Venstar, Inc.

TEST REPORT FOR

WiFi Thermostat
Models: Explorer Mini, T2000, T2050, T2100, T2150

Tested To The Following Standards:

FCC Part 15 Subpart C Section(s)

15.207 & 15.247
(DTS 2400-2483.5 MHz)

Report No.: 99771-7

Date of issue: May 31, 2017

ACCREDITED
Testing Certificates:
803.01, 803.02, 803.05, 803.06

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

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

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ADMINISTRATIVE INFORMATION

Test Report Information

REPORT PREPARED FOR:

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REPORT PREPARED BY:

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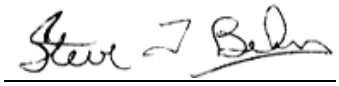
Project Number: 99771

DATE OF EQUIPMENT RECEIPT: May 3, 2017
DATE(S) OF TESTING: May 3-13, 2017

Report Authorization

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



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

Test Facility Information

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

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

Software Versions

CKC Laboratories Proprietary Software	Version
EMITest Emissions	5.03.02

Site Registration & Accreditation Information

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

SUMMARY OF RESULTS

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

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

NA = Not Applicable

Modifications During Testing

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

Summary of Conditions
No modifications were made during testing.

Modifications listed above must be incorporated into all production units.

Conditions During Testing

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

Summary of Conditions
None

EQUIPMENT UNDER TEST (EUT)

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

The following model has been tested by CKC Laboratories: **WiFi Thermostat, Exploere Mini**

The manufacturer states that the following additional models are identical electrically to the one which was tested, or any differences between them do not affect their EMC characteristics, and therefore they meet the level of testing equivalent to the tested models:
T2000
T2050
T2100
T2150

Configuration 1

Equipment Tested:

Device	Manufacturer	Model #	S/N
WiFi Thermostat	Venstar, Inc.	Explorer Mini	NA

Support Equipment:

Device	Manufacturer	Model #	S/N
Laptop Computer	Lenovo	ThinkPad T500	L3B3906
USB to Serial programming adapter board	FTDI Ltd.	FT2232H	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:	2412MHz to 2462MHz
Modulation Type(s):	DSSS, CCK, OFDM, BPSK, QPSK, 16-QAM, 64-QAM
Maximum Duty Cycle:	99%
Number of TX Chains:	1
Antenna Type(s) and Gain:	Chip and 1.9dBi
Beamforming Type:	NA
Antenna Connection Type:	Integral
Nominal Input Voltage:	3.3Vdc
Firmware / Software used for Test:	Texas Instruments CC3120/CC3220 Radio Tool v0.8.5973.20907

FCC Part 15 Subpart C

15.247(a)(2) 6dB Bandwidth

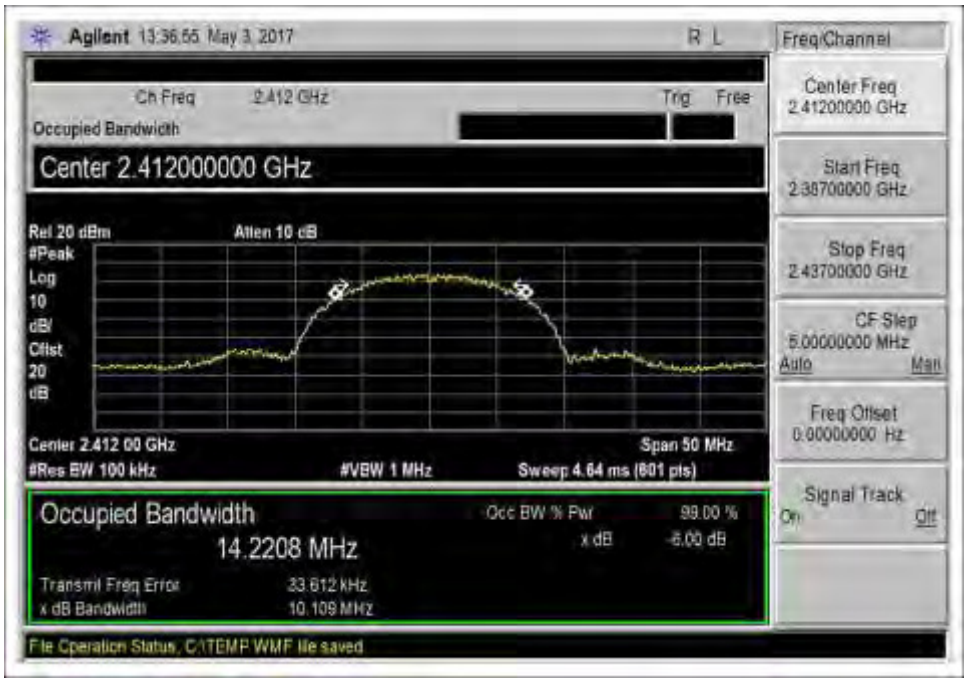
Test Setup/Conditions			
Test Location:	Brea Lab D	Test Engineer:	S. Yamamoto
Test Method:	ANSI C63.10 (2013), KDB 558074 v04 2017	Test Date(s):	5/3/2017
Configuration:	1		
Test Setup:	Antenna port of EUT connected to spectrum analyzer using a coaxial cable and attenuator.		

Environmental Conditions			
Temperature (ºC)	20	Relative Humidity (%):	45

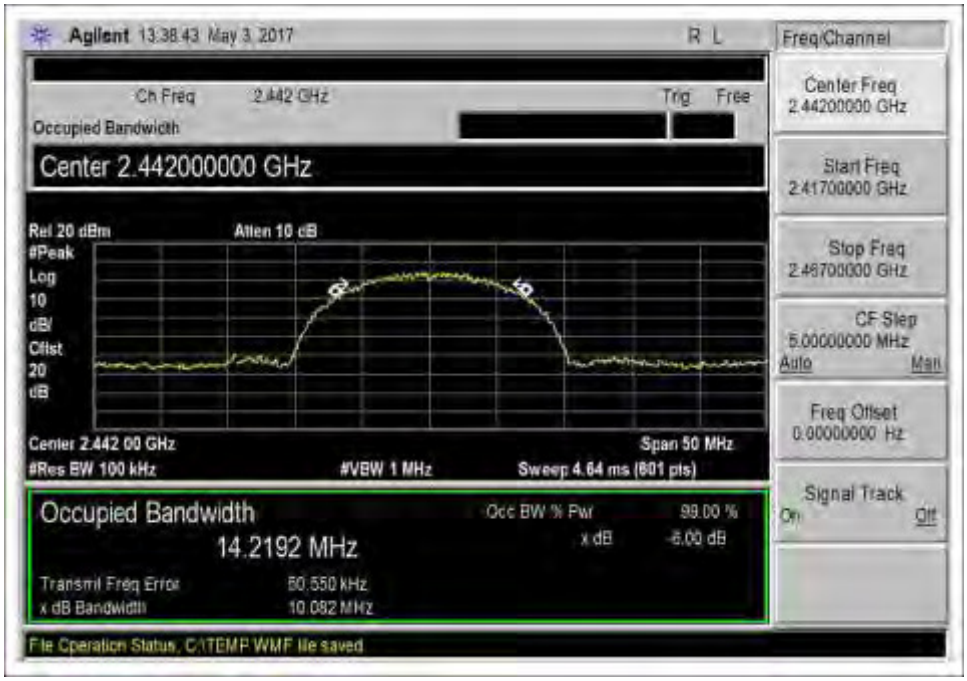
Test Equipment					
Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
02869	Spectrum Analyzer	Agilent	E4440A	7/8/2016	7/8/2017
03431	Attenuator	Aeroflex/Weinschel	89-20-21	11/2/2015	11/2/2017
P06544	Cable	Astro Steel	32026-29094K-29094K-36TC	11/2/2015	11/2/2017

Test Data Summary					
Frequency (MHz)	Antenna Port	Modulation	Measured (kHz)	Limit (kHz)	Results
2412	1	CCK	10109	≥500	Pass
2442	1	CCK	10082	≥500	Pass
2462	1	CCK	10053	≥500	Pass
2412	1	OFDM	16489	≥500	Pass
2442	1	OFDM	16447	≥500	Pass
2462	1	OFDM	16476	≥500	Pass
2412	1	BPSK	17674	≥500	Pass
2442	1	BPSK	17717	≥500	Pass
2462	1	BPSK	17601	≥500	Pass

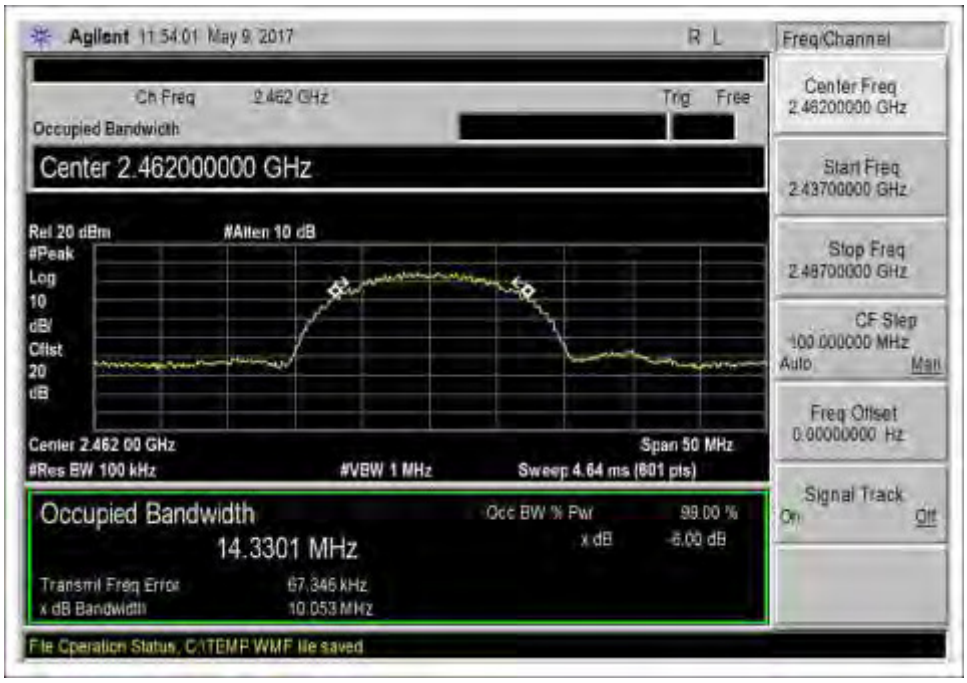
Plots



802.11b_Low Channel_2412MHz_DTS_-6dB_BW



802.11b_Middle Channel_2442MHz_DTS_-6dB_BW



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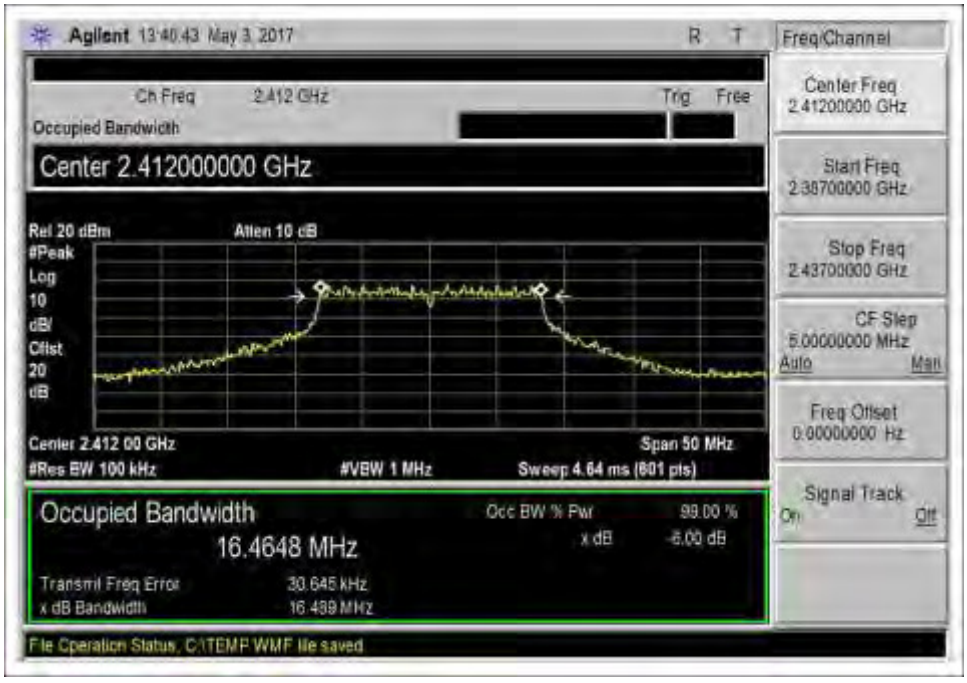
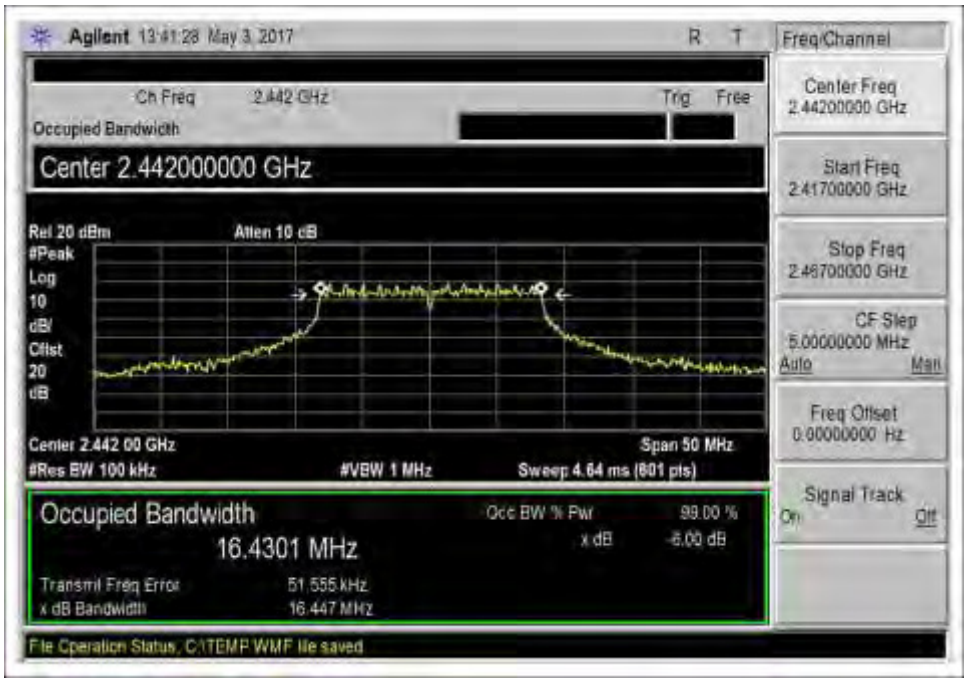
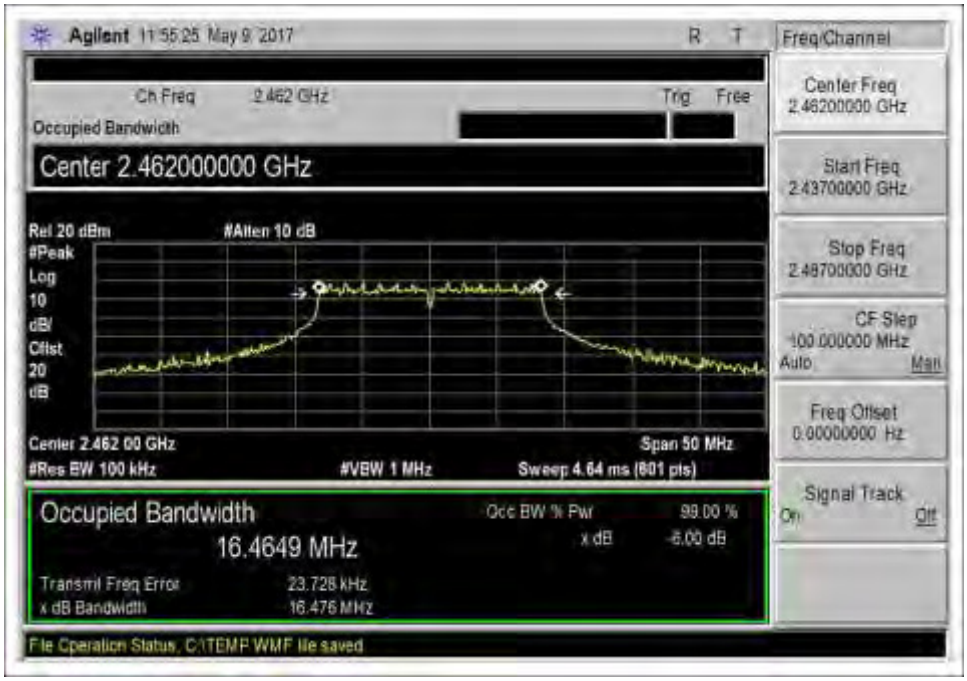


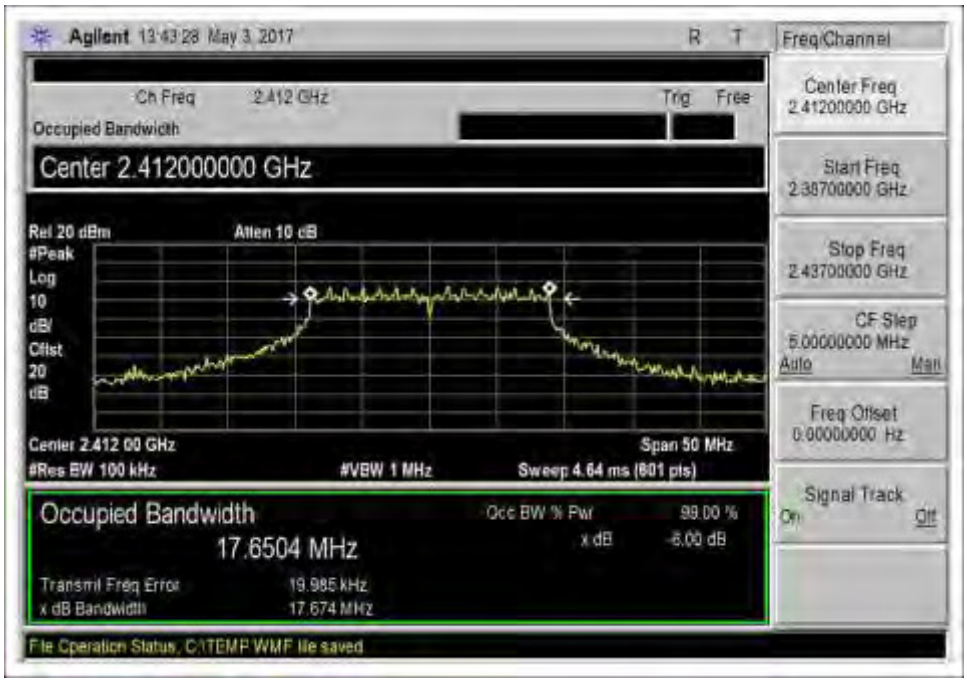
802.11g_Low Channel_2412MHz_DTS_-6dB_BW



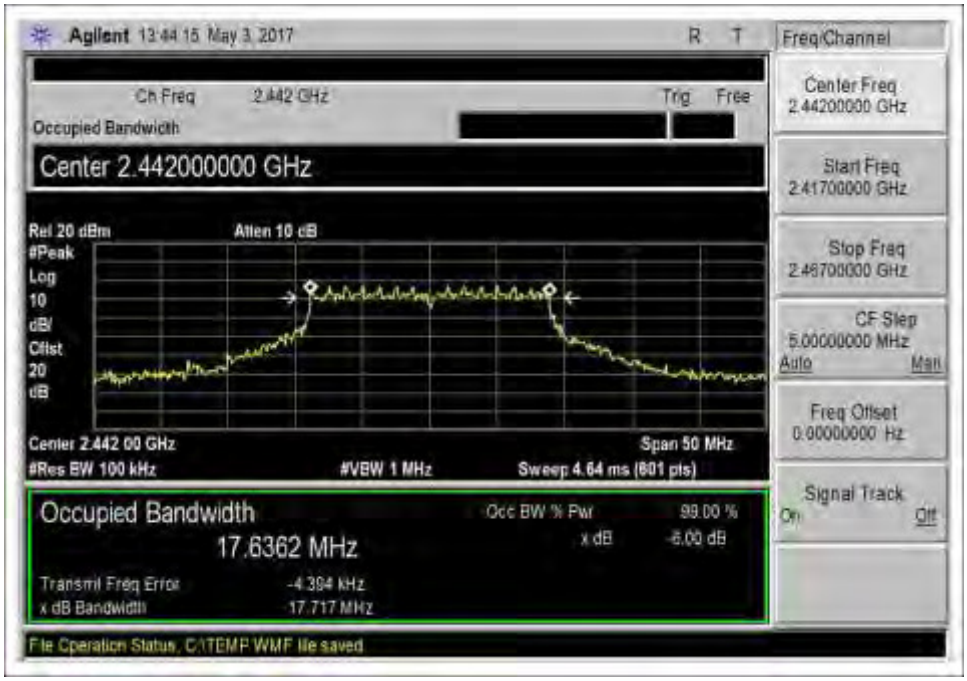
802.11g_Middle Channel_2442MHz_DTS_-6dB_BW



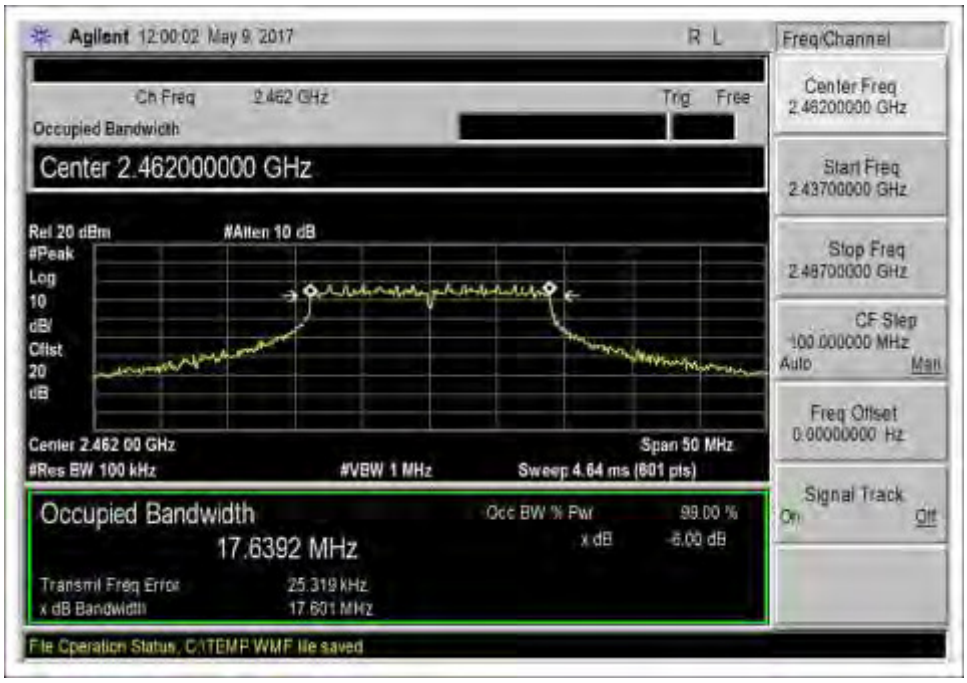
802.11g_High Channel_2462MHz_DTS_-6dB_BW



802.11n20_Low Channel_2412MHz_DTS_-6dB_BW



802.11n20_Middle Channel_2442MHz_DTS_-6dB_BW



802.11n20_High Channel_2462MHz_DTS_-6dB_BW

Test Setup Photo

15.247(b)(3) Output Power

Test Setup / Conditions			
Test Location:	Brea Lab D	Test Engineer:	S. Yamamoto
Test Method:	ANSI C63.10 (2013), KDB 558074 v04 2017	Test Date(s):	5/3/2017
Configuration:	1		
Test Setup:	Antenna port of EUT connected to spectrum analyzer using a coaxial cable and attenuator.		

Environmental Conditions			
Temperature (ºC)	20	Relative Humidity (%):	45

Test Equipment					
Asset#	**Description**	**Manufacturer**	**Model**	**Cal Date**	**Cal Due**
02869	Spectrum Analyzer	Agilent	E4440A	7/8/2016	7/8/2017
03431	Attenuator	Aeroflex/Weinschel	89-20-21	11/2/2015	11/2/2017
P06544	Cable	Astro Steel	32026-29094K-29094K-36TC	11/2/2015	11/2/2017

Test Data Summary - Voltage Variations					
Frequency (MHz)	**Modulation / Ant Port**	**$V_{Minimum}$ (dBm)**	**$V_{Nominal}$ (dBm)**	**$V_{Maximum}$ (dBm)**	**Max Deviation from $V_{Nominal}$ (dB)**
2142	CCK / 1	12.5	12.5	12.5	0
2442	CCK / 1	13	13	13	0
2462	CCK / 1	13.4	13.4	13.4	0
2142	OFDM / 1	10	10	10	0
2442	OFDM / 1	12.9	12.9	12.9	0
2462	OFDM / 1	10.2	10.2	10.2	0
2142	BPSK / 1	9.4	9.4	9.4	0
2442	BPSK / 1	12.6	12.6	12.6	0
2462	BPSK / 1	9.5	9.5	9.5	0

Parameter Definitions:

Measurements performed at input voltage Vnominal ± 15%.

