Itron, Inc.

TEST REPORT FOR

AMR Transceiver Device For Communicating With Utility Meters
Model: IMRB

Tested to The Following Standards:

FCC Part 15 Subpart C Section(s)

15.207 & 15.247
(FHSS 902-928 MHz)

Report No.: 102206-4

Date of issue: March 25, 2019

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

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

Test Certificate # 803.05

Testing the Future
CKC LABORATORIES, INC.

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ADMINISTRATIVE INFORMATION

Test Report Information

REPORT PREPARED FOR:

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

Representative: Jay Holcomb
Customer Reference Number: 170692

REPORT PREPARED BY:

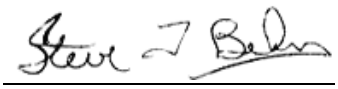
Terri Rayle
CKC Laboratories, Inc.
5046 Sierra Pines Drive
Mariposa, CA 95338

Project Number: 102206

DATE OF EQUIPMENT RECEIPT: February 1, 2019
DATE(S) OF TESTING: February 1-8, 2019

Report Authorization

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



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

Test Facility Information

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

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

Software Versions

CKC Laboratories Proprietary Software	Version
EMITest Emissions	5.03.11

Site Registration & Accreditation Information

Location	*NIST CB #	FCC	JAPAN
Canyon Park, Bothell, WA	US0081	US1022	A-0148

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

SUMMARY OF RESULTS

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

ISO/IEC 17025 Decision Rule
The declaration of pass or fail herein is based upon assessment to the specification(s) listed above, including where applicable, assessment of measurement uncertainties. For performance related tests, equipment was monitored for specified criteria identified in that section of testing.

Modifications During Testing

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

Summary of Conditions
No modifications were made during testing.

Modifications listed above must be incorporated into all production units.

Conditions During Testing

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

Summary of Conditions
The device tested in this report is for the External Antenna version of model IMRB. The Internal Antenna version on the IMRB has been previously tested in a separate report.

EQUIPMENT UNDER TEST (EUT)

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

Configuration 1

Equipment Tested:

Device	Manufacturer	Model #	S/N
AMR Transceiver Device For Communicating With Utility Meters	Itron, Inc.	IMRB	66031570

Support Equipment:

Device	Manufacturer	Model #	S/N
Laptop	Dell	E6410	3XG40P1
AC Adapter for Laptop	Dell	DA130PE1-00	NA
Power Supply	Triad	WDU12-1200	NA

Configuration 2

Equipment Tested:

Device	Manufacturer	Model #	S/N
AMR Transceiver Device For Communicating With Utility Meters	Itron, Inc.	IMRB	66031570

Support Equipment:

Device	Manufacturer	Model #	S/N
Laptop	Dell	E6410	3XG40P1
AC Adapter for Laptop	Dell	DA130PE1-00	NA
Power Supply	Triad	WDU12-1200	NA
External Monopole Vehicle Mounted Antenna- 5dBi	PCTel	Z3182	NA

Configuration 3

Equipment Tested:

Device	Manufacturer	Model #	S/N
AMR Transceiver Device For Communicating With Utility Meters	Itron, Inc.	IMRB	66031570

Support Equipment:

Device	Manufacturer	Model #	S/N
Laptop	Dell	E6410	3XG40P1
AC Adapter for Laptop	Dell	DA130PE1-00	NA
Power Supply	Triad	WDU12-1200	NA
External Monopole Attached Antenna – 3dBi	L-Com	HG903RD-RSP	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% (100% tested as worst case)
Number of TX Chains:	1
Antenna Type(s) and Gain:	External Monopole Vehicle Mounted, 5dBi gain and External Monopole Attached, 3dBi gain
Beamforming Type:	N/A
Antenna Connection Type:	External Connector
Nominal Input Voltage:	12VDC Nominal (7 to 18VDC), 120VAC 60Hz through AC Adapter
Firmware / Software used for Test:	DSP Version 85.75.00.02/FPGA Version 3.02 / MC3 Test v4.0.2.2

FCC Part 15 Subpart C

15.247(a) Transmitter Characteristics

Test Setup/Conditions			
Test Location:	Bothell Lab C3	Test Engineer:	M. Atkinson
Test Method:	ANSI C63.10 (2013)	Test Date(s):	2/1/2019
Configuration:	1		
Test Setup:	Frequency Range: 908-923.8 Frequency tested: 908, 916, 923.8MHz Firmware power setting: Max Power Protocol /MCS/Modulation: FSK Duty Cycle: 100% (Test Mode) Test Mode: Continuously transmitting Test Setup: EUT is transmitting through the antenna port connector and is attached to the spectrum analyzer.		

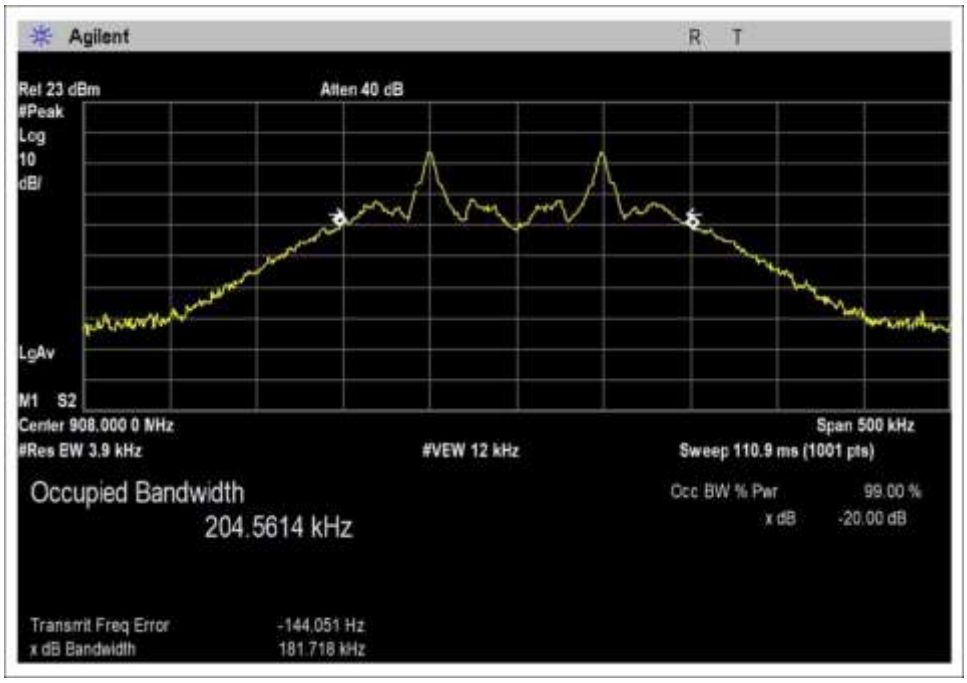
Environmental Conditions			
Temperature (ºC)	20-23	Relative Humidity (%):	25-35

Test Equipment					
Asset#	**Description**	**Manufacturer**	**Model**	**Cal Date**	**Cal Due**
02872	Spectrum Analyzer	Agilent	E4440A	11/3/2017	11/3/2019
P07229	Attenuator	Pasternack	PE7004-20	12/1/2017	12/1/2019
P06927	Cable	Andrews	Heliax 1/4	8/28/2018	8/28/2020

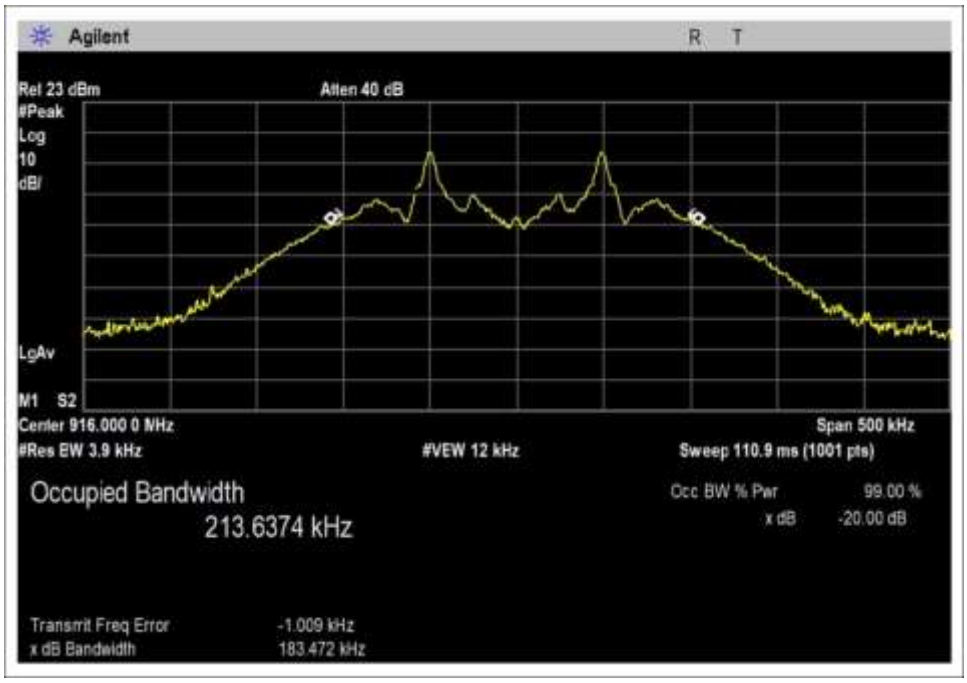
15.247(a)(1)(i) 20 dB Bandwidth

Test Data Summary					
Frequency (MHz)	**Antenna Port**	**Modulation**	**Measured (kHz)**	**Limit (kHz)**	**Results**
908	1	FSK	181.718	≤500	Pass
916	1	FSK	183.742	≤500	Pass
923.8	1	FSK	182.424	≤500	Pass

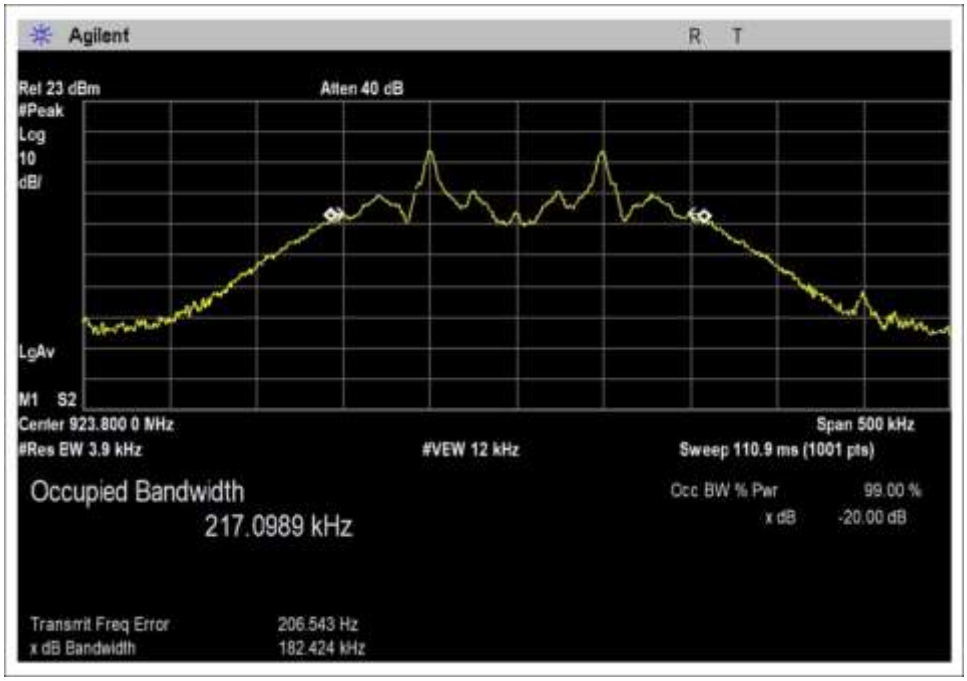
Plot(s)



Low Channel



Middle Channel

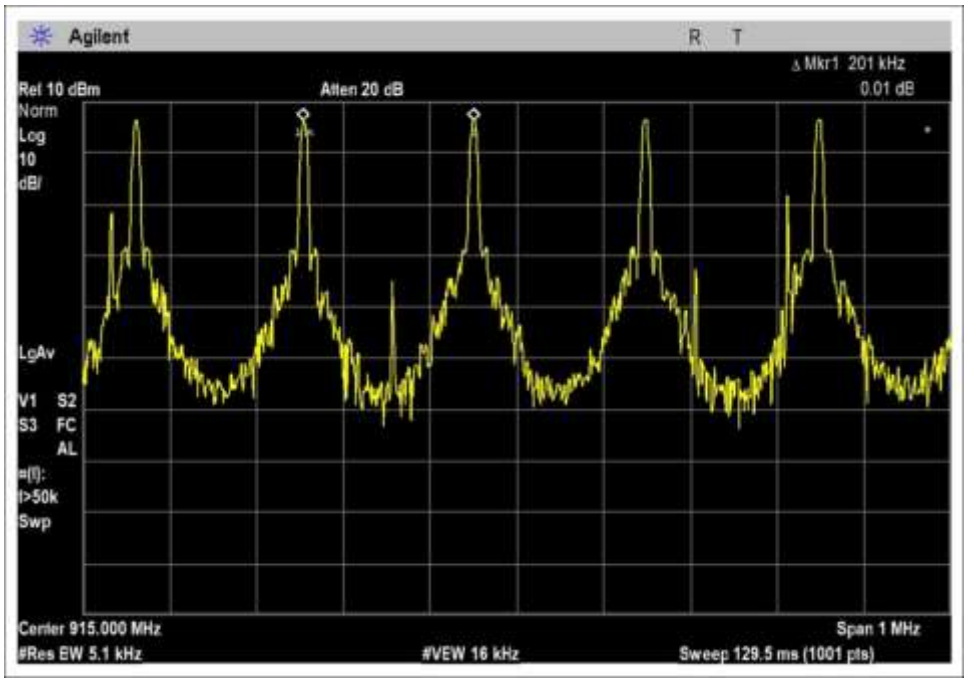


High Channel

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	201	>183.412	Pass

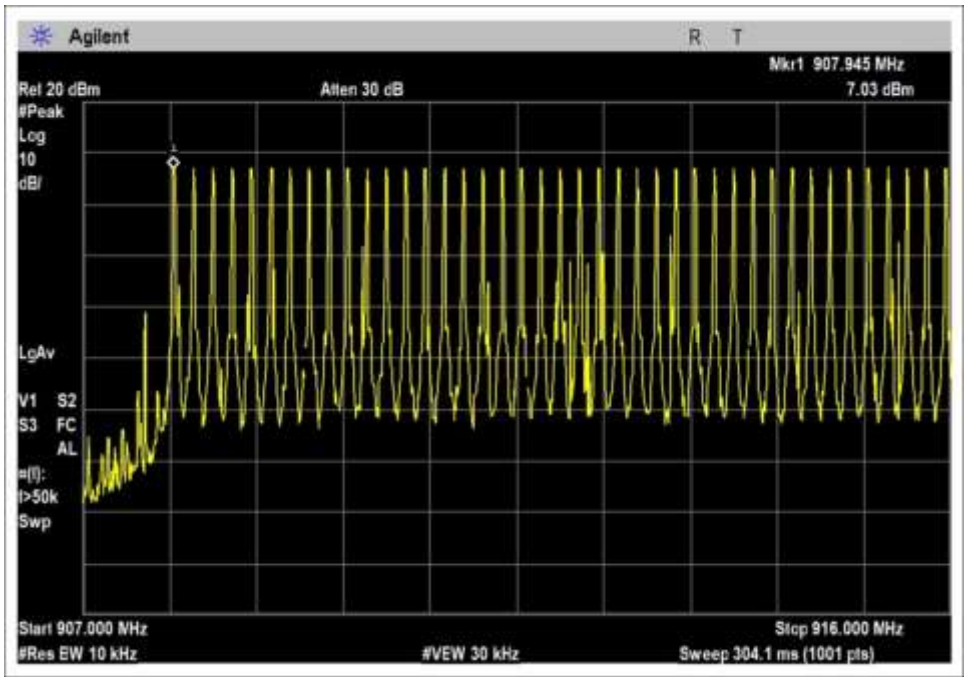
Plot(s)



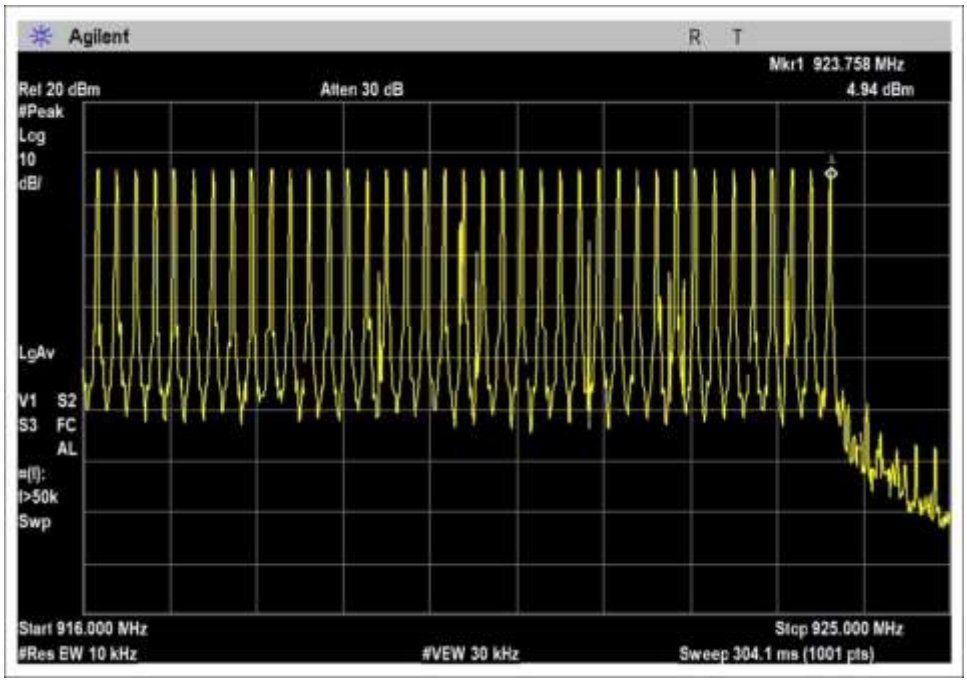
15.247(a)(1)(i) Number of Hopping Channels

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

Plot(s)



First 41


Agilent
R T
Mkr1 923.758 MHz
Ref 20 dBm
Atten 30 dB
4.94 dBm
#Peak
Log
10
dB/
LgAv
V1 S2
S3 FC
AL
#(f):
f>50k
Swp
Start 916.000 MHz
Stop 925.000 MHz
#Res BW 10 kHz
#VBW 30 kHz
Sweep 304.1 ms (1001 pts)

Second 39

15.247(a)(1)(i) 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	361.6	≤400	Pass

