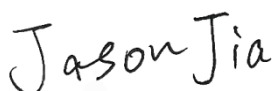


FCC RF Test Report

APPLICANT : Aerohive networks Inc
EQUIPMENT : wireless access point
BRAND NAME : Aerohive
MODEL NAME : AP650X
FCC ID : WBV-AP650X
STANDARD : FCC Part 15 Subpart C §15.247
CLASSIFICATION : (DTS) Digital Transmission System

The product was received on Feb. 15, 2019 and testing was completed on Jul. 12, 2019. We, Sporton International (Kunshan) Inc., would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International (Kunshan) Inc., the test report shall not be reproduced except in full.



Reviewed by: Jason Jia / Supervisor



Approved by: James Huang / Manager



Sporton International (Kunshan) Inc.

**No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300
People's Republic of China**



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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR921502A	Rev. 01	Initial issue of report	Aug. 12, 2019

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
-	15.247(a)(2)	6dB Bandwidth	$\geq 0.5\text{MHz}$	Not Required	-
-	-	99% Bandwidth	-	Not Required	-
3.1	15.247(b)	Power Output Measurement	$\leq 30\text{dBm}$	Pass	-
-	15.247(e)	Power Spectral Density	$\leq 8\text{dBm/3kHz}$	Not Required	-
3.2	15.247(d)	Conducted Band Edges	15.247(d)	Pass	-
		Conducted Spurious Emission		Not Required	-
3.2	15.247(d)	Radiated Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 1.90 dB at 4824.000 MHz
-	15.207	AC Conducted Emission	15.207(a)	Not Required	-
3.3	15.203 & 15.247(b)	Antenna Requirement	N/A	Pass	-
Remark: Not required means after assessing, test items are not necessary to carry out.					



1 General Description

1.1 Applicant

Aerohive networks Inc

1011 McCarthy Boulevard Milpitas, CA 95035 United States

1.2 Product Feature of Equipment Under Test

Product Feature	
Equipment	wireless access point
Brand Name	Aerohive
Model Name	AP650X
FCC ID	WBV-AP650X
EUT supports Radios application	WLAN 2.4GHz 802.11b/g/n (HT20) WLAN 2.4GHz 802.11ac (VHT20) WLAN 2.4GHz 802.11ax (HE20) WLAN 5GHz 802.11a/n(HT20/HT40) WLAN 5GHz 802.11ac (VHT20/VHT40/VHT80) WLAN 5GHz 802.11ax (HE20/HE40/HE80/HE160) Bluetooth v4.0 LE
HW Version	1
SW Version	10.0
EUT Stage	Production Unit

Remark:

1. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.
2. Support cross-polarization Antenna
3. ETH6 module support WLAN 5G B1-4, ETH7 module support WLAN 2.4G and 5G B1-2.
4. This is a C2PC report for AP650X For model change note, please refer the product equality declaration exhibit submitted separately. Based on the similarity between current and previous project, only the power, conducted band-edge and RSE from original test report (Report Number 1842039R-RF-US-P06V01, FCC ID WBV-AP650X) was verified for the differences.

1.3 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx/Rx Channel Frequency Range	2412 MHz ~ 2462 MHz
Antenna Type	Internal bent metal Antenna
Antenna Gain	Ant. 1 : 6.00 dBi Ant. 2 : 6.00 dBi Ant. 3 : 6.00 dBi Ant. 4 : 6.00 dBi
Type of Modulation	802.11b : DSSS (DBPSK / DQPSK / CCK) 802.11g/n/ac/ax : OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM / 1024QAM)



1.4 Modification of EUT

No modifications are made to the EUT during all test items.

1.5 Testing Location

Sporton International (Kunshan) Inc. is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.02.

Test Firm	Sporton International (Kunshan) Inc.		
Test Site Location	No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300 People's Republic of China TEL : +86-512-57900158 FAX : +86-512-57900958		
Test Site No.	Sporton Site No.	FCC Designation No.	FCC Test Firm Registration No.
	TH01-KS 03CH06-KS	CN1257	314309

1.6 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- 47 CFR Part 15 Subpart C §15.247
- FCC KDB 558074 D01 15.247 Meas Guidance v05r02
- FCC KDB 662911 D01 Multiple Transmitter Output v02r01.
- ANSI C63.10-2013

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

2 Test Configuration of Equipment Under Test

- a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (Z plane) were recorded in this report.

2.1 Carrier Frequency and Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
2400-2483.5 MHz	1	2412	7	2442
	2	2417	8	2447
	3	2422	9	2452
	4	2427	10	2457
	5	2432	11	2462
	6	2437		

2.2 Test Mode

Final test modes are considering the modulation and worse data rates as below table.

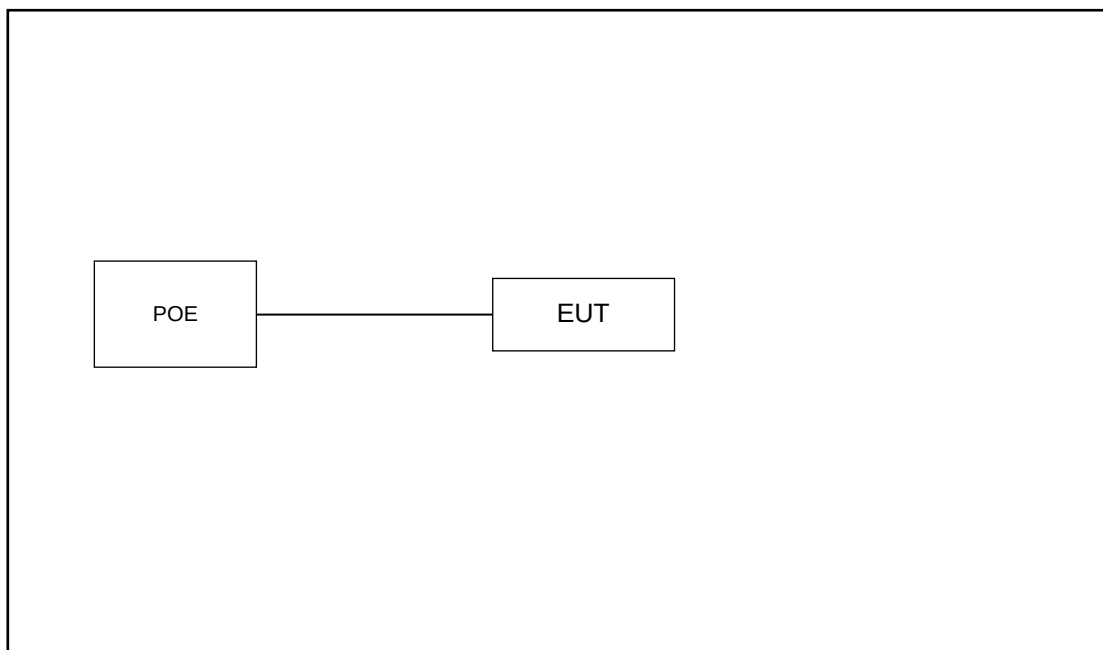
MIMO Antenna

Modulation	Data Rate
802.11b	1 Mbps
802.11g	6 Mbps
802.11ac VHT20	MCS0
802.11ax HE20	MCS0

Single Antenna

Modulation	Data Rate
802.11b	1 Mbps
802.11g	6 Mbps
802.11ac VHT20	MCS0
802.11ax HE20	MCS0

2.3 Connection Diagram of Test System



2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	POE	Microsemi	PD-9001GR/AT/AC	N/A	Unshielded, 1.5 m	N/A



2.5 EUT Operation Test Setup

For WLAN RF test items, an engineering test program was provided and enabled to make EUT continuous transmit/receive.

2.6 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Example:

The spectrum analyzer offset is derived from RF cable loss.

Offset = RF cable loss.

Following shows an offset computation example with cable loss 6.1 dB.

$$\begin{aligned}\text{Offset(dB)} &= \text{RF cable loss(dB)} \\ &= 6.1 \text{ (dB)}\end{aligned}$$

3 Test Result

3.1 Output Power Measurement

3.1.1 Limit of Output Power

For systems using digital modulation in the 2400-2483.5MHz, the limit for peak output power is 30dBm. If transmitting antenna with directional gain greater than 6dBi is used, the peak output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

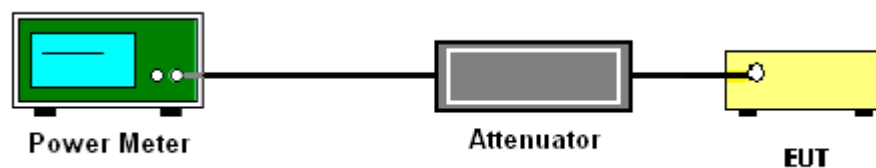
3.1.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.1.3 Test Procedures

1. The testing follows the Measurement Procedure of ANSI C63.10-2013 clause 11.9.1.3 PKPM1 Peak power meter or ANSI C63.10-2013 clause 11.9.2.3.2 Method AVGPM-G method.
2. The RF output of EUT was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Measure the conducted output power and record the results in the test report.
5. For MIMO mode, calculation method follows FCC KDB 662911 D01 Multiple Transmitter Output v02r01.

3.1.4 Test Setup



3.1.5 Test Result of Peak Output Power

Please refer to Appendix A.

3.1.6 Test Result of Average output Power (Reporting Only)

Please refer to Appendix A.

3.2 Radiated Band Edges and Spurious Emission Measurement

3.2.1 Limit of Radiated band edge and Spurious Emission Measurement

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. If the output power of this device was measured by spectrum analyzer, the attenuation under this paragraph shall be 30 dB instead of 20 dB. In addition, radiated emissions which fall in the restricted bands must also comply with the limits as below.

