FCC TEST REPORT

For

Shenzhen ISONWIFI Co.,Ltd

Smart-Home WiFi System

Model No.: e+2, e+1, e+3, e+4, e+5, e+6, e+7, e+8, e+9

Prepared For	:	Shenzhen ISONWIFI Co.,Ltd
Address	:	3/F, Building 1, Henghui Science and Technology Park, Yuxing Road NO.63 GuangMing New District, Shenzhen China
Prepared By	:	Shenzhen Anbotek Compliance Laboratory Limited
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Report Number	:	SZAWW180123006-02
Date of Test	:	Jan. 23~Mar. 31, 2018
Date of Report	:	Mar. 31, 2018

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TEST REPORT

Applicant	:	Shenzhen ISONWIFI Co.,Ltd
Manufacturer	:	Shenzhen ISONWIFI Co.,Ltd
Product Name	:	Smart-Home WiFi System
Model No.	:	e+2, e+1, e+3, e+4, e+5, e+6, e+7, e+8, e+9
Trade Mark	:	ISONWIFI
Rating(s)	:	Input: DC 12V 1.5A
Test Standard(s)	**:**	**FCC Part15 Subpart E 2017, Paragraph 15.407** **ANSI C63.10: 2013,**
Test Method(s)	**:**	**KDB 789033 D02 General UNII Test Procedures New Rules v02r01** **KDB662911 D01 Multiple Transmitter Output v02r01**

The device described above is tested by Shenzhen Anbotek Compliance Laboratory Limited to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and Shenzhen Anbotek Compliance Laboratory Limited is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment Under Test) is technically compliant with the FCC Part 15 Subpart E requirements.

This report applies to above tested sample only and shall not be reproduced in part without written approval of Shenzhen Anbotek Compliance Laboratory Limited.

Date of Test : : Jan. 23~Mar. 31, 2018

Prepared by : :

(Tested Engineer / Winkey Wang)

Reviewer : :

(Project Manager / Tangcy. T)

Approved & Authorized Signer : :

(Manager / Tom Chen)

1. General Information

1.1. Client Information

Applicant	:	Shenzhen ISONWIFI Co.,Ltd
Address	:	3/F, Building 1, Henghui Science and Technology Park, Yuxing Road NO.63 GuangMing New District, Shenzhen China
Manufacturer	:	Shenzhen ISONWIFI Co.,Ltd
Address	:	3/F, Building 1, Henghui Science and Technology Park, Yuxing Road NO.63 GuangMing New District, Shenzhen China

1.2. Description of Device (EUT)

Product Name	:	Smart-Home WiFi System	
Model No.	:	e+2, e+1, e+3, e+4, e+5, e+6, e+7, e+8, e+9 (Note: All samples are the same except the model number and colour, so we prepare "e+2" for test only.)	
Trade Mark	:	ISONWIFI	
Test Power Supply	:	AC 120V, 60Hz for adapter/AC 240V, 60Hz for adapter	
Product Description	:	Operation Frequency:	5180MHz~5240MHz / 5190MHz~5230MHz/ 5210MHz
		Number of Channel:	4 Channels for 802.11a 4 Channels for 802.11n(HT20) 4 Channels for 802.11ac(HT20) 2 Channels for 802.11n(HT40) 2 Channels for 802.11ac(HT40)
		Modulation Type:	OFDM with BPSK/QPSK/16QAM/64QAM for 802.11a/n; OFDM with BPSK/QPSK/16QAM/64QAM/ 256QAM for 802.11ac
		Antenna Type:	PIFA Antenna
		Antenna Gain(Peak):	2 dBi
		The directional gain	5.01 dBi
Remark: 1) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual. 2)This report is for WIFI 5.1G.			

1.3. Auxiliary Equipment Used During Test

Adapter	:	Model: HJF017-X120150XYC Input: 100-240V~50/60HZ, 0.5A Output: 12V/1.5A

1.4. Description of Test Modes

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Mode	Test channel	Frequency (MHz)
OFDM(802.11a/n20/ac20)	CH 36	5180MHz
	CH 40	5200MHz
	CH 48	5240MHz
OFDM(802.11n40/ac40)	CH 38	5190MHz
	CH 46	5230MHz

Note:
1. The measurements are performed at the highest, middle, lowest available channels.
2. The EUT has been tested as an independent unit. And Continual Transmitting in maximum power.
3. For the relevant Conducted Measurement, the temporary antenna connector is used during the measurement. Antenna Connector Impedance: 50Ω, Cable Loss: 1.0 dB
4. The EUT was programmed to be in continuously transmitting mode and the transmit duty cycle is more than 98%

1.5. List of channels

802.11a/n20/ac20

Channel	Freq. (MHz)	Channel	Freq. (MHz)
36	5180	44	5220
40	5200	48	5240

802.11n40/ac40

Channel	Freq. (MHz)	Channel	Freq. (MHz)
38	5190	46	5230

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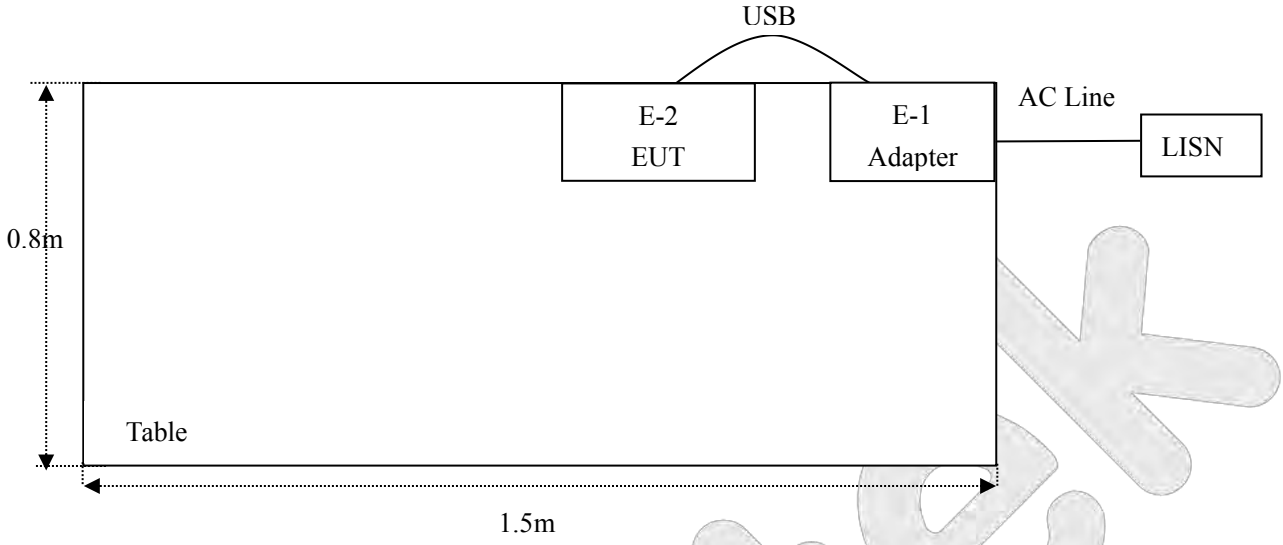
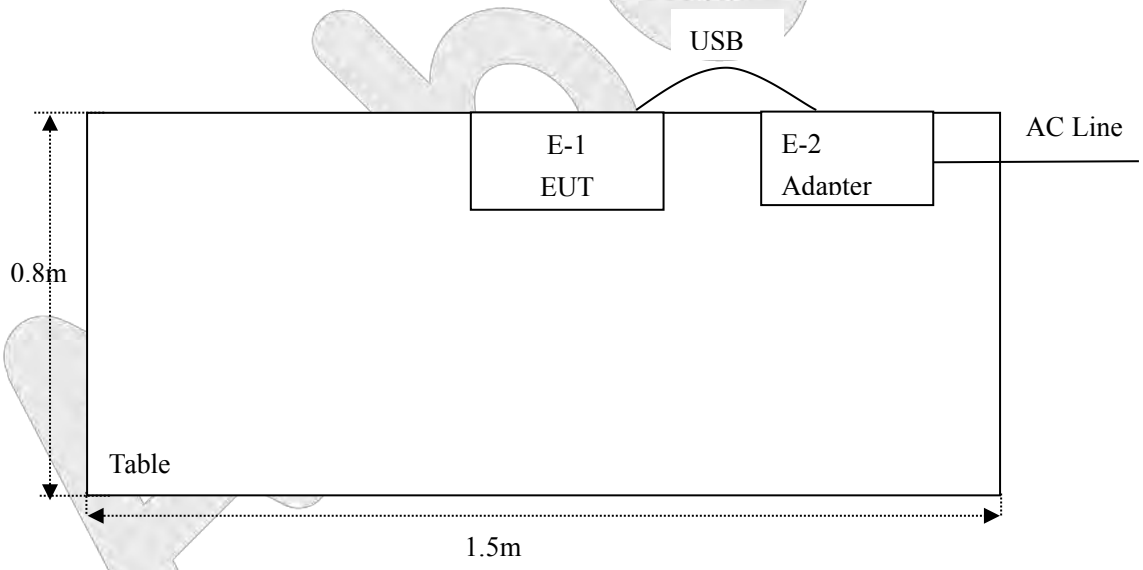
1.6. Description Of Test Setup

CE



RE



1.7. Test Equipment List

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	L.I.S.N. Artificial Mains Network	Rohde & Schwarz	ENV216	100055	Nov. 17, 2017	1 Year
2.	EMI Test Receiver	Rohde & Schwarz	ESCI	100627	Nov. 17, 2017	1 Year
3.	RF Switching Unit	Compliance Direction	RSU-M2	38303	Nov. 17, 2017	1 Year
4.	Spectrum Analysis	Agilent	E4407B	US39390582	Nov. 17, 2017	1 Year
5.	Spectrum Analysis	Agilent	N9038A	MY53227295	Nov. 17, 2017	1 Year
6.	Preamplifier	SKET Electronic	BK1G18G30 D	KD17503	Nov. 17, 2017	1 Year
7.	EMI Test Receiver	Rohde & Schwarz	ESPI	101604	Nov. 17, 2017	1 Year
8.	Double Ridged Horn Antenna	Instruments corporation	GTH-0118	351600	Nov. 20, 2017	1 Year
9.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	VULB 9163-289	Nov. 20, 2017	1 Year
10.	Loop Antenna	Schwarzbeck	HFH2-Z2	100047	Nov. 17, 2017	1 Year
11.	Horn Antenna	Schewarzbeck	BBHA9170	9170-375	Nov. 17, 2017	1 Year
12.	Pre-amplifier	SONOMA	310N	186860	Nov. 17, 2017	1 Year
13.	EMI Test Software EZ-EMC	SHURPLE	N/A	N/A	N/A	N/A
14.	RF Test Control System	YIHENG	YH3000	2017430	Nov. 18, 2017	1 Year
15.	Power Sensor	DAER	RPR3006W	15I00041SN045	Nov. 17, 2017	1 Year
16.	Power Sensor	DAER	RPR3006W	15I00041SN046	Nov. 17, 2017	1 Year
17.	MXA Spectrum Analysis	Agilent	N9020A	MY51170037	Nov. 18, 2017	1 Year
18.	MXG RF Vector Signal Generator	Agilent	N5182A	MY48180656	Nov. 18, 2017	1 Year
19.	Signal Generator	Agilent	E4421B	MY41000743	Nov. 18, 2017	1 Year
20.	DC Power Supply	LW	TPR-6410D	349315	Nov. 01, 2017	1 Year
21.	Constant Temperature Humidity Chamber	Sertep	ZJ-HWHS80 B	ZJ-17042804	Nov. 01, 2017	1 Year

1.8. Measurement Uncertainty

Radiation Uncertainty	:	Ur = 4.1 dB (Horizontal)
		Ur = 4.3 dB (Vertical)
Conduction Uncertainty	:	Uc = 3.4dB

1.9. Description of Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

FCC-Registration No.: 184111

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registed and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration No. 184111, July 31, 2017.

