

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

### **CERTIFICATION TEST REPORT**

For

**Smart Cordless Vacuum&Washer** 

**MODEL NUMBER: FW150100CA** 

**ADDTIONAL MODEL NUMBER: FW150100US** 

**PROJECT NUMBER: 4789884561** 

REPORT NUMBER: 4789884651-1

FCC ID: 2AV7A-FS15

IC: 26039-FS15

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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



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# **Revision History**

Rev.	Issue Date	Revisions	Revised By
V0	05/26/2021	Initial Issue	



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### 1. ATTESTATION OF TEST RESULTS

**Applicant 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 Name: FW150100CA
Additional No.: FW150100US
Sample Number: 3776641
Data of Receipt Sample: 2021-04-02

Date Tested: 2021-04-02~ 2021-05-26

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 Test Items **FCC Rules Test Results** Clause FCC 15.247 (a) (2) 6db DTS Bandwidth 1 RSS-247 Clause 5.2 (a) Complied and 99% Bandwidth RSS-Gen Clause 6.7 FCC 15.247 (b) (3) **Conducted Power** RSS-247 Clause 5.4 (d) Complied 2 RSS-Gen Clause 6.12 FCC 15.247 (e) 3 **Power Spectral Density** Complied RSS-247 Clause 5.2 (b) FCC 15.247 (d) Conducted Band edge And 4 RSS-247 Clause 5.5 Complied Spurious emission **RSS-GEN Clause 6.13** FCC 15.247 (d) FCC 15.209 Radiated Band edges and Spurious FCC 15.205 5 Complied emission **RSS-247 Clause 5.5 RSS-GEN Clause 8.9** RSS-GEN Clause 6.13 Conducted Emission Test For AC FCC 15.207 6 Complied **Power Port** RSS-GEN Clause 8.8 FCC 15.203 7 Antenna Requirement Complied **RSS-GEN Clause 6.8** 

#### Remark:

Laboratory Leader

Prepared By:	Reviewed By:
Tom Tang	Leon Wu
Tom Tang Project Engineer	Leon Wu Senior Project Engineer
Authorized By:	
Chris Zhong	
Chris Zhong	

<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, ISED RSS-247> 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, ISED RSS-247 ISSUE2.

### 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) 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, 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
Radiation Emission test(include Fundamental	
emission)	3.4dB
(9KHz-30MHz)	
Radiation Emission test(include Fundamental	
emission)	3.4dB
(30MHz-1GHz)	
Radiation Emission test (1GHz to 26GHz)( include Fundamental emission)	3.9dB (1GHz-18Gz)
,	4.2dB (18GHz-26.5Gz)
Note: This uncortainty represents an expanded unc	cortainty expressed at approximately the

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 Cordless Vacuum&Washer
Model No.:	FW150100CA
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:	Meandered printed inverted-F antenna
Antenna Gain:	2.0 dBi
	Remark: This data is provided by customer and our lab isn't responsible for this data
Adapter	Name: Class 2 Power Supply MODEL:S030-1B260080HU INPUT:100-240V~50/60Hz 0.8A Max OUTPUT:26V 0.8A
Battery	HIGHSTAR 3.7V ISR18650-2500 INR19/66 Li-Ion 123020

### Remark:

### Model No.:

Number:	Name:	Number:	Name:	Number:	Name:
1	FW150100CA	2	FW150100US		

Only the main model **FW150100CA** was tested and only the data of this model is shown in this test report. FW150100US have the same technical construction including circuit diagram, PCB Layout, components and component layout, all electrical construction and mechanical construction with FW150100CA. The difference lies only model number . all these changes do not degrade the unwanted emissions of the certified product..



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# **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]	16.33
1	IEEE 802.11G SISO	1-11[11]	15.96
1	IEEE 802.11nHT20	1-11[11]	11.32

# 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 Software			EspRFtestTool					
	Transmit		Test Channel					
Modulation Mode	Antenna Number	NCB: 20MHz			NCB: 40MHz			
Mode		CH 1	CH 6	CH 11	CH 3	CH 6	CH 9	
802.11b	1	16	16	16	/			
802.11g	1	16	16	16	] /			
802.11n HT20	1	16	16	16				

Remark: The level in this list is the value of att setting in software



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# 5.6. DESCRIPTION OF AVAILABLE ANTENNAS

Ant.	Frequency (MHz)	Antenna Type	Antenna Gain (dBi)
1	2400-2483.5	Meandered printed inverted-F antenna	2.0

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 802.11n HT40 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 3.7V	
	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
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				

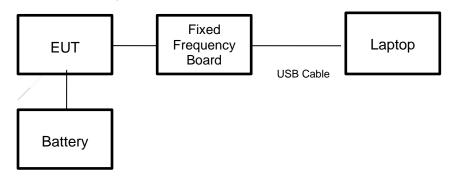
### **ACCESSORY**

Item	Accessory	Brand Name	Model Name	Description
1	N/A			

### **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

	Radiated Emissions (Instrument)								
Used	Equipment	Manufacturer	Мо	del No.	Ser	al No.	Upper Last Cal.	Last Cal.	Next Cal.
$\overline{\checkmark}$	Spectrum Analyzer	Keysight	Ζ	9010B	MY57	'110128	2019-05-29	2020-05-10	2021-05-09
$\overline{\checkmark}$	EMI test receiver	R&S	ESR26		126	67603	2019-12-12	2020-12-05	2021-12-04
<b>V</b>	Receiver Antenna (9kHz-30MHz)	Schwarzbeck	FM	ZB 1513	51:	3-265	N/A	2018-06-15	2021-06-14
<b>V</b>	Receiver Antenna (30MHz-1GHz)	SunAR RF Motion		JB1	17	7821	N/A	2019-01-28	2022-01-27
<b>V</b>	Receiver Antenna (1GHz-18GHz)	R&S	⊥	IF907	12	6705	2018-01-29	2019-01-28	2022-01-27
<b>V</b>	Receiver Antenna (18GHz-26.5GHz)	Schwarzbeck	ВВ	HA9170	12	6706	2019-02-06	2020-12-05	2021-12-04
<b>V</b>	Pre-amplification (To 18GHz)	Compliance Direction System Inc.	PAP-1G18-50		1414	0-13467	2019-03-18	2020-12-05	2021-12-04
<b>V</b>	Pre-amplification (To 26.5GHz)	R&S	SC	CU-26D	13	4668	2019-02-06	2020-09-27	2021-09-26
V	Band Reject Filter	Wainwright	235 2483	RCJV8- 50-2400- .5-2533.5- 40SS		1	2019-05-29	2020-05-10	2021-05-09
<b>V</b>	Highpass Filter	Wainwright	270	HKX10- 00-3000- 00-40SS		2/	2019-05-29	2020-05-10	2021-05-09
				Soft	ware				
Used	Desci	ription	Manufac		turer		Name	Version	
$\square$	Test Software for R	adiated disturbar	nce Tonsce		end		JS32	V1.0	
	Other instruments								
Used	Equipment	Manufacturer	Model No.		Seri	al No.	Upper Last Cal.	Last Cal.	Next Cal.
<b>V</b>	Spectrum Analyzer	Keysight	N	9010B	MY57	'110128	2019-05-29	2020-05-10	2021-05-09
	Power Meter	Keysight	U2	U2021XA		'110002	2019-06-12	2020-05-10	2021-05-09



