

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

**TEST REPORT** 

For

**Robotic Vacuum Cleaner** 

## **MODEL NUMBER: QR2PPS**

## PROJECT NUMBER: 4791151047

## **REPORT NUMBER: 4791151047-3**

FCC ID: 2AN2O-QR2PPS02

IC: 23317-QR2PPS02

HVIN: QR2PPS-FNF8

ISSUE DATE: Mar. 18, 2024

Prepared for

Beijing Roborock Technology Co., Ltd.

Prepared by

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### **Revision History**

Rev.	Issue Date	Revisions	Revised By
V0	03/18/2024	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:	QR2PPS
	Note: The product only has one model, but the product has different colors of appearance, such as white and black.
Additional No.:	/
Model Difference:	/
Sample Number:	6869291
Data of Receipt Sample:	Jan. 29, 2024
Test Date:	Jan. 29, 2024~ Mar. 11, 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:

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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.:	QR2PPS				
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				
	2.22 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]	17.62
1	IEEE 802.11G	1-11[11]	14.44
1	IEEE 802.11N HT20	1-11[11]	13.89
1	IEEE 802.11N HT40	3-9[7]	13.83

## 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		

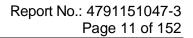


## 5.4. TEST CHANNEL CONFIGURATION

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 V	Vorse Case	e Power Se	Power Setting Parameter under 2400 ~ 2483.5MHz Band				
Test Softw	/are			A	DB		
	Transmit			Test C	Channel		
Modulation Mode	Antenna	1	NCB: 20MH	z	Ν	ICB: 40MHz	
Wiode	Number	CH 1	CH 6	CH 11	CH 3	CH 6	CH 9
802.11B	1	default	default	default			
802.11G	1	default	default	default		/	
802.11N HT20	1	default	default	default			
802.11N HT40	1		/		default	default	default





## 5.6. DESCRIPTION OF AVAILABLE ANTENNAS

Ant.	Frequency (MHz)	Antenna Type	Antenna Gain (dBi)
1	2400-2483.5	PCB Antenna	2.22

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:	10	01.5kPa
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 Dock 1	roborock	EWFD22LRR	Input: 120V~ 60Hz Output: 20V <del></del> 1.5A
2	Empty Wash Fill Dock 2	roborock	EWFD22LRR	Input: 120V~ 60Hz Output: 20V- 1.5A

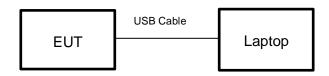


### TEST SETUP

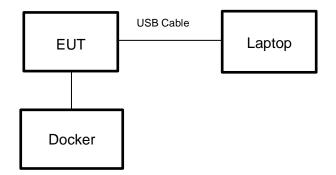
The EUT can work in an engineer mode with a software through a laptop.

### **SETUP DIAGRAM FOR TESTS**

For Antenna Port test and Radiated Test:



For Conducted Emission Test:



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# 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	२३	12	6700	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	5	EMC32	Ver. 9.25	
		Ra	diated l	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	202-11-25	2024-11-24
	Spectrum Analyzer Receiver Antenna	R&S	FSV3	6044	22	2992	2022-05-20	2023-04-08	2024-04-07
	(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
V	Pre-amplification (To 18GHz)	Tonscned	TAP010	18050	22	4539	2022-10-11	2023-10-10	2024-10-09
V	Pre-amplification (To 18GHz)	R&S	SCU-	18D	13	4667	2022-11-26	2023-11-25	2024-11-24
	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 40S	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			nd		TS+	Ver. 2.5	
			Other ins		trum	ents			
Used	Equipment	Manufacturer	Mode	l No.	Seri	al No.	Upper Last Cal.	Last Cal.	Next Cal.
	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
V	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 AVGPM)
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

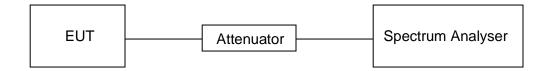
## <u>LIMITS</u>

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

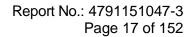
Note: 1) Duty Cycle Correction Factor=10log(1/x).

2) Where: x is Duty Cycle (Linear)

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

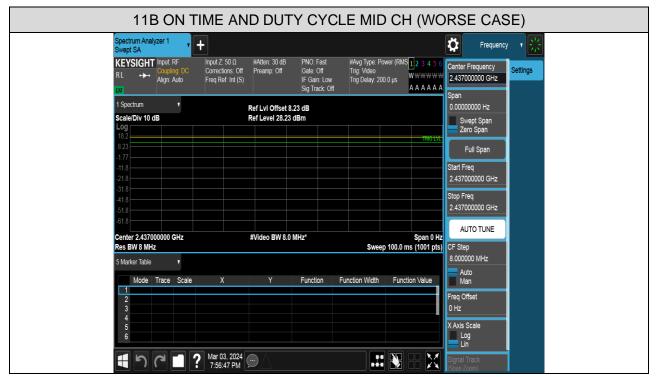
4) If the duty cycle is above 98%, the Final VBW is 10Hz.

