Itron, Inc.

REVISED TEST REPORT FOR

ORRN
Model: RN-EGS

Tested To The Following Standards:

FCC Part 15 Subpart C Section(s)

15.207 & 15.247
(FHSS 902-928 MHz)

Report No.: 100138-6A

Date of issue: January 10, 2018

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.

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: 135282

REPORT PREPARED BY:

Joyce Walker
CKC Laboratories, Inc.
5046 Sierra Pines Drive
Mariposa, CA 95338

Project Number: 100138

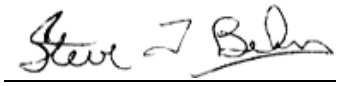
DATE OF EQUIPMENT RECEIPT: September 28, 2017
DATE(S) OF TESTING: September 28-29, 2017

Revision History

Original: Testing of the ORRN, Model: RN-EGS to FCC Part 15 Subpart C Section(s) 15.207 & 15.247.
Revision A: Changing one antenna gain from 5.1dBi to 5.5dBi.

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	5.03.11

Site Registration & Accreditation Information

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

SUMMARY OF RESULTS

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

NP = CKC Laboratories was not contracted to perform test. See Appendix A for Manufacturer's Declaration.

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
ORRN	Itron, Inc.	RN-EGS	320270235

Support Equipment:

Device	Manufacturer	Model #	S/N
Laptop	Dell	E6430	NA
AC/DC Adapter (for Laptop)	Dell	DA130PE-00	NA

General Product Information:

Product Information	Manufacturer-Provided Details
Equipment Type:	Stand-Alone Equipment
Type of Wideband System:	Proprietary FHSS
Operating Frequency Range:	903-926.9MHz
Number of Hopping Channels:	120
Modulation Type(s):	12.5 Kbit/sec FM (2GFSK), 37.5 Kbit/sec FM (2GFSK)
Maximum Duty Cycle:	23.8%
Number of TX Chains:	1
Antenna Type(s) and Gain:	External Monopole, 5.15dBi or 5.5dBi
Beamforming Type:	NA
Antenna Connection Type:	External Connector
Nominal Input Voltage:	115VAC, 60Hz
Firmware / Software used for Test:	Firmware: ARM 1.0.0.0 DSP 1.0.0.0, FPGA 4.14 Software: SrTest100 v4.1.1.25

FCC Part 15 Subpart C

15.247(a) Transmitter Characteristics

Test Setup/Conditions			
Test Location:	Bothell Lab Bench	Test Engineer:	M. Atkinson
Test Method:	ANSI C63.10 (2013)	Test Date(s):	9/28/2017 to 9/29/2017
Configuration:	1		
Test Setup:	The EUT ISM port is continuously transmitting with modulation. The EUT ISM port is connected directly to a spectrum analyzer for direct connected measurements. Low, Mid, High channels investigated, all modulation types investigated, worst case reported.		

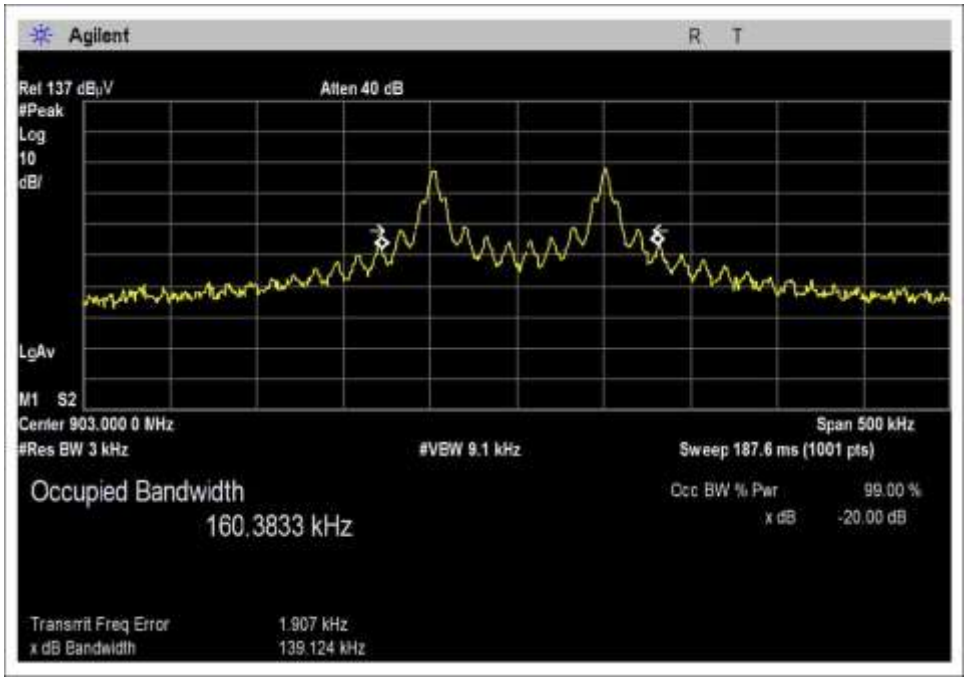
Environmental Conditions			
Temperature (ºC)	20-24	Relative Humidity (%):	34-40

Test Equipment					
Asset#	**Description**	**Manufacturer**	**Model**	**Cal Date**	**Cal Due**
02872	Spectrum Analyzer	Agilent	E4440A	11/18/2015	11/18/2017
P06124	Attenuator	Aeroflex	18N-6	5/5/2017	5/5/2019
P06219	Attenuator	Narda	768-10	4/12/2016	4/12/2018
P06540	Cable	Andrews	Heliax	10/29/2015	10/29/2017

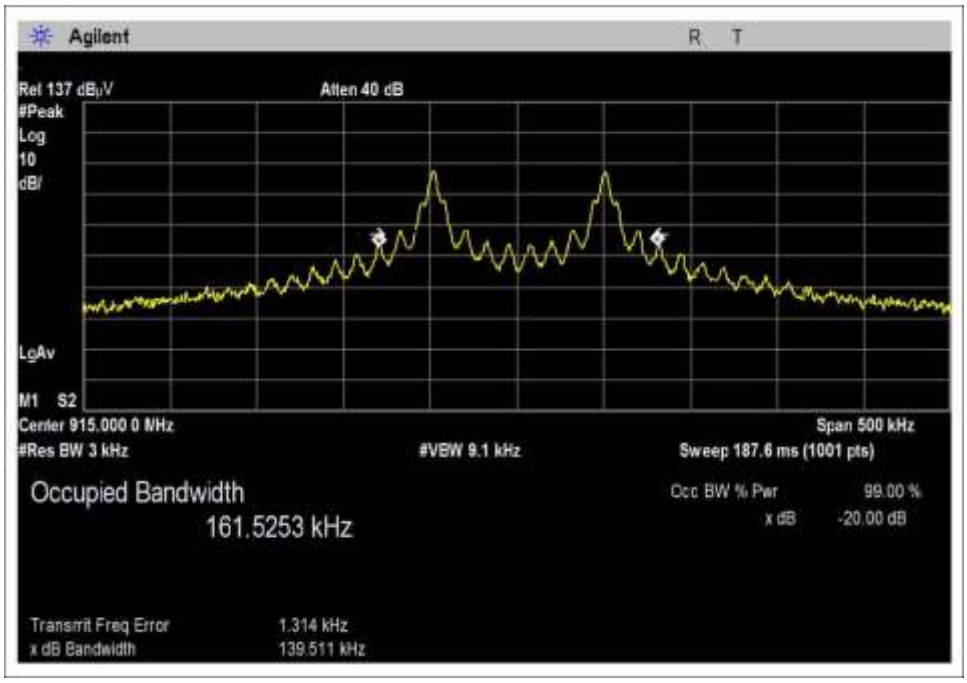
15.247(a)(1) 20 dB Bandwidth

Test Data Summary					
Frequency (MHz)	**Antenna Port**	**Modulation**	**Measured (kHz)**	**Limit (kHz)**	**Results**
903	1	12.5 Kbit/sec FM (2GFSK)	139.12	≤500	Pass
915	1	12.5 Kbit/sec FM (2GFSK)	139.51	≤500	Pass
926.9	1	12.5 Kbit/sec FM (2GFSK)	139.25	≤500	Pass
903	1	37.5 Kbit/sec FM (2GFSK)	84.00	≤500	Pass
915	1	37.5 Kbit/sec FM (2GFSK)	85.02	≤500	Pass
926.9	1	37.5 Kbit/sec FM (2GFSK)	82.53	≤500	Pass

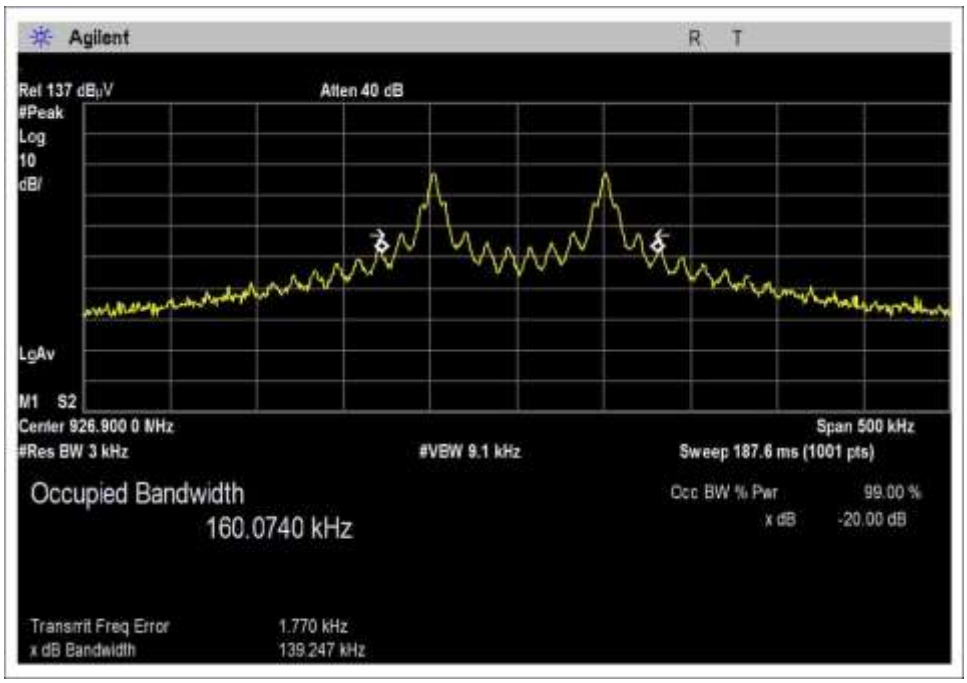
Plots



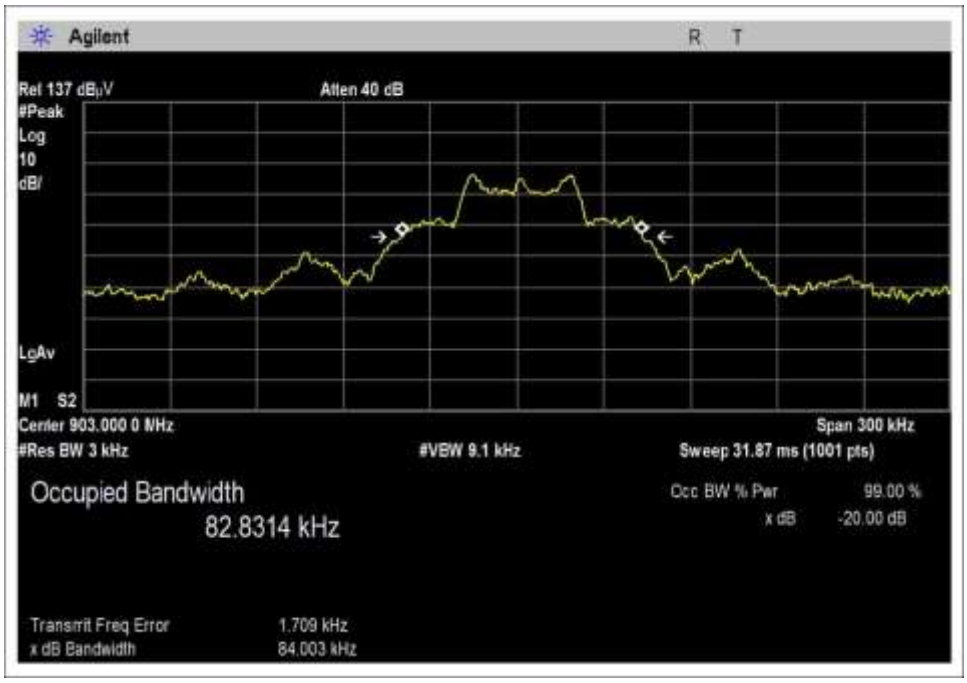
FM 12.5, Low Channel



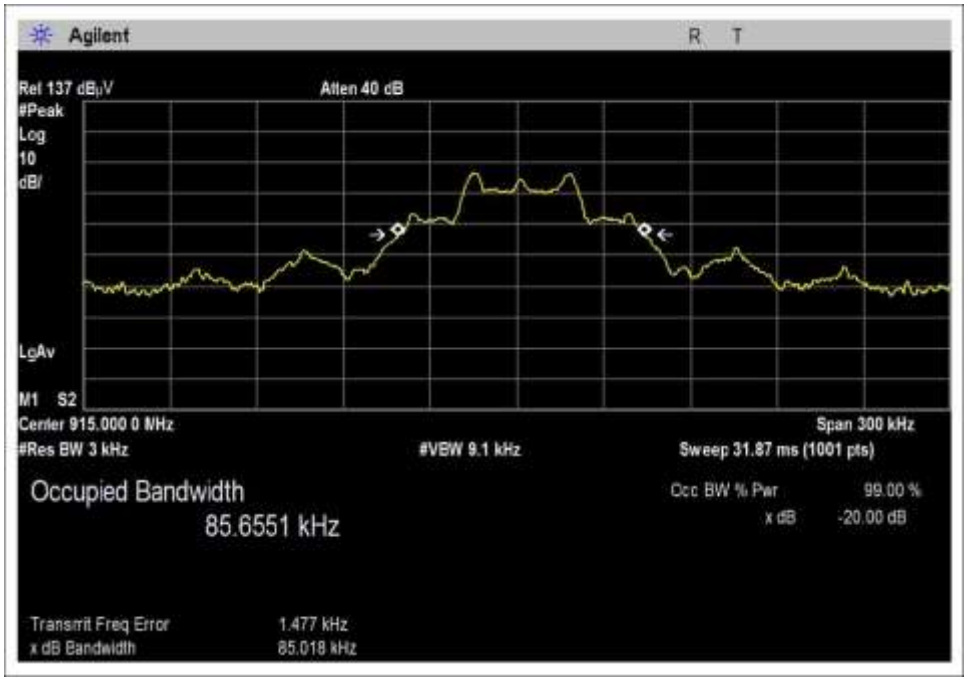
FM 12.5, Middle Channel



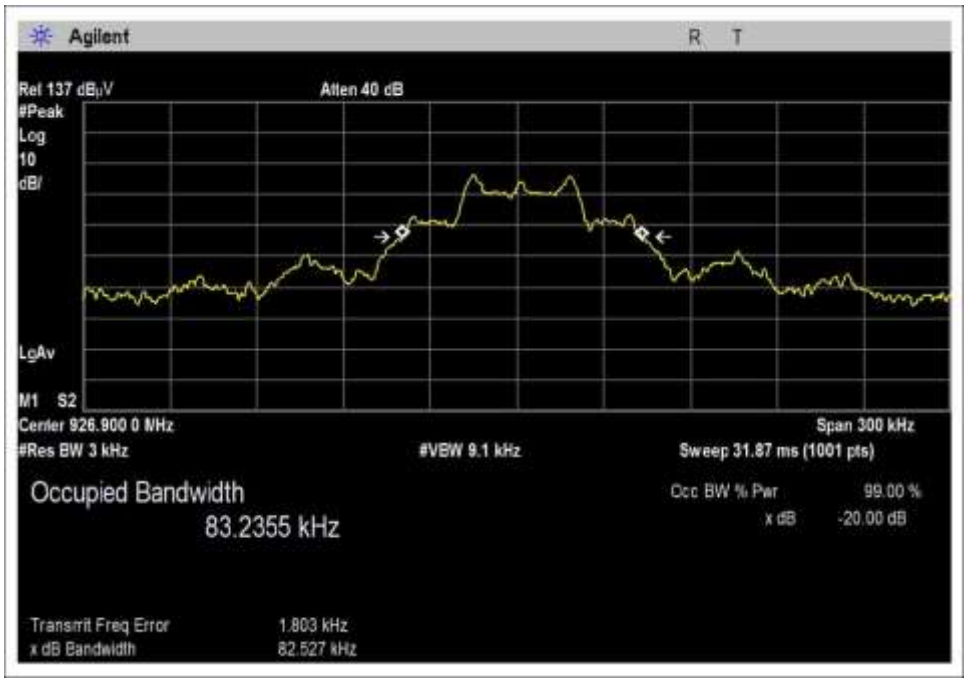
FM 12.5, High Channel



FM 37.5, Low Channel



FM 37.5, Middle Channel

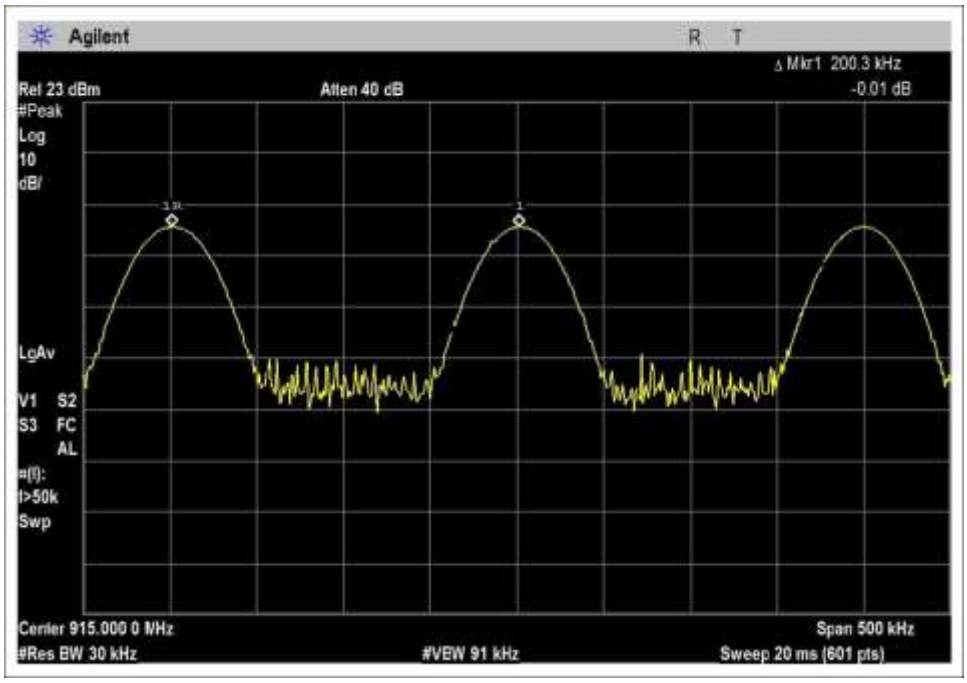


FM 37.5, High Channel

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	Continuously Transmitting while Hopping	200.3	>139.51	Pass

