

# Venstar, Inc.

## REVISED TEST REPORT FOR

**WiFi Module**  
**Model: ACC-VWF2**

### Tested to The Following Standards:

**FCC Part 15 Subpart C Section(s)**

**15.207**

**&**

**15.247**

**(DTS 2400-2483.5 MHz)**

**Report No.: 100430-6A**

**Date of issue: November 6, 2017**



This test report bears the accreditation symbol indicating that the testing performed herein meets the test and reporting requirements of ISO/IEC 17025 under the applicable scope of EMC testing for CKC Laboratories, Inc.

We strive to create long-term, trust based relationships by providing sound, adaptive, customer first testing services. We embrace each of our customers' unique EMC challenges, not as an interruption to set processes, but rather as the reason we are in business.

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## ADMINISTRATIVE INFORMATION

### Test Report Information

**REPORT PREPARED FOR:**

Venstar, Inc.  
9250 Owensmouth Avenue  
Chatsworth, CA 91311

Representative: Alex Garashin

**DATE OF EQUIPMENT RECEIPT:**

**DATE(S) OF TESTING:**

**REPORT PREPARED BY:**

Dianne Dudley  
CKC Laboratories, Inc.  
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Mariposa, CA 95338

Project Number: 100430

October 19, 2017

October 19-20, 2017

### Revision History

**Original:** Testing of the WiFi Module, Model: ACC-VWF2 to FCC Part 15 Subpart C Section(s) 15.207 & 15.247 (DTS 2400-2483.5 MHz).

**Revision A:** To revise the band edge limit line.

### Report Authorization

The test data contained in this report documents the observed testing parameters pertaining to and are relevant for only the sample equipment tested in the agreed upon operational mode(s) and configuration(s) as identified herein. Compliance assessment remains the client's responsibility. This report may not be used to claim product endorsement by A2LA or any government agencies. This test report has been authorized for release under quality control from CKC Laboratories, Inc.



**Steve Behm**  
*Director of Quality Assurance & Engineering Services*  
CKC Laboratories, Inc.

## Test Facility Information



Our laboratories are configured to effectively test a wide variety of product types. CKC utilizes first class test equipment, anechoic chambers, data acquisition and information services to create accurate, repeatable and affordable test results.

TEST LOCATION(S):  
CKC Laboratories, Inc.  
110 Olinda Place  
Brea, CA 92823

## Software Versions

CKC Laboratories Proprietary Software	Version
EMITest Emissions	5.03.02

## Site Registration & Accreditation Information

Location	NIST CB #	TAIWAN	CANADA	FCC	JAPAN
Brea D, CA	US0060	SL2-IN-E-1146R	3082D-2	US1025	A-0147

## SUMMARY OF RESULTS

### Standard / Specification: FCC Part 15 Subpart C - 15.247 (DTS)

Test Procedure	Description	Modifications	Results
15.247(a)(2)	6dB Bandwidth	NA	Pass
15.247(b)(3)	Output Power	NA	Pass
15.247(e)	Power Spectral Density	NA	Pass
15.247(d)	RF Conducted Emissions & Band Edge	NA	Pass
15.247(d)	Radiated Emissions & Band Edge	NA	Pass
15.207	AC Conducted Emissions	NA	Pass

NA = Not Applicable

### Modifications During Testing

This list is a summary of the modifications made to the equipment during testing.

Summary of Conditions
No modifications were made during testing.

**Modifications listed above must be incorporated into all production units.**

### Conditions During Testing

This list is a summary of the conditions noted to the equipment during testing.

Summary of Conditions
None

## EQUIPMENT UNDER TEST (EUT)

During testing numerous configurations may have been utilized. The configurations listed below support compliance to the standard(s) listed in the Summary of Results section.

### Configuration 1

***Equipment Tested:***

Device	Manufacturer	Model #	S/N
WiFi Module	Venstar, Inc.	ACC-VWF2	Unit 1

***Support Equipment:***

Device	Manufacturer	Model #	S/N
Development Board	Texas Instrument	T005V0	NA
Mouse	Microsoft	Optic 3000	482813
Laptop	Lenovo	T500	2242CTO

### Configuration 2

***Equipment Tested:***

Device	Manufacturer	Model #	S/N
WiFi Module	Venstar, Inc.	ACC-VWF2	Unit 2

***Support Equipment:***

Device	Manufacturer	Model #	S/N
Development Board	Texas Instrument	T005V0	NA
Mouse	Microsoft	Optic 3000	482813
Laptop	Lenovo	T500	2242CTO

## General Product Information:

Product Information	Manufacturer-Provided Details
Equipment Type:	Stand-Alone Equipment
Type of Wideband System:	802.11 b/g/n20
Operating Frequency Range:	2412-2462MHz
Modulation Type(s):	CCK/OFDM/64QAM
Maximum Duty Cycle:	80%
Number of TX Chains:	1
Antenna Type(s) and Gain:	Integral, 1.9dBi
Beamforming Type:	NA
Antenna Connection Type:	Integral (External connector provided to facilitate testing)
Nominal Input Voltage:	3.3V
Firmware / Software used for Test:	TI CC3100/CC3200 Radio tool V.1.2.5942.19689

Note: Device with Identical RF Circuit but different digital circuit was tested for portion of testing. Unit 1 and Unit 2. Unit 1 is device seeking certification.







## FCC Part 15 Subpart C

### 15.247(a)(2) 6dB Bandwidth

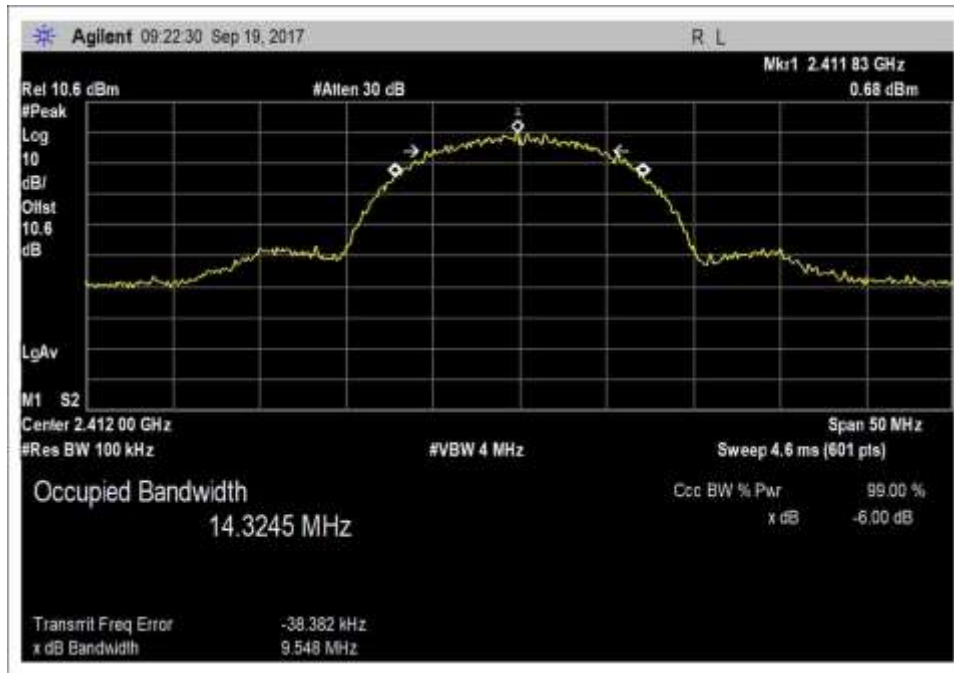
Test Setup/Conditions			
Test Location:	Brea Lab D	Test Engineer:	E. Wong
Test Method:	ANSI C63.10 (2013), KDB 558074	Test Date(s):	9/18/2017
Configuration:	1		
Test Setup:	<p>The EUT seeking certification as standalone transmitter. Part of the product will stay outside the host enclosure with labeling visible during final installation.</p> <p>The EUT is placed on test bench, connected to a laptop via a USB development board. The Laptop is running TI CC3100/CC3200 Radio tool V.1.2.5942.19689 to place the EUT in test mode</p> <p>Freq range: 2400-2483.5MHz            TX :2412MHz,2442MHz, 2462MHz            802.11b, 11Mbps CCK            802.11g, 54Mbps OFDM            802.11n (20MHz) 65Mbps MCS07</p> <p>Packet size 1400 byte (max), infinite packet (0), Continuous transmit            Firmware Power setting (0-15): 0 (max power setting)</p>		

Environmental Conditions			
Temperature (°C)	25	Relative Humidity (%):	60

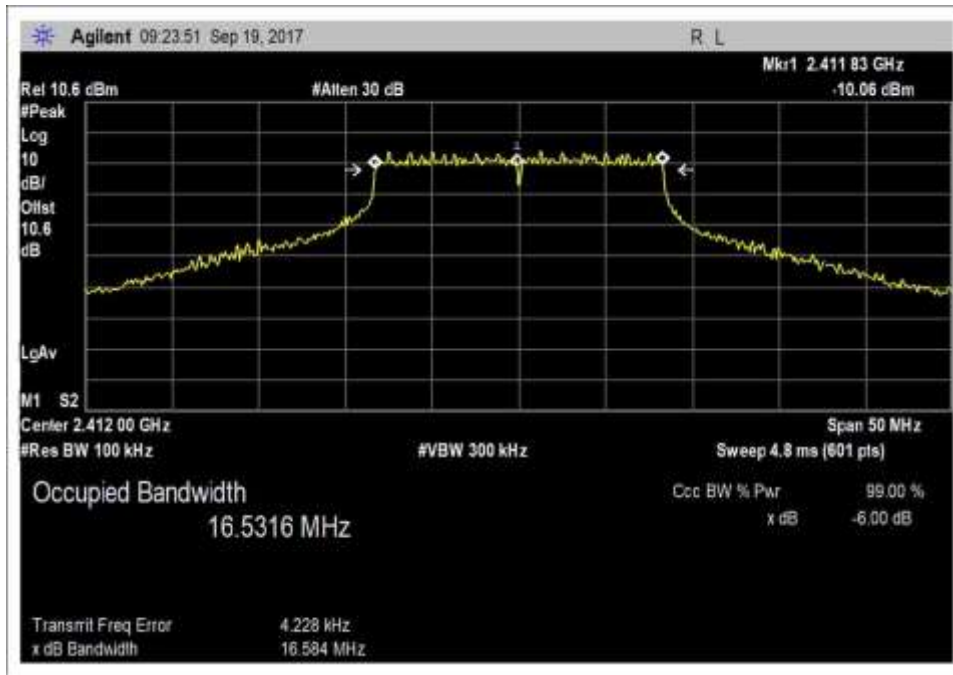
Test Equipment					
Asset #	Description	Manufacturer	Model	Cal Date	Cal Due
02869	Spectrum Analyzer	Agilent	E4440A	8/1/2017	8/1/2018
03430	Attenuator	Aeroflex/Weinschel	75A-10-12	11/2/2015	11/2/2017
06554	Cable	Astrolab	32022-29094K-29094K-24TC	12/30/2015	12/30/2017

Test Data Summary					
Frequency (MHz)	Antenna Port	Modulation	Measured (kHz)	Limit (kHz)	Results
2412	1	802.11b	9548	≥500	Pass
2442	1	802.11b	8915	≥500	Pass
2462	1	802.11b	9555	≥500	Pass
2412	1	802.11g	16532	≥500	Pass
2442	1	802.11g	16576	≥500	Pass
2462	1	802.11g	16546	≥500	Pass
2412	1	802.11n20	17654	≥500	Pass
2442	1	802.11n20	17758	≥500	Pass
2462	1	802.11n20	17734	≥500	Pass

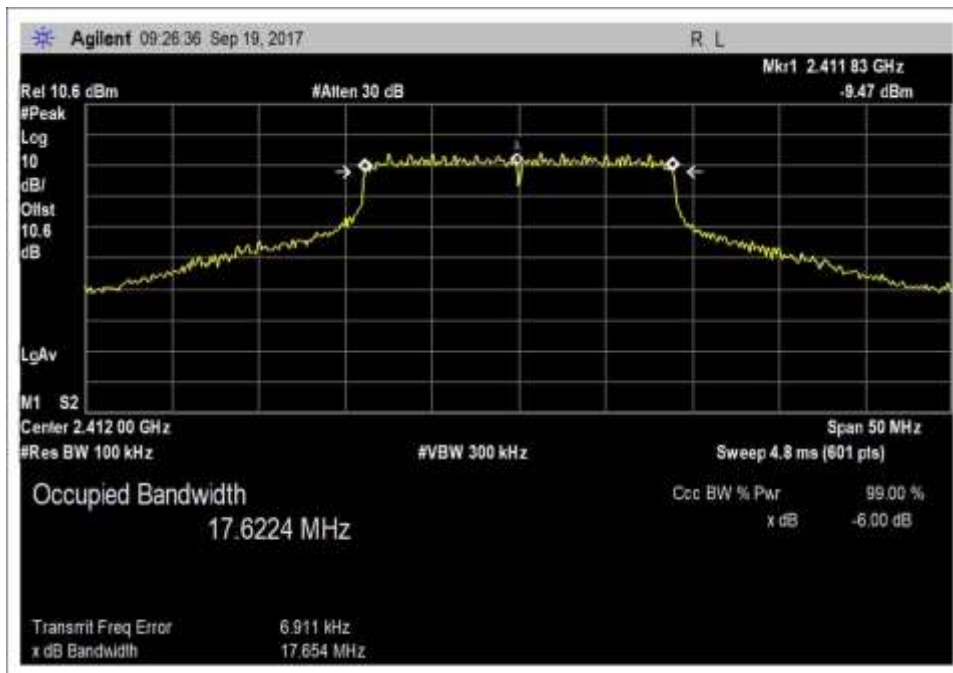
### Plot(s)



