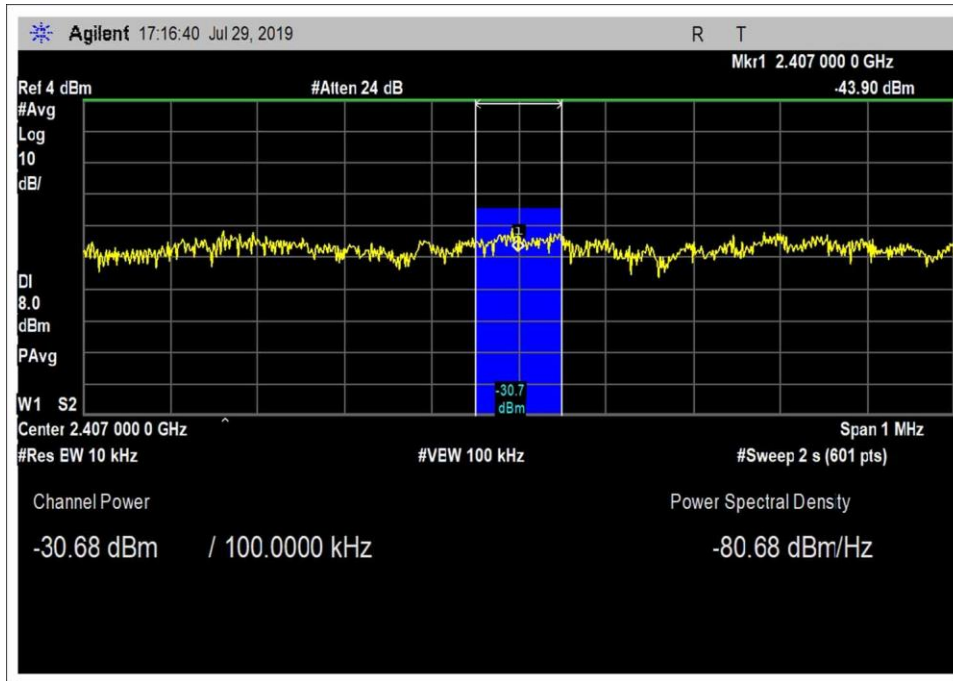
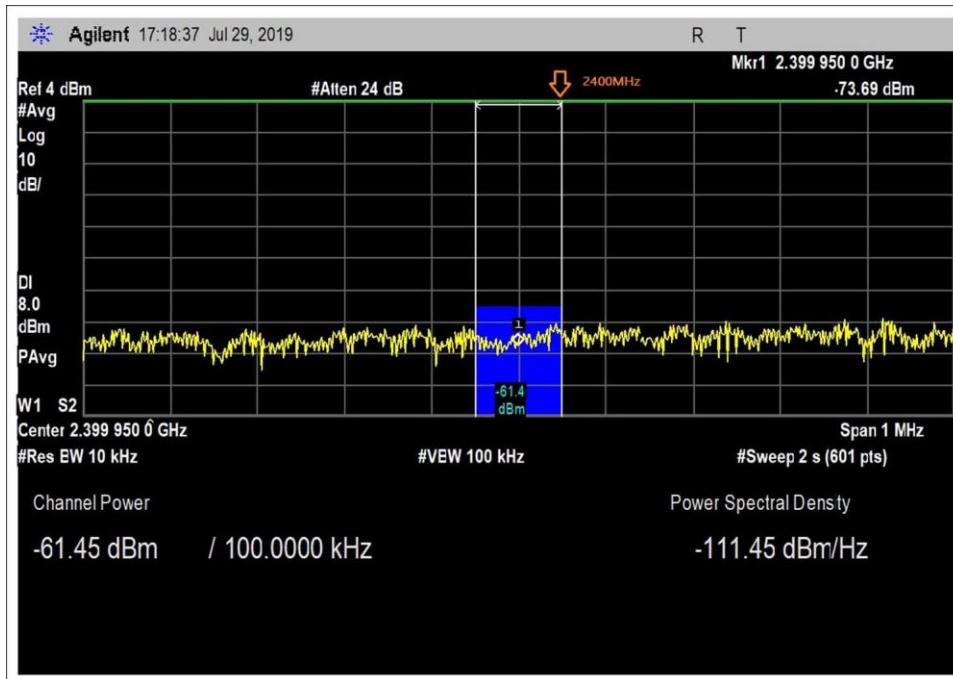


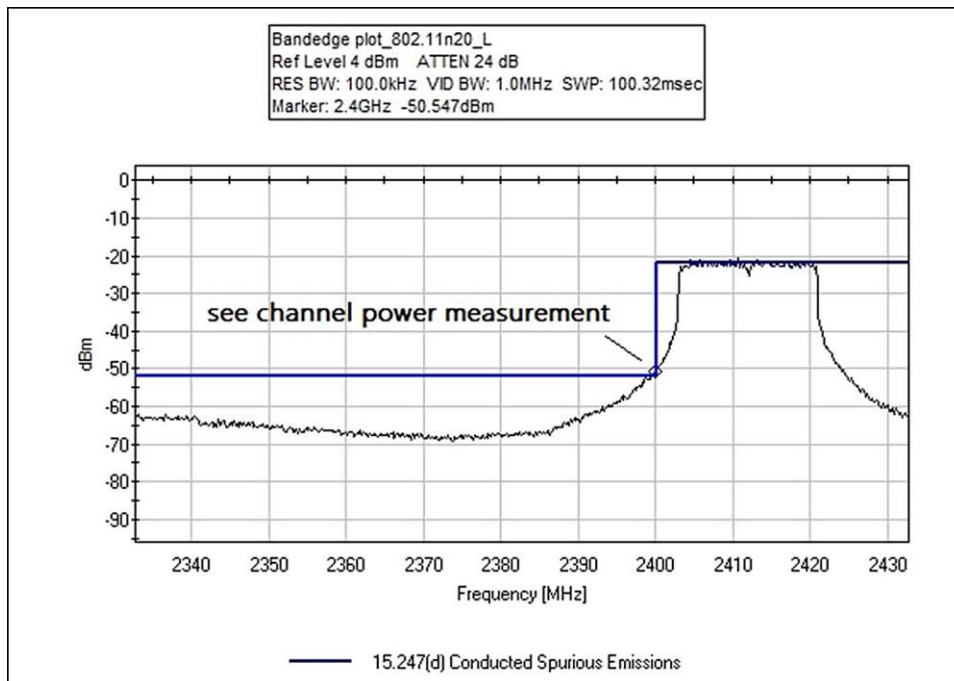
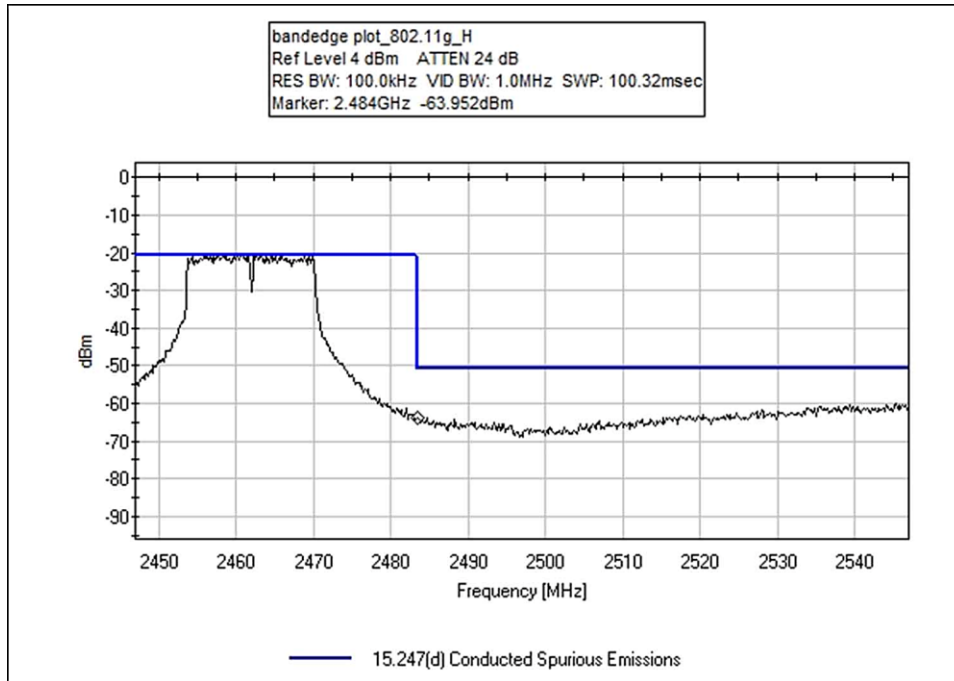
802.11g, Low Channel – Fundamental #1

