Itron, Inc.

TEST REPORT FOR

AMR Transceiver Device for Communicating with Utility Meters
Model: IMR

Tested to The Following Standards:

FCC Part 15 Subpart C Section(s)

15.207
&
15.231a
(PERIODIC OPERATION >70MHZ)

Report No.: 99119-7

Date of issue: November 14, 2016

ACCREDITED
Testing Certificates:
803.01, 803.02, 803.05, 803.06

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

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

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Testing the Future
CKC LABORATORIES, INC.

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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: 107098

REPORT PREPARED BY:

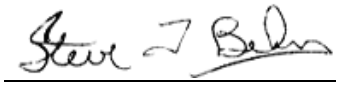
Dianne Dudley
CKC Laboratories, Inc.
5046 Sierra Pines Drive
Mariposa, CA 95338

Project Number: 99119

DATE OF EQUIPMENT RECEIPT: October 7, 2016
DATE(S) OF TESTING: October 7-12, 2016

Report Authorization

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



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

Test Facility Information

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

TEST LOCATION(S):
CKC Laboratories, Inc.
22116 23rd Drive S.E., Suite A
Bothell, WA 98021-4413

Software Versions

CKC Laboratories Proprietary Software	Version
EMITest Emissions	5.03.02

Site Registration & Accreditation Information

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

SUMMARY OF RESULTS

Standard / Specification: FCC Part 15 Subpart C - 15.231a

Test Procedure	Description	Modifications	Results
15.231(c)	Occupied Bandwidth	NA	Pass
15.231(b)	Field Strength of Fundamental	NA	Pass
15.231(a)	Periodic Operation Requirements	NA	Pass
15.231(b)	Field Strength of Spurious Emissions	NA	Pass
15.207	AC Conducted Emissions	NA	Pass

Na = Not applicable

Modifications During Testing

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

Summary of Conditions
No modifications were made during testing.

Modifications listed above must be incorporated into all production units.

Conditions During Testing

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

Summary of Conditions
None

EQUIPMENT UNDER TEST (EUT)

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

Configuration 1

Equipment Tested:

Device	Manufacturer	Model #	S/N
AMR transceiver device for communicating with utility meters	Itron, Inc	IMR	00000005

Support Equipment:

Device	Manufacturer	Model #	S/N
Laptop	Dell	M6300	9KG4MF1
AC Adapter for Laptop	Dell	NADP-130AB D	N/A

Configuration 2

Equipment Tested:

Device	Manufacturer	Model #	S/N
AMR transceiver device for communicating with utility meters	Itron, Inc	IMR	00000005

Support Equipment:

Device	Manufacturer	Model #	S/N
AC Adapter	Itron, Inc	GUSB05	N/A

General Product Information:

Product Information	Manufacturer-Provided Details
Equipment Type:	Stand-Alone Equipment
Modulation Type(s):	OOK
Maximum Duty Cycle:	100%
Antenna Type(s) and Gain:	Internal PIFA 1dBi
Antenna Connection Type:	Integral (External connector provided to facilitate testing)
Operational Trigger Type:	Manually Activated Trigger
Nominal Input Voltage:	120VAC, 60Hz
Firmware / Software used for Test:	DPS Firmware 5.71 / MC3 Test v4.0.2.2

FCC Part 15 Subpart C

15.231(c) Occupied Bandwidth (20dB BW)

Test Setup/Conditions			
Test Location:	Bothell Lab C3	Test Engineer:	M. Atkinson
Test Method:	ANSI C63.10 (2013)	Test Date(s):	10/10/2016
Configuration:	1		
Test Setup:	Frequency Range: 952MHz Frequency tested: 952MHz Firmware power setting: Max Power EUT Firmware: 5.71 Protocol /MCS/Modulation: OOK Antenna type: Internal PIFA Antenna Gain: 1.0 dBi Duty Cycle: 100% (Test Mode) Test Mode: Continuously transmitting Test Setup: EUT is transmitting sitting on foam table 80cm high. Modifications Added: None		

Environmental Conditions			
Temperature (ºC)	20 to 24	Relative Humidity (%):	32 to 45

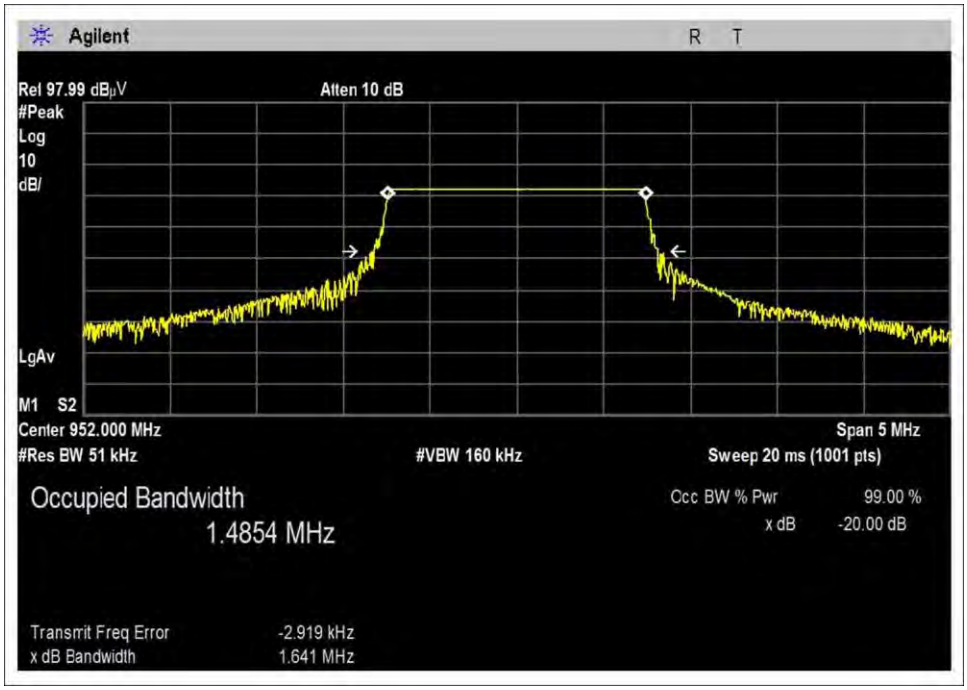
Test Equipment					
Asset#	**Description**	**Manufacturer**	**Model**	**Cal Date**	**Cal Due**
02871	Spectrum Analyzer	Agilent	E4440A	8/25/2015	8/25/2017
P06503	Cable	Astrolab	32026-29801-29801-36	4/28/2016	4/28/2018
P06242	Attenuator	Weinschel	54A-10	3/28/2016	3/28/2018

Test Data Summary

$$Limit = \begin{cases} 0.25\%\ f_c \mid 70\ MHz < f_c < 900MHz \\ 0.5\%\ f_c \mid f_c > 900MHz \end{cases}$$

Frequency (MHz)	Antenna Port	Modulation	Measured (kHz)	Limit (kHz)	Results
952	1	OOK	1641	≤4760	Pass

Plot(s)



Test Setup Photo(s)

15.231(b) Field Strength of Fundamental

Test Setup/Conditions			
Test Location:	Bothell Lab C3	Test Engineer:	M. Atkinson
Test Method:	ANSI C63.10 (2013)	Test Date(s):	10/12/2016
Configuration:	1		
Test Setup:	See Data Sheet.		

