

## FCC 47 CFR PART 15 SUBPART C ISED RSS 247 ISSUE 2 CERTIFICATION TEST REPORT

For

#### SMART VACUUM CLEANER

**MODEL NUMBER: S11US0A00** 

ADDITIONAL MODEL NUMBER: S11US0A01, S11CA0A00, S11CA0A01, VS11US0000, VS11CA0000, VS11US0201, VS11US0200, VS11CA0210, VS11US0001, VS11CA0001

**PROJECT NUMBER: 4789259184** 

REPORT NUMBER: 4789259184-1

FCC ID: 2ASWB-S11

IC: 24918-S11

**ISSUE DATE: Jan. 14, 2020** 

Prepared for

**Ecovacs Robotics Co Ltd** 

Prepared by

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## **Revision History**

Rev.	Issue Date	Revisions	Revised By
V0	01/14/2020	Initial Issue	



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## 1. ATTESTATION OF TEST RESULTS

**Applicant Information** 

Company Name: Ecovacs Robotics Co Ltd

Address: No. 108 Shihu Road West, Wuzhong Zone, Suzhou, 215128

P.R.China

**Manufacturer Information** 

Company Name: Ecovacs Robotics Co Ltd

Address: No. 108 Shihu Road West, Wuzhong Zone, Suzhou, 215128

P.R.China

**Factory Information** 

Company Name: Ecovacs Robotics Co Ltd

Address: No. 108 Shihu Road West, Wuzhong Zone, Suzhou, 215128

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**EUT Description** 

Product Name SMART VACUUM CLEANER

Model Name S11US0A00

Additional No. S11US0A01, S11CA0A00, S11CA0A01, VS11US0000,

VS11CA0000, VS11US0201, VS11US0200, VS11CA0210,

VS11US0001, VS11CA0001

Sample Number 2748831

Data of Receipt Sample Dec. 11, 2019

Date Tested Dec. 11, 2019~ Jan. 14, 2020

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



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Summary of Test Results					
Clause	Test Items	FCC/IC Rules	Test Results		
1	6db DTS Bandwidth and 99% Bandwidth	FCC 15.247 (a) (2) RSS-247 Clause 5.2 (a)	Complied		
2	Peak Conducted Power	FCC 15.247 (b) (3) RSS-247 Clause 5.4 (e)	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	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	Complied		
6	Conducted Emission Test For AC Power Port	FCC 15.207 RSS-GEN Clause 8.8	NA		
7	Antenna Requirement	FCC 15.203 RSS-GEN Clause 8.3	Complied		

### Remark:

2) The EUT can't work during the AC charging mode

Prepared By:	Reviewed By:	
Tom Tang	Chris Zhong	
Tom Tang Engineer Project Associate	Chris Zhong Senior Project Engineer	-
Authorized By:		
Scholl Zhang		
Scholl Zhang Laboratory Leader		

<sup>1)</sup> 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 Issue5, ISED RSS-247 Issue2> > when <Accuracy Method> decision rule is applied.



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### 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 ISSUE5 and ISED RSS-247 ISSUE5.

## 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	CNAS (Certificate No.: L2065) The Laboratory has been assessed and proved to be in compliance with CNAS, The Certificate Registration Number is L2065. 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) 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.



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## 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	3.00dB	
Radiation Emission test(include Fundamental emission) (9KHz-30MHz)	3.32dB	
Radiation Emission test(include Fundamental emission) (30MHz-1GHz)	3.27dB	
Radiation Emission test (1GHz to 26GHz)( include Fundamental emission)	3.80dB (1GHz-18Gz)	
Note: This was estaints assessed as a series of the series	4.11dB (18GHz-26.5Gz)	

Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.



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## 5. EQUIPMENT UNDER TEST

## 5.1. DESCRIPTION OF EUT

Product Name:	SMART VACUUM CLEANER	
Model No.:	S11US0A00	
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 power grade:	NA (manufacturer declare)	
Test software of EUT:	EspRFtestTool_2.0 (manufacturer declare)	
Antenna Type:	PCB Antenna	
Antenna Gain:	2.3 dBi	
Battery	NAME: Rechargeable Li-ion Battery MODEL:S11-01 OUTPUT:21.6V DC 2000 mAh 43.2Wh	
	NAME: Rechargeable Li-ion Battery MODEL:S11-02 OUTPUT:21.6V DC 2500 mAh 54Wh	
Adapter	MODEL:YLS0241A-T260070 INPUT:100-240V~50/60Hz 0.8A Max OUTPUT:26V 700 mA	

#### Model No.:

Wiodel 140					
Number:	Name:	Number:	Name:	Number:	Name:
1	S11US0A00	2	S11US0A01	3	S11CA0A00
4	S11CA0A01	5	VS11US0000	6	VS11CA0000
7	VS11US0201	8	VS11US0200	9	VS11CA0210
10	VS11US0001	11	VS11CA0001		

Remark: Only the main model **\$11US0A00** was tested and only the data of this model is shown in this test report. Since Their electrical circuit design, layout, components used and internal wiring are identical, only the model name, product color, marketing channel and sale contury.



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## **5.2. MAXIMUM OUTPUT POWER**

Number of Transmit Chains (NTX)	IEE Std. 802.11	Channel Number	Max PK Conducted Power (dBm)
1	IEEE 802.11B	1-11[11]	13.30
1	IEEE 802.11G	1-11[11]	18.19
1	IEEE 802.11n HT20	1-11[11]	18.37

## 5.3. CHANNEL LIST

	Channel List for 802.11b/g/n (20 MHz)						
Channel	Frequency (MHz)	Channel	Frequenc y(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		



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## 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 Softw	vare			EspRFtes	tTool_2.0		
	Transmit			Test C	Channel		
Modulation Mode	Antenna	1	NCB: 20MHz		NCB: 40MHz		
Mode	Number	CH 1	CH 6	CH 11	CH 3	CH 6	CH 9
802.11b	1	NA	NA	NA	·		
802.11g	1	NA NA NA			] /		
802.11n HT20	1	NA	NA	NA			

Remark: The att in the software is setting 28.



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### 5.6. DESCRIPTION OF AVAILABLE ANTENNAS

Ant.	Frequency (MHz)	Antenna Type	Antenna Gain (dBi)
1	2400-2483.5	PCB Antenna	2.3

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

For the product, there two transmission antennas, and pre-testing both of them, only the worse data for the antenna is recorded in the report.