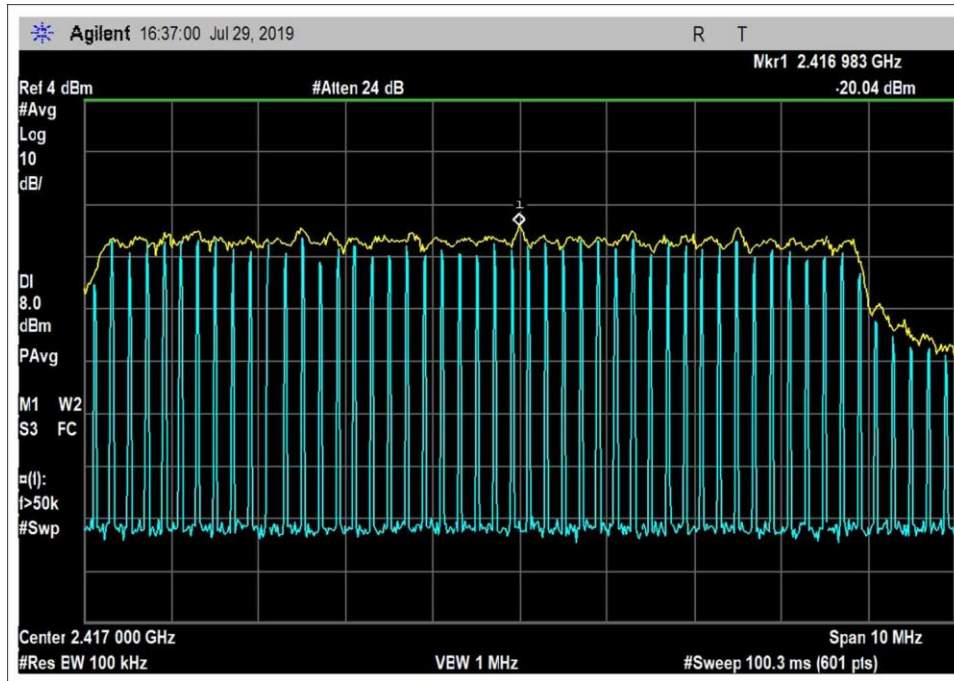


802.11g, Low Channel – Fundamental #2

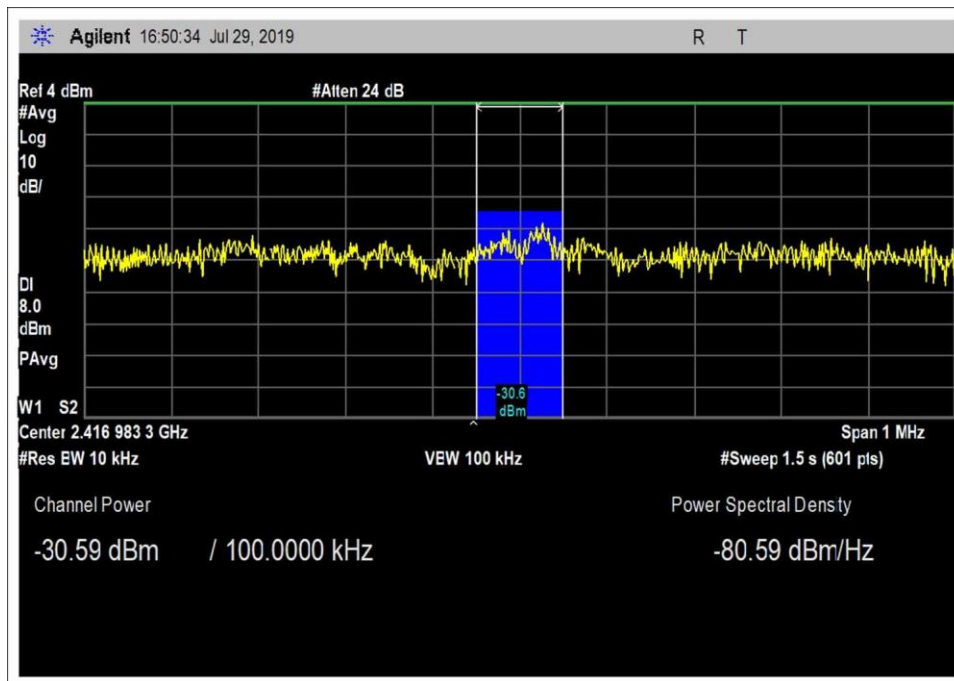


802.11g, Low Channel

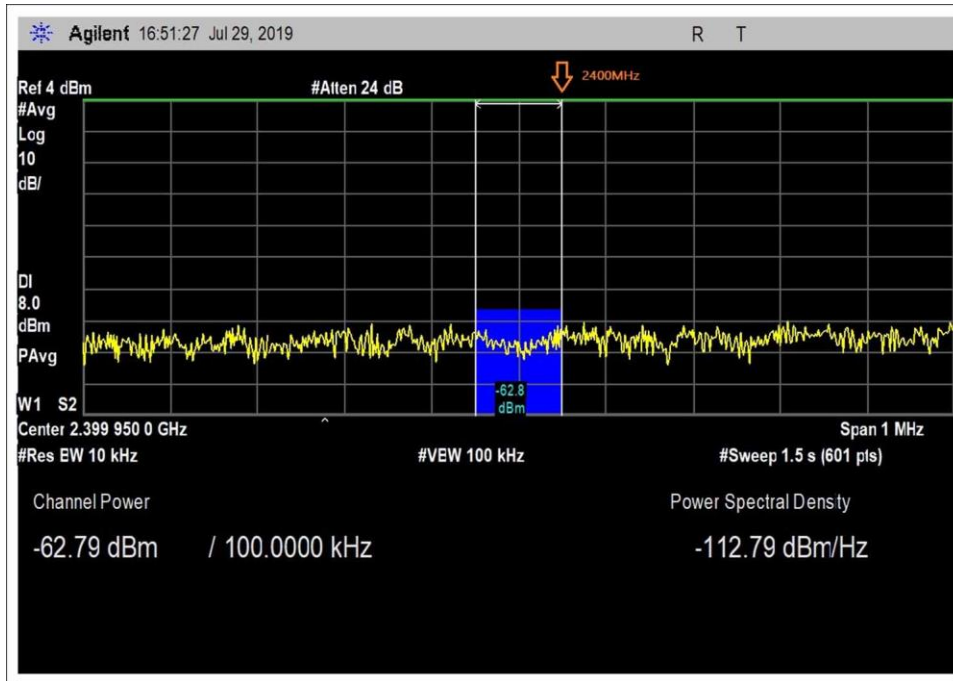




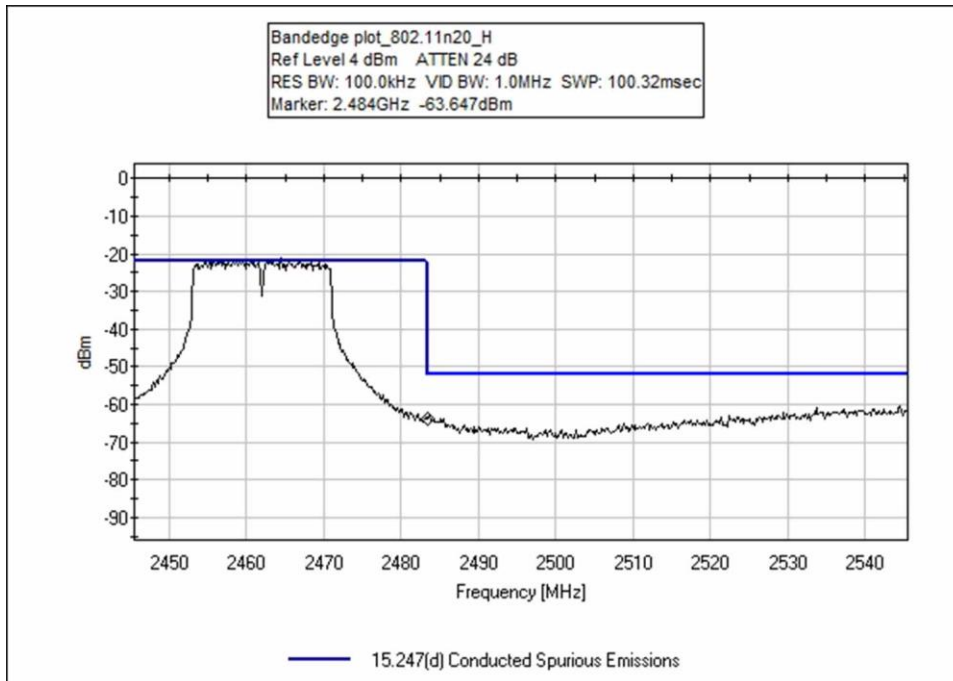
802.11n20, Low Channel – Fundamental #1



802.11n20, Low Channel – Fundamental #2



802.11n20, Low Channel



**Test Setup / Conditions / Data**

Test Location: CKC Laboratories, Inc. • 110 N. Olinda Place • Brea, CA • 714 993 6112  
 Customer: **Venstar, Inc.**  
 Specification: **15.247(d) Conducted Spurious Emissions**  
 Work Order #: **102914** Date: 7/30/2019  
 Test Type: **Conducted Emissions** Time: 08:58:53  
 Tested By: E. Wong Sequence#: 1  
 Software: EMITest 5.03.12 120/60Hz

**Equipment Tested:**

Device	Manufacturer	Model #	S/N
Configuration 1			

**Support Equipment:**

Device	Manufacturer	Model #	S/N
Configuration 1			

**Test Conditions / Notes:**

The EUT is placed on test bench, connected to a laptop. The Laptop is running TI CC31XX/CC32XX Radio Tool V 1.0.3.11 to place the EUT in test mode.

Freq range: 2400-2483.5MHz

Freq: 2412- 2462 MHz  
 Protocol: 802.11 b/g/n20

Packet size 1400 byte (max) infinite packet (0), delay 2 ms (worst case setting)  
 Firmware Power setting listed below: range 0-15, 0 is max power setting.

802.11 b	2412, 2442, 2462	0,0,0
802.11 g	2412, 2442, 2462	1,0,0
802.11n20	2412, 2442, 2462	0,0,0

The EUT has integral antenna however, conducted measurement was made with RF antenna test port.

Frequency range of measurement = Fundamental

Test environment conditions:  
 Temperature: 25°C  
 Relative Humidity: 58%  
 Atmospheric Pressure: 98.9kPa

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

558074 D01 15.247 Meas Guidance v05r02April 2, 2019

Includes measurement made with channel power integrated in 100kHz segment with reduced RBW.

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02672	Spectrum Analyzer	E4446A	3/13/2019	3/13/2021
T2	AN03430	Attenuator	75A-10-12	12/19/2017	12/19/2019
T3	ANP07246	Cable	32022-29094K-29094K-24TC	7/5/2018	7/5/2020

**Measurement Data:**

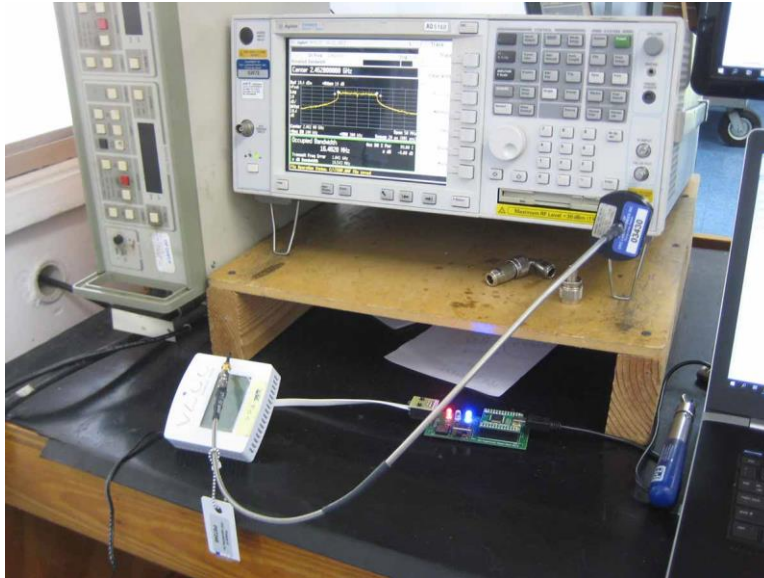
Reading listed by margin.

Test Lead: Antenna port

#	Freq MHz	Rdng dB $\mu$ V	T1 dB	T2 dB	T3 dB	Dist Table dB	Corr dBm	Spec dBm	Margin dB	Polar Ant
1	2414.500M	-20.5	+0.0	+10.1	+0.3	+0.0	-10.1	-10.1	+0.0	Anten
								802.11g_Fundamental		
2	2416.983M	-30.6	+0.0	+10.1	+0.3	+0.0	-20.2	-20.2	+0.0	Anten
								802.11n20_L_channel power_fundamental		
3	2407.000M	-30.7	+0.0	+10.1	+0.3	+0.0	-20.3	-20.3	+0.0	Anten
								802.11g_channel power_fundamental_L_Pset1		
4	2412.670M	-12.6	+0.0	+10.1	+0.3	+0.0	-2.2	-2.2	+0.0	Anten
								802.11b_Fundamental		
5	2399.950M	-61.4	+0.0	+10.1	+0.3	+0.0	-51.0	-50.3	-0.7	Anten
								802.11g_channel power_L_Pset1		
6	2399.950M	-62.2	+0.0	+10.1	+0.3	+0.0	-51.8	-50.2	-1.6	Anten
								802.11n20_L_channel power_L		
7	2483.500M	-63.6	+0.0	+10.2	+0.3	+0.0	-53.1	-41.4	-11.7	Anten
								802.11n20_H		
8	2400.000M	-55.7	+0.0	+10.1	+0.3	+0.0	-45.3	-32.3	-13.0	Anten
								802.11b_L		
9	2483.500M	-64.0	+0.0	+10.2	+0.3	+0.0	-53.5	-40.1	-13.4	Anten
								802.11g_H		
10	2483.500M	-60.8	+0.0	+10.2	+0.3	+0.0	-50.3	-32.3	-18.0	Anten
								802.11b_H		



**Test Setup Photo**





## 15.247(d) Radiated Emissions & Band Edge

### Test Setup / Conditions / Data

Test Location: CKC Laboratories, Inc. • 110 N. Olinda Place • Brea, CA • 714 993 6112  
 Customer: **Venstar, Inc.**  
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**  
 Work Order #: **102914** Date: 7/31/2019  
 Test Type: **Maximized Emissions** Time: 13:49:53  
 Tested By: S. Yamamoto Sequence#: 7  
 Software: EMITest 5.03.12

#### Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

#### Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

#### Test Conditions / Notes:

The EUT is placed on test bench, connected to a laptop. The Laptop is running TI CC31XX/CC32XX Radio Tool V 1.0.3.11 to place the EUT in test mode.

Freq range of test: 9kHz to 25GHz. RBW=100kHz, VBW=1MHz

Freq range of EUT: 2412MHz to 2462 MHz

Protocol: 802.11 b/g/n20

Packet size 1400 byte (max) infinite packet (0), delay 2 ms (worst case setting)

Firmware Power setting listed below: 0 is max power setting.

