TEST REPORT

Eurofins KCTL Co.,Ltd. 65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea TEL: 82-31-285-0894 FAX: 82-505-299-8311 www.kctl.co.kr	Report No.: KR23-SRF0006-A Page (1) of (228)	eurofins | KCTL

1. Client

- Name : Samsung Electronics Co., Ltd.
- Address : 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
- Date of Receipt : 2022-10-17

2. Use of Report : Certification

3. Name of Product / Model : Mobile phone / SM-A346M/DSN

4. Manufacturer / Country of Origin : Samsung Electronics Co., Ltd. / Vietnam

5. FCC ID : A3LSMA346M

6. Date of Test : 2022-11-09 to 2023-01-04

7. Location of Test : ■ Permanent Testing Lab ☐ On Site Testing
(Address:65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea)

8. Test method used : FCC Part 15 Subpart E, 15.407

9. Test Result : Refer to the test result in the test report

Affirmation	Tested by Name : Sunghyun Yoon (Signature)	Technical Manager Name : Seungyong Kim (Signature)

2023-01-11

Eurofins KCTL Co.,Ltd.

REPORT REVISION HISTORY

Date	Revision	Page No
2023-01-06	Originally issued	-
2023-01-11	Updated	23 ~ 25

Note. The report No. KR23-SRF0006 is superseded by the report No. KR23-SRF0006-A.

General remarks for test reports

Statement concerning the uncertainty of the measurement systems used for the tests

(may be required by the product standard or client)

☐ **Internal procedure used for type testing through which traceability of the measuring uncertainty has been established:**

Procedure number, issue date and title:

Calculations leading to the reported values are on file with the testing laboratory that conducted the testing.

☒ **Statement not required by the standard or client used for type testing**

CONTENTS

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.
Address	:	129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
Factory	:	Samsung Electronics Vietnam Thai Nguyen Co., Ltd
Address	:	Yen Binh Industrial Park, Dong Tien Ward, Pho Yen Town, Thai Nguyen Province, Vietnam
Laboratory	:	Eurofins KCTL Co.,Ltd.
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 CAB Identifier: KR0040 ISED Number: 8035A KOLAS No.: KT231

2. Device information

Equipment under test	:	Mobile phone				
Model	:	SM-A346M/DSN				
Derivative model	:	SM-A346M/N				
Modulation technique		OFDM (802.11a/b/g/n/ac)				
Number of channels		UNII-1	:	4 ch (20 ㎒), 2 ch (40 ㎒), 1 ch (80 ㎒)		
		UNII-2A	:	4 ch (20 ㎒), 2 ch (40 ㎒), 1 ch (80 ㎒)		
		UNII-2C	:	12 ch (20 ㎒), 6 ch (40 ㎒), 3 ch (80 ㎒)		
		UNII-3	:	5 ch (20 ㎒), 2 ch (40 ㎒), 1 ch (80 ㎒)		
Power source	:	DC 3.88 V				
Antenna specification		Antenna 1	:	Metal+LDS Antenna		
		Antenna 2	:	Metal+LDS Antenna		
Antenna gain	:		Antenna 1			Antenna 2
		UNII-1	:	-8.89 dBi	UNII-1	: -9.78 dBi
		UNII-2A	:	-8.89 dBi	UNII-2A	: -9.78 dBi
		UNII-2C	:	-8.70 dBi	UNII-2C	: -9.51 dBi
		UNII-3	:	-9.03 dBi	UNII-3	: -9.43 dBi
Frequency range		UNII-1	:	5 180 ㎒ ~ 5 240 ㎒	(802.11a/n/ac_HT20/VHT20)	
		UNII-1	:	5 190 ㎒ ~ 5 230 ㎒	(802.11n/ac_HT40/VHT40)	
		UNII-1	:	5 210 ㎒	(802.11ac_VHT80)	
		UNII-2A	:	5 260 ㎒ ~ 5 320 ㎒	(802.11a/n/ac _HT20/VHT20)	
		UNII-2A	:	5 270 ㎒ ~ 5 310 ㎒	(802.11n/ac_HT40/VHT40)	
		UNII-2A	:	5 290 ㎒	(802.11ac _VHT80)	
		UNII-2C	:	5 500 ㎒ ~ 5 720 ㎒	(802.11a/n/ac _HT20/VHT20)	
		UNII-2C	:	5 510 ㎒ ~ 5 710 ㎒	(802.11n/ac_HT40/VHT40)	
		UNII-2C	:	5 530 ㎒ ~ 5 690 ㎒	(802.11ac_VHT80)	
		UNII-3	:	5 745 ㎒ ~ 5 825 ㎒	(802.11a/n/ac _HT20/VHT20)	
		UNII-3	:	5 755 ㎒ ~ 5 795 ㎒	(802.11n/ac _HT40/VHT40)	
		UNII-3	:	5 775 ㎒	(802.11ac _VHT80)	
Software version	:	A346M.001				
Hardware version	:	REV1.0				
Test device serial No.	:	Conducted	:	R3CT904MLNZ		
		Radiated	:	R3CT904NAJE		
Operation temperature	:	-20 ℃ ~ 60 ℃				

Note. The Product equality letter includes detailed information about the differences between basic and derivative model.

2.1. Frequency/channel operations

This device contains the following capabilities:
WLAN (11a/b/g/n/ac), Bluetooth (BDR/EDR/BLE), NR n5/66, LTE B2/4/5/12/13/17/26/41/66, GSM 850/1900, WCDMA 850/1700/1900, NFC

UNII-1		UNII-2A		UNII-2C		UNII-3	
Ch.	Frequency (㎒)	Ch.	Frequency (㎒)	Ch.	Frequency (㎒)	Ch.	Frequency (㎒)
36	5 180	52	5 260	100	5 500	149	5 745
40	5 200	56	5 280	120	5 600	157	5 785
48	5 240	64	5 320	140	5 700	165	5 825
				144	5 720		

Table 2.1-1. 802.11a/n/ac HT20/VHT20 mode

UNII-1		UNII-2A		UNII-2C		UNII-3	
Ch.	Frequency (㎒)	Ch.	Frequency (㎒)	Ch.	Frequency (㎒)	Ch.	Frequency (㎒)
38	5 190	54	5 270	102	5 510	151	5 755
46	5 230	62	5 310	118	5 590	159	5 795
				134	5 670		
				142	5 710		

Table 2.1-2. 802.11n/ac HT40/VHT40 mode

UNII-1		UNII-2A		UNII-2C		UNII-3	
Ch.	Frequency (㎒)	Ch.	Frequency (㎒)	Ch.	Frequency (㎒)	Ch.	Frequency (㎒)
42	5 210	58	5 290	106	5 530	155	5 775
				122	5 610		
				138	5 690		

Table 2.1-3. 802.11ac VHT80 mode

2.2. Simultaneous Tx Condition

The device supports simultaneous transmission operation, which allows for two channels to operate independent of one another in the Bluetooth, 2.4 ㎓ or 5 ㎓ bands simultaneously on each antenna.

Simultaneous Tx condition – not RSDB

Mode	# of TX	WLAN 5 ㎓		WLAN 2.4 ㎓		Bluetooth	Report
		ANT 1	ANT 2	ANT 1	ANT 2	ANT 1	
Bluetooth + WLAN	2	-	-	-	O	O	
	2	-	O	-	-	O	√

Notes.
Simultaneous condition was performed as a worst case which is configured as a combination of lowest margin for each mode during radiated spurious emission.

2.3. Duty Cycle Factor

SISO

Test mode	Period (ms)	T_{on} time (ms)	Duty cycle		Duty cycle factor (dB)
			(Linear)	(%)	
802.11a	1.486	1.388	0.934 1	93.41	0.30
802.11n_HT20	1.394	1.296	0.929 7	92.97	0.32
802.11n_HT40	0.746	0.647	0.867 3	86.73	0.62
802.11ac_VHT20	1.406	1.307	0.929 6	92.96	0.32
802.11ac_VHT40	0.750	0.652	0.869 3	86.93	0.61
802.11ac_VHT80	0.421	0.324	0.769 6	76.96	1.14

MIMO

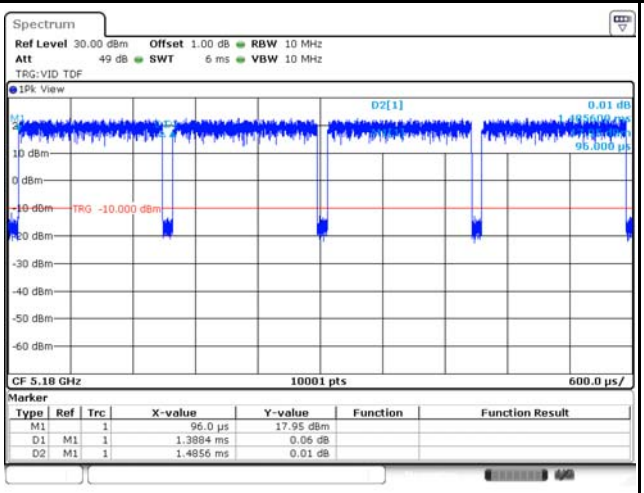
Test mode	Period (ms)	T_{on} time (ms)	Duty cycle		Duty cycle factor (dB)
			(Linear)	(%)	
802.11a	1.485	1.388	0.934 7	93.47	0.29
802.11n_HT20	1.393	1.296	0.930 4	93.04	0.31
802.11n_HT40	0.746	0.648	0.868 6	86.86	0.61
802.11ac_VHT20	0.777	0.680	0.875 2	87.52	0.58
802.11ac_VHT40	0.450	0.352	0.782 2	78.22	1.07
802.11ac_VHT80	0.285	0.188	0.659 6	65.96	1.81

Notes.

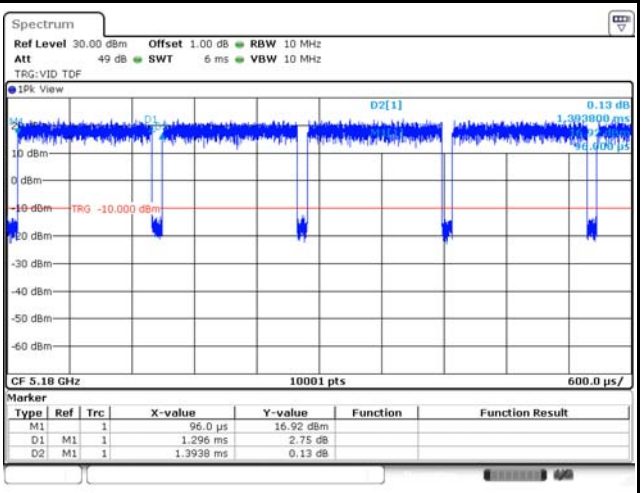
1. Duty cycle (Linear) = T_{on} time / Period
2. DCF(Duty cycle factor) = 10log(1/duty cycle)
3. DCF is not compensated to average result if duty cycle is more than 98%

SISO

802.11a



802.11n_HT20



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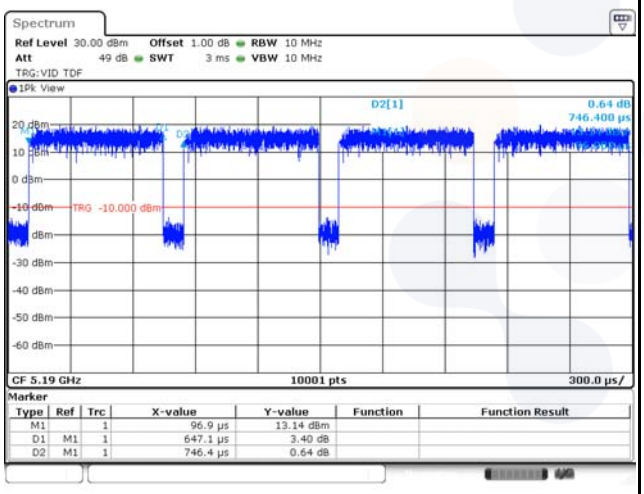
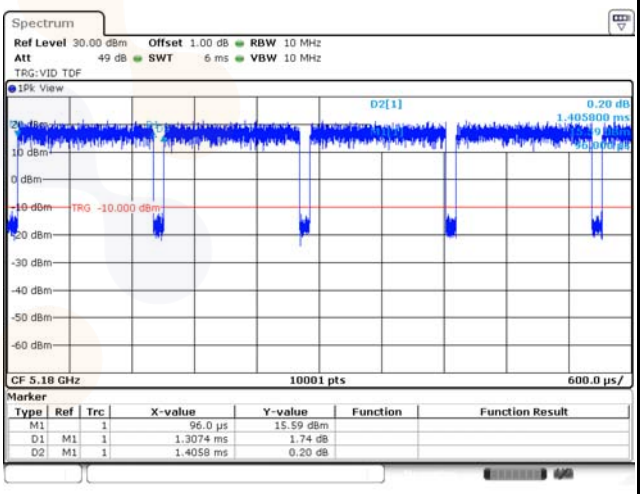


802.11ac_VHT20



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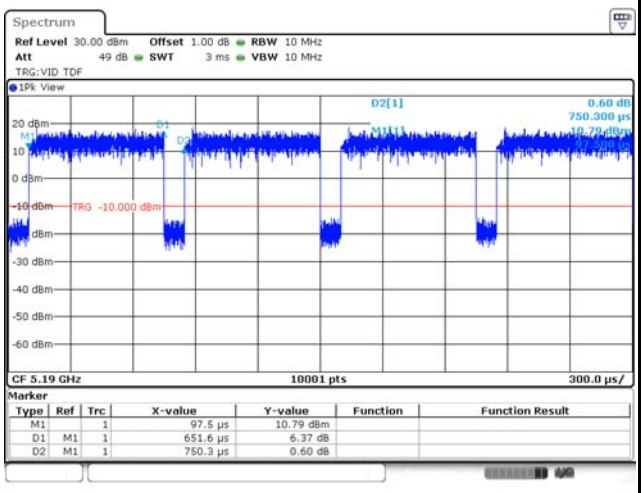
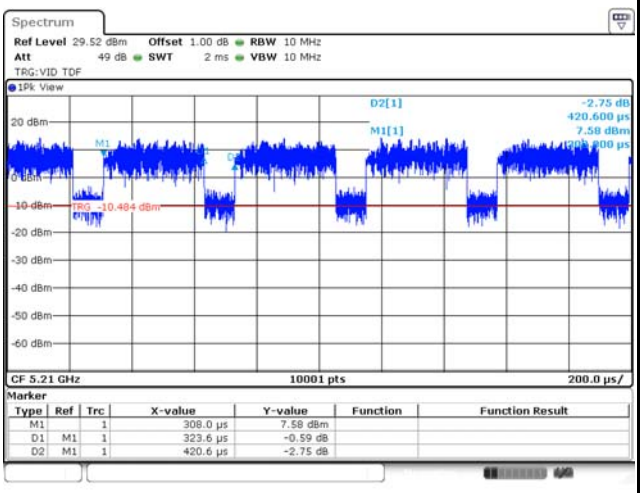
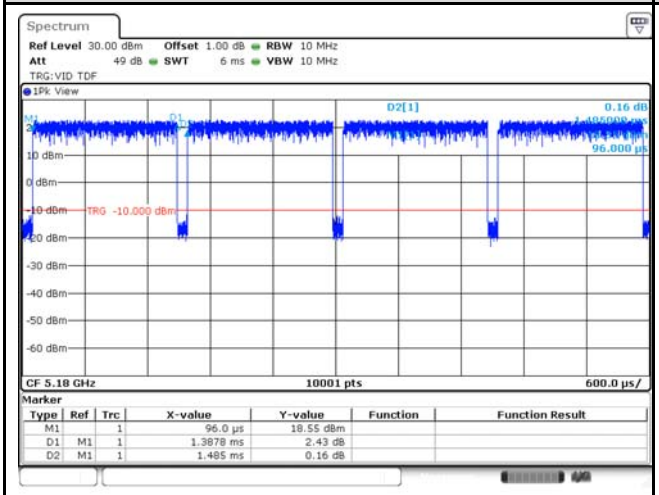