Environmental Conditions			
Temperature (ºC)	20-24	Relative Humidity (%):	32-45

Test Data Summary - Voltage Variations					
Frequency (MHz)	**Modulation / Ant Port**	**$V_{Minimum}$ (dBuV/m@3m)**	**$V_{Nominal}$ (dBuV/m@3m)**	**$V_{Maximum}$ (dBuV/m@3m)**	**Max Deviation from $V_{Nominal}$ (dB)**
952	OOK	75.4	75.4	75.5	0.1

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

Parameter Definitions:

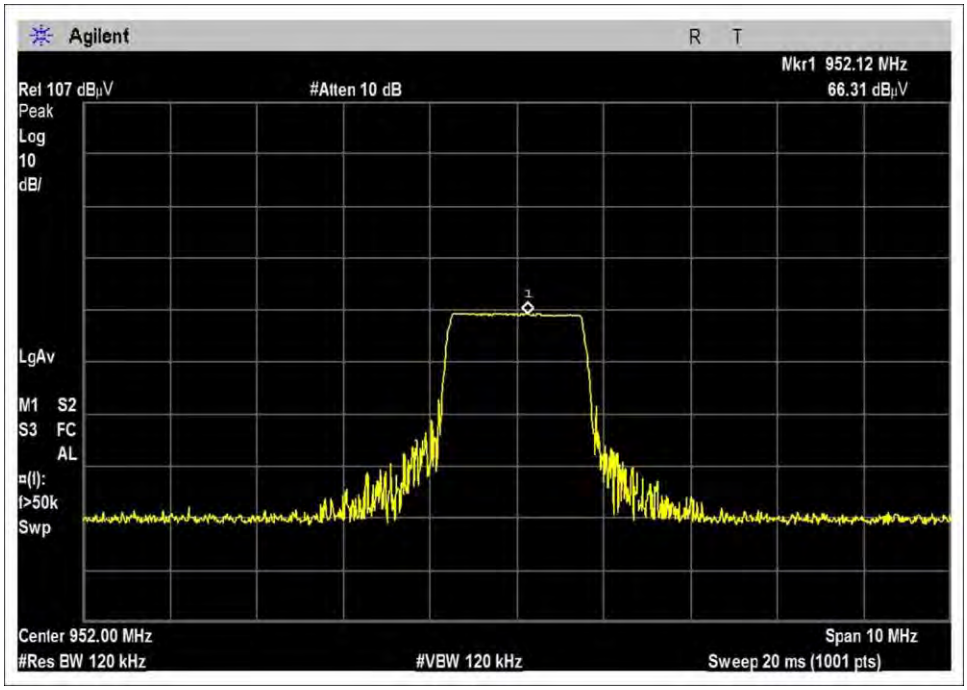
Measurements performed at input voltage Vnominal ± 15%.

Parameter	Value
$V_{Nominal}$:	120 VAC
$V_{Minimum}$:	102.00 VAC
$V_{Maximum}$:	138.00 VAC

Test Data Summary – Radiated Field Strength Measurement					
Frequency (MHz)	**Modulation**	**Ant. Type**	**Measured (dBuV/m @ 3m)**	**Limit (dBuV/m @ 3m)**	**Results**
952	OOK	Internal PIFA (1.5dBi)	75.4	≤81.9	Pass

Plot Data

Place content into folder



Test Data

Test Location:	CKC Laboratories, Inc. • 22116 23rd Drive SE, Suite A • Bothell, WA. 98021 • 1-800-500-4EMC (4362)		
Customer:	**Itron, Inc**		
Specification:	**15.231(b) Fundamental Field Strength**		
Work Order #:	**99119**	Date:	10/12/2016
Test Type:	**Maximized Emissions**	Time:	09:36:11
Tested By:	Michael Atkinson	Sequence#:	11
Software:	EMITest 5.03.02		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Temperature: 20 to 24°C
Humidity: 32 to 45%
Pressure: 101.3 to 103.5kPa

Frequency Range: 952MHz
Frequency tested: 952MHz
Firmware power setting: Max Power
EUT Firmware: 5.71
Protocol /MCS/Modulation: OOK

Antenna type: Internal PIFA
Antenna Gain: 1.0 dBi.

Duty Cycle: 100% (Test Mode)

Test Mode: Continuously transmitting
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)


Itron, Inc WO#: 99119 Sequence#: 11 Date: 10/12/2016
15.231(b) Fundamental Field Strength Test Distance: 3 Meters H+V
100
90
80
70
60
50
40
30
20
10
dBµV/m
70M
1G
10G
100G
200G
Frequency [k=kHz M=MHz G=GHz]
Readings
QP Readings
Ambient
1 - 15.231(b) Fundamental Field Strength
Peak Readings
Average Readings
Software Version: 5.03.02

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02871	Spectrum Analyzer	E4440A	8/25/2015	8/25/2017
T1	ANP06540	Cable	Heliax	10/29/2015	10/29/2017
T2	ANP05963	Cable	RG-214	2/15/2016	2/15/2018
T3	ANP05360	Cable	RG214	12/1/2014	12/1/2016
T4	AN02307	Preamp	8447D	2/15/2016	2/15/2018
T5	AN01991	Biconilog Antenna	CBL6111C	3/11/2016	3/11/2018
T6	ANP05657	Attenuator	PE7004-6	12/22/2015	12/22/2017

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

#	Freq	Rdng	T1 T5	T2 T6	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	952.120M	66.3	+0.4 +25.3	+2.4 +6.1	+2.1	-27.2	+0.0	75.4	81.9	-6.5	H+V

Test Setup Photo(s)

X Axis

Y Axis

Z Axis

15.231(a) Periodic Operation Requirements

Test Setup/Conditions			
Test Location:	Bothell Lab C3	Test Engineer:	M. Atkinson
Test Method:	ANSI C63.10 (2013)	Test Date(s):	10/7/2016
Configuration:	1		
Test Setup:	Frequency Range: 952 Frequency tested: 952 Firmware power setting: Max Power EUT Firmware: 5.71 Protocol /MCS/Modulation: OOK Antenna type: Internal PIFA Antenna Gain: 1.0 dBi Duty Cycle: 100% (Test Mode) Test Mode: Continuously transmitting Test Setup: EUT is transmitting through a temporary antenna connector and is attached directly to the spectrum analyzer. Various modulation tones were investigated, only worst case reported. Modifications Added: None		

