TEST REPORT

FCC ID:2AR8Q-UBG3

Product	:	**5.8G 900Mbps Outdoor CPE**
Model Name	:	**UBG3102-900, UBG3102-900H, UBG3302-900H**
Brand	:	**UTEPO**
Report No.	:	**NCT23049063E**

Prepared for

SHENZHEN UTEPO Tech Co. Ltd

Room No.2604, Desay Technology Building, No.9789 Shennan Avenue, Nanshan Dist, Shenzhen, Guangdong, China

Prepared by

Shenzhen NCT Testing Technology Co., Ltd.

A101&2F B2, Fuqiao 6th Area, Xintian Community, Fuhai Street, Baoan District, Shenzhen, People's Republic of China

TEL: 400-8868-419

FAX: 86-755-27790922

1 TEST RESULT CERTIFICATION

Applicant’s name	:	SHENZHEN UTEPO Tech Co. Ltd
Address	:	Room No.2604, Desay Technology Building, No.9789 Shennan Avenue, Nanshan Dist, Shenzhen, Guangdong, China
Manufacture's name	:	SHENZHEN UTEPO TECH LTD
Address	:	C2301, Block BC, Union R&D Center, Longteng Community, Xixiang Street, Bao'an District, Shenzhen, Guangdong, China
Product name	:	5.8G 900Mbps Outdoor CPE
Model name	:	UBG3102-900, UBG3102-900H, UBG3302-900H
Standards	:	FCC CFR Title 47 Part 15 Subpart C Section 15.407 ANSI C63.10:2013 KDB 789033 D02 v02r01
Test procedure	:	ANSI C63.10:2013
Test Date	:	Dec. 10, 2023 to Dec. 27, 2023
Date of Issue	:	Dec. 28, 2023
Test Result	:	Pass

This device described above has been tested by NCT, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

This report shall not be reproduced except in full, without the written approval of NCT, this document may be altered or revised by NCT, personal only, and shall be noted in the revision of the document.

Test Engineer:

Keven Wu / Engineer

Technical Manager:

Henry Wang / Manager

Contents

Page

1 TEST RESULT CERTIFICATION 2
2 TEST SUMMARY 5
3 TEST FACILITY 6
4 GENERAL INFORMATION 7
4.1 General Description of E.U.T. 7
4.2 Test Setup Configuration 11
4.3 Test Mode 11
5 EQUIPMENT DURING TEST 12
5.1 Equipments List 12
5.2 Measurement Uncertainty 14
5.3 Description of Support Units 14
6 CONDUCTED EMISSION 15
6.1 E.U.T. Operation 15
6.2 EUT Setup 15
6.3 Test SET-UP (Block Diagram of Configuration) 16
6.4 Measurement Procedure: 16
6.5 Conducted Emission Limit 16
6.6 Measurement Description 16
6.7 Conducted Emission Test Result 16
7 RADIATED SPURIOUS EMISSIONS 19
7.1 EUT Operation 19
7.2 Test Setup 20
7.3 Spectrum Analyzer Setup 21
7.4 Test Procedure 22
7.5 Summary of Test Results 23
8 POWER SPECTRAL DENSITY TEST 32
8.1 Test Standard and Limit 32
8.2 Test Setup 33
8.3 Test Procedure 33

8.4 TEST DATA 34
9 26DB & 6DB & 99% EMISSION BANDWIDTH TEST 35
9.1 TEST STANDARD 35
9.2 TEST SETUP 35
9.3 TEST PROCEDURE 35
9.4 TEST DATA 36
10 MAXIMUM CONDUCTED OUTPUT POWER 37
10.1 TEST STANDARD AND LIMIT 37
10.2 TEST SETUP 37
10.3 TEST PROCEDURE 37
10.4 TEST DATA 40
11 OUT OF BAND EMISSIONS AND SPURIOUS EMISSION 41
11.1 TEST STANDARD AND LIMIT 41
11.2 TEST SETUP 41
11.3 TEST PROCEDURE 41
11.4 TEST DATA 42
12 FREQUENCY STABILITY MEASUREMENT 47
12.1 TEST STANDARD AND LIMIT 47
12.2 TEST SETUP 47
12.3 TEST PROCEDURE 47
12.4 TEST DATA 48
13 ANTENNA REQUIREMENT 50
13.1 TEST STANDARD AND REQUIREMENT 50
13.2 ANTENNA CONNECTED CONSTRUCTION 50
14 TEST SETUP & EUT PHOTOGRAPH 51

2 Test Summary

FCC Part15 (15.407) , Subpart E			
Standard Section	Test Item	Judgment	Remark
15.407(b), 15.209	Radiated Spurious Emission	PASS	
15.207	Conducted Emission	PASS	
15.407 (a) 15.407 (e)	99% , 6dB and 26dB Bandwidth	PASS	
15.407 (a)	Maximum Conducted Output Power	PASS	
15.407(b)	Band Edge	PASS	
15.407 (a)	Power Spectral Density	PASS	
15.407(g)	Frequency Stability	PASS	
15.203	Antenna Requirement	PASS	

Remark:

1. "N/A" denotes test is not applicable in this Test Report.

3 TEST FACILITY

Site Description

EMC Lab. : Accredited by CNAS, 2022-09-27

The certificate is valid until 2028.01.07

The Laboratory has been assessed and proved to be in compliance with CNAS-CL01:2006 (identical to ISO/IEC 17025:2017)

The Certificate Registration Number is L8251

Designation Number: CN1347

Test Firm Registration Number: 894804

Accredited by A2LA, June 14, 2023

The Certificate Registration Number is 6837.01

Accredited by Industry Canada, November 09, 2018

The Conformity Assessment Body Identifier is CN0150

Company Number: 30806

Name of Firm : Shenzhen NCT Testing Technology Co., Ltd.

Site Location : A101&2F B2, Fuqiao 6th Area, Xintian Community, Fuhai Street, Baoan District, Shenzhen, People's Republic of China

4 General Information

4.1 General Description of E.U.T.

Product Name:	5.8G 900Mbps Outdoor CPE
Model No.:	UBG3102-900, UBG3102-900H, UBG3302-900H
Model different:	All the same except the model number.
Sample ID	23049063-001#
Sample(s) Status:	Engineer sample
Operation Frequency:	WIFI 5.8G:5725MHz~5850MHz
Modulation type:	802.11a(OFDM): BPSK,QPSK,16-QAM,64-QAM 802.11n(OFDM): BPSK,QPSK,16-QAM,64-QAM 802.11ac(OFDM): BPSK,QPSK,16-QAM,64-QAM,256-QAM
Antenna Type:	Internal Antenna
Antenna gain:	1.2 dBi
Power supply	DC 24V from Adapter
Adapter information	Model:GRT-POE20-240050 Input:AC 100-240V 0.5A Max 50/60Hz Ouput:24Vdc, 0.5A
Hardware Version:	V1.0
Software Version:	V1.0
Remark:	The MIMO mode only support Internal antennaA and Internal antennaB the 802.11n/ac mode, the Directional Gain=1.2dBi+10log(2)=4.2dBi.
Remark:	the Antenna gain is provided by customer from Antenna spec. and the laboratory will not be responsible for the accumulated calculation results which covers the information provided by the applicant.

802.11a/ac/n(20 MHz) Frequency Channel							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
149	5745	153	5765	157	5785	161	5805
165	5825	-	-	-	-	-	-

802.11ac/n(40MHz) Frequency Channel					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
151	5755	159	5795	-	-

802.11ac(80MHz) Frequency Channel	
Channel	Frequency (MHz)
155	5775

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.

Description		
Pretest Mode	Channel	Band 4
Mode 1	802.11a/n/acHT20	CH149, CH157, CH165
Mode 2	802.11n/acHT40	CH151, CH159
Mode 3	802.11acHT80	CH155
Mode 4	Link Mode	
Mode 5	MIMO Mode(802.11n/acHT20)	CH149, CH157, CH165
Mode 6	MIMO Mode(802.11n/acHT40)	CH151, CH159
Mode 7	MIMO Mode(802.11acHT80)	CH155

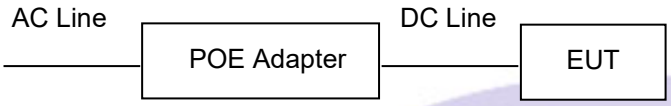
For Conducted Emission	
Final Test Mode	Description
Other	Link Mode

For Radiated Emission		
Pretest Mode	Channel	Band 4
Mode 1	802.11a/n/acHT20	CH149, CH157, CH165
Mode 2	802.11n/acHT40	CH151, CH159
Mode 3	802.11acHT80	CH155
Mode 4	Link Mode	
Mode 5	MIMO Mode(802.11n/acHT20)	CH149, CH157, CH165
Mode 6	MIMO Mode(802.11n/acHT40)	CH151, CH159
Mode 7	MIMO Mode(802.11acHT80)	CH155

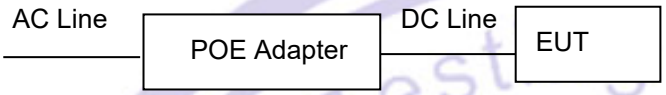
Note: 1. The measurements are performed at the highest, middle, lowest available channels.
2. During the test, the test voltage was tuned from 85% to 115% of the nominal rated supply voltage, and found that the worst case was under the nominal rated supply condition. So the report just shows that condition's data.

