density, 5825 MHz, 802.11a 6Mbps, Ant 1



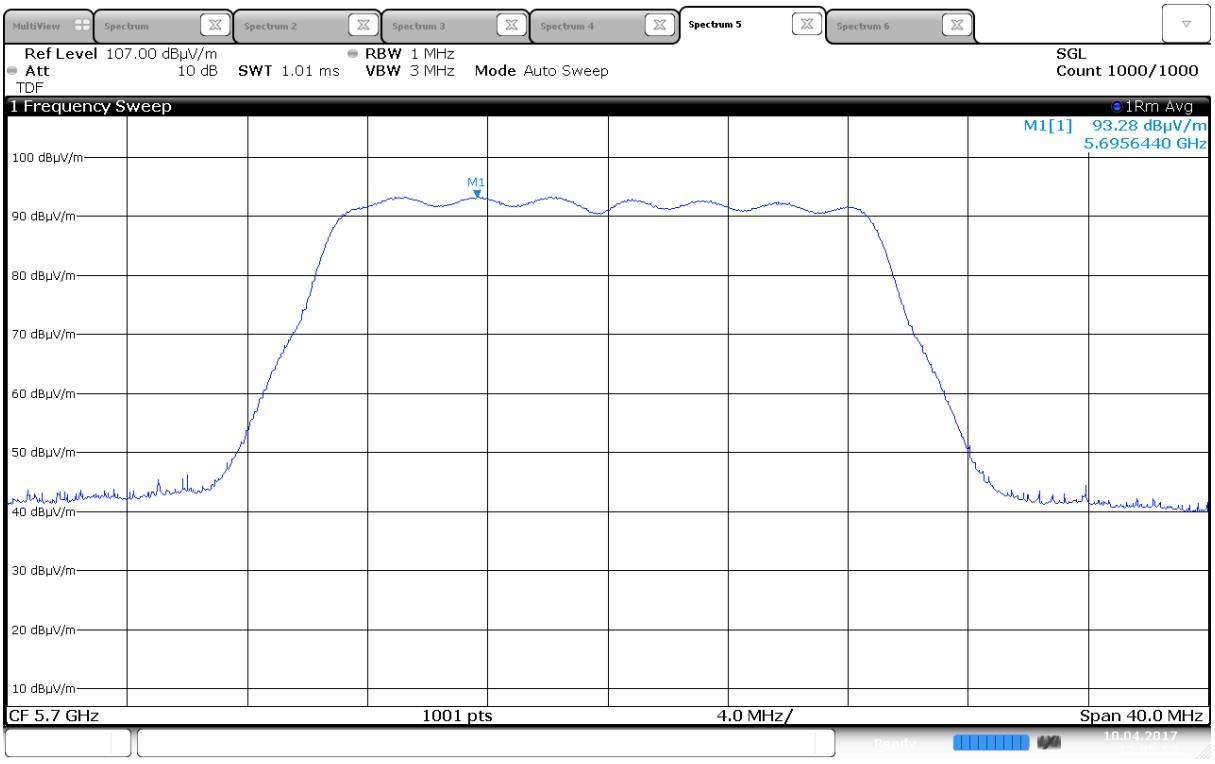
Power Spectral Density, 5180 MHz, 802.11n HT20, MIMO



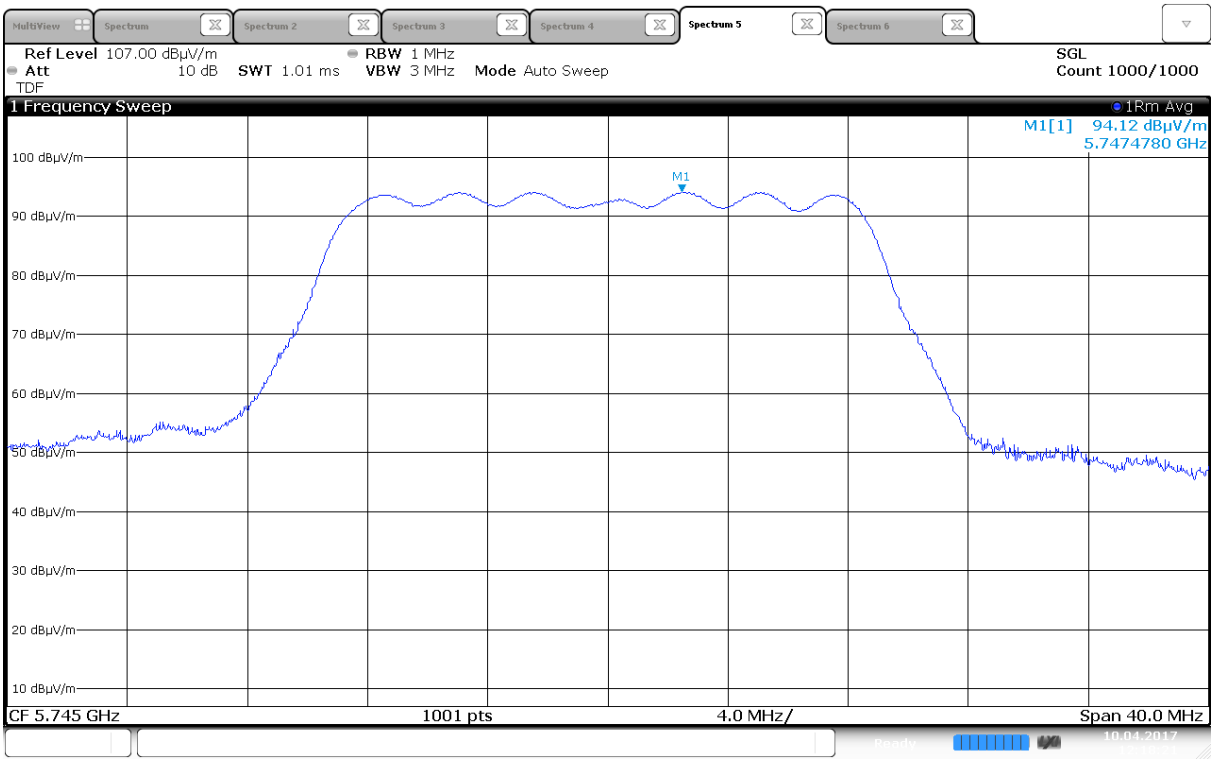
Power Spectral Density, 5320 MHz, 802.11n HT20, MIMO