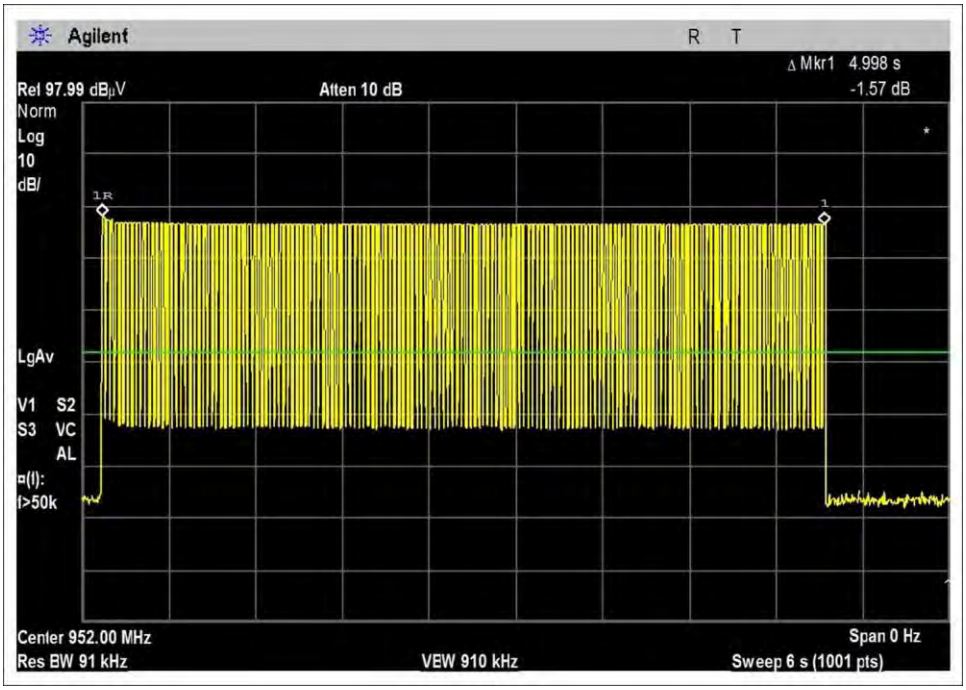
Environmental Conditions			
Temperature (ºC)	20 to 24	Relative Humidity (%):	32 to 45

Test Equipment					
Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
02871	Spectrum Analyzer	Agilent	E4440A	8/25/2015	8/25/2017
P06503	Cable	Astrolab	32026-29801-29801-36	4/28/2016	4/28/2018
P06242	Attenuator	Weinschel	54A-10	3/28/2016	3/28/2018

15.231(a)(1) Manual Triggered Deactivation Time

Test Data Summary					
Frequency (MHz)	Antenna Port	Modulation	Measured (s)	Limit (s)	Results
952	1	OOK	4.998	≤5	Pass

Plot(s)



Test Setup Photo(s)

15.231(b) Radiated Emissions

Test Setup/Conditions			
Test Location:	Bothell Lab C3	Test Engineer:	M. Atkinson
Test Method:	ANSI C63.10 (2013)	Test Date(s):	10/6/16 to 10/12/16
Configuration:	1		

Environmental Conditions			
Temperature (ºC)	20-24	Relative Humidity (%):	32-45

See data sheets for test setup and test equipment.

Test Data

Test Location: CKC Laboratories, Inc. • 22116 23rd Drive SE, Suite A • Bothell, WA. 98021 • 1-800-500-4EMC (4362)
Customer: **Itron, Inc**
Specification: **15.231(b) Spurious Field Strength (>470 MHz Transmitter)**
Work Order #: **99119** Date: 10/12/2016
Test Type: **Maximized Emissions** Time: 13:21:24
Tested By: Michael Atkinson Sequence#: 8
Software: EMITest 5.03.02

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

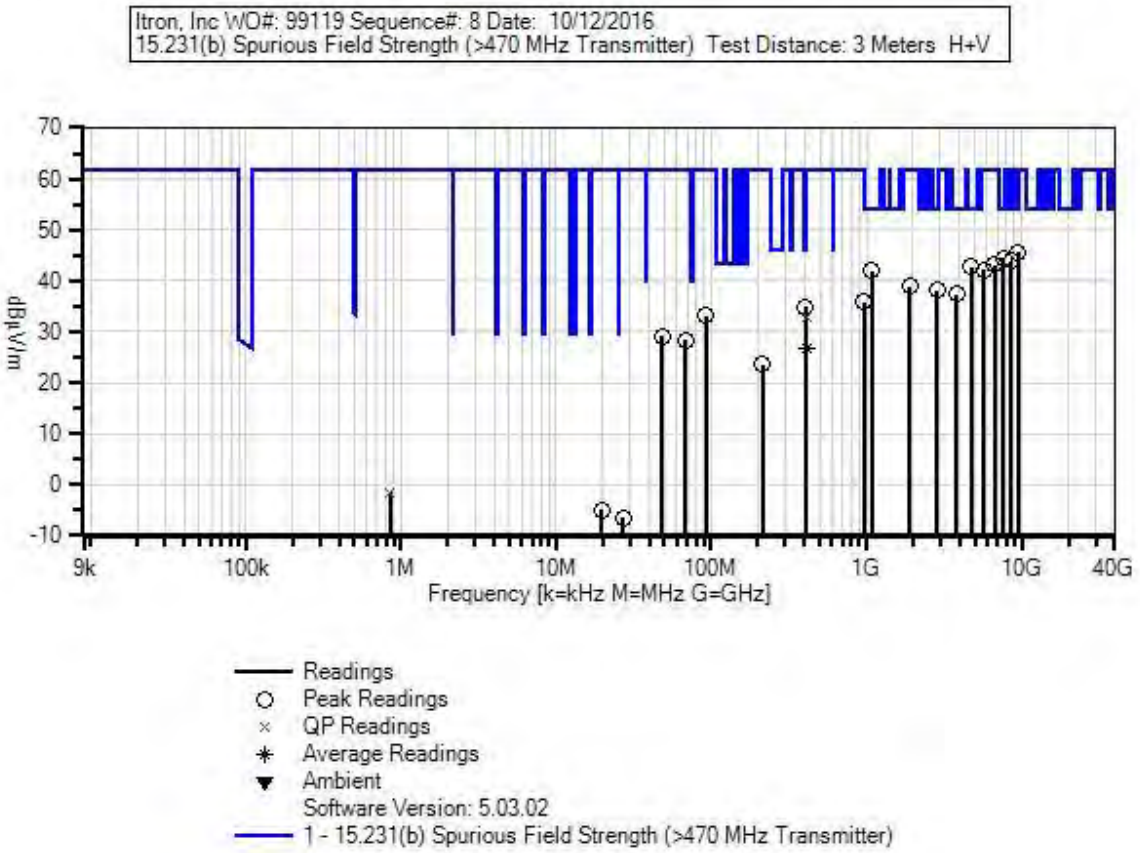
Temperature: 20 to 24°C
Humidity: 32 to 45%
Pressure: 101.3 to 103.5kPa

Frequency Range: 9kHz-9.28GHz
Frequency tested: 952MHz
Firmware power setting: Max Power
EUT Firmware: 5.71
Protocol /MCS/Modulation: OOK

Antenna type: Internal PIFA
Antenna Gain: 1.0 dBi.

