

Itron, Inc.

REVISED TEST REPORT TO 102014-5

AMR Transceiver Device For Communicating With Utility Meters Model: IMRB

Tested to The Following Standards:

FCC Part 15 Subpart C Section(s)

15.207 & 15.249

Report No.: 102014-5A

Date of issue: May 30, 2019



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.

Test Certificate # 803.05

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ADMINISTRATIVE INFORMATION

Test Report Information

REPORT PREPARED FOR:

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

Representative: Jay Holcomb
Customer Reference Number: 165609

REPORT PREPARED BY:

Terri Rayle
CKC Laboratories, Inc.
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Mariposa, CA 95338

Project Number: 102014

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

December 10, 2018
December 10-13, 2018 and February 23, 2019

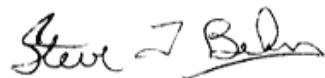
Revision History

Original: Testing of the AMR Transceiver Device For Communicating With Utility Meters, Model: IMRB to FCC Part 15 Subpart C Section(s) and 15.207 & 15.249.

Revision A: To replace data in 15.249(a) Radiated Emissions and Band Edge and correct the BE summary table.

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	5.03.11

Site Registration & Accreditation Information

Location	NIST CB #	TAIWAN	CANADA	FCC	JAPAN
Canyon Park Bothell, WA	US0081	SL2-IN-E-1145R	3082C-1	US1022	A-0148

SUMMARY OF RESULTS

Standard / Specification: FCC Part 15 Subpart C - 15.249

Test Procedure	Description	Modifications	Results
15.215(c)	Occupied Bandwidth	NA	Pass
15.249(a)	Field Strength of Fundamental	NA	Pass
15.249(a)	Radiated Emissions and Band Edge	NA	Pass
15.207	AC Conducted Emissions	NA	Pass

NA = Not Applicable

ISO/IEC 17025 Decision Rule

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

Modifications During Testing

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

Summary of Conditions

No modifications were made during testing.

Modifications listed above must be incorporated into all production units.

Conditions During Testing

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

Summary of Conditions

None

EQUIPMENT UNDER TEST (EUT)

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

Configuration 1

Equipment Tested:

Device	Manufacturer	Model #	S/N
AMR transceiver device for communicating with utility meters	Itron, Inc.	IMRB	IMR007894

Support Equipment:

Device	Manufacturer	Model #	S/N
Laptop	Dell	E6410	46TXXN1
AC Adapter for Laptop	Dell	DA130PE1-00	NA
AC Adapter	DVE	DV-51AR	NA

General Product Information:

Product Information	Manufacturer-Provided Details
Equipment Type:	Stand-Alone Equipment
Modulation Type(s):	FSK
Maximum Duty Cycle:	100%
Antenna Type(s) and Gain:	Internal PIFA 1.2dBi
Antenna Connection Type:	Integral
Nominal Input Voltage:	120VAC, 60Hz
Firmware / Software used for Test:	DSP Version 85.75.00.02/FPGA Version 3.02 / MC3 Test v4.0.2.2

FCC Part 15 Subpart C

15.215(c) Occupied Bandwidth (20dB BW)

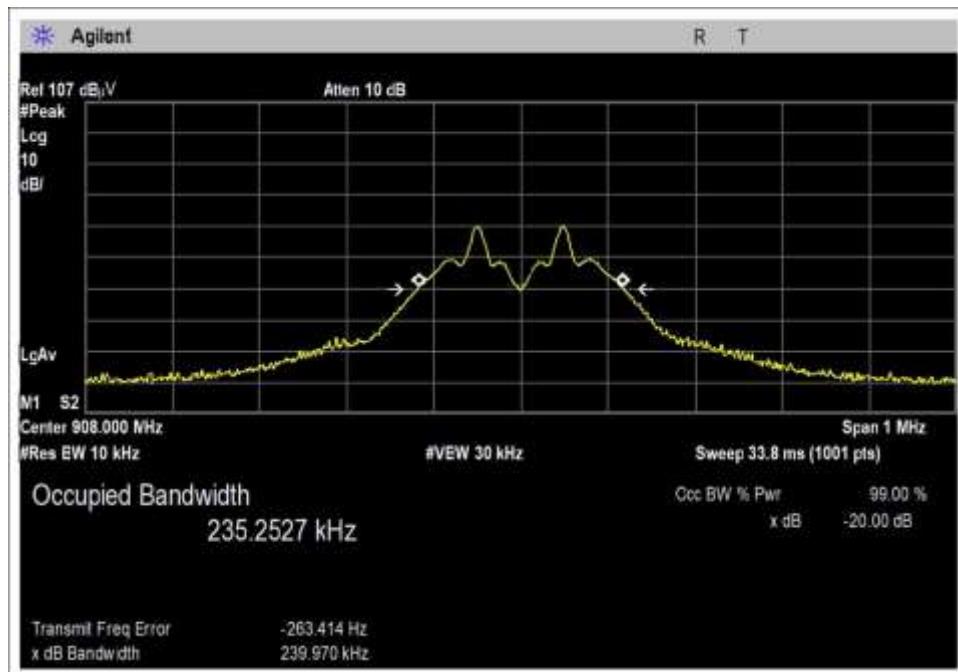
Test Setup/Conditions			
Test Location:	Canyon Park Lab C3	Test Engineer:	S. Pittsford
Test Method:	ANSI C63.10 (2013)	Test Date(s):	2/23/2019
Configuration:	1		
Test Conditions:	Frequency Range: 908-923.8MHz Frequency tested: 908, 916 and 923.8MHz Firmware power setting: Low Power Protocol /MCS/Modulation: FSK Antenna type: Internal PIFA Antenna Gain: 1.2 dBi. Duty Cycle: 100% (Test Mode) Test Mode: Continuously transmitting Test Setup: EUT is transmitting sitting on foam table high. Modifications Added: None		

Environmental Conditions			
Temperature (°C)	21	Relative Humidity (%):	26

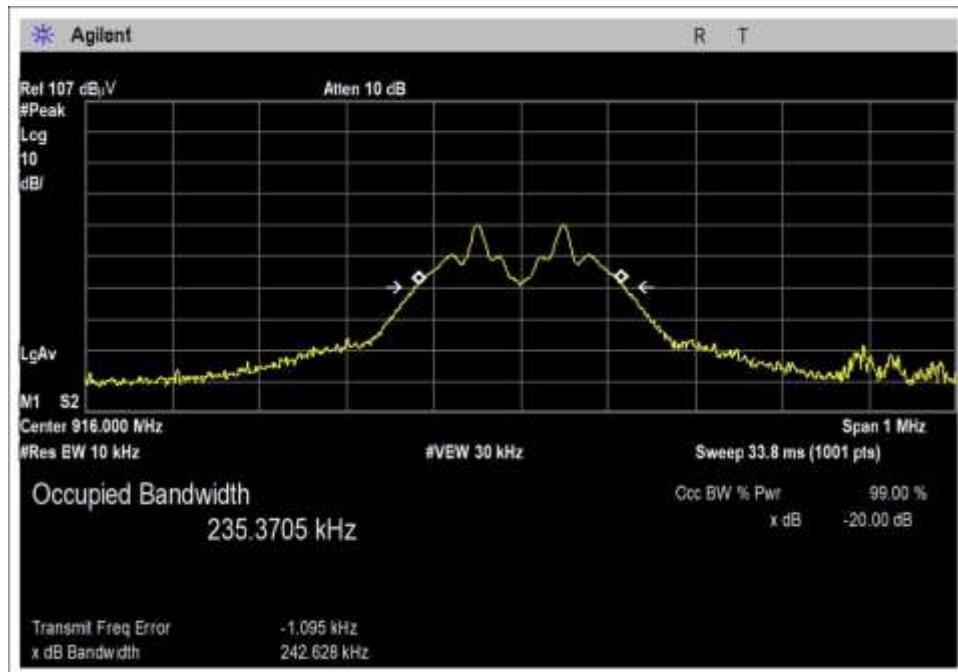
Test Equipment					
Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
02307	Preamp	HP	8447D	1/15/2018	1/15/2020
P05305	Cable	Andrews	ETSI-50T	10/24/2017	10/24/2019
P05360	Cable	Belden	RG214	1/31/2018	1/31/2020
02673	Spectrum Analyzer	Agilent	E4446A	2/3/2017	2/3/2019
P06123	Attenuator	Aeroflex	18N-6	5/5/2017	5/5/2019
P06540	Cable	Andrews	Heliax	10/30/2017	10/30/2019
03628	Biconilog Antenna	ETS	3142E	6/7/2017	6/7/2019

Test Data Summary					
Frequency (MHz)	Antenna Port	Modulation	Measured (kHz)	Limit (kHz)	Results
908	1	FSK	240.0	None	NA
916	1	FSK	242.6	None	NA
923.8	1	FSK	248.9	None	NA

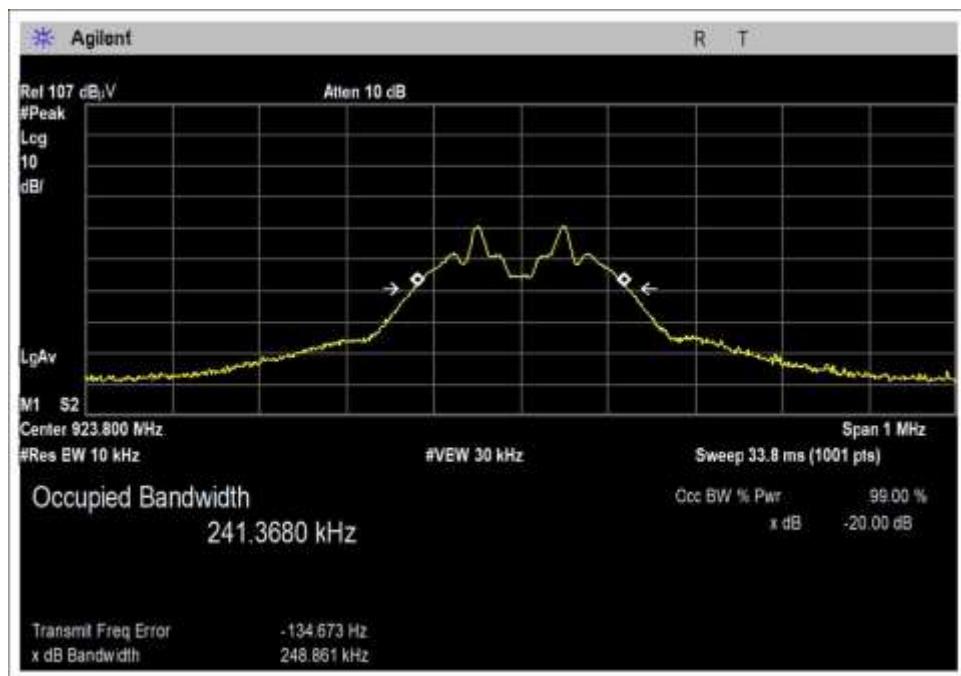
Plot(s)



