

# Venstar, Inc.

## TEST REPORT FOR

**Thermostat with WiFi  
Model: Colortouch 1B**

### Tested to The Following Standards:

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

**15.207 & 15.247  
(DTS 2400-2483.5 MHz)**

**Report No.: 104980-6**

**Date of issue: February 15, 2021**



**Test Certificate # 803.01**

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 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:**

Samantha Mossman  
CKC Laboratories, Inc.  
5046 Sierra Pines Drive  
Mariposa, CA 95338

Project Number: 104980

January 28, 2021

January 28-29, 2021

February 2-3, 2021

### Report Authorization

The test data contained in this report documents the observed testing parameters pertaining to and are relevant for only the equipment provided by the client, 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	5.03.19

## Site Registration & Accreditation Information

Location	*NIST CB #	FCC	Canada	Japan
Canyon Park, Bothell, WA	US0103	US1024	3082C	A-0136
Brea, CA	US0103	US1024	3082D	A-0136
Fremont, CA	US0103	US1024	3082B	A-0136
Mariposa, CA	US0103	US1024	3082A	A-0136

\*CKC's list of NIST designated countries can be found at: <https://standards.gov/cabs/designations.html>

## 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(d)	RF Conducted Emissions & Band Edge	NA	Pass
15.247(d)	Radiated Emissions & Band Edge	NA	Pass
15.247(e)	Power Spectral Density	NA	Pass
15.207	AC Conducted Emissions	NA	Pass

NA = Not Applicable

ISO/IEC 17025 Decision Rule
The declaration of pass or fail herein is based upon assessment to the specification(s) listed above, including where applicable, assessment of measurement uncertainties. For performance related tests, equipment was monitored for specified criteria identified in that section of testing.

### 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
Thermostat with WiFi	Venstar, Inc.	Colortouch 1B	UNIT #10

#### Support Equipment:

Device	Manufacturer	Model #	S/N
24Vac Adapter	Unbranded	MKA-412400200	NA

### Configuration 2

#### Equipment Tested:

Device	Manufacturer	Model #	S/N
Thermostat with WiFi	Venstar, Inc.	Colortouch 1B	UNIT #9

#### Support Equipment:

Device	Manufacturer	Model #	S/N
24Vac Adapter	Unbranded	MKA-412400200	NA

## General Product Information:

Product Information	Manufacturer-Provided Details
Equipment Type:	Stand-Alone Equipment
Type of Wideband System:	802.11b/g/n20
Operating Frequency Range:	2412-2462MHz
Modulation Type(s):	802.11b: DSSS, CCK 802.11g: OFDM 802.11n20: BPSK, QPSK, 16-QAM, 64-QAM
Maximum Duty Cycle:	100%
Number of TX Chains:	1
Antenna Type(s) and Gain:	Chip Antenna/+2dBi
Beamforming Type:	NA
Antenna Connection Type:	Integral (External connector provided to facilitate testing)
Nominal Input Voltage:	24Vac/60Hz
Firmware / Software used for Test:	FCC 404

**EUT and Accessory Photo(s)**



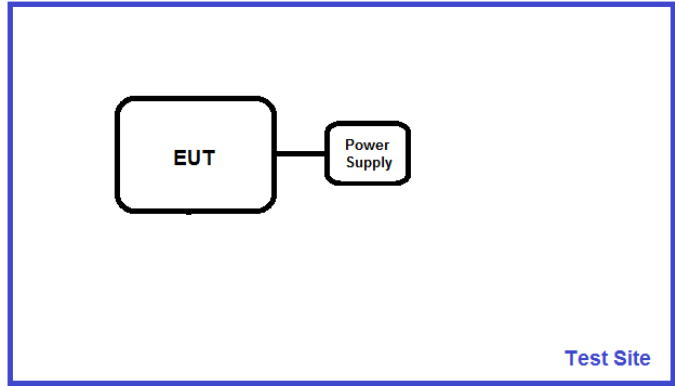
**Support Equipment Photo(s)**



24VAC Adapter

**Block Diagram of Test Setup(s)**

**Test Setup Block Diagram**





## FCC Part 15 Subpart C

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

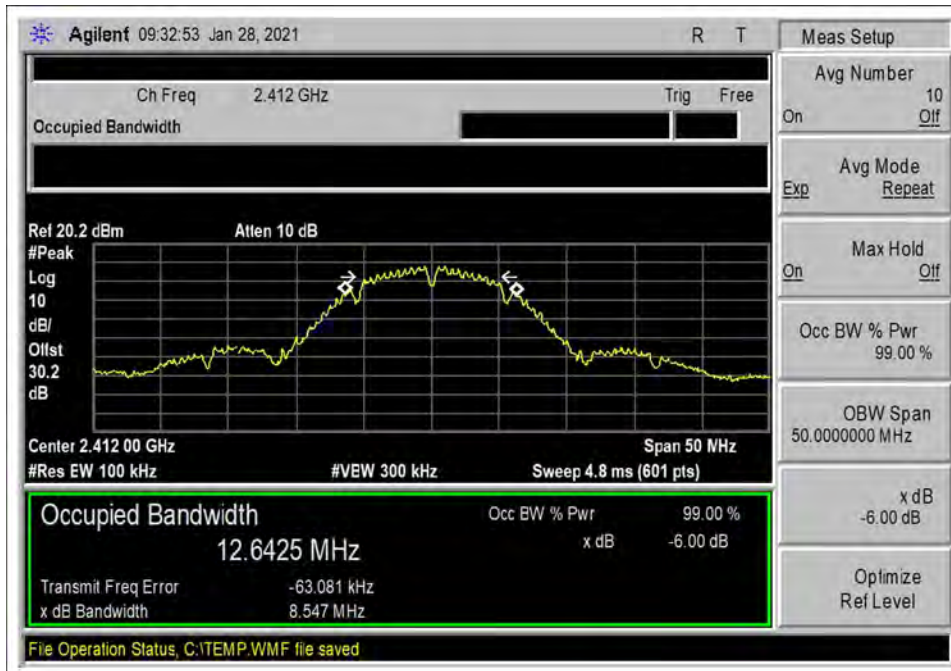
Test Setup/Conditions			
Test Location:	Brea Lab A	Test Engineer:	Don Nguyen
Test Method:	ANSI C63.10 (2013), KDB 558074 v05r02: 04/02/2019	Test Date(s):	1/28/2021
Configuration:	1		
Test Setup:	EUT is powered from 24Vac AC Adapter. Transmitter is activated via touch screen. Software setting: Testing Frequency: 2412, 2437, 2462MHz  Data Rate 802.11b: 1Mbps (DSSS), 11Mbps (CCK) 802.11g: 6Mbps (OFDM), 54Mbps (OFDM) 802.11n20: MCS0 (BPSK), MCS7 (64-QAM)  Modulation: DSSS, CCK, OFDM, BPSK, 64-QAM Mode: Continuous Modulated TX Power Level: 50mW  Frequency of measurement: 2412, 2437, 2462MHz RBW=100kHz, VBW=300kHz		

Environmental Conditions			
Temperature (°C)	24.2	Relative Humidity (%):	28

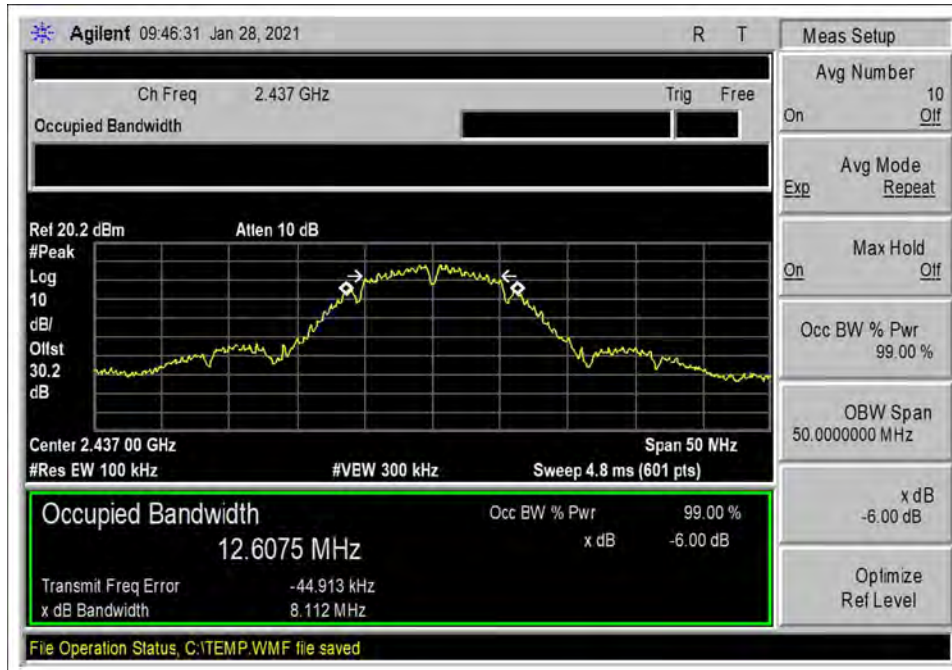
Test Equipment					
Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
02869	Spectrum Analyzer	Agilent	E4440	8/3/2020	8/3/2021
03432	Attenuator	Aeroflex/Weinschel	90-30-34	10/22/2019	10/22/2021
P07243	Cable	H&S	32022-29094K- 29094K-24TC	5/29/2020	5/29/2022

Test Data Summary					
Frequency (MHz)	Antenna Port	Modulation	Measured (kHz)	Limit (kHz)	Results
2412	Wi-Fi	802.11b/1Mbps	8547	≥500	Pass
2437	Wi-Fi	802.11b/1Mbps	8112	≥500	Pass
2462	Wi-Fi	802.11b/1Mbps	7612	≥500	Pass
2412	Wi-Fi	802.11b/11Mbps	8362	≥500	Pass
2437	Wi-Fi	802.11b/11Mbps	7632	≥500	Pass
2462	Wi-Fi	802.11b/11Mbps	7587	≥500	Pass
2412	Wi-Fi	802.11g/6Mbps	15364	≥500	Pass
2437	Wi-Fi	802.11g/6Mbps	15349	≥500	Pass
2462	Wi-Fi	802.11g/6Mbps	15162	≥500	Pass
2412	Wi-Fi	802.11g/54Mbps	15810	≥500	Pass
2437	Wi-Fi	802.11g/54Mbps	15489	≥500	Pass
2462	Wi-Fi	802.11g/54Mbps	15571	≥500	Pass
2412	Wi-Fi	802.11n20/MCS0	16058	≥500	Pass
2437	Wi-Fi	802.11n20/MCS0	16157	≥500	Pass
2462	Wi-Fi	802.11n20/MCS0	15121	≥500	Pass
2412	Wi-Fi	802.11n20/MCS7	16712	≥500	Pass
2437	Wi-Fi	802.11n20/MCS7	15147	≥500	Pass
2462	Wi-Fi	802.11n20/MCS7	15505	≥500	Pass

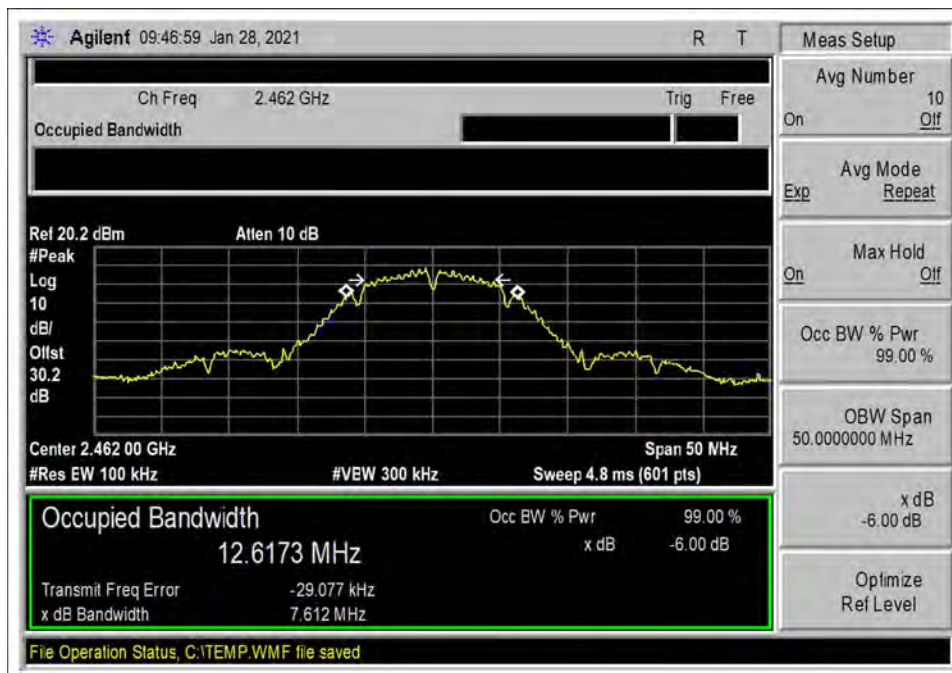
### Plot(s)