ISED-Registration No.: 8058A-1

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (ISED) Innovation, Science and Economic Development Canada. The acceptance letter from the ISED is maintained in our files. Registration 8058A-1, June 13, 2016.

Test Location

All Emissions tests were performed at

Shenzhen Anbotek Compliance Laboratory Limited. at 1/F, Building D, Sogood Science and Technology Park, Sanwei community, Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China.518102

2. Summary of Test Results

Standard	Test Type	Result
15.207 & 15.407	Conducted Emission	PASS
15.205/15.209	Spurious Emission	PASS
15.407(b)	Band Edge	PASS
15.407(a)(5)	Occupy Bandwidth	PASS
15.407(a)(1)(3)	Maximum Conducted Output Power	PASS
15.407(a)(1)(3)	Peak Power Spectral Density	PASS
15.203/15.407g	Antenna Requirement	PASS

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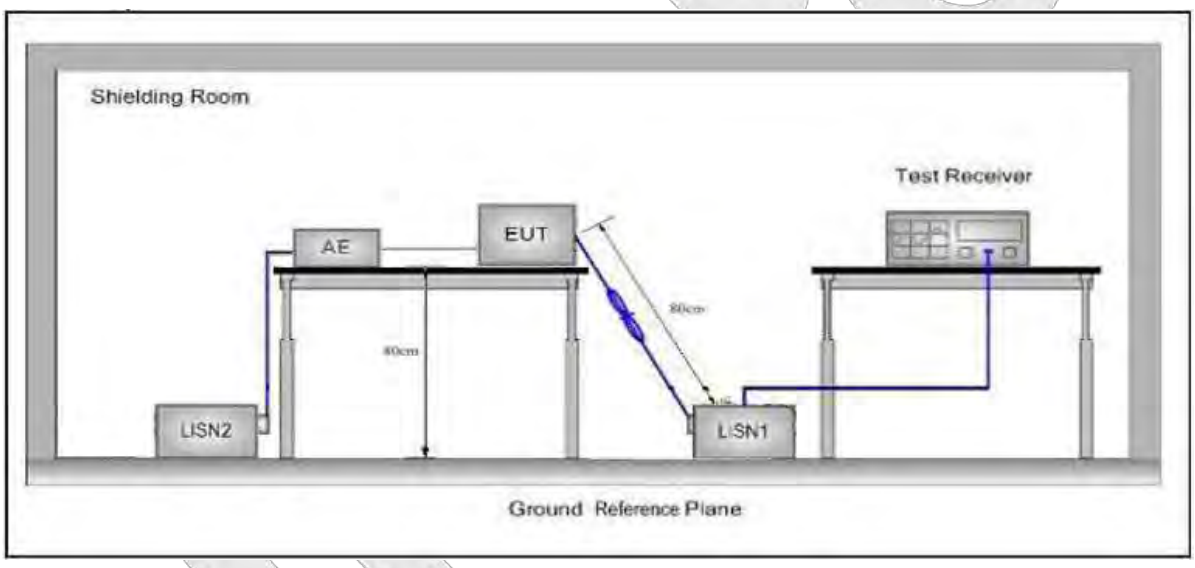
3. Conducted Emission Test

3.1. Test Standard and Limit

Test Standard	FCC Part15 Section 15.207&15.407		
Test Limit	Frequency	Maximum RF Line Voltage (dBuV)	
		Quasi-peak Level	Average Level
	150kHz~500kHz	66 ~ 56 *	56 ~ 46 *
	500kHz~5MHz	56	46
	5MHz~30MHz	60	50
Remark: (1) *Decreasing linearly with logarithm of the frequency. (2) The lower limit shall apply at the transition frequency.			

3.2. Test Setup



3.3. Test Procedure

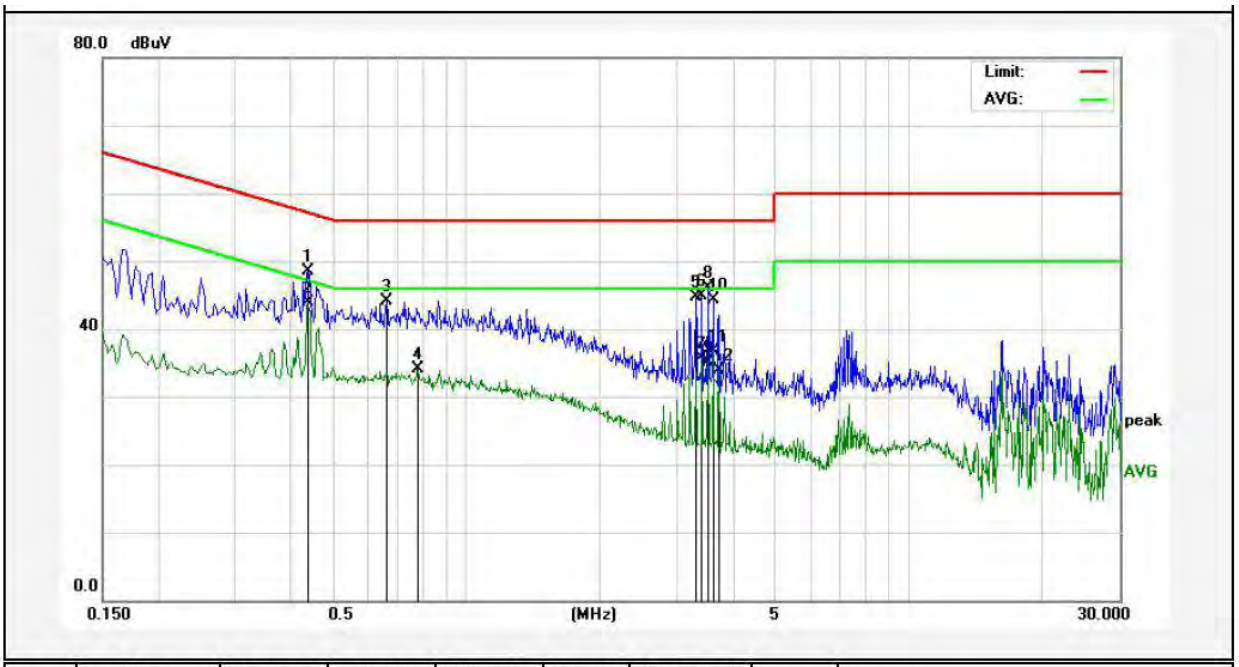
The EUT system is connected to the power mains through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm coupling impedance for the EUT system. Please refer the block diagram of the test setup and photographs. Both sides of AC line are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to FCC ANSI C63.10-2013 on Conducted Emission Measurement.
The bandwidth of test receiver (ESCI) set at 9kHz.
The frequency range from 150kHz to 30MHz is checked.

3.4. Test Data

Please to see the following pages

Conducted Emission Test Data

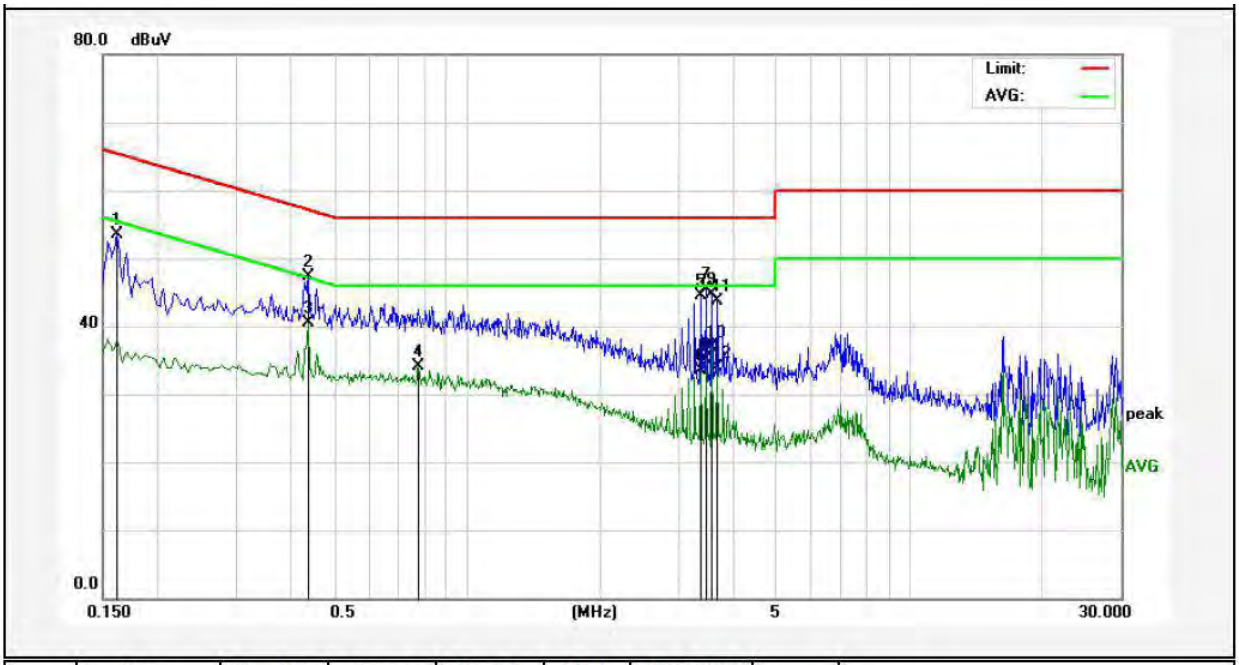
Test Site: 1# Shielded Room
Operating Condition: TX+Charging mode
Test Specification: AC 120V, 60Hz via adapter
Comment: Live Line
Tem.:25.4℃ Hum.:54%



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Over Limit (dB)	Detector	Remark
1	0.4380	30.60	17.95	48.55	57.10	-8.55	QP	
2	0.4380	25.91	17.95	43.86	47.10	-3.24	AVG	
3	0.6580	26.16	18.03	44.19	56.00	-11.81	QP	
4	0.7780	16.14	18.06	34.20	46.00	-11.80	AVG	
5	3.3100	26.44	18.17	44.61	56.00	-11.39	QP	
6	3.4140	26.75	18.17	44.92	56.00	-11.08	QP	
7	3.4140	17.50	18.17	35.67	46.00	-10.33	AVG	
8	3.5180	27.85	18.17	46.02	56.00	-9.98	QP	
9	3.5180	16.87	18.17	35.04	46.00	-10.96	AVG	
10	3.6180	26.11	18.17	44.28	56.00	-11.72	QP	
11	3.6180	18.63	18.17	36.80	46.00	-9.20	AVG	
12	3.7220	15.69	18.17	33.86	46.00	-12.14	AVG	

Conducted Emission Test Data

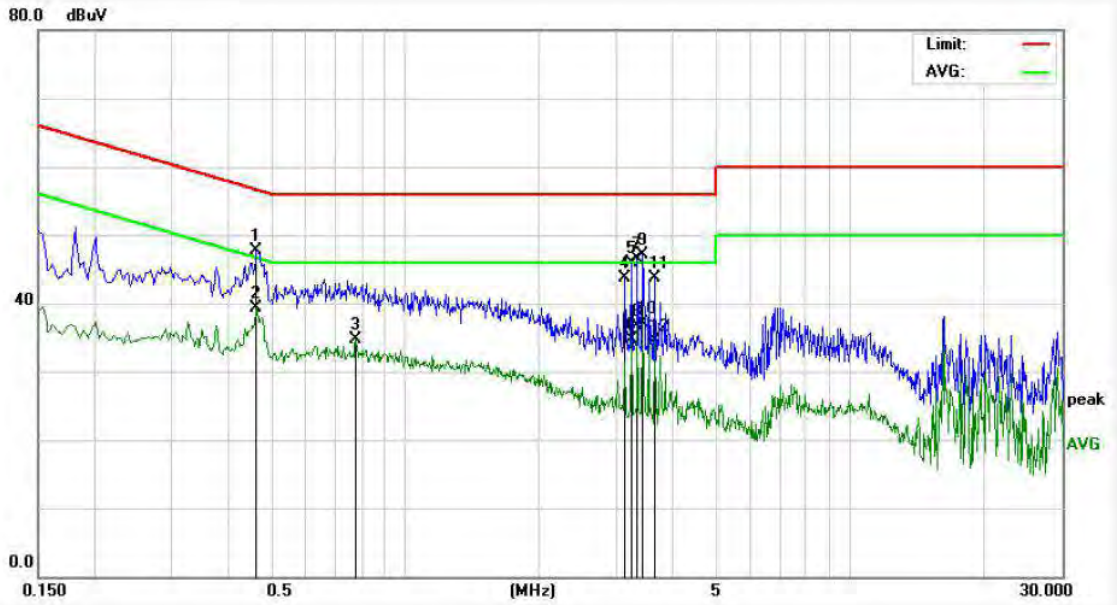
Test Site: 1# Shielded Room
Operating Condition: TX+Charging mode
Test Specification: AC 120V, 60Hz via adapter
Comment: Neutral Line
Tem.:25.4℃ Hum.:54%