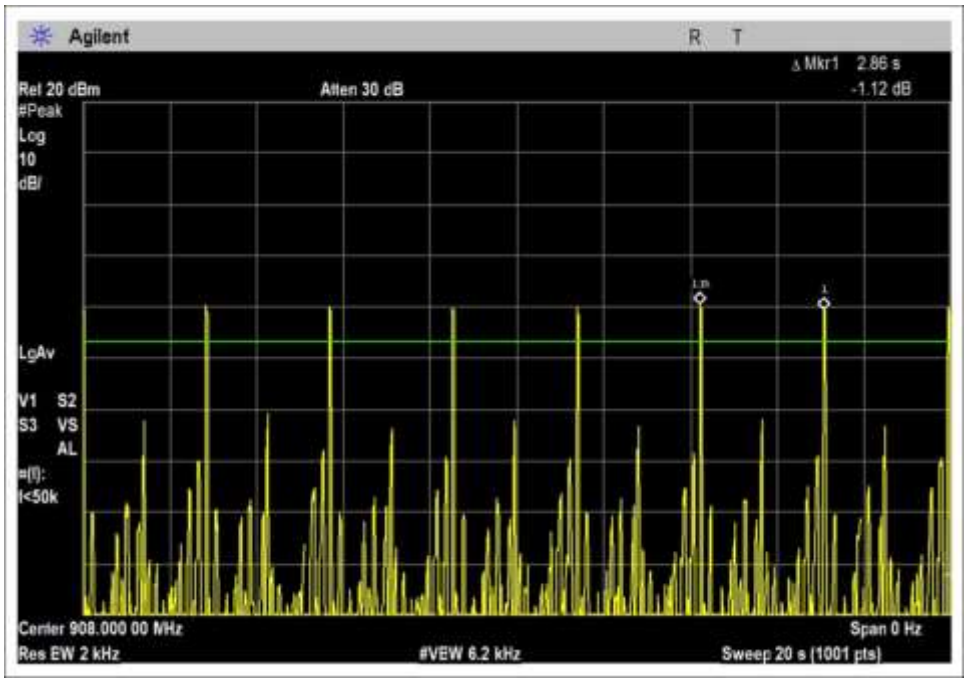
Measured results are calculated as follows:

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

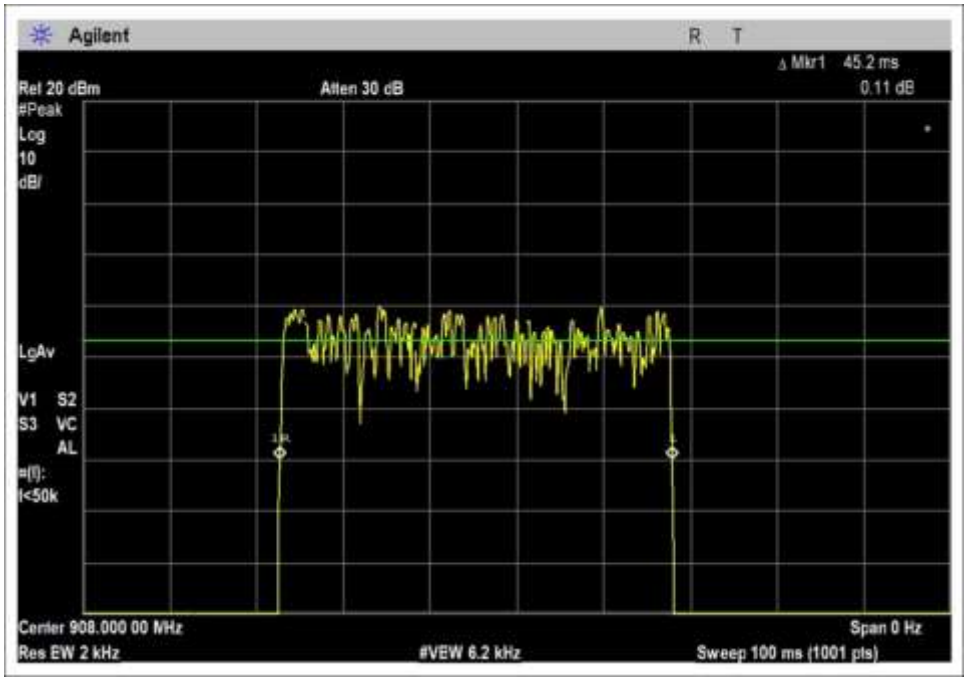
Actual Calculated Values:

Parameter	Value
Observation Period (P_{obs}):	20 sec
Number of RF Bursts / P_{obs}:	8
On time of RF Burst:	45.2
Number of Control or other signals / P_{obs}:	0
On time of Control or other Signals:	0
Total Measured On Time:	361.6

Plot(s)



20sec



Single burst

Test Setup Photo(s)

15.247(b)(1) Output Power

Test Setup/Conditions			
Test Location:	Bothell Lab C3	Test Engineer:	M. Atkinson
Test Method:	ANSI C63.10 (2013)	Test Date(s):	2/1/2019
Configuration:	1		
Test Setup:	Frequency Range: 908-923.8 Frequency tested: 908, 916, 923.8MHz Firmware power setting: Max Power Protocol /MCS/Modulation: FSK Duty Cycle: 100% (Test Mode) Test Mode: Continuously transmitting Test Setup: EUT is transmitting through the antenna port connector and is attached to the spectrum analyzer, insertion loss of other equipment is accounted for and programmed into the Spectrum Analyzer.		

Environmental Conditions			
Temperature (ºC)	20-23	Relative Humidity (%):	28-35

Test Equipment					
Asset#	**Description**	**Manufacturer**	**Model**	**Cal Date**	**Cal Due**
02872	Spectrum Analyzer	Agilent	E4440A	11/3/2017	11/3/2019
P07229	Attenuator	Pasternack	PE7004-20	12/1/2017	12/1/2019
P06927	Cable	Andrews	Heliax 1/4	8/28/2018	8/28/2020

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	26.69	26.63	26.73	0.10
916	FSK	26.69	26.73	26.70	0.04
923.8	FSK	26.63	26.74	26.64	0.10

Test performed using operational mode with the highest output power, representing worst case.
Investigated minimum and maximum voltage for both AC and DC input, worst case reported.

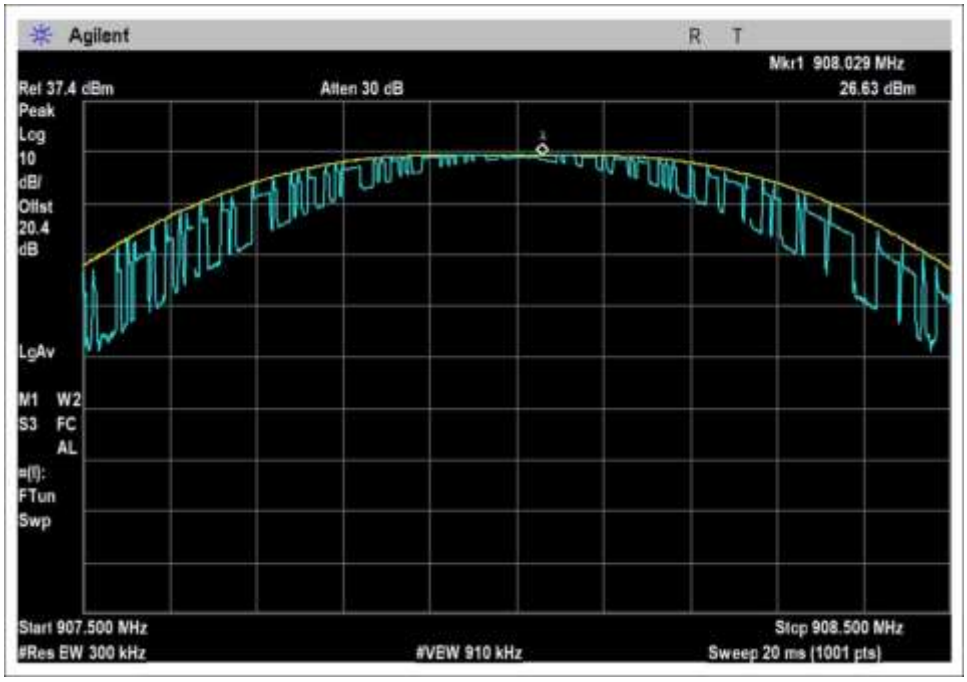
Parameter Definitions:

Measurements performed at input voltage Vnominal ± 15%. (AC Input)
Measurements performed at input voltage according to manufacturer specification. (DC Input)

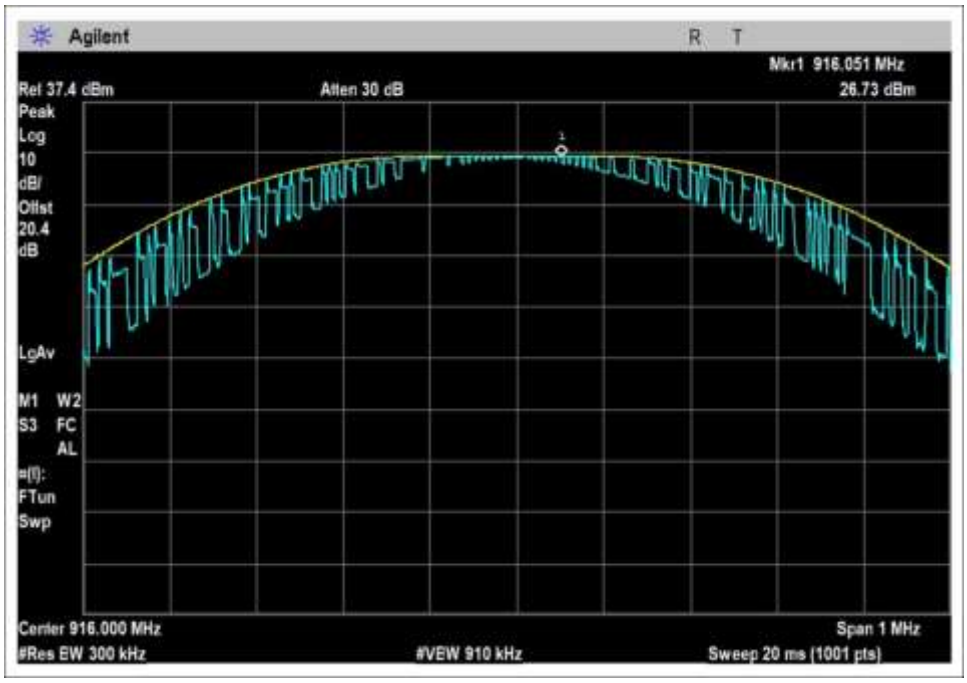
Parameter	Value
$V_{Nominal}$:	115VAC / 12VDC
$V_{Minimum}$:	97VAC / 7VDC
$V_{Maximum}$:	133VAC / 18VDC

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	External Monopole, 5dBi max	26.63	≤30	Pass
916	FSK	External Monopole, 5dBi max	26.73	≤30	Pass
923.8	FSK	External Monopole, 5dBi max	26.74	≤30	Pass

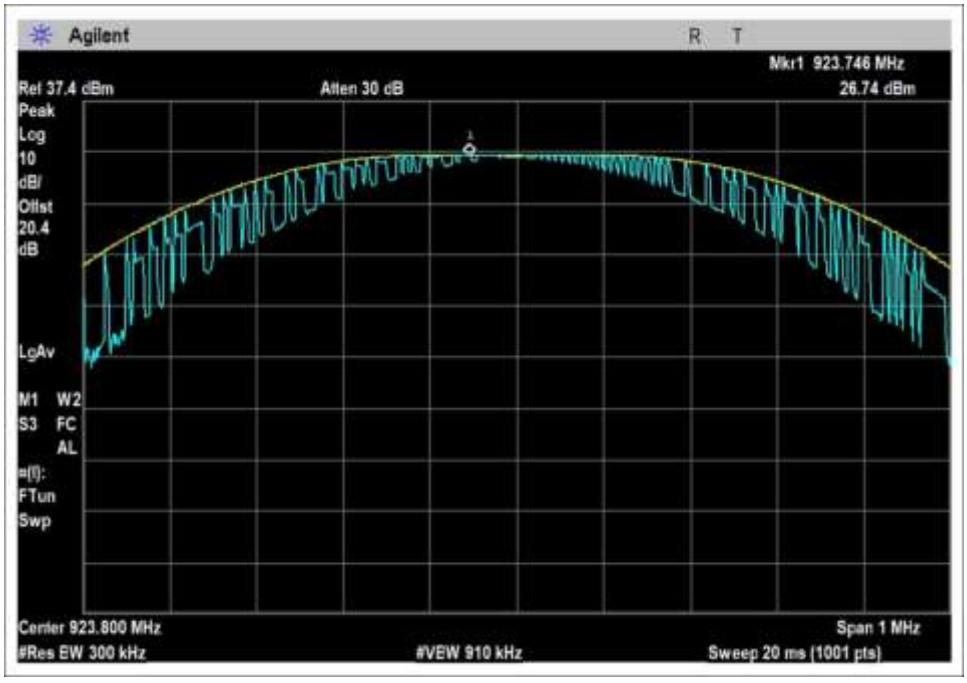
Plots



Low Channel



Middle Channel

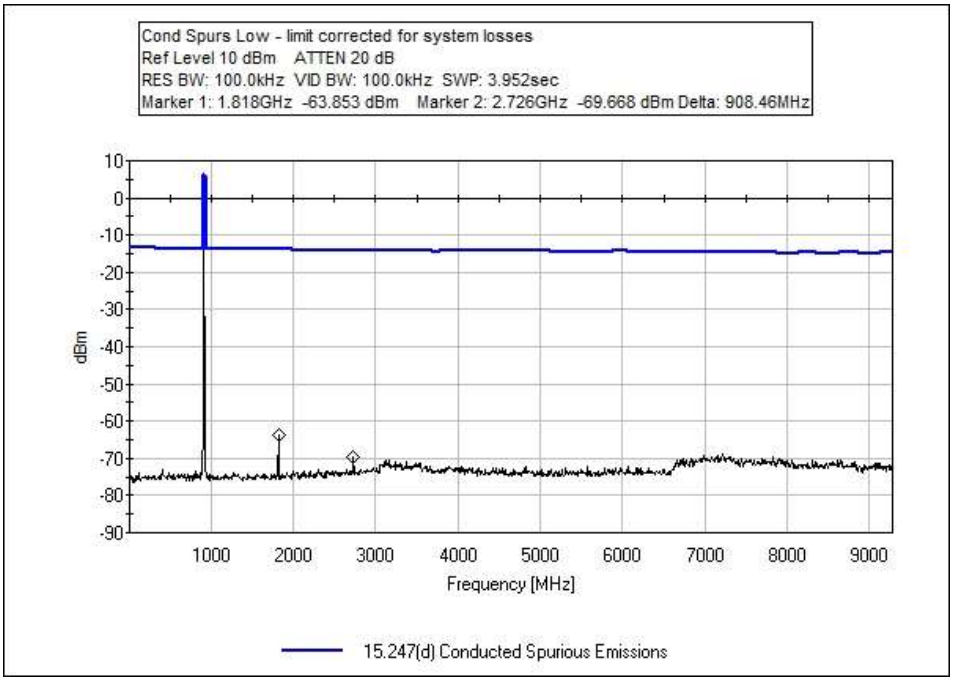


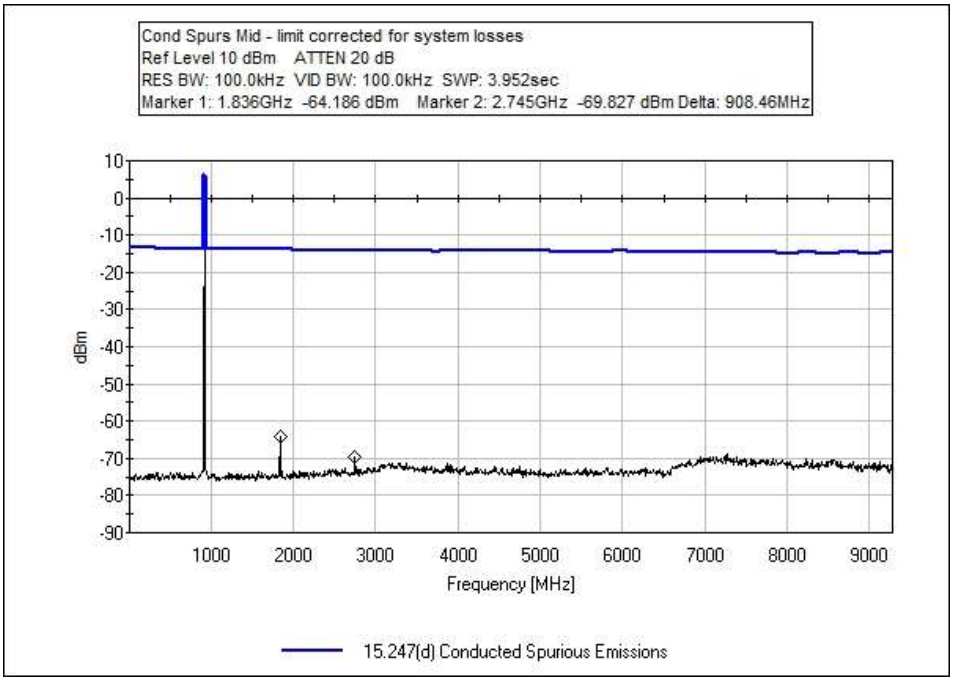
High Channel

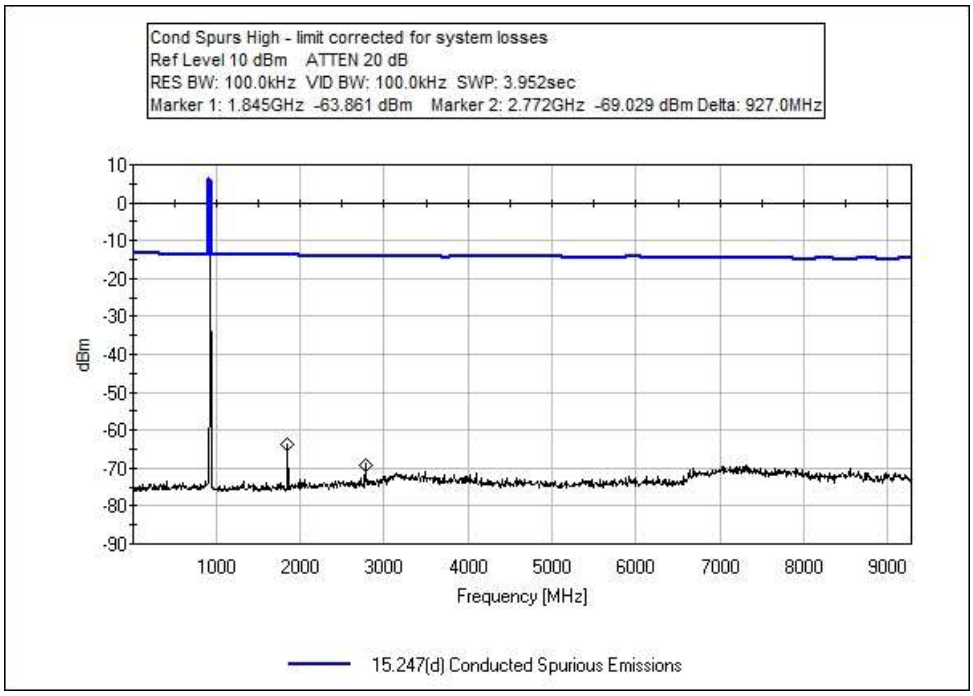
Test Setup Photo

15.247(d) RF Conducted Emissions & Band Edge

Plots






Cond Spurs High - limit corrected for system losses
Ref Level 10 dBm ATTEN 20 dB
RES BW: 100.0kHz VID BW: 100.0kHz SWP: 3.952sec
Marker 1: 1.845GHz -63.861 dBm Marker 2: 2.772GHz -69.029 dBm Delta: 927.0MHz
dBm
Frequency [MHz]
15.247(d) Conducted Spurious Emissions

