

Itron, Inc.

REVISED TEST REPORT TO 103221-3

CCU100

Model: CCU100C*

(*See Appendix A for Manufacturer Declaration)

Tested to The Following Standards:

FCC Part 15 Subpart C Section(s)

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

Report No.: 103221-3A

Date of issue: June 26, 2020



Test Certificate # 803.01

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

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

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ADMINISTRATIVE INFORMATION

Test Report Information

REPORT PREPARED FOR:

Itron, Inc.
2111 N. Molter Road
Liberty Lake, WA 99019

Representative: Jay Holcomb
Customer Reference Number: 193369

DATE OF EQUIPMENT RECEIPT:
DATE(S) OF TESTING:

REPORT PREPARED BY:

Terri Rayle
CKC Laboratories, Inc.
5046 Sierra Pines Drive
Mariposa, CA 95338

Project Number: 103221

December 6, 2019
December 6-14, 2019

Revision History

Original: Testing of the CCU100, Model: CCU100C* to FCC Part 15 Subpart C Section(s) 15.207 & 15.247 (DTS 2400-2483.5 MHz).

Revision A: To revise the General Product Table Equipment Type to Stand-Alone Equipment.

Report Authorization

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



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

Test Facility Information



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

TEST LOCATION(S):
CKC Laboratories, Inc.
22116 23rd Drive S.E., Suite A
Canyon Park, Bothell WA 98021

Software Versions

CKC Laboratories Proprietary Software	Version
EMITest Emissions	5.03.12

Site Registration & Accreditation Information

Location	*NIST CB #	FCC	Japan
Canyon Park, Bothell, WA	US0081	US1022	A-0136
Brea, CA	US0060	US1025	A-0136
Fremont, CA	US0082	US1023	A-0136
Mariposa, CA	US0103	US1024	A-0136

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

SUMMARY OF RESULTS

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

Test Procedure	Description	Modifications	Results
15.247(a)(2)	6dB Bandwidth	Mod. #1 and #2	Pass
15.247(b)(3)	Output Power	Mod. #1 and #2	Pass
15.247(e)	Power Spectral Density	Mod. #1 and #2	Pass
15.247(d)	RF Conducted Emissions & Band Edge	NA	NA1
15.247(d)	Radiated Emissions & Band Edge	Mod. #1 and #2	Pass
15.207	AC Conducted Emissions	Mod. #1 and #2	Pass

NA = Not Applicable

NA1 = Not applicable because antenna is integral and does not have a conducted port.

ISO/IEC 17025 Decision Rule

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

Modifications During Testing

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

Summary of Conditions

Modification #1: Added ferrite Laird Technologies – 28B0355-000 with no turns on battery cable.

Modification #2: Mounting plate ground was removed

Modifications listed above must be incorporated into all production units.

Conditions During Testing

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

Summary of Conditions

None

EQUIPMENT UNDER TEST (EUT)

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

Configuration 1

Equipment Tested:

Device	Manufacturer	Model #	S/N
CCU100	Itron, Inc.	CCU100C	74048330

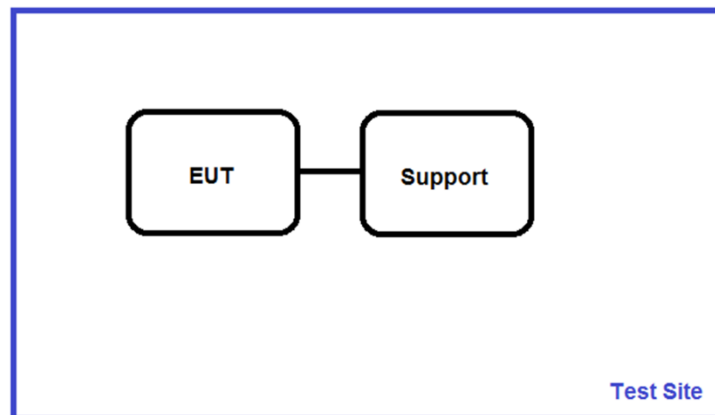
Support Equipment:

Device	Manufacturer	Model #	S/N
Omnidirectional Antenna	PCTEL	BOA9025NM-ITR	NA
Omnidirectional Antenna	PCTEL	MHO3G4G02NM	NA

General Product Information:

Product Information	Manufacturer-Provided Details
Equipment Type:	Stand-Alone Equipment
Type of Wideband System:	802.11b, 802.11g
Operating Frequency Range:	2412-2462 MHz
Modulation Type(s):	OFDM, CCK
Maximum Duty Cycle:	Tested 100% Modulated
Number of TX Chains:	1
Antenna Type(s) and Gain:	Ceramic / 0.5dBi
Beamforming Type:	NA
Antenna Connection Type:	Integral
Nominal Input Voltage:	115 VAC
Firmware / Software used for Test:	Wireless Connectivity WL1271 Command Line Interface (CLI), FW Version 6.1.0.0.313

Test Setup Block Diagram



FCC Part 15 Subpart C

15.247(a)(2) 6dB Bandwidth

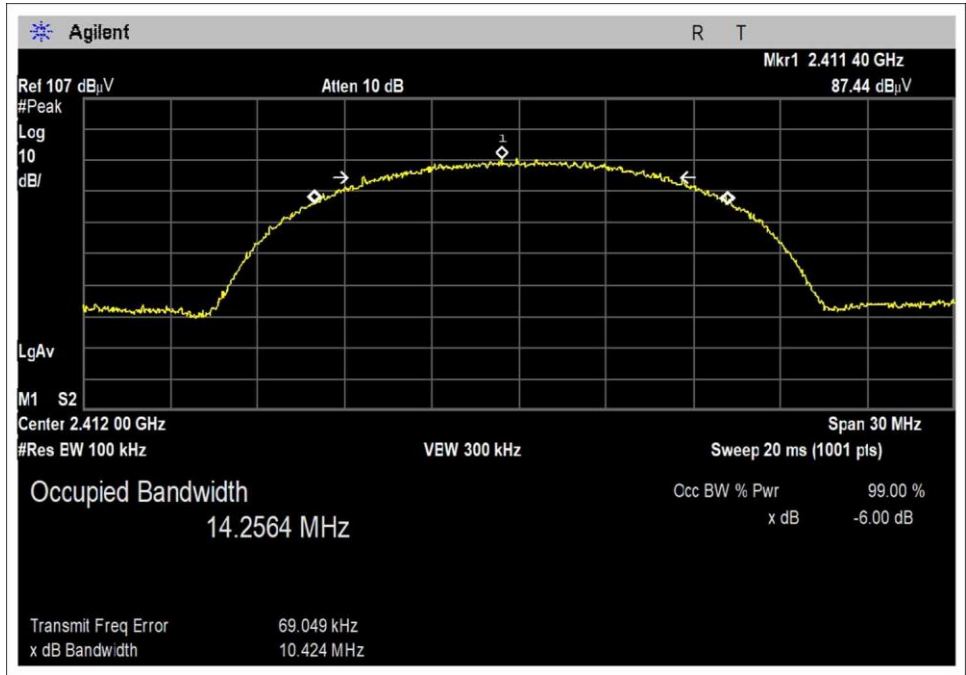
Test Setup/Conditions			
Test Location:	Bothell Lab C3	Test Engineer:	M. Harrison
Test Method:	ANSI C63.10 (2013), KDB 558074 D01 15.247 Meas Guidance v05r02	Test Date(s):	12/6/2019
Configuration:	1		
Test Setup:	EUT is on foam table 1.5m high. EUT is continuously transmitting on selected channel. Modification #1 and #2 were in place during testing.		

Environmental Conditions			
Temperature (°C)	22	Relative Humidity (%):	34

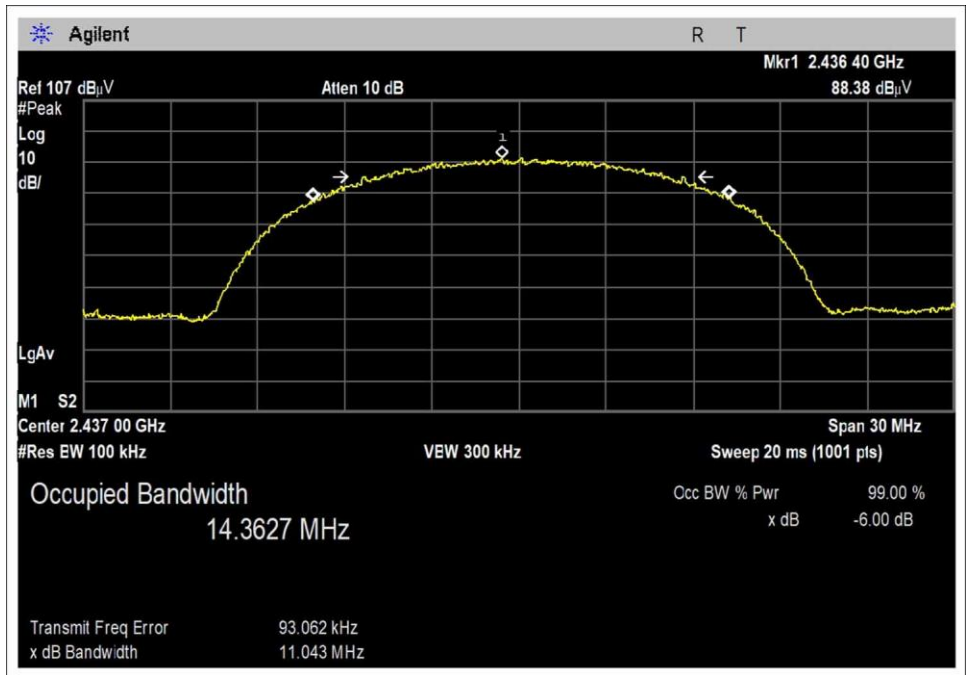
Test Equipment					
Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
01467	Horn Antenna	EMCO	3115	7/5/2019	7/5/2021
02673	Spectrum Analyzer	Agilent	E4446A	2/22/2019	2/22/2021
03540	Preamp	HP	83017A	5/13/2019	5/13/2021

Test Data Summary					
Frequency (MHz)	Antenna Port	Modulation	Measured (kHz)	Limit (kHz)	Results
2412	1	CCK	10424	≥500	Pass
2437	1	CCK	11043	≥500	Pass
2462	1	CCK	10536	≥500	Pass
2412	1	OFDM	16356	≥500	Pass
2437	1	OFDM	16357	≥500	Pass
2462	1	OFDM	16342	≥500	Pass

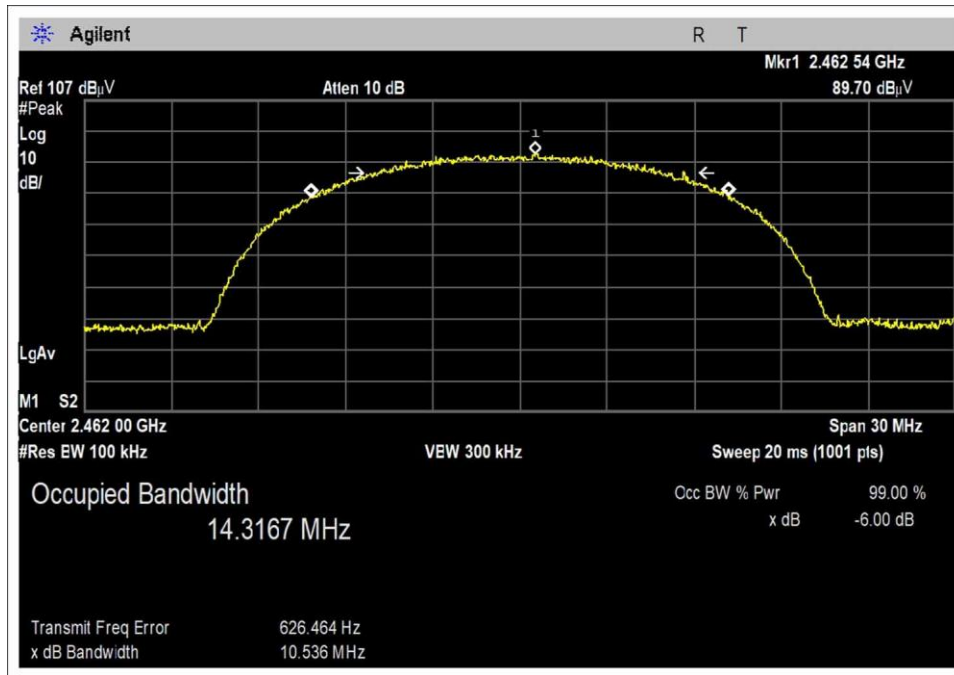
Plot(s)