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### **TEST GRAPHS**







Spectrum Analyzer 1 Swept SA	• +						Frequency	· • 😤
KEYSIGHT Input: RF RL +++ Coupling: I 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: Po Trig: Video Trig Delay: 200	0.0 µs W	L 2 3 4 5 6 V W W W W A A A A A A	2.401000000 0112	Settings
1 Spectrum v Scale/Div 10 dB Log		Ref LvI Offset 8 Ref Level 28.23					Span 0.00000000 Hz Swept Span Zero Span	
18.2 8.23 -1.77 -11.8						TRIG EVE	Full Span Start Freq	
-11.0 -21.8 -31.8 -41.8							2.437000000 GHz Stop Freq	
-51.8 -61.8 Center 2.437000000 GHz		#Video BW 8.0	MU-*			Span 0 Hz	2.437000000 GHz AUTO TUNE	
S Marker Table		#video Bw 6.0		Sweep			CF Step 8.000000 MHz	
Mode Trace Sc 1 2	ale X	Y	Function	Function Width	Functio	on Value	Auto Man Freq Offset	
3 4 5 6							0 Hz X Axis Scale Log	
- - -	Mar 03, 2024 8:25:56 PM	$\Theta \wedge$		P4			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)	>= 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:

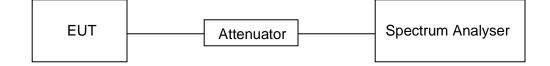
Center Frequency	The centre frequency of the channel under test
Detector	Peak
IBBW/	For 6 dB Bandwidth: 100 kHz For 99% Occupied Bandwidth: 1% to 5% of the occupied bandwidth
NRW	For 6 dB Bandwidth: ≥3 × RBW For 99% Occupied Bandwidth: ≥3 × RBW
Trace	Max hold
Sweep	Auto couple

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

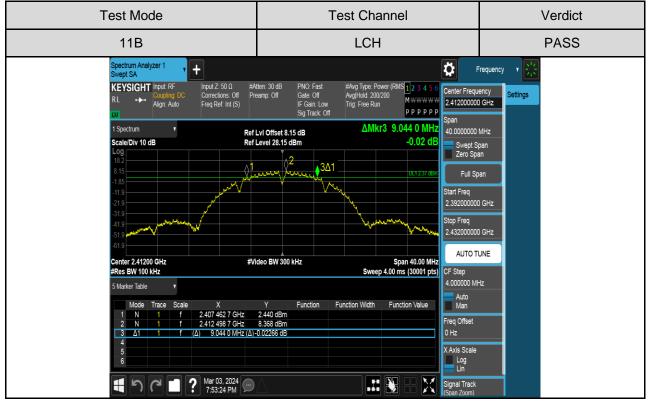
#### TEST RESULTS TABLE

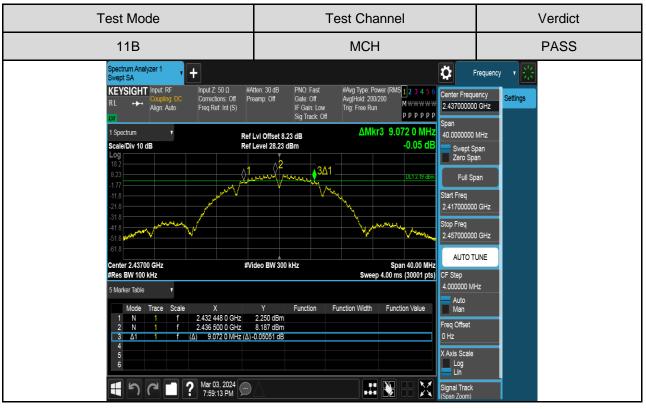
Test Mode	Test Channel	6dB bandwidth (MHz)	99% bandwidth (MHz)	Result
	LCH	9.0440	13.588	Pass
11B	MCH	9.0720	13.674	Pass
	HCH	9.0453	13.739	Pass
	LCH	16.5640	16.592	Pass
11G	MCH	16.5147	16.588	Pass
	HCH	16.5280	16.602	Pass
	LCH	17.7960	17.749	Pass
11N HT20	MCH	17.6840	17.749	Pass
	HCH	17.7173	17.765	Pass
	LCH	36.3840	36.158	Pass
11N HT40	MCH	36.3787	36.159	Pass
	НСН	36.4160	36.194	Pass