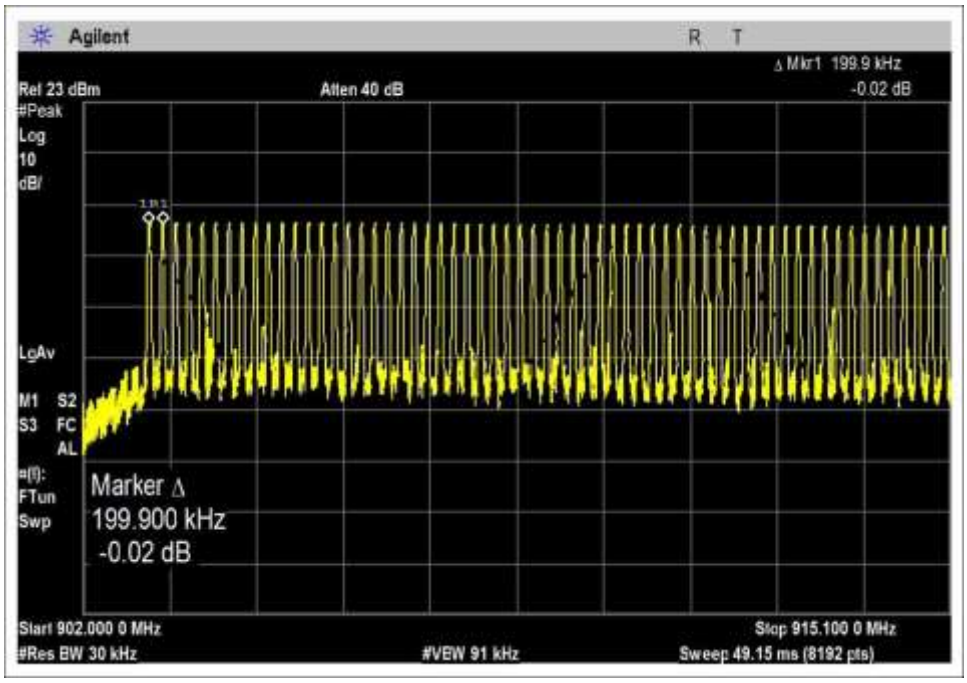
Plot



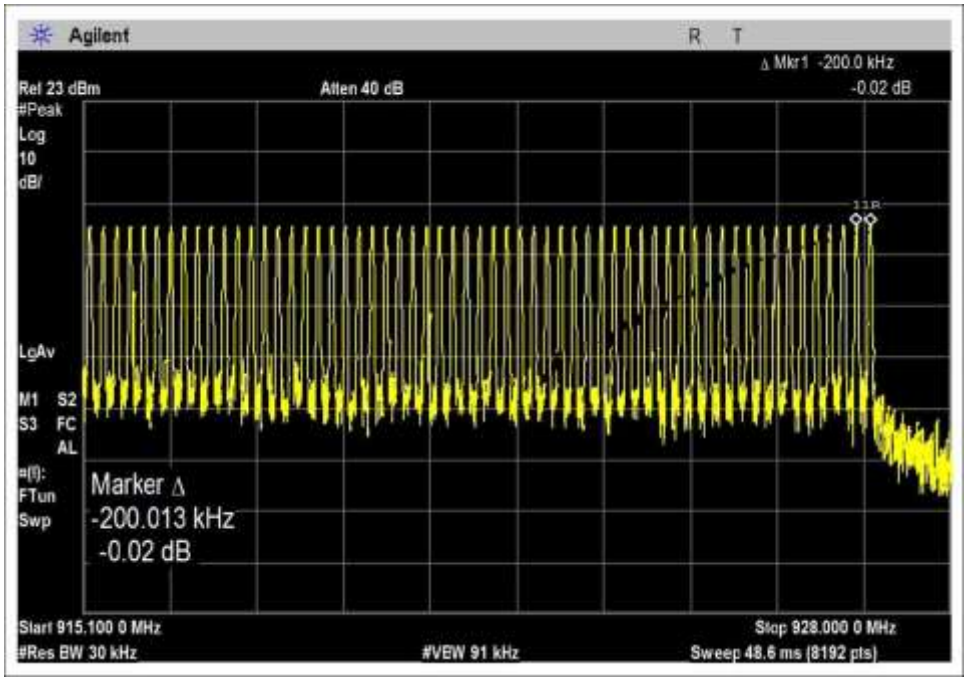
15.247(a)(1)(i) Number of Hopping Channels

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	Continuously Transmitting while Hopping	120	≥50	Pass

Plots



902-915.1MHz, 61 channels



915.1-928MHz, 59 channels

Test Setup Photo

15.247(b)(2) Output Power

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)**
903	37.5 Kbit/sec FM (2GFSK)	28.0	28.0	28.0	0.0
915	37.5 Kbit/sec FM (2GFSK)	27.8	27.8	27.8	0.0
926.9	37.5 Kbit/sec FM (2GFSK)	27.4	27.4	27.4	0.0

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

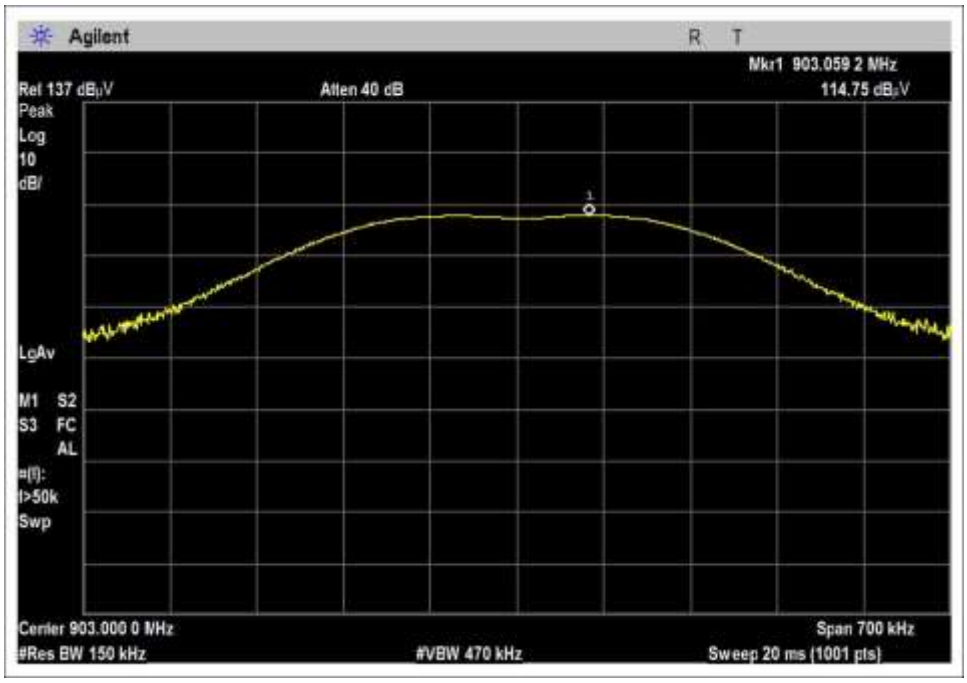
Parameter Definitions:

Measurements performed at input voltage according to manufacturer specification.

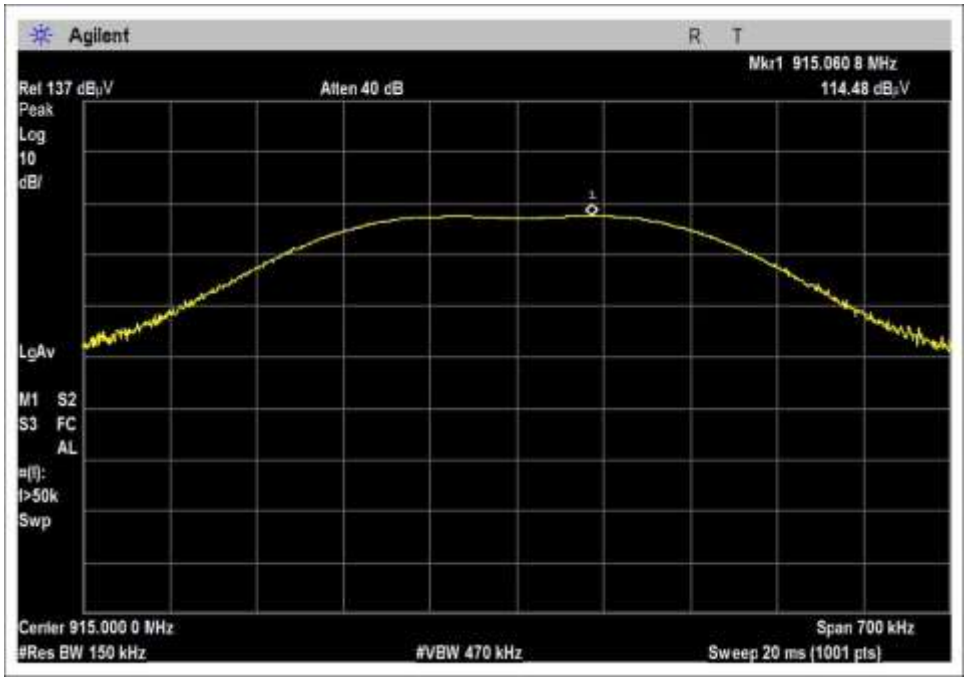
Parameter	Value
$V_{Nominal}$:	120VAC, 60Hz
$V_{Minimum}$:	102VAC, 60Hz
$V_{Maximum}$:	264VAC, 60Hz

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**
903	12.5 Kbit/sec FM (2GFSK)	External Monopole, 5.15dBi Max	28.0	≤30	Pass
915	12.5 Kbit/sec FM (2GFSK)	External Monopole, 5.15dBi Max	27.8	≤30	Pass
926.9	12.5 Kbit/sec FM (2GFSK)	External Monopole, 5.15dBi Max	27.4	≤30	Pass
903	37.5 Kbit/sec FM (2GFSK)	External Monopole, 5.15dBi Max	28.0	≤30	Pass
915	37.5 Kbit/sec FM (2GFSK)	External Monopole, 5.15dBi Max	27.8	≤30	Pass
926.9	37.5 Kbit/sec FM (2GFSK)	External Monopole, 5.15dBi Max	27.4	≤30	Pass

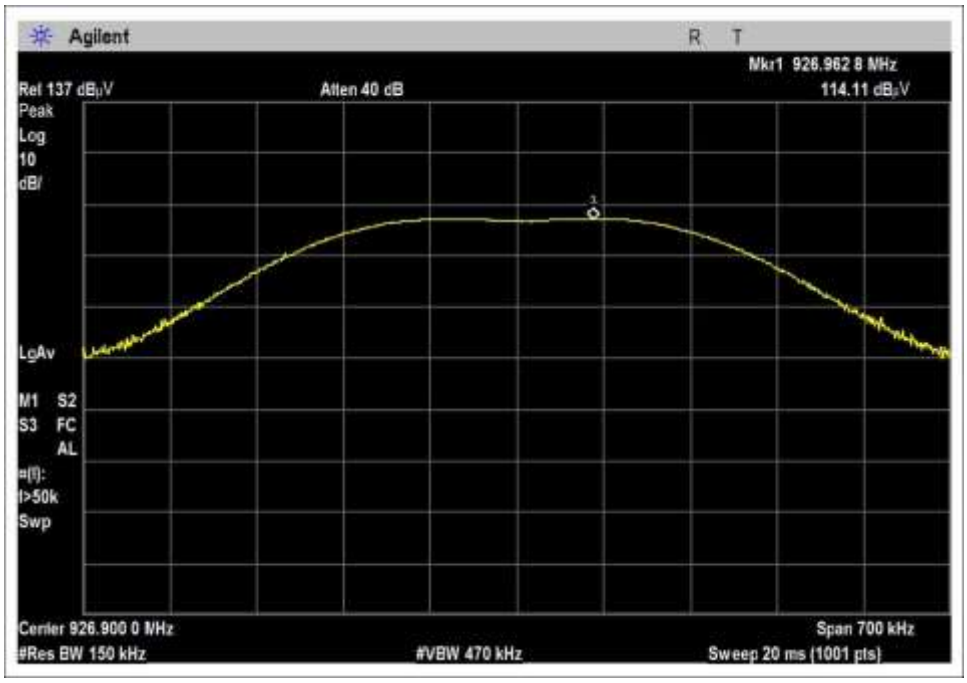
Plots



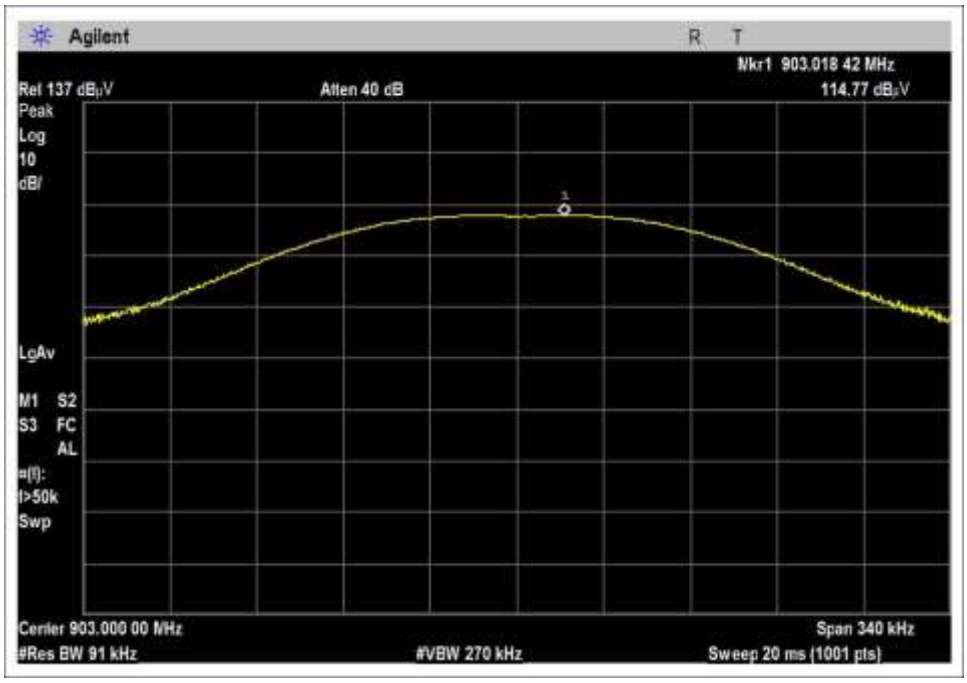
FM 12.5 Low Channel



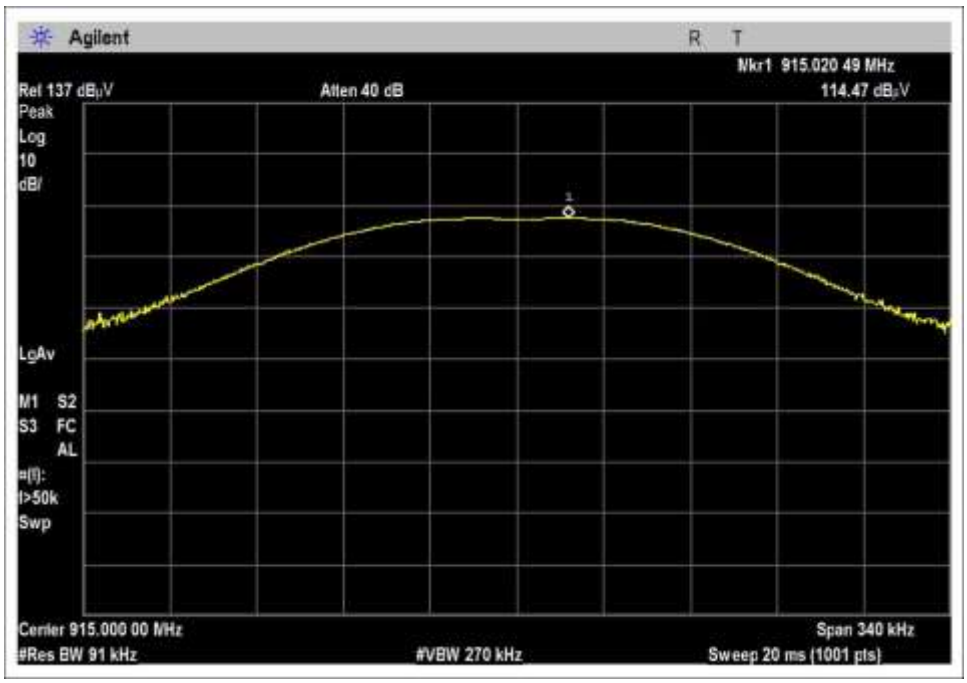
FM 12.5 Middle Channel



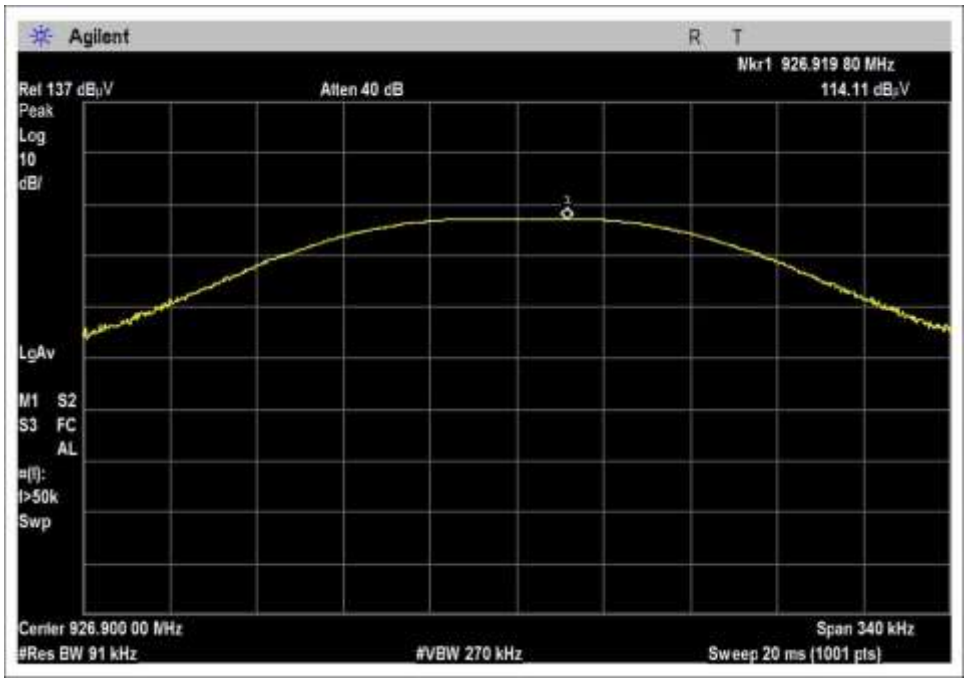
FM 12.5 High Channel



FM 37.5 Low Channel



FM 37.5 Middle Channel



FM 37.5 High Channel

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(b) Power Output (902-928 MHz FHSS >50 Channels)**		
Work Order #:	**100138**	Date:	9/29/2017
Test Type:	**Conducted Emissions**	Time:	08:21:35
Tested By:	Michael Atkinson	Sequence#:	3
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			

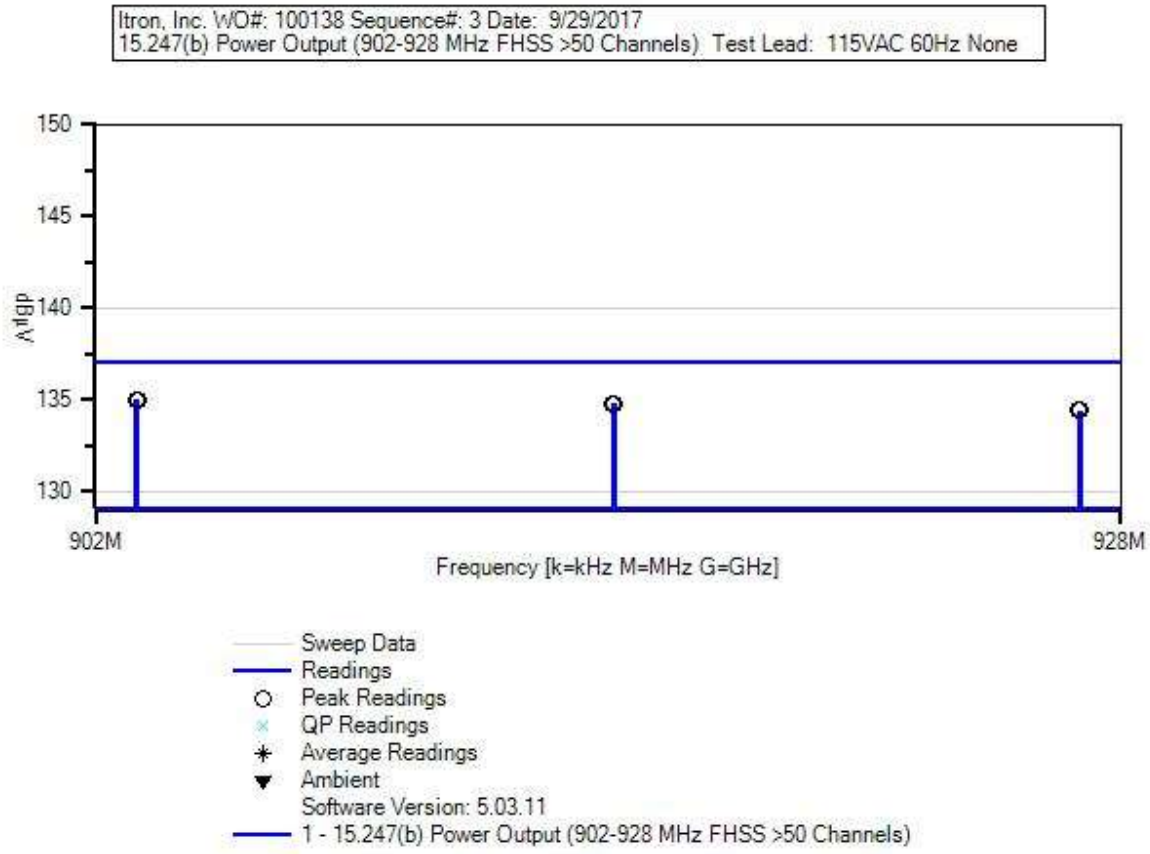
Test Conditions / Notes:

Frequency Range: Fundamental
Frequency tested: 903, 915, 926.9MHz
Firmware power setting: Max
Firmware: ARM 1.0.0.0 DSP 1.0.0.0, FPGA 4.1, Test Software: SrTest100 v4.1.1.25
Modulation: 12.5 Kbit/sec FM (2GFSK), 37.5 Kbit/sec FM (2GFSK)

Antenna type: External Monopole
Antenna Gain: 5.15 dBi or 5.5dBi

Duty Cycle: Tested at 100%
Test Location: Bothell Lab Bench
Test Method: ANSI C63.10 (2013)
Temperature (ºC): 23
Relative Humidity (%): 42

Setup: The EUT ISM port is continuously transmitting with modulation.
The EUT ISM port is connected directly to a spectrum analyzer for direct connected measurements.
Low, Mid, High channels investigated, all modulation types investigated, worst case reported.
Investigated voltage variations based on manufacturer specified Vmin and Vmax.