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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	Conducted 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
7	Conducted Emission Test For AC Power Port	ANSI C63.10-2013	6.2

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# 7. ANTENNA PORT TEST RESULTS

### 7.1. ON TIME AND DUTY CYCLE

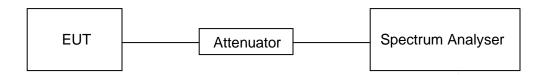
#### **LIMITS**

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 3.7V

### **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	4.18	4.71	0.887	88.7	0.52	0.24	1
11G	0.6906	0.794	0.870	87.0	0.60	1.45	2
11N HT20	0.655	0.759	0.876	87.6	0.57	1.53	2

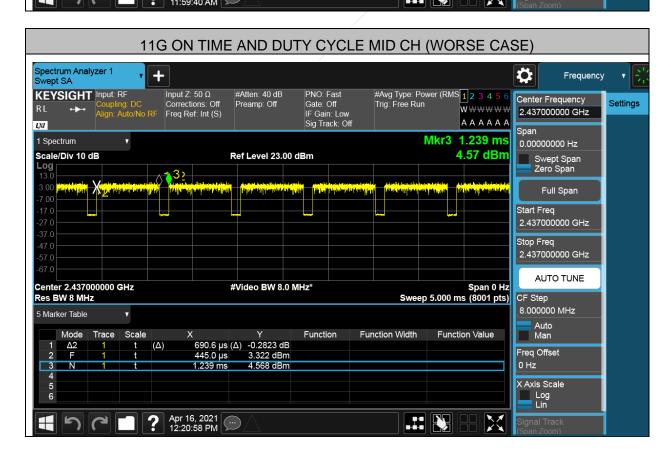
Note: 1) Duty Cycle Correction Factor=10log(1/x).

2) Where: x is Duty Cycle(Linear)

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



11B ON TIME AND DUTY CYCLE MID CH (WORSE CASE) Spectrum Analyzer 1 Ö Frequency Swept SA KEYSIGHT Input: RF Input Z: 50 Ω #Atten: 40 dB PNO: Fast #Avg Type: Power (RMS 1 2 3 4 5 6 Center Frequency Settings Corrections: Off Preamp: Off Gate: Off Tria: Free Run **w**₩₩₩₩ 2.437000000 GHz Freq Ref: Int (S) IF Gain: Low AAAAAA Sig Track: Off LXI Mkr3 6.305 ms 0.00000000 Hz Scale/Div 10 dB Ref Level 23.00 dBm 7.13 dBm Swept Span Zero Span 132 Full Span Start Freq 2.437000000 GHz Stop Freq 2.437000000 GHz **AUTO TUNE** Center 2.437000000 GHz #Video BW 8.0 MHz\* Span 0 Hz Res BW 8 MHz Sweep 40.00 ms (8001 pts) CF Step 8.000000 MHz 5 Marker Table Scale Function Function Width Function Value Δ2 **(Δ)** 4.180 ms (Δ) -0.4133 dB Freq Offset F 1.595 ms 7.121 dBm 0 Hz Ν 6.305 ms 4 X Axis Scale 5 6 Log Lin Apr 16, 2021 11:59:40 AM 





11N HT20 ON TIME AND DUTY CYCLE MID CH (WORSE CASE) Spectrum Analyzer 1 Ö Frequency Swept SA Input Z: 50 Ω #Atten: 40 dB #Avg Type: Power (RMS 1 2 3 4 5 6 Trig: Free Run KEYSIGHT Input: RF PNO: Fast Center Frequency Corrections: Off Freq Ref: Int (S) Gate: Off Settings Preamp: Off **W** \ \ \ \ \ \ \ IF Gain: Low Sig Track: Off 2.437000000 GHz Align: Auto A A A A A A LXI 1 Spectrum Mkr3 1.139 ms 0.00000000 Hz Scale/Div 10 dB Ref Level 23.00 dBm -1.18 dBm Swept Span Zero Span 32 Full Span Start Freq 2.437000000 GHz Stop Freq 2.437000000 GHz AUTO TUNE Center 2.437000000 GHz Res BW 8 MHz Span 0 Hz Sweep 5.000 ms (8001 pts) #Video BW 8.0 MHz\* CF Step 8.000000 MHz 5 Marker Table Scale Function Function Width Function Value Δ2 (Δ) 655.0 μs (Δ) -0.3580 dB Freq Offset 380.0 µs F -1.106 dBm 0 Hz Ν -1.184 dBm 4 5 6 X Axis Scale Log Lin Apr 17, 2021 4:23:17 PM 

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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			

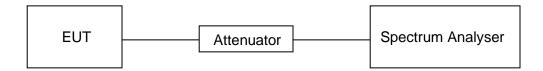
### **TEST PROCEDURE**

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

Center Frequency	The centre frequency of the channel under test
Detector	Peak
IRRW	For 6dB Bandwidth :100K For 99% Occupied Bandwidth :1% to 5% of the occupied bandwidth
IV/R/W	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**





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Test Mode	Test Channel	6dB bandwidth (MHz)	99% bandwidth (MHz)	Result
	LCH	8.093	10.465	Pass
11B	MCH	8.086	10.521	Pass
	HCH	8.065	10.494	Pass
11G	LCH	16.25	16.355	Pass
	MCH	15.78	16.405	Pass
	HCH	16.27	16.376	Pass
11N HT20	LCH	16.54	17.290	Pass
	MCH	16.54	17.265	Pass
	HCH	16.55	17.295	Pass



