Itron, Inc.

TEST REPORT FOR

AMR Transceiver Device For Communicating With Utility Meters
Model: IMRA

Tested To The Following Standards:

FCC Part 15 Subpart C Section(s)

15.207 & 15.247
(FHSS 902-928 MHz)

Report No.: 99513-1

Date of issue: June 1, 2017

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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ADMINISTRATIVE INFORMATION

Test Report Information

REPORT PREPARED FOR:

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

REPRESENTATIVE: Jay Holcomb
Customer Reference Number: 114073

REPORT PREPARED BY:

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

Project Number: 99513

DATE OF EQUIPMENT RECEIPT: April 11, 2017
DATE(S) OF TESTING: April 11-14, 2017

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
Canyon Park, Bothell, WA 98021

Software Versions

CKC Laboratories Proprietary Software	Version
EMITest Emissions	5.03.02

Site Registration & Accreditation Information

Location	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 - 15.247 (FHSS 902-928MHz)

Test Procedure	Description	Modifications	Results
15.247(a)(1)(i)	Occupied Bandwidth	NA	Pass
15.247(a)(1)	Carrier Separation	NA	Pass
15.247(a)(1)(i)	Number of Hopping Channels	NA	Pass
15.247(a)(1)(i)	Average Time of Occupancy	NA	Pass
15.247(b)(2)	Output Power	NA	Pass
15.247(d)	RF Conducted Emissions & Band Edge	NA	Pass
15.247(d)	Radiated Emissions & Band Edge	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.	IMRA	66030023

Support Equipment:

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

Configuration 2

Equipment Tested:

Device	Manufacturer	Model #	S/N
AMR Transceiver Device For Communicating With Utility Meters	Itron, Inc.	IMRA	66030023

Support Equipment:

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

Configuration 3

Equipment Tested:

Device	Manufacturer	Model #	S/N
AMR Transceiver Device For Communicating With Utility Meters	Itron, Inc.	IMRA	66030024

Support Equipment:

Device	Manufacturer	Model #	S/N
Laptop	Dell	E6410	46TXXN1
AC Adapter for Laptop	Dell	DA130PE1-00	NA
DC Power Supply	C&C Jetronic, Inc.	GPSU18UI-1	NA
DC Power Filter	Itron, Inc.	Filter Block 1	NA

General Product Information:

Product Information	Manufacturer-Provided Details
Equipment Type:	Stand-Alone Equipment
Type of Wideband System:	Proprietary FHSS
Operating Frequency Range:	908-923.8MHz
Number of Hopping Channels:	80
Modulation Type(s):	FSK
Maximum Duty Cycle:	45%
Number of TX Chains:	1
Antenna Type(s) and Gain:	Internal PIFA 1.2dBi
Beamforming Type:	NA
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 v4.0.3.4

FCC Part 15 Subpart C

15.247(a) Transmitter Characteristics

Test Setup/Conditions			
Test Location:	Bothell Lab C3	Test Engineer:	Randal Clark and Michael Atkinson
Test Method:	ANSI C63.10 (2013)	Test Date(s):	4/18/17 to 4/20/17
Configuration:	3		
Test Setup:	Frequency Range: 908-923.8MHz Frequency tested: 908, 916, 923.8MHz Firmware power setting: Max Power EUT Firmware: 5.71 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 through a temporary antenna connector and is attached directly to the spectrum analyzer. Modifications Added: None		

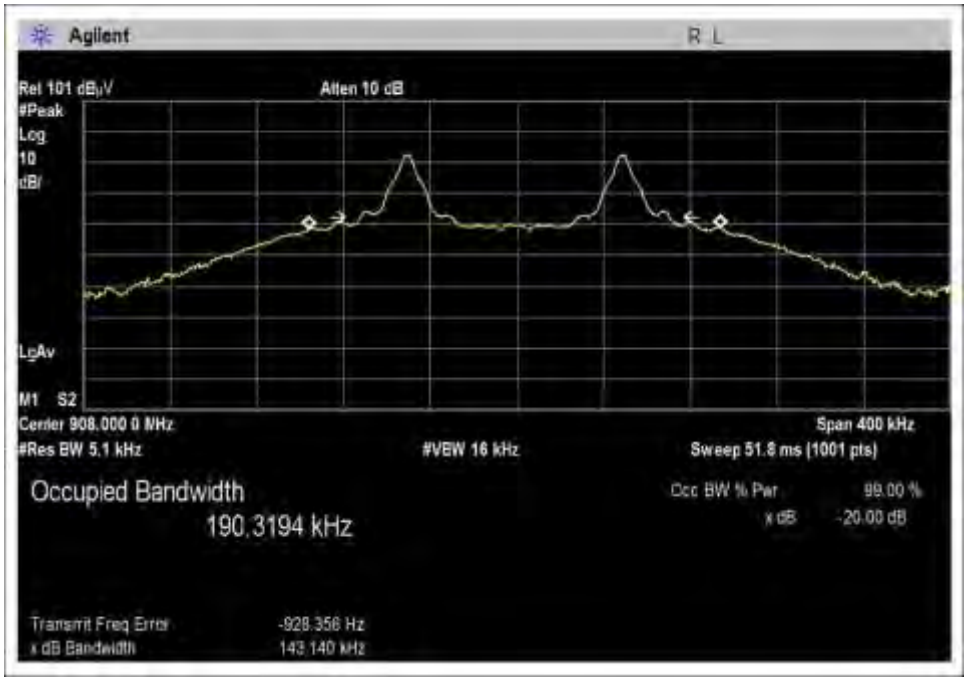
Environmental Conditions			
Temperature (ºC)	20-22	Relative Humidity (%):	30-40

Test Equipment					
Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
02872	Spectrum Analyzer	Agilent	E4440A	11/18/2015	11/18/2017
P06243	Attenuator	Weinschel	54A-10	3/9/2016	3/9/2018
03122	Cable	Astrolab	32026-2-29801-36	4/28/2016	4/28/2018

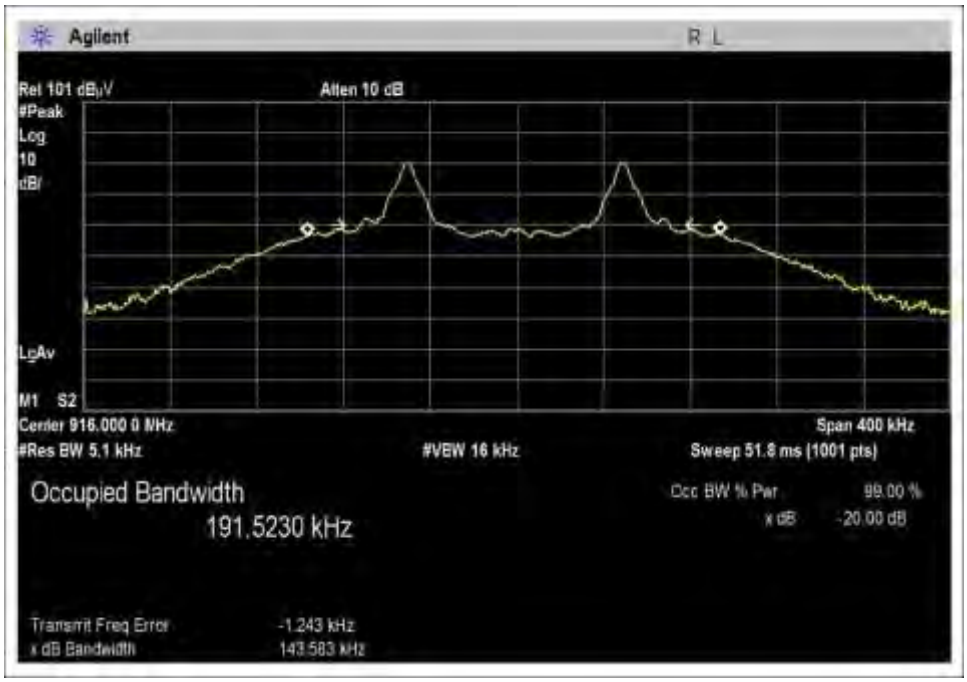
15.247(a)(1) 20 dB Bandwidth

Test Data Summary					
Frequency (MHz)	Antenna Port	Modulation	Measured (kHz)	Limit (kHz)	Results
908	1	FSK	143.1	≤500	Pass
916	1	FSK	143.6	≤500	Pass
923.8	1	FSK	153.5	≤500	Pass

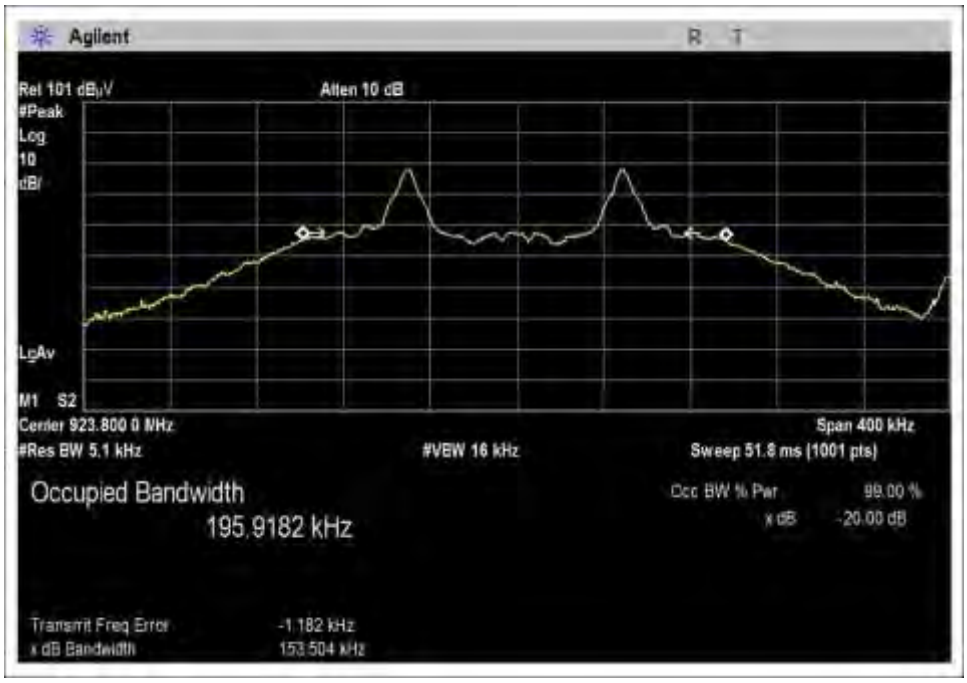
Plots



Low Channel



Middle Channel

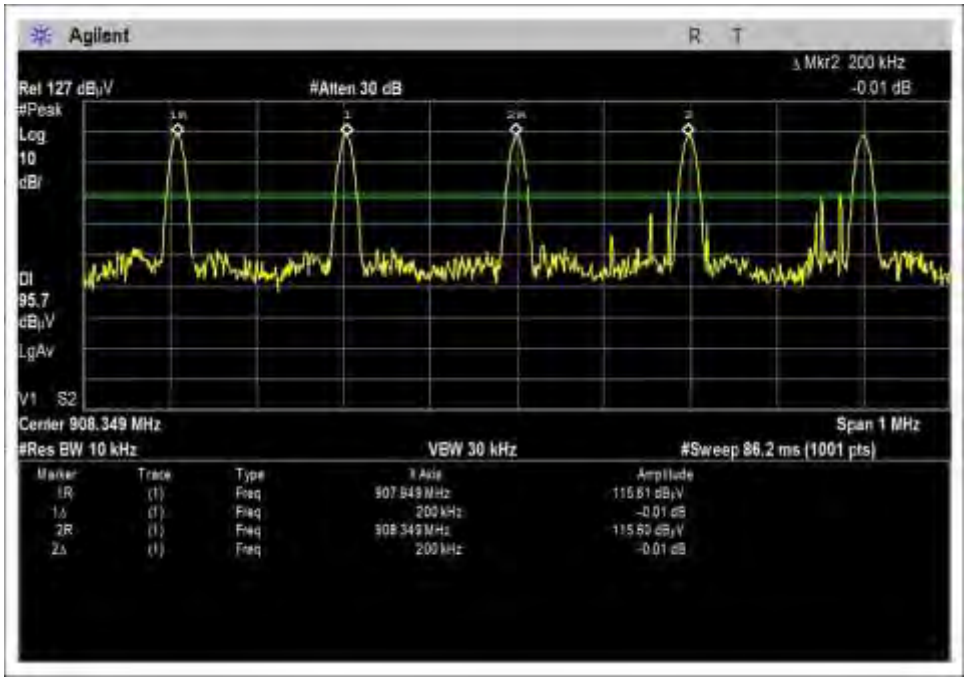


High Channel

15.247(a)(1) Carrier Separation

Test Data Summary				
Limit applied: 20dB bandwidth of the hopping channel.				
Antenna Port	**Operational Mode**	**Measured (kHz)**	**Limit (kHz)**	**Results**
1	Normal Hopping	200	>153.5	Pass

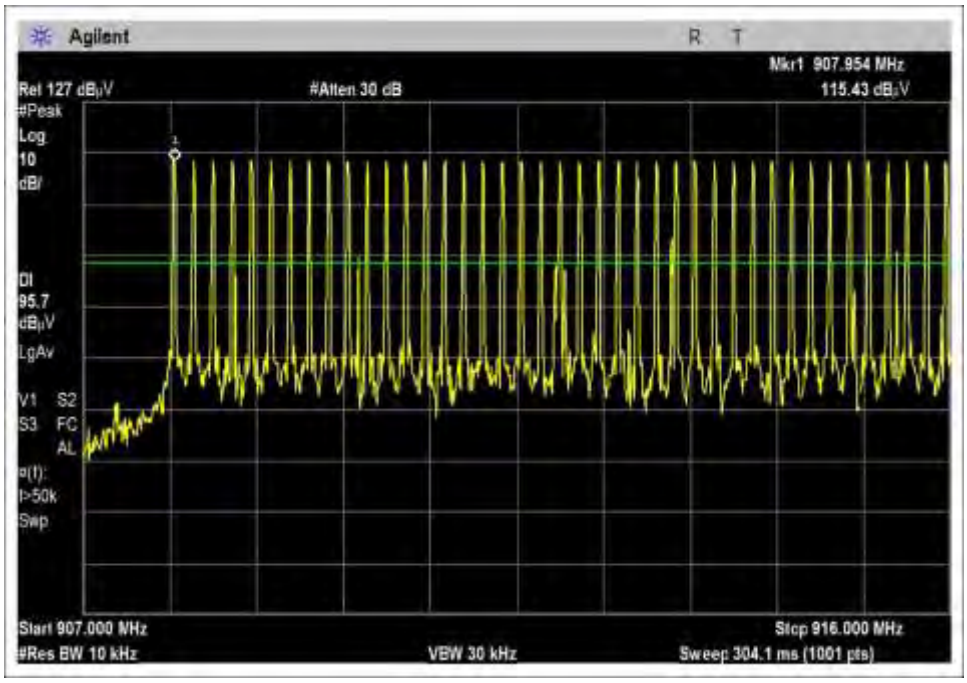
Plot

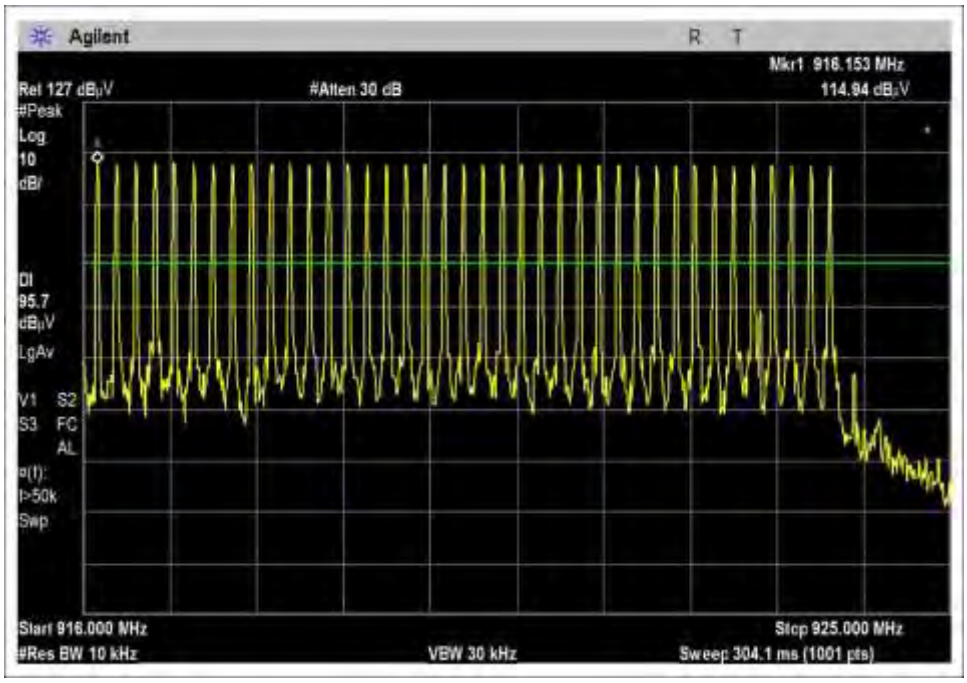


15.247(a)(1)(iii) Number of Hopping Channels

Test Data Summary				
$Limit = \begin{cases} 50\ Channels \mid 20\ dB\ BW < 250kHz \\ 25\ Channels \mid 20\ dB\ BW \geq 250kHz \end{cases}$				
Antenna Port	**Operational Mode**	**Measured (Channels)**	**Limit (Channels)**	**Results**
1	Normal Hopping	80	≥50	Pass

