TEST REPORT

Test report
On Behalf of
Venture 3 Systems LLC
For
Notebook
Model No.: ADR15-01, ADR15-02, ADR15-03, ADR15-04
FCC ID：2AVAHADR15-01

Prepared for :	**Venture 3 Systems LLC** **2805 Sterling Drive Hatfield, PA 19440, USA**
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:	**Nov. 28, 2019 ~ Dec. 05, 2019**
Date of Report:	**Dec. 05, 2019**
Report Number:	**HK1911293050-3E**

TEST RESULT CERTIFICATION

Applicant's name.....: Venture 3 Systems LLC

Address .....: 2805 Sterling Drive Hatfield, PA 19440, USA.

Manufacture's Name.....: Shenzhen Adreamer Elite Co., Ltd.

Address .....: Floor 4th, Fuanna industrial park,No.1 qingning road, qinghu, longhua Dist, Shenzhen, China.

Product description

Trade Mark: Telikin

Product name.....: Notebook

Model and/or type reference .: ADR15-01, ADR15-02, ADR15-03, ADR15-04

Standards.....: FCC Rules and Regulations Part 15 Subpart C Section 15.247
ANSI C63.10: 2013

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Date of Test.....:

Date (s) of performance of tests .....: Nov. 28, 2019 ~ Dec. 05, 2019

Date of Issue.....: Dec. 05, 2019

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/§15.247 (c)	PASS
AC Power Line Conducted Emission	§15.207	PASS
Conducted Peak Output Power	§15.247 (b)(3) §2.1046	PASS
6dB Emission Bandwidth	§15.247 (a)(2) §2.1049	PASS
Power Spectral Density	§15.247 (e)	PASS
Band Edge	1§5.247(d) §2.1051, §2.1057	PASS
Spurious Emission	§15.205/§15.209 §2.1053, §2.1057	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	Notebook
Model Name	ADR15-01
Serial No.	ADR15-02, ADR15-03, ADR15-04
Model Difference	All model's the function, software and electric circuit are the same, only with a product color and model named different. Test sample model: ADR15-01
Trade Mark	Telikin
Antenna Type	Internal Antenna 802.11b/g: SISO 802.11n(HT20), 802.11n(HT40): MIMO
Antenna gain per antenna	-2.81dBi
Operation frequency	802.11b/g/n 20:2412~2462MHz 802.11n 40: 2422~2452MHz
Number of Channels	802.11b/g/n20: 11CH 802.11n 40: 7CH
Modulation Type	CCK/OFDM/DBPSK/DAPSK
Power Source	AC 100-240V~50/60Hz
Power Rating	AC 100-240V~50/60Hz

Remark：Antenna directional gain=-2.81+10log2=0.2dBi

2.2. Carrier Frequency of Channels

Channel List for 802.11b/802.11g/802.11n (HT20)							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
01	2412	04	2427	07	2442	10	2457
02	2417	05	2432	08	2447	11	2462
03	2422	06	2437	09	2452		

Channel List For 802.11n (HT40)							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
--	--	04	2427	07	2442	--	--
--	--	05	2432	08	2447	--	--
03	2422	06	2437	09	2452		

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:

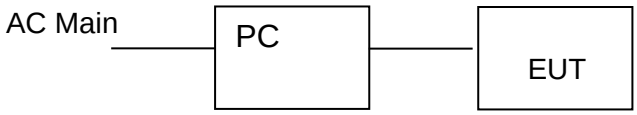
2.3. Operation of EUT during testing

Operating Mode
The mode is used: **Transmitting mode for 802.11b/802.11g/802.11n (HT20)**
Low Channel: 2412MHz
Middle Channel: 2437MHz
High Channel: 2462MHz

The mode is used: Transmitting mode for 802.11n (HT40)
Low Channel: 2422MHz
Middle Channel: 2437MHz
High Channel: 2452MHz

2.4. DESCRIPTION OF TEST SETUP

Operation of EUT during conducted testing and Radiation and Above1GHz Radiation testing:



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 98.46%)
The sample was placed (0.8m below 1GHz, 1.5m 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. For the full battery state and The output power to the maximum state.	

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
802.11b	1Mbps
802.11g	6Mbps
802.11n(H20)	6.5Mbps
802.11n(H40)	13.5Mbps
Final Test Mode:	
Operation mode:	Keep the EUT in continuous transmitting with modulation
1. For WIFI function, the engineering test program was provided and enabled to make EUT continuous transmit/receive. 2.According to ANSI C63.10 standards, the test results are both the “worst case” and “worst setup” 1Mbps for 802.11b, 6Mbps for 802.11g, 6.5Mbps for 802.11n(H20), 13.5Mbps for 802.11(H40). Duty cycle setting during the transmission is 98.5% with maximum power setting for all modulations.	

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
PC	Inspiron5570	JR4G1A00DPC	/	DELL
AC Adaptor	HA45NM140	CN-00285K-CH200-88V-OEYC-A06	/	DELL

Note:

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

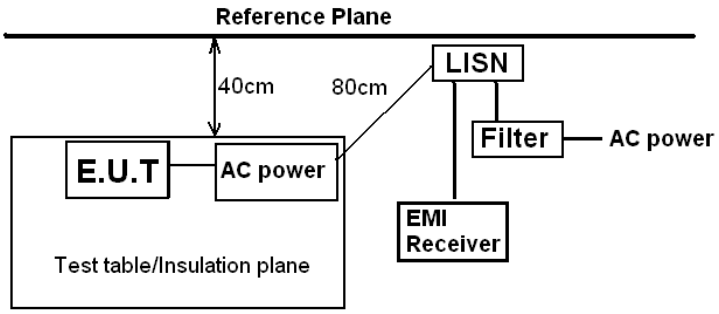
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

3. For conducted measurements (Output Power, 6dB 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

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>Charging + transmitting with modulation</td></tr>
<tr><td>Test Procedure:</td><td>1. The E.U.T is 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>

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, 2020
LISN	R&S	ENV216	HKE-002	Sep. 27, 2020
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).*

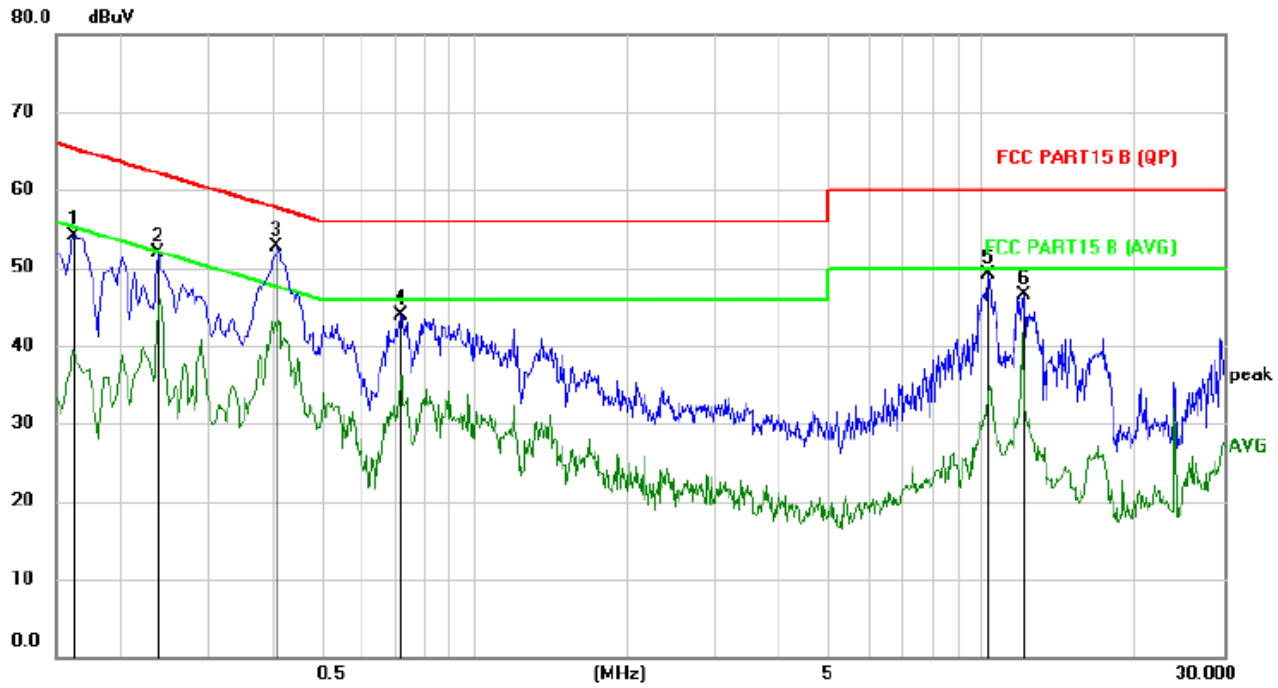
Test data

ANT1

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

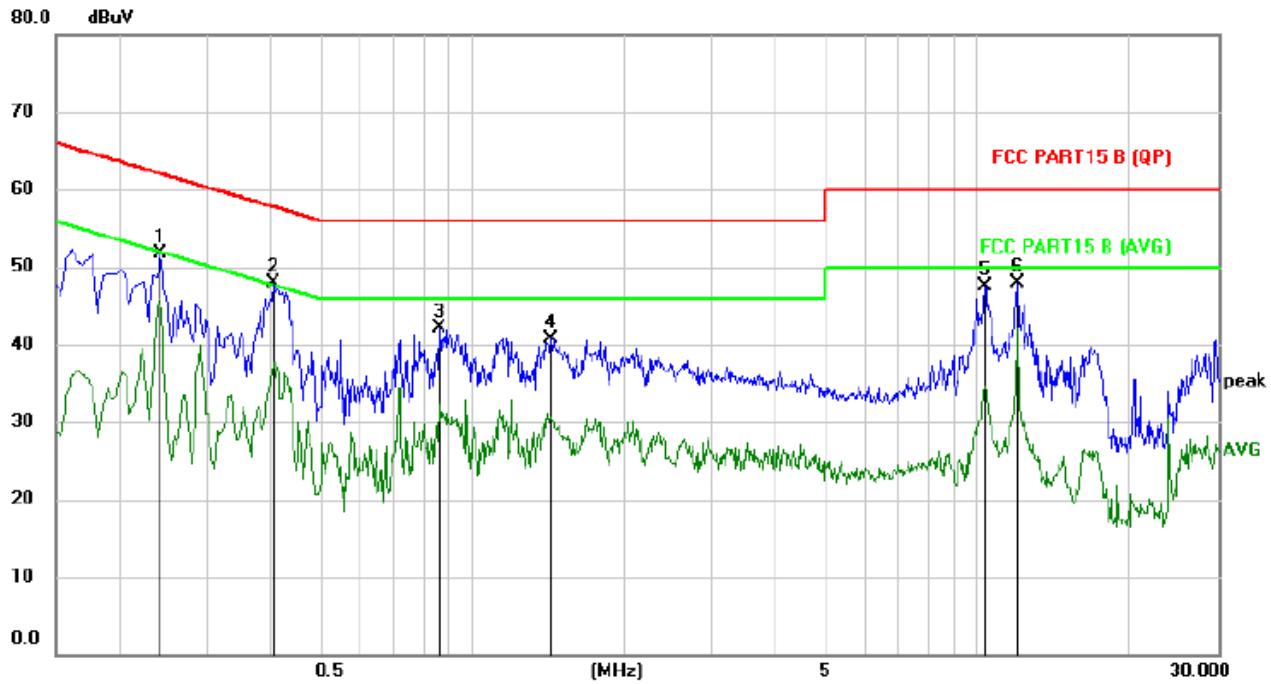
Conducted Emission on Line Terminal of the power line (150 kHz to 30MHz)



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1624	44.12	9.89	54.01	65.34	-11.33	peak	
2		0.2380	42.00	9.92	51.92	62.17	-10.25	peak	
3	*	0.4100	42.84	9.95	52.79	57.65	-4.86	peak	
4		0.7180	33.83	10.04	43.87	56.00	-12.13	peak	
5		10.2980	38.41	10.60	49.01	60.00	-10.99	peak	
6		12.1260	35.97	10.62	46.59	60.00	-13.41	peak	

Remark: Factor = Cable loss + LISN factor, Margin = Limit – Level

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



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.2420	41.62	10.01	51.63	62.03	-10.40	peak	
2	*	0.4060	38.02	9.83	47.85	57.73	-9.88	peak	
3		0.8660	32.15	9.97	42.12	56.00	-13.88	peak	
4		1.4380	30.64	10.09	40.73	56.00	-15.27	peak	
5		10.3540	37.01	10.51	47.52	60.00	-12.48	peak	
6		12.0020	37.35	10.57	47.92	60.00	-12.08	peak	

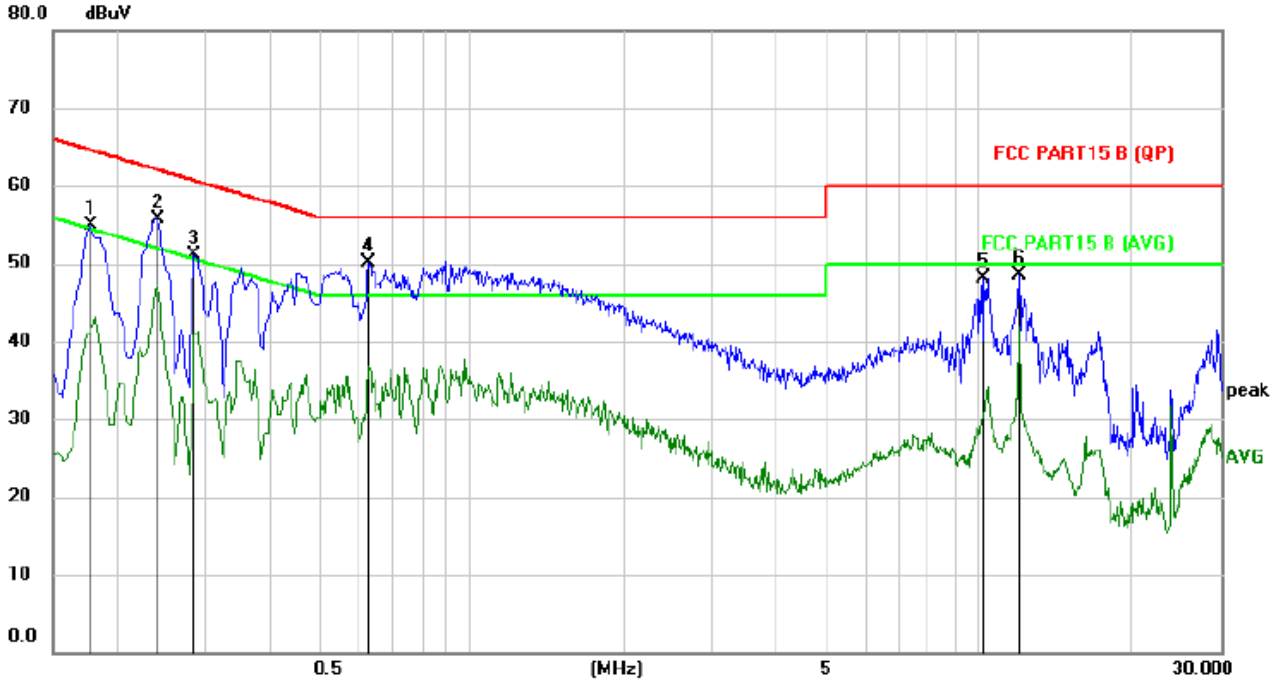
Remark: Factor = Cable loss + LISN factor, Margin = Limit – Level