Duty Cycle: 100% (Test Mode)

Test Mode: Continuously transmitting.
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)


Itron, Inc WO#: 99119 Sequence#: 8 Date: 10/12/2016
15.231(b) Spurious Field Strength (>470 MHz Transmitter) Test Distance: 3 Meters H+V
70
60
50
40
30
20
10
0
-10
dBµV/m
9k
100k
1M
10M
100M
1G
10G
40G
Frequency [k=kHz M=MHz G=GHz]
Readings
Peak Readings
QP Readings
Average Readings
Ambient
Software Version: 5.03.02
1 - 15.231(b) Spurious Field Strength (>470 MHz Transmitter)

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02673	Spectrum Analyzer	E4446A	10/12/2015	10/12/2017
T2	ANP06540	Cable	Heliax	10/29/2015	10/29/2017
T3	ANP05305	Cable	ETSI-50T	2/15/2016	2/15/2018
T4	AN03540	Preamp	83017A	4/30/2015	4/30/2017
T5	AN01467	Horn Antenna-ANSI C63.5 Calibration	3115	8/12/2015	8/12/2017
T6	ANP06935	Cable	32026-29801-29801-18	3/11/2016	3/11/2018
T7	AN03170	High Pass Filter	HM1155-11SS	12/17/2015	12/17/2017
	AN02871	Spectrum Analyzer	E4440A	8/25/2015	8/25/2017
T8	ANP05963	Cable	RG-214	2/15/2016	2/15/2018
T9	ANP05360	Cable	RG214	12/1/2014	12/1/2016
T10	AN02307	Preamp	8447D	2/15/2016	2/15/2018
T11	AN01991	Biconilog Antenna	CBL6111C	3/11/2016	3/11/2018
T12	ANP05657	Attenuator	PE7004-6	12/22/2015	12/22/2017
T13	AN00052	Loop Antenna	6502	4/8/2016	4/8/2018

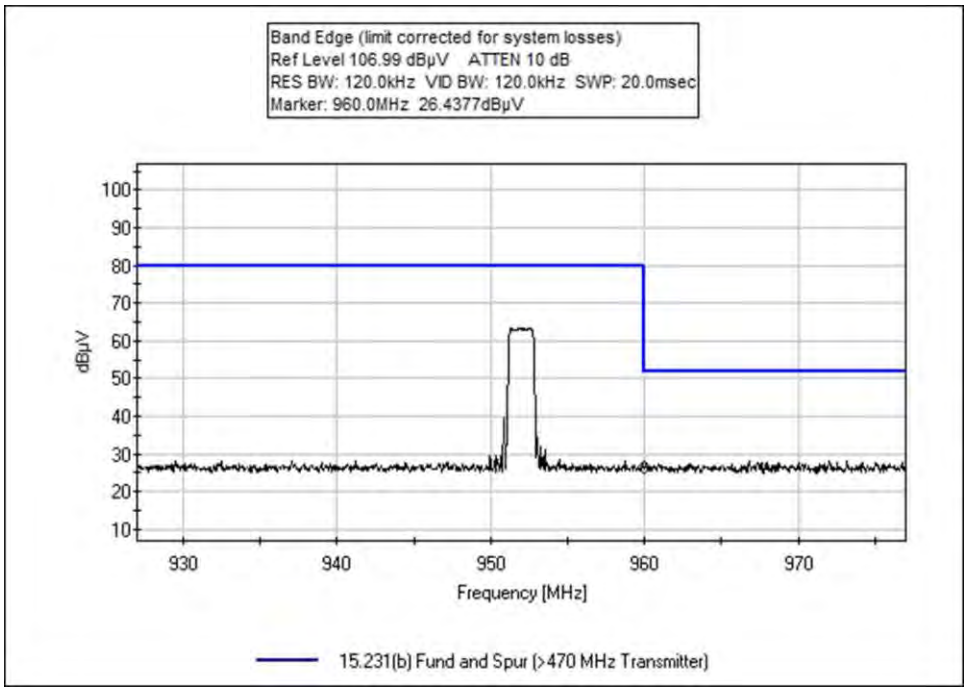
Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq	Rdng	T1 T5 T9 T13	T2 T6 T10	T3 T7 T11	T4 T8 T12	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	7621.850M	35.5	+0.0 +36.8 +0.0 +0.0	+1.3 +0.6 +0.0	+5.0 +0.2 +0.0	-34.9 +0.0 +0.0	+0.0	44.5	54.0	-9.5	H+V
2	407.300M	37.0	+0.0 +0.0 +1.2 +0.0	+0.3 +0.0 -27.7	+0.0 +0.0 +16.3	+0.0 +1.8 +6.0	+0.0	34.9	46.0	-11.1	H+V
3	4760.960M	37.9	+0.0 +32.7 +0.0 +0.0	+0.9 +0.5 +0.0	+4.3 +0.6 +0.0	-34.2 +0.0 +0.0	+0.0	42.7	54.0	-11.3	H+V
4	1081.000M	45.4	+0.0 +24.2 +0.0 +0.0	+0.4 +0.2 +0.0	+1.9 +7.0 +0.0	-37.2 +0.0 +0.0	+0.0	41.9	54.0	-12.1	H+V
5	407.603M QP	35.0	+0.0 +0.0 +1.2 +0.0	+0.3 +0.0 -27.7	+0.0 +0.0 +16.3	+0.0 +1.8 +6.0	+0.0	32.9	46.0	-13.1	H+V
6	2855.970M	38.9	+0.0 +29.2 +0.0 +0.0	+0.7 +0.4 +0.0	+3.1 +0.3 +0.0	-34.4 +0.0 +0.0	+0.0	38.2	54.0	-15.8	H+V