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Over Limit (dB)	Detector	Remark
1	0.1620	35.69	17.90	53.59	65.36	-11.77	QP	
2	0.4380	29.30	17.95	47.25	57.10	-9.85	QP	
3	0.4380	22.55	17.95	40.50	47.10	-6.60	AVG	
4	0.7780	16.11	18.06	34.17	46.00	-11.83	AVG	
5	3.3700	26.26	18.17	44.43	56.00	-11.57	QP	
6	3.3700	15.36	18.17	33.53	46.00	-12.47	AVG	
7	3.4700	27.35	18.17	45.52	56.00	-10.48	QP	
8	3.4700	16.85	18.17	35.02	46.00	-10.98	AVG	
9	3.5740	26.48	18.17	44.65	56.00	-11.35	QP	
10	3.5740	18.69	18.17	36.86	46.00	-9.14	AVG	
11	3.6780	25.51	18.17	43.68	56.00	-12.32	QP	
12	3.6780	15.77	18.17	33.94	46.00	-12.06	AVG	

Conducted Emission Test Data

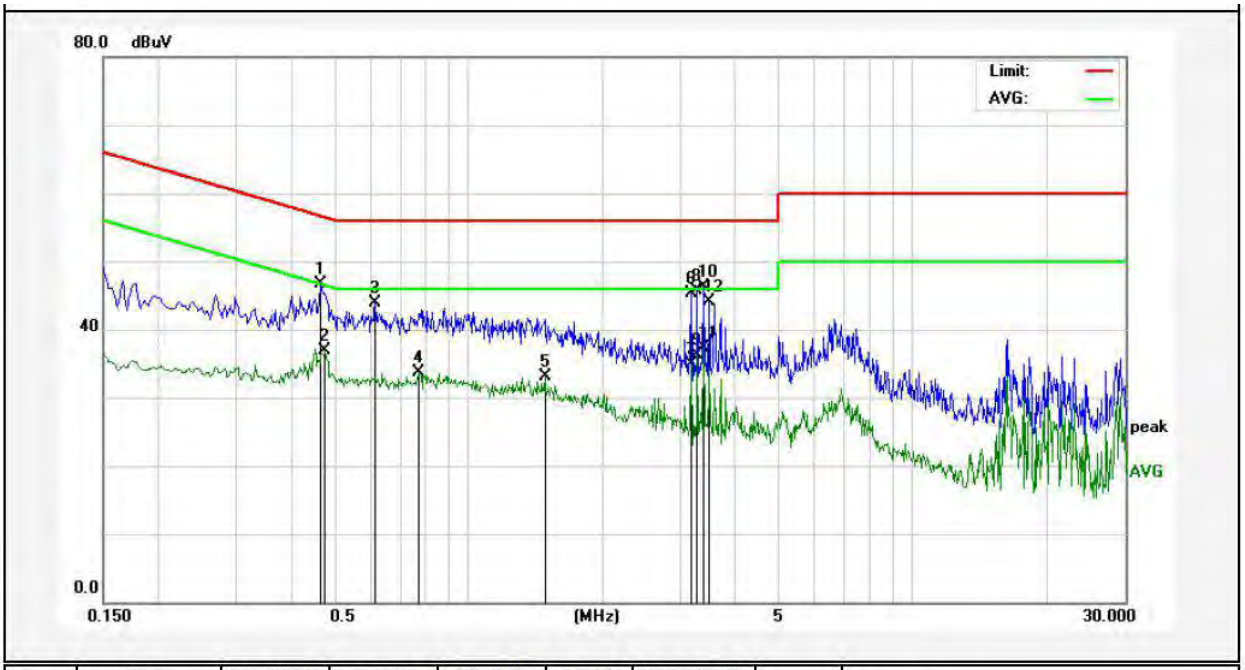
Test Site: 1# Shielded Room
Operating Condition: TX+Charging mode
Test Specification: AC 240V, 60Hz via adapter
Comment: Live Line
Tem.:25.4℃ Hum.:54%



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Over Limit (dB)	Detector	Remark
1	0.4660	29.74	17.96	47.70	56.58	-8.88	QP	
2	0.4660	21.35	17.96	39.31	46.58	-7.27	AVG	
3	0.7780	16.59	18.06	34.65	46.00	-11.35	AVG	
4	3.1220	25.52	18.16	43.68	56.00	-12.32	QP	
5	3.2260	27.70	18.16	45.86	56.00	-10.14	QP	
6	3.2260	16.60	18.16	34.76	46.00	-11.24	AVG	
7	3.3300	28.30	18.17	46.47	56.00	-9.53	QP	
8	3.3300	18.45	18.17	36.62	46.00	-9.38	AVG	
9	3.4340	28.99	18.17	47.16	56.00	-8.84	QP	
10	3.4340	18.93	18.17	37.10	46.00	-8.90	AVG	
11	3.6460	25.49	18.17	43.66	56.00	-12.34	QP	
12	3.6460	16.33	18.17	34.50	46.00	-11.50	AVG	

Conducted Emission Test Data

Test Site: 1# Shielded Room
Operating Condition: TX+Charging mode
Test Specification: AC 240V, 60Hz via adapter
Comment: Neutral Line
Tem.:25.4℃ Hum.:54%



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Over Limit (dB)	Detector	Remark
1	0.4660	28.81	17.96	46.77	56.58	-9.81	QP	
2	0.4740	19.03	17.97	37.00	46.44	-9.44	AVG	
3	0.6140	25.82	18.01	43.83	56.00	-12.17	QP	
4	0.7740	15.67	18.06	33.73	46.00	-12.27	AVG	
5	1.4819	14.91	18.13	33.04	46.00	-12.96	AVG	
6	3.1619	27.17	18.16	45.33	56.00	-10.67	QP	
7	3.1619	16.82	18.16	34.98	46.00	-11.02	AVG	
8	3.2659	27.51	18.17	45.68	56.00	-10.32	QP	
9	3.2659	18.10	18.17	36.27	46.00	-9.73	AVG	
10	3.3700	28.15	18.17	46.32	56.00	-9.68	QP	
11	3.3700	19.11	18.17	37.28	46.00	-8.72	AVG	
12	3.4740	25.92	18.17	44.09	56.00	-11.91	QP	

4. Radiation Spurious Emission and Band Edge

4.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.209, 15.205 and 15.407				
Test Limit	Frequency (MHz)	Field strength (microvolt/meter)	Limit (dBuV/m)	Remark	Measurement distance (m)
	0.009MHz~0.490MHz	2400/F(kHz)	-	-	300
	0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
	1.705MHz-30MHz	30	-	-	30
	30MHz~88MHz	100	40.0	Quasi-peak	3
	88MHz~216MHz	150	43.5	Quasi-peak	3
	216MHz~960MHz	200	46.0	Quasi-peak	3
	960MHz~1000MHz	500	54.0	Quasi-peak	3
	Above 1000MHz	500	54.0	Average	3
		-	68.2	Peak	3

Remark:

(1)The lower limit shall apply at the transition frequency.

(2) 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.

(3)Above 1GHz limit:E[dBμV/m] = EIRP[dBm] + 95.2=68.2 dBuV/m, for EIPR[dBm]=-27dBm.