-6dB\_2412MHz\_802.11b



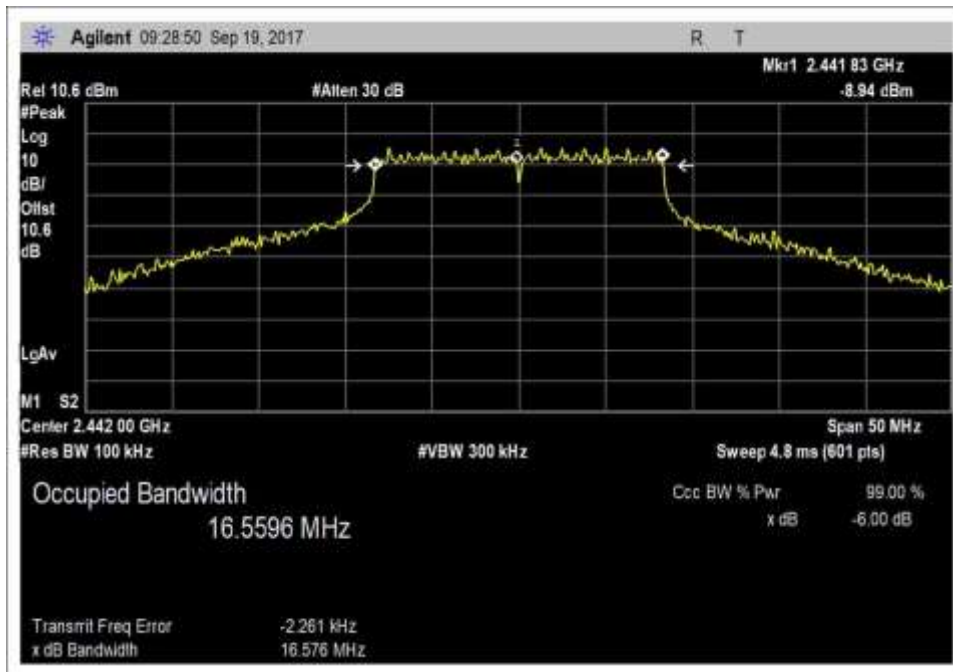
-6dB\_2412MHz\_802.11g



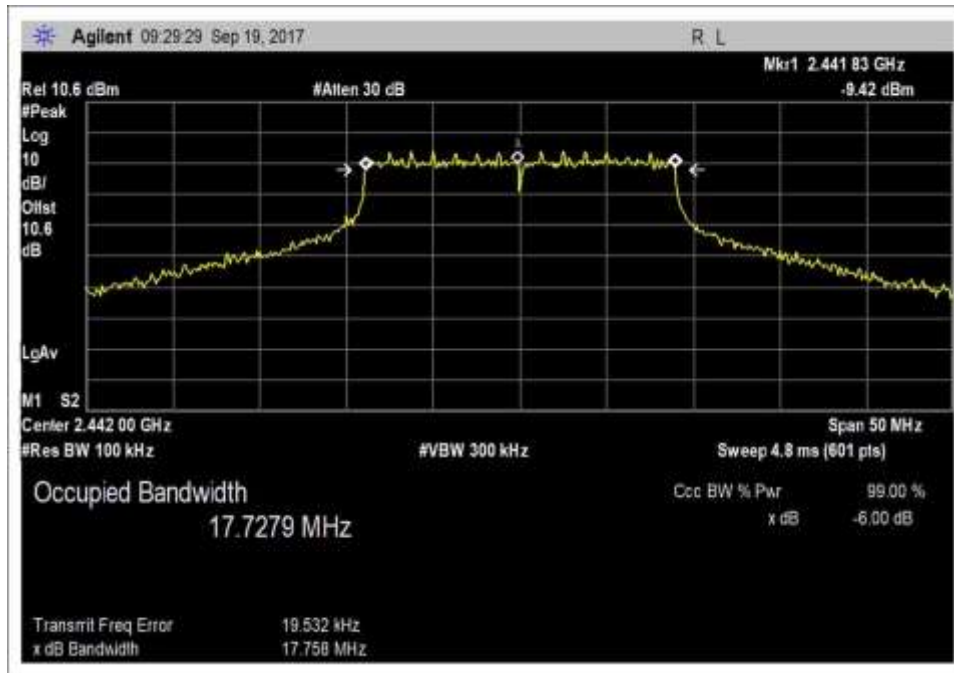
-6dB\_2412MHz\_802.11n



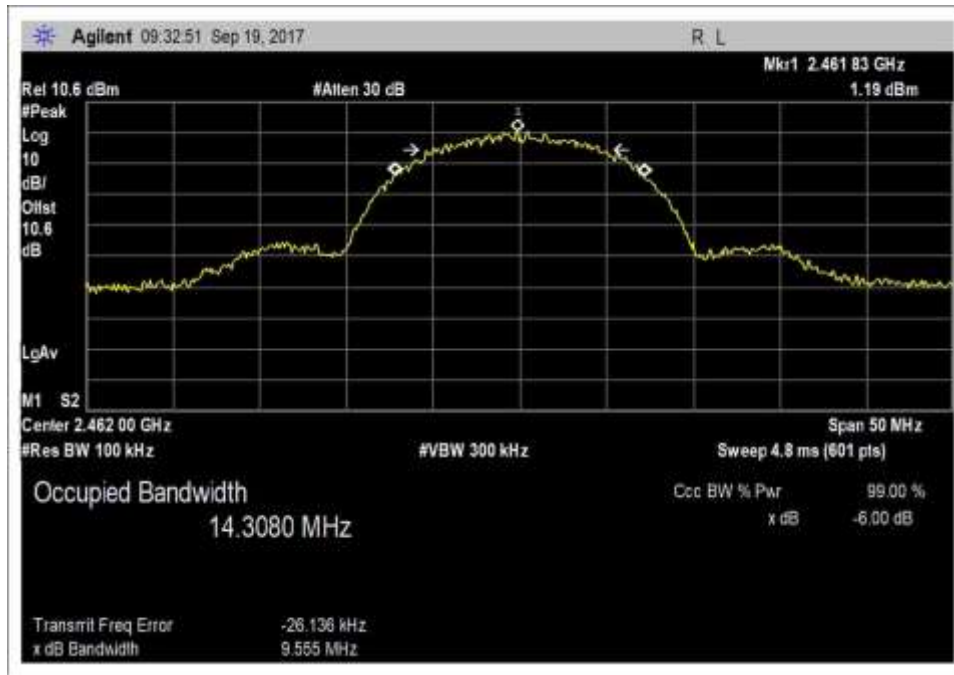
-6dB\_2442MHz\_802.11b



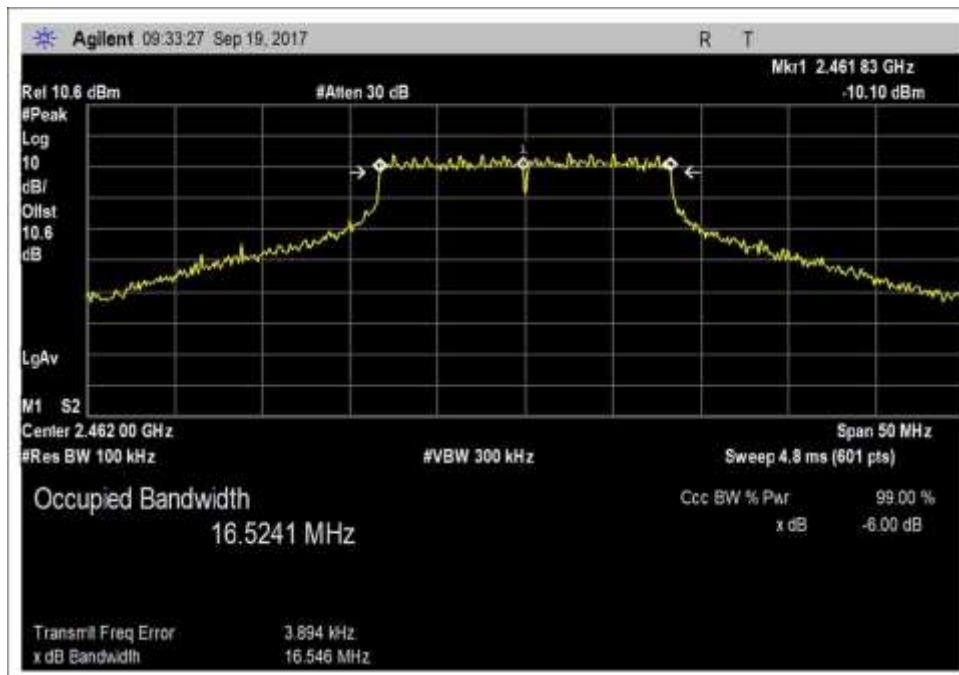
-6dB\_2442MHz\_802.11g



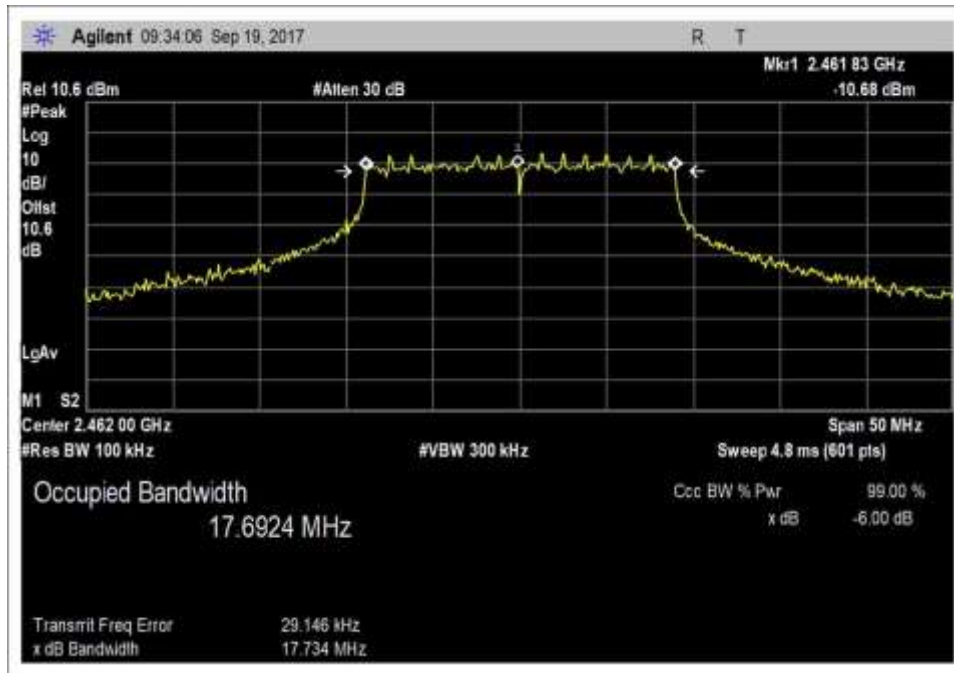
-6dB\_2442MHz\_802.11n



-6dB\_2462MHz\_802.11b



-6dB\_2462MHz\_802.11g



-6dB\_2462MHz\_802.11n

**Test Setup Photo(s)**



## 15.247(b)(3) Output Power

Test Setup / Conditions			
Test Location:	Brea Lab D	Test Engineer:	E. Wong
Test Method:	ANSI C63.10 (2013), KDB 558074	Test Date(s):	9/20/2017
Configuration:	2		
Test Setup:	<p>The EUT seeking certification as standalone transmitter. Part of the product will stay outside the host enclosure with labeling visible during final installation.</p> <p>The EUT is placed on test bench, connected to a laptop via a USB development board. The Laptop is running TI CC3100/CC3200 Radio tool V.1.2.5942.19689 to place the EUT in test mode</p> <p>Freq range: 2400-2483.5MHz            TX :2412MHz,2442MHz, 2462MHz            802.11b, 11Mbps CCK            802.11g, 54Mbps OFDM            802.11n (20MHz) 65Mbps MCS07</p> <p>Packet size 1400 byte (max), infinite packet (0), Continuous transmit            Firmware Power setting (0-15) : 0 ( max power setting)</p>		

Environmental Conditions			
Temperature (°C)	25	Relative Humidity (%):	60

Test Equipment					
Asset #	Description	Manufacturer	Model	Cal Date	Cal Due
02869	Spectrum Analyzer	Agilent	E4440A	8/1/2017	8/1/2018
03430	Attenuator	Aeroflex/Weinschel	75A-10-12	11/2/2015	11/2/2017
06554	Cable	Astrolab	32022-29094K-29094K-24TC	12/30/2015	12/30/2017
01438	DC Power Supply	Topward	6306D	1/25/2017	1/25/2019



Test Data Summary - Voltage Variations					
Frequency (MHz)	Modulation / Ant Port	V <sub>Minimum</sub> (dBm)	V <sub>Nominal</sub> (dBm)	V <sub>Maximum</sub> (dBm)	Max Deviation from V <sub>Nominal</sub> (dB)
2412	802.11b	12.2	12.2	12.2	0
2442	802.11b	13.9	13.9	13.9	0
2462	802.11b	12.7	12.7	12.7	0
2412	802.11g	8.2	8.2	8.2	0
2442	802.11g	10.2	10.2	10.2	0
2462	802.11g	9.2	9.2	9.2	0
2412	802.11n20	8.4	8.4	8.4	0
2442	802.11n20	10.1	10.1	10.1	0
2462	802.11n20	9.1	9.1	9.1	0

Test performed using operational mode with the highest output power, representing worst case.  
13.9dBm= **0.0245W**

***Parameter Definitions:***

Measurements performed at input voltage V<sub>Nominal</sub> ± 15%.

Parameter	Value
V <sub>Nominal</sub> :	2.8
V <sub>Minimum</sub> :	3.3
V <sub>Maximum</sub> :	3.8

Power Output Test Data Summary - RF Conducted Measurement					
Measurement Option: AVGSA-2					
Frequency (MHz)	Modulation	Ant. Type / Gain (dBi)	Measured (dBm)	Limit (dBm)	Results
2412	802.11b	Integral/ 1.9	12.2	≤ 30	Pass
2442	802.11b	Integral/ 1.9	<b>13.9</b>	≤ 30	Pass
2462	802.11b	Integral/ 1.9	12.7	≤ 30	Pass
2412	802.11g	Integral/ 1.9	8.2	≤ 30	Pass
2442	802.11g	Integral/ 1.9	10.2	≤ 30	Pass
2462	802.11g	Integral/ 1.9	9.2	≤ 30	Pass
2412	802.11n20	Integral/ 1.9	8.4	≤ 30	Pass
2442	802.11n20	Integral/ 1.9	10.1	≤ 30	Pass
2462	802.11n20	Integral/ 1.9	9.1	≤ 30	Pass

Note 10 Log 1/x, where x is duty cycle added to measured channel power in accordance with 9.2.2.4

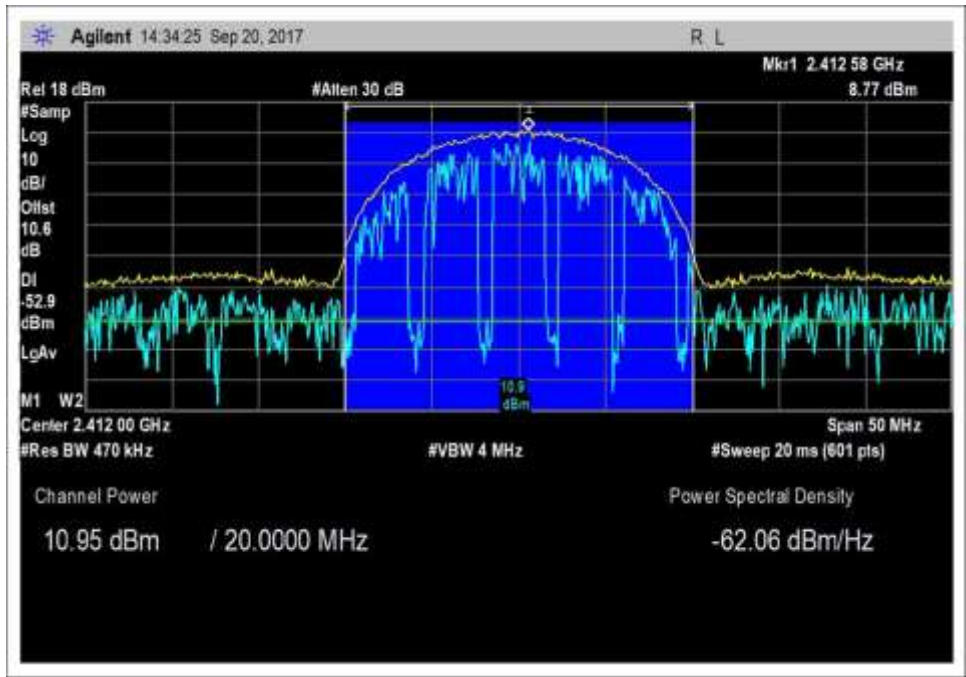
		Measured	Duty Cycle	ACC-VWF2 unit2
		dBm	corr	dBm
<b>802.11b</b>	2412	11.0	1.3	12.2
	2442	12.6	1.3	<b>13.9</b>
	2462	11.4	1.3	12.7
<b>802.11g</b>	2412	2.8	5.4	8.2
	2442	4.8	5.4	10.2
	2462	3.8	5.4	9.2
<b>802.11n</b>	2412	1.0	7.4	8.4
	2442	2.7	7.4	10.1
	2462	1.7	7.4	9.1

Duty Cycle \_802.11b.  $1.119/1.493 = 75\%$   
 $10 \text{ Log } 1/0.75 = 1.3\text{dB}$

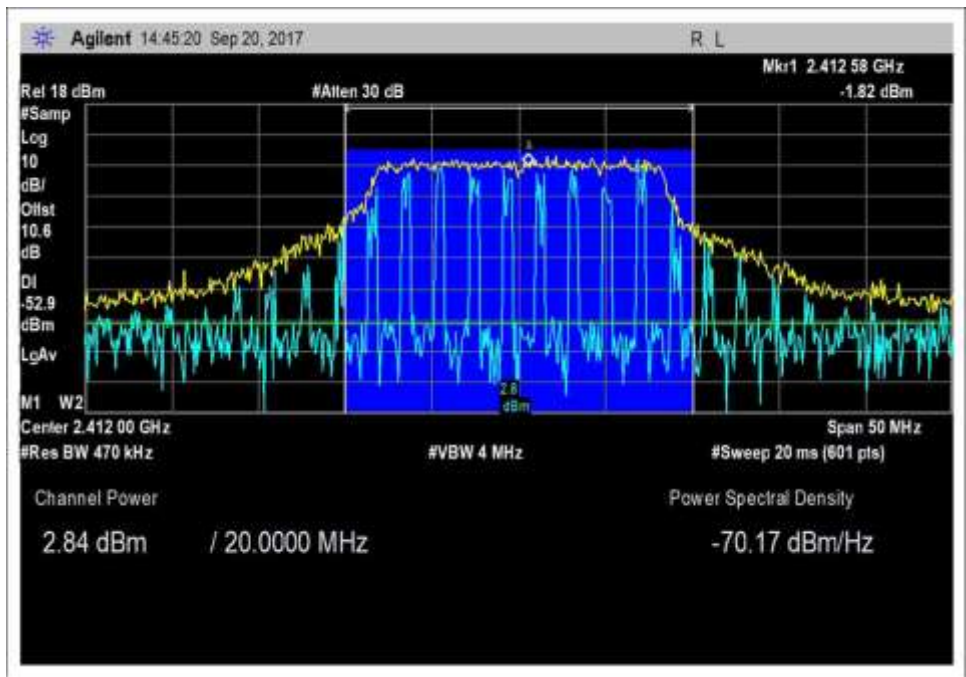
Duty Cycle \_802.11g,  $228.3 \text{ us} / 777.6\text{us} = 0.29\%$   
 $10 \text{ log } 1/0.29 = 5.4\text{dB}$

Duty cycle 802.11n20,  $= (91.2\text{us} + 192.5\text{us}) / 1.533\text{ms} = (0.0912+0.1925) / 1.533 = 0.18\%$   
 $10\text{Log}1/x = 10 \text{ Log } 1/0.18 = 7.4\text{dB}$

