





# TEST REPORT

<p><b>KCTL KCTL Inc.</b> 65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea TEL: 82-31-285-0894 FAX: 82-505-299-8311 <a href="http://www.kctl.co.kr">www.kctl.co.kr</a></p>	<p>Report No.: KR20-SRF0257 Page (1) of (213)</p>	
<p><b>1. Client</b></p> <ul style="list-style-type: none"> <li>◦ Name : Samsung Electronics Co., Ltd.</li> <li>◦ Address : 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea</li> <li>◦ Date of Receipt : 2020-08-31</li> </ul> <p><b>2. Use of Report</b> : Certification</p> <p><b>3. Name of Product / Model</b> : Tablet PC / SM-T577U/DS</p> <p><b>4. Manufacturer / Country of Origin</b> : Samsung Electronics Co., Ltd. / Vietnam</p> <p><b>5. FCC ID</b> : A3LSMT577U</p> <p><b>6. IC Certificate No.</b> : 649E-SMT577U</p> <p><b>7. Date of Test</b> : 2020-07-14 to 2020-09-28</p> <p><b>8. Location of Test</b> : <input checked="" type="checkbox"/> Permanent Testing Lab <input type="checkbox"/> On Site Testing (Address: Address of testing location)</p> <p><b>9. Test method used</b> : FCC Part 15 Subpart E, 15.407 RSS-247 Issue 2 February 2017 RSS GEN Issue 5 March 2019</p> <p><b>10. Test Results</b> : Refer to the test result in the test report</p>		
<p>Affirmation</p>	<p>Tested by Name : Taeyoung Kim </p>	<p>Technical Manager Name : Seungyong Kim </p>
<p style="text-align: right;">2020-10-06</p>		
<p style="text-align: center;"><b>KCTL Inc.</b></p> <p>As a test result of the sample which was submitted from the client, this report does not guarantee the whole product quality. This test report should not be used and copied without a written agreement by KCTL Inc.</p>		

**REPORT REVISION HISTORY**

Date	Revision	Page No
2020-10-06	Originally issued	-

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**General remarks for test reports**

Nothing significant to report.



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## 1. General information

Client : Samsung Electronics Co., Ltd.  
Address : 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677,  
Rep. of Korea  
Manufacturer : Samsung Electronics Co., Ltd.  
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Address : Yen binh Industrial Park, Dong Tien Ward, Pho Yen Town Thai Nguyen  
Province, Vietnam  
Laboratory : KCTL Inc.  
Address : 65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea  
Accreditations : FCC Site Designation No: KR0040, FCC Site Registration No: 687132  
VCCI Registration No. : R-20080, G-20078, C-20059, T-20056  
Industry Canada Registration No. : 8035A  
KOLAS No.: KT231

## 2. Device information

Equipment under test : Tablet PC  
Model : SM-T577U/DS  
Modulation technique : Bluetooth(BDR/EDR)\_GFSK,  $\pi/4$ DQPSK, 8DPSK  
Bluetooth(BLE)\_GFSK  
WIFI(802.11a/b/g/n/ac/ax)\_DSSS, OFDM, OFDMA  
NFC\_ASK  
LTE\_QPSK, 16QAM, 64QAM  
WCDMA\_QPSK  
GSM\_GMSK, 8-PSK  
Number of channels : Bluetooth(BDR/EDR)\_79 ch / Bluetooth(BLE)\_40 ch  
802.11b/g/n/ac/ax\_HT20/VHT20/HE20 : 11 ch  
UNII-1: 4 ch (20 MHz), 2 ch (40 MHz), 1 ch (80 MHz)  
UNII-2A: 4 ch (20 MHz), 2 ch (40 MHz), 1 ch (80 MHz)  
UNII-2C: 12 ch (20 MHz), 6 ch (40 MHz), 3 ch (80 MHz)  
UNII-3: 5 ch (20 MHz), 2 ch (40 MHz), 1 ch (80 MHz)  
NFC: 1 ch  
Power source : DC 3.85 V  
Antenna specification : LTE/WCDMA\_LDS carrier Antenna  
WIFI/Bluetooth(BDR/EDR/BLE)\_LDS carrier Antenna  
NFC\_FPCB Antenna

Antenna gain	: WIFI/Bluetooth(BDR/EDR/BLE): ANT 1: -2.50 dBi, ANT 2: -2.50 dBi UNII-1 ANT 1: -3.20 dBi, ANT 2: -3.70 dBi UNII-2A ANT 1: -3.20 dBi, ANT 2: -3.80 dBi UNII-2C ANT 1: -6.20 dBi, ANT 2: -6.70 dBi UNII-3 ANT 1: -6.50 dBi, ANT 2: -6.40 dBi
Frequency range	: Bluetooth(BDR/EDR/BLE)_2 402 MHz ~ 2 480 MHz 2 412 MHz ~ 2 462 MHz (802.11b/g/n/ac/ax_HT20/VHT20/HE20) UNII-1: 5 180 MHz ~ 5 240 MHz (802.11a/n/ac/ax_HT20/VHT20/HE20) UNII-1: 5 190 MHz ~ 5 230 MHz (802.11n/ac/ax_HT40/VHT40/HE40) UNII-1: 5 210 MHz (802.11ac/ax_VHT80/HE80) UNII-2A: 5 260 MHz ~ 5 320 MHz (802.11a/n/ac/ax_HT20/VHT20/HE20) UNII-2A: 5 270 MHz ~ 5 310 MHz (802.11n/ac/ax_HT40/VHT40/HE40) UNII-2A: 5 290 MHz (802.11ac/ax_VHT80/HE80) UNII-2C: 5 500 MHz ~ 5 720 MHz (802.11a/n/ac/ax_HT20/VHT20/HE20) UNII-2C: 5 510 MHz ~ 5 710 MHz (802.11n/ac/ax_HT40/VHT40/HE40) UNII-2C: 5 530 MHz ~ 5 690 MHz (802.11ac/ax_VHT80/HE80) UNII-3: 5 745 MHz ~ 5 825 MHz (802.11a/n/ac/ax_HT20/VHT20/HE20) UNII-3: 5 755 MHz ~ 5 795 MHz (802.11n/ac/ax_HT40/VHT40/HE40) UNII-3: 5 775 MHz (802.11ac/ax_VHT80/HE80) LTE Band 2_1 850.7 MHz ~ 1 909.3 MHz LTE Band 4_1 710.7 MHz ~ 1 754.3 MHz LTE Band 5_824.7 MHz ~ 848.3 MHz LTE Band 7_2 502.5 MHz ~ 2 567.5 MHz LTE Band 12_699.7 MHz ~ 715.3 MHz LTE Band 13_779.5 MHz ~ 784.5 MHz LTE Band 14_790.5 MHz ~ 795.5 MHz LTE Band 17_706.5 MHz ~ 713.5 MHz LTE Band 25_1 850.7 MHz ~ 1 914.3 MHz LTE Band 26_814.7 MHz ~ 848.3 MHz, 814.7 MHz ~ 823.3 MHz LTE Band 41_2 498.5 MHz ~ 2 687.5 MHz (FCC) LTE Band 41_2 502.5 MHz ~ 2 687.5 MHz (IC) LTE Band 66_1 710.7 MHz ~ 1 779.3 MHz LTE Band 71_665.5 MHz ~ 695.5 MHz WCDMA 850_826.4 MHz ~ 846.6 MHz WCDMA 1700_1 712.4 MHz ~ 1 752.6 MHz WCDMA 1900_1 852.4 MHz ~ 1 907.6 MHz NFC_13.56 MHz
Software version	: T577U.001
Hardware version	: REV1.0
Test device serial No.	: Conducted(R32N601ACHA,R32N601A7VE) Radiated(R32N601A80M, R32N601AW9N)
Operation temperature	: -30 °C ~ 50 °C

**2.1. Accessory information**

Equipment	Manufacturer	Model	Serial No.	Power source	FCC ID & IC
Travel Adapter	SOLU-M	EP-TA200	R37M12L1A C1HM3	Input : 100-240V, 50-60Hz (0.5A) Output : 9.0V, 1.67A or 5.0V, 2.0A	-
Data Cable	RFTECH	EP- DT725BBE	-	-	-
External Earphone	ALMUS	EHS64AVF BE	-	-	-
Protective Cover	WILLTECH VINA	GH98- 45810A	-	-	-
S-Pen	WACOM	CP-913W- 00B	-	-	-

**2.2. Frequency/channel operations**

This device contains the following capabilities:

WiFi (802.11a/b/g/n/ac/ax), Bluetooth (BDR/EDR/BLE), NFC,  
LTE Band 2, LTE Band 4, LTE Band 5, LTE Band 7, LTE Band 12, LTE Band 13, LTE Band 14, LTE Band 17,  
LTE Band 25, LTE Band 26, LTE Band 29 (Downlink only), LTE Band 41 (PC2, PC3), LTE Band 66,  
LTE Band 71, WCDMA 850, WCDMA 1700, WCDMA 1900

**UNII-1**

Ch.	Frequency (MHz)
36	5 180
40	5 200
48	5 240

**UNII-2A**

Ch.	Frequency (MHz)
52	5 260
56	5 280
64	5 320

**UNII-2C**

Ch.	Frequency (MHz)
100	5 500
120	5 580
140	5 700
144	5 720

**UNII-3**

Ch.	Frequency (MHz)
149	5 745
157	5 785
165	5 825

Table 2.2-1. 802.11a/n/ac\_HT20/VHT20 mode

**UNII-1**

Ch.	Frequency (MHz)
38	5 190
46	5 230

**UNII-2A**

Ch.	Frequency (MHz)
54	5 270
62	5 310

**UNII-2C**

Ch.	Frequency (MHz)
102	5 510
118	5 590
134	5 670
142	5 710

**UNII-3**

Ch.	Frequency (MHz)
151	5 755
159	5 795

Table 2.2-2. 802.11n/ac\_HT40/VHT40 mode

**UNII-1**

Ch.	Frequency (MHz)
42	5 210

**UNII-2A**

Ch.	Frequency (MHz)
58	5 290

**UNII-2C**

Ch.	Frequency (MHz)
106	5 530
122	5 610
138	5 690

**UNII-3**

Ch.	Frequency (MHz)
155	5 775

Table 2.2-3. 802.11ac\_VHT80 mode

### 2.3. Simultaneous Tx Condition

For Simultaneous mode (Bluetooth, WLAN), please refer to

Test report #KR20-SRF0258\_04639\_Samsung Electronics\_SM-T577UDS\_WiFi(P15.407)\_ax.

### 2.4. Duty Cycle Factor

#### SISO

Test mode	Period (ms)	T <sub>on</sub> time (ms)	Duty cycle		Duty cycle factor (dB)
			(Linear)	(%)	
802.11a	1.526	1.428	0.935 8	93.58	0.29
802.11n_HT20	1.435	1.336	0.931 0	93.10	0.31
802.11n_HT40	0.763	0.664	0.870 2	87.02	0.60
802.11ac_VHT20	1.443	1.343	0.930 7	93.07	0.31
802.11ac_VHT40	0.767	0.668	0.870 9	87.09	0.60
802.11ac_VHT80	0.431	0.332	0.770 3	77.03	1.13

#### MIMO

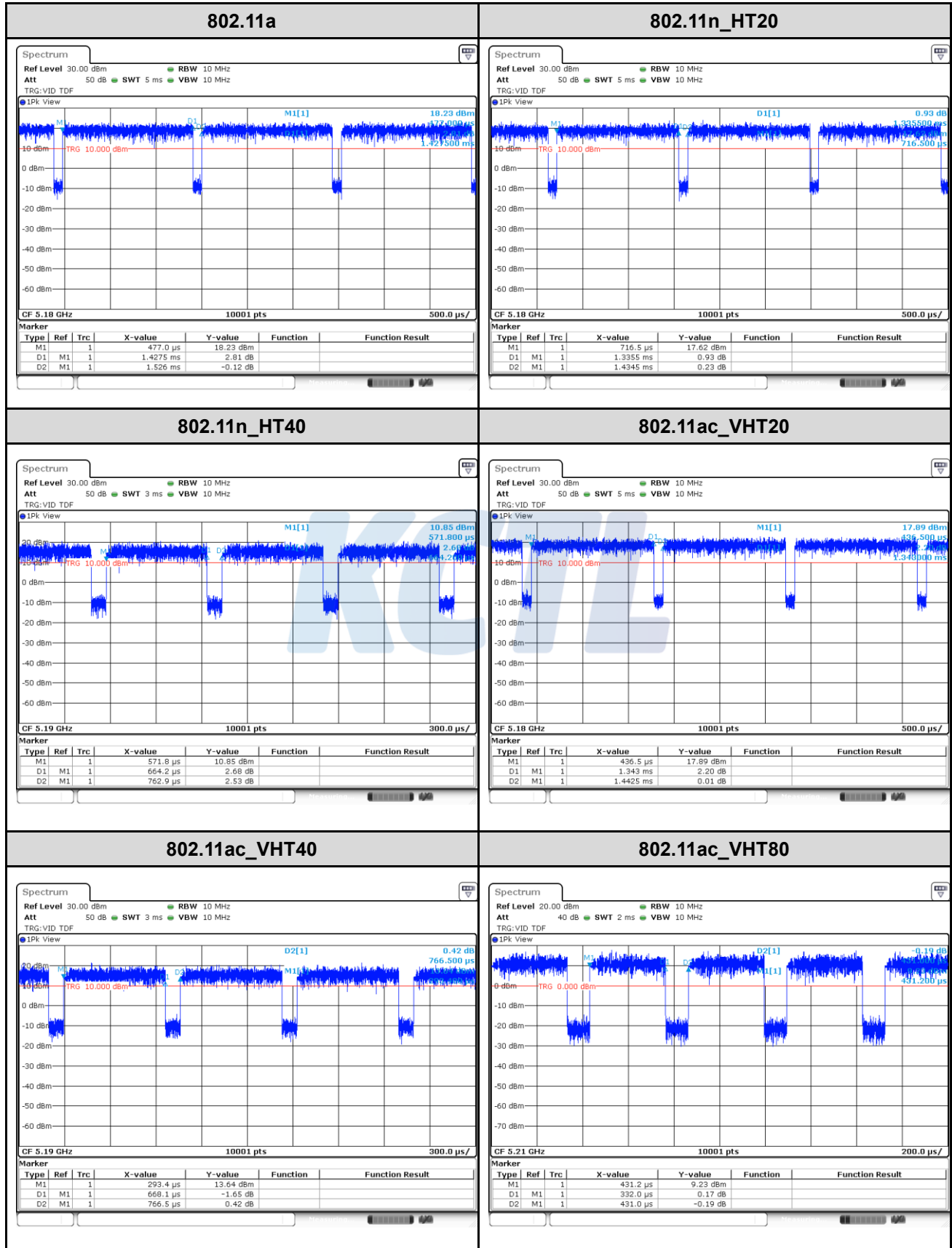
Test mode	Period (ms)	T <sub>on</sub> time (ms)	Duty cycle		Duty cycle factor (dB)
			(Linear)	(%)	
802.11a	1.527	1.428	0.935 2	93.52	0.29
802.11n_HT20	1.434	1.336	0.931 7	93.17	0.31
802.11n_HT40	0.763	0.664	0.870 2	87.02	0.60
802.11ac_VHT20	1.435	1.336	0.931 0	93.10	0.31
802.11ac_VHT40	0.459	0.360	0.784 3	78.43	1.06
802.11ac_VHT80	0.291	0.192	0.659 8	65.98	1.81

#### Notes.

1. Duty cycle (Linear) = T<sub>on</sub> time / Period
2. DCF(Duty cycle factor) = 10log(1/duty cycle)
3. DCF is not compensated to average result if duty cycle is more than 98%

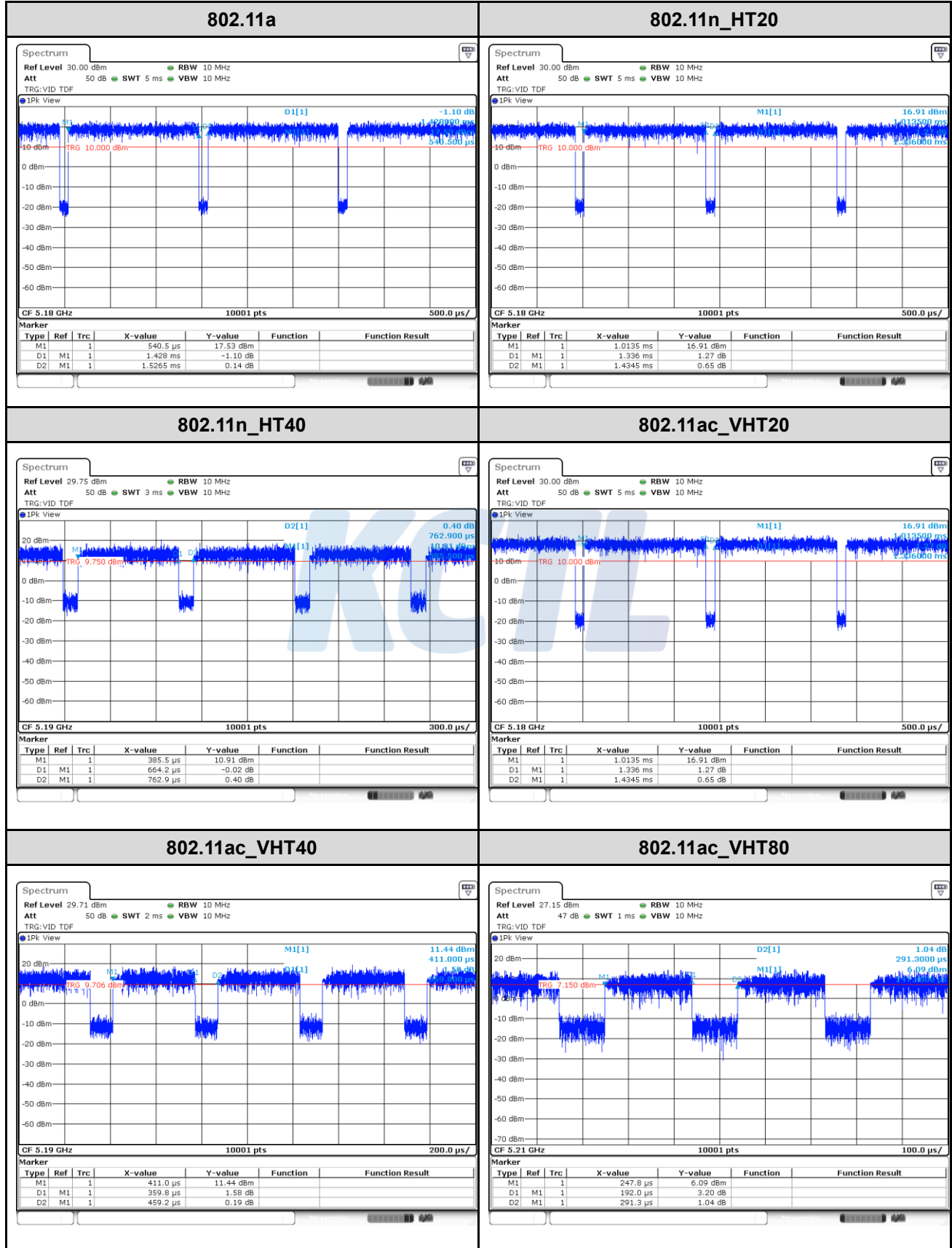


**SISO**





**MIMO**



### **3. Antenna requirement**

#### **Requirement of FCC part section 15.203**

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

#### **Requirement of RSS-Gen Section 6.8:**

The applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list.