ANT2

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

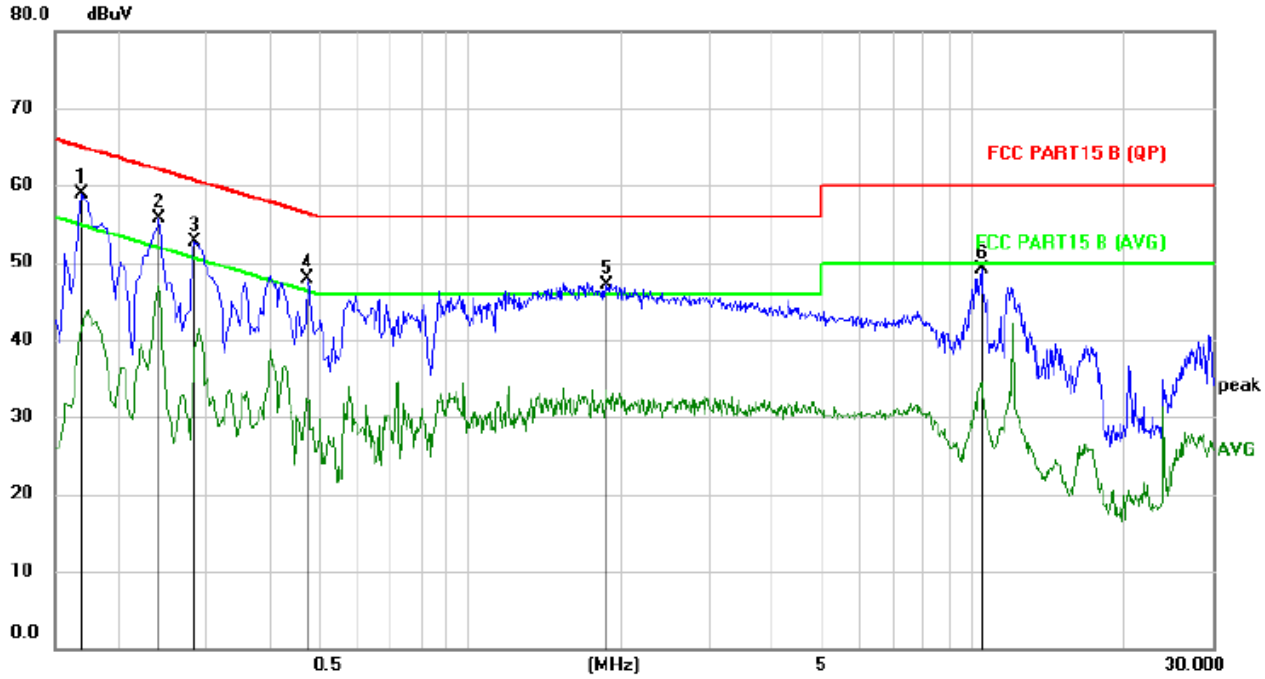
Conducted Emission on Line Terminal of the power line (150 kHz to 30MHz)



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1780	44.99	9.89	54.88	64.58	-9.70	peak	
2		0.2420	45.87	9.92	55.79	62.03	-6.24	peak	
3		0.2860	41.18	9.87	51.05	60.64	-9.59	peak	
4	*	0.6300	40.09	10.05	50.14	56.00	-5.86	peak	
5		10.2860	37.54	10.60	48.14	60.00	-11.86	peak	
6		12.0020	37.90	10.62	48.52	60.00	-11.48	peak	

Remark: Factor = Cable loss + LISN factor, Margin = Limit – Level

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

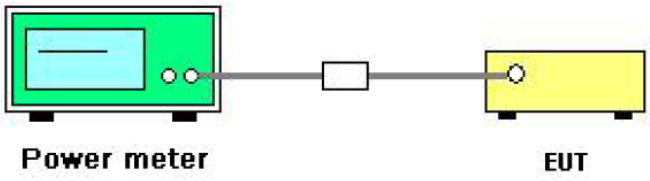


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	*	0.1700	48.77	10.06	58.83	64.96	-6.13	peak	
2		0.2420	45.76	10.01	55.77	62.03	-6.26	peak	
3		0.2860	42.80	9.92	52.72	60.64	-7.92	peak	
4		0.4780	38.03	9.80	47.83	56.37	-8.54	peak	
5		1.8780	37.01	10.12	47.13	56.00	-8.87	peak	
6		10.4379	38.54	10.51	49.05	60.00	-10.95	peak	

Remark: Factor = Cable loss + LISN factor, Margin = Limit – Level

4.2. Maximum Conducted Output Power

Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (b)(3)
Test Method:	KDB 558074, April 2017
Limit:	30dBm
Test Setup:	
Test Mode:	Transmitting mode with modulation
Test Procedure:	1. The testing follows the Measurement Procedure of FCC KDB No. 558074 DTS D01 Meas. Guidance v04. 2. The RF output of EUT was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement. 3. Set to the maximum power setting and enable the EUT transmit continuously. 4. Measure the output power and record the results in the test report.
Test Result:	PASS

Test Instruments

RF Test Room				
Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Power meter	Agilent	E4417B	HKE-107	Sep. 27, 2020
Power Sensor	Agilent	E9327A	HKE-113	Sep. 27, 2020
RF cable	Times	1-40G	HKE-034	Sep. 27, 2020
RF automatic control unit	Tonscend	JS0806-2	HKE-060	Sep. 27, 2020

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

Test Data

ANT1

TX 802.11b Mode			
Test Channe	Frequency	Maximum Conducted Output Power	LIMIT
	(MHz)	(dBm)	dBm
CH01	2412	8.925	30
CH06	2437	8.777	30
CH11	2462	8.685	30
TX 802.11g Mode			
CH01	2412	7.966	30
CH06	2437	7.565	30
CH11	2462	8.448	30
TX 802.11n20 Mode			
CH01	2412	8.201	30
CH06	2437	7.908	30
CH11	2462	8.25	30
TX 802.11n40 Mode			
CH03	2422	7.176	30
CH06	2437	6.673	30
CH09	2452	7.078	30

ANT2

TX 802.11b Mode			
Test Channe	Frequency	Maximum Conducted Output Power	LIMIT
	(MHz)	(dBm)	dBm
CH01	2412	8.356	30
CH06	2437	8.39	30
CH11	2462	8.064	30
TX 802.11g Mode			
CH01	2412	7.287	30
CH06	2437	7.156	30
CH11	2462	7.845	30
TX 802.11n20 Mode			
CH01	2412	7.605	30
CH06	2437	7.109	30
CH11	2462	7.754	30
TX 802.11n40 Mode			
CH03	2422	6.831	30
CH06	2437	5.986	30
CH09	2452	6.721	30

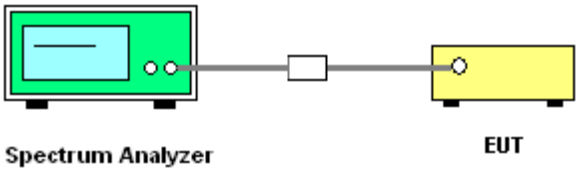
MIMO: ANT1+ANT2

TX 802.11n20 Mode			
Test Channe	Frequency	Maximum Conducted Output Power	LIMIT
	(MHz)	(dBm)	dBm
CH01	2412	10.924	30
CH06	2437	10.537	30
CH11	2462	11.019	30

TX 802.11n40 Mode			
Test Channe	Frequency	Maximum Conducted Output Power	LIMIT
	(MHz)	(dBm)	dBm
CH03	2422	10.017	30
CH06	2437	9.353	30
CH09	2452	9.913	30

4.3. Emission Bandwidth

Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (a)(2)
Test Method:	KDB 558074, April 2017
Limit:	>500kHz
Test Setup:	
Test Mode:	Transmitting mode with modulation
Test Procedure:	1. The testing follows FCC KDB Publication No. 558074 DTS D01 Meas. Guidance v04. 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

Test Instruments

RF Test Room				
Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum analyzer	Agilent	N9020A	HKE-048	Sep. 27, 2020
RF Cable (9KHz-26.5GHz)	Tonscend	170660	N/A	Sep. 27, 2020
RF automatic control unit	Tonscend	JS0806-2	HKE-060	Sep. 27, 2020

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

Test data

Remark: This Report only show the test plots of the ANT1 worst case.

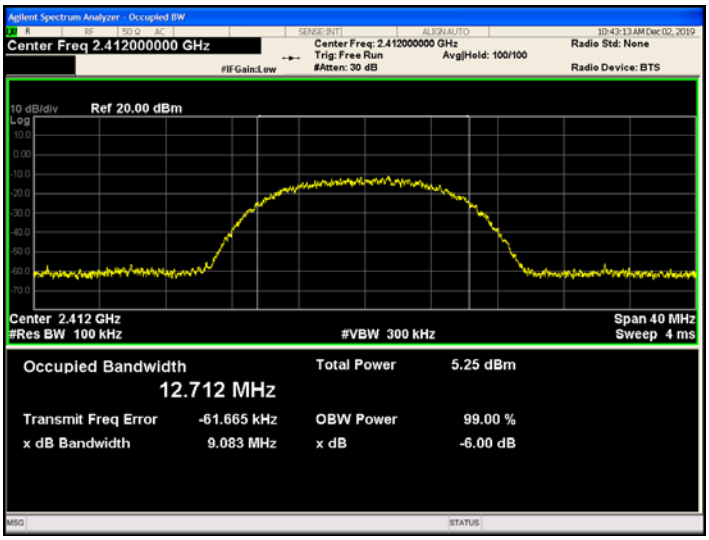
Test channel	6dB Emission Bandwidth (MHz)			
	802.11b	802.11g	802.11n(H20)	802.11n(H40)
Lowest	9.0831	15.0242	11.9608	35.0054
Middle	9.0434	14.5273	13.4308	33.8815
Highest	9.5476	15.1343	17.5267	35.0782
Limit:	>500k			
Test Result:	PASS			

Test channel	99% Occupied Bandwidth (MHz)			
	802.11b	802.11g	802.11n(H20)	802.11n(H40)
Lowest	12.7121	16.3918	17.5855	35.9283
Middle	12.6525	16.4016	17.597	35.948
Highest	12.6673	16.3713	17.5839	35.948
Limit:	>500k			
Test Result:	PASS			

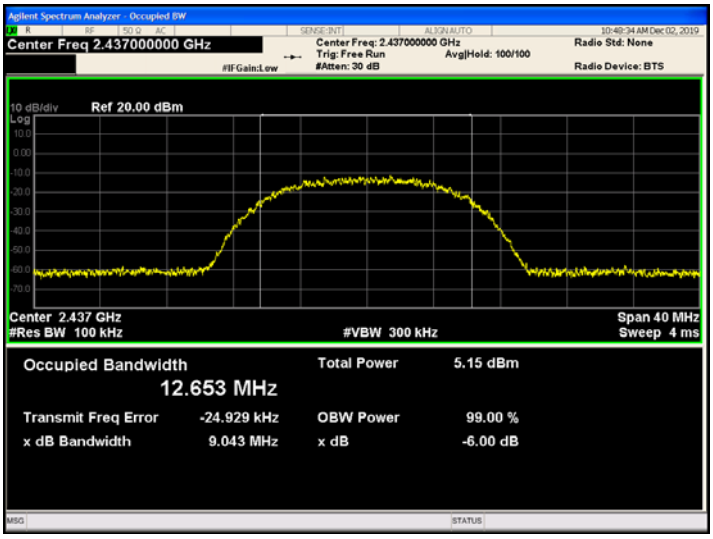
Test plots as follows:

802.11b Modulation

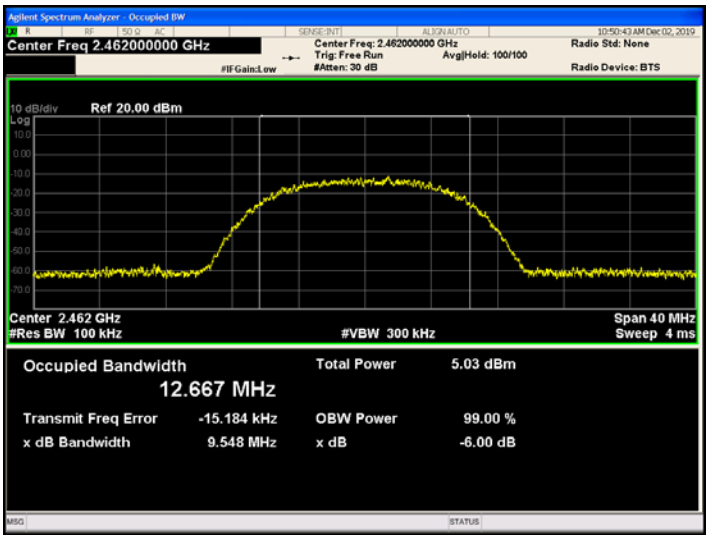
Lowest channel



Middle channel

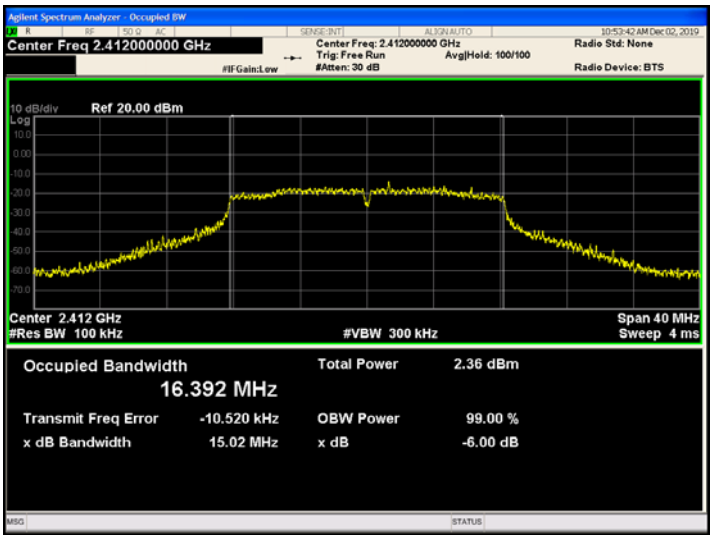


Highest channel

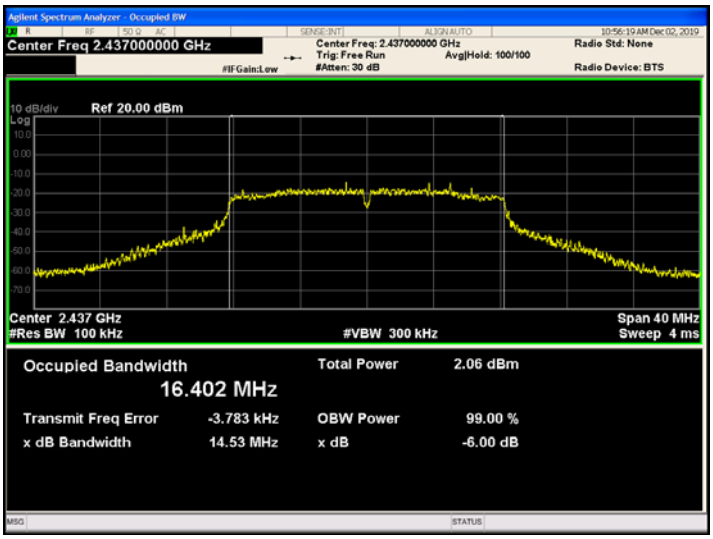


802.11g Modulation

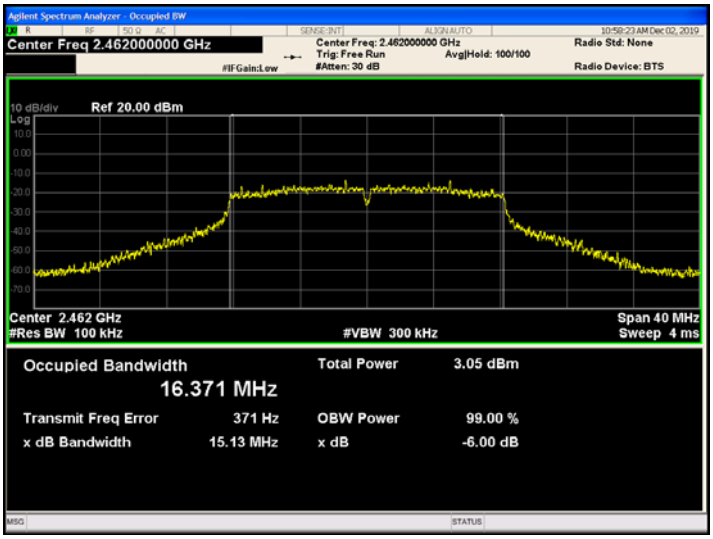
Lowest channel



Middle channel

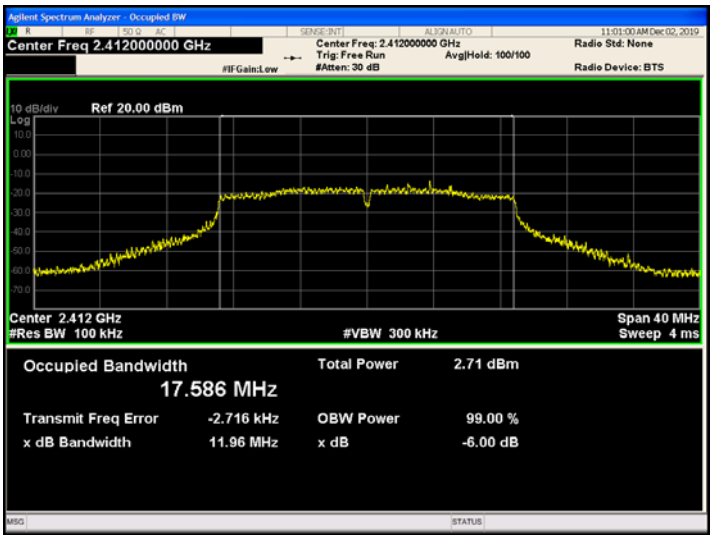


Highest channel

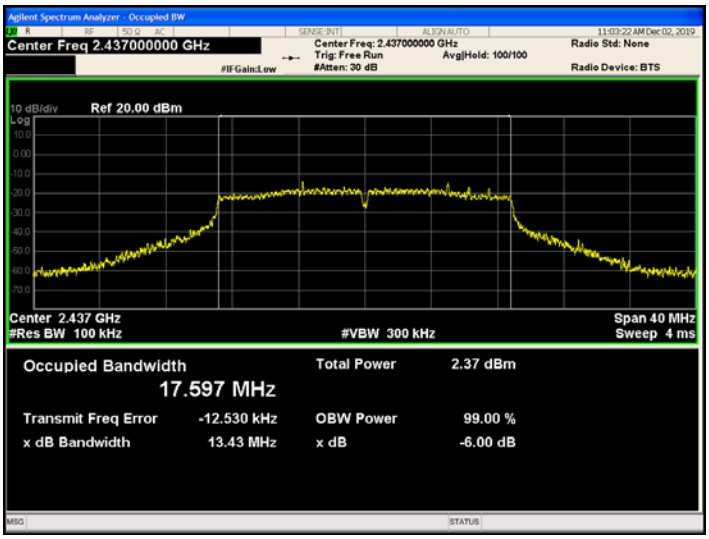


802.11n (HT20) Modulation

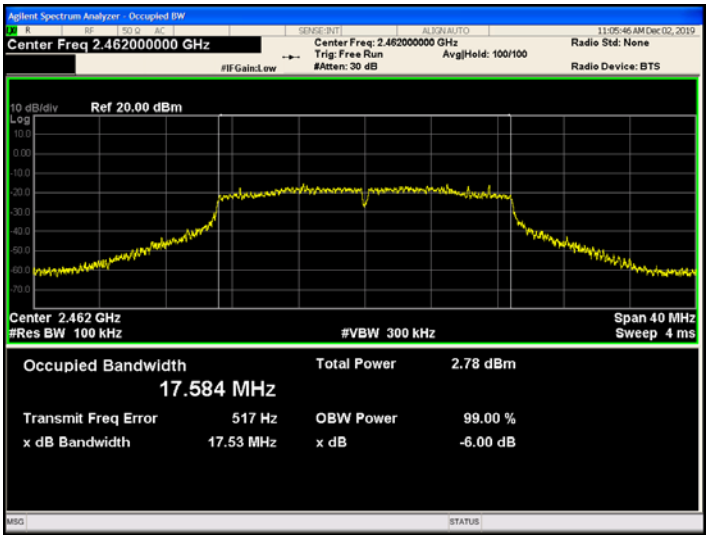
Lowest channel



Middle channel

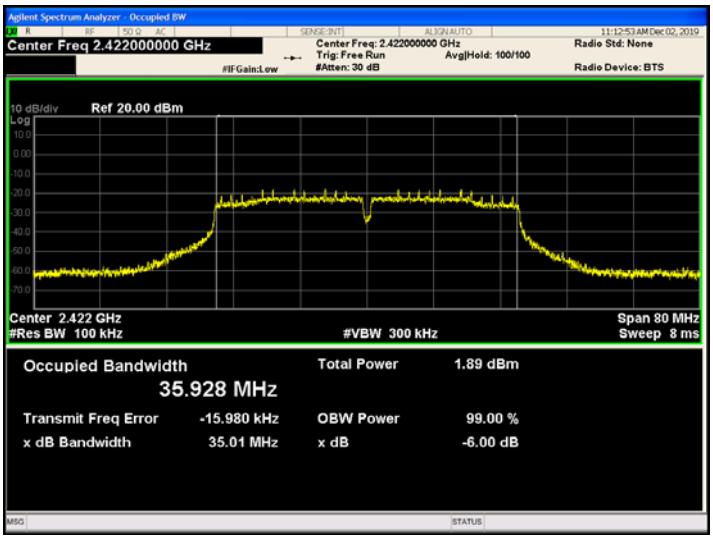


Highest channel

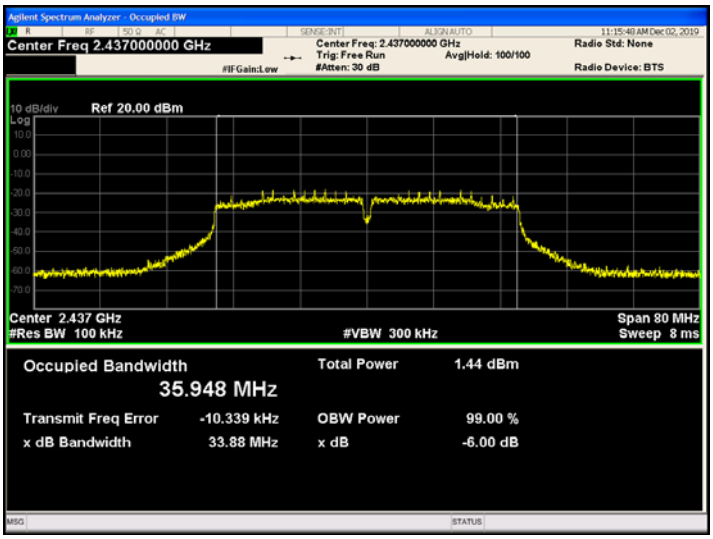


802.11n (HT40) Modulation

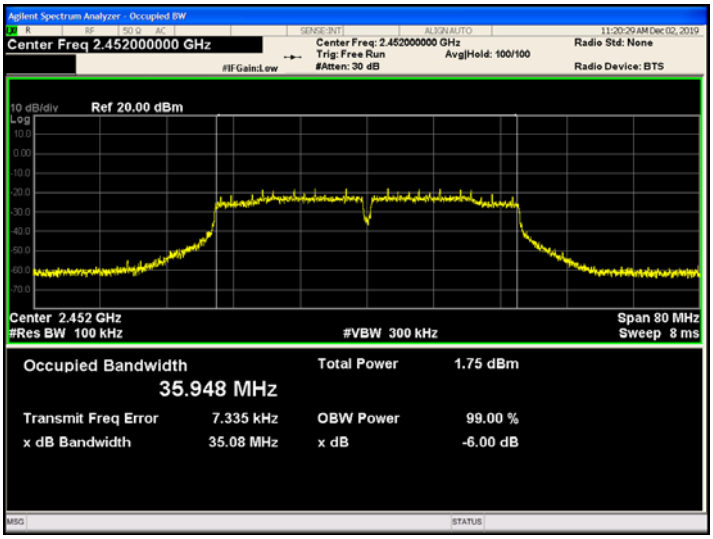
Lowest channel



Middle channel

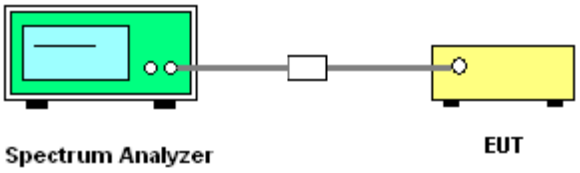


Highest channel



4.4. Power Spectral Density

Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (e)
Test Method:	KDB 558074, April 2017
Limit:	The average power spectral density shall not be greater than 8dBm in any 3kHz band at any time interval of continuous transmission.
Test Setup:	
Test Mode:	Transmitting mode with modulation
Test Procedure:	1. The testing follows Measurement procedure 10.2 method PKPSD of FCC KDB Publication No.558074 D01 DTS Meas. Guidance v04 2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement. 3. Set to the maximum power setting and enable the EUT transmit continuously. 4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW): 3 kHz ≤ RBW ≤ 100 kHz. Video bandwidth VBW ≥ 3 x RBW. Set the span to at least 1.5 times the OBW. 5. Detector = RMS, Sweep time = auto couple. 6. Employ trace averaging (RMS) mode over a minimum of 100 traces. Use the peak marker function to determine the maximum power level. 7. Measure and record the results in the test report.
Test Result:	PASS

Test Instruments

RF Test Room				
Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum analyzer	Agilent	N9020A	HKE-048	Sep. 27, 2020
RF Cable (9KHz-26.5GHz)	Tonscend	170660	N/A	Sep. 27, 2020
RF automatic control unit	Tonscend	JS0806-2	HKE-060	Sep. 27, 2020

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

Test data

ANT1

Test channel	Power Spectral Density (dBm/3kHz)			
	802.11b	802.11g	802.11n(H20)	802.11n(H40)
Lowest	-21.901	-24.706	-24.399	-27.315
Middle	-21.463	-24.935	-24.819	-29.611
Highest	-21.489	-24.262	-24.038	-28.155
Limit:	8dBm/3kHz			
Test Result:	PASS			

ANT2

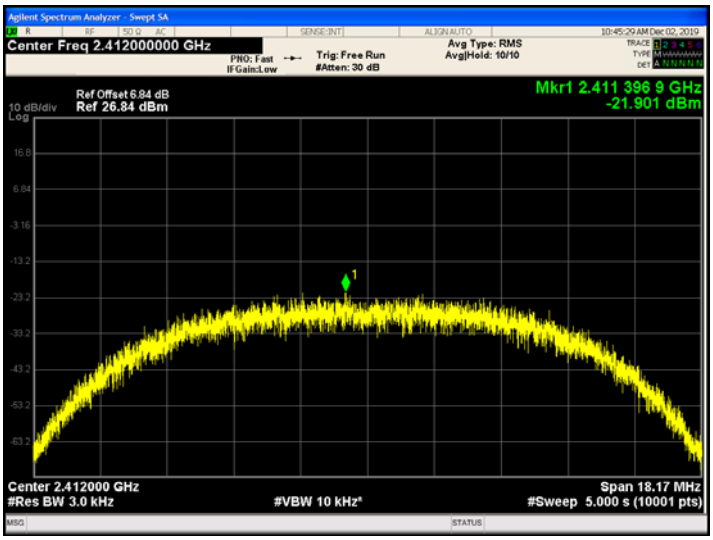
Test channel	Power Spectral Density (dBm/3kHz)			
	802.11b	802.11g	802.11n(H20)	802.11n(H40)
Lowest	-21.992	-25.149	-24.817	-27.481
Middle	-21.815	-25.255	-24.831	-29.809
Highest	-21.811	-24.745	-24.222	-28.532
Limit:	8dBm/3kHz			
Test Result:	PASS			

worse case of MIMO mode（802.11n H20) :-24.038+10log2=-21.028dBm<8dBm
worse case of MIMO mode (802.11n H40) :-27.315+10log2=-24.305dBm<8dBm

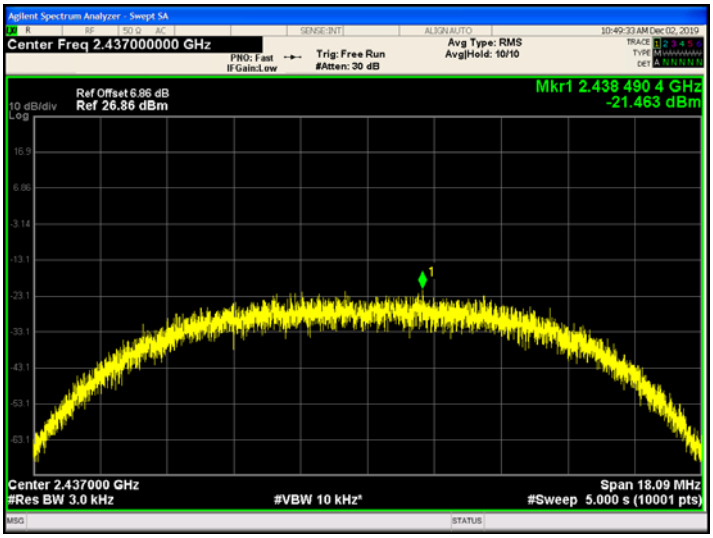
Test plots as follows:
Remark: This Report only show the test plots of the ANT1 worst case.