Plots




Agilent
R T
Mkr1 916.153 MHz
114.94 dBµV
Ref 127 dBµV
#Atten 30 dB
#Peak
Log
10
dB/
Dl
95.7
dBµV
LgAv
V1 S2
S3 FC
AL
σ(t):
t>50k
Swp
Start 916.000 MHz
#Res BW 10 kHz
VBW 30 kHz
Stop 925.000 MHz
Sweep 304.1 ms (1001 pts)

15.247(a)(1)(iii) Time of Occupancy

Test Data Summary				
Observation Period, P_{obs} is derived from the following: $P_{Obs} = \begin{cases} 20\ Seconds & 20\ dB\ BW < 250kHz \\ 10\ Seconds & 20\ dB\ BW \geq 250kHz \end{cases}$				
Antenna Port	**Operational Mode**	**Measured (ms)**	**Limit (ms/P_{obs})**	**Results**
1	Normal Hopping	364.8	≤400	Pass

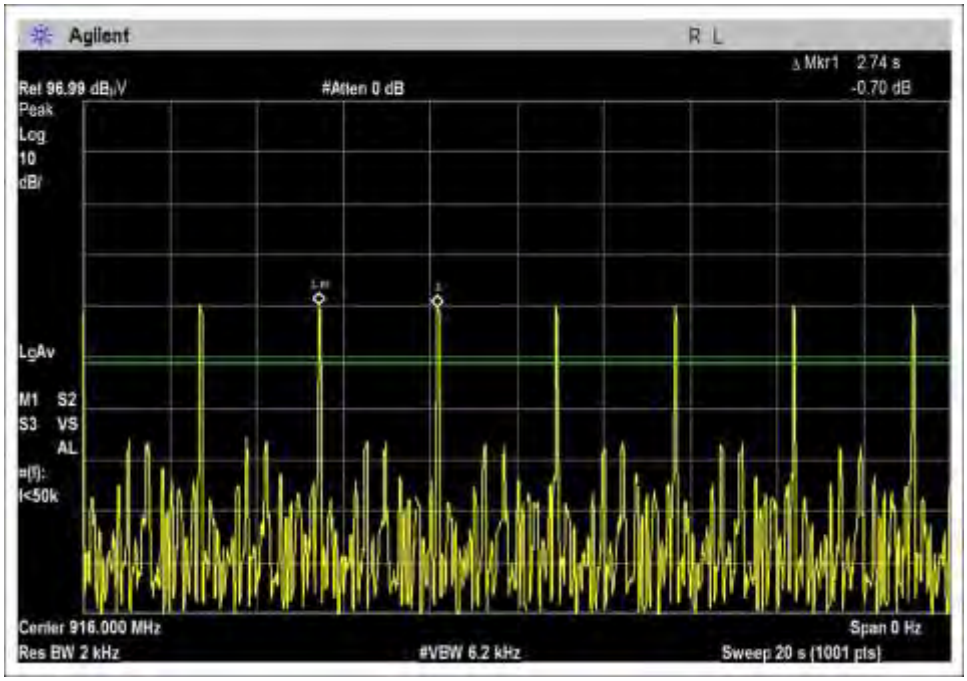
Measured results are calculated as follows:

$$Dwell\ time = \left(\sum_{Bursts} RF\ Burst\ On\ Time + \sum_{Control} Control\ Signal\ On\ time \right)\Big|_{P_{obs}}$$

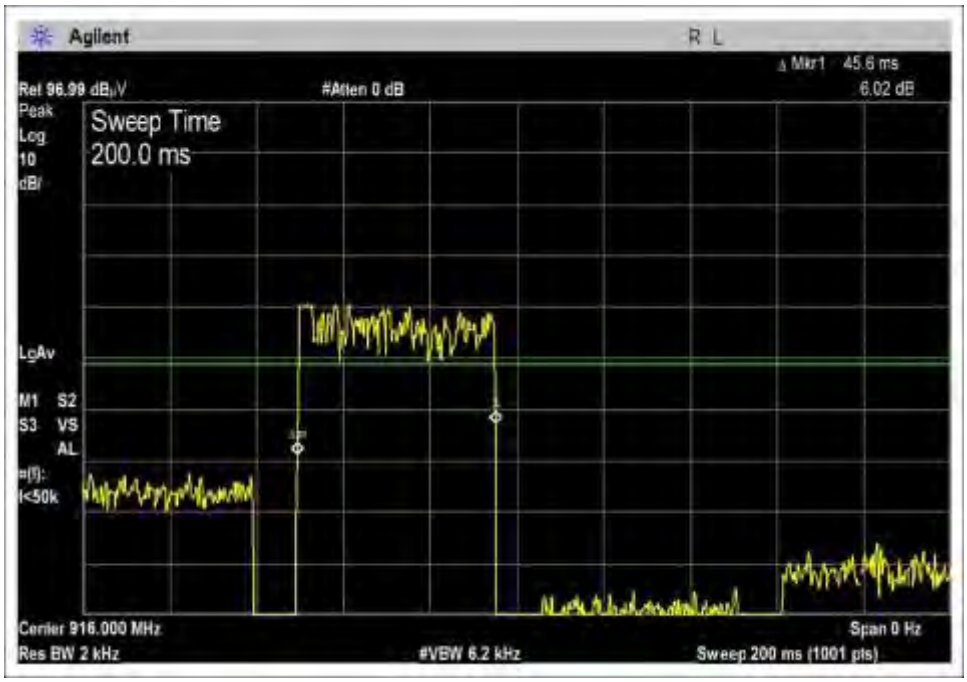
Actual Calculated Values:

Parameter	Value
Observation Period (P_{obs}):	20 s
Number of RF Bursts / P_{obs}::	8
On time of RF Burst:	45.6 ms
Number of Control or other signals / P_{obs}:	0
On time of Control or other Signals:	0
Total Measured On Time:	364.8 ms

Plots



20 Second Window



Single Burst

Test Setup Photo

15.247(b)(1) Output Power

Test Setup/Conditions			
Test Location:	Bothell Lab C3	Test Engineer:	Randal Clark
Test Method:	ANSI C63.10 (2013)	Test Date(s):	4/18/2017
Configuration:	3		
Test Setup:	Frequency Range: 908-923.8MHz Frequency tested: 908, 916, 923.8MHz Firmware power setting: Max User Allowed EUT Firmware: 5.71 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 through a temporary antenna connector and is attached directly to the spectrum analyzer. Modifications Added: None		

Environmental Conditions			
Temperature (ºC)	20-22	Relative Humidity (%):	30-40

Test Equipment					
Asset#	**Description**	**Manufacturer**	**Model**	**Cal Date**	**Cal Due**
02872	Spectrum Analyzer	Agilent	E4440A	11/18/2015	11/18/2017
P06243	Attenuator	Weinschel	54A-10	3/9/2016	3/9/2018
03122	Cable	Astrolab	32026-2-29801-36	4/28/2016	4/28/2018

Test Data Summary - Voltage Variations					
Frequency (MHz)	**Modulation / Ant Port**	**$V_{Minimum}$ (dBm)**	**$V_{Nominal}$ (dBm)**	**$V_{Maximum}$ (dBm)**	**Max Deviation from $V_{Nominal}$ (dB)**
908	FSK	18.4	18.3	18.3	0.1
916	FSK	18.0	18.0	18.1	0.1
923.8	FSK	17.4	17.4	17.1	0.0

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

Parameter Definitions:

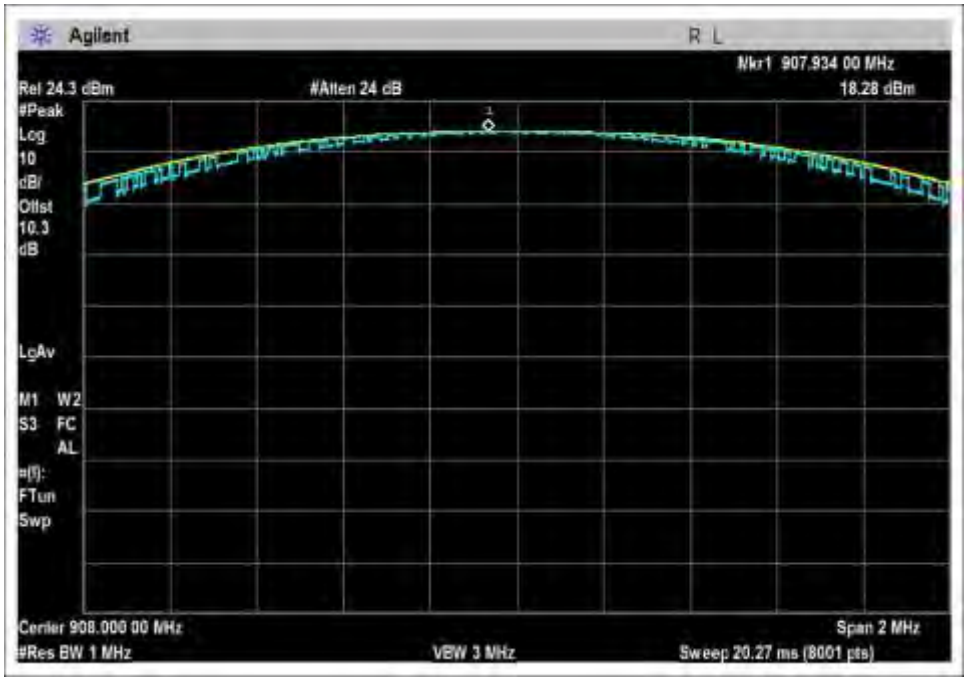
Measurements performed at input voltage Vnominal ± 15%.

Parameter	Value
$V_{Nominal}$:	115VAC
$V_{Minimum}$:	97VAC
$V_{Maximum}$:	133VAC

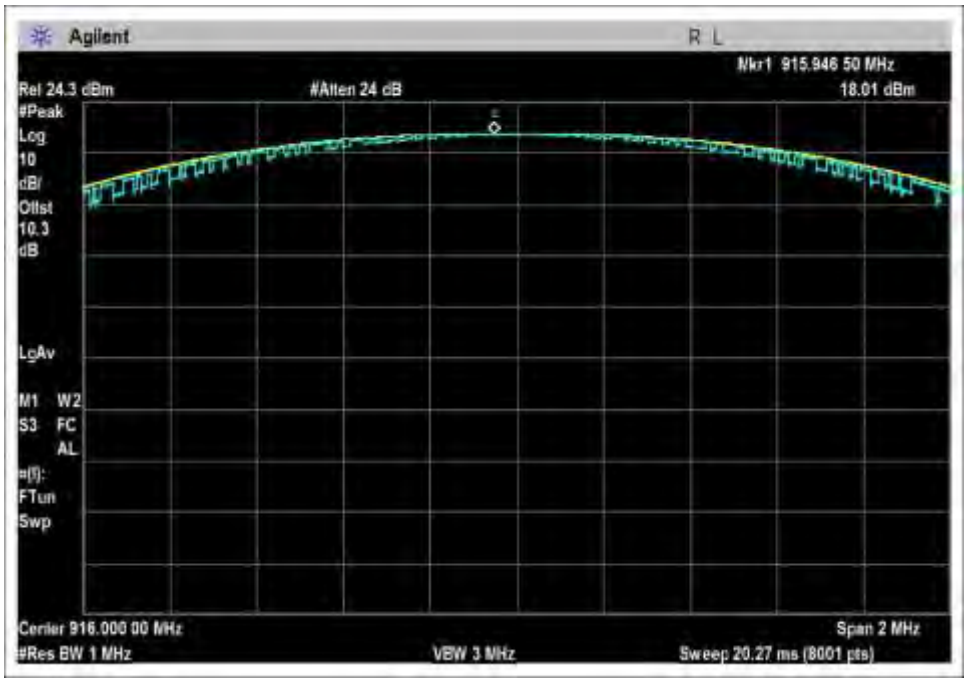
Test Data Summary - RF Conducted Measurement					
$Limit = \begin{cases} 30dBm\ Conducted/36dBm\ EIRP \mid \geq 50\ Channels \\ 24dBm\ Conducted/30dBm\ EIRP \mid < 50\ Channels\ (\min 25) \end{cases}$					
Frequency (MHz)	**Modulation**	**Ant. Type / Gain (dBi)**	**Measured (dBm)**	**Limit (dBm)**	**Results**
908	FSK	Internal PIFA 1.2dBi	18.3	≤30	Pass
916	FSK	Internal PIFA 1.2dBi	18.0	≤30	Pass
923.8	FSK	Internal PIFA 1.2dBi	17.4	≤30	Pass

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

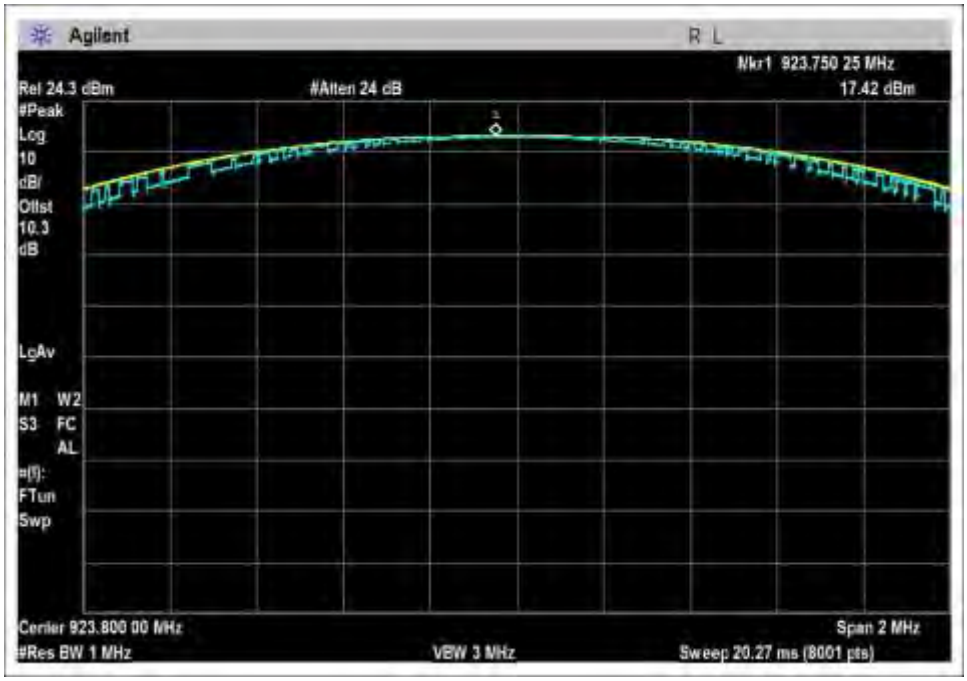
Plots



Low Channel



Middle Channel



High Channel

Test Setup Photo

15.35(c) Duty Cycle Correction Factor

Test Data Summary			
Antenna Port	**Operational Mode**	**Measured On Time (mS / P_{obs})**	**Calculated DCCF (dB)**
1	Transmitting RF Bursts	45	-6.9