4.2. Test Setup

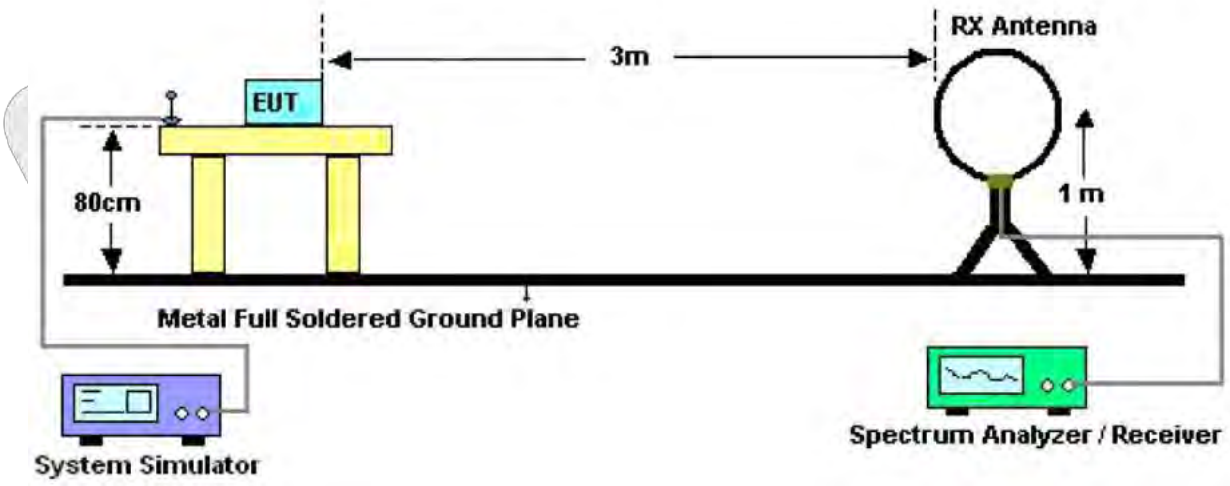


Figure 1. Below 30MHz

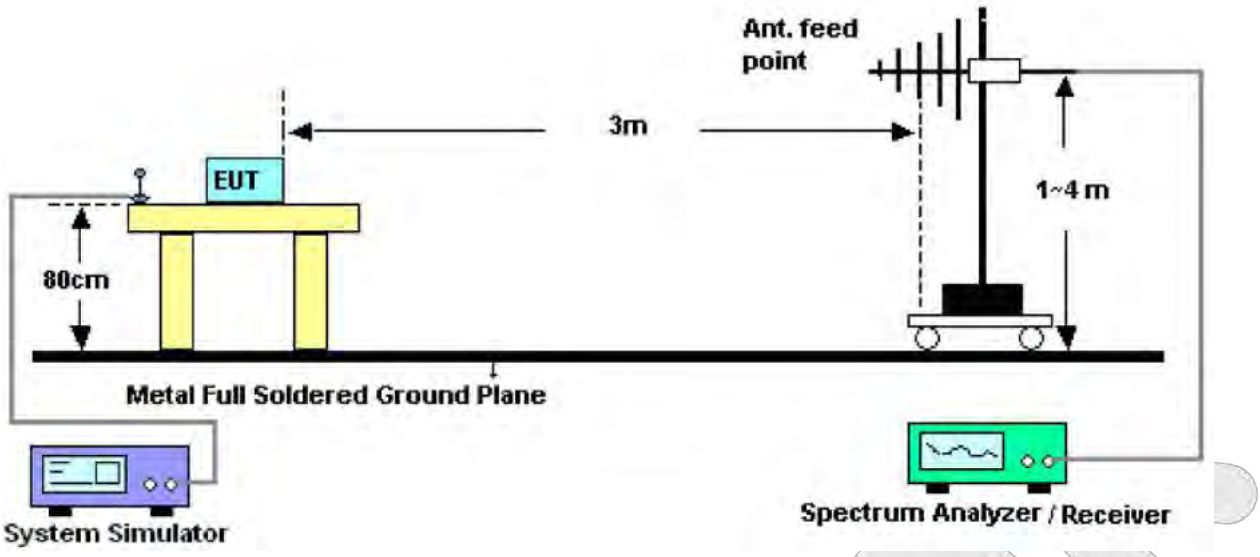


Figure 2. 30MHz to 1GHz

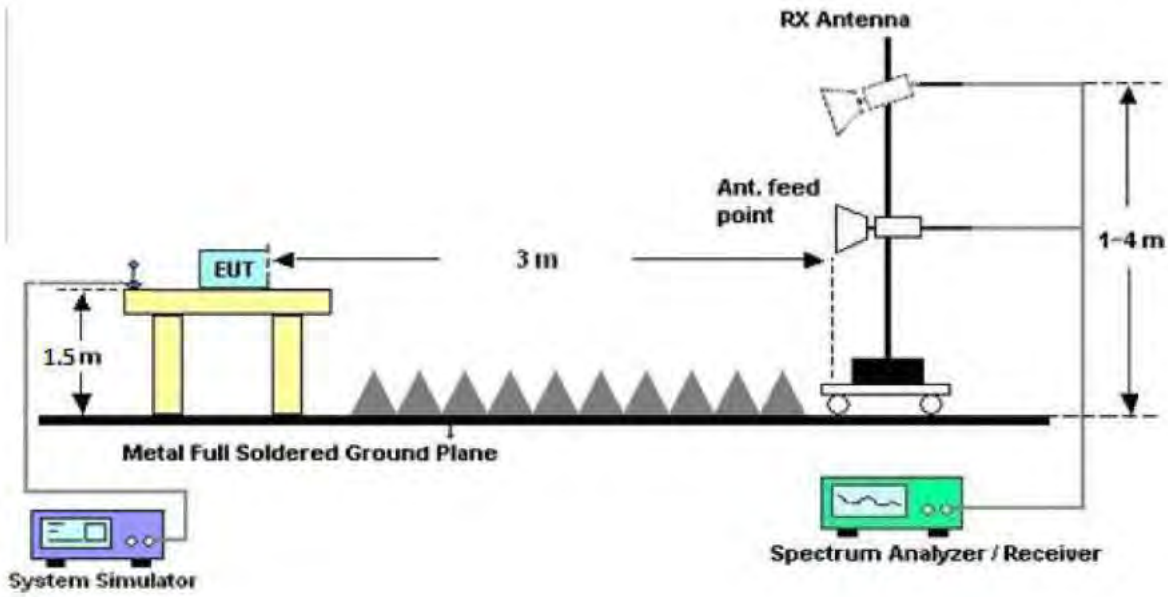


Figure 3. Above 1 GHz

4.3. Test Procedure

For below 1GHz: The EUT is placed on a turntable, which is 0.8m above the ground plane.

For above 1GHz: The EUT is placed on a turntable, which is 1.5m above the ground plane.

The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT is set 3 meters away from the receiving antenna which is mounted on a antenna tower. The antenna can be moved up and down from 1 to 4 meters to find out the maximum emission level. Rotated the EUT through three orthogonal axes to determine the maximum emissions, both horizontal and vertical polarization of the antenna are set on test. The EUT is tested in 9*6*6 Chamber. The device is evaluated in xyz orientation.

For the radiated emission test above 1GHz:

Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying

aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.

For 9kHz to 150kHz, Set the spectrum analyzer as:
RBW = 200Hz, VBW =1kHz, Detector= Quasi-Peak, Trace mode= Max hold, Sweep- auto couple.

For 150kHz to 30MHz, Set the spectrum analyzer as:
RBW = 9KHz, VBW =30kHz, Detector= Quasi-Peak, Trace mode= Max hold, Sweep- auto couple.

For 30MHz to 1000MHz, Set the spectrum analyzer as:
RBW = 100kHz, VBW =300kHz, Detector= Quasi-Peak, Trace mode= Max hold, Sweep- auto couple.
.
For above 1GHz, Set the spectrum analyzer as:
RBW =1MHz, VBW =1MHz, Detector= Peak, Trace mode= Max hold, Sweep- auto couple.
RBW =1MHz, VBW =10Hz, Detector= Average, Trace mode= Max hold, Sweep- auto couple.

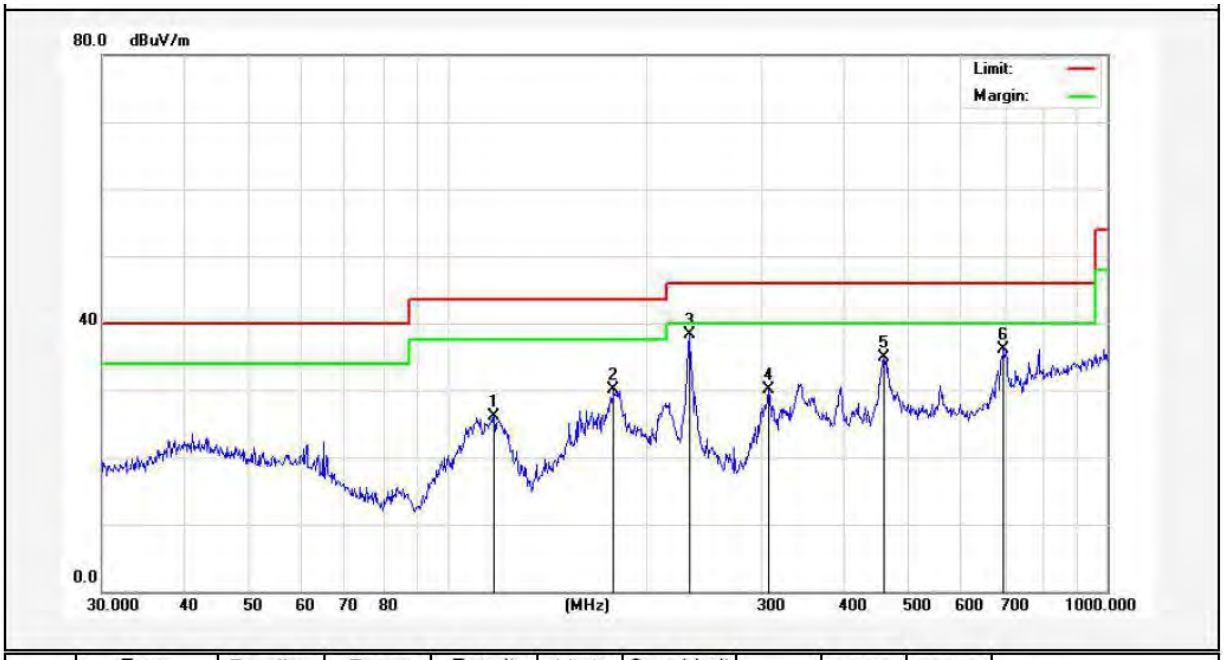
4.4. Test Data

PASS

The test results of 9kHz-30MHz was attenuated more than 20dB below the permissible limits, so the results don't record in the report.

Test Results (30~1000MHz)

Job No.:	SZAWW180123006-02	Temp.(℃)/Hum.(%RH):	23.2℃/53.4%RH
Standard:	FCC PART 15C	Power Source:	AC 120V, 60Hz via adapter
Test Mode:	TX+Charging mode	Polarization:	Horizontal



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	117.7725	41.27	-15.18	26.09	43.50	-17.41	QP	300	16	
2	178.7584	44.01	-13.81	30.20	43.50	-13.30	QP	300	77	
3	232.5318	50.39	-12.18	38.21	46.00	-7.79	QP	300	152	
4	306.7537	41.05	-10.87	30.18	46.00	-15.82	QP	300	167	
5	459.1144	40.95	-6.10	34.85	46.00	-11.15	QP	300	212	
6	696.8567	38.58	-2.56	36.02	46.00	-9.98	QP	300	267	

Test Results (30~1000MHz)

Job No.:	SZAWW180123006-02	Temp.(℃)/Hum.(%RH):	23.2℃/53.4%RH
Standard:	FCC PART 15C	Power Source:	AC 120V, 60Hz via adapter
Test Mode:	TX+Charging mode	Polarization:	Vertical

No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	37.0248	40.12	-8.98	31.14	40.00	-8.86	QP	300	33	
2	97.7983	40.35	-8.97	31.38	43.50	-12.12	QP	300	121	
3	117.3602	46.28	-9.14	37.14	43.50	-6.36	QP	300	157	
4	154.2786	40.28	-11.14	29.14	43.50	-14.36	QP	300	214	
5	232.5318	39.59	-7.80	31.79	46.00	-14.21	QP	300	263	
6	455.9058	37.77	-5.91	31.86	46.00	-14.14	QP	300	297	

Test mode:	IEEE 802.11a	Test channel:	Low CH

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Pol.
10360.00	41.09	31.98	17.08	33.91	56.24	68.20	-11.96	V
15540.00	38.37	32.65	20.03	34.85	56.20	68.20	-12.00	V
10360.00	38.38	31.98	17.08	33.91	53.53	68.20	-14.67	H
15540.00	38.56	32.65	20.03	34.85	56.39	68.20	-11.81	H

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Pol.
10360.00	31.80	31.98	17.08	33.91	46.95	54.00	-7.05	V
15540.00	30.56	32.65	20.03	34.85	48.39	54.00	-5.61	V
10360.00	29.88	31.98	17.08	33.91	45.03	54.00	-8.97	H
15540.00	29.65	32.65	20.03	34.85	47.48	54.00	-6.52	H

Test mode:	IEEE 802.11a	Test channel:	Mid CH

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Pol.
10400.00	42.68	32.44	17.18	33.91	58.39	68.20	-9.81	V
15600.00	38.94	32.78	20.12	34.86	56.98	68.20	-11.22	V
10400.00	38.89	32.44	17.18	33.91	54.60	68.20	-13.60	H
15600.00	39.96	32.78	20.12	34.86	58.00	68.20	-10.20	H

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Pol.
10400.00	31.81	32.44	17.18	33.91	47.52	54.00	-6.48	V
15600.00	30.35	32.78	20.12	34.86	48.39	54.00	-5.61	V
10400.00	30.74	32.44	17.18	33.91	46.45	54.00	-7.55	H
15600.00	30.44	32.78	20.12	34.86	48.48	54.00	-5.52	H

Test mode:	IEEE 802.11a	Test channel:	High CH

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Pol.
10480.00	42.37	32.59	18.02	33.92	59.06	68.20	-9.14	V
15720.00	38.37	32.87	20.15	34.88	56.51	68.20	-11.69	V
10480.00	39.36	32.59	18.02	33.92	56.05	68.20	-12.15	H
15720.00	38.36	32.87	20.15	34.88	56.50	68.20	-11.70	H

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Pol.
10480.00	32.11	32.59	18.02	33.92	48.80	54.00	-5.20	V
15720.00	30.74	32.87	20.15	34.88	48.88	54.00	-5.12	V
10480.00	30.10	32.59	18.02	33.92	46.79	54.00	-7.21	H
15720.00	31.28	32.87	20.15	34.88	49.42	54.00	-4.58	H

Test mode:	IEEE 802.11n(HT20)	Test channel:	Low CH

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Pol.
10360.00	42.19	31.98	17.08	33.91	57.34	68.20	-10.86	V
15540.00	37.01	32.65	20.03	34.85	54.84	68.20	-13.36	V
10360.00	38.90	31.98	17.08	33.91	54.05	68.20	-14.15	H
15540.00	38.20	32.65	20.03	34.85	56.03	68.20	-12.17	H

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Pol.
10360.00	31.71	31.98	17.08	33.91	46.86	54.00	-7.14	V
15540.00	30.72	32.65	20.03	34.85	48.55	54.00	-5.45	V
10360.00	31.05	31.98	17.08	33.91	46.20	54.00	-7.80	H
15540.00	30.39	32.65	20.03	34.85	48.22	54.00	-5.78	H