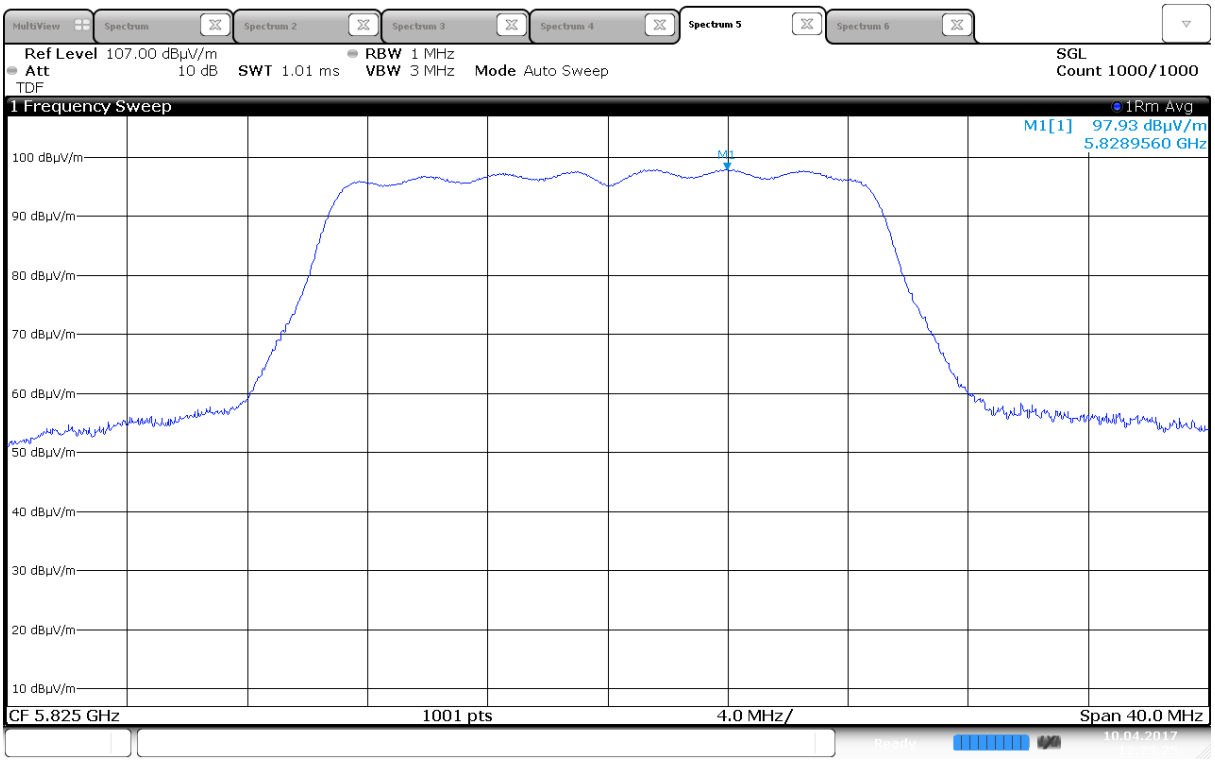
Power Spectral Density, 5500 MHz, 802.11n HT20, MIMO



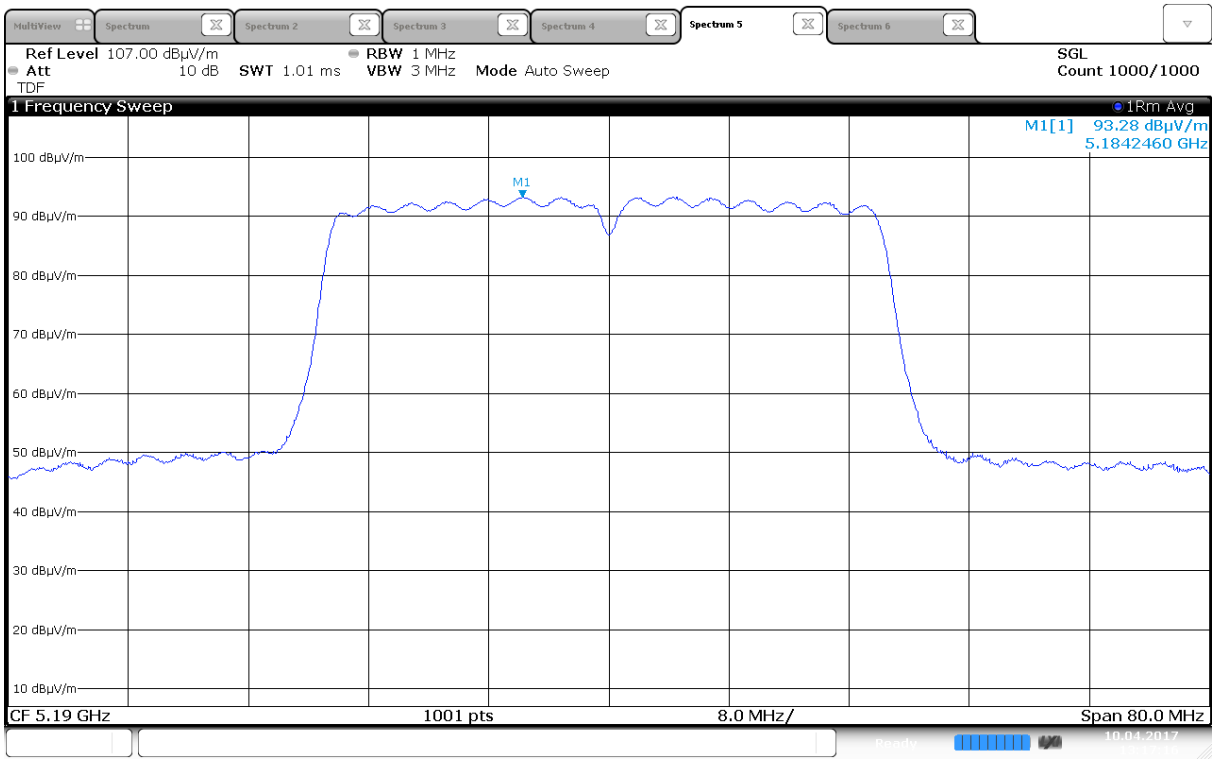
Power Spectral Density, 5700 MHz, 802.11n HT20, MIMO



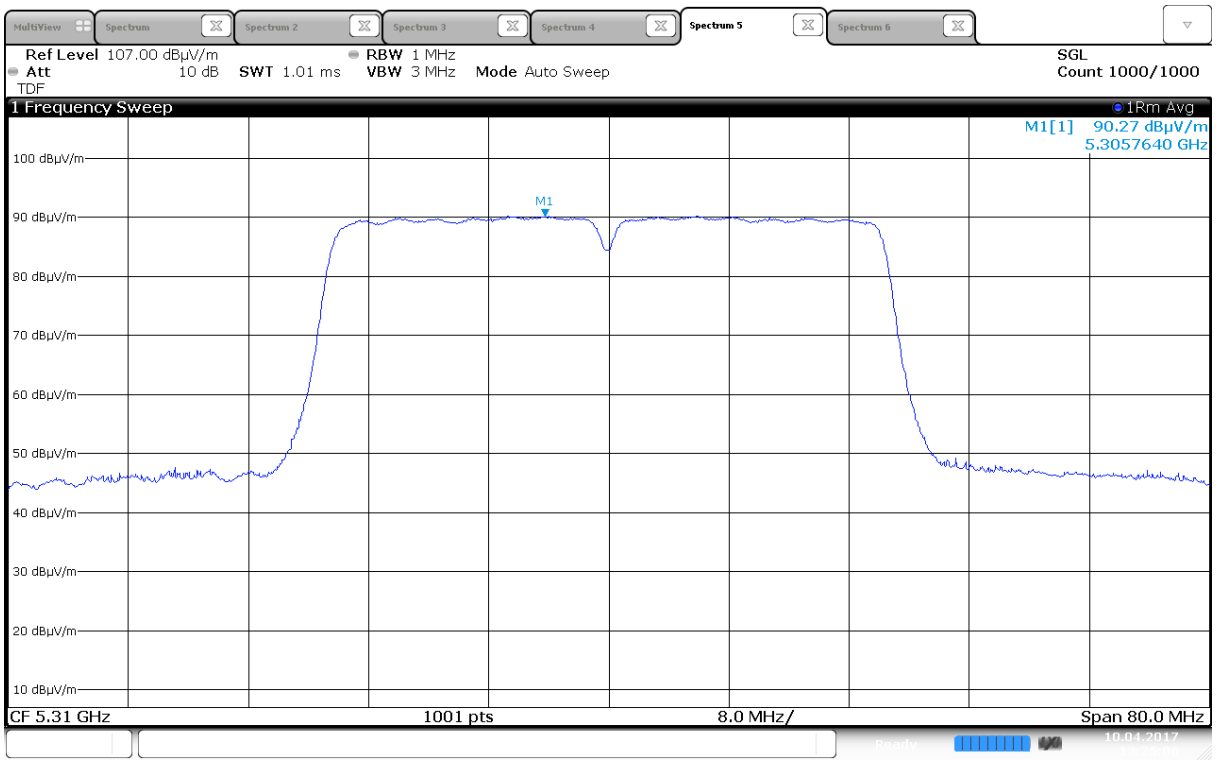
Power Spectral Density, 5745 MHz, 802.11n HT20, MIMO