Observation Period, P_{obs} is the duration of the pulse train or maximum 100mS

Measured results are calculated as follows:

$$On\ Time = \left(\sum_{Bursts} RF\ Burst\ On\ Time + \sum_{Control} Control\ Signal\ On\ time \right) \Bigg|_{P_{obs}\ (\max 100ms)}$$

Measured Values:

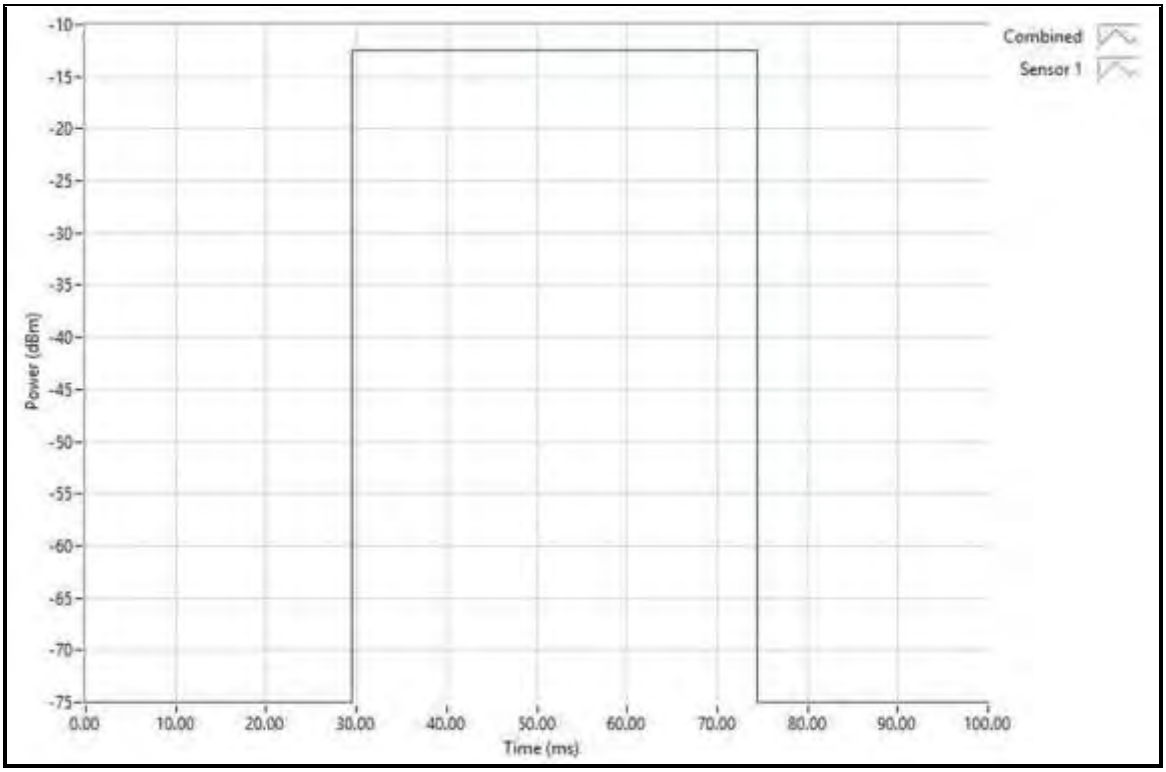
Parameter	Value
Observation Period (P_{obs}):	100ms
Number of RF Bursts / P_{obs}::	1
On time of RF Burst:	45ms
Number of Control or other signals / P_{obs}:	0
On time of Control or other Signals:	0
Total Measured On Time:	45mS

Duty Cycle Correction Factor (DCCF) is calculated in accordance with ANSI C63.10:

$$DCCF = 20 \cdot Log\left(\frac{On\ Time}{P_{obs}}\right)$$

Duty Cycle Correction Factor Test Data

Burst #	TxOff Time (ms)	TxOn Time (ms)
1	55.0298	44.9702



Test Setup Photo

15.247(d) RF Conducted Emissions & Band Edge

Test Setup / Conditions / Data

Test Location:	CKC Laboratories, Inc. • 22116 23rd Drive SE Suite A • Bothell, WA 98021 • 800-500-4EMC (4362)		
Customer:	**Itron, Inc.**		
Specification:	**15.247(d) Conducted Spurious Emissions**		
Work Order #:	**99513**	Date:	4/18/2017
Test Type:	**Conducted Emissions**	Time:	15:57:52
Tested By:	Randal Clark	Sequence#:	6
Software:	EMITest 5.03.02		120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 3			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 3			

Test Conditions / Notes:

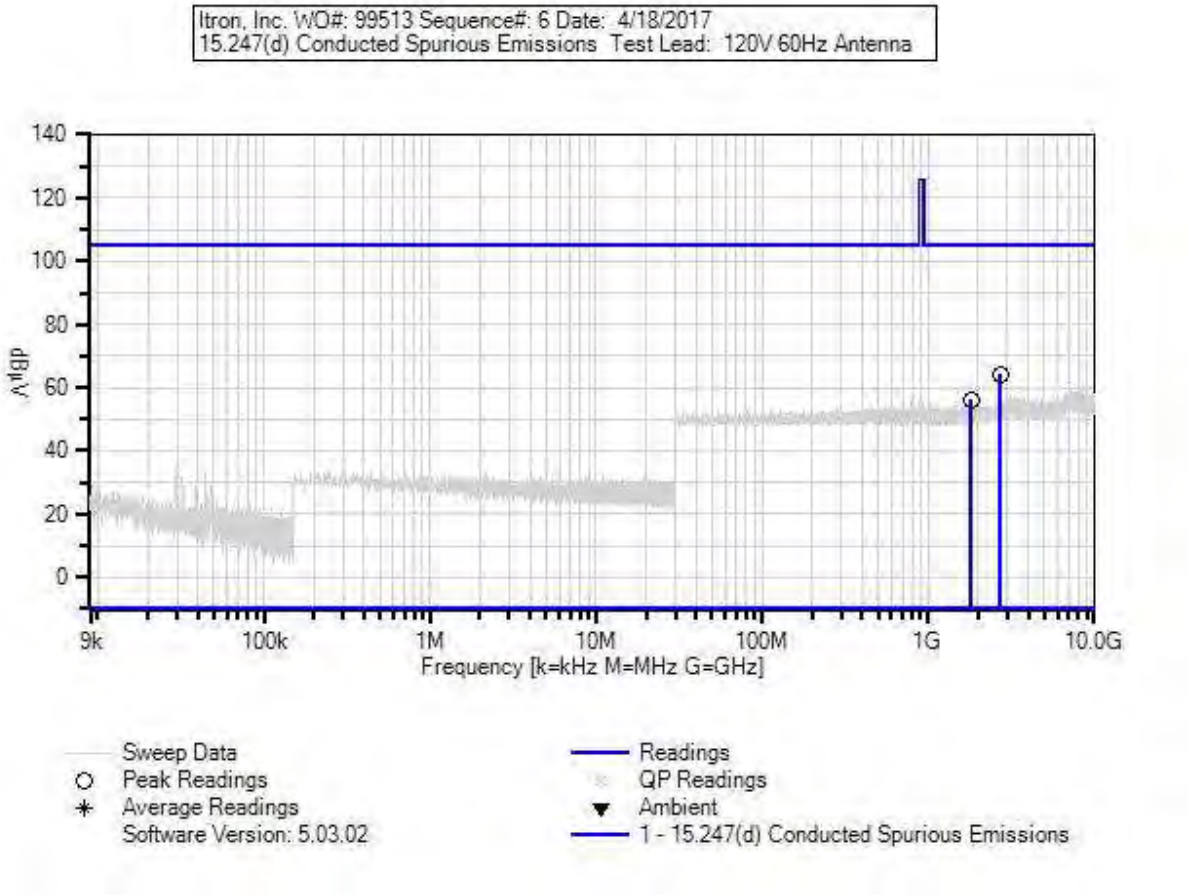
Temperature: 20 to 22°C
Humidity: 30 to 40%
Pressure: 101.0 to 102.5kPa

Frequency Range: 9kHz-10GHz
Frequency tested: 908, 923.8MHz
Firmware power setting: Max Power
EUT Firmware: 5.71
Protocol /MCS/Modulation: Continuous FSK and Hopping FSK

Antenna type: Internal PIFA
Antenna Gain: 1.2 dBi.

Duty Cycle: 100% (Test Mode)

Test Mode: Continuously transmitting FSK on single channel and Hopping mode both investigated, worst case data reported.
Test Setup: EUT is transmitting through a temporary antenna connector and is attached directly to the spectrum analyzer.
Modifications Added: None
Test Method: ANSI C63.10 (2013)



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02872	Spectrum Analyzer	E4440A	11/18/2015	11/18/2017
T1	ANP06243	Attenuator	54A-10	3/9/2016	3/9/2018
T2	AN03122	Cable	32026-2-29801-36	4/28/2016	4/28/2018

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

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	dB	dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	2723.851M	53.5	+9.8	+0.8			+0.0	64.1	105.4	-41.3	Anten
2	1815.895M	45.6	+9.8	+0.7			+0.0	56.1	105.4	-49.3	Anten

Test Location:	CKC Laboratories, Inc. • 22116 23rd Drive SE Suite A • Bothell, WA 98021 • 800-500-4EMC (4362)		
Customer:	**Itron, Inc.**		
Specification:	**15.247(d) Conducted Spurious Emissions**		
Work Order #:	**99513**	Date:	4/18/2017
Test Type:	**Conducted Emissions**	Time:	19:31:49
Tested By:	Randal Clark	Sequence#:	8
Software:	EMITest 5.03.02		120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 3			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 3			

Test Conditions / Notes:

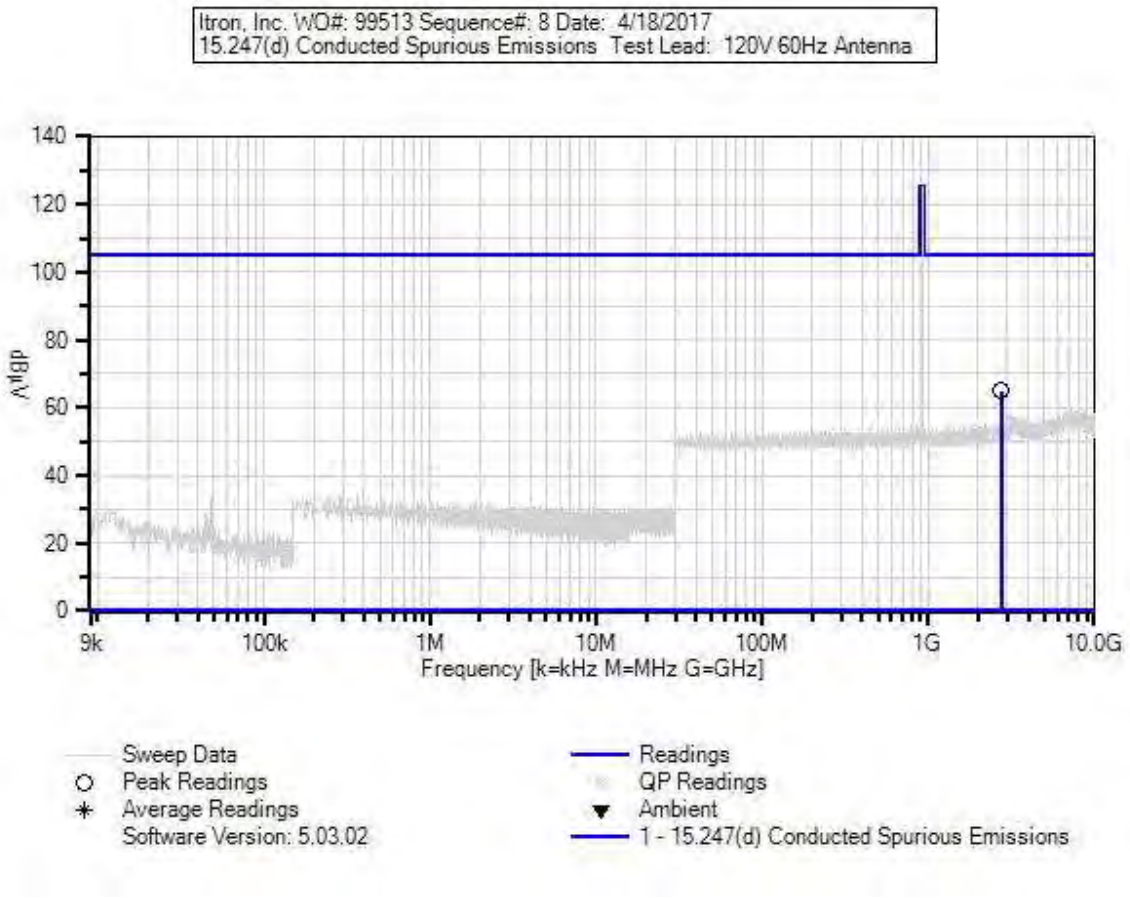
Temperature: 20 to 22°C
Humidity: 30 to 40%
Pressure: 101.0 to 102.5kPa

Frequency Range: 9kHz-10GHz
Frequency tested: 908, 923.8MHz
Firmware power setting: Max Power
EUT Firmware: 5.71
Protocol /MCS/Modulation: Continuous FSK and Hopping FSK

Antenna type: Internal PIFA
Antenna Gain: 1.2 dBi.

Duty Cycle: 100% (Test Mode)

Test Mode: Continuously transmitting FSK on single channel and Hopping mode both investigated, worst case data reported.
Test Setup: EUT is transmitting through a temporary antenna connector and is attached directly to the spectrum analyzer.
Modifications Added: None
Test Method: ANSI C63.10 (2013)



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02872	Spectrum Analyzer	E4440A	11/18/2015	11/18/2017
T1	ANP06243	Attenuator	54A-10	3/9/2016	3/9/2018
T2	AN03122	Cable	32026-2-29801-36	4/28/2016	4/28/2018

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

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	dB	dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	2747.989M	54.3	+9.8	+0.8			+0.0	64.9	105.4	-40.5	Anten

Test Location:	CKC Laboratories, Inc. • 22116 23rd Drive SE Suite A • Bothell, WA 98021 • 800-500-4EMC (4362)		
Customer:	**Itron, Inc.**		
Specification:	**15.247(d) Conducted Spurious Emissions**		
Work Order #:	**99513**	Date:	4/18/2017
Test Type:	**Conducted Emissions**	Time:	17:34:17
Tested By:	Randal Clark	Sequence#:	10
Software:	EMITest 5.03.02		120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 3			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 3			

Test Conditions / Notes:

Temperature: 20 to 22°C
Humidity: 30 to 40%
Pressure: 101.0 to 102.5kPa

Frequency Range: 9kHz-10GHz
Frequency tested: 908, 923.8MHz
Firmware power setting: Max Power
EUT Firmware: 5.71
Protocol /MCS/Modulation: Continuous FSK and Hopping FSK

Antenna type: Internal PIFA
Antenna Gain: 1.2 dBi.