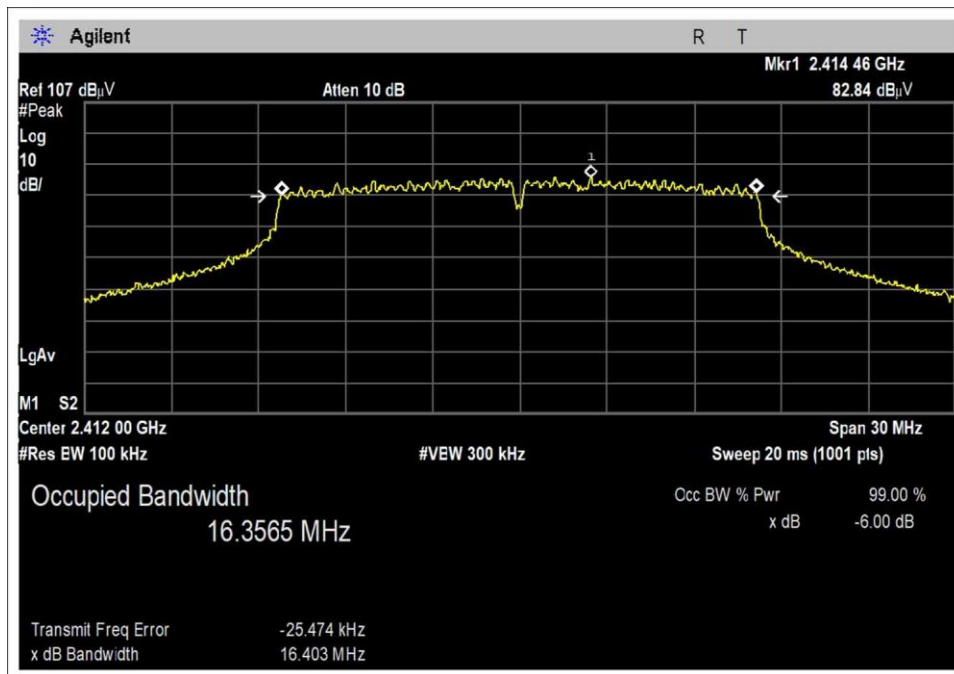
DTS BW 802.11b Low Channel



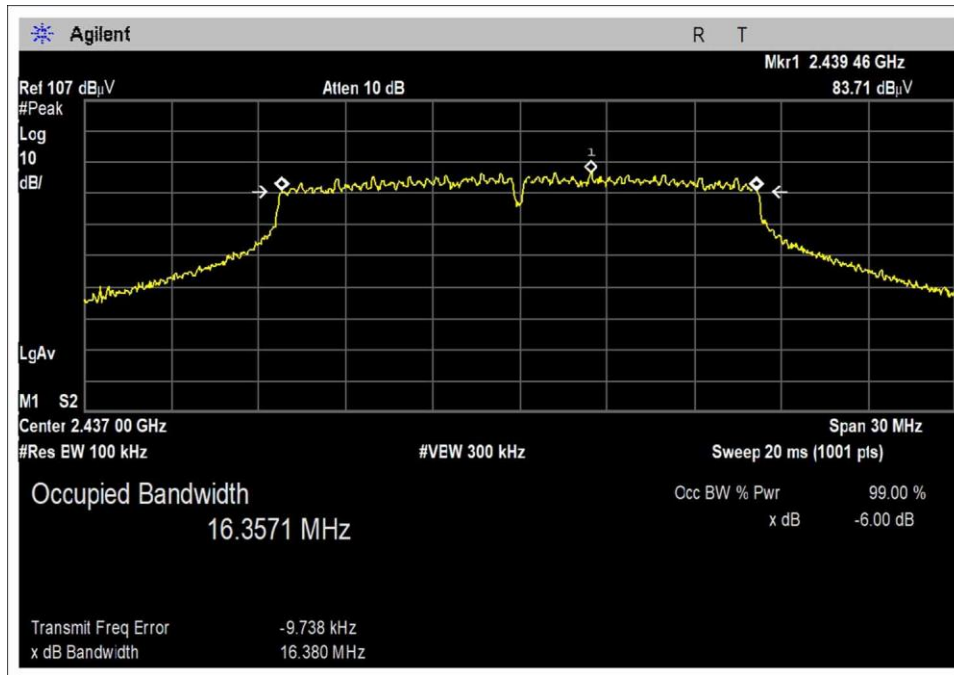
DTS BW 802.11b Middle Channel



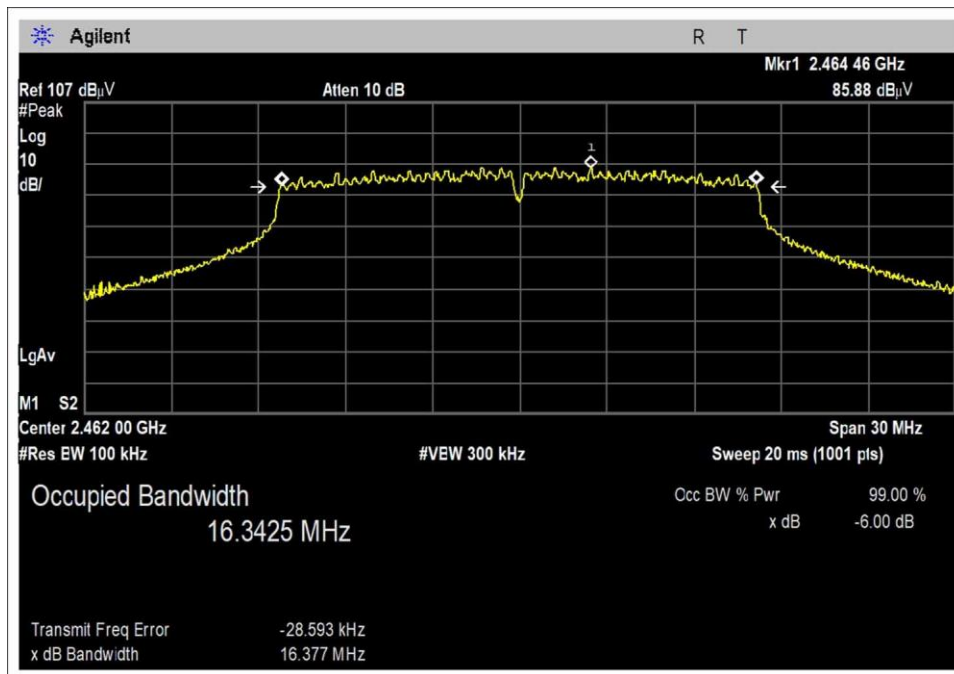
DT BW 802.11b High Channel



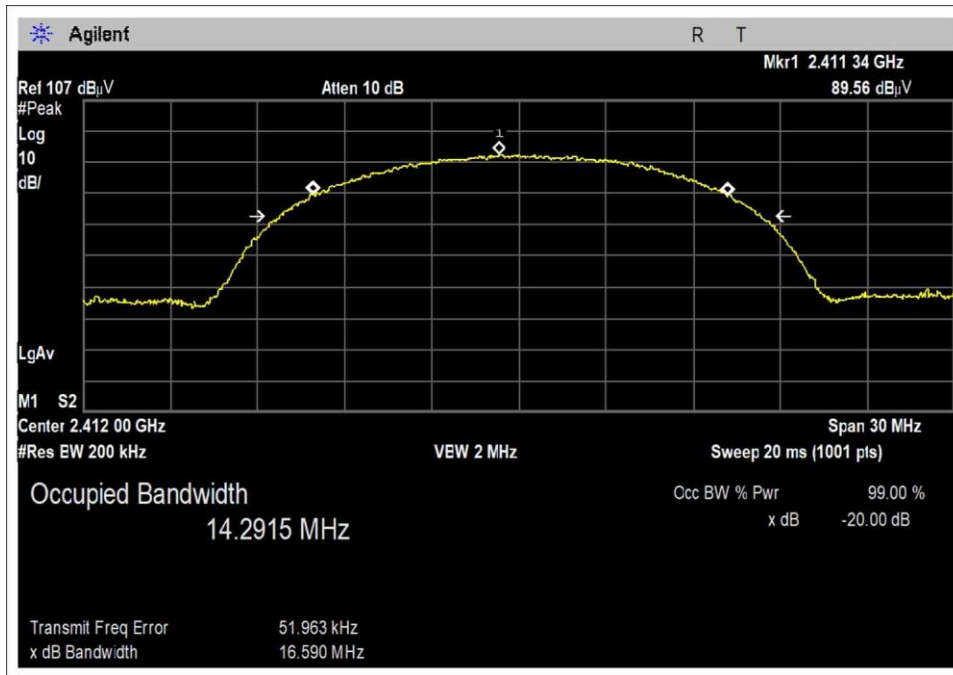
DT BW 802.11g Low Channel



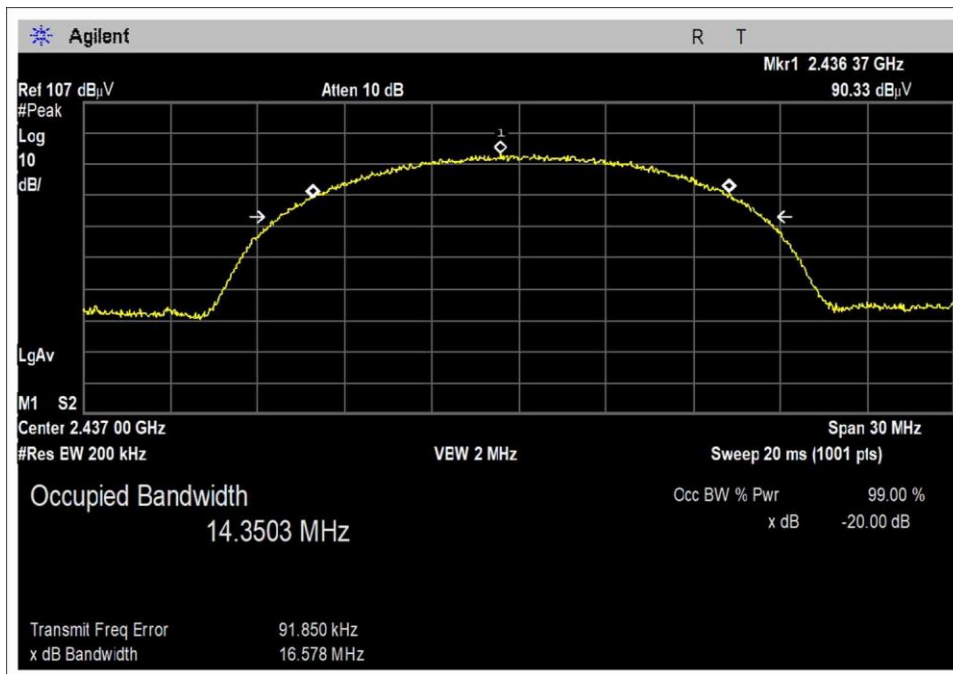
DT BW 802.11g Middle Channel



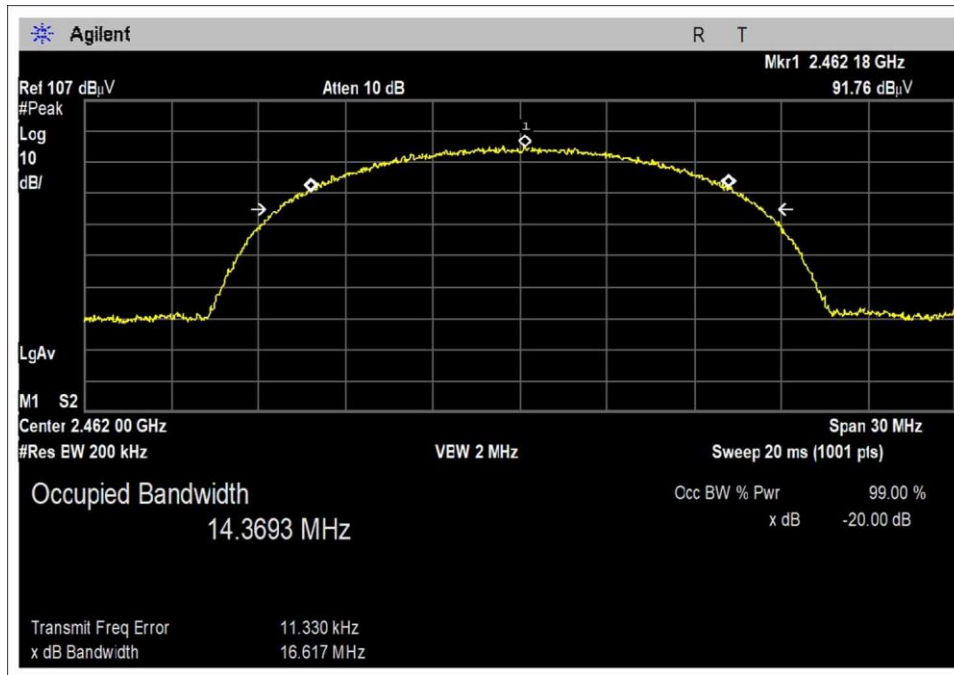
DT BW 802.11g High Channel



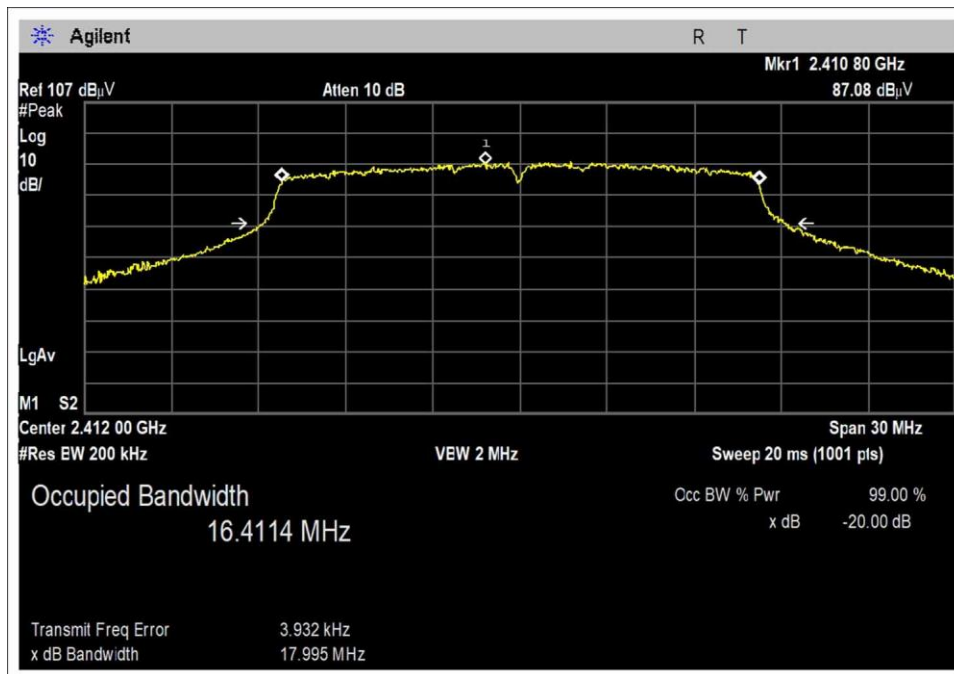
OBW 802.11b Low Channel



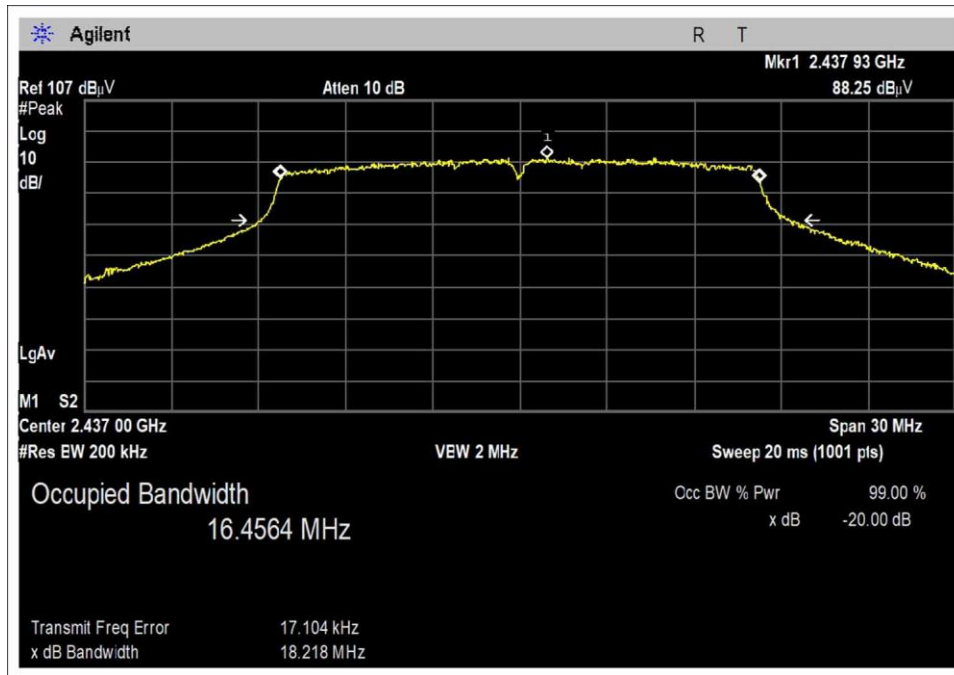
OBW 802.11b Middle Channel



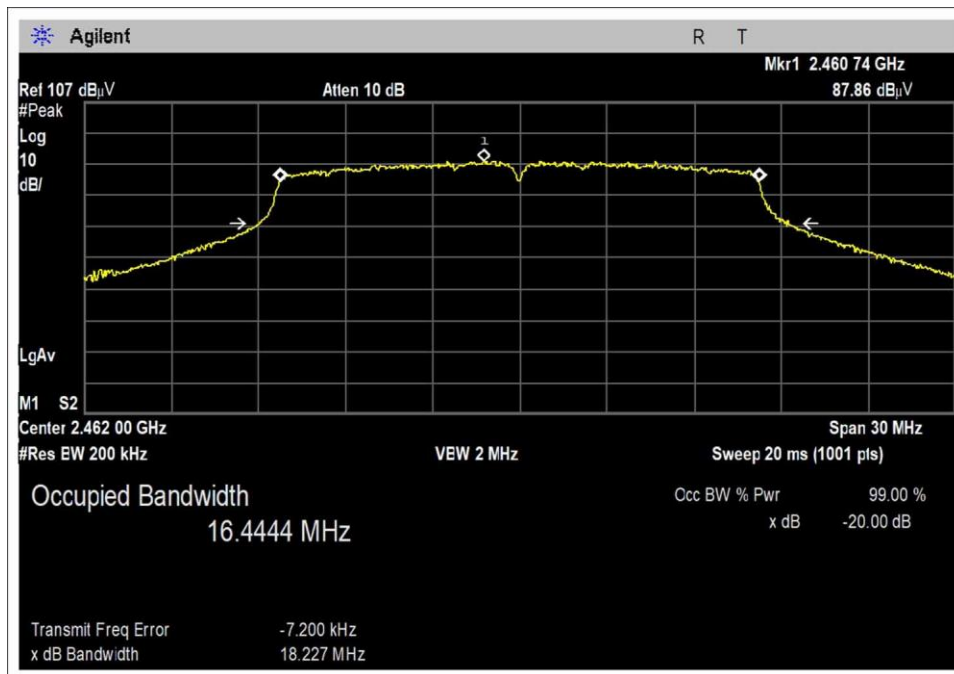
OBW 802.11b High Channel



OBW 802.11g Low Channel

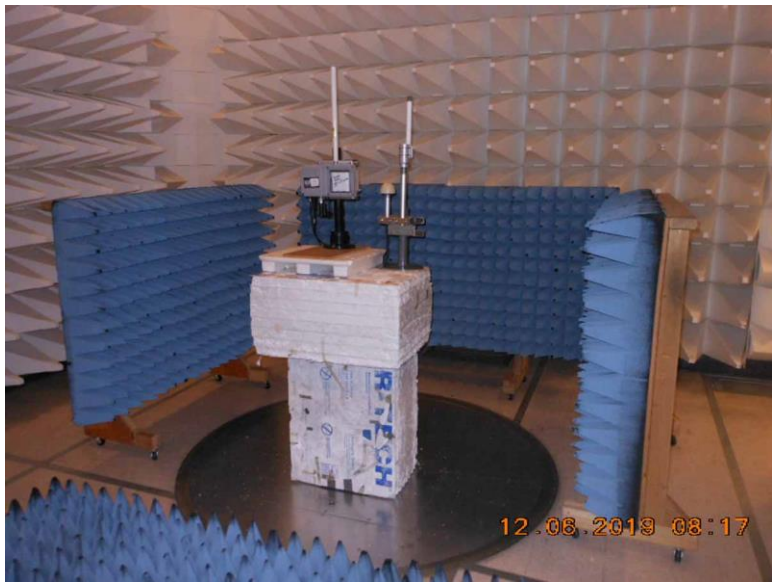
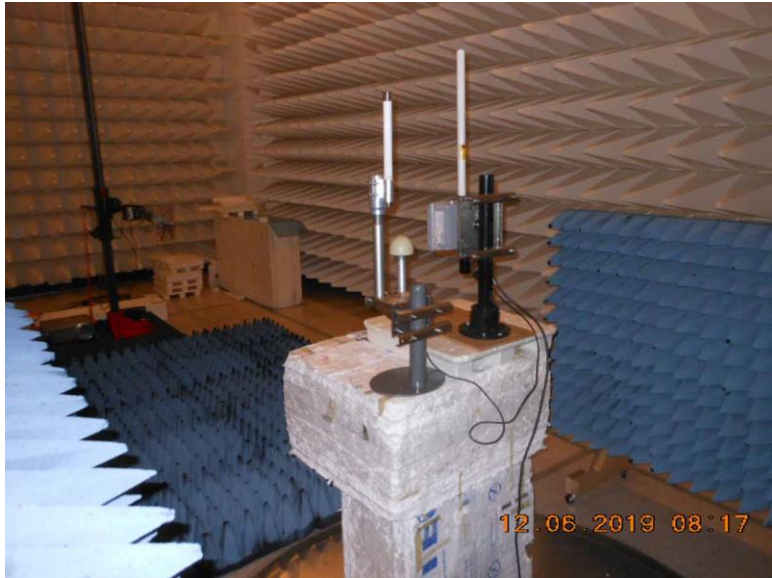


OBW 802.11g Middle Channel



OBW 802.11g High Channel

Test Setup Photo(s)



15.247(b)(3) Output Power

Test Setup / Conditions			
Test Location:	Bothell Lab C3	Test Engineer:	M. Harrison
Test Method:	ANSI C63.10 (2013), KDB 558074 D01 15.247 Meas Guidance v05r02	Test Date(s):	12/13/2019
Configuration:	1		
Test Setup:	EUT is on foam table 1.5m high. EUT is continuously transmitting on selected channel. Modification #1 and #2 were in place during testing.		

Environmental Conditions			
Temperature (°C)	22	Relative Humidity (%):	34

Test Equipment					
Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
02673	Spectrum Analyzer	Agilent	E4446A	2/22/2019	2/22/2021
01467	Horn Antenna	EMCO	3115	7/5/2019	7/5/2021
03540	Preamp	HP	83017A	5/13/2019	5/13/2021

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)
2412	CCK	6.95	7.05	7.00	0.1
2437	CCK	8.35	8.49	8.40	0.14
2462	CCK	10.49	10.56	10.4	0.14
2412	OFDM	6.5	6.7	6.9	0.1
2437	OFDM	8.38	8.41	8.32	0.1
2462	OFDM	9.45	9.54	9.49	0.1

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

Parameter Definitions:

Measurements performed at input voltage V_{Nominal} ± 15%.

Parameter	Value
V _{Nominal} :	115
V _{Minimum} :	98
V _{Maximum} :	132

Power Output Test Data Summary - Radiated Measurement						
Measurement Option: AVGSA-1						
Frequency (MHz)	Modulation	Ant. Type / Gain (dBi)	Field Strength (dBuV/m @3m)	Calculated (dBm)	Limit (dBm)	Results
2412	CCK	Ceramic / 0.5 dBi	102.77	7.05	≤30	Pass
2437	CCK	Ceramic / 0.5 dBi	104.21	8.49	≤30	Pass
2462	CCK	Ceramic / 0.5 dBi	106.28	10.56	≤30	Pass
2412	OFDM	Ceramic / 0.5 dBi	102.42	6.7	≤30	Pass
2437	OFDM	Ceramic / 0.5 dBi	104.13	8.41	≤30	Pass
2462	OFDM	Ceramic / 0.5 dBi	105.26	9.54	≤30	Pass

For fixed point-to-point antennas, the limit is calculated in accordance with 15.247(c)(1): $Limit = 30 - Roundup\left(\frac{G-6}{3}\right)$

For directional beamforming antennas, the limit is calculated in accordance with 15.247(c)(2) and KDB 662911.

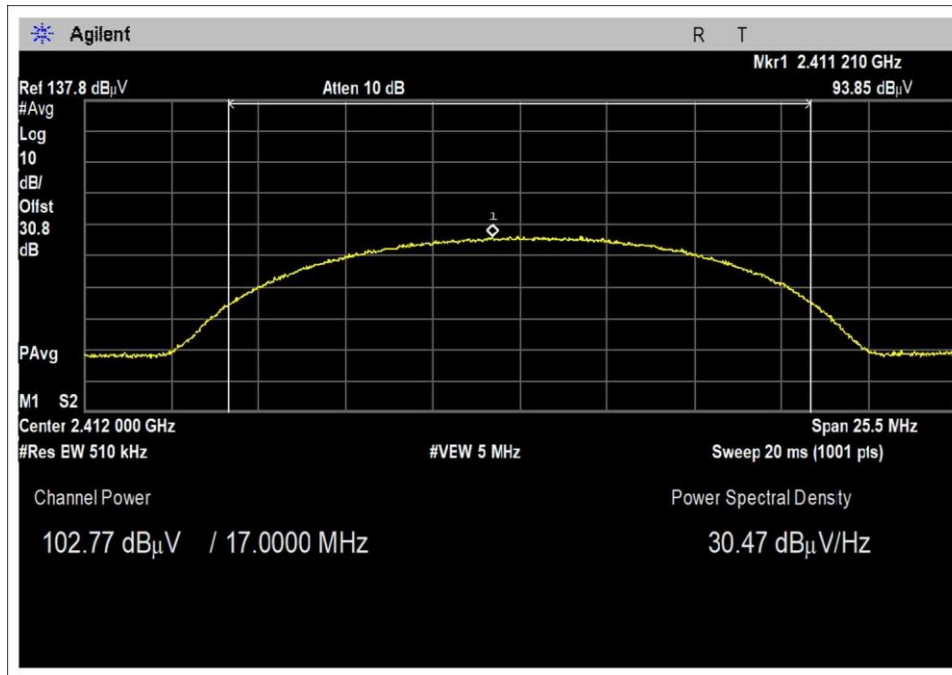
Conducted RF output power calculated in accordance with ANSI C63.10.

