



FCC TEST REPORT

**Test report
On Behalf of
Curvalux UK Ltd
For
Access Point and CPE
Model No.: 900-00021, 900-00025**

FCC ID: 2A8EB-900-00021

**Prepared For : Curvalux UK Ltd
Electric Works Sheffield, S1 2BJ United Kingdom**

**Prepared By : Shenzhen HUAK Testing Technology Co., Ltd.
1-2/F., Building B2, Junfeng Zhongcheng Zhizao Innovation Park, Heping,
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**Date of Test: Oct. 09, 2022 ~ Dec. 07, 2022
Date of Report: Dec. 07, 2022
Report Number: HK2210094428-1E**

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**TEST RESULT CERTIFICATION****Applicant's name** Curvalux UK Ltd

Address Electric Works Sheffield, S1 2BJ United Kingdom

Manufacture's Name Curvalux UK Ltd

Address Electric Works Sheffield, S1 2BJ United Kingdom

Product description

Trade Mark: N/A

Product name Access Point and CPE

Model and/or type reference : 900-00021, 900-00025

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

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Date of TestDate (s) of performance of tests **Oct. 09, 2022 ~ Dec. 07, 2022**Date of Issue **Dec. 07, 2022**Test Result..... **Pass**

Testing Engineer :

(Gary Qian)

Technical Manager :

(Eden Hu)

Authorized Signatory :

(Jason Zhou)



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**** Modified History ****

Revision	Description	Issued Data	Remark
Revision 1.0	Initial Test Report Release	Dec. 07, 2022	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(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	1§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. 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 $y \pm U$, 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	$\pm 0.37\text{dB}$
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:	Access Point and CPE
Model Name:	900-00021
Serial Model:	900-00025
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 mode: 900-00021.
Trade Mark:	N/A
FCC ID:	2A8EB-900-00021
Antenna Type:	External Antenna
Antenna Gain:	Antenna 1:12dBi Antenna 2:12dBi MIMO: 15.01dBi
Operation frequency:	802.11b/g/n20: 2412~2462MHz 802.11n40: 2422~2452MHz 802.11ax HT20: 2412~2462MHz 802.11ax HT40: 2422~2452MHz
Number of Channels:	802.11b/g/n20: 11CH 802.11n40: 7CH 802.11ax HT20: 11CH 802.11ax HT40: 7CH
Modulation Type:	CCK/OFDM/DBPSK/DAPSK
Power Source:	DC 48V From POE
Power Rating:	DC 48V From POE
Hardware Version	V3.0
Software Version:	V3.0
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)/ 802.11ax (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) / 802.11ax (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)/802.11ax (HT20)

Low Channel: 2412MHz
Middle Channel: 2437MHz
High Channel: 2462MHz

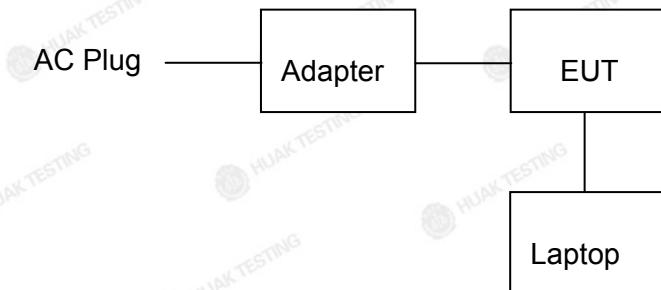
The mode is used: Transmitting mode for 802.11n (HT40)/802.11ax (HT40)

Low Channel: 2422MHz
Middle Channel: 2437MHz
High Channel: 2452MHz



2.4. DESCRIPTION OF TEST SETUP

Operation of EUT during conducted testing and below 1GHz Radiation testing:



Operation of EUT during Above 1GHz Radiation testing:



Laptop information

Model: TP00018A

Input: DC 20V, 3.25~4.5A

Adapter information

Model: GRT-POE15-480050

Input: AC100-240V 0.8A Max 50/60Hz

Output: DC48V 500mA

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 98.46%)
The sample was placed (0.8m below 1GHz, 1.5m above 1GHz) above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages. For the full battery state and The output power to the maximum state.	