802.11b Modulation

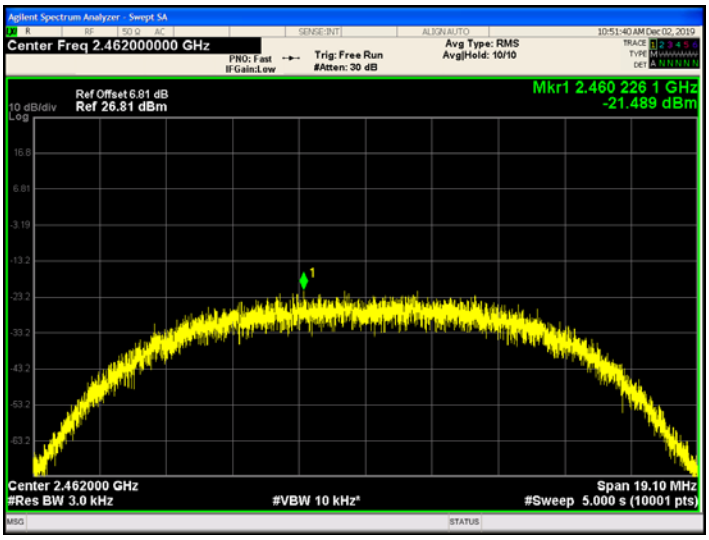
Lowest channel



Middle channel

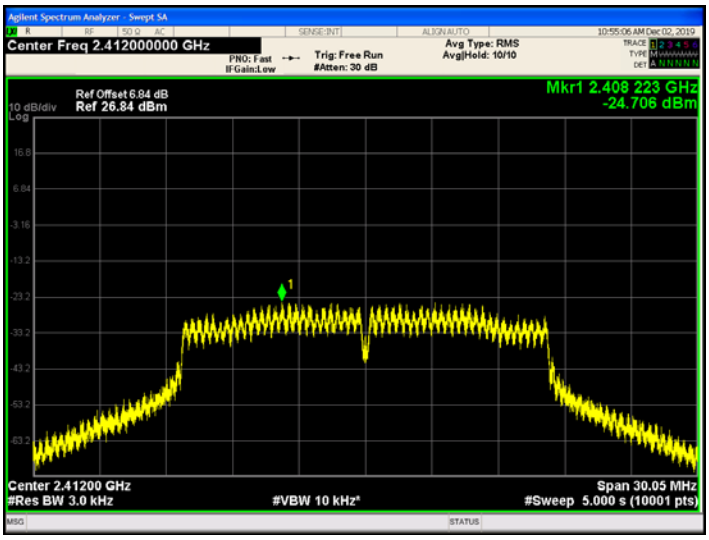


Highest channel

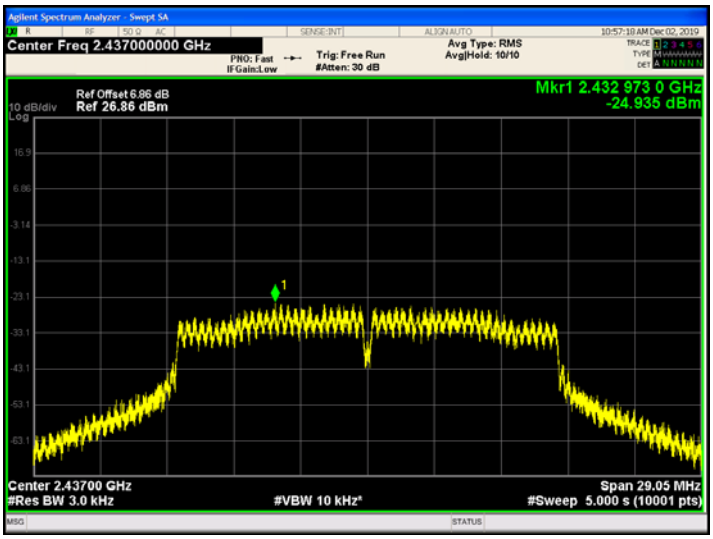


802.11g Modulation

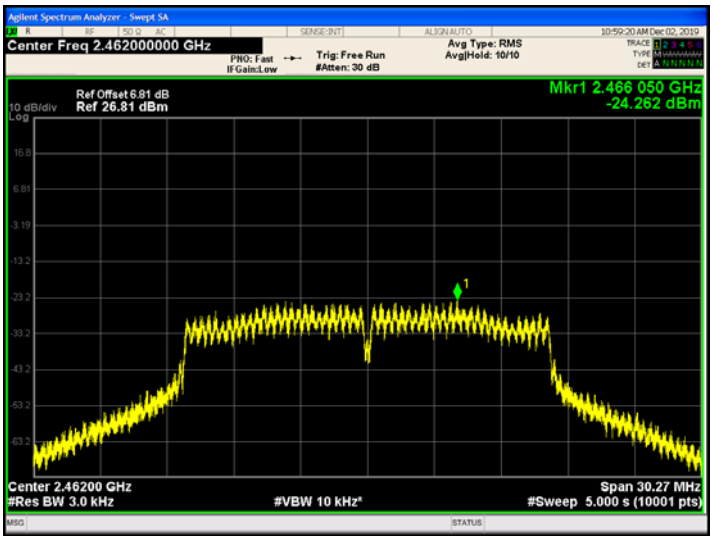
Lowest channel



Middle channel

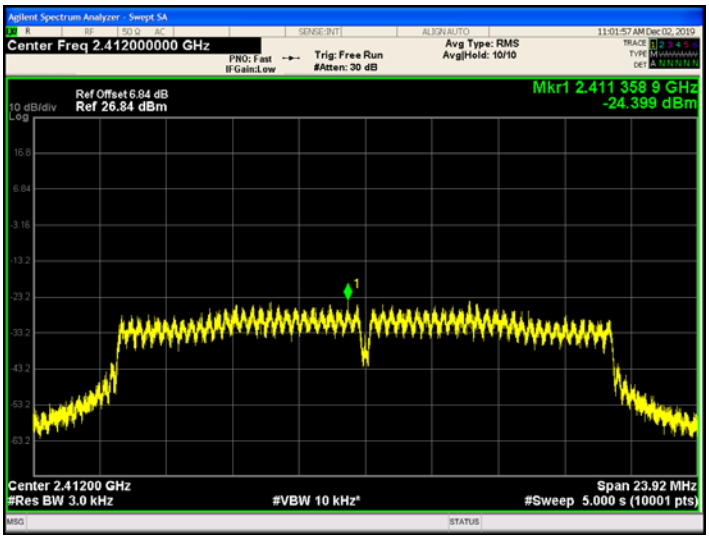


Highest channel

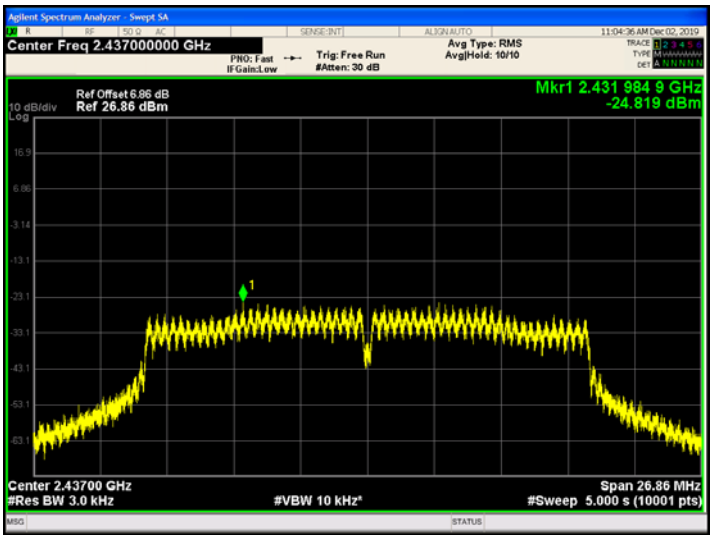


802.11n (HT20) Modulation

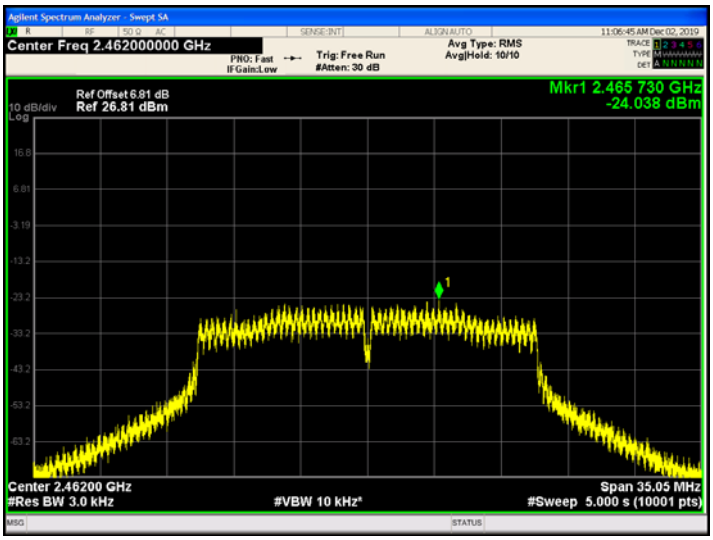
Lowest channel



Middle channel

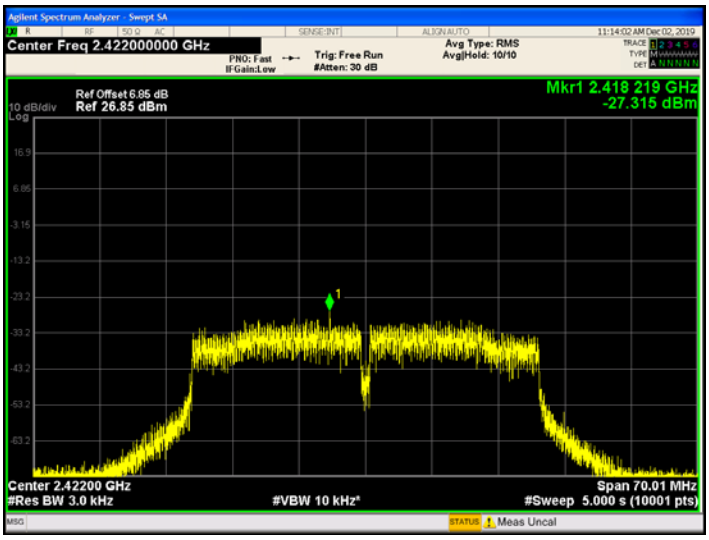


Highest channel

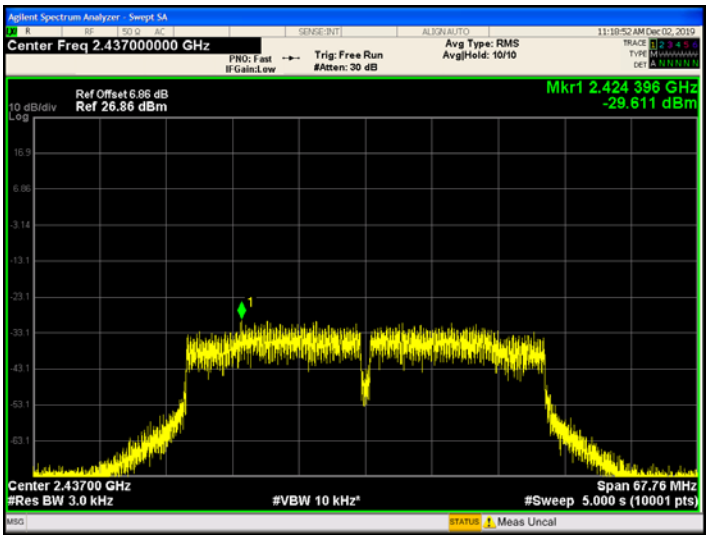


802.11n (HT40) Modulation

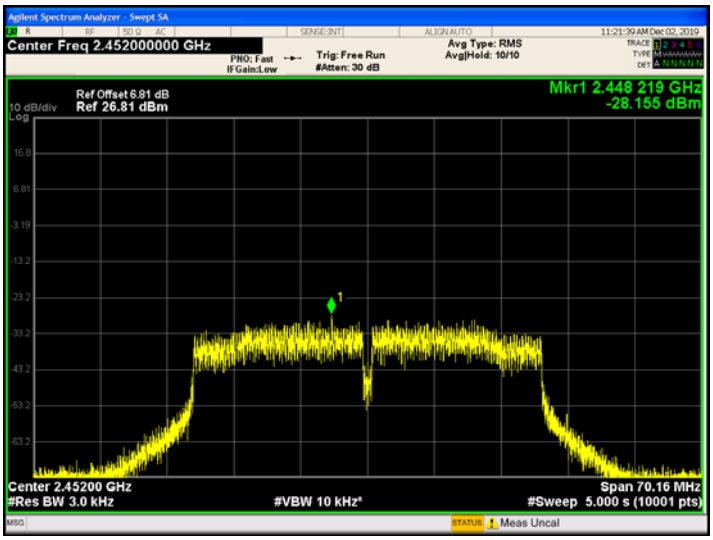
Lowest channel



Middle channel

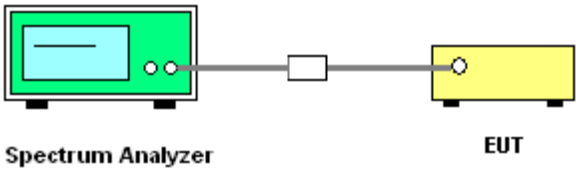


Highest channel



4.5. Conducted Band Edge and Spurious Emission Measurement

Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	KDB558074, April 2017
Limit:	In any 100 kHz bandwidth outside of the authorized frequency band, the emissions which fall in the non-restricted bands shall be attenuated at least 20 dB / 30dB relative to the maximum PSD level in 100 kHz by RF conducted measurement and radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).
Test Setup:	
Test Mode:	Transmitting mode with modulation
Test Procedure:	1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v04. 2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement. 3. Set to the maximum power setting and enable the EUT transmit continuously. 4. Set RBW = 100 kHz, VBW=300 kHz, Peak Detector. Unwanted Emissions measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when maximum peak conducted output power procedure is used. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB per 15.247(d). 5. Measure and record the results in the test report. 6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
Test Result:	PASS