802.11bgn20 2412, 2442, 2462 0,0,0

The power setting for radiated measurement differs from conducted measurement. Product is to be certified with power setting used for conducted measurement.

The test data represents worst case emissions for the investigated operational modes.

Test environment conditions:

Temperature: 23°C

Relative Humidity: 52%

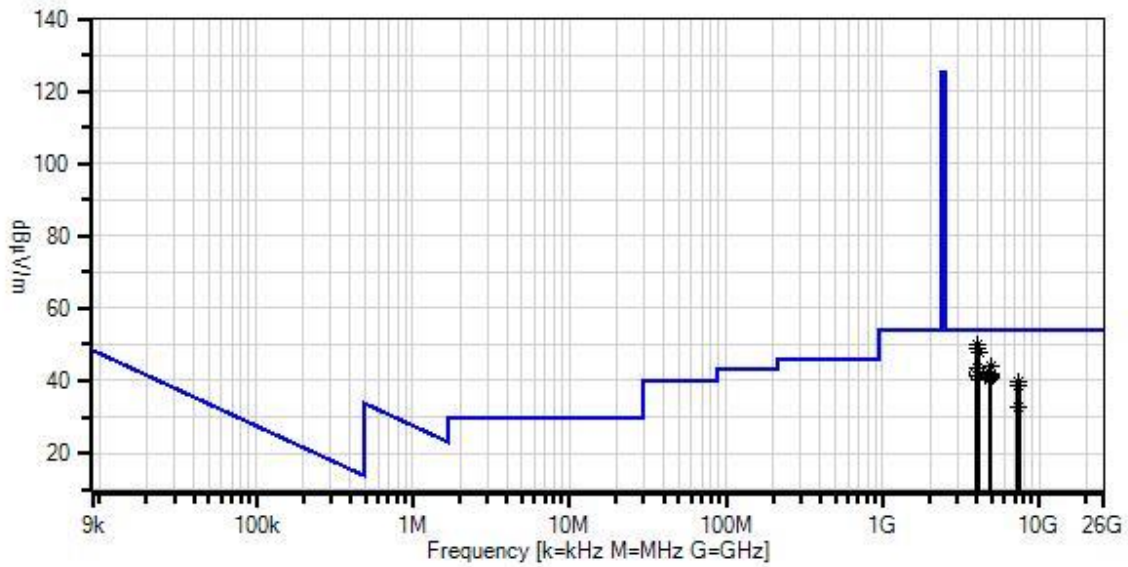
Atmospheric Pressure: 99kPa

All data rates / modulation types were evaluated during preliminary investigation.

ANSI C63.10 2013

558074 D01 15.247 Meas Guidance v05r02 April 2, 2019

Venstar, Inc. WO#: 102914 Sequence#: 7 Date: 7/31/2019  
 15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Horiz



- Readings
- × QP Readings
- ▼ Ambient
- 1 - 15.247(d) / 15.209 Radiated Spurious Emissions

- Peak Readings
  - \* Average Readings
- Software Version: 5.03.12

**Test Equipment:**

ID	Asset #	Description	Model	Cal Date	Cal Due Date
T1	AN02672	Spectrum Analyzer	E4446A	3/13/2019	3/13/2021
T2	ANP07139	Cable	ANDL1-PNMNM-48	3/4/2019	3/4/2021
T3	AN00786	Preamp	83017A	5/12/2018	5/12/2020
T4	ANP07244	Cable	32022-29094K-29094K-24TC	7/5/2018	7/5/2020
T5	AN03385	High Pass Filter	11SH10-3000/T10000-O/O	5/13/2019	5/13/2021
T6	AN00849	Horn Antenna	3115	3/14/2018	3/14/2020
	AN01413	Horn Antenna-ANSI C63.5 (dB/m)	84125-80008	10/17/2018	10/17/2020
	AN00314	Loop Antenna	6502	5/13/2018	5/13/2020
	ANP05050	Cable	RG223/U	12/24/2018	12/24/2020
	AN00309	Preamp	8447D	2/19/2018	2/19/2020
	ANP05198	Cable-Amplitude -15C to +15dC (dB)	8268	12/4/2018	12/4/2020
	ANP05198	Cable-Amplitude +15C to +45C (dB)	8268	12/4/2018	12/4/2020
	ANP05275	Attenuator	1W	4/5/2018	4/5/2020
	AN01995	Biconilog Antenna	CBL6111C	4/23/2018	4/23/2020

**Measurement Data:**

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dB $\mu$ V	T1 T5 dB	T2 T6 dB	T3 dB	T4 dB	Dist Table	Corr dB $\mu$ V/m	Spec dB $\mu$ V/m	Margin dB	Polar Ant
1	4019.800M Ave	50.1	+0.0 +0.5	+4.2 +32.8	-38.1	+0.7	+0.0	50.2	54.0	-3.8	Horiz
^	4019.800M	60.7	+0.0 +0.5	+4.2 +32.8	-38.1	+0.7	+0.0	60.8	54.0	+6.8	Horiz
3	4070.000M Ave	48.8	+0.0 +0.5	+4.3 +32.5	-38.0	+0.7	+0.0	48.8	54.0	-5.2	Horiz
^	4070.000M	58.0	+0.0 +0.5	+4.3 +32.5	-38.0	+0.7	+0.0	58.0	54.0	+4.0	Horiz
5	4103.500M Ave	47.8	+0.0 +0.5	+4.4 +32.3	-38.0	+0.7	+0.0	47.7	54.0	-6.3	Horiz
^	4103.500M	56.8	+0.0 +0.5	+4.4 +32.3	-38.0	+0.7	+0.0	56.7	54.0	+2.7	Horiz
7	4924.000M Ave	42.4	+0.0 +0.3	+4.8 +33.6	-37.6	+0.5	+0.0	44.0	54.0	-10.0	Horiz
^	4924.000M	54.1	+0.0 +0.3	+4.8 +33.6	-37.6	+0.5	+0.0	55.7	54.0	+1.7	Horiz
9	4070.000M Ave	43.5	+0.0 +0.5	+4.3 +32.5	-38.0	+0.7	+0.0	43.5	54.0	-10.5	Vert
^	4070.000M	53.8	+0.0 +0.5	+4.3 +32.5	-38.0	+0.7	+0.0	53.8	54.0	-0.2	Vert

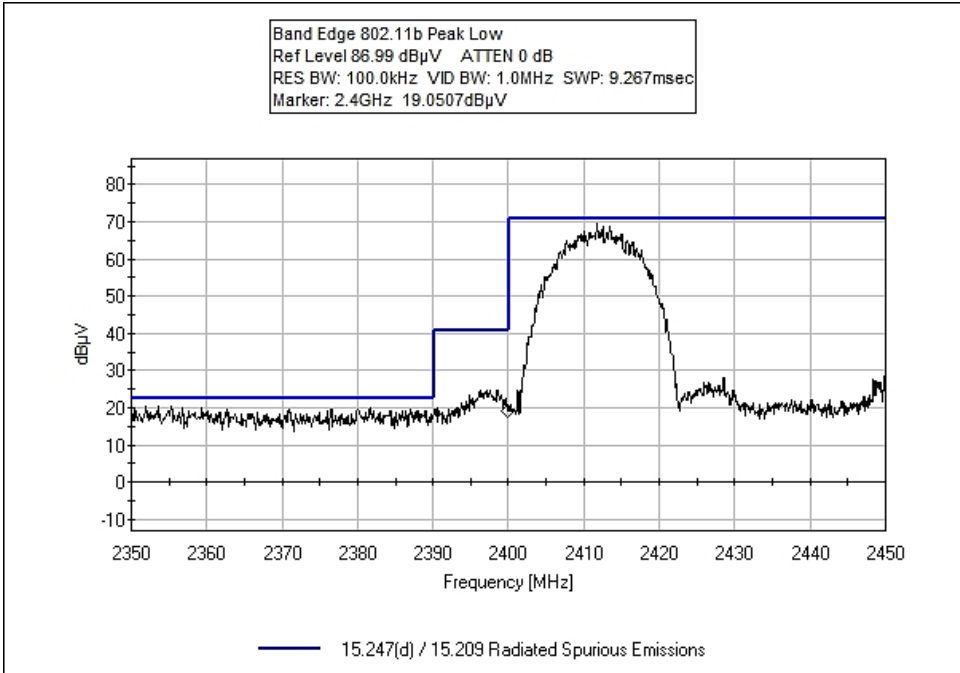
11	4924.000M Ave	40.3	+0.0 +0.3	+4.8 +33.6	-37.6	+0.5	+0.0	41.9	54.0	-12.1	Vert
^	4924.000M	52.6	+0.0 +0.3	+4.8 +33.6	-37.6	+0.5	+0.0	54.2	54.0	+0.2	Vert
13	4019.800M	41.8	+0.0 +0.5	+4.2 +32.8	-38.1	+0.7	+0.0	41.9	54.0	-12.1	Vert
14	4884.000M Ave	40.1	+0.0 +0.3	+4.8 +33.5	-37.6	+0.5	+0.0	41.6	54.0	-12.4	Horiz
^	4884.000M	52.4	+0.0 +0.3	+4.8 +33.5	-37.6	+0.5	+0.0	53.9	54.0	-0.1	Horiz
16	4103.500M Ave	41.4	+0.0 +0.5	+4.4 +32.3	-38.0	+0.7	+0.0	41.3	54.0	-12.7	Vert
^	4103.500M	53.0	+0.0 +0.5	+4.4 +32.3	-38.0	+0.7	+0.0	52.9	54.0	-1.1	Vert
18	4824.000M Ave	39.4	+0.0 +0.3	+4.8 +33.4	-37.6	+0.6	+0.0	40.9	54.0	-13.1	Horiz
^	4824.000M	51.3	+0.0 +0.3	+4.8 +33.4	-37.6	+0.6	+0.0	52.8	54.0	-1.2	Horiz
20	4884.000M Ave	39.2	+0.0 +0.3	+4.8 +33.5	-37.6	+0.5	+0.0	40.7	54.0	-13.3	Vert
^	4884.000M	51.4	+0.0 +0.3	+4.8 +33.5	-37.6	+0.5	+0.0	52.9	54.0	-1.1	Vert
22	4824.000M Ave	38.6	+0.0 +0.3	+4.8 +33.4	-37.6	+0.6	+0.0	40.1	54.0	-13.9	Vert
^	4824.000M	49.9	+0.0 +0.3	+4.8 +33.4	-37.6	+0.6	+0.0	51.4	54.0	-2.6	Vert
24	7326.000M Ave	34.8	+0.0 +0.2	+5.9 +36.0	-37.4	+0.2	+0.0	39.7	54.0	-14.3	Horiz
^	7326.000M	44.2	+0.0 +0.2	+5.9 +36.0	-37.4	+0.2	+0.0	49.1	54.0	-4.9	Horiz
26	7386.000M Ave	33.5	+0.0 +0.2	+5.9 +36.2	-37.4	+0.3	+0.0	38.7	54.0	-15.3	Horiz
^	7386.000M	46.1	+0.0 +0.2	+5.9 +36.2	-37.4	+0.3	+0.0	51.3	54.0	-2.7	Horiz
28	7326.000M Ave	27.8	+0.0 +0.2	+5.9 +36.0	-37.4	+0.2	+0.0	32.7	54.0	-21.3	Vert
^	7326.000M	37.6	+0.0 +0.2	+5.9 +36.0	-37.4	+0.2	+0.0	42.5	54.0	-11.5	Vert

