

Craftmade International, Inc

# TEST REPORT

**SCOPE OF WORK**

FCC TESTING—WCS-100

**REPORT NUMBER**

200819022SZN-001

**ISSUE DATE**

**[REVISED DATE]**

12 November 2020

[-----]

**PAGES**

52

**DOCUMENT CONTROL NUMBER**

FCC ID 247\_b

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**Craftmade International, Inc**

Application  
For  
Certification

**FCC ID: XEJ-WCS100****Smart Wi-Fi Switch****Model: WCS-100****Brand name: CRAFTMADE™****2.4GHz Wi-Fi Transceiver**

Report No.: 200819022SZN-001

We hereby certify that the sample of the above item is considered to comply with the requirements of FCC Part 15, Subpart C for Intentional Radiator,  
mention 47 CFR [10-1-19]

**Prepared and Checked by:**

**Ryan Chen**  
**Engineer**

**Approved by:**

---

**Kidd Yang**  
**Technical Supervisor**  
**Date: 12 November 2020**

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**Intertek Testing Services Shenzhen Ltd. Longhua Branch**

101, 201, Building B, No. 308 Wuhe Avenue, Zhangkengjing Community, GuanHu Subdistrict, LongHua District, Shenzhen, P.R. China.  
Tel: (86 755) 8601 6288 Fax: (86 755) 8601 6751

**MEASUREMENT/TECHNICAL REPORT**

This report concerns (check one)      Original Grant       Class II Change

Equipment Type: DTS - Part 15 Digital Transmission Systems (Wi-Fi transmitter portion)

Deferred grant requested per 47 CFR 0.457(d)(1)(ii)?      Yes       No

If yes, defer until : \_\_\_\_\_  
date

Company Name agrees to notify the Commission by: \_\_\_\_\_  
date

of the intended date of announcement of the product so that the grant can be issued on  
that date.

Transition Rules Request per 15.37?      Yes       No

If no, assumed Part 15, Subpart C for intentional radiator - the new 47 CFR [10-01-  
19] Edition] provision.

Report prepared by:

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**1.0 Summary of Test results**

Applicant: Craftmade International, Inc

Applicant Address: 650 S. Royal Lane, Suite 100 Coppell, Texas 75019, United States

Manufacturer: NanChang Innotech Homesmart Co., Ltd

Manufacturer Address: 1st to 5th floor, 2-1#, Nanchang Small and Medium- sized Enterprises Entrepreneurship Incubation Base (Phase II), Guowei Industrial Park, No. 669 Huangtang E Rd, Linkong Economic Zone, Nanchang, Jiangxi

Model: WCS-100

FCC ID: XEJ-WCS100

TEST ITEM	REFERENCE	RESULTS
Max. Output power	15.247(b)(3)	Pass
6 dB Bandwidth	15.247(a)(2)	Pass
Max. Power Density	15.247(e)	Pass
Out of Band Antenna Conducted Emission	15.247(d)	Pass
Radiated Emission in Restricted Bands	15.247(d), 15.209, FCC 15.205	Pass
AC Conducted Emission	15.207	Pass
Antenna Requirement	15.203	Pass (See Notes)

Notes: The EUT uses an Integral Antenna which in accordance to Section 15.203 is considered sufficient to comply with the provisions of this section.

## 2.0 General Description

### 2.1 Product Description

The Equipment Under Test (EUT) is a Smart Wi-Fi Switch with Wi-Fi function operating at 2412-2462MHz for 802.11b/g/n-HT20, 11 channels with 5MHz channel spacing. The EUT is powered by AC 120V/60Hz. For more detailed features description, please refer to the user's manual.

Type of Modulation: BPSK, QPSK, 16QAM, 64QAM for OFDM; CCK, DQPSK, DBPSK for DSSS.

Antenna Type: Integral Antenna

Antenna Gain: 3dBi

For electronic filing, the brief circuit description is saved with filename: descri.pdf.

### 2.2 Related Submittal(s) Grants

This is an application for certification of:

DTS- Part 15 Digital Transmission Systems (2.4GHz Wi-Fi transmitter portion).

For other functions were reported in the SDOC report: 200819022SZN-003.

Remaining portions are subject to the following procedures:

1. Receiver portion of WiFi: exempt from technical requirement of this Part.
2. Other Digital Function: Subject to FCC Part 15B SDOC.

### 2.3 Test Methodology

Both AC mains line-conducted and radiated emission measurements were performed according to the procedures in ANSI C63.10 (2013) and KDB 558074 D01 v05r02. Radiated emission measurement was performed in semi-anechoic chamber and conducted emission measurement was performed in shield room. For radiated emission measurement, preliminary scans were performed in the semi-anechoic chamber only to determine the worst case modes. All radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "**Justification Section**" of this Application.

### 2.4 Test Facility

The Semi-anechoic chamber and shielded room used to collect the radiated data and conducted data are **Intertek Testing Services Shenzhen Ltd. Longhua Branch** and located at 101, 201, Building B, No. 308 Wuhe Avenue, Zhangkengjing Community, GuanHu Subdistrict, LongHua District, Shenzhen, P.R. China. This test facility and site measurement data have been fully placed on file with File Number: CN1188.

### **3.0 System Test Configuration**

#### **3.1 Justification**

For emissions testing, the equipment under test (EUT) setup to transmit continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing. During testing, all cables were manipulated to produce worst case emissions. The EUT was powered by AC120V/60Hz during the test.

On 802.11b/g/n-HT20 mode, only one antenna is used, and all data rate were tested and only the worst case data is shown in the report.

For maximizing emissions, the EUT was rotated through 360°, the EUT was placed on the styrene turntable with 0.8m up to 1GHz and 1.5 m above 1GHz. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters. Radiated emissions are taken at three meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance.

All readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance. Analyzer resolution is 100 kHz or greater for frequencies below 1000 MHz. The resolution is 1 MHz or greater for frequencies above 1000 MHz. The spurious emissions more than 20 dB below the permissible value are not reported.

The rear of unit shall be flushed with the rear of the table.

Radiated emission measurement was performed the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

#### **3.2 EUT Exercising Software**

The EUT exercise program (provided by client) used during radiated and conducted testing was designed to exercise the various system components in a manner similar to a typical use. The worst case configuration is used in all specified testing.

The parameters of test software setting:

During the test, Channel and power controlling software provided by the applicant was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the application and is going to be fixed on the firmware of the end product.

#### **3.3 Special Accessories**

N/A.

### 3.4 Measurement Uncertainty

When determining of the test conclusion, the Measurement Uncertainty of test has been considered.

### 3.5 Equipment Modification

Any modifications installed previous to testing by Craftmade International, Inc will be incorporated in each production model sold / leased in the United States.

No modifications were installed by Intertek Testing Services Shenzhen Ltd. Longhua Branch.

### 3.6 Support Equipment List and Description

Description	Manufacturer	Model No.
Lamp (Provided by Intertek)	N/A	N/A
Power Cord (Provided by Intertek)	N/A	Unshielded, 1.5m

Applicant: Craftmade International, Inc

Date of Test: 09 September 2020

Model: WCS-100

#### 4.0 Measurement Results

##### 4.1 Maximum Conducted Output Power at Antenna Terminals, FCC Rules 15.247(b)(3):

The antenna power of the EUT was connected to the input of a broadband peak RF power meter. The power meter has a video bandwidth that is greater than DTS bandwidth and utilize a fast-responding diode detector. Power was read directly at the EUT antenna terminals with cable loss added.

For antennas with gains of 6 dBi or less, maximum allowed Transmitter output is 1 watt (+30 dBm).

IEEE 802.11b (Antenna Gain = 3dBi) (CCK, 1Mbps)		
Frequency (MHz)	Output in dBm (Peak Reading)	Output in mWatt
Low Channel: 2412	20.2	104.71
Middle Channel: 2437	19.7	93.33
High Channel: 2462	18.4	69.18

IEEE 802.11g (Antenna Gain = 3dBi) (16QAM, 6Mbps)		
Frequency (MHz)	Output in dBm (Peak Reading)	Output in mWatt
Low Channel: 2412	22.2	165.96
Middle Channel: 2437	22.1	162.18
High Channel: 2462	22.0	158.49

IEEE 802.11n-HT20 (Antenna Gain = 3dBi) (64QAM, 6Mbps)		
Frequency (MHz)	Output in dBm (Peak Reading)	Output in mWatt
Low Channel: 2412	22.4	173.78
Middle Channel: 2437	22.5	177.83
High Channel: 2462	22.1	162.18

Cable loss: 1.0 dB    External Attenuation: 0 dB

Cable loss, external attenuation has been included in OFFSET function

EUT max. output level = 22.5dBm

EUT max. E.I.R.P = 22.5dBm + 3dBi = 25.5dBm = 354.8mW

For RF Exposure, the information is saved with filename: RF exposure.pdf.

Applicant: Craftmade International, Inc

Date of Test: 09 September 2020

Model: WCS-100

**4.2 Minimum 6 dB RF Bandwidth, FCC Rule 15.247(a) (2):**

The antenna port of the EUT was connected to the input of a spectrum analyzer. Analyzer RES BW was set to 100 KHz according to FCC KDB 558074 D01 v05r02. For each RF output channel investigated, the spectrum analyzer center frequency was set to the channel carrier. A PEAK output reading was taken, a DISPLAY line was drawn 6 dB lower than PEAK level. The 6dB bandwidth was determined from where the channel output spectrum intersected the display line.

Limit: The 6 dB Bandwidth is at least 500 kHz.

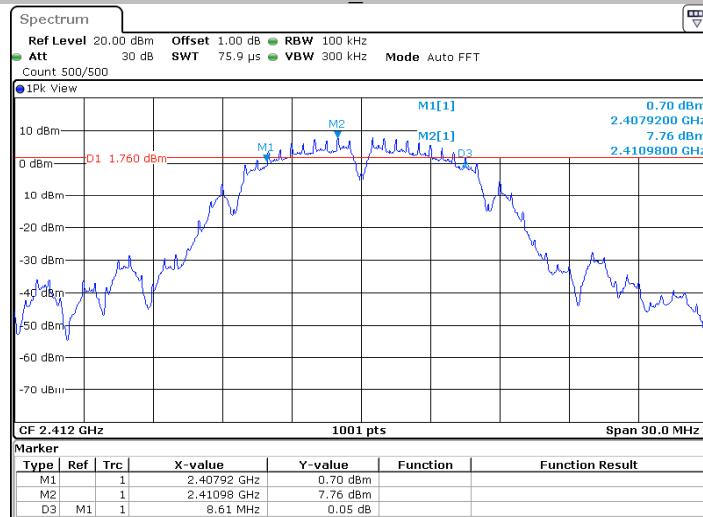
IEEE 802.11b (CCK, 1Mbps)	
Frequency (MHz)	6 dB Bandwidth (MHz)
2412	8.610
2437	8.610
2462	8.610

IEEE 802.11g (16QAM, 6Mbps)	
Frequency (MHz)	6 dB Bandwidth (MHz)
2412	16.110
2437	16.140
2462	16.350

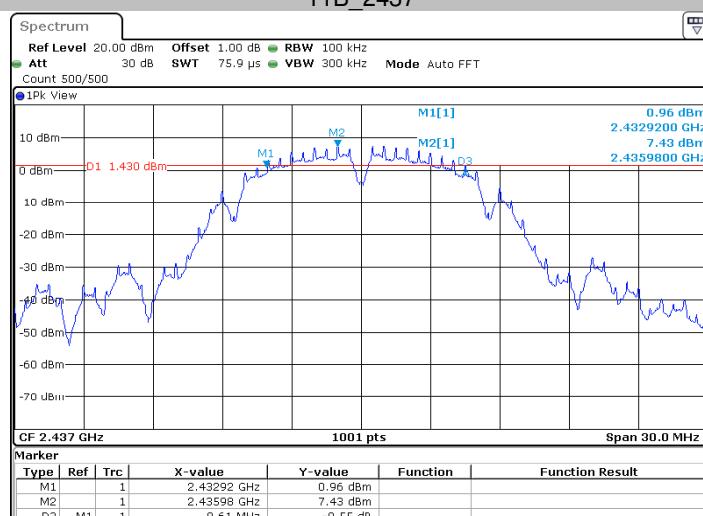
IEEE 802.11n-HT20 (64QAM, 6Mbps)	
Frequency (MHz)	6 dB Bandwidth (MHz)
2412	16.380
2437	16.380
2462	16.620

The test plots are attached as below.

