Itron, Inc.

TEST REPORT FOR

ORRNA
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.: 100619-5

Date of issue: December 15, 2017

A2LA 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.

TABLE OF CONTENTS

ADMINISTRATIVE INFORMATION

Test Report Information

REPORT PREPARED FOR:

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

Representative: Jay Holcomb
Customer Reference Number: 135842

REPORT PREPARED BY:

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

Project Number: 100619

DATE OF EQUIPMENT RECEIPT: November 27, 2017
DATE(S) OF TESTING: November 27-29, 2017

Report Authorization

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

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

Test Facility Information

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

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

The following device has been tested by CKC Laboratories**: ORRN**

Since the time of testing the manufacturer has updated the device name from **ORRN** to **ORRNA** and declares the device is identical electrically, any differences between them do not affect their EMC characteristics, and therefore meets the level of testing equivalent to the tested device.

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
ORRNA	Itron, Inc.	RN-EGS	321128365

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, 5.15 or 5.5 dBi
Beamforming Type:	N/A
Antenna Connection Type:	External Connector
Nominal Input Voltage:	115-230VAC, 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):	11/27/17
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.		

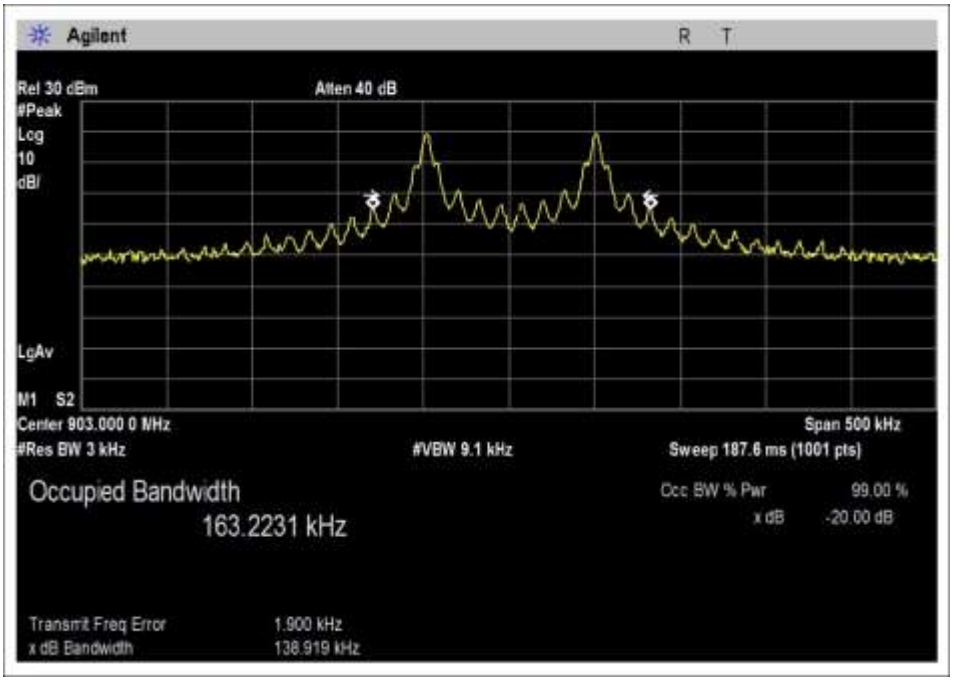
Environmental Conditions			
Temperature (ºC)	21	Relative Humidity (%):	37

Test Equipment					
Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
02871	Spectrum Analyzer	Agilent	E4440A	2/24/2017	2/24/2019
P06219	Attenuator	Narda	768-10	4/12/2016	4/12/2018
02871	Spectrum Analyzer	Agilent	E4440A	2/24/2017	2/24/2019

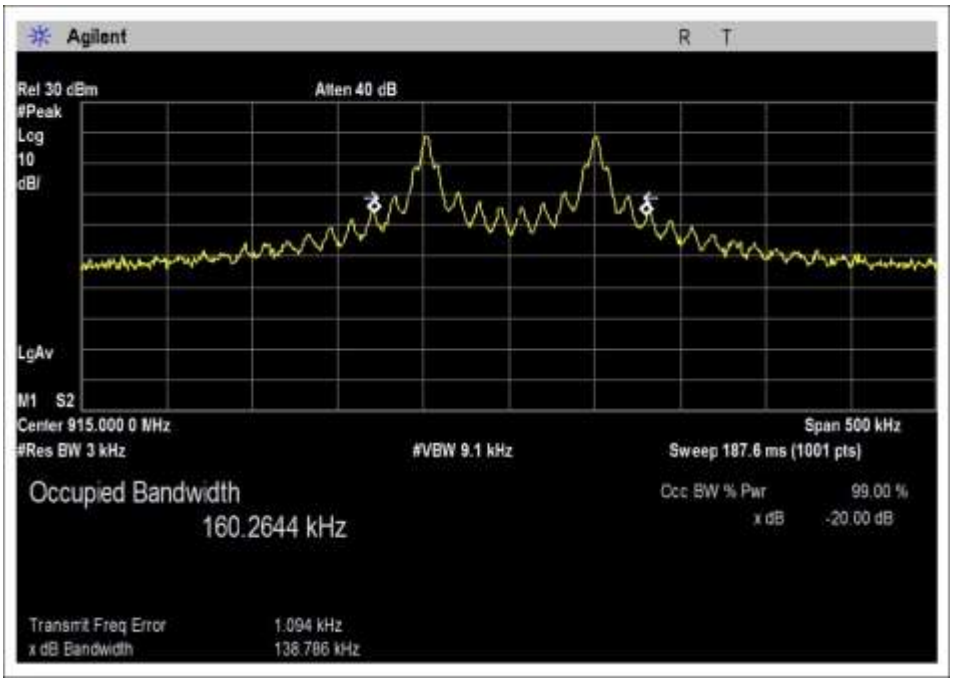
15.247(a)(1)(i) 20 dB Bandwidth

Test Data Summary					
Frequency (MHz)	Antenna Port	Modulation	Measured (kHz)	Limit (kHz)	Results
903	1	12.5 Kbit/sec FM (2GFSK)	138.92	≤500	Pass
915	1	12.5 Kbit/sec FM (2GFSK)	138.79	≤500	Pass
926.9	1	12.5 Kbit/sec FM (2GFSK)	138.98	≤500	Pass
903	1	37.5 Kbit/sec FM (2GFSK)	83.82	≤500	Pass
915	1	37.5 Kbit/sec FM (2GFSK)	84.52	≤500	Pass
926.9	1	37.5 Kbit/sec FM (2GFSK)	85.07	≤500	Pass

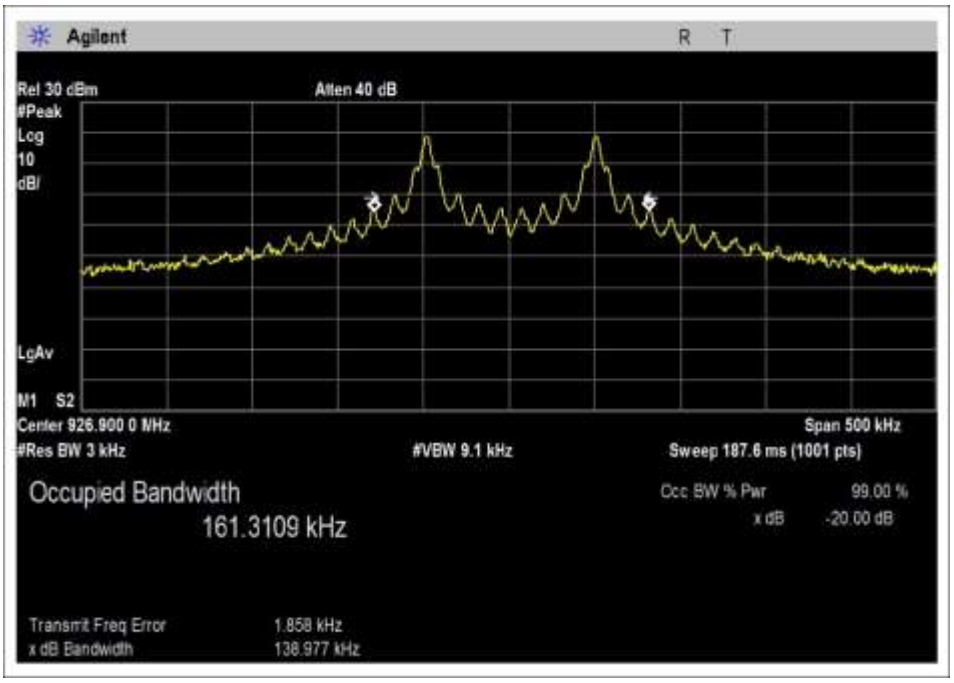
Plot(s)



