FCC TEST REPORT

Test report
On Behalf of
Fortune Joint Industry Co., Limited
For
Mini PC
Model No.: FJ-W211

FCC ID: S74-FJW211

Prepared for :	**Fortune Joint Industry Co., Limited** **Flat Rm 704, 7 F, Bright Way Tower, 33 Mong Kok Road, Mong Kok, KL, Hong Kong, China**
Prepared By :	**Shenzhen HUAK Testing Technology Co., Ltd.** **1F, B2 Building, Junfeng Zhongcheng Zhizao Innovation Park, Fuhai Street, Bao'an District, Shenzhen City, China**

Date of Test:	**Jul. 10, 2018 ~ Jul. 17, 2018**
Date of Report:	**Jul. 17, 2018**
Report Number:	**HK180710366-E**

TEST RESULT CERTIFICATION

Applicant's name.....: Fortune Joint Industry Co., Limited

Address .....: Flat Rm 704, 7 F, Bright Way Tower, 33 Mong Kok Road, Mong Kok, KL, Hong Kong, China

Manufacture's Name.....: Fortune Joint Industry Co., Limited

Address .....: Flat Rm 704, 7 F, Bright Way Tower, 33 Mong Kok Road, Mong Kok, KL, Hong Kong, China

Product description

Trade Mark: N/A

Product name.....: Mini PC

Model and/or type reference .: FJ-W211

Standards .....: FCC Rules and Regulations Part 15 Subpart E Section 15.407
ANSI C63.10: 2013

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Date of Test .....:

Date (s) of performance of tests .....: Jul. 10, 2018 ~ Jul. 17, 2018

Date of Issue.....: Jul. 17, 2018

Test Result.....: Pass

Testing Engineer : Gary Qian

(Gary Qian)

Technical Manager : Eden Hu

(Eden Hu)

Authorized Signatory : Jason Zhou

(Jason Zhou)

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1. Test Result Summary

1.1. TEST PROCEDURES AND RESULTS

Requirement	CFR 47 Section	Result
Antenna requirement	§15.203	PASS
AC Power Line Conducted Emission	§15.207	PASS
Maximum Conducted Output Power	§15.407(a) §2.1046	PASS
6dB Emission Bandwidth	§15.407(e)	PASS
26dB Emission Bandwidth& 99% Occupied Bandwidth	§15.407(a) §2.1049	N/A
Power Spectral Density	§15.407(a)	PASS
Band edge	§15.407(a)	PASS
Radiated Emission	§15.407(a) §2.1053	PASS
Frequency Stability	§15.407(g) §2.1055	PASS

Note:

1. PASS: Test item meets the requirement.

2. Fail: Test item does not meet the requirement.

3. N/A: Test case does not apply to the test object.

4. The test result judgment is decided by the limit of test standard.

1.2. TEST FACILITY

Test Firm : Shenzhen HUAK Testing Technology Co., Ltd.

Address 1F, B2 Building, Junfeng Zhongcheng Zhizao Innovation Park, Fuhai Street, Bao'an District, Shenzhen City, China

1.3. Measurement Uncertainty

The reported uncertainty of measurement y ± U, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95 %.

No.	Item	MU
1	Conducted Emission	±2.56dB
2	RF power, conducted	±0.12dB
3	Spurious emissions, conducted	±0.11dB
4	All emissions, radiated(<1G)	±3.92dB
5	All emissions, radiated(>1G)	±4.28dB
6	Temperature	±0.1°C
7	Humidity	±1.0%

2. EUT Description

2.1. GENERAL DESCRIPTION OF EUT

Equipment	Mini PC
Model Name	FJ-W211
Serial No.	N/A
Trade Mark	N/A
Model Difference	N/A
FCC ID	**S74-FJW211**
Operation Frequency:	802.11a/n 20: 5745~5825 MHz 802.11n 40: 5755 MHz -5795 MHz
Channel Bandwidth:	802.11a/n 20:20MHz 802.11n 40: 40 MHz
Modulation Technology:	IEEE 802.11a/n20/n40
Modulation Type	CCK/OFDM/DBPSK/DQPSK
Antenna Type	Internal Antenna
Antenna Gain	1dBi
Power Source	DC12V, 2A from AC Adapter with AC120V/60Hz
Power Supply:	DC12V, 2A from AC Adapter with AC120V/60Hz

2.2. Operation Frequency each of channel

20MHz		40MHz	
Channel	Frequency	Channel	Frequency
149	5745	151	5755
153	5765	159	5790
157	5785		
161	5805		
165	5825		

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

2.3. Operation of EUT during testing

For 802.11a/n (HT20)

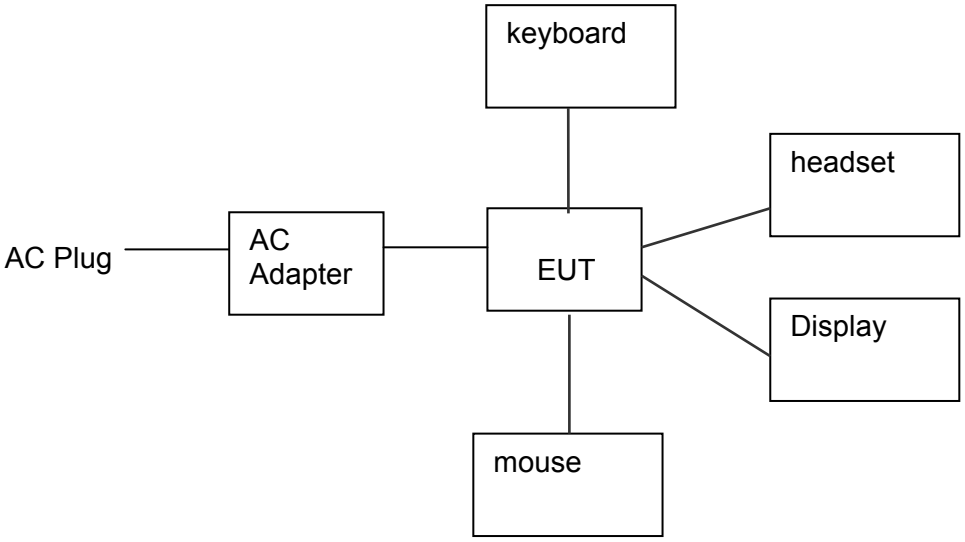
Band IV (5725 - 5850 MHz)		
Channel Number	Channel	Frequency (MHz)
149	Low	5745
157	Mid	5785
165	High	5825

For 802.11n (HT40)

Band IV (5725 - 5850 MHz)		
Channel Number	Channel	Frequency (MHz)
151	Low	5755
159	High	5795

2.4. DESCRIPTION OF TEST SETUP

Operation of EUT during conducted and during Radiation testing:



Operation of EUT Above1GHz Radiation testing:

● Adapter information
Model: XS-1202000
Input: 100-240V~, 50/60Hz, 0.6A
Output: 12VDC, 2A

●Display information
Model: 24PFF3661/T3
Input: AC120V/60Hz

●headset information
Model: MIT283
Input: DC5V

●mouse information
Model: OP-220
Input: DC5V

●keyboard information
Model: OJVMCW
Input: DC5V

3. Genera Information

3.1. Test environment and mode

Operating Environment:	
Temperature:	25.0 °C
Humidity:	56 % RH
Atmospheric Pressure:	1010 mbar
Test Mode:	
Engineering mode:	Keep the EUT in continuous transmitting by select channel and modulations(The value of duty cycle is 100%)
The sample was placed 0.8m/1.5m for blow/above 1GHz above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.	

We have verified the construction and function in typical operation. All the test modes were carried out with the EUT in transmitting operation, which was shown in this test report and defined as follows:	
Per-scan all kind of data rate in lowest channel, and found the follow list which it was worst case.	
Mode	Data rate
802.11a	6 Mbps
802.11n(HT20)	MCS0
802.11n(HT40)	MCS0
Final Test Mode:	
Operation mode:	Keep the EUT in continuous transmitting with modulation

3.2. 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.

Equipment	Model No.	Serial No.	FCC ID	Trade Name
/	/	/	/	/

Note:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.

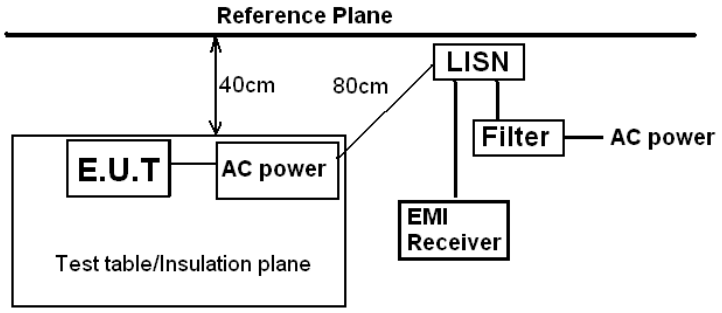
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

3. For conducted measurements (Output Power, Emission Bandwidth, Power Spectral Density, Spurious Emissions), the antenna of EUT is connected to the test equipment via temporary antenna connector, the antenna connector is soldered on the antenna port of EUT, and the temporary antenna connector is listed in the Test Instruments.