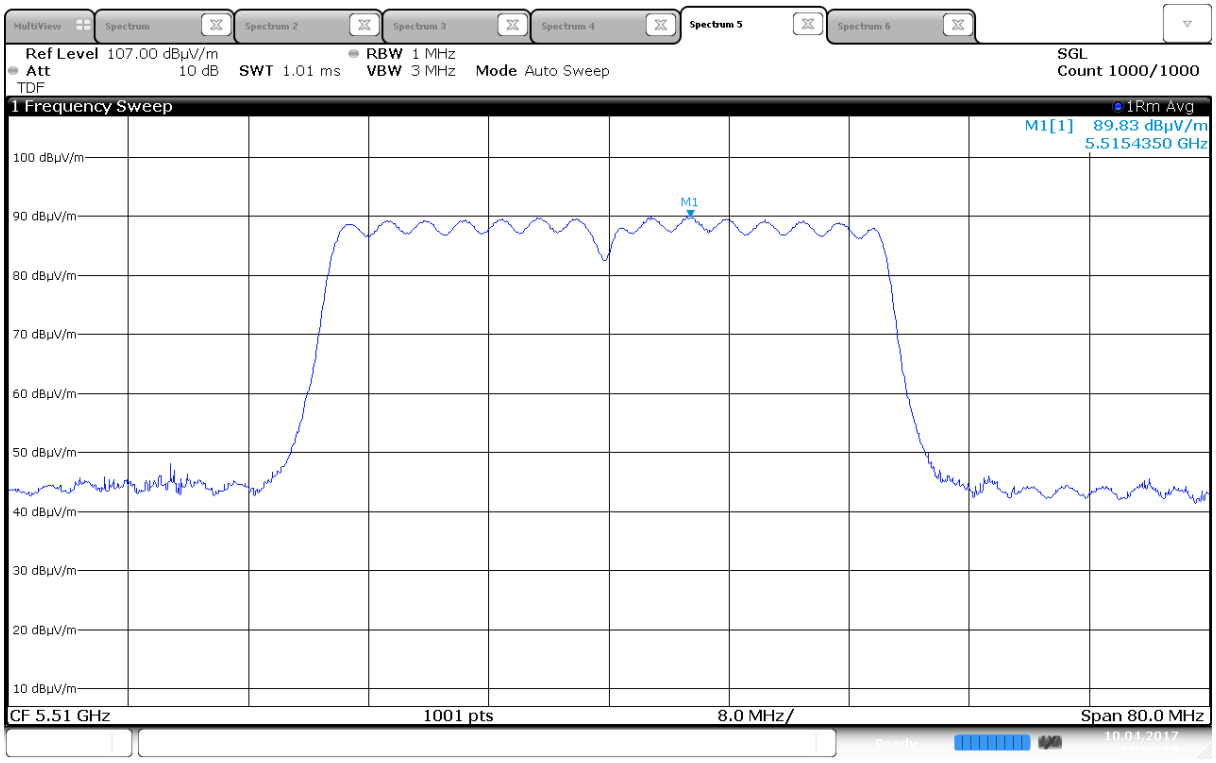
Power Spectral Density, 5825 MHz, 802.11n HT20, MIMO



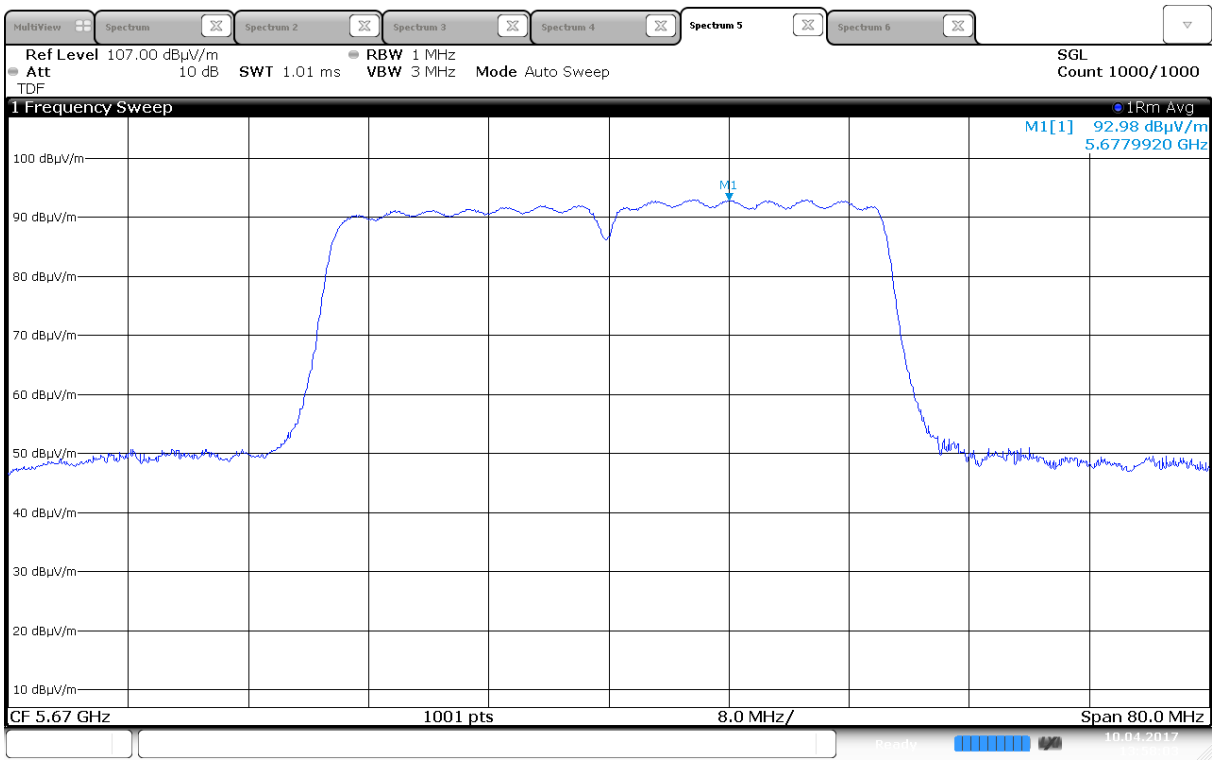
Power Spectral Density, 5190 MHz, 802.11n HT40, MIMO