For expediting the testing, measurements may be performed using only the antenna with highest gain of each combination of transmitter and antenna type, with the transmitter output power set at the maximum level. However, the transmitter shall comply with the applicable requirements under all operational conditions and when in combination with any type of antenna from the list provided in the test report (and in the notice to be included in the user manual, provided below).

When measurements at the antenna port are used to determine the RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna's manufacturer.

The test report shall state the RF power, output power setting and spurious emission measurements with each antenna type that is used with the transmitter being tested.

Immediately following the above notice, the manufacturer shall provide a list of all antenna types which can be used with the transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna type.

- The transmitter has permanently attached LDS carrier Antenna (Internal antenna) on board.
- The E.U.T Complies with the requirement of §15.203, §15.247, §15.407.

### 3.1 Antenna information

Mode	SISO		CDD	MIMO
	ANT 1	ANT 2	ANT 1 + 2	ANT 1 + 2
802.11a	√	√	√	X
802.11n HT20	√	√	√	√
802.11n HT40	√	√	√	√
802.11ac VHT20	√	√	√	√
802.11ac VHT40	√	√	√	√
802.11ac VHT80	√	√	√	√

√ = Support, X = Not support

### 3.2 Directional Gain Calculations

According to clause F), 2), d), (i) of KDB 662911 D01 Multiple Transmitter Output, Directional gain may be calculated by using the formulas as below.

#### 3.2.1. Directional Antenna Gain

Band	ANT 1 Gain (dBi)	ANT 2 Gain (dBi)	Power Directional Gain (dBi)
UNII 1	-3.20	-3.70	-0.44
UNII 2A	-3.20	-3.80	-0.48
UNII 2C	-6.20	-6.70	-3.44
UNII 3	-6.50	-6.40	-3.44

**Note.**

Unequal antenna gains, with equal transmit powers. For antenna gains given by  $G_1, G_2, \dots, G_N$  dBi  
 Directional gain =  $10 \log[(10^{G_1/20} + 10^{G_2/20} + \dots + 10^{G_N/20})^2 / N_{ANT}]$  dB i

## 4. Introduction

This report referenced from the FCC ID : A3LSMT575

Based on their similarity, the FCC Part 15C (equipment class: NII) reuses the original model's result and do spot-check, following the FCC KDB 484596 D01 v01.

And the applicant takes full responsibility that the test data as referenced in this report represent compliance for this FCC ID.

### 4.1 Difference

The FCC ID: A3LSMT577U shares the same enclosure and circuit board as FCC ID: A3LSMT575. The WIFI/BT/BLE/NFC/WCDMA/LTE antenna and surrounding circuitry and layout are identical between these two units.

As for all bands, they have been verified and the parent model test results under FCC ID : A3LSMT575 shall remain representative of FCC ID : A3LSMT577U.

**Note.** The Product equality letter includes detailed information about the differences between FCC ID: A3LSMT575 and FCC ID: A3LSMT577U.

### 4.2 Spot check verification data (Band-edge & Spurious emission)

Test band	Test item	Test mode	Channel	Measured frequency (MHz)	SM-T575 (dB $\mu$ V)		SM-T577U/DS (dB $\mu$ V)		Deviation (dB)	
					Avg.	Peak	Avg.	Peak	Avg.	Peak
UNII-1	Band edge	802.11ac VHT40 MIMO	38	4 500 ~ 5 150	45.59	58.27	43.82	57.73	1.77	0.54
	RSE	802.11a MIMO	48	10 480	-	54.62	-	51.66	-	2.96
UNII-2A	Band edge	802.11ac VHT40 MIMO	62	5 350 ~ 5 460	49.34	61.04	47.78	59.42	1.56	1.62
	RSE	802.11a MIMO	52	10 520	-	54.26	-	50.56	-	3.70
UNII-2C	Band edge	802.11n HT20 ANT 1	140	5 730	-	61.88	-	59.75	-	2.13
	RSE	802.11a MIMO	116	11 160	45.09	54.76	39.50	47.27	5.59	7.49
UNII-3	Band edge	802.11n HT40 MIMO	151	5 725	-	64.05	-	65.02	-	-0.97
	RSE	802.11a ANT 2	165	11 650	-	50.74	-	46.38	-	4.36

**Notes:**

- For FCC ID: A3LSMT577U has been verified the performance as for WIFI identical with the FCC ID: A3LSMT575.
- Comparison of two models, upper deviation is within 3 dB range and all test results are under FCC technical limits.
- The test procedure(s) in this report were performed in accordance as following.
  - ◆ KDB 484596 D01 v01

### 4.3 Reference Detail

Reference application that contains the reused reference data in the individual test reports.

Equipment Class	Reference FCC ID	Application Type	Reference Test report Number	Exhibit Type	Variant Test Report Number	Data Re-used
DTS	A3LSMT575	Original	KP20-SRF0209 (802.11b/g/n/ac)	Test report	KR20-SRF0255	All
			KP20-SRF0214 (802.11ax)	Test report	KR20-SRF0256	All
			KP20-SRF0208 (Bluetooth LE)	Test report	KR20-SRF0253	All
DSS	A3LSMT575	Original	KP20-SRF0207 (Bluetooth)	Test report	KR20-SRF0252	All
NII	A3LSMT575	Original	KP20-SRF0210 (802.11a/n/ac)	Test report	KR20-SRF0257	All
			KP20-SRF0215 (802.11ax)	Test report	KR20-SRF0258	All
			KR20-SRF0216 (DFS)	Test report	KR20-SRF0259	All
DXX	A3LSMT575	Original	KP20-SRF0211 (NFC)	Test report	KR20-SRF0254	All
PCB	A3LSMT575	Original	KP20-SRF0212 (2G, 3G)	Test report	KR20-SRF0260	Partial
			KP20-SRF0213 (LTE)	Test report	KR20-SRF0261	Partial

For this application the data reuse is summarized below for each equipment class

Equipment Class	Reference FCC ID	Application Type	Test Item	Data Re-used
DTS	A3LSMT575	Original	WLAN (802.11b/g/n/ac)	All
			WLAN (802.11ax)	All
			Bluetooth LE	All
DSS	A3LSMT575	Original	Bluetooth	All
NII	A3LSMT575	Original	WLAN (802.11a/n/ac)	All
			WLAN (802.11ax)	All
			WLAN (DFS)	All
DXX	A3LSMT575	Original	NFC	All
PCB	A3LSMT575	Original	2G, 3G	All except for 2G
			LTE	Band 66, Band 12, Band 5, Band 13 LTE 41 (PC 3)

**5. Summary of tests**

FCC Part section(s)	IC Rule Reference	Parameter	Test Condition	Test results
15.407(a)	RSS-247 Issue 2, 6.2	Maximum conducted output power	Conducted	Pass
15.407(a)	RSS-247 Issue 2, 6.2	Maximum power spectral density		Pass
15.407(a)	RSS-Gen Issue 5, 6.7	26 dB Channel Bandwidth		Pass
15.407(e)	RSS-247 Issue 2, 6.2.4	6 dB Channel Bandwidth		Pass
-	RSS-Gen Issue 5, 6.7	Occupied Bandwidth		Pass
15.207(a)	RSS-Gen Issue 5, 8.8	AC Conducted Emissions		Pass
15.407(b), 15.205(a), 15.209(a)	RSS-Gen Issue 5, 8.9, 8.10 RSS-247 Issue 2, 6.2,	Spurious emission Band-edge, restricted band	Radiated	Pass Pass

**Notes:**

- All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
- According to exploratory test no any obvious emission were detected from 9 kHz to 30 MHz. Although these tests were performed other than open field site, adequate comparison measurements were confirmed against 30 m open field site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.
- The fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z. It was determined that **X** orientation was worst-case orientation. Therefore, all final radiated testing was performed with the EUT in **X** orientation.
- All the radiated tests have been performed several case.  
(Stand-alone, with accessories (earphone, cover, TA etc.))  
Worst case: stand-alone
- The test procedure(s) in this report were performed in accordance as following.
  - ANSI C63.10-2013
  - KDB 662911 D01 v02r01
  - KDB 789033 D02 v02r01
- Based on the baseline scan, the worst-case data rates were:
  - 802.11a mode: 6Mbps
  - 802.11n HT20 mode: MCS0
  - 802.11n HT40 mode: MCS0
  - 802.11ac VHT20 mode: MCS0
  - 802.11ac VHT40 mode: MCS0
  - 802.11ac VHT80 mode: MCS0

## 6. Measurement uncertainty

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2013.

All measurement uncertainty values are shown with a coverage factor of  $k=2$  to indicate a 95 % level of confidence. The measurement data shown herein meets or exceeds the  $U_{\text{CISPR}}$  measurement uncertainty values specified in CISPR 16-4-2 and thus, can be compared directly to specified limits to determine compliance.

Parameter	Expanded uncertainty ( $\pm$ )	
Conducted RF power	1.3 dB	
Conducted spurious emissions	1.3 dB	
Radiated spurious emissions	9 kHz ~ 30 MHz:	2.3 dB
	30 MHz ~ 300 MHz	5.4 dB
	300 MHz ~ 1 000 MHz	5.5 dB
	Above 1 GHz	6.7 dB
Conducted emissions	9 kHz ~ 150 kHz	3.7 dB
	150 kHz ~ 30 MHz	3.3 dB

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**7. Measurement results explanation example**

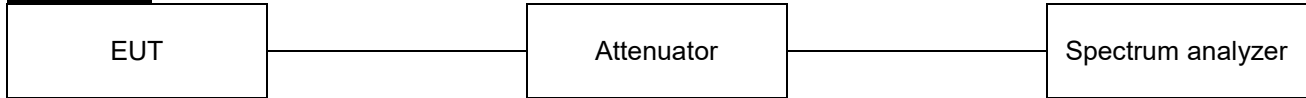
The offset level is set in the spectrum analyzer to compensate the RF cable loss factor between EUT conducted output port and spectrum analyzer.

With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Frequency (MHz)	Factor(dB)	Frequency (MHz)	Factor(dB)
30	9.29	9 000	12.34
50	9.36	10 000	12.61
100	9.43	11 000	12.79
200	9.55	12 000	12.81
300	9.64	13 000	12.85
400	9.73	14 000	12.99
500	9.80	15 000	13.10
600	9.85	16 000	13.52
700	9.89	17 000	13.55
800	9.94	18 000	13.74
900	10.03	19 000	13.77
1 000	10.09	20 000	13.82
2 000	10.93	21 000	14.14
3 000	11.21	22 000	14.44
4 000	11.54	23 000	14.64
5 000	11.89	24 000	14.71
6 000	12.17	25 000	15.01
7 000	12.05	26 000	15.06
8 000	12.26	26 500	15.10

**Notes:**

Offset(dB) = RF cable loss(dB) + Attenuator(dB)

**8. Test results****8.1. Maximum conducted output power****Test setup****Limit**

According to §15.407(a), RSS-247(6.2)

**FCC**

Band	EUT category	Conducted output power limit
UNII-1	Outdoor access point	1 W (30 dBm)
	Indoor access point	
	Fixed point-to-point access point	
	√ Client device	250 mW (23.98 dBm)
UNII-2A	√	250 mW or 11 dBm + 10logB <sup>1)</sup>
UNII-2C	√	250 mW or 11 dBm + 10logB <sup>1)</sup>
UNII-3	√	1 W (30 dBm)

**IC**

Band	Maximum e.i.r.p. limit
UNII-1	200 mW or 10 + 10 log10B <sup>2)</sup> , dBm
UNII-2A	1 W or 17 dBm + 10logB <sup>2)</sup>
UNII-2C	1 W or 17 dBm + 10logB <sup>2)</sup>
UNII-3	1 W (30 dBm)

**Note:**

- 1) Conducted output power limit B is the 26 dB emission bandwidth.
- 2) Maximum e.i.r.p. limit B is the 99% emission bandwidth.

**Test procedure**ANSI C63.10-2013-Section 12.3.3.2 and 14.2  
KDB 789033 D02 v02r01 - Section E.2.d) or e)  
KDB 662911 D01 v02r01 – Section E).1)

**Test settings****◆ KDB 789033 D02 v02r01****Section E.2.d)****Method SA-2 (trace averaging across on and off times of the EUT transmissions, followed by duty cycle correction):**

- (i) Measure the duty cycle,  $x$ , of the transmitter output signal as described in II.B..
- (ii) Set span to encompass the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal.
- (iii) Set RBW = 1 MHz
- (iv) Set RBW  $\geq$  3 MHz
- (v) Number of points in sweep  $\geq 2 \times \text{span}/\text{RBW}$ . (This ensures that bin-to-bin spacing is  $\leq \text{RBW}/2$ , so that narrowband signals are not lost between frequency bins.)
- (vi) Sweep time = auto.
- (vii) Detector = power averaging (rms), if available. Otherwise use sample detector mode.
- (viii) Do not use sweep triggering. Allow the sweep to “free run.”
- (ix) Trace average at least 100 traces in power averaging (rms) mode; however, the number of traces to be averaged shall be increased above 100 as needed to ensure that the average accurately represents the true average over the on and off periods of the transmitter.
- (x) Compute power by integrating the spectrum across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal using the instrument’s band power measurement function with band limits set equal to the EBW (or occupied bandwidth) band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at 1 MHz intervals extending across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal.
- (xi) Add  $10 \log(1/x)$ , where  $x$  is the duty cycle, to the measured power in order to compute the average power during the actual transmission times (because the measurement represents an average over both the on and off times of the transmission). For example, add  $10 \log(1/0,25) = 6 \text{ dB}$  if the duty cycle is 25%.

**Section E.2.e)****Method SA-2 Alternative (power averaging(rms) detection with slow sweep with each spectrum bin averaging across on and off times of the EUT transmissions, followed by duty cycle correction):**

- (i) Measure the duty cycle,  $x$ , of the transmitter output signal as described in II.B..
- (ii) Set span to encompass the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal.
- (iii) Set RBW = 1 MHz
- (iv) Set RBW  $\geq$  3 MHz
- (v) Number of points in sweep  $\geq 2 \times \text{span}/\text{RBW}$ . (This ensures that bin-to-bin spacing is  $\leq \text{RBW}/2$ , so that narrowband signals are not lost between frequency bins.)
- (vi) Manually set sweep time  $\geq 10 \times (\text{number of points in sweep}) \times (\text{total on/off period of the transmitted signal})$ .
- (vii) Set detector = power averaging (rms)
- (viii) Perform a single sweep.
- (ix) Compute power by integrating the spectrum across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal using the instrument’s band power measurement function with band limits set equal to the EBW (or occupied bandwidth) band edges. If

the instrument does not have a band power function, sum the spectrum levels (in power units) at 1 MHz intervals extending across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the spectrum.

- (x) Add  $10 \log(1/x)$ , where  $x$  is the duty cycle, to the measured power in order to compute the average power during the actual transmission times (because the measurement represents an average over both the on and off times of the transmission). For example, add  $10 \log(1/0.25) = 6$  dB if the duty cycle is 25%.

**Section E.3.a)****Method PM (Measurement using an RF average power meter):**

- (xi) Measurements may be performed using a wideband RF power meter with a thermocouple detector or equivalent if all of the conditions listed below are satisfied.
- The EUT is configured to transmit continuously or to transmit with a constant duty cycle.
  - At all times when the EUT is transmitting, it must be transmitting at its maximum power control level.
  - The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a factor of five
- (xii) If the transmitter does not transmit continuously, measure the duty cycle,  $x$ , of the transmitter output signal as described in II
- (xiii) Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.
- (xiv) Adjust the measurement in dBm by adding  $10 \log(1/x)$  where  $x$  is the duty cycle (e.g.,  $10 \log(1/0.25)$  if the duty cycle is 25%).

**Section E.3.b)****Method PM-G (Measurement using a gated RF average power meter):**

Measurements may be performed using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.

**Test results****SISO Conducted Output Power**

Test mode	Band	Frequency (MHz)	Measured output power					Limit (dBm)
			Reading (dBm)		DCF (dB)	Result (dBm)		
			ANT1	ANT2		ANT1	ANT2	
802.11a	UNII 1	5 180	14.19	13.82	0.29	14.48	14.11	24.00
		5 200	14.44	13.86	0.29	14.73	14.15	
		5 240	14.55	13.93	0.29	14.84	14.22	
	UNII 2A	5 260	14.66	14.02	0.29	14.95	14.31	24.00
		5 280	14.49	13.93	0.29	14.78	14.22	
		5 320	14.11	13.49	0.29	14.40	13.78	
	UNII 2C	5 500	13.97	14.15	0.29	14.26	14.44	24.00
		5 580	14.07	14.05	0.29	14.36	14.34	
		5 700	14.08	14.12	0.29	14.37	14.41	
	UNII 3	5 745	14.03	14.20	0.29	14.32	14.49	30.00
		5 785	14.30	14.47	0.29	14.59	14.76	
		5 825	14.28	14.47	0.29	14.57	14.76	
802.11n HT20	UNII 1	5 180	14.34	13.77	0.31	14.65	14.08	24.00
		5 200	14.31	13.82	0.31	14.62	14.13	
		5 240	14.43	14.10	0.31	14.74	14.41	
	UNII 2A	5 260	14.60	13.99	0.31	14.91	14.30	24.00
		5 280	14.49	14.01	0.31	14.80	14.32	
		5 320	14.16	13.66	0.31	14.47	13.97	
	UNII 2C	5 500	14.04	14.22	0.31	14.35	14.53	24.00
		5 580	14.22	14.27	0.31	14.53	14.58	
		5 700	13.85	14.01	0.31	14.16	14.32	
	UNII 3	5 745	13.93	14.13	0.31	14.24	14.44	30.00
		5 785	14.20	14.49	0.31	14.51	14.80	
		5 825	14.34	14.45	0.31	14.65	14.76	
802.11n HT40	UNII 1	5 190	13.01	12.44	0.60	13.61	13.04	24.00
		5 230	13.27	12.66	0.60	13.87	13.26	
	UNII 2A	5 270	13.29	12.65	0.60	13.89	13.25	24.00
		5 310	13.16	12.64	0.60	13.76	13.24	
	UNII 2C	5 510	13.01	13.15	0.60	13.61	13.75	24.00
		5 590	12.86	12.94	0.60	13.46	13.54	
		5 670	12.62	12.77	0.60	13.22	13.37	
	UNII 3	5 755	13.10	13.17	0.60	13.70	13.77	30.00
		5 795	13.36	13.31	0.60	13.96	13.91	