4. Test Results and Measurement Data

4.1. Conducted Emission

4.1.1. Test Specification

<table>
<tr><td>Test Requirement:</td><td>FCC Part15 C Section 15.207</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.10:2013</td></tr>
<tr><td>Frequency Range:</td><td>150 kHz to 30 MHz</td></tr>
<tr><td>Receiver setup:</td><td>RBW=9 kHz, VBW=30 kHz, Sweep time=auto</td></tr>
<tr><td>Limits:</td><td>
<table>
<tr><td rowspan="2">Frequency range (MHz)</td><td colspan="2">Limit (dBuV)</td></tr>
<tr><td>Quasi-peak</td><td>Average</td></tr>
<tr><td>0.15-0.5</td><td>66 to 56*</td><td>56 to 46*</td></tr>
<tr><td>0.5-5</td><td>56</td><td>46</td></tr>
<tr><td>5-30</td><td>60</td><td>50</td></tr>
</table>
</td></tr>
<tr><td>Test Setup:</td><td>


Remark:
E.U.T: Equipment Under Test
LISN: Line Impedence Stabilization Network
Test table height=0.8m
</td></tr>
<tr><td>Test Mode:</td><td>Tx Mode</td></tr>
<tr><td>Test Procedure:</td><td>1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment.
2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs).
3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10: 2013 on conducted measurement.</td></tr>
<tr><td>Test Result:</td><td>PASS</td></tr>
</table>

4.1.2. Test Instruments

Conducted Emission Shielding Room Test Site (843)				
Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Receiver	R&S	ESCI 7	HKE-010	Sep. 27, 2018
LISN	R&S	ENV216	HKE-002	Sep. 27, 2018
Coax cable (9KHz-30MHz)	Times	381806-002	N/A	Sep. 27, 2018
Conducted test software	Tonscend	TS+ Rev 2.5.0.0	HKE-081	N/A

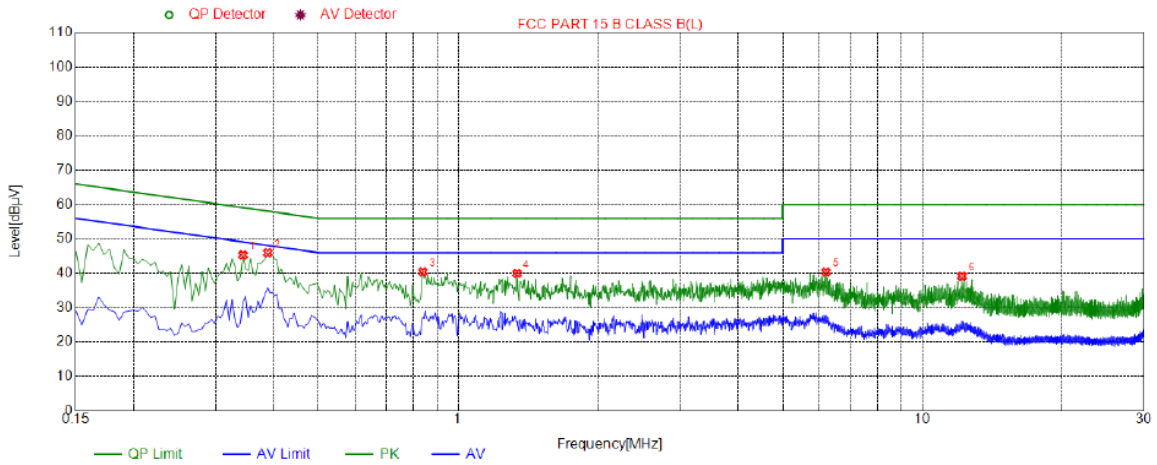
Note: *The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).*

4.1.3. Test data

Remark: We tested three Channels in AC 120V/60Hz and AC 230V/50Hz, the worst case was recorded. Please refer to following diagram for individual

Conducted Emission on Line Terminal of the power line (150 kHz to 30MHz)

Test Graph



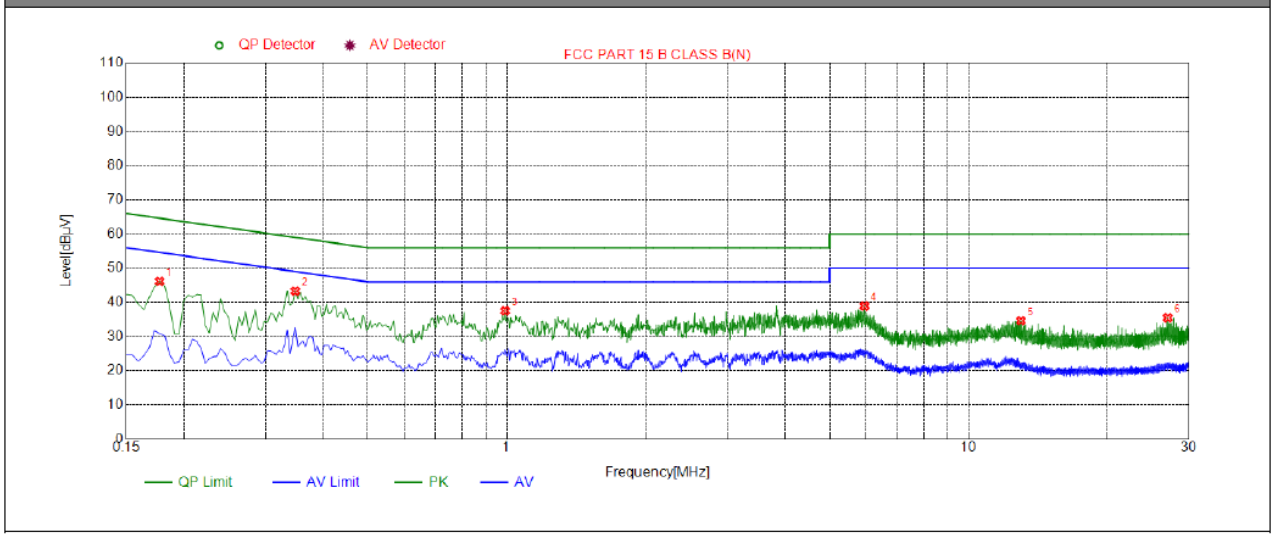
NO.	Freq. [MHz]	Level [dBµV]	Factor [dB]	Limit [dBµV]	Margin [dB]	Detector
1	0.3435	45.32	10.03	59.12	13.80	PK
2	0.3885	45.95	10.04	58.10	12.15	PK
3	0.8385	40.40	10.06	56.00	15.60	PK
4	1.3380	39.94	10.10	56.00	16.06	PK
5	6.1980	40.34	10.22	60.00	19.66	PK
6	12.1740	39.12	9.99	60.00	20.88	PK

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. *Final Level =Receiver Read level + LISN Factor + Cable Loss*
4. *If the average limit is met when using a quasi-peak detector receiver, the EUT shall be deemed to meet both limits and measurement with the average detector receiver is unnecessary.*

Conducted Emission on Neutral Terminal of the power line (150 kHz to 30MHz)

Test Graph



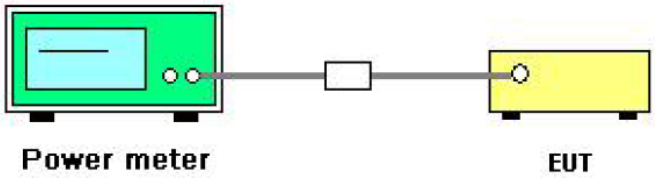
NO.	Freq. [MHz]	Level [dBμV]	Factor [dB]	Limit [dBμV]	Margin [dB]	Detector
1	0.1770	46.14	10.05	64.64	18.50	PK
2	0.3480	43.28	10.03	59.01	15.73	PK
3	0.9915	37.50	10.06	56.00	18.50	PK
4	5.9505	38.90	10.23	60.00	21.10	PK
5	12.9885	34.61	9.97	60.00	25.39	PK
6	27.0105	35.48	10.26	60.00	24.52	PK

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. *Final Level =Receiver Read level + LISN Factor + Cable Loss.*
4. *If the average limit is met when using a quasi-peak detector receiver, the EUT shall be deemed to meet both limits and measurement with the average detector receiver is unnecessary.*