### **TEST GRAPHS**

#### 6dB Bandwdith

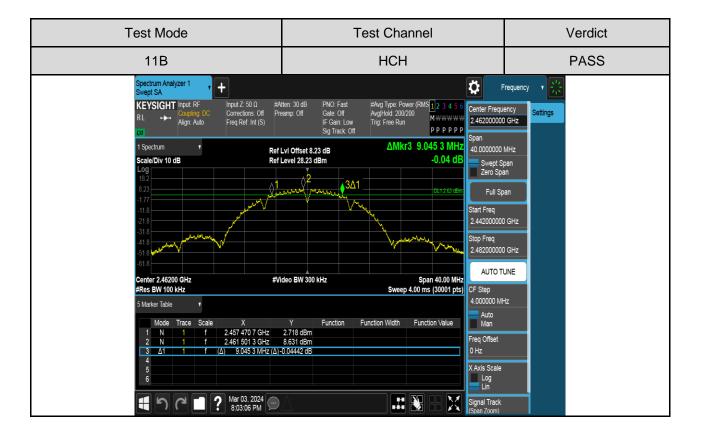




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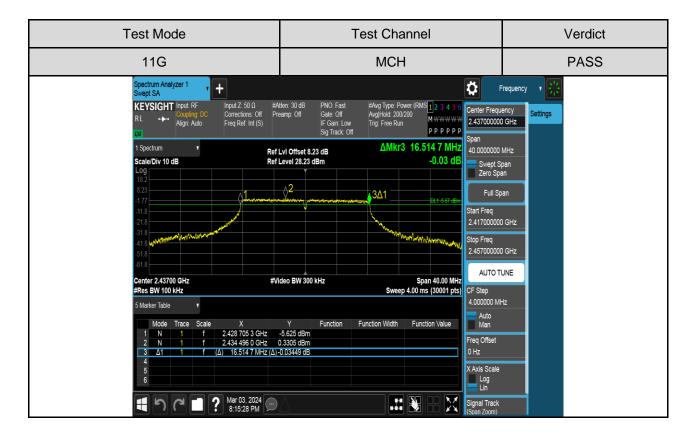
UL-CCIC COMPANY LIMITED





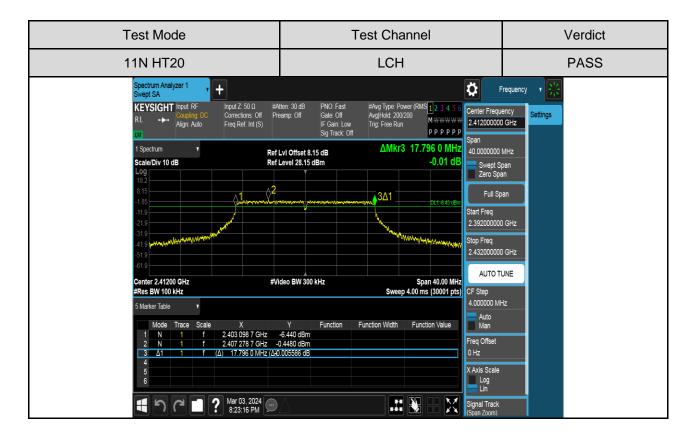
Test Mode	Test Channel	Verdict
11G	LCH	PASS
RL     →     Coupling DC Align: Auto     Corrections: Off     Pr       1     Spectrum     I     Ref       1     Spectrum     I     I       1     Spectrum     I     Ref       1     Spectrum     I     I       <	tten: 30 dB         PNO: Fast         #Avg Type: Power (RMS 12 3 4 5 6 0 F Avg)Hold: 200200         2 3 4 5 6 F Avg)Hold: 200200         C           JF Gain: Low         Ting: Free Run         P P P P P P         P         P         P         P P P P P         P	Frequency   enter Frequency   412000000 GHz   pan   0.0000000 MHz   Swept Span   Zero Span   Full Span   Full Span   Full Span   Latt Freq   .33200000 GHz   Auto TUNE   F Stap   0.000000 MHz   Auto Man   req Offset   Hz   Axis Scale   Lin   ganal Track rean Zoom)





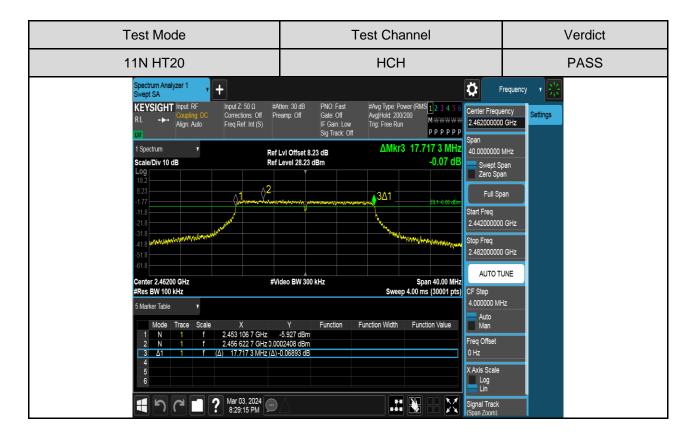
Test Mode	Test Channel	Verdict
11G	НСН	PASS
RL       →       Coupling: DC       Corrections: Off       Pre         1       Spectrum       •       Ref         1       10       0       0         1       10       0       0         1       10       0       0         1       10       0       0         1       10       0       0         1       10       0       0         1       10       0       0         11.8       0       0       0         11.8       0       0       0         1.1       0       0       0         1.1       0       0       0         1.1       0       0       0         1.1       0       0       0         1.1       0       0       0         1.1       0       0       0	Amp: Oil     Oil Gain Low Sig Track: Off     Tig Free Run     M <td>ter Frequency 6200000 MHz swept Span Zero Span Full Span t Freq 42000000 GHz b Freq 82000000 GHz Auto TUNE Step 00000 MHz Auto Man</td>	ter Frequency 6200000 MHz swept Span Zero Span Full Span t Freq 42000000 GHz b Freq 82000000 GHz Auto TUNE Step 00000 MHz Auto Man