Test mode	Band	Frequency (MHz)	Measured output power					Limit (dBm)
			Reading (dBm)		DCF (dB)	Result (dBm)		
			ANT1	ANT2		ANT1	ANT2	
802.11ac VHT20	UNII 1	5 180	14.27	13.75	0.31	14.58	14.06	24.00
		5 200	14.24	13.97	0.31	14.55	14.28	
		5 240	14.43	14.10	0.31	14.74	14.41	
	UNII 2A	5 260	14.47	14.03	0.31	14.78	14.34	24.00
		5 280	14.44	13.93	0.31	14.75	14.24	
		5 320	14.12	13.62	0.31	14.43	13.93	
	UNII 2C	5 500	14.16	14.09	0.31	14.47	14.40	24.00
		5 580	14.07	14.22	0.31	14.38	14.53	
		5 700	14.04	14.11	0.31	14.35	14.42	
	UNII 3	5 745	13.93	14.18	0.31	14.24	14.49	30.00
		5 785	14.03	14.53	0.31	14.34	14.84	
		5 825	14.47	14.42	0.31	14.78	14.73	
802.11ac VHT40	UNII 1	5 190	13.08	12.41	0.60	13.68	13.01	24.00
		5 230	13.24	12.72	0.60	13.84	13.32	
	UNII 2A	5 270	13.34	12.80	0.60	13.94	13.40	24.00
		5 310	13.23	12.64	0.60	13.83	13.24	
	UNII 2C	5 510	12.79	13.09	0.60	13.39	13.69	24.00
		5 590	12.87	12.99	0.60	13.47	13.59	
		5 670	12.58	12.95	0.60	13.18	13.55	
	UNII 3	5 755	13.15	13.33	0.60	13.75	13.93	30.00
		5 795	13.10	13.32	0.60	13.70	13.92	
	802.11ac VHT80	UNII 1	5 210	11.65	10.91	1.13	12.78	12.04
UNII 2A		5 290	11.56	10.96	1.13	12.69	12.09	24.00
UNII 2C		5 530	11.19	11.26	1.13	12.32	12.39	24.00
		5 610	11.10	11.08	1.13	12.23	12.21	
UNII 3		5 775	11.49	11.47	1.13	12.62	12.60	30.00

**Note.**

1. Result(dBm) = Reading Power + D.C.F

**SISO e.i.r.p.**

Test mode	Band	Frequency (MHz)	Measured output power						MAX e.i.r.p Limit (dBm)	
			Conducted output power (dBm)		ANT gain (dBi)		MAX e.i.r.p (dBm)		ANT1	ANT2
			ANT1	ANT2	ANT1	ANT2	ANT1	ANT2		
802.11a	UNII 1	5 180	14.48	14.11	-3.20	-3.70	11.28	10.41	22.26	22.22
		5 200	14.73	14.15			11.53	10.45	22.26	22.22
		5 240	14.84	14.22			11.64	10.52	22.26	22.22
	UNII 2A	5 260	14.95	14.31	-3.20	-3.80	11.75	10.51	29.26	29.22
		5 280	14.78	14.22			11.58	10.42	29.25	29.22
		5 320	14.40	13.78			11.20	9.98	29.26	29.22
	UNII 2C	5 500	14.26	14.44	-6.20	-6.70	8.06	7.74	29.26	29.22
		5 580	14.36	14.34			8.16	7.64	29.26	29.22
		5 700	14.37	14.41			8.17	7.71	29.26	29.22
	UNII 3	5 745	14.32	14.49	-6.50	-6.40	7.82	8.09	30.00	
		5 785	14.59	14.76			8.09	8.36		
		5 825	14.57	14.76			8.07	8.36		
802.11n HT20	UNII 1	5 180	14.65	14.08	-3.20	-3.70	11.45	10.38	22.54	22.51
		5 200	14.62	14.13			11.42	10.43	22.55	22.52
		5 240	14.74	14.41			11.54	10.71	22.54	22.51
	UNII 2A	5 260	14.91	14.30	-3.20	-3.80	11.71	10.50	29.54	29.52
		5 280	14.80	14.32			11.60	10.52	29.54	29.52
		5 320	14.47	13.97			11.27	10.17	29.54	29.51
	UNII 2C	5 500	14.35	14.53	-6.20	-6.70	8.15	7.83	29.54	29.51
		5 580	14.53	14.58			8.33	7.88	29.54	29.51
		5 700	14.16	14.32			7.96	7.62	29.54	29.51
	UNII 3	5 745	14.24	14.44	-6.50	-6.40	7.74	8.04	30.00	
		5 785	14.51	14.80			8.01	8.40		
		5 825	14.65	14.76			8.15	8.36		
802.11n HT40	UNII 1	5 190	13.61	13.04	-3.20	-3.70	10.41	9.34	23.01	
		5 230	13.87	13.26			10.67	9.56		
	UNII 2A	5 270	13.89	13.25	-3.20	-3.80	10.69	9.45	30.00	
		5 310	13.76	13.24			10.56	9.44		
	UNII 2C	5 510	13.61	13.75	-6.20	-6.70	7.41	7.05	30.00	
		5 590	13.46	13.54			7.26	6.84		
		5 670	13.22	13.37			7.02	6.67		
	UNII 3	5 755	13.70	13.77	-6.50	-6.40	7.20	7.37	30.00	
		5 795	13.96	13.91			7.46	7.51		



Test mode	Band	Frequency (MHz)	Measured output power						MAX e.i.r.p Limit (dBm)	
			Reading (dBm)		ANT gain (dBi)		MAX e.i.r.p (dBm)		ANT1	ANT2
			ANT1	ANT1	ANT1	ANT2	ANT1	ANT2		
802.11ac VHT20	UNII 1	5 180	14.58	14.06	-3.20	-3.70	11.38	10.36	22.55	22.51
		5 200	14.55	14.28			11.35	10.58	22.54	22.51
		5 240	14.74	14.41			11.54	10.71	22.55	22.51
	UNII 2A	5 260	14.78	14.34	-3.20	-3.80	11.58	10.54	29.54	29.51
		5 280	14.75	14.24			11.55	10.44	29.54	29.51
		5 320	14.43	13.93			11.23	10.13	29.54	29.51
	UNII 2C	5 500	14.47	14.40	-6.20	-6.70	8.27	7.70	29.54	29.51
		5 580	14.38	14.53			8.18	7.83	29.54	29.51
		5 700	14.35	14.42			8.15	7.72	29.54	29.51
	UNII 3	5 745	14.24	14.49	-6.50	-6.40	7.74	8.09	30.00	
		5 785	14.34	14.84			7.84	8.44		
		5 825	14.78	14.73			8.28	8.33		
802.11ac VHT40	UNII 1	5 190	13.68	13.01	-3.20	-3.70	10.48	9.31	23.01	
		5 230	13.84	13.32			10.64	9.62		
	UNII 2A	5 270	13.94	13.40	-3.20	-3.80	10.74	9.60	30.00	
		5 310	13.83	13.24			10.63	9.44		
	UNII 2C	5 510	13.39	13.69	-6.20	-6.70	7.19	6.99	30.00	
		5 590	13.47	13.59			7.27	6.89		
		5 670	13.18	13.55			6.98	6.85		
	UNII 3	5 755	13.75	13.93	-6.50	-6.40	7.25	7.53	30.00	
		5 795	13.70	13.92			7.20	7.52		
	802.11ac VHT80	UNII 1	5 210	12.78	12.04	-3.20	-3.70	9.58	8.34	23.01
UNII 2A		5 290	12.69	12.09	-3.20	-3.80	9.49	8.29	30.00	
UNII 2C		5 530	12.32	12.39	-6.20	-6.70	6.12	5.69	30.00	
		5 610	12.23	12.21			6.03	5.51		
UNII 3		5 775	12.62	12.60	-6.50	-6.40	6.12	6.20	30.00	

**Notes:**

1. e.i.r.p. Calculation: e.i.r.p. (dBm) = Conducted output power (dBm) + Antenna gain (dBi)

**MIMO Conducted Output Power**

Test mode	Band	Frequency (MHz)	Measured output power				Limit (dBm)
			Reading (dBm)		DCF (dB)	Result (dBm)	
			ANT1	ANT2			
802.11a	UNII 1	5 180	13.61	13.28	0.29	16.75	24.00
		5 200	13.78	13.52	0.29	16.95	
		5 240	13.98	13.74	0.29	17.16	
	UNII 2A	5 260	13.84	13.43	0.29	16.94	24.00
		5 280	14.03	13.48	0.29	17.06	
		5 320	13.74	13.10	0.29	16.73	
	UNII 2C	5 500	13.54	13.66	0.29	16.90	24.00
		5 580	13.49	13.86	0.29	16.98	
		5 700	13.45	13.49	0.29	16.77	
	UNII 3	5 745	13.52	13.79	0.29	16.96	30.00
		5 785	13.80	14.00	0.29	17.20	
		5 825	13.83	14.03	0.29	17.23	
802.11n HT20	UNII 1	5 180	13.65	13.35	0.31	16.82	24.00
		5 200	13.60	13.31	0.31	16.78	
		5 240	14.02	13.64	0.31	17.15	
	UNII 2A	5 260	14.06	13.37	0.31	17.05	24.00
		5 280	14.03	13.37	0.31	17.03	
		5 320	13.61	13.01	0.31	16.64	
	UNII 2C	5 500	13.58	13.74	0.31	16.98	24.00
		5 580	13.70	13.73	0.31	17.04	
		5 700	13.56	13.61	0.31	16.91	
	UNII 3	5 745	13.57	13.97	0.31	17.09	30.00
		5 785	13.91	13.88	0.31	17.22	
		5 825	13.85	14.01	0.31	17.25	
802.11n HT40	UNII 1	5 190	12.57	11.97	0.60	15.89	24.00
		5 230	12.70	12.18	0.60	16.06	
	UNII 2A	5 270	12.63	12.14	0.60	16.00	24.00
		5 310	12.51	12.03	0.60	15.89	
	UNII 2C	5 510	12.27	12.64	0.60	16.07	24.00
		5 590	12.40	12.62	0.60	16.12	
		5 670	11.98	12.52	0.60	15.87	
	UNII 3	5 755	12.54	12.59	0.60	16.18	30.00
5 795		12.82	12.84	0.60	16.44		

Test mode	Band	Frequency (MHz)	Measured output power				Limit (dBm)
			Reading (dBm)		DCF (dB)	Result (dBm)	
			ANT1	ANT2			
802.11ac VHT20	UNII 1	5 180	14.17	13.80	0.31	17.00	24.00
		5 200	14.21	13.95	0.31	17.09	
		5 240	14.38	14.20	0.31	17.30	
	UNII 2A	5 260	14.54	14.37	0.31	17.47	24.00
		5 280	14.64	14.37	0.31	17.52	
		5 320	14.27	13.80	0.31	17.05	
	UNII 2C	5 500	14.35	14.29	0.31	17.33	24.00
		5 580	14.28	14.37	0.31	17.34	
		5 700	14.30	14.09	0.31	17.21	
	UNII 3	5 745	13.27	13.53	0.31	16.41	30.00
		5 785	13.7	13.68	0.31	16.70	
		5 825	13.71	13.67	0.31	16.70	
802.11ac VHT40	UNII 1	5 190	12.22	11.48	1.06	15.94	24.00
		5 230	12.30	11.71	1.06	16.09	
	UNII 2A	5 270	12.29	11.79	1.06	16.12	24.00
		5 310	12.18	11.69	1.06	16.01	
	UNII 2C	5 510	11.93	12.12	1.06	16.10	24.00
		5 590	11.86	12.15	1.06	16.08	
		5 670	11.78	11.87	1.06	15.90	
	UNII 3	5 755	12.17	12.21	1.06	16.26	30.00
		5 795	12.15	12.42	1.06	16.36	
	802.11ac VHT80	UNII 1	5 210	10.25	9.78	1.81	14.84
UNII 2A		5 290	10.46	9.97	1.81	15.04	24.00
UNII 2C		5 530	10.04	10.39	1.81	15.04	24.00
		5 610	9.83	10.06	1.81	14.77	
UNII 3		5 775	10.38	10.32	1.81	15.17	30.00

**Note.**

1. Result(dBm) =  $10\log(10^{(\text{ANT } 1/10)} + 10^{(\text{ANT } 2/10)}) + \text{D.C.F}$

**MIMO e.i.r.p.**

Test mode	Band	Frequency (MHz)	Measured output power			MAX e.i.r.p Limit (dBm)
			Conducted output Power (dBm)	ANT gain (dBi)	MAX e.i.r.p (dBm)	
802.11a	UNII 1	5 180	16.75	-0.44	16.31	22.22
		5 200	16.95		16.51	22.22
		5 240	17.16		16.72	22.22
	UNII 2A	5 260	16.94	-0.48	16.46	29.22
		5 280	17.06		16.58	29.22
		5 320	16.73		16.25	29.22
	UNII 2C	5 500	16.90	-3.44	13.46	29.22
		5 580	16.98		13.54	29.22
		5 700	16.77		13.33	29.22
	UNII 3	5 745	16.96	-3.44	13.52	30.00
		5 785	17.20		13.76	
		5 825	17.23		13.79	
802.11n HT20	UNII 1	5 180	16.82	-0.44	16.38	22.51
		5 200	16.78		16.34	22.52
		5 240	17.15		16.71	22.51
	UNII 2A	5 260	17.05	-0.48	16.57	29.52
		5 280	17.03		16.55	29.52
		5 320	16.64		16.16	29.51
	UNII 2C	5 500	16.98	-3.44	13.54	29.51
		5 580	17.04		13.60	29.51
		5 700	16.91		13.47	29.51
	UNII 3	5 745	17.09	-3.44	13.65	30.00
		5 785	17.22		13.78	
		5 825	17.25		13.81	
802.11n HT40	UNII 1	5 190	15.89	-0.44	15.45	23.01
		5 230	16.06		15.62	
	UNII 2A	5 270	16.00	-0.48	15.52	30.00
		5 310	15.89		15.41	
	UNII 2C	5 510	16.07	-3.44	12.63	30.00
		5 590	16.12		12.68	
		5 670	15.87		12.43	
	UNII 3	5 755	16.18	-3.44	12.74	30.00
		5 795	16.44		13.00	

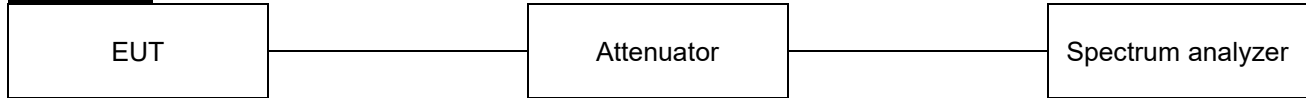
Test mode	Band	Frequency (MHz)	Measured output power			MAX e.i.r.p Limit (dBm)
			Conducted output Power (dBm)	ANT gain (dBi)	MAX e.i.r.p (dBm)	
802.11ac VHT20	UNII 1	5 180	17.00	-0.44	16.56	22.51
		5 200	17.09		16.65	22.51
		5 240	17.30		16.86	22.51
	UNII 2A	5 260	17.47	-0.48	16.99	29.51
		5 280	17.52		17.04	29.51
		5 320	17.05		16.57	29.51
	UNII 2C	5 500	17.33	-3.44	13.89	29.51
		5 580	17.34		13.90	29.51
		5 700	17.21		13.77	29.51
	UNII 3	5 745	16.41	-3.44	12.97	30.00
		5 785	16.70		13.26	
		5 825	16.70		13.26	
802.11ac VHT40	UNII 1	5 190	15.94	-0.44	15.50	23.01
		5 230	16.09		15.65	
	UNII 2A	5 270	16.12	-0.48	15.64	30.00
		5 310	16.01		15.53	
	UNII 2C	5 510	16.10	-3.44	12.66	30.00
		5 590	16.08		12.64	
		5 670	15.90		12.46	
	UNII 3	5 755	16.26	-3.44	12.82	30.00
		5 795	16.36		12.92	
	802.11ac VHT80	UNII 1	5 210	14.84	-0.44	14.40
UNII 2A		5 290	15.04	-0.48	14.56	30.00
UNII 2C		5 530	15.04	-3.44	11.60	30.00
		5 610	14.77		11.33	
UNII 3		5 775	15.17	-3.44	11.73	30.00

**Notes:**

1. e.i.r.p. Calculation: e.i.r.p. (dBm) = Conducted output power (dBm) + Antenna gain (dBi)

## 8.2. Maximum Power Spectral Density

### Test setup



### Limit

According to §15.407(a), RSS-247(6.2)

Band	EUT category		Limit
UNII-1		Outdoor access point	17dBm/MHz
		Indoor access point	
		Fixed point-to-point access point	
	√	Client device	11 dBm /MHz
UNII-2A		√	11 dBm /MHz
UNII-2C		√	11 dBm /MHz
UNII-3		√	30 dBm /500 kHz

### Notes:

If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain if the antenna exceed 6 dBi

### Test procedure

ANSI C63.10-2013 Section 12.3.2.2, 14.3.2.2  
KDB 789033 D02 v02r01 - Section F  
KDB 662911 D01 v02r01 - Section E). 2)

### Test settings

#### Section F

The rules requires “maximum power spectral density” measurements where the intent is to measure the maximum value of the time average of the power spectral density measured during a period of continuous transmission. Refer to III.A for additional guidance for devices that use channel aggregation.

1. Create an average power spectrum for the EUT operating mode being tested by following the instructions in II.E.2. for measuring maximum conducted output power using a spectrum analyzer or EMI receiver: select the appropriate test method (SA-1, SA-2, SA-3, or alternatives to each) and apply it up to, but not including, the step labeled, “Compute power...” (This procedure is required even if the maximum conducted output power measurement was performed using a power meter, method PM.)
2. Search function on the instrument to find the peak of the spectrum and record its value.
3. Adjustments to the peak value of the spectrum, if applicable:
  - a) If Method SA-2 or SA-2 Alternative was used, add  $10 \log(1/x)$ , where  $x$  is the duty cycle, to the peak of the spectrum.
  - b) If Method SA-3 Alternative was used and the linear mode was used in II.E.2.g) (viii), add 1 dB to the final result to compensate for the difference between linear averaging and power averaging.
4. The result is the Maximum PSD over 1MHz reference bandwidth
5. For devices operating in the bands 5.15-5.25 GHz, 5.25-5.35 GHz, and 5.47-5.725 GHz, the

preceding procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference bandwidth specified in Section 15.407(a)(5). For devices operating in the band 5.725-5.85 GHz, the rules specify a measurement bandwidth of 500 kHz. Many spectrum analyzers do not have 500 kHz RBW, thus a narrower RBW may need to be used. The rules permit the use of RBWs less than 1MHz, or 500 kHz, "provided that the measured power is integrated over the full reference bandwidth" to show the total power over the specified measurement bandwidth(i.e., 1 MHz, or 500 kHz). If measurements are performed using a reduced resolution bandwidth (< 1 MHz, or < 500 kHz) and integrated over 1 MHz, or 500 kHz bandwidth, the following adjustments to the procedures apply:

- a) Set  $RBW \geq 1/T$ , where T is defined in II.B.1.a).
- b) Set  $VBW \geq 3 RBW$ .
- c) If measurement bandwidth of Maximum PSD is specified in 500 kHz, add  $10 \log (500 \text{ kHz} / RBW)$  to the measured result, whereas RBW (<500 kHz) is the reduced resolution bandwidth of the spectrum analyzer set during measurement.
- d) If measurement bandwidth of Maximum PSD is specified in 1 MHz, add  $10 \log (1\text{MHz}/RBW)$  to the measured result, whereas RBW (< 1 MHz) is the reduced resolution bandwidth of spectrum analyzer set during measurement.
- e) Care must be taken to ensure that the measurements are performed during a period of continuous transmission or are corrected upward for duty cycle.