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02673	Spectrum Analyzer	E4446A	10/12/2015	10/12/2017
T2	AN03565	Attenuator	766-20	10/7/2015	10/7/2017
T3	ANP06540	Cable	Heliax	10/29/2015	10/29/2017

Measurement Data: Reading listed by margin. Test Lead: None

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	903.018M	114.8	+0.0	+19.9	+0.3		+0.0	135.0	137.0 FM 37.5	-2.0	None
2	903.059M	114.8	+0.0	+19.9	+0.3		+0.0	135.0	137.0 FM 12.5	-2.1	None
3	915.061M	114.5	+0.0	+19.9	+0.4		+0.0	134.8	137.0 FM 12.5	-2.2	None
4	915.020M	114.5	+0.0	+19.9	+0.4		+0.0	134.8	137.0 FM 37.5	-2.2	None
5	926.963M	114.1	+0.0	+19.9	+0.4		+0.0	134.4	137.0 FM 12.5	-2.6	None
6	926.920M	114.1	+0.0	+19.9	+0.4		+0.0	134.4	137.0 FM 37.5	-2.6	None

15.35(c) Duty Cycle Correction Factor

Test Data Summary			
Antenna Port	**Operational Mode**	**Measured On Time (mS / P_{obs})**	**Calculated DCCF (dB)**
1	Longest Pulse Possible	0.238	-12.4

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}):	100
Number of RF Bursts / P_{obs}:	1
On time of RF Burst:	23.8mS
Number of Control or other signals / P_{obs}:	0
On time of Control or other Signals:	0
Total Measured On Time:	23.8mS

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

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

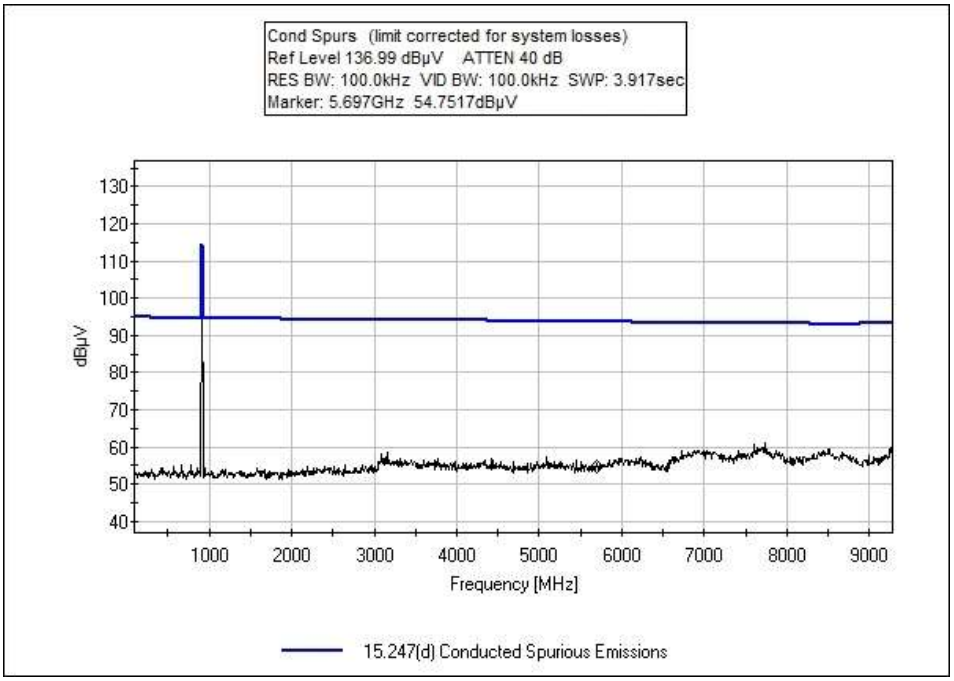
Duty Cycle Correction Factor Test Data

DCCF is based on manufacturer measured worst case data, due to the firmware not being available to allow this measurement to be made at the test lab during time of test. See Appendix data for manufacturer provided data.

Test Setup Photo

15.247(d) RF Conducted Emissions & Band Edge

Plot



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 #:	**100138**	Date:	9/29/2017
Test Type:	**Conducted Emissions**	Time:	11:24:25
Tested By:	Michael Atkinson	Sequence#:	4
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			

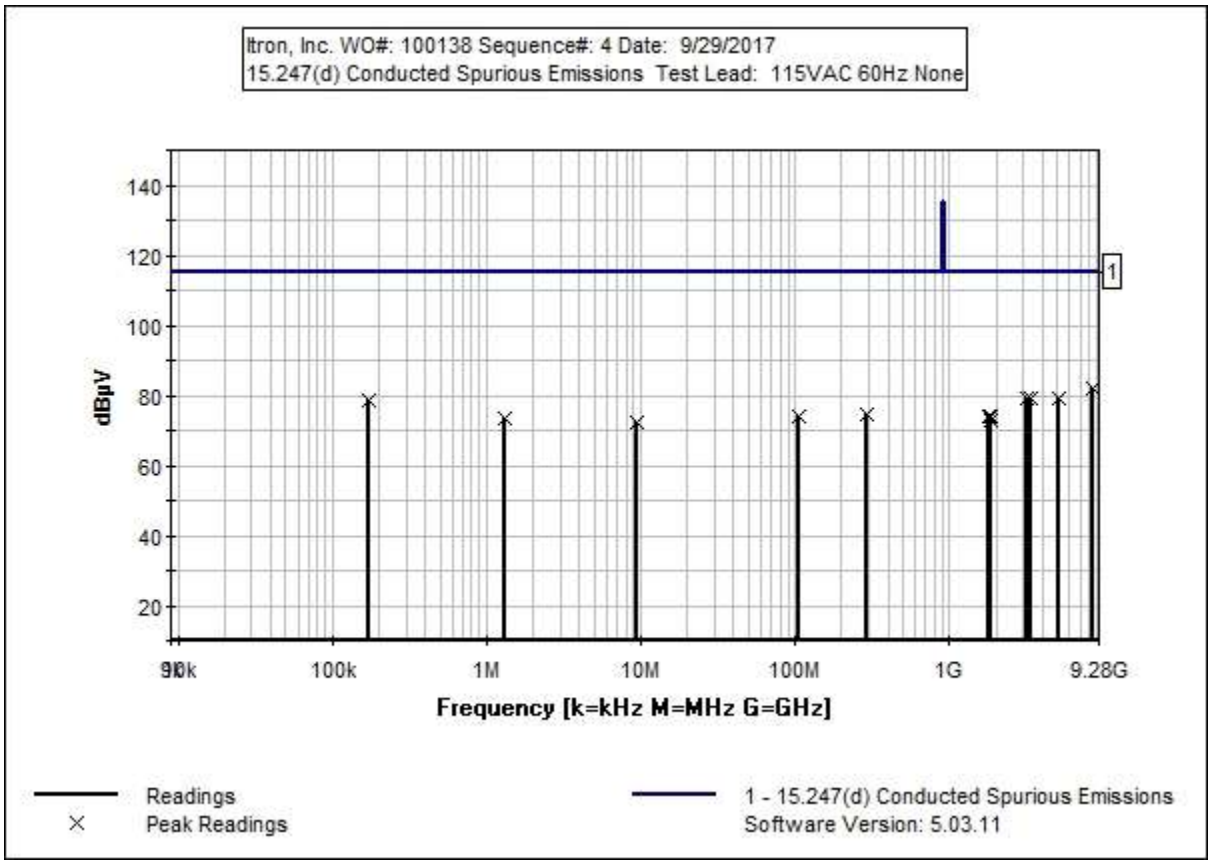
Test Conditions / Notes:

Frequency Range:9kHz-9.28GHz
Frequency tested: 903, 915, 926.9MHz
Firmware power setting: Max
Firmware: ARM 1.0.0.0 DSP 1.0.0.0, FPGA 4.1, Test Software: SrTest100 v4.1.1.25
Modulation: 12.5 Kbit/sec FM (2GFSK), 37.5 Kbit/sec FM (2GFSK)

Antenna type: External Monopole
Antenna Gain: 5.15 dBi or 5.5dBi

Duty Cycle: Tested at 100%
Test Location: Bothell Lab Bench
Test Method: ANSI C63.10 (2013)
Temperature (ºC): 20-25
Relative Humidity (%): 35-40

Setup: The EUT ISM port is continuously transmitting with modulation.
The EUT ISM port is connected directly to a spectrum analyzer for direct connected measurements.
Low, Mid, and High channels investigated, as well as Hopping with modulation, all modulation types investigated, worst case reported.


Itron, Inc. WO#: 100138 Sequence#: 4 Date: 9/29/2017
15.247(d) Conducted Spurious Emissions Test Lead: 115VAC 60Hz None
140
120
100
80
60
40
20
dBµV
1
100k
1M
10M
100M
1G
9.28G
Frequency [k=kHz M=MHz G=GHz]
Readings
Peak Readings
1 - 15.247(d) Conducted Spurious Emissions
Software Version: 5.03.11

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	ANP05748	Attenuator	PE7004-20	4/11/2016	4/11/2018

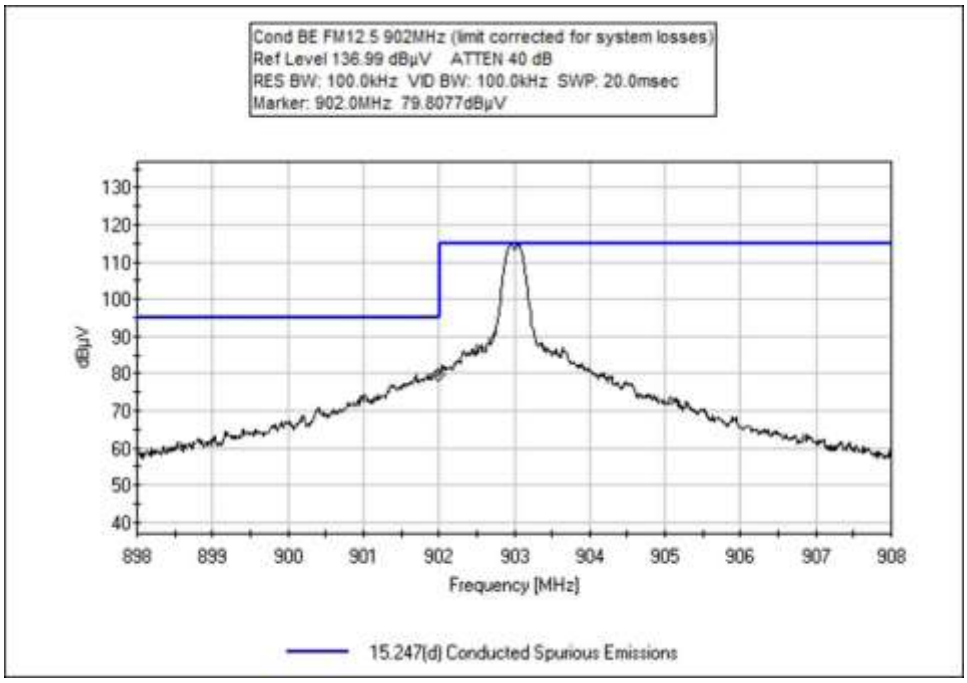
Measurement Data: Reading listed by margin. Test Lead: None

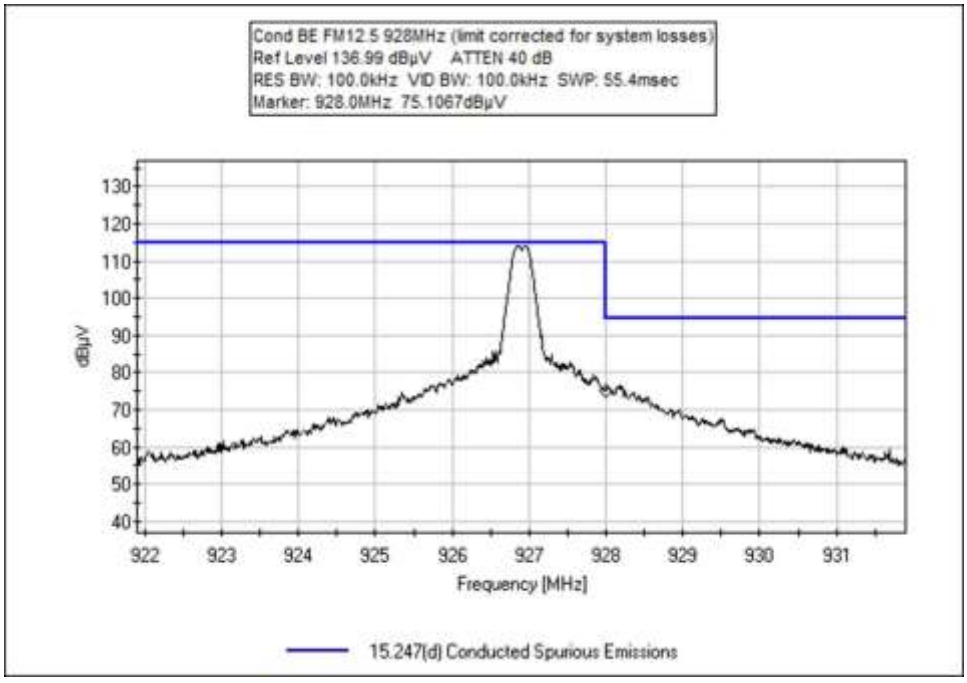
#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	dB	dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	8554.000M	60.0	+1.7	+20.5			+0.0	82.2	115.1	-32.9	None
2	3152.000M	58.5	+0.7	+20.1			+0.0	79.3	115.1	-35.8	None
3	3390.000M	58.3	+0.8	+20.2			+0.0	79.3	115.1	-35.8	None
4	5155.000M	57.9	+0.9	+20.4			+0.0	79.2	115.1	-35.9	None
5	174.643k	58.2	+0.0	+20.1			+0.0	78.3	115.1	-36.8	None
6	295.000M	54.1	+0.2	+20.1			+0.0	74.4	115.1	-40.7	None
7	1805.195M	53.5	+0.5	+20.1			+0.0	74.1	115.1	-41.0	None
8	105.450M	53.9	+0.1	+20.0			+0.0	74.0	115.1	-41.1	None
9	1854.843M	53.2	+0.5	+20.1			+0.0	73.8	115.1	-41.3	None
10	1.303M	53.2	+0.0	+20.1			+0.0	73.3	115.1	-41.8	None
11	1829.195M	52.1	+0.5	+20.1			+0.0	72.7	115.1	-42.4	None
12	9.349M	52.1	+0.0	+20.0			+0.0	72.1	115.1	-43.0	None

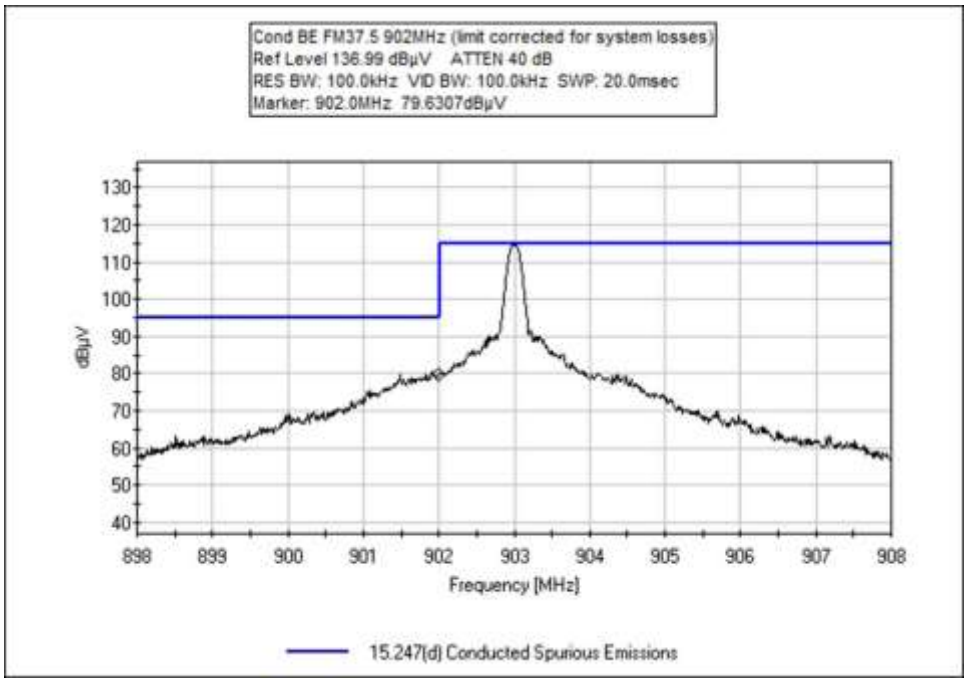
Band Edge

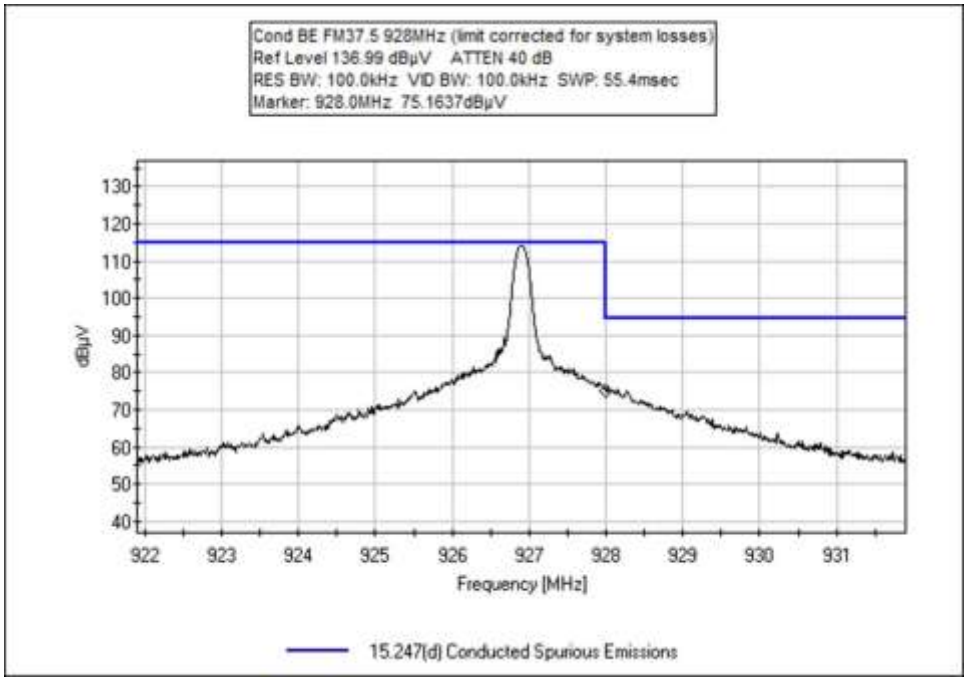
Band Edge Summary				
Limit applied: Max Power/100kHz - 20dB.				
Frequency (MHz)	**Modulation**	**Measured (dBm)**	**Limit (dBm)**	**Results**
902	12.5 Kbit/sec FM (2GFSK)	-7	< 8.1	Pass
928	12.5 Kbit/sec FM (2GFSK)	-11.6	< 8.1	Pass
902	37.5 Kbit/sec FM (2GFSK)	-7.2	< 8.1	Pass
928	37.5 Kbit/sec FM (2GFSK)	-11.5	< 8.1	Pass
902	Hopping with modulation (37.5 Kbit/sec Modulations worst case)	-7.8	< 8.1	Pass
928	Hopping with modulation (37.5 Kbit/sec Modulations worst case)	-14.2	< 8.1	Pass