Worst-case data rates as provided by the client were:

802.11b mode: 1 Mbps 802.11b mode: 6 Mbps 802.11n HT20 mode: MCS0



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#### 5.8. **TEST ENVIRONMENT**

Environment Parameter	Selected Values During Tests				
Relative Humidity	55 ~ 65%				
Atmospheric Pressure:	1025Pa				
Temperature	TN	23 ~ 28°C			
	VL	N/A			
Voltage :	VN	DC 21.6V			
	VH	N/A			

Note: VL= Lower Extreme Test Voltage

VN= Nominal Voltage

VH= Upper Extreme Test Voltage TN= Normal Temperature

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## 5.9. DESCRIPTION OF TEST SETUP

### **SUPPORT EQUIPMENT**

Item	Equipment	Brand Name	Model Name	Description
1	Laptop	ThinkPad	E550c	N/A
2	Fixed Frequency Board	N/A	N/A	Supply by Customer

### **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

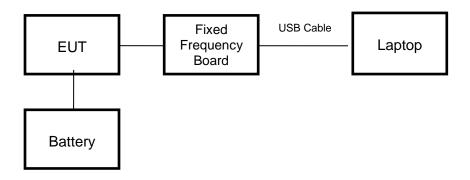
### **ACCESSORY**

Item	Accessory	Brand Name	Model Name	Description
2	USB Cable	N/A	N/A	Supply by UL Lab

### **TEST SETUP**

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

### **SETUP DIAGRAM FOR TESTS**





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## 5.10. MEASURING INSTRUMENT AND SOFTWARE USED

	5.10. MEASURING INSTRUMENT AND SOFTWARE USED							
		Cor	nducted	Emis	sions (Instrur			
Used	Equipment	Manufacturer	Model	No.	Serial No.	Upper Last Cal.	Last Cal.	Next Cal.
$\checkmark$	EMI Test Receiver	R&S	ESR:	3	126700	2018-12-13	2019-12-07	2020-12-06
	Two-Line V-Network	R&S	ENV2	16	126701	2018-12-13	2019-12-07	2020-12-06
	Artificial Mains Networks	R&S	ENY8	31	126711	2018-12-13	2019-12-07	2020-12-06
				Soft	ware			
Used	Des	cription		Ma	nufacturer	Name	Version	
	Test Software for 0	Conducted distur	bance		R&S	EMC32	Ver. 9.25	
		Ra	diated E	miss	ions (Instrum	ent <b>)</b>		
Used	Equipment	Manufacturer	Model	No.	Serial No.	Upper Last Cal.	Last Cal.	Next Cal.
$\overline{\checkmark}$	Spectrum Analyzer	Keysight	N9010	)B	MY57110128	2018-05-30	2019-05-29	2020-05-28
V	EMI test receiver	R&S	ESR2	26	1267603	2018-12-13	2019-12-07	2020-12-06
	Receiver Antenna (9kHz-30MHz)	Schwarzbeck	FMZB 1	513	513-265	2018-06-17	2019-06-16	2022-06-15
	Receiver Antenna (30MHz-1GHz)	SunAR RF Motion	JB1		126704	N/A	2019-01-28	2022-01-27
V	Receiver Antenna (1GHz-18GHz)	R&S	HF90	)7	126705	2018-01-27	2019-01-26	2022-01-26
	Receiver Antenna (18GHz-26.5GHz)	Schwarzbeck	BBHA9	170	126706	2018-02-07	2019-02-06	2022-02-05
	Receiver Antenna (26.5GHz-40GHz)	TOYO	HAP 26-	40W	00000012	2018-07-25	2019-07-23	2020-07-22
<b>V</b>	Pre-amplification (To 18GHz)	Compliance Direction System Inc.	PAP-1G1	18-50	14140-13467	2018-04-10	2019-04-09	2020-04-08
	Pre-amplification (To 26.5GHz)	R&S	SCU-2	6D	134668	N/A	2019-03-18	2020-03-17
<b>\</b>	Band Reject Filter	Wainwright	WRCJ' 2350-24 2483.5-25 40SS	400- 533.5-	1	2018-02-07	2019-02-06	2020-02-05
$\square$	Highpass Filter	Wainwright	WHKX 2700-30 18000-4	000-	2	2018-05-30	2019-05-29	2020-05-28
				Soft	ware			
Used	Desci	ription	Ma	nufac	turer I	Name	Version	
$\overline{\checkmark}$	Test Software for R	adiated disturbar	nce T	onsce	end	JS32	V1.0	
			Oth	er ins	truments			
Used	Equipment	Manufacturer	Model	No.	Serial No.	Upper Last Cal.	Last Cal.	Next Cal.
	Spectrum Analyzer	Keysight	N9010	)B	MY57110128	2018-05-30	2019-05-29	2020-05-28
	Power Meter	Keysight	U2021	XA	MY57110002	2018-06-13	2019-06-12	2020-06-11



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# **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	Peak Output Power	KDB 558074 D01 15.247 Meas Guidance v05r02	8.3.1.3/8.3.2.3
3	Power Spectral Density	KDB 558074 D01 15.247 Meas Guidance v05r02	8.4
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

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## 7. ANTENNA PORT TEST RESULTS

### 7.1. ON TIME AND DUTY CYCLE

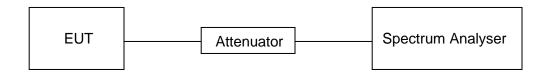
#### **LIMITS**

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	DC 21.6V

### **RESULTS**

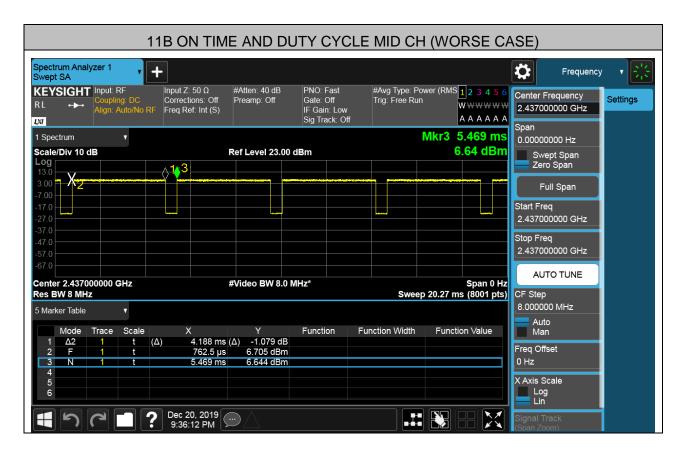
Mode	On Time (msec)	Period (msec)	Duty Cycle x (Linear)	Duty Cycle (%)	Duty Cycle Correction Factor (db)	1/T Minimum VBW (KHz)
11B	4.188	4.7065	0.89	89	0.51	0.24
11G	0.6911	0.7949	0.87	87	0.60	1.45
11N20 HT20	0.6551	0.759	0.86	86	0.66	1.53

