FCC TEST REPORT

Test report
On Behalf of
Winner Wave Limited
For
EZC-5601
Model No.: EZC-5601, RBT-5600

FCC ID: 2ADFS-EZC-5601

Prepared For :	**Winner Wave Limited** **Unit 1615 Peninsula Tower,538 Castle Peak Road, Lai Chi Kok, Kowloon, Hong Kong**
Prepared By :	**Shenzhen HUAK Testing Technology Co., Ltd.** **1-2/F., Building B2, Junfeng Zhongcheng Zhizao Innovation Park, Heping, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China**
Date of Test:	**Jul. 26, 2022 ~ Aug. 02, 2022**
Date of Report:	**Aug. 02, 2022**
Report Number:	**HK2207193140-2E**

TEST RESULT CERTIFICATION

Applicant's name ..... :	Winner Wave Limited
Address ..... :	Unit 1615 Peninsula Tower,538 Castle Peak Road, Lai Chi Kok, Kowloon, Hong Kong
Manufacture's Name ..... :	Actions Microelectronics Co., Ltd.
Address ..... :	201, No.9 Building, Software Park, KeJiZhongEr Road, GaoXinQu, NanShan, Shenzhen, China

Product description

Trade Mark:	EZCast, RedBirdtek
Product name ..... :	EZC-5601
Model and/or type reference .:	EZC-5601, RBT-5600
Standards ..... :	FCC Rules and Regulations Part 15 Subpart E Section 15.407 ANSI C63.10: 2013

Date of Test ..... :	
Date (s) of performance of tests ..... :	**Jul. 26, 2022 ~ Aug. 02, 2022**
Date of Issue ..... :	**Aug. 02, 2022**
Test Result ..... :	**Pass**

Prepared by: Guang Qian

Project Engineer

Reviewed by: Zden Hu

Project Supervisor

Approved by: Jason Hu

Technical Director

TABLE OF CONTENTS

** Modified History **

Revision	Description	Issued Data	Remark
Revision 1.0	Initial Test Report Release	Aug. 02, 2022	Jason Zhou

TEL : +86-755 2302 9901 FAX : +86-755 2302 9901 E-mail : service@cer-mark.com
Add: 1-2F., Building B2, Junfeng Zhongcheng Zhizao Innovation Park, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China

1. TEST RESULT SUMMARY

1.1. TEST PROCEDURES AND RESULTS

Requirement	CFR 47 Section	Result
Antenna requirement	§15.203	PASS
AC Power Line Conducted Emission	§15.207	PASS
Maximum Conducted Output Power	§15.407(a)	PASS
6dB Emission Bandwidth	§15.407(e)	PASS
26dB Emission Bandwidth& 99% Occupied Bandwidth	§15.407(a)	N/A
Power Spectral Density	§15.407(a)	PASS
Band edge	§15.407(b)/15.209/15.205	PASS
Radiated Emission	§15.407(b)/15.209/15.205	PASS
Frequency Stability	§15.407(g)	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. INFORMATION OF THE TEST LABORATORY

Shenzhen HUAK Testing Technology Co., Ltd.
Add.: 1-2/F., Building B2, Junfeng Zhongcheng Zhizao Innovation Park, Heping, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China

Testing Laboratory Authorization：

A2LA Accreditation Code is 4781.01.
FCC Designation Number is CN1229.
Canada IC CAB identifier is CN0045.
CNAS Registration Number is L9589.

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	±0.37dB
2	RF power, conducted	±3.35dB
3	Spurious emissions, conducted	±2.20dB
4	All emissions, radiated(<1G)	±3.90dB
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:	EZC-5601
Model Name:	EZC-5601
Serial Model:	RBT-5600
Model Difference:	All model's the function, software and electric circuit are the same, only with a product color, appearance and model named different. Test sample model: EZC-5601
Trade Mark:	EZCast, RedBirdtek
FCC ID:	2ADFS-EZC-5601
Operation Frequency:	IEEE 802.11a/n/ac/ax(HT20) 5.180GHz-5.240GHz IEEE 802.11n/ac/ax(HT40) 5.190GHz-5.230GHz IEEE 802.11ac/ax(HT80) 5.210GHz
Modulation Technology:	IEEE 802.11a/n/ac/ax
Modulation Type:	OFDM, OFDMA
Antenna Type:	Internal Antenna
Antenna Gain:	Antenna 1:2.2dBi Antenna 2:2.2dBi MIMO: 5.21dBi
Power Source:	DC 5V From PC
Power Supply:	DC 5V From PC
Hardware Version	V1.01
Software Version:	V1.0
Note: The EUT incorporates a MIMO function. Physically, it provides two completed transmitters and receivers(2T2R), two transmit signals are completely correlated, then, Direction gain= GANT + Array Gain(Array Gain=10 log(2) dB for power spectral density; Array Gain=0 for power measurement)	

2.2. OPERATION FREQUENCY EACH OF CHANNEL

802.11a/802.11n(HT20) 802.11ac(HT20)/ 802.11ax(HT20)		802.11n(HT40)/ 802.11ac(HT40)/ 802.11ax(HT40)		802.11ac(HT80)/ 802.11ax(HT80)	
Channel	Frequency	Channel	Frequency	Channel	Frequency
36	5180	38	5190	42	5210
40	5200	46	5230		
44	5220				
48	5240				

Note:

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

2.3. OPERATION OF EUT DURING TESTING

For 802.11a/n (HT20)/ac(HT20)/ax(HT20)

Band I (5150 - 5250 MHz)		
Channel Number	Channel	Frequency (MHz)
36	Low	5180
40	Mid	5200
48	High	5240

For 802.11n (HT40)/ ac(HT40)/ax(HT40)

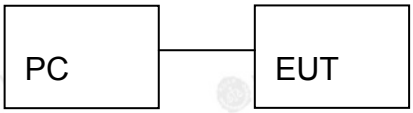
Band I (5150 - 5250 MHz)		
Channel Number	Channel	Frequency (MHz)
38	Low	5190
46	High	5230

For 802.11ac(HT80)/ax(HT80)

Band I (5150 - 5250 MHz)	
Channel Number	Frequency (MHz)
42	5210

2.4. DESCRIPTION OF TEST SETUP

Operation of EUT during testing:



PC information
Model: TP00067A
Input: DC20V, 2.25-3.25A
Output: 5VDC, 0.5A

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. The worst case is X position

3. GENERA INFORMATION

3.1. TEST ENVIRONMENT AND MODE

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

We have verified the construction and function in typical operation. All the test modes were carried out with the EUT in transmitting operation, which was shown in this test report and defined as follows:

Per-scan all kind of data rate in lowest channel, and found the follow list which it was worst case.	
Mode	Data rate
802.11a	6 Mbps
802.11n(HT20)	MCS0
802.11n(HT40)	MCS0
802.11ac(HT20)/ac(HT40)/ac(HT80)	MCS0
802.11ax(HT20)/ax(HT40)/ax(HT80)	MCS0
Final Test Mode:	
Operation mode:	Keep the EUT in continuous transmitting with modulation

3.2. DESCRIPTION OF SUPPORT UNITS

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

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

Note:

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

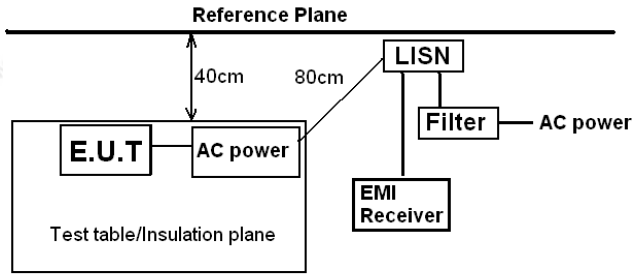
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

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

4. TEST RESULTS AND MEASUREMENT DATA

4.1. CONDUCTED EMISSION

4.1.1. Test Specification

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

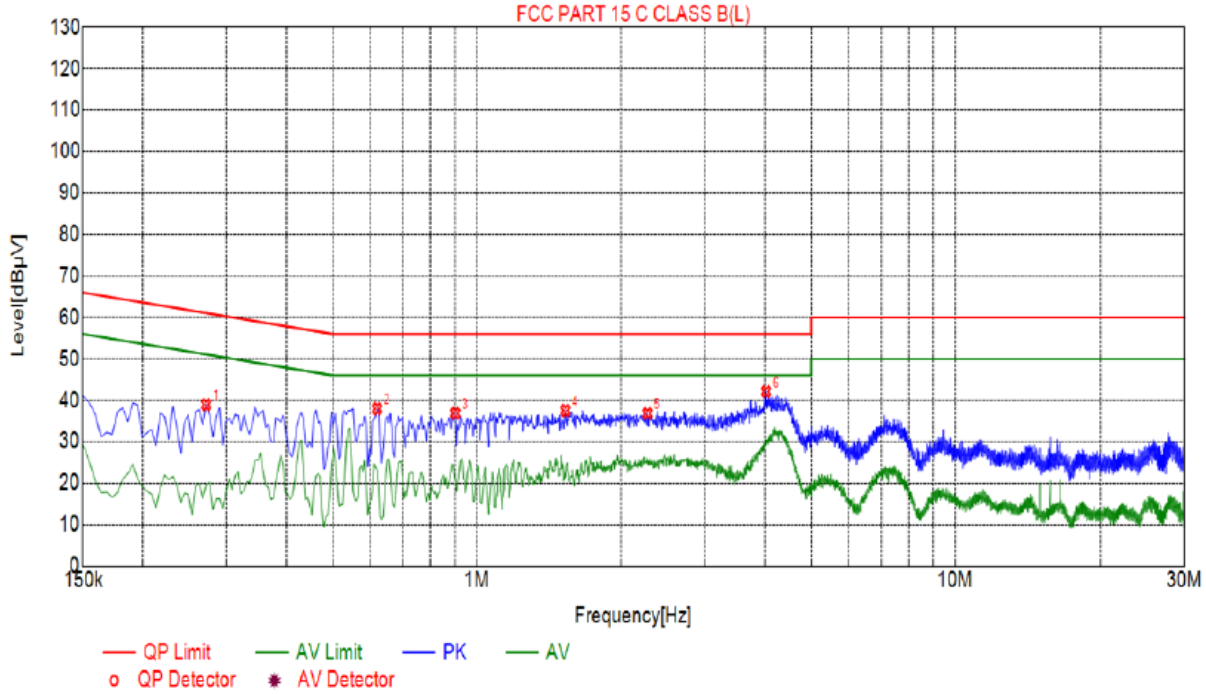
4.1.2. Test Instruments

Conducted Emission Shielding Room Test Site (843)					
Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Date**	**Calibration Due**
Receiver	R&S	ESR-7	HKE-010	Feb. 18, 2022	Feb. 17, 2023
LISN	R&S	ENV216	HKE-002	Feb. 18, 2022	Feb. 17, 2023
Coax cable (9KHz-30MHz)	Times	381806-002	N/A	Feb. 18, 2022	Feb. 17, 2023
Conducted test software	Tonscend	TS+ Rev 2.5.0.0	HKE-081	N/A	N/A

