



FCC Test Report

Test report
On Behalf of
Shenzhen Xmacaw Technology Co., LTD.
For

SMART HOME PROJECTOR

Model No.: SAIL 2, T4, G1, KP1, KP1 PRO, KP1 PLUS,
Meta-P2, SAIL 2 Pro, SAIL 3, SAIL 3 Pro, SAIL 5, SAIL 5 Pro, SAIL
6, SAIL 6 Pro, Soar 11, Soar 12, Soar 13, Soar 21, Soar 22, Soar
23, Q1, Q1 Pro, Q2, Q2 Pro, Q3, Q3 Pro, Q6, Q6 Pro, Q8, Q8 Pro,
KP2, KP2 Pro, KP3, KP3 Pro, KP1 mini, V1, V2, V3, V4, V5, V6,
V7, V8, V9, G2, G3, G4, G5, G6, G7, G8, G9, P1, P2, P3, P4, P5, P6,
P7, P8, P9, SAIL 1

FCC ID: 2BD4J-SAIL2

Prepared For : Shenzhen Xmacaw Technology Co., LTD.
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China

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Date of Test: Dec. 13, 2023 ~ Dec. 27, 2023

Date of Report: Dec. 27, 2023

Report Number: HK2312136074-E

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Test Result Certification

Applicant's name: Shenzhen Xmacaw Technology Co., LTD.

Address: 606, Lushi Industrial Building, 28 Zone, Xinan Street, Baoan District, Shenzhen, China

Manufacturer's Name: Shenzhen Xmacaw Technology Co., LTD.

Address: 606, Lushi Industrial Building, 28 Zone, Xinan Street, Baoan District, Shenzhen, China

Product description

Trade Mark: N/A

Product name.....: SMART HOME PROJECTOR

Model and/or type reference ..: SAIL 2, T4, G1, KP1, KP1 PRO, KP1 PLUS, Meta-P2, SAIL 2 Pro, SAIL 3, SAIL 3 Pro, SAIL 5, SAIL 5 Pro, SAIL 6, SAIL 6 Pro, Soar 11, Soar 12, Soar 13, Soar 21, Soar 22, Soar 23, Q1, Q1 Pro, Q2, Q2 Pro, Q3, Q3 Pro, Q6, Q6 Pro, Q8, Q8 Pro, KP2, KP2 Pro, KP3, KP3 Pro, KP1 mini, V1, V2, V3, V4, V5, V6, V7, V8, V9, G2, G3, G4, G5, G6, G7, G8, G9, P1, P2, P3, P4, P5, P6, P7, P8, P9, SAIL 1

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

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Date of Test.....:

Date (s) of performance of tests: Dec. 13, 2023 ~ Dec. 27, 2023

Date of Issue.....: Dec. 27, 2023

Test Result.....: Pass

Testing Engineer :

(Len Liao)

Technical Manager :

(Sliver Wan)

Authorized Signatory :

(Jason Zhou)

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**** Modified History ****

Revision	Description	Issued Data	Remark
Revision 1.0	Initial Test Report Release	Dec. 27, 2023	Jason Zhou



1. Test Result Summary

1.1. Test Procedures and Results

Requirement	CFR 47 Section	Result
Antenna requirement	§15.203/§15.247(b)(4)	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	§15.247(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. Information of the Test Laboratory

Shenzhen HUAKE 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 $y \pm U$, where expanded 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	$\pm 0.37\text{dB}$
2	RF power, conducted	$\pm 3.35\text{dB}$
3	Spurious emissions, conducted	$\pm 2.20\text{dB}$
4	All emissions, radiated(<1G)	$\pm 3.90\text{dB}$
5	All emissions, radiated(>1G)	$\pm 4.28\text{dB}$
6	Temperature	$\pm 0.1^{\circ}\text{C}$
7	Humidity	$\pm 1.0\%$



2. EUT Description

2.1. General Description of EUT

Equipment:	SMART HOME PROJECTOR
Model Name:	SAIL 2
Serial Model:	T4, G1, KP1, KP1 PRO, KP1 PLUS, Meta-P2, SAIL 2 Pro, SAIL 3, SAIL 3 Pro, SAIL 5, SAIL 5 Pro, SAIL 6, SAIL 6 Pro, Soar 11, Soar 12, Soar 13, Soar 21, Soar 22, Soar 23, Q1, Q1 Pro, Q2, Q2 Pro, Q3, Q3 Pro, Q6, Q6 Pro, Q8, Q8 Pro, KP2, KP2 Pro, KP3, KP3 Pro, KP1 mini, V1, V2, V3, V4, V5, V6, V7, V8, V9, G2, G3, G4, G5, G6, G7, G8, G9, P1, P2, P3, P4, P5, P6, P7, P8, P9, SAIL 1
Model Difference:	All model's the function, software and electric circuit are the same, only with a product color and model named different. Test sample model: SAIL 2.
Trade Mark:	N/A
FCC ID:	2BD4J-SAIL2
Antenna Type:	PCB Antenna
Antenna Gain:	Antenna 1:1.61dBi Antenna 2:4.77dBi MIMO: 6.48dBi
Operation frequency:	802.11b/g/n20: 2412~2462MHz 802.11n40: 2422~2452MHz
Number of Channels:	802.11b/g/n20: 11CH 802.11n40: 7CH
Modulation Type:	CCK/OFDM/DBPSK/DAPSK
Power Source:	DC 5V From USB
Power Rating:	DC 5V From USB
Hardware Version	V1.0
Software Version:	V1.0
Note: 1.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. Carrier Frequency of Channels

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

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

Note:

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

2.3. Operation of EUT During Testing

Operating Mode

The mode is used: Transmitting mode for 802.11b/802.11g/802.11n(HT20)

Low Channel: 2412MHz

Middle Channel: 2437MHz

High Channel: 2462MHz

The mode is used: Transmitting mode for 802.11n (HT40)

Low Channel: 2422MHz

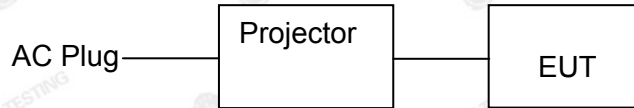
Middle Channel: 2437MHz

High Channel: 2452MHz



2.4. Description of Test Setup

Operation of EUT during testing:



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.



2.5. 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.

Item	Equipment	Trade Mark	Model/Type No.	Specification	Remark
1	SMART HOME PROJECTOR	N/A	SAIL 2	N/A	EUT
2	Projector	N/A	N/A	N/A	Accessory
3	Power Lne	N/A	N/A	Length:1.18m	Accessory
4	RF Cable	N/A	N/A	Length:0.1m	Peripheral

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.



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
<p>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.</p>	



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

Per-scan all kind of data rate in lowest channel, and found the follow list which it was worst case.

Mode	Data rate
802.11b	1Mbps
802.11g	6Mbps
802.11n(H20)	6.5Mbps
802.11n(H40)	13.5Mbps

Final Test Mode:

Operation mode:	Keep the EUT in continuous transmitting with modulation
-----------------	---

1. For WIFI function, the engineering test program was provided and enabled to make EUT continuous transmit/receive.

2. According to ANSI C63.10 standards, the test results are both the “worst case” and “worst setup” 1Mbps for 802.11b, 6Mbps for 802.11g, 6.5Mbps for 802.11n(H20), 13.5Mbps for 802.11n(H40).

3. Mode Test Duty Cycle

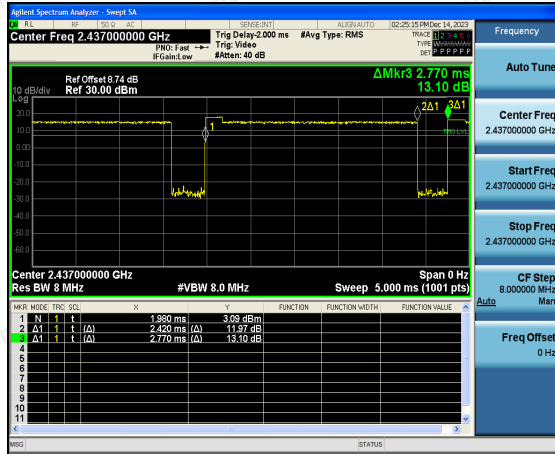
ANT.1:

Mode	Duty Cycle	Duty Cycle Factor (dB)
802.11b	0.87	-0.60
802.11g	0.95	-0.22
802.11n(H20)	0.91	-0.41
802.11n(H40)	0.81	-0.92

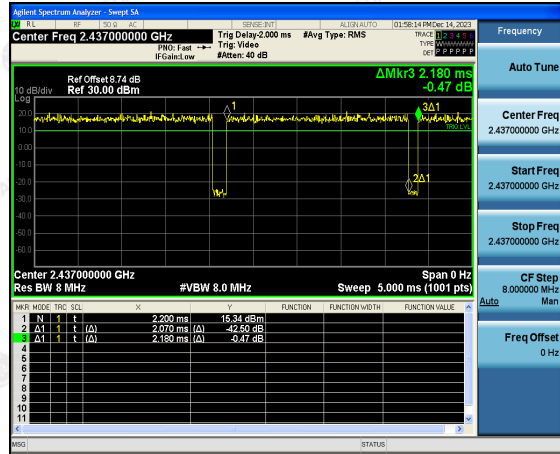
Test plots as follows:



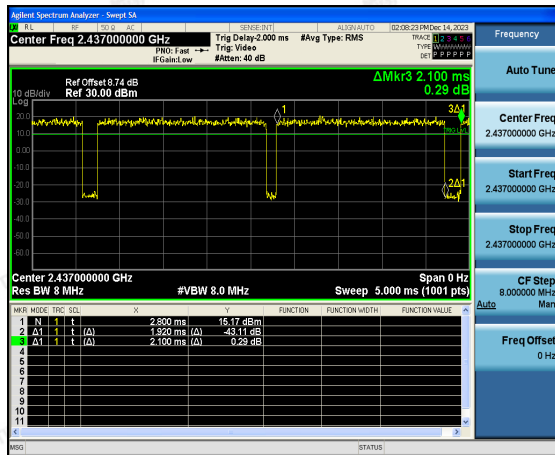
802.11b



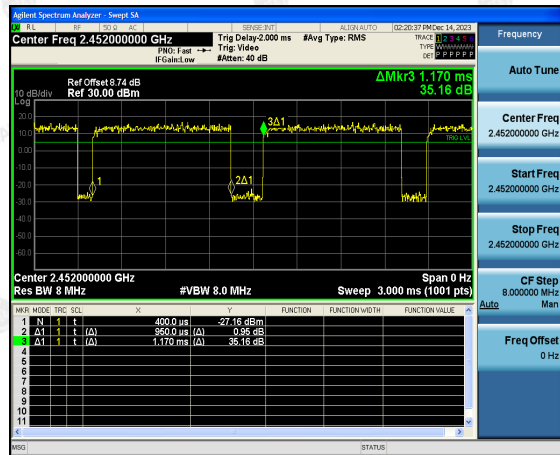
802.11g



802.11n(H20)



802.11n(H40)



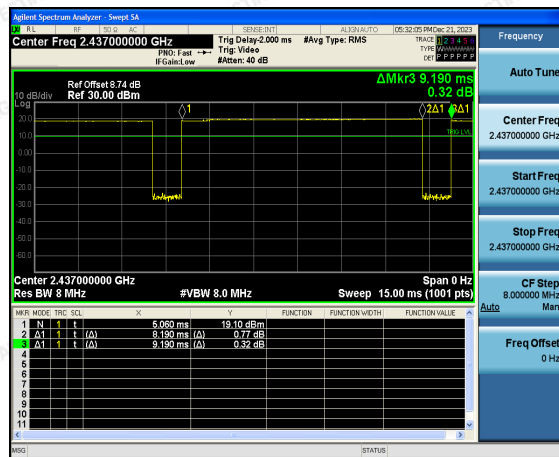


ANT.2:

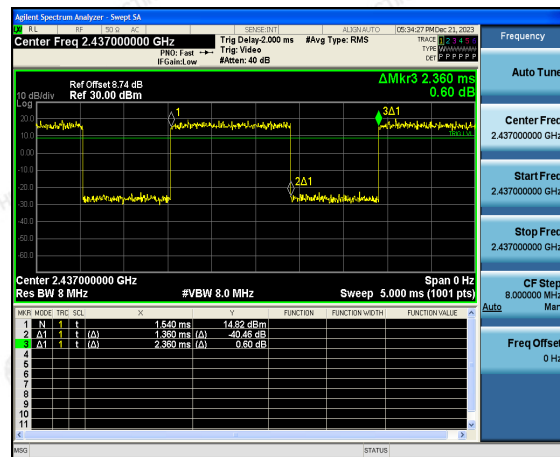
Mode	Duty Cycle	Duty Cycle Factor (dB)
802.11b	0.89	-0.51
802.11g	0.58	-2.37
802.11n(H20)	0.56	-2.52
802.11n(H40)	0.39	-4.09

Test plots as follows:

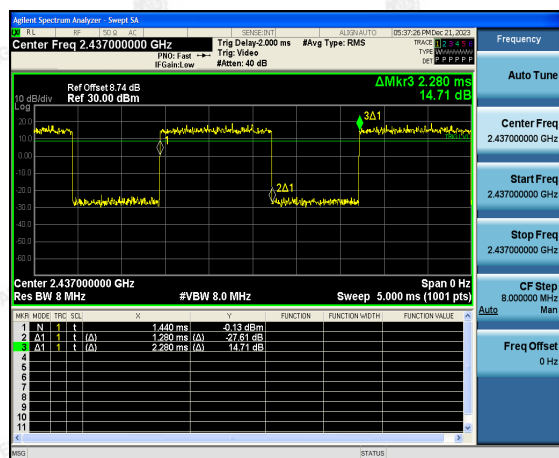
802.11b



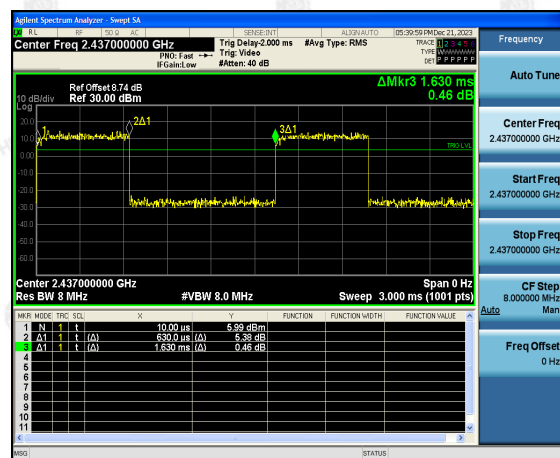
802.11g



802.11n(H20)



802.11n(H40)





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:	<table><tr><th rowspan="2">Frequency range (MHz)</th><th colspan="2">Limit (dBuV)</th></tr><tr><th>Quasi-peak</th><th>Average</th></tr><tr><td>0.15-0.5</td><td>66 to 56*</td><td>56 to 46*</td></tr><tr><td>0.5-5</td><td>56</td><td>46</td></tr><tr><td>5-30</td><td>60</td><td>50</td></tr></table>	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
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:	<div><p>Reference Plane</p><p>40cm</p><p>Test table/Insulation plane</p><p>80cm</p><p>LISN</p><p>Filter</p><p>AC power</p><p>EMI Receiver</p><p>Remark E.U.T: Equipment Under Test LISN: Line Impedance Stabilization Network Test table height=0.8m</p></div>														
Test Mode:	Charging + transmitting with modulation														
Test Procedure:	<div><div>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.</div><div>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).</div><div>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.</div></div>														
Test Result:	PASS														



4.1.2. Test Instruments

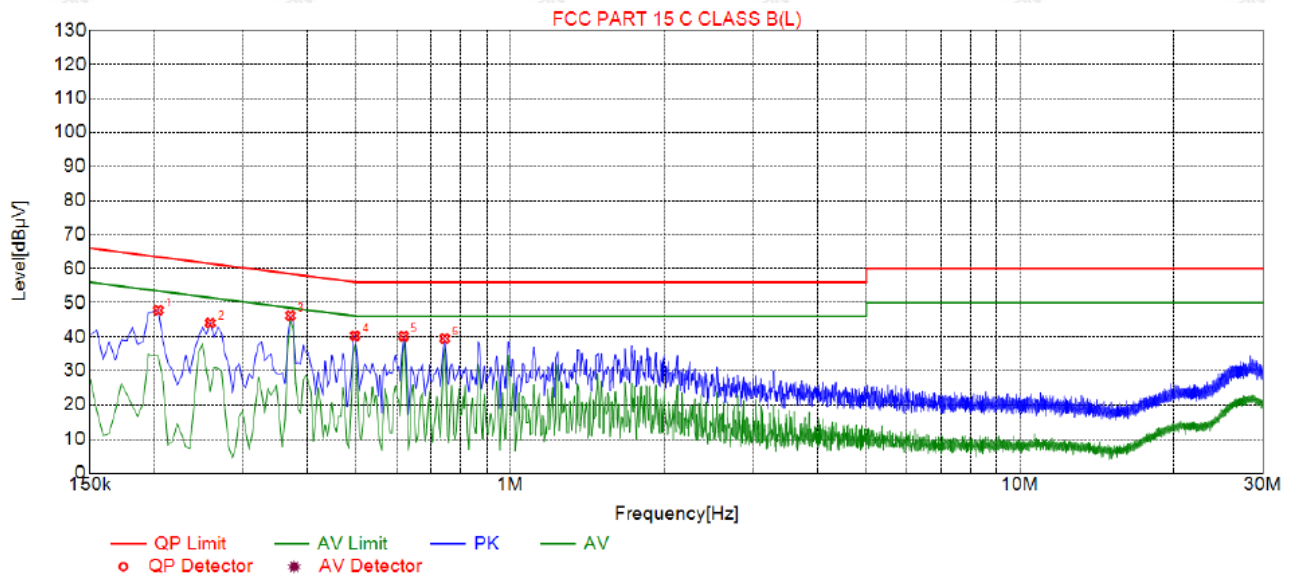
Conducted Emission Shielding Room Test Site (843)					
Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Receiver	R&S	ESR-7	HKE-005	Feb. 17, 2023	Feb. 16, 2024
LISN	R&S	ENV216	HKE-002	Feb. 17, 2023	Feb. 16, 2024
Coax cable (9KHz-30MHz)	Times	381806-002	N/A	Feb. 17, 2023	Feb. 16, 2024
10dB Attenuator	Schwarzbeck	VTSD956 1F	HKE-153	Feb. 17, 2023	Feb. 16, 2024
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	0.2040	47.81	20.04	63.45	15.64	35.77	PK	L
2	0.2580	44.05	20.04	61.50	17.45	32.01	PK	L
3	0.3705	46.21	20.05	58.49	12.28	34.16	PK	L
4	0.4965	40.30	20.04	56.06	15.76	28.26	PK	L
5	0.6180	40.18	20.05	56.00	15.82	28.13	PK	L
6	0.7440	39.49	20.06	56.00	16.51	27.43	PK	L

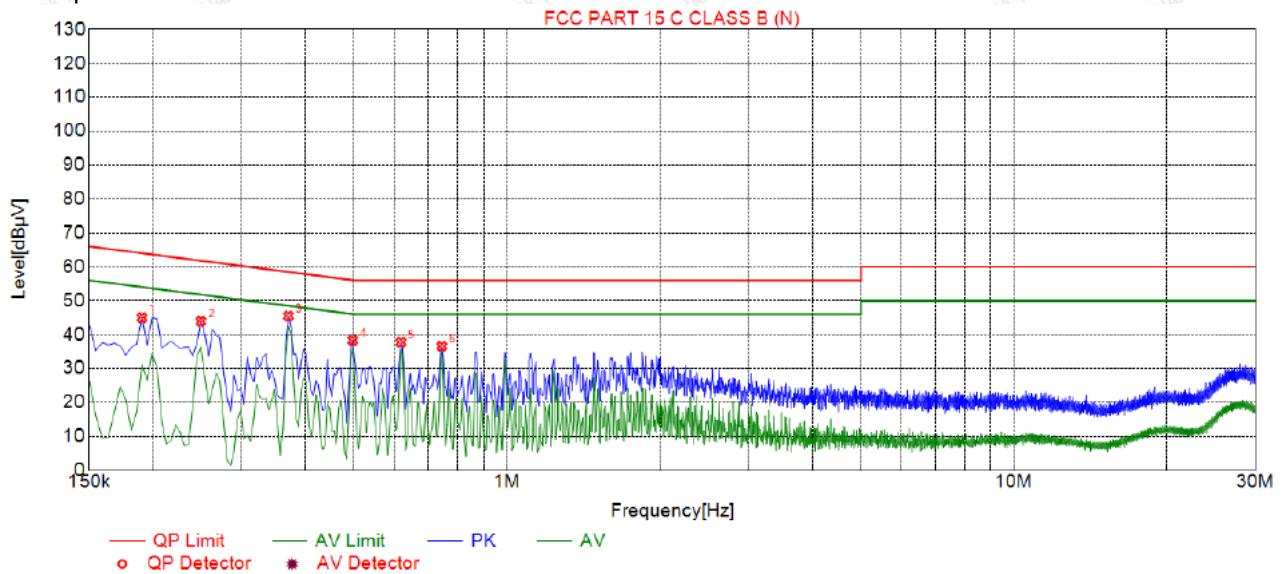
Remark: Margin = Limit – Level

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	45.01	20.04	64.01	19.00	34.97	PK	N
2	0.2490	43.96	20.04	61.79	17.83	33.92	PK	N
3	0.3705	45.47	20.05	58.49	13.02	35.42	PK	N
4	0.4965	38.32	20.04	56.06	17.74	28.28	PK	N
5	0.6180	37.76	20.05	56.00	18.24	27.71	PK	N
6	0.7440	36.57	20.06	56.00	19.43	26.51	PK	N

Remark: Margin = Limit – Level

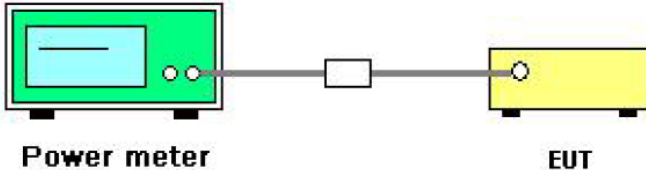
Correction factor = Cable lose + LISN insertion loss

Level=Test receiver reading + correction factor



4.2. Maximum Conducted Output Power

4.2.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (b)(3)
Test Method:	KDB 558074 D01 15.247 Meas Guidance v05r02
Limit:	30dBm
Test Setup:	 <p>The diagram illustrates the test setup. On the left is a green box labeled 'Power meter'. A line connects it to a small white box, which is then connected to a yellow box labeled 'EUT' (Equipment Under Test). The labels 'Power meter' and 'EUT' are placed below their respective boxes.</p>
Test Mode:	Transmitting mode with modulation
Test Procedure:	<ol style="list-style-type: none">1. The testing follows the Measurement Procedure of FCC KDB 558074 D01 15.247 Meas 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

4.2.2. Test Instruments

RF Test Room					
Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Power meter	Agilent	E4419B	HKE-085	Feb. 17, 2023	Feb. 16, 2024
Power Sensor	Agilent	E9300A	HKE-086	Feb. 17, 2023	Feb. 16, 2024
RF cable	Times	1-40G	HKE-034	Feb. 17, 2023	Feb. 16, 2024
RF automatic control unit	Tonscend	JS0806-2	HKE-060	Feb. 17, 2023	Feb. 16, 2024

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**

Mode	Test channel	Frequency (MHz)	Reading Conducted Output Power (dBm)			Limit (dBm)	Result
			Antenna port 1	Antenna port 2	MIMO		
802.11b	CH01	2412	13.79	11.78		30	PASS
802.11b	CH06	2437	13.57	10.23		30	PASS
802.11b	CH11	2462	14.36	13.61		30	PASS
802.11g	CH01	2412	13.28	11.25		30	PASS
802.11g	CH06	2437	13.00	12.47		30	PASS
802.11g	CH11	2462	13.22	12.23		30	PASS
802.11n(HT20)	CH01	2412	13.21	12.02	15.67	30	PASS
802.11n(HT20)	CH06	2437	12.82	12.46	15.65	30	PASS
802.11n(HT20)	CH11	2462	13.05	12.22	15.67	30	PASS
802.11n(HT40)	CH03	2422	13.52	12.26	15.95	30	PASS
802.11n(HT40)	CH06	2437	12.77	12.16	15.49	30	PASS
802.11n(HT40)	CH09	2452	12.70	12.05	15.40	30	PASS


Note: 1.The test results including the cable lose.