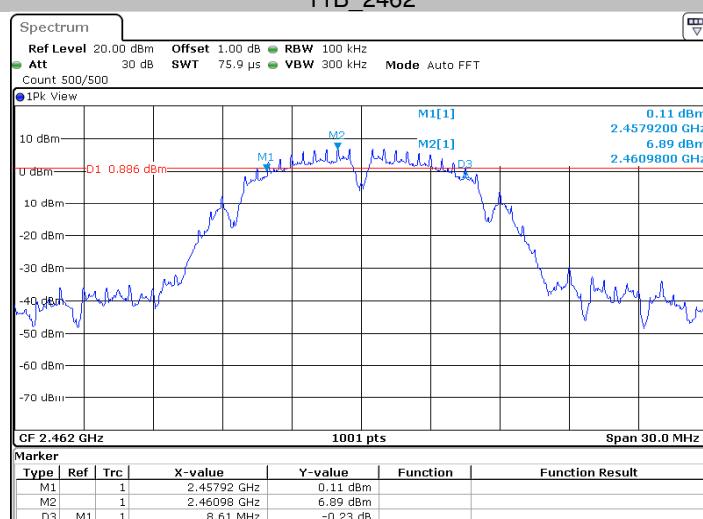
## 11B\_2412

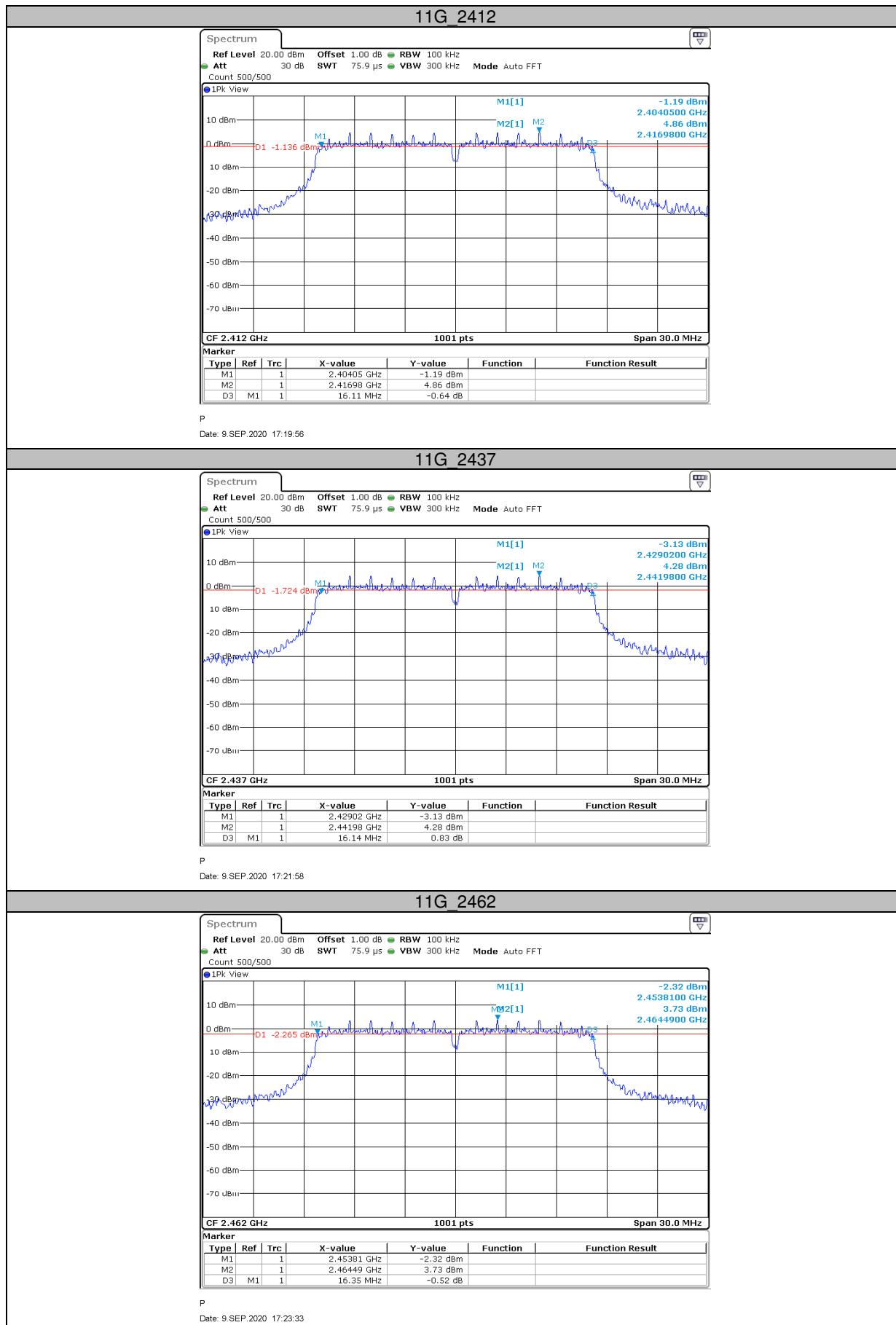


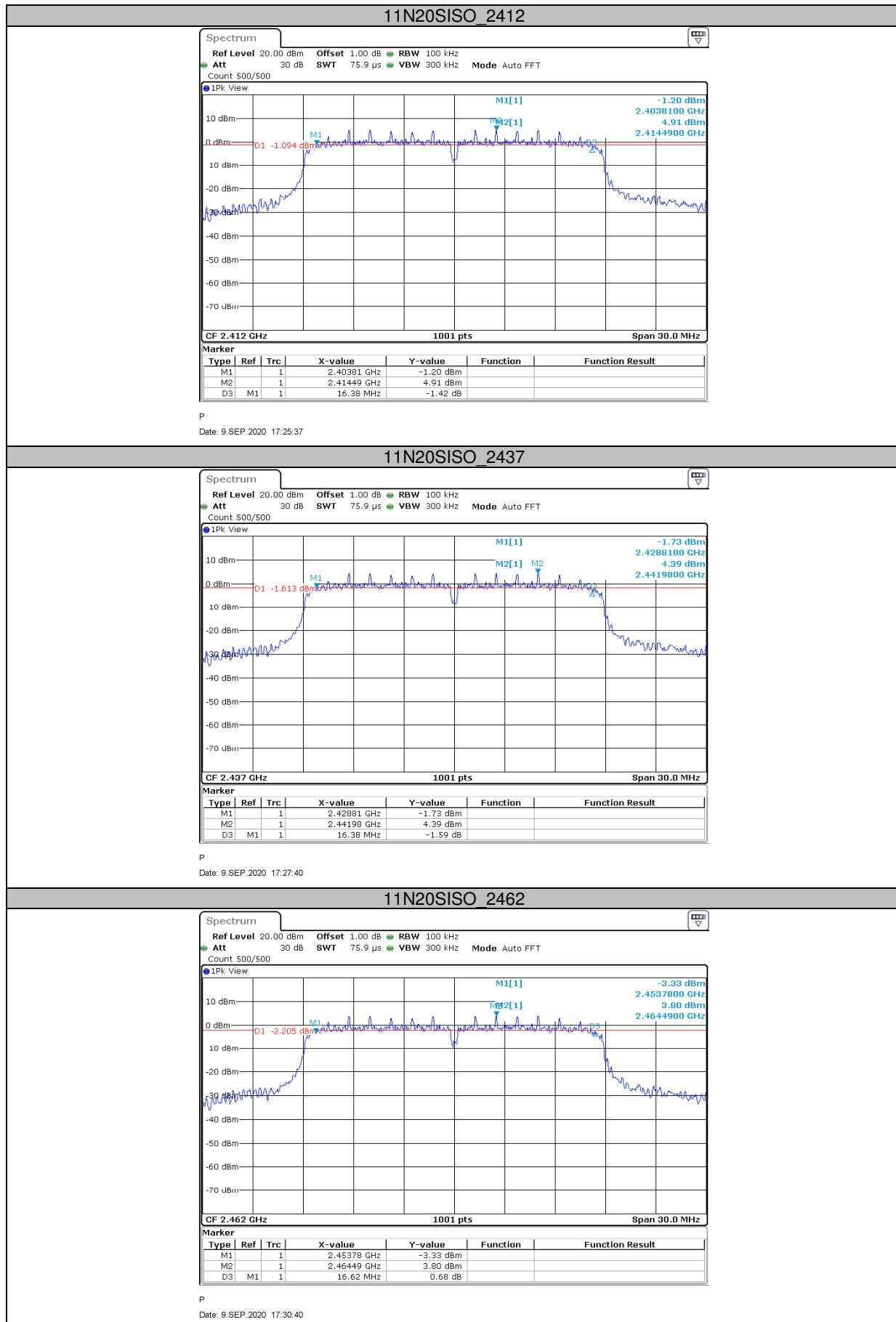
## 11B\_2437



## 11B\_2462







Applicant: Craftmade International, Inc

Date of Test: 09 September 2020

Model: WCS-100

**4.3 Maximum Power Density Reading, FCC Rule 15.247(e):**

The Measurement Procedure PKPSD was set according to the FCC KDB 558074 D01 v05r02.

Antenna output of the EUT was coupled directly to spectrum analyzer; if an external attenuator and/or cable was used, these losses are compensated for with the analyzer OFFSET function.

Limit: The Power Density does not exceed 8dBm/3 kHz.

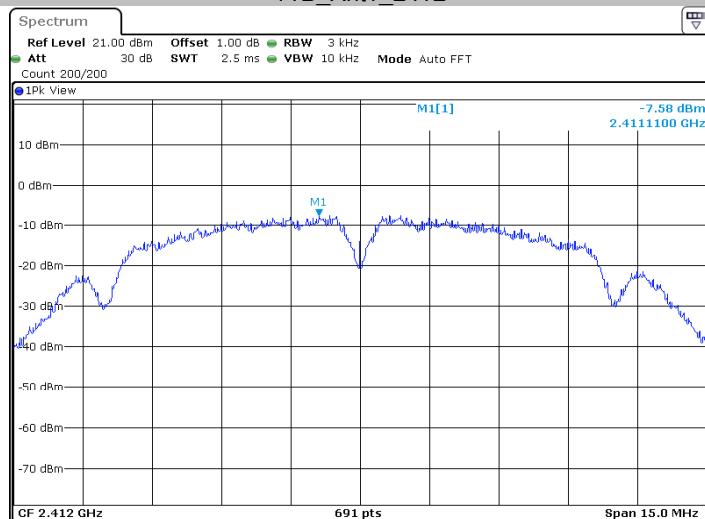
IEEE 802.11b (CCK, 1Mbps)	
Frequency (MHz)	Power Density with RBW 3KHz
2412	-7.58
2437	-7.86
2462	-8.48

IEEE 802.11g (16QAM, 6Mbps)	
Frequency (MHz)	Power Density with RBW 3KHz
2412	-10.13
2437	-10.36
2462	-10.89

IEEE 802.11n-HT20 (64QAM, 6Mbps)	
Frequency (MHz)	Power Density with RBW 3KHz
2412	-10.29
2437	-10.58
2462	-11.14

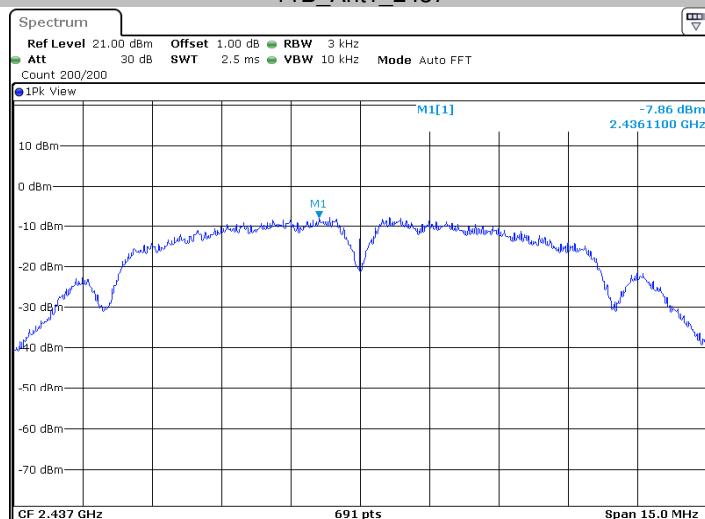
The test plots are attached as below.