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 - 960	200	3
Above 960	500	3

3.2.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.2.3 Test Procedures

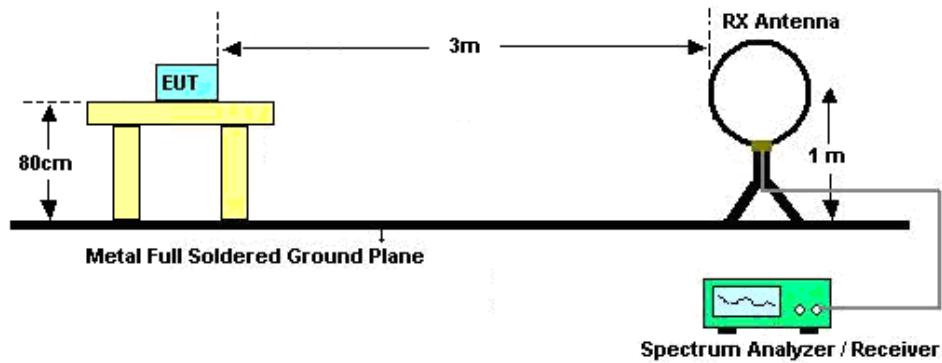
1. The testing follows ANSI C63.10-2013 clause 11.11 & 11.12
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level.
3. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
6. For testing below 1GHz, if the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the CISPR quasi-peak method and reported.
7. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
8. Use the following spectrum analyzer settings:
 - (1) Span shall wide enough to fully capture the emission being measured;
 - (2) Set RBW=100 kHz for $f < 1$ GHz; VBW $\geq$ RBW; Sweep = auto; Detector function = peak; Trace = max hold;
 - (3) Set RBW = 1 MHz, VBW= 3MHz for $f \geq 1$ GHz for peak measurement.

For average measurement:

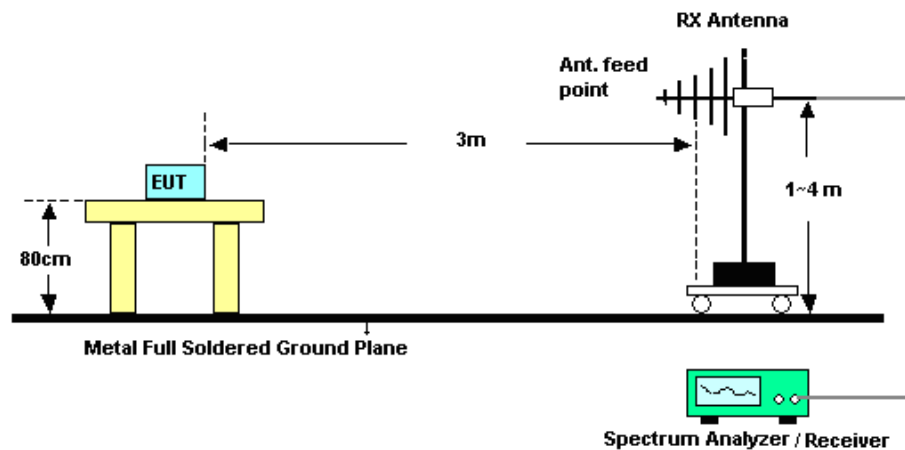
 - VBW = 10 Hz, when duty cycle is no less than 98 percent.
 - VBW $\geq 1/T$, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

3.2.4 Test Setup

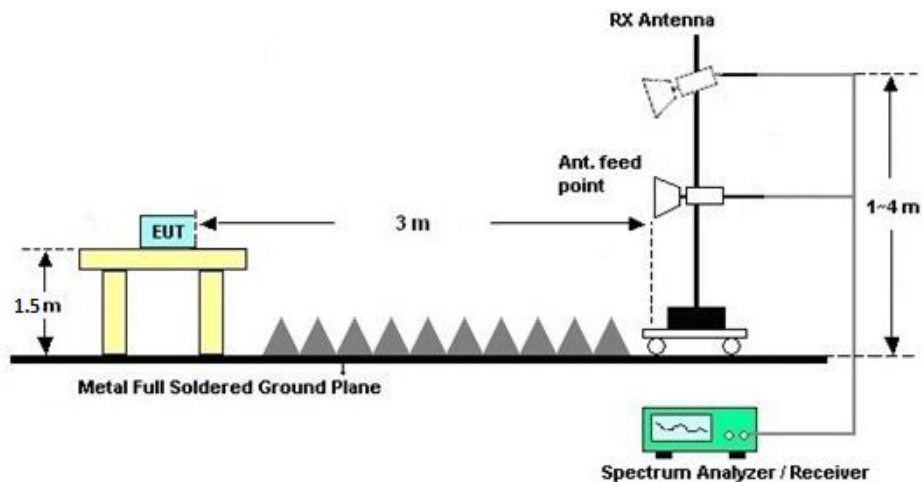
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



**3.2.5 Test Results of Radiated Spurious Emissions (9kHz ~ 30MHz)**

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported.

There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

3.2.6 Test Result of Conducted Spurious at Band Edges

Please refer to Appendix C.

3.2.7 Duty Cycle

Please refer to Appendix D.

3.2.8 Test Result of Radiated Spurious Emission (30MHz ~ 10th Harmonic)

Please refer to Appendix B.

3.3 Antenna Requirements

3.3.1 Standard Applicable

If directional gain of transmitting Antennas is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi. 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 rule.

3.3.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.3.3 Antenna Gain

<CDD Modes >

FCC KDB 662911 D01 Multiple Transmitter Output v02r01

For CDD transmissions, directional gain is calculated as

Directional gain = G_{ANT} + Array Gain, where Array Gain is as follows.

For power spectral density (PSD) measurements on all devices,

Array Gain = $10 \log(N_{ANT}/N_{SS}=1)$ dB.

For power measurements on IEEE 802.11 devices,

Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$.

Directional gain may be calculated by using the formulas applicable to equal gain antennas with G_{ANT} set equal to the gain of the antenna having the highest gain;

The EUT supports CDD mode.

For power, the directional gain G_{ANT} is set equal to the antenna having the highest gain, i.e., F)2)f)i).

For PSD, the directional gain calculation is following F)2)f)ii) of KDB 662911 D01 v02r01.

The power and PSD limit should be modified if the directional gain of EUT is over 6 dBi,

The directional gain "DG" is calculated as following table.

<CDD Modes>								
	Ant. 1	Ant. 2	Ant. 3	Ant. 4	DG for Power	DG for PSD	Power Limit Reduction	PSD Limit Reduction
	(dBi)	(dBi)	(dBi)	(dBi)	(dBi)	(dBi)	(dB)	(dB)
2.4 GHz	6.00	6.00	6.00	6.00	6.00	12.02	0.00	6.02



4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Pulse Power Sensor	Anritsu	MA2411B	0917070	300MHz~40GHz	Jan. 14, 2019	Jul. 12, 2019	Jan. 13, 2020	Conducted (TH01-KS)
Power Meter	Anritsu	ML2495A	1005002	50MHz Bandwidth	Jan. 14, 2019	Jul. 12, 2019	Jan. 13, 2020	Conducted (TH01-KS)
EMI Test Receiver	Keysight	N9038A	MY56400023	3Hz~8.5GHz; Max 30dBm	Oct. 12, 2018	Jul. 01, 2019	Oct. 11, 2019	Radiation (03CH06-KS)
EXA Spectrum Analyzer	Keysight	N9010A	MY55150208	10Hz~44GHz	Apr. 16, 2019	Jul. 01, 2019	Apr. 18, 2020	Radiation (03CH06-KS)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz~30MHz	Oct. 19, 2018	Jul. 01, 2019	Oct. 18, 2019	Radiation (03CH06-KS)
Bilog Antenna	TeseQ	CBL6111D	44483	30MHz~1GHz	Dec. 28, 2018	Jul. 01, 2019	Dec. 27, 2019	Radiation (03CH06-KS)
Double Ridge Horn Antenna	ETS-Lindgren	3117	75957	1GHz~18GHz	Oct. 20, 2018	Jul. 01, 2019	Oct. 19, 2019	Radiation (03CH06-KS)
SHF-EHF Horn	Com-power	AH-840	101070	18GHz~40GHz	Jan. 05, 2019	Jul. 01, 2019	Jan. 04, 2020	Radiation (03CH06-KS)
Amplifier	SONOMA	310N	187289	9KHz ~1GHZ	Aug. 06, 2018	Jul. 01, 2019	Aug. 05, 2019	Radiation (03CH06-KS)
Amplifier	MITEQ	TTA1840-35-HG	2014749	18~40GHz	Jan. 14, 2019	Jul. 01, 2019	Jan. 13, 2020	Radiation (03CH06-KS)
high gain Amplifier	MITEQ	AMF-7D-0010 1800-30-10P	2025788	1GHz-18GHz	Apr. 17, 2019	Jul. 01, 2019	Apr. 16, 2020	Radiation (03CH06-KS)
Amplifier	Keysight	83017A	MY53270203	500MHz~26.5GHz	Apr. 15, 2019	Jul. 01, 2019	Apr. 14, 2020	Radiation (03CH06-KS)
AC Power Source	Chroma	61601	F104090004	N/A	NCR	Jul. 01, 2019	NCR	Radiation (03CH06-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	Jul. 01, 2019	NCR	Radiation (03CH06-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	Jul. 01, 2019	NCR	Radiation (03CH06-KS)

NCR: No Calibration Required

5 Uncertainty of Evaluation

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI 63.10-2013. All the measurement uncertainty value were shown with a coverage $K=2$ to indicate 95% level of confidence. The measurement data show herein meets or exceeds the CISPR measurement uncertainty values specified in CISPR 16-4-2 and can be compared directly to specified limit to determine compliance.