Test Setup / Conditions / Data

Test Location:	CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)		
Customer:	**Itron, Inc.**		
Specification:	**15.247(d) Conducted Spurious Emissions**		
Work Order #:	**102206**	Date:	2/1/2019
Test Type:	**Conducted Emissions**	Time:	15:15:23
Tested By:	Michael Atkinson	Sequence#:	5
Software:	EMITest 5.03.11		115VAC 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

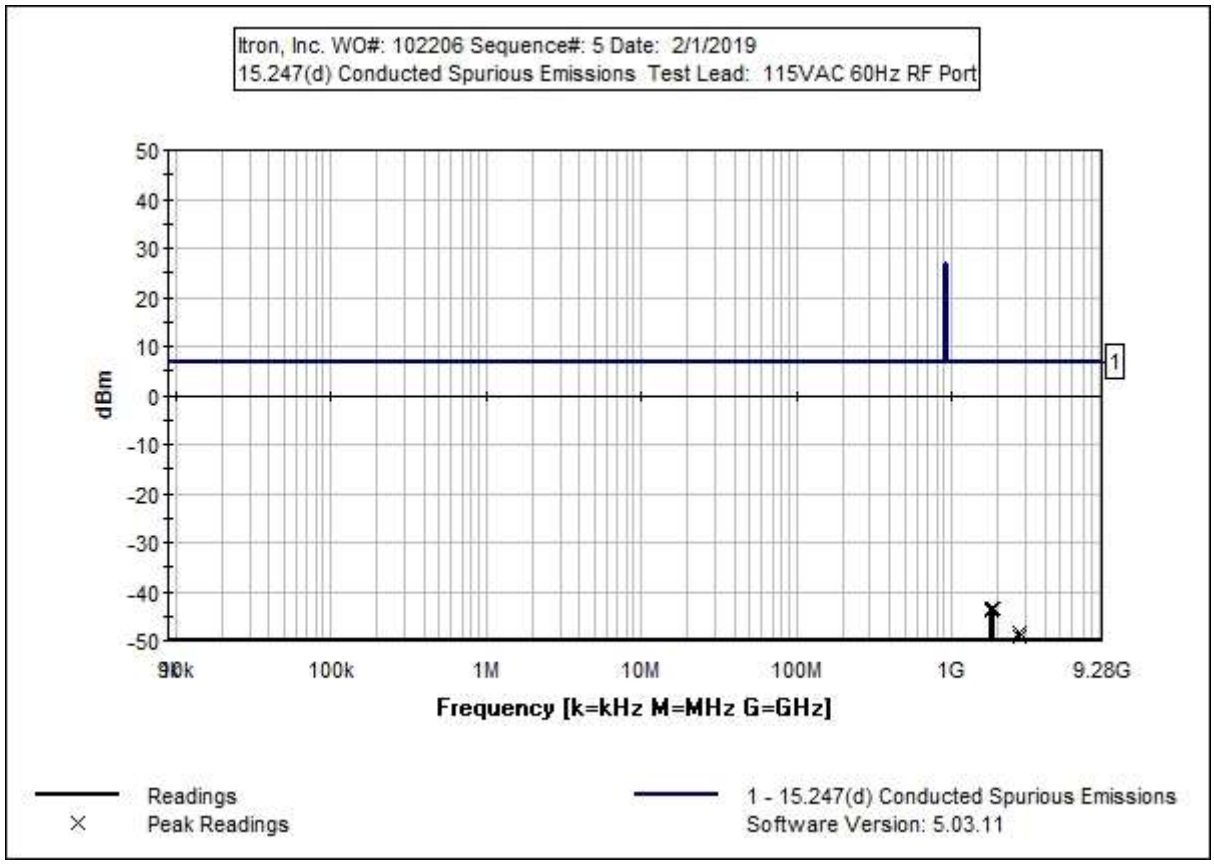
Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Frequency Range: 908-923.8
Frequency tested: 908, 916, 923.8MHz
Firmware power setting: Max Power
Protocol /MCS/Modulation: FSK

Duty Cycle: 100% (Test Mode)
Temperature (ºC): 20-23
Relative Humidity (%): 28-35
Test Location: Bothell Lab C3

Test Method: ANSI C63.10 (2013)
Test Mode: Continuously transmitting
Test Setup: EUT is transmitting through the antenna port connector and is attached to the spectrum analyzer.



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02673	Spectrum Analyzer	E4446A	2/3/2017	2/3/2019
T1	ANP07229	Attenuator	PE7004-20	12/1/2017	12/1/2019
T2	ANP06927	Cable	Heliax 1/4	8/28/2018	8/28/2020

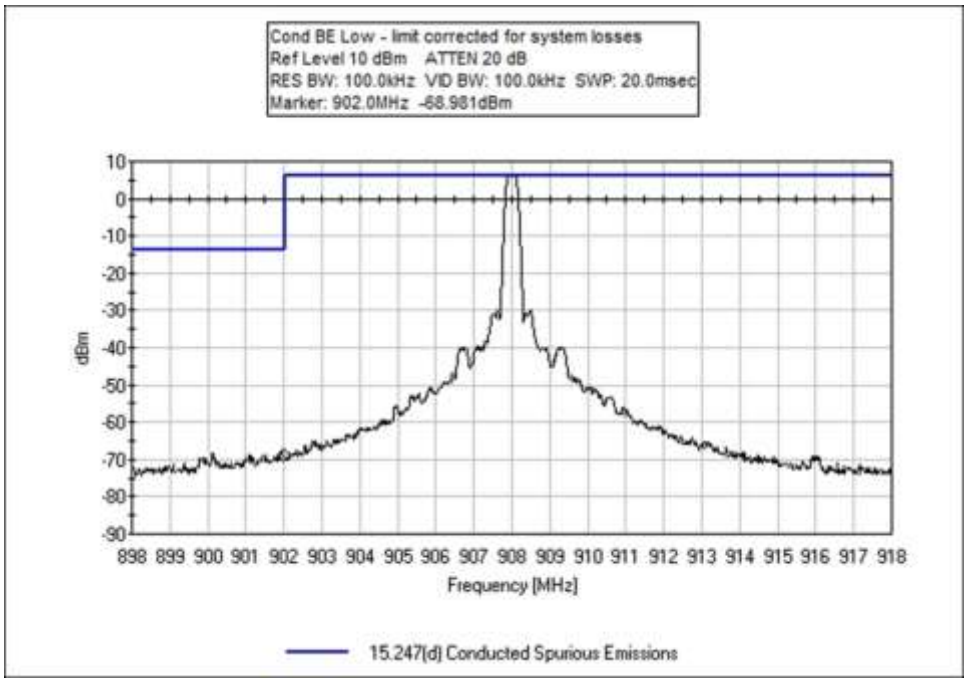
Measurement Data: Reading listed by margin. Test Lead: RF Port

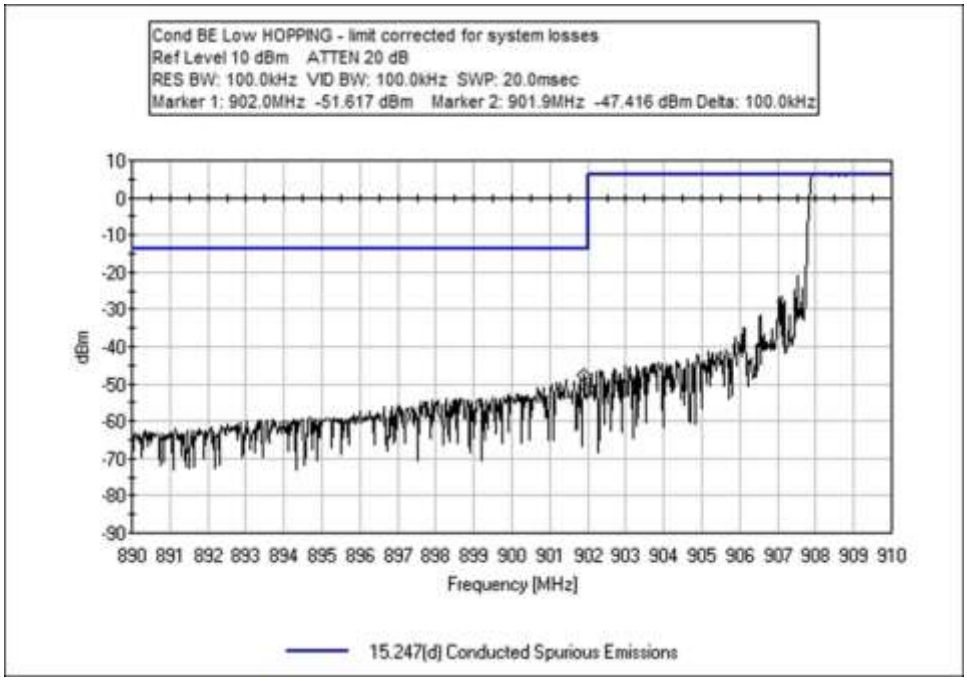
#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	dB	dB	Dist Table	Corr dBm	Spec dBm	Margin dB	Polar Ant
1	1817.650M	-63.9	+20.1	+0.4			+0.0	-43.4	6.6 Low	-50.0	RF Po
2	1845.460M	-63.9	+20.1	+0.4			+0.0	-43.4	6.6 High	-50.0	RF Po
3	1836.190M	-64.2	+20.1	+0.4			+0.0	-43.7	6.6 Mid	-50.3	RF Po
4	2772.460M	-69.0	+20.1	+0.5			+0.0	-48.4	6.6 High	-55.0	RF Po
5	2726.110M	-69.7	+20.1	+0.5			+0.0	-49.1	6.6 Low	-55.7	RF Po
6	2744.650M	-69.8	+20.1	+0.5			+0.0	-49.2	6.6 Mid	-55.8	RF Po

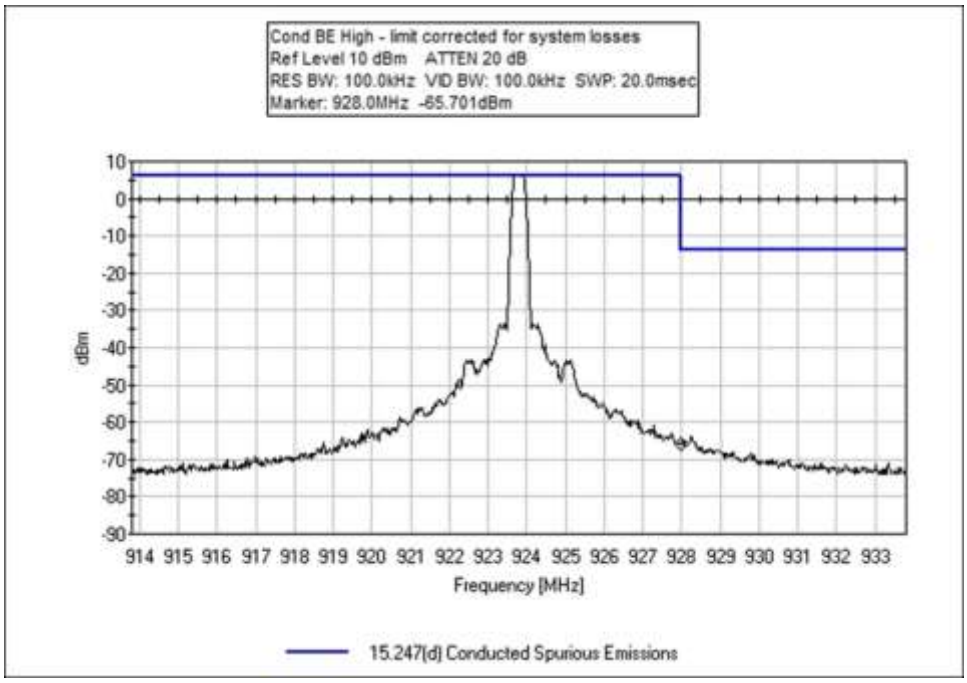
Band Edge

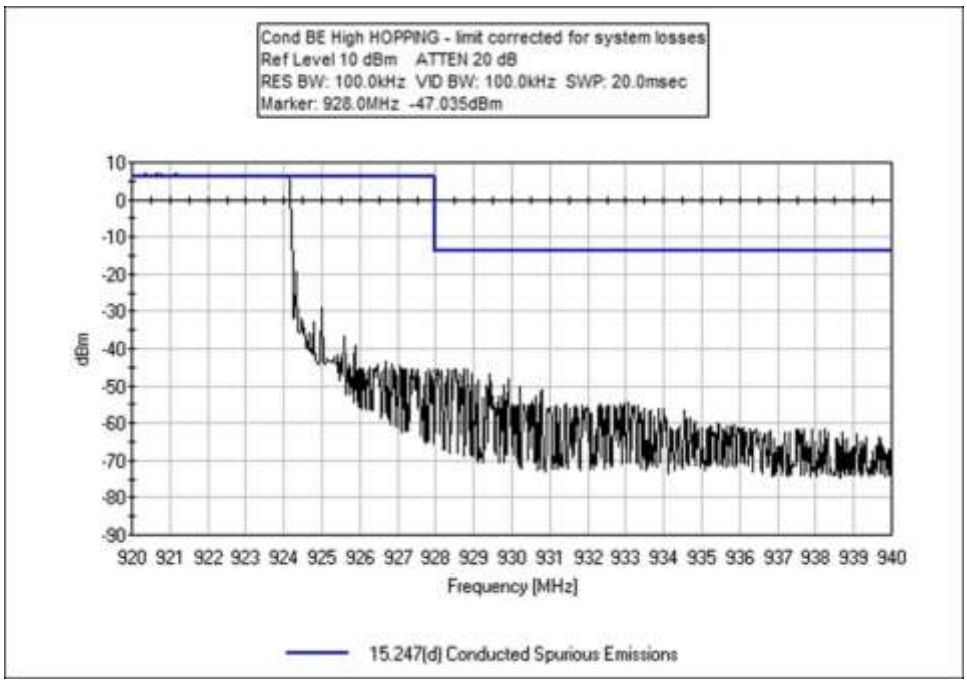
Band Edge Summary				
Limit applied: Max Power/100kHz - 20dB.				
Frequency (MHz)	**Modulation**	**Measured (dBm)**	**Limit (dBm)**	**Results**
902	Continuously Transmitting FSK	-48.7	<6.6	Pass
928	Continuously Transmitting FSK	-45.3	<6.6	Pass
902	Hopping FSK	-27.1	<6.6	Pass
928	Hopping FSK	-26.6	<6.6	Pass

Band Edge Plots






Cond BE High - limit corrected for system losses
Ref Level 10 dBm ATTEN 20 dB
RES BW: 100.0kHz VID BW: 100.0kHz SWP: 20.0msec
Marker: 928.0MHz -65.701dBm
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
dBm
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) Conducted Spurious Emissions


Cond BE High HOPPING - limit corrected for system losses
Ref Level 10 dBm ATTEN 20 dB
RES BW: 100.0kHz VID BW: 100.0kHz SWP: 20.0msec
Marker: 928.0MHz -47.035dBm
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
dBm
920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 940
Frequency [MHz]
15.247(d) Conducted Spurious Emissions

Test Setup / Conditions / Data

Test Location:	CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)		
Customer:	**Itron, Inc.**		
Specification:	**15.247(d) Conducted Spurious Emissions**		
Work Order #:	**102206**	Date:	2/1/2019
Test Type:	**Conducted Emissions**	Time:	16:17:24
Tested By:	Michael Atkinson	Sequence#:	6
Software:	EMITest 5.03.11		115VAC 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Frequency Range: 908-923.8
Frequency tested: Band Edge
Firmware power setting: Max Power
Protocol /MCS/Modulation: FSK

Duty Cycle: 100% (Test Mode)

Test Mode: Continuously transmitting
Test Setup: EUT is transmitting through the antenna port connector and is attached to the spectrum analyzer. Also investigated continuously hopping mode.