Duty Cycle: 100% (Test Mode)

Test Mode: Continuously transmitting FSK on single channel and Hopping mode both investigated, worst case data reported.
Test Setup: EUT is transmitting through a temporary antenna connector and is attached directly to the spectrum analyzer.
Modifications Added: None
Test Method: ANSI C63.10 (2013)

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02872	Spectrum Analyzer	E4440A	11/18/2015	11/18/2017
T1	ANP06243	Attenuator	54A-10	3/9/2016	3/9/2018
T2	AN03122	Cable	32026-2-29801-36	4/28/2016	4/28/2018

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

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	dB	dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	2771.533M	57.2	+9.8	+0.8			+0.0	67.8	105.4	-37.6	Anten

Band Edge

Band Edge Summary				
Limit applied: Max Power/100kHz - 20dB.				
Frequency (MHz)	**Modulation**	**Measured (dBm)**	**Limit (dBm)**	**Results**
902	Continuously Transmitting FSK	60.3	<105.4	Pass
928	Continuously Transmitting FSK	60.9	<105.4	Pass
902	Hopping FSK	87.5	<105.4	Pass
928	Hopping FSK	78.4	<105.4	Pass

Test Setup / Conditions / Data

Test Location: CKC Laboratories, Inc. • 22116 23rd Drive SE Suite A • Bothell, WA 98021 • 800-500-4EMC (4362)
Customer: **Itron, Inc.**
Specification: **15.247(d) Conducted Spurious Emissions**
Work Order #: **99513** Date: 4/18/2017
Test Type: **Conducted Emissions** Time: 15:57:52
Tested By: Randal Clark Sequence#: 6
Software: EMITest 5.03.02 120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 3			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 3			

Test Conditions / Notes:

Temperature: 20 to 22°C
Humidity: 30 to 40%
Pressure: 101.0 to 102.5kPa

Frequency Range: 908-923.8MHz
Frequency tested: 908, 923.8MHz
Firmware power setting: Max Power
EUT Firmware: 5.71
Protocol /MCS/Modulation: Continuous FSK and Hopping FSK

Antenna type: Internal PIFA
Antenna Gain: 1.2 dBi.

Duty Cycle: 100% (Test Mode)

Test Mode: Continuously transmitting FSK on single channel and Hopping mode both investigated, worst case data reported.
Test Setup: EUT is transmitting through a temporary antenna connector and is attached directly to the spectrum analyzer.
Modifications Added: None
Test Method: ANSI C63.10 (2013)

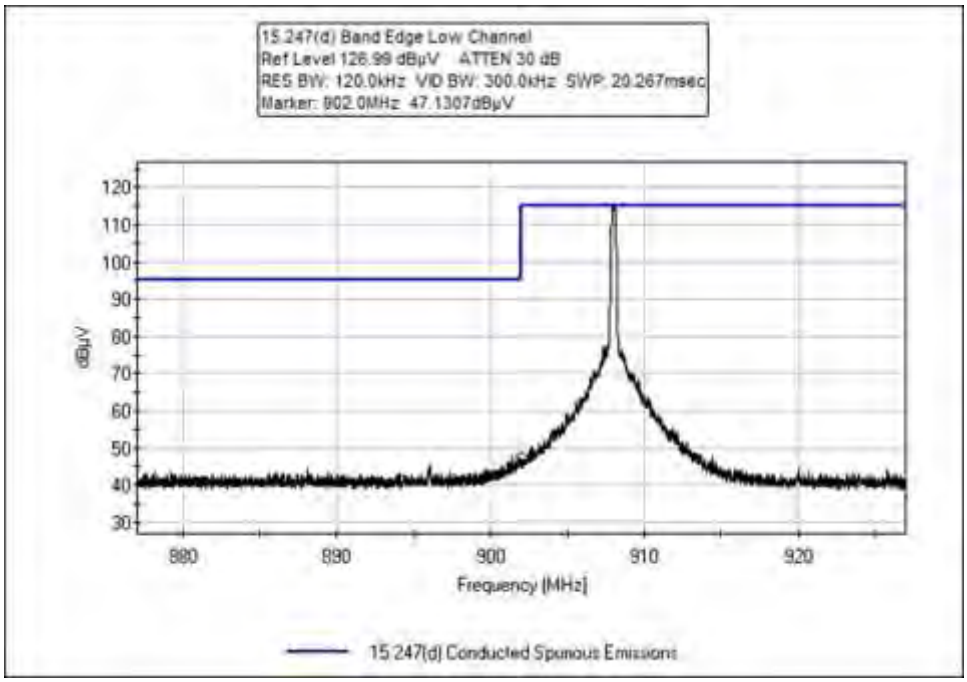
Test Equipment:

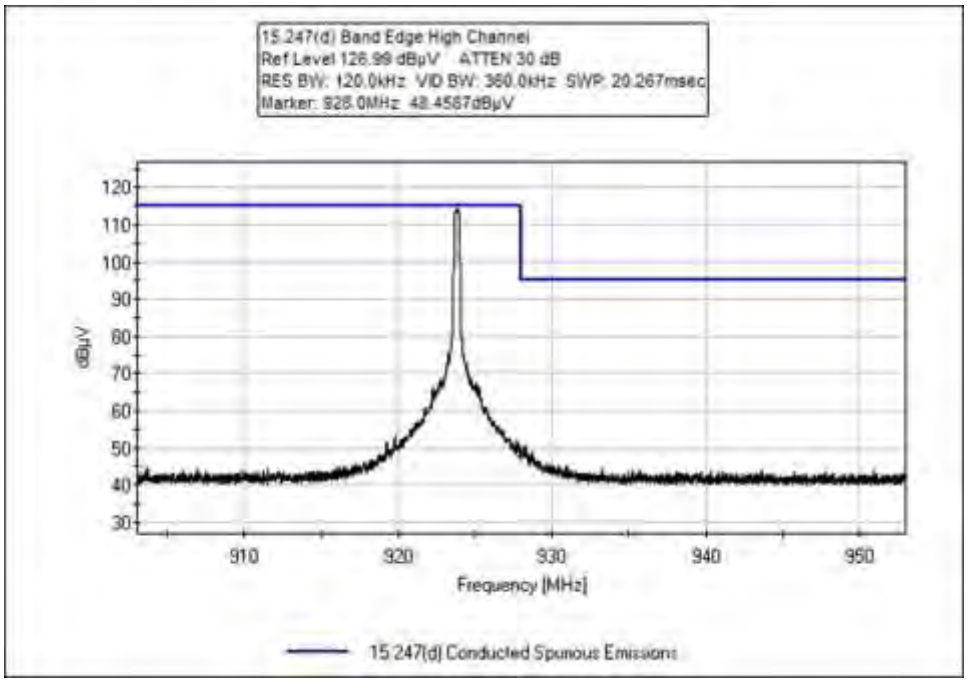
ID	Asset #/Serial #	Description	Model	Calibration Date	Cal Due Date
	AN02872	Spectrum Analyzer	E4440A	11/18/2015	11/18/2017
T1	ANP06243	Attenuator	54A-10	3/9/2016	3/9/2018
T2	AN03122	Cable	32026-2-29801-36	4/28/2016	4/28/2018

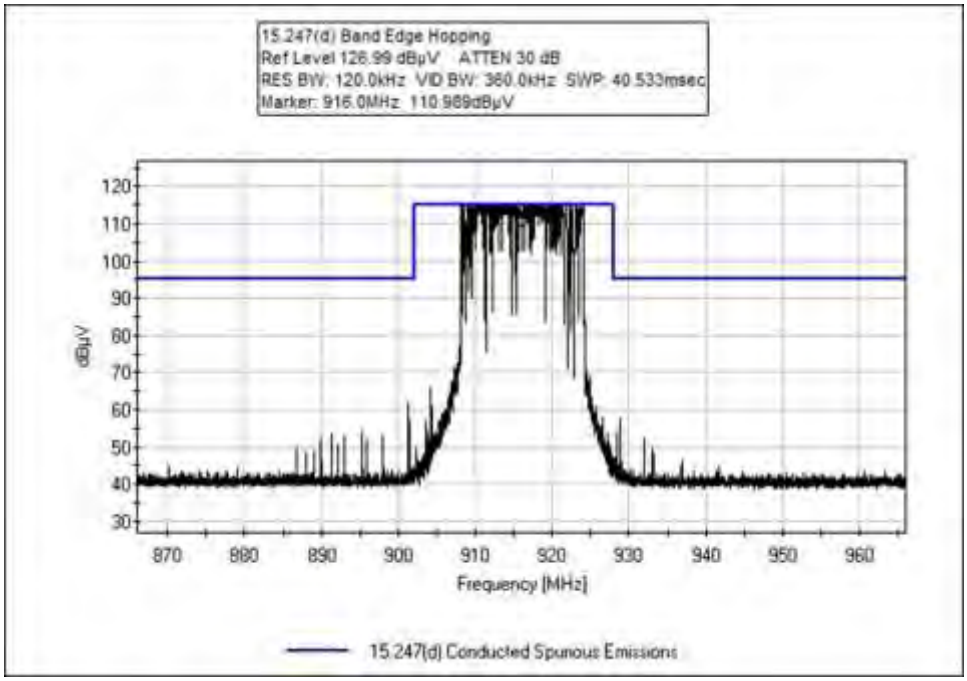
Measurement Data: Reading listed by margin. Test Lead: Antenna

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	dB	dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	902.000M	77.2	+9.8	+0.5			+0.0	87.5	105.4	-17.9	Anten
									Hopping FSK		
2	928.000M	68.1	+9.8	+0.5			+0.0	78.4	105.4	-27.0	Anten
									Hopping FSK		
3	928.000M	50.6	+9.8	+0.5			+0.0	60.9	105.4	-44.5	Anten
									Cont FSK		
4	902.000M	50.0	+9.8	+0.5			+0.0	60.3	105.4	-45.1	Anten
									Cont FSK		

Band Edge Plots




15.247(d) Band Edge High Channel
Ref Level 126.99 dBµV ATTEN 30 dB
RES BW: 120.0kHz VID BW: 360.0kHz SWP: 20.267msec
Marker: 928.0MHz 48.4567dBµV
dBµV
120
110
100
90
80
70
60
50
40
30
910
920
930
940
950
Frequency [MHz]
15.247(d) Conducted Spurious Emissions


15.247(d) Band Edge Hopping
Ref Level 126.99 dBµV ATTEN 30 dB
RES BW: 120.0kHz VID BW: 360.0kHz SWP: 40.533msec
Marker: 916.0MHz 110.989dBµV
dBµV
120
110
100
90
80
70
60
50
40
30
870
880
890
900
910
920
930
940
950
960
Frequency [MHz]
15.247(d) Conducted Spurious Emissions

Test Setup Photo

15.247(d) Radiated Emissions & Band Edge

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:	**15.247(d) / 15.209 Radiated Spurious Emissions**		
Work Order #:	**99513**	Date:	4/11/2017
Test Type:	**Maximized Emissions**	Time:	08:52:44
Tested By:	Michael Atkinson	Sequence#:	1
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:

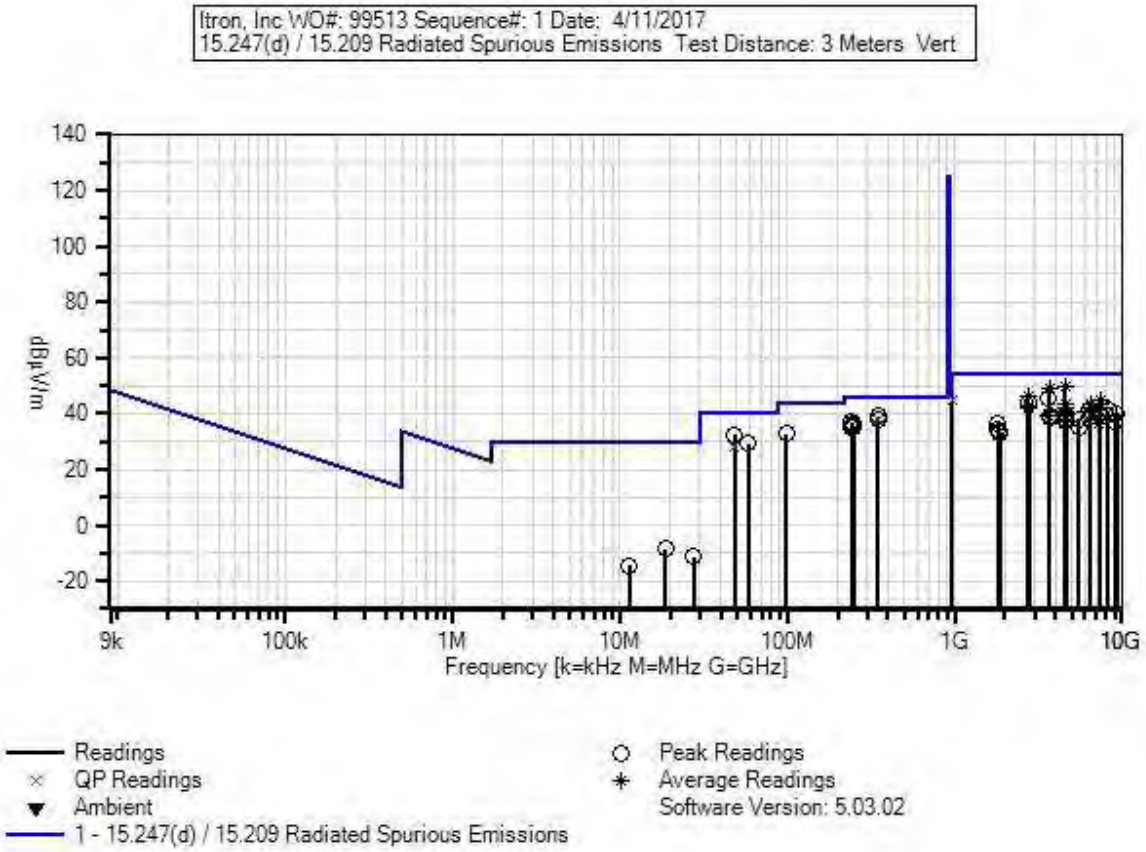
Temperature: 20 to 24°C
Humidity: 32 to 45%
Pressure: 101.3 to 103.5kPa

Frequency Range: Band Edge
Frequency tested: 908, 923.8MHz
Firmware power setting: Max Power
EUT Firmware: 5.71
Protocol /MCS/Modulation: Continuous FSK and Hopping FSK

Antenna type: Internal PIFA
Antenna Gain: 1.2 dBi.

Duty Cycle: 100% (Test Mode)

Test Mode: Continuously transmitting FSK on single channel and Hopping mode both investigated, worst case data reported.
Test Setup: EUT is transmitting sitting on foam table. X, Y, Z axis investigated. 3 orthogonal antenna polarities investigated below 30MHz, both horizontal and vertical antenna polarities investigated above 30MHz, worst case data reported.
Modifications Added: None
Test Method: ANSI C63.10 (2013)


Itron, Inc WO#: 99513 Sequence#: 1 Date: 4/11/2017
15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Vert
140
120
100
80
60
40
20
0
-20
dBµV/m
9k
100k
1M
10M
100M
1G
10G
Frequency [k=kHz M=MHz G=GHz]
Readings
QP Readings
Ambient
1 - 15.247(d) / 15.209 Radiated Spurious Emissions
Peak Readings
Average Readings
Software Version: 5.03.02

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02673	Spectrum Analyzer	E4446A	10/12/2015	10/12/2017
T1	ANP06540	Cable	Heliax	10/29/2015	10/29/2017
T2	ANP05305	Cable	ETSI-50T	2/15/2016	2/15/2018
T3	AN03540	Preamp	83017A	4/30/2015	4/30/2017
T4	AN01467	Horn Antenna-ANSI C63.5 Calibration	3115	8/12/2015	8/12/2017
T5	ANP06935	Cable	32026-29801-29801-18	3/11/2016	3/11/2018
	AN02872	Spectrum Analyzer	E4440A	11/18/2015	11/18/2017
T6	ANP05963	Cable	RG-214	2/15/2016	2/15/2018
T7	ANP05360	Cable	RG214	11/30/2016	11/30/2018
T8	AN01991	Biconilog Antenna	CBL6111C	3/11/2016	3/11/2018
T9	ANP05657	Attenuator	PE7004-6	12/22/2015	12/22/2017
T10	AN00052	Loop Antenna	6502	4/8/2016	4/8/2018
T11	AN45% DCCF	Test Data Adjustment		10/11/2016	10/11/2018
T12	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	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	4563.971M	52.1	+0.9	+4.2	-34.1	+32.5	+0.0	49.5	54.0	-4.5	Vert
	Ave		+0.5	+0.0	+0.0	+0.0			Y, Hopping		
			+0.0	+0.0	-6.9	+0.3					
^	4564.000M	53.0	+0.9	+4.2	-34.1	+32.5	+0.0	50.4	54.0	-3.6	Vert
			+0.5	+0.0	+0.0	+0.0			Y, Hopping		
			+0.0	+0.0	-6.9	+0.3					
3	3681.967M	54.9	+0.7	+3.7	-34.1	+30.0	+0.0	49.1	54.0	-4.9	Vert
	Ave		+0.5	+0.0	+0.0	+0.0			Y, Hopping		
			+0.0	+0.0	-6.9	+0.3					
^	3682.000M	56.0	+0.7	+3.7	-34.1	+30.0	+0.0	50.2	54.0	-3.8	Vert
			+0.5	+0.0	+0.0	+0.0			Y, Hopping		
			+0.0	+0.0	-6.9	+0.3					
5	348.200M	15.2	+0.2	+0.0	+0.0	+0.0	+0.0	39.1	46.0	-6.9	Horiz
			+0.0	+1.7	+1.2	+14.8					
			+6.0	+0.0	+0.0	+0.0					
6	48.400M	16.2	+0.1	+0.0	+0.0	+0.0	+0.0	32.5	40.0	-7.5	Vert
			+0.0	+0.6	+0.4	+9.2					
			+6.0	+0.0	+0.0	+0.0					
7	2724.000M	54.2	+0.7	+3.0	-34.5	+28.7	+0.0	46.1	54.0	-7.9	Vert
	Ave		+0.4	+0.0	+0.0	+0.0			Y, Low		
			+0.0	+0.0	-6.9	+0.5					
^	2724.000M	57.4	+0.7	+3.0	-34.5	+28.7	+0.0	49.3	54.0	-4.7	Vert
			+0.4	+0.0	+0.0	+0.0			Y, Low		
			+0.0	+0.0	-6.9	+0.5					

