

### CFR 47 FCC PART 15 SUBPART C ISED RSS-247 Issue 2

### **CERTIFICATION TEST REPORT**

For

**Smart Cordless Vacuum & Washer** 

MODEL NUMBER: FW103200US

PROJECT NUMBER: 4790554902

**REPORT NUMBER: 4790554902-4** 

FCC ID: 2AV7A-FS12

IC: 26039- FS12

ISSUE DATE: Dec. 07, 2022

Prepared for

Tineco Intelligent Technology Co., Ltd.

Prepared by

UL-CCIC COMPANY LIMITED No. 2, Chengwan Road, Suzhou Industrial Park, People's Republic of China Tel: + 86-512-6808 6400 Fax: + 86-512-6808 4099 Website: www.ul.com



### **Revision History**

Rev.	Issue Date	Revisions	Revised By
V0	12/07/2022	Initial Issue	



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# 1. ATTESTATION OF TEST RESULTS

Company Name:	Tineco Intelligent Technology Co., Ltd.
Address:	No. 108 Shihu Road West, Wuzhong Zone, Suzhou, 215168 P.R.China
Factory Information	
Company Name:	Tineco Intelligent Technology Co., Ltd.
Address:	No. 108 Shihu Road West, Wuzhong Zone, Suzhou, 215168 P.R.China
	-
EUT Description	
Product Name:	Smart Cordless Vacuum & Washer
Model Number:	FW103200US
Comunito Nicumbio vi	E 40700E

Sample Number: Data of Receipt Sample: Date Tested: Smart Cordless Vacuum & Washer FW103200US 5487085 Dec.01, 2022 Dec.01, 2022 –Dec.06, 2022

APPLICABLE STANDARDS						
STANDARD	TEST RESULTS					
CFR 47 Part 15 Subpart C	PASS					
ISED RSS-247 Issue 2	PASS					
ISED RSS-GEN Issue 5	PASS					



Summary of Test Results						
Clause	Test Items	FCC Rules	Test Results			
1	6db DTS Bandwidth and 99% Bandwidth	FCC 15.247 (a) (2) RSS-247 Clause 5.2 (a) RSS-Gen Clause 6.7	Complied			
2	Conducted (average)Output Power	FCC 15.247 (b) (3) RSS-247 Clause 5.4 (d) RSS-Gen Clause 6.12	Complied			
3	Power Spectral Density	FCC 15.247 (e) RSS-247 Clause 5.2 (b)	Complied			
4	Conducted Band edge And Spurious emission	FCC 15.247 (d) RSS-247 Clause 5.5 RSS-GEN Clause 6.13	Complied			
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 8.9 RSS-GEN Clause 6.13	Complied			
6	Conducted Emission Test For AC Power Port	FCC 15.207 RSS-GEN Clause 8.8	Complied			
7	Antenna Requirement	FCC 15.203 RSS-GEN Clause 6.8	Complied			
Remark:						

1) The measurement result for the sample received is <Pass> according to < ANSI C63.10-2013, FCC CFR 47 Part 2, FCC CFR 47 Part 15C, ISED RSS-GEN ISSUE 5, ISED RSS-247 ISSUE2> when <Accuracy Method> decision rule is applied.

Prepared By:

Tom Tang

Tom Tang

Reviewed By:

Leon Wu

Leon Wu

Authorized By:

Chris Zhong.

Chris Zhong EMC&RF Lab Operations Manager



# 2. TEST METHODOLOGY

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

# 3. FACILITIES AND ACCREDITATION

Test Location	UL-CCIC Company Limited, EMC&RF Lab
Address	No. 2, Chengwan Road, Suzhou Industrial Park, Suzhou 215122 ,China
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.

Note 1: All tests measurement facilities use to collect the measurement data are located at No. 2, Chengwan Road, Suzhou Industrial Park, Suzhou 215122, People's Republic of 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	3.1dB		
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)	3.7dB (1GHz-18Gz)		
(**************************************	4.0dB (18GHz-26.5Gz)		
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:	Smart Cordless Vacuum & Washer
Model No.:	FW103200US
Operating Frequency:	IEEE 802.11b/g/n(HT20): 2412MHz to 2462MHz
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: OFDM (64QAM, 16QAM, QPSK, BPSK)
Channels Step:	Channels with 5MHz step
Test software of EUT:	EspRFtestTool_2.0 (manufacturer declare)
Antenna Type:	PCB antenna
Antenna Gain:	2dBi
	Remark: This data is provided by customer and our lab isn't responsible for this data
Test Voltage	AC120V



# 5.2. MAXIMUM OUTPUT POWER

Number of Transmit Chains (NTX)	IEE Std. 802.11	Channel Number	Max AV Conducted Power (dBm)
1	IEEE 802.11B SISO	1-11[11]	11.62
1	IEEE 802.11G SISO	1-11[11]	11.06
1	IEEE 802.11nHT20	1-11[11]	10.85

## 5.3. CHANNEL LIST

	Channel List for 802.11b/g/n (20 MHz)								
Channel         Frequency (MHz)         Channel         Frequency (MHz)         Channel         Frequency (MHz)         Frequency (MHz)         Frequency (MHz)									
<u>1</u>	<u>2412</u>	4	<u>2427</u>	<u>7</u>	<u>2442</u>	<u>10</u>	<u>2457</u>		
2	<u>2417</u>	<u>5</u>	<u>2432</u>	<u>8</u>	<u>2447</u>	<u>11</u>	<u>2462</u>		
<u>3</u>	2422	6	<u>2437</u>	9	<u>2452</u>				

### 5.4. TEST CHANNEL CONFIGURATION

Test Mode	Test Channel	Frequency
WiFi TX(802.11b)	CH 1, CH 6, CH 11	2412MHz, 2437MHz, 2462MHz
WiFi TX(802.11g)	CH 1, CH 6, CH 11	2412MHz, 2437MHz, 2462MHz
WiFi TX(802.11n HT20)	CH 1, CH 6, CH 11	2412MHz, 2437MHz, 2462MHz

## 5.5. THE WORSE CASE POWER SETTING PARAMETER

The Worse Case Power Setting Parameter under 2400 ~ 2483.5MHz Band									
Test Software			EspRFtestTool						
	Transmit			Test C	hannel				
Modulation Mode		NCB: 20MHz		NCB: 40MHz					
Widde		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					

Remark: The value list above is the setting of att in the software.



## 5.6. DESCRIPTION OF AVAILABLE ANTENNAS

Ant.	Frequency (MHz)	Antenna Type	Antenna Gain (dBi)
1	2400-2483.5	PCB antenna	2

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.