2. This product supports antenna 1 and antenna 2 launch, but only support 802.11 n for MIMO mode, not support 802.11 b and 802.11 g for MIMO mode.



4.3. Emission Bandwidth

4.3.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (a)(2)
Test Method:	KDB 558074 D01 15.247 Meas Guidance v05r02
Limit:	>500kHz
Test Setup:	 Spectrum Analyzer EUT
Test Mode:	Transmitting mode with modulation
Test Procedure:	<ol style="list-style-type: none">1. The testing follows FCC KDB Publication No. 558074 D01 15.247 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

4.3.2. Test Instruments

RF Test Room					
Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Spectrum analyzer	Agilent	N9020A	HKE-048	Feb. 17, 2023	Feb. 16, 2024
RF Cable (9KHz-26.5GHz)	Tonscend	170660	N/A	Feb. 17, 2023	Feb. 16, 2024
RF automatic control unit	Tonscend	JS0806-2	HKE-060	Feb. 17, 2023	Feb. 16, 2024

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

For antenna port 1

Test channel	6dB Emission Bandwidth (MHz)			
	802.11b	802.11g	802.11n (HT20)	802.11n (HT40)
Lowest	10.00	14.64	17.04	34.96
Middle	10.04	15.04	17.00	35.04
Highest	10.08	15.08	17.52	35.04
Limit:	>500KHz			
Test Result:	PASS			

Test plots as follows:



802.11b Modulation

Lowest channel



Middle channel



Highest channel



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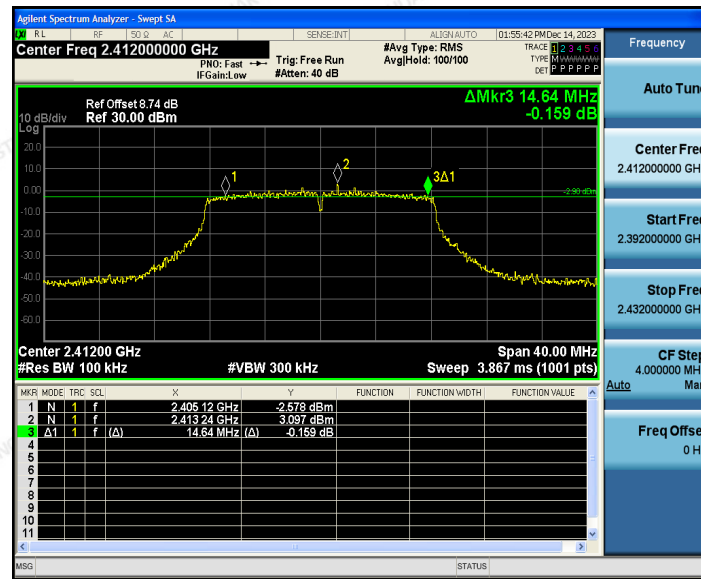
TEL : +86-755 2302 9901 FAX : +86-755 2302 9901 E-mail : service@cer-mark.com

Add: 1-2F., Building B2, Junfeng Zhongcheng Zhizao Innovation Park, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China

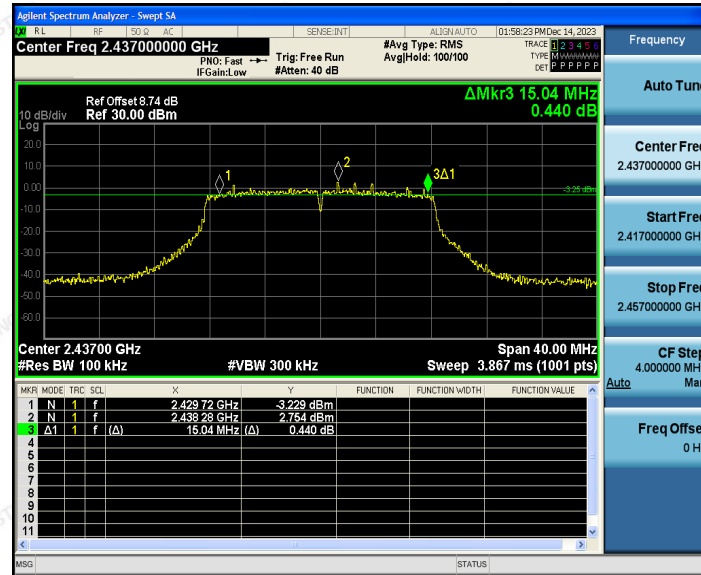


802.11g Modulation

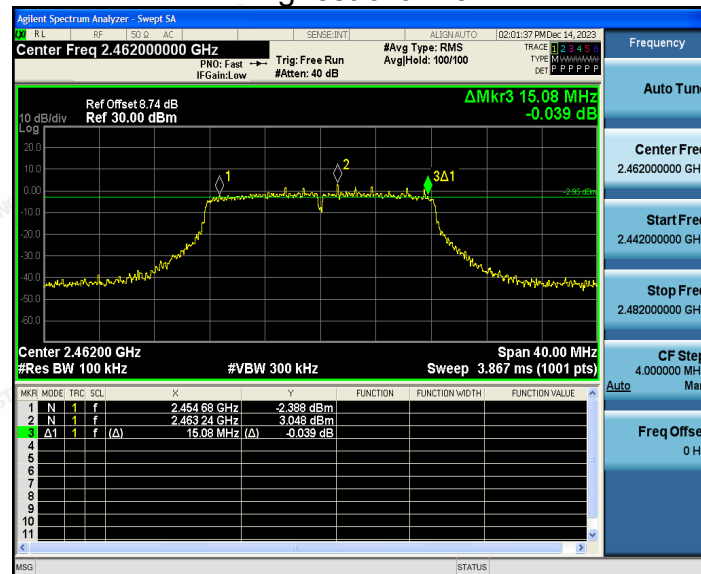
Lowest channel



Middle channel



Highest channel



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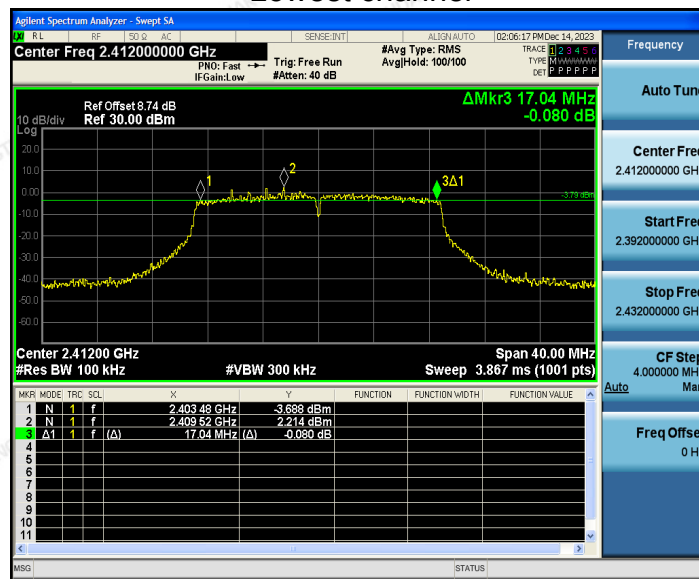
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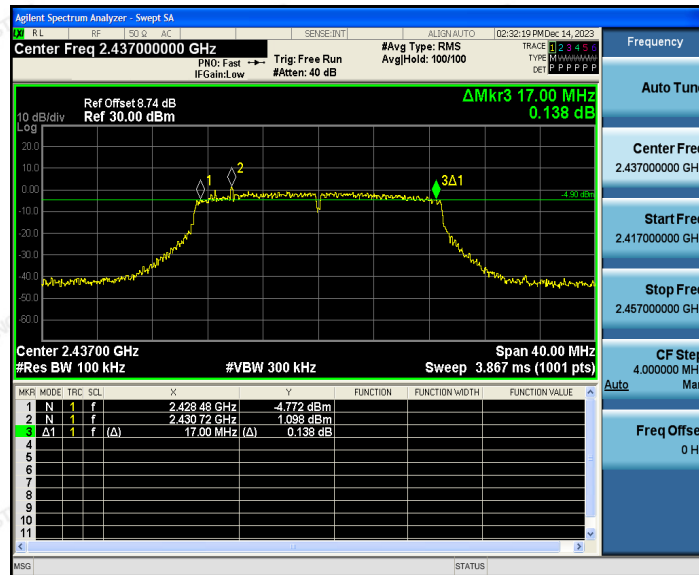


802.11n (HT20) Modulation

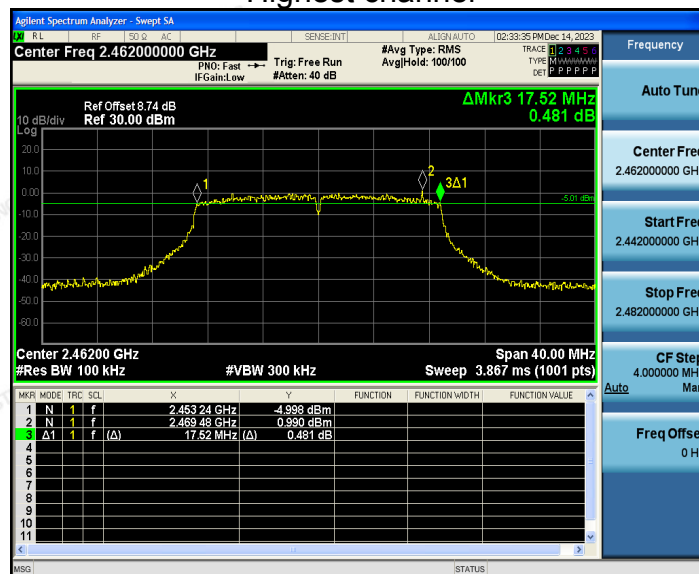
Lowest channel



Middle channel



Highest channel



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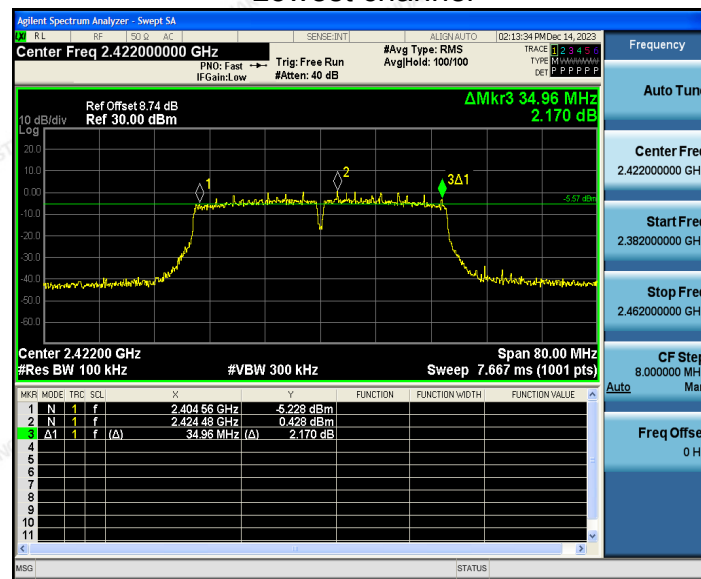
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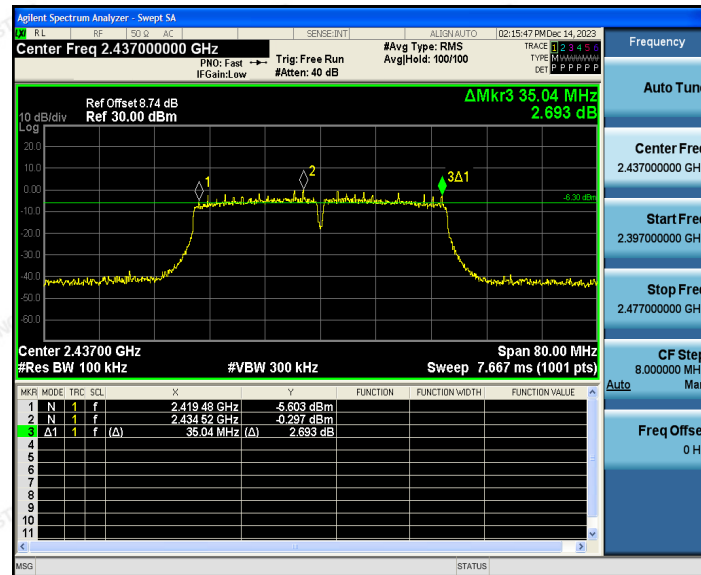