7	9524.590M	34.4	+0.0 +37.4 +0.0 +0.0	+1.6 +0.8 +0.0	+6.1 +0.2 +0.0	-34.9 +0.0 +0.0	+0.0	45.6	61.9	-16.3	H+V
8	3808.570M	35.8	+0.0 +30.4 +0.0 +0.0	+0.7 +0.5 +0.0	+3.8 +0.3 +0.0	-34.1 +0.0 +0.0	+0.0	37.4	54.0	-16.6	H+V
9	8574.450M	33.7	+0.0 +36.8 +0.0 +0.0	+1.7 +0.7 +0.0	+5.6 +0.2 +0.0	-34.8 +0.0 +0.0	+0.0	43.9	61.9	-18.0	H+V
10	960.000M	26.4	+0.0 +0.0 +2.1 +0.0	+0.4 +0.0 -27.1	+0.0 +0.0 +25.4	+0.0 +2.5 +6.1	+0.0	35.8	54.0	-18.2	H+V
11	6669.250M	36.3	+0.0 +34.6 +0.0 +0.0	+1.2 +0.6 +0.0	+4.5 +0.2 +0.0	-34.2 +0.0 +0.0	+0.0	43.2	61.9	-18.7	H+V
12	407.603M Ave	28.9	+0.0 +0.0 +1.2 +0.0	+0.3 +0.0 -27.7	+0.0 +0.0 +16.3	+0.0 +1.8 +6.0	+0.0	26.8	46.0	-19.2	H+V
13	5714.670M	35.8	+0.0 +34.2 +0.0 +0.0	+1.1 +0.5 +0.0	+4.4 +0.2 +0.0	-34.1 +0.0 +0.0	+0.0	42.1	61.9	-19.8	H+V
14	1903.520M	42.8	+0.0 +27.3 +0.0 +0.0	+0.6 +0.3 +0.0	+2.6 +0.3 +0.0	-35.0 +0.0 +0.0	+0.0	38.9	61.9	-23.0	H+V
15	92.100M	44.1	+0.0 +0.0 +0.6 +0.0	+0.1 +0.0 -27.7	+0.0 +0.0 +9.1	+0.0 +1.0 +6.0	+0.0	33.2	61.9	-28.7	H+V
16	48.400M	40.7	+0.0 +0.0 +0.4 +0.0	+0.1 +0.0 -27.9	+0.0 +0.0 +9.2	+0.0 +0.6 +6.0	+0.0	29.1	61.9	-32.8	H+V
17	67.800M	42.2	+0.0 +0.0 +0.4 +0.0	+0.1 +0.0 -27.8	+0.0 +0.0 +6.8	+0.0 +0.7 +6.0	+0.0	28.4	61.9	-33.5	H+V

18	215.300M	32.3	+0.0 +0.0 +0.9 +0.0	+0.2 +0.0 -27.2	+0.0 +0.0 +10.0	+0.0 +1.4 +6.0	+0.0	23.6	61.9	-38.3	H+V
19	849.000k QP	28.7	+0.0 +0.0 +0.0 +9.8	+0.0 +0.0 +0.0	+0.1 +0.0 +0.0	+0.0 +0.0 +0.0	-40.0	-1.4	61.9	-63.3	Para+
^	849.000k	32.2	+0.0 +0.0 +0.0 +9.8	+0.0 +0.0 +0.0	+0.1 +0.0 +0.0	+0.0 +0.0 +0.0	-40.0	2.1	61.9	-59.8	Para+
21	19.743M	26.5	+0.0 +0.0 +0.0 +8.3	+0.0 +0.0 +0.0	+0.3 +0.0 +0.0	+0.0 +0.0 +0.0	-40.0	-4.9	61.9	-66.8	Para+
22	26.941M	26.8	+0.0 +0.0 +0.0 +6.4	+0.0 +0.0 +0.0	+0.3 +0.0 +0.0	+0.0 +0.0 +0.0	-40.0	-6.5	61.9	-68.4	Para+
23	55.818k	56.3	+0.0 +0.0 +0.0 +10.6	+0.0 +0.0 +0.0	+0.0 +0.0 +0.0	+0.0 +0.0 +0.0	-80.0	-13.1	61.9	-75.0	Para+
24	6.337M	16.9	+0.0 +0.0 +0.0 +9.3	+0.0 +0.0 +0.0	+0.1 +0.0 +0.0	+0.0 +0.0 +0.0	-40.0	-13.7	61.9	-75.6	Para+

Bandedge Plot



Test Setup Photo(s)

9kHz-1GHz

1-9.8GHz

X Axis

Y Axis

Z Axis

15.207 AC Conducted Emissions

Test Setup/Conditions			
Test Location:	Bothell Lab C3	Test Engineer:	M. Atkinson
Test Method:	ANSI C63.10 (2013)	Test Date(s):	10/11/2016
Configuration:	2		

Environmental Conditions			
Temperature (ºC)	20-24	Relative Humidity (%):	32-45

See data sheets for test setup and test equipment.

Test Data

Test Location: CKC Laboratories, Inc. • 22116 23rd Drive SE, Suite A • Bothell, WA. 98021 • 1-800-500-4EMC (4362)
Customer: **Itron, Inc**
Specification: **15.207 AC Mains - Average**
Work Order #: **99119** Date: 10/11/2016
Test Type: **Conducted Emissions** Time: 18:28:01
Tested By: Michael Atkinson Sequence#: 8
Software: EMITest 5.03.02 115V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

Test Conditions / Notes:

Temperature: 20 to 24°C
Humidity: 32 to 45%
Pressure: 101.3 to 103.5kPa

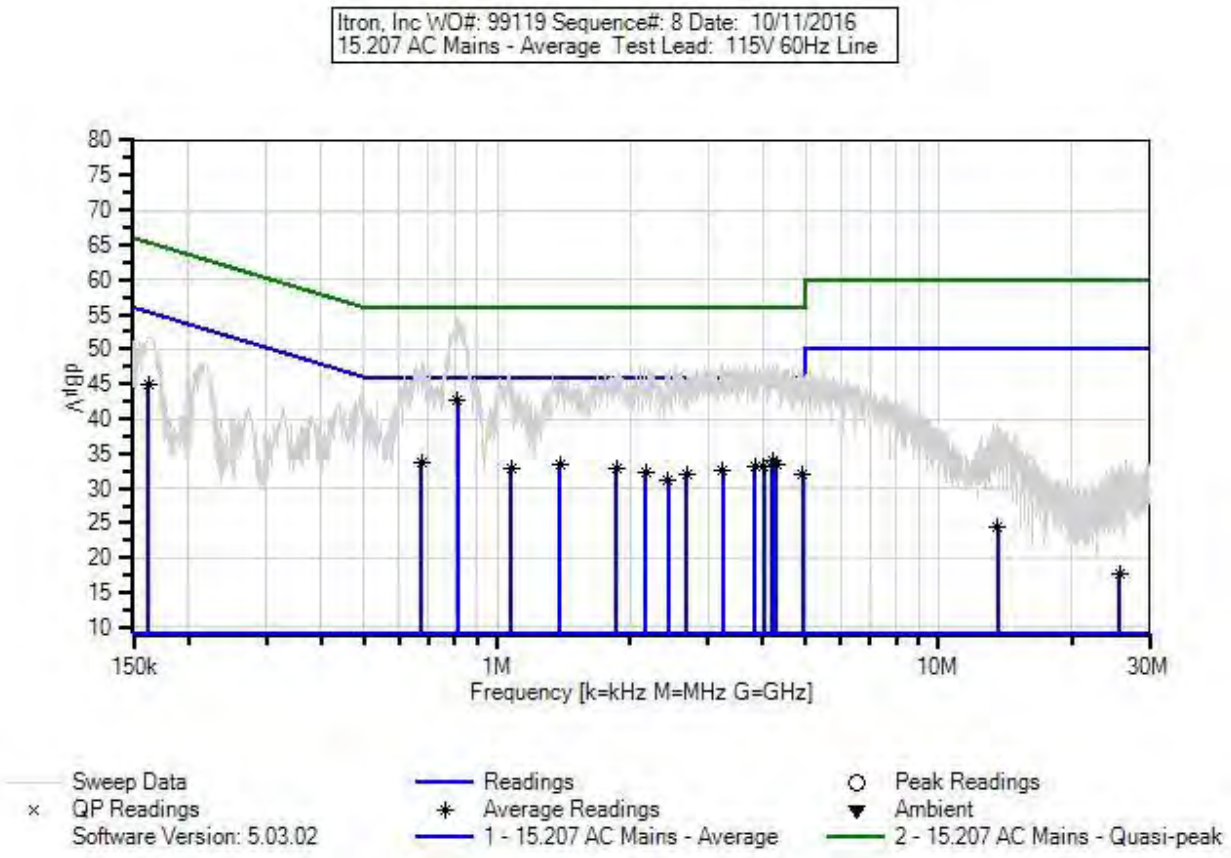
Frequency Range: 0.15-30MHz

Frequency tested: 952MHz
Firmware power setting: Max Power
EUT Firmware: 5.71
Protocol /MCS/Modulation: OOK

Antenna type: Internal PIFA
Antenna Gain: 1.0 dBi.

Duty Cycle: 100% (Test Mode)

Test Mode: Continuously transmitting
Test Setup: EUT connected to USB Adapter via USB cable. AC Adapter connected to AC mains through LISN.
Modifications Added: None
Test Method: ANSI C63.10 (2013)


Itron, Inc WO#: 99119 Sequence#: 8 Date: 10/11/2016
15.207 AC Mains - Average Test Lead: 115V 60Hz Line
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
dBµV
150k
1M
10M
30M
Frequency [k=kHz M=MHz G=GHz]
Sweep Data
QP Readings
Software Version: 5.03.02
Readings
Average Readings
1 - 15.207 AC Mains - Average
Peak Readings
Ambient
2 - 15.207 AC Mains - Quasi-peak

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02871	Spectrum Analyzer	E4440A	8/25/2015	8/25/2017
T2	AN02611	High Pass Filter	HE9615-150K-50-720B	2/18/2016	2/18/2018
T3	ANP06540	Cable	Heliax	10/29/2015	10/29/2017
T4	ANP05305	Cable	ETSI-50T	2/15/2016	2/15/2018
T5	ANP06219	Attenuator	768-10	4/12/2016	4/12/2018
T6	AN01492	50uH LISN-Line	3816/2NM	8/5/2015	8/5/2017
	AN01492	50uH LISN-Neutral	3816/2NM	8/5/2015	8/5/2017

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

#	Freq	Rdng	T1 T5	T2 T6	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV	dBµV	dB	Ant
1	815.319k	32.9	+0.0 +9.1	+0.2 +0.4	+0.0	+0.1	+0.0	42.7	46.0	-3.3	Line
Ave											
^	815.318k	44.6	+0.0 +9.1	+0.2 +0.4	+0.0	+0.1	+0.0	54.4	46.0	+8.4	Line
3	162.500k	33.5	+0.0 +9.1	+0.5 +1.7	+0.0	+0.0	+0.0	44.8	55.3	-10.5	Line
Ave											
^	162.500k	40.5	+0.0 +9.1	+0.5 +1.7	+0.0	+0.0	+0.0	51.8	55.3	-3.5	Line
5	4.208M	24.4	+0.0 +9.1	+0.1 +0.4	+0.0	+0.1	+0.0	34.1	46.0	-11.9	Line
Ave											
^	4.208M	38.0	+0.0 +9.1	+0.1 +0.4	+0.0	+0.1	+0.0	47.7	46.0	+1.7	Line
7	674.413k	23.9	+0.0 +9.1	+0.2 +0.4	+0.0	+0.1	+0.0	33.7	46.0	-12.3	Line
Ave											
^	674.413k	38.4	+0.0 +9.1	+0.2 +0.4	+0.0	+0.1	+0.0	48.2	46.0	+2.2	Line
9	1.388M	23.7	+0.0 +9.1	+0.2 +0.4	+0.0	+0.1	+0.0	33.5	46.0	-12.5	Line
Ave											
^	1.388M	36.6	+0.0 +9.1	+0.2 +0.4	+0.0	+0.1	+0.0	46.4	46.0	+0.4	Line
11	4.298M	23.7	+0.0 +9.1	+0.1 +0.4	+0.0	+0.1	+0.0	33.4	46.0	-12.6	Line
Ave											
^	4.298M	38.1	+0.0 +9.1	+0.1 +0.4	+0.0	+0.1	+0.0	47.8	46.0	+1.8	Line
13	4.009M	23.4	+0.0 +9.1	+0.1 +0.4	+0.0	+0.1	+0.0	33.1	46.0	-12.9	Line
Ave											
^	4.009M	39.0	+0.0 +9.1	+0.1 +0.4	+0.0	+0.1	+0.0	48.7	46.0	+2.7	Line

