FCC TEST REPORT

Test Report

On Behalf of

USecureprop,LLC

For

uSecureHome

Model No.: uSecureHome 2020-01

FCC ID:2AWQW-USHOME

Prepared for : USecureprop,LLC
1049 Durbin Parke Dr, Saint Johns, FL 32259

Prepared By : Shenzhen HUAK Testing Technology Co., Ltd.
1F, B2 Building, JunfengZhongchengZhizao Innovation Park, Fuhai Street, Bao'an District, Shenzhen City, China

Date of Test: Jun. 15, 2020--Jun. 24, 2020

Date of Report: Jun. 24, 2020

Report Number: HK2001150135-E

TEST RESULT CERTIFICATION

Applicant's name..... : USecureprop,LLC

Address..... : 1049 Durbin Parke Dr, Saint Johns, FL 32259

Manufacture's Name..... : Shenzhen Gaopusheng Electronic Technology Co., Ltd.

Address..... : 1109, Jiangshi Building, Fuyong First Industrial Park, Xintian Avenue, Fuyong Street, Baoan District, Shenzhen, Guangdong, China

Product description

Trade Mark: uSecureHome

Product name..... : uSecureHome

Model and/or type reference : uSecureHome 2020-01

Standards..... : FCC Rules and Regulations Part 15 Subpart C Section 15.247

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Date of Test..... :

Date (s) of performance of tests..... : Jun. 15, 2020 -- Jun. 24, 2020

Date of Issue..... : Jun. 24, 2020

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)	PASS
6dB Emission Bandwidth	§15.247 (a)(2)	PASS
Power Spectral Density	§15.247 (e)	PASS
Band Edge	§5.247(d)	PASS
Spurious Emission	§15.205/§15.209	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, JunfengZhongchengZhizao 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	uSecureHome
Model Name	uSecureHome 2020-01
Serial No.	N/A
Model Difference	N/A
Trade Mark	uSecureHome
FCC ID	2AWQW-USHOME
Hardware Version:	V1.0
Software Version:	V2.2.3
Test sample ID:	HK2001150135-S
Operation frequency	802.11b/g/n 20: 2412~2462 MHz
Number of Channels	802.11b/g/n20: 11CH
Antenna Type	PCBAntenna
Antenna Gain	0dBi
Modulation Type	CCK/DSSS/OFDM
PowerSource	DC 12.0V from adapter

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		

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)**

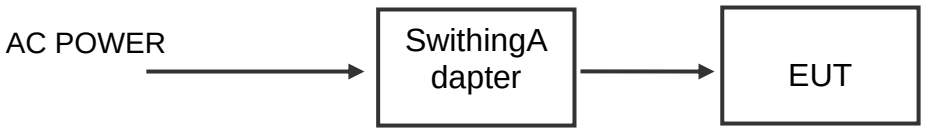
Low Channel: 2412MHz

Middle Channel: 2437MHz

High Channel: 2462MHz

2.4. DESCRIPTION OF TEST SETUP

Operation of EUT during conducted



Operation of EUT during Radiation and Above1GHz Radiationtesting:

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:	The applicant provides communication tools software (espRFTool.exe) to control the EUT transmitting continuously at select channel and modulations(Duty Cycle more than 98%)
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)	MCS0
/	/
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, MCS0 for 802.11n(H20). 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.

Description	Model No.	Manufacturer	Remark	Certificate
SwithingAdapter	TPA-46B050100UU	SHENZHEN TIANYIN ELECTRONICS CO.,LTD	Provide by lab	SDOC
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Note:

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

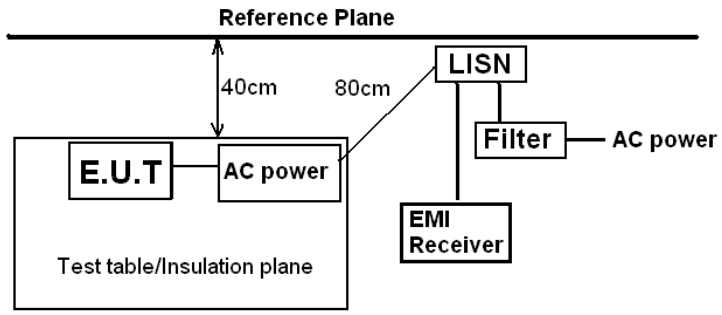
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

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	Dec. 25, 2020
LISN	R&S	ENV216	HKE-002	Dec. 25, 2020
Conducted test software	Tonscend	TS+ Rev 2.5.0.0	HKE-081	N/A

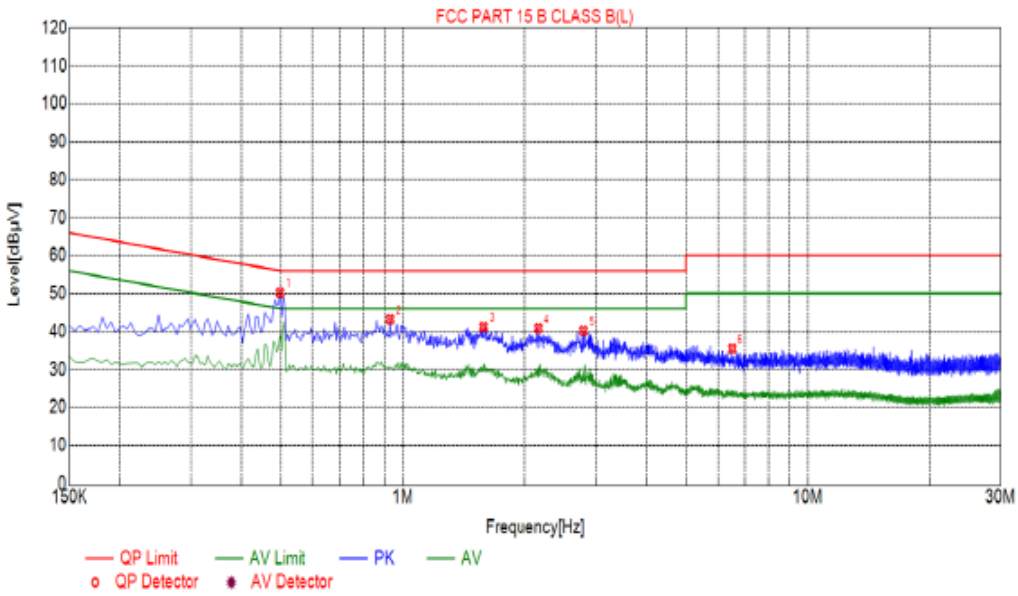
Note: *The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).*

Test data

Temperature	22.8℃	Humidity	56%
Test Engineer	Eden Hu	Configurations	WIFI

Note :
All the test modes completed for test. only the worst result of AC 120V/60Hz(802.11b at 2412MHz) was reported as below:

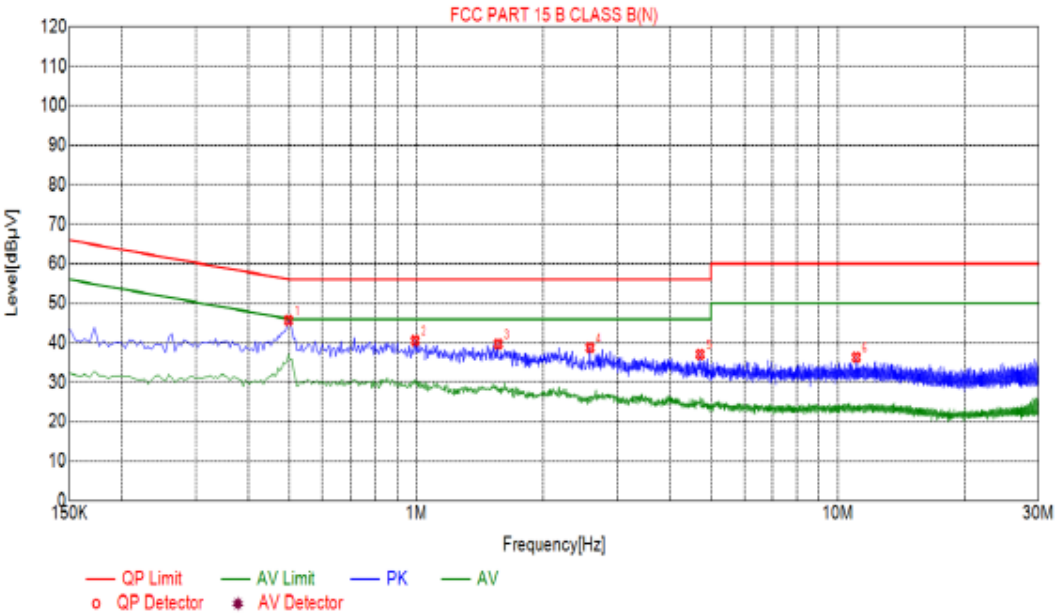
Conducted Emission on Line Terminal of the power line (150 kHz to 30MHz)



Suspected List						
NO.	Freq. [MHz]	Level [dBµV]	Factor [dB]	Limit [dBµV]	Margin [dB]	Detector
1	0.4965	50.27	10.04	56.06	5.79	PK
2	0.9285	43.26	10.06	56.00	12.74	PK
3	1.5810	41.24	10.11	56.00	14.76	PK
4	2.1660	40.87	10.16	56.00	15.13	PK
5	2.7915	40.15	10.21	56.00	15.85	PK
6	6.4995	35.46	10.21	60.00	24.54	PK

Remark: Margin = Limit – Level
Correction factor = Cable lose + LISN insertion loss
Level=Test receiver reading + correction factor

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

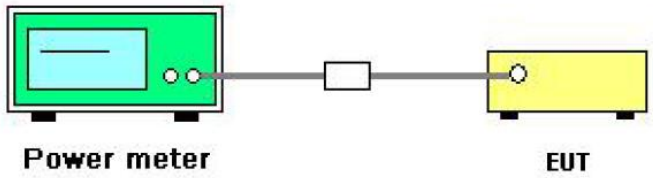


Suspected List						
NO.	Freq. [MHz]	Level [dBµV]	Factor [dB]	Limit [dBµV]	Margin [dB]	Detector
1	0.4965	45.65	10.04	56.06	10.41	PK
2	0.9915	40.53	10.06	56.00	15.47	PK
3	1.5630	39.75	10.11	56.00	16.25	PK
4	2.5845	38.76	10.20	56.00	17.24	PK
5	4.7175	37.08	10.26	56.00	18.92	PK
6	11.0535	36.29	10.01	60.00	23.71	PK

Remark: Margin = Limit – Level
Correction factor = Cable lose + LISN insertion loss
Level=Test receiver reading + correction factor

4.2. Maximum Conducted Output Power

Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (b)(3)
Test Method:	KDB 558074
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 v05. 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 Peak 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	Dec. 25, 2020
Power Sensor	Agilent	U2021X	HKE-113	Dec. 25, 2020
RF cable	Times	1-40G	HKE-034	Dec. 25, 2020
RF automatic control unit	Tonscend	JS0806-2	HKE-060	Dec. 25, 2020

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

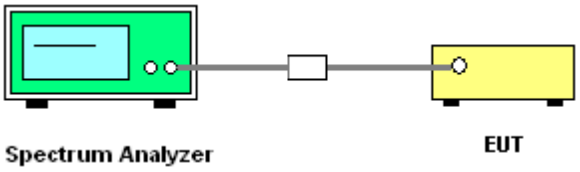
Test Data

Temperature	22.8℃	Humidity	56%
Test Engineer	Eden Hu	Configurations	WIFI

TX 802.11b Mode			
Test Channe	Frequency	MaximumPeak Conducted Output Power	LIMIT
	(MHz)	(dBm)	dBm
CH01	2412	15.66	30
CH06	2437	15.14	30
CH11	2462	13.86	30
TX 802.11g Mode			
CH01	2412	12.83	30
CH06	2437	13.67	30
CH11	2462	12.01	30
TX 802.11n20 Mode			
CH01	2412	12.37	30
CH06	2437	13.42	30
CH11	2462	11.82	30

4.3. Emission Bandwidth

Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (a)(2)
Test Method:	KDB 558074
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 v05. 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	Dec. 25, 2020
RF Cable (9KHz-26.5GHz)	Tonscend	170660	N/A	Dec. 25, 2020
RF automatic control unit	Tonscend	JS0806-2	HKE-060	Dec. 25, 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

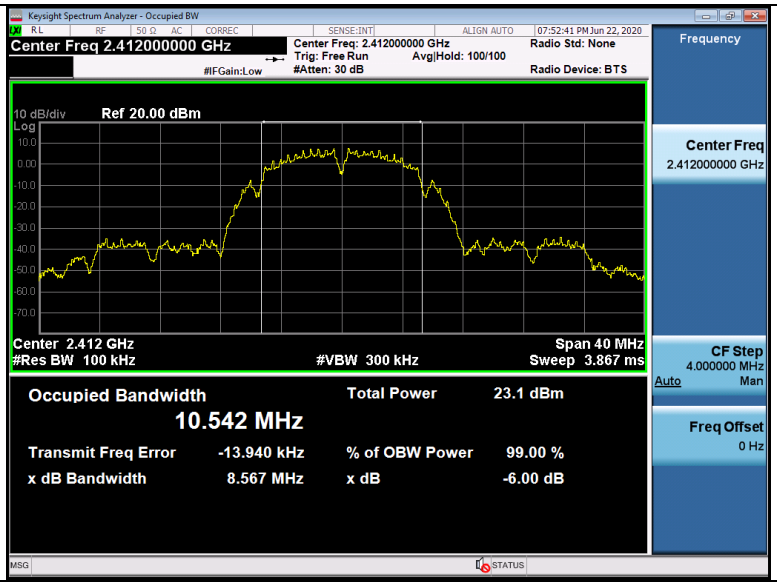
Temperature	22.8℃	Humidity	56%
Test Engineer	Eden Hu	Configurations	WIFI

