

Ittron, 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 & 15.249

Report No.: 99119-2

Date of issue: November 21, 2016



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

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

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ADMINISTRATIVE INFORMATION

Test Report Information

REPORT PREPARED FOR:

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

Representative: Jay Holcomb
Customer Reference Number: 107098

DATE OF EQUIPMENT RECEIPT:

DATE(S) OF TESTING:

REPORT PREPARED BY:

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

Project Number: 99119

October 10, 2016

October 10-13, 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.

A handwritten signature in black ink, reading "Steve Behm", is positioned above a horizontal line.

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 - 15.249

Test Procedure	Description	Modifications	Results
15.215(c)	Occupied Bandwidth	NA	Pass
15.249(a)	Field Strength of Fundamental	NA	Pass
15.249(a)	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	NA

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	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 1.5dBi
Antenna Connection Type:	Integral (External connector provided to facilitate testing)
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

15.215(c) Occupied Bandwidth (20dB BW)

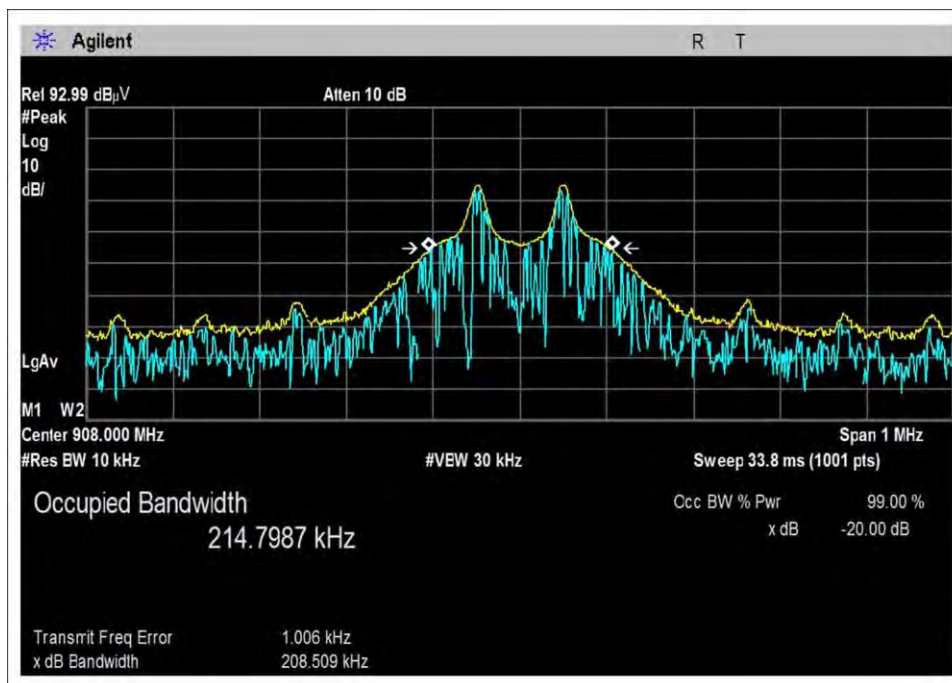
Test Setup/Conditions			
Test Location:	Bothell Lab C3	Test Engineer:	M. Atkinson
Test Method:	ANSI C63.10 (2013)	Test Date(s):	10/10/2016
Configuration:	1		
Test Setup:	<p>Frequency Range: 908MHz Frequency tested: 908MHz Firmware power setting: Max Power EUT Firmware: 5.71 Protocol /MCS/Modulation: FSK</p> <p>Antenna type: Internal PIFA Antenna Gain: 1.5 dBi.</p> <p>Duty Cycle: 100% (Test Mode)</p> <p>Test Mode: Continuously transmitting Test Setup: EUT is transmitting sitting on foam table 80cm high. Modifications Added: None</p>		

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

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					
Frequency (MHz)	Antenna Port	Modulation	Measured (kHz)	Limit (kHz)	Results
908	1	FSK	208.5	None	NA

Plot(s)



Test Setup Photo(s)



15.249(a) 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 test data below.		

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

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	75.3	75.7	75.8	0.4

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

Test Data Summary – Radiated Field Strength Measurement					
Frequency (MHz)	Modulation	Ant. Type	Measured (dBuV/m @ 3m)	Limit (dBuV/m @ 3m)	Results
908	FSK	Internal PIFA (1.5dBi)	75.7	≤94	Pass

Test Data

Test Location: CKC Laboratories, Inc. • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • (425) 402-1717
 Customer: **Itron, Inc**
 Specification: **15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter)**
 Work Order #: **99119** Date: 10/12/2016
 Test Type: **Maximized Emissions** Time: 08:59:10
 Tested By: Michael Atkinson Sequence#: 9
 Software: EMITest 5.03.02