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

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

Mode	Data rate
802.11b	1Mbps
802.11g	6Mbps
802.11n(HT20)/ax (HT20)	6.5Mbps
802.11n(HT40)/ax (HT40)	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(HT20)/ax (HT20), 13.5Mbps for 802.11n(HT40)/ax (HT40). Duty cycle setting during the transmission is 98.5% with maximum power setting for all modulations.



3.2. DESCRIPTION OF SUPPORT UNITS

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

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

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

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 border="1"> <thead> <tr> <th>Frequency range (MHz)</th> <th colspan="2">Limit (dBuV)</th> </tr> <tr> <th></th> <th>Quasi-peak</th> <th>Average</th> </tr> </thead> <tbody> <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> </tbody> </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:	<p>Reference Plane</p> <p>E.U.T AC power</p> <p>Test table/Insulation plane</p> <p>40cm 80cm</p> <p>LISN</p> <p>Filter 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>																	
Test Mode:	Charging + transmitting with modulation																	
Test Procedure:	<ol style="list-style-type: none"> 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																	

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4.1.2. Test Instruments

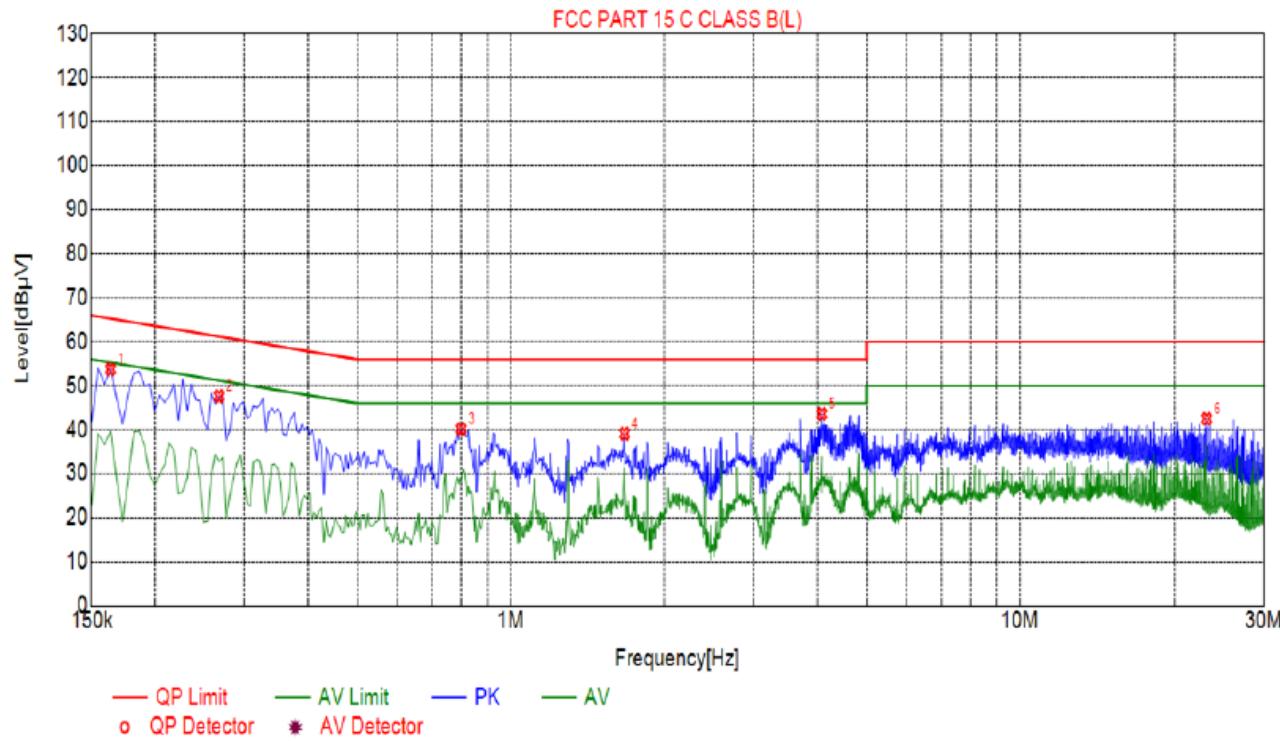
Conducted Emission Shielding Room Test Site (843)					
Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Receiver	R&S	ESCI 7	HKE-010	Feb. 18, 2022	Feb. 17, 2023
LISN	R&S	ENV216	HKE-002	Feb. 18, 2022	Feb. 17, 2023
Conducted test software	Tonscend	TS+ Rev 2.5.0.0	HKE-081	N/A	N/A

