

## FCC 47 CFR PART 15 SUBPART C ISED RSS-247 Issue 3

**TEST REPORT** 

For

## **Robotic Vacuum Cleaner**

## MODEL NUMBER: QX1PEC

## PROJECT NUMBER: 4791155019

### **REPORT NUMBER: 4791155019-1**

FCC ID: 2AN2O-QX1PEC01

IC: 23317-QX1PEC01

HVIN: QX1PEC-FNF8

ISSUE DATE: Feb. 06, 2024

Prepared for

Beijing Roborock Technology Co., Ltd.

Prepared by

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### **Revision History**

Rev.	Issue Date	Revisions	Revised By
V0	02/06/2024	Initial Issue	

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# **1. APPLICANT INFORMATION**

### **Applicant Information**

Company Name: Address:	Beijing Roborock Technology Co., Ltd. Room 1001, Floor 10, Building 3, Yard 17, Anju Road, Changping District, Beijing, P.R. China
Manufacturer Information	
Company Name:	Beijing Roborock Technology Co., Ltd.
Address:	Room 1001, Floor 10, Building 3, Yard 17, Anju Road,
	Changping District, Beijing, P.R. China
EUT Description	
Product Name:	Robotic Vacuum Cleaner
Model Name:	QX1PEC
Additional No.:	1
Model Difference:	1
Sample Number:	6813106
Data of Receipt Sample:	Jan. 09, 2024
Test Date:	Jan. 09, 2024~ Feb. 02, 2024

APPLICABLE STANDARDS					
STANDARD	TEST RESULTS				
FCC 47 CFR Part 15 Subpart C	PASS				
ISED RSS-247 Issue 3	PASS				
ISED RSS-GEN Issue 5	PASS				



Summary of Test Results					
Clause	Test Items	FCC&ISED Rules	Test Results		
1	6 dB Bandwidth and 99% Occupied Bandwidth	FCC 15.247 (a) (2) RSS-247 Clause 5.2 (a) RSS-Gen Clause 6.7	PASS		
2	Conducted Power	FCC 15.247 (b) (3) RSS-247 Clause 5.4 (d) RSS-Gen Clause 6.12	PASS		
3	Power Spectral Density	FCC 15.247 (e) RSS-247 Clause 5.2 (b)	PASS		
4	Conducted Band edge And Spurious emission	FCC 15.247 (d) RSS-247 Clause 5.5 RSS-GEN Clause 6.13	PASS		
5	Radiated Band edges and Spurious emission	FCC 15.247 (d) FCC 15.209 FCC 15.205 RSS-247 Clause 5.5 RSS-GEN Clause 6.13 RSS-GEN Clause 8.9 RSS-GEN Clause 8.10	PASS		
6	Conducted Emission Test for AC Power Port	FCC 15.207 RSS-GEN Clause 8.8	PASS		
7	Antenna Requirement	FCC 15.203 RSS-GEN Clause 6.8	PASS		
Note: The measurement result for the sample received is <pass> according to &lt; ANSI C63.10-2013, FCC 47 CFR Part 2, FCC 47 CFR Part 15C, ISED RSS-247, ISED RSS-Gen &gt; when <accuracy< td=""></accuracy<></pass>					

Method> decision rule is applied.

Prepared By:

Tom Tang

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Kevin Shen

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# 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with KDB 558074 D01 15.247 Meas Guidance v05r02, 414788 D01 Radiated Test Site v01r01, FCC 47 CFR Part 2, FCC 47 CFR Part 15, ANSI C63.10-2013, ISED RSS-247 Issue 3 and ISED RSS-GEN Issue 5.

# 3. FACILITIES AND ACCREDITATION

Accreditation Certificate	A2LA (Certificate No.: 4829.01) UL-CCIC COMPANY LIMITED has been assessed and proved to be in compliance with A2LA. FCC (FCC Designation No.: CN1247) UL-CCIC COMPANY LIMITED has been recognized to perform compliance testing on equipment subject to the Commission's Declaration of Conformity (DoC) and Certification rules. IC (IC Designation No.: 25056; CAB No.: CN0073) UL-CCIC COMPANY LIMITED has been recognized to perform compliance testing on equipment subject to the Commission's Declaration of Conformity (DoC) and Certification rules.
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Note 1: All tests measurement facilities use to collect the measurement data are located at No. 2, Chengwan Road, Suzhou Industrial Park, Suzhou 215122, China.

Note 2: For below 30MHz, lab had performed measurements at test anechoic chamber and comparing to measurements obtained on an open field site. These measurements below 30MHz had been correlated to measurements performed on an OFS.

Note 3: The test anechoic chamber in UL-CCIC COMPANY LIMITED had been calibrated and compared to the open field sites and the test anechoic chamber is shown to be equivalent to or worst case from the open field site.



# 4. CALIBRATION AND UNCERTAINTY

## 4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations and is traceable to recognized national standards.

## 4.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Test Item	Uncertainty		
Conduction emission	3.1 dB		
DTS Bandwidth	1.9 %		
Maximum Conducted Output Power	1.3 dB		
Maximum Power Spectral Density Level	1.5 dB		
Band-edge Compliance	1.9%		
Unwanted Emissions in Non-restricted Freq Bands	9kHz-30MHz: ±0.90dB 30MHz-1GHz: ±1.5 dB 1GHz-12.75GHz: ±1.9dB 12.75GHz-26.5GHz: ±2.1dB		
Radiation Emission test (include Fundamental emission) (9kHz-30MHz)	3.4dB		
Radiation Emission test (include Fundamental emission) (30MHz-1GHz)	3.4dB		
Radiation Emission test (1GHz to 26GHz) (include Fundamental emission)	3.5dB (1GHz-18GHz)		
	3.9dB (18GHz-26.5GHz)		
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.			



# 5. EQUIPMENT UNDER TEST

# 5.1. DESCRIPTION OF EUT

Product Name:	Robotic Vacuum Cleaner
Model No.:	QX1PEC
Operating Frequency:	IEEE 802.11B/G/N(HT20): 2412MHz to 2462MHz IEEE 802.11N(HT40): 2422MHz to 2452MHz
Type of Modulation:	IEEE for 802.11B: DSSS (CCK, DQPSK, DBPSK) IEEE for 802.11G: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE for 802.11N(HT20 and HT40): OFDM (64QAM, 16QAM, QPSK, BPSK)
Channels Step:	Channels with 5MHz step
Test software of EUT:	ADB (manufacturer declare)
Antenna Type:	PCB Antenna
	1.78 dBi
Antenna Gain:	Note: This data is provided by customer and our lab isn't responsible for this data.