Test Instruments

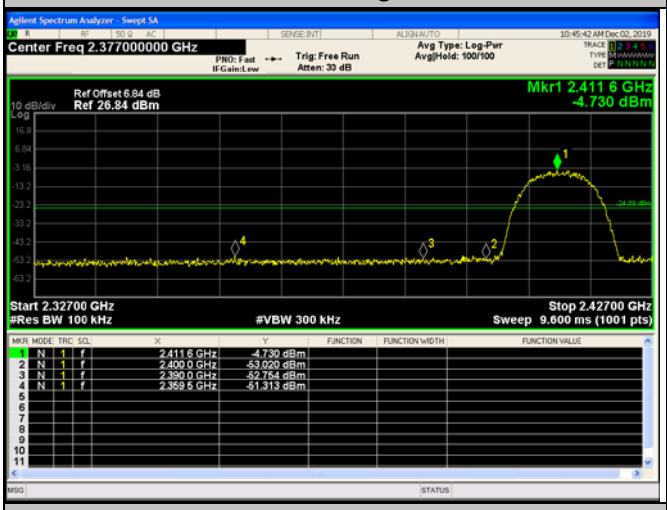
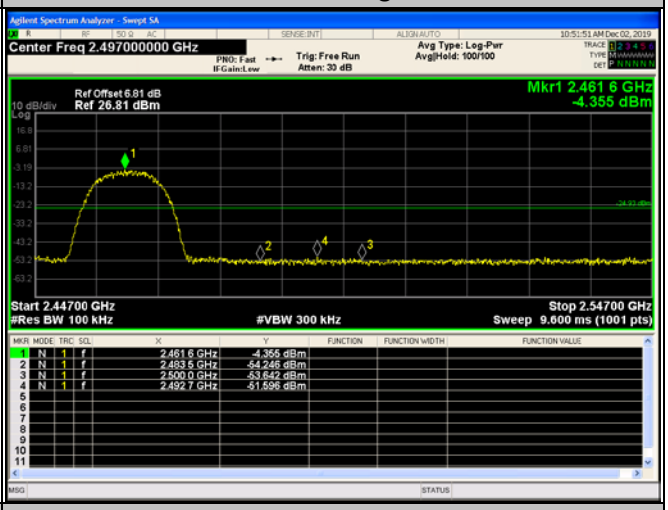
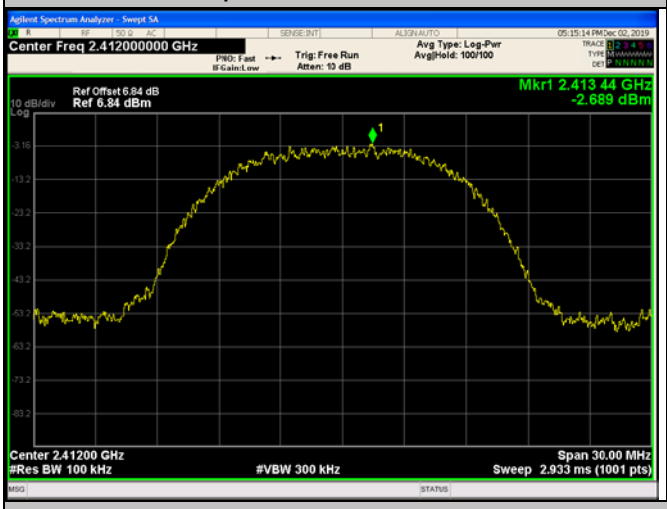
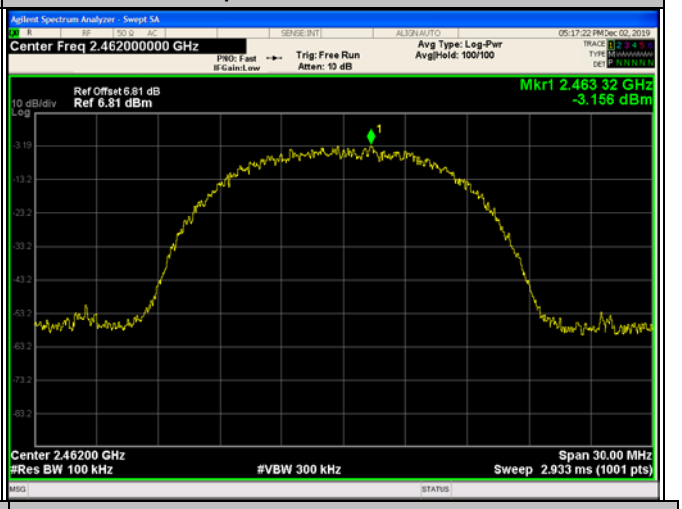
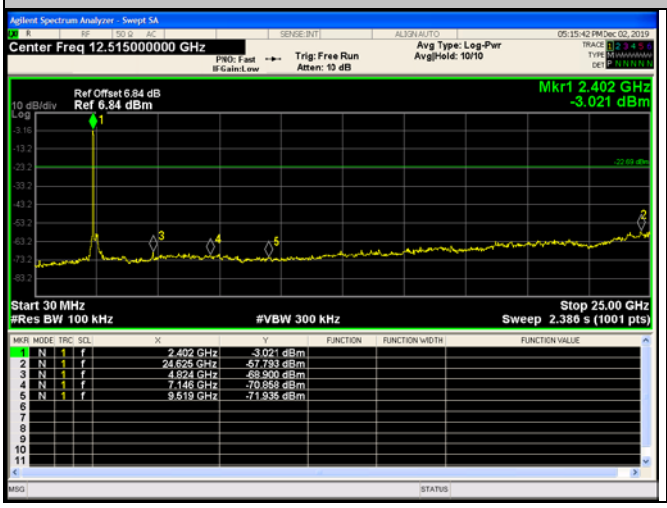
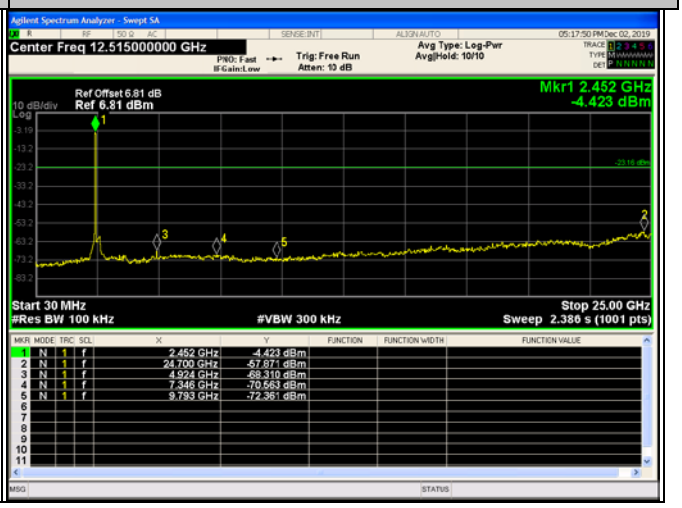
RF Test Room				
Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum analyzer	Agilent	N9020A	HKE-048	Sep. 27, 2020
Signal generator	Agilent	N5183A	HKE-071	Sep. 27, 2020
RF Cable (9KHz-26.5GHz)	Tonscend	170660	N/A	Sep. 27, 2020
RF automatic control unit	Tonscend	JS0806-2	HKE-060	Sep. 27, 2020

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

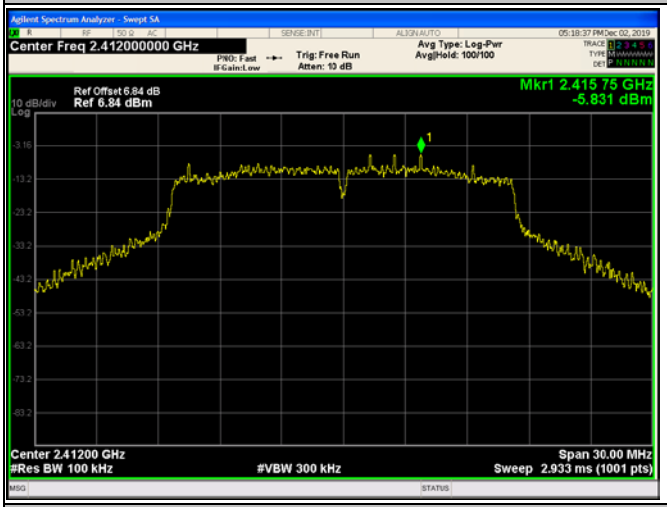
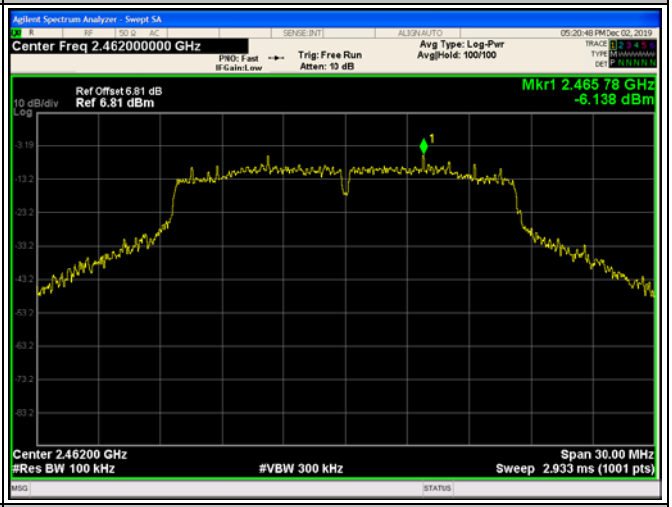
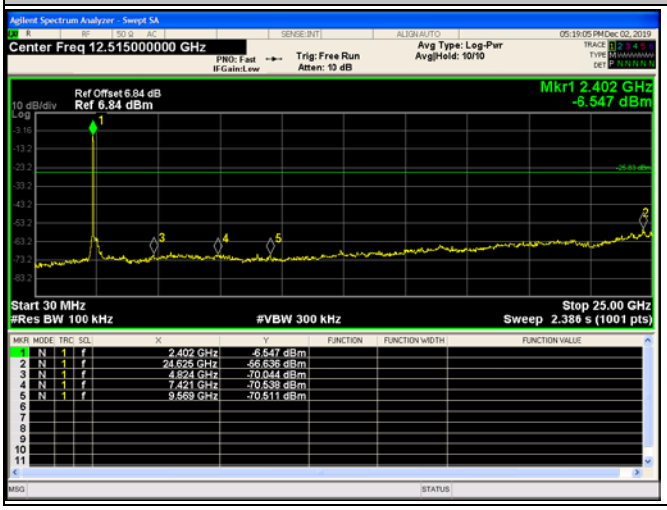
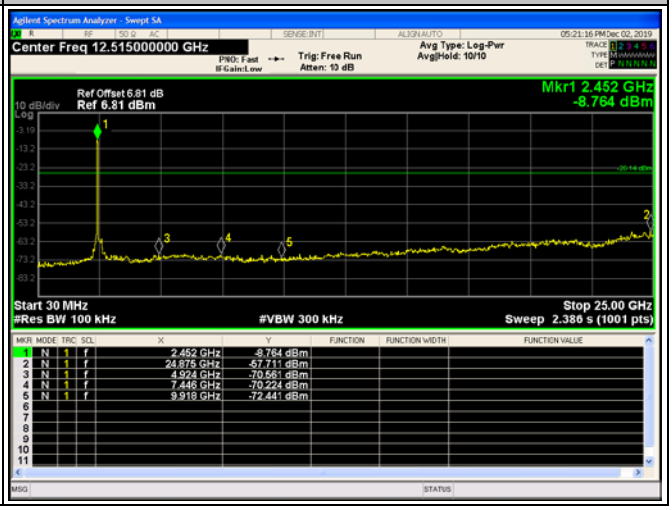
Remark: This Report only show the test plots of the ANT1 worst case.

Test Data

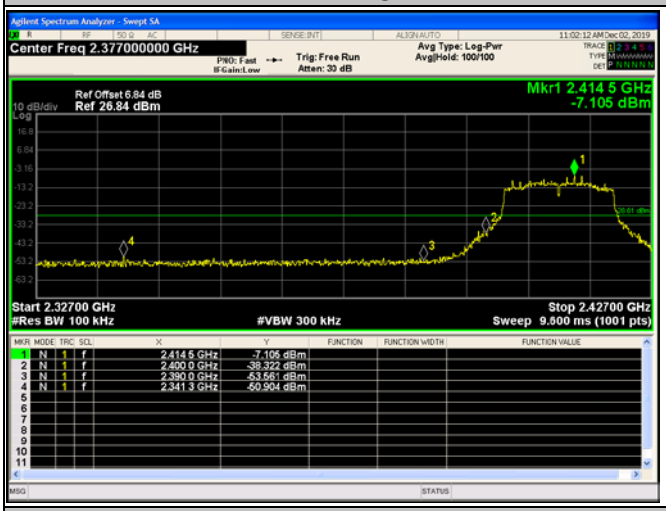
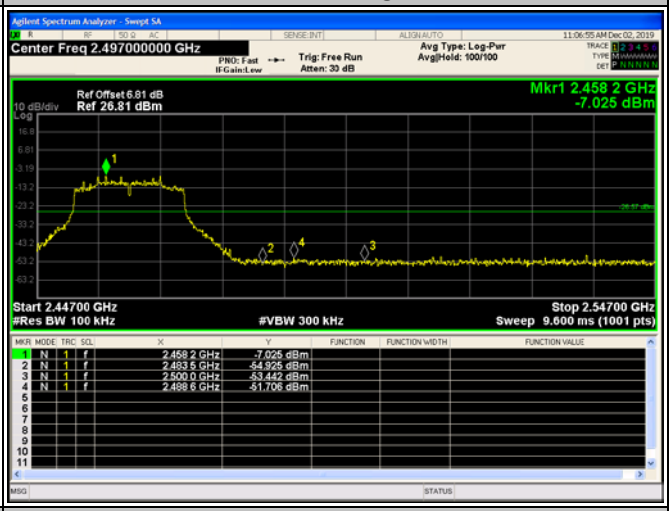
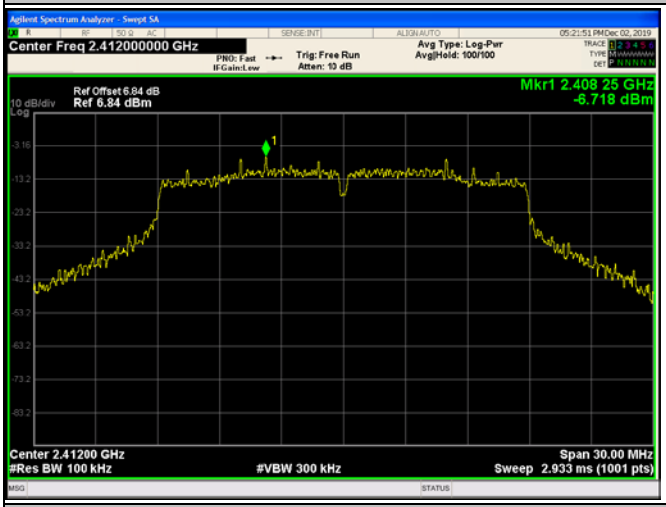
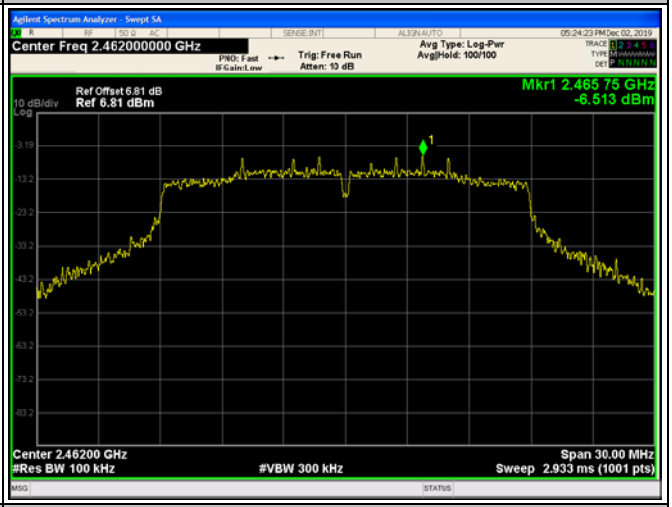
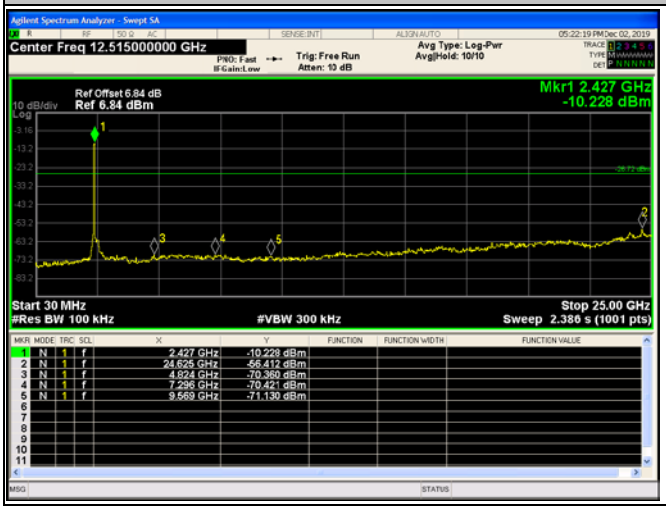
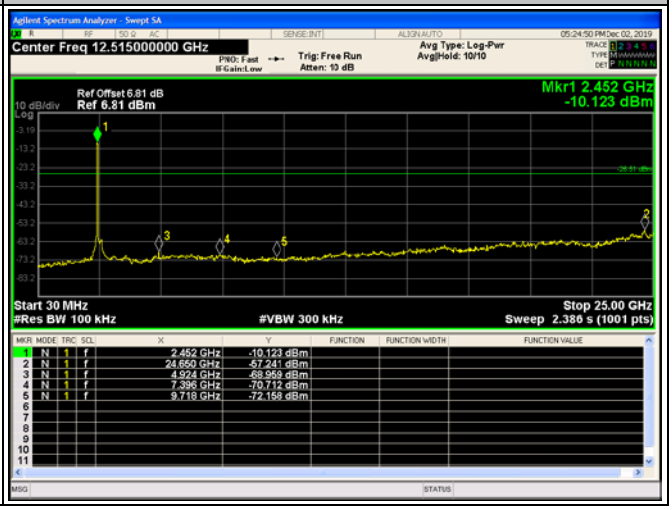
802.11b Modulation

Lowest Channel	Highest Channel
Band Edge	Band Edge
	
Spurious emission	Spurious emission
	
	