Parameter	Value
$V_{Nominal}$:	115Vac
$V_{Minimum}$:	97Vac
$V_{Maximum}$:	132Vac

Test Data Summary - RF Conducted Measurement					
Measurement Option: AVGSA-1					
Frequency (MHz)	**Modulation**	**Ant. Type / Gain (dBi)**	**Measured (dBm)**	**Limit (dBm)**	**Results**
2142	CCK	Chip / 1.9	12.5	≤ 30	Pass
2442	CCK	Chip / 1.9	13	≤ 30	Pass
2462	CCK	Chip / 1.9	13.4	≤ 30	Pass
2142	OFDM	Chip / 1.9	10	≤ 30	Pass
2442	OFDM	Chip / 1.9	12.9	≤ 30	Pass
2462	OFDM	Chip / 1.9	10.2	≤ 30	Pass
2142	BPSK	Chip / 1.9	9.4	≤ 30	Pass
2442	BPSK	Chip / 1.9	12.6	≤ 30	Pass
2462	BPSK	Chip / 1.9	9.5	≤ 30	Pass

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(b) Power Output (2400-2483.5 MHz DTS)**
Work Order #: **99771** Date: 5/3/2017
Test Type: **Conducted Emissions** Time: 15:31:07
Tested By: S. Yamamoto Sequence#: 1
Software: EMITest 5.03.02 115V 60Hz

Equipment Tested:

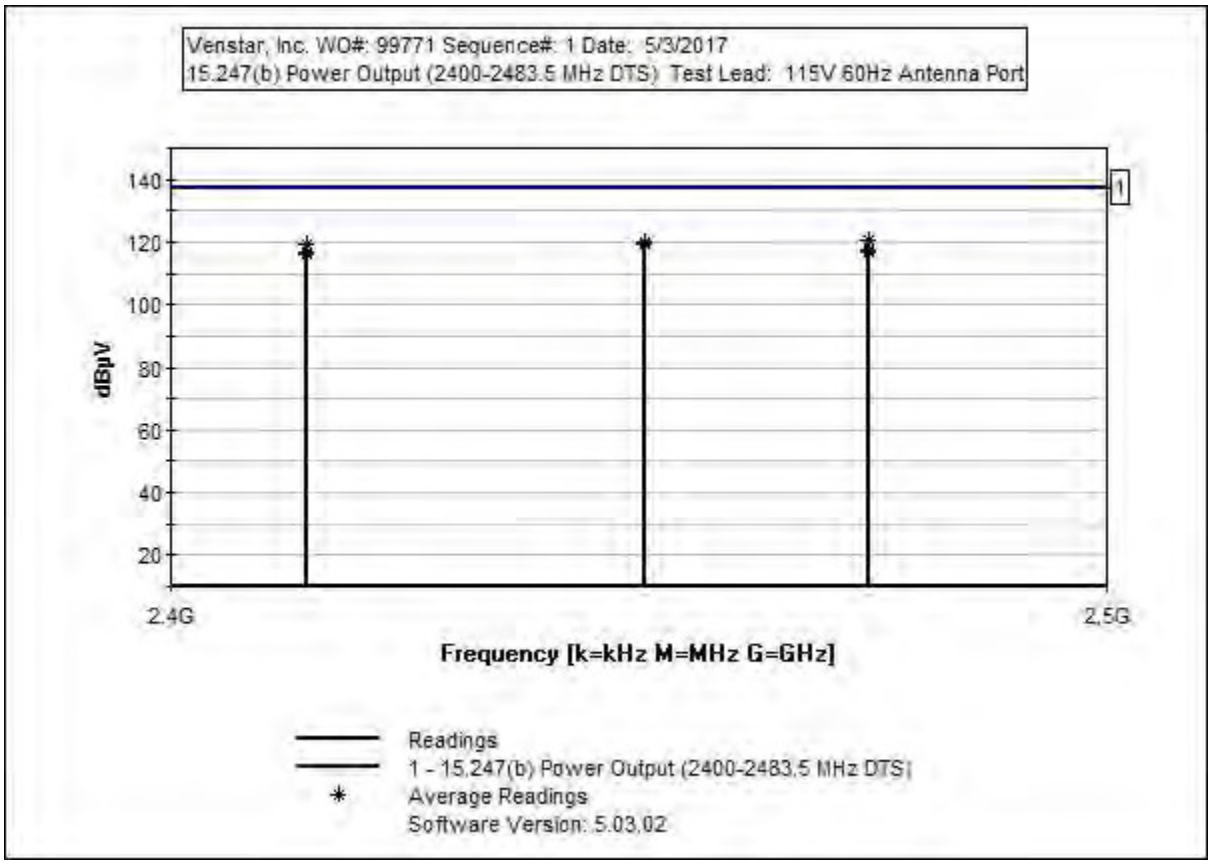
Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Frequency Range: 2412MHz to 2462MHz
Frequency tested: 2412MHz, 2442MHz, 2462MHz
Firmware power setting: 0
EUT firmware: 3.3.0.0-31.2.0.0.0-2.2.0.4
Protocol /MCS/Modulation: CCK, OFDM, BPSK
Antenna type: Chip
Antenna Gain: 1.9dBi.
Duty Cycle: >98%
Test Method: KDB 558074 D01 v04 2017, AVGSA-1.
Test Mode: Continuous transmit
Test Setup: EUT antenna port connected to spectrum analyzer input using coaxial cable and attenuator
Modifications Added: None
Setup: The equipment under test (EUT) is connected to the laptop computer via a serial to USB interface board.
The EUT antenna port is connected to the spectrum analyzer input via coaxial cable and attenuator.
The EUT was tested 802.11b, 802.11g, and 802.11n20.
Site D.


Venstar, Inc. WO#: 99771 Sequence#: 1 Date: 5/3/2017
15.247(b) Power Output (2400-2483.5 MHz DTS) Test Lead: 115V 60Hz Antenna Port
140
120
100
80
60
40
20
dBµV
1
2.4G
2.5G
Frequency [k=kHz M=MHz G=GHz]
Readings
1 - 15.247(b) Power Output (2400-2483.5 MHz DTS)
Average Readings
Software Version: 5.03.02

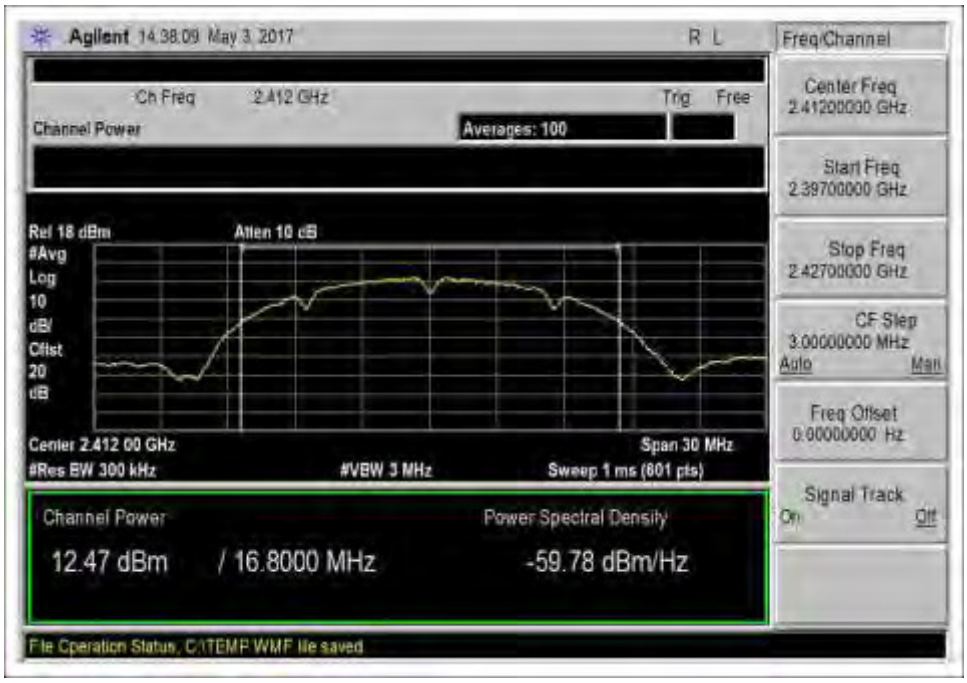
Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02869	Spectrum Analyzer	E4440A	7/8/2016	7/8/2017
T2	ANP06544	Cable	32026-29094K-29094K-36TC	11/2/2015	11/2/2017
T3	AN03431	Attenuator	89-20-21	11/2/2015	11/2/2017

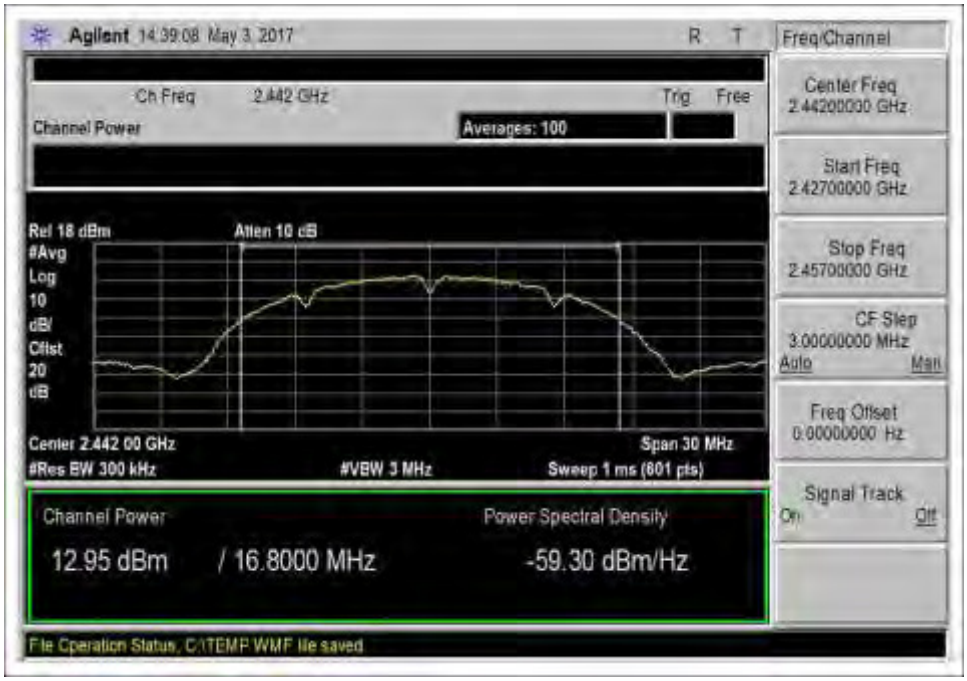
Measurement Data: Reading listed by margin. Test Lead: Antenna Port

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	2462.000M Ave	100.4	+0.0	+0.7	+19.3		+0.0	120.4	137.0 802.11b	-16.6	Anten
2	2442.000M Ave	100.0	+0.0	+0.7	+19.3		+0.0	120.0	137.0 802.11b	-17.1	Anten
3	2442.000M Ave	99.9	+0.0	+0.7	+19.3		+0.0	119.9	137.0 802.11g	-17.2	Anten
4	2442.000M Ave	99.6	+0.0	+0.7	+19.3		+0.0	119.6	137.0 802.11n20	-17.4	Anten
5	2412.000M Ave	99.5	+0.0	+0.7	+19.3		+0.0	119.5	137.0 802.11b	-17.5	Anten
6	2462.000M Ave	97.2	+0.0	+0.7	+19.3		+0.0	117.2	137.0 802.11g	-19.8	Anten
7	2412.000M Ave	97.0	+0.0	+0.7	+19.3		+0.0	117.0	137.0 802.11g	-20.0	Anten
8	2462.000M Ave	96.5	+0.0	+0.7	+19.3		+0.0	116.5	137.0 802.11n20	-20.5	Anten
9	2412.000M Ave	96.4	+0.0	+0.7	+19.3		+0.0	116.4	137.0 802.11n20	-20.6	Anten

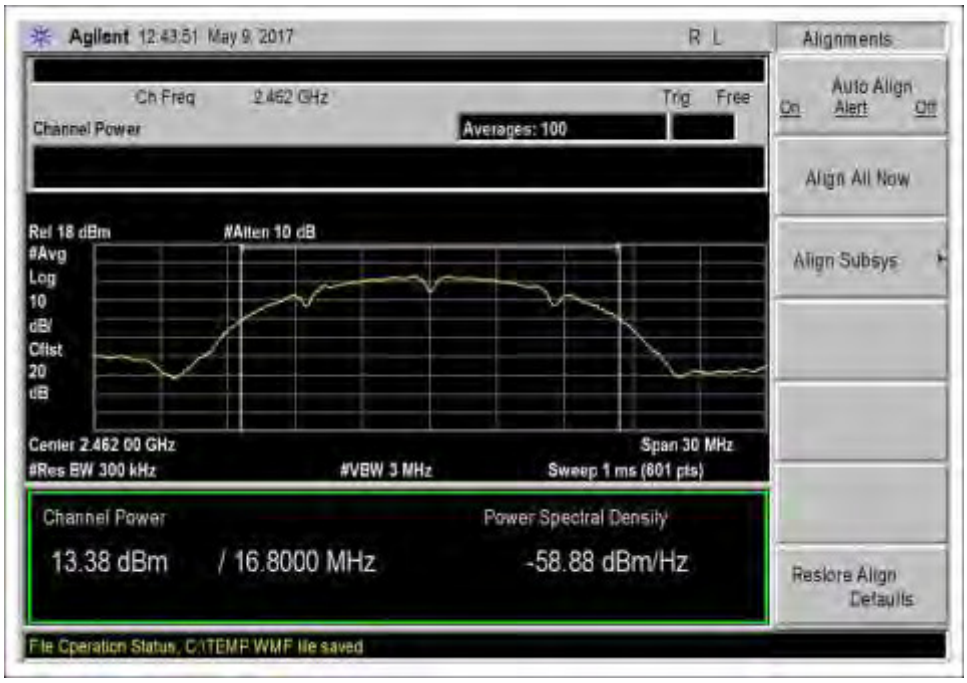
Plots



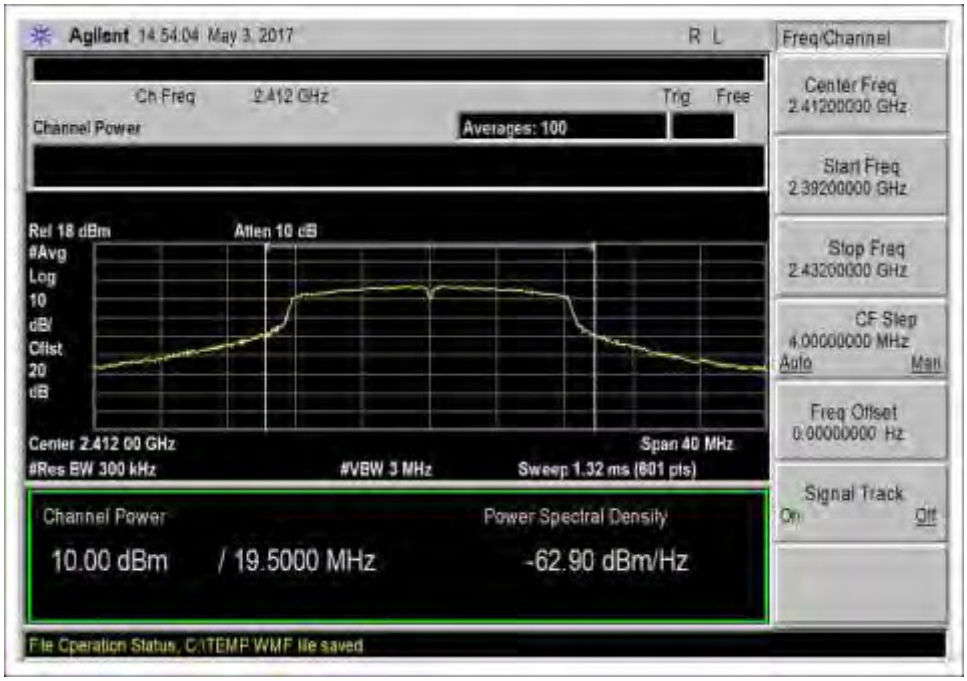
802.11b_Low Channel_2412MHz_PowerOutput



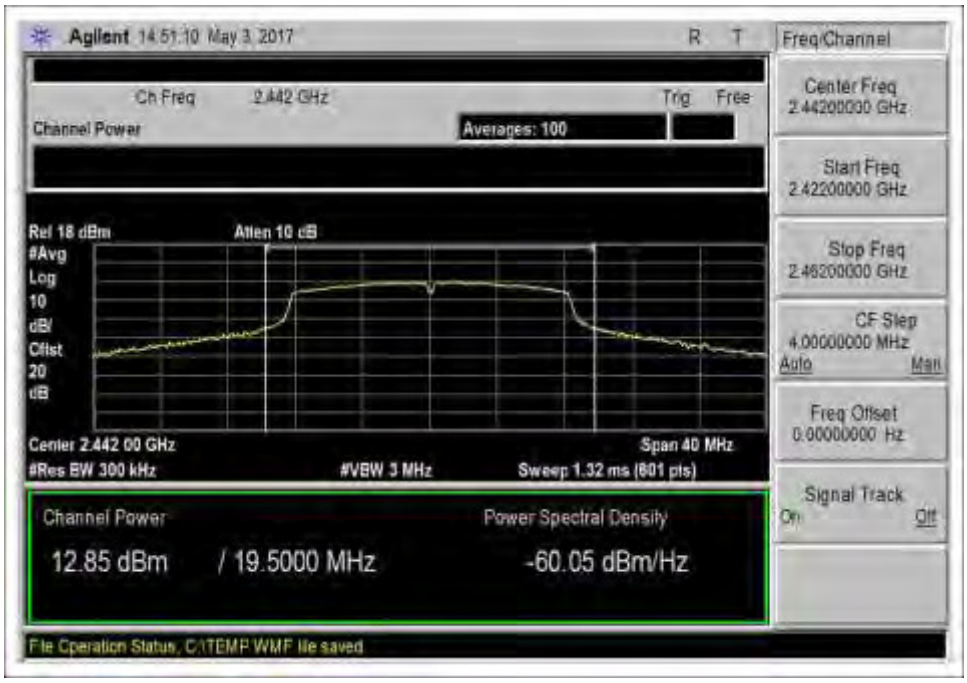
802.11b_Middle Channel_2442MHz_PowerOutput



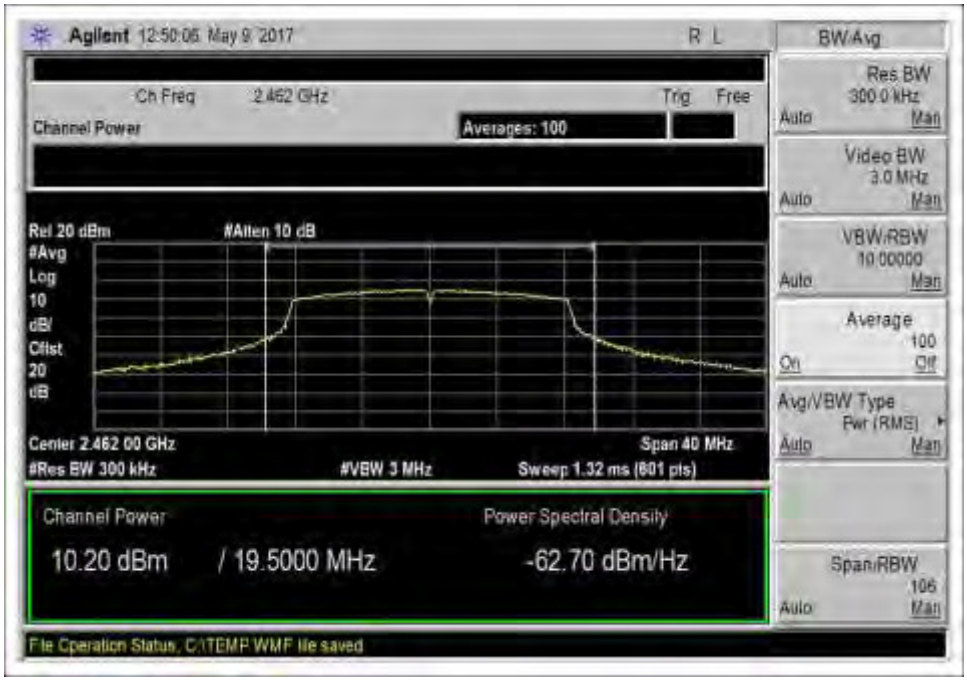
802.11b_High Channel_2462MHz_PowerOutput



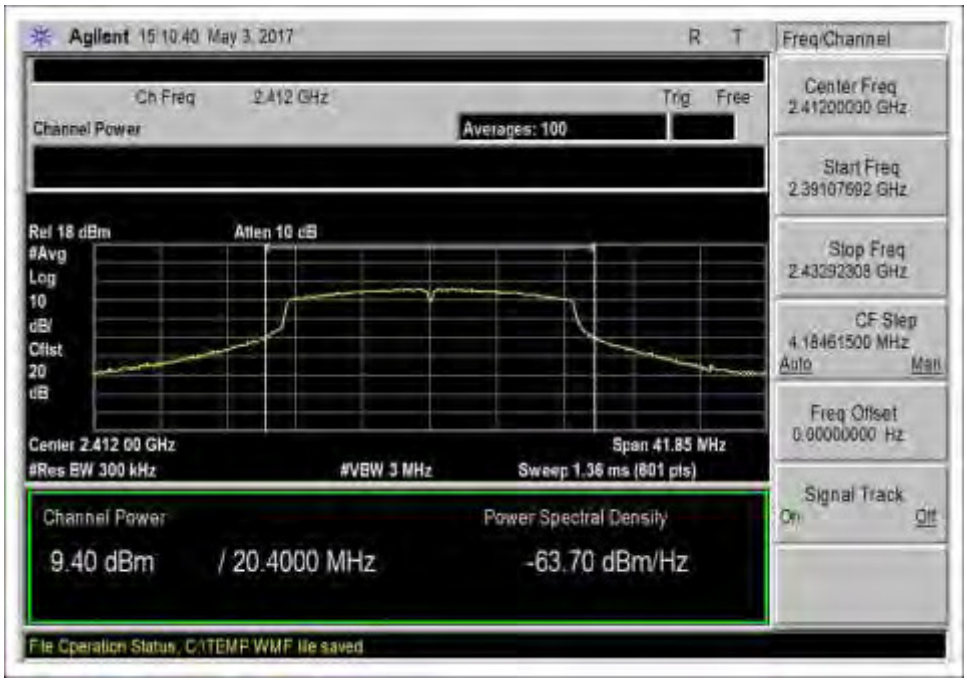
802.11g_Low Channel_2412MHz_PowerOutput



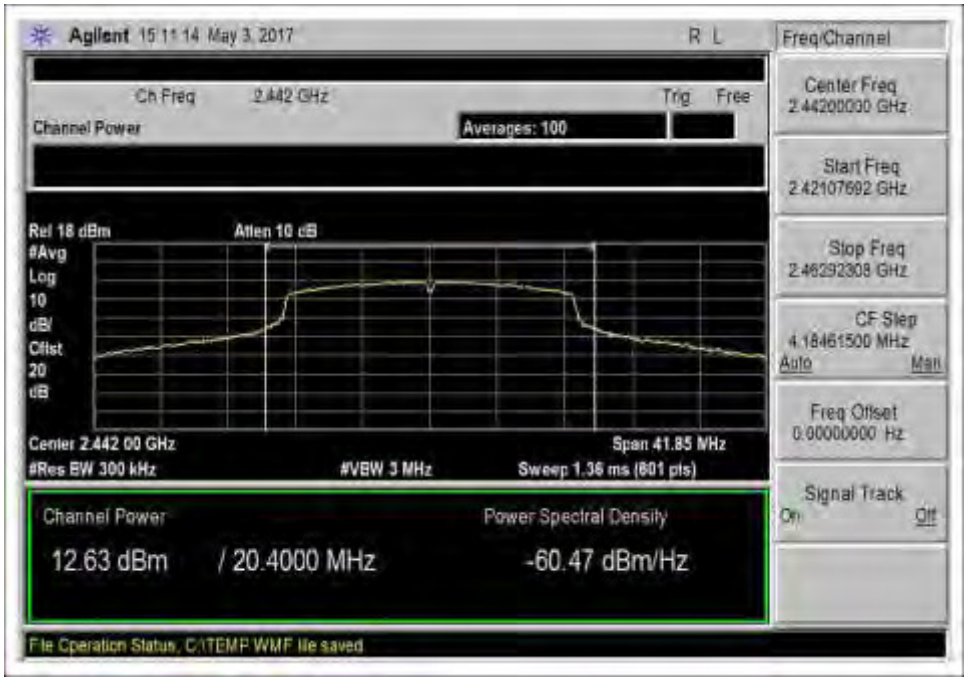
802.11g_Middle Channel_2442MHz_PowerOutput



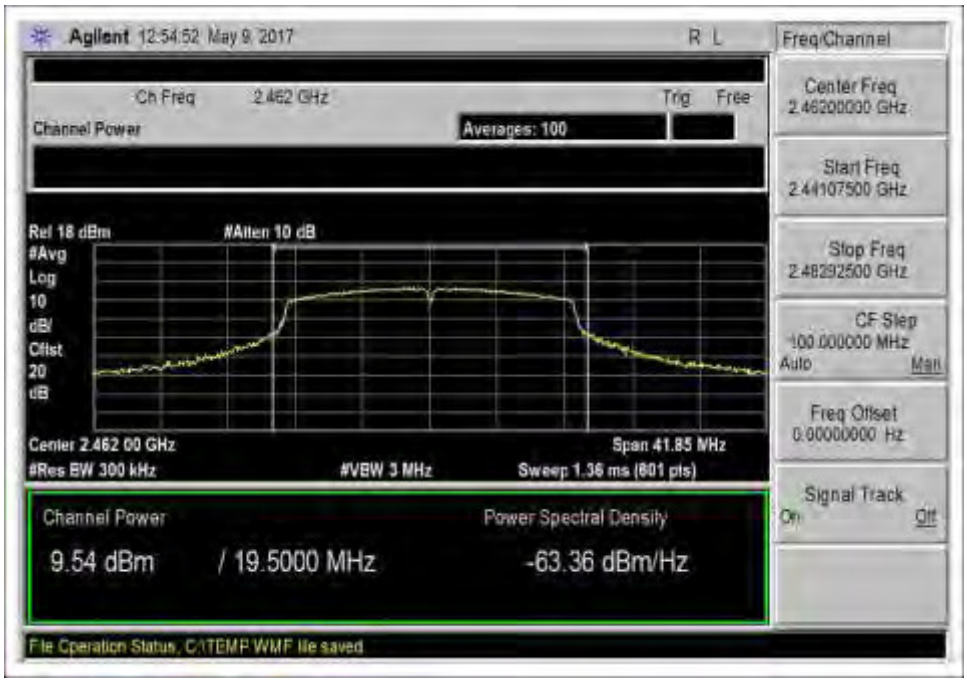
802.11g_High Channel_2462MHz_PowerOutput



802.11n20_Low Channel_2412MHz_PowerOutput



802.11n20_Middle Channel_2442MHz_PowerOutput



802.11n20_High Channel_2462MHz_PowerOutput

Test Setup Photo

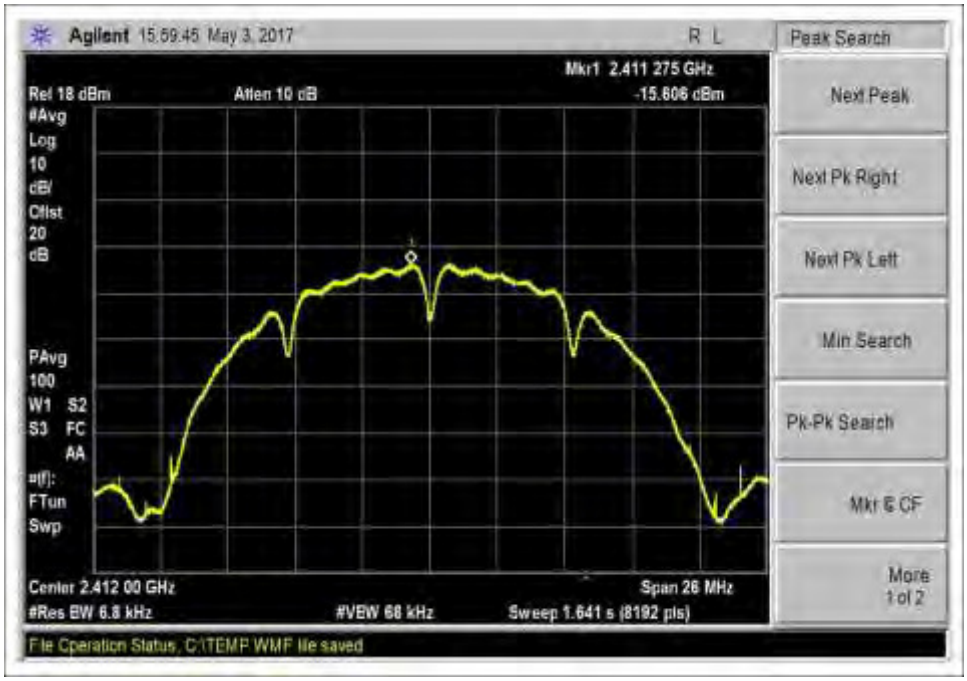
15.247(e) Power Spectral Density

Test Setup / Conditions / Data			
Test Location:	Brea Lab D	Test Engineer:	S. Yamamoto
Test Method:	ANSI C63.10 (2013), KDB 558074 v04 2017	Test Date(s):	5/3/2017
Configuration:	1		
Test Setup:	Antenna port of EUT connected to spectrum analyzer using a coaxial cable and attenuator.		