4.2 Test Setup Configuration

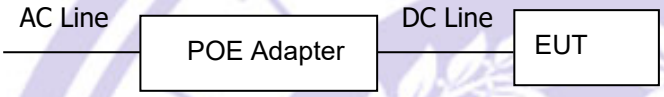
Conducted Emission



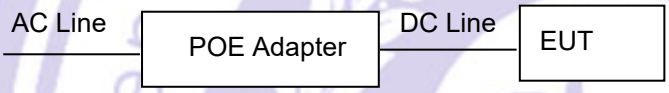
Radiated Emission(30MHz-1GHz)



Radiated Emission(above 1GHz)



Conducted Spurious



4.3 Test Mode

Transmitting mode	Keep the EUT in continuously transmitting mode.
Remark: During the test, the test voltage was tuned from 85% to 115% of the nominal rated supply voltage, and found that the worst case was under the nominal rated supply condition. So the report just shows that condition's data.	

5 Equipment During Test

5.1 Equipments List

Conducted emission Test Equipment

Name	Model No.	Serial No.	Manufacturer	Date of Cal.	Due Date
944 Shielded Room	944 Room	/	EMToni	2022/5/31	2025/5/30
EMI Test Receiver	ESPI	101604	Rohde & Schwarz	2023/6/21	2024/6/20
LISN	ENV 216	102796	Rohde & Schwarz	2023/6/21	2024/6/20
LISN	VN1-13S	004023	CRANAGE	2023/6/21	2024/6/20
Cable	RG223-1500MM	NA	RG	2023/6/21	2024/6/20

Radiated emission & Radio Frequency Test Equipment

Name	Model No.	Serial No.	Manufacturer	Date of Cal.	Due Date
966 Shielded Room	966 Room	/	EMToni	2022/5/31	2025/5/30
EMI Test Receiver	ESCI	101178	Rohde & Schwarz	2023/6/21	2024/6/20
Amplifi（30MHz-1GHz）	BBV 9743 B	00374	SCHNWARZBECK	2023/6/21	2024/6/20
Bilog Antenna（30MHz-1GHz）	VULB9162	00473	SCHNWARZBECK	2023/3/19	2025/3/18
Horn antenna（1GHz-18GHz）	BBHA 9120 D	02622	SCHNWARZBECK	2023/3/19	2025/3/18
Pream plifier（1GHz-18GHz）	BBV 9718D	0024	SCHNWARZBECK	2023/6/21	2024/6/20
Spectrum Analyze（10Hz-40GHz）	FSV 40	100952	Rohde & Schwarz	2023/6/21	2024/6/20
Pream plifier（18GHz-40GHz）	BBV 9721	0056	SCHNWARZBECK	2023/6/21	2024/6/20
Double Ridge Guide Horn Antenna（18GHz-40GHz）	SAS-574	588	A.H.System	2023/3/19	2025/3/18
Loop Antenna (9KHz-30MHz)	FMZB 1513-60	00115	SCHNWARZBECK	2023/6/21	2024/6/20
Amplifier (9KHz-30MHz)	BBV 9745	00109	CHNWARZBECK	2023/6/21	2024/6/20

MXG Signal Analyzer	N9020A	MY50510202	Agilent	2023/6/21	2024/6/20
MXG Vector Signal Generator	N5182A	MY50140020	Agilent	2023/6/21	2024/6/20
MXG Analog Signal Generator	N5181A	MY47420919	Agilent	2023/6/21	2024/6/20
Power Sensor	TR1029-2	512364	Techoy	2023/6/21	2024/6/20
RF Swith	TR1029-1	512364	Techoy	2023/6/21	2024/6/20
Cable	DA800-4000MM	NA	DA	2023/6/21	2024/6/20
Cable	DA800-11000MM	NA	DA	2023/6/21	2024/6/20

Other

Item	Name	Manufacturer	Model	Software version
1	EMC Conduction Test System	AUDIX	e3	6.120718
2	EMC radiation test system	AUDIX	e3	6.120718
3	RF test system	TACHOY	RFTest	V1.0.0
4	RF communication test system	TACHOY	RFTest	V1.0.0

5.2 Measurement Uncertainty

Parameter	Uncertainty
RF output power, conducted	±1.0dB
Power Spectral Density, conducted	±2.2dB
Radio Frequency	± 1 x 10^{-6}
Bandwidth	± 1.5 x 10^{-6}
Time	±2%
Duty Cycle	±2%
Temperature	±1°C
Humidity	±5%
DC and low frequency voltages	±3%
Conducted Emissions (150kHz~30MHz)	±3.64dB
Radiated Emission(9KHz~30MHz)	±4.51dB
Radiated Emission(30MHz~1GHz)	±5.03dB
Radiated Emission(1GHz~25GHz)	±4.74dB
Radiated Emission(25GHz~40GHz)	±3.38dB
Remark: The coverage Factor (k=2), and measurement Uncertainty for a level of Confidence of 95%	

5.3 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Note
E-1	5.8G 900Mbps Outdoor CPE	UTEPO	UBG3102-900	N/A	EUT

Note:

(1) The support equipment was authorized by Declaration of Confirmation.

(2) For detachable type I/O cable should be specified the length in cm in『Length』column.

6 Conducted Emission

Test Requirement:	:	FCC CFR 47 Part 15 Section 15.207
Test Method:	:	ANSI C63.10:2013
Test Result:	:	PASS
Frequency Range:	:	150kHz to 30MHz
Class/Severity:	:	Class B
Detector:	:	Peak for pre-scan (9kHz Resolution Bandwidth)

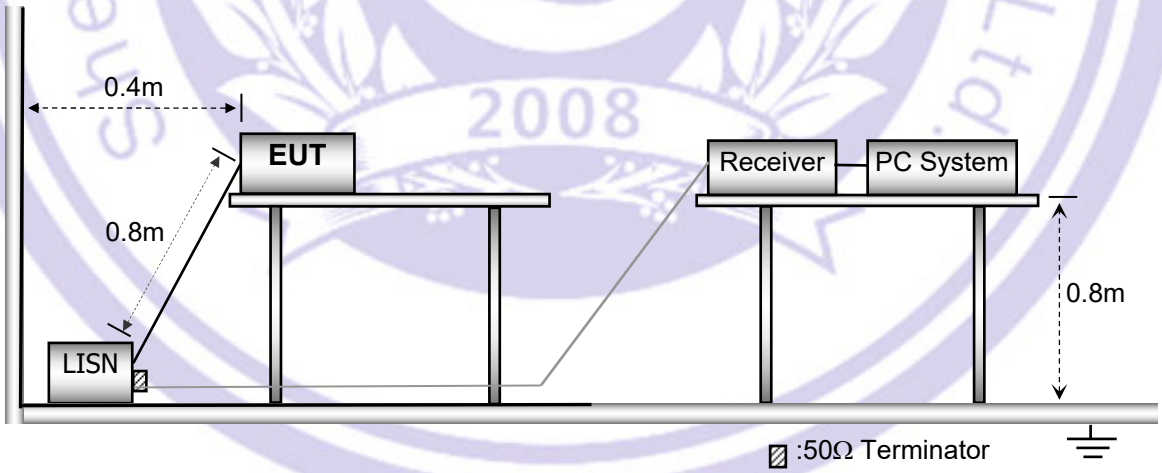
6.1 E.U.T. Operation

Operating Environment **:**

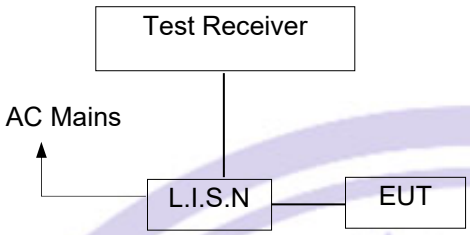
Temperature:	:	23.2°C
Humidity:	:	51 % RH
Atmospheric Pressure:	:	101.12 kPa
Test Voltage	:	AC 120V/60Hz

6.2 EUT Setup

The conducted emission tests were performed using the setup accordance with the ANSI C63.10: 2013



6.3 Test SET-UP (Block Diagram of Configuration)



6.4 Measurement Procedure:

1. The EUT was placed on a table, which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured was complete.

6.5 Conducted Emission Limit

Conducted Emission

Frequency(MHz)	Quasi-peak	Average
0.15-0.5	66-56	56-46
0.5-5.0	56	46
5.0-30.0	60	50

Note:

1. The lower limit shall apply at the transition frequencies
2.The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

6.6 Measurement Description

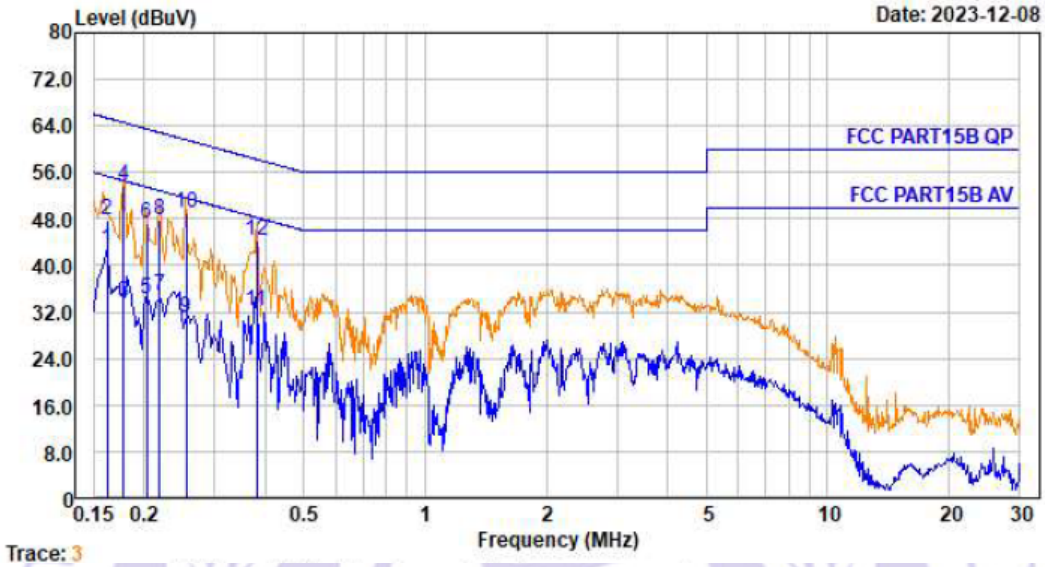
The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

6.7 Conducted Emission Test Result

Pass

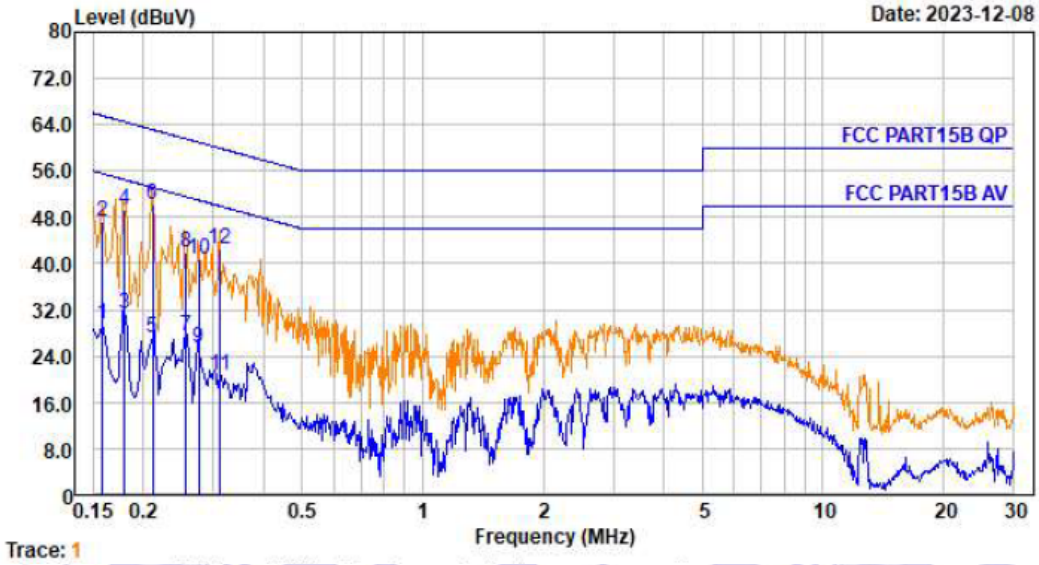
Conducted emission at both 120V & 240V is assessed, and emission at 120V represents the worst case. All the modulation modes were tested the data of the worst mode (802.11a,Lowest channel) are recorded in the following pages and the others modulation methods do not exceed the limits.

Temperature:	26°C	Relative Humidity:	54%
Pressure:	101kPa	Phase :	L
Test Voltage :	DC 24V from Adapter input AC 120V/60Hz		



No.	Freq MHz	Cable Loss dB	LISN Factor dB/m	Receiver Reading dBuV	Emission Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark
1.	0.162	0.00	9.54	33.37	42.91	55.34	-12.43	Average
2.	0.162	0.00	9.54	38.31	47.85	65.34	-17.49	QP
3.	0.178	0.00	9.55	24.22	33.77	54.59	-20.82	Average
4.	0.178	0.00	9.55	44.20	53.75	64.59	-10.84	QP
5.	0.203	0.01	9.55	24.69	34.25	53.49	-19.24	Average
6.	0.203	0.01	9.55	37.60	47.16	63.49	-16.33	QP
7.	0.219	0.01	9.55	25.24	34.80	52.88	-18.08	Average
8.	0.219	0.01	9.55	38.20	47.76	62.88	-15.12	QP
9.	0.255	0.01	9.56	21.44	31.01	51.60	-20.59	Average
10.	0.255	0.01	9.56	39.39	48.96	61.60	-12.64	QP
11.	0.381	0.01	9.56	22.69	32.26	48.25	-15.99	Average
12.	0.381	0.01	9.56	34.61	44.18	58.25	-14.07	QP

Temperature:	26°C	Relative Humidity:	54%
Pressure:	101kPa	Phase :	N
Test Voltage :	DC 24V from Adapter input AC 120V/60Hz		



No.	Freq MHz	Cable Loss dB	LISN Factor dB/m	Receiver Reading dBuV	Emission Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark
1.	0.158	0.00	9.53	20.03	29.56	55.56	-26.00	Average
2.	0.158	0.00	9.53	37.71	47.24	65.56	-18.32	QP
3.	0.180	0.01	9.54	21.85	31.40	54.50	-23.10	Average
4.	0.180	0.01	9.54	39.70	49.25	64.50	-15.25	QP
5.	0.212	0.01	9.55	17.61	27.17	53.14	-25.97	Average
6.	0.212	0.01	9.55	40.60	50.16	63.14	-12.98	QP
7.	0.256	0.01	9.56	17.84	27.41	51.56	-24.15	Average
8.	0.256	0.01	9.56	32.39	41.96	61.56	-19.60	QP
9.	0.276	0.01	9.56	15.95	25.52	50.94	-25.42	Average
10.	0.276	0.01	9.56	31.30	40.87	60.94	-20.07	QP
11.	0.312	0.01	9.56	10.95	20.52	49.93	-29.41	Average
12.	0.312	0.01	9.56	32.80	42.37	59.93	-17.56	QP

Notes:
1.An initial pre-scan was performed on the line and neutral lines with peak detector.
2.Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3.Mesurement Level = Reading level + Correct Factor

7 Radiated Spurious Emissions

Test Requirement : FCC CFR47 Part 15 Section 15.209 & 15.407

Test Method : ANSI C63.10:2013

Test Result : PASS

Measurement Distance : 3m

Limit : See the follow table

Frequency (MHz)	Field Strength		Field Strength Limit at 3m Measurement Dist	
	uV/m	Distance (m)	uV/m	dBuV/m
0.009 ~ 0.490	2400/F(kHz)	300	10000 * 2400/F(kHz)	$20\log^{(2400/F(kHz))} + 80$
0.490 ~ 1.705	24000/F(kHz)	30	100 * 24000/F(kHz)	$20\log^{(24000/F(kHz))} + 40$
1.705 ~ 30	30	30	100 * 30	$20\log^{(30)} + 40$
30 ~ 88	100	3	100	$20\log^{(100)}$
88 ~ 216	150	3	150	$20\log^{(150)}$
216 ~ 960	200	3	200	$20\log^{(200)}$
Above 960	500	3	500	$20\log^{(500)}$

7.1 EUT Operation

Operating Environment :

Temperature : 24.5 °C

Humidity : 55.5% RH

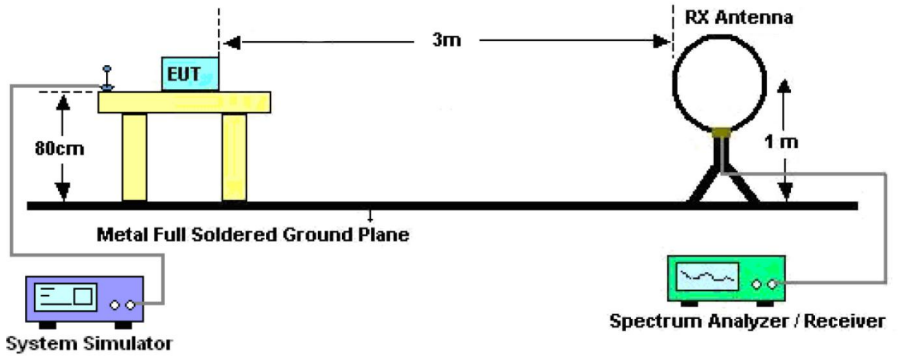
Atmospheric Pressure : 101.3kPa

Test Voltage : AC 120V60Hz

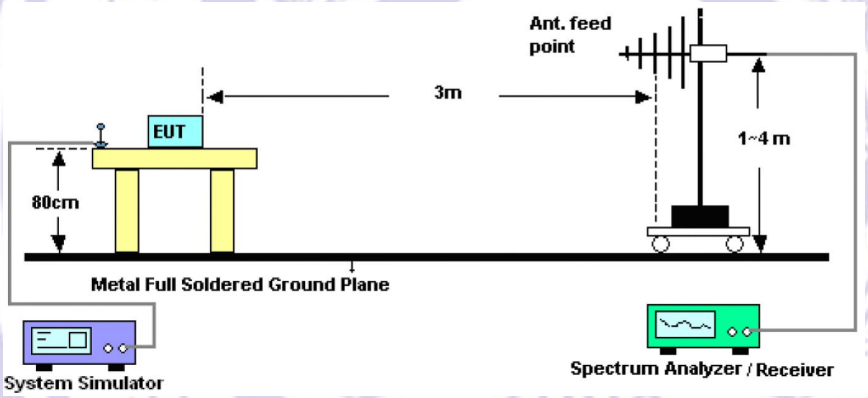
7.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site