802.11ac_VHT80

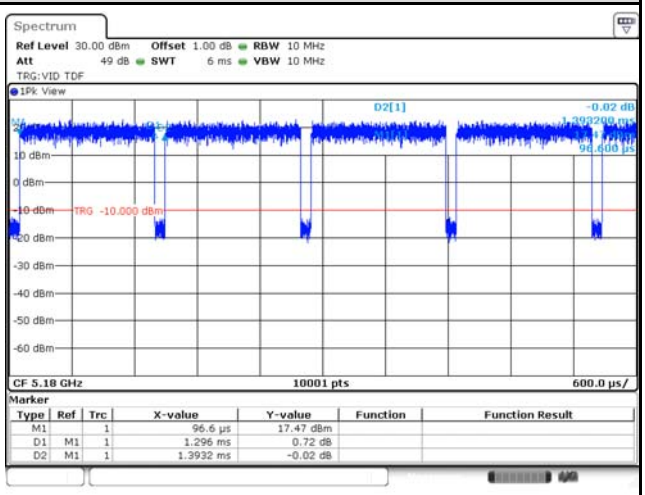


MIMO

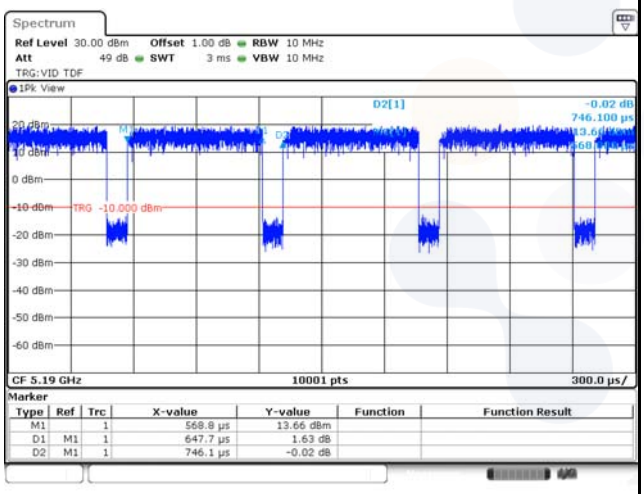
802.11a



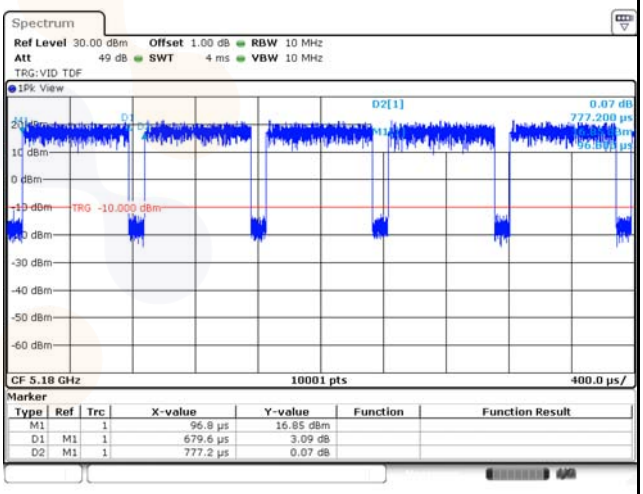
802.11n_HT20



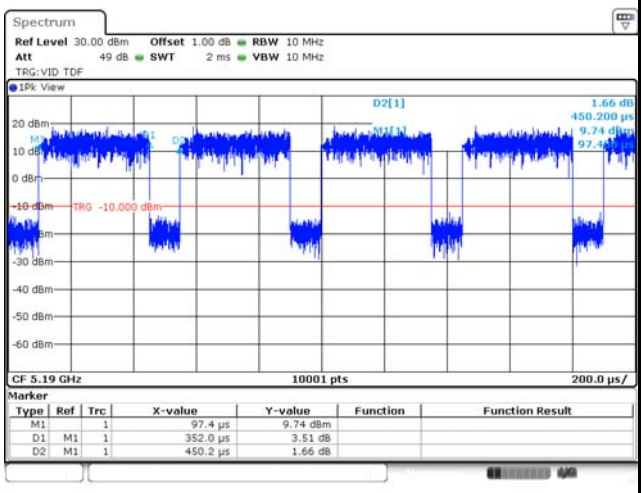
802.11n_HT40



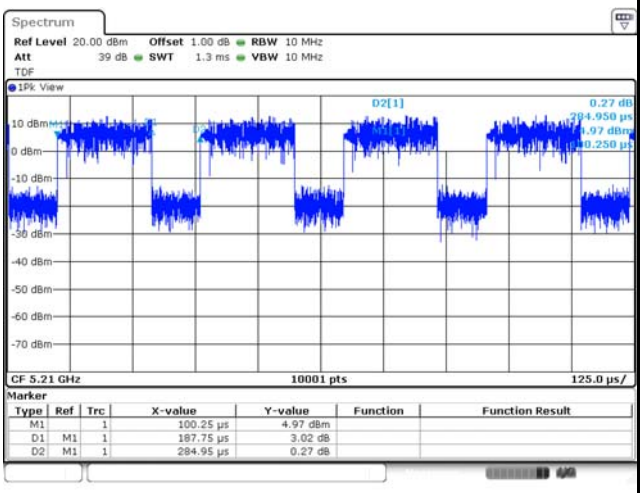
802.11ac_VHT20



802.11ac_VHT40



802.11ac_VHT80



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.

- The transmitter has permanently attached Metal+LDS 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	√	√	√	×
802.11n HT20	√	√	√	√
802.11n HT40	√	√	√	√
802.11ac VHT20	√	√	√	√
802.11ac VHT40	√	√	√	√
802.11ac VHT80	√	√	√	√

√ = Support, × = 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.

Directional Antenna Gain

Band	ANT 1 Gain (dBi)	ANT 2 Gain (dBi)	Power Directional Gain (dBi)
UNII 1	-8.89	-9.78	-6.31
UNII 2A	-8.89	-9.78	-6.31
UNII 2C	-8.70	-9.51	-6.09
UNII 3	-9.03	-9.43	-6.22

Note.

Unequal antenna gains, with equal transmit powers. For antenna gains given by G_1, G_2, …, G_N dBi

Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20} + \ldots + 10^{GN/20})^2 / N_{ANT}]$ dBi

Sample calculation

In case of UNII 1, directional gain = $10 \log[(10^{-8.89/20} + 10^{-9.78/20})^2 / 2] = -6.31$ dBi

4. Summary of tests

FCC Part section(s)	Parameter	Test Condition	Test results
15.407(a)	Maximum conducted output power	Conducted	Pass
15.407(a)	Maximum power spectral density		Pass
15.407(a)	26 dB Channel Bandwidth		Pass
15.407(e)	6 dB Channel Bandwidth		Pass
15.207(a)	AC Conducted Emissions		Pass
15.407(b), 15.205(a), 15.209(a)	Spurious emission	Radiated	Pass
	Band-edge, restricted band		Pass

Notes:

1. All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
2. According to exploratory test no any obvious emission were detected from 9 ㎑ to 30 ㎒. 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.
3. 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
4. All the radiated tests have been performed several case. (Stand-alone, with accessories (DLC Cable etc.))
   Worst case: stand-alone
5. The test procedure(s) in this report were performed in accordance as following.
   - ANSI C63.10-2013
   - KDB 662911 D01 v02r01
6. 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

5. 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 indicated a 95 % level of confidence. The measurement data shown herein meets of exceeds the U_{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 (±)	
Conducted RF power	0.9 dB	
Conducted spurious emissions	1.1 dB	
Radiated spurious emissions	Below 30 ㎒:	2.4 dB
	30 ㎒ ~ 1 000 ㎒	2.3 dB
	1 000 ㎒ ~ 18 000 ㎒	5.6 dB
	Above 18 000 ㎒	5.7 dB
Conducted emissions	9 ㎑ ~ 150 ㎑	1.6 dB
	150 ㎑ ~ 30 ㎒	1.7 dB

6. 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.

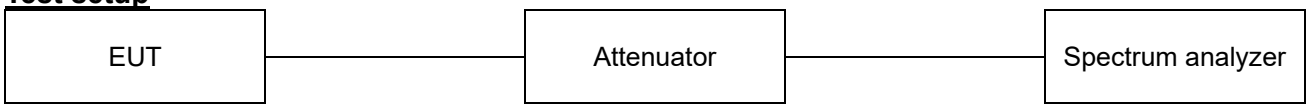
Frequency (㎒)	Factor(㏈)	Frequency (㎒)	Factor(㏈)
30	10.05	9 000	11.95
50	10.14	10 000	11.95
100	10.30	11 000	11.86
200	10.39	12 000	12.18
300	10.50	13 000	12.36
400	10.63	14 000	12.29
500	10.78	15 000	12.14
600	10.88	16 000	12.76
700	10.96	17 000	12.45
800	10.92	18 000	12.86
900	10.94	19 000	12.54
1 000	10.93	20 000	12.87
2 000	11.28	21 000	13.43
3 000	11.51	22 000	13.45
4 000	11.68	23 000	13.61
5 000	11.77	24 000	13.75
6 000	12.50	25 000	13.80
7 000	11.52	26 000	13.91
8 000	11.97	26 500	14.03

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

7. Test results

7.1. Maximum conducted output power

Test setup



Limit

According to §15.407(a), RSS-247(6.2)

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[1)]
UNII-2C	√		250 mW or 11 dBm + 10logB[1)]
UNII-3	√		1 W (30 dBm)
UNII-4			EIRP 30 dBm

Note:

1) Conducted output power limit B is the 26 dB emission bandwidth.

Test procedure

ANSI C63.10-2013-Section 12.3.2.4 or 12.3.3.1, 14.2
KDB 789033 D02 v02r01 - Section E.2.d) or E.3.a)

Test settings

Used test method is Section E.2.d)

◆ **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 ㎒

(iv) Set RBW ≥ 3 ㎒

(v) Number of points in sweep ≥ 2×span/RBW. (This ensures that bin-to-bin spacing is ≤ 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 ㎒ 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 ㏈ 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 ㎒

(iv) Set RBW ≥ 3 ㎒

(v) Number of points in sweep ≥ 2×span/RBW. (This ensures that bin-to-bin spacing is ≤ RBW/2, so that narrowband signals are not lost between frequency bins.)

(vi) Manually set sweep time ≥ 10 × (number of points in sweep) × (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 ㎒ 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 ㏈ 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 ㏈m 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

Test mode	Band	Frequency (㎒)	Measured output power					Limit (dBm)
			Reading (dBm)		DCF (dB)	Result (dBm)		
			ANT1	ANT2		ANT1	ANT2	
802.11a	UNII 1	5 180	16.60	15.92	0.30	16.90	16.22	23.98
		5 200	16.50	15.98		16.80	16.28	
		5 240	17.52	17.30		17.82	17.60	
	UNII 2A	5 260	16.61	16.33		16.91	16.63	23.98
		5 280	16.94	16.59		17.24	16.89	
		5 320	17.09	16.97		17.39	17.27	
	UNII 2C	5 500	17.47	17.03		17.77	17.33	23.98
		5 600	17.05	16.67		17.35	16.97	
		5 700	16.98	16.68		17.28	16.98	
	UNII 3	5 745	16.33	17.10		16.63	17.40	30.00
		5 785	16.44	16.78		16.74	17.08	
		5 825	16.23	16.09		16.53	16.39	
802.11n HT20	UNII 1	5 180	15.51	14.89	0.32	15.83	15.21	23.98
		5 200	15.31	14.95		15.63	15.27	
		5 240	16.34	16.14		16.66	16.46	
	UNII 2A	5 260	15.46	15.29		15.78	15.61	23.98
		5 280	15.71	15.63		16.03	15.95	
		5 320	15.93	15.90		16.25	16.22	
	UNII 2C	5 500	16.30	15.99		16.62	16.31	23.98
		5 600	16.00	15.60		16.32	15.92	
		5 700	15.83	15.72		16.15	16.04	
	UNII 3	5 745	15.29	15.78		15.61	16.10	30.00
		5 785	15.15	15.57		15.47	15.89	
		5 825	15.33	14.97		15.65	15.29	
802.11n HT40	UNII 1	5 190	12.21	12.19	0.62	12.83	12.81	23.98
		5 230	15.93	15.99		16.55	16.61	
	UNII 2A	5 270	15.33	15.51		15.95	16.13	23.98
		5 310	13.54	13.50		14.16	14.12	
	UNII 2C	5 510	14.04	13.66		14.66	14.28	23.98
		5 590	15.82	15.52		16.44	16.14	
		5 670	15.51	15.89		16.13	16.51	
	UNII 3	5 755	15.35	16.16		15.97	16.78	30.00
		5 795	15.41	15.79		16.03	16.41	