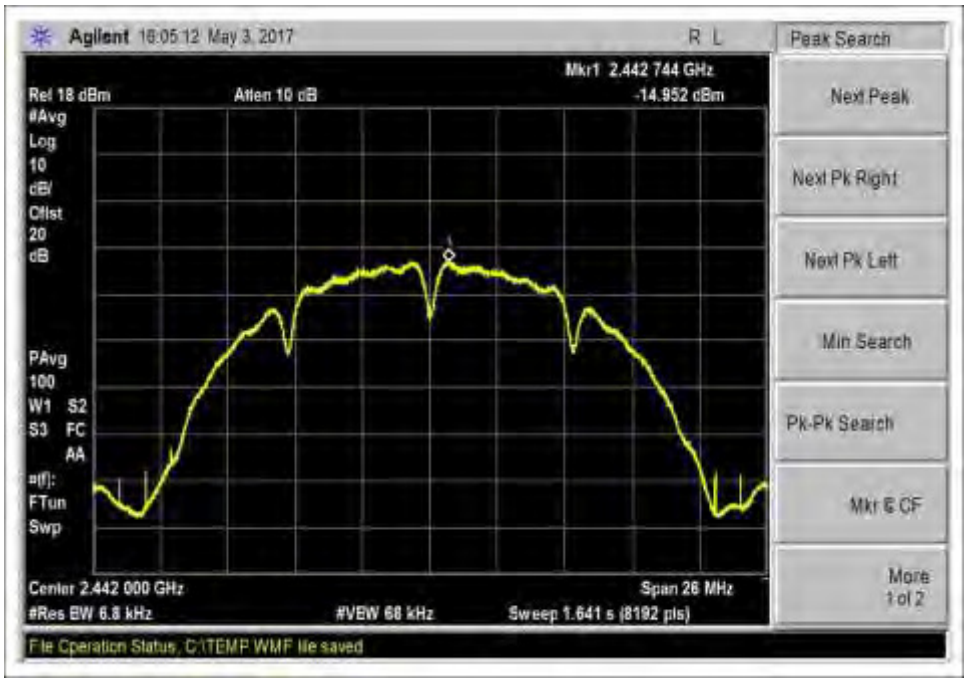
Environmental Conditions			
Temperature (ºC)	20	Relative Humidity (%):	45

Test Data Summary - RF Conducted Measurement				
Measurement Method: AVGPSD-1				
Frequency (MHz)	**Modulation**	**Measured (dBm/6.8kHz)**	**Limit (dBm/3kHz)**	**Results**
2142	CCK	-15.6	≤8	Pass
2442	CCK	-15	≤8	Pass
2462	CCK	-14.7	≤8	Pass
2142	OFDM	-19.4	≤8	Pass
2442	OFDM	-16.9	≤8	Pass
2462	OFDM	-18.5	≤8	Pass
2142	BPSK	-19.8	≤8	Pass
2442	BPSK	-17	≤8	Pass
2462	BPSK	-19.2	≤8	Pass

Plots



802.11b_Low Channel_2412MHz_PSD



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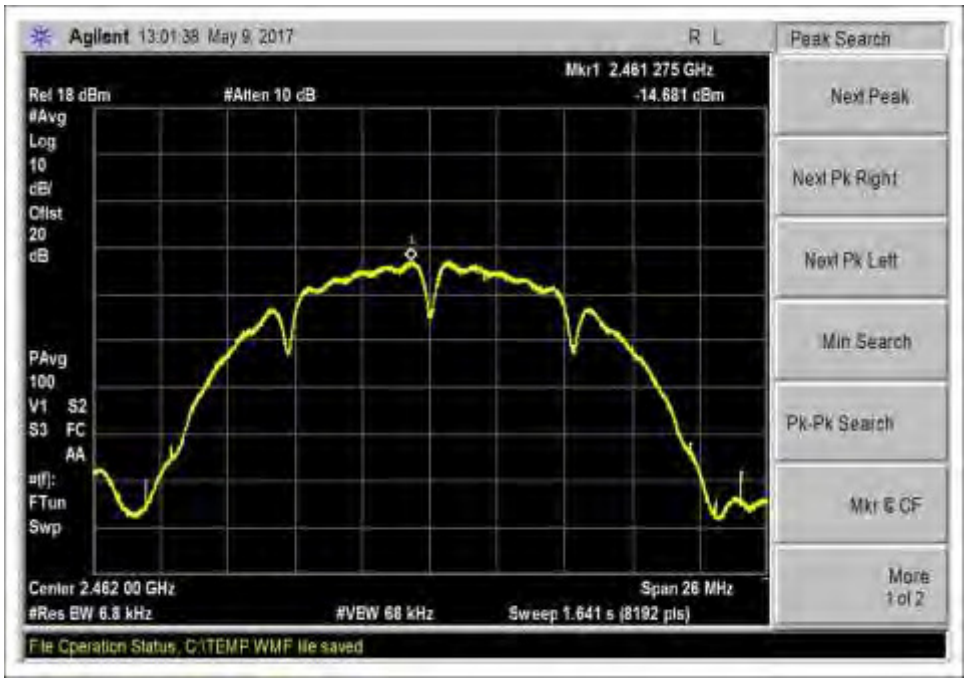

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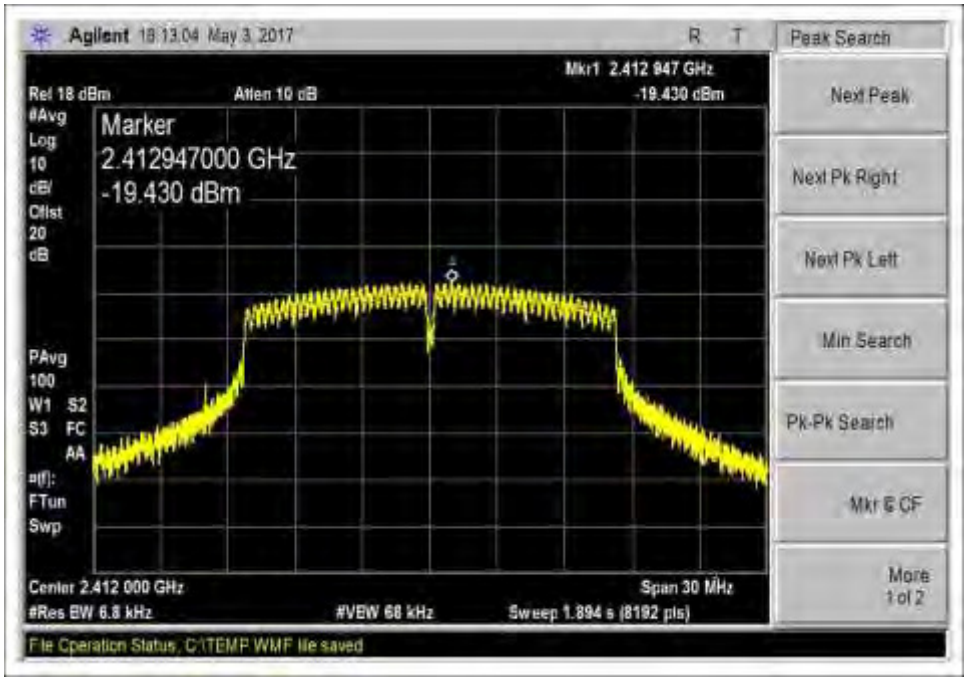
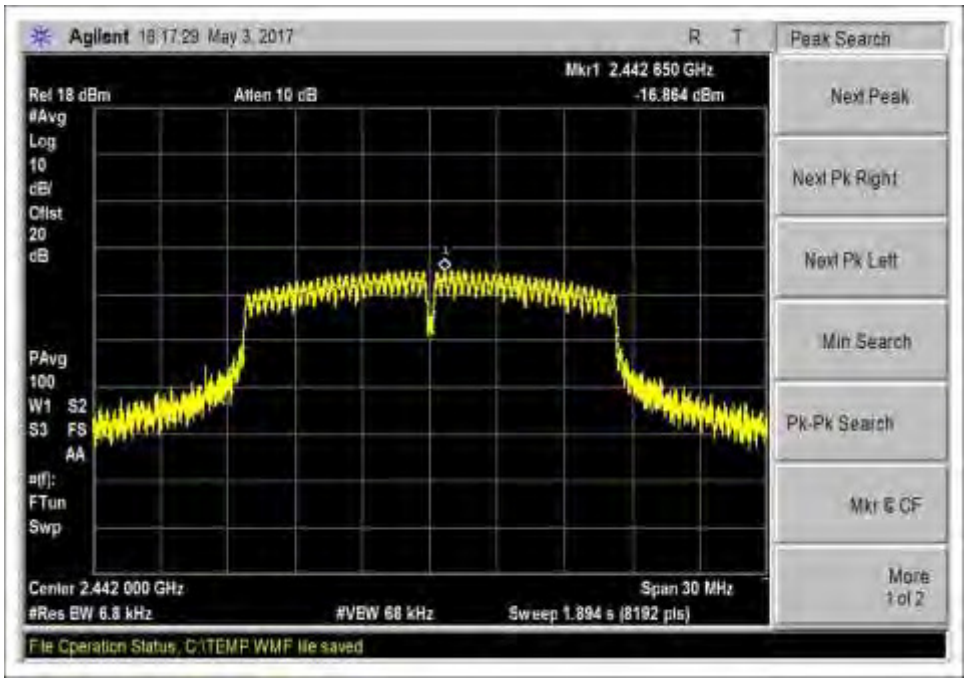
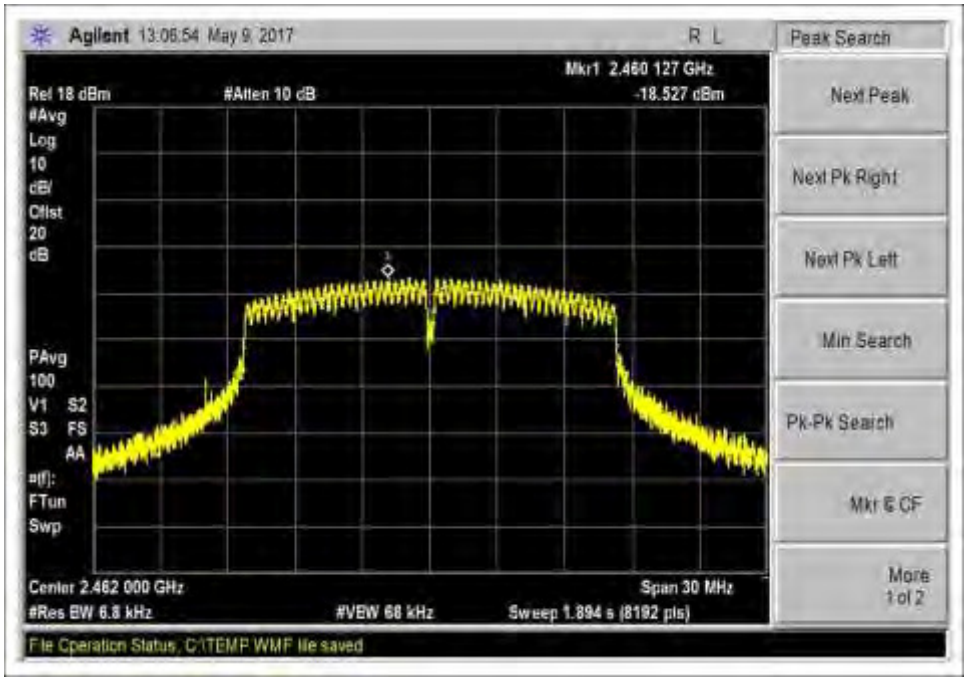


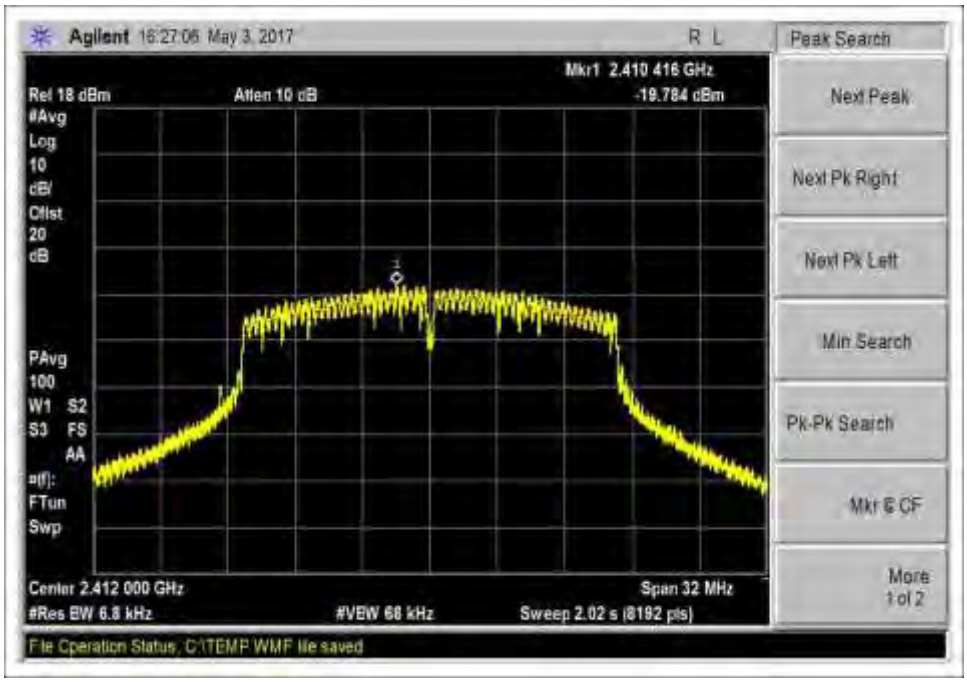
802.11g_Low Channel_2412MHz_PSD



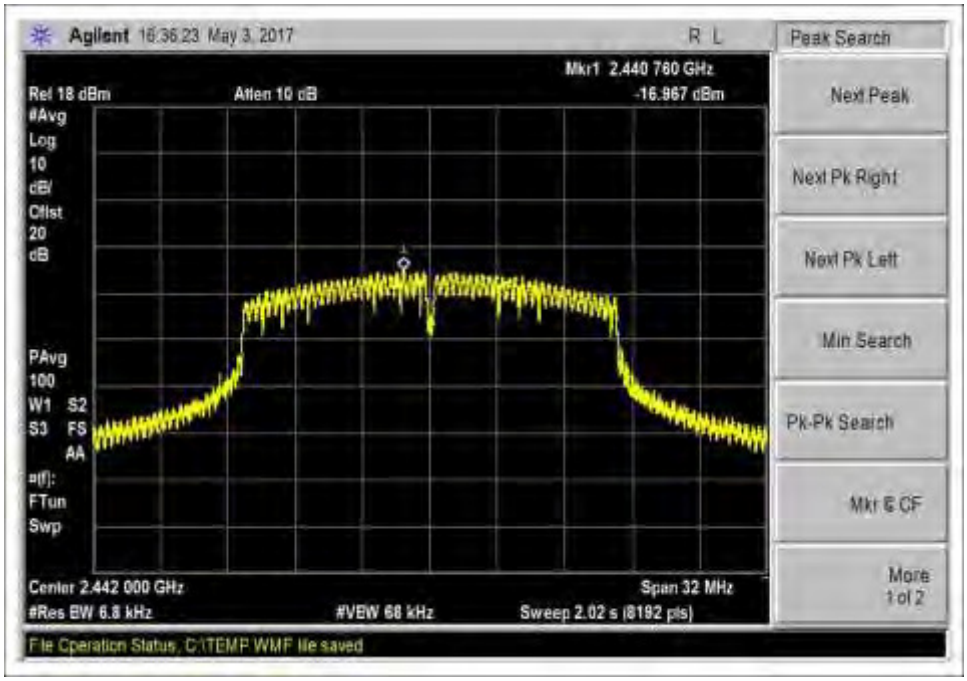
802.11g_Middle Channel_2442MHz_PSD



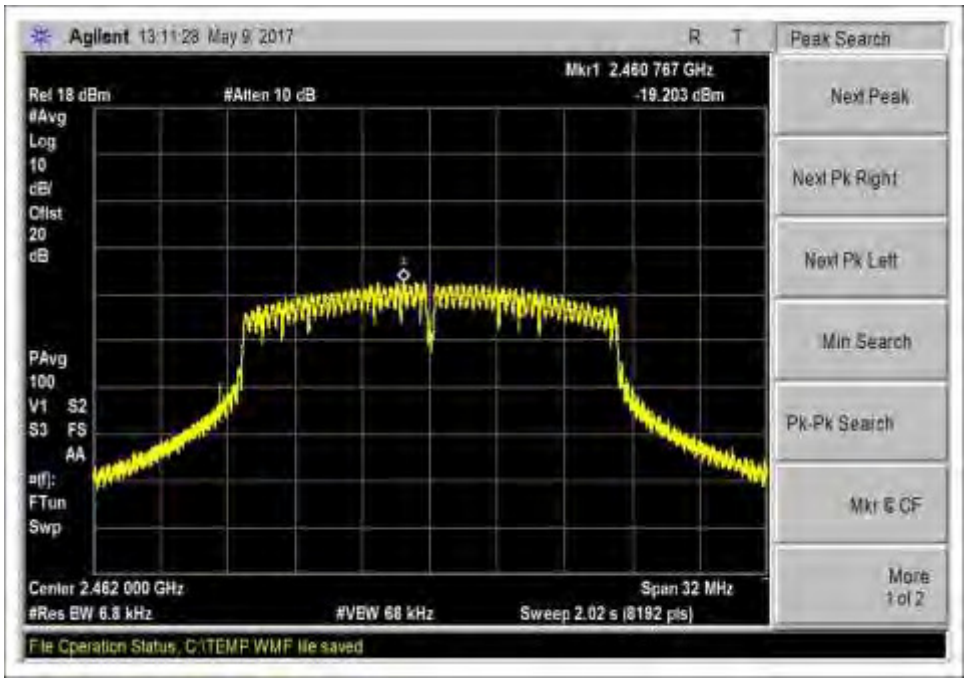
802.11g_High Channel_2462MHz_PSD



802.11n20_Low Channel_2412MHz_PSD



802.11n20_Middle Channel_2442MHz_PSD



802.11n20_High Channel_2462MHz_PSD

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(e) Peak Power Spectral Density (2400-2483.5 MHz DTS)**		
Work Order #:	**99771**	Date:	5/3/2017
Test Type:	**Conducted Emissions**	Time:	15:31:07
Tested By:	S. Yamamoto	Sequence#:	2
Software:	EMITest 5.03.02		115V 60Hz

Equipment Tested:

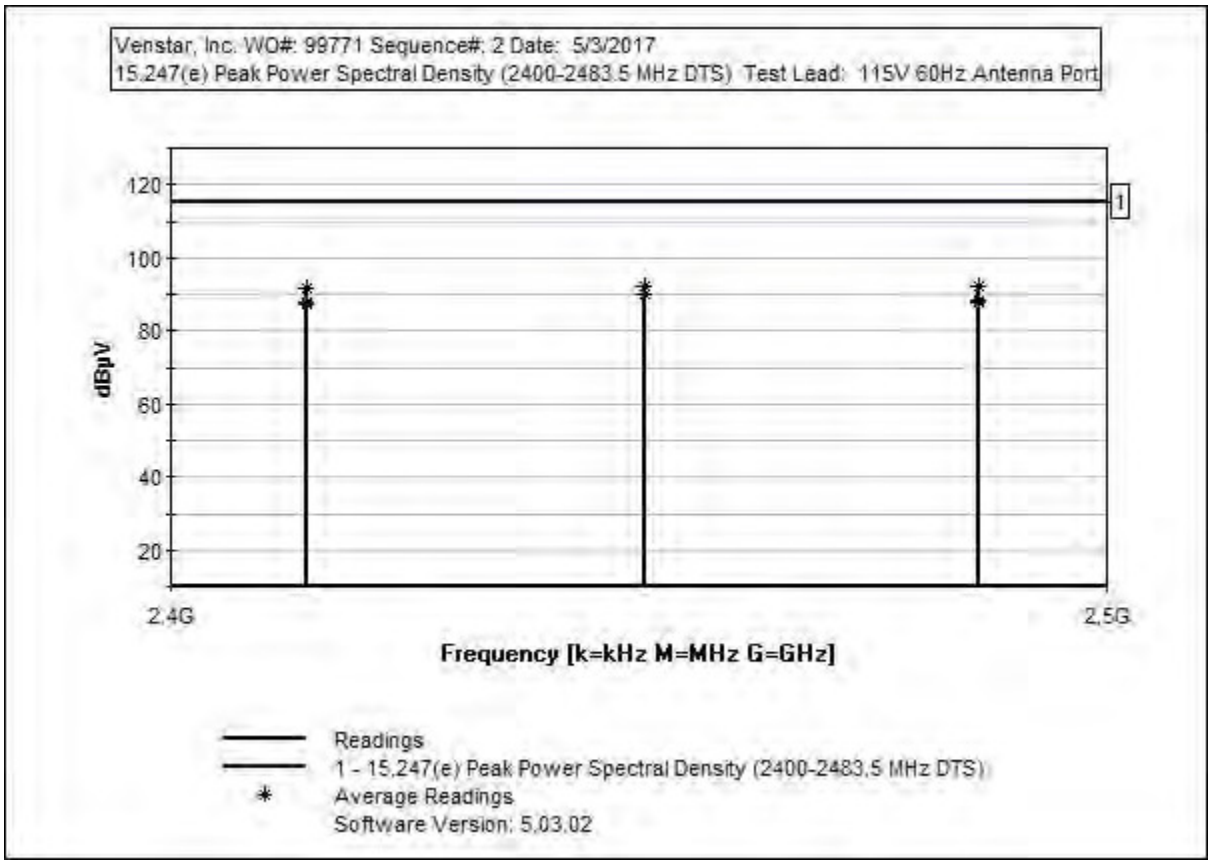
Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Frequency Range: 2412MHz to 2462MHz
Frequency tested: 2412MHz, 2442MHz, 2462MHz
Firmware power setting: 0
EUT firmware: 3.3.0.0-31.2.0.0.0-2.2.0.4
Protocol /MCS/Modulation: CCK, OFDM, BPSK
Antenna type: Chip
Antenna Gain: 1.9dBi.
Duty Cycle: >98%
Test Method: KDB 558074 D01 v04, AVGPSD-1.
Test Mode: Continuous transmit
Test Setup: EUT antenna port connected to spectrum analyzer input using coaxial cable and attenuator
Modifications Added: None
Setup: The equipment under test (EUT) is connected to the laptop computer via a serial to USB interface board.
The EUT antenna port is connected to the spectrum analyzer input via coaxial cable and attenuator.
The EUT was tested 802.11b, 802.11g, and 802.11n20.
Site D.


Venstar, Inc. WO#: 99771 Sequence#: 2 Date: 5/3/2017
15.247(e) Peak Power Spectral Density (2400-2483.5 MHz DTS) Test Lead: 115V 60Hz Antenna Port
120
100
80
60
40
20
dBµV
1
2.4G
2.5G
Frequency [k=kHz M=MHz G=GHz]
Readings
1 - 15.247(e) Peak Power Spectral Density (2400-2483.5 MHz DTS)
Average Readings
Software Version: 5.03.02

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02869	Spectrum Analyzer	E4440A	7/8/2016	7/8/2017
T2	ANP06544	Cable	32026-29094K-29094K-36TC	11/2/2015	11/2/2017
T3	AN03431	Attenuator	89-20-21	11/2/2015	11/2/2017

Measurement Data: Reading listed by margin. Test Lead: Antenna Port

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	2472.000M Ave	72.3	+0.0	+0.7	+19.3		+0.0	92.3	115.0 802.11b	-22.7	Anten
2	2442.000M Ave	72.0	+0.0	+0.7	+19.3		+0.0	92.0	115.0 802.11b	-23.0	Anten
3	2412.000M Ave	71.4	+0.0	+0.7	+19.3		+0.0	91.4	115.0 802.11b	-23.6	Anten
4	2442.000M Ave	70.1	+0.0	+0.7	+19.3		+0.0	90.1	115.0 802.11g	-24.9	Anten
5	2442.000M Ave	70.0	+0.0	+0.7	+19.3		+0.0	90.0	115.0 802.11n20	-25.0	Anten
6	2472.000M Ave	68.5	+0.0	+0.7	+19.3		+0.0	88.5	115.0 802.11g	-26.5	Anten
7	2472.000M Ave	67.8	+0.0	+0.7	+19.3		+0.0	87.8	115.0 802.11n20	-27.2	Anten
8	2412.000M Ave	67.6	+0.0	+0.7	+19.3		+0.0	87.6	115.0 802.11g	-27.4	Anten
9	2412.000M Ave	67.2	+0.0	+0.7	+19.3		+0.0	87.2	115.0 802.11n20	-27.8	Anten

Test Setup Photo

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 #:	**99771**	Date:	5/9/2017
Test Type:	**Conducted Emissions**	Time:	14:07:05
Tested By:	S. Yamamoto	Sequence#:	3
Software:	EMITest 5.03.02		115V 60Hz

Equipment Tested:

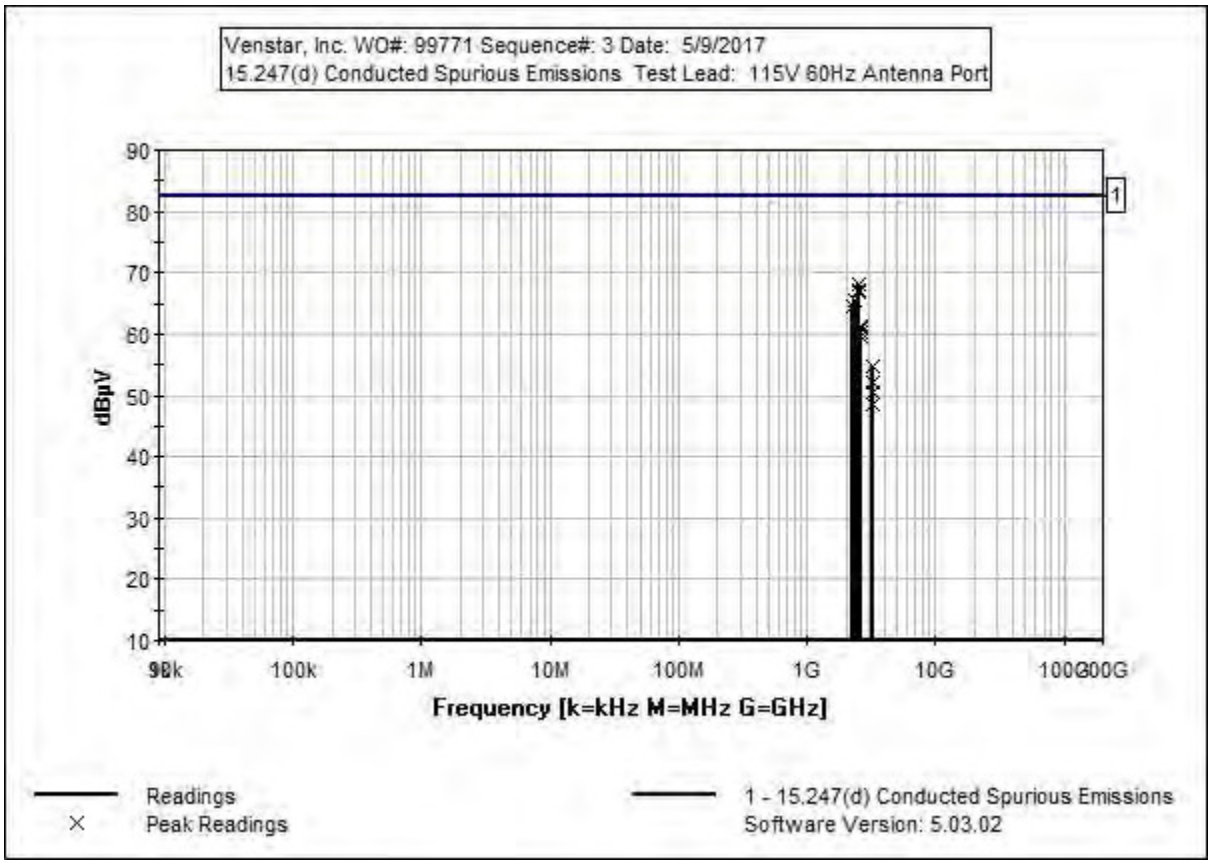
Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Frequency Range: 9kHz to 25GHz
Frequency tested: 2412MHz, 2442MHz, 2462MHz
Firmware power setting: 0
EUT firmware: 3.3.0.0-31.2.0.0.0-2.2.0.4
Protocol /MCS/Modulation: CCK
Antenna type: Chip
Antenna Gain: 1.9dBi.
Duty Cycle: >98%
Test Method: KDB 558074 D01 v04
Test Mode: Continuous transmit
Test Setup: EUT antenna port connected to spectrum analyzer input using coaxial cable and attenuator
Modifications Added: None
Setup: The equipment under test (EUT) is connected to the laptop computer via a serial to USB interface board. The EUT antenna port is connected to the spectrum analyzer input via coaxial cable and attenuator.
The EUT was tested 802.11b.
Site D.