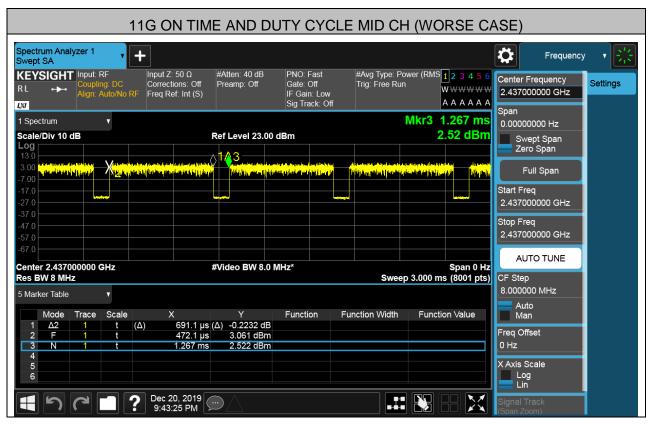
Note: 1) Duty Cycle Correction Factor= $10\log(1/x)$ .

2) Where: x is Duty Cycle(Linear)

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







XX



11N HT20 ON TIME AND DUTY CYCLE MID CH (WORSE CASE) Spectrum Analyzer 1 Swept SA Ö Frequency Input Z: 50 Ω Corrections: Off Freq Ref: Int (S) #Avg Type: Power (RMS 1 2 3 4 5 6 Trig: Free Run #Atten: 40 dB PNO: Fast Gate: Off KEYSIGHT Input: RF Center Frequency Settings Preamp: Off **w**₩₩₩₩ 2.437000000 GHz IF Gain: Low AAAAAA ĻΧΙ Mkr3 1.380 ms 1 Spectrum 0.00000000 Hz 3.40 dBm Scale/Div 10 dB Ref Level 23.00 dBm Swept Span Zero Span Full Span Start Freq 2.437000000 GHz 2.437000000 GHz **AUTO TUNE** Center 2.437000000 GHz Res BW 8 MHz Span 0 Hz Sweep 3.000 ms (8001 pts) #Video BW 8.0 MHz\* CF Step 8.000000 MHz 5 Marker Table Auto Man Function Value Trace Scale Function Function Width 655.1 μs (Δ) -0.7926 dB 621.0 μs 2.759 dBm (Δ) Freq Offset 0 Hz 3.401 dBm 1.380 ms X Axis Scale 5 6 Log Lin

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### 7.2. 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 Clause 6.7	99% Occupied Bandwidth	For reporting purposes only.	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	For 6dB Bandwidth :100K For 99% Occupied Bandwidth :1% to 5% of the occupied bandwidth
VBW	For 6dB Bandwidth : ≥3 × RBW For 99% Occupied Bandwidth : approximately 3×RBW
Trace	Max hold
Sweep	Auto couple

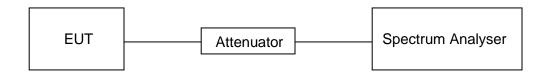
Allow the trace to stabilize and measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

### **TEST ENVIRONMENT**

Temperature	22°C	Relative Humidity	56%
Atmosphere Pressure	101kPa	Test Voltage	DC 21.6V



## **TEST SETUP**

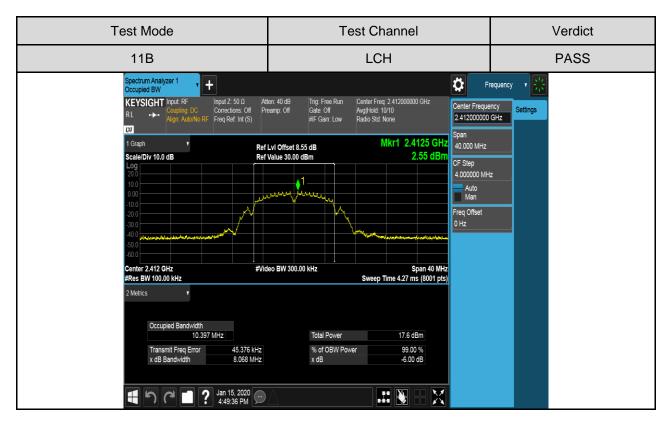


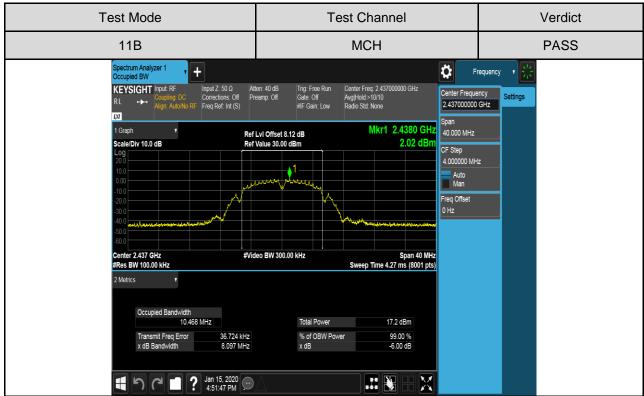
## **RESULTS TABLE**

Test Mode	Test Channel	6dB bandwidth(MHz)	99% bandwidth(MHz)	Verdict
11B	LCH	8.068	10.397	PASS
11B	MCH	8.097	10.468	PASS
11B	HCH	8.058	10.464	PASS
11G	LCH	16.34	16.485	PASS
11G	MCH	16.33	16.457	PASS
11G	HCH	16.33	16.476	PASS
11N HT20	LCH	17.56	17.595	PASS
11N HT20	MCH	17.54	17.592	PASS
11N HT20	HCH	17.55	17.601	PASS