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

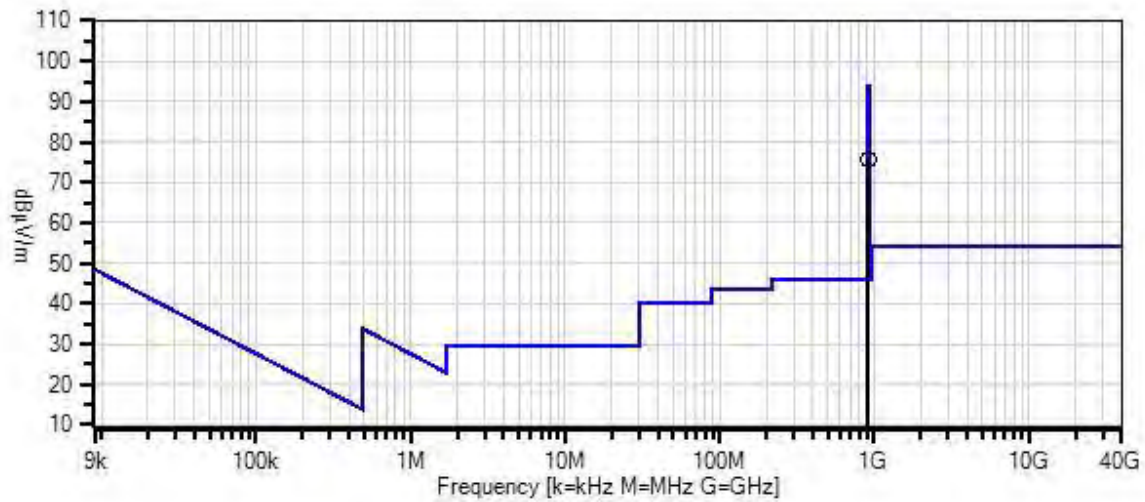
Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Frequency Range: 908MHz Frequency tested: 908MHz Firmware power setting: Max Power EUT Firmware: 5.71 Protocol /MCS/Modulation: FSK Antenna type: Internal PIFA Antenna Gain: 1.5 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#: 9 Date: 10/12/2016
 15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter) Test Distance: 3 Meters H+V



- Readings
- Peak Readings
- × QP Readings
- * Average Readings
- ▼ Ambient
- Software Version: 5.03.02
- 1 - 15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter)

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02871	Spectrum Analyzer	E4440A	8/25/2015	8/25/2017
T1	ANP06540	Cable	Heliac	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

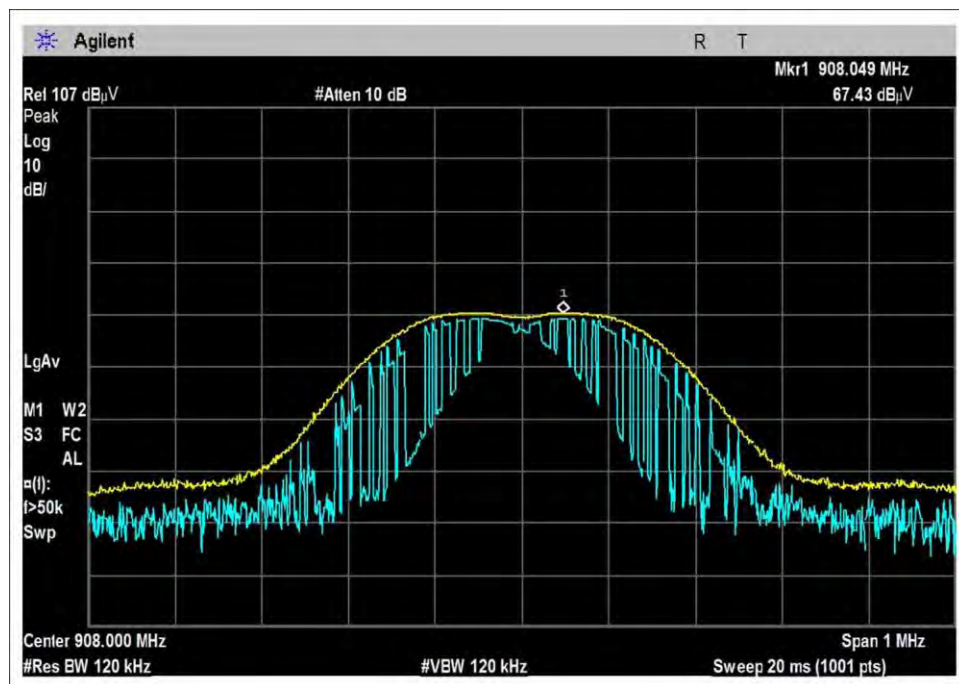
Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dB μ V	T5	T6			Table	dB μ V/m	dB μ V/m	dB	Ant
1	908.049M	67.4	+0.3	+2.4	+2.0	-27.4	+0.0	75.7	94.0	-18.3	H+V
			+25.0	+6.0							

Plot Data



Test Setup Photo(s)



X Axis



Y Axis



Z Axis

15.249(a) Radiated Emissions

Test Setup/Conditions			
Test Location:	Bothell Lab C3	Test Engineer:	M. Atkinson
Test Method:	ANSI C63.10 (2013)	Test Date(s):	10/12/16 to 10/13/16
Configuration:	1		

Environmental Conditions			
Temperature (°C)	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 • (425) 402-1717
 Customer: **Itron, Inc**
 Specification: **15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter)**
 Work Order #: **99119** Date: 10/13/2016
 Test Type: **Maximized Emissions** Time: 10:40:56
 Tested By: Michael Atkinson Sequence#: 10
 Software: EMITest 5.03.02