Venstar, Inc. WO#: 99771 Sequence#: 3 Date: 5/9/2017
15.247(d) Conducted Spurious Emissions Test Lead: 115V 60Hz Antenna Port
90
80
70
60
50
40
30
20
10
dBµV
1
100k
1M
10M
100M
1G
10G
Frequency [k=kHz M=MHz G=GHz]
Readings
Peak Readings
1 - 15.247(d) Conducted Spurious Emissions
Software Version: 5.03.02

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02869	Spectrum Analyzer	E4440A	7/8/2016	7/8/2017
T1	ANP06544	Cable	32026-29094K-29094K-36TC	11/2/2015	11/2/2017
T2	AN03431	Attenuator	89-20-21	11/2/2015	11/2/2017

Measurement Data: Reading listed by margin. Test Lead: Antenna Port

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	dB	dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	2543.500M	48.1	+0.7	+19.3			+0.0	68.1	82.5	-14.4	Anten
2	2562.700M	47.2	+0.7	+19.3			+0.0	67.2	82.5	-15.3	Anten
3	2517.900M	46.7	+0.7	+19.3			+0.0	66.7	82.5	-15.8	Anten
4	2391.300M	45.5	+0.7	+19.3			+0.0	65.5	82.5	-17.0	Anten
5	2305.200M	44.6	+0.6	+19.3			+0.0	64.5	82.5	-18.0	Anten
6	2624.000M	41.4	+0.7	+19.3			+0.0	61.4	82.5	-21.1	Anten
7	2600.600M	41.1	+0.7	+19.3			+0.0	61.1	82.5	-21.4	Anten
8	2632.400M	40.4	+0.7	+19.3			+0.0	60.4	82.5	-22.1	Anten
9	2573.000M	39.7	+0.7	+19.3			+0.0	59.7	82.5	-22.8	Anten
10	3216.000M	34.6	+0.8	+19.4			+0.0	54.8	82.5	-27.7	Anten
11	3256.000M	32.0	+0.8	+19.4			+0.0	52.2	82.5	-30.3	Anten
12	3282.667M	30.2	+0.8	+19.4			+0.0	50.4	82.5	-32.1	Anten
13	3296.000M	28.3	+0.8	+19.4			+0.0	48.5	82.5	-34.0	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 #:	**99771**	Date:	5/9/2017
Test Type:	**Conducted Emissions**	Time:	14:26:20
Tested By:	S. Yamamoto	Sequence#:	4
Software:	EMITest 5.03.02		115V 60Hz

Equipment Tested:

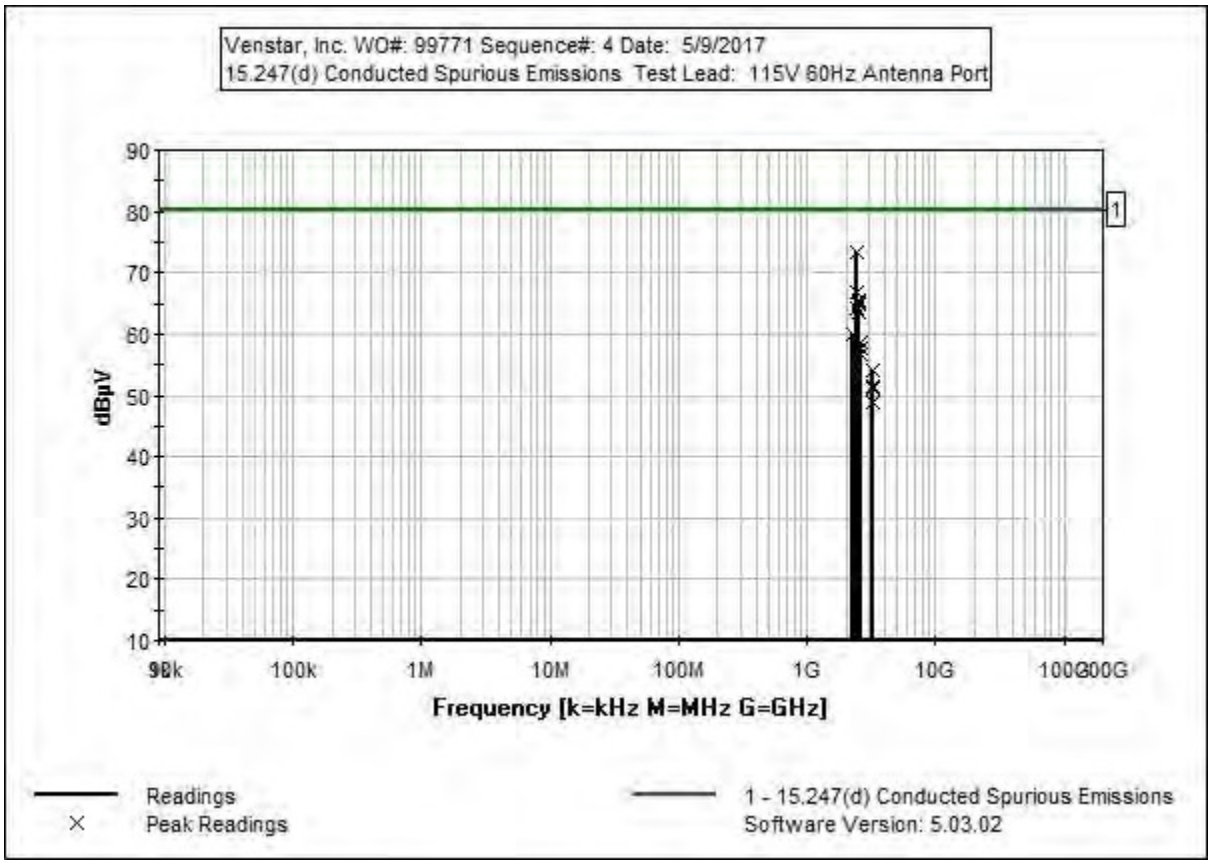
Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Frequency Range: 9kHz to 25GHz
Frequency tested: 2412MHz, 2442MHz, 2462MHz
Firmware power setting: 0
EUT firmware: 3.3.0.0-31.2.0.0.0-2.2.0.4
Protocol /MCS/Modulation: OFDM
Antenna type: Chip
Antenna Gain: 1.9dBi.
Duty Cycle: >98%
Test Method: KDB 558074 D01 v04
Test Mode: Continuous transmit
Test Setup: EUT antenna port connected to spectrum analyzer input using coaxial cable and attenuator
Modifications Added: None
Setup: The equipment under test (EUT) is connected to the laptop computer via a serial to USB interface board. The EUT antenna port is connected to the spectrum analyzer input via coaxial cable and attenuator.
The EUT was tested 802.11g.
Site D.


Venstar, Inc. WO#: 99771 Sequence#: 4 Date: 5/9/2017
15.247(d) Conducted Spurious Emissions Test Lead: 115V 60Hz Antenna Port
90
80
70
60
50
40
30
20
10
dBµV
1
100k
1M
10M
100M
1G
10G
Frequency [k=kHz M=MHz G=GHz]
Readings
Peak Readings
1 - 15.247(d) Conducted Spurious Emissions
Software Version: 5.03.02

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02869	Spectrum Analyzer	E4440A	7/8/2016	7/8/2017
T1	ANP06544	Cable	32026-29094K-29094K-36TC	11/2/2015	11/2/2017
T2	AN03431	Attenuator	89-20-21	11/2/2015	11/2/2017

Measurement Data: Reading listed by margin. Test Lead: Antenna Port

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	dB	dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	2399.721M	53.3	+0.7	+19.3			+0.0	73.3	80.2	-6.9	Anten
2	2395.541M	46.9	+0.7	+19.3			+0.0	66.9	80.2	-13.3	Anten
3	2554.525M	45.6	+0.7	+19.3			+0.0	65.6	80.2	-14.6	Anten
4	2529.100M	45.3	+0.7	+19.3			+0.0	65.3	80.2	-14.9	Anten
5	2543.170M	45.0	+0.7	+19.3			+0.0	65.0	80.2	-15.2	Anten
6	2396.000M	44.1	+0.7	+19.3			+0.0	64.1	80.2	-16.1	Anten
7	2502.290M	43.6	+0.7	+19.3			+0.0	63.6	80.2	-16.6	Anten
8	2307.500M	40.0	+0.6	+19.3			+0.0	59.9	80.2	-20.3	Anten
9	2635.835M	38.8	+0.7	+19.3			+0.0	58.8	80.2	-21.4	Anten
10	2620.670M	37.8	+0.7	+19.3			+0.0	57.8	80.2	-22.4	Anten
11	2602.300M	37.8	+0.7	+19.3			+0.0	57.8	80.2	-22.4	Anten
12	2573.000M	36.7	+0.7	+19.3			+0.0	56.7	80.2	-23.5	Anten
13	3216.000M	33.9	+0.8	+19.4			+0.0	54.1	80.2	-26.1	Anten
14	3282.687M	31.3	+0.8	+19.4			+0.0	51.5	80.2	-28.7	Anten
15	3256.025M	31.1	+0.8	+19.4			+0.0	51.3	80.2	-28.9	Anten
16	3296.000M	28.7	+0.8	+19.4			+0.0	48.9	80.2	-31.3	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 #:	**99771**	Date:	5/9/2017
Test Type:	**Conducted Emissions**	Time:	14:28:27
Tested By:	S. Yamamoto	Sequence#:	5
Software:	EMITest 5.03.02		115V 60Hz

Equipment Tested:

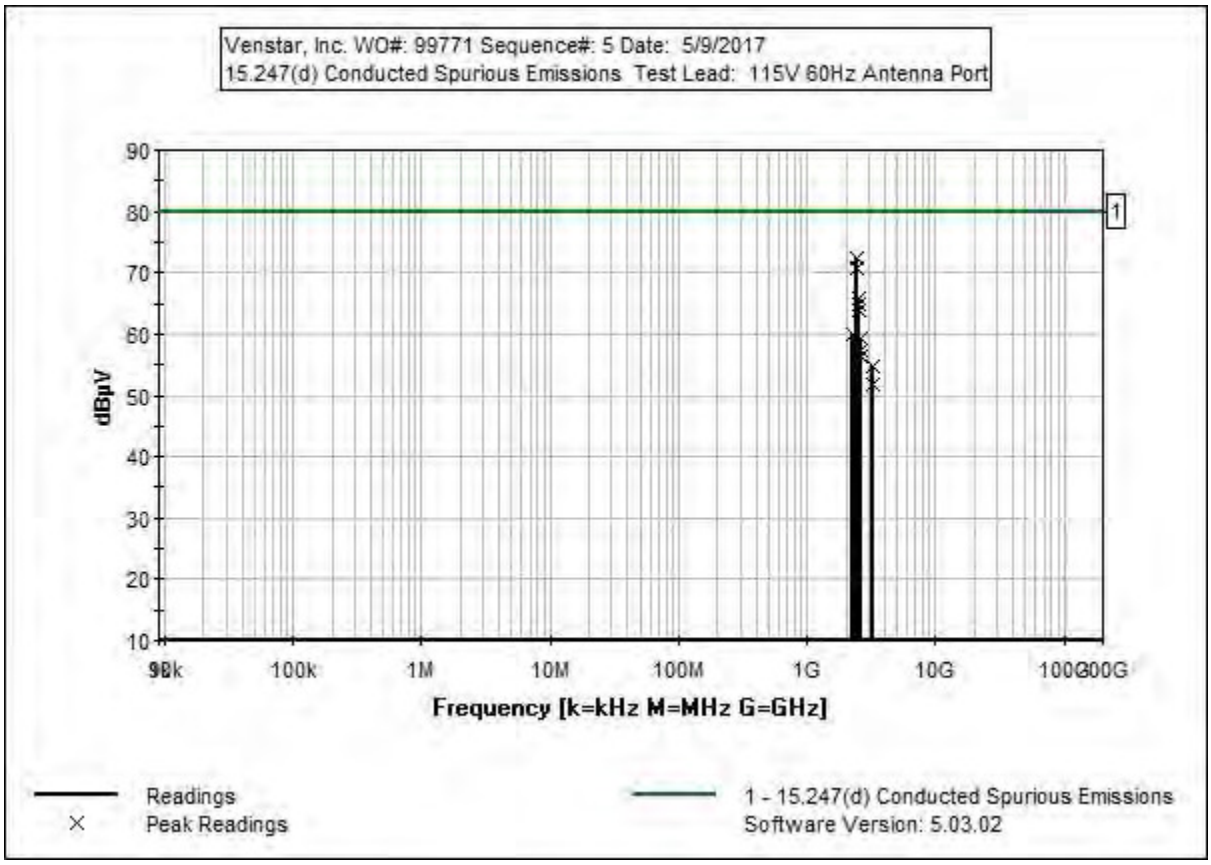
Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Frequency Range: 9kHz to 25GHz
Frequency tested: 2412MHz, 2442MHz, 2462MHz
Firmware power setting: 0
EUT firmware: 3.3.0.0-31.2.0.0.0-2.2.0.4
Protocol /MCS/Modulation: BPSK
Antenna type: Chip
Antenna Gain: 1.9dBi.
Duty Cycle: >98%
Test Method: KDB 558074 D01 v04
Test Mode: Continuous transmit
Test Setup: EUT antenna port connected to spectrum analyzer input using coaxial cable and attenuator
Modifications Added: None
Setup: The equipment under test (EUT) is connected to the laptop computer via a serial to USB interface board. The EUT antenna port is connected to the spectrum analyzer input via coaxial cable and attenuator.
The EUT was tested 802.11n20.
Site D.


Venstar, Inc. WO#: 99771 Sequence#: 5 Date: 5/9/2017
15.247(d) Conducted Spurious Emissions Test Lead: 115V 60Hz Antenna Port
90
80
70
60
50
40
30
20
10
dBµV
1
100k
1M
10M
100M
1G
10G
Frequency [k=kHz M=MHz G=GHz]
Readings
Peak Readings
1 - 15.247(d) Conducted Spurious Emissions
Software Version: 5.03.02

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02869	Spectrum Analyzer	E4440A	7/8/2016	7/8/2017
T1	ANP06544	Cable	32026-29094K-29094K-36TC	11/2/2015	11/2/2017
T2	AN03431	Attenuator	89-20-21	11/2/2015	11/2/2017

Measurement Data: Reading listed by margin. Test Lead: Antenna Port

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	dB	dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	2397.937M	52.5	+0.7	+19.3			+0.0	72.5	80.0	-7.5	Anten
2	2396.109M	50.6	+0.7	+19.3			+0.0	70.6	80.0	-9.4	Anten
3	2517.300M	45.7	+0.7	+19.3			+0.0	65.7	80.0	-14.3	Anten
4	2541.220M	45.0	+0.7	+19.3			+0.0	65.0	80.0	-15.0	Anten
5	2562.230M	44.0	+0.7	+19.3			+0.0	64.0	80.0	-16.0	Anten
6	2302.560M	40.0	+0.6	+19.3			+0.0	59.9	80.0	-20.1	Anten
7	2600.500M	39.2	+0.7	+19.3			+0.0	59.2	80.0	-20.8	Anten
8	2625.200M	37.3	+0.7	+19.3			+0.0	57.3	80.0	-22.7	Anten
9	2575.600M	36.5	+0.7	+19.3			+0.0	56.5	80.0	-23.5	Anten
10	2638.680M	36.5	+0.7	+19.3			+0.0	56.5	80.0	-23.5	Anten
11	3216.000M	34.4	+0.8	+19.4			+0.0	54.6	80.0	-25.4	Anten
12	3256.000M	31.7	+0.8	+19.4			+0.0	51.9	80.0	-28.1	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	CCK	-43.4	< -24.5	Pass
2483.5	CCK	-43.8	< -24.5	Pass
2400.0	OFDM	-33.4	< -26.8	Pass
2483.5	OFDM	-43.5	< -26.8	Pass
2400.0	BPSK	-33.9	< -27	Pass
2483.5	BPSK	-45.6	< -27	Pass

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 #:	**99771**	Date:	5/3/2017
Test Type:	**Conducted Emissions**	Time:	17:39:06
Tested By:	S. Yamamoto	Sequence#:	3
Software:	EMITest 5.03.02		115V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Frequency Range: 2399MHz to 2484.5MHz
Frequency tested: 2412MHz, 2462MHz
Firmware power setting: 0
EUT firmware: 3.3.0.0-31.2.0.0.0-2.2.0.4
Protocol /MCS/Modulation: CCK
Antenna type: Chip
Antenna Gain: 1.9dBi.
Duty Cycle: >98%
Test Method: KDB 558074 D01 v04
Test Mode: Continuous transmit
Test Setup: EUT antenna port connected to spectrum analyzer input using coaxial cable and attenuator
Modifications Added: None
Setup: The equipment under test (EUT) is connected to the laptop computer via a serial to USB interface board.
The EUT antenna port is connected to the spectrum analyzer input via coaxial cable and attenuator.
The EUT was tested 802.11b.
Site D.

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02869	Spectrum Analyzer	E4440A	7/8/2016	7/8/2017
T2	ANP06544	Cable	32026-29094K-29094K-36TC	11/2/2015	11/2/2017
T3	AN03431	Attenuator	89-20-21	11/2/2015	11/2/2017

Measurement Data: Reading listed by margin. Test Lead: Antenna Port

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	2483.500M	43.2	+0.0	+0.7	+19.3		+0.0	63.2	82.5	-19.3	Anten
2	2400.000M	43.6	+0.0	+0.7	+19.3		+0.0	63.6	82.5	-18.9	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 #:	**99771**	Date:	5/3/2017
Test Type:	**Conducted Emissions**	Time:	17:47:21
Tested By:	S. Yamamoto	Sequence#:	4
Software:	EMITest 5.03.02		115V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Frequency Range: 2399MHz to 2484.5MHz
Frequency tested: 2412MHz, 2462MHz
Firmware power setting: 0
EUT firmware: 3.3.0.0-31.2.0.0.0-2.2.0.4
Protocol /MCS/Modulation: OFDM
Antenna type: Chip
Antenna Gain: 1.9dBi.
Duty Cycle: >98%
Test Method: KDB 558074 D01 v04
Test Mode: Continuous transmit
Test Setup: EUT antenna port connected to spectrum analyzer input using coaxial cable and attenuator
Modifications Added: None
Setup: The equipment under test (EUT) is connected to the laptop computer via a serial to USB interface board.
The EUT antenna port is connected to the spectrum analyzer input via coaxial cable and attenuator.
The EUT was tested 802.11g.
Site D.

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02869	Spectrum Analyzer	E4440A	7/8/2016	7/8/2017
T2	ANP06544	Cable	32026-29094K-29094K-36TC	11/2/2015	11/2/2017
T3	AN03431	Attenuator	89-20-21	11/2/2015	11/2/2017

Measurement Data: Reading listed by margin. Test Lead: Antenna Port

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	2400.000M	53.6	+0.0	+0.7	+19.3		+0.0	73.6	80.2	-6.6	Anten
2	2483.500M	43.5	+0.0	+0.7	+19.3		+0.0	63.5	80.2	-16.7	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 #:	**99771**	Date:	5/3/2017
Test Type:	**Conducted Emissions**	Time:	17:55:47
Tested By:	S. Yamamoto	Sequence#:	5
Software:	EMITest 5.03.02		115V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Frequency Range: 2399MHz to 2484.5MHz
Frequency tested: 2412MHz, 2462MHz
Firmware power setting: 0
EUT firmware: 3.3.0.0-31.2.0.0.0-2.2.0.4
Protocol /MCS/Modulation: BPSK
Antenna type: Chip
Antenna Gain: 1.9dBi.
Duty Cycle: >98%
Test Method: KDB 558074 D01 v04
Test Mode: Continuous transmit
Test Setup: EUT antenna port connected to spectrum analyzer input using coaxial cable and attenuator
Modifications Added: None
Setup: The equipment under test (EUT) is connected to the laptop computer via a serial to USB interface board.
The EUT antenna port is connected to the spectrum analyzer input via coaxial cable and attenuator.
The EUT was tested 802.11n20.
Site D.

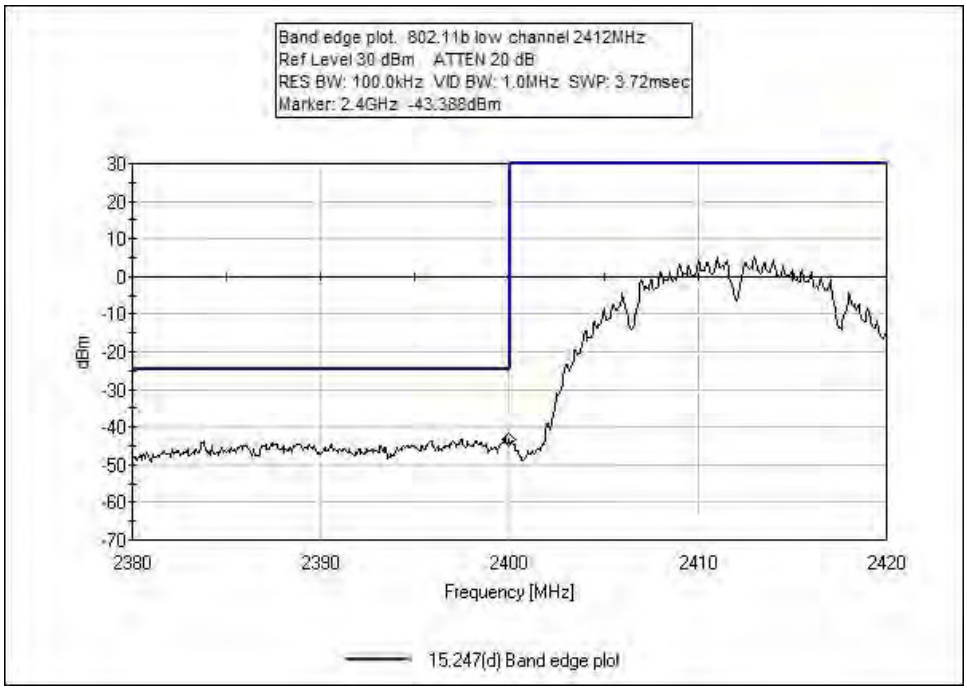
Test Equipment:

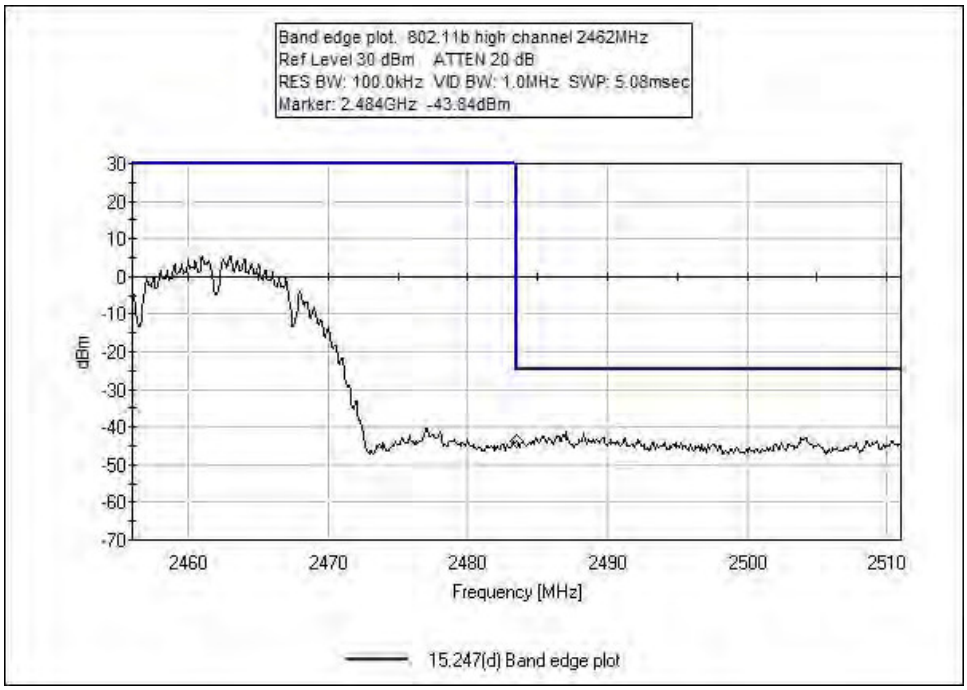
ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02869	Spectrum Analyzer	E4440A	7/8/2016	7/8/2017
T2	ANP06544	Cable	32026-29094K-29094K-36TC	11/2/2015	11/2/2017
T3	AN03431	Attenuator	89-20-21	11/2/2015	11/2/2017