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### Test Graphs

### For 6dB Bandwidth part:







Test Channel **Test Mode** Verdict 11B HCH **PASS** Spectrum Analyzer 1 Occupied BW Ö + Frequency KEYSIGHT Input: RF Input Z: 50 Ω Atten: 40 dB Trig: Free Run Center Freq: 2.462000000 GHz Center Frequency oupling: DC Corrections: Off Freq Ref: Int (S) Avg|Hold: 10/10 Radio Std: None Settings Preamp: Off Gate: Off 2.462000000 GHz #IF Gain: Low LXI Span Mkr1 2.4610 GHz 1 Graph Ref Lvi Offset 9.01 dB Ref Value 30.00 dBm 40.000 MHz Scale/Div 10.0 dB 7.81 dBm CF Step 4.000000 MHz Auto Man Freq Offset 20.0 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) 2 Metrics Occupied Bandwidth 10.442 MHz 22.9 dBm Total Power Transmit Freq Error 18.115 kHz % of OBW Power 99.00 % -6.00 dB x dB Bandwidth 8.065 MHz x dB Apr 16, 2021 12:01:46 PM

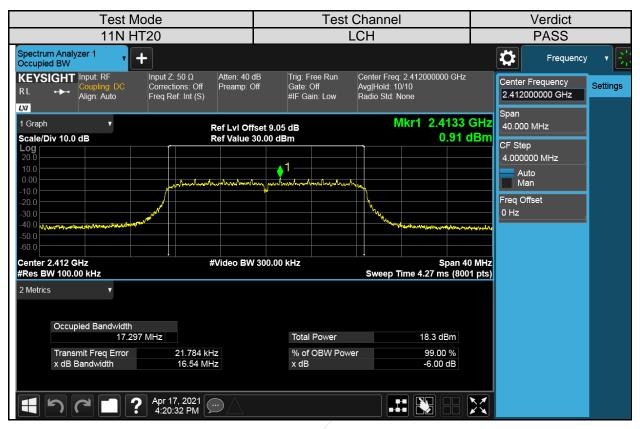


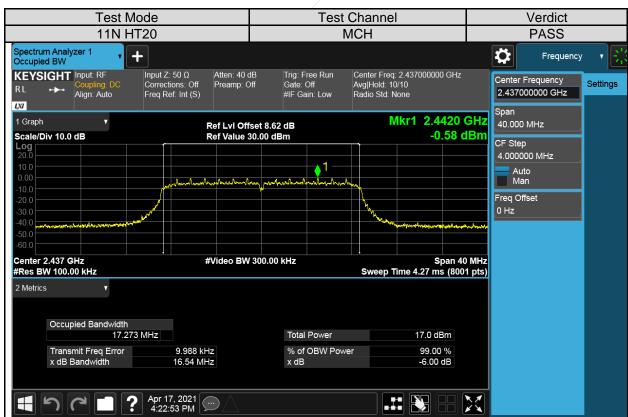


Test Channel **Test Mode** Verdict 11G **MCH PASS** Spectrum Analyzer 1 Occupied BW + Ö Frequency KEYSIGHT Input: RF Input Z: 50 Ω Atten: 40 dB Trig: Free Run Center Freq: 2.462000000 GHz Center Frequency oupling: DC Corrections: Off Freq Ref: Int (S) Avg|Hold:>10/10 Radio Std: None Settings Preamp: Off Gate: Off 2.462000000 GHz #IF Gain: Low LXI Span Mkr1 2.4670 GHz 1 Graph Ref Lvi Offset 9.01 dB Ref Value 30.00 dBm 40.000 MHz Scale/Div 10.0 dB 4.48 dBm CF Step 4.000000 MHz Auto Man Freq Offset 20.0 0 Hz Mary bon wind house Center 2.462 GHz #Res BW 100.00 kHz #Video BW 300.00 kHz Span 40 MHz Sweep Time 4.27 ms (8001 pts) 2 Metrics Occupied Bandwidth 16.329 MHz 22.0 dBm Total Power Transmit Freq Error 3.538 kHz % of OBW Power 99.00 % 16.27 MHz -6.00 dB x dB Bandwidth x dB

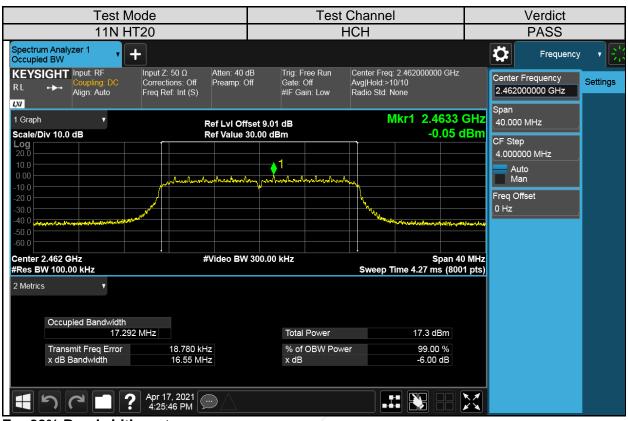


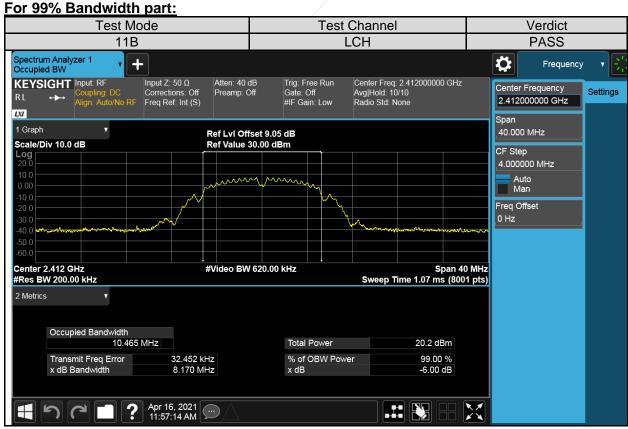














Test Channel **Test Mode** Verdict 11B **MCH PASS** Spectrum Analyzer 1 Occupied BW Ö + Frequency KEYSIGHT Input: RF Input Z: 50 Ω Atten: 40 dB Trig: Free Run Center Freq: 2.437000000 GHz Center Frequency oupling: DC Corrections: Off Freq Ref: Int (S) Avg|Hold:>10/10 Radio Std: None Settings Preamp: Off Gate: Off 2.437000000 GHz #IF Gain: Low LXI Span 1 Graph Ref Lvi Offset 8.62 dB Ref Value 30.00 dBm 40.000 MHz Scale/Div 10.0 dB CF Step 4.000000 MHz Auto Man Freq Offset 20.0 0 Hz 40.C Center 2.437 GHz #Res BW 200.00 kHz #Video BW 620.00 kHz Span 40 MHz Sweep Time 1.07 ms (8001 pts) 2 Metrics Occupied Bandwidth 10.521 MHz Total Power 21.7 dBm Transmit Freq Error 31.268 kHz % of OBW Power 99.00 % -6.00 dB x dB Bandwidth 8.168 MHz x dB