4.2. Maximum Conducted Output Power

4.2.1. Test Specification

Test Requirement:	FCC Part15 E Section 15.407(a)& Part 2 J Section 2.1046
Test Method:	KDB789033 D02 General UNII Test Procedures New Rules v02.r01 Section E
Limit:	Frequency Band (MHz) / Limit 5150-5250 / 250mW for client devices 5725-5850 / 1 W
Test Setup:	
Test Mode:	Transmitting mode with modulation
Test Procedure:	1. The testing follows the Measurement Procedure of KDB789033 D02 General UNII Test Procedures New Rules v02r01 Section E, 3, a 2. The RF output of EUT was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement. 3. Set to the maximum power setting and enable the EUT transmit continuously. 5. Measure the conducted output power and record the results in the test report.
Test Result:	PASS
Remark:	Conducted output power= measurement power +10log(1/x) X is duty cycle=1, so 10log(1/1)=0 Conducted output power= measurement power

4.2.2. Test Instruments

RF Test Room				
Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum analyzer	Agilent	N9020A	HKE-048	Sep. 27, 2018
Power meter	Agilent	E4419B	HKE-085	Sep. 27, 2018
Power Sensor	Agilent	E9300A	HKE-086	Sep. 27, 2018
RF cable	Times	1-40G	HKE-034	Sep. 27, 2018
RF automatic control unit	Tonscend	JS0806-2	HKE-060	Sep. 27, 2018

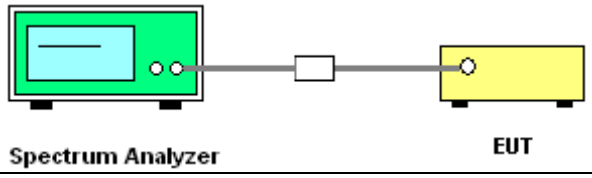
Note: *The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).*

4.2.3. Test Data

Configuration Band IV (5725 - 5850 MHz)				
Mode	Test channel	Maximum Conducted Output Power (dBm)	FCC Limit (dBm)	Result
11a	CH149	16.35	30	PASS
11a	CH157	15.89	30	PASS
11a	CH165	16.22	30	PASS
11n (HT20)	CH149	16.06	30	PASS
11n (HT20)	CH157	15.84	30	PASS
11n (HT20)	CH165	15.67	30	PASS
11n (HT40)	CH151	15.56	30	PASS
11n (HT40)	CH159	15.43	30	PASS

4.3. 6dB Emission Bandwidth

4.3.1. Test Specification

Test Requirement:	FCC CFR47 Part 15 Section 15.407(e)& Part 2 J Section 2.1049
Test Method:	KDB789033 D02 General UNII Test Procedures New Rules v02r01 Section C
Limit:	>500kHz
Test Setup:	
Test Mode:	Transmitting mode with modulation
Test Procedure:	1. KDB789033 D02 General UNII Test Procedures New Rules v02r01 Section C 2. Set to the maximum power setting and enable the EUT transmit continuously. 3. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement. The 6dB bandwidth must be greater than 500 kHz. 4. Measure and record the results in the test report.
Test Result:	PASS

4.3.2. Test Instruments

RF Test Room				
Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum analyzer	Agilent	N9020A	HKE-048	Sep. 27, 2018
RF cable	Times	1-40G	HKE-034	Sep. 27, 2018
RF automatic control unit	Tonscend	JS0806-2	HKE-060	Sep. 27, 2018

Note: *The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).*

4.3.3. Test data

Band IV (5725 - 5850 MHz)					
Mode	Test channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limit (MHz)	Result
11a	CH149	5745	16.35	0.5	PASS
11a	CH157	5785	16.35	0.5	PASS
11a	CH161	5825	16.36	0.5	PASS
11n(HT20)	CH149	5745	17.05	0.5	PASS
11n(HT20)	CH157	5785	17.06	0.5	PASS
11n(HT20)	CH161	5825	16.83	0.5	PASS
11n(HT40)	CH151	5755	35.31	0.5	PASS
11n(HT40)	CH159	5795	35.39	0.5	PASS

Test plots as follows:

Band IV (5725 – 5850 MHz)

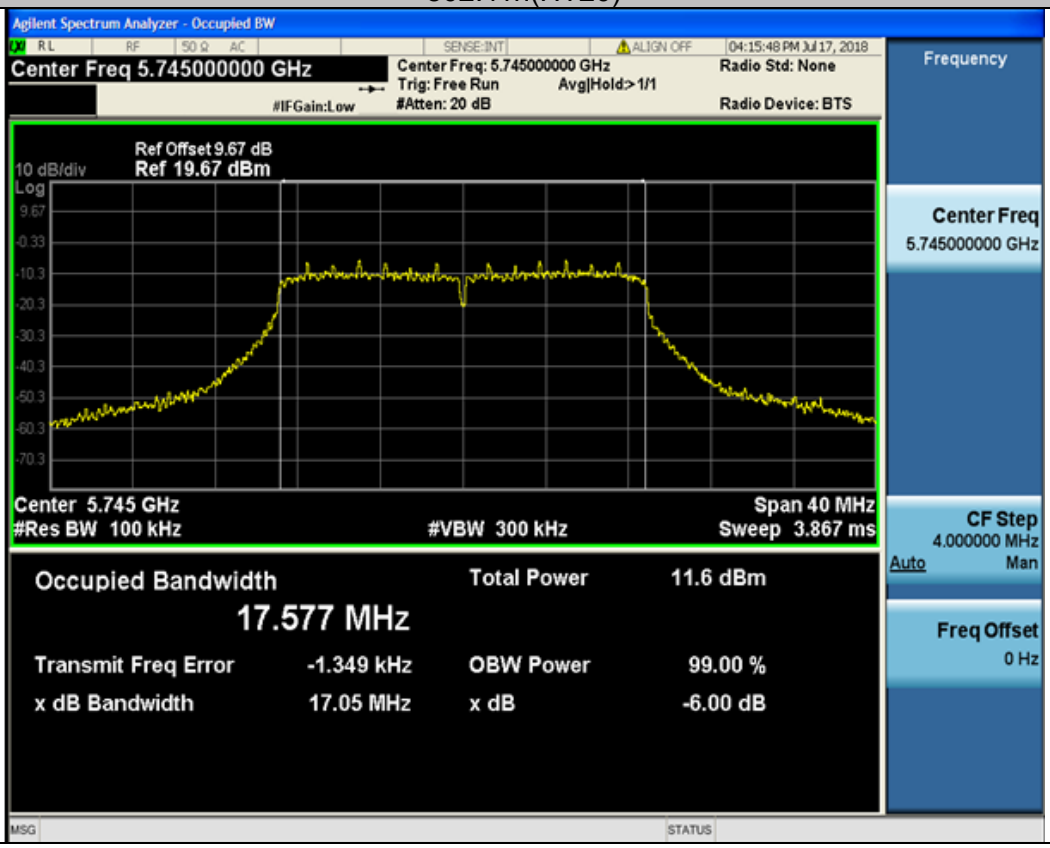
802.11a

Low

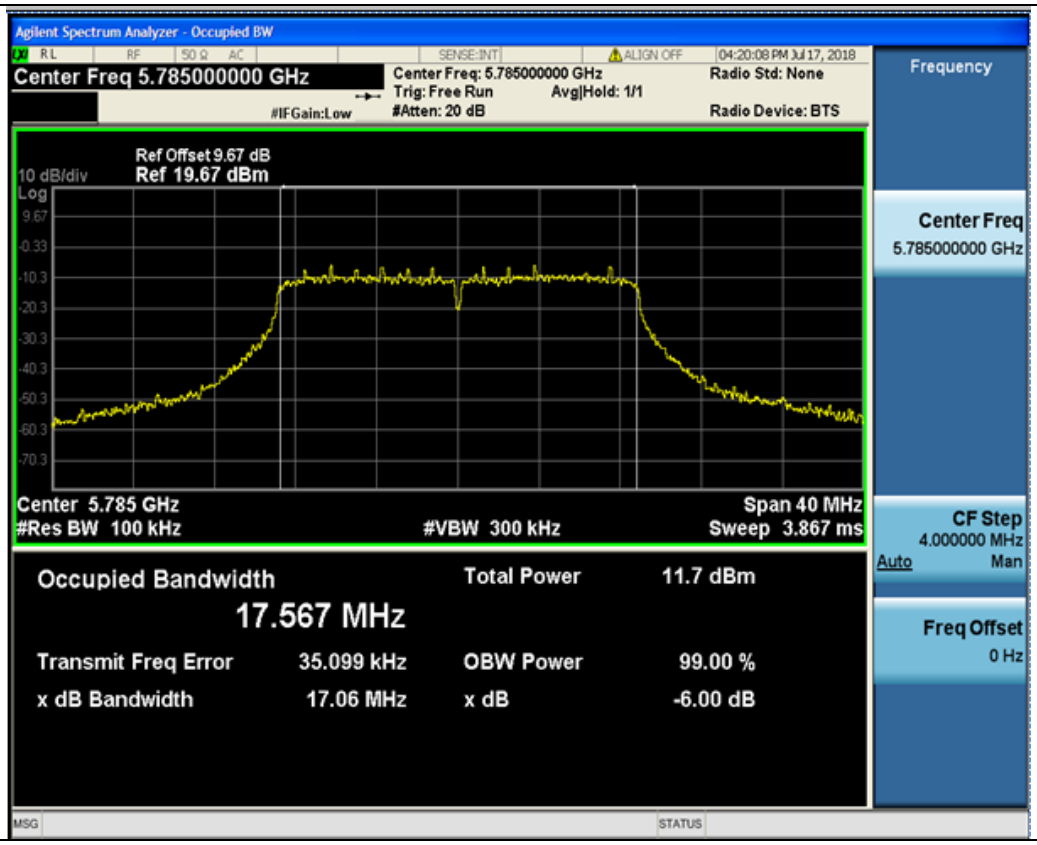
Mid

High

802.11n(HT20)