## 5.7. THE WORSE CASE CONFIGURATIONS

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



## 5.8. DESCRIPTION OF TEST SETUP

#### SUPPORT EQUIPMENT

Item	Equipment	Brand Name	Model Name	Description
1	Laptop	ThinkPad	E590	N/A
2	Fixed Frequency Board	N/A	N/A	Supply by Customer
3	USB Cable	N/A	N/A	Supply by UL Lab(100cm length)

#### I/O PORT

Cable No	Port	Connector Type	Cable Type	Cable Length(m)	Remarks
1	N/A	N/A	N/A	N/A	N/A

#### ACCESSORY

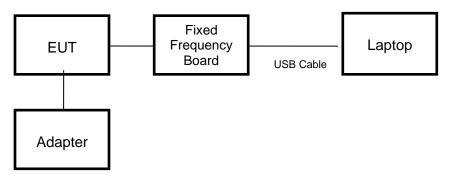
Item	Accessory	Brand Name	Model Name	Description
1	AC/DC	Class 2 Power	KL-WA260100-	INPUT:100-240V~, 50/60Hz, 1.2A
	ADAPTOR	Supply	A3	OUTPUT:26.0V=1.0A
2	AC/DC	Class 2 Power	S030-	INPUT:100-240V~, 50/60Hz, 0.8A
	ADAPTOR	Supply	1B260100HU	OUTPUT:26.0V=1.0A

Remark: Pre-testing both models of the adapters and find the model: S030-1B260100HU which is worse, so only the data of worse model: S030-1B260100HU is included in this report.

#### TEST SETUP

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

#### SETUP DIAGRAM FOR TESTS





### 5.9. MEASURING INSTRUMENT AND SOFTWARE USED

	Conducted Emissions (Instrument)								
Used	Equipment	Manufacturer	Model		Serial No.	Upper Last Cal.	Last Cal.	Next Cal.	
$\checkmark$	EMI Test Receiver	R&S	ESR3		126700	2021-12-04	2022-12-03	2023-12-02	
V	Two-Line V- Network	R&S	ENV2	16	126701	2021-12-04	2022-12-03	2023-12-02	
				Soft	ware				
Used		cription		Ma	Inufacturer	Name	Version		
$\checkmark$	Test Software for C				R&S	EMC32	Ver. 9.25		
	Radiated Emissions (Instrument)								
Used	Equipment	Manufacturer	Model	No.	Serial No.	Upper Last Cal.	Last Cal.	Next Cal.	
$\checkmark$	Spectrum Analyzer	Keysight	N901		155727	2021-05-09	2022-04-09	2023-04-08	
$\checkmark$	EMI test receiver	R&S	ESR		221694	/	2022-05-20	2023-05-19	
$\checkmark$	EMI test receiver	R&S	ESR	26	126703	2021-12-04	2022-12-03	2023-12-02	
	Receiver Antenna (9kHz-30MHz)	Schwarzbeck	FMZB <sup>2</sup>	1513	155456	2018-06-15	2021-06-03	2024-06-02	
	Receiver Antenna (30MHz-1GHz)	Schwarzbeck	VULB 9	9163	126704	2019-02-15	2022-01-18	2025-01-17	
	Receiver Antenna (1GHz-18GHz)	R&S	HF90	)7	126705	2018-01-29	2022-02-28	2025-02-27	
$\checkmark$	Receiver Antenna (18GHz-26.5GHz)	ETS	3160-	10	155565	2019-01-05	2021-07-15	2024-07-14	
$\checkmark$	Pre-amplification (To 18GHz)	R&S	SCU-1	8D	134667	2021-12-04	2022-12-03	2023-12-02	
V	Pre-amplification (To 18GHz)	Tonsend	TAP010 0	1805	224539	/	2022-10-20	2023-10-19	
	Pre-amplification (To 26.5GHz)	R&S	SCU-2	26D	135391	2021-12-04	2022-12-03	2023-12-02	
	Band Reject Filter	Wainwright	WRCJ 2350-2 2483 2533.5-4	400- .5-	1	2021-05-09	2022-04-09	2023-04-08	
	Highpass Filter	Wainwright	WHKX 2700-3 18000-4	000-	2	2021-05-09	2022-04-09	2023-04-08	
$\checkmark$	Attenuator	Wainwright	BW-N1-		3	2021-05-09	2022-05-08	2023-05-07	
					ware				
Used	Descr			anufac		Name	Version		
	Test Software for R	adiated disturba		onsce		36-RSE	4.0.0.1		
-			Oth	er Ins	truments				
Used	Equipment	Manufacturer	Model		Serial No.	Upper Last Cal.	Last Cal.	Next Cal.	
$\checkmark$	Spectrum Analyzer	Keysight	N901	0B	155368	2021-05-09	2022-04-09	2023-04-08	
V	Attenuator	PASTERNAC K	PE708	87-6	1624	/	2022-05-23	2023-05-22	

# 6. MEASUREMENT METHODS

No.	Test Item	KDB Name	Section
1	6dB Bandwidth and 99% Bandwidth	KDB 558074 D01 15.247 Meas Guidance v05r02	8.2
2	Conducted (average)Output Power	KDB 558074 D01 15.247 Meas Guidance v05r02	8.3.2.2 (Method AVGSA-2)
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. TEST ENVIRONMENT

Environment Parameter	Selected Values During Tests	
Relative Humidity	56.5%	
Atmospheric Pressure:	102.1kPa	
Temperature	22°C	
Test Voltage	AC120V	



### 7.2. ON TIME AND DUTY CYCLE

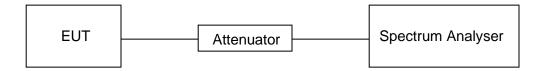
#### **LIMITS**

None; for reporting purposes only

#### PROCEDURE

FCC KDB 558074 Zero-Span Spectrum Analyzer Method

#### **TEST SETUP**



#### **RESULTS**

Mode	On Time (msec)	Period (msec)	Duty Cycle x (Linear)	Duty Cycle (%)	Duty Cycle Correction Factor (db)	1/T Minimum VBW (KHz)	Final Minimum VBW (KHz)
11B	4.19	4.71	0.89	89	0.51	0.239	1
11G	0.69	0.79	0.87	87	0.60	1.449	2
11N HT20	0.66	0.76	0.87	87	0.60	1.515	2

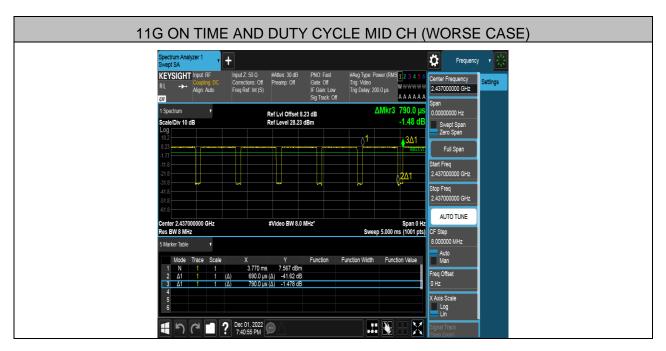
Note: 1) Duty Cycle Correction Factor= $10\log(1/x)$ .