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02673	Spectrum Analyzer	E4446A	2/3/2017	2/3/2019
T2	ANP07229	Attenuator	PE7004-20	12/1/2017	12/1/2019
T3	ANP06927	Cable	Heliax 1/4	8/28/2018	8/28/2020

Measurement Data: Reading listed by margin. Test Lead: RF Port

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	dB	Dist Table	Corr dBm	Spec dBm	Margin dB	Polar Ant
1	928.000M	-47.0	+0.0	+20.1	+0.3		+0.0	-26.6	6.6 hopping	-33.2	RF Po
2	901.900M	-47.4	+0.0	+20.0	+0.3		+0.0	-27.1	6.6 hopping	-33.7	RF Po
3	902.000M	-51.6	+0.0	+20.0	+0.3		+0.0	-31.3	6.6 hopping	-37.9	RF Po
4	928.000M	-65.7	+0.0	+20.1	+0.3		+0.0	-45.3	6.6	-51.9	RF Po
5	902.000M	-69.0	+0.0	+20.0	+0.3		+0.0	-48.7	6.6	-55.3	RF Po

Test Setup Photo(s)

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 #:	**102206**	Date:	2/8/2019
Test Type:	**Maximized Emissions**	Time:	13:43:53
Tested By:	Michael Atkinson	Sequence#:	4
Software:	EMITest 5.03.11		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

Test Conditions / Notes:

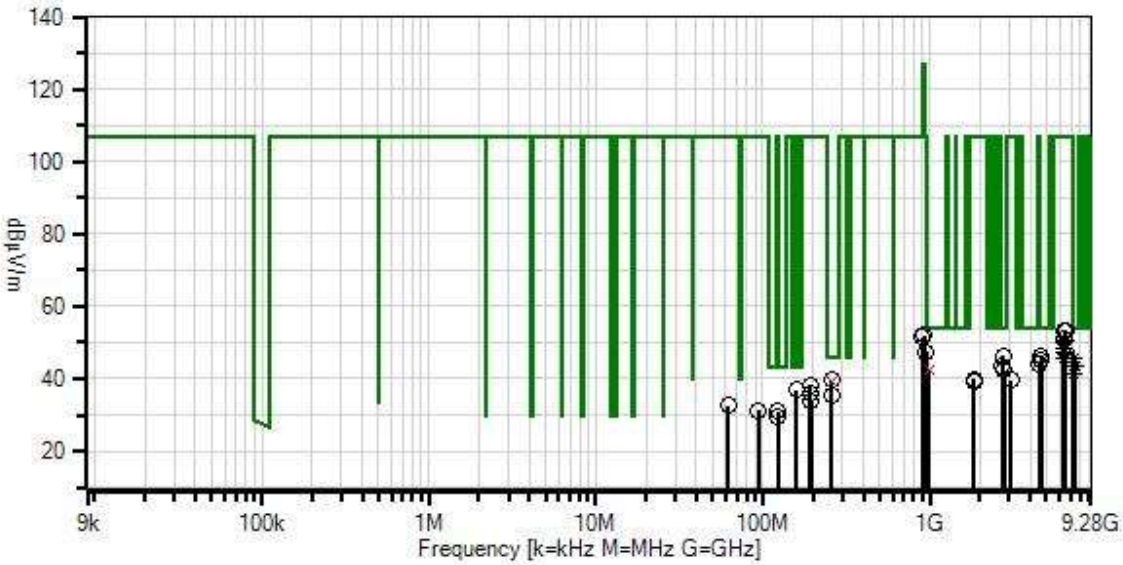
Frequency Range: 908-923.8
Frequency tested: 9kHz-9.28GHz
Firmware power setting: Max Power
Protocol /MCS/Modulation: FSK

Duty Cycle: 100% (Test Mode)
Test Location: Bothell Lab C3
Temperature (ºC) 21-23
Relative Humidity (%): 20-35
Test Method: ANSI C63.10 (2013)
Test Mode: Continuously transmitting
Test Setup: EUT is continuously transmitting through antenna. Low, Mid, High channels investigated, worst case reported. X, Y, Z EUT axes investigated, worst case reported. Horizontal and Vertical antenna polarities investigated above 30MHz, worst case reported. 3 orthogonal antenna orientations investigated below 30MHz, worst case reported.

Type 44 material ferrite with 2 passes each on AC power cord and USB cord underneath ground plane outside of test volume (NOT a modification to the EUT)

Antenna: 5dBi External Vehicle Antenna

Itron, Inc WO#: 102014 Sequence#: 4 Date: 2/8/2019
15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Various



Readings
QP Readings
Ambient
1 - 15.247(d) / 15.209 Radiated Spurious Emissions
Peak Readings
Average Readings
Software Version: 5.03.11

Test Equipment:

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

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	257.900M	18.7	+0.2 +0.0 +0.9	+0.0 +0.0 +5.9	+0.0 +0.0 +13.1	+0.0 +0.8 +0.0	+0.0	39.6	46.0	-6.4	Vert
2	257.000M QP	18.2	+0.2 +0.0 +0.9	+0.0 +0.0 +5.9	+0.0 +0.0 +13.0	+0.0 +0.8 +0.0	+0.0	39.0	46.0	-7.0	Vert
3	4619.080M	40.7	+0.5 +32.1 +0.0	+4.0 +0.8 +0.0	-33.1 +0.0 +0.0	+1.5 +0.0 +0.0	+0.0	46.5	54.0 Z	-7.5	Vert
4	2748.260M	46.5	+0.5 +28.8 +0.0	+2.6 +0.6 +0.0	-33.8 +0.0 +0.0	+1.1 +0.0 +0.0	+0.0	46.3	54.0 Z	-7.7	Vert
5	7263.560M Ave	34.1	+0.8 +36.3 +0.0	+5.4 +0.6 +0.0	-33.9 +0.0 +0.0	+2.1 +0.0 +0.0	+0.0	45.4	54.0 Y	-8.6	Horiz
^	7263.560M	38.1	+0.8 +36.3 +0.0	+5.4 +0.6 +0.0	-33.9 +0.0 +0.0	+2.1 +0.0 +0.0	+0.0	49.4	54.0 Y	-4.6	Horiz
7	4579.940M	39.2	+0.5 +32.0 +0.0	+4.0 +0.8 +0.0	-33.1 +0.0 +0.0	+1.5 +0.0 +0.0	+0.0	44.9	54.0 Z	-9.1	Vert
8	4540.190M	38.6	+0.5 +32.0 +0.0	+3.9 +0.8 +0.0	-33.1 +0.0 +0.0	+1.5 +0.0 +0.0	+0.0	44.2	54.0 Z	-9.8	Vert
9	2723.970M	44.0	+0.5 +28.8 +0.0	+2.6 +0.6 +0.0	-33.8 +0.0 +0.0	+1.1 +0.0 +0.0	+0.0	43.8	54.0 Z	-10.2	Vert

10	7390.390M	32.0	+1.0	+5.4	-34.3	+2.2	+0.0	43.5		54.0	-10.5	Horiz
	Ave		+36.7	+0.5	+0.0	+0.0			Y			
			+0.0	+0.0	+0.0	+0.0						
^	7390.390M	40.1	+1.0	+5.4	-34.3	+2.2	+0.0	51.6		54.0	-2.4	Horiz
			+36.7	+0.5	+0.0	+0.0			Y			
			+0.0	+0.0	+0.0	+0.0						
12	256.400M	14.7	+0.2	+0.0	+0.0	+0.0	+0.0	35.4		46.0	-10.6	Horiz
			+0.0	+0.0	+0.0	+0.8						
			+0.9	+5.9	+12.9	+0.0						
13	2771.500M	42.4	+0.5	+2.6	-33.8	+1.1	+0.0	42.3		54.0	-11.7	Vert
			+28.9	+0.6	+0.0	+0.0			Z			
			+0.0	+0.0	+0.0	+0.0						
14	983.600M	7.9	+0.4	+0.0	+0.0	+0.0	+0.0	42.3		54.0	-11.7	Horiz
	QP		+0.0	+0.0	+0.0	+1.6						
			+2.1	+5.9	+24.4	+0.0						
^	983.600M	13.0	+0.4	+0.0	+0.0	+0.0	+0.0	47.4		54.0	-6.6	Horiz
			+0.0	+0.0	+0.0	+1.6						
			+2.1	+5.9	+24.4	+0.0						
16	7328.000M	30.2	+0.9	+5.4	-34.1	+2.1	+0.0	41.5		54.0	-12.5	Horiz
	Ave		+36.5	+0.5	+0.0	+0.0			Y			
			+0.0	+0.0	+0.0	+0.0						
^	7328.000M	36.1	+0.9	+5.4	-34.1	+2.1	+0.0	47.4		54.0	-6.6	Horiz
			+36.5	+0.5	+0.0	+0.0			Y			
			+0.0	+0.0	+0.0	+0.0						
18	123.100M	16.3	+0.2	+0.0	+0.0	+0.0	+0.0	30.9		43.5	-12.6	Vert
			+0.0	+0.0	+0.0	+0.6						
			+0.6	+5.9	+7.3	+0.0						
19	123.900M	14.9	+0.2	+0.0	+0.0	+0.0	+0.0	29.5		43.5	-14.0	Horiz
			+0.0	+0.0	+0.0	+0.6						
			+0.6	+5.9	+7.3	+0.0						
20	6412.380M	43.3	+0.6	+5.4	-33.6	+1.9	+0.0	53.5		107.0	-53.5	Horiz
			+35.4	+0.5	+0.0	+0.0			Y			
			+0.0	+0.0	+0.0	+0.0						
21	6466.140M	42.5	+0.6	+5.5	-33.6	+1.9	+0.0	53.0		107.0	-54.0	Vert
			+35.5	+0.6	+0.0	+0.0			Z			
			+0.0	+0.0	+0.0	+0.0						
22	896.000M	18.2	+0.3	+0.0	+0.0	+0.0	+0.0	51.4		107.0	-55.6	Vert
			+0.0	+0.0	+0.0	+1.5						
			+1.9	+5.9	+23.6	+0.0						
23	6411.620M	40.9	+0.6	+5.4	-33.6	+1.9	+0.0	51.1		107.0	-55.9	Vert
			+35.4	+0.5	+0.0	+0.0			Z			
			+0.0	+0.0	+0.0	+0.0						
24	6466.620M	39.8	+0.6	+5.5	-33.6	+1.9	+0.0	50.3		107.0	-56.7	Horiz
	Ave		+35.5	+0.6	+0.0	+0.0			Y			
			+0.0	+0.0	+0.0	+0.0						
^	6466.650M	44.6	+0.6	+5.5	-33.6	+1.9	+0.0	55.1		107.0	-51.9	Horiz
			+35.5	+0.6	+0.0	+0.0			Y			
			+0.0	+0.0	+0.0	+0.0						

26	6356.460M	39.7	+0.6	+5.3	-33.5	+1.9	+0.0	49.8	107.0	-57.2	Horiz
	Ave		+35.3	+0.5	+0.0	+0.0			Y		
			+0.0	+0.0	+0.0	+0.0					
^	6356.460M	43.7	+0.6	+5.3	-33.5	+1.9	+0.0	53.8	107.0	-53.2	Horiz
			+35.3	+0.5	+0.0	+0.0			Y		
			+0.0	+0.0	+0.0	+0.0					
28	6412.192M	37.9	+0.6	+5.4	-33.6	+1.9	+0.0	48.1	107.0	-58.9	Horiz
	Ave		+35.4	+0.5	+0.0	+0.0			Y		
			+0.0	+0.0	+0.0	+0.0					
29	944.600M	12.7	+0.4	+0.0	+0.0	+0.0	+0.0	47.5	107.0	-59.5	Horiz
			+0.0	+0.0	+0.0	+1.6					
			+2.0	+5.9	+24.9	+0.0					
30	6355.350M	37.1	+0.6	+5.3	-33.5	+1.9	+0.0	47.2	107.0	-59.8	Vert
	Ave		+35.3	+0.5	+0.0	+0.0			Z		
			+0.0	+0.0	+0.0	+0.0					
^	6355.350M	42.5	+0.6	+5.3	-33.5	+1.9	+0.0	52.6	107.0	-54.4	Vert
			+35.3	+0.5	+0.0	+0.0			Z		
			+0.0	+0.0	+0.0	+0.0					
32	6466.610M	36.1	+0.6	+5.5	-33.6	+1.9	+0.0	46.6	107.0	-60.4	Vert
	Ave		+35.5	+0.6	+0.0	+0.0			Z		
			+0.0	+0.0	+0.0	+0.0					
33	6412.040M	35.2	+0.6	+5.4	-33.6	+1.9	+0.0	45.4	107.0	-61.6	Vert
	Ave		+35.4	+0.5	+0.0	+0.0			Z		
			+0.0	+0.0	+0.0	+0.0					
34	1847.610M	43.5	+0.4	+2.3	-34.5	+0.7	+0.0	39.9	107.0	-67.1	Vert
			+26.8	+0.7	+0.0	+0.0			Z		
			+0.0	+0.0	+0.0	+0.0					
35	3061.000M	38.5	+0.5	+3.0	-33.6	+1.1	+0.0	39.7	107.0	-67.3	Horiz
			+29.6	+0.6	+0.0	+0.0			Y		
			+0.0	+0.0	+0.0	+0.0					
36	1832.140M	42.8	+0.4	+2.3	-34.5	+0.7	+0.0	39.0	107.0	-68.0	Vert
			+26.6	+0.7	+0.0	+0.0			Z		
			+0.0	+0.0	+0.0	+0.0					
37	192.500M	20.7	+0.2	+0.0	+0.0	+0.0	+0.0	37.9	107.0	-69.1	Vert
			+0.0	+0.0	+0.0	+0.7					
			+0.8	+5.9	+9.6	+0.0					
38	160.100M	19.3	+0.2	+0.0	+0.0	+0.0	+0.0	36.8	107.0	-70.2	Vert
			+0.0	+0.0	+0.0	+0.6					
			+0.7	+5.9	+10.1	+0.0					
39	191.000M	18.8	+0.2	+0.0	+0.0	+0.0	+0.0	35.9	107.0	-71.1	Vert
			+0.0	+0.0	+0.0	+0.7					
			+0.8	+5.9	+9.5	+0.0					

40	195.500M	16.4	+0.2 +0.0 +0.8	+0.0 +0.0 +5.9	+0.0 +0.0 +9.7	+0.0 +0.7 +0.0	+0.0	33.7	107.0	-73.3	Horiz
41	62.000M	18.9	+0.1 +0.0 +0.4	+0.0 +0.0 +5.9	+0.0 +0.0 +6.8	+0.0 +0.4 +0.0	+0.0	32.5	107.0	-74.5	Vert
42	920.000M	17.5	+0.4 +0.0 +2.0	+0.0 +0.0 +5.9	+0.0 +0.0 +24.5	+0.0 +1.6 +0.0	+0.0	51.9	127.0	-75.1	Vert
43	94.000M	16.9	+0.1 +0.0 +0.5	+0.0 +0.0 +5.9	+0.0 +0.0 +7.4	+0.0 +0.5 +0.0	+0.0	31.3	107.0	-75.7	Vert
44	530.600k	36.2	+0.0 +0.0 +0.0	+0.0 +0.0 +0.0	+0.0 +0.0 +0.0	+0.0 +0.0 +9.7	-40.0	5.9	107.0	-101.1	Para

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 #:	**102206**	Date:	2/8/2019
Test Type:	**Maximized Emissions**	Time:	13:23:11
Tested By:	Michael Atkinson	Sequence#:	5
Software:	EMITest 5.03.11		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 3			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 3			

Test Conditions / Notes:

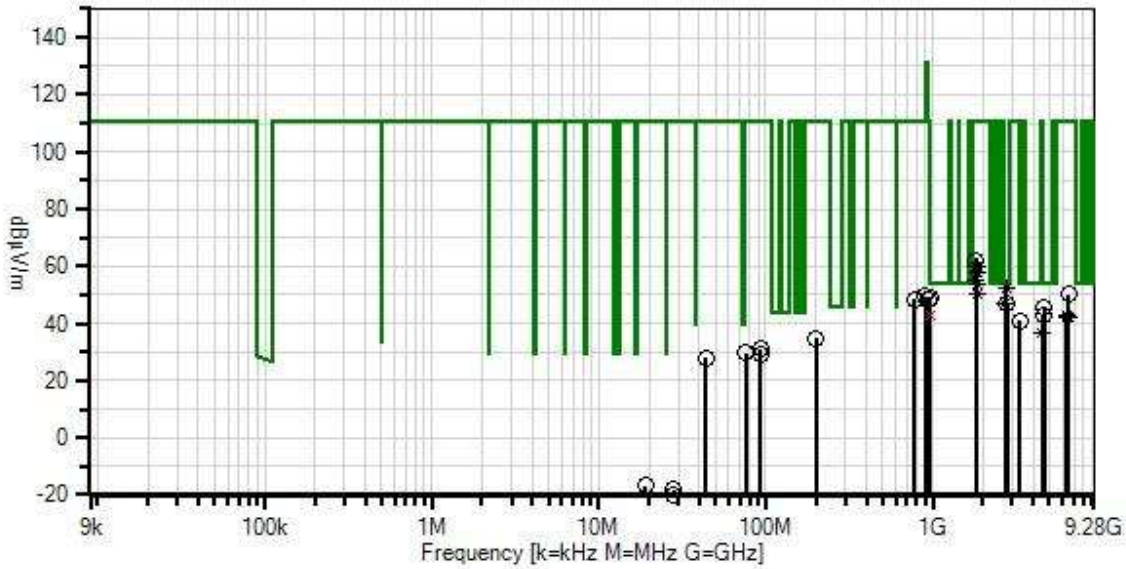
Frequency Range: 908-923.8
Frequency tested: 9kHz-9.28GHz
Firmware power setting: Max Power
Protocol /MCS/Modulation: FSK

Duty Cycle: 100% (Test Mode)
Test Location: Bothell Lab C3 Temperature (ºC) 21-23
Relative Humidity (%): 20-35
Test Method: ANSI C63.10 (2013)
Test Mode: Continuously transmitting
Test Setup: EUT is continuously transmitting through antenna. Low, Mid, High channels investigated, worst case reported.. X,Y,Z EUT axes investigated, worst case reported. Horizontal and Vertical antenna polarities investigated above 30MHz, worst case reported. 3 orthogonal antenna orientations investigated below 30MHz, worst case reported.