$$P(W) = \frac{(E \cdot d)^2}{30 G}$$

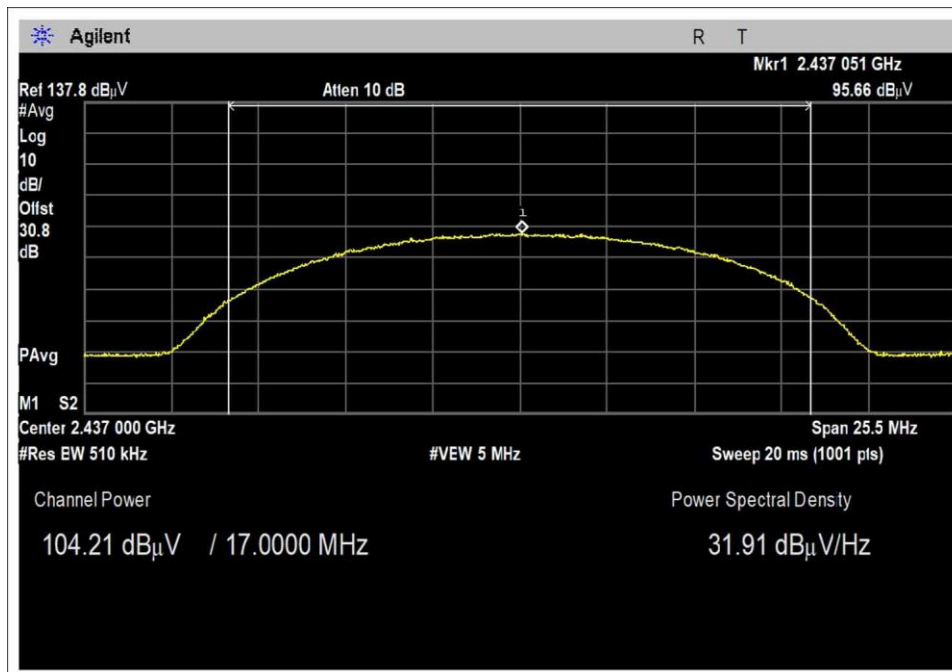
Or equivalently, in logarithmic form:

$$P(dBm) = E(dBuV/m) + 20LOG(d) - G - 104.77$$

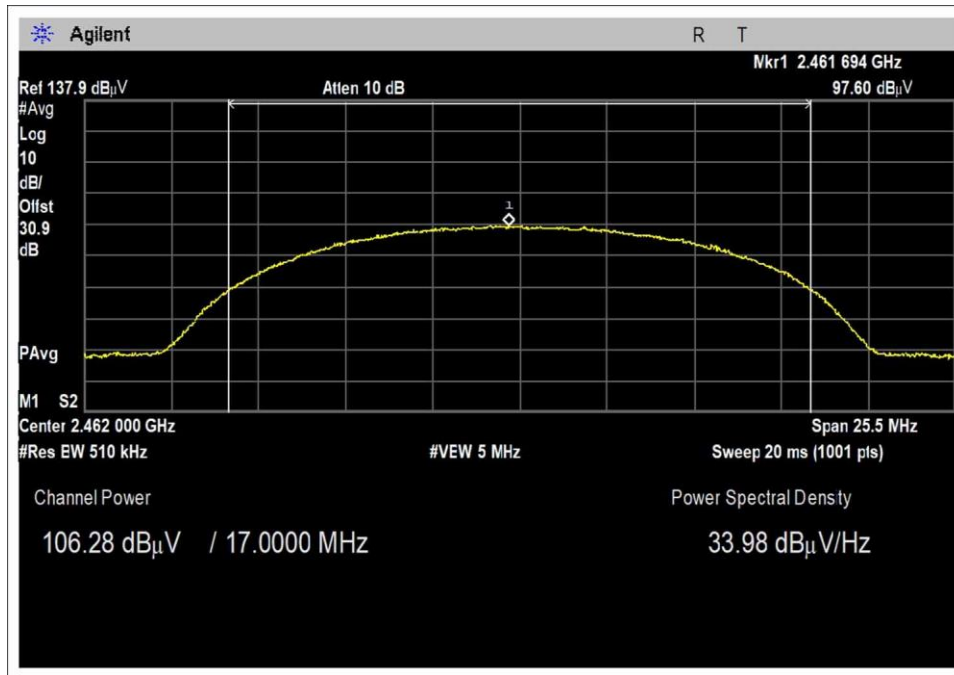
Plots



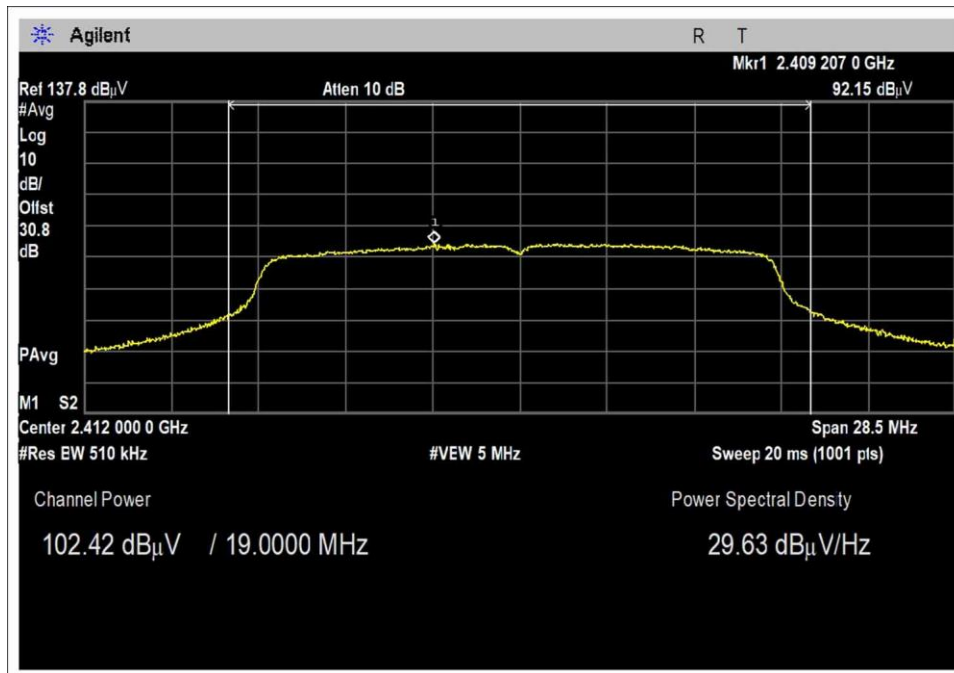
802.11b Low Channel



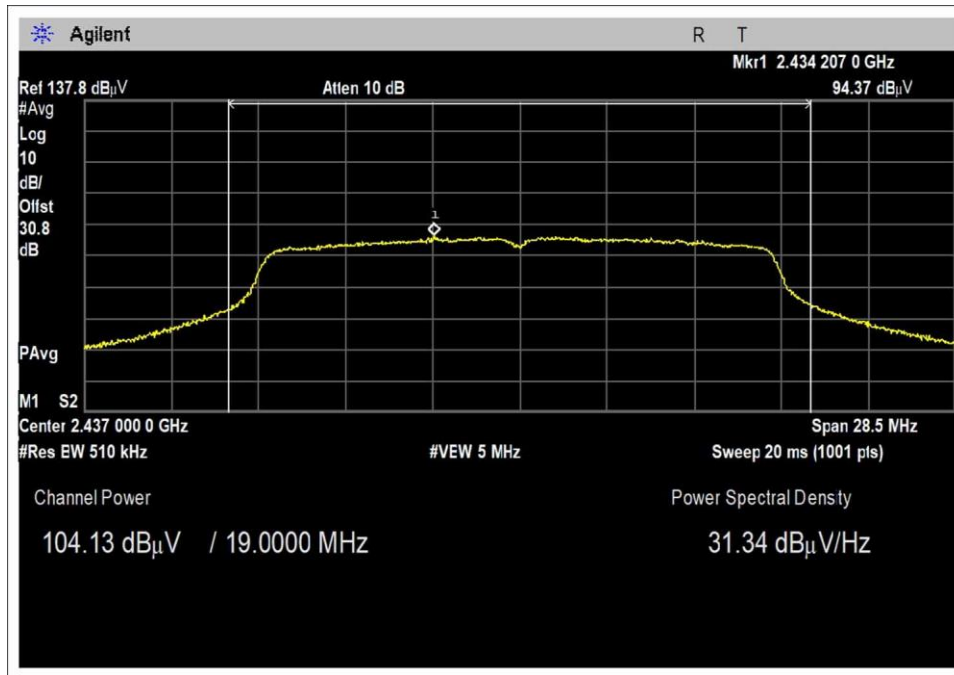
802.11b Middle Channel



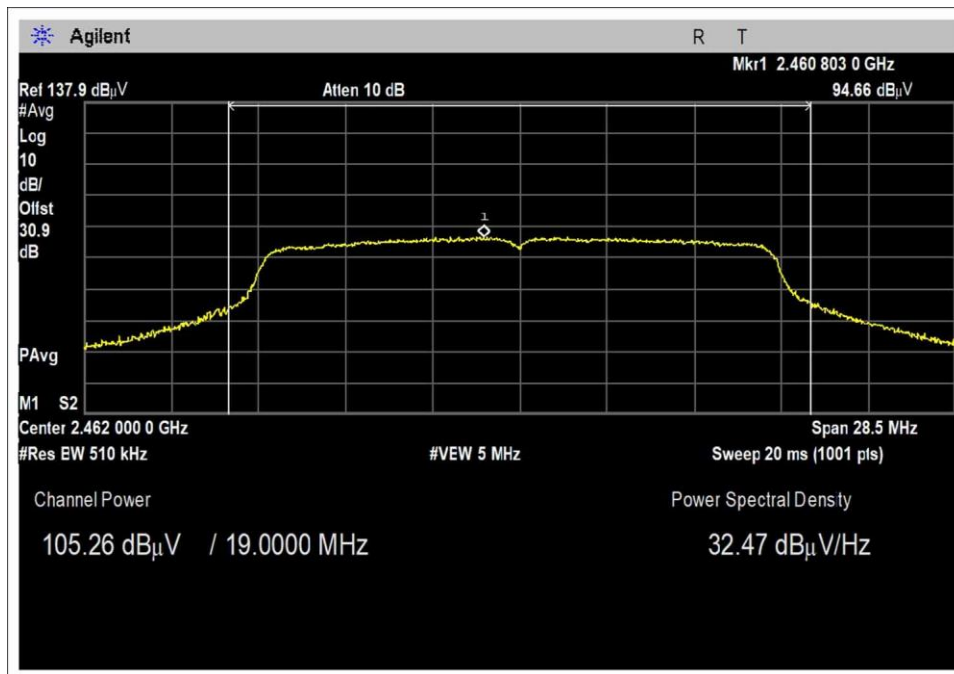
802.11b High Channel



802.11g Low Channel

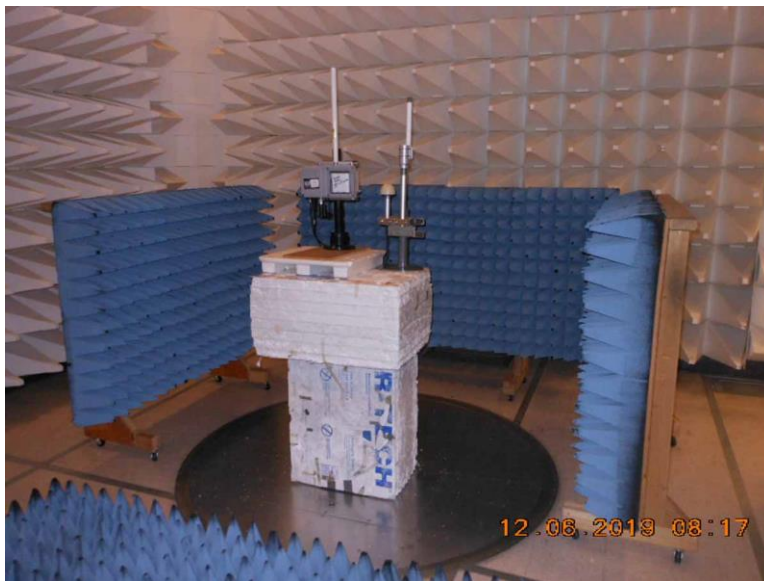


802.11g Middle Channel



802.11g High Channel

Test Setup Photo(s)



15.247(e) Power Spectral Density

Test Summary - Radiated Measurement

Measurement Method: PKPSD

Frequency (MHz)	Modulation	Ant. Type / Gain (dBi)	Field Strength (dBuV/m @3m)	Calculated (dBm/100kHz)	Limit (dBm/3kHz)	Results
2412	CCK	Ceramic / 0.5 dBi	91.5	-4.22	≤8	Pass
2437	CCK	Ceramic / 0.5 dBi	92.6	-3.12	≤8	Pass
2462	CCK	Ceramic / 0.5 dBi	94.9	-0.82	≤8	Pass
2412	OFDM	Ceramic / 0.5 dBi	91.5	-4.22	≤8	Pass
2437	OFDM	Ceramic / 0.5 dBi	90.8	-4.92	≤8	Pass
2462	OFDM	Ceramic / 0.5 dBi	92.7	-3.02	≤8	Pass

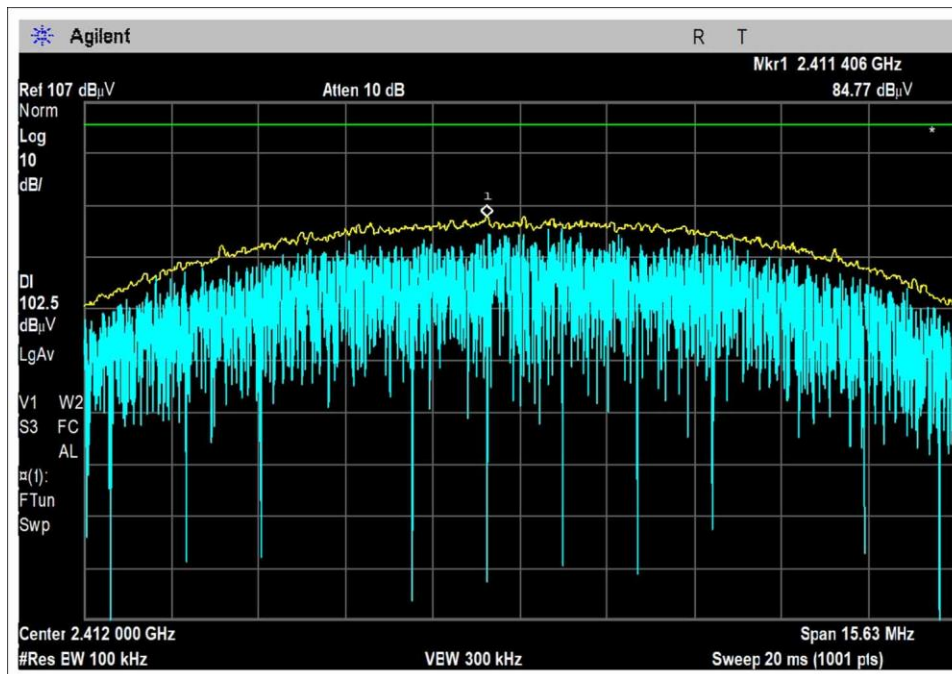
Conducted RF output power calculated in accordance with ANSI C63.10.

$$P(W) = \frac{(E \cdot d)^2}{30 G}$$

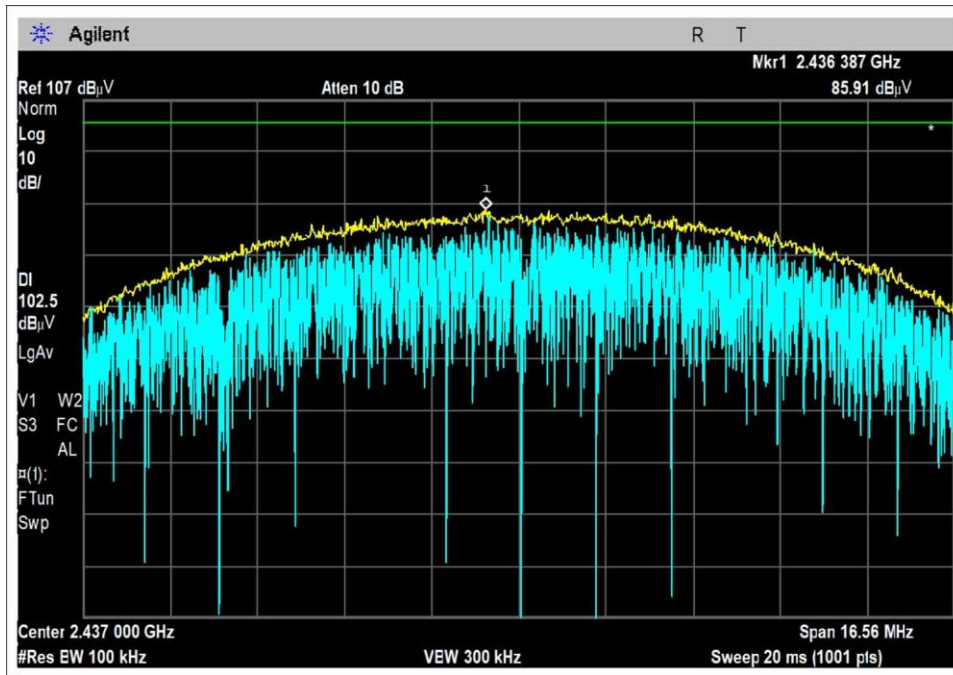
Or equivalently, in logarithmic form:

$$P(dBm) = E(dBuV/m) + 20LOG(d) - G - 104.77$$

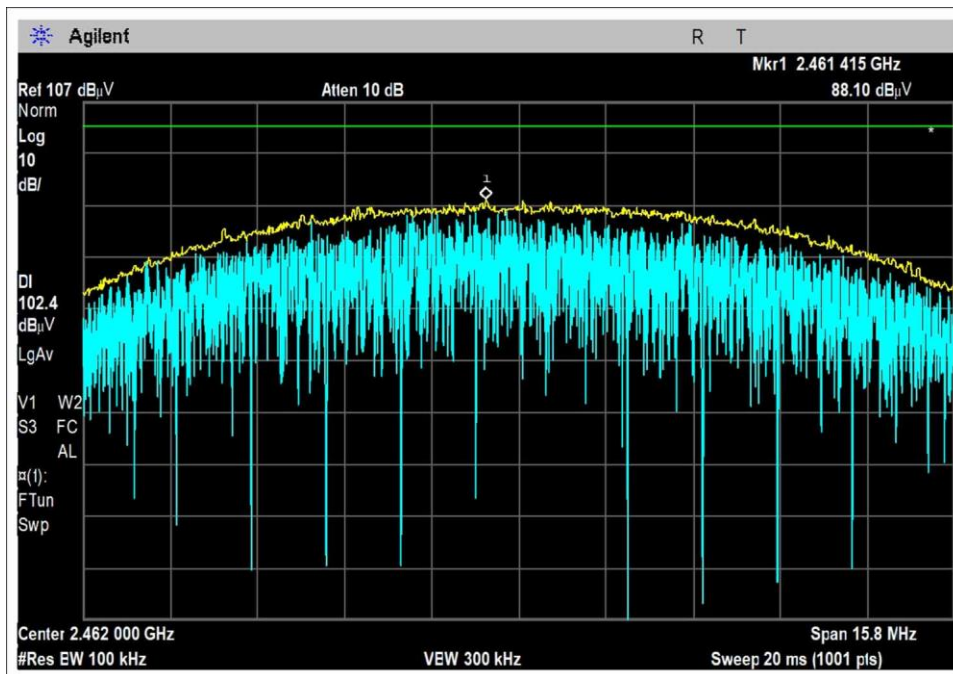
Plots



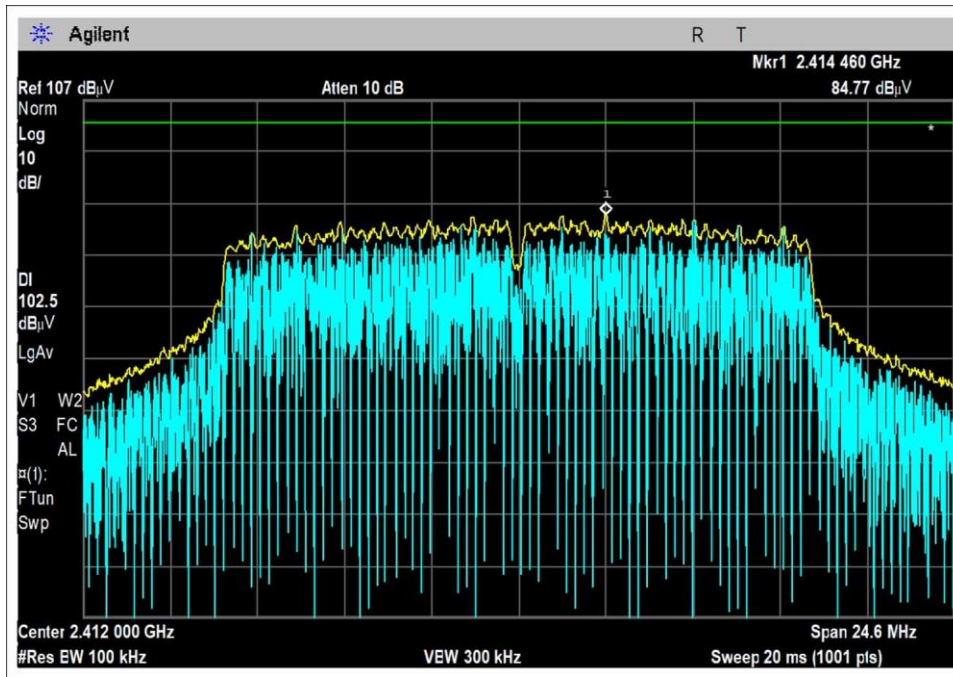
802.11b Low Channel



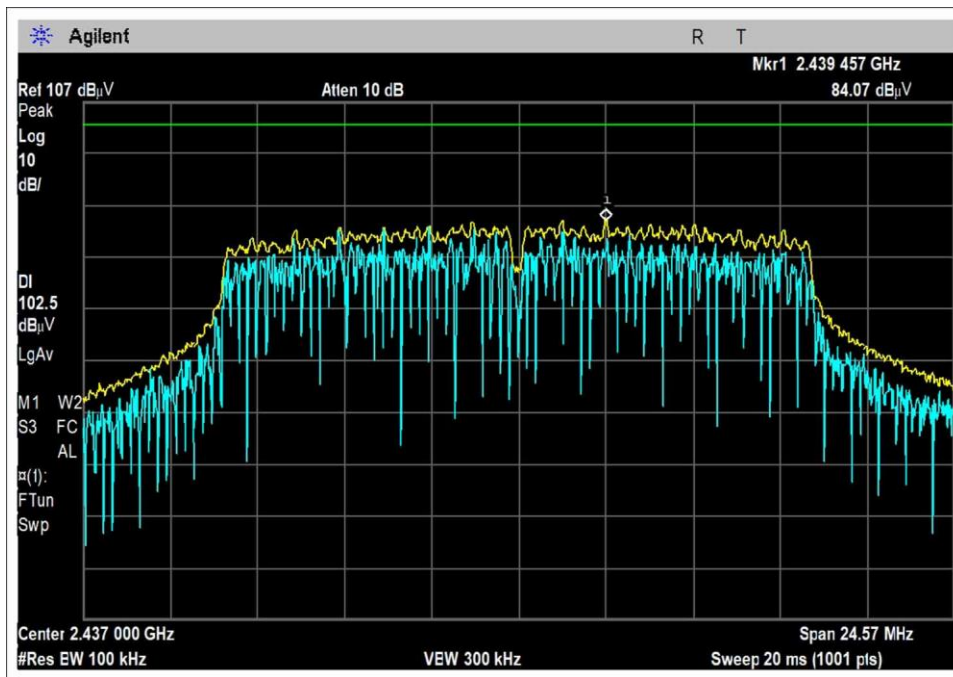
802.11b Middle Channel



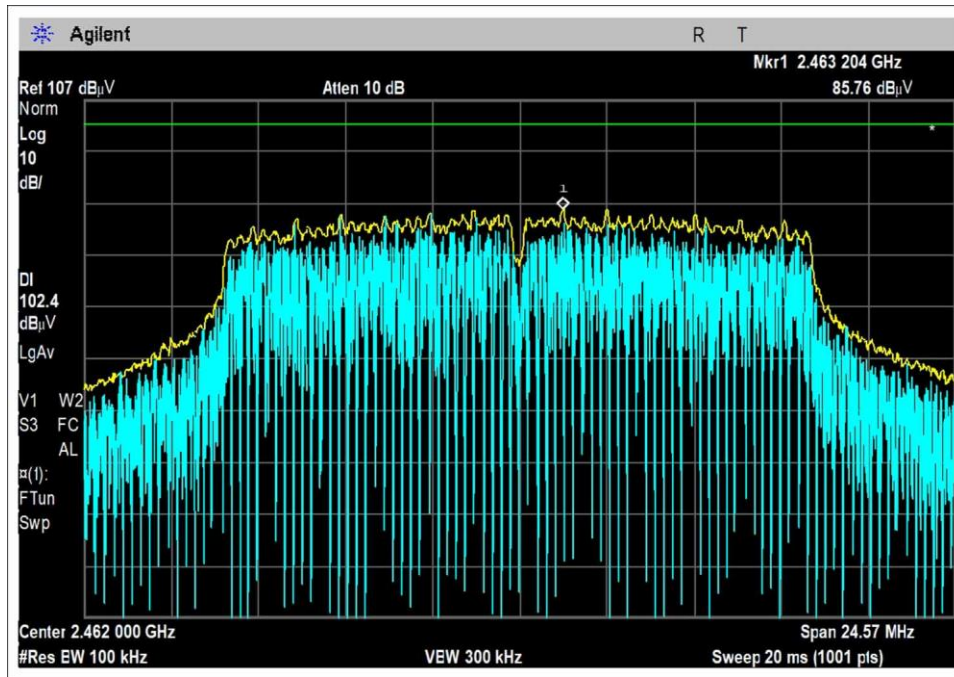
802.11b High Channel



802.11g Low Channel



802.11g Middle Channel



802.11g High Channel

Test Setup / Conditions / Data

Test Location: CKC Laboratories, Inc. • 22116 23rd Dr SE • Bothell, WA 98021 • 800-500-4362
 Customer: **Itron, Inc.**
 Specification: **15.247(e) Peak Power Spectral Density (2400-2483.5 MHz DTS)**
 Work Order #: **103221** Date: 12/6/2019
 Test Type: **Radiated Scan** Time: 12:14:13
 Tested By: Matthew Harrison Sequence#: 28
 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:

Temperature: 23° C
 Humidity: 39%
 Pressure: 101.1 kPa

 Frequency Range: 2400-2483.5 MHz
 Frequency tested: 2412, 2437, 2462 MHz
 Firmware power setting: Max

 Antenna type: Ceramic
 Antenna Gain: 0.5dBi

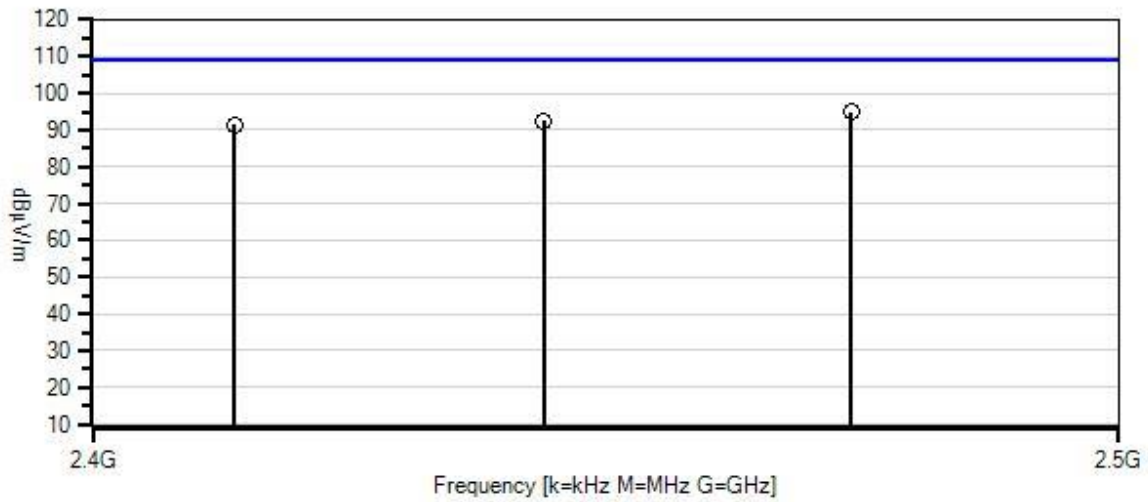
 Duty Cycle: 100% Modulated

 Test Method: ANSI C63.10: 2013
 KDB 558074 D01 15.247 Meas Guidance v05r02

 Test Mode: Transmitting 802.11b
 Test Setup: EUT is setup in a tabletop configuration 150cm high on a Styrofoam table.

 Modification #1 and #2 were in place during testing.

Itron, Inc. WD#: 103221 Sequence#: 28 Date: 12/6/2019
15.247(e) Peak Power Spectral Density (2400-2483.5 MHz DTS) Test Distance: 3 Meters Horiz



- Readings
 - Peak Readings
 - × QP Readings
 - * Average Readings
 - ▼ Ambient
- Software Version: 5.03.12
- 1 - 15.247(e) Peak Power Spectral Density (2400-2483.5 MHz DTS)

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02673	Spectrum Analyzer	E4446A	2/22/2019	2/22/2021
T1	AN03540	Preamp	83017A	5/13/2019	5/13/2021
T2	AN01467	Horn Antenna-ANSI C63.5 Calibration	3115	7/5/2019	7/5/2021
T3	ANP06242	Attenuator	54A-10	3/13/2018	3/13/2020
T4	ANP06515	Cable	Heliac	6/29/2018	6/29/2020
T5	ANP06540	Cable	Heliac	8/23/2019	8/23/2021
T6	ANP07504	Cable	CLU40-KMKM- 02.00F	1/17/2019	1/17/2021

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dB μ V	T5 dB	T6 dB	dB	dB	Table	dB μ V/m	dB μ V/m	dB	Ant
1	2461.415M	88.1	-34.3 +0.6	+27.6 +0.3	+9.9	+2.7	+0.0	94.9	109.2	-14.3	Horiz
2	2436.387M	85.9	-34.3 +0.6	+27.6 +0.3	+9.9	+2.6	+0.0	92.6	109.2	-16.6	Horiz
3	2411.406M	84.8	-34.3 +0.6	+27.6 +0.3	+9.9	+2.6	+0.0	91.5	109.2	-17.7	Horiz

Test Location: CKC Laboratories, Inc. • 22116 23rd Dr SE • Bothell, WA 98021 • 800-500-4362
 Customer: **Itron, Inc.**
 Specification: **15.247(e) Peak Power Spectral Density (2400-2483.5 MHz DTS)**
 Work Order #: **103221** Date: 12/6/2019
 Test Type: **Radiated Scan** Time: 12:35:14
 Tested By: Matthew Harrison Sequence#: 29
 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:

Temperature: 23° C
 Humidity: 39%
 Pressure: 101.1 kPa

Frequency Range: 2400-2483.5 MHz
 Frequency tested: 2412, 2437, 2462 MHz
 Firmware power setting: Max

Antenna type: Ceramic
 Antenna Gain: 0.5dBi

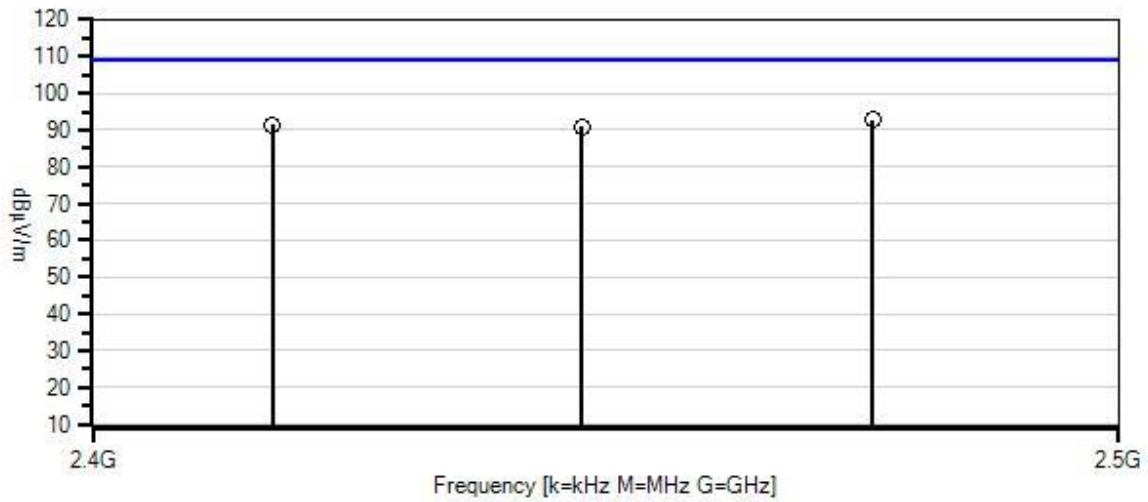
Duty Cycle: 100% Modulated

Test Method: ANSI C63.10: 2013
 KDB 558074 D01 15.247 Meas Guidance v05r02

Test Mode: Transmitting 802.11g
 Test Setup: EUT is setup in a tabletop configuration 150cm high on a Styrofoam table.

Modification #1 and #2 were in place during testing.

Itron, Inc. WD#: 103221 Sequence#: 29 Date: 12/6/2019
15.247(e) Peak Power Spectral Density (2400-2483.5 MHz DTS) Test Distance: 3 Meters Horiz



- Readings
 - Peak Readings
 - × QP Readings
 - * Average Readings
 - ▼ Ambient
- Software Version: 5.03.12
- 1 - 15.247(e) Peak Power Spectral Density (2400-2483.5 MHz DTS)

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02673	Spectrum Analyzer	E4446A	2/22/2019	2/22/2021
T1	AN03540	Preamp	83017A	5/13/2019	5/13/2021
T2	AN01467	Horn Antenna-ANSI C63.5 Calibration	3115	7/5/2019	7/5/2021
T3	ANP06242	Attenuator	54A-10	3/13/2018	3/13/2020
T4	ANP06515	Cable	Heliac	6/29/2018	6/29/2020
T5	ANP06540	Cable	Heliac	8/23/2019	8/23/2021
T6	ANP07504	Cable	CLU40-KMKM- 02.00F	1/17/2019	1/17/2021

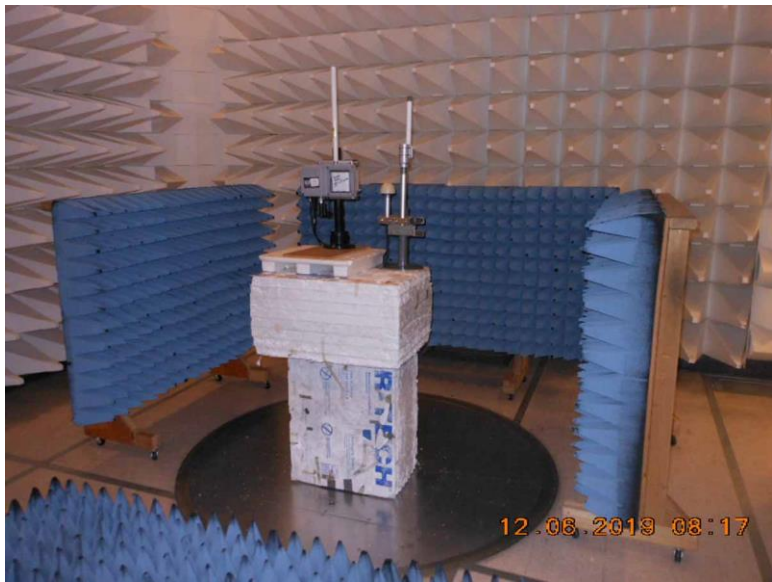
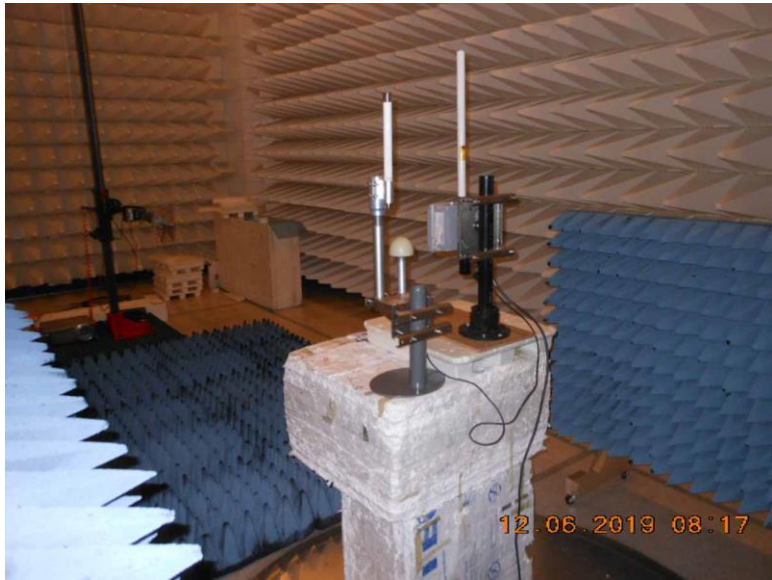
Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dB μ V	T1 T5 dB	T2 T6 dB	T3 dB	T4 dB	Dist Table	Corr dB μ V/m	Spec dB μ V/m	Margin dB	Polar Ant
1	2463.204M	85.8	-34.2 +0.6	+27.6 +0.3	+9.9	+2.7	+0.0	92.7	109.2	-16.5	Horiz
2	2414.460M	84.8	-34.3 +0.6	+27.6 +0.3	+9.9	+2.6	+0.0	91.5	109.2	-17.7	Horiz
3	2439.457M	84.1	-34.3 +0.6	+27.6 +0.3	+9.9	+2.6	+0.0	90.8	109.2	-18.4	Horiz

Test Setup Photo(s)



15.247(d) Radiated Emissions & Band Edge

Test Setup / Conditions / Data

Test Location: CKC Laboratories, Inc. • 22116 23rd Dr SE • Bothell, WA 98021 • 800-500-4362
 Customer: **Itron, Inc.**
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**
 Work Order #: **103221** Date: 12/14/2019
 Test Type: **Radiated Scan** Time: 09:13:31
 Tested By: Matthew Harrison Sequence#: 32
 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:

Temperature: 23° C
 Humidity: 39%
 Pressure: 101.1 kPa

 Frequency Range: 9kHz-25GHz
 Frequency tested: 2412, 2437, 2462 MHz
 Firmware power setting: Max

 Antenna type: Ceramic
 Antenna Gain: 0.5dBi

 Duty Cycle: 100% Modulated

 Test Method: ANSI C63.10: 2013
 KDB 558074 D01 15.247 Meas Guidance v05r02

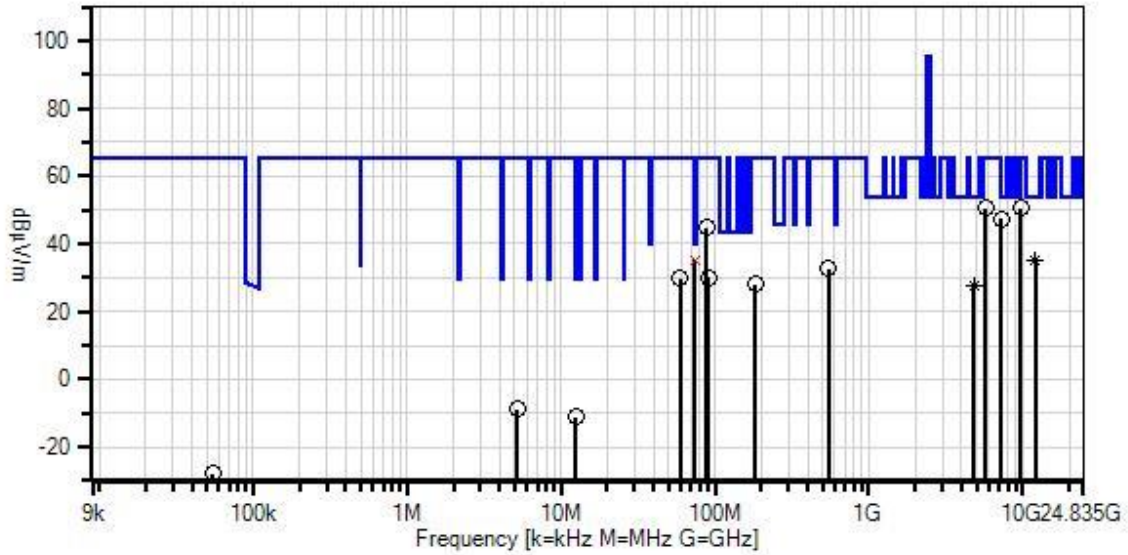
 Test Mode: Transmitting 802.11b
 Test Setup: EUT is setup in a tabletop configuration on a Styrofoam table:
 Below 1GHz set 80cm high.
 Above 1GHz set 1.5m high

 Modification #1 and #2 were in place during testing.

 Co-Location testing was performed with Wi-Fi, Cell, and FHSS radios transmitting simultaneously in both CCU100C and CCU100RC configurations.

No harmonics or spurs found above 5.7 GHz, floor readings taken.

Itron, Inc. WD#: 103221 Sequence#: 32 Date: 12/14/2019
 15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Para



- Readings
 - × QP Readings
 - ▼ Ambient
 - Peak Readings
 - * Average Readings
- 1 - 15.247(d) / 15.209 Radiated Spurious Emissions
- Software Version: 5.03.12

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02673	Spectrum Analyzer	E4446A	2/22/2019	2/22/2021
T2	AN03540	Preamp	83017A	5/13/2019	5/13/2021
T3	AN01467	Horn Antenna-ANSI C63.5 Calibration	3115	7/5/2019	7/5/2021
T4	ANP06515	Cable	Heliac	6/29/2018	6/29/2020
T5	ANP06540	Cable	Heliac	8/23/2019	8/23/2021
T6	ANP07504	Cable	CLU40-KMKM- 02.00F	1/17/2019	1/17/2021
T7	ANP07563	High Pass Filter	VHF-2700A+	3/15/2019	3/15/2021
	AN02742	Active Horn Antenna	AMFW-5F- 18002650-20-10P	10/16/2018	10/16/2020
	AN02763-69	Waveguide	Multiple	4/23/2018	4/23/2020
	ANP06503	Cable	32026-29801- 29801-36	3/13/2018	3/13/2020
	ANP06678	Cable	32026-29801- 29801-144	3/13/2018	3/13/2020
T8	AN02307	Preamp	8447D	1/15/2018	1/15/2020
T9	AN03628	Biconilog Antenna	3142E	6/11/2019	6/11/2021
T10	ANP06123	Attenuator	18N-6	4/5/2019	4/5/2021
T11	ANP05305	Cable	ETSI-50T	9/6/2019	9/6/2021
T12	ANP05360	Cable	RG214	1/31/2018	1/31/2020
T13	AN00052	Loop Antenna	6502	5/7/2018	5/7/2020

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
			T5	T6	T7	T8					
			T9	T10	T11	T12					
			T13								
	MHz	dB μ V	dB	dB	dB	dB	Table	dB μ V/m	dB μ V/m	dB	Ant
1	73.600M	49.3	+0.0	+0.0	+0.0	+0.0	+0.0	35.4	40.0	-4.6	Vert
	QP		+0.1	+0.0	+0.0	-27.8					
			+7.1	+5.8	+0.4	+0.5					
			+0.0								
^	73.600M	58.4	+0.0	+0.0	+0.0	+0.0	+0.0	44.5	40.0	+4.5	Vert
			+0.1	+0.0	+0.0	-27.8					
			+7.1	+5.8	+0.4	+0.5					
			+0.0								
3	5743.750M	44.0	+0.0	-33.7	+34.1	+4.5	+0.0	50.6	65.5	-14.9	Horiz
			+1.0	+0.5	+0.2	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0								
4	9648.000M	38.8	+0.0	-33.9	+37.6	+6.2	+0.0	50.5	65.5	-15.0	Horiz
			+1.3	+0.5	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0								
5	7236.000M	37.5	+0.0	-34.5	+36.6	+5.3	+0.0	47.4	65.5	-18.1	Horiz
			+1.1	+0.5	+0.9	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0								