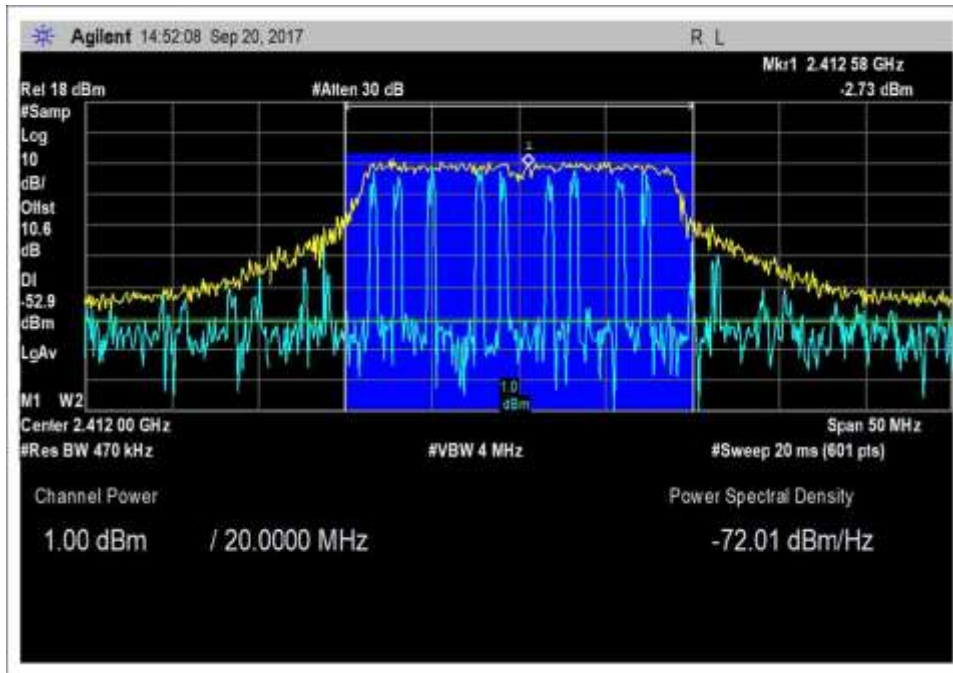
**Plots**



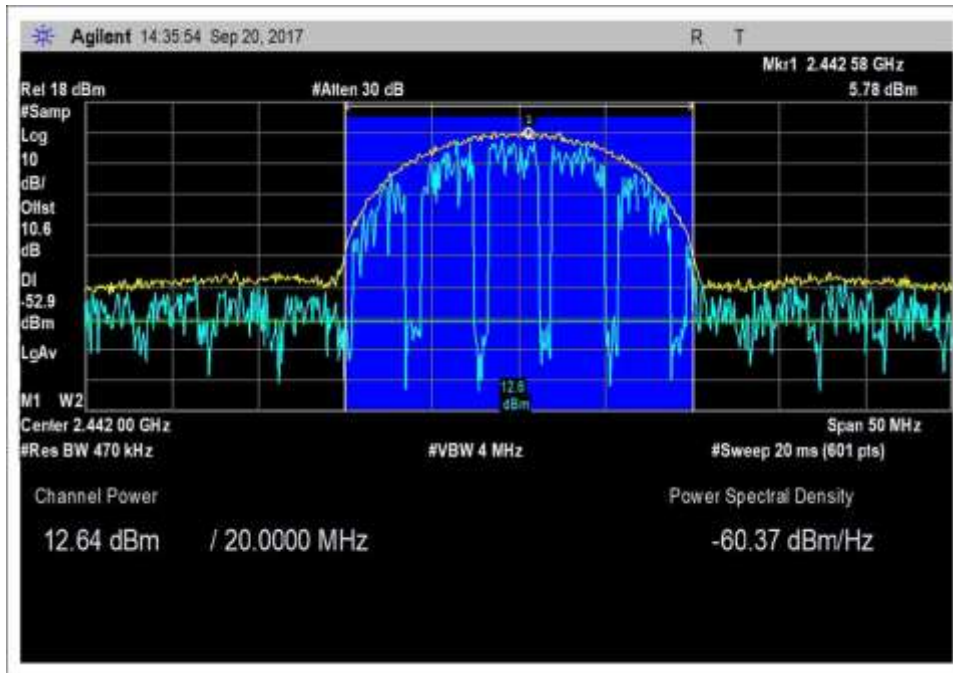
2412MHz-802.11b



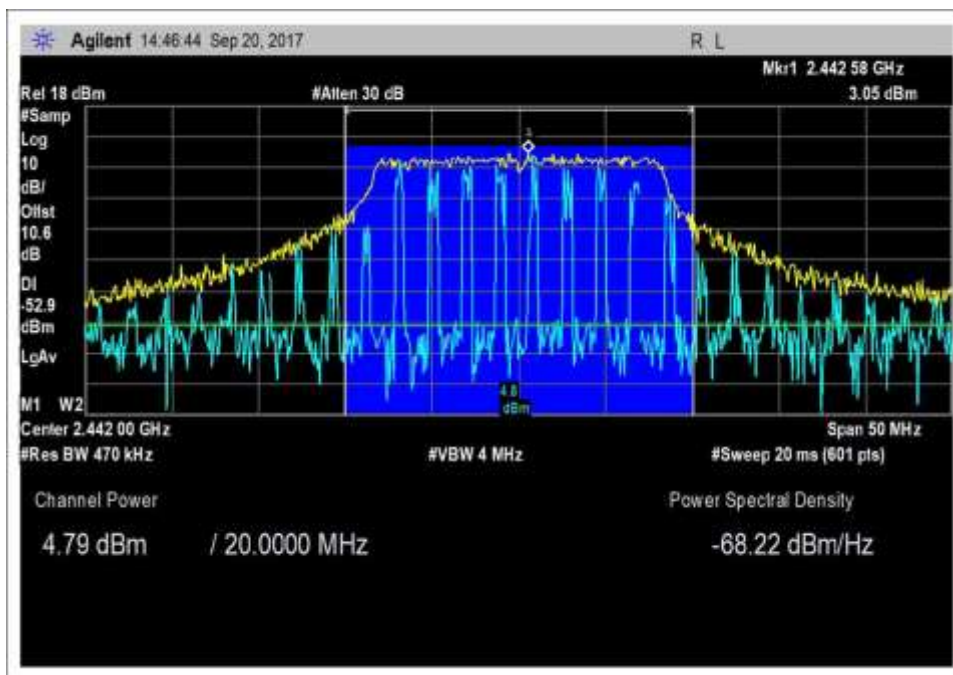
2412MHz-802.11g



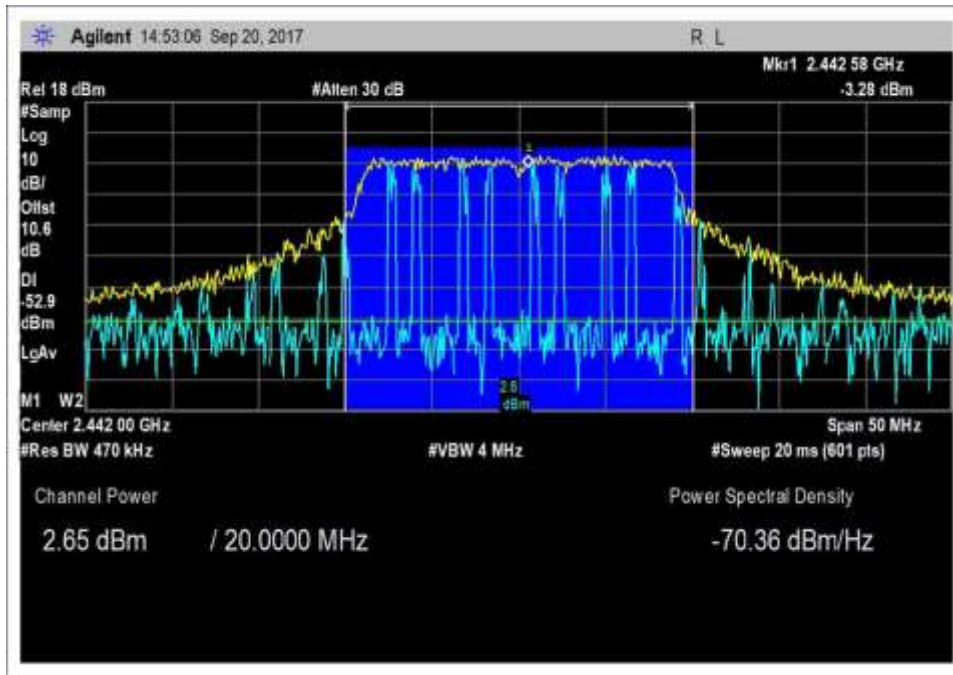
2412MHz-802.11n20



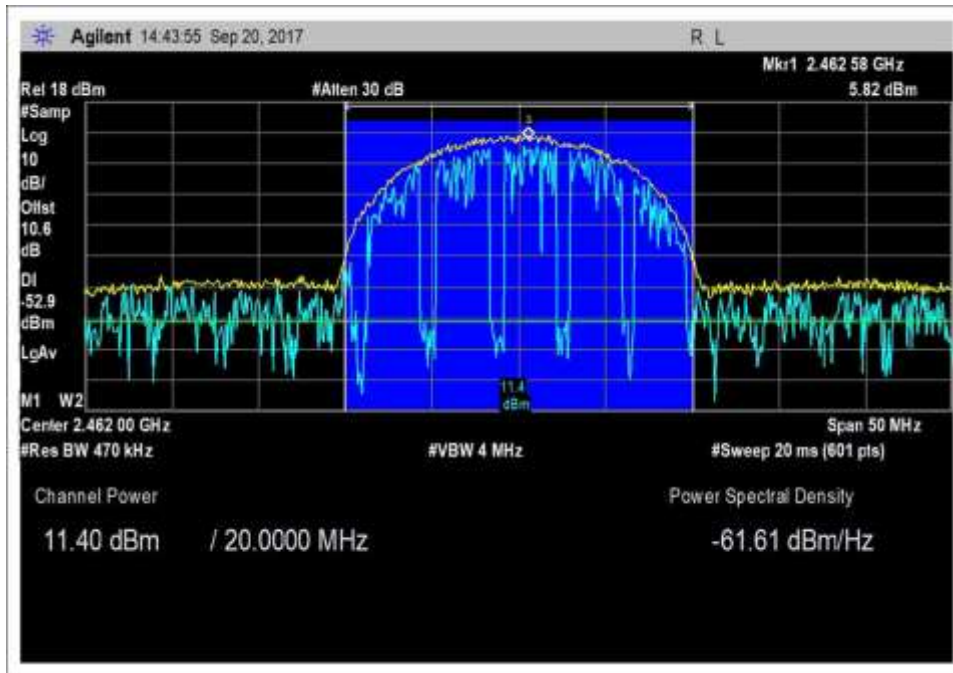
2442MHz-802.11b



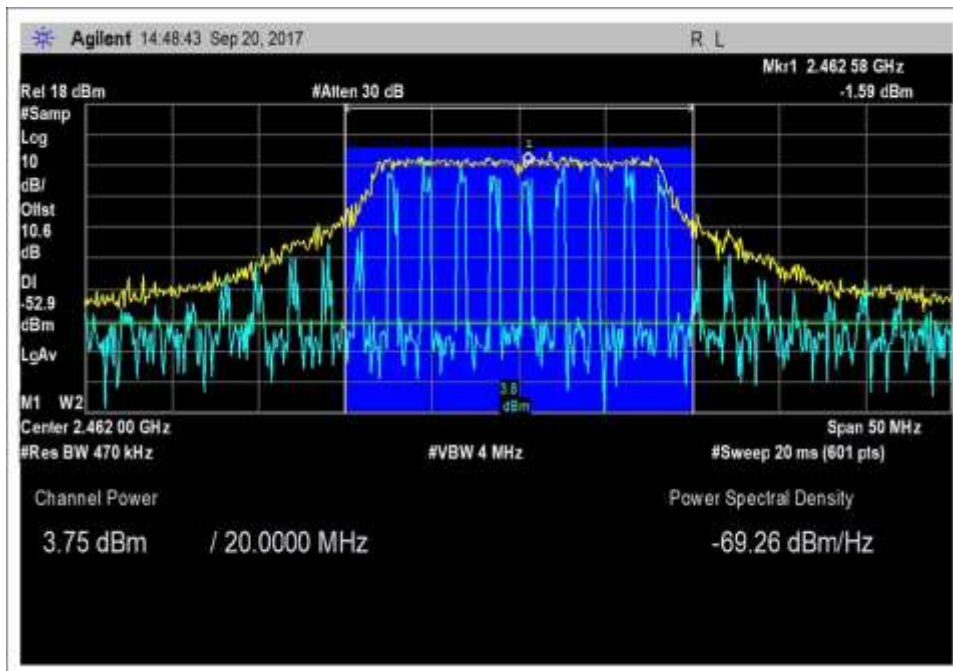
2442MHz-802.11g



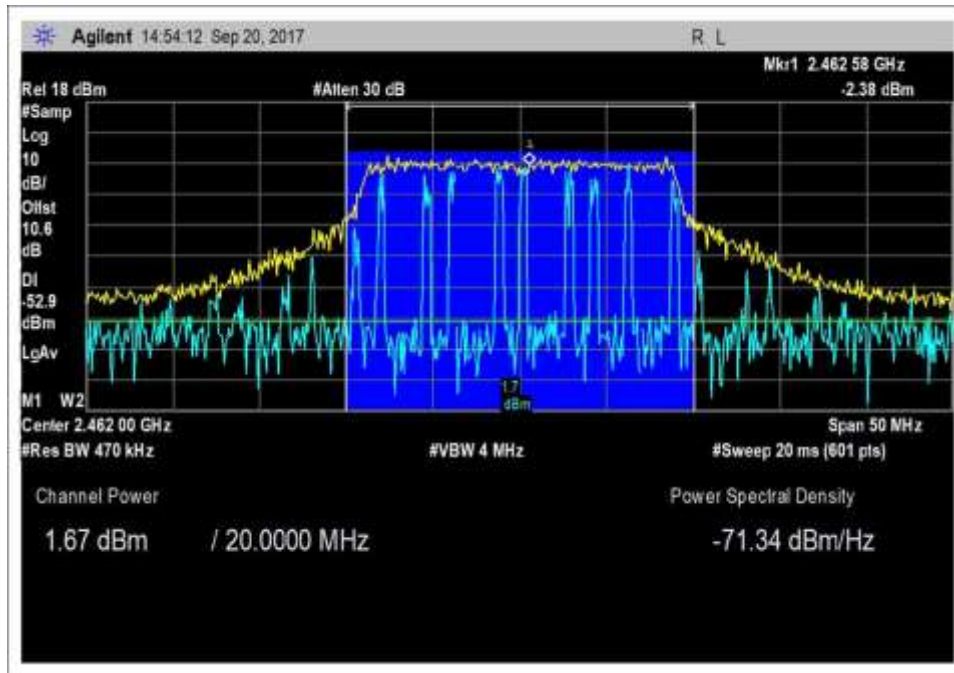
2442MHz-802.11n20



2462MHz-802.11b

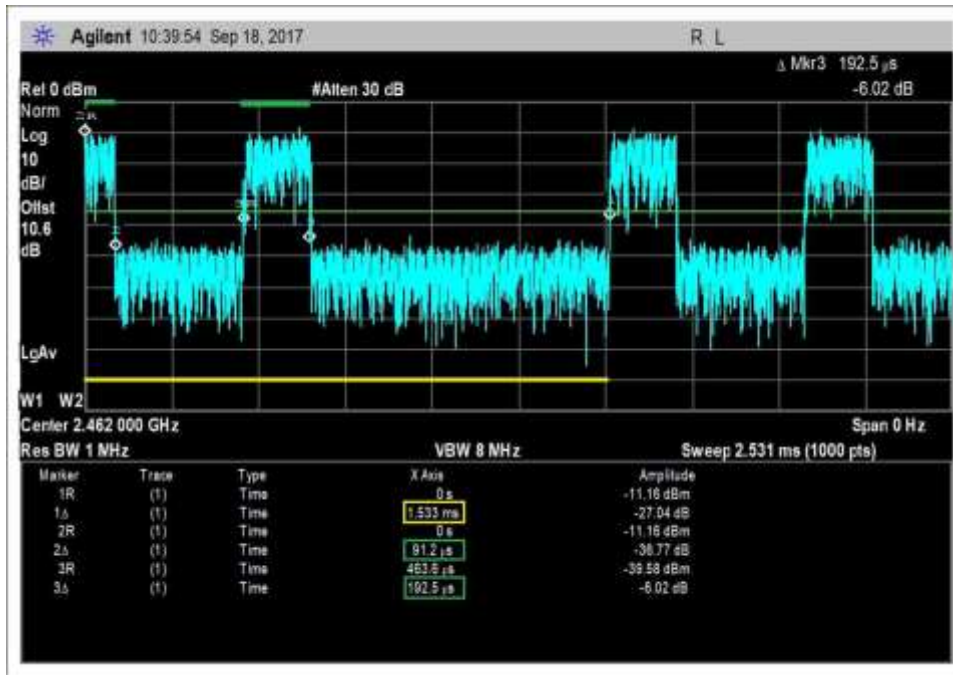


2462MHz-802.11g

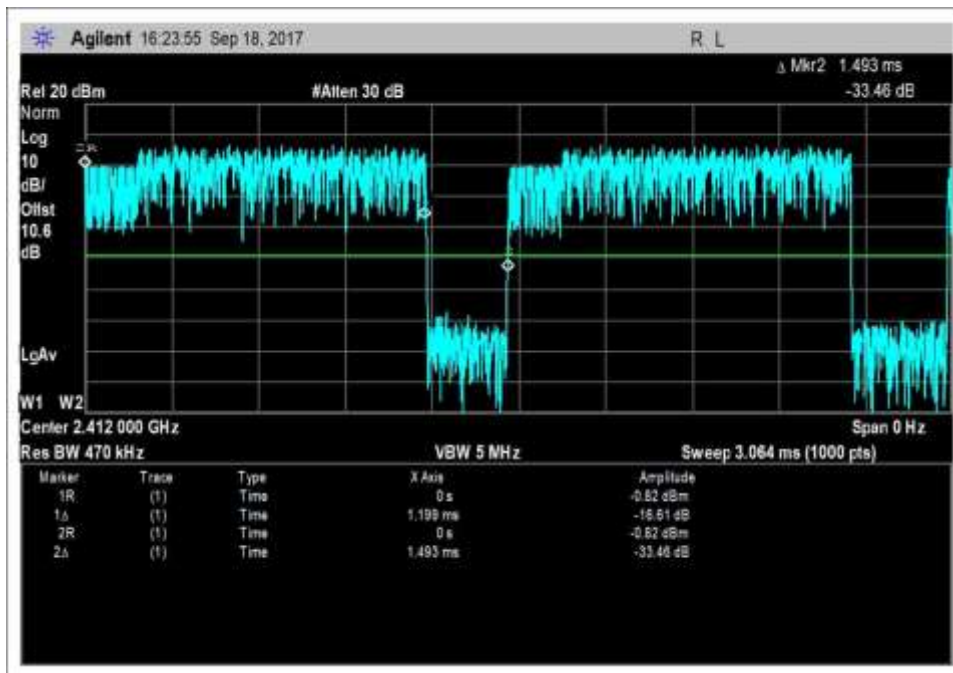


2462MHz-802.11n20

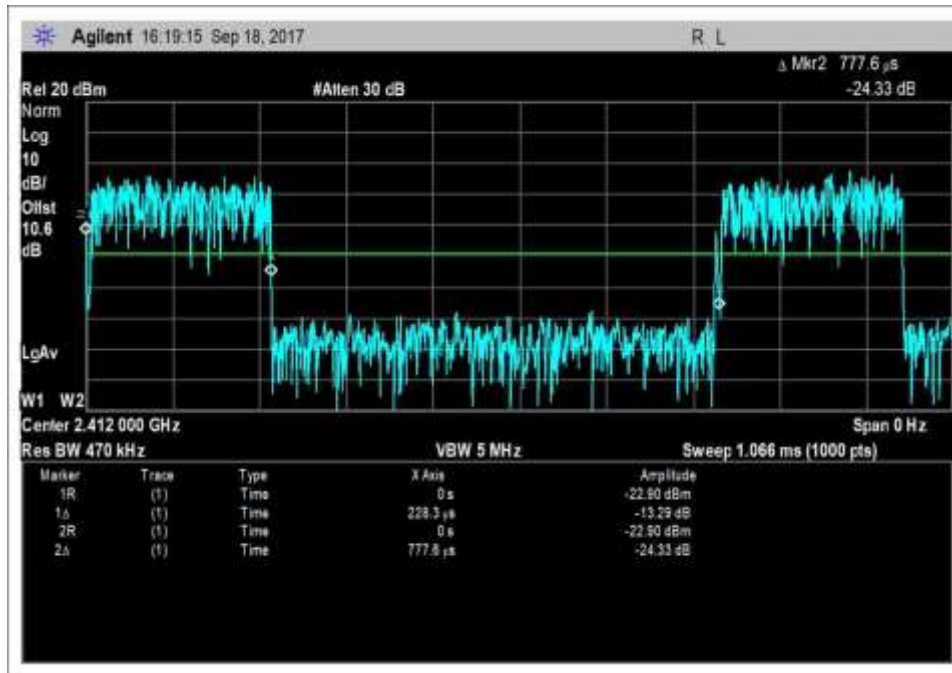




Duty Cycle, 802.11n



Duty Cycle, 802.11b



Duty Cycle, 802.11g

**Test Setup Photo(s)**



## 15.247(e) Power Spectral Density

Test Setup / Conditions / Data			
Test Location:	Brea Lab D	Test Engineer:	E. Wong
Test Method:	ANSI C63.10 (2013), KDB 558074	Test Date(s):	9/20/2017
Configuration:	2		
Test Setup:	<p>The EUT seeking certification as standalone transmitter. Part of the product will stay outside the host enclosure with labeling visible during final installation.</p> <p>The EUT is placed on test bench, connected to a laptop via a USB development board. The Laptop is running TI CC3100/CC3200 Radio tool V.1.2.5942.19689 to place the EUT in test mode</p> <p>Freq range: 2400-2483.5MHz            TX :2412MHz,2442MHz, 2462MHz            802.11b, 11Mbps CCK            802.11g, 54Mbps OFDM            802.11n (20MHz) 65Mbps MCS07</p> <p>Packet size 1400 byte (max), infinite packet (0), Continuous transmit            Firmware Power setting (0-15): 0 ( max power setting)</p> <p>The EUT has integral antenna with external connector provided to facilitate testing            ANSI C63.10-2013</p>		

Environmental Conditions			
Temperature (°C)	25	Relative Humidity (%):	60

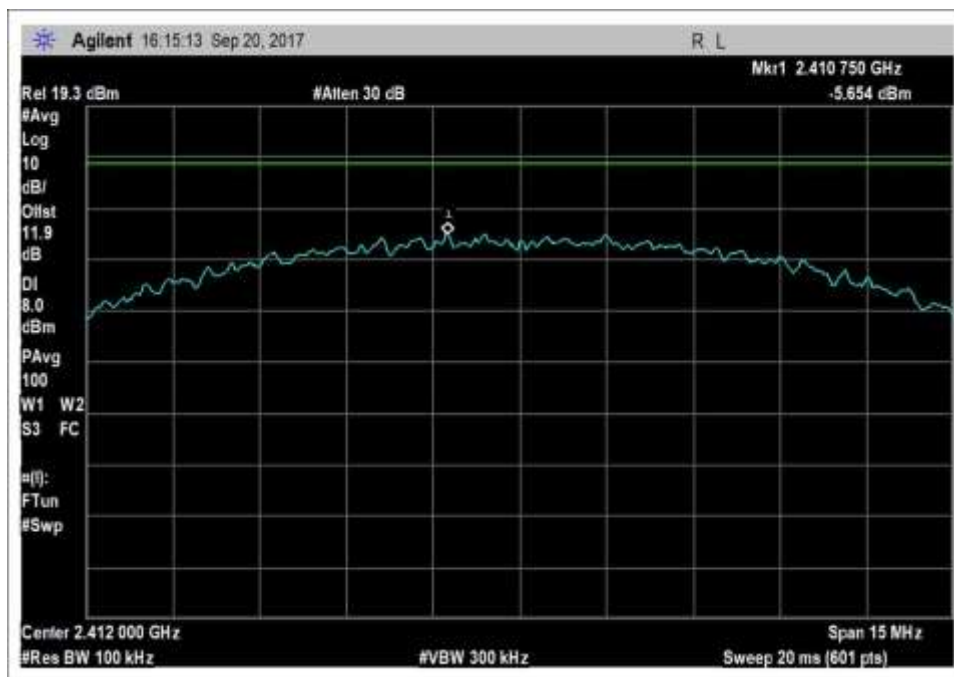
Test Equipment					
Asset #	Description	Manufacturer	Model	Cal Date	Cal Due
02869	Spectrum Analyzer	Agilent	E4440A	8/1/2017	8/1/2018
03430	Attenuator	Aeroflex/Weinschel	75A-10-12	11/2/2015	11/2/2017
06554	Cable	Astrolab	32022-29094K-29094K-24TC	12/30/2015	12/30/2017

### PSD Test Data Summary - RF Conducted Measurement

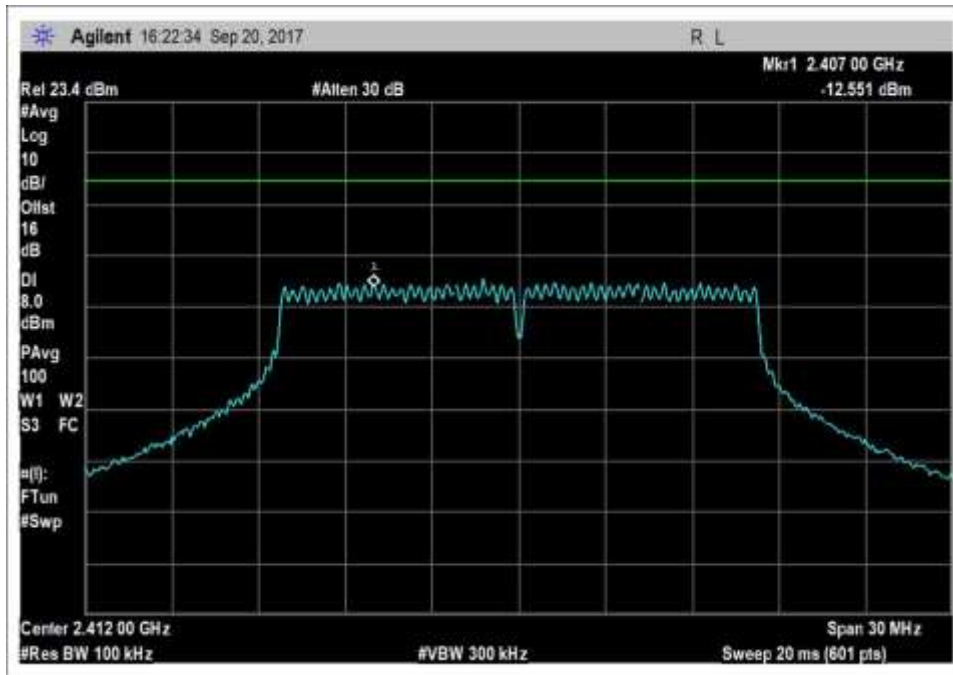
Measurement Method: AVGPDS-2					
Frequency (MHz)	Modulation/	10Log(1/x)	Measured (dBm/100kHz)	Limit (dBm/3kHz)	Results
2412	802.11b	1.3	-5.7	≤8	Pass
2442	802.11b	1.3	-4.6	≤8	Pass
2462	802.11b	1.3	-4.8	≤8	Pass
2412	802.11g	5.4	-12.6	≤8	Pass
2442	802.11g	5.4	-9.8	≤8	Pass
2462	802.11g	5.4	-10.7	≤8	Pass
2412	802.11n20	7.4	-11.8	≤8	Pass
2442	802.11n20	7.4	-8.5	≤8	Pass
2462	802.11n20	7.4	-9.8	≤8	Pass