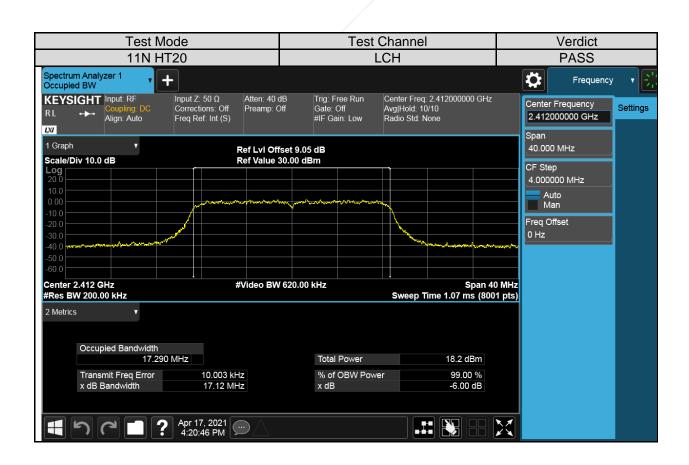
Test Channel **Test Mode** Verdict 11G LCH **PASS** Spectrum Analyzer 1 Occupied BW Ö + Frequency KEYSIGHT Input: RF Input Z: 50 Ω Atten: 40 dB Trig: Free Run Center Freq: 2.412000000 GHz Center Frequency oupling: DC Corrections: Off Freq Ref: Int (S) Avg|Hold: 10/10 Radio Std: None Settings Preamp: Off Gate: Off #IF Gain: Low 2.412000000 GHz LXI Span 1 Graph Ref Lvi Offset 9.05 dB Ref Value 30.00 dBm 40.000 MHz Scale/Div 10.0 dB CF Step 4.000000 MHz Auto Man Freq Offset 20.0 0 Hz Center 2.412 GHz #Video BW 620.00 kHz Span 40 MHz #Res BW 200.00 kHz Sweep Time 1.07 ms (8001 pts) 2 Metrics Occupied Bandwidth 16.355 MHz Total Power 20.9 dBm Transmit Freq Error 11.428 kHz % of OBW Power 99.00 % -6.00 dB x dB Bandwidth 16.33 MHz x dB





Test Channel **Test Mode** Verdict 11G HCH **PASS** Spectrum Analyzer 1 Occupied BW Ö + Frequency KEYSIGHT Input: RF Center Freq: 2.462000000 GHz Input Z: 50 Ω Atten: 40 dB Trig: Free Run Center Frequency oupling: DC Corrections: Off Freq Ref: Int (S) Avg|Hold: 10/10 Radio Std: None Settings Preamp: Off Gate: Off #IF Gain: Low 2.462000000 GHz LXI Span 1 Graph Ref Lvi Offset 9.01 dB Ref Value 30.00 dBm 40.000 MHz Scale/Div 10.0 dB CF Step 4.000000 MHz Auto Man Freq Offset 20.0 0 Hz Center 2.462 GHz #Res BW 200.00 kHz #Video BW 620.00 kHz Span 40 MHz Sweep Time 1.07 ms (8001 pts) 2 Metrics Occupied Bandwidth 16.376 MHz 22.0 dBm Total Power 17.519 kHz Transmit Freq Error % of OBW Power 99.00 % -6.00 dB x dB Bandwidth 16.33 MHz x dB

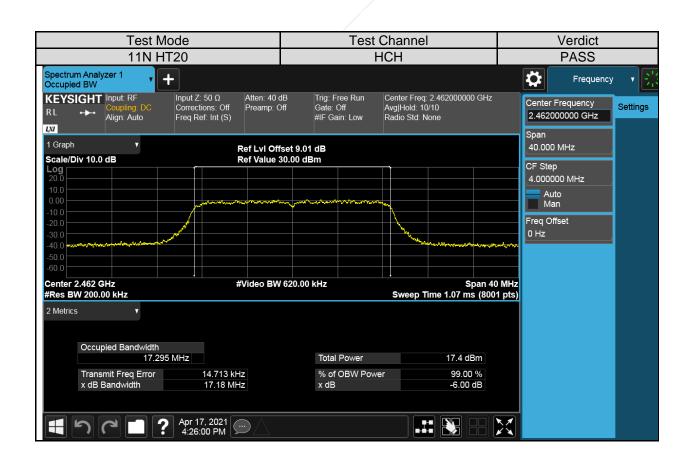
> Apr 16, 2021 12:23:13 PM





Test Channel Test Mode Verdict 11N HT20 MCH **PASS** Spectrum Analyzer 1 Occupied BW Ö Frequency KEYSIGHT Input: RF Center Freq: 2.437000000 GHz Input Z: 50 Ω Atten: 40 dB Trig: Free Run Center Frequency Corrections: Off Freq Ref: Int (S) Avg|Hold: 10/10 Radio Std: None Settings Preamp: Off Gate: Off #IF Gain: Low 2.437000000 GHz Align: Auto LXI Span 1 Graph Ref Lvi Offset 8.62 dB Ref Value 30.00 dBm 40.000 MHz Scale/Div 10.0 dB CF Step 4.000000 MHz Auto Man Freq Offset 20.0 0 Hz 40.C #Video BW 620.00 kHz Center 2.437 GHz Span 40 MHz #Res BW 200.00 kHz Sweep Time 1.07 ms (8001 pts) 2 Metrics Occupied Bandwidth 17.265 MHz Total Power 17.1 dBm Transmit Freq Error 20.067 kHz % of OBW Power 99.00 % -6.00 dB x dB Bandwidth 17.18 MHz x dB

> Apr 17, 2021 4:23:07 PM



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### 7.3. CONDUCTED 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**

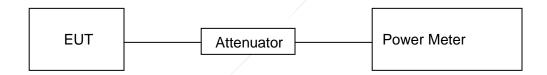
Place the EUT on the table and set it in the transmitting mode.

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.

AVG Detector use for AVG result.

### **TEST SETUP**



Test Mode	Test Channel	Maximum Conducted Output Power (AV)	Result
11B	LCH	14.86	Pass
	MCH	16.33	Pass
	HCH	15.90	Pass
11G	LCH	14.41	Pass
	MCH	15.96	Pass
	HCH	15.54	Pass
11N HT20	LCH	11.32	Pass
	MCH	10.46	Pass
	HCH	10.79	Pass

### Remark:

- For all the test results has been adjusted the duty cycle factor.
   For Correction Factor is refer to the result in section 7.1

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### 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.