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

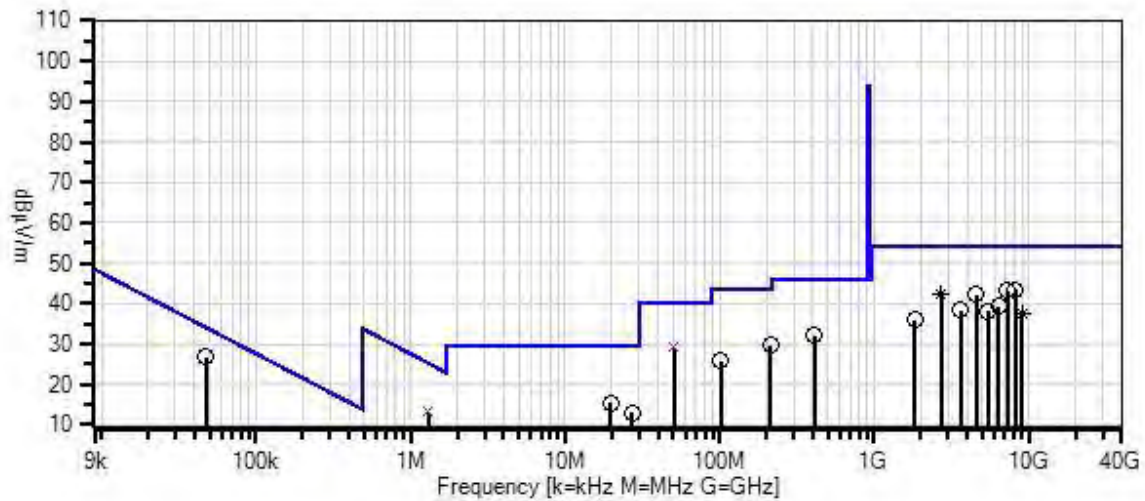
Support Equipment:

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: 908MHz Firmware power setting: Max Power EUT Firmware: 5.71 Protocol /MCS/Modulation: FSK Antenna type: Internal PIFA Antenna Gain: 1.5 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#: 10 Date: 10/13/2016
15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter) Test Distance: 3 Meters H+V



- Readings
- Peak Readings
- × QP Readings
- * Average Readings
- ▼ Ambient
- Software Version: 5.03.02
- 1 - 15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter)

Test Equipment:

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

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	47.604k	55.8	+0.0 +0.0 +10.9 +0.0	+0.0 +0.0 +0.0 +0.0	+0.0 +0.0 +0.0 +0.0	+0.0 +0.0 +0.0 +0.0	-40.0	26.7	34.0	-7.3	Para+
2	8172.020M	34.3	+0.0 +0.0 +0.0 +0.3	+1.3 +0.0 -35.1 +0.3	+0.0 +0.0 +36.7 +0.7	+0.0 +5.3 +0.7 +0.7	+0.0	43.5	54.0	-10.5	H+V
3	7264.080M	35.1	+0.0 +0.0 +0.0 +0.3	+1.2 +0.0 -34.5 +0.3	+0.0 +0.0 +35.9 +0.6	+0.0 +4.6 +0.6 +0.6	+0.0	43.2	54.0	-10.8	H+V
4	50.468M QP	41.5	+0.0 -27.9 +0.0 +0.0	+0.1 +8.4 +0.0 +0.0	+0.6 +6.0 +0.0 +0.0	+0.4 +0.0 +0.0 +0.0	+0.0	29.1	40.0	-10.9	H+V
^	50.400M	45.3	+0.0 -27.9 +0.0 +0.0	+0.1 +8.4 +0.0 +0.0	+0.6 +6.0 +0.0 +0.0	+0.4 +0.0 +0.0 +0.0	+0.0	32.9	40.0	-7.1	H+V

6	2723.996M Ave	43.5	+0.0 +0.0 +0.0 +0.5	+0.7 +0.0 -34.5	+0.0 +0.0 +28.7	+0.0 +3.0 +0.4	+0.0	42.3	54.0	-11.7	H+V
^	2724.020M	47.2	+0.0 +0.0 +0.0 +0.5	+0.7 +0.0 -34.5	+0.0 +0.0 +28.7	+0.0 +3.0 +0.4	+0.0	46.0	54.0	-8.0	H+V
8	4540.300M	37.9	+0.0 +0.0 +0.0 +0.3	+0.9 +0.0 -34.1	+0.0 +0.0 +32.5	+0.0 +4.2 +0.5	+0.0	42.2	54.0	-11.8	H+V
9	1.299M QP	23.4	+0.0 +0.0 +9.7 +0.0	+0.0 +0.0 +0.0	+0.0 +0.0 +0.0	-20.0	13.2	25.3	-12.1	Para+	
^	1.299M	28.5	+0.0 +0.0 +9.7 +0.0	+0.0 +0.0 +0.0	+0.0 +0.0 +0.0	-20.0	18.3	25.3	-7.0	Para+	
11	213.300M	38.4	+0.0 -27.2 +0.0 +0.0	+0.2 +9.9 +0.0	+1.4 +6.0 +0.0	+0.9 +0.0	+0.0	29.6	43.5	-13.9	H+V
12	411.200M	34.2	+0.0 -27.7 +0.0 +0.0	+0.3 +16.3 +0.0	+1.8 +6.0 +0.0	+1.2 +0.0	+0.0	32.1	46.0	-13.9	H+V
13	19.773M	26.8	+0.0 +0.0 +8.3 +0.0	+0.0 +0.0 +0.0	+0.0 +0.3 +0.0	-20.0	15.4	29.5	-14.1	Para+	
14	6356.300M	32.0	+0.0 +0.0 +0.0 +0.3	+1.3 +0.0 -34.2	+0.0 +0.0 +34.7	+0.0 +4.7 +0.6	+0.0	39.4	54.0	-14.6	H+V
15	3632.020M	37.5	+0.0 +0.0 +0.0 +0.4	+0.7 +0.0 -34.2	+0.0 +0.0 +29.8	+0.0 +3.7 +0.5	+0.0	38.4	54.0	-15.6	H+V
16	5448.300M	32.9	+0.0 +0.0 +0.0 +0.3	+1.0 +0.0 -34.2	+0.0 +0.0 +33.1	+0.0 +4.5 +0.6	+0.0	38.2	54.0	-15.8	H+V
17	27.031M	26.4	+0.0 +0.0 +6.4 +0.0	+0.0 +0.0 +0.0	+0.0 +0.3 +0.0	-20.0	13.1	29.5	-16.4	Para+	