### 11B\_Ant1\_2412



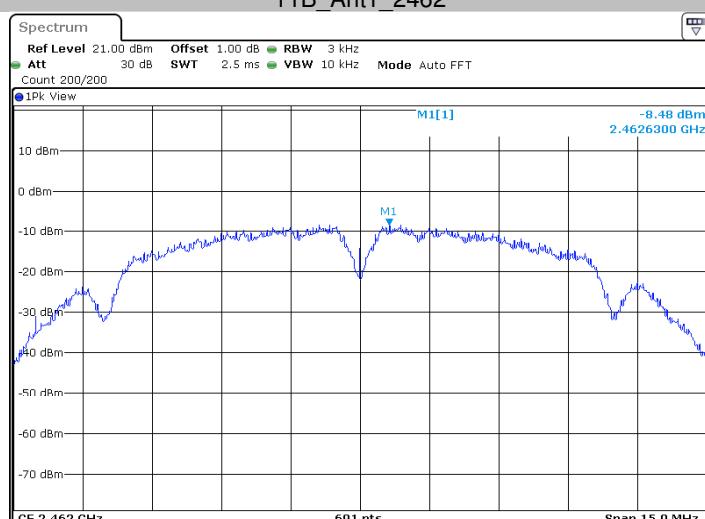
P  
 Date: 9 SEP.2020 17:13:49

### 11B\_Ant1\_2437



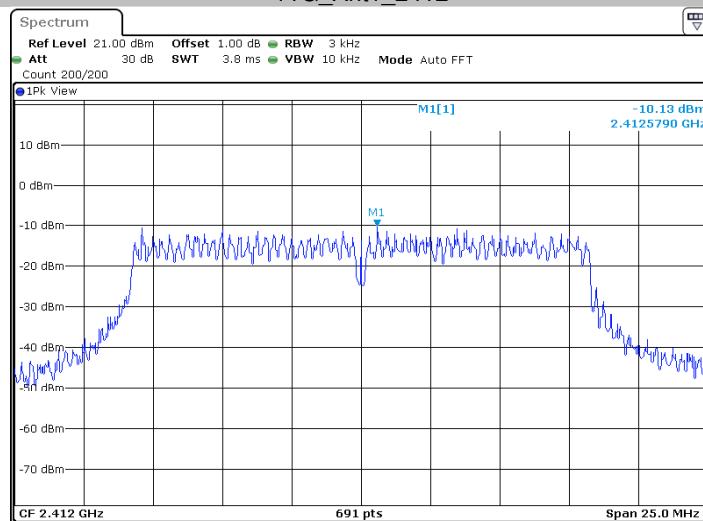
P  
 Date: 9 SEP.2020 17:16:19

### 11B\_Ant1\_2462



P  
 Date: 9 SEP.2020 17:18:04

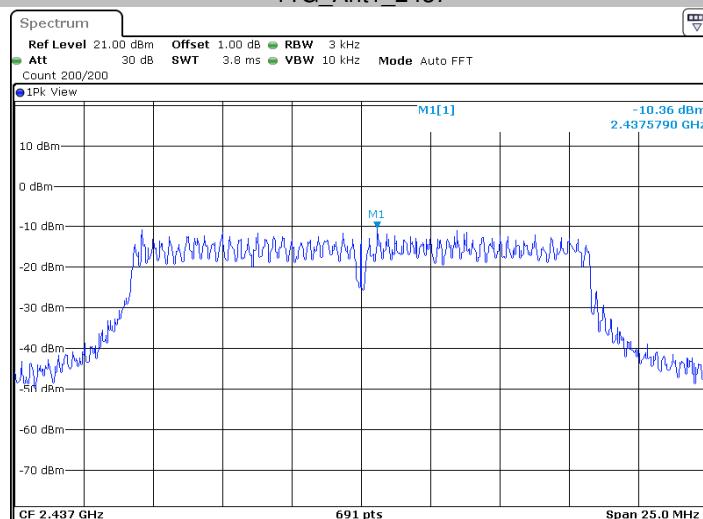
### 11G\_Ant1\_2412



P

Date: 9.SEP.2020 17:20:24

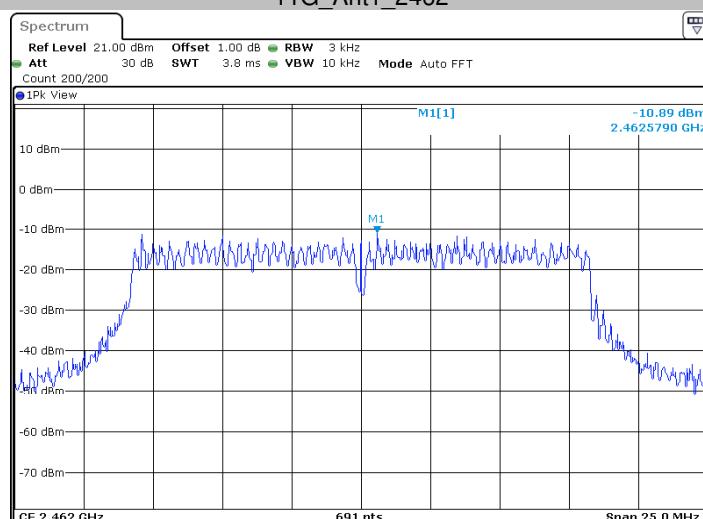
### 11G\_Ant1\_2437



P

Date: 9.SEP.2020 17:22:26

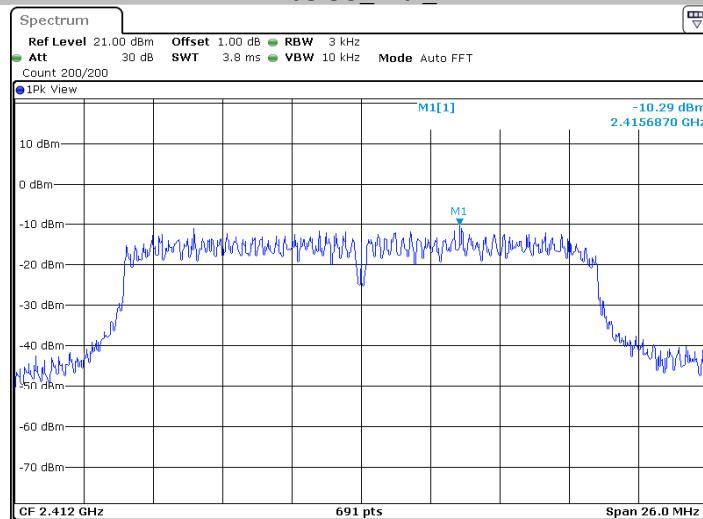
### 11G\_Ant1\_2462



P

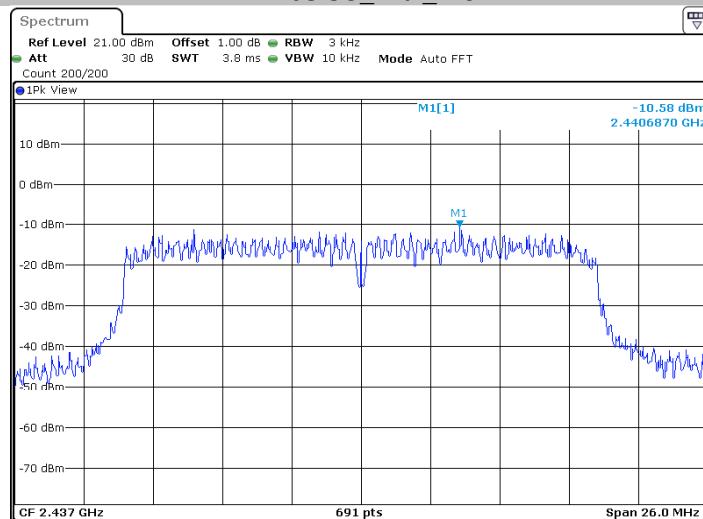
Date: 9.SEP.2020 17:24:01

### 11N20SISO\_Ant1\_2412



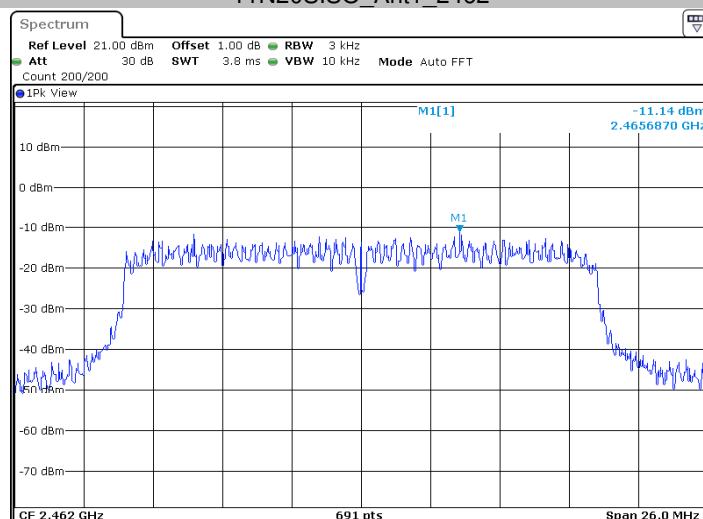
P  
Date: 9 SEP. 2020 17:26:15

### 11N20SISO\_Ant1\_2437



P  
Date: 9 SEP. 2020 17:29:14

### 11N20SISO\_Ant1\_2462



P  
Date: 9 SEP. 2020 17:31:12

Applicant: Craftmade International, Inc

Date of Test: 09 September 2020

Model: WCS-100

#### 4.4 Out of Band Conducted Emissions, FCC Rule 15.247(d)

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. The Measurement Procedure was set according to the FCC KDB 558074 D01 v05r02.

All other types of emissions from the EUT shall meet the general limits for radiated frequencies outside the passband.

Refer to the attached test plots for out of band conducted emissions data with rate of 1Mbps for 802.11b and 6Mbps for 802.11g and 6Mbps for 802.11n-HT20.

The test plots showed all spurious emission up to the tenth harmonic were measured and they were found to be at least 20 dB below the highest level of the desired power in the passband.

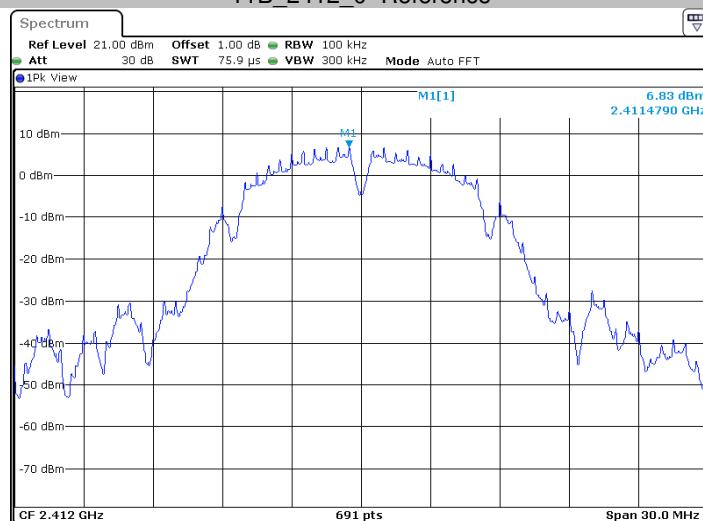
The test plots are attached as below.

## TEST REPORT

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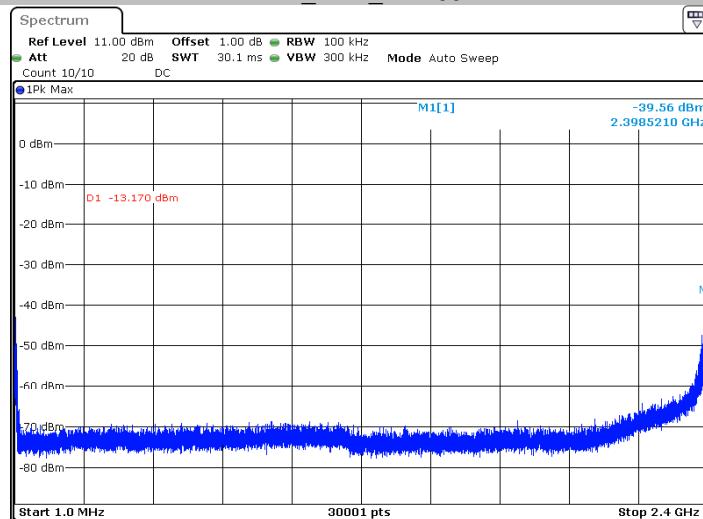
### 802.11b Channel 01 (2412MHz) Reference Level: 6.83dBm

11B\_2412\_0~Reference



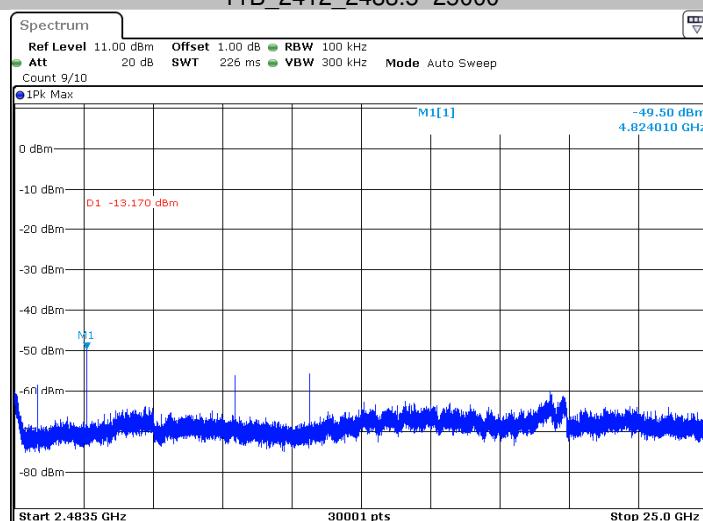
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Date: 9 SEP.2020 17:14:26

11B\_2412\_1~2400

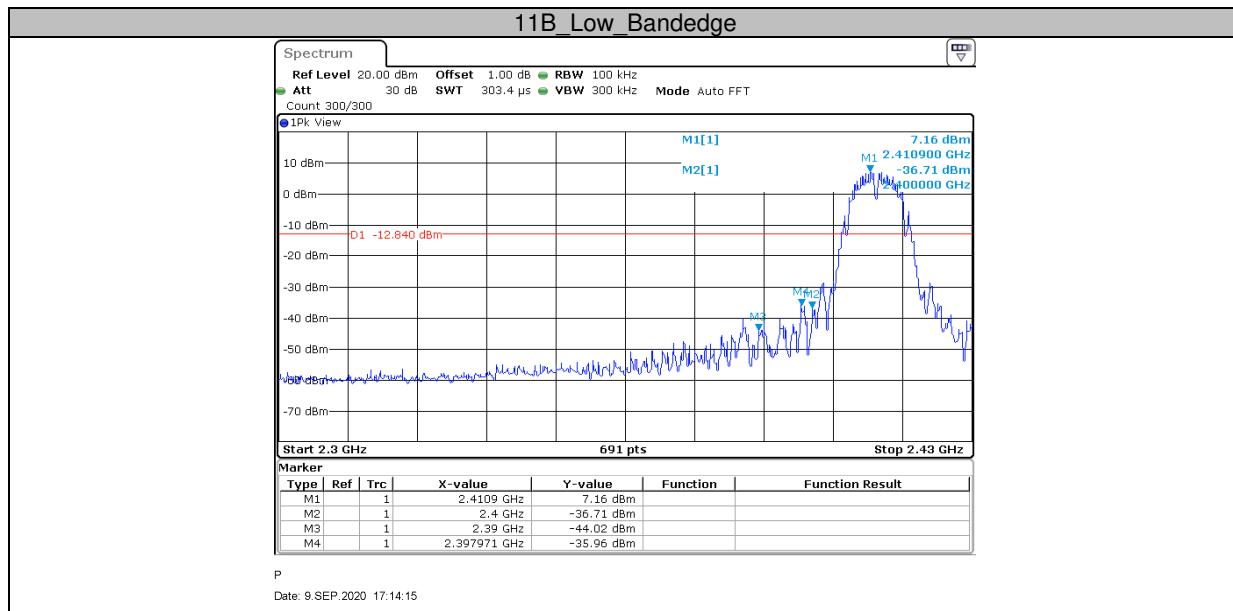


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11B\_2412\_2483.5~25000



P  
Date: 9 SEP.2020 17:14:38

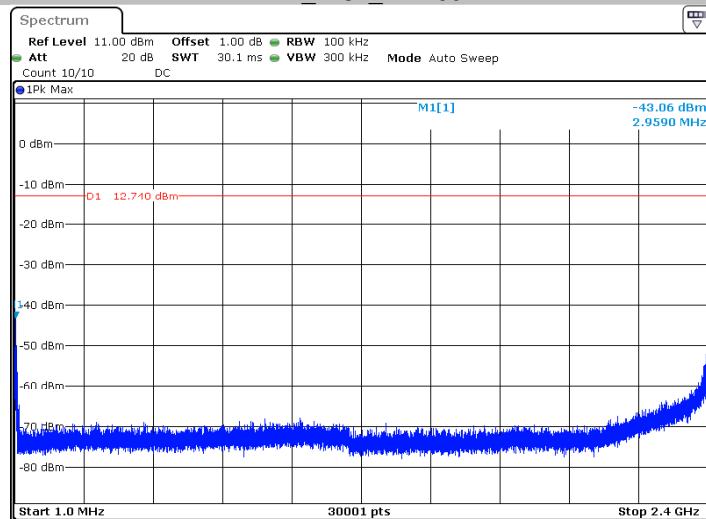


## Channel 06 (2437MHz) Reference Level: 7.26dBm

## 11B\_2437\_0~Reference



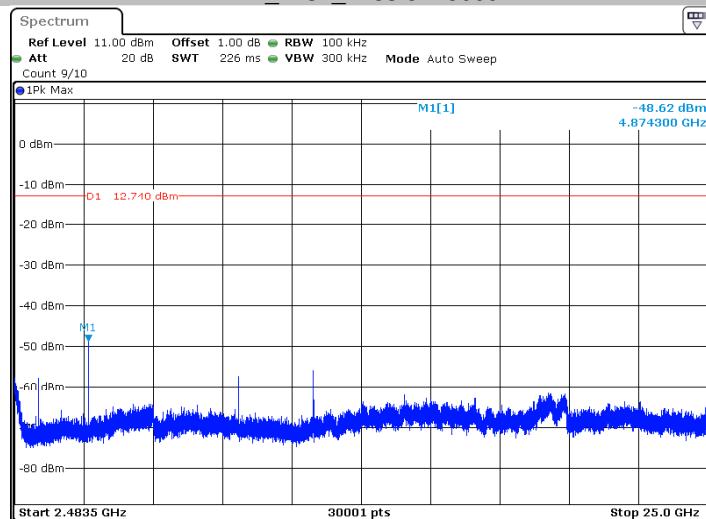
## 11B\_2437\_1~2400



P

Date: 9 SEP. 2020 17:16:37

## 11B\_2437\_2483.5~25000



P

Date: 9 SEP. 2020 17:16:44

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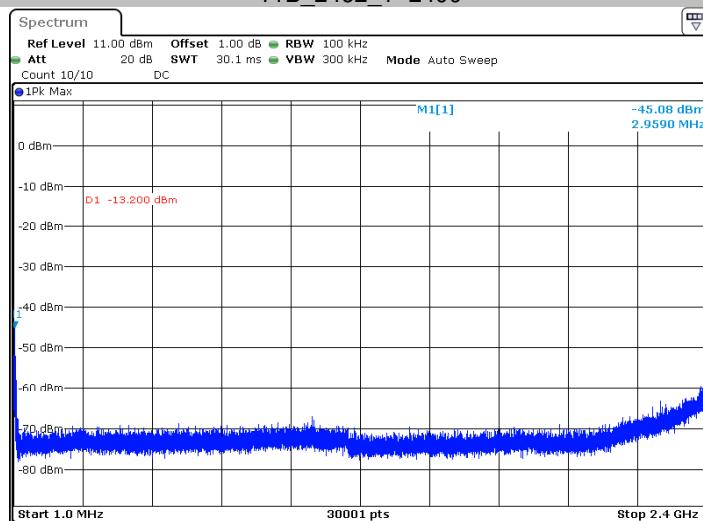
### Channel 11 (2462MHz) Reference Level: 6.80dBm