Low


Agilent Spectrum Analyzer - Occupied BW
Center Freq 5.785000000 GHz
Center Freq: 5.785000000 GHz
Trig: Free Run
Avg|Hold: 1/1
#Atten: 20 dB
Radio Std: None
Radio Device: BTS
#IFGain:Low
04:20:08 PM Jul 17, 2018
Frequency
Ref Offset 9.67 dB
10 dB/div
Ref 19.67 dBm
Log
Center Freq
5.785000000 GHz
Center 5.785 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 40 MHz
Sweep 3.867 ms
CF Step
4.000000 MHz
Auto
Man
Occupied Bandwidth
17.567 MHz
Total Power
11.7 dBm
Transmit Freq Error
35.099 kHz
OBW Power
99.00 %
x dB Bandwidth
17.06 MHz
x dB
-6.00 dB
Freq Offset
0 Hz
MSG
STATUS

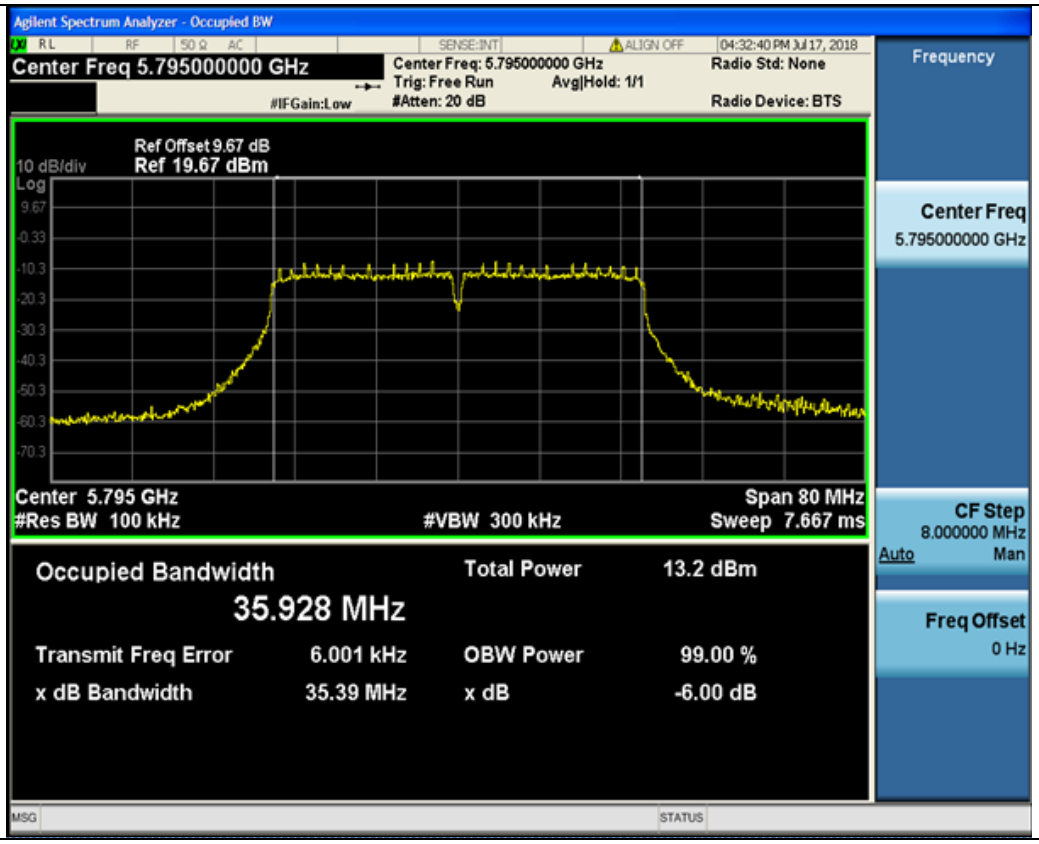
Mid

Agilent Spectrum Analyzer - Occupied BW
Center Freq 5.825000000 GHz
Center Freq: 5.825000000 GHz
Trig: Free Run
Avg|Hold: 1/1
#Atten: 20 dB
Radio Std: None
Radio Device: BTS
#IFGain:Low
04:23:55 PM Jul 17, 2018
Frequency
Ref Offset 10 dB
10 dB/div
Ref 20.00 dBm
Log
Center Freq
5.825000000 GHz
Center 5.825 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 40 MHz
Sweep 3.867 ms
CF Step
4.000000 MHz
Auto
Man
Occupied Bandwidth
17.579 MHz
Total Power
12.6 dBm
Transmit Freq Error
9.797 kHz
OBW Power
99.00 %
x dB Bandwidth
16.83 MHz
x dB
-6.00 dB
Freq Offset
0 Hz
MSG
STATUS

High

802.11n(HT40)

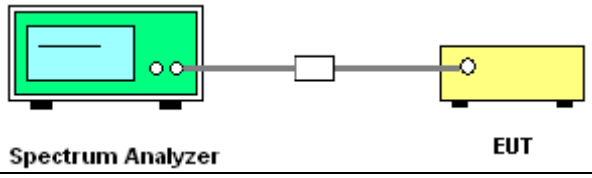
Low



High

4.4. 26dB Bandwidth and 99% Occupied Bandwidth

4.4.1. Test Specification

Test Requirement:	47 CFR Part 15C Section 15.407 (a)& Part 2 J Section 2.1049
Test Method:	KDB789033 D02 General UNII Test Procedures New Rules v02r01 Section C
Limit:	No restriction limits
Test Setup:	
Test Mode:	Transmitting mode with modulation
Test Procedure:	1. KDB789033 D02 General UNII Test Procedures New Rules v02r01 Section C 2. Set to the maximum power setting and enable the EUT transmit continuously. 3. Make the measurement with the spectrum analyzer's resolution bandwidth RBW = 1% EBW, VBW≥3RBW, In order to make an accurate measurement. 4. Measure and record the results in the test report.
Test Result:	PASS

4.4.2. Test Instruments

RF Test Room				
Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum analyzer	Agilent	N9020A	HKE-048	Sep. 27, 2018
RF cable	Times	1-40G	HKE-034	Sep. 27, 2018
RF automatic control unit	Tonscend	JS0806-2	HKE-060	Sep. 27, 2018

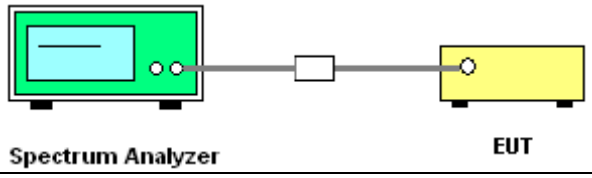
Note: *The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).*

Test Result

Not applicable.
Note: EUT only supports Band IV (5725-5850MHz), not supports Band I(5180-5240MHz), so this test not applicable

4.5. Power Spectral Density

4.5.1. Test Specification

Test Requirement:	FCC Part15 E Section 15.407 (a)
Test Method:	KDB789033 D02 General UNII Test Procedures New Rules v02r01 Section F
Limit:	≤11.00dBm/MHz for Band I 5150MHz-5250MHz ≤30.00dBm/500KHz for Band IV 5725MHz-5850MHz The e.i,r,p spectral density for Band I 5150MHz – 5250 MHz should not exceed 10dBm/MHz
Test Setup:	
Test Mode:	Transmitting mode with modulation
Test Procedure:	1. Set the spectrum analyzer or EMI receiver span to view the entire emission bandwidth. 1. Set RBW = 510 kHz/1 MHz, VBW ≥ 3*RBW, Sweep time = Auto, Detector = RMS. 2. Allow the sweeps to continue until the trace stabilizes. 3. Use the peak marker function to determine the maximum amplitude level. 4. The E.I.R.P spectral density used radiated test method. At a test site that has been validated using the procedures of ANSI C63.4 or the latest CISPR 16-1-4 for measurements above 1 GHz, so as to simulate a near free-space environment.
Test Result:	PASS