Note: As a practical matter, it is recommended to use reduced RBW of 100 kHz for the II.F.5.c) and II.F.5.d), since RBW=100 kHz is available on nearly all spectrum analyzers.



**Test results**

**SISO**

Test mode	Band	Frequency (MHz)	Measured PSD (dBm/MHz)		DCF (dB)	Maximum PSD (dB m/MHz)		Limit (dBm/MHz)
			ANT1	ANT2		ANT1	ANT2	
802.11a	UNII 1	5 180	3.05	3.06	0.29	3.34	3.35	11
		5 200	3.37	3.08	0.29	3.66	3.37	
		5 240	3.56	3.13	0.29	3.85	3.42	
	UNII 2A	5 260	3.30	2.97	0.29	3.59	3.26	11
		5 280	3.41	2.86	0.29	3.70	3.15	
		5 320	3.14	2.61	0.29	3.43	2.90	
	UNII 2C	5 500	3.01	3.18	0.29	3.30	3.47	11
		5 580	2.97	3.12	0.29	3.26	3.41	
		5 700	3.10	3.06	0.29	3.39	3.35	
802.11n HT20	UNII 1	5 180	2.91	2.31	0.31	3.22	2.62	11
		5 200	2.85	2.55	0.31	3.16	2.86	
		5 240	3.30	2.69	0.31	3.61	3.00	
	UNII 2A	5 260	3.19	2.44	0.31	3.50	2.75	11
		5 280	3.23	2.48	0.31	3.54	2.79	
		5 320	2.92	2.33	0.31	3.23	2.64	
	UNII 2C	5 500	2.80	2.82	0.31	3.11	3.13	11
		5 580	2.73	2.74	0.31	3.04	3.05	
		5 700	2.50	2.76	0.31	2.81	3.07	
802.11n HT40	UNII 1	5 190	-1.33	-1.65	0.60	-0.73	-1.05	11
		5 230	-1.09	-1.37	0.60	-0.49	-0.77	
	UNII 2A	5 270	-1.09	-1.44	0.60	-0.49	-0.84	11
		5 310	-1.06	-1.55	0.60	-0.46	-0.95	
	UNII 2C	5 510	-1.40	-1.07	0.60	-0.80	-0.47	11
		5 590	-1.33	-1.11	0.60	-0.73	-0.51	
5 670	-1.39	-1.42	0.60	-0.79	-0.82			
802.11ac VHT20	UNII 1	5 180	2.95	2.56	0.31	3.26	2.87	11
		5 200	3.03	2.60	0.31	3.34	2.91	
		5 240	3.07	2.93	0.31	3.38	3.24	
	UNII 2A	5 260	3.10	2.75	0.31	3.41	3.06	11
		5 280	3.44	2.75	0.31	3.75	3.06	
		5 320	2.64	2.42	0.31	2.95	2.73	
	UNII 2C	5 500	2.66	2.83	0.31	2.97	3.14	11
		5 580	2.74	2.77	0.31	3.05	3.08	
		5 700	2.71	3.04	0.31	3.02	3.35	

Test mode	Band	Frequency (MHz)	Measured PSD (dBm/MHz)		DCF (dB)	Maximum PSD (dBm/MHz)		Limit (dBm/MHz)
			ANT1	ANT2		ANT1	ANT2	
802.11ac VHT40	UNII 1	5 190	-0.93	-1.87	0.60	-0.33	-1.27	11
		5 230	-1.06	-1.48	0.60	-0.46	-0.88	
	UNII 2A	5 270	-0.94	-1.51	0.60	-0.34	-0.91	11
		5 310	-0.91	-1.48	0.60	-0.31	-0.88	
	UNII 2C	5 510	-1.32	-0.94	0.60	-0.72	-0.34	11
		5 590	-1.57	-0.97	0.60	-0.97	-0.37	
5 670		-1.59	-1.44	0.60	-0.99	-0.84		
802.11ac VHT80	UNII 1	5 210	-5.17	-5.94	1.13	-4.04	-4.81	11
	UNII 2A	5 290	-5.64	-5.71	1.13	-4.51	-4.58	11
	UNII 2C	5 530	-5.97	-5.91	1.13	-4.84	-4.78	11
		5 610	-5.92	-5.77	1.13	-4.79	-4.64	

Test mode	Band	Frequency (MHz)	Measured PSD (dBm/MHz)		DCF (dB)	Maximum PSD (dBm /500 kHz)		Limit (dBm /500 kHz)
			ANT1	ANT2		ANT1	ANT2	
802.11a	UNII 3	5 745	0.22	0.36	0.29	0.51	0.65	30
		5 785	0.49	0.57	0.29	0.78	0.86	
		5 825	0.63	0.70	0.29	0.92	0.99	
802.11n HT20		5 745	-0.12	-0.02	0.31	0.19	0.29	
		5 785	0.37	0.46	0.31	0.68	0.77	
		5 825	0.15	0.73	0.31	0.46	1.04	
802.11n HT40		5 755	-4.02	-3.76	0.60	-3.42	-3.16	
		5 795	-3.62	-3.75	0.60	-3.02	-3.15	
802.11ac VHT20		5 745	-0.03	0.24	0.31	0.28	0.55	
		5 785	0.16	0.42	0.31	0.47	0.73	
	5 825	0.41	0.44	0.31	0.72	0.75		
802.11ac VHT40	5 755	-3.55	-3.84	0.60	-2.95	-3.24		
	5 795	-3.76	-3.92	0.60	-3.16	-3.32		
802.11ac VHT80	5 775	-8.65	-8.60	1.13	-7.52	-7.47		

**Notes:**

- Maximum PSD calculation  
- Maximum PSD = Measured PSD + D.C.F

**MIMO**

Test mode	Band	Frequency (MHz)	Measured PSD (dBm/MHz)		DCF (dB)	Maximum PSD (dB m/MHz)	Limit (dBm/MHz)
			ANT1	ANT2			
802.11a	UNII 1	5 180	2.68	2.96	0.29	6.12	11
		5 200	2.80	2.36	0.29	5.89	
		5 240	2.95	2.58	0.29	6.07	
	UNII 2A	5 260	2.78	2.55	0.29	5.97	11
		5 280	3.04	2.58	0.29	6.12	
		5 320	2.57	2.29	0.29	5.73	
	UNII 2C	5 500	2.35	2.79	0.29	5.88	11
		5 580	2.40	2.60	0.29	5.80	
		5 700	2.40	2.60	0.29	5.80	
802.11n HT20	UNII 1	5 180	2.41	1.81	0.31	5.44	11
		5 200	2.22	2.10	0.31	5.48	
		5 240	2.66	2.47	0.31	5.89	
	UNII 2A	5 260	2.64	2.09	0.31	5.69	11
		5 280	2.82	2.33	0.31	5.90	
		5 320	2.42	1.80	0.31	5.44	
	UNII 2C	5 500	2.07	2.39	0.31	5.55	11
		5 580	2.41	2.24	0.31	5.65	
		5 700	2.07	2.20	0.31	5.46	
802.11n HT40	UNII 1	5 190	-1.48	-2.17	0.60	1.80	11
		5 230	-1.57	-1.82	0.60	1.92	
	UNII 2A	5 270	-1.60	-1.82	0.60	1.90	11
		5 310	-1.30	-2.26	0.60	1.86	
	UNII 2C	5 510	-1.93	-1.71	0.60	1.79	11
		5 590	-2.03	-1.66	0.60	1.77	
802.11ac VHT20	UNII 1	5 180	2.68	2.23	0.31	5.78	11
		5 200	2.67	2.84	0.31	6.08	
		5 240	3.09	2.75	0.31	6.24	
	UNII 2A	5 260	3.58	3.56	0.31	6.89	11
		5 280	3.32	3.25	0.31	6.61	
		5 320	3.07	2.59	0.31	6.16	
	UNII 2C	5 500	3.22	2.92	0.31	6.39	11
		5 580	2.95	3.17	0.31	6.38	
		5 700	2.97	2.83	0.31	6.22	

Test mode	Band	Frequency (MHz)	Measured PSD (dBm/MHz)		DCF (dB)	Maximum PSD (dB m/MHz)	Limit (dBm/MHz)
			ANT1	ANT2			
802.11ac VHT40	UNII 1	5 190	-1.90	-2.82	1.06	1.73	11
		5 230	-1.65	-2.57	1.06	1.98	
	UNII 2A	5 270	-2.04	-2.35	1.06	1.88	11
		5 310	-2.01	-2.41	1.06	1.86	
	UNII 2C	5 510	-1.96	-2.15	1.06	2.02	11
		5 590	-1.99	-1.96	1.06	2.10	
5 670		-2.31	-2.52	1.06	1.66		
802.11ac VHT80	UNII 1	5 210	-6.63	-7.11	1.81	-2.04	11
	UNII 2A	5 290	-6.50	-6.90	1.81	-1.88	11
	UNII 2C	5 530	-6.89	-5.96	1.81	-1.58	11
		5 610	-7.14	-6.82	1.81	-2.16	

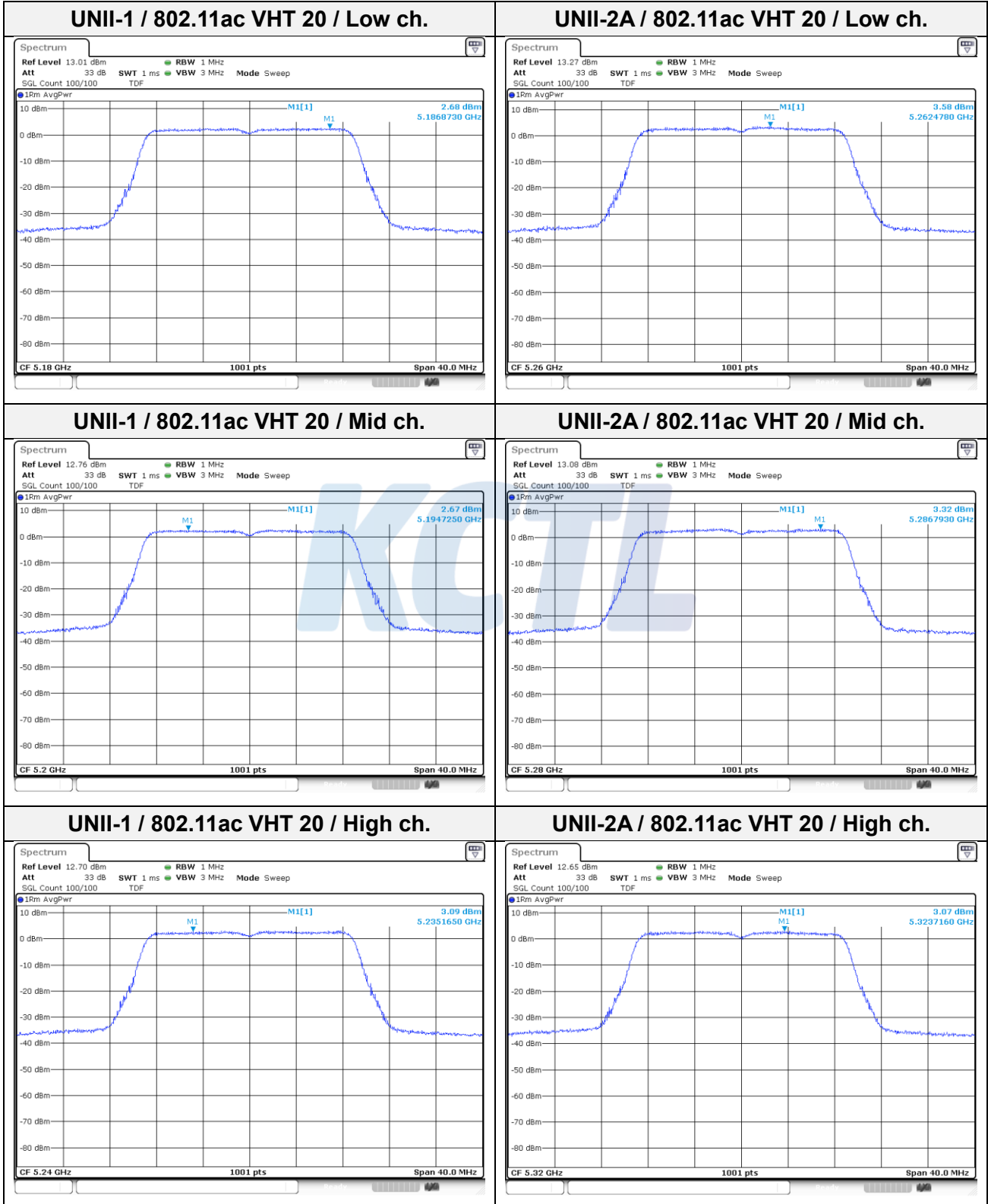
Test mode	Band	Frequency (MHz)	Measured PSD (dBm/MHz)		DCF (dB)	Maximum PSD (dBm /500 kHz)	Limit (dBm /500 kHz)
			ANT1	ANT2			
802.11a	UNII 3	5 745	-0.12	-0.06	0.29	3.21	30
		5 785	0.12	0.42	0.29	3.57	
		5 825	-0.03	0.40	0.29	3.49	
802.11n HT20		5 745	-0.48	0.11	0.31	3.15	
		5 785	-0.19	0.06	0.31	3.26	
		5 825	-0.01	0.14	0.31	3.39	
802.11n HT40		5 755	-4.60	-4.02	0.60	-0.69	
		5 795	-4.36	-4.25	0.60	-0.69	
802.11ac VHT20		5 745	-0.79	-0.48	0.31	2.69	
		5 785	-0.33	-0.32	0.31	3.00	
	5 825	-0.54	-0.19	0.31	2.96		
802.11ac VHT40	5 755	-5.03	-4.70	1.06	-0.79		
	5 795	-4.40	-4.54	1.06	-0.40		
802.11ac VHT80	5 775	-9.17	-9.32	1.81	-4.42		

**Notes:**

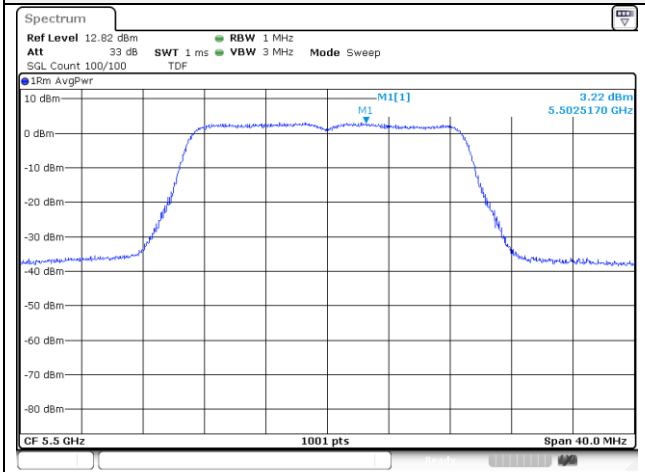
1. Maximum PSD calculation

- Maximum PSD = Measured  $10\log(10^{(\text{ANT } 1/10)} + 10^{(\text{ANT } 2/10)}) + \text{D.C.F}$

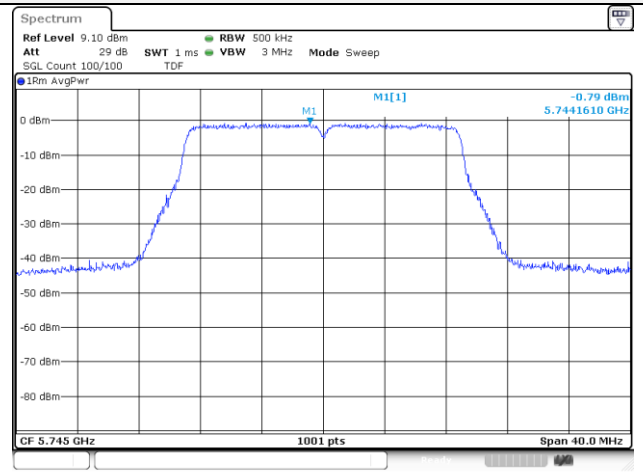
In order to simplify the report, attached plots were only MIMO (Worst bandwidth)  
**MIMO ANT 1**