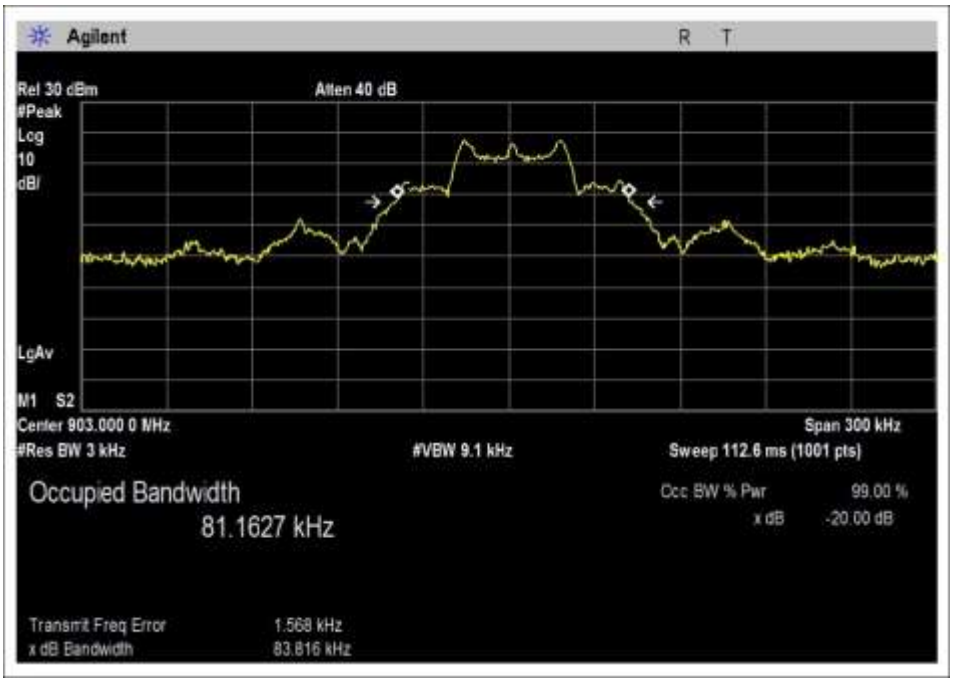
12.5k 903MHz



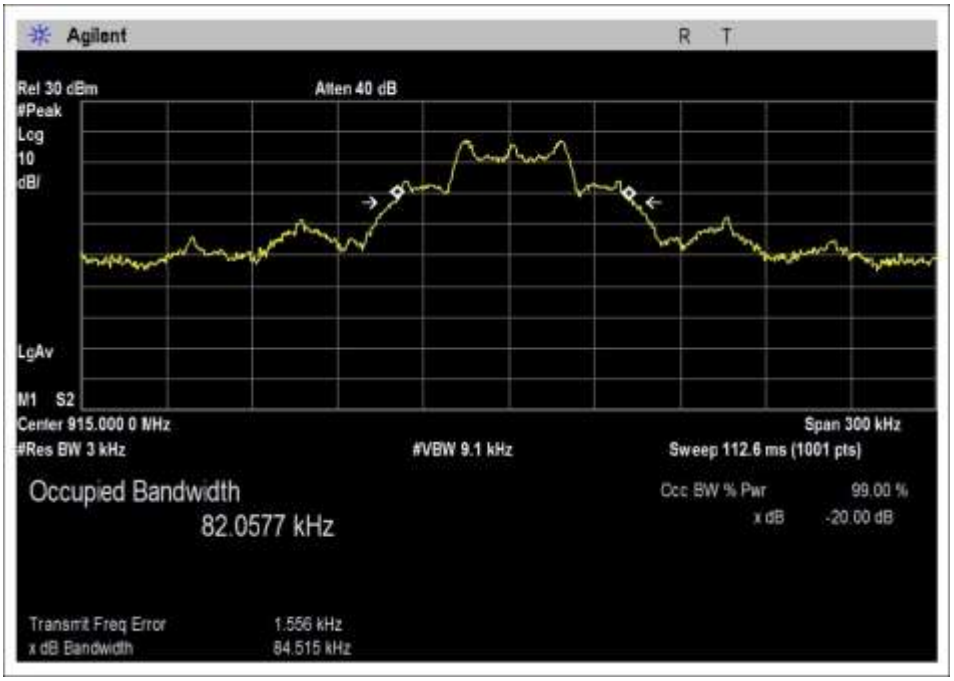
12.5k 915MHz



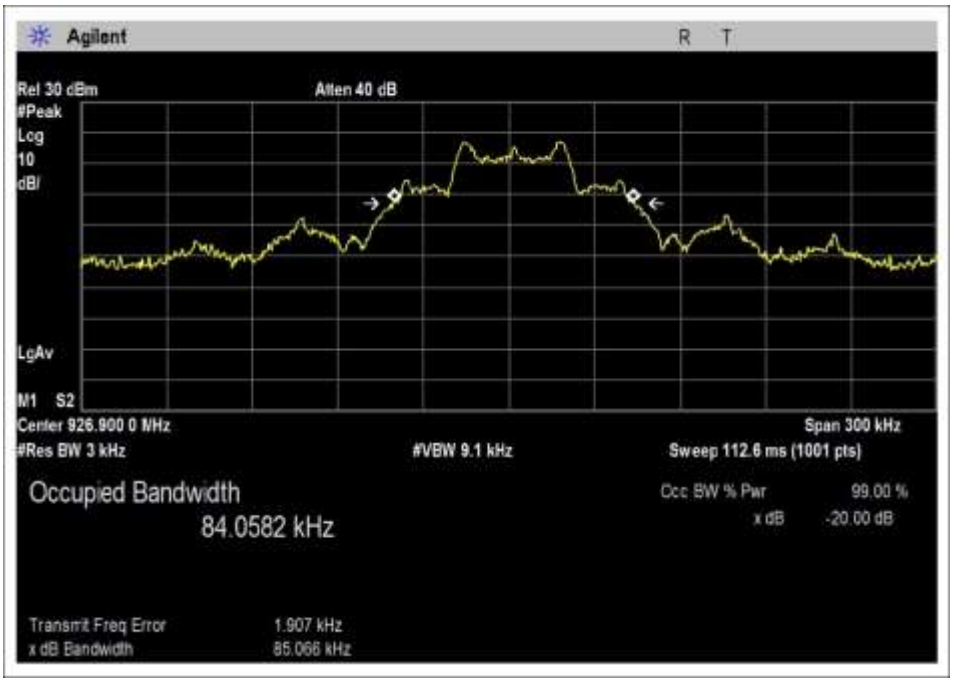
12.5k 926.9MHz



37.5k 903MHz



37.5k 915MHz

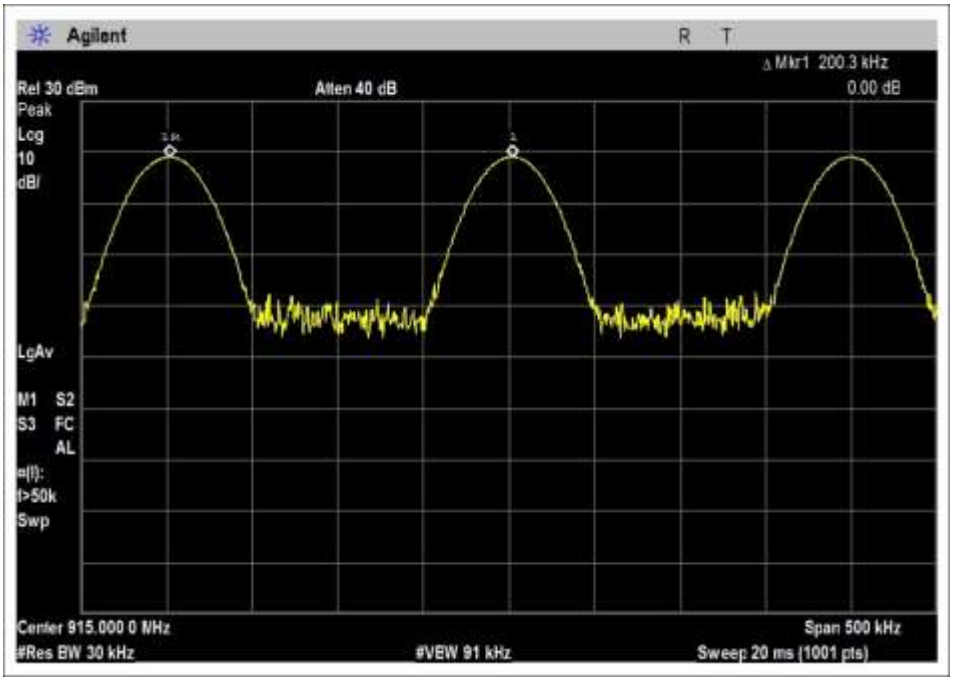


37.5k 926.9MHz

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	≥138.98kHz	Pass

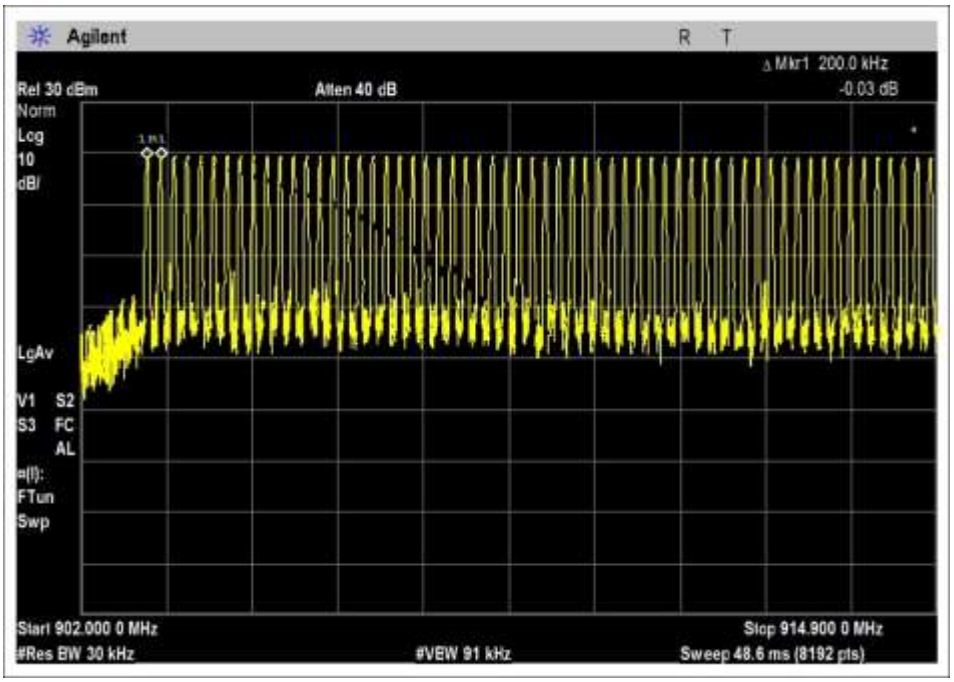
Plot(s)



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

Plot(s)



902-914.9MHz, 60 Channels

914.9-928MHz, 60 Channels

Test Setup Photo(s)

15.247(b)(2) Output Power

Test Setup/Conditions			
Test Location:	Bothell Lab Bench	Test Engineer:	M. Atkinson
Test Method:	ANSI C63.10 (2013)	Test Date(s):	11/27/17
Configuration:	1		
Test Setup:	See data sheet below.		

Environmental Conditions			
Temperature (ºC)	22	Relative Humidity (%):	36

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)	28.9	28.9	28.9	0.0
915	37.5 Kbit/sec FM (2GFSK)	28.7	28.7	28.7	0.0
926.9	37.5 Kbit/sec FM (2GFSK)	28.7	28.7	28.7	0.0

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

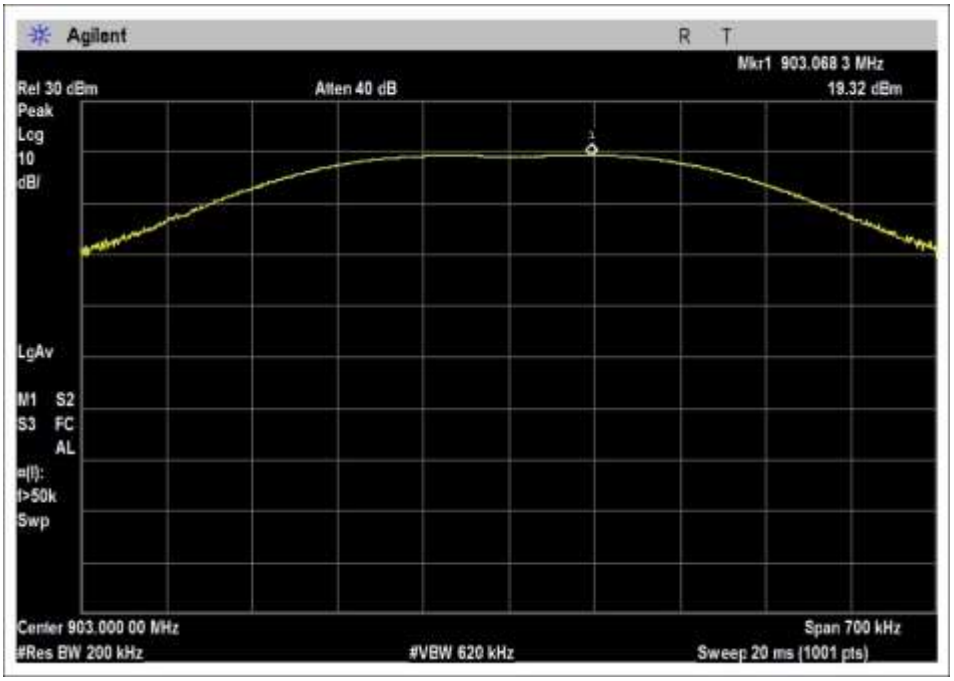
Parameter Definitions:

Measurements performed at input voltage according to manufacturer specification.
The EUT does not operate beyond the listed Vminimum and Vmaximum

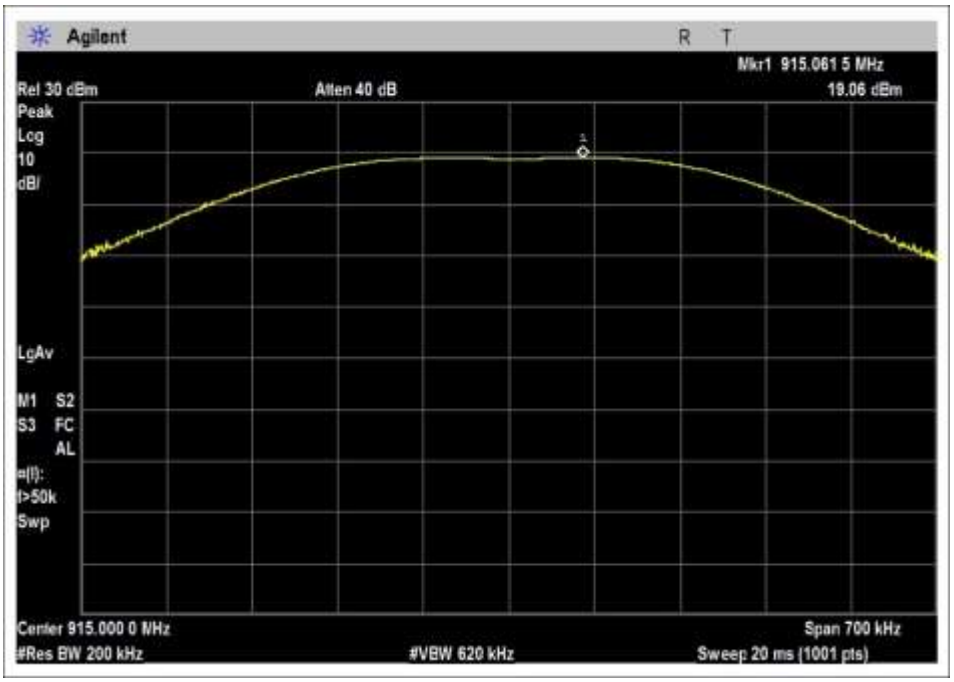
Parameter	Value
$V_{Nominal}$:	115-230VAC, 60Hz
$V_{Minimum}$:	85VAC, 60Hz
$V_{Maximum}$:	264VAC, 60Hz

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, 5.5dBi Max	28.9	≤30	Pass
915	12.5 Kbit/sec FM (2GFSK)	External Monopole, 5.5dBi Max	28.8	≤30	Pass
926.9	12.5 Kbit/sec FM (2GFSK)	External Monopole, 5.5dBi Max	28.6	≤30	Pass
903	37.5 Kbit/sec FM (2GFSK)	External Monopole, 5.5dBi Max	28.9	≤30	Pass
915	37.5 Kbit/sec FM (2GFSK)	External Monopole, 5.5dBi Max	28.7	≤30	Pass
926.9	37.5 Kbit/sec FM (2GFSK)	External Monopole, 5.5dBi Max	28.7	≤30	Pass