2) Where: x is Duty Cycle(Linear)

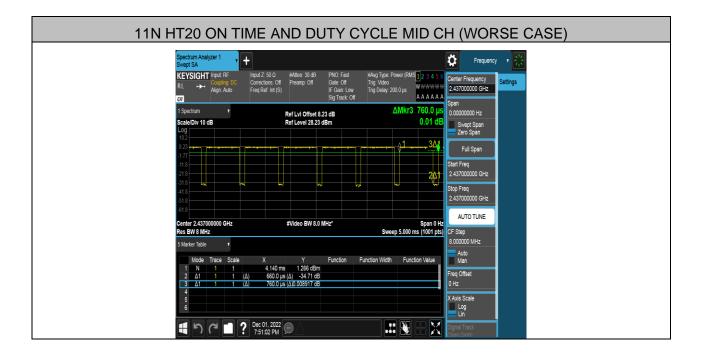
3) Where: T is On Time (transmit duration)













### 7.3. 6 dB BANDWIDTH AND 99% BANDWIDTH

#### **LIMITS**

FCC Part15 (15.247) Subpart C, ISED RSS-247 Issue 2						
Section Test Item Limit Frequency Range (MHz)						
FCC 15.247(a)(2)	6dB Bandwidth	>= 500KHz	2400-2483.5			
ISED RSS-Gen Clause99% Occupied BandwidthFor reporting purposes only.2400-2483.5						

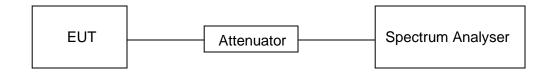
#### TEST PROCEDURE

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

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

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





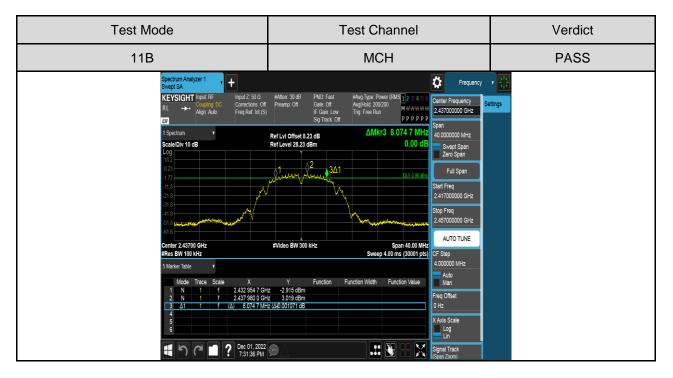
### **RESULTS**

Test Mode	Test Channel	6dB bandwidth (MHz)	99% bandwidth (MHz)	Result
	LCH	8.553	10.598	Pass
11B	MCH	8.075	10.551	Pass
	НСН	8.096	10.541	Pass
	LCH	15.776	16.414	Pass
11G	MCH	15.815	16.386	Pass
	НСН	15.807	16.405	Pass
	LCH	15.969	17.332	Pass
11N HT20	MCH	16.035	17.311	Pass
	НСН	16.043	17.339	Pass



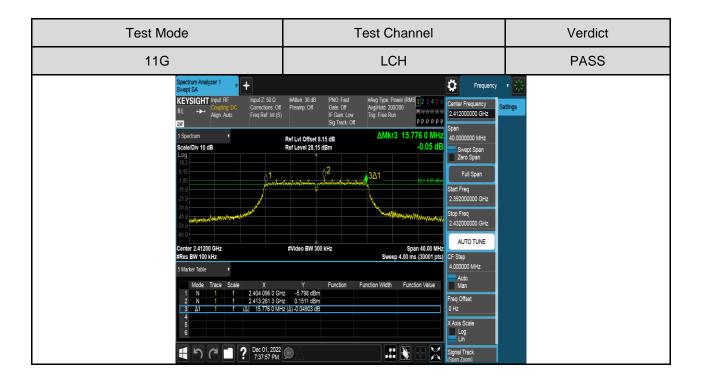
### Test Graphs For 6dB Bandwidth part:





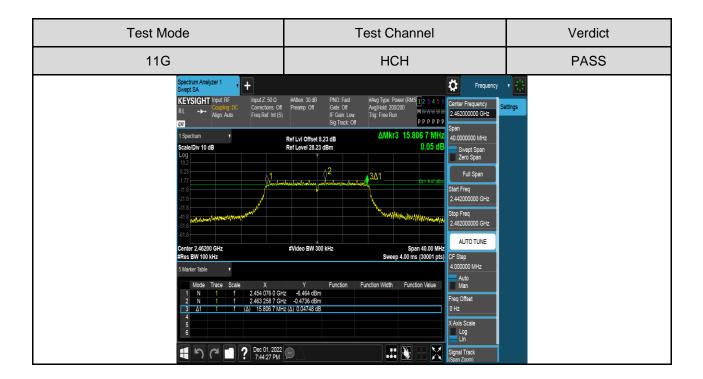


Test Mode	Test Channel	Verdict
11B	НСН	PASS
Spectrum Analyzer 1 Nept SA KEYSIGHT Input R RL  Common	IF Cam. Low Sg Track. Off         Trig. Free Run         M.WWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWW	vetings



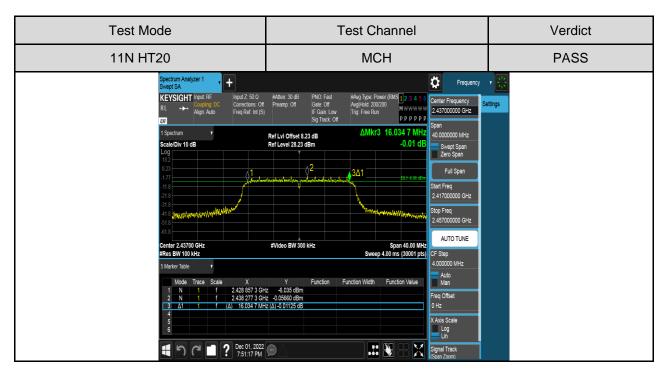


Test Mode	Test Channel	Verdict
11G	MCH	PASS
11.8         -11.8           -21.8         -11.8           -31.8         -11.8           -31.8         -11.8           -11.8         -12.423           -11.8         -12.423           -11.8         -12.423           -11.8         -12.423           -11.8         -12.423           -11.8         -12.423           -11.8         -12.423           -11.8         -12.423	IF Gam Low Sg Track Off         Trig Free Run         P p P p P p P         Span         Span<	Settings