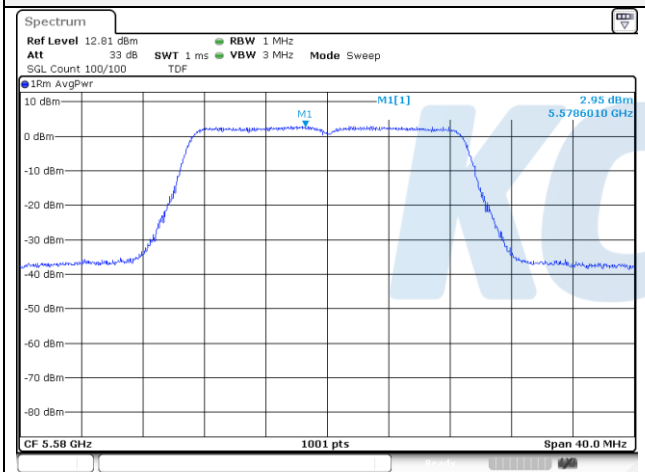
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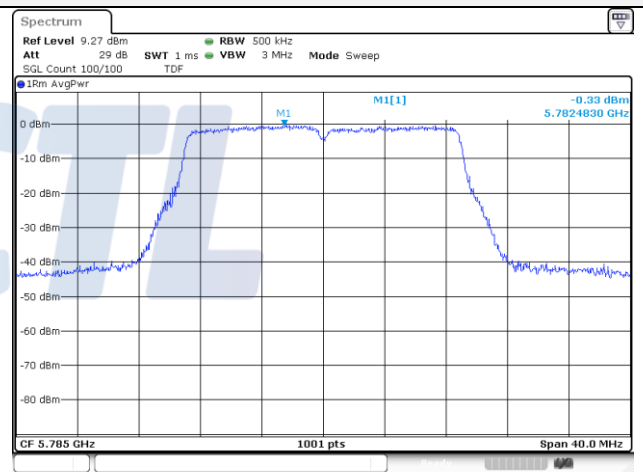
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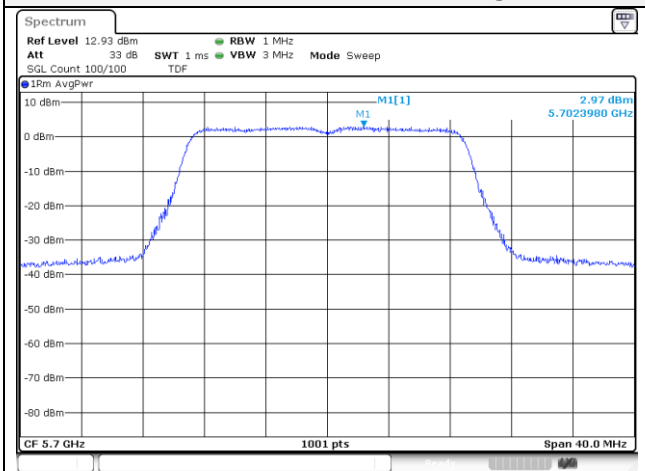
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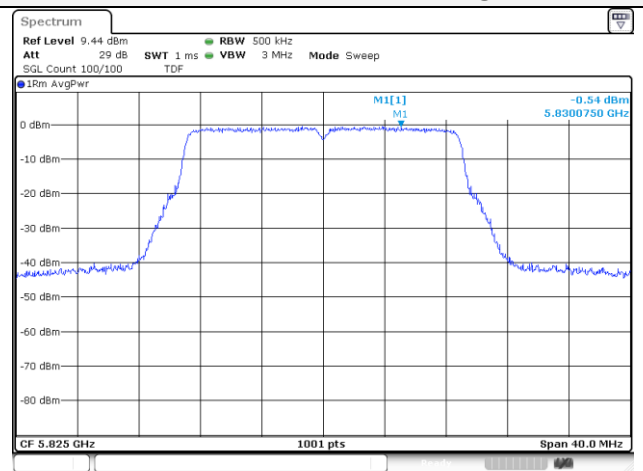
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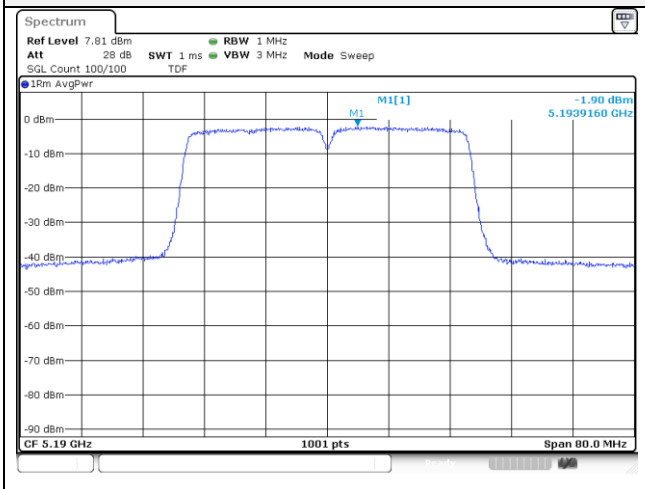
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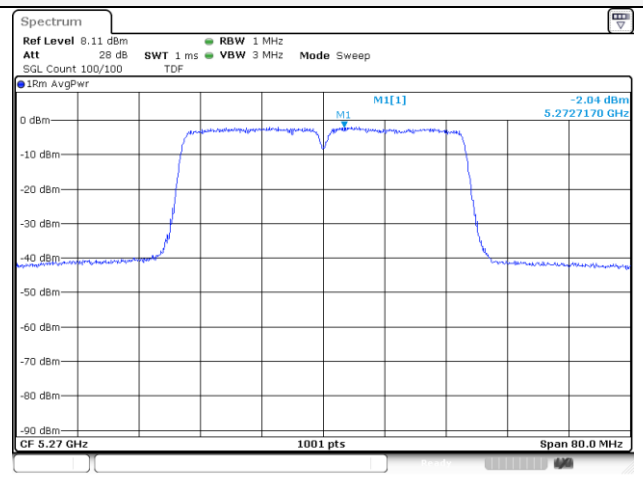
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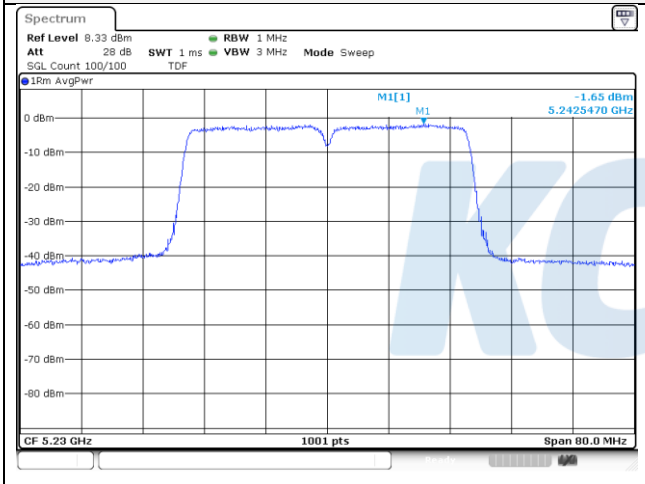
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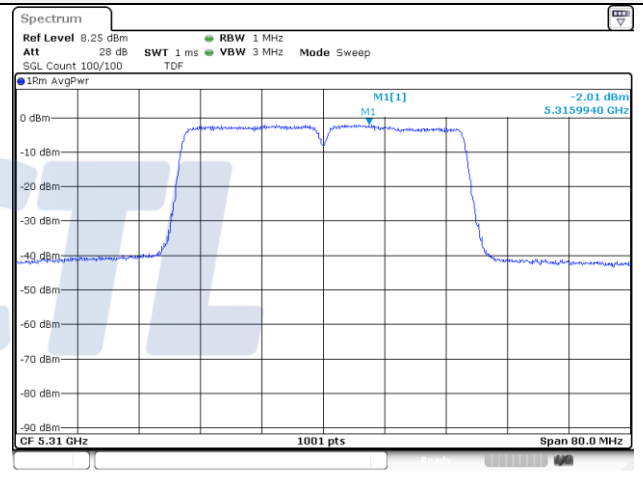
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**UNII-1 / 802.11ac VHT40 / High ch.**

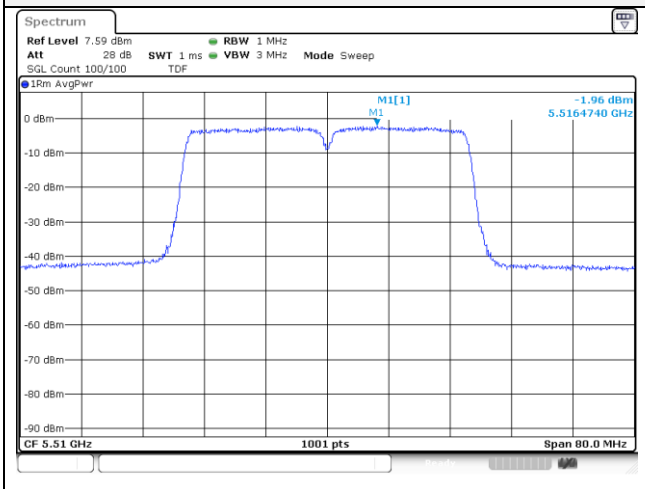


**UNII-2A 802.11ac VHT40 / High ch.**

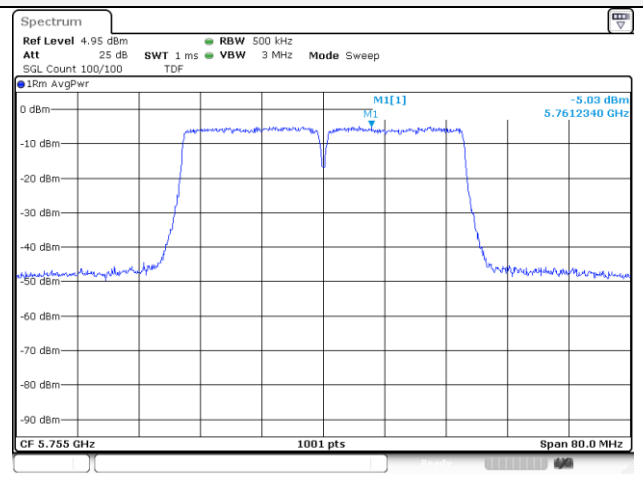




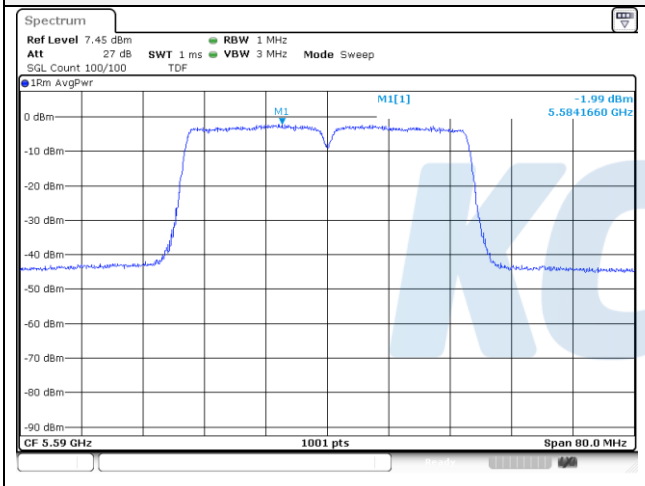
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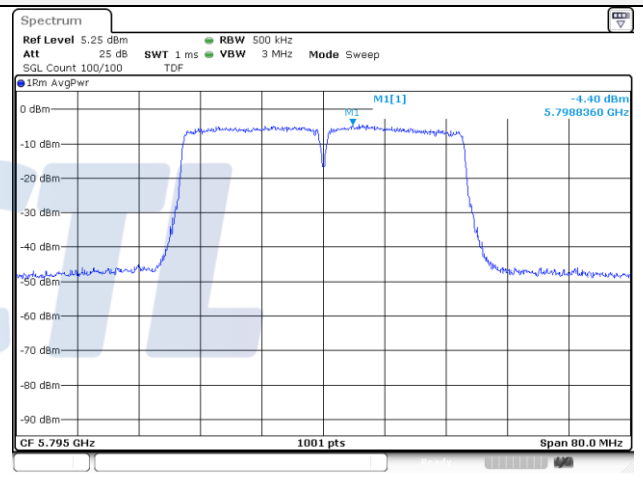
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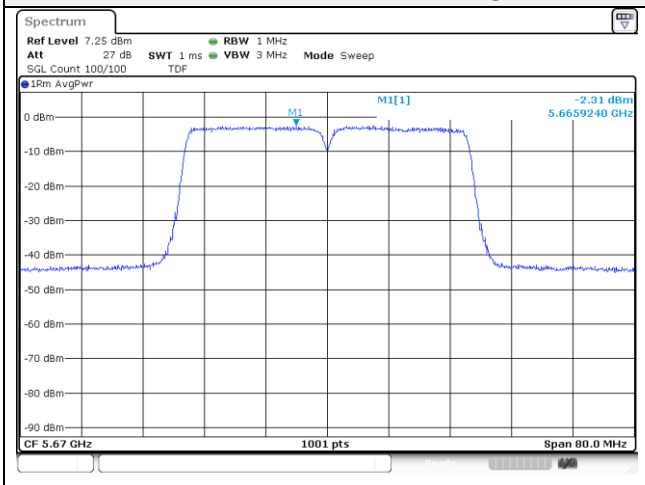
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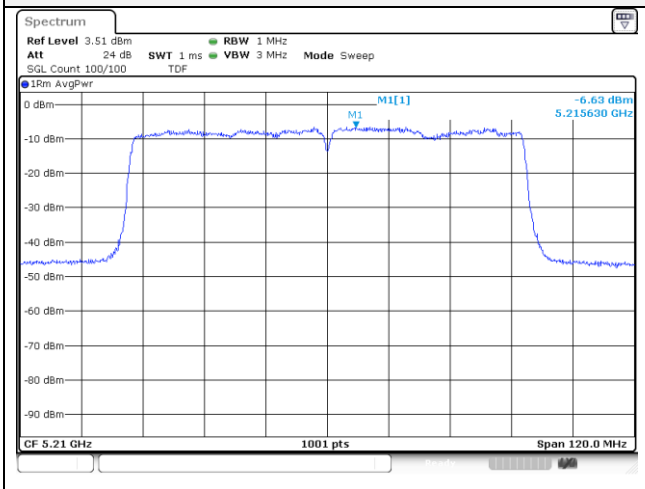


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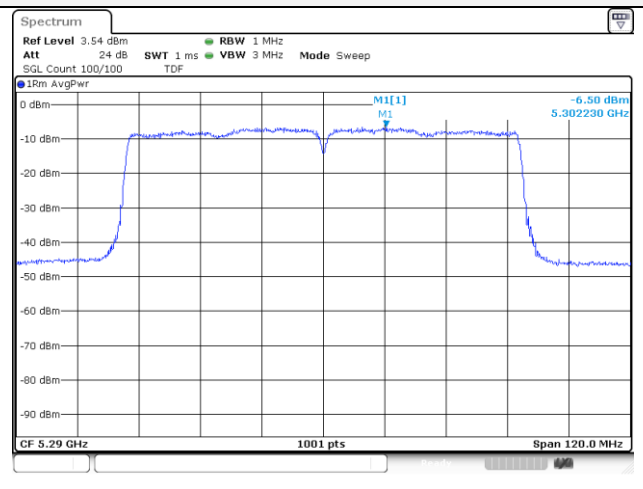


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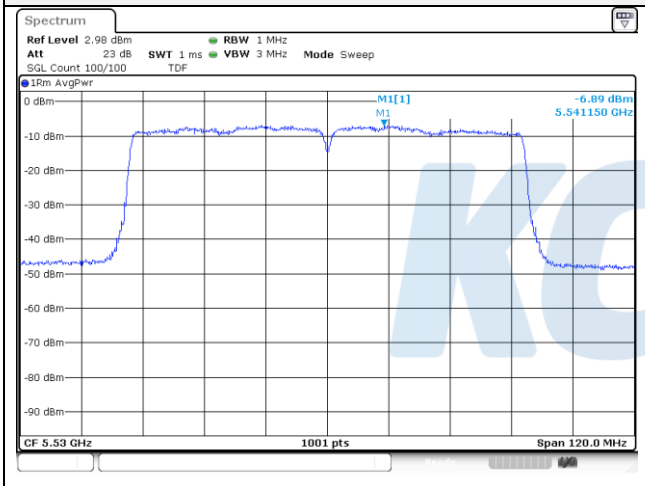
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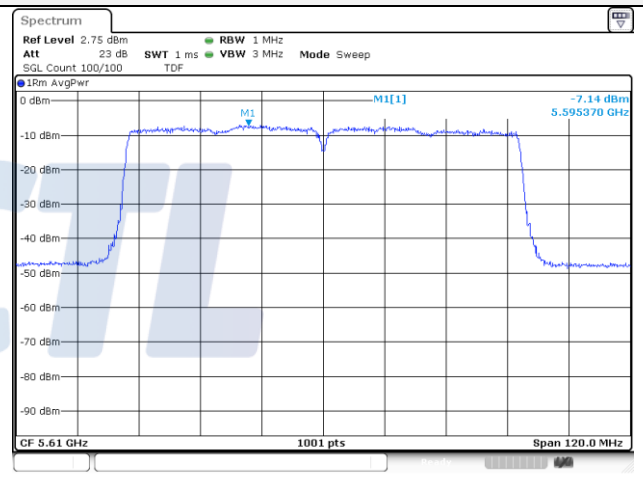
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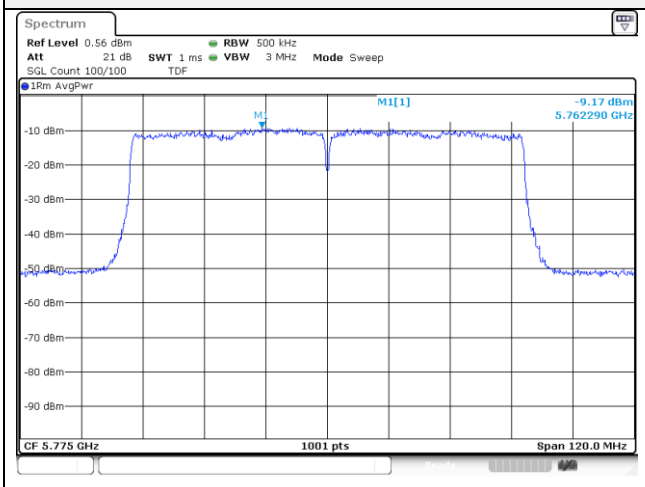
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**UNII-2C / 802.11ac VHT80 / High ch.**



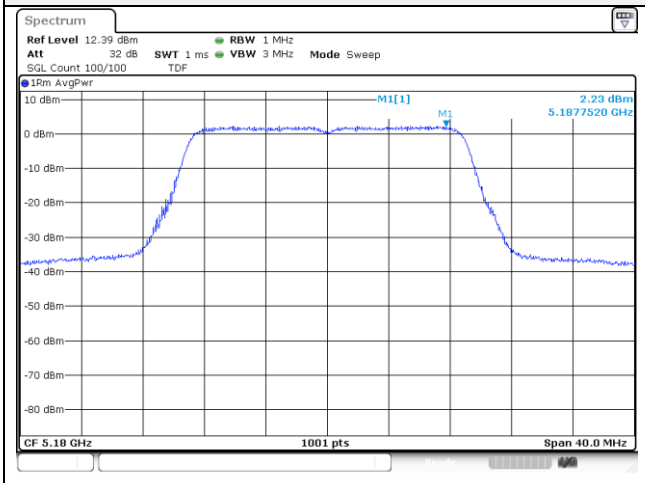
**UNII-3 / 802.11ac VHT80 / Low ch.**



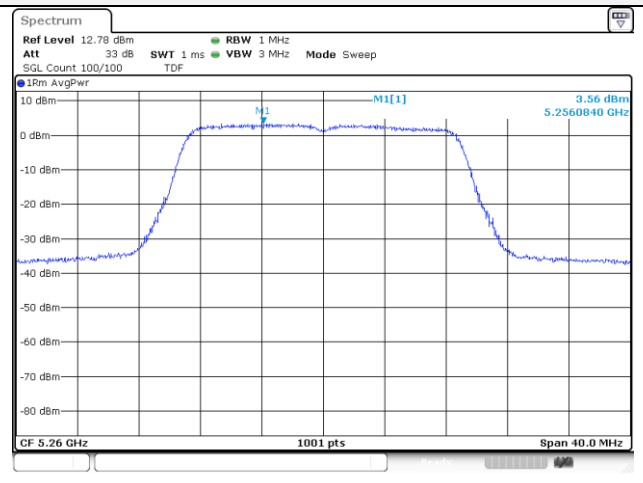
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**MIMO ANT 2**