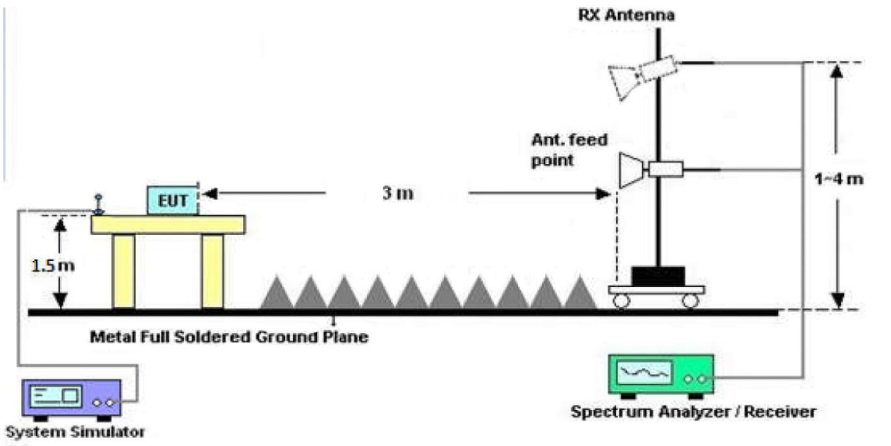
The test setup for emission measurement below 30MHz.



The test setup for emission measurement from 30 MHz to 1 GHz.



The test setup for emission measurement above 1 GHz.



7.3 Spectrum Analyzer Setup

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (emission in restricted band)	1 MHz / 1 MHz for Peak, 1 MHz / *10Hz* for Average

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

7.4 Test Procedure

1. The testing follows the guidelines in Spurious Radiated Emissions of ANSI C63.10-2013.

2. Below 1000MHz, The EUT was placed on a turn table which is 0.8m above ground plane. And above 1000MHz, The EUT was placed on a styrofoam table which is 1.5m above ground plane.

3. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.

4. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (From 1m to 4m) and turntable (from 0 degree to 360 degree) 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 to comply with the guidelines.

5. Set to the maximum power setting and enable the EUT transmit continuously.

6. Final measurement (Above 1GHz): The frequency range will be divided into different sub ranges depending of the frequency range of the used horn antenna. The EMI Receiver set to peak and average mode and a resolution bandwidth of 1MHz. The measurement will be performed in horizontal and vertical polarization of the measuring antenna and while rotating the EUT in its vertical axis in the range of 0 degree to 360 degree in order to have the antenna inside the cone of radiation.

7. Test Procedure of measurement (For Above 1GHz):

1) Monitor the frequency range at horizontal polarization and move the antenna over all sides of the EUT(if necessary move the EUT to another orthogonal axis).

2) Change the antenna polarization and repeat 1) with vertical polarization.

3) Make a hardcopy of the spectrum.

4) Measure the frequency of the detected emissions with a lower span and resolution bandwidth to increase the accuracy and note the frequency value.

5) Change the analyser mode to Clear/ Write and found the cone of emission.

6) Rotate and move the EUT, so that the measuring distance can be enlarged to 3m and the antenna will be still inside the cone of emission.

7) Measure the level of the detected frequency with the correct resolution bandwidth, with the antenna polarization and azimuth and the peak and average detector, which causes the maximum emission.

8) Repeat steps 1) to 7) for the next antenna spot if the EUT is larger than the antenna beamwidth.

7. The radiation measurements are tested under 3-axes(X,Y,Z) position(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand), After pre-test, It was found that the worse radiation emission was get at the X position. So the data shown was the X position only.

7.5 Summary of Test Results

Test Frequency: 9KHz-30MHz

Freq. (MHz)	Ant.Pol. H/V	Emission Level (dBuV/m)	Limit 3m (dBuV/m)	Over (dB)
--	--	--	--	>20

Note:

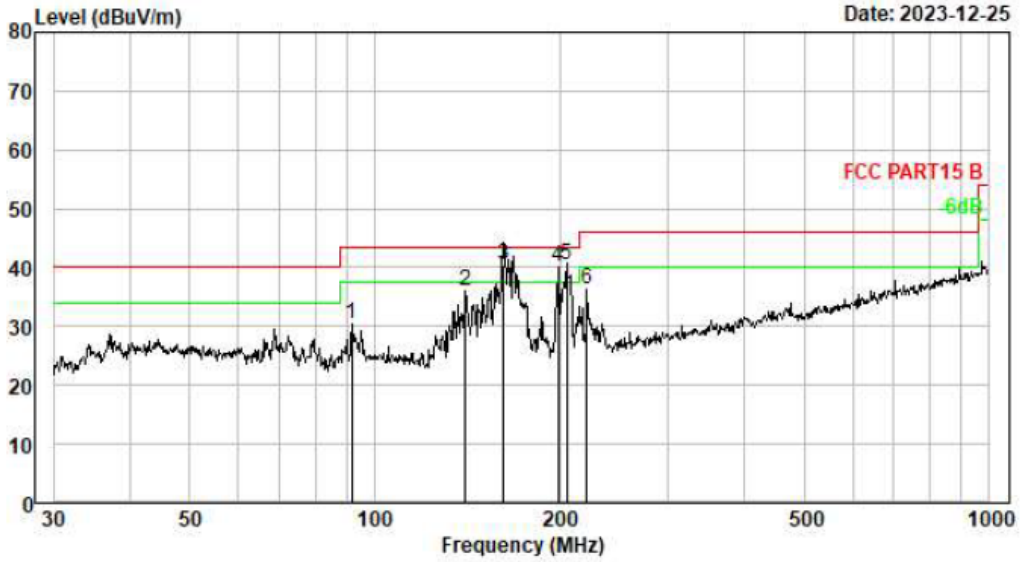
The amplitude of spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported.

Distance extrapolation factor =40log(Specific distance/ test distance)(dB);
Limit line=Specific limits(dBuV) + distance extrapolation factor.

Test Frequency: 30MHz ~ 1GHz

Please refer to the following test plots,Low Channel Worst case 802.11a for record:

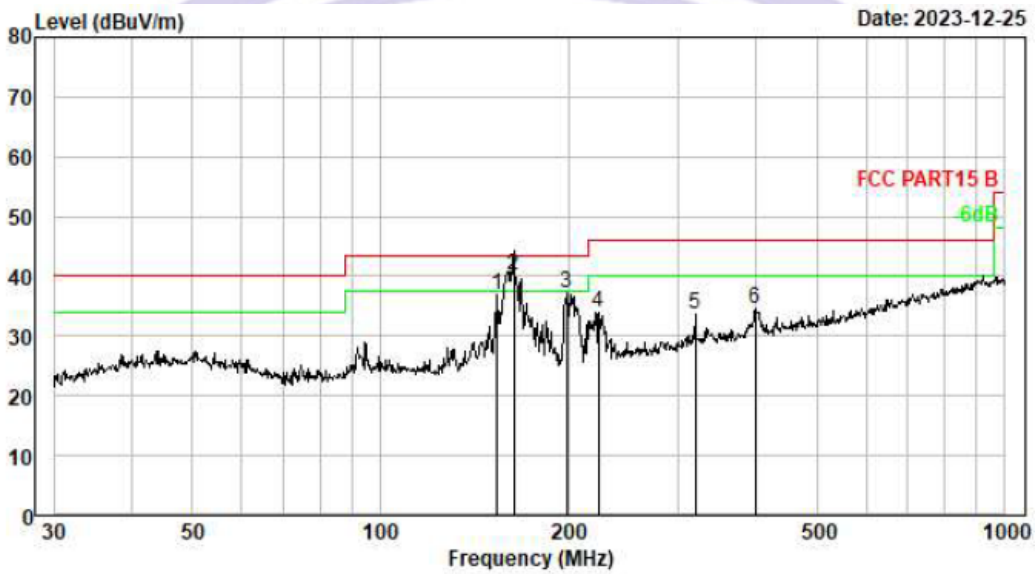
Temperature:	26℃	Relative Humidity:	54%
Pressure:	101kPa	Polarization:	Vertical
Test Voltage:	DC 24V from Adapter input AC 120V/60Hz		