## 5.2. MAXIMUM OUTPUT POWER

Number of Transmit Chains (NTX)	IEE Std. 802.11	Channel Number	Max AVG Conducted Power (dBm)
1	IEEE 802.11B	1-11[11]	16.47
1	IEEE 802.11G	1-11[11]	12.80
1	IEEE 802.11N HT20	1-11[11]	11.83
1	IEEE 802.11N HT40	3-9[7]	10.96

## 5.3. CHANNEL LIST

	Channel List for 802.11B/G/N(20 MHz)							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	
1	2412	4	2427	7	2442	10	2457	
2	2417	5	2432	8	2447	11	2462	
3	2422	6	2437	9	2452			

	Channel List for 802.11N(40 MHz)						
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
3	2422	5	2432	7	2442	9	2452
4	2427	6	2437	8	2447		

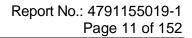


## 5.4. TEST CHANNEL CONFIGURATION

Test Mode	Test Channel (MHz)
	LCH: CH01 2412
IEEE 802.11B	MCH: CH06 2437
	HCH: CH11 2462
	LCH: CH01 2412
IEEE 802.11G	MCH: CH06 2437
	HCH: CH11 2462
	LCH: CH01 2412
IEEE 802.11N HT20	MCH: CH06 2437
	HCH: CH11 2462
	LCH: CH03 2422
IEEE 802.11N HT40	MCH: CH06 2437
	HCH: CH09 2452

## 5.5. THE WORSE CASE POWER SETTING PARAMETER

The W	Vorse Case	e Power Se	Power Setting Parameter under 2400 ~ 2483.5MHz Band					
Test Softw	vare		ADB					
	Transmit			Test C	Channel			
Modulation Mode	Antenna	NCB: 20MHz NCB: 40MHz						
Mode	Number	CH 1	CH 6	CH 11	CH 3	CH 6	CH 9	
802.11B	1	40	40	40				
802.11G	1	44	44	44		/		
802.11N HT20	1	42	42	42				
802.11N HT40	1		/		40	40	40	





## 5.6. DESCRIPTION OF AVAILABLE ANTENNAS

Ant.	Frequency (MHz)	Antenna Type	Antenna Gain (dBi)
1	2400-2483.5	PCB Antenna	1.78

Note: This data is provided by customer and our lab isn't responsible for this data.

Test Mode	Transmit and Receive Mode	Description
IEEE 802.11B	⊠1TX, 1RX	Antenna1 can be used as transmitting/receiving antenna independently.
IEEE 802.11G	⊠1TX, 1RX	Antenna1 can be used as transmitting/receiving antenna independently.
IEEE 802.11N HT20	⊠1TX, 1RX	Antenna1 can be used as transmitting/receiving antenna independently.
IEEE 802.11N HT40	⊠1TX, 1RX	Antenna1 can be used as transmitting/receiving antenna independently.

## 5.7. THE WORSE CASE CONFIGURATIONS

For WIFI module, the worst-case data rates as provided by the client were: 802.11B mode: 1 Mbps 802.11G mode: 6 Mbps 802.11N HT20 mode: MCS0 802.11N HT40 mode: MCS0

## 5.8. TEST ENVIRONMENT

Environment Parameter	Selected Va	lues During Tests
Relative Humidity:	55	5 ~ 65%
Atmospheric Pressure:	1	025Pa
Temperature:	TN	23 ~ 28°C
	VL	N/A
Voltage:	VN	AC 120V
	VH	N/A

Note: VL= Lower Extreme Test Voltage VN= Nominal Voltage VH= Upper Extreme Test Voltage TN= Normal Temperature



# 5.9. DESCRIPTION OF TEST SETUP

#### SUPPORT EQUIPMENT

Item	Equipment	Brand Name	Model Name	Description
1	Laptop	ThinkPad	E590	/

#### <u>I/O PORT</u>

Cable No	Port	Connector Type	Cable Type	Cable Length(m)	Remarks
1	USB	USB	USB	100cm Length	/

#### ACCESSORY

Item	Accessory	Brand Name	Model Name	Description
1	Empty Wash Fill Docker 1	roborock	EWFD24LRR	Input: 120V~ 60Hz Output: 20V <del></del> 1.5A
2	Empty Wash Fill Docker 2	roborock	EWFD24LRR	Input: 120V~ 60Hz Output: 20V- 1.5A

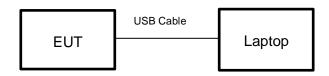


### TEST SETUP

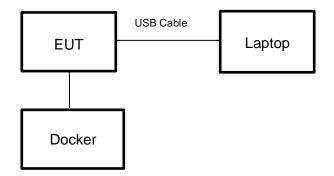
The EUT can work in an engineer mode with a software through a laptop.

### **SETUP DIAGRAM FOR TESTS**

For Antenna Port test and Radiated Test:



For Conducted Emission Test:





## 5.10. MEASURING INSTRUMENT AND SOFTWARE USED

		Cor	nducted	Emiss	sions	(Instru	ment)		
Used	Equipment	Manufacturer	Mode	l No.	Seri	al No.	Upper Last Cal.	Last Cal.	Next Cal.
$\checkmark$	EMI Test Receiver	R&S	ESF	₹3	126700		2022-11-26	2023-11-25	2024-11-24
$\checkmark$	Two-Line V-Network	R&S	ENV	216	12	6701	2022-11-26	2023-11-25	2024-11-24
V	Artificial Mains Networks	R&S	ENY	′81	12	6712	2022-09-27	2023-09-26	2024-09-25
				Soft	ware				
Used	Des	cription		Ma	nufac	turer	Name	Version	
$\checkmark$	Test Software for (	Conducted distur	bance		R&S	;	EMC32	Ver. 9.25	
		Ra	diated	Emissi	ions (	Instrum	nent)		
Used	Equipment	Manufacturer	Mode	l No.	Seri	al No.	Upper Last Cal.	Last Cal.	Next Cal.
$\checkmark$	EMI test receiver	R&S	ESF			2993	2022-05-20	2023-04-08	2024-04-07
	EMI test receiver	R&S	ESR			6703	2022-11-26	2023-11-25	2024-11-24
	Spectrum Analyzer	R&S	FSV3	3044	22	2992	2022-05-20	2023-04-08	2024-04-07
	Receiver Antenna (9kHz-30MHz)	Schwarzbeck	FMZB	1513	15	5456	2018-06-04	2021-06-03	2024-06-02
V	Receiver Antenna (30MHz-1GHz)	SunAR RF Motion	JB	1	17	7821	2019-01-28	2022-01-18	2025-01-17
$\checkmark$	Receiver Antenna (1GHz-18GHz)	R&S	HF9	07	12	6705	2019-01-27	2022-02-28	2025-02-27
V	Receiver Antenna (18GHz-26.5GHz)	Schwarzbeck	BBHA	9170	12	6706	2019-02-29	2022-02-28	2025-02-27
	Pre-amplification (To 18GHz)	Tonscned	TAP010	18050	22	4539	2022-10-11	2023-10-10	2024-10-09
	Pre-amplification (To 18GHz)	R&S	SCU-	18D	13	4667	2022-11-26	2023-11-25	2024-11-24
V	Pre-amplification (To 26.5GHz)	R&S	SCU-	26D	13	5391	2022-11-26	2023-11-25	2024-11-24
N	Band Reject Filter	Wainwright	WRCG 2375-2 2485-2 405	2400- 2510-		1	2022-12-19	2023-12-18	2024-12-17
V	High Pass Filter	Wainwright	WHK) 5850-6 1800-4	6500-		2	2022-12-19	2023-12-18	2024-12-17
			Soft		ware				
Used	Desci	ription	Manufac		turer		Name	Version	
$\checkmark$	Test Software for R	adiated disturbar	nce Tonsce		nd		TS+	Ver. 2.5	
			Other instrument		ents				
Used	Equipment	Manufacturer	Mode	l No.	Seri	al No.	Upper Last Cal.	Last Cal.	Next Cal.
V	Spectrum Analyzer	Keysight	N901	10B	15	5368	2022-05-20	2023-04-08	2024-04-07
	Power Meter	MWT	MW100-	-RFCB	22	1694	2022-05-23	2023-04-08	2024-04-07
	Attenuator	PASTERNACK	PE70	87-6	1	624	2022-05-23	2023-04-08	2024-04-07