802.11n (HT40) Modulation

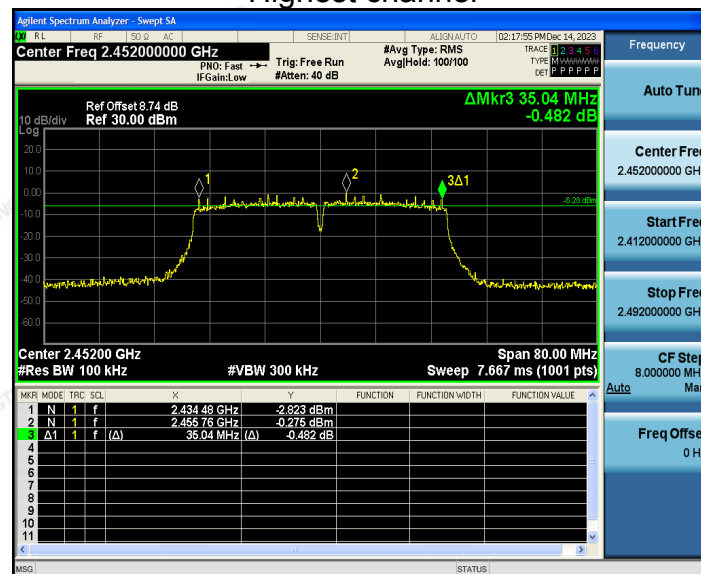
Lowest channel



Middle channel



Highest channel



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**For antenna port 2**

Test channel	6dB Emission Bandwidth (MHz)			
	802.11b	802.11g	802.11n (HT20)	802.11n (HT40)
Lowest	10.08	16.56	17.80	36.32
Middle	10.00	16.52	17.80	36.40
Highest	10.00	16.56	17.80	36.40
Limit:	>500KHz			
Test Result:	PASS			

Test plots as follows:



802.11b Modulation

Lowest channel



Middle channel



Highest channel



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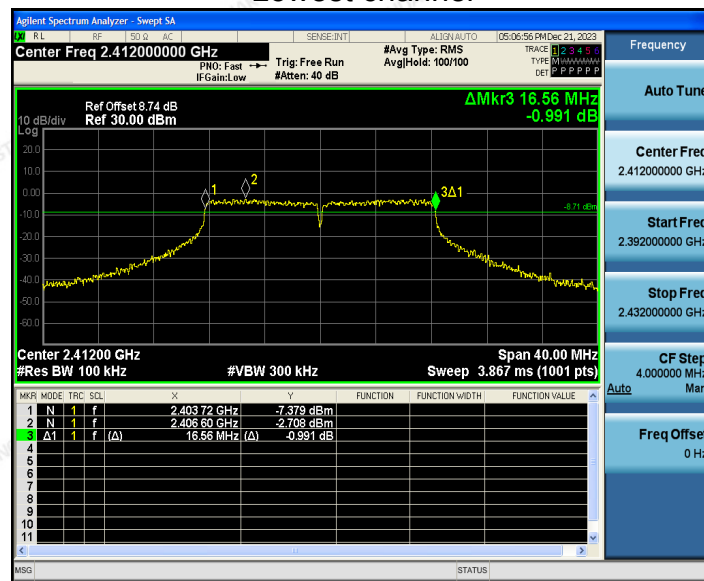
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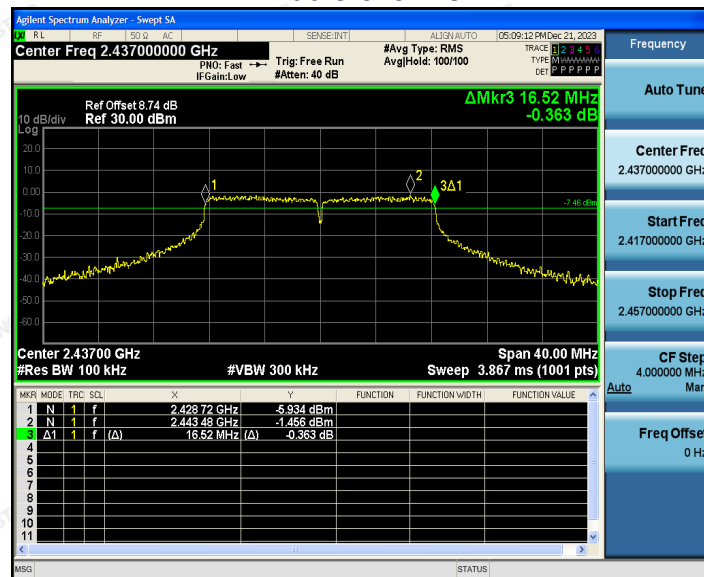


802.11g Modulation

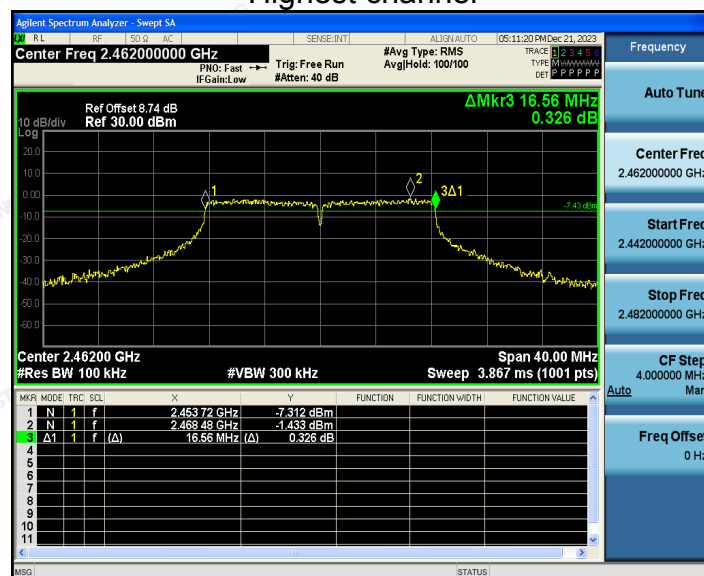
Lowest channel



Middle channel



Highest channel



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802.11n (HT20) Modulation

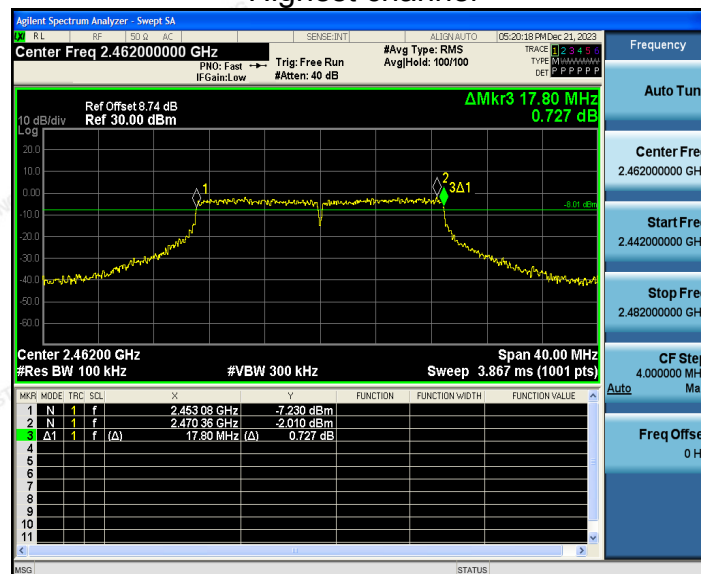
Lowest channel



Middle channel



Highest channel



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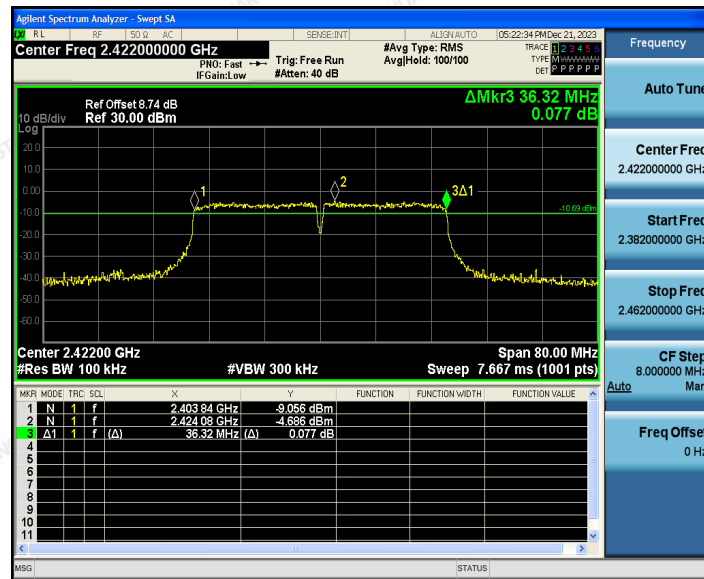
TEL : +86-755 2302 9901 FAX : +86-755 2302 9901 E-mail : service@cer-mark.com

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802.11n (HT40) Modulation

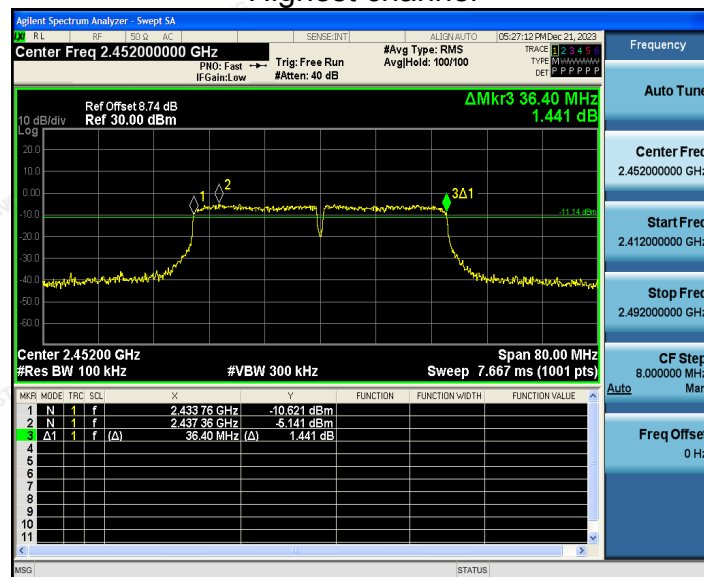
Lowest channel



Middle channel



Highest channel



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4.4. Power Spectral Density

4.4.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (e)
Test Method:	KDB 558074 D01 15.247 Meas Guidance v05r02
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:	<div><p>The diagram illustrates the test setup. On the left is a green Spectrum Analyzer. A cable connects it to a small white rectangular attenuator. Another cable connects the attenuator to a yellow rectangular Equipment Under Test (EUT) on the right.</p></div>
Test Mode:	Transmitting mode with modulation
Test Procedure:	<ol style="list-style-type: none">1. The testing follows Measurement procedure 10.2 method PKPSD of FCC KDB Publication No. 558074 D01 15.247 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): $3\text{ kHz} \leq \text{RBW} \leq 100\text{ kHz}$. Video bandwidth VBW $\geq 3 \times \text{RBW}$. 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.7. 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. 17, 2023	Feb. 16, 2024
RF Cable (9KHz-26.5GHz)	Tonscend	170660	N/A	Feb. 17, 2023	Feb. 16, 2024
RF automatic control unit	Tonscend	JS0806-2	HKE-060	Feb. 17, 2023	Feb. 16, 2024

