FCC TEST REPORT

Test report
On Behalf of
ComNav Technology Ltd.
For
R550 Data Collector

Model List : R550

FCC ID: 2ACHB-R550

Prepared for : ComNav Technology Ltd.
Building 2, No.618,Chengliu Middle Rd. Jiading district. Shanghai, China

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

Date of Test: Jun. 05, 2020 -- Jul. 20, 2020
Date of Report: Jul. 20, 2020
Report Number: HK2007011614-6E

TEST RESULT CERTIFICATION

Applicant's name .....: ComNav Technology Ltd.

Address.....: Building 2, No.618,Chengliu Middle Rd. Jiading district. Shanghai, China

Manufacture's Name.....: ComNav Technology Ltd.

Address.....: Building 2, No.618,Chengliu Middle Rd. Jiading district. Shanghai, China

Product description

Trade Mark : SinoGNSS® By ComNav Technology Ltd.

Product name.....: R550 Data Collector

Model and/or type reference .: R550

Standards .....: FCC Part 15 Subpart C Section 15.247

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Date of Test .....:

Date (s) of performance of tests .....: Jun. 05, 2020 -- Jul. 20, 2020

Date of Issue.....: Jul. 20, 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, 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

Product Name:	R550 Data Collector
Model/Type reference:	R550
Serial Model:	N/A
Trade Mark	SinoGNSS By ComNav Technology Ltd.
FCC ID	2ACHB-R550
Hardware Version:	Main board: SD55-D3_Main board_P3 8400347FA30
Software Version:	V1.3
Operation frequency	802.11b/g/n 20: 2412~2462 MHz
Number of Channels	802.11b/g/n20: 11CH
Modulation Type	CCK/DSSS/OFDM
Antenna type:	FPC Antenna
Antenna gain:	-3.1dBi
Power supply:	DC 3.8V from battery
Power Source	AC 120V/60Hz

Note: 1. For more details, refer to the user's manual of the EUT.

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

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:

Operation of EUT during Radiation and Above1GHz Radiation testing:

3. General 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 98.99%)
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
802.11n(H40)	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), MCS7 for 802.11n(H40). Duty cycle setting during the transmission is 98.99%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	Information	Manufacturer	Remark	Certificate
Adapter	MODEL:KA1801A-0902000DE INPUT:100-240V ~50/60Hz 0.55A max OUTPUT:9V 2000mA	Shenzhen Keyu Power Supply Technology Co.,Ltd	Provide by applicant	SDOC
/	/	/	/	/

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

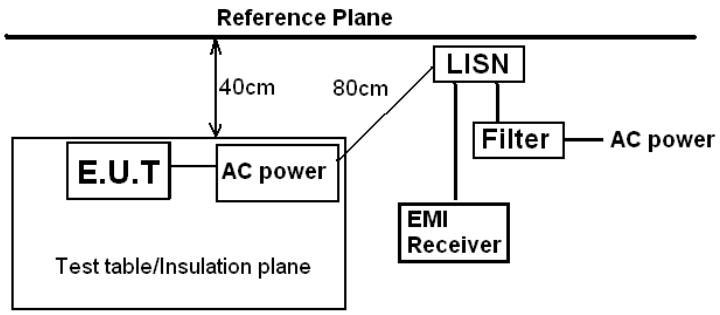
4.1. Conducted Emission

Test Specification

Test Requirement:	FCC Part15 C Section 15.207
Test Method:	ANSI C63.10:2013
Frequency Range:	150 kHz to 30 MHz
Receiver setup:	RBW=9 kHz, VBW=30 kHz, Sweep time=auto
Limits:	

Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

Test Setup:



Remark:
E.U.T: Equipment Under Test
LISN: Line Impedence Stabilization Network
Test table height=0.8m

Test Mode:	Charging + transmitting with modulation
Test Procedure:	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.
Test Result:	PASS

Test Instruments

Conducted Emission Shielding Room Test Site (843)				
Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Receiver	R&S	ESCI 7	HKE-010	Dec. 26, 2020
LISN	R&S	ENV216	HKE-002	Dec. 26, 2020
Conducted test software	Tonscend	TS+ Rev 2.5.0.0	HKE-081	N/A

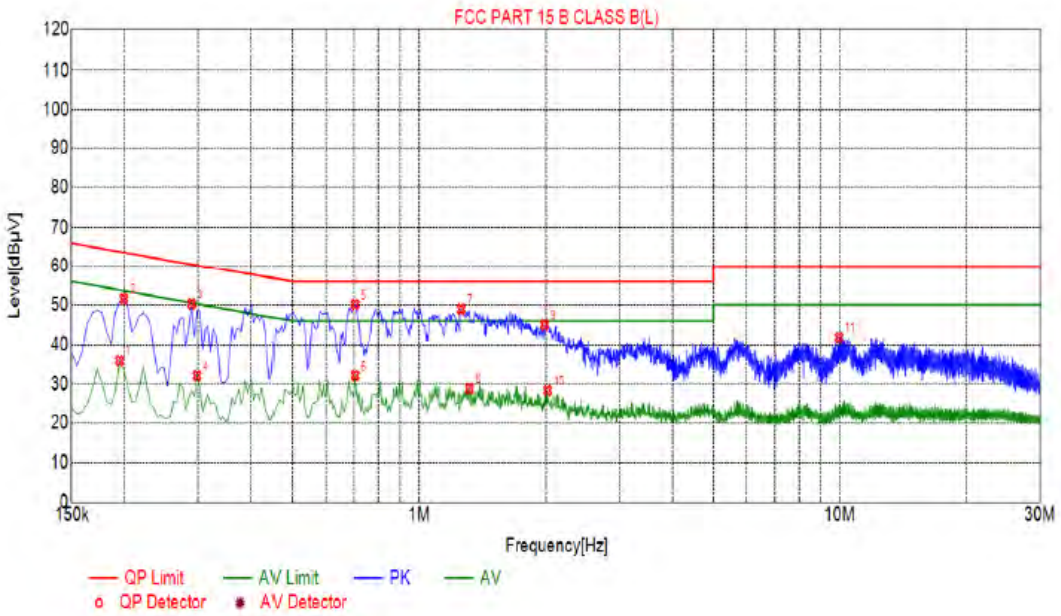
Note: *The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).*

Test data

Note :

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

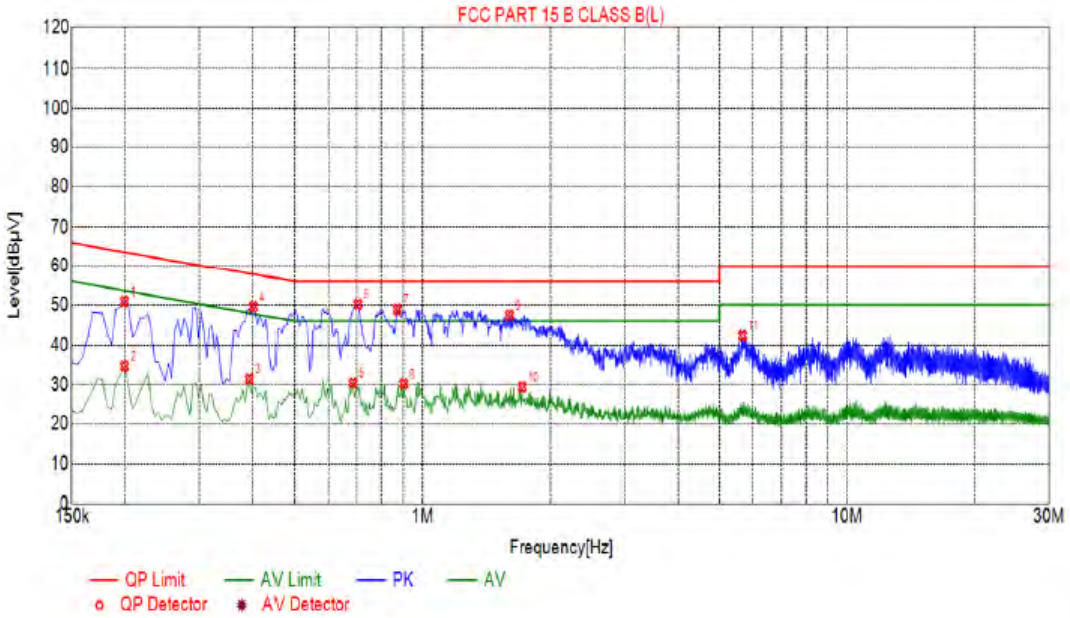
Conducted Emission on Line Terminal of the power line (150 kHz to 30MHz)



Suspected List								
NO.	Freq. [MHz]	Level [dBµV]	Factor [dB]	Limit [dBµV]	Margin [dB]	Reading [dBµV]	Detector	Type
1	0.1950	35.94	10.03	53.82	17.88	25.91	AV	L
2	0.1995	51.58	10.03	63.63	12.05	41.55	PK	L
3	0.2895	50.30	10.03	60.54	10.24	40.27	PK	L
4	0.2985	32.12	10.04	50.28	18.16	22.08	AV	L
5	0.7035	50.14	10.05	56.00	5.86	40.09	PK	L
6	0.7035	32.15	10.05	46.00	13.85	22.10	AV	L
7	1.2570	48.98	10.09	56.00	7.02	38.89	PK	L
8	1.3155	28.79	10.10	46.00	17.21	18.69	AV	L
9	1.9860	45.02	10.14	56.00	10.98	34.88	PK	L
10	2.0175	28.30	10.15	46.00	17.70	18.15	AV	L
11	9.9690	41.83	10.06	60.00	18.17	31.77	PK	L

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)

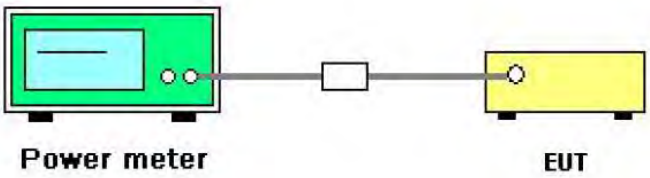


Suspected List								
NO.	Freq. [MHz]	Level [dBµV]	Factor [dB]	Limit [dBµV]	Margin [dB]	Reading [dBµV]	Detector	Type
1	0.1995	50.95	10.03	63.63	12.68	40.92	PK	L
2	0.1995	34.64	10.03	53.63	18.99	24.61	AV	L
3	0.3930	31.43	10.04	48.00	16.57	21.39	AV	L
4	0.4020	49.55	10.04	57.81	8.26	39.51	PK	L
5	0.6855	30.41	10.05	46.00	15.59	20.36	AV	L
6	0.7035	50.20	10.05	56.00	5.80	40.15	PK	L
7	0.8700	48.93	10.06	56.00	7.07	38.87	PK	L
8	0.9015	30.18	10.06	46.00	15.82	20.12	AV	L
9	1.5990	47.48	10.11	56.00	8.52	37.37	PK	L
10	1.7160	29.36	10.13	46.00	16.64	19.23	AV	L
11	5.6760	42.43	10.24	60.00	17.57	32.19	PK	L

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 558074 D01 guidance V05r02 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. 26, 2020
Power Sensor	Agilent	U2021X	HKE-113	Dec. 26, 2020
RF cable	Times	1-40G	HKE-034	Dec. 26, 2020
RF automatic control unit	Tonscend	JS0806-2	HKE-060	Dec. 26, 2020

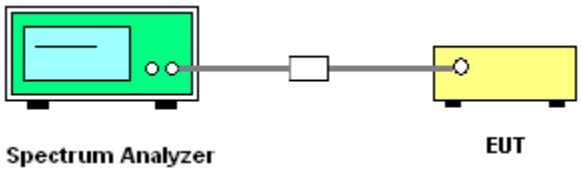
Note: *The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).*

Test Data

TX 802.11b Mode				
Test Channe	Frequency	Maximum Peak Conducted Output Power	Average Output Power	LIMIT
	(MHz)	(dBm)	(dBm)	dBm
CH01	2412	16.31	12.73	30
CH06	2437	15.80	13.85	30
CH11	2462	16.98	13.65	30
TX 802.11g Mode				
CH01	2412	14.91	13.29	30
CH06	2437	15.02	12.24	30
CH11	2462	15.89	12.19	30
TX 802.11n20 Mode				
CH01	2412	14.72	12.30	30
CH06	2437	15.05	11.75	30
CH11	2462	15.64	11.97	30
TX 802.11n40 Mode				
CH03	2422	14.81	12.17	30
CH06	2437	14.38	11.29	30
CH09	2452	14.36	11.75	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 v05r02. 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. 26, 2020
RF Cable (9KHz-26.5GHz)	Tonscend	170660	N/A	Dec. 26, 2020
RF automatic control unit	Tonscend	JS0806-2	HKE-060	Dec. 26, 2020