Note: 10Log1/x duty cycle correction added to measured PSD in accordance with 10.5

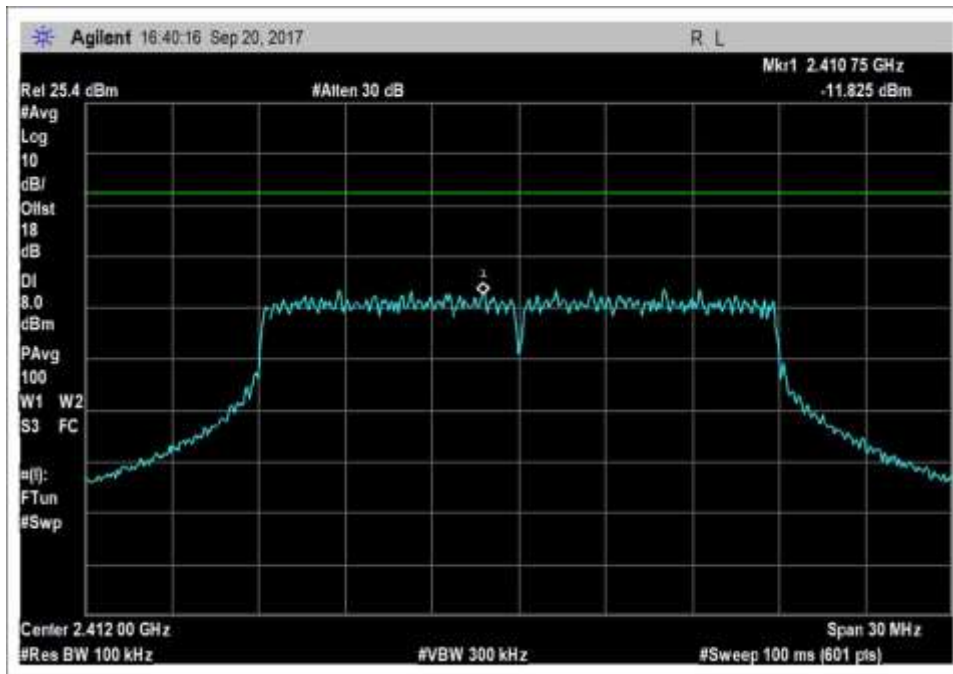
### Test Plots



802.11b\_2412MHz



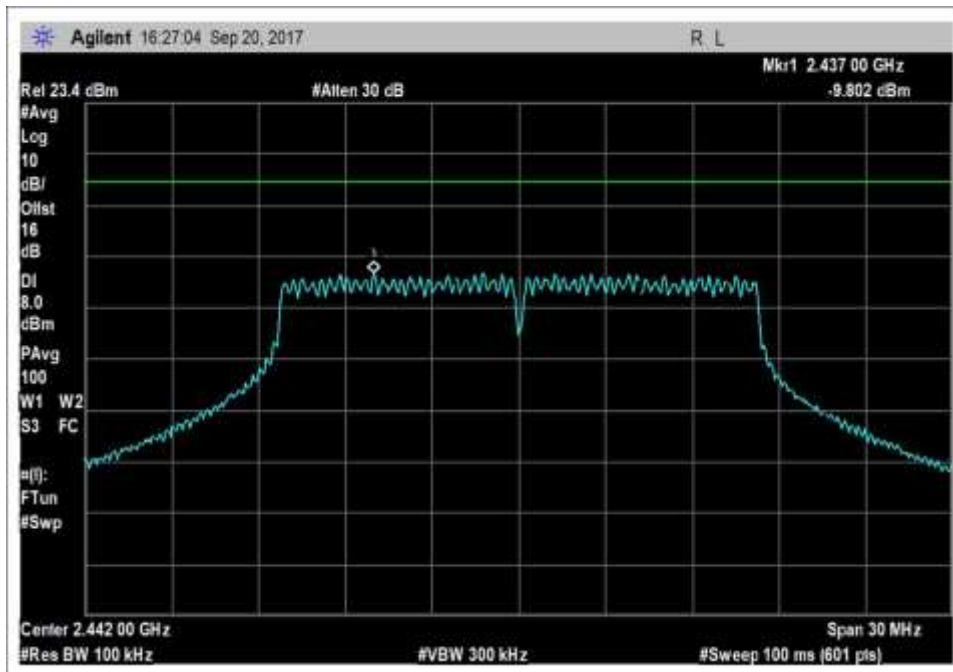
802.11g\_2412MHz



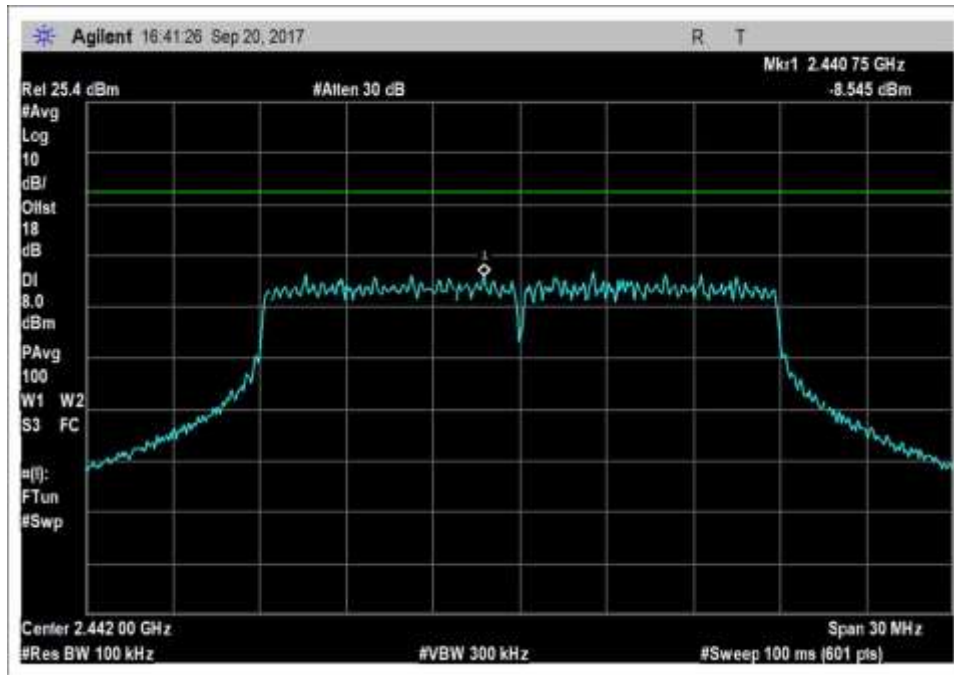
802.11n20\_2412MHz



802.11b\_2442MHz

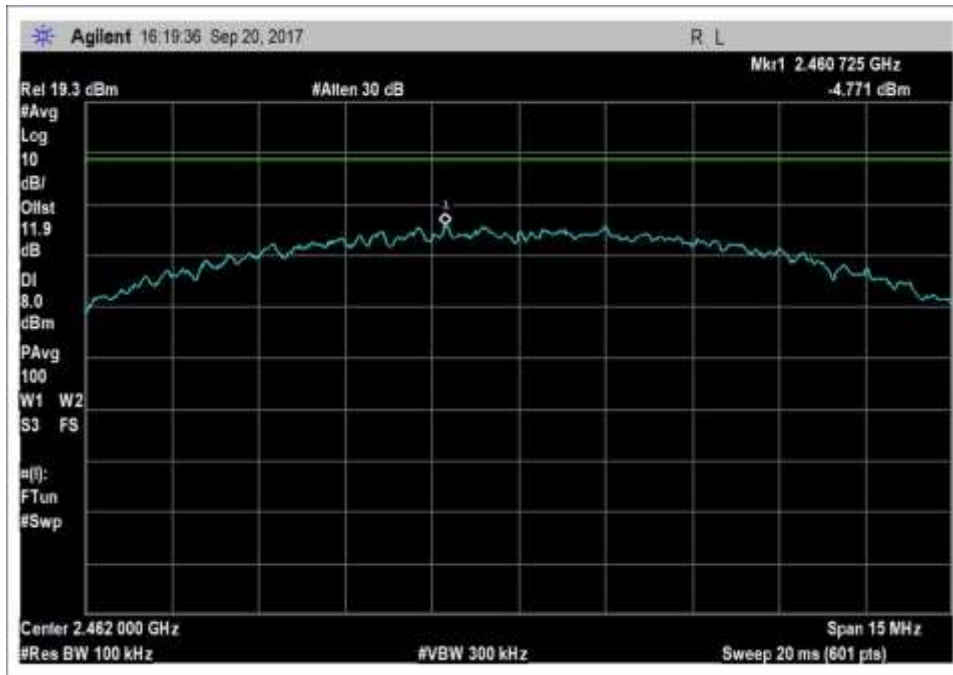


802.11g\_2442MHz

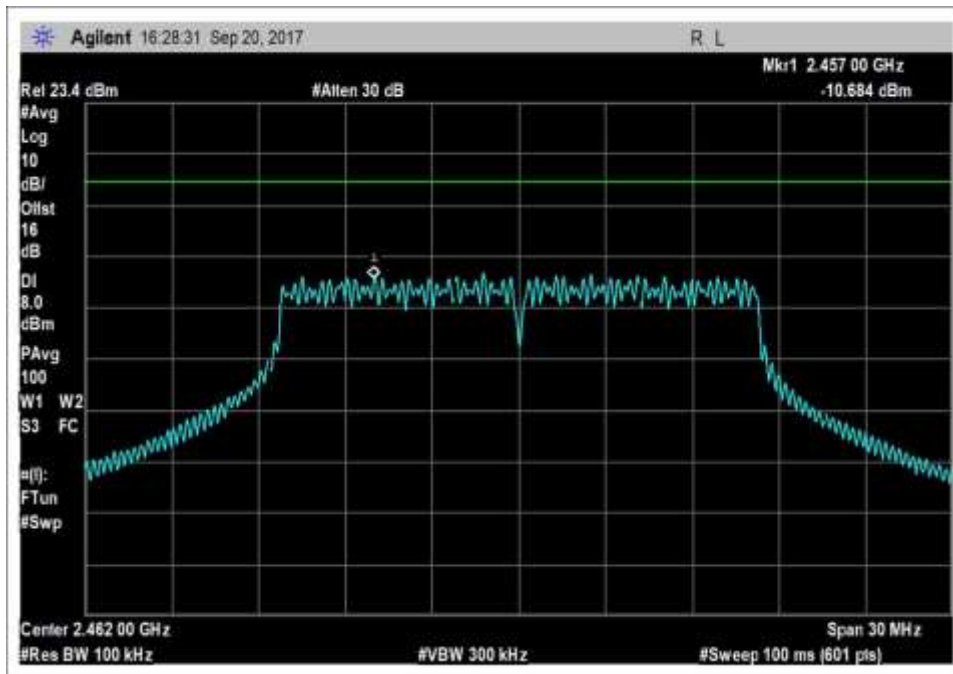


802.11n20\_2442MHz

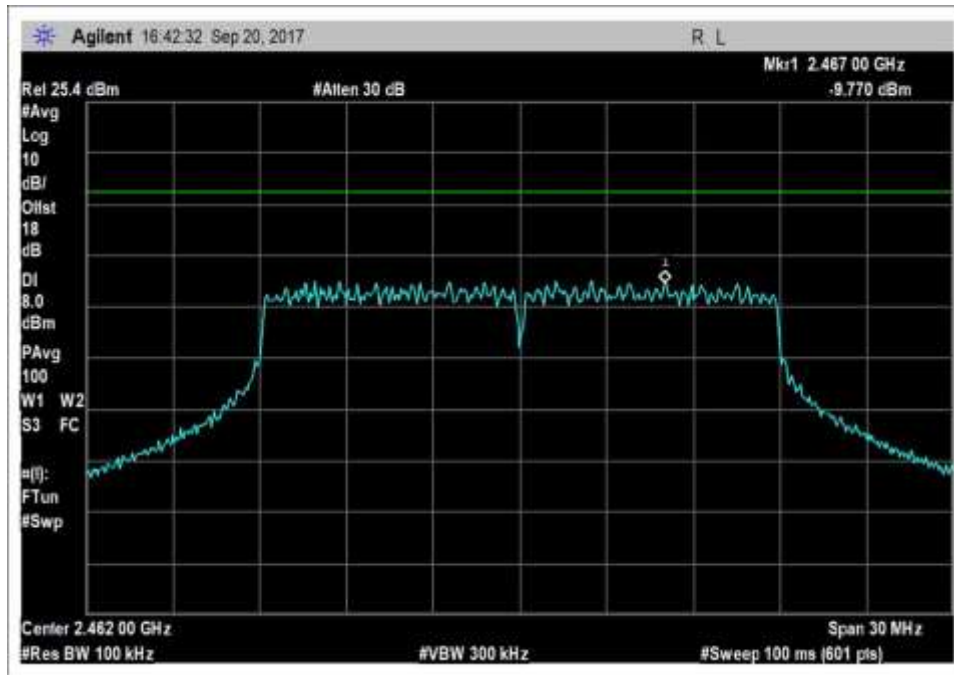




802.11b\_2462MHz



802.11g\_2462MHz



802.11n20\_2462MHz

Test Setup Photo(s)



## 15.247(d) RF Conducted Emissions & Band Edge

See data sheets for test setup and test equipment.

### Test Setup / Conditions / Data

Test Location: CKC Laboratories, Inc • 110 N. Olinda Place • Brea, CA 92821 • 714 993 6112  
 Customer: **Venstar, Inc.**  
 Specification: **15.247(d) Conducted Spurious Emissions**  
 Work Order #: **100430** Date: 9/20/2017  
 Test Type: **Conducted Emissions** Time: 17:36:23  
 Tested By: E. Wong Sequence#: 2  
 Software: EMITest 5.03.02 3.3V DC

#### Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

#### Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

#### Test Conditions / Notes:

The EUT seeking certification stand-alone transmitter. Part of the product is outside the host enclosure with labeling visible during final installation.

The EUT is placed on test bench, connected to a laptop via a USB development board. The Laptop is running TI CC3100/CC3200 Radio tool V.1.2.5942.19689 to place the EUT in test mode

Freq range: 2400-2483.5MHz  
 Tx Freq 2412Mhz, 2442MHz, 2462MHz

802.11b, 11Mbps CCK  
 802.11g, 54Mbps OFDM  
 802.11n (20MHz), 65Mbps MCS07

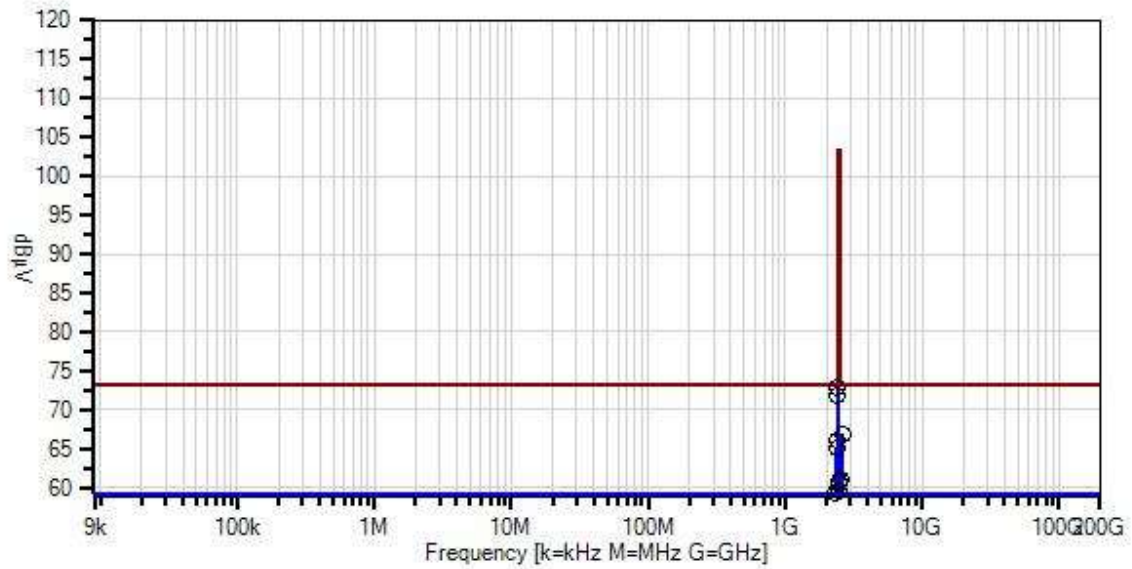
packet size 1400 byte (max) infinite packet (0) Continuous transmit  
 Firmware Power setting (0-15): 0 (max power setting)  
 The EUT has integral antenna with external connector provided to facilitate testing  
 Frequency range of measurement = 9kHz- 25GHz.  
 9kHz-25000MHz RBW=VBW=200kHz  
 Test environment conditions: 25°C, 60% Relative Humidity, 100kPa

All data rates / modulation types were evaluated during preliminary investigation. The test data represents worst case emissions for the investigated operational modes.  
 Test performed at rated power in of 3.3 V.

Site D  
 ANSI C63.10-2013

558074 D01 DTS Meas Guidance v04 April 5, 2017

Venstar, Inc. W/O#: 100430 Sequence#: 2 Date: 9/20/2017  
 15.247(d) Conducted Spurious Emissions Test Lead: 3.3V DC Antenna port



- Sweep Data
  - Peak Readings
  - \* Average Readings
  - Readings
  - \* QP Readings
  - ▼ Ambient
  - 1 - 15.247(d) Conducted Spurious Emissions
- Software Version: 5.03.02

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02869	Spectrum Analyzer	E4440A	8/1/2017	8/1/2018
T2	AN03430	Attenuator	75A-10-12	11/2/2015	11/2/2017
T3	ANP06554	Cable	32022-29094K-29094K-24TC	12/30/2015	12/30/2017

**Measurement Data:**

Reading listed by margin.