9	349.100M	14.0	+0.2	+0.0	+0.0	+0.0	+0.0	37.9	46.0	-8.1	Horiz
	QP		+0.0	+1.7	+1.2	+14.8					
			+6.0	+0.0	+0.0	+0.0					
^	349.100M	16.5	+0.2	+0.0	+0.0	+0.0	+0.0	40.4	46.0	-5.6	Horiz
			+0.0	+1.7	+1.2	+14.8					
			+6.0	+0.0	+0.0	+0.0					
11	348.200M	13.9	+0.2	+0.0	+0.0	+0.0	+0.0	37.8	46.0	-8.2	Vert
			+0.0	+1.7	+1.2	+14.8					
			+6.0	+0.0	+0.0	+0.0					
12	348.654M	13.9	+0.2	+0.0	+0.0	+0.0	+0.0	37.8	46.0	-8.2	Horiz
	QP		+0.0	+1.7	+1.2	+14.8					
			+6.0	+0.0	+0.0	+0.0					
13	3631.860M	51.8	+0.7	+3.7	-34.2	+29.8	+0.0	45.8	54.0	-8.2	Vert
			+0.5	+0.0	+0.0	+0.0			Y, Low		
			+0.0	+0.0	-6.9	+0.4					
14	348.631M	13.9	+0.2	+0.0	+0.0	+0.0	+0.0	37.8	46.0	-8.2	Vert
	QP		+0.0	+1.7	+1.2	+14.8					
			+6.0	+0.0	+0.0	+0.0					
15	7372.000M	43.6	+1.2	+4.7	-34.6	+36.3	+0.0	45.2	54.0	-8.8	Vert
	Ave		+0.6	+0.0	+0.0	+0.0			Y, Hopping		
			+0.0	+0.0	-6.9	+0.3					
16	240.500M	16.6	+0.2	+0.0	+0.0	+0.0	+0.0	36.9	46.0	-9.1	Vert
			+0.0	+1.5	+0.9	+11.7					
			+6.0	+0.0	+0.0	+0.0					
17	244.400M	16.1	+0.2	+0.0	+0.0	+0.0	+0.0	36.7	46.0	-9.3	Vert
			+0.0	+1.5	+0.9	+12.0					
			+6.0	+0.0	+0.0	+0.0					
18	964.100M	8.0	+0.4	+0.0	+0.0	+0.0	+0.0	44.6	54.0	-9.4	Vert
	QP		+0.0	+2.5	+2.2	+25.4					
			+6.1	+0.0	+0.0	+0.0					
^	964.100M	13.6	+0.4	+0.0	+0.0	+0.0	+0.0	50.2	54.0	-3.8	Vert
			+0.0	+2.5	+2.2	+25.4					
			+6.1	+0.0	+0.0	+0.0					
20	2771.540M	52.0	+0.7	+3.0	-34.5	+28.9	+0.0	44.0	54.0	-10.0	Vert
			+0.4	+0.0	+0.0	+0.0			Y, High		
			+0.0	+0.0	-6.9	+0.4					
21	246.300M	15.0	+0.2	+0.0	+0.0	+0.0	+0.0	35.8	46.0	-10.2	Horiz
			+0.0	+1.5	+1.0	+12.1					
			+6.0	+0.0	+0.0	+0.0					
22	4580.020M	45.9	+0.9	+4.2	-34.1	+32.6	+0.0	43.5	54.0	-10.5	Vert
	Ave		+0.5	+0.0	+0.0	+0.0			Y, Mid		
			+0.0	+0.0	-6.9	+0.4					
23	6435.866M	43.2	+1.2	+4.7	-34.2	+34.5	+0.0	43.4	54.0	-10.6	Vert
	Ave		+0.6	+0.0	+0.0	+0.0			Y, Hopping		
			+0.0	+0.0	-6.9	+0.3					
24	7371.967M	41.7	+1.2	+4.7	-34.6	+36.3	+0.0	43.3	54.0	-10.7	Vert
	Ave		+0.6	+0.0	+0.0	+0.0			Y, Hopping		
			+0.0	+0.0	-6.9	+0.3					
25	58.100M	15.7	+0.1	+0.0	+0.0	+0.0	+0.0	29.2	40.0	-10.8	Vert
			+0.0	+0.7	+0.4	+6.3					
			+6.0	+0.0	+0.0	+0.0					

26	97.900M	15.0	+0.1 +0.0 +6.0	+0.0 +1.1 +0.0	+0.0 +0.6 +0.0	+0.0 +9.8 +0.0	+0.0	32.6	43.5	-10.9	Vert
27	247.300M	14.3	+0.2 +0.0 +6.0	+0.0 +1.5 +0.0	+0.0 +1.0 +0.0	+0.0 +12.1 +0.0	+0.0	35.1	46.0	-10.9	Vert
28	243.400M	14.6	+0.2 +0.0 +6.0	+0.0 +1.5 +0.0	+0.0 +0.9 +0.0	+0.0 +11.9 +0.0	+0.0	35.1	46.0	-10.9	Vert
29	2736.983M Ave	50.9	+0.7 +0.4 +0.0	+3.0 +0.0 +0.0	-34.5 +0.0 -6.9	+28.7 +0.0 +0.5	+0.0	42.8	54.0 Y, Hopping	-11.2	Vert
^	2737.000M	56.2	+0.7 +0.4 +0.0	+3.0 +0.0 +0.0	-34.5 +0.0 -6.9	+28.7 +0.0 +0.5	+0.0	48.1	54.0 Y, Hopping	-5.9	Vert
31	48.130M QP	11.8	+0.1 +0.0 +6.0	+0.0 +0.6 +0.0	+0.0 +0.4 +0.0	+0.0 +9.3 +0.0	+0.0	28.2	40.0	-11.8	Vert
32	6436.000M Ave	42.0	+1.2 +0.6 +0.0	+4.7 +0.0 +0.0	-34.2 +0.0 -6.9	+34.5 +0.0 +0.3	+0.0	42.2	54.0 Y, Hopping	-11.8	Vert
33	2747.923M Ave	50.3	+0.7 +0.4 +0.0	+3.0 +0.0 +0.0	-34.5 +0.0 -6.9	+28.8 +0.0 +0.4	+0.0	42.2	54.0 Y, Mid	-11.8	Vert
^	2747.866M	52.4	+0.7 +0.4 +0.0	+3.0 +0.0 +0.0	-34.5 +0.0 -6.9	+28.8 +0.0 +0.4	+0.0	44.3	54.0 Y, Mid	-9.7	Vert
35	4579.713M Ave	44.6	+0.9 +0.5 +0.0	+4.2 +0.0 +0.0	-34.1 +0.0 -6.9	+32.5 +0.0 +0.4	+0.0	42.1	54.0 Y, Mid	-11.9	Vert
^	4579.787M	50.2	+0.9 +0.5 +0.0	+4.2 +0.0 +0.0	-34.1 +0.0 -6.9	+32.6 +0.0 +0.4	+0.0	47.8	54.0 Y, Mid	-6.2	Vert
37	2771.405M Ave	50.0	+0.7 +0.4 +0.0	+3.0 +0.0 +0.0	-34.5 +0.0 -6.9	+28.9 +0.0 +0.4	+0.0	42.0	54.0 Y, High	-12.0	Vert
38	6412.490M	41.3	+1.2 +0.6 +0.0	+4.7 +0.0 +0.0	-34.2 +0.0 -6.9	+34.6 +0.0 +0.3	+0.0	41.6	54.0 Y, Mid	-12.4	Vert
39	8244.490M	38.6	+1.3 +0.7 +0.0	+5.3 +0.0 +0.0	-35.0 +0.0 -6.9	+36.7 +0.0 +0.3	+0.0	41.0	54.0 Y, Mid	-13.0	Vert
40	9160.490M	35.7	+1.4 +0.7 +0.0	+6.1 +0.0 +0.0	-34.7 +0.0 -6.9	+37.7 +0.0 +0.2	+0.0	40.2	54.0 Y, Mid	-13.8	Vert
41	7390.230M	38.5	+1.3 +0.6 +0.0	+4.8 +0.0 +0.0	-34.7 +0.0 -6.9	+36.4 +0.0 +0.2	+0.0	40.2	54.0 Y, High	-13.8	Vert
42	9237.830M	35.6	+1.4 +0.7 +0.0	+6.2 +0.0 +0.0	-34.7 +0.0 -6.9	+37.6 +0.0 +0.2	+0.0	40.1	54.0 Y, High	-13.9	Vert

43	4545.940M	42.6	+0.9 +0.5 +0.0	+4.2 +0.0 +0.0	-34.1 +0.0 -6.9	+32.5 +0.0 +0.3	+0.0	40.0	54.0 Y, Low	-14.0	Vert
44	7328.490M	38.2	+1.2 +0.6 +0.0	+4.7 +0.0 +0.0	-34.6 +0.0 -6.9	+36.2 +0.0 +0.3	+0.0	39.7	54.0 Y, Mid	-14.3	Vert
45	4618.830M	41.8	+0.9 +0.5 +0.0	+4.2 +0.0 +0.0	-34.1 +0.0 -6.9	+32.6 +0.0 +0.5	+0.0	39.5	54.0 Y, High	-14.5	Vert
46	3632.000M Ave	45.3	+0.7 +0.5 +0.0	+3.7 +0.0 +0.0	-34.2 +0.0 -6.9	+29.8 +0.0 +0.4	+0.0	39.3	54.0 Y, Low	-14.7	Vert
47	6466.430M	39.1	+1.2 +0.6 +0.0	+4.6 +0.0 +0.0	-34.2 +0.0 -6.9	+34.5 +0.0 +0.3	+0.0	39.2	54.0 Y, High	-14.8	Vert
48	3663.861M	45.2	+0.7 +0.5 +0.0	+3.7 +0.0 +0.0	-34.2 +0.0 -6.9	+29.9 +0.0 +0.3	+0.0	39.2	54.0 Y, Mid	-14.8	Vert
49	8171.660M	36.6	+1.3 +0.7 +0.0	+5.3 +0.0 +0.0	-35.1 +0.0 -6.9	+36.7 +0.0 +0.3	+0.0	38.9	54.0 Y, Low	-15.1	Vert
50	3695.650M	44.6	+0.7 +0.5 +0.0	+3.7 +0.0 +0.0	-34.1 +0.0 -6.9	+30.1 +0.0 +0.3	+0.0	38.9	54.0 Y, High	-15.1	Vert
51	6350.500M	38.3	+1.3 +0.6 +0.0	+4.7 +0.0 +0.0	-34.2 +0.0 -6.9	+34.7 +0.0 +0.3	+0.0	38.8	54.0 Y, Low	-15.2	Vert
52	6355.980M	38.2	+1.3 +0.6 +0.0	+4.7 +0.0 +0.0	-34.2 +0.0 -6.9	+34.7 +0.0 +0.3	+0.0	38.7	54.0 Y, Low	-15.3	Vert
53	5495.780M	39.4	+1.0 +0.6 +0.0	+4.5 +0.0 +0.0	-34.1 +0.0 -6.9	+33.1 +0.0 +0.3	+0.0	37.9	54.0 Y, Mid	-16.1	Vert
54	4534.500M	40.2	+0.9 +0.5 +0.0	+4.2 +0.0 +0.0	-34.1 +0.0 -6.9	+32.5 +0.0 +0.3	+0.0	37.6	54.0 Y, Low	-16.4	Vert
55	4539.920M	39.6	+0.9 +0.5 +0.0	+4.2 +0.0 +0.0	-34.1 +0.0 -6.9	+32.5 +0.0 +0.3	+0.0	37.0	54.0 Y, Low	-17.0	Vert
56	9079.660M	32.4	+1.3 +0.7 +0.0	+6.1 +0.0 +0.0	-34.7 +0.0 -6.9	+37.7 +0.0 +0.2	+0.0	36.8	54.0 Y, Low	-17.2	Vert
57	1815.780M	47.9	+0.5 +0.3 +0.0	+2.5 +0.0 +0.0	-35.1 +0.0 -6.9	+26.9 +0.0 +0.4	+0.0	36.5	54.0 Y, Low	-17.5	Vert
58	7263.709M Ave	35.0	+1.2 +0.6 +0.0	+4.6 +0.0 +0.0	-34.5 +0.0 -6.9	+35.9 +0.0 +0.3	+0.0	36.2	54.0 Y, Low	-17.8	Vert
^	7263.660M	42.9	+1.2 +0.6 +0.0	+4.6 +0.0 +0.0	-34.5 +0.0 -6.9	+35.9 +0.0 +0.3	+0.0	44.1	54.0 Y, Low	-9.9	Vert

60	5542.630M	36.2	+1.0 +0.6 +0.0	+4.5 +0.0 +0.0	-34.1 +0.0 -6.9	+33.3 +0.0 +0.3	+0.0	34.9	54.0 Y, High	-19.1	Vert
61	1819.000M	45.7	+0.5 +0.3 +0.0	+2.5 +0.0 +0.0	-35.1 +0.0 -6.9	+26.9 +0.0 +0.4	+0.0	34.3	54.0 Y, Hopping	-19.7	Vert
62	1831.802M	45.4	+0.5 +0.3 +0.0	+2.5 +0.0 +0.0	-35.1 +0.0 -6.9	+26.9 +0.0 +0.3	+0.0	33.9	54.0 Y, Mid	-20.1	Vert
63	1847.460M	44.5	+0.5 +0.3 +0.0	+2.5 +0.0 +0.0	-35.1 +0.0 -6.9	+27.0 +0.0 +0.3	+0.0	33.1	54.0 Y, High	-20.9	Vert
64	18.753M	23.0	+0.0 +0.0 +0.0	+0.3 +0.0 +8.4	+0.0 +0.0 +0.0	+0.0 +0.0 +0.0	-40.0	-8.3	29.5	-37.8	Para
65	27.721M	22.1	+0.0 +0.0 +0.0	+0.3 +0.0 +6.3	+0.0 +0.0 +0.0	+0.0 +0.0 +0.0	-40.0	-11.3	29.5	-40.8	Para
66	11.406M	16.3	+0.0 +0.0 +0.0	+0.2 +0.0 +9.0	+0.0 +0.0 +0.0	+0.0 +0.0 +0.0	-40.0	-14.5	29.5	-44.0	Para
67	309.000k	39.8	+0.0 +0.0 +0.0	+0.0 +0.0 +9.6	+0.0 +0.0 +0.0	+0.0 +0.0 +0.0	-80.0	-30.6	17.8	-48.4	Para

Band Edge

Band Edge Summary					
Frequency (MHz)	**Modulation**	**Ant. Type**	**Field Strength (dBuV/m @3m)**	**Limit (dBuV/m @3m)**	**Results**
614	Continuously Transmitting FSK	Integral	38.3	<46	Pass
902	Continuously Transmitting FSK	Integral	57.8	<107	Pass
928	Continuously Transmitting FSK	Integral	57.2	< 107	Pass
960	Continuously Transmitting FSK	Integral	44.8	<54	Pass

Band Edge Summary					
614	**Hopping FSK**	**Integral**	**38.4**	**<46**	**Pass**
902	Hopping FSK	Integral	77.9	<107	Pass
928	Hopping FSK	Integral	76.6	<107	Pass
960	Hopping FSK	Integral	44.9	<54	Pass

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:	**15.247(d) / 15.209 Radiated Spurious Emissions**		
Work Order #:	**99513**	Date:	4/19/2017
Test Type:	**Maximized Emissions**	Time:	14:00:03
Tested By:	Michael Atkinson	Sequence#:	3
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 26°C
Humidity: 31 to 41%
Pressure: 101.0 to 102.5kPa

Frequency Range: Band Edge
Frequency tested: 908, 923.8MHz
Firmware power setting: Max Power
EUT Firmware: 5.71
Protocol /MCS/Modulation: Continuous FSK and Hopping FSK

Antenna type: Internal PIFA
Antenna Gain: 1.2 dBi.