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# 6. MEASUREMENT METHODS

No.	Test Item	KDB Name	Section
1	6dB Bandwidth and 99% Occupied Bandwidth	KDB 558074 D01 15.247 Meas Guidance v05r02	8.2
2	Output Power	KDB 558074 D01 15.247 Meas Guidance v05r02	8.3.2.3 (Method PM)
3	Power Spectral Density	KDB 558074 D01 15.247 Meas Guidance v05r02	8.4 (Method PKPSD)
4	Out-of-band emissions in non-restricted bands	KDB 558074 D01 15.247 Meas Guidance v05r02	8.5
5	Out-of-band emissions in restricted bands	KDB 558074 D01 15.247 Meas Guidance v05r02	8.6
6	Band-edge	KDB 558074 D01 15.247 Meas Guidance v05r02	8.7
7	Conducted Emission Test for AC Power Port	ANSI C63.10-2013	6.2



# 7. ANTENNA PORT TEST RESULTS

# 7.1. ON TIME AND DUTY CYCLE

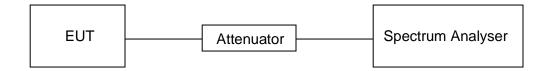
### <u>LIMITS</u>

None; for reporting purposes only

### PROCEDURE

FCC KDB 558074 Zero-Span Spectrum Analyzer Method

### TEST SETUP



### TEST ENVIRONMENT

Temperature	22°C	Relative Humidity	56%
Atmosphere Pressure	101kPa	Test Voltage	AC 120V

### TEST RESULTS TABLE

Mode	On Time (msec)	Period (msec)	Duty Cycle x (Linear)	Duty Cycle (%)	Duty Cycle Correction Factor (db)	1/T Minimum VBW (kHz)	Final VBW (kHz)
11B	100	100	1	100%	0	0.01	0.01
11G	100	100	1	100%	0	0.01	0.01
802.11N HT20	100	100	1	100%	0	0.01	0.01
802.11N HT40	100	100	1	100%	0	0.01	0.01

Note: 1) Duty Cycle Correction Factor=10log(1/x).

2) Where: x is Duty Cycle (Linear)

3) Where: T is On Time (transmit duration)

4) If the duty cycle is above 98%, the Final VBW is 10Hz.

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### TEST GRAPHS







11N HT20 Spectrum Analyzer 1 Swept SA	<b>, +</b>					Frequen	cy y 🔆
KEYSIGHT Input: RF RL ↔ Coupling: E Align: Auto	Input Z: 50 Ω Corrections: Off Freq Ref: Int (S)	#Atten: 30 dB Preamp: Off	PNO: Fast Gate: Off IF Gain: Low Sig Track: Off	#Avg Type: Pov Trig: Video Trig Delay: 200	ver (RMS <mark>1</mark> 23) .0 μs A A A A	2.437000000 GHz	Settings
1 Spectrum v Scale/Div 10 dB Log		Ref Lvl Offset 8 Ref Level 28.23				Span 0.00000000 Hz Swept Span Zero Span	
18.2 8.23 -1.77					IR	Full Span	
-11.8 -21.8 -31.8 -41.8						Start Freq 2.437000000 GHz Stop Freq	
-51.8 -61.8 Center 2.437000000 GHz		#Video BW 8.0	MU-*		Spar	2.437000000 GHz	
Res BW 8 MHz 5 Marker Table		#video Bw 6.0		Sweep	100.0 ms (100		
Mode Trace Sc 1 2	ale X	Y	Function	Function Width	Function Valu	e Man Freq Offset	
3 4 5 6						0 Hz X Axis Scale Log	
156	<b>?</b> Jan 13, 2024 2:22:00 PM	$Q\Lambda$				Lin Signal Track	





## 7.2. 6 dB BANDWIDTH AND 99% OCCUPIED BANDWIDTH

#### **LIMITS**

FCC Part15 (15.247), Subpart C				
Section Test Item Limit Frequency Range (MHz)				
FCC 47 CFR 15.247(a)(2) ISED RSS-247 5.2 (a)	6dB Bandwidth	>= 500kHz	2400-2483.5	
ISED RSS-Gen Clause 6.7	99% Occupied Bandwidth	For reporting purposes only	2400-2483.5	

### TEST PROCEDURE

Refer to ANSI C63.10-2013 clause 11.8 for DTS bandwidth and clause 6.9 for Occupied Bandwidth.

Connect the EUT to the spectrum analyser and use the following settings:

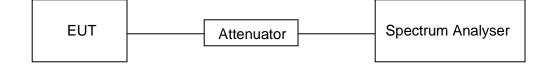
Center Frequency	The centre frequency of the channel under test
Detector	Peak
IBBW/	For 6 dB Bandwidth: 100 kHz For 99% Occupied Bandwidth: 1% to 5% of the occupied bandwidth
NRW	For 6 dB Bandwidth: ≥3 × RBW For 99% Occupied Bandwidth: ≥3 × RBW
Trace	Max hold
Sweep	Auto couple

a) Use the 99% power bandwidth function of the instrument, allow the trace to stabilize and report the measured bandwidth.

b) Allow the trace to stabilize and measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.



### TEST SETUP



#### **TEST ENVIRONMENT**

Temperature	22°C	Relative Humidity	56%
Atmosphere Pressure	101kPa	Test Voltage	AC 120V

#### TEST RESULTS TABLE

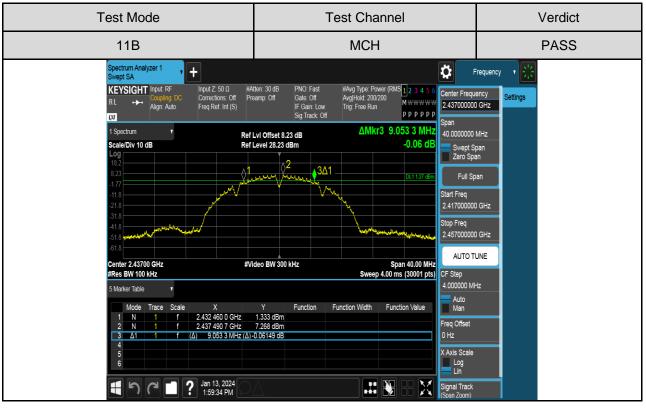
Test Mode	Test Channel	6dB bandwidth (MHz)	99% bandwidth (MHz)	Result
	LCH	9.0280	13.364	Pass
11B	MCH	9.0533	13.353	Pass
	HCH	9.0387	13.374	Pass
	LCH	16.5600	16.601	Pass
11G	MCH	16.5667	16.597	Pass
	HCH	16.5627	16.612	Pass
	LCH	17.7853	17.759	Pass
11N HT20	MCH	17.7773	17.761	Pass
	HCH	17.7693	17.771	Pass
	LCH	36.4107	36.248	Pass
11N HT40	MCH	36.4320	36.249	Pass
	НСН	36.4400	36.286	Pass