4.5.2. Test Instruments

RF Test Room				
Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum analyzer	Agilent	N9020A	HKE-048	Sep. 27, 2018
RF cable	Times	1-40G	HKE-034	Sep. 27, 2018
RF automatic control unit	Tonscend	JS0806-2	HKE-060	Sep. 27, 2018

Note: *The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).*

4.5.3. Test data

Configuration Band IV (5725 - 5850 MHz)						
Mode	Test channel	Level [dBm/500kHz]	10log(1/x) Factor[dB]	Power Spectral Density	Limit (dBm/500kHz)	Result
11a	CH149	-0.45	0	-0.08	30	PASS
11a	CH157	-2.36	0	-2.15	30	PASS
11a	CH161	-2.04	0	-1.86	30	PASS
11n(HT20)	CH149	-3.44	0	-3.25	30	PASS
11n(HT20)	CH157	-2.95	0	-2.76	30	PASS
11n(HT20)	CH161	-1.54	0	-1.40	30	PASS
11n(HT40)	CH151	-5.41	0	-4.49	30	PASS
11n(HT40)	CH159	-4.75	0	-4.37	30	PASS

Test plots as follows:

Band IV (5725 – 5850 MHz)

802.11a

Low

Mid

High

802.11n(HT20)

Low

Agilent Spectrum Analyzer - Swept SA
Center Freq 5.785000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 20 dB
Avg Type: RMS
Avg|Hold: 10/10
04:21:26 PM Jul 17, 2018
Ref Offset 9.67 dB
10 dB/div
Ref 19.67 dBm
Mkr1 5.778 41 GHz
-2.947 dBm
Center 5.78500 GHz
#Res BW 510 kHz
#VBW 1.5 MHz*
Span 34.12 MHz
Sweep 1.000 ms (1001 pts)
Frequency
Auto Tune
Center Freq
5.785000000 GHz
Start Freq
5.767940000 GHz
Stop Freq
5.802060000 GHz
CF Step
3.412000 MHz
Auto
Man
Freq Offset
0 Hz

Mid

Agilent Spectrum Analyzer - Swept SA
Center Freq 5.825000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 20 dB
Avg Type: RMS
Avg|Hold: 10/10
04:25:13 PM Jul 17, 2018
Ref Offset 10 dB
10 dB/div
Ref 20.00 dBm
Mkr1 5.829 14 GHz
-1.541 dBm
Center 5.82500 GHz
#Res BW 510 kHz
#VBW 1.5 MHz*
Span 33.66 MHz
Sweep 1.000 ms (1001 pts)
Frequency
Auto Tune
Center Freq
5.825000000 GHz
Start Freq
5.808170000 GHz
Stop Freq
5.841830000 GHz
CF Step
3.366000 MHz
Auto
Man
Freq Offset
0 Hz

High

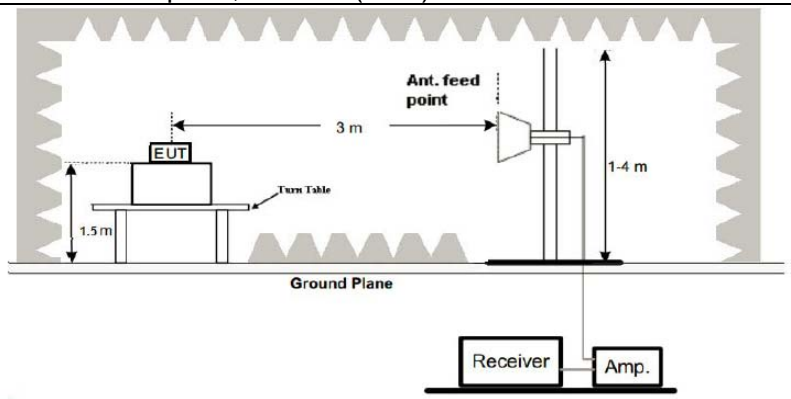
802.11n(HT40)

Low

High

4.6. Band edge

4.6.1. Test Specification

Test Requirement:	FCC CFR47 Part 15E Section 15.407
Test Method:	ANSI C63.10 2013
Limit:	For band I&II&III: E[dBμV/m] = EIRP[dBm] + 95.2=68.2 dBμV/m, for EIRP(dBm)= **-27dBm** For transmitters operating in the 5.725-5.85 GHz band: All emissions shall be limited to a level of −27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge. For band IV(5715-5725MHz&5850-5860MHz): E[dBμV/m] = EIRP[dBm] + 95.2=78.2 dBμV/m, for EIRP(dBm)= **-27dBm**; For band IV(other un-restricted band):E[dBμV/m] = EIRP[dBm] + 95.2=68.2 dBμV/m, for EIRP(dBm)= **-27dBm**
Test Setup:	
Test Mode:	Transmitting mode with modulation
Test Procedure:	1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation. 2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. 3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. 4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was

	turned from 0 degrees to 360 degrees to find the maximum reading. 5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasipeak or average method as specified and then reported in a data sheet.
Test Result:	PASS

4.6.2. Test Instruments

Radiated Emission Test Site (966)				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Receiver	R&S	ESRP3	HKE-005	Sep. 27, 2018
Spectrum analyzer	Agilent	N9020A	HKE-048	Sep. 27, 2018
Preamplifier	EMCI	EMC051845SE	HKE-015	Sep. 27, 2018
Preamplifier	Agilent	83051A	HKE-016	Sep. 27, 2018
Loop antenna	Schwarzbeck	FMZB 1519 B	HKE-014	Sep. 26, 2019
Broadband antenna	Schwarzbeck	VULB 9163	HKE-012	Sep. 26, 2019
Horn antenna	Schwarzbeck	9120D	HKE-013	Sep. 26, 2019
Antenna Mast	Keleto	CC-A-4M	N/A	N/A
Position controller	Taiwan MF	MF7802	HKE-011	Sep. 27, 2018
Radiated test software	Tonscend	TS+ Rev 2.5.0.0	HKE-082	N/A
RF cable (9KHz-1GHz)	Times	381806-001	N/A	N/A
Hf antenna	Schwarzbeck	LB-180400-KF	HKE-031	Sep. 27, 2019
RF cable	Tonscend	1-18G	HKE-099	Sep. 27, 2018
RF cable	Times	1-40G	HKE-034	Sep. 27, 2018

Note: *The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).*

4.6.3. Test Data

Radiated Band Edge Test:
Operation Mode: 802.11a Mode with 5.8G TX CH Low

Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
5650	57.46	-2.06	55.4	68.2	-12.8	peak
5650	/	-2.06	/	54	/	AVG
5700	89.53	-1.96	87.57	105.2	-17.63	peak
5700	/	-1.96	/	54	/	AVG
5720	92.65	-2.87	89.78	110.8	-21.02	peak
5720	/	-2.87	/	54	/	AVG
5725	111.72	-2.14	109.58	122.2	-12.62	peak
5725	/	-2.14	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
5650	58.47	-2.06	56.41	68.2	-11.79	peak
5650	/	-2.06	/	54	/	AVG
5700	90.13	-1.96	88.17	105.2	-17.03	peak
5700	/	-1.96	/	54	/	AVG
5720	94.55	-2.87	91.68	110.8	-19.12	peak
5720	/	-2.87	/	54	/	AVG
5725	111.96	-2.14	109.82	122.2	-12.38	peak
5725	/	-2.14	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Operation Mode: TX CH High with 5.8G

Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
5850	112.52	-1.97	110.55	122.2	-11.65	peak
5850	/	-1.97	/	54	/	AVG
5855	94.76	-2.13	92.63	110.8	-18.17	peak
5855	/	-2.13	/	54	/	AVG
5875	86.54	-2.65	83.89	105.2	-21.31	peak
5875	/	-2.65	/	54	/	AVG
5925	53.29	-2.28	51.01	68.2	-17.19	peak
5925	/	-2.28	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
5850	111.83	-1.97	109.86	122.2	-12.34	peak
5850	/	-1.97	/	54	/	AVG
5855	92.57	-2.13	90.44	110.8	-20.36	peak
5855	/	-2.13	/	54	/	AVG
5875	85.42	-2.65	82.77	105.2	-22.43	peak
5875	/	-2.65	/	54	/	AVG
5925	54.19	-2.28	51.91	68.2	-16.29	peak
5925	/	-2.28	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Operation Mode: 802.11n20 Mode with 5.8G TX CH Low

Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
5650	56.88	-2.06	54.82	68.2	-13.38	peak
5650	/	-2.06	/	54	/	AVG
5700	91.46	-1.96	89.5	105.2	-15.7	peak
5700	/	-1.96	/	54	/	AVG
5720	93.73	-2.87	90.86	110.8	-19.94	peak
5720	/	-2.87	/	54	/	AVG
5725	112.59	-2.14	110.45	122.2	-11.75	peak
5725	/	-2.14	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
5650	59.47	-2.06	57.41	68.2	-10.79	peak
5650	/	-2.06	/	54	/	AVG
5700	97.62	-1.96	95.66	105.2	-9.54	peak
5700	/	-1.96	/	54	/	AVG
5720	93.84	-2.87	90.97	110.8	-19.83	peak
5720	/	-2.87	/	54	/	AVG
5725	112.56	-2.14	110.42	122.2	-11.78	peak
5725	/	-2.14	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Operation Mode: TX CH High with 5.8G
Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
5850	111.76	-1.97	109.79	122.2	-12.41	peak
5850	/	-1.97	/	54	/	AVG
5855	93.25	-2.13	91.12	110.8	-19.68	peak
5855	/	-2.13	/	54	/	AVG
5875	87.15	-2.65	84.5	105.2	-20.7	peak
5875	/	-2.65	/	54	/	AVG
5925	52.49	-2.28	50.21	68.2	-17.99	peak
5925	/	-2.28	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
5850	111.34	-1.97	109.37	122.2	-12.83	peak
5850	/	-1.97	/	54	/	AVG
5855	92.59	-2.13	90.46	110.8	-20.34	peak
5855	/	-2.13	/	54	/	AVG
5875	86.72	-2.65	84.07	105.2	-21.13	peak
5875	/	-2.65	/	54	/	AVG
5925	55.56	-2.28	53.28	68.2	-14.92	peak
5925	/	-2.28	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Operation Mode: 802.11n40 Mode with 5.8G TX CH Low

Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
5650	57.26	-2.06	55.2	68.2	-13	peak
5650	/	-2.06	/	54	/	AVG
5700	92.48	-1.96	90.52	105.2	-14.68	peak
5700	/	-1.96	/	54	/	AVG
5720	94.55	-2.87	91.68	110.8	-19.12	peak
5720	/	-2.87	/	54	/	AVG
5725	113.04	-2.14	110.9	122.2	-11.3	peak
5725	/	-2.14	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
5650	60.21	-2.06	58.15	68.2	-10.05	peak
5650	/	-2.06	/	54	/	AVG
5700	95.47	-1.96	93.51	105.2	-11.69	peak
5700	/	-1.96	/	54	/	AVG
5720	92.58	-2.87	89.71	110.8	-21.09	peak
5720	/	-2.87	/	54	/	AVG
5725	112.54	-2.14	110.4	122.2	-11.8	peak
5725	/	-2.14	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Operation Mode: TX CH High with 5.8G
Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
5850	110.23	-1.97	108.26	122.2	-13.94	peak
5850	/	-1.97	/	54	/	AVG
5855	94.17	-2.13	92.04	110.8	-18.76	peak
5855	/	-2.13	/	54	/	AVG
5875	88.64	-2.65	85.99	105.2	-19.21	peak
5875	/	-2.65	/	54	/	AVG
5925	53.39	-2.28	51.11	68.2	-17.09	peak
5925	/	-2.28	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
5850	110.02	-1.97	108.05	122.2	-14.15	peak
5850	/	-1.97	/	54	/	AVG
5855	93.57	-2.13	91.44	110.8	-19.36	peak
5855	/	-2.13	/	54	/	AVG
5875	86.61	-2.65	83.96	105.2	-21.24	peak
5875	/	-2.65	/	54	/	AVG
5925	52.48	-2.28	50.2	68.2	-18	peak
5925	/	-2.28	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

4.7. Spurious Emission

4.7.1.1. Test Specification

Test Requirement:	FCC CFR47 Part 15 Section 15.407 & 15.209 & 15.205
Test Method:	KDB 789033 D02 v02r01
Frequency Range:	9kHz to 40GHz
Measurement Distance:	3 m
Antenna Polarization:	Horizontal & Vertical
Operation mode:	Transmitting mode with modulation

Receiver Setup:

Frequency	Detector	RBW	VBW	Remark
9kHz- 150kHz	Quasi-peak	200Hz	1kHz	Quasi-peak Value
150kHz-30MHz	Quasi-peak	9kHz	30kHz	Quasi-peak Value
30MHz-1GHz	Quasi-peak	100KHz	300KHz	Quasi-peak Value
Above 1GHz	Peak	1MHz	3MHz	Peak Value
	Peak	1MHz	10Hz	Average Value

Limit:

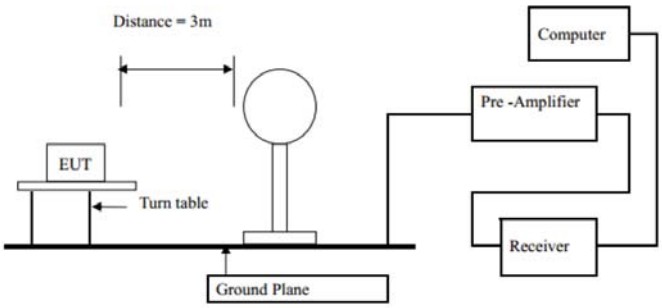
Unwanted spurious emissions fallen in restricted bands per FCC Part15.205 shall comply with the general field strength limits set forth in § 15.209 as below table,

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

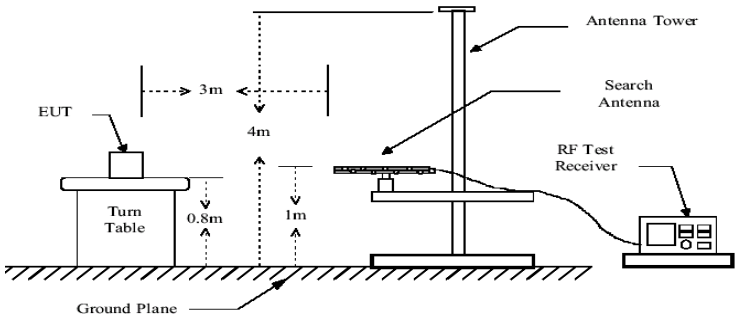
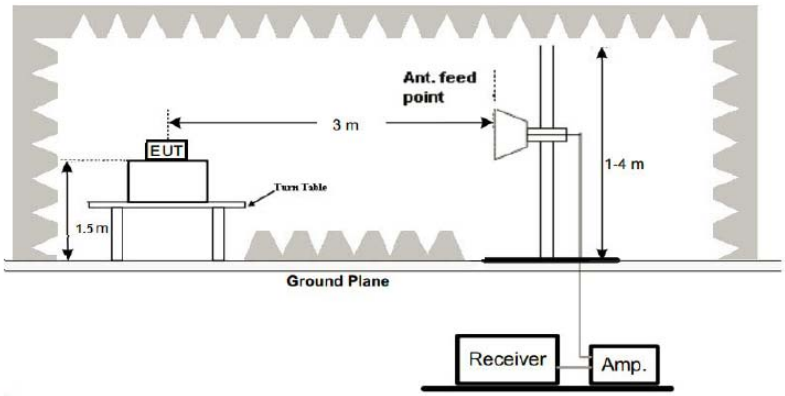
Frequency	Limit (dBuV/m @3m)	Detector
Above 1G	74.0	Peak
	54.0	Average

Test setup:

For radiated emissions below 30MHz



30MHz to 1GHz

	 Above 1GHz 
Test Procedure:	1. The EUT was placed on the top of a rotating table 0.8 meters above the groundat a 3 meter camber. The table was rotated 360 degrees todetermine the position of the highest radiation. 2. The EUT was set 3 meters away from the interference-receiving antenna, whichwas mounted on the top of a variable-height antenna tower. 3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. 4. For each suspected emission, the EUT was arranged to its worst case and thenthe antenna was tuned to heights from 1 meter to 4 meters and the rotatablewas turned from 0 degrees to 360 degrees to find the maximum reading. 5. The test-receiver system was set to Peak Detect Function and SpecifiedBandwidth with Maximum Hold Mode. 6. If the emission level of the EUT in peak mode was 10dB lower than the limitspecified, then testing could be stopped and the peak values of the EUT wouldbe reported. Otherwise the emissions that did not have 10dB margin would bere-tested one by one using peak, quasi-peak or average method as specified andthen reported in a data sheet.
Test results:	PASS