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

4.1.3. Test data

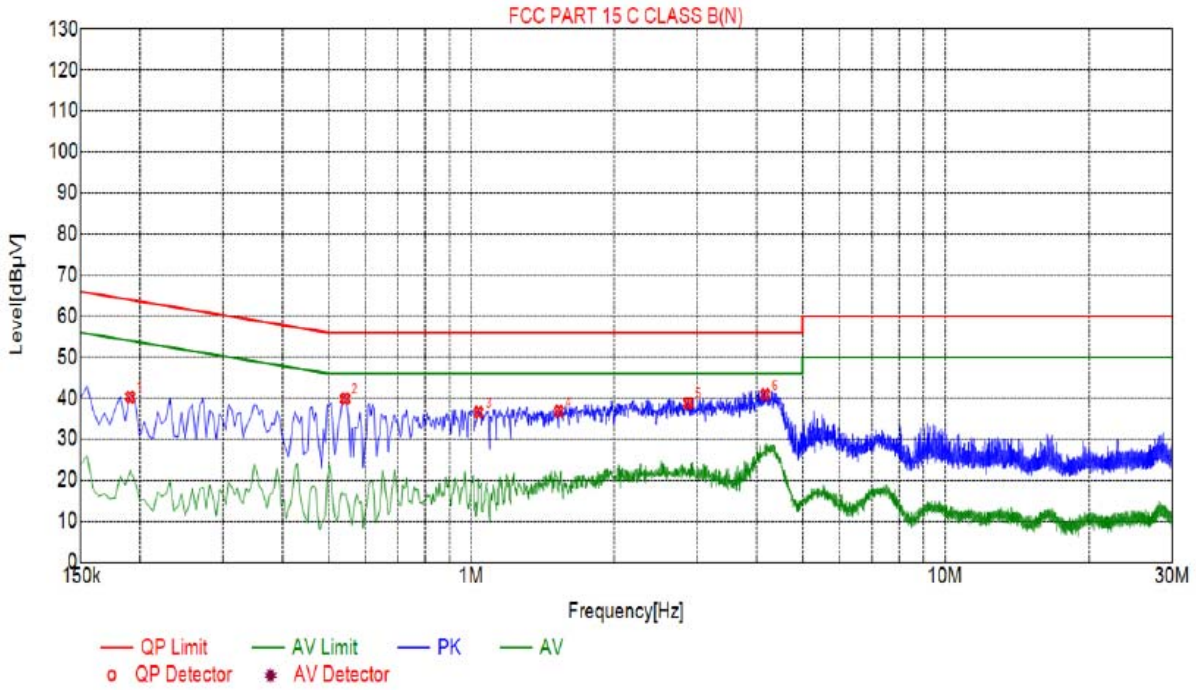
Test Specification: Line



Suspected List								
NO.	Freq. [MHz]	Level [dBµV]	Factor [dB]	Limit [dBµV]	Margin [dB]	Reading [dBµV]	Detector	Type
1	0.2715	38.92	20.03	61.07	22.15	18.89	PK	L
2	0.6180	37.96	20.05	56.00	18.04	17.91	PK	L
3	0.9015	36.86	20.06	56.00	19.14	16.80	PK	L
4	1.5315	37.53	20.11	56.00	18.47	17.42	PK	L
5	2.2740	36.82	20.18	56.00	19.18	16.64	PK	L
6	4.0245	42.12	20.25	56.00	13.88	21.87	PK	L

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

Test Specification: Neutral

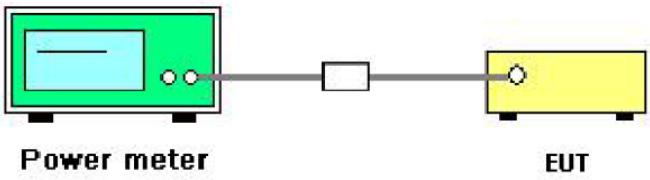


Suspected List								
NO.	Freq. [MHz]	Level [dBµV]	Factor [dB]	Limit [dBµV]	Margin [dB]	Reading [dBµV]	Detector	Type
1	0.1905	40.28	20.04	64.10	23.82	20.24	PK	N
2	0.5415	39.86	20.05	56.00	16.14	19.81	PK	N
3	1.0365	36.55	20.07	56.00	19.45	16.48	PK	N
4	1.5315	36.81	20.11	56.00	19.19	16.70	PK	N
5	2.8725	38.79	20.21	56.00	17.21	18.58	PK	N
6	4.1730	40.90	20.25	56.00	15.10	20.65	PK	N

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

4.2. MAXIMUM CONDUCTED OUTPUT POWER

4.2.1. Test Specification

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

4.2.2. Test Instruments

RF Test Room					
Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Date**	**Calibration Due**
Spectrum analyzer	Agilent	N9020A	HKE-048	Feb. 18, 2022	Feb. 17, 2023
Power meter	Agilent	E4419B	HKE-085	Feb. 18, 2022	Feb. 17, 2023
Power Sensor	Agilent	E9300A	HKE-086	Feb. 18, 2022	Feb. 17, 2023
RF cable	Times	1-40G	HKE-034	Feb. 18, 2022	Feb. 17, 2023
RF automatic control unit	Tonscend	JS0806-2	HKE-060	Feb. 18, 2022	Feb. 17, 2023

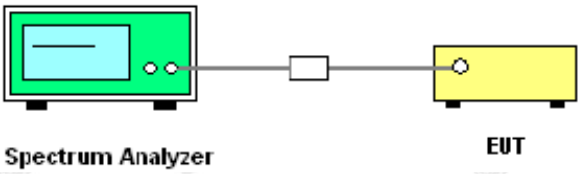
Note: *The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).*

4.2.3. Test Data

Configuration Band I (5150 - 5250 MHz)						
Mode	Test channel	Maximum Conducted Output Power (dBm)			FCC Limit (dBm)	Result
		Antenna port 1	Antenna port 2	MIMO		
11a	CH36	9.47	10.37	/	30	PASS
11a	CH40	9.90	9.17	/	30	PASS
11a	CH48	9.85	9.08	/	30	PASS
11n(HT20)	CH36	7.65	9.52	11.70	30	PASS
11n(HT20)	CH40	8.05	9.57	11.89	30	PASS
11n(HT20)	CH48	7.67	9.10	11.45	30	PASS
11n(HT40)	CH38	9.52	9.78	12.66	30	PASS
11n(HT40)	CH46	8.84	9.63	12.26	30	PASS
11ac(HT20)	CH36	9.19	9.78	12.51	30	PASS
11ac(HT20)	CH40	9.24	9.88	12.58	30	PASS
11ac(HT20)	CH48	7.90	9.16	11.59	30	PASS
11ac(HT40)	CH38	9.55	10.27	12.94	30	PASS
11ac(HT40)	CH46	9.44	10.31	12.91	30	PASS
11ac(HT80)	CH42	9.25	10.03	13.04	30	PASS
11ax(HT20)	CH36	8.12	10.21	12.36	30	PASS
11ax(HT20)	CH40	8.28	9.19	11.77	30	PASS
11ax(HT20)	CH48	7.73	8.23	11.00	30	PASS
11ax(HT40)	CH38	8.40	8.44	11.43	30	PASS
11ax(HT40)	CH46	8.13	8.41	11.28	30	PASS
11ax(HT80)	CH42	8.63	9.15	11.91	30	PASS

4.3. 6DB EMISSION BANDWIDTH

4.3.1. Test Specification

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

4.3.2. Test Instruments

	RF Test Room				
Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Date**	**Calibration Due**
Spectrum analyzer	Agilent	N9020A	HKE-048	Feb. 18, 2022	Feb. 17, 2023
RF cable	Times	1-40G	HKE-034	Feb. 18, 2022	Feb. 17, 2023
RF automatic control unit	Tonscend	JS0806-2	HKE-060	Feb. 18, 2022	Feb. 17, 2023

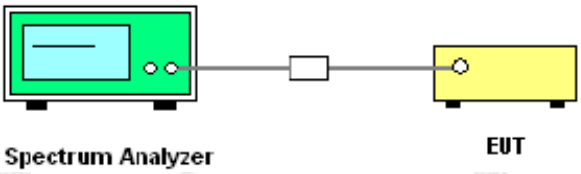
Note: *The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).*

4.3.3. Test data

N/A

4.4. 26DB BANDWIDTH AND 99% OCCUPIED BANDWIDTH

4.4.1. Test Specification

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

4.4.2. Test Instruments

RF Test Room					
Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Date**	**Calibration Due**
Spectrum analyzer	Agilent	N9020A	HKE-048	Feb. 18, 2022	Feb. 17, 2023
RF cable	Times	1-40G	HKE-034	Feb. 18, 2022	Feb. 17, 2023
RF automatic control unit	Tonscend	JS0806-2	HKE-060	Feb. 18, 2022	Feb. 17, 2023