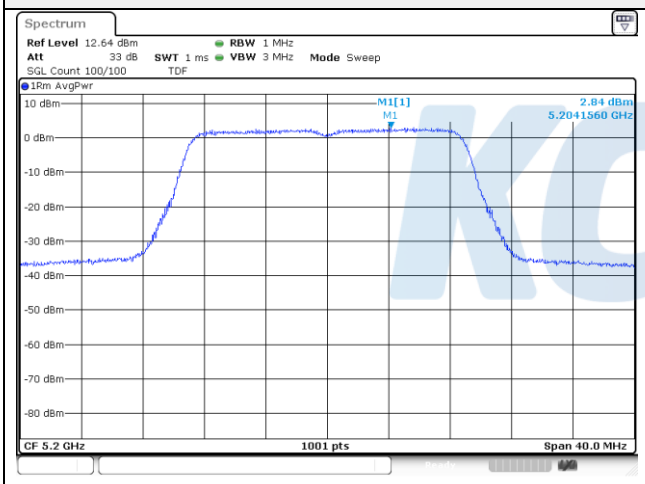
**UNII-1 / 802.11ac VHT 20 / Low ch.**



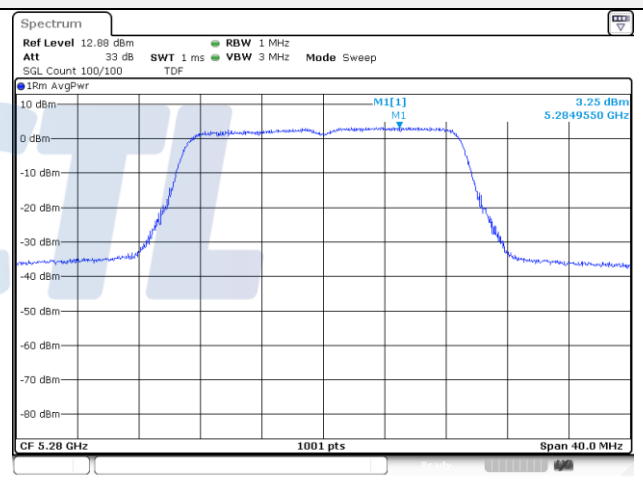
**UNII-2A / 802.11ac VHT 20 / Low ch.**



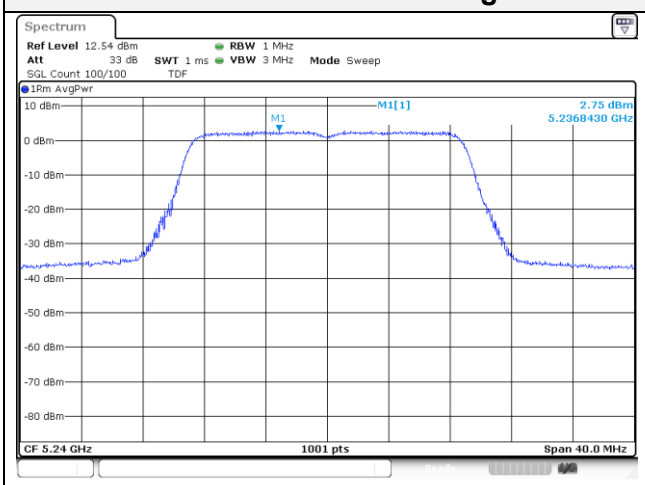
**UNII-1 / 802.11ac VHT 20 / Mid ch.**



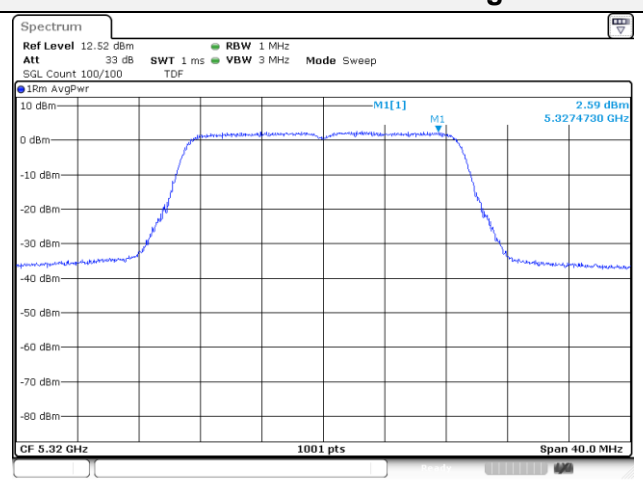
**UNII-2A / 802.11ac VHT 20 / Mid ch.**



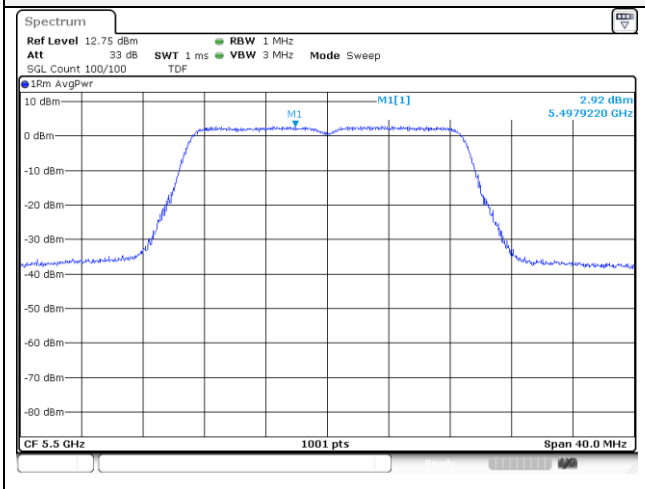
**UNII-1 / 802.11ac VHT 20 / High ch.**



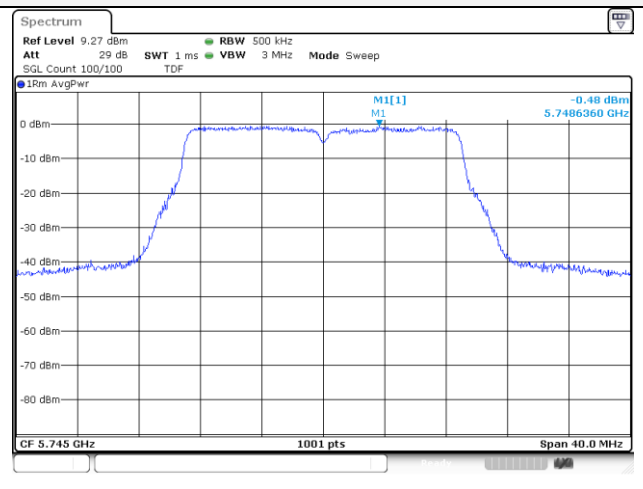
**UNII-2A / 802.11ac VHT 20 / High ch.**



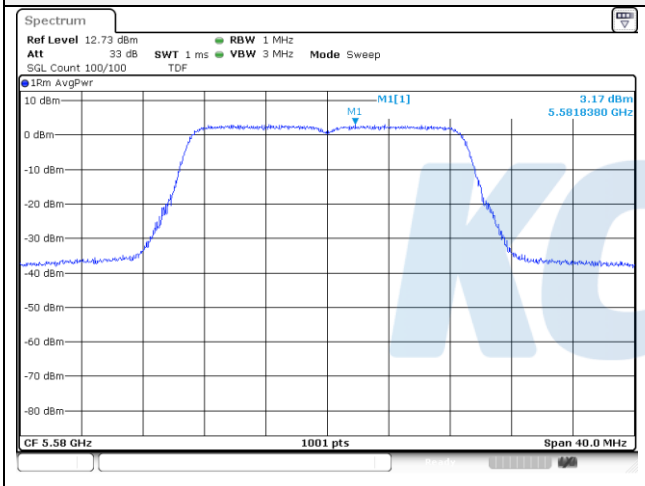
**UNII-2C / 802.11ac VHT 20 / Low ch.**



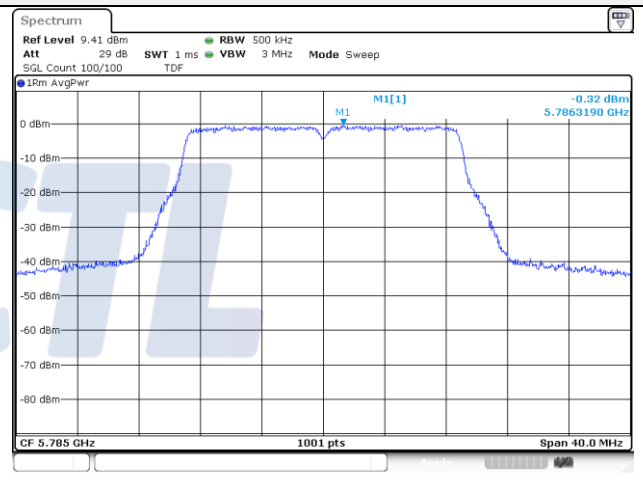
**UNII-3 / 802.11ac VHT 20 / Low ch.**



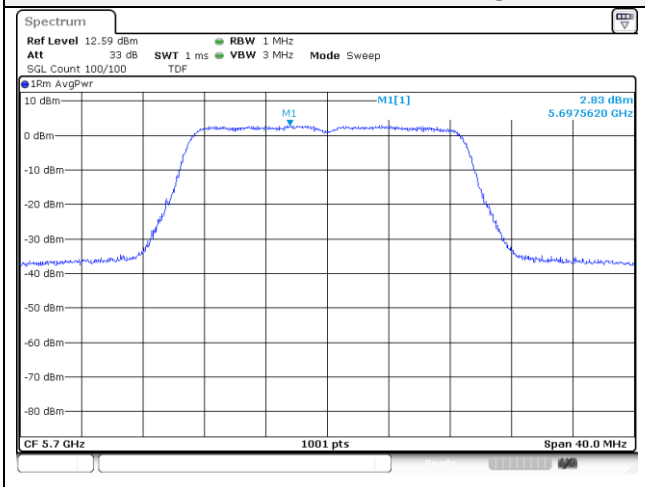
**UNII-2C / 802.11ac VHT 20 / Mid ch.**



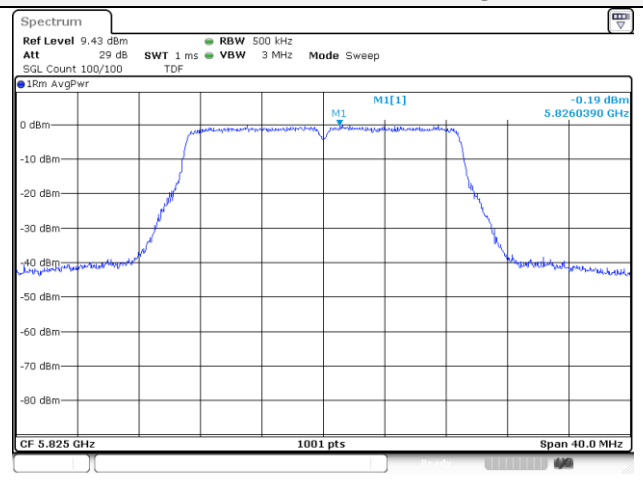
**UNII-3 / 802.11ac VHT 20 / Mid ch.**



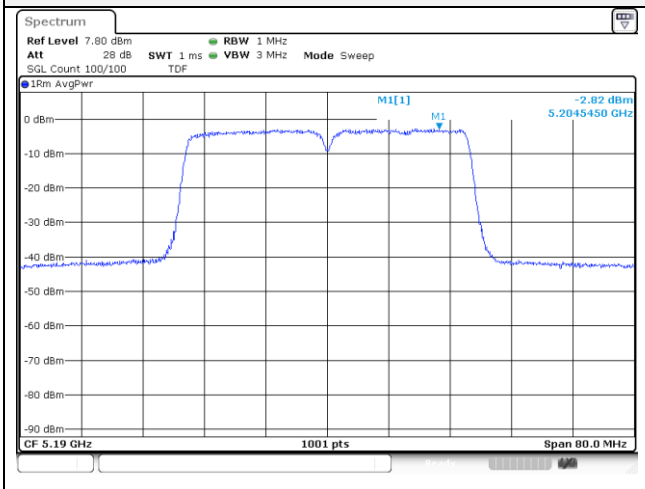
**UNII-2C / 802.11ac VHT 20 / High ch.**