6	12060.000 M Ave	22.4	+0.0 +1.4 +0.0 +0.0	-34.6 +0.6 +0.0 +0.0	+38.5 +0.0 +0.0 +0.0	+6.8 +0.0 +0.0 +0.0	+0.0	35.1	54.0	-18.9	Horiz
^	12060.000 M	36.9	+0.0 +1.4 +0.0 +0.0	-34.6 +0.6 +0.0 +0.0	+38.5 +0.0 +0.0 +0.0	+6.8 +0.0 +0.0 +0.0	+0.0	49.6	54.0	-4.4	Horiz
8	88.200M	58.9	+0.0 +0.1 +7.0 +0.0	+0.0 +0.0 +5.8 +0.4	+0.0 +0.0 +0.4 +0.5	+0.0 -27.8 +0.5 +0.5	+0.0	44.9	65.5	-20.6	Vert
9	4824.000M Ave	23.1	+0.0 +0.9 +0.0 +0.0	-33.6 +0.5 +0.0 +0.0	+32.4 +0.3 +0.0 +0.0	+4.1 +0.0 +0.0 +0.0	+0.0	27.7	54.0	-26.3	Horiz
^	4824.000M	38.0	+0.0 +0.9 +0.0 +0.0	-33.6 +0.5 +0.0 +0.0	+32.4 +0.3 +0.0 +0.0	+4.1 +0.0 +0.0 +0.0	+0.0	42.6	54.0	-11.4	Horiz
11	546.000M	32.7	+0.0 +0.3 +19.7 +0.0	+0.0 +0.0 +5.8 +1.1	+0.0 +0.0 +1.1 +1.4	+0.0 -28.2 +1.4 +1.4	+0.0	32.8	65.5	-32.7	Horiz
12	91.100M	43.8	+0.0 +0.1 +7.2 +0.0	+0.0 +0.0 +5.8 +0.4	+0.0 +0.0 +0.4 +0.5	+0.0 -27.8 +0.5 +0.5	+0.0	30.0	65.5	-35.5	Horiz
13	59.100M	43.2	+0.0 +0.1 +7.7 +0.0	+0.0 +0.0 +5.8 +0.4	+0.0 +0.0 +0.4 +0.4	+0.0 -27.9 +0.4 +0.4	+0.0	29.7	65.5	-35.8	Horiz
14	182.300M	38.1	+0.0 +0.2 +10.0 +0.0	+0.0 +0.0 +5.8 +0.6	+0.0 +0.0 +0.6 +0.8	+0.0 -27.4 +0.8 +0.8	+0.0	28.1	65.5	-37.4	Horiz
15	5.224M	21.3	+0.0 +0.0 +0.0 +9.7	+0.0 +0.0 +0.0 +0.0	+0.0 +0.0 +0.0 +0.0	+0.1 +0.0 +0.0 +0.0	-40.0	-8.9	65.5	-74.4	Para
16	12.478M	19.5	+0.0 +0.0 +0.0 +9.1	+0.0 +0.0 +0.0 +0.0	+0.0 +0.0 +0.0 +0.0	+0.2 +0.0 +0.0 +0.0	-40.0	-11.2	65.5	-76.7	Perp
17	54.402k	42.2	+0.0 +0.0 +0.0 +10.0	+0.0 +0.0 +0.0 +0.0	+0.0 +0.0 +0.0 +0.0	+0.0 +0.0 +0.0 +0.0	-80.0	-27.8	65.5	-93.3	Perp

Test Location: CKC Laboratories, Inc. • 22116 23rd Dr SE • Bothell, WA 98021 • 800-500-4362
 Customer: **Itron, Inc.**
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**
 Work Order #: **103221** Date: 12/14/2019
 Test Type: **Radiated Scan** Time: 08:36:02
 Tested By: Matthew Harrison Sequence#: 33
 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:

Temperature: 23° C
 Humidity: 39%
 Pressure: 101.1 kPa

Frequency Range: 9kHz-25GHz
 Frequency tested: 2412, 2437, 2462 MHz
 Firmware power setting: Max

Antenna type: Ceramic
 Antenna Gain: 0.5dBi

Duty Cycle: 100% Modulated

Test Method: ANSI C63.10: 2013
 KDB 558074 D01 15.247 Meas Guidance v05r02

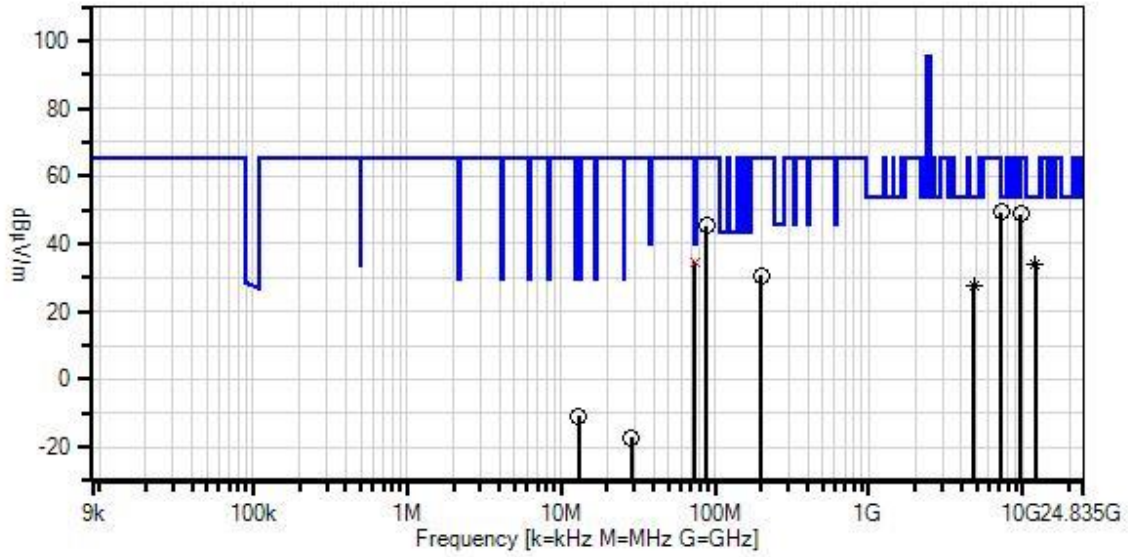
Test Mode: Transmitting 802.11g
 Test Setup: EUT is setup in a tabletop configuration on a Styrofoam table:
 Below 1GHz set 80cm high.
 Above 1GHz set 1.5m high

Modification #1 and #2 were in place during testing.

Co-Location testing was performed with Wi-Fi, Cell, and FHSS radios transmitting simultaneously in both CCU100C and CCU100RC configurations.

No harmonics or spurs found above 3 GHz, floor readings taken.

Itron, Inc. WD#: 103221 Sequence#: 33 Date: 12/14/2019
 15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Para



- 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	Calibration Date	Cal Due Date
	AN02673	Spectrum Analyzer	E4446A	2/22/2019	2/22/2021
T1	AN03540	Preamp	83017A	5/13/2019	5/13/2021
T2	AN01467	Horn Antenna-ANSI C63.5 Calibration	3115	7/5/2019	7/5/2021
T3	ANP06515	Cable	Heliac	6/29/2018	6/29/2020
T4	ANP06540	Cable	Heliac	8/23/2019	8/23/2021
T5	ANP07504	Cable	CLU40-KMKM- 02.00F	1/17/2019	1/17/2021
T6	ANP07563	High Pass Filter	VHF-2700A+	3/15/2019	3/15/2021
	AN02742	Active Horn Antenna	AMFW-5F- 18002650-20- 10P	10/16/2018	10/16/2020
	AN02763-69	Waveguide	Multiple	4/23/2018	4/23/2020
	ANP06503	Cable	32026-29801- 29801-36	3/13/2018	3/13/2020
	ANP06678	Cable	32026-29801- 29801-144	3/13/2018	3/13/2020
T7	AN02307	Preamp	8447D	1/15/2018	1/15/2020
T8	AN03628	Biconilog Antenna	3142E	6/11/2019	6/11/2021
T9	ANP06123	Attenuator	18N-6	4/5/2019	4/5/2021
T10	ANP05305	Cable	ETSI-50T	9/6/2019	9/6/2021
T11	ANP05360	Cable	RG214	1/31/2018	1/31/2020
T12	AN00052	Loop Antenna	6502	5/7/2018	5/7/2020

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq	Rdng	Reading listed by margin.				Dist	Corr	Spec	Margin	Polar
			T1	T2	T3	T4					
	MHz	dB μ V	T5	T6	T7	T8	Table	dB μ V/m	dB μ V/m	dB	Ant
1	73.600M QP	48.5	+0.0	+0.0	+0.0	+0.1	+0.0	34.6	40.0	-5.4	Vert
			+0.0	+0.0	-27.8	+7.1					
			+5.8	+0.4	+0.5	+0.0					
^	73.600M	60.7	+0.0	+0.0	+0.0	+0.1	+0.0	46.8	40.0	+6.8	Vert
			+0.0	+0.0	-27.8	+7.1					
			+5.8	+0.4	+0.5	+0.0					
3	7221.000M	39.6	-34.5	+36.5	+5.3	+1.1	+0.0	49.4	65.5	-16.1	Horiz
			+0.5	+0.9	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
4	9633.000M	36.9	-33.9	+37.6	+6.2	+1.3	+0.0	48.6	65.5	-16.9	Horiz
			+0.5	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
5	12045.000 M Ave	21.4	-34.6	+38.5	+6.8	+1.4	+0.0	34.1	54.0	-19.9	Horiz
			+0.6	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
^	12045.000 M	36.9	-34.6	+38.5	+6.8	+1.4	+0.0	49.6	54.0	-4.4	Horiz
			+0.6	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					

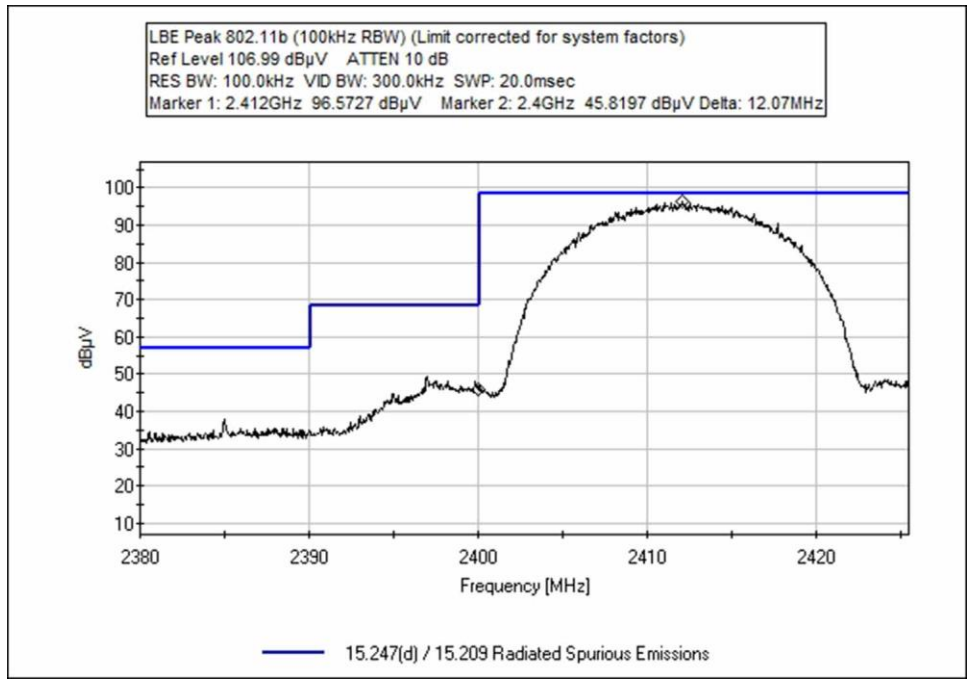
7	88.690M	59.2	+0.0	+0.0	+0.0	+0.1	+0.0	45.3	65.5	-20.2	Vert
			+0.0	+0.0	-27.8	+7.1					
			+5.8	+0.4	+0.5	+0.0					
8	4809.000M Ave	23.1	-33.6	+32.4	+4.1	+0.9	+0.0	27.8	54.0	-26.2	Horiz
			+0.6	+0.3	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
^	4809.000M	36.1	-33.6	+32.4	+4.1	+0.9	+0.0	40.8	54.0	-13.2	Horiz
			+0.6	+0.3	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
10	200.100M	40.4	+0.0	+0.0	+0.0	+0.2	+0.0	30.5	65.5	-35.0	Vert
			+0.0	+0.0	-27.2	+9.8					
			+5.8	+0.7	+0.8	+0.0					
11	12.956M	19.8	+0.0	+0.0	+0.2	+0.0	-40.0	-10.9	65.5	-76.4	Perp
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+9.1					
12	28.448M	16.5	+0.0	+0.0	+0.3	+0.1	-40.0	-17.1	65.5	-82.6	Para
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+6.0					
13	69.066k	40.3	+0.0	+0.0	+0.0	+0.0	-80.0	-30.1	65.5	-95.6	Para
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+9.6					

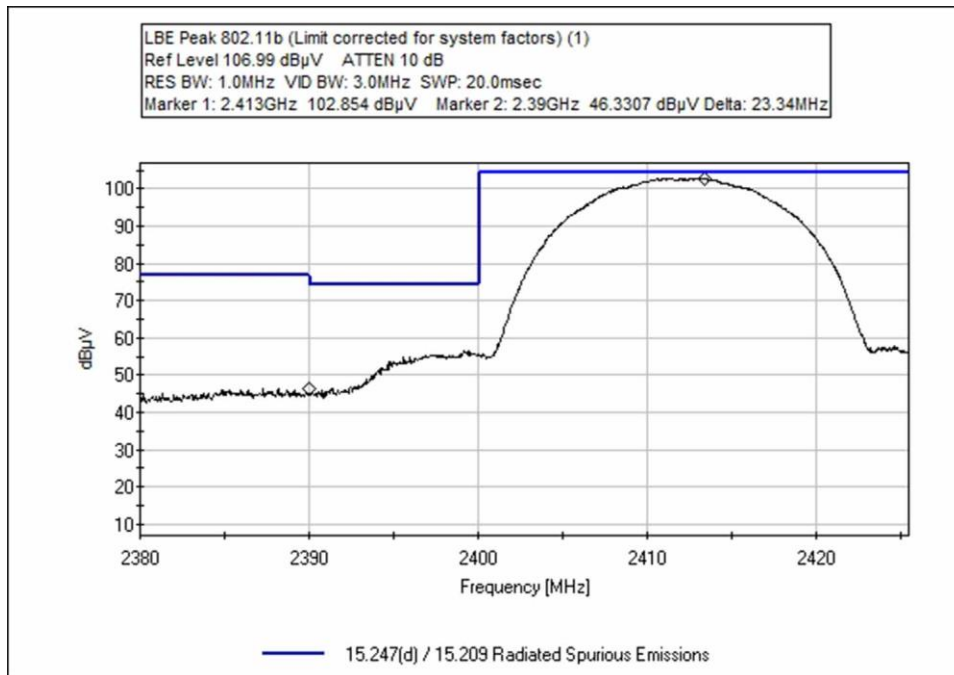
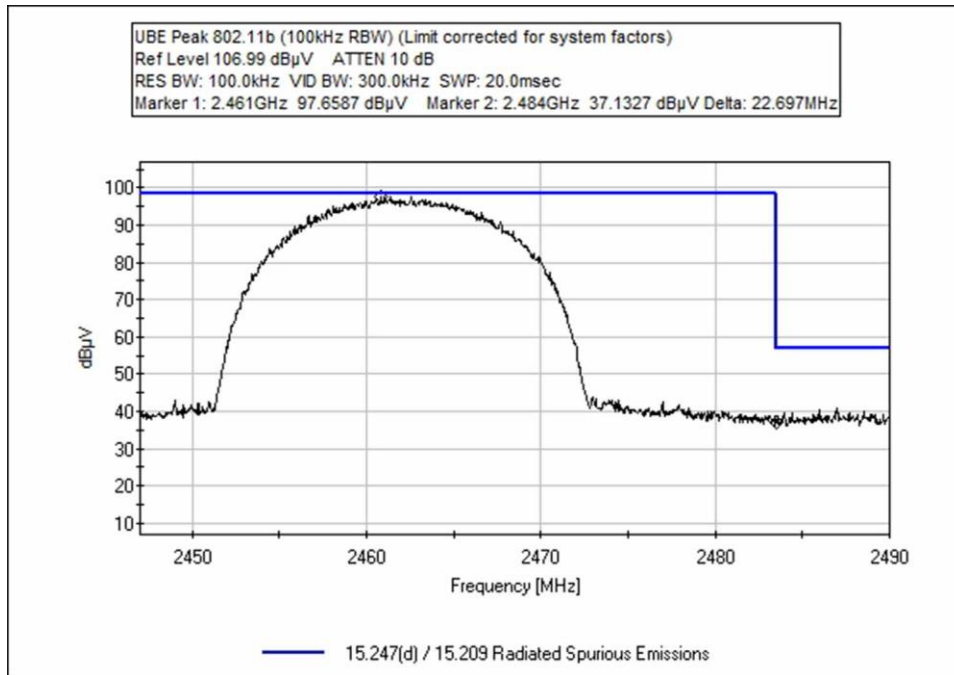
Band Edge

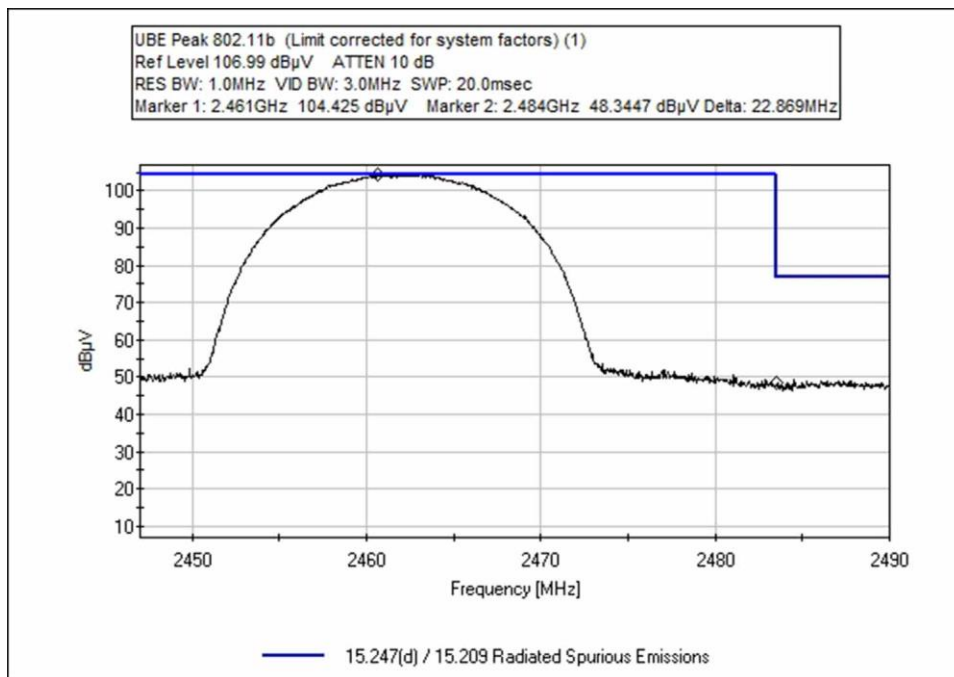
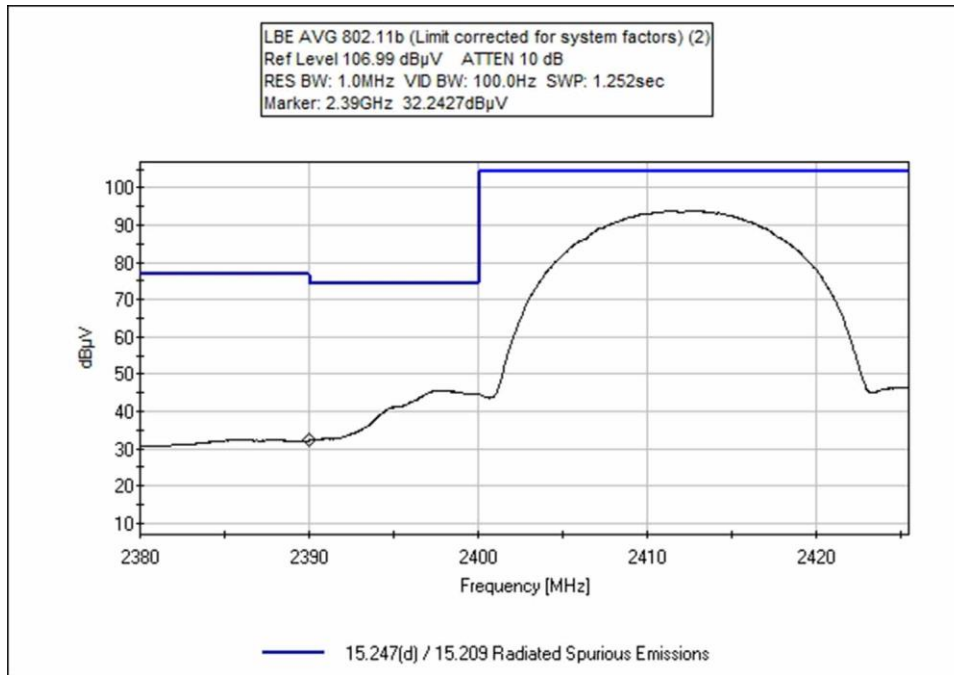
Band Edge Summary