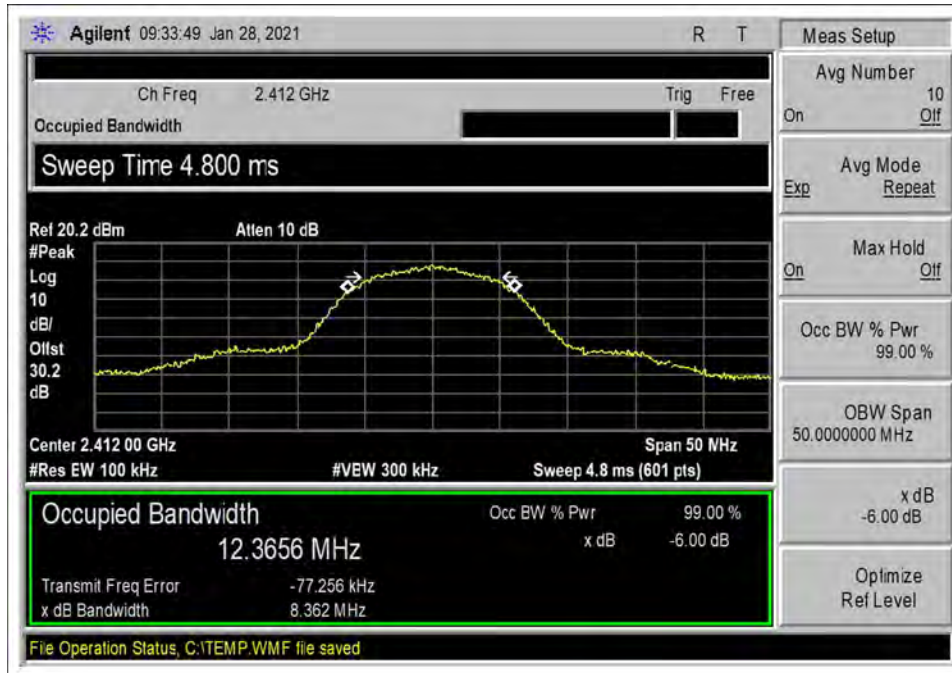
802.11b\_1Mbps\_Low Channel



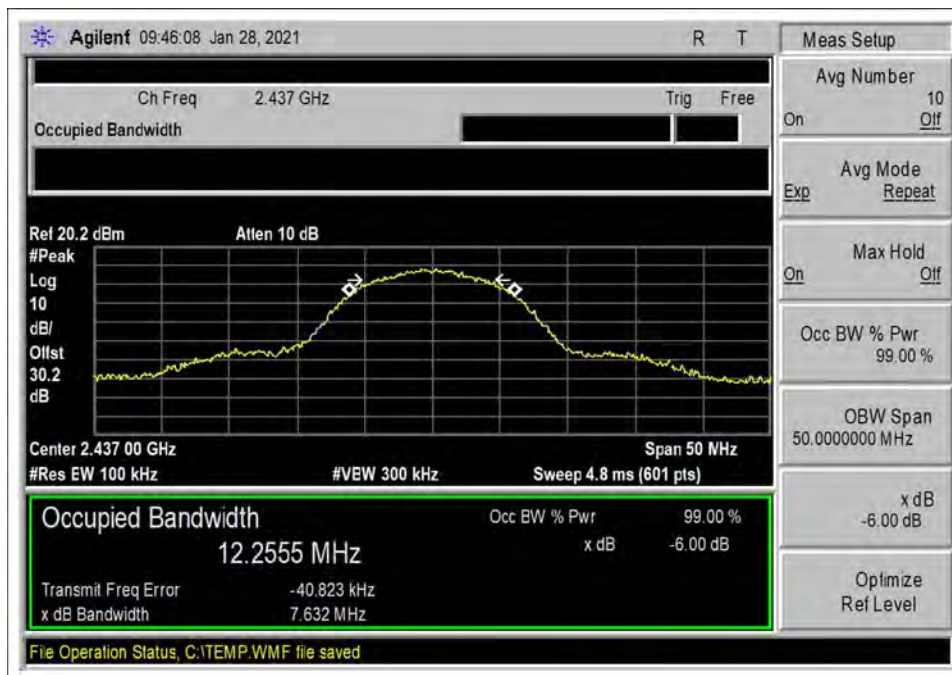
802.11b \_1Mbps \_Middle Channel



802.11b \_1Mbps \_High Channel

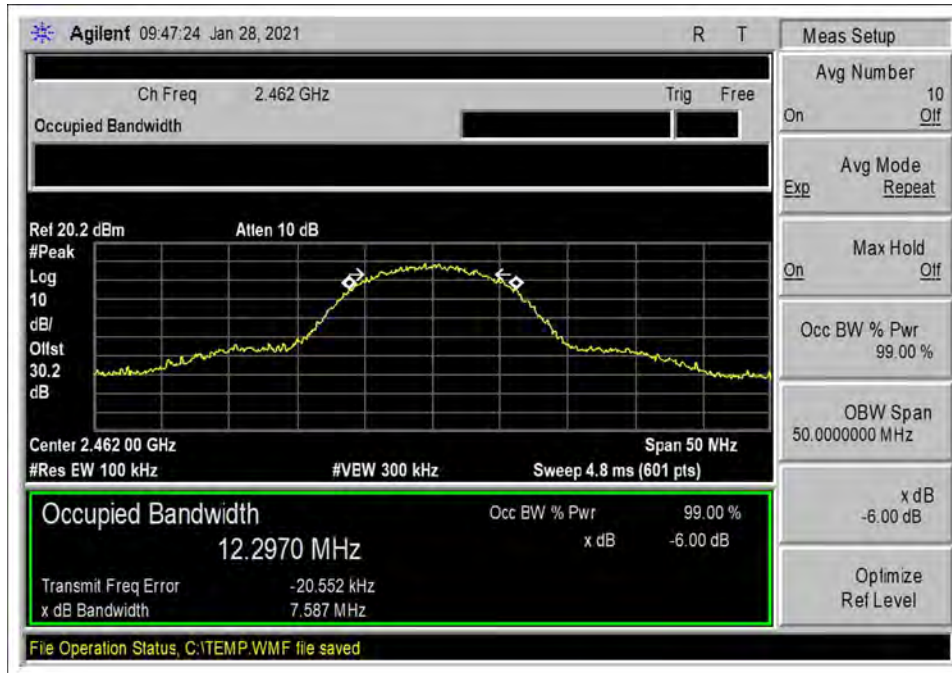


802.11b \_11Mbps \_Low Channel

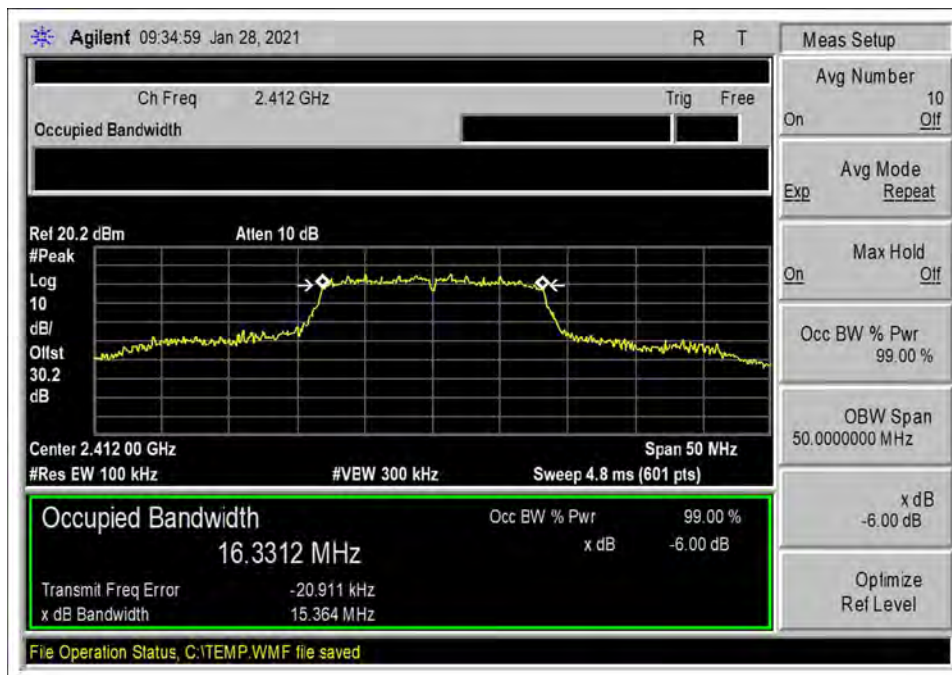


802.11b \_11Mbps \_Middle Channel

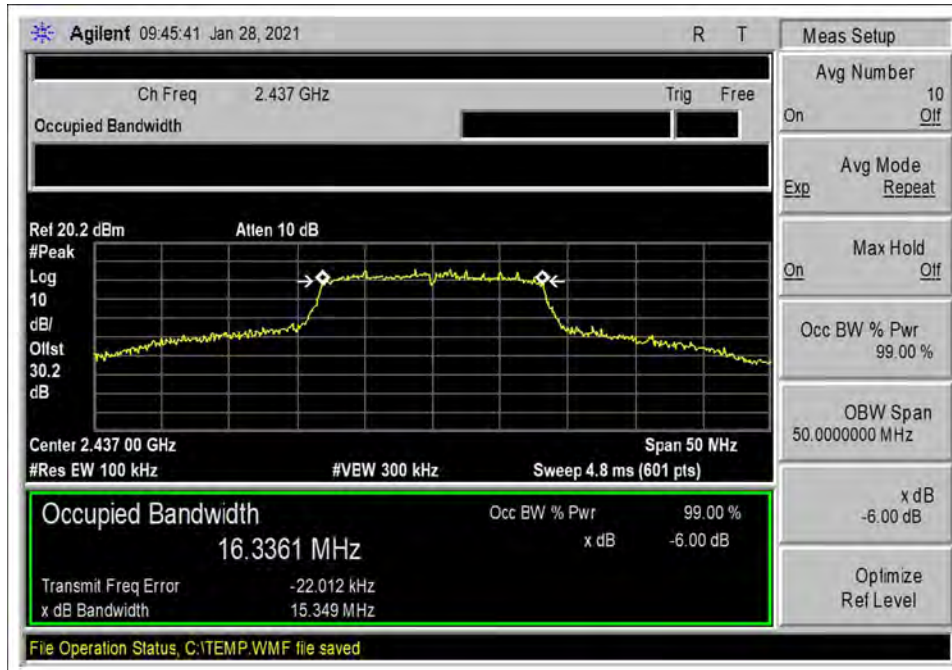




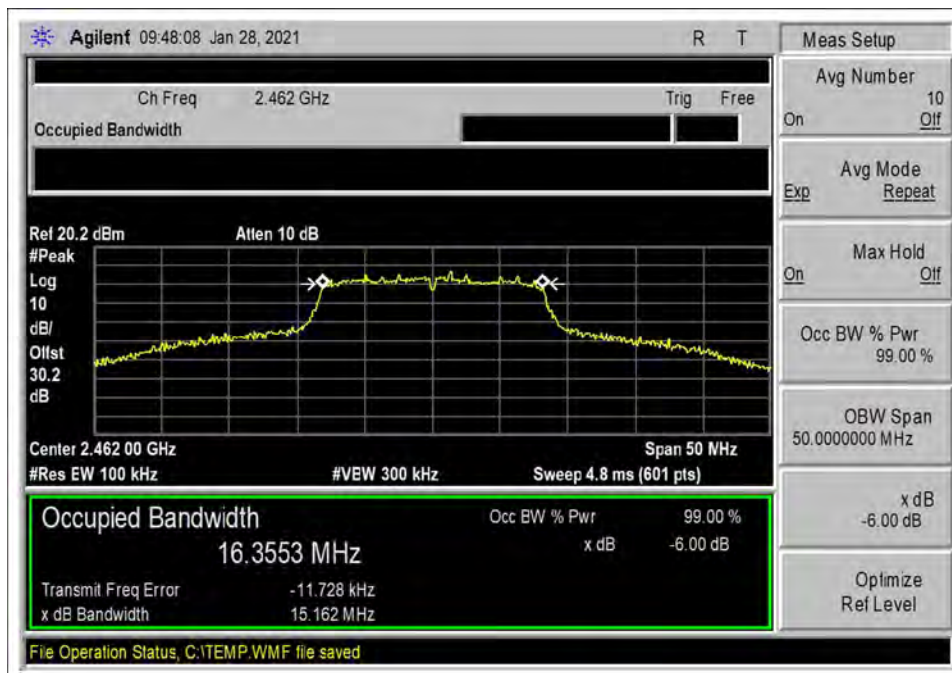
802.11b \_11Mbps \_High Channel



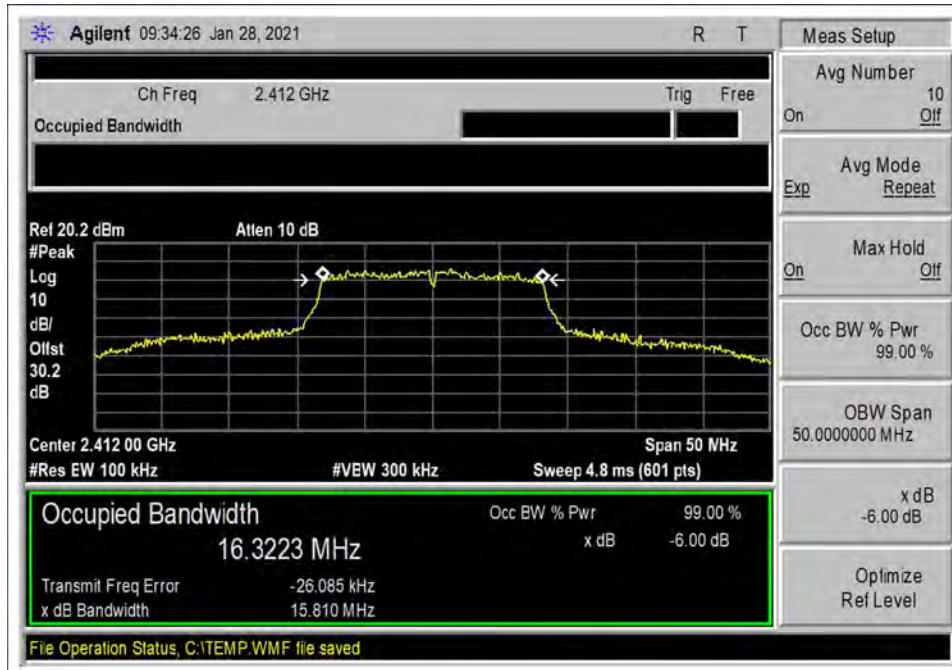
802.11g\_6Mbps Low Channel



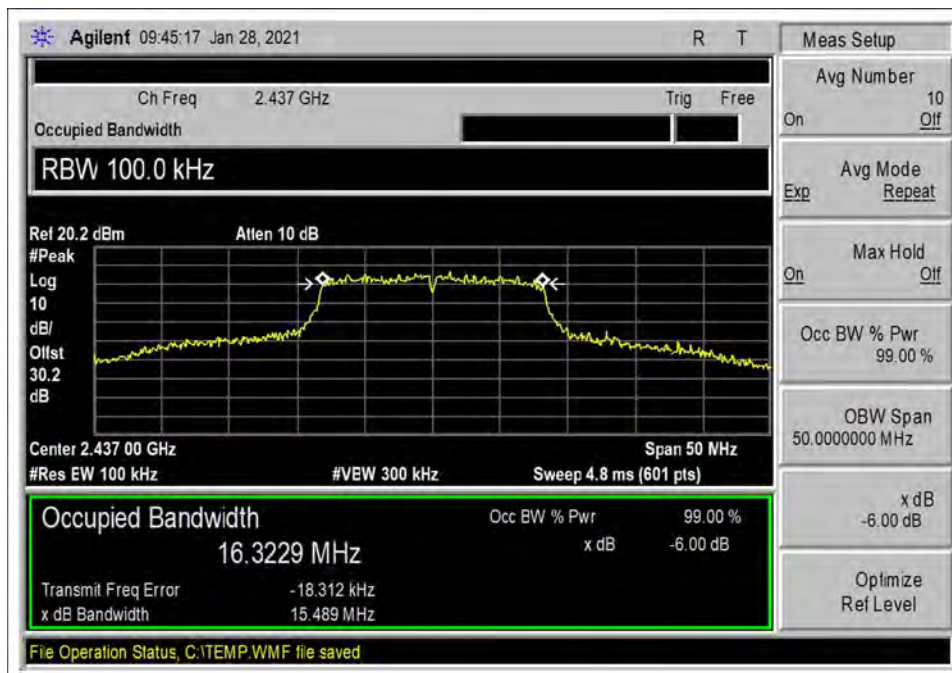
802.11g\_6Mbps\_Middle Channel



802.11g\_6Mbps\_High Channel

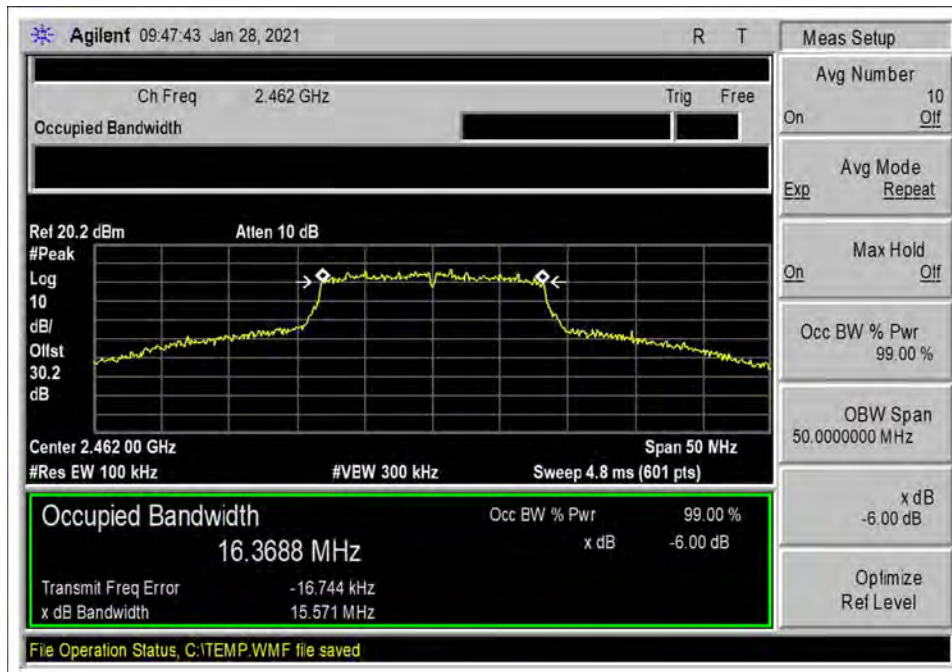


802.11g\_54Mbps\_Low Channel

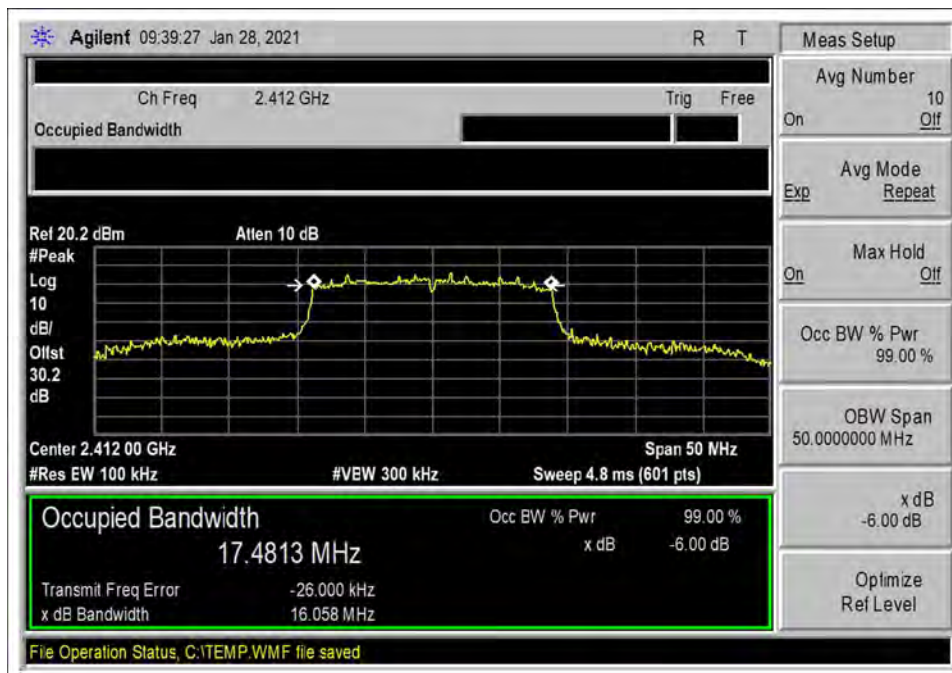


802.11g\_54Mbps\_Middle Channel



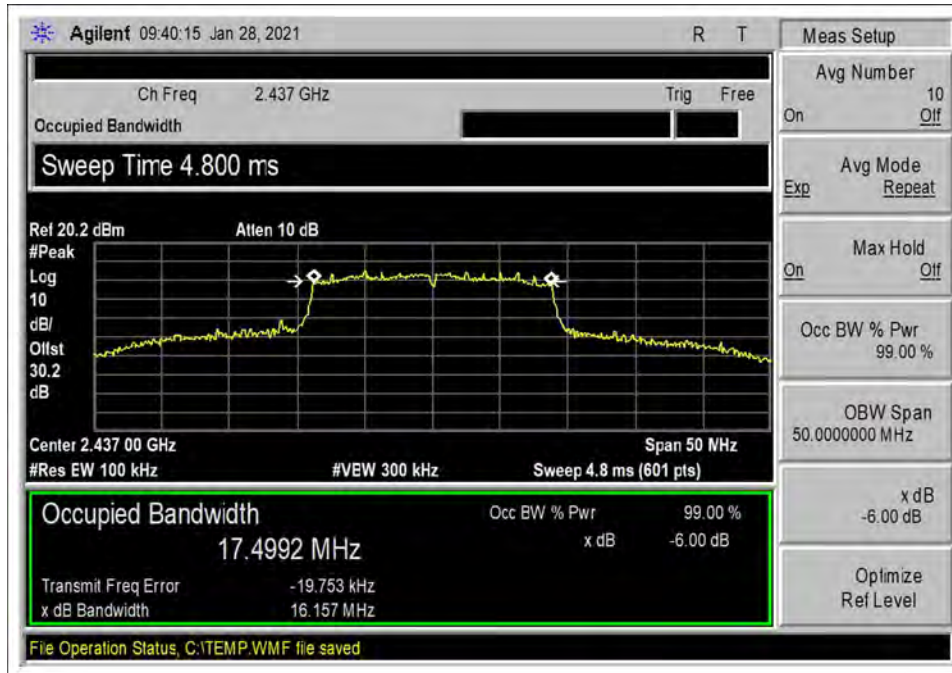


802.11g\_54Mbps\_High Channel

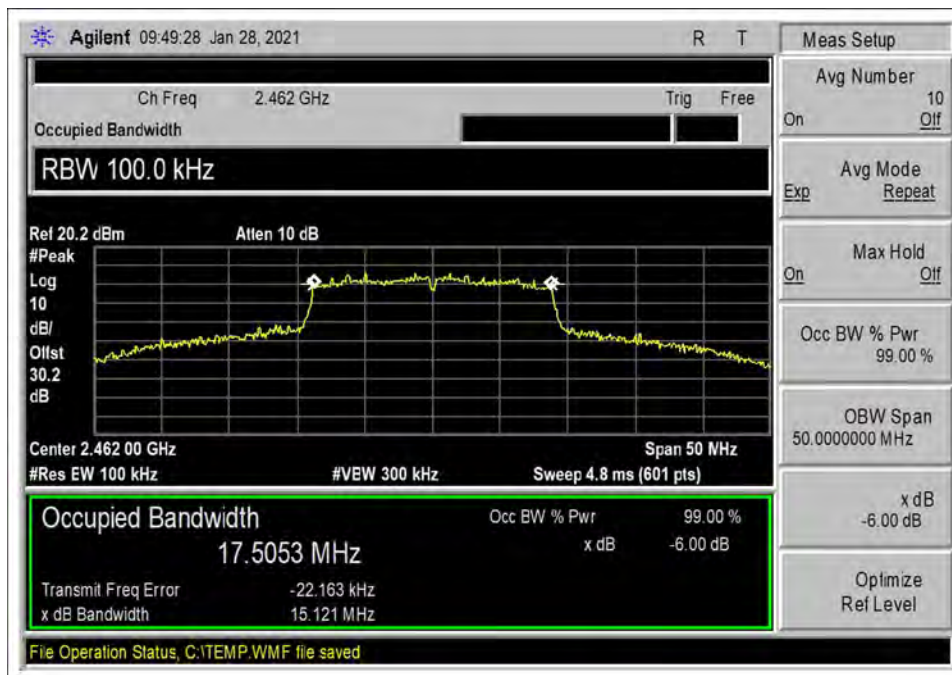


802.11n20\_MCS0\_Low Channel

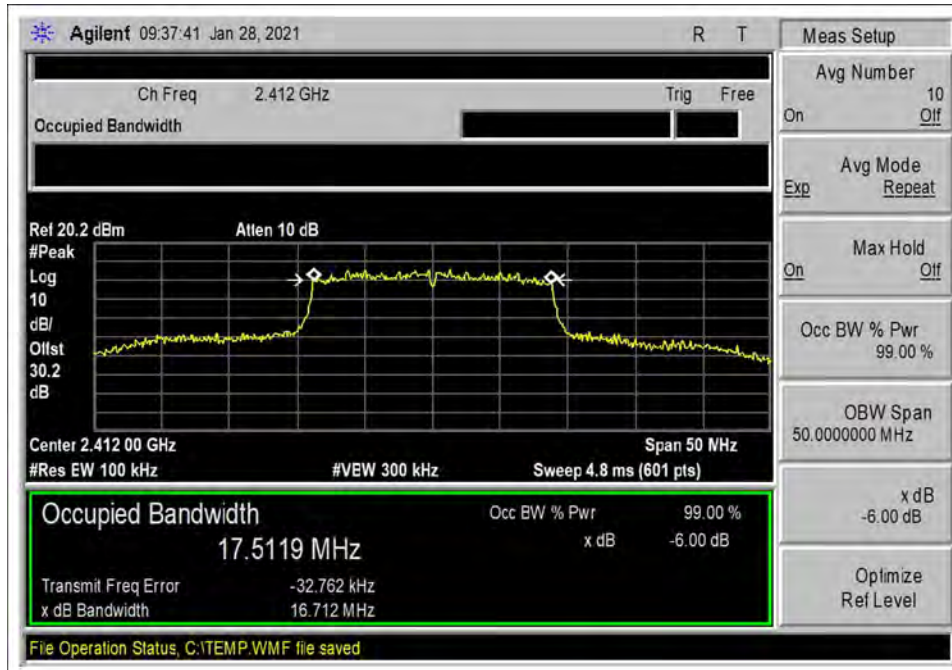




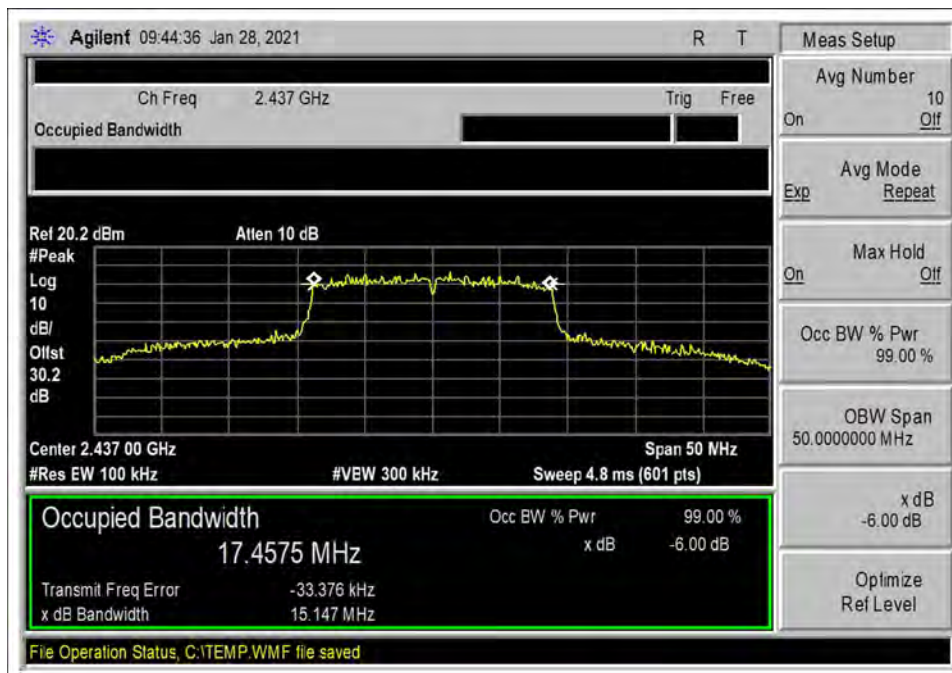
802.11n20\_MCS0\_Middle Channel



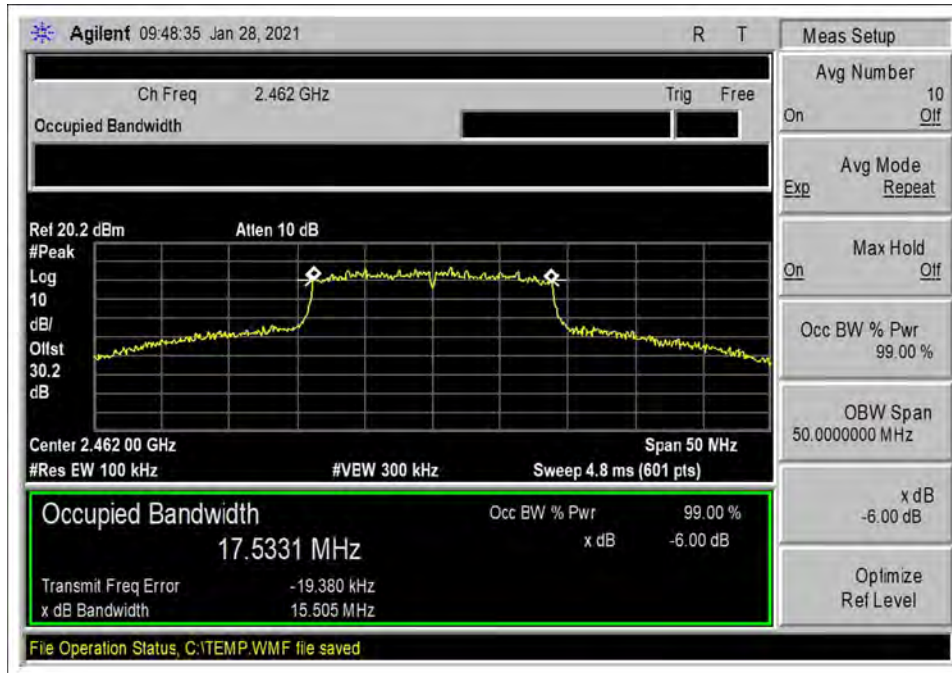
802.11n20\_MCS0\_High Channel



802.11n20\_MCS7\_Low Channel

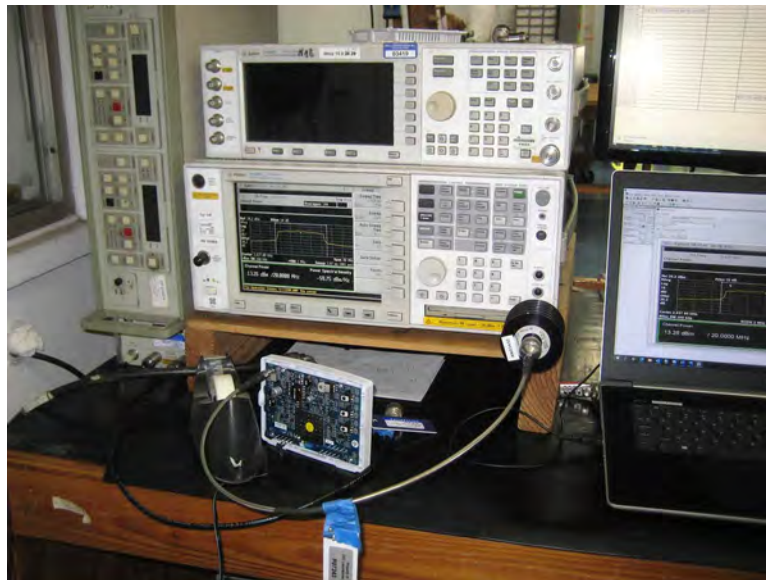


802.11n20\_MCS7\_Middle Channel



802.11n20\_MCS7\_High Channel

**Test Setup Photo(s)**



## 15.247(b)(3) Output Power

Test Setup / Conditions			
Test Location:	Brea Lab A	Test Engineer:	Don Nguyen
Test Method:	ANSI C63.10 (2013), KDB 558074 v05r02: 04/02/2019	Test Date(s):	1/28/2021
Configuration:	1		
Test Setup:	EUT is powered from 24Vac AC Adapter. Transmitter is activated via touch screen. Software setting: Testing Frequency: 2412, 2437, 2462MHz  Data Rate 802.11b: 1Mbps (DSSS), 11Mbps (CCK) 802.11g: 6Mbps (OFDM), 54Mbps (OFDM) 802.11n20: MCS0 (BPSK), MCS7 (64-QAM)  Modulation: DSSS, CCK, OFDM, BPSK, 64-QAM Mode: Continuous Modulated TX Power Level: 50mW  Frequency of measurement: 2412, 2437, 2462MHz RBW=200kHz, VBW=2000kHz		

Environmental Conditions			
Temperature (°C)	24.2	Relative Humidity (%):	28

Test Equipment					
Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
02869	Spectrum Analyzer	Agilent	E4440	8/3/2020	8/3/2021
03432	Attenuator	Aeroflex/Weinschel	90-30-34	10/22/2019	10/22/2021
P07243	Cable	H&S	32022-29094K-29094K-24TC	5/29/2020	5/29/2022

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/11Mbps	16.17	16.29	16.29	0.12
2437	802.11g/54Mbps	16.62	16.58	16.60	0.04
2462	802.11b/11Mbps	16.94	16.99	16.90	0.05

Test performed using operational mode with the highest output power, representing worst case.



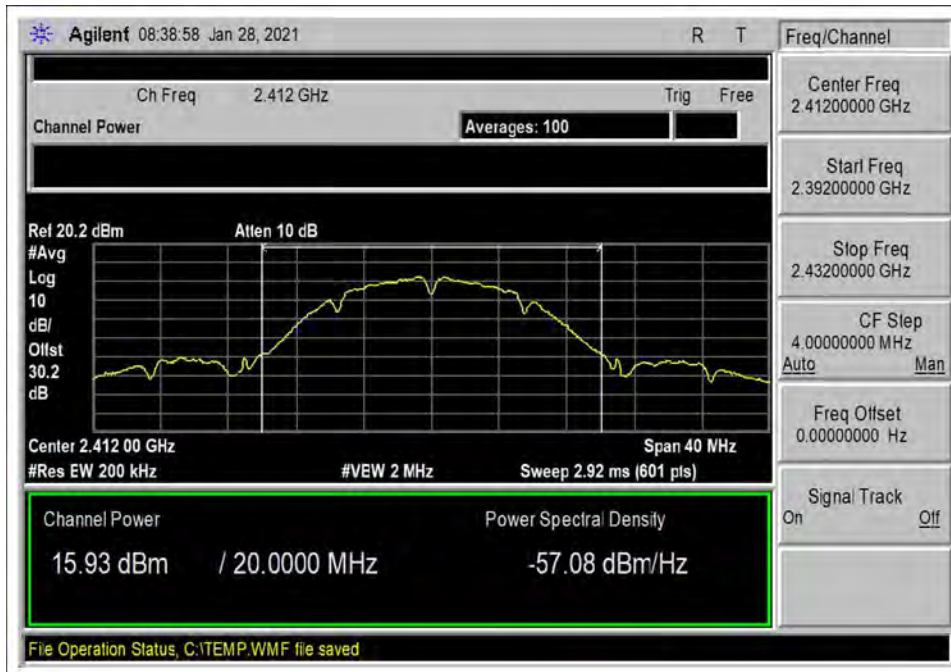
**Parameter Definitions:**

Measurements performed at input voltage  $V_{Nominal} \pm 15\%$ .

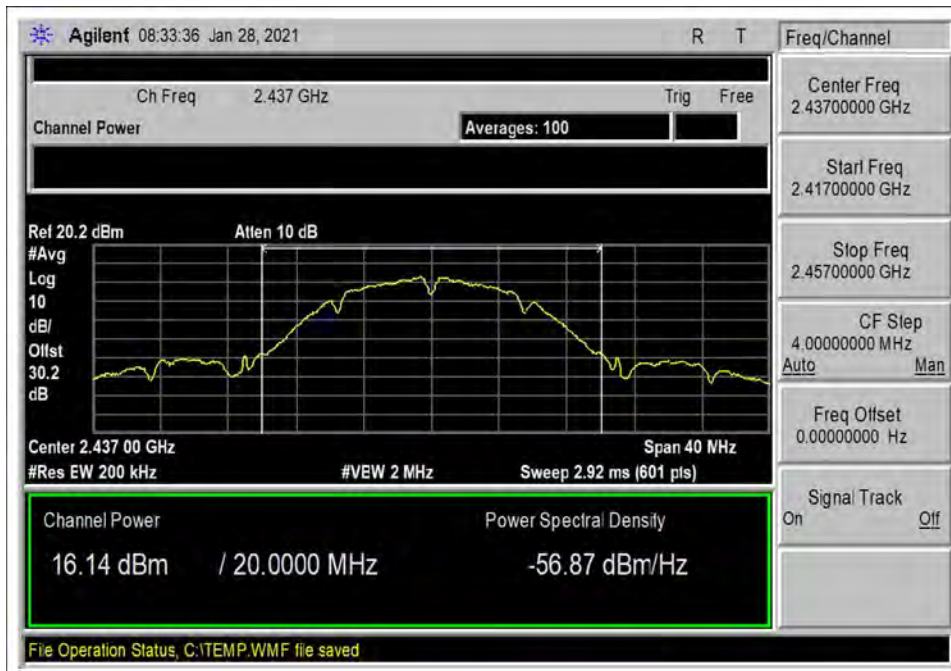
Parameter	Value
$V_{Nominal}$ :	24.0Vac
$V_{Minimum}$ :	20.4Vac
$V_{Maximum}$ :	27.6Vac

Test Data Summary - Voltage Variations							
Measurement Option: AVGSA-2							
Frequency (MHz)	Mode/Data Rate	Ant. Type / Gain (dBi)	Measured (dBm)	DDCF (dBm)	Measured + DDCF (dBm)	Limit (dBm)	Results
2412	802.11b/1Mbps	Chip/+2.0	15.93	0	15.93	≤30	Pass
2437	802.11b/1Mbps	Chip/+2.0	16.14	0	16.14	≤30	Pass
2462	802.11b/1Mbps	Chip/+2.0	16.57	0	16.57	≤30	Pass
2412	802.11b/11Mbps	Chip/+2.0	16.24	0.05	16.29	≤30	Pass
2437	802.11b/11Mbps	Chip/+2.0	16.47	0.05	16.52	≤30	Pass
2462	802.11b/11Mbps	Chip/+2.0	16.94	0.05	16.99	≤30	Pass
2412	802.11g/6Mbps	Chip/+2.0	16.13	0.05	16.18	≤30	Pass
2437	802.11g/6Mbps	Chip/+2.0	16.42	0.05	16.47	≤30	Pass
2462	802.11g/6Mbps	Chip/+2.0	16.54	0.05	16.59	≤30	Pass
2412	802.11g/54Mbps	Chip/+2.0	15.77	0.41	16.18	≤30	Pass
2437	802.11g/54Mbps	Chip/+2.0	16.17	0.41	16.58	≤30	Pass
2462	802.11g/54Mbps	Chip/+2.0	16.30	0.41	16.71	≤30	Pass
2412	802.11n20/MCS0	Chip/+2.0	15.92	0.05	15.97	≤30	Pass
2437	802.11n20/MCS0	Chip/+2.0	16.20	0.05	16.25	≤30	Pass
2462	802.11n20/MCS0	Chip/+2.0	16.03	0.05	16.08	≤30	Pass
2412	802.11n20/MCS7	Chip/+2.0	15.61	0.42	16.03	≤30	Pass
2437	802.11n20/MCS7	Chip/+2.0	15.84	0.42	16.26	≤30	Pass
2462	802.11n20/MCS7	Chip/+2.0	16.56	0.42	16.98	≤30	Pass