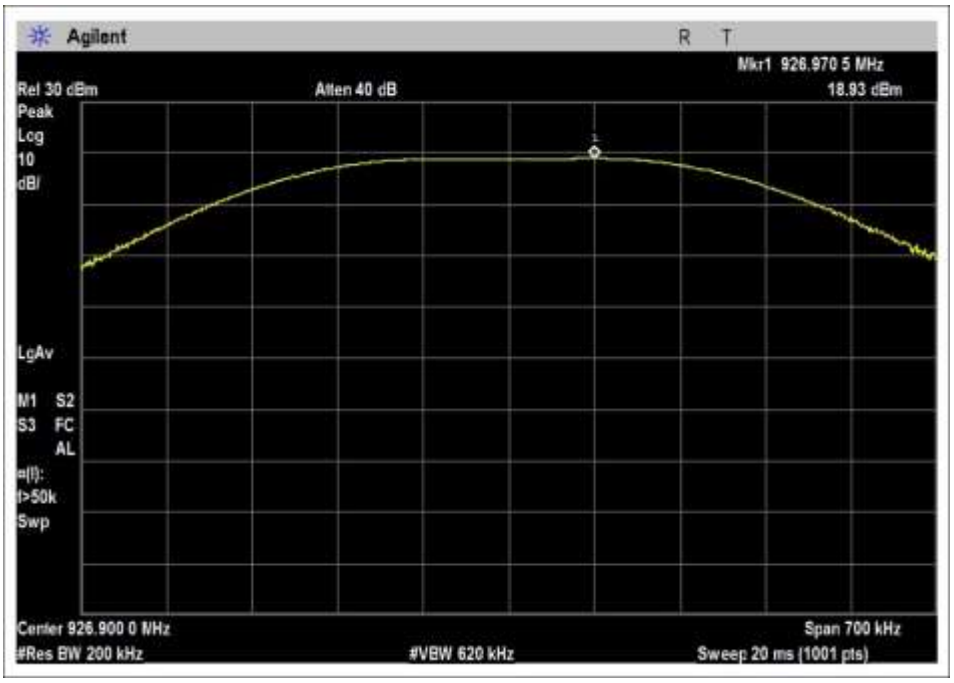
Plots



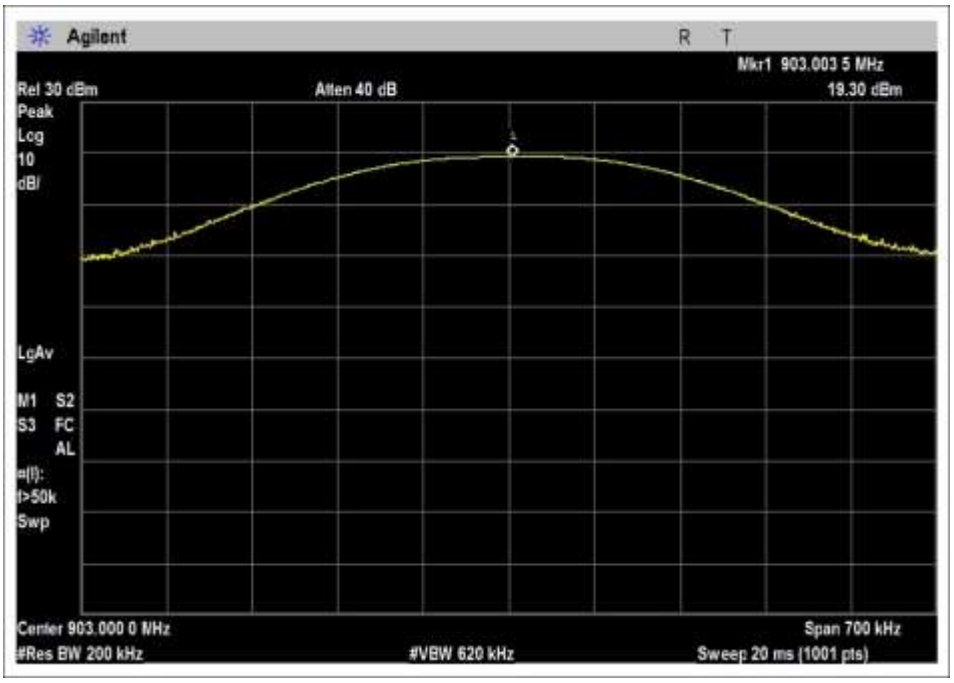
12.5k 903MHz



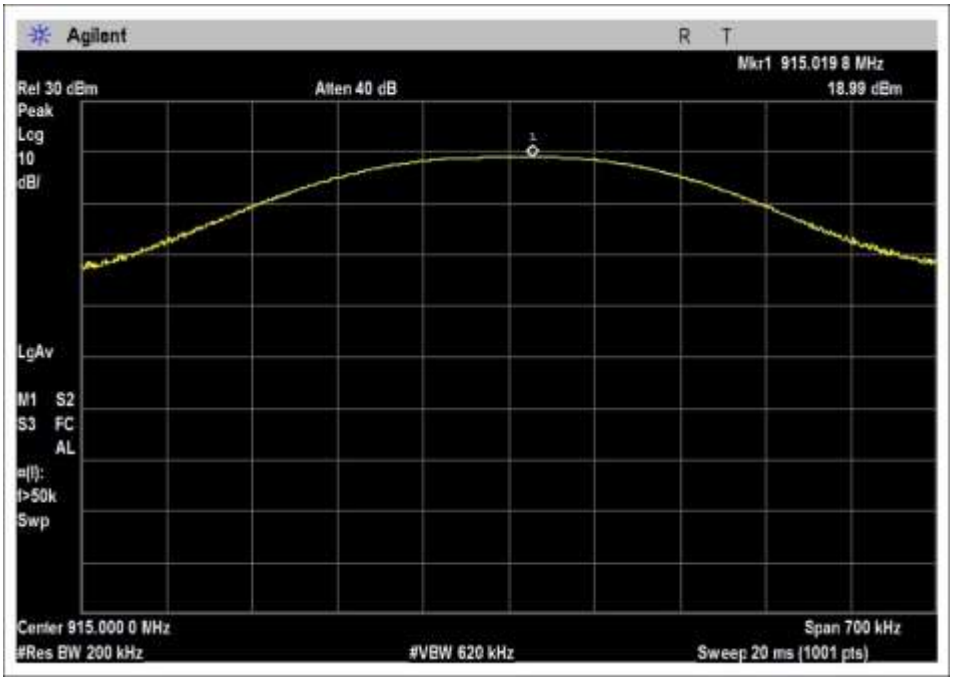
12.5k 915MHz



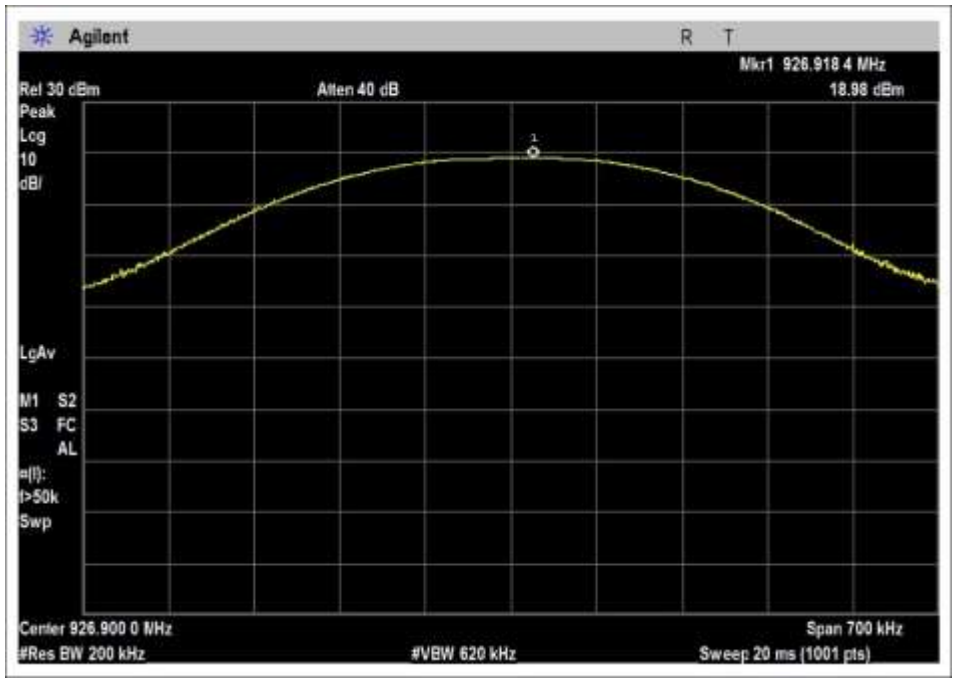
12.5k 926.9MHz



37.5k 903MHz



37.5k 915MHz



37.5k 926.9MHz

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 #:	**100619**	Date:	11/27/2017
Test Type:	**Conducted Emissions**	Time:	12:02:13
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			

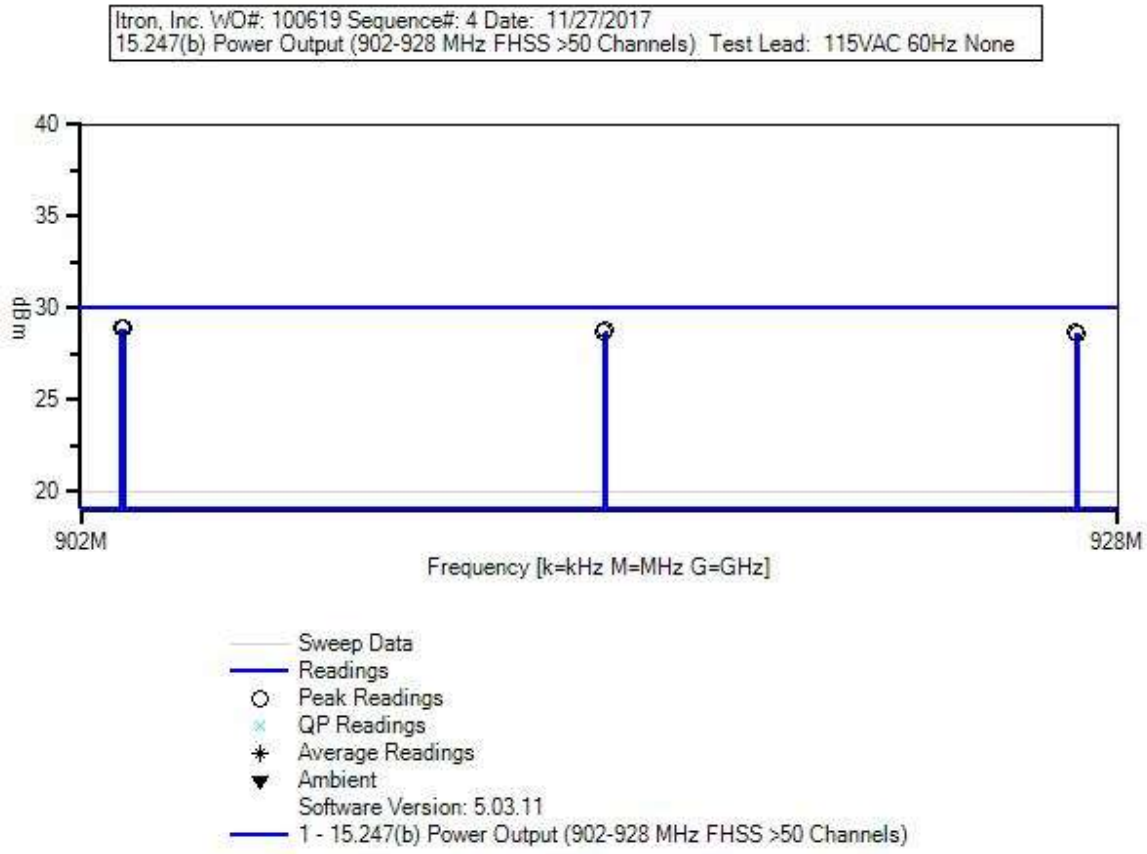
Test Conditions / Notes:

Frequency Range: 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 5.5 dBi

Duty Cycle: Tested at 100%

Setup: 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. Also investigated voltage variations based on manufacturer specified Vmin and Vmax.


Itron, Inc. WO#: 100619 Sequence#: 4 Date: 11/27/2017
15.247(b) Power Output (902-928 MHz FHSS >50 Channels) Test Lead: 115VAC 60Hz None
40
35
30
25
20
dBm
902M
928M
Frequency [k=kHz M=MHz G=GHz]
Sweep Data
Readings
Peak Readings
QP Readings
Average Readings
Ambient
Software Version: 5.03.11
1 - 15.247(b) Power Output (902-928 MHz FHSS >50 Channels)

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02871	Spectrum Analyzer	E4440A	2/24/2017	2/24/2019
T2	ANP06219	Attenuator	768-10	4/12/2016	4/12/2018
T3	ANP06011	Cable	Heliax	10/25/2017	10/25/2019

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

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	dB	Dist Table	Corr dBm	Spec dBm	Margin dB	Polar Ant
1	903.004M	19.3	+0.0	+9.1	+0.5		+0.0	28.9	30.0 FM 37.5K	-1.1	None
2	903.068M	19.3	+0.0	+9.1	+0.5		+0.0	28.9	30.0 FM 12.5K	-1.1	None
3	915.062M	19.1	+0.0	+9.2	+0.5		+0.0	28.8	30.0 FM 12.5K	-1.2	None
4	915.020M	19.0	+0.0	+9.2	+0.5		+0.0	28.7	30.0 FM 37.5K	-1.3	None
5	926.918M	19.0	+0.0	+9.2	+0.5		+0.0	28.7	30.0 FM 37.5K	-1.3	None
6	926.971M	18.9	+0.0	+9.2	+0.5		+0.0	28.6	30.0 FM 12.5K	-1.4	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 A, Customer Provided Information for manufacturer provided data.

Test Setup Photo(s)

15.247(d) RF Conducted Emissions & Band Edge

Test Setup/Conditions			
Test Location:	Bothell Lab Bench	Test Engineer:	M. Atkinson
Test Method:	ANSI C63.10 (2013)	Test Date(s):	11/27/17
Configuration:	1		

Environmental Conditions			
Temperature (ºC)	22	Relative Humidity (%):	36

See data sheets for test setup and test equipment.

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 #: **100619** Date: 11/27/2017
Test Type: **Conducted Emissions** Time: 13:54:50
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:

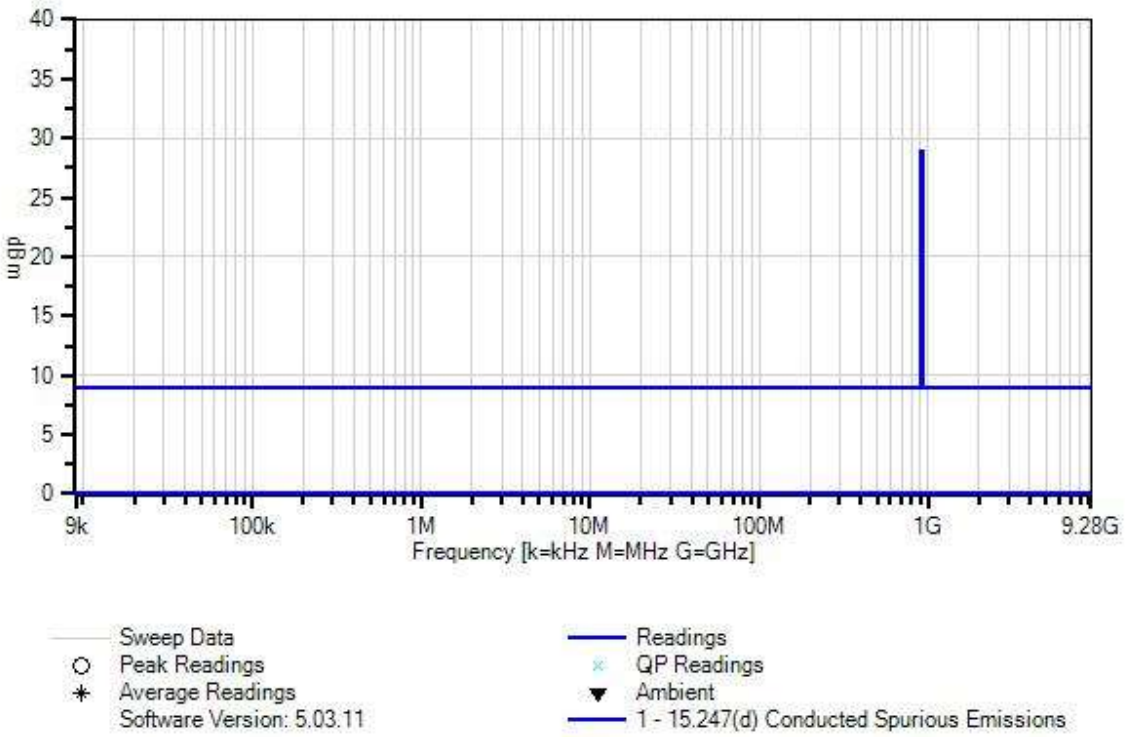
Frequency Range:9kHz-9.28GHz
Frequency tested: 903, 915, 926.9MHz
Firmware power setting: Max
Firmware: ARM 1.0.0.0 DSP 1.0.0.0, FPGA 4.1, Test Software: SrTest100 v4.1.1.25
Modulation: 12.5 Kbit/sec FM (2GFSK), 37.5 Kbit/sec FM (2GFSK)

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

Duty Cycle: Tested at 100%

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. In addition to the Low/Mid/High investigation, spurious emissions also investigated with EUT channel Hopping with modulation. All modulation types investigated, worst case reported.