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.0dB
---	-------

Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.0dB
---	-------

Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.0dB
---	-------



Appendix A. Conducted Test Results

Test Engineer:	Aly Cao	Temperature:	21~25	°C
Test Date:	2019/7/12	Relative Humidity:	51~54	%

TEST RESULTS DATA
Average Power Table
SISO

2.4GHz Band											
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)	Average Conducted Power (dBm)	Conducted Power Limit (dBm)	DG (dBi)	EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail
11b	1Mbps	1	1	2412	0.22	20.39	30.00	6.00	26.39	36.00	Pass
11b	1Mbps	1	6	2437	0.22	20.47	30.00	6.00	26.47	36.00	Pass
11b	1Mbps	1	11	2462	0.22	14.71	30.00	6.00	20.71	36.00	Pass
11g	6Mbps	1	1	2412	0.23	12.21	30.00	6.00	18.21	36.00	Pass
11g	6Mbps	1	6	2437	0.23	12.69	30.00	6.00	18.69	36.00	Pass
11g	6Mbps	1	11	2462	0.23	12.45	30.00	6.00	18.45	36.00	Pass
HT20	MCS0	1	1	2412	0.20	12.56	30.00	6.00	18.56	36.00	Pass
HT20	MCS0	1	6	2437	0.20	13.05	30.00	6.00	19.05	36.00	Pass
HT20	MCS0	1	11	2462	0.20	12.80	30.00	6.00	18.80	36.00	Pass
VHT20	MCS0	1	1	2412	0.07	13.07	30.00	6.00	19.07	36.00	Pass
VHT20	MCS0	1	6	2437	0.07	12.86	30.00	6.00	18.86	36.00	Pass
VHT20	MCS0	1	11	2462	0.07	13.02	30.00	6.00	19.02	36.00	Pass
AX20	MCS0	1	1	2412	0.08	12.66	30.00	6.00	18.66	36.00	Pass
AX20	MCS0	1	6	2437	0.08	12.78	30.00	6.00	18.78	36.00	Pass
AX20	MCS0	1	11	2462	0.08	12.97	30.00	6.00	18.97	36.00	Pass

TEST RESULTS DATA
Average Output Power
MIMO

2.4GHz Band																		
Mod.	Data Rate	N _{TX}	CH.	Freq. (MHz)	Duty Factor (dB)				Average Conducted Power (dBm)					Eirp power (dBm)	Conducted Power Limit (dBm)	DG (dBi)	Eirp power Limit	Pass /Fail
					Ant 1	Ant 2	Ant 3	Ant 4	Ant 1	Ant 2	Ant 3	Ant 4	SUM					
11b	1Mbps	4	1	2412	0.22	0.22	0.22	0.22	20.39	20.30	19.99	20.23	26.25	32.25	30	6.00	36.00	PASS
11b	1Mbps	4	6	2437	0.22	0.22	0.22	0.22	20.47	19.91	20.40	20.07	26.24	32.24	30	6.00	36.00	PASS
11b	1Mbps	4	11	2462	0.22	0.22	0.22	0.22	20.14	20.15	20.18	20.58	26.28	32.28	30	6.00	36.00	PASS
11g	6Mbps	4	1	2412	0.23	0.23	0.23	0.23	12.21	12.56	11.71	11.36	18.00	24.00	30	6.00	36.00	PASS
11g	6Mbps	4	6	2437	0.23	0.23	0.23	0.23	12.13	12.14	12.23	12.19	18.19	24.19	30	6.00	36.00	PASS
11g	6Mbps	4	11	2462	0.23	0.23	0.23	0.23	12.28	12.35	11.40	11.94	18.02	24.02	30	6.00	36.00	PASS
HT20	MCS0	4	1	2412	0.20	0.20	0.20	0.20	12.13	12.16	11.93	11.43	17.94	23.94	30	6.00	36.00	PASS
HT20	MCS0	4	6	2437	0.20	0.20	0.20	0.20	12.31	12.51	12.45	12.31	18.41	24.41	30	6.00	36.00	PASS
HT20	MCS0	4	11	2462	0.20	0.20	0.20	0.20	12.29	12.34	12.07	12.00	18.20	24.20	30	6.00	36.00	PASS
VHT20	MCS0	4	1	2412	0.07	0.07	0.07	0.07	12.47	12.38	12.48	12.35	18.44	24.44	30	6.00	36.00	PASS
VHT20	MCS0	4	6	2437	0.07	0.07	0.07	0.07	12.57	12.29	12.68	12.56	18.54	24.54	30	6.00	36.00	PASS
VHT20	MCS0	4	11	2462	0.07	0.07	0.07	0.07	12.62	12.24	12.33	12.83	18.53	24.53	30	6.00	36.00	PASS
AXT20	MCS0	4	1	2412	0.08	0.08	0.08	0.08	12.26	12.27	12.41	11.80	18.21	24.21	30	6.00	36.00	PASS
AXT20	MCS0	4	6	2437	0.08	0.08	0.08	0.08	12.23	12.20	12.28	12.23	18.26	24.26	30	6.00	36.00	PASS
AXT20	MCS0	4	11	2462	0.08	0.08	0.08	0.08	12.27	12.41	12.58	12.26	18.40	24.40	30	6.00	36.00	PASS

Note: Measured power (dBm) has offset with cable loss.



Appendix B. Radiated Spurious Emission

2.4GHz 2400~2483.5MHz

WIFI 802.11b (Harmonic @ 3m)

WIFI Ant. 1+2+3+4	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11b CH 01 2412MHz		4824	53.97	-20.03	74	78.37	30.92	8.43	63.75	276	0	P	H
		4824	52.1	-1.9	54	76.5	30.92	8.43	63.75	276	0	A	H
		4824	50.98	-23.02	74	75.38	30.92	8.43	63.75	100	339	P	V
		4824	48.86	-5.14	54	73.26	30.92	8.43	63.75	100	339	A	V
802.11b CH 06 2437MHz		4872	50.07	-23.93	74	74.32	31.05	8.43	63.73	230	360	P	H
		4872	47.53	-6.47	54	71.78	31.05	8.43	63.73	230	360	A	H
		7308	46.13	-27.87	74	64.91	35.52	10.07	64.37	100	0	P	H
		4872	48.7	-25.3	74	72.95	31.05	8.43	63.73	100	347	P	V
		4872	46.28	-7.72	54	70.53	31.05	8.43	63.73	100	347	A	V
		7308	43.68	-30.32	74	62.46	35.52	10.07	64.37	100	0	P	V
802.11b CH 11 2462MHz		4926	43.32	-30.68	74	67.41	31.18	8.44	63.71	100	0	P	H
		7386	40.47	-33.53	74	59.01	35.69	10.15	64.38	100	0	P	H
		4924	38.27	-35.73	74	62.36	31.18	8.44	63.71	100	0	P	V
		7386	39.78	-34.22	74	58.32	35.69	10.15	64.38	100	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



2.4GHz 2400~2483.5MHz

WIFI 802.11g (Harmonic @ 3m)

WIFI Ant. 1+2+3+4	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11g		4824	41.52	-32.48	74	65.92	30.92	8.43	63.75	100	0	P	H
CH 01 2412MHz		4824	39.07	-34.93	74	63.47	30.92	8.43	63.75	100	0	P	V
802.11g		4874	35.66	-38.34	74	59.91	31.05	8.43	63.73	100	0	P	H
CH 06 2437MHz		7308	40.06	-33.94	74	58.84	35.52	10.07	64.37	100	0	P	H
		4872	34.73	-39.27	74	58.98	31.05	8.43	63.73	100	0	P	V
		7311	40.04	-33.96	74	58.82	35.52	10.07	64.37	100	0	P	V
802.11g		4926	36.87	-37.13	74	60.96	31.18	8.44	63.71	100	0	P	H
CH 11 2462MHz		7386	39.72	-34.28	74	58.26	35.69	10.15	64.38	100	0	P	H
		4926	37.98	-36.02	74	62.07	31.18	8.44	63.71	100	0	P	V
		7386	39.9	-34.1	74	58.44	35.69	10.15	64.38	100	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



2.4GHz 2400~2483.5MHz

WIFI 802.11ac VHT20 (Harmonic @ 3m)

WIFI Ant. 1+2+3+4	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11ac VHT20 CH 01 2412MHz		4824	40.59	-33.41	74	64.99	30.92	8.43	63.75	100	0	P	H
		4824	40.01	-33.99	74	64.41	30.92	8.43	63.75	100	0	P	V
802.11ac VHT20 CH 06 2437MHz		4874	37.1	-36.9	74	61.35	31.05	8.43	63.73	100	0	P	H
		7308	41.58	-32.42	74	60.36	35.52	10.07	64.37	100	0	P	H
		4872	37.42	-36.58	74	61.67	31.05	8.43	63.73	100	0	P	V
		7311	41.19	-32.81	74	59.97	35.52	10.07	64.37	100	0	P	V
802.11ac VHT20 CH 11 2462MHz		4926	37.67	-36.33	74	61.76	31.18	8.44	63.71	100	0	P	H
		7386	40.66	-33.34	74	59.2	35.69	10.15	64.38	100	0	P	H
		4924	36.94	-37.06	74	61.03	31.18	8.44	63.71	100	0	P	V
		7386	40.06	-33.94	74	58.6	35.69	10.15	64.38	100	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



2.4GHz 2400~2483.5MHz

WIFI 802.11ax HEW20 (Harmonic @ 3m)

WIFI Ant. 1+2+3+4	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11ax HEW20 CH 01 2412MHz		4824	37.19	-36.81	74	61.59	30.92	8.43	63.75	100	360	P	H
		4824	36.32	-37.68	74	60.72	30.92	8.43	63.75	100	0	P	V
802.11ax HEW20 CH 06 2437MHz		4872	34.58	-39.42	74	58.83	31.05	8.43	63.73	100	360	P	H
		7308	39.79	-34.21	74	58.57	35.52	10.07	64.37	100	360	P	H
		4872	36.13	-37.87	74	60.38	31.05	8.43	63.73	100	0	P	V
		7308	40.33	-33.67	74	59.11	35.52	10.07	64.37	100	0	P	V
802.11ax HEW20 CH 11 2462MHz		4926	36.37	-37.63	74	60.46	31.18	8.44	63.71	100	360	P	H
		7386	40.02	-33.98	74	58.56	35.69	10.15	64.38	100	360	P	H
		4926	35.58	-38.42	74	59.67	31.18	8.44	63.71	100	0	P	V
		7386	39.66	-34.34	74	58.2	35.69	10.15	64.38	100	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



2.4GHz 2400~2483.5MHz

WIFI 802.11b (Harmonic @ 3m)

WIFI Ant. 1	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11b CH 01 2412MHz		4824	37.36	-36.64	74	61.76	30.92	8.43	63.75	100	360	P	H
		4824	39.29	-34.71	74	63.69	30.92	8.43	63.75	100	0	P	V
802.11b CH 06 2437MHz		4872	39.1	-34.9	74	63.35	31.05	8.43	63.73	100	360	P	H
		7308	41.19	-32.81	74	59.97	35.52	10.07	64.37	100	360	P	H
		4872	39.51	-34.49	74	63.76	31.05	8.43	63.73	100	0	P	V
		7308	40.23	-33.77	74	59.01	35.52	10.07	64.37	100	0	P	V
802.11b CH 11 2462MHz		4926	38.69	-35.31	74	62.78	31.18	8.44	63.71	100	360	P	H
		7386	40.67	-33.33	74	59.21	35.69	10.15	64.38	100	360	P	H
		4926	36.31	-37.69	74	60.4	31.18	8.44	63.71	100	0	P	V
		7386	40.24	-33.76	74	58.78	35.69	10.15	64.38	100	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