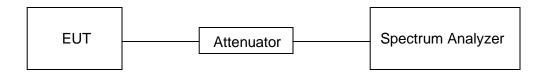
Allow trace to fully stabilize and use the peak marker function to determine the maximum amplitude level within the RBW.

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 3.7V

### **TEST SETUP**





RESULTS

Test Mode	Test Channel	Maximum Peak power spectral density (dBm/30kHz)	Result
	LCH	3.74	Pass
11B	MCH	4.89	Pass
	HCH	4.25	Pass
	LCH	-1.89	Pass
11G	MCH	0.06	Pass
	HCH	-0.46	Pass
11N HT20	LCH	-4.11	Pass
	MCH	-4.95	Pass
	HCH	-4.43	Pass



**Test Graphs:** 

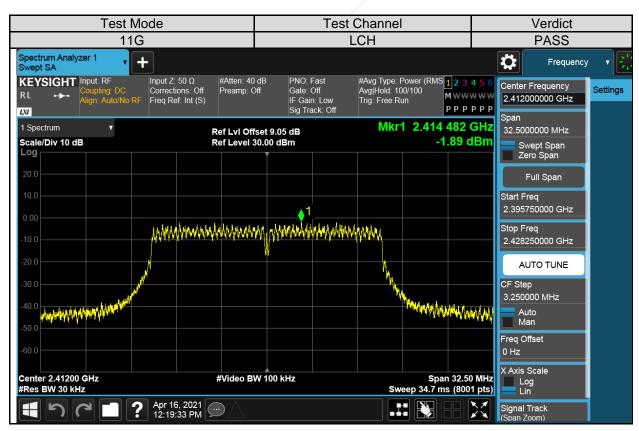






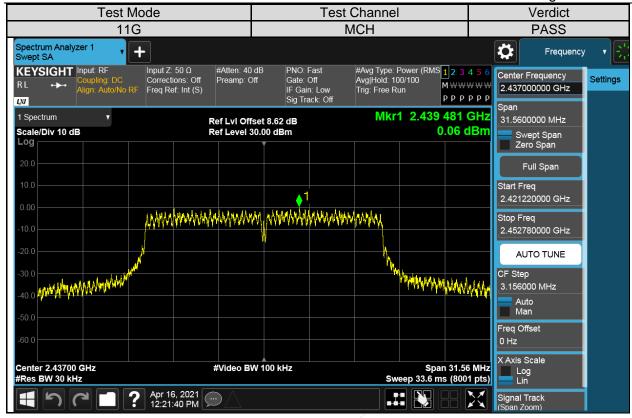
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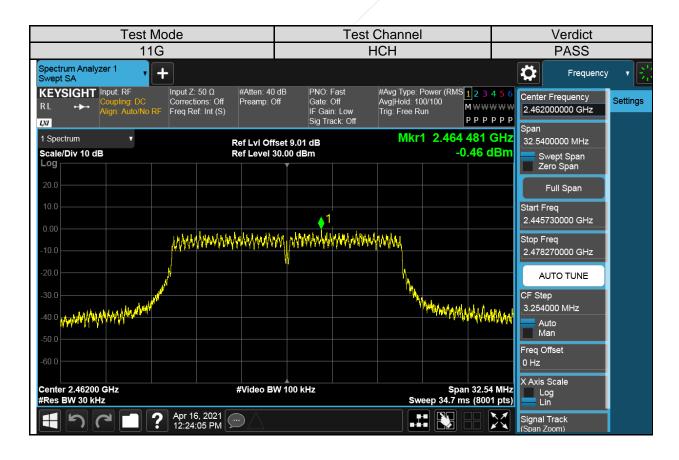






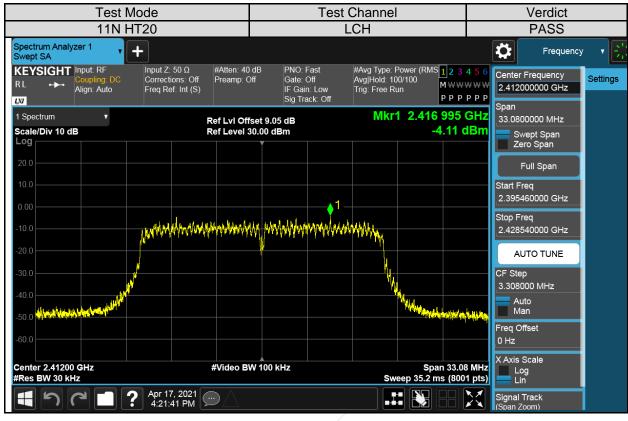
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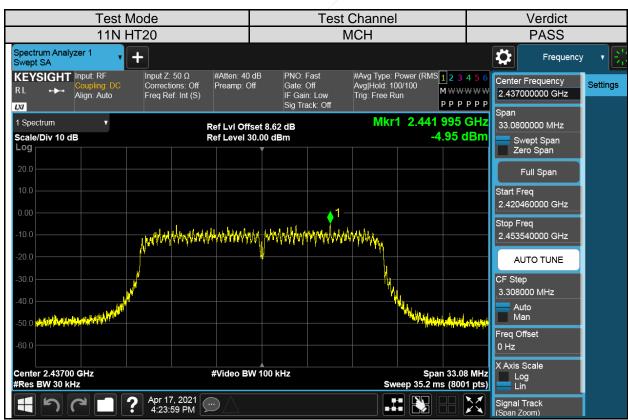






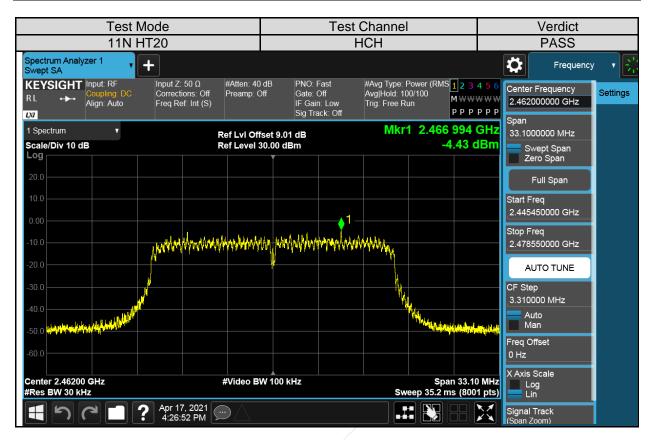
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# 7.5. CONDUCTED BANDEDGE AND SPURIOUS EMISSIONS