Test mode:	IEEE 802.11n(HT20)	Test channel:	Mid CH

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Pol.
10400.00	41.83	32.44	17.18	33.91	57.54	68.20	-10.66	V
15600.00	37.19	32.78	20.12	34.86	55.23	68.20	-12.97	V
10400.00	37.12	32.44	17.18	33.91	52.83	68.20	-15.37	H
15600.00	38.32	32.78	20.12	34.86	56.36	68.20	-11.84	H

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Pol.
10400.00	32.39	32.44	17.18	33.91	48.10	54.00	-5.90	V
15600.00	30.58	32.78	20.12	34.86	48.62	54.00	-5.38	V
10400.00	29.22	32.44	17.18	33.91	44.93	54.00	-9.07	H
15600.00	31.29	32.78	20.12	34.86	49.33	54.00	-4.67	H

Test mode:	IEEE 802.11n(HT20)	Test channel:	High CH

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Pol.
10480.00	42.21	32.59	18.02	33.92	58.90	68.20	-9.30	V
15720.00	37.92	32.87	20.15	34.88	56.06	68.20	-12.14	V
10480.00	39.74	32.59	18.02	33.92	56.43	68.20	-11.77	H
15720.00	39.25	32.87	20.15	34.88	57.39	68.20	-10.81	H

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Pol.
10480.00	31.36	32.59	18.02	33.92	48.05	54.00	-5.95	V
15720.00	30.28	32.87	20.15	34.88	48.42	54.00	-5.58	V
10480.00	30.34	32.59	18.02	33.92	47.03	54.00	-6.97	H
15720.00	30.25	32.87	20.15	34.88	48.39	54.00	-5.61	H

Test mode:	IEEE 802.11n(ac20)	Test channel:	Low CH

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Pol.
10360.00	41.99	31.98	17.08	33.91	57.14	68.20	-11.06	V
15540.00	38.05	32.65	20.03	34.85	55.88	68.20	-12.32	V
10360.00	38.62	31.98	17.08	33.91	53.77	68.20	-14.43	H
15540.00	39.35	32.65	20.03	34.85	57.18	68.20	-11.02	H

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Pol.
10360.00	32.91	31.98	17.08	33.91	48.06	54.00	-5.94	V
15540.00	29.45	32.65	20.03	34.85	47.28	54.00	-6.72	V
10360.00	29.84	31.98	17.08	33.91	44.99	54.00	-9.01	H
15540.00	28.20	32.65	20.03	34.85	46.03	54.00	-7.97	H

Test mode:	IEEE 802.11n(ac20)	Test channel:	Mid CH

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Pol.
10400.00	42.53	32.44	17.18	33.91	58.24	68.20	-9.96	V
15600.00	39.72	32.78	20.12	34.86	57.76	68.20	-10.44	V
10400.00	38.82	32.44	17.18	33.91	54.53	68.20	-13.67	H
15600.00	39.84	32.78	20.12	34.86	57.88	68.20	-10.32	H

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Pol.
10400.00	32.06	32.44	17.18	33.91	47.77	54.00	-6.23	V
15600.00	31.57	32.78	20.12	34.86	49.61	54.00	-4.39	V
10400.00	29.58	32.44	17.18	33.91	45.29	54.00	-8.71	H
15600.00	29.65	32.78	20.12	34.86	47.69	54.00	-6.31	H

Test mode:	IEEE 802.11n(ac20)	Test channel:	High CH

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Pol.
10480.00	42.87	32.59	18.02	33.92	59.56	68.20	-8.64	V
15720.00	39.45	32.87	20.15	34.88	57.59	68.20	-10.61	V
10480.00	39.95	32.59	18.02	33.92	56.64	68.20	-11.56	H
15720.00	37.55	32.87	20.15	34.88	55.69	68.20	-12.51	H

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Pol.
10480.00	31.11	32.59	18.02	33.92	47.80	54.00	-6.20	V
15720.00	30.52	32.87	20.15	34.88	48.66	54.00	-5.34	V
10480.00	30.49	32.59	18.02	33.92	47.18	54.00	-6.82	H
15720.00	30.59	32.87	20.15	34.88	48.73	54.00	-5.27	H

Test mode:	IEEE 802.11n(HT40)	Test channel:	Low CH

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Pol.
10380.00	41.96	31.98	17.08	33.91	57.11	68.20	-11.09	V
15570.00	37.94	32.65	20.03	34.85	55.77	68.20	-12.43	V
10380.00	39.76	31.98	17.08	33.91	54.91	68.20	-13.29	H
15570.00	38.72	32.65	20.03	34.85	56.55	68.20	-11.65	H

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Pol.
10380.00	32.48	31.98	17.08	33.91	47.63	54.00	-6.37	V
15570.00	29.27	32.65	20.03	34.85	47.10	54.00	-6.90	V
10380.00	29.94	31.98	17.08	33.91	45.09	54.00	-8.91	H
15570.00	30.94	32.65	20.03	34.85	48.77	54.00	-5.23	H

Test mode:	IEEE 802.11n(HT40)	Test channel:	High CH

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Pol.
10460.00	42.39	32.59	18.02	33.92	59.08	68.20	-9.12	V
15690.00	37.06	32.87	20.15	34.88	55.20	68.20	-13.00	V
10460.00	39.85	32.59	18.02	33.92	56.54	68.20	-11.66	H
15690.00	38.20	32.87	20.15	34.88	56.34	68.20	-11.86	H

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Pol.
10460.00	32.39	32.59	18.02	33.92	49.08	54.00	-4.92	V
15690.00	31.48	32.87	20.15	34.88	49.62	54.00	-4.38	V
10460.00	29.92	32.59	18.02	33.92	46.61	54.00	-7.39	H
15690.00	29.38	32.78	20.12	34.86	47.42	54.00	-6.58	H

Test mode:	IEEE 802.11ac(HT40)	Test channel:	Low CH

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Pol.
10380.00	41.09	31.98	17.08	33.91	56.24	68.20	-11.96	V
15570.00	38.94	32.65	20.03	34.85	56.77	68.20	-11.43	V
10380.00	37.20	31.98	17.08	33.91	52.35	68.20	-15.85	H
15570.00	37.53	32.65	20.03	34.85	55.36	68.20	-12.84	H

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Pol.
10380.00	32.76	31.98	17.08	33.91	47.91	54.00	-6.09	V
15570.00	29.82	32.65	20.03	34.85	47.65	54.00	-6.35	V
10380.00	30.14	31.98	17.08	33.91	45.29	54.00	-8.71	H
15570.00	30.70	32.65	20.03	34.85	48.53	54.00	-5.47	H

Test mode:	IEEE 802.11ac(HT40)	Test channel:	High CH

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Pol.
10460.00	42.40	32.59	18.02	33.92	59.09	68.20	-9.11	V
15690.00	39.75	32.87	20.15	34.88	57.89	68.20	-10.31	V
10460.00	37.28	32.59	18.02	33.92	53.97	68.20	-14.23	H
15690.00	37.51	32.87	20.15	34.88	55.65	68.20	-12.55	H

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Pol.
10460.00	32.95	32.59	18.02	33.92	49.64	54.00	-4.36	V
15690.00	31.53	32.87	20.15	34.88	49.67	54.00	-4.33	V
10460.00	30.23	32.59	18.02	33.92	46.92	54.00	-7.08	H
15690.00	31.79	32.78	20.12	34.86	49.83	54.00	-4.17	H

Note:

1. Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor

Radiated Band Edge:

Test Mode: 802.11a								
Peak Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
5150.00	41.91	28.65	13.58	31.04	53.10	68.20	-15.10	H
5350.00	41.48	29.16	14.68	31.96	53.36	68.20	-14.84	H
5150.00	41.79	28.65	13.58	31.04	52.98	68.20	-15.22	V
5350.00	41.54	29.16	14.68	31.96	53.42	68.20	-14.78	V
Average Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
5150.00	35.68	28.65	13.58	31.04	46.87	54.00	-7.13	H
5350.00	35.17	29.16	14.68	31.96	47.05	54.00	-6.95	H
5150.00	34.41	28.65	13.58	31.04	45.60	54.00	-8.40	V
5350.00	35.93	29.16	14.68	31.96	47.81	54.00	-6.19	V

Test Mode: 802.11n20								
Peak Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
5150.00	41.45	28.65	13.58	31.04	52.64	68.20	-15.56	H
5350.00	41.23	29.16	14.68	31.96	53.11	68.20	-15.09	H
5150.00	41.73	28.65	13.58	31.04	52.92	68.20	-15.28	V
5350.00	42.77	29.16	14.68	31.96	54.65	68.20	-13.55	V
Average Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
5150.00	34.93	28.65	13.58	31.04	46.12	54.00	-7.88	H
5350.00	34.25	29.16	14.68	31.96	46.13	54.00	-7.87	H
5150.00	34.67	28.65	13.58	31.04	45.86	54.00	-8.14	V
5350.00	34.76	29.16	14.68	31.96	46.64	54.00	-7.36	V

Test Mode: 802.11n40								
Peak Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
5150.00	42.40	28.65	13.58	31.04	53.59	68.20	-14.61	H
5350.00	41.39	29.16	14.68	31.96	53.27	68.20	-14.93	H
5150.00	41.35	28.65	13.58	31.04	52.54	68.20	-15.66	V
5350.00	41.79	29.16	14.68	31.96	53.67	68.20	-14.53	V
Average Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
5150.00	35.51	28.65	13.58	31.04	46.70	54.00	-7.30	H
5350.00	35.44	29.16	14.68	31.96	47.32	54.00	-6.68	H
5150.00	35.29	28.65	13.58	31.04	46.48	54.00	-7.52	V
5350.00	35.35	29.16	14.68	31.96	47.23	54.00	-6.77	V

Test Mode: 802.11ac20								
Peak Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
5150.00	42.31	28.65	13.58	31.04	53.50	68.20	-14.70	H
5350.00	42.86	29.16	14.68	31.96	54.74	68.20	-13.46	H
5150.00	41.07	28.65	13.58	31.04	52.26	68.20	-15.94	V
5350.00	41.09	29.16	14.68	31.96	52.97	68.20	-15.23	V
Average Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
5150.00	34.15	28.65	13.58	31.04	45.34	54.00	-8.66	H
5350.00	34.20	29.16	14.68	31.96	46.08	54.00	-7.92	H
5150.00	35.39	28.65	13.58	31.04	46.58	54.00	-7.42	V
5350.00	34.57	29.16	14.68	31.96	46.45	54.00	-7.55	V

Test Mode: 802.11ac40								
Peak Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
5150.00	41.25	28.65	13.58	31.04	52.44	68.20	-15.76	H
5350.00	42.37	29.16	14.68	31.96	54.25	68.20	-13.95	H
5150.00	41.54	28.65	13.58	31.04	52.73	68.20	-15.47	V
5350.00	43.41	29.16	14.68	31.96	55.29	68.20	-12.91	V
Average Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
5150.00	33.47	28.65	13.58	31.04	44.66	54.00	-9.34	H
5350.00	34.61	29.16	14.68	31.96	46.49	54.00	-7.51	H
5150.00	33.62	28.65	13.58	31.04	44.81	54.00	-9.19	V
5350.00	35.01	29.16	14.68	31.96	46.89	54.00	-7.11	V

For conducted test:

Ant 1

802.11a: Band Edge, Left Side

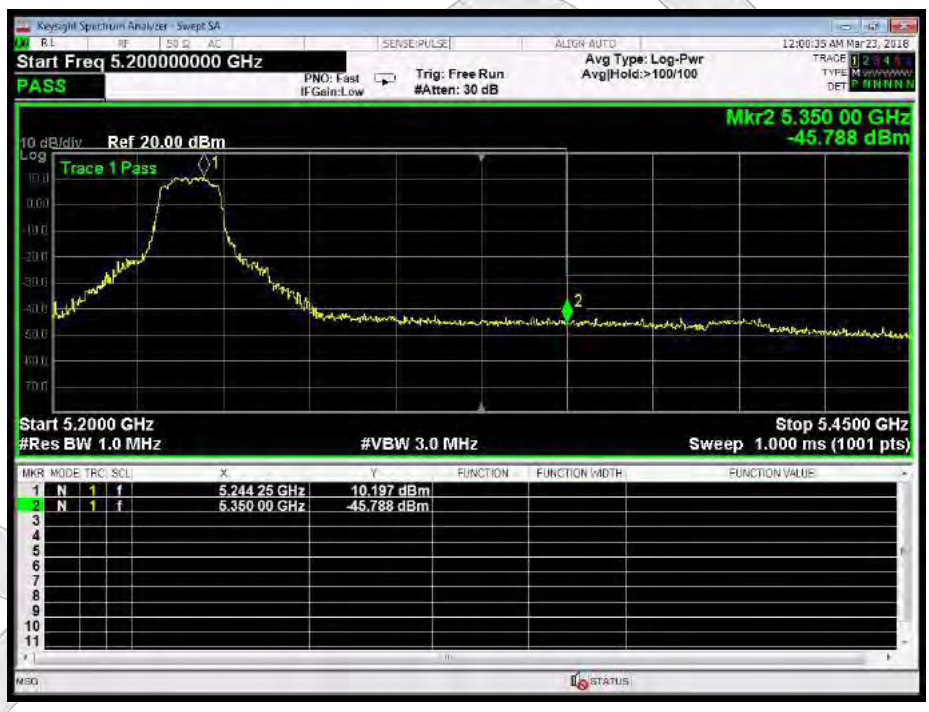
802.11a: Band Edge, Right Side

802.11n(20): Band Edge, Left Side

802.11n(20): Band Edge, Right Side

802.11ac(20): Band Edge, Left Side

802.11ac(20): Band Edge, Right Side



802.11n(40): Band Edge, Left Side

802.11n(40): Band Edge, Right Side

802.11ac(40): Band Edge, Left Side

802.11ac(40): Band Edge, Right Side

Ant 2

802.11a: Band Edge, Left Side

802.11a: Band Edge, Right Side

802.11n(20): Band Edge, Left Side

802.11n(20): Band Edge, Right Side

802.11ac(20): Band Edge, Left Side

802.11ac(20): Band Edge, Right Side

802.11n(40): Band Edge, Left Side

802.11n(40): Band Edge, Right Side

802.11ac(40): Band Edge, Left Side

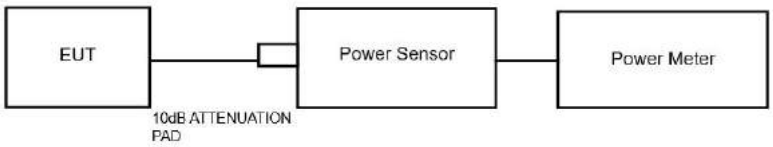
802.11ac(40): Band Edge, Right Side

5. Maximum Peak Output Power Test

5.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.407 (a)(1) (3)
Test Limit	24dBm for client device,30 dBm for an indoor access point

5.2. Test Setup



5.3. Test Procedure

1. The Transmitter output (antenna port) was connected to the power meter.
2. Turn on the EUT and power meter and then record the power value.
3. Repeat above procedures on all channels needed to be tested.

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

5.4. Test Data

Test Item	:	Max. peak output power	Test Mode	:	CH Low ~ CH High
Test Voltage	:	AC 120V, 60Hz via adapter	Temperature	:	24℃
Test Result	:	PASS	Humidity	:	55%RH

for client device

Ant 1

Mode	Channel Frequency (MHz)	Peak Power output (dBm)	Limit (dBm)	Results
802.11a	5180	12.56	24.00	PASS
	5200	12.36	24.00	PASS
	5240	12.69	24.00	PASS
802.11n20	5180	12.58	24.00	PASS
	5200	12.11	24.00	PASS
	5240	12.47	24.00	PASS
802.11n40	5190	11.98	24.00	PASS
	5230	11.69	24.00	PASS
802.11ac20	5180	11.88	24.00	PASS
	5200	11.59	24.00	PASS
	5240	11.99	24.00	PASS
802.11ac40	5190	12.02	24.00	PASS
	5230	12.04	24.00	PASS

Ant 2

Mode	Channel Frequency (MHz)	Peak Power output (dBm)	Limit (dBm)	Results
802.11a	5180	12.55	24.00	PASS
	5200	12.54	24.00	PASS
	5240	12.46	24.00	PASS
802.11n20	5180	12.77	24.00	PASS
	5200	12.39	24.00	PASS
	5240	12.12	24.00	PASS
802.11n40	5190	12.05	24.00	PASS
	5230	11.98	24.00	PASS
802.11ac20	5180	11.93	24.00	PASS
	5200	11.28	24.00	PASS
	5240	11.34	24.00	PASS
802.11ac40	5190	11.29	24.00	PASS
	5230	11.20	24.00	PASS

MIMO

Mode	Channel Frequency (MHz)	Peak Power output (dBm)	Limit (dBm)	Results
802.11a	5180	15.57	24.00	PASS
	5200	15.46	24.00	PASS
	5240	15.59	24.00	PASS
802.11n20	5180	15.69	24.00	PASS
	5200	15.26	24.00	PASS
	5240	15.31	24.00	PASS
802.11n40	5190	15.03	24.00	PASS
	5230	14.85	24.00	PASS
802.11ac20	5180	14.92	24.00	PASS
	5200	14.45	24.00	PASS
	5240	14.69	24.00	PASS
802.11ac40	5190	14.68	24.00	PASS
	5230	14.65	24.00	PASS

for an indoor access point

Ant 1

Mode	Channel Frequency (MHz)	Peak Power output (dBm)	Limit (dBm)	Results
802.11a	5180	15.23	30.00	PASS
	5200	**15.87**	30.00	PASS
	5240	15.33	30.00	PASS
802.11n20	5180	14.85	30.00	PASS
	5200	15.12	30.00	PASS
	5240	14.75	30.00	PASS
802.11n40	5190	15.16	30.00	PASS
	5230	14.98	30.00	PASS
802.11ac20	5180	14.23	30.00	PASS
	5200	14.68	30.00	PASS
	5240	14.98	30.00	PASS
802.11ac40	5190	15.21	30.00	PASS
	5230	15.46	30.00	PASS

Ant 2

Mode	Channel Frequency (MHz)	Peak Power output (dBm)	Limit (dBm)	Results
802.11a	5180	15.55	30.00	PASS
	5200	14.99	30.00	PASS
	5240	**15.69**	30.00	PASS
802.11n20	5180	14.88	30.00	PASS
	5200	15.46	30.00	PASS
	5240	14.70	30.00	PASS
802.11n40	5190	14.88	30.00	PASS
	5230	14.91	30.00	PASS
802.11ac20	5180	14.85	30.00	PASS
	5200	14.61	30.00	PASS
	5240	14.90	30.00	PASS
802.11ac40	5190	15.36	30.00	PASS
	5230	15.49	30.00	PASS

MIMO

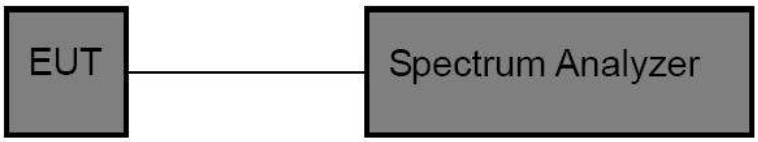
Mode	Channel Frequency (MHz)	Peak Power output (dBm)	Limit (dBm)	Results
802.11a	5180	18.40	30.00	PASS
	5200	18.46	30.00	PASS
	5240	**18.52**	30.00	PASS
802.11n20	5180	17.88	30.00	PASS
	5200	18.30	30.00	PASS
	5240	17.74	30.00	PASS
802.11n40	5190	18.03	30.00	PASS
	5230	17.96	30.00	PASS
802.11ac20	5180	17.56	30.00	PASS
	5200	17.66	30.00	PASS
	5240	17.95	30.00	PASS
802.11ac40	5190	18.30	30.00	PASS
	5230	18.49	30.00	PASS

6. Occupy Bandwidth Test

6.1. Test Standard

Test Standard	FCC Part15 C Section 15.407 (a)(5)

6.2. Test Setup



6.3. Test Procedure

1. Place the EUT on the table and set it in the transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

3. Set the spectrum analyzer as:

26 dB &99%bandwidth

RBW = approximately 1% of the emission bandwidth;
Set the VBW＞RBW;
Detector= Peak
Trace mode= Max hold.
Sweep- auto couple.

6 dB bandwidth

RBW = 100kHz;
Set the video bandwidth (VBW) ≥ 3 RBW;
Detector= Peak
Trace mode= Max hold.
Sweep- auto couple.

4. Measure the maximum width of the emission that is 26dB /6dB down from the maximum of the emission. Compare this with the RBW setting of the analyzer.

5. Repeat until all the rest channels are investigated.

6.4. Test Data

Test Item	:	6dB &26dB BW	Test Mode	:	CH Low ~ CH High
Test Voltage	:	AC 120V, 60Hz via adapter	Temperature	:	24℃
Test Result	:	PASS	Humidity	:	55%RH

Ant 1

Mode	Channel Frequency (MHz)	6dB BW(MHz)	Limit	Results
802.11a	5180	15.16	>0.5MHz	PASS
	5200	15.15		PASS
	5240	15.15		PASS
802.11n20	5180	15.16		PASS
	5200	15.04		PASS
	5240	15.15		PASS
802.11ac20	5180	13.87		PASS
	5200	15.09		PASS
	5240	15.07		PASS
802.11ac40	5190	35.07		PASS
	5230	35.14		PASS
802.11n40	5190	35.16		PASS
	5230	35.20		PASS

Mode	Channel Frequency (MHz)	26dB BW(MHz)	99%Bandwidth (MHz)
802.11a	5180	25.79	16.826
	5200	26.94	16.920
	5240	29.32	17.081
802.11n20	5180	27.19	18.118
	5200	27.33	17.981
	5240	28.28	18.105
802.11ac20	5180	26.40	17.958
	5200	26.45	18.005
	5240	28.31	18.210
802.11ac40	5190	46.86	36.322
	5230	49.88	36.372
802.11n40	5190	47.86	36.352
	5230	49.09	36.285

Ant 2

Mode	Channel Frequency (MHz)	6dB BW(MHz)	Limit	Results
802.11a	5180	15.04	>0.5MHz	PASS
	5200	15.17		PASS
	5240	15.17		PASS
802.11n20	5180	15.07		PASS
	5200	15.11		PASS
	5240	13.92		PASS
802.11ac20	5180	15.06		PASS
	5200	15.09		PASS
	5240	13.92		PASS
802.11ac40	5190	33.96		PASS
	5230	33.91		PASS
802.11n40	5190	35.12		PASS
	5230	35.20		PASS

Mode	Channel Frequency (MHz)	26dB BW(MHz)	99%Bandwidth (MHz)
802.11a	5180	25.78	16.940
	5200	26.75	16.849
	5240	26.34	16.862
802.11n20	5180	25.11	17.879
	5200	25.87	17.959
	5240	27.54	18.071
802.11ac20	5180	26.34	17.942
	5200	27.37	18.058
	5240	26.00	18.044
802.11ac40	5190	46.60	36.304
	5230	47.07	36.291
802.11n40	5190	49.57	36.484
	5230	47.97	36.309