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

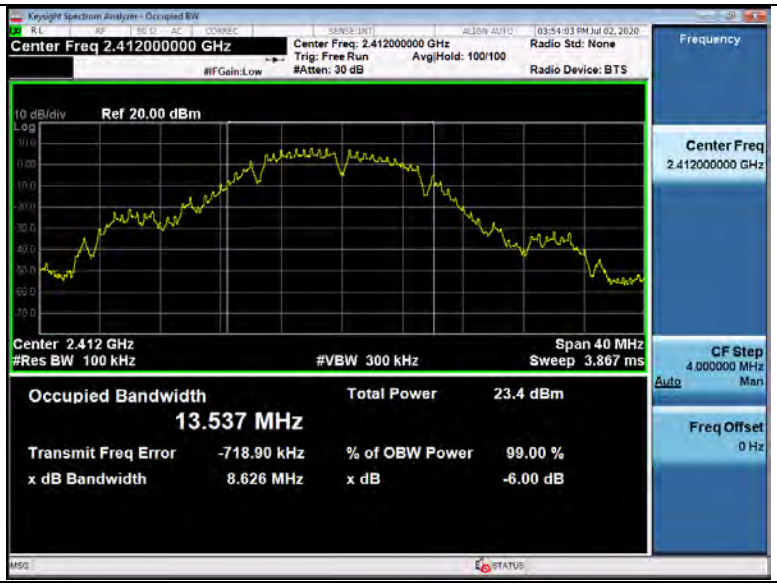
Test data

Test channel	6dB Emission Bandwidth (MHz)			
	802.11b	802.11g	802.11n(H20)	802.11n(H40)
Lowest	8.626	13.719	13.112	34.563
Middle	9.608	16.446	17.724	15.581
Highest	8.652	12.891	14.171	18.124
Limit:	>500kHz			
Test Result:	PASS			

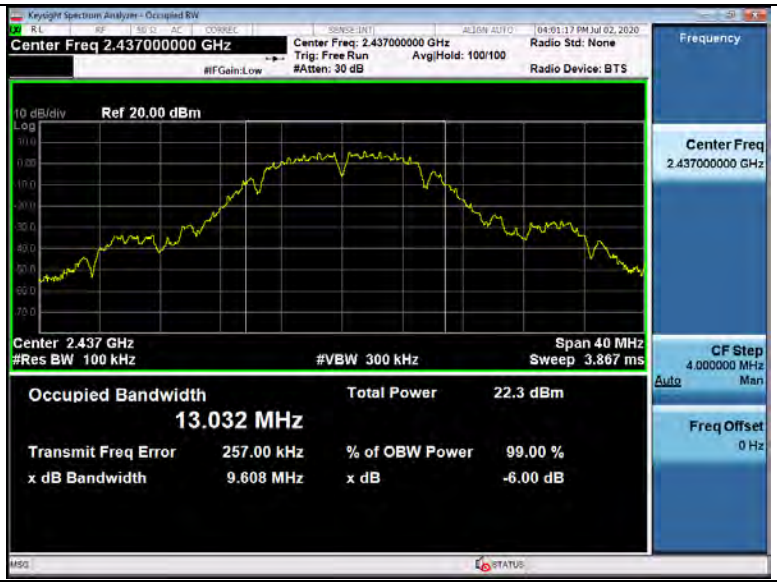
Test plots as follows:

802.11b Modulation

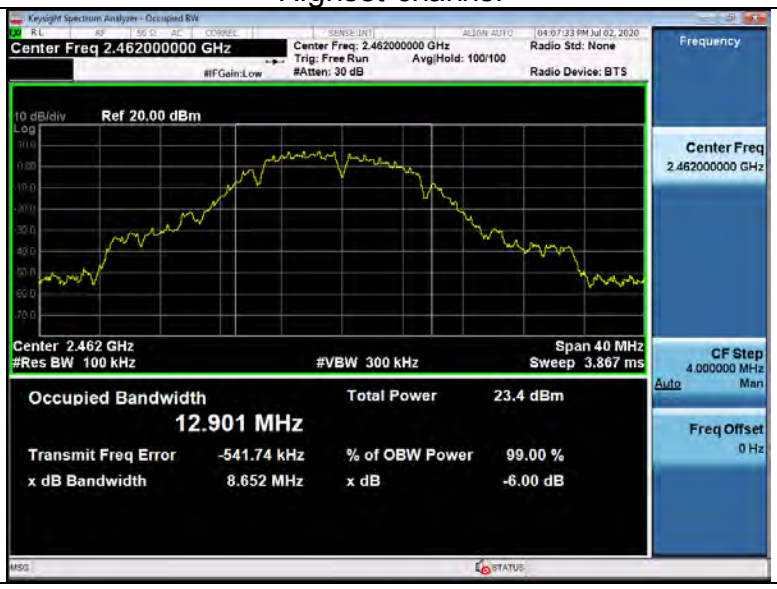
Lowest channel



Middle channel



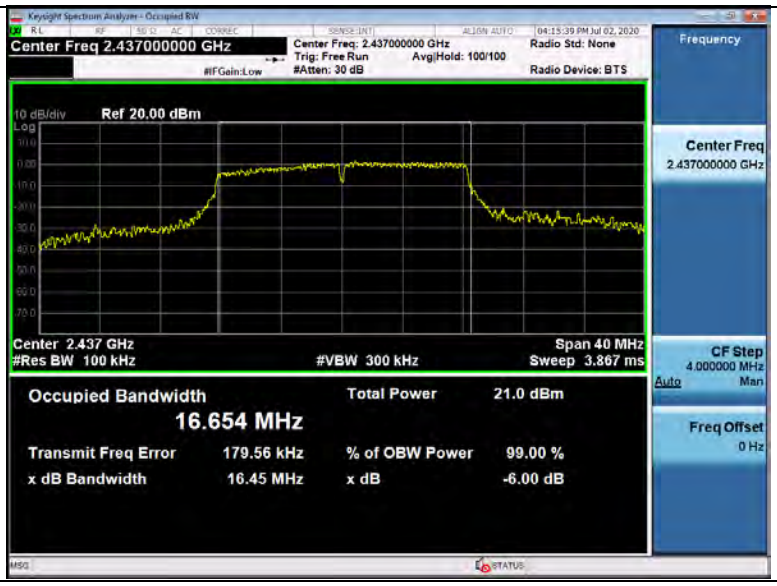
Highest channel



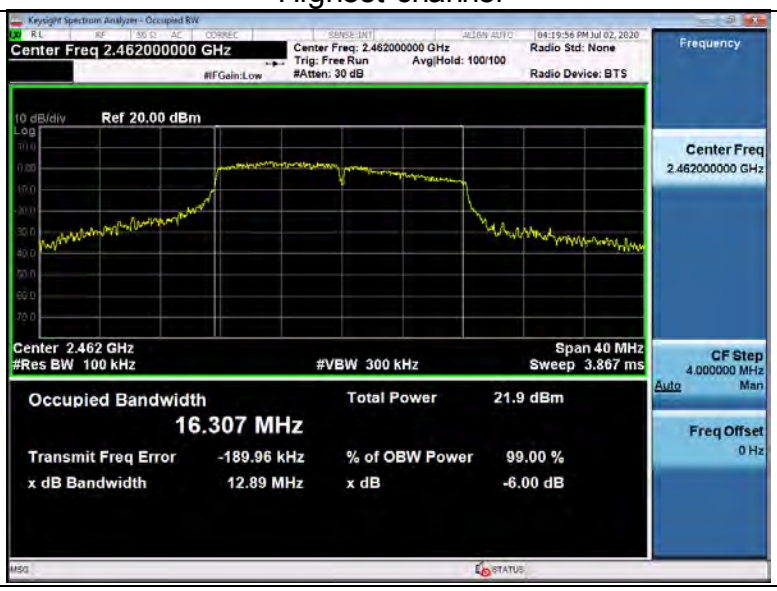
802.11g Modulation

Lowest channel

Middle channel

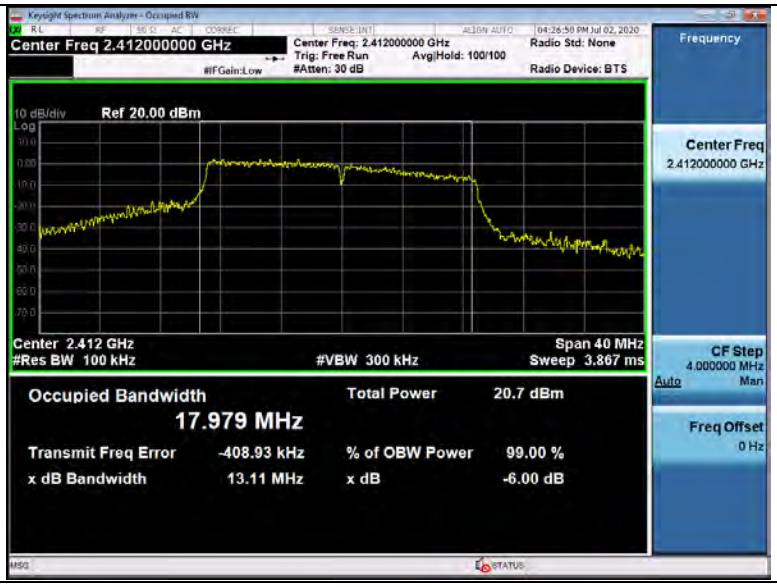


Highest channel

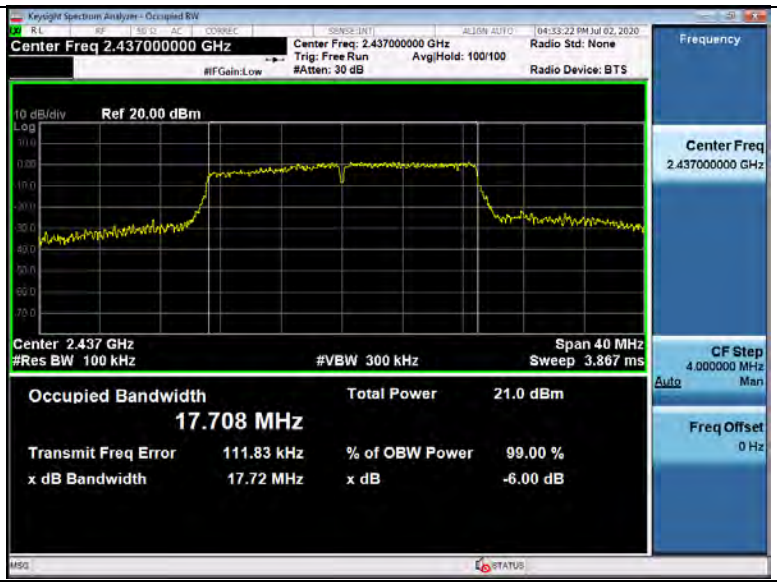


802.11n (HT20) Modulation

Lowest channel



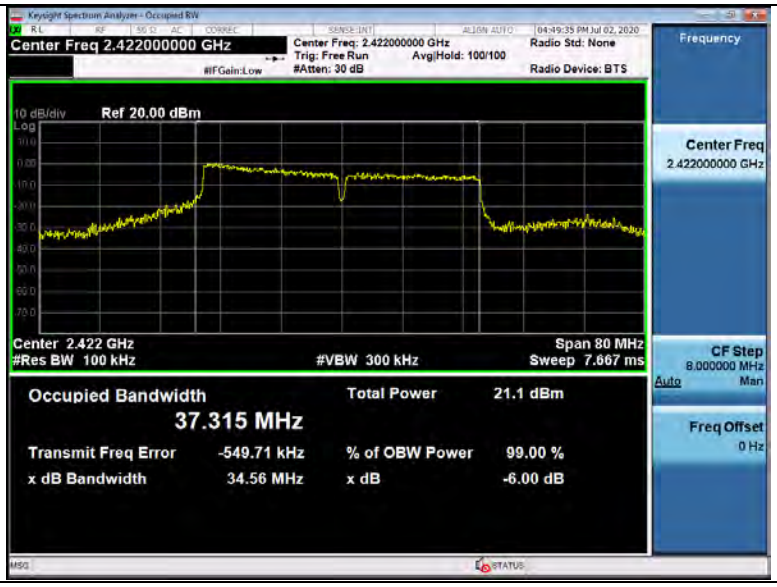
Middle channel



Highest channel

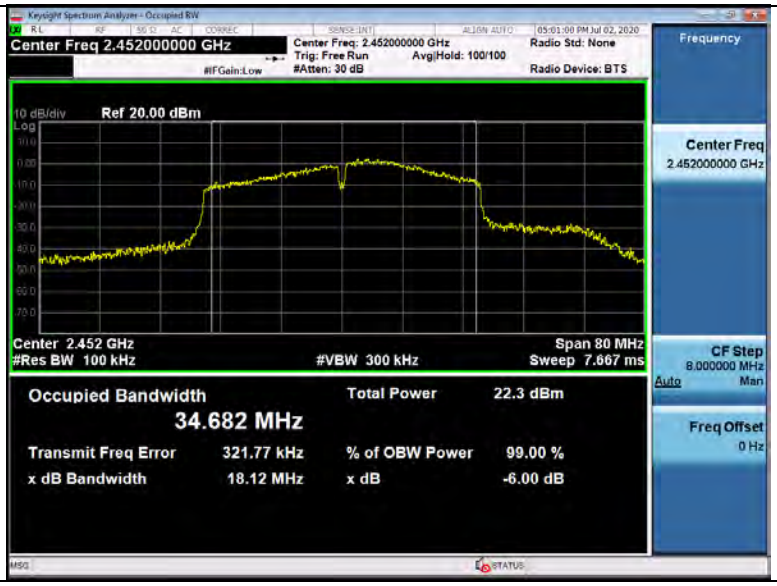
802.11n (HT40) Modulation

Lowest channel



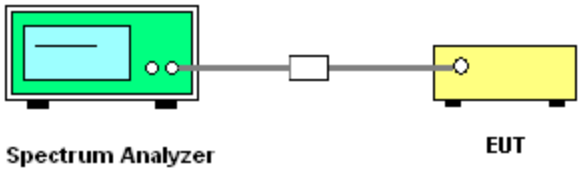
Middle channel

Highest channel



4.4. Power Spectral Density

Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (e)
Test Method:	KDB 558074
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 v05r02 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. 27, 2019
RF Cable (9KHz-26.5GHz)	Tonscend	170660	N/A	Dec. 27, 2019
RF automatic control unit	Tonscend	JS0806-2	HKE-060	Dec. 27, 2019