Duty Cycle: 100% (Test Mode)

Test Mode: Continuously transmitting FSK on single channel and Hopping mode both investigated, 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)

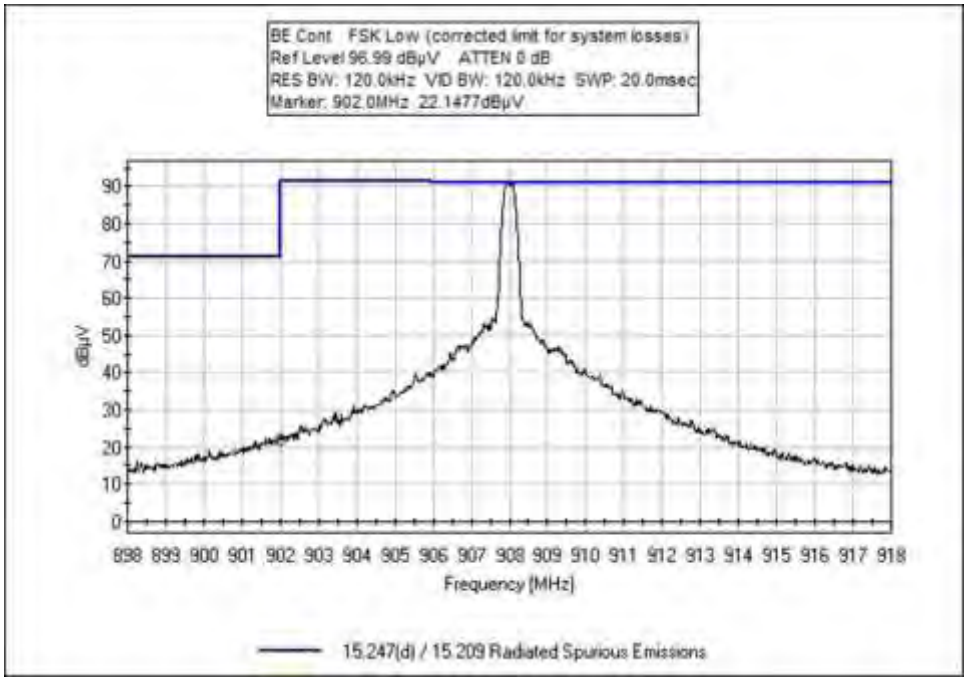
Test Equipment:

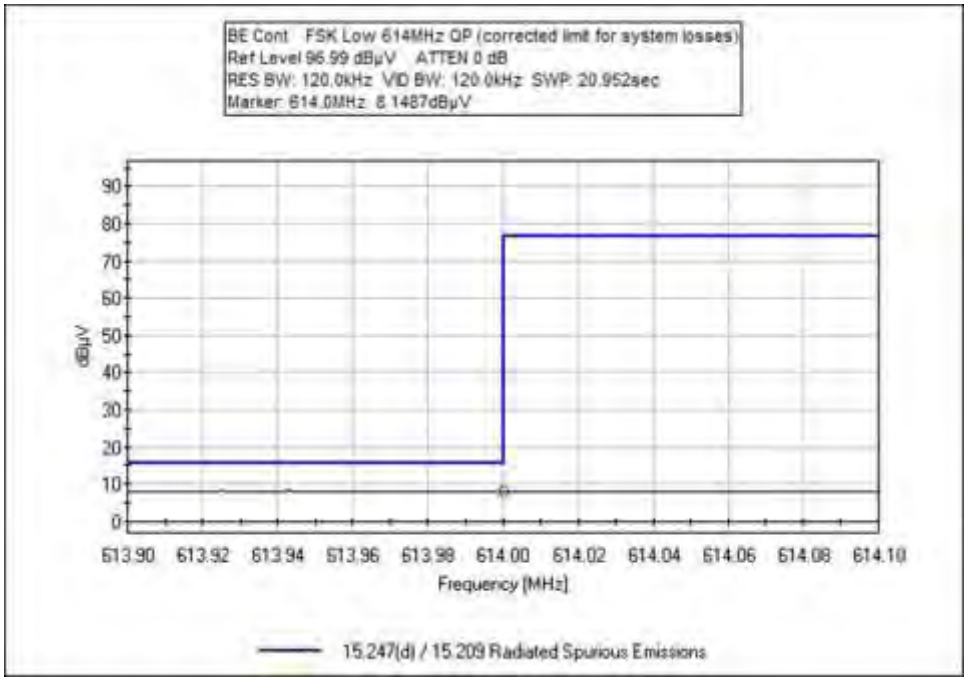
ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02872	Spectrum Analyzer	E4440A	11/18/2015	11/18/2017
T1	ANP06540	Cable	Heliax	10/29/2015	10/29/2017
T2	ANP05963	Cable	RG-214	2/15/2016	2/15/2018
T3	ANP05360	Cable	RG214	11/30/2016	11/30/2018
T4	AN01991	Biconilog Antenna	CBL6111C	3/11/2016	3/11/2018
T5	ANP05657	Attenuator	PE7004-6	12/22/2015	12/22/2017
	AN02307	Preamp	8447D	2/15/2016	2/15/2018
	ANP05747	Attenuator	PE7004-20	1/29/2016	1/29/2018

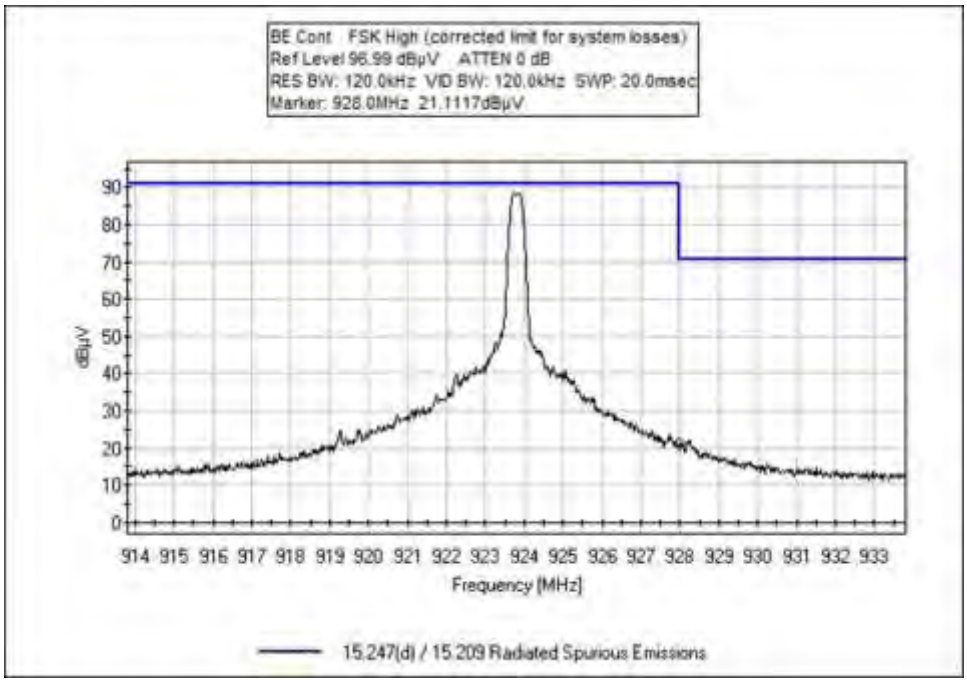
Measurement Data: Reading listed by margin. Test Distance: 3 Meters

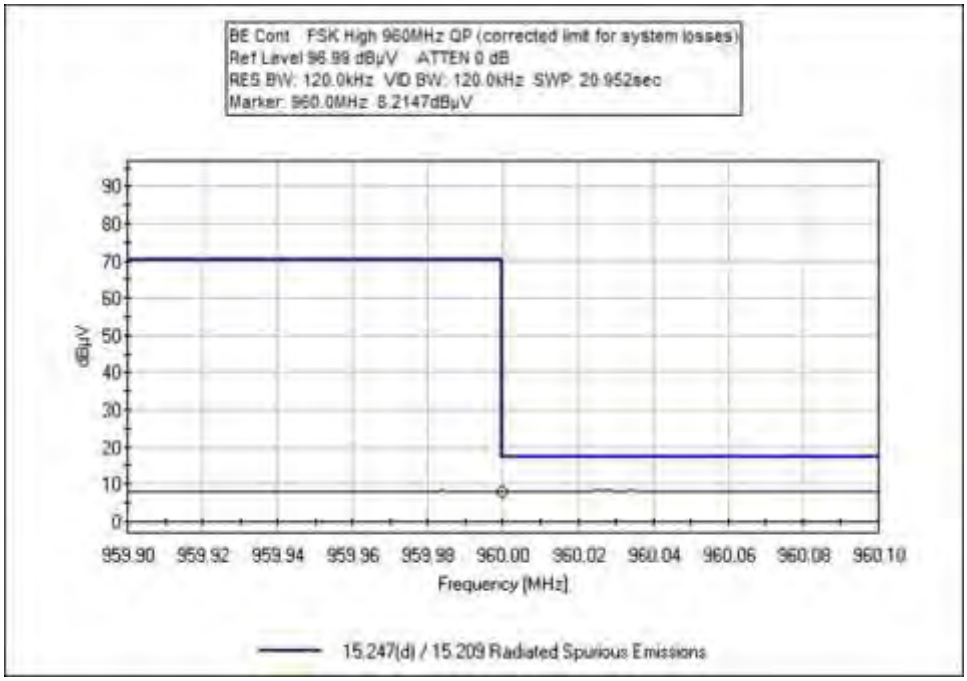
#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	614.000M QP	8.2	+0.3 +6.0	+2.1	+1.6	+20.2	+0.0	38.4	46.0 Hopping FSK (Z)	-7.6	Horiz
2	614.000M QP	8.1	+0.3 +6.0	+2.1	+1.6	+20.2	+0.0	38.3	46.0 Continuous FSK (Z)	-7.7	Vert
3	960.000M QP	8.3	+0.4 +6.1	+2.5	+2.2	+25.4	+0.0	44.9	54.0 Hopping FSK (Z)	-9.1	Horiz
4	960.000M QP	8.2	+0.4 +6.1	+2.5	+2.2	+25.4	+0.0	44.8	54.0 Continuous FSK (Z)	-9.2	Horiz
5	901.900M	42.2	+0.3 +6.0	+2.4	+2.1	+24.9	+0.0	77.9	107.0 Hopping FSK (Z)	-29.1	Horiz
6	928.080M	40.5	+0.4 +6.1	+2.4	+2.1	+25.1	+0.0	76.6	107.0 Hopping FSK (Z)	-30.4	Horiz
7	902.000M	22.1	+0.3 +6.0	+2.4	+2.1	+24.9	+0.0	57.8	107.0 Continuous FSK (Z)	-49.2	Vert
8	928.000M	21.1	+0.4 +6.1	+2.4	+2.1	+25.1	+0.0	57.2	107.0 Continuous FSK (Z)	-49.8	Horiz