11B\_2462\_0~Reference



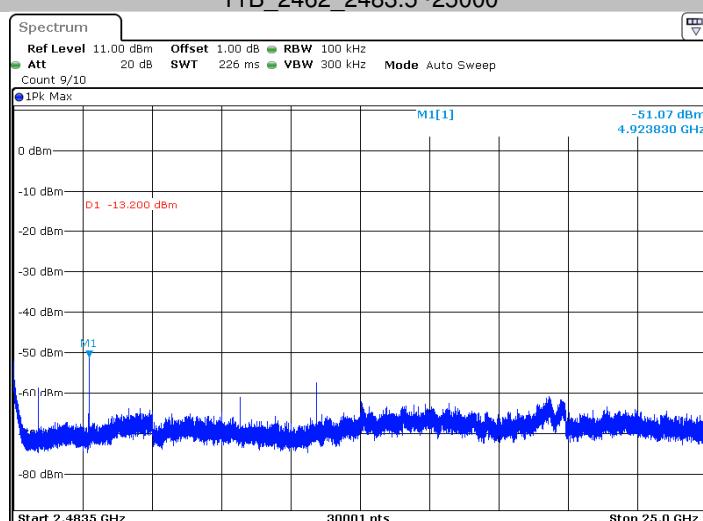
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11B\_2462\_1~2400

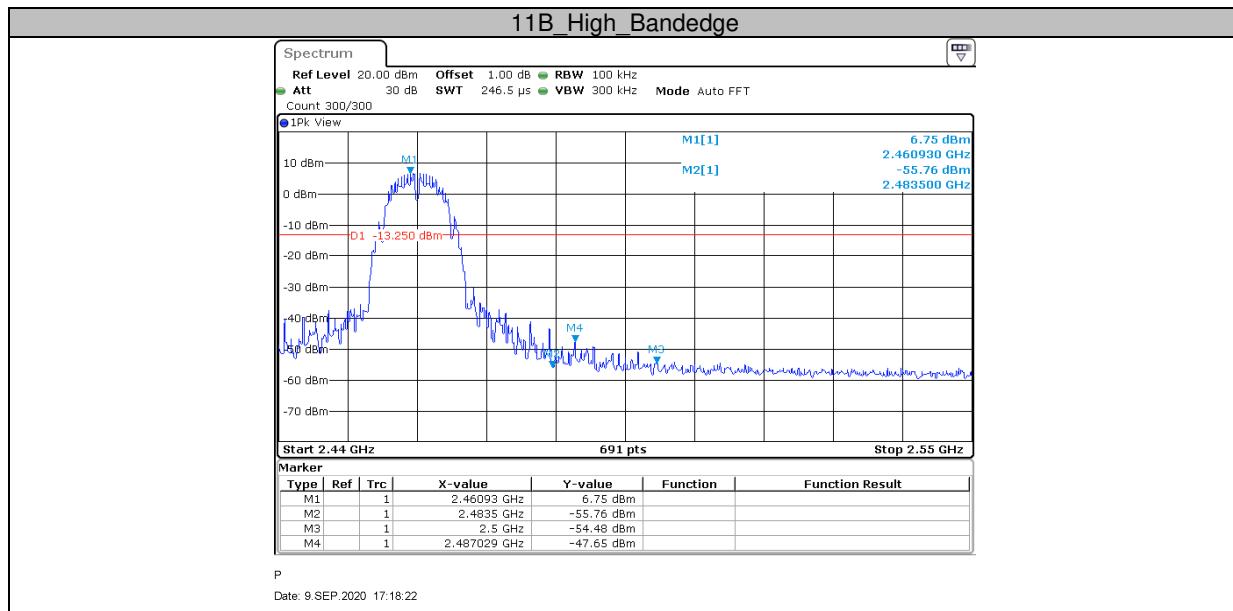


P  
 Date: 9 SEP.2020 17:18:39

11B\_2462\_2483.5~25000

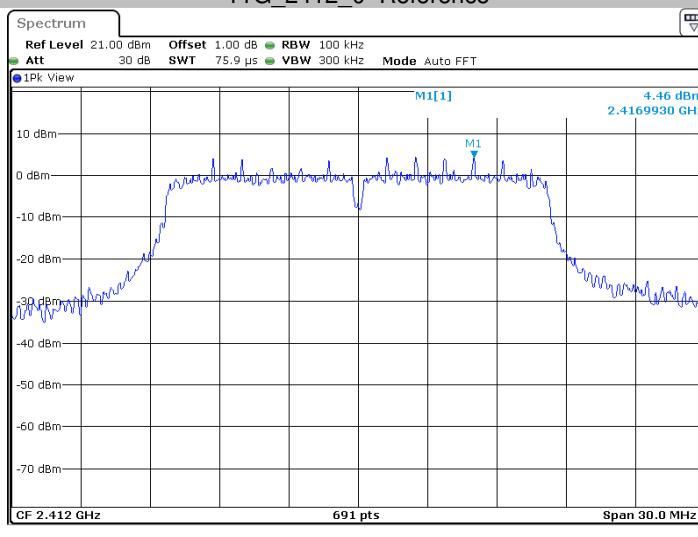


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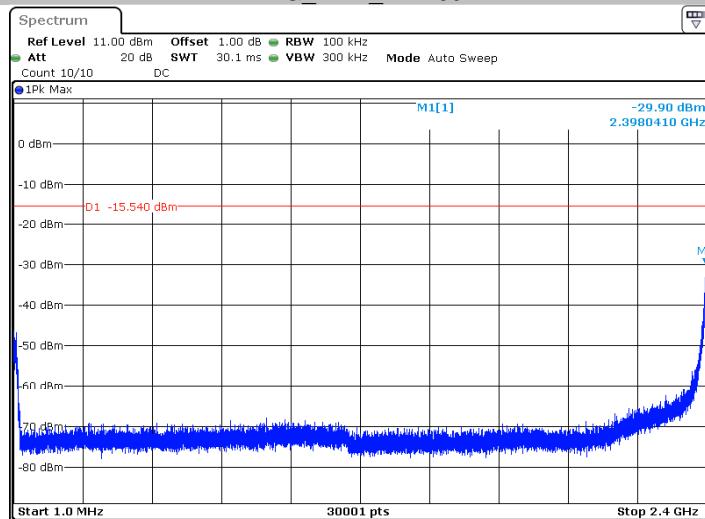


**802.11g Channel 01 (2412MHz) Reference Level: 4.46dBm**

**11G\_2412\_0~Reference**



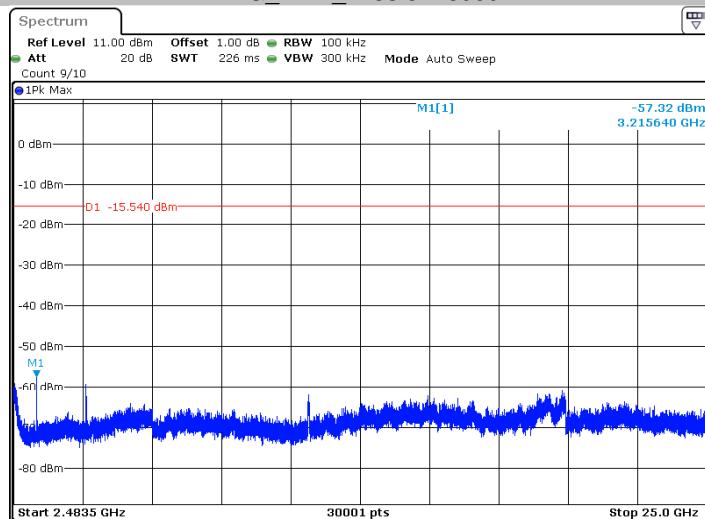
## 11G\_2412\_1~2400



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Date: 9 SEP. 2020 17:21:16

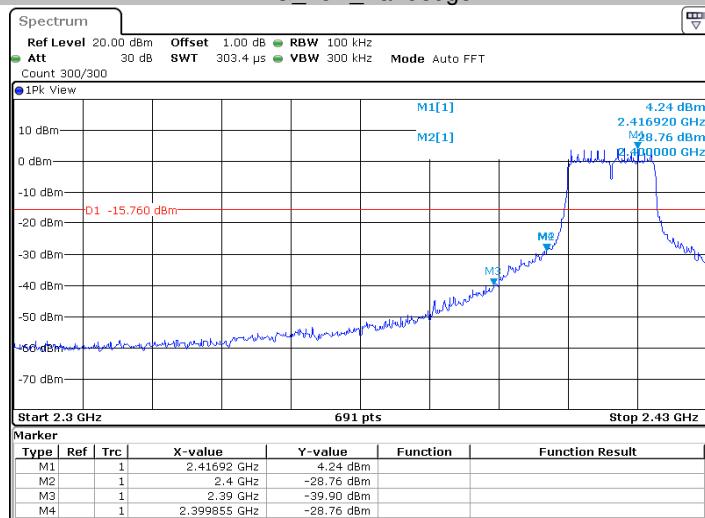
## 11G\_2412\_2483.5~25000



P

Date: 9 SEP. 2020 17:21:23

## 11G\_Low\_Bandedge



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1	1		2.41692 GHz	4.24 dBm		
M2	1		2.4 GHz	-28.76 dBm		
M3	1		2.39 GHz	-39.90 dBm		
M4	1		2.399855 GHz	-28.76 dBm		

P

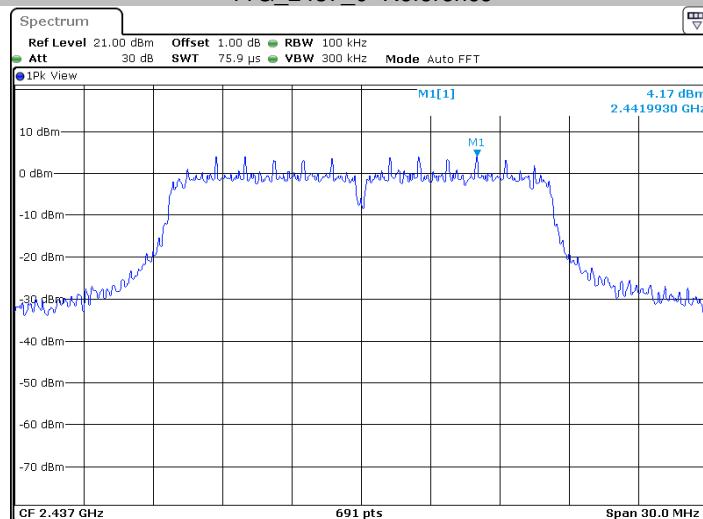
Date: 9 SEP. 2020 17:20:42

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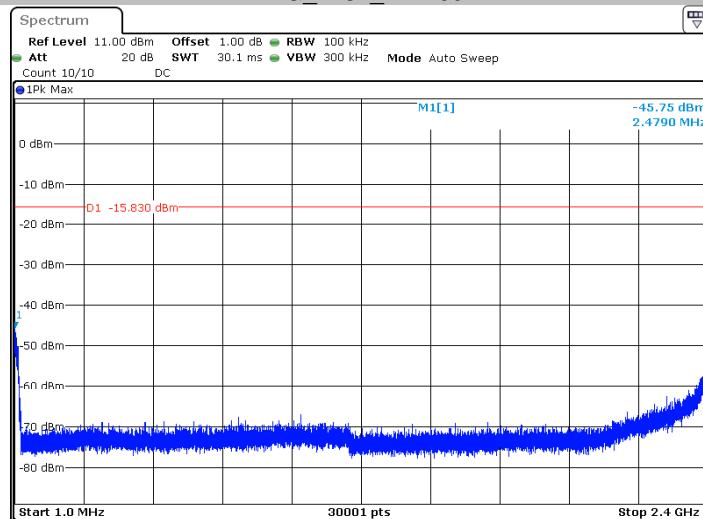
### Channel 06 (2437MHz) Reference Level: 4.17dBm