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 [dB μ V]	Factor [dB]	Limit [dB μ V]	Margin [dB]	Reading [dB μ V]	Detector	Type
1	0.1635	53.74	19.98	65.28	11.54	33.76	PK	L
2	0.2670	47.64	20.03	61.21	13.57	27.61	PK	L
3	0.7980	40.18	20.06	56.00	15.82	20.12	PK	L
4	1.6710	39.09	20.12	56.00	16.91	18.97	PK	L
5	4.0830	43.59	20.25	56.00	12.41	23.34	PK	L
6	23.1270	42.49	20.19	60.00	17.51	22.30	PK	L

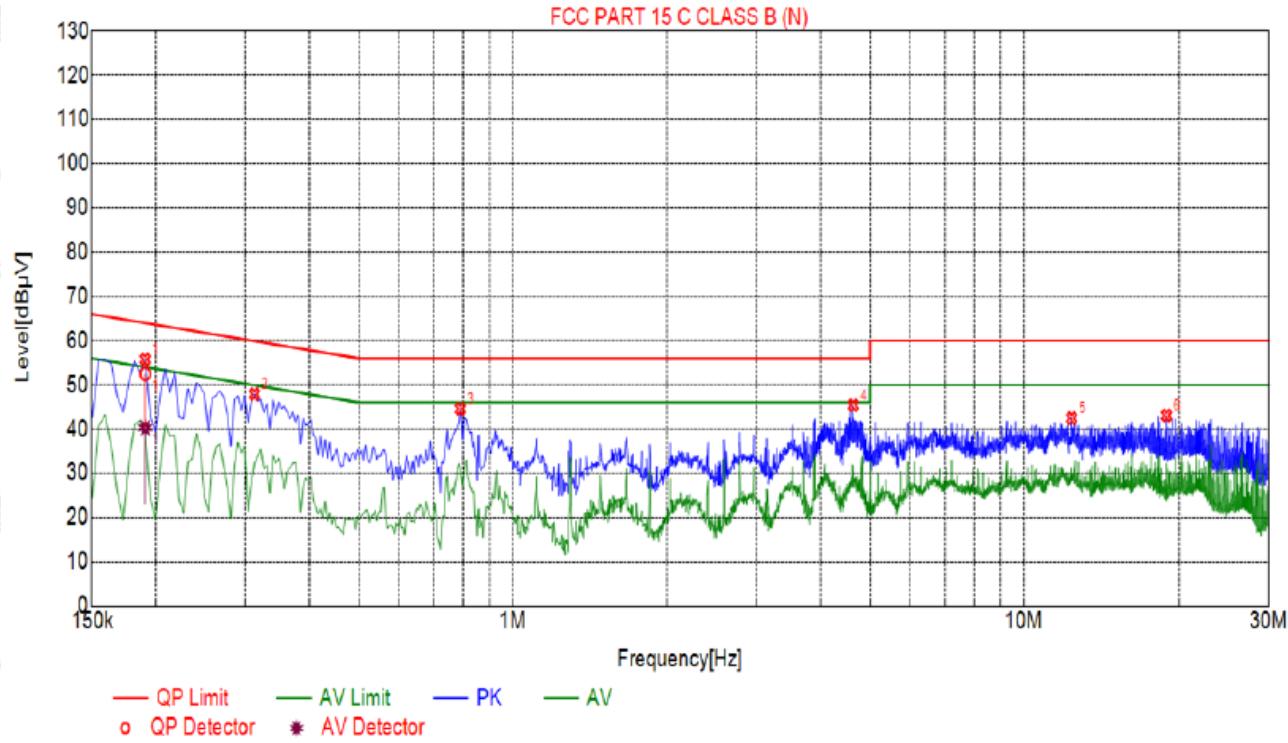
Remark: Margin = Limit – Level

Correction factor = Cable loss + LISN insertion loss

Level=Test receiver reading + correction factor



Test Specification: Neutral



Suspected List

NO.	Freq. [MHz]	Level [dB μ V]	Factor [dB]	Limit [dB μ V]	Margin [dB]	Reading [dB μ V]	Detector	Type
1	0.1905	55.78	20.04	64.01	8.23	35.74	PK	N
2	0.3120	47.90	20.05	59.92	12.02	27.85	PK	N
3	0.7890	44.58	20.05	56.00	11.42	24.53	PK	N
4	4.6365	45.39	20.26	56.00	10.61	25.13	PK	N
5	12.4170	42.46	19.98	60.00	17.54	22.48	PK	N
6	18.9150	43.06	20.06	60.00	16.94	23.00	PK	N

Final Data List

NO.	Freq. [MHz]	Correction factor [dB]	QP Value [dB μ V]	QP Limit [dB μ V]	QP Margin [dB]	QP Reading [dB μ V]	AV Value [dB μ V]	AV Limit [dB μ V]	AV Margin [dB]	AV Reading [dB μ V]	Type
1	0.1905	20.04	52.49	64.01	11.52	32.45	40.28	54.01	13.73	20.24	N

Remark: Margin = Limit – Level

Correction factor = Cable loss + LISN insertion loss

Level=Test receiver reading + correction factor

4.2. MAXIMUM CONDUCTED OUTPUT POWER

4.2.1. Test Specification

4.2.2. Test Instruments

RF Test Room					
Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
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).

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4.2.3. Test Data

Test Channel	Frequency	Maximum Peak Conducted Output Power (dBm)			LIMIT