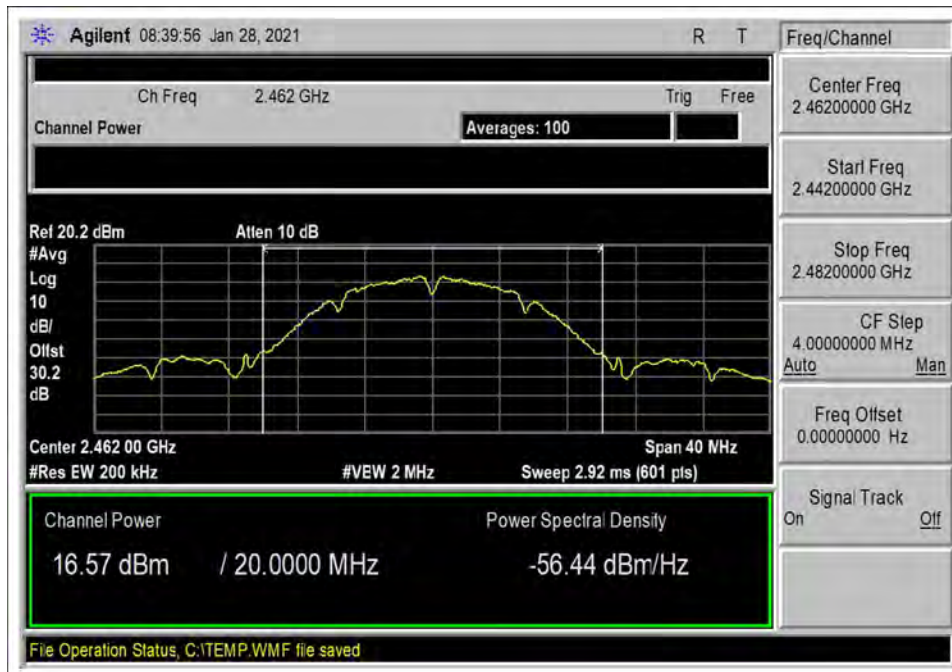
**Plots**



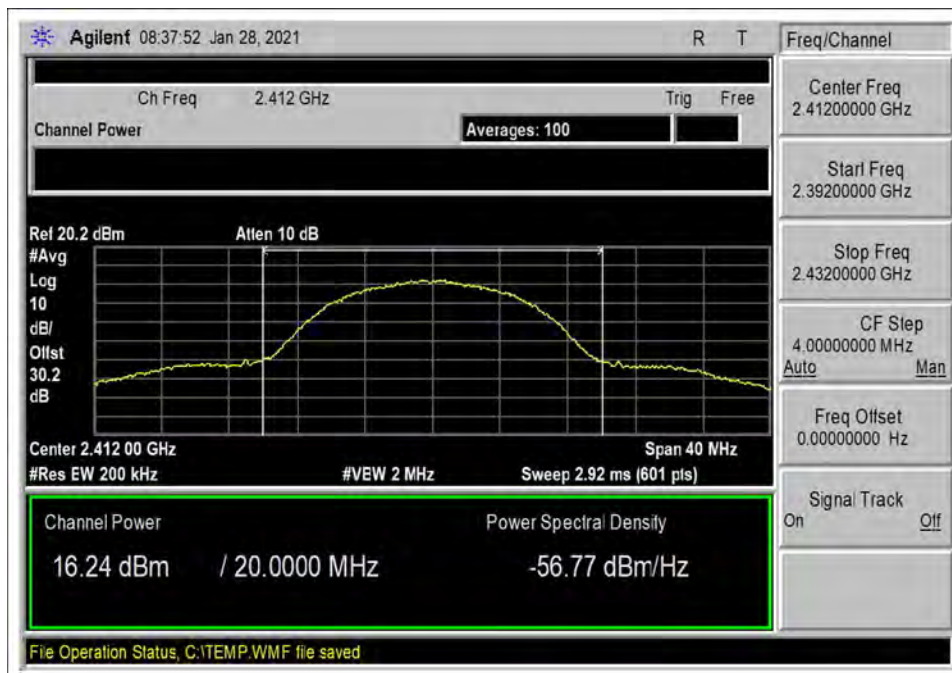
802.11b\_1Mbps\_Low Channel



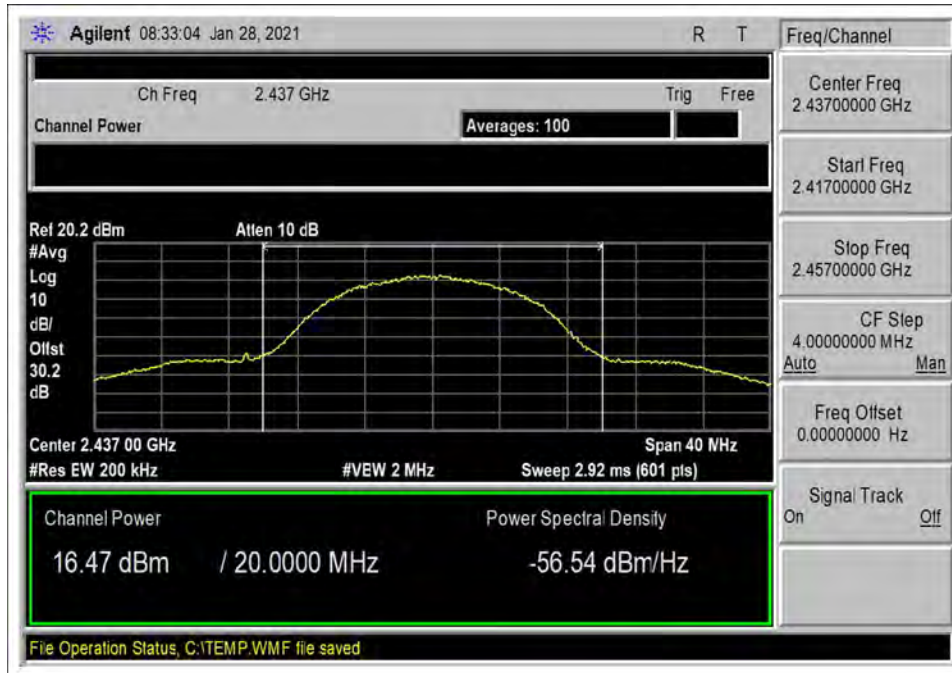
802.11b\_1Mbps\_Middle Channel



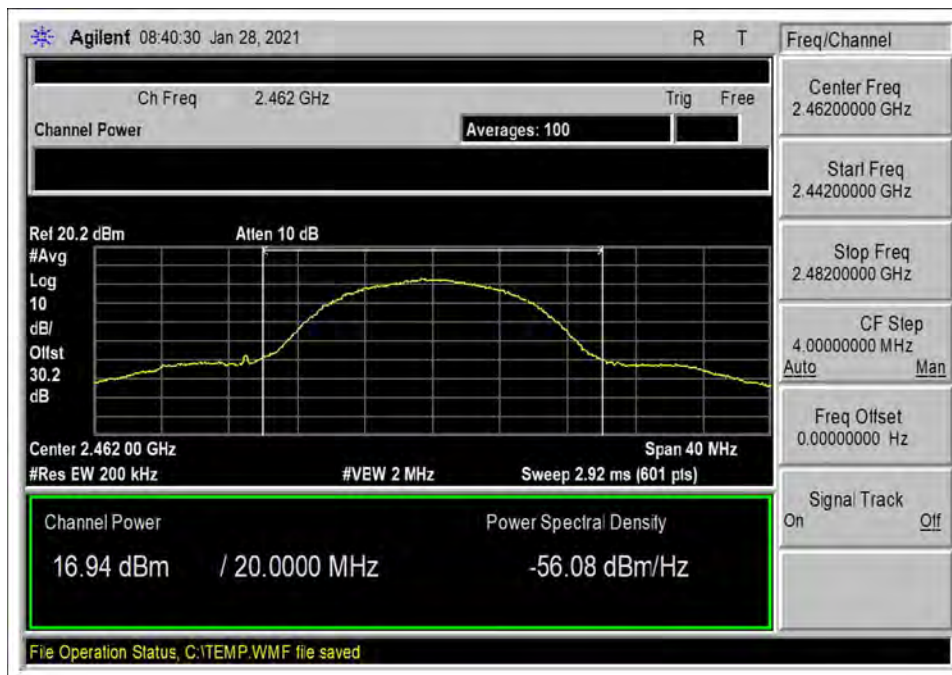
802.11b\_1Mbps\_High Channel



802.11b\_11Mbps\_Low Channel

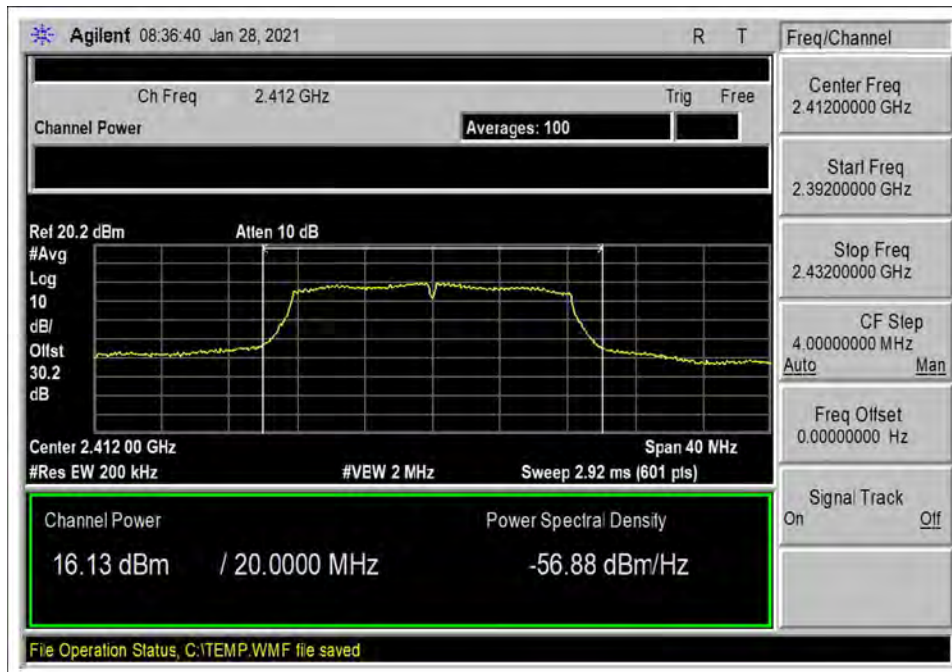


802.11b\_11Mbps\_Middle Channel

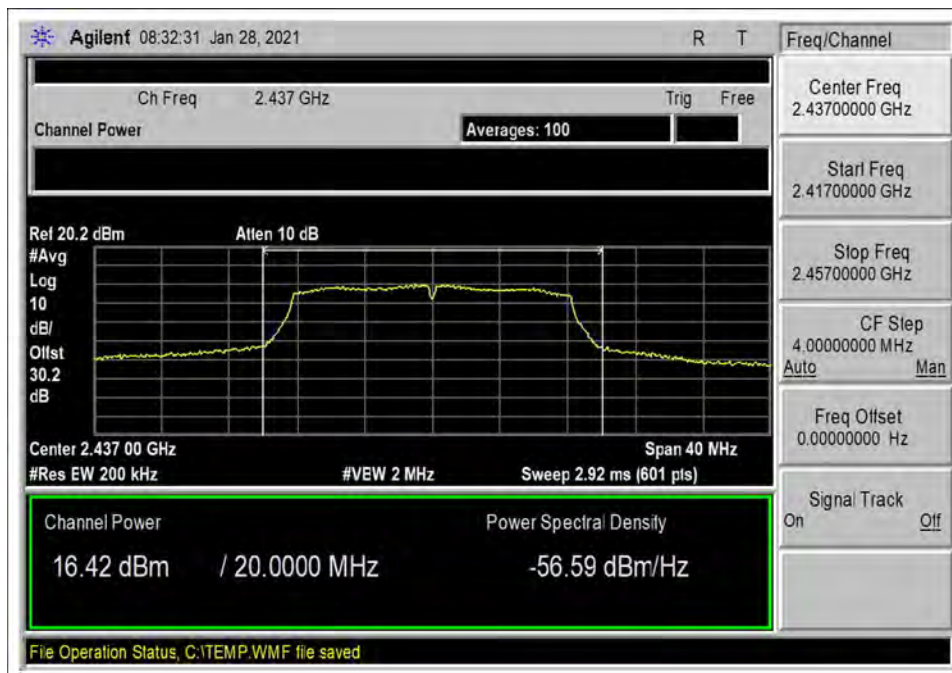


802.11b\_11Mbps\_High Channel

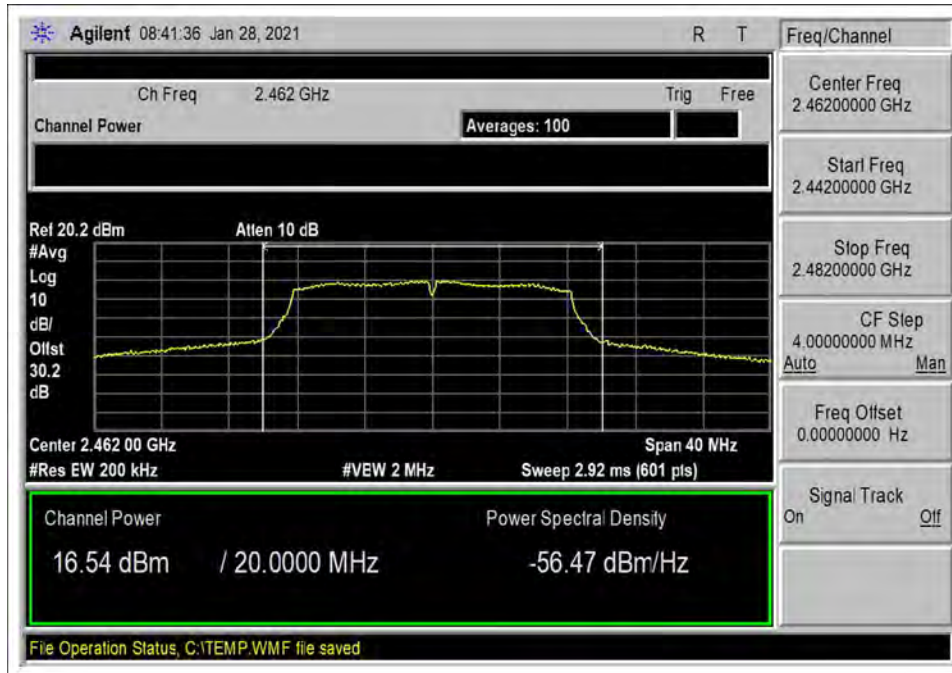




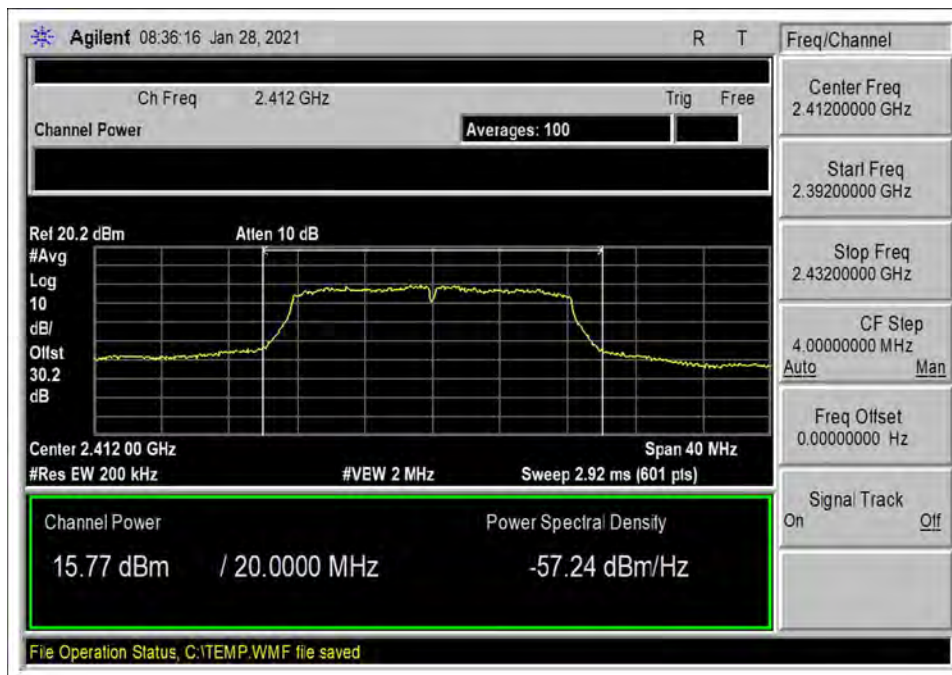
802.11g\_6Mbps\_Low Channel



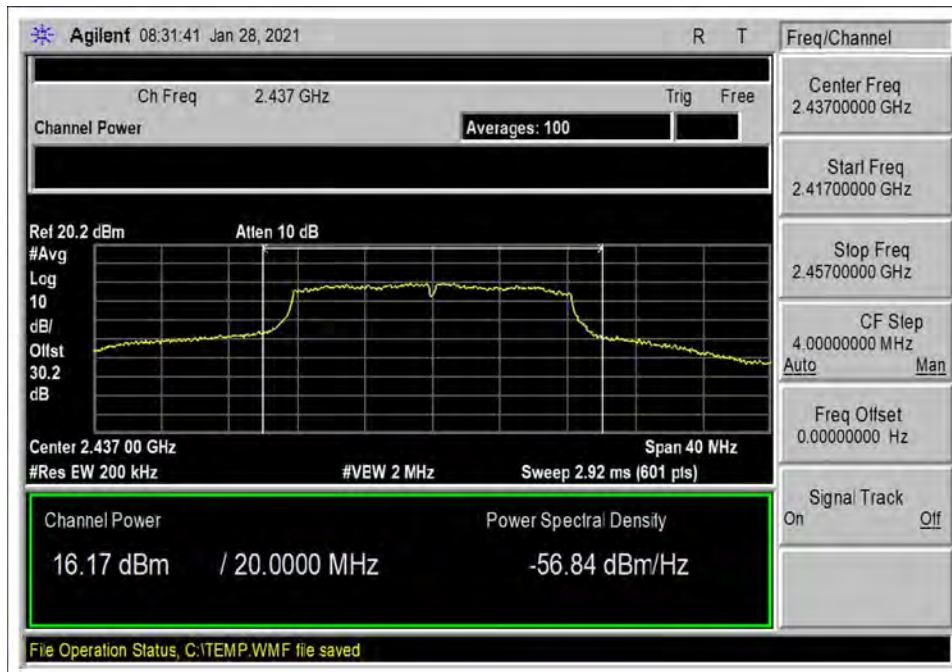
802.11g\_6Mbps\_Middle Channel



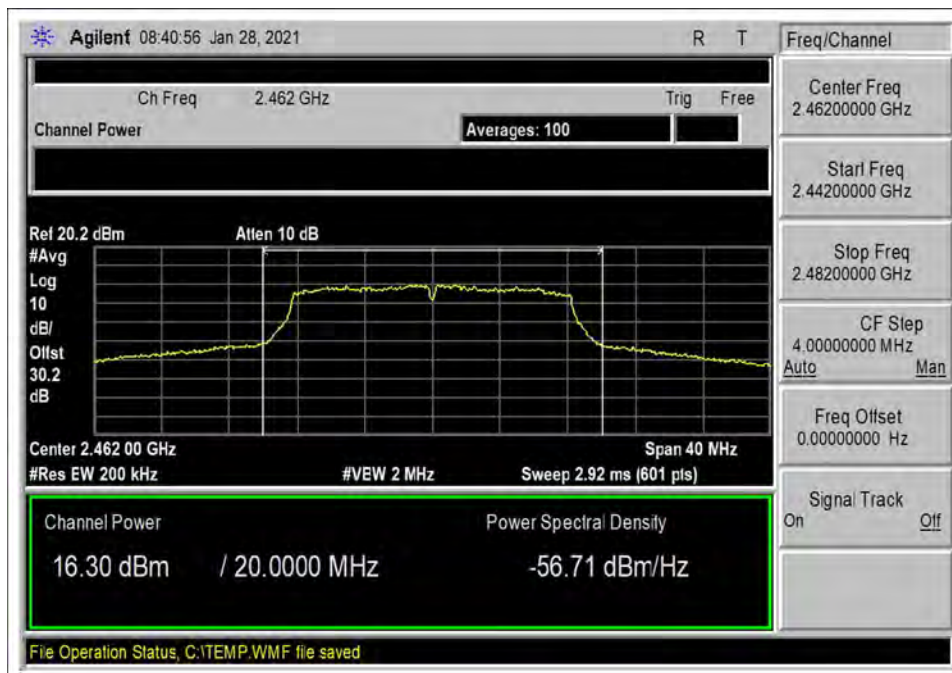
802.11g\_6Mbps\_High Channel



802.11g\_54Mbps\_Low Channel

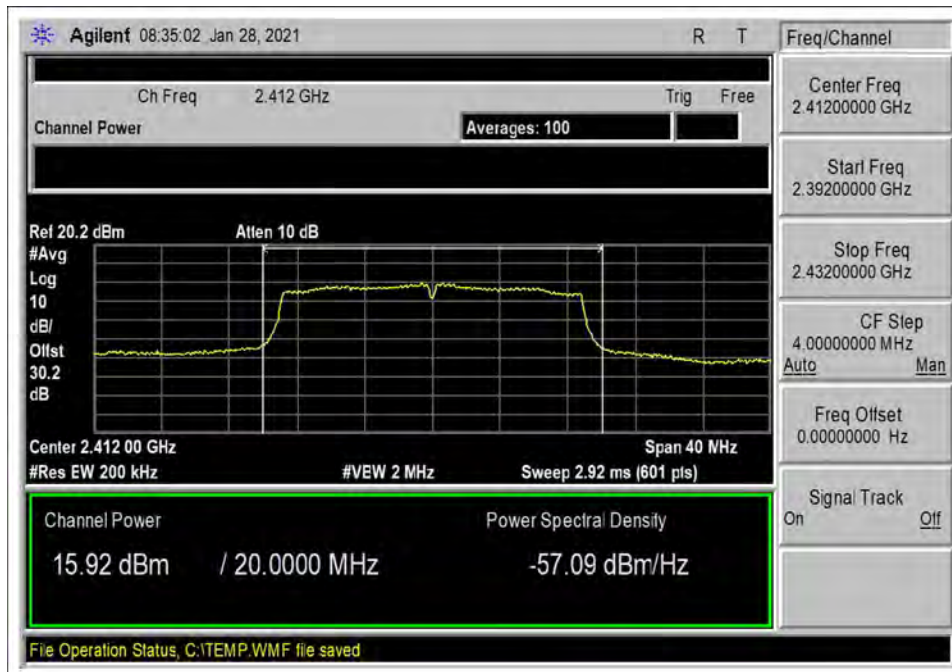


802.11g\_54Mbps\_Middle Channel

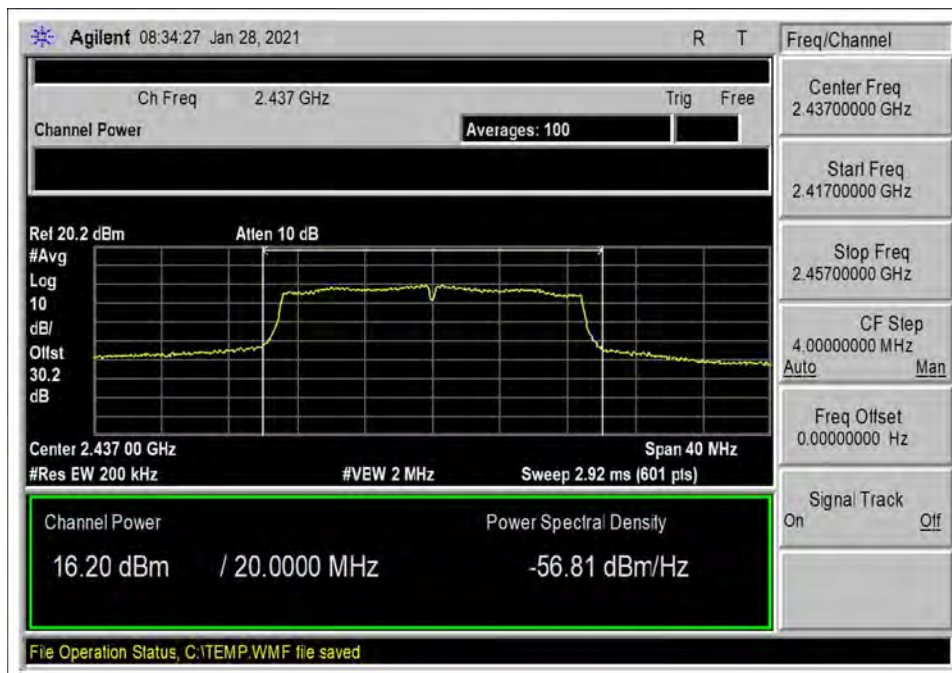


802.11g\_54Mbps\_High Channel

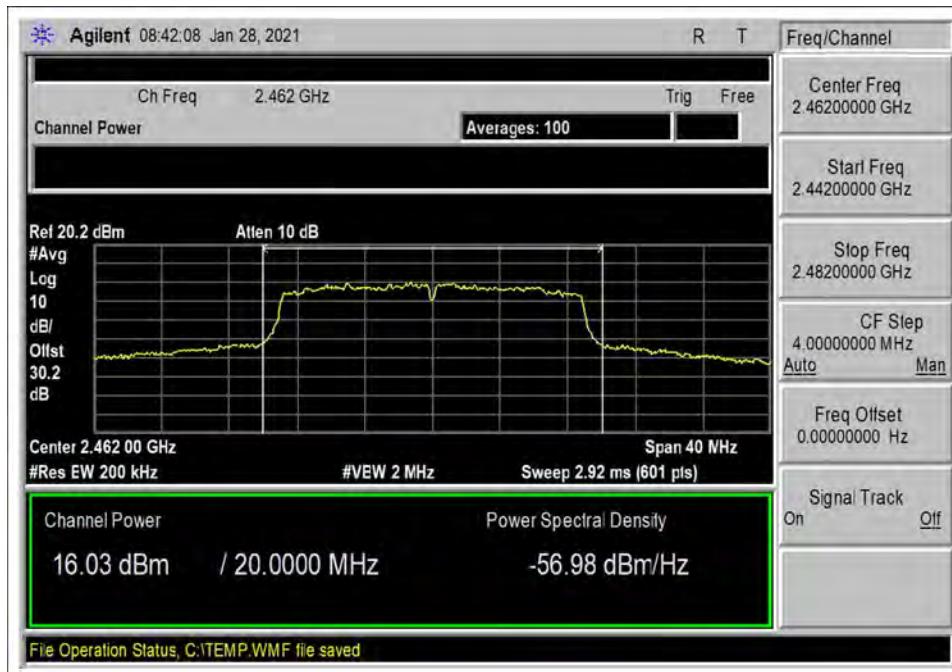




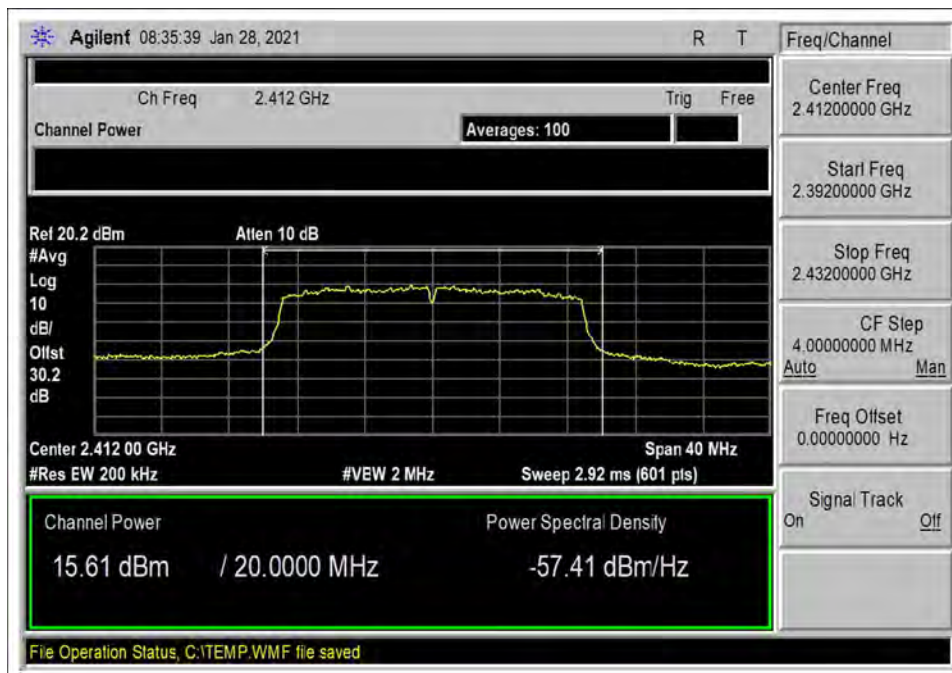
802.11n20\_MCS0\_Low Channel



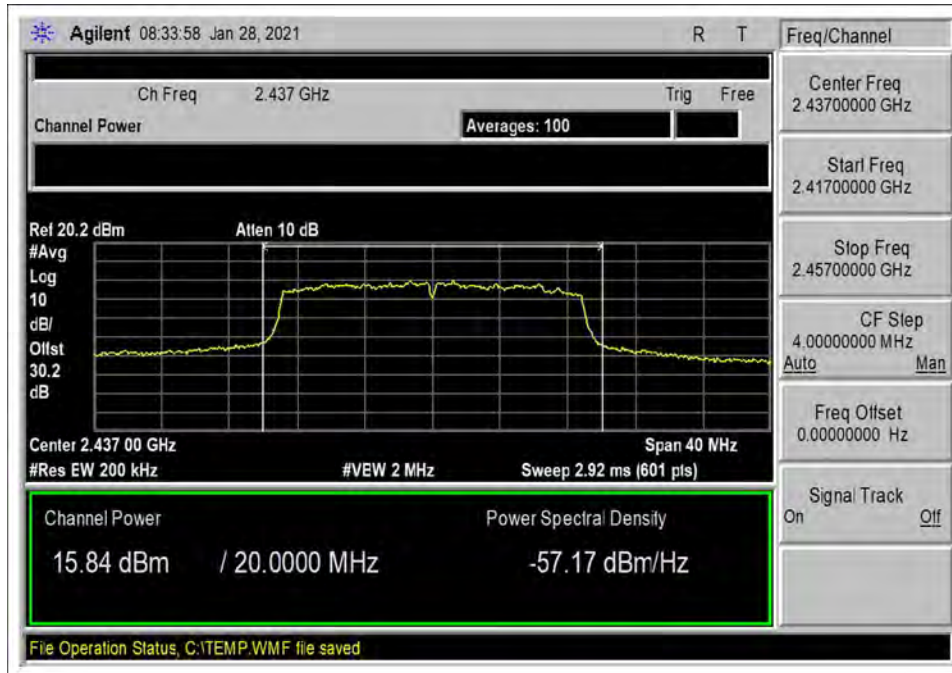
802.11n20\_MCS0\_Middle Channel



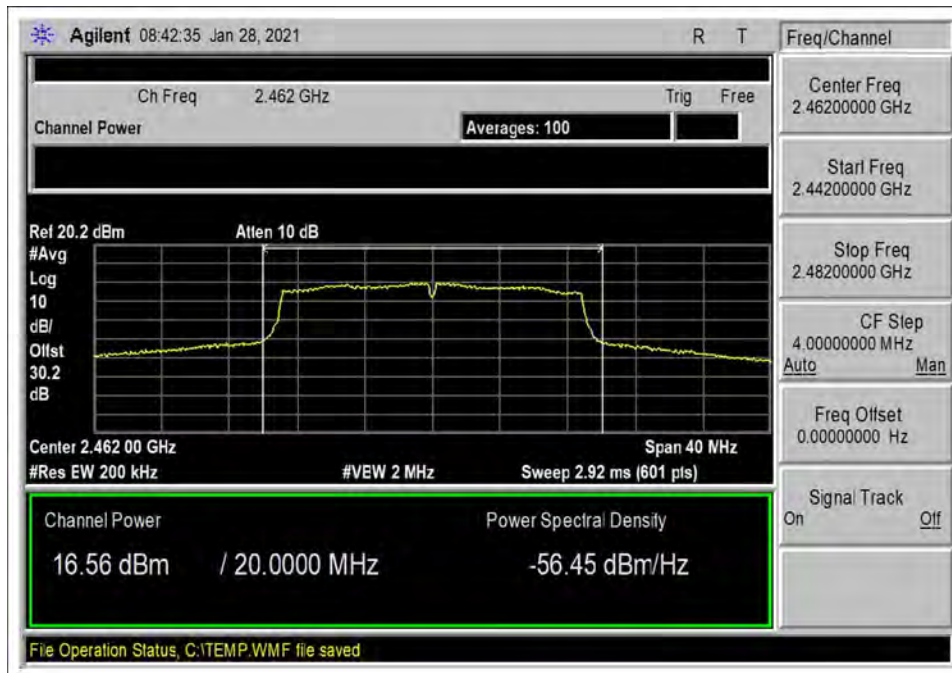
802.11n20\_MCS0\_High Channel



802.11n20\_MCS7\_Low Channel



802.11n20\_MCS7\_Middle Channel



802.11n20\_MCS7\_High Channel

### 15.35(c) Duty Cycle Correction Factor

Test Data Summary				
Antenna Port	Operational Mode	Measured On Time/One Period (mS)	Calculated Duty Cycle D	DCCF (dB)
Wi-Fi	802.11b/1Mbps	1/1	1	0
Wi-Fi	802.11b/11Mbps	0.8576/0.8683	0.99	0.05
Wi-Fi	802.11g/6Mbps	1.42/1.436	0.99	0.05
Wi-Fi	802.11g/54Mbps	0.1805/0.1985	0.91	0.41
Wi-Fi	802.11n20/MCS0	1.326/1.341	0.99	0.05
Wi-Fi	802.11n20/MCS7	0.169/0.1863	0.91	0.42

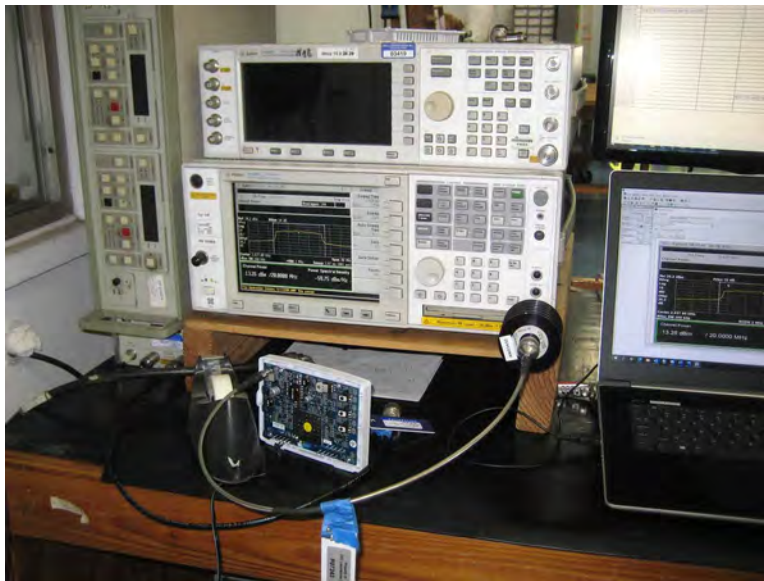
Measured results are calculated as follows:

$$On\ Time = \left( \sum_{Bursts} RF\ Burst\ On\ Time + \sum_{Control} Control\ Signal\ On\ time \right) \Big|_{P_{obs} \text{ (max 100ms)}}$$

Duty Cycle Correction Factor (DCCF) is calculated in accordance with ANSI C63.10:

$$DCCF = 20 \cdot \text{Log} \left( \frac{On\ Time}{P_{obs}} \right)$$

### Test Setup Photo(s)





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

### Test Setup / Conditions / Data

Test Location: CKC Laboratories Inc. • 110 N. Olinda Pl. • Brea, CA 92823 • 714-993-6112  
 Customer: **Venstar, Inc.**  
 Specification: **15.247(d) Conducted Spurious Emissions**  
 Work Order #: **104980** Date: 1/28/2021  
 Test Type: **Conducted Emissions** Time: 13:12:51  
 Tested By: Don Nguyen Sequence#: 0  
 Software: EMITest 5.03.19 24Vac

***Equipment Tested:***

Device	Manufacturer	Model #	S/N
Configuration 1			

***Support Equipment:***

Device	Manufacturer	Model #	S/N
Configuration 1			

***Test Conditions / Notes:***

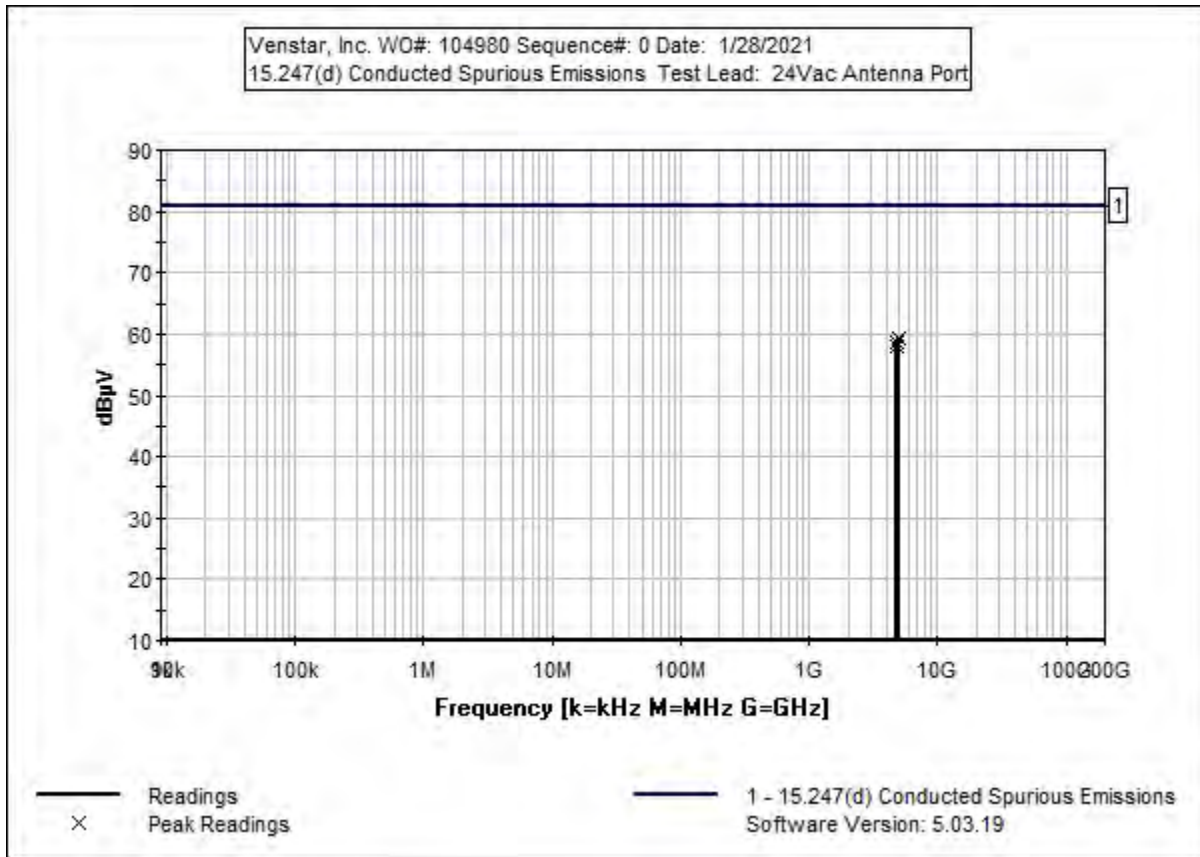
EUT is powered from 24Vac AC Adapter. The transmitter is activated via touch screen.  
 Software setting:  
 Testing Frequency: 2412, 2437, 2462MHz

Data Rate  
**802.11b: 1Mbps**  
 Mode: Continuous Modulated  
 TX Power Level: 50mW

Frequency of measurement: 9kHz-25GHz  
 RBW=100kHz, VBW=300kHz

Test Method: ANSI C63.10 (2013), KDB 558074 v05r02: 04/02/2019  
 Temperature (°C): 24.2  
 Relative Humidity (%): 28





**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN03430	Attenuator	75A-10-12	12/20/2019	12/20/2021
T2	ANP07243	Cable	32022-29094K-29094K-24TC	5/29/2020	5/29/2022
	AN02869	Spectrum Analyzer	E4440A	8/3/2020	8/3/2021

**Measurement Data:**

Reading listed by margin.

Test Lead: Antenna Port

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	dB	Dist. dB	Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	4924.009M	48.5	+10.1	+0.7		+0.0		59.3	80.7	-21.4	Anten
2	4874.017M	47.7	+10.1	+0.7		+0.0		58.5	80.7	-22.2	Anten
3	4824.009M	47.0	+10.2	+0.7		+0.0		57.9	80.7	-22.8	Anten



Test Location: CKC Laboratories Inc. • 110 N. Olinda Pl. • Brea, CA 92823 • 714-993-6112  
 Customer: **Venstar, Inc.**  
 Specification: **15.247(d) Conducted Spurious Emissions**  
 Work Order #: **104980** Date: 1/28/2021  
 Test Type: **Conducted Emissions** Time: 13:15:35  
 Tested By: Don Nguyen Sequence#: 1  
 Software: EMITest 5.03.19 24Vac

***Equipment Tested:***

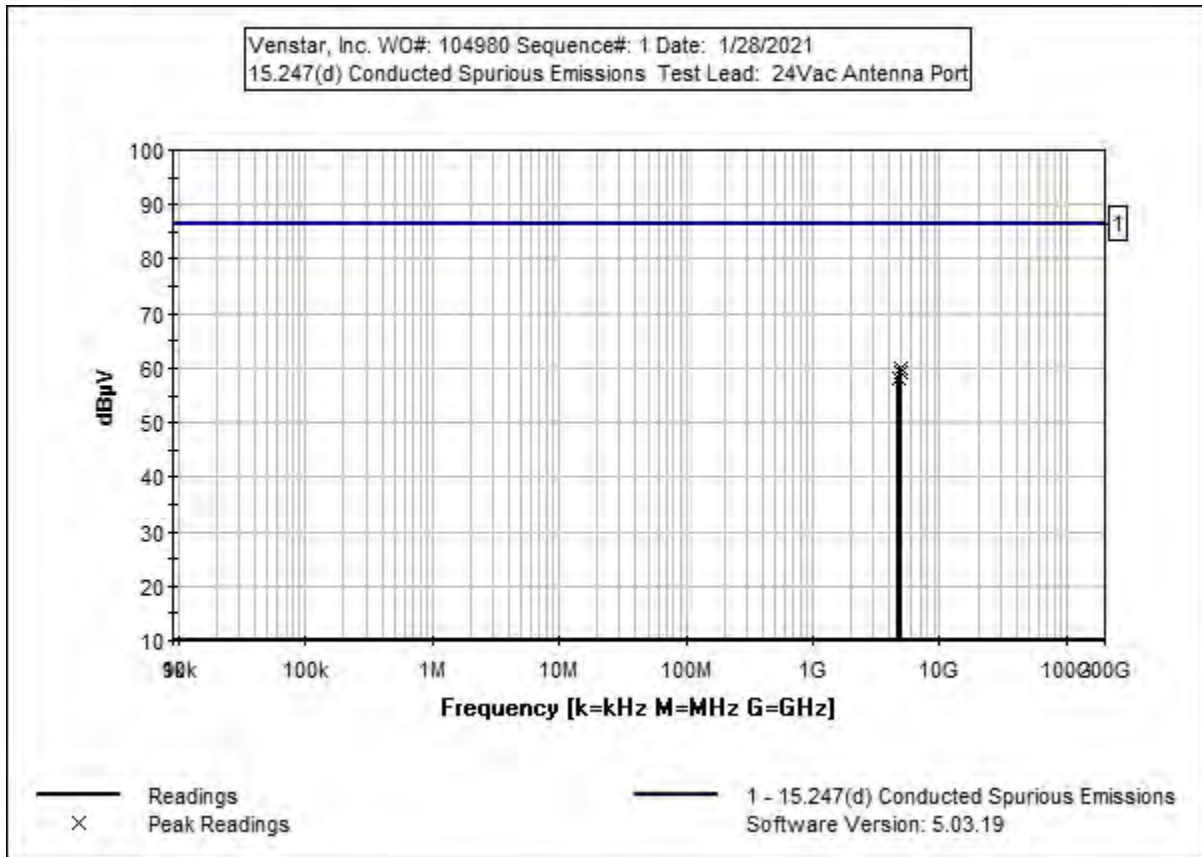
Device	Manufacturer	Model #	S/N
Configuration 1			

***Support Equipment:***

Device	Manufacturer	Model #	S/N
Configuration 1			

***Test Conditions / Notes:***

EUT is powered from 24Vac AC Adapter. The transmitter is activated via touch screen.  
 Software setting:  
 Testing Frequency: 2412, 2437, 2462MHz  
  
 Data Rate  
**802.11b: 11Mbps**  
 Mode: Continuous Modulated  
 TX Power Level: 50mW  
  
 Test Method: ANSI C63.10 (2013), KDB 558074 v05r02: 04/02/2019  
 Temperature (°C): 24.2  
 Relative Humidity (%): 28  
  
 Frequency of measurement: 9kHz-25GHz  
 RBW=100kHz, VBW=300kHz



**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN03430	Attenuator	75A-10-12	12/20/2019	12/20/2021
T2	ANP07243	Cable	32022-29094K-29094K-24TC	5/29/2020	5/29/2022
	AN02869	Spectrum Analyzer	E4440A	8/3/2020	8/3/2021

**Measurement Data:**

Reading listed by margin.

Test Lead: Antenna Port

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	dB	Dist. Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	4924.003M	49.2	+10.1	+0.7		+0.0	60.0	86.5	-26.5	Anten
2	4873.999M	48.4	+10.1	+0.7		+0.0	59.2	86.5	-27.3	Anten
3	4823.989M	47.3	+10.2	+0.7		+0.0	58.2	86.5	-28.3	Anten

Test Location: CKC Laboratories Inc. • 110 N. Olinda Pl. • Brea, CA 92823 • 714-993-6112  
 Customer: **Venstar, Inc.**  
 Specification: **15.247(d) Conducted Spurious Emissions**  
 Work Order #: **104980** Date: 1/28/2021  
 Test Type: **Conducted Emissions** Time: 13:18:55  
 Tested By: Don Nguyen Sequence#: 2  
 Software: EMITest 5.03.19 24Vac

***Equipment Tested:***

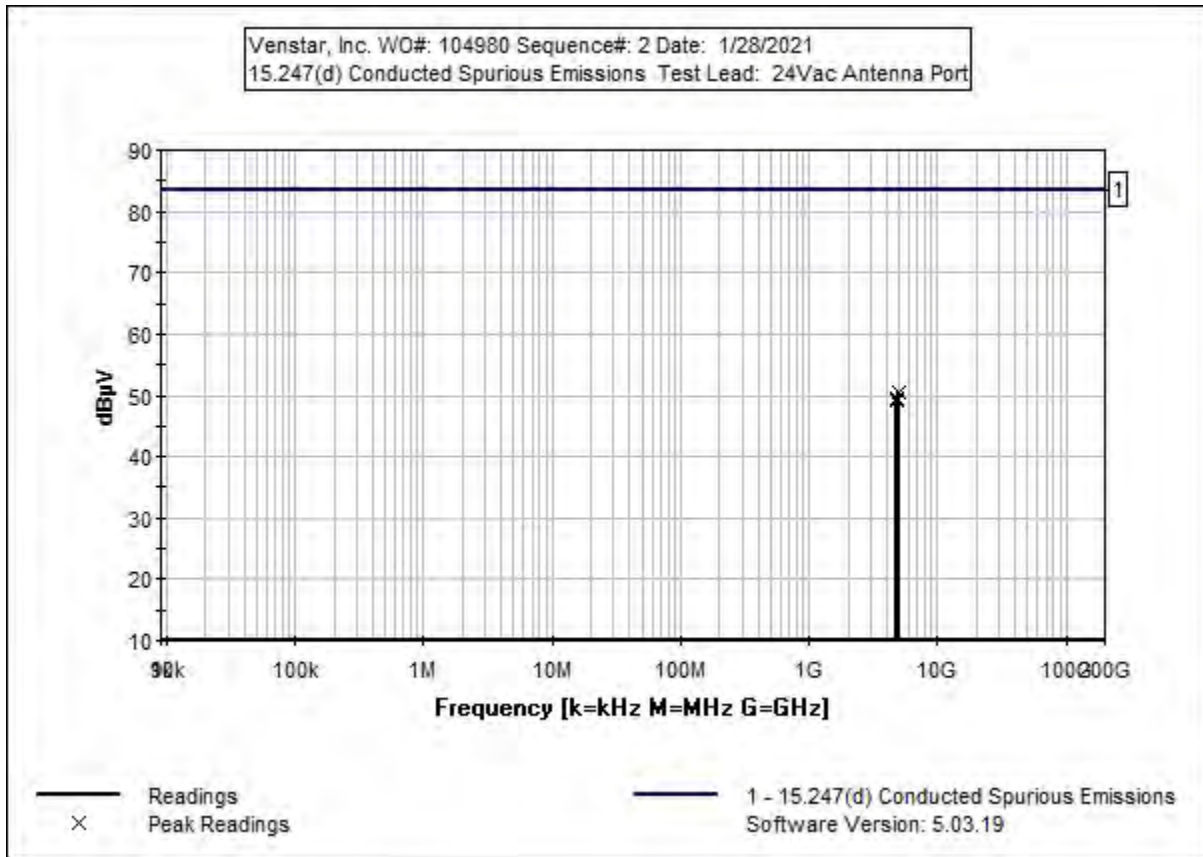
Device	Manufacturer	Model #	S/N
Configuration 1			

***Support Equipment:***

Device	Manufacturer	Model #	S/N
Configuration 1			

***Test Conditions / Notes:***

EUT is powered from 24Vac AC Adapter. The transmitter is activated via touch screen.  
 Software setting:  
 Testing Frequency: 2412, 2437, 2462MHz  
  
 Data Rate  
**802.11g: 6Mbps**  
 Mode: Continuous Modulated  
 TX Power Level: 50mW  
  
 Test Method: ANSI C63.10 (2013), KDB 558074 v05r02: 04/02/2019  
 Temperature (°C): 24.2  
 Relative Humidity (%): 28  
  
 Frequency of measurement: 9kHz-25GHz  
 RBW=100kHz, VBW=300kHz



**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN03430	Attenuator	75A-10-12	12/20/2019	12/20/2021
T2	ANP07243	Cable	32022-29094K-29094K-24TC	5/29/2020	5/29/2022
	AN02869	Spectrum Analyzer	E4440A	8/3/2020	8/3/2021

**Measurement Data:**

Reading listed by margin.

Test Lead: Antenna Port

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	dB	Dist. dB	Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	4924.000M	39.8	+10.1	+0.7		+0.0		50.6	83.5	-32.9	Anten
2	4874.000M	38.8	+10.1	+0.7		+0.0		49.6	83.5	-33.9	Anten
3	4824.000M	38.2	+10.2	+0.7		+0.0		49.1	83.5	-34.4	Anten



Test Location: CKC Laboratories Inc. • 110 N. Olinda Pl. • Brea, CA 92823 • 714-993-6112  
 Customer: **Venstar, Inc.**  
 Specification: **15.247(d) Conducted Spurious Emissions**  
 Work Order #: **104980** Date: 1/28/2021  
 Test Type: **Conducted Emissions** Time: 13:21:13  
 Tested By: Don Nguyen Sequence#: 3  
 Software: EMITest 5.03.19 24Vac

**Equipment Tested:**

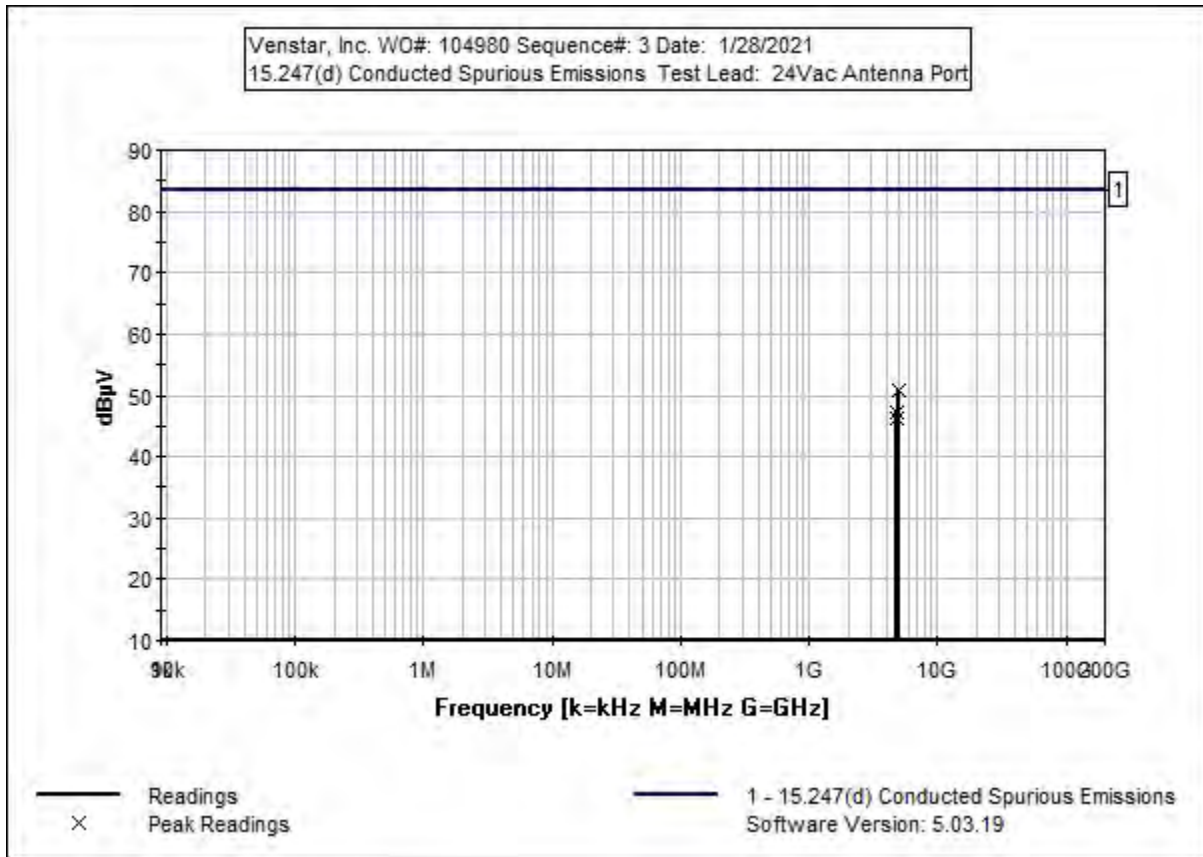
Device	Manufacturer	Model #	S/N
Configuration 1			

**Support Equipment:**

Device	Manufacturer	Model #	S/N
Configuration 1			

**Test Conditions / Notes:**

EUT is powered from 24Vac AC Adapter. The transmitter is activated via touch screen.  
 Software setting:  
 Testing Frequency: 2412, 2437, 2462MHz  
  
 Data Rate  
**802.11g: 54Mbps**  
 Mode: Continuous Modulated  
 TX Power Level: 50mW  
  
 Test Method: ANSI C63.10 (2013), KDB 558074 v05r02: 04/02/2019  
 Temperature (°C): 24.2  
 Relative Humidity (%): 28  
  
 Frequency of measurement: 9kHz-25GHz  
 RBW=100kHz, VBW=300kHz



**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN03430	Attenuator	75A-10-12	12/20/2019	12/20/2021
T2	ANP07243	Cable	32022-29094K-29094K-24TC	5/29/2020	5/29/2022
	AN02869	Spectrum Analyzer	E4440A	8/3/2020	8/3/2021

**Measurement Data:**

Reading listed by margin.

Test Lead: Antenna Port

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	Dist. dB	Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	4924.003M	40.0	+10.1	+0.7	+0.0		50.8	83.5	-32.7	Anten
2	4824.003M	36.3	+10.2	+0.7	+0.0		47.2	83.5	-36.3	Anten
3	4874.003M	35.5	+10.1	+0.7	+0.0		46.3	83.5	-37.2	Anten



Test Location: CKC Laboratories Inc. • 110 N. Olinda Pl. • Brea, CA 92823 • 714-993-6112  
 Customer: **Venstar, Inc.**  
 Specification: **15.247(d) Conducted Spurious Emissions**  
 Work Order #: **104980** Date: 1/28/2021  
 Test Type: **Conducted Emissions** Time: 13:23:35  
 Tested By: Don Nguyen Sequence#: 4  
 Software: EMITest 5.03.19 24Vac

***Equipment Tested:***

Device	Manufacturer	Model #	S/N
Configuration 1			

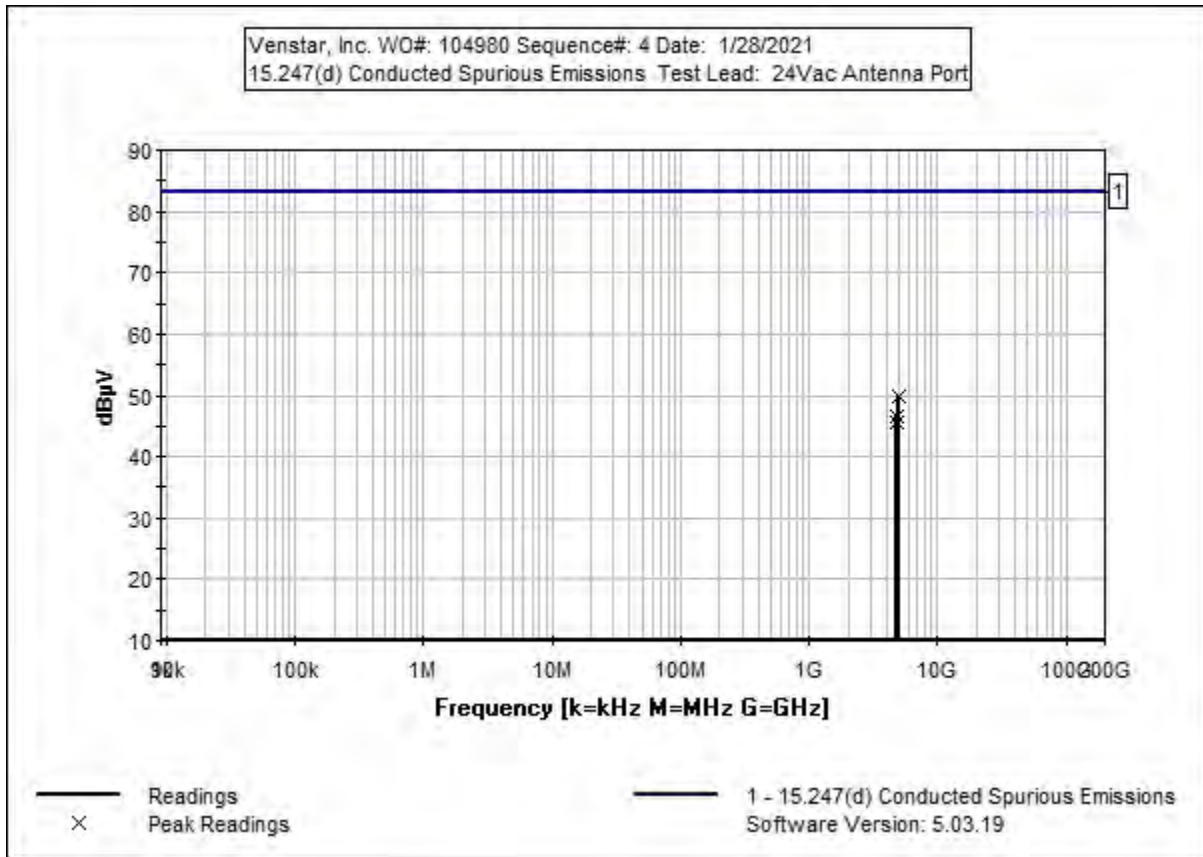
***Support Equipment:***

Device	Manufacturer	Model #	S/N
Configuration 1			

***Test Conditions / Notes:***

EUT is powered from 24Vac AC Adapter. The transmitter is activated via touch screen.  
 Software setting:  
 Testing Frequency: 2412, 2437, 2462MHz  
  
 Data Rate  
**802.11n20: MCS0**  
 Mode: Continuous Modulated  
 TX Power Level: 50mW  
  
 Test Method: ANSI C63.10 (2013), KDB 558074 v05r02: 04/02/2019  
 Temperature (°C): 24.2  
 Relative Humidity (%): 28  
  
 Frequency of measurement: 9kHz-25GHz  
 RBW=100kHz, VBW=300kHz





**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN03430	Attenuator	75A-10-12	12/20/2019	12/20/2021
T2	ANP07243	Cable	32022-29094K-29094K-24TC	5/29/2020	5/29/2022
	AN02869	Spectrum Analyzer	E4440A	8/3/2020	8/3/2021

**Measurement Data:**

Reading listed by margin.