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

Test data

EUT Set Mode	Channel	Result (dBm/3kHz)
802.11b	Lowest	-12.460
	Middle	-13.097
	Highest	-11.734
802.11g	Lowest	-12.458
	Middle	-13.006
	Highest	-11.231
802.11n(H20)	Lowest	-10.998
	Middle	-12.852
	Highest	-8.249
802.11n(H40)	Lowest	-11.688
	Middle	-13.876
	Highest	-9.111
Limit:	8dBm/3kHz	
Test Result:	PASS	

Test plots as follows:

802.11b Modulation

Lowest channel

Middle channel

Highest channel

802.11g Modulation

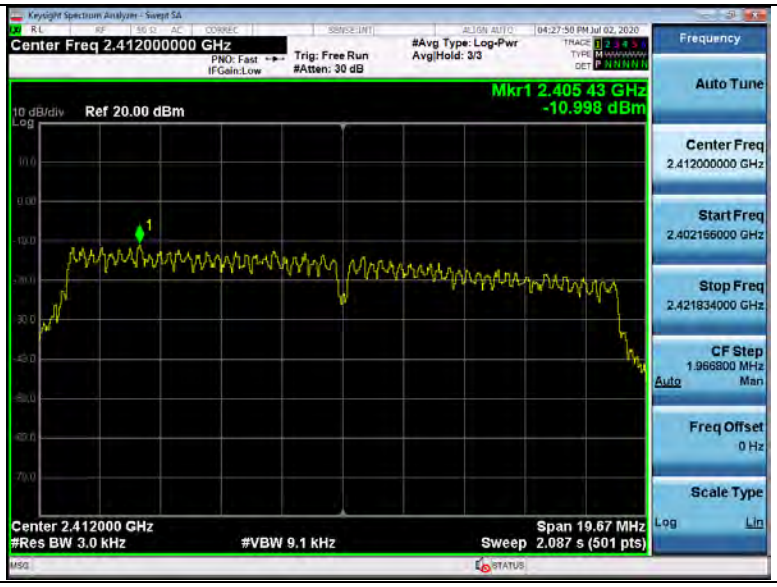
Lowest channel

Middle channel

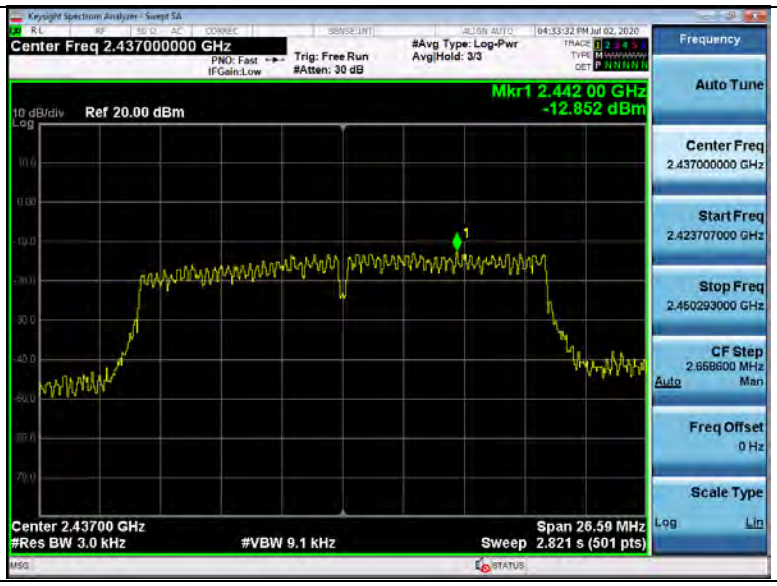
Highest channel

802.11n (HT20) Modulation

Lowest channel



Middle channel



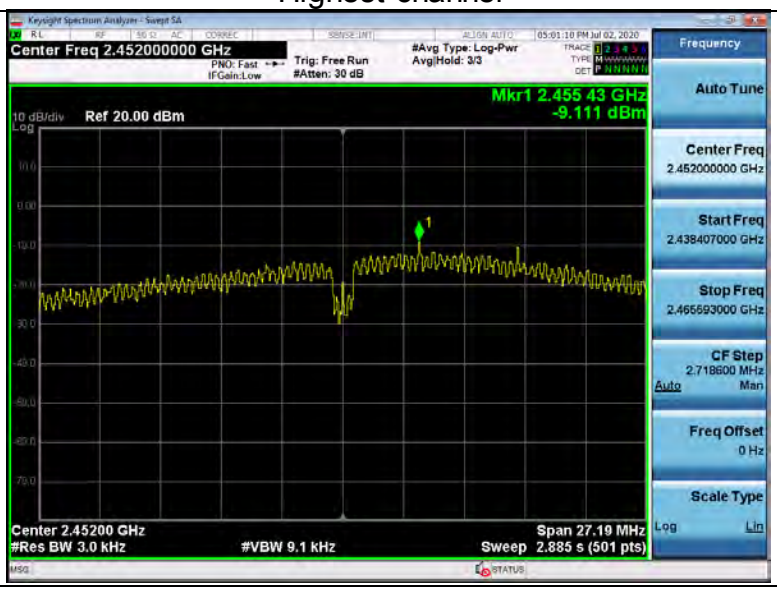
Highest channel

802.11n (HT40) Modulation

Lowest channel

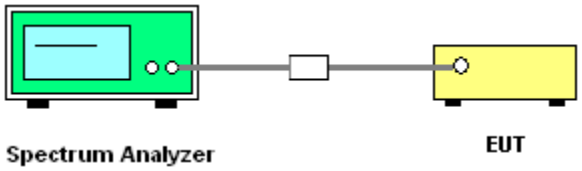
Middle channel

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
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 v05r02. 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

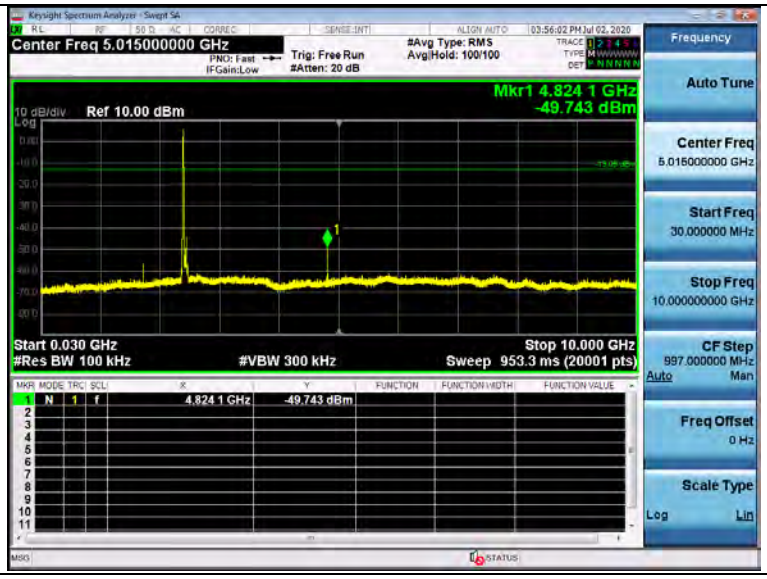
Test Instruments

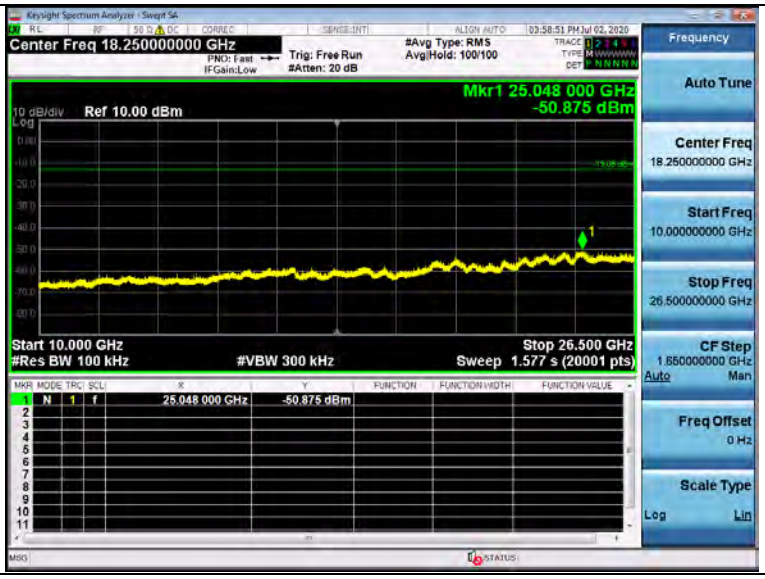
RF Test Room				
Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum analyzer	Agilent	N9020A	HKE-048	Dec. 26, 2020
Signal generator	Agilent	N5183A	HKE-071	Dec. 26, 2020
RF Cable (9KHz-26.5GHz)	Tonscend	170660	N/A	Dec. 26, 2020
RF automatic control unit	Tonscend	JS0806-2	HKE-060	Dec. 26, 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

802.11b Modulation

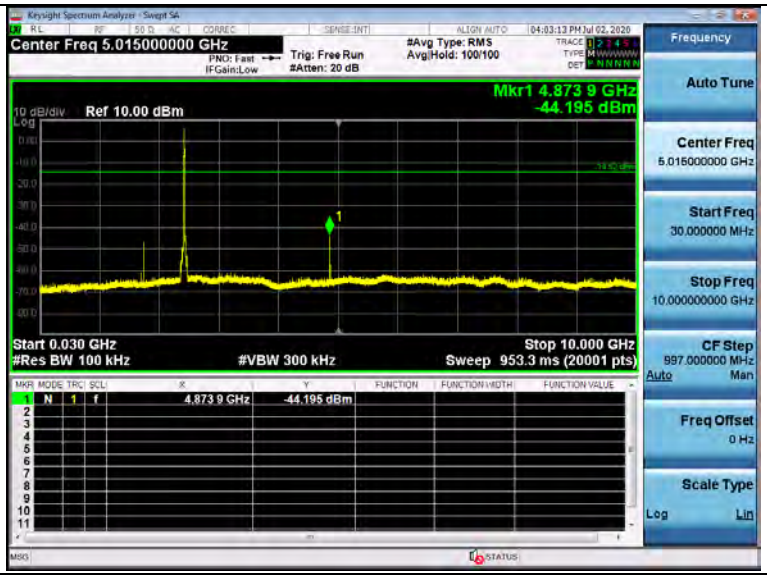
Spurious emission	
	Reference
Low Channel	
	30MHz-10GHz
	