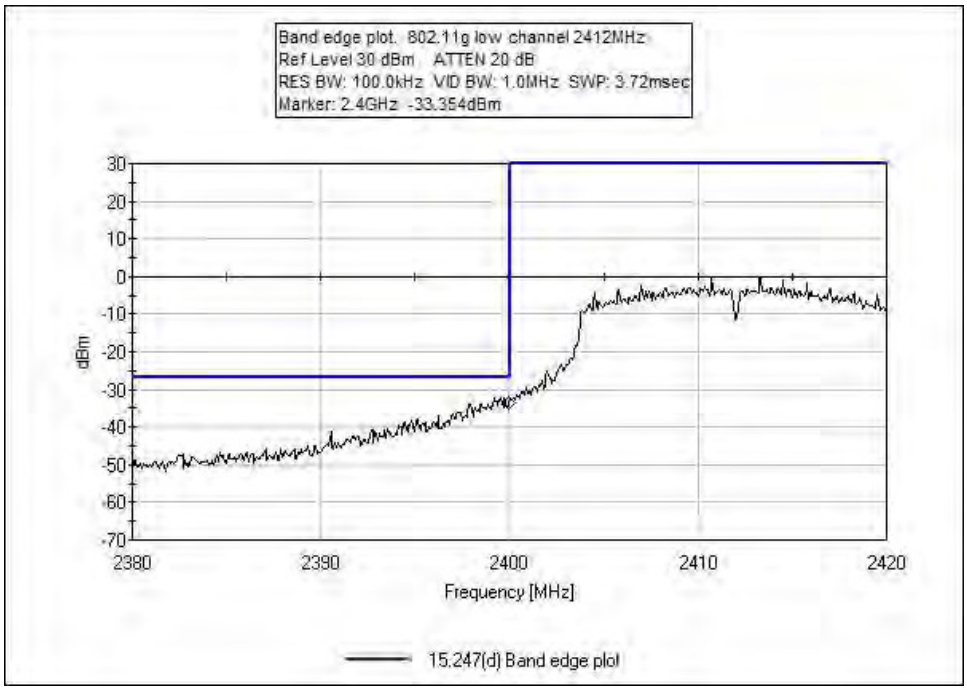
Measurement Data: Reading listed by margin. Test Lead: Antenna Port

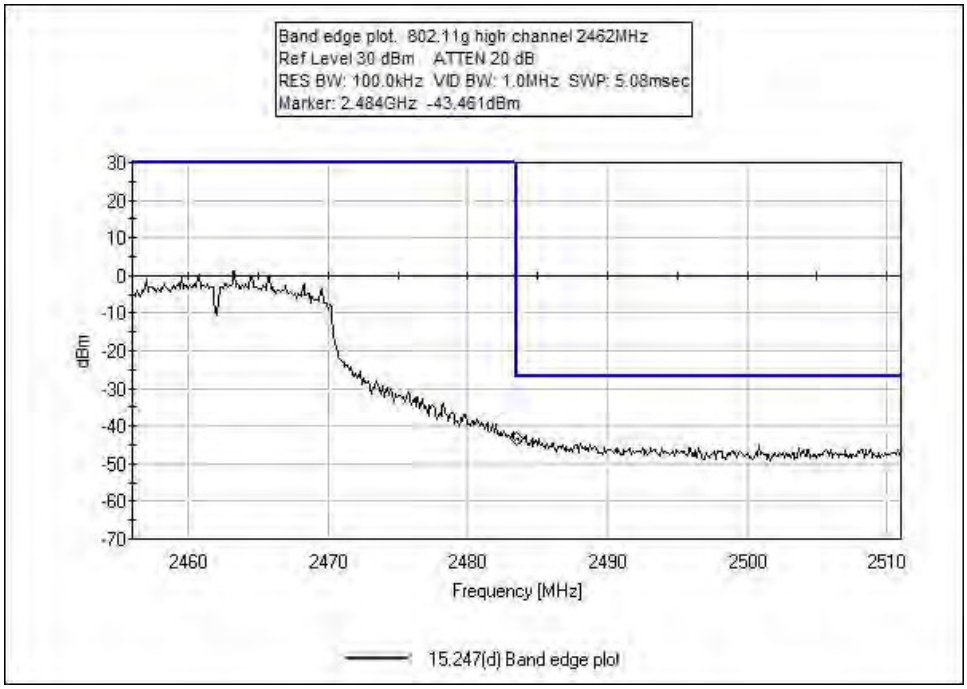
#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	2400.000M	53.1	+0.0	+0.7	+19.3		+0.0	73.1	80.0	-6.9	Anten
2	2483.500M	41.4	+0.0	+0.7	+19.3		+0.0	61.4	80.0	-18.6	Anten

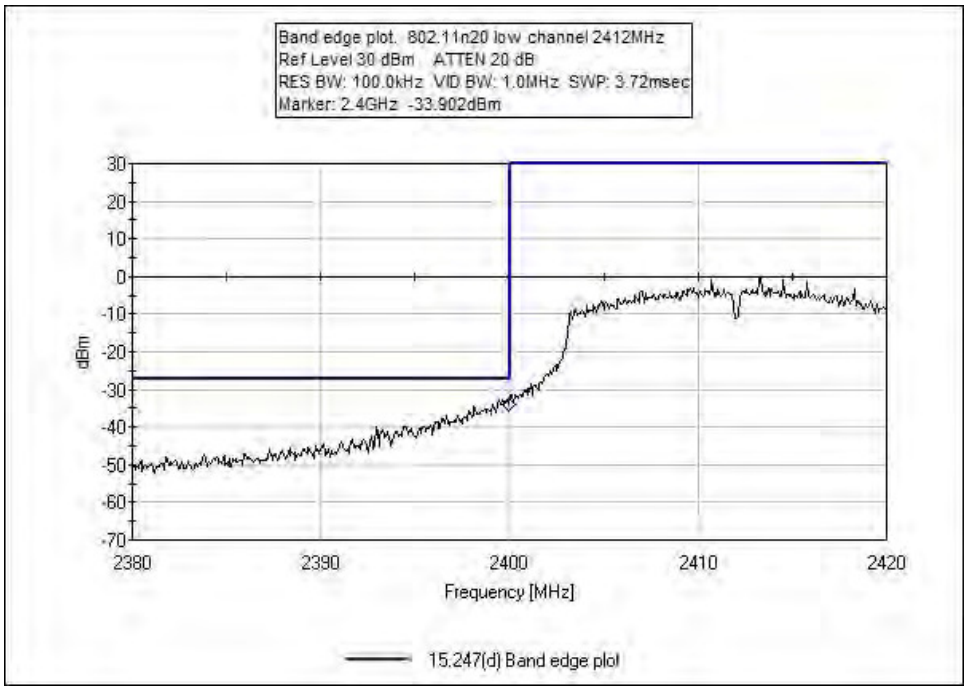
Band Edge Plots

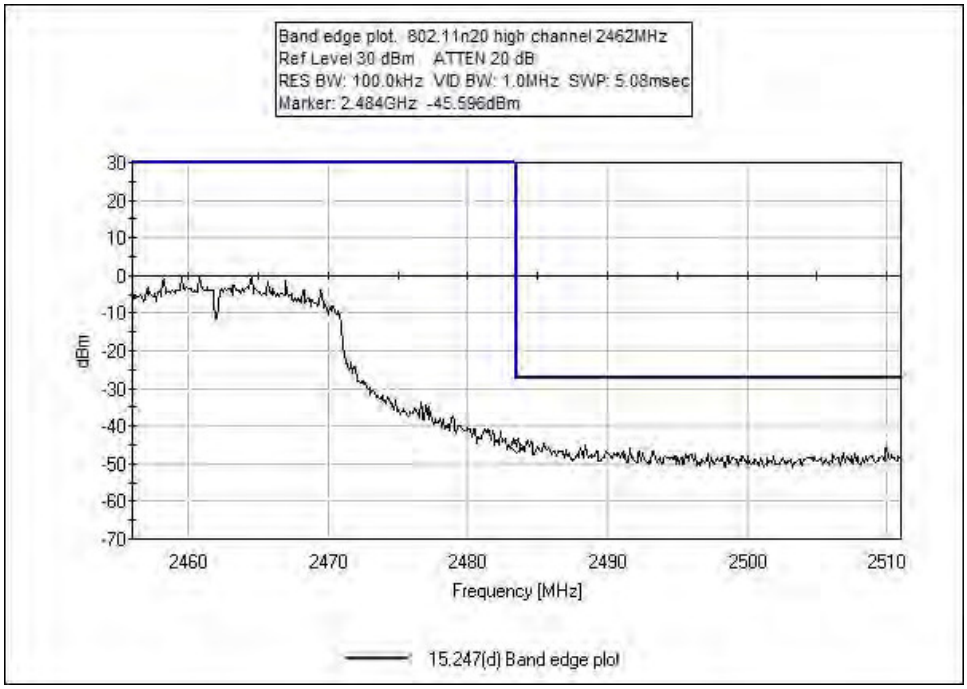





Band edge plot. 802.11g low channel 2412MHz
Ref Level 30 dBm ATTEN 20 dB
RES BW: 100.0kHz VID BW: 1.0MHz SWP: 3.72msec
Marker: 2.4GHz -33.354dBm
dBm
Frequency [MHz]
15.247(d) Band edge plot


Band edge plot. 802.11g high channel 2462MHz
Ref Level 30 dBm ATTEN 20 dB
RES BW: 100.0kHz VID BW: 1.0MHz SWP: 5.08msec
Marker: 2.484GHz -43.461dBm
dBm
Frequency [MHz]
15.247(d) Band edge plot


Band edge plot. 802.11n20 low channel 2412MHz
Ref Level 30 dBm ATTEN 20 dB
RES BW: 100.0kHz VID BW: 1.0MHz SWP: 3.72msec
Marker: 2.4GHz -33.902dBm
dBm
Frequency [MHz]
15.247(d) Band edge plot


Band edge plot. 802.11n20 high channel 2462MHz
Ref Level 30 dBm ATTEN 20 dB
RES BW: 100.0kHz VID BW: 1.0MHz SWP: 5.08msec
Marker: 2.484GHz -45.596dBm
dBm
Frequency [MHz]
15.247(d) Band edge plot

Test Setup Photo

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 #:	**99771**	Date:	5/10/2017
Test Type:	**Maximized Emissions**	Time:	20:24:31
Tested By:	S. Yamamoto	Sequence#:	6
Software:	EMITest 5.03.02		

Equipment Tested:

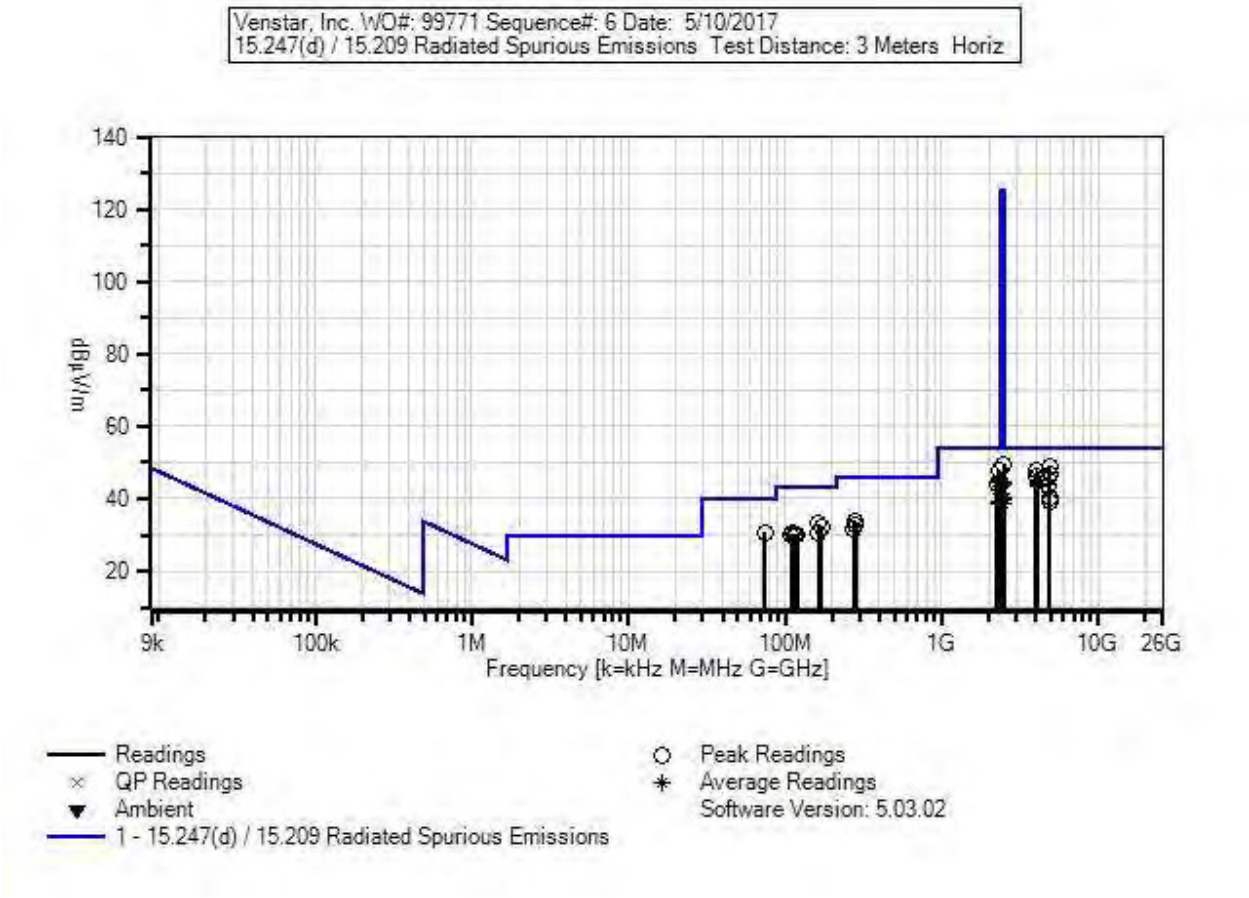
Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Frequency Range: 9kHz to 25GHz
Frequency tested: 2412MHz, 2442MHz, 2462MHz
Firmware power setting: 0
EUT firmware: 3.3.0.0-31.2.0.0.0-2.2.0.4
Protocol /MCS/Modulation: CCK
Antenna type: Chip
Antenna Gain: 1.9dBi.
Duty Cycle: >98%
Test Method: KDB 558074 D01 v04 2017, ANSI C63.10 2013
Test Mode: Continuous transmit
Test Setup: EUT with integral antenna.
Modifications Added: None
Setup: The equipment under test (EUT) is connected to the laptop computer via a serial to USB interface board.
The EUT was tested 802.11b.
Site D.
Temperature: 20°C
Relative Humidity: 45%


Venstar, Inc. WO#: 99771 Sequence#: 6 Date: 5/10/2017
15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Horiz
140
120
100
80
60
40
20
dBµV/m
9k
100k
1M
10M
100M
1G
10G
26G
Frequency [k=kHz M=MHz G=GHz]
Readings
QP Readings
Ambient
1 - 15.247(d) / 15.209 Radiated Spurious Emissions
Peak Readings
Average Readings
Software Version: 5.03.02

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02869	Spectrum Analyzer	E4440A	7/8/2016	7/8/2017
T2	ANP04382	Cable	LDF-50	6/6/2016	6/6/2018
T3	ANP07139	Cable	ANDL1-PNMNM-48	3/1/2017	3/1/2019
T4	AN01646	Horn Antenna	3115	3/4/2016	3/4/2018
T5	AN00787	Preamp	83017A	6/10/2015	6/10/2017
T6	ANP06544	Cable	32026-29094K-29094K-36TC	11/2/2015	11/2/2017
T7	AN03385	High Pass Filter	11SH10-3000/T10000-O/O	6/15/2015	6/15/2017
	AN03367	Horn Antenna-ANSI C63.5 Calibration	62-GH-62-25.	7/17/2015	7/17/2017
	AN01413	Horn Antenna	84125-80008	10/7/2016	10/7/2018
T8	AN03430	Attenuator	75A-10-12	11/2/2015	11/2/2017
T9	ANP05569	Cable-Amplitude +15C to +45C (dB)	RG-214/U	12/7/2016	12/7/2018
T10	ANP05555	Cable	RG223/U	4/5/2016	4/5/2018
T11	ANP05275	Attenuator	1W	5/5/2016	5/5/2018
T12	AN01995	Biconilog Antenna	CBL6111C	5/10/2016	5/10/2018
T13	AN00010	Preamp	8447D	3/14/2016	3/14/2018
	AN00314	Loop Antenna	6502	5/20/2016	5/20/2018

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

#	Freq	Rdng	T1 T5 T9 T13	T2 T6 T10	T3 T7 T11	T4 T8 T12	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	2497.470M	44.2	+0.0 -39.7 +0.0 +0.0	+6.1 +0.7 +0.0	+3.1 +0.0 +0.0	+25.2 +10.1 +0.0	+0.0	49.7	54.0	-4.3	Horiz
2	4924.117M	44.6	+0.0 -40.1 +0.0 +0.0	+9.0 +1.0 +0.0	+4.3 +0.1 +0.0	+30.0 +0.0 +0.0	+0.0	48.9	54.0	-5.1	Horiz
3	2315.930M	43.4	+0.0 -39.6 +0.0 +0.0	+5.8 +0.6 +0.0	+2.8 +0.0 +0.0	+24.8 +10.1 +0.0	+0.0	47.9	54.0	-6.1	Horiz
4	4070.970M	46.1	+0.0 -40.4 +0.0 +0.0	+8.0 +0.9 +0.0	+3.9 +0.3 +0.0	+28.8 +0.0 +0.0	+0.0	47.6	54.0	-6.4	Horiz

5	4923.975M	42.4	+0.0 -40.1 +0.0 +0.0	+9.0 +1.0 +0.0	+4.3 +0.1 +0.0	+30.0 +0.0 +0.0	+0.0	46.7	54.0	-7.3	Vert
6	4020.780M	45.0	+0.0 -40.4 +0.0 +0.0	+8.0 +0.9 +0.0	+3.9 +0.3 +0.0	+28.7 +0.0 +0.0	+0.0	46.4	54.0	-7.6	Vert
7	4069.200M	44.8	+0.0 -40.4 +0.0 +0.0	+8.0 +0.9 +0.0	+3.9 +0.3 +0.0	+28.8 +0.0 +0.0	+0.0	46.3	54.0	-7.7	Vert
8	4020.633M Ave	44.8	+0.0 -40.4 +0.0 +0.0	+8.0 +0.9 +0.0	+3.9 +0.3 +0.0	+28.7 +0.0 +0.0	+0.0	46.2	54.0	-7.8	Horiz
^	4020.630M	48.9	+0.0 -40.4 +0.0 +0.0	+8.0 +0.9 +0.0	+3.9 +0.3 +0.0	+28.7 +0.0 +0.0	+0.0	50.3	54.0	-3.7	Horiz
10	4823.968M	42.0	+0.0 -40.4 +0.0 +0.0	+8.8 +1.0 +0.0	+4.2 +0.1 +0.0	+30.0 +0.0 +0.0	+0.0	45.7	54.0	-8.3	Vert
11	2363.600M Ave	40.5	+0.0 -39.6 +0.0 +0.0	+5.9 +0.6 +0.0	+2.9 +0.0 +0.0	+24.9 +10.1 +0.0	+0.0	45.3	54.0	-8.7	Vert
^	2363.600M	52.1	+0.0 -39.6 +0.0 +0.0	+5.9 +0.6 +0.0	+2.9 +0.0 +0.0	+24.9 +10.1 +0.0	+0.0	56.9	54.0	+2.9	Vert
13	2380.200M Ave	39.8	+0.0 -39.6 +0.0 +0.0	+6.0 +0.7 +0.0	+2.9 +0.0 +0.0	+24.9 +10.1 +0.0	+0.0	44.8	54.0	-9.2	Vert
^	2380.200M	51.1	+0.0 -39.6 +0.0 +0.0	+6.0 +0.7 +0.0	+2.9 +0.0 +0.0	+24.9 +10.1 +0.0	+0.0	56.1	54.0	+2.1	Vert
15	74.540M	43.2	+0.0 +0.0 +0.8 -27.2	+0.8 +0.0 +0.1	+0.0 +0.0 +6.0	+0.0 +0.0 +7.0	+0.0	30.7	40.0	-9.3	Vert
16	2330.267M Ave	40.0	+0.0 -39.6 +0.0 +0.0	+5.9 +0.6 +0.0	+2.8 +0.0 +0.0	+24.8 +10.1 +0.0	+0.0	44.6	54.0	-9.4	Vert
^	2330.267M	48.4	+0.0 -39.6 +0.0 +0.0	+5.9 +0.6 +0.0	+2.8 +0.0 +0.0	+24.8 +10.1 +0.0	+0.0	53.0	54.0	-1.0	Vert

18	2493.658M Ave	38.9	+0.0 -39.7 +0.0 +0.0	+6.1 +0.7 +0.0	+3.1 +0.0 +0.0	+25.2 +10.1 +0.0	+0.0	44.4	54.0	-9.6	Vert
^	2493.658M	49.6	+0.0 -39.7 +0.0 +0.0	+6.1 +0.7 +0.0	+3.1 +0.0 +0.0	+25.2 +10.1 +0.0	+0.0	55.1	54.0	+1.1	Vert
^	2493.634M	40.9	+0.0 -39.7 +0.0 +0.0	+6.1 +0.7 +0.0	+3.1 +0.0 +0.0	+25.2 +10.1 +0.0	+0.0	46.4	54.0	-7.6	Vert
21	2483.500M Ave	38.8	+0.0 -39.7 +0.0 +0.0	+6.1 +0.7 +0.0	+3.1 +0.0 +0.0	+25.2 +10.1 +0.0	+0.0	44.3	54.0	-9.7	Vert
22	2248.450M	40.0	+0.0 -39.6 +0.0 +0.0	+5.8 +0.6 +0.0	+2.7 +0.0 +0.0	+24.6 +10.1 +0.0	+0.0	44.2	54.0	-9.8	Vert
23	4104.333M Ave	42.4	+0.0 -40.4 +0.0 +0.0	+8.0 +0.9 +0.0	+3.9 +0.2 +0.0	+28.9 +0.0 +0.0	+0.0	43.9	54.0	-10.1	Horiz
^	4104.333M	49.4	+0.0 -40.4 +0.0 +0.0	+8.0 +0.9 +0.0	+3.9 +0.2 +0.0	+28.9 +0.0 +0.0	+0.0	50.9	54.0	-3.1	Horiz
25	163.624M	41.0	+0.0 +0.0 +1.3 -26.9	+1.3 +0.0 +0.2	+0.0 +0.0 +6.0	+0.0 +0.0 +10.3	+0.0	33.2	43.5	-10.3	Vert
26	4101.867M Ave	42.0	+0.0 -40.4 +0.0 +0.0	+8.0 +0.9 +0.0	+3.9 +0.2 +0.0	+28.9 +0.0 +0.0	+0.0	43.5	54.0	-10.5	Vert
^	4101.867M	49.5	+0.0 -40.4 +0.0 +0.0	+8.0 +0.9 +0.0	+3.9 +0.2 +0.0	+28.9 +0.0 +0.0	+0.0	51.0	54.0	-3.0	Vert
28	2383.867M Ave	38.5	+0.0 -39.6 +0.0 +0.0	+6.0 +0.7 +0.0	+2.9 +0.0 +0.0	+24.9 +10.1 +0.0	+0.0	43.5	54.0	-10.5	Vert
^	2383.867M	51.4	+0.0 -39.6 +0.0 +0.0	+6.0 +0.7 +0.0	+2.9 +0.0 +0.0	+24.9 +10.1 +0.0	+0.0	56.4	54.0	+2.4	Vert
30	4823.971M	39.6	+0.0 -40.4 +0.0 +0.0	+8.8 +1.0 +0.0	+4.2 +0.1 +0.0	+30.0 +0.0 +0.0	+0.0	43.3	54.0	-10.7	Horiz

31	170.923M	40.5	+0.0 +0.0 +1.3 -26.9	+1.4 +0.0 +0.2	+0.0 +0.0 +6.0	+0.0 +0.0 +9.8	+0.0	32.3	43.5	-11.2	Vert
32	280.050M	38.0	+0.0 +0.0 +1.7 -26.6	+1.7 +0.0 +0.2	+0.0 +0.0 +6.0	+0.0 +0.0 +12.9	+0.0	33.9	46.0	-12.1	Horiz
33	2381.200M Ave	36.6	+0.0 -39.6 +0.0 +0.0	+6.0 +0.7 +0.0	+2.9 +0.0 +0.0	+24.9 +10.1 +0.0	+0.0	41.6	54.0	-12.4	Horiz
^	2381.200M	47.4	+0.0 -39.6 +0.0 +0.0	+6.0 +0.7 +0.0	+2.9 +0.0 +0.0	+24.9 +10.1 +0.0	+0.0	52.4	54.0	-1.6	Horiz
35	163.629M	38.3	+0.0 +0.0 +1.3 -26.9	+1.3 +0.0 +0.2	+0.0 +0.0 +6.0	+0.0 +0.0 +10.3	+0.0	30.5	43.5	-13.0	Horiz
36	283.575M	36.9	+0.0 +0.0 +1.7 -26.6	+1.7 +0.0 +0.2	+0.0 +0.0 +6.0	+0.0 +0.0 +13.0	+0.0	32.9	46.0	-13.1	Horiz
37	112.760M	38.1	+0.0 +0.0 +1.0 -27.0	+1.1 +0.0 +0.1	+0.0 +0.0 +6.0	+0.0 +0.0 +11.1	+0.0	30.4	43.5	-13.1	Vert
38	116.400M	37.5	+0.0 +0.0 +1.1 -27.0	+1.1 +0.0 +0.1	+0.0 +0.0 +6.0	+0.0 +0.0 +11.4	+0.0	30.2	43.5	-13.3	Vert
39	120.017M	37.2	+0.0 +0.0 +1.1 -27.0	+1.1 +0.0 +0.1	+0.0 +0.0 +6.0	+0.0 +0.0 +11.6	+0.0	30.1	43.5	-13.4	Vert
40	109.097M	38.2	+0.0 +0.0 +1.0 -27.1	+1.0 +0.0 +0.1	+0.0 +0.0 +6.0	+0.0 +0.0 +10.9	+0.0	30.1	43.5	-13.4	Vert
41	4883.980M	35.9	+0.0 -40.2 +0.0 +0.0	+8.9 +1.0 +0.0	+4.3 +0.1 +0.0	+30.0 +0.0 +0.0	+0.0	40.0	54.0	-14.0	Horiz
42	2488.533M Ave	34.5	+0.0 -39.7 +0.0 +0.0	+6.1 +0.7 +0.0	+3.1 +0.0 +0.0	+25.2 +10.1 +0.0	+0.0	40.0	54.0	-14.0	Horiz
^	2488.533M	47.5	+0.0 -39.7 +0.0 +0.0	+6.1 +0.7 +0.0	+3.1 +0.0 +0.0	+25.2 +10.1 +0.0	+0.0	53.0	54.0	-1.0	Horiz

44	2483.500M Ave	34.5	+0.0 -39.7 +0.0 +0.0	+6.1 +0.7 +0.0	+3.1 +0.0 +0.0	+25.2 +10.1 +0.0	+0.0	40.0	54.0	-14.0	Vert
^	2483.500M	47.6	+0.0 -39.7 +0.0 +0.0	+6.1 +0.7 +0.0	+3.1 +0.0 +0.0	+25.2 +10.1 +0.0	+0.0	53.1	54.0	-0.9	Vert
^	2483.500M	44.0	+0.0 -39.7 +0.0 +0.0	+6.1 +0.7 +0.0	+3.1 +0.0 +0.0	+25.2 +10.1 +0.0	+0.0	49.5	54.0	-4.5	Vert
47	272.700M	36.1	+0.0 +0.0 +1.7 -26.6	+1.7 +0.0 +0.2	+0.0 +0.0 +6.0	+0.0 +0.0 +12.8	+0.0	31.9	46.0	-14.1	Vert
48	2490.678M Ave	34.3	+0.0 -39.7 +0.0 +0.0	+6.1 +0.7 +0.0	+3.1 +0.0 +0.0	+25.2 +10.1 +0.0	+0.0	39.8	54.0	-14.2	Vert
^	2490.678M	48.0	+0.0 -39.7 +0.0 +0.0	+6.1 +0.7 +0.0	+3.1 +0.0 +0.0	+25.2 +10.1 +0.0	+0.0	53.5	54.0	-0.5	Vert
50	2363.600M Ave	34.4	+0.0 -39.6 +0.0 +0.0	+5.9 +0.6 +0.0	+2.9 +0.0 +0.0	+24.9 +10.1 +0.0	+0.0	39.2	54.0	-14.8	Horiz
^	2363.600M	45.8	+0.0 -39.6 +0.0 +0.0	+5.9 +0.6 +0.0	+2.9 +0.0 +0.0	+24.9 +10.1 +0.0	+0.0	50.6	54.0	-3.4	Horiz
52	4883.971M	35.0	+0.0 -40.2 +0.0 +0.0	+8.9 +1.0 +0.0	+4.3 +0.1 +0.0	+30.0 +0.0 +0.0	+0.0	39.1	54.0	-14.9	Vert