Test Lead: Antenna Port

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	Dist. dB	Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	4924.003M	38.9	+10.1	+0.7	+0.0		49.7	83.2	-33.5	Anten
2	4874.003M	35.9	+10.1	+0.7	+0.0		46.7	83.2	-36.5	Anten
3	4824.003M	34.7	+10.2	+0.7	+0.0		45.6	83.2	-37.6	Anten



Test Location: CKC Laboratories Inc. • 110 N. Olinda Pl. • Brea, CA 92823 • 714-993-6112  
 Customer: **Venstar, Inc.**  
 Specification: **15.247(d) Conducted Spurious Emissions**  
 Work Order #: **104980** Date: 1/28/2021  
 Test Type: **Conducted Emissions** Time: 13:27:49  
 Tested By: Don Nguyen Sequence#: 5  
 Software: EMITest 5.03.19 24Vac

**Equipment Tested:**

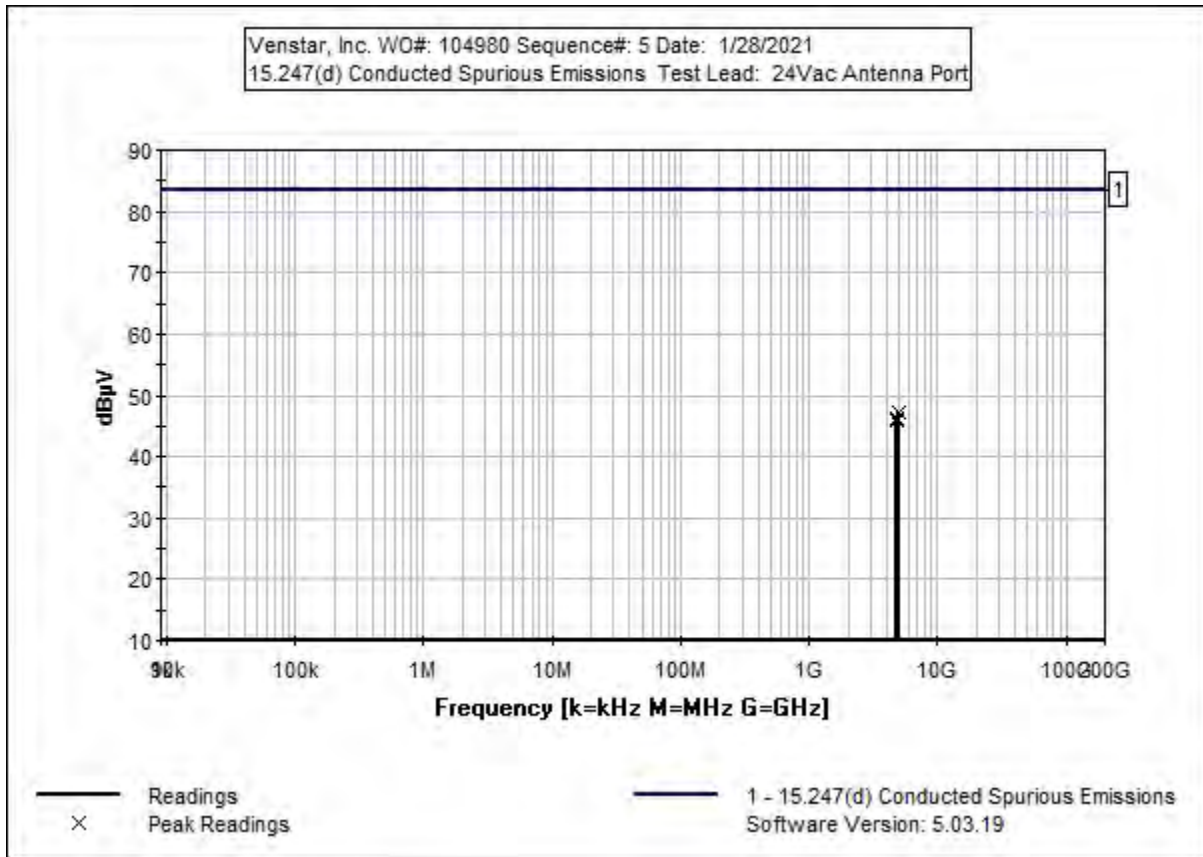
Device	Manufacturer	Model #	S/N
Configuration 1			

**Support Equipment:**

Device	Manufacturer	Model #	S/N
Configuration 1			

**Test Conditions / Notes:**

EUT is powered from 24Vac AC Adapter. The transmitter is activated via touch screen.  
 Software setting:  
 Testing Frequency: 2412, 2437, 2462MHz  
  
 Data Rate  
**802.11n20: MCS7**  
 Mode: Continuous Modulated  
 TX Power Level: 50mW  
  
 Test Method: ANSI C63.10 (2013), KDB 558074 v05r02: 04/02/2019  
 Temperature (°C): 24.2  
 Relative Humidity (%): 28  
  
 Frequency of measurement: 9kHz-25GHz  
 RBW=100kHz, VBW=300kHz



**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN03430	Attenuator	75A-10-12	12/20/2019	12/20/2021
T2	ANP07243	Cable	32022-29094K-29094K-24TC	5/29/2020	5/29/2022
	AN02869	Spectrum Analyzer	E4440A	8/3/2020	8/3/2021

**Measurement Data:**

Reading listed by margin.

Test Lead: Antenna Port

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	dB	Dist. dB	Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	4924.003M	36.4	+10.1	+0.7		+0.0		47.2	83.6	-36.4	Anten
2	4824.003M	35.4	+10.2	+0.7		+0.0		46.3	83.6	-37.3	Anten
3	4874.003M	35.1	+10.1	+0.7		+0.0		45.9	83.6	-37.7	Anten

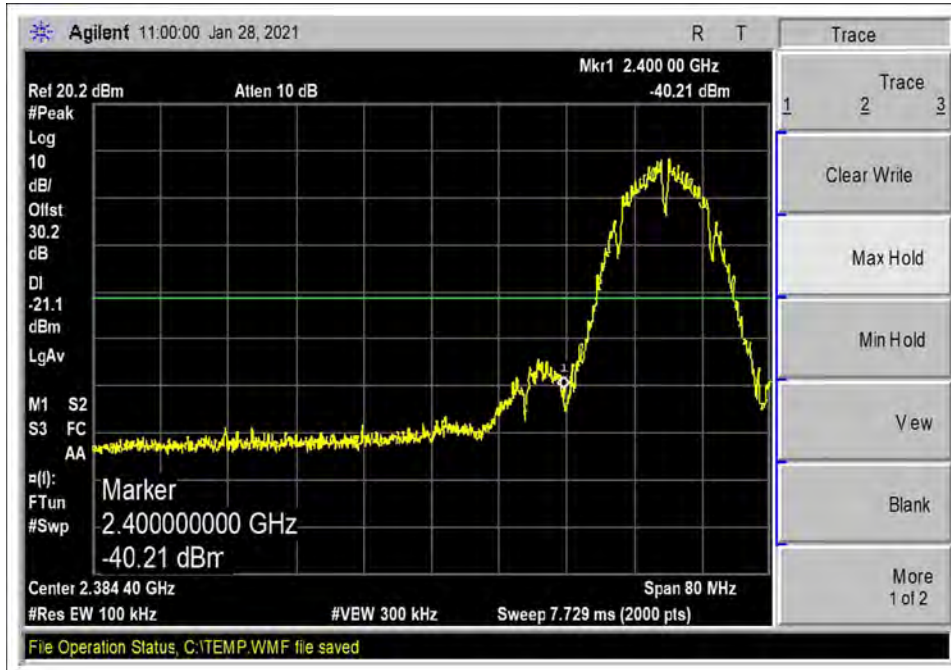
**Band Edge**

**Band Edge Summary**

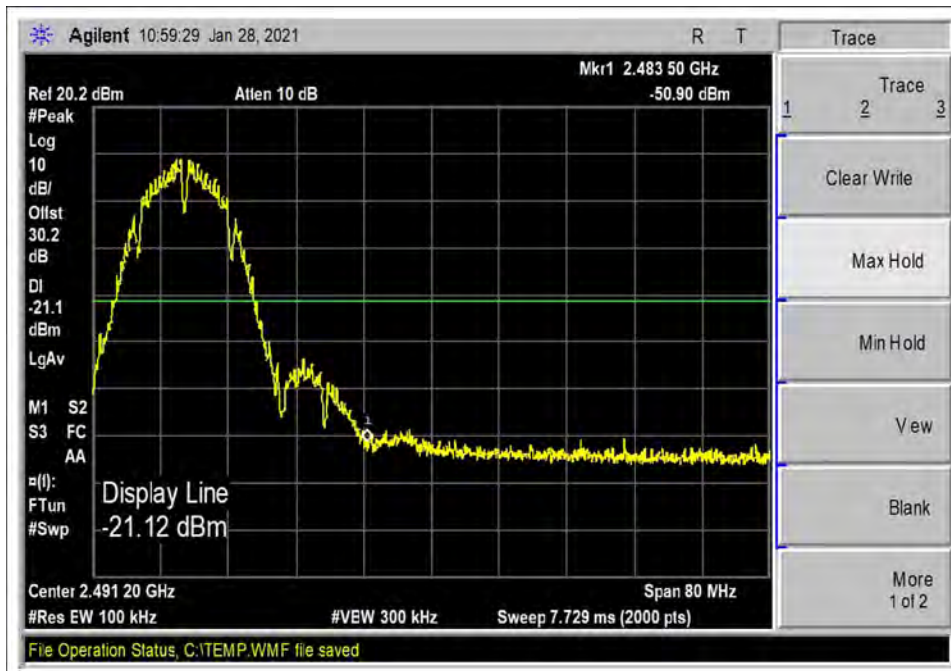
Limit applied: Max Power/100kHz - 30dB (When average power limit is applied).

Frequency (MHz)	Modulation	Measured (dBm)	Limit (dBm)	Results
2400.0	802.11b/1Mbps	-40.21	<-21.12	Pass
2483.5	802.11b/1Mbps	-50.90	<-21.12	Pass
2400.0	802.11b/11Mbps	-36.15	<-20.53	Pass
2483.5	802.11b/11Mbps	-50.92	<-20.53	Pass
2400.0	802.11g/6Mbps	-30.30	<-23.48	Pass
2483.5	802.11g/6Mbps	-37.54	<-23.48	Pass
2400.0	802.11g/54Mbps	-29.43	<-23.47	Pass
2483.5	802.11g/54Mbps	-39.26	<-23.47	Pass
2400.0	802.11n20/MCS0	-27.28	<-23.79	Pass
2483.5	802.11n20/MCS0	-36.36	<-23.79	Pass
2400.0	802.11n20/MCS7	-30.37	<-23.45	Pass
2483.5	802.11n20/MCS7	-37.56	<-23.45	Pass

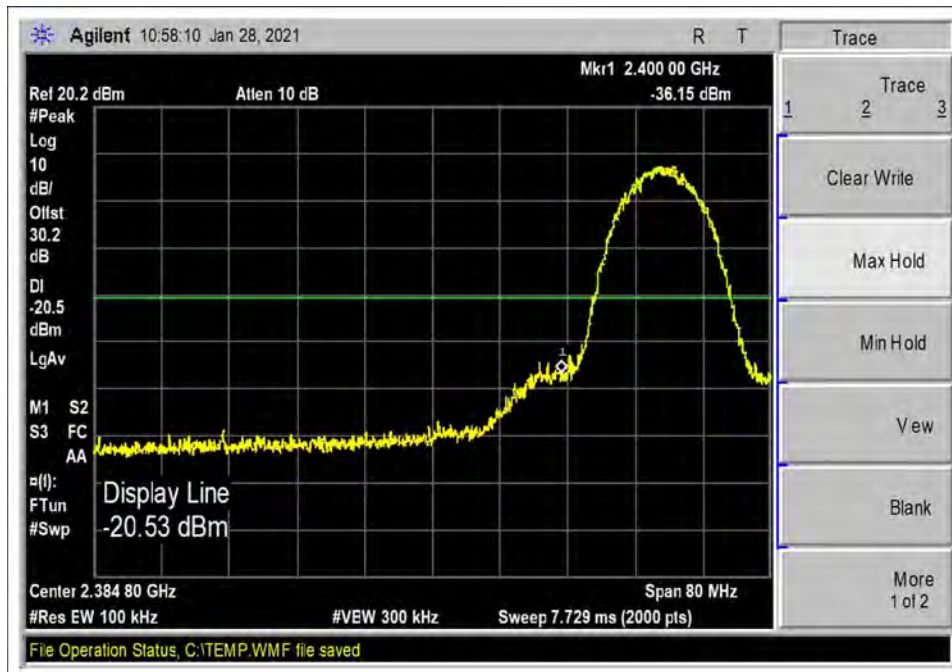
## Band Edge Plots



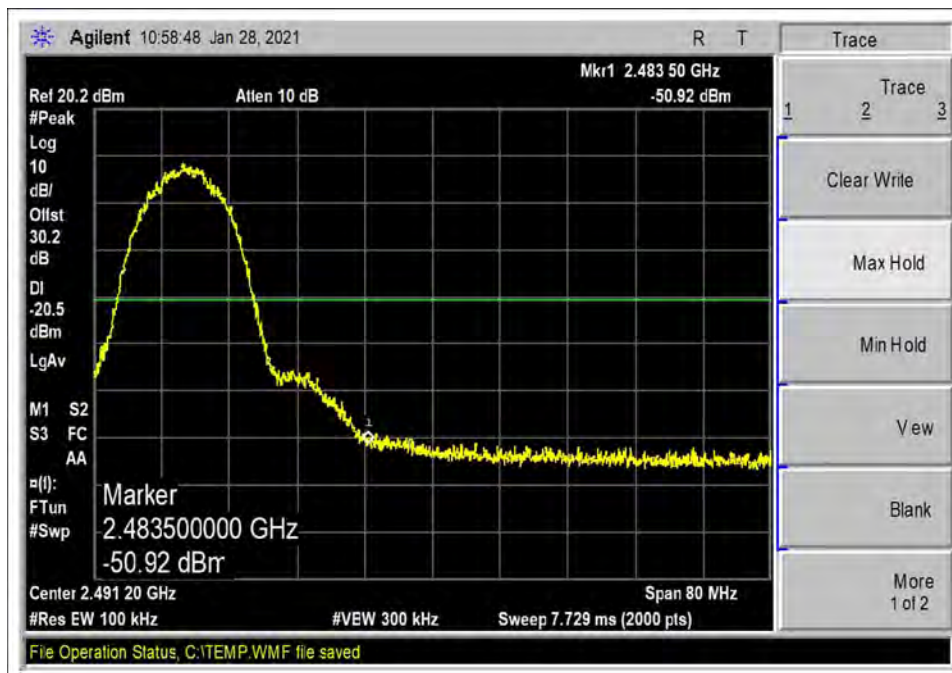
802.11b\_1Mbps \_Low Channel



802.11b\_1Mbps \_High Channel

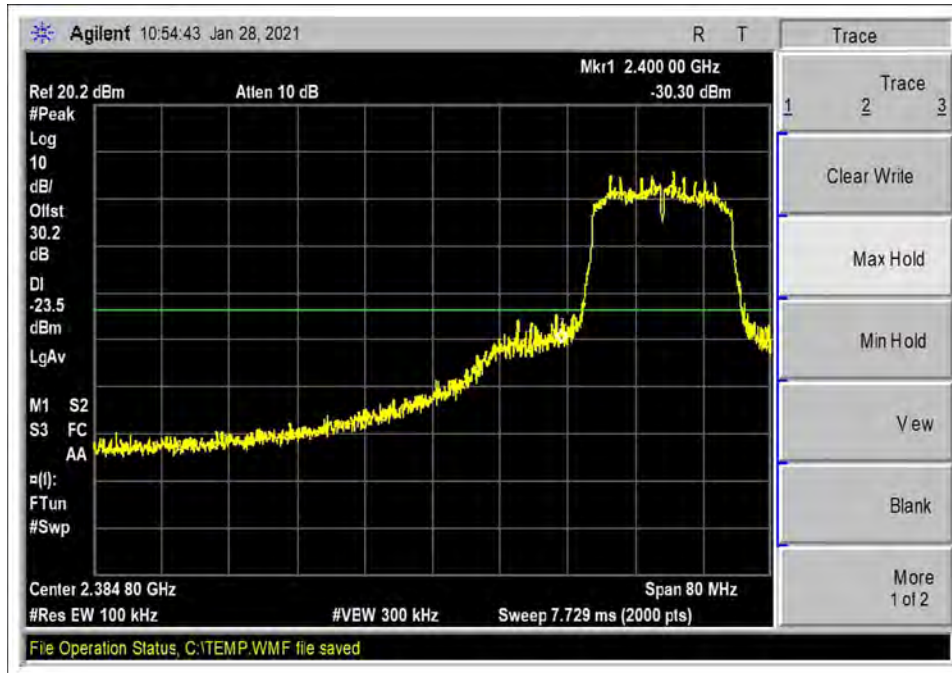


802.11b\_11Mbps\_Low Channel

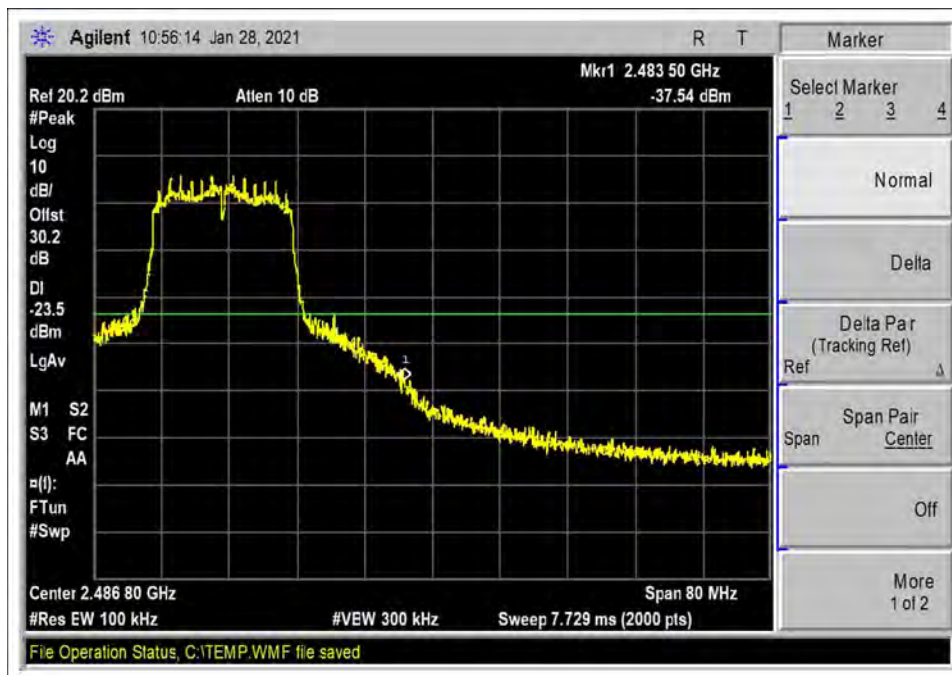


802.11b\_11Mbps\_High Channel

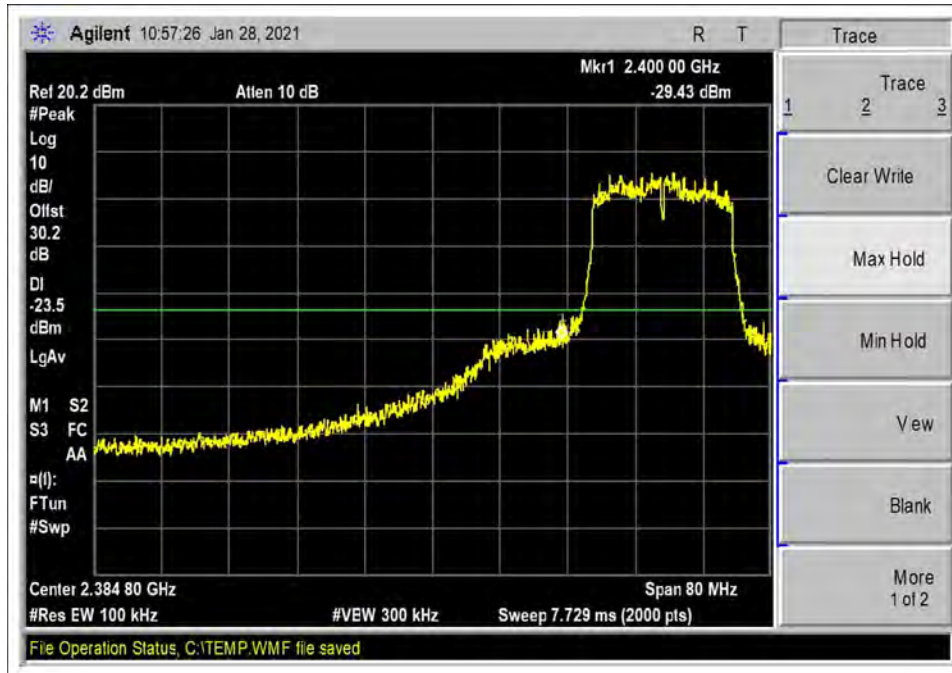




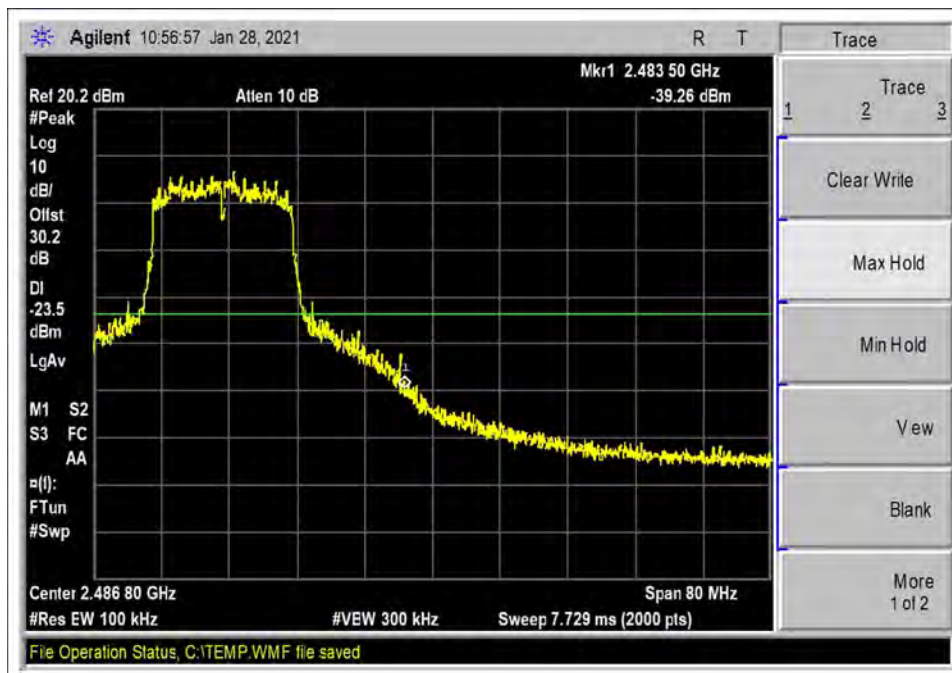
802.11g\_6Mbps\_Low Channel



802.11g\_6Mbps\_High Channel

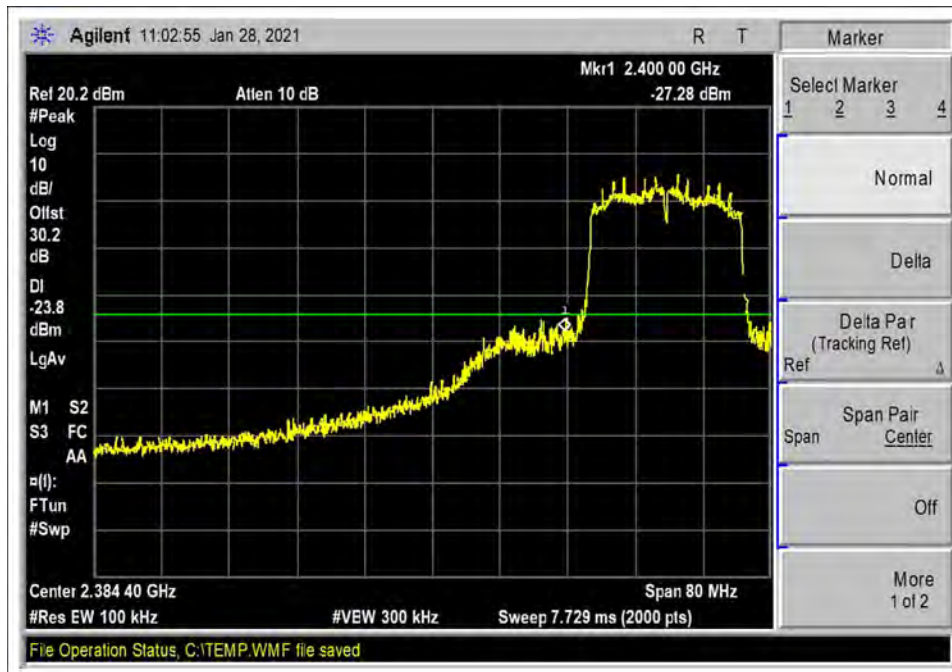


802.11g\_54Mbps\_Low Channel

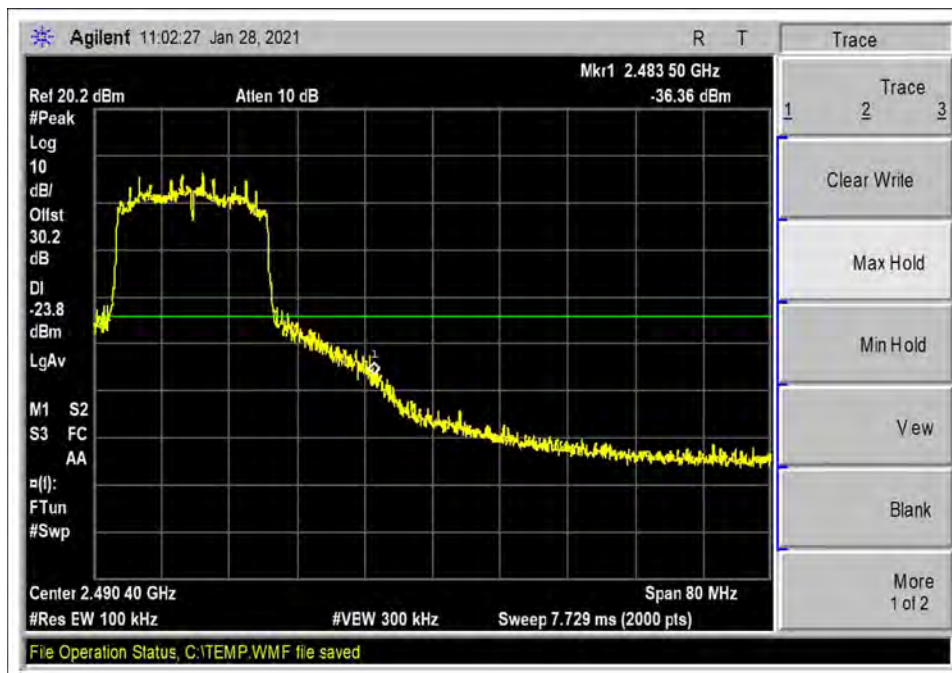


802.11g\_54Mbps\_High Channel

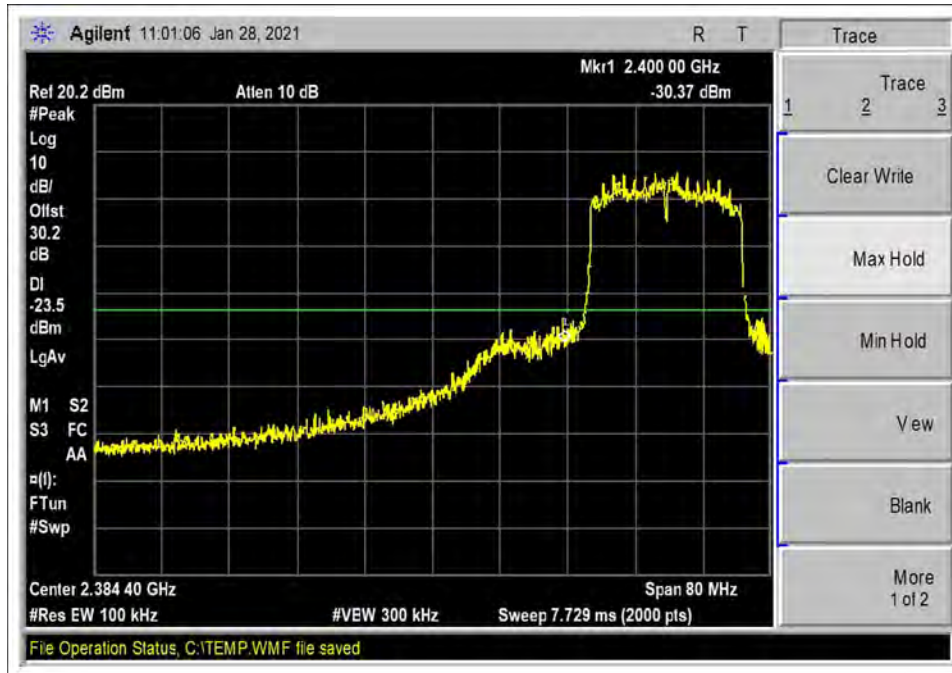




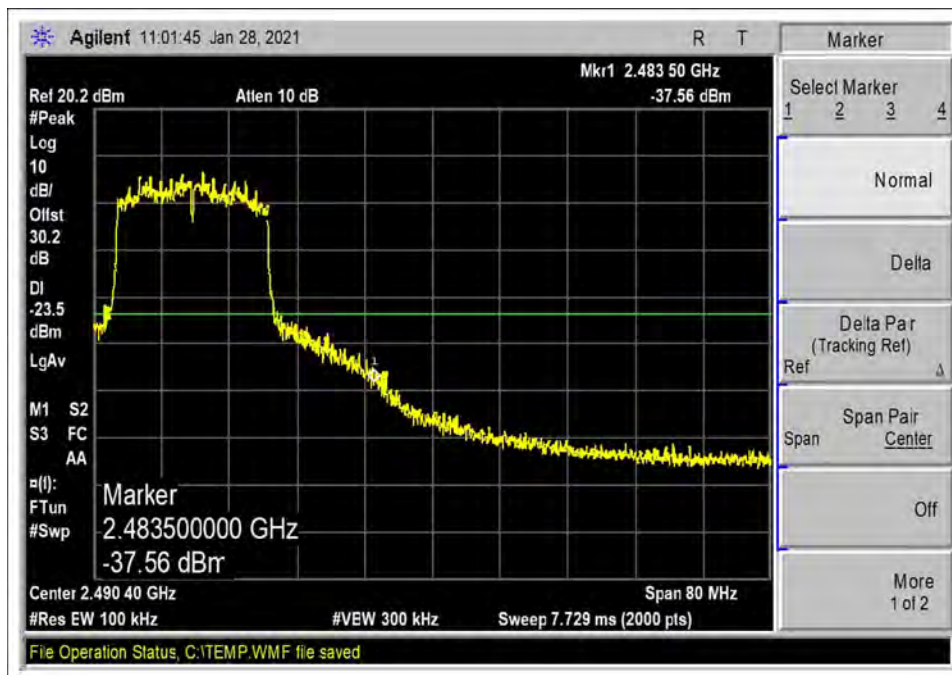
802.11n20\_MCS0\_Low Channel



802.11n20\_MCS0\_High Channel

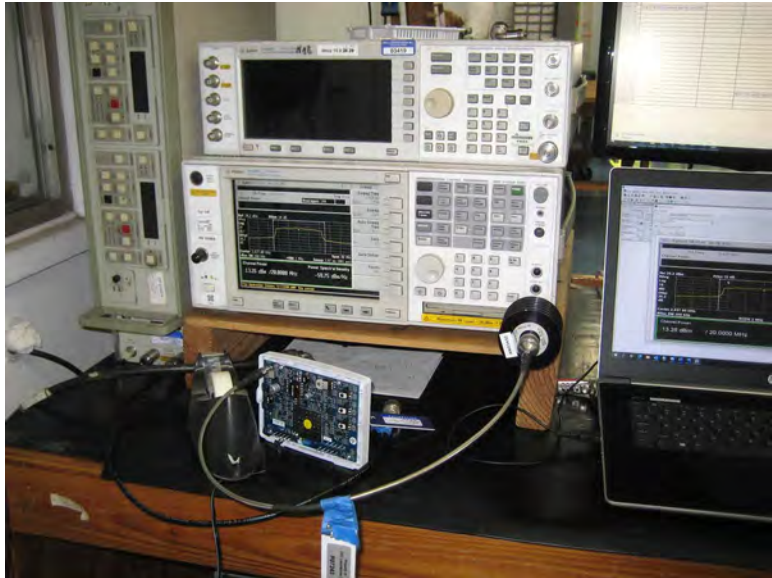


802.11n20\_MCS7\_Low Channel



802.11n20\_MCS7\_High Channel

Test Setup Photo(s)



## 15.247(d) Radiated Emissions & Band Edge

### Test Setup / Conditions / Data

Test Location: CKC Laboratories Inc. • 110 N. Olinda Pl. • Brea, CA 92823 • 714-993-6112  
 Customer: **Venstar, Inc.**  
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**  
 Work Order #: **104980** Date: 2/2/2021  
 Test Type: **Maximized Emissions** Time: 09:10:12  
 Tested By: Don Nguyen Sequence#: 0  
 Software: EMITest 5.03.19

**Equipment Tested:**

Device	Manufacturer	Model #	S/N
Configuration 2			

**Support Equipment:**

Device	Manufacturer	Model #	S/N
Configuration 2			

**Test Conditions / Notes:**

EUT is powered from 24Vac AC Adapter and set to transmit continuously. All IO ports are populated with unterminated cables.  
 The manufacturer declares that the EUT has fixed orientation.

Software setting:  
 Testing Frequency: 2412, 2437, 2462MHz

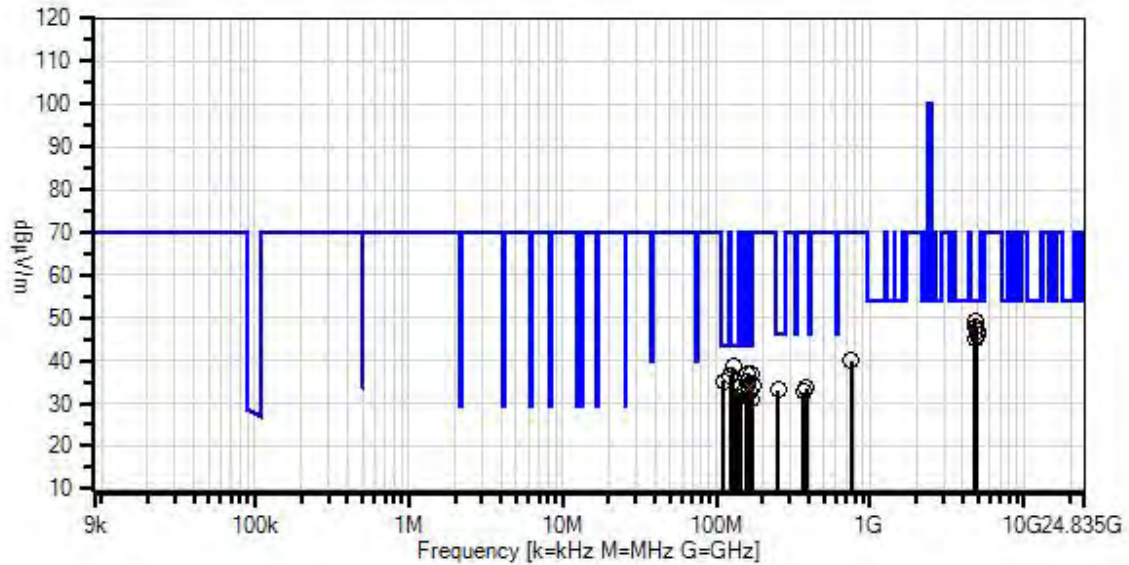
Data Rate  
**802.11b: 1Mbps and 11Mbps (data represents the worst case data rate)**  
 Mode: Continuous Modulated  
 TX Power Level: 50mW

Frequency of measurement: 9kHz-25000MHz  
 9kHz to 150kHz RBW=0.2kHz, VBW=0.6kHz.  
 150kHz to 30MHz RBW=9kHz, VBW=27kHz.  
 30-1000MHz, RBW=120kHz, VBW=360kHz  
 1000-25000MHz, RBW=1MHz, VBW=3MHz  
 -30dBc limit, RBW=100kHz, VBW=300kHz

Test Method: ANSI C63.10 (2013), KDB 558074 v05r02: 04/02/2019  
 Temperature (°C): 22.8  
 Relative Humidity (%): 44

Site A

Venstar, Inc. WO#: 104980 Sequence#: 0 Date: 2/2/2021  
 15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Horiz



— Readings  
 × QP Readings  
 ▼ Ambient  
 ○ Peak Readings  
 \* Average Readings  
 Software Version: 5.03.19  
 1 - 15.247(d) / 15.209 Radiated Spurious Emissions

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN00314	Loop Antenna	6502	4/13/2020	4/13/2022
T1	AN00309	Preamp	8447D	12/24/2019	12/24/2021
T2	ANP05281	Attenuator	1B	4/7/2020	4/7/2022
T3	ANP05050	Cable	RG223/U	12/24/2020	12/24/2022
T4	ANP05198	Cable-Amplitude +15C to +45C (dB)	8268	12/21/2020	12/21/2022
T5	AN01993	Biconilog Antenna	CBL6111C	6/11/2019	6/11/2021
T6	AN02869	Spectrum Analyzer	E4440A	8/3/2020	8/3/2021
T7	AN00786	Preamp	83017A	5/20/2020	5/20/2022
T8	AN00849	Horn Antenna	3115	3/17/2020	3/17/2022
T9	ANP06360	Cable	L1-PNMM-48	8/8/2019	8/8/2021
T10	ANP07246	Cable	32022-29094K- 29094K-24TC	5/29/2020	5/29/2022
T11	AN03385	High Pass Filter	115H10- 3000/T10000- O/O	5/13/2019	5/13/2021
	AN01413	Horn Antenna	84125-80008	10/19/2020	10/19/2022
	AN03367	Horn Antenna	62-GH-62-25.	8/1/2019	8/1/2021



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	T5 dB					
1	4824.130M	48.4	+0.0 +0.0 +4.5	+0.0 +0.0 +0.7	+0.0 -37.6 +0.3	+0.0 +33.1	+0.0	49.4	54.0	-4.6	Horiz	
2	128.300M	47.4	-28.0 +11.3 +0.0	+5.9 +0.0 +0.0	+0.1 +0.0 +0.0	+1.9 +0.0	+0.0	38.6	43.5	-4.9	Vert	
3	4874.070M	47.0	+0.0 +0.0 +4.5	+0.0 +0.0 +0.6	+0.0 -37.6 +0.3	+0.0 +33.2	+0.0	48.0	54.0	-6.0	Horiz	
4	4824.500M	46.6	+0.0 +0.0 +4.5	+0.0 +0.0 +0.7	+0.0 -37.6 +0.3	+0.0 +33.1	+0.0	47.6	54.0	-6.4	Vert	
5	167.830M	46.4	-28.0 +10.0 +0.0	+5.9 +0.0 +0.0	+0.2 +0.0 +0.0	+2.3 +0.0	+0.0	36.8	43.5	-6.7	Vert	
6	4924.030M	46.0	+0.0 +0.0 +4.5	+0.0 +0.0 +0.6	+0.0 -37.6 +0.3	+0.0 +33.3	+0.0	47.1	54.0	-6.9	Horiz	
7	123.800M	45.3	-28.0 +11.3 +0.0	+5.9 +0.0 +0.0	+0.1 +0.0 +0.0	+1.9 +0.0	+0.0	36.5	43.5	-7.0	Vert	
8	4924.030M	44.9	+0.0 +0.0 +4.5	+0.0 +0.0 +0.6	+0.0 -37.6 +0.3	+0.0 +33.3	+0.0	46.0	54.0	-8.0	Vert	
9	110.500M	44.6	-28.0 +10.7 +0.0	+5.9 +0.0 +0.0	+0.1 +0.0 +0.0	+1.8 +0.0	+0.0	35.1	43.5	-8.4	Vert	
10	4874.030M	44.1	+0.0 +0.0 +4.5	+0.0 +0.0 +0.6	+0.0 -37.6 +0.3	+0.0 +33.2	+0.0	45.1	54.0	-8.9	Vert	
11	164.400M QP	43.2	-28.0 +10.2 +0.0	+5.9 +0.0 +0.0	+0.2 +0.0 +0.0	+2.2 +0.0	+0.0	33.7	43.5	-9.8	Vert	
^	164.400M	49.0	-28.0 +10.2 +0.0	+5.9 +0.0 +0.0	+0.2 +0.0 +0.0	+2.2 +0.0	+0.0	39.5	43.5	-4.0	Vert	
13	137.340M	42.2	-28.0 +11.4 +0.0	+5.9 +0.0 +0.0	+0.1 +0.0 +0.0	+2.0 +0.0	+0.0	33.6	43.5	-9.9	Horiz	
14	164.340M	42.3	-28.0 +10.2 +0.0	+5.9 +0.0 +0.0	+0.2 +0.0 +0.0	+2.2 +0.0	+0.0	32.8	43.5	-10.7	Horiz	
15	168.740M	40.8	-28.0 +9.9 +0.0	+5.9 +0.0 +0.0	+0.2 +0.0 +0.0	+2.3 +0.0	+0.0	31.1	43.5	-12.4	Horiz	

16	252.100M	39.8	-27.9 +12.3 +0.0	+5.9 +0.0 +0.0	+0.2 +0.0 +0.0	+2.8 +0.0 +0.0	+0.0	33.1	46.0	-12.9	Vert
17	756.250M	33.8	-27.1 +21.7 +0.0	+6.0 +0.0 +0.0	+0.4 +0.0 +0.0	+5.1 +0.0 +0.0	+0.0	39.9	70.2	-30.3	Vert
18	159.830M	45.8	-28.0 +10.6 +0.0	+5.9 +0.0 +0.0	+0.2 +0.0 +0.0	+2.2 +0.0 +0.0	+0.0	36.7	70.2	-33.5	Vert
19	159.740M	44.0	-28.0 +10.6 +0.0	+5.9 +0.0 +0.0	+0.2 +0.0 +0.0	+2.2 +0.0 +0.0	+0.0	34.9	70.2	-35.3	Horiz
20	173.275M	44.2	-28.0 +9.5 +0.0	+5.9 +0.0 +0.0	+0.2 +0.0 +0.0	+2.3 +0.0 +0.0	+0.0	34.1	70.2	-36.1	Vert
21	387.150M	35.9	-27.9 +15.8 +0.0	+5.9 +0.0 +0.0	+0.2 +0.0 +0.0	+3.6 +0.0 +0.0	+0.0	33.5	70.2	-36.7	Vert
22	155.340M	42.0	-28.0 +10.9 +0.0	+5.9 +0.0 +0.0	+0.2 +0.0 +0.0	+2.2 +0.0 +0.0	+0.0	33.2	70.2	-37.0	Horiz
23	369.140M	35.7	-27.9 +15.3 +0.0	+5.9 +0.0 +0.0	+0.2 +0.0 +0.0	+3.5 +0.0 +0.0	+0.0	32.7	70.2	-37.5	Horiz
24	142.100M	40.2	-28.0 +11.4 +0.0	+5.9 +0.0 +0.0	+0.1 +0.0 +0.0	+2.0 +0.0 +0.0	+0.0	31.6	70.2	-38.6	Vert

Test Location: CKC Laboratories Inc. • 110 N. Olinda Pl. • Brea, CA 92823 • 714-993-6112  
 Customer: **Venstar, Inc.**  
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**  
 Work Order #: **104980** Date: 1/29/2021  
 Test Type: **Maximized Emissions** Time: 09:43:06  
 Tested By: Don Nguyen Sequence#: 1  
 Software: EMITest 5.03.19

**Equipment Tested:**

Device	Manufacturer	Model #	S/N
Configuration 2			

**Support Equipment:**

Device	Manufacturer	Model #	S/N
Configuration 2			

**Test Conditions / Notes:**

EUT is powered from 24Vac AC Adapter and set to transmit continuously. All IO ports are populated with unterminated cables.  
 The manufacturer declares that the EUT has fixed orientation.