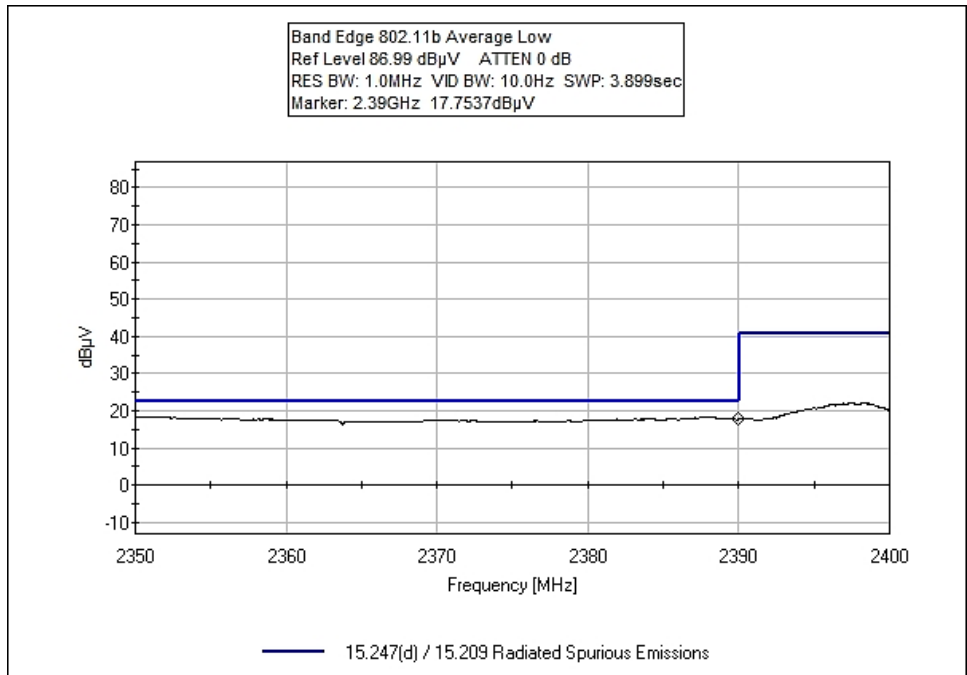
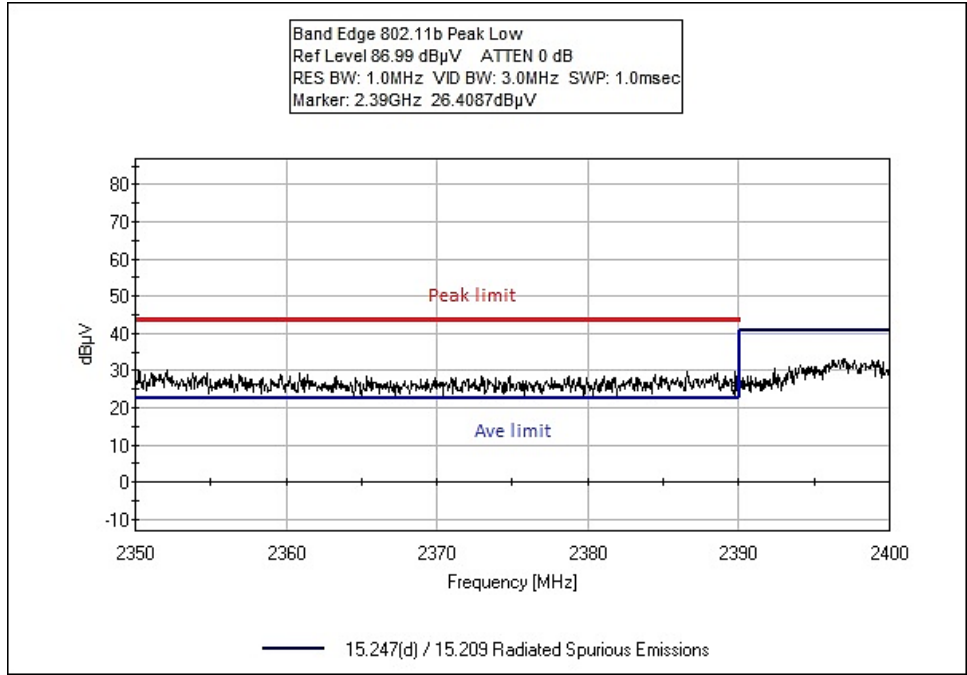
**Band Edge**

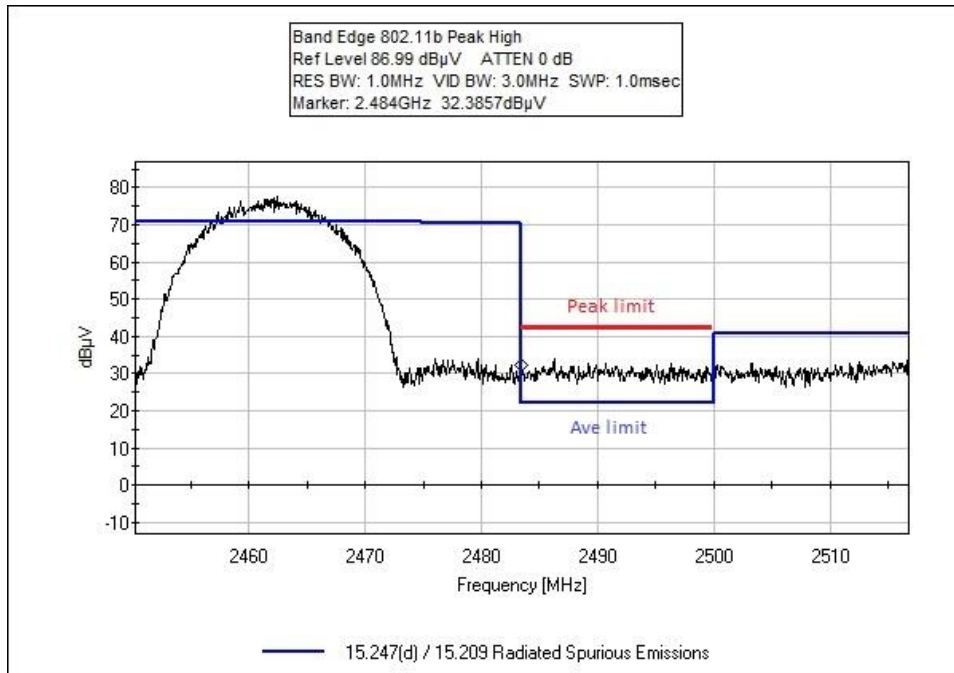
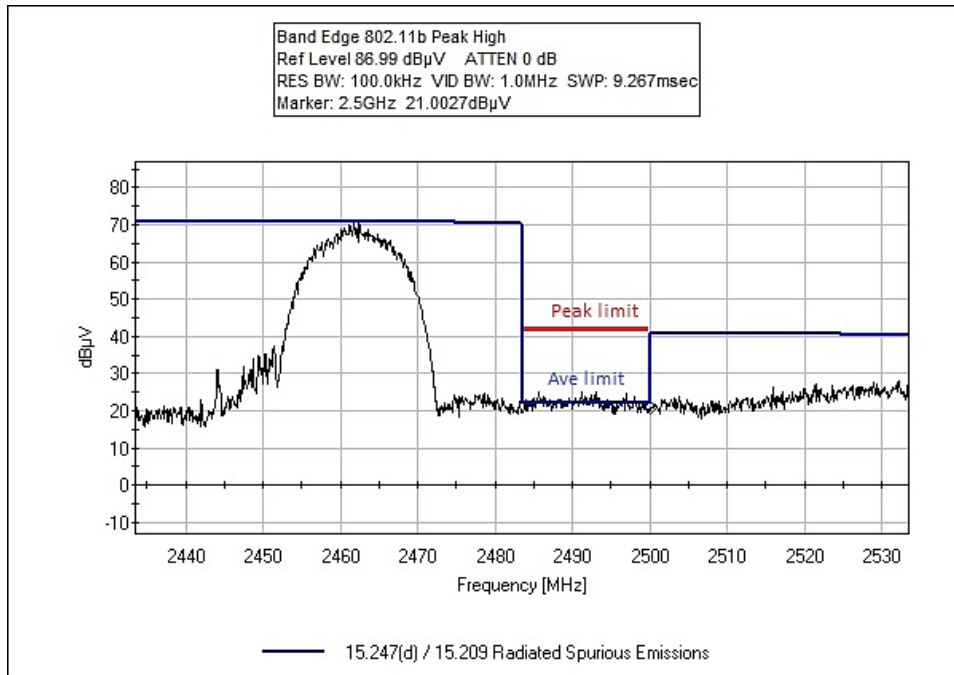
**Band Edge Summary**

Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
2390.0	802.11b	Integral	49.2	<54	Pass
2400.0	802.11b	Integral	50.4	<72.3	Pass
2483.5	802.11b	Integral	51.2	<54	Pass
2390.0	802.11g	Integral	46.2	<54	Pass
2400.0	802.11g	Integral	56.9	<66.7	Pass
2483.5	802.11g	Integral	46.2	<54	Pass
2390.0	802.11n20	Integral	45.9	<54	Pass
2400.0	802.11n20	Integral	58.4	<65.6	Pass
2483.5	802.11n20	Integral	46.7	<54	Pass