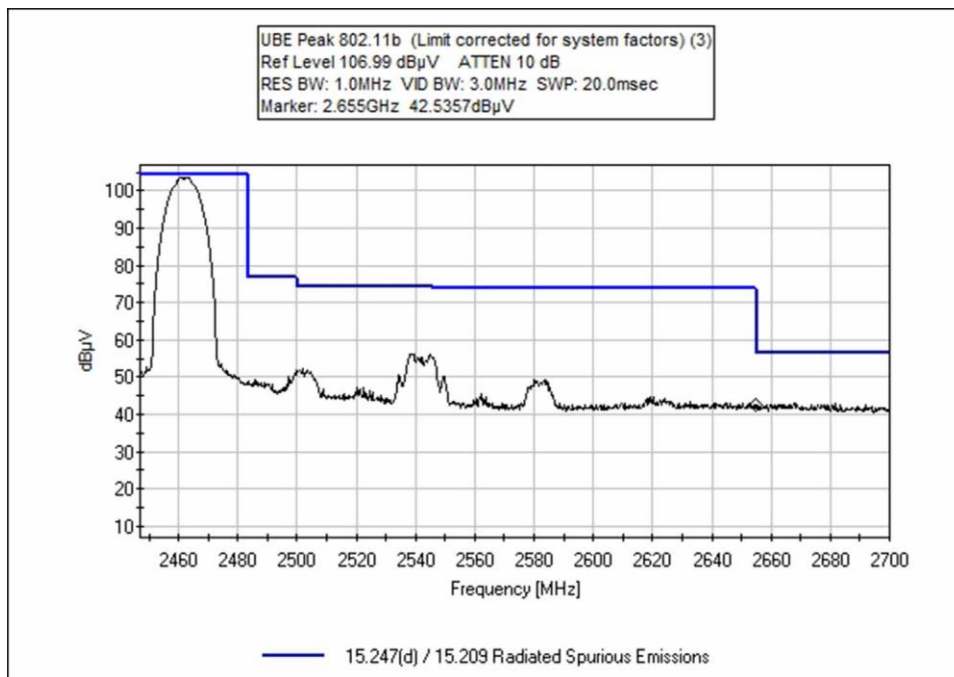
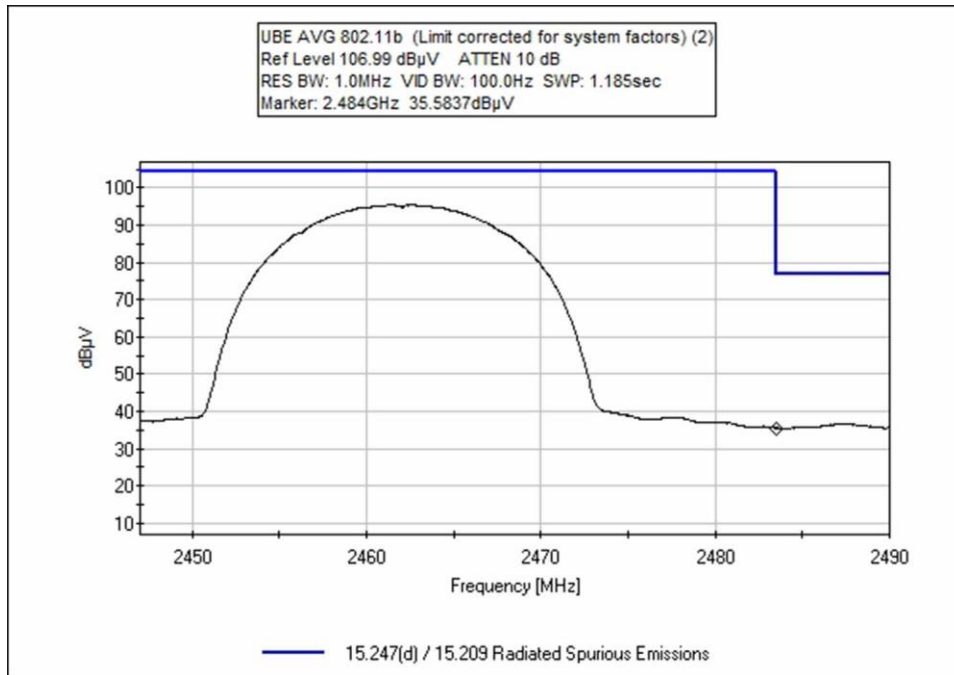
Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
2390.0	CCK	Ceramic	29.1	<54	Pass
2400.0	CCK	Ceramic	42.7	<65.5	Pass
2483.5	CCK	Ceramic	34.1	<54	Pass
2390.0	OFDM	Ceramic	37.1	<54	Pass
2400.0	OFDM	Ceramic	56.9	<63.4	Pass
2483.5	OFDM	Ceramic	45.7	<54	Pass

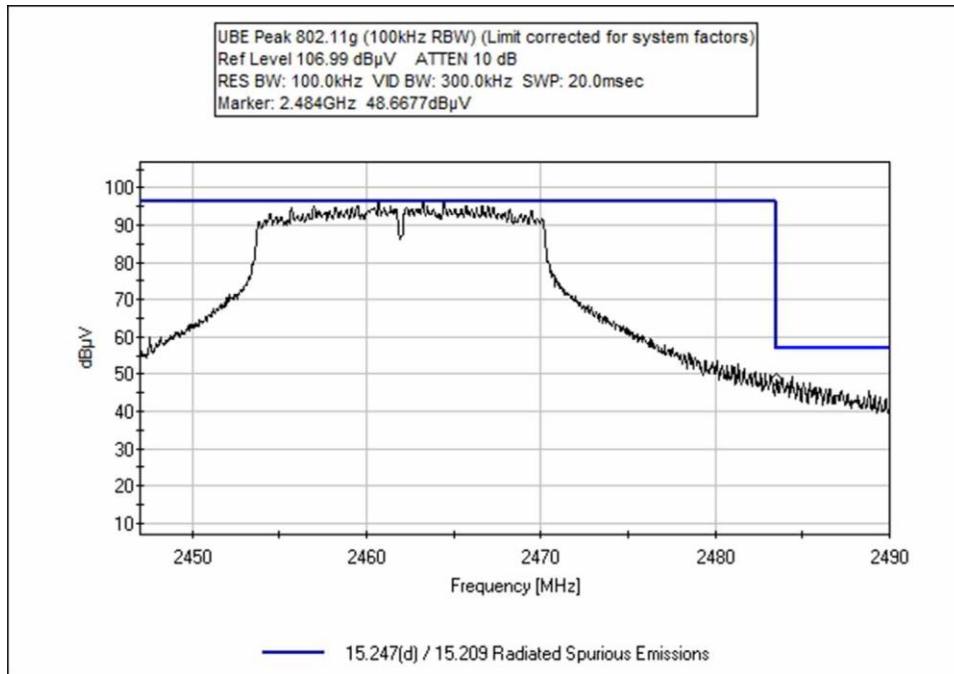
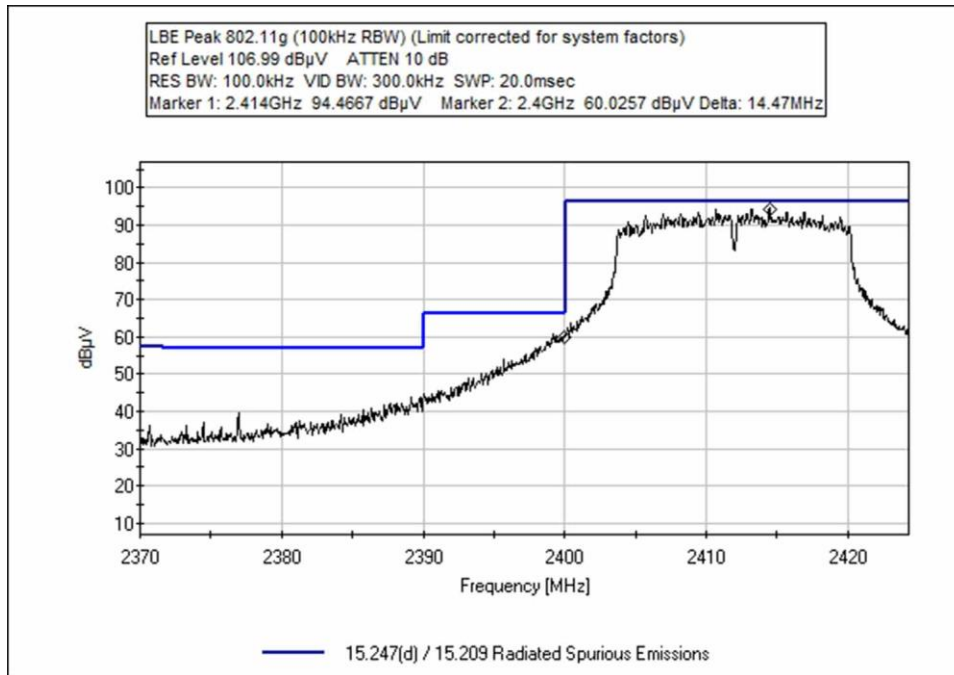
Band Edge Plots

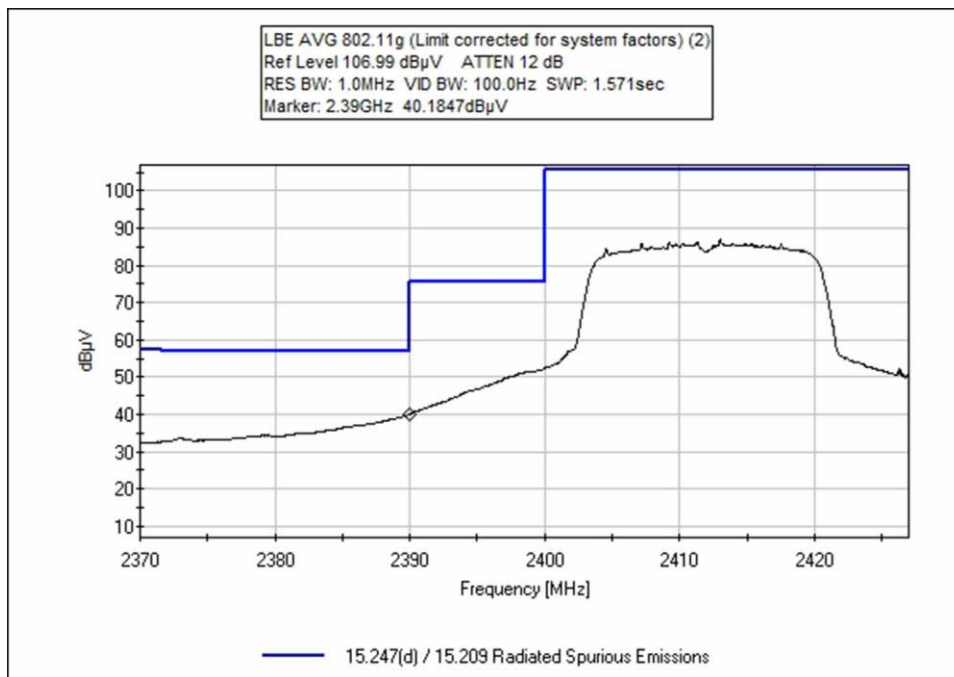
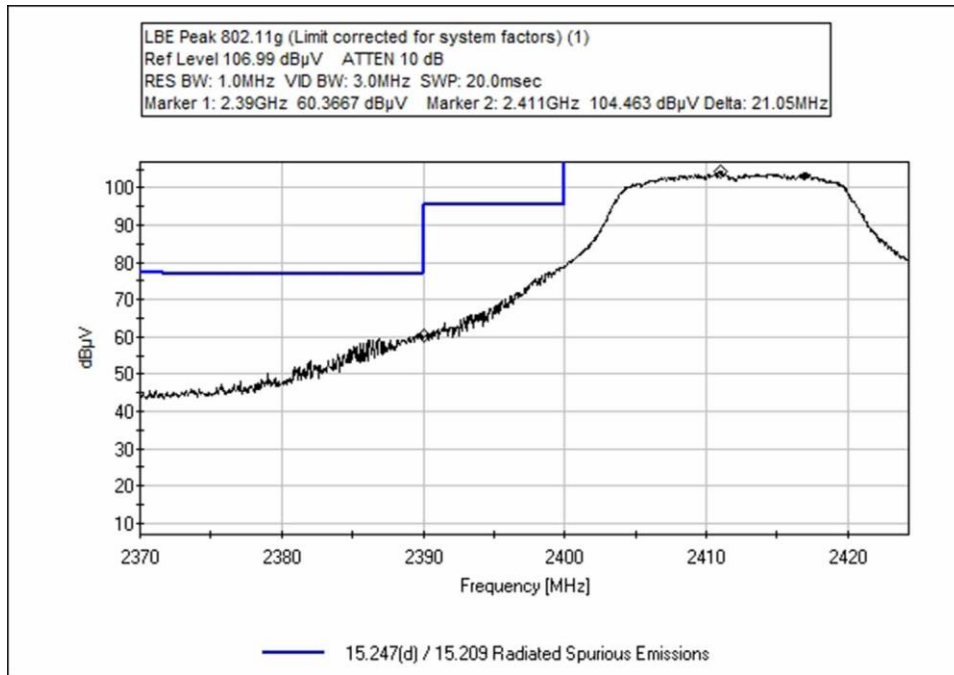


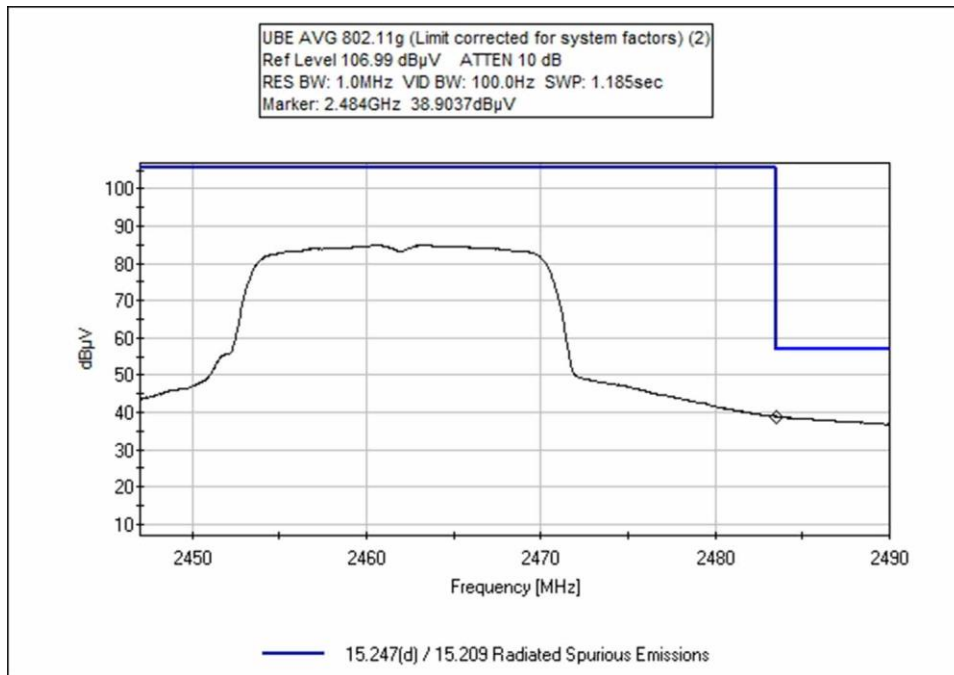
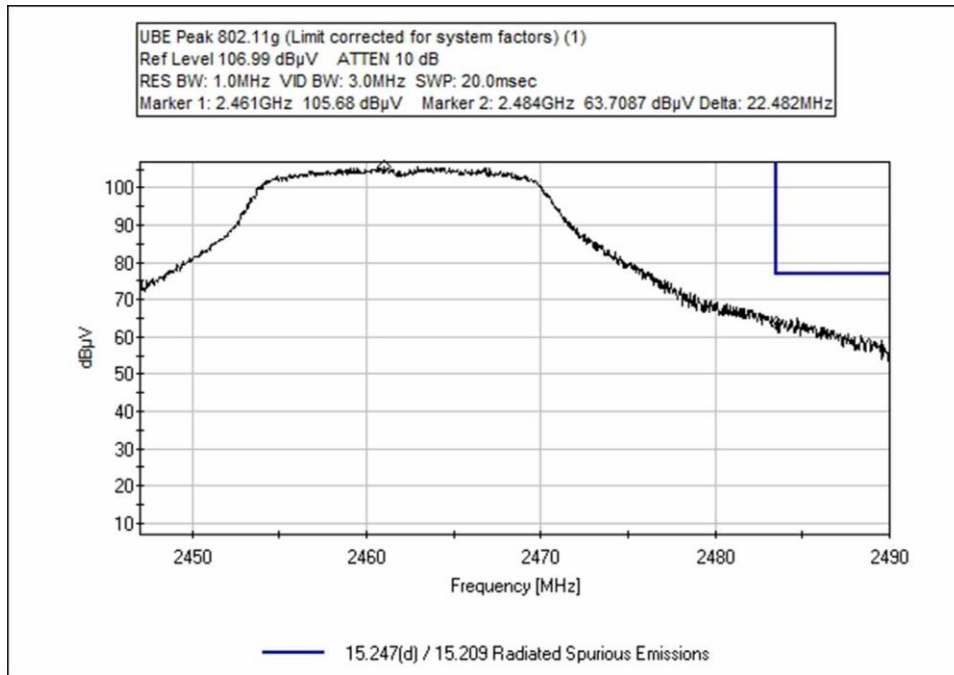












Test Setup / Conditions / Data

Test Location: CKC Laboratories, Inc. • 22116 23rd Dr SE • Bothell, WA 98021 • 800-500-4362
 Customer: **Itron, Inc.**
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**
 Work Order #: **103221** Date: 12/7/2019
 Test Type: **Radiated Scan** Time: 07:57:42
 Tested By: Matthew Harrison Sequence#: 30
 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:

Temperature: 23° C
 Humidity: 39%
 Pressure: 101.1 kPa

 Frequency Range: 2400-2483.5 MHz
 Frequency tested: 2412, 2437, 2462 MHz
 Firmware power setting: Max

 Antenna type: Ceramic
 Antenna Gain: 0.5dBi

 Duty Cycle: 100% Modulated

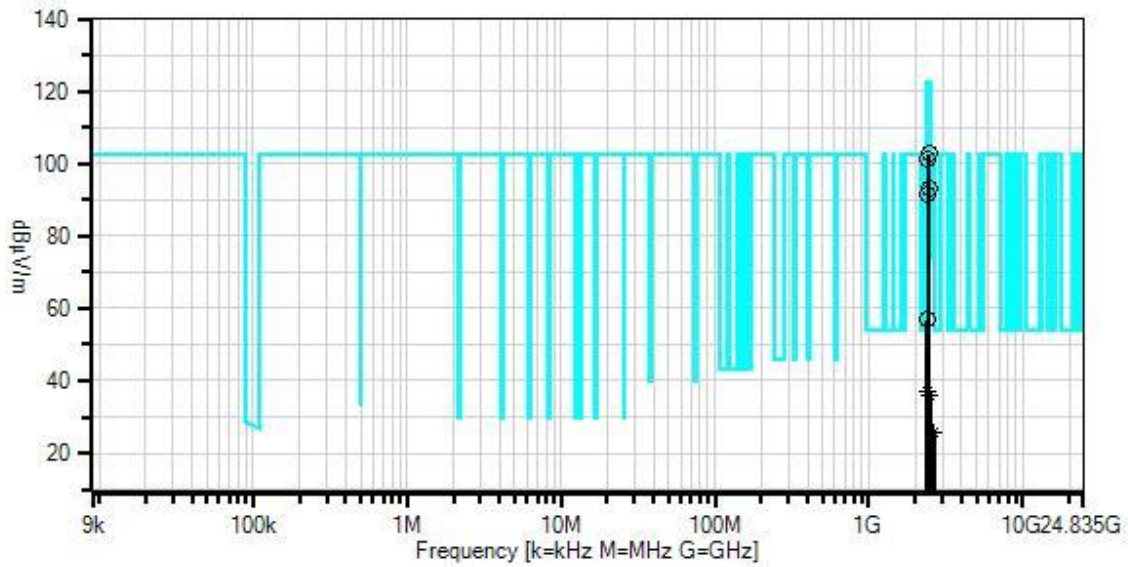
 Test Method: ANSI C63.10: 2013
 KDB 558074 D01 15.247 Meas Guidance v05r02

 Test Mode: Transmitting 802.11g
 Test Setup: EUT is setup in a tabletop configuration on a Styrofoam table:
 Above 1GHz set 1.5m high

 Co-Location testing was performed with Wi-Fi, Cell, and FHSS radios transmitting simultaneously in both
 CCU100C and CCU100RC configurations.

 Modification #1 and #2 were in place during testing.