Software setting:  
 Testing Frequency: 2412, 2437, 2462MHz

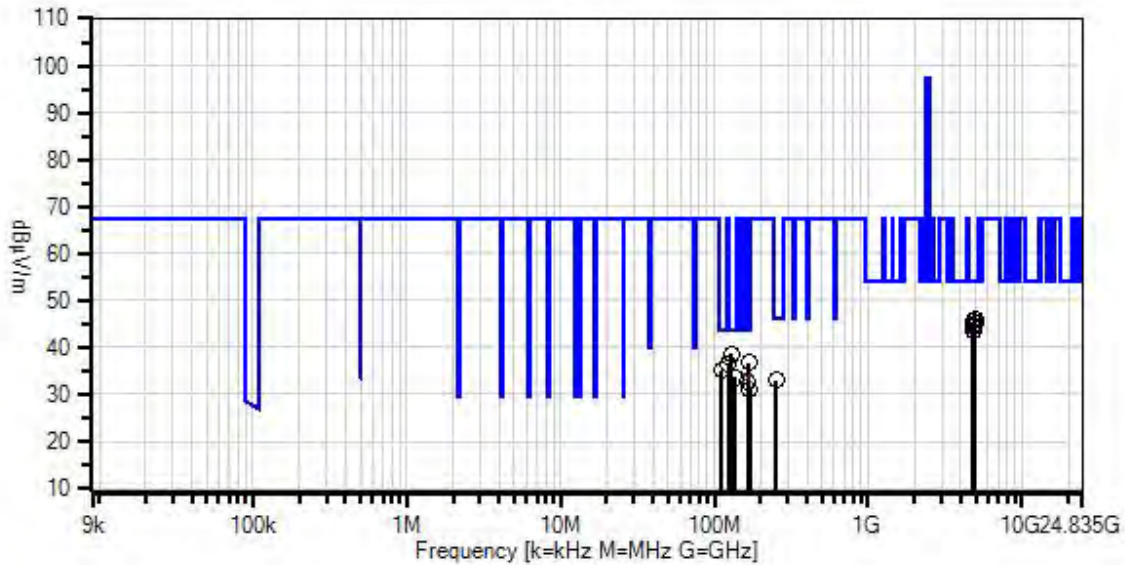
Data Rate  
**802.11g: 6Mbps and 54Mbps (data represents the worst case data rate)**  
 Mode: Continuous Modulated  
 TX Power Level: 50mW

Frequency of measurement: 9kHz-25000MHz  
 9kHz to 150kHz RBW=0.2kHz, VBW=0.6kHz.  
 150kHz to 30MHz RBW=9kHz, VBW=27kHz.  
 30-1000MHz, RBW=120kHz, VBW=360kHz  
 1000-25000MHz, RBW=1MHz, VBW=3MHz  
 -30dBc limit, RBW=100kHz, VBW=300kHz

Test Method: ANSI C63.10 (2013), KDB 558074 v05r02: 04/02/2019  
 Temperature (°C): 22.8  
 Relative Humidity (%): 44

Site A

Venstar, Inc. WO#: 104980 Sequence#: 1 Date: 1/29/2021  
 15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Horiz



— Readings  
 × QP Readings  
 ▼ Ambient  
 ○ Peak Readings  
 \* Average Readings  
 Software Version: 5.03.19  
 — 1 - 15.247(d) / 15.209 Radiated Spurious Emissions

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN00314	Loop Antenna	6502	4/13/2020	4/13/2022
T1	AN00309	Preamp	8447D	12/24/2019	12/24/2021
T2	ANP05281	Attenuator	1B	4/7/2020	4/7/2022
T3	ANP05050	Cable	RG223/U	12/24/2020	12/24/2022
T4	ANP05198	Cable-Amplitude +15C to +45C (dB)	8268	12/21/2020	12/21/2022
T5	AN01993	Biconilog Antenna	CBL6111C	6/11/2019	6/11/2021
T6	AN02869	Spectrum Analyzer	E4440A	8/3/2020	8/3/2021
T7	AN00786	Preamp	83017A	5/20/2020	5/20/2022
T8	AN00849	Horn Antenna	3115	3/17/2020	3/17/2022
T9	ANP06360	Cable	L1-PNMM-48	8/8/2019	8/8/2021
T10	ANP07246	Cable	32022-29094K- 29094K-24TC	5/29/2020	5/29/2022
T11	AN03385	High Pass Filter	11SH10- 3000/T10000- O/O	5/13/2019	5/13/2021
	AN01413	Horn Antenna	84125-80008	10/19/2020	10/19/2022
	AN03367	Horn Antenna	62-GH-62-25.	8/1/2019	8/1/2021

**Measurement Data:**

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dB $\mu$ V	T1	T2	T3	T4	Dist.	Corr	Spec	Margin	Polar
			T5	T6	T7	T8					
			T9	T10	T11		Table	dB $\mu$ V/m	dB $\mu$ V/m	dB	Ant
1	128.300M	47.4	-28.0 +11.3 +0.0	+5.9 +0.0 +0.0	+0.1 +0.0 +0.0	+1.9 +0.0 +0.0	+0.0	38.6	43.5	-4.9	Vert
2	167.830M	46.4	-28.0 +10.0 +0.0	+5.9 +0.0 +0.0	+0.2 +0.0 +0.0	+2.3 +0.0 +0.0	+0.0	36.8	43.5	-6.7	Vert
3	123.800M	45.3	-28.0 +11.3 +0.0	+5.9 +0.0 +0.0	+0.1 +0.0 +0.0	+1.9 +0.0 +0.0	+0.0	36.5	43.5	-7.0	Vert
4	4924.000M	44.9	+0.0 +0.0 +4.5	+0.0 +0.0 +0.6	+0.0 -37.6 +0.3	+0.0 +33.3	+0.0	46.0	54.0	-8.0	Horiz
5	110.500M	44.6	-28.0 +10.7 +0.0	+5.9 +0.0 +0.0	+0.1 +0.0 +0.0	+1.8 +0.0 +0.0	+0.0	35.1	43.5	-8.4	Vert
6	4824.830M	44.5	+0.0 +0.0 +4.5	+0.0 +0.0 +0.7	+0.0 -37.6 +0.3	+0.0 +33.1	+0.0	45.5	54.0	-8.5	Horiz
7	4924.000M	44.1	+0.0 +0.0 +4.5	+0.0 +0.0 +0.6	+0.0 -37.6 +0.3	+0.0 +33.3	+0.0	45.2	54.0	-8.8	Vert
8	4824.830M	43.9	+0.0 +0.0 +4.5	+0.0 +0.0 +0.7	+0.0 -37.6 +0.3	+0.0 +33.1	+0.0	44.9	54.0	-9.1	Vert
9	164.400M QP	43.2	-28.0 +10.2 +0.0	+5.9 +0.0 +0.0	+0.2 +0.0 +0.0	+2.2 +0.0	+0.0	33.7	43.5	-9.8	Vert
^	164.400M	49.0	-28.0 +10.2 +0.0	+5.9 +0.0 +0.0	+0.2 +0.0 +0.0	+2.2 +0.0	+0.0	39.5	43.5	-4.0	Vert
11	4874.000M	43.2	+0.0 +0.0 +4.5	+0.0 +0.0 +0.6	+0.0 -37.6 +0.3	+0.0 +33.2	+0.0	44.2	54.0	-9.8	Horiz
12	137.340M	42.2	-28.0 +11.4 +0.0	+5.9 +0.0 +0.0	+0.1 +0.0 +0.0	+2.0 +0.0	+0.0	33.6	43.5	-9.9	Horiz



13	4874.000M	42.5	+0.0	+0.0	+0.0	+0.0	+0.0	43.5	54.0	-10.5	Vert
			+0.0	+0.0	-37.6	+33.2					
			+4.5	+0.6	+0.3						
14	164.340M	42.3	-28.0	+5.9	+0.2	+2.2	+0.0	32.8	43.5	-10.7	Horiz
			+10.2	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0						
15	168.740M	40.8	-28.0	+5.9	+0.2	+2.3	+0.0	31.1	43.5	-12.4	Horiz
			+9.9	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0						
16	252.100M	39.8	-27.9	+5.9	+0.2	+2.8	+0.0	33.1	46.0	-12.9	Vert
			+12.3	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0						

Test Location: CKC Laboratories Inc. • 110 N. Olinda Pl. • Brea, CA 92823 • 714-993-6112  
 Customer: **Venstar, Inc.**  
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**  
 Work Order #: **104980** Date: 1/29/2021  
 Test Type: **Maximized Emissions** Time: 09:48:28  
 Tested By: Don Nguyen Sequence#: 2  
 Software: EMITest 5.03.19

**Equipment Tested:**

Device	Manufacturer	Model #	S/N
Configuration 2			

**Support Equipment:**

Device	Manufacturer	Model #	S/N
Configuration 2			

**Test Conditions / Notes:**

EUT is powered from 24Vac AC Adapter and set to transmit continuously. All IO ports are populated with unterminated cables.  
 The manufacturer declares that the EUT has fixed orientation.

Software setting:  
 Testing Frequency: 2412, 2437, 2462MHz

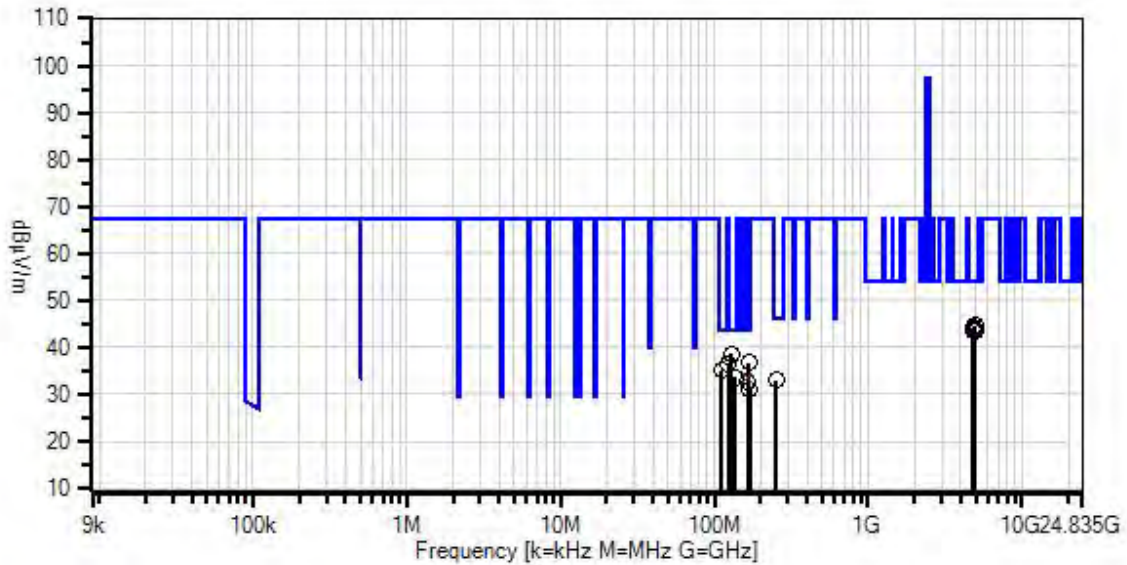
Data Rate  
**802.11n20: MCS0 and MCS7 (data represents the worst case data rate)**  
 Mode: Continuous Modulated  
 TX Power Level: 50mW

Frequency of measurement: 9kHz-25000MHz  
 9kHz to 150kHz RBW=0.2kHz, VBW=0.6kHz.  
 150kHz to 30MHz RBW=9kHz, VBW=27kHz.  
 30-1000MHz, RBW=120kHz, VBW=360kHz  
 1000-25000MHz, RBW=1MHz, VBW=3MHz  
 -30dBc limit, RBW=100kHz, VBW=300kHz

Test Method: ANSI C63.10 (2013), KDB 558074 v05r02: 04/02/2019  
 Temperature (°C): 22.8  
 Relative Humidity (%): 44

Site A

Venstar, Inc. WO#: 104980 Sequence#: 2 Date: 1/29/2021  
 15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Horiz



— Readings  
 × QP Readings  
 ▼ Ambient  
 ○ Peak Readings  
 \* Average Readings  
 Software Version: 5.03.19

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN00314	Loop Antenna	6502	4/13/2020	4/13/2022
T1	AN00309	Preamp	8447D	12/24/2019	12/24/2021
T2	ANP05281	Attenuator	1B	4/7/2020	4/7/2022
T3	ANP05050	Cable	RG223/U	12/24/2020	12/24/2022
T4	ANP05198	Cable-Amplitude +15C to +45C (dB)	8268	12/21/2020	12/21/2022
T5	AN01993	Biconilog Antenna	CBL6111C	6/11/2019	6/11/2021
T6	AN02869	Spectrum Analyzer	E4440A	8/3/2020	8/3/2021
T7	AN00786	Preamp	83017A	5/20/2020	5/20/2022
T8	AN00849	Horn Antenna	3115	3/17/2020	3/17/2022
T9	ANP06360	Cable	L1-PNMM-48	8/8/2019	8/8/2021
T10	ANP07246	Cable	32022-29094K- 29094K-24TC	5/29/2020	5/29/2022
T11	AN03385	High Pass Filter	115H10- 3000/T10000- O/O	5/13/2019	5/13/2021
	AN01413	Horn Antenna	84125-80008	10/19/2020	10/19/2022
	AN03367	Horn Antenna	62-GH-62-25.	8/1/2019	8/1/2021

**Measurement Data:**

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dB $\mu$ V	T1	T2	T3	T4	Dist.	Corr	Spec	Margin	Polar
			T5	T6	T7	T8					
			T9	T10	T11						Ant
			dB	dB	dB	dB	Table	dB $\mu$ V/m	dB $\mu$ V/m	dB	
1	128.300M	47.4	-28.0 +11.3 +0.0	+5.9 +0.0 +0.0	+0.1 +0.0 +0.0	+1.9 +0.0	+0.0	38.6	43.5	-4.9	Vert
2	167.830M	46.4	-28.0 +10.0 +0.0	+5.9 +0.0 +0.0	+0.2 +0.0 +0.0	+2.3 +0.0	+0.0	36.8	43.5	-6.7	Vert
3	123.800M	45.3	-28.0 +11.3 +0.0	+5.9 +0.0 +0.0	+0.1 +0.0 +0.0	+1.9 +0.0	+0.0	36.5	43.5	-7.0	Vert
4	110.500M	44.6	-28.0 +10.7 +0.0	+5.9 +0.0 +0.0	+0.1 +0.0 +0.0	+1.8 +0.0	+0.0	35.1	43.5	-8.4	Vert
5	4924.000M	43.5	+0.0 +0.0 +4.5	+0.0 +0.0 +0.6	+0.0 -37.6 +0.3	+0.0 +33.3	+0.0	44.6	54.0	-9.4	Horiz
6	4824.000M	43.2	+0.0 +0.0 +4.5	+0.0 +0.0 +0.7	+0.0 -37.6 +0.3	+0.0 +33.1	+0.0	44.2	54.0	-9.8	Vert
7	164.400M QP	43.2	-28.0 +10.2 +0.0	+5.9 +0.0 +0.0	+0.2 +0.0 +0.0	+2.2 +0.0	+0.0	33.7	43.5	-9.8	Vert
^	164.400M	49.0	-28.0 +10.2 +0.0	+5.9 +0.0 +0.0	+0.2 +0.0 +0.0	+2.2 +0.0	+0.0	39.5	43.5	-4.0	Vert
9	137.340M	42.2	-28.0 +11.4 +0.0	+5.9 +0.0 +0.0	+0.1 +0.0 +0.0	+2.0 +0.0	+0.0	33.6	43.5	-9.9	Horiz
10	4874.000M	43.1	+0.0 +0.0 +4.5	+0.0 +0.0 +0.6	+0.0 -37.6 +0.3	+0.0 +33.2	+0.0	44.1	54.0	-9.9	Horiz
11	4824.000M	42.9	+0.0 +0.0 +4.5	+0.0 +0.0 +0.7	+0.0 -37.6 +0.3	+0.0 +33.1	+0.0	43.9	54.0	-10.1	Horiz
12	4874.000M	42.7	+0.0 +0.0 +4.5	+0.0 +0.0 +0.6	+0.0 -37.6 +0.3	+0.0 +33.2	+0.0	43.7	54.0	-10.3	Vert

13	4924.000M	42.3	+0.0	+0.0	+0.0	+0.0	+0.0	43.4	54.0	-10.6	Vert
			+0.0	+0.0	-37.6	+33.3					
			+4.5	+0.6	+0.3						
14	164.340M	42.3	-28.0	+5.9	+0.2	+2.2	+0.0	32.8	43.5	-10.7	Horiz
			+10.2	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0						
15	168.740M	40.8	-28.0	+5.9	+0.2	+2.3	+0.0	31.1	43.5	-12.4	Horiz
			+9.9	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0						
16	252.100M	39.8	-27.9	+5.9	+0.2	+2.8	+0.0	33.1	46.0	-12.9	Vert
			+12.3	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0						

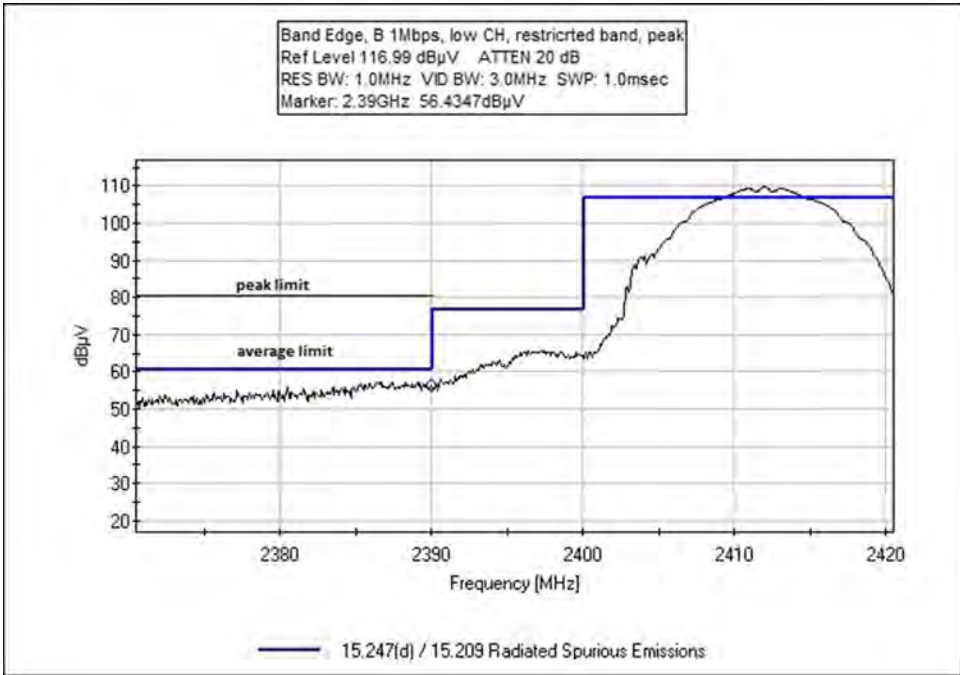
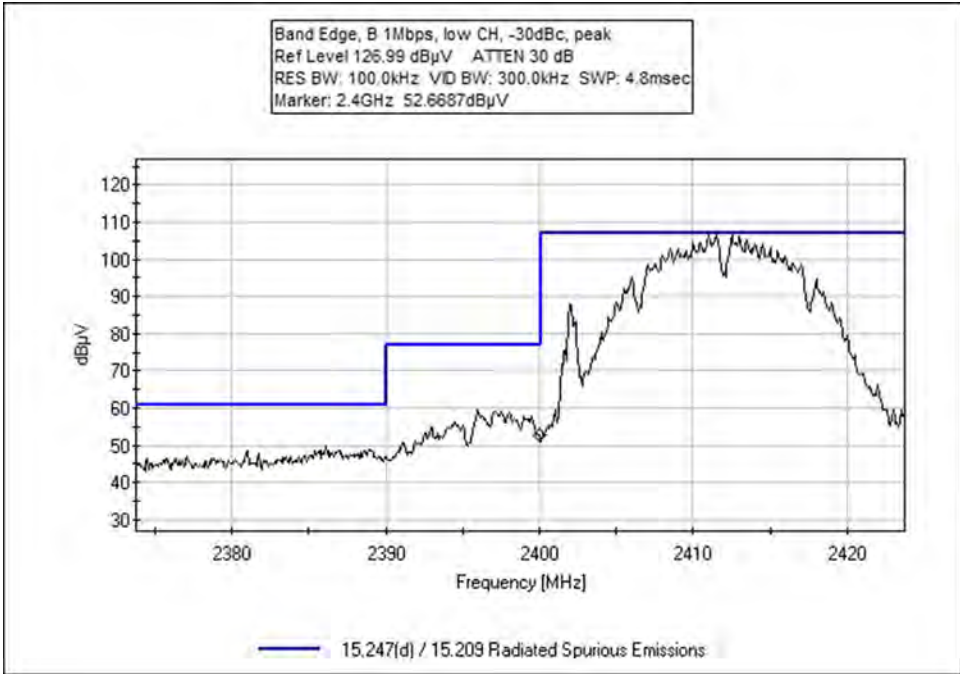


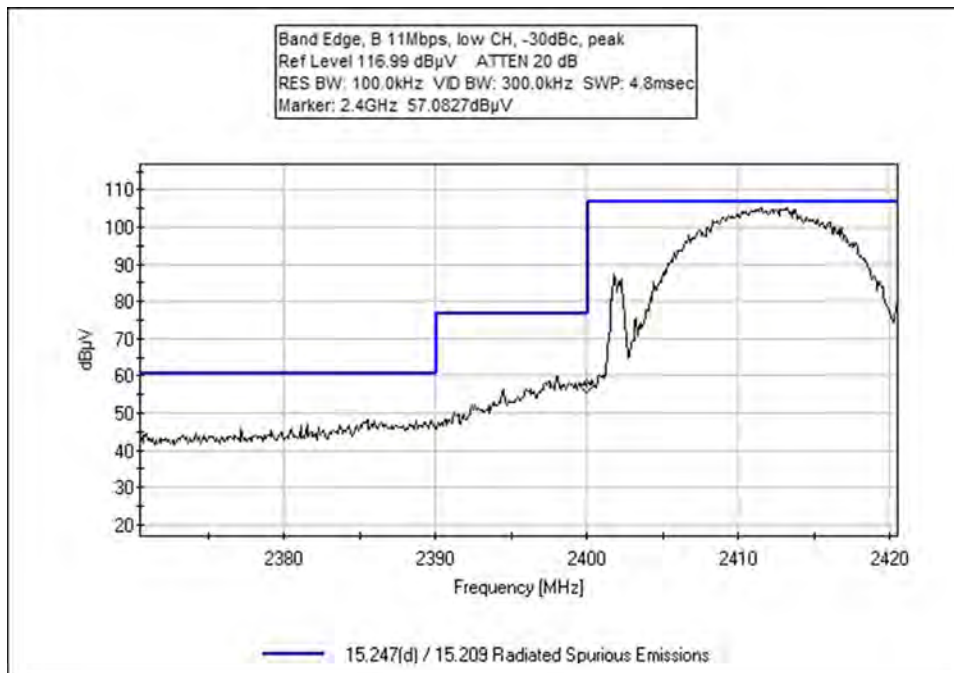
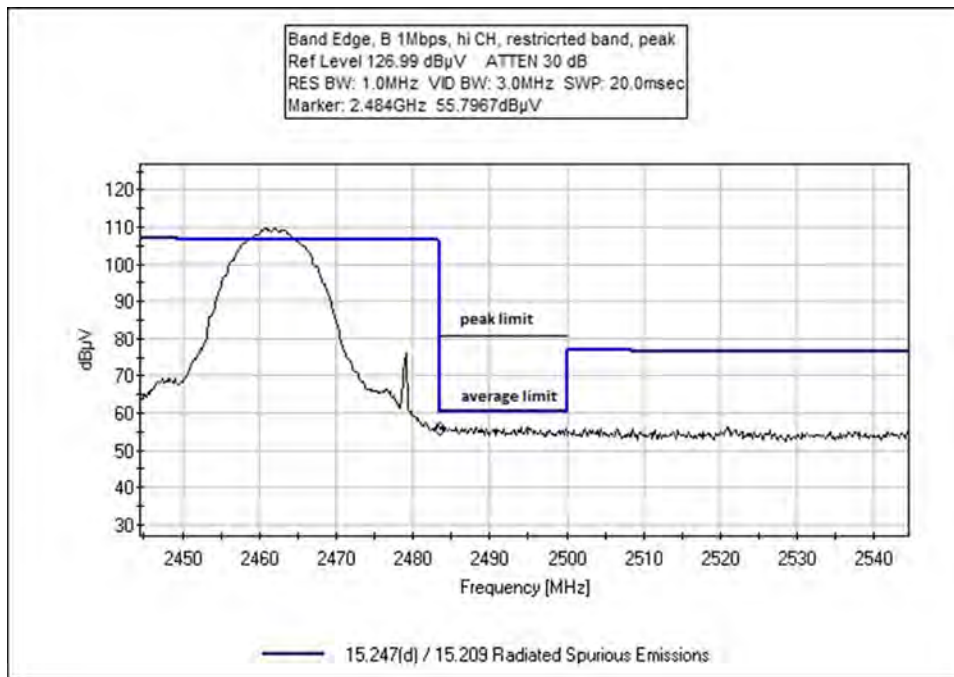
**Band Edge**

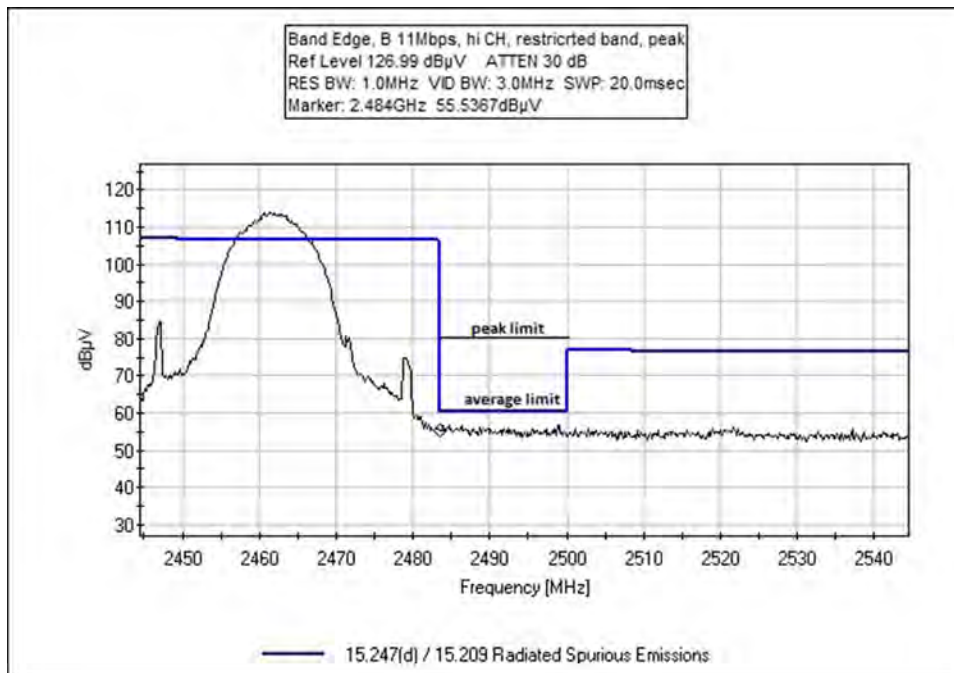
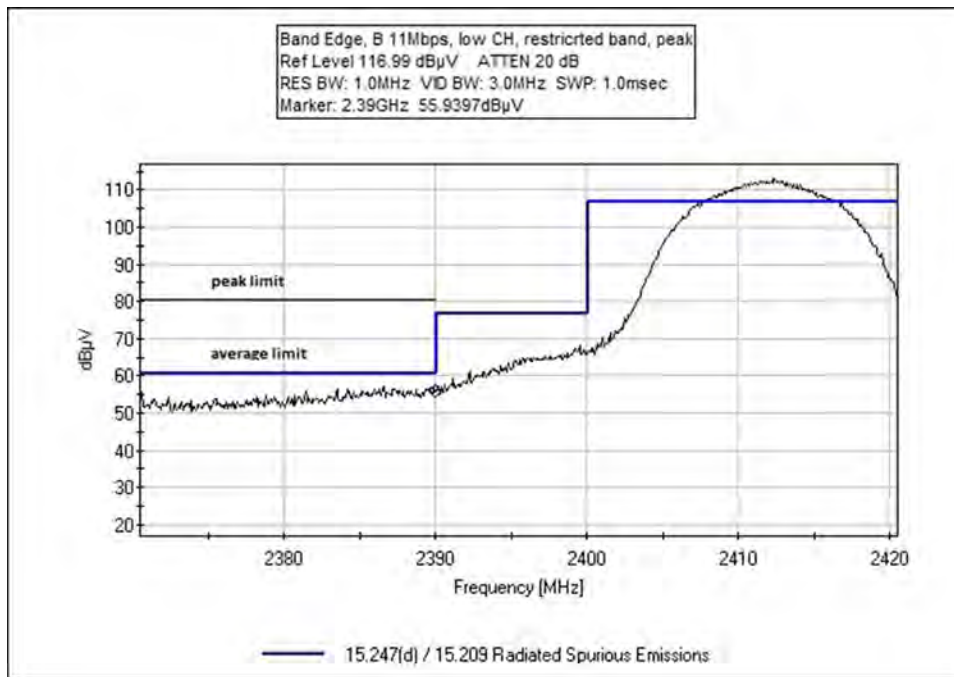
<b>Band Edge Summary</b>					
<b>Frequency (MHz)</b>	<b>Modulation</b>	<b>Ant. Type</b>	<b>Field Strength (dBuV/m @3m)</b>	<b>Limit (dBuV/m @3m)</b>	<b>Results</b>
2390.0	802.11b/1Mbps	Chip	49.7	<54	Pass
2400.0	802.11b/1Mbps	Chip	46.0	<70.2	Pass
2483.5	802.11b/1Mbps	Chip	49.2	<54	Pass
2390.0	802.11b/11Mbps	Chip	49.2	<54	Pass
2400.0	802.11b/11Mbps	Chip	50.4	<70.2	Pass
2483.5	802.11b/11Mbps	Chip	48.7	<54	Pass
2390.0	802.11g/6Mbps	Chip	52.4*	<54	Pass
2400.0	802.11g/6Mbps	Chip	60.1	<67.5	Pass
2483.5	802.11g/6Mbps	Chip	48.4*	<54	Pass
2390.0	802.11g/54Mbps	Chip	50.3*	<54	Pass
2400.0	802.11g/54Mbps	Chip	64.7	<67.5	Pass
2483.5	802.11g/54Mbps	Chip	47.1*	<54	Pass
2390.0	802.11n20/MCS0	Chip	53.6*	<54	Pass
2400.0	802.11n20/MCS0	Chip	58.9	<67.5	Pass
2483.5	802.11n20/MCS0	Chip	52.1*	<54	Pass
2390.0	802.11n20/MCS7	Chip	50.5*	<54	Pass
2400.0	802.11n20/MCS7	Chip	62.1	<67.5	Pass
2483.5	802.11n20/MCS7	Chip	50.2*	<54	Pass

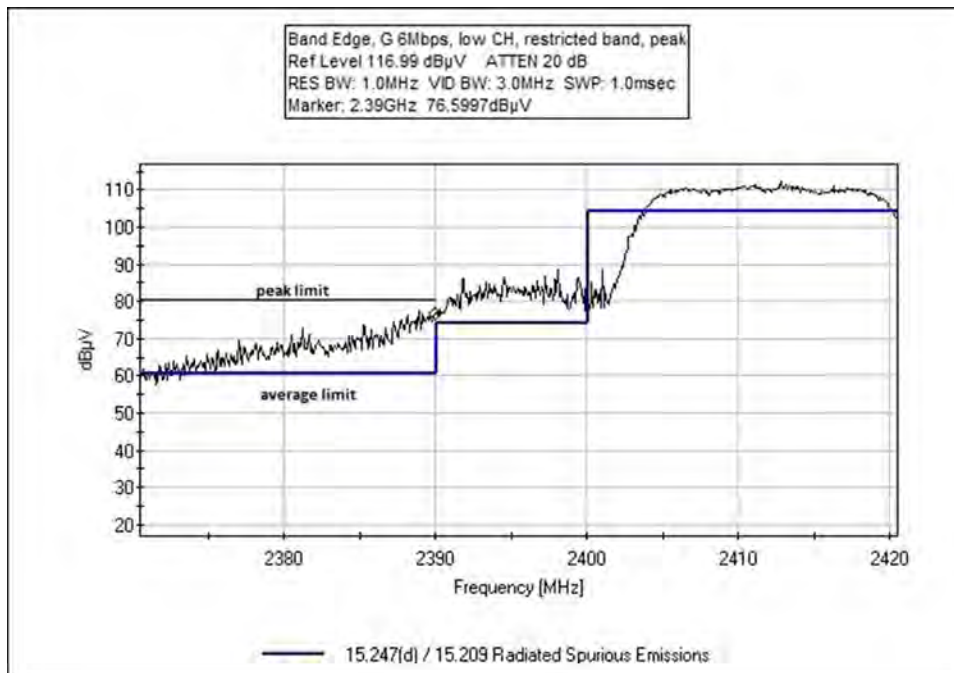
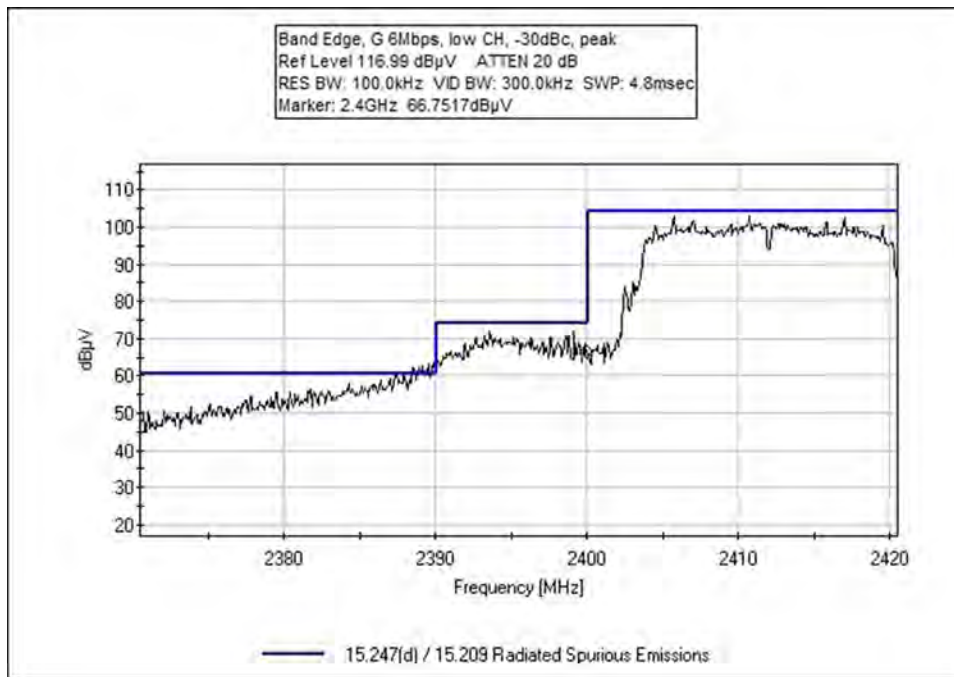
\* Average detector