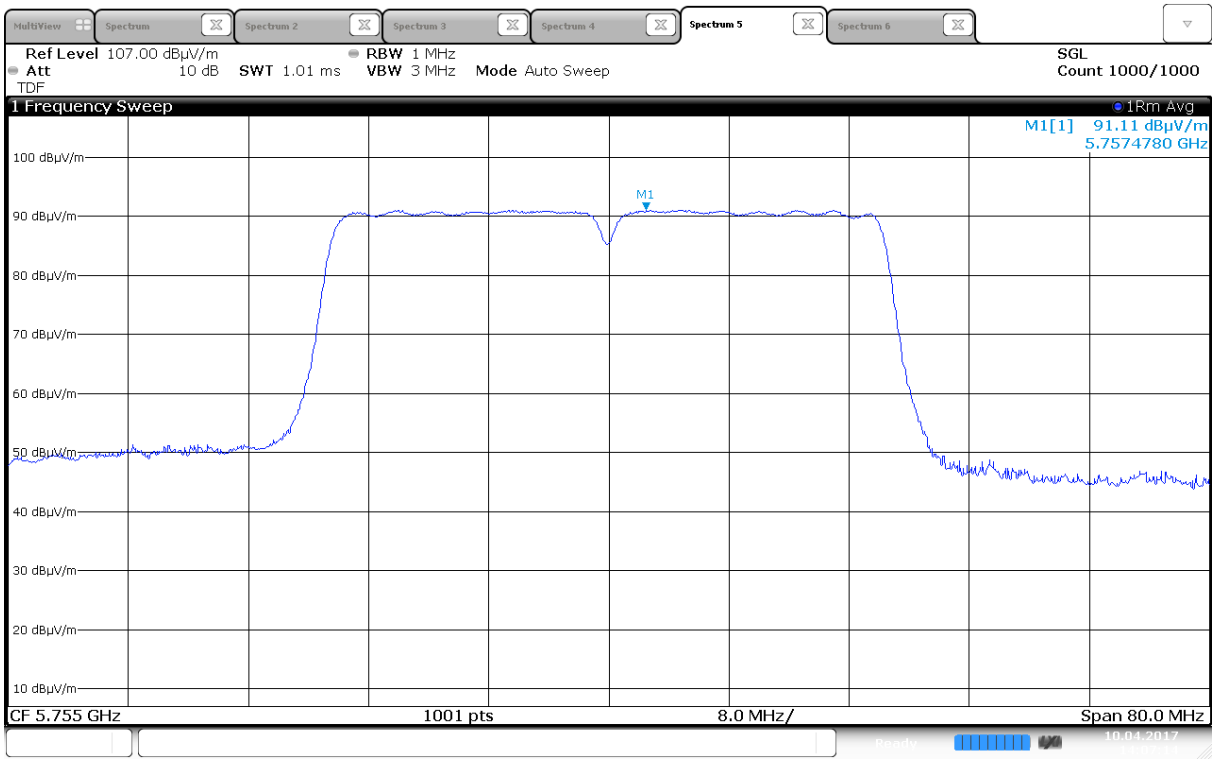
Power Spectral Density, 5310 MHz, 802.11n HT40, MIMO



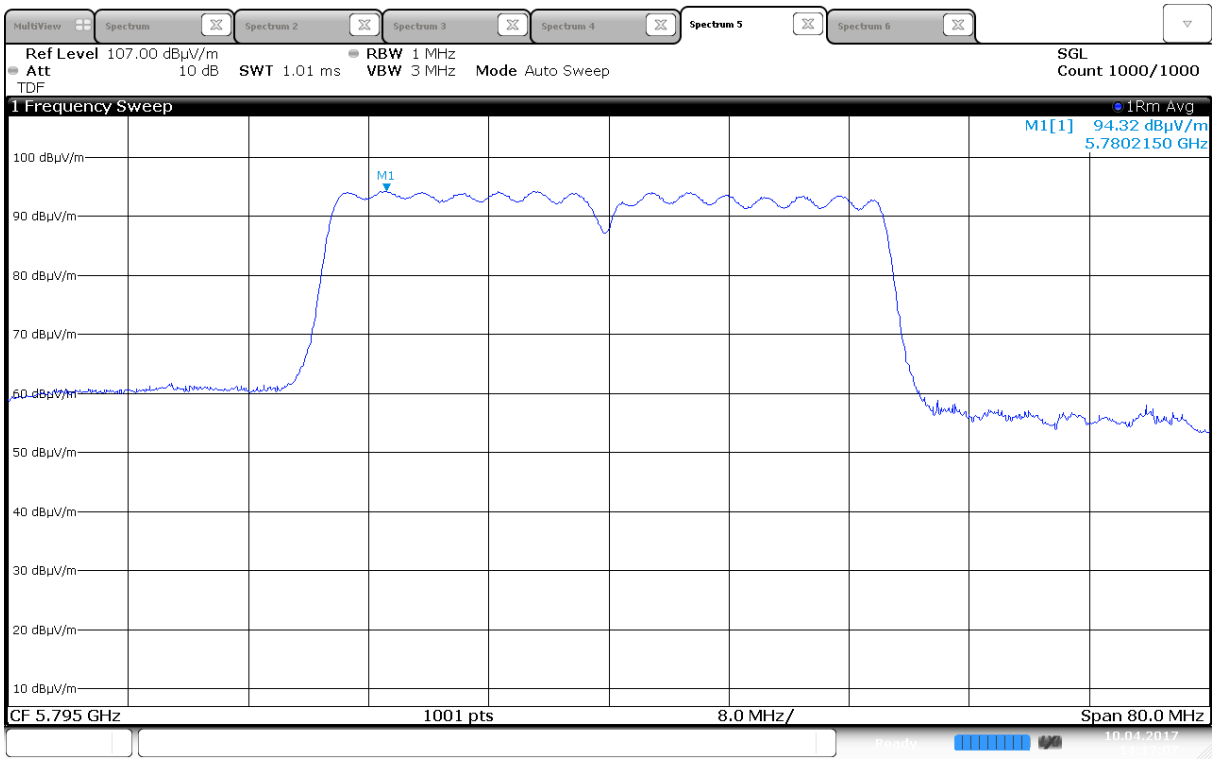
Power Spectral Density, 5510 MHz, 802.11n HT40, MIMO



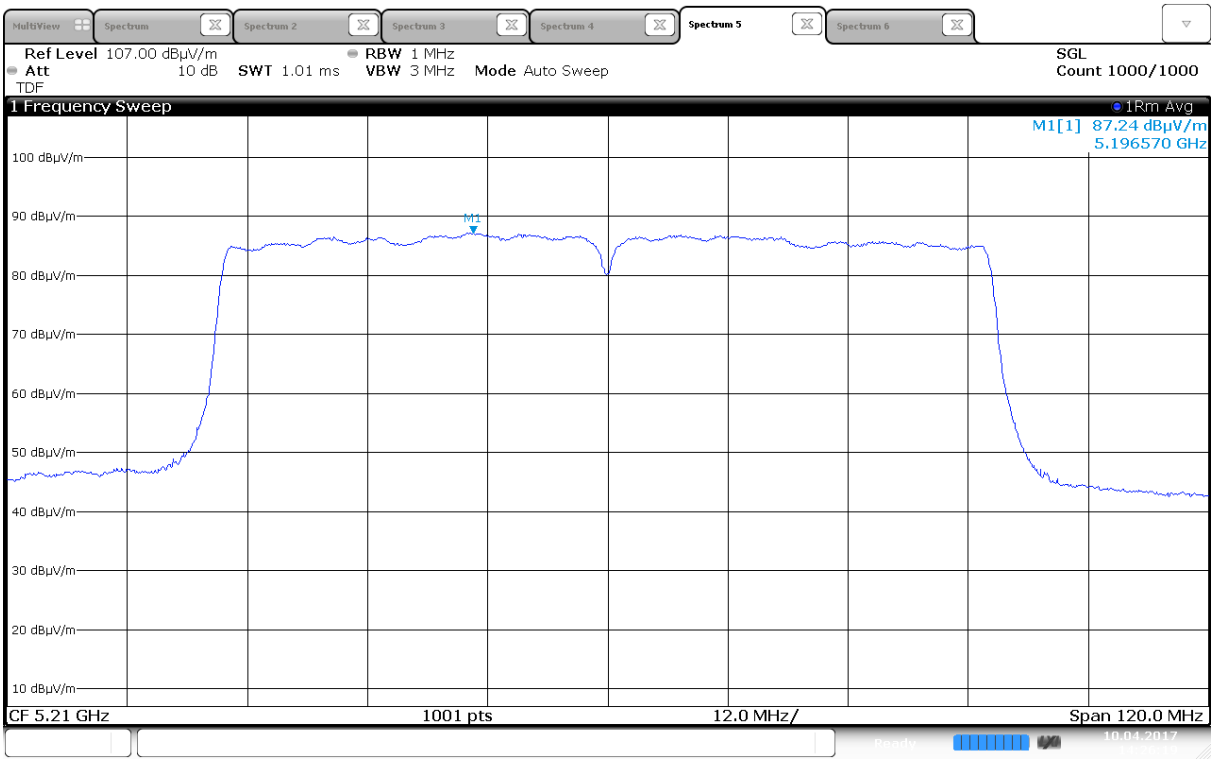
Power Spectral Density, 5670 MHz, 802.11n HT40, MIMO