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

4.4.3. Test data

ANT 1

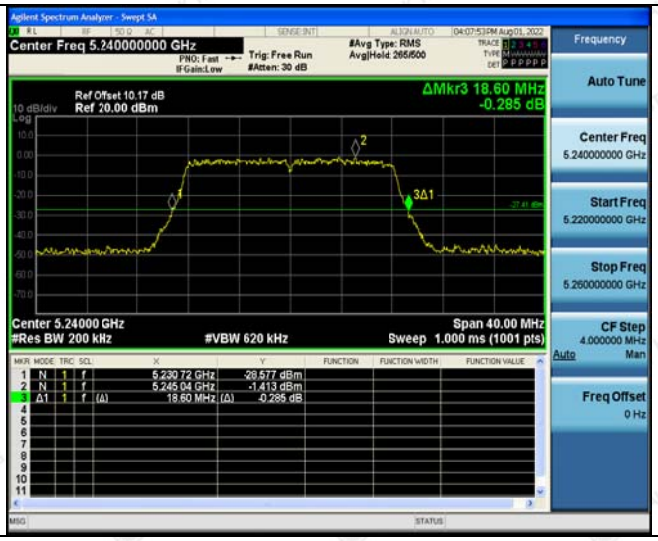
Mode	Test channel	Frequency (MHz)	26 dB Bandwidth (MHz)	Verdict
11a	CH36	5180	18.560	PASS
11a	CH40	5200	18.360	PASS
11a	CH48	5240	18.600	PASS
11n(HT20)	CH36	5180	19.320	PASS
11n(HT20)	CH40	5200	19.160	PASS
11n(HT20)	CH48	5240	19.440	PASS
11n(HT40)	CH38	5190	38.480	PASS
11n(HT40)	CH46	5230	38.480	PASS
11ac(HT20)	CH36	5180	19.280	PASS
11ac(HT20)	CH40	5200	19.080	PASS
11ac(HT20)	CH48	5240	19.400	PASS
11ac(HT40)	CH38	5190	38.640	PASS
11ac(HT40)	CH46	5230	38.880	PASS
11ac(HT80)	CH42	5210	85.440	PASS
11ax(HT20)	CH36	5180	20.240	PASS
11ax(HT20)	CH40	5200	20.200	PASS
11ax(HT20)	CH48	5240	20.320	PASS
11ax(HT40)	CH38	5190	39.680	PASS
11ax(HT40)	CH46	5230	39.600	PASS
11ax(HT80)	CH42	5210	80.320	PASS

Test plots as follows:

Band I （5150 – 5250 MHz）

802.11a

Low

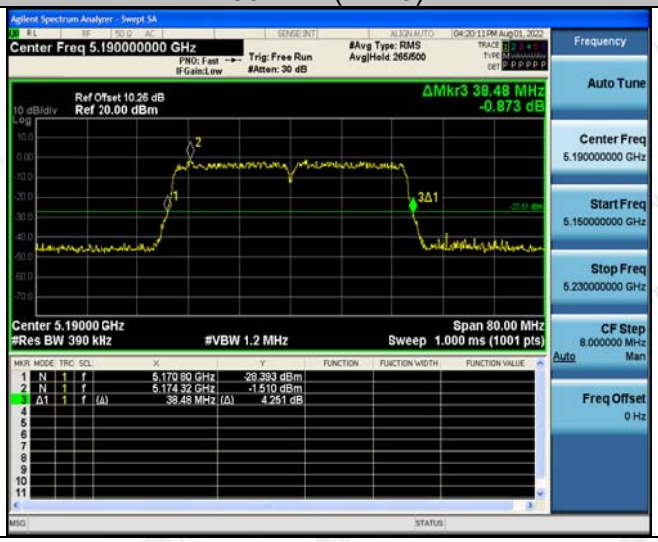
Mid

High

802.11n(HT20)

Low

Mid

High

802.11n(HT40)

Low

High

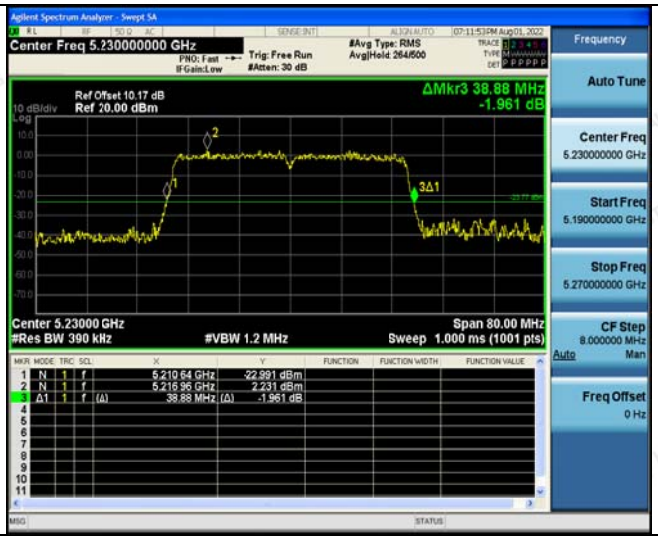
802.11ac(HT20)

Low

Mid

High

802.11ac(HT40)

Low

High

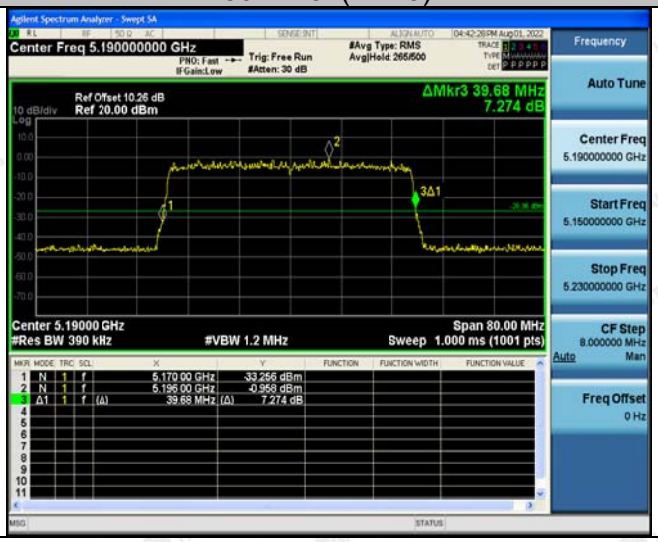
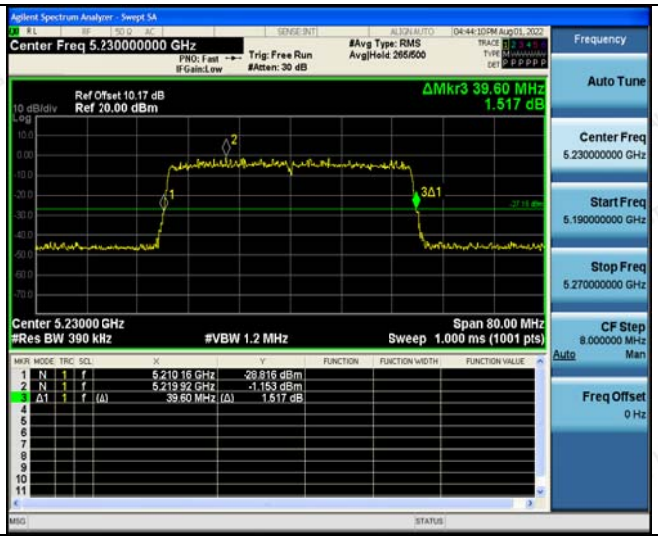
802.11ac(HT80)


802.11ax(HT20)

Low

Mid

High

802.11ax(HT40)

Low

High

802.11ax(HT80)

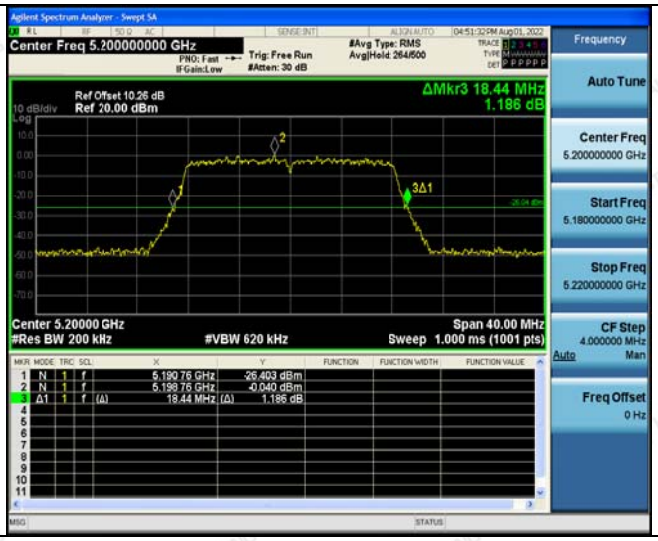

ANT 2

Mode	Test channel	Frequency (MHz)	26 dB Bandwidth (MHz)	Verdict
11a	CH36	5180	18.240	PASS
11a	CH40	5200	18.440	PASS
11a	CH48	5240	18.240	PASS
11n(HT20)	CH36	5180	19.200	PASS
11n(HT20)	CH40	5200	19.320	PASS
11n(HT20)	CH48	5240	19.160	PASS
11n(HT40)	CH38	5190	38.880	PASS
11n(HT40)	CH46	5230	38.720	PASS
11ac(HT20)	CH36	5180	19.320	PASS
11ac(HT20)	CH40	5200	19.320	PASS
11ac(HT20)	CH48	5240	19.200	PASS
11ac(HT40)	CH38	5190	39.040	PASS
11ac(HT40)	CH46	5230	38.720	PASS
11ac(HT80)	CH42	5210	84.800	PASS
11ax(HT20)	CH36	5180	20.280	PASS
11ax(HT20)	CH40	5200	20.120	PASS
11ax(HT20)	CH48	5240	20.240	PASS
11ax(HT40)	CH38	5190	39.520	PASS
11ax(HT40)	CH46	5230	39.440	PASS
11ax(HT80)	CH42	5210	80.640	PASS

Test plots as follows:

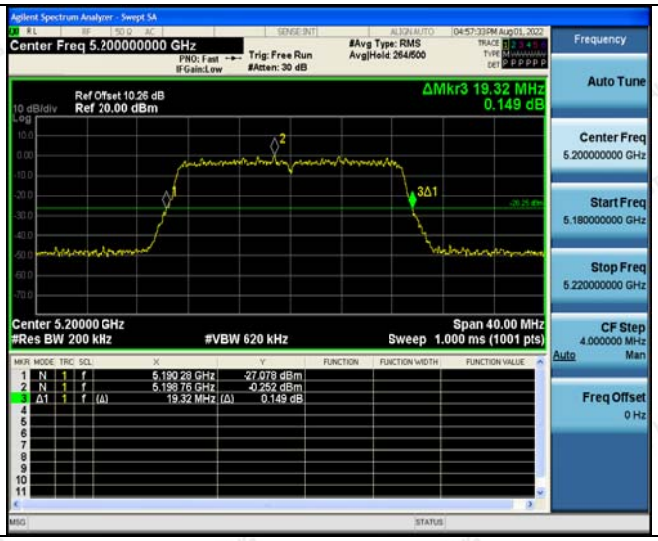
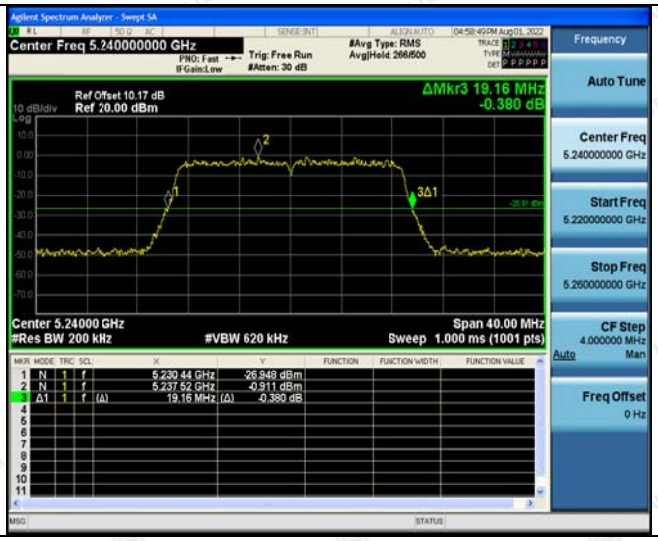
Band I （5150 – 5250 MHz）

802.11a

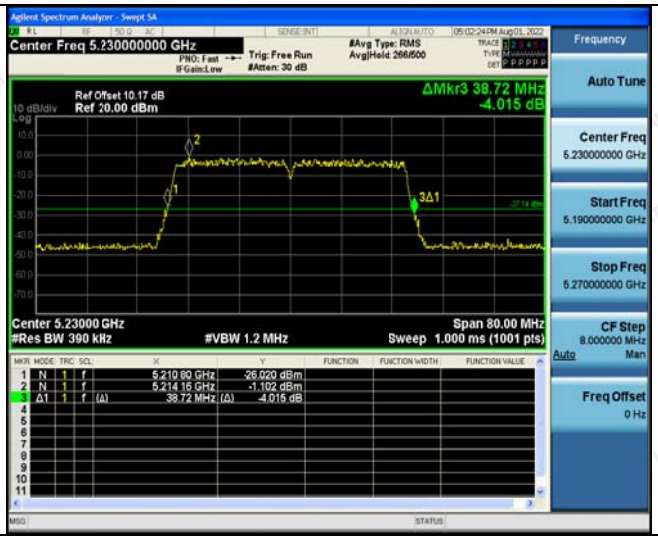
Low

Mid

High

802.11n(HT20)

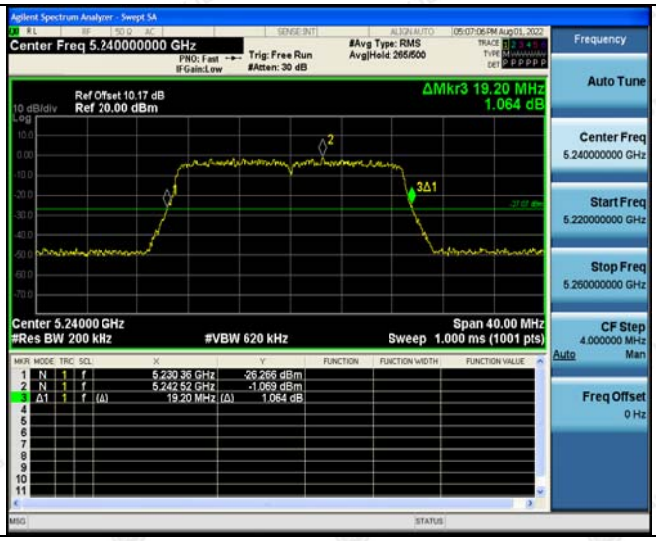
Low

Mid

High

802.11n(HT40)

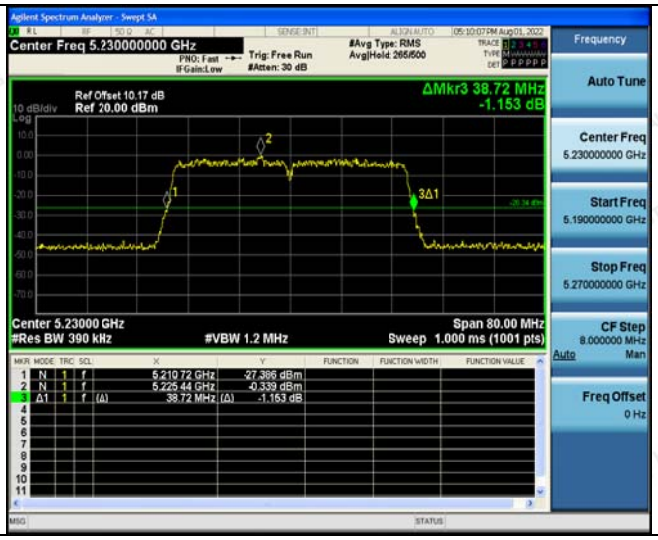
Low

High

802.11ac(HT20)

Low

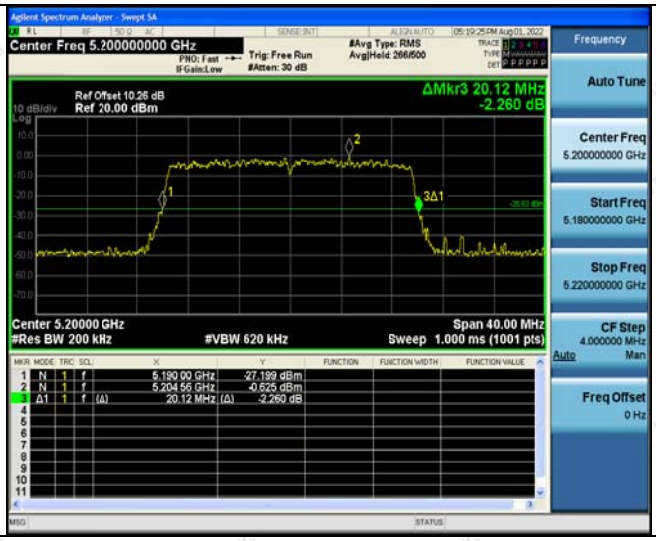
Mid

High

802.11ac(HT40)

Low

High

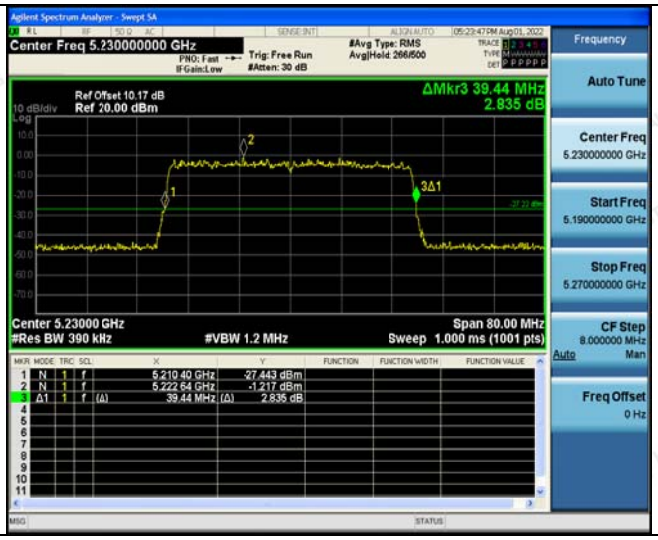
802.11ac(HT80)


802.11ax(HT20)

Low

Mid

High

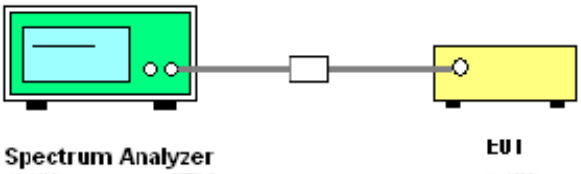
802.11ax(HT40)

Low

High

802.11ax(HT80)


4.5. POWER SPECTRAL DENSITY

4.5.1. Test Specification

Test Requirement:	FCC Part15 E Section 15.407 (a)
Test Method:	KDB789033 D02 General UNII Test Procedures New Rules v02r01 Section F
Limit:	17dBm/MHz for Band I 5150MHz-5250MHz
Test Setup:	
Test Mode:	Transmitting mode with modulation
Test Procedure:	1. Set the spectrum analyzer or EMI receiver span to view the entire emission bandwidth. 2. Set RBW =1 MHz, VBW ≥ 3*RBW, Sweep time = Auto, Detector = RMS. 3. Allow the sweeps to continue until the trace stabilizes. 4. Use the peak marker function to determine the maximum amplitude level. 5. The E.I.R.P spectral density used radiated test method. At a test site that has been validated using the procedures of ANSI C63.4 or the latest CISPR 16-1-4 for measurements above 1 GHz, so as to simulate a near free-space environment.
Test Result:	PASS