Test mode	Band	Frequency (㎒)	Measured output power					Limit (dBm)
			Reading (dBm)		DCF (dB)	Result (dBm)		
			ANT1	ANT2		ANT1	ANT2	
802.11ac VHT20	UNII 1	5 180	14.34	13.91	0.32	14.66	14.23	23.98
		5 200	14.24	14.02		14.56	14.34	
		5 240	15.32	15.35		15.64	15.67	
	UNII 2A	5 260	14.40	14.58		14.72	14.90	23.98
		5 280	14.86	14.81		15.18	15.13	
		5 320	14.95	15.08		15.27	15.40	
	UNII 2C	5 500	15.28	15.21		15.60	15.53	23.98
		5 600	14.99	14.77		15.31	15.09	
		5 700	14.83	14.88		15.15	15.20	
	UNII 3	5 745	14.26	14.81		14.58	15.13	30.00
		5 785	14.27	14.40		14.59	14.72	
		5 825	14.32	14.07		14.64	14.39	
802.11ac VHT40	UNII 1	5 190	11.33	11.27	0.61	11.94	11.88	23.98
		5 230	13.83	13.88		14.44	14.49	
	UNII 2A	5 270	13.26	13.46		13.87	14.07	23.98
		5 310	13.57	13.83		14.18	14.44	
	UNII 2C	5 510	14.00	13.95		14.61	14.56	23.98
		5 590	13.78	13.66		14.39	14.27	
		5 670	13.50	14.06		14.11	14.67	
	UNII 3	5 755	13.21	14.30		13.82	14.91	30.00
		5 795	13.29	13.88		13.90	14.49	
802.11ac VHT80	UNII 1	5 210	8.22	7.93	1.14	9.36	9.07	23.98
	UNII 2A	5 290	10.89	10.85		12.03	11.99	23.98
	UNII 2C	5 530	9.62	9.07		10.76	10.21	23.98
		5 610	12.09	12.09		13.23	13.23	
	UNII 3	5 775	11.82	12.50		12.96	13.64	30.00

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

MIMO

Test mode	Band	Frequency (㎒)	Measured output power				Limit (dBm)
			Reading (dBm)		DCF (dB)	Result (dBm)	
			ANT1	ANT2			
802.11a	UNII 1	5180	15.98	15.73	0.29	19.16	23.98
		5200	16.17	15.74		19.26	
		5240	17.23	16.93		20.38	
	UNII 2A	5260	16.26	16.02		19.44	23.98
		5280	16.62	16.23		19.73	
		5320	16.73	16.51		19.92	
	UNII 2C	5500	17.06	16.78		20.22	23.98
		5600	16.76	16.35		19.86	
		5700	16.62	16.36		19.79	
	UNII 3	5745	16.03	16.41		19.52	30.00
		5785	16.14	15.98		19.36	
		5825	16.18	15.72		19.26	
802.11n HT20	UNII 1	5 180	14.89	14.72	0.31	18.13	23.98
		5 200	15.25	15.18		18.54	
		5 240	16.33	16.39		19.68	
	UNII 2A	5 260	15.41	15.57		18.81	23.98
		5 280	15.68	15.80		19.06	
		5 320	15.98	16.03		19.33	
	UNII 2C	5 500	16.36	16.25		19.63	23.98
		5 600	16.01	15.90		19.28	
		5 700	15.92	15.94		19.25	
	UNII 3	5 745	15.38	15.82		18.93	30.00
		5 785	14.96	15.84		18.74	
		5 825	15.46	15.12		18.61	

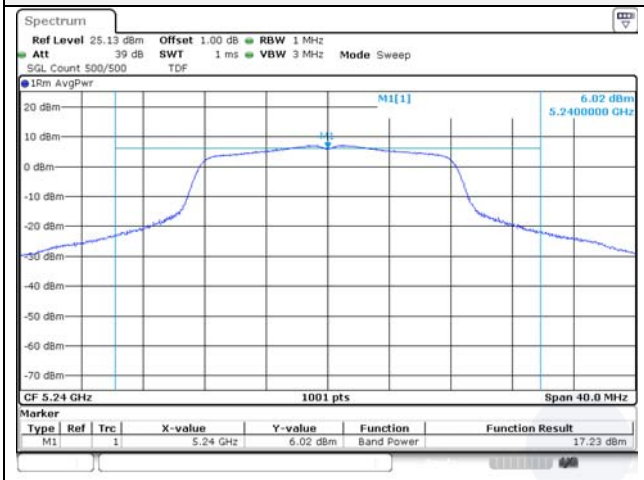
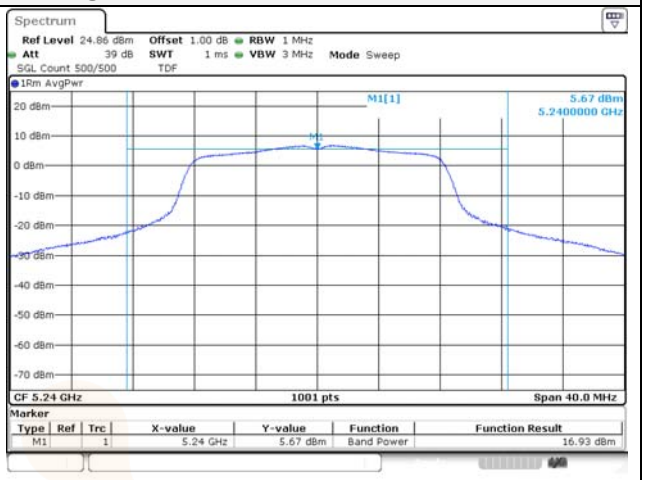
Test mode	Band	Frequency (㎒)	Measured output power				Limit (dBm)
			Reading (dBm)		DCF (dB)	Result (dBm)	
			ANT1	ANT2			
802.11n HT40	UNII 1	5 190	12.36	11.86	0.61	15.74	23.98
		5 230	15.50	15.30		19.02	
	UNII 2A	5 270	14.95	14.72		18.46	23.98
		5 310	14.19	14.21		17.82	
	UNII 2C	5 510	14.05	13.95		17.62	23.98
		5 590	15.38	14.90		18.77	
		5 670	15.02	15.25		18.76	
	UNII 3	5 755	14.94	15.40		18.80	30.00
		5 795	15.00	15.03		18.64	
802.11ac VHT20	UNII 1	5 180	14.72	14.12	0.58	18.02	23.98
		5 200	14.45	14.21		17.92	
		5 240	15.31	15.09		18.79	
	UNII 2A	5 260	14.67	14.62		18.24	23.98
		5 280	15.01	14.82		18.51	
		5 320	15.24	15.10		18.76	
	UNII 2C	5 500	15.06	15.38		18.81	23.98
		5 600	15.26	14.94		18.69	
		5 700	15.11	14.92		18.61	
	UNII 3	5 745	14.60	14.89		18.34	30.00
		5 785	14.61	14.72		18.26	
		5 825	14.70	14.22		18.06	
802.11ac VHT40	UNII 1	5 190	11.58	11.10	1.07	15.43	23.98
		5 230	13.46	13.21		17.42	
	UNII 2A	5 270	13.01	12.74		16.96	23.98
		5 310	13.24	13.08		17.24	
	UNII 2C	5 510	13.09	12.90		17.08	23.98
		5 590	13.31	12.83		17.16	
		5 670	13.13	13.19		17.24	
	UNII 3	5 755	13.00	13.37		17.27	30.00
		5 795	13.02	12.99		17.09	

Test mode	Band	Frequency (㎒)	Measured output power				Limit (dBm)
			Reading (dBm)		DCF (dB)	Result (dBm)	
			ANT1	ANT2			
802.11ac VHT80	UNII 1	5 210	7.85	7.79	1.81	12.64	23.98
	UNII 2A	5 290	10.22	9.98		14.92	23.98
	UNII 2C	5 530	8.64	8.56		13.42	23.98
		5 610	11.38	11.03		16.03	
	UNII 3	5 775	11.11	11.42		16.09	30.00

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

In order to simplify the report, attached plots were the worst case per bandwidth

MIMO

MIMO_ANT 1	MIMO_ANT 2
UNII-1 / 802.11a / High ch.	
	
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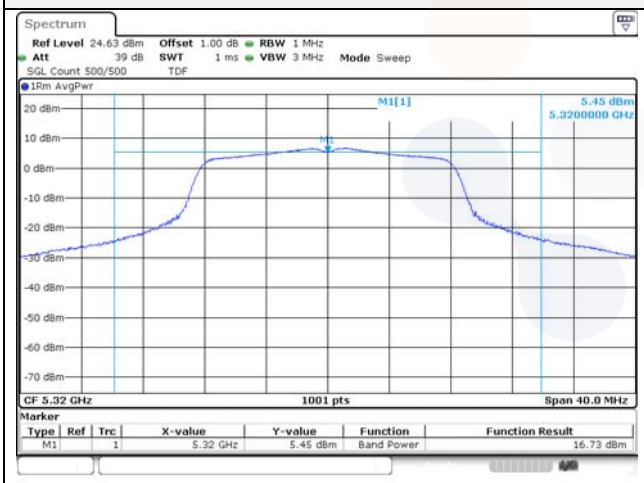	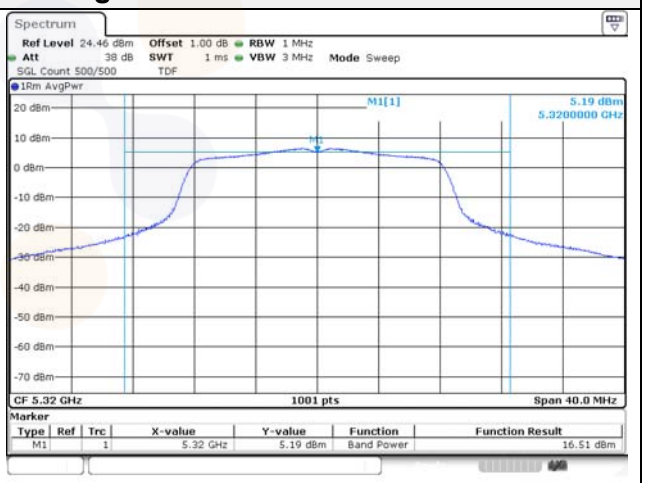
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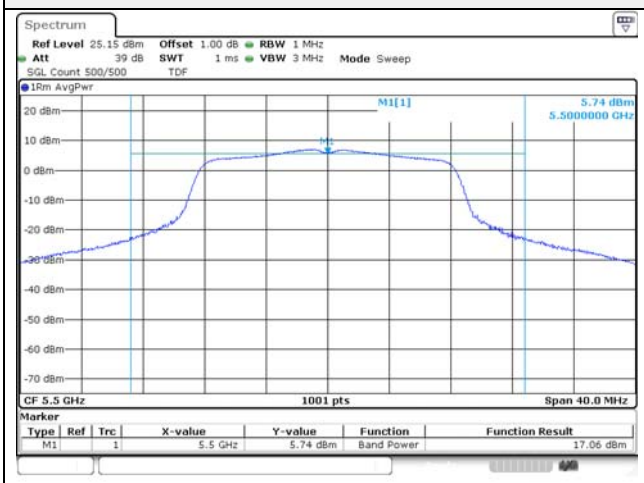	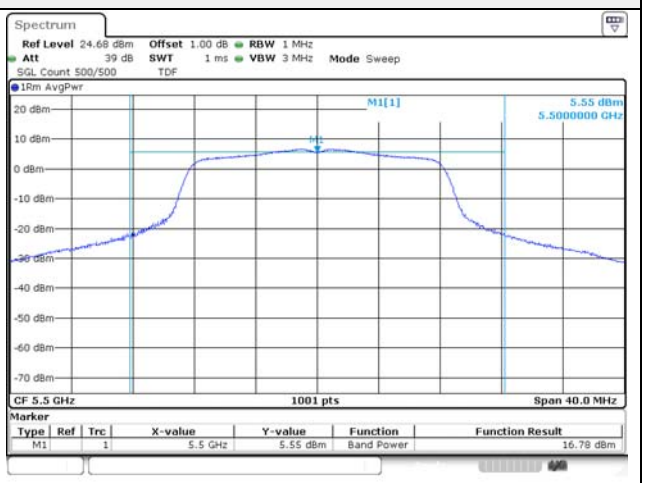

MIMO_ANT 1	MIMO_ANT 2
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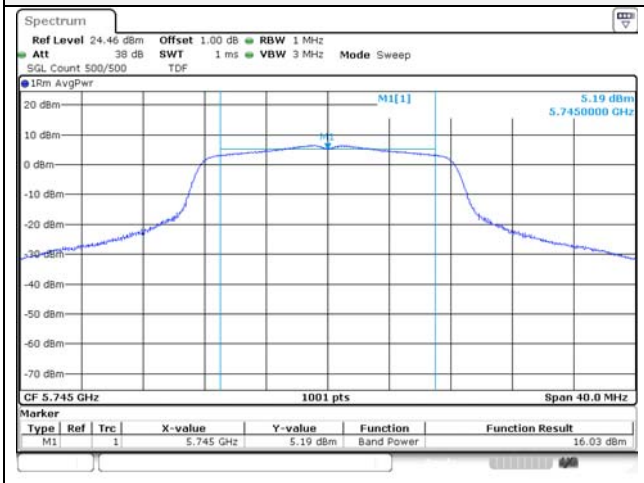
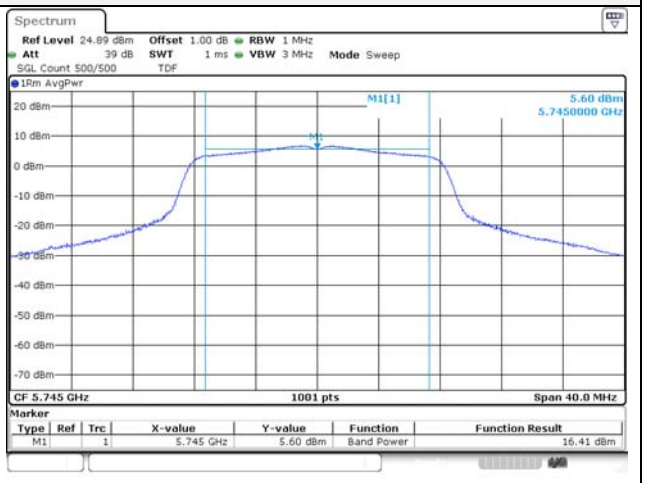
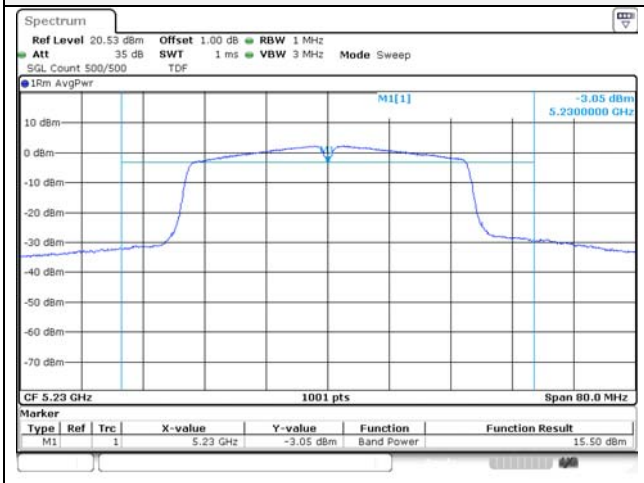
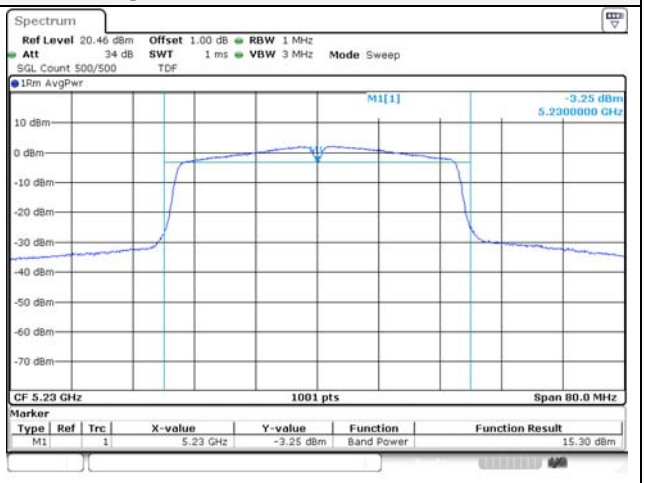
	

MIMO_ANT 1	MIMO_ANT 2
UNII-1 / 802.11n HT40 / High ch.	
	