6dB Bandwidth

ANT 1

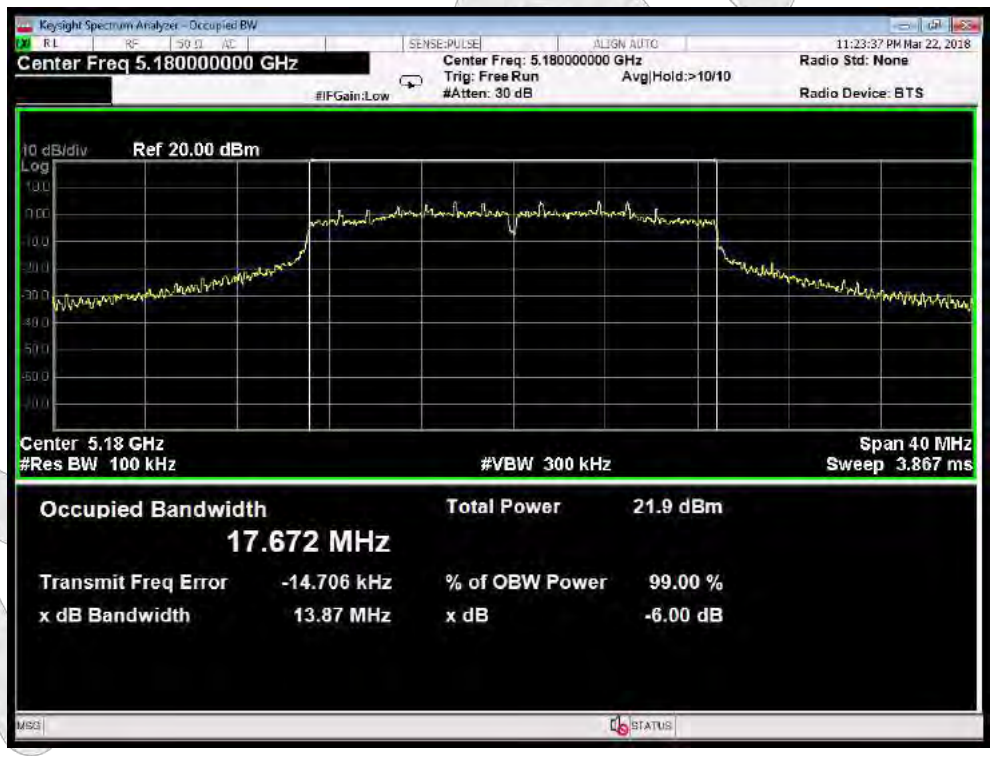
Test Mode: 802.11n20---Low

Test Mode: 802.11n20---Middle

Test Mode: 802.11n20---High

Test Mode: 802.11n40--Low

Test Mode: 802.11n40---High

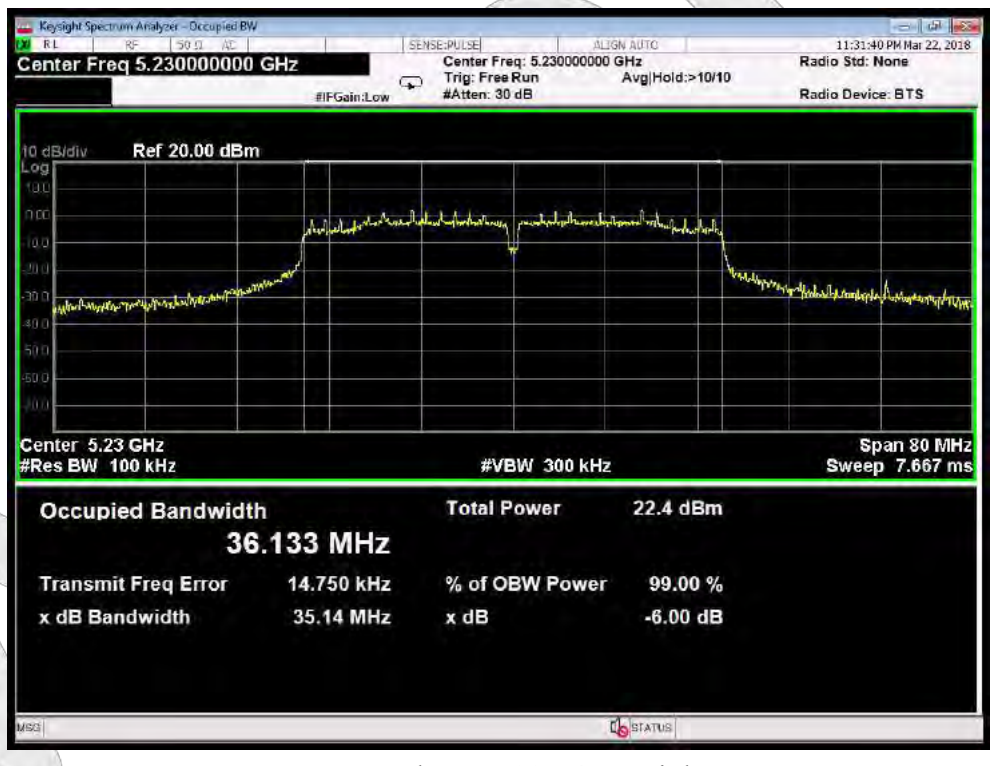


Test Mode: 802.11ac20--Low

Test Mode: 802.11ac20---Middle

Test Mode: 802.11ac20---High

Test Mode: 802.11ac40---Low



Test Mode: 802.11ac40---High

Test Mode: 802.11a---Low

Test Mode: 802.11a---Middle

Test Mode: 802.11a---High

6dB Bandwidth

ANT 2

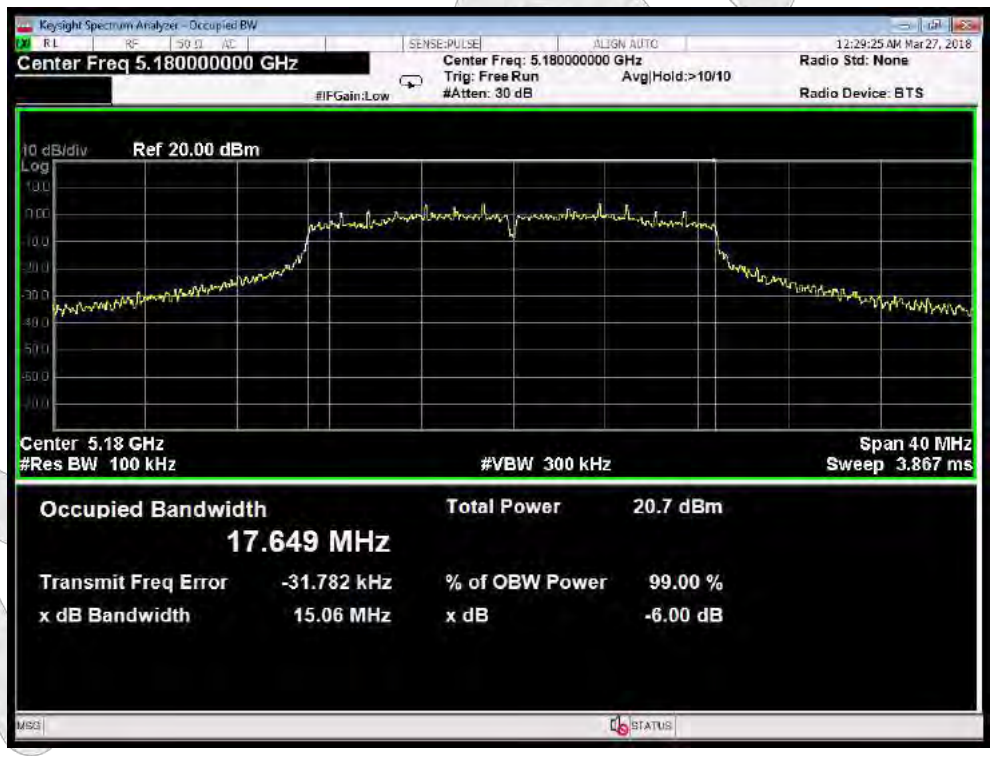
Test Mode: 802.11n20---Low

Test Mode: 802.11n20---Middle

Test Mode: 802.11n20---High

Test Mode: 802.11n40--Low

Test Mode: 802.11n40---High



Test Mode: 802.11ac20--Low

Test Mode: 802.11ac20---Middle

Test Mode: 802.11ac20---High

Test Mode: 802.11ac40---Low

Test Mode: 802.11ac40---High

Test Mode: 802.11a---Low

Test Mode: 802.11a---Middle

Test Mode: 802.11a---High

26dB &99% Bandwidth

ANT 1

Test Mode: 802.11n20---Low

Test Mode: 802.11n20---Middle

Test Mode: 802.11n20---High

Test Mode: 802.11n40---Low

Test Mode: 802.11n40--High

Test Mode: 802.11ac20--Low

Test Mode: 802.11ac20---Middle

Test Mode: 802.11ac20---High

Test Mode: 802.11ac40---Low

Test Mode: 802.11ac40---High

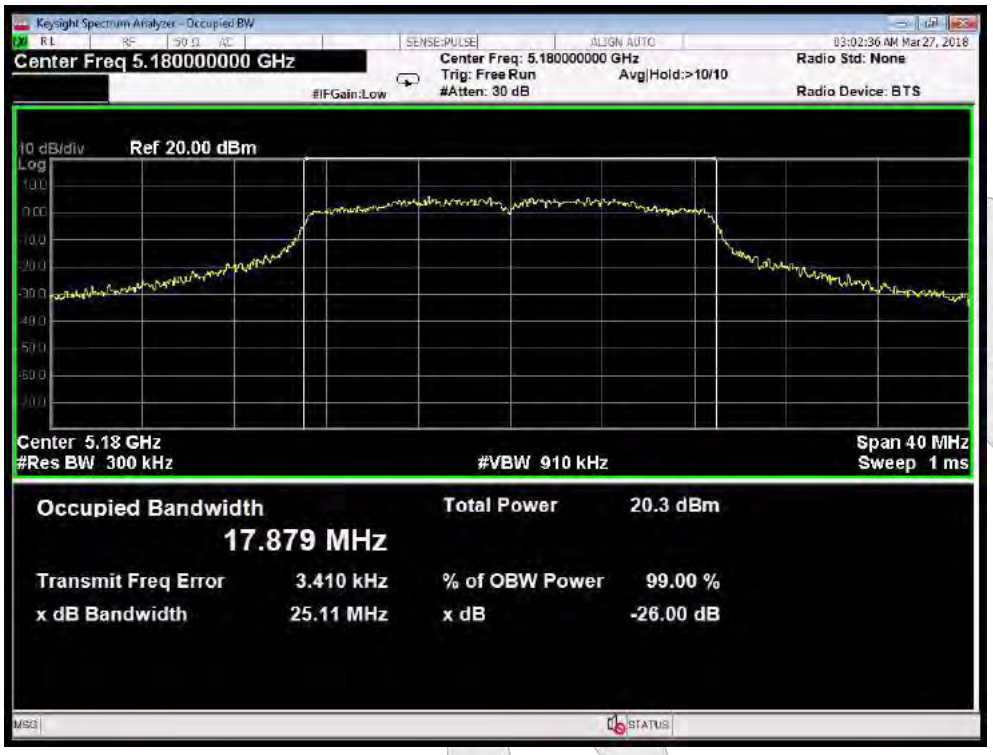
Test Mode: 802.11a---Low

Test Mode: 802.11a---Middle

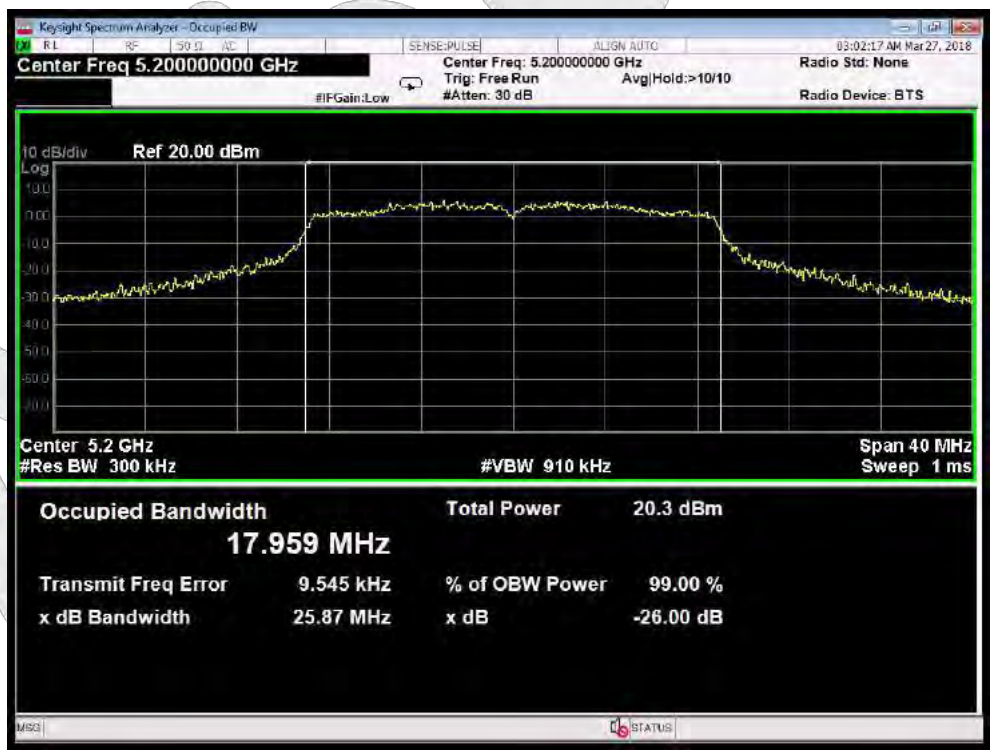
Test Mode: 802.11a---High

26dB &99% Bandwidth

ANT 2



Test Mode: 802.11n20---Low



Test Mode: 802.11n20---Middle

Test Mode: 802.11n20---High

Test Mode: 802.11n40---Low

Test Mode: 802.11n40--High

Test Mode: 802.11ac20--Low

Test Mode: 802.11ac20---Middle

Test Mode: 802.11ac20---High

Test Mode: 802.11ac40---Low

Test Mode: 802.11ac40---High

Test Mode: 802.11a---Low

Test Mode: 802.11a---Middle

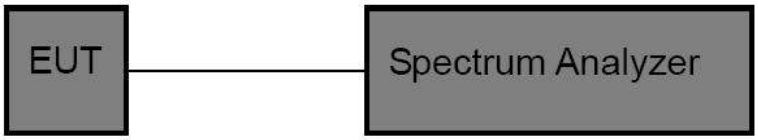
Test Mode: 802.11a---High

7. Power Spectral Density Test

7.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.407 (a) (1) (2) (3)
Test Limit	11dBm for client device,17 dBm for an indoor access point

7.2. Test Setup



7.3. Test Procedure

For devices operating in the bands 5.15-5.25 GHz, 5.25-5.35 GHz, and 5.47-5.725 GHz, the above procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference bandwidth specified in § 15.407(a)(5). For devices operating in the band 5.725-5.85 GHz, the rules specify a measurement bandwidth of 500 kHz. Many spectrum analyzers do not have 500 kHz RBW, thus a narrower RBW may need to be used. The rules permit the use of a RBWs less than 1 MHz, or 500 kHz, "provided that the measured power is integrated over the full reference bandwidth" to show the total power over the specified measurement bandwidth (i.e., 1 MHz, or 500 kHz).

1. The EUT is directly connected to the spectrum analyzer;
2. Set RBW =1MHz;
3. Set VBW ≥ 3 RBW=3MHz;
3. Set the span to encompass the entire emissions bandwidth (EBW) of the signal;
5. Detector=RMS;
6. Sweep time= auto couple;
7. Trace mode=max. hold;

7.4. Test Data

Test Item	:	Power Spectral Density	Test Mode	:	CH Low ~ CH High
Test Voltage	:	AC 120V, 60Hz via adapter	Temperature	:	24℃
Test Result	:	PASS	Humidity	:	55%RH

for client device

ANT 1

Mode	Channel Frequency (MHz)	Final Power Spectral Density (dBm)	Limit	Results
802.11n20	5180	2.211	11dBm	PASS
	5200	2.768		PASS
	5240	2.084		PASS
802.11ac20	5180	3.518		PASS
	5200	4.097		PASS
	5240	3.223		PASS
802.11ac40	5190	0.214		PASS
	5230	0.533		PASS
802.11n40	5190	0.414		PASS
	5230	0.953		PASS
802.11a	5180	4.224		PASS
	5200	4.324		PASS
	5240	3.812		PASS

ANT 2

Mode	Channel Frequency (MHz)	Final Power Spectral Density (dBm)	Limit	Results
802.11n20	5180	3.200	11dBm	PASS
	5200	3.166		PASS
	5240	3.727		PASS
802.11ac20	5180	3.705		PASS
	5200	4.281		PASS
	5240	3.524		PASS
802.11ac40	5190	0.290		PASS
	5230	0.498		PASS
802.11n40	5190	0.537		PASS
	5230	0.441		PASS
802.11a	5180	3.705		PASS
	5200	4.281		PASS
	5240	3.524		PASS

MIMO

Mode	Channel Frequency (MHz)	Final Power Spectral Density (dBm)	Limit	Results