2.4GHz 2400~2483.5MHz

WIFI 802.11g (Harmonic @ 3m)

WIFI Ant. 1	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11g		4824	36.13	-37.87	74	60.53	30.92	8.43	63.75	100	360	P	H
CH 01 2412MHz		4824	36.57	-37.43	74	60.97	30.92	8.43	63.75	100	0	P	V
802.11g		4872	35.16	-38.84	74	59.41	31.05	8.43	63.73	100	360	P	H
CH 06 2437MHz		7308	40.42	-33.58	74	59.2	35.52	10.07	64.37	100	360	P	H
		4872	33.93	-40.07	74	58.18	31.05	8.43	63.73	100	0	P	V
		7308	41.56	-32.44	74	60.34	35.52	10.07	64.37	100	0	P	V
802.11g		4926	35.55	-38.45	74	59.64	31.18	8.44	63.71	100	360	P	H
CH 11 2462MHz		7386	40.56	-33.44	74	59.1	35.69	10.15	64.38	100	360	P	H
		4926	37.7	-36.3	74	61.79	31.18	8.44	63.71	100	0	P	V
		7386	41.19	-32.81	74	59.73	35.69	10.15	64.38	100	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



2.4GHz 2400~2483.5MHz

WIFI 802.11ac VHT20 (Harmonic @ 3m)

WIFI Ant. 1	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11ac VHT20 CH 01 2412MHz		4824	35.27	-38.73	74	59.67	30.92	8.43	63.75	100	360	P	H
		4824	35.45	-38.55	74	59.85	30.92	8.43	63.75	100	0	P	V
802.11ac VHT20 CH 06 2437MHz		4872	34.75	-39.25	74	59	31.05	8.43	63.73	100	360	P	H
		7308	39.9	-34.1	74	58.68	35.52	10.07	64.37	100	360	P	H
		4872	35.24	-38.76	74	59.49	31.05	8.43	63.73	100	0	P	V
		7308	40	-34	74	58.78	35.52	10.07	64.37	100	0	P	V
802.11ac VHT20 CH 11 2462MHz		4926	35.74	-38.26	74	59.83	31.18	8.44	63.71	100	360	P	H
		7386	40.38	-33.62	74	58.92	35.69	10.15	64.38	100	360	P	H
		4926	36.04	-37.96	74	60.13	31.18	8.44	63.71	100	0	P	V
		7386	39.5	-34.5	74	58.04	35.69	10.15	64.38	100	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



2.4GHz 2400~2483.5MHz

WIFI 802.11ax HEW20 (Harmonic @ 3m)

WIFI Ant. 1	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11ax HEW20 CH 01 2412MHz		4824	35.41	-38.59	74	59.81	30.92	8.43	63.75	100	360	P	H
		4824	36.08	-37.92	74	60.48	30.92	8.43	63.75	100	0	P	V
802.11ax HEW 20 CH 06 2437MHz		4872	35.29	-38.71	74	59.54	31.05	8.43	63.73	100	360	P	H
		7308	39.99	-34.01	74	58.77	35.52	10.07	64.37	100	360	P	H
		4872	34.48	-39.52	74	58.73	31.05	8.43	63.73	100	0	P	V
		7308	40.09	-33.91	74	58.87	35.52	10.07	64.37	100	0	P	V
802.11ax HEW 20 CH 11 2462MHz		4926	35.4	-38.6	74	59.49	31.18	8.44	63.71	100	360	P	H
		7386	40.07	-33.93	74	59.65	35.62	10.12	64.38	100	360	P	H
		4926	35.44	-38.56	74	59.53	31.18	8.44	63.71	100	0	P	V
		7386	40.31	-33.69	74	58.85	35.69	10.15	64.38	100	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



15C 2.4GHz 2400~2483.5MHz

15C Emission below 1GHz

2.4GHz WIFI 802.11 ac VHT20 (LF)

WIFI Ant. 1	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11ac VHT20 CH 01 2412MHz		42.61	28.66	-11.34	40	41.79	18.08	0.74	31.95	100	0	P	H
		79.47	26.25	-13.75	40	43.5	13.62	1.06	31.93	-	-	P	H
		154.16	28.05	-15.45	43.5	41.51	17.04	1.44	31.94	-	-	P	H
		170.65	28.29	-15.21	43.5	42.35	16.34	1.52	31.92	-	-	P	H
		233.7	29.01	-16.99	46	41.64	17.52	1.79	31.94	-	-	P	H
		910.76	24.72	-21.28	46	23.05	29.57	3.47	31.37	-	-	P	H
		51.34	36.18	-3.82	40	52.84	14.44	0.84	31.94	100	0	P	V
		108.57	33.23	-10.27	43.5	47.59	16.37	1.2	31.93	-	-	P	V
		163.86	28.76	-14.74	43.5	42.56	16.62	1.51	31.93	-	-	P	V
		206.54	31.9	-11.6	43.5	46.56	15.58	1.67	31.91	-	-	P	V
		664.38	22.33	-23.67	46	25.1	26.63	2.95	32.35	-	-	P	V
		850.62	23.86	-22.14	46	22.99	29.3	3.35	31.78	-	-	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



Note symbol

*	Fundamental Frequency which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.
!	Test result is over limit line.
P/A	P eak or A verage
H/V	H orizontal or V ertical



A calculation example for radiated spurious emission is shown as below:

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
2		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
CH 01													
2412MHz		2390	43.54	-10.46	54	42.6	32.22	4.58	35.86	103	308	A	H

1. Level(dBμV/m) =

Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

2. Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)

For Peak Limit @ 2390MHz:

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 54.51(dBμV) – 35.86 (dB)

= 55.45 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 55.45(dBμV/m) – 74(dBμV/m)

= -18.55(dB)

For Average Limit @ 2390MHz:

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 42.6(dBμV) – 35.86 (dB)

= 43.54 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 43.54(dBμV/m) – 54(dBμV/m)

= -10.46(dB)

Both peak and average measured complies with the limit line, so test result is “PASS”.

Appendix C. Conducted Spurious at Band Edges

Note symbol

-L	Low channel location
-R	High channel location

Procedure for conducted measurements in restricted bands:

- Measure the conducted output power (in dBm) using the detector specified by the appropriate regulatory agency
- Add the maximum transmit antenna gain (in dBi) to the measured output power level to determine the EIRP (see 11.12.2.6 for guidance on determining the applicable antenna gain)
- Add the appropriate maximum ground reflection factor to the EIRP (6 dB for frequencies ≤ 30 MHz; 4.7 dB for frequencies between 30 MHz and 1000 MHz, inclusive; and 0 dB for frequencies > 1000 MHz).
- For MIMO devices, measure the power of each chain and sum the EIRP of all chains in linear terms
- Convert the resultant EIRP to an equivalent electric field strength using the following relationship:

$$E = \sqrt{EIRP - 20 \log d + 104.8}$$

where

E is the electric field strength in dB μ V/m

EIRP is the equivalent isotropically radiated power in dBm

d is the specified measurement distance in m

- Compare the resultant electric field strength level with the applicable regulatory limit.

Thus, the conducted limits for restricted bands can be converted:

For SISO mode:

Conducted Peak limit = 74 dB μ V/m - 95.2 - Antenna Gain (6 dBi) - setup loss (3.01 dB) = -30.21 dBm

Conducted Average limit = 54 dB μ V/m - 95.2 - Antenna Gain (6 dBi) - setup loss (3.01 dB) = -50.21 dBm

For CDD MIMO mode:

Conducted Peak limit = 74 dB μ V/m - 95.2 - Directional Gain (9.01 dBi) - 10 log(N_{ANT}) dB (6.02 dB) - setup loss (0 dB) = -36.23 dBm

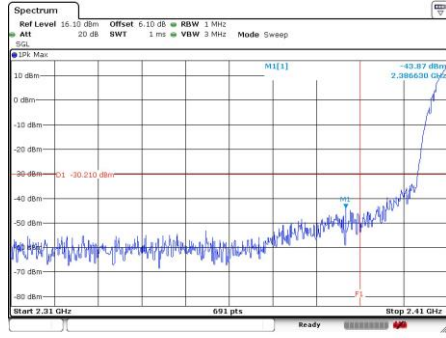
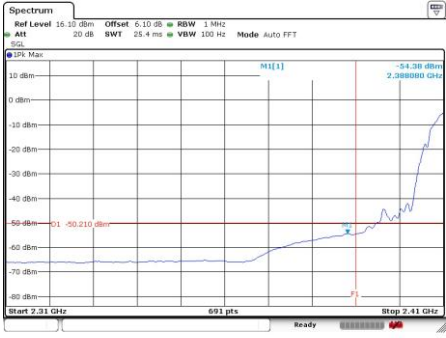
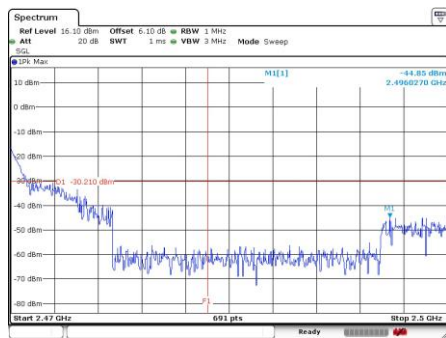
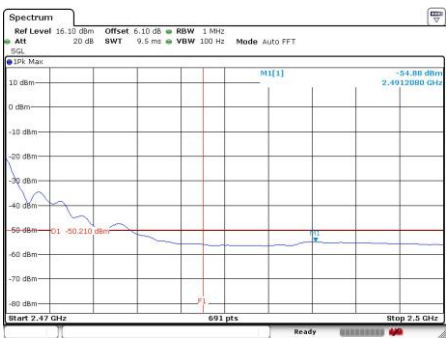
Conducted Average limit = 54 dB μ V/m - 95.2 - Directional Gain (9.01 dBi) - 10 log(N_{ANT}) dB (6.02 dB) - setup loss (0 dB) = -56.23 dBm