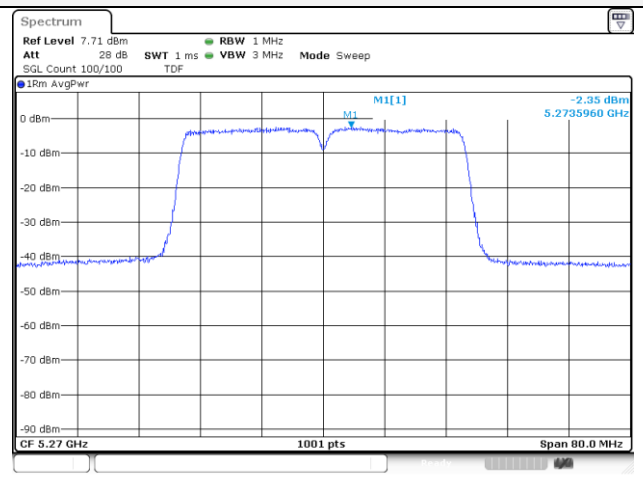
**UNII-3 / 802.11ac VHT 20 / High ch.**



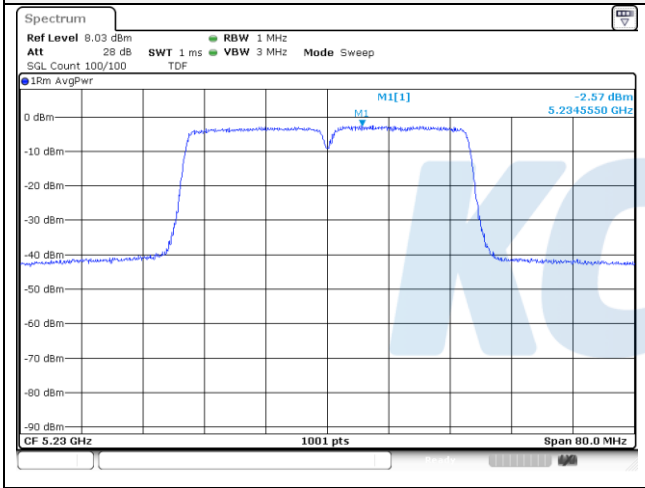
**UNII-1 / 802.11ac VHT40 / Low ch.**



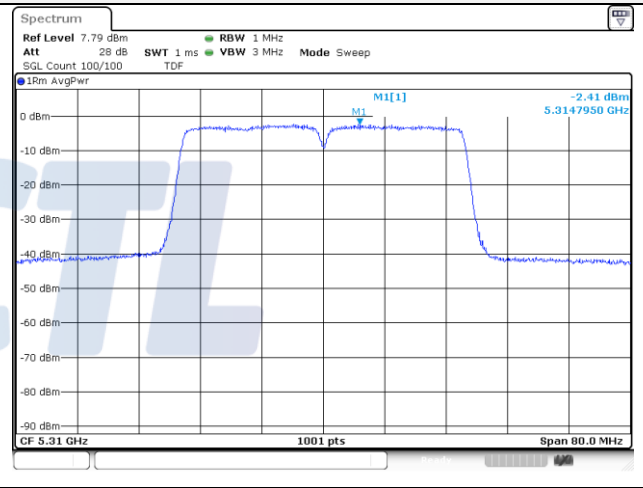
**UNII-2A / 802.11ac VHT40 / Low ch.**



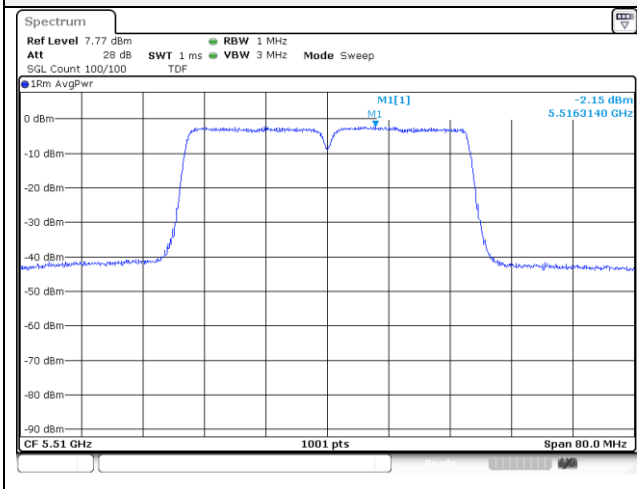
**UNII-1 / 802.11ac VHT40 / High ch.**



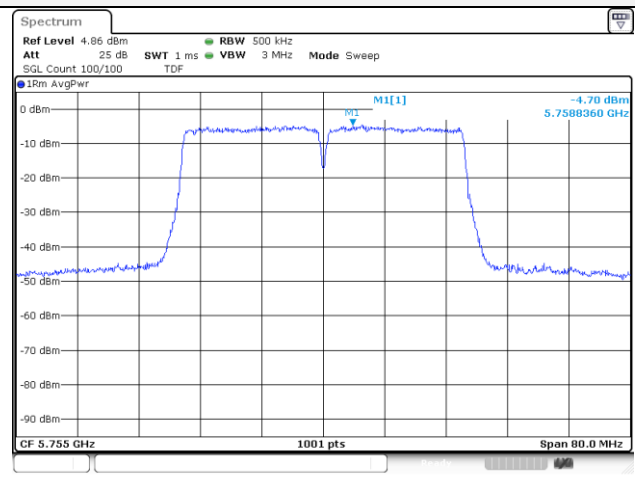
**UNII-2A / 802.11ac VHT40 / High ch.**



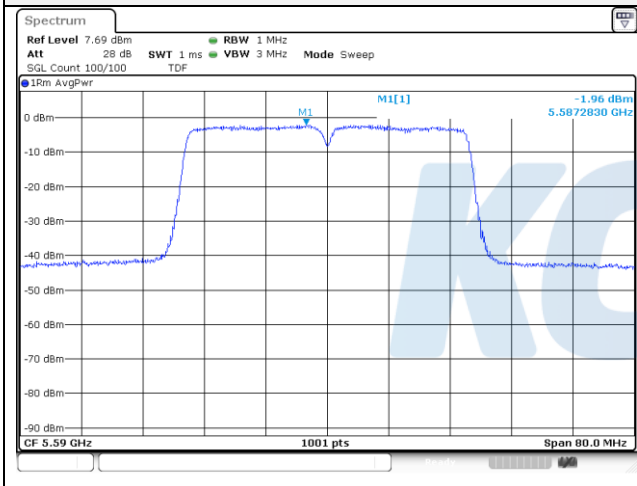
**UNII-2C / 802.11ac VHT40 / Low ch.**



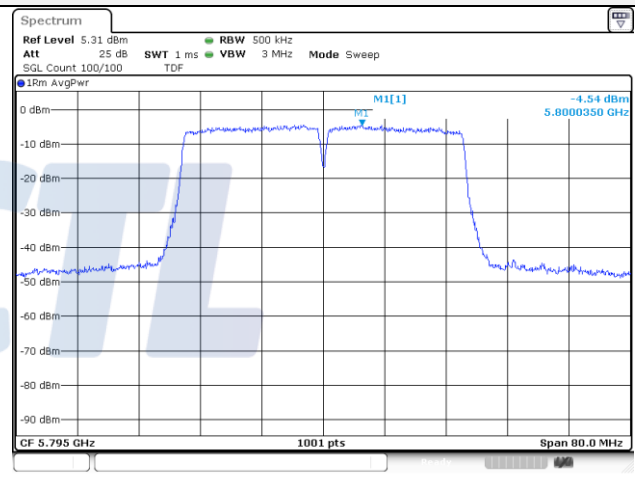
**UNII-3 / 802.11ac VHT40 / Low ch.**



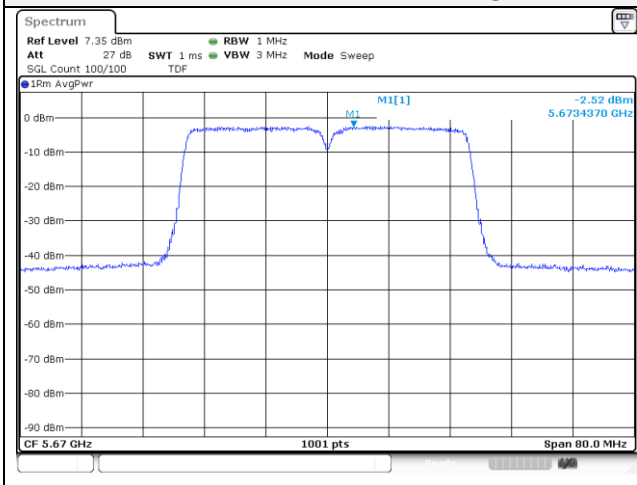
**UNII-2C / 802.11ac VHT40 / Mid ch.**



**UNII-3 / 802.11ac VHT40 / High ch.**

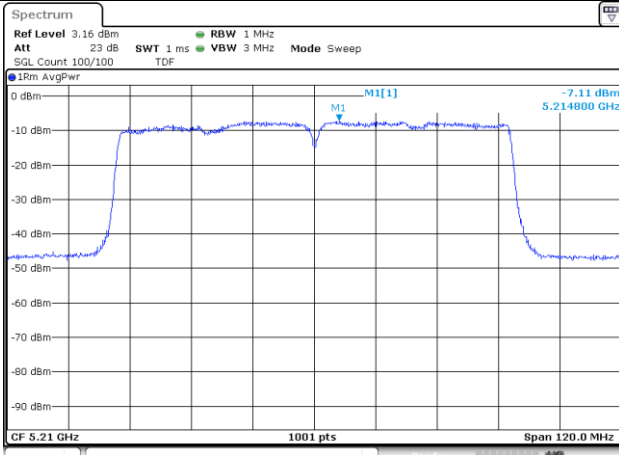


**UNII-2C / 802.11ac VHT40 / High ch.**

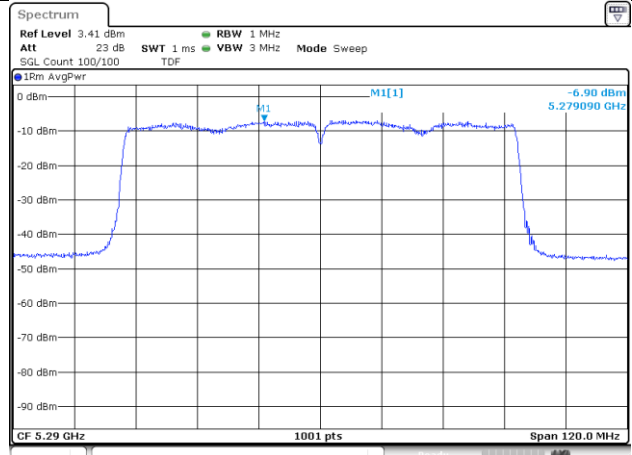


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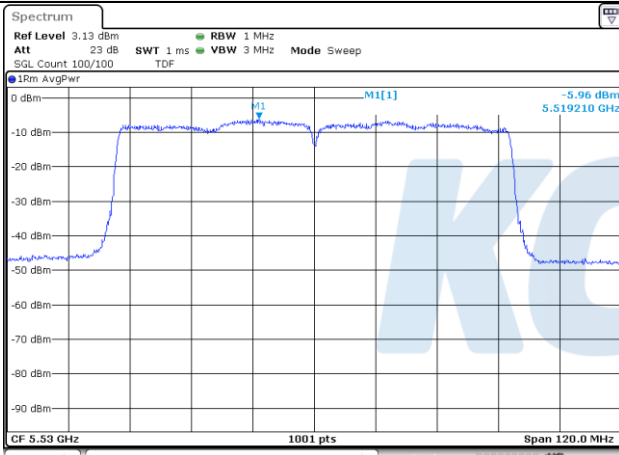
**UNII-1 / 802.11ac VHT80 / Low ch.**



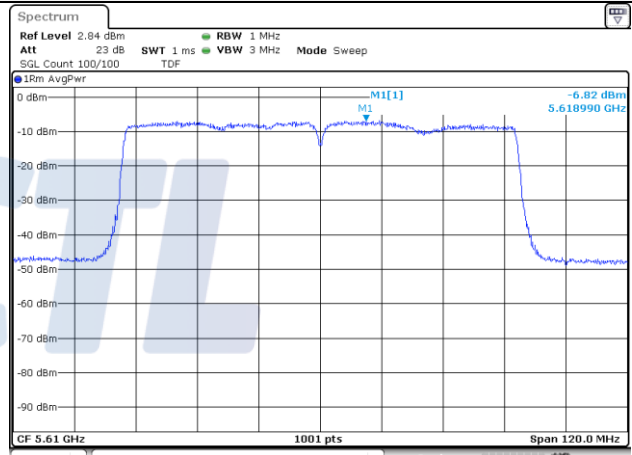
**UNII-2A / 802.11ac VHT80 / Low ch.**



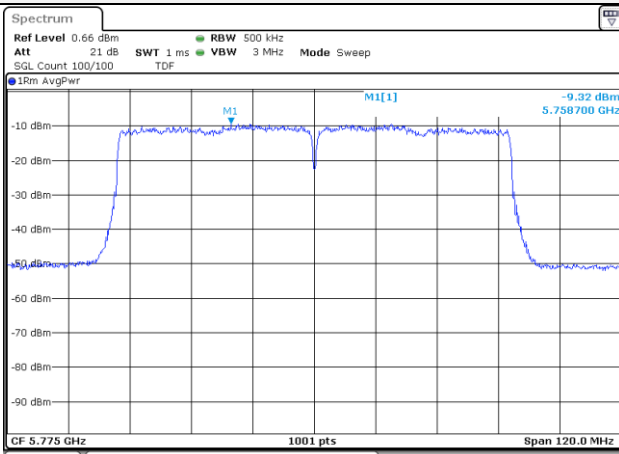
**UNII-2C / 802.11ac VHT80 / Low ch.**



**UNII-2C / 802.11ac VHT80 / High ch.**



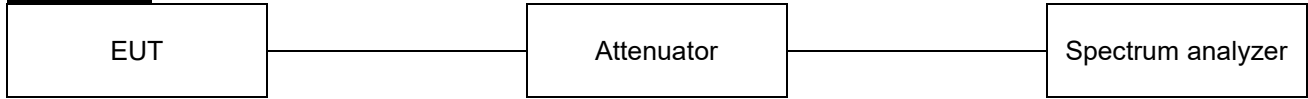
**UNII-3 / 802.11ac VHT80 / Low ch.**



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### 8.3. 26 dB Bandwidth & 99% Bandwidth

#### Test setup



#### Limit

N/A

#### Test procedure

ANSI C63.10-2013 Section 12.4

KDB 789033 D02 v02r01 - Section C.1 (26dB bandwidth)

KDB 789033 D02 v02r01 - Section D (99% bandwidth)

#### Test settings

##### 1. 26 dB Bandwidth

- Set RBW = approximately 1% of the emission bandwidth.
- Set the VBW > RBW.
- Detector = Peak.
- Trace mode = max hold.
- Measure the maximum width of the emission that is 26 dB down from the maximum 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%.

##### 2. 99% Occupied Bandwidth

- Set center frequency to the nominal EUT channel center frequency.
- Set span = 1.5 times to 5.0 times the OBW.
- Set RBW = 1% to 5% of the OBW
- Set VBW  $\geq 3 \times$  RBW
- 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.
- Use the 99% power bandwidth function of the instrument (if available).
- 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.



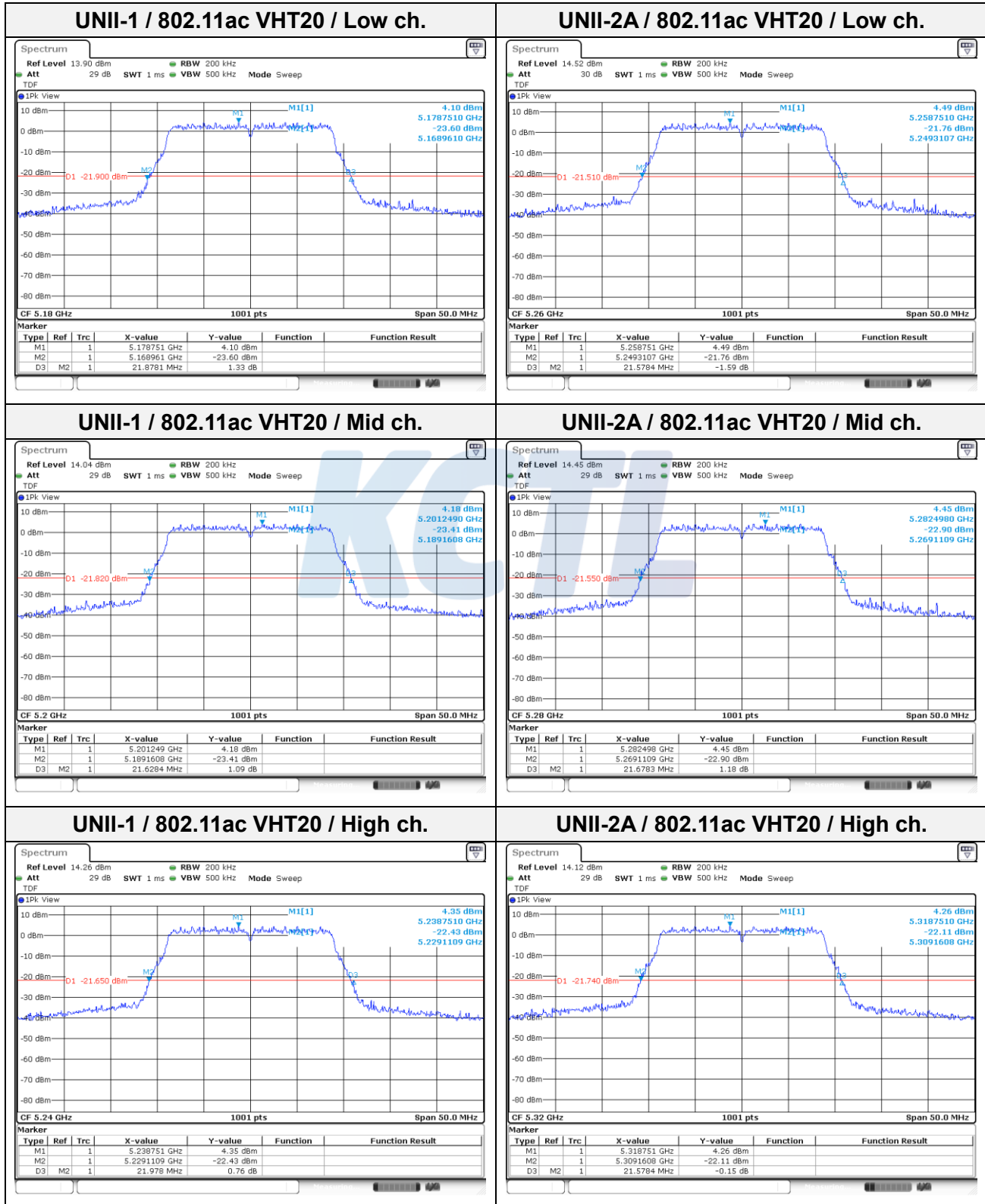
**Test results**

Test mode	Band	Frequency(MHz)	26 dB bandwidth (MHz)		99% bandwidth (MHz)	
			ANT1	ANT2	ANT1	ANT2
802.11a	UNII-1	5 180	21.43	21.43	16.83	16.68
		5 200	21.58	21.38	16.83	16.68
		5 240	21.53	21.33	16.83	16.68
	UNII-2A	5 260	21.23	21.38	16.83	16.68
		5 280	21.18	21.18	16.78	16.68
		5 320	21.43	21.18	16.83	16.68
	UNII-2C	5 500	21.33	21.23	16.83	16.68
		5 580	21.33	21.23	16.83	16.68
		5 700	21.38	21.28	16.83	16.68
802.11n HT20	UNII-1	5 180	21.38	21.53	17.93	17.83
		5 200	21.68	21.43	17.98	17.88
		5 240	21.83	21.58	17.93	17.83
	UNII-2A	5 260	21.78	21.43	17.93	17.88
		5 280	21.43	21.33	17.93	17.88
		5 320	21.58	21.53	17.93	17.83
	UNII-2C	5 500	21.63	21.38	17.93	17.83
		5 580	21.48	21.43	17.93	17.83
		5 700	21.63	21.53	17.93	17.83
802.11n HT40	UNII-1	5 190	40.46	39.86	36.56	36.26
		5 230	40.06	39.86	36.56	36.26
	UNII-2A	5 270	40.56	39.96	36.56	36.26
		5 310	40.26	40.06	36.56	36.26
	UNII-2C	5 510	40.46	39.86	36.56	36.36
		5 590	40.36	39.86	36.46	36.36
		5 670	40.36	39.86	36.56	36.36

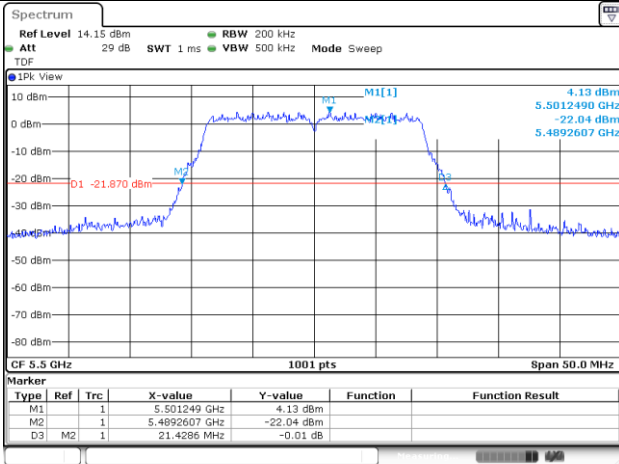
Test mode	Band	Frequency(MHz)	26 dB bandwidth (MHz)		99% bandwidth (MHz)	
			ANT1	ANT2	ANT1	ANT2
802.11ac VHT20	UNII-1	5 180	21.88	21.68	17.98	17.83
		5 200	21.63	21.63	17.93	17.83
		5 240	21.98	21.83	17.98	17.83
	UNII-2A	5 260	21.58	21.68	17.93	17.83
		5 280	21.68	21.68	17.93	17.83
		5 320	21.58	21.53	17.93	17.83
	UNII-2C	5 500	21.43	21.63	17.93	17.83
		5 580	21.53	21.58	17.93	17.83
		5 700	21.58	21.68	17.93	17.83
802.11ac VHT40	UNII-1	5 190	40.36	39.96	36.56	36.26
		5 230	40.36	39.96	36.56	36.26
	UNII-2A	5 270	40.56	39.76	36.56	36.36
		5 310	40.26	40.16	36.46	36.36
	UNII-2C	5 510	40.46	39.86	36.56	36.36
		5 590	40.36	39.86	36.56	36.36
5 670		40.76	39.96	36.56	36.36	
802.11ac VHT80	UNII-1	5 210	82.12	81.76	75.76	75.76
	UNII-2A	5 290	82.24	81.88	75.76	75.76
	UNII-2C	5 530	82.48	82.12	75.88	75.76
		5 610	82.36	82.12	75.88	75.64

In order to simplify the report, attached plots were only MIMO ANT 1

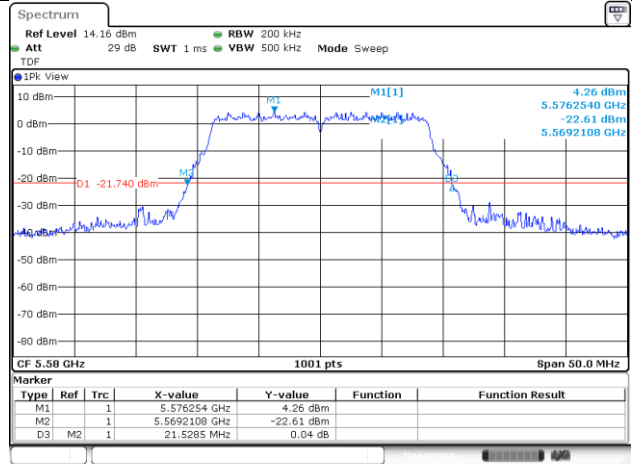
**26 dB bandwidth**



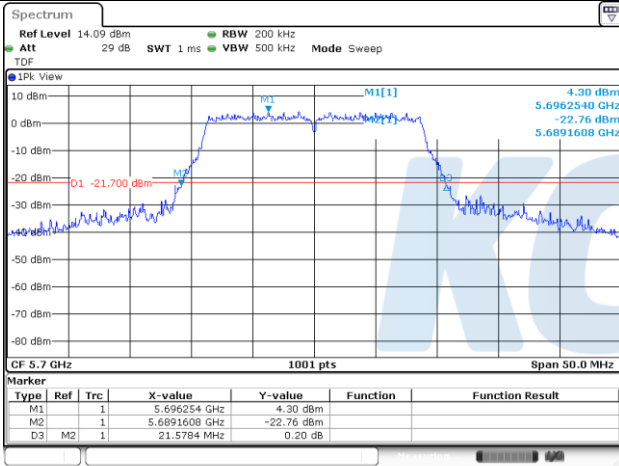
**UNII-2C / 802.11ac VHT20 / Low ch.**



**UNII-2C / 802.11ac VHT20 / Mid ch.**

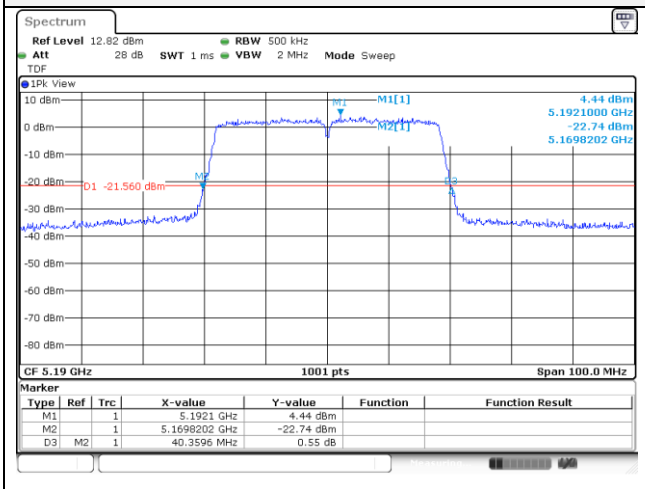


**UNII-2C / 802.11ac VHT20 / High ch.**

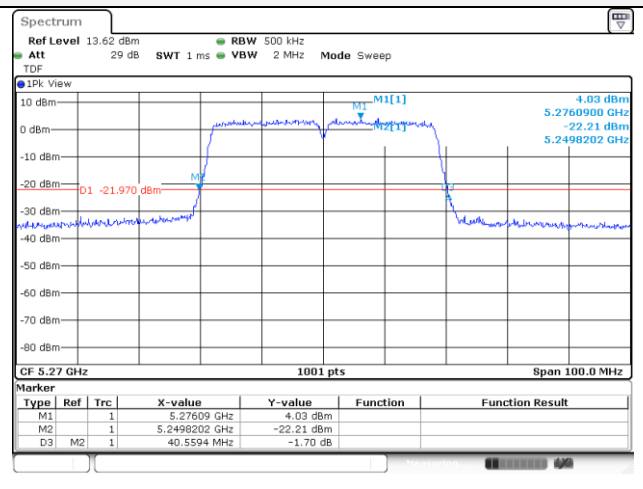


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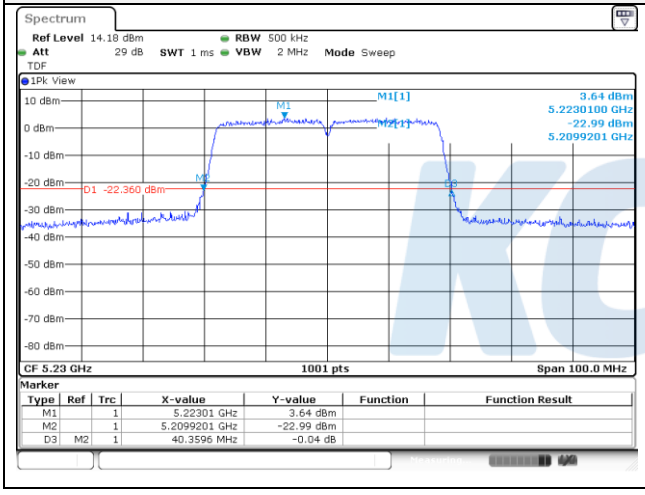
**UNII-1 / 802.11ac VHT40 / Low ch.**