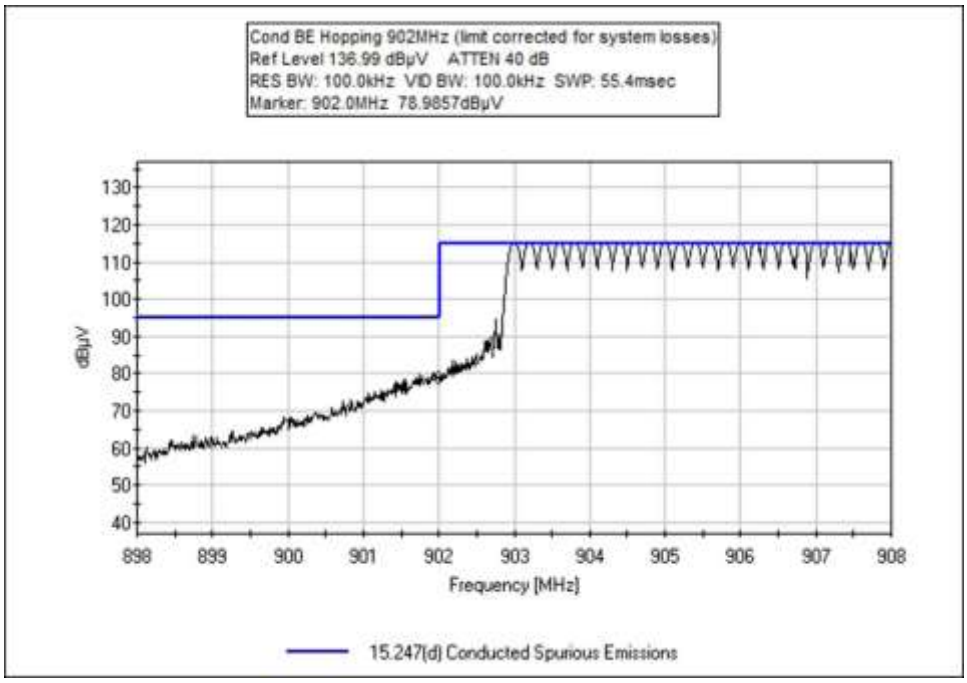
Band Edge Plots

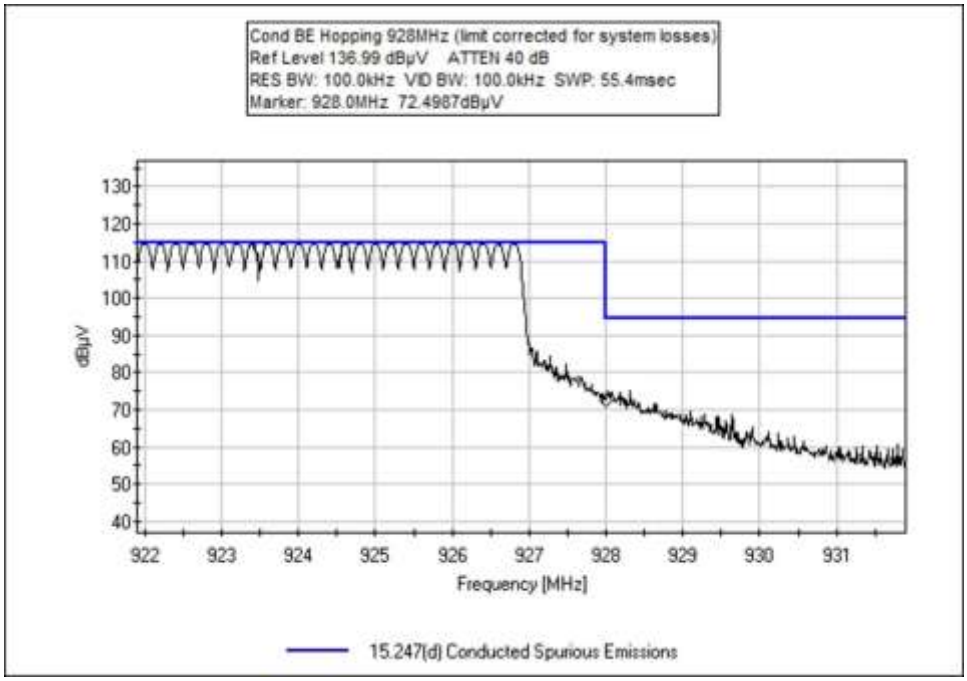





Cond BE FM37.5 902MHz (limit corrected for system losses)
Ref Level 136.99 dBµV ATTEN 40 dB
RES BW: 100.0kHz VID BW: 100.0kHz SWP: 20.0msec
Marker: 902.0MHz 79.6307dBµV
dBµV
130
120
110
100
90
80
70
60
50
40
898
899
900
901
902
903
904
905
906
907
908
Frequency [MHz]
15.247(d) Conducted Spurious Emissions


Cond BE FM37.5 928MHz (limit corrected for system losses)
Ref Level 136.99 dBµV ATTEN 40 dB
RES BW: 100.0kHz VID BW: 100.0kHz SWP: 55.4msec
Marker: 928.0MHz 75.1637dBµV
dBµV
130
120
110
100
90
80
70
60
50
40
922
923
924
925
926
927
928
929
930
931
Frequency [MHz]
15.247(d) Conducted Spurious Emissions


Cond BE Hopping 902MHz (limit corrected for system losses)
Ref Level 136.99 dBµV ATTEN 40 dB
RES BW: 100.0kHz VID BW: 100.0kHz SWP: 55.4msec
Marker: 902.0MHz 78.9857dBµV
dBµV
130
120
110
100
90
80
70
60
50
40
898
899
900
901
902
903
904
905
906
907
908
Frequency [MHz]
15.247(d) Conducted Spurious Emissions


Cond BE Hopping 928MHz (limit corrected for system losses)
Ref Level 136.99 dBµV ATTEN 40 dB
RES BW: 100.0kHz VID BW: 100.0kHz SWP: 55.4msec
Marker: 928.0MHz 72.4987dBµV
dBµV
130
120
110
100
90
80
70
60
50
40
922
923
924
925
926
927
928
929
930
931
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 #:	**100138**	Date:	9/29/2017
Test Type:	**Conducted Emissions**	Time:	10:36:52
Tested By:	Michael Atkinson	Sequence#:	4
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: Band Edge
Frequency tested: 903, 926.9MHz
Firmware power setting: Max
Firmware: ARM 1.0.0.0 DSP 1.0.0.0, FPGA 4.1, Test Software: SrTest100 v4.1.1.25
Modulation: 12.5 Kbit/sec FM (2GFSK), 37.5 Kbit/sec FM (2GFSK)

Antenna type: External Monopole
Antenna Gain: 5.15 dBi or 5.5dBi

Duty Cycle: Tested at 100%
Test Location: Bothell Lab Bench
Test Method: ANSI C63.10 (2013)
Temperature (ºC): 20-25
Relative Humidity (%): 35-40

Setup: The EUT ISM port is continuously transmitting with modulation.
The EUT ISM port is connected directly to a spectrum analyzer for direct connected measurements.
Low, High channels investigated, as well as Hopping with modulation, all modulation types investigated, worst case reported.

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02673	Spectrum Analyzer	E4446A	10/12/2015	10/12/2017
T2	AN03565	Attenuator	766-20	10/7/2015	10/7/2017
T3	ANP06540	Cable	Heliax	10/29/2015	10/29/2017

Measurement Data: Reading listed by margin. Test Lead: None

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	902.000M	79.8	+0.0	+19.9	+0.3		+0.0	100.0	115.1 FM 12.5	-15.1	None
2	902.000M	79.6	+0.0	+19.9	+0.3		+0.0	99.8	115.1 FM 37.5	-15.3	None
3	902.000M	79.0	+0.0	+19.9	+0.3		+0.0	99.2	115.1 Hopping	-15.9	None
4	928.000M	75.2	+0.0	+19.9	+0.4		+0.0	95.5	115.1 FM 37.5	-19.6	None
5	928.000M	75.1	+0.0	+19.9	+0.4		+0.0	95.4	115.1 FM 12.5	-19.7	None
6	928.000M	72.5	+0.0	+19.9	+0.4		+0.0	92.8	115.1 Hopping	-22.3	None

Test Setup Photo

15.247(d) Radiated Emissions & Band Edge

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 #:	**100138**	Date:	9/28/2017
Test Type:	**Maximized Emissions**	Time:	15:08:43
Tested By:	Michael Atkinson	Sequence#:	12
Software:	EMITest 5.03.11		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

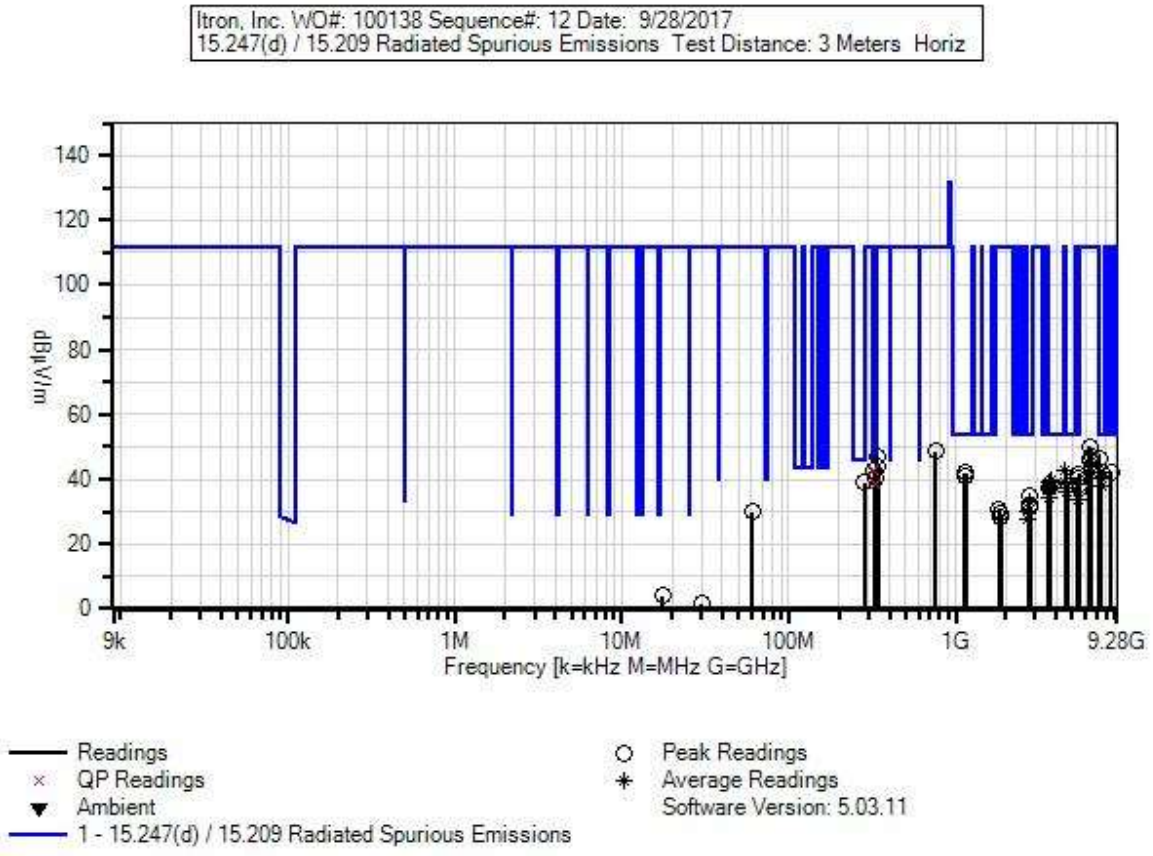
Frequency Range: 9kHz-9.28GHz
Frequency tested: 903, 915MHz, 926.9MHz
Firmware power setting: Max
Firmware: ARM 1.0.0.0 DSP 1.0.0.0, FPGA 4.1, Test Software: SrTest100 v4.1.1.25
Modulation: 12.5 Kbit/sec FM (2GFSK), 37.5 Kbit/sec FM (2GFSK)

Antenna type: External Monopole
Antenna Gain: 5.15 dBi or 5.5dBi

Duty Cycle: Tested at 100%
Test Location: Bothell Lab C3
Test Method: ANSI C63.10 (2013)
Temperature (ºC): 20-25
Relative Humidity (%): 35-40

Setup: The EUT ISM port is continuously transmitting with modulation.
The EUT ISM port has an external antenna installed, both 5.15 and 5.5dBi antennas investigated, only worst case reported.
Low and High channels investigated, as well as Hopping with modulation, all modulation types investigated, worst case reported.
Both Horizontal and Vertical antenna polarities investigated above 30MHz, only worst case reported.
3 orthogonal axes investigated below 30MHz, only worst case reported.

All average data points marked Low, Mid, High have duty cycle correction applied (23.8%, -12.44dB)


Itron, Inc. WO#: 100138 Sequence#: 12 Date: 9/28/2017
15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Horiz
140
120
100
80
60
40
20
0
dBµV/m
9k
100k
1M
10M
100M
1G
9.28G
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: 5.03.11

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP06540	Cable	Heliax	10/29/2015	10/29/2017
T2	ANP06515	Cable	Heliax	1/21/2016	1/21/2018
T3	AN03540	Preamp	83017A	5/2/2017	5/2/2019
T4	AN01467	Horn Antenna-ANSI C63.5 Calibration	3115	7/21/2017	7/21/2019
T5	ANP06935	Cable	32026-29801-29801-18	3/11/2016	3/11/2018
T6	AN03170	High Pass Filter	HM1155-11SS	12/17/2015	12/17/2017
T7	AN02673	Spectrum Analyzer	E4446A	10/12/2015	10/12/2017
T8	ANP05963	Cable	RG-214	2/15/2016	2/15/2018
T9	ANP05360	Cable	RG214	11/30/2016	11/30/2018
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	4/8/2016	4/8/2018
T13	ANDCCF	Test Data Adjustment		5/13/2016	5/13/2018

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

#	Freq	Rdng	T1 T5 T9 T13	T2 T6 T10	T3 T7 T11	T4 T8 T12	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	325.027M QP	20.5	+0.2 +0.0 +1.1 +0.0	+0.0 +0.0 +5.9	+0.0 +0.0 +13.6	+0.0 +1.7 +0.0	+0.0	43.0	46.0	-3.0	Vert
2	324.900M	20.1	+0.2 +0.0 +1.1 +0.0	+0.0 +0.0 +5.9	+0.0 +0.0 +13.6	+0.0 +1.7 +0.0	+0.0	42.6	46.0	-3.4	Vert
3	326.800M	17.8	+0.2 +0.0 +1.1 +0.0	+0.0 +0.0 +5.9	+0.0 +0.0 +13.7	+0.0 +1.7 +0.0	+0.0	40.4	46.0	-5.6	Horiz
4	284.100M	18.1	+0.2 +0.0 +1.0 +0.0	+0.0 +0.0 +5.9	+0.0 +0.0 +12.3	+0.0 +1.6 +0.0	+0.0	39.1	46.0	-6.9	Vert
5	327.013M QP	16.0	+0.2 +0.0 +1.1 +0.0	+0.0 +0.0 +5.9	+0.0 +0.0 +13.7	+0.0 +1.7 +0.0	+0.0	38.6	46.0	-7.4	Horiz

6	4515.023M Ave	51.3	+0.9 +0.5 +0.0 -12.4	+3.8 +0.0 +0.0	-33.1 +0.0 +0.0	+31.9 +0.0 +0.0	+0.0	42.9	54.0 Low	-11.1	Horiz
^	4515.000M	53.9	+0.9 +0.5 +0.0 -12.4	+3.8 +0.0 +0.0	-33.1 +0.0 +0.0	+31.9 +0.0 +0.0	+0.0	45.5	54.0 Low	-8.5	Horiz
8	7417.000M	45.0	+1.3 +0.6 +0.0 -12.4	+5.4 +0.0 +0.0	-34.4 +0.0 +0.0	+36.8 +0.0 +0.0	+0.0	42.3	54.0 High	-11.7	Vert
9	7319.984M Ave	45.2	+1.2 +0.6 +0.0 -12.4	+5.3 +0.0 +0.0	-34.1 +0.0 +0.0	+36.5 +0.0 +0.0	+0.0	42.3	54.0 Mid	-11.7	Horiz
^	7319.984M	47.3	+1.2 +0.6 +0.0 -12.4	+5.3 +0.0 +0.0	-34.1 +0.0 +0.0	+36.5 +0.0 +0.0	+0.0	44.4	54.0 Mid	-9.6	Horiz
11	1135.000M	49.8	+0.4 +0.3 +0.0 +0.0	+1.8 +1.6 +0.0	-36.2 +0.0 +0.0	+24.4 +0.0 +0.0	+0.0	42.1	54.0	-11.9	Vert
12	1144.000M	49.9	+0.4 +0.3 +0.0 +0.0	+1.8 +1.4 +0.0	-36.1 +0.0 +0.0	+24.4 +0.0 +0.0	+0.0	42.1	54.0	-11.9	Vert
13	1153.000M	49.1	+0.4 +0.3 +0.0 +0.0	+1.8 +1.3 +0.0	-36.1 +0.0 +0.0	+24.4 +0.0 +0.0	+0.0	41.2	54.0	-12.8	Vert
14	5419.000M	46.2	+1.0 +0.6 +0.0 -12.4	+4.3 +0.0 +0.0	-33.1 +0.0 +0.0	+34.0 +0.0 +0.0	+0.0	40.6	54.0 Low	-13.4	Horiz
15	7415.138M Ave	43.1	+1.3 +0.6 +0.0 -12.4	+5.4 +0.0 +0.0	-34.4 +0.0 +0.0	+36.8 +0.0 +0.0	+0.0	40.4	54.0 High	-13.6	Vert
16	3707.619M Ave	50.0	+0.7 +0.5 +0.0 -12.4	+3.4 +0.0 +0.0	-33.4 +0.0 +0.0	+30.9 +0.0 +0.0	+0.0	39.7	54.0 High	-14.3	Horiz
^	3707.619M	52.2	+0.7 +0.5 +0.0 -12.4	+3.4 +0.0 +0.0	-33.4 +0.0 +0.0	+30.9 +0.0 +0.0	+0.0	41.9	54.0 High	-12.1	Horiz