Test Lead: Antenna port

#	Freq MHz	Rdng dB $\mu$ V	T1 dB	T2 dB	T3 dB	dB	Dist Table	Corr dB $\mu$ V	Spec dB $\mu$ V	Margin dB	Polar Ant
1	2400.000M	62.1	+0.0	+10.1	+0.5		+0.0	72.7	73.3 band edge L_802.11g	-0.6	Anten
2	2400.000M	61.3	+0.0	+10.1	+0.5		+0.0	71.9	73.3 band edge L_802.11n20	-1.4	Anten
3	2564.500M	50.3	+0.0	+10.1	+0.6		+0.0	61.0	73.3 802.11g	-12.3	Anten
4	2483.500M	50.1	+0.0	+10.1	+0.5		+0.0	60.7	73.3 802.11n20	-12.6	Anten
5	2602.500M	56.0	+0.0	+10.1	+0.6		+0.0	66.7	79.6 802.11b	-12.9	Anten
6	2400.000M	55.5	+0.0	+10.1	+0.5		+0.0	66.1	79.6 802.11b	-13.5	Anten
7	2483.500M	48.9	+0.0	+10.1	+0.5		+0.0	59.5	73.3 802.11g	-13.8	Anten
8	2349.500M	48.6	+0.0	+10.1	+0.5		+0.0	59.2	73.3 802.11g	-14.1	Anten
9	2377.500M	54.5	+0.0	+10.1	+0.5		+0.0	65.1	79.6 802.11b	-14.5	Anten
10	2483.500M	49.9	+0.0	+10.1	+0.5		+0.0	60.5	79.6 802.11b	-19.1	Anten
11	4068.000M	47.5	+0.0	+10.1	+0.7		+0.0	58.3	79.6 802.11b	-21.3	Anten

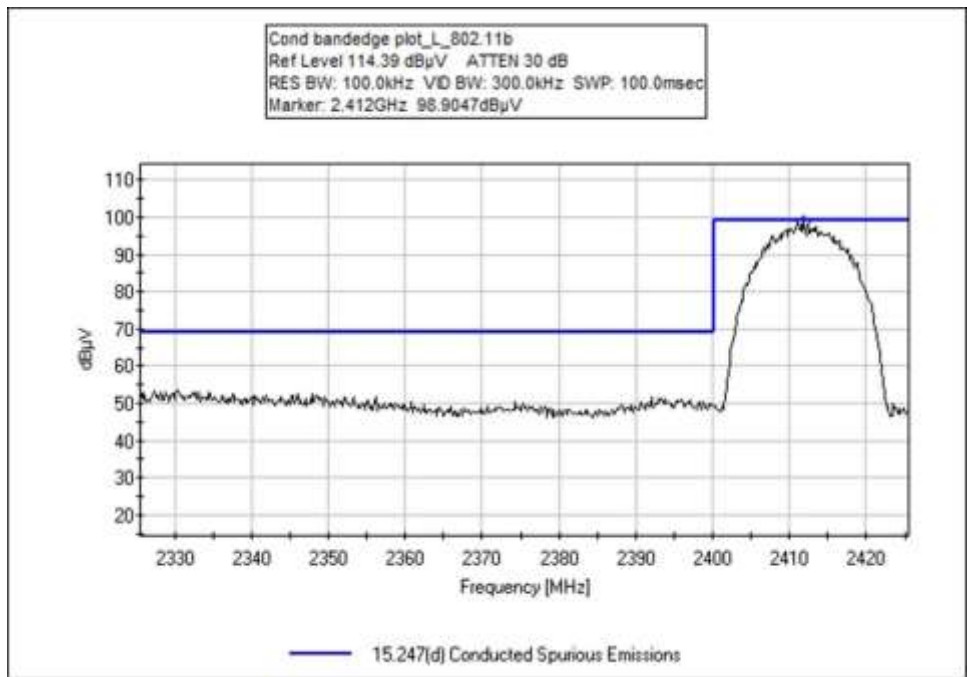
## Band Edge

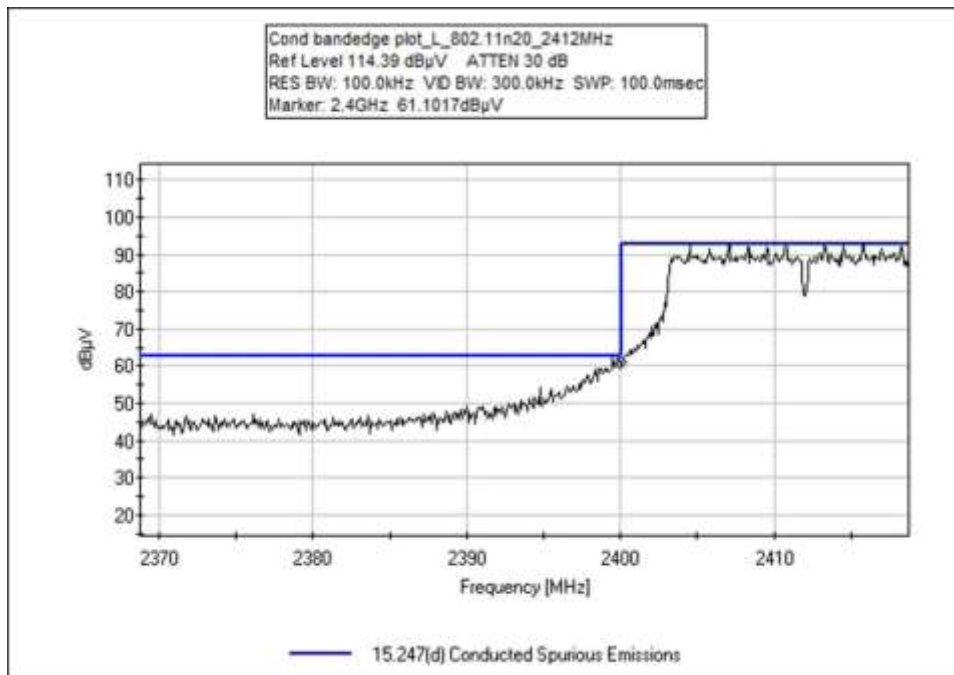
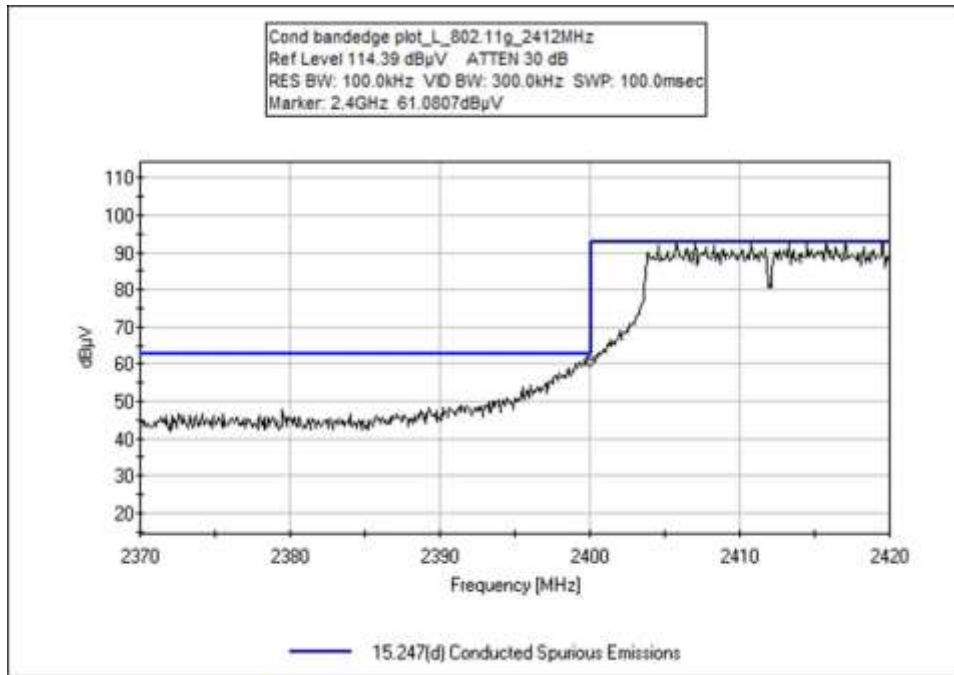
### Band Edge Summary

Limit applied: Max Power/100kHz - 30dB (When average power limit is applied).

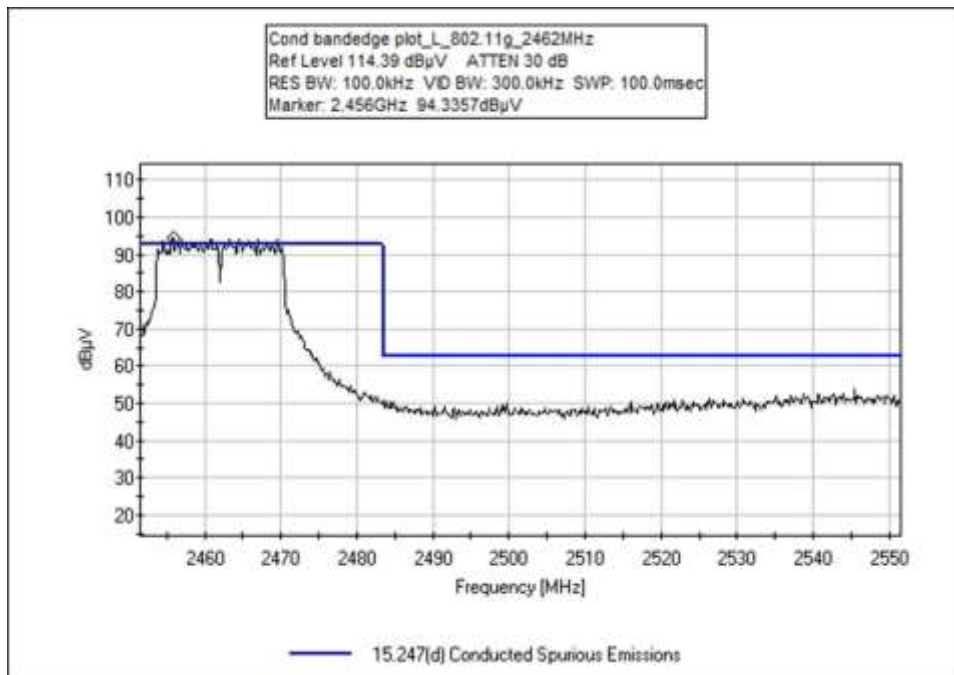
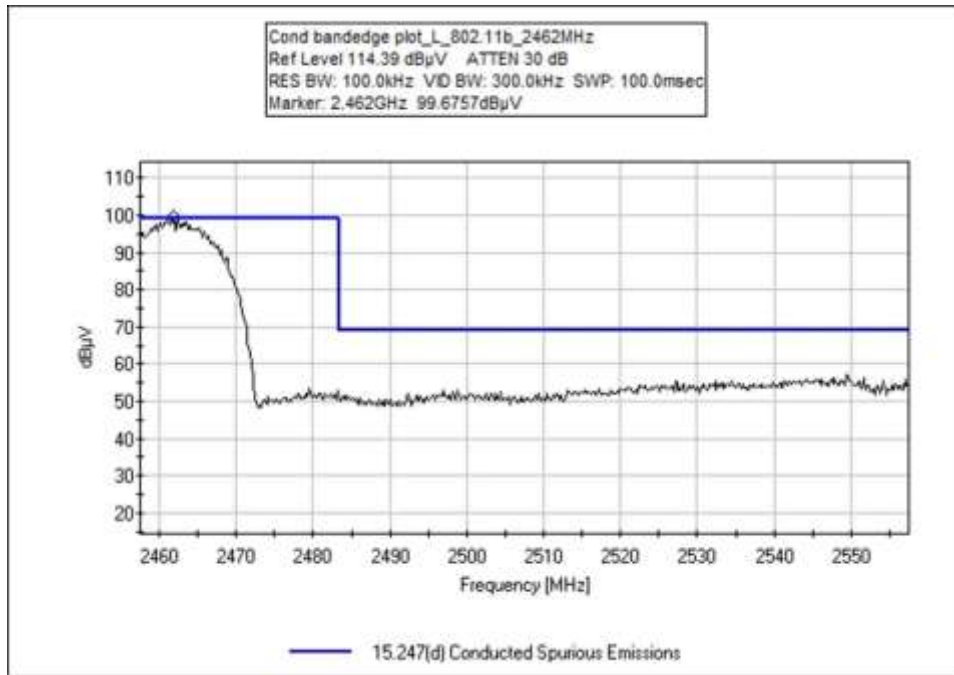
Frequency (MHz)	Modulation	Measured (dBm)	Limit (dBm)	Results
2400.0	802.11b	66.1	<79.6	Pass
2483.5	802.11b	60.5	<79.6	Pass
2400.0	802.11g	72.7	<73.3	Pass
2483.5	802.11g	59.5	<73.3	Pass
2400.0	802.11n20	71.9	<73.3	Pass
2483.5	802.11n20	60.7	<73.3	Pass

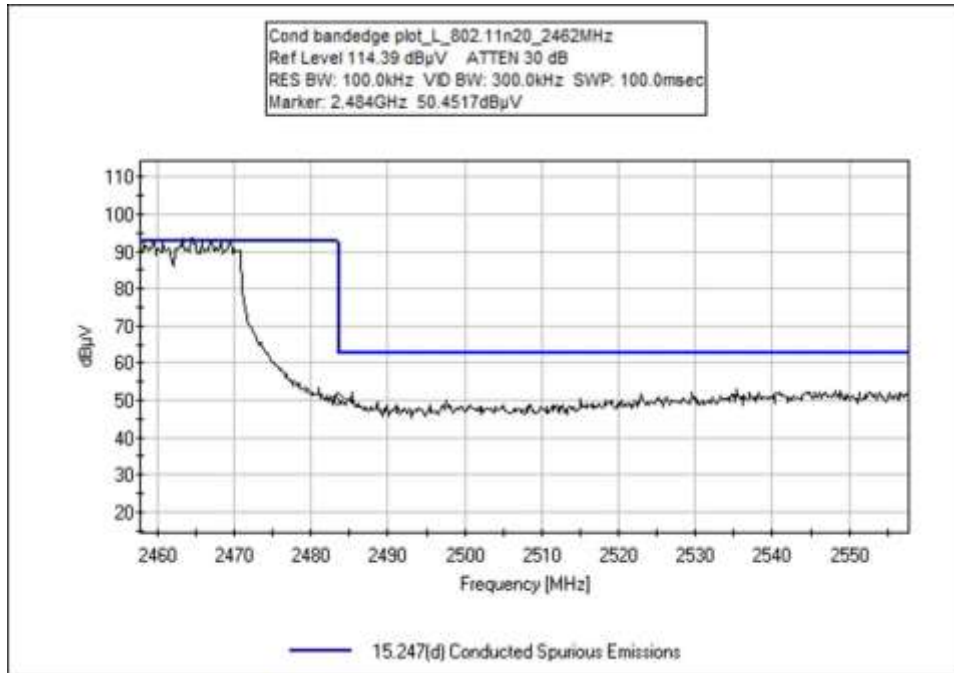
## Band Edge Plots











Test Setup Photo(s)



## 15.247(d) Radiated Emissions & Band Edge

See data sheets for test setup and test equipment.

### Test Setup / Conditions / Data

Test Location: CKC Laboratories, Inc • 110 N. Olinda Place • Brea, CA 92821 • 714 993 6112  
 Customer: **Venstar, Inc.**  
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**  
 Work Order #: **100430** Date: 9/20/2017  
 Test Type: **Radiated Scan** Time: 09:47:17  
 Tested By: E. Wong Sequence#: 6  
 Software: EMITest 5.03.02

***Equipment Tested:***

Device	Manufacturer	Model #	S/N
Configuration 1			

***Support Equipment:***

Device	Manufacturer	Model #	S/N
Configuration 1			

***Test Conditions / Notes:***

The EUT seeking certification as standalone transmitter. Part of the product will stay outside the host enclosure with labeling visible during final installation.

The EUT is placed on Styrofoam platform, connected to a laptop via a USB development board. The Laptop is running TI CC3100/CC3200 Radio tool V.1.2.5942.19689 to place the EUT in test mode

Freq range: 2400-2483.5MHz  
 TX freq: 2412MHz, 2442MHz, 2462MHz

802.11b, 11Mbps CCK  
 802.11g, 54Mbps OFDM  
 802.11n (20MHz), 65Mbps MCS07

packet size 1400 byte (max) infinite packet (0) Continuous transmit  
 Firmware Power setting (0-15): 0 (max power setting)

The EUT has integral antenna with external connector provided to facilitate testing

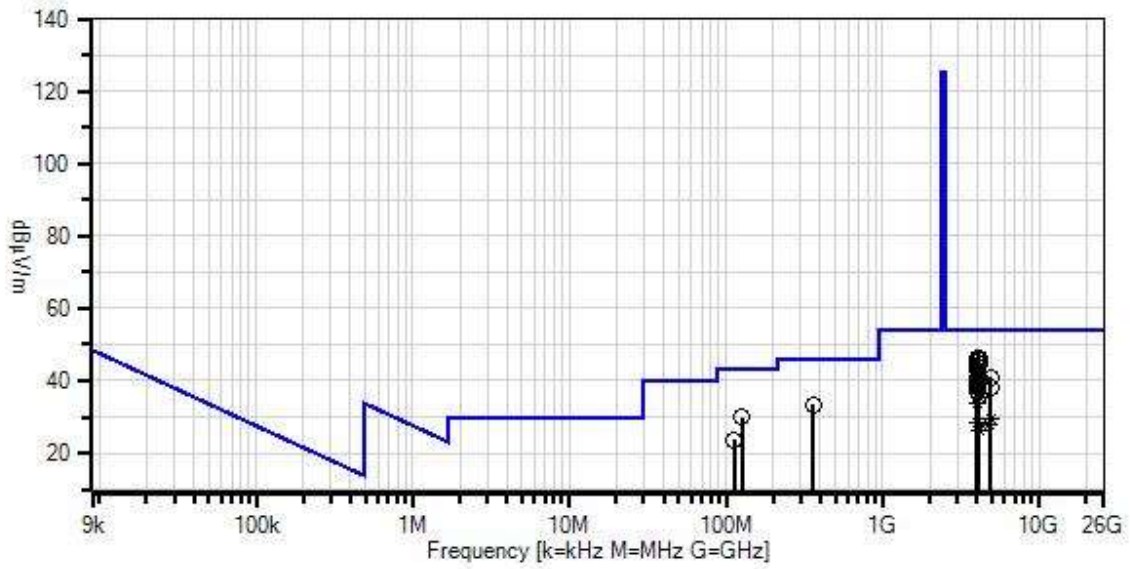
Frequency range of measurement = 9 kHz- 25GHz.  
 9kHz -150kHz; RBW=200Hz, VBW=200Hz; 150kHz-30 MHz; RBW=9kHz, VBW=9 kHz; 30 MHz-1000 MHz; RBW=120 kHz, VBW=120 kHz, 1000 MHz-25000MHz; RBW=1 MHz, VBW=1MHz.  
 Test environment conditions: 25°C, 60% Relative Humidity, 100kPa

All data rates / modulation types were evaluated during preliminary investigation. The test data represents worst case emissions for the investigated operational modes.  
 Test performed at rated power in of 3.3 V.

15.31(e) compliance: the supply voltage was varied between 85% and 115% of the nominal rated supply voltage, no change in the Fundamental signal level was observed.