18	9079.980M	26.2	+0.0	+1.3	+0.0	+0.0	+0.0	37.5	54.0	-16.5	H+V
	Ave		+0.0	+0.0	+0.0	+6.1					
			+0.0	-34.7	+37.7	+0.7					
			+0.2								
^	9079.980M	34.9	+0.0	+1.3	+0.0	+0.0	+0.0	46.2	54.0	-7.8	H+V
			+0.0	+0.0	+0.0	+6.1					
			+0.0	-34.7	+37.7	+0.7					
			+0.2								
20	101.800M	35.4	+0.0	+0.1	+1.2	+0.6	+0.0	25.8	43.5	-17.7	H+V
			-27.7	+10.2	+6.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0								
21	1816.040M	40.4	+0.0	+0.5	+0.0	+0.0	+0.0	35.9	54.0	-18.1	H+V
			+0.0	+0.0	+0.0	+2.5					
			+0.0	-35.1	+26.9	+0.3					
			+0.4								
22	7.447M	15.8	+0.0	+0.0	+0.0	+0.0	-20.0	5.3	29.5	-24.2	Para+
			+0.0	+0.0	+0.0	+0.2					
			+9.3	+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
902	FSK	Internal PIFA (1.5dBi)	37.2	<46	Pass
928	FSK	Internal PIFA (1.5dBi)	36.3	<46	Pass

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

Test Location: CKC Laboratories, Inc. • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • (425) 402-1717
 Customer: **Itron, Inc**
 Specification: **15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter)**
 Work Order #: **99119** Date: 10/13/2016
 Test Type: **Maximized Emissions** Time: 10:40:56
 Tested By: Michael Atkinson Sequence#: 10
 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

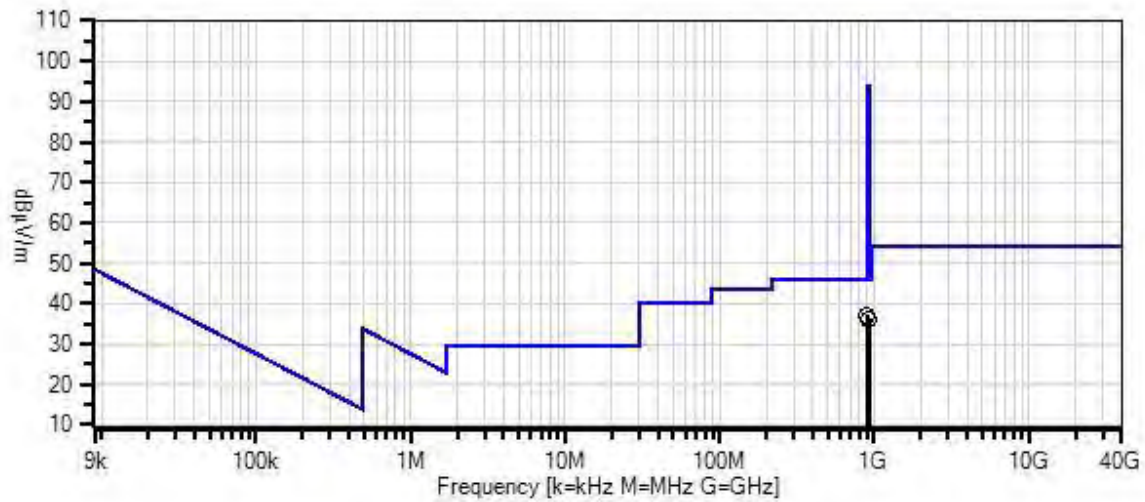
Frequency Range: Band Edge
 Frequency tested: 908MHz
 Firmware power setting: Max Power
 EUT Firmware: 5.71
 Protocol /MCS/Modulation: FSK

Antenna type: Internal PIFA
 Antenna Gain: 1.5 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)

Ittron, Inc WD#: 99119 Sequence#: 10 Date: 10/13/2016
15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter) Test Distance: 3 Meters H+V



- Readings
- Peak Readings
- × QP Readings
- * Average Readings
- ▼ Ambient
- Software Version: 5.03.02
- 1 - 15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter)

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02871	Spectrum Analyzer	E4440A	8/25/2015	8/25/2017
T1	ANP06540	Cable	Heliac	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
	ANP05305	Cable	ETSI-50T	2/15/2016	2/15/2018
	AN00052	Loop Antenna	6502	4/8/2016	4/8/2018
	AN03540	Preamp	83017A	4/30/2015	4/30/2017
	AN01467	Horn Antenna- ANSI C63.5 Calibration	3115	8/12/2015	8/12/2017
	ANP06935	Cable	32026-29801- 29801-18	3/11/2016	3/11/2018
	AN03170	High Pass Filter	HM1155-11SS	12/17/2015	12/17/2017