# **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 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.	

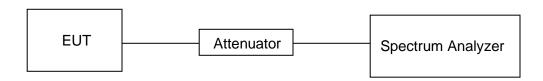
settings:

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 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**





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# TEST ENVIRONMENT

Temperature	22°C	Relative Humidity	56%
Atmosphere Pressure	101kPa	Test Voltage	DC 3.7V



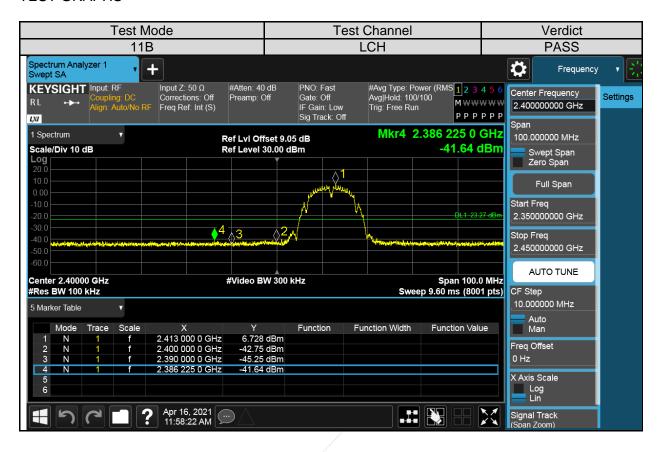
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# Part I : Conducted Bandedge

# **RESULTS TABLE**

Test Mode	Test Channel	Carrier Power[dBm]	Max. Spurious Level [dBm]	Limit [dBm]	Verdict
11D	LCH	6.728	-41.64	-23.27	PASS
11B	HCH	7.620	-40.71	-22.38	PASS
440	LCH	3.145	-38.79	-26.86	PASS
11G	HCH	4.412	-36.89	-25.59	PASS
11N UT20	LCH	0.192	-40.73	-29.81	PASS
11N HT20	HCH	-0.093	-40.84	-30.09	PASS

#### TEST GRAPHS



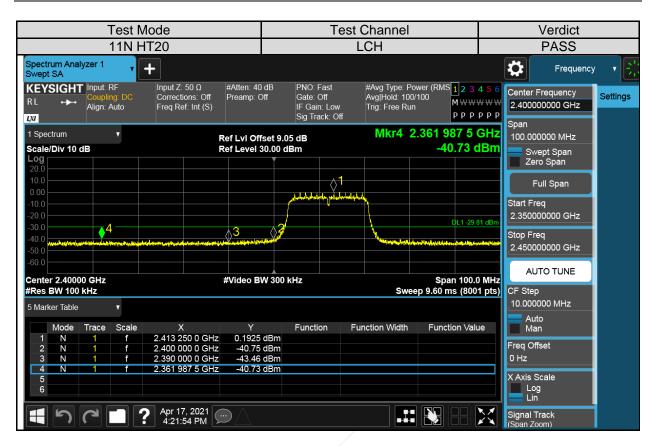


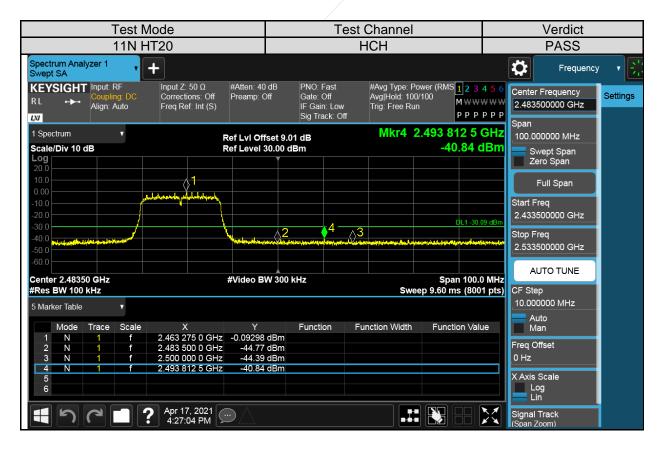














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# Part II :Conducted Emission

Test Result Table

Test Mode	Test Antenna	Channel	Pref(dBm)	Puw(dBm)	Verdict
	, , ,	LCH	6.57	<limit< td=""><td>PASS</td></limit<>	PASS
11B	Antenna 1	MCH	8.25	<limit< td=""><td>PASS</td></limit<>	PASS
		HCH	7.51	<limit< td=""><td>PASS</td></limit<>	PASS
	Antenna 1	LCH	3.46	<limit< td=""><td>PASS</td></limit<>	PASS
11G		MCH	5.07	<limit< td=""><td>PASS</td></limit<>	PASS
110		HCH	4.61	<limit< td=""><td>PASS</td></limit<>	PASS
	A . 1	LCH	-0.17	<limit< td=""><td>PASS</td></limit<>	PASS
11N HT20	Antenna 1	MCH	-0.59	<limit< td=""><td>PASS</td></limit<>	PASS
111111120		HCH	-0.18	<limit< td=""><td>PASS</td></limit<>	PASS



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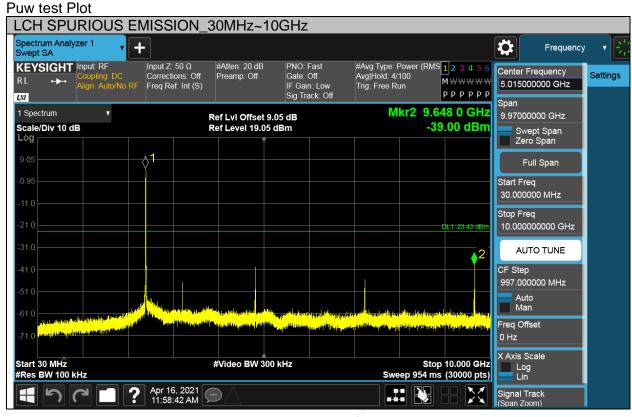
## **Test Plots**