Type 44 material ferrite with 2 passes each on AC power cord and USB cord underneath ground plane outside of test volume (NOT a modification to the EUT)

Antenna: 3dBi attached rubber duck antenna

Itron, Inc WO#: 102014 Sequence#: 5 Date: 2/8/2019
15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Various



Readings
QP Readings
Ambient
1 - 15.247(d) / 15.209 Radiated Spurious Emissions
Peak Readings
Average Readings
Software Version: 5.03.11

Test Equipment:

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

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	2746.000M	52.5	+0.5	+2.6	-33.8	+1.1	+0.0	52.3	54.0	-1.7	Horiz
	Ave		+28.8	+0.6	+0.0	+0.0			X		
			+0.0	+0.0	+0.0	+0.0					
^	2746.000M	59.0	+0.5	+2.6	-33.8	+1.1	+0.0	58.8	54.0	+4.8	Horiz
			+28.8	+0.6	+0.0	+0.0			X		
			+0.0	+0.0	+0.0	+0.0					
3	2747.880M	46.9	+0.5	+2.6	-33.8	+1.1	+0.0	46.7	54.0	-7.3	Horiz
			+28.8	+0.6	+0.0	+0.0			Y		
			+0.0	+0.0	+0.0	+0.0					
4	2724.031M	46.8	+0.5	+2.6	-33.8	+1.1	+0.0	46.6	54.0	-7.4	Horiz
	Ave		+28.8	+0.6	+0.0	+0.0			Y		
			+0.0	+0.0	+0.0	+0.0					
^	2724.031M	54.5	+0.5	+2.6	+0.0	+0.0	+0.0	57.6	54.0	+3.6	Horiz
			+0.0	+0.0	+0.0	+0.0			Y		
			+0.0	+0.0	+0.0	+0.0					
6	2771.180M	46.7	+0.5	+2.6	-33.8	+1.1	+0.0	46.6	54.0	-7.4	Horiz
			+28.9	+0.6	+0.0	+0.0			Y		
			+0.0	+0.0	+0.0	+0.0					
7	4619.270M	39.9	+0.5	+4.0	-33.1	+1.5	+0.0	45.7	54.0	-8.3	Horiz
			+32.1	+0.8	+0.0	+0.0			Y		
			+0.0	+0.0	+0.0	+0.0					

8	4580.220M	37.1	+0.5	+4.0	-33.1	+1.5	+0.0	42.8		54.0	-11.2	Horiz
			+32.0	+0.8	+0.0	+0.0			Y			
			+0.0	+0.0	+0.0	+0.0						
9	966.200M	7.9	+0.4	+0.0	+0.0	+0.0	+0.0	42.7		54.0	-11.3	Vert
	QP		+0.0	+0.0	+0.0	+1.6						
			+2.1	+5.9	+24.8	+0.0						
^	966.200M	13.9	+0.4	+0.0	+0.0	+0.0	+0.0	48.7		54.0	-5.3	Vert
			+0.0	+0.0	+0.0	+1.6						
			+2.1	+5.9	+24.8	+0.0						
11	4540.040M	31.2	+0.5	+3.9	-33.1	+1.5	+0.0	36.8		54.0	-17.2	Horiz
	Ave		+32.0	+0.8	+0.0	+0.0			Y			
			+0.0	+0.0	+0.0	+0.0						
^	4539.960M	39.8	+0.5	+3.9	-33.1	+1.5	+0.0	45.4		54.0	-8.6	Horiz
			+32.0	+0.8	+0.0	+0.0			Y			
			+0.0	+0.0	+0.0	+0.0						
13	1815.880M	65.5	+0.4	+2.3	-34.5	+0.7	+0.0	61.6		111.0	-49.4	Horiz
			+26.5	+0.7	+0.0	+0.0			X			
			+0.0	+0.0	+0.0	+0.0						
14	1847.570M	63.5	+0.4	+2.3	-34.5	+0.7	+0.0	59.9		111.0	-51.1	Horiz
	Ave		+26.8	+0.7	+0.0	+0.0			X			
			+0.0	+0.0	+0.0	+0.0						
^	1847.520M	64.4	+0.4	+2.3	-34.5	+0.7	+0.0	60.8		111.0	-50.2	Horiz
			+26.8	+0.7	+0.0	+0.0			X			
			+0.0	+0.0	+0.0	+0.0						
16	1816.038M	63.8	+0.4	+2.3	-34.5	+0.7	+0.0	59.9		111.0	-51.1	Horiz
	Ave		+26.5	+0.7	+0.0	+0.0			X			
			+0.0	+0.0	+0.0	+0.0						
17	1832.060M	61.6	+0.4	+2.3	-34.5	+0.7	+0.0	57.8		111.0	-53.2	Horiz
	Ave		+26.6	+0.7	+0.0	+0.0			X			
			+0.0	+0.0	+0.0	+0.0						
^	1832.060M	62.7	+0.4	+2.3	-34.5	+0.7	+0.0	58.9		111.0	-52.1	Horiz
			+26.6	+0.7	+0.0	+0.0			X			
			+0.0	+0.0	+0.0	+0.0						
19	1816.100M	58.8	+0.4	+2.3	-34.5	+0.7	+0.0	54.9		111.0	-56.1	Vert
	Ave		+26.5	+0.7	+0.0	+0.0			Y			
			+0.0	+0.0	+0.0	+0.0						
^	1816.100M	61.9	+0.4	+2.3	-34.5	+0.7	+0.0	58.0		111.0	-53.0	Vert
			+26.5	+0.7	+0.0	+0.0			Y			
			+0.0	+0.0	+0.0	+0.0						
21	1847.520M	57.2	+0.4	+2.3	-34.5	+0.7	+0.0	53.6		111.0	-57.4	Vert
	Ave		+26.8	+0.7	+0.0	+0.0			Y			
			+0.0	+0.0	+0.0	+0.0						
22	1832.070M	54.3	+0.4	+2.3	-34.5	+0.7	+0.0	50.5		111.0	-60.5	Vert
	Ave		+26.6	+0.7	+0.0	+0.0			Y			
			+0.0	+0.0	+0.0	+0.0						
23	6467.000M	39.8	+0.6	+5.5	-33.6	+1.9	+0.0	50.3		111.0	-60.7	Horiz
			+35.5	+0.6	+0.0	+0.0			X			
			+0.0	+0.0	+0.0	+0.0						
24	896.000M	16.2	+0.3	+0.0	+0.0	+0.0	+0.0	49.4		111.0	-61.6	Vert
			+0.0	+0.0	+0.0	+1.5						
			+1.9	+5.9	+23.6	+0.0						

25	959.200M	14.2	+0.4	+0.0	+0.0	+0.0	+0.0	49.1	111.0	-61.9	Vert
			+0.0	+0.0	+0.0	+1.6					
			+2.1	+5.9	+24.9	+0.0					
26	952.800M	13.6	+0.4	+0.0	+0.0	+0.0	+0.0	48.5	111.0	-62.5	Vert
			+0.0	+0.0	+0.0	+1.6					
			+2.0	+5.9	+25.0	+0.0					
27	777.670M	16.0	+0.3	+0.0	+0.0	+0.0	+0.0	48.3	111.0	-62.7	Vert
			+0.0	+0.0	+0.0	+1.4					
			+1.7	+5.9	+23.0	+0.0					
28	6412.070M	32.3	+0.6	+5.4	-33.6	+1.9	+0.0	42.5	111.0	-68.5	Horiz
	Ave		+35.4	+0.5	+0.0	+0.0			X		
			+0.0	+0.0	+0.0	+0.0					
^	6412.060M	39.2	+0.6	+5.4	-33.6	+1.9	+0.0	49.4	111.0	-61.6	Horiz
			+35.4	+0.5	+0.0	+0.0			X		
			+0.0	+0.0	+0.0	+0.0					
30	6356.052M	32.3	+0.6	+5.3	-33.5	+1.9	+0.0	42.4	111.0	-68.6	Horiz
	Ave		+35.3	+0.5	+0.0	+0.0			X		
			+0.0	+0.0	+0.0	+0.0					
^	6356.030M	39.8	+0.6	+5.3	-33.5	+1.9	+0.0	49.9	111.0	-61.1	Horiz
			+35.3	+0.5	+0.0	+0.0			X		
			+0.0	+0.0	+0.0	+0.0					
32	6466.600M	31.4	+0.6	+5.5	-33.6	+1.9	+0.0	41.9	111.0	-69.1	Horiz
	Ave		+35.5	+0.6	+0.0	+0.0			X		
			+0.0	+0.0	+0.0	+0.0					
33	3322.000M	38.8	+0.4	+3.3	-33.5	+1.2	+0.0	41.1	111.0	-69.9	Horiz
			+30.2	+0.7	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
34	199.400M	17.3	+0.2	+0.0	+0.0	+0.0	+0.0	34.8	111.0	-76.2	Horiz
			+0.0	+0.0	+0.0	+0.7					
			+0.8	+5.9	+9.9	+0.0					
35	92.370M	16.8	+0.1	+0.0	+0.0	+0.0	+0.0	31.0	111.0	-80.0	Vert
			+0.0	+0.0	+0.0	+0.5					
			+0.5	+5.9	+7.2	+0.0					
36	75.430M	15.7	+0.1	+0.0	+0.0	+0.0	+0.0	29.6	111.0	-81.4	Vert
			+0.0	+0.0	+0.0	+0.5					
			+0.5	+5.9	+6.9	+0.0					
37	92.370M	14.8	+0.1	+0.0	+0.0	+0.0	+0.0	29.0	111.0	-82.0	Vert
			+0.0	+0.0	+0.0	+0.5					
			+0.5	+5.9	+7.2	+0.0					
38	43.860M	12.6	+0.1	+0.0	+0.0	+0.0	+0.0	27.8	111.0	-83.2	Vert
			+0.0	+0.0	+0.0	+0.3					
			+0.3	+5.9	+8.6	+0.0					
39	18.980M	14.7	+0.0	+0.2	+0.0	+0.0	-40.0	-16.9	111.0	-127.9	Para
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+8.2					
40	28.115M	15.4	+0.1	+0.3	+0.0	+0.0	-40.0	-18.1	111.0	-129.1	Para
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+6.1					
41	27.941M	13.8	+0.1	+0.3	+0.0	+0.0	-40.0	-19.7	111.0	-130.7	Perp
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+6.1					

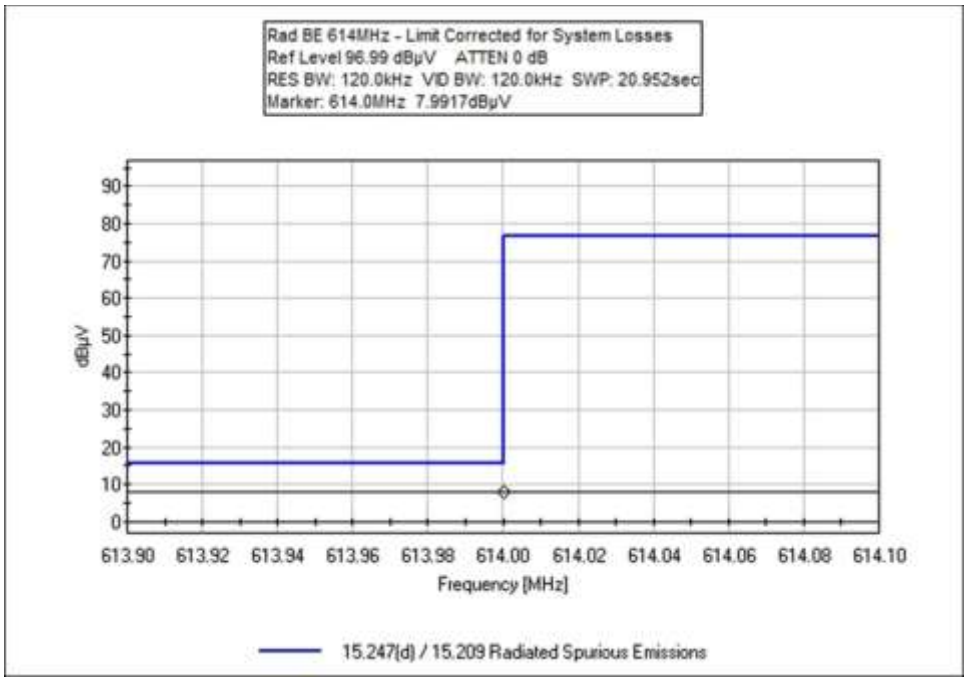
Band Edge

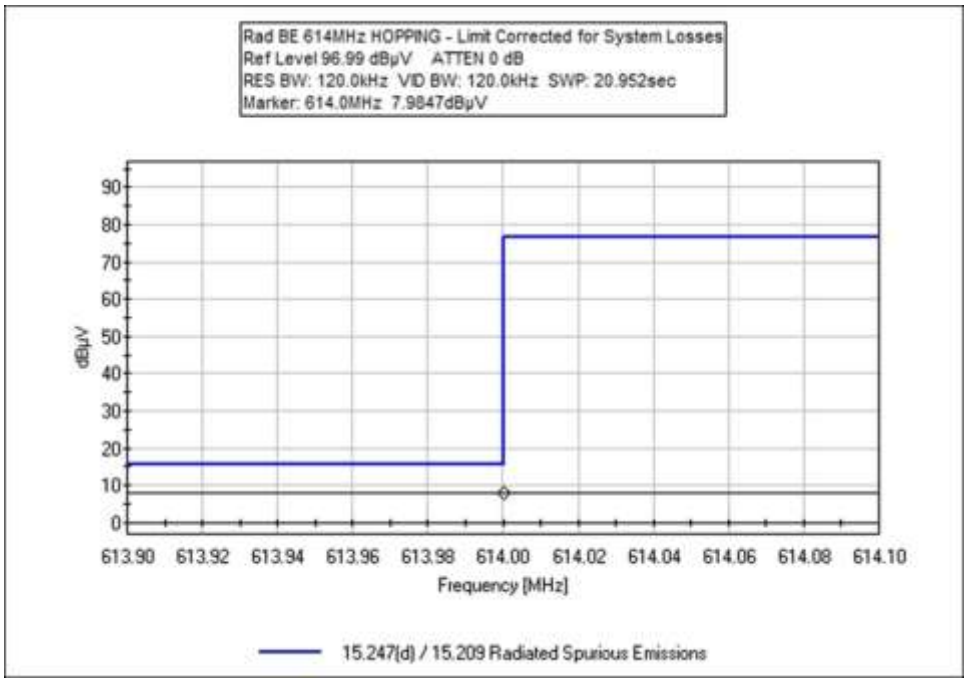
Band Edge Summary					
Frequency (MHz)	**Modulation**	**Ant. Type**	**Field Strength (dBuV/m @3m)**	**Limit (dBuV/m @3m)**	**Results**
614	Continuously Transmitting FSK	3dBi Attached Monopole	38.3	<46	Pass
902	Continuously Transmitting FSK	3dBi Attached Monopole	57.8	<111.0	Pass
928	Continuously Transmitting FSK	3dBi Attached Monopole	59.5	<111.0	Pass
960	Continuously Transmitting FSK	3dBi Attached Monopole	43.1	<54	Pass
614	Hopping FSK	3dBi Attached Monopole	38.3	<46	Pass
902	Hopping FSK	3dBi Attached Monopole	75.4	<111.0	Pass
928	Hopping FSK	3dBi Attached Monopole	75.6	<111.0	Pass
960	Hopping FSK	3dBi Attached Monopole	43.0	<54	Pass

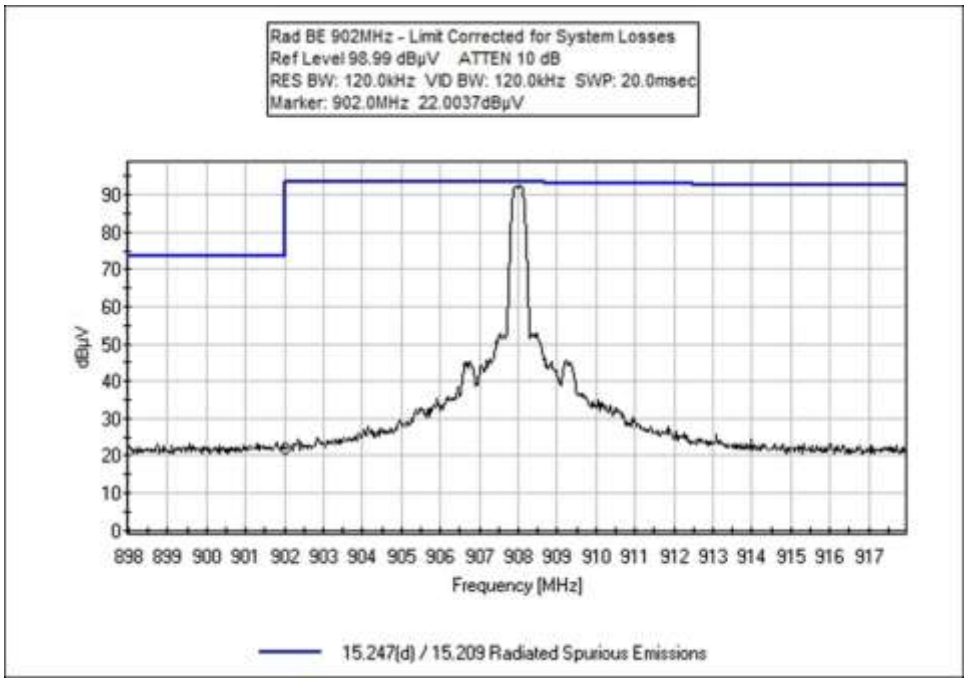
Band Edge Summary					
Frequency (MHz)	**Modulation**	**Ant. Type**	**Field Strength (dBuV/m @3m)**	**Limit (dBuV/m @3m)**	**Results**
614	Continuously Transmitting FSK	5dBi External Monopole	38.2	<46	Pass
902	Continuously Transmitting FSK	5dBi External Monopole	55.5	<111.0	Pass
928	Continuously Transmitting FSK	5dBi External Monopole	58.2	<111.0	Pass
960	Continuously Transmitting FSK	5dBi External Monopole	43.0	<54	Pass
614	Hopping FSK	5dBi External Monopole	38.2	<46	Pass
902	Hopping FSK	5dBi External Monopole	72.8	<111.0	Pass
928	Hopping FSK	5dBi External Monopole	75.3	<111.0	Pass
960	Hopping FSK	5dBi External Monopole	43.0	<54	Pass