11G\_2437\_0~Reference



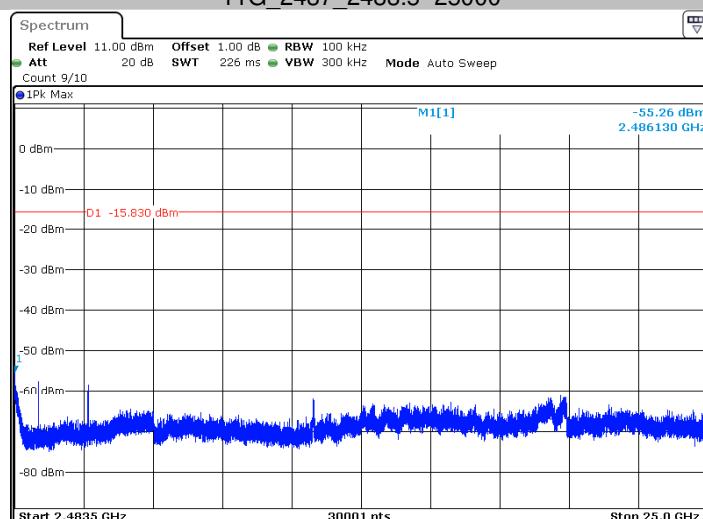
P  
Date: 9 SEP. 2020 17:22:37

11G\_2437\_1~2400



P  
Date: 9 SEP. 2020 17:22:42

11G\_2437\_2483.5~25000



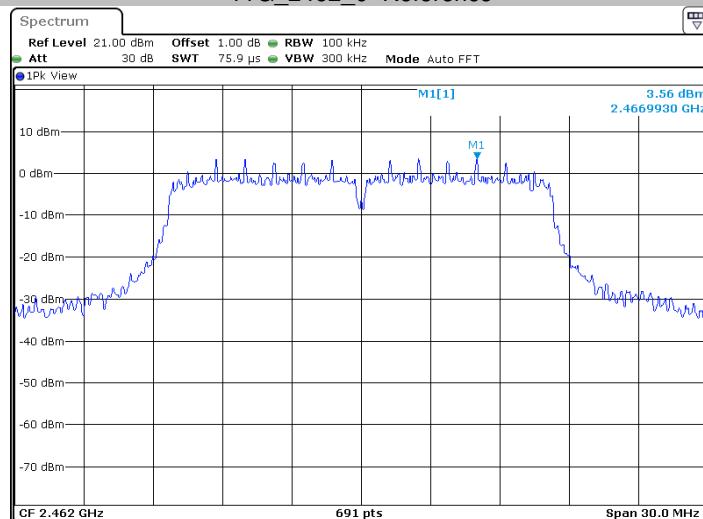
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Date: 9 SEP. 2020 17:22:49

## TEST REPORT

Intertek Report No.: 200819022SZN-001

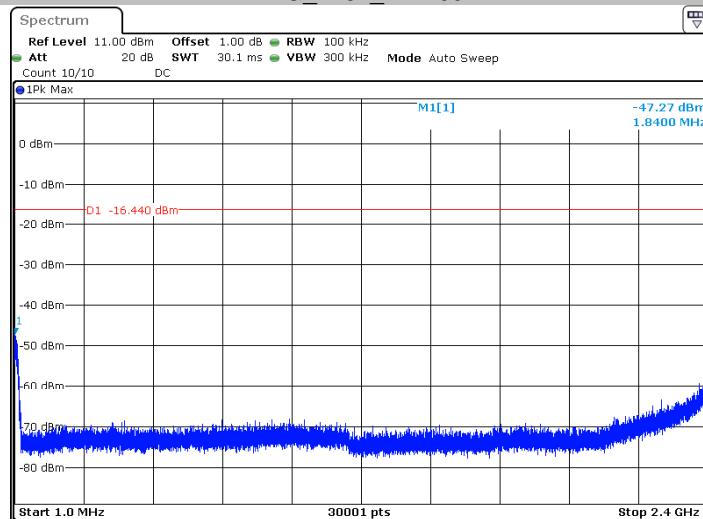
### Channel 11 (2462MHz) Reference Level: 3.56dBm

11G\_2462\_0~Reference



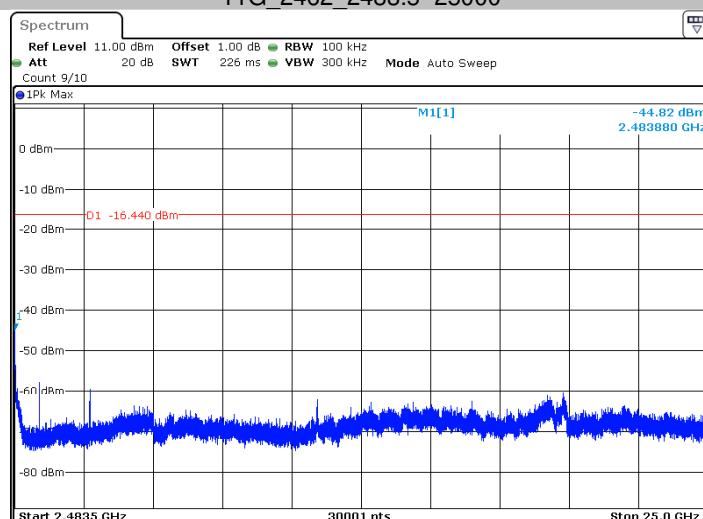
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Date: 9 SEP. 2020 17:24:29

11G\_2462\_1~2400

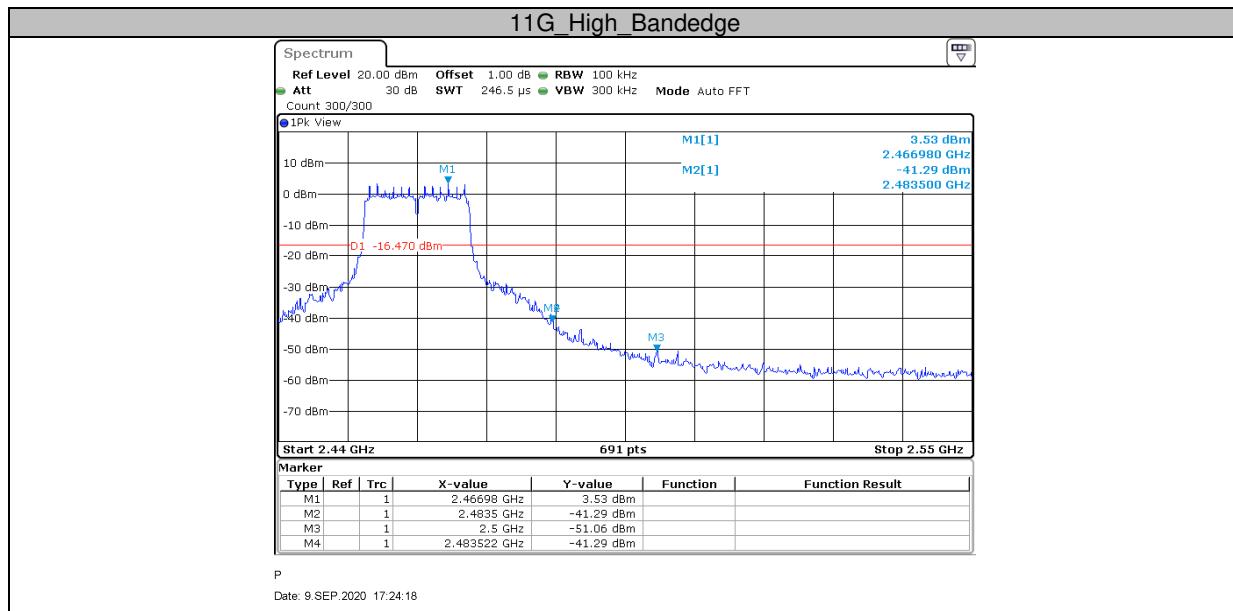


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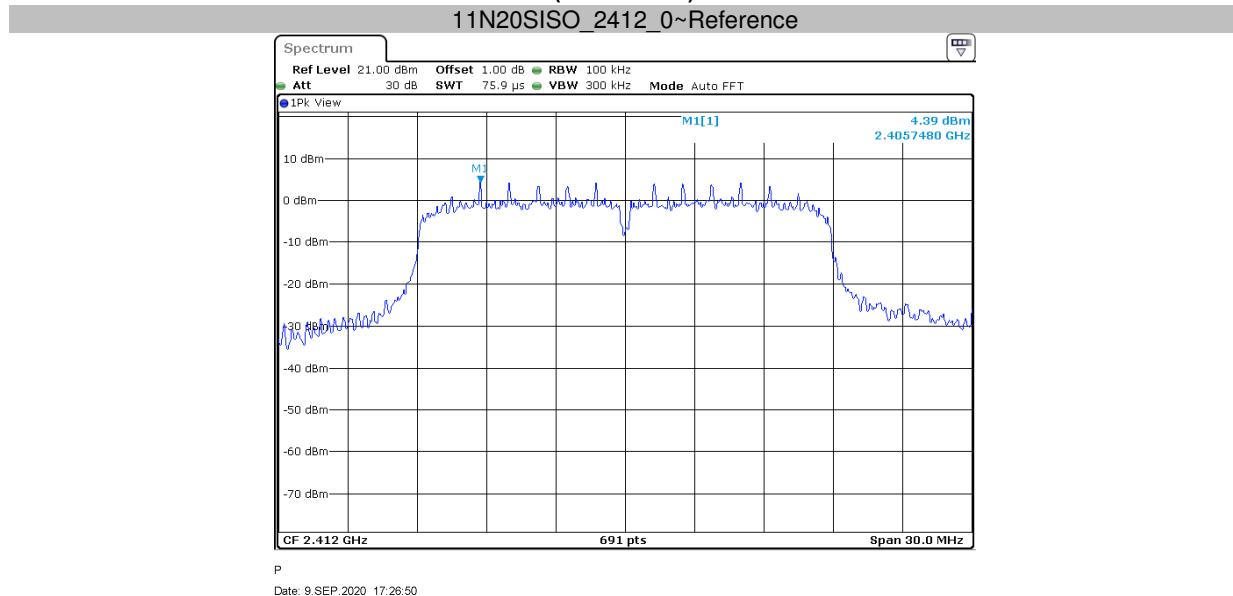
11G\_2462\_2483.5~25000



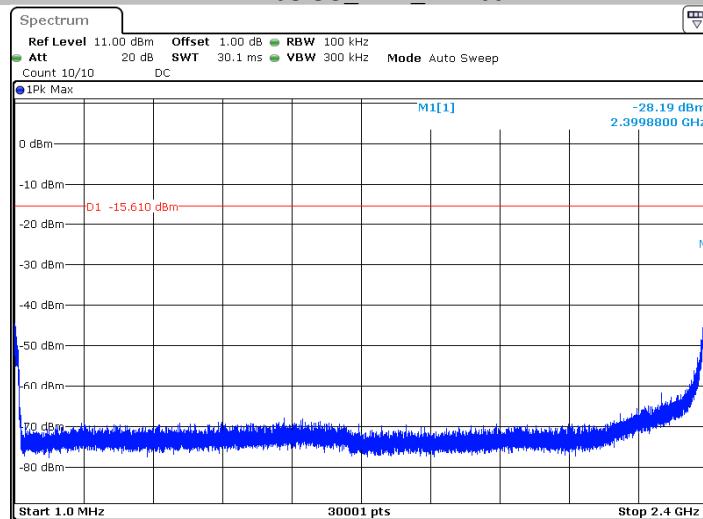
P  
Date: 9 SEP. 2020 17:24:41



**802.11n-HT20 Channel 01 (2412MHz) Reference Level: 4.39dBm**



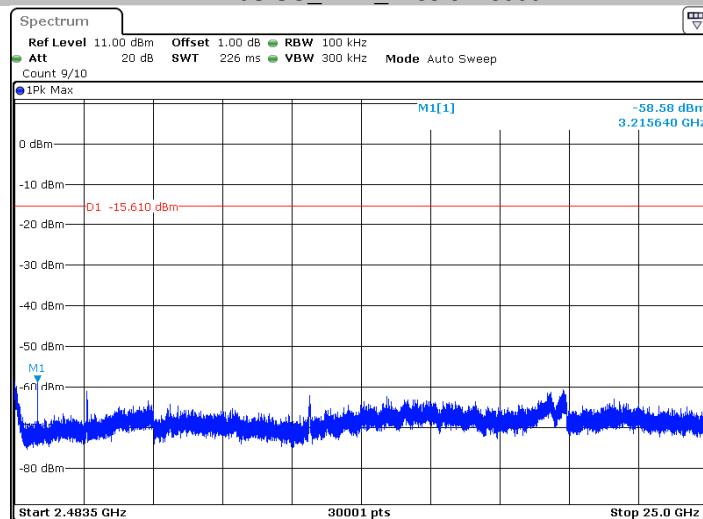
### 11N20SISO\_2412\_1~2400



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Date: 9 SEP. 2020 17:26:55

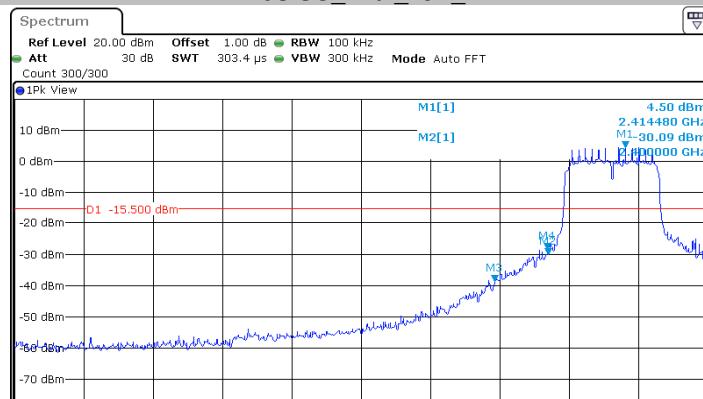
### 11N20SISO\_2412\_2483.5~25000



P

Date: 9 SEP. 2020 17:27:03

### 11N20SISO\_Ant1\_Low\_2412



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1	1		2.41448 GHz	4.50 dBm		
M2	1		2.4 GHz	-30.09 dBm		
M3	1		2.39 GHz	-38.67 dBm		
M4	1		2.399855 GHz	-28.44 dBm		