Test Mode	Test Channel	Verdict
11N HT20	MCH	PASS
RL       →       Coupling DC Align: Auto       Corrections: Off Freq Ref. Int (S)       Pr         1       Spectrum       Image: Spectrum       Image: Spectrum       Ref         1       Spectrum       Image: Spectrum       Ref         20       Image: Spectrum       Image: Spectrum       Ref         20       Image: Spectrum       Image: Spectrum       Ref         20       Image: Spectrum       Image: Spectrum       Ref         210       Image: Spectrum       Image: Spectrum       Ref         212       Image: Spectrum       Image: Spectrum       Ref         213       Image: Spectrum       Image: Spectrum       Ref         313       Image: Spectrum       Image: Spectrum       Image: Spectrum         318       Image: Spectrum       Image: Spectrum       Image: Spectrum	LNL Offset 8.23 dB       ΔMkr3       17.684 0 MHz       Span         Lvl Offset 8.23 dB       0.02 dB       2       3Δ1       9 p p p p         2       3Δ1       9 p p p p       341       31 p p p p p         2       3Δ1       9 p p p p       341       31 p p p p p p         3       0.02 dB       341       9 p p p p p       341       31 p p p p p p         1	000000 MHz Swept Span Full Span Freq 7000000 GHz Freq 7000000 GHz AUTO TUNE tep 0000 MHz Auto Aan Offset





Test Mode	Test Channel	Verdict
11N HT40	LCH	PASS
RL     →     Coupling DC Align: Auto     Corrections: Off     Pn       1     Spectrum     Image: Spectrum     Image: Spectrum     Ref       1     1     Spectrum     Image: Spectrum       1     1     Spectrum     Image: Spectrum       1     1     1     Spectrum       1     1     1     1       1     1     1     1       2     1     1     1       319     1     1     1       5     1     1     1       5     Marker Table     1     1       1     1     1     1	Junip Coll         Old Coll	000000 MHz Swept Span Full Span Freq 2000000 GHz Freq 2000000 GHz AUTO TUNE tep 0000 MHz Auto Aan Offset



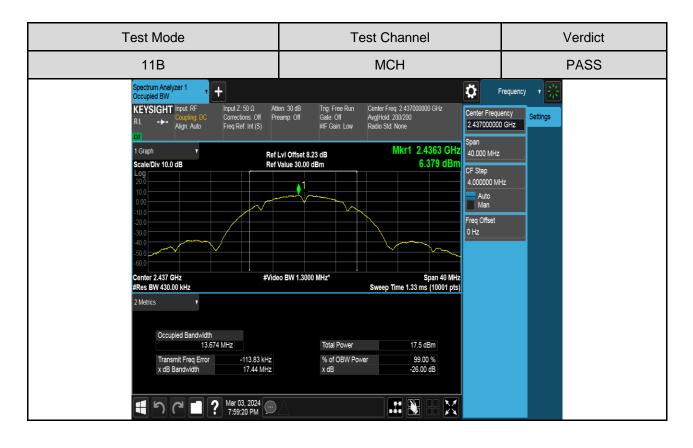


Test Mode	Test Channel	Verdict
11N HT40	НСН	PASS
RL       →       Coupling DC Align Auto       Corrections: Off Freq Ref. Int (S)       Preq Ref. Int (S)         1       Spectrum       *       Ref         1       Spectrum       *       Ref         Scale/Div 10 dB       Ref         10       1       1         10       1       1         11       1       1         12       1       1         13       1       1         14.7       1       1         15.8       1       1         15.1.8       1       1         5.1.8       1       1         5.1.8       1       1         5.1.8       1       1         5.1.8       1       1         5.1.8       1       1         5.1.8       1       1         5.1.8       1       1         5.1.8       1       1         1       1       1         1       1       1         1       1       1         1       1       1         1       1       1         1       1       1	Sig Track: Off         Tig: Free Run         M.W.W.W.W.W.W.W.W.W.W.W.W.W.W.W.W.W.W.W	1000000 MHz Swept Span Zero Span Fill Span Freq 2000000 GHz AUTO TUNE Nep 00000 MHz Auto Man