No.	Freq MHz	Cable Loss dB	ANT Factor dB/m	Preamp Gain dB	Receiver Reading dBμV	Emission Level dBμV/m	Limit dBμV/m	Over Limit dB	Remark
1	91.816	0.66	10.13	0.00	19.51	30.30	43.50	-13.20	QP
2	140.342	0.87	8.49	0.00	26.70	36.06	43.50	-7.44	QP
3	162.041	0.95	8.90	0.00	30.50	40.35	43.50	-3.15	QP
4	198.588	1.06	11.36	0.00	27.60	40.02	43.50	-3.48	QP
5	205.675	1.08	11.60	0.00	27.80	40.48	43.50	-3.02	QP
6	221.392	1.11	12.13	0.00	22.94	36.18	46.00	-9.82	QP

Remark:Emission Level=Reading+Cable Loss+ANT Factor-AMP Factor

Temperature:	26℃	Relative Humidity:	54%
Pressure:	101 kPa	Polarization:	Horizontal
Test Voltage:	DC 24V from Adapter input AC 120V/60Hz		



No.	Freq MHz	Cable Loss dB	ANT Factor dB/m	Preamp Gain dB	Receiver Reading dBμV	Emission Level dBμV/m	Limit dBμV/m	Over Limit dB	Remark
1	153.739	0.92	8.49	0.00	27.47	36.88	43.50	-6.62	QP
2	163.755	0.95	8.99	0.00	30.20	40.14	43.50	-3.36	QP
3	198.588	1.06	11.36	0.00	24.73	37.15	43.50	-6.35	QP
4	223.733	1.12	12.20	0.00	20.75	34.07	46.00	-11.93	QP
5	319.937	1.31	14.64	0.00	17.75	33.70	46.00	-12.30	QP
6	399.030	1.43	15.79	0.00	17.25	34.47	46.00	-11.53	QP

Remark:Emission Level=Reading+Cable Loss+ANT Factor-AMP Factor

Test Frequency 1GHz-40GHz

802.11a

We test all antenna's data, the data only show the antennaA worst mode1.

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
Low Channel:5745MHz									
V	11490	41.23	32.29	8.39	38.9	56.23	74.00	-17.77	PK
V	11490	19.69	32.29	8.39	38.9	34.69	54.00	-19.31	AV
V	17233.3	36.52	31.19	9.62	40.37	55.32	74.00	-18.68	PK
V	17233.3	19.23	31.19	9.62	40.37	38.03	54.00	-15.97	AV
V	22980	36.88	27.02	7.2	38.98	56.04	74.00	-17.96	PK
V	22980	17.69	27.02	7.2	38.98	36.85	54.00	-17.15	AV
V	28723.3	35.78	27.1	7.56	40.18	56.42	74.00	-17.58	PK
V	28723.3	14.97	27.1	7.56	40.18	35.61	54.00	-18.39	AV
H	11490	41.23	32.29	8.39	38.9	56.23	74.00	-17.77	PK
H	11490	20.82	32.29	8.39	38.9	35.82	54.00	-18.18	AV
H	17233.3	37.63	31.19	9.62	40.37	56.43	74.00	-17.57	PK
H	17233.3	17.56	31.19	9.62	40.37	36.36	54.00	-17.64	AV
H	22980	35.68	27.02	7.2	38.98	54.84	74.00	-19.16	PK
H	22980	18.56	27.02	7.2	38.98	37.72	54.00	-16.28	AV
H	28723.3	36.53	27.1	7.56	40.18	57.17	74.00	-16.83	PK
H	28723.3	14.89	27.1	7.56	40.18	35.53	54.00	-18.47	AV

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
Middle Channel:5785MHz									
V	11570	40.56	32.26	8.48	38.9	55.68	74.00	-18.32	PK
V	11570	16.92	32.26	8.48	38.9	32.04	54.00	-21.96	AV
V	17353.3	36.26	31.08	9.67	40.61	55.46	74.00	-18.54	PK
V	17353.3	15.96	31.08	9.67	40.61	35.16	54.00	-18.84	AV
V	23140	34.93	27.03	7.24	39.03	54.17	74.00	-19.83	PK
V	23140	15.33	27.03	7.24	39.03	34.57	54.00	-19.43	AV
V	28923.3	34.86	27.1	7.58	40.34	55.68	74.00	-18.32	PK
V	28923.3	15.43	27.1	7.58	40.34	36.25	54.00	-17.75	AV
H	11570	36.84	32.26	8.48	38.9	51.96	74.00	-22.04	PK
H	11570	18.19	32.26	8.48	38.9	33.31	54.00	-20.69	AV
H	17353.3	34.69	31.08	9.67	40.61	53.89	74.00	-20.11	PK
H	17353.3	15.03	31.08	9.67	40.61	34.23	54.00	-19.77	AV
H	23140	34.53	27.03	7.24	39.03	53.77	74.00	-20.23	PK
H	23140	15.52	27.03	7.24	39.03	34.76	54.00	-19.24	AV
H	28923.3	34.69	27.1	7.58	40.34	55.51	74.00	-18.49	PK
H	28923.3	12.99	27.1	7.58	40.34	33.81	54.00	-20.19	AV

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
High Channel:5825MHz									
V	11650	42.66	32.23	8.56	38.9	57.89	74.00	-16.11	PK
V	11650	30.86	32.23	8.56	38.9	46.09	54.00	-7.91	AV
V	17473.3	42.25	30.97	9.73	40.85	61.86	74.00	-12.14	PK
V	17473.3	27.83	30.97	9.73	40.85	47.44	54.00	-6.56	AV
V	23300	40.26	27.03	7.26	39.06	59.55	74.00	-14.45	PK
V	23300	23.19	27.03	7.26	39.06	42.48	54.00	-11.52	AV
V	29123.3	40.26	27.1	7.61	40.4	61.17	74.00	-12.83	PK
V	29123.3	22.78	27.1	7.61	40.4	43.69	54.00	-10.31	AV
H	11650	43.99	32.23	8.56	38.9	59.22	74.00	-14.78	PK
H	11650	29.63	32.23	8.56	38.9	44.86	54.00	-9.14	AV
H	17473.3	43.55	30.97	9.73	40.85	63.16	74.00	-10.84	PK
H	17473.3	26.96	30.97	9.73	40.85	46.57	54.00	-7.43	AV
H	23300	43.36	27.03	7.26	39.06	62.65	74.00	-11.35	PK
H	23300	22.83	27.03	7.26	39.06	42.12	54.00	-11.88	AV
H	29123.3	36.12	27.1	7.61	40.4	57.03	74.00	-16.97	PK
H	29123.3	23.78	27.1	7.61	40.4	44.69	54.00	-9.31	AV

802.11n HT20

We test all MINO mode, the data only show the worst mode 5(802.11n HT20)

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
Low Channel:5745MHz									
V	11490	48.53	32.29	8.39	38.9	63.53	74.00	-10.47	PK
V	11490	23.58	32.29	8.39	38.9	38.58	54.00	-15.42	AV
V	17233.3	39.36	31.19	9.62	40.37	58.16	74.00	-15.84	PK
V	17233.3	25.58	31.19	9.62	40.37	44.38	54.00	-9.62	AV
V	22980	41.56	27.02	7.2	38.98	60.72	74.00	-13.28	PK
V	22980	23.68	27.02	7.2	38.98	42.84	54.00	-11.16	AV
V	28723.3	35.78	27.1	7.56	40.18	56.42	74.00	-17.58	PK
V	28723.3	14.97	27.1	7.56	40.18	35.61	54.00	-18.39	AV
H	11490	45.69	32.29	8.39	38.9	60.69	74.00	-13.31	PK
H	11490	25.69	32.29	8.39	38.9	40.69	54.00	-13.31	AV
H	17233.3	42.15	31.19	9.62	40.37	60.95	74.00	-13.05	PK
H	17233.3	23.36	31.19	9.62	40.37	42.16	54.00	-11.84	AV
H	22980	39.56	27.02	7.2	38.98	58.72	74.00	-15.28	PK
H	22980	23.36	27.02	7.2	38.98	42.52	54.00	-11.48	AV
H	28723.3	41.23	27.1	7.56	40.18	61.87	74.00	-12.13	PK
H	28723.3	20.12	27.1	7.56	40.18	40.76	54.00	-13.24	AV