P

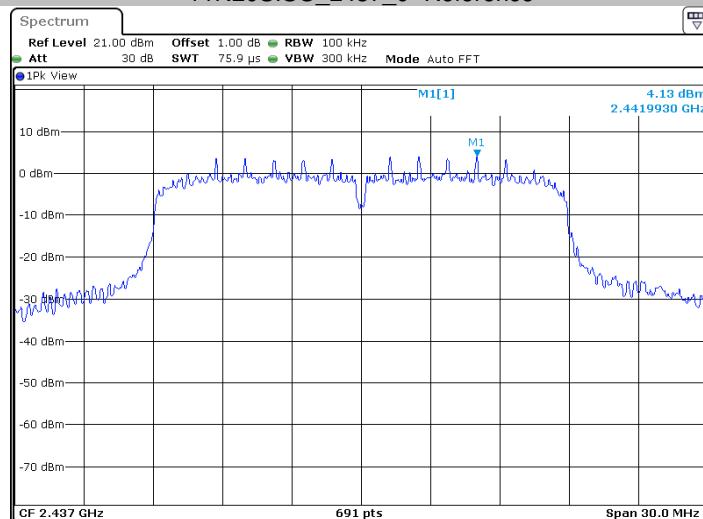
Date: 9 SEP. 2020 17:26:38

## TEST REPORT

Intertek Report No.: 200819022SZN-001

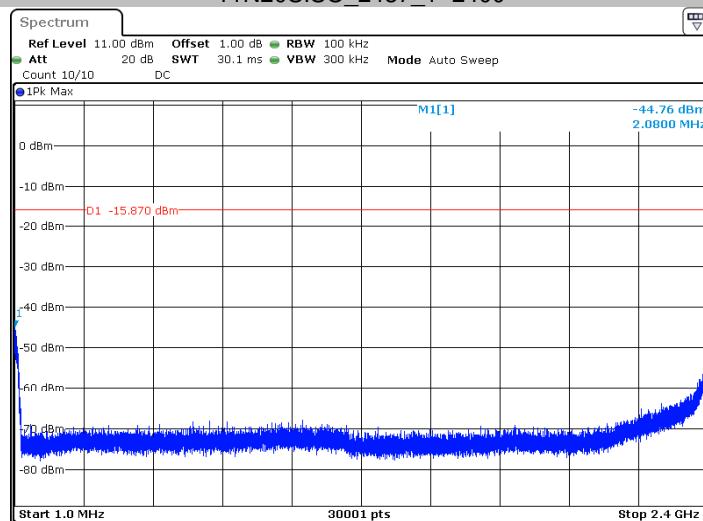
Channel 06 (2437MHz) Reference Level: 4.13dBm

11N20SISO\_2437\_0~Reference



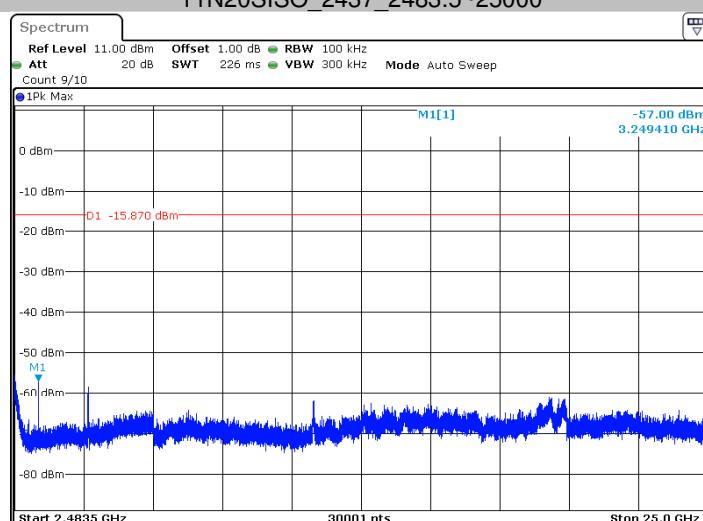
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Date: 9 SEP. 2020 17:29:27

11N20SISO\_2437\_1~2400



P  
Date: 9 SEP. 2020 17:29:32

11N20SISO\_2437\_2483.5~25000



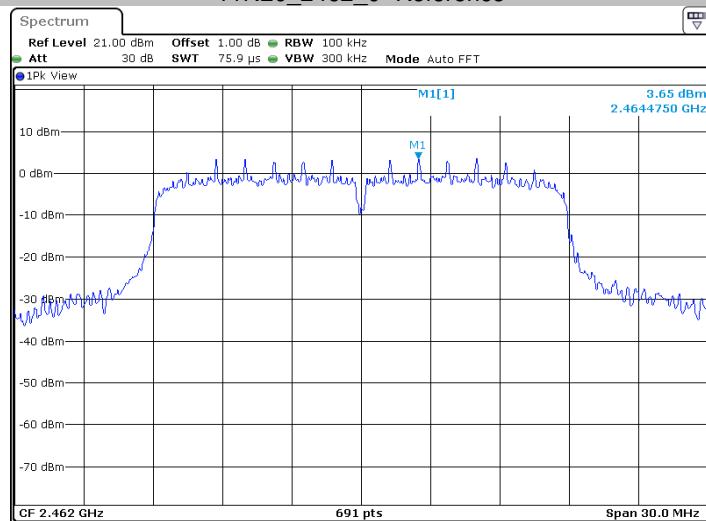
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Date: 9 SEP. 2020 17:29:39

## TEST REPORT

Intertek Report No.: 200819022SZN-001

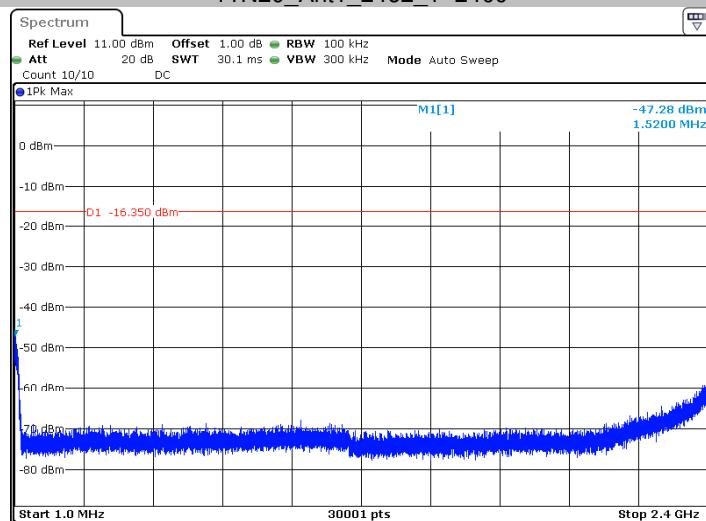
### Channel 11 (2462MHz) Reference Level: 3.65dBm

11N20\_2462\_0~Reference



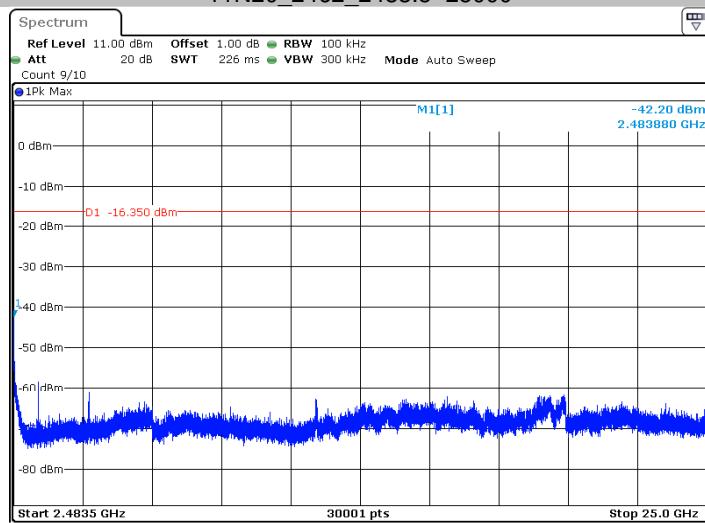
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 Date: 9 SEP. 2020 17:31:43

11N20\_Ant1\_2462\_1~2400



P  
 Date: 9 SEP. 2020 17:31:48

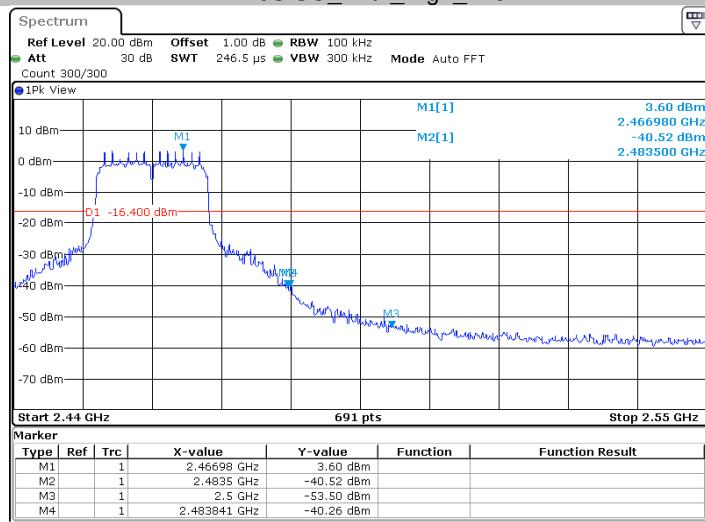
## 11N20\_2462\_2483.5~25000



P

Date: 9 SEP. 2020 17:31:55

## 11N20SISO\_Ant1\_High\_2462



P

Date: 9 SEP. 2020 17:31:32

## Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1	1		2.46698 GHz	3.60 dBm		
M2	1		2.4835 GHz	-40.52 dBm		
M3	1		2.5 GHz	-53.50 dBm		
M4	1		2.483841 GHz	-40.26 dBm		

Applicant: Craftmade International, Inc

Date of Test: 09 September 2020

Model: WCS-100

4.5 Out of Band Radiated Emissions (for emissions in 4.4 above that are less than 20dB below carrier), FCC Rule 15.247(d):

For out of band emissions that are close to or that exceed the 20dB attenuation requirement described in the specification, radiated measurements were performed at a 3m separation distance to determine whether these emissions complied with the general radiated emission requirement.

- Not required, since all emissions are more than 20dB below fundamental
- See attached data sheet

Applicant: Craftmade International, Inc

Date of Test: 09 September 2020

Model: WCS-100

#### 4.6 Transmitter Radiated Emissions in Restricted Bands, FCC Rule 15.35(b) (c):

Data is included of the worst-case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included. All measurements were performed with peak detection unless otherwise specified.

The data on the following pages list the significant emission frequencies, the limit and the margin of compliance.

Applicant: Craftmade International, Inc

Date of Test: 09 September 2020

Model: WCS-100

#### 4.7 Field Strength Calculation

The field strength is calculated by adding the reading on the Spectrum Analyzer to the factors associated with preamplifiers (if any), antennas, cables, pulse desensitization and average factors (when specified limit is in average and measurements are made with peak detectors). A sample calculation is included below.

$$FS = RA + AF + CF - AG + PD$$

Where

FS = Field Strength in  $\text{dB}\mu\text{V}/\text{m}$ RA = Receiver Amplitude (including preamplifier) in  $\text{dB}\mu\text{V}$ 

CF = Cable Attenuation Factor in dB

AF = Antenna Factor in dB

AG = Amplifier Gain in dB

PD = Pulse Desensitization in dB

In the radiated emission table which follows, the reading shown on the data table may reflect the preamplifier gain. An example of the calculations, where the reading does not reflect the preamplifier gain, follows:

$$FS = RA + AF + CF - AG + PD$$

Example

Assume a receiver reading of 62.0  $\text{dB}\mu\text{V}$  is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted. The pulse desensitization factor of the spectrum analyzer was 0 dB. The net field strength for comparison to the appropriate emission limit is 42  $\text{dB}\mu\text{V}/\text{m}$ . This value in  $\text{dB}\mu\text{V}/\text{m}$  was converted to its corresponding level in  $\mu\text{V}/\text{m}$ .

$$RA = 62.0 \text{ dB}\mu\text{V}$$

$$AF = 7.4 \text{ dB}$$

$$CF = 1.6 \text{ dB}$$

$$AG = 29.0 \text{ dB}$$

$$PD = 0 \text{ dB}$$

$$FS = 62 + 7.4 + 1.6 - 29 + 0 = 42 \text{ dB}\mu\text{V}/\text{m}$$

Level in  $\text{mV}/\text{m}$  = Common Antilogarithm  $[(42 \text{ dB}\mu\text{V}/\text{m})/20] = 125.9 \mu\text{V}/\text{m}$

Applicant: Craftmade International, Inc

Date of Test: 09 September 2020

Model: WCS-100

#### 4.8 Radiated Spurious Emission

Worst Case Radiated Spurious Emission  
at 4924.0MHz  
is passed by 4.5dB margin.

For the electronic filing, the worst case radiated emission configuration photographs are saved with filename: radiated photos.pdf.