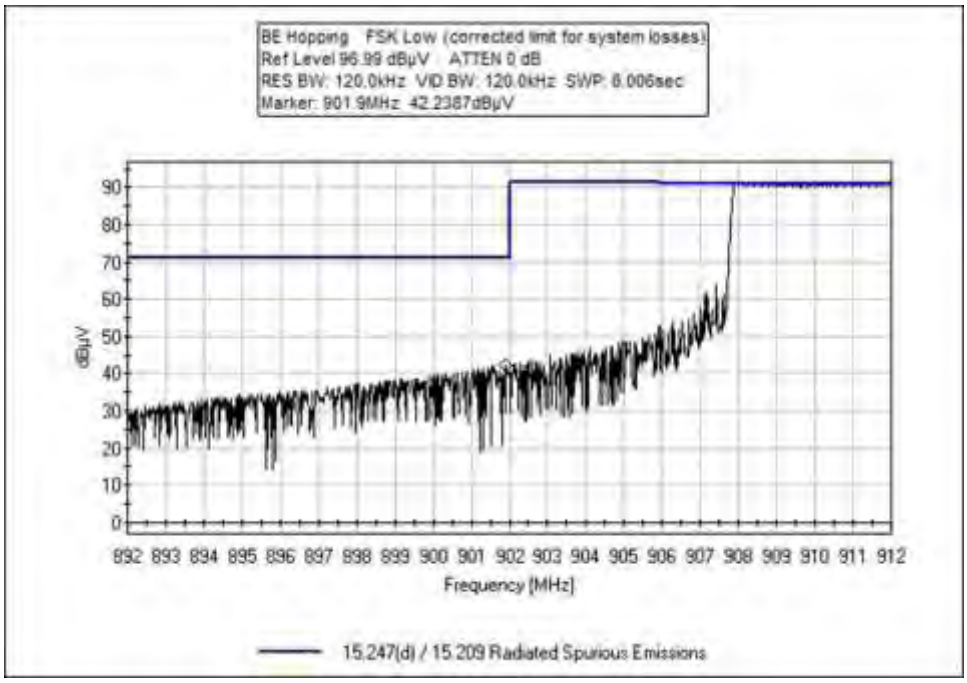
Band Edge Plots

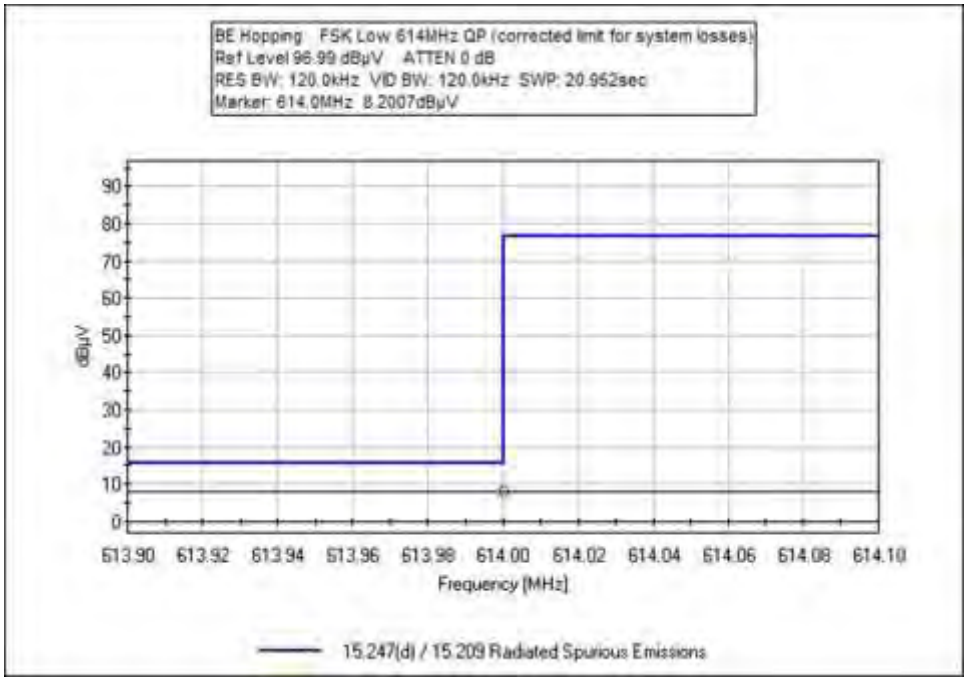


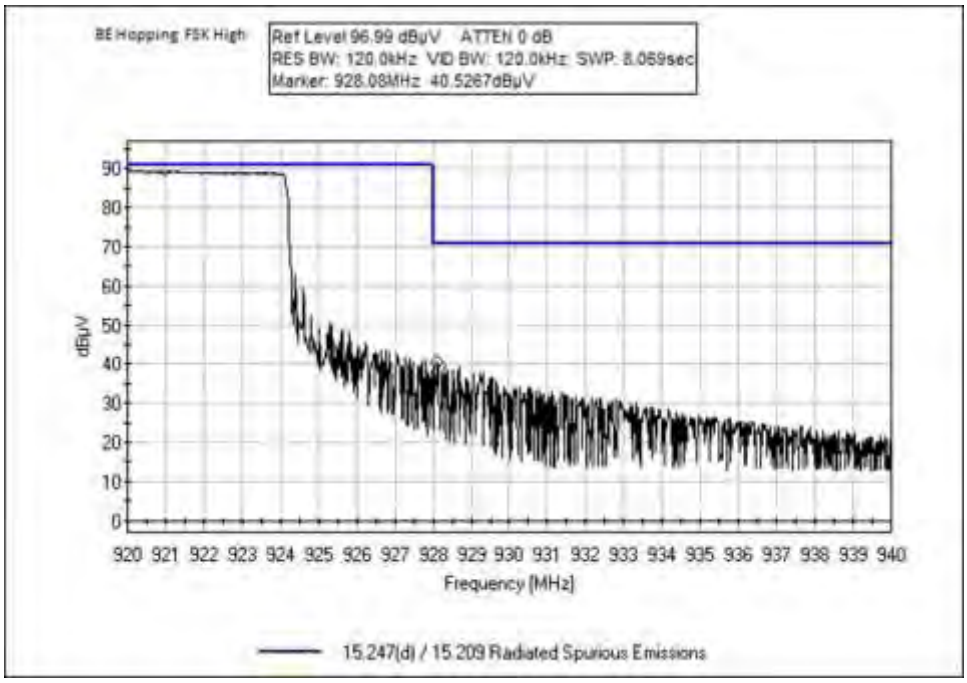


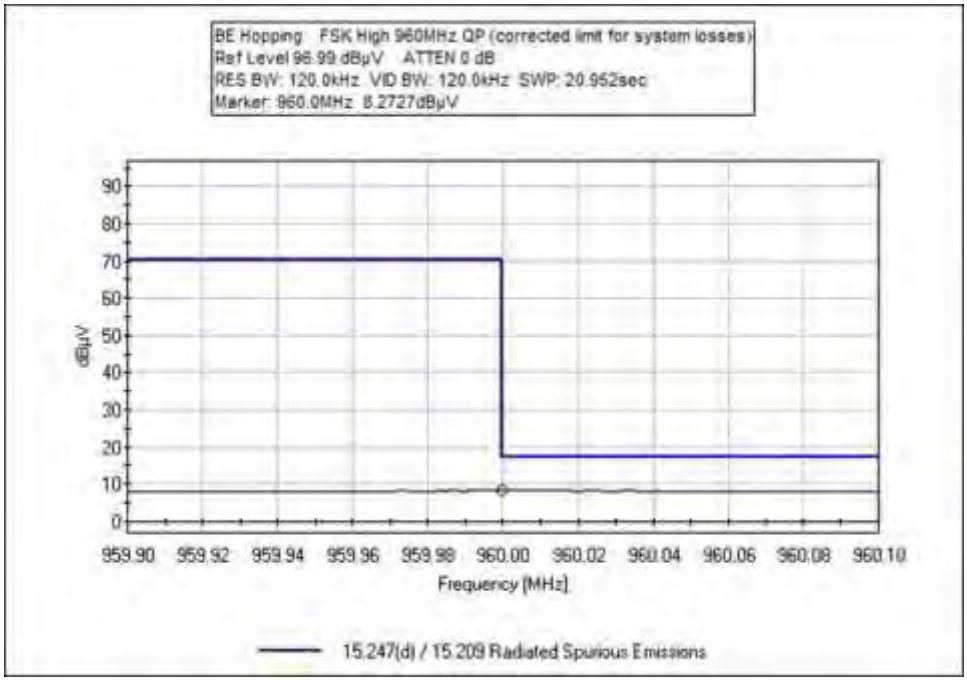

BE Cont FSK High (corrected limit for system losses)
Ref Level 96.99 dBµV ATTEN 0 dB
RES BW: 120.0kHz VID BW: 120.0kHz SWP: 20.0msec
Marker: 926.0MHz 21.1117dBµV
dBµV
90
80
70
60
50
40
30
20
10
0
914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions


BE Cont FSK High 960MHz QP (corrected limit for system losses)
Ref Level 96.99 dBµV ATTEN 0 dB
RES BW: 120.0kHz VID BW: 120.0kHz SWP: 20.952sec
Marker: 960.0MHz 8.2147dBµV
dBµV
90
80
70
60
50
40
30
20
10
0
959.90 959.92 959.94 959.96 959.98 960.00 960.02 960.04 960.06 960.08 960.10
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions


BE Hopping FSK Low (corrected limit for system losses)
Ref Level 96.99 dBµV ATTEN 0 dB
RES BW: 120.0kHz VID BW: 120.0kHz SWP: 6.006sec
Marker: 901.9MHz 42.2387dBµV
dBµV
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions


BE Hopping FSK Low 614MHz QP (corrected limit for system losses)
Ref Level 96.99 dBµV ATTEN 0 dB
RES BW: 120.0kHz VID BW: 120.0kHz SWP: 20.952sec
Marker: 614.0MHz 8.2007dBµV
dBµV
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions


BE Hopping FSK High
Ref Level 96.99 dBµV ATTEN 0 dB
RES BW: 120.0kHz VID BW: 120.0kHz SWP: 8.059sec
Marker: 928.08MHz 40.5267dBµV
dBµV
Frequency (MHz)
15.247(d) / 15.209 Radiated Spurious Emissions


BE Hopping FSK High 960MHz QP (corrected limit for system losses)
Ref Level 96.99 dBµV ATTEN 0 dB
RES BW: 120.0kHz VID BW: 120.0kHz SWP: 20.952sec
Marker: 960.0MHz 8.2727dBµV
dBµV
Frequency (MHz)
15.247(d) / 15.209 Radiated Spurious Emissions

Test Setup Photos

Below 1GHz

Above 1GHz

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 #:	**99513**	Date:	4/11/2017
Test Type:	**Conducted Emissions**	Time:	10:18:09
Tested By:	Michael Atkinson	Sequence#:	10
Software:	EMITest 5.03.02		115VAC 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

Test Conditions / Notes:

Temperature: 22°C
Humidity: 30%
Pressure: 102.2kPa

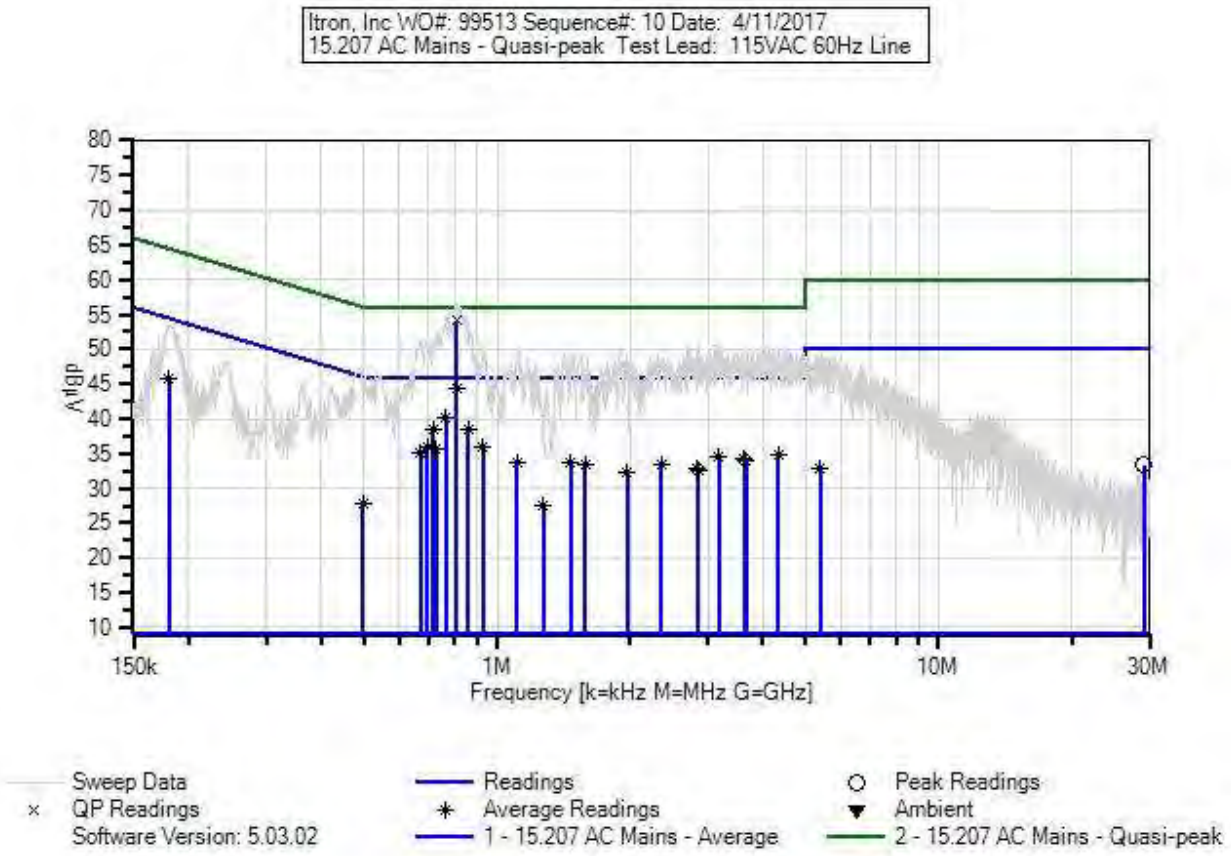
Frequency Range: 0.15-30MHz

Frequency tested: 916MHz
Firmware power setting: Max User Allowed
EUT Firmware: 5.71
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 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#: 99513 Sequence#: 10 Date: 4/11/2017
15.207 AC Mains - Quasi-peak Test Lead: 115VAC 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
	AN02872	Spectrum Analyzer	E4440A	11/18/2015	11/18/2017
T1	ANP06540	Cable	Heliax	10/29/2015	10/29/2017
T2	ANP05305	Cable	ETSI-50T	2/15/2016	2/15/2018
T3	AN02611	High Pass Filter	HE9615-150K-50-720B	2/18/2016	2/18/2018
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	dBµV	dB	dB	dB	dB	Table	dBµV	dBµV	dB	Ant
1	808.642k	34.5	+0.0 +0.4	+0.1	+0.2	+9.1	+0.0	44.3	46.0	-1.7	Line
	Ave										
2	808.642k	44.4	+0.0 +0.4	+0.1	+0.2	+9.1	+0.0	54.2	56.0	-1.8	Line
	QP										
^	808.641k	46.7	+0.0 +0.4	+0.1	+0.2	+9.1	+0.0	56.5	56.0	+0.5	Line
4	767.037k	30.3	+0.0 +0.4	+0.1	+0.2	+9.1	+0.0	40.1	46.0	-5.9	Line
	Ave										
^	767.036k	44.8	+0.0 +0.4	+0.1	+0.2	+9.1	+0.0	54.6	56.0	-1.4	Line
6	714.932k	28.7	+0.0 +0.4	+0.1	+0.2	+9.1	+0.0	38.5	46.0	-7.5	Line
	Ave										
^	714.932k	41.5	+0.0 +0.4	+0.1	+0.2	+9.1	+0.0	51.3	56.0	-4.7	Line
8	861.033k	28.7	+0.0 +0.4	+0.1	+0.2	+9.1	+0.0	38.5	46.0	-7.5	Line
	Ave										
^	861.032k	44.1	+0.0 +0.4	+0.1	+0.2	+9.1	+0.0	53.9	56.0	-2.1	Line
10	180.310k	34.8	+0.0 +1.5	+0.0	+0.3	+9.1	+0.0	45.7	54.5	-8.8	Line
	Ave										
^	180.310k	41.6	+0.0 +1.5	+0.0	+0.3	+9.1	+0.0	52.5	64.5	-12.0	Line
12	694.673k	26.2	+0.0 +0.4	+0.1	+0.2	+9.1	+0.0	36.0	46.0	-10.0	Line
	Ave										
^	694.672k	42.6	+0.0 +0.4	+0.1	+0.2	+9.1	+0.0	52.4	56.0	-3.6	Line
14	929.400k	26.2	+0.0 +0.4	+0.1	+0.2	+9.1	+0.0	36.0	46.0	-10.0	Line
	Ave										
^	929.400k	40.3	+0.0 +0.4	+0.1	+0.2	+9.1	+0.0	50.1	56.0	-5.9	Line

16 Ave	727.028k	26.0	+0.0 +0.4	+0.1	+0.2	+9.1	+0.0	35.8	46.0	-10.2	Line
^	727.027k	42.5	+0.0 +0.4	+0.1	+0.2	+9.1	+0.0	52.3	56.0	-3.7	Line
18 Ave	671.692k	25.4	+0.0 +0.4	+0.1	+0.2	+9.1	+0.0	35.2	46.0	-10.8	Line
^	671.691k	41.7	+0.0 +0.4	+0.1	+0.2	+9.1	+0.0	51.5	56.0	-4.5	Line
20 Ave	4.323M	25.0	+0.0 +0.4	+0.1	+0.1	+9.1	+0.0	34.7	46.0	-11.3	Line
^	4.323M	40.8	+0.0 +0.4	+0.1	+0.1	+9.1	+0.0	50.5	56.0	-5.5	Line
22 Ave	3.175M	24.7	+0.0 +0.4	+0.1	+0.1	+9.1	+0.0	34.4	46.0	-11.6	Line
^	3.175M	41.0	+0.0 +0.4	+0.1	+0.1	+9.1	+0.0	50.7	56.0	-5.3	Line
24 Ave	3.631M	24.5	+0.0 +0.4	+0.1	+0.1	+9.1	+0.0	34.2	46.0	-11.8	Line
^	3.631M	40.8	+0.0 +0.4	+0.1	+0.1	+9.1	+0.0	50.5	56.0	-5.5	Line
26 Ave	3.656M	24.3	+0.0 +0.4	+0.1	+0.1	+9.1	+0.0	34.0	46.0	-12.0	Line
^	3.656M	40.8	+0.0 +0.4	+0.1	+0.1	+9.1	+0.0	50.5	56.0	-5.5	Line
28 Ave	1.468M	23.9	+0.0 +0.4	+0.1	+0.2	+9.1	+0.0	33.7	46.0	-12.3	Line
^	1.468M	39.6	+0.0 +0.4	+0.1	+0.2	+9.1	+0.0	49.4	56.0	-6.6	Line
30 Ave	1.112M	23.8	+0.0 +0.4	+0.1	+0.2	+9.1	+0.0	33.6	46.0	-12.4	Line
^	1.112M	39.6	+0.0 +0.4	+0.1	+0.2	+9.1	+0.0	49.4	56.0	-6.6	Line
32 Ave	2.360M	23.6	+0.0 +0.4	+0.1	+0.1	+9.1	+0.0	33.3	46.0	-12.7	Line
^	2.360M	40.5	+0.0 +0.4	+0.1	+0.1	+9.1	+0.0	50.2	56.0	-5.8	Line
34 Ave	1.584M	23.5	+0.0 +0.4	+0.1	+0.2	+9.1	+0.0	33.3	46.0	-12.7	Line
^	1.584M	41.5	+0.0 +0.4	+0.1	+0.2	+9.1	+0.0	51.3	56.0	-4.7	Line
36 Ave	2.843M	23.1	+0.0 +0.4	+0.1	+0.1	+9.1	+0.0	32.8	46.0	-13.2	Line
^	2.843M	41.0	+0.0 +0.4	+0.1	+0.1	+9.1	+0.0	50.7	56.0	-5.3	Line
38 Ave	2.861M	22.9	+0.0 +0.4	+0.1	+0.1	+9.1	+0.0	32.6	46.0	-13.4	Line
^	2.861M	41.0	+0.0 +0.4	+0.1	+0.1	+9.1	+0.0	50.7	56.0	-5.3	Line
40 Ave	1.968M	22.7	+0.0 +0.4	+0.1	+0.1	+9.1	+0.0	32.4	46.0	-13.6	Line
^	1.968M	40.0	+0.0 +0.4	+0.1	+0.1	+9.1	+0.0	49.7	56.0	-6.3	Line