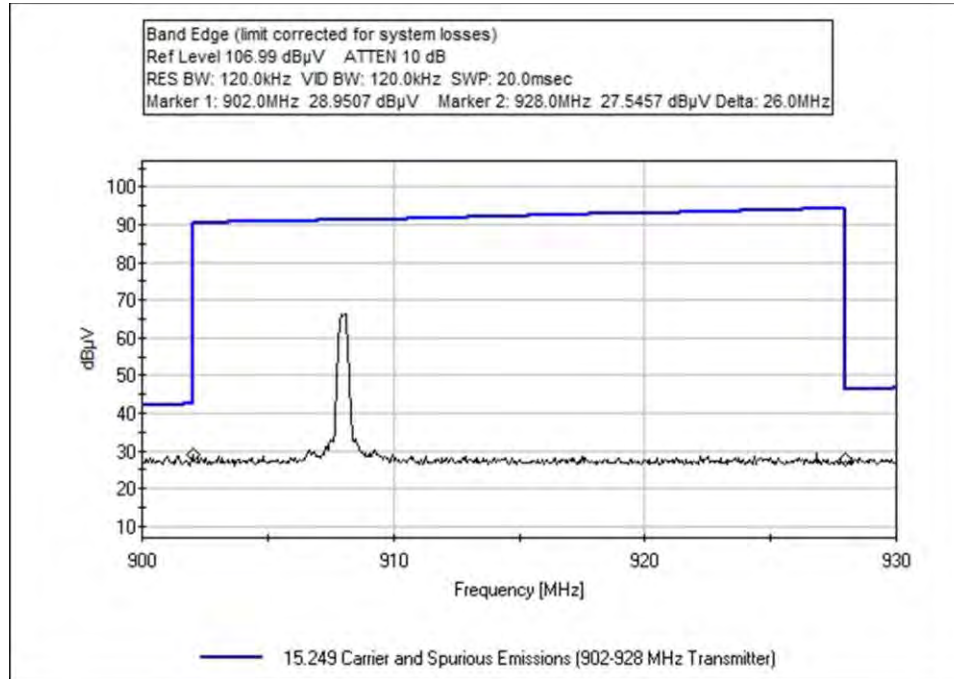
Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBμV	T5 dB	T6 dB	dB	dB	Table	dBμV/m	dBμV/m	dB	Ant
1	902.000M	29.0	+0.3 +24.9	+2.4 +6.0	+2.0	-27.4	+0.0	37.2	46.0	-8.8	H+V
2	928.000M	27.5	+0.4 +25.1	+2.4 +6.1	+2.1	-27.3	+0.0	36.3	46.0	-9.7	H+V

Band Edge Plots



Test Setup Photo(s)



9kHz-1GHz



1-9.28GHz



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 (°C)	20-24	Relative Humidity (%):	32-45
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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 • (425) 402-1717
 Customer: **Itron, Inc**
 Specification: **15.207 AC Mains - Average**
 Work Order #: **99119** Date: 10/11/2016
 Test Type: **Conducted Emissions** Time: 17:45:18
 Tested By: Michael Atkinson Sequence#: 5
 Software: EMITest 5.03.02 115V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

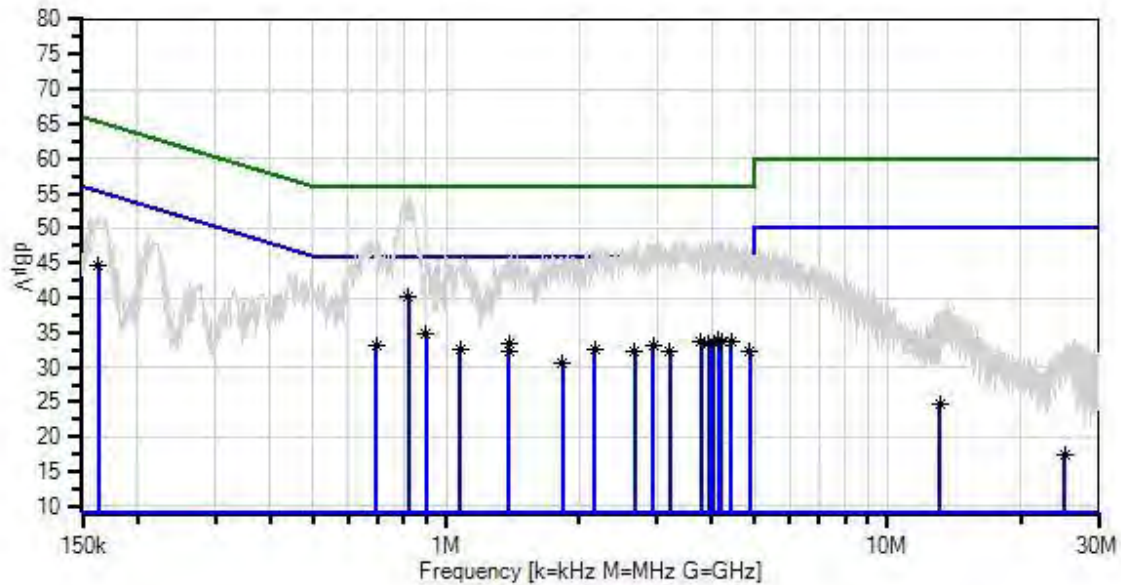
Support Equipment:

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: 908MHz
 Firmware power setting: Max Power
 EUT Firmware: 5.71
 Protocol /MCS/Modulation: FSK
 Antenna type: Internal PIFA
 Antenna Gain: 1.5 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 W/O#: 99119 Sequence#: 5 Date: 10/11/2016
15.207 AC Mains - Average Test Lead: 115V 60Hz Line