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
Middle Channel:5785MHz									
V	11570	45.23	32.26	8.48	38.9	60.35	74.00	-13.65	PK
V	11570	20.23	32.26	8.48	38.9	35.35	54.00	-18.65	AV
V	17353.3	41.36	31.08	9.67	40.61	60.56	74.00	-13.44	PK
V	17353.3	20.12	31.08	9.67	40.61	39.32	54.00	-14.68	AV
V	23140	40.37	27.03	7.24	39.03	59.61	74.00	-14.39	PK
V	23140	19.55	27.03	7.24	39.03	38.79	54.00	-15.21	AV
V	28923.3	40.03	27.1	7.58	40.34	60.85	74.00	-13.15	PK
V	28923.3	18.25	27.1	7.58	40.34	39.07	54.00	-14.93	AV
H	11570	38.36	32.26	8.48	38.9	53.48	74.00	-20.52	PK
H	11570	21.21	32.26	8.48	38.9	36.33	54.00	-17.67	AV
H	17353.3	38.63	31.08	9.67	40.61	57.83	74.00	-16.17	PK
H	17353.3	20.36	31.08	9.67	40.61	39.56	54.00	-14.44	AV
H	23140	39.25	27.03	7.24	39.03	58.49	74.00	-15.51	PK
H	23140	18.69	27.03	7.24	39.03	37.93	54.00	-16.07	AV
H	28923.3	39.15	27.1	7.58	40.34	59.97	74.00	-14.03	PK
H	28923.3	16.53	27.1	7.58	40.34	37.35	54.00	-16.65	AV

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
High Channel:5825MHz									
V	11650	46.12	32.23	8.56	38.9	61.35	74.00	-12.65	PK
V	11650	29.01	32.23	8.56	38.9	44.24	54.00	-9.76	AV
V	17473.3	43.15	30.97	9.73	40.85	62.76	74.00	-11.24	PK
V	17473.3	27.15	30.97	9.73	40.85	46.76	54.00	-7.24	AV
V	23300	43.89	27.03	7.26	39.06	63.18	74.00	-10.82	PK
V	23300	25.23	27.03	7.26	39.06	44.52	54.00	-9.48	AV
V	29123.3	42.85	27.1	7.61	40.4	63.76	74.00	-10.24	PK
V	29123.3	25.31	27.1	7.61	40.4	46.22	54.00	-7.78	AV
H	11650	45.56	32.23	8.56	38.9	60.79	74.00	-13.21	PK
H	11650	32.25	32.23	8.56	38.9	47.48	54.00	-6.52	AV
H	17473.3	45.16	30.97	9.73	40.85	64.77	74.00	-9.23	PK
H	17473.3	27.58	30.97	9.73	40.85	47.19	54.00	-6.81	AV
H	23300	45.36	27.03	7.26	39.06	64.65	74.00	-9.35	PK
H	23300	23.86	27.03	7.26	39.06	43.15	54.00	-10.85	AV
H	29123.3	38.26	27.1	7.61	40.4	59.17	74.00	-14.83	PK
H	29123.3	24.36	27.1	7.61	40.4	45.27	54.00	-8.73	AV

Remark:
1. Emission Level = Meter Reading + Antenna Factor + Cable Loss – Pre-amplifier,
Margin= Emission Level - Limit
2. If peak below the average limit, the average emission was no test.
3. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
4. We tested all the mode, only the Worst mode data is recorded in the report.

8 POWER SPECTRAL DENSITY TEST

8.1 Test Standard and Limit

According to FCC §15.407(3)

(1) For the band 5.15-5.25 GHz.

(i) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum

power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

(ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(iii) For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

(iv) For client devices in the 5.15-5.25 GHz band, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(3) For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi

without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

8.2 Test Setup

8.3 Test Procedure

1. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above,

2. Spectrum Setting:

   RBW > the 20 dB bandwidth of the emission being measured

   Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel

   VBW ≥ RBW

   Sweep = auto

   Detector function = peak

   Trace = max hold

8.4 Test Data

Test mode	Test Channel (MHz)	PSD [dBm/1MHz]		PSD [dBm/500kHz]		Total PSD [dBm/500kHz]	Limit (dBm/500 kHz)	Result
		ANT A	ANT B	ANT A	ANT B			
802.11a	5745	-11.80	-12.10	-11.77	-12.01	/	30	Pass
	5785	-11.10	-10.83	-11.00	-10.73	/	30	Pass
	5825	-14.84	-12.18	-14.81	-12.15	/	30	Pass
802.11n(HT20)	5745	-13.91	-11.28	-13.78	-11.15	-9.245	30	Pass
	5785	-12.69	-10.58	-12.56	-10.52	-8.416	30	Pass
	5825	-14.70	-11.68	-14.56	-11.62	-9.830	30	Pass
802.11n(HT40)	5755	-15.40	-14.33	-15.21	-13.99	-11.549	30	Pass
	5795	-15.07	-14.32	-14.88	-14.13	-11.487	30	Pass
802.11ac(VH20)	5745	-14.06	-11.33	-13.93	-11.21	-9.355	30	Pass
	5785	-12.52	-10.11	-12.39	-9.98	-8.013	30	Pass
	5825	-14.79	-11.41	-14.66	-11.28	-9.666	30	Pass
802.11ac(VH40)	5755	-15.47	-14.43	-15.27	-14.10	-11.612	30	Pass
	5795	-15.48	-14.56	-15.28	-14.24	-11.739	30	Pass
802.11ac(VH80)	5775	-18.15	-17.65	-17.44	-16.94	-14.202	30	Pass

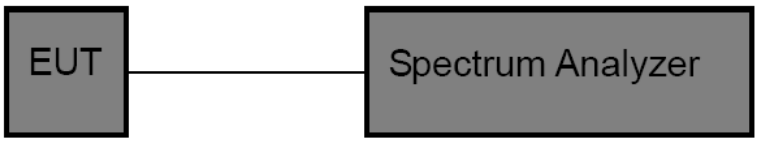
Note: ANT A and ANT B test data Please see the attachment for WIFI5.8G data.

9 26DB & 6DB & 99% Emission Bandwidth Test

9.1 Test Standard

Test Standard	FCC Part15 C Section 15.407
	The maximum power spectral density is measured as a conducted emission by direct connection of a calibrated test instrument to the equipment under test. If the device cannot be connected directly, alternative techniques acceptable to the Commission may be used. Measurements in the 5.725-5.85 GHz band, the minimum bandwidth 6 dB bandwidth of U-NII devices shall be at least 500KHz. Measurements in the 5.15-5.25 GHz, 5.25-5.35 GHz, and the 5.47-5.725 GHz bands are made over a bandwidth of 1 MHz or the 26 dB emission bandwidth of the device, whichever is less. A narrower resolution bandwidth can be used, provided that the measured power is integrated over the full reference bandwidth.

9.2 Test Setup



9.3 Test Procedure

a) Set RBW = 1000KHz.

b) Set the VBW > RBW.

c) Detector = Peak.

d) Trace mode = max hold.

e) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

The following procedure shall be used for measuring (99 %) power bandwidth:

1. Set center frequency to the nominal EUT channel center frequency.

2. Set span = 1.5 times to 3.3 times the OBW.

3. Set RBW = 1 % to 5 % of the OBW

4. Set VBW ≥ 3 · RBW

5. Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.

6. Use the 99 % power bandwidth function of the instrument (if available).

7. If the instrument does not have a 99 % power bandwidth function, the trace data points are recovered and directly summed in power units. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5 % of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5 % of the total is reached; that frequency is recorded as the upper frequency. The 99% occupied bandwidth is the difference between these two frequencies.

9.4 Test Data

Please see the attachment for WIFI5.8G data.

10 Maximum Conducted Output Power

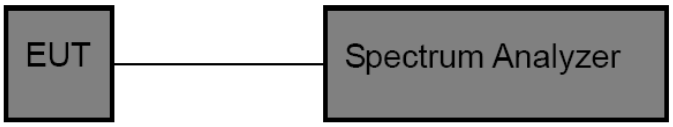
10.1 Test Standard and Limit

According to FCC §15.407

For an outdoor access point operating in the band 5.15–5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

For the band 5.725–5.850 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.

10.2 Test Setup



10.3 Test Procedure

The EUT was directly connected to the Power meter

1. Device Configuration

If possible, configure or modify the operation of the EUT so that it transmits continuously at its maximum power control level (see section II.B.).

The intent is to test at 100 percent duty cycle; however a small reduction in duty cycle (to no lower than 98 percent) is permitted if required by the EUT for amplitude control purposes. Manufacturers are expected to provide software to the test lab to permit such continuous operation.

b) If continuous transmission (or at least 98 percent duty cycle) cannot be achieved due to hardware limitations (e.g., overheating), the EUT shall be operated at its maximum power control level with the transmit duration as long as possible and the duty cycle as high as possible.

2. Measurement using a Spectrum Analyzer or EMI Receiver (SA)

Measurement of maximum conducted output power using a spectrum analyzer requires integrating the spectrum across a frequency span that encompasses, at a minimum, either the EBW or the 99-percent occupied bandwidth of the signal.1 However, the EBW must be used to determine bandwidth dependent limits on maximum conducted output power in accordance with § 15.407(a).

a) The test method shall be selected as follows: (i) Method SA-1 or SA-1 Alternative (averaging with the EUT transmitting at full power throughout each sweep) shall be applied if either of the following conditions can be satisfied:

• The EUT transmits continuously (or with a duty cycle ≥ 98 percent).