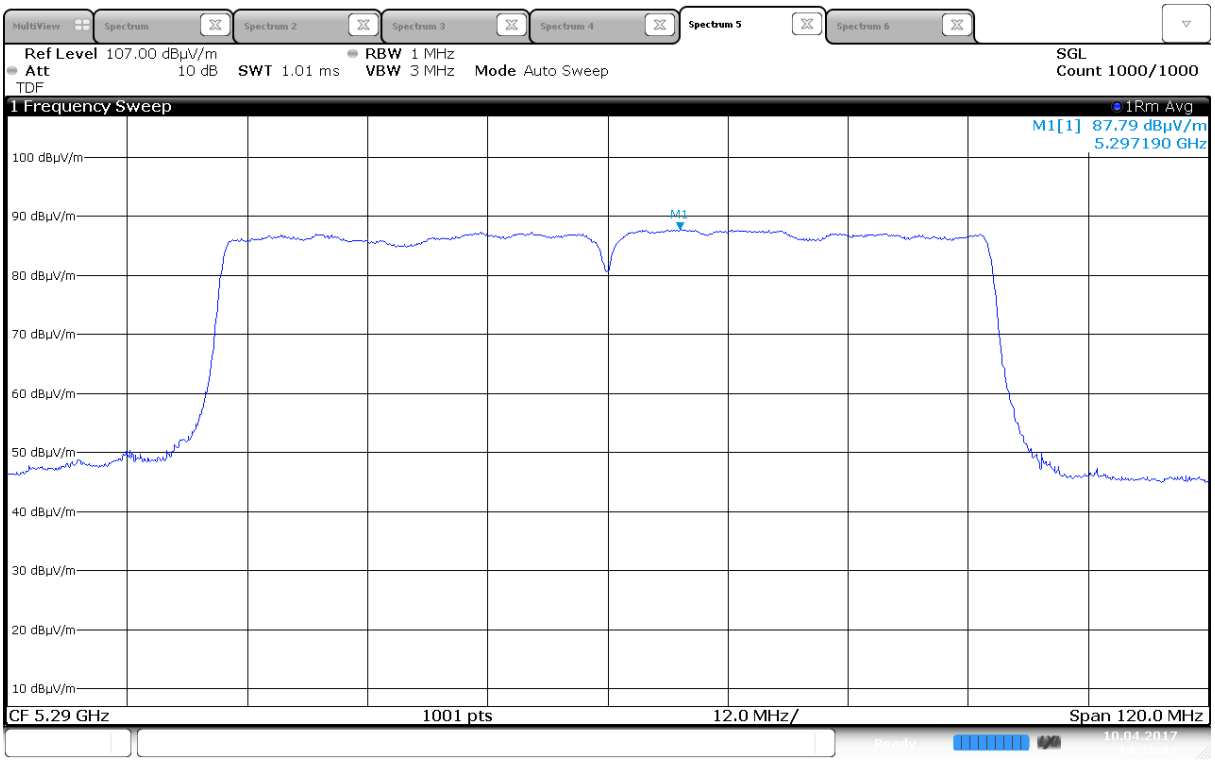
Power Spectral Density, 5755 MHz, 802.11n HT40, MIMO



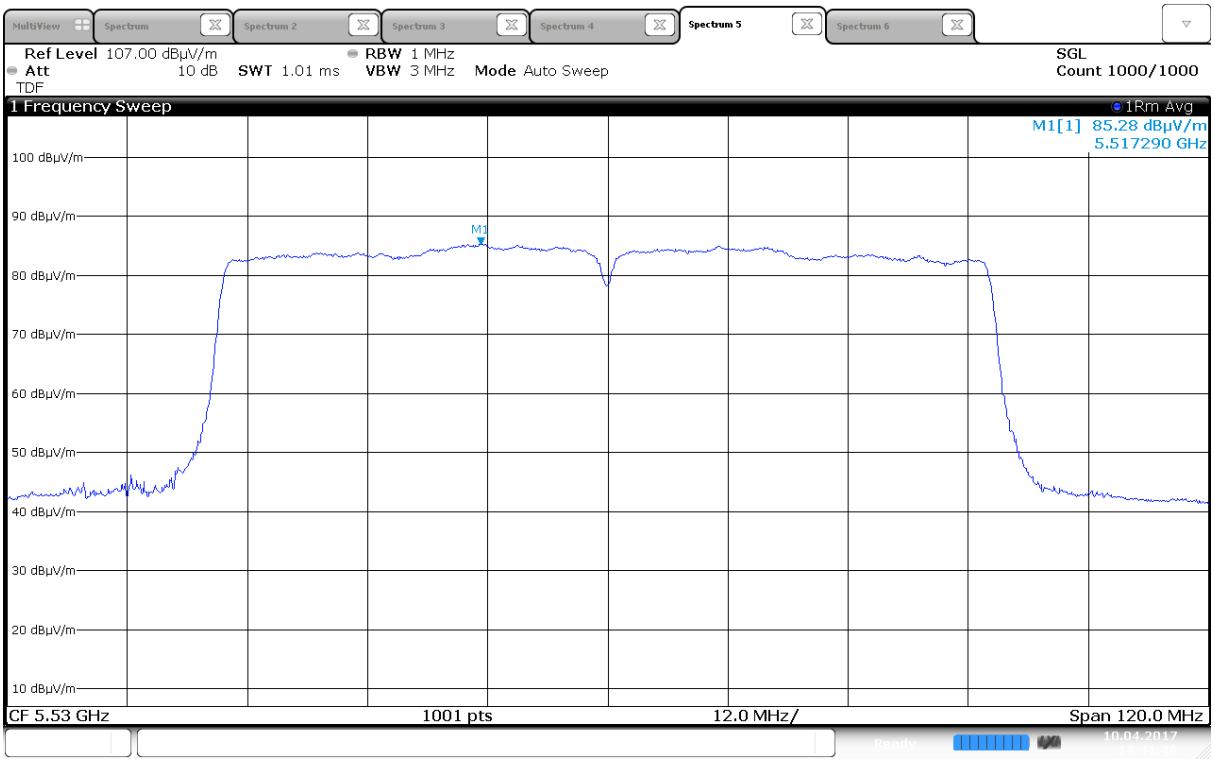
Power Spectral Density, 5795 MHz, 802.11n HT40, MIMO