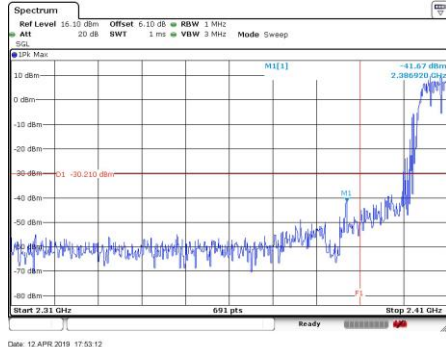
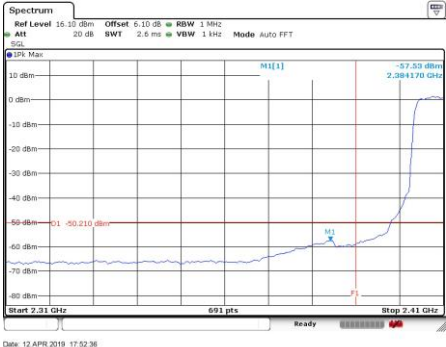
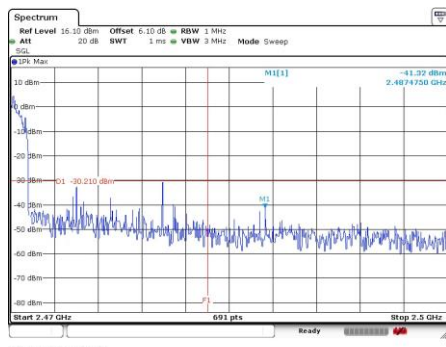
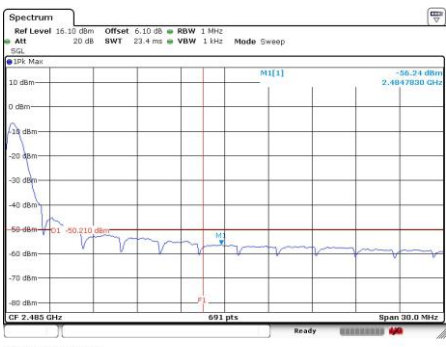
For SISO mode:

2.4GHz 2400~2483.5MHz

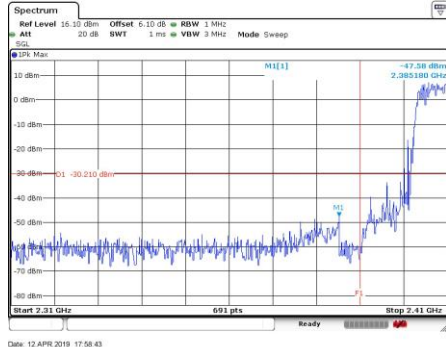
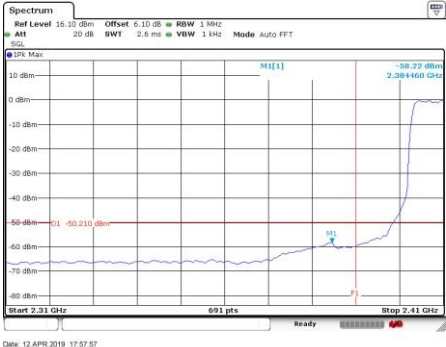
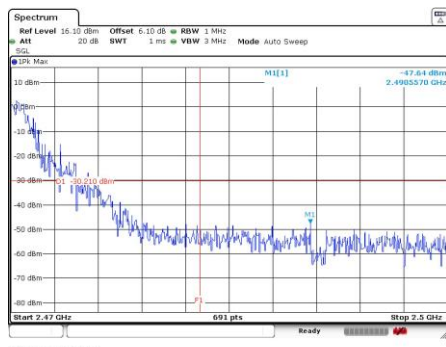
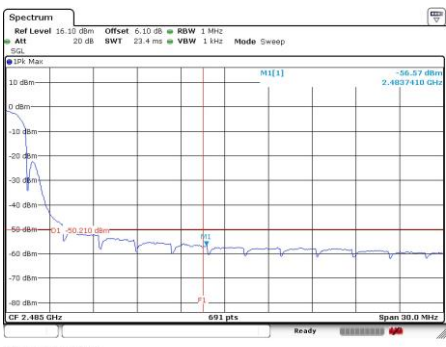
WIFI 802.11b (Band Edge)

WIFI	2.4GHz 2400~2483.5MHz Band Edge	
Ant1	Peak	Average
CH01		
CH11		

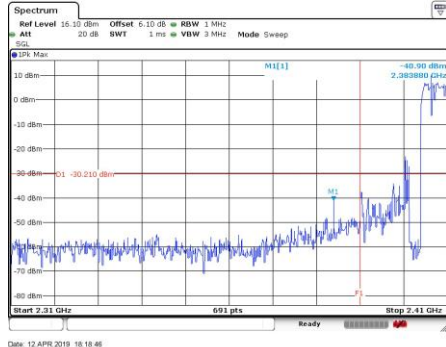
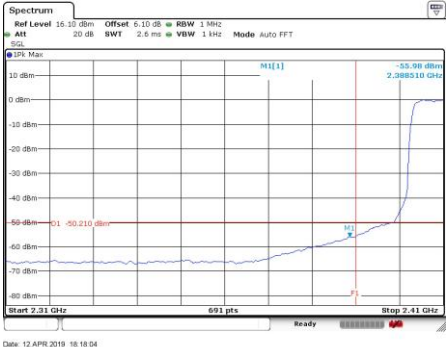
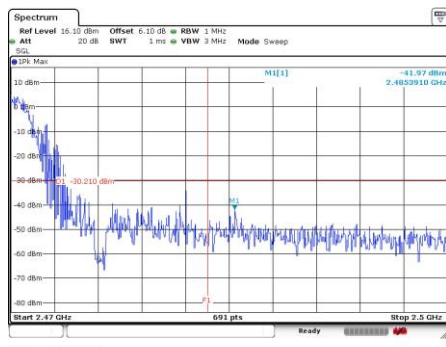
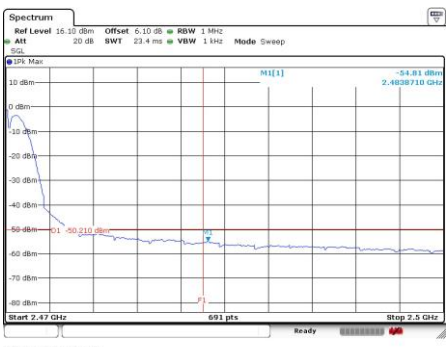
WIFI 802.11g (Band Edge)

WIFI	2.4GHz 2400~2483.5MHz Band Edge	
Ant1	Peak	Average
CH01	 Spectrum plot for CH01 Peak. The plot shows a frequency range from 2.31 GHz to 2.41 GHz. The y-axis represents power in dBm, ranging from -80 to 10. A significant signal is visible at the upper edge of the band, with a peak level of approximately -41.57 dBm at 2.389920 GHz. The plot includes a red line at -30.210 dBm and a blue line at -57.53 dBm. The date is 12 APR 2019 17:53:12.	 Spectrum plot for CH01 Average. The plot shows a frequency range from 2.31 GHz to 2.41 GHz. The y-axis represents power in dBm, ranging from -80 to 10. A significant signal is visible at the upper edge of the band, with a peak level of approximately -41.57 dBm at 2.389920 GHz. The plot includes a red line at -30.210 dBm and a blue line at -57.53 dBm. The date is 12 APR 2019 17:53:38.
CH11	 Spectrum plot for CH11 Peak. The plot shows a frequency range from 2.47 GHz to 2.5 GHz. The y-axis represents power in dBm, ranging from -80 to 10. A significant signal is visible at the upper edge of the band, with a peak level of approximately -41.32 dBm at 2.4671750 GHz. The plot includes a red line at -30.210 dBm and a blue line at -56.21 dBm. The date is 12 APR 2019 17:55:38.	 Spectrum plot for CH11 Average. The plot shows a frequency range from 2.485 GHz to 2.5 GHz. The y-axis represents power in dBm, ranging from -80 to 10. A significant signal is visible at the upper edge of the band, with a peak level of approximately -41.32 dBm at 2.4671750 GHz. The plot includes a red line at -30.210 dBm and a blue line at -56.21 dBm. The date is 12 APR 2019 18:35:45.

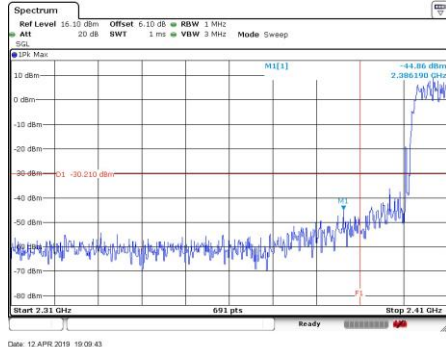
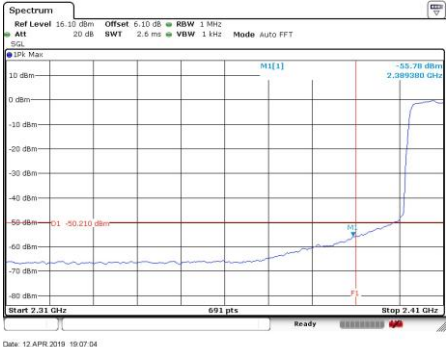
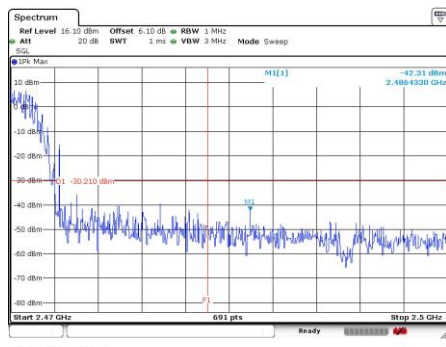
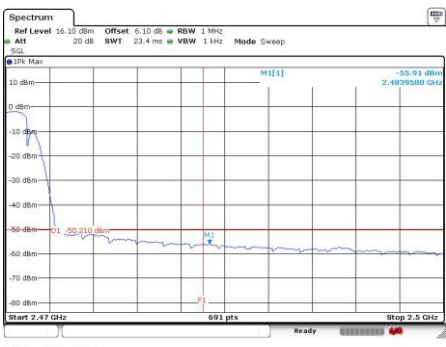
WIFI 802.11n HT20 (Band Edge)