Applicant: Craftmade International, Inc

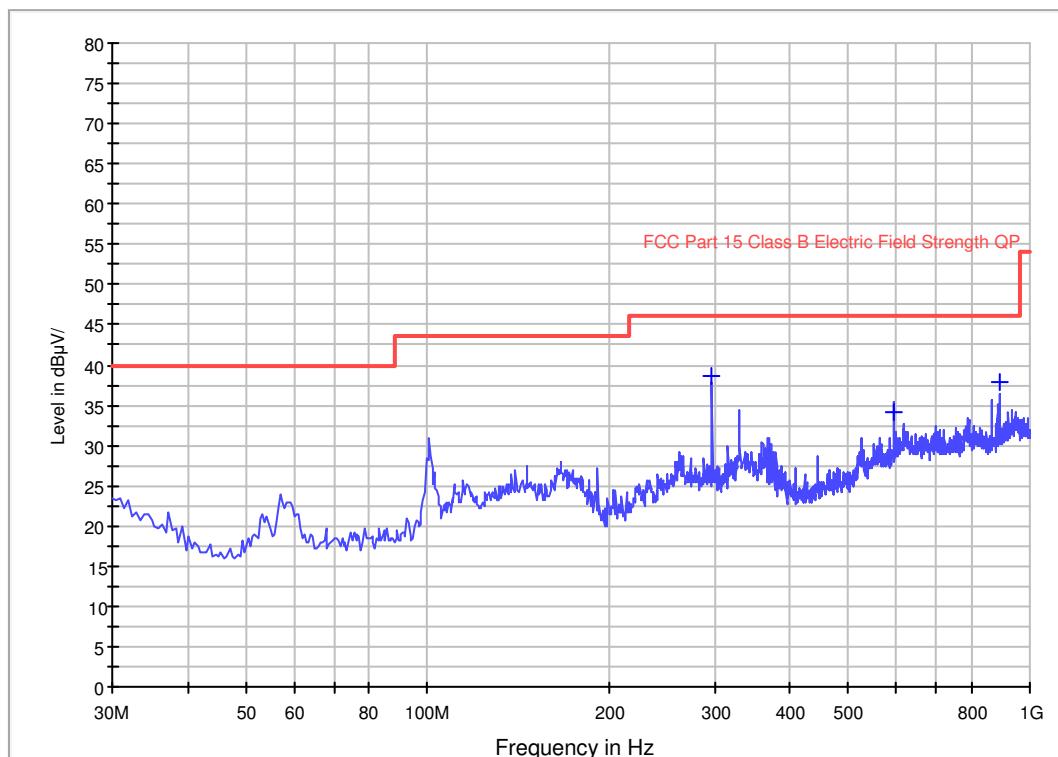
Date of Test: 09 September 2020

Worst Case Operating Mode:

Model: WCS-100

Transmitting (802.11b-Channel 01)

ANT Polarity: Horizontal

**FCC Part 15**

Frequency (MHz)	QuasiPeak (dB $\mu$ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dB $\mu$ V/m)
297.000000	38.6	1000.0	120.000	0.0	H	15.4	7.4	46.0
593.570000	34.1	1000.0	120.000	0.0	H	22.2	11.9	46.0
890.390000	37.9	1000.0	120.000	0.0	H	26.1	8.1	46.0

**Remark:**

1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
2. QuasiPeak (dB $\mu$ V/m) = Corr. (dB/m) + Read Level (dB $\mu$ V)
3. Margin (dB) = Limit Line(dB $\mu$ V/m) – Level (dB $\mu$ V/m)

Applicant: Craftmade International, Inc

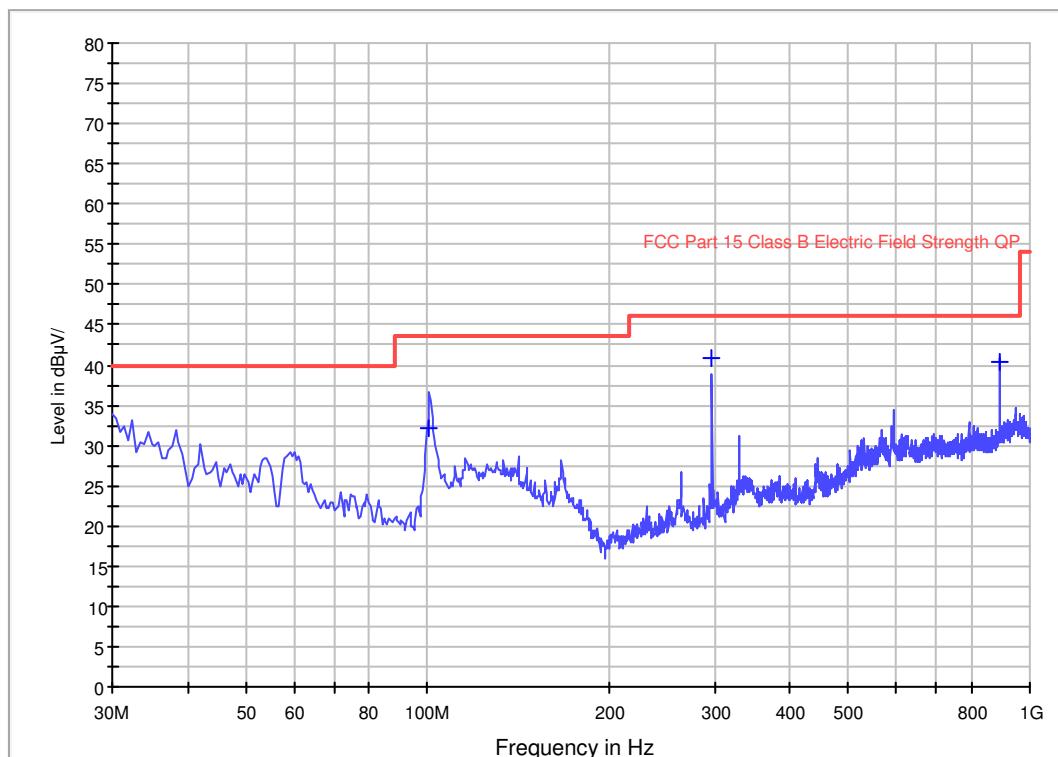
Date of Test: 09 September 2020

Worst Case Operating Mode:

Model: WCS-100

Transmitting (802.11b-Channel 01)

ANT Polarity: Vertical

**FCC Part 15**

Frequency (MHz)	QuasiPeak (dB $\mu$ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dB $\mu$ V/m)
100.810000	32.1	1000.0	120.000	0.0	V	9.8	11.4	43.5
296.750000	40.8	1000.0	120.000	0.0	V	15.4	5.2	46.0
890.108000	40.5	1000.0	120.000	0.0	V	26.1	5.5	46.0

**Remark:**

1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
2. QuasiPeak (dB $\mu$ V/m) = Corr. (dB/m) + Read Level (dB $\mu$ V)
3. Margin (dB) = Limit Line(dB $\mu$ V/m) – Level (dB $\mu$ V/m)

Applicant: Craftmade International, Inc

Date of Test: 09 September 2020

Worst Case Operating Mode:

Model: WCS-100

Transmitting (802.11b-Channel 01)

**Radiated Emissions (above 1GHz)**

Polarization	Frequency (MHz)	Reading (dB $\mu$ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dB $\mu$ V/m)	Peak Limit at 3m (dB $\mu$ V/m)	Margin (dB)
Horizontal	*4824.000	64.5	36.8	33.5	61.2	74.0	-12.8
Horizontal	*2390.000	65.7	36.4	29.1	58.4	74.0	-15.6

Polarization	Frequency (MHz)	Reading (dB $\mu$ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dB $\mu$ V/m)	Average Limit at 3m (dB $\mu$ V/m)	Margin (dB)
Horizontal	*4824.000	44.4	36.8	33.5	41.1	54.0	-12.9
Horizontal	*2390.000	46.8	36.4	29.1	39.5	54.0	-14.5

## NOTES:

1. Peak detector is used, RBW=1MHz/VBW=3MHz for peak value and RBW=1MHz/VBW=10Hz for average value.
2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.
3. Negative value in the margin column shows emission below limit.
4. Horn antenna used for the emission over 1000MHz.

\* Emission within the restricted band meets the requirement of section 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000 MHz and average limit for frequencies over 1000 MHz. The radio frequency emissions above 1GHz also meet corresponding 20dB permitted peak limit with a peak detector function.

Applicant: Craftmade International, Inc

Date of Test: 09 September 2020

Worst Case Operating Mode:

Model: WCS-100

Transmitting (802.11b-Channel 06)

**Radiated Emissions (above 1GHz)**

Polarization	Frequency (MHz)	Reading (dB $\mu$ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dB $\mu$ V/m)	Peak Limit at 3m (dB $\mu$ V/m)	Margin (dB)
Horizontal	*4874.000	64.9	36.7	33.4	61.6	74.0	-12.4
Horizontal	*7311.000	61.1	36.6	35.8	60.3	74.0	-13.7

Polarization	Frequency (MHz)	Reading (dB $\mu$ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dB $\mu$ V/m)	Average Limit at 3m (dB $\mu$ V/m)	Margin (dB)
Horizontal	*4874.000	46.4	36.7	33.4	43.1	54.0	-10.9
Horizontal	*7311.000	41.0	36.6	35.8	40.2	54.0	-13.8

## NOTES:

1. Peak detector is used, RBW=1MHz/VBW=3MHz for peak value and RBW=1MHz / VBW=10Hz for average value.
2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.
3. Negative value in the margin column shows emission below limit.
4. Horn antenna used for the emission over 1000MHz.

\* Emission within the restricted band meets the requirement of section 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000 MHz and average limit for frequencies over 1000 MHz. The radio frequency emissions above 1GHz also meet corresponding 20dB permitted peak limit with a peak detector function.

Applicant: Craftmade International, Inc

Date of Test: 09 September 2020

Worst Case Operating Mode:

Model: WCS-100

Transmitting (802.11b-Channel 11)

**Radiated Emissions (above 1GHz)**

Polarization	Frequency (MHz)	Reading (dB $\mu$ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dB $\mu$ V/m)	Peak Limit at 3m (dB $\mu$ V/m)	Margin (dB)
Horizontal	*4924.000	64.2	36.8	33.3	60.7	74.0	-13.3
Horizontal	*7386.000	65.4	36.5	29.3	58.2	74.0	-15.8

Polarization	Frequency (MHz)	Reading (dB $\mu$ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dB $\mu$ V/m)	Average Limit at 3m (dB $\mu$ V/m)	Margin (dB)
Horizontal	*4924.000	53.0	36.8	33.3	49.5	54.0	-4.5
Horizontal	*7386.000	51.3	36.5	29.3	44.1	54.0	-9.9

## NOTES:

1. Peak detector is used, RBW=1MHz/VBW=3MHz for peak value and RBW=1MHz / VBW=10Hz for average value.
2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.
3. Negative value in the margin column shows emission below limit.
4. Horn antenna used for the emission over 1000MHz.
  - \* Emission within the restricted band meets the requirement of section 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000 MHz and average limit for frequencies over 1000 MHz. The radio frequency emissions above 1GHz also meet corresponding 20dB permitted peak limit with a peak detector function.

Applicant: Craftmade International, Inc

Date of Test: 09 September 2020

Worst Case Operating Mode:

Model: WCS-100

Transmitting (802.11g-Channel 01)

**Radiated Emissions (above 1GHz)**

Polarization	Frequency (MHz)	Reading (dB $\mu$ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dB $\mu$ V/m)	Peak Limit at 3m (dB $\mu$ V/m)	Margin (dB)
Horizontal	*4824.000	63.5	36.8	33.5	60.2	74.0	-13.8
Horizontal	*2390.000	65.7	36.4	29.1	58.4	74.0	-15.6

Polarization	Frequency (MHz)	Reading (dB $\mu$ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dB $\mu$ V/m)	Average Limit at 3m (dB $\mu$ V/m)	Margin (dB)
Horizontal	*4824.000	44.6	36.8	33.5	41.3	54.0	-12.7
Horizontal	*2390.000	46.3	36.4	29.1	39.0	54.0	-15.0

## NOTES:

1. Peak detector is used, RBW=1MHz/VBW=3MHz for peak value and RBW=1MHz/VBW=10Hz for average value.
2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.
3. Negative value in the margin column shows emission below limit.
4. Horn antenna used for the emission over 1000MHz.

\* Emission within the restricted band meets the requirement of section 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000 MHz and average limit for frequencies over 1000 MHz. The radio frequency emissions above 1GHz also meet corresponding 20dB permitted peak limit with a peak detector function.

Applicant: Craftmade International, Inc

Date of Test: 09 September 2020

Worst Case Operating Mode:

Model: WCS-100

Transmitting (802.11g-Channel 06)

**Radiated Emissions (above 1GHz)**

Polarization	Frequency (MHz)	Reading (dB $\mu$ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dB $\mu$ V/m)	Peak Limit at 3m (dB $\mu$ V/m)	Margin (dB)
Horizontal	*4874.000	64.1	36.7	33.4	60.8	74.0	-13.2
Horizontal	*7311.000	59.0	36.6	35.8	58.2	74.0	-15.8

Polarization	Frequency (MHz)	Reading (dB $\mu$ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dB $\mu$ V/m)	Average Limit at 3m (dB $\mu$ V/m)	Margin (dB)
Horizontal	*4874.000	45.2	36.7	33.4	41.9	54.0	-12.1
Horizontal	*7311.000	42.4	36.6	35.8	41.6	54.0	-12.4

## NOTES:

1. Peak detector is used, RBW=1MHz/VBW=3MHz for peak value and RBW=1MHz / VBW=10Hz for average value.
2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.
3. Negative value in the margin column shows emission below limit.
4. Horn antenna used for the emission over 1000MHz.

\* Emission within the restricted band meets the requirement of section 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000 MHz and average limit for frequencies over 1000 MHz. The radio frequency emissions above 1GHz also meet corresponding 20dB permitted peak limit with a peak detector function.

Applicant: Craftmade International, Inc

Date of Test: 09 September 2020

Worst Case Operating Mode:

Model: WCS-100

Transmitting (802.11g-Channel 11)

**Radiated Emissions (above 1GHz)**

Polarization	Frequency (MHz)	Reading (dB $\mu$ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dB $\mu$ V/m)	Peak Limit at 3m (dB $\mu$ V/m)	Margin (dB)
Horizontal	*4924.000	64.2	36.8	33.3	60.7	74.0	-13.3
Horizontal	*7386.000	68.2	36.5	29.3	61.0	74.0	-13.0

Polarization	Frequency (MHz)	Reading (dB $\mu$ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dB $\mu$ V/m)	Average Limit at 3m (dB $\mu$ V/m)	Margin (dB)
Horizontal	*4924.000	45.4	36.8	33.3	41.9	54.0	-12.1
Horizontal	*7386.000	49.7	36.5	29.3	42.5	54.0	-11.5

## NOTES:

1. Peak detector is used, RBW=1MHz/VBW=3MHz for peak value and RBW=1MHz / VBW=10Hz for average value.
2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.
3. Negative value in the margin column shows emission below limit.
4. Horn antenna used for the emission over 1000MHz.
  - \* Emission within the restricted band meets the requirement of section 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000 MHz and average limit for frequencies over 1000 MHz. The radio frequency emissions above 1GHz also meet corresponding 20dB permitted peak limit with a peak detector function.

Applicant: Craftmade International, Inc

Date of Test: 09 September 2020

Worst Case Operating Mode:

Model: WCS-100

Transmitting (802.11n20-Channel 01)

**Radiated Emissions (above 1GHz)**

Polarization	Frequency (MHz)	Reading (dB $\mu$ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dB $\mu$ V/m)	Peak Limit at 3m (dB $\mu$ V/m)	Margin (dB)
Horizontal	*4824.000	64.8	36.8	33.5	61.5	74.0	-12.5
Horizontal	*2390.000	63.7	36.4	29.1	56.4	74.0	-17.6

Polarization	Frequency (MHz)	Reading (dB $\mu$ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dB $\mu$ V/m)	Average Limit at 3m (dB $\mu$ V/m)	Margin (dB)
Horizontal	*4824.000	45.0	36.8	33.5	41.7	54.0	-12.3
Horizontal	*2390.000	46.4	36.4	29.1	39.1	54.0	-14.9

## NOTES:

1. Peak detector is used, RBW=1MHz/VBW=3MHz for peak value and RBW=1MHz/VBW=10Hz for average value.
2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.
3. Negative value in the margin column shows emission below limit.
4. Horn antenna used for the emission over 1000MHz.