Test channel	6dB Emission Bandwidth (MHz)		
	802.11b	802.11g	802.11n(H20)
Lowest	8.567	15.73	16.04
Middle	7.644	15.89	15.43
Highest	8.071	15.75	15.89
Limit:	>500kHz		
Test Result:	PASS		

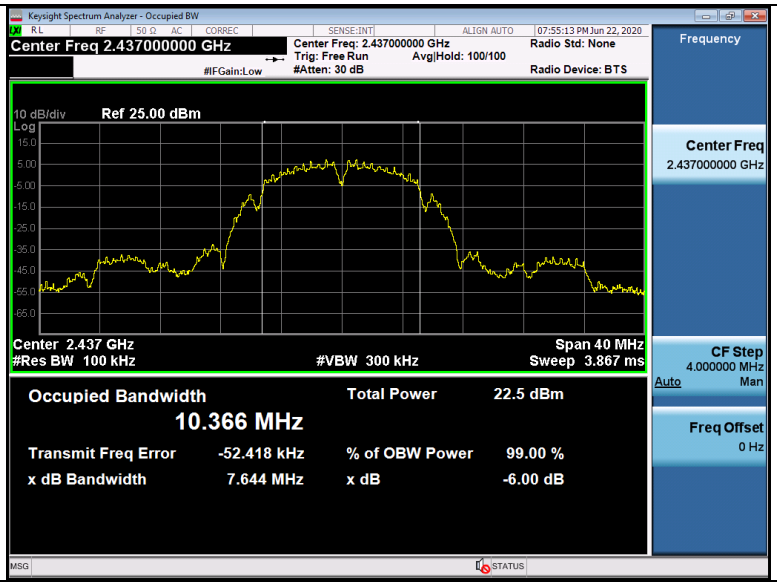
Test plots as follows:

802.11b Modulation

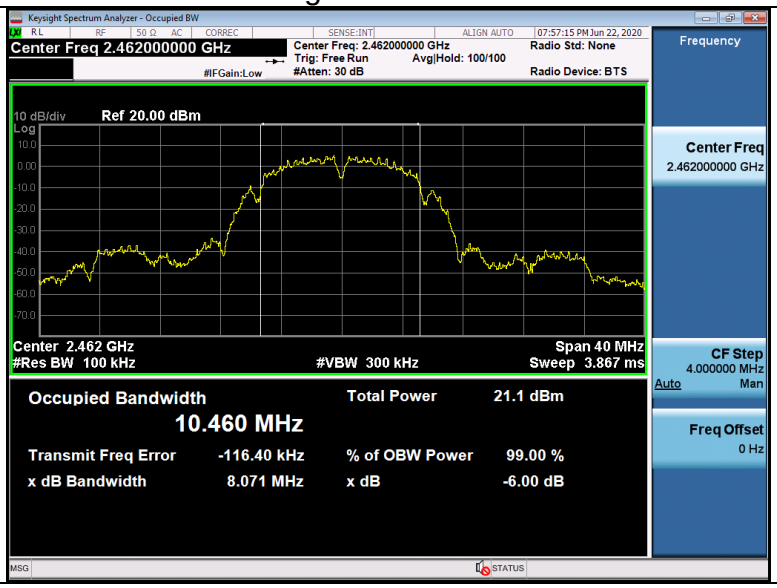
Lowest channel



Middle channel

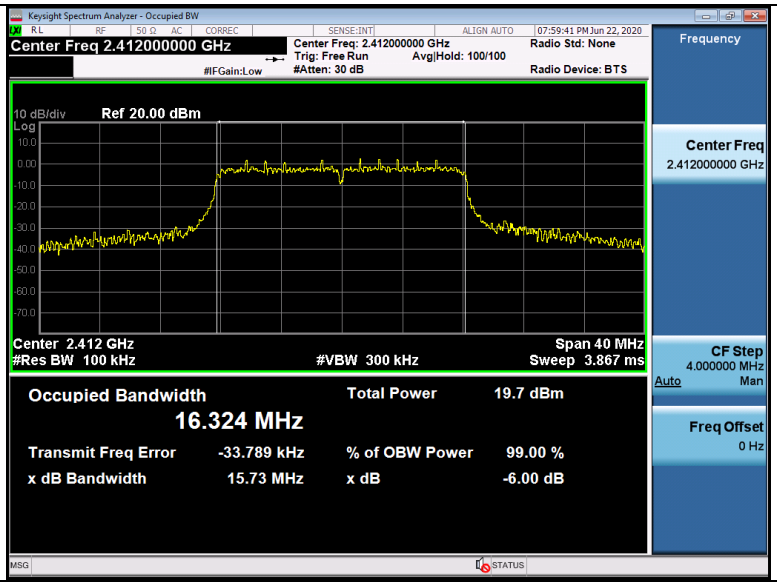


Highest channel

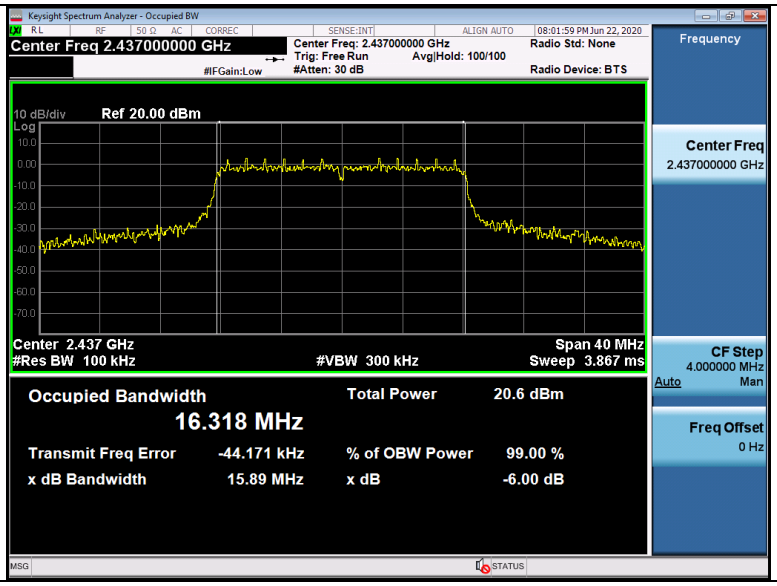


802.11g Modulation

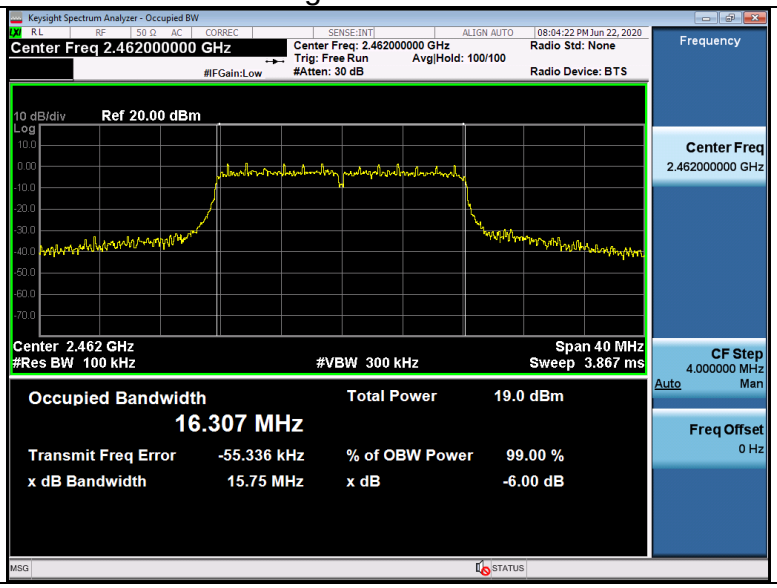
Lowest channel



Middle channel

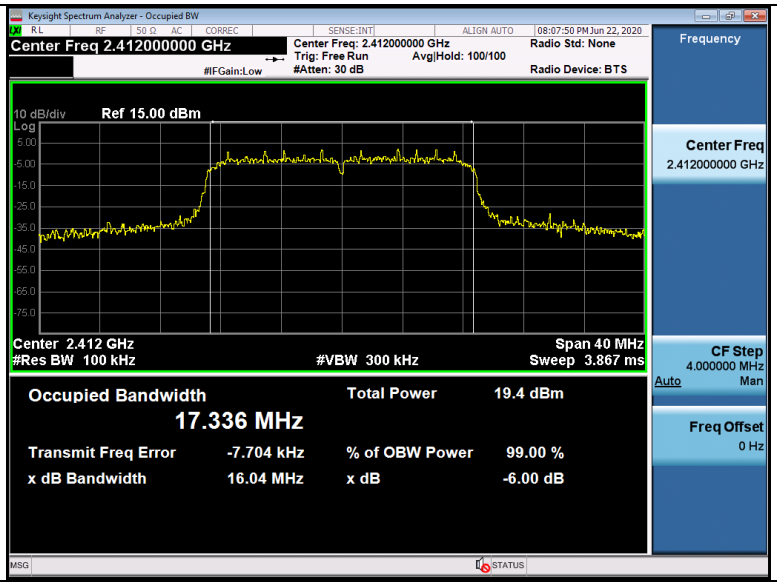


Highest channel

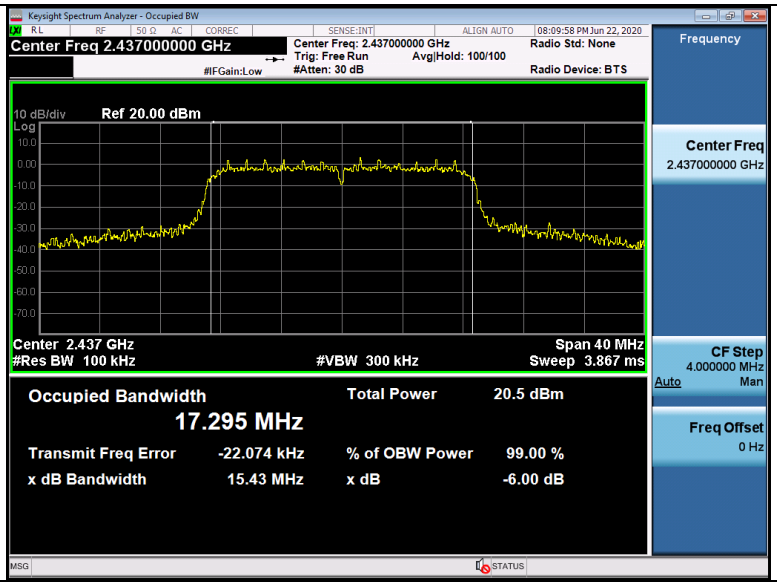


802.11n (HT20) Modulation

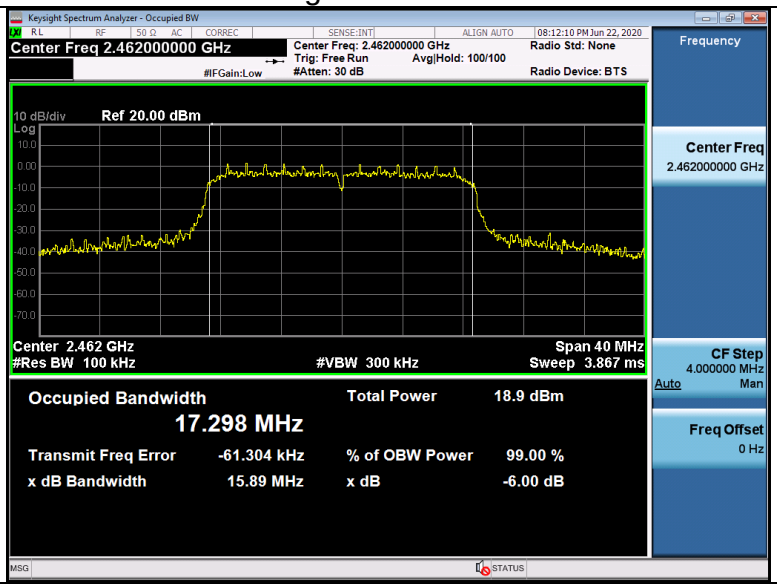
Lowest channel



Middle channel

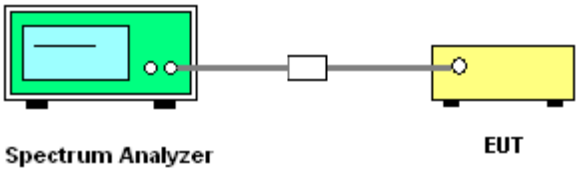


Highest channel



4.4. Power Spectral Density

Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (e)
Test Method:	KDB 558074
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 v05 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 = Peak, Sweep time = auto couple. 6. Employ trace averaging (Peak) mode over a minimum of 100 traces. Use the peak marker function to determine the maximum power level. 6. 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	Dec. 25, 2020
RF Cable (9KHz-26.5GHz)	Tonscend	170660	N/A	Dec. 25, 2020
RF automatic control unit	Tonscend	JS0806-2	HKE-060	Dec. 25, 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