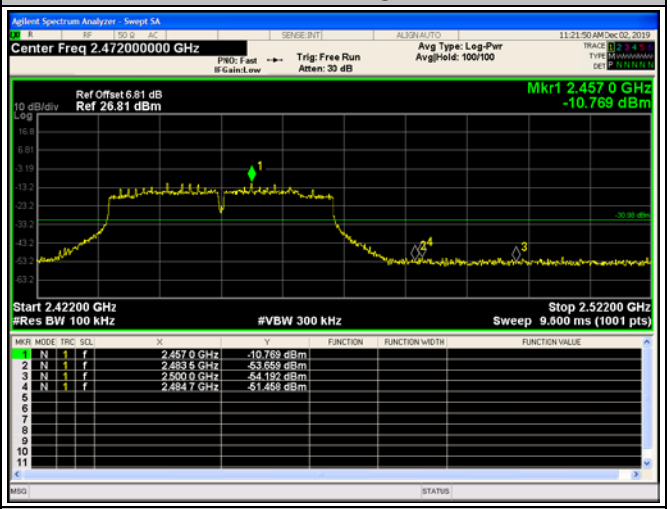
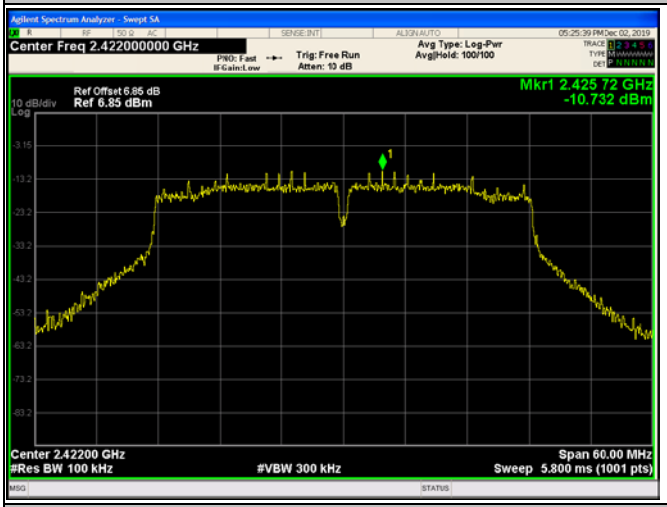
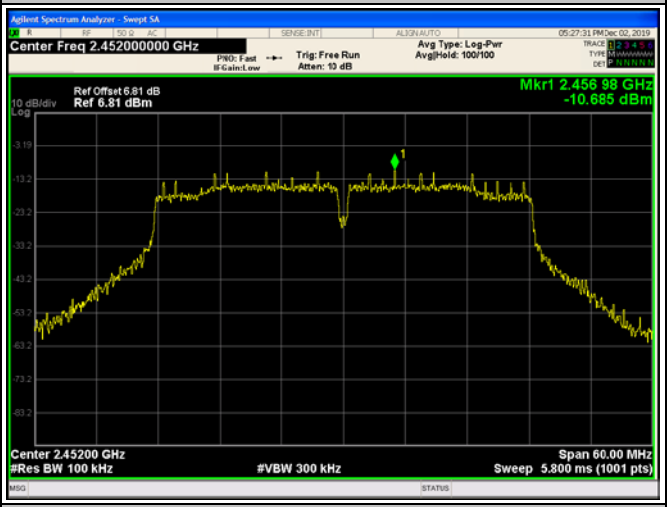
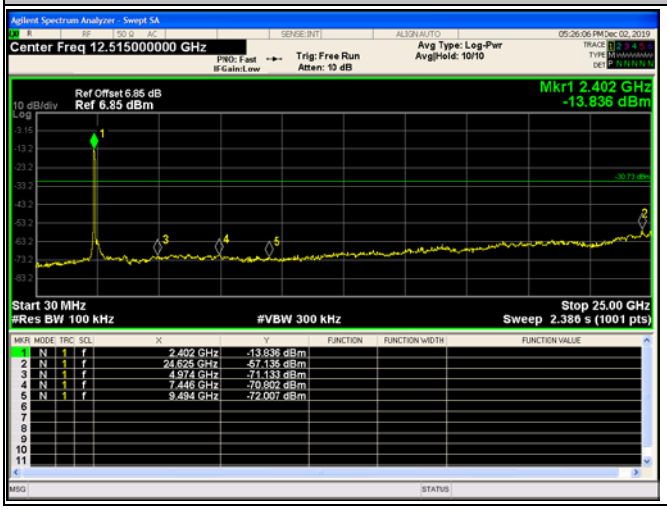
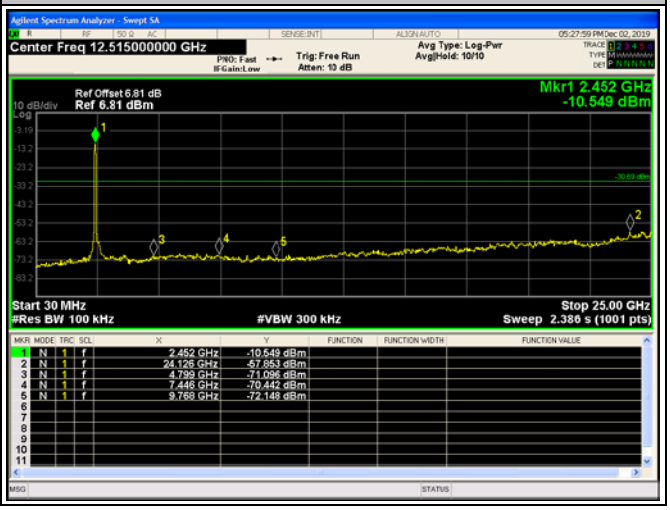
802.11g Modulation

Lowest Channel	Highest Channel
Band Edge	Band Edge
Spurious emission	Spurious emission
	
	

802.11n (HT20) Modulation

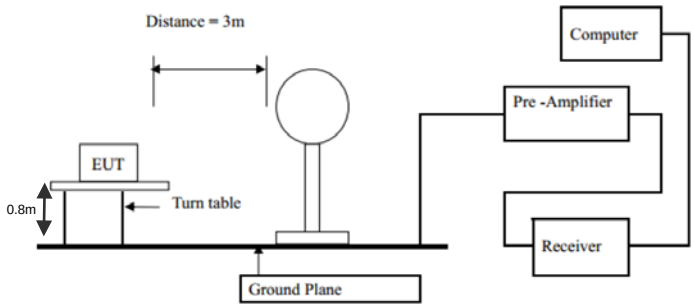
Lowest Channel	Highest Channel
Band Edge	Band Edge
	
Spurious emission	Spurious emission
	
	

802.11n (HT40) Modulation

Lowest Channel	Highest Channel
Band Edge	Band Edge
	
Spurious emission	Spurious emission
	
	

4.6. Radiated Spurious Emission Measurement

Test Specification

<table>
<tr><td>Test Requirement:</td><td>FCC Part15 C Section 15.209</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.10: 2013</td></tr>
<tr><td>Frequency Range:</td><td>9 kHz to 25 GHz</td></tr>
<tr><td>Measurement Distance:</td><td>3 m</td></tr>
<tr><td>Antenna Polarization:</td><td>Horizontal & Vertical</td></tr>
<tr><td>Operation mode:</td><td>Transmitting mode with modulation</td></tr>
<tr><td>Receiver Setup:</td><td>
<table>
<tr><td>Frequency</td><td>Detector</td><td>RBW</td><td>VBW</td><td>Remark</td></tr>
<tr><td>9kHz- 150kHz</td><td>Quasi-peak</td><td>200Hz</td><td>1kHz</td><td>Quasi-peak Value</td></tr>
<tr><td>150kHz-30MHz</td><td>Quasi-peak</td><td>9kHz</td><td>30kHz</td><td>Quasi-peak Value</td></tr>
<tr><td>30MHz-1GHz</td><td>Quasi-peak</td><td>120KHz</td><td>300KHz</td><td>Quasi-peak Value</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>Peak</td><td>1MHz</td><td>3MHz</td><td>Peak Value</td></tr>
<tr><td>Peak</td><td>1MHz</td><td>10Hz</td><td>Average Value</td></tr>
</table>
</td></tr>
<tr><td>Limit:</td><td>
<table>
<tr><td>Frequency</td><td>Field Strength (microvolts/meter)</td><td>Measurement Distance (meters)</td></tr>
<tr><td>0.009-0.490</td><td>2400/F(KHz)</td><td>300</td></tr>
<tr><td>0.490-1.705</td><td>24000/F(KHz)</td><td>30</td></tr>
<tr><td>1.705-30</td><td>30</td><td>30</td></tr>
<tr><td>30-88</td><td>100</td><td>3</td></tr>
<tr><td>88-216</td><td>150</td><td>3</td></tr>
<tr><td>216-960</td><td>200</td><td>3</td></tr>
<tr><td>Above 960</td><td>500</td><td>3</td></tr>
</table>
<table>
<tr><td>Frequency</td><td>Field Strength (microvolts/meter)</td><td>Measurement Distance (meters)</td><td>Detector</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>500</td><td>3</td><td>Average</td></tr>
<tr><td>5000</td><td>3</td><td>Peak</td></tr>
</table>
</td></tr>
<tr><td>Test setup:</td><td>For radiated emissions below 30MHz
 

30MHz to 1GHz</td></tr>
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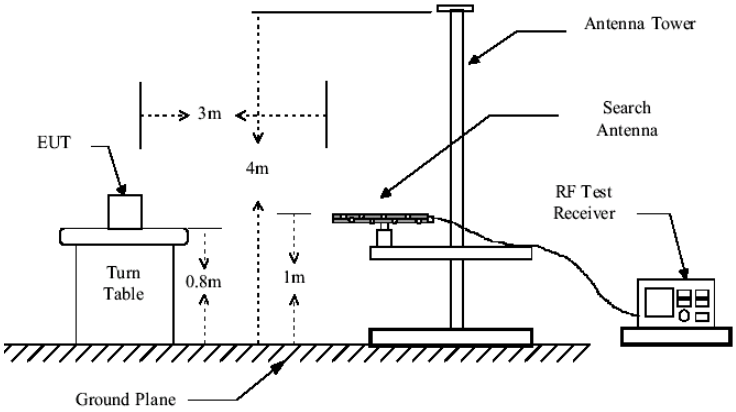
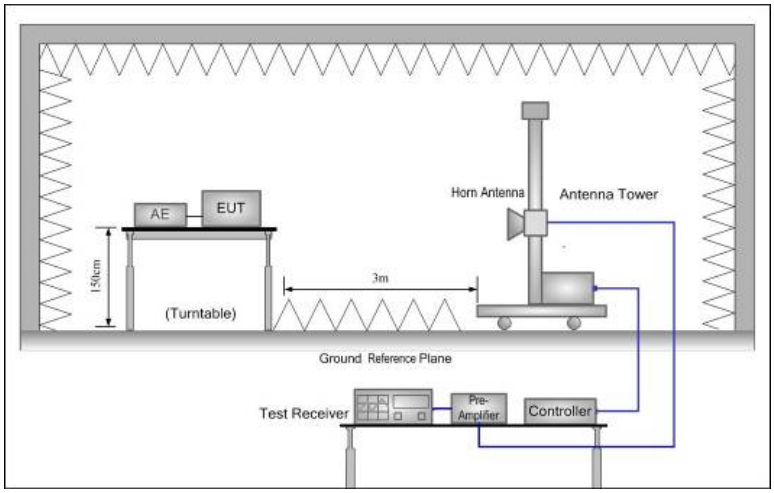


Above 1GHz



Test Procedure:

1. For the radiated emission test below 1GHz:
   The EUT was placed on a turntable with 0.8 meter above ground. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high PASS filter are used for the test in order to get better signal level.
   For the radiated emission test above 1GHz:
   Place the measurement antenna on a turntable with 1.5 meter above ground, which is away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which

	maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane. 3. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level 4. For measurement below 1GHz, If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported. 5. Use the following spectrum analyzer settings: (1) Span shall wide enough to fully capture the emission being measured; (2) Set RBW=100 kHz for f < 1 GHz; VBW ≥RBW; Sweep = auto; Detector function = peak; Trace = max hold; (3) Set RBW = 1 MHz, VBW= 3MHz for f for peak measurement. For average measurement: VBW = 10 Hz, when duty cycle is no less than 98 percent. VBW ≥ 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.
Test results:	PASS

Test Instruments

Radiated Emission Test Site (966)				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Receiver	R&S	ESCI-7	HKE-010	Sep. 27, 2020
Spectrum analyzer	Agilent	N9020A	HKE-048	Sep. 27, 2020
Preamplifier	EMCI	EMC051845 SE	HKE-015	Sep. 27, 2020
Preamplifier	Agilent	83051A	HKE-016	Sep. 27, 2020
Loop antenna	Schwarzbeck	FMZB 1519 B	HKE-014	Sep. 26, 2020
Broadband antenna	Schwarzbeck	VULB 9163	HKE-012	Sep. 26, 2020
Horn antenna	Schwarzbeck	9120D	HKE-013	Sep. 26, 2020
Antenna Mast	Keleto	CC-A-4M	N/A	N/A
Position controller	Taiwan MF	MF7802	HKE-011	Sep. 27, 2020
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
RF cable	Times	1-40G	HKE-034	Sep. 27, 2020