Low Channel



Middle Channel



Test Setup Photo(s)



15.249(a) Field Strength of Fundamental

Test Data Summary - Voltage Variations					
Frequency (MHz)	Modulation / Ant Port	V _{Minimum} (dBuV/m)	V _{Nominal} (dBuV/m)	V _{Maximum} (dBuV/m)	Max Deviation from V _{Nominal} (dB)
908	FSK	74.8	74.7	74.6	0.2
916	FSK	74.9	74.7	74.9	0.2
923.8	FSK	74.8	75.0	74.8	0.2

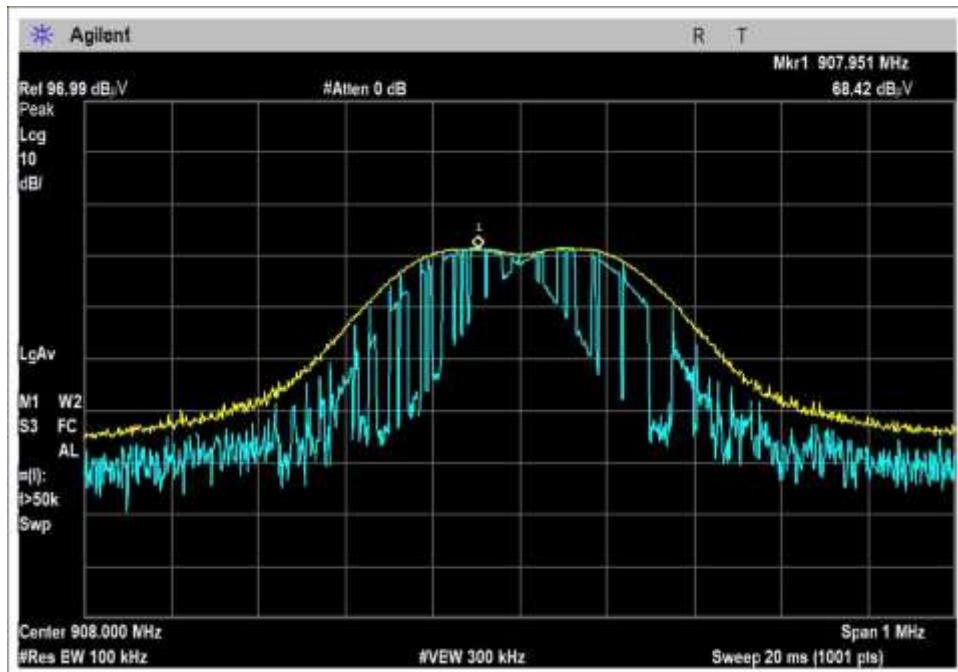
Test performed using operational mode with the highest output power, representing worst case.

Parameter Definitions:

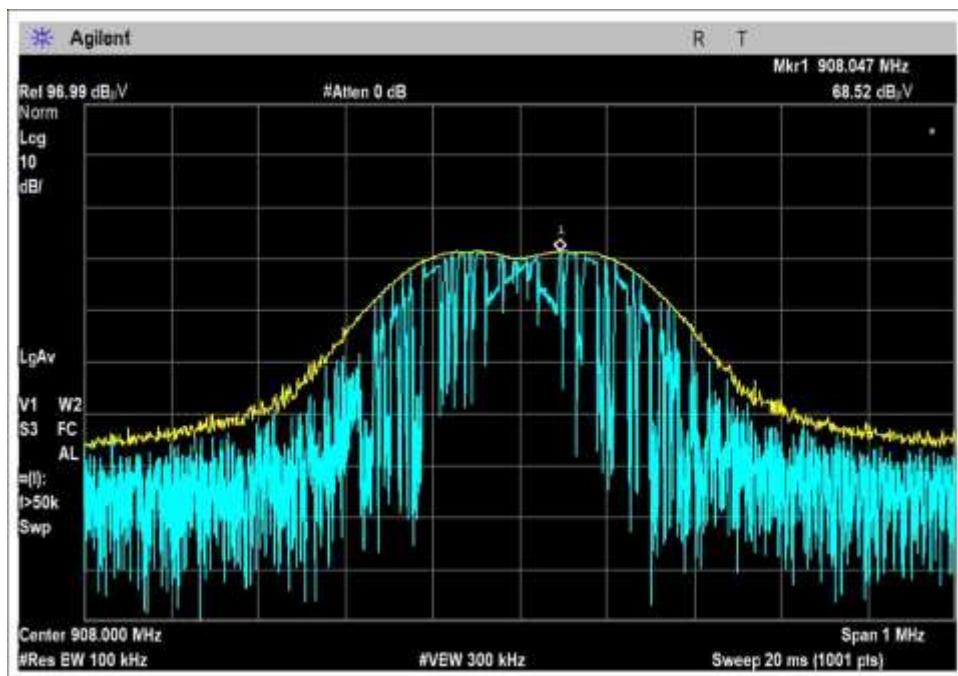
Measurements performed at input voltage V_{Nominal} ± 15%.

Parameter	Value
V _{Nominal} :	120 VAC
V _{Minimum} :	102.00 VAC
V _{Maximum} :	138.00 VAC

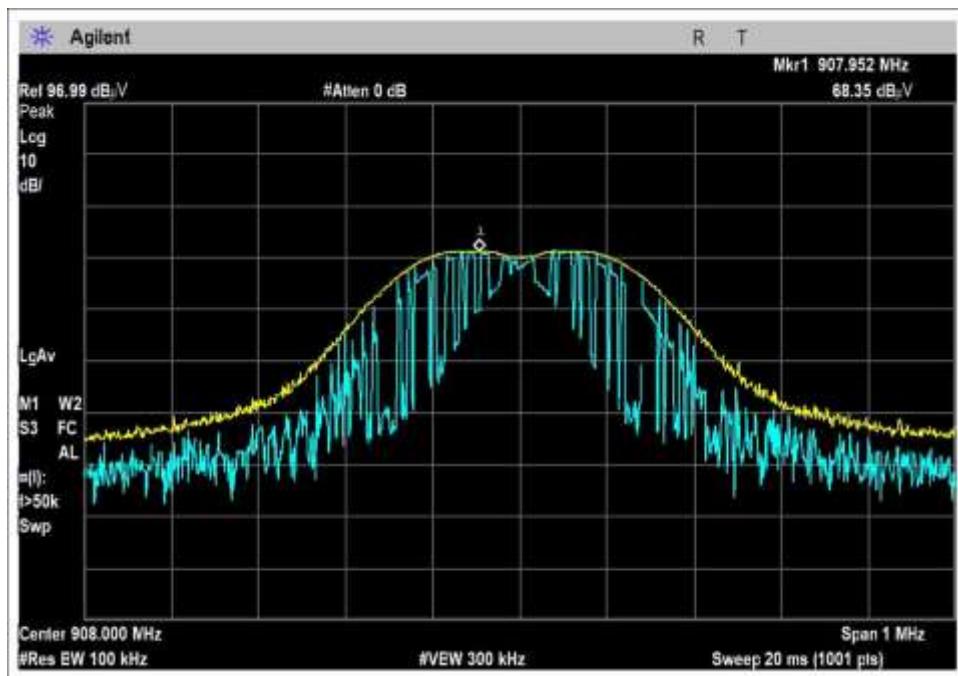
Plot(s)



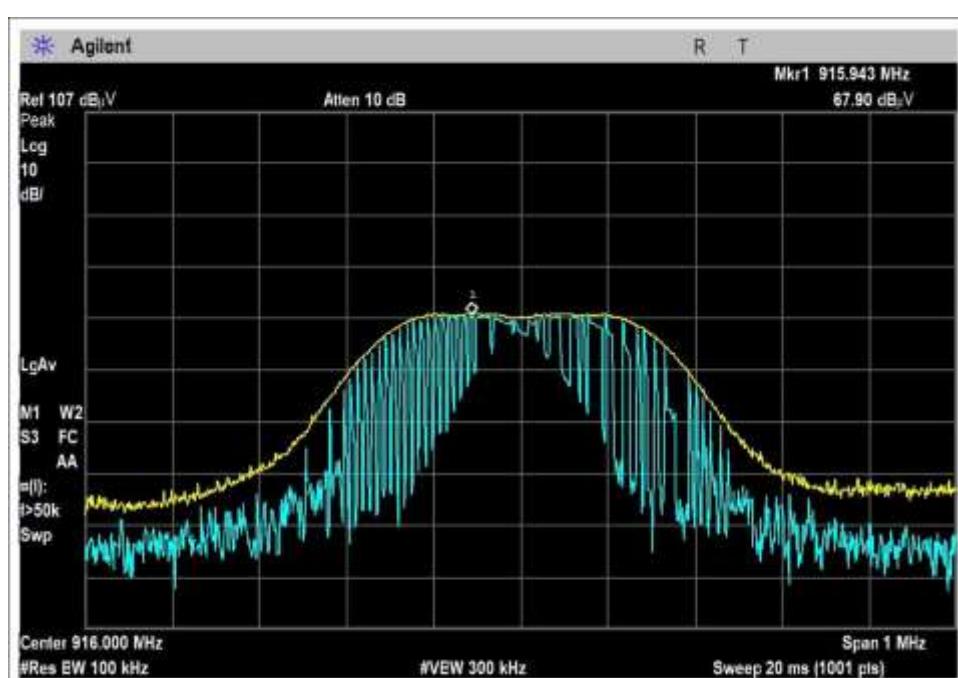
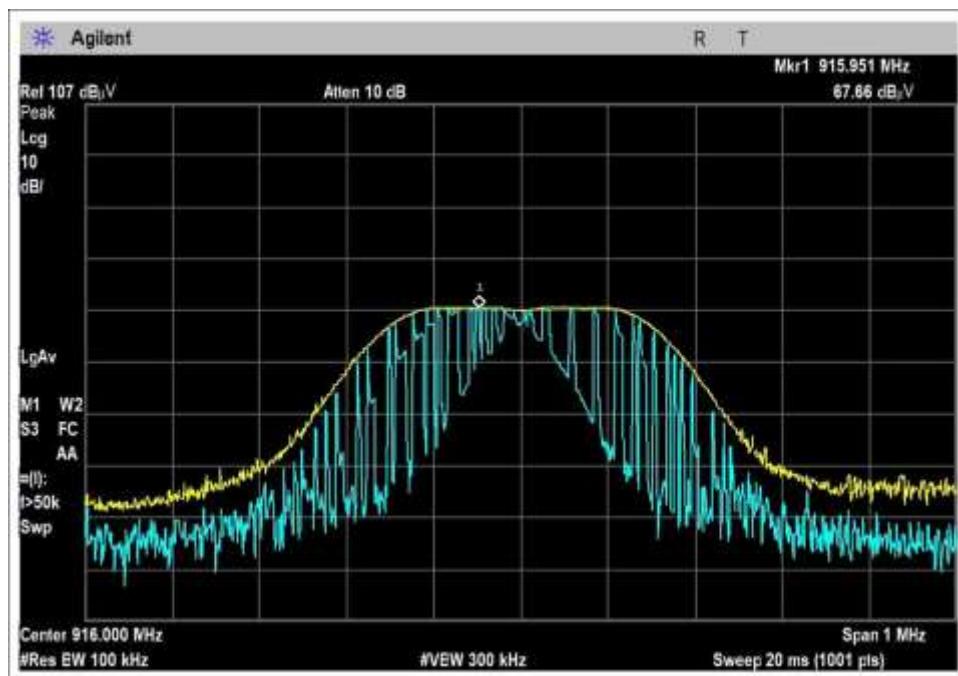
Low Channel, Z Axis, V_{Nom}