Test Mode	Test Channel	Verdict
11N HT20	LCH	PASS
Spectrum Analyzer 1 Swept SA       +         KEYSIGHT Input RF RL → Caper. Auto       Input Z 50 0 Correctors: Off Free Ref Int (S)         1 Spectrum       *         Scale/Dv 10 dB       1         Log       1         1 Spectrum       *         Scale/Dv 10 dB       1         Log       1         1 Spectrum       *         Scale/Dv 10 dB       1         Log       1         1 Spectrum       *         Scale/Dv 10 dB       1         Log       1         1 Spectrum       *         Scale/Dv 10 dB       1         Log       1         1 Spectrum       *         Stale       *         Center 2.41200 GHz       #         #Res BW 100 NHz       *         S Marker Table       *         Mode Trace Scale       X         1 f       2.404 133 7 GH         2 N       1 f       2.404 133 7 GH         3 dt       1 f       (Δ)       15.369 3 MH         4       5       5       5         6       5       5       5	IF Can. Low Sig Track Off         Ting Free Run         WWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWW	vetings





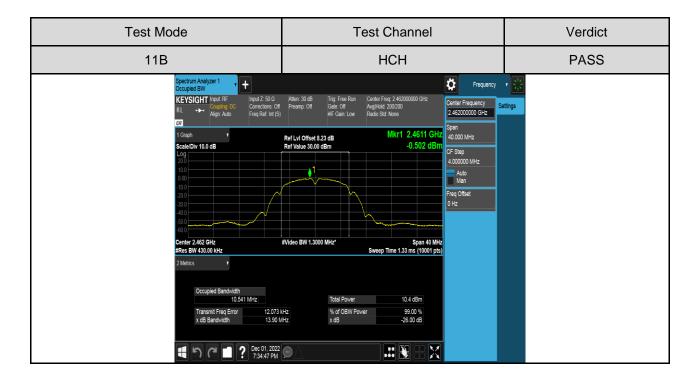
Test Mode	Test Channel	Verdict
11N HT20	НСН	PASS
Scale/Div 10 dB	IF Gan. Low Sig Track. Off         Trig Free Run P P P P P Ref Level 28.23 dBm         2.442000000 GHz           Ref Level 28.23 dBm         0.066 dB         Sweet Span           2         2         3Δ1         Stat Free 2.442000000 GHz           2         3Δ1         Stat Free 2.442000000 GHz           2         3Δ1         Stat Free 2.442000000 GHz           5         Stat Free 2.44200000 GHz           Fvideo BW 300 kHz         Span 40.00 MHz Sweep 4.00 ms (30001 ptr)           Y         Function           Y         Stat Free 3.4300000           Y         Function           Y         Function           Y         Function           Y         Function           Y	ettings

### For 99% Bandwidth part:



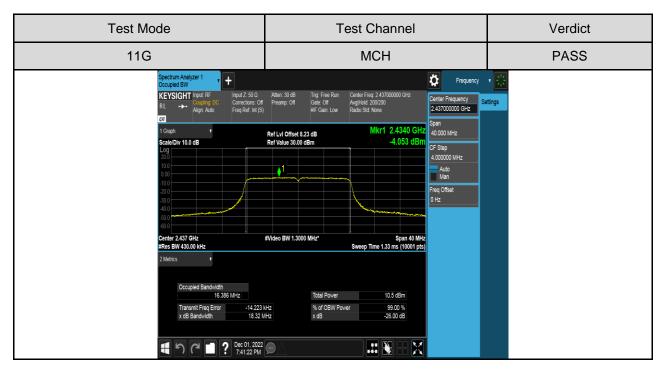


Test Mode	Test Channel		Verdict
11B	MCH		PASS
Spectrum Analyzer 1     +       Occupied BW     Input 27 50 0.       RL     →       Align Auto     Corrections of       Freq Ref Int (State     1 Graph       Scale/Div 10.0 dB     0       100     0       100     0       000     0       000     0       000     0       000     0       000     0       000     0		2 43700000 GH2 Span 40 0000 MH2 CF Step 4 00000 MH2 Auto Man Freq Offset 0 H2	ings
Areas By 430.00 kHz       2 Metrics       2 Metrics       Occupied Bandwidth 10.551 MiHz       Transmit Freq Error x dB Bandwidth       13.90	Sweep Time 1.33 ms (10001 pts)           Total Power         10.9 dBm           KHz         % of OBW Power         99.00 %           X dB         -26.00 dB		



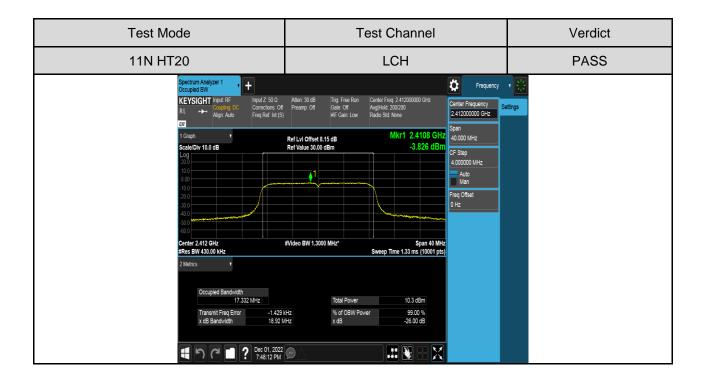


Test Mode	Test Channel		Verdict
11G	LCH		PASS
Spectrum Analyzer 1 + Cecupied BW KEVSIGHT input RF RL → Coopend DC RL → Coopend DC I Graph Scale/Div 10.0 dB Correctors Off Preg Ref Int (S) Scale/Div 10.0 dB Correctors Off Preg Ref Int (S) Correctors Off Correctors Off Preg Ref Int (S) Correctors Off Correctors Off Corre	Alten 30.dB Top Free Run Preamp Off Gale Off #F Gain Low Radio Std None Ref Lvi Offset 8.15 dB Mkr1 2.4182 GHz 3.878 dBm 4.10 dbs 1.300 MHz Sweep Time 1.33 ms (1001 pts) Total Power 10.5 dBm % of OBW Power 99.00 %	Frequency     Center Frequency 2.41200000 GH2 Span 40.000 MHz CF Step 4.00000 MHz A0000 MHz A000 MHz A00 Freq Offset 0 Hz	
E 9 C I ? Dec 01,2022 7.38.11 PM			