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	Heliac	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
T5	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	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	823.537k	30.3	+0.2	+0.0	+0.1	+9.1	+0.0	40.1	46.0	-5.9	Line
	Ave		+0.4								
^	823.537k	44.9	+0.2	+0.0	+0.1	+9.1	+0.0	54.7	46.0	+8.7	Line
			+0.4								
3	163.319k	33.4	+0.5	+0.0	+0.0	+9.1	+0.0	44.7	55.3	-10.6	Line
	Ave		+1.7								
^	166.100k	40.4	+0.5	+0.0	+0.0	+9.1	+0.0	51.7	55.2	-3.5	Line
			+1.7								
5	900.000k	25.0	+0.2	+0.0	+0.1	+9.1	+0.0	34.8	46.0	-11.2	Line
	Ave		+0.4								
^	900.000k	36.7	+0.2	+0.0	+0.1	+9.1	+0.0	46.5	46.0	+0.5	Line
			+0.4								
7	4.132M	24.2	+0.1	+0.0	+0.1	+9.1	+0.0	33.9	46.0	-12.1	Line
	Ave		+0.4								
^	4.132M	38.7	+0.1	+0.0	+0.1	+9.1	+0.0	48.4	46.0	+2.4	Line
			+0.4								
9	4.422M	24.1	+0.1	+0.0	+0.1	+9.1	+0.0	33.8	46.0	-12.2	Line
	Ave		+0.4								
^	4.422M	38.8	+0.1	+0.0	+0.1	+9.1	+0.0	48.5	46.0	+2.5	Line
			+0.4								
11	4.195M	24.1	+0.1	+0.0	+0.1	+9.1	+0.0	33.8	46.0	-12.2	Line
	Ave		+0.4								
^	4.195M	38.5	+0.1	+0.0	+0.1	+9.1	+0.0	48.2	46.0	+2.2	Line
			+0.4								
13	3.770M	23.9	+0.1	+0.0	+0.1	+9.1	+0.0	33.6	46.0	-12.4	Line
	Ave		+0.4								
^	3.770M	38.2	+0.1	+0.0	+0.1	+9.1	+0.0	47.9	46.0	+1.9	Line
			+0.4								
15	4.032M	23.7	+0.1	+0.0	+0.1	+9.1	+0.0	33.4	46.0	-12.6	Line
	Ave		+0.4								
^	4.032M	38.9	+0.1	+0.0	+0.1	+9.1	+0.0	48.6	46.0	+2.6	Line
			+0.4								

17	3.926M	23.6	+0.1	+0.0	+0.1	+9.1	+0.0	33.3	46.0	-12.7	Line
^	Ave		+0.4								
19	3.926M	38.5	+0.1	+0.0	+0.1	+9.1	+0.0	48.2	46.0	+2.2	Line
^			+0.4								
19	1.388M	23.5	+0.2	+0.0	+0.1	+9.1	+0.0	33.3	46.0	-12.7	Line
^	Ave		+0.4								
20	2.938M	23.5	+0.1	+0.0	+0.1	+9.1	+0.0	33.2	46.0	-12.8	Line
^	Ave		+0.4								
^	2.938M	37.5	+0.1	+0.0	+0.1	+9.1	+0.0	47.2	46.0	+1.2	Line
^			+0.4								
22	694.673k	23.2	+0.2	+0.0	+0.1	+9.1	+0.0	33.0	46.0	-13.0	Line
^	Ave		+0.4								
^	694.672k	38.8	+0.2	+0.0	+0.1	+9.1	+0.0	48.6	46.0	+2.6	Line
^			+0.4								
24	2.175M	23.0	+0.1	+0.0	+0.1	+9.1	+0.0	32.7	46.0	-13.3	Line
^	Ave		+0.4								
^	2.175M	38.5	+0.1	+0.0	+0.1	+9.1	+0.0	48.2	46.0	+2.2	Line
^			+0.4								
^	2.175M	38.5	+0.1	+0.0	+0.1	+9.1	+0.0	48.2	46.0	+2.2	Line
^			+0.4								
27	1.076M	22.7	+0.2	+0.0	+0.1	+9.1	+0.0	32.5	46.0	-13.5	Line
^	Ave		+0.4								
^	1.076M	36.4	+0.2	+0.0	+0.1	+9.1	+0.0	46.2	46.0	+0.2	Line
^			+0.4								
29	3.208M	22.7	+0.1	+0.0	+0.1	+9.1	+0.0	32.4	46.0	-13.6	Line
^	Ave		+0.4								
^	3.208M	37.9	+0.1	+0.0	+0.1	+9.1	+0.0	47.6	46.0	+1.6	Line
^			+0.4								
31	1.384M	22.6	+0.2	+0.0	+0.1	+9.1	+0.0	32.4	46.0	-13.6	Line
^	Ave		+0.4								
^	1.384M	36.7	+0.2	+0.0	+0.1	+9.1	+0.0	46.5	46.0	+0.5	Line
^			+0.4								
^	1.388M	36.5	+0.2	+0.0	+0.1	+9.1	+0.0	46.3	46.0	+0.3	Line
^			+0.4								
34	2.679M	22.6	+0.1	+0.0	+0.1	+9.1	+0.0	32.3	46.0	-13.7	Line
^	Ave		+0.4								
^	2.679M	37.9	+0.1	+0.0	+0.1	+9.1	+0.0	47.6	46.0	+1.6	Line
^			+0.4								
36	4.865M	22.4	+0.1	+0.0	+0.1	+9.1	+0.0	32.2	46.0	-13.8	Line
^	Ave		+0.5								
^	4.865M	37.9	+0.1	+0.0	+0.1	+9.1	+0.0	47.7	46.0	+1.7	Line
^			+0.5								
38	1.835M	21.0	+0.1	+0.0	+0.1	+9.1	+0.0	30.7	46.0	-15.3	Line
^	Ave		+0.4								
^	1.835M	36.7	+0.1	+0.0	+0.1	+9.1	+0.0	46.4	46.0	+0.4	Line
^			+0.4								