Itron, Inc. WO#: 100619 Sequence#: 3 Date: 11/27/2017
15.247(d) Conducted Spurious Emissions Test Lead: 115VAC 60Hz RF Output



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02871	Spectrum Analyzer	E4440A	2/24/2017	2/24/2019
T1	ANP06219	Attenuator	768-10	4/12/2016	4/12/2018
T2	ANP06011	Cable	Heliax	10/25/2017	10/25/2019

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

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	dB	dB	Dist Table	Corr dBm	Spec dBm	Margin dB	Polar Ant
1	7166.440M	-48.1	+9.8	+1.9			+0.0	-36.4	8.9	-45.3	RF Ou
2	3106.180M	-50.7	+9.3	+1.1			+0.0	-40.3	8.9	-49.2	RF Ou
3	204.670M	-53.9	+9.1	+0.2			+0.0	-44.6	8.9	-53.5	RF Ou

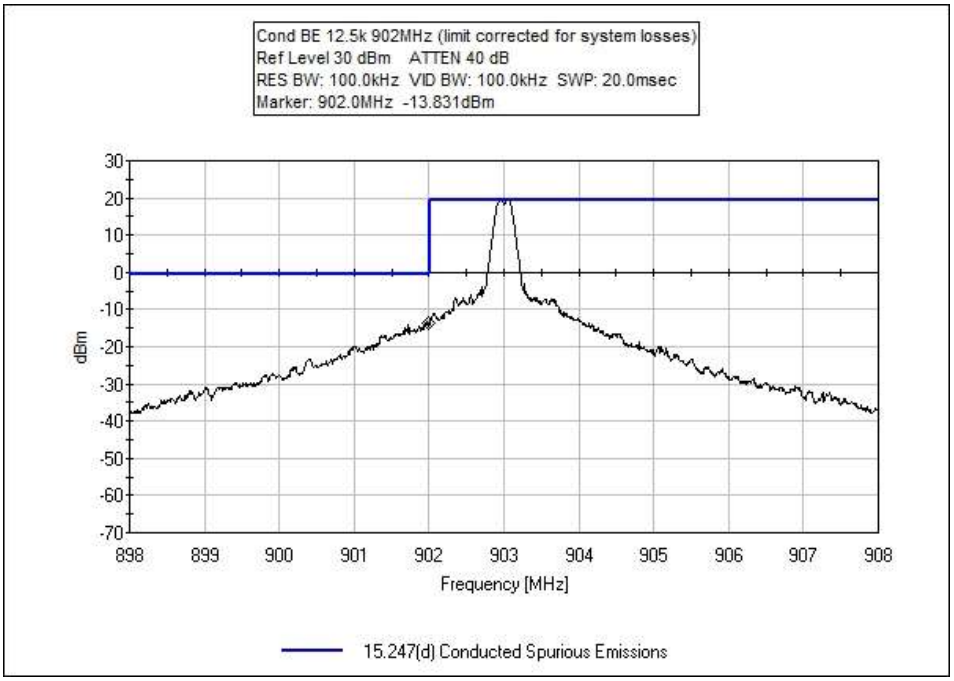
Band Edge

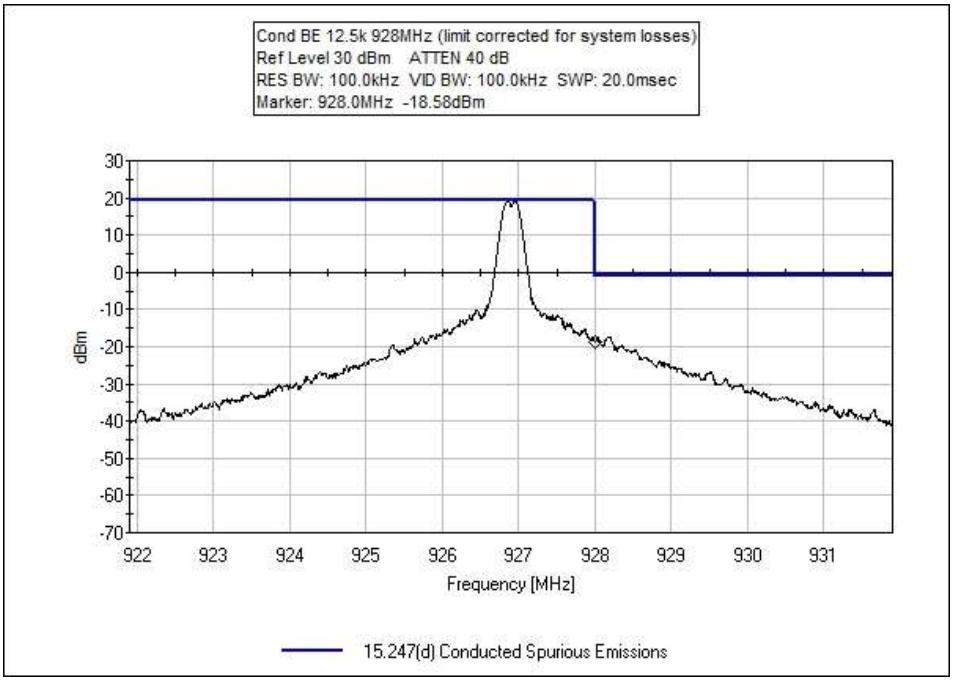
Band Edge Summary

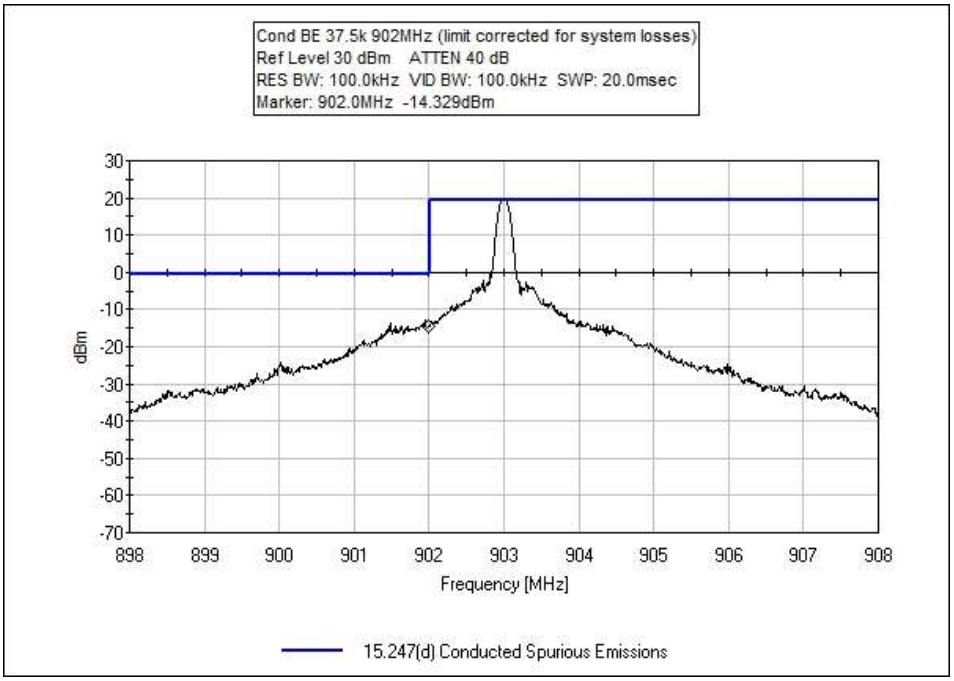
Limit applied: Max Power/100kHz - 20dB.

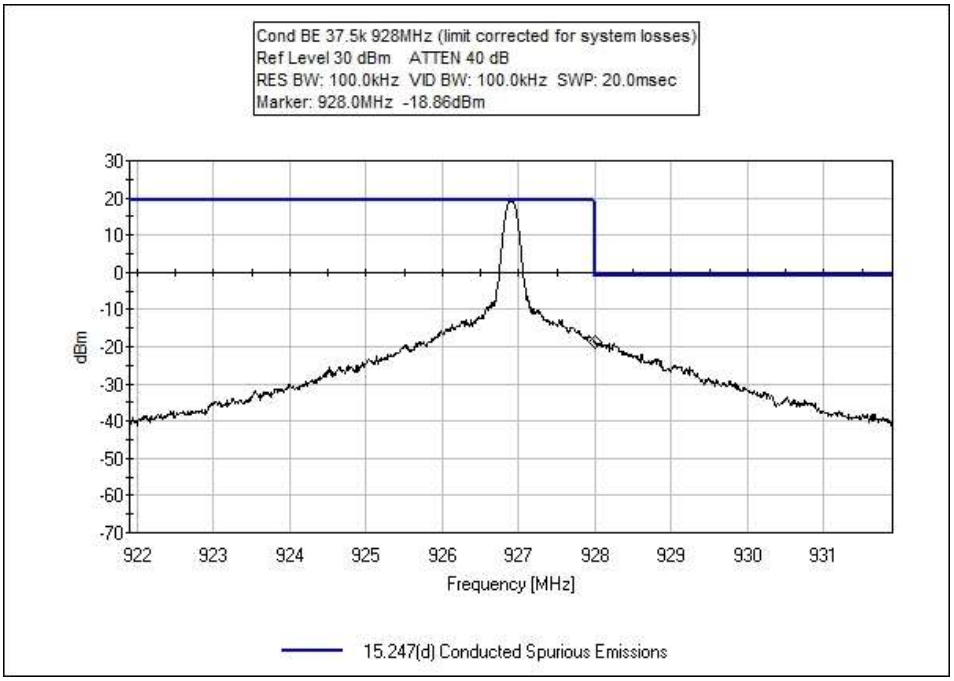
Frequency (MHz)	Modulation	Measured (dBm)	Limit (dBm)	Results
902	12.5 Kbit/sec FM (2GFSK)	-4.2	< 8.9	Pass
928	12.5 Kbit/sec FM (2GFSK)	-8.9	< 8.9	Pass
902	37.5 Kbit/sec FM (2GFSK)	-4.7	< 8.9	Pass
928	37.5 Kbit/sec FM (2GFSK)	-9.2	< 8.9	Pass
902	Hopping with modulation (12.5 Kbit/sec Modulations worst case)	-5.1	< 8.9	Pass
928	Hopping with modulation (12.5 Kbit/sec Modulations worst case)	-12.0	< 8.9	Pass

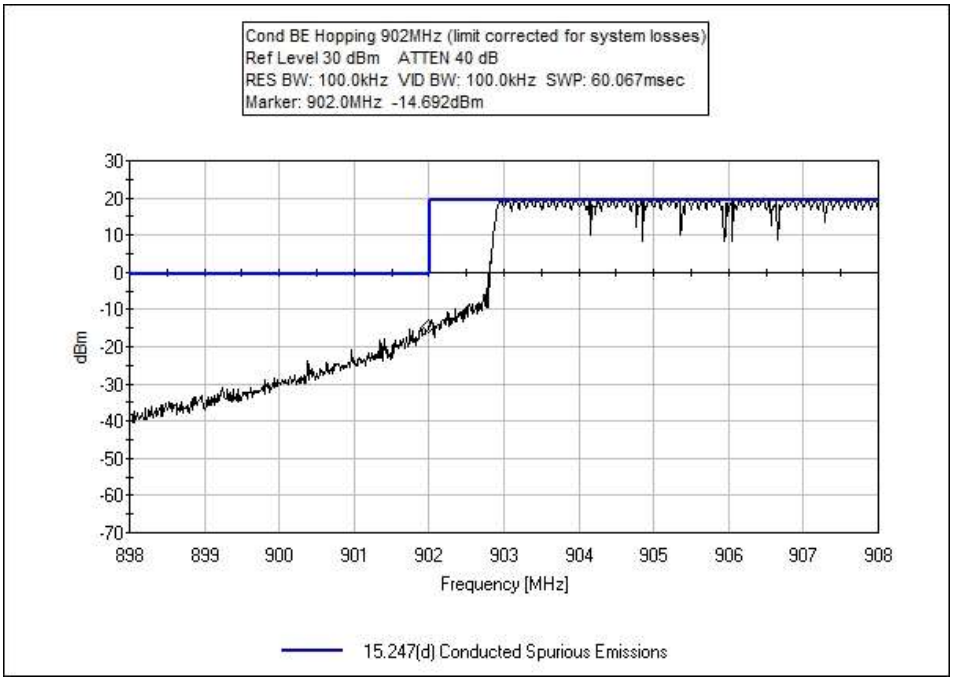
Band Edge Plots

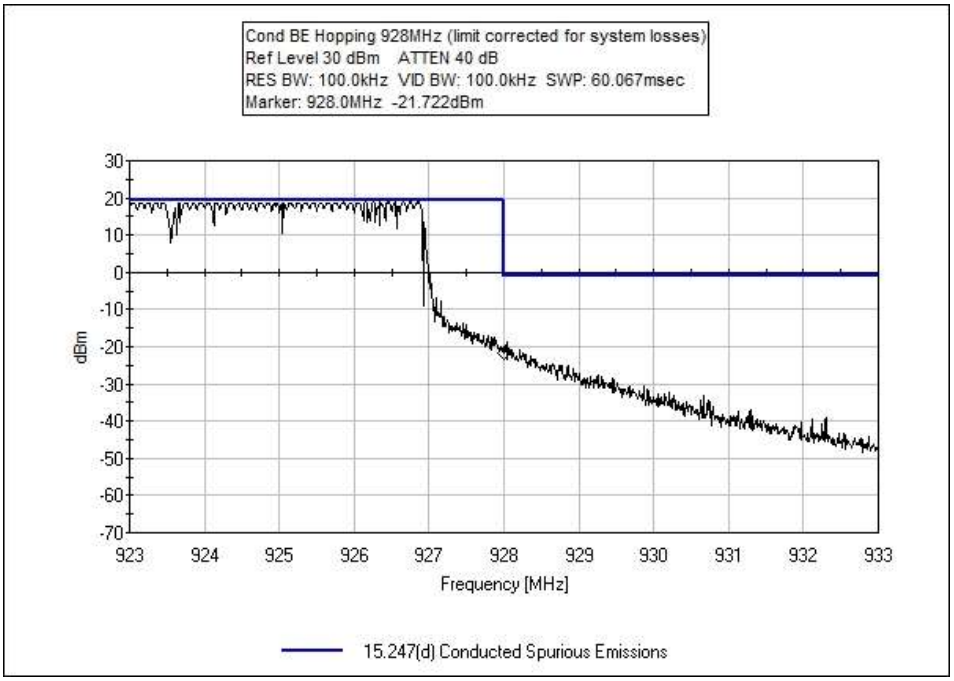





Cond BE 37.5k 902MHz (limit corrected for system losses)
Ref Level 30 dBm ATTEN 40 dB
RES BW: 100.0kHz VID BW: 100.0kHz SWP: 20.0msec
Marker: 902.0MHz -14.329dBm
dBm
Frequency [MHz]
15.247(d) Conducted Spurious Emissions


Cond BE 37.5k 928MHz (limit corrected for system losses)
Ref Level 30 dBm ATTEN 40 dB
RES BW: 100.0kHz VID BW: 100.0kHz SWP: 20.0msec
Marker: 928.0MHz -18.86dBm
dBm
Frequency [MHz]
15.247(d) Conducted Spurious Emissions


Cond BE Hopping 902MHz (limit corrected for system losses)
Ref Level 30 dBm ATTEN 40 dB
RES BW: 100.0kHz VID BW: 100.0kHz SWP: 60.067msec
Marker: 902.0MHz -14.692dBm
dBm
Frequency [MHz]
15.247(d) Conducted Spurious Emissions


Cond BE Hopping 928MHz (limit corrected for system losses)
Ref Level 30 dBm ATTEN 40 dB
RES BW: 100.0kHz VID BW: 100.0kHz SWP: 60.067msec
Marker: 928.0MHz -21.722dBm
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 #:	**100619**	Date:	11/27/2017
Test Type:	**Conducted Emissions**	Time:	13:43:46
Tested By:	Michael Atkinson	Sequence#:	2
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 5.5 dBi

Duty Cycle: Tested at 100%

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. In addition to the Low/Mid/High investigation, spurious emissions also investigated with EUT channel Hopping with modulation. All modulation types investigated, worst case reported.