Site D  
 ANSI C63.10-2013  
 558074 D01 DTS Meas Guidance v04 April 5, 2017

Venstar, Inc. W/O#: 100430 Sequence#: 6 Date: 9/20/2017  
 15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Horiz



- Readings
  - × QP Readings
  - ▼ Ambient
  - 1 - 15.247(d) / 15.209 Radiated Spurious Emissions
  - Peak Readings
  - \* Average Readings
- Software Version: 5.03.02

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02869	Spectrum Analyzer	E4440A	8/1/2017	8/1/2018
T2	AN01646	Horn Antenna	3115	3/4/2016	3/4/2018
T3	ANP06554	Cable	32022-29094K-29094K-24TC	12/30/2015	12/30/2017
T4	AN00787	Preamp	83017A	6/9/2017	6/9/2019
T5	ANP07139	Cable	ANDL1-PNMNM-48	3/1/2017	3/1/2019
T6	ANP04382	Cable	LDF-50	6/6/2016	6/6/2018
T7	AN03385	High Pass Filter	11SH10-3000/T10000-O/O	6/2/2017	6/2/2019
T8	AN01994	Biconilog Antenna	CBL6111C	3/11/2016	3/11/2018
T9	ANP05283	Attenuator	ATT-0218-06-NNN-02	5/5/2016	5/5/2018
T10	ANP05569	Cable-Amplitude +15C to +45C (dB)	RG-214/U	12/7/2016	12/7/2018
T11	AN00010	Preamp	8447D	3/14/2016	3/14/2018
T12	ANP06978	Cable	Sucoflex 104A	4/5/2016	4/5/2018
	AN01413	Horn Antenna	84125-80008	10/7/2016	10/7/2018
	AN00314	Loop Antenna	6502	5/20/2016	5/20/2018

**Measurement Data:**

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dB $\mu$ V	Reading listed by margin				Dist Table	Corr dB $\mu$ V/m	Spec dB $\mu$ V/m	Margin dB	Polar Ant
			T1 dB	T2 dB	T3 dB	T4 dB					
1	4102.830M	44.5	+0.0 +3.9 +0.0	+28.9 +8.0 +0.0	+0.7 +0.3 +0.0	-40.0 +0.0 +0.0	+0.0	46.3	54.0 802.11b_X_2462M Hz	-7.7	Vert
2	4018.500M	44.6	+0.0 +3.9 +0.0	+28.7 +8.0 +0.0	+0.7 +0.3 +0.0	-40.2 +0.0 +0.0	+0.0	46.0	54.0 802.11b_X_2412M Hz	-8.0	Vert
3	4103.000M	43.6	+0.0 +3.9 +0.0	+28.9 +8.0 +0.0	+0.7 +0.3 +0.0	-40.0 +0.0 +0.0	+0.0	45.4	54.0 802.11b_Y_2462M Hz	-8.6	Vert
4	4022.000M	43.7	+0.0 +3.9 +0.0	+28.7 +8.0 +0.0	+0.7 +0.3 +0.0	-40.2 +0.0 +0.0	+0.0	45.1	54.0 802.11b_X_2412M Hz	-8.9	Horiz
5	4103.000M	42.7	+0.0 +3.9 +0.0	+28.9 +8.0 +0.0	+0.7 +0.3 +0.0	-40.0 +0.0 +0.0	+0.0	44.5	54.0 802.11b_Z_2442M Hz	-9.5	Horiz
6	4068.800M	42.3	+0.0 +3.9 +0.0	+28.8 +8.0 +0.0	+0.7 +0.3 +0.0	-40.1 +0.0 +0.0	+0.0	43.9	54.0 802.11b_Y_2442M Hz	-10.1	Vert
7	4068.000M	41.4	+0.0 +3.9 +0.0	+28.8 +8.0 +0.0	+0.7 +0.3 +0.0	-40.1 +0.0 +0.0	+0.0	43.0	54.0 802.11b_X_2442M Hz	-11.0	Vert

8	4018.700M	41.5	+0.0	+28.7	+0.7	-40.2	+0.0	42.9	54.0	-11.1	Horiz
			+3.9	+8.0	+0.3	+0.0			802.11b		
			+0.0	+0.0	+0.0	+0.0			_Y_2412MHz		
9	359.950M	34.5	+0.0	+0.0	+0.0	+0.0	+0.0	33.5	46.0	-12.5	Horiz
			+0.0	+2.0	+0.0	+15.9					
			+5.8	+2.0	-27.0	+0.3					
10	4103.667M	39.2	+0.0	+28.9	+0.7	-40.0	+0.0	41.0	54.0	-13.0	Vert
			+3.9	+8.0	+0.3	+0.0			802.11b_Z_2462M		
			+0.0	+0.0	+0.0	+0.0			Hz		
11	4069.300M	39.4	+0.0	+28.8	+0.7	-40.1	+0.0	41.0	54.0	-13.0	Vert
			+3.9	+8.0	+0.3	+0.0			802.11b_Z_2442M		
			+0.0	+0.0	+0.0	+0.0			Hz		
12	4883.700M	36.3	+0.0	+30.0	+0.8	-39.7	+0.0	40.9	54.0	-13.1	Horiz
			+4.3	+8.9	+0.3	+0.0			802.11b_Z_2442M		
			+0.0	+0.0	+0.0	+0.0			Hz		
13	125.980M	36.5	+0.0	+0.0	+0.0	+0.0	+0.0	29.9	43.5	-13.6	Horiz
			+0.0	+1.1	+0.0	+12.2					
			+5.8	+1.1	-27.0	+0.2					
14	4020.300M	38.9	+0.0	+28.7	+0.7	-40.2	+0.0	40.3	54.0	-13.7	Vert
			+3.9	+8.0	+0.3	+0.0			802.11b_Z_2412M		
			+0.0	+0.0	+0.0	+0.0			Hz		
15	4102.600M	38.1	+0.0	+28.9	+0.7	-40.0	+0.0	39.9	54.0	-14.1	Horiz
			+3.9	+8.0	+0.3	+0.0			802.11n20_Y_2462		
			+0.0	+0.0	+0.0	+0.0			MHz		
16	4106.650M	38.1	+0.0	+28.9	+0.7	-40.0	+0.0	39.9	54.0	-14.1	Vert
			+3.9	+8.0	+0.3	+0.0			802.11g_Y_2462M		
			+0.0	+0.0	+0.0	+0.0			Hz		
17	4103.700M	38.0	+0.0	+28.9	+0.7	-40.0	+0.0	39.8	54.0	-14.2	Horiz
			+3.9	+8.0	+0.3	+0.0			802.11b_X_2462M		
			+0.0	+0.0	+0.0	+0.0			Hz		
18	4025.000M	38.2	+0.0	+28.7	+0.7	-40.2	+0.0	39.6	54.0	-14.4	Horiz
			+3.9	+8.0	+0.3	+0.0			802.11g_Y_2412M		
			+0.0	+0.0	+0.0	+0.0			Hz		
19	4012.000M	37.7	+0.0	+28.6	+0.7	-40.2	+0.0	39.0	54.0	-15.0	Vert
			+3.9	+8.0	+0.3	+0.0			802.11g_Y_2412M		
			+0.0	+0.0	+0.0	+0.0			Hz		
20	4012.000M	37.7	+0.0	+28.6	+0.7	-40.2	+0.0	39.0	54.0	-15.0	Horiz
			+3.9	+8.0	+0.3	+0.0			802.11n20_Y_2412		
			+0.0	+0.0	+0.0	+0.0			MHz		
21	4069.000M	37.4	+0.0	+28.8	+0.7	-40.1	+0.0	39.0	54.0	-15.0	Vert
			+3.9	+8.0	+0.3	+0.0			802.11g_Y_2442M		
			+0.0	+0.0	+0.0	+0.0			Hz		
22	4068.000M	37.1	+0.0	+28.8	+0.7	-40.1	+0.0	38.7	54.0	-15.3	Horiz
			+3.9	+8.0	+0.3	+0.0			802.11g_Y_2442M		
			+0.0	+0.0	+0.0	+0.0			Hz		
23	4886.700M	33.7	+0.0	+30.0	+0.8	-39.7	+0.0	38.3	54.0	-15.7	Horiz
			+4.3	+8.9	+0.3	+0.0			802.11b_X_2412M		
			+0.0	+0.0	+0.0	+0.0			Hz		
24	4069.000M	36.3	+0.0	+28.8	+0.7	-40.1	+0.0	37.9	54.0	-16.1	Horiz
			+3.9	+8.0	+0.3	+0.0			802.11n20_Y_2442		
			+0.0	+0.0	+0.0	+0.0			MHz		

25	4081.000M	35.2	+0.0	+28.8	+0.7	-40.0	+0.0	36.9	54.0	-17.1	Vert
			+3.9	+8.0	+0.3	+0.0			802.11n20_Y_2462		
			+0.0	+0.0	+0.0	+0.0			MHz		
26	4072.000M	35.2	+0.0	+28.8	+0.7	-40.1	+0.0	36.8	54.0	-17.2	Vert
			+3.9	+8.0	+0.3	+0.0			802.11n20_Y_2442		
			+0.0	+0.0	+0.0	+0.0			MHz		
27	4020.000M	35.2	+0.0	+28.7	+0.7	-40.2	+0.0	36.6	54.0	-17.4	Horiz
	Ave		+3.9	+8.0	+0.3	+0.0			802.11b_Z_2412M		
			+0.0	+0.0	+0.0	+0.0			Hz		
^	4020.000M	46.8	+0.0	+28.7	+0.7	-40.2	+0.0	48.2	54.0	-5.8	Horiz
			+3.9	+8.0	+0.3	+0.0			802.11b_Z_2412M		
			+0.0	+0.0	+0.0	+0.0			Hz		
29	4070.000M	34.8	+0.0	+28.8	+0.7	-40.1	+0.0	36.4	54.0	-17.6	Horiz
	Ave		+3.9	+8.0	+0.3	+0.0			802.11b_Y_2442M		
			+0.0	+0.0	+0.0	+0.0			Hz		
^	4070.000M	46.9	+0.0	+28.8	+0.7	-40.1	+0.0	48.5	54.0	-5.5	Horiz
			+3.9	+8.0	+0.3	+0.0			802.11b_Y_2442M		
			+0.0	+0.0	+0.0	+0.0			Hz		
^	4070.000M	41.8	+0.0	+28.8	+0.7	-40.1	+0.0	43.4	54.0	-10.6	Horiz
			+3.9	+8.0	+0.3	+0.0			802.11b_X_2442M		
			+0.0	+0.0	+0.0	+0.0			Hz		
32	4130.000M	34.0	+0.0	+29.0	+0.8	-40.0	+0.0	36.2	54.0	-17.8	Vert
			+4.0	+8.1	+0.3	+0.0			802.11n20_Y_2412		
			+0.0	+0.0	+0.0	+0.0			MHz		
33	4102.000M	33.8	+0.0	+28.9	+0.7	-40.0	+0.0	35.6	54.0	-18.4	Horiz
	Ave		+3.9	+8.0	+0.3	+0.0			802.11b_Y_2462M		
			+0.0	+0.0	+0.0	+0.0			Hz		
^	4102.000M	46.0	+0.0	+28.9	+0.7	-40.0	+0.0	47.8	54.0	-6.2	Horiz
			+3.9	+8.0	+0.3	+0.0			802.11b_Y_2462M		
			+0.0	+0.0	+0.0	+0.0			Hz		
35	112.150M	31.1	+0.0	+0.0	+0.0	+0.0	+0.0	23.6	43.5	-19.9	Horiz
			+0.0	+1.1	+0.0	+11.4					
			+5.8	+1.0	-27.0	+0.2					
36	4068.667M	32.2	+0.0	+28.8	+0.7	-40.1	+0.0	33.8	54.0	-20.2	Horiz
	Ave		+3.9	+8.0	+0.3	+0.0			802.11b_Z_2442M		
			+0.0	+0.0	+0.0	+0.0			Hz		
^	4068.667M	45.1	+0.0	+28.8	+0.7	-40.1	+0.0	46.7	54.0	-7.3	Horiz
			+3.9	+8.0	+0.3	+0.0			802.11b_Z_2442M		
			+0.0	+0.0	+0.0	+0.0			Hz		
38	4883.667M	24.9	+0.0	+30.0	+0.8	-39.7	+0.0	29.5	54.0	-24.5	Vert
	Ave		+4.3	+8.9	+0.3	+0.0			802.11b_Z_2442M		
			+0.0	+0.0	+0.0	+0.0			Hz		
39	4019.500M	27.0	+0.0	+28.7	+0.7	-40.2	+0.0	28.4	54.0	-25.6	Vert
	Ave		+3.9	+8.0	+0.3	+0.0			802.11b		
			+0.0	+0.0	+0.0	+0.0			_Y_2412MHz		
^	4019.500M	39.1	+0.0	+28.7	+0.7	-40.2	+0.0	40.5	54.0	-13.5	Vert
			+3.9	+8.0	+0.3	+0.0			802.11b		
			+0.0	+0.0	+0.0	+0.0			_Y_2412MHz		
41	4823.333M	23.8	+0.0	+30.0	+0.8	-39.8	+0.0	28.1	54.0	-25.9	Horiz
	Ave		+4.2	+8.8	+0.3	+0.0			802.11b_Z_2412M		
			+0.0	+0.0	+0.0	+0.0			Hz		

^	4823.300M	37.3	+0.0	+30.0	+0.8	-39.8	+0.0	41.6	54.0	-12.4	Horiz
			+4.2	+8.8	+0.3	+0.0			802.11b_Z_2412M		
			+0.0	+0.0	+0.0	+0.0			Hz		
43	4106.000M	24.5	+0.0	+28.9	+0.7	-40.0	+0.0	26.3	54.0	-27.7	Horiz
	Ave		+3.9	+8.0	+0.3	+0.0			802.11g_Y_2462M		
			+0.0	+0.0	+0.0	+0.0			Hz		
^	4106.000M	38.7	+0.0	+28.9	+0.7	-40.0	+0.0	40.5	54.0	-13.5	Horiz
			+3.9	+8.0	+0.3	+0.0			802.11g_Y_2462M		
			+0.0	+0.0	+0.0	+0.0			Hz		



**Band Edge**

**Band Edge Summary**

Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
2390.0	802.11b	Integral	47.4	<54	Pass
2400.0	802.11b	Integral	52.0	<64.8	Pass
2483.5	802.11b	Integral	44.4	< 54	Pass
2390.0	802.11g	Integral	27.5	<54	Pass
2400.0	802.11g	Integral	50.4 *	<51.6 *	Pass
2483.5	802.11g	Integral	26.3 ave	< 54	Pass
2390.0	802.11n20	Integral	26.2 ave	<54	Pass
2400.0	802.11n20	Integral	53.4*	<59	Pass
2483.5	802.11n20	integral	24.6 ave	< 54	Pass

\* Measurement made with RBW=100kHz

**Test Setup / Conditions / Data**

Test Location: CKC Laboratories, Inc • 110 N. Olinda Place • Brea, CA 92821 • 714 993 6112  
 Customer: **Venstar, Inc.**  
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**  
 Work Order #: **100430** Date: 9/19/2017  
 Test Type: **Radiated Scan** Time: 19:44:01  
 Tested By: E. Wong Sequence#: 6  
 Software: EMITest 5.03.02

**Equipment Tested:**

Device	Manufacturer	Model #	S/N
Configuration 1			

**Support Equipment:**

Device	Manufacturer	Model #	S/N
Configuration 1			

***Test Conditions / Notes:***

The EUT seeking certification as stand alone transmitter. Part of the product will stay outside the host enclosure with labeling visible during final installation.

The EUT is placed on Styrofoam platform, connected to a laptop via a USB development board.. The Laptop is running TI CC3100/CC3200 Radio tool V.1.2.5942.19689 to place the EUT in test mode

Freq range: 2400-2483.5MHz

802.11b, 11Mbps CCK

802.11g, 54Mbps OFDM

802.11n (20MHz), 65Mbps MCS07

Packet size 1400 byte (max) infinite packet (0) Continuous transmit

Firmware Power setting (0-15): 0 (max power setting)

The EUT has integral antenna with external connector provided to facilitate testing

Frequency range of measurement = 2390-2655MHz. RBW=1 MHz, VBW=1MHz.

Test environment conditions: 25°C, 60% Relative Humidity, 100kPa

All data rates / modulation types were evaluated during preliminary investigation. The test data represents worst case emissions for the investigated operational modes.

Test performed at rated power in of 3.3 V.

Site D

ANSI C63.10-2013

558074 D01 DTS Meas Guidance v04 April 5, 2017

Venstar, Inc. W/O#: 100430 Sequence#: 6 Date: 9/19/2017  
 15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Horiz



- Readings
  - × QP Readings
  - ▼ Ambient
  - 1 - 15.247(d) / 15.209 Radiated Spurious Emissions
  - Peak Readings
  - \* Average Readings
- Software Version: 5.03.02

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02869	Spectrum Analyzer	E4440A	8/1/2017	8/1/2018
T2	AN01646	Horn Antenna	3115	3/4/2016	3/4/2018
T3	ANP06554	Cable	32022-29094K-29094K-24TC	12/30/2015	12/30/2017
T4	AN00787	Preamp	83017A	6/9/2017	6/9/2019
T5	ANP07139	Cable	ANDL1-PNMNM-48	3/1/2017	3/1/2019
T6	ANP04382	Cable	LDF-50	6/6/2016	6/6/2018

**Measurement Data:**

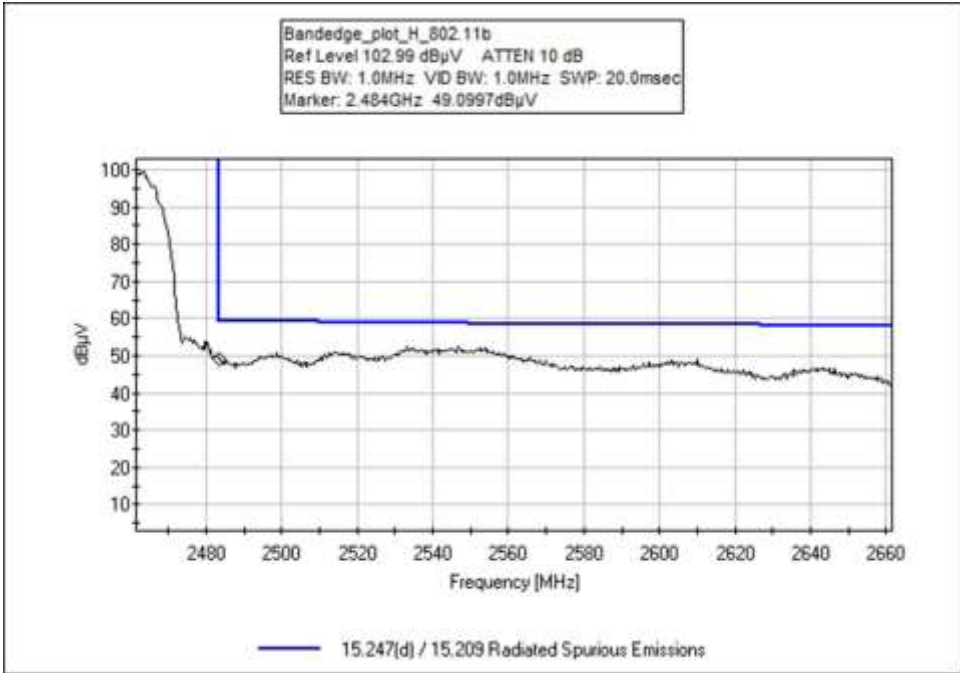
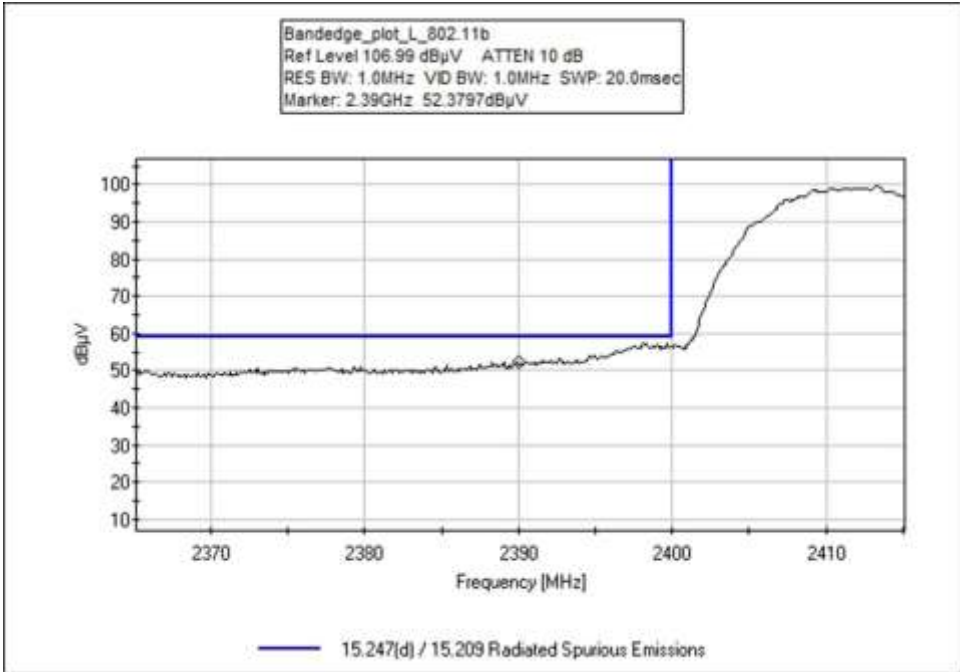
Reading listed by margin.