	(MHz)	Antenna port 1	Antenna port 2	MIMO	
TX 802.11b Mode					
CH01	2412	14.22	13.43	/	30
CH06	2437	13.66	13.62	/	30
CH11	2462	13.97	12.47	/	30
TX 802.11g Mode					
CH01	2412	12.48	11.22	/	30
CH06	2437	13.69	12.31	/	30
CH11	2462	14.05	11.85	/	30
TX 802.11n20 Mode					
CH01	2412	12.12	10.21	14.28	30
CH06	2437	10.71	11.14	13.94	30
CH11	2462	13.22	11.45	15.43	30
TX 802.11n40 Mode					
CH03	2422	13.13	9.52	14.70	30
CH06	2437	11.30	10.96	14.14	30
CH09	2452	11.28	13.31	15.42	30
TX 802.11ax HT20 Mode					
CH01	2412	10.19	10.34	13.28	30
CH06	2437	13.46	11.07	15.44	30
CH11	2462	13.90	10.88	15.66	30
TX 802.11ax HT40 Mode					
CH03	2422	13.19	10.74	15.15	30
CH06	2437	10.51	9.22	12.92	30
CH09	2452	12.26	11.45	14.88	30
Note: This product supports antenna 1 and antenna 2 launch, but only support 802.11 n /802.11ax for MIMO mode, not support 802.11 b and 802.11 g for MIMO mode.					

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4.3. EMISSION BANDWIDTH

4.3.1. Test Specification

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 (9KHz-26.5GHz)	Tonscend	170660	N/A	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).

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**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)	802.11ax (HT20)	802.11ax (HT40)
Lowest	7.60	13.84	17.28	33.84	15.56	23.92
Middle	7.12	12.56	15.04	31.68	14.48	22.16
Highest	6.52	13.84	11.96	35.04	17.96	32.32
Limit:	>500KHz					
Test Result:	PASS					

Test plots as follows:



802.11b Modulation

Lowest channel



Middle channel



Highest channel



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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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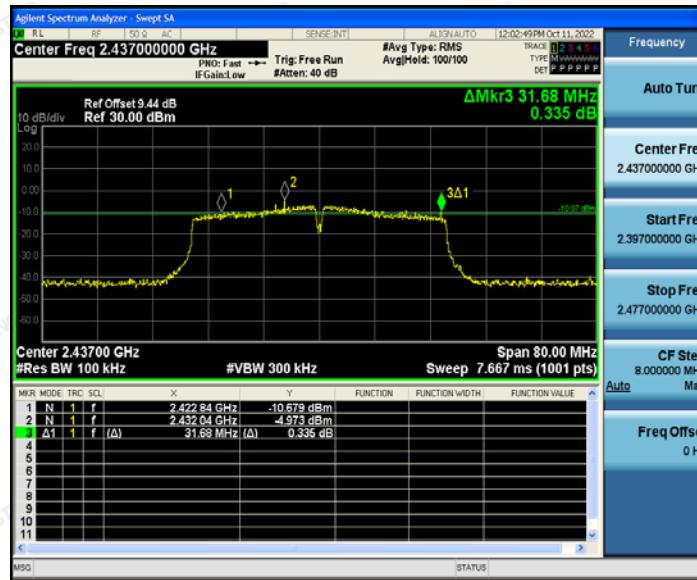