### **TEST GRAPHS**

#### 6dB Bandwdith

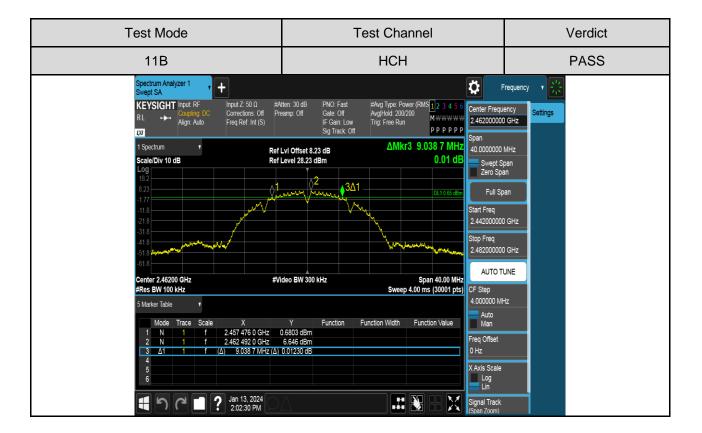




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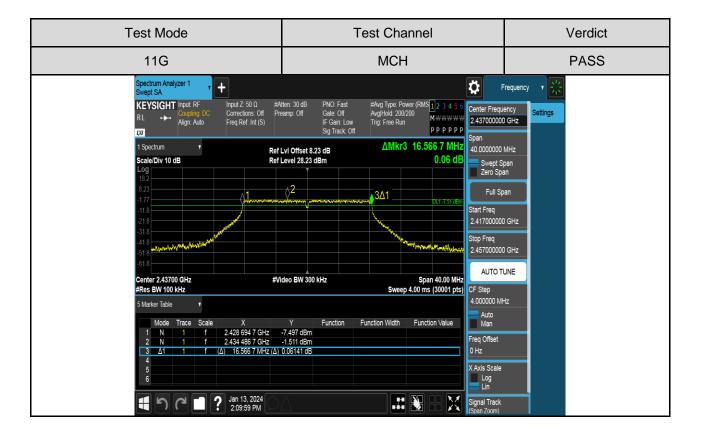
UL-CCIC COMPANY LIMITED





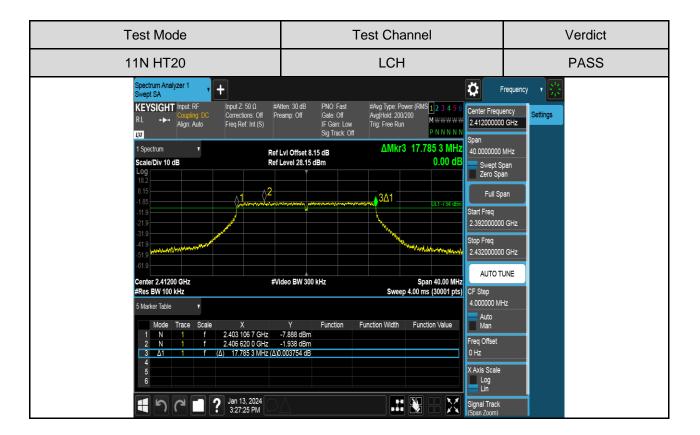
Test Mode	Test Channel	Verdict
11G	LCH	PASS
RL     Coupling DC     Corrections: Off       RU     Align: Auto     Freq Ref. Int (S)       ISpectrum     R       Scale/Div 10 dB     R       Log     1       182     11       182     11       182     11       19     1       219     1       319     1       619     1	Picality. Oli         Odde Coli         Other Mark Off         Trg: Fiee Run         MWWWWW         2.4           ef Lvi Offset 8.15 dB         ΔMkr3 16.560 0 MHz         40           ef Lvi Offset 8.15 dB         -0.01 dB         40           ef Lvi Offset 8.15 dB         -0.01 dB         3Δ1         -0.01 dB           via the state of th	nter Frequency 412000000 GHz an 10000000 MHz Swept Span Zero Span Full Span art Freq 39200000 GHz pp Freq 432000000 GHz Step 000000 MHz Step 000000 MHz aq Offset





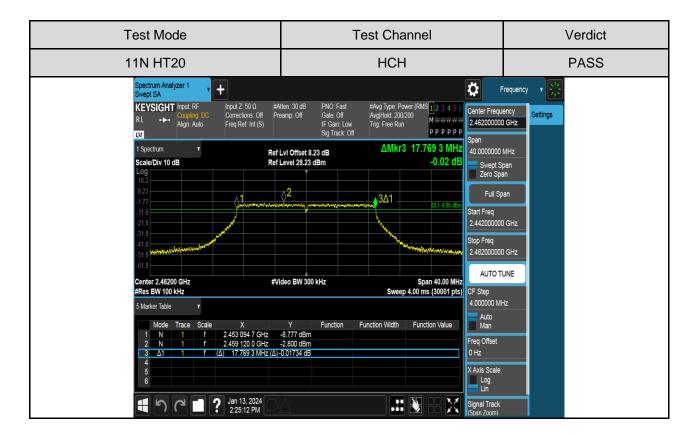
Test Mode	Test Channel	Verdict
11G	НСН	PASS
RL       →       Coupling DC Align: Auto       Corrections: Off       Pr         1       Spectrum       Image: Spectrum       Ref         1       Spectrum       Ref         20       Image: Spectrum       Ref         1       Spectrum       Ref         1       Spectrum       Ref         1       Spectrum       Ref         102       Image: Spectrum       Ref         103       Image: Spectrum       Ref         103       Image: Spectrum       Ref         110       Image: Spectrum       Image: Spectrum         111       Image: Spectrum       Image: Spectrum	Ampliful 2002/20         Memory and the second	000000 GHz req 000000 GHz UTO TUNE pp 000 MHz .to an iffset Scale op n





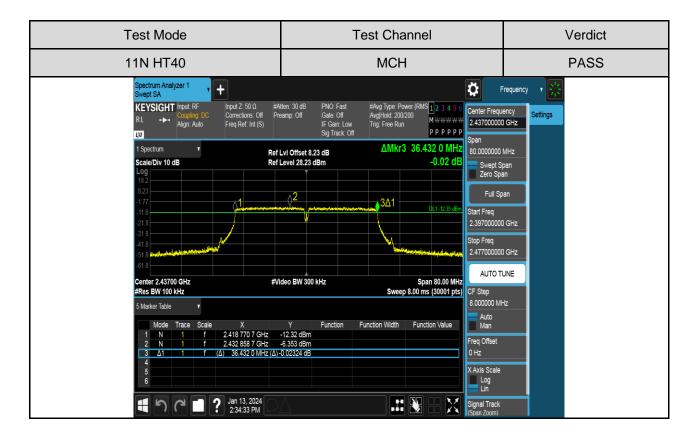
Test Mode	Test Channel	Verdict
11N HT20	MCH	PASS
RL     Couping DC     Corrections: Off     Freq Ref. Int (S)       DV     I     Spectrum     I     Ref       Scale/Div 10 dB     Ref       Log     I     I       102     I     I       103     I     I       104     I     I       105     I     I       106     I     I       107     I     I       108     I     I       109     I     I       100     I     I       11.8     I     I       21.8     I     I       31.8     I     I       51.8     I     I       61.8     I     I	Composition         Composition <thcomposition< th=""> <thcomposition< th=""></thcomposition<></thcomposition<>	000000 MHz Swept Span Zero Span Full Span Freq 7000000 GHz Freq 7000000 GHz AUTO TUNE tep 0000 MHz Auto Man Offset