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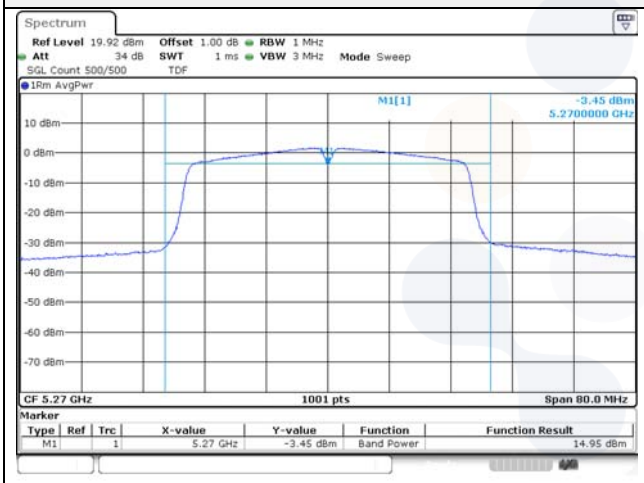
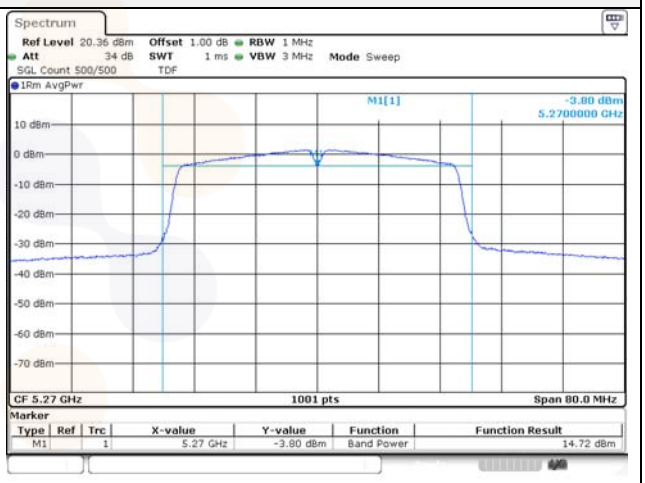
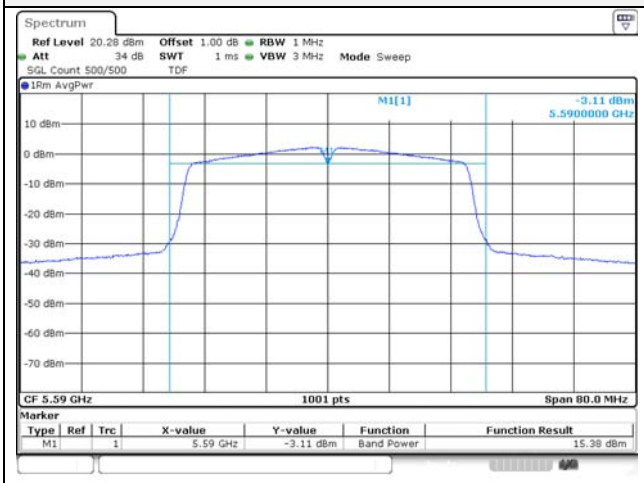
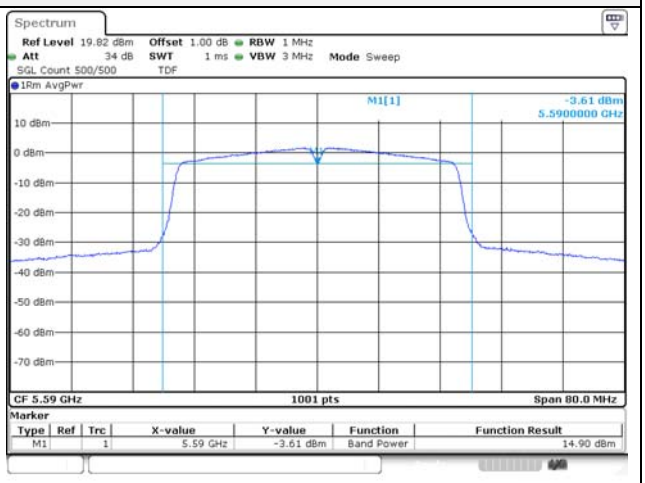
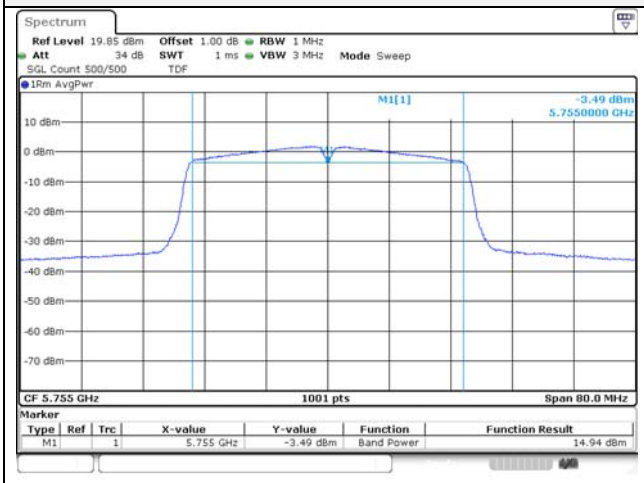
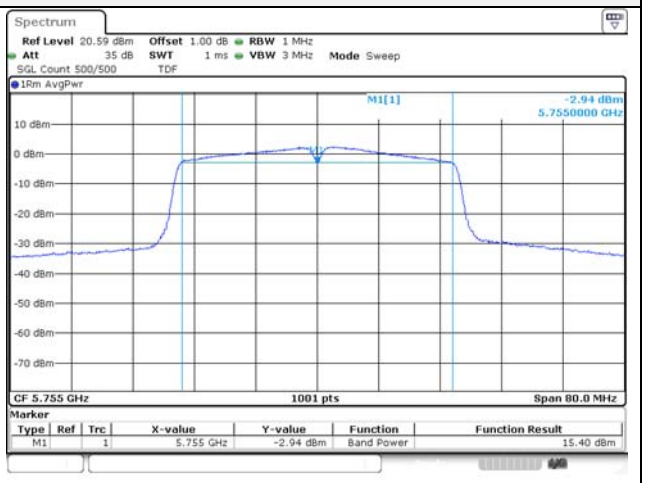
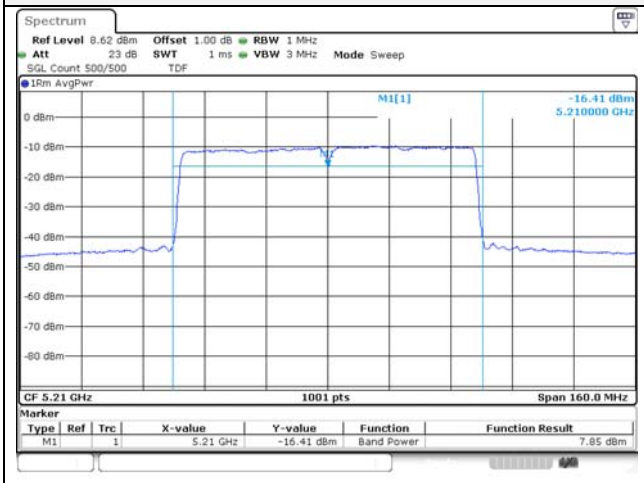
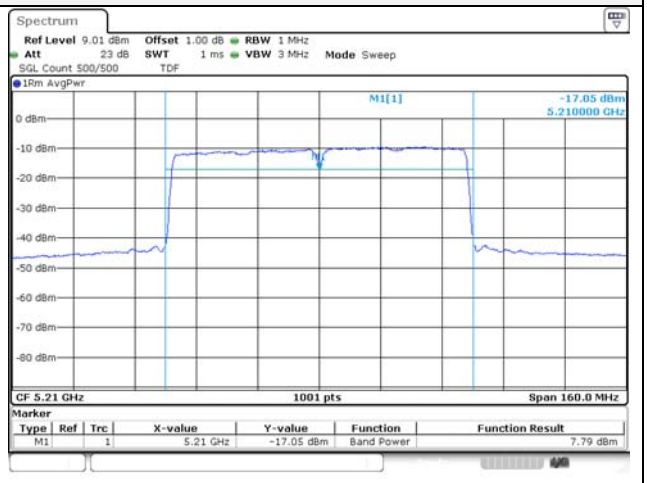
	
UNII-2C / 802.11n HT40 / Mid ch.	
	

MIMO_ANT 1	MIMO_ANT 2
UNII-3 / 802.11n HT40 / Low ch.	
	

MIMO_ANT 1	MIMO_ANT 2
UNII-1 / 802.11ac VHT80 / Mid ch.	
	
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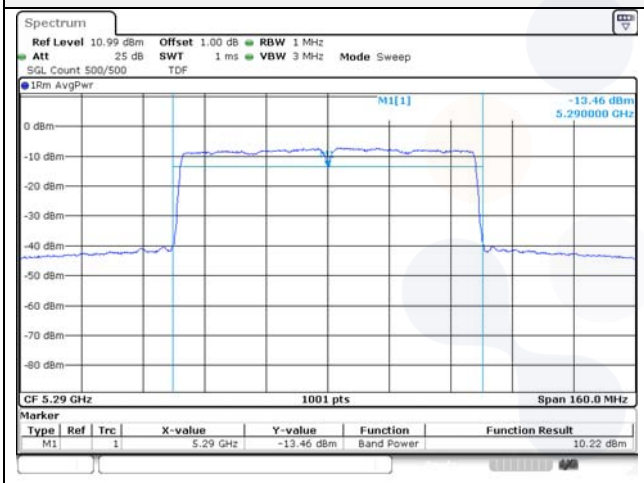
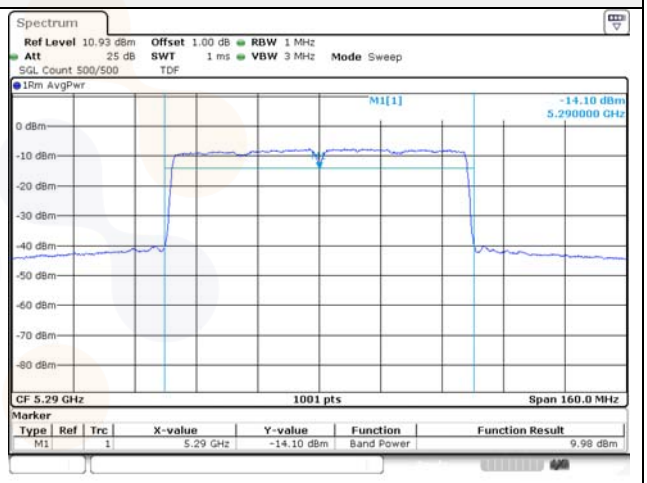
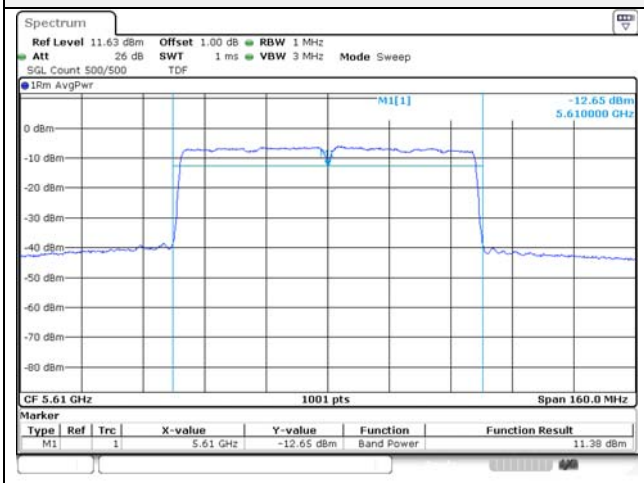
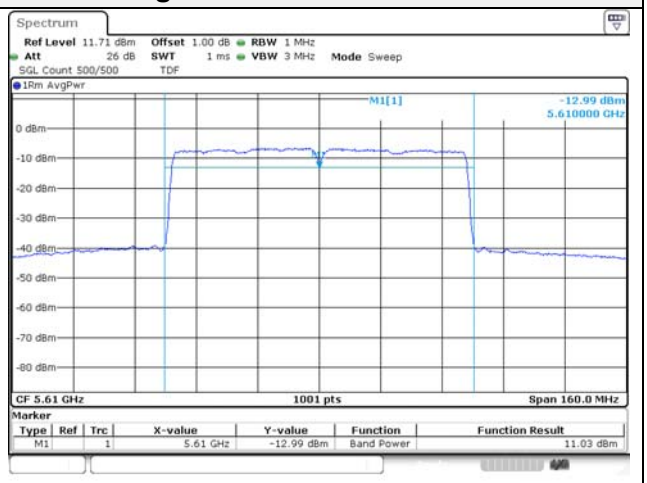
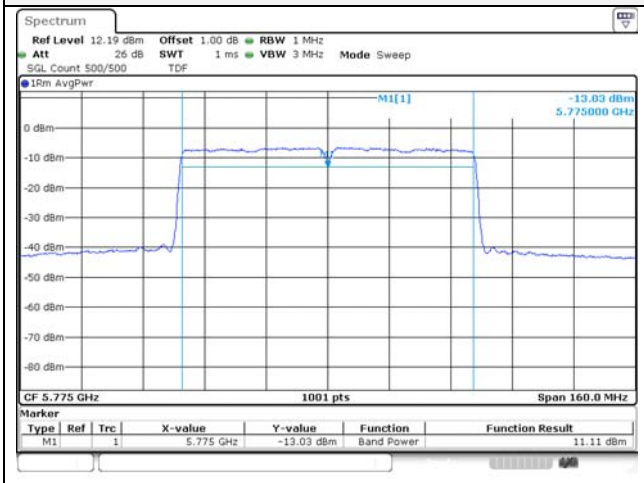
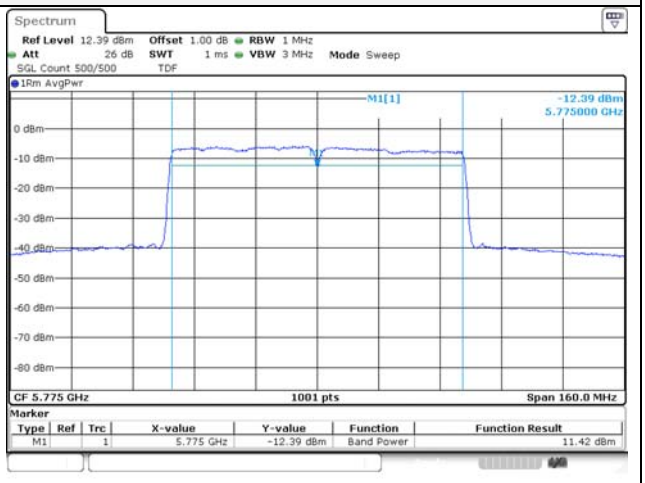
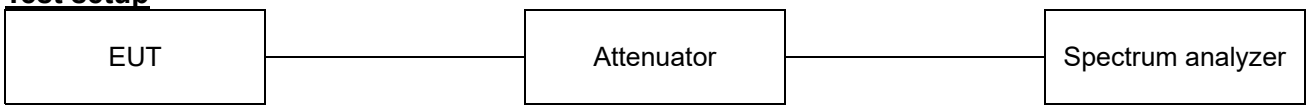
	