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

For antenna port 1

EUT Set Mode	Channel	Test Result (dBm/30kHz)	Result (dBm/3kHz)
802.11b	Lowest	0.04	-9.96
	Middle	0.56	-9.44
	Highest	1.56	-8.44
802.11g	Lowest	-2.01	-12.01
	Middle	-1.17	-11.17
	Highest	-1.61	-11.61
802.11n(H20)	Lowest	-1.34	-11.34
	Middle	-2.36	-12.36
	Highest	-2.53	-12.53
802.11n(H40)	Lowest	-3.28	-13.28
	Middle	-4.32	-14.32
	Highest	-3.99	-13.99
PSD test result (dBm/3kHz)= PSD test result (dBm/30kHz)-10			
Limit: 8dBm/3kHz			
Test Result:		PASS	

Test plots as follows:



802.11b Modulation

Lowest channel



Middle channel



Highest channel



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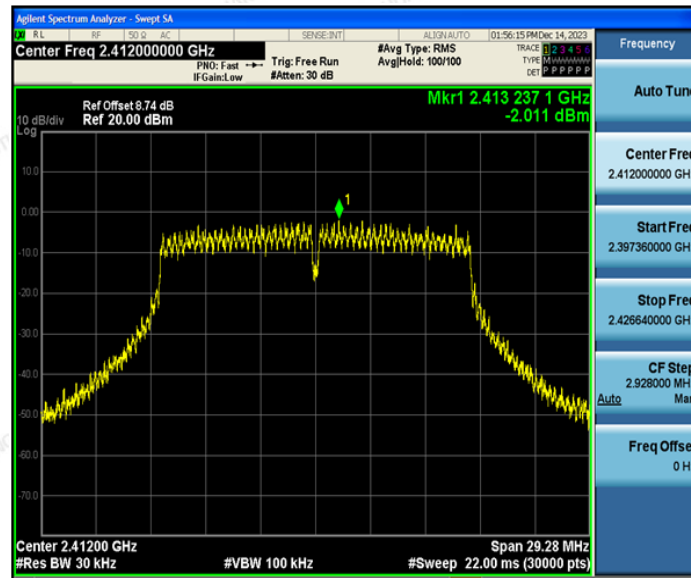
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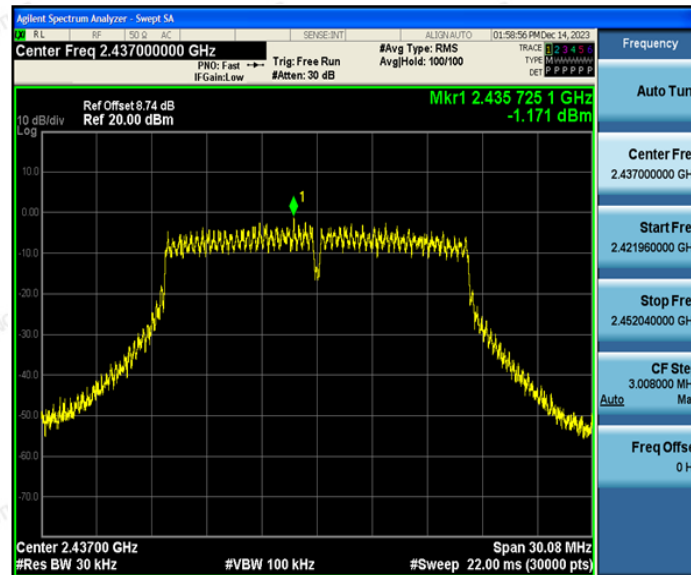


802.11g Modulation

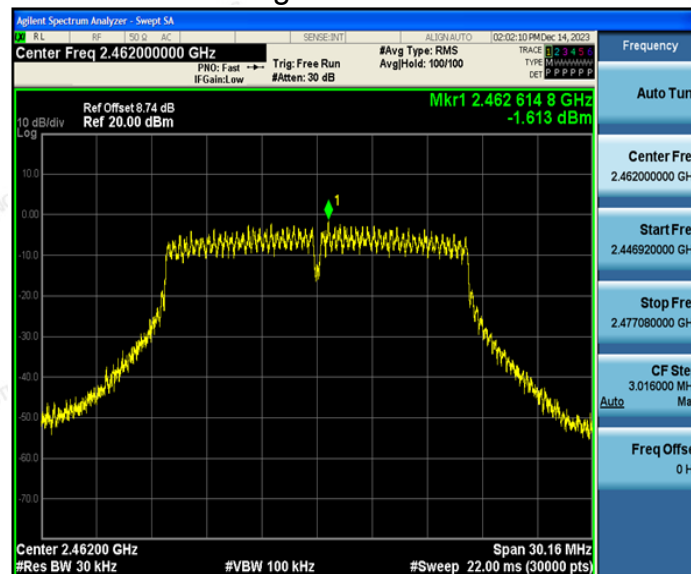
Lowest channel



Middle channel



Highest channel



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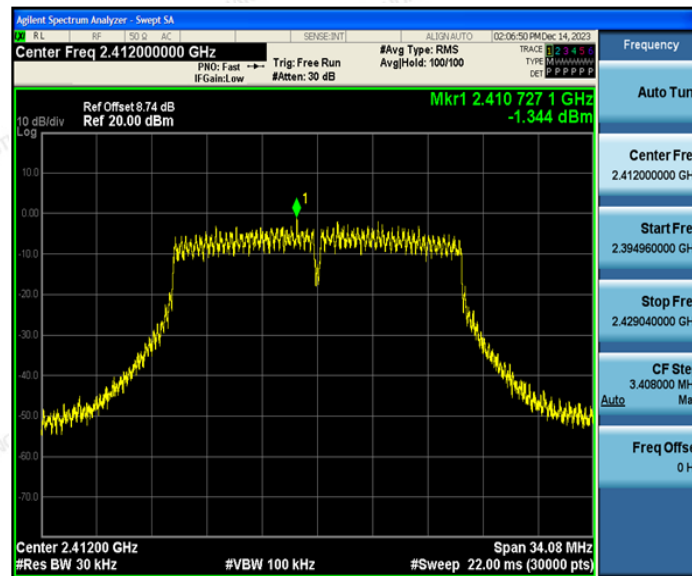
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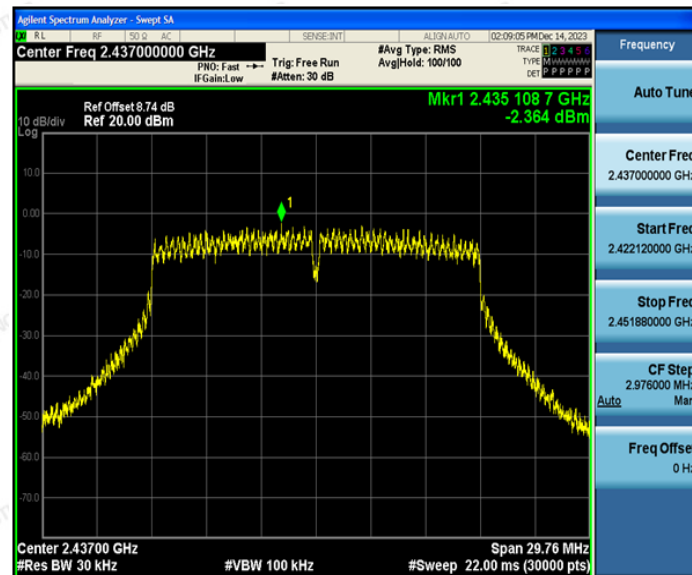


802.11n (HT20) Modulation

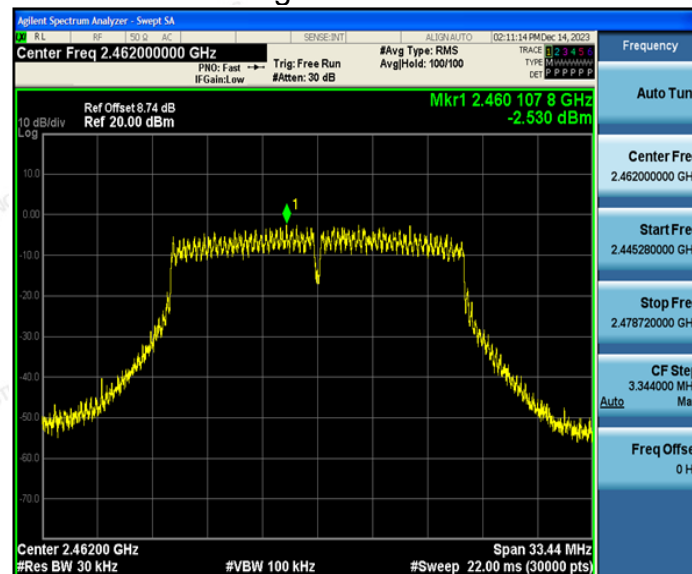
Lowest channel



Middle channel



Highest channel



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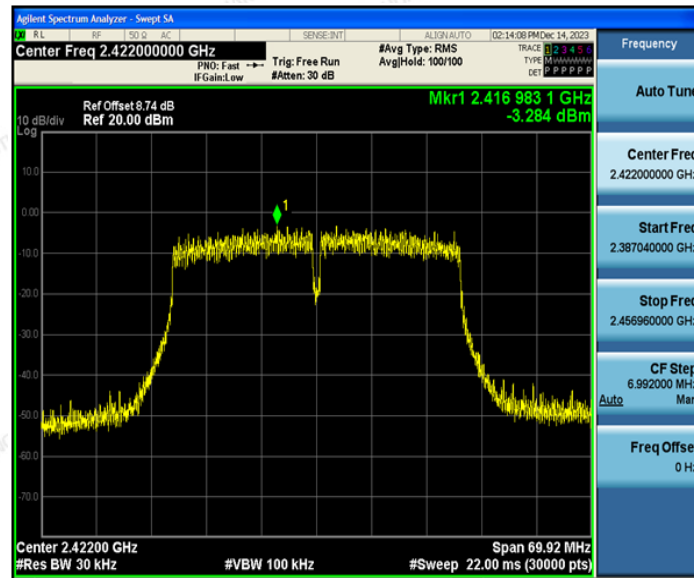
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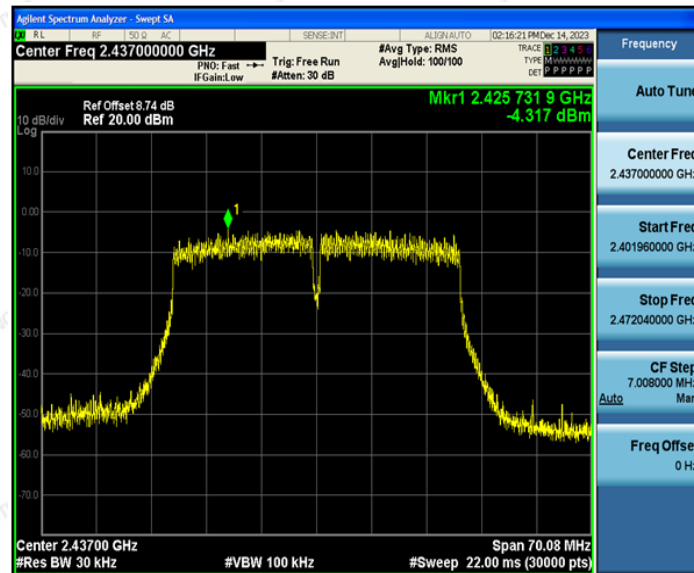