WIFI	2.4GHz 2400~2483.5MHz Band Edge	
Ant1	Peak	Average
CH01	 Spectrum Ref Level 16.10 dBm Offset 6.10 dB RBW 1 MHz Att 20 dB SWT 1 ms VBW 3 MHz Mode Sweep Start 2.31 GHz 691 pts Stop 2.41 GHz Date: 12 APR 2019 17:58:43	 Spectrum Ref Level 16.10 dBm Offset 6.10 dB RBW 1 MHz Att 20 dB SWT 2.0 ms VBW 1 MHz Mode Auto FFT Start 2.31 GHz 691 pts Stop 2.41 GHz Date: 12 APR 2019 17:57:57
CH11	 Spectrum Ref Level 16.10 dBm Offset 6.10 dB RBW 1 MHz Att 20 dB SWT 1 ms VBW 3 MHz Mode Auto Sweep Start 2.47 GHz 691 pts Stop 2.5 GHz Date: 10 JUL 2019 14:02:23	 Spectrum Ref Level 16.10 dBm Offset 6.10 dB RBW 1 MHz Att 20 dB SWT 23.4 ms VBW 1 MHz Mode Sweep CF 2.485 GHz 691 pts Span 30.0 MHz Date: 12 APR 2019 18:37:22

WIFI 802.11ac VHT20 (Band Edge)

WIFI	2.4GHz 2400~2483.5MHz Band Edge	
Ant1	Peak	Average
CH01	 Ref Level 15.10 dBm Offset 6.10 dB RBW 1 MHz Att 20 dB SWF 1 ms VBW 3 MHz Mode Sweep Start 2.31 GHz 691 pts Stop 2.41 GHz Date: 12 APR 2019 18:18:46	 Ref Level 15.10 dBm Offset 6.10 dB RBW 1 MHz Att 20 dB SWF 2.0 ms VBW 1 MHz Mode Auto FFT Start 2.31 GHz 691 pts Stop 2.41 GHz Date: 12 APR 2019 18:18:04
CH11	 Ref Level 15.10 dBm Offset 6.10 dB RBW 1 MHz Att 20 dB SWF 1 ms VBW 3 MHz Mode Sweep Start 2.47 GHz 691 pts Stop 2.5 GHz Date: 12 APR 2019 18:24:37	 Ref Level 15.10 dBm Offset 6.10 dB RBW 1 MHz Att 20 dB SWF 23.4 ms VBW 1 MHz Mode Sweep Start 2.47 GHz 691 pts Stop 2.5 GHz Date: 12 APR 2019 19:02:55

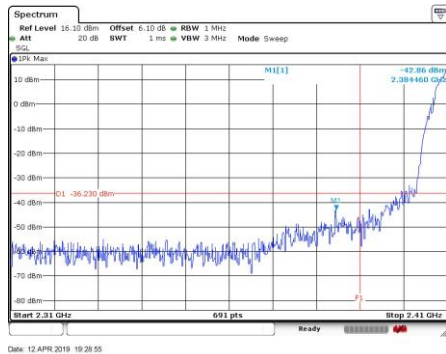
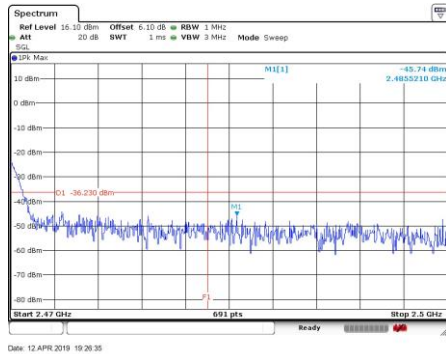
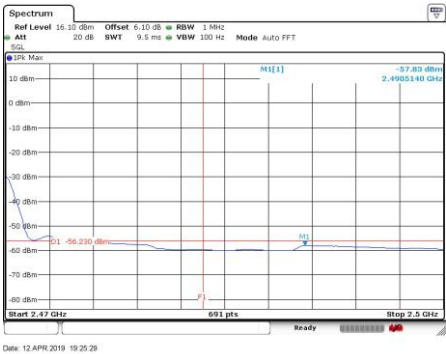
WIFI 802.11ax HE20 (Band Edge)

WIFI	2.4GHz 2400~2483.5MHz Band Edge	
Ant1	Peak	Average
CH01	 Spectrum plot for CH01 Peak. The plot shows a frequency range from 2.31 GHz to 2.41 GHz. The y-axis represents power in dBm, ranging from -80 to 10. A significant peak is visible at approximately 2.385190 GHz, reaching a power level of -44.86 dBm. The plot includes a red line at -30 dBm and a blue line at -50 dBm. The date is 12 APR 2019 19:09:43.	 Spectrum plot for CH01 Average. The plot shows a frequency range from 2.31 GHz to 2.41 GHz. The y-axis represents power in dBm, ranging from -80 to 10. A significant peak is visible at approximately 2.385980 GHz, reaching a power level of -53.78 dBm. The plot includes a red line at -30 dBm and a blue line at -50 dBm. The date is 12 APR 2019 19:07:04.
CH11	 Spectrum plot for CH11 Peak. The plot shows a frequency range from 2.47 GHz to 2.5 GHz. The y-axis represents power in dBm, ranging from -80 to 10. A significant peak is visible at approximately 2.4891030 GHz, reaching a power level of -42.31 dBm. The plot includes a red line at -30 dBm and a blue line at -50 dBm. The date is 12 APR 2019 19:12:04.	 Spectrum plot for CH11 Average. The plot shows a frequency range from 2.47 GHz to 2.5 GHz. The y-axis represents power in dBm, ranging from -80 to 10. A significant peak is visible at approximately 2.4895680 GHz, reaching a power level of -55.91 dBm. The plot includes a red line at -30 dBm and a blue line at -50 dBm. The date is 12 APR 2019 19:11:15.

For MIMO mode:

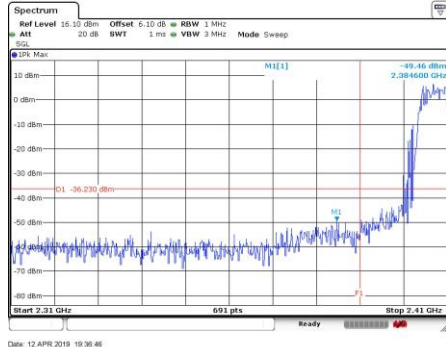
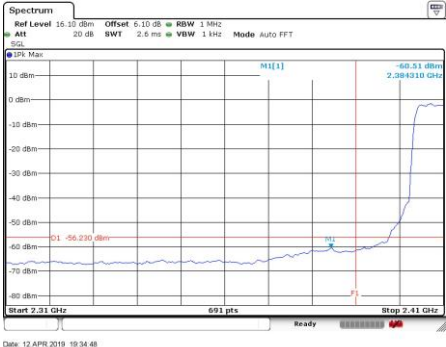
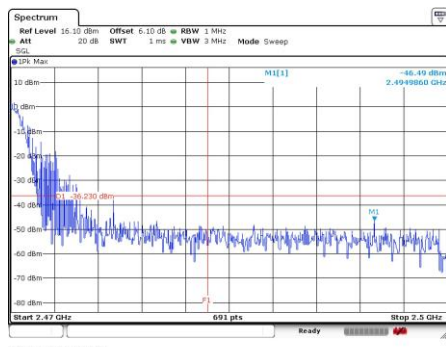
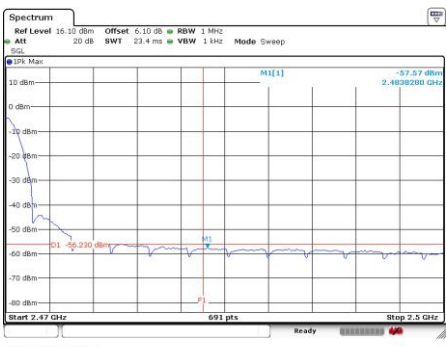
2.4GHz 2400~2483.5MHz

WIFI 802.11b (Band Edge)

WIFI	2.4GHz 2400~2483.5MHz Band Edge	
Ant1	Peak	Average
CH01	 Spectrum plot for CH01 Peak. The plot shows a noisy signal with a peak at 2.391160 GHz. The peak level is -42.38 dBm. The plot is titled 'Spectrum' and includes parameters: Ref Level 15.10 dBm, Offset 5.10 dB, RBW 1 MHz, Att 20 dB, SWT 1 ms, VBW 3 MHz, Mode Sweep. The x-axis ranges from 2.31 GHz to 2.41 GHz. The y-axis ranges from -80 dBm to 10 dBm. The plot is dated 12 APR 2019 19:28:55.	 Spectrum plot for CH01 Average. The plot shows a noisy signal with a peak at 2.397958 GHz. The peak level is -56.83 dBm. The plot is titled 'Spectrum' and includes parameters: Ref Level 15.10 dBm, Offset 5.10 dB, RBW 1 MHz, Att 20 dB, SWT 25.4 ms, VBW 100 Hz, Mode Auto FFT. The x-axis ranges from 2.31 GHz to 2.41 GHz. The y-axis ranges from -80 dBm to 10 dBm. The plot is dated 12 APR 2019 19:28:18.
CH11	 Spectrum plot for CH11 Peak. The plot shows a noisy signal with a peak at 2.4855710 GHz. The peak level is -45.74 dBm. The plot is titled 'Spectrum' and includes parameters: Ref Level 15.10 dBm, Offset 5.10 dB, RBW 1 MHz, Att 20 dB, SWT 1 ms, VBW 3 MHz, Mode Sweep. The x-axis ranges from 2.47 GHz to 2.5 GHz. The y-axis ranges from -80 dBm to 10 dBm. The plot is dated 12 APR 2019 19:28:35.	 Spectrum plot for CH11 Average. The plot shows a noisy signal with a peak at 2.4905140 GHz. The peak level is -57.83 dBm. The plot is titled 'Spectrum' and includes parameters: Ref Level 15.10 dBm, Offset 5.10 dB, RBW 1 MHz, Att 20 dB, SWT 9.5 ms, VBW 100 Hz, Mode Auto FFT. The x-axis ranges from 2.47 GHz to 2.5 GHz. The y-axis ranges from -80 dBm to 10 dBm. The plot is dated 12 APR 2019 19:28:29.