\* Emission within the restricted band meets the requirement of section 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000 MHz and average limit for frequencies over 1000 MHz. The radio frequency emissions above 1GHz also meet corresponding 20dB permitted peak limit with a peak detector function.

Applicant: Craftmade International, Inc

Date of Test: 09 September 2020

Worst Case Operating Mode:

Model: WCS-100

Transmitting (802.11n20-Channel 06)

**Radiated Emissions (above 1GHz)**

Polarization	Frequency (MHz)	Reading (dB $\mu$ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dB $\mu$ V/m)	Peak Limit at 3m (dB $\mu$ V/m)	Margin (dB)
Horizontal	*4874.000	65.0	36.7	33.4	61.7	74.0	-12.3
Horizontal	*7311.000	57.6	36.6	35.8	56.8	74.0	-17.2

Polarization	Frequency (MHz)	Reading (dB $\mu$ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dB $\mu$ V/m)	Average Limit at 3m (dB $\mu$ V/m)	Margin (dB)
Horizontal	*4874.000	44.8	36.7	33.4	41.5	54.0	-12.5
Horizontal	*7311.000	38.6	36.6	35.8	37.8	54.0	-16.2

## NOTES:

1. Peak detector is used, RBW=1MHz/VBW=3MHz for peak value and RBW=1MHz / VBW=10Hz for average value.
2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.
3. Negative value in the margin column shows emission below limit.
4. Horn antenna used for the emission over 1000MHz.

\* Emission within the restricted band meets the requirement of section 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000 MHz and average limit for frequencies over 1000 MHz. The radio frequency emissions above 1GHz also meet corresponding 20dB permitted peak limit with a peak detector function.

Applicant: Craftmade International, Inc

Date of Test: 09 September 2020

Worst Case Operating Mode:

Model: WCS-100

Transmitting (802.11n20-Channel 11)

**Radiated Emissions (above 1GHz)**

Polarization	Frequency (MHz)	Reading (dB $\mu$ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dB $\mu$ V/m)	Peak Limit at 3m (dB $\mu$ V/m)	Margin (dB)
Horizontal	*4924.000	65.3	36.8	33.3	61.8	74.0	-12.2
Horizontal	*7386.000	65.1	36.5	29.3	57.9	74.0	-16.1

Polarization	Frequency (MHz)	Reading (dB $\mu$ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dB $\mu$ V/m)	Average Limit at 3m (dB $\mu$ V/m)	Margin (dB)
Horizontal	*4924.000	45.1	36.8	33.3	41.6	54.0	-12.4
Horizontal	*7386.000	45.8	36.5	29.3	38.6	54.0	-15.4

## NOTES:

1. Peak detector is used, RBW=1MHz/VBW=3MHz for peak value and RBW=1MHz / VBW=10Hz for average value.
2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.
3. Negative value in the margin column shows emission below limit.
4. Horn antenna used for the emission over 1000MHz.
  - \* Emission within the restricted band meets the requirement of section 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000 MHz and average limit for frequencies over 1000 MHz. The radio frequency emissions above 1GHz also meet corresponding 20dB permitted peak limit with a peak detector function.

Applicant: Craftmade International, Inc

Date of Test: 09 September 2020

Model: WCS-100

#### 4.9 Conducted Emission

Worst Case Conducted Emission  
at 29.234MHz  
is passed by 21.2dB margin.

For the electronic filing, the worst case radiated emission configuration photographs are saved with filename: conducted photos.pdf.

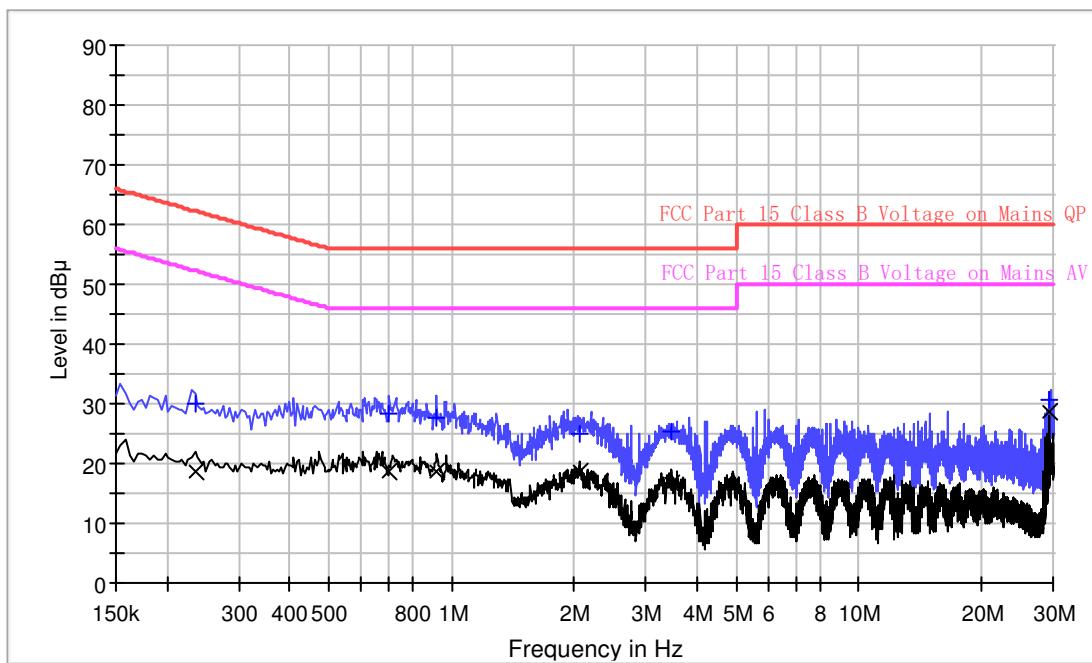
Applicant: Craftmade International, Inc

Date of Test: 09 September 2020

Model: WCS-100

Worst Case Operating Mode: Transmitting (802.11b-Channel 01)

Phase: Live

**Graphic / Data Table****Conducted Emissions  
Pursuant to FCC 15.207: Emissions Requirement****Limit and Margin QP**

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.234000	30.0	9.000	L1	9.7	32.3	62.3
0.702000	28.3	9.000	L1	9.7	27.7	56.0
0.918000	27.8	9.000	L1	9.7	28.2	56.0
2.070000	24.9	9.000	L1	9.7	31.1	56.0
3.450000	25.2	9.000	L1	9.8	30.8	56.0
29.234000	30.7	9.000	L1	11.2	29.3	60.0

**Limit and Margin AV**

Frequency (MHz)	Average (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.234000	18.7	9.000	L1	9.7	33.6	52.3
0.702000	18.6	9.000	L1	9.7	27.4	46.0
0.918000	18.6	9.000	L1	9.7	27.4	46.0
2.070000	18.6	9.000	L1	9.7	27.4	46.0
3.450000	16.7	9.000	L1	9.8	29.3	46.0
29.234000	28.8	9.000	L1	11.2	21.2	50.0

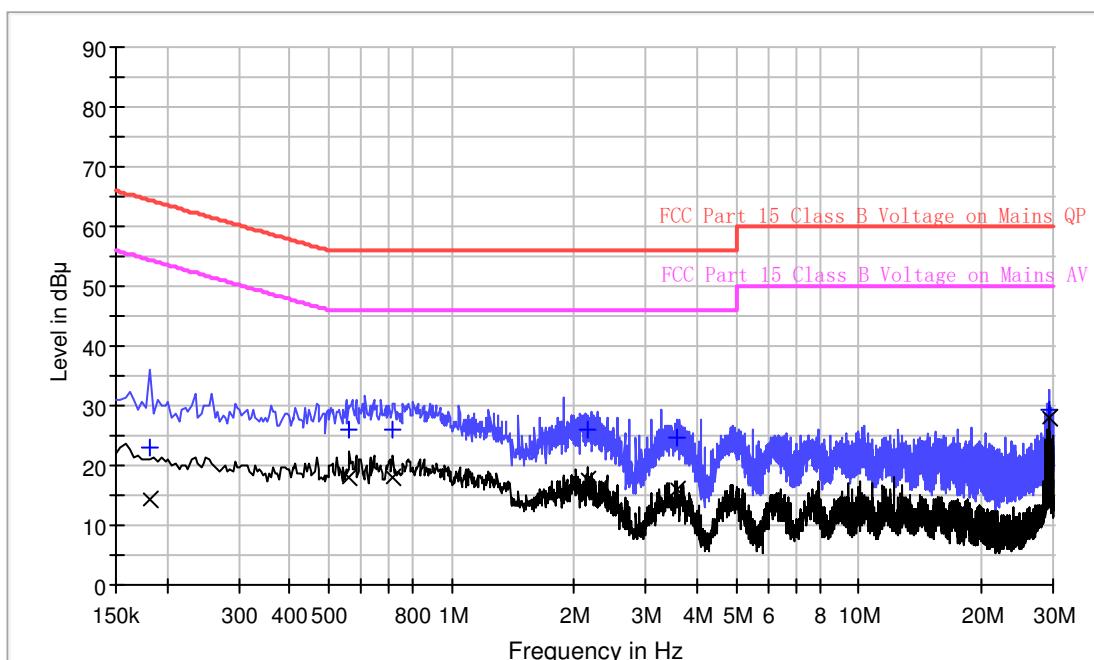
Applicant: Craftmade International, Inc

Date of Test: 09 September 2020

Model: WCS-100

Worst Case Operating Mode: Transmitting (802.11b-Channel 01)

Phase: Neutral

**Graphic / Data Table****Conducted Emissions  
Pursuant to FCC 15.207: Emissions Requirement****Limit and Margin QP**

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.182000	22.9	9.000	N	9.7	41.5	64.4
0.562000	26.0	9.000	N	9.7	30.0	56.0
0.714000	26.0	9.000	N	9.7	30.0	56.0
2.150000	25.9	9.000	N	9.8	30.1	56.0
3.574000	24.6	9.000	N	9.8	31.4	56.0
29.234000	29.4	9.000	N	11.4	30.6	60.0

**Limit and Margin AV**

Frequency (MHz)	Average (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.182000	14.3	9.000	N	9.7	40.1	54.4
0.562000	18.0	9.000	N	9.7	28.0	46.0
0.714000	18.0	9.000	N	9.7	28.0	46.0
2.150000	17.8	9.000	N	9.8	28.2	46.0
3.574000	16.0	9.000	N	9.8	30.0	46.0
29.234000	27.9	9.000	N	11.4	22.1	50.0

Applicant: Craftmade International, Inc

Date of Test: 09 September 2020

Model: WCS-100

**4.10 Radiated Emissions from Digital Section of Transceiver, FCC Ref: 15.109**

- [ ] Not required - No digital part
- [ ] Test results are attached
- [ x ] Included in the separated report.

Applicant: Craftmade International, Inc

Date of Test: 09 September 2020

Model: WCS-100

#### 4.11 Transmitter Duty Cycle Calculation and Measurements, FCC Rule 15.35(b), (c)

The EUT antenna output port was connected to the input of the spectrum analyzer. The analyzer center frequency was set to EUT RF channel carrier. The SWEP function on the analyzer was set to ZERO SPAN. The Transmitter ON time was determined from the resultant time-amplitude display:

	See attached spectrum analyzer chart (s) for Transmitter timing
	See Transmitter timing diagram provided by manufacturer
x	Not applicable, duty cycle was not used.

## 5.0 Equipment Photographs

For electronic filing, the photographs are saved with filename: external photos.pdf & internal photos.pdf.

## 6.0 Product Labeling

For electronic filing, the FCC ID label artwork and location is saved with filename: label.pdf.

## 7.0 Technical Specifications

For electronic filing, the block diagram and circuit diagram are saved with filename: block.pdf and circuit.pdf respectively.

## 8.0 Instruction Manual

For electronic filing, a preliminary copy of the Instruction Manual is saved with filename: manual.pdf.

This manual will be provided to the end-user with each unit sold/leased in the United States.

## 9.0 Confidentiality Request

For electronic filing, the confidentiality request of the tested EUT is saved with filename: request.pdf.

## 10.0 Discussion of Pulse Desensitization

The determination of pulse desensitivity was made in accordance with Hewlett Packard Application Note 150-2, *Spectrum Analysis ... Pulsed RF*.

Pulse desensitivity is not applicable for this device since the transmitter transmits the RF signal continuously.

**11.0 Test Equipment List**

Equipment No.	Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Due Date
SZ182-02	RF Power Meter	Anritsu	ML2496A	1302005	2020-05-27	2021-05-27
SZ182-02-01	Power Sensor	Anritsu	MA2411B	1207429	2020-05-27	2021-05-27
SZ061-03	BiConiLog Antenna	ETS	3142C	00078828	2019-05-24	2021-05-24
SZ185-01	EMI Receiver	R&S	ESCI	100547	2019-12-24	2020-12-24
SZ061-08	Horn Antenna	ETS	3115	00092346	2019-09-07	2021-09-07
SZ061-06	Active Loop Antenna	Electro-Metrics	EM-6876	217	2019-05-24	2021-05-24
SZ056-03	Spectrum Analyzer	R&S	FSP 30	101148	2020-05-27	2021-05-27
SZ056-07	Signal Analyzer	R&S	FSV40	101214	2019-10-29	2020-10-29
SZ181-04	Preamplifier	Agilent	8449B	3008A02474	2020-05-27	2021-05-27
SZ188-01	Anechoic Chamber	ETS	RFD-F/A-100	4102	2018-12-15	2021-12-15
SZ062-02	RF Cable	RADIALL	RG 213U	--	2020-06-12	2020-12-12
SZ062-05	RF Cable	RADIALL	0.04-26.5GHz	--	2020-08-24	2021-02-24
SZ062-12	RF Cable	RADIALL	0.04-26.5GHz	--	2020-08-24	2021-02-24
SZ067-04	Notch Filter	Micro-Tronics	BRM50702-02	--	2020-05-27	2021-05-27
SZ185-02	EMI Test Receiver	R&S	ESCI	100692	2019-10-29	2020-10-29
SZ187-01	Two-Line V-Network	R&S	ENV216	100072	2019-10-29	2020-10-29
SZ188-03	Shielding Room	ETS	RFD-100	4100	2020-01-07	2023-01-07
SZ062-16	RF Cable	HUBER+SUHN-ER	CBL2-BN-1m	--	2019-10-30	2020-10-30

\*\*\*\*\* End of Report\*\*\*\*\*