### **Test Graphs**

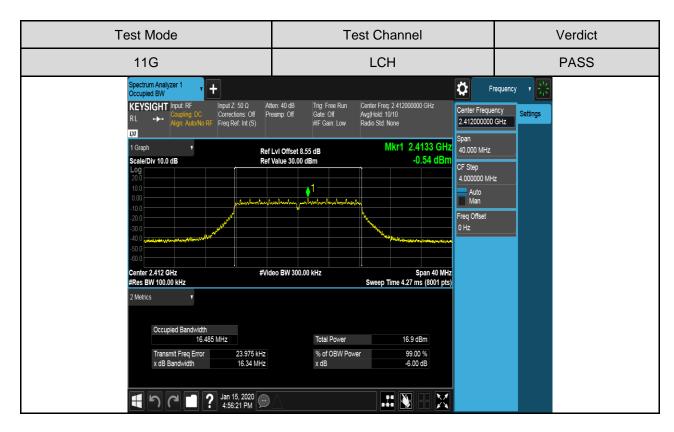






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Test Mode Test Channel Verdict **PASS** 11G **MCH** Spectrum Analyzer 1 Occupied BW Ö Frequency Center Freq: 2.437000000 GHz Avg|Hold: 10/10 Radio Std: None Input Z: 50 Ω Corrections: Off Freq Ref: Int (S) Trig: Free Run Gate: Off #IF Gain: Low KEYSIGHT Input RF Atten: 40 dB Preamp: Off Settings 2.437000000 GHz L)XI 1 Graph Mkr1 2.4383 GHz Ref Lvl Offset 8.12 dB Ref Value 30.00 dBm 40.000 MHz -1.14 dBn Scale/Div 10.0 dB CF Step 4.000000 MHz Auto Man Freq Offset 0 Hz Span 40 MHz Sweep Time 4.27 ms (8001 pts) Center 2.437 GHz #Res BW 100.00 kHz #Video BW 300.00 kHz 2 Metrics

Total Power

x dB

% of OBW Power

16.3 dBm

99.00 % -6.00 dB

# 👫

X

Occupied Bandwidth 16.457 MHz

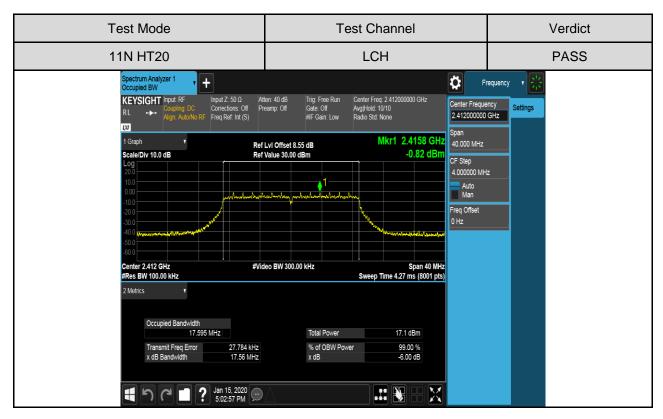
1 5 C 2 2 Jan 15, 2020 5 4:58:25 PM

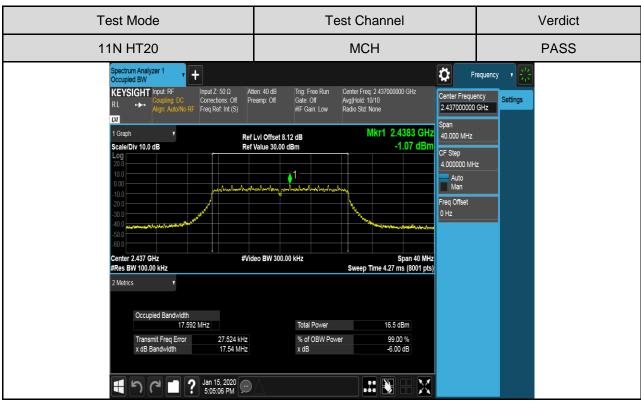
Transmit Freq Error

14.157 kHz 16.33 MHz











Test Mode **Test Channel** Verdict **HCH PASS** 11N HT20 Spectrum Analyzer 1 Occupied BW Ö + Frequency KEYSIGHT Input RF Center Freq: 2.462000000 GHz Center Frequency 2.462000000 GHz Corrections: Off Freq Ref: Int (S) Settings Avg|Hold: 10/10 Radio Std: None Mkr1 2.4633 GHz Ref Lvl Offset 8.51 dB Ref Value 30.00 dBm 40.000 MHz -1.92 dBn Scale/Div 10.0 dB CF Step 4.000000 MHz Auto Man Freq Offset 0 Hz Center 2.462 GHz #Res BW 100.00 kHz #Video BW 300.00 kHz Span 40 MHz Sweep Time 4.27 ms (8001 pts) Occupied Bandwidth 17.601 MHz Total Power 15.8 dBm 28.299 kHz 17.55 MHz % of OBW Power x dB 99.00 % -6.00 dB Transmit Freq Error x dB Bandwidth

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## 7.3. PEAK CONDUCTED 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	Peak Output Power	1 watt or 30dBm	2400-2483.5

### **TEST PROCEDURE**

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

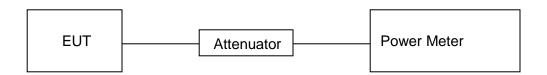
Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the Power sensor.

Measure the power of each channel.

Peak Detector use for Peak result.

AVG Detector use for AVG result.

## **TEST SETUP**



#### **TEST ENVIRONMENT**

Temperature	22°C	Relative Humidity	56%
Atmosphere Pressure	101kPa	Test Voltage	DC 21.6V



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## **RESULTS**

Maximum Peak Conducted Output Power(dBm)

Test Mode	Test Channel	Maximum Peak Conducted Output Power(dBm)	EIRP (dBm)	Result
	LCH	13.30	15.60	Pass
11B	MCH	12.86	15.16	Pass
	HCH	12.22	14.52	Pass
	LCH	18.19	20.49	Pass
11G	MCH	17.63	19.93	Pass
	HCH	17.06	19.36	Pass
	LCH	18.37	20.67	Pass
11N HT20	MCH	17.79	20.09	Pass
	HCH	17.21	19.51	Pass



## 7.4. 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.	

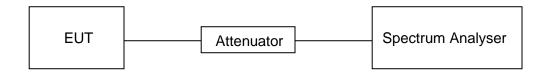
Allow trace to fully stabilize and use the peak marker function to determine the maximum amplitude level within the RBW.