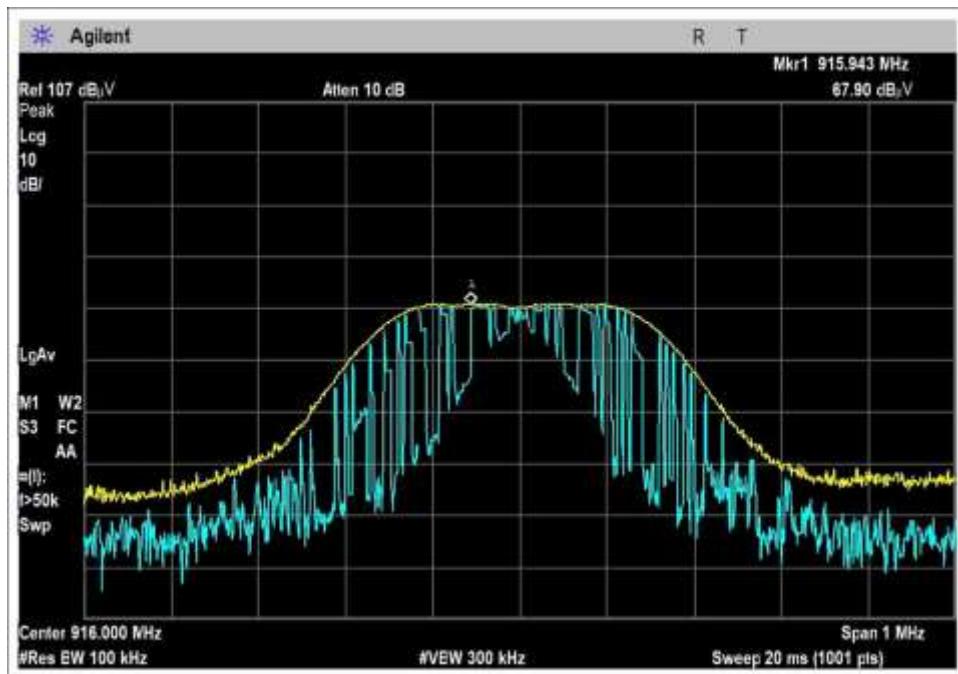


Low Channel, Z Axis, Vmin

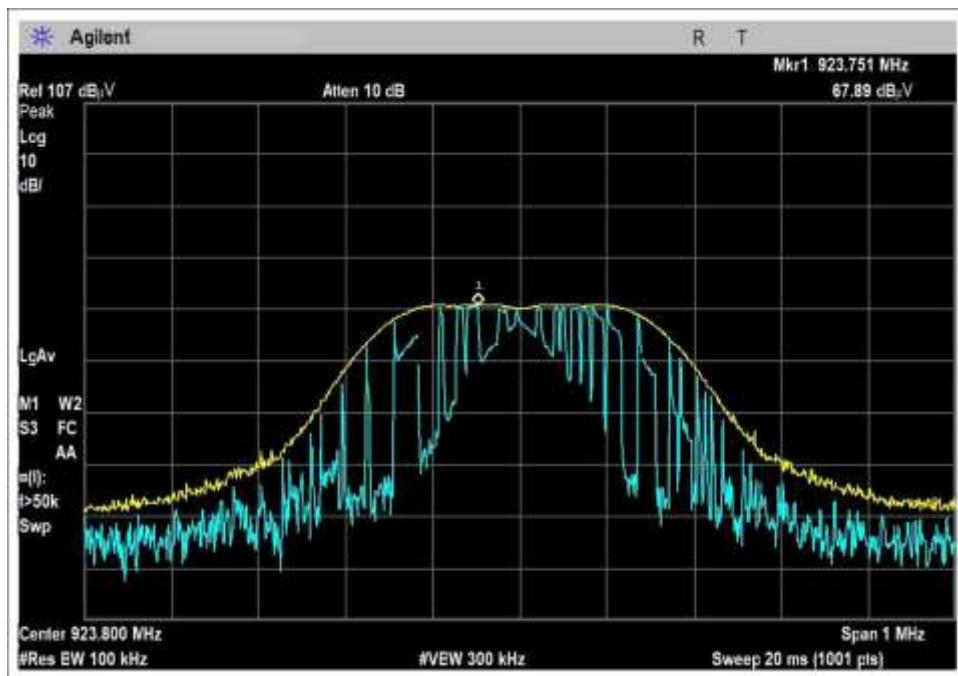


High Channel, Z Axis, Vmax

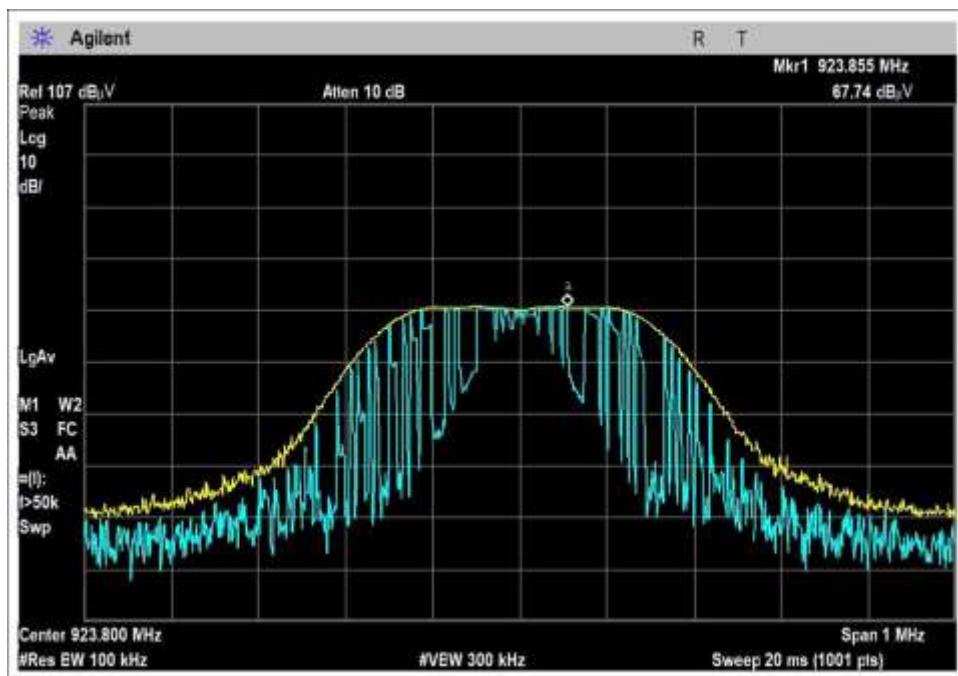




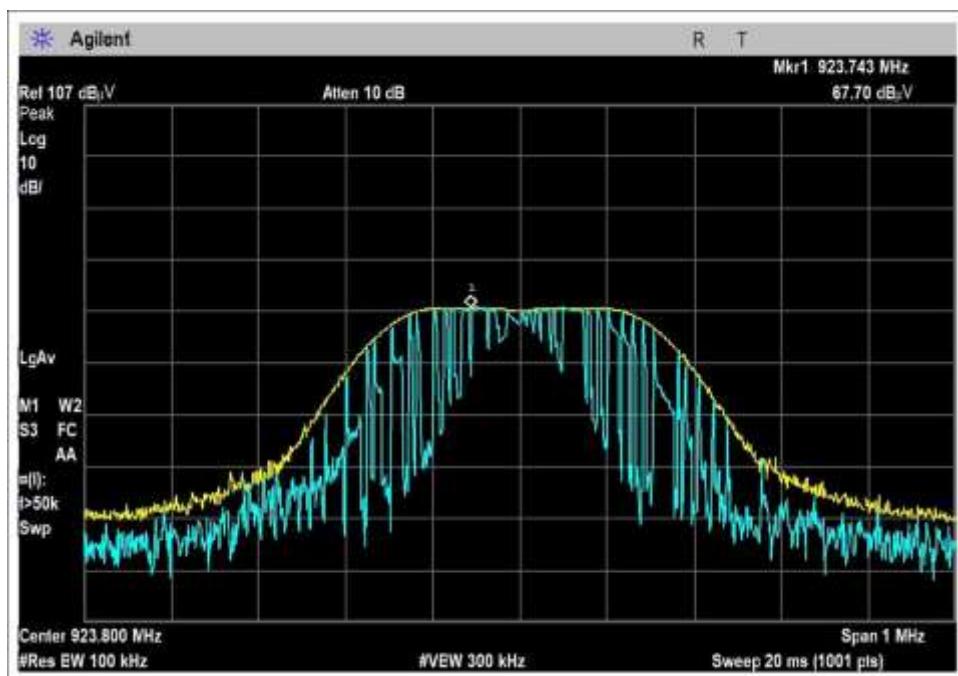
Middle Channel, Z Axis, Vmax



High Channel, Z Axis, Vnom


Testing the Future
LABORATORIES, INC.