• Sweep triggering or gating can be implemented in a way that the device transmits at the maximum power control level throughout the duration of each of the instrument sweeps to be averaged. This condition can generally be achieved by triggering the instrument's sweep if the duration of the sweep (with the analyzer configured as in Method SA-1, below) is equal to or shorter than the duration T of each transmission from the EUT and if those transmissions exhibit full power throughout their durations.

(ii) Method SA-2 or SA-2 Alternative (averaging across on and off times of the EUT transmissions, followed by duty cycle correction) shall be applied if the conditions of (i) cannot be achieved and the transmissions exhibit a constant duty cycle during the measurement duration. Duty cycle will be considered to be constant if variations are less than ± 2 percent.

(iii) Method SA-3 (RMS detection with max hold) or SA-3 Alternative (reduced VBW with max hold) shall be applied if the conditions of (i) and (ii) cannot be achieved.

b) Method SA-1 (trace averaging with the EUT transmitting at full power throughout each sweep):
(i) Set span to encompass the entire emission bandwidth (EBW) (or, alternatively, the entire 99% occupied bandwidth) of the signal.

(ii) Set RBW = 1 MHz.

(iii) Set VBW ≥ 3 MHz.

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

(v) Sweep time = auto.

(vi) Detector = RMS (i.e., power averaging), if available. Otherwise, use sample detector mode.

(vii) If transmit duty cycle < 98 percent, use a video trigger with the trigger level set to enable triggering only on full power pulses. Transmitter must operate at maximum power control level for the entire duration of every sweep. If the EUT transmits continuously (i.e., with no off intervals) or at duty cycle ≥ 98 percent, and if each transmission is entirely at the maximum power control level, then the trigger shall be set to “free run”.

(viii) Trace average at least 100 traces in power averaging (i.e., RMS) mode.

(ix) Compute power by integrating the spectrum across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal using the instrument’s band power measurement function with band limits set equal to the EBW (or occupied bandwidth) band edges. If the instrument does not have a band power function, sum the spectrum

10.4 Test Data

Test Channel	Frequency (MHz)	Maximum Conducted Output Power (dBm)		Total power (dBm)	Limit (dBm)
		ANT A	ANT B		
TX 802.11a Mode					
CH149	5745	2.23	2.21	-	30.00
CH157	5785	3.13	3.35	-	30.00
CH165	5825	-1.08	1.93	-	30.00
TX 802.11n(HT20) Mode					
CH149	5745	0.44	2.47	4.55	30.00
CH157	5785	1.75	3.59	5.77	30.00
CH165	5825	-0.70	2.71	4.35	30.00
TX 802.11n(HT40) Mode					
CH151	5755	1.77	3.05	5.47	30.00
CH159	5795	1.87	3.13	5.55	30.00
TX 802.11ac(VHT20) Mode					
CH149	5745	0.36	2.88	4.81	30.00
CH157	5785	1.78	4.10	6.11	30.00
CH165	5825	-0.67	2.79	4.41	30.00
TX 802.11ac(VHT40) Mode					
CH151	5755	1.82	3.04	5.48	30.00
CH159	5795	1.84	2.89	5.40	30.00
TX 802.11ac(VHT80) Mode					
CH155	5775	2.91	3.29	6.12	30.00

Note: ANT A and ANT B test data Please see the attachment for WIFI5.8G data.

11 Out of Band Emissions and Spurious Emission

11.1 Test Standard and Limit

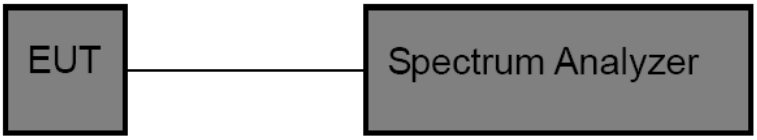
According to FCC §15.407(b)

Undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

(1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

(2) For transmitters operating in the 5.725-5.85 GHz band: All emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of −17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of −27 dBm/MHz.

11.2 Test Setup



11.3 Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.

2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.

3. Set RBW of spectrum analyzer to 1 MHz with a convenient frequency span.

4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.

5. Repeat above procedures until all measured frequencies were complete.

11.4 Test Data

We test all antenna's data, the data only show the worst antennaA

Frequency	Meter Reading	antenna Factor	cable loss	preamp factor	Emission Level	EIRP	Limit	Polar	Detector Type	Result
(MHz)	(dB μ V)	(dB)	(dB)	(dB)	(dB μ V/m)	[dBm]	[dBm]	(H/V)		
802.11a										
5720.00	50.67	33.33	5.7	33.42	56.28	-38.92	15.60	V	PK	Pass
5725.00	55.82	33.34	5.7	33.42	61.44	-33.76	27.00	V	PK	Pass
5850.00	57.83	33.64	5.78	33.32	63.93	-31.27	27.00	V	PK	Pass
5855.00	50.45	33.64	5.78	33.32	56.55	-38.65	15.60	V	PK	Pass
5720.00	51.23	33.33	5.7	33.42	56.84	-38.36	15.60	H	PK	Pass
5725.00	53.69	33.34	5.7	33.42	59.31	-35.89	27.00	H	PK	Pass
5850.00	51.33	33.64	5.78	33.32	57.43	-37.77	27.00	H	PK	Pass
5855.00	50.53	33.64	5.78	33.32	56.63	-38.57	15.60	H	PK	Pass
802.11n20										
5720.00	50.55	33.33	5.7	33.42	56.16	-39.04	15.60	V	PK	Pass
5725.00	52.26	33.34	5.7	33.42	57.88	-37.32	27.00	V	PK	Pass
5850.00	50.78	33.64	5.78	33.32	56.88	-38.32	27.00	V	PK	Pass
5855.00	54.66	33.64	5.78	33.32	60.76	-34.44	15.60	V	PK	Pass
5720.00	47.23	33.33	5.7	33.42	52.84	-42.36	15.60	H	PK	Pass
5725.00	50.82	33.34	5.7	33.42	56.44	-38.76	27.00	H	PK	Pass
5850.00	47.16	33.64	5.78	33.32	53.26	-41.94	27.00	H	PK	Pass
5855.00	51.36	33.64	5.78	33.32	57.46	-37.74	15.60	H	PK	Pass

802.11ac20										
5720.00	48.23	33.33	5.7	33.42	53.84	-41.36	15.60	V	PK	Pass
5725.00	56.26	33.34	5.7	33.42	61.88	-33.32	27.00	V	PK	Pass
5850.00	56.66	33.64	5.78	33.32	62.76	-32.44	27.00	V	PK	Pass
5855.00	51.27	33.64	5.78	33.32	57.37	-37.83	15.60	V	PK	Pass
5720.00	50.35	33.33	5.7	33.42	55.96	-39.24	15.60	H	PK	Pass
5725.00	53.69	33.34	5.7	33.42	59.31	-35.89	27.00	H	PK	Pass
5850.00	53.58	33.64	5.78	33.32	59.68	-35.52	27.00	H	PK	Pass
5855.00	53.55	33.64	5.78	33.32	59.65	-35.55	15.60	H	PK	Pass
802.11n40										
5720.00	53.12	33.33	5.7	33.42	58.73	-36.47	15.60	V	PK	Pass
5725.00	54.15	33.34	5.7	33.42	59.77	-35.43	27.00	V	PK	Pass
5850.00	57.25	33.64	5.78	33.32	63.35	-31.85	27.00	V	PK	Pass
5855.00	54.63	33.64	5.78	33.32	60.73	-34.47	15.60	V	PK	Pass
5720.00	49.53	33.33	5.7	33.42	55.14	-40.06	15.60	H	PK	Pass
5725.00	49.39	33.34	5.7	33.42	55.01	-40.19	27.00	H	PK	Pass
5850.00	50.26	33.64	5.78	33.32	56.36	-38.84	27.00	H	PK	Pass
5855.00	50.27	33.64	5.78	33.32	56.37	-38.83	15.60	H	PK	Pass
802.11ac40										
5720.00	49.27	33.33	5.7	33.42	54.88	-40.32	15.60	V	PK	Pass
5725.00	57.35	33.34	5.7	33.42	62.97	-32.23	27.00	V	PK	Pass
5850.00	58.29	33.64	5.78	33.32	64.39	-30.81	27.00	V	PK	Pass
5855.00	52.62	33.64	5.78	33.32	58.72	-36.48	15.60	V	PK	Pass
5720.00	49.66	33.33	5.7	33.42	55.27	-39.93	15.60	H	PK	Pass

5725.00	51.86	33.34	5.7	33.42	57.48	-37.72	27.00	H	PK	Pass
5850.00	52.35	33.64	5.78	33.32	58.45	-36.75	27.00	H	PK	Pass
5855.00	50.43	33.64	5.78	33.32	56.53	-38.67	15.60	H	PK	Pass
802.11ac80										
5720.00	50.58	33.33	5.7	33.42	56.19	-39.01	15.60	V	PK	Pass
5725.00	55.53	33.34	5.7	33.42	61.15	-34.05	27.00	V	PK	Pass
5850.00	56.11	33.64	5.78	33.32	62.21	-32.99	27.00	V	PK	Pass
5855.00	49.63	33.64	5.78	33.32	55.73	-39.47	15.60	V	PK	Pass
5720.00	50.78	33.33	5.7	33.42	56.39	-38.81	15.60	H	PK	Pass
5725.00	51.86	33.34	5.7	33.42	57.48	-37.72	27.00	H	PK	Pass
5850.00	53.89	33.64	5.78	33.32	59.99	-35.21	27.00	H	PK	Pass
5855.00	48.27	33.64	5.78	33.32	54.37	-40.83	15.60	H	PK	Pass