UNII-2C / 802.11ac VHT80 / High ch.	
	

MIMO_ANT 1	MIMO_ANT 2
UNII-3 / 802.11ac VHT80 / Mid ch.	
	

7.2. 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/㎒
		Indoor access point	
		Fixed point-to-point access point	
	√	Client device	11 dBm /㎒
UNII-2A	√		11 dBm /㎒
UNII-2C	√		11 dBm /㎒
UNII-3	√		30 dBm /500 ㎑
UNII-4			14 dBm /㎒ (E.I.R.P.)

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

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 1㎒ reference bandwidth
5. For devices operating in the bands 5.15-5.25 ㎓, 5.25-5.35 ㎓, and 5.47-5.725 ㎓, the

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

a) Set RBW≥1/T, where T is defined in II.B.I.a).
b) Set VBW≥3 RBW.
c) If measurement bandwidth of Maximum PSD is specified in 500 ㎑, add 10 log (500 ㎑ /RBW) to the measured result, whereas RBW (<500 ㎑) is the reduced resolution bandwidth of the spectrum analyzer set during measurement.
d) If measurement bandwidth of Maximum PSD is specified in 1 ㎒, add 10 log (1㎒/RBW) to the measured result, whereas RBW (< 1 ㎒) 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 ㎑ for the II.F.5.c) and II.F.5.d), since RBW=100 ㎑ is available on nearly all spectrum analyzers.

Test results

SISO

Test mode	Band	Frequency (㎒)	Measured PSD (dBm/㎒)		DCF (dB)	Maximum PSD (dB m/㎒)		Limit (dBm/㎒)
			ANT1	ANT2		ANT1	ANT2	
802.11a	UNII 1	5 180	6.60	6.07	0.30	6.90	6.37	11
		5 200	6.52	6.09		6.82	6.39	
		5 240	7.51	7.24		7.81	7.54	
	UNII 2A	5 260	6.51	6.41		6.81	6.71	11
		5 280	6.83	6.65		7.13	6.95	
		5 320	7.17	7.05		7.47	7.35	
	UNII 2C	5 500	7.23	6.99		7.53	7.29	11
		5 600	7.17	6.57		7.47	6.87	
		5 700	6.87	6.92		7.17	7.22	
802.11n HT20	UNII 1	5 180	5.40	4.68	0.32	5.72	5.00	11
		5 200	5.22	4.76		5.54	5.08	
		5 240	6.24	6.16		6.56	6.48	
	UNII 2A	5 260	5.37	5.18		5.69	5.50	11
		5 280	5.49	5.29		5.81	5.61	
		5 320	5.70	5.90		6.02	6.22	
	UNII 2C	5 500	6.19	5.91		6.51	6.23	11
		5 600	5.97	5.56		6.29	5.88	
		5 700	5.76	5.51		6.08	5.83	
802.11n HT40	UNII 1	5 190	-1.18	-1.19	0.62	-0.56	-0.57	11
		5 230	2.80	2.81		3.42	3.43	
	UNII 2A	5 270	2.24	2.40		2.86	3.02	11
		5 310	0.40	0.29		1.02	0.91	
	UNII 2C	5 510	0.71	0.44		1.33	1.06	11
		5 590	2.72	2.22		3.34	2.84	
		5 670	2.25	2.68		2.87	3.30	
802.11ac VHT20	UNII 1	5 180	4.20	3.85	0.32	4.52	4.17	11
		5 200	4.03	3.82		4.35	4.14	
		5 240	5.10	5.29		5.42	5.61	
	UNII 2A	5 260	4.24	4.24		4.56	4.56	11
		5 280	4.76	4.55		5.08	4.87	
		5 320	4.72	4.83		5.04	5.15	
	UNII 2C	5 500	5.04	4.97		5.36	5.29	11
		5 600	4.99	4.44		5.31	4.76	
		5 700	4.61	4.70		4.93	5.02	

Test mode	Band	Frequency (㎒)	Measured PSD (dBm/㎒)		DCF (dB)	Maximum PSD (dB m/㎒)		Limit (dBm/㎒)
			ANT1	ANT2		ANT1	ANT2	
802.11ac VHT40	UNII 1	5190	-2.05	-2.19	0.61	-1.44	-1.58	11
		5230	0.45	0.80		1.06	1.41	
	UNII 2A	5270	-0.04	0.14		0.57	0.75	11
		5310	0.37	0.47		0.98	1.08	
	UNII 2C	5510	0.65	0.76		1.26	1.37	11
		5590	0.53	0.22		1.14	0.83	
		5670	0.36	0.80		0.97	1.41	
802.11ac VHT80	UNII 1	5210	-9.35	-9.47	1.14	-8.21	-8.33	11
	UNII 2A	5290	-6.79	-6.88		-5.65	-5.74	11
	UNII 2C	5530	-8.19	-8.77		-7.05	-7.63	11
		5610	-5.60	-5.47		-4.46	-4.33	

Test mode	Band	Frequency (㎒)	Measured PSD (dBm /500 ㎑)		DCF (dB)	Maximum PSD (dBm /500 ㎑)		Limit (dBm /500 ㎑)
			ANT1	ANT2		ANT1	ANT2	
802.11a	UNII 3	5745	4.16	4.39	0.30	4.46	4.69	30
		5785	4.18	4.03		4.48	4.33	
		5825	4.12	3.64		4.42	3.94	
802.11n HT20		5745	2.70	3.13	0.32	3.02	3.45	
		5785	2.70	3.07		3.02	3.39	
		5825	2.85	2.45		3.17	2.77	
802.11n HT40		5755	-0.81	0.20	0.62	-0.19	0.82	
		5795	-0.72	-0.24		-0.10	0.38	
802.11ac VHT20		5745	1.82	2.48	0.32	2.14	2.80	
		5785	1.71	2.09		2.03	2.41	
		5825	1.89	1.63		2.21	1.95	
802.11ac VHT40		5755	-2.75	-1.81	0.61	-2.14	-1.20	
		5795	-2.66	-2.11		-2.05	-1.50	
802.11ac VHT80		5775	-8.59	-7.82	1.14	-7.45	-6.68	

Notes:
1. Maximum PSD calculation
- Maximum PSD = Measured PSD + D.C.F

MIMO (ANT1+ANT2)

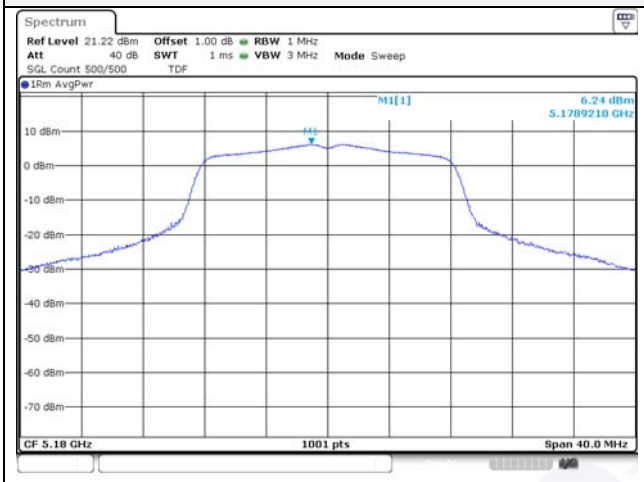
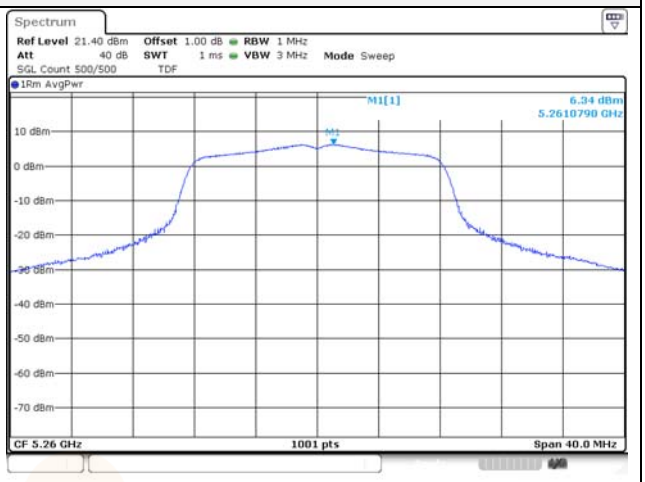
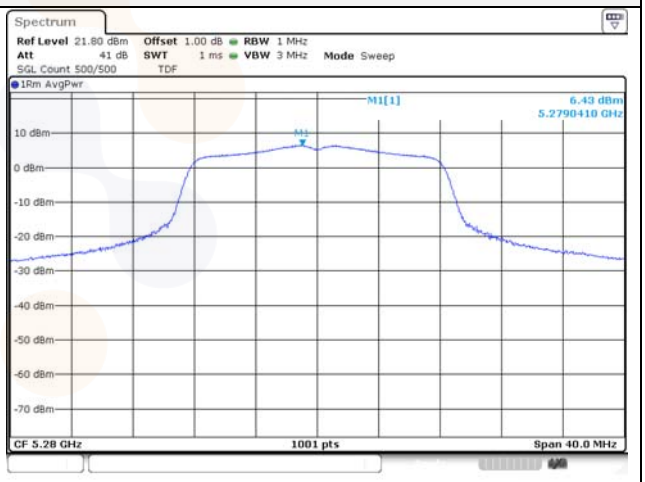
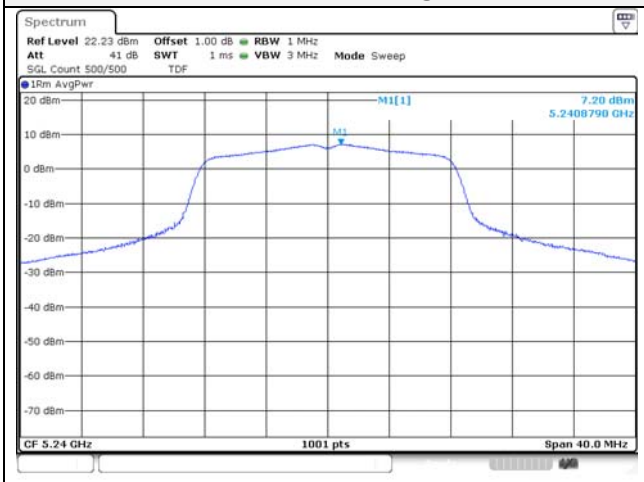
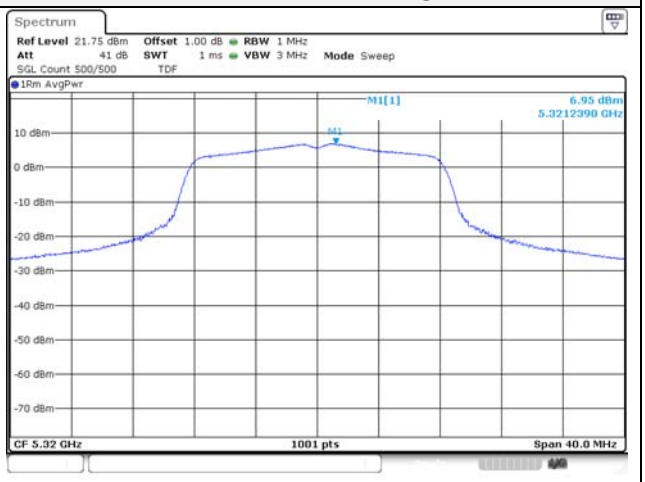
Test mode	Band	Frequency (㎒)	Measured PSD (dBm/㎒)		DCF (dB)	Maximum PSD (dB m/㎒)	Limit (dBm/㎒)
			ANT1	ANT2			
802.11a	UNII 1	5 180	6.24	5.85	0.29	9.35	11
		5 200	6.41	5.90		9.47	
		5 240	7.20	6.82		10.32	
	UNII 2A	5 260	6.34	5.89		9.42	11
		5 280	6.43	6.27		9.65	
		5 320	6.95	6.55		10.06	
	UNII 2C	5 500	6.96	6.57		10.07	11
		5 600	6.84	6.25		9.86	
		5 700	6.62	6.41		9.82	
802.11n HT20	UNII 1	5 180	4.57	4.52	0.31	7.87	11
		5 200	4.94	5.04		8.31	
		5 240	6.23	6.30		9.59	
	UNII 2A	5 260	5.28	5.28		8.60	11
		5 280	5.67	5.65		8.98	
		5 320	5.69	5.78		9.06	
	UNII 2C	5 500	6.17	6.23		9.52	11
		5 600	5.75	5.78		9.09	
		5 700	5.77	6.11		9.27	
802.11n HT40	UNII 1	5190	-0.83	-1.23	0.61	2.60	11
		5230	2.40	2.14		5.89	
	UNII 2A	5270	1.95	1.71		5.45	11
		5310	1.00	1.06		4.65	
	UNII 2C	5510	0.81	0.66		4.36	11
		5590	2.12	1.72		5.55	
		5670	1.81	2.01		5.53	
802.11ac VHT20	UNII 1	5 180	4.42	4.03	0.58	7.82	11
		5 200	4.36	3.89		7.72	
		5 240	5.56	5.38		9.06	
	UNII 2A	5 260	4.47	4.49		8.07	11
		5 280	4.69	4.77		8.32	
		5 320	4.98	4.94		8.55	
	UNII 2C	5 500	5.32	5.30		8.90	11
		5 600	5.24	4.80		8.61	
		5 700	5.15	4.76		8.55	