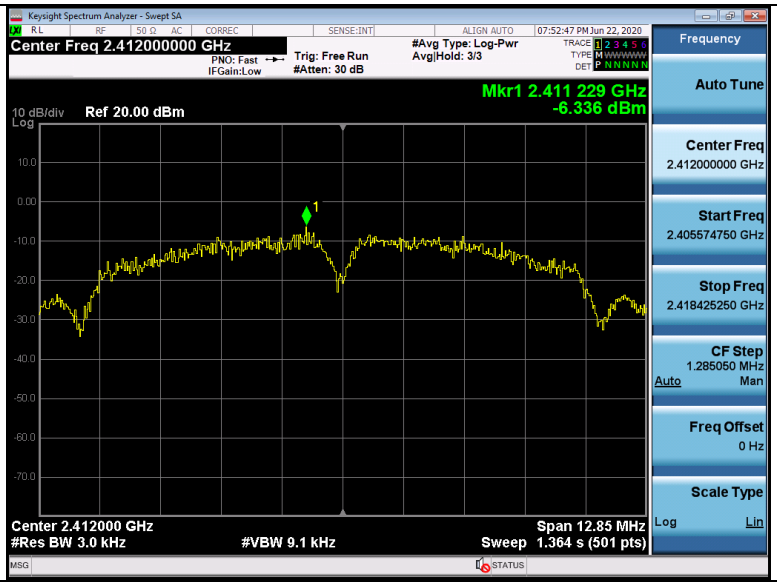
Temperature	22.8℃	Humidity	56%
Test Engineer	Eden Hu	Configurations	WIFI

EUT Set Mode	Channel	Result (dBm/3kHz)
802.11b	Lowest	-6.336
	Middle	-7.162
	Highest	-9.623
802.11g	Lowest	-12.801
	Middle	-11.605
	Highest	-13.324
802.11n(H20)	Lowest	-13.078
	Middle	-12.475
	Highest	-13.332
Limit: 8dBm/3kHz		
Test Result:	PASS	

Test plots as follows:

802.11b Modulation

Lowest channel

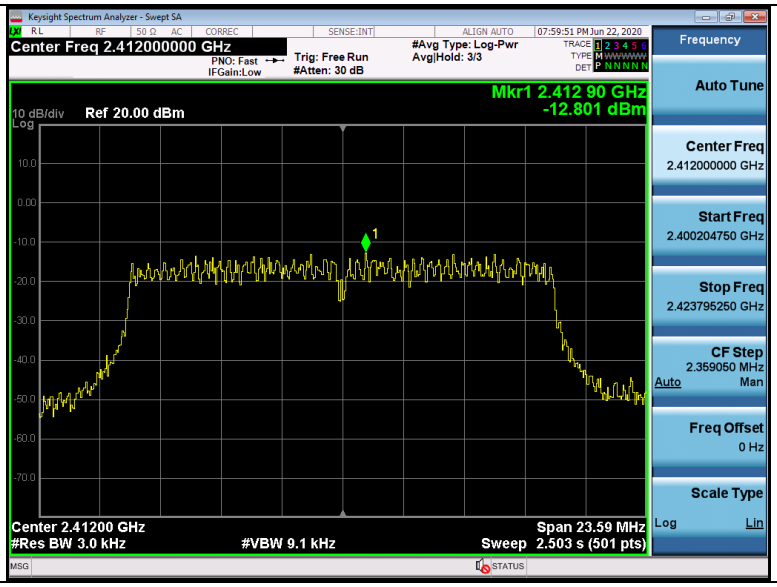


Middle channel

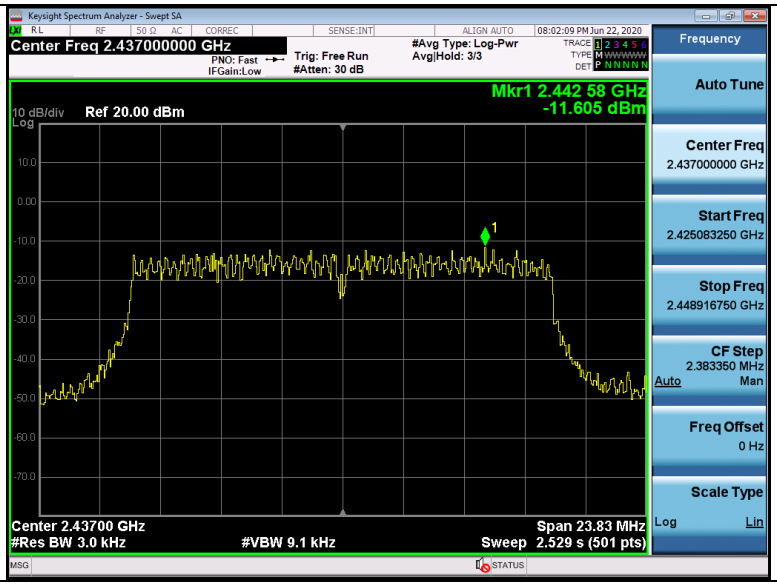
Highest channel

802.11g Modulation

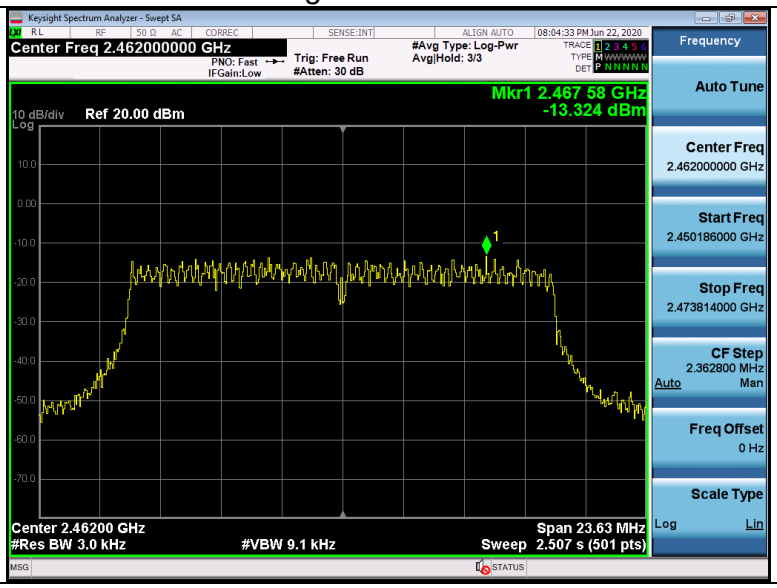
Lowest channel



Middle channel

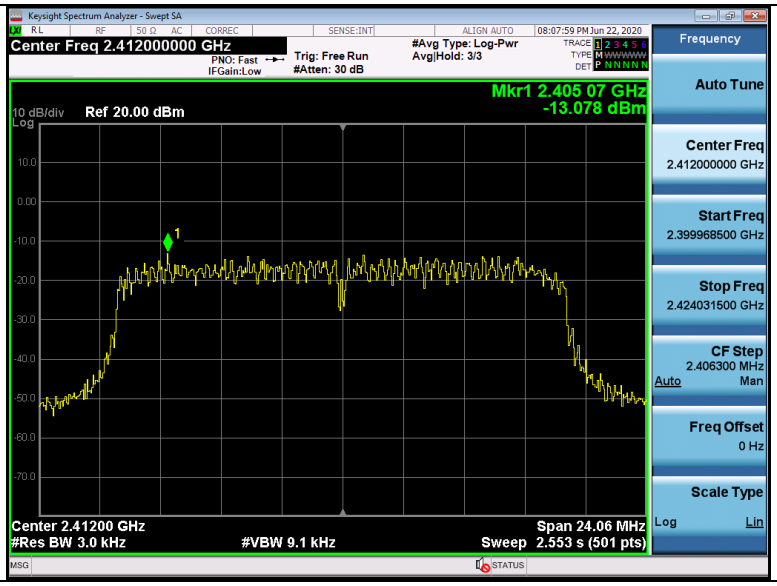


Highest channel

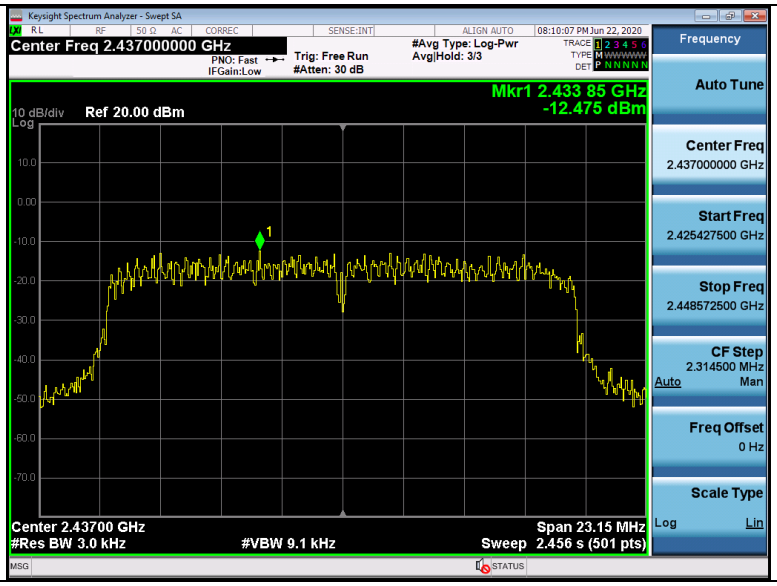


802.11n (HT20) Modulation

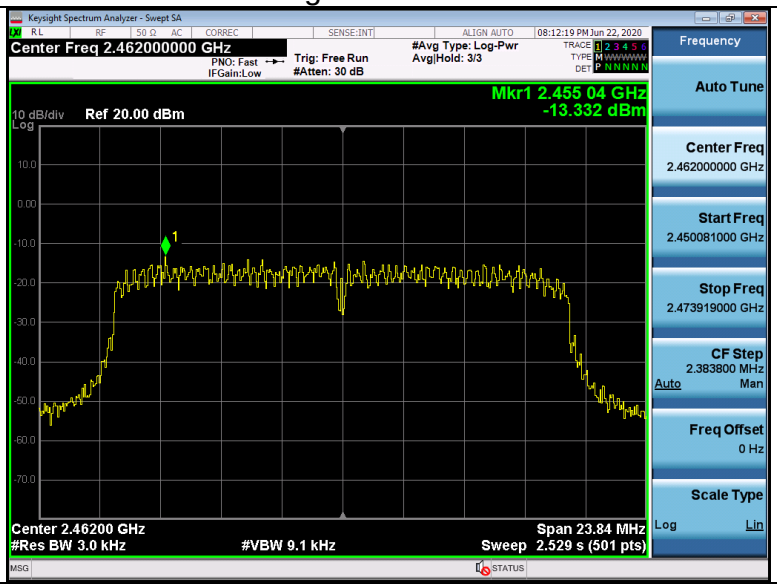
Lowest channel



Middle channel

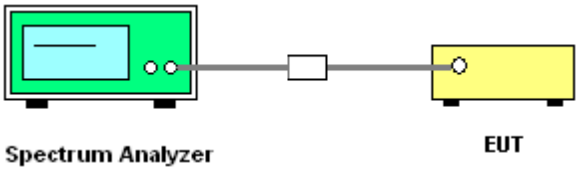


Highest channel



4.5. Conducted Band Edge and Spurious Emission Measurement

Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	KDB558074
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 v05. 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

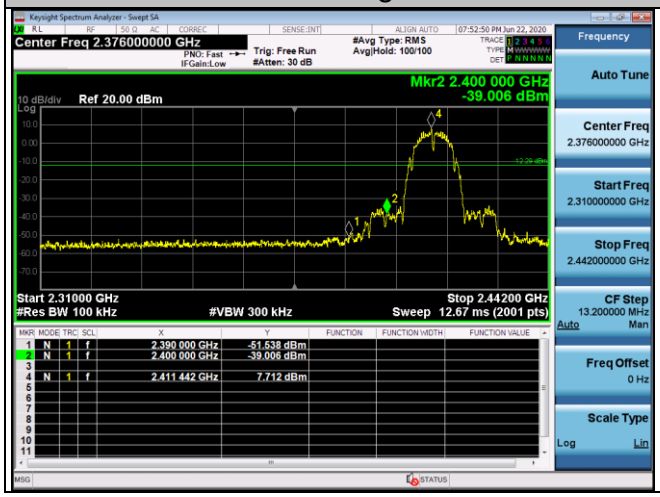
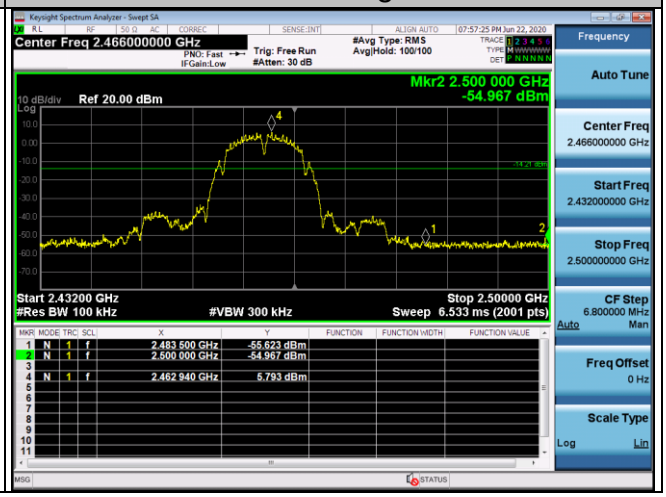
RF Test Room				
Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum analyzer	Agilent	N9020A	HKE-048	Dec. 25, 2020
Signal generator	Agilent	N5183A	HKE-071	Dec. 25, 2020
RF Cable (9KHz-26.5GHz)	Tonscend	170660	N/A	Dec. 25, 2020
RF automatic control unit	Tonscend	JS0806-2	HKE-060	Dec. 25, 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