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

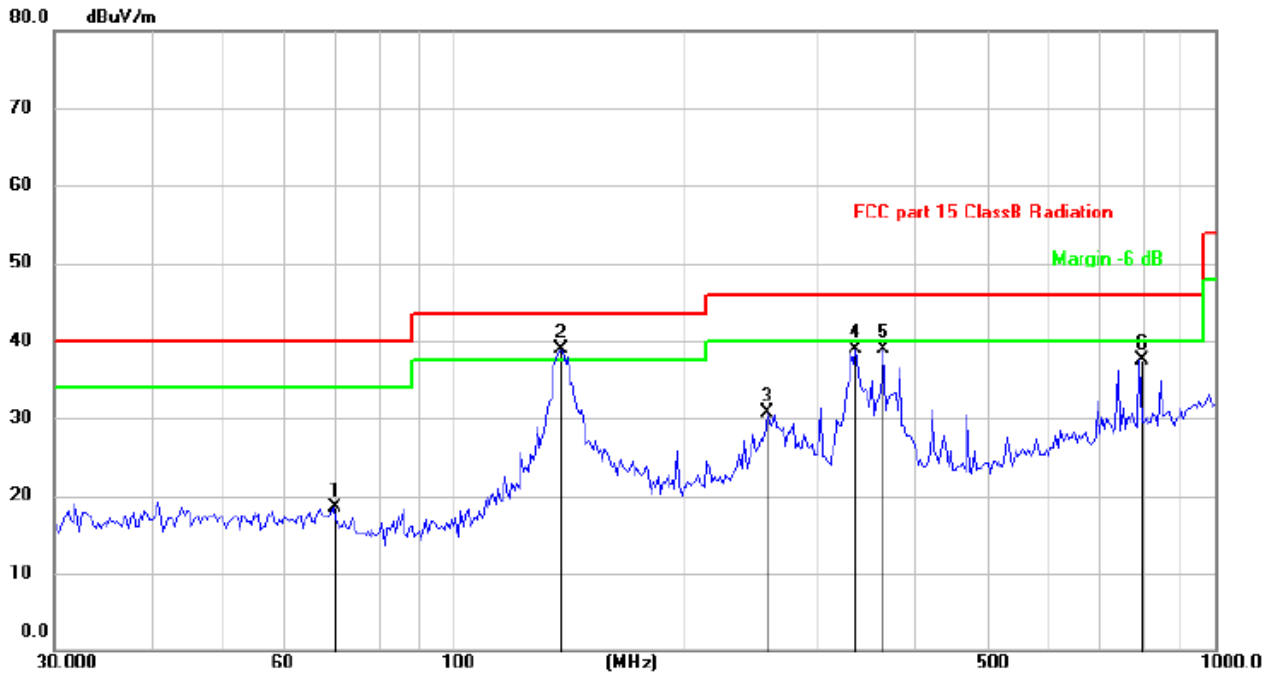
Test Data

Please refer to following diagram for individual

ANT1

Below 1GHz

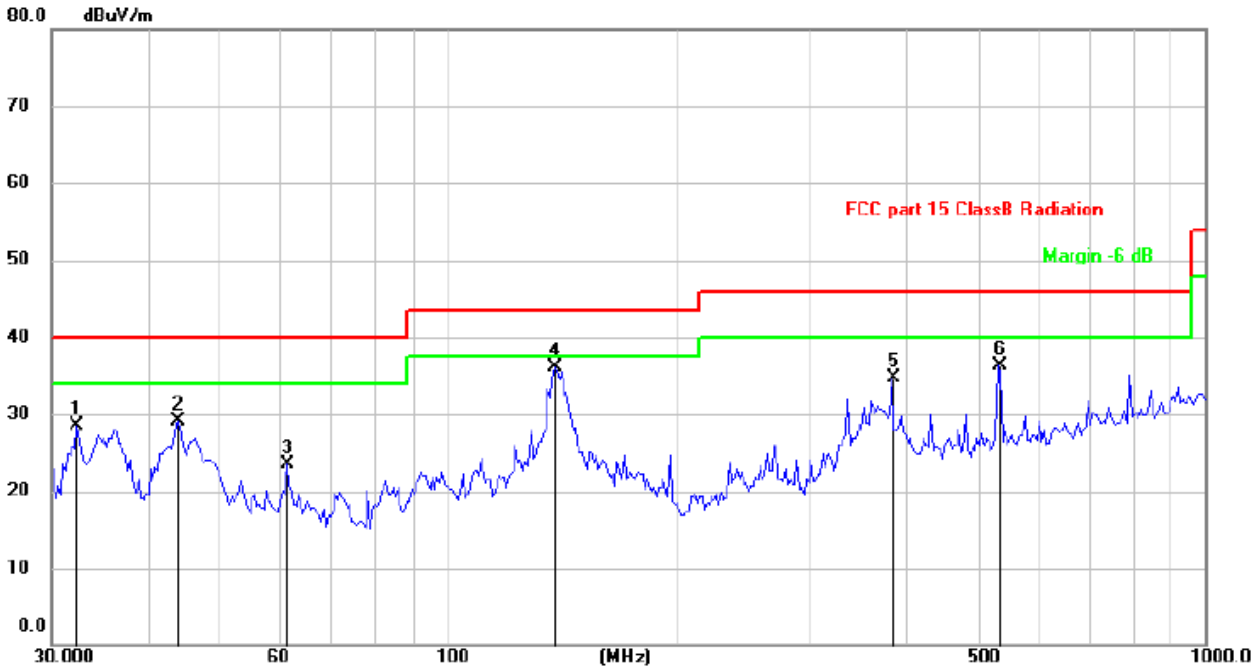
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector	cm	degree	Comment
1		69.6005	27.00	-8.56	18.44	40.00	-21.56	peak			
2	*	138.3873	45.72	-6.81	38.91	43.50	-4.59	peak			
3		258.3264	38.06	-7.35	30.71	46.00	-15.29	peak			
4		337.2155	43.65	-4.77	38.88	46.00	-7.12	peak			
5		366.8231	43.07	-4.11	38.96	46.00	-7.04	peak			
6		793.3960	32.36	5.23	37.59	46.00	-8.41	peak			

Remark: Factor= Cableloss + Antenna factor - Pre-amplifier; Margin = Measurement – Limit

Vertical



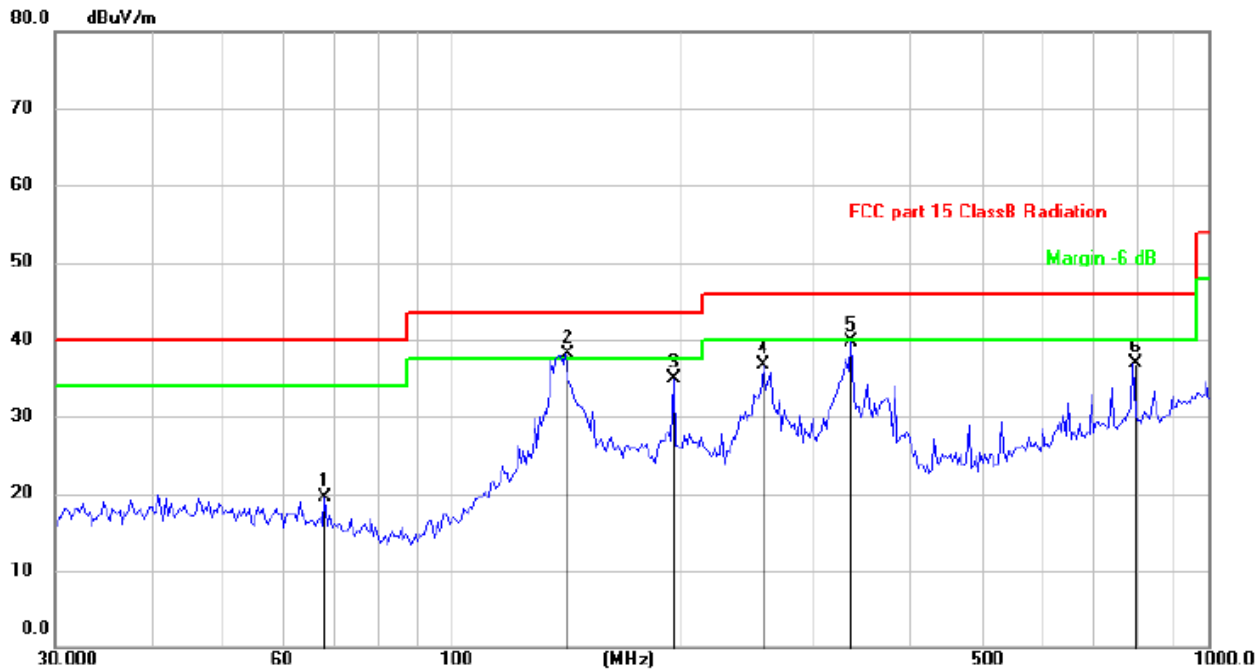
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector	cm	degree	Comment
1		32.4059	35.76	-7.18	28.58	40.00	-11.42	peak			
2		44.1202	35.51	-6.43	29.08	40.00	-10.92	peak			
3		61.3463	30.65	-7.23	23.42	40.00	-16.58	peak			
4	*	138.3873	42.93	-6.81	36.12	43.50	-7.38	peak			
5		385.2805	38.37	-3.65	34.72	46.00	-11.28	peak			
6		531.9635	36.49	-0.23	36.26	46.00	-9.74	peak			

Remark: Factor= Cableloss + Antenna factor - Pre-amplifier; Margin = Measurement – Limit

ANT2

Below 1GHz

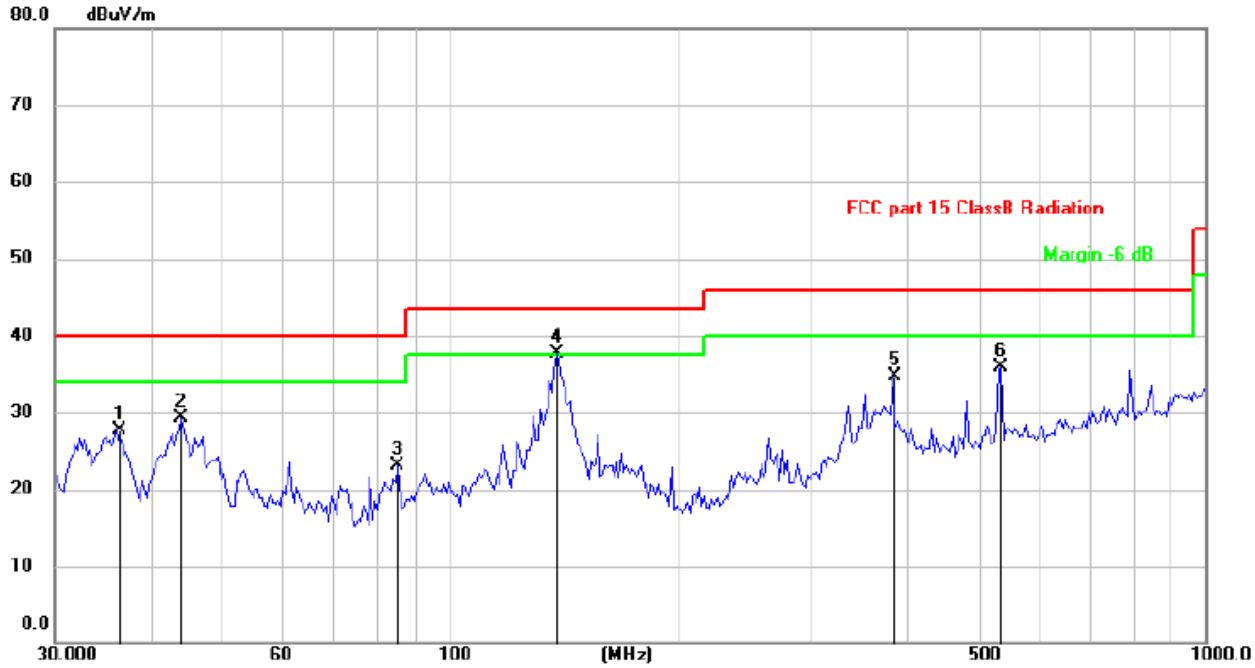
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector	cm	degree	Comment
1		68.1514	27.78	-8.33	19.45	40.00	-20.55	peak			
2	*	141.3298	44.78	-6.72	38.06	43.50	-5.44	peak			
3		196.5098	44.05	-9.22	34.83	43.50	-8.67	peak			
4		258.3264	44.11	-7.35	36.76	46.00	-9.24	peak			
5		337.2155	44.45	-4.77	39.68	46.00	-6.32	peak			
6		793.3960	31.58	5.23	36.81	46.00	-9.19	peak			

Remark: Factor= Cableloss + Antenna factor - Pre-amplifier; Margin = Measurement – Limit

Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector	cm	degree	Comment
1		36.2541	34.58	-6.86	27.72	40.00	-12.28	peak			
2		44.1202	35.65	-6.43	29.22	40.00	-10.78	peak			
3		85.2980	33.68	-10.62	23.06	40.00	-16.94	peak			
4	*	138.3873	44.52	-6.81	37.71	43.50	-5.79	peak			
5		385.2805	38.32	-3.65	34.67	46.00	-11.33	peak			
6		535.7073	35.97	-0.08	35.89	46.00	-10.11	peak			

Remark: Factor= Cableloss + Antenna factor - Pre-amplifier; Margin = Measurement – Limit

Above 1GHz

ANT1

RADIATED EMISSION TEST

LOW CH1 (802.11b Mode)/2412

Horizontal:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4824	66.02	-3.64	62.38	74	-11.62	peak
4824	49.57	-3.64	45.93	54	-8.07	AVG
7236	57.42	-0.95	56.47	74	-17.53	peak
7236	46.45	-0.95	45.50	54	-8.50	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4824	69.24	-3.64	65.60	74	-8.40	peak
4824	50.67	-3.64	47.03	54	-6.97	AVG
7236	58.60	-0.95	57.65	74	-16.35	peak
7236	43.16	-0.95	42.21	54	-11.79	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

MID CH6 (802.11b Mode)/2437

Horizontal:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4874	65.21	-3.51	61.70	74	-12.30	peak
4874	51.11	-3.51	47.60	54	-6.40	AVG
7311	62.21	-0.82	61.39	74	-12.61	peak
7311	45.12	-0.82	44.30	54	-9.70	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4874	63.58	-3.51	60.07	74	-13.93	peak
4874	48.67	-3.51	45.16	54	-8.84	AVG
7311	57.90	-0.82	57.08	74	-16.92	peak
7311	43.56	-0.82	42.74	54	-11.26	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

HIGH CH11 (802.11b Mode)/2462

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4924	65.11	-3.43	61.68	74	-12.32	peak
4924	48.14	-3.43	44.71	54	-9.29	AVG
7386	58.92	-0.75	58.17	74	-15.83	peak
7386	44.61	-0.75	43.86	54	-10.14	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4924	65.33	-3.43	61.90	74	-12.10	peak
4924	48.66	-3.43	45.23	54	-8.77	AVG
7386	56.49	-0.75	55.74	74	-18.26	peak
7386	42.80	-0.75	42.05	54	-11.95	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

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.

LOW CH1 (802.11g Mode)/2412

Horizontal:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4824	66.15	-3.64	62.51	74	-11.49	peak
4824	50.32	-3.64	46.68	54	-7.32	AVG
7236	57.41	-0.95	56.46	74	-17.54	peak
7236	46.68	-0.95	45.73	54	-8.27	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4824	64.00	-3.64	60.36	74	-13.64	peak
4824	48.15	-3.64	44.51	54	-9.49	AVG
7236	58.82	-0.95	57.87	74	-16.13	peak
7236	45.24	-0.95	44.29	54	-9.71	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

MID CH6 (802.11g Mode)/2437

Horizontal:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4874	65.62	-3.51	62.11	74	-11.89	peak
4874	48.10	-3.51	44.59	54	-9.41	AVG
7311	60.51	-0.82	59.69	74	-14.31	peak
7311	47.10	-0.82	46.28	54	-7.72	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4874	64.16	-3.51	60.65	74	-13.35	peak
4874	48.14	-3.51	44.63	54	-9.37	AVG
7311	56.97	-0.82	56.15	74	-17.85	peak
7311	42.56	-0.82	41.74	54	-12.26	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

HIGH CH11 (802.11g Mode)/2462

Horizontal:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4924	65.07	-3.43	61.64	74	-12.36	peak
4924	51.37	-3.43	47.94	54	-6.06	AVG
7386	55.92	-0.75	55.17	74	-18.83	peak
7386	42.58	-0.75	41.83	54	-12.17	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4924	64.15	-3.43	60.72	74	-13.28	peak
4924	48.50	-3.43	45.07	54	-8.93	AVG
7386	58.81	-0.75	58.06	74	-15.94	peak
7386	41.74	-0.75	40.99	54	-13.01	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

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.