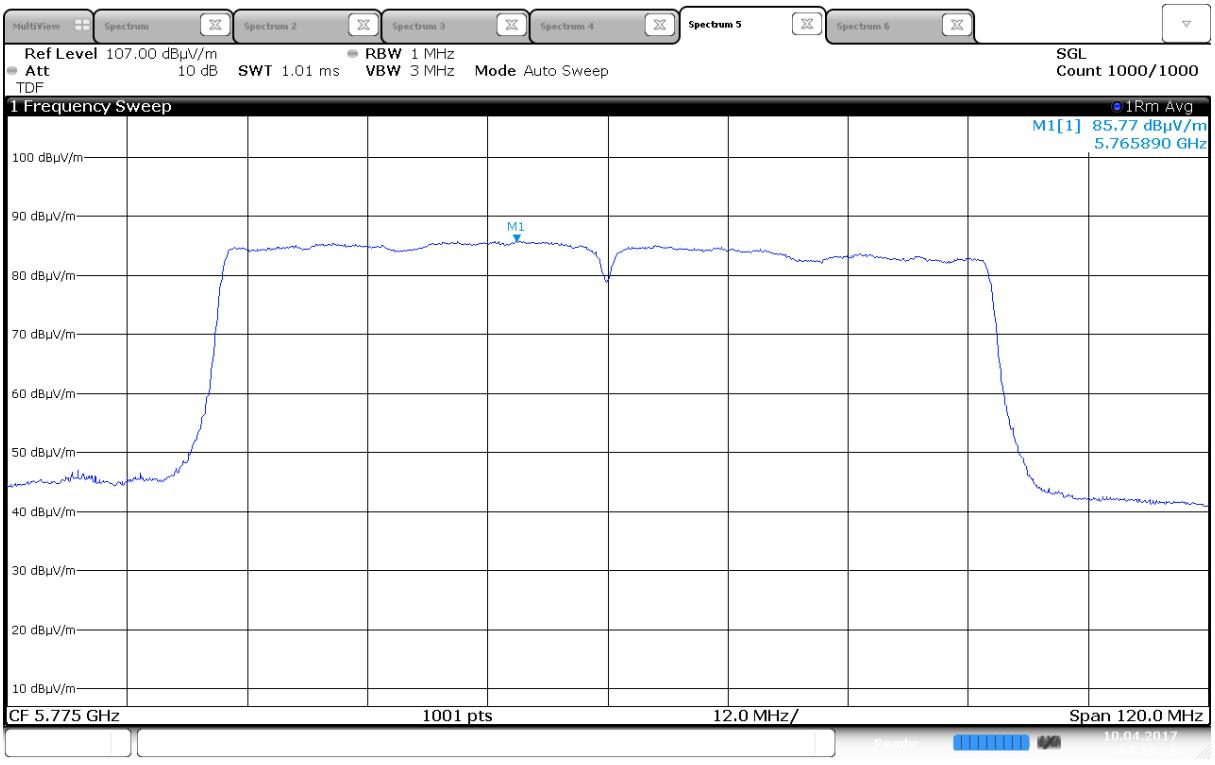
Power Spectral Density, 5210 MHz, 802.11n HT80, MIMO



Power Spectral Density, 5290 MHz, 802.11n HT80, MIMO



Power Spectral Density, 5530 MHz, 802.11n HT80, MIMO



Power Spectral Density, 5775 MHz, 802.11n HT80, MIMO

3.5 Unwanted Emissions

FCC 15.407(b)

ISED RSS-247 Issue 2, clause 6.2

Test Results: Complies

Measurement Data:

Band Edge Emissions, 5150MHz						
Carrier Modulation	**Ch. No.**	**Carrier Freq MHz**	**Measured value Peak dBµV/m @3m**	**Calculated value Peak dBm/MHz**	**Limit dBm/MHz**	**Verdict**
802.11a, Ant 0	36	5180	55.2	-40.1	-27	Complies
802.11a, Ant 1	36	5180	55.1	-40.1	-27	Complies
802.11n, HT20, MIMO	36	5180	58.3	-37.0	-27	Complies
802.11n, HT40, MIMO	38	5190	63.7	-31.5	-27	Complies
802.11n, HT80, MIMO	42	5210	63.4	-31.8	-27	Complies

Band Edge Emissions, 5350MHz						
Carrier Modulation	**Ch. No.**	**Carrier Freq MHz**	**Measured value Peak dBµV/m @3m**	**Calculated value Peak dBm/MHz**	**Limit dBm/MHz**	**Verdict**
802.11a, Ant 0	64	5320	57.4	-37.8	-27	Complies
802.11a, Ant 1	64	5320	52.8	-42.5	-27	Complies
802.11n, HT20, MIMO	64	5320	68.2	-27.1	-27	Complies
802.11n, HT40, MIMO	62	5310	65.7	-29.5	-27	Complies
802.11n, HT80, MIMO	58	5290	66.6	-28.7	-27	Complies

Band Edge Emissions, 5470MHz						
Carrier Modulation	**Ch. No.**	**Carrier Freq MHz**	**Measured value Peak dBµV/m @3m**	**Calculated value Peak dBm/MHz**	**Limit dBm/MHz**	**Verdict**
802.11a, Ant 0	100	5500	58.3	-36.9	-27	Complies
802.11a, Ant 1	100	5500	61.7	-33.5	-27	Complies
802.11n, HT20, MIMO	100	5500	66.9	-28.4	-27	Complies
802.11n, HT40, MIMO	102	5510	68.1	-27.1	-27	Complies
802.11n, HT80, MIMO	106	5530	65.3	-29.9	-27	Complies

Band Edge Emissions, 5725MHz						
Carrier Modulation	**Ch. No.**	**Carrier Freq MHz**	**Measured value Peak dBµV/m @3m**	**Calculated value Peak dBm/MHz**	**Limit dBm/MHz**	**Verdict**
802.11a, Ant 0	140	5700	62.3	-33.0	-27	Complies
802.11a, Ant 1	140	5700	57.8	-37.4	-27	Complies
802.11n, HT20, MIMO	140	5700	63.8	-31.5	-27	Complies
802.11n, HT40, MIMO	134	5670	60.7	-34.5	-27	Complies

Band Edge Emissions, 5700 – 5725 MHz					
Carrier Modulation	**Ch. No.**	**Carrier Freq MHz**	**Measured value Peak dBµV/m @3m**	**Calculated value Peak dBm/MHz**	**Verdict**
802.11a, Ant 0	149	5745	< 75	< -20	Complies
802.11a, Ant 1	149	5745	< 65	< -30	Complies
802.11n, HT20, MIMO	149	5745	< 73	< -22	Complies
802.11n, HT40, MIMO	151	5755	< 76	< -19	Complies
802.11n, HT80, MIMO	155	5775	< 70	< -25	Complies
Band Edge Emissions, 5650 – 5700 MHz					
Carrier Modulation	**Ch. No.**	**Carrier Freq MHz**	**Measured value Peak dBµV/m @3m**	**Calculated value Peak dBm/MHz**	**Verdict**
All modulations	/	/	< 65	< -30	Complies
Band Edge Emissions, < 5650 MHz					
Carrier Modulation	**Ch. No.**	**Carrier Freq MHz**	**Measured value Peak dBµV/m @3m**	**Calculated value Peak dBm/MHz**	**Verdict**
All modulations	/	/	< 55	< -40	Complies