Itron, Inc. WO#: 103221 Sequence#: 30 Date: 12/7/2019
 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	Calibration Date	Cal Due Date
T1	AN02673	Spectrum Analyzer	E4446A	2/22/2019	2/22/2021
T2	AN03540	Preamp	83017A	5/13/2019	5/13/2021
T3	AN01467	Horn Antenna-ANSI C63.5 Calibration	3115	7/5/2019	7/5/2021
T4	ANP06515	Cable	Heliac	6/29/2018	6/29/2020
T5	ANP06540	Cable	Heliac	8/23/2019	8/23/2021
T6	ANP07504	Cable	CLU40-KMKM- 02.00F	1/17/2019	1/17/2021

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dB μ V	T1 T5 dB	T2 T6 dB	T3 dB	T4 dB	Dist Table	Corr dB μ V/m	Spec dB μ V/m	Margin dB	Polar Ant
1	2463.211M	96.1	+0.0 +0.6	-34.2 +0.3	+27.6	+2.7	+0.0	93.1	93.4 100kHz	-0.3	Horiz
2	2414.470M	94.5	+0.0 +0.6	-34.3 +0.3	+27.6	+2.6	+0.0	91.3	93.4 100kHz	-2.1	Horiz
3	2400.000M	60.0	+0.0 +0.6	-34.3 +0.3	+27.7	+2.6	+0.0	56.9	73.4 100kHz	-16.5	Horiz
4	2390.000M Ave	40.2	+0.0 +0.6	-34.3 +0.3	+27.7	+2.6	+0.0	37.1	54.0	-16.9	Horiz
^	2390.000M	60.4	+0.0 +0.6	-34.3 +0.3	+27.7	+2.6	+0.0	57.3	74.0	-16.7	Horiz
6	2483.500M Ave	38.9	+0.0 +0.6	-34.2 +0.3	+27.6	+2.7	+0.0	35.9	54.0	-18.1	Horiz
^	2483.500M	48.7	+0.0 +0.6	-34.2 +0.3	+27.6	+2.7	+0.0	45.7	54.0 100kHz	-8.3	Horiz
^	2483.500M	63.7	+0.0 +0.6	-34.2 +0.3	+27.6	+2.7	+0.0	60.7	74.0	-13.3	Horiz
9	2461.018M	105.7	+0.0 +0.6	-34.3 +0.3	+27.6	+2.7	+0.0	102.6	122.6	-20.0	Horiz
10	2410.940M	104.3	+0.0 +0.6	-34.3 +0.3	+27.6	+2.6	+0.0	101.1	122.6	-21.5	Horiz
11	2655.000M Ave	28.1	+0.0 +0.7	-34.2 +0.2	+28.1	+2.6	+0.0	25.5	54.0	-28.5	Horiz
^	2655.000M	40.8	+0.0 +0.7	-34.2 +0.2	+28.1	+2.6	+0.0	38.2	54.0	-15.8	Horiz

Test Location: CKC Laboratories, Inc. • 22116 23rd Dr SE • Bothell, WA 98021 • 800-500-4362
 Customer: **Itron, Inc.**
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**
 Work Order #: **103221** Date: 12/7/2019
 Test Type: **Radiated Scan** Time: 08:17:45
 Tested By: Matthew Harrison Sequence#: 31
 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:

Temperature: 23° C
 Humidity: 39%
 Pressure: 101.1 kPa

Frequency Range: 2400-2483.5 MHz
 Frequency tested: 2412, 2437, 2462 MHz
 Firmware power setting: Max

Antenna type: Ceramic
 Antenna Gain: 0.5dBi

Duty Cycle: 100% Modulated

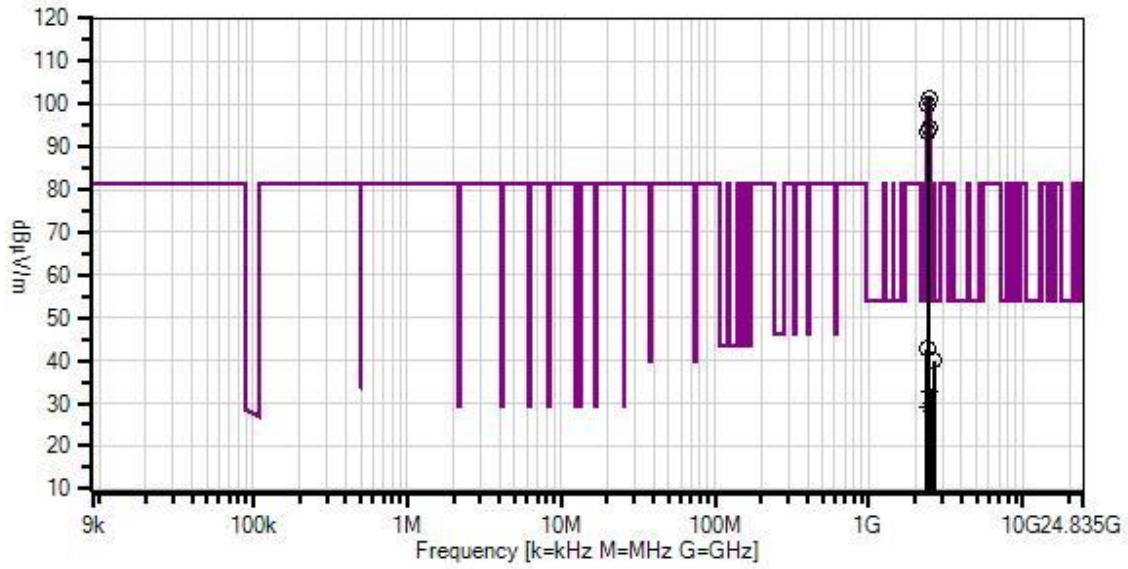
Test Method: ANSI C63.10: 2013
 KDB 558074 D01 15.247 Meas Guidance v05r02

Test Mode: Transmitting 802.11b
 Test Setup: EUT is setup in a tabletop configuration on a Styrofoam table:
 Above 1GHz set 1.5m high

Co-Location testing was performed with Wi-Fi, Cell, and FHSS radios transmitting simultaneously in both
 CCU100C and CCU100RC configurations.

Modification #1 and #2 were in place during testing.

Itron, Inc. WO#: 103221 Sequence#: 31 Date: 12/7/2019
 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	Calibration Date	Cal Due Date
T1	AN02673	Spectrum Analyzer	E4446A	2/22/2019	2/22/2021
T2	AN03540	Preamp	83017A	5/13/2019	5/13/2021
T3	AN01467	Horn Antenna-ANSI C63.5 Calibration	3115	7/5/2019	7/5/2021
T4	ANP06515	Cable	Heliac	6/29/2018	6/29/2020
T5	ANP06540	Cable	Heliac	8/23/2019	8/23/2021
T6	ANP07504	Cable	CLU40-KMKM- 02.00F	1/17/2019	1/17/2021

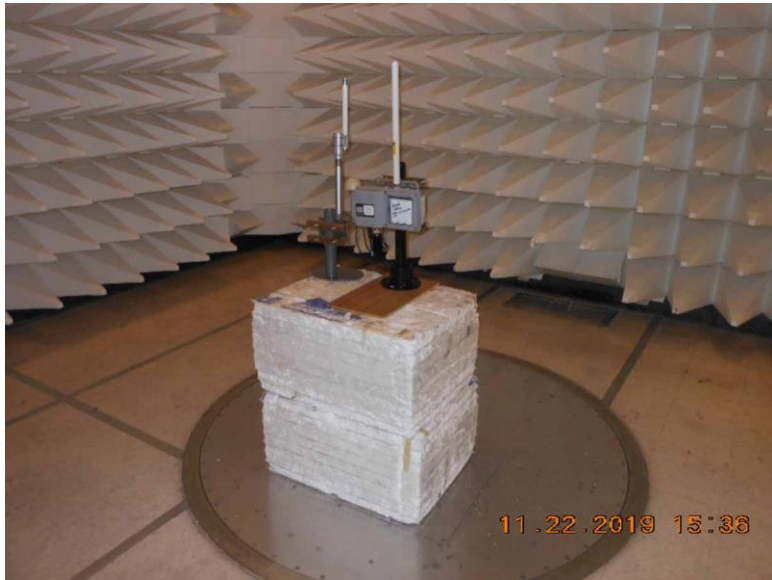
Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dB μ V	T1 T5 dB	T2 T6 dB	T3 dB	T4 dB	Dist Table	Corr dB μ V/m	Spec dB μ V/m	Margin dB	Polar Ant
1	2460.803M	97.7	+0.0 +0.6	-34.3 +0.3	+27.6	+2.7	+0.0	94.6	95.5 100kHz	-0.9	Horiz
2	2412.070M	96.6	+0.0 +0.6	-34.3 +0.3	+27.6	+2.6	+0.0	93.4	95.5 100kHz	-2.1	Horiz
3	2655.000M	42.5	+0.0 +0.7	-34.2 +0.2	+28.1	+2.6	+0.0	39.9	54.0	-14.1	Horiz
4	2460.631M	104.4	+0.0 +0.6	-34.3 +0.3	+27.6	+2.7	+0.0	101.3	121.3	-20.0	Horiz
5	2483.500M Ave	35.6	+0.0 +0.6	-34.2 +0.3	+27.6	+2.7	+0.0	32.6	54.0	-21.4	Horiz
^	2483.500M	37.1	+0.0 +0.6	-34.2 +0.3	+27.6	+2.7	+0.0	34.1	54.0 100kHz	-19.9	Horiz
^	2483.500M	48.3	+0.0 +0.6	-34.2 +0.3	+27.6	+2.7	+0.0	45.3	74.0	-28.7	Horiz
8	2413.340M	102.9	+0.0 +0.6	-34.3 +0.3	+27.6	+2.6	+0.0	99.7	121.3	-21.6	Horiz
9	2390.000M Ave	32.2	+0.0 +0.6	-34.3 +0.3	+27.7	+2.6	+0.0	29.1	54.0	-24.9	Horiz
^	2390.000M	46.3	+0.0 +0.6	-34.3 +0.3	+27.7	+2.6	+0.0	43.2	74.0	-30.8	Horiz
11	2400.000M	45.8	+0.0 +0.6	-34.3 +0.3	+27.7	+2.6	+0.0	42.7	75.5 100kHz	-32.8	Horiz

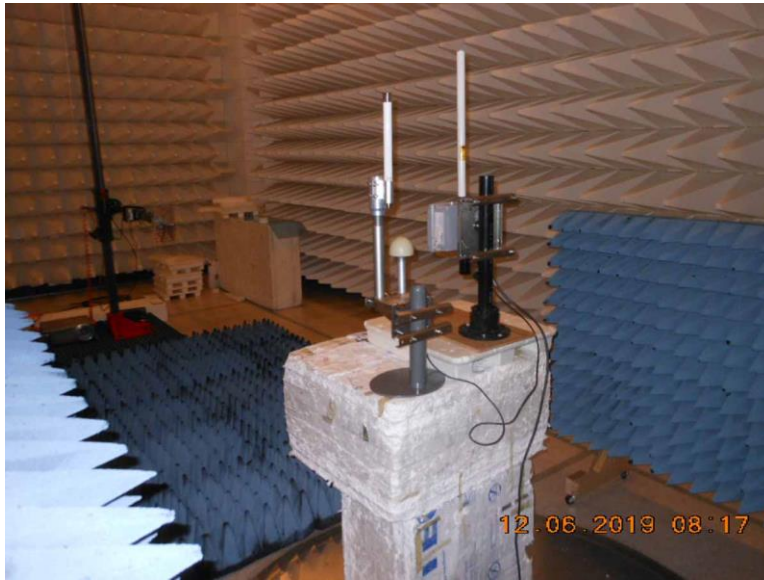
Test Setup Photo(s)



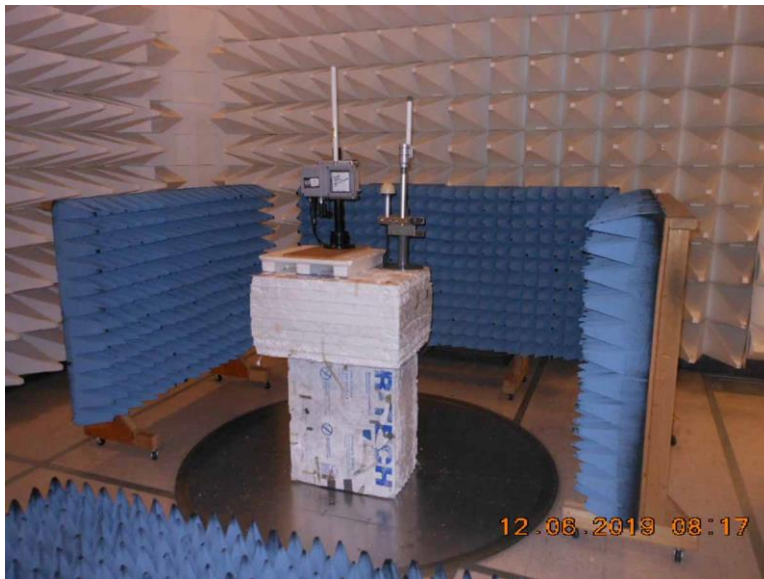
Below 1GHz



Below 1GHz



Above 1GHz



Above 1GHz

15.207 AC Conducted Emissions

Test Setup / Conditions / Data

Test Location: CKC Laboratories, Inc. • 22116 23rd Dr SE • Bothell, WA 98021 • 800-500-4362
 Customer: **Itron, Inc.**
 Specification: **15.207 AC Mains - Average**
 Work Order #: **103221** Date: 12/14/2019
 Test Type: **Conducted Emissions** Time: 09:30:53
 Tested By: Matthew Harrison Sequence#: 35
 Software: EMITest 5.03.12 120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Temperature: 23° C
 Humidity: 39%
 Pressure: 101.1 kPa

 Frequency Range: 150kHz-30MHz
 Frequency tested: 2412, 2437, 2462 MHz
 Firmware power setting: Max

 Antenna type: Ceramic
 Antenna Gain: 0.5dBi

 Duty Cycle: 100% Modulated

 Test Method: ANSI C63.10: 2013
 KDB 558074 D01 15.247 Meas Guidance v05r02

 Test Mode: Transmitting 802.11b
 Test Setup: EUT is setup in a tabletop configuration 0.8m high on a Styrofoam table.

 Modification #1 and #2 were in place during testing.
No harmonics or spurs found above 5.7 GHz, floor readings taken.

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02673	Spectrum Analyzer	E4446A	2/22/2019	2/22/2021
T1	ANP06219	Attenuator	768-10	4/13/2018	4/13/2020
T2	ANP06515	Cable	Heliac	6/29/2018	6/29/2020
T3	ANP06540	Cable	Heliac	8/23/2019	8/23/2021
T4	AN01311	50uH LISN-Line1 (L)	3816/2	3/16/2018	3/16/2020
	AN01311	50uH LISN-Line2 (N)	3816/2	3/16/2018	3/16/2020
T5	AN02611	High Pass Filter	HE9615-150K-50-720B	1/15/2018	1/15/2020

Measurement Data:

Reading listed by margin.

Test Lead: Line

#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dB μ V	T5				Table	dB μ V	dB μ V	dB	Ant
			dB	dB	dB	dB					
1	498.332k	28.9	+9.1	+0.0	+0.0	+0.4	+0.0	38.6	46.0	-7.4	Line
	Ave		+0.2								
^	498.331k	32.9	+9.1	+0.0	+0.0	+0.4	+0.0	42.6	46.0	-3.4	Line
			+0.2								
3	589.960k	15.7	+9.1	+0.0	+0.0	+0.4	+0.0	25.4	46.0	-20.6	Line
	Ave		+0.2								
^	589.959k	27.3	+9.1	+0.0	+0.0	+0.4	+0.0	37.0	46.0	-9.0	Line
			+0.2								
5	605.231k	14.1	+9.1	+0.0	+0.0	+0.4	+0.0	23.8	46.0	-22.2	Line
	Ave		+0.2								
^	605.230k	25.7	+9.1	+0.0	+0.0	+0.4	+0.0	35.4	46.0	-10.6	Line
			+0.2								
7	12.959M	17.9	+9.1	+0.2	+0.0	+0.4	+0.0	27.7	50.0	-22.3	Line
	Ave		+0.1								
^	12.959M	29.5	+9.1	+0.2	+0.0	+0.4	+0.0	39.3	50.0	-10.7	Line
			+0.1								
9	13.454M	16.4	+9.1	+0.2	+0.0	+0.4	+0.0	26.2	50.0	-23.8	Line
	Ave		+0.1								
^	13.454M	30.4	+9.1	+0.2	+0.0	+0.4	+0.0	40.2	50.0	-9.8	Line
			+0.1								
11	27.992M	15.7	+9.1	+0.3	+0.1	+0.6	+0.0	26.0	50.0	-24.0	Line
	Ave		+0.2								
^	27.992M	29.0	+9.1	+0.3	+0.1	+0.6	+0.0	39.3	50.0	-10.7	Line
			+0.2								
13	28.650M	14.3	+9.1	+0.3	+0.1	+0.6	+0.0	24.6	50.0	-25.4	Line
	Ave		+0.2								
^	28.650M	28.8	+9.1	+0.3	+0.1	+0.6	+0.0	39.1	50.0	-10.9	Line
			+0.2								
15	14.202M	11.5	+9.1	+0.2	+0.0	+0.4	+0.0	21.4	50.0	-28.6	Line
	Ave		+0.2								
^	14.202M	29.4	+9.1	+0.2	+0.0	+0.4	+0.0	39.3	50.0	-10.7	Line
			+0.2								

17	14.130M Ave	11.4	+9.1 +0.2	+0.2	+0.0	+0.4	+0.0	21.3	50.0	-28.7	Line
^	14.130M	30.0	+9.1 +0.2	+0.2	+0.0	+0.4	+0.0	39.9	50.0	-10.1	Line
19	14.013M Ave	11.4	+9.1 +0.2	+0.2	+0.0	+0.4	+0.0	21.3	50.0	-28.7	Line
^	14.013M	31.7	+9.1 +0.2	+0.2	+0.0	+0.4	+0.0	41.6	50.0	-8.4	Line
21	13.842M Ave	11.3	+9.1 +0.2	+0.2	+0.0	+0.4	+0.0	21.2	50.0	-28.8	Line
^	13.842M	30.8	+9.1 +0.2	+0.2	+0.0	+0.4	+0.0	40.7	50.0	-9.3	Line
23	13.788M Ave	11.1	+9.1 +0.2	+0.2	+0.0	+0.4	+0.0	21.0	50.0	-29.0	Line
^	13.788M	30.8	+9.1 +0.2	+0.2	+0.0	+0.4	+0.0	40.7	50.0	-9.3	Line
25	14.058M Ave	11.1	+9.1 +0.2	+0.2	+0.0	+0.4	+0.0	21.0	50.0	-29.0	Line
^	14.058M	30.4	+9.1 +0.2	+0.2	+0.0	+0.4	+0.0	40.3	50.0	-9.7	Line
27	13.535M Ave	10.8	+9.1 +0.2	+0.2	+0.0	+0.4	+0.0	20.7	50.0	-29.3	Line
^	13.535M	30.2	+9.1 +0.2	+0.2	+0.0	+0.4	+0.0	40.1	50.0	-9.9	Line
29	13.625M Ave	10.6	+9.1 +0.2	+0.2	+0.0	+0.4	+0.0	20.5	50.0	-29.5	Line
^	13.625M	30.8	+9.1 +0.2	+0.2	+0.0	+0.4	+0.0	40.7	50.0	-9.3	Line

Test Location: CKC Laboratories, Inc. • 22116 23rd Dr SE • Bothell, WA 98021 • 800-500-4362
 Customer: **Itron, Inc.**
 Specification: **15.207 AC Mains - Average**
 Work Order #: **103221** Date: 12/14/2019
 Test Type: **Conducted Emissions** Time: 09:39:47
 Tested By: Matthew Harrison Sequence#: 36
 Software: EMITest 5.03.12 120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Temperature: 23° C
 Humidity: 39%
 Pressure: 101.1 kPa

 Frequency Range: 150kHz-30MHz
 Frequency tested: 2412, 2437, 2462 MHz
 Firmware power setting: Max

 Antenna type: Ceramic
 Antenna Gain: 0.5dBi

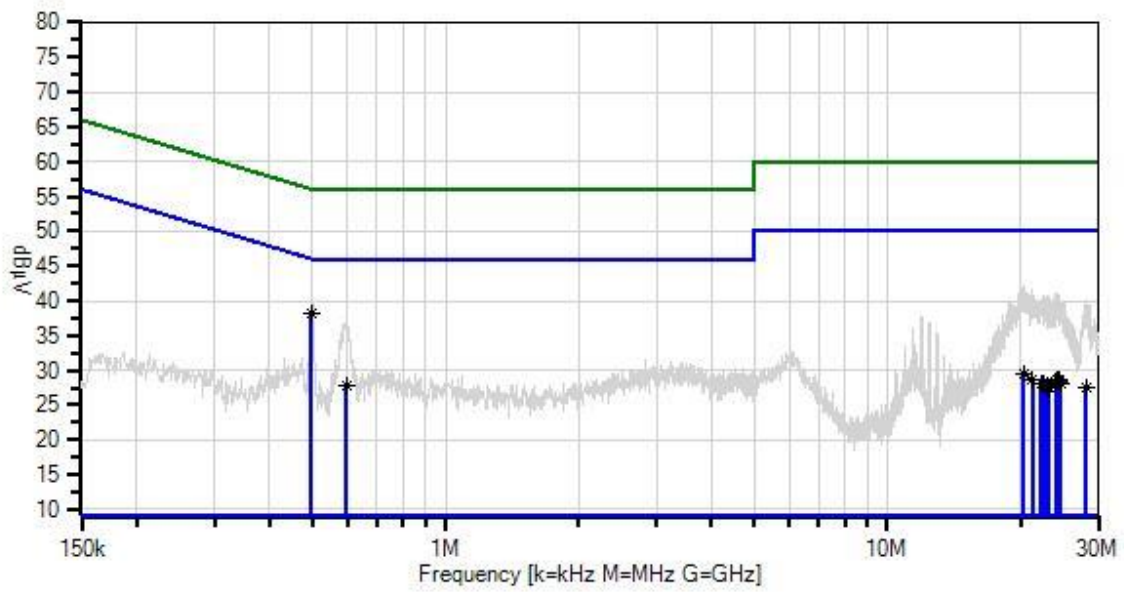
 Duty Cycle: 100% Modulated

 Test Method: ANSI C63.10: 2013
 KDB 558074 D01 15.247 Meas Guidance v05r02

 Test Mode: Transmitting 802.11b
 Test Setup: EUT is setup in a tabletop configuration 0.8m high on a Styrofoam table.

Modification #1 and #2 were in place during testing.
No harmonics or spurs found above 5.7 GHz, floor readings taken.