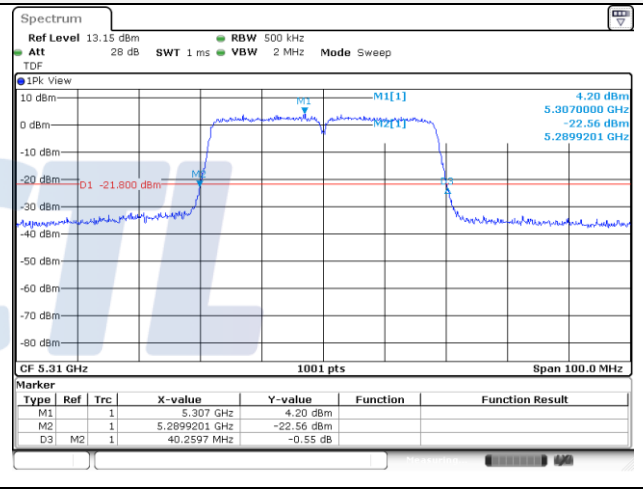
**UNII-2A / 802.11ac VHT40 / Low ch.**



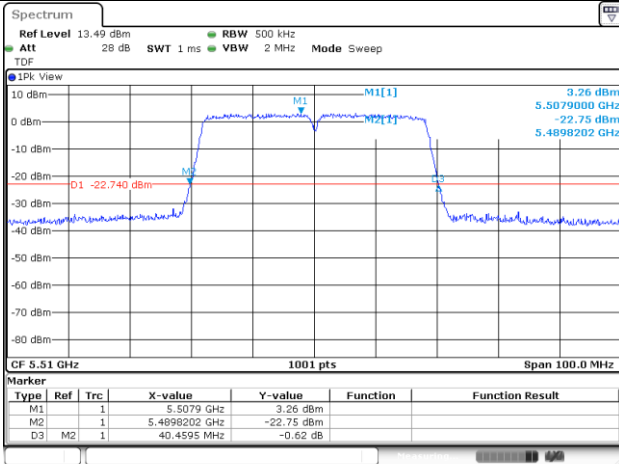
**UNII-1 / 802.11ac VHT40 / High ch.**



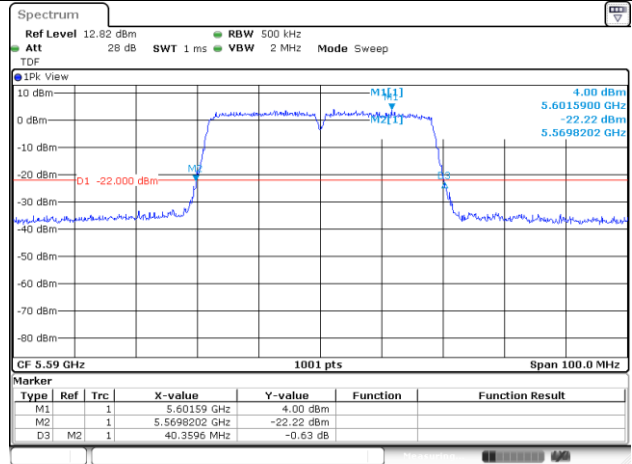
**UNII-2A / 802.11ac VHT40 / High ch.**



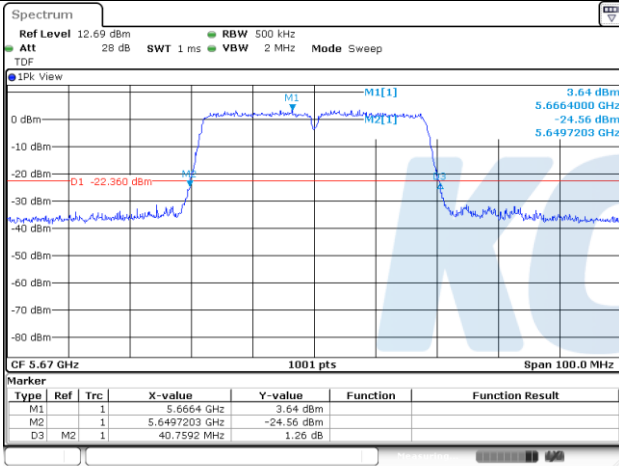
**UNII-2C / 802.11ac VHT40 / Low ch.**



**UNII-2C / 802.11ac VHT40 / Mid ch.**

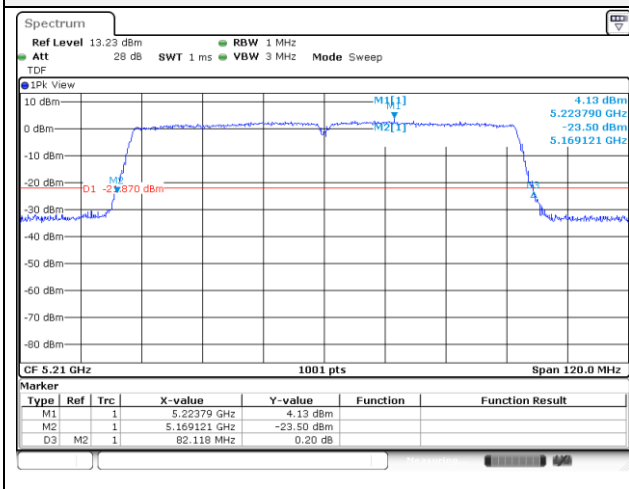


**UNII-2C / 802.11ac VHT40 / High ch.**

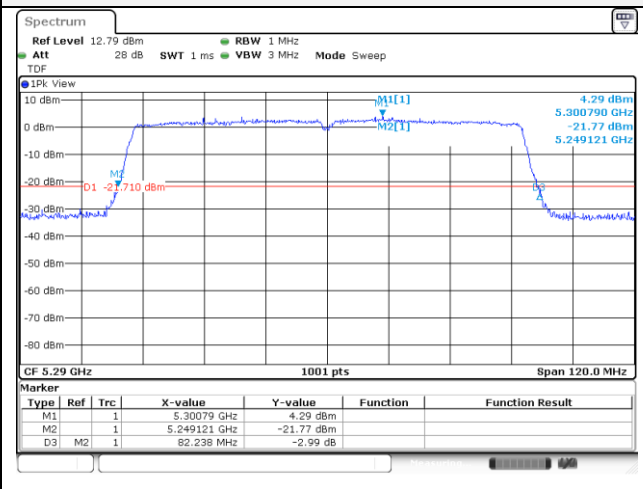


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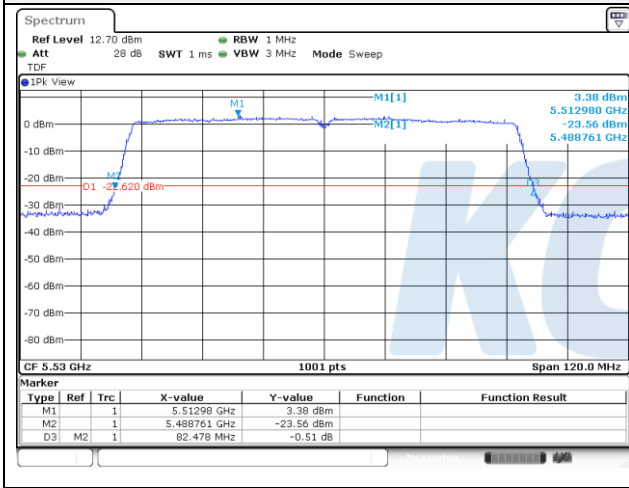
**UNII-1 / 802.11ac VHT80 / Low ch.**



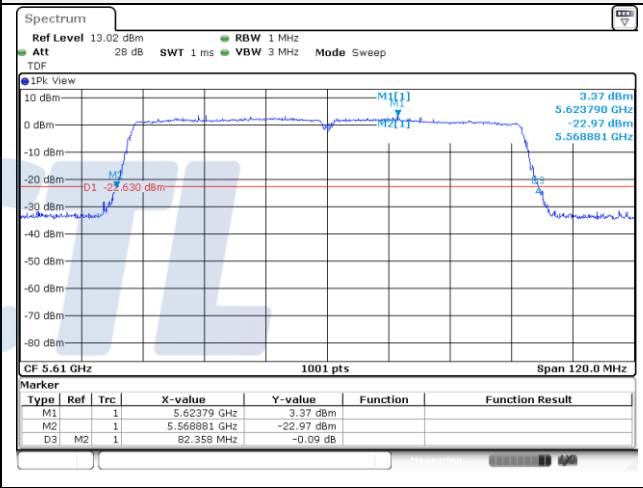
**UNII-2A / 802.11ac VHT80 / Low ch.**



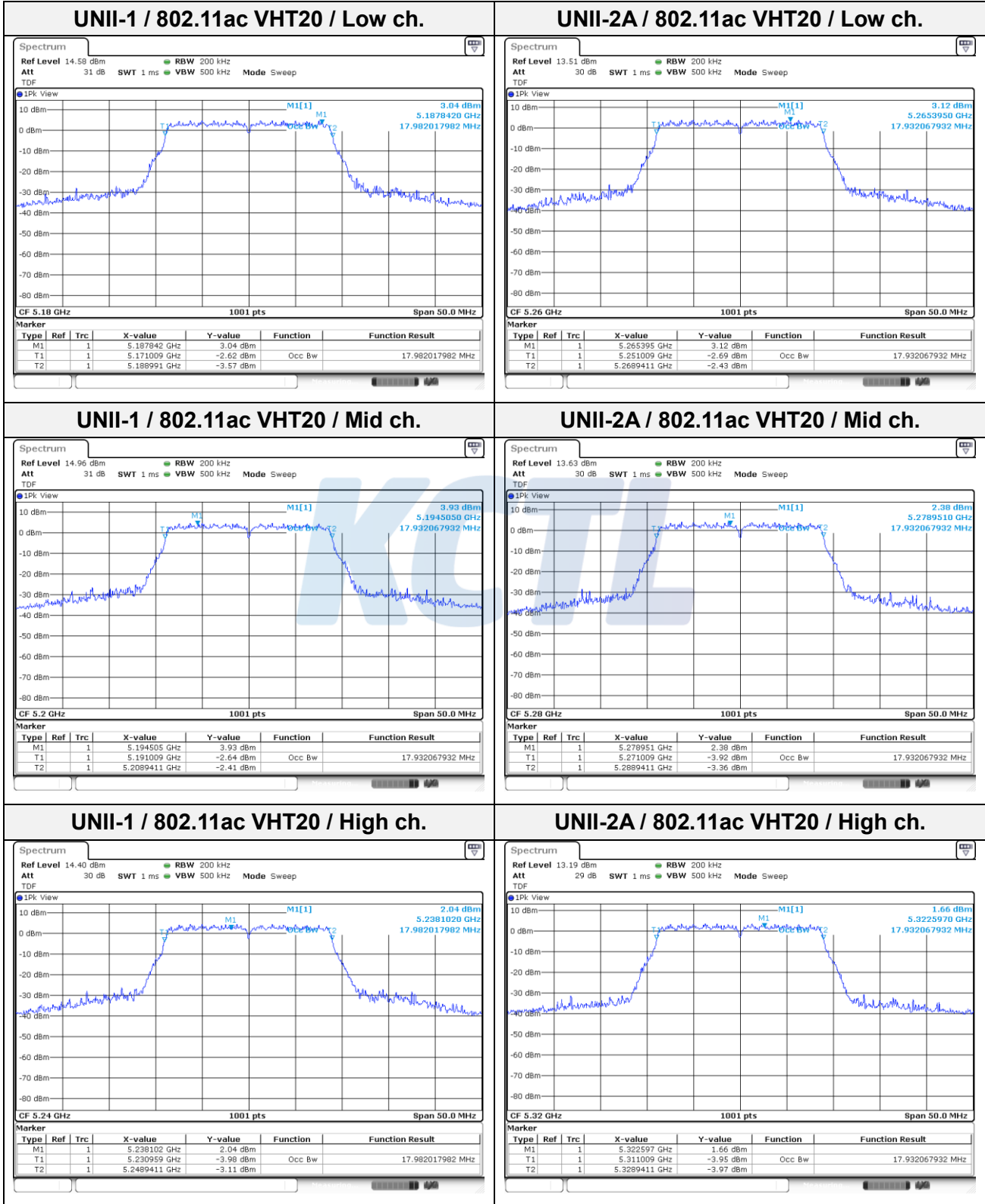
**UNII-2C / 802.11ac VHT80 / Low ch.**



**UNII-2C / 802.11ac VHT80 / High ch.**

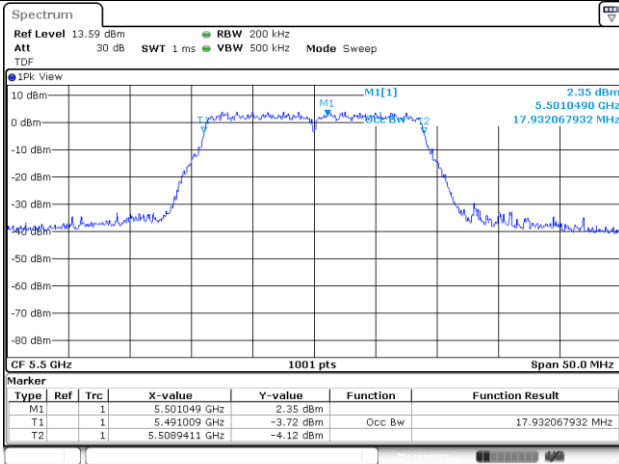


In order to simplify the report, attached plots were only MIMO ANT 1  
**99% bandwidth**

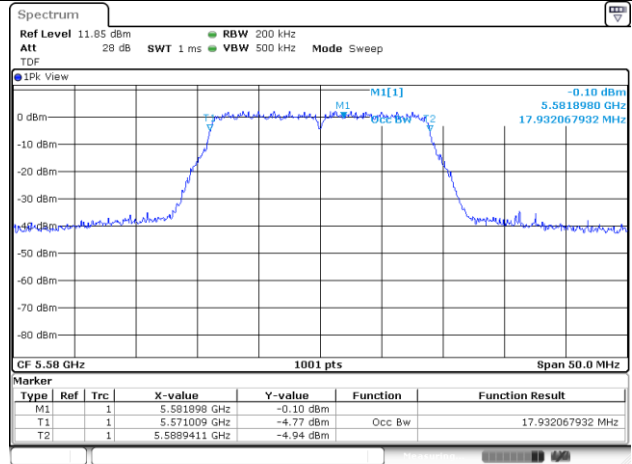




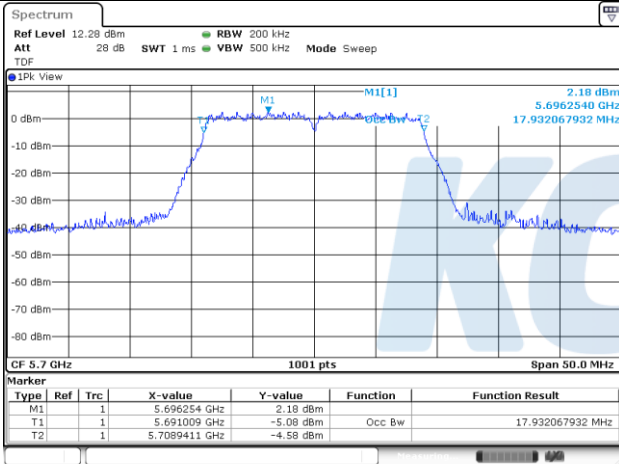
**UNII-2C / 802.11ac VHT20 / Low ch.**



**UNII-2C / 802.11ac VHT20 / Mid ch.**

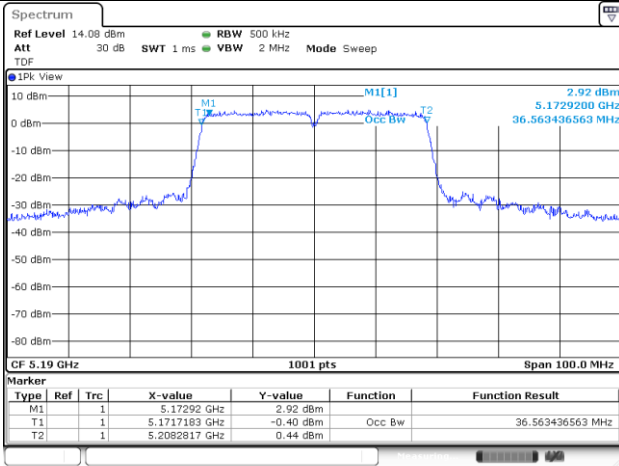


**UNII-2C / 802.11ac VHT20 / High ch.**

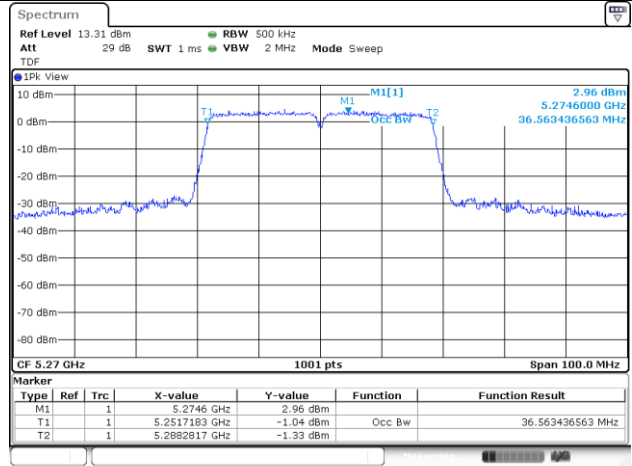


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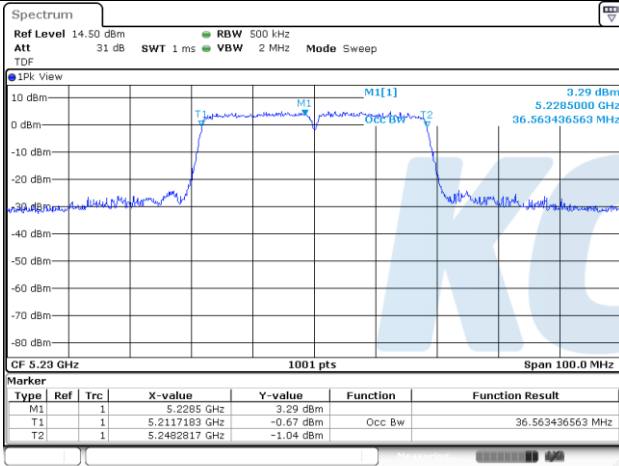
### UNII-1 / 802.11ac VHT40 / Low ch.



### UNII-2A / 802.11ac VHT40 / Low ch.



### UNII-1 / 802.11ac VHT40 / High ch.



### UNII-2A / 802.11ac VHT40 / High ch.