Test Mode	Test Channel	Verdict
11N HT40	LCH	PASS
RL       →       Coupling DC Align: Auto       Corrections: Off       Pre         1       Spectrum       •       Ref       Scale/Div 10 dB       Ref         100       1       Spectrum       •       Ref       Scale/Div 10 dB       Ref         101       1       1       Spectrum       •       Ref       Scale/Div 10 dB       Ref         102       1       •       •       •       •       Scale/Div 10 dB       Ref         102       •       •       •       •       •       •       Ref         102       •       •       •       •       •       •       •       •         119       •<	Amp: On         Dif Gain Low Sig Track: Off         Program Low Tig Free Run         P P P P P P P P P P P P P P P P P P P	ter Frequency 2200000 GHz m 0000000 MHz Swept Span Zero Span Full Span t Freq 82000000 GHz P Freq 62000000 GHz Step 00000 MHz Auto Man q Offset





Test Mode	Test Channel	Verdict
11N HT40	НСН	PASS
RL     Coupling DC Align: Auto     Corrections: Off     Pn       1     Spectrum     Image: Spectrum     Ref       1     Spectrum     Image: Spectrum     Image: Spectrum       1     Image: Spectrum     Image: Spectrum     Image: Spectrum       1     N     Image: Spectrum     Image: Spectrum	Iten: 30 dB       PNO. Fast Gate: Off       #Avg Type: Power (RMS 1/2) 2 3 4 5 6 Avg Hold: 200200 IF Gam: Low Sig Track: Off       Image: Comparison of the comparison o	Frequency Settings enter Frequency Settings enter Frequency Settings pan 10.0000000 MHz Settings Full Span



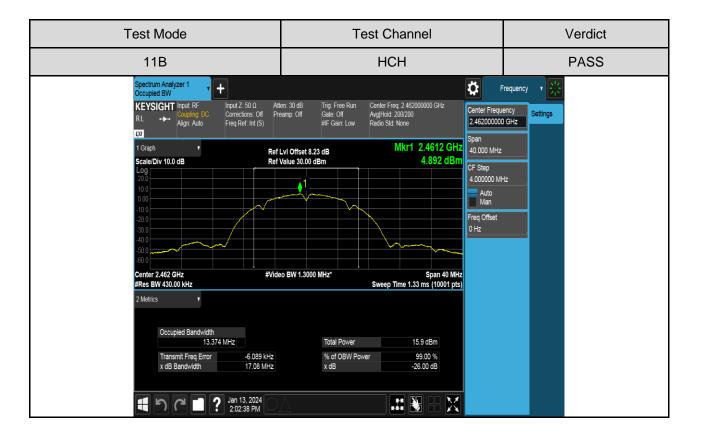
#### 99% Bandwidth





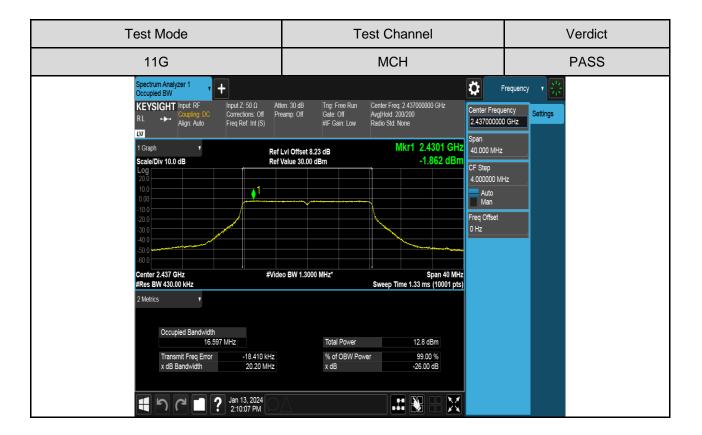
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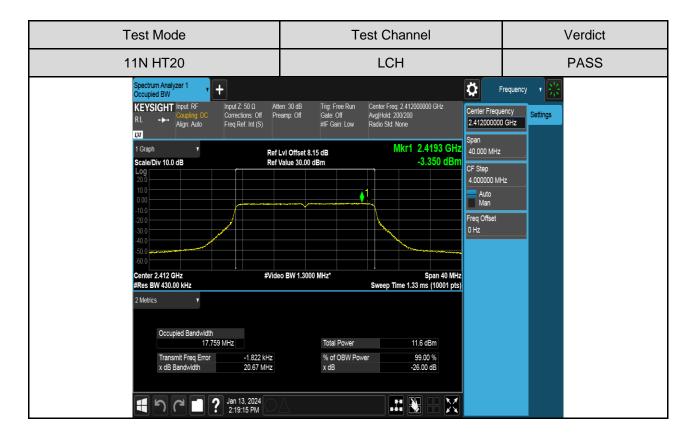
Test Mode	Test Channel	Verdict
11G	LCH	PASS
Spectrum Analyzer 1 Cocupied BW KEYSIGHT Input RF RL	an: 30 dB Trig: Free Run Gate: Off Arg Hold: 200/200 #IF Gain: Low Radio Std: None NI Offset 8.15 dB Mkr1 2.4109 GHz /alue 30.00 dBm -2.057 dBm 0 BW 1.3000 MHz* Span 40 MHz Sweep Time 1.33 ms (10001 pts)	Erequency Settings Center Frequency Settings Span 40.000 MHz CF Step 4000000 MHZ CF Step 40000000 MHZ CF Step 40000000 MHZ





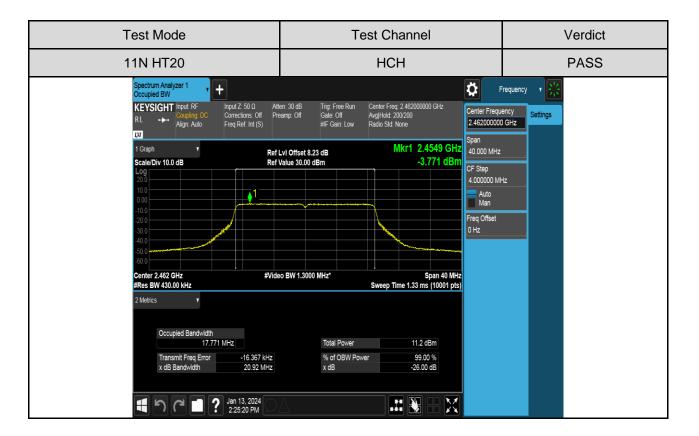
Test Mode	Test Channel	Verdict
11G	НСН	PASS
Spectrum Analyzer 1 Cccupied BW KEYSIGHT Input: RF RL → Align: Auto 1 Graph 1 Graph 1 Graph 200 100 000 000 000 000 000 000	HCH en: 30 dB amp: Off gate: Off #IF Gain: Low Center Freq: 2.462000000 GHz AvgHold: 200/200 Radio Std. None Mkr1 2.4629 GHz -2.619 dBm -2.619 dBm -2.610 dBm -2.6	Frequency     Settings       2.46200000 GHz     Settings       2.46200000 HHz     C       40.000 MHz     Auto       Man     Freq Offset       0 Hz     Hz
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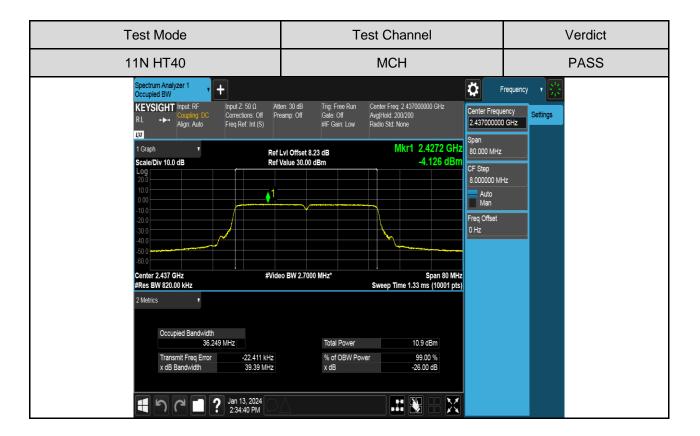
Test Mode	Test Channel	Verdict
11N HT20	MCH	PASS
Spectrum Analyzer 1 Occupied BW KEYSIGHT Input RF RL →→ Align Auto T Graph 1 G	ten: 30 dB Trig: Free Run Center Freq: 2.437000000 GHz earnp: Off Gate: Off Avg Hold: 200/200 #IF Gain: Low Radio Std: None Span LvI Offset 8.23 dB Mkr1 2.4300 GHz Value 30.00 dBm -3.089 dBm GF S	Frequency Settings er Frequency Settings 000 MHz Nopo MHz Auto Man Offset
x dB Bandwidth 20.65 MHz	x dB -26.00 dB	