Iron, Inc. WD#: 103221 Sequence#: 36 Date: 12/14/2019
 15.207 AC Mains - Average Test Lead: 120V 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
	AN02673	Spectrum Analyzer	E4446A	2/22/2019	2/22/2021
T1	ANP06219	Attenuator	768-10	4/13/2018	4/13/2020
T2	ANP06515	Cable	Heliac	6/29/2018	6/29/2020
T3	ANP06540	Cable	Heliac	8/23/2019	8/23/2021
	AN01311	50uH LISN-Line1 (L)	3816/2	3/16/2018	3/16/2020
T4	AN01311	50uH LISN-Line2 (N)	3816/2	3/16/2018	3/16/2020
T5	AN02611	High Pass Filter	HE9615-150K-50-720B	1/15/2018	1/15/2020

Measurement Data:

Reading listed by margin.

Test Lead: Neutral

#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dB μ V	T5				Table	dB μ V	dB μ V	dB	Ant
			dB	dB	dB	dB					
1	497.604k	28.5	+9.1	+0.0	+0.0	+0.4	+0.0	38.2	46.0	-7.8	Neutr
	Ave		+0.2								
^	497.604k	30.9	+9.1	+0.0	+0.0	+0.4	+0.0	40.6	46.0	-5.4	Neutr
			+0.2								
3	595.777k	18.0	+9.1	+0.0	+0.0	+0.4	+0.0	27.7	46.0	-18.3	Neutr
	Ave		+0.2								
^	595.777k	27.2	+9.1	+0.0	+0.0	+0.4	+0.0	36.9	46.0	-9.1	Neutr
			+0.2								
5	20.355M	19.3	+9.1	+0.2	+0.1	+0.7	+0.0	29.6	50.0	-20.4	Neutr
	Ave		+0.2								
^	20.355M	32.0	+9.1	+0.2	+0.1	+0.7	+0.0	42.3	50.0	-7.7	Neutr
			+0.2								
7	21.247M	18.3	+9.1	+0.3	+0.1	+0.7	+0.0	28.7	50.0	-21.3	Neutr
	Ave		+0.2								
^	21.247M	31.3	+9.1	+0.3	+0.1	+0.7	+0.0	41.7	50.0	-8.3	Neutr
			+0.2								
9	24.470M	18.5	+9.1	+0.3	+0.1	+0.5	+0.0	28.7	50.0	-21.3	Neutr
	Ave		+0.2								
^	24.470M	30.2	+9.1	+0.3	+0.1	+0.5	+0.0	40.4	50.0	-9.6	Neutr
			+0.2								
11	24.183M	18.4	+9.1	+0.3	+0.1	+0.5	+0.0	28.6	50.0	-21.4	Neutr
	Ave		+0.2								
^	24.183M	30.9	+9.1	+0.3	+0.1	+0.5	+0.0	41.1	50.0	-8.9	Neutr
			+0.2								
13	24.532M	18.1	+9.1	+0.3	+0.1	+0.5	+0.0	28.3	50.0	-21.7	Neutr
	Ave		+0.2								
^	24.532M	30.7	+9.1	+0.3	+0.1	+0.5	+0.0	40.9	50.0	-9.1	Neutr
			+0.2								
15	23.998M	18.1	+9.1	+0.3	+0.1	+0.5	+0.0	28.3	50.0	-21.7	Neutr
	Ave		+0.2								
^	23.998M	30.8	+9.1	+0.3	+0.1	+0.5	+0.0	41.0	50.0	-9.0	Neutr
			+0.2								

17	22.328M	17.6	+9.1	+0.3	+0.1	+0.9	+0.0	28.2	50.0	-21.8	Neutr
	Ave		+0.2								
^	22.328M	29.5	+9.1	+0.3	+0.1	+0.9	+0.0	40.1	50.0	-9.9	Neutr
			+0.2								
19	22.535M	17.8	+9.1	+0.3	+0.1	+0.7	+0.0	28.2	50.0	-21.8	Neutr
	Ave		+0.2								
^	22.535M	30.3	+9.1	+0.3	+0.1	+0.7	+0.0	40.7	50.0	-9.3	Neutr
			+0.2								
21	24.683M	17.8	+9.1	+0.3	+0.1	+0.5	+0.0	28.0	50.0	-22.0	Neutr
	Ave		+0.2								
^	24.683M	29.7	+9.1	+0.3	+0.1	+0.5	+0.0	39.9	50.0	-10.1	Neutr
			+0.2								
23	22.950M	17.4	+9.1	+0.3	+0.1	+0.6	+0.0	27.7	50.0	-22.3	Neutr
	Ave		+0.2								
^	22.950M	30.4	+9.1	+0.3	+0.1	+0.6	+0.0	40.7	50.0	-9.3	Neutr
			+0.2								
25	23.076M	17.2	+9.1	+0.3	+0.1	+0.6	+0.0	27.5	50.0	-22.5	Neutr
	Ave		+0.2								
^	23.076M	29.6	+9.1	+0.3	+0.1	+0.6	+0.0	39.9	50.0	-10.1	Neutr
			+0.2								
27	23.230M	17.2	+9.1	+0.3	+0.1	+0.6	+0.0	27.5	50.0	-22.5	Neutr
	Ave		+0.2								
^	23.230M	30.2	+9.1	+0.3	+0.1	+0.6	+0.0	40.5	50.0	-9.5	Neutr
			+0.2								
29	28.095M	17.1	+9.1	+0.3	+0.1	+0.6	+0.0	27.4	50.0	-22.6	Neutr
	Ave		+0.2								
^	28.095M	29.9	+9.1	+0.3	+0.1	+0.6	+0.0	40.2	50.0	-9.8	Neutr
			+0.2								

Test Location: CKC Laboratories, Inc. • 22116 23rd Dr SE • Bothell, WA 98021 • 800-500-4362
 Customer: **Itron, Inc.**
 Specification: **15.207 AC Mains - Average**
 Work Order #: **103221** Date: 12/14/2019
 Test Type: **Conducted Emissions** Time: 09:53:54
 Tested By: Matthew Harrison Sequence#: 37
 Software: EMITest 5.03.12 120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Temperature: 23° C
 Humidity: 39%
 Pressure: 101.1 kPa

Frequency Range: 150kHz-30MHz
 Frequency tested: 2412, 2437, 2462 MHz
 Firmware power setting: Max

Antenna type: Ceramic
 Antenna Gain: 0.5dBi

Duty Cycle: 100% Modulated

Test Method: ANSI C63.10: 2013
 KDB 558074 D01 15.247 Meas Guidance v05r02

Test Mode: Transmitting 802.11g
 Test Setup: EUT is setup in a tabletop configuration 0.8m high on a Styrofoam table.

Modification #1 and #2 were in place during testing.
No harmonics or spurs found above 5.7 GHz, floor readings taken.

Test Equipment:

ID	Asset #/	Description	Model	Calibration Date	Cal Due Date
	AN02673	Spectrum Analyzer	E4446A	2/22/2019	2/22/2021
T1	ANP06219	Attenuator	768-10	4/13/2018	4/13/2020
T2	ANP06515	Cable	Heliac	6/29/2018	6/29/2020
T3	ANP06540	Cable	Heliac	8/23/2019	8/23/2021
T4	AN01311	50uH LISN-Line1 (L)	3816/2	3/16/2018	3/16/2020
	AN01311	50uH LISN-Line2 (N)	3816/2	3/16/2018	3/16/2020
T5	AN02611	High Pass Filter	HE9615-150K-50-720B	1/15/2018	1/15/2020

Measurement Data:

Reading listed by margin.

Test Lead: Line

#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dB μ V	T5 dB	dB	dB	dB	Table	dB μ V	dB μ V	dB	Ant
1	498.332k	28.9	+9.1	+0.0	+0.0	+0.4	+0.0	38.6	46.0	-7.4	Line
	Ave		+0.2								
^	498.331k	32.4	+9.1	+0.0	+0.0	+0.4	+0.0	42.1	46.0	-3.9	Line
			+0.2								
3	585.596k	15.6	+9.1	+0.0	+0.0	+0.4	+0.0	25.3	46.0	-20.7	Line
	Ave		+0.2								
^	585.596k	27.0	+9.1	+0.0	+0.0	+0.4	+0.0	36.7	46.0	-9.3	Line
			+0.2								
5	575.416k	15.4	+9.1	+0.0	+0.0	+0.4	+0.0	25.1	46.0	-20.9	Line
	Ave		+0.2								
^	575.415k	27.1	+9.1	+0.0	+0.0	+0.4	+0.0	36.8	46.0	-9.2	Line
			+0.2								
7	602.322k	14.5	+9.1	+0.0	+0.0	+0.4	+0.0	24.2	46.0	-21.8	Line
	Ave		+0.2								
^	602.322k	26.2	+9.1	+0.0	+0.0	+0.4	+0.0	35.9	46.0	-10.1	Line
			+0.2								
9	517.239k	13.7	+9.1	+0.0	+0.0	+0.4	+0.0	23.4	46.0	-22.6	Line
	Ave		+0.2								
^	517.239k	25.3	+9.1	+0.0	+0.0	+0.4	+0.0	35.0	46.0	-11.0	Line
			+0.2								
11	28.650M	13.9	+9.1	+0.3	+0.1	+0.6	+0.0	24.2	50.0	-25.8	Line
	Ave		+0.2								
^	28.650M	28.3	+9.1	+0.3	+0.1	+0.6	+0.0	38.6	50.0	-11.4	Line
			+0.2								
13	3.348M	9.3	+9.1	+0.1	+0.0	+0.3	+0.0	18.9	46.0	-27.1	Line
	Ave		+0.1								
^	3.348M	26.5	+9.1	+0.1	+0.0	+0.3	+0.0	36.1	46.0	-9.9	Line
			+0.1								
15	3.199M	8.7	+9.1	+0.1	+0.0	+0.3	+0.0	18.3	46.0	-27.7	Line
	Ave		+0.1								
^	3.199M	25.7	+9.1	+0.1	+0.0	+0.3	+0.0	35.3	46.0	-10.7	Line
			+0.1								

17	14.022M	11.4	+9.1	+0.2	+0.0	+0.4	+0.0	21.3	50.0	-28.7	Line
	Ave		+0.2								
^	14.022M	29.9	+9.1	+0.2	+0.0	+0.4	+0.0	39.8	50.0	-10.2	Line
			+0.2								
19	13.986M	11.3	+9.1	+0.2	+0.0	+0.4	+0.0	21.2	50.0	-28.8	Line
	Ave		+0.2								
^	13.986M	30.4	+9.1	+0.2	+0.0	+0.4	+0.0	40.3	50.0	-9.7	Line
			+0.2								
21	14.202M	11.2	+9.1	+0.2	+0.0	+0.4	+0.0	21.1	50.0	-28.9	Line
	Ave		+0.2								
^	14.202M	29.4	+9.1	+0.2	+0.0	+0.4	+0.0	39.3	50.0	-10.7	Line
			+0.2								
23	13.887M	11.1	+9.1	+0.2	+0.0	+0.4	+0.0	21.0	50.0	-29.0	Line
	Ave		+0.2								
^	13.887M	31.0	+9.1	+0.2	+0.0	+0.4	+0.0	40.9	50.0	-9.1	Line
			+0.2								
25	14.103M	11.1	+9.1	+0.2	+0.0	+0.4	+0.0	21.0	50.0	-29.0	Line
	Ave		+0.2								
^	14.103M	29.6	+9.1	+0.2	+0.0	+0.4	+0.0	39.5	50.0	-10.5	Line
			+0.2								
27	14.139M	11.1	+9.1	+0.2	+0.0	+0.4	+0.0	21.0	50.0	-29.0	Line
	Ave		+0.2								
^	14.139M	29.6	+9.1	+0.2	+0.0	+0.4	+0.0	39.5	50.0	-10.5	Line
			+0.2								
29	13.598M	10.6	+9.1	+0.2	+0.0	+0.4	+0.0	20.5	50.0	-29.5	Line
	Ave		+0.2								
^	13.598M	30.7	+9.1	+0.2	+0.0	+0.4	+0.0	40.6	50.0	-9.4	Line
			+0.2								

Test Location: CKC Laboratories, Inc. • 22116 23rd Dr SE • Bothell, WA 98021 • 800-500-4362
 Customer: **Itron, Inc.**
 Specification: **15.207 AC Mains - Average**
 Work Order #: **103221** Date: 12/14/2019
 Test Type: **Conducted Emissions** Time: 10:04:13
 Tested By: Matthew Harrison Sequence#: 38
 Software: EMITest 5.03.12 120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Temperature: 23° C
 Humidity: 39%
 Pressure: 101.1 kPa

 Frequency Range: 150kHz-30MHz
 Frequency tested: 2412, 2437, 2462 MHz
 Firmware power setting: Max

 Antenna type: Ceramic
 Antenna Gain: 0.5dBi

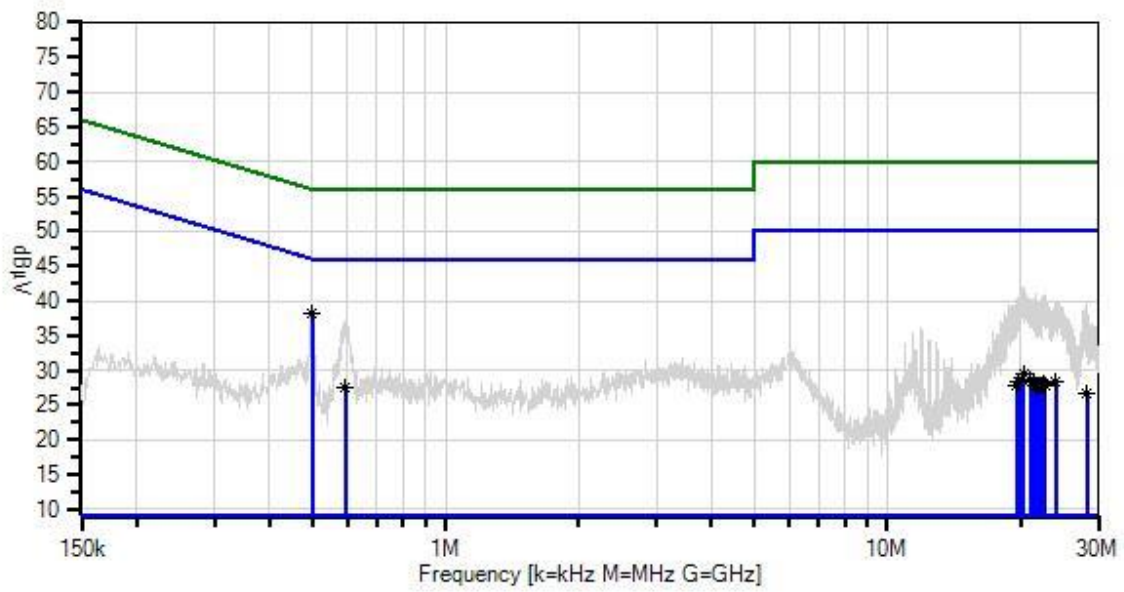
 Duty Cycle: 100% Modulated

 Test Method: ANSI C63.10: 2013
 KDB 558074 D01 15.247 Meas Guidance v05r02

 Test Mode: Transmitting 802.11g
 Test Setup: EUT is setup in a tabletop configuration 0.8m high on a Styrofoam table.

 Modification #1 and #2 were in place during testing.
No harmonics or spurs found above 5.7 GHz, floor readings taken.

Iron, Inc. WD#: 103221 Sequence#: 38 Date: 12/14/2019
 15.207 AC Mains - Average Test Lead: 120V 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
	AN02673	Spectrum Analyzer	E4446A	2/22/2019	2/22/2021
T1	ANP06219	Attenuator	768-10	4/13/2018	4/13/2020
T2	ANP06515	Cable	Heliac	6/29/2018	6/29/2020
T3	ANP06540	Cable	Heliac	8/23/2019	8/23/2021
	AN01311	50uH LISN-Line1 (L)	3816/2	3/16/2018	3/16/2020
T4	AN01311	50uH LISN-Line2 (N)	3816/2	3/16/2018	3/16/2020
T5	AN02611	High Pass Filter	HE9615-150K-50-720B	1/15/2018	1/15/2020

Measurement Data:

Reading listed by margin.

Test Lead: Neutral

#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dB μ V	T5				Table	dB μ V	dB μ V	dB	Ant
			dB	dB	dB	dB					
1	499.059k	28.4	+9.1	+0.0	+0.0	+0.4	+0.0	38.1	46.0	-7.9	Neutr
	Ave		+0.2								
^	499.058k	31.3	+9.1	+0.0	+0.0	+0.4	+0.0	41.0	46.0	-5.0	Neutr
			+0.2								
3	593.596k	17.9	+9.1	+0.0	+0.0	+0.4	+0.0	27.6	46.0	-18.4	Neutr
	Ave		+0.2								
^	593.595k	27.6	+9.1	+0.0	+0.0	+0.4	+0.0	37.3	46.0	-8.7	Neutr
			+0.2								
5	20.382M	19.1	+9.1	+0.2	+0.1	+0.7	+0.0	29.4	50.0	-20.6	Neutr
	Ave		+0.2								
^	20.382M	31.6	+9.1	+0.2	+0.1	+0.7	+0.0	41.9	50.0	-8.1	Neutr
			+0.2								
7	21.094M	18.4	+9.1	+0.2	+0.1	+0.7	+0.0	28.7	50.0	-21.3	Neutr
	Ave		+0.2								
^	21.094M	30.0	+9.1	+0.2	+0.1	+0.7	+0.0	40.3	50.0	-9.7	Neutr
			+0.2								
9	19.788M	18.2	+9.1	+0.2	+0.1	+0.7	+0.0	28.5	50.0	-21.5	Neutr
	Ave		+0.2								
^	19.788M	30.2	+9.1	+0.2	+0.1	+0.7	+0.0	40.5	50.0	-9.5	Neutr
			+0.2								
11	21.346M	18.0	+9.1	+0.3	+0.1	+0.8	+0.0	28.5	50.0	-21.5	Neutr
	Ave		+0.2								
^	21.346M	29.8	+9.1	+0.3	+0.1	+0.8	+0.0	40.3	50.0	-9.7	Neutr
			+0.2								
13	24.025M	18.2	+9.1	+0.3	+0.1	+0.5	+0.0	28.4	50.0	-21.6	Neutr
	Ave		+0.2								
^	24.025M	29.7	+9.1	+0.3	+0.1	+0.5	+0.0	39.9	50.0	-10.1	Neutr
			+0.2								
15	22.517M	17.6	+9.1	+0.3	+0.1	+0.7	+0.0	28.0	50.0	-22.0	Neutr
	Ave		+0.2								
^	22.517M	30.0	+9.1	+0.3	+0.1	+0.7	+0.0	40.4	50.0	-9.6	Neutr
			+0.2								

17	21.779M	17.1	+9.1	+0.3	+0.1	+1.1	+0.0	27.9	50.0	-22.1	Neutr
	Ave		+0.2								
^	21.779M	28.9	+9.1	+0.3	+0.1	+1.1	+0.0	39.7	50.0	-10.3	Neutr
			+0.2								
19	22.283M	17.3	+9.1	+0.3	+0.1	+0.9	+0.0	27.9	50.0	-22.1	Neutr
	Ave		+0.2								
^	22.283M	30.0	+9.1	+0.3	+0.1	+0.9	+0.0	40.6	50.0	-9.4	Neutr
			+0.2								
21	21.670M	17.1	+9.1	+0.3	+0.1	+1.0	+0.0	27.8	50.0	-22.2	Neutr
	Ave		+0.2								
^	21.670M	30.4	+9.1	+0.3	+0.1	+1.0	+0.0	41.1	50.0	-8.9	Neutr
			+0.2								
23	22.040M	17.1	+9.1	+0.3	+0.1	+1.0	+0.0	27.8	50.0	-22.2	Neutr
	Ave		+0.2								
^	22.040M	29.0	+9.1	+0.3	+0.1	+1.0	+0.0	39.7	50.0	-10.3	Neutr
			+0.2								
25	22.688M	17.4	+9.1	+0.3	+0.1	+0.6	+0.0	27.7	50.0	-22.3	Neutr
	Ave		+0.2								
^	22.688M	30.6	+9.1	+0.3	+0.1	+0.6	+0.0	40.9	50.0	-9.1	Neutr
			+0.2								
27	19.589M	17.4	+9.1	+0.2	+0.1	+0.7	+0.0	27.7	50.0	-22.3	Neutr
	Ave		+0.2								
^	19.589M	29.9	+9.1	+0.2	+0.1	+0.7	+0.0	40.2	50.0	-9.8	Neutr
			+0.2								
29	28.232M	16.4	+9.1	+0.3	+0.1	+0.6	+0.0	26.7	50.0	-23.3	Neutr
	Ave		+0.2								
^	28.232M	29.7	+9.1	+0.3	+0.1	+0.6	+0.0	40.0	50.0	-10.0	Neutr
			+0.2								

Test Setup Photo(s)



Appendix A: Manufacturer Declaration

The following device/models were checked and worst-case provided for testing:

Device: CCU100

Model: CCU100C and CCU100RC

The manufacturer declares that the following additional models are identical electrically or any differences between them do not affect their EMC characteristics, and therefore meets the level of testing equivalent to the tested model.

The CCU100C and CCU100RC are representative of worst case testing of the following models per the manufacturer:

CCU100C Repeater

CCU100RC Repeater

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.