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02871	Spectrum Analyzer	E4440A	2/24/2017	2/24/2019
T2	ANP06219	Attenuator	768-10	4/12/2016	4/12/2018
T3	ANP06011	Cable	Heliax	10/25/2017	10/25/2019

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

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	dB	Dist Table	Corr dBm	Spec dBm	Margin dB	Polar Ant
1	902.000M	-13.8	+0.0	+9.1	+0.5		+0.0	-4.2	8.9 12.5k	-13.1	RF Ou
2	902.000M	-14.3	+0.0	+9.1	+0.5		+0.0	-4.7	8.9 37.5k	-13.6	RF Ou
3	902.000M	-14.7	+0.0	+9.1	+0.5		+0.0	-5.1	8.9 Hopping	-14.0	RF Ou
4	928.000M	-18.6	+0.0	+9.2	+0.5		+0.0	-8.9	8.9 12.5k	-17.8	RF Ou
5	928.000M	-18.9	+0.0	+9.2	+0.5		+0.0	-9.2	8.9 37.5k	-18.1	RF Ou
6	928.000M	-21.7	+0.0	+9.2	+0.5		+0.0	-12.0	8.9 Hopping	-20.9	RF Ou

Test Setup Photo(s)

15.247(d) Radiated Emissions & Band Edge

Test Setup/Conditions			
Test Location:	Bothell Lab C3	Test Engineer:	M. Atkinson
Test Method:	ANSI C63.10 (2013)	Test Date(s):	11/27/17 to 11/29/17
Configuration:	1		

Environmental Conditions			
Temperature (ºC)	21-23	Relative Humidity (%):	34-38

See data sheets for test setup and test equipment.

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 #: **100619** Date: 11/28/2017
Test Type: **Maximized Emissions** Time: 13:34:53
Tested By: Michael Atkinson Sequence#: 8
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)

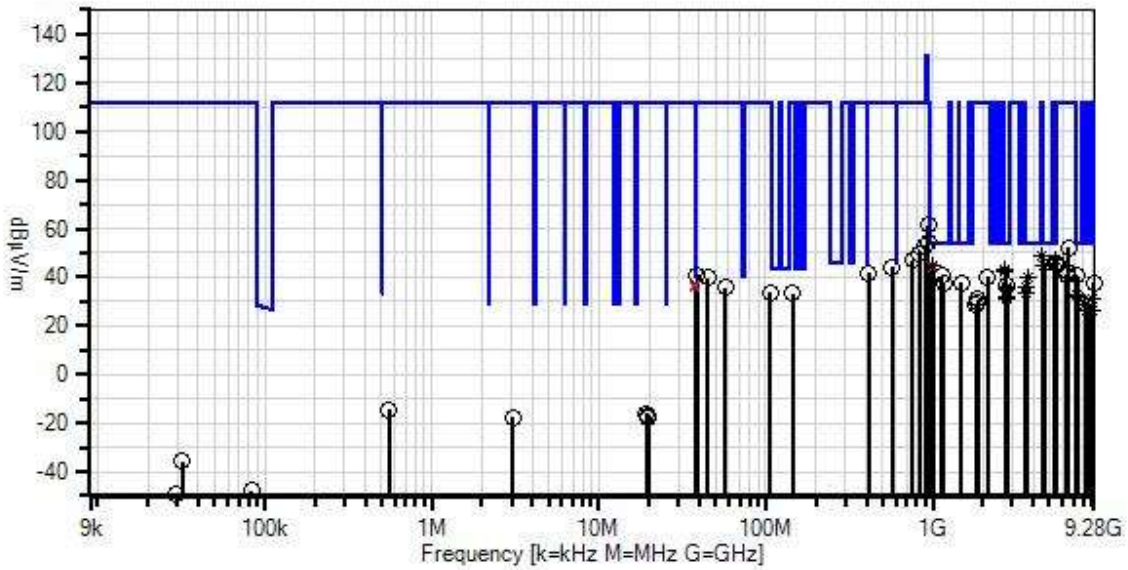
Antenna type: External Monopole
Antenna Gain: 5.15 dBi or 5.5 dBi

Duty Cycle: Tested at 100%

Setup: The EUT ISM port is continuously transmitting with modulation. The EUT ISM port has an external antenna installed, both 5.15 and 5.5 dBi antennas investigated, only worst case reported.
Low, Mid, and High channels investigated. In addition to Low/Mid/High channel investigation, spurious emissions also investigated with EUT channel 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#: 100619 Sequence#: 8 Date: 11/28/2017
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
	AN02871	Spectrum Analyzer	E4440A	2/24/2017	2/24/2019
T1	ANP06540	Cable	Heliax	10/30/2017	10/30/2019
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	ANP06934	Cable	32026-29801-29801-18	3/11/2016	3/11/2018
T6	AN03170	High Pass Filter	HM1155-11SS	11/27/2017	11/27/2019
T7	ANDCCF	Test Data Adjustment		5/13/2016	5/13/2018
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

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	37.547M	18.4	+0.1	+0.0	+0.0	+0.0	+0.0	37.0	40.0	-3.0	Vert
	QP		+0.0	+0.0	+0.0	+0.5					
			+0.3	+5.9	+11.8	+0.0					
2	37.619M	17.5	+0.1	+0.0	+0.0	+0.0	+0.0	36.0	40.0	-4.0	Vert
	QP		+0.0	+0.0	+0.0	+0.5					
			+0.3	+5.9	+11.7	+0.0					
^	37.547M	20.9	+0.1	+0.0	+0.0	+0.0	+0.0	39.5	40.0	-0.5	Vert
			+0.0	+0.0	+0.0	+0.5					
			+0.3	+5.9	+11.8	+0.0					
^	37.619M	20.5	+0.1	+0.0	+0.0	+0.0	+0.0	39.0	40.0	-1.0	Vert
			+0.0	+0.0	+0.0	+0.5					
			+0.3	+5.9	+11.7	+0.0					
5	4515.027M	56.8	+0.5	+3.8	-33.1	+31.9	+0.0	48.8	54.0	-5.2	Horiz
	Ave		+0.5	+0.8	-12.4	+0.0			Low		
			+0.0	+0.0	+0.0	+0.0					
^	4515.027M	58.8	+0.5	+3.8	-33.1	+31.9	+0.0	50.8	54.0	-3.2	Horiz
			+0.5	+0.8	-12.4	+0.0			Low		
			+0.0	+0.0	+0.0	+0.0					

7	5417.965M	52.4	+0.6	+4.3	-33.1	+33.9	+0.0	47.2	54.0	-6.8	Horiz
	Ave		+0.5	+1.0	-12.4	+0.0			Low		
			+0.0	+0.0	+0.0	+0.0					
^	5417.965M	54.1	+0.6	+4.3	-33.1	+33.9	+0.0	48.9	54.0	-5.1	Horiz
			+0.5	+1.0	-12.4	+0.0			Low		
			+0.0	+0.0	+0.0	+0.0					
9	4634.480M	53.0	+0.5	+3.9	-33.2	+32.1	+0.0	45.2	54.0	-8.8	Horiz
	Ave		+0.5	+0.8	-12.4	+0.0			High		
			+0.0	+0.0	+0.0	+0.0					
^	4634.480M	55.8	+0.5	+3.9	-33.2	+32.1	+0.0	48.0	54.0	-6.0	Horiz
			+0.5	+0.8	-12.4	+0.0			High		
			+0.0	+0.0	+0.0	+0.0					
11	1007.000M	33.5	+0.4	+1.7	-36.8	+23.8	+0.0	45.1	54.0	-8.9	Horiz
	Ave		+0.3	+22.2	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
12	4574.900M	52.8	+0.5	+3.8	-33.1	+32.0	+0.0	44.9	54.0	-9.1	Horiz
	Ave		+0.5	+0.8	-12.4	+0.0			Mid		
			+0.0	+0.0	+0.0	+0.0					
^	4574.900M	56.1	+0.5	+3.8	-33.1	+32.0	+0.0	48.2	54.0	-5.8	Horiz
			+0.5	+0.8	-12.4	+0.0			Mid		
			+0.0	+0.0	+0.0	+0.0					
14	995.440M	8.8	+0.4	+0.0	+0.0	+0.0	+0.0	44.3	54.0	-9.7	Vert
	QP		+0.0	+0.0	+0.0	+2.5					
			+2.3	+5.9	+24.4	+0.0					
^	995.440M	12.4	+0.4	+0.0	+0.0	+0.0	+0.0	47.9	54.0	-6.1	Vert
			+0.0	+0.0	+0.0	+2.5					
			+2.3	+5.9	+24.4	+0.0					
16	2708.999M	56.6	+0.5	+2.8	-33.8	+28.7	+0.0	43.4	54.0	-10.6	Vert
	Ave		+0.4	+0.6	-12.4	+0.0			Low		
			+0.0	+0.0	+0.0	+0.0					
^	2708.999M	57.4	+0.5	+2.8	-33.8	+28.7	+0.0	44.2	54.0	-9.8	Vert
			+0.4	+0.6	-12.4	+0.0			Low		
			+0.0	+0.0	+0.0	+0.0					
18	2709.027M	55.3	+0.5	+2.8	-33.8	+28.7	+0.0	42.1	54.0	-11.9	Horiz
	Ave		+0.4	+0.6	-12.4	+0.0			Low		
			+0.0	+0.0	+0.0	+0.0					
^	2709.010M	57.3	+0.5	+2.8	-33.8	+28.7	+0.0	44.1	54.0	-9.9	Horiz
			+0.4	+0.6	-12.4	+0.0			Low		
			+0.0	+0.0	+0.0	+0.0					
20	7320.120M	43.2	+0.9	+5.3	-34.1	+36.5	+0.0	40.5	54.0	-13.5	Horiz
			+0.6	+0.5	-12.4	+0.0			Mid		
			+0.0	+0.0	+0.0	+0.0					
21	1128.000M	47.9	+0.4	+1.8	-36.2	+24.3	+0.0	40.4	54.0	-13.6	Horiz
			+0.3	+1.9	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					

22	3707.600M	49.4	+0.4	+3.4	-33.4	+30.9	+0.0	39.7	54.0	-14.3	Horiz
	Ave		+0.5	+0.9	-12.4	+0.0			High		
			+0.0	+0.0	+0.0	+0.0					
^	3707.600M	49.2	+0.4	+3.4	-33.4	+30.9	+0.0	39.5	54.0	-14.5	Horiz
			+0.5	+0.9	-12.4	+0.0			High		
			+0.0	+0.0	+0.0	+0.0					
24	1482.000M	43.6	+0.4	+2.0	-35.0	+25.5	+0.0	37.6	54.0	-16.4	Horiz
			+0.3	+0.8	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
25	1168.000M	45.1	+0.4	+1.8	-36.0	+24.5	+0.0	37.4	54.0	-16.6	Horiz
			+0.3	+1.3	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
26	2745.060M	50.2	+0.5	+2.8	-33.8	+28.8	+0.0	37.1	54.0	-16.9	Vert
			+0.4	+0.6	-12.4	+0.0			Mid		
			+0.0	+0.0	+0.0	+0.0					
27	3660.000M	46.1	+0.4	+3.4	-33.4	+30.8	+0.0	36.3	54.0	-17.7	Horiz
	Ave		+0.5	+0.9	-12.4	+0.0			Mid		
			+0.0	+0.0	+0.0	+0.0					
^	3659.920M	48.0	+0.4	+3.4	-33.4	+30.8	+0.0	38.2	54.0	-15.8	Horiz
			+0.5	+0.9	-12.4	+0.0			Mid		
			+0.0	+0.0	+0.0	+0.0					
29	2745.040M	48.8	+0.5	+2.8	-33.8	+28.8	+0.0	35.7	54.0	-18.3	Horiz
	Ave		+0.4	+0.6	-12.4	+0.0			Mid		
			+0.0	+0.0	+0.0	+0.0					
^	2745.040M	51.9	+0.5	+2.8	-33.8	+28.8	+0.0	38.8	54.0	-15.2	Horiz
			+0.4	+0.6	-12.4	+0.0			Mid		
			+0.0	+0.0	+0.0	+0.0					
31	2744.953M	48.0	+0.5	+2.8	-33.8	+28.8	+0.0	34.9	54.0	-19.1	Vert
	Ave		+0.4	+0.6	-12.4	+0.0			Mid		
			+0.0	+0.0	+0.0	+0.0					
32	3612.000M	43.7	+0.4	+3.3	-33.5	+30.7	+0.0	33.4	54.0	-20.6	Horiz
	Ave		+0.4	+0.8	-12.4	+0.0			Low		
			+0.0	+0.0	+0.0	+0.0					
^	3612.000M	46.8	+0.4	+3.3	-33.5	+30.7	+0.0	36.5	54.0	-17.5	Horiz
			+0.4	+0.8	-12.4	+0.0			Low		
			+0.0	+0.0	+0.0	+0.0					
34	7320.000M	35.3	+0.9	+5.3	-34.1	+36.5	+0.0	32.6	54.0	-21.4	Horiz
	Ave		+0.6	+0.5	-12.4	+0.0			Mid		
			+0.0	+0.0	+0.0	+0.0					
35	2780.700M	45.2	+0.5	+2.8	-33.8	+28.9	+0.0	32.2	54.0	-21.8	Vert
	Ave		+0.4	+0.6	-12.4	+0.0			High		
			+0.0	+0.0	+0.0	+0.0					
^	2780.740M	47.3	+0.5	+2.8	-33.8	+28.9	+0.0	34.3	54.0	-19.7	Vert
			+0.4	+0.6	-12.4	+0.0			High		
			+0.0	+0.0	+0.0	+0.0					
37	7415.200M	34.5	+1.1	+5.4	-34.4	+36.8	+0.0	32.1	54.0	-21.9	Horiz
	Ave		+0.6	+0.5	-12.4	+0.0			High		
			+0.0	+0.0	+0.0	+0.0					
^	7415.200M	40.4	+1.1	+5.4	-34.4	+36.8	+0.0	38.0	54.0	-16.0	Horiz
			+0.6	+0.5	-12.4	+0.0			High		
			+0.0	+0.0	+0.0	+0.0					