53	2330.750M Ave	34.5	+0.0 -39.6 +0.0 +0.0	+5.9 +0.6 +0.0	+2.8 +0.0 +0.0	+24.8 +10.1 +0.0	+0.0	39.1	54.0	-14.9	Horiz
^	2330.750M	45.1	+0.0 -39.6 +0.0 +0.0	+5.9 +0.6 +0.0	+2.8 +0.0 +0.0	+24.8 +10.1 +0.0	+0.0	49.7	54.0	-4.3	Horiz
55	2321.619M Ave	34.3	+0.0 -39.6 +0.0 +0.0	+5.8 +0.6 +0.0	+2.8 +0.0 +0.0	+24.8 +10.1 +0.0	+0.0	38.8	54.0	-15.2	Vert
^	2321.620M	47.4	+0.0 -39.6 +0.0 +0.0	+5.8 +0.6 +0.0	+2.8 +0.0 +0.0	+24.8 +10.1 +0.0	+0.0	51.9	54.0	-2.1	Vert
57	2483.500M Ave	32.9	+0.0 -39.7 +0.0 +0.0	+6.1 +0.7 +0.0	+3.1 +0.0 +0.0	+25.2 +10.1 +0.0	+0.0	38.4	54.0	-15.6	Horiz
^	2483.500M	43.5	+0.0 -39.7 +0.0 +0.0	+6.1 +0.7 +0.0	+3.1 +0.0 +0.0	+25.2 +10.1 +0.0	+0.0	49.0	54.0	-5.0	Horiz

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 #:	**99771**	Date:	5/13/2017
Test Type:	**Maximized Emissions**	Time:	16:06:11
Tested By:	S. Yamamoto	Sequence#:	7
Software:	EMITest 5.03.02		

Equipment Tested:

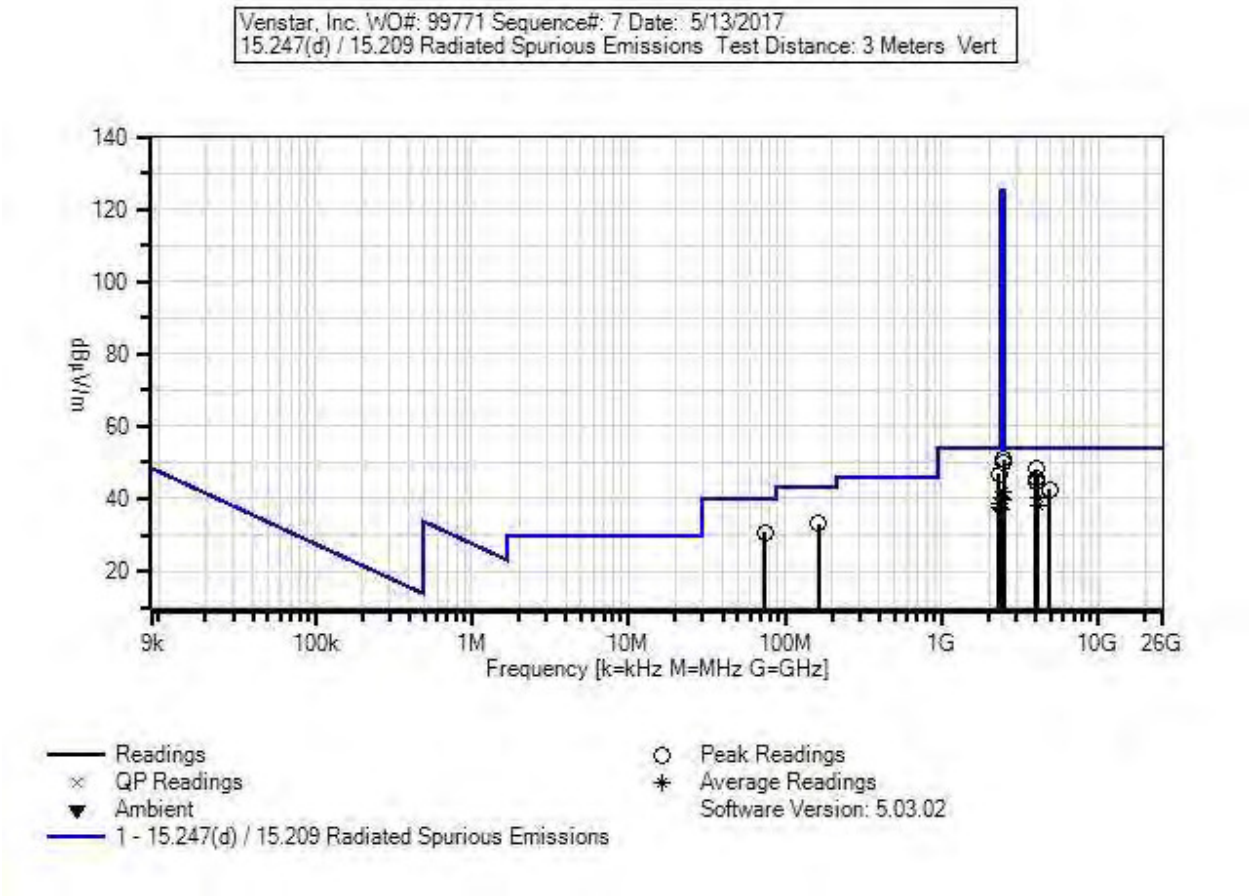
Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Frequency Range: 9kHz to 25GHz
Frequency tested: 2412MHz, 2442MHz, 2462MHz
Firmware power setting: 0
EUT firmware: 3.3.0.0-31.2.0.0.0-2.2.0.4
Protocol /MCS/Modulation: OFDM
Antenna type: Chip
Antenna Gain: 1.9dBi.
Duty Cycle: >98%
Test Method: KDB 558074 D01 v04 2017, ANSI C63.10 2013
Test Mode: Continuous transmit
Test Setup: EUT with integral antenna.
Modifications Added: None
Setup: The equipment under test (EUT) is connected to the laptop computer via a serial to USB interface board.
The EUT was tested 802.11g.
Site D.


Venstar, Inc. WO#: 99771 Sequence#: 7 Date: 5/13/2017
15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Vert
140
120
100
80
60
40
20
dBµV/m
9k
100k
1M
10M
100M
1G
10G
26G
Frequency [k=kHz M=MHz G=GHz]
Readings
QP Readings
Ambient
1 - 15.247(d) / 15.209 Radiated Spurious Emissions
Peak Readings
Average Readings
Software Version: 5.03.02

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02869	Spectrum Analyzer	E4440A	7/8/2016	7/8/2017
T2	ANP04382	Cable	LDF-50	6/6/2016	6/6/2018
T3	ANP07139	Cable	ANDL1-PNMNM-48	3/1/2017	3/1/2019
T4	AN01646	Horn Antenna	3115	3/4/2016	3/4/2018
T5	AN00787	Preamp	83017A	6/10/2015	6/10/2017
T6	ANP06544	Cable	32026-29094K-29094K-36TC	11/2/2015	11/2/2017
T7	AN03385	High Pass Filter	11SH10-3000/T10000-O/O	6/15/2015	6/15/2017
	AN03367	Horn Antenna-ANSI C63.5 Calibration	62-GH-62-25.	7/17/2015	7/17/2017
	AN01413	Horn Antenna	84125-80008	10/7/2016	10/7/2018
T8	AN03430	Attenuator	75A-10-12	11/2/2015	11/2/2017
T9	ANP05569	Cable-Amplitude +15C to +45C (dB)	RG-214/U	12/7/2016	12/7/2018
T10	ANP05555	Cable	RG223/U	4/5/2016	4/5/2018
T11	ANP05275	Attenuator	1W	5/5/2016	5/5/2018
T12	AN01995	Biconilog Antenna	CBL6111C	5/10/2016	5/10/2018
T13	AN00010	Preamp	8447D	3/14/2016	3/14/2018
	AN00314	Loop Antenna	6502	5/20/2016	5/20/2018

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

#	Freq	Rdng	T1 T5 T9 T13	T2 T6 T10	T3 T7 T11	T4 T8 T12	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	2497.718M	45.3	+0.0 -39.7 +0.0 +0.0	+6.1 +0.7 +0.0	+3.1 +0.0 +0.0	+25.2 +10.1 +0.0	+0.0	50.8	54.0	-3.2	Horiz
2	2494.995M	44.4	+0.0 -39.7 +0.0 +0.0	+6.1 +0.7 +0.0	+3.1 +0.0 +0.0	+25.2 +10.1 +0.0	+0.0	49.9	54.0	-4.1	Horiz
3	4022.360M	46.8	+0.0 -40.4 +0.0 +0.0	+8.0 +0.9 +0.0	+3.9 +0.3 +0.0	+28.7 +0.0 +0.0	+0.0	48.2	54.0	-5.8	Horiz
4	2323.090M	42.5	+0.0 -39.6 +0.0 +0.0	+5.8 +0.6 +0.0	+2.8 +0.0 +0.0	+24.8 +10.1 +0.0	+0.0	47.0	54.0	-7.0	Horiz

5	4069.230M	44.2	+0.0 -40.4 +0.0 +0.0	+8.0 +0.9 +0.0	+3.9 +0.3 +0.0	+28.8 +0.0 +0.0	+0.0	45.7	54.0	-8.3	Horiz
6	4021.000M	44.1	+0.0 -40.4 +0.0 +0.0	+8.0 +0.9 +0.0	+3.9 +0.3 +0.0	+28.7 +0.0 +0.0	+0.0	45.5	54.0	-8.5	Vert
7	74.540M	43.2	+0.0 +0.0 +0.8 -27.2	+0.8 +0.0 +0.1	+0.0 +0.0 +6.0	+0.0 +0.0 +7.0	+0.0	30.7	40.0	-9.3	Vert
8	4070.920M	42.8	+0.0 -40.4 +0.0 +0.0	+8.0 +0.9 +0.0	+3.9 +0.3 +0.0	+28.8 +0.0 +0.0	+0.0	44.3	54.0	-9.7	Vert
9	163.624M	41.0	+0.0 +0.0 +1.3 -26.9	+1.3 +0.0 +0.2	+0.0 +0.0 +6.0	+0.0 +0.0 +10.3	+0.0	33.2	43.5	-10.3	Vert
10	4924.300M	38.4	+0.0 -40.1 +0.0 +0.0	+9.0 +1.0 +0.0	+4.3 +0.1 +0.0	+30.0 +0.0 +0.0	+0.0	42.7	54.0	-11.3	Vert
11	4924.283M	37.9	+0.0 -40.1 +0.0 +0.0	+9.0 +1.0 +0.0	+4.3 +0.1 +0.0	+30.0 +0.0 +0.0	+0.0	42.2	54.0	-11.8	Horiz
12	2498.158M Ave	36.3	+0.0 -39.7 +0.0 +0.0	+6.1 +0.7 +0.0	+3.1 +0.0 +0.0	+25.2 +10.1 +0.0	+0.0	41.8	54.0	-12.2	Vert
^	2498.158M	50.8	+0.0 -39.7 +0.0 +0.0	+6.1 +0.7 +0.0	+3.1 +0.0 +0.0	+25.2 +10.1 +0.0	+0.0	56.3	54.0	+2.3	Vert
^	2498.158M	38.9	+0.0 -39.7 +0.0 +0.0	+6.1 +0.7 +0.0	+3.1 +0.0 +0.0	+25.2 +10.1 +0.0	+0.0	44.4	54.0	-9.6	Vert
15	2389.804M Ave	35.3	+0.0 -39.6 +0.0 +0.0	+6.0 +0.7 +0.0	+2.9 +0.0 +0.0	+25.0 +10.1 +0.0	+0.0	40.4	54.0	-13.6	Vert
^	2389.804M	54.9	+0.0 -39.6 +0.0 +0.0	+6.0 +0.7 +0.0	+2.9 +0.0 +0.0	+25.0 +10.1 +0.0	+0.0	60.0	54.0	+6.0	Vert

17	4104.167M Ave	38.8	+0.0 -40.4 +0.0 +0.0	+8.0 +0.9 +0.0	+3.9 +0.2 +0.0	+28.9 +0.0 +0.0	+0.0	40.3	54.0	-13.7	Horiz
^	4104.167M	49.5	+0.0 -40.4 +0.0 +0.0	+8.0 +0.9 +0.0	+3.9 +0.2 +0.0	+28.9 +0.0 +0.0	+0.0	51.0	54.0	-3.0	Horiz
19	2377.200M Ave	35.0	+0.0 -39.6 +0.0 +0.0	+6.0 +0.7 +0.0	+2.9 +0.0 +0.0	+24.9 +10.1 +0.0	+0.0	40.0	54.0	-14.0	Vert
^	2377.200M	50.1	+0.0 -39.6 +0.0 +0.0	+6.0 +0.7 +0.0	+2.9 +0.0 +0.0	+24.9 +10.1 +0.0	+0.0	55.1	54.0	+1.1	Vert
21	2498.900M Ave	34.5	+0.0 -39.7 +0.0 +0.0	+6.1 +0.7 +0.0	+3.1 +0.0 +0.0	+25.2 +10.1 +0.0	+0.0	40.0	54.0	-14.0	Vert
^	2498.900M	47.6	+0.0 -39.7 +0.0 +0.0	+6.1 +0.7 +0.0	+3.1 +0.0 +0.0	+25.2 +10.1 +0.0	+0.0	53.1	54.0	-0.9	Vert
^	2498.900M	31.6	+0.0 -39.7 +0.0 +0.0	+6.1 +0.7 +0.0	+3.1 +0.0 +0.0	+25.2 +10.1 +0.0	+0.0	37.1	54.0	-16.9	Vert
24	2313.584M Ave	34.3	+0.0 -39.6 +0.0 +0.0	+5.8 +0.6 +0.0	+2.8 +0.0 +0.0	+24.8 +10.1 +0.0	+0.0	38.8	54.0	-15.2	Vert
^	2313.580M	46.6	+0.0 -39.6 +0.0 +0.0	+5.8 +0.6 +0.0	+2.8 +0.0 +0.0	+24.8 +10.1 +0.0	+0.0	51.1	54.0	-2.9	Vert
26	4104.570M Ave	36.8	+0.0 -40.4 +0.0 +0.0	+8.0 +0.9 +0.0	+3.9 +0.2 +0.0	+28.9 +0.0 +0.0	+0.0	38.3	54.0	-15.7	Vert
^	4104.570M	48.6	+0.0 -40.4 +0.0 +0.0	+8.0 +0.9 +0.0	+3.9 +0.2 +0.0	+28.9 +0.0 +0.0	+0.0	50.1	54.0	-3.9	Vert
28	2337.937M Ave	32.9	+0.0 -39.6 +0.0 +0.0	+5.9 +0.6 +0.0	+2.8 +0.0 +0.0	+24.8 +10.1 +0.0	+0.0	37.5	54.0	-16.5	Vert
^	2337.940M	46.3	+0.0 -39.6 +0.0 +0.0	+5.9 +0.6 +0.0	+2.8 +0.0 +0.0	+24.8 +10.1 +0.0	+0.0	50.9	54.0	-3.1	Vert

30	2358.933M Ave	32.5	+0.0 -39.6 +0.0 +0.0	+5.9 +0.6 +0.0	+2.9 +0.0 +0.0	+24.9 +10.1 +0.0	+0.0	37.3	54.0	-16.7	Horiz
^	2358.930M	46.2	+0.0 -39.6 +0.0 +0.0	+5.9 +0.6 +0.0	+2.9 +0.0 +0.0	+24.9 +10.1 +0.0	+0.0	51.0	54.0	-3.0	Horiz
32	2389.902M Ave	32.1	+0.0 -39.6 +0.0 +0.0	+6.0 +0.7 +0.0	+2.9 +0.0 +0.0	+25.0 +10.1 +0.0	+0.0	37.2	54.0	-16.8	Horiz
^	2389.902M	52.2	+0.0 -39.6 +0.0 +0.0	+6.0 +0.7 +0.0	+2.9 +0.0 +0.0	+25.0 +10.1 +0.0	+0.0	57.3	54.0	+3.3	Horiz
34	2384.800M Ave	32.0	+0.0 -39.6 +0.0 +0.0	+6.0 +0.7 +0.0	+2.9 +0.0 +0.0	+24.9 +10.1 +0.0	+0.0	37.0	54.0	-17.0	Horiz
^	2384.800M	46.5	+0.0 -39.6 +0.0 +0.0	+6.0 +0.7 +0.0	+2.9 +0.0 +0.0	+24.9 +10.1 +0.0	+0.0	51.5	54.0	-2.5	Horiz

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 #:	**99771**	Date:	5/13/2017
Test Type:	**Maximized Emissions**	Time:	16:14:30
Tested By:	S. Yamamoto	Sequence#:	8
Software:	EMITest 5.03.02		

Equipment Tested:

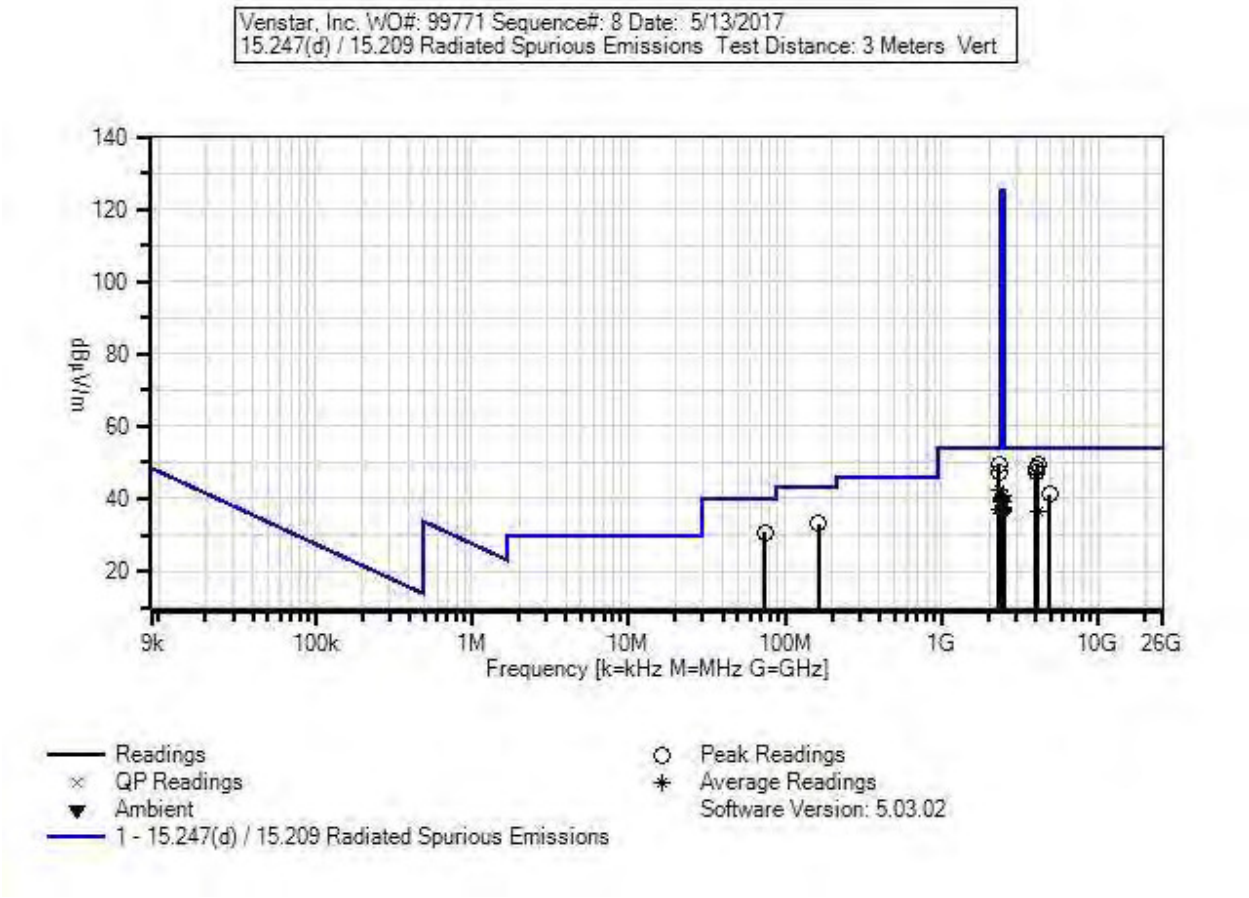
Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Frequency Range: 9kHz to 25GHz
Frequency tested: 2412MHz, 2442MHz, 2462MHz
Firmware power setting: 0
EUT firmware: 3.3.0.0-31.2.0.0.0-2.2.0.4
Protocol /MCS/Modulation: BPSK
Antenna type: Chip
Antenna Gain: 1.9dBi.
Duty Cycle: >98%
Test Method: KDB 558074 D01 v04 2017, ANSI C63.10 2013
Test Mode: Continuous transmit
Test Setup: EUT with integral antenna.
Modifications Added: None
Setup: The equipment under test (EUT) is connected to the laptop computer via a serial to USB interface board.
The EUT was tested 802.11n20.
Site D.


Venstar, Inc. WO#: 99771 Sequence#: 8 Date: 5/13/2017
15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Vert
140
120
100
80
60
40
20
dBµV/m
9k
100k
1M
10M
100M
1G
10G
26G
Frequency [k=kHz M=MHz G=GHz]
Readings
QP Readings
Ambient
1 - 15.247(d) / 15.209 Radiated Spurious Emissions
Peak Readings
Average Readings
Software Version: 5.03.02

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02869	Spectrum Analyzer	E4440A	7/8/2016	7/8/2017
T2	ANP04382	Cable	LDF-50	6/6/2016	6/6/2018
T3	ANP07139	Cable	ANDL1-PNMNM-48	3/1/2017	3/1/2019
T4	AN01646	Horn Antenna	3115	3/4/2016	3/4/2018
T5	AN00787	Preamp	83017A	6/10/2015	6/10/2017
T6	ANP06544	Cable	32026-29094K-29094K-36TC	11/2/2015	11/2/2017
T7	AN03385	High Pass Filter	11SH10-3000/T10000-O/O	6/15/2015	6/15/2017
	AN03367	Horn Antenna-ANSI C63.5 Calibration	62-GH-62-25.	7/17/2015	7/17/2017
	AN01413	Horn Antenna	84125-80008	10/7/2016	10/7/2018
T8	AN03430	Attenuator	75A-10-12	11/2/2015	11/2/2017
T9	ANP05555	Cable	RG223/U	4/5/2016	4/5/2018
T10	ANP05569	Cable-Amplitude +15C to +45C (dB)	RG-214/U	12/7/2016	12/7/2018
T11	AN01995	Biconilog Antenna	CBL6111C	5/10/2016	5/10/2018
T12	ANP05275	Attenuator	1W	5/5/2016	5/5/2018
T13	AN00010	Preamp	8447D	3/14/2016	3/14/2018
	AN00314	Loop Antenna	6502	5/20/2016	5/20/2018

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

#	Freq	Rdng	T1 T5 T9 T13	T2 T6 T10	T3 T7 T11	T4 T8 T12	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	2314.706M	45.1	+0.0 -39.6 +0.0 +0.0	+5.8 +0.6 +0.0	+2.8 +0.0 +0.0	+24.8 +10.1 +0.0	+0.0	49.6	54.0	-4.4	Vert
2	4101.200M	47.7	+0.0 -40.4 +0.0 +0.0	+8.0 +0.9 +0.0	+3.9 +0.2 +0.0	+28.9 +0.0 +0.0	+0.0	49.2	54.0	-4.8	Horiz
3	4068.870M	47.0	+0.0 -40.4 +0.0 +0.0	+8.0 +0.9 +0.0	+3.9 +0.3 +0.0	+28.8 +0.0 +0.0	+0.0	48.5	54.0	-5.5	Horiz
4	2322.800M	43.0	+0.0 -39.6 +0.0 +0.0	+5.8 +0.6 +0.0	+2.8 +0.0 +0.0	+24.8 +10.1 +0.0	+0.0	47.5	54.0	-6.5	Horiz

5	4020.920M	46.0	+0.0 -40.4 +0.0 +0.0	+8.0 +0.9 +0.0	+3.9 +0.3 +0.0	+28.7 +0.0 +0.0	+0.0	47.4	54.0	-6.6	Horiz
6	4024.310M	46.0	+0.0 -40.4 +0.0 +0.0	+8.0 +0.9 +0.0	+3.9 +0.3 +0.0	+28.7 +0.0 +0.0	+0.0	47.4	54.0	-6.6	Vert
7	4071.750M	45.7	+0.0 -40.4 +0.0 +0.0	+8.0 +0.9 +0.0	+3.9 +0.3 +0.0	+28.8 +0.0 +0.0	+0.0	47.2	54.0	-6.8	Vert
8	74.540M	43.2	+0.0 +0.0 +0.1 -27.2	+0.8 +0.0 +0.8	+0.0 +0.0 +7.0	+0.0 +0.0 +6.0	+0.0	30.7	40.0	-9.3	Vert
9	163.624M	41.0	+0.0 +0.0 +0.2 -26.9	+1.3 +0.0 +1.3	+0.0 +0.0 +10.3	+0.0 +0.0 +6.0	+0.0	33.2	43.5	-10.3	Vert
10	2362.400M Ave	37.9	+0.0 -39.6 +0.0 +0.0	+5.9 +0.6 +0.0	+2.9 +0.0 +0.0	+24.9 +10.1 +0.0	+0.0	42.7	54.0	-11.3	Vert
^	2362.400M	51.7	+0.0 -39.6 +0.0 +0.0	+5.9 +0.6 +0.0	+2.9 +0.0 +0.0	+24.9 +10.1 +0.0	+0.0	56.5	54.0	+2.5	Vert
12	4923.975M	36.9	+0.0 -40.1 +0.0 +0.0	+9.0 +1.0 +0.0	+4.3 +0.1 +0.0	+30.0 +0.0 +0.0	+0.0	41.2	54.0	-12.8	Horiz
13	4924.158M	36.8	+0.0 -40.1 +0.0 +0.0	+9.0 +1.0 +0.0	+4.3 +0.1 +0.0	+30.0 +0.0 +0.0	+0.0	41.1	54.0	-12.9	Vert
14	2483.500M Ave	35.5	+0.0 -39.7 +0.0 +0.0	+6.1 +0.7 +0.0	+3.1 +0.0 +0.0	+25.2 +10.1 +0.0	+0.0	41.0	54.0	-13.0	Vert
15	2495.133M Ave	35.2	+0.0 -39.7 +0.0 +0.0	+6.1 +0.7 +0.0	+3.1 +0.0 +0.0	+25.2 +10.1 +0.0	+0.0	40.7	54.0	-13.3	Vert
^	2495.133M	39.3	+0.0 -39.7 +0.0 +0.0	+6.1 +0.7 +0.0	+3.1 +0.0 +0.0	+25.2 +10.1 +0.0	+0.0	44.8	54.0	-9.2	Vert