	Above 10GHz



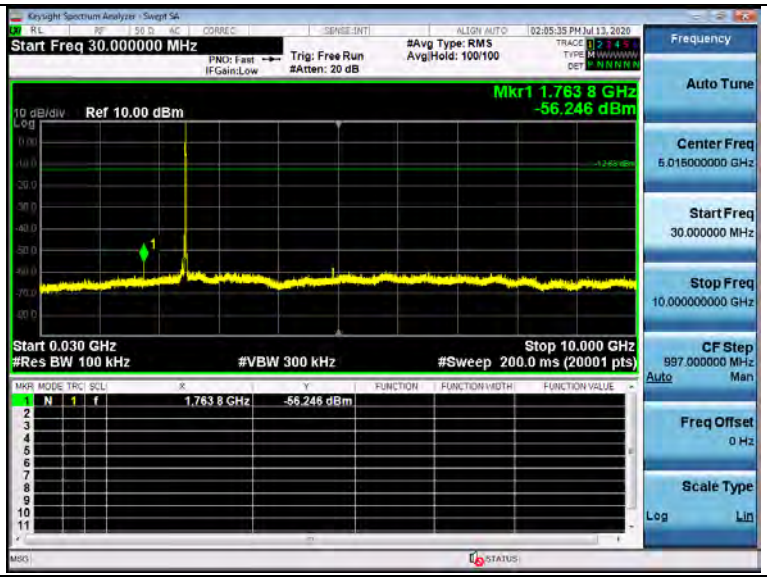
Reference

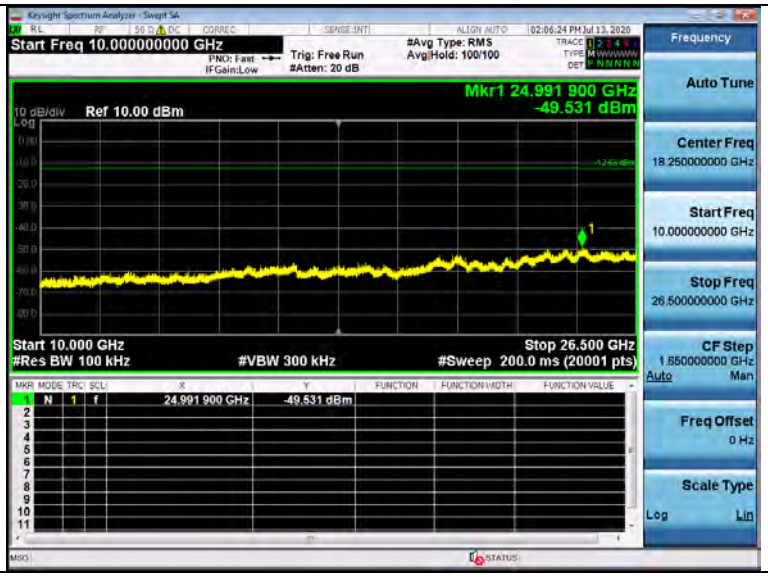
Middle Channel

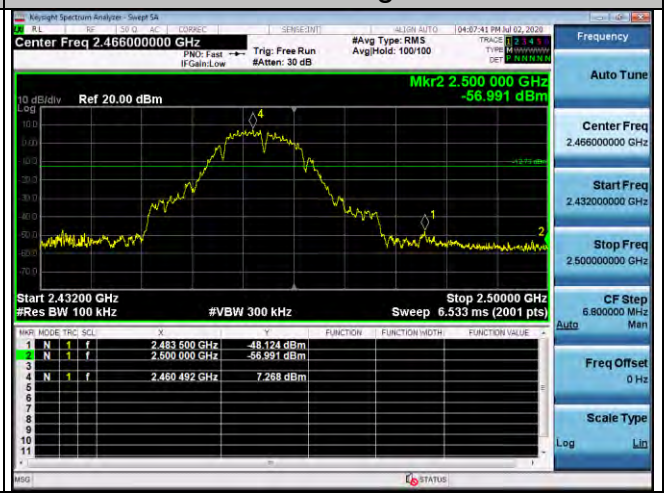
30MHz-10GHz



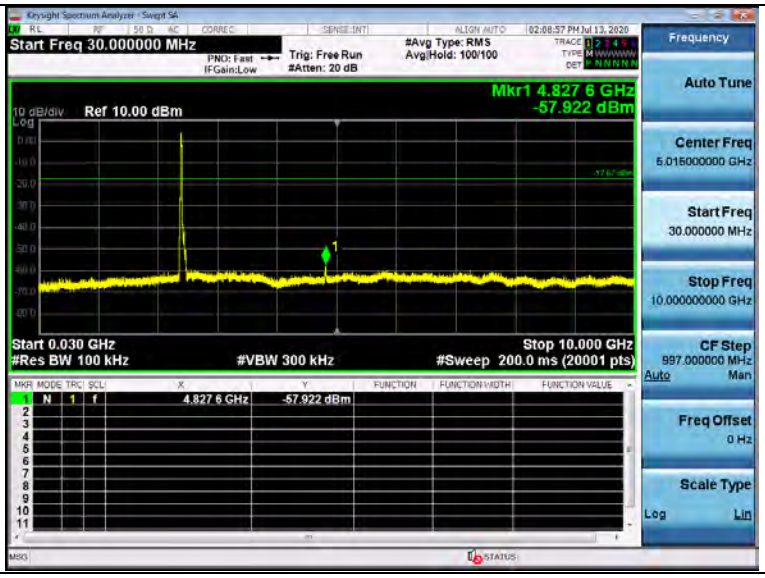
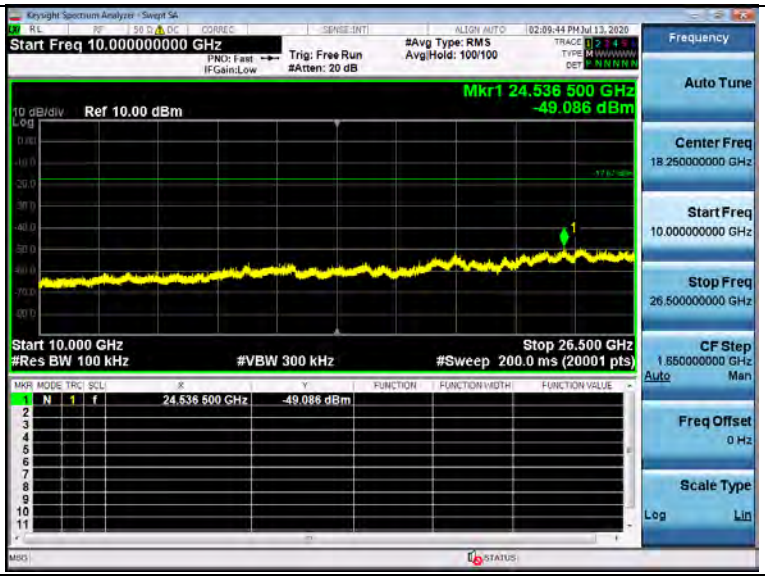
Above 10GHz

	Reference
High Channel	30MHz-10GHz
	
	Above 10GHz

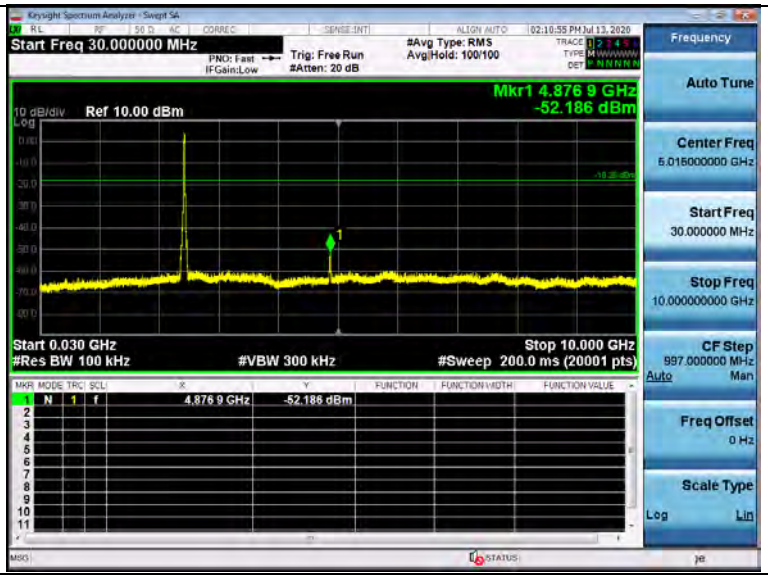

Start Freq 10.000000000 GHz
Trig: Free Run
#Atten: 20 dB
#Avg Type: RMS
Avg|Hold: 100/100
Mkr1 24.991 900 GHz
-49.531 dBm
10 dB/div Ref 10.00 dBm
Start 10.000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 26.500 GHz
#Sweep 200.0 ms (20001 pts)
24.991 900 GHz -49.531 dBm
Frequency
Auto Tune
Center Freq
18.250000000 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