High Channel, Z Axis, Vmin



High Channel, Z Axis, Vmax

Test Setup / Conditions / Data

Test Location: CKC Laboratories, Inc. • 22116 23rd Drive SE, Suite A • Bothell, WA. 98021 • 1-800-500-4EMC
 Customer: **Itron, Inc**
 Specification: **15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter)**
 Work Order #: **102014** Date: 2/23/2019
 Test Type: **Maximized Emissions** Time: 08:57:45
 Tested By: Matthew Harrison / Steven Pittsford Sequence#: 18
 Software: EMITest 5.03.11

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

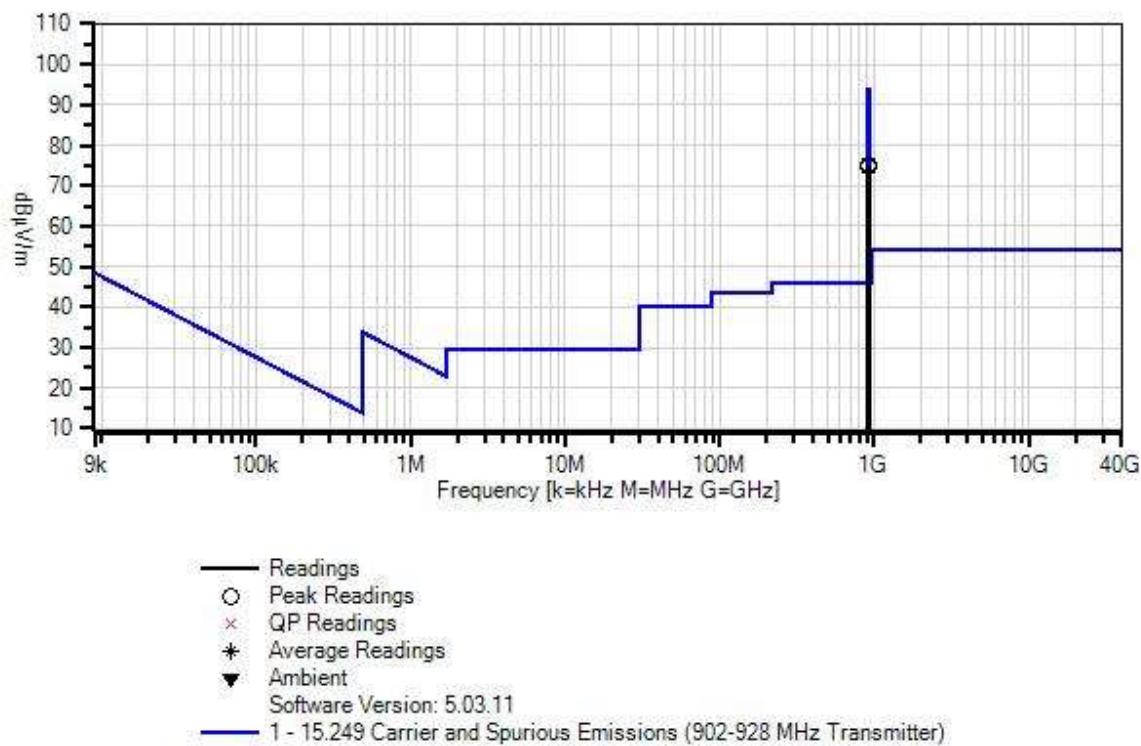
Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Temperature: 20-23°C
Humidity: 26-32%
Pressure: 100.8-102.7kPa
Frequency Range: 9kHz to 10GHz
Frequency tested: 908, 916 & 923.8MHz
Firmware power setting: Low Power
Protocol /MCS/Modulation: Continuous FSK
Duty Cycle: 100% (Test Mode)
Test Mode: Continuously transmitting FSK on single channel, worst case data reported.
Test Setup: EUT is transmitting sitting on foam table. X, Y, Z axis investigated, both antenna polarities investigated, worst case data reported.
Modifications Added: None
Test Method: ANSI C63.10 (2013)
Plots are uncorrected/raw data

Itron, Inc WO#: 102014 Sequence#: 18 Date: 2/23/2019
15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter) Test Distance: 3 Meters Vert



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN03628	Biconilog Antenna	3142E	6/7/2017	6/7/2019
T2	ANP06123	Attenuator	18N-6	5/5/2017	5/5/2019
T3	ANP05305	Cable	ETSI-50T	10/24/2017	10/24/2019
T4	ANP05360	Cable	RG214	1/31/2018	1/31/2020
T5	ANP06540	Cable	Heliax	10/30/2017	10/30/2019
T6	AN02673	Spectrum Analyzer	E4446A	2/3/2017	2/3/2019
T7	AN02307	Preamp	8447D	1/15/2018	1/15/2020
T8	AN02872	Spectrum Analyzer	E4440A	11/3/2017	11/3/2019

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					
	MHz	dB μ V	dB	dB	dB	dB	Table	dB μ V/m	dB μ V/m	dB	Ant
1	923.751M	67.9	+24.5	+5.9	+1.6	+2.0	+0.0	75.0	94.0	-19.0	Vert
			+0.4	+0.0	-27.3	+0.0	211				Z-Axis, Vnom 99
2	915.943M	67.9	+24.4	+5.9	+1.6	+2.0	+0.0	74.9	94.0	-19.1	Vert
			+0.4	+0.0	-27.3	+0.0	182				Z-Axis, Vmax 99
3	915.943M	67.9	+24.4	+5.9	+1.6	+2.0	+0.0	74.9	94.0	-19.1	Vert
			+0.4	+0.0	-27.3	+0.0	170				Z-Axis, Vmin 99
4	908.047M	68.5	+24.0	+5.9	+1.5	+2.0	+0.0	74.8	94.0	-19.2	Vert
			+0.3	+0.0	-27.4	+0.0	360				Z-Axis, Vmin 101
5	923.855M	67.7	+24.5	+5.9	+1.6	+2.0	+0.0	74.8	94.0	-19.2	Vert
			+0.4	+0.0	-27.3	+0.0	211				Z-Axis, Vmin 99
6	923.743M	67.7	+24.5	+5.9	+1.6	+2.0	+0.0	74.8	94.0	-19.2	Vert
			+0.4	+0.0	-27.3	+0.0	211				Z-Axis, Vmax 99
7	907.951M	68.4	+24.0	+5.9	+1.5	+2.0	+0.0	74.7	94.0	-19.3	Vert
			+0.3	+0.0	-27.4	+0.0	360				Z Axis, Vnom 101
8	915.951M	67.7	+24.4	+5.9	+1.6	+2.0	+0.0	74.7	94.0	-19.3	Vert
			+0.4	+0.0	-27.3	+0.0	187				Z-Axis, Vnom 99
9	907.952M	68.3	+24.0	+5.9	+1.5	+2.0	+0.0	74.6	94.0	-19.4	Vert
			+0.3	+0.0	-27.4	+0.0	360				Z-Axis, Vmax 101

Test Setup Photo(s)



Below 1GHz



X Axis



Y Axis



Z Axis

15.249(a) Radiated Emissions and Band Edge

Test Setup / Conditions / Data

Test Location: CKC Laboratories, Inc. • 22116 23rd Drive SE, Suite A • Bothell, WA. 98021 • 1-800-500-4EMC (4362)
 Customer: **Itron, Inc**
 Specification: **15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter)**
 Work Order #: **102014** Date: 2/23/2019
 Test Type: **Maximized Emissions** Time: 11:12:40
 Tested By: Matthew Harrison / Steven Pittsford Sequence#: 17
 Software: EMITest 5.03.11

Equipment Tested:

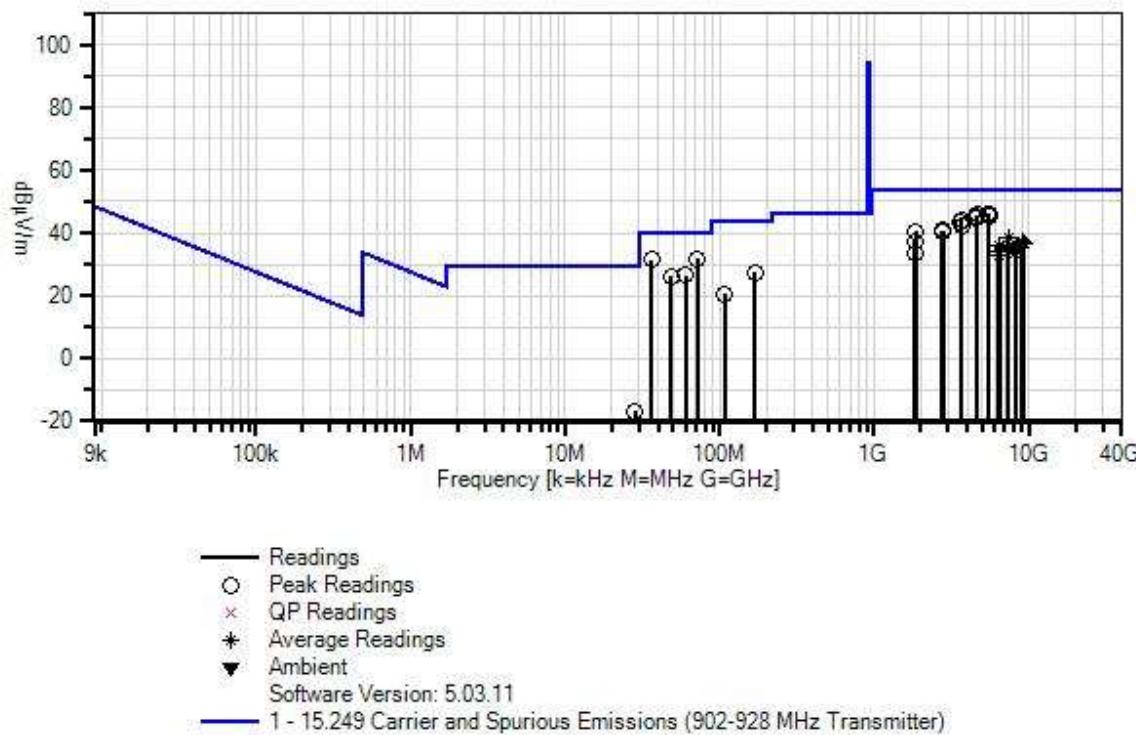
Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Temperature: 21-22°C
Humidity: 26-33%
Pressure: 100.8-102.7kPa
Frequency Range: 9kHz to 10GHz
Frequency tested: 908, 916 & 923.8MHz
Firmware power setting: Low Power
Protocol /MCS/Modulation: Continuous FSK
Duty Cycle: 100% (Test Mode)
Test Mode: Continuously transmitting FSK on single channel, worst case data reported.
Test Setup: EUT is transmitting sitting on foam table. X, Y, Z axis investigated, both antenna polarities investigated, worst case data reported.
Modifications Added: None
Test Method: ANSI C63.10 (2013)

Itron, Inc WO#: 102014 Sequence#: 17 Date: 2/23/2019
 15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter) Test Distance: 3 Meters Vert

Test Equipment:

ID	Asset #/Serial #	Description	Model	Calibration Date	Cal Due Date
T1	AN03628	Biconilog Antenna	3142E	6/7/2017	6/7/2019
T2	ANP06123	Attenuator	18N-6	5/5/2017	5/5/2019
T3	ANP05305	Cable	ETSI-50T	10/24/2017	10/24/2019
T4	ANP05360	Cable	RG214	1/31/2018	1/31/2020
T5	ANP06540	Cable	Heliax	10/30/2017	10/30/2019
T6	AN02673	Spectrum Analyzer	E4446A	2/3/2017	2/3/2019
T7	AN00052	Loop Antenna	6502	5/7/2018	5/7/2020
T8	ANP06515	Cable	Heliax	6/29/2018	6/29/2020
T9	AN03170	High Pass Filter	HM1155-11SS	11/27/2017	11/27/2019
T10	AN01467	Horn Antenna- ANSI C63.5 Calibration	3115	7/21/2017	7/21/2019
T11	AN03540	Preamp	83017A	5/2/2017	5/2/2019
T12	ANP06503	Cable	32026-29801- 29801-36	3/13/2018	3/13/2020
T13	AN02307	Preamp	8447D	1/15/2018	1/15/2020
T14	AN02872	Spectrum Analyzer	E4440A	11/3/2017	11/3/2019

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	T14							
	MHz	dB μ V	dB	dB	dB	dB	Table	dB μ V/m	dB μ V/m	dB	Ant
1	5447.870M	37.3	+0.0	+0.0	+0.0	+0.0	+0.0	46.2	54.0	-7.8	Vert
			+0.7	+0.0	+0.0	+4.5					153
			+1.0	+34.0	-33.1	+1.8					
			+0.0	+0.0							
2	5496.092M	36.9	+0.0	+0.0	+0.0	+0.0	+0.0	45.9	54.0	-8.1	Vert
			+0.7	+0.0	+0.0	+4.5	360				156
			+0.9	+34.2	-33.1	+1.8					
			+0.0	+0.0							
3	4618.770M	40.1	+0.0	+0.0	+0.0	+0.0	+0.0	45.9	54.0	-8.1	Vert
			+0.5	+0.0	+0.0	+4.0	265				141
			+0.8	+32.1	-33.1	+1.5					
			+0.0	+0.0							
4	71.920M	45.8	+7.0	+5.9	+0.4	+0.5	+0.0	31.8	40.0	-8.2	Vert
			+0.1	+0.0	+0.0	+0.0	330				100
			+0.0	+0.0	+0.0	+0.0					
			-27.9	+0.0							
5	5542.366M	36.6	+0.0	+0.0	+0.0	+0.0	+0.0	45.5	54.0	-8.5	Vert
			+0.7	+0.0	+0.0	+4.5	67				148
			+0.8	+34.3	-33.2	+1.8					
			+0.0	+0.0							
6	35.951M	40.2	+12.6	+5.9	+0.3	+0.3	+0.0	31.4	40.0	-8.6	Vert
			+0.1	+0.0	+0.0	+0.0					99
			+0.0	+0.0	+0.0	+0.0					
			-28.0	+0.0							
7	4579.810M	39.3	+0.0	+0.0	+0.0	+0.0	+0.0	45.0	54.0	-9.0	Vert
			+0.5	+0.0	+0.0	+4.0	350				156
			+0.8	+32.0	-33.1	+1.5					
			+0.0	+0.0							
8	4539.970M	38.8	+0.0	+0.0	+0.0	+0.0	+0.0	44.4	54.0	-9.6	Vert
			+0.5	+0.0	+0.0	+3.9					166
			+0.8	+32.0	-33.1	+1.5					
			+0.0	+0.0							
9	3694.600M	40.4	+0.0	+0.0	+0.0	+0.0	+0.0	44.2	54.0	-9.8	Vert
			+0.4	+0.0	+0.0	+3.8	332				132
			+0.9	+30.8	-33.4	+1.3					
			+0.0	+0.0							
10	3632.894M	39.6	+0.0	+0.0	+0.0	+0.0	+0.0	43.3	54.0	-10.7	Vert
			+0.4	+0.0	+0.0	+3.7					166
			+0.9	+30.8	-33.4	+1.3					
			+0.0	+0.0							
11	3664.276M	38.4	+0.0	+0.0	+0.0	+0.0	+0.0	42.1	54.0	-11.9	Vert
			+0.4	+0.0	+0.0	+3.7	11				143
			+0.9	+30.8	-33.4	+1.3					
			+0.0	+0.0							

12	2771.776M	40.8	+0.0	+0.0	+0.0	+0.0	+0.0	40.7	54.0	-13.3	Vert
			+0.5	+0.0	+0.0	+2.6	210		High		142
			+0.6	+28.9	-33.8	+1.1					
			+0.0	+0.0							
13	2747.396M	40.7	+0.0	+0.0	+0.0	+0.0	+0.0	40.5	54.0	-13.5	Vert
			+0.5	+0.0	+0.0	+2.6			Mid		143
			+0.6	+28.8	-33.8	+1.1					
			+0.0	+0.0							
14	59.997M	40.8	+6.7	+5.9	+0.4	+0.4	+0.0	26.4	40.0	-13.6	Vert
			+0.1	+0.0	+0.0	+0.0	360				100
			+0.0	+0.0	+0.0	+0.0					
			-27.9	+0.0							
15	1848.270M	44.0	+0.0	+0.0	+0.0	+0.0	+0.0	40.4	54.0	-13.6	Vert
			+0.4	+0.0	+0.0	+2.3	155		High		142
			+0.7	+26.8	-34.5	+0.7					
			+0.0	+0.0							
16	2724.622M	40.5	+0.0	+0.0	+0.0	+0.0	+0.0	40.3	54.0	-13.7	Vert
			+0.5	+0.0	+0.0	+2.6	244		Low		142
			+0.6	+28.8	-33.8	+1.1					
			+0.0	+0.0							
17	48.090M	40.1	+7.2	+5.9	+0.4	+0.4	+0.0	26.2	40.0	-13.8	Vert
			+0.1	+0.0	+0.0	+0.0	75				100
			+0.0	+0.0	+0.0	+0.0					
			-27.9	+0.0							
18	7390.534M	26.7	+0.0	+0.0	+0.0	+0.0	+0.0	38.2	54.0	-15.8	Vert
Ave			+1.0	+0.0	+0.0	+5.4	360		High		150
			+0.5	+36.7	-34.3	+2.2					
			+0.0	+0.0							
^	7390.534M	38.9	+0.0	+0.0	+0.0	+0.0	+0.0	50.4	54.0	-3.6	Vert
			+1.0	+0.0	+0.0	+5.4	23		High		138
			+0.5	+36.7	-34.3	+2.2					
			+0.0	+0.0							
20	168.040M	38.3	+9.3	+5.9	+0.6	+0.7	+0.0	27.5	43.5	-16.0	Vert
			+0.2	+0.0	+0.0	+0.0	360				100
			+0.0	+0.0	+0.0	+0.0					
			-27.5	+0.0							
21	1831.326M	41.2	+0.0	+0.0	+0.0	+0.0	+0.0	37.4	54.0	-16.6	Vert
			+0.4	+0.0	+0.0	+2.3			Mid		143
			+0.7	+26.6	-34.5	+0.7					
			+0.0	+0.0							
22	9160.324M	24.0	+0.0	+0.0	+0.0	+0.0	+0.0	37.3	54.0	-16.7	Vert
Ave			+0.8	+0.0	+0.0	+6.2	360		Mid		137
			+0.6	+37.2	-33.9	+2.4					
			+0.0	+0.0							
^	9160.324M	36.0	+0.0	+0.0	+0.0	+0.0	+0.0	49.3	54.0	-4.7	Vert
			+0.8	+0.0	+0.0	+6.2	360		Mid		137
			+0.6	+37.2	-33.9	+2.4					
			+0.0	+0.0							
24	9238.320M	23.1	+0.0	+0.0	+0.0	+0.0	+0.0	36.7	54.0	-17.3	Vert
Ave			+0.9	+0.0	+0.0	+6.2	360		High		150
			+0.6	+37.2	-33.8	+2.5					
			+0.0	+0.0							

^	9238.320M	38.4	+0.0	+0.0	+0.0	+0.0	+0.0	52.0	54.0	-2.0	Vert
			+0.9	+0.0	+0.0	+6.2	272		High		150
			+0.6	+37.2	-33.8	+2.5					
			+0.0	+0.0							
26	9079.838M	23.5	+0.0	+0.0	+0.0	+0.0	+0.0	36.6	54.0	-17.4	Vert
	Ave		+0.7	+0.0	+0.0	+6.2			Low		153
			+0.6	+37.1	-33.9	+2.4					
			+0.0	+0.0							
^	9079.838M	37.1	+0.0	+0.0	+0.0	+0.0	+0.0	50.2	54.0	-3.8	Vert
			+0.7	+0.0	+0.0	+6.2			Low		153
			+0.6	+37.1	-33.9	+2.4					
			+0.0	+0.0							
28	6466.194M	25.6	+0.0	+0.0	+0.0	+0.0	+0.0	36.1	54.0	-17.9	Vert
	Ave		+0.6	+0.0	+0.0	+5.5	360		High		150
			+0.6	+35.5	-33.6	+1.9					
			+0.0	+0.0							
^	6466.194M	38.5	+0.0	+0.0	+0.0	+0.0	+0.0	49.0	54.0	-5.0	Vert
			+0.6	+0.0	+0.0	+5.5			High		148
			+0.6	+35.5	-33.6	+1.9					
			+0.0	+0.0							
30	7327.844M	24.4	+0.0	+0.0	+0.0	+0.0	+0.0	35.7	54.0	-18.3	Vert
	Ave		+0.9	+0.0	+0.0	+5.4			Mid		140
			+0.5	+36.5	-34.1	+2.1					
			+0.0	+0.0							
^	7327.844M	38.5	+0.0	+0.0	+0.0	+0.0	+0.0	49.8	54.0	-4.2	Vert
			+0.9	+0.0	+0.0	+5.4	360		Mid		137
			+0.5	+36.5	-34.1	+2.1					
			+0.0	+0.0							
32	8314.844M	23.8	+0.0	+0.0	+0.0	+0.0	+0.0	35.6	54.0	-18.4	Vert
	Ave		+0.8	+0.0	+0.0	+5.8	360		High		150
			+0.5	+37.0	-34.6	+2.3					
			+0.0	+0.0							
^	8314.844M	39.3	+0.0	+0.0	+0.0	+0.0	+0.0	51.1	54.0	-2.9	Vert
			+0.8	+0.0	+0.0	+5.8	112		High		138
			+0.5	+37.0	-34.6	+2.3					
			+0.0	+0.0							
34	7263.280M	24.1	+0.0	+0.0	+0.0	+0.0	+0.0	35.4	54.0	-18.6	Vert
	Ave		+0.8	+0.0	+0.0	+5.4	360		Low		149
			+0.6	+36.3	-33.9	+2.1					
			+0.0	+0.0							
^	7263.280M	37.8	+0.0	+0.0	+0.0	+0.0	+0.0	49.1	54.0	-4.9	Vert
			+0.8	+0.0	+0.0	+5.4			Low		153
			+0.6	+36.3	-33.9	+2.1					
			+0.0	+0.0							
36	8244.324M	23.6	+0.0	+0.0	+0.0	+0.0	+0.0	34.9	54.0	-19.1	Vert
	Ave		+0.7	+0.0	+0.0	+5.7	208		Mid		140
			+0.5	+36.9	-34.8	+2.3					
			+0.0	+0.0							
^	8244.324M	36.6	+0.0	+0.0	+0.0	+0.0	+0.0	47.9	54.0	-6.1	Vert
			+0.7	+0.0	+0.0	+5.7	360		Mid		137
			+0.5	+36.9	-34.8	+2.3					
			+0.0	+0.0							