17	2379.600M Ave	35.1	+0.0 -39.6 +0.0 +0.0	+6.0 +0.7 +0.0	+2.9 +0.0 +0.0	+24.9 +10.1 +0.0	+0.0	40.1	54.0	-13.9	Vert
^	2379.600M	49.8	+0.0 -39.6 +0.0 +0.0	+6.0 +0.7 +0.0	+2.9 +0.0 +0.0	+24.9 +10.1 +0.0	+0.0	54.8	54.0	+0.8	Vert
19	2382.400M Ave	34.9	+0.0 -39.6 +0.0 +0.0	+6.0 +0.7 +0.0	+2.9 +0.0 +0.0	+24.9 +10.1 +0.0	+0.0	39.9	54.0	-14.1	Vert
^	2382.400M	49.1	+0.0 -39.6 +0.0 +0.0	+6.0 +0.7 +0.0	+2.9 +0.0 +0.0	+24.9 +10.1 +0.0	+0.0	54.1	54.0	+0.1	Vert
21	2483.500M Ave	33.6	+0.0 -39.7 +0.0 +0.0	+6.1 +0.7 +0.0	+3.1 +0.0 +0.0	+25.2 +10.1 +0.0	+0.0	39.1	54.0	-14.9	Vert
^	2483.500M	49.7	+0.0 -39.7 +0.0 +0.0	+6.1 +0.7 +0.0	+3.1 +0.0 +0.0	+25.2 +10.1 +0.0	+0.0	55.2	54.0	+1.2	Vert
^	2483.500M	44.9	+0.0 -39.7 +0.0 +0.0	+6.1 +0.7 +0.0	+3.1 +0.0 +0.0	+25.2 +10.1 +0.0	+0.0	50.4	54.0	-3.6	Vert
24	2389.867M Ave	34.0	+0.0 -39.6 +0.0 +0.0	+6.0 +0.7 +0.0	+2.9 +0.0 +0.0	+25.0 +10.1 +0.0	+0.0	39.1	54.0	-14.9	Vert
^	2389.867M	52.0	+0.0 -39.6 +0.0 +0.0	+6.0 +0.7 +0.0	+2.9 +0.0 +0.0	+25.0 +10.1 +0.0	+0.0	57.1	54.0	+3.1	Vert
26	2483.500M Ave	32.1	+0.0 -39.7 +0.0 +0.0	+6.1 +0.7 +0.0	+3.1 +0.0 +0.0	+25.2 +10.1 +0.0	+0.0	37.6	54.0	-16.4	Horiz
^	2483.500M	47.0	+0.0 -39.7 +0.0 +0.0	+6.1 +0.7 +0.0	+3.1 +0.0 +0.0	+25.2 +10.1 +0.0	+0.0	52.5	54.0	-1.5	Horiz
28	2368.133M Ave	32.2	+0.0 -39.6 +0.0 +0.0	+5.9 +0.7 +0.0	+2.9 +0.0 +0.0	+24.9 +10.1 +0.0	+0.0	37.1	54.0	-16.9	Horiz
^	2368.130M	46.3	+0.0 -39.6 +0.0 +0.0	+5.9 +0.7 +0.0	+2.9 +0.0 +0.0	+24.9 +10.1 +0.0	+0.0	51.2	54.0	-2.8	Horiz

30	2382.267M Ave	32.0	+0.0 -39.6 +0.0 +0.0	+6.0 +0.7 +0.0	+2.9 +0.0 +0.0	+24.9 +10.1 +0.0	+0.0	37.0	54.0	-17.0	Horiz
^	2382.267M	46.4	+0.0 -39.6 +0.0 +0.0	+6.0 +0.7 +0.0	+2.9 +0.0 +0.0	+24.9 +10.1 +0.0	+0.0	51.4	54.0	-2.6	Horiz
32	2495.930M Ave	31.4	+0.0 -39.7 +0.0 +0.0	+6.1 +0.7 +0.0	+3.1 +0.0 +0.0	+25.2 +10.1 +0.0	+0.0	36.9	54.0	-17.1	Horiz
^	2495.930M	45.8	+0.0 -39.7 +0.0 +0.0	+6.1 +0.7 +0.0	+3.1 +0.0 +0.0	+25.2 +10.1 +0.0	+0.0	51.3	54.0	-2.7	Horiz
34	4100.800M Ave	35.0	+0.0 -40.4 +0.0 +0.0	+8.0 +0.9 +0.0	+3.9 +0.2 +0.0	+28.9 +0.0 +0.0	+0.0	36.5	54.0	-17.5	Vert
^	4100.800M	46.9	+0.0 -40.4 +0.0 +0.0	+8.0 +0.9 +0.0	+3.9 +0.2 +0.0	+28.9 +0.0 +0.0	+0.0	48.4	54.0	-5.6	Vert
36	2491.503M Ave	30.9	+0.0 -39.7 +0.0 +0.0	+6.1 +0.7 +0.0	+3.1 +0.0 +0.0	+25.2 +10.1 +0.0	+0.0	36.4	54.0	-17.6	Horiz
^	2491.503M	46.4	+0.0 -39.7 +0.0 +0.0	+6.1 +0.7 +0.0	+3.1 +0.0 +0.0	+25.2 +10.1 +0.0	+0.0	51.9	54.0	-2.1	Horiz
38	2389.067M Ave	30.6	+0.0 -39.6 +0.0 +0.0	+6.0 +0.7 +0.0	+2.9 +0.0 +0.0	+25.0 +10.1 +0.0	+0.0	35.7	54.0	-18.3	Horiz
^	2389.067M	47.4	+0.0 -39.6 +0.0 +0.0	+6.0 +0.7 +0.0	+2.9 +0.0 +0.0	+25.0 +10.1 +0.0	+0.0	52.5	54.0	-1.5	Horiz

Band Edge

Band Edge Summary					
Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
2390.0	CCK	Chip	44.8	<54	Pass
2400.0	CCK	Chip	51.5	<66.2	Pass
2483.5	CCK	Chip	44.3	<54	Pass
2390.0	OFDM	Chip	40.4	<54	Pass
2400.0	OFDM	Chip	59.2	<62.4	Pass
2483.5	OFDM	Chip	41.5	<54	Pass
2390.0	BPSK	Chip	39.1	<54	Pass
2400.0	BPSK	Chip	57.3	<63.9	Pass
2483.5	BPSK	Chip	41.0	<54	Pass

Peak level does not exceed 20dB above the average limit

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 #: **99771** Date: 5/13/2017
Test Type: **Maximized Emissions** Time: 15:32:56
Tested By: S. Yamamoto Sequence#: 6
Software: EMITest 5.03.02

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Frequency Range: 2390MHz to 2485MHz
Frequency tested: 2412MHz, 2442MHz, 2462MHz
Firmware power setting: 0
EUT firmware: 3.3.0.0-31.2.0.0.0-2.2.0.4
Protocol /MCS/Modulation: CCK
Antenna type: Chip
Antenna Gain: 1.9dBi.
Duty Cycle: >98%
Test Method: KDB 558074 D01 v04 2017, ANSI C63.10 2013
Test Mode: Continuous transmit
Test Setup: EUT with integral antenna.
Modifications Added: None
Setup: The equipment under test (EUT) is connected to the laptop computer via a serial to USB interface board.
The EUT was tested 802.11b.
Site D.

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02869	Spectrum Analyzer	E4440A	7/8/2016	7/8/2017
T2	ANP04382	Cable	LDF-50	6/6/2016	6/6/2018
T3	ANP07139	Cable	ANDL1-PNMNM-48	3/1/2017	3/1/2019
T4	AN01646	Horn Antenna	3115	3/4/2016	3/4/2018
T5	AN00787	Preamp	83017A	6/10/2015	6/10/2017
T6	ANP06544	Cable	32026-29094K-29094K-36TC	11/2/2015	11/2/2017
T7	AN03430	Attenuator	75A-10-12	11/2/2015	11/2/2017

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

#	Freq	Rdng	T1 T5	T2 T6	T3 T7	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	2390.000M	39.7	+0.0	+6.0	+2.9	+25.0	+0.0	44.8	54.0	-9.2	Vert
	Ave		-39.6	+0.7	+10.1						
2	2483.500M	38.8	+0.0	+6.1	+3.1	+25.2	+0.0	44.3	54.0	-9.7	Vert
	Ave		-39.7	+0.7	+10.1						
3	2400.000M	46.4	+0.0	+6.0	+2.9	+25.0	+0.0	51.5	66.2	-14.7	Vert
			-39.6	+0.7	+10.1						

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 #:	**99771**	Date:	5/13/2017
Test Type:	**Maximized Emissions**	Time:	15:17:31
Tested By:	S. Yamamoto	Sequence#:	7
Software:	EMITest 5.03.02		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Frequency Range: 2390MHz to 2485MHz
Frequency tested: 2412MHz, 2442MHz, 2462MHz
Firmware power setting: 0
EUT firmware: 3.3.0.0-31.2.0.0.0-2.2.0.4
Protocol /MCS/Modulation: OFDM
Antenna type: Chip
Antenna Gain: 1.9dBi.
Duty Cycle: >98%
Test Method: KDB 558074 D01 v04 2017, ANSI C63.10 2013
Test Mode: Continuous transmit
Test Setup: EUT with integral antenna.
Modifications Added: None
Setup: The equipment under test (EUT) is connected to the laptop computer via a serial to USB interface board.
The EUT was tested 802.11g.
Site D.

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02869	Spectrum Analyzer	E4440A	7/8/2016	7/8/2017
T2	ANP04382	Cable	LDF-50	6/6/2016	6/6/2018
T3	ANP07139	Cable	ANDL1-PNMNM-48	3/1/2017	3/1/2019
T4	AN01646	Horn Antenna	3115	3/4/2016	3/4/2018
T5	AN00787	Preamp	83017A	6/10/2015	6/10/2017
T6	ANP06544	Cable	32026-29094K-29094K-36TC	11/2/2015	11/2/2017
T7	AN03430	Attenuator	75A-10-12	11/2/2015	11/2/2017

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

#	Freq	Rdng	T1 T5	T2 T6	T3 T7	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	2400.000M	54.1	+0.0 -39.6	+6.0 +0.7	+2.9 +10.1	+25.0	+0.0	59.2	62.4	-3.2	Vert
2	2483.500M Ave	36.0	+0.0 -39.7	+6.1 +0.7	+3.1 +10.1	+25.2	+0.0	41.5	54.0	-12.5	Vert
3	2390.000M Ave	35.3	+0.0 -39.6	+6.0 +0.7	+2.9 +10.1	+25.0	+0.0	40.4	54.0	-13.6	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 #:	**99771**	Date:	5/13/2017
Test Type:	**Maximized Emissions**	Time:	15:17:31
Tested By:	S. Yamamoto	Sequence#:	8
Software:	EMITest 5.03.02		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Frequency Range: 2390MHz to 2485MHz
Frequency tested: 2412MHz, 2442MHz, 2462MHz
Firmware power setting: 0
EUT firmware: 3.3.0.0-31.2.0.0.0-2.2.0.4
Protocol /MCS/Modulation: BPSK
Antenna type: Chip
Antenna Gain: 1.9dBi.
Duty Cycle: >98%
Test Method: KDB 558074 D01 v04 2017, ANSI C63.10 2013
Test Mode: Continuous transmit
Test Setup: EUT with integral antenna.
Modifications Added: None
Setup: The equipment under test (EUT) is connected to the laptop computer via a serial to USB interface board.
The EUT was tested 802.11n20.
Site D.

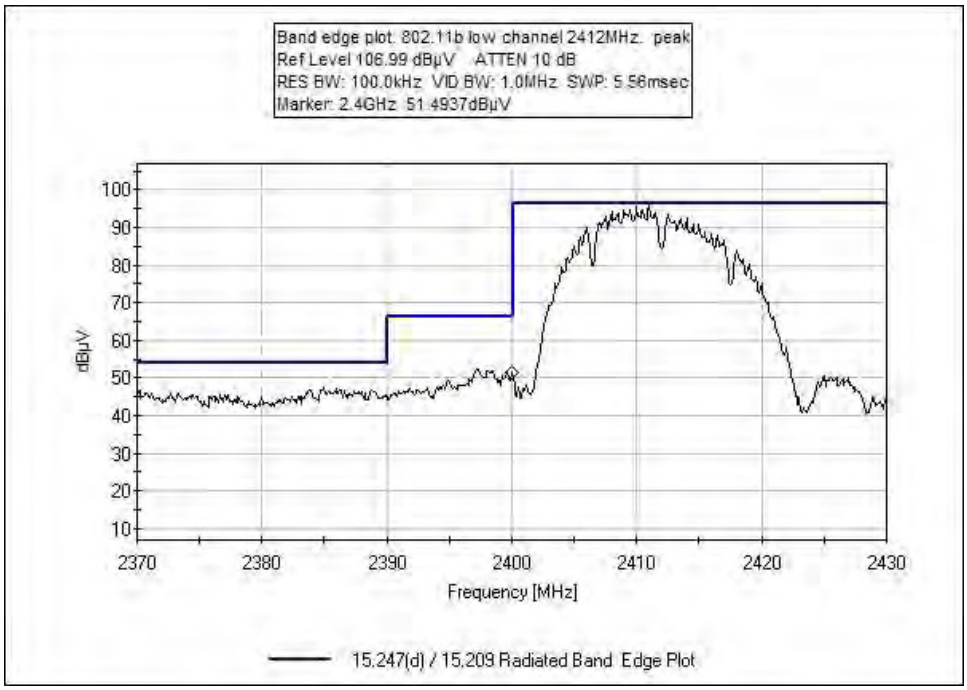
Test Equipment:

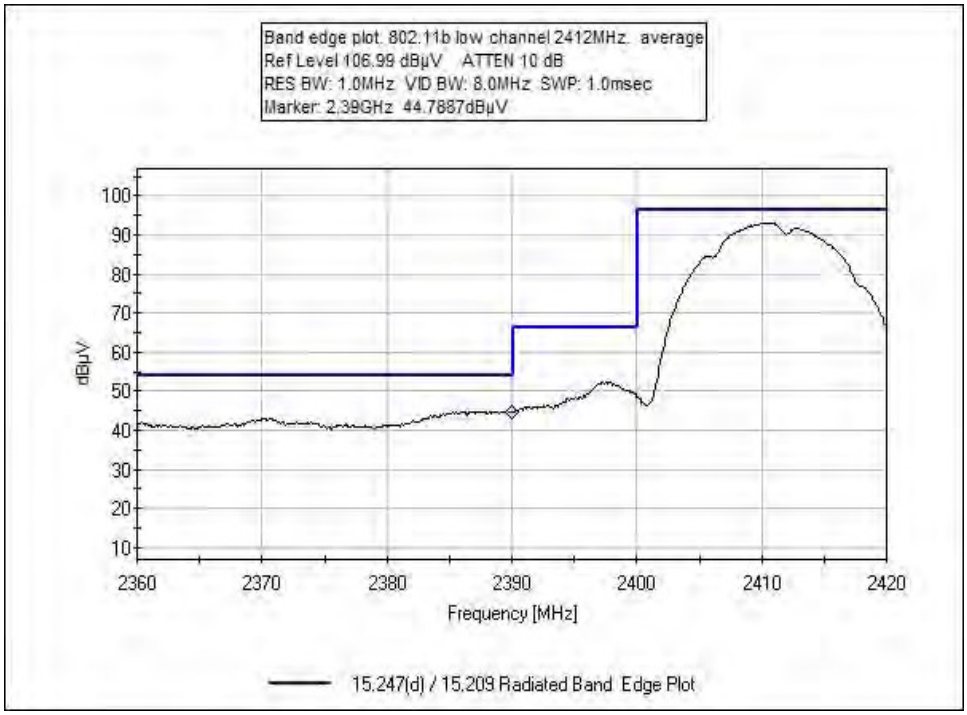
ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02869	Spectrum Analyzer	E4440A	7/8/2016	7/8/2017
T2	ANP04382	Cable	LDF-50	6/6/2016	6/6/2018
T3	ANP07139	Cable	ANDL1-PNMNM-48	3/1/2017	3/1/2019
T4	AN01646	Horn Antenna	3115	3/4/2016	3/4/2018
T5	AN00787	Preamp	83017A	6/10/2015	6/10/2017
T6	ANP06544	Cable	32026-29094K-29094K-36TC	11/2/2015	11/2/2017
T7	AN03430	Attenuator	75A-10-12	11/2/2015	11/2/2017

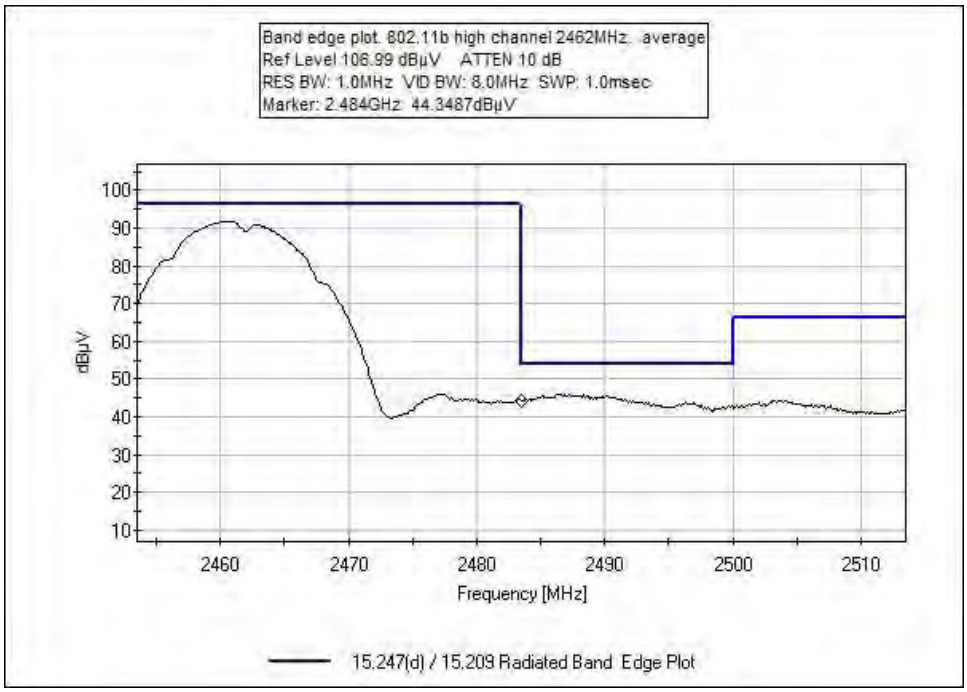
Measurement Data: Reading listed by margin. Test Distance: 3 Meters

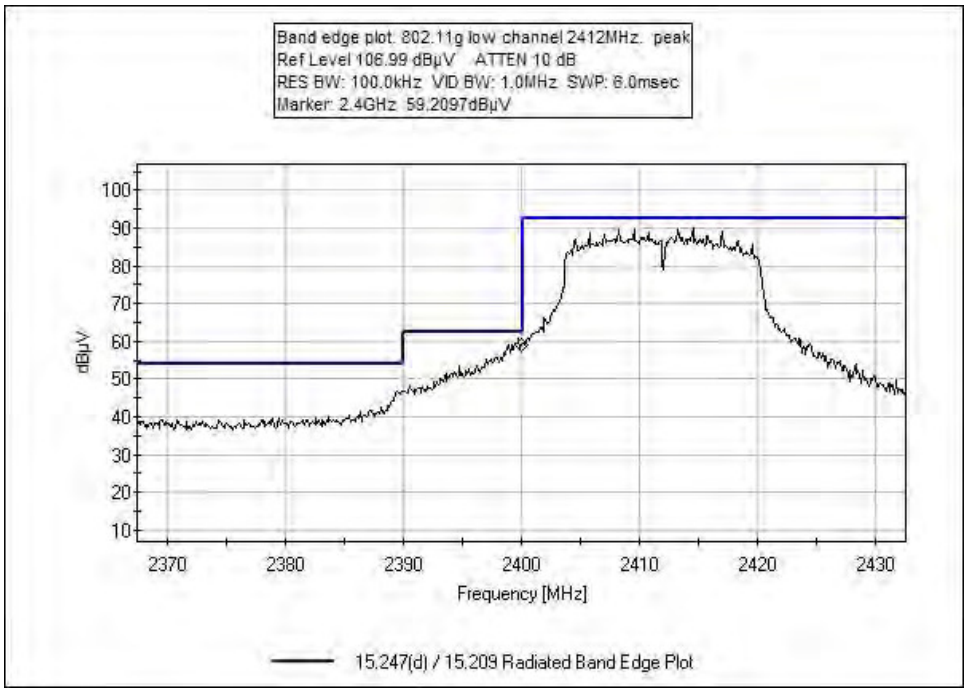
#	Freq	Rdng	T1 T5	T2 T6	T3 T7	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	2400.000M	52.2	+0.0 -39.6	+6.0 +0.7	+2.9 +10.1	+25.0	+0.0	57.3	63.9	-6.6	Vert
2	2483.500M Ave	35.5	+0.0 -39.7	+6.1 +0.7	+3.1 +10.1	+25.2	+0.0	41.0	54.0	-13.0	Vert
3	2390.000M Ave	34.0	+0.0 -39.6	+6.0 +0.7	+2.9 +10.1	+25.0	+0.0	39.1	54.0	-14.9	Vert

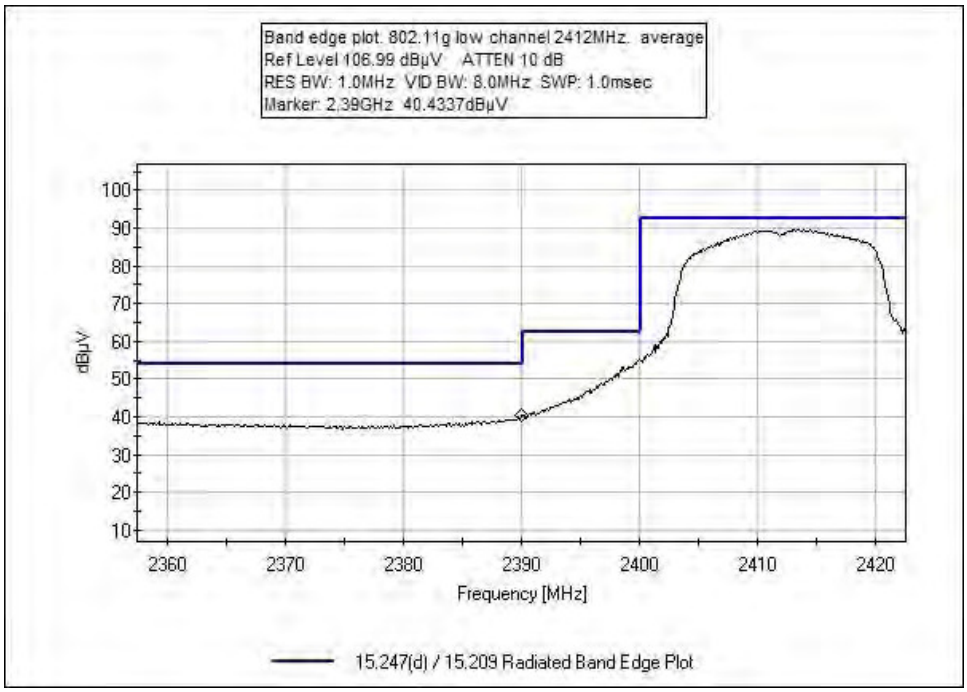
Band Edge Plots

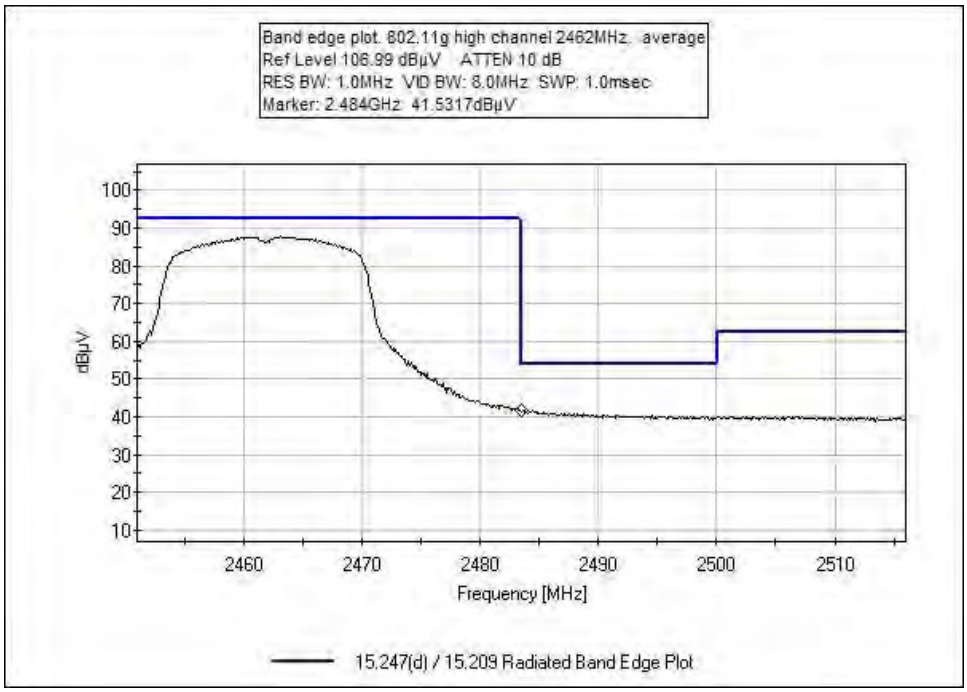


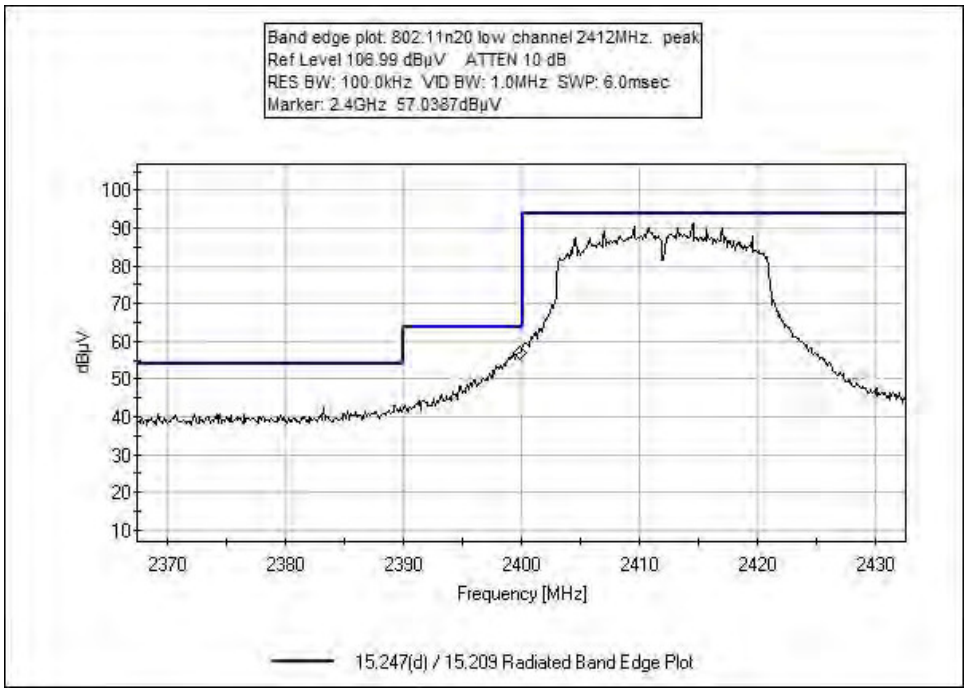


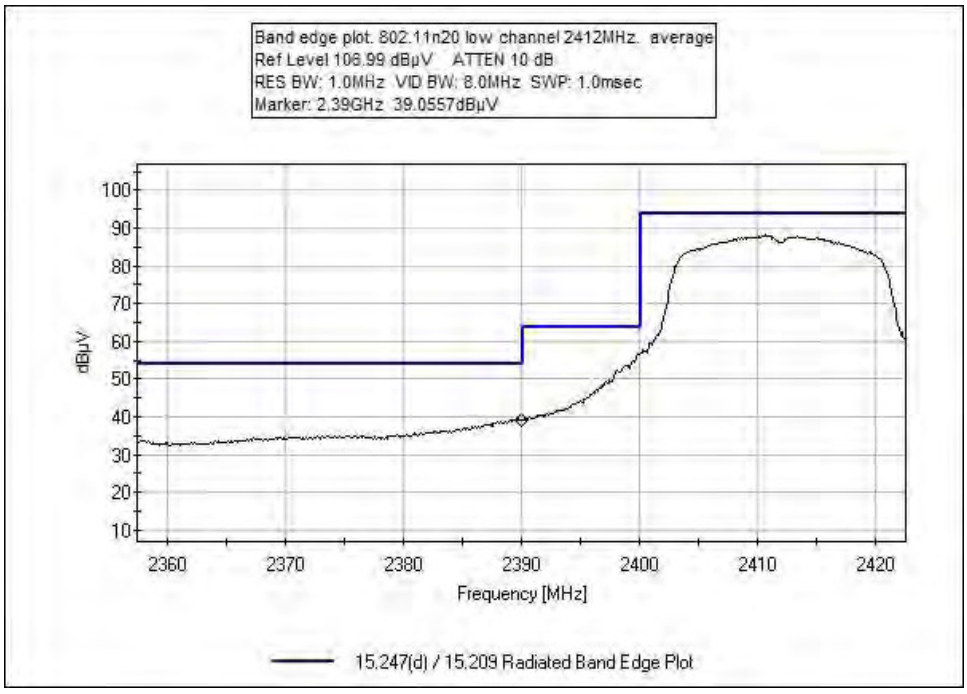

Band edge plot. 802.11b high channel 2462MHz. average
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 1.0MHz VID BW: 8.0MHz SWP: 1.0msec
Marker: 2.484GHz 44.3487dBµV
dBµV
Frequency [MHz]
15.247(d) / 15.209 Radiated Band Edge Plot