802.11n20	5180	5.74	11dBm	PASS
	5200	5.98		PASS
	5240	5.99		PASS
802.11ac20	5180	6.62		PASS
	5200	7.20		PASS
	5240	6.39		PASS
802.11ac40	5190	3.26		PASS
	5230	3.53		PASS
802.11n40	5190	3.49		PASS
	5230	3.71		PASS
802.11a	5180	6.98		PASS
	5200	7.31		PASS
	5240	6.68		PASS

for an indoor access point

ANT 1

Mode	Channel Frequency (MHz)	Final Power Spectral Density (dBm)	Limit	Results
802.11n20	5180	6.114	17dBm	PASS
	5200	6.169		PASS
	5240	6.603		PASS
802.11ac20	5180	6.127		PASS
	5200	7.508		PASS
	5240	6.337		PASS
802.11ac40	5190	3.327		PASS
	5230	3.231		PASS
802.11n40	5190	2.663		PASS
	5230	3.264		PASS
802.11a	5180	6.065		PASS
	5200	6.898		PASS
	5240	7.315		PASS

ANT 2

Mode	Channel Frequency (MHz)	Final Power Spectral Density (dBm)	Limit	Results
802.11n20	5180	6.471	17dBm	PASS
	5200	6.953		PASS
	5240	6.897		PASS
802.11ac20	5180	6.734		PASS
	5200	7.430		PASS
	5240	7.292		PASS
802.11ac40	5190	3.272		PASS
	5230	3.432		PASS
802.11n40	5190	2.603		PASS
	5230	3.497		PASS
802.11a	5180	6.615		PASS
	5200	6.984		PASS
	5240	6.939		PASS

MIMO

Mode	Channel Frequency (MHz)	Final Power Spectral Density (dBm)	Limit	Results
802.11n20	5180	9.31	17dBm	PASS
	5200	9.59		PASS
	5240	9.76		PASS
802.11ac20	5180	9.45		PASS
	5200	10.48		PASS
	5240	9.85		PASS
802.11ac40	5190	6.31		PASS
	5230	6.34		PASS
802.11n40	5190	5.64		PASS
	5230	6.39		PASS
802.11a	5180	9.36		PASS
	5200	9.95		PASS
	5240	10.14		PASS

client

ANT 1

Test Mode: 802.11n20---Low

Test Mode: 802.11n20---Middle

Test Mode: 802.11n20---High

Test Mode: 802.11n40--Low

Test Mode: 802.11n40---High

Test Mode: 802.11ac20--Low

Test Mode: 802.11ac20---Middle

Test Mode: 802.11ac20---High

Test Mode: 802.11ac40---Low

Test Mode: 802.11ac40---High

Test Mode: 802.11a---Low

Test Mode: 802.11a---Middle

Test Mode: 802.11a---High

ANT 2

Test Mode: 802.11n20---Low

Test Mode: 802.11n20---Middle

Test Mode: 802.11n20---High

Test Mode: 802.11n40--Low

Test Mode: 802.11n40---High

Test Mode: 802.11ac20--Low

Test Mode: 802.11ac20---Middle

Test Mode: 802.11ac20---High

Test Mode: 802.11ac40---Low

Test Mode: 802.11ac40---High

Test Mode: 802.11a---Low

Test Mode: 802.11a---Middle

Test Mode: 802.11a---High

AP

ANT 1

Test Mode: 802.11n20---Low

Test Mode: 802.11n20---Middle

Test Mode: 802.11n20---High

Test Mode: 802.11n40--Low

Test Mode: 802.11n40---High

Test Mode: 802.11ac20--Low

Test Mode: 802.11ac20---Middle

Test Mode: 802.11ac20---High

Test Mode: 802.11ac40---Low

Test Mode: 802.11ac40---High

Test Mode: 802.11a---Low

Test Mode: 802.11a---Middle

Test Mode: 802.11a---High

ANT 2

Test Mode: 802.11n20---Low

Test Mode: 802.11n20---Middle

Test Mode: 802.11n20---High

Test Mode: 802.11n40--Low

Test Mode: 802.11n40---High

Test Mode: 802.11ac20--Low

Test Mode: 802.11ac20---Middle

Test Mode: 802.11ac20---High

Test Mode: 802.11ac40---Low

Test Mode: 802.11ac40---High

Test Mode: 802.11a---Low

Test Mode: 802.11a---Middle

Test Mode: 802.11a---High

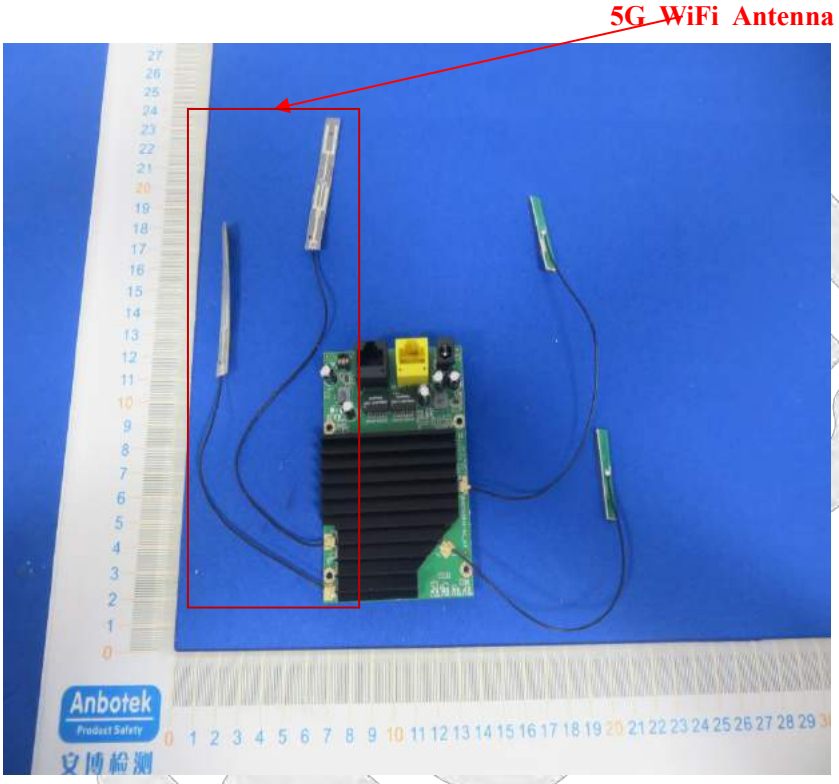
8. Antenna Requirement

8.1. Test Standard and Requirement

Test Standard	FCC Part15 Section 15.203 /15.407
Requirement	1) 15.203 requirement: 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, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. 2) 15.407 requirement: 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 manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

8.2. Antenna Connected Construction

The WIFI antenna is a PIFA Antenna which permanently attached, and the best case gain of the antenna is 2 dBi. It complies with the standard requirement.



APPENDIX I -- TEST SETUP PHOTOGRAPH

Please see the test report of SZAWW180123006-01

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APPENDIX II -- EXTERNAL PHOTOGRAPH

Please see the test report of SZAWW180123006-01

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APPENDIX III -- INTERNAL PHOTOGRAPH

Please see the test report of SZAWW180123006-01

End of Report