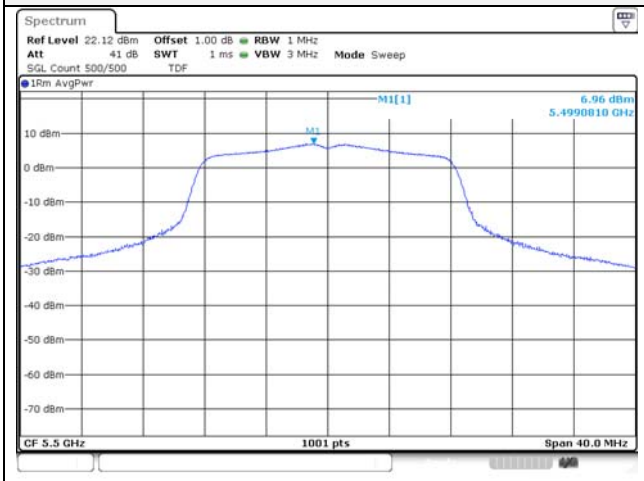
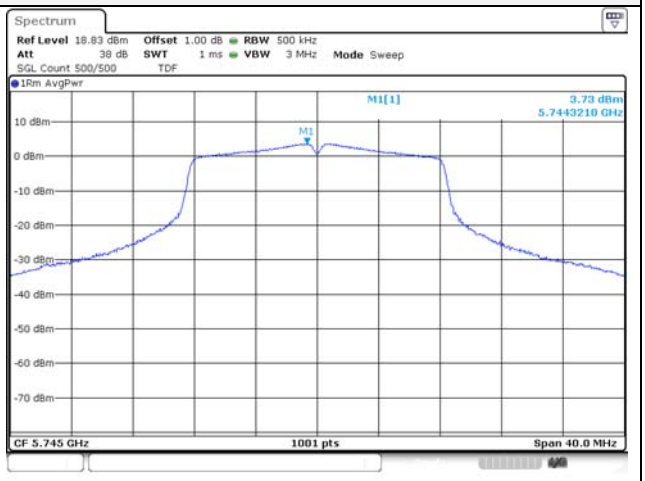
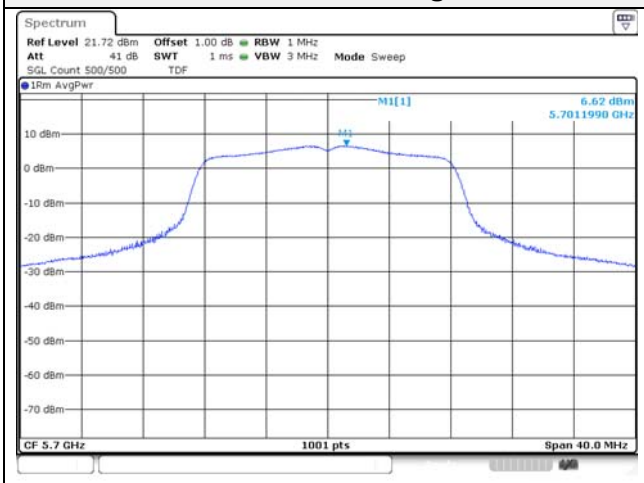
Test mode	Band	Frequency (㎒)	Measured PSD (dBm/㎒)		DCF (dB)	Maximum PSD (dB m/㎒)	Limit (dBm/㎒)
			ANT1	ANT2			
802.11ac VHT40	UNII 1	5 190	-1.80	-2.12	1.07	2.12	11
		5 230	0.45	-0.03		4.29	
	UNII 2A	5 270	-0.25	-0.42		3.74	11
		5 310	0.10	-0.17		4.04	
	UNII 2C	5 510	-0.25	-0.14		3.88	11
		5 590	0.13	-0.17		4.06	
		5 670	-0.12	0.02		4.03	
802.11ac VHT80	UNII 1	5210	-9.47	-9.42	1.81	-4.63	11
	UNII 2A	5290	-7.34	-7.52		-2.61	11
	UNII 2C	5530	-8.72	-8.09		-3.58	11
		5610	-5.73	-6.31		-1.19	

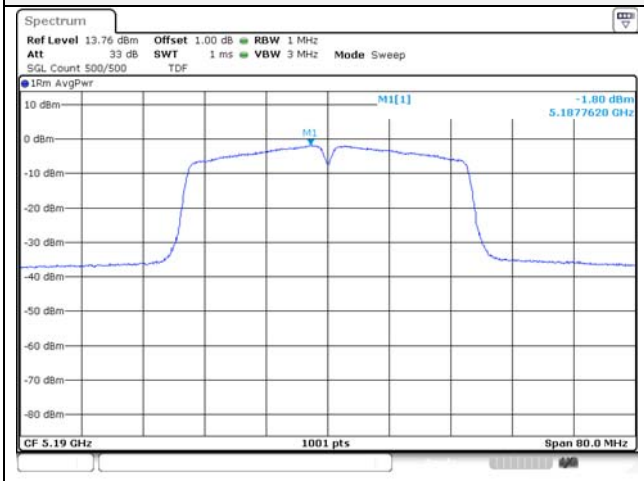
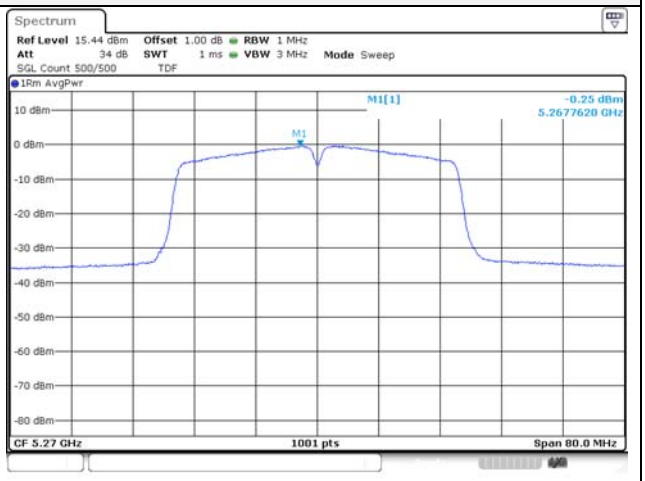
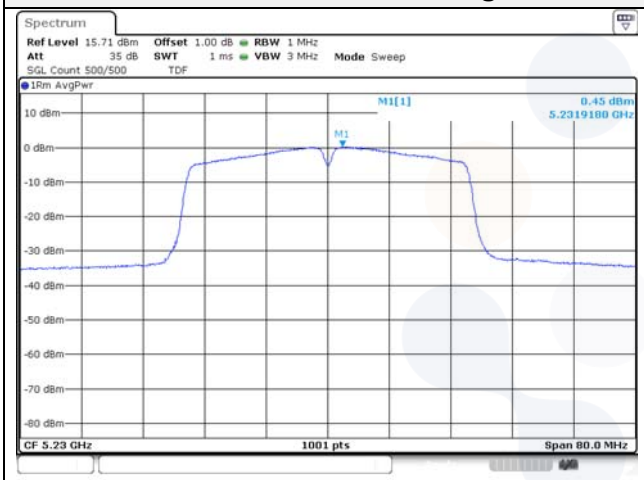
Test mode	Band	Frequency (㎒)	Measured PSD (dBm/500 ㎑)		DCF (dB)	Maximum PSD (dBm /500 ㎑)	Limit (dBm /500 ㎑)
			ANT1	ANT2			
802.11a	UNII 3	5745	3.73	3.86	0.29	7.10	30
		5785	3.66	3.79		7.03	
		5825	3.70	3.04		6.69	
802.11n HT20		5745	2.85	3.26	0.31	6.38	
		5785	2.87	3.15		6.34	
		5825	2.99	2.63		6.14	
802.11n HT40		5755	-0.96	-0.52	0.61	2.89	
		5795	-1.10	-1.02		2.56	
802.11ac VHT20		5745	1.95	2.32	0.58	5.73	
		5785	1.97	2.06		5.60	
		5825	2.11	1.61		5.46	
802.11ac VHT40		5755	-3.21	-2.65	1.07	1.16	
		5795	-2.78	-3.15		1.12	
802.11ac VHT80		5775	-9.11	-8.47	1.81	-3.96	

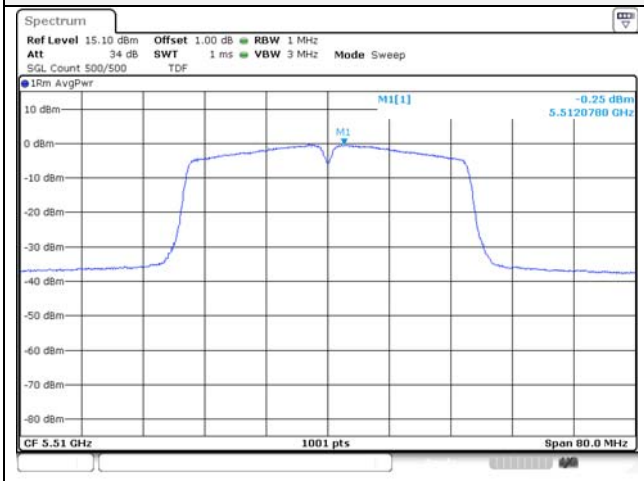
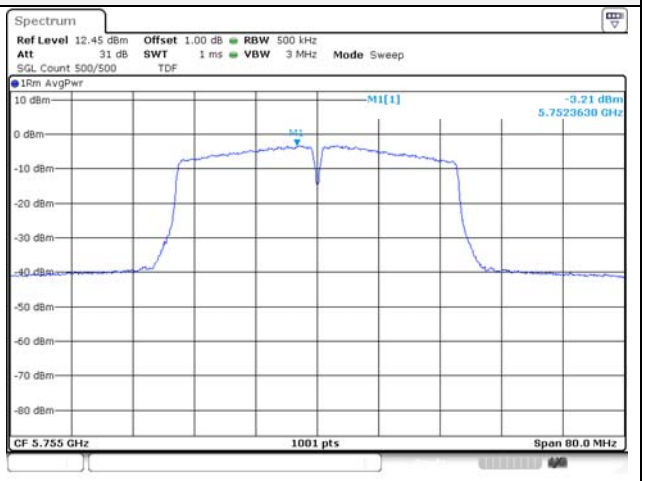
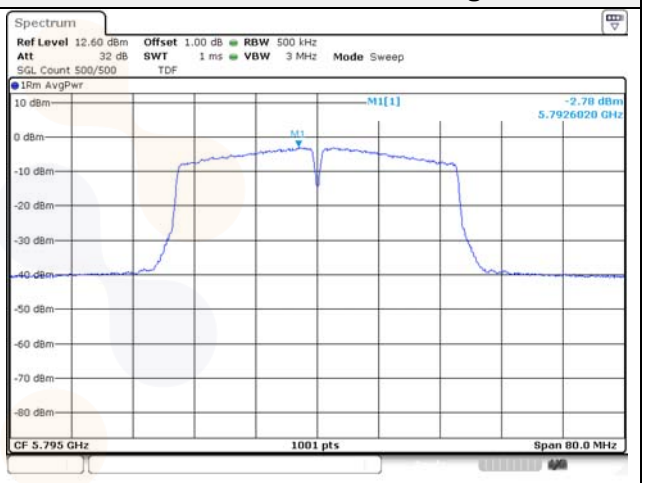
Notes:
1. Maximum PSD calculation
- Maximum PSD = Measured $10\log(10^{(ANT\ 1/10)} + 10^{(ANT\ 2/10)}) + D.C.F$

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

UNII-1 / 802.11a / Low ch.	UNII-2A / 802.11a / Low ch.
	
UNII-1 / 802.11a / Mid ch.	**UNII-2A / 802.11a / Mid ch.**
	
UNII-1 / 802.11a / High ch.	**UNII-2A / 802.11a / High ch.**
	

UNII-2C / 802.11a / Low ch.	UNII-3 / 802.11a / Low ch.
	
UNII-2C / 802.11a / Mid ch.	**UNII-3 / 802.11a / Mid ch.**
	
UNII-2C / 802.11a / High ch.	**UNII-3 / 802.11a / High ch.**
	

UNII-1 / 802.11ac VHT40 / Low ch.	UNII-2A / 802.11 ac VHT40 / Low ch.
	