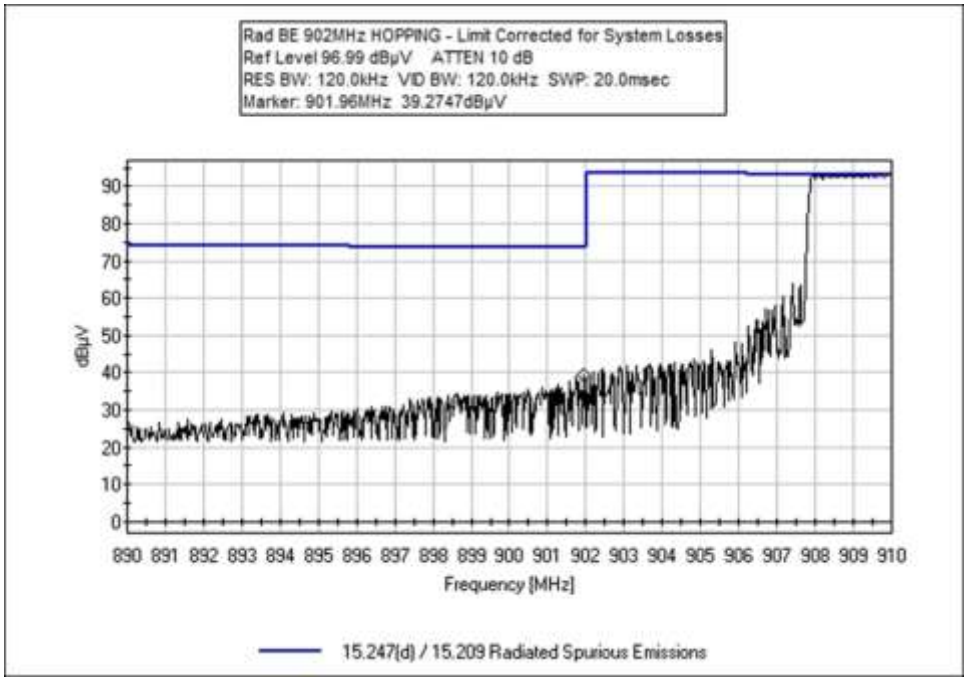
Band Edge Plots

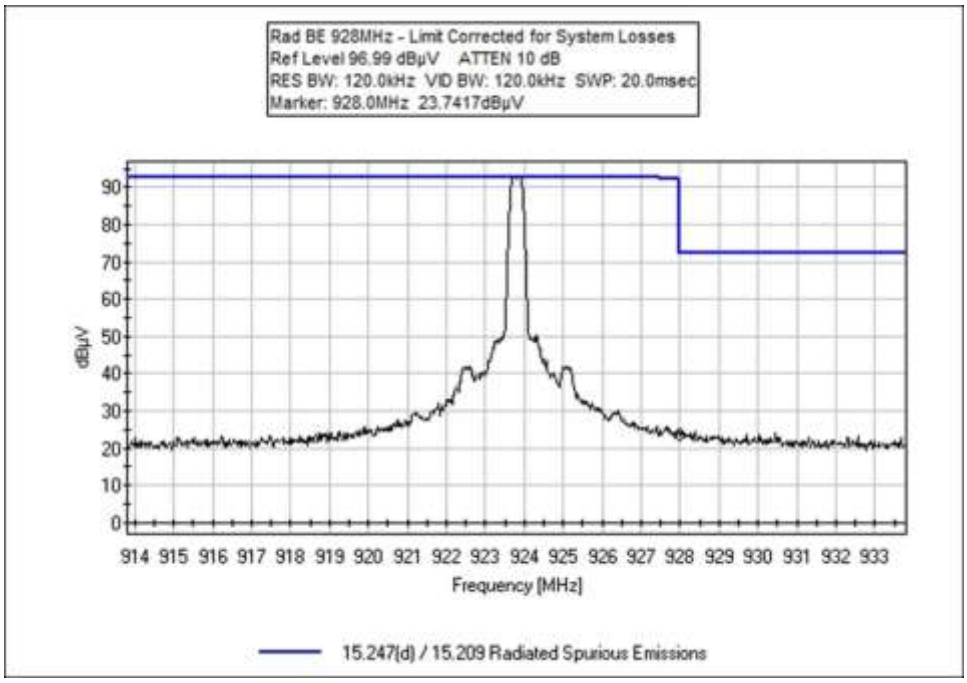
Configuration 2

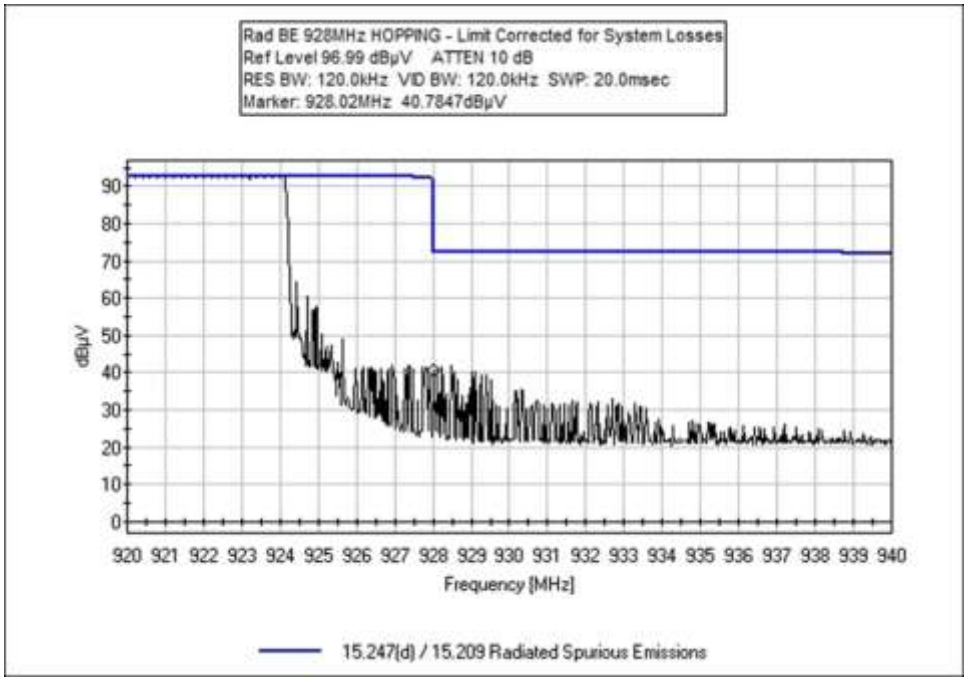


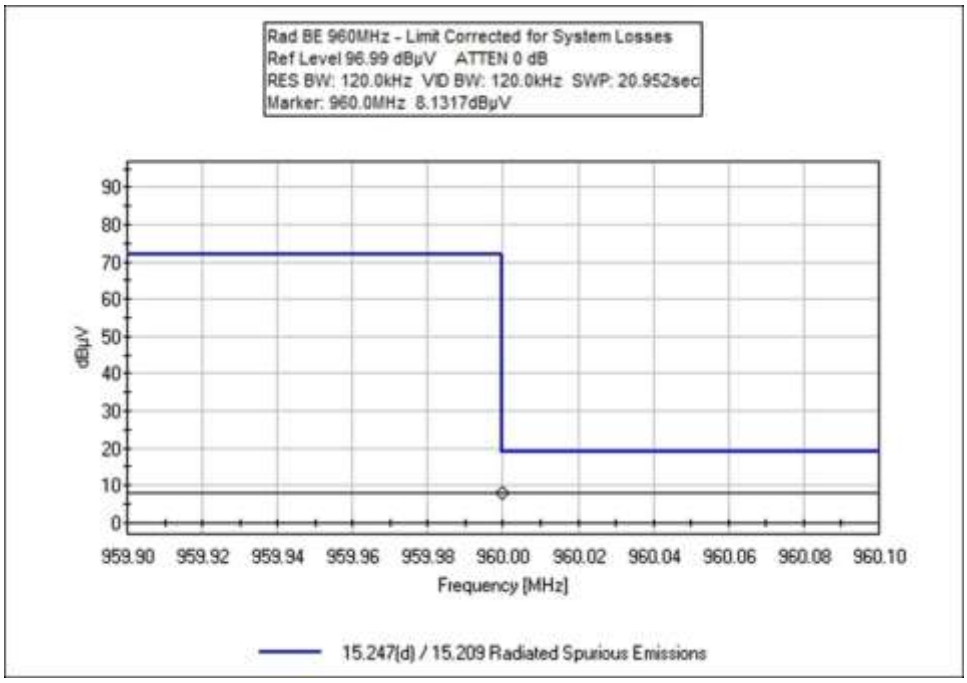


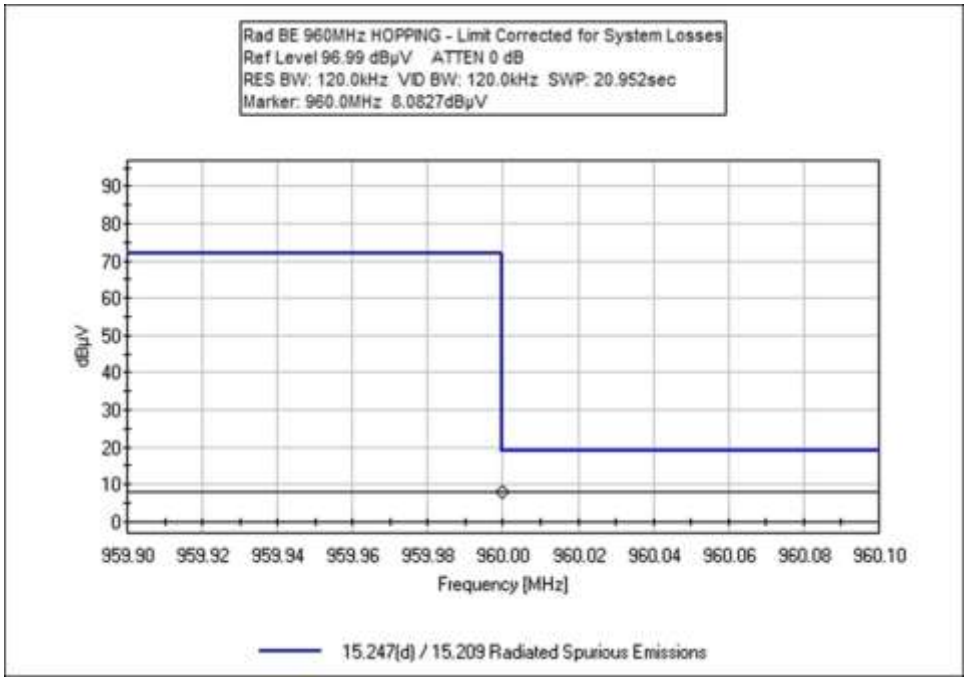

Rad BE 902MHz - Limit Corrected for System Losses
Ref Level 98.99 dBµV ATTEN 10 dB
RES BW: 120.0kHz VID BW: 120.0kHz SWP: 20.0msec
Marker: 902.0MHz 22.0037dBµV
dBµV
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions


Rad BE 902MHz HOPPING - Limit Corrected for System Losses
Ref Level 96.99 dBµV ATTEN 10 dB
RES BW: 120.0kHz VID BW: 120.0kHz SWP: 20.0msec
Marker: 901.96MHz 39.2747dBµV
dBµV
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions

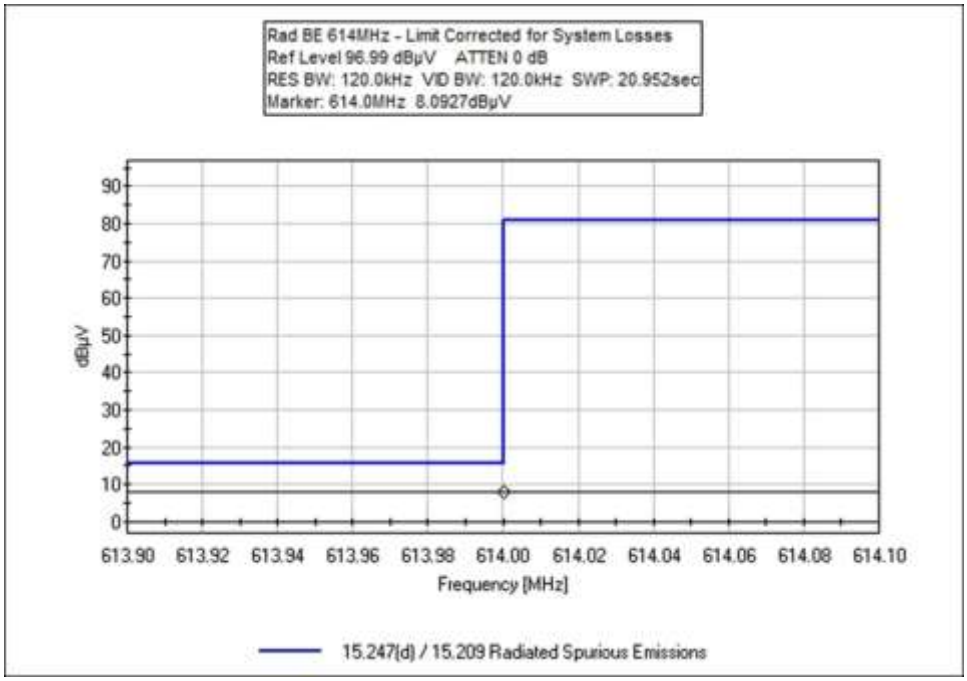

Rad BE 928MHz - Limit Corrected for System Losses
Ref Level 96.99 dBµV ATTEN 10 dB
RES BW: 120.0kHz VID BW: 120.0kHz SWP: 20.0msec
Marker: 928.0MHz 23.7417dBµV
dBµV
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions

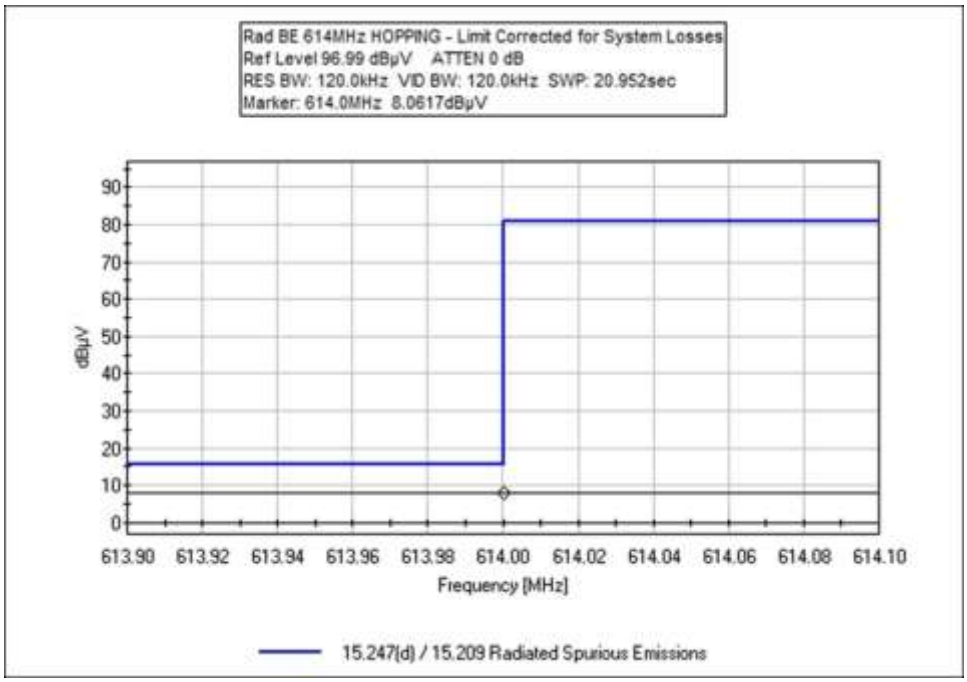

Rad BE 928MHz HOPPING - Limit Corrected for System Losses
Ref Level 96.99 dBµV ATTEN 10 dB
RES BW: 120.0kHz VID BW: 120.0kHz SWP: 20.0msec
Marker: 928.02MHz 40.7847dBµV
dBµV
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions

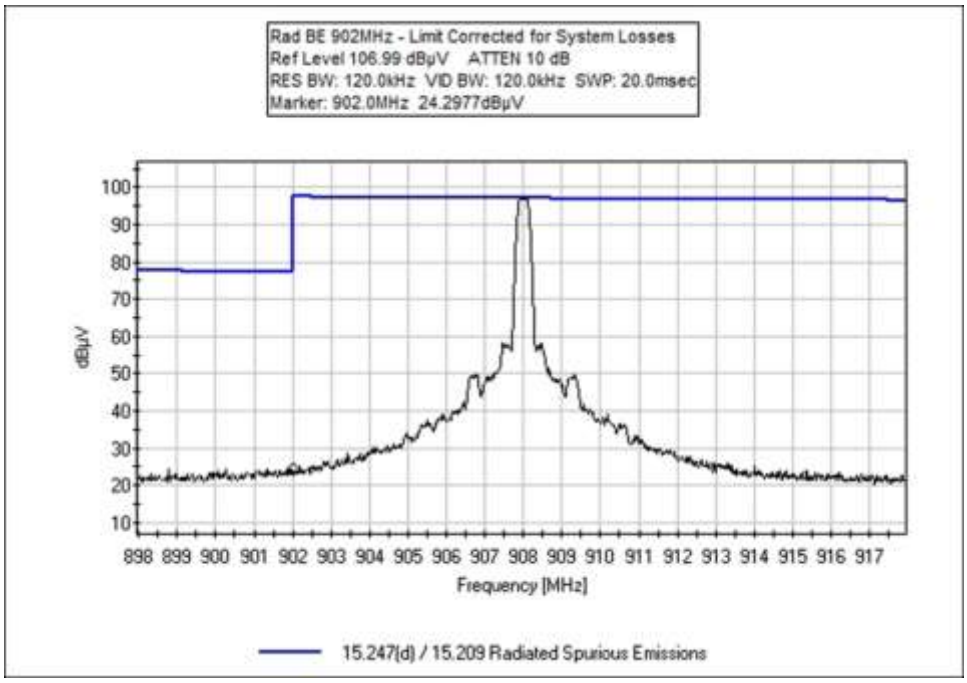

Rad BE 960MHz - Limit Corrected for System Losses
Ref Level 96.99 dBµV ATTEN 0 dB
RES BW: 120.0kHz VID BW: 120.0kHz SWP: 20.952sec
Marker: 960.0MHz 8.1317dBµV
dBµV
90
80
70
60
50
40
30
20
10
0
959.90 959.92 959.94 959.96 959.98 960.00 960.02 960.04 960.06 960.08 960.10
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions

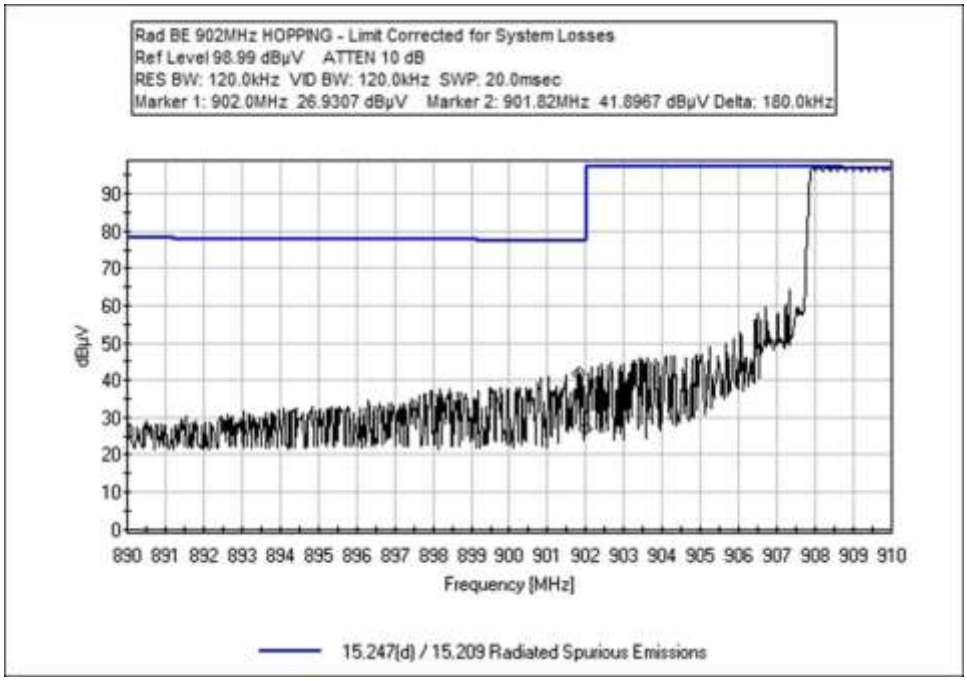

Rad BE 960MHz HOPPING - Limit Corrected for System Losses
Ref Level 96.99 dBµV ATTEN 0 dB
RES BW: 120.0kHz VID BW: 120.0kHz SWP: 20.952sec
Marker: 960.0MHz 8.0827dBµV
dBµV
90
80
70
60
50
40
30
20
10
0
959.90 959.92 959.94 959.96 959.98 960.00 960.02 960.04 960.06 960.08 960.10
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions

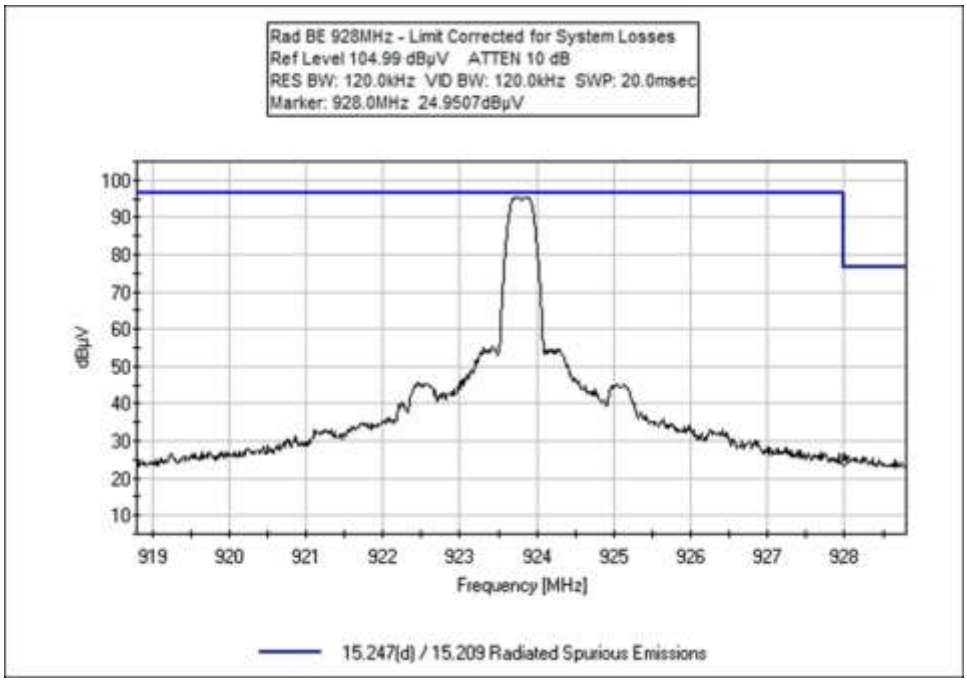
Configuration 3

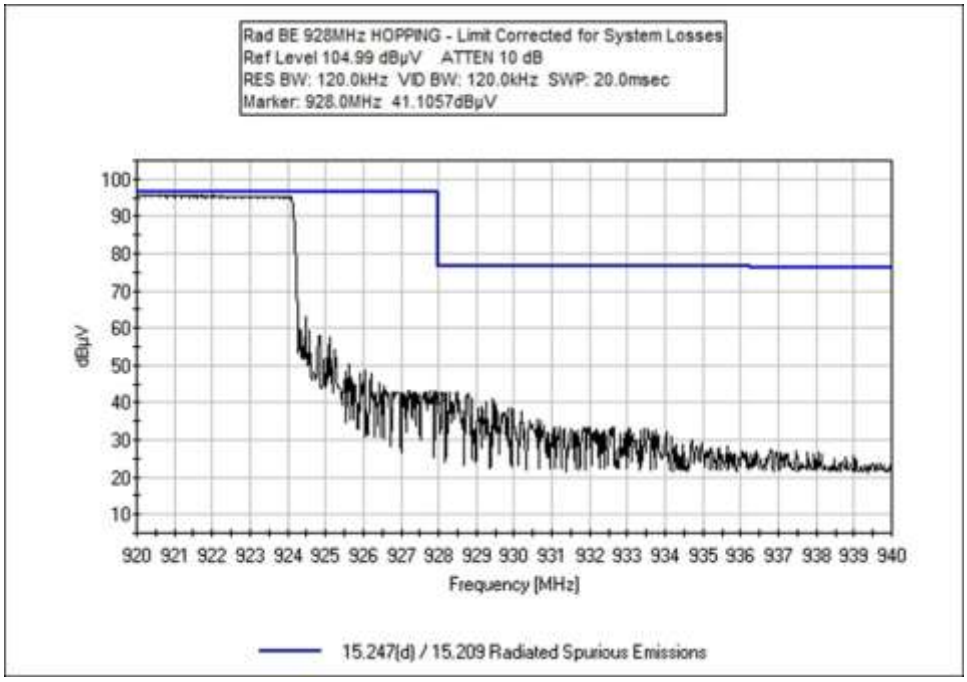


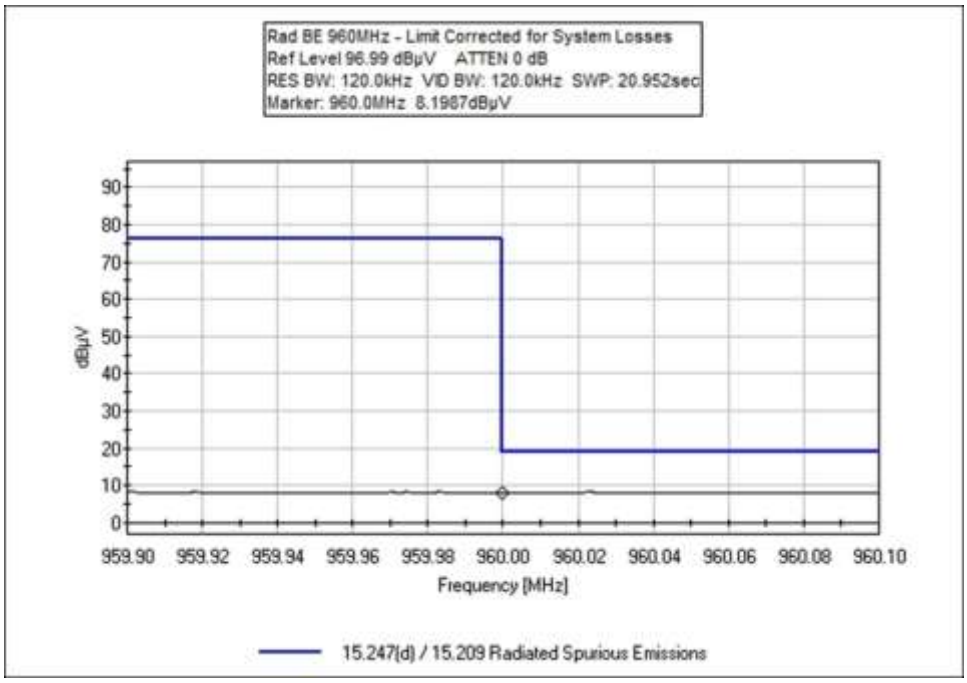


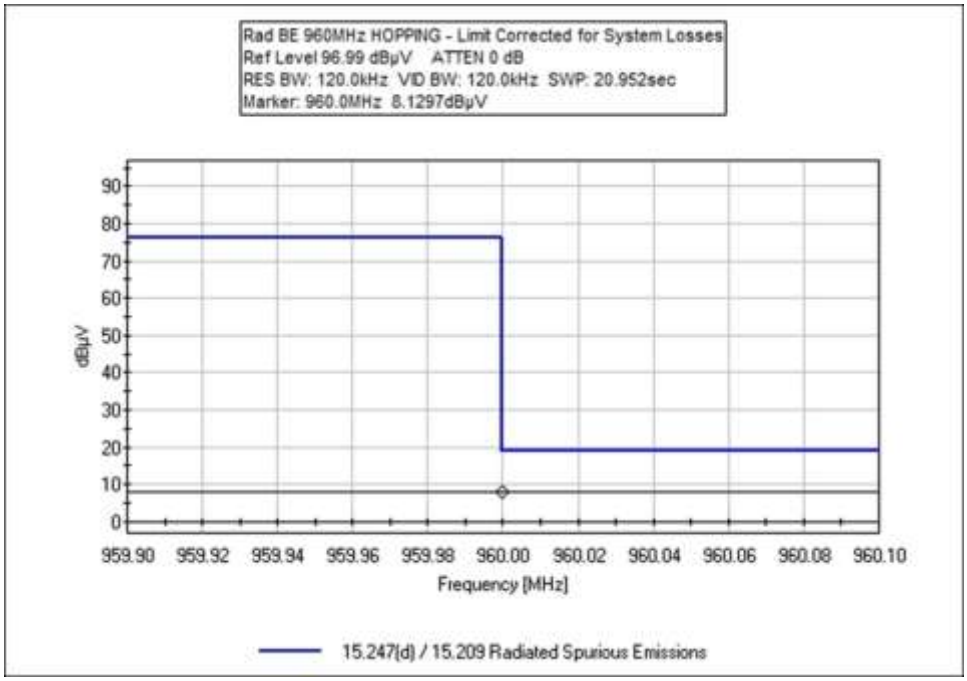

Rad BE 902MHz - Limit Corrected for System Losses
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 120.0kHz VID BW: 120.0kHz SWP: 20.0msec
Marker: 902.0MHz 24.2977dBµV
dBµV
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions


Rad BE 902MHz HOPPING - Limit Corrected for System Losses
Ref Level 98.99 dBµV ATTEN 10 dB
RES BW: 120.0kHz VID BW: 120.0kHz SWP: 20.0msec
Marker 1: 902.0MHz 26.9307 dBµV Marker 2: 901.82MHz 41.8967 dBµV Delta: 180.0kHz
dBµV
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions


Rad BE 928MHz - Limit Corrected for System Losses
Ref Level 104.99 dBµV ATTEN 10 dB
RES BW: 120.0kHz VID BW: 120.0kHz SWP: 20.0msec
Marker: 928.0MHz 24.9507dBµV
dBµV
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions


Rad BE 928MHz HOPPING - Limit Corrected for System Losses
Ref Level 104.99 dBµV ATTEN 10 dB
RES BW: 120.0kHz VID BW: 120.0kHz SWP: 20.0msec
Marker: 928.0MHz 41.1057dBµV
dBµV
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions


Rad BE 960MHz - Limit Corrected 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 8.1987dBµV
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


Rad BE 960MHz HOPPING - Limit Corrected 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 8.1297dBµV
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

Test Setup / Conditions / Data

Test Location:	CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)		
Customer:	**Itron, Inc.**		
Specification:	**15.247(d) / 15.209 Radiated Spurious Emissions**		
Work Order #:	**102206**	Date:	2/8/2019
Test Type:	**Maximized Emissions**	Time:	11:28:00
Tested By:	Michael Atkinson	Sequence#:	3
Software:	EMITest 5.03.11		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

Test Conditions / Notes:

Frequency Range: 908-923.8
Frequency tested: Band Edge
Firmware power setting: Max Power
Protocol /MCS/Modulation: FSK

Duty Cycle: 100% (Test Mode)

Test Mode: Continuously transmitting
Test Setup: EUT is continuously transmitting through the external 5dBi vehicle mounted antenna. Also investigated continuously hopping mode. Investigated X, Y, Z EUT axes and vertical/horizontal polarity, worst case reported.

Test Equipment:

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

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	8.0	+0.3 +21.2	+1.3	+1.5	+5.9	+0.0	38.2	46.0 Hopping	-7.8	Vert
2	614.000M QP	8.0	+0.3 +21.2	+1.3	+1.5	+5.9	+0.0	38.2	46.0	-7.8	Vert
3	960.000M QP	8.1	+0.4 +24.9	+1.6	+2.1	+5.9	+0.0	43.0	54.0	-11.0	Vert
4	960.000M QP	8.1	+0.4 +24.9	+1.6	+2.1	+5.9	+0.0	43.0	54.0 Hopping	-11.0	Vert
5	928.020M	40.8	+0.4 +24.6	+1.6	+2.0	+5.9	+0.0	75.3	107.0 Hopping	-31.7	Vert
6	901.960M	39.3	+0.3 +23.8	+1.5	+2.0	+5.9	+0.0	72.8	107.0 Hopping	-34.2	Vert
7	928.000M	23.7	+0.4 +24.6	+1.6	+2.0	+5.9	+0.0	58.2	107.0	-48.8	Vert
8	902.000M	22.0	+0.3 +23.8	+1.5	+2.0	+5.9	+0.0	55.5	107.0	-51.5	Vert

Test Location:	CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)		
Customer:	**Itron, Inc.**		
Specification:	**15.247(d) / 15.209 Radiated Spurious Emissions**		
Work Order #:	**102206**	Date:	2/8/2019
Test Type:	**Maximized Emissions**	Time:	10:41:25
Tested By:	Michael Atkinson	Sequence#:	2
Software:	EMITest 5.03.11		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 3			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 3			

Test Conditions / Notes:

Frequency Range: 908-923.8
Frequency tested: Band Edge
Firmware power setting: Max Power
Protocol /MCS/Modulation: FSK

Duty Cycle: 100% (Test Mode)

Test Mode: Continuously transmitting
Test Setup: EUT is continuously transmitting through the attached 3dBi Rubber Duck antenna. Also investigated continuously hopping mode. Investigated X, Y, Z EUT axes and vertical/horizontal polarity, worst case reported.

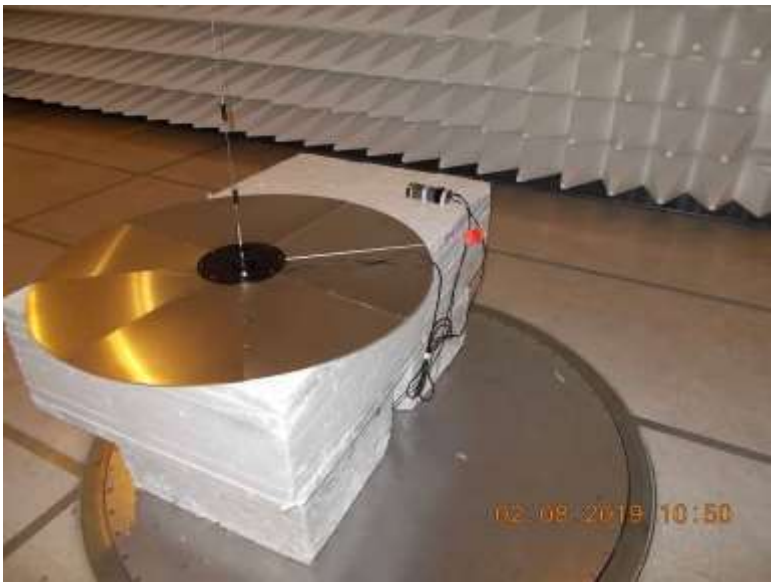
Test Equipment:

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

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	8.1	+0.3 +21.2	+1.3	+1.5	+5.9	+0.0	38.3	46.0	-7.7	Horiz
2	614.000M QP	8.1	+0.3 +21.2	+1.3	+1.5	+5.9	+0.0	38.3	46.0 Hopping	-7.7	Horiz
3	960.000M QP	8.2	+0.4 +24.9	+1.6	+2.1	+5.9	+0.0	43.1	54.0	-10.9	Horiz
4	960.000M QP	8.1	+0.4 +24.9	+1.6	+2.1	+5.9	+0.0	43.0	54.0 Hopping	-11.0	Horiz
5	928.000M	41.1	+0.4 +24.6	+1.6	+2.0	+5.9	+0.0	75.6	111.0 Hopping	-35.4	Horiz
6	901.820M	41.9	+0.3 +23.8	+1.5	+2.0	+5.9	+0.0	75.4	111.0 Hopping	-35.6	Horiz
7	902.000M	26.9	+0.3 +23.8	+1.5	+2.0	+5.9	+0.0	60.4	111.0 Hopping	-50.6	Horiz
8	928.000M	25.0	+0.4 +24.6	+1.6	+2.0	+5.9	+0.0	59.5	111.0	-51.5	Horiz
9	902.000M	24.3	+0.3 +23.8	+1.5	+2.0	+5.9	+0.0	57.8	111.0	-53.2	Horiz

Test Setup Photo(s)



Configuration 2, Below 1GHz

Configuration 2, Above 1GHz Cone placement

Configuration 3, Below 1GHz

Configuration 3, Above 1GHz Cone placement

X Axis

Y Axis

Z Axis

15.207 AC Conducted Emissions

Test Setup / Conditions / Data

Test Location:	CKC Laboratories, Inc. • 22116 23rd Drive SE, Suite A • Bothell, WA. 98021 • 1-800-500-4EMC		
Customer:	**Itron, Inc**		
Specification:	**15.207 AC Mains - Average**		
Work Order #:	**102206**	Date:	2/8/2019
Test Type:	**Conducted Emissions**	Time:	09:14:04
Tested By:	Michael Atkinson	Sequence#:	17
Software:	EMITest 5.03.11		115VAC 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 3			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 3			

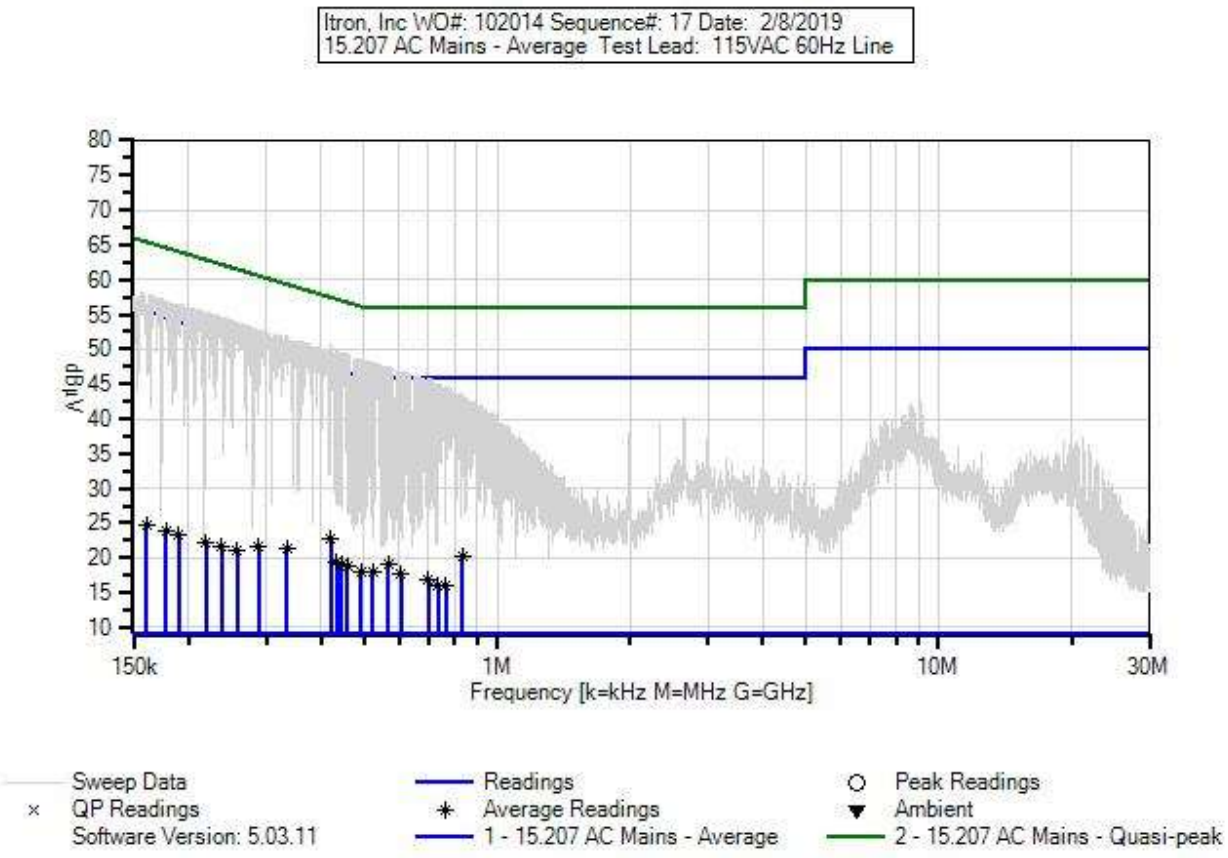
Test Conditions / Notes:

Temperature: 20-23°C
Humidity: 20-30%
Pressure: 102-103kPa

Frequency Range: 908-923.8
Frequency tested: 0.15-30MHz
Firmware power setting: Max Power
Protocol /MCS/Modulation: FSK
Test Location: Bothell Lab C3

Test Method: ANSI C63.10 (2013)
Duty Cycle: 100% (Test Mode)

Test Mode: Continuously transmitting
Test Setup: EUT is transmitting through to attached antenna port. Investigated multiple Low, Middle, High channels, mid channel data that is representative of worst case reported. Investigated attached and vehicle mounted antenna, attached antenna data that is representative of worst case reported.