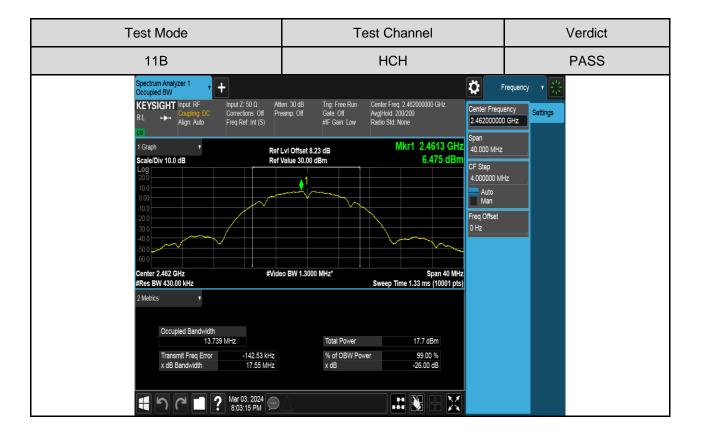
#### 99% Bandwidth





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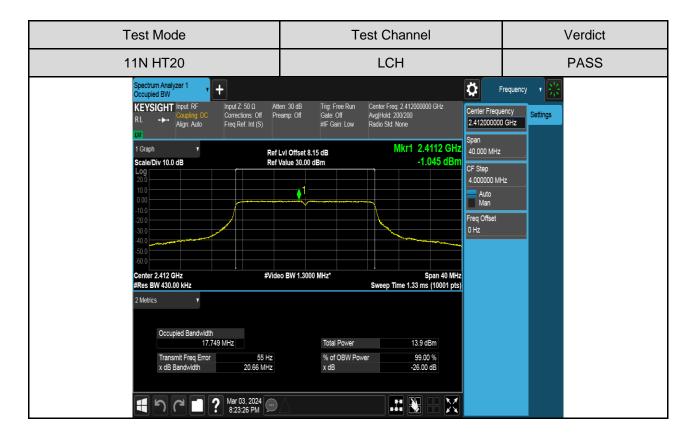
Test Mode	Test Channel		Verdict
11G	LCH		PASS
Spectrum Analyzer 1 Coccupied BW KEYSIGHT Input RF RL → Align Auto 1 Graph 1	tten: 30 dB reamp: Off #IF Gain: Low Radio Std: None fLvi Offset 8.15 dB fValue 30.00 dBm → 0.187 c → 0.18	Center Frequ 2.4120000 Span 40.000 MHz CF Step 4.000000 M Auto Man Freq Offset 0 Hz	Frequency Frequency Settings





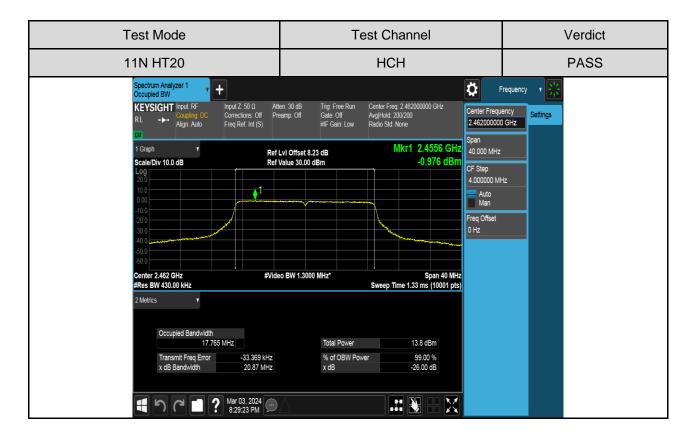
Test Mode	Test Channel	Verdict
11G	НСН	PASS
Spectrum Analyzer 1       +         Cocupied BW       +         KEYSIGHT       Input RF         Coupling DC       Corrections: Off         RL       +         Corrections: Off       Freq Ref. Int (S)         I Graph       Ref.         Scale/Div 10.0 dB       Ref.         10       0         20       10         -00       -00         -00       -00	en: 30 dB Trig: Free Run Center Freq: 2.462000000 GHz amp: Olf Gate. Off Avg Hold: 200/200 #IF Gain: Low Radio Std: None Lvl Offset 8.23 dB Mkr1 2.4556 GHz Value 30.00 dBm -0.371 dBm	PASS Frequency Settings Span 40.000 MHz Freq Offset 0 Hz
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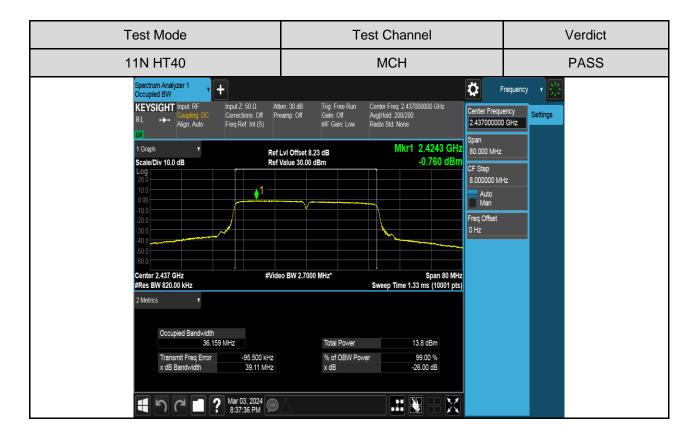
Test Mode	Test Cha	nnel	Verdict
11N HT20	MCH		PASS
Spectrum Analyzer 1 Occupied BW       +         KEYSIGHT Input RF RL ++       Couping DC Align: Auto       Input Z: 50 Ω Corrections: OL Freq Ref: Int (S         1 Graph       *         Scale/Div 10.0 dB       0         20       0         100       0         200       0         200       0         0       0	Atten: 30 dB Preamp: Off Gate: Off Gate: Off Gate: Off AnglHold: 2002 Ref Lvl Offset 8.23 dB Ref Value 30.00 dBm #Video BW 1.3000 MHz* Sweep Time Total Power HZ % of OBW Power	437000000 GHz Center Frequ	requency • K ency D GHz Settings
x dB Bandwidth 20.61			





Test Mode	Test Channel	Verdict
11N HT40	LCH	PASS
Spectrum Analyzer 1       +         Cccupied BW       Input Z: 50 Ω         KEVSIGHT       Input Z: 50 Ω         RL       +         Align Auto       Freq Ref Int (S)         I Graph       Ref         Scale/Div 10.0 dB       Ref         200       -         100       -         200       -	en: 30 dB samp: Off Gate Off #IF Gain Low Lvl Offset 8.15 dB Lvl Offset 8.15 dB Center Freq. 2.42200000 GHz Avg Hold: 200200 Rdio Std None Lvl Offset 8.15 dB Center Fre 2.4220000 Auto Total Power Total Power Center Fre 1.132 dBm Span 80 MHz Sweep Time 1.33 ms (10001 pts) Total Power Solution Center Fre 2.4220000 Center Fre 2.422000 Center Fre 2.4220000 Center Fre 2.422000 Center Fre 2.422000 Ce	Frequency vertings OO GHz Hz MHz