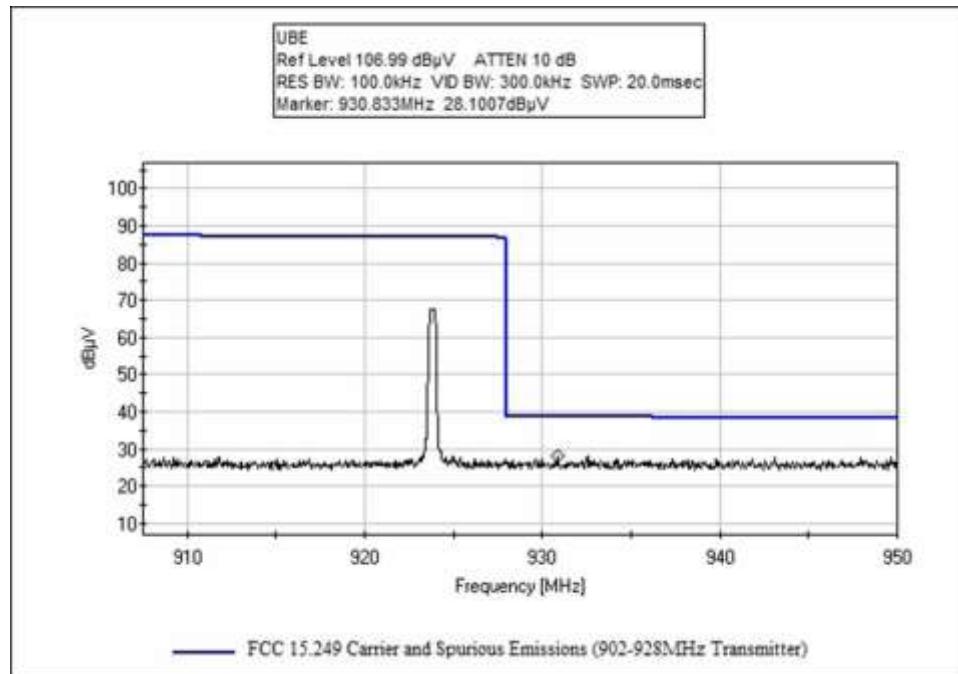
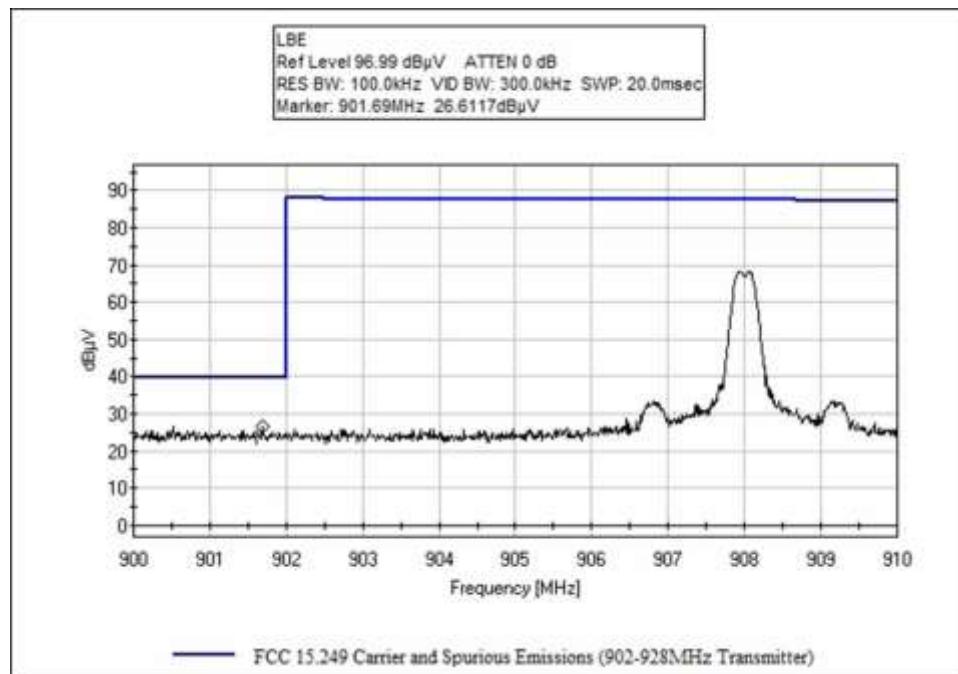
38	6412.616M	24.0	+0.0	+0.0	+0.0	+0.0	+0.0	34.2	54.0	-19.8	Vert
	Ave		+0.6	+0.0	+0.0	+5.4			Mid		145
			+0.5	+35.4	-33.6	+1.9					
			+0.0	+0.0							
^	6412.616M	37.3	+0.0	+0.0	+0.0	+0.0	+0.0	47.5	54.0	-6.5	Vert
			+0.6	+0.0	+0.0	+5.4	360		Mid		143
			+0.5	+35.4	-33.6	+1.9					
			+0.0	+0.0							
40	8172.102M	22.4	+0.0	+0.0	+0.0	+0.0	+0.0	33.8	54.0	-20.2	Vert
	Ave		+0.7	+0.0	+0.0	+5.7	360				149
			+0.5	+36.9	-34.7	+2.3					
			+0.0	+0.0							
^	8172.102M	37.2	+0.0	+0.0	+0.0	+0.0	+0.0	48.6	54.0	-5.4	Vert
			+0.7	+0.0	+0.0	+5.7	134		Low		149
			+0.5	+36.9	-34.7	+2.3					
			+0.0	+0.0							
42	1815.430M	37.1	+0.0	+0.0	+0.0	+0.0	+0.0	33.2	54.0	-20.8	Vert
			+0.4	+0.0	+0.0	+2.3	360		Low		145
			+0.7	+26.5	-34.5	+0.7					
			+0.0	+0.0							
43	6355.276M	23.0	+0.0	+0.0	+0.0	+0.0	+0.0	33.1	54.0	-20.9	Vert
	Ave		+0.6	+0.0	+0.0	+5.3	360		Low		149
			+0.5	+35.3	-33.5	+1.9					
			+0.0	+0.0							
^	6355.276M	37.0	+0.0	+0.0	+0.0	+0.0	+0.0	47.1	54.0	-6.9	Vert
			+0.6	+0.0	+0.0	+5.3			Low		153
			+0.5	+35.3	-33.5	+1.9					
			+0.0	+0.0							
45	107.719M	33.1	+8.2	+5.9	+0.5	+0.6	+0.0	20.7	43.5	-22.8	Vert
			+0.1	+0.0	+0.0	+0.0	360				100
			+0.0	+0.0	+0.0	+0.0					
			-27.7	+0.0							
46	28.227M	16.6	+0.0	+0.0	+0.0	+0.0	-40.0	-16.8	29.5	-46.3	Perp
			+0.1	+0.0	+6.1	+0.3					102
			+0.0	+0.0	+0.0	+0.1					
			+0.0	+0.0							
47	16.473k	44.8	+0.0	+0.0	+0.0	+0.0	-80.0	-22.7	43.3	-66.0	Perp
			+0.0	+0.0	+12.5	+0.0					102
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0							

Band Edge

Band Edge Summary

Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
901.69	FSK	Internal PIFA 1.2dBi	32.7	<46	Pass
930.8	FSK	Internal PIFA 1.2dBi	35.3	<46	Pass
902.0	FSK	Internal PIFA 1.2dBi	30.6	<46	Pass
928.0	FSK	Internal PIFA 1.2dBi	33.5	<46	Pass

Band Edge Plots



Test Setup / Conditions / Data

Test Location: CKC Laboratories, Inc. • 22116 23rd Drive SE, Suite A • Bothell, WA. 98021 • 1-800-500-4EMC
 Customer: **Itron, Inc**
 Specification: **15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter)**
 Work Order #: **102014** Date: 2/23/2019
 Test Type: **Maximized Emissions** Time: 09:29:51
 Tested By: Matthew Harrison / Steven Pittsford Sequence#: 19
 Software: EMITest 5.03.11

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Temperature: 21-22°C
Humidity: 26-33%
Pressure: 100.8kPa
Frequency Range: Band Edge
Frequency tested: 908, 916 & 923.8MHz
Firmware power setting: Low Power
Protocol /MCS/Modulation: Continuous FSK
Duty Cycle: 100% (Test Mode)
Test Mode: Continuously transmitting GFSK on single channel, worst case data reported.
Test Setup: EUT is transmitting sitting on foam table 80cm high. X, Y, Z axis investigated, both antenna polarities investigated, worst case data reported.
Modifications Added: None
Test Method: ANSI C63.10 (2013)
Plots are uncorrected/raw data

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN03628	Biconilog Antenna	3142E	6/7/2017	6/7/2019
T2	ANP06123	Attenuator	18N-6	5/5/2017	5/5/2019
T3	ANP05305	Cable	ETSI-50T	10/24/2017	10/24/2019
T4	ANP05360	Cable	RG214	1/31/2018	1/31/2020
T5	ANP06540	Cable	Heliax	10/30/2017	10/30/2019
	AN02673	Spectrum Analyzer	E4446A	2/3/2017	2/3/2019
T6	AN02307	Preamp	8447D	1/15/2018	1/15/2020
	AN02872	Spectrum Analyzer	E4440A	11/3/2017	11/3/2019

Measurement Data:

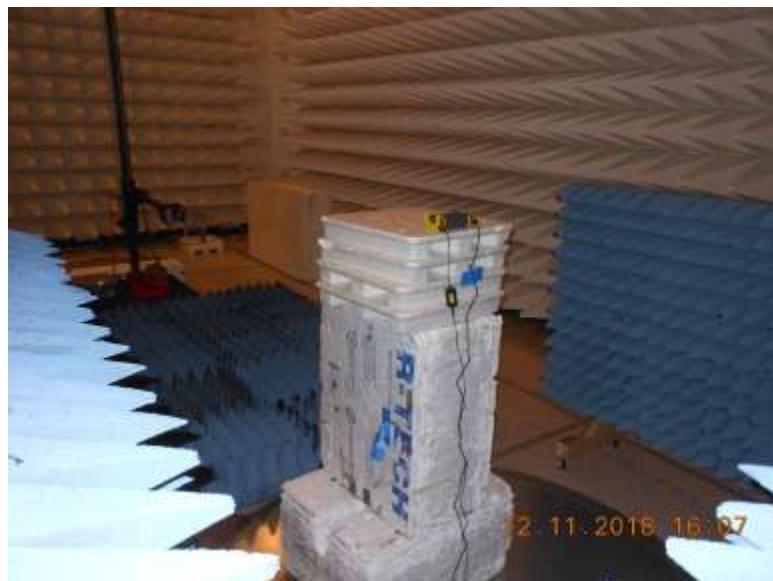
Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dB μ V	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
			T5	T6	T7	Table	dB μ V/m	dB μ V/m	dB	Ant	
1	930.833M	28.1	+24.6 +0.4	+5.9 +0.0	+1.6 -27.3	+2.0 211	+0.0	35.3	46.0	-10.7 99	Vert
2	928.000M	26.3	+24.6 +0.4	+5.9 +0.0	+1.6 -27.3	+2.0 211	+0.0	33.5	46.0	-12.5 100	Vert
3	901.690M	26.6	+23.8 +0.3	+5.9 +0.0	+1.5 -27.4	+2.0 360	+0.0	32.7	46.0	-13.3 101	Vert
4	902.000M	24.5	+23.8 +0.3	+5.9 +0.0	+1.5 -27.4	+2.0 360	+0.0	30.6	46.0	-15.4 101	Vert

Test Setup Photo(s)


Below 1GHz



Above 1GHz, Cone placement



X Axis



Y Axis



Z Axis

15.207 AC Conducted Emissions

Test Setup / Conditions / Data

Test Location: CKC Laboratories, Inc. • 22116 23rd Drive SE, Suite A • Bothell, WA. 98021 • 1-800-500-4EMC
 Customer: **Itron, Inc.**
 Specification: **15.207 AC Mains - Quasi-peak**
 Work Order #: **102014** Date: 12/11/2018
 Test Type: **Conducted Emissions** Time: 10:52:26
 Tested By: Steven Pittsford Sequence#: 9
 Software: EMITest 5.03.11 115VAC 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

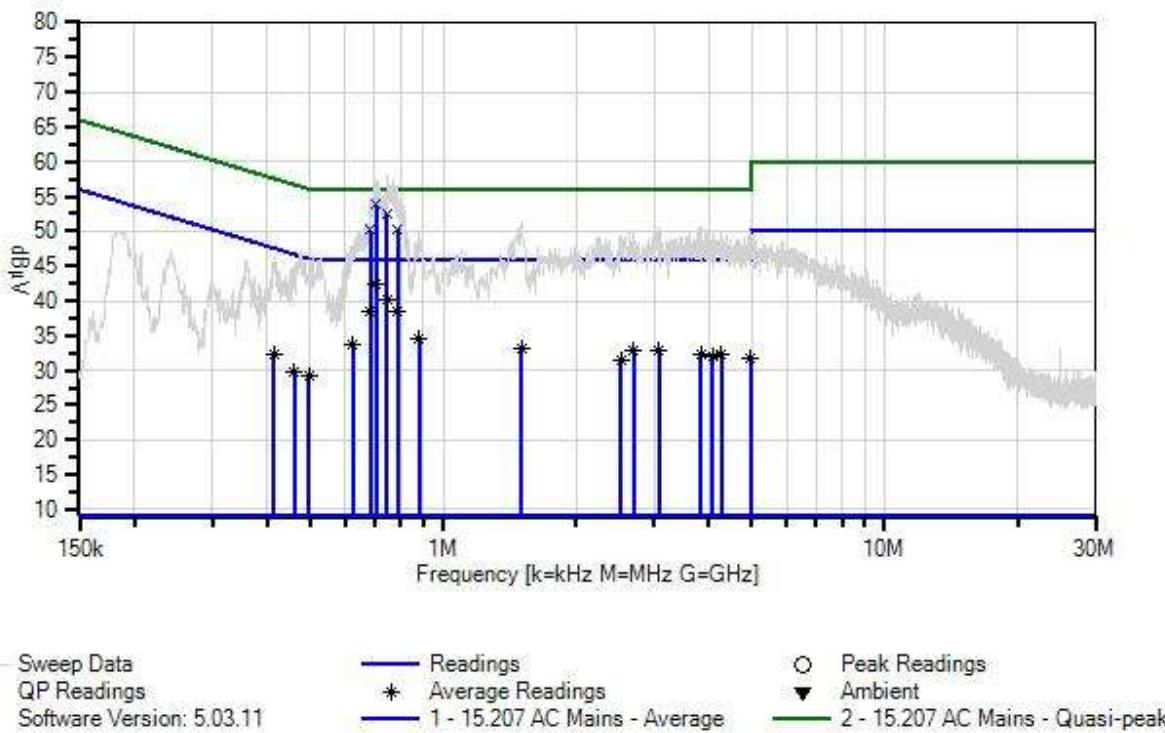
Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Temperature: 22°C
Humidity: 33%
Pressure: 101.4kPa
Frequency Range: 0.15-30MHz
Frequency tested: 908MHz
Firmware power setting: Low Power
Protocol /MCS/Modulation: FSK
Duty Cycle: 100% (Test Mode)
Test Mode: Continuously transmitting
Test Setup: EUT connected to USB AC Adapter via USB cable. USB AC Adapter connected to AC mains through LISN.
Modifications Added: None
Test Method: ANSI C63.10 (2013)

Itron, Inc WO#: 102014 Sequence#: 9 Date: 12/11/2018
15.207 AC Mains - Quasi-peak Test Lead: 115VAC 60Hz Line



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP06219	Attenuator	768-10	4/13/2018	4/13/2020
T2	ANP06515	Cable	Heliax	6/29/2018	6/29/2020
T3	ANP06540	Cable	Heliax	10/30/2017	10/30/2019
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
	AN02673	Spectrum Analyzer	E4446A	2/3/2017	2/3/2019
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 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dB μ V	dB	dB	dB	dB	Table	dB μ V	dB μ V	dB	Ant
1	706.313k	44.2	+9.1 +0.2	+0.0	+0.0	+0.3	+0.0	53.8	56.0	-2.2	Line
	QP										
2	746.309k	43.0	+9.1 +0.2	+0.0	+0.0	+0.3	+0.0	52.6	56.0	-3.4	Line
	QP										
3	706.313k	32.8	+9.1 +0.2	+0.0	+0.0	+0.3	+0.0	42.4	46.0	-3.6	Line
	Ave										
^	706.312k	47.8	+9.1 +0.2	+0.0	+0.0	+0.3	+0.0	57.4	46.0	+11.4	Line
5	790.668k	40.7	+9.1 +0.2	+0.0	+0.0	+0.3	+0.0	50.3	56.0	-5.7	Line
	QP										
6	683.769k	40.6	+9.1 +0.2	+0.0	+0.0	+0.3	+0.0	50.2	56.0	-5.8	Line
	QP										
7	746.309k	30.5	+9.1 +0.2	+0.0	+0.0	+0.3	+0.0	40.1	46.0	-5.9	Line
	Ave										
^	746.308k	48.5	+9.1 +0.2	+0.0	+0.0	+0.3	+0.0	58.1	46.0	+12.1	Line
9	683.769k	28.9	+9.1 +0.2	+0.0	+0.0	+0.3	+0.0	38.5	46.0	-7.5	Line
	Ave										
^	683.769k	45.3	+9.1 +0.2	+0.0	+0.0	+0.3	+0.0	54.9	46.0	+8.9	Line
11	790.668k	28.7	+9.1 +0.2	+0.0	+0.0	+0.3	+0.0	38.3	46.0	-7.7	Line
	Ave										
^	790.668k	46.1	+9.1 +0.2	+0.0	+0.0	+0.3	+0.0	55.7	46.0	+9.7	Line
13	881.458k	25.0	+9.1 +0.2	+0.0	+0.0	+0.3	+0.0	34.6	46.0	-11.4	Line
	Ave										
^	881.457k	40.7	+9.1 +0.2	+0.0	+0.0	+0.3	+0.0	50.3	46.0	+4.3	Line

15	624.100k	23.9	+9.1 +0.2	+0.0	+0.0	+0.4	+0.0	33.6	46.0	-12.4	Line
^	624.100k	38.5	+9.1 +0.2	+0.0	+0.0	+0.4	+0.0	48.2	46.0	+2.2	Line
17	1.507M	23.5	+9.1 +0.1	+0.1	+0.0	+0.3	+0.0	33.1	46.0	-12.9	Line
^	1.507M	41.7	+9.1 +0.1	+0.1	+0.0	+0.3	+0.0	51.3	46.0	+5.3	Line
19	3.089M	23.2	+9.1 +0.1	+0.1	+0.0	+0.3	+0.0	32.8	46.0	-13.2	Line
^	3.089M	41.0	+9.1 +0.1	+0.1	+0.0	+0.3	+0.0	50.6	46.0	+4.6	Line
21	2.702M	23.1	+9.1 +0.1	+0.1	+0.0	+0.3	+0.0	32.7	46.0	-13.3	Line
^	2.702M	40.8	+9.1 +0.1	+0.1	+0.0	+0.3	+0.0	50.4	46.0	+4.4	Line
23	3.829M	22.8	+9.1 +0.1	+0.1	+0.0	+0.3	+0.0	32.4	46.0	-13.6	Line
^	3.829M	41.2	+9.1 +0.1	+0.1	+0.0	+0.3	+0.0	50.8	46.0	+4.8	Line
25	4.275M	22.7	+9.1 +0.1	+0.1	+0.0	+0.3	+0.0	32.3	46.0	-13.7	Line
^	4.275M	40.2	+9.1 +0.1	+0.1	+0.0	+0.3	+0.0	49.8	46.0	+3.8	Line
27	4.080M	22.3	+9.1 +0.1	+0.1	+0.0	+0.3	+0.0	31.9	46.0	-14.1	Line
^	4.080M	40.1	+9.1 +0.1	+0.1	+0.0	+0.3	+0.0	49.7	46.0	+3.7	Line
29	4.968M	22.1	+9.1 +0.1	+0.1	+0.0	+0.3	+0.0	31.7	46.0	-14.3	Line
^	4.968M	40.5	+9.1 +0.1	+0.1	+0.0	+0.3	+0.0	50.1	46.0	+4.1	Line
31	2.532M	21.9	+9.1 +0.1	+0.1	+0.0	+0.3	+0.0	31.5	46.0	-14.5	Line
^	2.532M	39.8	+9.1 +0.1	+0.1	+0.0	+0.3	+0.0	49.4	46.0	+3.4	Line
33	413.300k	22.6	+9.1 +0.1	+0.0	+0.0	+0.5	+0.0	32.3	47.6	-15.3	Line
^	413.300k	36.5	+9.1 +0.1	+0.0	+0.0	+0.5	+0.0	46.2	47.6	-1.4	Line
35	497.200k	19.5	+9.1 +0.2	+0.0	+0.0	+0.4	+0.0	29.2	46.0	-16.8	Line
^	497.200k	37.7	+9.1 +0.2	+0.0	+0.0	+0.4	+0.0	47.4	46.0	+1.4	Line
37	459.600k	19.9	+9.1 +0.1	+0.1	+0.0	+0.5	+0.0	29.7	46.7	-17.0	Line
^	459.600k	37.6	+9.1 +0.1	+0.1	+0.0	+0.5	+0.0	47.4	46.7	+0.7	Line