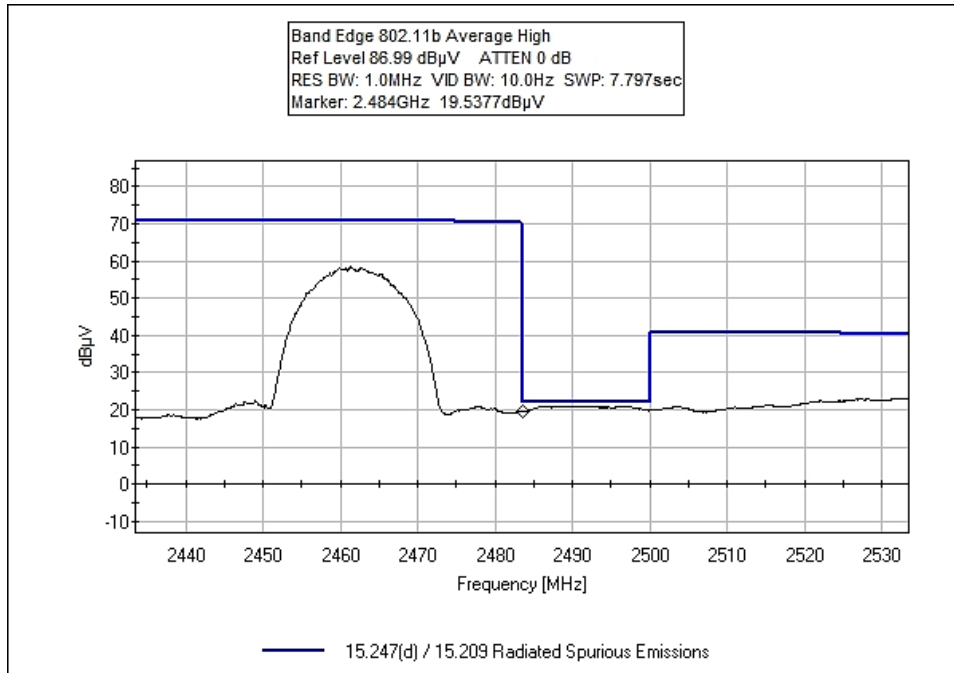
**Band Edge Plots**

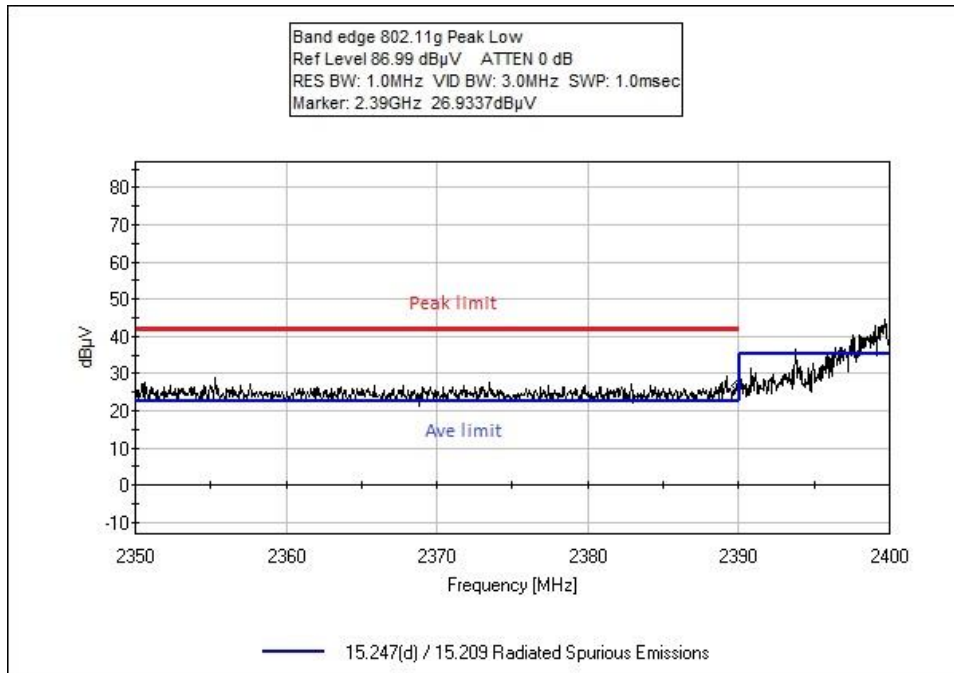
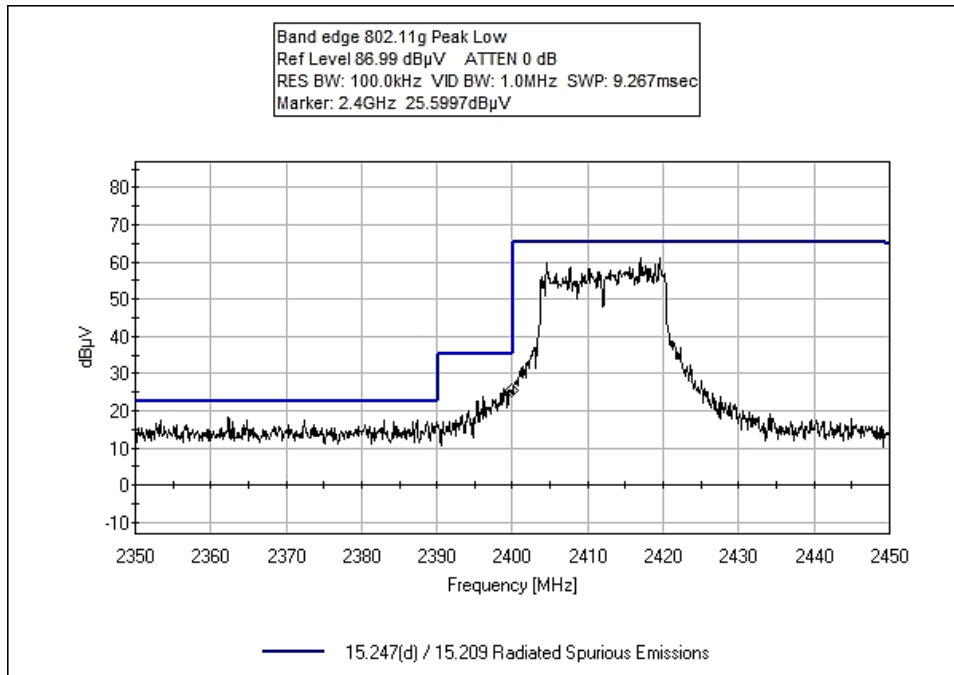


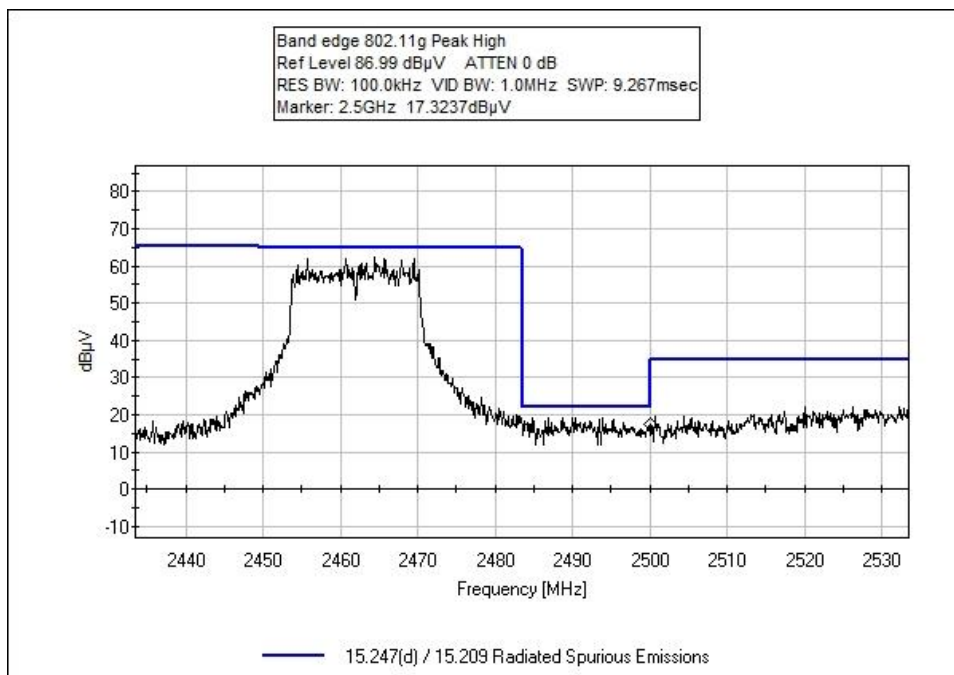
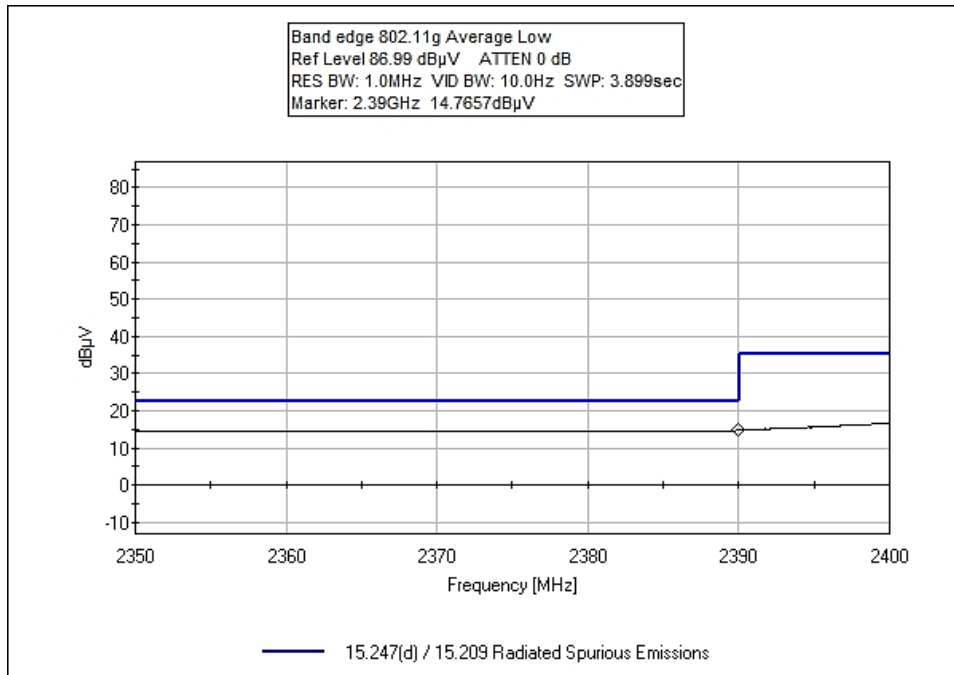


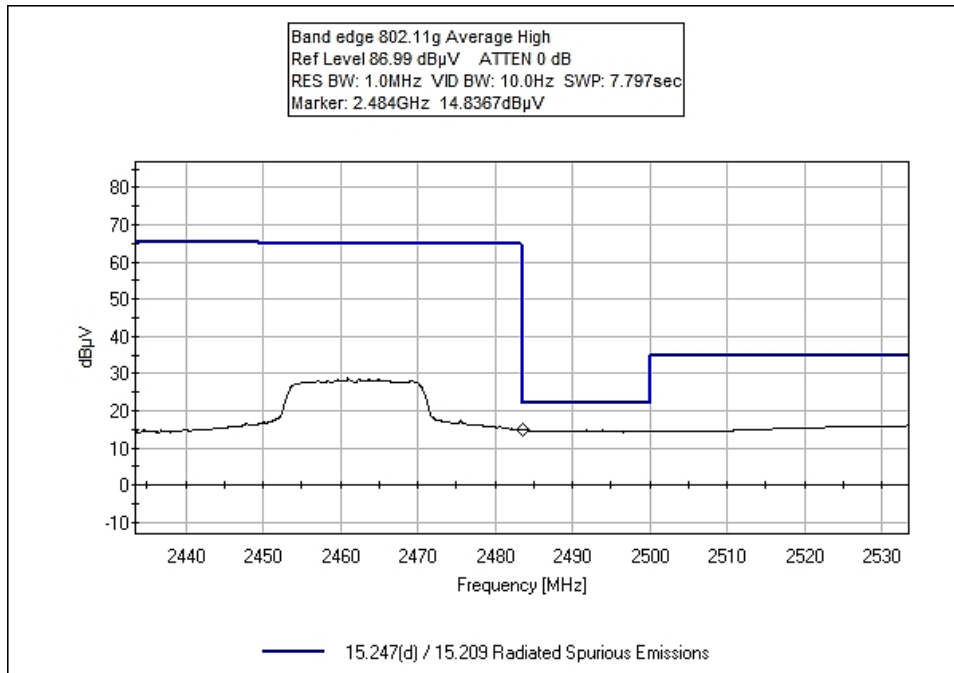
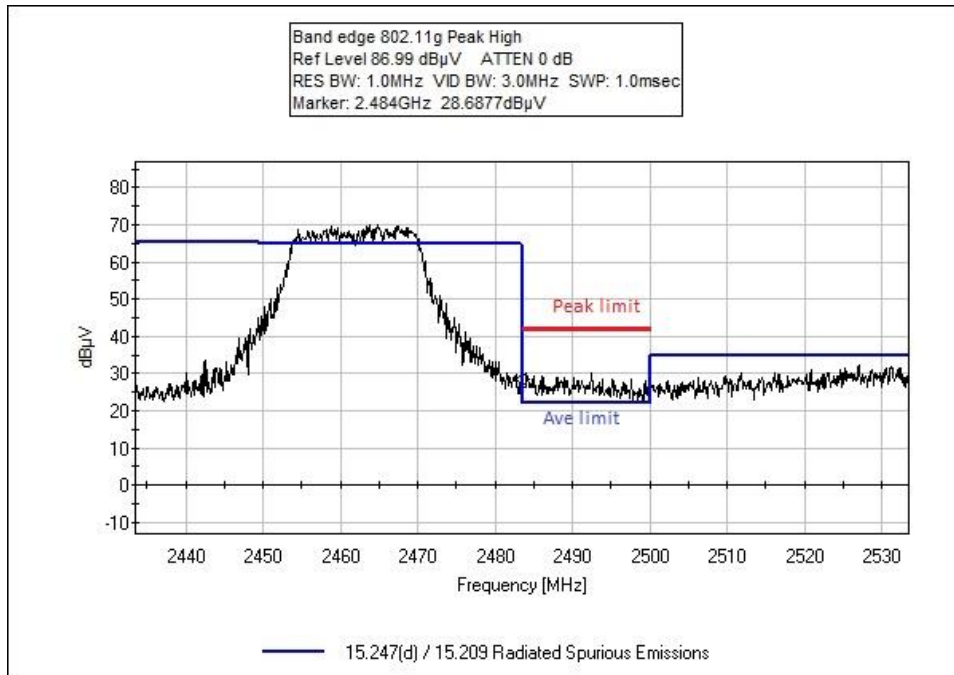