Test Mode	Test Channel	Verdict
11N HT40	НСН	PASS
RL → Coupling DC Corrections: Off Pro Align: Auto Freq Ref: Int (S) UT 1 Graph 1 Graph 7 Ref Scale/Div 10.0 dB 7 Ref 100 100 100 100 100 100 100 100 100 10	en: 30 dB Trig: Free Run Center Freq: 2.452000000 GHz eamp: Off Gate: Off Avg Hold: 200/200 #IF Gain: Low Radio Std: None Lvl Offset 8.23 dB Mkr1 2.4388 GHz Value 30.00 dBm -0.699 dBm	Frequency       Settings         Center Frequency       Settings         2452000000 GHz       Settings         Span       80.000 MHz         CF Step       8.000000 MHz         Auto       Man         Freq Offset       0 Hz
Occupied Bandwidth 36.194 MHz Transmit Freq Error x dB Bandwidth 39.21 MHz	Total Power         13.6 dBm           % of OBW Power         99.00 %           x dB         -26.00 dB	
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## 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

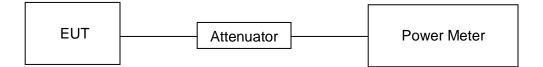
Place the EUT on the table and set it in the transmitting mode.

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

Measure the power of each channel.

AVGPM 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	17.58	0	17.58	30
11B	MCH	17.52	0	17.52	30
	HCH	17.62	0	17.62	30
	LCH	14.44	0	14.44	30
11G	MCH	14.31	0	14.31	30
	HCH	14.08	0	14.08	30
	LCH	13.89	0	13.89	30
11N HT20	MCH	13.83	0	13.83	30
	HCH	13.77	0	13.77	30
	LCH	13.67	0	13.67	30
11N HT40	MCH	13.83	0	13.83	30
	HCH	13.61	0	13.61	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

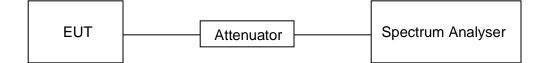
Refer to FCC KDB 558074, connect the UUT to the spectrum analyser and use the following settings:

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

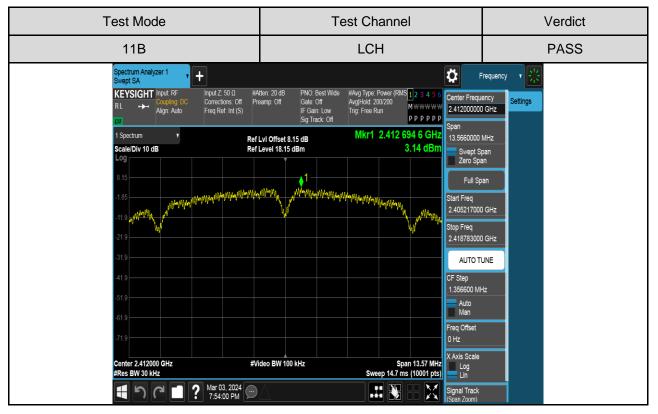
Temperature	22°C	Relative Humidity	56%
Atmosphere Pressure	101kPa	Test Voltage	AC 120V

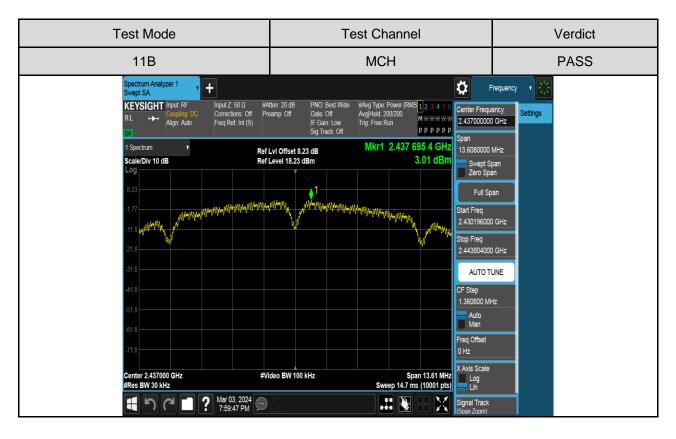
#### TEST RESULTS TABLE

Test Mode	Test Channel	Maximum Peak power spectral density (dBm/30kHz)	Result
	LCH	3.14	Pass
11B	MCH	3.01	Pass
	HCH	3.05	Pass
	LCH	-2.77	Pass
11G	MCH	-2.80	Pass
	HCH	-3.04	Pass
	LCH	-2.74	Pass
11N HT20	MCH	-2.95	Pass
	HCH	-2.94	Pass
	LCH	-6.21	Pass
11N HT40	MCH	-5.71	Pass
	HCH	-5.99	Pass