802.11n (HT40) Modulation

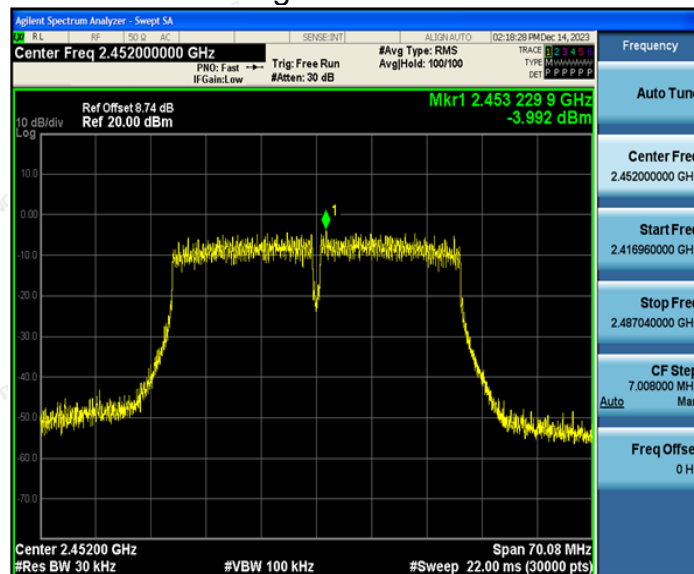
Lowest channel



Middle channel



Highest channel



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**For antenna port 2**

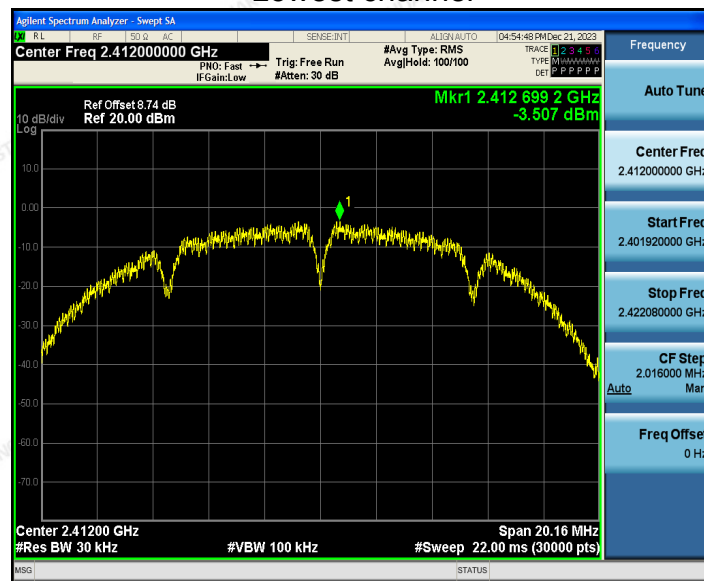
EUT Set Mode	Channel	Result (dBm/30kHz)	Result (dBm/3kHz)
802.11b	Lowest	-3.51	-13.51
	Middle	-4.90	-14.90
	Highest	-4.35	-14.35
802.11g	Lowest	-5.34	-15.34
	Middle	-4.18	-14.18
	Highest	-4.23	-14.23
802.11n(HT20)	Lowest	-4.49	-14.49
	Middle	-4.16	-14.16
	Highest	-4.22	-14.22
802.11n(HT40)	Lowest	-6.03	-16.03
	Middle	-6.11	-16.11
	Highest	-6.31	-16.31
PSD test result (dBm/3kHz)= PSD test result (dBm/30kHz)-10			
Limit: 8dBm/3kHz			
Test Result:	PASS		

Test plots as follows:



802.11b Modulation

Lowest channel



Middle channel



Highest channel



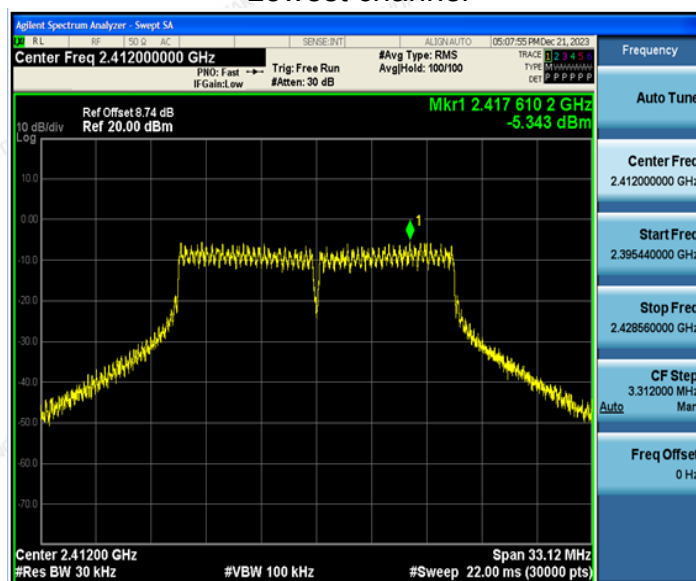
The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by HUAKE, this document cannot be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at <http://www.cer-mark.com>.

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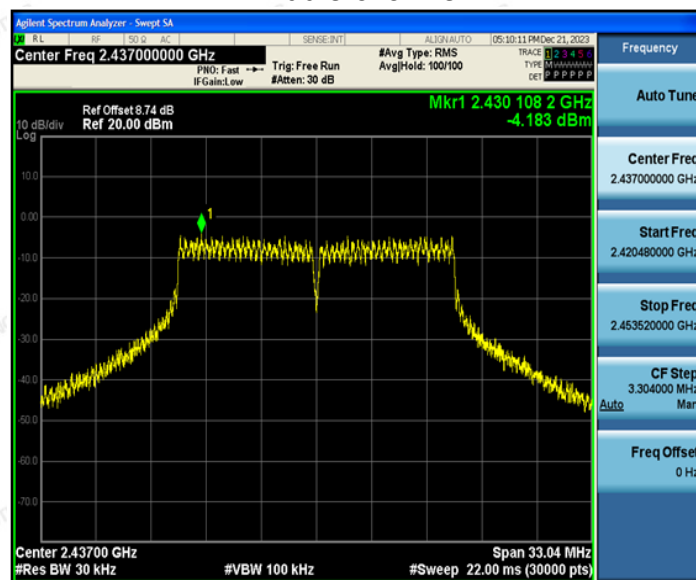
Add: 1-2F., Building B2, Junfeng Zhongcheng Zhizao Innovation Park, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China

802.11g Modulation

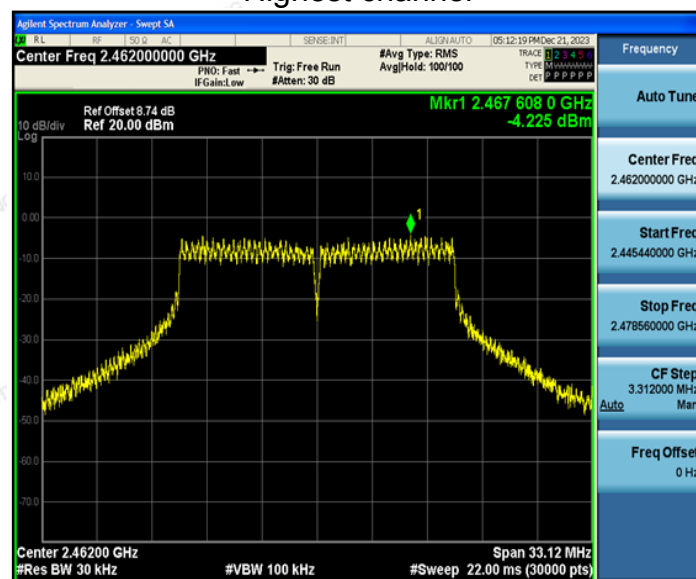
Lowest channel



Middle channel



Highest channel



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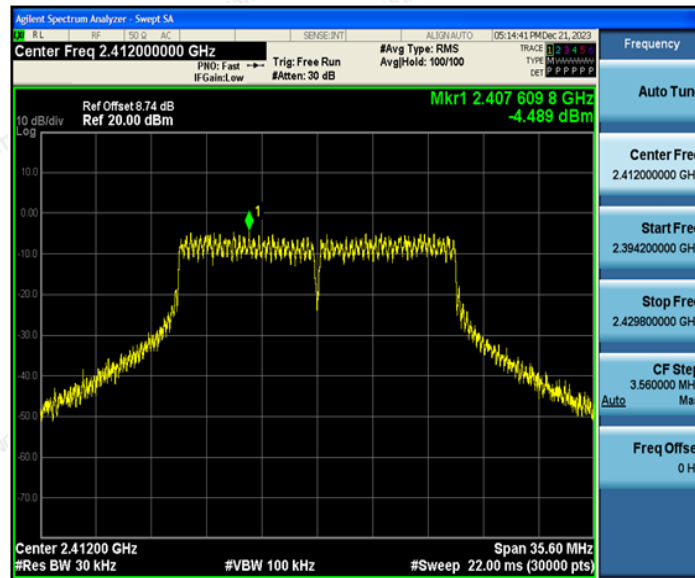
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Add: 1-2F., Building B2, Junfeng Zhongcheng Zhizao Innovation Park, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China