Band Edge Emissions, 5850 – 5875 MHz					
Carrier Modulation	**Ch. No.**	**Carrier Freq MHz**	**Measured value Peak dBµV/m @3m**	**Calculated value Peak dBm/MHz**	**Verdict**
802.11a, Ant 0	165	5825	< 70	< -25	Complies
802.11a, Ant 1	165	5825	< 64	< -31	Complies
802.11n, HT20, MIMO	165	5825	< 73	< -22	Complies
802.11n, HT40, MIMO	159	5795	< 64	< -31	Complies
802.11n, HT80, MIMO	155	5775	< 58	< -37	Complies
Band Edge Emissions, 5875 – 5925 MHz					
Carrier Modulation	**Ch. No.**	**Carrier Freq MHz**	**Measured value Peak dBµV/m @3m**	**Calculated value Peak dBm/MHz**	**Verdict**
All modulations	/	/	< 60	< -35	Complies
Band Edge Emissions, > 5925 MHz					
Carrier Modulation	**Ch. No.**	**Carrier Freq MHz**	**Measured value Peak dBµV/m @3m**	**Calculated value Peak dBm/MHz**	**Verdict**
All modulations	/	/	< 55	< -40	Complies

See plots.

All measurements were performed radiated.

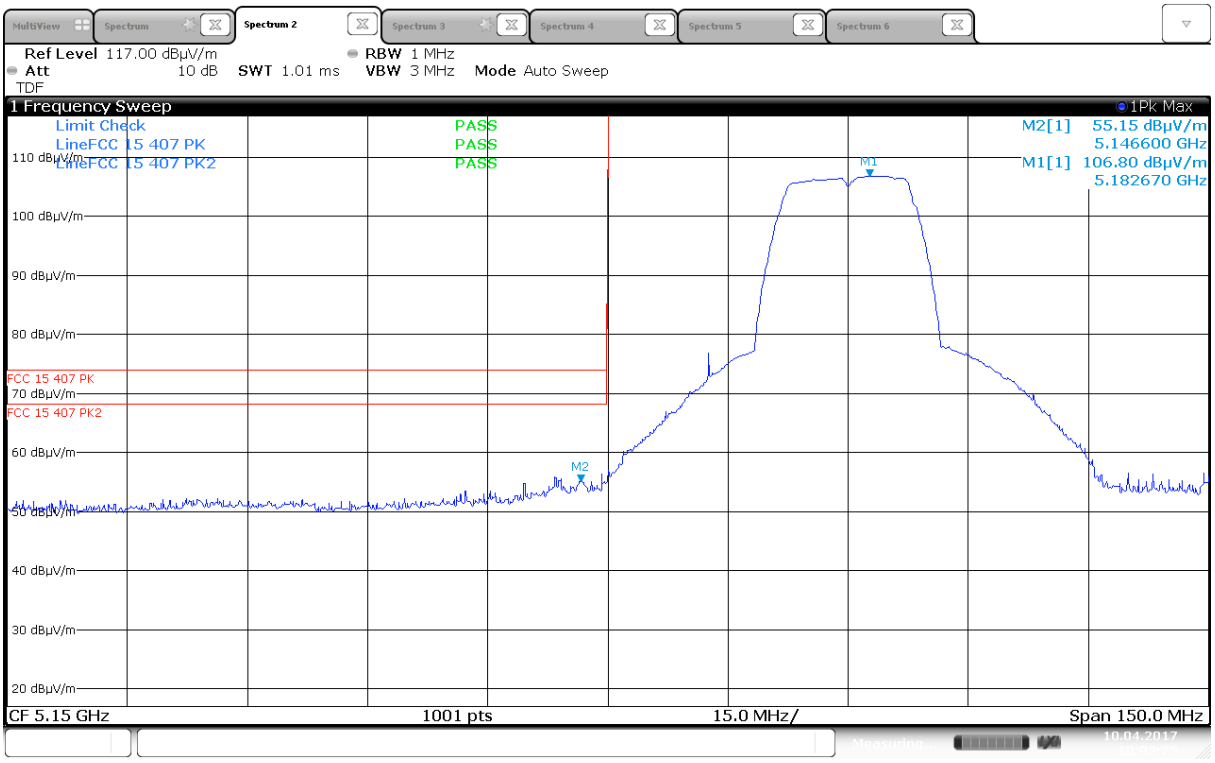
The tested equipment is for indoor use only, no band-edge requirements apply at 5250 MHz.

No spurious emissions except the above listed harmonics and band-edge emissions were found.

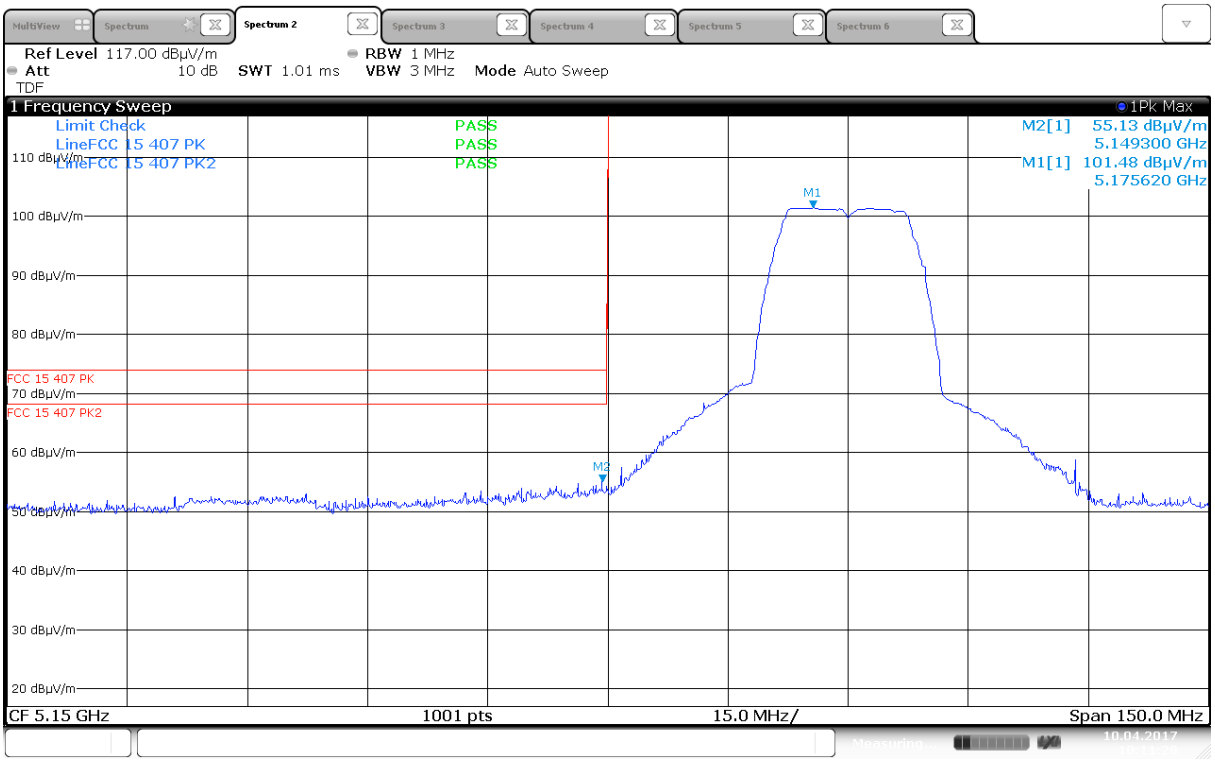
Unwanted Emissions limit:

Operating Frequency band	Limit for Emissions Outside Operating Frequency Band
5150 – 5250 MHz	-27 dBm/MHz
5250 – 5350 MHz	-27 dBm/MHz
5470 – 5725 MHz	-27 dBm/MHz
5725 – 5850 MHz	See FCC 15.407(b)(4)(i) or 15.407(b)(4)(ii) and ISED RSS-247 Issue 2, Clause 6.2.4 (2)

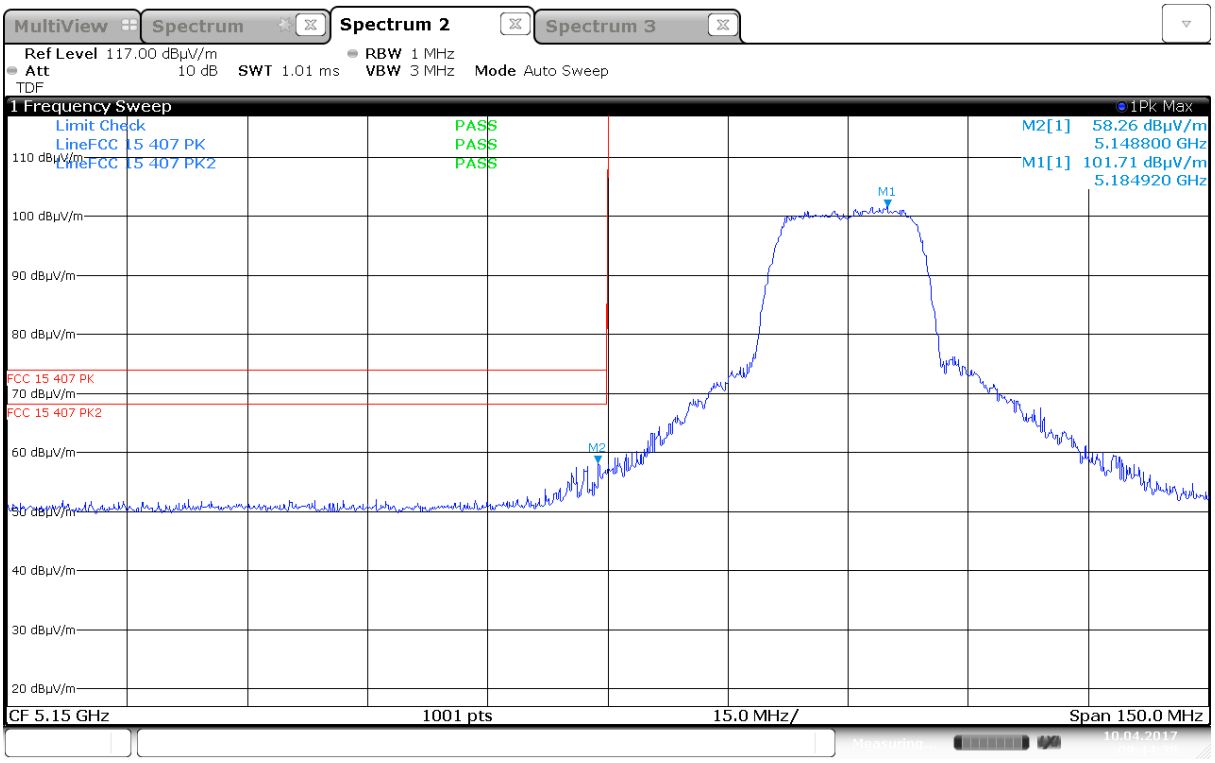
Devices operating in the 5.25-5.35 GHz band that generate emissions in the 5.15-5.25 GHz band must meet all applicable technical requirements for operation in the 5.15-5.25 GHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of -27 dBm/MHz in the 5.15-5.25 GHz band.



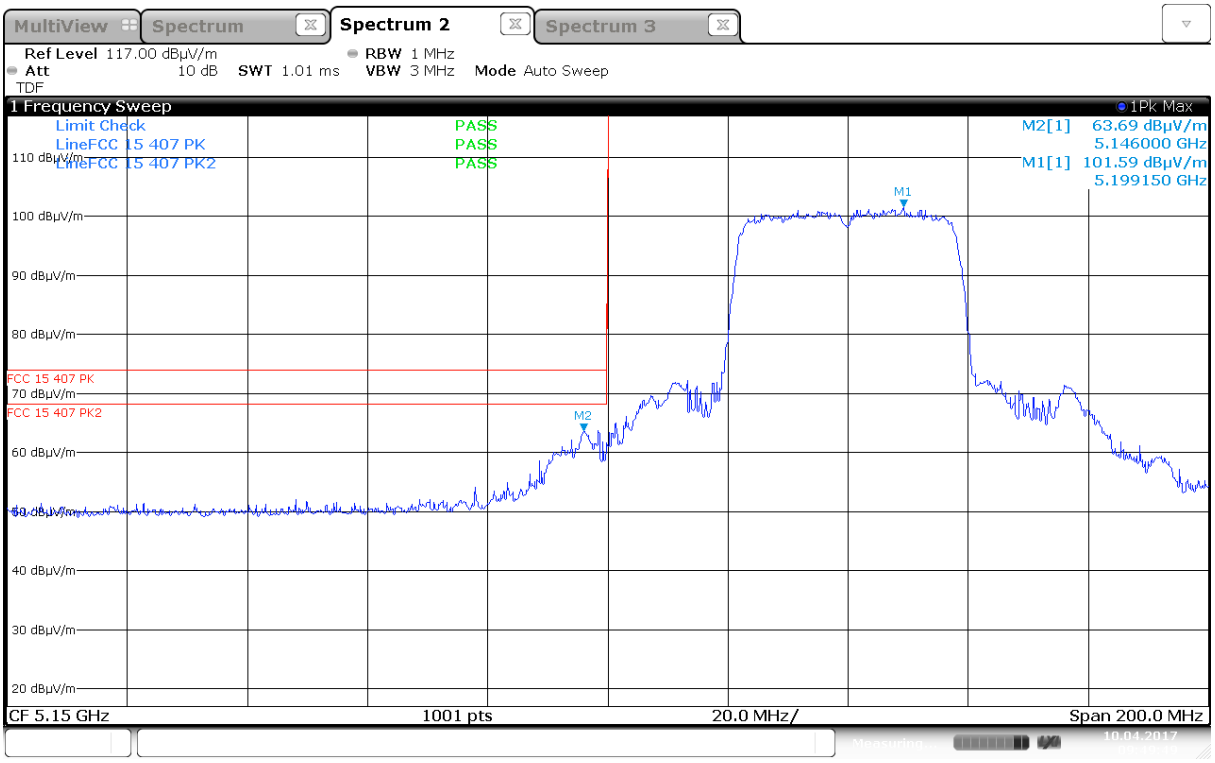
Unwanted Emissions, Band Edge, 5150MHz, ch36, 802.11a 6M, ant 0



Unwanted Emissions, Band Edge, 5150MHz, ch36, 802.11a 6M, ant 1



Unwanted Emissions, Band Edge, 5150MHz, ch36, 802.11n MCS0 HT20, MIMO



Unwanted Emissions, Band Edge, 5150MHz, ch38, 802.11n MCS0 HT40, MIMO