Test Location: CKC Laboratories, Inc. • 22116 23rd Drive SE, Suite A • Bothell, WA. 98021 • 1-800-500-4EMC
Customer: **Itron, Inc.**
Specification: **RSS GEN 8.8 AC Power Line Conducted Emission Limit - Average**
Work Order #: **102014** Date: 12/11/2018
Test Type: **Conducted Emissions** Time: 11:10:51
Tested By: Steven Pittsford Sequence#: 10
Software: EMITest 5.03.11 115VAC 60Hz

Equipment Tested:

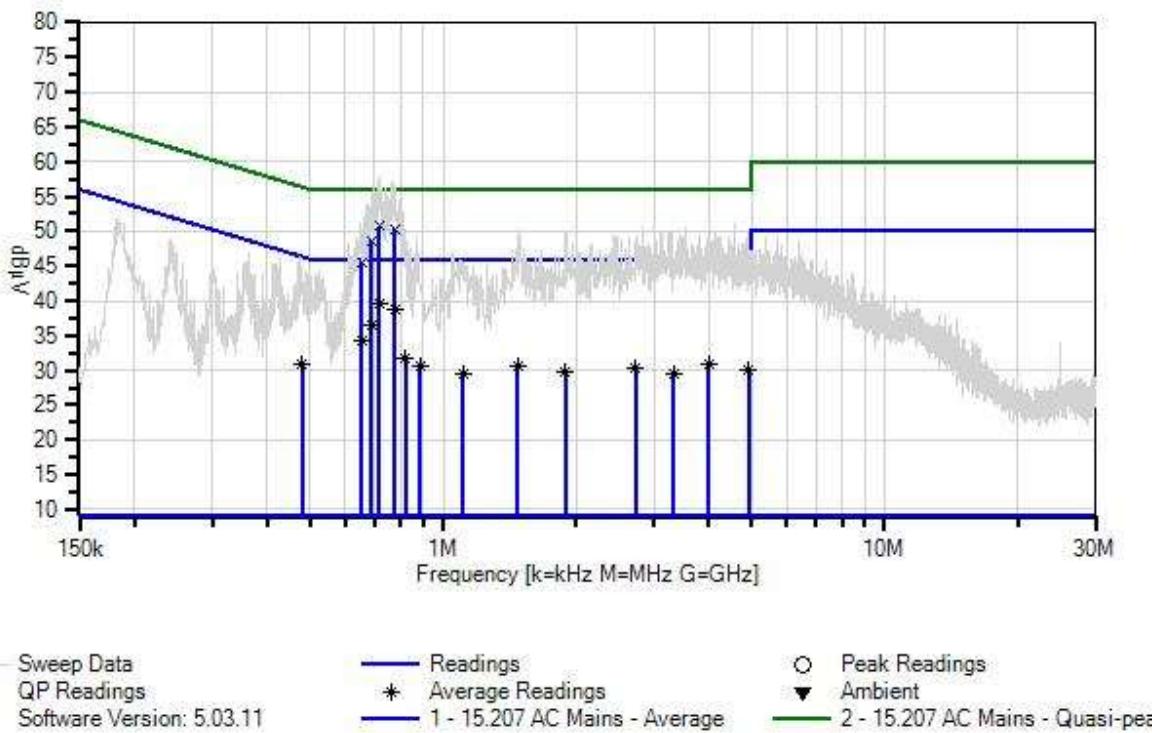
Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Temperature: 22°C
Humidity: 33%
Pressure: 101.4kPa
Frequency Range: 0.15-30MHz
Frequency tested: 908MHz
Firmware power setting: Low Power
Protocol /MCS/Modulation: FSK
Duty Cycle: 100% (Test Mode)
Test Mode: Continuously transmitting
Test Setup: EUT connected to USB AC Adapter via USB cable. USB AC Adapter connected to AC mains through LISN.
Modifications Added: None
Test Method: ANSI C63.10 (2013)

Itron, Inc WO#: 102014 Sequence#: 10 Date: 12/11/2018
 RSS GEN 8.8 AC Power Line Conducted Emission Limit - Average Test Lead: 115VAC 60Hz Neutral


Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP06219	Attenuator	768-10	4/13/2018	4/13/2020
T2	ANP06515	Cable	Heliax	6/29/2018	6/29/2020
T3	ANP06540	Cable	Heliax	10/30/2017	10/30/2019
	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
	AN02673	Spectrum Analyzer	E4446A	2/3/2017	2/3/2019
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 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dB μ V	dB	dB	dB	dB	Table	dB μ V	dB μ V	dB	Ant
1	717.100k	41.1	+9.1 +0.2	+0.0	+0.0	+0.3	+0.0	50.7	56.0	-5.3	Neutr
	QP										
2	779.000k	40.7	+9.1 +0.2	+0.0	+0.0	+0.3	+0.0	50.3	56.0	-5.7	Neutr
	QP										
3	717.100k	30.0	+9.1 +0.2	+0.0	+0.0	+0.3	+0.0	39.6	46.0	-6.4	Neutr
	Ave										
^	717.100k	49.0	+9.1 +0.2	+0.0	+0.0	+0.3	+0.0	58.6	46.0	+12.6	Neutr
5	779.000k	29.1	+9.1 +0.2	+0.0	+0.0	+0.3	+0.0	38.7	46.0	-7.3	Neutr
	Ave										
^	779.000k	47.6	+9.1 +0.2	+0.0	+0.0	+0.3	+0.0	57.2	46.0	+11.2	Neutr
7	688.700k	39.0	+9.1 +0.2	+0.0	+0.0	+0.3	+0.0	48.6	56.0	-7.4	Neutr
	QP										
8	688.700k	26.9	+9.1 +0.2	+0.0	+0.0	+0.3	+0.0	36.5	46.0	-9.5	Neutr
	Ave										
^	688.700k	45.0	+9.1 +0.2	+0.0	+0.0	+0.3	+0.0	54.6	46.0	+8.6	Neutr
10	653.400k	35.9	+9.1 +0.2	+0.0	+0.0	+0.4	+0.0	45.6	56.0	-10.4	Neutr
	QP										
11	653.400k	24.4	+9.1 +0.2	+0.0	+0.0	+0.4	+0.0	34.1	46.0	-11.9	Neutr
	Ave										
^	653.400k	43.0	+9.1 +0.2	+0.0	+0.0	+0.4	+0.0	52.7	46.0	+6.7	Neutr
13	820.600k	22.2	+9.1 +0.2	+0.0	+0.0	+0.3	+0.0	31.8	46.0	-14.2	Neutr
	Ave										
^	820.600k	40.2	+9.1 +0.2	+0.0	+0.0	+0.3	+0.0	49.8	46.0	+3.8	Neutr

15	3.998M	21.3	+9.1 +0.1	+0.1	+0.0	+0.3	+0.0	30.9	46.0	-15.1	Neutr
^	3.998M	40.5	+9.1 +0.1	+0.1	+0.0	+0.3	+0.0	50.1	46.0	+4.1	Neutr
17	1.471M	21.1	+9.1 +0.1	+0.1	+0.0	+0.3	+0.0	30.7	46.0	-15.3	Neutr
^	1.471M	41.6	+9.1 +0.1	+0.1	+0.0	+0.3	+0.0	51.2	46.0	+5.2	Neutr
19	888.800k	21.0	+9.1 +0.2	+0.0	+0.0	+0.3	+0.0	30.6	46.0	-15.4	Neutr
^	888.800k	39.1	+9.1 +0.2	+0.0	+0.0	+0.3	+0.0	48.7	46.0	+2.7	Neutr
21	479.800k	21.1	+9.1 +0.2	+0.0	+0.0	+0.4	+0.0	30.8	46.3	-15.5	Neutr
^	479.800k	37.3	+9.1 +0.2	+0.0	+0.0	+0.4	+0.0	47.0	46.3	+0.7	Neutr
23	2.726M	20.8	+9.1 +0.1	+0.1	+0.0	+0.3	+0.0	30.4	46.0	-15.6	Neutr
^	2.726M	41.3	+9.1 +0.1	+0.1	+0.0	+0.3	+0.0	50.9	46.0	+4.9	Neutr
25	4.916M	20.4	+9.1 +0.1	+0.1	+0.0	+0.3	+0.0	30.0	46.0	-16.0	Neutr
^	4.916M	40.7	+9.1 +0.1	+0.1	+0.0	+0.3	+0.0	50.3	46.0	+4.3	Neutr
27	1.890M	20.2	+9.1 +0.1	+0.1	+0.0	+0.3	+0.0	29.8	46.0	-16.2	Neutr
^	1.890M	41.7	+9.1 +0.1	+0.1	+0.0	+0.3	+0.0	51.3	46.0	+5.3	Neutr
29	3.323M	20.0	+9.1 +0.1	+0.1	+0.0	+0.3	+0.0	29.6	46.0	-16.4	Neutr
^	3.323M	41.5	+9.1 +0.1	+0.1	+0.0	+0.3	+0.0	51.1	46.0	+5.1	Neutr
31	1.112M	20.0	+9.1 +0.2	+0.0	+0.0	+0.3	+0.0	29.6	46.0	-16.4	Neutr
^	1.112M	40.5	+9.1 +0.2	+0.0	+0.0	+0.3	+0.0	50.1	46.0	+4.1	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 dB μ V/m, the spectrum analyzer reading in dB μ V 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	(dB μ V)
+ Antenna Factor	(dB/m)
+ Cable Loss	(dB)
- Distance Correction	(dB)
- Preamplifier Gain	(dB)
= Corrected Reading	(dB μ V/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.