4.5.2. Test Instruments

RF Test Room					
Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Date**	**Calibration Due**
Spectrum analyzer	Agilent	N9020A	HKE-048	Feb. 18, 2022	Feb. 17, 2023
RF cable	Times	1-40G	HKE-034	Feb. 18, 2022	Feb. 17, 2023
RF automatic control unit	Tonscend	JS0806-2	HKE-060	Feb. 18, 2022	Feb. 17, 2023

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

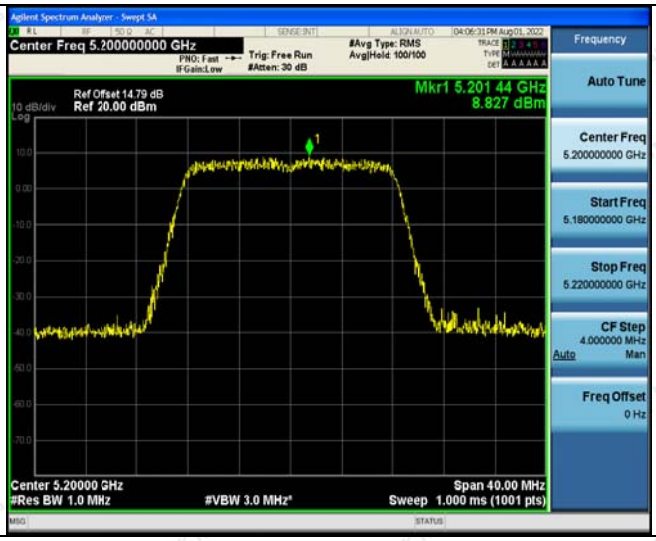
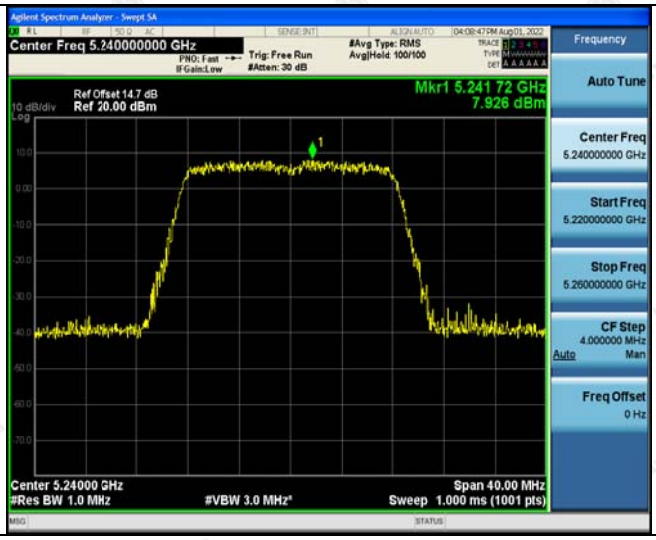
4.5.3. Test data

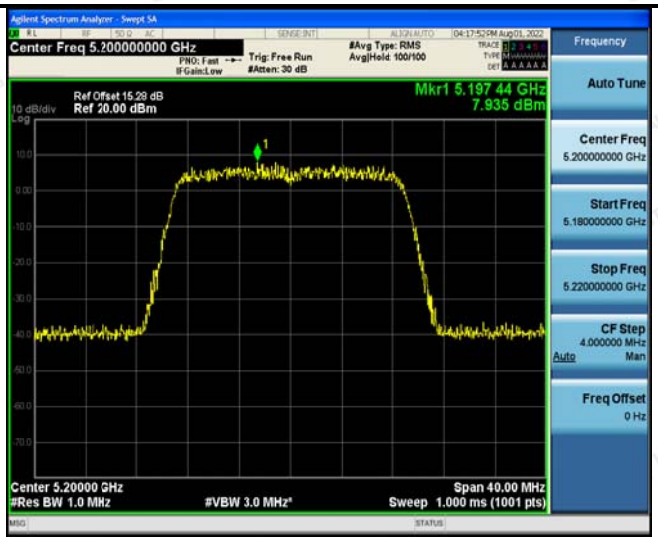
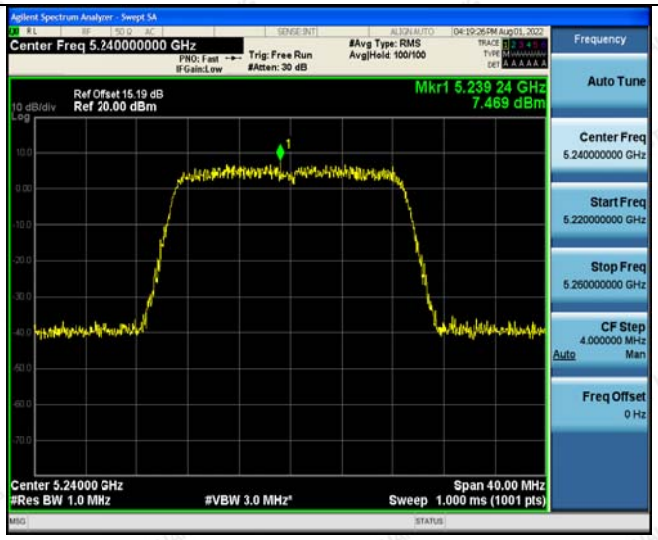
ANT 1

Configuration Band I (5150 - 5250 MHz)				
Mode	Test channel	Level [dBm/MHz]	Limit (dBm/MHz)	Result
11a	CH36	8.3	17	PASS
11a	CH40	8.83	17	PASS
11a	CH48	7.93	17	PASS
11n(HT20)	CH36	8.18	17	PASS
11n(HT20)	CH40	7.94	17	PASS
11n(HT20)	CH48	7.47	17	PASS
11n(HT40)	CH38	8.26	17	PASS
11n(HT40)	CH46	8.05	17	PASS
11ac(HT20)	CH36	9.29	17	PASS
11ac(HT20)	CH40	8.91	17	PASS
11ac(HT20)	CH48	7.55	17	PASS
11ac(HT40)	CH38	8.17	17	PASS
11ac(HT40)	CH46	8.57	17	PASS
11ac(HT80)	CH42	7.17	17	PASS
11ax(HT20)	CH36	8.95	17	PASS
11ax(HT20)	CH40	9.12	17	PASS
11ax(HT20)	CH48	8.97	17	PASS
11ax(HT40)	CH38	8.59	17	PASS
11ax(HT40)	CH46	8.91	17	PASS
11ax(HT80)	CH42	7.27	17	PASS

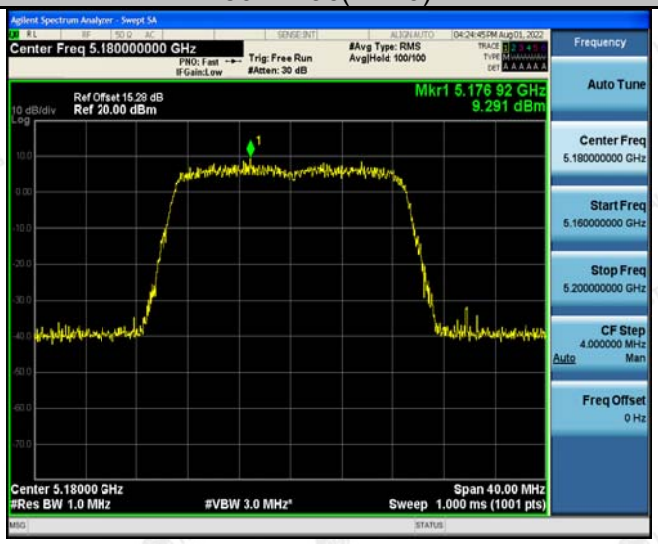
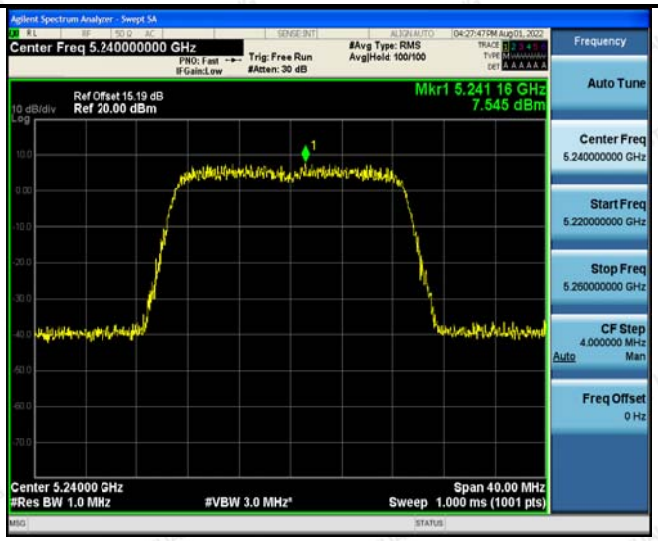
Test plots as follows:
Band I （5150 – 5250 MHz）

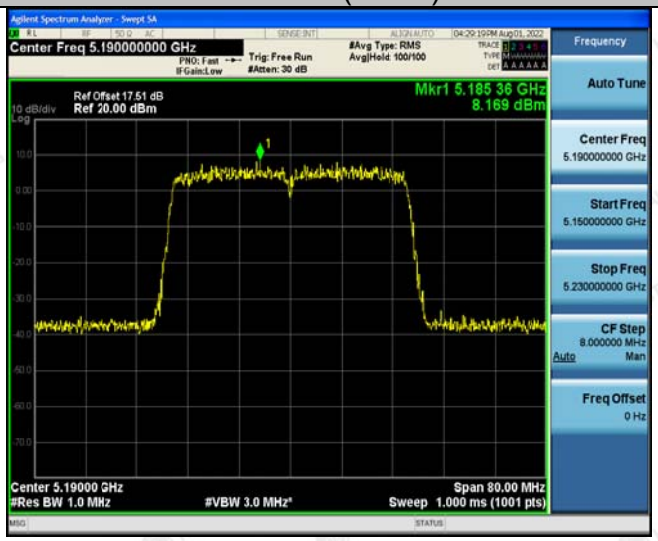
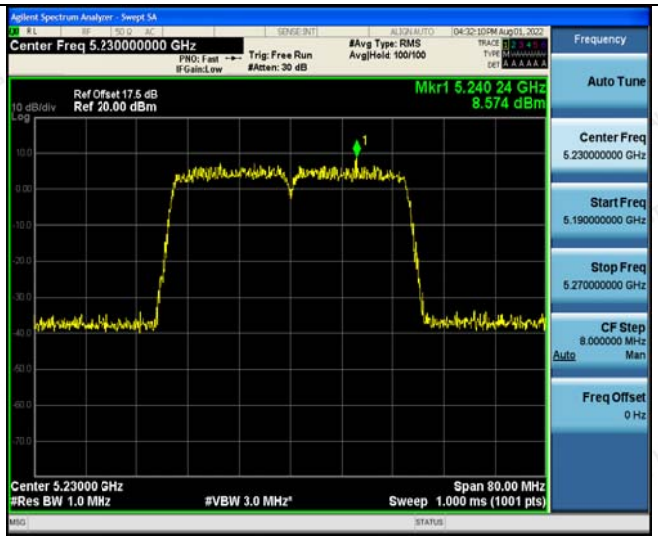
802.11a