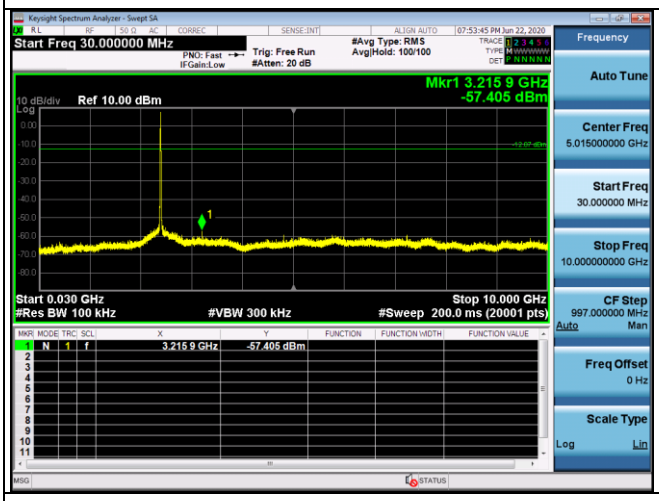
Temperature	22.8℃	Humidity	56%
Test Engineer	Eden Hu	Configurations	WIFI

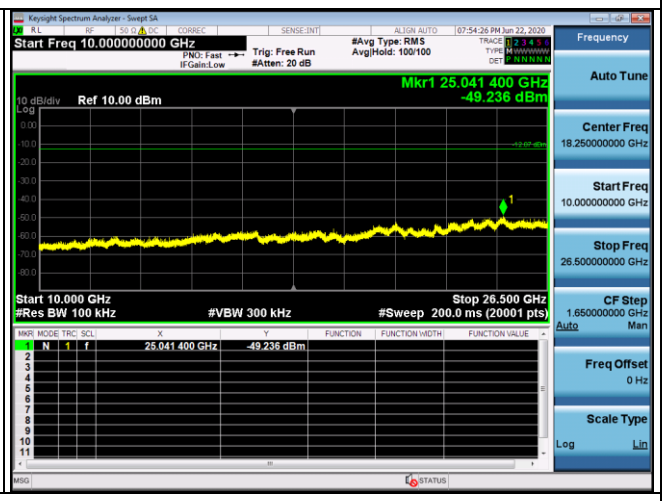
802.11b Modulation

Lowest Channel	Highest Channel
Band Edge	Band Edge
	

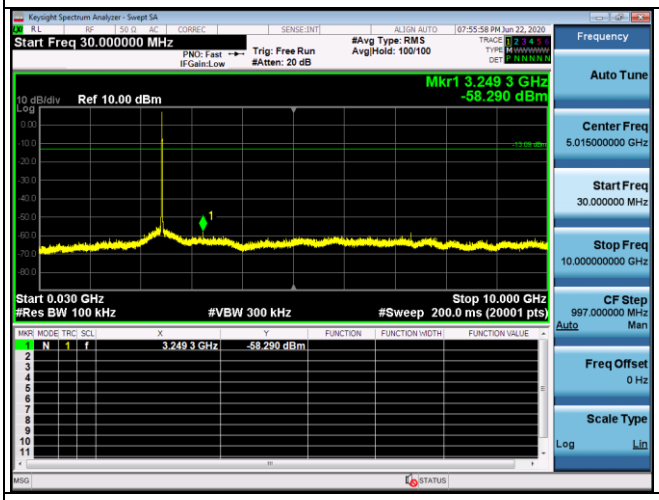
Spurious emission

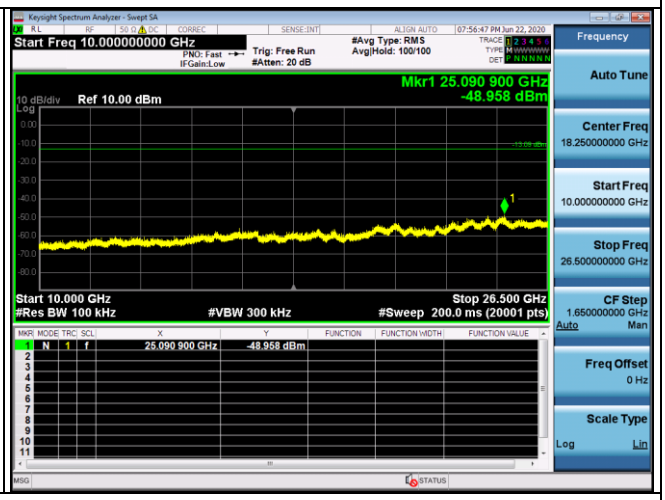
Low Channel



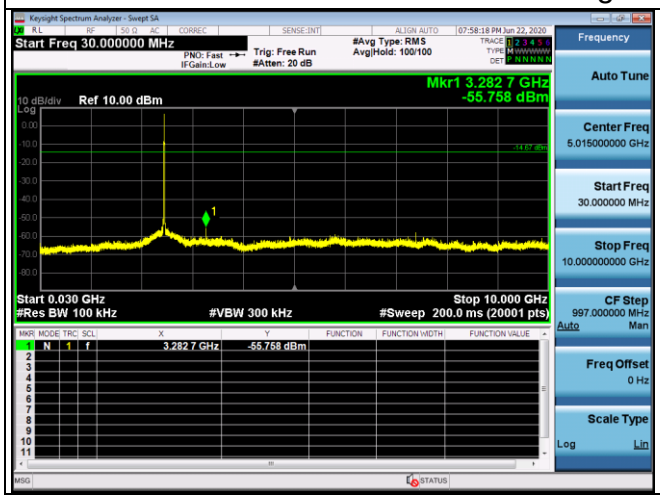


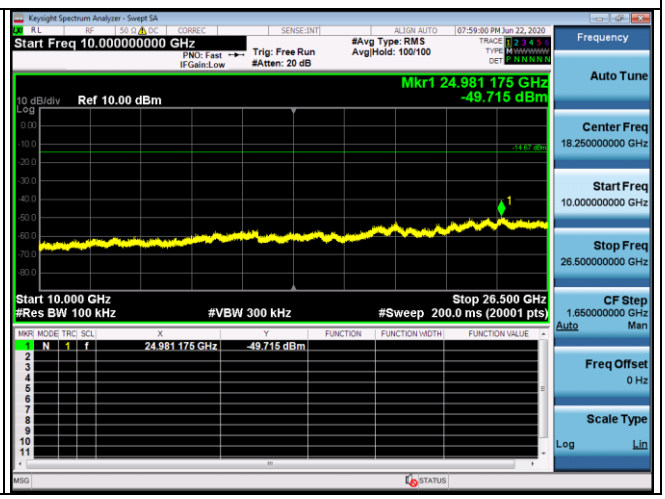
Middle Channel



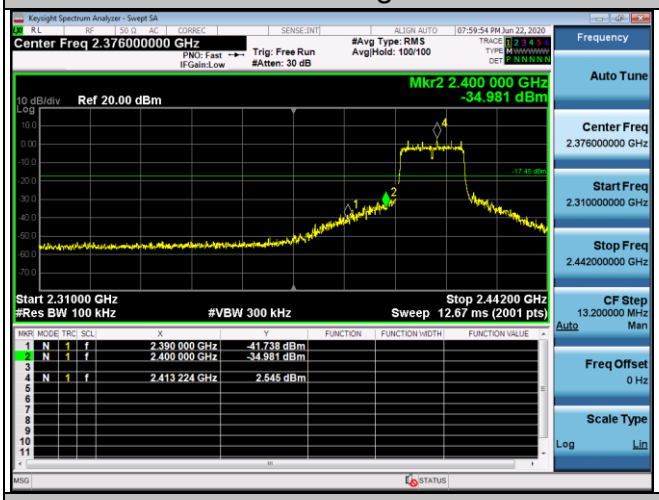
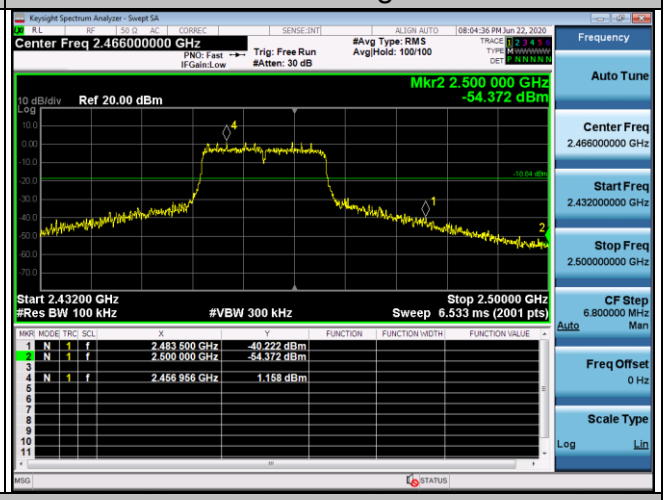
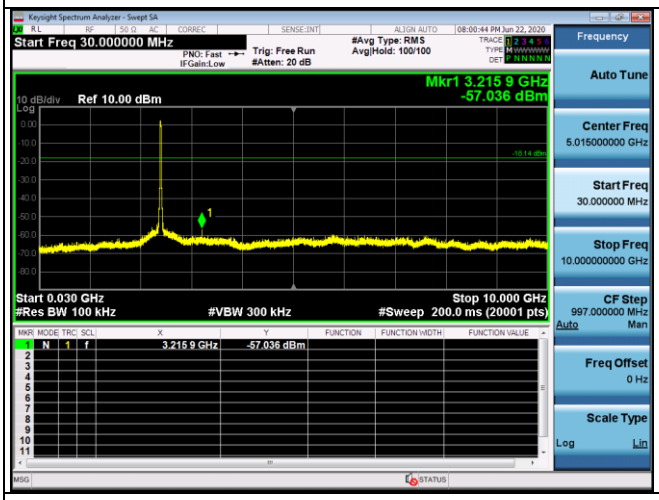
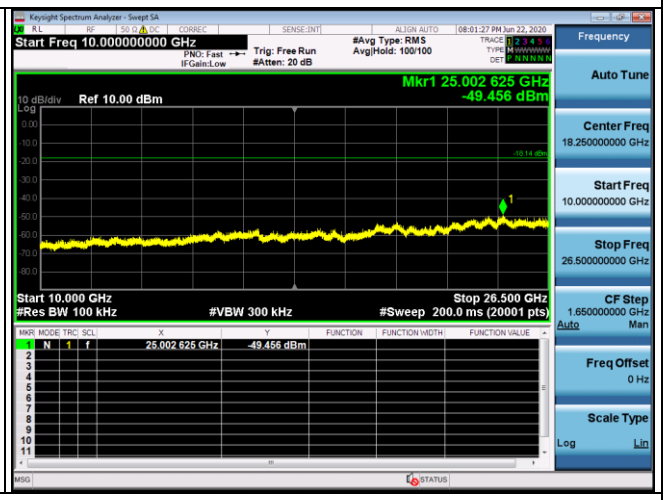
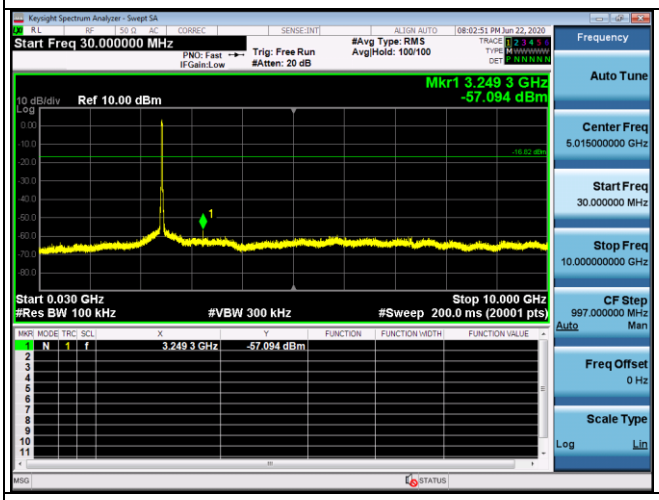
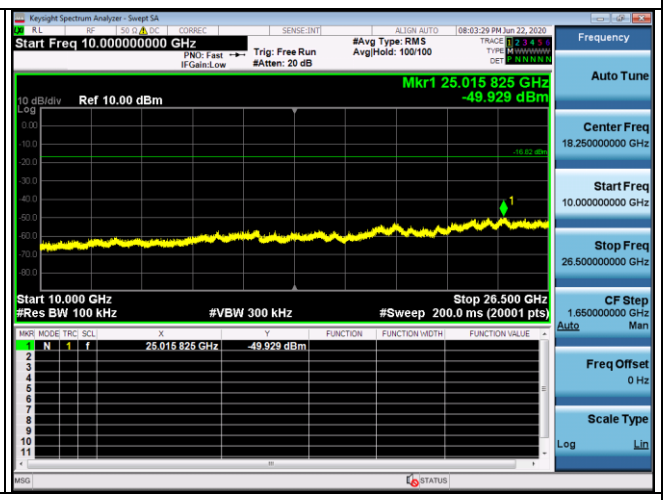