18	4515.052M Ave	47.8	+0.9 +0.5 +0.0 -12.4	+3.8 +0.0 +0.0	-33.1 +0.0 +0.0	+31.9 +0.0 +0.0	+0.0	39.4	54.0 Low	-14.6	Vert
^	4515.000M	52.2	+0.9 +0.5 +0.0 -12.4	+3.8 +0.0 +0.0	-33.1 +0.0 +0.0	+31.9 +0.0 +0.0	+0.0	43.8	54.0 Low	-10.2	Vert
^	4515.000M	51.9	+0.9 +0.5 +0.0 -12.4	+3.8 +0.0 +0.0	-33.1 +0.0 +0.0	+31.9 +0.0 +0.0	+0.0	43.5	54.0 Low	-10.5	Vert
21	3659.989M Ave	49.5	+0.7 +0.5 +0.0 -12.4	+3.4 +0.0 +0.0	-33.4 +0.0 +0.0	+30.8 +0.0 +0.0	+0.0	39.1	54.0 Mid	-14.9	Horiz
^	3659.989M	50.7	+0.7 +0.5 +0.0 -12.4	+3.4 +0.0 +0.0	-33.4 +0.0 +0.0	+30.8 +0.0 +0.0	+0.0	40.3	54.0 Mid	-13.7	Horiz
23	4575.075M Ave	47.1	+0.9 +0.5 +0.0 -12.4	+3.8 +0.0 +0.0	-33.1 +0.0 +0.0	+32.0 +0.0 +0.0	+0.0	38.8	54.0 Mid	-15.2	Horiz
^	4575.075M	48.6	+0.9 +0.5 +0.0 -12.4	+3.8 +0.0 +0.0	-33.1 +0.0 +0.0	+32.0 +0.0 +0.0	+0.0	40.3	54.0 Mid	-13.7	Horiz
25	3660.015M Ave	48.1	+0.7 +0.5 +0.0 -12.4	+3.4 +0.0 +0.0	-33.4 +0.0 +0.0	+30.8 +0.0 +0.0	+0.0	37.7	54.0 Mid	-16.3	Vert
^	3660.015M	48.8	+0.7 +0.5 +0.0 -12.4	+3.4 +0.0 +0.0	-33.4 +0.0 +0.0	+30.8 +0.0 +0.0	+0.0	38.4	54.0 Mid	-15.6	Vert
27	7415.325M Ave	40.4	+1.3 +0.6 +0.0 -12.4	+5.4 +0.0 +0.0	-34.4 +0.0 +0.0	+36.8 +0.0 +0.0	+0.0	37.7	54.0 High	-16.3	Horiz
^	7415.325M	45.4	+1.3 +0.6 +0.0 -12.4	+5.4 +0.0 +0.0	-34.4 +0.0 +0.0	+36.8 +0.0 +0.0	+0.0	42.7	54.0 High	-11.3	Horiz
29	3611.981M Ave	48.0	+0.8 +0.4 +0.0 -12.4	+3.3 +0.0 +0.0	-33.5 +0.0 +0.0	+30.7 +0.0 +0.0	+0.0	37.3	54.0 Low	-16.7	Horiz
30	3610.000M	48.0	+0.8 +0.4 +0.0 -12.4	+3.3 +0.0 +0.0	-33.5 +0.0 +0.0	+30.7 +0.0 +0.0	+0.0	37.3	54.0 Low	-16.7	Vert

31	4634.580M	45.5	+0.9	+3.9	-33.2	+32.1	+0.0	37.3	54.0	-16.7	Horiz
	Ave		+0.5	+0.0	+0.0	+0.0			High		
			+0.0	+0.0	+0.0	+0.0					
			-12.4								
^	4634.580M	46.9	+0.9	+3.9	-33.2	+32.1	+0.0	38.7	54.0	-15.3	Horiz
			+0.5	+0.0	+0.0	+0.0			High		
			+0.0	+0.0	+0.0	+0.0					
			-12.4								
33	3707.656M	47.5	+0.7	+3.4	-33.4	+30.9	+0.0	37.2	54.0	-16.8	Vert
	Ave		+0.5	+0.0	+0.0	+0.0			High		
			+0.0	+0.0	+0.0	+0.0					
			-12.4								
^	3707.656M	49.6	+0.7	+3.4	-33.4	+30.9	+0.0	39.3	54.0	-14.7	Vert
			+0.5	+0.0	+0.0	+0.0			High		
			+0.0	+0.0	+0.0	+0.0					
			-12.4								
35	3612.036M	47.6	+0.8	+3.3	-33.5	+30.7	+0.0	36.9	54.0	-17.1	Vert
	Ave		+0.4	+0.0	+0.0	+0.0			Low		
			+0.0	+0.0	+0.0	+0.0					
			-12.4								
^	3612.000M	51.1	+0.8	+3.3	-33.5	+30.7	+0.0	40.4	54.0	-13.6	Vert
			+0.4	+0.0	+0.0	+0.0			Low		
			+0.0	+0.0	+0.0	+0.0					
			-12.4								
37	4575.074M	44.2	+0.9	+3.8	-33.1	+32.0	+0.0	35.9	54.0	-18.1	Vert
	Ave		+0.5	+0.0	+0.0	+0.0			Mid		
			+0.0	+0.0	+0.0	+0.0					
			-12.4								
^	4575.074M	46.0	+0.9	+3.8	-33.1	+32.0	+0.0	37.7	54.0	-16.3	Vert
			+0.5	+0.0	+0.0	+0.0			Mid		
			+0.0	+0.0	+0.0	+0.0					
			-12.4								
39	4634.508M	44.1	+0.9	+3.9	-33.2	+32.1	+0.0	35.9	54.0	-18.1	Vert
	Ave		+0.5	+0.0	+0.0	+0.0			High		
			+0.0	+0.0	+0.0	+0.0					
			-12.4								
^	4634.508M	47.5	+0.9	+3.9	-33.2	+32.1	+0.0	39.3	54.0	-14.7	Vert
			+0.5	+0.0	+0.0	+0.0			High		
			+0.0	+0.0	+0.0	+0.0					
			-12.4								
41	2746.000M	48.3	+0.7	+2.8	-33.8	+28.8	+0.0	34.8	54.0	-19.2	Vert
			+0.4	+0.0	+0.0	+0.0			Mid		
			+0.0	+0.0	+0.0	+0.0					
			-12.4								
42	3612.072M	45.1	+0.8	+3.3	-33.5	+30.7	+0.0	34.4	54.0	-19.6	Horiz
	Ave		+0.4	+0.0	+0.0	+0.0			Low		
			+0.0	+0.0	+0.0	+0.0					
			-12.4								
^	3611.981M	52.2	+0.8	+3.3	-33.5	+30.7	+0.0	41.5	54.0	-12.5	Horiz
			+0.4	+0.0	+0.0	+0.0			Low		
			+0.0	+0.0	+0.0	+0.0					
			-12.4								

44	5418.083M Ave	39.4	+1.0 +0.6 +0.0 -12.4	+4.3 +0.0 +0.0	-33.1 +0.0 +0.0	+33.9 +0.0 +0.0	+0.0	33.7	54.0 Low	-20.3	Vert
^	5418.000M	45.4	+1.0 +0.6 +0.0 -12.4	+4.3 +0.0 +0.0	-33.1 +0.0 +0.0	+33.9 +0.0 +0.0	+0.0	39.7	54.0 Low	-14.3	Vert
46	2744.986M Ave	46.5	+0.7 +0.4 +0.0 -12.4	+2.8 +0.0 +0.0	-33.8 +0.0 +0.0	+28.8 +0.0 +0.0	+0.0	33.0	54.0 Mid	-21.0	Horiz
^	2745.000M	49.4	+0.7 +0.4 +0.0 -12.4	+2.8 +0.0 +0.0	-33.8 +0.0 +0.0	+28.8 +0.0 +0.0	+0.0	35.9	54.0 Mid	-18.1	Horiz
48	2782.000M	45.1	+0.7 +0.4 +0.0 -12.4	+2.8 +0.0 +0.0	-33.8 +0.0 +0.0	+28.9 +0.0 +0.0	+0.0	31.7	54.0 High	-22.3	Vert
49	2782.000M	44.6	+0.7 +0.4 +0.0 -12.4	+2.8 +0.0 +0.0	-33.8 +0.0 +0.0	+28.9 +0.0 +0.0	+0.0	31.2	54.0 High	-22.8	Horiz
50	2709.020M Ave	43.9	+0.7 +0.4 +0.0 -12.4	+2.8 +0.0 +0.0	-33.8 +0.0 +0.0	+28.7 +0.0 +0.0	+0.0	30.3	54.0 Low	-23.7	Vert
^	2709.020M	49.0	+0.7 +0.4 +0.0 -12.4	+2.8 +0.0 +0.0	-33.8 +0.0 +0.0	+28.7 +0.0 +0.0	+0.0	35.4	54.0 Low	-18.6	Vert
52	2708.976M Ave	41.6	+0.7 +0.4 +0.0 -12.4	+2.8 +0.0 +0.0	-33.8 +0.0 +0.0	+28.7 +0.0 +0.0	+0.0	28.0	54.0 Low	-26.0	Horiz
^	2709.000M	48.9	+0.7 +0.4 +0.0 -12.4	+2.8 +0.0 +0.0	-33.8 +0.0 +0.0	+28.7 +0.0 +0.0	+0.0	35.3	54.0 Low	-18.7	Horiz
54	6319.000M	54.2	+1.3 +0.6 +0.0 -12.4	+4.8 +0.0 +0.0	-33.5 +0.0 +0.0	+35.3 +0.0 +0.0	+0.0	50.3	111.7 Low	-61.4	Vert
55	755.600M	15.9	+0.3 +0.0 +1.8 +0.0	+0.0 +0.0 +5.9	+0.0 +0.0 +22.4	+0.0 +2.2 +0.0	+0.0	48.5	111.7	-63.2	Vert
56	336.500M	23.9	+0.2 +0.0 +1.1 +0.0	+0.0 +0.0 +5.9	+0.0 +0.0 +14.3	+0.0 +1.7 +0.0	+0.0	47.1	111.7	-64.6	Vert

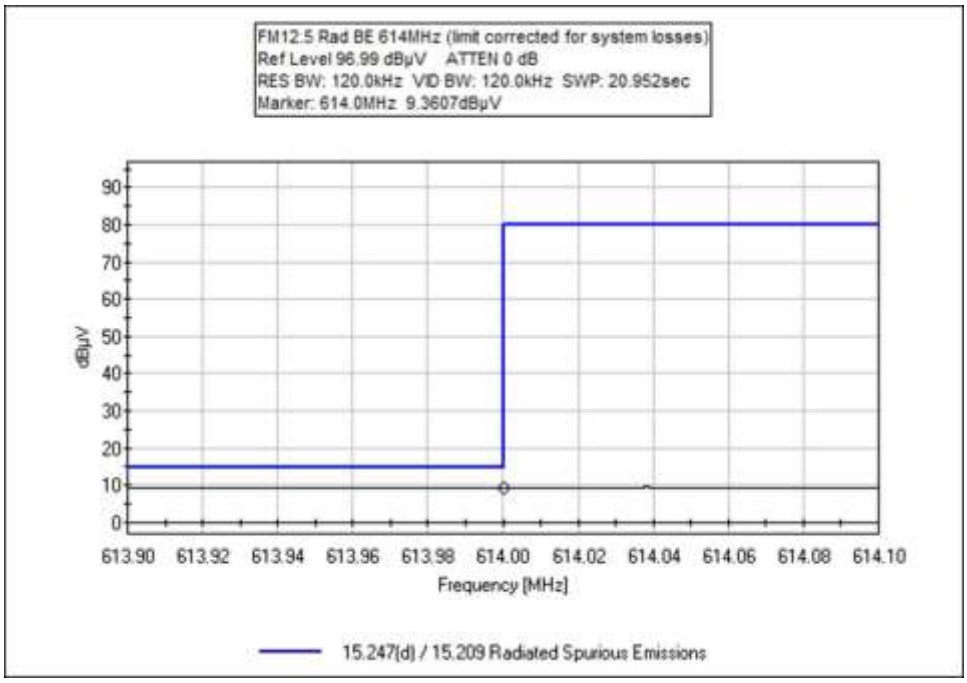
57	6490.000M	50.9	+1.2 +0.6 +0.0 -12.4	+4.9 +0.0 +0.0	-33.6 +0.0 +0.0	+35.5 +0.0 +0.0	+0.0	47.1	111.7 High	-64.6	Horiz
58	6409.000M	50.2	+1.2 +0.6 +0.0 -12.4	+4.8 +0.0 +0.0	-33.6 +0.0 +0.0	+35.4 +0.0 +0.0	+0.0	46.2	111.7 Mid	-65.5	Horiz
59	7228.000M	49.0	+1.2 +0.6 +0.0 -12.4	+5.3 +0.0 +0.0	-33.9 +0.0 +0.0	+36.3 +0.0 +0.0	+0.0	46.1	111.7 Low	-65.6	Vert
60	6409.000M	49.7	+1.2 +0.6 +0.0 -12.4	+4.8 +0.0 +0.0	-33.6 +0.0 +0.0	+35.4 +0.0 +0.0	+0.0	45.7	111.7 Mid	-66.0	Vert
61	6490.000M	47.9	+1.2 +0.6 +0.0 -12.4	+4.9 +0.0 +0.0	-33.6 +0.0 +0.0	+35.5 +0.0 +0.0	+0.0	44.1	111.7 High	-67.6	Vert
62	340.400M	20.3	+0.2 +0.0 +1.1 +0.0	+0.0 +0.0 +5.9	+0.0 +0.0 +14.6	+0.0 +1.7 +0.0	+0.0	43.8	111.7	-67.9	Horiz
63	8533.000M	43.6	+1.7 +0.7 +0.0 -12.4	+5.7 +0.0 +0.0	-34.2 +0.0 +0.0	+37.2 +0.0 +0.0	+0.0	42.3	111.7 High	-69.4	Horiz
64	5491.000M	47.1	+1.0 +0.6 +0.0 -12.4	+4.3 +0.0 +0.0	-33.1 +0.0 +0.0	+34.2 +0.0 +0.0	+0.0	41.7	111.7 Mid	-70.0	Horiz
65	5491.000M	47.0	+1.0 +0.6 +0.0 -12.4	+4.3 +0.0 +0.0	-33.1 +0.0 +0.0	+34.2 +0.0 +0.0	+0.0	41.6	111.7 Mid	-70.1	Vert
66	5563.000M	44.1	+1.0 +0.6 +0.0 -12.4	+4.3 +0.0 +0.0	-33.2 +0.0 +0.0	+34.3 +0.0 +0.0	+0.0	38.7	111.7 High	-73.0	Horiz
67	5563.000M	43.0	+1.0 +0.6 +0.0 -12.4	+4.3 +0.0 +0.0	-33.2 +0.0 +0.0	+34.3 +0.0 +0.0	+0.0	37.6	111.7 High	-74.1	Vert
68	1810.000M	48.4	+0.5 +0.3 +0.0 -12.4	+2.3 +0.0 +0.0	-34.5 +0.0 +0.0	+26.4 +0.0 +0.0	+0.0	31.0	111.7 Low	-80.7	Horiz
69	60.100M	16.3	+0.1 +0.0 +0.4 +0.0	+0.0 +0.0 +5.9	+0.0 +0.0 +6.7	+0.0 +0.7 +0.0	+0.0	30.1	111.7	-81.6	Vert

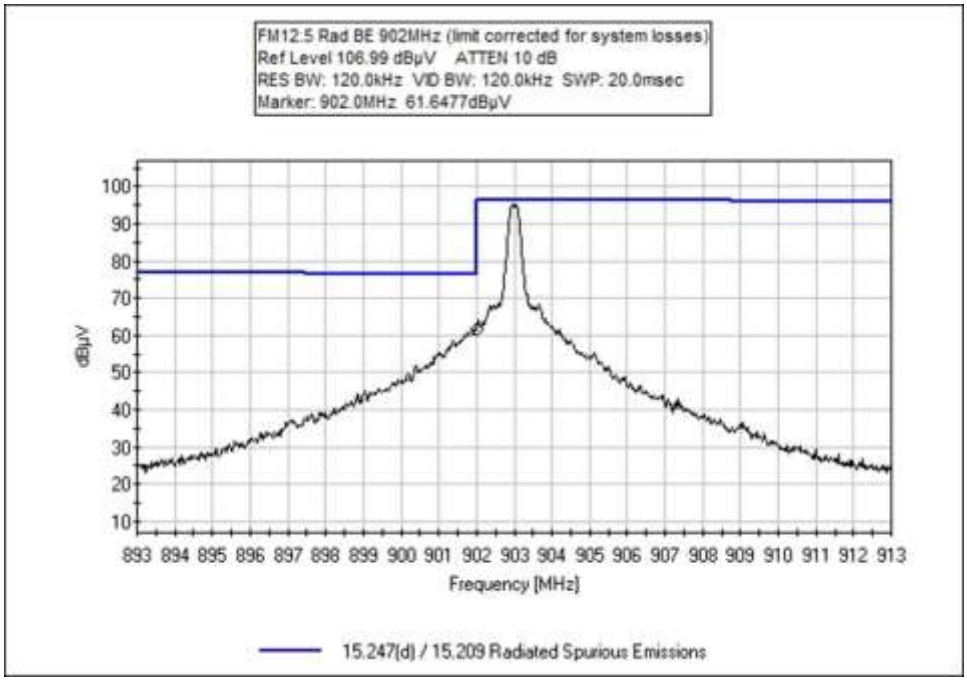
70	1828.000M	46.9	+0.5 +0.3 +0.0 -12.4	+2.3 +0.0 +0.0	-34.5 +0.0 +0.0	+26.6 +0.0 +0.0	+0.0	29.7	111.7 Mid	-82.0	Vert
71	1855.000M	45.5	+0.5 +0.3 +0.0 -12.4	+2.3 +0.0 +0.0	-34.5 +0.0 +0.0	+26.8 +0.0 +0.0	+0.0	28.5	111.7 High	-83.2	Vert
72	17.494M	35.4	+0.0 +0.0 +0.0 +0.0	+0.3 +0.0 +0.0	+0.0 +0.0 +0.0	+0.0 +0.0 +8.4	-40.0	4.1	111.7	-107.6	Para
73	29.940M	35.7	+0.0 +0.0 +0.0 +0.0	+0.3 +0.0 +0.0	+0.0 +0.0 +0.0	+0.0 +0.0 +5.8	-40.0	1.8	111.7	-109.9	Para
74	25.231M	28.2	+0.0 +0.0 +0.0 +0.0	+0.3 +0.0 +0.0	+0.0 +0.0 +0.0	+0.0 +0.0 +6.8	-40.0	-4.7	111.7	-116.4	Para

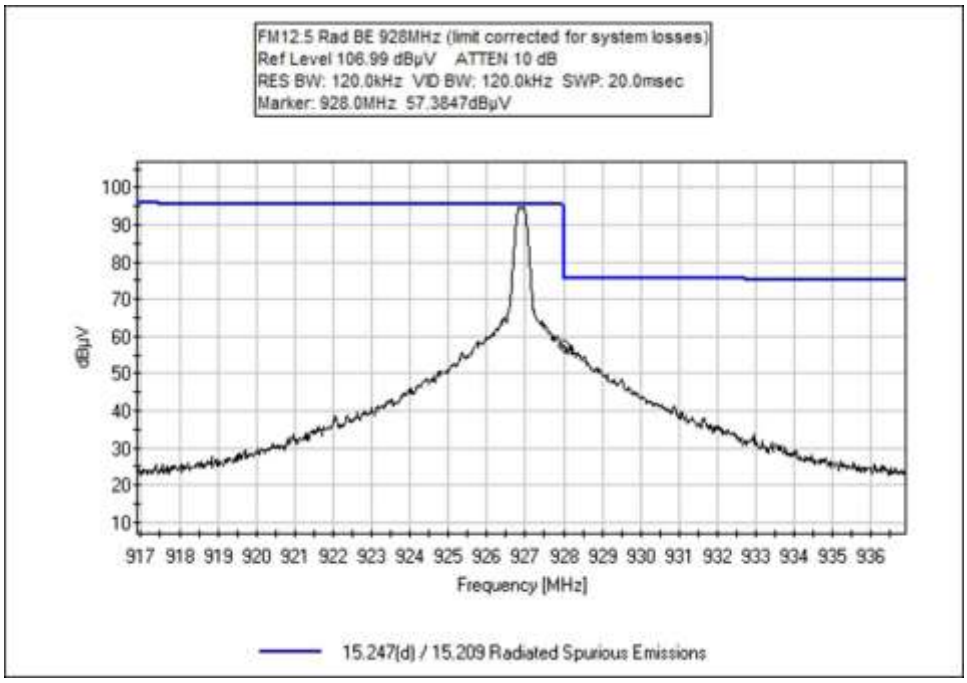
Band Edge

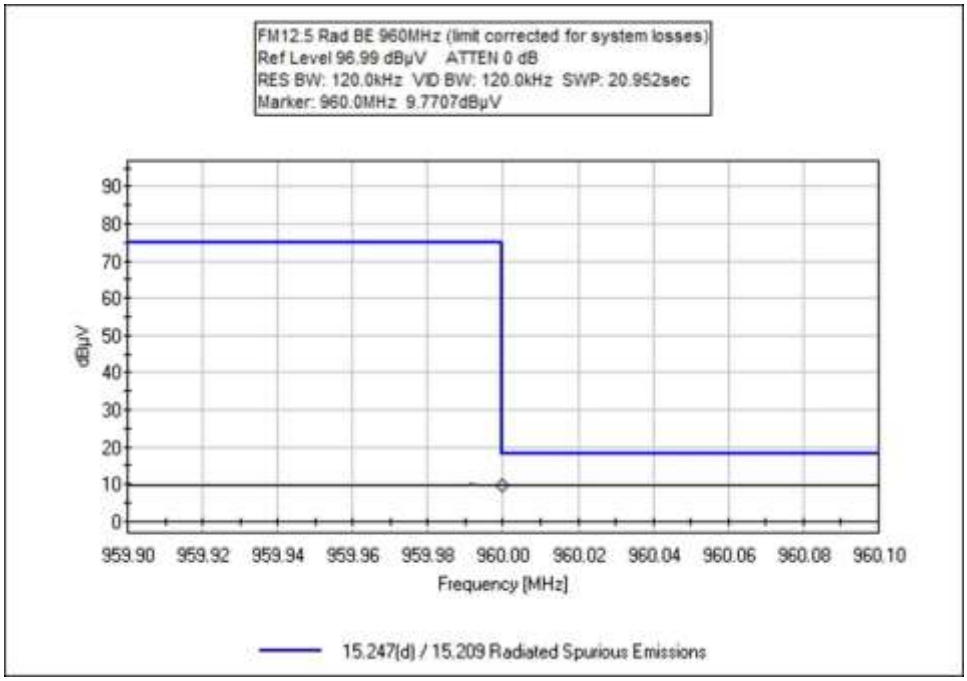
Band Edge Summary					
Frequency (MHz)	**Modulation**	**Ant. Type**	**Field Strength (dBuV/m @3m)**	**Limit (dBuV/m @3m)**	**Results**
614 (QP)	12.5 Kbit/sec FM (2GFSK)	External Monopole, 5.15dBi Max	40.5	<46	Pass
902	12.5 Kbit/sec FM (2GFSK)	External Monopole, 5.15dBi Max	96.1	<111.0	Pass
928	12.5 Kbit/sec FM (2GFSK)	External Monopole, 5.15dBi Max	92.8	<111.0	Pass
960 (QP)	12.5 Kbit/sec FM (2GFSK)	External Monopole, 5.15dBi Max	45.7	<54	Pass
614 (QP)	37.5 Kbit/sec FM (2GFSK)	External Monopole, 5.15dBi Max	40.5	<46	Pass
902	37.5 Kbit/sec FM (2GFSK)	External Monopole, 5.15dBi Max	96.3	<111.0	Pass
928	37.5 Kbit/sec FM (2GFSK)	External Monopole, 5.15dBi Max	93.8	<111.0	Pass
960 (QP)	37.5 Kbit/sec FM (2GFSK)	External Monopole, 5.15dBi Max	45.7	<54	Pass
614 (QP)	Hopping with modulation (37.5 Kbit/sec Modulations worst case)	External Monopole, 5.15dBi Max	40.4	<46	Pass
902	Hopping with modulation (37.5 Kbit/sec Modulations worst case)	External Monopole, 5.15dBi Max	93.4	<111.0	Pass
928	Hopping with modulation (37.5 Kbit/sec Modulations worst case)	External Monopole, 5.15dBi Max	91.5	<111.0	Pass
960 (QP)	Hopping with modulation (37.5 Kbit/sec Modulations worst case)	External Monopole, 5.15dBi Max	45.5	<54	Pass