## Band Edge Plots

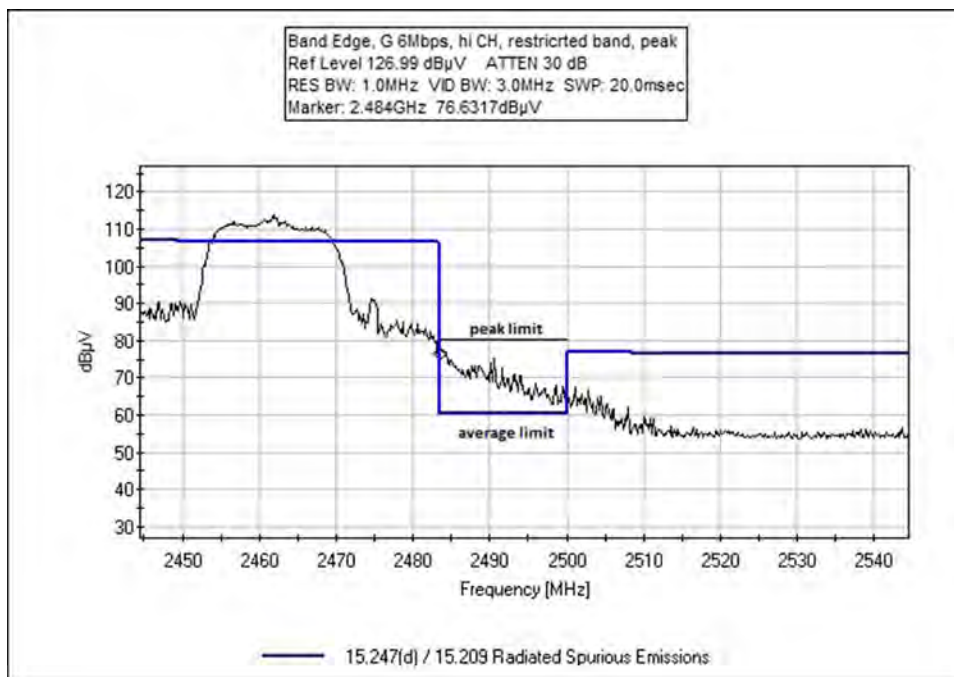
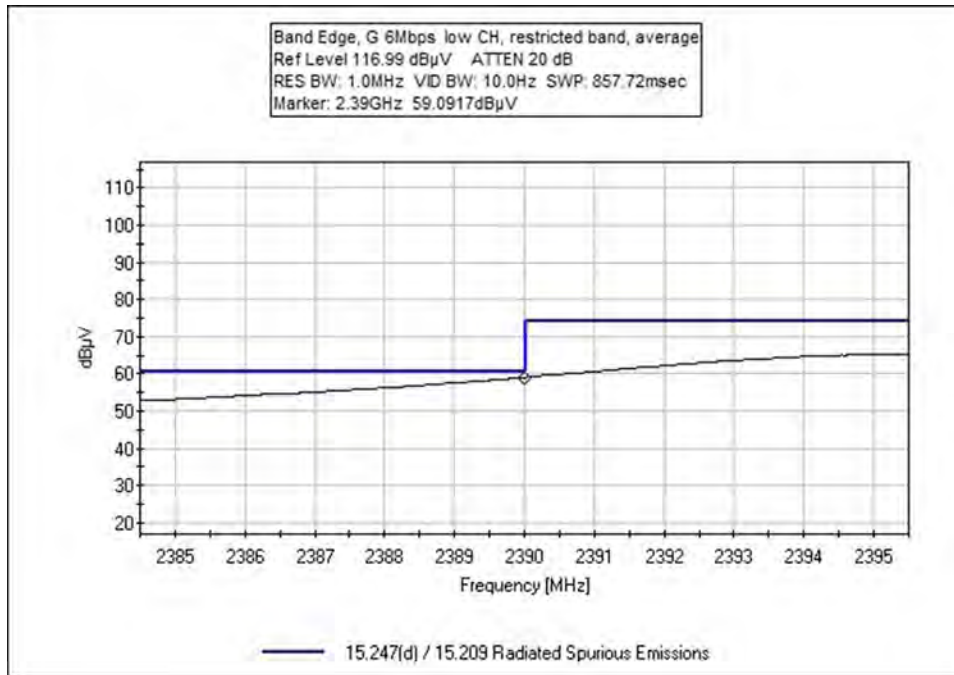


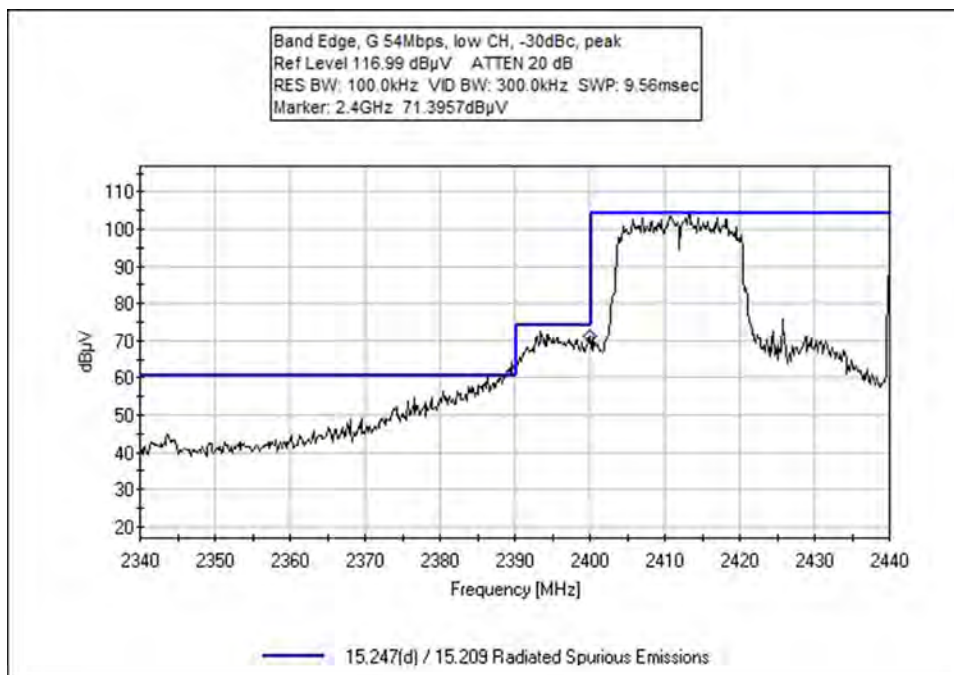
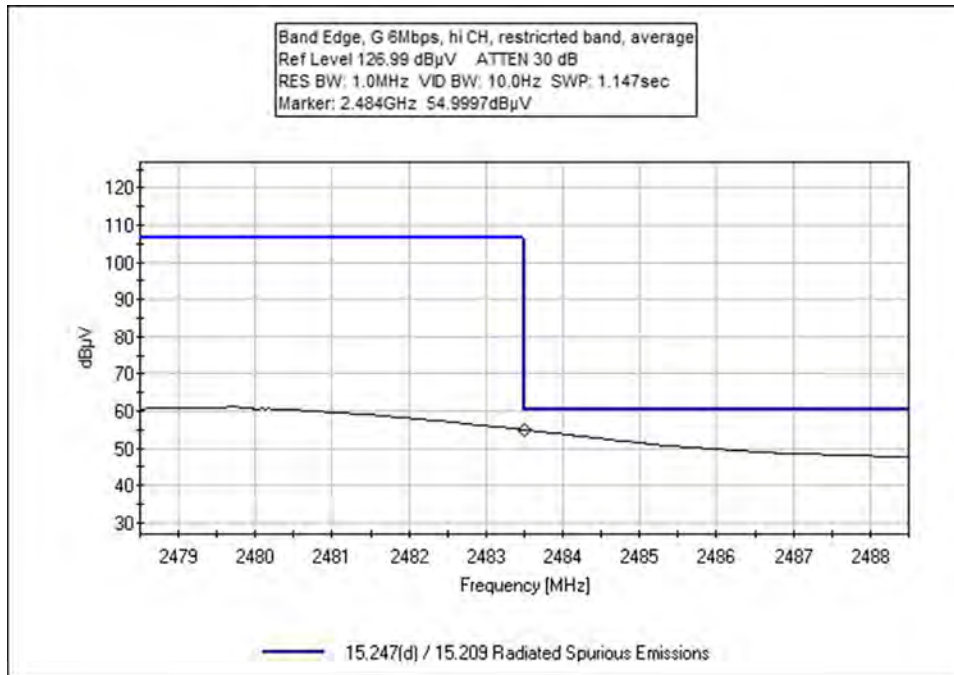


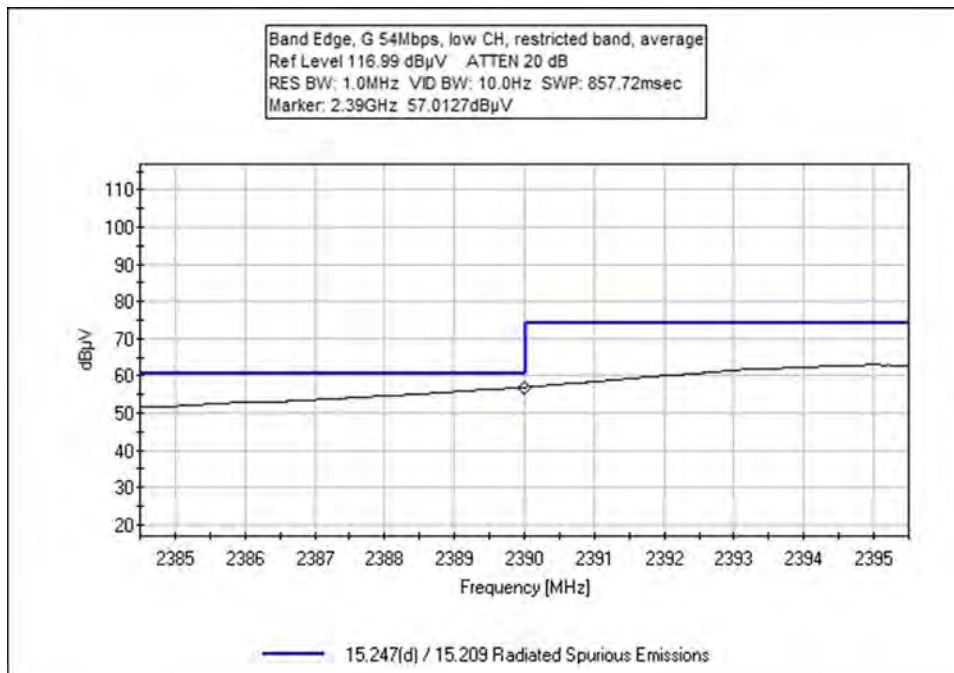
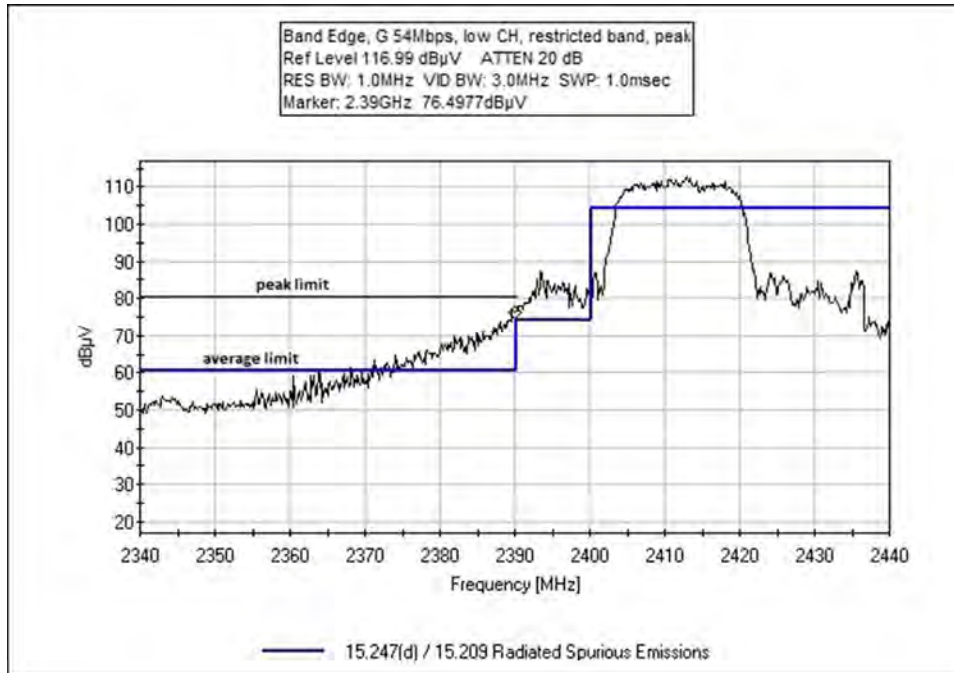


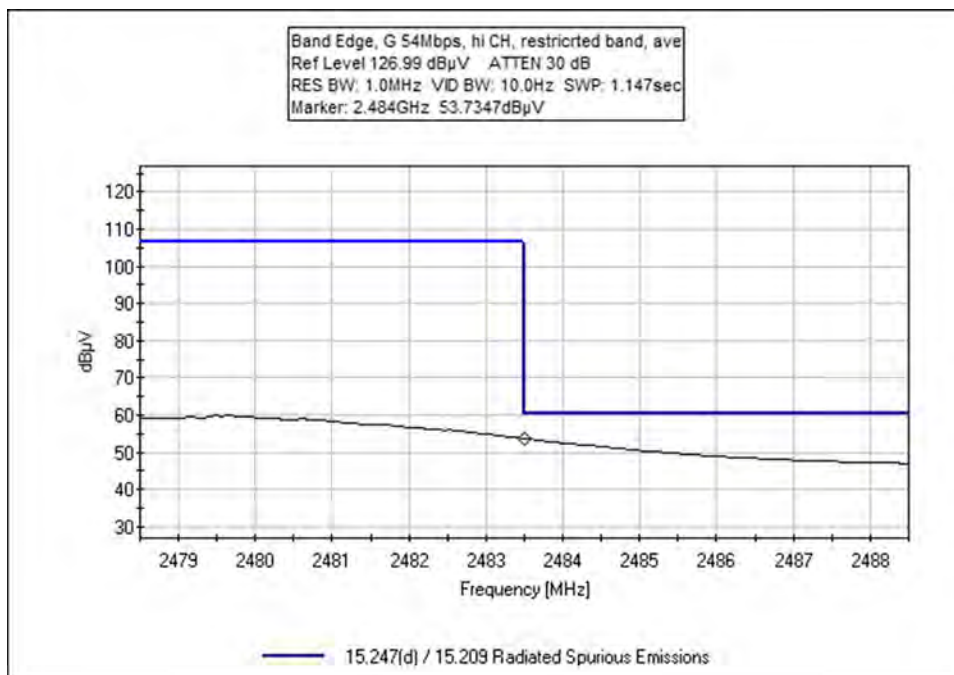
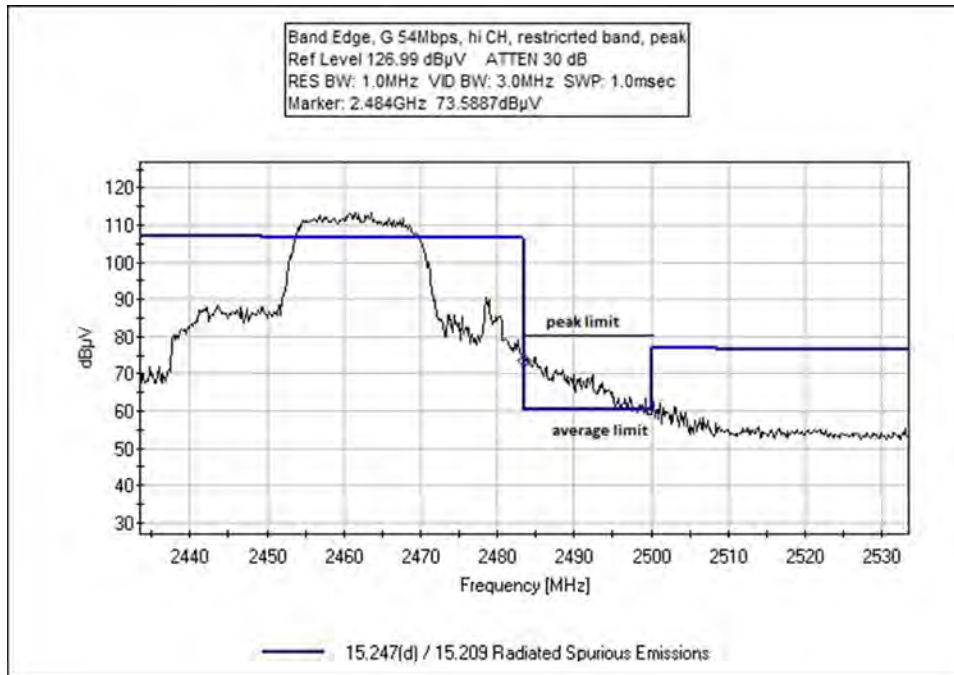


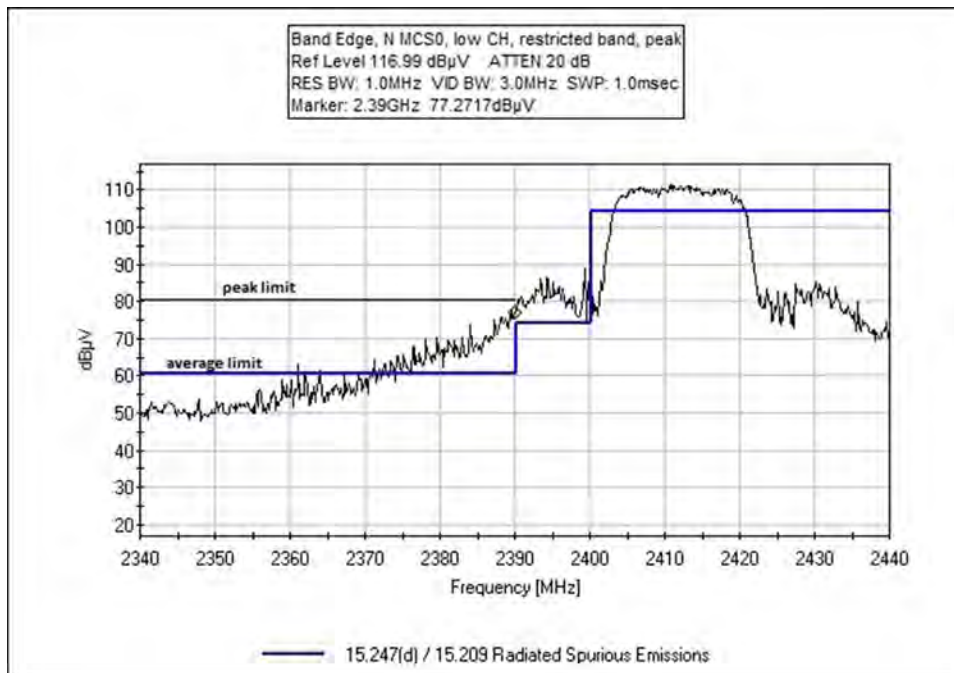
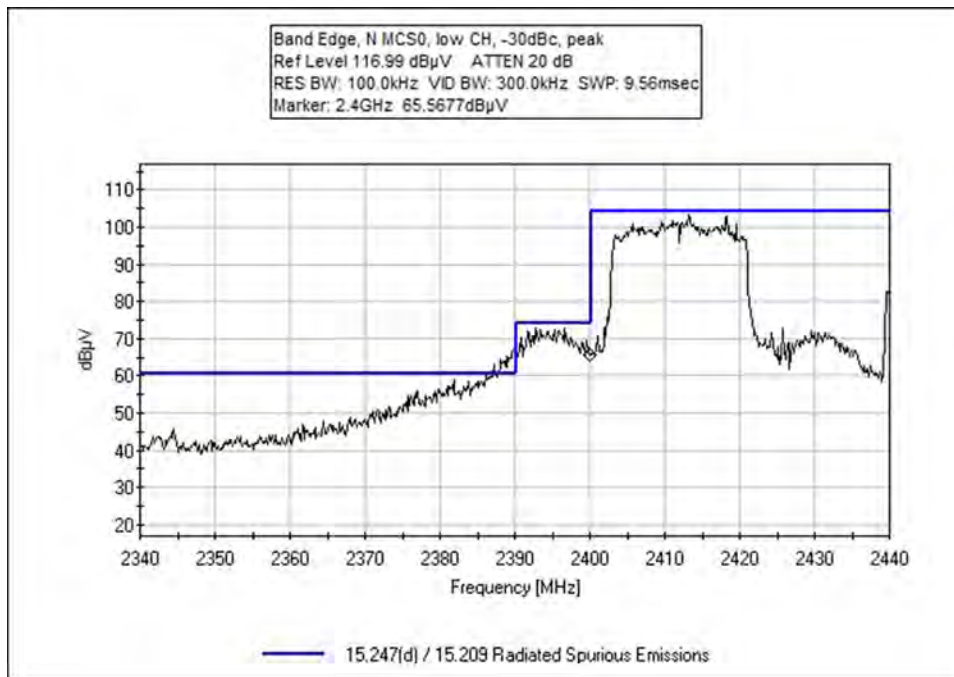




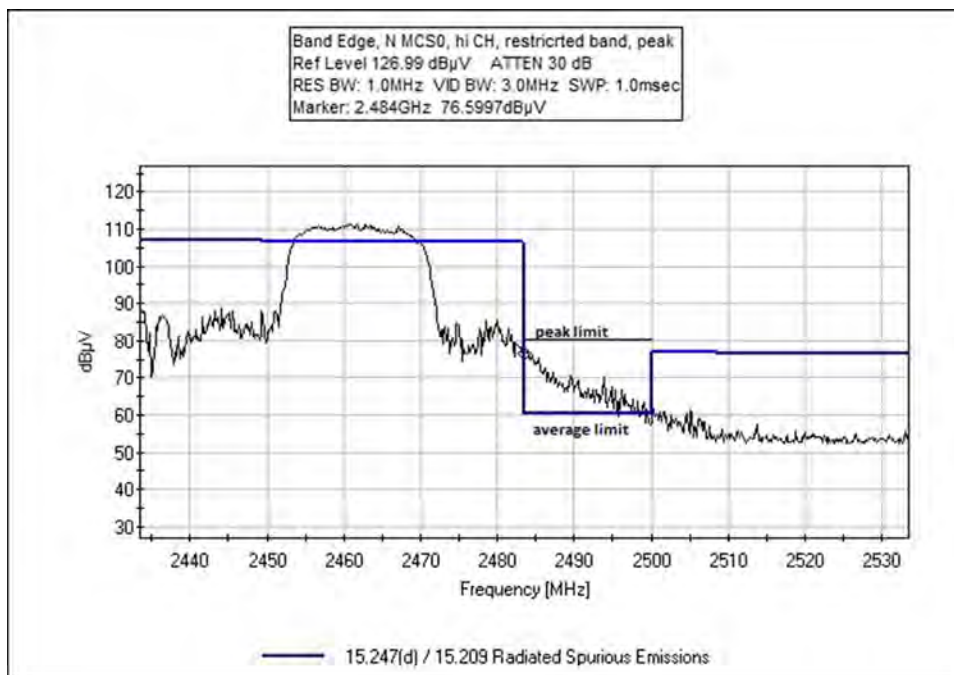
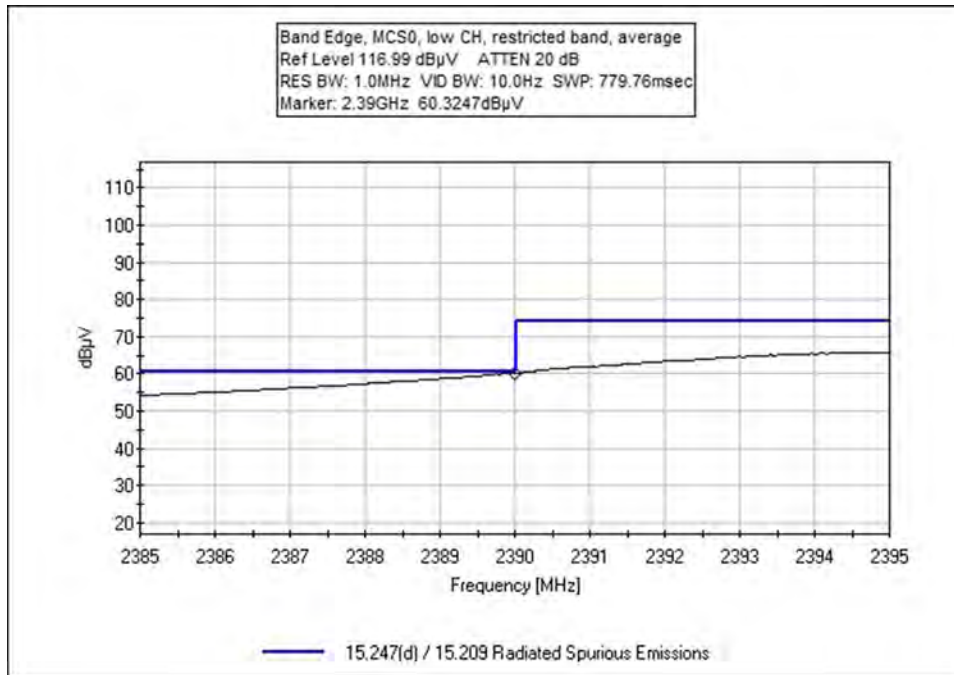


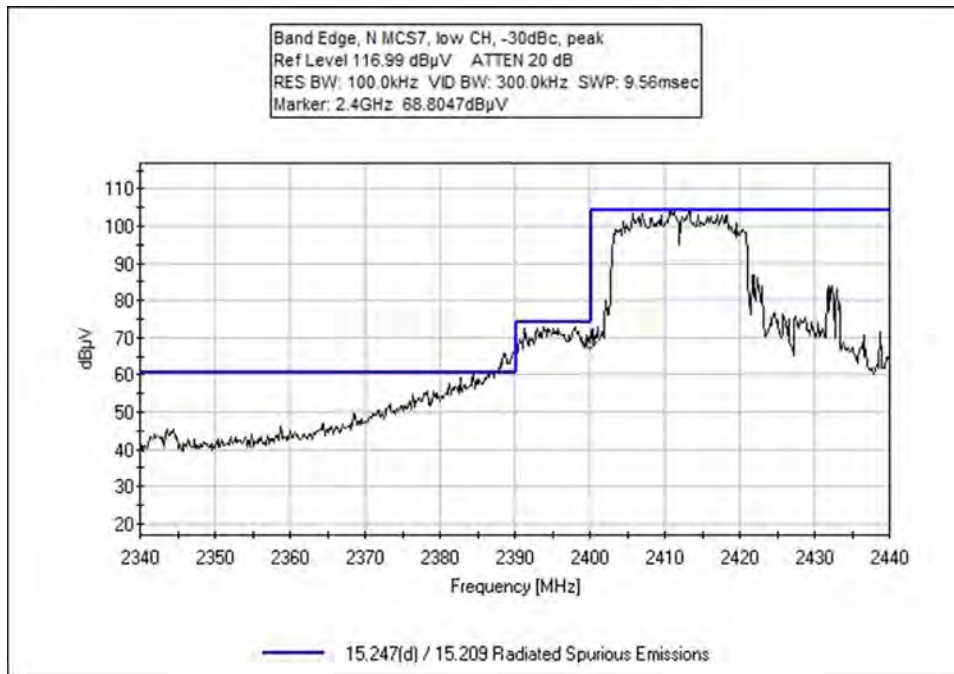
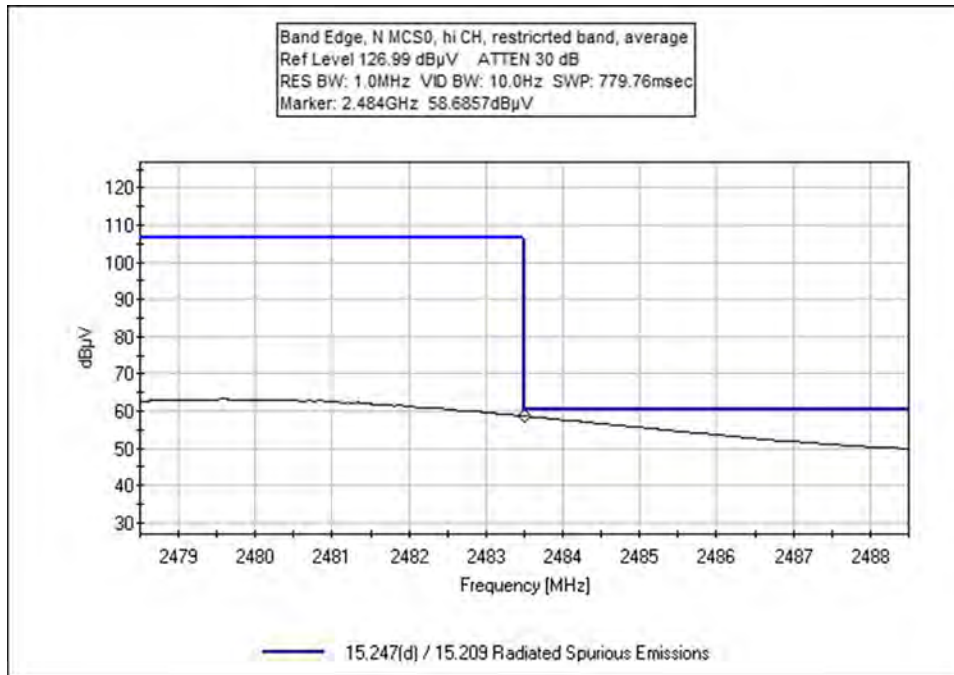


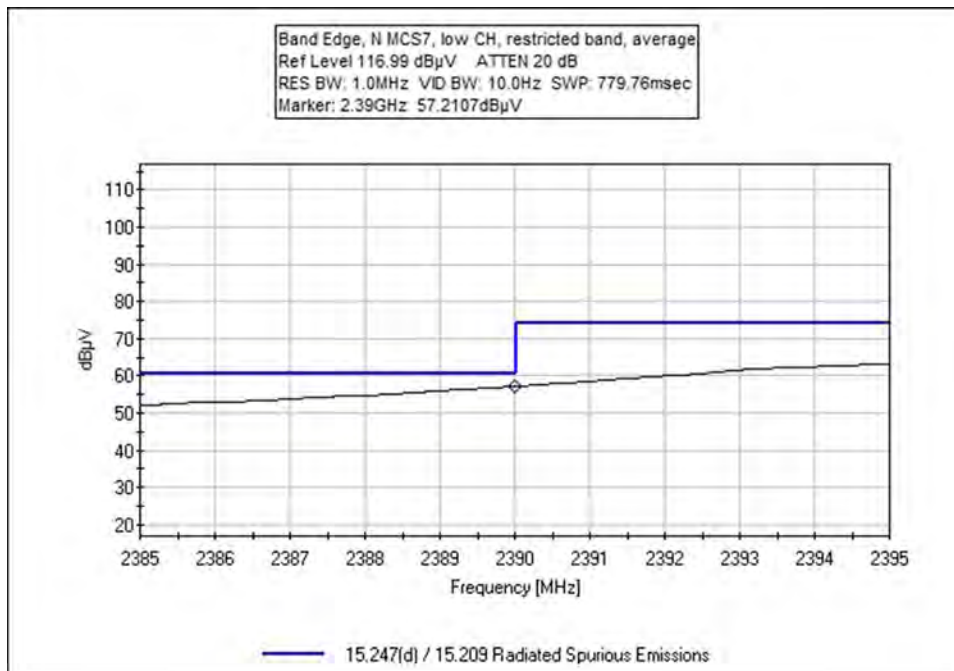
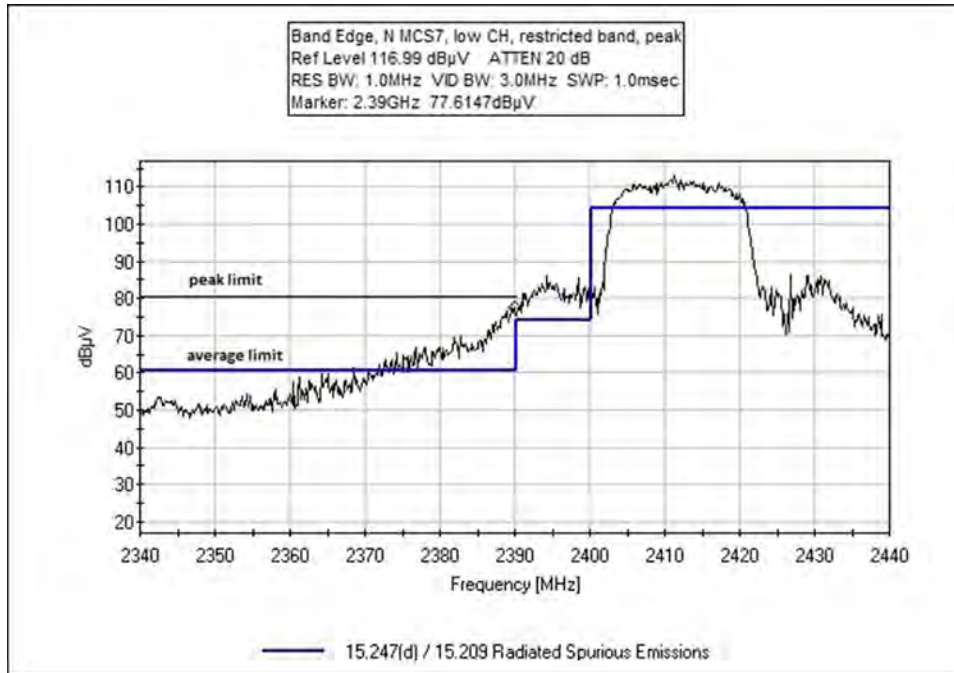


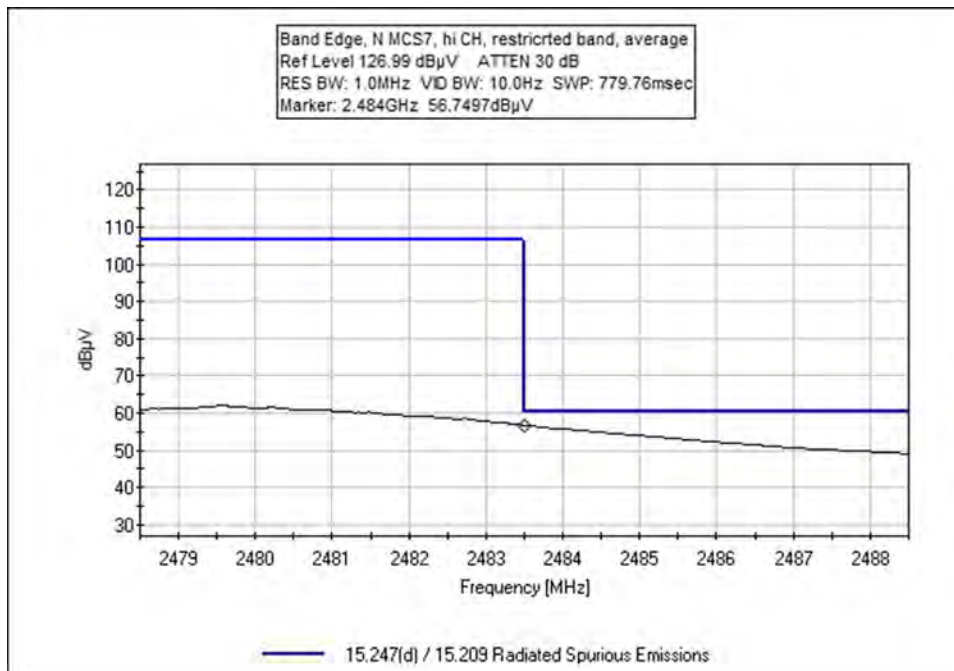
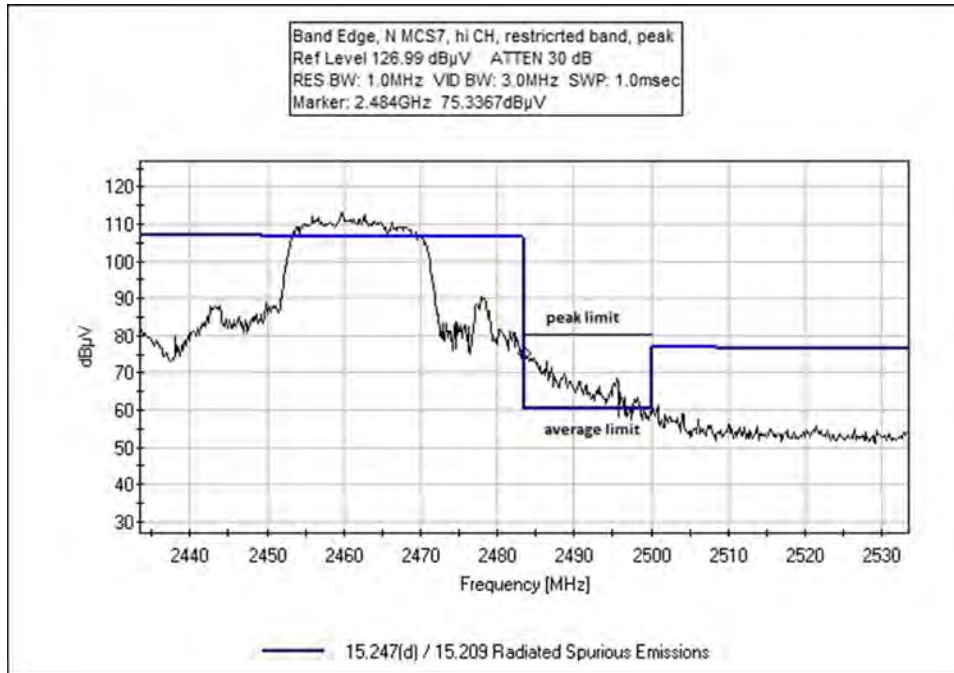












**Test Setup / Conditions / Data**

Test Location: CKC Laboratories Inc. • 110 N. Olinda Pl. • Brea, CA 92823 • 714-993-6112  
 Customer: **Venstar, Inc.**  
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**  
 Work Order #: **104980** Date: 2/3/2021  
 Test Type: **Maximized Emissions** Time: 13:17:52  
 Tested By: Don Nguyen Sequence#: 1  
 Software: EMITest 5.03.19

**Equipment Tested:**

Device	Manufacturer	Model #	S/N
Configuration 2			

**Support Equipment:**

Device	Manufacturer	Model #	S/N
Configuration 2			

**Test Conditions / Notes:**

EUT is powered from 24Vac AC Adapter and set to transmit continuously. All IO ports are populated with unterminated cables.  
 The manufacturer declares that the EUT has fixed orientation.

Software setting:  
 Testing Frequency: 2412, 2437, 2462MHz

Data Rate  
**802.11b: 1Mbps**  
 Mode: Continuous Modulated  
 TX Power Level: 50mW

Frequency of measurement: 2390-2483.5MHz  
 1000-25000MHz, RBW=1MHz, VBW=3MHz  
 -30dBc limit, RBW=100kHz, VBW=300kHz

Test Method: ANSI C63.10 (2013), KDB 558074 v05r02: 04/02/2019  
 Temperature (°C): 22.8  
 Relative Humidity (%): 44

Site A

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02869	Spectrum Analyzer	E4440A	8/3/2020	8/3/2021
T2	AN00786	Preamp	83017A	5/20/2020	5/20/2022
T3	AN00849	Horn Antenna	3115	3/17/2020	3/17/2022
T4	ANP06360	Cable	L1-PNMNM-48	8/8/2019	8/8/2021
T5	ANP07246	Cable	32022-29094K- 29094K-24TC	5/29/2020	5/29/2022



**Measurement Data:** Reading listed by margin. Test Distance: 3 Meters

#	Freq MHz	Rdng dB $\mu$ V	T1 T5 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dB $\mu$ V/m	Spec dB $\mu$ V/m	Margin dB	Polar Ant
1	2390.000M	56.4	+0.0 +0.4	-38.6	+28.3	+3.2	+0.0	49.7	54.0	-4.3	Vert
2	2483.670M	55.8	+0.0 +0.4	-38.6	+28.3	+3.3	+0.0	49.2	54.0	-4.8	Vert
3	2400.000M	52.7	+0.0 +0.4	-38.6	+28.3	+3.2	+0.0	46.0	70.2	-24.2	Vert

Test Location: CKC Laboratories Inc. • 110 N. Olinda Pl. • Brea, CA 92823 • 714-993-6112  
 Customer: **Venstar, Inc.**  
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**  
 Work Order #: **104980** Date: 2/3/2021  
 Test Type: **Maximized Emissions** Time: 13:21:26  
 Tested By: Don Nguyen Sequence#: 2  
 Software: EMITest 5.03.19

**Equipment Tested:**

Device	Manufacturer	Model #	S/N
Configuration 2			

**Support Equipment:**

Device	Manufacturer	Model #	S/N
Configuration 2			

**Test Conditions / Notes:**

EUT is powered from 24Vac AC Adapter and set to transmit continuously. All IO ports are populated with unterminated cables.  
 The manufacturer declares that the EUT has fixed orientation.