Lowest Channel	Highest Channel
Band Edge	Band Edge
	

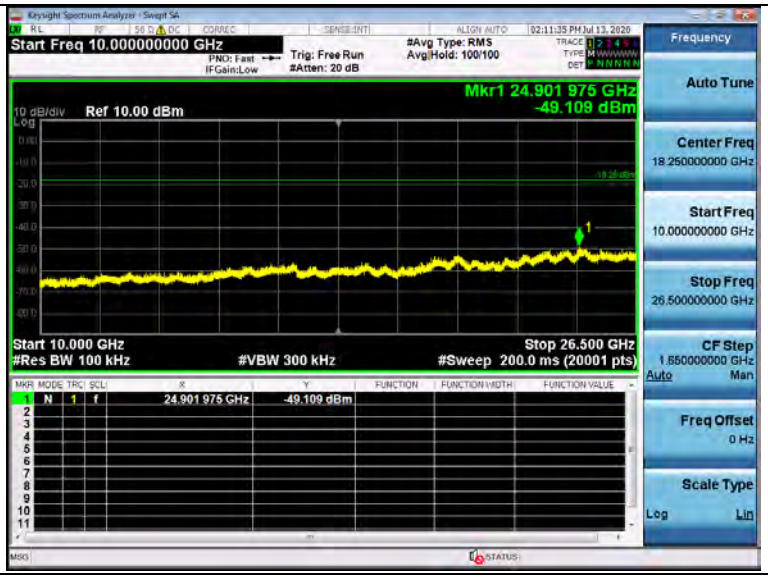
802.11g Modulation

Spurious emission	
	Reference
Low Channel	
	30MHz-10GHz
	
	Above 10GHz
	
Middle Channel	Reference

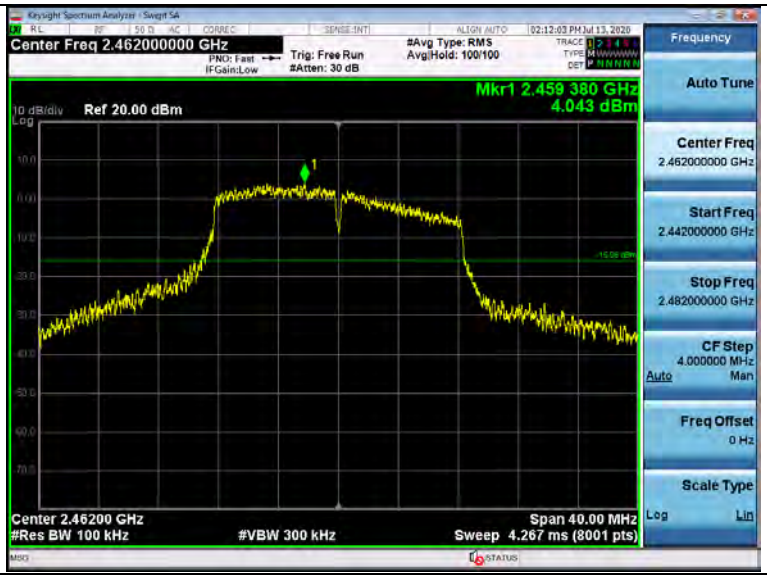
30MHz-10GHz



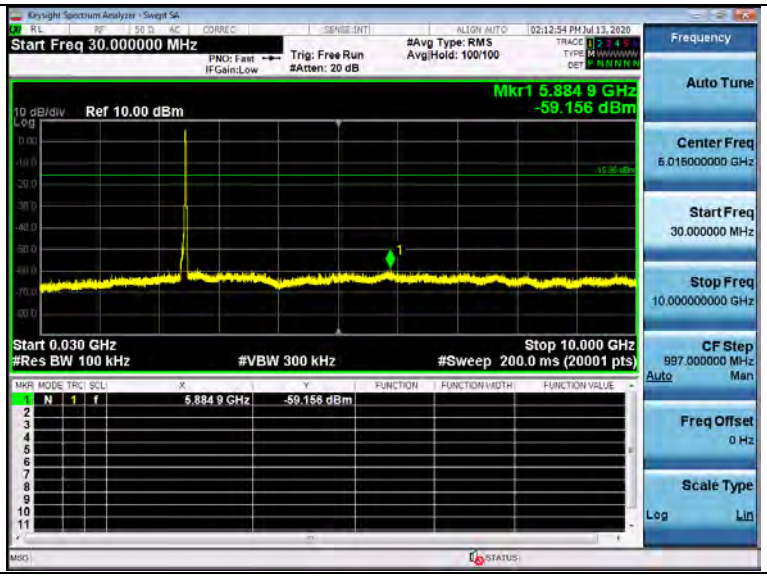
Above 10GHz



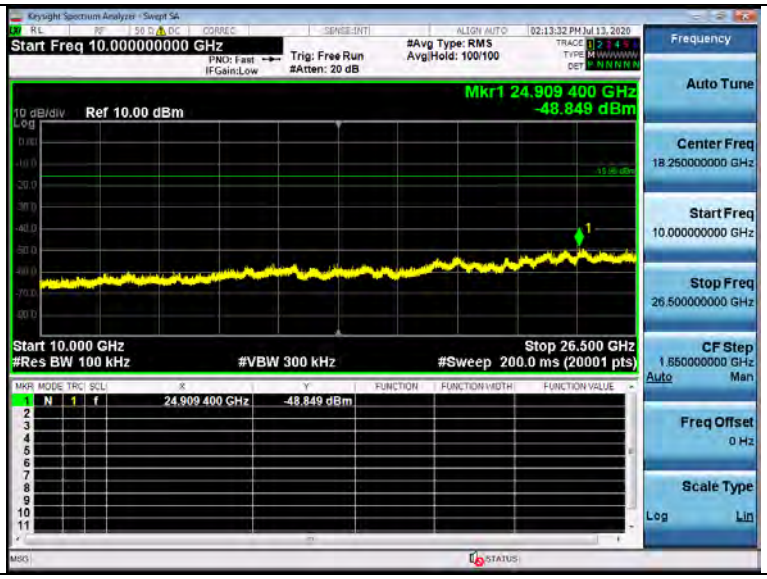
High Channel	Reference



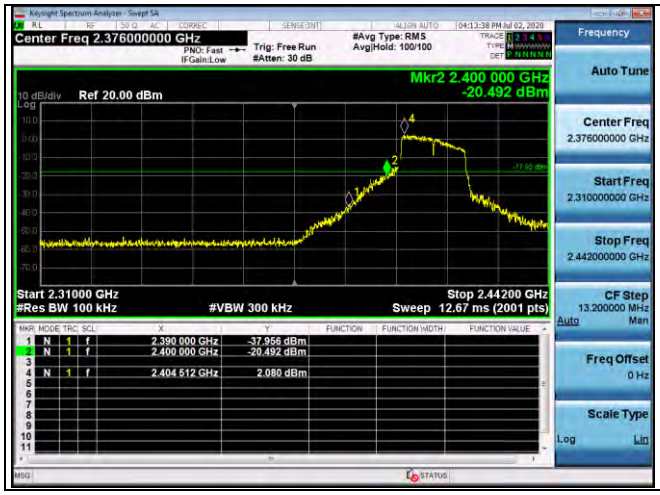
30MHz-10GHz



Above 10GHz

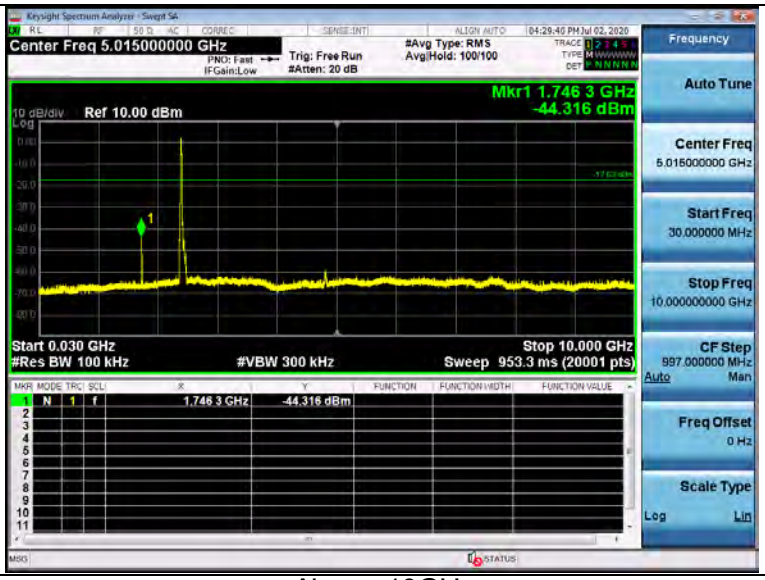


Lowest Channel	Highest Channel
Band Edge	Band Edge

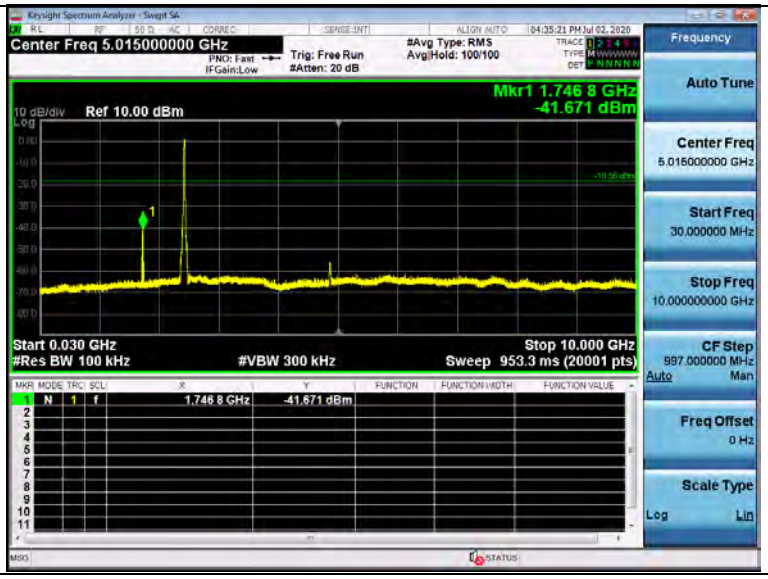

Keysight Spectrum Analyzer - Swept SA
Center Freq 2.376000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
#Avg Type: RMS
Avg|Hold: 100/100
04:13:38 PM Jul 02, 2020
Mkr2 2.400 000 GHz
-20.492 dBm
10 dB/div Ref 20.00 dBm
Start 2.31000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.44200 GHz
Sweep 12.67 ms (2001 pts)
1 N 1 f 2.390 000 GHz -37.956 dBm
2 N 1 f 2.400 000 GHz -20.492 dBm
4 N 1 f 2.404 512 GHz 2.080 dBm
Frequency
Auto Tune
Center Freq 2.376000000 GHz
Start Freq 2.310000000 GHz
Stop Freq 2.442000000 GHz
CF Step 13.200000 MHz
Auto Man
Freq Offset 0 Hz
Scale Type
Log Lin

Keysight Spectrum Analyzer - Swept SA
Center Freq 2.466000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
#Avg Type: RMS
Avg|Hold: 100/100
04:20:07 PM Jul 02, 2020
Mkr2 2.500 000 GHz
-56.379 dBm
10 dB/div Ref 20.00 dBm
Start 2.43200 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.50000 GHz
Sweep 6.533 ms (2001 pts)
1 N 1 f 2.483 500 GHz -39.426 dBm
2 N 1 f 2.500 000 GHz -56.379 dBm
4 N 1 f 2.457 024 GHz 2.874 dBm
Frequency
Auto Tune
Center Freq 2.466000000 GHz
Start Freq 2.432000000 GHz
Stop Freq 2.500000000 GHz
CF Step 6.800000 MHz
Auto Man
Freq Offset 0 Hz
Scale Type
Log Lin

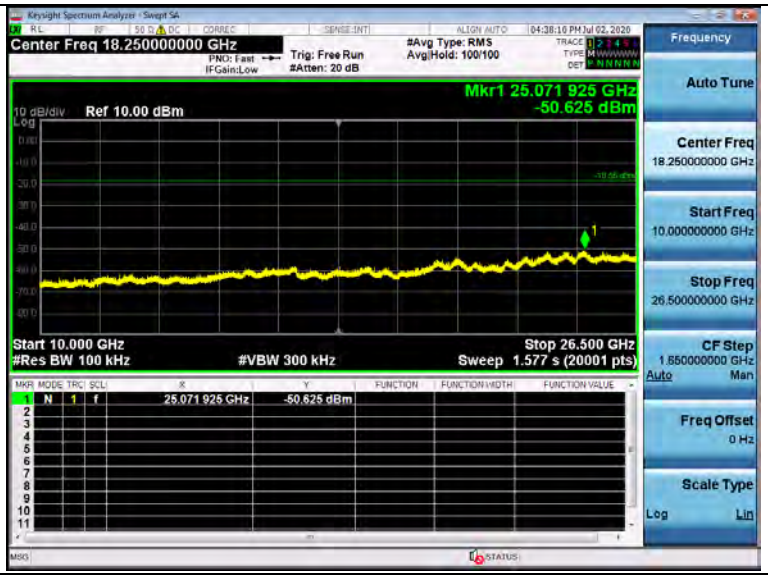
802.11n (HT20) Modulation

Spurious emission	
	Reference
Low Channel	
	30MHz-10GHz
	
	Above 10GHz
Middle Channel	Reference

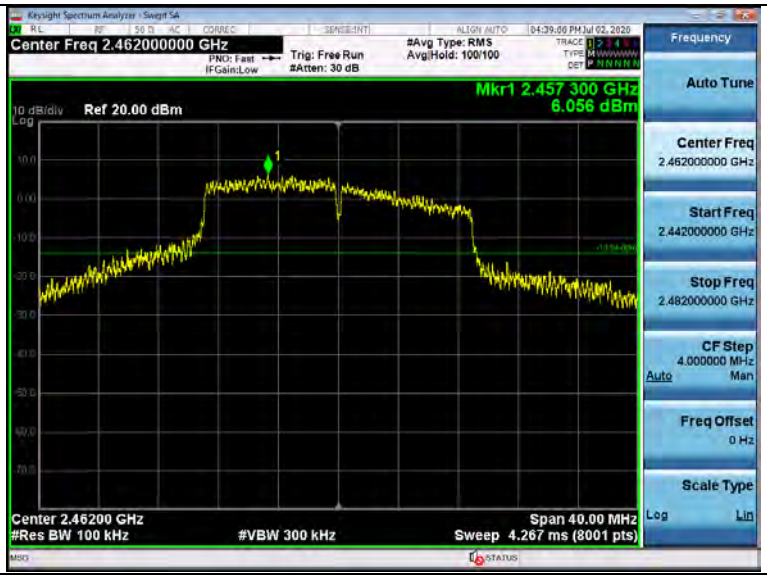
30MHz-10GHz



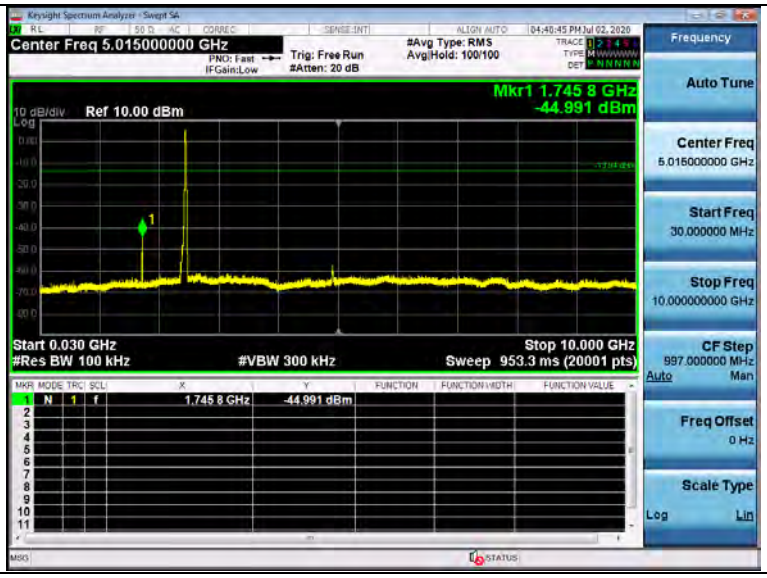
Above 10GHz



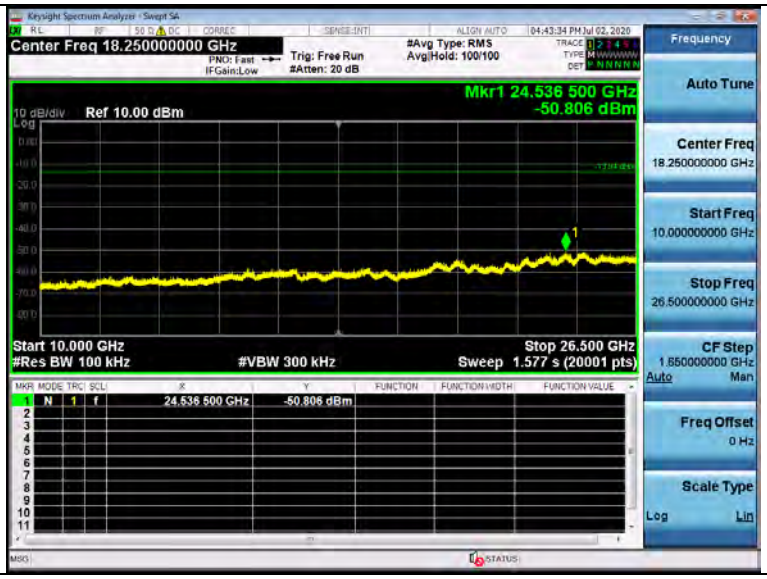
High Channel	Reference



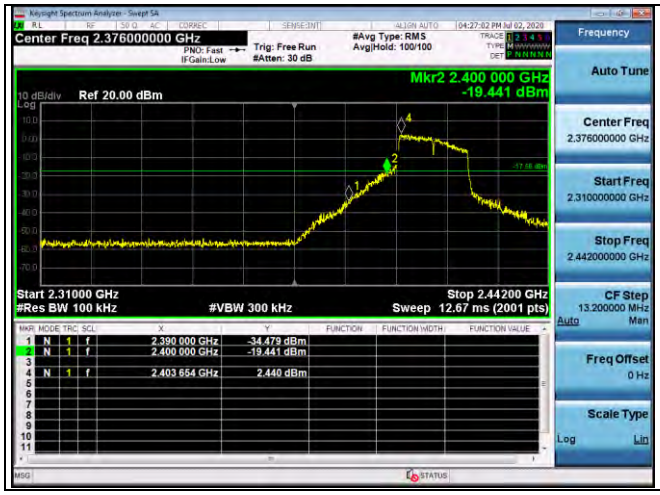
30MHz-10GHz



Above 10GHz

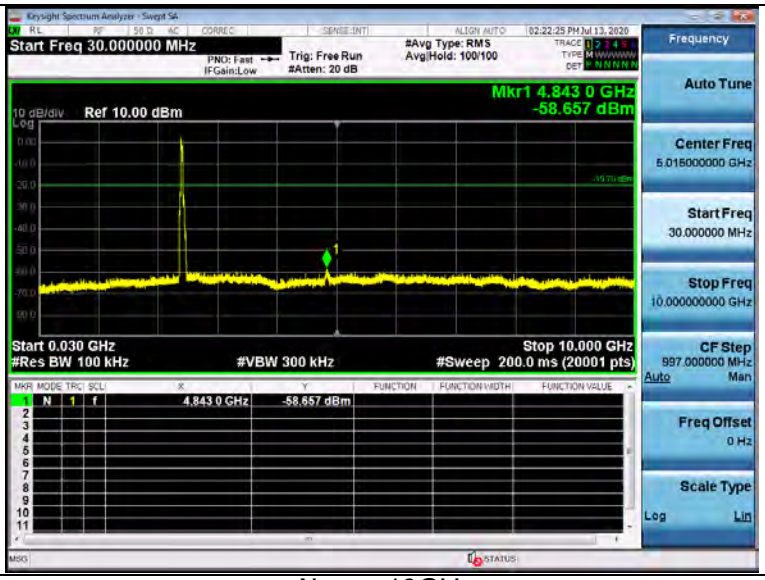
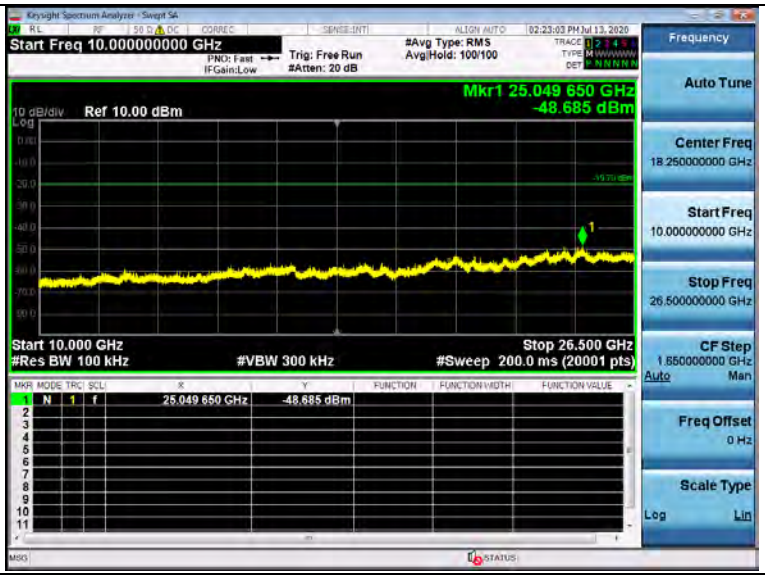