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

#### **TEST ENVIRONMENT**

Temperature	22°C	Relative Humidity	56%
Atmosphere Pressure	101kPa	Test Voltage	DC 21.6V

#### **TEST SETUP**



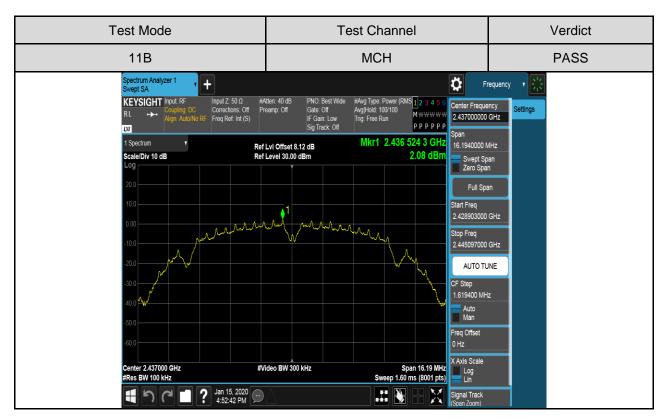


Test Mode	Test Channel	Maximum Peak power spectral density (dBm/3KHz)	Result
	LCH	2.54	Pass
11B	MCH	2.08	Pass
	HCH	0.97	Pass
	LCH	-0.62	Pass
11G	MCH	-1.17	Pass
	HCH	-1.80	Pass
	LCH	-0.62	Pass
11N HT20	MCH	-1.28	Pass
	HCH	-1.91	Pass

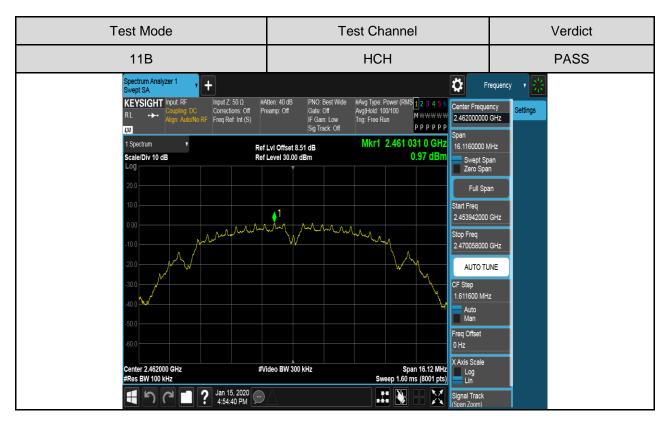


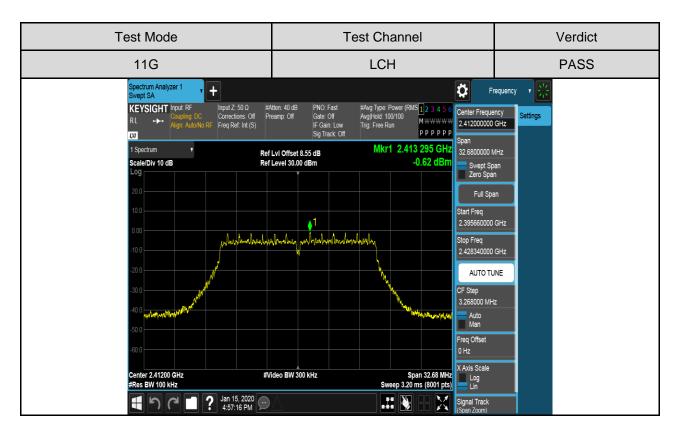
#### **Test Graphs:**





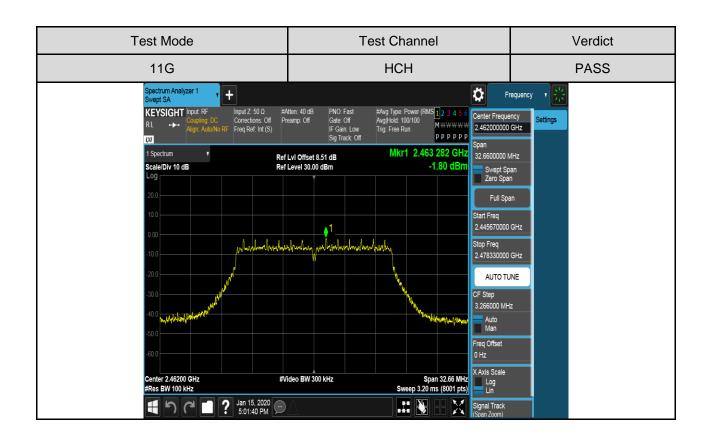


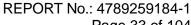






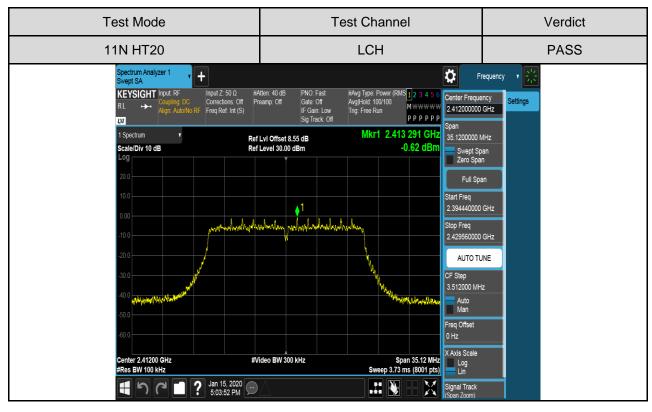
Test Mode Test Channel Verdict **MCH PASS** 11G pectrum Analyzer 1 wept SA Ö Frequency Input Z: 50 Ω Corrections: Off Freq Ref: Int (S) PNO: Fast Gate: Off IF Gain: Low Sig Track: Off #Atten: 40 dB Preamp: Off KEYSIGHT Input RF Settings 2.437000000 GHz PPPPPP L)XI Mkr1 2.438 298 GHz 1 Spectrum Ref Lvl Offset 8.12 dB 32.6600000 MHz -1.17 dBn Scale/Div 10 dB Swept Span Zero Span Full Span 2.420670000 GHz Stop Freq 2.453330000 GHz AUTO TUNE 3.266000 MHz Auto Man req Offset 0 Hz X Axis Scale Span 32.66 MHz Sweep 3.20 ms (8001 pts) enter 2.43700 GHz #Video BW 300 kHz Log Lin Res BW 100 kHz # 1