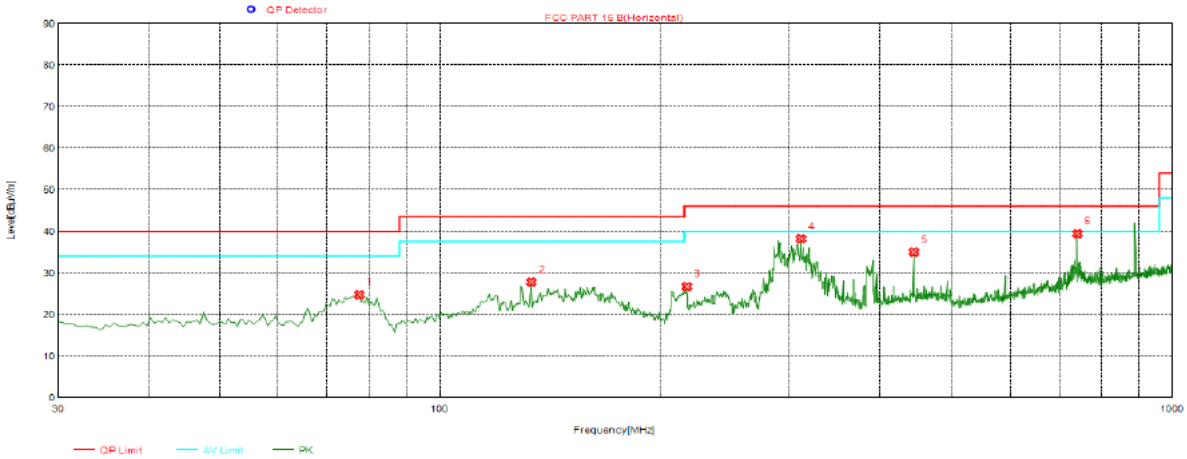
4.7.2. Test Data

Remark: We tested all Channels, the worst case was recorded.

Please refer to following diagram for individual

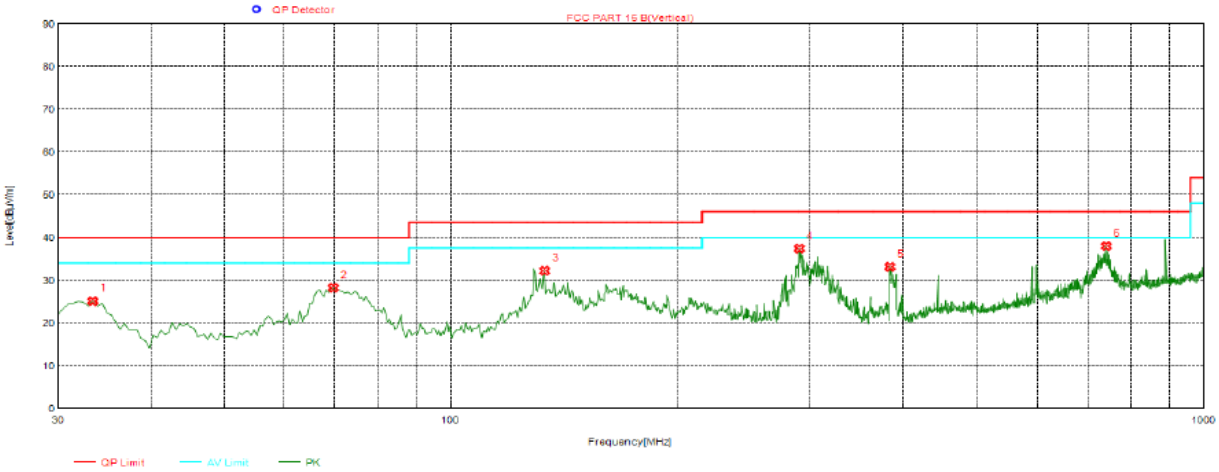
Below 1GHz

Horizontal



NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Trace	Height [cm]	Angle [°]	Polarity
1	77.5300	24.71	-18.90	40.00	15.29	PK	100	56	Horizontal
2	133.3050	27.74	-13.38	43.50	15.76	PK	100	281	Horizontal
3	217.6950	26.66	-15.29	46.00	19.34	PK	100	78	Horizontal
4	311.7850	38.18	-12.90	46.00	7.82	PK	100	60	Horizontal
5	445.1600	35.00	-9.26	46.00	11.00	PK	100	314	Horizontal
6	741.9800	39.42	-3.32	46.00	6.58	PK	100	332	Horizontal

Vertical



NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Trace	Height [cm]	Angle [°]	Polarity
1	33.3950	25.08	-17.35	40.00	14.92	PK	100	77	Vertical
2	69.7700	28.21	-17.74	40.00	11.79	PK	100	10	Vertical
3	133.3050	32.20	-13.38	43.50	11.30	PK	100	360	Vertical
4	290.9300	37.40	-13.34	46.00	8.60	PK	100	187	Vertical
5	384.0500	33.14	-10.99	46.00	12.86	PK	100	44	Vertical
6	741.9800	37.98	-3.32	46.00	8.02	PK	100	32	Vertical

Above 1GHz

LOW CH 149 (802.11 a Mode with 5.8G)/5745

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
3647	62.85	-4.59	58.26	74	-15.74	peak
3647	46.69	-4.59	42.1	54	-11.9	AVG
11570	53.42	4.21	57.63	74	-16.37	peak
11570	41.36	4.21	45.57	54	-8.43	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
3647	62.26	-4.59	57.67	74	-16.33	peak
3647	46.44	-4.59	41.85	54	-12.15	AVG
11570	54.37	4.21	58.58	74	-15.42	peak
11570	40.61	4.21	44.82	54	-9.18	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

MID CH157 (802.11 a Mode with 5.8G)/5785

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
3647	61.53	-4.59	56.94	74	-17.06	peak
3647	46.28	-4.59	41.69	54	-12.31	AVG
11570	53.45	4.21	57.66	74	-16.34	peak
11570	39.86	4.21	44.07	54	-9.93	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
3647	61.16	-4.59	56.57	74	-17.43	peak
3647	46.43	-4.59	41.84	54	-12.16	AVG
11570	52.58	4.21	56.79	74	-17.21	peak
11570	38.65	4.21	42.86	54	-11.14	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

HIGH CH 165 (802.11a Mode with 5.8G)/5825

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
3647	61.87	-4.59	57.28	74	-16.72	peak
3647	46.25	-4.59	41.66	54	-12.34	AVG
11650	52.43	4.84	57.27	74	-16.73	peak
11650	38.52	4.84	43.36	54	-10.64	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

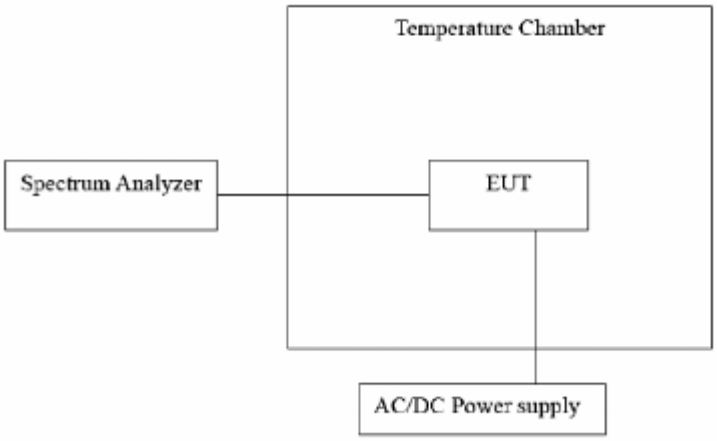
Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
3647	61.05	-4.59	56.46	74	-17.54	peak
3647	45.59	-4.59	41	54	-13	AVG
11650	51.64	4.84	56.48	74	-17.52	peak
11650	38.21	4.84	43.05	54	-10.95	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Remark：
(1) Measuring frequencies from 1 GHz to the 25 GHz。
(2) “F” denotes fundamental frequency; “H” denotes spurious frequency. “E” denotes band edge frequency.
(3) * denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.
(4) Data of measurement within this frequency range shown “--- ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
(5) The IF bandwidth of EMI Test Receiver between 30MHz to 1GHz was 120KHz, 1 MHz for measuring above 1 GHz, below 30MHz was 10KHz.
(6) When the test results of Peak Detected below the limits of Average Detected, the Average Detected is not need completed. For example: Top Channel at Fundamental 73.16dBuV/m(PK Value) <93.98(AV Limit), at harmonic 53.20 dBuV/m(PK Value) <54 dBuV/m(AV Limit), the Average Detected not need to completed.