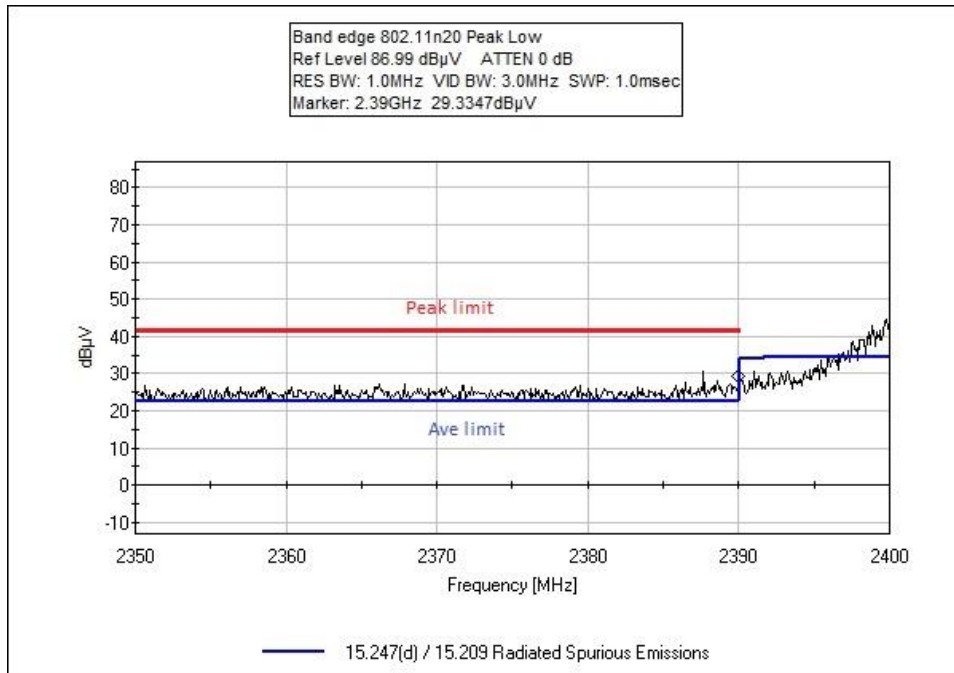
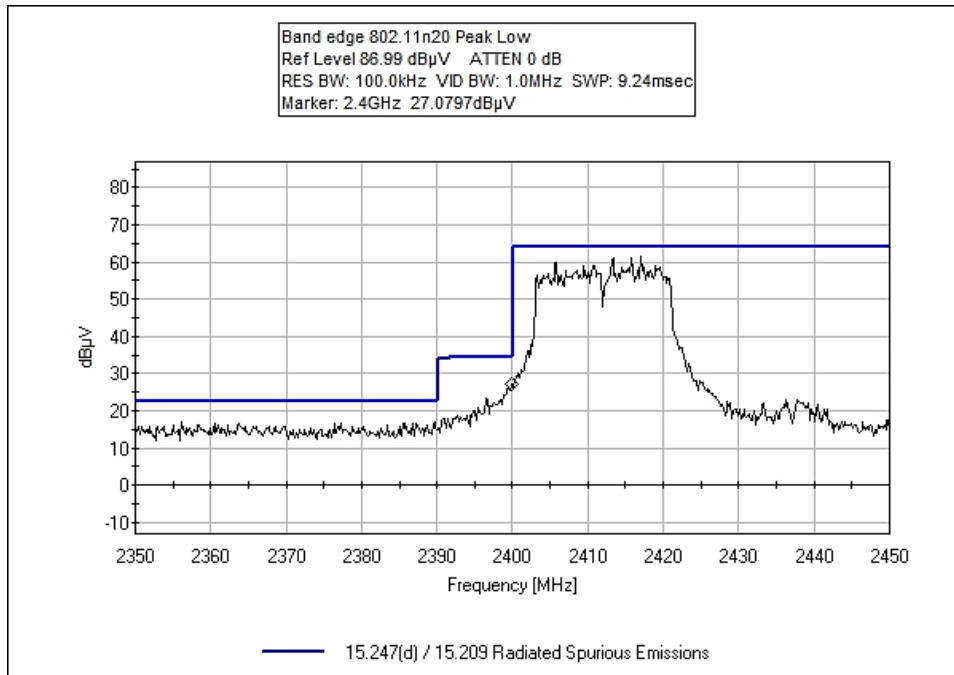


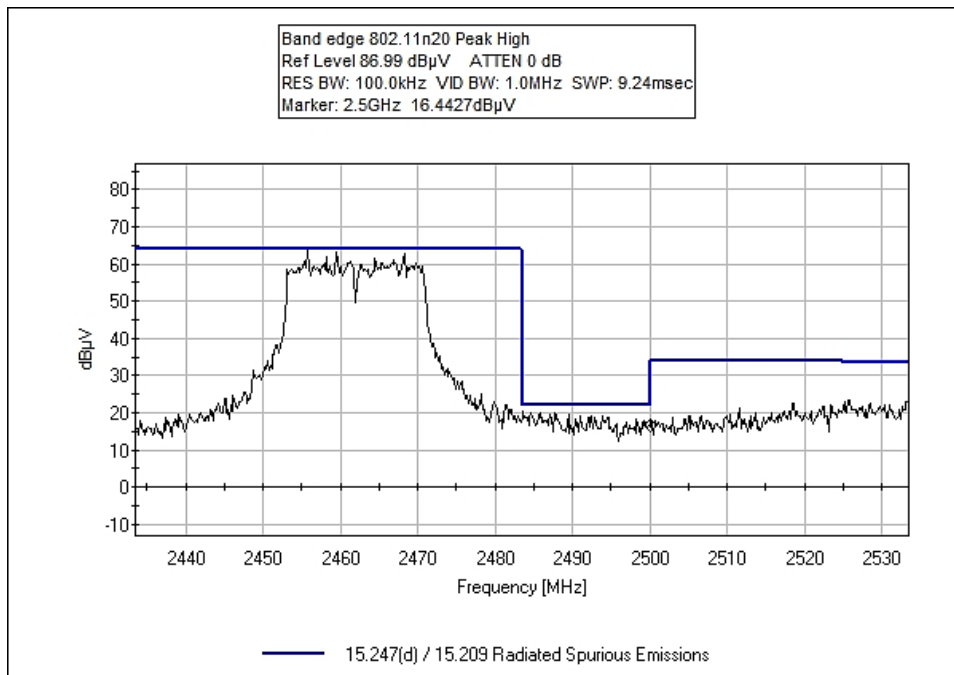
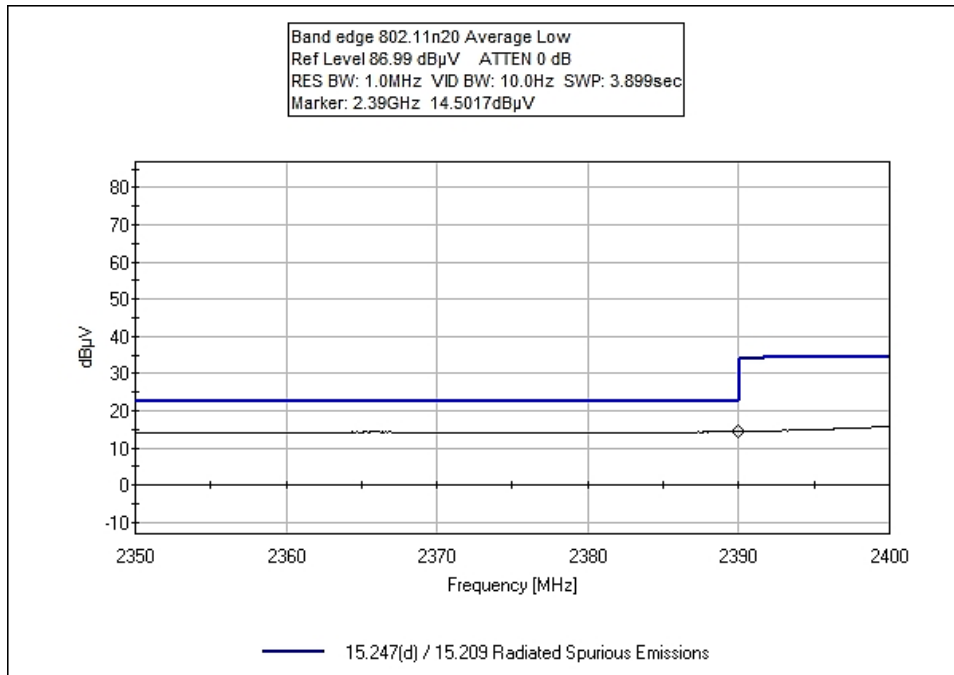


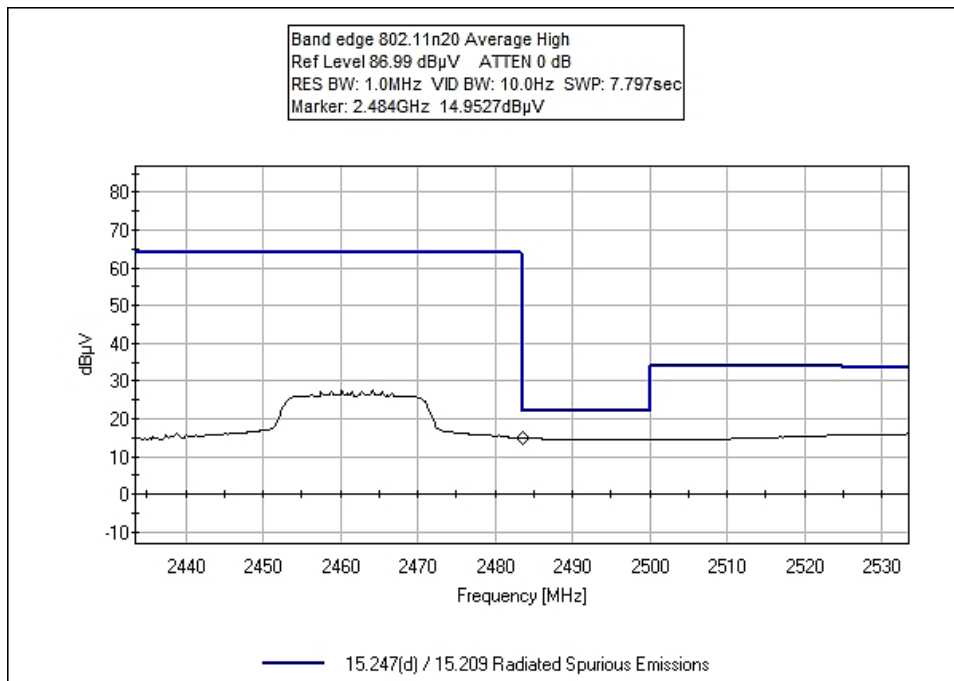
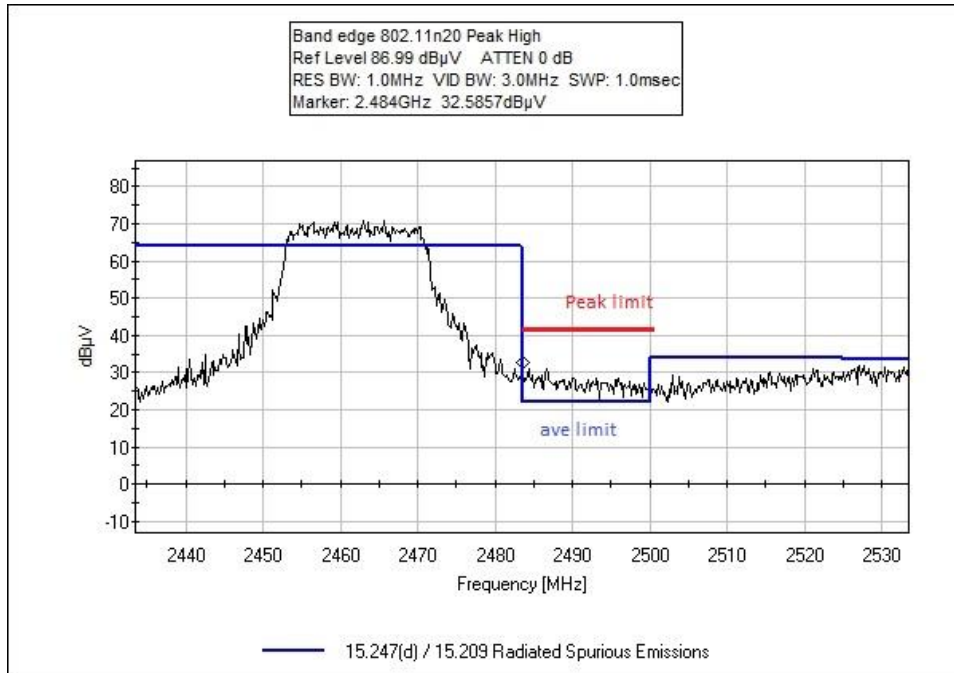