Test Mode	Test Channel	Verdict
11N HT40	LCH	PASS
Spectrum Analyzer 1       ↓         Cocupied BW       ↓         KEYSIGHT Input RF       Input Z 50 Ω         RL       ↓         Coupling DC       Align: Auto         I Graph       Ref I         Scale/Div 10.0 dB       Ref I         10 0       0         -00       -00         -00       -00         -00       -00	sn. 30 dB rmg: Free Run Gate: Off Gate: Off AugiHold: 200/200 Radio Std None Mkr1 2.4309 GHZ AugiHold: 200/200 Radio Std None Span 80.000 MF CF Step 8.000000 Auto Man Freq Offset 0 Hz Total Power 11.0 dBm % of OBW Power 9.00 % x dB -26.00 dB	Frequency Cettings
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Test Mode	Test Channel	Verdict
11N HT40	НСН	PASS
R L →→ Coupling DC Corrections: Off Pre Align: Auto Freq Ref. Int (S) U Carbon Coupling DC Corrections: Off Pre Freq Ref. Int (S) Carbon Coupling DC Corrections: Off Pre Scale/Div 10.0 dB Ref. V	Mightub 200200         Mightub 200200         2 452           #IF Gain: Low         Radio Skit None         2 452           Lvi Offset 8.23 dB         Mikr1 2.4383 GHz         Span           Value 30.00 dBm         -4.161 dBm         CF Str	
20 0 10 0 -10 0 -20 0 -30 0 -40 0 -50 0 -60 0	Freq C DHz	000 MHz Ian Dffset
#Res BW 820.00 kHz 2 Metrics  Cccupied Bandwidth 36 286 MHz	to BW 2.7000 MHz* Span 80 MHz Sweep Time 1.33 ms (10001 pts)	
Transmit Freq Error -28.906 kHz x dB Bandwidth 39.61 MHz	% of OBW Power 99.00 % x dB -26.00 dB	
📲 🔊 (c) 🖬 ? Jan 13, 2024 2:37:41 PM		



## 7.3. CONDUCTED OUTPUT POWER

#### **LIMITS**

	FCC Part15 (	15.247), Subpart C	
Section	Test Item	Limit	Frequency Range (MHz)
FCC 15.247(b)(3) ISED RSS-247 5.4 (d) RSS-Gen Clause 6.12	Output Power	1 watt or 30dBm	2400-2483.5

#### TEST PROCEDURE

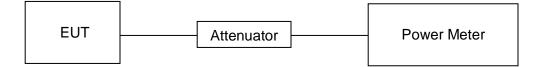
Place the EUT on the table and set it in the transmitting mode.

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the Power sensor.

Measure the power of each channel.  $A_{A}(C)$ 

AVG Detector used for AVG result.

#### TEST SETUP





### TEST ENVIRONMENT

Temperature	22°C	Relative Humidity	56%
Atmosphere Pressure	101kPa	Test Voltage	AC 120V

#### TEST RESULTS TABLE

Test Mode	Test Channel	Measurement Output Power (AV)	10log(1/x) Factor	Maximum Conducted Output Power (AV)	LIMIT
		dBm	dBm	dBm	dBm
	LCH	16.29	0	16.29	30
11B	MCH	16.47	0	16.47	30
	HCH	15.88	0	15.88	30
	LCH	12.71	0	12.71	30
11G	MCH	12.80	0	12.80	30
	HCH	12.18	0	12.18	30
	LCH	11.63	0	11.63	30
11N HT20	MCH	11.83	0	11.83	30
	HCH	11.21	0	11.21	30
	LCH	10.96	0	10.96	30
11N HT40	MCH	10.96	0	10.96	30
	HCH	10.65	0	10.65	30



## 7.4. POWER SPECTRAL DENSITY

#### **LIMITS**

	FCC Part15 (15.247),	Subpart C	
Section	Test Item	Limit	Frequency Range (MHz)
FCC §15.247 (e) ISED RSS-247 5.2 (b)	Power Spectral Density	8 dBm/3 kHz	2400-2483.5

#### TEST PROCEDURE

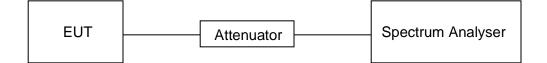
Refer to FCC KDB 558074, connect the UUT to the spectrum analyser and use the following settings:

Center Frequency	The centre frequency of the channel under test	
Detector	Peak	
RBW	3 kHz ≤ RBW ≤100 kHz	
VBW	≥3 × RBW	
Span	1.5 x DTS bandwidth	
Trace	Max hold	
Sweep time	Auto couple.	

Allow trace to fully stabilize and use the peak marker function to determine the maximum amplitude level within the RBW.

If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

### TEST SETUP





#### TEST ENVIRONMENT

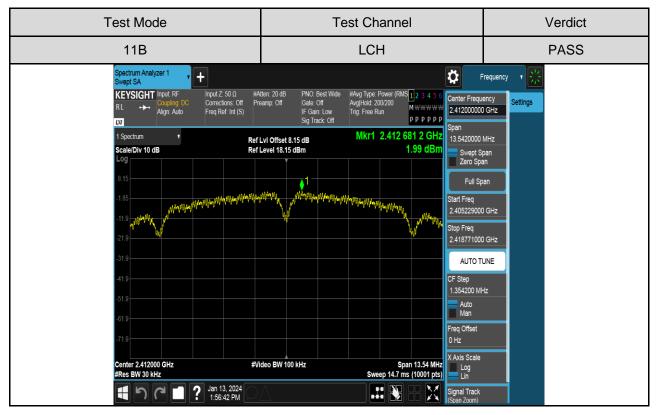
Temperature	22°C	Relative Humidity	56%
Atmosphere Pressure	101kPa	Test Voltage	AC 120V