802.11n (HT40) Modulation

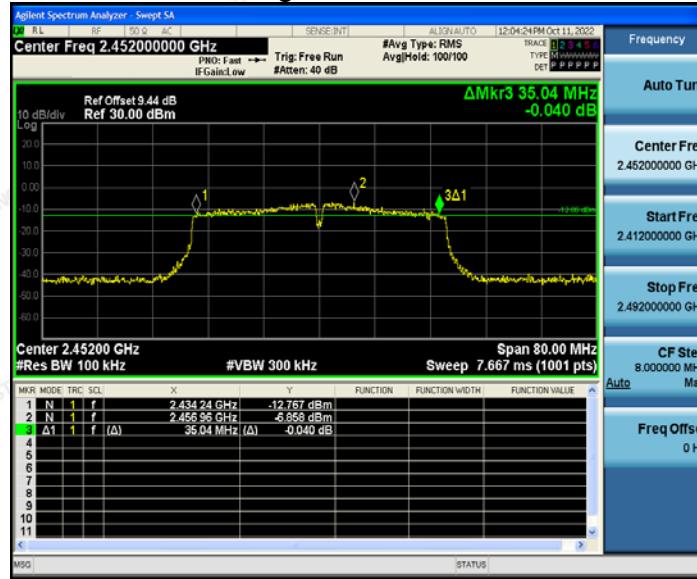
Lowest channel



Middle channel



Highest channel



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802.11ax (HT20) Modulation

Lowest channel



Middle channel



Highest channel



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802.11ax (HT40) Modulation

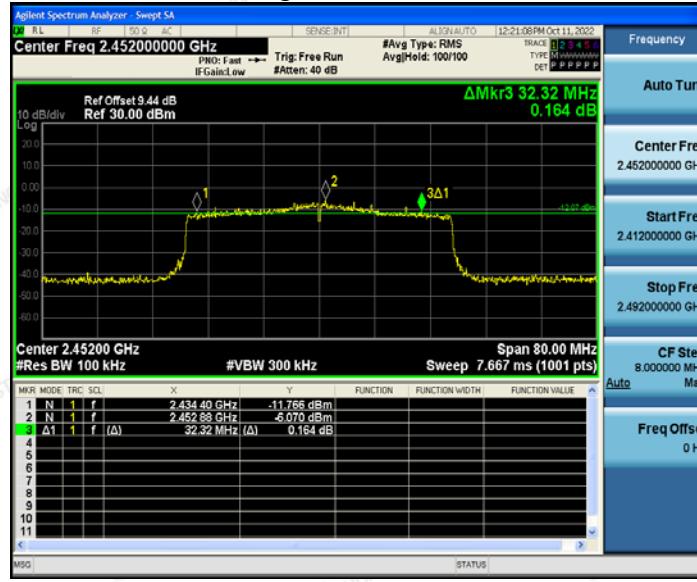
Lowest channel



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)	802.11ax (HT20)	802.11ax (HT40)
Lowest	8.04	14.40	15.72	31.28	17.76	30.40
Middle	7.96	11.24	16.40	31.28	14.32	32.08
Highest	8.00	15.92	14.36	35.76	15.72	31.60
Limit:	>500KHz					
Test Result:	PASS					

Test plots as follows:



802.11b Modulation

Lowest channel



Middle channel



Highest channel



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802.11g Modulation

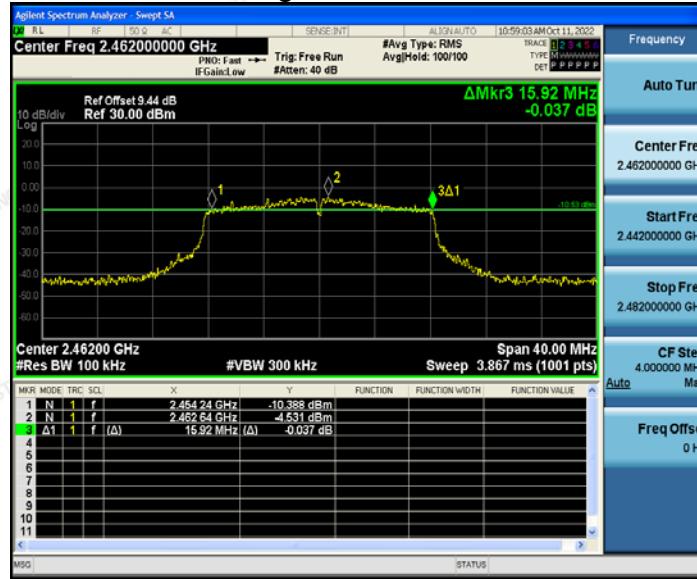
Lowest channel



Middle channel



Highest channel



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802.11n (HT20) Modulation

Lowest channel



Middle channel



Highest channel



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802.11n (HT40) Modulation

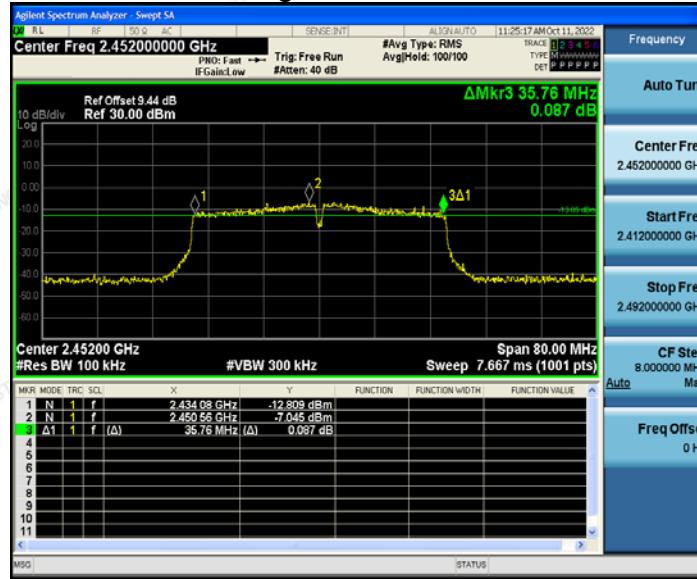
Lowest channel



Middle channel



Highest channel



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802.11ax (HT20) Modulation

Lowest channel



Middle channel



Highest channel



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802.11ax (HT40) Modulation

Lowest channel



Middle channel



Highest channel

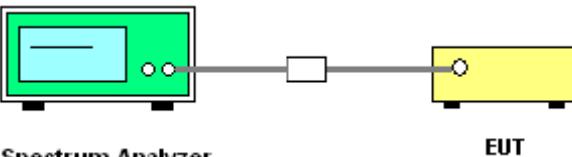


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4.4. POWER SPECTRAL DENSITY

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:	 <p>Spectrum Analyzer EUT</p>
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

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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 (9KHz-26.5GHz)	Tonscend	170660	N/A	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

For antenna port 1

EUT Set Mode	Channel	Result (dBm/30kHz)	Result (dBm/3kHz)
802.11b	Lowest	-1.76	-11.76
	Middle	-2.28	-12.28
	Highest	-1.58	-11.58
802.11g	Lowest	-9.04	-19.04
	Middle	-7.63	-17.63
	Highest	-7.46	-17.46
802.11n(HT20)	Lowest	-8.57	-18.57
	Middle	-7.49	-17.49
	Highest	-5.93	-15.93
802.11n(HT40)	Lowest	-9.66	-19.66
	Middle	-8.37	-18.37
	Highest	-9.74	-19.74
802.11ax(HT20)	Lowest	-7.55	-17.55
	Middle	-7	-17
	Highest	-8.65	-18.65
802.11ax(HT40)	Lowest	-11.1	-21.1
	Middle	-10.72	-20.72
	Highest	-11.59	-21.59
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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