UNII-1 / 802.11 ac VHT40 / High ch.	**UNII-2A / 802.11 ac 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.**
	
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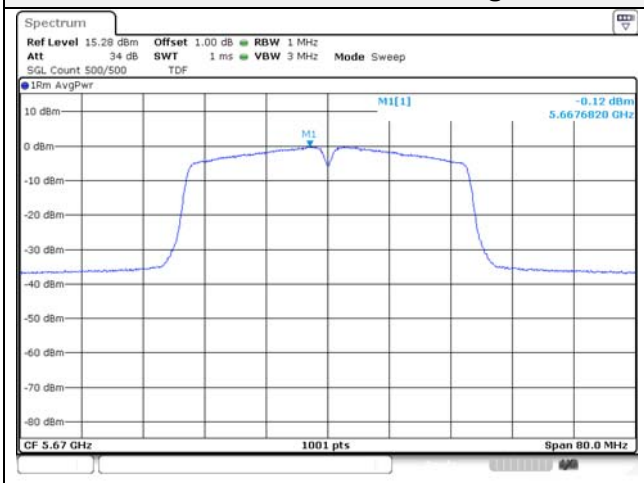
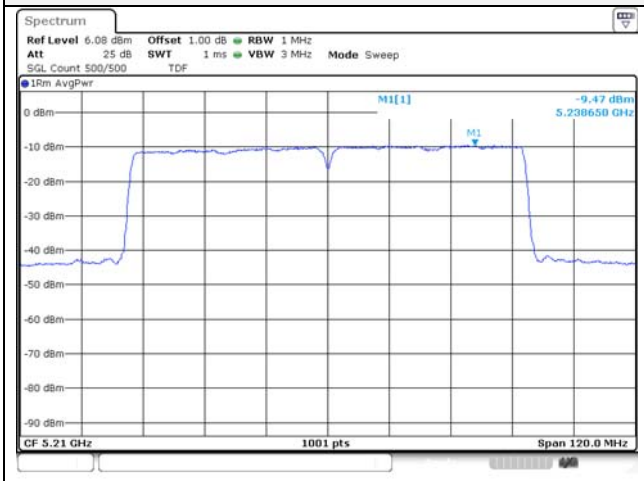
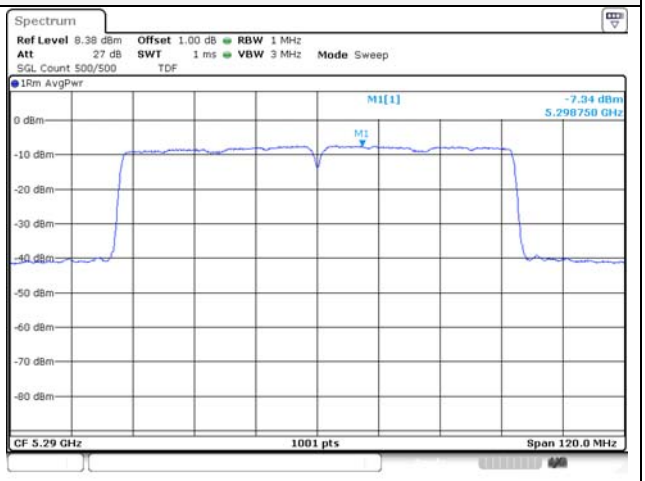
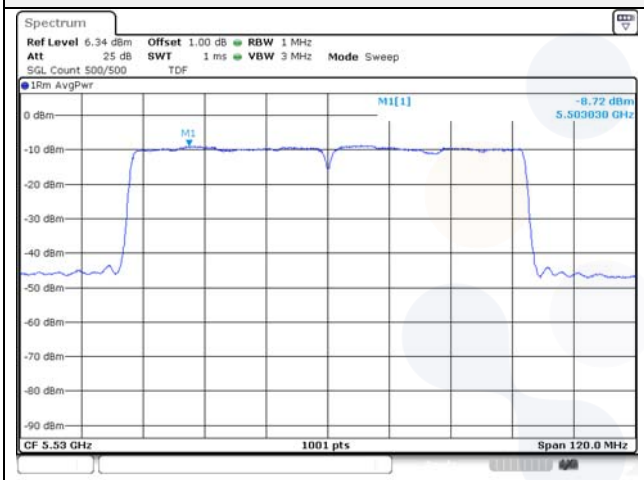
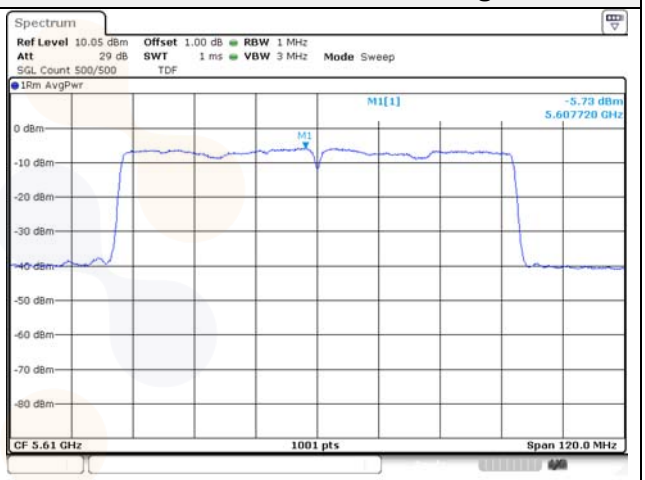
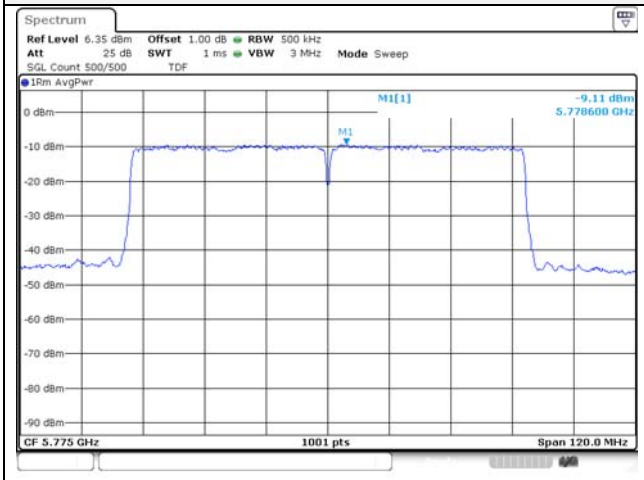
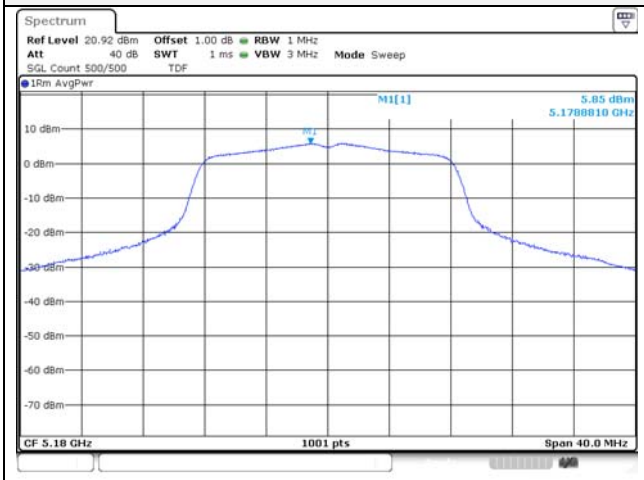
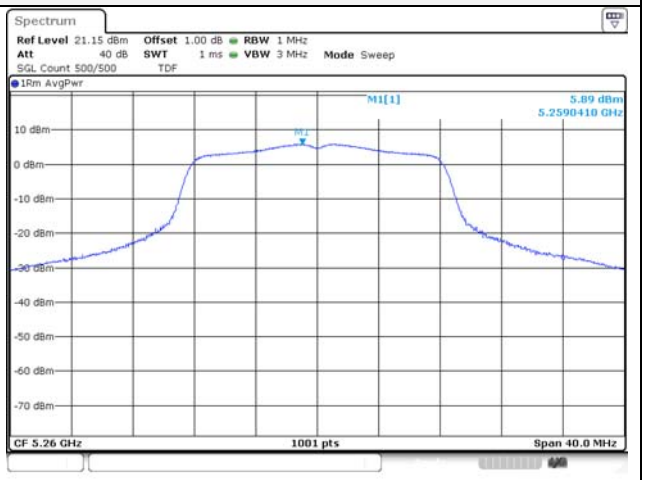
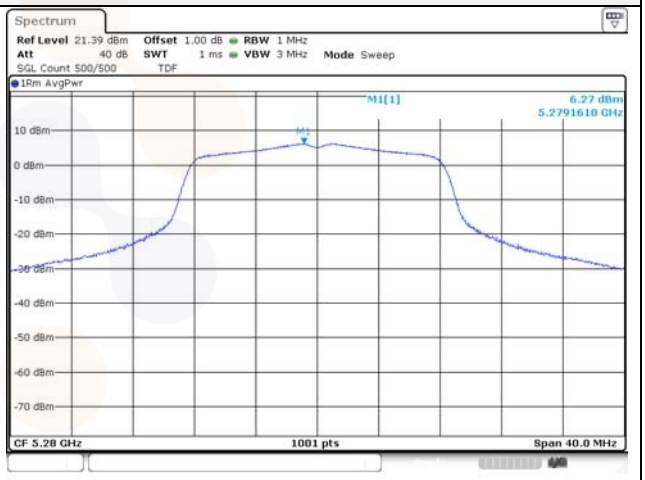
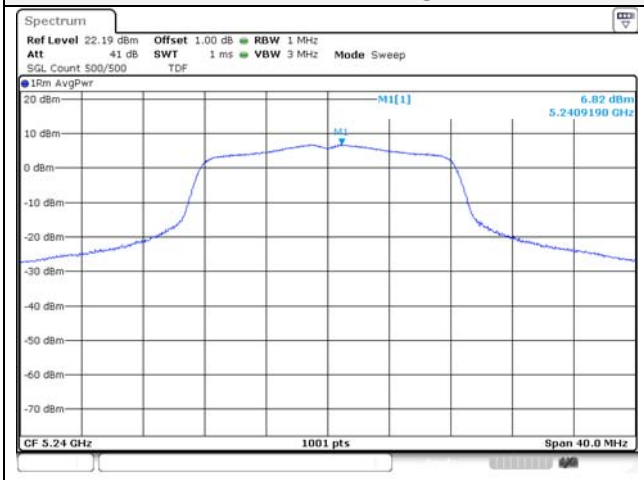
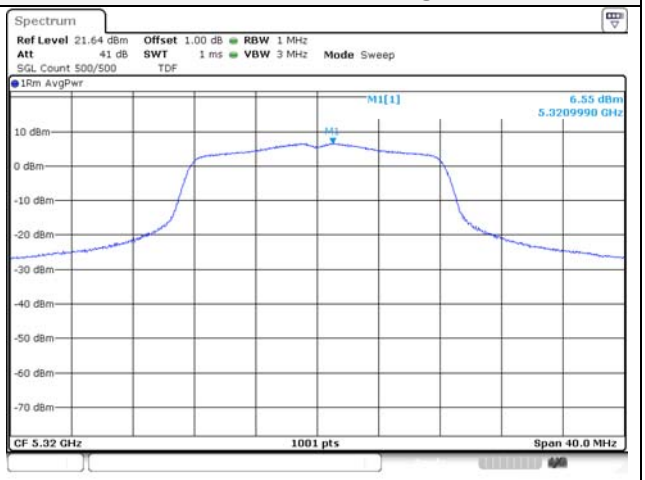
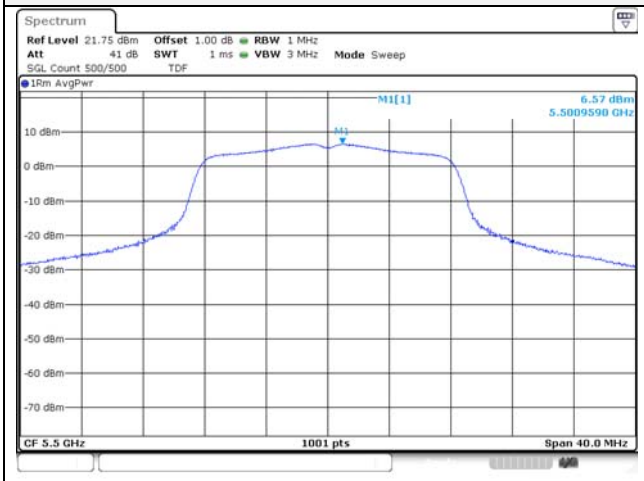
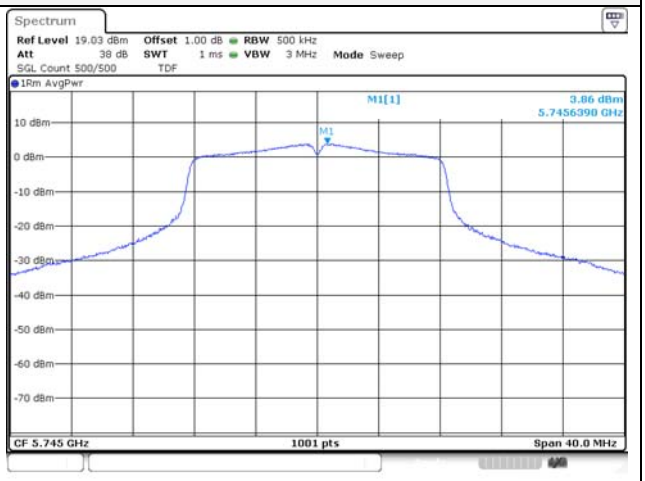
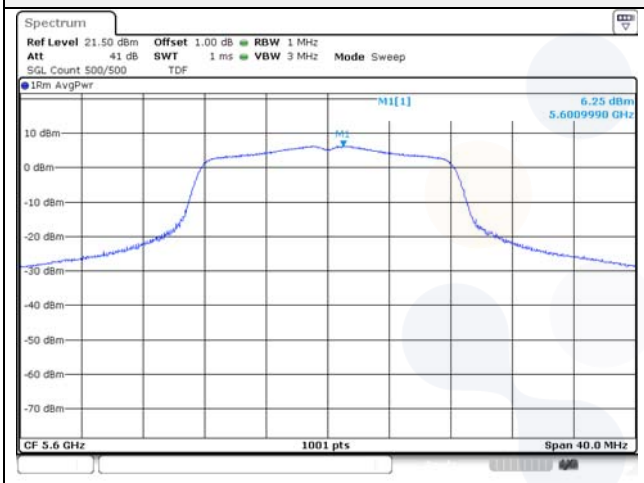
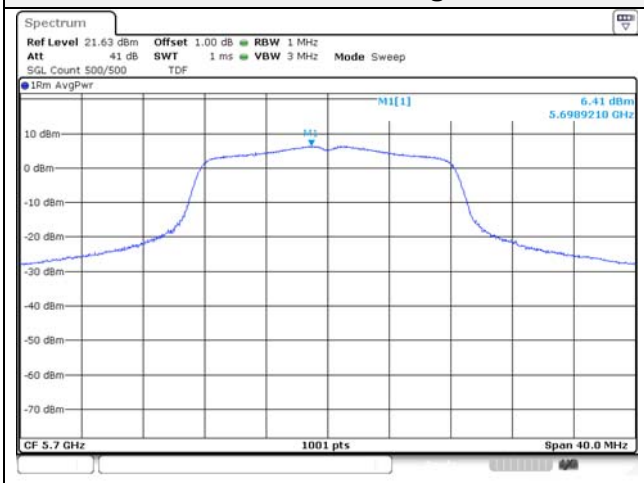
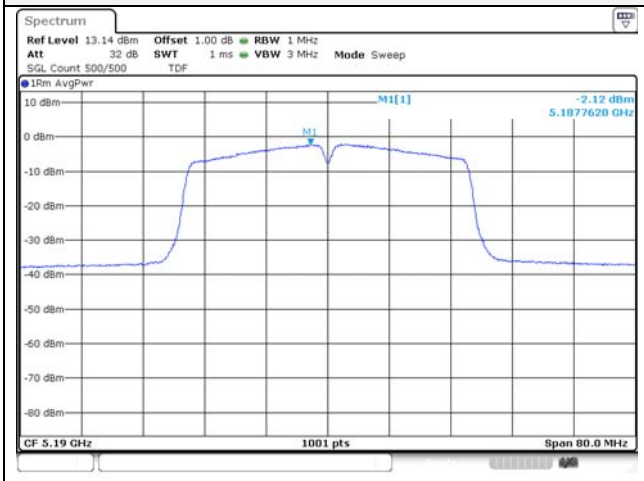
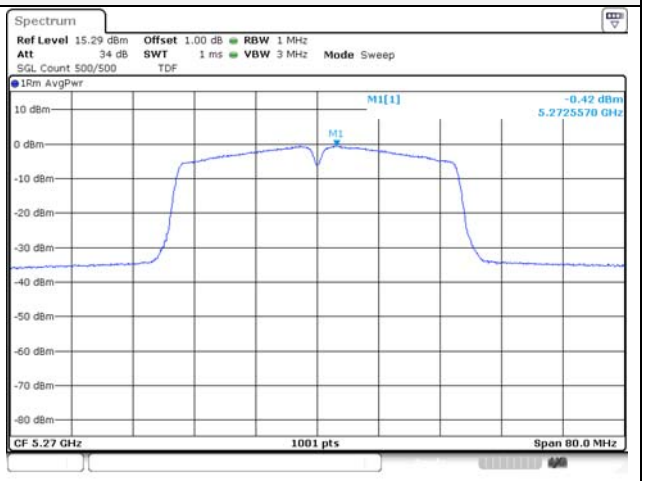
	Blank