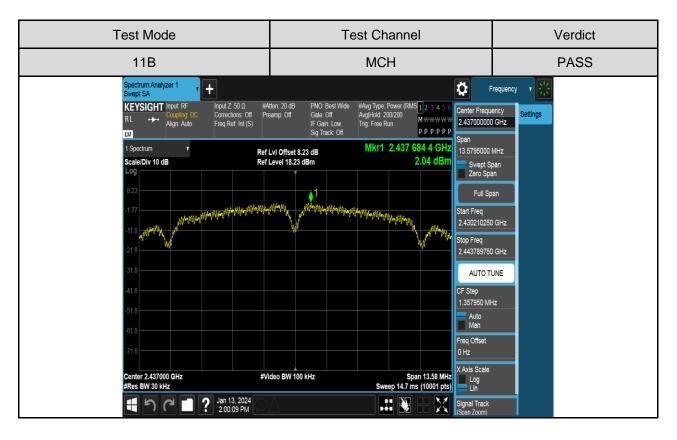
#### TEST RESULTS TABLE

Test Mode	Test Channel	Maximum Peak power spectral density (dBm/30kHz)	Result
	LCH	1.99	Pass
11B	MCH	2.04	Pass
	HCH	1.51	Pass
	LCH	-4.32	Pass
11G	MCH	-4.50	Pass
	HCH	-5.05	Pass
	LCH	-5.02	Pass
11N HT20	MCH	-4.82	Pass
	HCH	-5.53	Pass
	LCH	-8.81	Pass
11N HT40	MCH	-9.09	Pass
	HCH	-9.34	Pass



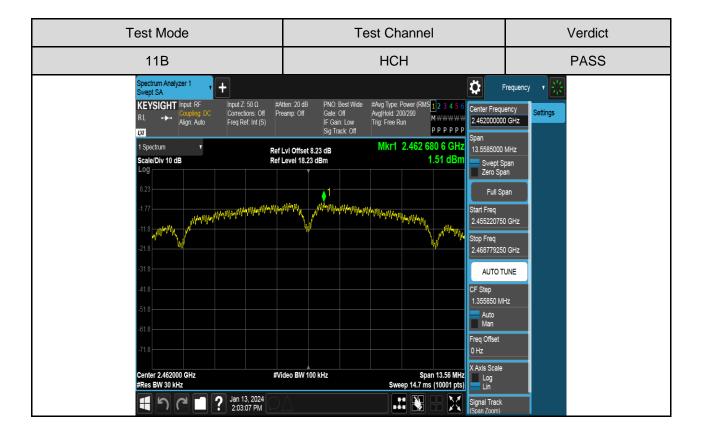
### **TEST GRAPHS**

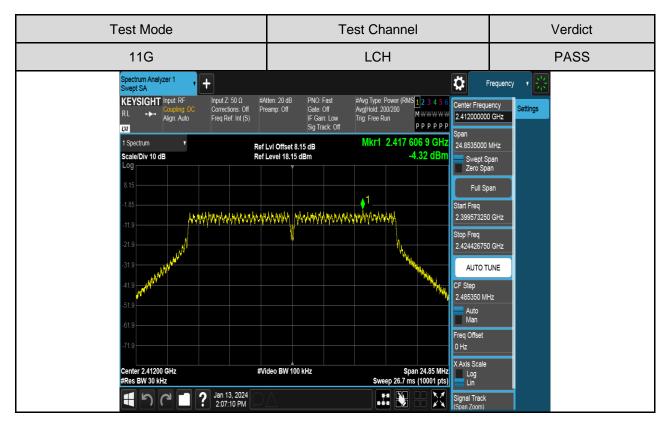




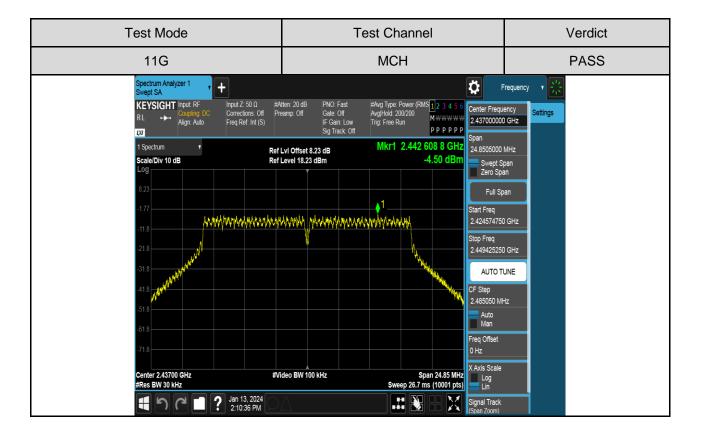
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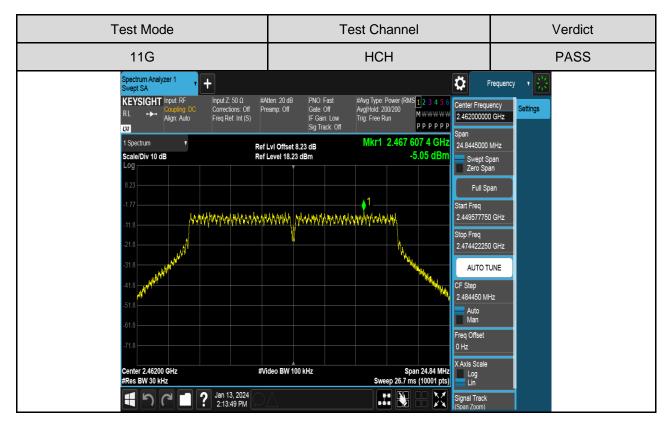