### **TEST GRAPHS**

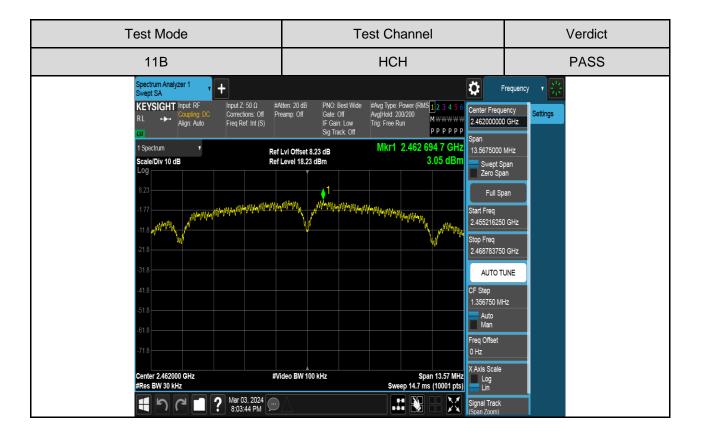


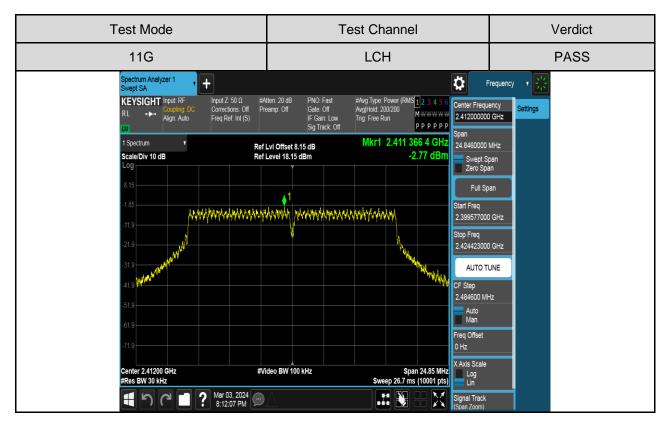


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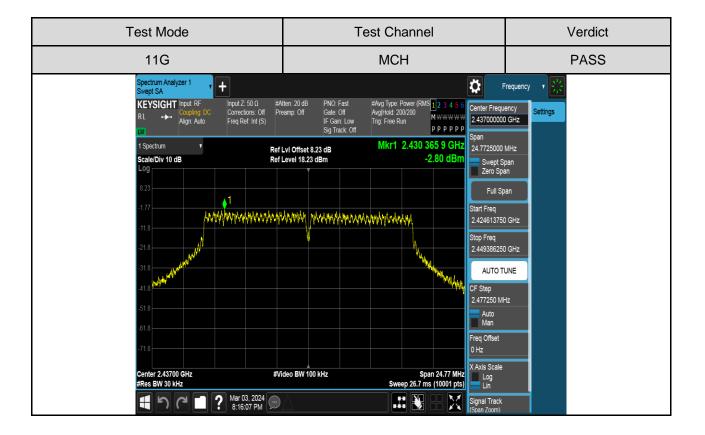
UL-CCIC COMPANY LIMITED