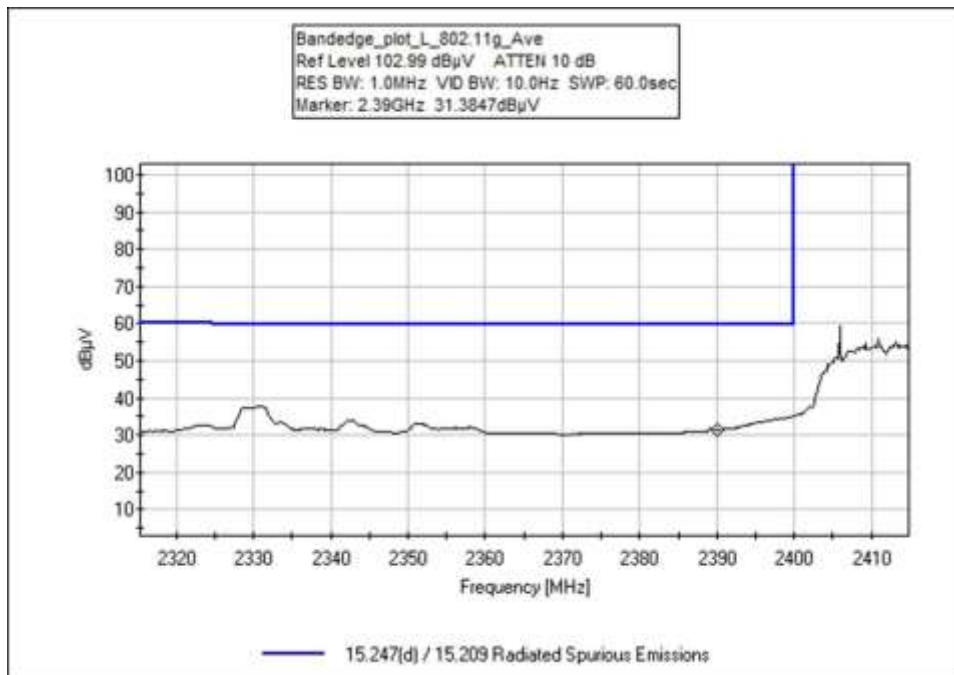
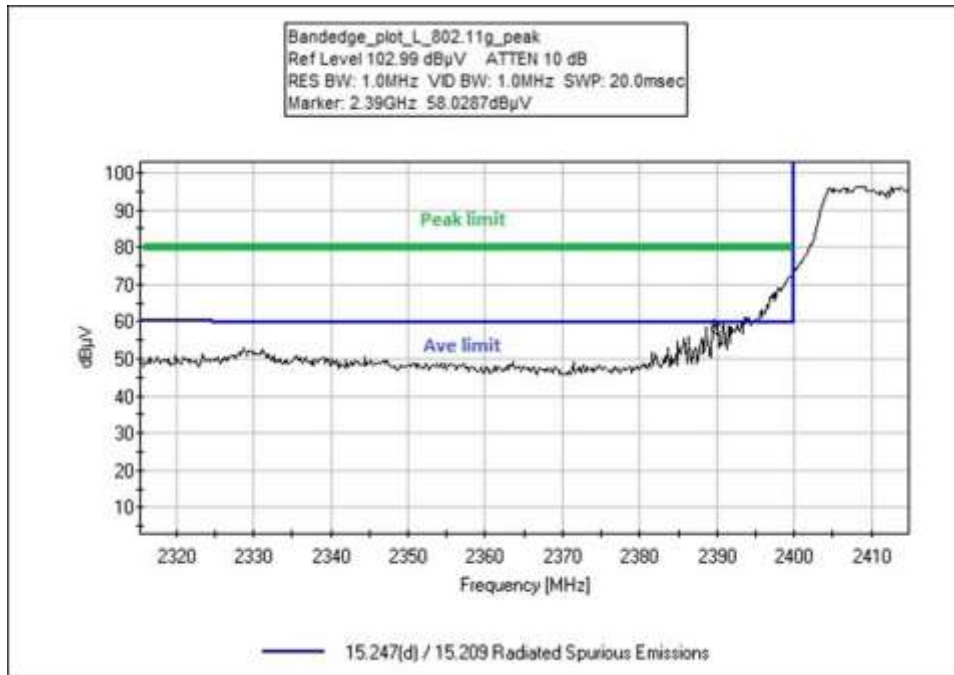
Test Distance: 3 Meters

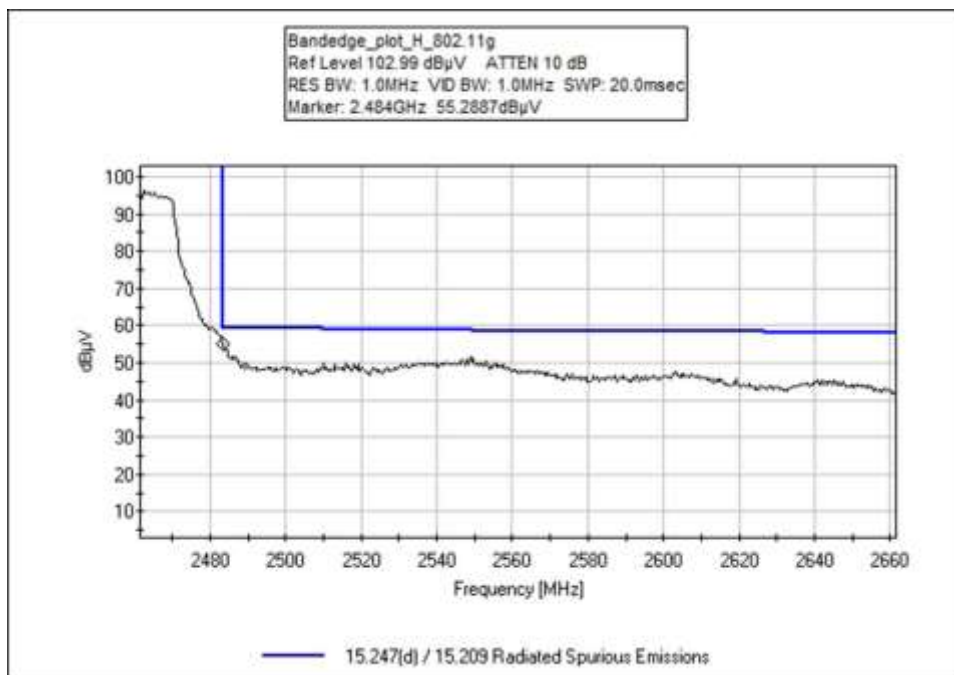
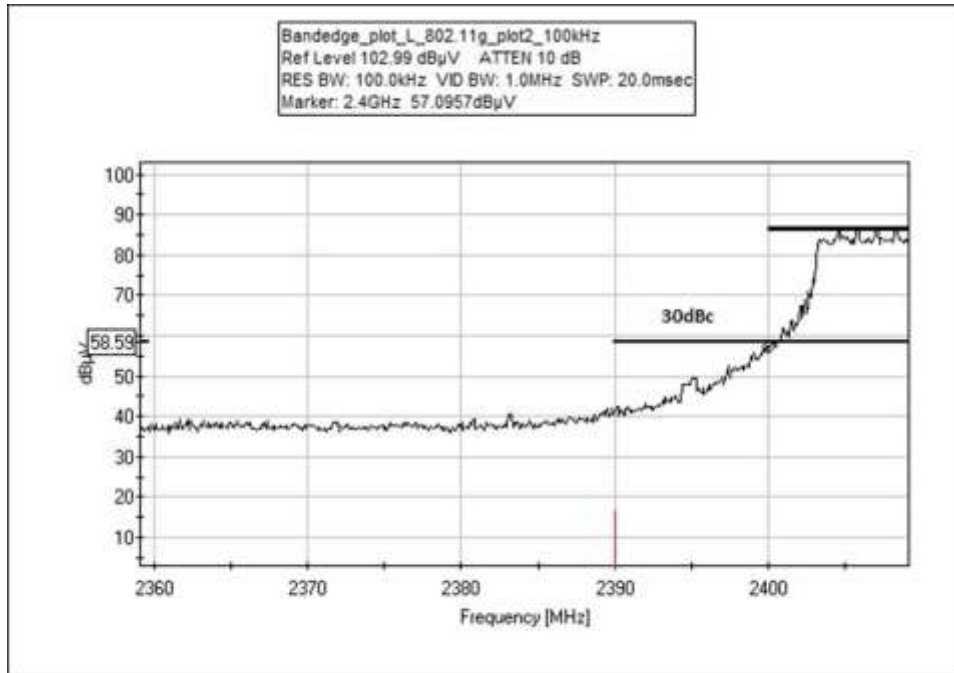
#	Freq MHz	Rdng dB $\mu$ V	T1 T5 dB	T2 T6 dB	T3 dB	T4 dB	Dist Table	Corr dB $\mu$ V/m	Spec dB $\mu$ V/m	Margin dB	Polar Ant
1	2655.000M	44.9	+0.0 +3.2	+26.0 +6.4	+0.6	-40.2	+0.0	40.9	54.0 bandedge H 802.11b	-13.1	Horiz
2	2400.000M Ave	44.8	+0.0 +2.9	+25.0 +6.0	+0.5	-40.0	+0.0	39.2	54.0 bandedge_L_802.1 1g	-14.8	Horiz
3	2655.000M	43.0	+0.0 +3.2	+26.0 +6.4	+0.6	-40.2	+0.0	39.0	54.0 bandedge H 802.11g	-15.0	Horiz
4	2655.000M	39.7	+0.0 +3.2	+26.0 +6.4	+0.6	-40.2	+0.0	35.7	54.0 bandedge_H_802.1 1n20	-18.3	Horiz
5	2400.000M Ave	40.9	+0.0 +2.9	+25.0 +6.0	+0.5	-40.0	+0.0	35.3	54.0 bandedge L 802.11n20	-18.7	Horiz
^	2400.000M	73.7	+0.0 +2.9	+25.0 +6.0	+0.5	-40.0	+0.0	68.1	54.0 bandedge_L_802.1 1g	+14.1	Horiz
^	2400.000M	72.8	+0.0 +2.9	+25.0 +6.0	+0.5	-40.0	+0.0	67.2	54.0 bandedge L 802.11n20	+13.2	Horiz
^	2400.000M	59.0	+0.0 +2.9	+25.0 +6.0	+0.5	-40.0	+0.0	53.4	54.0 bandedge L 802.11n20_rbw=10 0kHz	-0.6	Horiz
^	2400.000M	57.0	+0.0 +2.9	+25.0 +6.0	+0.5	-40.0	+0.0	51.4	54.0 bandedge L 802.11b	-2.6	Horiz
^	2400.000M	56.0	+0.0 +2.9	+25.0 +6.0	+0.5	-40.0	+0.0	50.4	54.0 bandedge_L_802.1 1g_RBW=100kHz	-3.6	Horiz

11	2390.000M Ave	32.8	+0.0 +2.9	+25.0 +6.0	+0.5	-40.0	+0.0	27.2	54.0	-26.8	Horiz
									bandedge_L_802.1 1g		
12	2483.500M Ave	31.6	+0.0 +3.1	+25.2 +6.1	+0.5	-40.2	+0.0	26.3	54.0	-27.7	Horiz
									bandedge H 802.11g		
13	2390.000M Ave	31.8	+0.0 +2.9	+25.0 +6.0	+0.5	-40.0	+0.0	26.2	54.0	-27.8	Horiz
									bandedge L 802.11n20		
^	2390.000M	61.1	+0.0 +2.9	+25.0 +6.0	+0.5	-40.0	+0.0	55.5	54.0	+1.5	Horiz
									bandedge_L_802.1 1g		
^	2390.000M	52.4	+0.0 +2.9	+25.0 +6.0	+0.5	-40.0	+0.0	46.8	54.0	-7.2	Horiz
									bandedge L 802.11b		
^	2390.000M	50.7	+0.0 +2.9	+25.0 +6.0	+0.5	-40.0	+0.0	45.1	54.0	-8.9	Horiz
									bandedge L 802.11n20		
17	2483.500M Ave	29.9	+0.0 +3.1	+25.2 +6.1	+0.5	-40.2	+0.0	24.6	54.0	-29.4	Horiz
									bandedge_H_802.1 1n20		
^	2483.500M	54.4	+0.0 +3.1	+25.2 +6.1	+0.5	-40.2	+0.0	49.1	54.0	-4.9	Horiz
									bandedge H 802.11g		
^	2483.500M	49.7	+0.0 +3.1	+25.2 +6.1	+0.5	-40.2	+0.0	44.4	54.0	-9.6	Horiz
									bandedge H 802.11b		
^	2483.500M	45.5	+0.0 +3.1	+25.2 +6.1	+0.5	-40.2	+0.0	40.2	54.0	-13.8	Horiz
									bandedge_H_802.1 1n20		

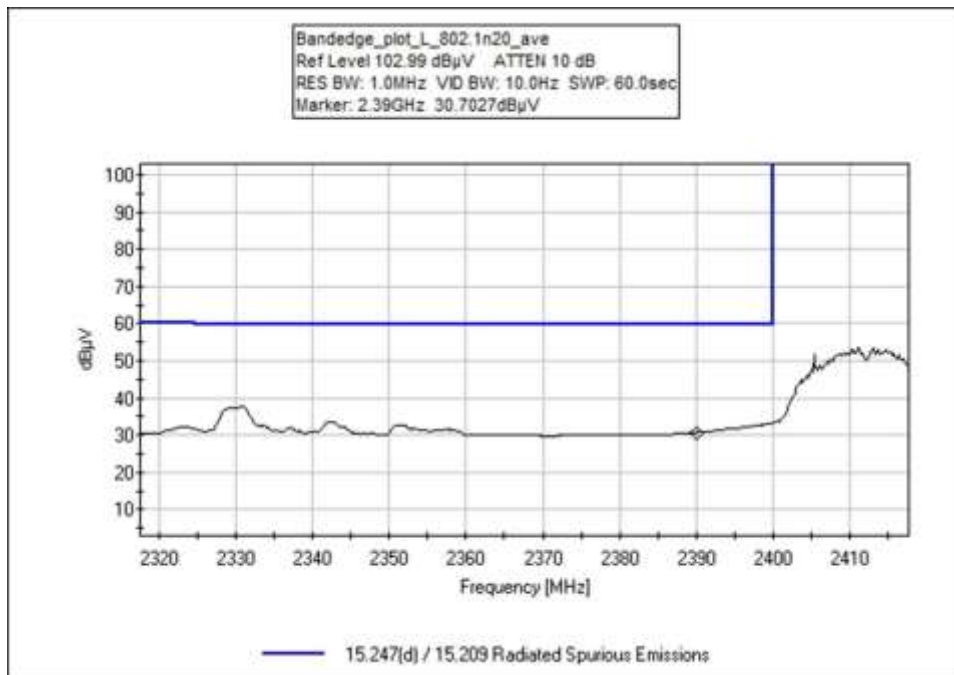
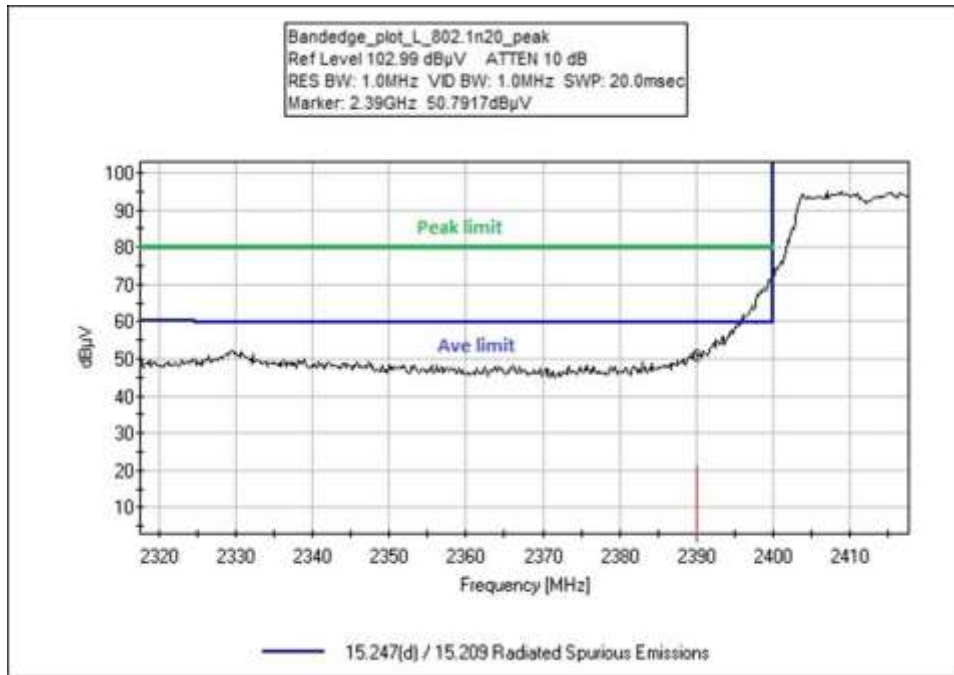
**Band Edge Plots**

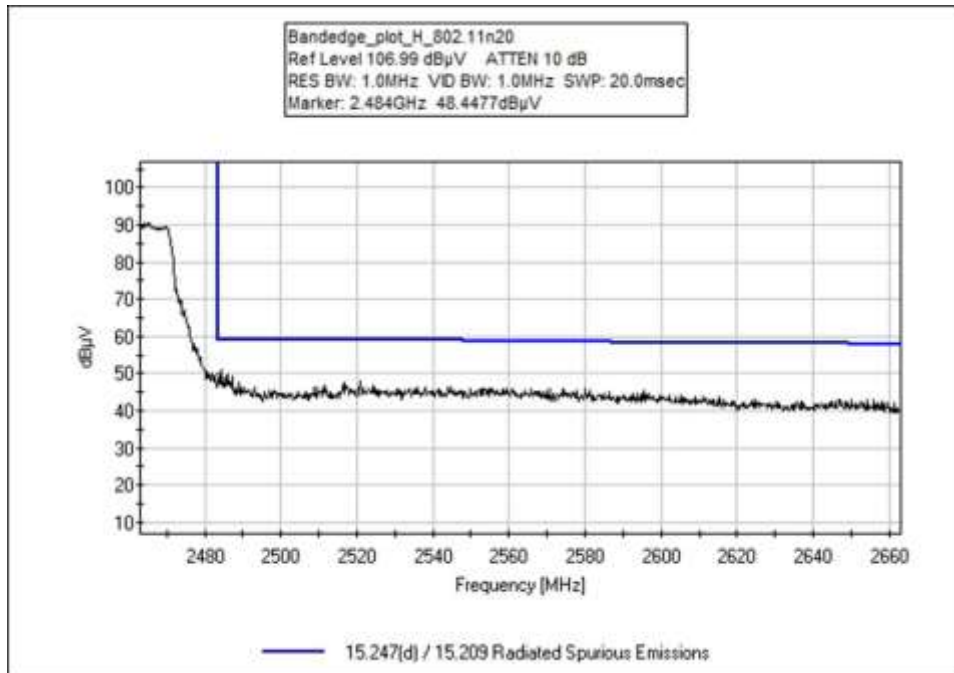
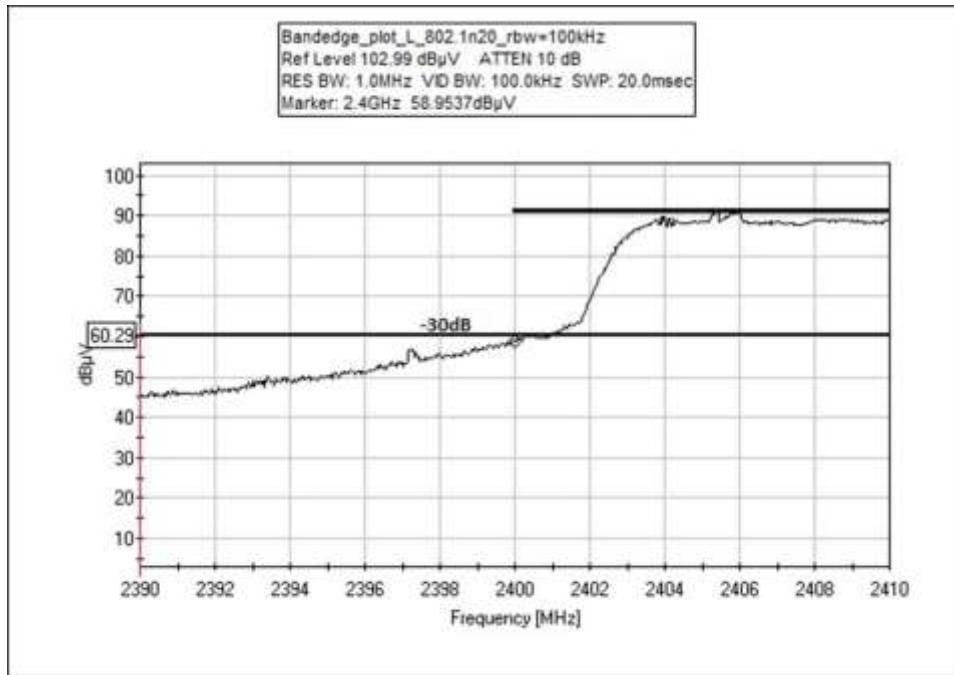




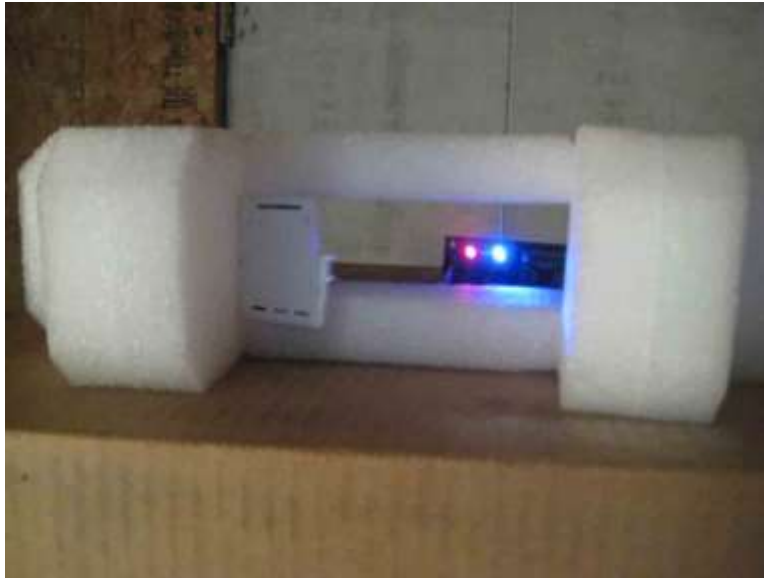








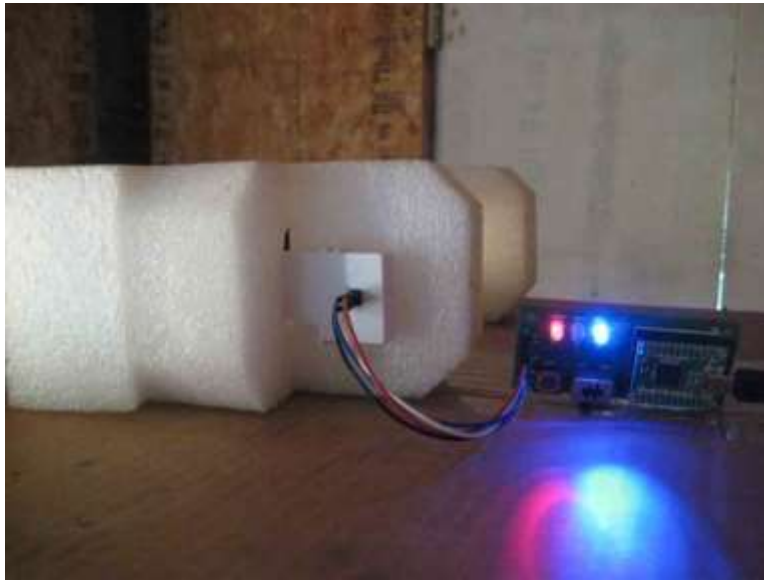
Test Setup Photo(s)



X Axis



Y Axis



Z Axis



Below 1GHz



Below 1GHz



Above 1GHz



Above 1GHz



Above 1GHz

## 15.207 AC Conducted Emissions

See data sheets for test setup and test equipment.