Lowest Channel	Highest Channel
Band Edge	Band Edge

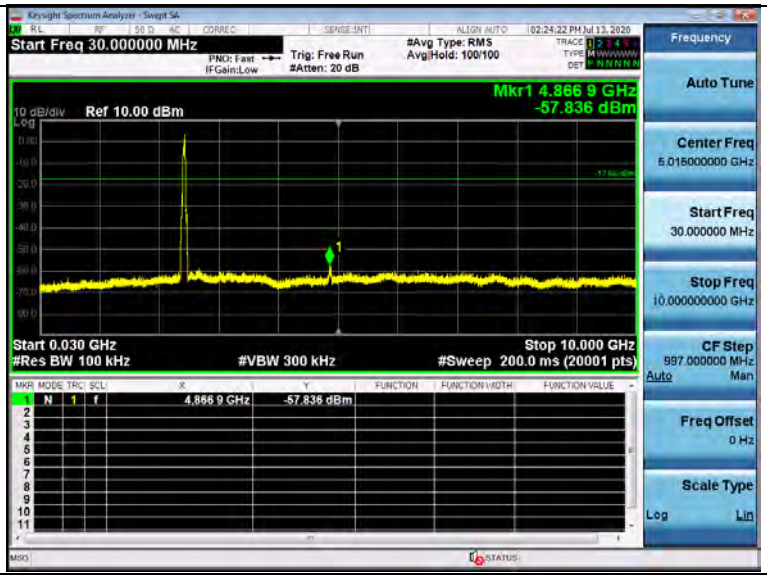

Keysight Spectrum Analyzer - Swept SA
Center Freq 2.376000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
#Avg Type: RMS
Avg|Hold: 100/100
04:27:02 PM Jul 02, 2020
Mkr2 2.400 000 GHz
-19.441 dBm
10 dB/div Ref 20.00 dBm
Start 2.31000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.44200 GHz
Sweep 12.67 ms (2001 pts)
1 N 1 f 2.390 000 GHz -34.479 dBm
2 N 1 f 2.400 000 GHz -19.441 dBm
4 N 1 f 2.403 654 GHz 2.440 dBm
Frequency
Auto Tune
Center Freq 2.376000000 GHz
Start Freq 2.310000000 GHz
Stop Freq 2.442000000 GHz
CF Step 13.200000 MHz
Auto Man
Freq Offset 0 Hz
Scale Type
Log Lin

Keysight Spectrum Analyzer - Swept SA
Center Freq 2.466000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
#Avg Type: RMS
Avg|Hold: 100/100
04:38:57 PM Jul 02, 2020
Mkr2 2.500 000 GHz
-56.352 dBm
10 dB/div Ref 20.00 dBm
Start 2.43200 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.50000 GHz
Sweep 6.533 ms (2001 pts)
1 N 1 f 2.483 500 GHz -27.297 dBm
2 N 1 f 2.500 000 GHz -56.352 dBm
4 N 1 f 2.456 650 GHz 6.328 dBm
Frequency
Auto Tune
Center Freq 2.466000000 GHz
Start Freq 2.432000000 GHz
Stop Freq 2.500000000 GHz
CF Step 6.800000 MHz
Auto Man
Freq Offset 0 Hz
Scale Type
Log Lin

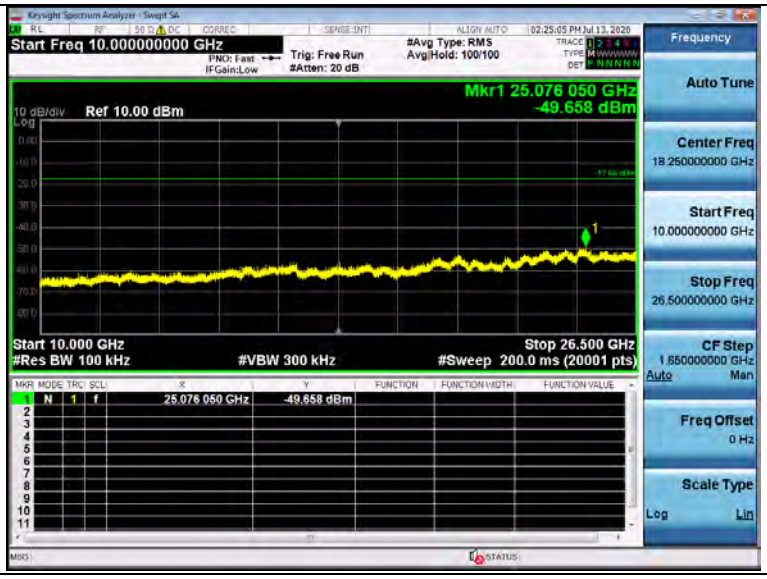
802.11n (HT40) Modulation

Spurious emission	
	Reference
Low Channel	
	30MHz-10GHz
	
	Above 10GHz
	
Middle Channel	Reference

30MHz-10GHz

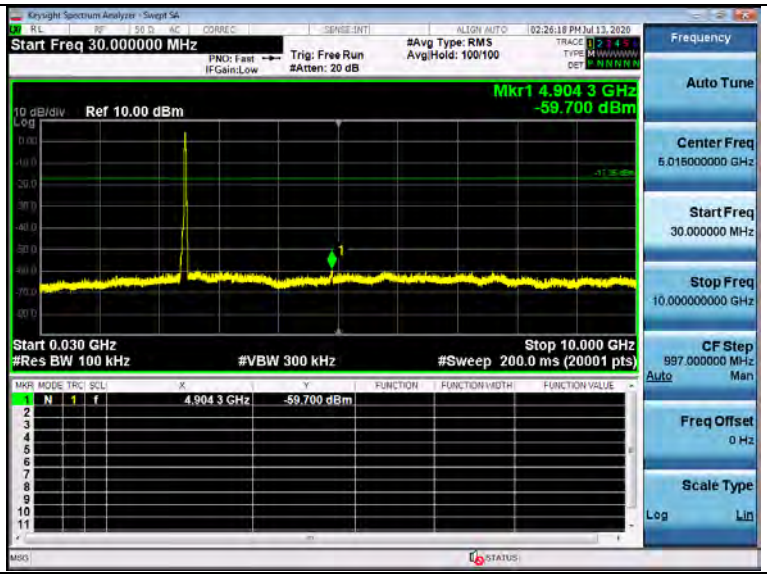


Above 10GHz

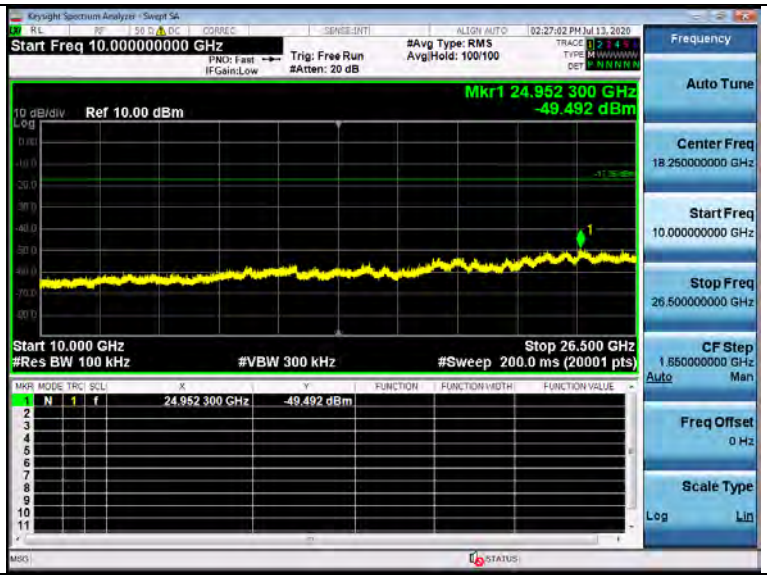


High Channel	Reference

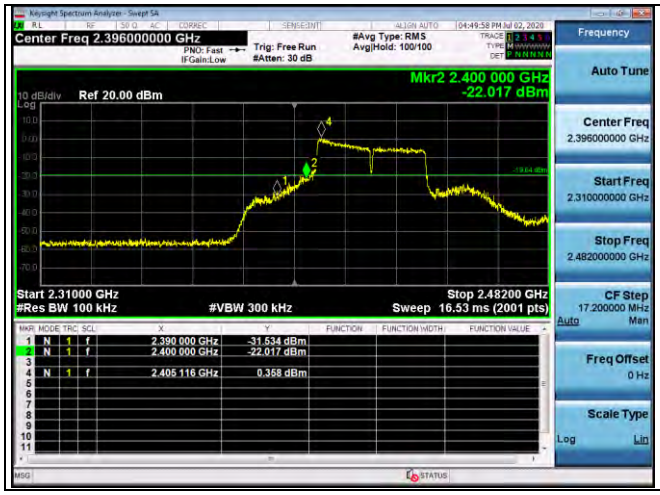
30MHz-10GHz



Above 10GHz



Lowest Channel	Highest Channel
Band Edge	Band Edge


Keysight Spectrum Analyzer - Swept SA
Center Freq 2.396000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
#Avg Type: RMS
Avg|Hold: 100/100
Mkr2 2.400 000 GHz
-22.017 dBm
10 dB/div Ref 20.00 dBm
Start 2.31000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.48200 GHz
Sweep 16.53 ms (2001 pts)
1 N 1 f 2.390 000 GHz -31.534 dBm
2 N 1 f 2.400 000 GHz -22.017 dBm
4 N 1 f 2.405 116 GHz 0.358 dBm
Frequency
Auto Tune
Center Freq 2.396000000 GHz
Start Freq 2.310000000 GHz
Stop Freq 2.482000000 GHz
CF Step 17.200000 MHz
Auto Man
Freq Offset 0 Hz
Scale Type
Log Lin

Keysight Spectrum Analyzer - Swept SA
Center Freq 2.446000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
#Avg Type: RMS
Avg|Hold: 100/100
Mkr2 2.500 000 GHz
-56.147 dBm
10 dB/div Ref 20.00 dBm
Start 2.39200 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.50000 GHz
Sweep 10.40 ms (2001 pts)
1 N 1 f 2.483 500 GHz -31.961 dBm
2 N 1 f 2.500 000 GHz -56.147 dBm
4 N 1 f 2.455 342 GHz 2.273 dBm
Frequency
Auto Tune
Center Freq 2.446000000 GHz
Start Freq 2.392000000 GHz
Stop Freq 2.500000000 GHz
CF Step 10.800000 MHz
Auto Man
Freq Offset 0 Hz
Scale Type
Log Lin

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

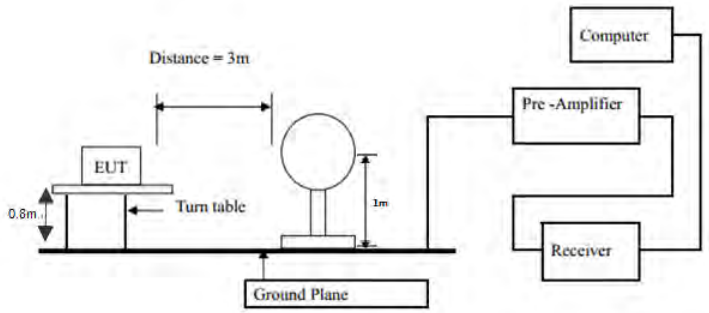
Limit:

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

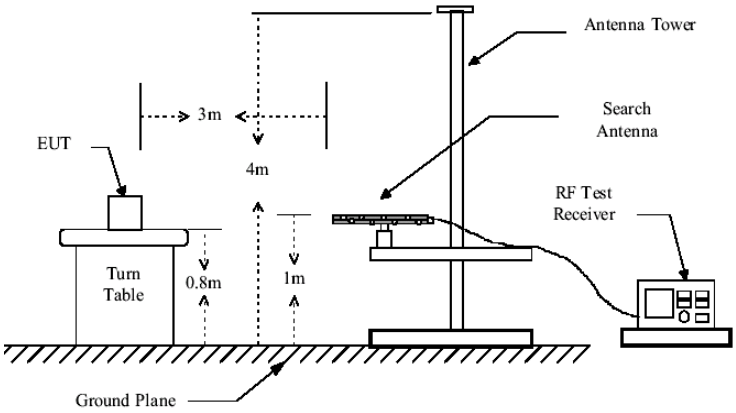
Frequency	Field Strength (microvolts/meter)	Measurement Distance (meters)	Detector
Above 1GHz	500	3	Average
	5000	3	Peak

Test setup:

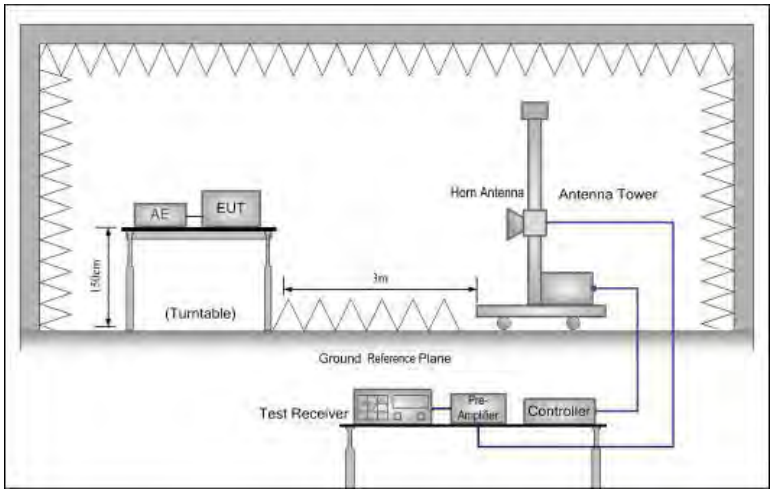
For radiated emissions below 30MHz



30MHz to 1GHz



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 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 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	Dec. 26, 2020
Spectrum analyzer	Agilent	N9020A	HKE-048	Dec. 26, 2020
Preamplifier	EMCI	EMC051845SE	HKE-015	Dec. 26, 2020
Preamplifier	Agilent	83051A	HKE-016	Dec. 26, 2020
Loop antenna	Schwarzbeck	FMZB 1519 B	HKE-014	Dec. 26, 2020
Broadband antenna	Schwarzbeck	VULB 9163	HKE-012	Dec. 26, 2020
Horn antenna	Schwarzbeck	9120D	HKE-013	Dec. 26, 2020
Antenna Mast	Keleto	CC-A-4M	N/A	N/A
Position controller	Taiwan MF	MF7802	HKE-011	Dec. 26, 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. 26, 2020
High Gain Antenna	Schewarzbeck	LB-180400KF	HKE-054	Dec. 26, 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

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

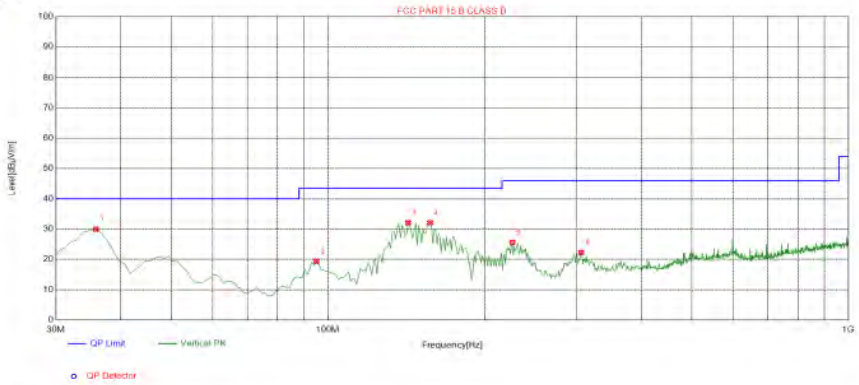
Suspected List

Suspected List									
NO.	Freq. [MHz]	Factor [dB]	Reading [dBµV/m]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	150.4004	-18.91	48.75	29.84	43.50	13.66	100	35	Horizontal
2	228.0781	-14.37	47.39	33.02	46.00	12.98	100	295	Horizontal
3	241.6717	-13.78	46.64	32.86	46.00	13.14	100	273	Horizontal
4	362.0721	-11.27	42.24	30.97	46.00	15.03	100	84	Horizontal
5	481.5015	-8.46	32.79	24.33	46.00	21.67	100	237	Horizontal
6	744.6346	-3.94	29.82	25.88	46.00	20.12	100	305	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]	Factor [dB]	Reading [dBµV/m]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	35.8258	-15.88	45.86	29.98	40.00	10.02	100	56	Vertical
2	95.0551	-16.23	35.59	19.36	43.50	24.14	100	31	Vertical
3	142.6326	-19.12	51.20	32.08	43.50	11.42	100	169	Vertical
4	157.1972	-18.42	50.53	32.11	43.50	11.39	100	202	Vertical
5	226.1361	-14.41	39.99	25.58	46.00	20.42	100	156	Vertical
6	306.7267	-12.65	34.92	22.27	46.00	23.73	100	348	Vertical

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

Harmonics and Spurious Emissions

Frequency Range (9 kHz-30MHz)

Frequency (MHz)	Level@3m (dBµV/m)	Limit@3m (dBµV/m)
--	--	--
--	--	--
--	--	--
--	--	--

Note: *1. Emission Level=Reading+ Cable loss-Antenna factor-Amp factor*

2. The emission 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	56.94	-3.64	53.30	74	-20.70	Peak
4824.00	34.14	-3.64	30.50	54	-23.50	AVG
7236.00	51.00	-0.95	50.05	74	-23.95	Peak
7236.00	32.96	-0.95	32.01	54	-21.99	AVG
Remark :Factor= Antenna Factor + Cable Loss - Pre-amplifier						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4824.00	55.20	-3.64	51.56	74	-22.44	Peak
4824.00	34.60	-3.64	30.96	54	-23.04	AVG
7236.00	51.90	-0.95	50.95	74	-23.05	Peak
7236.00	33.63	-0.95	32.68	54	-21.32	AVG
Remark :Factor= Antenna Factor + Cable Loss - Pre-amplifier						

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	54.93	-3.51	51.42	74	-22.58	Peak
4874.00	35.90	-3.51	32.39	54	-21.61	AVG
7311.00	52.22	-0.82	51.40	74	-22.60	Peak
7311.00	33.90	-0.82	33.08	54	-20.92	AVG
Remark :Factor= Antenna Factor + Cable Loss - Pre-amplifier						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4874.00	57.09	-3.51	53.58	74	-20.42	Peak
4874.00	33.84	-3.51	30.33	54	-23.67	AVG
7311.00	51.47	-0.82	50.65	74	-23.35	Peak
7311.00	33.46	-0.82	32.64	54	-21.36	AVG
Remark :Factor= Antenna Factor + Cable Loss - Pre-amplifier						

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	56.59	-3.43	53.16	74	-20.84	Peak
4924.00	34.14	-3.43	30.71	54	-23.29	AVG
7386.00	53.63	-0.75	52.88	74	-21.12	Peak
7386.00	33.92	-0.75	33.17	54	-20.83	AVG
Remark :Factor= Antenna Factor + Cable Loss - Pre-amplifier						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4924.00	54.91	-3.43	51.48	74	-22.52	Peak
4924.00	36.56	-3.43	33.13	54	-20.87	AVG
7386.00	51.09	-0.75	50.34	74	-23.66	Peak
7386.00	32.53	-0.75	31.78	54	-22.22	AVG
Remark :Factor= Antenna Factor + Cable Loss - Pre-amplifier						

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

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	54.61	-3.43	51.18	74	-22.82	Peak
4824.00	35.39	-3.43	31.96	54	-22.04	AVG
7236.00	51.73	-0.75	50.98	74	-23.02	Peak
7236.00	32.85	-0.75	32.10	54	-21.90	AVG
Remark :Factor= Antenna Factor + Cable Loss - Pre-amplifier						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4824.00	57.09	-3.43	53.66	74	-20.34	Peak
4824.00	35.46	-3.43	32.03	54	-21.97	AVG
7236.00	52.45	-0.75	51.70	74	-22.30	Peak
7236.00	33.27	-0.75	32.52	54	-21.48	AVG
Remark :Factor= Antenna Factor + Cable Loss - Pre-amplifier						

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	55.48	-3.51	51.97	74	-22.03	Peak
4874.00	34.13	-3.51	30.62	54	-23.38	AVG
7311.00	51.43	-0.82	50.61	74	-23.39	Peak
7311.00	33.06	-0.82	32.24	54	-21.76	AVG
Remark :Factor= Antenna Factor + Cable Loss - Pre-amplifier						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4874.00	56.67	-3.51	53.16	74	-20.84	56.67
4874.00	34.78	-3.51	31.27	54	-22.73	34.78
7311.00	52.01	-0.82	51.19	74	-22.81	52.01
7311.00	33.01	-0.82	32.19	54	-21.81	33.01
Remark :Factor= Antenna Factor + Cable Loss - Pre-amplifier						

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	54.68	-3.43	51.25	74	-22.75	Peak
4924.00	35.87	-3.43	32.44	54	-21.56	AVG
7386.00	51.61	-0.75	50.86	74	-23.14	Peak
7386.00	33.59	-0.75	32.84	54	-21.16	AVG
Remark :Factor= Antenna Factor + Cable Loss - Pre-amplifier						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4924.00	55.66	-3.43	52.23	74	-21.77	Peak
4924.00	34.59	-3.43	31.16	54	-22.84	AVG
7386.00	53.42	-0.75	52.67	74	-21.33	Peak
7386.00	32.22	-0.75	31.47	54	-22.53	AVG
Remark :Factor= Antenna Factor + Cable Loss - Pre-amplifier						

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

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	56.55	-3.64	52.91	74	-21.09	Peak
4824.00	35.98	-3.64	32.34	54	-21.66	AVG
7236.00	51.26	-0.95	50.31	74	-23.69	Peak
7236.00	33.18	-0.95	32.23	54	-21.77	AVG
Remark :Factor= Antenna Factor + Cable Loss - Pre-amplifier						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4824.00	56.74	-3.64	53.10	74	-20.90	Peak
4824.00	35.96	-3.64	32.32	54	-21.68	AVG
7236.00	53.26	-0.95	52.31	74	-21.69	Peak
7236.00	32.92	-0.95	31.97	54	-22.03	AVG
Remark :Factor= Antenna Factor + Cable Loss - Pre-amplifier						

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	56.32	-3.51	52.81	74	-21.19	Peak
4874.00	33.82	-3.51	30.31	54	-23.69	AVG
7311.00	53.27	-0.82	52.45	74	-21.55	Peak
7311.00	33.93	-0.82	33.11	54	-20.89	AVG
Remark :Factor= Antenna Factor + Cable Loss - Pre-amplifier						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4874.00	56.45	-3.51	52.94	74	-21.06	Peak
4874.00	36.63	-3.51	33.12	54	-20.88	AVG
7311.00	51.46	-0.82	50.64	74	-23.36	Peak
7311.00	32.67	-0.82	31.85	54	-22.15	AVG
Remark :Factor= Antenna Factor + Cable Loss - Pre-amplifier						

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	55.72	-3.43	52.29	74	-21.71	Peak
4924.00	35.16	-3.43	31.73	54	-22.27	AVG
7386.00	52.17	-0.75	51.42	74	-22.58	Peak
7386.00	33.43	-0.75	32.68	54	-21.32	AVG
Remark :Factor= Antenna Factor + Cable Loss - Pre-amplifier						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4924.00	55.78	-3.43	52.35	74	-21.65	Peak
4924.00	34.63	-3.43	31.20	54	-22.80	AVG
7386.00	51.03	-0.75	50.28	74	-23.72	Peak
7386.00	33.45	-0.75	32.70	54	-21.30	AVG
Remark :Factor= Antenna Factor + Cable Loss - Pre-amplifier						

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

LOW CH3 (802.11n/H40 Mode)/2422

Horizontal:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4844.00	57.54	-3.63	53.91	74	-20.09	Peak
4844.00	35.26	-3.63	31.63	54	-22.37	AVG
7266.00	50.67	-0.94	49.73	74	-24.27	Peak
7266.00	32.19	-0.94	31.25	54	-22.75	AVG
Remark :Factor= Antenna Factor + Cable Loss - Pre-amplifier						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4844.00	54.88	-3.63	51.25	74	-22.75	Peak
4844.00	35.54	-3.63	31.91	54	-22.09	AVG
7266.00	51.65	-0.94	50.71	74	-23.29	Peak
7266.00	32.17	-0.94	31.23	54	-22.77	AVG
Remark :Factor= Antenna Factor + Cable Loss - Pre-amplifier						

MID CH6 (802.11n/H40 Mode)/2437

Horizontal:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4874.00	56.10	-3.51	52.59	74	-21.41	Peak
4874.00	34.53	-3.51	31.02	54	-22.98	AVG
7311.00	52.19	-0.82	51.37	74	-22.63	Peak
7311.00	32.44	-0.82	31.62	54	-22.38	AVG
Remark :Factor= Antenna Factor + Cable Loss - Pre-amplifier						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4874.00	56.23	-3.51	52.72	74	-21.28	Peak
4874.00	34.73	-3.51	31.22	54	-22.78	AVG
7311.00	51.81	-0.82	50.99	74	-23.01	Peak
7311.00	32.53	-0.82	31.71	54	-22.29	AVG
Remark :Factor= Antenna Factor + Cable Loss - Pre-amplifier						

HIGH CH9 (802.11n/H40 Mode)/2452

Horizontal:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4904.00	54.90	-3.43	51.47	74	-22.53	Peak
4904.00	35.46	-3.43	32.03	54	-21.97	AVG
7356.00	53.59	-0.75	52.84	74	-21.16	Peak
7356.00	33.08	-0.75	32.33	54	-21.67	AVG
Remark :Factor= Antenna Factor + Cable Loss - Pre-amplifier						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4904.00	56.29	-3.43	52.86	74	-21.14	Peak
4904.00	35.62	-3.43	32.19	54	-21.81	AVG
7356.00	53.41	-0.75	52.66	74	-21.34	Peak
7356.00	33.77	-0.75	33.02	54	-20.98	AVG
Remark :Factor= Antenna Factor + Cable Loss - Pre-amplifier						