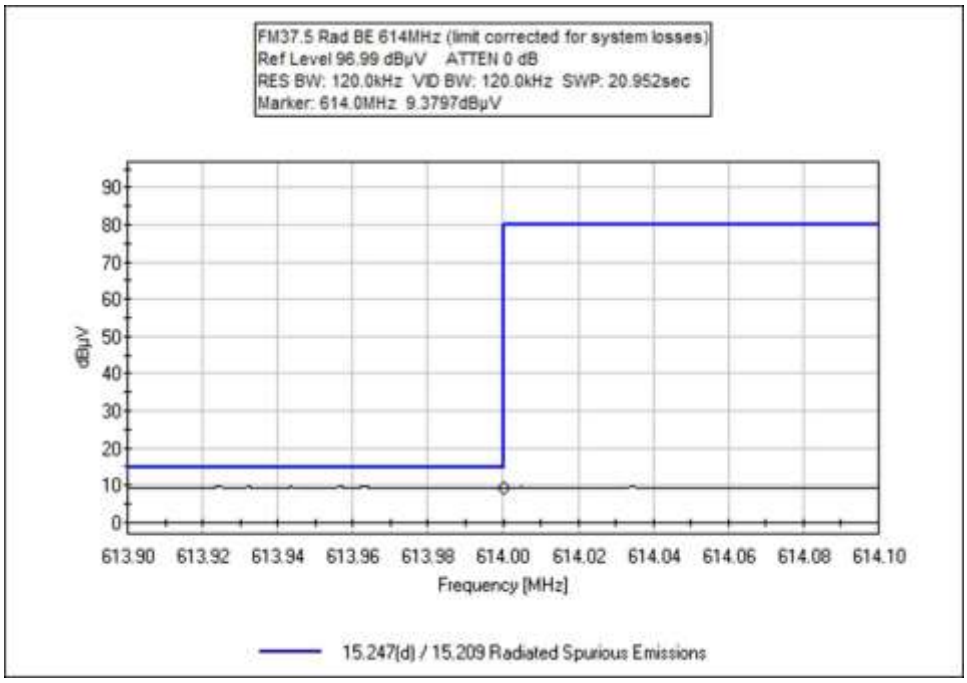
Band Edge Plots

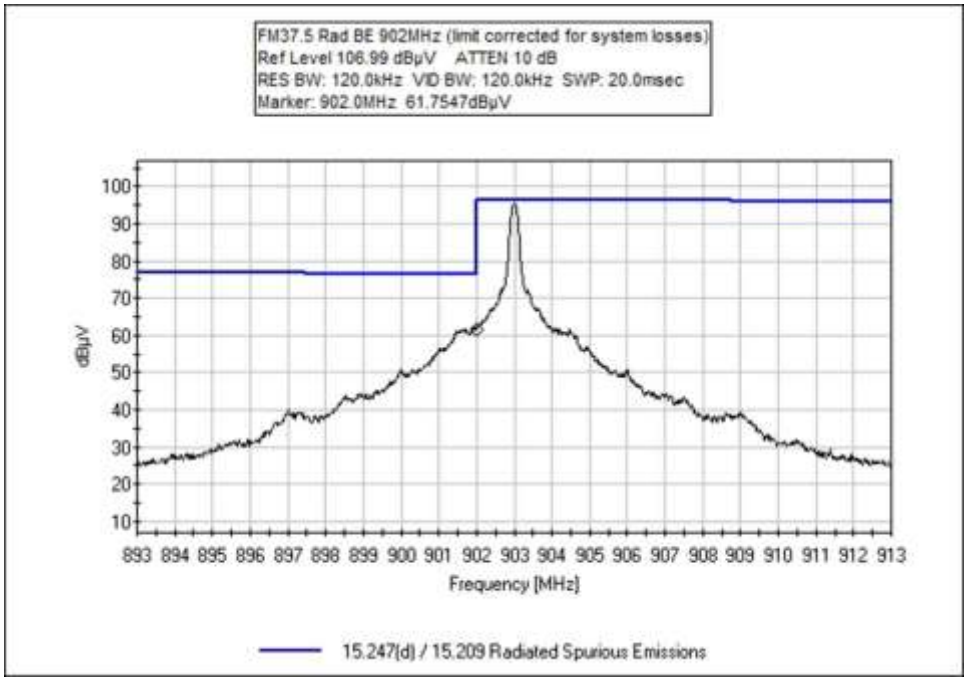


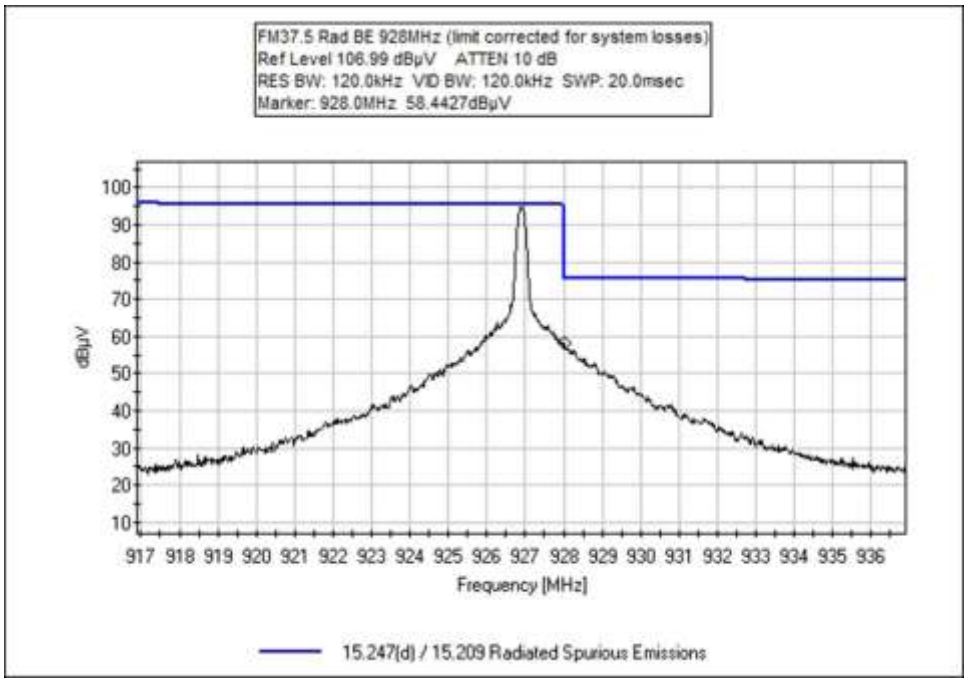


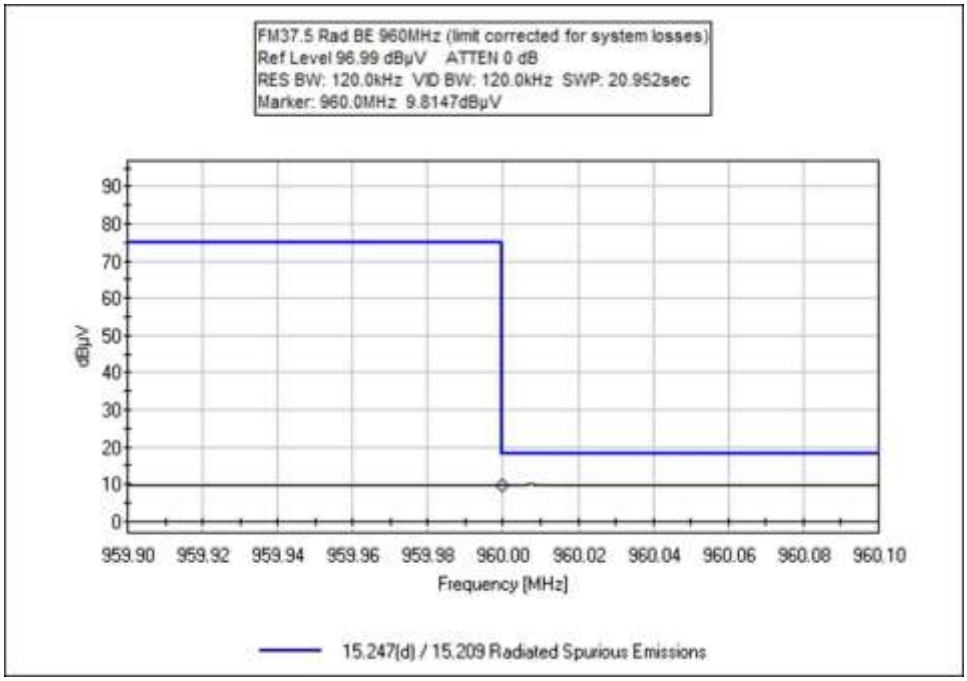

FM12.5 Rad BE 928MHz (limit corrected for system losses)
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 120.0kHz VID BW: 120.0kHz SWP: 20.0msec
Marker: 928.0MHz 57.3847dBµV
dBµV
100
90
80
70
60
50
40
30
20
10
917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions

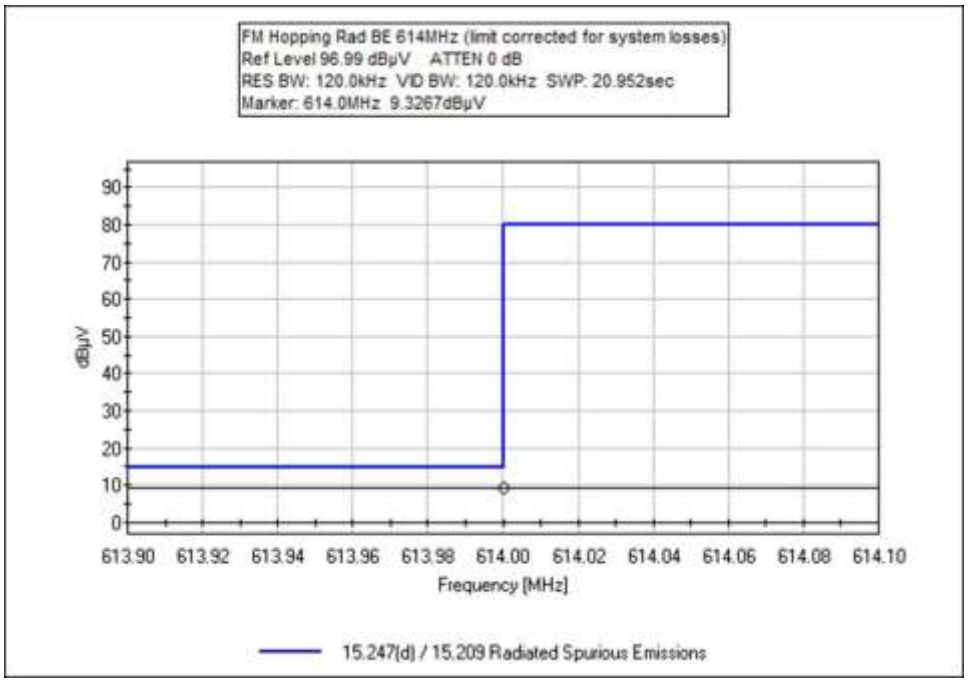

FM12.5 Rad BE 960MHz (limit corrected for system losses)
Ref Level 96.99 dBµV ATTEN 0 dB
RES BW: 120.0kHz VID BW: 120.0kHz SWP: 20.952sec
Marker: 960.0MHz 9.7707dBµV
dBµV
90
80
70
60
50
40
30
20
10
0
959.90 959.92 959.94 959.96 959.98 960.00 960.02 960.04 960.06 960.08 960.10
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions

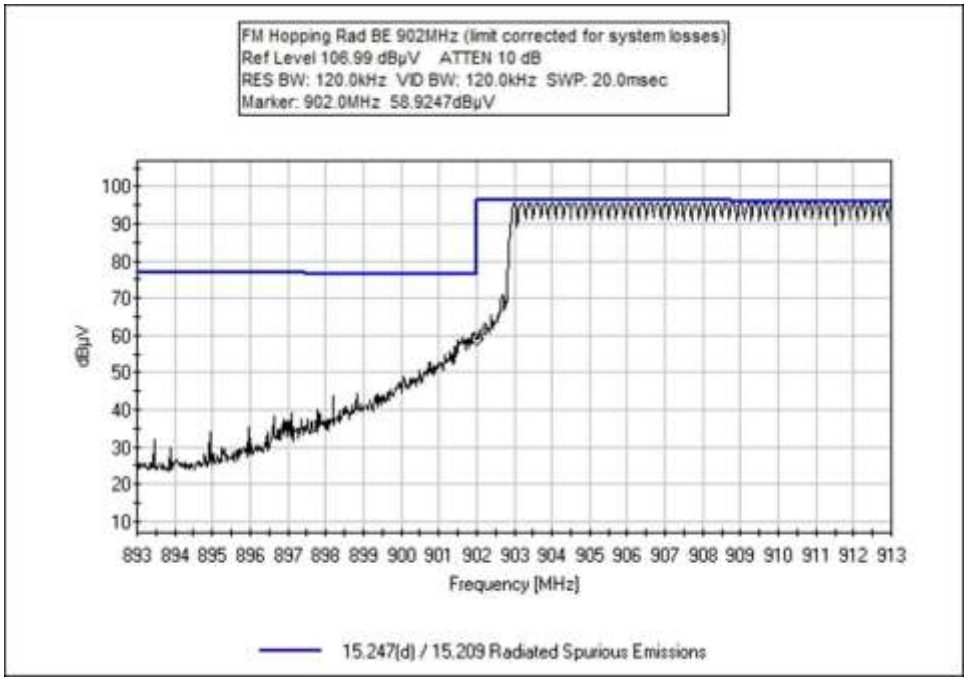

FM37.5 Rad BE 614MHz (limit corrected for system losses)
Ref Level 96.99 dBµV ATTEN 0 dB
RES BW: 120.0kHz VID BW: 120.0kHz SWP: 20.952sec
Marker: 614.0MHz 9.3797dBµV
dBµV
90
80
70
60
50
40
30
20
10
0
613.90 613.92 613.94 613.96 613.98 614.00 614.02 614.04 614.06 614.08 614.10
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions

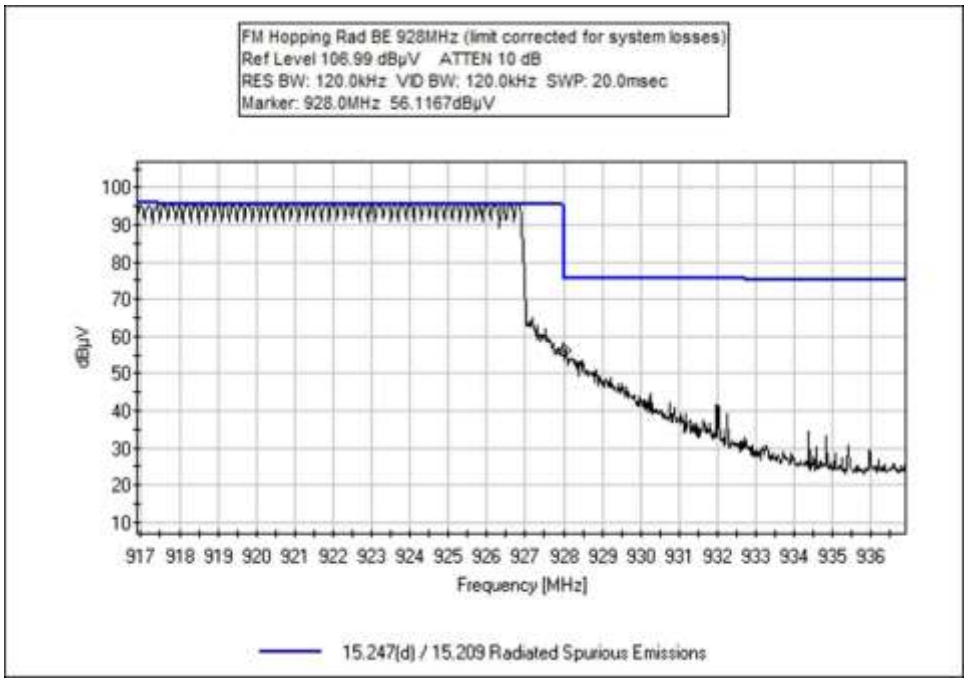

FM37.5 Rad BE 902MHz (limit corrected for system losses)
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 120.0kHz VID BW: 120.0kHz SWP: 20.0msec
Marker: 902.0MHz 61.7547dBµV
dBµV
100
90
80
70
60
50
40
30
20
10
893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions

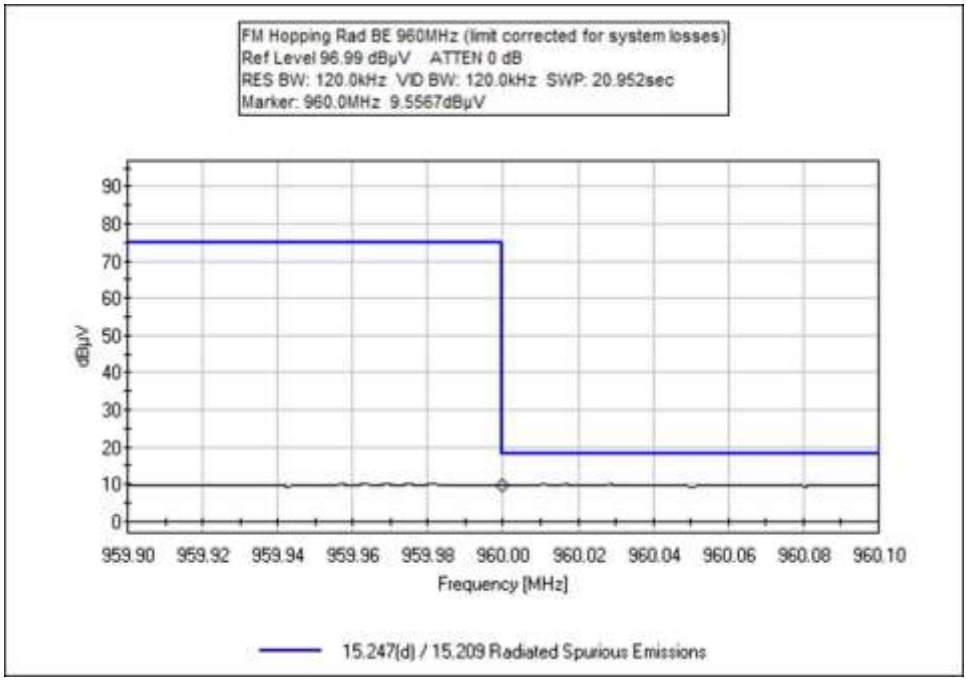

FM37.5 Rad BE 928MHz (limit corrected for system losses)
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 120.0kHz VID BW: 120.0kHz SWP: 20.0msec
Marker: 928.0MHz 58.4427dBµV
dBµV
100
90
80
70
60
50
40
30
20
10
917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions


FM37.5 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 9.8147dBµV
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


FM Hopping Rad BE 614MHz (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: 614.0MHz 9.3267dBµV
dBµV
90
80
70
60
50
40
30
20
10
0
613.90 613.92 613.94 613.96 613.98 614.00 614.02 614.04 614.06 614.08 614.10
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions


FM Hopping 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 58.9247dBµV
dBµV
100
90
80
70
60
50
40
30
20
10
893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions


FM Hopping Rad BE 928MHz (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: 928.0MHz 56.1167dBµV
dBµV
100
90
80
70
60
50
40
30
20
10
917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions


FM Hopping 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 9.5567dBµV
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 #:	**100138**	Date:	9/28/2017
Test Type:	**Maximized Emissions**	Time:	14:25:41
Tested By:	Michael Atkinson	Sequence#:	14
Software:	EMITest 5.03.11		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Frequency Range: Band Edge
Frequency tested: 903, 926.9MHz
Firmware power setting: Max
Firmware: ARM 1.0.0.0 DSP 1.0.0.0, FPGA 4.1, Test Software: SrTest100 v4.1.1.25
Modulation: 12.5 Kbit/sec FM (2GFSK), 37.5 Kbit/sec FM (2GFSK)

Antenna type: External Monopole
Antenna Gain: 5.15 dBi or 5.5dBi

Duty Cycle: Tested at 100%
Test Location: Bothell Lab C3
Test Method: ANSI C63.10 (2013)

Setup: The EUT ISM port is continuously transmitting with modulation.
The EUT ISM port has an external antenna installed, both 5.15 and 5.5dBi antennas investigated, only worst case reported.
Low and High channels investigated, as well as Hopping with modulation, all modulation types investigated, worst case reported.
Both Horizontal and Vertical antenna polarities investigated, only worst case reported.

Test Equipment:

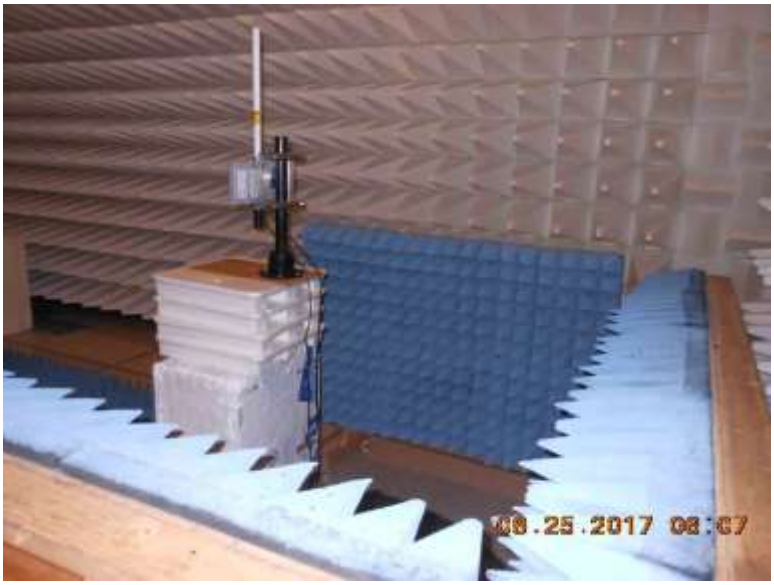
ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP06540	Cable	Heliax	10/29/2015	10/29/2017
T2	ANP05963	Cable	RG-214	2/15/2016	2/15/2018
T3	ANP05360	Cable	RG214	11/30/2016	11/30/2018
T4	ANP06123	Attenuator	18N-6	5/5/2017	5/5/2019
T5	AN03628	Biconilog Antenna	3142E	6/7/2017	6/7/2019
T6	AN02673	Spectrum Analyzer	E4446A	10/12/2015	10/12/2017

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

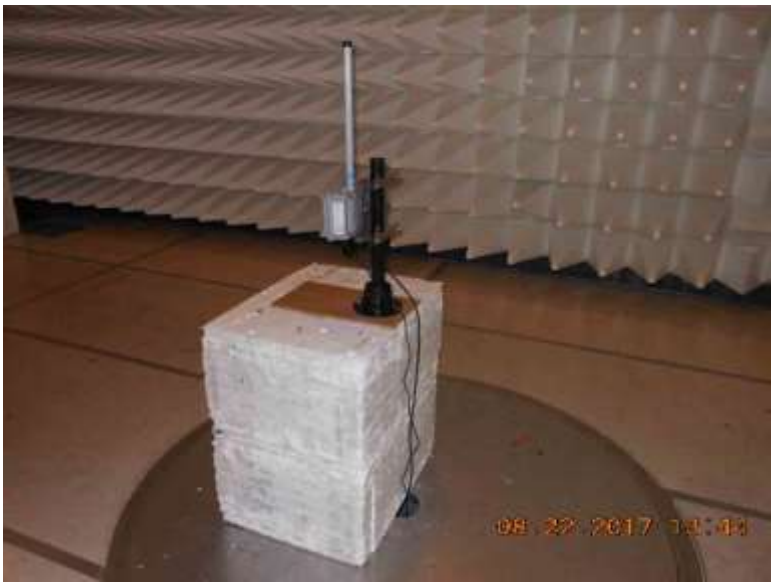
#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
			T5	T6							
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	614.000M	9.4	+0.3	+2.1	+1.6	+5.9	+0.0	40.5	46.0	-5.5	Vert
	QP		+21.2	+0.0					FM37.5		
2	614.000M	9.4	+0.3	+2.1	+1.6	+5.9	+0.0	40.5	46.0	-5.5	Vert
	QP		+21.2	+0.0					FM12.5		
3	614.000M	9.3	+0.3	+2.1	+1.6	+5.9	+0.0	40.4	46.0	-5.6	Vert
	QP		+21.2	+0.0					Hop		
4	960.000M	9.8	+0.4	+2.5	+2.2	+5.9	+0.0	45.7	54.0	-8.3	Vert
	QP		+24.9	+0.0					FM37.5		
5	960.000M	9.8	+0.4	+2.5	+2.2	+5.9	+0.0	45.7	54.0	-8.3	Vert
	QP		+24.9	+0.0					FM12.5		
6	960.000M	9.6	+0.4	+2.5	+2.2	+5.9	+0.0	45.5	54.0	-8.5	Vert
	QP		+24.9	+0.0					Hop		
7	902.000M	61.8	+0.3	+2.4	+2.1	+5.9	+0.0	96.3	111.0	-14.7	Vert
			+23.8	+0.0					FM37.5		
8	902.000M	61.6	+0.3	+2.4	+2.1	+5.9	+0.0	96.1	111.0	-14.9	Vert
			+23.8	+0.0					FM12.5		
9	928.000M	58.4	+0.4	+2.4	+2.1	+5.9	+0.0	93.8	111.0	-17.2	Vert
			+24.6	+0.0					FM37.5		
10	902.000M	58.9	+0.3	+2.4	+2.1	+5.9	+0.0	93.4	111.0	-17.6	Vert
			+23.8	+0.0					Hop		
11	928.000M	57.4	+0.4	+2.4	+2.1	+5.9	+0.0	92.8	111.0	-18.2	Vert
			+24.6	+0.0					FM12.5		
12	928.000M	56.1	+0.4	+2.4	+2.1	+5.9	+0.0	91.5	111.0	-19.5	Vert
			+24.6	+0.0					Hop		

Test Setup Photos

Below 1GHz, 5.5dBi Antenna



Above 1GHz, 5.5dBi Antenna, Cone Placement



Below 1GHz, 5.15dBi Antenna

Above 1GHz, 5.15dBi Antenna, Cone Placement

15.207 AC Conducted 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:	**15.207 AC Mains - Average**		
Work Order #:	**100138**	Date:	9/28/2017
Test Type:	**Conducted Emissions**	Time:	16:07:23
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:

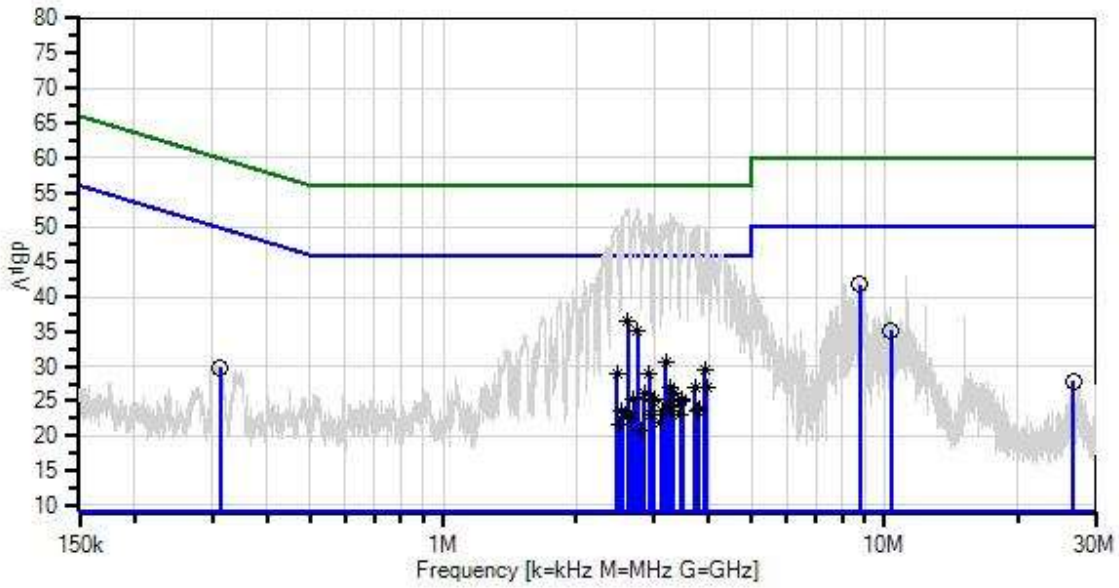
Frequency Range: 150kHz-30MHz
Frequency tested: 903, 915, 926.9MHz
Firmware power setting: Max
Firmware: ARM 1.0.0.0 DSP 1.0.0.0, FPGA 4.1, Test Software: SrTest100 v4.1.1.25
Modulation: 12.5 Kbit/sec FM (2GFSK), 37.5 Kbit/sec FM (2GFSK)

Antenna type: External Monopole
Antenna Gain: 5.15 dBi or 5.5dBi

Duty Cycle: Tested at 100%

Setup: The EUT is connected to AC mains through LISN.
The EUT ISM port is continuously transmitting with modulation.
The EUT ISM port is connected directly to a spectrum analyzer for direct connected measurements.
Low, Mid, and High channels investigated, as well as Hopping with modulation, all modulation types investigated, worst case reported.

Itron, Inc. WO#: 100138 Sequence#: 5 Date: 9/28/2017
15.207 AC Mains - Average Test Lead: 115VAC 60Hz Line



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
T1	AN02611	High Pass Filter	HE9615-150K-50-720B	2/18/2016	2/18/2018
T2	ANP06540	Cable	Heliax	10/29/2015	10/29/2017
T3	ANP05305	Cable	ETSI-50T	2/15/2016	2/15/2018
T4	ANP06219	Attenuator	768-10	4/12/2016	4/12/2018
	AN01311	50uH LISN-Line1 (N)	3816/2	3/7/2016	3/7/2018
T5	AN01311	50uH LISN-Line2 (L)	3816/2	3/7/2016	3/7/2018
	AN02673	Spectrum Analyzer	E4446A	10/12/2015	10/12/2017

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	8.792M	32.3	+0.1 +0.1	+0.0	+0.2	+9.1	+0.0	41.8	50.0	-8.2	Line
2	2.613M	27.0	+0.1	+0.0	+0.1	+9.1	+0.0	36.4	46.0	-9.6	Line
	Ave		+0.1								
^	2.613M	43.2	+0.1 +0.1	+0.0	+0.1	+9.1	+0.0	52.6	46.0	+6.6	Line
4	2.762M	25.8	+0.1	+0.0	+0.1	+9.1	+0.0	35.2	46.0	-10.8	Line
	Ave		+0.1								
^	2.762M	43.5	+0.1 +0.1	+0.0	+0.1	+9.1	+0.0	52.9	46.0	+6.9	Line
6	10.320M	25.7	+0.1 +0.1	+0.0	+0.2	+9.1	+0.0	35.2	50.0	-14.8	Line
7	3.197M	21.2	+0.1	+0.0	+0.1	+9.1	+0.0	30.6	46.0	-15.4	Line
	Ave		+0.1								
^	3.197M	41.4	+0.1 +0.1	+0.0	+0.1	+9.1	+0.0	50.8	46.0	+4.8	Line
9	3.913M	20.0	+0.1	+0.0	+0.1	+9.1	+0.0	29.4	46.0	-16.6	Line
	Ave		+0.1								
^	3.913M	40.4	+0.1 +0.1	+0.0	+0.1	+9.1	+0.0	49.8	46.0	+3.8	Line
11	2.936M	19.5	+0.1	+0.0	+0.1	+9.1	+0.0	28.9	46.0	-17.1	Line
	Ave		+0.1								
^	2.936M	42.6	+0.1 +0.1	+0.0	+0.1	+9.1	+0.0	52.0	46.0	+6.0	Line
13	2.478M	19.4	+0.1	+0.0	+0.1	+9.1	+0.0	28.8	46.0	-17.2	Line
	Ave		+0.1								
^	2.478M	40.8	+0.1 +0.1	+0.0	+0.1	+9.1	+0.0	50.2	46.0	+4.2	Line
15	3.252M	17.6	+0.1	+0.0	+0.1	+9.1	+0.0	27.0	46.0	-19.0	Line
	Ave		+0.1								
^	3.252M	40.6	+0.1 +0.1	+0.0	+0.1	+9.1	+0.0	50.0	46.0	+4.0	Line
17	3.958M	17.6	+0.1	+0.0	+0.1	+9.1	+0.0	27.0	46.0	-19.0	Line
	Ave		+0.1								
^	3.958M	40.0	+0.1 +0.1	+0.0	+0.1	+9.1	+0.0	49.4	46.0	+3.4	Line

19	3.722M	17.5	+0.1	+0.0	+0.1	+9.1	+0.0	26.9	46.0	-19.1	Line
	Ave		+0.1								
^	3.722M	40.5	+0.1	+0.0	+0.1	+9.1	+0.0	49.9	46.0	+3.9	Line
			+0.1								
21	2.858M	16.7	+0.1	+0.0	+0.1	+9.1	+0.0	26.1	46.0	-19.9	Line
	Ave		+0.1								
^	2.858M	40.8	+0.1	+0.0	+0.1	+9.1	+0.0	50.2	46.0	+4.2	Line
			+0.1								
23	3.325M	16.7	+0.1	+0.0	+0.1	+9.1	+0.0	26.1	46.0	-19.9	Line
	Ave		+0.1								
^	3.325M	42.0	+0.1	+0.0	+0.1	+9.1	+0.0	51.4	46.0	+5.4	Line
			+0.1								
25	311.990k	20.7	+0.1	+0.0	+0.0	+9.1	+0.0	29.9	49.9	-20.0	Line
			+0.0								
26	2.999M	16.0	+0.1	+0.0	+0.1	+9.1	+0.0	25.4	46.0	-20.6	Line
	Ave		+0.1								
^	2.999M	42.3	+0.1	+0.0	+0.1	+9.1	+0.0	51.7	46.0	+5.7	Line
			+0.1								
28	3.466M	15.8	+0.1	+0.0	+0.1	+9.1	+0.0	25.2	46.0	-20.8	Line
	Ave		+0.1								
^	3.466M	40.1	+0.1	+0.0	+0.1	+9.1	+0.0	49.5	46.0	+3.5	Line
			+0.1								
30	2.701M	15.8	+0.1	+0.0	+0.1	+9.1	+0.0	25.2	46.0	-20.8	Line
	Ave		+0.1								
^	2.701M	41.5	+0.1	+0.0	+0.1	+9.1	+0.0	50.9	46.0	+4.9	Line
			+0.1								
32	2.987M	15.7	+0.1	+0.0	+0.1	+9.1	+0.0	25.1	46.0	-20.9	Line
	Ave		+0.1								
^	2.987M	42.4	+0.1	+0.0	+0.1	+9.1	+0.0	51.8	46.0	+5.8	Line
			+0.1								
34	3.477M	15.6	+0.1	+0.0	+0.1	+9.1	+0.0	25.0	46.0	-21.0	Line
	Ave		+0.1								
^	3.477M	41.3	+0.1	+0.0	+0.1	+9.1	+0.0	50.7	46.0	+4.7	Line
			+0.1								
36	3.267M	14.9	+0.1	+0.0	+0.1	+9.1	+0.0	24.3	46.0	-21.7	Line
	Ave		+0.1								
^	3.267M	42.5	+0.1	+0.0	+0.1	+9.1	+0.0	51.9	46.0	+5.9	Line
			+0.1								
38	3.277M	14.8	+0.1	+0.0	+0.1	+9.1	+0.0	24.2	46.0	-21.8	Line
	Ave		+0.1								
^	3.277M	40.3	+0.1	+0.0	+0.1	+9.1	+0.0	49.7	46.0	+3.7	Line
			+0.1								
40	3.802M	14.6	+0.1	+0.0	+0.1	+9.1	+0.0	24.0	46.0	-22.0	Line
	Ave		+0.1								
^	3.802M	40.8	+0.1	+0.0	+0.1	+9.1	+0.0	50.2	46.0	+4.2	Line
			+0.1								
42	26.722M	18.0	+0.1	+0.0	+0.3	+9.1	+0.0	27.9	50.0	-22.1	Line
			+0.4								
43	3.762M	14.3	+0.1	+0.0	+0.1	+9.1	+0.0	23.7	46.0	-22.3	Line
	Ave		+0.1								
^	3.762M	41.0	+0.1	+0.0	+0.1	+9.1	+0.0	50.4	46.0	+4.4	Line
			+0.1								