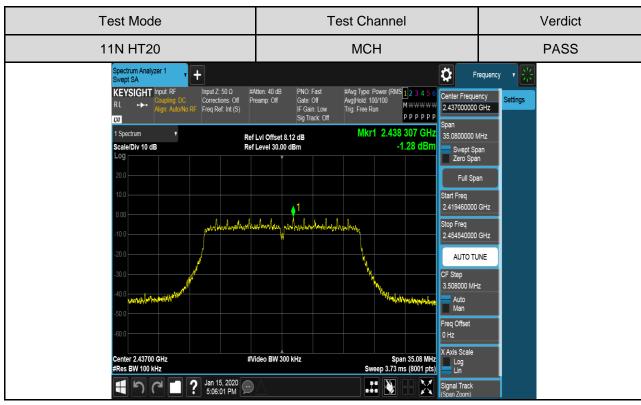






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Test Mode **Test Channel** Verdict **HCH PASS** 11N HT20 Spectrum Analyzer 1 Swept SA Ö + Frequency KEYSIGHT Input RF Center Frequency 2.462000000 GHz pling: DC Corrections: Off n: Auto/No RF Freq Ref: Int (S) Gate: Off IF Gain: Low Sig Track: Off Settings PPPPPP Mkr1 2.463 307 GHz Ref Lvl Offset 8.51 dB Ref Level 30.00 dBm 35.1000000 MHz -1.91 dBn Scale/Div 10 dB Full Span Start Freq 2.444450000 GHz Stop Freq 2.479550000 GHz AUTO TUNE CF Step 3.510000 MHz Auto Man Freq Offset Span 35.10 MHz Sweep 3.73 ms (8001 pts) enter 2.46200 GHz #Video BW 300 kHz Res BW 100 kHz

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## 7.5. CONDUCTED BANDEDGE AND SPURIOUS EMISSIONS

### **LIMITS**

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 20 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

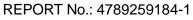
Center Frequency	The centre frequency of the channel under test
Detector	Peak
RBW	100K
VBW	≥3 × RBW
Span	1.5 x DTS bandwidth
Trace	Max hold
Sweep time	Auto couple.

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.

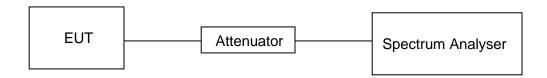
Use the peak marker function to determine the maximum amplitude level.





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## **TEST SETUP**



## **TEST ENVIRONMENT**

Temperature	22°C	Relative Humidity	56%
Atmosphere Pressure	101kPa	Test Voltage	DC 21.6V



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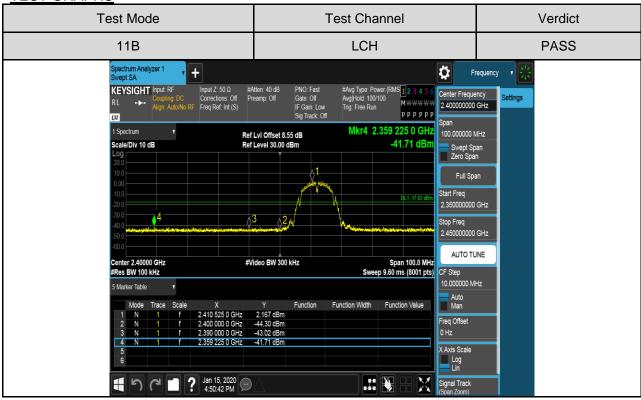
# Part I: Conducted Bandedge

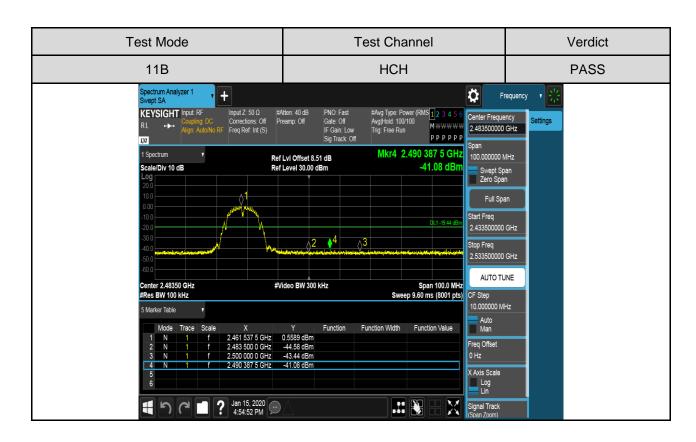
## **RESULTS TABLE**

Test Mode	Test Antenna	Test Channel	Carrier Power[dBm]	Max. Spurious Level [dBm]	Limit [dBm]	Verdict
11B	Antonno 1	LCH	2.167	-41.708	-17.83	PASS
IIB	Antenna 1	HCH	0.559	-41.082	-19.44	PASS
440	LCH	-1.223	-40.953	-21.22	PASS	
11G	Antenna 1	HCH	-2.216	-41.920	-22.22	PASS
11N HT20	Antonno 1	LCH	-0.665	-39.888	-20.67	-20.67 PASS
	Antenna 1	HCH	-2.227	-41.289	-22.23	PASS



**TEST GRAPHS** 





Log Lin

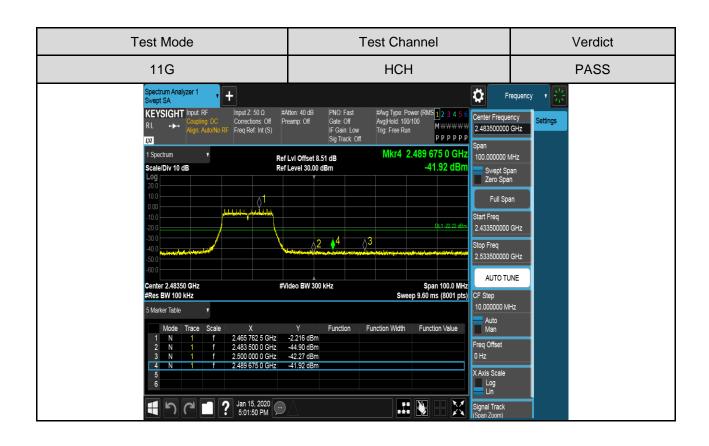
Signal Track (Span Zoom)

# 🐉



**Test Channel** Test Mode Verdict LCH **PASS** 11G pectrum Analyzer 1 wept SA Ö Frequency KEYSIGHT Input RF Center Frequency M₩₩₩₩ 2.400000000 GHz PPPPPP Mkr4 2.369 850 0 GHz Ref LvI Offset 8.55 dB Ref Level 30.00 dBm 100.000000 MHz -40.95 dBi Scale/Div 10 dB Full Span Start Freq 2.350000000 GHz Stop Freq 2.450000000 GHz AUTO TUNE enter 2.40000 GHz #Video BW 300 kHz Span 100.0 MH Res BW 100 kHz Sweep 9.60 ms (8001 pts) Auto Man Function Function Width Function Value -1.223 dBm -37.33 dBm -44.81 dBm Freq Offset 2.400 000 0 GHz 2.390 000 0 GHz X Axis Scale