40	13.140M	14.9	+0.1	+0.0	+0.2	+9.1	+0.0	24.8	50.0	-25.2	Line
	Ave		+0.5								
^	13.140M	28.1	+0.1	+0.0	+0.2	+9.1	+0.0	38.0	50.0	-12.0	Line
			+0.5								
42	25.160M	7.6	+0.1	+0.0	+0.3	+9.1	+0.0	17.5	50.0	-32.5	Line
	Ave		+0.4								
^	25.160M	23.4	+0.1	+0.0	+0.3	+9.1	+0.0	33.3	50.0	-16.7	Line
			+0.4								

Test Location: CKC Laboratories, Inc. • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • (425) 402-1717
 Customer: **Iron, Inc**
 Specification: **15.207 AC Mains - Average**
 Work Order #: **99119** Date: 10/11/2016
 Test Type: **Conducted Emissions** Time: 17:57:05
 Tested By: Michael Atkinson Sequence#: 6
 Software: EMITest 5.03.02 115V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

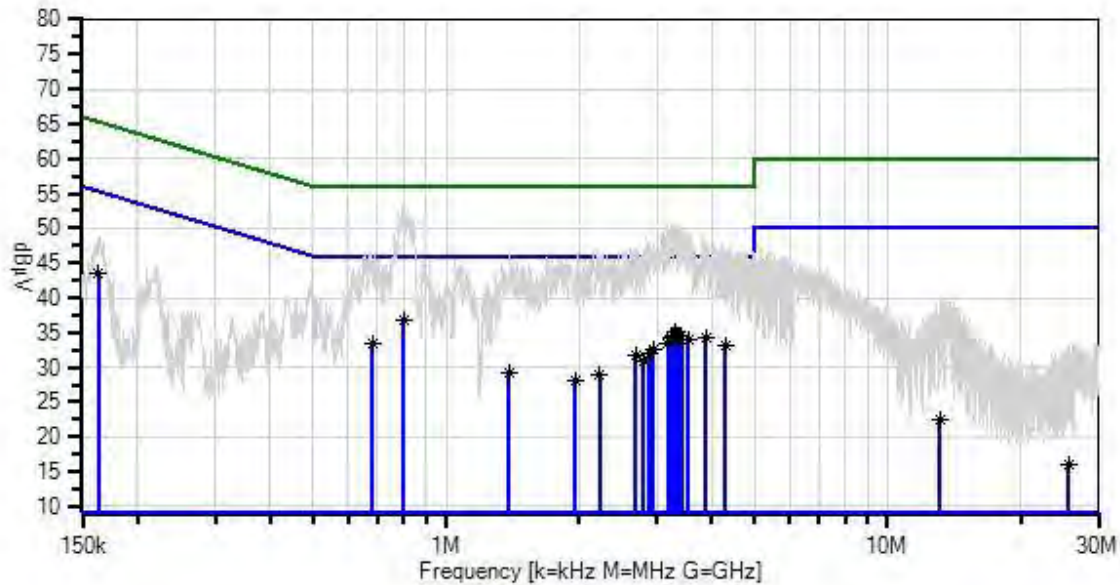
Support Equipment:

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: 908MHz Firmware power setting: Max Power EUT Firmware: 5.71 Protocol /MCS/Modulation: FSK Antenna type: Internal PIFA Antenna Gain: 1.5 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 W/O#: 99119 Sequence#: 6 Date: 10/11/2016
15.207 AC Mains - Average Test Lead: 115V 60Hz Return



— 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	Heliac	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	802.991k	26.9	+0.2	+0.0	+0.1	+9.1	+0.0	36.7	46.0	-9.3	Retur
	Ave		+0.4								
^	802.991k	43.6	+0.2	+0.0	+0.1	+9.1	+0.0	53.4	46.0	+7.4	Retur
			+0.4								
3	3.305M	25.3	+0.1	+0.0	+0.1	+9.1	+0.0	35.0	46.0	-11.0	Retur
	Ave		+0.4								
^	3.305M	40.9	+0.1	+0.0	+0.1	+9.1	+0.0	50.6	46.0	+4.6	Retur
			+0.4								
5	3.331M	24.9	+0.1	+0.0	+0.1	+9.1	+0.0	34.6	46.0	-11.4	Retur
	Ave		+0.4								
^	3.331M	40.1	+0.1	+0.0	+0.1	+9.1	+0.0	49.8	46.0	+3.8	Retur
			+0.4								
7	3.353M	24.8	+0.1	+0.0	+0.1	+9.1	+0.0	34.5	46.0	-11.5	Retur
	Ave		+0.4								
^	3.353M	40.2	+0.1	+0.0	+0.1	+9.1	+0.0	49.9	46.0	+3.9	Retur
			+0.4								
9	3.271M	24.7	+0.1	+0.0	+0.1	+9.1	+0.0	34.4	46.0	-11.6	Retur
	Ave		+0.4								
^	3.271M	41.2	+0.1	+0.0	+0.1	+9.1	+0.0	50.9	46.0	+4.9	Retur
			+0.4								
11	3.405M	24.7	+0.1	+0.0	+0.1	+9.1	+0.0	34.4	46.0	-11.6	Retur
	Ave		+0.4								
^	3.405M	40.1	+0.1	+0.0	+0.1	+9.1	+0.0	49.8	46.0	+3.8	Retur
			+0.4								
13	3.248M	24.6	+0.1	+0.0	+0.1	+9.1	+0.0	34.3	46.0	-11.7	Retur
	Ave		+0.4								
^	3.248M	40.9	+0.1	+0.0	+0.1	+9.1	+0.0	50.6	46.0	+4.6	Retur
			+0.4								
15	3.879M	24.5	+0.1	+0.0	+0.1	+9.1	+0.0	34.2	46.0	-11.8	Retur
	Ave		+0.4								
^	3.879M	38.3	+0.1	+0.0	+0.1	+9.1	+0.0	48.0	46.0	+2.0	Retur
			+0.4								