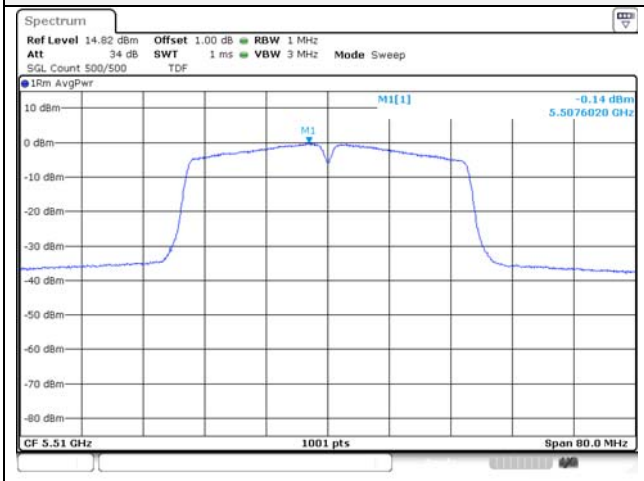
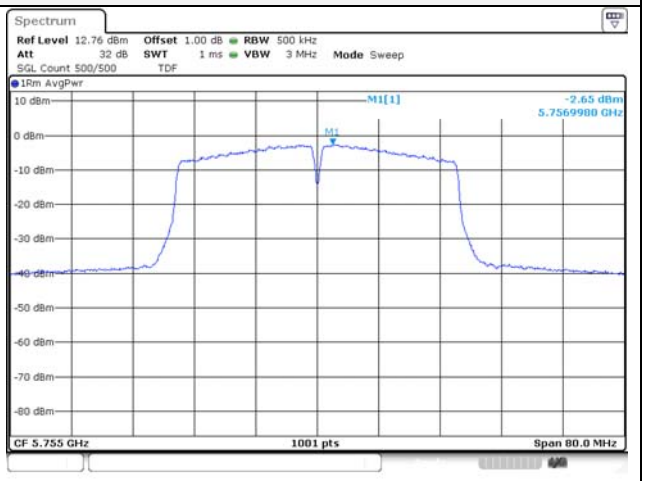
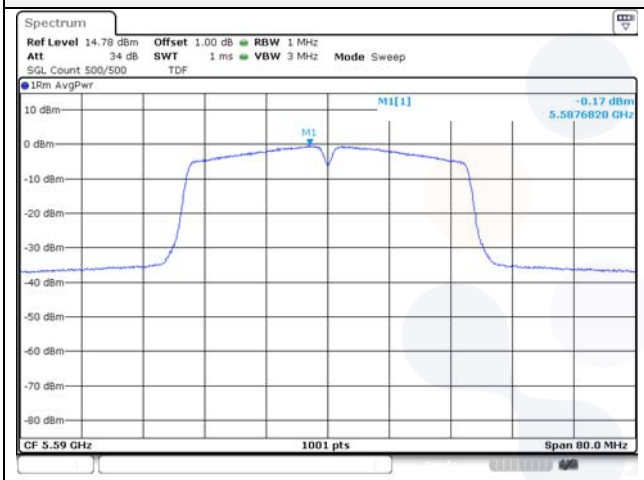
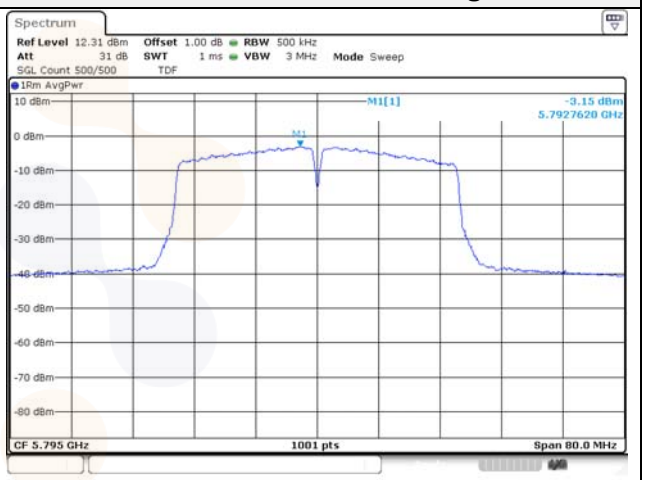
UNII-1 / 802.11ac VHT80 / Mid ch.	UNII-2A / 802.11ac VHT80 / Mid ch.
	
UNII-2C / 802.11ac VHT80 / Low ch.	**UNII-2C / 802.11ac VHT80 / High ch.**
	
UNII-3 / 802.11ac VHT80 / Mid ch.	
	Blank

MIMO ANT 2

UNII-1 / 802.11a / Low ch.	UNII-2A / 802.11a / Low ch.
	
UNII-1 / 802.11a / Mid ch.	**UNII-2A / 802.11a / Mid ch.**
	
UNII-1 / 802.11a / High ch.	**UNII-2A / 802.11a / High ch.**
	

UNII-2C / 802.11a / Low ch.	UNII-3 / 802.11a / Low ch.
	
UNII-2C / 802.11a / Mid ch.	**UNII-3 / 802.11a / Mid ch.**
	
UNII-2C / 802.11a / High ch.	**UNII-3 / 802.11a / High ch.**
	

UNII-1 / 802.11ac VHT40 / Low ch.	UNII-2A / 802.11 ac VHT40 / Low ch.
	
UNII-1 / 802.11 ac VHT40 / High ch.	**UNII-2A / 802.11 ac 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.**
	
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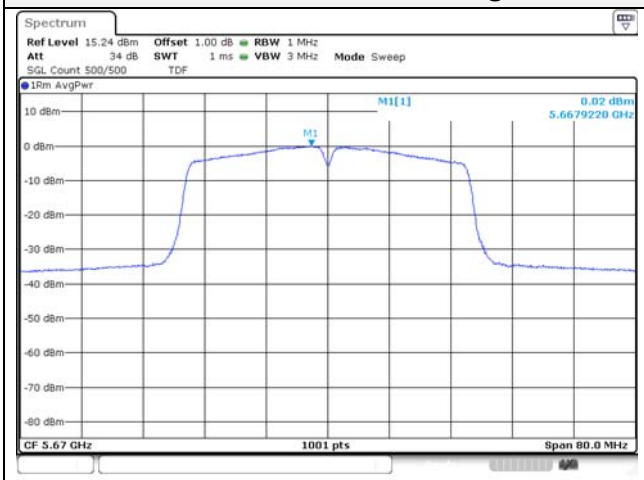
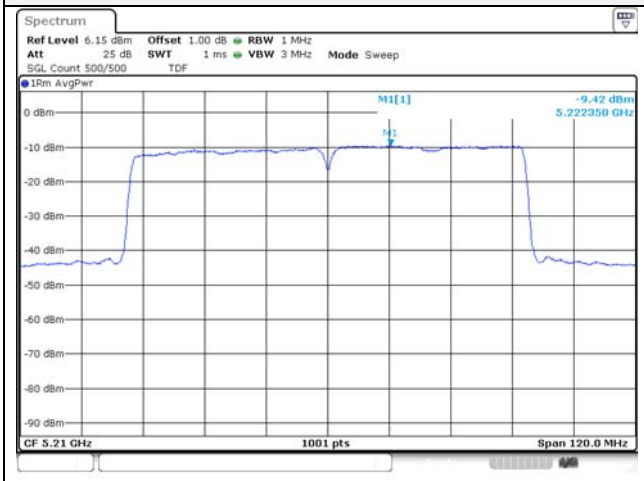
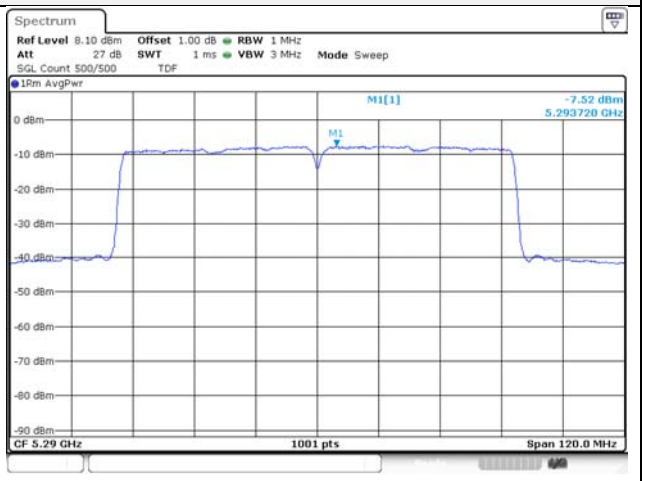
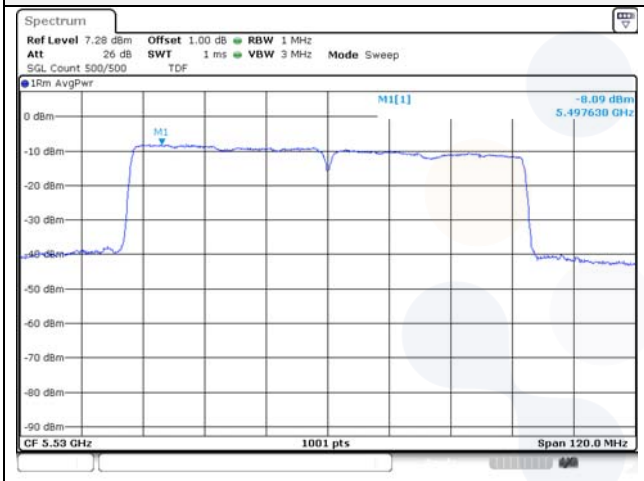
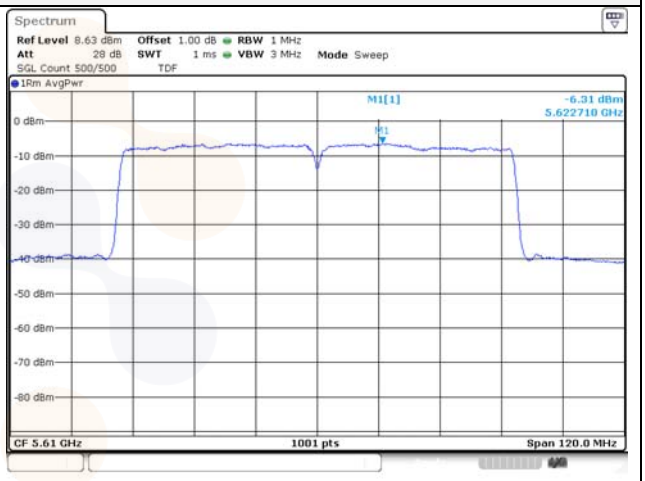
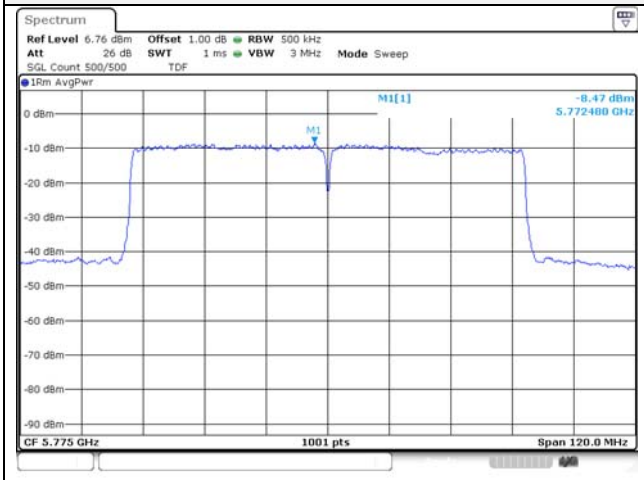
	Blank

UNII-1 / 802.11ac VHT80 / Mid ch.	UNII-2A / 802.11ac VHT80 / Mid ch.
	
UNII-2C / 802.11ac VHT80 / Low ch.	**UNII-2C / 802.11ac VHT80 / High ch.**
	
UNII-3 / 802.11ac VHT80 / Mid ch.	
	Blank