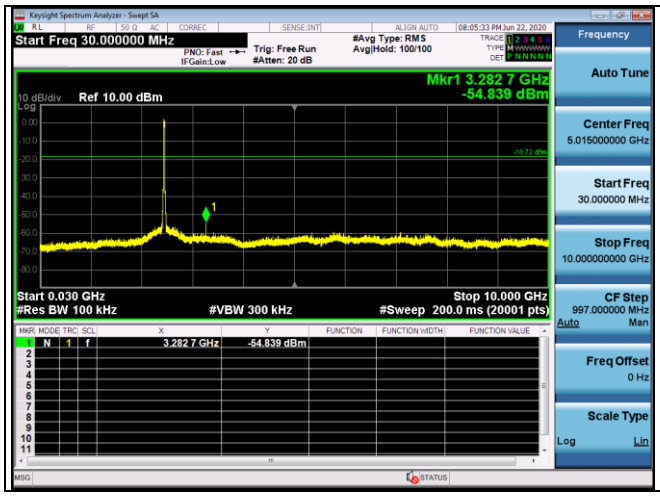
High Channel

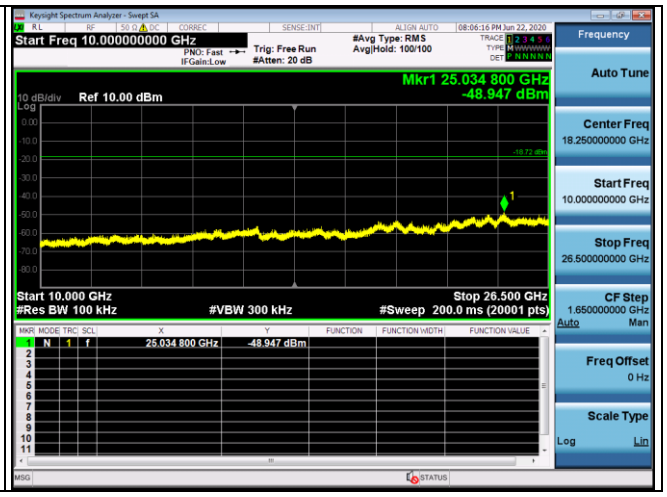




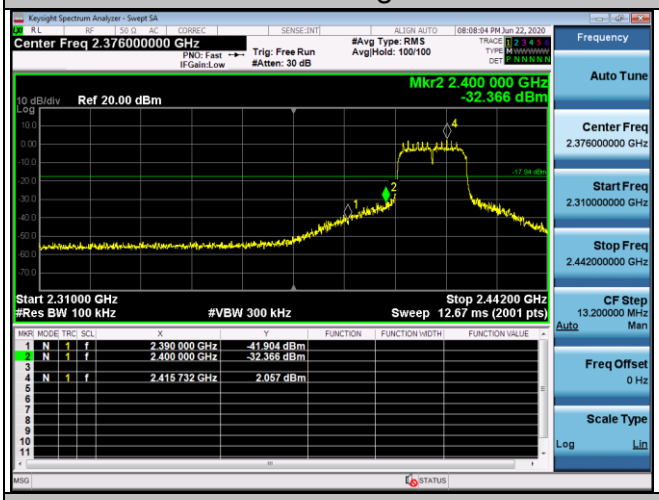
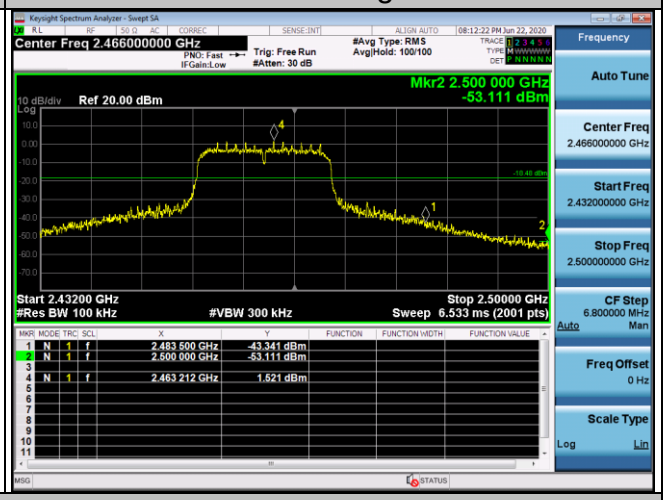
802.11g Modulation

Lowest Channel	Highest Channel
Band Edge	Band Edge
	
Spurious emission	
Low Channel	
	
Middle Channel	
	
High Channel	


Keysight Spectrum Analyzer - Swept SA
Start Freq 30.000000 MHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 20 dB
#Avg Type: RMS
Avg|Hold: 100/100
08:05:33 PM Jun 22, 2020
Mkr1 3.282 7 GHz
-54.839 dBm
10 dB/div
Ref 10.00 dBm
Start 0.030 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 10.000 GHz
#Sweep 200.0 ms (20001 pts)
1 N 1 f 3.282 7 GHz -54.839 dBm
Frequency
Auto Tune
Center Freq
5.015000000 GHz
Start Freq
30.000000 MHz
Stop Freq
10.000000000 GHz
CF Step
997.000000 MHz
Auto Man
Freq Offset
0 Hz
Scale Type
Log Lin

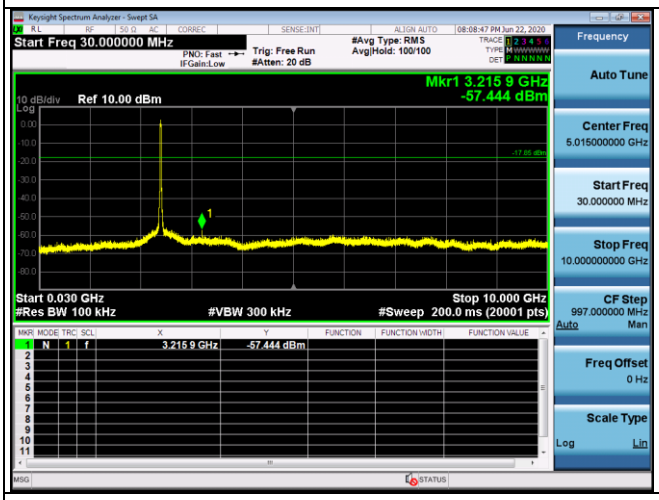

Keysight Spectrum Analyzer - Swept SA
Start Freq 10.000000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 20 dB
#Avg Type: RMS
Avg|Hold: 100/100
08:06:16 PM Jun 22, 2020
Mkr1 25.034 800 GHz
-48.947 dBm
10 dB/div
Ref 10.00 dBm
Start 10.000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 26.500 GHz
#Sweep 200.0 ms (20001 pts)
1 N 1 f 25.034 800 GHz -48.947 dBm
Frequency
Auto Tune
Center Freq
18.250000000 GHz
Start Freq
10.000000000 GHz
Stop Freq
26.500000000 GHz
CF Step
1.650000000 GHz
Auto Man
Freq Offset
0 Hz
Scale Type
Log Lin

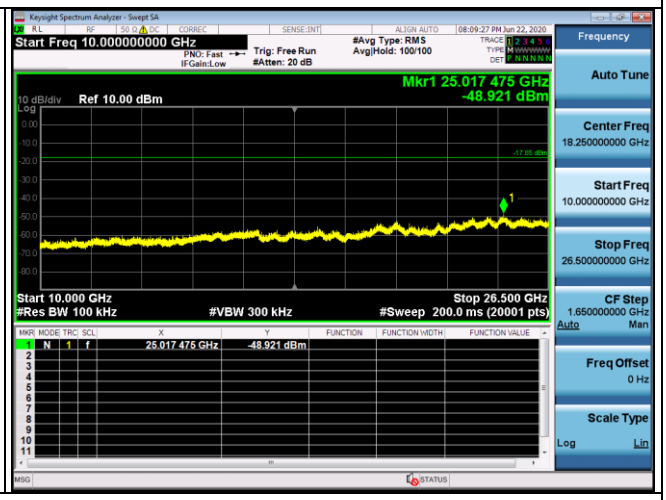
802.11n (HT20) Modulation

Lowest Channel	Highest Channel
Band Edge	Band Edge
	

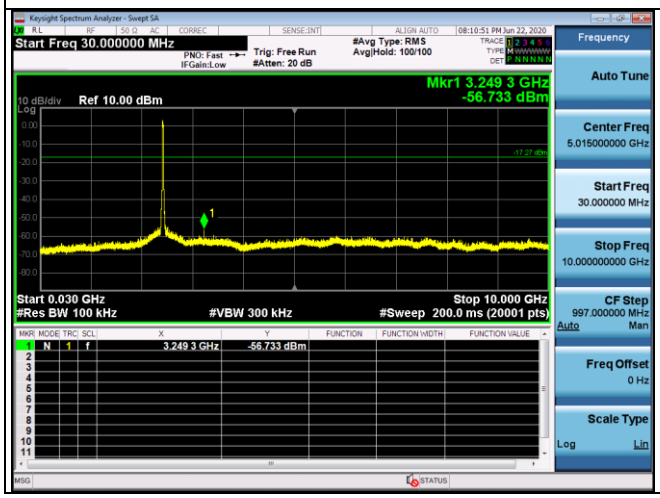
Spurious emission

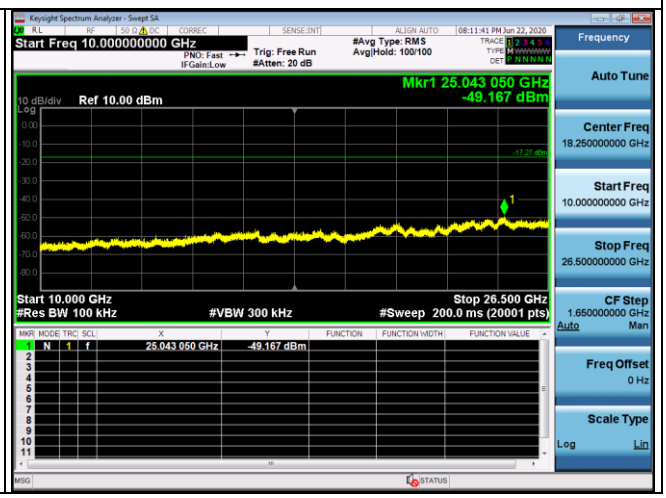
Low Channel



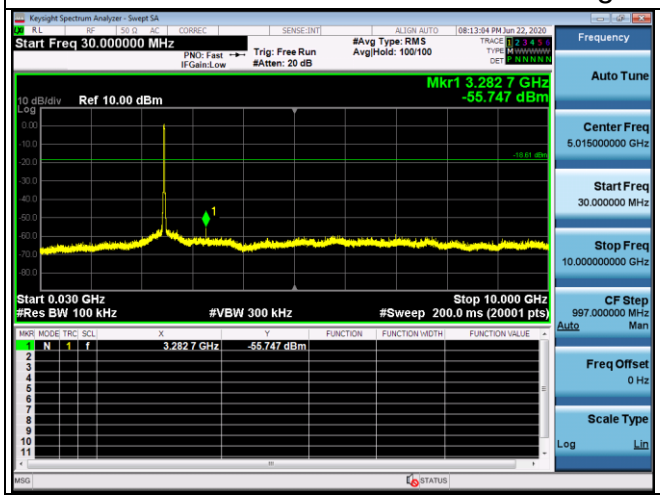


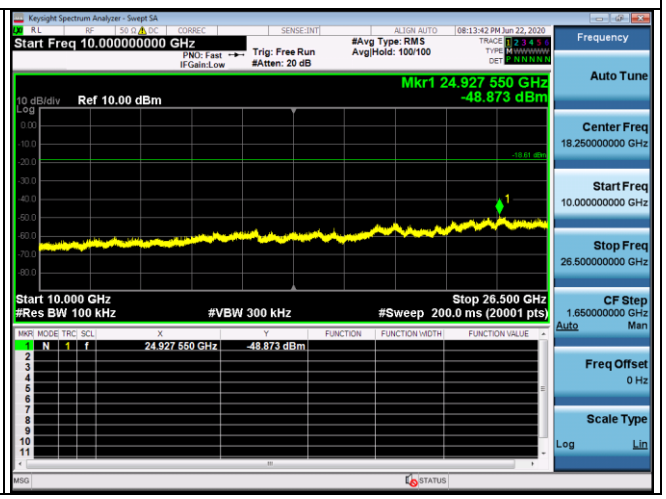
Middle Channel





High Channel





4.6. Radiated Spurious Emission Measurement

Test Specification

Test Requirement:	FCC Part15 C Section 15.209
Test Method:	ANSI C63.10: 2013
Frequency Range:	9 kHz to 25 GHz
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	120KHz	300KHz	Quasi-peak Value
Above 1GHz	Peak	1MHz	3MHz	Peak Value
	Peak	1MHz	10Hz	Average Value