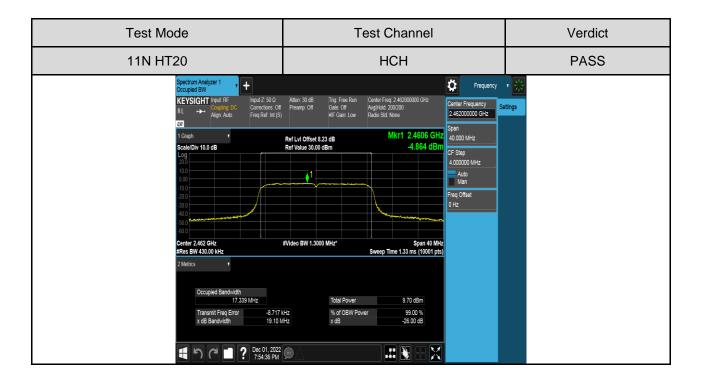


Test Mode	Test Channel	Verdict
11G	НСН	PASS
Spectrum Analyzer 1            Occupied BW         KEYSIGHT Input RF           RL         →           Align Audo         Freq Ref. Int (S)	Fleamp. On Gale. On Phyginiu. 200200	nter Frequency Settings
1 Graph   Scale/Div 10.0 dB  Cog 210 10.0 00 00 00 00 00 00 00 00 00 00 00 00	Ref Lvi Offset 8.23 dB         Mkr1 2.4632 GHz         40.           Ref Value 30.00 dBm         -4.646 dBm         CF           1	Step Auto Man
Center 2.462 GHz #Res BW 430.00 kHz	#Video BW 1.3000 MHz* Span 40 MHz Sweep Time 1.33 ms (10001 pts)	
2 Metrics v Occupied Bandwidth 16.405 MHz Transmit Freq Error -3.313 x dB Bandwidth 18.32 M		
■ つ C ■ ? Dec 01.2022 74440 PM		





Test Mode	Test Channel	Verdict
11N HT20	MCH	PASS
Spectrum Analyzer 1 Occupied BW KEYSIGHT Input: RF RL → Align: Auto Freq Ref: Int (S)	Atten: 30 dB Ting: Free Run Center Freq. 2437000000 GHz Peamp: Off Gate: Off AugHold: 200/200 #FGain: Low Radio Std: None S	Center Frequency Center Frequency 2437000000 GHz Settings
Scale/Div 10.0 dB	Ref Value 30.00 dBm -3.962 dBm C	40.000 MHz CF Step 4.00000 MHz Auto Man Freq Offset 0 Hz
300 400 600 Center 2 437 GHz #Res BW 430.00 KHz 2 Metrics	FVideo BW 1.3000 MHz* Span 40 MHz Sweep Time 1.33 ms (10001 pts)	
Occupied Bandwidth 17.311 MHz Transmit Freq Error -12.660 X x dB Bandwidth 18.99 M		





# 7.4. CONDUCTED (AVERAGE) OUTPUT POWER

#### **LIMITS**

FCC Part15 (15.247) Subpart C , ISED RSS-247 ISSUE 2				
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

KDB 558074 D01 15.247 Meas Guidance v05r02 Section 8.3.2.2 (Refer Section 11.9.2.2.4 in ANSI C63.10-2013):

Method AVGSA-2 uses trace averaging across ON and OFF times of the EUT transmissions, followed by duty cycle correction. The procedure for this method is as follows:

a) Measure the duty cycle D of the transmitter output signal as described in 11.6.

b) Set span to at least 1.5 times the OBW.

c) Set RBW = 1% to 5% of the OBW, not to exceed 1 MHz.

d) Set VBW  $\geq$  [3  $\times$  RBW].

e) Number of points in sweep  $\ge$  [2  $\times$  span / RBW]. (This gives bin-to-bin spacing  $\le$  RBW / 2, so that narrowband signals are not lost between frequency bins.)

f) Sweep time = auto.

g) Detector = RMS (i.e., power averaging), if available. Otherwise, use the sample detector mode.

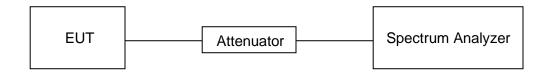
h) Do not use sweep triggering. Allow the sweep to "free run."

i) Trace average at least 100 traces in power averaging (rms) mode; however, the number of traces to be averaged shall be increased above 100 as needed such that the average accurately

represents the true average over the ON and OFF periods of the transmitter.

j) Compute power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function with band limits set equal to the OBW band edges. If the instrument does not have a band power function, then sum the spectrum levels (in power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.
k) Add [10 log (1 / D)], where D is the duty cycle, to the measured power to compute the average power during the actual transmission times (because the measurement represents an average over both the ON and OFF times of the transmission). For example, add [10 log (1/0.25)] = 6 dB if the duty cycle is 25%.

#### TEST SETUP





### **RESULTS**

For Normal Testing Part:

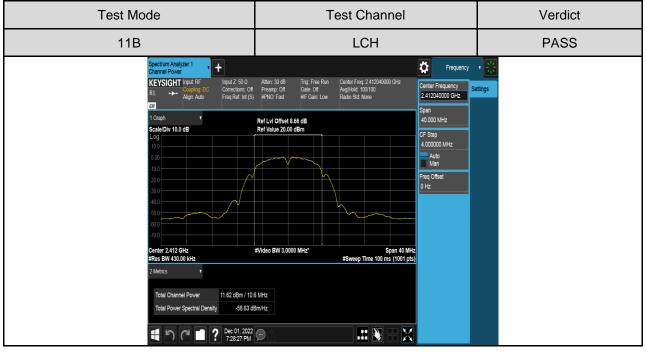
Test Mode	Test Channel	Measurement Output Power (AV)	10log(1/x) Factor	Maximum Conducted Output Power (AV)	Result
		dBm	dB	dBm	
	LCH	11.11	0.51	11.62	Pass
11B	MCH	10.97	0.51	11.48	Pass
	HCH	10.30	0.51	10.81	Pass
	LCH	10.45	0.60	11.05	Pass
11G	MCH	10.46	0.60	11.06	Pass
	HCH	9.84	0.60	10.44	Pass
	LCH	10.24	0.60	10.84	Pass
11N HT20	MCH	10.25	0.60	10.85	Pass
20	НСН	9.72	0.60	10.32	Pass

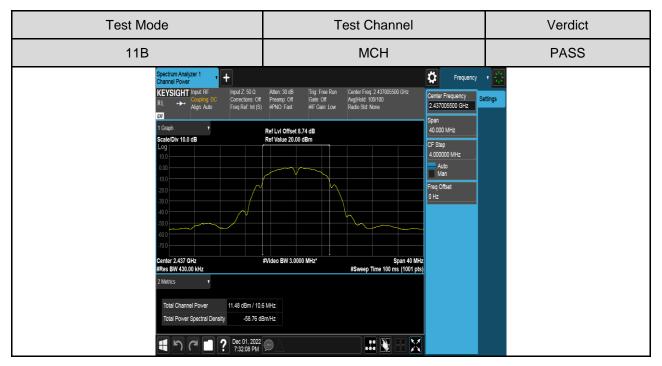
Remark:

For all the test results has been adjusted the duty cycle factor.
 For Correction Factor is refer to the result in section 7.2