4.8. requency Stability Measurement

4.8.1. Test Specification

Test Requirement:	FCC Part15 Section 15.407(g) &Part2 J Section 2.1055
Test Method:	ANSI C63.10: 2013
Limit:	The frequency tolerance shall be maintained within the band of operation frequency over a temperature variation of 0 degrees to 35 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C.
Test Setup:	
Test Procedure:	The EUT was placed inside the environmental test chamber and powered by nominal AC/DC voltage. b. Turn the EUT on and couple its output to a spectrum analyzer. c. Turn the EUT off and set the chamber to the highest temperature specified. d. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize. e. Repeat step 2 and 3 with the temperature chamber set to the lowest temperature. f. The test chamber was allowed to stabilize at +20 degree C for a minimum of 30 minutes. The supply voltage was then adjusted on the EUT from 85% to 115% and the frequency record.
Test Result:	PASS
Remark:	N/A

Test Result as follows:

Mode	Voltage (V)	FHL (5745MHz)	Deviation (KHz)	FHH (5825MHz)	Deviation (KHz)
5.8G Band	132 V	5744.985	15	5824.981	19
	120 V	5744.983	17	5824.986	14
	108 V	5744.988	12	5824.984	16

Mode	Temperature (℃)	FHL (5745MHz)	Deviation (KHz)	FHH (5825MHz)	Deviation (KHz)
5.8G Band	-30	5744.966	34	5824.969	31
	-20	5744.972	28	5824.968	32
	-10	5744.975	25	5824.971	29
	0	5744.978	22	5824.976	24
	10	5744.974	26	5824.977	23
	20	5744.983	17	5824.985	15
	30	5744.982	18	5824.983	17
	40	5744.978	22	5824.981	19
	50	5744.975	25	5824.980	20

4.9. ANTENNA REQUIREMENT

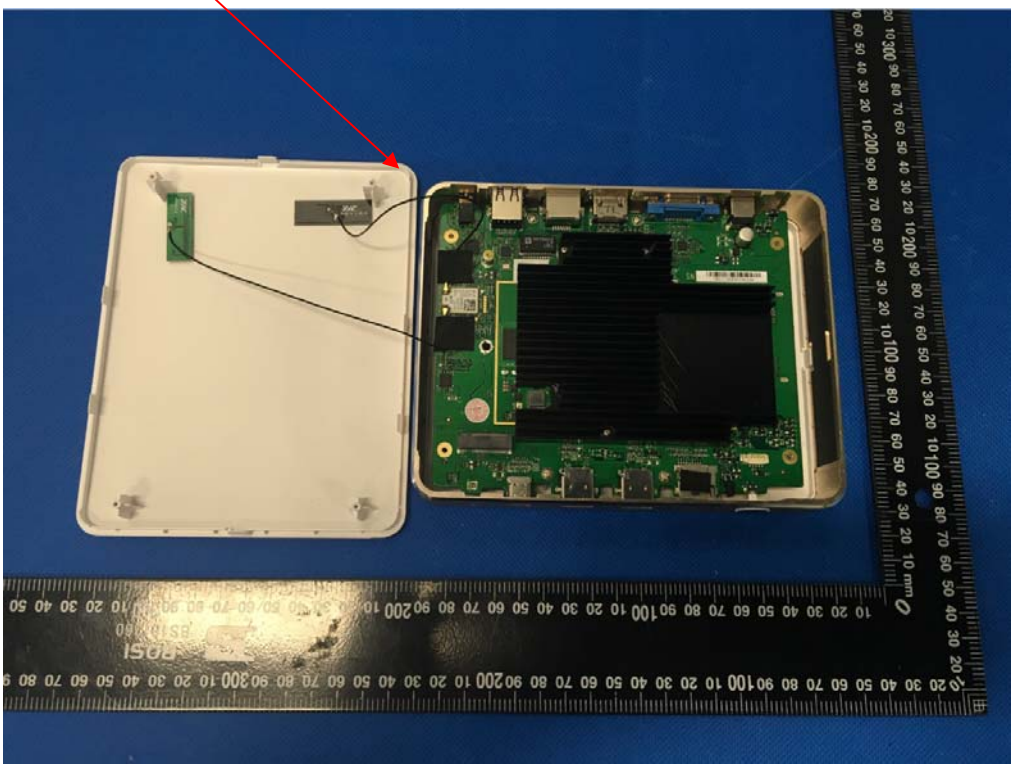
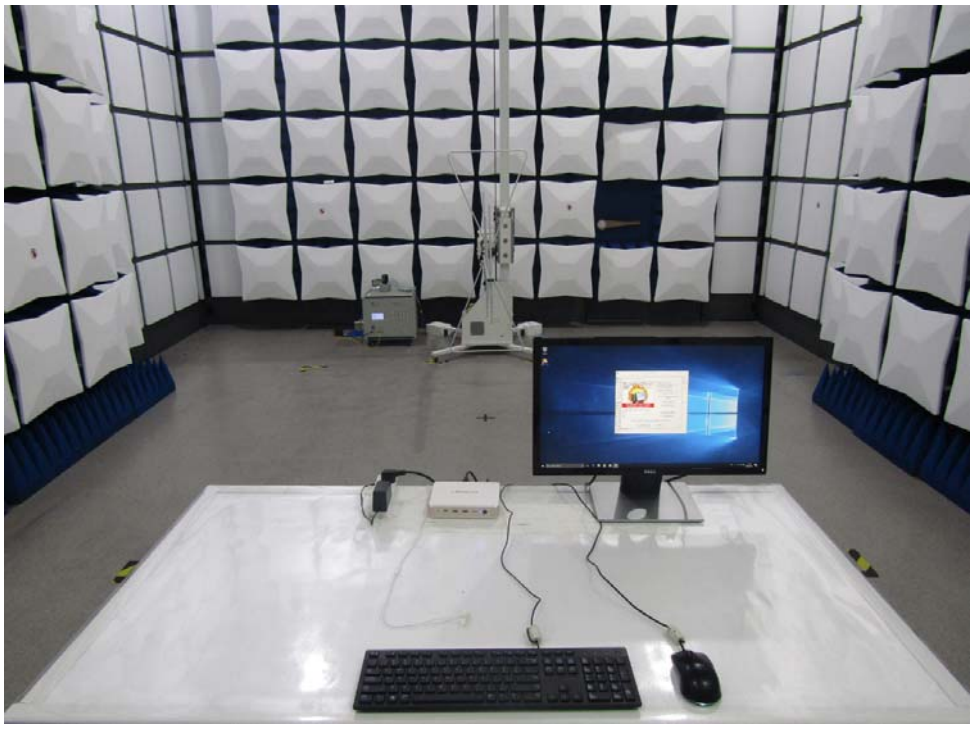
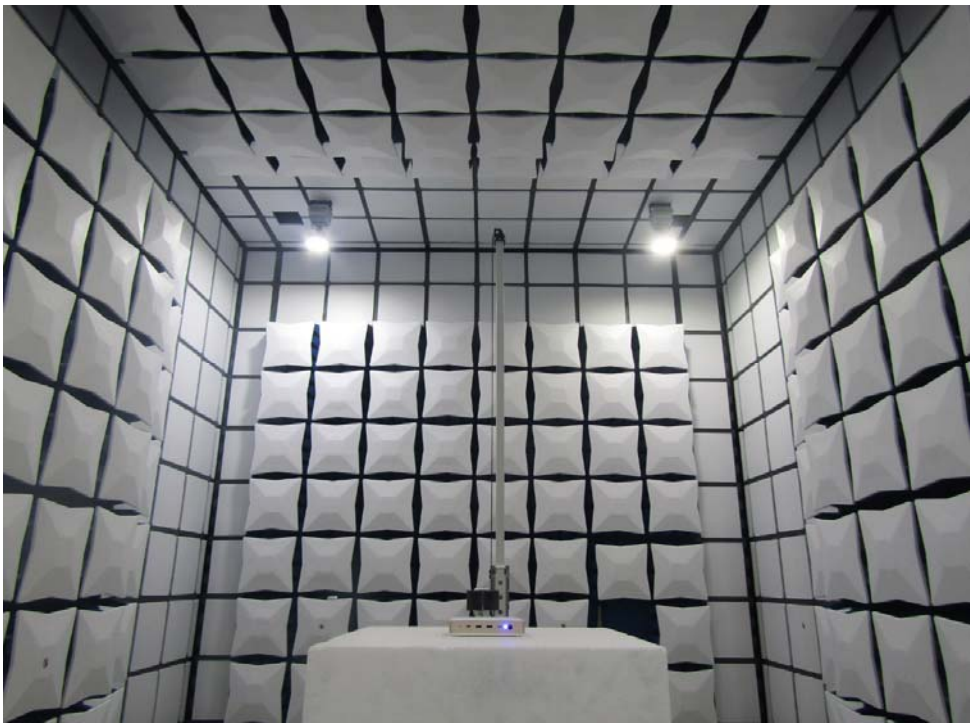
Standard Applicable
For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.249, if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

Refer to statement below for compliance.
The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

Antenna Connected Construction
The antenna used in this product is a Integral Antenna, The directional gains of antenna used for transmitting is 1dBi.

WIFI ANTENNA

Note: Only one Antenna is available, the other one Antenna not be used.



4.10. Photographs of Test Setup