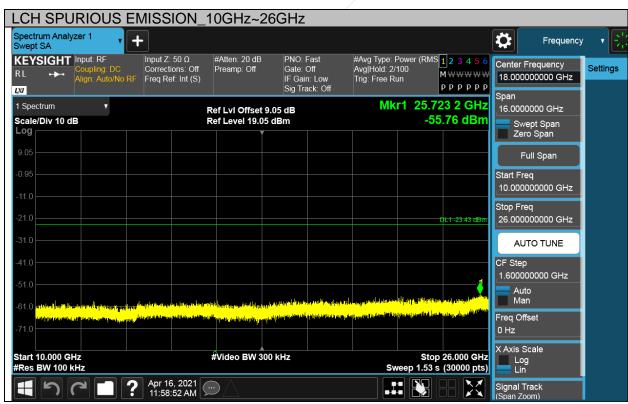
Test Mode	Channel	Verdict
11B	LCH	PASS





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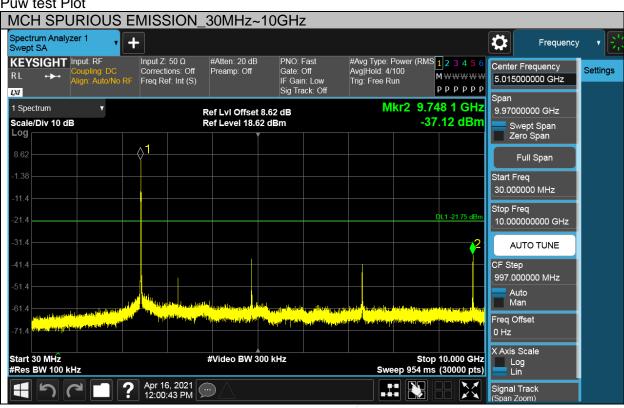
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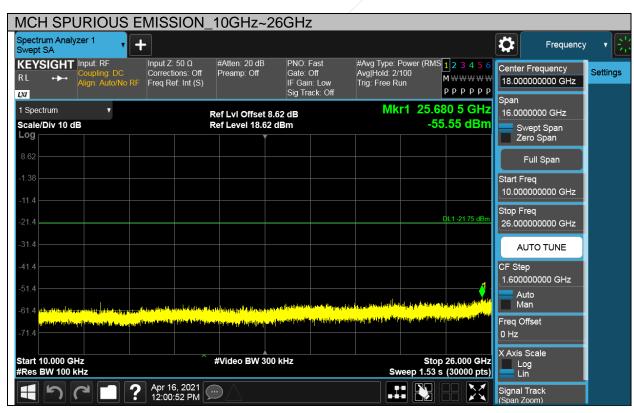
Test Mode	Channel	Verdict
11B	MCH	PASS





Puw test Plot







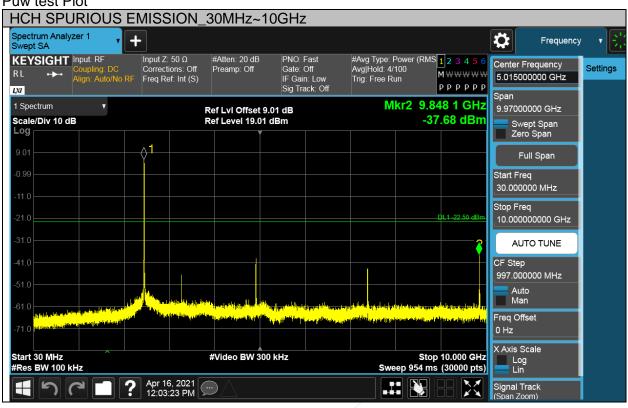
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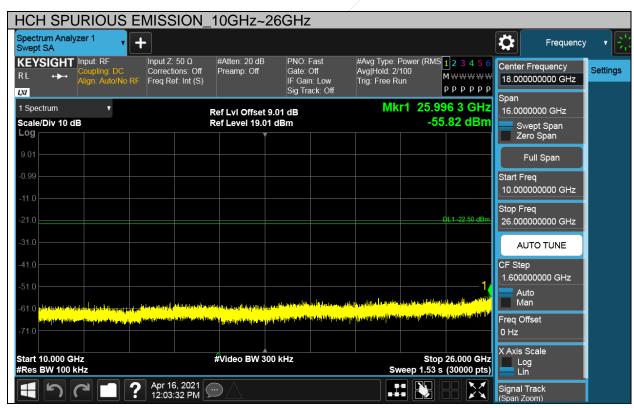
Test Mode	Channel	Verdict
11B	HCH	PASS





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Puw test Plot







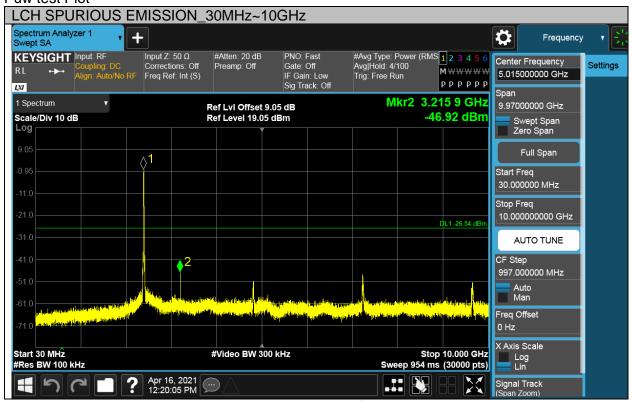
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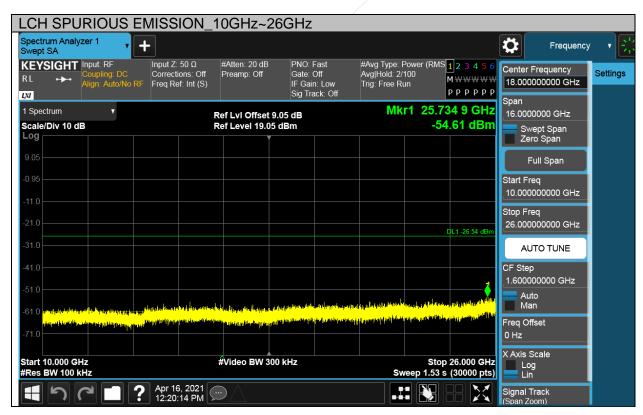
Test Mode	Channel	Verdict
11G	LCH	PASS