39	2780.740M	44.3	+0.5	+2.8	-33.8	+28.9	+0.0	31.3	54.0	-22.7	Horiz
	Ave		+0.4	+0.6	-12.4	+0.0			High		
			+0.0	+0.0	+0.0	+0.0					
^	2780.740M	47.7	+0.5	+2.8	-33.8	+28.9	+0.0	34.7	54.0	-19.3	Horiz
			+0.4	+0.6	-12.4	+0.0			High		
			+0.0	+0.0	+0.0	+0.0					
41	9149.820M	32.3	+0.8	+5.7	-33.9	+37.2	+0.0	31.0	54.0	-23.0	Horiz
	Ave		+0.7	+0.6	-12.4	+0.0			Mid		
			+0.0	+0.0	+0.0	+0.0					
^	9149.820M	40.9	+0.8	+5.7	-33.9	+37.2	+0.0	39.6	54.0	-14.4	Horiz
			+0.7	+0.6	-12.4	+0.0			Mid		
			+0.0	+0.0	+0.0	+0.0					
43	8127.000M	31.6	+0.7	+5.7	-34.7	+36.8	+0.0	29.0	54.0	-25.0	Horiz
	Ave		+0.7	+0.6	-12.4	+0.0			Low		
			+0.0	+0.0	+0.0	+0.0					
^	8126.960M	41.8	+0.7	+5.7	-34.7	+36.8	+0.0	39.2	54.0	-14.8	Horiz
			+0.7	+0.6	-12.4	+0.0			Low		
			+0.0	+0.0	+0.0	+0.0					
45	8342.260M	28.8	+0.8	+5.8	-34.6	+37.0	+0.0	26.6	54.0	-27.4	Horiz
	Ave		+0.7	+0.5	-12.4	+0.0			High		
			+0.0	+0.0	+0.0	+0.0					
^	8342.260M	38.6	+0.8	+5.8	-34.6	+37.0	+0.0	36.4	54.0	-17.6	Horiz
			+0.7	+0.5	-12.4	+0.0			High		
			+0.0	+0.0	+0.0	+0.0					
47	8235.240M	29.1	+0.7	+5.8	-34.8	+36.9	+0.0	26.5	54.0	-27.5	Horiz
	Ave		+0.7	+0.5	-12.4	+0.0			Mid		
			+0.0	+0.0	+0.0	+0.0					
^	8235.240M	40.4	+0.7	+5.8	-34.8	+36.9	+0.0	37.8	54.0	-16.2	Horiz
			+0.7	+0.5	-12.4	+0.0			Mid		
			+0.0	+0.0	+0.0	+0.0					
49	9030.360M	28.1	+0.6	+5.7	-34.0	+37.1	+0.0	26.3	54.0	-27.7	Horiz
	Ave		+0.6	+0.6	-12.4	+0.0			Low		
			+0.0	+0.0	+0.0	+0.0					
^	9030.360M	39.5	+0.6	+5.7	-34.0	+37.1	+0.0	37.7	54.0	-16.3	Horiz
			+0.6	+0.6	-12.4	+0.0			Low		
			+0.0	+0.0	+0.0	+0.0					
51	938.000M	25.8	+0.4	+0.0	+0.0	+0.0	+0.0	61.5	111.5	-50.0	Vert
			+0.0	+0.0	+0.0	+2.4					
			+2.2	+5.9	+24.8	+0.0					
52	938.600M	18.7	+0.4	+0.0	+0.0	+0.0	+0.0	54.4	111.5	-57.1	Horiz
			+0.0	+0.0	+0.0	+2.4					
			+2.2	+5.9	+24.8	+0.0					
53	896.500M	18.9	+0.3	+0.0	+0.0	+0.0	+0.0	53.2	111.5	-58.3	Vert
			+0.0	+0.0	+0.0	+2.4					
			+2.1	+5.9	+23.6	+0.0					
54	6488.080M	55.9	+0.6	+4.9	-33.6	+35.5	+0.0	52.1	111.5	-59.4	Horiz
			+0.6	+0.6	-12.4	+0.0			High		
			+0.0	+0.0	+0.0	+0.0					
55	829.500M	15.6	+0.3	+0.0	+0.0	+0.0	+0.0	49.8	111.5	-61.7	Vert
			+0.0	+0.0	+0.0	+2.3					
			+1.9	+5.9	+23.8	+0.0					

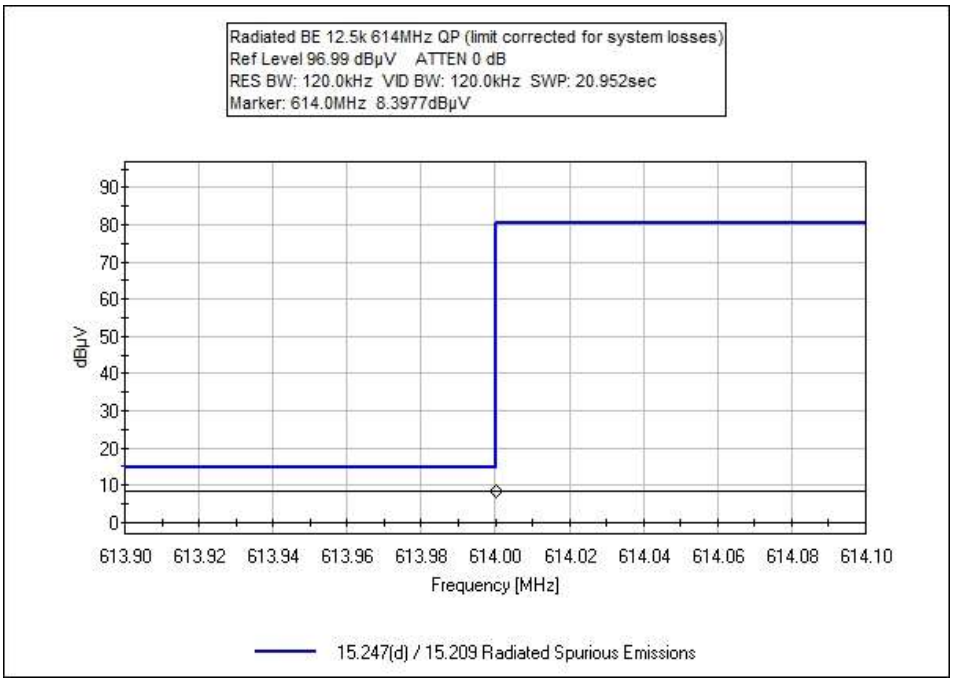
56	756.400M	14.2	+0.3 +0.0 +1.8	+0.0 +0.0 +5.9	+0.0 +0.0 +22.5	+0.0 +2.2 +0.0	+0.0	46.9	111.5	-64.6	Horiz
57	5490.000M	50.9	+0.7 +0.5 +0.0	+4.3 +0.9 +0.0	-33.1 -12.4 +0.0	+34.2 +0.0 +0.0	+0.0	46.0	111.5 Mid	-65.5	Horiz
58	5561.320M	50.5	+0.7 +0.5 +0.0	+4.3 +0.7 +0.0	-33.2 -12.4 +0.0	+34.3 +0.0 +0.0	+0.0	45.4	111.5 High	-66.1	Horiz
59	569.400M	14.4	+0.3 +0.0 +1.6	+0.0 +0.0 +5.9	+0.0 +0.0 +19.8	+0.0 +2.0 +0.0	+0.0	44.0	111.5	-67.5	Horiz
60	6405.040M	46.1	+0.6 +0.6 +0.0	+4.8 +0.5 +0.0	-33.6 -12.4 +0.0	+35.4 +0.0 +0.0	+0.0	42.0	111.5 Mid	-69.5	Horiz
61	414.500M	14.7	+0.2 +0.0 +1.3	+0.0 +0.0 +5.9	+0.0 +0.0 +17.9	+0.0 +1.8 +0.0	+0.0	41.8	111.5	-69.7	Horiz
62	6321.120M	45.2	+0.6 +0.6 +0.0	+4.8 +0.5 +0.0	-33.5 -12.4 +0.0	+35.3 +0.0 +0.0	+0.0	41.1	111.5 Low	-70.4	Horiz
63	38.820M	23.2	+0.1 +0.0 +0.3	+0.0 +0.0 +5.9	+0.0 +0.0 +11.1	+0.0 +0.5 +0.0	+0.0	41.1	111.5	-70.4	Vert
64	7224.040M	43.6	+0.8 +0.6 +0.0	+5.3 +0.6 +0.0	-33.9 -12.4 +0.0	+36.2 +0.0 +0.0	+0.0	40.8	111.5 Low	-70.7	Horiz
65	2128.000M	42.3	+0.4 +0.3 +0.0	+2.5 +0.6 +0.0	-34.2 +0.0 +0.0	+28.2 +0.0 +0.0	+0.0	40.1	111.5	-71.4	Vert
66	44.800M	24.5	+0.1 +0.0 +0.4	+0.0 +0.0 +5.9	+0.0 +0.0 +8.2	+0.0 +0.5 +0.0	+0.0	39.6	111.5	-71.9	Vert
67	9269.040M	38.7	+0.9 +0.7 +0.0	+5.7 +0.6 +0.0	-33.8 -12.4 +0.0	+37.3 +0.0 +0.0	+0.0	37.7	111.5 High	-73.8	Horiz
68	57.000M	22.0	+0.1 +0.0 +0.4	+0.0 +0.0 +5.9	+0.0 +0.0 +6.6	+0.0 +0.6 +0.0	+0.0	35.6	111.5	-75.9	Horiz
69	105.700M	17.6	+0.1 +0.0 +0.6	+0.0 +0.0 +5.9	+0.0 +0.0 +8.2	+0.0 +1.2 +0.0	+0.0	33.6	111.5	-77.9	Vert
70	144.000M	17.1	+0.2 +0.0 +0.7	+0.0 +0.0 +5.9	+0.0 +0.0 +8.2	+0.0 +1.3 +0.0	+0.0	33.4	111.5	-78.1	Vert
71	1853.840M	47.5	+0.4 +0.3 +0.0	+2.3 +0.7 +0.0	-34.5 -12.4 +0.0	+26.8 +0.0 +0.0	+0.0	31.1	111.5 High	-80.4	Horiz
72	1830.040M	46.0	+0.4 +0.3 +0.0	+2.3 +0.7 +0.0	-34.5 -12.4 +0.0	+26.6 +0.0 +0.0	+0.0	29.4	111.5 Mid	-82.1	Horiz

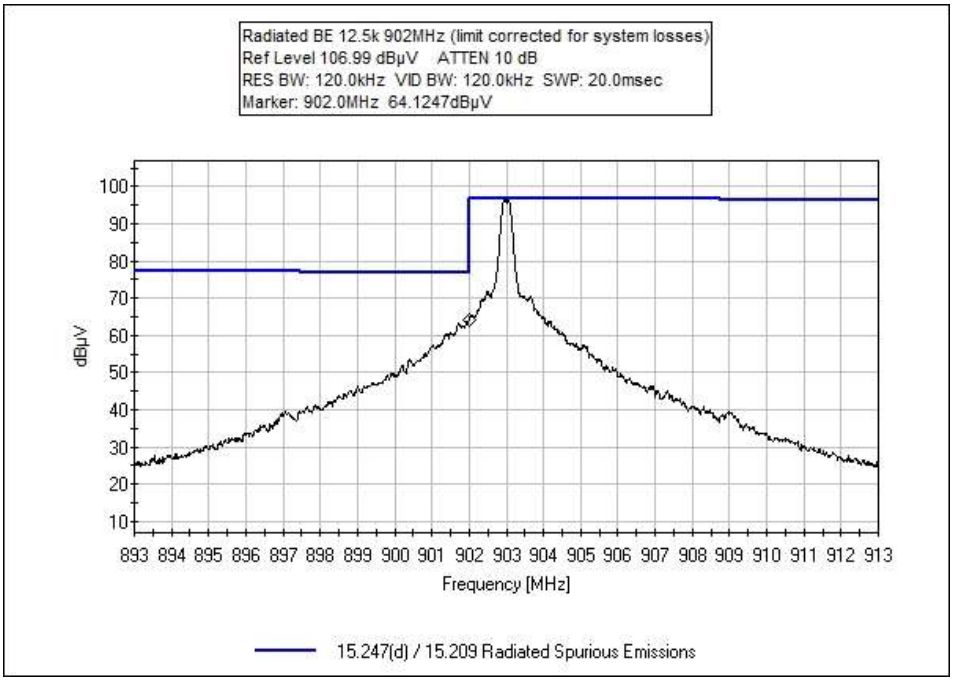
73	1806.130M	45.7	+0.5	+2.2	-34.5	+26.4	+0.0	28.9	111.5	-82.6	Horiz
			+0.3	+0.7	-12.4	+0.0			Low		
			+0.0	+0.0	+0.0	+0.0					
74	552.070k	15.8	+0.0	+0.0	+0.0	+0.0	-40.0	-14.4	111.5	-125.9	Perp
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+9.8					
75	19.328M	15.6	+0.0	+0.0	+0.0	+0.0	-40.0	-16.1	111.5	-127.6	Perp
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+8.3					
76	19.821M	14.9	+0.0	+0.0	+0.0	+0.0	-40.0	-16.8	111.5	-128.3	Perp
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+8.3					
77	19.803M	14.2	+0.0	+0.0	+0.0	+0.0	-40.0	-17.5	111.5	-129.0	Para
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+8.3					
78	3.068M	12.9	+0.0	+0.0	+0.0	+0.0	-40.0	-17.6	111.5	-129.1	Para
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+9.5					
79	19.792M	13.8	+0.0	+0.0	+0.0	+0.0	-40.0	-17.9	111.5	-129.4	Perp
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+8.3					
80	32.196k	32.2	+0.0	+0.0	+0.0	+0.0	-80.0	-35.8	111.5	-147.3	Para
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+12.0					
81	83.513k	22.0	+0.0	+0.0	+0.0	+0.0	-80.0	-47.9	111.5	-159.4	Perp
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+10.1					
82	29.113k	18.9	+0.0	+0.0	+0.0	+0.0	-80.0	-48.8	111.5	-160.3	Para
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+12.3					