**Test Setup / Conditions / Data**

Test Location: CKC Laboratories, Inc. • 110 N. Olinda Place • Brea, CA • 714 993 6112  
 Customer: **Venstar, Inc.**  
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**  
 Work Order #: **102914** Date: 8/1/2019  
 Test Type: **Maximized Emissions** Time: 16:17:12  
 Tested By: S. Yamamoto Sequence#: 8  
 Software: EMITest 5.03.12

**Equipment Tested:**

Device	Manufacturer	Model #	S/N
Configuration 1			

**Support Equipment:**

Device	Manufacturer	Model #	S/N
Configuration 1			

**Test Conditions / Notes:**

The EUT is placed on test bench, connected to a laptop. The Laptop is running TI CC31XX/CC32XX Radio Tool V 1.0.3.11 to place the EUT in test mode.

Freq range of test: 2350MHz to 2530MHz

Freq range of EUT: 2412MHz to 2462 MHz

Protocol: 802.11 b/g/n20

Packet size 1400 byte (max) infinite packet (0), delay 2 ms (worst case setting)

Firmware Power setting listed below: range 0-15, 0 is max power setting.

```

802.11b 2412, 2442, 2462 0,0,0
802.11g 2412, 2442, 2462 0,0,0
802.11n20 2412, 2442, 2462 0,0,0
  
```

The power setting for radiated measurement differs from conducted measurement. Product is to be certified with power setting used for conducted measurement.

The test data represents worst case emissions for the investigated operational modes.

Test environment conditions:  
 Temperature: 23°C  
 Relative Humidity: 52%  
 Atmospheric Pressure: 99kPa

All data rates / modulation types were evaluated during preliminary investigation.  
 558074 D01 15.247 Meas Guidance v05r02 April 2, 2019

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02672	Spectrum Analyzer	E4446A	3/13/2019	3/13/2021
T2	ANP07139	Cable	ANDL1-PNMNM-48	3/4/2019	3/4/2021
	AN00786	Preamp	83017A	5/12/2018	5/12/2020
	ANP07244	Cable	32022-29094K-29094K-24TC	7/5/2018	7/5/2020
	AN03385	High Pass Filter	11SH10-3000/T10000-O/O	5/13/2019	5/13/2021
T3	AN00849	Horn Antenna	3115	3/14/2018	3/14/2020

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

#	Freq MHz	Rdng dBμV	T1 dB	T2 dB	T3 dB	Dist Table dB	Corr dBμV/m	Spec dBμV/m	Margin dB	Polar Ant
1	2483.500M Ave	19.5	+0.0	+3.2	+28.5	+0.0	51.2	54.0	-2.8	Vert
2	2390.000M Ave	17.8	+0.0	+3.1	+28.3	+0.0	49.2	54.0	-4.8	Vert
3	2400.000M	27.1	+0.0	+3.1	+28.2	+0.0	58.4	65.6	-7.2	Vert
4	2483.500M Ave	15.0	+0.0	+3.2	+28.5	+0.0	46.7	54.0	-7.3	Vert
5	2483.500M Ave	14.8	+0.0	+3.2	+28.5	+0.0	46.5	54.0	-7.5	Vert
^	2483.500M	32.6	+0.0	+3.2	+28.5	+0.0	64.3	54.0	+10.3	Vert
^	2483.500M	32.4	+0.0	+3.2	+28.5	+0.0	64.1	54.0	+10.1	Vert
^	2483.500M	28.7	+0.0	+3.2	+28.5	+0.0	60.4	54.0	+6.4	Vert
9	2390.000M Ave	14.8	+0.0	+3.1	+28.3	+0.0	46.2	54.0	-7.8	Vert
10	2390.000M Ave	14.5	+0.0	+3.1	+28.3	+0.0	45.9	54.0	-8.1	Vert
^	2390.000M	29.3	+0.0	+3.1	+28.3	+0.0	60.7	54.0	+6.7	Vert
^	2390.000M	26.9	+0.0	+3.1	+28.3	+0.0	58.3	54.0	+4.3	Vert
^	2390.000M	26.4	+0.0	+3.1	+28.3	+0.0	57.8	54.0	+3.8	Vert
14	2400.000M	25.6	+0.0	+3.1	+28.2	+0.0	56.9	66.7	-9.8	Vert
15	2400.000M	19.1	+0.0	+3.1	+28.2	+0.0	50.4	72.3	-21.9	Vert

**Test Setup Photo(s)**



Below 1GHz



Below 1GHz



Above 1GHz

## 15.207 AC Conducted Emissions

### Test Setup / Conditions / Data

Test Location: CKC Laboratories, Inc. • 110 N. Olinda Place • Brea, CA • 714 993 6112  
 Customer: **Venstar, Inc.**  
 Specification: **15.207 AC Mains - Average**  
 Work Order #: **102914** Date: 7/31/2019  
 Test Type: **Conducted Emissions** Time: 08:59:37  
 Tested By: S. Yamamoto Sequence#: 5  
 Software: EMITest 5.03.12 120/60Hz

#### Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

#### Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

#### Test Conditions / Notes:

The EUT is placed on test bench, connected to a laptop. The Laptop is running TI CC31XX/CC32XX Radio Tool V 1.0.3.11 to place the EUT in test mode.

Freq range of test: 150kHz to 30MHz RBW=9kHz, VBW=30kHz

Freq range of EUT: 2412MHz to 2462 MHz

Protocol: 802.11 b

Packet size 1400 byte (max) infinite packet (0), delay 2 ms (worst case setting)

Firmware Power setting: 0 (0 is max power setting)

Test environment conditions:

Temperature: 23°C

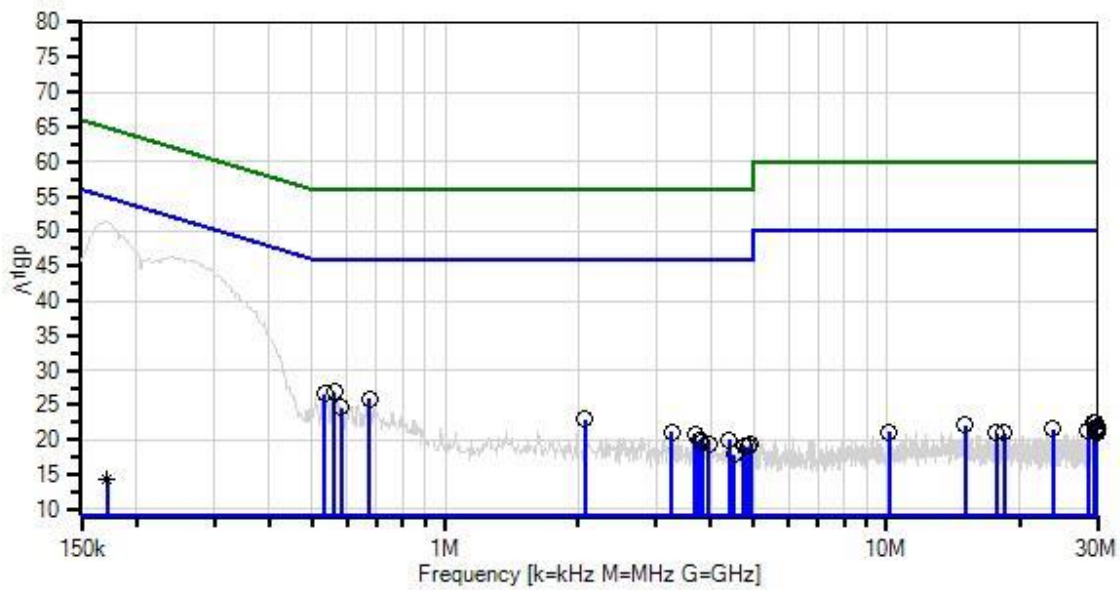
Relative Humidity: 49%

Atmospheric Pressure: 99kPa

Site A

Test method ANSI C63.10 2013

Venstar, Inc. WO#: 102914 Sequence#: 5 Date: 7/31/2019  
 15.207 AC Mains - Average Test Lead: 120/60Hz Line



- Sweep Data
- x QP Readings
- Software Version: 5.03.12
- 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
	AN02672	Spectrum Analyzer	E4446A	3/13/2019	3/13/2021
T1	AN02610	High Pass Filter	HE9615-150K-50-720B	10/25/2017	10/25/2019
T2	ANP07338	Cable	2249-Y-240	2/19/2018	2/19/2020
T3	ANP07545	Attenuator	SA18N10W-06	1/18/2019	1/18/2021
T4	ANP06986	Cable-Line L1(dB)	90cm-extcord	3/31/2018	3/31/2020
	ANP06986	Cable-Neutral L2(dB)	90cm-extcord	3/31/2018	3/31/2020
T5	AN00969A	50uH LISN-Line (dB)	3816/2NM	3/11/2019	3/11/2021
	AN00969A	50uH LISN-Return (dB)	3816/2NM	3/11/2019	3/11/2021

**Measurement Data:**

Reading listed by margin.

Test Lead: 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	560.871k	20.8	+0.2 +0.0	+0.1	+5.8	+0.0	+0.0	26.9	46.0	-19.1	Line
2	533.601k	20.4	+0.2 +0.1	+0.1	+5.8	+0.0	+0.0	26.6	46.0	-19.4	Line
3	675.406k	19.7	+0.2 +0.1	+0.1	+5.8	+0.0	+0.0	25.9	46.0	-20.1	Line
4	580.869k	18.5	+0.2 +0.1	+0.1	+5.8	+0.0	+0.0	24.7	46.0	-21.3	Line
5	2.068M	16.6	+0.2 +0.1	+0.1	+5.8	+0.1	+0.0	22.9	46.0	-23.1	Line
6	3.259M	14.9	+0.1 +0.1	+0.1	+5.8	+0.1	+0.0	21.1	46.0	-24.9	Line
7	3.683M	14.5	+0.1 +0.1	+0.1	+5.8	+0.1	+0.0	20.7	46.0	-25.3	Line
8	4.396M	13.6	+0.1 +0.2	+0.2	+5.8	+0.1	+0.0	20.0	46.0	-26.0	Line
9	3.764M	13.7	+0.1 +0.1	+0.1	+5.8	+0.1	+0.0	19.9	46.0	-26.1	Line
10	3.810M	13.6	+0.1 +0.1	+0.1	+5.8	+0.1	+0.0	19.8	46.0	-26.2	Line
11	3.945M	13.2	+0.1 +0.1	+0.2	+5.8	+0.1	+0.0	19.5	46.0	-26.5	Line
12	4.928M	13.0	+0.1 +0.2	+0.2	+5.8	+0.2	+0.0	19.5	46.0	-26.5	Line
13	4.748M	12.7	+0.1 +0.2	+0.2	+5.8	+0.2	+0.0	19.2	46.0	-26.8	Line
14	4.856M	12.5	+0.1 +0.2	+0.2	+5.8	+0.2	+0.0	19.0	46.0	-27.0	Line
15	29.824M	14.0	+0.2 +0.8	+0.5	+5.8	+1.1	+0.0	22.4	50.0	-27.6	Line
16	29.406M	14.0	+0.2 +0.8	+0.5	+5.8	+1.1	+0.0	22.4	50.0	-27.6	Line
17	15.079M	14.6	+0.2 +0.5	+0.3	+5.8	+0.7	+0.0	22.1	50.0	-27.9	Line