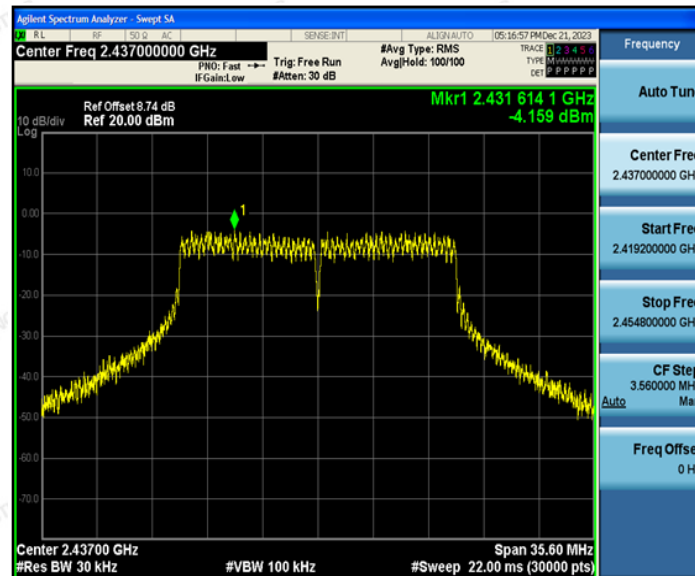


802.11n (HT20) Modulation

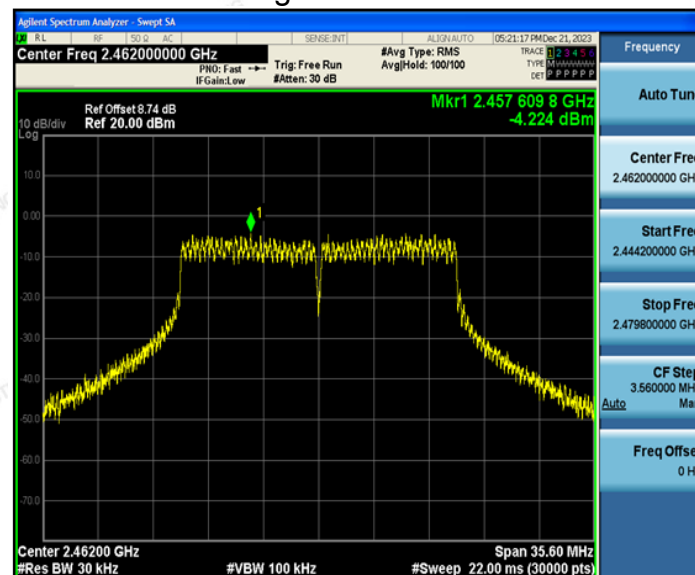
Lowest channel



Middle channel



Highest channel



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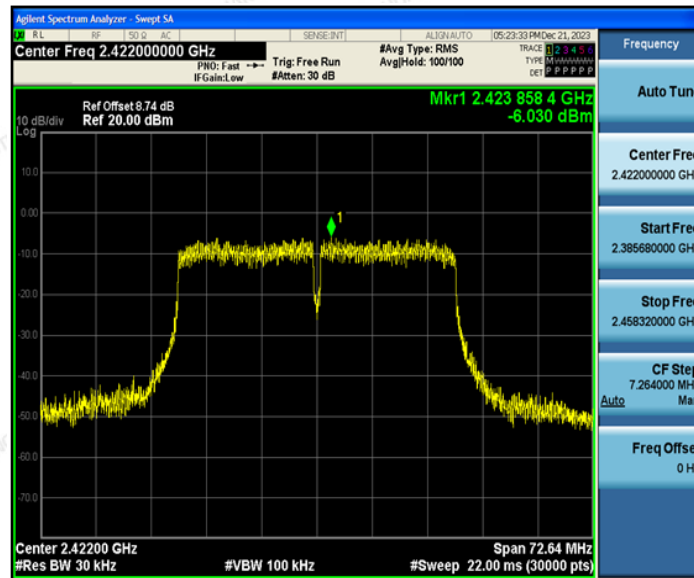
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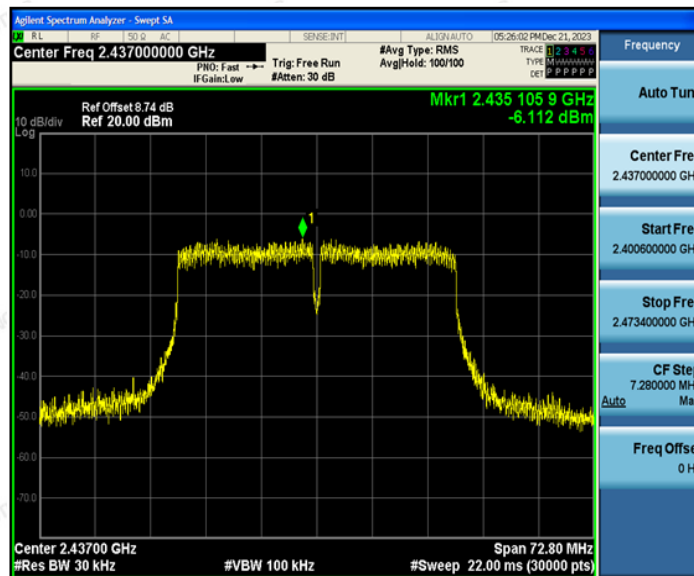


802.11n (HT40) Modulation

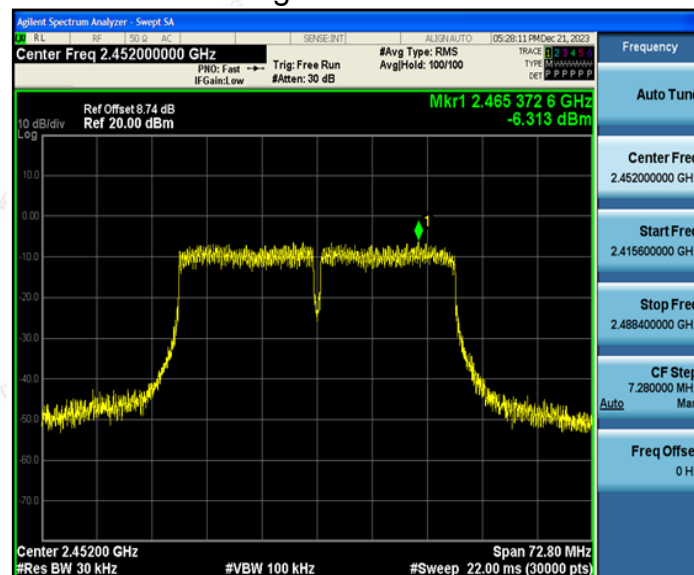
Lowest channel



Middle channel



Highest channel



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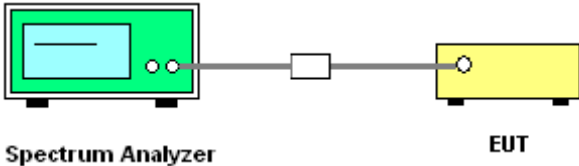
For MIMO antenna port 1+antenna port 2			
Frequency	Power Density (dBm)	Limit (dBm)	Result
TX 802.11n/HT20 Mode			
2412 MHz	-9.63	7.52	PASS
2437 MHz	-10.16	7.52	PASS
2462 MHz	-10.28	7.52	PASS
TX 802.11n/HT40 Mode			
2422 MHz	-11.43	7.52	PASS
2437 MHz	-12.11	7.52	PASS
2452 MHz	-11.99	7.52	PASS
Note: 1 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=8dBm-(direction gain-6dBi)=7.52dBm			

Note: This product supports antenna 1 and antenna 2 launch, but only support 802.11 n for MIMO mode, not support 802.11 b and 802.11 g for MIMO mode.



4.5. Conducted Band Edge and Spurious Emission Measurement

4.5.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	KDB558074 D01 15.247 Meas Guidance v05r02
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:	 <p>The diagram shows a Spectrum Analyzer (green box) connected to an EUT (yellow box) via an RF cable and an attenuator (white box). The Spectrum Analyzer is labeled 'Spectrum Analyzer' and the EUT is labeled 'EUT'.</p>
Test Mode:	Transmitting mode with modulation
Test Procedure:	<ol style="list-style-type: none">1. The testing follows FCC KDB Publication No. 558074 D01 15.247 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



4.5.2. Test Instruments

RF Test Room					
Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Spectrum analyzer	Agilent	N9020A	HKE-048	Feb. 17, 2023	Feb. 16, 2024
Signal generator	Agilent	N5183A	HKE-071	Feb. 17, 2023	Feb. 16, 2024
RF Cable (9KHz-26.5GHz)	Tonscend	170660	N/A	Feb. 17, 2023	Feb. 16, 2024
RF automatic control unit	Tonscend	JS0806-2	HKE-060	Feb. 17, 2023	Feb. 16, 2024

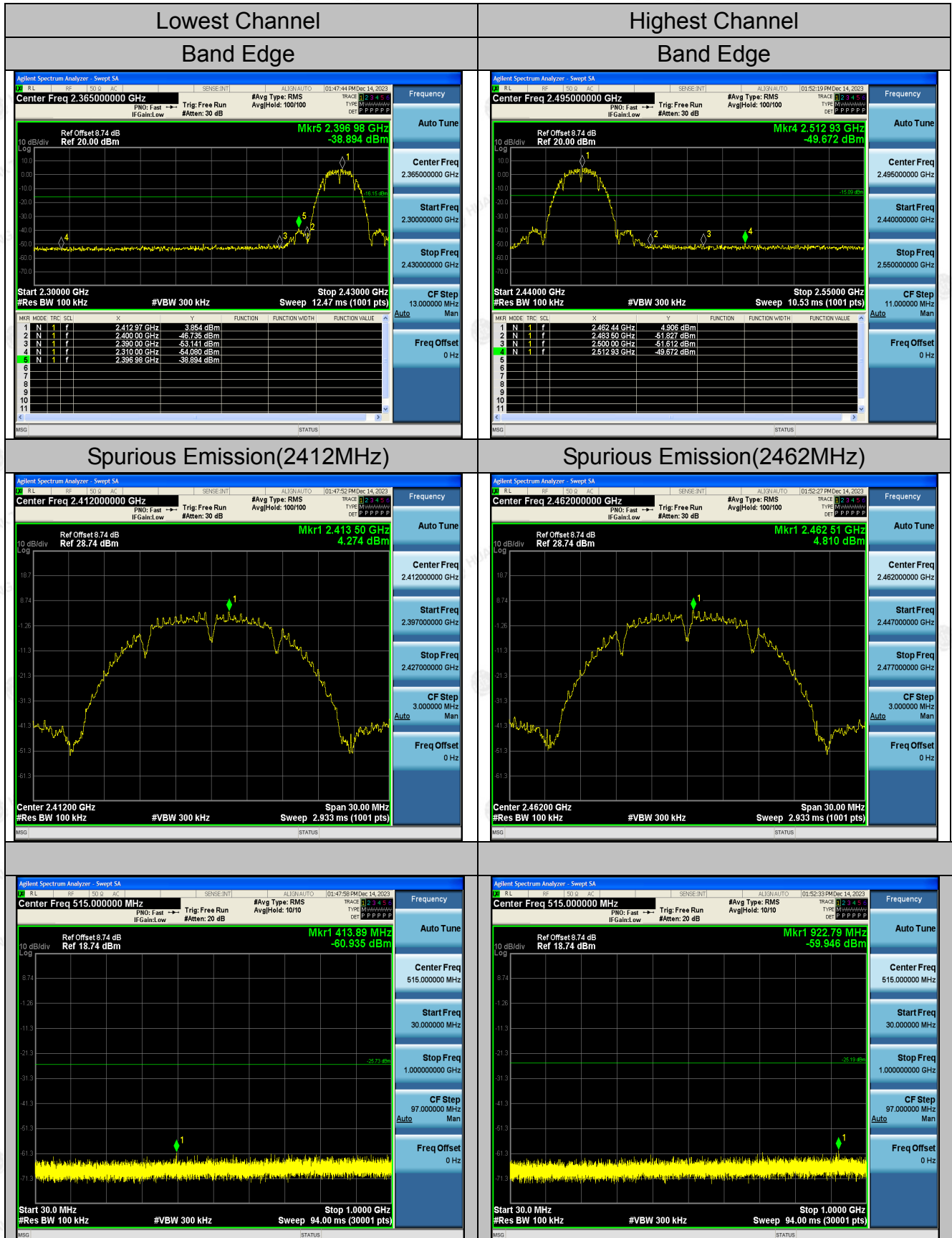
Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).