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

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	58.36	-5.81	52.55	74	-21.45	Peak
2310	42.97	-5.81	37.16	54	-16.84	AVG
2390	58.50	-5.84	52.66	74	-21.34	Peak
2390	44.34	-5.84	38.50	54	-15.50	AVG
Remark :Factor= Antenna Factor + Cable Loss - Pre-amplifier						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2310	59.31	-5.81	53.50	74	-20.50	Peak
2310	43.71	-5.81	37.90	54	-16.10	AVG
2390	58.38	-5.84	52.54	74	-21.46	Peak
2390	44.81	-5.84	38.97	54	-15.03	AVG
Remark :Factor= Antenna Factor + Cable Loss - Pre-amplifier						

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	58.36	-6.04	52.32	74	-21.68	Peak
2483.5	44.51	-6.04	38.47	54	-15.53	AVG
2500	59.67	-6.06	53.61	74	-20.39	Peak
2500	44.02	-6.06	37.96	54	-16.04	AVG
Remark :Factor= Antenna Factor + Cable Loss - Pre-amplifier						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.5	59.58	-6.04	53.54	74	-20.46	Peak
2483.5	44.36	-6.04	38.32	54	-15.68	AVG
2500	59.45	-6.06	53.39	74	-20.61	Peak
2500	44.63	-6.06	38.57	54	-15.43	AVG
Remark :Factor= Antenna Factor + Cable Loss - Pre-amplifier						

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	60.15	-5.81	54.34	74	-19.66	Peak
2310	45.90	-5.81	40.09	54	-13.91	AVG
2390	58.19	-5.84	52.35	74	-21.65	Peak
2390	45.27	-5.84	39.43	54	-14.57	AVG
Remark :Factor= Antenna Factor + Cable Loss - Pre-amplifier						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2310	59.72	-5.81	53.91	74	-20.09	Peak
2310	45.71	-5.81	39.90	54	-14.10	AVG
2390	59.26	-5.84	53.42	74	-20.58	Peak
2390	45.28	-5.84	39.44	54	-14.56	AVG
Remark :Factor= Antenna Factor + Cable Loss - Pre-amplifier						

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	61.53	-6.04	55.49	74	-18.51	Peak
2483.5	45.13	-6.04	39.09	54	-14.91	AVG
2500	59.02	-6.06	52.96	74	-21.04	Peak
2500	44.36	-6.06	38.30	54	-15.70	AVG
Remark :Factor= Antenna Factor + Cable Loss - Pre-amplifier						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.5	59.05	-6.04	53.01	74	-20.99	Peak
2483.5	43.79	-6.04	37.75	54	-16.25	AVG
2500	58.38	-6.06	52.32	74	-21.68	Peak
2500	44.18	-6.06	38.12	54	-15.88	AVG
Remark :Factor= Antenna Factor + Cable Loss - Pre-amplifier						

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	60.35	-5.81	54.54	74	-19.46	Peak
2310	45.08	-5.81	39.27	54	-14.73	AVG
2390	59.60	-5.84	53.76	74	-20.24	Peak
2390	44.51	-5.84	38.67	54	-15.33	AVG
Remark :Factor= Antenna Factor + Cable Loss - Pre-amplifier						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2310	58.99	-5.81	53.18	74	-20.82	Peak
2310	45.08	-5.81	39.27	54	-14.73	AVG
2390	59.58	-5.84	53.74	74	-20.26	Peak
2390	44.76	-5.84	38.92	54	-15.08	AVG
Remark :Factor= Antenna Factor + Cable Loss - Pre-amplifier						

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	60.72	-6.04	54.68	74	-19.32	Peak
2483.5	44.12	-6.04	38.08	54	-15.92	AVG
2500	58.47	-6.06	52.41	74	-21.59	Peak
2500	45.40	-6.06	39.34	54	-14.66	AVG
Remark :Factor= Antenna Factor + Cable Loss - Pre-amplifier						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.5	58.48	-6.04	52.44	74	-21.56	Peak
2483.5	45.73	-6.04	39.69	54	-14.31	AVG
2500	58.56	-6.06	52.50	74	-21.50	Peak
2500	44.28	-6.06	38.22	54	-15.78	AVG
Remark :Factor= Antenna Factor + Cable Loss - Pre-amplifier						

Operation Mode: 802.11n/H40 Mode TX CH Low (2422MHz)

Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2390	58.14	-5.81	52.33	74	-21.67	Peak
2390	44.40	-5.81	38.59	54	-15.41	AVG
2400	58.64	-5.84	52.80	74	-21.20	Peak
2400	44.28	-5.84	38.44	54	-15.56	AVG
Remark :Factor= Antenna Factor + Cable Loss - Pre-amplifier						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2390	59.33	-5.81	53.52	74	-20.48	Peak
2390	43.33	-5.81	37.52	54	-16.48	AVG
2400	59.39	-5.84	53.55	74	-20.45	Peak
2400	44.25	-5.84	38.41	54	-15.59	AVG
Remark :Factor= Antenna Factor + Cable Loss - Pre-amplifier						

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	60.46	-6.04	54.42	74	-19.58	Peak
2483.5	45.88	-6.04	39.84	54	-14.16	AVG
2500	59.60	-6.06	53.54	74	-20.46	Peak
2500	45.90	-6.06	39.84	54	-14.16	AVG
Remark :Factor= Antenna Factor + Cable Loss - Pre-amplifier						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.5	61.60	-6.04	55.56	74	-18.44	Peak
2483.5	43.39	-6.04	37.35	54	-16.65	AVG
2500	58.50	-6.06	52.44	74	-21.56	Peak
2500	45.95	-6.06	39.89	54	-14.11	AVG
Remark :Factor= Antenna Factor + Cable Loss - Pre-amplifier						

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. And according to FCC 47 CFR Section 15.247, if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

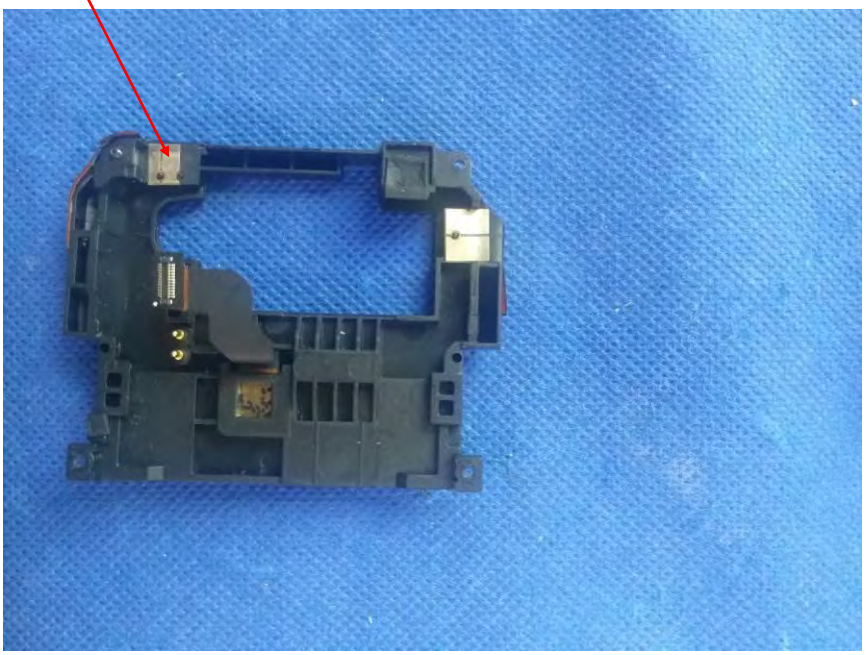
Refer to statement below for compliance.

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

Antenna Connected Construction

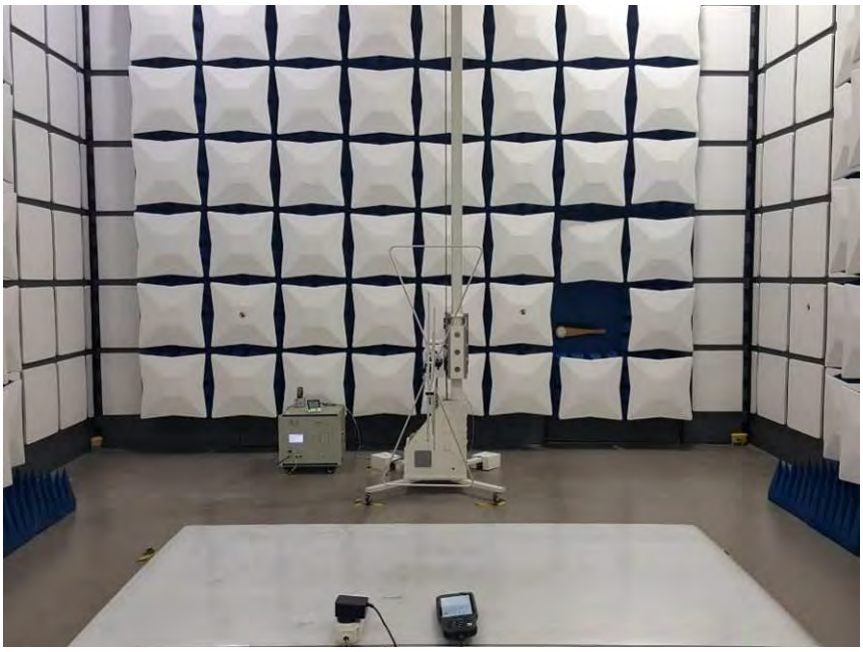
The antenna used in this product is a FPC Antenna, The directional gains of antenna used for transmitting is -3.1dBi

WIFI ANTENNA

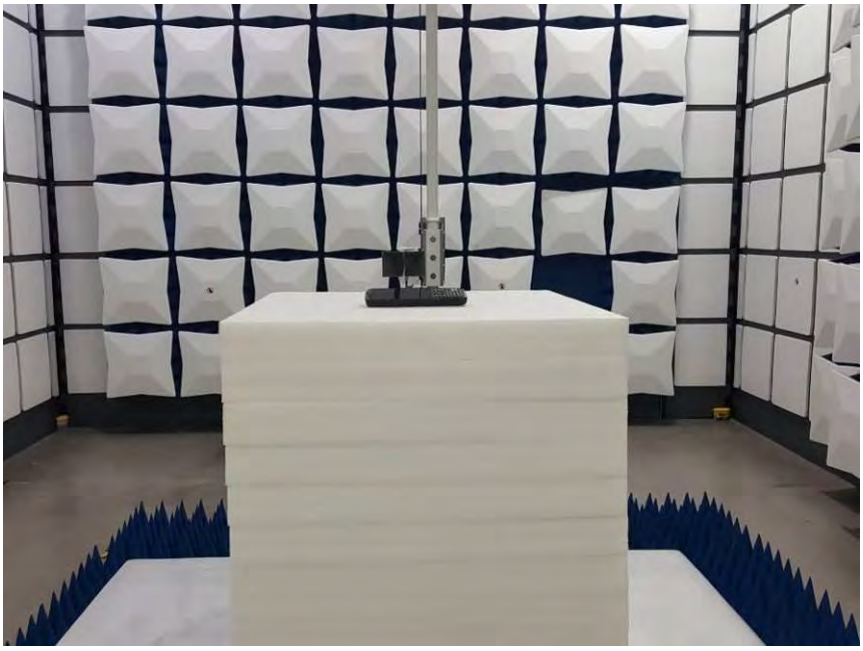


4.8. PHOTOGRAPH OF TEST

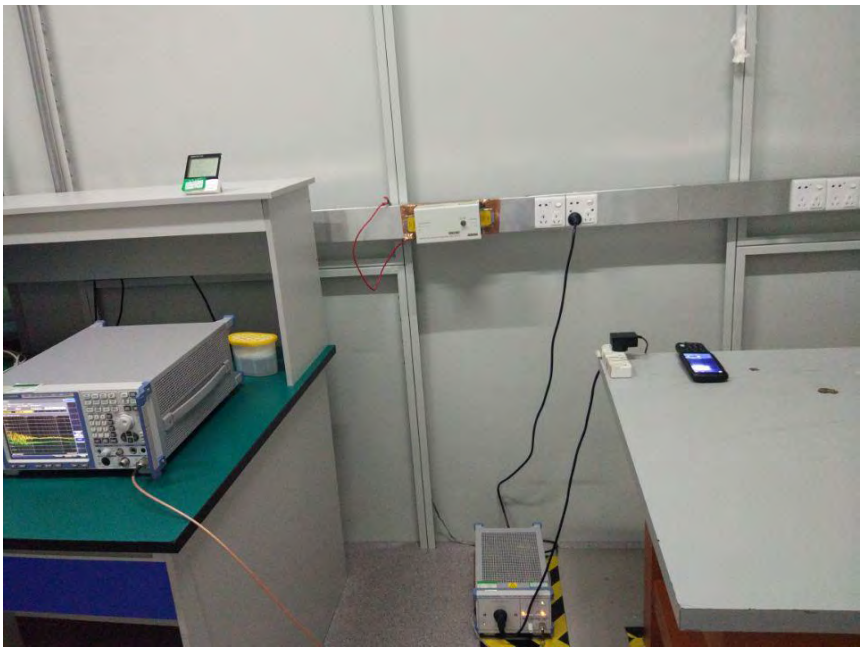
30MHz-1000MHz



Above 1000MHz



Conducted Emission



5. PHOTOS OF THE EUT

Please refer to the report No.: HK2007011614-8E

END