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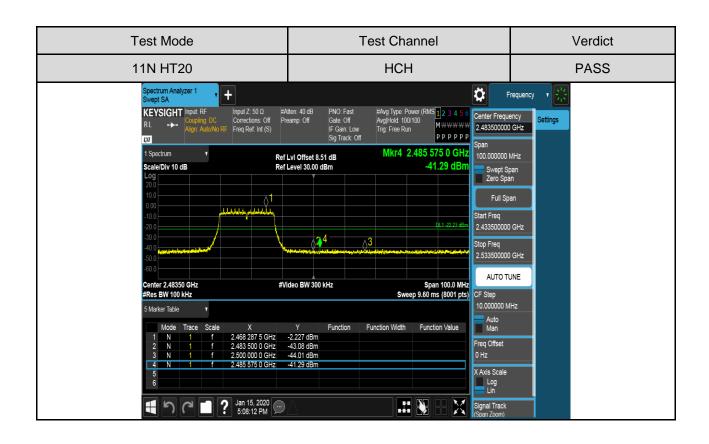


**Test Channel** Test Mode Verdict LCH **PASS** 11N HT20 pectrum Analyzer 1 wept SA Ö Frequency KEYSIGHT Input RF Center Frequency Settings M₩₩₩₩ 2.400000000 GHz PPPPPP Mkr4 2.380 600 0 GHz Ref LvI Offset 8.55 dB Ref Level 30.00 dBm 100.000000 MHz -39.89 dB Scale/Div 10 dB Swept Span Zero Span Full Span Start Freq 2.350000000 GHz Stop Freq 2.450000000 GHz AUTO TUNE enter 2.40000 GHz #Video BW 300 kHz Span 100.0 MH Res BW 100 kHz Sweep 9.60 ms (8001 pts) Auto Man Function Function Width Function Value -0.6645 dBm -40.63 dBm -43.10 dBm Freq Offset 2.400 000 0 GHz 2.390 000 0 GHz X Axis Scale Log Lin

# 🐉

Signal Track (Span Zoom)

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## Part II :Conducted Emission

Test Result Table

Test Mode	Channel	Pref(dBm)	Puw(dBm)	Verdict
	LCH	2.26	<limit< td=""><td>PASS</td></limit<>	PASS
11B	MCH	2.04	<limit< td=""><td>PASS</td></limit<>	PASS
	HCH	1.11	<limit< td=""><td>PASS</td></limit<>	PASS
	LCH	-1.82	<limit< td=""><td>PASS</td></limit<>	PASS
11G	MCH	-0.69	<limit< td=""><td>PASS</td></limit<>	PASS
	HCH	-1.59	<limit< td=""><td>PASS</td></limit<>	PASS
	LCH	-1.94	<limit< td=""><td>PASS</td></limit<>	PASS
11N HT20	MCH	-0.69	<limit< td=""><td>PASS</td></limit<>	PASS
	HCH	-1.70	<limit< td=""><td>PASS</td></limit<>	PASS



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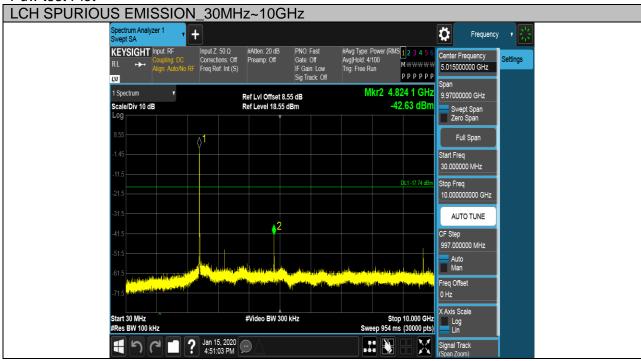
## **Test Plots**

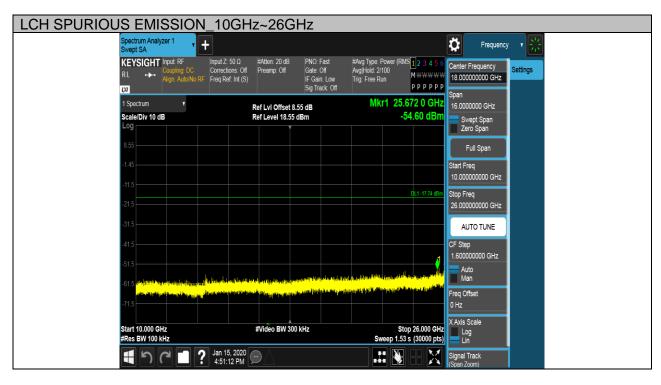
Test Mode	Channel	Verdict	
11B	LCH	PASS	





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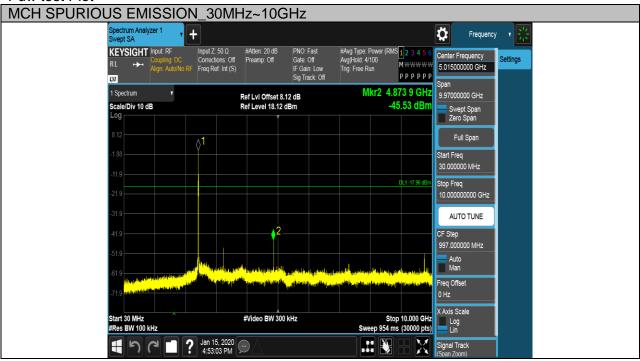
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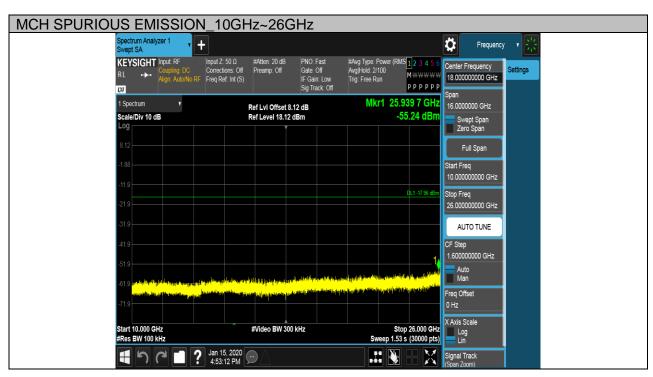
Test Mode	Channel	Verdict
11B	MCH	PASS