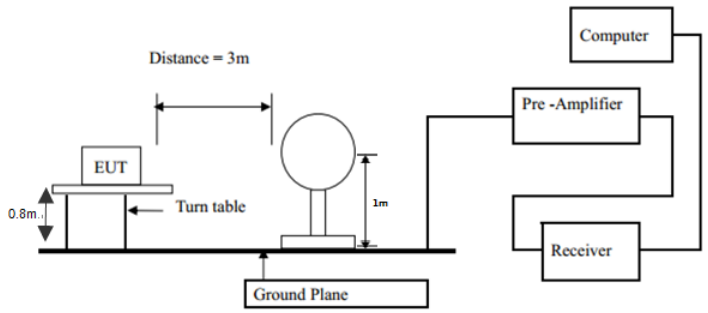
Limit:

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	Field Strength (microvolts/meter)	Measurement Distance (meters)	Detector
Above 1GHz	500	3	Average
	5000	3	Peak

Test setup:

For radiated emissions below 30MHz



30MHz to 1GHz

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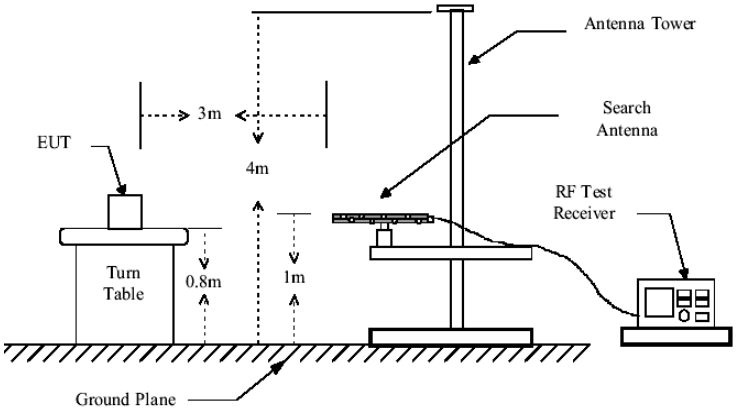
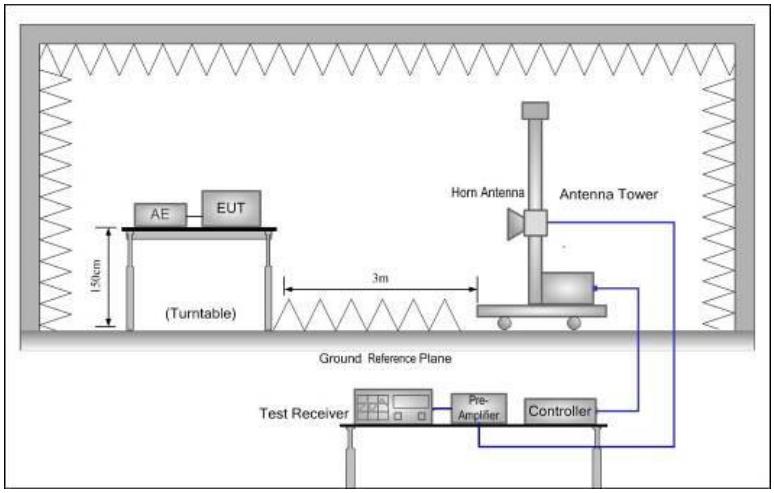


Above 1GHz


</td>
</tr>
<tr>
<td>Test Procedure:</td>
<td>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 thetop 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 highPASS 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</td>
</tr>
</table>

	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 detectoris 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, theemission 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 1 GHz 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 minimumtransmission duration over which the transmitter is on and is transmitting at its maximumpower 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	Dec. 25, 2020
Spectrum analyzer	Agilent	N9020A	HKE-048	Dec. 25, 2020
Preamplifier	EMCI	EMC051845SE	HKE-015	Dec. 25, 2020
Preamplifier	Agilent	83051A	HKE-016	Dec. 25, 2020
Loop antenna	Schwarzbeck	FMZB 1519 B	HKE-014	Dec. 25, 2020
Broadband antenna	Schwarzbeck	VULB 9163	HKE-012	Dec. 25, 2020
Broad-band Horn Antenna	Schwarzbeck	LB-180400-KF	HKE-031	Dec. 25, 2020
Horn antenna	Schwarzbeck	9120D	HKE-013	Dec. 25, 2020
Antenna Mast	Keleto	CC-A-4M	N/A	N/A
Position controller	Taiwan MF	MF7802	HKE-011	Dec. 25, 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	Dec. 25, 2020
High Gain Antenna	Schewarzbeck	LB-180400KF	HKE-054	Dec. 25, 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

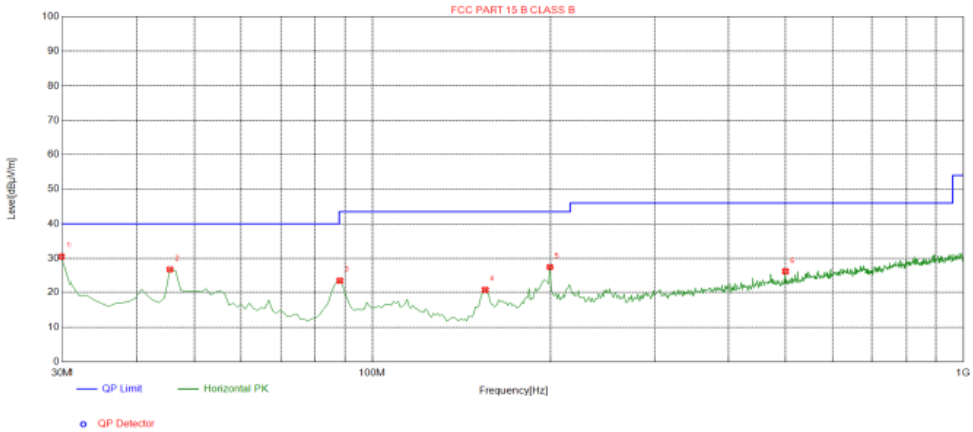
Temperature	22.8℃	Humidity	56%
Test Engineer	Eden Hu	Configurations	WIFI

Note:All the test modes completed for test. only the worst result of AC 120V/60Hz(802.11b at 2412MHz) was reported as below:

Below 1GHz

Horizontal

Test Graph



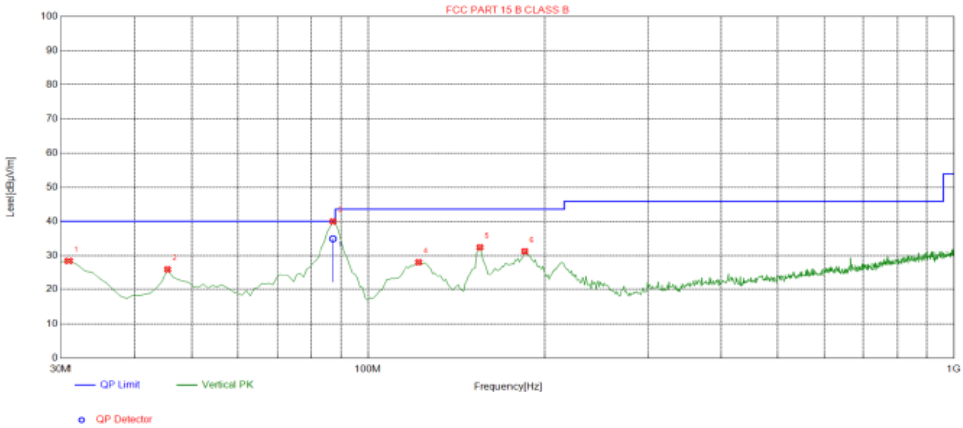
Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	30.0000	30.55	-16.34	40.00	9.45	100	139	Horizontal
2	45.5200	26.68	-13.65	40.00	13.32	100	327	Horizontal
3	88.2000	23.40	-17.50	43.50	20.10	100	317	Horizontal
4	155.130	20.77	-18.57	43.50	22.73	100	295	Horizontal
5	199.750	27.44	-15.08	43.50	16.06	100	82	Horizontal
6	500.450	26.10	-8.29	46.00	19.90	100	136	Horizontal

Remark: Margin = Limit – Level
Correction Factor= Antenna Factor + Cable loss – Pre-amplifier
Level=Test receiver reading + correction factor

Vertical

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	30.9700	28.48	-16.30	40.00	11.52	100	314	Vertical
2	45.5200	26.00	-13.65	40.00	14.00	100	2	Vertical
3	87.2300	39.95	-17.73	40.00	0.05	100	2	Vertical
4	122.150	28.08	-17.42	43.50	15.42	100	26	Vertical
5	155.130	32.42	-18.57	43.50	11.08	100	288	Vertical
6	185.200	31.27	-16.42	43.50	12.23	100	326	Vertical

Final Data List

Final Data List								
NO.	Freq. [MHz]	Factor [dB]	QP Value [dBµV/m]	QP Limit [dBµV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity
1	87.2073	-17.74	34.91	40.00	5.09	160	170.9	Vertical

Remark: Margin = Limit – Level
Correction Factor= Antenna Factor + Cable loss – Pre-amplifier
Level=Test receiver reading + correction factor

Harmonics and Spurious Emissions

FrequencyRange (9 kHz-30MHz)

Frequency (MHz)	Level@3m (dBµV/m)	Limit@3m (dBµV/m)
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--	--	--
--	--	--
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Note:*1. Emission Level=Reading+ Cable loss-Antenna factor-Amp factor*

2. Theemission levels are 20 dB below the limit value, which are not reported. It is deemed to comply with the requirement

For 1GHz to 25GHz

LOW CH1 (802.11b Mode)/2412MHz

Horizontal:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4824.00	60.06	-3.64	56.42	74	-17.58	Peak
4824.00	36.78	-3.64	33.14	54	-20.86	AVG
7236.00	49.76	-0.95	48.81	74	-25.19	Peak
7236.00	36.76	-0.95	35.81	54	-18.19	AVG

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4824.00	61.10	-3.64	57.46	74	-16.54	Peak
4824.00	37.16	-3.64	33.52	54	-20.48	AVG
7236.00	50.74	-0.95	49.79	74	-24.21	Peak
7236.00	35.87	-0.95	34.92	54	-19.08	AVG

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
4874.00	60.16	-3.51	56.65	74	-17.35	Peak
4874.00	36.27	-3.51	32.76	54	-21.24	AVG
7311.00	49.30	-0.82	48.48	74	-25.52	Peak
7311.00	35.05	-0.82	34.23	54	-19.77	AVG

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4874.00	60.96	-3.51	57.45	74	-16.55	Peak
4874.00	35.70	-3.51	32.19	54	-21.81	AVG
7311.00	50.82	-0.82	50.00	74	-24.00	Peak
7311.00	34.99	-0.82	34.17	54	-19.83	AVG

HIGH CH11 (802.11b Mode)/2462

Horizontal:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4924.00	61.14	-3.43	57.71	74	-16.29	Peak
4924.00	37.29	-3.43	33.86	54	-20.14	AVG
7386.00	51.43	-0.75	50.68	74	-23.32	Peak
7386.00	36.58	-0.75	35.83	54	-18.17	AVG

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4924.00	60.18	-3.43	56.75	74	-17.25	Peak
4924.00	37.40	-3.43	33.97	54	-20.03	AVG
7386.00	51.16	-0.75	50.41	74	-23.59	Peak
7386.00	36.10	-0.75	35.35	54	-18.65	AVG

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
4824.00	59.64	-3.64	56.00	74	-18.00	Peak
4824.00	37.46	-3.64	33.82	54	-20.18	AVG
7236.00	50.13	-0.95	49.18	74	-24.82	Peak
7236.00	35.89	-0.95	34.94	54	-19.06	AVG

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4824.00	60.81	-3.64	57.17	74	-16.83	Peak
4824.00	36.57	-3.64	32.93	54	-21.07	AVG
7236.00	49.38	-0.95	48.43	74	-25.57	Peak
7236.00	36.90	-0.95	35.95	54	-18.05	AVG

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
4874.00	60.02	-3.51	56.51	74	-17.49	Peak
4874.00	36.22	-3.51	32.71	54	-21.29	AVG
7311.00	51.03	-0.82	50.21	74	-23.79	Peak
7311.00	36.51	-0.82	35.69	54	-18.31	AVG

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4874.00	59.91	-3.51	56.40	74	-17.60	Peak
4874.00	35.88	-3.51	32.37	54	-21.63	AVG
7311.00	51.31	-0.82	50.49	74	-23.51	Peak
7311.00	36.50	-0.82	35.68	54	-18.32	AVG

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
4924.00	61.38	-3.43	57.95	74	-16.05	Peak
4924.00	35.83	-3.43	32.40	54	-21.60	AVG
7386.00	50.47	-0.75	49.72	74	-24.28	Peak
7386.00	36.60	-0.75	35.85	54	-18.15	AVG

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4924.00	58.62	-3.43	55.19	74	-18.81	Peak
4924.00	36.47	-3.43	33.04	54	-20.96	AVG
7386.00	50.32	-0.75	49.57	74	-24.43	Peak
7386.00	35.68	-0.75	34.93	54	-19.07	AVG