18	4.513M	11.4	+0.1 +0.2	+0.2	+5.8	+0.2	+0.0	17.9	46.0	-28.1	Line
19	29.902M	13.4	+0.2 +0.8	+0.5	+5.8	+1.1	+0.0	21.8	50.0	-28.2	Line
20	23.758M	13.6	+0.2 +0.6	+0.4	+5.8	+0.9	+0.0	21.5	50.0	-28.5	Line
21	29.846M	13.1	+0.2 +0.8	+0.5	+5.8	+1.1	+0.0	21.5	50.0	-28.5	Line
22	29.883M	13.1	+0.2 +0.8	+0.5	+5.8	+1.1	+0.0	21.5	50.0	-28.5	Line
23	29.855M	13.0	+0.2 +0.8	+0.5	+5.8	+1.1	+0.0	21.4	50.0	-28.6	Line
24	28.648M	13.1	+0.2 +0.7	+0.5	+5.8	+1.0	+0.0	21.3	50.0	-28.7	Line
25	10.116M	14.2	+0.1 +0.4	+0.3	+5.8	+0.4	+0.0	21.2	50.0	-28.8	Line
26	29.803M	12.7	+0.2 +0.8	+0.5	+5.8	+1.1	+0.0	21.1	50.0	-28.9	Line
27	17.695M	13.3	+0.2 +0.6	+0.4	+5.8	+0.7	+0.0	21.0	50.0	-29.0	Line
28	18.417M	13.3	+0.2 +0.6	+0.4	+5.8	+0.7	+0.0	21.0	50.0	-29.0	Line
29	29.980M	12.6	+0.2 +0.8	+0.5	+5.8	+1.1	+0.0	21.0	50.0	-29.0	Line
30	171.816k Ave	8.2	+0.2 +0.1	+0.0	+5.8	+0.0	+0.0	14.3	54.9	-40.6	Line
^	171.816k	45.2	+0.2 +0.1	+0.0	+5.8	+0.0	+0.0	51.3	54.9	-3.6	Line

Test Location: CKC Laboratories, Inc. • 110 N. Olinda Place • Brea, CA • 714 993 6112  
 Customer: **Venstar, Inc.**  
 Specification: **15.207 AC Mains - Average**  
 Work Order #: **102914** Date: 7/31/2019  
 Test Type: **Conducted Emissions** Time: 09:03:23  
 Tested By: S. Yamamoto Sequence#: 6  
 Software: EMITest 5.03.12 120/60Hz

***Equipment Tested:***

Device	Manufacturer	Model #	S/N
Configuration 1			

***Support Equipment:***

Device	Manufacturer	Model #	S/N
Configuration 1			

***Test Conditions / Notes:***

The EUT is placed on test bench, connected to a laptop. The Laptop is running TI CC31XX/CC32XX Radio Tool V 1.0.3.11 to place the EUT in test mode.

Freq range of test: 150kHz to 30MHz RBW=9kHz, VBW=30kHz

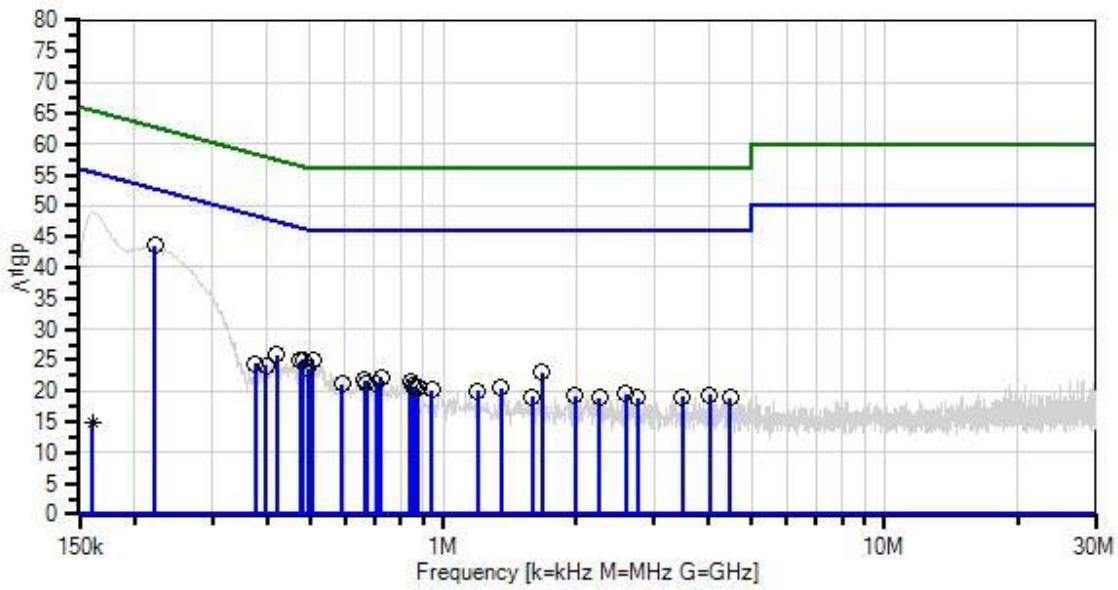
Freq range of EUT: 2412MHz to 2462 MHz  
 Protocol: 802.11 b

Packet size 1400 byte (max) infinite packet (0), delay 2 ms (worst case setting)  
 Firmware Power setting: 0 (0 is max power setting)

Test environment conditions:  
 Temperature: 23°C  
 Relative Humidity: 49%  
 Atmospheric Pressure: 99kPa  
 Site A

Test method ANSI C63.10 2013

Venstar, Inc. WO#: 102914 Sequence#: 6 Date: 7/31/2019  
 15.207 AC Mains - Average Test Lead: 120/60Hz Neutral



— Sweep Data  
 × QP Readings  
 Software Version: 5.03.12  
 — 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
	AN02672	Spectrum Analyzer	E4446A	3/13/2019	3/13/2021
T1	AN02610	High Pass Filter	HE9615-150K-50-720B	10/25/2017	10/25/2019
T2	ANP07338	Cable	2249-Y-240	2/19/2018	2/19/2020
T3	ANP07545	Attenuator	SA18N10W-06	1/18/2019	1/18/2021
	ANP06986	Cable-Line L1(dB)	90cm-extcord	3/31/2018	3/31/2020
T4	ANP06986	Cable-Neutral L2(dB)	90cm-extcord	3/31/2018	3/31/2020
	AN00969A	50uH LISN-Line (dB)	3816/2NM	3/11/2019	3/11/2021
T5	AN00969A	50uH LISN-Return (dB)	3816/2NM	3/11/2019	3/11/2021

**Measurement Data:**

Reading listed by margin.

Test Lead: 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	221.993k	37.4	+0.2 +0.1	+0.0	+5.8	+0.0	+0.0	43.5	52.7	-9.2	Neutr
2	507.058k	18.8	+0.2 +0.1	+0.1	+5.8	+0.0	+0.0	25.0	46.0	-21.0	Neutr
3	483.060k	18.8	+0.2 +0.1	+0.1	+5.8	+0.0	+0.0	25.0	46.3	-21.3	Neutr
4	420.520k	19.8	+0.2 +0.1	+0.0	+5.8	+0.0	+0.0	25.9	47.4	-21.5	Neutr
5	475.061k	18.7	+0.2 +0.1	+0.1	+5.8	+0.0	+0.0	24.9	46.4	-21.5	Neutr
6	494.695k	17.5	+0.2 +0.1	+0.1	+5.8	+0.0	+0.0	23.7	46.1	-22.4	Neutr
7	1.672M	16.8	+0.2 +0.1	+0.1	+5.8	+0.0	+0.0	23.0	46.0	-23.0	Neutr
8	397.977k	18.0	+0.2 +0.1	+0.0	+5.8	+0.0	+0.0	24.1	47.9	-23.8	Neutr
9	725.219k	15.9	+0.2 +0.1	+0.1	+5.8	+0.0	+0.0	22.1	46.0	-23.9	Neutr
10	374.706k	18.3	+0.2 +0.1	+0.0	+5.8	+0.0	+0.0	24.4	48.4	-24.0	Neutr
11	662.680k	15.6	+0.2 +0.1	+0.1	+5.8	+0.0	+0.0	21.8	46.0	-24.2	Neutr
12	842.300k	15.2	+0.2 +0.1	+0.1	+5.8	+0.0	+0.0	21.4	46.0	-24.6	Neutr
13	704.858k	15.1	+0.2 +0.1	+0.1	+5.8	+0.0	+0.0	21.3	46.0	-24.7	Neutr
14	671.406k	15.0	+0.2 +0.1	+0.1	+5.8	+0.0	+0.0	21.2	46.0	-24.8	Neutr
15	590.686k	14.9	+0.2 +0.1	+0.1	+5.8	+0.0	+0.0	21.1	46.0	-24.9	Neutr
16	852.480k	14.6	+0.2 +0.1	+0.1	+5.8	+0.0	+0.0	20.8	46.0	-25.2	Neutr
17	859.753k	14.4	+0.2 +0.1	+0.1	+5.8	+0.0	+0.0	20.6	46.0	-25.4	Neutr

18	876.478k	14.3	+0.2 +0.1	+0.1	+5.8	+0.0	+0.0	20.5	46.0	-25.5	Neutr
19	1.354M	14.3	+0.2 +0.1	+0.1	+5.8	+0.0	+0.0	20.5	46.0	-25.5	Neutr
20	940.995k	14.0	+0.2 +0.1	+0.1	+5.8	+0.0	+0.0	20.2	46.0	-25.8	Neutr
21	1.196M	13.8	+0.2 +0.1	+0.1	+5.8	+0.0	+0.0	20.0	46.0	-26.0	Neutr
22	2.587M	13.2	+0.2 +0.1	+0.1	+5.8	+0.1	+0.0	19.5	46.0	-26.5	Neutr
23	4.024M	13.0	+0.1 +0.1	+0.2	+5.8	+0.1	+0.0	19.3	46.0	-26.7	Neutr
24	1.991M	12.9	+0.2 +0.1	+0.1	+5.8	+0.1	+0.0	19.2	46.0	-26.8	Neutr
25	1.592M	12.9	+0.2 +0.1	+0.1	+5.8	+0.0	+0.0	19.1	46.0	-26.9	Neutr
26	3.480M	12.9	+0.1 +0.1	+0.1	+5.8	+0.1	+0.0	19.1	46.0	-26.9	Neutr
27	2.259M	12.6	+0.2 +0.1	+0.1	+5.8	+0.1	+0.0	18.9	46.0	-27.1	Neutr
28	2.757M	12.6	+0.2 +0.1	+0.1	+5.8	+0.1	+0.0	18.9	46.0	-27.1	Neutr
29	4.471M	12.5	+0.1 +0.2	+0.2	+5.8	+0.1	+0.0	18.9	46.0	-27.1	Neutr
30	160.908k	8.4	+0.5 +0.1	+0.0	+5.8	+0.0	+0.0	14.8	55.4	-40.6	Neutr
^	160.908k	42.6	+0.5 +0.1	+0.0	+5.8	+0.0	+0.0	49.0	55.4	-6.4	Neutr

**Test Setup Photo(s)**



## SUPPLEMENTAL INFORMATION

### Measurement Uncertainty

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

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

### Emissions Test Details

**TESTING PARAMETERS**

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

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

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

**CORRECTION FACTORS**

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

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



**TEST INSTRUMENTATION AND ANALYZER SETTINGS**

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

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

**SPECTRUM ANALYZER/RECEIVER DETECTOR FUNCTIONS**

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

**Peak**

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

**Quasi-Peak**

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

**Average**

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