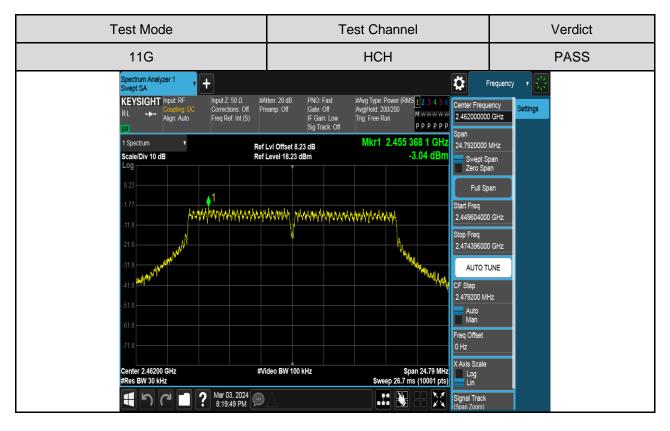




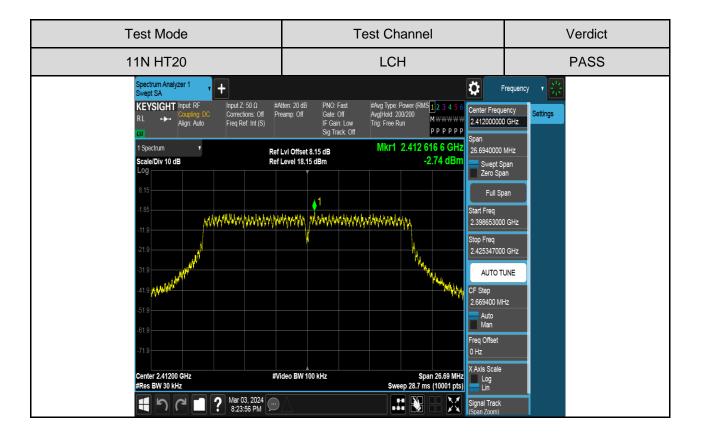


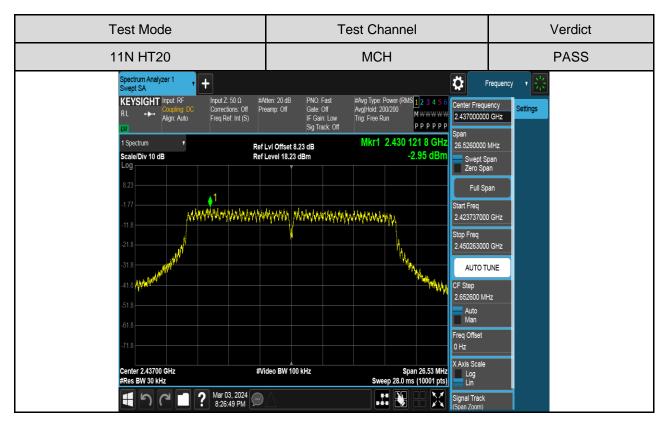




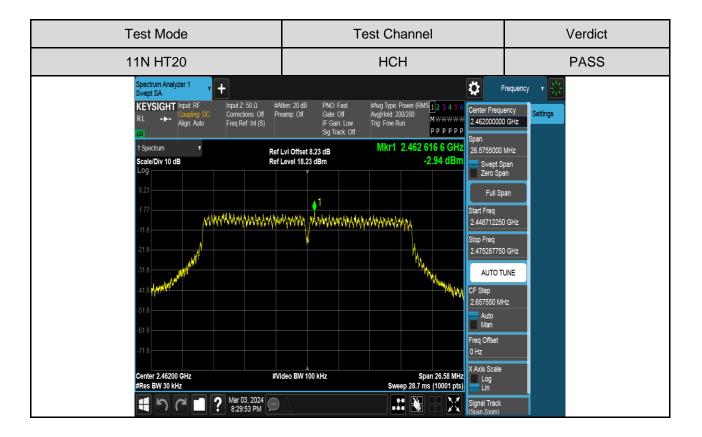


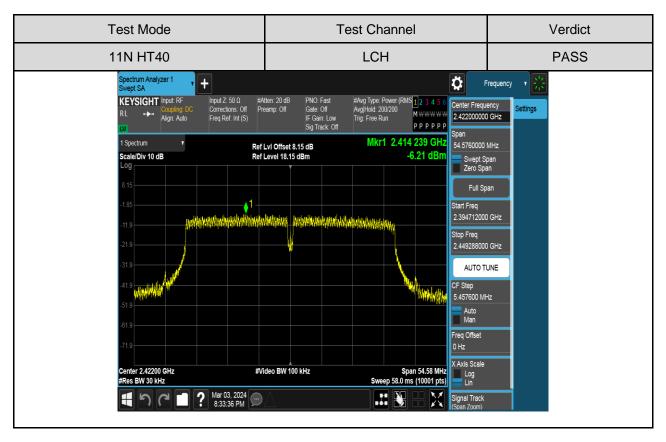






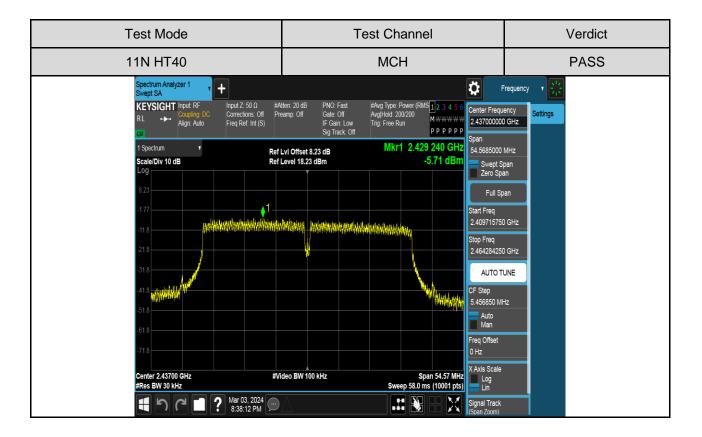


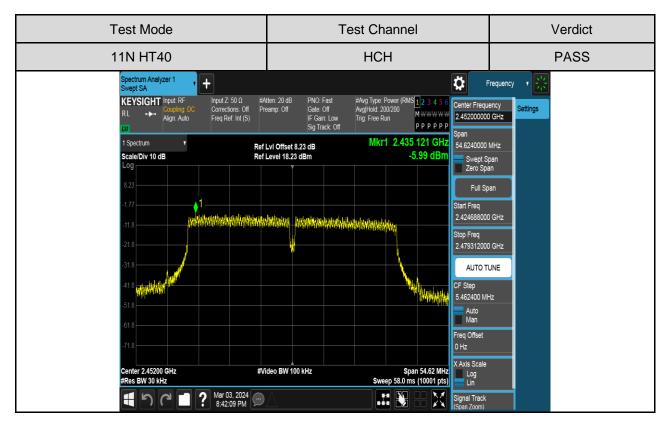




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## 7.5. CONDUCTED BANDEDGE AND SPURIOUS EMISSIONS

#### **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:

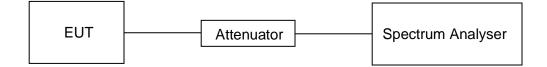
Center Frequency	The centre frequency of the channel under test
Detector	Peak
RBW	100K
VBW	≥3 × RBW
Span	1.5 x DTS bandwidth
Trace	Max hold
Sweep time	Auto couple.

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	8.20
	MCH	8.21
	HCH	8.25
11G	LCH	0.20
	MCH	0.15
	HCH	-0.04
11N HT20	LCH	-0.09
	MCH	0.17
	HCH	-0.03
11N HT40	LCH	-3.76
	MCH	-3.05
	HCH	-3.25