Itron, Inc WO#: 102014 Sequence#: 17 Date: 2/8/2019
15.207 AC Mains - Average 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: 5.03.11
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	11/3/2017	11/3/2019
T1	AN02611	High Pass Filter	HE9615-150K-50-720B	1/15/2018	1/15/2020
T2	ANP06540	Cable	Heliax	10/30/2017	10/30/2019
T3	ANP06515	Cable	Heliax	6/29/2018	6/29/2020
T4	ANP06219	Attenuator	768-10	4/13/2018	4/13/2020
T5	AN01311	50uH LISN-Line1 (L)	3816/2	3/16/2018	3/16/2020
	AN01311	50uH LISN-Line2 (N)	3816/2	3/16/2018	3/16/2020

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	419.994k	13.1	+0.1 +0.5	+0.0	+0.0	+9.1	+0.0	22.8	47.4	-24.6	Line
Ave											
^	419.993k	40.7	+0.1 +0.5	+0.0	+0.0	+9.1	+0.0	50.4	47.4	+3.0	Line
3	833.750k	10.7	+0.2 +0.3	+0.0	+0.0	+9.1	+0.0	20.3	46.0	-25.7	Line
Ave											
^	833.750k	33.6	+0.2 +0.3	+0.0	+0.0	+9.1	+0.0	43.2	46.0	-2.8	Line
5	566.580k	9.4	+0.2 +0.4	+0.0	+0.0	+9.1	+0.0	19.1	46.0	-26.9	Line
Ave											
^	566.580k	37.9	+0.2 +0.4	+0.0	+0.0	+9.1	+0.0	47.6	46.0	+1.6	Line
7	458.512k	9.0	+0.1 +0.5	+0.0	+0.1	+9.1	+0.0	18.8	46.7	-27.9	Line
Ave											
^	458.512k	39.6	+0.1 +0.5	+0.0	+0.1	+9.1	+0.0	49.4	46.7	+2.7	Line
9	522.950k	8.4	+0.2 +0.4	+0.0	+0.0	+9.1	+0.0	18.1	46.0	-27.9	Line
Ave											
^	522.950k	38.3	+0.2 +0.4	+0.0	+0.0	+9.1	+0.0	48.0	46.0	+2.0	Line
11	432.455k	9.4	+0.2 +0.5	+0.0	+0.1	+9.1	+0.0	19.3	47.2	-27.9	Line
Ave											
^	432.454k	39.9	+0.2 +0.5	+0.0	+0.1	+9.1	+0.0	49.8	47.2	+2.6	Line
13	443.091k	9.2	+0.2 +0.5	+0.0	+0.1	+9.1	+0.0	19.1	47.0	-27.9	Line
Ave											
^	443.090k	39.7	+0.2 +0.5	+0.0	+0.1	+9.1	+0.0	49.6	47.0	+2.6	Line
15	333.835k	11.6	+0.1 +0.6	+0.0	+0.0	+9.1	+0.0	21.4	49.4	-28.0	Line
Ave											
^	333.835k	42.2	+0.1 +0.6	+0.0	+0.0	+9.1	+0.0	52.0	49.4	+2.6	Line

17 Ave	492.682k	8.2	+0.2 +0.4	+0.0	+0.0	+9.1	+0.0	17.9	46.1	-28.2	Line
^	492.681k	39.0	+0.2 +0.4	+0.0	+0.0	+9.1	+0.0	48.7	46.1	+2.6	Line
19 Ave	606.340k	7.9	+0.2 +0.4	+0.0	+0.0	+9.1	+0.0	17.6	46.0	-28.4	Line
^	606.340k	36.8	+0.2 +0.4	+0.0	+0.0	+9.1	+0.0	46.5	46.0	+0.5	Line
21 Ave	288.320k	11.6	+0.1 +0.7	+0.0	+0.0	+9.1	+0.0	21.5	50.6	-29.1	Line
^	288.320k	43.0	+0.1 +0.7	+0.0	+0.0	+9.1	+0.0	52.9	50.6	+2.3	Line
23 Ave	698.810k	7.2	+0.2 +0.3	+0.0	+0.0	+9.1	+0.0	16.8	46.0	-29.2	Line
^	698.810k	36.4	+0.2 +0.3	+0.0	+0.0	+9.1	+0.0	46.0	46.0	+0.0	Line
25 Ave	765.040k	6.5	+0.2 +0.3	+0.0	+0.0	+9.1	+0.0	16.1	46.0	-29.9	Line
^	765.040k	34.5	+0.2 +0.3	+0.0	+0.0	+9.1	+0.0	44.1	46.0	-1.9	Line
27 Ave	735.130k	6.3	+0.2 +0.3	+0.0	+0.0	+9.1	+0.0	15.9	46.0	-30.1	Line
^	735.130k	35.0	+0.2 +0.3	+0.0	+0.0	+9.1	+0.0	44.6	46.0	-1.4	Line
29 Ave	257.290k	11.0	+0.2 +0.8	+0.0	+0.0	+9.1	+0.0	21.1	51.5	-30.4	Line
^	257.290k	44.1	+0.2 +0.8	+0.0	+0.0	+9.1	+0.0	54.2	51.5	+2.7	Line
31 Ave	219.290k	11.9	+0.2 +1.1	+0.0	+0.0	+9.1	+0.0	22.3	52.8	-30.5	Line
^	219.290k	45.2	+0.2 +1.1	+0.0	+0.0	+9.1	+0.0	55.6	52.8	+2.8	Line
33 Ave	237.770k	11.4	+0.2 +0.9	+0.0	+0.0	+9.1	+0.0	21.6	52.2	-30.6	Line
34 Ave	237.920k	11.4	+0.2 +0.9	+0.0	+0.0	+9.1	+0.0	21.6	52.2	-30.6	Line
^	237.920k	44.7	+0.2 +0.9	+0.0	+0.0	+9.1	+0.0	54.9	52.2	+2.7	Line
^	237.770k	44.6	+0.2 +0.9	+0.0	+0.0	+9.1	+0.0	54.8	52.2	+2.6	Line
37 Ave	160.570k	13.5	+0.6 +1.6	+0.0	+0.0	+9.1	+0.0	24.8	55.4	-30.6	Line
^	160.570k	46.8	+0.6 +1.6	+0.0	+0.0	+9.1	+0.0	58.1	55.4	+2.7	Line
39 Ave	190.100k	12.5	+0.3 +1.3	+0.0	+0.0	+9.1	+0.0	23.2	54.0	-30.8	Line
^	190.100k	45.9	+0.3 +1.3	+0.0	+0.0	+9.1	+0.0	56.6	54.0	+2.6	Line
41 Ave	177.450k	13.0	+0.3 +1.4	+0.0	+0.0	+9.1	+0.0	23.8	54.6	-30.8	Line
^	177.450k	46.2	+0.3 +1.4	+0.0	+0.0	+9.1	+0.0	57.0	54.6	+2.4	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 - Average**		
Work Order #:	**102206**	Date:	2/8/2019
Test Type:	**Conducted Emissions**	Time:	09:00:10
Tested By:	Michael Atkinson	Sequence#:	16
Software:	EMITest 5.03.11		115VAC 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 3			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 3			

Test Conditions / Notes:

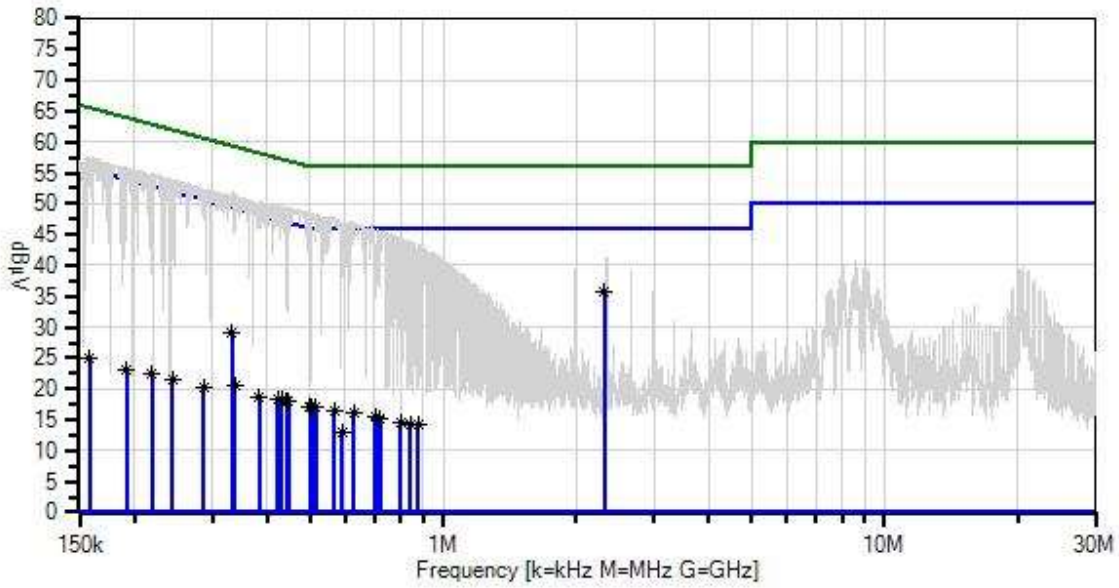
Temperature: 20-23°C
Humidity: 20-30%
Pressure: 102-103kPa

Frequency Range: 908-923.8
Frequency tested: 0.15-30MHz
Firmware power setting: Max Power
Protocol /MCS/Modulation: FSK

Duty Cycle: 100% (Test Mode)

Test Mode: Continuously transmitting
Test Setup: EUT is transmitting through to attached antenna port. Investigated multiple Low, Middle, High channels, mid channel data that is representative of worst case reported. Investigated attached and vehicle mounted antenna, attached antenna data that is representative of worst case reported.

Itron, Inc WO#: 102014 Sequence#: 16 Date: 2/8/2019
15.207 AC Mains - Average Test Lead: 115VAC 60Hz Return



Sweep Data
× QP Readings
Software Version: 5.03.11
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	11/3/2017	11/3/2019
T1	AN02611	High Pass Filter	HE9615-150K-50-720B	1/15/2018	1/15/2020
T2	ANP06540	Cable	Heliax	10/30/2017	10/30/2019
T3	ANP06515	Cable	Heliax	6/29/2018	6/29/2020
T4	ANP06219	Attenuator	768-10	4/13/2018	4/13/2020
	AN01311	50uH LISN-Line1 (L)	3816/2	3/16/2018	3/16/2020
T5	AN01311	50uH LISN-Line2 (N)	3816/2	3/16/2018	3/16/2020

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	2.315M	26.2	+0.1 +0.3	+0.0	+0.1	+9.1	+0.0	35.8	46.0	-10.2	Retur
Ave											
^	2.315M	32.6	+0.1 +0.3	+0.0	+0.1	+9.1	+0.0	42.2	46.0	-3.8	Retur
3	332.767k	19.2	+0.1 +0.6	+0.0	+0.0	+9.1	+0.0	29.0	49.4	-20.4	Retur
Ave											
4	498.427k	7.5	+0.2 +0.4	+0.0	+0.0	+9.1	+0.0	17.2	46.0	-28.8	Retur
Ave											
^	498.426k	38.5	+0.2 +0.4	+0.0	+0.0	+9.1	+0.0	48.2	46.0	+2.2	Retur
6	337.039k	10.7	+0.1 +0.6	+0.0	+0.0	+9.1	+0.0	20.5	49.3	-28.8	Retur
Ave											
^	332.767k	42.2	+0.1 +0.6	+0.0	+0.0	+9.1	+0.0	52.0	49.4	+2.6	Retur
^	337.039k	41.9	+0.1 +0.6	+0.0	+0.0	+9.1	+0.0	51.7	49.3	+2.4	Retur
9	446.720k	8.2	+0.2 +0.5	+0.0	+0.1	+9.1	+0.0	18.1	46.9	-28.8	Retur
Ave											
^	446.719k	39.7	+0.2 +0.5	+0.0	+0.1	+9.1	+0.0	49.6	46.9	+2.7	Retur
11	441.579k	8.2	+0.2 +0.5	+0.0	+0.1	+9.1	+0.0	18.1	47.0	-28.9	Retur
Ave											
^	441.579k	39.6	+0.2 +0.5	+0.0	+0.1	+9.1	+0.0	49.5	47.0	+2.5	Retur
13	503.870k	7.4	+0.2 +0.4	+0.0	+0.0	+9.1	+0.0	17.1	46.0	-28.9	Retur
Ave											
^	503.869k	38.8	+0.2 +0.4	+0.0	+0.0	+9.1	+0.0	48.5	46.0	+2.5	Retur
15	430.675k	8.3	+0.2 +0.5	+0.0	+0.1	+9.1	+0.0	18.2	47.2	-29.0	Retur
Ave											
^	430.674k	39.8	+0.2 +0.5	+0.0	+0.1	+9.1	+0.0	49.7	47.2	+2.5	Retur

17 Ave	514.453k	7.3	+0.2 +0.4	+0.0	+0.0	+9.1	+0.0	17.0	46.0	-29.0	Retur
^	514.453k	38.6	+0.2 +0.4	+0.0	+0.0	+9.1	+0.0	48.3	46.0	+2.3	Retur
19 Ave	421.774k	8.4	+0.1 +0.5	+0.0	+0.1	+9.1	+0.0	18.2	47.4	-29.2	Retur
^	421.774k	39.9	+0.1 +0.5	+0.0	+0.1	+9.1	+0.0	49.7	47.4	+2.3	Retur
21 Ave	382.967k	9.0	+0.1 +0.5	+0.0	+0.0	+9.1	+0.0	18.7	48.2	-29.5	Retur
^	382.967k	40.8	+0.1 +0.5	+0.0	+0.0	+9.1	+0.0	50.5	48.2	+2.3	Retur
23 Ave	566.580k	6.7	+0.2 +0.4	+0.0	+0.0	+9.1	+0.0	16.4	46.0	-29.6	Retur
^	566.580k	37.8	+0.2 +0.4	+0.0	+0.0	+9.1	+0.0	47.5	46.0	+1.5	Retur
25 Ave	628.240k	6.5	+0.2 +0.4	+0.0	+0.0	+9.1	+0.0	16.2	46.0	-29.8	Retur
^	628.240k	37.2	+0.2 +0.4	+0.0	+0.0	+9.1	+0.0	46.9	46.0	+0.9	Retur
27 Ave	286.370k	10.4	+0.1 +0.7	+0.0	+0.0	+9.1	+0.0	20.3	50.6	-30.3	Retur
^	286.370k	42.7	+0.1 +0.7	+0.0	+0.0	+9.1	+0.0	52.6	50.6	+2.0	Retur
29 Ave	158.460k	13.6	+0.7 +1.6	+0.0	+0.0	+9.1	+0.0	25.0	55.5	-30.5	Retur
^	158.460k	46.4	+0.7 +1.6	+0.0	+0.0	+9.1	+0.0	57.8	55.5	+2.3	Retur
31 Ave	700.170k	5.8	+0.2 +0.3	+0.0	+0.0	+9.1	+0.0	15.4	46.0	-30.6	Retur
^	700.170k	36.5	+0.2 +0.3	+0.0	+0.0	+9.1	+0.0	46.1	46.0	+0.1	Retur
33 Ave	219.140k	12.0	+0.2 +1.0	+0.0	+0.0	+9.1	+0.0	22.3	52.9	-30.6	Retur
^	219.140k	44.7	+0.2 +1.0	+0.0	+0.0	+9.1	+0.0	55.0	52.9	+2.1	Retur
35 Ave	243.930k	11.2	+0.2 +0.9	+0.0	+0.0	+9.1	+0.0	21.4	52.0	-30.6	Retur
^	243.930k	43.9	+0.2 +0.9	+0.0	+0.0	+9.1	+0.0	54.1	52.0	+2.1	Retur
37 Ave	715.610k	5.6	+0.2 +0.3	+0.0	+0.0	+9.1	+0.0	15.2	46.0	-30.8	Retur
^	715.610k	36.0	+0.2 +0.3	+0.0	+0.0	+9.1	+0.0	45.6	46.0	-0.4	Retur
39 Ave	192.210k	12.5	+0.3 +1.2	+0.0	+0.0	+9.1	+0.0	23.1	53.9	-30.8	Retur
^	192.210k	45.3	+0.3 +1.2	+0.0	+0.0	+9.1	+0.0	55.9	53.9	+2.0	Retur
41 Ave	721.060k	5.6	+0.2 +0.3	+0.0	+0.0	+9.1	+0.0	15.2	46.0	-30.8	Retur
^	721.060k	36.2	+0.2 +0.3	+0.0	+0.0	+9.1	+0.0	45.8	46.0	-0.2	Retur

43	800.330k Ave	5.1	+0.2 +0.3	+0.0	+0.0	+9.1	+0.0	14.7	46.0	-31.3	Retur
^	800.330k	34.9	+0.2 +0.3	+0.0	+0.0	+9.1	+0.0	44.5	46.0	-1.5	Retur
45	841.420k Ave	4.7	+0.2 +0.3	+0.0	+0.0	+9.1	+0.0	14.3	46.0	-31.7	Retur
^	841.420k	34.2	+0.2 +0.3	+0.0	+0.0	+9.1	+0.0	43.8	46.0	-2.2	Retur
47	876.130k Ave	4.6	+0.2 +0.3	+0.0	+0.0	+9.1	+0.0	14.2	46.0	-31.8	Retur
^	876.130k	33.6	+0.2 +0.3	+0.0	+0.0	+9.1	+0.0	43.2	46.0	-2.8	Retur
49	591.720k Ave	3.4	+0.2 +0.4	+0.0	+0.0	+9.1	+0.0	13.1	46.0	-32.9	Retur
^	591.720k	37.6	+0.2 +0.4	+0.0	+0.0	+9.1	+0.0	47.3	46.0	+1.3	Retur

Test Setup Photo(s)

SUPPLEMENTAL INFORMATION

Measurement Uncertainty

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

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.