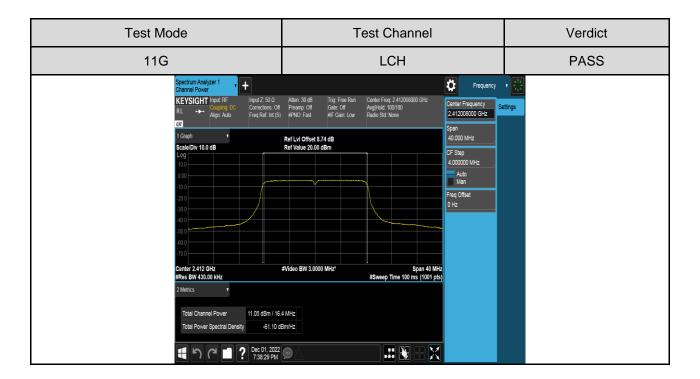
### Test Graphs:





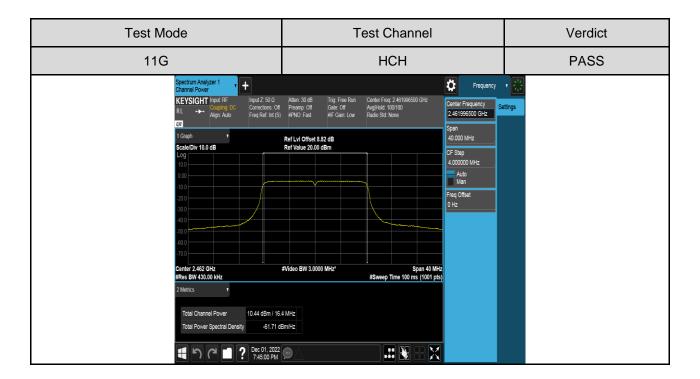


Test Mode	Test Channel	Verdict
11B	НСН	PASS
Spectrum Analyzer 1 , + Channel Pover KEYSIGHT Input RF Company DC Correctors	Atten: 30 dB Trig: Free Run Center Freq. 2 462012500 GHz Center Fre Preamo Off Gale: Off Avail-Haid 100100	Frequency settings
200 -700 Center 2.462 GHz #Res BW 430.00 kHz 2 Metrics Total Channel Power Total Channel Power Total Power Spectral Density -59.42 Total Power Spectral Density -59.42 Center 2.462 GHz -59.42 Center 2.462 GHZ -59.	dBm/Hz	



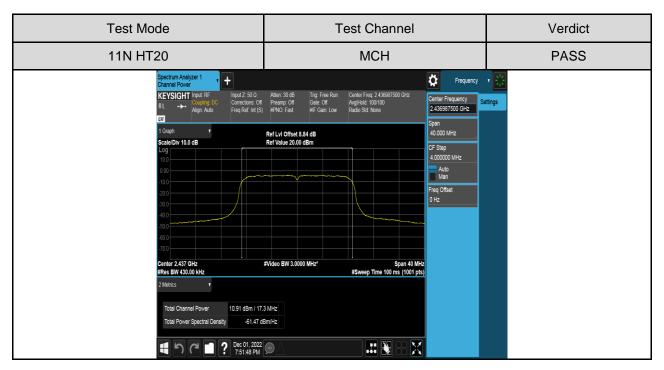


Test Mode	Test Channel	Verdict
11G	МСН	PASS
Spectrum Analyzer 1 Channel Power KEVSIGHT Input RF Contentions C	Atten: 30 dB Ting Free Run Center Freg 243066000 GHz	etings
2 Metrics  Total Channel Power  11.06 dBm / 1	64 MHz JBm/Hz	





Test Mode	Test Channel	Verdict
11N HT20	LCH	PASS
	#PNO Fast         #F Gain Low         Radio Skt None         2.411999000 GHz           Span         Span         40.000 MHz         40.000 MHz	ettings
	CF Step 4.00000 MHz Auto Mato Freq Offset 0 Hz	
40.0 50.0 60.0 70.0 Center 2.412 GHz #Res BW 430.00 kHz	Video BW 3.0000 MHz* \$pan 40 MHz #Sweep Time 100 ms (1001 pts)	
2 Metrics ・ Total Channel Power 10.90 dBm / 17.3 Total Power Spectral Density61 48 dB ●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●	MHz myHz	





Test Mode	Test Channel	Verdict
11N HT20	НСН	PASS
Spectrum Analyzer 1       +         Channel Power       Input RF         RL       →       Comentors Off         I Graph       1         Scale/Div 10.0 dB       Log         Log       0         0	#PNOF Fast         #IF Gain: Low         Radio Std: None         2451991500 GHz           Ref Lvi Offset 8.91 dB Ref Value 20.00 dBm         Span 40.0000 MHz         GF Step 400000 MHz         GF Step 400000 MHz           #Video BW 3.0000 MHz*         Span 40 MHz #Sweep Time 100 ms (1001 pts)         Hez	etings



# 7.5. POWER SPECTRAL DENSITY

### LIMITS

FCC Part15 (15.247) Subpart C, ISED RSS-247 ISSUE 2				
Section Test Item Limit Frequency Range (MHz)				
FCC §15.247 (e) ISED RSS-247 5.2 (b)	Power Spectral Density	8 dBm in any 3 kHz band	2400-2483.5	

### TEST PROCEDURE

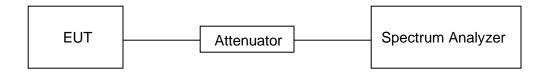
Refer to FCC KDB 558074, connect the UUT to the spectrum analyser and use the following settings:

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





## **RESULTS**

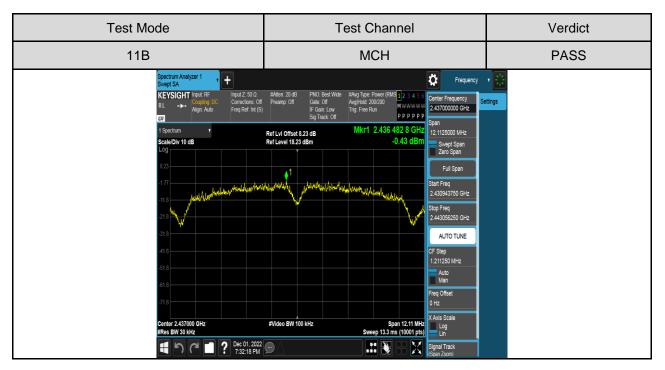
For Normal Testing Part:

Test Mode	Test Channel	Maximum Peak power spectral density (dBm/30kHz)	Result
	LCH	-0.01	Pass
11B	MCH	-0.43	Pass
	HCH	-1.18	Pass
	LCH	-5.16	Pass
11G	MCH	-5.15	Pass
	HCH	-5.73	Pass
	LCH	-4.26	Pass
11N HT20	MCH	-4.47	Pass
	НСН	-5.12	Pass