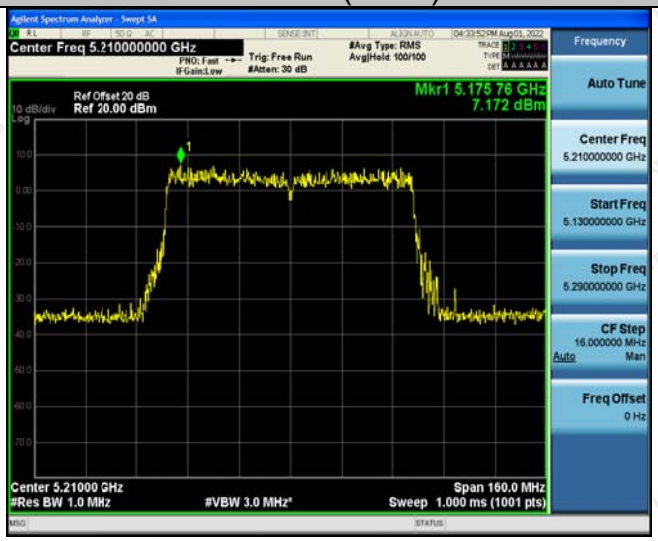
Low

Mid

High

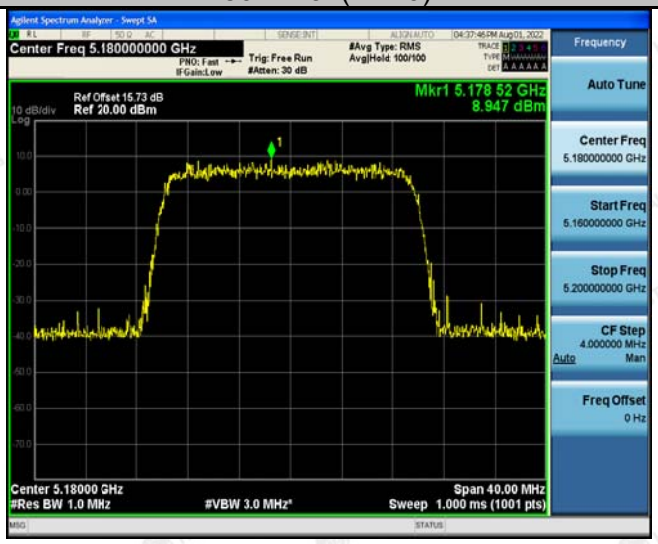
802.11n(HT20)
 Low
 Mid
 High

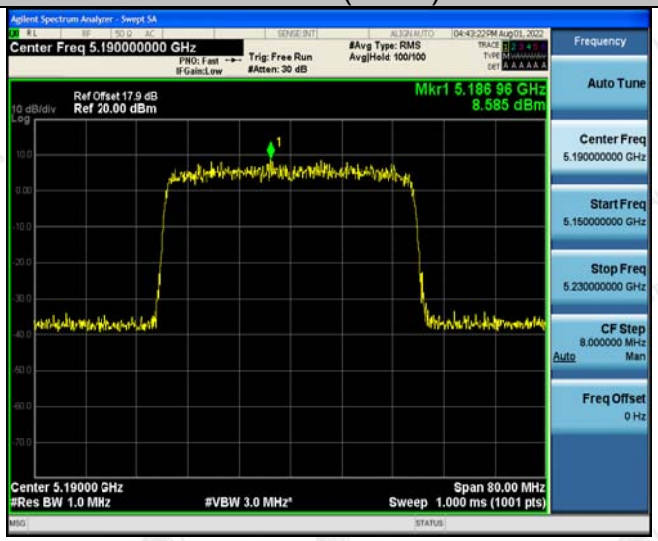
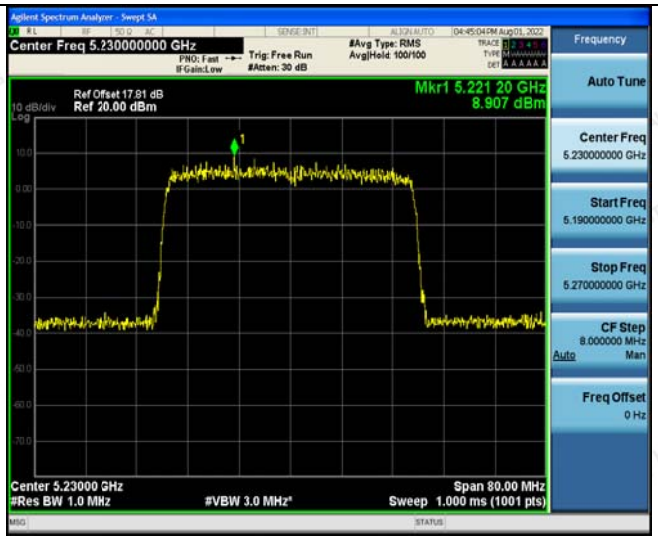
802.11n(HT40)
 Low
 High

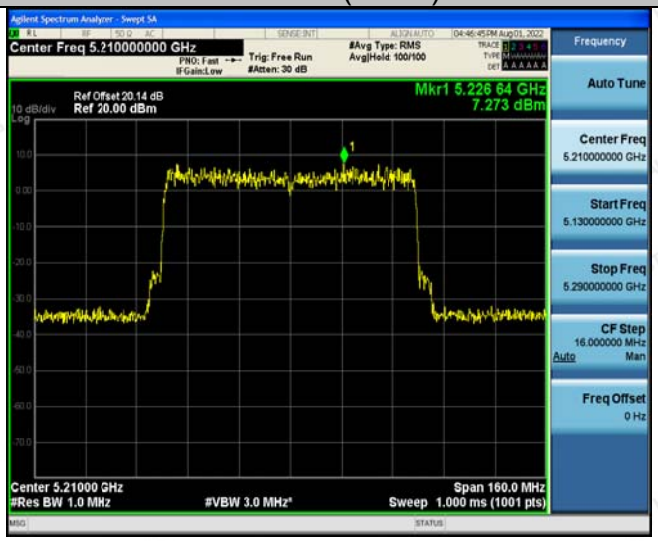
802.11ac(HT20)
 Low
 Mid
 High

802.11ac(HT40)
 Low
 High

802.11ac(HT80)

Low

802.11ax(HT20)
 Low
 Mid
 High

802.11ax(HT40)
 Low
 High

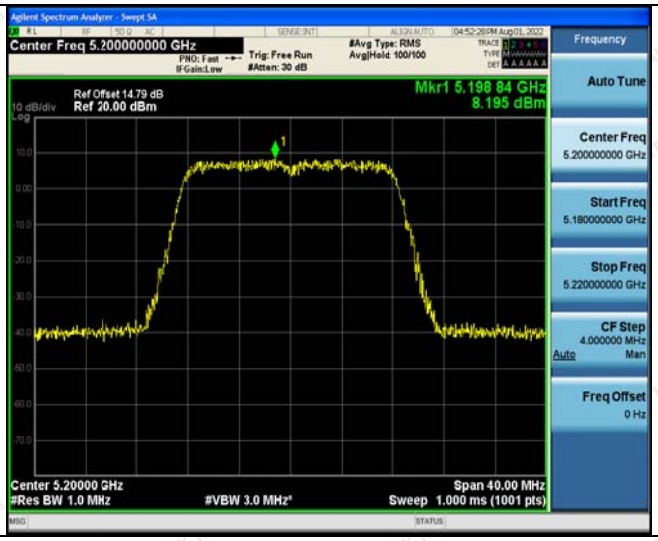
802.11ax(HT80)

Low

ANT 2

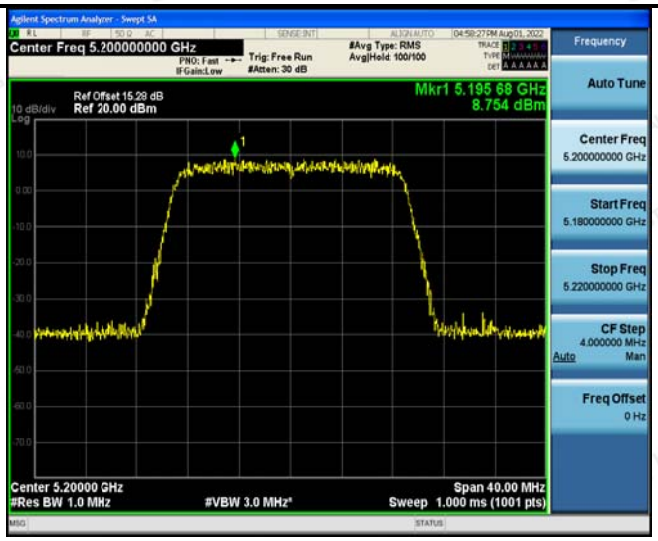
Configuration Band I (5150 - 5250 MHz)				
Mode	Test channel	Level [dBm/MHz]	Limit (dBm/MHz)	Result
11a	CH36	8.03	17	PASS
11a	CH40	8.2	17	PASS
11a	CH48	7.75	17	PASS
11n(HT20)	CH36	9.91	17	PASS
11n(HT20)	CH40	8.75	17	PASS
11n(HT20)	CH48	9.04	17	PASS
11n(HT40)	CH38	9.1	17	PASS
11n(HT40)	CH46	8.46	17	PASS
11ac(HT20)	CH36	9.95	17	PASS
11ac(HT20)	CH40	8.76	17	PASS
11ac(HT20)	CH48	9	17	PASS
11ac(HT40)	CH38	8.98	17	PASS
11ac(HT40)	CH46	8.51	17	PASS
11ac(HT80)	CH42	8.74	17	PASS
11ax(HT20)	CH36	9.51	17	PASS
11ax(HT20)	CH40	9.76	17	PASS
11ax(HT20)	CH48	9.16	17	PASS
11ax(HT40)	CH38	8.25	17	PASS
11ax(HT40)	CH46	7.98	17	PASS
11ax(HT80)	CH42	8.31	17	PASS