4.5.3. Test Data

Chain 1

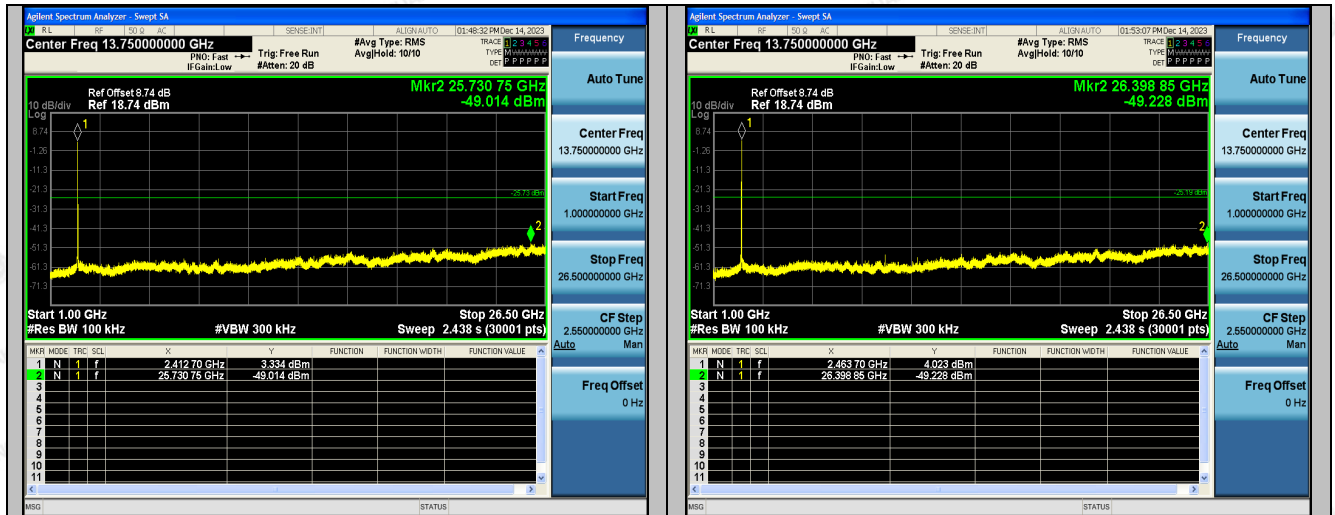
802.11b Modulation



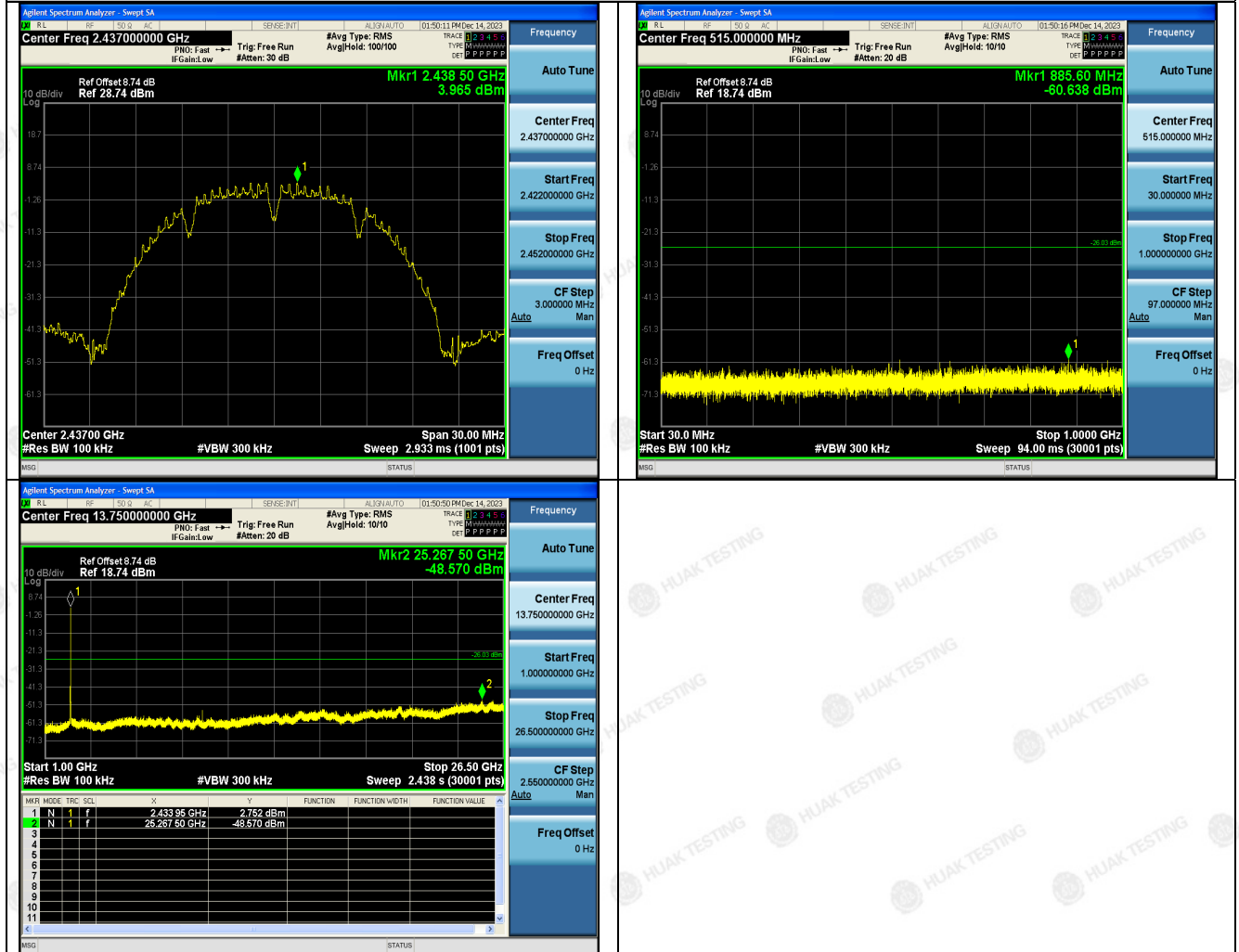
The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by HUAKE, this document cannot be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at <http://www.cer-mark.com>.

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Add: 1-2F., Building B2, Junfeng Zhongcheng Zhizao Innovation Park, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China

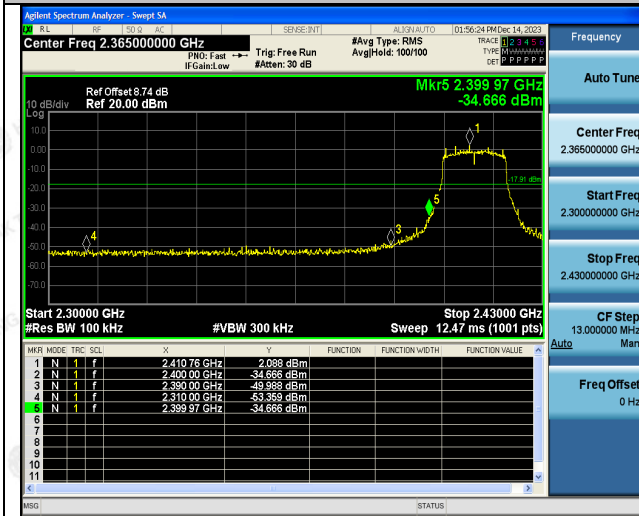
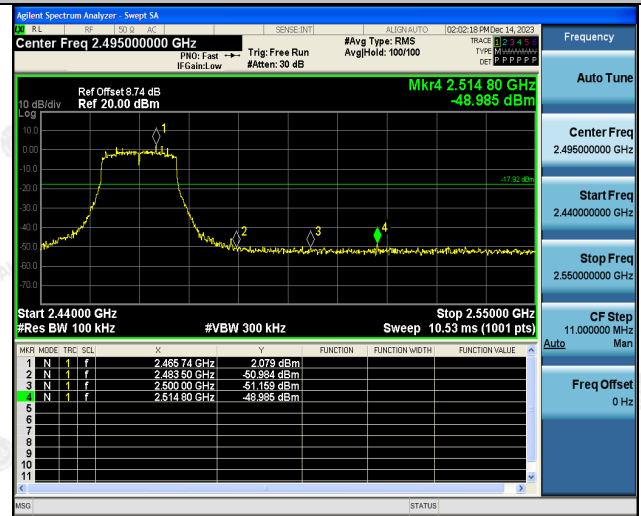


Spurious Emission(2437MHz)

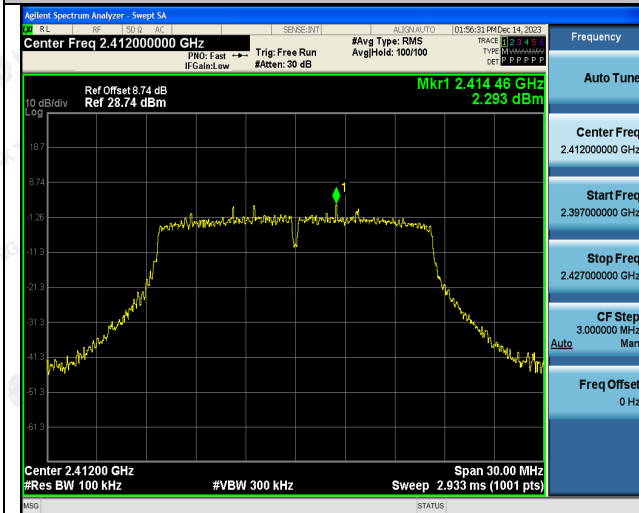




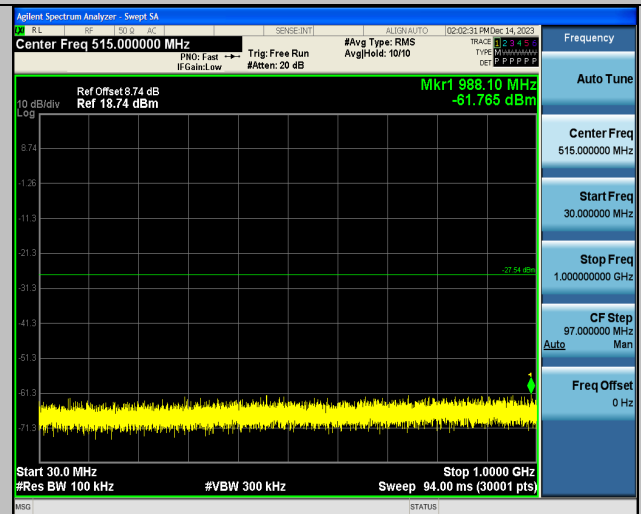
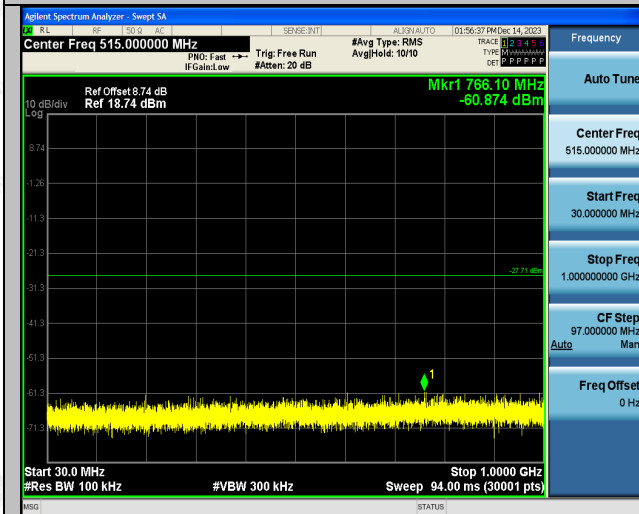
802.11g Modulation

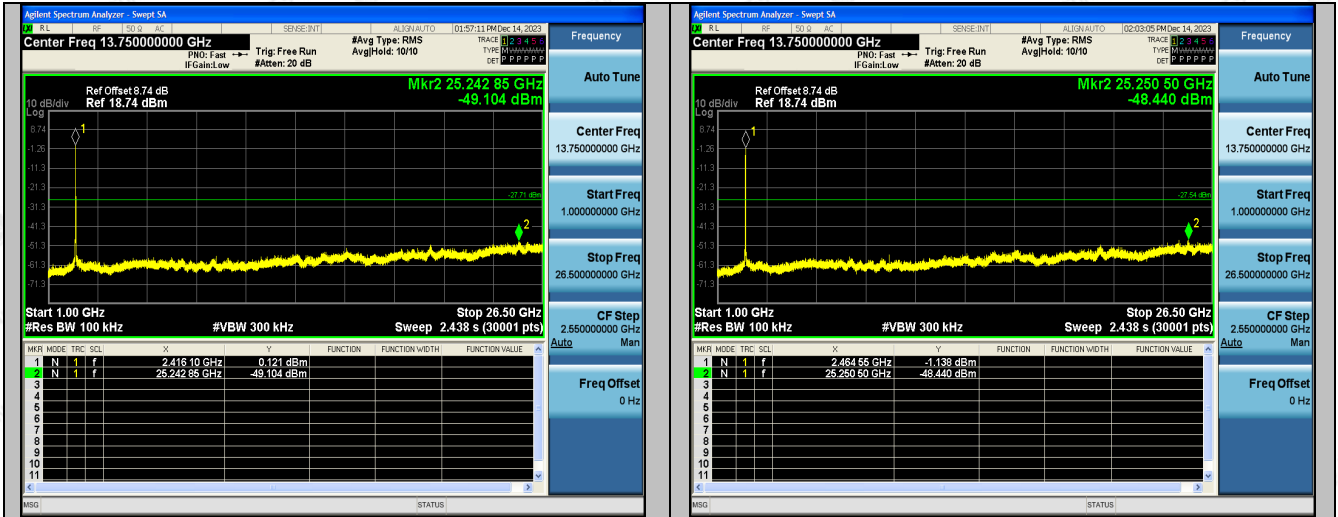
Lowest Channel
Band EdgeHighest Channel
Band Edge

Spurious Emission(2412MHz)



Spurious Emission(2462MHz)





Spurious Emission(2437MHz)