17	162.900k	32.2	+0.5 +1.7	+0.0	+0.0	+9.1	+0.0	43.5	55.3	-11.8	Retur
^	162.900k	37.2	+0.5 +1.7	+0.0	+0.0	+9.1	+0.0	48.5	55.3	-6.8	Retur
19	3.542M	24.3	+0.1 +0.4	+0.0	+0.1	+9.1	+0.0	34.0	46.0	-12.0	Retur
^	3.542M	39.2	+0.1 +0.4	+0.0	+0.1	+9.1	+0.0	48.9	46.0	+2.9	Retur
21	3.172M	23.6	+0.1 +0.4	+0.0	+0.1	+9.1	+0.0	33.3	46.0	-12.7	Retur
^	3.172M	40.8	+0.1 +0.4	+0.0	+0.1	+9.1	+0.0	50.5	46.0	+4.5	Retur
23	682.100k	23.5	+0.2 +0.4	+0.0	+0.1	+9.1	+0.0	33.3	46.0	-12.7	Retur
^	682.100k	37.3	+0.2 +0.4	+0.0	+0.1	+9.1	+0.0	47.1	46.0	+1.1	Retur
25	4.290M	23.4	+0.1 +0.4	+0.0	+0.1	+9.1	+0.0	33.1	46.0	-12.9	Retur
^	4.290M	37.8	+0.1 +0.4	+0.0	+0.1	+9.1	+0.0	47.5	46.0	+1.5	Retur
27	2.940M	23.0	+0.1 +0.4	+0.0	+0.1	+9.1	+0.0	32.7	46.0	-13.3	Retur
^	2.940M	41.1	+0.1 +0.4	+0.0	+0.1	+9.1	+0.0	50.8	46.0	+4.8	Retur
29	2.888M	22.2	+0.1 +0.4	+0.0	+0.1	+9.1	+0.0	31.9	46.0	-14.1	Retur
^	2.888M	40.8	+0.1 +0.4	+0.0	+0.1	+9.1	+0.0	50.5	46.0	+4.5	Retur
31	2.685M	22.0	+0.1 +0.4	+0.0	+0.1	+9.1	+0.0	31.7	46.0	-14.3	Retur
^	2.685M	39.6	+0.1 +0.4	+0.0	+0.1	+9.1	+0.0	49.3	46.0	+3.3	Retur
33	2.795M	21.3	+0.1 +0.4	+0.0	+0.1	+9.1	+0.0	31.0	46.0	-15.0	Retur
^	2.795M	39.3	+0.1 +0.4	+0.0	+0.1	+9.1	+0.0	49.0	46.0	+3.0	Retur
35	1.384M	19.5	+0.2 +0.4	+0.0	+0.1	+9.1	+0.0	29.3	46.0	-16.7	Retur
^	1.384M	36.2	+0.2 +0.4	+0.0	+0.1	+9.1	+0.0	46.0	46.0	+0.0	Retur
37	2.221M	19.3	+0.1 +0.4	+0.0	+0.1	+9.1	+0.0	29.0	46.0	-17.0	Retur
^	2.221M	37.9	+0.1 +0.4	+0.0	+0.1	+9.1	+0.0	47.6	46.0	+1.6	Retur
39	1.964M	18.3	+0.1 +0.4	+0.0	+0.1	+9.1	+0.0	28.0	46.0	-18.0	Retur
^	1.964M	36.9	+0.1 +0.4	+0.0	+0.1	+9.1	+0.0	46.6	46.0	+0.6	Retur

41	13.120M	12.5	+0.1	+0.0	+0.2	+9.1	+0.0	22.4	50.0	-27.6	Retur
	Ave		+0.5								
^	13.120M	29.7	+0.1	+0.0	+0.2	+9.1	+0.0	39.6	50.0	-10.4	Retur
			+0.5								
43	25.740M	6.2	+0.1	+0.0	+0.3	+9.1	+0.0	16.1	50.0	-33.9	Retur
	Ave		+0.4								
^	25.740M	24.0	+0.1	+0.0	+0.3	+9.1	+0.0	33.9	50.0	-16.1	Retur
			+0.4								

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 $\text{dB}\mu\text{V}/\text{m}$, the spectrum analyzer reading in $\text{dB}\mu\text{V}$ 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	($\text{dB}\mu\text{V}$)
+	Antenna Factor	(dB/m)
+	Cable Loss	(dB)
-	Distance Correction	(dB)
-	Preamplifier Gain	(dB)
=	Corrected Reading	($\text{dB}\mu\text{V}/\text{m}$)

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.