Test plots as follows:
Band I （5150 – 5250 MHz）

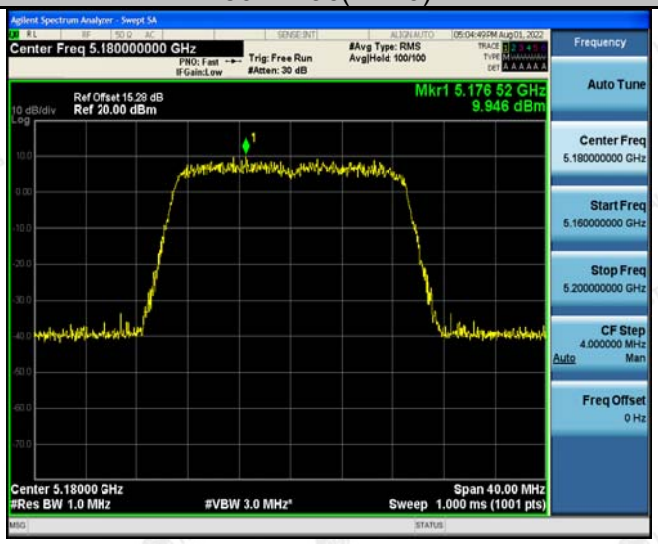
802.11a

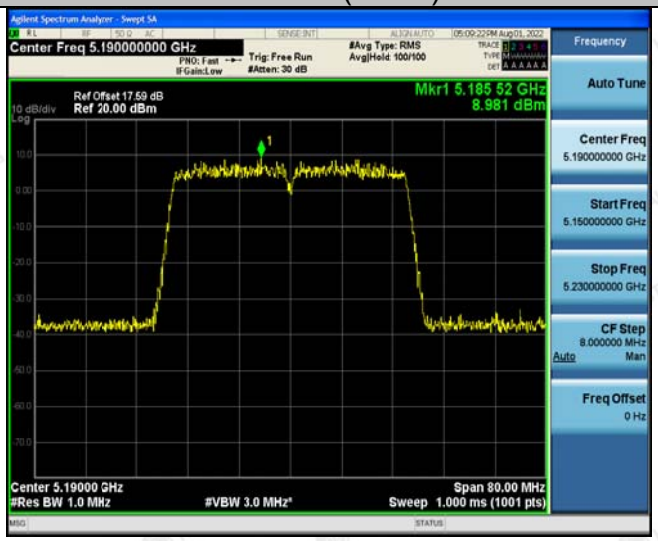
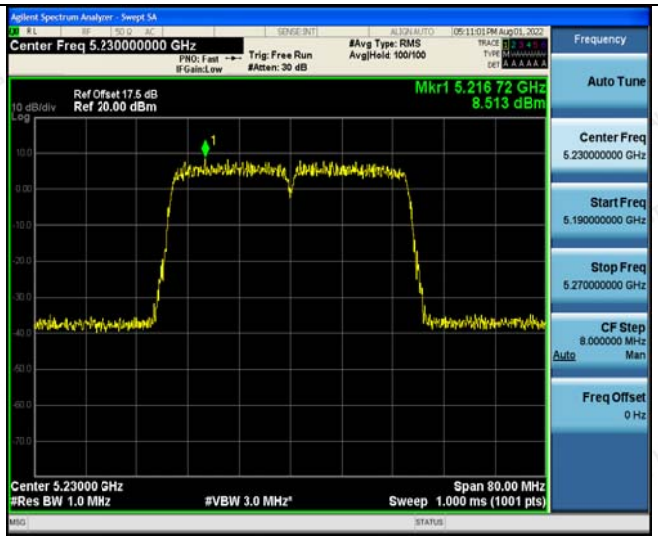
Low

Mid

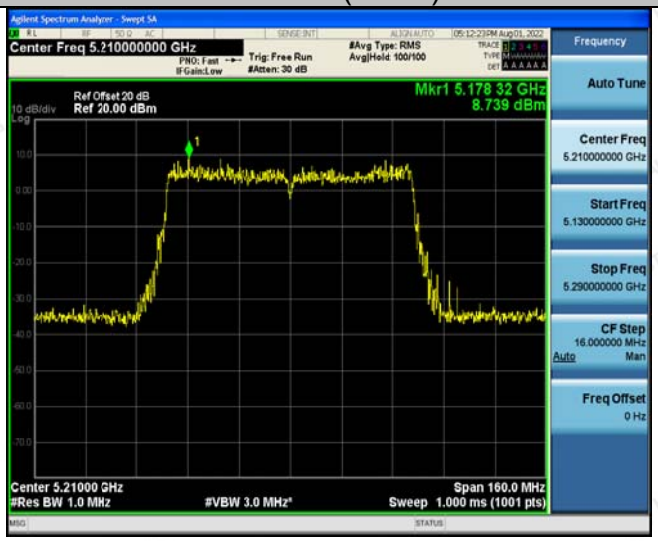
High

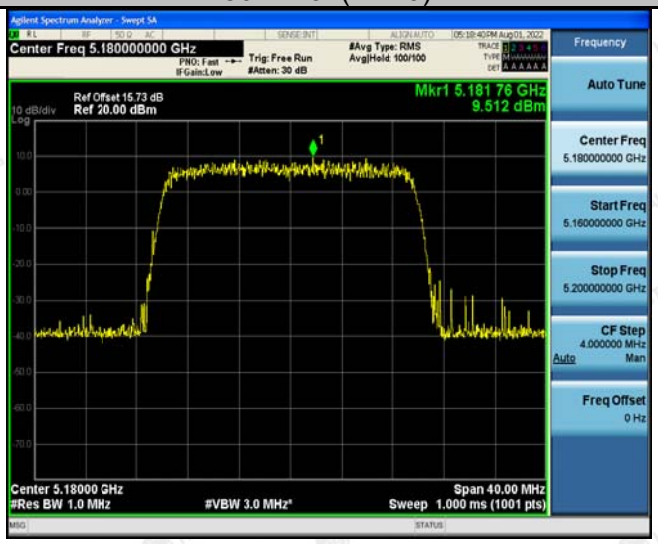
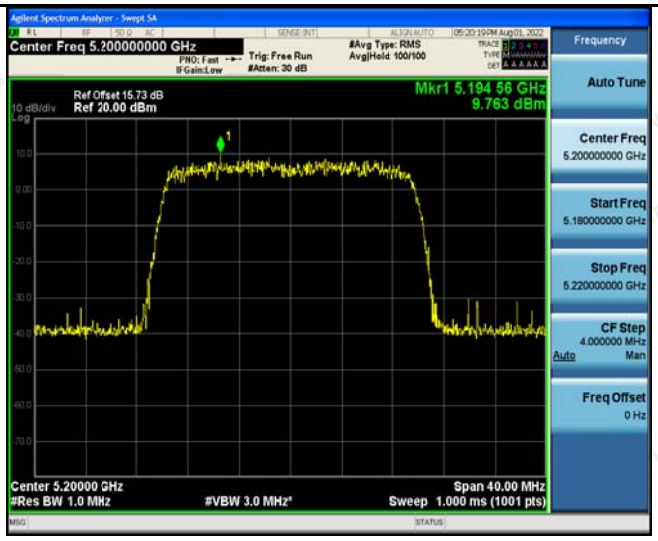
802.11n(HT20)
 Low
 Mid
 High

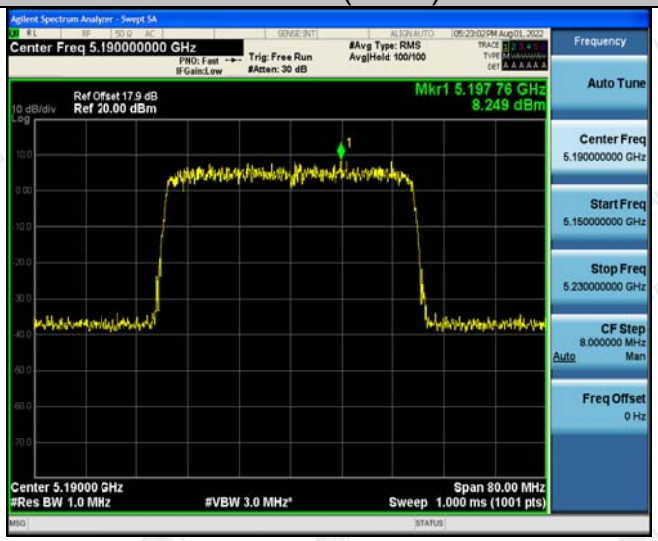
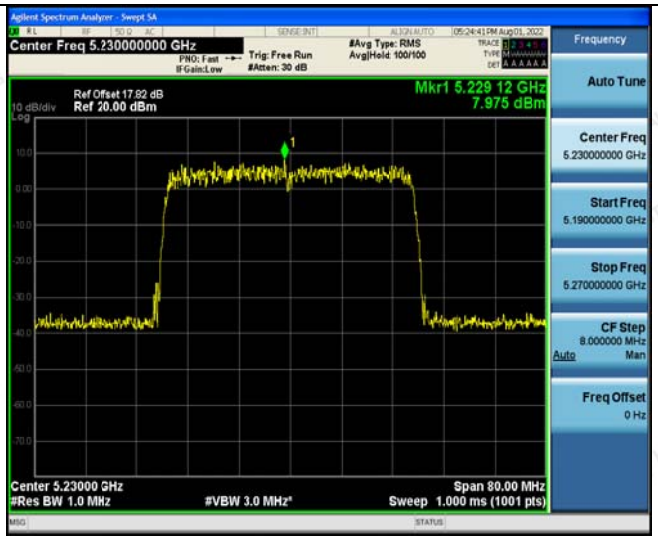
802.11n(HT40)
 Low
 High