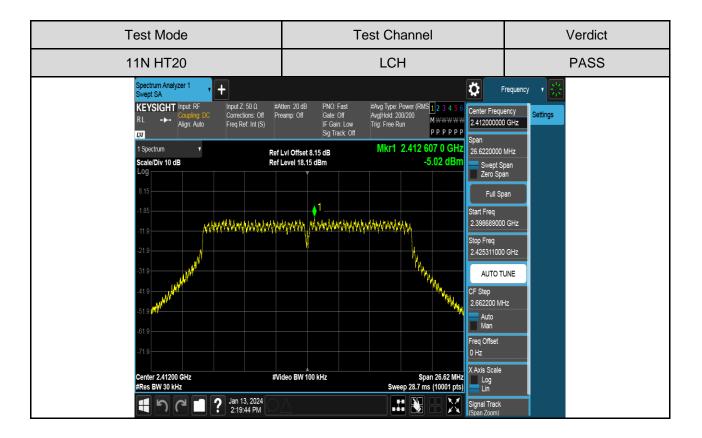


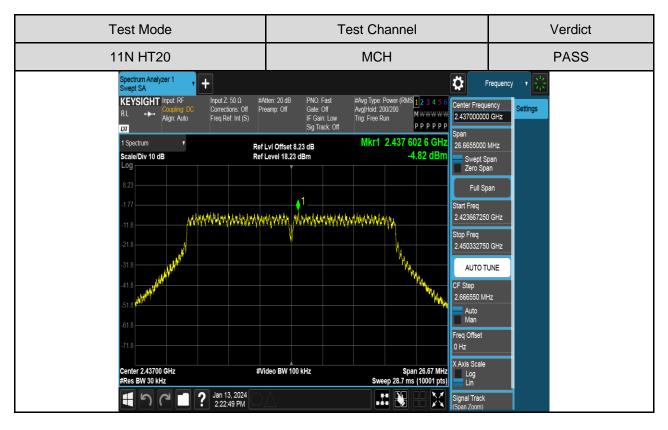




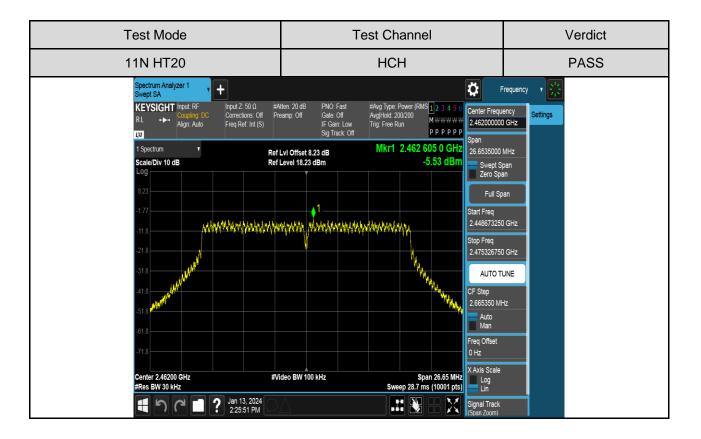


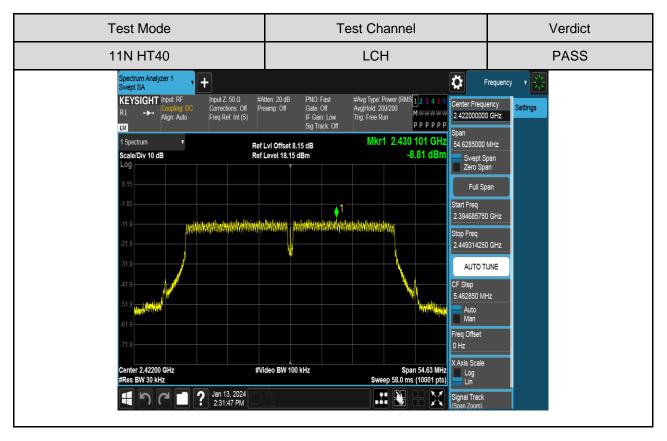






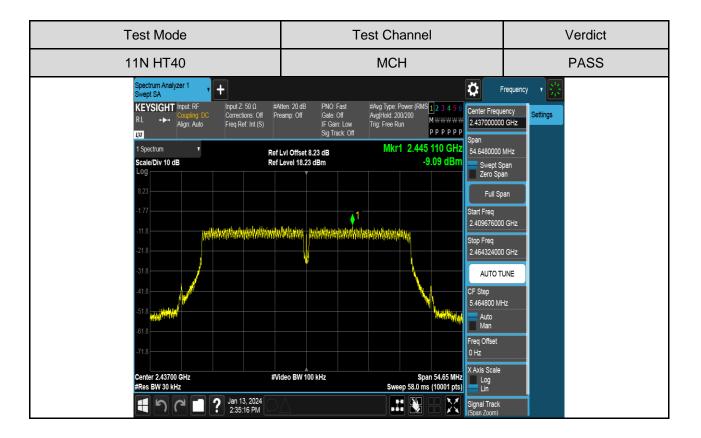


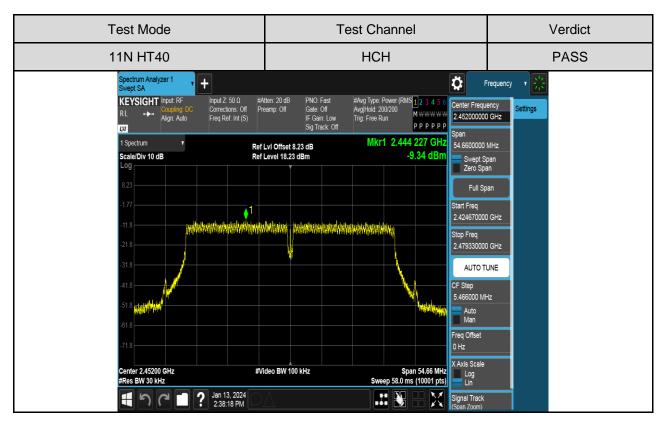




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## 7.5. CONDUCTED BANDEDGE AND SPURIOUS EMISSIONS

#### **LIMITS**

FCC Part15 (15.247), Subpart C		
Section Test Item Limit		
FCC §15.247 (d)	Conducted	30 dB below that in the 100 kHz bandwidth
RSS-247 Clause 5.5	Bandedge and	within the band that contains the highest
RSS-GEN Clause 6.13	Spurious Emissions	level of the desired power

#### TEST PROCEDURE

Refer to FCC KDB 558074, connect the UUT to the spectrum analyser and use the following settings:

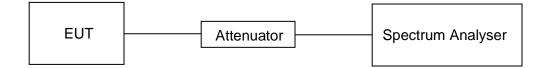
Center Frequency	The centre frequency of the channel under test
Detector	Peak
RBW	100K
VBW	≥3 × RBW
Span	1.5 x DTS bandwidth
Trace	Max hold
Sweep time	Auto couple.

Use the peak marker function to determine the maximum PSD level.

Span	Set the center frequency and span to encompass frequency range to be measured
Detector	Peak
RBW	100K
VBW	≥3 x RBW
measurement points	≥span/RBW
Trace	Max hold
Sweep time	Auto couple.

Use the peak marker function to determine the maximum amplitude level.

### TEST SETUP





#### TEST ENVIRONMENT

Temperature	22°C	Relative Humidity	56%
Atmosphere Pressure	101kPa	Test Voltage	AC 120V

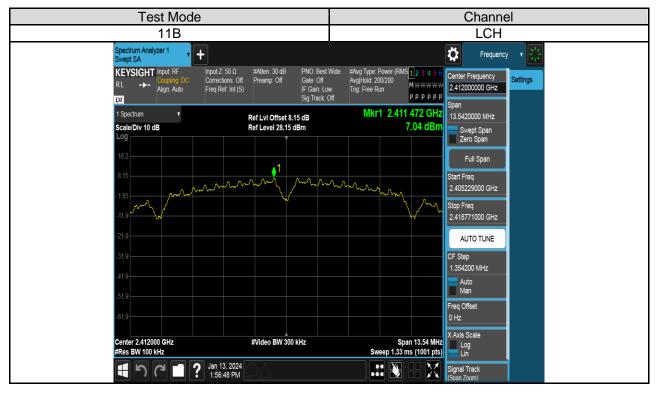
#### PART 1: REFERENCE LEVEL MEASUREMENT

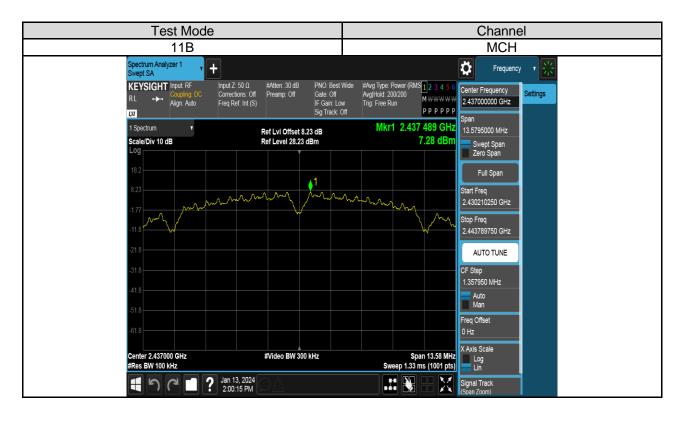
## TEST RESULTS TABLE

Test Mode	Test Channel	Result[dBm]
11B	LCH	7.04
	MCH	7.28
	HCH	6.62
11G	LCH	-1.78
	MCH	-1.67
	HCH	-2.30
11N HT20	LCH	-2.74
	MCH	-2.10
	HCH	-2.46
11N HT40	LCH	-6.38
	MCH	-6.50
	НСН	-6.69



### **TEST GRAPHS**





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