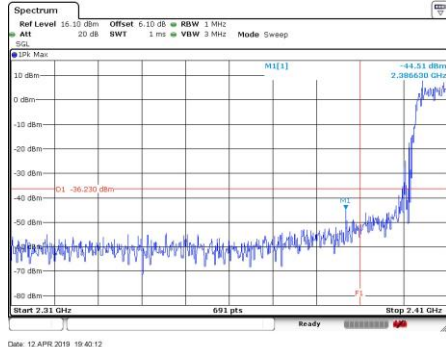
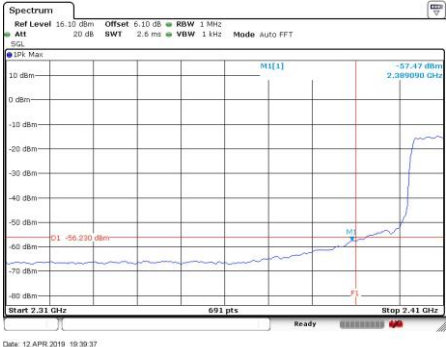
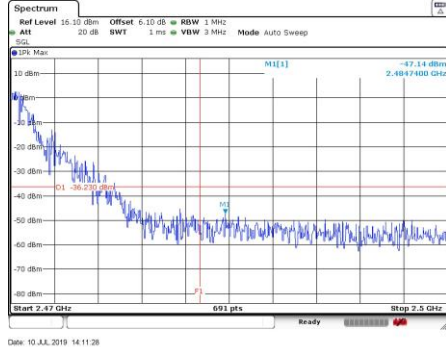
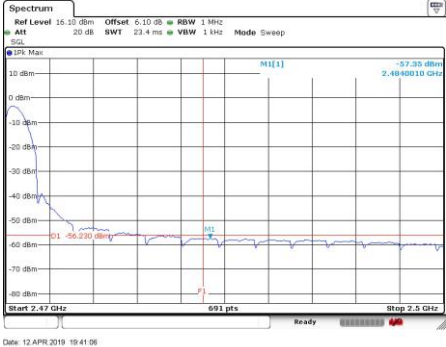


WIFI 802.11g (Band Edge)

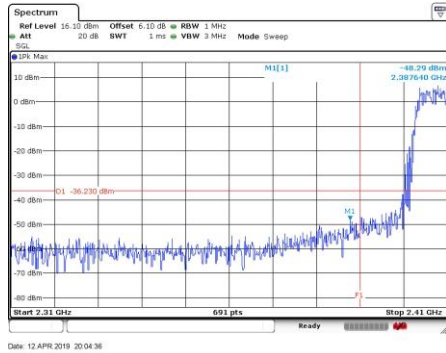
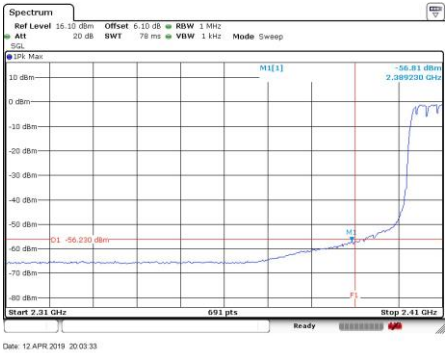
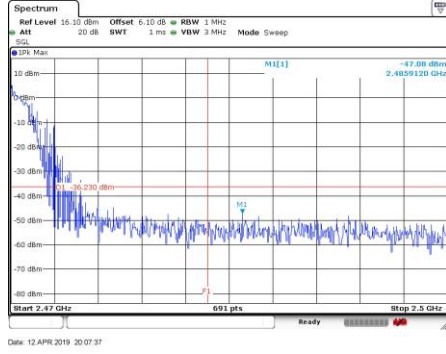
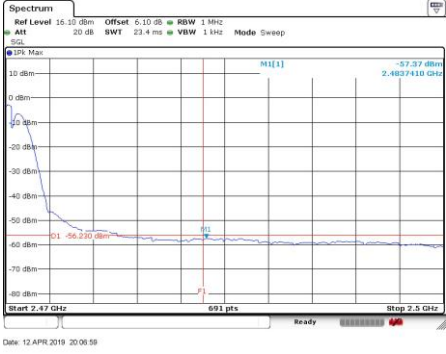
WIFI	2.4GHz 2400~2483.5MHz Band Edge	
Ant1	Peak	Average
CH01		
CH11		



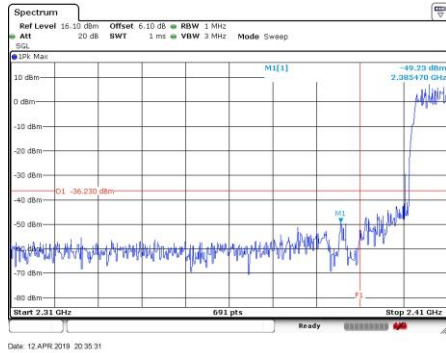
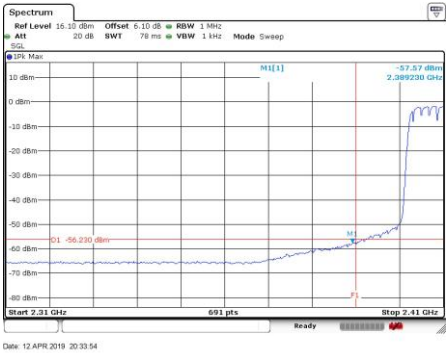
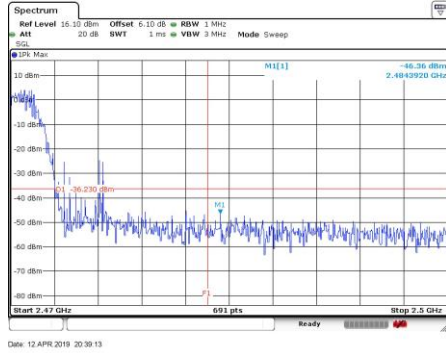
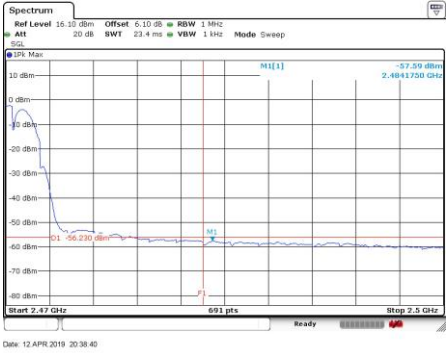
WIFI 802.11n HT20 (Band Edge)

WIFI	2.4GHz 2400~2483.5MHz Band Edge	
Ant1	Peak	Average
CH01		
CH11		

WIFI 802.11ac VHT20 (Band Edge)

WIFI	2.4GHz 2400~2483.5MHz Band Edge	
Ant1	Peak	Average
CH01	 Spectrum Ref Level 15.10 dBm Offset 6.10 dB RBW 1 MHz Att 20 dB SWT 1 ms VBW 3 MHz Mode Sweep SQL SPK Max -48.29 dBm 2.397640 GHz M1[1] -56.230 dBm Start 2.31 GHz 691 pts Stop 2.41 GHz Date: 12 APR 2019 20:04:36	 Spectrum Ref Level 15.10 dBm Offset 6.10 dB RBW 1 MHz Att 20 dB SWT 78 ms VBW 1 kHz Mode Sweep SQL SPK Max -56.81 dBm 2.399220 GHz M1[1] -56.230 dBm Start 2.31 GHz 691 pts Stop 2.41 GHz Date: 12 APR 2019 20:03:33
CH11	 Spectrum Ref Level 15.10 dBm Offset 6.10 dB RBW 1 MHz Att 20 dB SWT 1 ms VBW 3 MHz Mode Sweep SQL SPK Max -47.08 dBm 2.4859120 GHz M1[1] -56.230 dBm Start 2.47 GHz 691 pts Stop 2.5 GHz Date: 12 APR 2019 20:07:37	 Spectrum Ref Level 15.10 dBm Offset 6.10 dB RBW 1 MHz Att 20 dB SWT 23.4 ms VBW 1 kHz Mode Sweep SQL SPK Max -57.97 dBm 2.4837410 GHz M1[1] -56.230 dBm Start 2.47 GHz 691 pts Stop 2.5 GHz Date: 12 APR 2019 20:06:58

WIFI 802.11ax HE20 (Band Edge)

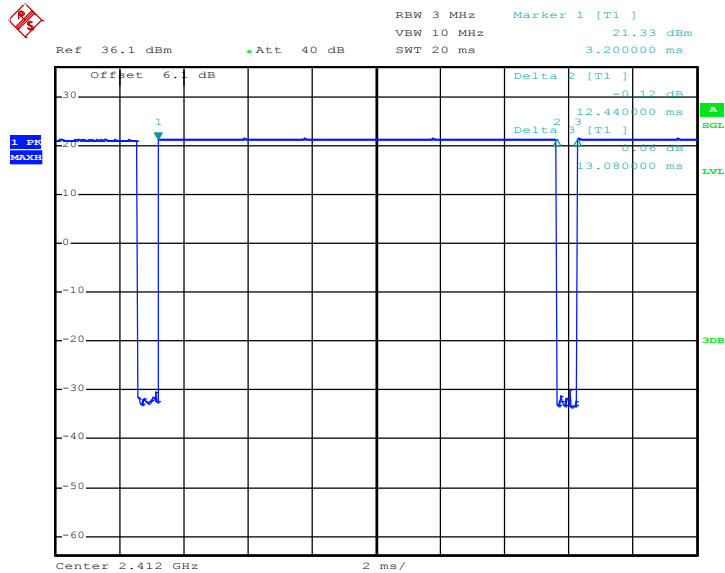
WIFI	2.4GHz 2400~2483.5MHz Band Edge	
Ant1	Peak	Average
CH01	 Spectrum plot for CH01 Peak. The plot shows a noisy signal with a sharp rise at the band edge. The y-axis ranges from -80 dBm to 10 dBm. The x-axis ranges from 2.41 GHz to 2.42 GHz. A red line indicates a level of -56.230 dBm. The plot is labeled 'M1[1]' and 'M1'. The date is 12 APR 2019 20:35:31.	 Spectrum plot for CH01 Average. The plot shows a noisy signal with a sharp rise at the band edge. The y-axis ranges from -80 dBm to 10 dBm. The x-axis ranges from 2.41 GHz to 2.42 GHz. A red line indicates a level of -56.230 dBm. The plot is labeled 'M1[1]' and 'M1'. The date is 12 APR 2019 20:35:54.
CH11	 Spectrum plot for CH11 Peak. The plot shows a noisy signal with a sharp rise at the band edge. The y-axis ranges from -80 dBm to 10 dBm. The x-axis ranges from 2.47 GHz to 2.48 GHz. A red line indicates a level of -56.230 dBm. The plot is labeled 'M1[1]' and 'M1'. The date is 12 APR 2019 20:36:13.	 Spectrum plot for CH11 Average. The plot shows a noisy signal with a sharp rise at the band edge. The y-axis ranges from -80 dBm to 10 dBm. The x-axis ranges from 2.47 GHz to 2.48 GHz. A red line indicates a level of -56.230 dBm. The plot is labeled 'M1[1]' and 'M1'. The date is 12 APR 2019 20:36:40.