15	3.835M	23.3	+0.0	+0.1	+0.0	+0.1	+0.0	33.0	46.0	-13.0	Line
	Ave		+9.1	+0.4							
^	3.835M	38.1	+0.0	+0.1	+0.0	+0.1	+0.0	47.8	46.0	+1.8	Line
			+9.1	+0.4							
17	1.862M	23.1	+0.0	+0.2	+0.0	+0.1	+0.0	32.9	46.0	-13.1	Line
	Ave		+9.1	+0.4							
^	1.862M	37.5	+0.0	+0.2	+0.0	+0.1	+0.0	47.3	46.0	+1.3	Line
			+9.1	+0.4							
19	1.074M	23.1	+0.0	+0.2	+0.0	+0.1	+0.0	32.9	46.0	-13.1	Line
	Ave		+9.1	+0.4							
^	1.074M	36.4	+0.0	+0.2	+0.0	+0.1	+0.0	46.2	46.0	+0.2	Line
			+9.1	+0.4							
21	3.240M	22.8	+0.0	+0.1	+0.0	+0.1	+0.0	32.5	46.0	-13.5	Line
	Ave		+9.1	+0.4							
^	3.240M	38.6	+0.0	+0.1	+0.0	+0.1	+0.0	48.3	46.0	+2.3	Line
			+9.1	+0.4							
23	2.170M	22.7	+0.0	+0.1	+0.0	+0.1	+0.0	32.4	46.0	-13.6	Line
	Ave		+9.1	+0.4							
^	2.170M	38.4	+0.0	+0.1	+0.0	+0.1	+0.0	48.1	46.0	+2.1	Line
			+9.1	+0.4							
25	4.914M	22.3	+0.0	+0.1	+0.0	+0.1	+0.0	32.1	46.0	-13.9	Line
	Ave		+9.1	+0.5							
^	4.914M	37.0	+0.0	+0.1	+0.0	+0.1	+0.0	46.8	46.0	+0.8	Line
			+9.1	+0.5							
27	2.684M	22.3	+0.0	+0.1	+0.0	+0.1	+0.0	32.0	46.0	-14.0	Line
	Ave		+9.1	+0.4							
^	2.684M	38.6	+0.0	+0.1	+0.0	+0.1	+0.0	48.3	46.0	+2.3	Line
			+9.1	+0.4							
29	2.444M	21.6	+0.0	+0.1	+0.0	+0.1	+0.0	31.3	46.0	-14.7	Line
	Ave		+9.1	+0.4							
^	2.444M	37.1	+0.0	+0.1	+0.0	+0.1	+0.0	46.8	46.0	+0.8	Line
			+9.1	+0.4							
31	13.640M	14.6	+0.0	+0.1	+0.0	+0.2	+0.0	24.5	50.0	-25.5	Line
	Ave		+9.1	+0.5							
^	13.640M	29.6	+0.0	+0.1	+0.0	+0.2	+0.0	39.5	50.0	-10.5	Line
			+9.1	+0.5							
33	25.660M	7.7	+0.0	+0.1	+0.0	+0.3	+0.0	17.6	50.0	-32.4	Line
	Ave		+9.1	+0.4							
^	25.660M	22.9	+0.0	+0.1	+0.0	+0.3	+0.0	32.8	50.0	-17.2	Line
			+9.1	+0.4							

Test Location:	CKC Laboratories, Inc. • 22116 23rd Drive SE, Suite A • Bothell, WA. 98021 • 1-800-500-4EMC (4362)		
Customer:	**Itron, Inc**		
Specification:	**15.207 AC Mains - Average**		
Work Order #:	**99119**	Date:	10/11/2016
Test Type:	**Conducted Emissions**	Time:	18:18:41
Tested By:	Michael Atkinson	Sequence#:	7
Software:	EMITest 5.03.02		115V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

Test Conditions / Notes:

Temperature: 20 to 24°C
Humidity: 32 to 45%
Pressure: 101.3 to 103.5kPa

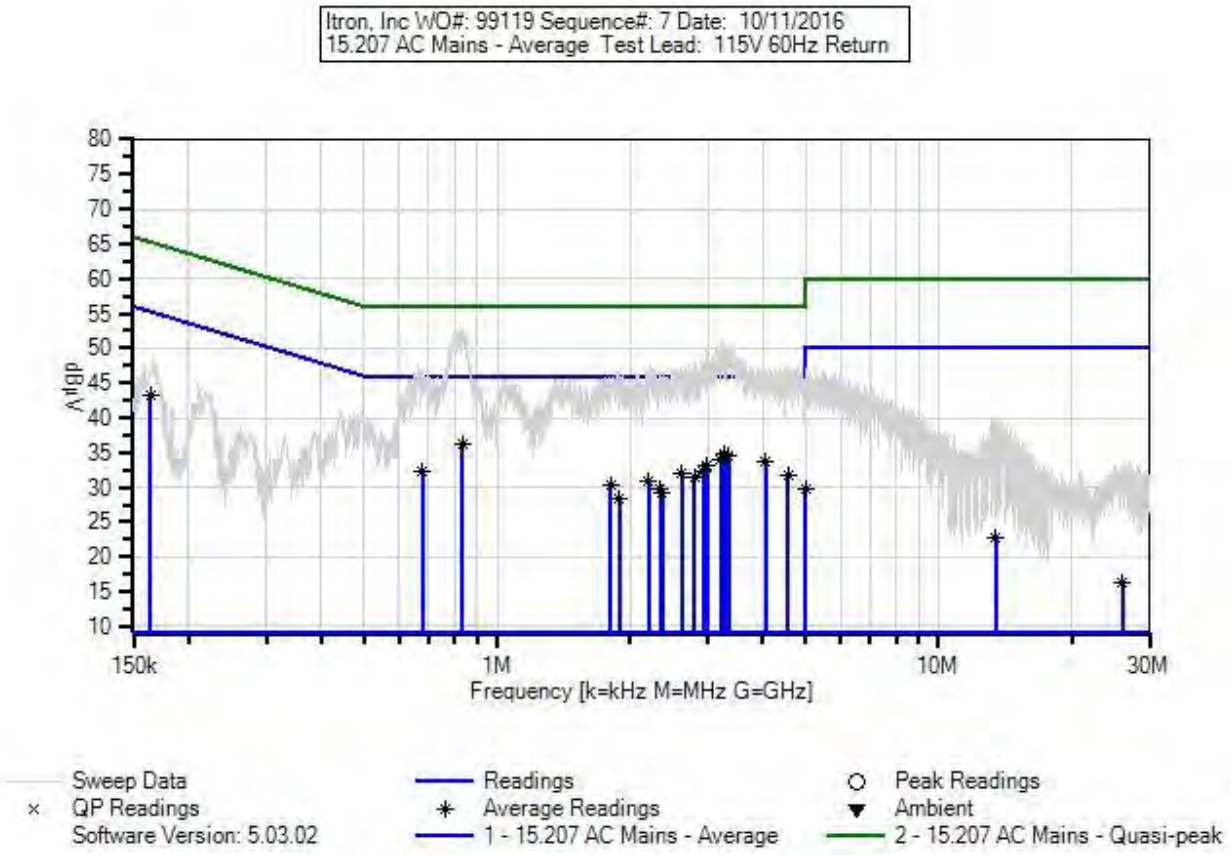
Frequency Range: 0.15-30MHz

Frequency tested: 952MHz
Firmware power setting: Max Power
EUT Firmware: 5.71
Protocol /MCS/Modulation: OOK

Antenna type: Internal PIFA
Antenna Gain: 1.0 dBi.