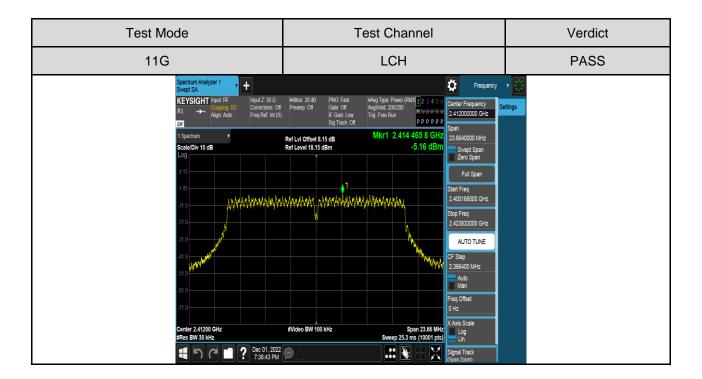
### Test Graphs:





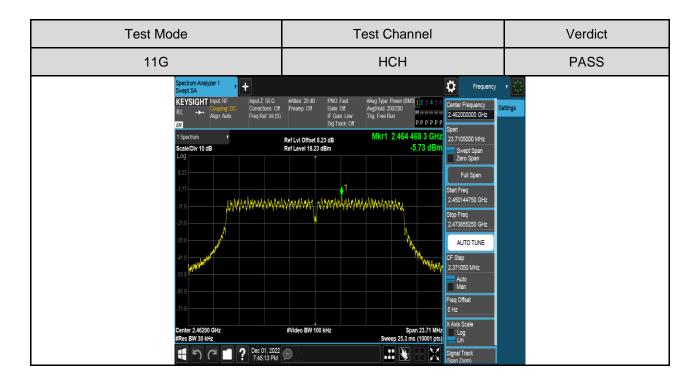


Test Mode	Test Channel	Verdict
11B	НСН	PASS
Spectrum Analyzer 1 Swept SA KEYSIGHT Input RF RL → Page Auto Scale Div 10 dB Log 0 23 1 Spectrum Scale Div 10 dB Log 0 23 1 T77 -118 -117 -118 -1	IF Gam. Low Sig Track off         Trig: Free Run         WWWWWW         245200000 GHz           Ref Lvi Offset 8.23 dB         Mkr1 2.459 998 5 GHZ         12.1440000 MHz           Ref Level 18.23 dBm         -1.18 dEm         Swept Span           Video BW 100 kHz         Span 12.14 MHz         Span 12.14 MHz           File Span 12.14 MHz         Swept Span         File Span           Video BW 100 kHz         Span 12.14 MHz         Auto           File Span 12.14 MHz         Swept 13.3 ms (10001 ptz)         Ling	etings



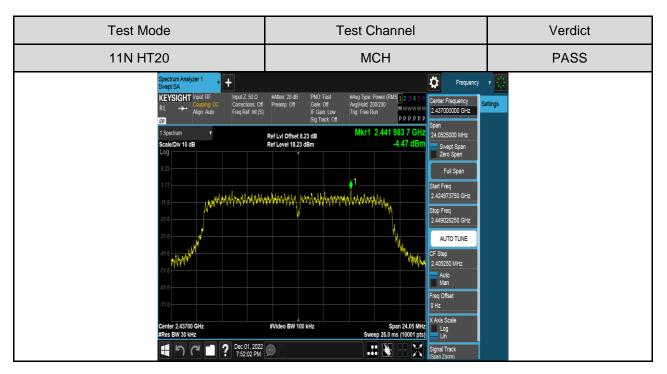


Test Mode	Test Channel	Verdict
11G	МСН	PASS
Spectrum Analyzer 1 Swept SA KEYSIGHT Input RF RL + Pactum 1 Spectrum 2 Scale/Dv 10 dB Log 0 23 1 77 1 8 2 18 3 18 3 18 3 18 4 18 5 18 Center 2 43700 GHz #Res BV 30 Hz Center 2 43700 GHz #Res BV 30 Hz Center 2 43700 GHz #Res BV 30 Hz Center 2 43700 GHz #Res BV 30 Hz	IF Ceam Low Sg Track Off         Trig Free Run         WWW WY P P P P P P         2.43700000 GHz           Ref Lvi Offset 8.23 dB         Mkr1 2.430 725 4 GHz         23.7255000 MHz           Ref Level 18.23 dB         -5.15 dBm         2475 Span           Very P P P P P P         -5.15 dBm         Swept Span           Very P P P P P         -5.15 dBm         Swept Span           Very P P P P P P         -5.15 dBm         Swept Span           Very P P P P P P         -5.15 dBm         Swept Span           Very P P P P P P P         -5.15 dBm         Swept Span           Very P P P P P P P P P P P P P P P P P P P	Settings





Test Mode	Test Channel	Verdict
11N HT20	LCH	PASS
Spectrum Analyzer 1 Swept SA       +         KEYSIGHT Input IP RL →       Front Z: 90 0 Correctors: 01 Freq Ref Int (S)         1       Spectrum         ScaleDbv 10 dB       0         Log       -         11:9       -         -11:9       -	IF Gam. Low Sig Track Off         Trig: Free Run         VIEWWWW         2.41200000 GHz           PP P P P P         Span         Span         2.395000 MHz           Ref Level 18.15 dB         -4.26 dBT         Sweet Span         Zero Span           VIEWWW         2.40003250 GHz         Statt Free 2.40003250 GHz         Statt Free 2.40003250 GHz           VIEWWW         VIEWWW         CF Step 2.395500 MHz         Auto TUNE           VIEWW0         VIEWWW         CF Step 2.395500 MHz         Auto TUNE           VIEW00 BW 100 kHz         Span 23.85 MHz         Lin         Lin	* Irings





Test Mode	Test Channel	Verdict
11N HT20	НСН	PASS
Spectrum Analyzer 1 Swept SA KEVSIGHT Induk RF RL → Align Auto CO 1 Spectrum Scale/Div 10 dB Log 8 20 1 Spectrum Scale/Div 10 dB Log 8 20 1 Spectrum Co 1 Spectrum Co 1 Spectrum Co 1 Spectrum Co 1 Spectrum Co 1 Spectrum Co Co Co Co Co Co Co Co Co Co	s) IF Gain Low Thig Free Run P P P P P P P P P P P P P P P P P P P	vetings



## 7.6. CONDUCTED BANDEDGE AND SPURIOUS EMISSIONS

#### <u>LIMITS</u>

FCC Part15 (15.247) Subpart C, ISED RSS-247 ISSUE 2			
Section	Test Item	Limit	
FCC §15.247 (d) RSS-247 Clause 5.5 RSS-GEN Clause 6.13	Conducted Bandedge and Spurious Emissions	At least 30 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power	

## TEST PROCEDURE

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

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.