42	5.387M Ave	23.0	+0.0 +0.5	+0.1	+0.1	+9.1	+0.0	32.8	50.0	-17.2	Line
^	5.387M	40.1	+0.0 +0.5	+0.1	+0.1	+9.1	+0.0	49.9	60.0	-10.1	Line
44	495.600k Ave	18.0	+0.0 +0.5	+0.0	+0.2	+9.1	+0.0	27.8	46.1	-18.3	Line
^	495.600k	38.2	+0.0 +0.5	+0.0	+0.2	+9.1	+0.0	48.0	56.1	-8.1	Line
46	1.272M Ave	17.8	+0.0 +0.4	+0.1	+0.2	+9.1	+0.0	27.6	46.0	-18.4	Line
^	1.272M	38.2	+0.0 +0.4	+0.1	+0.2	+9.1	+0.0	48.0	56.0	-8.0	Line
48	29.210M	23.3	+0.0 +0.5	+0.3	+0.2	+9.1	+0.0	33.4	60.0	-26.6	Line

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 #:	**99513**	Date:	4/11/2017
Test Type:	**Conducted Emissions**	Time:	10:36:36
Tested By:	Michael Atkinson	Sequence#:	11
Software:	EMITest 5.03.02		115VAC 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

Test Conditions / Notes:

Temperature: 22°C
Humidity: 30%
Pressure: 102.2kPa

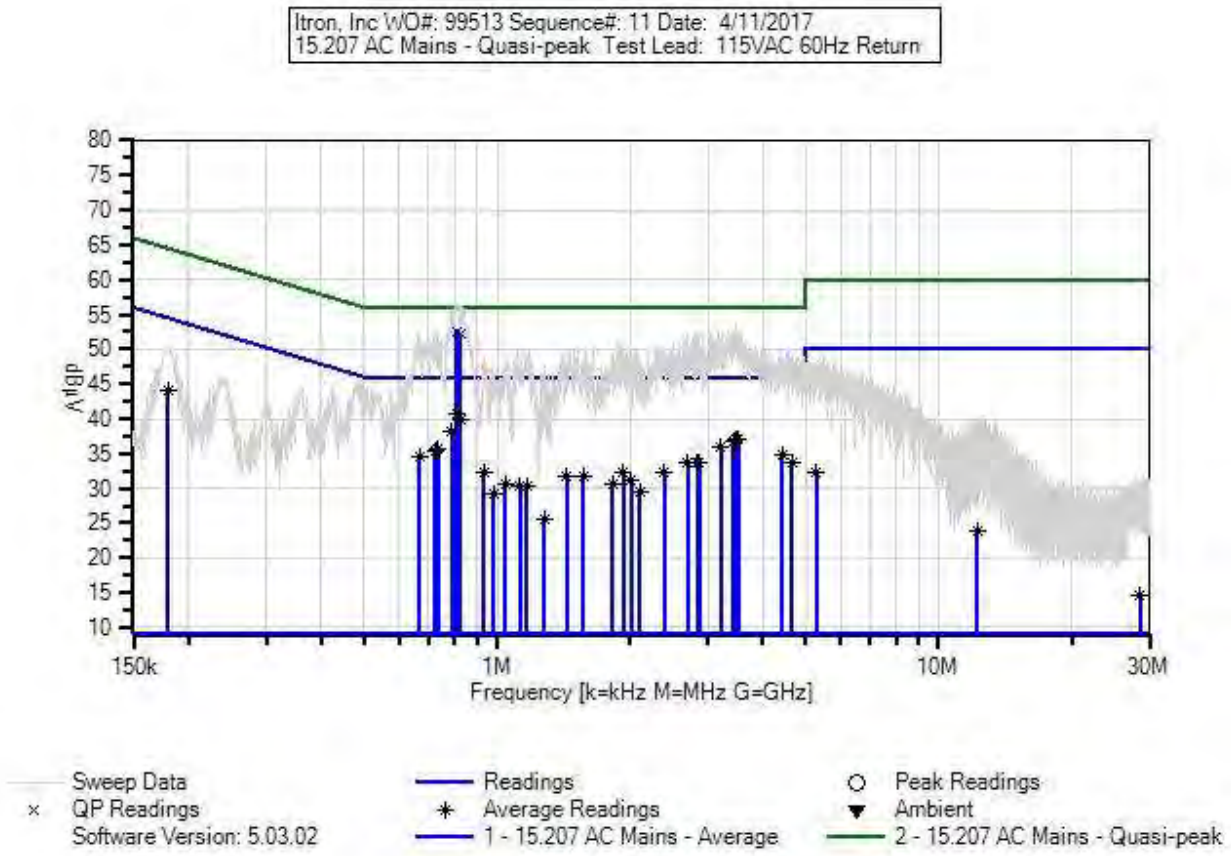
Frequency Range: 0.15-30MHz

Frequency tested: 916MHz
Firmware power setting: Max User Allowed
EUT Firmware: 5.71
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 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#: 99513 Sequence#: 11 Date: 4/11/2017
15.207 AC Mains - Quasi-peak Test Lead: 115VAC 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
	AN02872	Spectrum Analyzer	E4440A	11/18/2015	11/18/2017
T1	ANP06540	Cable	Heliax	10/29/2015	10/29/2017
T2	ANP05305	Cable	ETSI-50T	2/15/2016	2/15/2018
T3	AN02611	High Pass Filter	HE9615-150K-50-720B	2/18/2016	2/18/2018
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	808.642k	42.7	+0.0 +0.4	+0.1	+0.2	+9.1	+0.0	52.5	56.0	-3.5	Retur
	QP										
2	824.075k	42.4	+0.0 +0.4	+0.1	+0.2	+9.1	+0.0	52.2	56.0	-3.8	Retur
	QP										
3	808.642k	30.8	+0.0 +0.4	+0.1	+0.2	+9.1	+0.0	40.6	46.0	-5.4	Retur
	Ave										
^	808.641k	47.0	+0.0 +0.4	+0.1	+0.2	+9.1	+0.0	56.8	56.0	+0.8	Retur
5	824.075k	30.1	+0.0 +0.4	+0.1	+0.2	+9.1	+0.0	39.9	46.0	-6.1	Retur
	Ave										
6	790.664k	28.4	+0.0 +0.4	+0.1	+0.2	+9.1	+0.0	38.2	46.0	-7.8	Retur
	Ave										
^	790.664k	45.8	+0.0 +0.4	+0.1	+0.2	+9.1	+0.0	55.6	56.0	-0.4	Retur
8	3.479M	27.5	+0.0 +0.4	+0.1	+0.1	+9.1	+0.0	37.2	46.0	-8.8	Retur
	Ave										
^	3.479M	44.2	+0.0 +0.4	+0.1	+0.1	+9.1	+0.0	53.9	56.0	-2.1	Retur
10	3.526M	27.3	+0.0 +0.4	+0.1	+0.1	+9.1	+0.0	37.0	46.0	-9.0	Retur
	Ave										
^	3.526M	43.1	+0.0 +0.4	+0.1	+0.1	+9.1	+0.0	52.8	56.0	-3.2	Retur
12	3.428M	27.2	+0.0 +0.4	+0.1	+0.1	+9.1	+0.0	36.9	46.0	-9.1	Retur
	Ave										
^	3.428M	43.7	+0.0 +0.4	+0.1	+0.1	+9.1	+0.0	53.4	56.0	-2.6	Retur
^	3.428M	43.3	+0.0 +0.4	+0.1	+0.1	+9.1	+0.0	53.0	56.0	-3.0	Retur
15	3.216M	26.3	+0.0 +0.4	+0.1	+0.1	+9.1	+0.0	36.0	46.0	-10.0	Retur
	Ave										
^	3.216M	42.9	+0.0 +0.4	+0.1	+0.1	+9.1	+0.0	52.6	56.0	-3.4	Retur
17	733.680k	26.0	+0.0 +0.4	+0.1	+0.2	+9.1	+0.0	35.8	46.0	-10.2	Retur
	Ave										
^	733.680k	42.7	+0.0 +0.4	+0.1	+0.2	+9.1	+0.0	52.5	56.0	-3.5	Retur

19 Ave	179.560k	33.2	+0.0 +1.5	+0.0	+0.3	+9.1	+0.0	44.1	54.5	-10.4	Retur
^	179.560k	39.3	+0.0 +1.5	+0.0	+0.3	+9.1	+0.0	50.2	64.5	-14.3	Retur
21 Ave	724.911k	25.6	+0.0 +0.4	+0.1	+0.2	+9.1	+0.0	35.4	46.0	-10.6	Retur
^	724.911k	42.9	+0.0 +0.4	+0.1	+0.2	+9.1	+0.0	52.7	56.0	-3.3	Retur
23 Ave	4.428M	25.0	+0.0 +0.5	+0.1	+0.1	+9.1	+0.0	34.8	46.0	-11.2	Retur
^	4.428M	40.5	+0.0 +0.5	+0.1	+0.1	+9.1	+0.0	50.3	56.0	-5.7	Retur
25 Ave	665.947k	24.6	+0.0 +0.4	+0.1	+0.2	+9.1	+0.0	34.4	46.0	-11.6	Retur
^	665.946k	42.6	+0.0 +0.4	+0.1	+0.2	+9.1	+0.0	52.4	56.0	-3.6	Retur
27 Ave	4.652M	23.9	+0.0 +0.5	+0.1	+0.1	+9.1	+0.0	33.7	46.0	-12.3	Retur
^	4.652M	39.2	+0.0 +0.5	+0.1	+0.1	+9.1	+0.0	49.0	56.0	-7.0	Retur
29 Ave	2.840M	24.0	+0.0 +0.4	+0.1	+0.1	+9.1	+0.0	33.7	46.0	-12.3	Retur
^	2.840M	42.7	+0.0 +0.4	+0.1	+0.1	+9.1	+0.0	52.4	56.0	-3.6	Retur
31 Ave	2.874M	23.9	+0.0 +0.4	+0.1	+0.1	+9.1	+0.0	33.6	46.0	-12.4	Retur
^	2.874M	43.0	+0.0 +0.4	+0.1	+0.1	+9.1	+0.0	52.7	56.0	-3.3	Retur
33 Ave	2.705M	23.9	+0.0 +0.4	+0.1	+0.1	+9.1	+0.0	33.6	46.0	-12.4	Retur
^	2.705M	42.5	+0.0 +0.4	+0.1	+0.1	+9.1	+0.0	52.2	56.0	-3.8	Retur
35 Ave	2.387M	22.7	+0.0 +0.4	+0.1	+0.1	+9.1	+0.0	32.4	46.0	-13.6	Retur
^	2.387M	42.8	+0.0 +0.4	+0.1	+0.1	+9.1	+0.0	52.5	56.0	-3.5	Retur
37 Ave	932.100k	22.5	+0.0 +0.4	+0.1	+0.2	+9.1	+0.0	32.3	46.0	-13.7	Retur
^	932.100k	39.9	+0.0 +0.4	+0.1	+0.2	+9.1	+0.0	49.7	56.0	-6.3	Retur
39 Ave	1.934M	22.5	+0.0 +0.4	+0.1	+0.2	+9.1	+0.0	32.3	46.0	-13.7	Retur
^	1.934M	40.6	+0.0 +0.4	+0.1	+0.2	+9.1	+0.0	50.4	56.0	-5.6	Retur
41 Ave	1.571M	21.9	+0.0 +0.4	+0.1	+0.2	+9.1	+0.0	31.7	46.0	-14.3	Retur
^	1.571M	41.7	+0.0 +0.4	+0.1	+0.2	+9.1	+0.0	51.5	56.0	-4.5	Retur
43 Ave	1.438M	21.8	+0.0 +0.4	+0.1	+0.2	+9.1	+0.0	31.6	46.0	-14.4	Retur
^	1.438M	41.6	+0.0 +0.4	+0.1	+0.2	+9.1	+0.0	51.4	56.0	-4.6	Retur

45 Ave	2.007M	21.5	+0.0 +0.4	+0.1	+0.1	+9.1	+0.0	31.2	46.0	-14.8	Retur
^	2.007M	41.5	+0.0 +0.4	+0.1	+0.1	+9.1	+0.0	51.2	56.0	-4.8	Retur
47 Ave	1.045M	20.7	+0.0 +0.4	+0.1	+0.2	+9.1	+0.0	30.5	46.0	-15.5	Retur
^	1.045M	40.0	+0.0 +0.4	+0.1	+0.2	+9.1	+0.0	49.8	56.0	-6.2	Retur
49 Ave	1.821M	20.8	+0.0 +0.4	+0.1	+0.1	+9.1	+0.0	30.5	46.0	-15.5	Retur
^	1.821M	40.5	+0.0 +0.4	+0.1	+0.1	+9.1	+0.0	50.2	56.0	-5.8	Retur
51 Ave	1.127M	20.6	+0.0 +0.4	+0.1	+0.2	+9.1	+0.0	30.4	46.0	-15.6	Retur
^	1.127M	41.9	+0.0 +0.4	+0.1	+0.2	+9.1	+0.0	51.7	56.0	-4.3	Retur
53 Ave	1.168M	20.5	+0.0 +0.4	+0.1	+0.2	+9.1	+0.0	30.3	46.0	-15.7	Retur
^	1.168M	41.6	+0.0 +0.4	+0.1	+0.2	+9.1	+0.0	51.4	56.0	-4.6	Retur
55 Ave	2.110M	19.7	+0.0 +0.4	+0.1	+0.1	+9.1	+0.0	29.4	46.0	-16.6	Retur
^	2.110M	39.8	+0.0 +0.4	+0.1	+0.1	+9.1	+0.0	49.5	56.0	-6.5	Retur
57 Ave	980.200k	19.3	+0.0 +0.4	+0.1	+0.2	+9.1	+0.0	29.1	46.0	-16.9	Retur
^	980.200k	37.8	+0.0 +0.4	+0.1	+0.2	+9.1	+0.0	47.6	56.0	-8.4	Retur
59 Ave	5.297M	22.5	+0.0 +0.5	+0.1	+0.1	+9.1	+0.0	32.3	50.0	-17.7	Retur
^	5.297M	39.3	+0.0 +0.5	+0.1	+0.1	+9.1	+0.0	49.1	60.0	-10.9	Retur
61 Ave	1.280M	15.8	+0.0 +0.4	+0.1	+0.2	+9.1	+0.0	25.6	46.0	-20.4	Retur
^	1.280M	39.3	+0.0 +0.4	+0.1	+0.2	+9.1	+0.0	49.1	56.0	-6.9	Retur
63 Ave	12.200M	14.0	+0.0 +0.5	+0.2	+0.1	+9.1	+0.0	23.9	50.0	-26.1	Retur
^	12.200M	30.6	+0.0 +0.5	+0.2	+0.1	+9.1	+0.0	40.5	60.0	-19.5	Retur
65 Ave	28.600M	4.5	+0.0 +0.4	+0.3	+0.2	+9.1	+0.0	14.5	50.0	-35.5	Retur
^	28.600M	20.7	+0.0 +0.4	+0.3	+0.2	+9.1	+0.0	30.7	60.0	-29.3	Retur

Test Setup Photo

SUPPLEMENTAL INFORMATION

Measurement Uncertainty

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

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

Emissions Test Details

TESTING PARAMETERS

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

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

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

CORRECTION FACTORS

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

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

TEST INSTRUMENTATION AND ANALYZER SETTINGS

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

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

SPECTRUM ANALYZER/RECEIVER DETECTOR FUNCTIONS

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

Peak

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

Quasi-Peak

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

Average

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