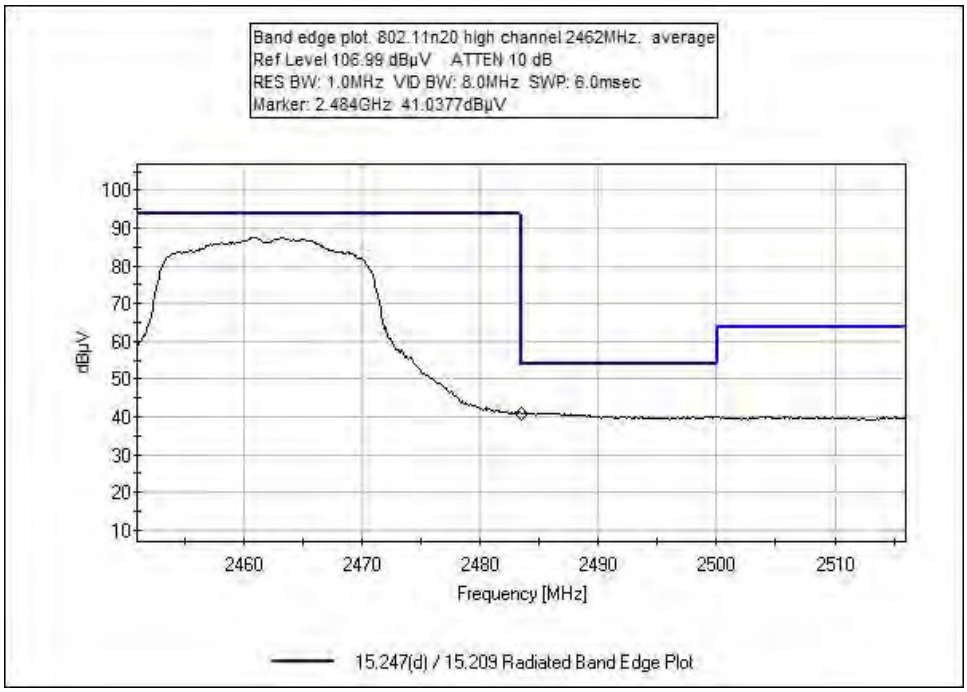

Band edge plot. 802.11g low channel 2412MHz. peak
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 100.0kHz VID BW: 1.0MHz SWP: 6.0msec
Marker: 2.4GHz 59.2097dBµV
dBµV
Frequency [MHz]
15.247(d) / 15.209 Radiated Band Edge Plot


Band edge plot. 802.11g low channel 2412MHz. average
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 1.0MHz VID BW: 8.0MHz SWP: 1.0msec
Marker: 2.39GHz 40.4337dBµV
dBµV
100
90
80
70
60
50
40
30
20
10
2360
2370
2380
2390
2400
2410
2420
Frequency [MHz]
15.247(d) / 15.209 Radiated Band Edge Plot


Band edge plot. 802.11g high channel 2462MHz. average
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 1.0MHz VID BW: 8.0MHz SWP: 1.0msec
Marker: 2.484GHz 41.5317dBµV
dBµV
100
90
80
70
60
50
40
30
20
10
2460
2470
2480
2490
2500
2510
Frequency [MHz]
15.247(d) / 15.209 Radiated Band Edge Plot


Band edge plot: 802.11n20 low channel 2412MHz. peak
Ref Level 108.99 dBµV ATTEN 10 dB
RES BW: 100.0kHz VID BW: 1.0MHz SWP: 6.0msec
Marker: 2.4GHz 57.0387dBµV
dBµV
Frequency [MHz]
15.247(d) / 15.209 Radiated Band Edge Plot


Band edge plot: 802.11n20 low channel 2412MHz. average
Ref Level 108.99 dBµV ATTEN 10 dB
RES BW: 1.0MHz VID BW: 8.0MHz SWP: 1.0msec
Marker: 2.39GHz 39.0557dBµV
dBµV
Frequency [MHz]
15.247(d) / 15.209 Radiated Band Edge Plot


Band edge plot. 802.11n20 high channel 2462MHz. average
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 1.0MHz VID BW: 8.0MHz SWP: 6.0msec
Marker: 2.484GHz 41.0377dBµV
100
90
80
70
60
50
40
30
20
10
dBµV
2460
2470
2480
2490
2500
2510
Frequency [MHz]
15.247(d) / 15.209 Radiated Band Edge Plot

Test Setup Photos

Below 1GHz

Above 1GHz

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 #:	**99771**	Date:	5/8/2017
Test Type:	**Conducted Emissions**	Time:	5:04:38 PM
Tested By:	S. Yamamoto	Sequence#:	9
Software:	EMITest 5.03.02		115V 60Hz

Equipment Tested:

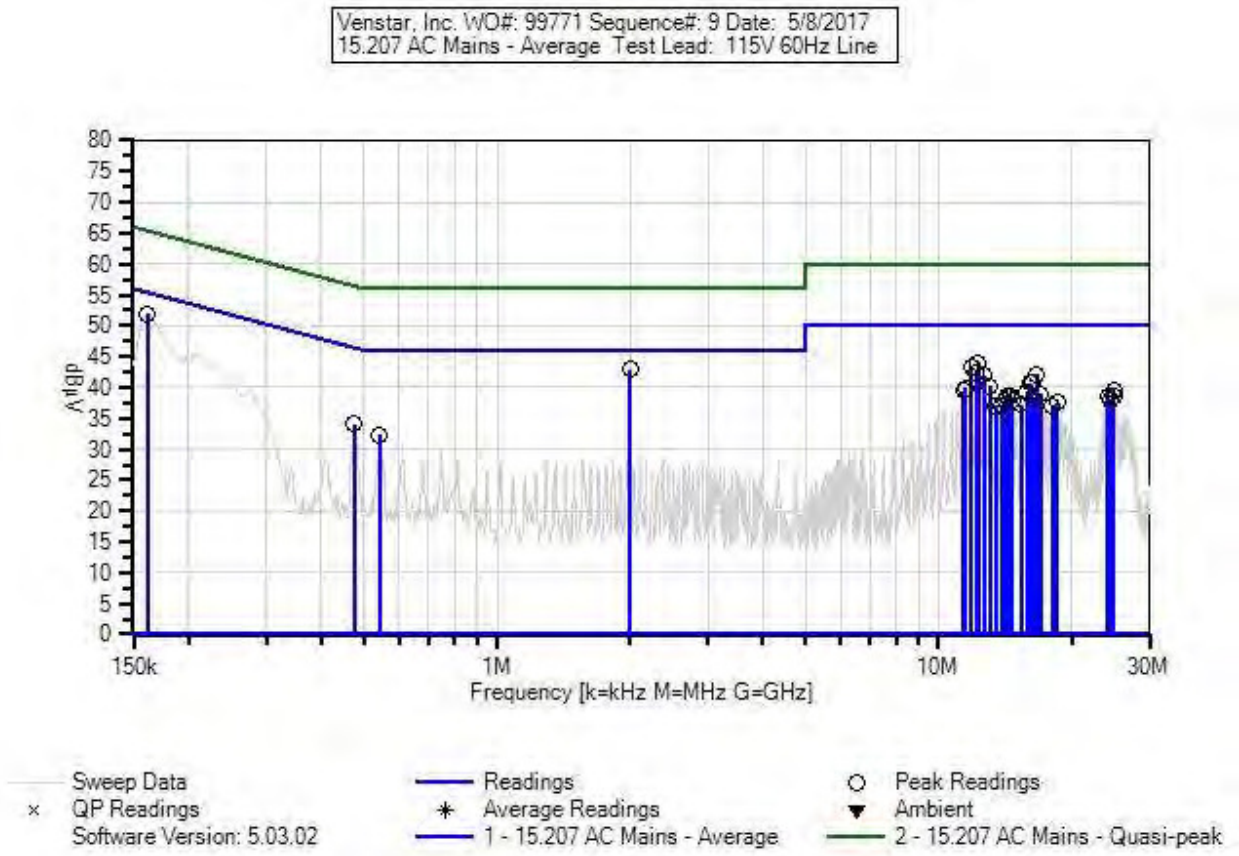
Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Frequency Range: 150kHz to 30MHz
Frequency tested: 2462MHz
Firmware power setting: 0
EUT firmware: 3.3.0.0-31.2.0.0.0-2.2.0.4
Protocol /MCS/Modulation: CCK
Antenna type: Chip
Antenna Gain: 1.9dBi.
Duty Cycle: >98%
Test Method: KDB 558074 D01 v04 2017
Test Mode: Continuous transmit
Test Setup: EUT with integral antenna.
Modifications Added: None
Setup: The equipment under test (EUT) is connected to the laptop computer via a serial to USB interface board.
The EUT was tested 802.11b.
Site D.
Temperature: 20°C
Relative Humidity: 35%


Venstar, Inc. WO#: 99771 Sequence#: 9 Date: 5/8/2017
15.207 AC Mains - Average Test Lead: 115V 60Hz Line
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
dBµV
150k
1M
10M
30M
Frequency [k=kHz M=MHz G=GHz]
Sweep Data
QP Readings
Software Version: 5.03.02
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
	AN02869	Spectrum Analyzer	E4440A	7/8/2016	7/8/2017
T1	AN02343	High Pass Filter	HE9615-150K-50-720B	1/25/2017	1/25/2019
T2	ANP01910	Cable	RG-142	11/30/2015	11/30/2017
T3	ANP06085	Attenuator	SA18N10W-09	11/14/2016	11/14/2018
T4	AN00847.1	50uH LISN-Line 1 (L1)	3816/2NM	3/14/2017	3/14/2018
	AN00847.1	50uH LISN-Line2 (L2)	3816/2NM	3/14/2017	3/14/2018
T5	ANP06986	Cable-Line 1(dB)	1m-extcord	5/12/2016	5/12/2018
	ANP06986	Cable-Line 2(dB)	1m-extcord	5/12/2016	5/12/2018

Measurement Data: Reading listed by margin. Test Lead: Line

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV	dBµV	dB	Ant
1	2.004M	37.1	+0.1 +0.1	+0.0	+5.7	+0.0	+0.0	43.0	46.0	-3.0	Line
2	161.635k	45.7	+0.5 +0.0	+0.0	+5.7	+0.0	+0.0	51.9	55.4	-3.5	Line
3	12.274M	37.4	+0.1 +0.6	+0.1	+5.8	+0.1	+0.0	44.1	50.0	-5.9	Line
4	11.878M	36.7	+0.1 +0.6	+0.1	+5.7	+0.1	+0.0	43.3	50.0	-6.7	Line
5	12.184M	35.8	+0.1 +0.6	+0.1	+5.7	+0.1	+0.0	42.4	50.0	-7.6	Line
6	16.634M	35.0	+0.1 +0.9	+0.1	+5.8	+0.2	+0.0	42.1	50.0	-7.9	Line
7	12.661M	35.2	+0.1 +0.6	+0.1	+5.8	+0.1	+0.0	41.9	50.0	-8.1	Line
8	16.121M	33.6	+0.1 +0.9	+0.1	+5.8	+0.2	+0.0	40.7	50.0	-9.3	Line
9	16.247M	33.6	+0.1 +0.9	+0.1	+5.8	+0.2	+0.0	40.7	50.0	-9.3	Line
10	13.067M	33.4	+0.1 +0.7	+0.1	+5.8	+0.1	+0.0	40.2	50.0	-9.8	Line
11	11.481M	33.3	+0.1 +0.6	+0.1	+5.7	+0.1	+0.0	39.9	50.0	-10.1	Line
12	24.936M	31.8	+0.2 +1.3	+0.2	+5.8	+0.2	+0.0	39.5	50.0	-10.5	Line
13	11.409M	32.9	+0.1 +0.6	+0.1	+5.7	+0.1	+0.0	39.5	50.0	-10.5	Line
14	15.833M	32.2	+0.1 +0.9	+0.1	+5.8	+0.2	+0.0	39.3	50.0	-10.7	Line
15	17.031M	31.7	+0.1 +1.0	+0.1	+5.8	+0.2	+0.0	38.9	50.0	-11.1	Line
16	24.141M	31.1	+0.2 +1.3	+0.2	+5.7	+0.2	+0.0	38.7	50.0	-11.3	Line

17	14.562M	31.8	+0.1 +0.8	+0.1	+5.8	+0.1	+0.0	38.7	50.0	-11.3	Line
18	24.957M	30.9	+0.2 +1.3	+0.2	+5.8	+0.2	+0.0	38.6	50.0	-11.4	Line
19	14.247M	31.8	+0.1 +0.7	+0.1	+5.8	+0.1	+0.0	38.6	50.0	-11.4	Line
20	14.652M	31.1	+0.1 +0.8	+0.1	+5.8	+0.1	+0.0	38.0	50.0	-12.0	Line
21	24.580M	30.3	+0.2 +1.3	+0.2	+5.8	+0.2	+0.0	38.0	50.0	-12.0	Line
22	14.148M	31.1	+0.1 +0.7	+0.1	+5.8	+0.1	+0.0	37.9	50.0	-12.1	Line
23	16.517M	30.7	+0.1 +0.9	+0.1	+5.8	+0.2	+0.0	37.8	50.0	-12.2	Line
24	475.061k	28.1	+0.2 +0.0	+0.0	+5.7	+0.0	+0.0	34.0	46.4	-12.4	Line
25	18.598M	30.4	+0.1 +1.0	+0.1	+5.7	+0.2	+0.0	37.5	50.0	-12.5	Line
26	15.346M	30.4	+0.1 +0.8	+0.1	+5.8	+0.1	+0.0	37.3	50.0	-12.7	Line
27	18.121M	30.0	+0.1 +1.0	+0.1	+5.7	+0.2	+0.0	37.1	50.0	-12.9	Line
28	13.860M	30.3	+0.1 +0.7	+0.1	+5.8	+0.1	+0.0	37.1	50.0	-12.9	Line
29	13.463M	30.2	+0.1 +0.7	+0.1	+5.8	+0.1	+0.0	37.0	50.0	-13.0	Line
30	542.691k	26.4	+0.2 +0.0	+0.0	+5.7	+0.0	+0.0	32.3	46.0	-13.7	Line

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 #:	**99771**	Date:	5/8/2017
Test Type:	**Conducted Emissions**	Time:	17:12:42
Tested By:	S. Yamamoto	Sequence#:	10
Software:	EMITest 5.03.02		115V 60Hz

Equipment Tested:

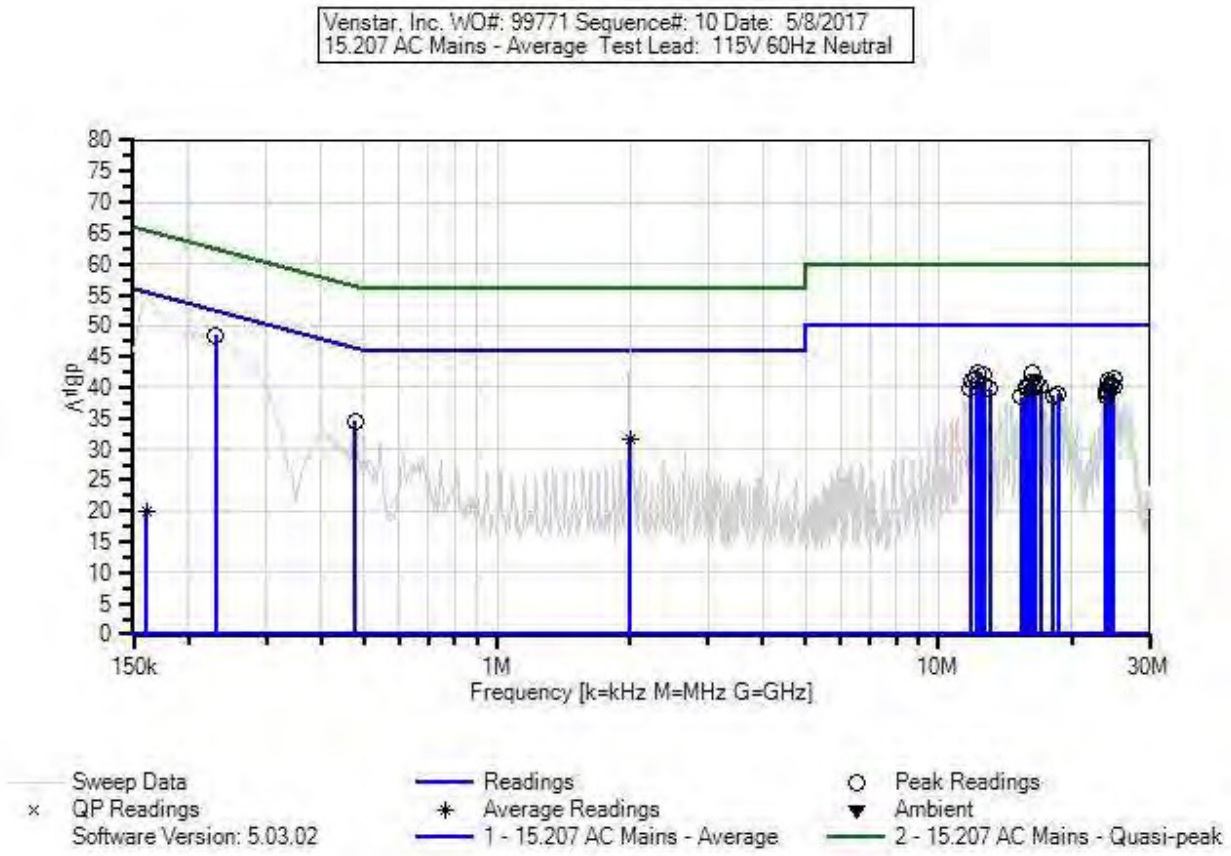
Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Frequency Range: 150kHz to 30MHz
Frequency tested: 2462MHz
Firmware power setting: 0
EUT firmware: 3.3.0.0-31.2.0.0.0-2.2.0.4
Protocol /MCS/Modulation: CCK
Antenna type: Chip
Antenna Gain: 1.9dBi.
Duty Cycle: >98%
Test Method: KDB 558074 D01 v04
Test Mode: Continuous transmit
Test Setup: EUT with integral antenna.
Modifications Added: None
Setup: The equipment under test (EUT) is connected to the laptop computer via a serial to USB interface board.
The EUT was tested 802.11b.
Site D.
Temperature: 20°C
Relative Humidity: 35%


Venstar, Inc. WO#: 99771 Sequence#: 10 Date: 5/8/2017
15.207 AC Mains - Average Test Lead: 115V 60Hz Neutral
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
dBµV
150k
1M
10M
30M
Frequency [k=kHz M=MHz G=GHz]
Sweep Data
QP Readings
Software Version: 5.03.02
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
	AN02869	Spectrum Analyzer	E4440A	7/8/2016	7/8/2017
T1	AN02343	High Pass Filter	HE9615-150K-50-720B	1/25/2017	1/25/2019
T2	ANP01910	Cable	RG-142	11/30/2015	11/30/2017
T3	ANP06085	Attenuator	SA18N10W-09	11/14/2016	11/14/2018
	AN00847.1	50uH LISN-Line 1 (L1)	3816/2NM	3/14/2017	3/14/2018
T4	AN00847.1	50uH LISN-Line2 (L2)	3816/2NM	3/14/2017	3/14/2018
	ANP06986	Cable-Line 1(dB)	1m-extcord	5/12/2016	5/12/2018
T5	ANP06986	Cable-Line 2(dB)	1m-extcord	5/12/2016	5/12/2018

Measurement Data: Reading listed by margin. Test Lead: Neutral

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV	dBµV	dB	Ant
1	230.719k	42.5	+0.2 +0.0	+0.0	+5.7	+0.0	+0.0	48.4	52.4	-4.0	Neutr
2	12.283M	35.7	+0.1 +0.6	+0.1	+5.8	+0.2	+0.0	42.5	50.0	-7.5	Neutr
3	16.247M	35.2	+0.1 +0.9	+0.1	+5.8	+0.2	+0.0	42.3	50.0	-7.7	Neutr
4	12.670M	35.1	+0.1 +0.6	+0.1	+5.8	+0.2	+0.0	41.9	50.0	-8.1	Neutr
5	24.943M	33.7	+0.2 +1.3	+0.2	+5.8	+0.3	+0.0	41.5	50.0	-8.5	Neutr
6	12.193M	34.6	+0.1 +0.6	+0.1	+5.7	+0.2	+0.0	41.3	50.0	-8.7	Neutr
7	11.887M	34.5	+0.1 +0.6	+0.1	+5.7	+0.2	+0.0	41.2	50.0	-8.8	Neutr
8	24.141M	33.3	+0.2 +1.3	+0.2	+5.7	+0.3	+0.0	41.0	50.0	-9.0	Neutr
9	16.616M	33.6	+0.1 +0.9	+0.1	+5.8	+0.2	+0.0	40.7	50.0	-9.3	Neutr
10	16.121M	33.6	+0.1 +0.9	+0.1	+5.8	+0.2	+0.0	40.7	50.0	-9.3	Neutr
11	12.589M	33.8	+0.1 +0.6	+0.1	+5.8	+0.2	+0.0	40.6	50.0	-9.4	Neutr
12	24.532M	32.6	+0.2 +1.3	+0.2	+5.8	+0.3	+0.0	40.4	50.0	-9.6	Neutr
13	24.388M	32.6	+0.2 +1.3	+0.2	+5.7	+0.3	+0.0	40.3	50.0	-9.7	Neutr
14	17.040M	33.0	+0.1 +1.0	+0.1	+5.8	+0.2	+0.0	40.2	50.0	-9.8	Neutr
15	15.743M	33.0	+0.1 +0.9	+0.1	+5.8	+0.2	+0.0	40.1	50.0	-9.9	Neutr
16	24.895M	32.3	+0.2 +1.3	+0.2	+5.8	+0.3	+0.0	40.1	50.0	-9.9	Neutr

17	16.526M	32.9	+0.1 +0.9	+0.1	+5.8	+0.2	+0.0	40.0	50.0	-10.0	Neutr
18	15.842M	32.7	+0.1 +0.9	+0.1	+5.8	+0.2	+0.0	39.8	50.0	-10.2	Neutr
19	11.806M	33.1	+0.1 +0.6	+0.1	+5.7	+0.2	+0.0	39.8	50.0	-10.2	Neutr
20	13.085M	32.8	+0.1 +0.7	+0.1	+5.8	+0.2	+0.0	39.7	50.0	-10.3	Neutr
21	23.922M	31.7	+0.2 +1.3	+0.2	+5.7	+0.3	+0.0	39.4	50.0	-10.6	Neutr
22	23.963M	31.6	+0.2 +1.3	+0.2	+5.7	+0.3	+0.0	39.3	50.0	-10.7	Neutr
23	24.039M	31.6	+0.2 +1.3	+0.2	+5.7	+0.3	+0.0	39.3	50.0	-10.7	Neutr
24	18.607M	31.8	+0.1 +1.0	+0.1	+5.7	+0.2	+0.0	38.9	50.0	-11.1	Neutr
25	23.977M	31.0	+0.2 +1.3	+0.2	+5.7	+0.3	+0.0	38.7	50.0	-11.3	Neutr
26	18.211M	31.5	+0.1 +1.0	+0.1	+5.7	+0.2	+0.0	38.6	50.0	-11.4	Neutr
27	15.346M	31.5	+0.1 +0.8	+0.1	+5.8	+0.2	+0.0	38.5	50.0	-11.5	Neutr
28	475.788k	28.7	+0.2 +0.0	+0.0	+5.7	+0.0	+0.0	34.6	46.4	-11.8	Neutr
29 Ave	2.004M	25.6	+0.1 +0.1	+0.0	+5.7	+0.0	+0.0	31.5	46.0	-14.5	Neutr
^	2.004M	40.7	+0.1 +0.1	+0.0	+5.7	+0.0	+0.0	46.6	46.0	+0.6	Neutr
31 Ave	160.908k	13.6	+0.5 +0.0	+0.0	+5.7	+0.0	+0.0	19.8	55.4	-35.6	Neutr
^	160.908k	48.3	+0.5 +0.0	+0.0	+5.7	+0.0	+0.0	54.5	55.4	-0.9	Neutr

Test Setup Photo

SUPPLEMENTAL INFORMATION

Measurement Uncertainty

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

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

Emissions Test Details

TESTING PARAMETERS

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

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

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

CORRECTION FACTORS

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

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

TEST INSTRUMENTATION AND ANALYZER SETTINGS

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

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

SPECTRUM ANALYZER/RECEIVER DETECTOR FUNCTIONS

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

Peak

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

Quasi-Peak

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

Average

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