Software setting:  
 Testing Frequency: 2412, 2437, 2462MHz

Data Rate  
**802.11b: 11Mbps**  
 Mode: Continuous Modulated  
 TX Power Level: 50mW

Frequency of measurement: 2390-2483.5MHz  
 1000-25000MHz, RBW=1MHz, VBW=3MHz  
 -30dBc limit, RBW=100kHz, VBW=300kHz

Test Method: ANSI C63.10 (2013), KDB 558074 v05r02: 04/02/2019  
 Temperature (°C): 22.8  
 Relative Humidity (%): 44

Site A

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02869	Spectrum Analyzer	E4440A	8/3/2020	8/3/2021
T2	AN00786	Preamp	83017A	5/20/2020	5/20/2022
T3	AN00849	Horn Antenna	3115	3/17/2020	3/17/2022
T4	ANP06360	Cable	L1-PNMMN-48	8/8/2019	8/8/2021
T5	ANP07246	Cable	32022-29094K-29094K-24TC	5/29/2020	5/29/2022

**Measurement Data:** Reading listed by margin. Test Distance: 3 Meters

#	Freq MHz	Rdng dB $\mu$ V	T1 T5 dB	T2 dB	T3 dB	T4 dB	Dist. Table	Corr dB $\mu$ V/m	Spec dB $\mu$ V/m	Margin dB	Polar Ant
1	2390.000M	55.9	+0.0 +0.4	-38.6	+28.3	+3.2	+0.0	49.2	54.0	-4.8	Vert
2	2483.500M	55.3	+0.0 +0.4	-38.6	+28.3	+3.3	+0.0	48.7	54.0	-5.3	Vert
3	2400.000M	57.1	+0.0 +0.4	-38.6	+28.3	+3.2	+0.0	50.4	70.2	-19.8	Vert

Test Location: CKC Laboratories Inc. • 110 N. Olinda Pl. • Brea, CA 92823 • 714-993-6112  
 Customer: **Venstar, Inc.**  
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**  
 Work Order #: **104980** Date: 2/3/2021  
 Test Type: **Maximized Emissions** Time: 13:23:39  
 Tested By: Don Nguyen Sequence#: 1  
 Software: EMITest 5.03.19

**Equipment Tested:**

Device	Manufacturer	Model #	S/N
Configuration 2			

**Support Equipment:**

Device	Manufacturer	Model #	S/N
Configuration 2			

**Test Conditions / Notes:**

EUT is powered from 24Vac AC Adapter and set to transmit continuously. All IO ports are populated with unterminated cables.  
 The manufacturer declares that the EUT has fixed orientation.

Software setting:  
 Testing Frequency: 2412, 2437, 2462MHz

Data Rate  
**802.11g: 6Mbps**  
 Mode: Continuous Modulated  
 TX Power Level: 50mW

Frequency of measurement: 2390-2483.5MHz  
 1000-25000MHz, RBW=1MHz, VBW=3MHz  
 -30dBc limit, RBW=100kHz, VBW=300kHz

Test Method: ANSI C63.10 (2013), KDB 558074 v05r02: 04/02/2019  
 Temperature (°C): 22.8  
 Relative Humidity (%): 44

Site A

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02869	Spectrum Analyzer	E4440A	8/3/2020	8/3/2021
T2	AN00786	Preamp	83017A	5/20/2020	5/20/2022
T3	AN00849	Horn Antenna	3115	3/17/2020	3/17/2022
T4	ANP06360	Cable	L1-PNMMN-48	8/8/2019	8/8/2021
T5	ANP07246	Cable	32022-29094K-29094K-24TC	5/29/2020	5/29/2022

**Measurement Data:**

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dB $\mu$ V	T1 T5 dB	T2 dB	T3 dB	T4 dB	Dist. Table	Corr dB $\mu$ V/m	Spec dB $\mu$ V/m	Margin dB	Polar Ant
1	2390.000M Ave	59.1	+0.0 +0.4	-38.6	+28.3	+3.2	+0.0	52.4	54.0	-1.6	Vert
^	2390.000M	76.6	+0.0 +0.4	-38.6	+28.3	+3.2	+0.0	69.9	54.0	+15.9	Vert
3	2483.500M Ave	55.0	+0.0 +0.4	-38.6	+28.3	+3.3	+0.0	48.4	54.0	-5.6	Vert
^	2483.500M	76.6	+0.0 +0.4	-38.6	+28.3	+3.3	+0.0	70.0	54.0	+16.0	Vert
5	2400.000M	66.8	+0.0 +0.4	-38.6	+28.3	+3.2	+0.0	60.1	67.5	-7.4	Vert



Test Location: CKC Laboratories Inc. • 110 N. Olinda Pl. • Brea, CA 92823 • 714-993-6112  
 Customer: **Venstar, Inc.**  
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**  
 Work Order #: **104980** Date: 2/3/2021  
 Test Type: **Maximized Emissions** Time: 13:26:07  
 Tested By: Don Nguyen Sequence#: 2  
 Software: EMITest 5.03.19

**Equipment Tested:**

Device	Manufacturer	Model #	S/N
Configuration 2			

**Support Equipment:**

Device	Manufacturer	Model #	S/N
Configuration 2			

**Test Conditions / Notes:**

EUT is powered from 24Vac AC Adapter and set to transmit continuously. All IO ports are populated with unterminated cables.  
 The manufacturer declares that the EUT has fixed orientation.

Software setting:  
 Testing Frequency: 2412, 2437, 2462MHz

Data Rate  
**802.11g: 54Mbps**  
 Mode: Continuous Modulated  
 TX Power Level: 50mW

Frequency of measurement: 2390-2483.5MHz  
 1000-25000MHz, RBW=1MHz, VBW=3MHz  
 -30dBc limit, RBW=100kHz, VBW=300kHz

Test Method: ANSI C63.10 (2013), KDB 558074 v05r02: 04/02/2019  
 Temperature (°C): 22.8  
 Relative Humidity (%): 44

Site A

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02869	Spectrum Analyzer	E4440A	8/3/2020	8/3/2021
T2	AN00786	Preamp	83017A	5/20/2020	5/20/2022
T3	AN00849	Horn Antenna	3115	3/17/2020	3/17/2022
T4	ANP06360	Cable	L1-PNMM-48	8/8/2019	8/8/2021
T5	ANP07246	Cable	32022-29094K- 29094K-24TC	5/29/2020	5/29/2022

**Measurement Data:** Reading listed by margin. Test Distance: 3 Meters

#	Freq MHz	Rdng dB $\mu$ V	T1 T5 dB	T2 dB	T3 dB	T4 dB	Dist. Table	Corr dB $\mu$ V/m	Spec dB $\mu$ V/m	Margin dB	Polar Ant
1	2400.000M	71.4	+0.0 +0.4	-38.6	+28.3	+3.2	+0.0	64.7	67.5	-2.8	Vert
2	2390.000M Ave	57.0	+0.0 +0.4	-38.6	+28.3	+3.2	+0.0	50.3	54.0	-3.7	Vert
^	2390.000M	76.5	+0.0 +0.4	-38.6	+28.3	+3.2	+0.0	69.8	54.0	+15.8	Vert
4	2483.500M Ave	53.7	+0.0 +0.4	-38.6	+28.3	+3.3	+0.0	47.1	54.0	-6.9	Vert
^	2483.500M	73.6	+0.0 +0.4	-38.6	+28.3	+3.3	+0.0	67.0	54.0	+13.0	Vert

Test Location: CKC Laboratories Inc. • 110 N. Olinda Pl. • Brea, CA 92823 • 714-993-6112  
 Customer: **Venstar, Inc.**  
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**  
 Work Order #: **104980** Date: 2/3/2021  
 Test Type: **Maximized Emissions** Time: 14:04:24  
 Tested By: Don Nguyen Sequence#: 3  
 Software: EMITest 5.03.19

**Equipment Tested:**

Device	Manufacturer	Model #	S/N
Configuration 2			

**Support Equipment:**

Device	Manufacturer	Model #	S/N
Configuration 2			

**Test Conditions / Notes:**

EUT is powered from 24Vac AC Adapter and set to transmit continuously. All IO ports are populated with unterminated cables.  
 The manufacturer declares that the EUT has fixed orientation.

Software setting:  
 Testing Frequency: 2412, 2437, 2462MHz

Data Rate  
**802.11n20: MCS0**  
 Mode: Continuous Modulated  
 TX Power Level: 50mW

Frequency of measurement: 2390-2483.5MHz  
 1000-25000MHz, RBW=1MHz, VBW=3MHz  
 -30dBc limit, RBW=100kHz, VBW=300kHz

Test Method: ANSI C63.10 (2013), KDB 558074 v05r02: 04/02/2019  
 Temperature (°C): 22.8  
 Relative Humidity (%): 44

Site A

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02869	Spectrum Analyzer	E4440A	8/3/2020	8/3/2021
T2	AN00786	Preamp	83017A	5/20/2020	5/20/2022
T3	AN00849	Horn Antenna	3115	3/17/2020	3/17/2022
T4	ANP06360	Cable	L1-PNMNM-48	8/8/2019	8/8/2021
T5	ANP07246	Cable	32022-29094K-29094K-24TC	5/29/2020	5/29/2022

**Measurement Data:** Reading listed by margin. Test Distance: 3 Meters

#	Freq MHz	Rdng dB $\mu$ V	T1 T5 dB	T2 dB	T3 dB	T4 dB	Dist. Table	Corr dB $\mu$ V/m	Spec dB $\mu$ V/m	Margin dB	Polar Ant
1	2390.000M Ave	60.3	+0.0 +0.4	-38.6	+28.3	+3.2	+0.0	53.6	54.0	-0.4	Vert
^	2390.000M	77.3	+0.0 +0.4	-38.6	+28.3	+3.2	+0.0	70.6	54.0	+16.6	Vert
3	2483.500M Ave	58.7	+0.0 +0.4	-38.6	+28.3	+3.3	+0.0	52.1	54.0	-1.9	Vert
^	2483.500M	76.6	+0.0 +0.4	-38.6	+28.3	+3.3	+0.0	70.0	54.0	+16.0	Vert
5	2400.000M	65.6	+0.0 +0.4	-38.6	+28.3	+3.2	+0.0	58.9	67.5	-8.6	Vert

Test Location: CKC Laboratories Inc. • 110 N. Olinda Pl. • Brea, CA 92823 • 714-993-6112  
 Customer: **Venstar, Inc.**  
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**  
 Work Order #: **104980** Date: 2/3/2021  
 Test Type: **Maximized Emissions** Time: 14:14:47  
 Tested By: Don Nguyen Sequence#: 4  
 Software: EMITest 5.03.19

**Equipment Tested:**

Device	Manufacturer	Model #	S/N
Configuration 2			

**Support Equipment:**

Device	Manufacturer	Model #	S/N
Configuration 2			

**Test Conditions / Notes:**

EUT is powered from 24Vac AC Adapter and set to transmit continuously. All IO ports are populated with unterminated cables.  
 The manufacturer declares that the EUT has fixed orientation.

Software setting:  
 Testing Frequency: 2412, 2437, 2462MHz

Data Rate  
**802.11n20: MCS7**  
 Mode: Continuous Modulated  
 TX Power Level: 50mW

Frequency of measurement: 2390-2483.5MHz  
 1000-25000MHz, RBW=1MHz, VBW=3MHz  
 -30dBc limit, RBW=100kHz, VBW=300kHz

Test Method: ANSI C63.10 (2013), KDB 558074 v05r02: 04/02/2019  
 Temperature (°C): 22.8  
 Relative Humidity (%): 44

Site A

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02869	Spectrum Analyzer	E4440A	8/3/2020	8/3/2021
T2	AN00786	Preamp	83017A	5/20/2020	5/20/2022
T3	AN00849	Horn Antenna	3115	3/17/2020	3/17/2022
T4	ANP06360	Cable	L1-PNMM-48	8/8/2019	8/8/2021
T5	ANP07246	Cable	32022-29094K- 29094K-24TC	5/29/2020	5/29/2022

**Measurement Data:** Reading listed by margin. Test Distance: 3 Meters

#	Freq MHz	Rdng dB $\mu$ V	T1 T5 dB	T2 dB	T3 dB	T4 dB	Dist. Table	Corr dB $\mu$ V/m	Spec dB $\mu$ V/m	Margin dB	Polar Ant
1	2390.000M Ave	57.2	+0.0 +0.4	-38.6	+28.3	+3.2	+0.0	50.5	54.0	-3.5	Vert
^	2390.000M	77.6	+0.0 +0.4	-38.6	+28.3	+3.2	+0.0	70.9	54.0	+16.9	Vert
3	2483.500M Ave	56.8	+0.0 +0.4	-38.6	+28.3	+3.3	+0.0	50.2	54.0	-3.8	Vert
^	2483.500M	75.3	+0.0 +0.4	-38.6	+28.3	+3.3	+0.0	68.7	54.0	+14.7	Vert
5	2400.000M	68.8	+0.0 +0.4	-38.6	+28.3	+3.2	+0.0	62.1	67.5	-5.4	Vert



**Test Setup Photo(s)**



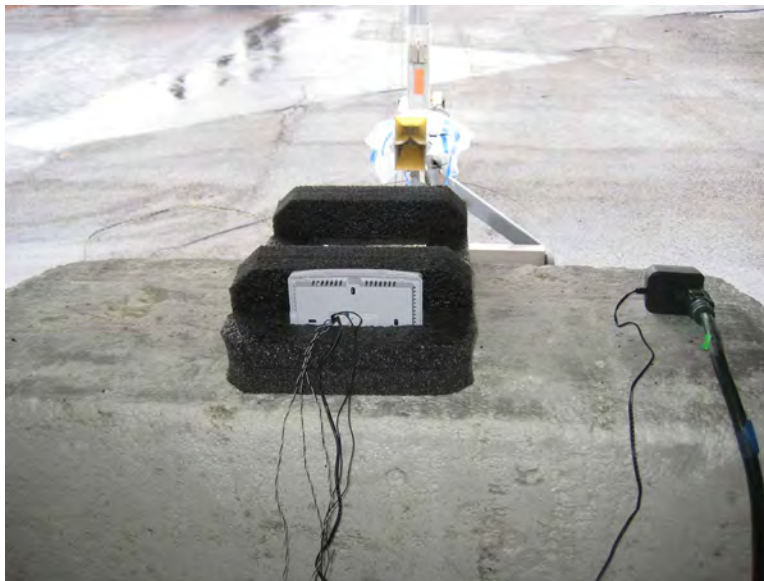
Below 1GHz



Below 1GHz



Above 1GHz



Above 1GHz

## 15.247(e) Power Spectral Density

Test Setup / Conditions / Data			
Test Location:	Brea Lab A	Test Engineer:	Don Nguyen
Test Method:	ANSI C63.10 (2013), KDB 558074 v05r02: 04/02/2019	Test Date(s):	1/28/2021
Configuration:	1		
Test Setup:	EUT is powered from 24Vac AC Adapter. Transmitter is activated via touch screen. Software setting: Testing Frequency: 2412, 2437, 2462MHz  Data Rate 802.11b: 1Mbps (DSSS), 11Mbps (CCK) 802.11g: 6Mbps (OFDM), 54Mbps (OFDM) 802.11n20: MCS0 (BPSK), MCS7 (64-QAM)  Modulation: DSSS, CCK, OFDM, BPSK, 64-QAM Mode: Continuous Modulated TX Power Level: 50mW  Frequency of measurement: 2412, 2437, 2462MHz RBW=100kHz, VBW=300kHz		

Environmental Conditions			
Temperature (°C)	24.2	Relative Humidity (%):	28

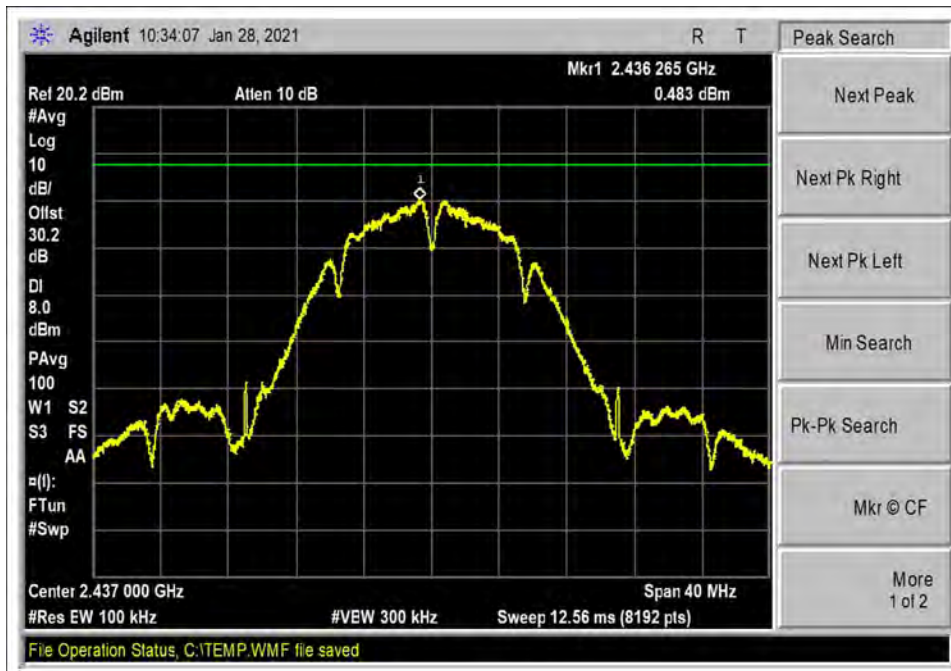
Test Equipment					
Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
02869	Spectrum Analyzer	Agilent	E4440	8/3/2020	8/3/2021
03432	Attenuator	Aeroflex/Weinschel	90-30-34	10/22/2019	10/22/2021
P07243	Cable	H&S	32022-29094K-29094K-24TC	5/29/2020	5/29/2022

Test Data Summary - RF Conducted Measurement						
Measurement Method: AVGPSSD-2						
Frequency (MHz)	Mode/Data Rate	Measured (dBm/100kHz)	DDCF (dB)	Measured+DDCF (dBm/100kHz)	Limit (dBm/3kHz)	Results
2412	802.11b/1Mbps	0.425	0	0.425	≤8	Pass
2437	802.11b/1Mbps	0.483	0	0.483	≤8	Pass
2462	802.11b/1Mbps	0.743	0	0.743	≤8	Pass
2412	802.11b/11Mbps	-0.017	0.05	0.033	≤8	Pass
2437	802.11b/11Mbps	-0.033	0.05	0.017	≤8	Pass
2462	802.11b/11Mbps	0.288	0.05	0.338	≤8	Pass
2412	802.11g/6Mbps	-2.326	0.05	-2.276	≤8	Pass
2437	802.11g/6Mbps	-1.992	0.05	-1.942	≤8	Pass
2462	802.11g/6Mbps	-1.820	0.05	-1.77	≤8	Pass
2412	802.11g/54Mbps	-1.816	0.41	-1.406	≤8	Pass
2437	802.11g/54Mbps	-1.839	0.41	-1.429	≤8	Pass
2462	802.11g/54Mbps	-1.347	0.41	-0.937	≤8	Pass
2412	802.11n20/MCS0	-2.722	0.05	-2.672	≤8	Pass
2437	802.11n20/MCS0	-2.263	0.05	-2.213	≤8	Pass
2462	802.11n20/MCS0	-2.075	0.05	-2.025	≤8	Pass
2412	802.11n20/MCS7	-1.265	0.42	-0.845	≤8	Pass
2437	802.11n20/MCS7	-1.149	0.42	-0.729	≤8	Pass
2462	802.11n20/MCS7	-1.821	0.42	-1.401	≤8	Pass