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Puw test Plot







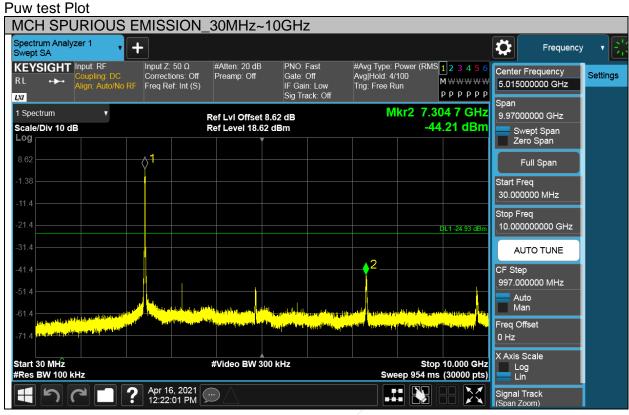
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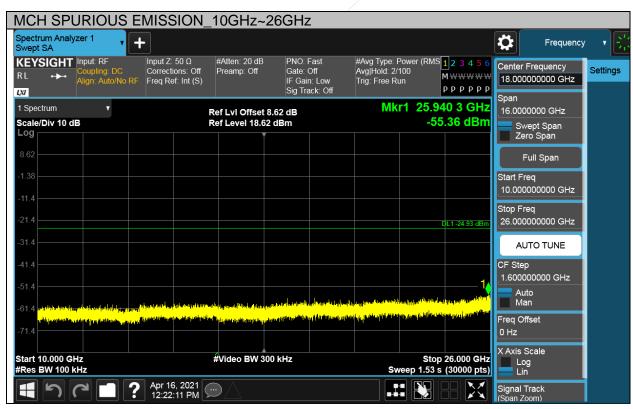
Test Mode	Channel	Verdict
11G	MCH	PASS





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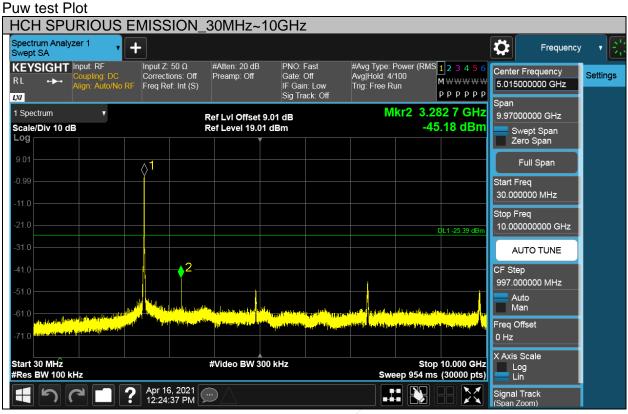
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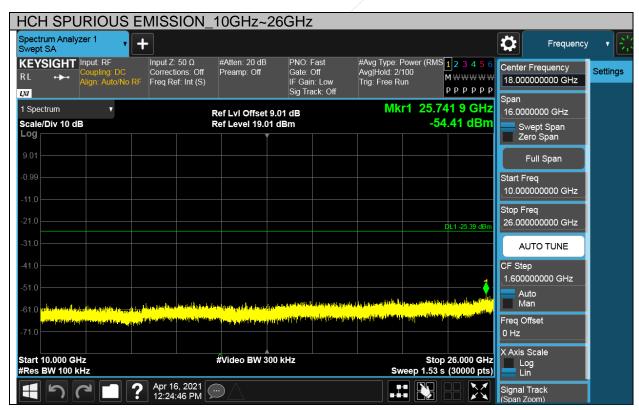
Test Mode	Channel	Verdict
11G	HCH	PASS





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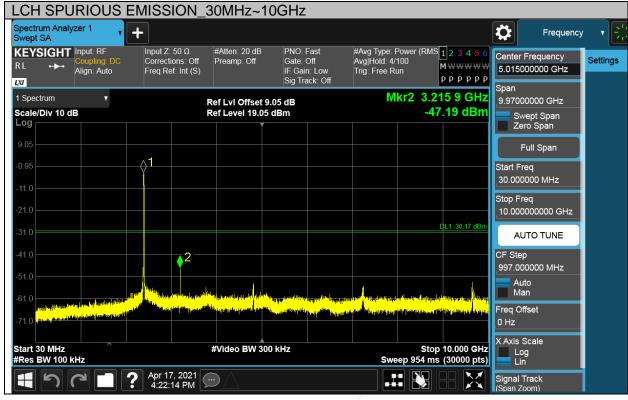
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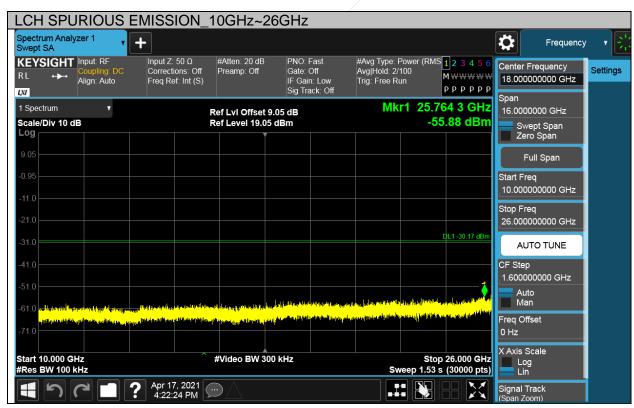
Test Mode	Channel	Verdict
11N HT20	LCH	PASS





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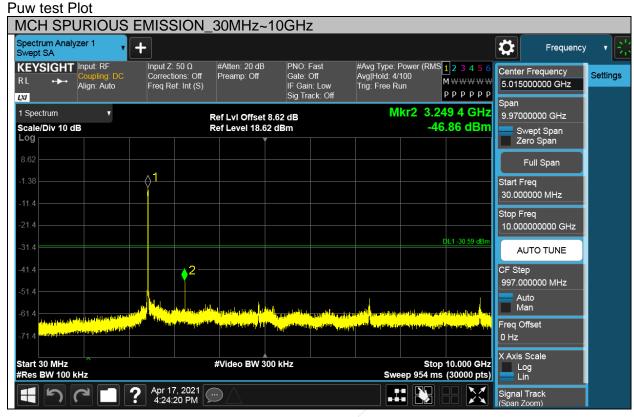
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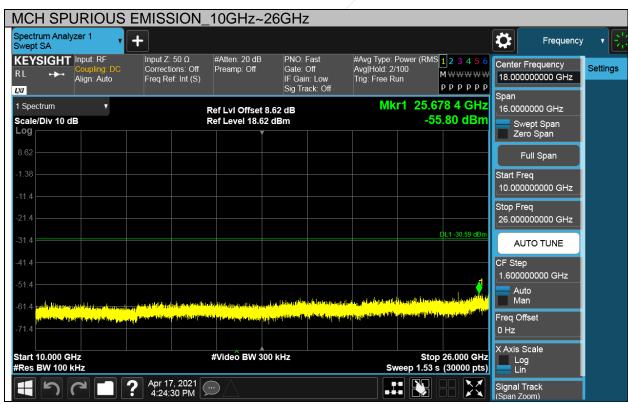
Test Mode	Channel	Verdict
11N HT20	MCH	PASS





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Test Mode	Channel	Verdict
11N HT20	HCH	PASS