Appendix D. Duty Cycle Plots

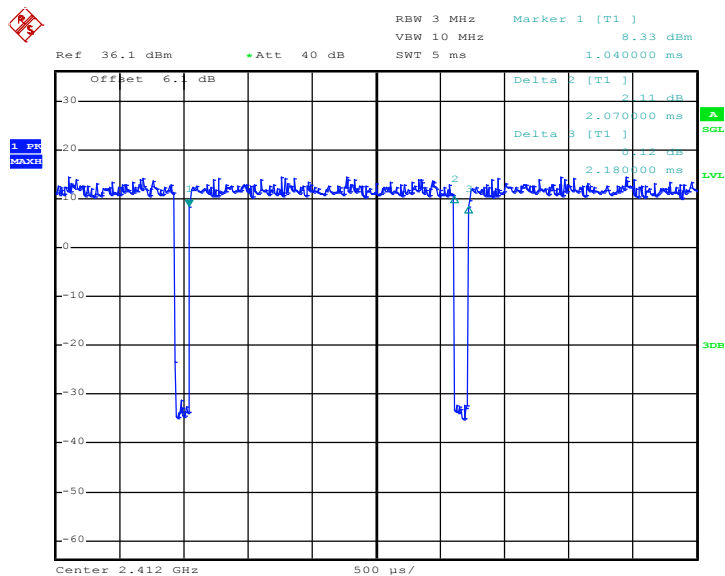
Antenna	Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
1+2+3+4	802.11b	95.11	12.440	0.080	0.1KHZ
1+2+3+4	802.11g	94.95	2.070	0.483	1KHZ
1+2+3+4	802.11ac VHT20	98.48	-	-	10HZ
1+2+3+4	802.11ax HE20	98.17	-	-	10HZ
1	802.11b	95.12	12.480	0.080	0.1KHZ
1	802.11g	95.39	2.070	0.483	1KHZ
1	802.11ac VHT20	98.48	-	-	10HZ
1	802.11ax HE20	98.03	-	-	10HZ

Antenna 1+2+3+4:

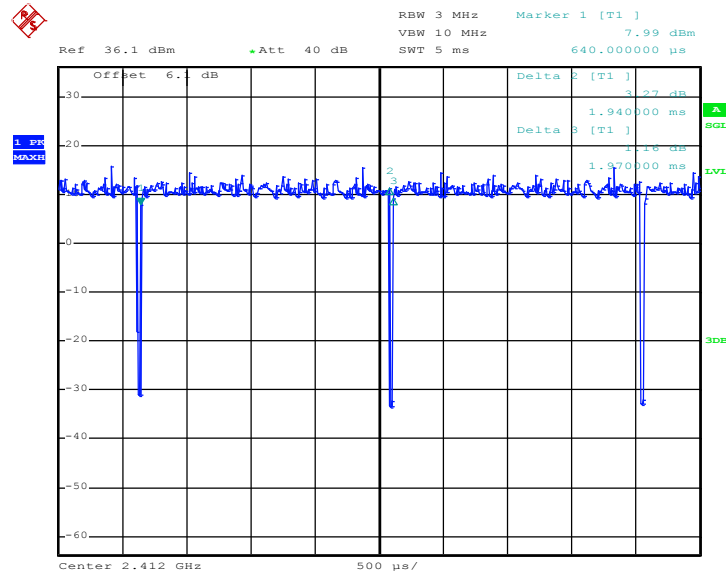
802.11b



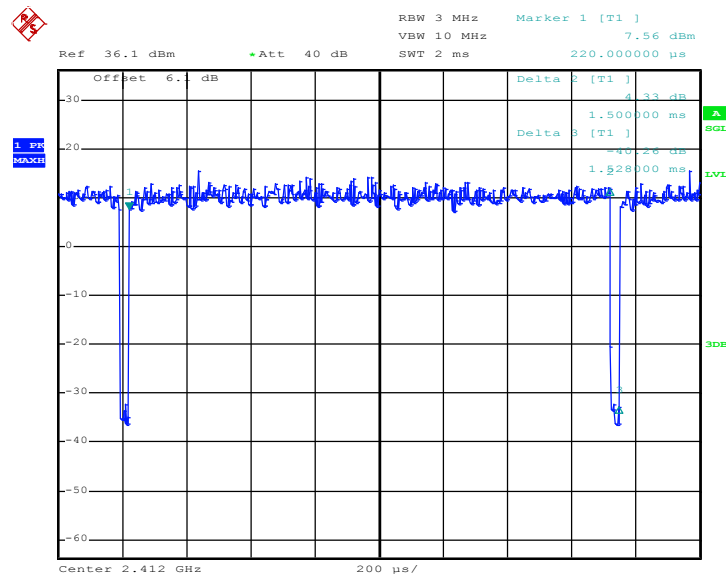
802.11g



802.11ac VHT20



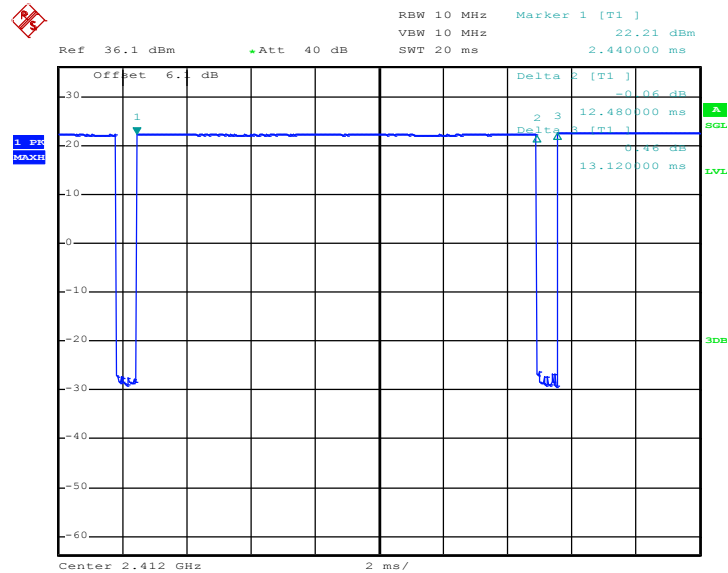
802.11ax HE20



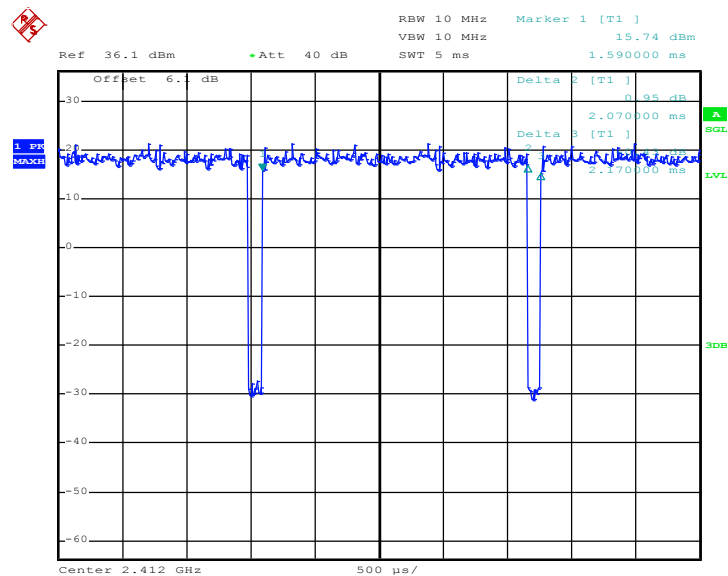


Antenna 1:

802.11b

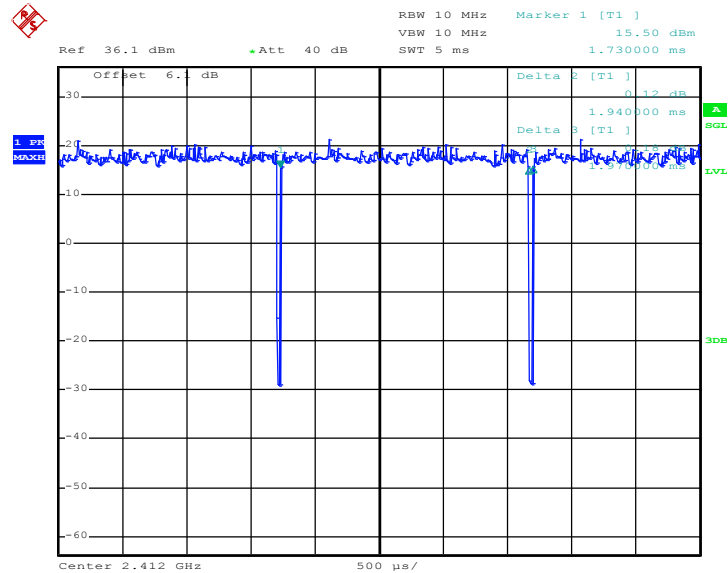


802.11g





802.11ac VHT20



802.11ax HE20