We test all MINO mode, the data only show the worst mode 5

Frequency	Meter Reading	antenna Factor	cable loss	preamp factor	Emission Level	EIRP	Limit	Polar	Detector Type	Result
(MHz)	(dB μ V)	(dB)	(dB)	(dB)	(dB μ V/m)	[dBm]	[dBm]	(H/V)		
802.11n20										
5720.00	53.68	33.33	5.7	33.42	59.29	-35.91	15.60	V	PK	Pass
5725.00	55.56	33.34	5.7	33.42	61.18	-34.02	27.00	V	PK	Pass
5850.00	53.16	33.64	5.78	33.32	59.26	-35.94	27.00	V	PK	Pass
5855.00	55.39	33.64	5.78	33.32	61.49	-33.71	15.60	V	PK	Pass
5720.00	50.33	33.33	5.7	33.42	55.94	-39.26	15.60	H	PK	Pass
5725.00	52.76	33.34	5.7	33.42	58.38	-36.82	27.00	H	PK	Pass
5850.00	50.25	33.64	5.78	33.32	56.35	-38.85	27.00	H	PK	Pass
5855.00	53.53	33.64	5.78	33.32	59.63	-35.57	15.60	H	PK	Pass
802.11ac20										
5720.00	50.23	33.33	5.7	33.42	55.84	-39.36	15.60	V	PK	Pass
5725.00	58.21	33.34	5.7	33.42	63.83	-31.37	27.00	V	PK	Pass
5850.00	58.66	33.64	5.78	33.32	64.76	-30.44	27.00	V	PK	Pass
5855.00	55.36	33.64	5.78	33.32	61.46	-33.74	15.60	V	PK	Pass
5720.00	57.83	33.33	5.7	33.42	63.44	-31.76	15.60	H	PK	Pass
5725.00	55.56	33.34	5.7	33.42	61.18	-34.02	27.00	H	PK	Pass
5850.00	55.69	33.64	5.78	33.32	61.79	-33.41	27.00	H	PK	Pass
5855.00	55.23	33.64	5.78	33.32	61.33	-33.87	15.60	H	PK	Pass

Remark:

1. Emission Level = Meter Reading + Antenna Factor + Cable Loss – Pre-amplifier,

   Margin= Emission Level - Limit

2. If peak below the average limit, the average emission was no test.

3. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

4. We tested all the mode, only the Worst mode data is recorded in the report.

5.The test result of ANTA & ANTB are all attenuated 3dB below the limit. So the MIMO mode is passed.

Shenzhen NCT Testing Technology Co.,Ltd. 2008

12 Frequency Stability Measurement

12.1 Test Standard and Limit

FCC

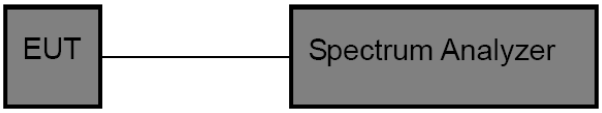
Manufactures of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

The transmitter center frequency tolerance shall be ± 20 ppm maximum for the 5 GHz band (IEEE 802.11n specification).

IC

If the frequency stability of the licence-exempt radio apparatus is not specified in the applicable RSS, the fundamental emissions of the radio apparatus should be kept within at least the central 80% of its permitted operating frequency band in order to minimize the possibility of out-of-band operation. In addition, its occupied bandwidth shall be entirely outside the restricted bands and the prohibited TV bands of 54 72 MHz, 76-88 MHz, 174-216 MHz, and 470-602 MHz, unless otherwise indicated.

12.2 Test Setup



12.3 Test Procedure

1. The transmitter output (antenna port) was connected to the spectrum analyzer.
2. EUT have transmitted absence of modulation signal and fixed channelize.
3. Set the spectrum analyzer span to view the entire absence of modulation emissions bandwidth.
4. Set RBW = 10 kHz, VBW = 10 kHz with peak detector and maxhold settings.
5. fc is declaring of channel frequency. Then the frequency error formula is (fc-f)/fc × 106 ppm and the limit is less than ±20ppm (IEEE 802.11nspecification).

6. The test extreme voltage is to change the primary supply voltage from 85 to 115 percent of the nominal value

7. Extreme temperature is -20°C~50°C.

12.4 Test Data

Test Voltage	Test Temp.	Measured Frequency (MHz)	Spectrum Frequency (MHz)			Tolerance（ppm）			Limit（ppm）
			802.11a	802.n HT20	802.ac HT20	802.11a	802.n HT20	802.ac HT 20	
AC 102V	-20℃	5745.000	5745.0342	5744.9961	5745.0363	5.953	-0.679	6.319	±20
		5785.000	5784.9651	5784.9835	5785.0126	-6.033	-2.852	2.178	±20
		5825.000	5825.0126	5825.0036	5824.9932	2.163	0.618	-1.167	±20
AC 138V		5745.000	5745.0329	5744.9823	5745.0363	5.727	-3.081	6.319	±20
		5785.000	5784.9615	5784.9787	5785.0189	-6.655	-3.682	3.267	±20
		5825.000	5825.0178	5825.0056	5824.9826	3.056	0.961	-2.987	±20
AC 120V	25℃	5745.000	5745.0332	5744.9536	5745.0352	5.779	-8.077	6.127	±20
		5785.000	5784.9852	5784.9635	5785.0206	-2.558	-6.309	3.561	±20
		5825.000	5825.0223	5825.0125	5824.9783	3.828	2.146	-3.725	±20
AC 102V	50℃	5745.000	5745.0325	5744.9696	5745.0216	5.657	-5.292	3.760	±20
		5785.000	5784.9663	5784.9621	5785.0235	-5.825	-6.551	4.062	±20
		5825.000	5825.0209	5825.0225	5824.9816	3.588	3.863	-3.159	±20
AC 138V		5745.000	5745.0388	5744.9736	5745.0263	6.754	-4.595	4.578	±20
		5785.000	5784.9759	5784.9812	5785.0278	-4.166	-3.250	4.806	±20
		5825.000	5825.02369	5825.0259	5824.9853	4.067	4.446	-2.524	±20

Test Voltage	Test Temp.	Measured Frequency (MHz)	Spectrum Frequency (MHz)		Tolerance（ppm）		Limit（ppm）
			802.11n HT40	802.11ac HT40	802.11n HT40	802.11ac HT40	
AC 102V	-20℃	5755.000	5755.0517	5755.0369	8.983	6.412	±20
		5795.000	5794.9656	5794.9699	-5.936	-5.194	±20
AC 138V		5755.000	5755.0621	5755.0385	10.791	6.690	±20
		5795.000	5794.9715	5794.9653	-4.918	-5.988	±20
AC 120V	25℃	5755.000	5755.0275	5755.0275	4.778	4.778	±20
		5795.000	5794.9712	5795.0125	-4.970	2.157	±20
AC 102V	50℃	5755.000	5755.0268	5755.0445	4.657	7.732	±20
		5795.000	5795.0517	5795.0503	8.921	8.680	±20
AC 138V		5755.000	5755.0236	5755.0465	4.101	8.080	±20
		5795.000	5795.0565	5795.0526	9.750	9.077	±20

Test Voltage	Test Temp.	Measured Frequency (MHz)	Spectrum Frequency (MHz)	Tolerance（ppm）	Limit（ppm）
			802.11ac HT80	802.11ac HT80	
AC 102V	-20℃	5775.000	5775.0125	2.165	±20
AC 138V		5775.000	5775.0231	4.000	±20
AC 120V	25℃	5775.000	5775.0226	3.913	±20
AC 102V	50℃	5775.000	5774.9963	-0.641	±20
AC 138V		5775.000	5774.9856	-2.494	±20

Note:The worst mode is Antenna A , only the worst data is recorded.

13 Antenna Requirement

13.1 Test Standard and Requirement

Test Standard	FCC Part15 Section 15.203
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. According to RSS-GEN section 6.8 The applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list. For expediting the testing, measurements may be performed using only the antenna with highest gain of each combination of transmitter and antenna type, with the transmitter output power set at the maximum level. However, the transmitter shall comply with the applicable requirements under all operational conditions and when in combination with any type of antenna from the list provided in the test report (and in the notice to be included in the user manual, provided below). When measurements at the antenna port are used to determine the RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna's manufacturer. The test report shall state the RF power, output power setting and spurious emission measurements with each antenna type that is used with the transmitter being tested.

13.2 Antenna Connected Construction

The antenna is Internal Antenna which permanently attached, and the best case gain of the antenna is 1.2 dBi. It complies with the standard requirement.

14 TEST SETUP & EUT PHOTOGRAPH

Please see the attachment for details.

---------- End of Report ----------