LOW CH1 (802.11n/H20 Mode)/2412

Horizontal:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4824.00	61.01	-3.64	57.37	74	-16.63	Peak
4824.00	36.96	-3.64	33.32	54	-20.68	AVG
7236.00	49.23	-0.95	48.28	74	-25.72	Peak
7236.00	36.83	-0.95	35.88	54	-18.12	AVG

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4824.00	61.52	-3.64	57.88	74	-16.12	Peak
4824.00	36.70	-3.64	33.06	54	-20.94	AVG
7236.00	50.60	-0.95	49.65	74	-24.35	Peak
7236.00	36.14	-0.95	35.19	54	-18.81	AVG

MID CH6 (802.11n/H20 Mode)/2437

Horizontal:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4874.00	60.18	-3.51	56.67	74	-17.33	Peak
4874.00	36.74	-3.51	33.23	54	-20.77	AVG
7311.00	49.49	-0.82	48.67	74	-25.33	Peak
7311.00	35.36	-0.82	34.54	54	-19.46	AVG

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4874.00	60.70	-3.51	57.19	74	-16.81	Peak
4874.00	36.25	-3.51	32.74	54	-21.26	AVG
7311.00	51.10	-0.82	50.28	74	-23.72	Peak
7311.00	36.20	-0.82	35.38	54	-18.62	AVG

HIGH CH11 (802.11n/H20 Mode)/2462

Horizontal:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4924.00	59.26	-3.43	55.83	74	-18.17	Peak
4924.00	36.51	-3.43	33.08	54	-20.92	AVG
7386.00	49.71	-0.75	48.96	74	-25.04	Peak
7386.00	35.06	-0.75	34.31	54	-19.69	AVG

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4924.00	58.62	-3.43	55.19	74	-18.81	Peak
4924.00	37.57	-3.43	34.14	54	-19.86	AVG
7386.00	50.08	-0.75	49.33	74	-24.67	Peak
7386.00	35.32	-0.75	34.57	54	-19.43	AVG

Notes:

1). Radiated emissions measured in frequency range from 1GHz~10th harmonic of foundation(ex. 26GHz) with an instrument using Peak/AV detector.
2). Only the worst emission points were reported, these emission levels which were -20dB below the limit were not recorded.
3). Factor (dB)= Ant. Fac (dB/m)+ Cab. Loss (dB)- Pre. Fac.(dB)
4). Emission Level (dBuV/m) = Reading (dBuV)+ Factor (dB)
5). Margin = Emission Level (dBuV/m)- Limit(dBuV/m)

Test Result of Radiated Spurious at Band edges

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)	
2310	58.86	-5.81	53.05	74	-20.95	Peak
2310	43.08	-5.81	37.27	54	-16.73	AVG
2390	59.04	-5.84	53.20	74	-20.80	Peak
2390	45.39	-5.84	39.55	54	-14.45	AVG

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2310	59.89	-5.81	54.08	74	-19.92	Peak
2310	45.83	-5.81	40.02	54	-13.98	AVG
2390	59.43	-5.84	53.59	74	-20.41	Peak
2390	45.76	-5.84	39.92	54	-14.08	AVG

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	61.25	-6.04	55.21	74	-18.79	Peak
2483.5	44.76	-6.04	38.72	54	-15.28	AVG
2500	58.63	-6.06	52.57	74	-21.43	Peak
2500	45.70	-6.06	39.64	54	-14.36	AVG

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.5	59.50	-6.04	53.46	74	-20.54	Peak
2483.5	43.20	-6.04	37.16	54	-16.84	AVG
2500	59.06	-6.06	53.00	74	-21.00	Peak
2500	45.80	-6.06	39.74	54	-14.26	AVG

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

Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2310	58.27	-5.81	52.46	74	-21.54	Peak
2310	43.77	-5.81	37.96	54	-16.04	AVG
2390	59.18	-5.84	53.34	74	-20.66	Peak
2390	44.40	-5.84	38.56	54	-15.44	AVG

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2310	61.15	-5.81	55.34	74	-18.66	Peak
2310	43.57	-5.81	37.76	54	-16.24	AVG
2390	59.66	-5.84	53.82	74	-20.18	Peak
2390	45.52	-5.84	39.68	54	-14.32	AVG

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	59.08	-6.04	53.04	74	-20.96	Peak
2483.5	44.33	-6.04	38.29	54	-15.71	AVG
2500	59.85	-6.06	53.79	74	-20.21	Peak
2500	45.88	-6.06	39.82	54	-14.18	AVG

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.5	58.51	-6.04	52.47	74	-21.53	Peak
2483.5	43.94	-6.04	37.90	54	-16.10	AVG
2500	59.64	-6.06	53.58	74	-20.42	Peak
2500	44.13	-6.06	38.07	54	-15.93	AVG

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

Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2310	59.53	-5.81	53.72	74	-20.28	Peak
2310	45.48	-5.81	39.67	54	-14.33	AVG
2390	59.30	-5.84	53.46	74	-20.54	Peak
2390	44.90	-5.84	39.06	54	-14.94	AVG

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2310	58.23	-5.81	52.42	74	-21.58	Peak
2310	43.00	-5.81	37.19	54	-16.81	AVG
2390	59.62	-5.84	53.78	74	-20.22	Peak
2390	44.46	-5.84	38.62	54	-15.38	AVG

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	59.36	-6.04	53.32	74	-20.68	Peak
2483.5	44.34	-6.04	38.30	54	-15.70	AVG
2500	58.69	-6.06	52.63	74	-21.37	Peak
2500	44.12	-6.06	38.06	54	-15.94	AVG

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.5	59.60	-6.04	53.56	74	-20.44	Peak
2483.5	44.29	-6.04	38.25	54	-15.75	AVG
2500	58.35	-6.06	52.29	74	-21.71	Peak
2500	45.77	-6.06	39.71	54	-14.29	AVG

Notes:

1). Factor (dB)= Ant. Fac (dB/m)+ Cab. Loss (dB)- Pre. Fac.(dB)
2). Emission Level (dBuV/m) = Reading (dBuV)+ Factor (dB)
3). Margin = Emission Level (dBuV/m)- Limit(dBuV/m)

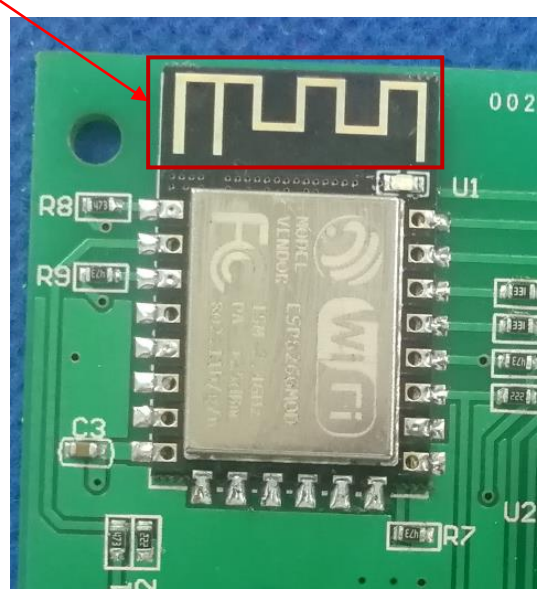
4.7. ANTENNA REQUIREMENT

Standard Applicable
For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed toensure that no antenna other than that furnished by the responsible party shall be used with the device.And according to FCC 47 CFR Section 15.247, if transmitting antennas of directional gain greater than6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antennaexceeds 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 astandard antenna jack or electrical connector is prohibited. Further, this requirement does not apply tointentional radiators that must be professionally installed.

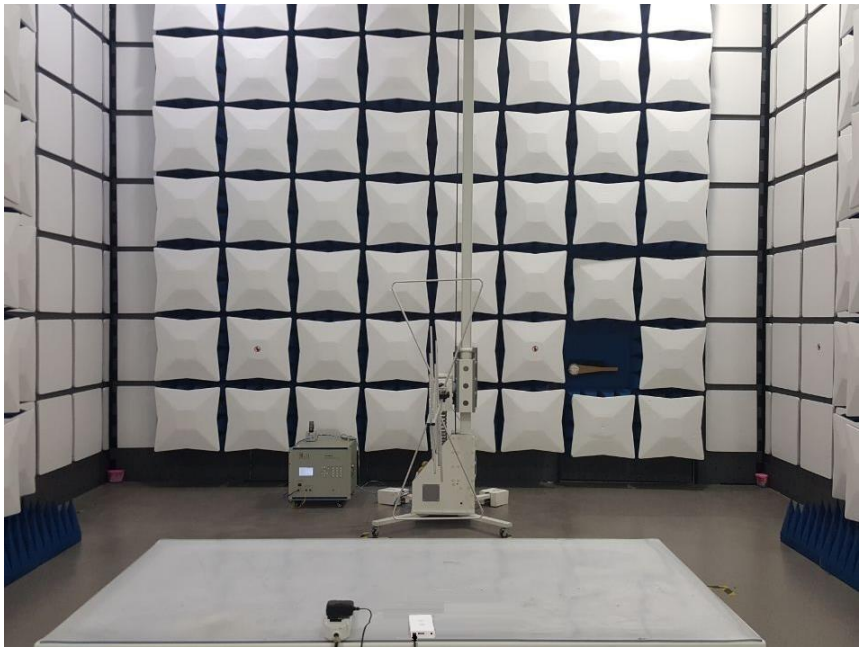
Antenna Connected Construction
The antenna used in this product is apcbAntenna, The directional gains of antenna used for transmitting is 0dBi.