### Test Setup / Conditions / Data

Test Location: CKC Laboratories, Inc • 110 N. Olinda Place • Brea, CA 92821 • 714 993 6112  
 Customer: **Venstar, Inc.**  
 Specification: **15.207 AC Mains - Average**  
 Work Order #: **100430** Date: 9/20/2017  
 Test Type: **Conducted Emissions** Time: 8:15:20 PM  
 Tested By: E. Wong Sequence#: 10  
 Software: EMITest 5.03.02 110V 60Hz

#### Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

#### Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

#### Test Conditions / Notes:

The EUT seeking certification standalone transmitter. Part of the product is outside the host enclosure with labeling visible during final installation.

The EUT is placed on the test bench, connected to a laptop via a USB development board. The Laptop is running TI CC3100/CC3200 Radio tool V.1.2.5942.19689 to place the EUT in test mode

Freq range: 2400-2483.5MHz

Tx Freq 2442MHz,

802.11b, 11Mbps CCK

packet size 1400 byte (max) infinite packet (0) Continuous transmit

Firmware Power setting (0-15): 0 ( max power setting)

Frequency range of measurement = 150kHz- 30MHz.

150 kHz-30 MHz; RBW=9 kHz, VBW=9kHz

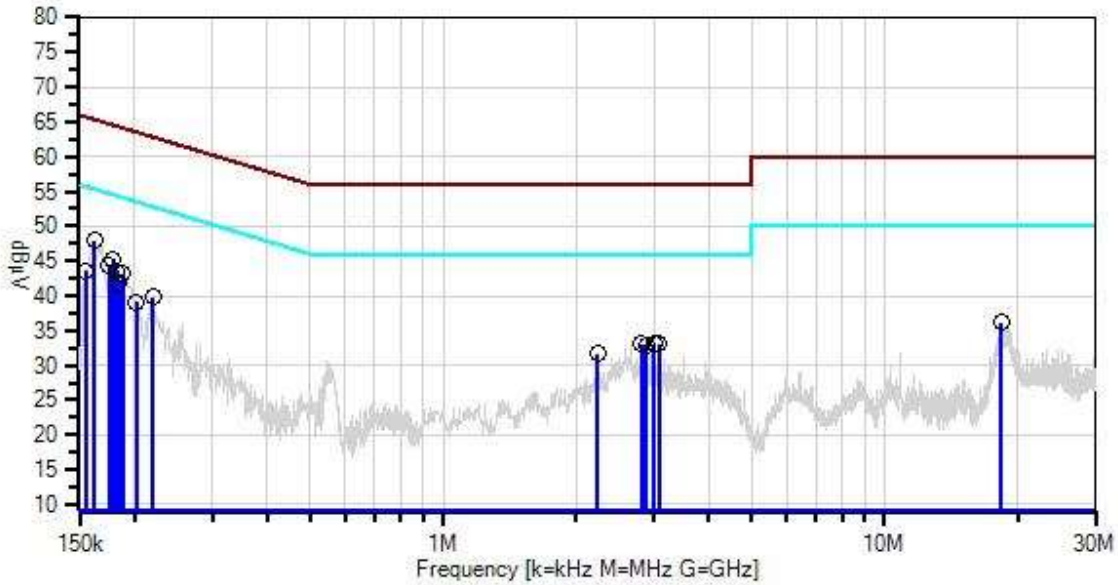
Test environment conditions: 25°C, 60% Relative Humidity, 100kPa

Test performed at rated power in of 3.3 V. AC Conducted emission evaluated at AC Main of the support laptop.

Site D

ANSI C63.10-2013

Venstar, Inc. WO#: 100430 Sequence#: 10 Date: 9/20/2017  
 15.207 AC Mains - Average Test Lead: 110V 60Hz L1-Line



— Sweep Data  
 × QP Readings  
 Software Version: 5.03.02  
 — Readings  
 \* Average Readings  
 ○ Peak Readings  
 ▼ Ambient  
 — 1 - 15.207 AC Mains - Average  
 — 2 - 15.207 AC Mains - Quasi-peak



**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02869	Spectrum Analyzer	E4440A	8/1/2017	8/1/2018
T1	AN02343	High Pass Filter	HE9615-150K-50-720B	1/25/2017	1/25/2019
T2	ANP01910	Cable	RG-142	11/30/2015	11/30/2017
T3	ANP06085	Attenuator	SA18N10W-09	11/14/2016	11/14/2018
T4	AN00969A	50uH LISN-Line 1 (L1)	3816/2NM	3/14/2017	3/14/2019
	AN00969A	50uH LISN-Line2 (L2)	3816/2NM	3/14/2017	3/14/2019

**Measurement Data:**

Reading listed by margin.

Test Lead: L1-Line

#	Freq MHz	Rdng dB $\mu$ V	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dB $\mu$ V	Spec dB $\mu$ V	Margin dB	Polar Ant
1	162.362k	41.8	+0.5	+0.0	+5.7	+0.0	+0.0	48.0	55.3	-7.3	L1-Li
2	179.088k	39.1	+0.3	+0.0	+5.7	+0.0	+0.0	45.1	54.5	-9.4	L1-Li
3	175.452k	38.4	+0.3	+0.0	+5.7	+0.0	+0.0	44.4	54.7	-10.3	L1-Li
4	182.724k	37.6	+0.3	+0.0	+5.7	+0.0	+0.0	43.6	54.4	-10.8	L1-Li
5	188.541k	37.3	+0.2	+0.0	+5.7	+0.0	+0.0	43.2	54.1	-10.9	L1-Li
6	155.090k	37.0	+0.9	+0.0	+5.7	+0.0	+0.0	43.6	55.7	-12.1	L1-Li
7	184.178k	35.9	+0.3	+0.0	+5.7	+0.0	+0.0	41.9	54.3	-12.4	L1-Li
8	3.080M	27.2	+0.1	+0.0	+5.7	+0.1	+0.0	33.1	46.0	-12.9	L1-Li
9	3.008M	27.2	+0.1	+0.0	+5.7	+0.1	+0.0	33.1	46.0	-12.9	L1-Li
10	219.811k	33.9	+0.2	+0.0	+5.7	+0.0	+0.0	39.8	52.8	-13.0	L1-Li
11	2.816M	27.2	+0.1	+0.0	+5.7	+0.0	+0.0	33.0	46.0	-13.0	L1-Li
12	2.880M	27.1	+0.1	+0.0	+5.7	+0.0	+0.0	32.9	46.0	-13.1	L1-Li
13	18.328M	29.9	+0.1	+0.1	+5.7	+0.3	+0.0	36.1	50.0	-13.9	L1-Li
14	2.242M	25.9	+0.1	+0.0	+5.7	+0.0	+0.0	31.7	46.0	-14.3	L1-Li
15	202.358k	33.2	+0.2	+0.0	+5.7	+0.0	+0.0	39.1	53.5	-14.4	L1-Li



Test Location: CKC Laboratories, Inc • 110 N. Olinda Place • Brea, CA 92821 • 714 993 6112  
 Customer: **Venstar, Inc.**  
 Specification: **15.207 AC Mains - Average**  
 Work Order #: **100430** Date: 9/20/2017  
 Test Type: **Conducted Emissions** Time: 8:18:35 PM  
 Tested By: E. Wong Sequence#: 11  
 Software: EMITest 5.03.02 110V 60Hz

**Equipment Tested:**

Device	Manufacturer	Model #	S/N
Configuration 1			

**Support Equipment:**

Device	Manufacturer	Model #	S/N
Configuration 1			

**Test Conditions / Notes:**

The EUT seeking certification standalone transmitter. Part of the product is outside the host enclosure with labeling visible during final installation.

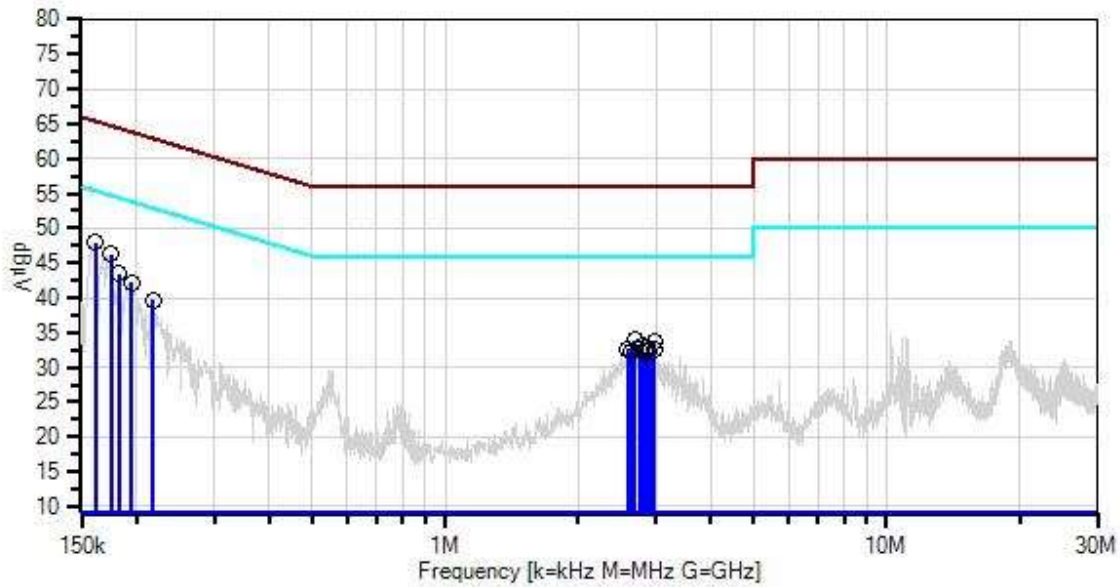
The EUT is placed on the test bench, connected to a laptop via a USB development board. The Laptop is running TI CC3100/CC3200 Radio tool V.1.2.5942.19689 to place the EUT in test mode  
 Freq range: 2400-2483.5MHz  
 Tx Freq 2442MHz,  
 802.11b, 11Mbps CCK  
 packet size 1400 byte (max) infinite packet (0) Continuous transmit  
 Firmware Power setting (0-15): 0 (max power setting)

Frequency range of measurement = 150kHz- 30MHz.  
 150 kHz-30 MHz; RBW=9 kHz, VBW=9kHz  
 Test environment conditions: 25°C, 60% Relative Humidity, 100kPa

Test performed at rated power in of 3.3 V. AC Conducted emission evaluated at AC Main of the support laptop.

Site D  
 ANSI C63.10-2013

Venstar, Inc. WO#: 100430 Sequence#: 11 Date: 9/20/2017  
 15.207 AC Mains - Average Test Lead: 110V 60Hz L2-Neutral



- Sweep Data
- × QP Readings
- Software Version: 5.03.02
- Readings
- \* Average Readings
- 1 - 15.207 AC Mains - Average
- 2 - 15.207 AC Mains - Quasi-peak
- Peak Readings
- ▼ Ambient

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02869	Spectrum Analyzer	E4440A	8/1/2017	8/1/2018
T1	AN02343	High Pass Filter	HE9615-150K-50-720B	1/25/2017	1/25/2019
T2	ANP01910	Cable	RG-142	11/30/2015	11/30/2017
T3	ANP06085	Attenuator	SA18N10W-09	11/14/2016	11/14/2018
	AN00969A	50uH LISN-Line 1 (L1)	3816/2NM	3/14/2017	3/14/2019
T4	AN00969A	50uH LISN-Line2 (L2)	3816/2NM	3/14/2017	3/14/2019

**Measurement Data:**

Reading listed by margin.

Test Lead: L2-Neutral

#	Freq MHz	Rdng dB $\mu$ V	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dB $\mu$ V	Spec dB $\mu$ V	Margin dB	Polar Ant
1	161.635k	41.8	+0.5	+0.0	+5.7	+0.0	+0.0	48.0	55.4	-7.4	L2-Ne
2	174.725k	40.1	+0.4	+0.0	+5.7	+0.0	+0.0	46.2	54.7	-8.5	L2-Ne
3	182.724k	37.5	+0.3	+0.0	+5.7	+0.0	+0.0	43.5	54.4	-10.9	L2-Ne
4	195.086k	36.3	+0.2	+0.0	+5.7	+0.0	+0.0	42.2	53.8	-11.6	L2-Ne
5	2.685M	28.0	+0.1	+0.0	+5.7	+0.1	+0.0	33.9	46.0	-12.1	L2-Ne
6	2.982M	27.8	+0.1	+0.0	+5.7	+0.1	+0.0	33.7	46.0	-12.3	L2-Ne
7	2.799M	27.2	+0.1	+0.0	+5.7	+0.1	+0.0	33.1	46.0	-12.9	L2-Ne
8	2.872M	26.9	+0.1	+0.0	+5.7	+0.1	+0.0	32.8	46.0	-13.2	L2-Ne
9	218.357k	33.8	+0.2	+0.0	+5.7	+0.0	+0.0	39.7	52.9	-13.2	L2-Ne
10	2.591M	26.7	+0.1	+0.0	+5.7	+0.1	+0.0	32.6	46.0	-13.4	L2-Ne
11	2.753M	26.7	+0.1	+0.0	+5.7	+0.1	+0.0	32.6	46.0	-13.4	L2-Ne
12	2.974M	26.6	+0.1	+0.0	+5.7	+0.1	+0.0	32.5	46.0	-13.5	L2-Ne
13	2.634M	26.5	+0.1	+0.0	+5.7	+0.1	+0.0	32.4	46.0	-13.6	L2-Ne
14	2.838M	26.3	+0.1	+0.0	+5.7	+0.1	+0.0	32.2	46.0	-13.8	L2-Ne
15	2.906M	26.3	+0.1	+0.0	+5.7	+0.1	+0.0	32.2	46.0	-13.8	L2-Ne

Test Setup Photo(s)



## SUPPLEMENTAL INFORMATION

### Measurement Uncertainty

Uncertainty Value	Parameter
4.73 dB	Radiated Emissions
3.34 dB	Mains Conducted Emissions
3.30 dB	Disturbance Power

Uncertainties reported are worst case for all CKC Laboratories’ sites and represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k=2. Compliance is deemed to occur provided measurements are below the specified limits.

### Emissions Test Details

**TESTING PARAMETERS**

Unless otherwise indicated, the following configuration parameters are used for equipment setup: The cables were routed consistent with the typical application by varying the configuration of the test sample. Interface cables were connected to the available ports of the test unit. The effect of varying the position of the cables was investigated to find the configuration that produced maximum emissions. Cables were of the type and length specified in the individual requirements. The length of cable that produced maximum emissions was selected.

The equipment under test (EUT) was set up in a manner that represented its normal use, as shown in the setup photographs. Any special conditions required for the EUT to operate normally are identified in the comments that accompany the emissions tables.

The emissions data was taken with a spectrum analyzer or receiver. Incorporating the applicable correction factors for distance, antenna, cable loss and amplifier gain, the data was reduced as shown in the table below. The corrected data was then compared to the applicable emission limits. Preliminary and final measurements were taken in order to ensure that all emissions from the EUT were found and maximized.

**CORRECTION FACTORS**

The basic spectrum analyzer reading was converted using correction factors as shown in the highest emissions readings in the tables. For radiated emissions in dBμV/m, the spectrum analyzer reading in dBμV was corrected by using the following formula. This reading was then compared to the applicable specification limit. Individual measurements were compared with the displayed limit value in the margin column. The margin was calculated based on subtracting the limit value from the corrected measurement value; a positive margin represents a measurement exceeding the limit, while a negative margin represents a measurement less than the limit.

SAMPLE CALCULATIONS		
	Meter reading	(dBμV)
+	Antenna Factor	(dB/m)
+	Cable Loss	(dB)
-	Distance Correction	(dB)
-	Preamplifier Gain	(dB)
=	Corrected Reading	(dBμV/m)

**TEST INSTRUMENTATION AND ANALYZER SETTINGS**

The test instrumentation and equipment listed were used to collect the emissions data. A spectrum analyzer or receiver was used for all measurements. Unless otherwise specified, the following table shows the measuring equipment bandwidth settings that were used in designated frequency bands. For testing emissions, an appropriate reference level and a vertical scale size of 10 dB per division were used.

MEASURING EQUIPMENT BANDWIDTH SETTINGS PER FREQUENCY RANGE			
TEST	BEGINNING FREQUENCY	ENDING FREQUENCY	BANDWIDTH SETTING
CONDUCTED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	9 kHz	150 kHz	200 Hz
RADIATED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	30 MHz	1000 MHz	120 kHz
RADIATED EMISSIONS	1000 MHz	>1 GHz	1 MHz

**SPECTRUM ANALYZER/RECEIVER DETECTOR FUNCTIONS**

The notes that accompany the measurements contained in the emissions tables indicate the type of detector function used to obtain the given readings. Unless otherwise noted, all readings were made in the "positive peak" detector mode. Whenever a "quasi-peak" or "average" reading was recorded, the measurement was annotated with a "QP" or an "Ave" on the appropriate rows of the data sheets. In cases where quasi-peak or average limits were employed and data exists for multiple measurement types for the same frequency then the peak measurement was retained in the report for reference, however the numbering for the affected row was removed and an arrow or caret ("^") was placed in the far left-hand column indicating that the row above takes precedence for comparison to the limit. The following paragraphs describe in more detail the detector functions and when they were used to obtain the emissions data.

**Peak**

In this mode, the spectrum analyzer or receiver recorded all emissions at their peak value as the frequency band selected was scanned. By combining this function with another feature called "peak hold," the measurement device had the ability to measure intermittent or low duty cycle transient emission peak levels. In this mode the measuring device made a slow scan across the frequency band selected and measured the peak emission value found at each frequency across the band.

**Quasi-Peak**

Quasi-peak measurements were taken using the quasi-peak detector when the true peak values exceeded or were within 2 dB of a quasi-peak specification limit. Additional QP measurements may have been taken at the discretion of the operator.

**Average**

Average measurements were taken using the average detector when the true peak values exceeded or were within 2 dB of an average specification limit. Additional average measurements may have been taken at the discretion of the operator. If the specification or test procedure requires trace averaging, then the averaging was performed using 100 samples or as required by the specification. All other average measurements are performed using video bandwidth averaging. To make these measurements, the test engineer reduces the video bandwidth on the measuring device until the modulation of the signal is filtered out. At this point the measuring device is set into the linear mode and the scan time is reduced.