## Plots

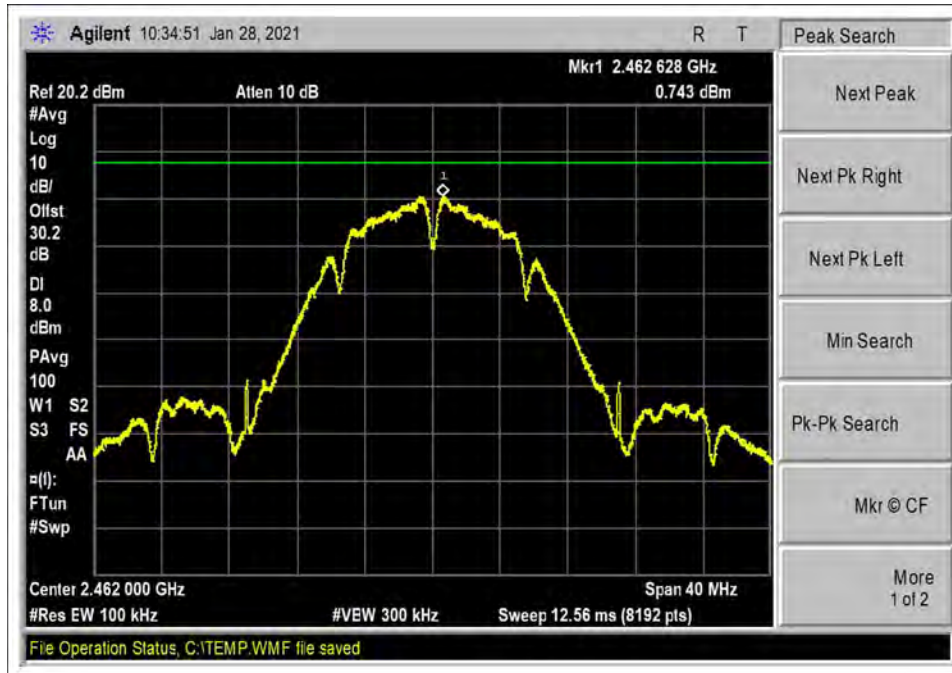


802.11b\_1Mbps\_Low Channel

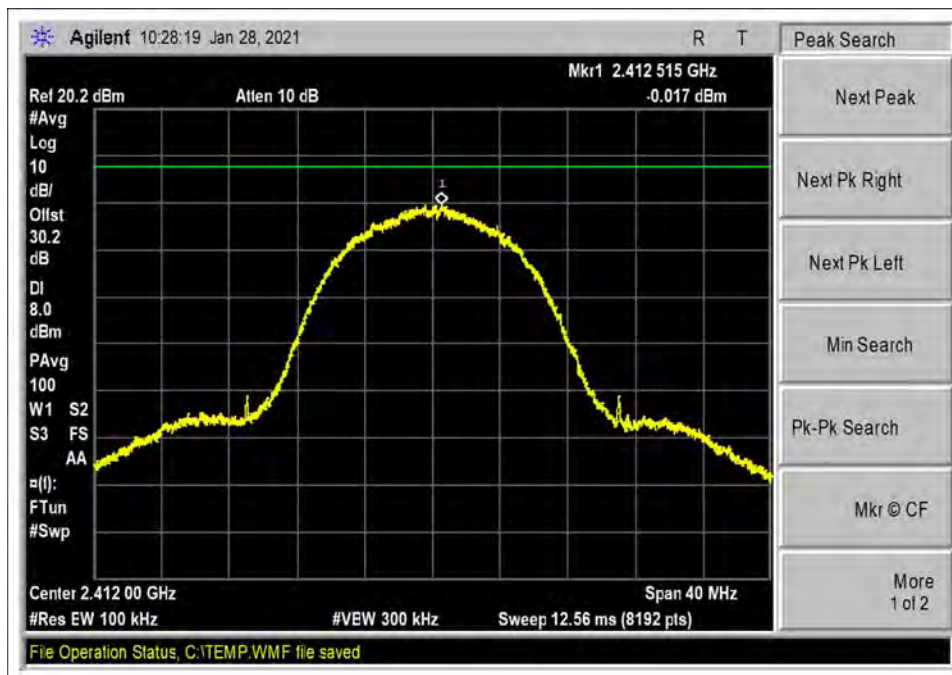


802.11b\_1Mbps\_Middle Channel



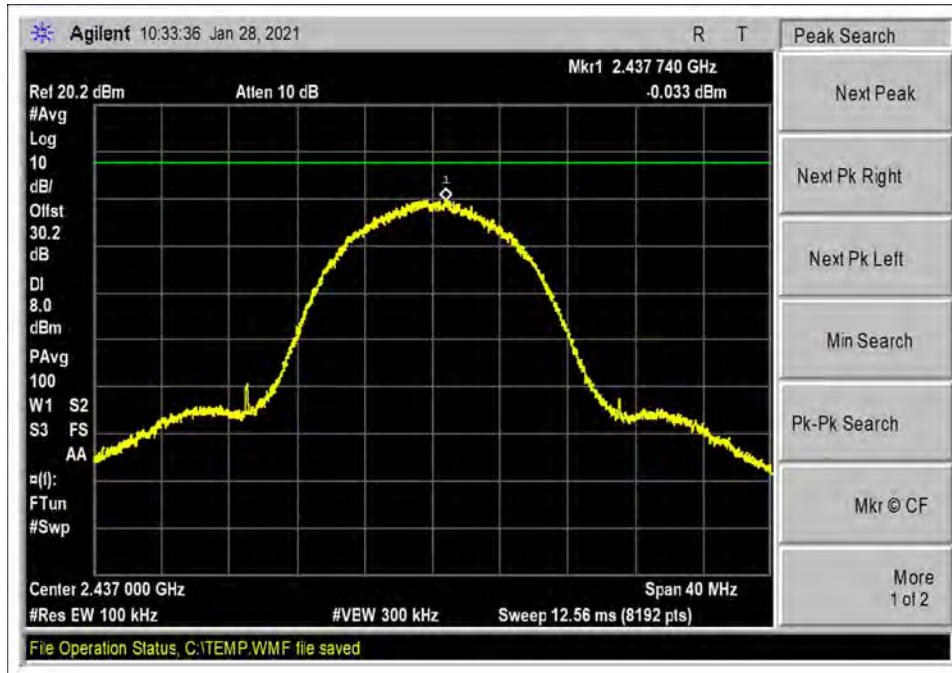


802.11b\_1Mbps\_High Channel

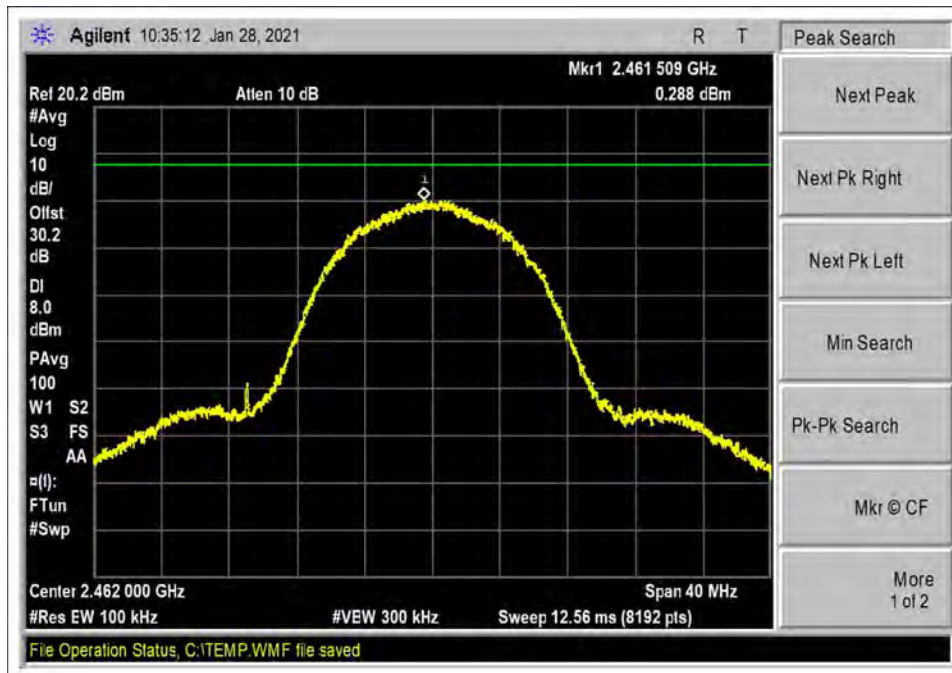


802.11b\_11Mbps\_Low Channel

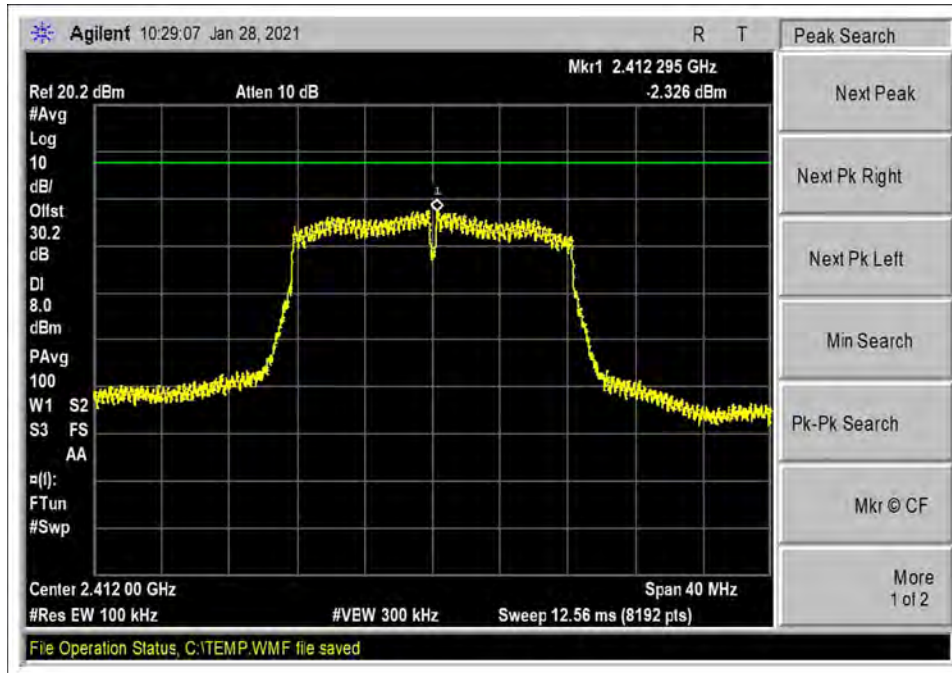




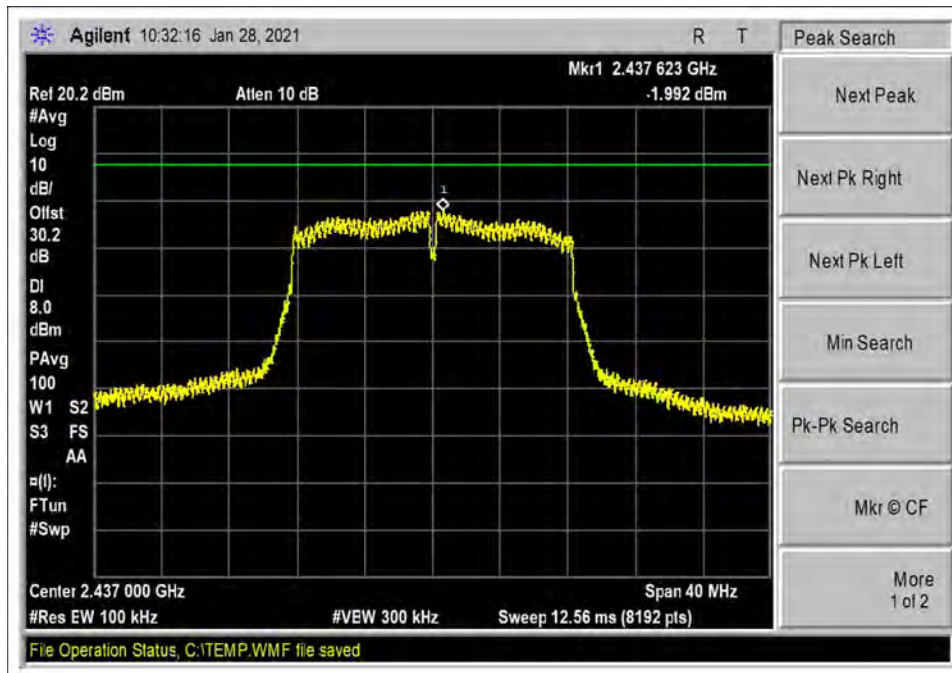
802.11b\_11Mbps\_Middle Channel



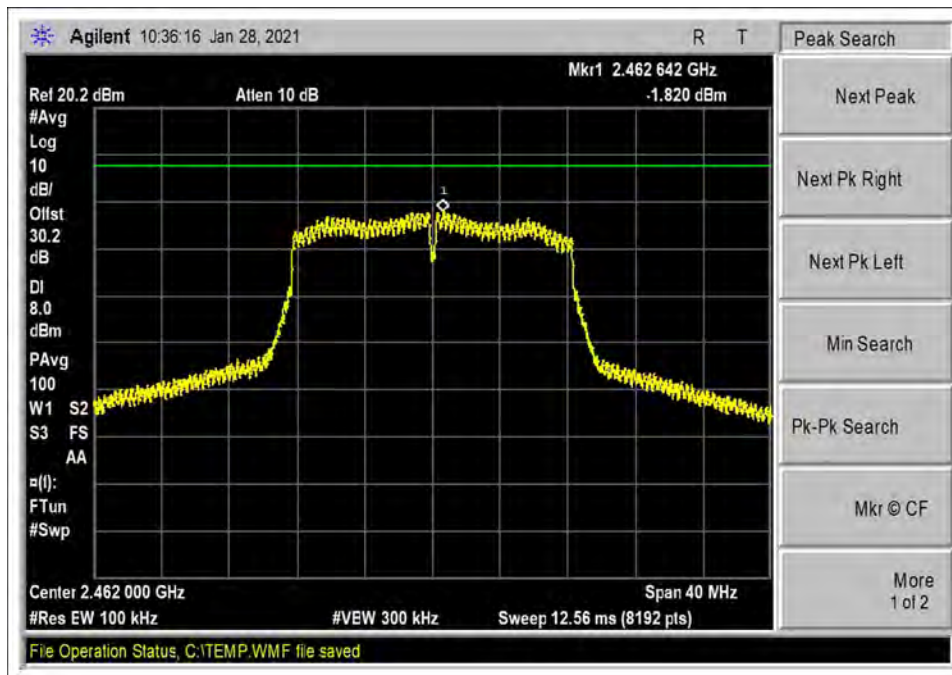
802.11b\_11Mbps\_High Channel



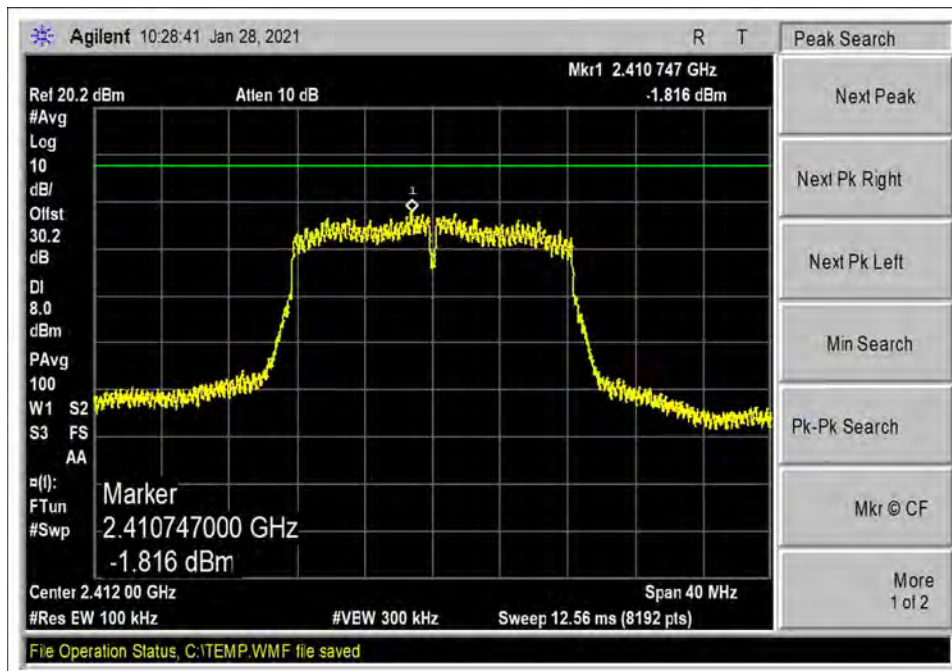
802.11g\_6Mbps \_Low Channel



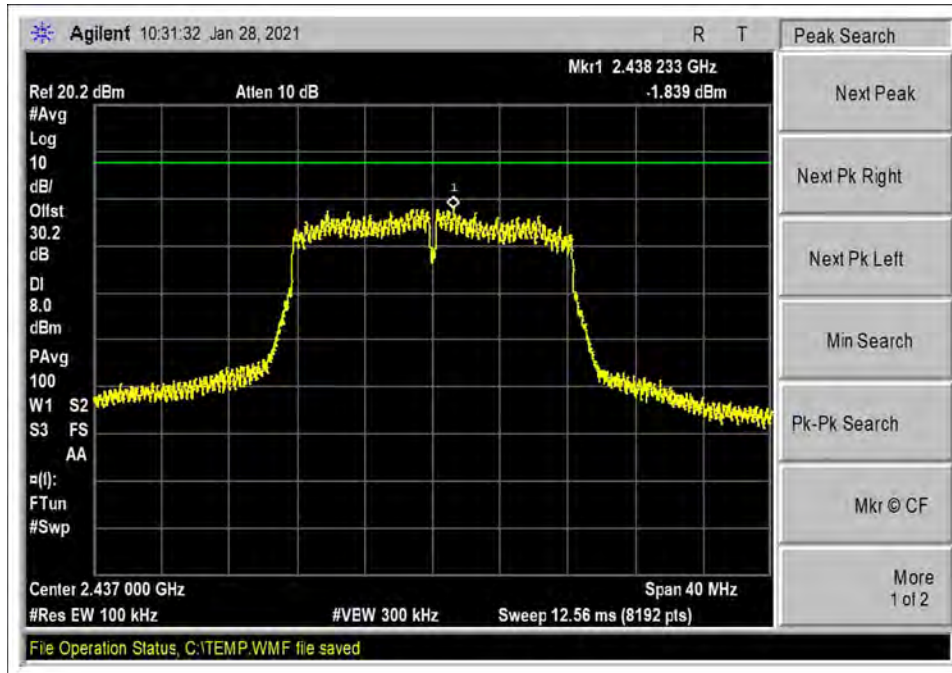
802.11g\_6Mbps \_Middle Channel



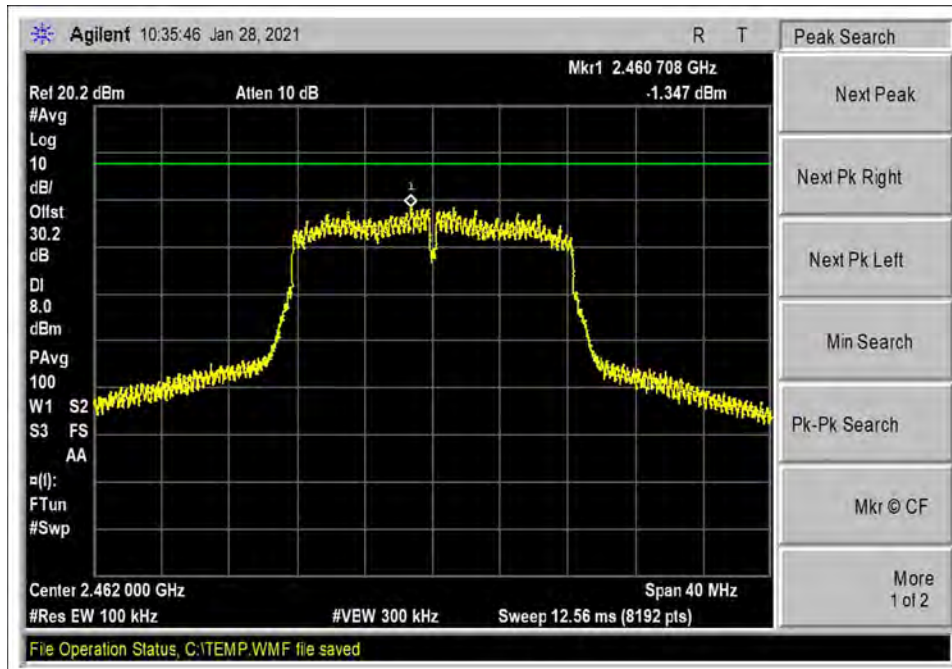
802.11g\_6Mbps\_High Channel



802.11g\_54Mbps\_Low Channel

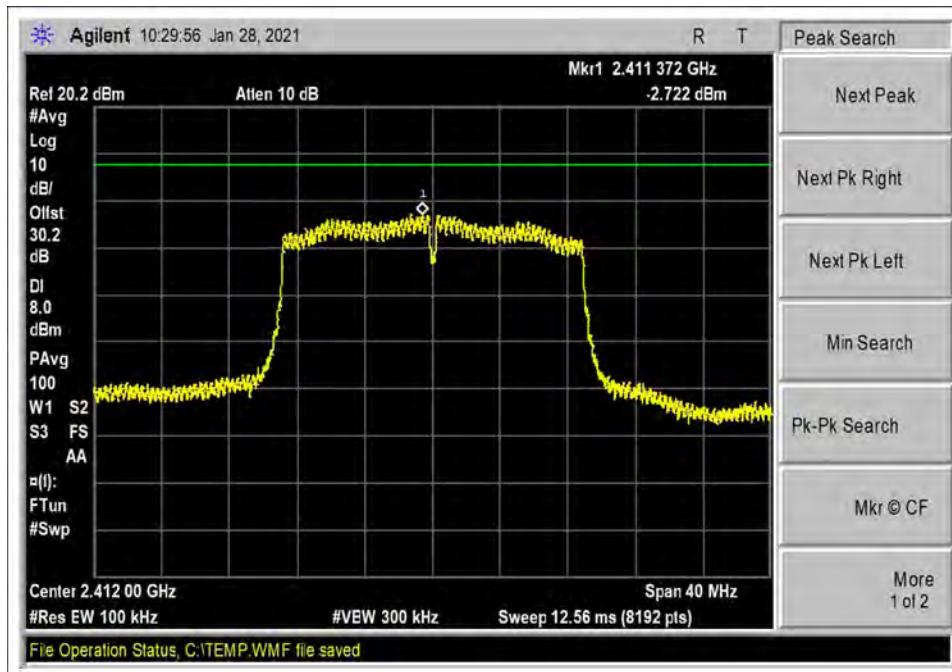


802.11g\_54Mbps \_Middle Channel

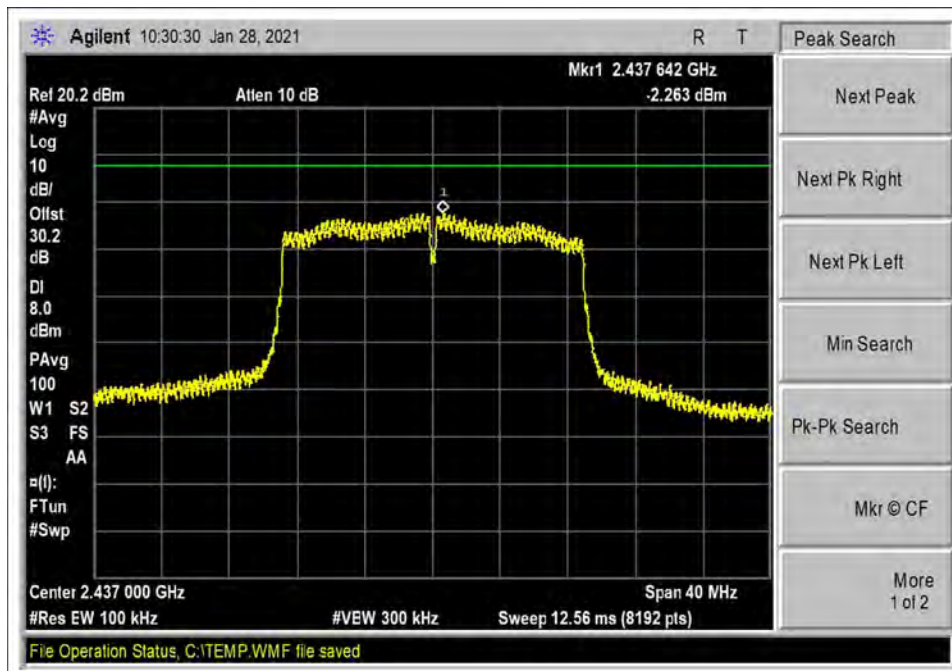


802.11g\_54Mbps \_High Channel

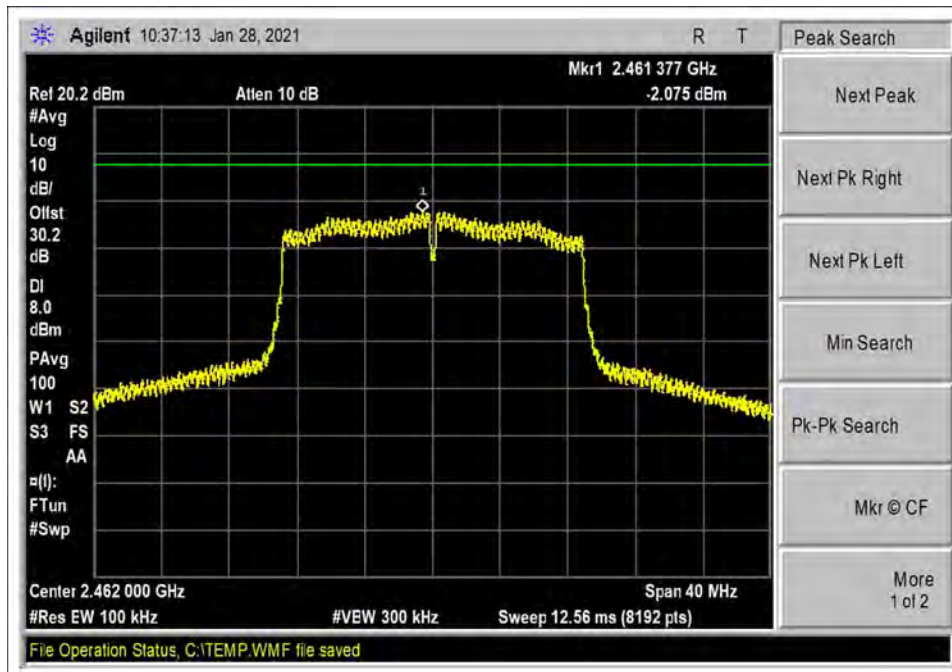




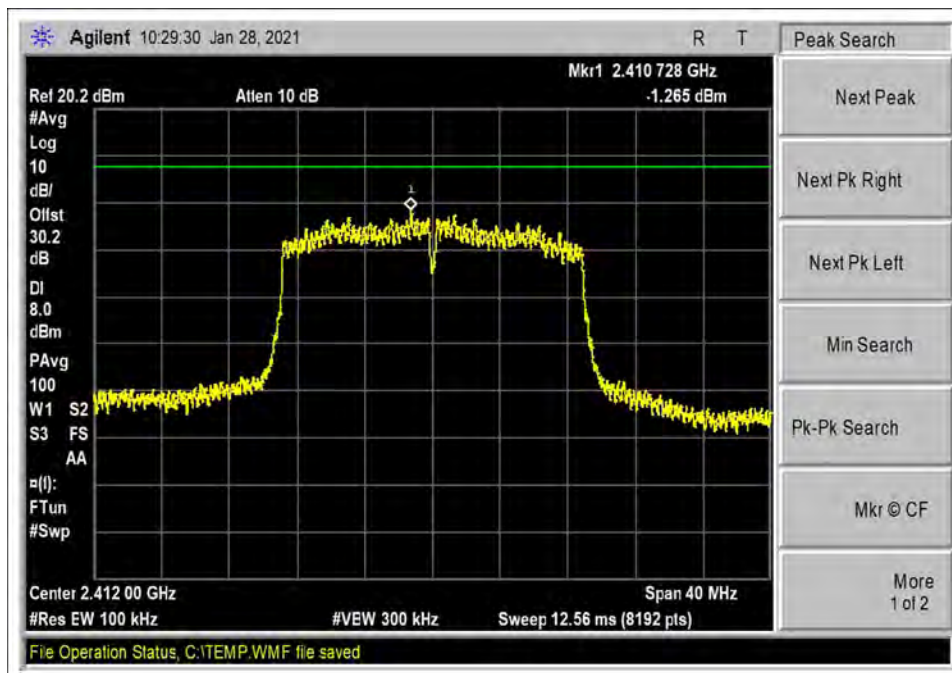
802.11n20\_MCS0\_Low Channel



802.11n20\_MCS0\_Middle Channel

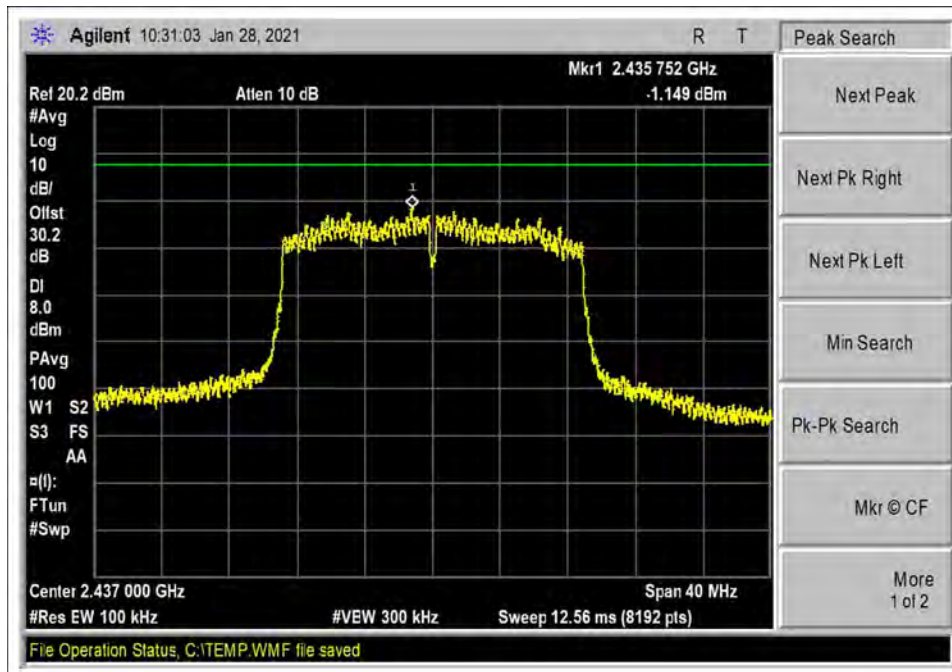


802.11n20\_MCS0\_High Channel

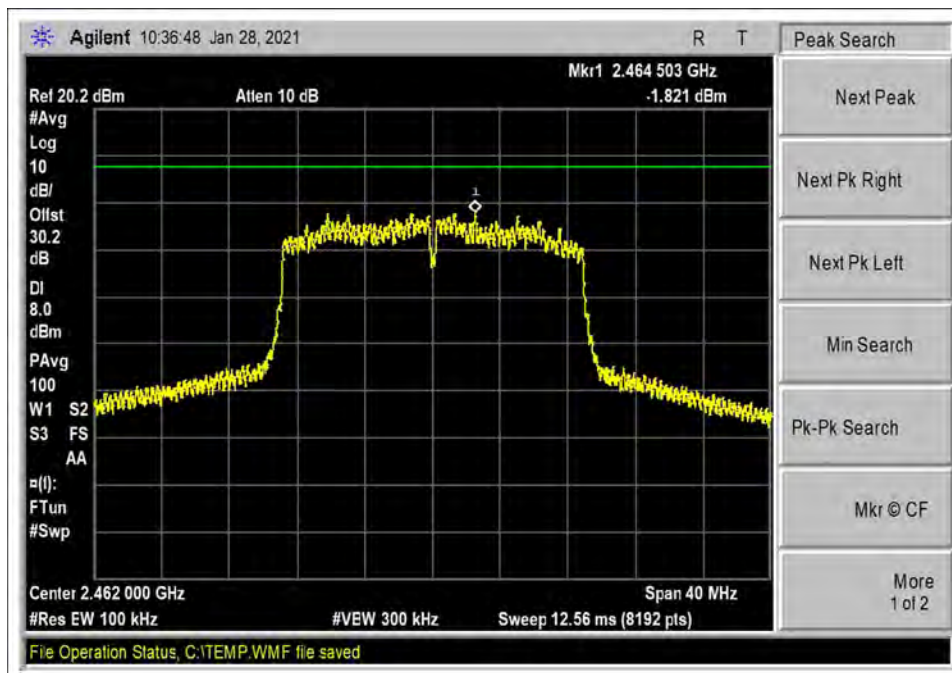


802.11n20\_MCS7\_Low Channel





802.11n20\_MCS7\_Middle Channel



802.11n20\_MCS7\_High Channel

**Test Setup Photo(s)**



## 15.207 AC Conducted Emissions

### Test Setup / Conditions / Data

Test Location: CKC Laboratories Inc. • 110 N. Olinda Pl. • Brea, CA 92823 • 714-993-6112  
 Customer: **Venstar, Inc.**  
 Specification: **15.207 AC Mains - Average**  
 Work Order #: **104980** Date: 1/28/2021  
 Test Type: **Conducted Emissions** Time: 1:59:54 PM  
 Tested By: Don Nguyen Sequence#: 1  
 Software: EMITest 5.03.19 120V 60Hz

#### Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

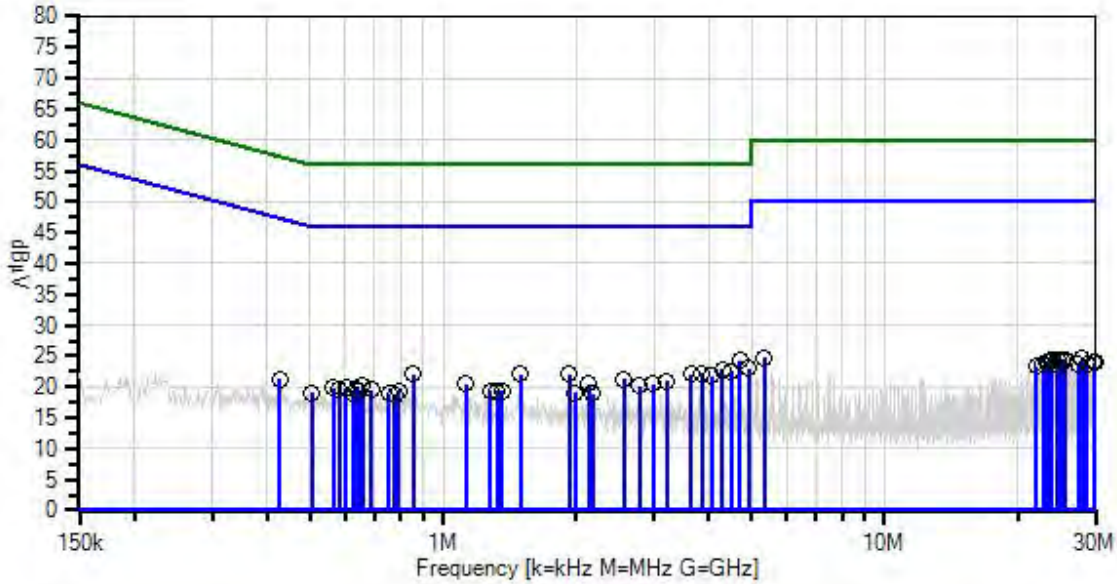
#### Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

#### Test Conditions / Notes:

EUT is powered from 24Vac AC Adapter. The transmitter is activated via touch screen. Only the worst case (highest output power) mode is investigated.  
 Software setting:  
 Testing Frequency: 2462MHz  
 Data Rate  
 802.11b: 11Mbps  
 Mode: Continuous Modulated  
 TX Power Level: 50mW  
  
 Test Method: ANSI C63.10 (2013), KDB 558074 v05r02: 04/02/2019  
 Temperature (°C): 24.2  
 Relative Humidity (%): 28  
  
 Frequency of measurement: 150kHz-30MHz  
 RBW=9kHz, VBW=30kHz

Venstar, Inc. WO#: 104980 Sequence#: 1 Date: 1/28/2021  
 15.207 AC Mains - Average Test Lead: 120V 60Hz L1-Line



— Sweep Data  
 × QP Readings  
 Software Version: 5.03.19  
 — Readings  
 \* Average Readings  
 — 1 - 15.207 AC Mains - Average  
 ○ Peak Readings  
 ▼ Ambient  
 — 2 - 15.207 AC Mains - Quasi-peak

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP07545	Attenuator	SA18N10W-06	1/4/2021	1/4/2023
T2	ANP07338	Cable	2249-Y-240	12/24/2019	12/24/2021
T3	AN00847.1	50uH LISN-(L) Line 1	3816/2NM	3/10/2020	3/10/2021
	AN00847.1	50uH LISN-(N) Line 2	3816/2NM	3/10/2020	3/10/2021
	AN02869	Spectrum Analyzer	E4440A	8/3/2020	8/3/2021
T4	AN02610	High Pass Filter	HE9615-150K-	10/22/2019	10/22/2021
			50-720B		
T5	ANP07738	Cable-Line L1(dB)	90cm-extcord	12/9/2020	12/9/2022
	ANP07738	Cable-Neutral L2(dB)	90cm-extcord	12/9/2020	12/9/2022

**Measurement Data:** Reading listed by margin. Test Lead: L1-Line

#	Freq MHz	Rdng dB $\mu$ V	T1 T5 dB	T2 dB	T3 dB	T4 dB	Dist. Table	Corr dB $\mu$ V	Spec dB $\mu$ V	Margin dB	Polar Ant
1	4.709M	18.0	+5.7 +0.2	+0.2	+0.1	+0.1	+0.0	24.3	46.0	-21.7	L1-Li
2	4.922M	16.7	+5.7 +0.2	+0.2	+0.1	+0.1	+0.0	23.0	46.0	-23.0	L1-Li
3	4.279M	16.6	+5.7 +0.2	+0.2	+0.1	+0.1	+0.0	22.9	46.0	-23.1	L1-Li
4	4.496M	16.3	+5.7 +0.2	+0.2	+0.1	+0.1	+0.0	22.6	46.0	-23.4	L1-Li
5	3.854M	16.0	+5.7 +0.2	+0.1	+0.1	+0.1	+0.0	22.2	46.0	-23.8	L1-Li
6	854.662k	15.9	+5.7 +0.1	+0.1	+0.0	+0.3	+0.0	22.1	46.0	-23.9	L1-Li
7	1.928M	16.0	+5.7 +0.1	+0.1	+0.0	+0.2	+0.0	22.1	46.0	-23.9	L1-Li
8	1.498M	15.9	+5.7 +0.1	+0.1	+0.0	+0.2	+0.0	22.0	46.0	-24.0	L1-Li
9	3.637M	15.8	+5.7 +0.2	+0.1	+0.1	+0.1	+0.0	22.0	46.0	-24.0	L1-Li
10	4.067M	15.5	+5.7 +0.2	+0.2	+0.1	+0.1	+0.0	21.8	46.0	-24.2	L1-Li
11	2.566M	15.1	+5.7 +0.1	+0.1	+0.0	+0.2	+0.0	21.2	46.0	-24.8	L1-Li
12	3.208M	14.7	+5.7 +0.2	+0.1	+0.1	+0.1	+0.0	20.9	46.0	-25.1	L1-Li
13	28.040M	17.2	+5.8 +0.9	+0.5	+0.2	+0.2	+0.0	24.8	50.0	-25.2	L1-Li
14	5.346M	18.4	+5.7 +0.2	+0.2	+0.1	+0.1	+0.0	24.7	50.0	-25.3	L1-Li
15	25.683M	17.0	+5.8 +0.9	+0.4	+0.2	+0.2	+0.0	24.5	50.0	-25.5	L1-Li
16	1.124M	14.4	+5.7 +0.1	+0.1	+0.0	+0.2	+0.0	20.5	46.0	-25.5	L1-Li
17	2.140M	14.4	+5.7 +0.1	+0.1	+0.0	+0.2	+0.0	20.5	46.0	-25.5	L1-Li
18	2.995M	14.2	+5.7 +0.2	+0.1	+0.0	+0.2	+0.0	20.4	46.0	-25.6	L1-Li
19	25.258M	16.8	+5.8 +0.9	+0.4	+0.2	+0.2	+0.0	24.3	50.0	-25.7	L1-Li
20	23.977M	17.0	+5.7 +0.8	+0.4	+0.2	+0.2	+0.0	24.3	50.0	-25.7	L1-Li
21	23.758M	16.9	+5.7 +0.8	+0.4	+0.2	+0.2	+0.0	24.2	50.0	-25.8	L1-Li
22	656.135k	14.0	+5.7 +0.1	+0.1	+0.0	+0.3	+0.0	20.2	46.0	-25.8	L1-Li
23	24.827M	16.8	+5.8 +0.8	+0.4	+0.2	+0.2	+0.0	24.2	50.0	-25.8	L1-Li
24	2.782M	13.9	+5.7 +0.2	+0.1	+0.0	+0.2	+0.0	20.1	46.0	-25.9	L1-Li

25	23.333M	16.8	+5.7 +0.8	+0.4	+0.2	+0.2	+0.0	24.1	50.0	-25.9	L1-Li
26	23.545M	16.8	+5.7 +0.8	+0.4	+0.2	+0.2	+0.0	24.1	50.0	-25.9	L1-Li
27	29.753M	16.3	+5.8 +1.0	+0.5	+0.2	+0.2	+0.0	24.0	50.0	-26.0	L1-Li
28	427.065k	15.3	+5.7 +0.1	+0.0	+0.0	+0.2	+0.0	21.3	47.3	-26.0	L1-Li
29	29.966M	16.1	+5.8 +1.0	+0.5	+0.3	+0.2	+0.0	23.9	50.0	-26.1	L1-Li
30	565.234k	13.5	+5.8 +0.1	+0.1	+0.0	+0.3	+0.0	19.8	46.0	-26.2	L1-Li
31	603.776k	13.5	+5.8 +0.1	+0.1	+0.0	+0.3	+0.0	19.8	46.0	-26.2	L1-Li
32	28.684M	16.1	+5.8 +0.9	+0.5	+0.2	+0.2	+0.0	23.7	50.0	-26.3	L1-Li
33	22.905M	16.4	+5.7 +0.7	+0.4	+0.2	+0.2	+0.0	23.6	50.0	-26.4	L1-Li
34	27.396M	16.0	+5.8 +0.9	+0.5	+0.2	+0.2	+0.0	23.6	50.0	-26.4	L1-Li
35	581.960k	13.3	+5.8 +0.1	+0.1	+0.0	+0.3	+0.0	19.6	46.0	-26.4	L1-Li
36	687.405k	13.3	+5.7 +0.1	+0.1	+0.0	+0.3	+0.0	19.5	46.0	-26.5	L1-Li
37	632.864k	13.2	+5.8 +0.1	+0.1	+0.0	+0.3	+0.0	19.5	46.0	-26.5	L1-Li
38	1.281M	13.3	+5.7 +0.1	+0.1	+0.0	+0.2	+0.0	19.4	46.0	-26.6	L1-Li
39	643.045k	13.1	+5.8 +0.1	+0.1	+0.0	+0.3	+0.0	19.4	46.0	-26.6	L1-Li
40	1.328M	13.3	+5.7 +0.1	+0.1	+0.0	+0.2	+0.0	19.4	46.0	-26.6	L1-Li
41	1.362M	13.3	+5.7 +0.1	+0.1	+0.0	+0.2	+0.0	19.4	46.0	-26.6	L1-Li
42	22.049M	16.1	+5.7 +0.7	+0.4	+0.2	+0.2	+0.0	23.3	50.0	-26.7	L1-Li
43	24.614M	15.9	+5.8 +0.8	+0.4	+0.2	+0.2	+0.0	23.3	50.0	-26.7	L1-Li
44	792.122k	13.1	+5.7 +0.1	+0.1	+0.0	+0.3	+0.0	19.3	46.0	-26.7	L1-Li
45	1.987M	13.0	+5.7 +0.1	+0.1	+0.0	+0.2	+0.0	19.1	46.0	-26.9	L1-Li
46	623.411k	12.8	+5.8 +0.1	+0.1	+0.0	+0.3	+0.0	19.1	46.0	-26.9	L1-Li
47	505.603k	13.0	+5.7 +0.1	+0.0	+0.0	+0.3	+0.0	19.1	46.0	-26.9	L1-Li
48	2.183M	12.8	+5.7 +0.1	+0.1	+0.0	+0.2	+0.0	18.9	46.0	-27.1	L1-Li
49	755.035k	12.7	+5.7 +0.1	+0.1	+0.0	+0.3	+0.0	18.9	46.0	-27.1	L1-Li
50	779.033k	12.6	+5.7 +0.1	+0.1	+0.0	+0.3	+0.0	18.8	46.0	-27.2	L1-Li





Test Location: CKC Laboratories Inc. • 110 N. Olinda Pl. • Brea, CA 92823 • 714-993-6112  
 Customer: **Venstar, Inc.**  
 Specification: **15.207 AC Mains - Average**  
 Work Order #: **104980** Date: 1/28/2021  
 Test Type: **Conducted Emissions** Time: 2:01:35 PM  
 Tested By: Don Nguyen Sequence#: 2  
 Software: EMITest 5.03.19 120V 60Hz

***Equipment Tested:***

Device	Manufacturer	Model #	S/N
Configuration 2			

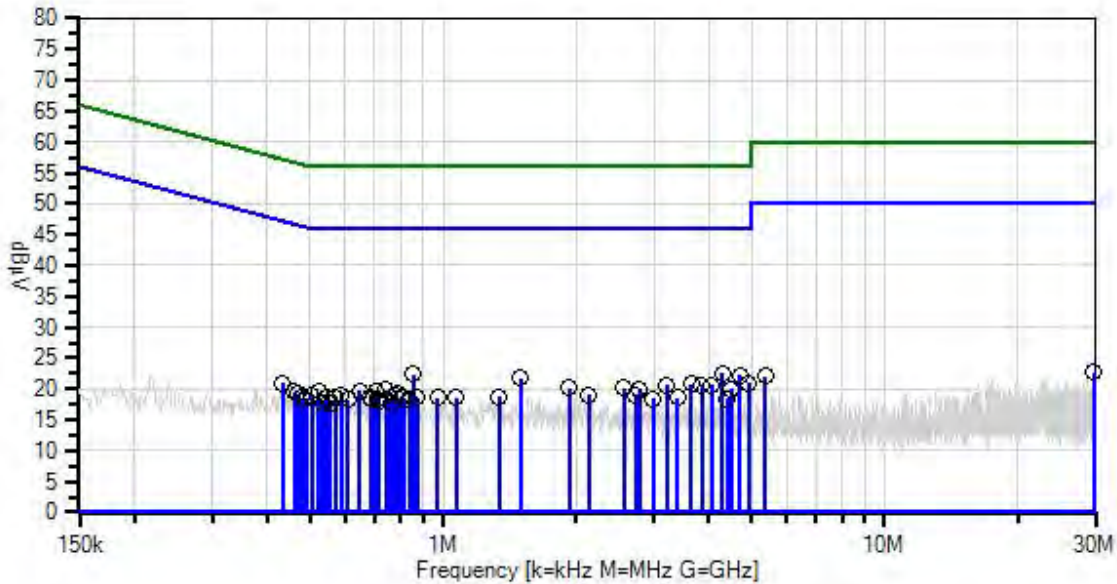
***Support Equipment:***

Device	Manufacturer	Model #	S/N
Configuration 2			

***Test Conditions / Notes:***

EUT is powered from 24Vac AC Adapter. The transmitter is activated via touch screen. Only the worst case (highest output power) mode is investigated.  
 Software setting:  
 Testing Frequency: 2462MHz  
 Data Rate  
 802.11b: 11Mbps  
 Mode: Continuous Modulated  
 TX Power Level: 50mW  
  
 Test Method: ANSI C63.10 (2013), KDB 558074 v05r02: 04/02/2019  
 Temperature (°C): 24.2  
 Relative Humidity (%): 28  
  
 Frequency of measurement: 150kHz-30MHz  
 RBW=9kHz, VBW=30kHz

Venstar, Inc. WD#: 104980 Sequence#: 2 Date: 1/28/2021  
 15.207 AC Mains - Average Test Lead: 120V 60Hz L2-Neutral



— Sweep Data  
 × QP Readings  
 Software Version: 5.03.19  
 — Readings  
 \* Average Readings  
 — 1 - 15.207 AC Mains - Average  
 ○ Peak Readings  
 ▼ Ambient  
 — 2 - 15.207 AC Mains - Quasi-peak

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP07545	Attenuator	SA18N10W-06	1/4/2021	1/4/2023
T2	ANP07338	Cable	2249-Y-240	12/24/2019	12/24/2021
	AN00847.1	50uH LISN-(L) Line 1	3816/2NM	3/10/2020	3/10/2021
T3	AN00847.1	50uH LISN-(N) Line 2	3816/2NM	3/10/2020	3/10/2021
	AN02869	Spectrum Analyzer	E4440A	8/3/2020	8/3/2021
T4	AN02610	High Pass Filter	HE9615-150K-50-720B	10/22/2019	10/22/2021
	ANP07738	Cable-Line L1(dB)	90cm-extcord	12/9/2020	12/9/2022
T5	ANP07738	Cable-Neutral L2(dB)	90cm-extcord	12/9/2020	12/9/2022

**Measurement Data:**

Reading listed by margin.

Test Lead: L2-Neutral

#	Freq MHz	Rdng dB $\mu$ V	T1 T5 dB	T2 dB	T3 dB	T4 dB	Dist. Table	Corr dB $\mu$ V	Spec dB $\mu$ V	Margin dB	Polar Ant
1	4.284M	16.2	+5.7 +0.2	+0.2	+0.1	+0.1	+0.0	22.5	46.0	-23.5	L2-Ne
2	856.117k	16.1	+5.7 +0.1	+0.1	+0.0	+0.3	+0.0	22.3	46.0	-23.7	L2-Ne
3	4.709M	15.9	+5.7 +0.2	+0.2	+0.1	+0.1	+0.0	22.2	46.0	-23.8	L2-Ne
4	1.498M	15.6	+5.7 +0.1	+0.1	+0.0	+0.2	+0.0	21.7	46.0	-24.3	L2-Ne
5	4.926M	14.6	+5.7 +0.2	+0.2	+0.1	+0.1	+0.0	20.9	46.0	-25.1	L2-Ne
6	3.641M	14.6	+5.7 +0.2	+0.1	+0.1	+0.1	+0.0	20.8	46.0	-25.2	L2-Ne
7	3.854M	14.5	+5.7 +0.2	+0.1	+0.1	+0.1	+0.0	20.7	46.0	-25.3	L2-Ne
8	4.067M	14.3	+5.7 +0.2	+0.2	+0.1	+0.1	+0.0	20.6	46.0	-25.4	L2-Ne
9	3.212M	14.5	+5.7 +0.1	+0.1	+0.1	+0.1	+0.0	20.6	46.0	-25.4	L2-Ne
10	1.928M	14.0	+5.7 +0.1	+0.1	+0.0	+0.2	+0.0	20.1	46.0	-25.9	L2-Ne
11	2.570M	13.9	+5.7 +0.1	+0.1	+0.1	+0.2	+0.0	20.1	46.0	-25.9	L2-Ne
12	4.496M	13.7	+5.7 +0.2	+0.2	+0.1	+0.1	+0.0	20.0	46.0	-26.0	L2-Ne
13	742.672k	13.7	+5.7 +0.1	+0.1	+0.0	+0.3	+0.0	19.9	46.0	-26.1	L2-Ne
14	432.883k	15.0	+5.7 +0.1	+0.0	+0.0	+0.2	+0.0	21.0	47.2	-26.2	L2-Ne
15	2.782M	13.6	+5.7 +0.1	+0.1	+0.1	+0.2	+0.0	19.8	46.0	-26.2	L2-Ne
16	645.954k	13.4	+5.8 +0.1	+0.1	+0.0	+0.3	+0.0	19.7	46.0	-26.3	L2-Ne
17	522.329k	13.5	+5.7 +0.1	+0.0	+0.0	+0.3	+0.0	19.6	46.0	-26.4	L2-Ne
18	701.949k	13.4	+5.7 +0.1	+0.1	+0.0	+0.3	+0.0	19.6	46.0	-26.4	L2-Ne
19	787.032k	13.2	+5.7 +0.1	+0.1	+0.0	+0.3	+0.0	19.4	46.0	-26.6	L2-Ne
20	503.422k	13.0	+5.7 +0.1	+0.0	+0.0	+0.3	+0.0	19.1	46.0	-26.9	L2-Ne
21	2.140M	13.0	+5.7 +0.1	+0.1	+0.0	+0.2	+0.0	19.1	46.0	-26.9	L2-Ne
22	587.778k	12.7	+5.8 +0.1	+0.1	+0.0	+0.3	+0.0	19.0	46.0	-27.0	L2-Ne
23	777.578k	12.8	+5.7 +0.1	+0.1	+0.0	+0.3	+0.0	19.0	46.0	-27.0	L2-Ne
24	2.731M	12.8	+5.7 +0.1	+0.1	+0.1	+0.2	+0.0	19.0	46.0	-27.0	L2-Ne

25	459.789k	13.5	+5.7 +0.1	+0.0	+0.0	+0.3	+0.0	19.6	46.7	-27.1	L2-Ne
26	570.325k	12.5	+5.8 +0.1	+0.1	+0.0	+0.3	+0.0	18.8	46.0	-27.2	L2-Ne
27	1.336M	12.7	+5.7 +0.1	+0.1	+0.0	+0.2	+0.0	18.8	46.0	-27.2	L2-Ne
28	29.760M	14.9	+5.8 +1.0	+0.5	+0.3	+0.2	+0.0	22.7	50.0	-27.3	L2-Ne
29	469.970k	13.1	+5.7 +0.1	+0.0	+0.0	+0.3	+0.0	19.2	46.5	-27.3	L2-Ne
30	801.576k	12.4	+5.7 +0.1	+0.1	+0.0	+0.3	+0.0	18.6	46.0	-27.4	L2-Ne
31	815.393k	12.4	+5.7 +0.1	+0.1	+0.0	+0.3	+0.0	18.6	46.0	-27.4	L2-Ne
32	1.069M	12.5	+5.7 +0.1	+0.1	+0.0	+0.2	+0.0	18.6	46.0	-27.4	L2-Ne
33	872.842k	12.4	+5.7 +0.1	+0.1	+0.0	+0.3	+0.0	18.6	46.0	-27.4	L2-Ne
34	3.391M	12.3	+5.7 +0.2	+0.1	+0.1	+0.1	+0.0	18.5	46.0	-27.5	L2-Ne
35	545.600k	12.4	+5.7 +0.1	+0.0	+0.0	+0.3	+0.0	18.5	46.0	-27.5	L2-Ne
36	970.764k	12.4	+5.7 +0.1	+0.1	+0.0	+0.2	+0.0	18.5	46.0	-27.5	L2-Ne
37	683.041k	12.3	+5.7 +0.1	+0.1	+0.0	+0.3	+0.0	18.5	46.0	-27.5	L2-Ne
38	4.394M	12.1	+5.7 +0.2	+0.2	+0.1	+0.1	+0.0	18.4	46.0	-27.6	L2-Ne
39	708.494k	12.2	+5.7 +0.1	+0.1	+0.0	+0.3	+0.0	18.4	46.0	-27.6	L2-Ne
40	2.995M	12.2	+5.7 +0.1	+0.1	+0.1	+0.2	+0.0	18.4	46.0	-27.6	L2-Ne
41	839.391k	12.2	+5.7 +0.1	+0.1	+0.0	+0.3	+0.0	18.4	46.0	-27.6	L2-Ne
42	688.859k	12.1	+5.7 +0.1	+0.1	+0.0	+0.3	+0.0	18.3	46.0	-27.7	L2-Ne
43	480.151k	12.5	+5.7 +0.1	+0.0	+0.0	+0.3	+0.0	18.6	46.3	-27.7	L2-Ne
44	608.866k	11.9	+5.8 +0.1	+0.1	+0.0	+0.3	+0.0	18.2	46.0	-27.8	L2-Ne
45	489.605k	12.3	+5.7 +0.1	+0.0	+0.0	+0.3	+0.0	18.4	46.2	-27.8	L2-Ne
46	5.355M	15.8	+5.7 +0.2	+0.2	+0.1	+0.1	+0.0	22.1	50.0	-27.9	L2-Ne
47	715.766k	11.9	+5.7 +0.1	+0.1	+0.0	+0.3	+0.0	18.1	46.0	-27.9	L2-Ne
48	534.691k	11.7	+5.7 +0.1	+0.0	+0.0	+0.3	+0.0	17.8	46.0	-28.2	L2-Ne
49	556.508k	11.5	+5.8 +0.1	+0.1	+0.0	+0.3	+0.0	17.8	46.0	-28.2	L2-Ne
50	762.307k	11.6	+5.7 +0.1	+0.1	+0.0	+0.3	+0.0	17.8	46.0	-28.2	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.

<b>MEASURING EQUIPMENT BANDWIDTH SETTINGS PER FREQUENCY RANGE</b>			
<b>TEST</b>	<b>BEGINNING FREQUENCY</b>	<b>ENDING FREQUENCY</b>	<b>BANDWIDTH SETTING</b>
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.