45 Ave	2.545M	14.3	+0.1 +0.1	+0.0	+0.1	+9.1	+0.0	23.7	46.0	-22.3	Line
^	2.545M	42.0	+0.1 +0.1	+0.0	+0.1	+9.1	+0.0	51.4	46.0	+5.4	Line
47 Ave	3.292M	14.3	+0.1 +0.1	+0.0	+0.1	+9.1	+0.0	23.7	46.0	-22.3	Line
^	3.292M	42.0	+0.1 +0.1	+0.0	+0.1	+9.1	+0.0	51.4	46.0	+5.4	Line
49 Ave	3.129M	14.1	+0.1 +0.1	+0.0	+0.1	+9.1	+0.0	23.5	46.0	-22.5	Line
50 Ave	2.647M	13.8	+0.1 +0.1	+0.0	+0.1	+9.1	+0.0	23.2	46.0	-22.8	Line
51 Ave	3.455M	13.6	+0.1 +0.1	+0.0	+0.1	+9.1	+0.0	23.0	46.0	-23.0	Line
^	3.455M	40.8	+0.1 +0.1	+0.0	+0.1	+9.1	+0.0	50.2	46.0	+4.2	Line
53 Ave	2.963M	13.5	+0.1 +0.1	+0.0	+0.1	+9.1	+0.0	22.9	46.0	-23.1	Line
^	2.963M	40.4	+0.1 +0.1	+0.0	+0.1	+9.1	+0.0	49.8	46.0	+3.8	Line
55 Ave	2.653M	13.1	+0.1 +0.1	+0.0	+0.1	+9.1	+0.0	22.5	46.0	-23.5	Line
^	2.653M	40.7	+0.1 +0.1	+0.0	+0.1	+9.1	+0.0	50.1	46.0	+4.1	Line
^	2.647M	40.5	+0.1 +0.1	+0.0	+0.1	+9.1	+0.0	49.9	46.0	+3.9	Line
58 Ave	3.122M	12.6	+0.1 +0.1	+0.0	+0.1	+9.1	+0.0	22.0	46.0	-24.0	Line
^	3.129M	41.3	+0.1 +0.1	+0.0	+0.1	+9.1	+0.0	50.7	46.0	+4.7	Line
^	3.122M	41.1	+0.1 +0.1	+0.0	+0.1	+9.1	+0.0	50.5	46.0	+4.5	Line
61 Ave	2.505M	12.3	+0.1 +0.1	+0.0	+0.1	+9.1	+0.0	21.7	46.0	-24.3	Line
^	2.505M	40.1	+0.1 +0.1	+0.0	+0.1	+9.1	+0.0	49.5	46.0	+3.5	Line
63 Ave	2.810M	11.3	+0.1 +0.1	+0.0	+0.1	+9.1	+0.0	20.7	46.0	-25.3	Line
^	2.810M	41.7	+0.1 +0.1	+0.0	+0.1	+9.1	+0.0	51.1	46.0	+5.1	Line

Test Location:	CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)		
Customer:	**Itron, Inc.**		
Specification:	**15.207 AC Mains - Average**		
Work Order #:	**100138**	Date:	9/28/2017
Test Type:	**Conducted Emissions**	Time:	16:25:39
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:

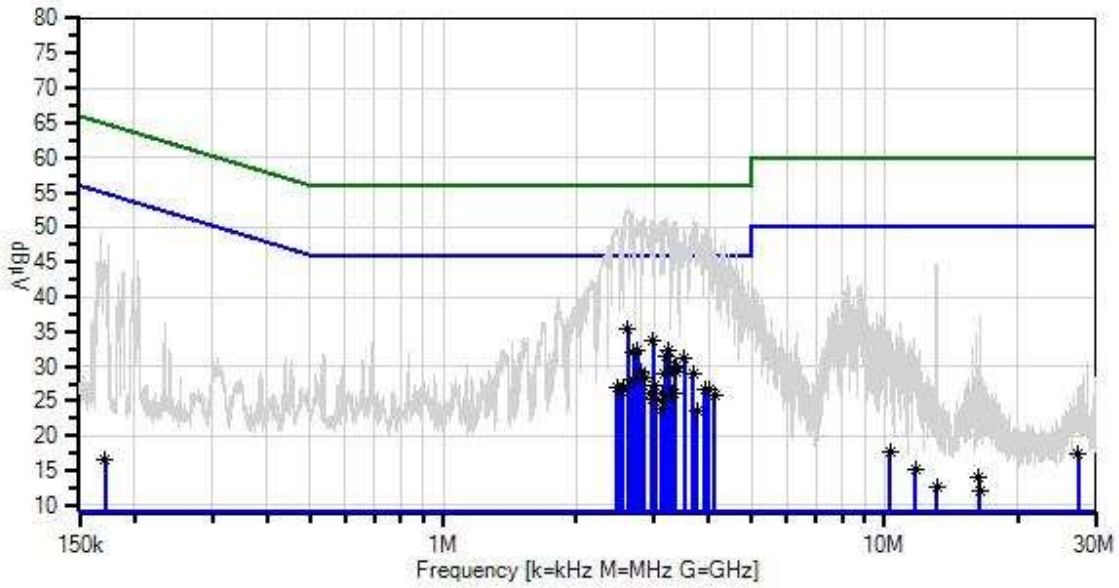
Frequency Range: 150kHz-30MHz
Frequency tested: 903, 915, 926.9MHz
Firmware power setting: Max
Firmware: ARM 1.0.0.0 DSP 1.0.0.0, FPGA 4.1, Test Software: SrTest100 v4.1.1.25
Modulation: 12.5 Kbit/sec FM (2GFSK), 37.5 Kbit/sec FM (2GFSK)

Antenna type: External Monopole
Antenna Gain: 5.15 dBi or 5.5dBi

Duty Cycle: Tested at 100%

Setup: The EUT is connected to AC mains through LISN.
The EUT ISM port is continuously transmitting with modulation.
The EUT ISM port is connected directly to a spectrum analyzer for direct connected measurements.
Low, Mid, and High channels investigated, as well as Hopping with modulation, all modulation types investigated, worst case reported.

Itron, Inc. WO#: 100138 Sequence#: 6 Date: 9/28/2017
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
T1	AN02611	High Pass Filter	HE9615-150K-50-720B	2/18/2016	2/18/2018
T2	ANP06540	Cable	Heliax	10/29/2015	10/29/2017
T3	ANP05305	Cable	ETSI-50T	2/15/2016	2/15/2018
T4	ANP06219	Attenuator	768-10	4/12/2016	4/12/2018
T5	AN01311	50uH LISN-Line1 (N)	3816/2	3/7/2016	3/7/2018
	AN01311	50uH LISN-Line2 (L)	3816/2	3/7/2016	3/7/2018
T6	AN02673	Spectrum Analyzer	E4446A	10/12/2015	10/12/2017

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

#	Freq	Rdng	T1 T5	T2 T6	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV	dBµV	dB	Ant
1	2.615M	26.1	+0.1	+0.0	+0.1	+9.1	+0.0	35.4	46.0	-10.6	Retur
Ave			+0.0	+0.0							
^	2.615M	43.4	+0.1	+0.0	+0.1	+9.1	+0.0	52.7	46.0	+6.7	Retur
			+0.0	+0.0							
3	2.990M	24.3	+0.1	+0.0	+0.1	+9.1	+0.0	33.6	46.0	-12.4	Retur
Ave			+0.0	+0.0							
4	2.754M	23.0	+0.1	+0.0	+0.1	+9.1	+0.0	32.3	46.0	-13.7	Retur
Ave			+0.0	+0.0							
^	2.754M	41.8	+0.1	+0.0	+0.1	+9.1	+0.0	51.1	46.0	+5.1	Retur
			+0.0	+0.0							
6	3.239M	22.9	+0.1	+0.0	+0.1	+9.1	+0.0	32.2	46.0	-13.8	Retur
Ave			+0.0	+0.0							
^	3.239M	41.4	+0.1	+0.0	+0.1	+9.1	+0.0	50.7	46.0	+4.7	Retur
			+0.0	+0.0							
8	2.702M	22.7	+0.1	+0.0	+0.1	+9.1	+0.0	32.0	46.0	-14.0	Retur
Ave			+0.0	+0.0							
^	2.702M	41.0	+0.1	+0.0	+0.1	+9.1	+0.0	50.3	46.0	+4.3	Retur
			+0.0	+0.0							
10	3.200M	22.1	+0.1	+0.0	+0.1	+9.1	+0.0	31.4	46.0	-14.6	Retur
Ave			+0.0	+0.0							
^	3.200M	42.0	+0.1	+0.0	+0.1	+9.1	+0.0	51.3	46.0	+5.3	Retur
			+0.0	+0.0							
12	3.513M	21.9	+0.1	+0.0	+0.1	+9.1	+0.0	31.2	46.0	-14.8	Retur
Ave			+0.0	+0.0							
^	3.513M	40.5	+0.1	+0.0	+0.1	+9.1	+0.0	49.8	46.0	+3.8	Retur
			+0.0	+0.0							
14	3.363M	20.7	+0.1	+0.0	+0.1	+9.1	+0.0	30.0	46.0	-16.0	Retur
Ave			+0.0	+0.0							
^	3.363M	41.4	+0.1	+0.0	+0.1	+9.1	+0.0	50.7	46.0	+4.7	Retur
			+0.0	+0.0							

16 Ave	3.340M	20.6	+0.1 +0.0	+0.0 +0.0	+0.1	+9.1	+0.0	29.9	46.0	-16.1	Retur
^	3.340M	40.4	+0.1 +0.0	+0.0 +0.0	+0.1	+9.1	+0.0	49.7	46.0	+3.7	Retur
18 Ave	2.818M	20.0	+0.1 +0.0	+0.0 +0.0	+0.1	+9.1	+0.0	29.3	46.0	-16.7	Retur
^	2.818M	41.6	+0.1 +0.0	+0.0 +0.0	+0.1	+9.1	+0.0	50.9	46.0	+4.9	Retur
20 Ave	3.353M	20.0	+0.1 +0.0	+0.0 +0.0	+0.1	+9.1	+0.0	29.3	46.0	-16.7	Retur
^	3.353M	41.7	+0.1 +0.0	+0.0 +0.0	+0.1	+9.1	+0.0	51.0	46.0	+5.0	Retur
22 Ave	3.177M	19.5	+0.1 +0.0	+0.0 +0.0	+0.1	+9.1	+0.0	28.8	46.0	-17.2	Retur
^	3.177M	42.0	+0.1 +0.0	+0.0 +0.0	+0.1	+9.1	+0.0	51.3	46.0	+5.3	Retur
24 Ave	3.691M	19.5	+0.1 +0.0	+0.0 +0.0	+0.1	+9.1	+0.0	28.8	46.0	-17.2	Retur
^	3.691M	41.8	+0.1 +0.0	+0.0 +0.0	+0.1	+9.1	+0.0	51.1	46.0	+5.1	Retur
26 Ave	2.850M	19.0	+0.1 +0.0	+0.0 +0.0	+0.1	+9.1	+0.0	28.3	46.0	-17.7	Retur
^	2.850M	42.3	+0.1 +0.0	+0.0 +0.0	+0.1	+9.1	+0.0	51.6	46.0	+5.6	Retur
28 Ave	2.683M	18.7	+0.1 +0.0	+0.0 +0.0	+0.1	+9.1	+0.0	28.0	46.0	-18.0	Retur
^	2.683M	42.9	+0.1 +0.0	+0.0 +0.0	+0.1	+9.1	+0.0	52.2	46.0	+6.2	Retur
30 Ave	3.016M	18.0	+0.1 +0.0	+0.0 +0.0	+0.1	+9.1	+0.0	27.3	46.0	-18.7	Retur
^	3.016M	41.3	+0.1 +0.0	+0.0 +0.0	+0.1	+9.1	+0.0	50.6	46.0	+4.6	Retur
32 Ave	2.557M	17.8	+0.1 +0.0	+0.0 +0.0	+0.1	+9.1	+0.0	27.1	46.0	-18.9	Retur
^	2.557M	42.0	+0.1 +0.0	+0.0 +0.0	+0.1	+9.1	+0.0	51.3	46.0	+5.3	Retur
34 Ave	2.481M	17.6	+0.1 +0.0	+0.0 +0.0	+0.1	+9.1	+0.0	26.9	46.0	-19.1	Retur
^	2.481M	40.8	+0.1 +0.0	+0.0 +0.0	+0.1	+9.1	+0.0	50.1	46.0	+4.1	Retur
36 Ave	3.908M	17.4	+0.1 +0.0	+0.0 +0.0	+0.1	+9.1	+0.0	26.7	46.0	-19.3	Retur
^	3.908M	40.9	+0.1 +0.0	+0.0 +0.0	+0.1	+9.1	+0.0	50.2	46.0	+4.2	Retur
38 Ave	3.986M	17.4	+0.1 +0.0	+0.0 +0.0	+0.1	+9.1	+0.0	26.7	46.0	-19.3	Retur
^	3.986M	40.7	+0.1 +0.0	+0.0 +0.0	+0.1	+9.1	+0.0	50.0	46.0	+4.0	Retur
40 Ave	2.526M	17.1	+0.1 +0.0	+0.0 +0.0	+0.1	+9.1	+0.0	26.4	46.0	-19.6	Retur
^	2.526M	40.5	+0.1 +0.0	+0.0 +0.0	+0.1	+9.1	+0.0	49.8	46.0	+3.8	Retur

42	3.322M	16.9	+0.1	+0.0	+0.1	+9.1	+0.0	26.2	46.0	-19.8	Retur
	Ave		+0.0	+0.0							
^	3.322M	41.5	+0.1	+0.0	+0.1	+9.1	+0.0	50.8	46.0	+4.8	Retur
			+0.0	+0.0							
44	3.151M	16.8	+0.1	+0.0	+0.1	+9.1	+0.0	26.1	46.0	-19.9	Retur
	Ave		+0.0	+0.0							
45	3.303M	16.7	+0.1	+0.0	+0.1	+9.1	+0.0	26.0	46.0	-20.0	Retur
	Ave		+0.0	+0.0							
^	3.303M	41.4	+0.1	+0.0	+0.1	+9.1	+0.0	50.7	46.0	+4.7	Retur
			+0.0	+0.0							
47	2.966M	16.7	+0.1	+0.0	+0.1	+9.1	+0.0	26.0	46.0	-20.0	Retur
	Ave		+0.0	+0.0							
^	2.966M	41.8	+0.1	+0.0	+0.1	+9.1	+0.0	51.1	46.0	+5.1	Retur
			+0.0	+0.0							
49	4.117M	16.5	+0.1	+0.0	+0.1	+9.1	+0.0	25.8	46.0	-20.2	Retur
	Ave		+0.0	+0.0							
^	4.117M	40.5	+0.1	+0.0	+0.1	+9.1	+0.0	49.8	46.0	+3.8	Retur
			+0.0	+0.0							
51	2.996M	15.9	+0.1	+0.0	+0.1	+9.1	+0.0	25.2	46.0	-20.8	Retur
	Ave		+0.0	+0.0							
^	2.996M	41.2	+0.1	+0.0	+0.1	+9.1	+0.0	50.5	46.0	+4.5	Retur
			+0.0	+0.0							
^	2.990M	40.7	+0.1	+0.0	+0.1	+9.1	+0.0	50.0	46.0	+4.0	Retur
			+0.0	+0.0							
54	3.142M	15.6	+0.1	+0.0	+0.1	+9.1	+0.0	24.9	46.0	-21.1	Retur
	Ave		+0.0	+0.0							
^	3.151M	41.5	+0.1	+0.0	+0.1	+9.1	+0.0	50.8	46.0	+4.8	Retur
			+0.0	+0.0							
^	3.142M	41.1	+0.1	+0.0	+0.1	+9.1	+0.0	50.4	46.0	+4.4	Retur
			+0.0	+0.0							
57	3.123M	14.5	+0.1	+0.0	+0.1	+9.1	+0.0	23.8	46.0	-22.2	Retur
	Ave		+0.0	+0.0							
^	3.123M	41.6	+0.1	+0.0	+0.1	+9.1	+0.0	50.9	46.0	+4.9	Retur
			+0.0	+0.0							
59	3.764M	14.4	+0.1	+0.0	+0.1	+9.1	+0.0	23.7	46.0	-22.3	Retur
	Ave		+0.0	+0.0							
^	3.764M	41.2	+0.1	+0.0	+0.1	+9.1	+0.0	50.5	46.0	+4.5	Retur
			+0.0	+0.0							
61	10.300M	8.2	+0.1	+0.0	+0.2	+9.1	+0.0	17.6	50.0	-32.4	Retur
	Ave		+0.0	+0.0							
^	10.300M	26.2	+0.1	+0.0	+0.2	+9.1	+0.0	35.6	50.0	-14.4	Retur
			+0.0	+0.0							

63	27.420M	7.5	+0.2	+0.0	+0.3	+9.1	+0.0	17.3	50.0	-32.7	Retur
	Ave		+0.2	+0.0							
^	27.420M	16.9	+0.2	+0.0	+0.3	+9.1	+0.0	26.7	50.0	-23.3	Retur
			+0.2	+0.0							
65	11.720M	5.9	+0.1	+0.0	+0.2	+9.1	+0.0	15.3	50.0	-34.7	Retur
	Ave		+0.0	+0.0							
^	11.720M	31.3	+0.1	+0.0	+0.2	+9.1	+0.0	40.7	50.0	-9.3	Retur
			+0.0	+0.0							
67	16.380M	4.6	+0.1	+0.0	+0.3	+9.1	+0.0	14.1	50.0	-35.9	Retur
	Ave		+0.0	+0.0							
^	16.380M	28.1	+0.1	+0.0	+0.3	+9.1	+0.0	37.6	50.0	-12.4	Retur
			+0.0	+0.0							
69	13.100M	3.2	+0.1	+0.0	+0.2	+9.1	+0.0	12.6	50.0	-37.4	Retur
	Ave		+0.0	+0.0							
^	13.100M	35.4	+0.1	+0.0	+0.2	+9.1	+0.0	44.8	50.0	-5.2	Retur
			+0.0	+0.0							
71	16.420M	2.6	+0.1	+0.0	+0.3	+9.1	+0.0	12.1	50.0	-37.9	Retur
	Ave		+0.0	+0.0							
^	16.420M	19.1	+0.1	+0.0	+0.3	+9.1	+0.0	28.6	50.0	-21.4	Retur
			+0.0	+0.0							
73	171.250k	7.1	+0.4	+0.0	+0.0	+9.1	+0.0	16.6	54.9	-38.3	Retur
	Ave		+0.0	+0.0							
74	171.250k	7.1	+0.4	+0.0	+0.0	+9.1	+0.0	16.6	54.9	-38.3	Retur
	Ave		+0.0	+0.0							
^	171.250k	40.5	+0.4	+0.0	+0.0	+9.1	+0.0	50.0	54.9	-4.9	Retur
			+0.0	+0.0							

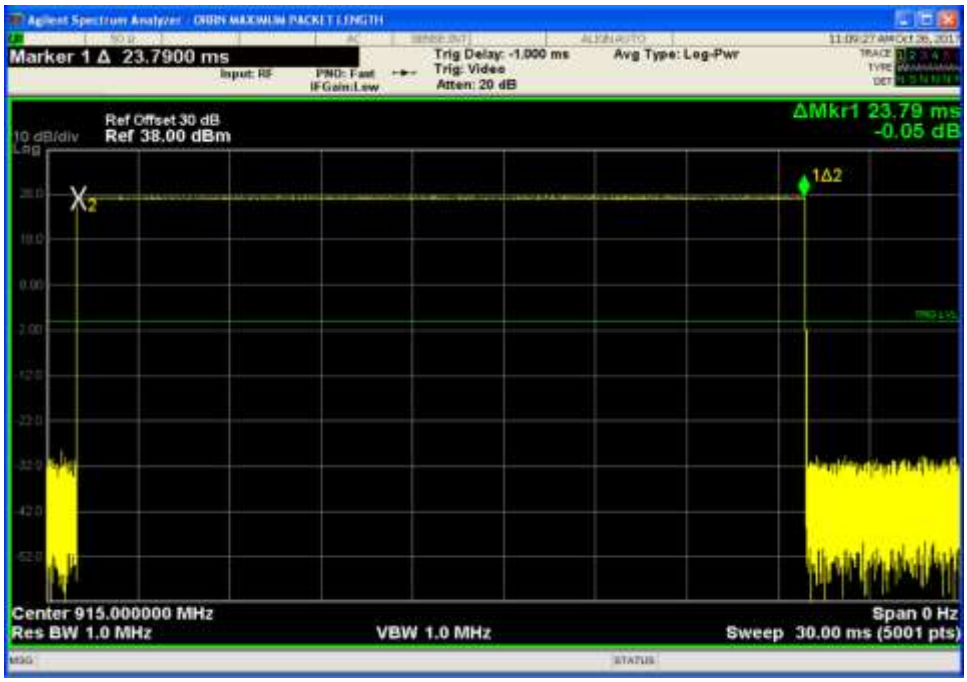
Test Setup Photo

APPENDIX A: CUSTOMER PROVIDED INFORMATION

Manufacturer's Declaration: 15.247(a)(1)(i) Average Time of Occupancy

The manufacturer declares:
Each transmission is a maximum of 23.8 mS long. Each transmission takes place on one of 120 different channels in a pseudorandom sequence. All 120 channels are used equally on the average. The algorithm that determines the pseudo-random hop sequence does not allow the device to transmit on the same channel more than 6 times in a 20 second period. The maximum possible occupancy time on any one frequency is 142.8 mS (6 times) within a 20 second period.

DCCF Plot Data



DCCF

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.