WIFI ANTENNA

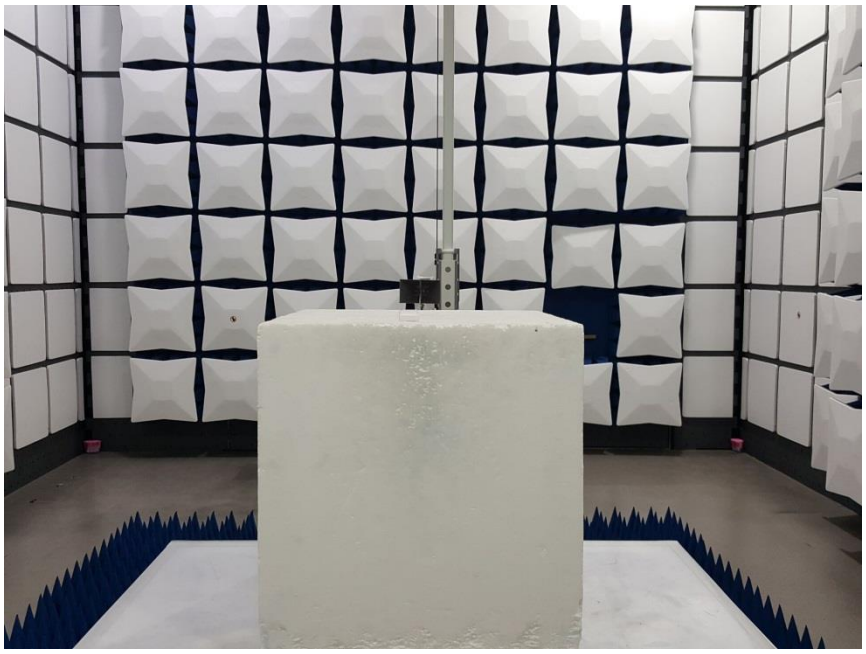


4.8. PHOTOGRAPH OF TEST

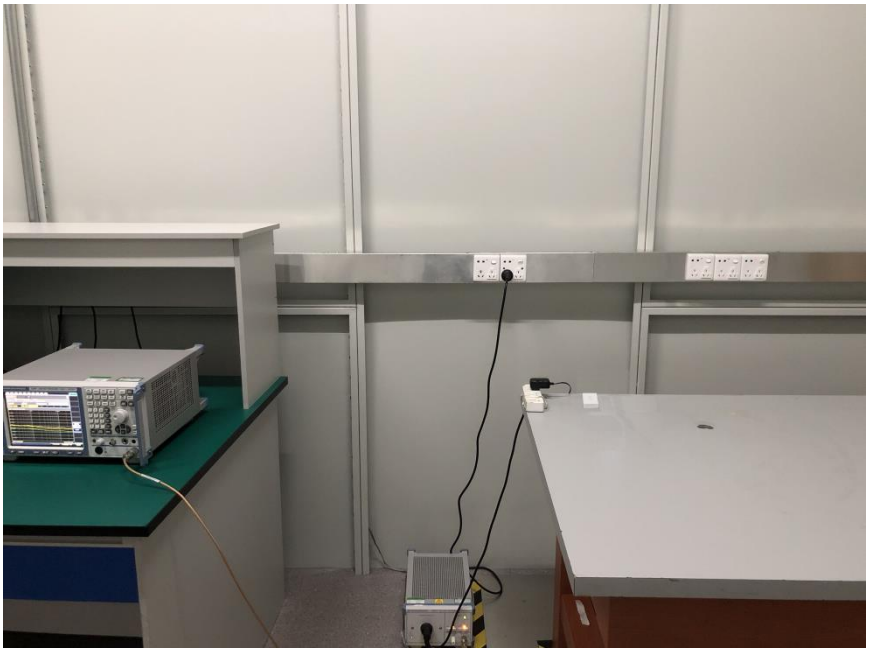
30MHz-1000MHz



Above 1000MHz

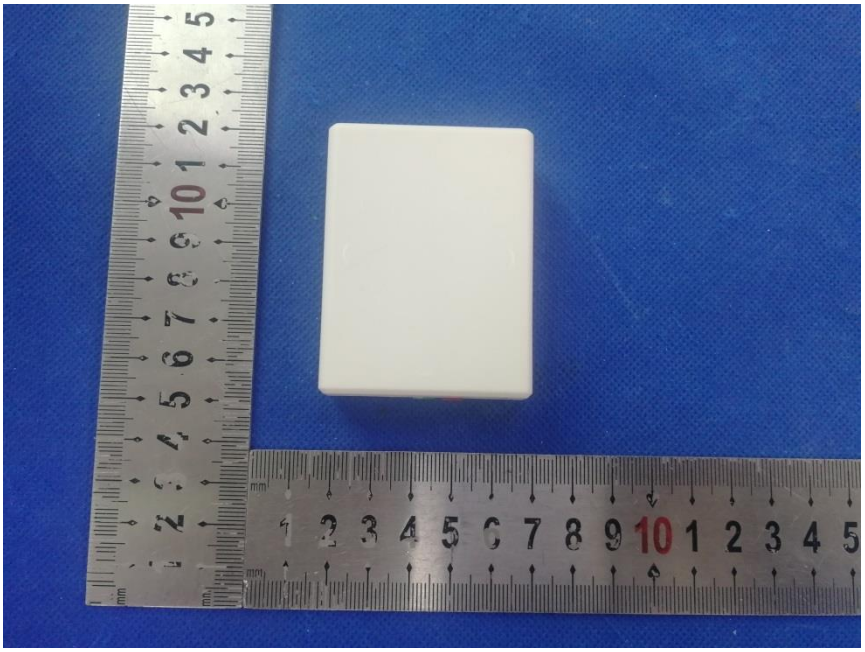


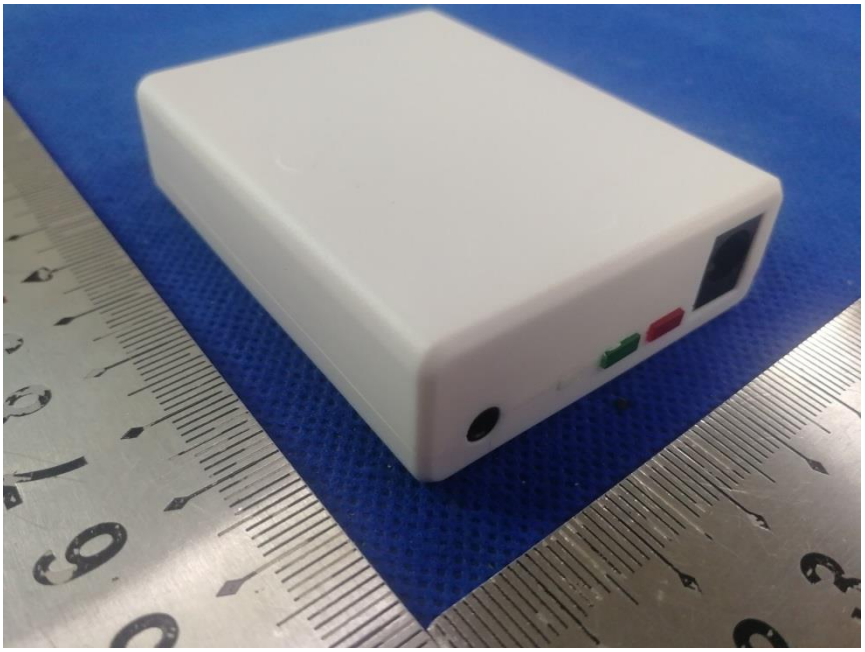
Conducted Emission

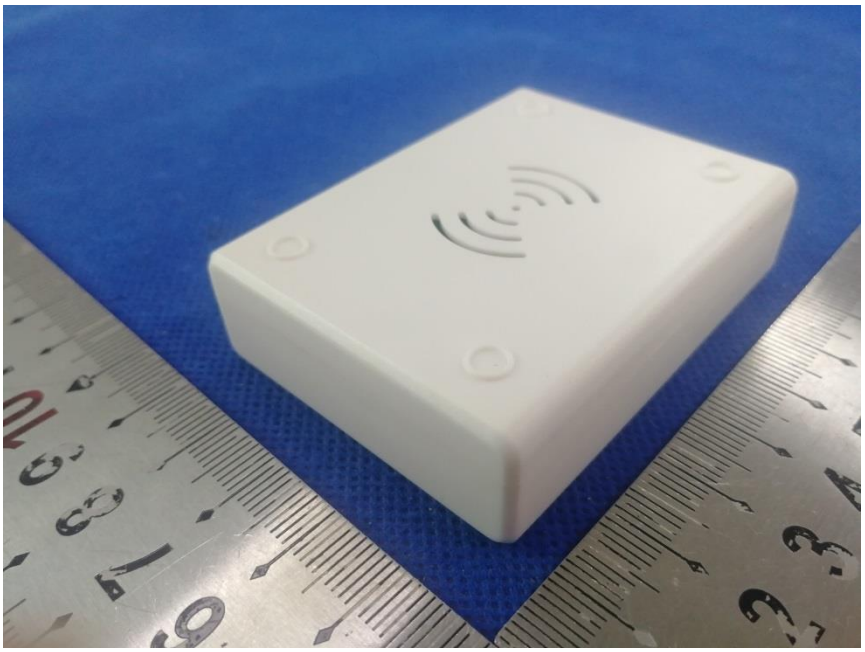


5. PHOTOS OF THE EUT

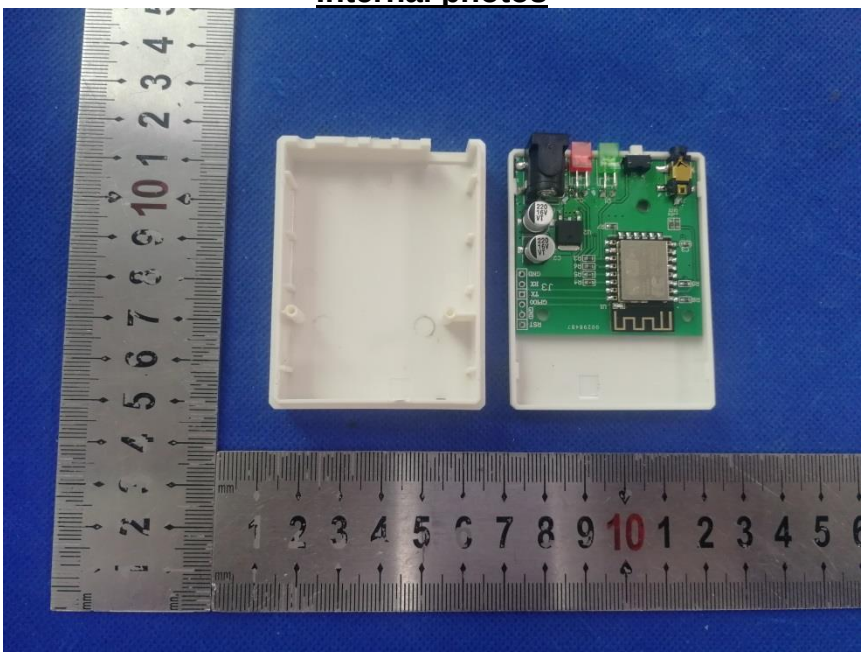
External photos

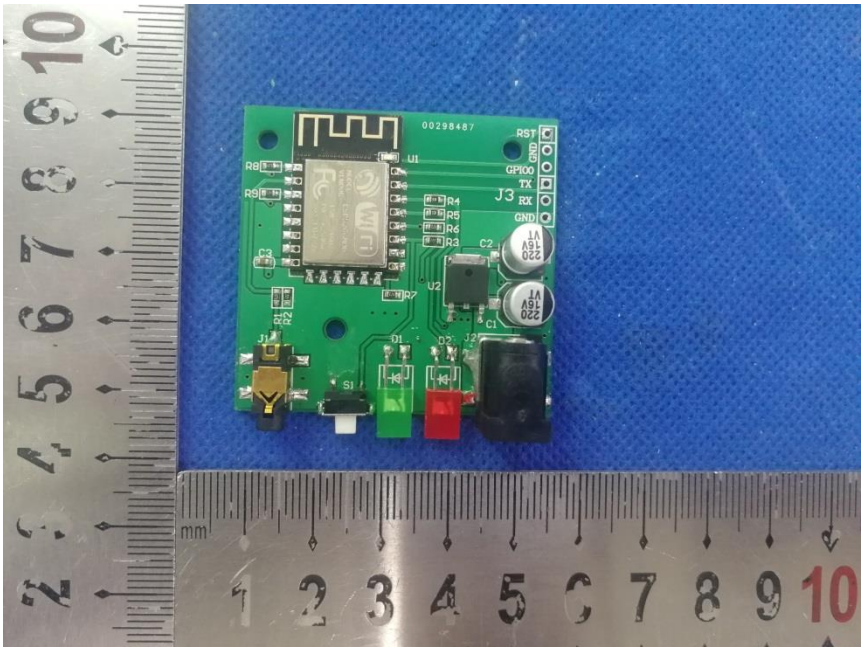


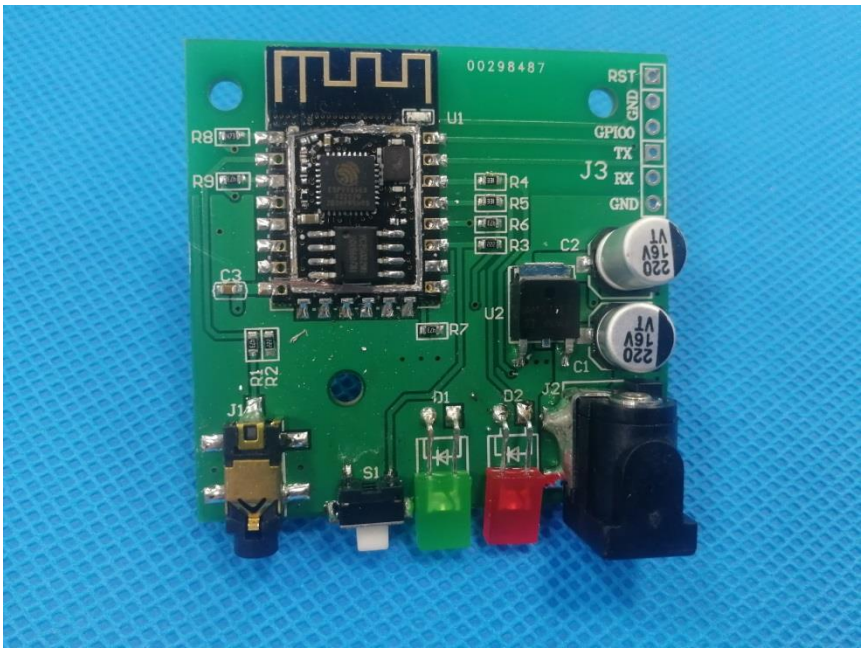




Internal photos



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RX
GND
J3
U1
R8
R9
R4
R5
R6
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C3
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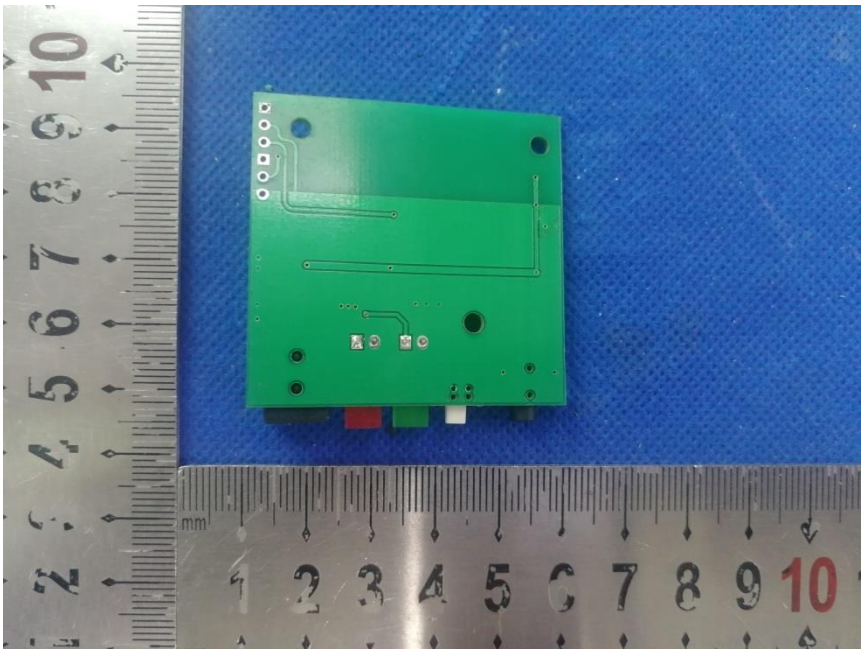
R7
C1
R1
R2
J1
D1
D2
J2
S1



END