MIMO: ANT1+ANT2
LOW CH1 (802.11n/H20 MIMO Mode)/2412

Horizontal:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4824	65.80	-3.64	62.16	74	-11.84	peak
4824	49.53	-3.64	45.89	54	-8.11	AVG
7236	61.03	-0.95	60.08	74	-13.92	peak
7236	42.76	-0.95	41.81	54	-12.19	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4824	62.47	-3.64	58.83	74	-15.17	peak
4824	48.35	-3.64	44.71	54	-9.29	AVG
7236	57.98	-0.95	57.03	74	-16.97	peak
7236	43.47	-0.95	42.52	54	-11.48	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

MID CH6 (802.11n/H20 MIMO Mode)/2437

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4874.00	66.28	-3.51	62.77	74.00	-11.23	peak
4874.00	47.40	-3.51	43.89	54.00	-10.11	AVG
7311.00	58.55	-0.82	57.73	74.00	-16.27	peak
7311.00	45.56	-0.82	44.74	54.00	-9.26	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4874.00	63.22	-3.51	59.71	74.00	-14.29	peak
4874.00	46.06	-3.51	42.55	54.00	-11.45	AVG
7311.00	56.59	-0.82	55.77	74.00	-18.23	peak
7311.00	41.46	-0.82	40.64	54.00	-13.36	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

HIGH CH11 (802.11n/H20 MIMO Mode)/2462

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4924	65.49	-3.43	62.06	74	-11.94	peak
4924	46.96	-3.43	43.53	54	-10.47	AVG
7386	60.85	-0.75	60.10	74	-13.90	peak
7386	41.63	-0.75	40.88	54	-13.12	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4924	63.99	-3.43	60.56	74	-13.44	peak
4924	45.39	-3.43	41.96	54	-12.04	AVG
7386	58.04	-0.75	57.29	74	-16.71	peak
7386	43.02	-0.75	42.27	54	-11.73	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

MIMO: ANT1+ANT2

LOW CH3 (802.11n/H40 MIMO Mode)/2422

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4844	63.80	-3.63	60.17	74	-13.83	peak
4844	51.03	-3.63	47.40	54	-6.60	AVG
7266	59.98	-0.94	59.04	74	-14.96	peak
7266	46.41	-0.94	45.47	54	-8.53	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4844	63.98	-3.63	60.35	74	-13.65	peak
4844	47.83	-3.63	44.20	54	-9.80	AVG
7266	60.76	-0.94	59.82	74	-14.18	peak
7266	45.79	-0.94	44.85	54	-9.15	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

MID CH6 (802.11n/H40 MIMO Mode)/2437

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4874	66.48	-3.51	62.97	74	-11.03	peak
4874	48.82	-3.51	45.31	54	-8.69	AVG
7311	58.13	-0.82	57.31	74	-16.69	peak
7311	44.51	-0.82	43.69	54	-10.31	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4874	64.96	-3.51	61.45	74	-12.55	peak
4874	48.04	-3.51	44.53	54	-9.47	AVG
7311	57.71	-0.82	56.89	74	-17.11	peak
7311	45.64	-0.82	44.82	54	-9.18	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

HIGH CH9 (802.11n/H40 MIMO Mode)/2452

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4904	63.46	-3.43	60.03	74	-13.97	peak
4904	48.96	-3.43	45.53	54	-8.47	AVG
7356	60.15	-0.75	59.40	74	-14.60	peak
7356	43.17	-0.75	42.42	54	-11.58	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4904	62.23	-3.43	58.80	74	-15.20	peak
4904	47.92	-3.43	44.49	54	-9.51	AVG
7356	59.17	-0.75	58.42	74	-15.58	peak
7356	42.44	-0.75	41.69	54	-12.31	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

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.

Test Result of Radiated Spurious at Band edges

Remark: This Report only show the test plots of the ANT1 worst case.

Operation Mode:
802.11b Mode TX CH Low (2412MHz)

Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2390	57.40	-5.81	51.59	74	-22.41	peak
2390	/	-5.81	/	54	/	AVG
2399	64.80	-5.84	58.96	74	-15.04	peak
2399	49.48	-5.84	43.64	54	-10.36	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2390	57.57	-5.81	51.76	74	-22.24	peak
2390	/	-5.81	/	54	/	AVG
2399	62.80	-5.84	56.96	74	-17.04	peak
2399	46.99	-5.84	41.15	54	-12.85	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

Operation Mode: TX CH High (2462MHz)

Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.5	58.14	-5.65	52.49	74	-21.51	peak
2483.5	/	-5.65	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.5	56.60	-5.65	50.95	74	-23.05	peak
2483.5	/	-5.65	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						
Remark: All the other emissions not reported were too low to read and deemed to comply with FCC limit.						

Operation Mode: 802.11g Mode TX CH Low (2412MHz)

Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2390	59.55	-5.81	53.74	74	-20.26	peak
2390	/	-5.81	/	54	/	AVG
2399	61.74	-5.84	55.90	74	-18.10	peak
2399	46.58	-5.84	40.74	54	-13.26	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2390	56.50	-5.81	50.69	74	-23.31	peak
2390	/	-5.81	/	54	/	AVG
2399	63.69	-5.84	57.85	74	-16.15	peak
2399	46.82	-5.84	40.98	54	-13.02	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

Operation Mode: TX CH High (2462MHz)

Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.5	58.52	-5.65	52.87	74	-21.13	peak
2483.5	/	-5.65	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.5	57.06	-5.65	51.41	74	-22.59	peak
2483.5	/	-5.65	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						
Remark: All the other emissions not reported were too low to read and deemed to comply with FCC limit.						

MIMO: ANT1+ANT2

Operation Mode: 802.11n/H20 Mode TX CH Low (2412MHz)

Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2390	56.32	-5.81	50.51	74	-23.49	peak
2390	/	-5.81	/	54	/	AVG
2399	64.37	-5.84	58.53	74	-15.47	peak
2399	47.07	-5.84	41.23	54	-12.77	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2390	57.21	-5.81	51.40	74	-22.60	peak
2390	/	-5.81	/	54	/	AVG
2399	60.60	-5.84	54.76	74	-19.24	peak
2399	47.47	-5.84	41.63	54	-12.37	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

MIMO: ANT1+ANT2

Operation Mode: TX CH High (2462MHz)

Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.5	59.89	-5.65	54.24	74	-19.76	peak
2483.5	41.24	-5.65	35.59	54	-18.41	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.5	56.04	-5.65	50.39	74	-23.61	peak
2483.5	/	-5.65	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						
Remark: All the other emissions not reported were too low to read and deemed to comply with FCC limit.						

MIMO: ANT1+ANT2
Operation Mode: 802.11n/H40 Mode TX CH Low (2422MHz)

Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2390	58.64	-5.81	52.83	74	-21.17	peak
2390	/	-5.81	/	54	/	AVG
2399	64.28	-5.84	58.44	74	-15.56	peak
2399	46.99	-5.84	41.15	54	-12.85	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2390	57.73	-5.81	51.92	74	-22.08	peak
2390	/	-5.81	/	54	/	AVG
2399	61.87	-5.84	56.03	74	-17.97	peak
2399	47.96	-5.84	42.12	54	-11.88	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

MIMO: ANT1+ANT2

Operation Mode: TX CH High (2452MHz)

Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.5	58.33	-5.65	52.68	74	-21.32	peak
2483.5	/	-5.65	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.5	56.50	-5.65	50.85	74	-23.15	peak
2483.5	/	-5.65	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						
Remark: All the other emissions not reported were too low to read and deemed to comply with FCC limit.						

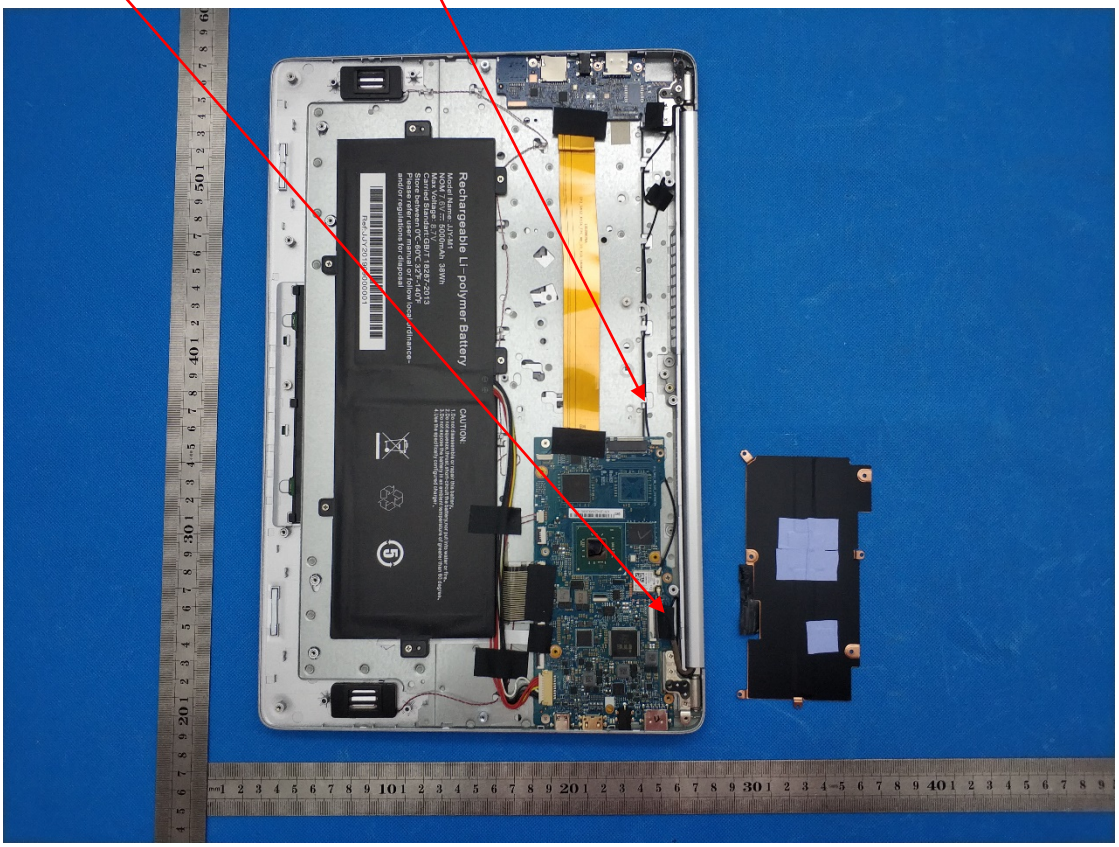
4.7. ANTENNA REQUIREMENT

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.

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.

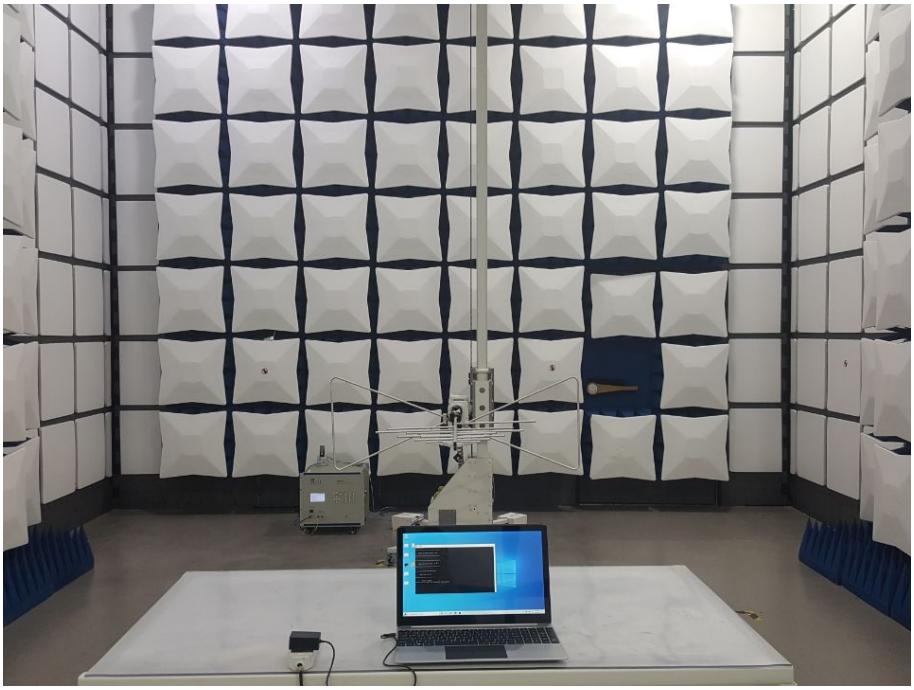
Antenna Connected Construction
The antenna used in this product is a Internal Antenna, The directional gains of antenna used for transmitting is 0.2dBi.

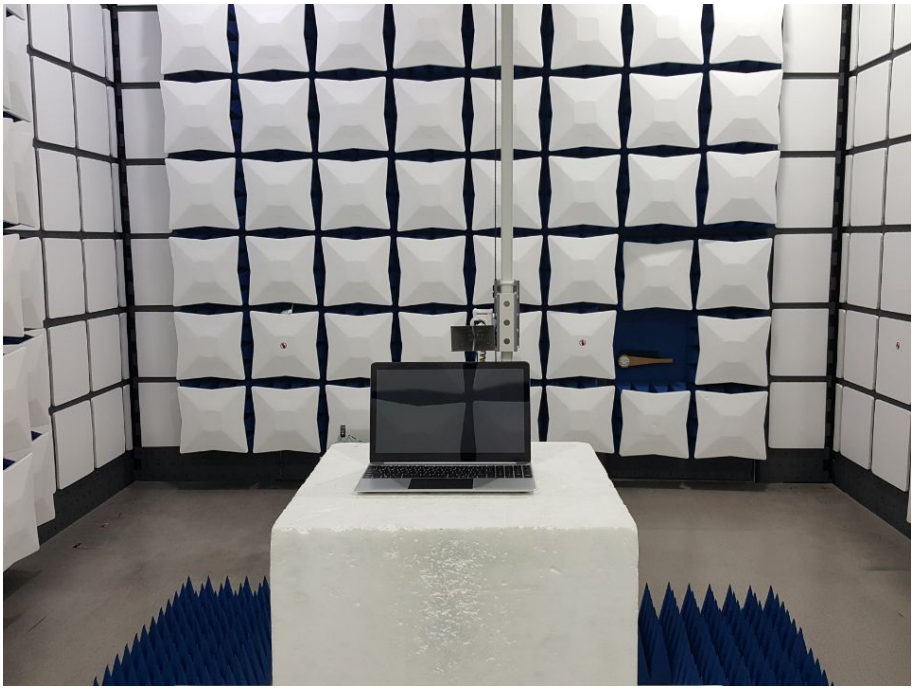
WIFI ANTENNA1 WIFI ANTENNA2



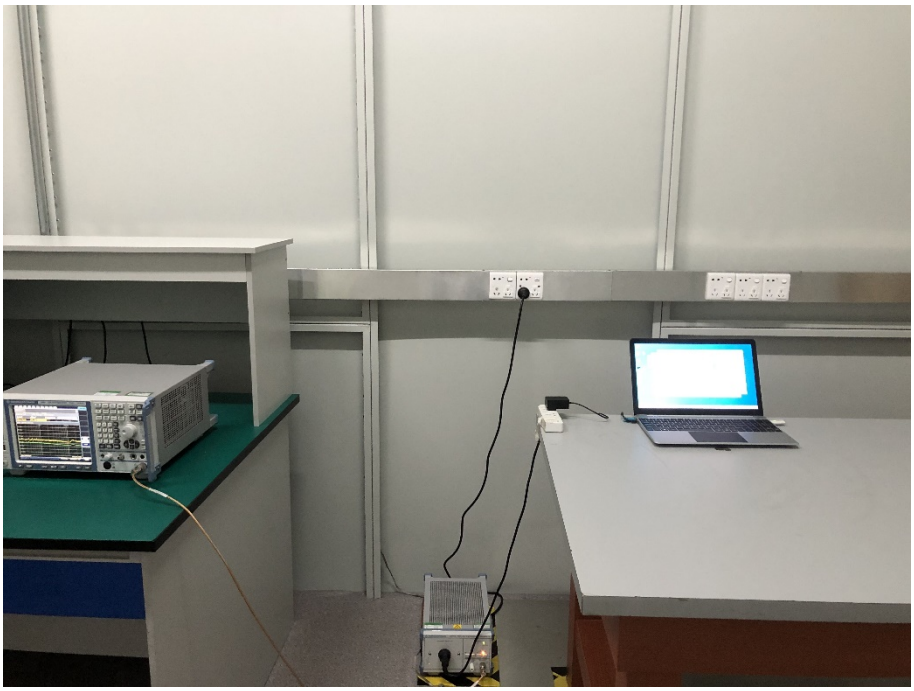
4.8. PHOTOGRAPH OF TEST

Radiated Emission





Conducted Emission



The end