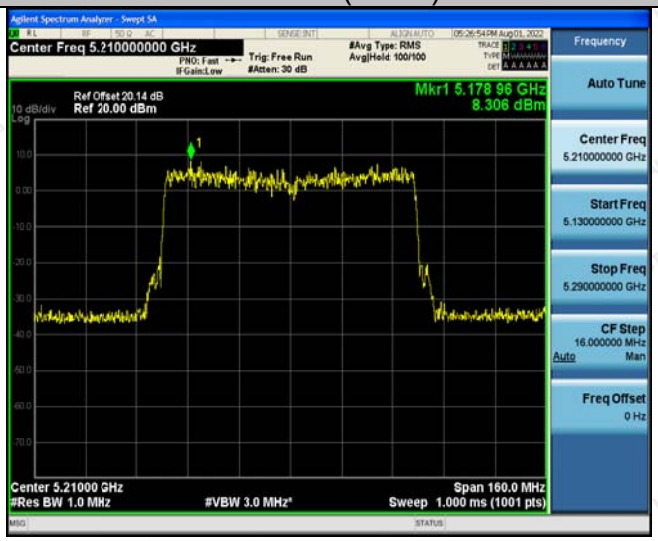
802.11ac(HT20)
 Low
 Mid
 High

802.11ac(HT40)
 Low
 High

802.11ac(HT80)

Low

802.11ax(HT20)
 Low
 Mid
 High

802.11ax(HT40)
 Low
 High

802.11ax(HT80)

Low

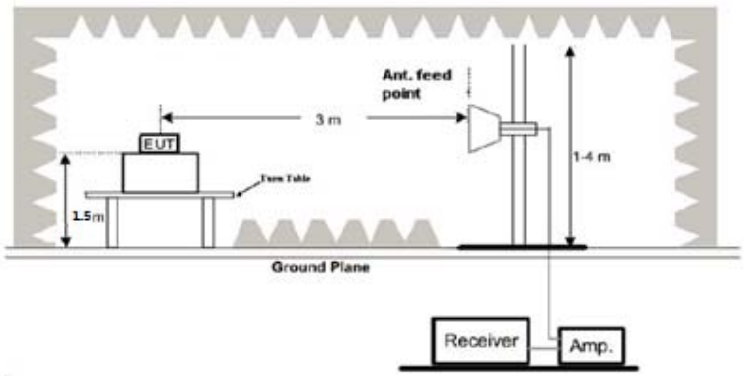
For MIMO antenna port 1+antenna port 2

Configuration Band IV (5150 - 5250MHz)				
Mode	Test channel	**Power Density (dBm)**	**Limit (dBm/MHz)**	**Result**
11n(HT20)	CH36	12.14	17	**PASS**
11n(HT20)	CH40	11.37	17	**PASS**
11n(HT20)	CH48	11.34	17	**PASS**
11n(HT40)	CH38	11.71	17	**PASS**
11n(HT40)	CH46	11.27	17	**PASS**
11ac(HT20)	CH36	12.64	17	**PASS**
11ac(HT20)	CH40	11.85	17	**PASS**
11ac(HT20)	CH48	11.35	17	**PASS**
11ac(HT40)	CH38	11.60	17	**PASS**
11ac(HT40)	CH46	11.55	17	**PASS**
11ac(HT80)	CH42	11.04	17	**PASS**
11ax(HT20)	CH36	12.25	17	**PASS**
11ax(HT20)	CH40	12.46	17	**PASS**
11ax(HT20)	CH48	12.08	17	**PASS**
11ax(HT40)	CH38	11.43	17	**PASS**
11ax(HT40)	CH46	11.48	17	**PASS**
11ax(HT80)	CH42	10.83	17	**PASS**
	Note: 1 According to KDB 662911, Result power = $10\log(10^{(ant1/10)}+10^{(ant2/10)})$. 2 Result unit: W, The end result is converted to units of dBm. limit=17dBm-(direction gain-6dBi)=17dBm			

Note: This product supports antenna 1 and antenna 2 launch, but only support 802.11 n/ac/ax for MIMO mode, not support 802.11 a for MIMO mode.

4.6. BAND EDGE

4.6.1. Test Specification

Test Requirement:	FCC CFR47 Part 15E Section 15.407
Test Method:	ANSI C63.10 2013
Limit:	(1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz. (2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of-27 dBm/MHz. (3) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of-27 dBm/MHz. (4) For transmitters operating in the 5.725-5.85 GHz band: (i) All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge. The limit of frequency below 1GHz and which fall in restricted bands should complies 15.209.
Test Setup:	
Test Mode:	Transmitting mode with modulation

Test Procedure:	1. The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation. 2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. 3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. 4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading. 5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi peak or average method as specified and then reported in a data sheet.
Test Result:	PASS

4.6.2. Test Instruments

Radiated Emission Test Site (966)					
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Date**	**Calibration Due**
Receiver	R&S	ESRP3	HKE-005	Feb. 18, 2022	Feb. 17, 2023
Spectrum analyzer	Agilent	N9020A	HKE-048	Feb. 18, 2022	Feb. 17, 2023
Preamplifier	EMCI	EMC051845SE	HKE-015	Feb. 18, 2022	Feb. 17, 2023
Preamplifier	Agilent	83051A	HKE-016	Feb. 18, 2022	Feb. 17, 2023
Loop antenna	Schwarzbeck	FMZB 1519 B	HKE-014	Feb. 18, 2022	Feb. 17, 2023
Broadband antenna	Schwarzbeck	VULB 9163	HKE-012	Feb. 18, 2022	Feb. 17, 2023
Horn antenna	Schwarzbeck	9120D	HKE-013	Feb. 18, 2022	Feb. 17, 2023
Antenna Mast	Keleto	CC-A-4M	N/A	N/A	N/A
Position controller	Taiwan MF	MF7802	HKE-011	Feb. 18, 2022	Feb. 17, 2023
Radiated test software	Tonscend	TS+ Rev 2.5.0.0	HKE-082	N/A	N/A
RF cable (9KHz-1GHz)	Times	381806-001	N/A	N/A	N/A
Hf antenna	Schwarzbeck	LB-180400-KF	HKE-031	Feb. 18, 2022	Feb. 17, 2023
RF cable	Tonscend	1-18G	HKE-099	Feb. 18, 2022	Feb. 17, 2023
RF cable	Times	1-40G	HKE-034	Feb. 18, 2022	Feb. 17, 2023
Horn Antenna	Schewarzbeck	BBHA 9170	HKE-017	Feb. 18, 2022	Feb. 17, 2023
Spectrum analyzer	R&S	FSP40	HKE-025	Feb. 18, 2022	Feb. 17, 2023

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

4.6.3. Test Data

ANT 1

Operation Mode: 802.11a Mode with 5.2G TX CH Low

Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
5150	54.02	-2.49	51.53	74	-22.47	peak
5150	/	-2.49	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
5150	52.39	-2.49	49.9	74	-24.1	peak
5150	/	-2.49	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Operation Mode: TX CH High with 5.2G

Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
5350	54.21	-2.11	52.1	74	-21.9	peak
5350	/	-2.11	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
5350	51.24	-2.11	49.13	74	-24.87	peak
5350	/	-2.11	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Operation Mode: 802.11n20 Mode with 5.2G TX CH Low

Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
5150	52.98	-2.49	50.49	74	-23.51	peak
5150	/	-2.49	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
5150	53.26	-2.49	50.77	74	-23.23	peak
5150	/	-2.49	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Operation Mode: TX CH High with 5.2G

Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
5350	53.69	-2.11	51.58	74	-22.42	peak
5350	/	-2.11	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
5350	52.69	-2.11	50.58	74	-23.42	peak
5350	/	-2.11	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Operation Mode: 802.11 n40 Mode with 5.2G TX CH Low

Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
5150	52.47	-2.49	49.98	74	-24.02	peak
5150	/	-2.49	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
5150	53.11	-2.49	50.62	74	-23.38	peak
5150	/	-2.49	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Operation Mode: TX CH High with 5.2G

Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
5350	53.98	-2.11	51.87	74	-22.13	peak
5350	/	-2.11	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
5350	52.47	-2.11	50.36	74	-23.64	peak
5350	/	-2.11	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Operation Mode: 802.11 ac20 Mode with 5.2G TX CH Low

Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
5150	53.49	-2.49	51	74	-23	peak
5150	/	-2.49	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
5150	52.47	-2.49	49.98	74	-24.02	peak
5150	/	-2.49	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Operation Mode: TX CH High with 5.2G

Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
5350	53.49	-2.11	51.38	74	-22.62	peak
5350	/	-2.11	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
5350	53.16	-2.11	51.05	74	-22.95	peak
5350	/	-2.11	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Operation Mode: 802.11 ac40 Mode with 5.2G TX CH Low

Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
5150	52.47	-2.49	49.98	74	-24.02	peak
5150	/	-2.49	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
5150	52.31	-2.49	49.82	74	-24.18	peak
5150	/	-2.49	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Operation Mode: TX CH High with 5.2G

Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
5350	54.21	-2.11	52.1	74	-21.9	peak
5350	/	-2.11	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
5350	53.49	-2.11	51.38	74	-22.62	peak
5350	/	-2.11	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Operation Mode: 802.11 ac80 Mode with 5.2G TX CH Low

Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
5150	52.47	-2.49	49.98	74	-24.02	peak
5150	/	-2.49	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
5150	53.16	-2.49	50.67	74	-23.33	peak
5150	/	-2.49	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						