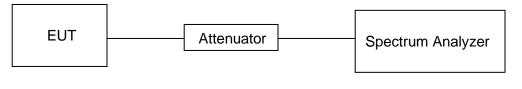
settings:

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 × 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



### Part I :Conducted Bandedge

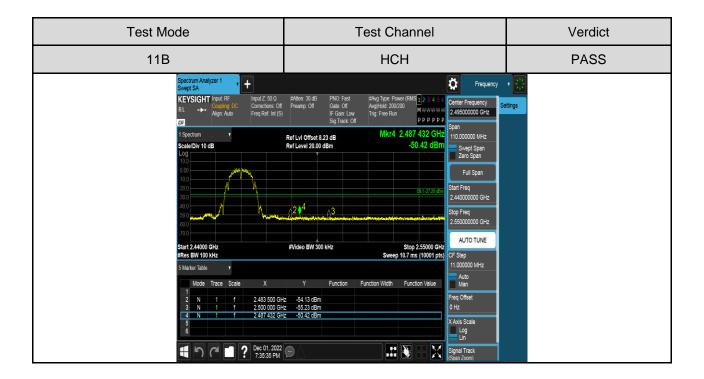
### **RESULTS TABLE**

Test Mode	Test Antenna	Test Channel	Test Result	Verdict
11B	Antenna 1	LCH	See the test graphs	PASS
ПD	Antenna i	НСН	See the test graphs	PASS
11G Antenna 1		LCH	See the test graphs	PASS
		НСН	See the test graphs	PASS
	Antonno 1	LCH	See the test graphs	PASS
11N HT20	Antenna 1	НСН	See the test graphs	PASS



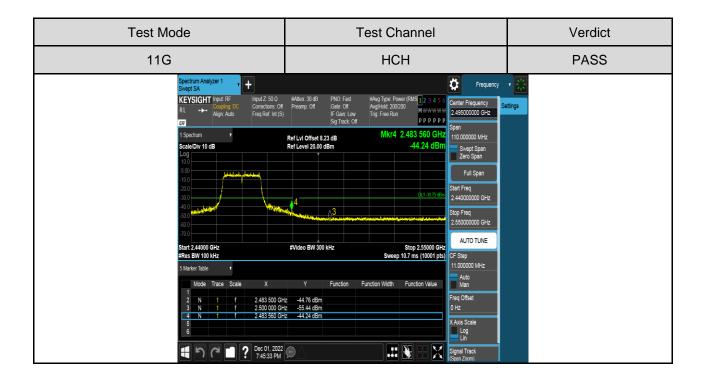
### **TEST GRAPHS**

Test Mode	Test Channel	Verdict
11B	LCH	PASS
Spectrum Analyzer 1         +           Snept SA         Imput 25 90 0.           RL         →         Align Auto           Topot File         RL         →           Align Auto         Freq Ref Int (S)           U         Scale Div 10 dB           Log         10           0.00         -           3.00         -           3.00         -           4.00         -           5 Marker Table         *           1         f           2.00         -           3.00         -           3.00         -           3.00         -           4.00         -           5 Marker Table         *           1         f           2.01         1           3.01         -           3.00         -           3.00         -           3.01         -           3.01         -           3.01         -           3.01         -           3.01         -           3.01         -           3.01         -           3.01         -	IF Cant. Low Sig Track. Off         Trig: Free Run         WWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWW	etting



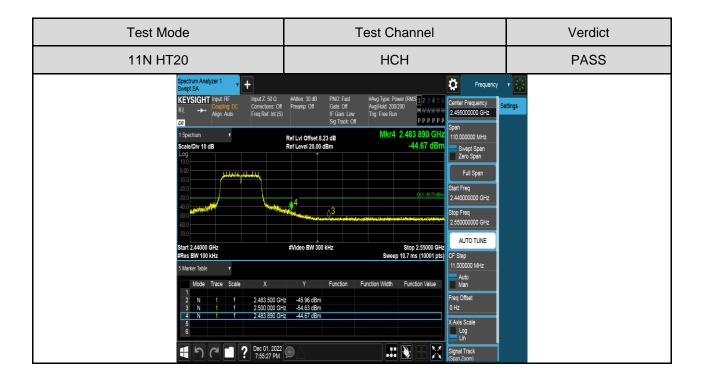


Test Mode	Test Channel	Verdict
11G	LCH	PASS
Spectrum Analyzer 1         +           Snept SA         Input Z 50 0           RL         →         Align Auto           1 Spectrum         *           Sale/Dv 10 dB         0           100         0           100         0           300         0           40         0           5 Marker Table         *           Start 2.30000 GHz         #           #Res EW 100 kHz         5 Marker Table           5 Marker Table         *           1 f         2.300 000 GHZ           #Res EW 100 kHz         5 Marker Table           5 Marker Table         *           1 mode         f           2 n         1 f           2 n         1 f           2 n         1 f           3 n         1 f           2 n         1 f           3 n         1 f           3 n         1 f           3 n         1 f           3 n         1 f           2 n         1 f           3 n         1 f           3 n         1 f           3 n         1 f           3 n         1 f	IF Cant. Low Sig Track. Off         Trig: Free Run         MWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWW	ettings





Test Mode	Test Channel	Verdict
11N HT20	LCH	PASS
Spectrum Analyzer 1         Imput 2 50.0           KEYSIGHT [mout RF]         Imput 2 50.0           RL         Align Auto           SalarDiv 10 dB         Contentions Of           Log         1           SalarDiv 10 dB         Imput 2 50.0           Log         1           SalarDiv 10 dB         Imput 2 50.0           Log         Imput 2 50.0           SalarDiv 10 dB         Imput 2 50.0           SolarDiv 10 dB         Imput 2 50.0 </td <td>IF Cam. Low Sg Track. Off         Trig: Free Run         WWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWW</td> <td>etings</td>	IF Cam. Low Sg Track. Off         Trig: Free Run         WWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWW	etings



## Part II :Conducted Emission

Test Result Tabl	е
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Test Mode	Test Antenna	Channel	Pref(dBm)	Puw(dBm)	Verdict
		LCH	See the test graphs	<limit< td=""><td>PASS</td></limit<>	PASS
11B SISO	B SISO Antenna 1	MCH	See the test graphs	<limit< td=""><td>PASS</td></limit<>	PASS
		HCH	See the test graphs	<limit< td=""><td>PASS</td></limit<>	PASS
		LCH	See the test graphs	<limit< td=""><td>PASS</td></limit<>	PASS
11G SISO	Antenna 1	MCH	See the test graphs	<limit< td=""><td>PASS</td></limit<>	PASS
		HCH	See the test graphs	<limit< td=""><td>PASS</td></limit<>	PASS
		LCH	See the test graphs	<limit< td=""><td>PASS</td></limit<>	PASS
11N HT20	1N HT20 Antenna 1	MCH	See the test graphs	<limit< td=""><td>PASS</td></limit<>	PASS
		HCH	See the test graphs	<limit< td=""><td>PASS</td></limit<>	PASS



#### **Test Plots**

Test Mode	Channel	Verdict		
11B	LCH	PASS		

Pref test Plot