Duty Cycle: 100% (Test Mode)

Test Mode: Continuously transmitting
Test Setup: EUT connected to USB Adapter via USB cable. AC Adapter connected to AC mains through LISN.
Modifications Added: None
Test Method: ANSI C63.10 (2013)


Itron, Inc WO#: 99119 Sequence#: 7 Date: 10/11/2016
15.207 AC Mains - Average Test Lead: 115V 60Hz Return
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
dBµV
150k
1M
10M
30M
Frequency [k=kHz M=MHz G=GHz]
Sweep Data
QP Readings
Software Version: 5.03.02
Readings
Average Readings
1 - 15.207 AC Mains - Average
Peak Readings
Ambient
2 - 15.207 AC Mains - Quasi-peak

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02871	Spectrum Analyzer	E4440A	8/25/2015	8/25/2017
T1	AN02611	High Pass Filter	HE9615-150K-50-720B	2/18/2016	2/18/2018
T2	ANP06540	Cable	Heliax	10/29/2015	10/29/2017
T3	ANP05305	Cable	ETSI-50T	2/15/2016	2/15/2018
T4	ANP06219	Attenuator	768-10	4/12/2016	4/12/2018
	AN01492	50uH LISN-Line	3816/2NM	8/5/2015	8/5/2017
T5	AN01492	50uH LISN-Neutral	3816/2NM	8/5/2015	8/5/2017

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

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV	dBµV	dB	Ant
1	835.351k	26.3	+0.2	+0.0	+0.1	+9.1	+0.0	36.1	46.0	-9.9	Retur
	Ave		+0.4								
^	835.350k	43.1	+0.2	+0.0	+0.1	+9.1	+0.0	52.9	46.0	+6.9	Retur
			+0.4								
3	3.276M	25.1	+0.1	+0.0	+0.1	+9.1	+0.0	34.8	46.0	-11.2	Retur
	Ave		+0.4								
4	3.282M	25.0	+0.1	+0.0	+0.1	+9.1	+0.0	34.7	46.0	-11.3	Retur
	Ave		+0.4								
^	3.276M	41.5	+0.1	+0.0	+0.1	+9.1	+0.0	51.2	46.0	+5.2	Retur
			+0.4								
^	3.282M	41.2	+0.1	+0.0	+0.1	+9.1	+0.0	50.9	46.0	+4.9	Retur
			+0.4								
7	3.343M	24.8	+0.1	+0.0	+0.1	+9.1	+0.0	34.5	46.0	-11.5	Retur
	Ave		+0.4								
^	3.343M	41.0	+0.1	+0.0	+0.1	+9.1	+0.0	50.7	46.0	+4.7	Retur
			+0.4								
9	164.300k	32.0	+0.5	+0.0	+0.0	+9.1	+0.0	43.3	55.2	-11.9	Retur
	Ave		+1.7								
^	164.300k	37.4	+0.5	+0.0	+0.0	+9.1	+0.0	48.7	55.2	-6.5	Retur
			+1.7								
11	3.208M	24.2	+0.1	+0.0	+0.1	+9.1	+0.0	33.9	46.0	-12.1	Retur
	Ave		+0.4								
^	3.208M	41.1	+0.1	+0.0	+0.1	+9.1	+0.0	50.8	46.0	+4.8	Retur
			+0.4								
13	4.052M	24.0	+0.1	+0.0	+0.1	+9.1	+0.0	33.7	46.0	-12.3	Retur
	Ave		+0.4								
^	4.052M	38.4	+0.1	+0.0	+0.1	+9.1	+0.0	48.1	46.0	+2.1	Retur
			+0.4								

15 Ave	2.989M	23.4	+0.1 +0.4	+0.0	+0.1	+9.1	+0.0	33.1	46.0	-12.9	Retur
^	2.989M	39.5	+0.1 +0.4	+0.0	+0.1	+9.1	+0.0	49.2	46.0	+3.2	Retur
17 Ave	678.600k	22.6	+0.2 +0.4	+0.0	+0.1	+9.1	+0.0	32.4	46.0	-13.6	Retur
^	678.600k	37.8	+0.2 +0.4	+0.0	+0.1	+9.1	+0.0	47.6	46.0	+1.6	Retur
19 Ave	2.930M	22.5	+0.1 +0.4	+0.0	+0.1	+9.1	+0.0	32.2	46.0	-13.8	Retur
^	2.930M	39.8	+0.1 +0.4	+0.0	+0.1	+9.1	+0.0	49.5	46.0	+3.5	Retur
21 Ave	2.623M	22.2	+0.1 +0.4	+0.0	+0.1	+9.1	+0.0	31.9	46.0	-14.1	Retur
^	2.623M	38.4	+0.1 +0.4	+0.0	+0.1	+9.1	+0.0	48.1	46.0	+2.1	Retur
23 Ave	4.561M	21.9	+0.1 +0.5	+0.0	+0.1	+9.1	+0.0	31.7	46.0	-14.3	Retur
^	4.561M	38.1	+0.1 +0.5	+0.0	+0.1	+9.1	+0.0	47.9	46.0	+1.9	Retur
25 Ave	2.796M	21.7	+0.1 +0.4	+0.0	+0.1	+9.1	+0.0	31.4	46.0	-14.6	Retur
^	2.796M	38.4	+0.1 +0.4	+0.0	+0.1	+9.1	+0.0	48.1	46.0	+2.1	Retur
27 Ave	2.199M	21.3	+0.1 +0.4	+0.0	+0.1	+9.1	+0.0	31.0	46.0	-15.0	Retur
^	2.199M	38.1	+0.1 +0.4	+0.0	+0.1	+9.1	+0.0	47.8	46.0	+1.8	Retur
29 Ave	1.811M	20.6	+0.1 +0.4	+0.0	+0.1	+9.1	+0.0	30.3	46.0	-15.7	Retur
^	1.811M	36.7	+0.1 +0.4	+0.0	+0.1	+9.1	+0.0	46.4	46.0	+0.4	Retur
31 Ave	4.992M	20.1	+0.1 +0.5	+0.0	+0.1	+9.1	+0.0	29.9	46.0	-16.1	Retur
^	4.992M	37.1	+0.1 +0.5	+0.0	+0.1	+9.1	+0.0	46.9	46.0	+0.9	Retur
33 Ave	2.343M	20.0	+0.1 +0.4	+0.0	+0.1	+9.1	+0.0	29.7	46.0	-16.3	Retur
^	2.343M	36.7	+0.1 +0.4	+0.0	+0.1	+9.1	+0.0	46.4	46.0	+0.4	Retur
35 Ave	2.370M	19.4	+0.1 +0.4	+0.0	+0.1	+9.1	+0.0	29.1	46.0	-16.9	Retur
^	2.370M	38.0	+0.1 +0.4	+0.0	+0.1	+9.1	+0.0	47.7	46.0	+1.7	Retur

37	1.889M Ave	18.7	+0.2 +0.4	+0.0	+0.1	+9.1	+0.0	28.5	46.0	-17.5	Retur
^	1.889M	36.4	+0.2 +0.4	+0.0	+0.1	+9.1	+0.0	46.2	46.0	+0.2	Retur
39	13.440M Ave	12.9	+0.1 +0.5	+0.0	+0.2	+9.1	+0.0	22.8	50.0	-27.2	Retur
^	13.440M	29.6	+0.1 +0.5	+0.0	+0.2	+9.1	+0.0	39.5	50.0	-10.5	Retur
41	26.060M Ave	6.5	+0.1 +0.3	+0.0	+0.3	+9.1	+0.0	16.3	50.0	-33.7	Retur
^	26.060M	22.1	+0.1 +0.3	+0.0	+0.3	+9.1	+0.0	31.9	50.0	-18.1	Retur

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

Reported uncertainties 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.