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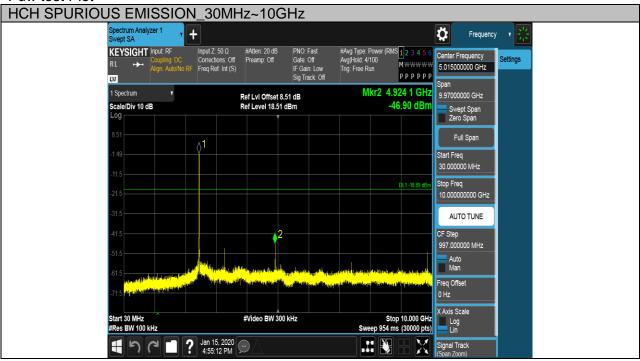
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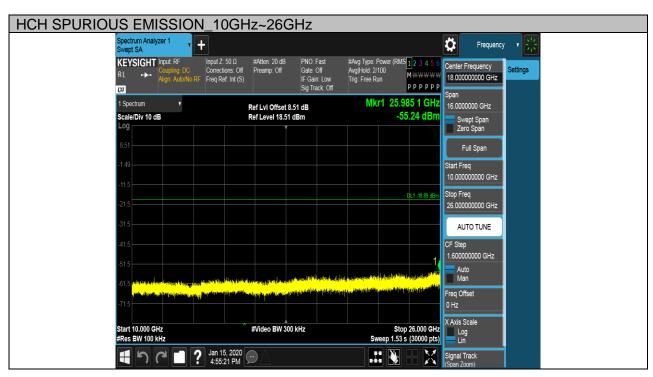
Test Mode	Channel	Verdict
11B	HCH	PASS





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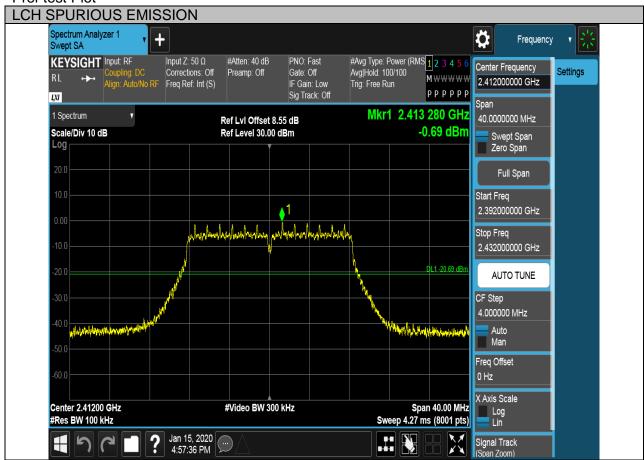






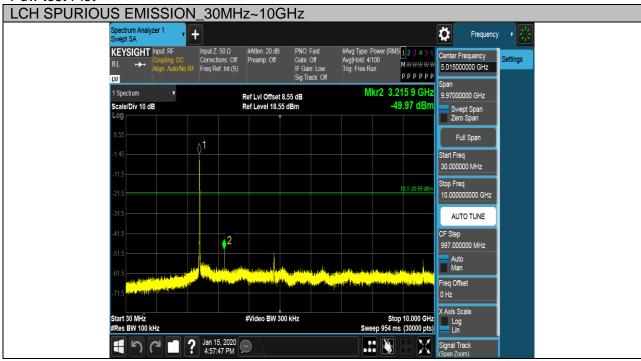
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Test Mode	Channel	Verdict
11G	LCH	PASS





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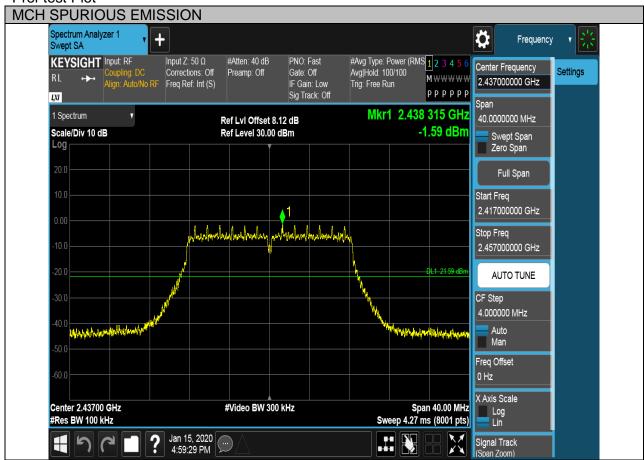






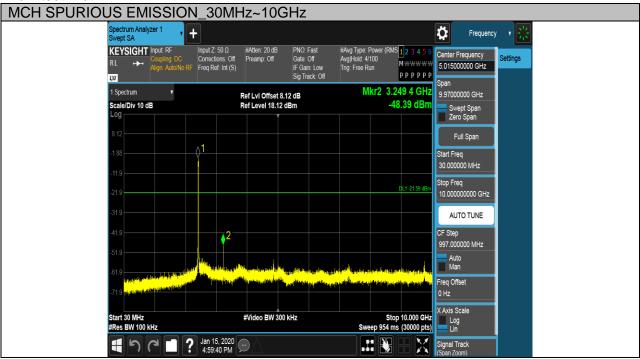
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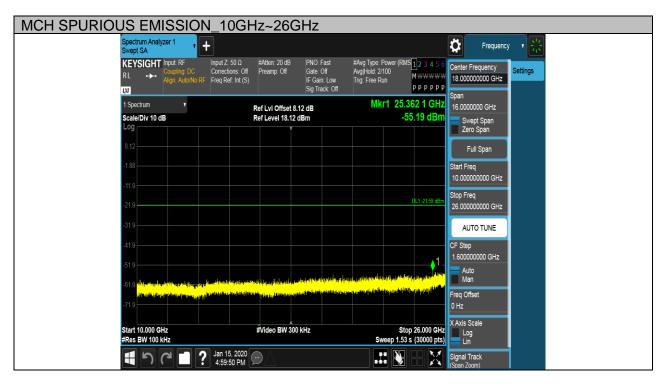
Test Mode	Channel	Verdict
11G	MCH	PASS





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Test Mode	Channel	Verdict
11G	HCH	PASS