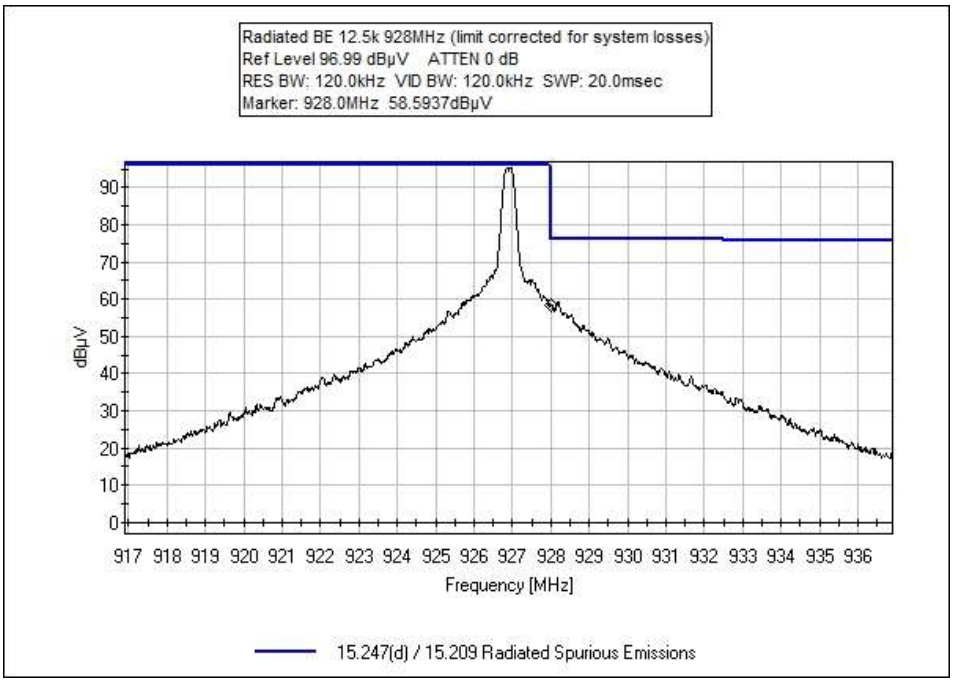
Band Edge

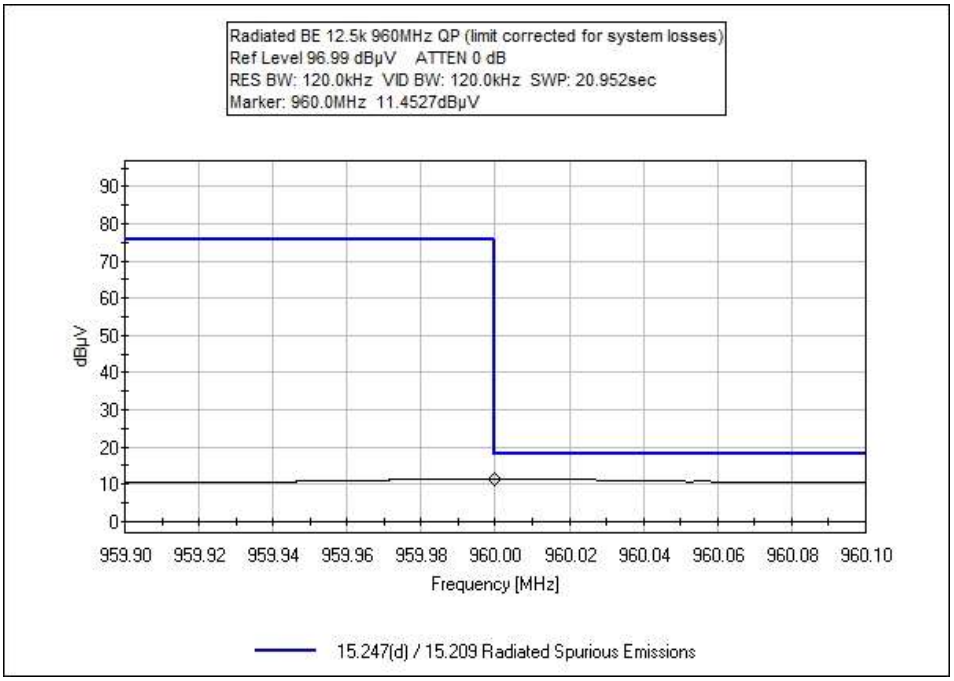
Band Edge Summary					
Frequency (MHz)	**Modulation**	**Ant. Type**	**Field Strength (dBuV/m @3m)**	**Limit (dBuV/m @3m)**	**Results**
614 (QP)	12.5 Kbit/sec FM (2GFSK)	External Monopole, 5.15dBi Max	39.5	< 46.0	Pass
902	12.5 Kbit/sec FM (2GFSK)	External Monopole, 5.15dBi Max	98.6	< 111.5	Pass
928	12.5 Kbit/sec FM (2GFSK)	External Monopole, 5.15dBi Max	94.0	< 111.5	Pass
960 (QP)	12.5 Kbit/sec FM (2GFSK)	External Monopole, 5.15dBi Max	47.4	< 54.0	Pass
614 (QP)	37.5 Kbit/sec FM (2GFSK)	External Monopole, 5.15dBi Max	39.5	< 46.0	Pass
902	37.5 Kbit/sec FM (2GFSK)	External Monopole, 5.15dBi Max	97.5	< 111.5	Pass
928	37.5 Kbit/sec FM (2GFSK)	External Monopole, 5.15dBi Max	93.8	< 111.5	Pass
960 (QP)	37.5 Kbit/sec FM (2GFSK)	External Monopole, 5.15dBi Max	47.0	< 54.0	Pass
614 (QP)	Hopping with modulation (12.5 Kbit/sec Modulations worst case)	External Monopole, 5.15dBi Max	39.4	< 46.0	Pass
902	Hopping with modulation (12.5 Kbit/sec Modulations worst case)	External Monopole, 5.15dBi Max	97.8	< 111.5	Pass
928	Hopping with modulation (12.5 Kbit/sec Modulations worst case)	External Monopole, 5.15dBi Max	93.0	< 111.5	Pass
960 (QP)	Hopping with modulation (12.5 Kbit/sec Modulations worst case)	External Monopole, 5.15dBi Max	46.4	< 54.0	Pass

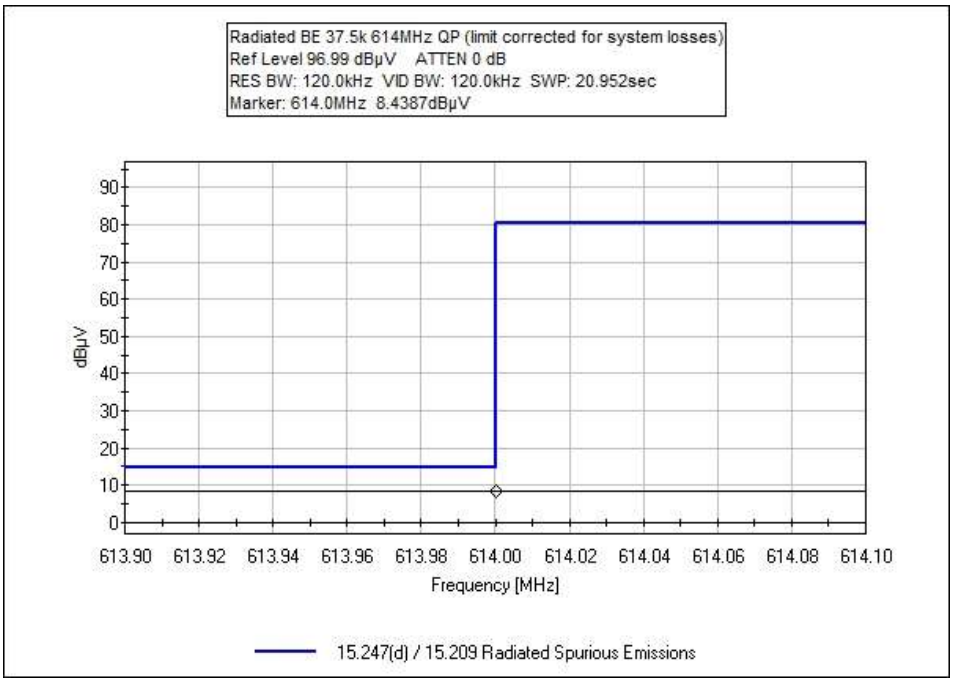
Band Edge Plots

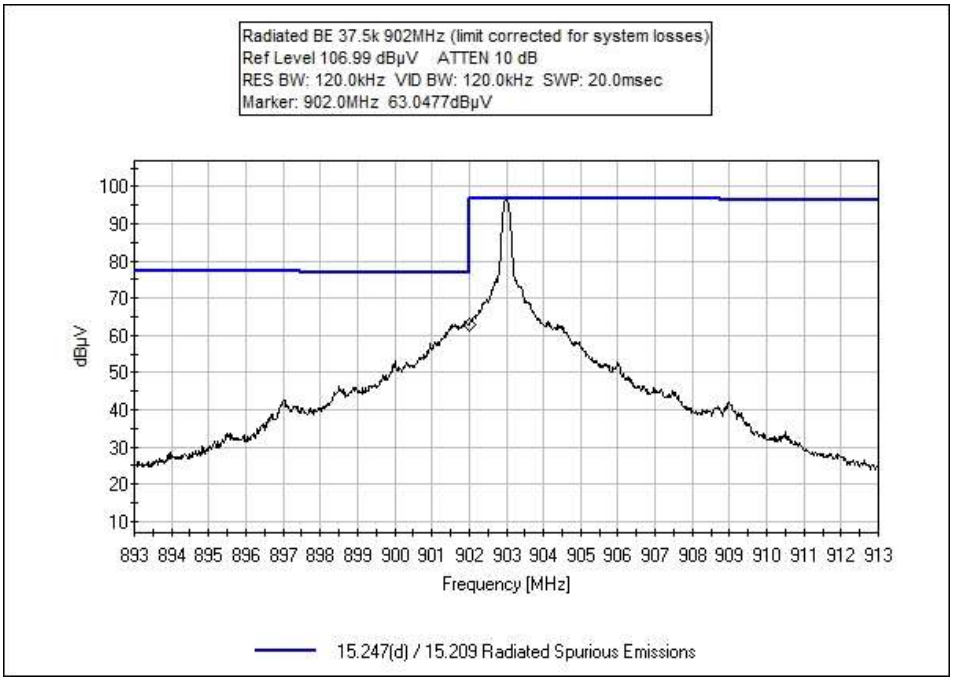


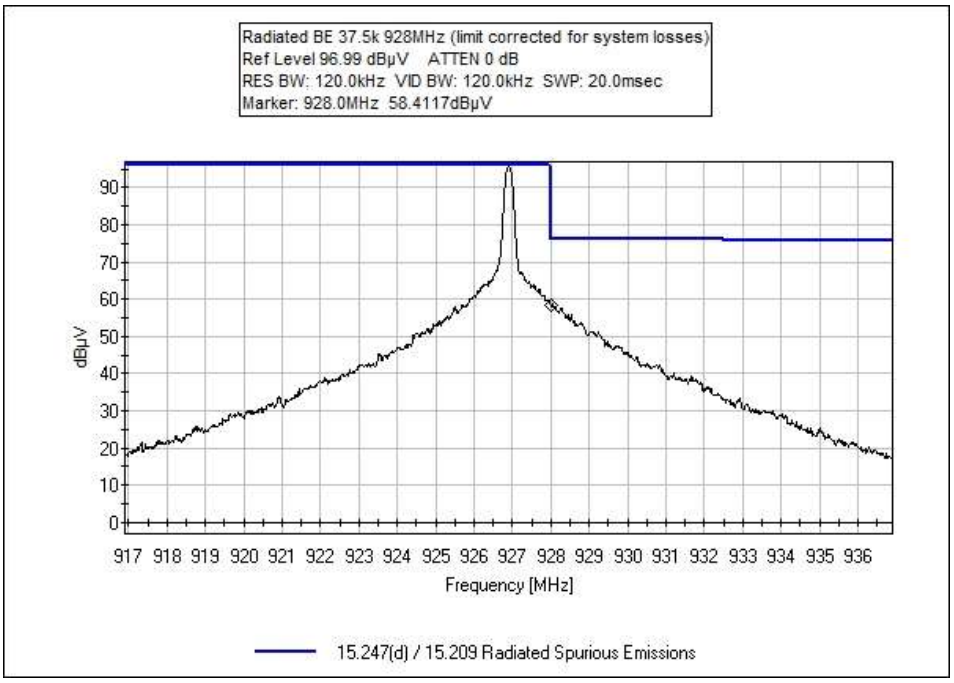


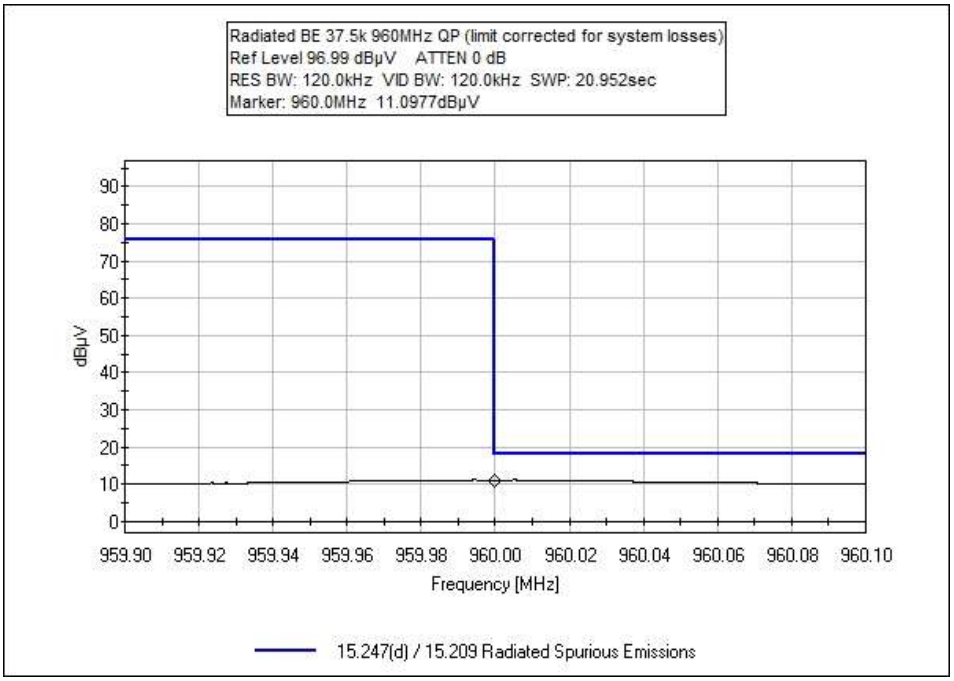

Radiated BE 12.5k 928MHz (limit corrected for system losses)
Ref Level 96.99 dBµV ATTEN 0 dB
RES BW: 120.0kHz VID BW: 120.0kHz SWP: 20.0msec
Marker: 928.0MHz 58.5937dBµV
dBµV
90
80
70
60
50
40
30
20
10
0
917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions

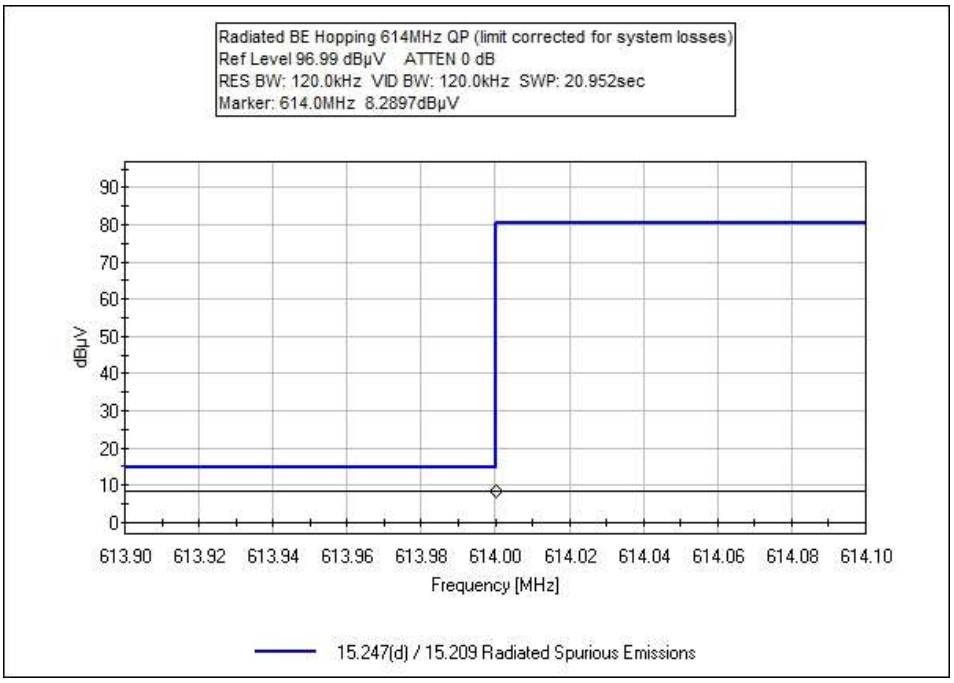

Radiated BE 12.5k 960MHz QP (limit corrected for system losses)
Ref Level 96.99 dBµV ATTEN 0 dB
RES BW: 120.0kHz VID BW: 120.0kHz SWP: 20.952sec
Marker: 960.0MHz 11.4527dBµV
dBµV
90
80
70
60
50
40
30
20
10
0
959.90 959.92 959.94 959.96 959.98 960.00 960.02 960.04 960.06 960.08 960.10
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions

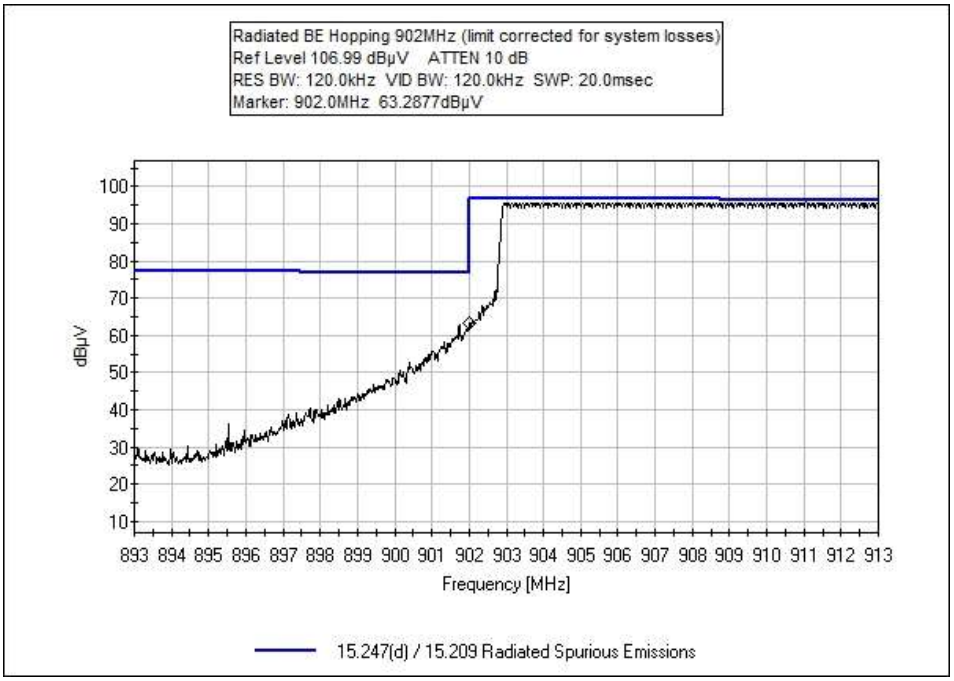

Radiated BE 37.5k 614MHz QP (limit corrected for system losses)
Ref Level 96.99 dBµV ATTEN 0 dB
RES BW: 120.0kHz VID BW: 120.0kHz SWP: 20.952sec
Marker: 614.0MHz 8.4387dBµV
dBµV
90
80
70
60
50
40
30
20
10
0
613.90 613.92 613.94 613.96 613.98 614.00 614.02 614.04 614.06 614.08 614.10
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions

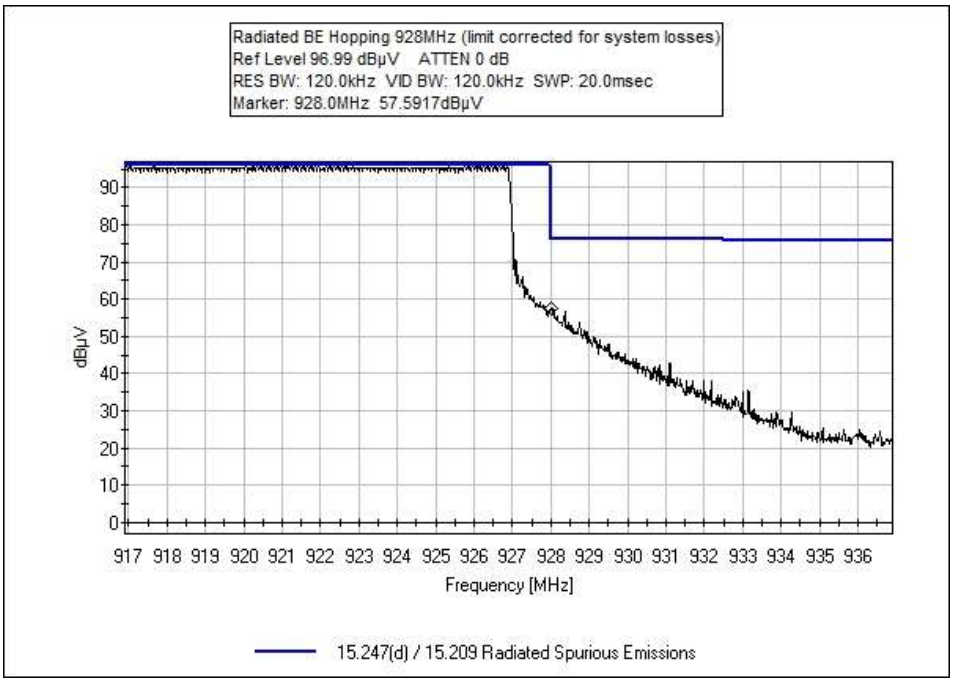

Radiated BE 37.5k 902MHz (limit corrected for system losses)
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 120.0kHz VID BW: 120.0kHz SWP: 20.0msec
Marker: 902.0MHz 63.0477dBµV
dBµV
100
90
80
70
60
50
40
30
20
10
893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions

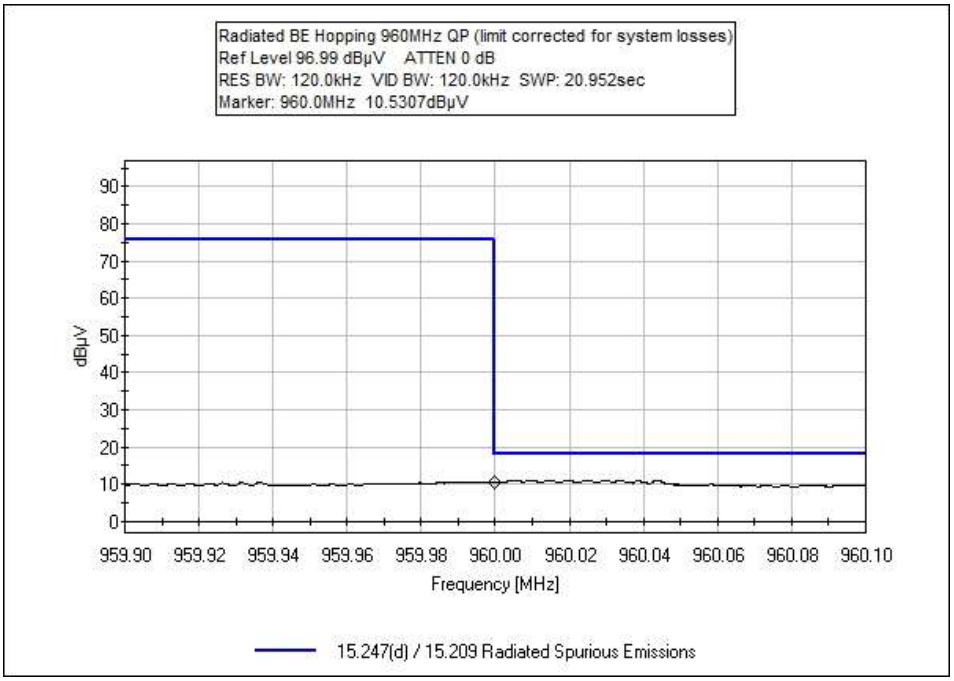

Radiated BE 37.5k 928MHz (limit corrected for system losses)
Ref Level 96.99 dBµV ATTEN 0 dB
RES BW: 120.0kHz VID BW: 120.0kHz SWP: 20.0msec
Marker: 928.0MHz 58.4117dBµV
dBµV
90
80
70
60
50
40
30
20
10
0
917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions


Radiated BE 37.5k 960MHz QP (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 11.0977dBµV
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


Radiated BE Hopping 614MHz QP (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 8.2897dBµV
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


Radiated BE Hopping 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 63.2877dBµV
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


Radiated BE Hopping 928MHz (limit corrected for system losses)
Ref Level 96.99 dBµV ATTEN 0 dB
RES BW: 120.0kHz VID BW: 120.0kHz SWP: 20.0msec
Marker: 928.0MHz 57.5917dBµV
dBµV
90
80
70
60
50
40
30
20
10
0
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


Radiated BE Hopping 960MHz QP (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 10.5307dBµV
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 #:	**100619**	Date:	11/28/2017
Test Type:	**Maximized Emissions**	Time:	06:38:33
Tested By:	Michael Atkinson	Sequence#:	4
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 5.5 dBi

Duty Cycle: Tested at 100%

Setup: The EUT ISM port is continuously transmitting with modulation. The EUT ISM port has an external antenna installed, both 5.15 and 5.5d Bi antennas investigated, only worst case reported.
Low, Mid, and High channels investigated. In addition to Low/Mid/High channel investigation, spurious emissions also investigated with EUT channel 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)

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02871	Spectrum Analyzer	E4440A	2/24/2017	2/24/2019
T2	ANP06540	Cable	Heliax	10/30/2017	10/30/2019
T3	ANP05963	Cable	RG-214	2/15/2016	2/15/2018
T4	ANP05360	Cable	RG214	11/30/2016	11/30/2018
T5	ANP06123	Attenuator	18N-6	5/5/2017	5/5/2019
T6	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 T6	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	614.000M	8.4	+0.0	+0.3	+2.1	+1.6	+0.0	39.5	46.0	-6.5	Vert
	QP		+5.9	+21.2					12.5k		
2	614.000M	8.4	+0.0	+0.3	+2.1	+1.6	+0.0	39.5	46.0	-6.5	Vert
	QP		+5.9	+21.2					37.5k		
3	614.000M	8.3	+0.0	+0.3	+2.1	+1.6	+0.0	39.4	46.0	-6.6	Vert
	QP		+5.9	+21.2					Hopping		
4	960.000M	11.5	+0.0	+0.4	+2.5	+2.2	+0.0	47.4	54.0	-6.6	Vert
	QP		+5.9	+24.9					12.5k		
5	960.000M	11.1	+0.0	+0.4	+2.5	+2.2	+0.0	47.0	54.0	-7.0	Vert
	QP		+5.9	+24.9					37.5k		
6	960.000M	10.5	+0.0	+0.4	+2.5	+2.2	+0.0	46.4	54.0	-7.6	Vert
	QP		+5.9	+24.9					Hopping		
7	902.000M	64.1	+0.0	+0.3	+2.4	+2.1	+0.0	98.6	111.5	-12.9	Vert
			+5.9	+23.8					12.5k		
8	902.000M	63.3	+0.0	+0.3	+2.4	+2.1	+0.0	97.8	111.5	-13.7	Vert
			+5.9	+23.8					Hopping		
9	902.000M	63.0	+0.0	+0.3	+2.4	+2.1	+0.0	97.5	111.5	-14.0	Vert
			+5.9	+23.8					37.5k		
10	928.000M	58.6	+0.0	+0.4	+2.4	+2.1	+0.0	94.0	111.5	-17.5	Vert
			+5.9	+24.6					12.5k		
11	928.000M	58.4	+0.0	+0.4	+2.4	+2.1	+0.0	93.8	111.5	-17.7	Vert
			+5.9	+24.6					37.5k		
12	928.000M	57.6	+0.0	+0.4	+2.4	+2.1	+0.0	93.0	111.5	-18.5	Vert
			+5.9	+24.6					Hopping		

Test Setup Photo(s)

Below 1GHz, 5.5 dBi

Below 1GHz, 5.15 dBi

Above 1GHz, 5.5 dBi (150cm), Cone Placement

Above 1GHz, 5.15 dBi (150cm), Cone Placement

15.207 AC Conducted Emissions

Test Setup/Conditions			
Test Location:	Bothell Lab C3	Test Engineer:	M. Atkinson
Test Method:	ANSI C63.10 (2013)	Test Date(s):	11/29/2017
Configuration:	1		

Environmental Conditions			
Temperature (ºC)	22	Relative Humidity (%):	33

See data sheets for test setup and test equipment.

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 #: **100619** Date: 11/29/2017
Test Type: **Conducted Emissions** Time: 10:50:25
Tested By: Michael Atkinson Sequence#: 20
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			

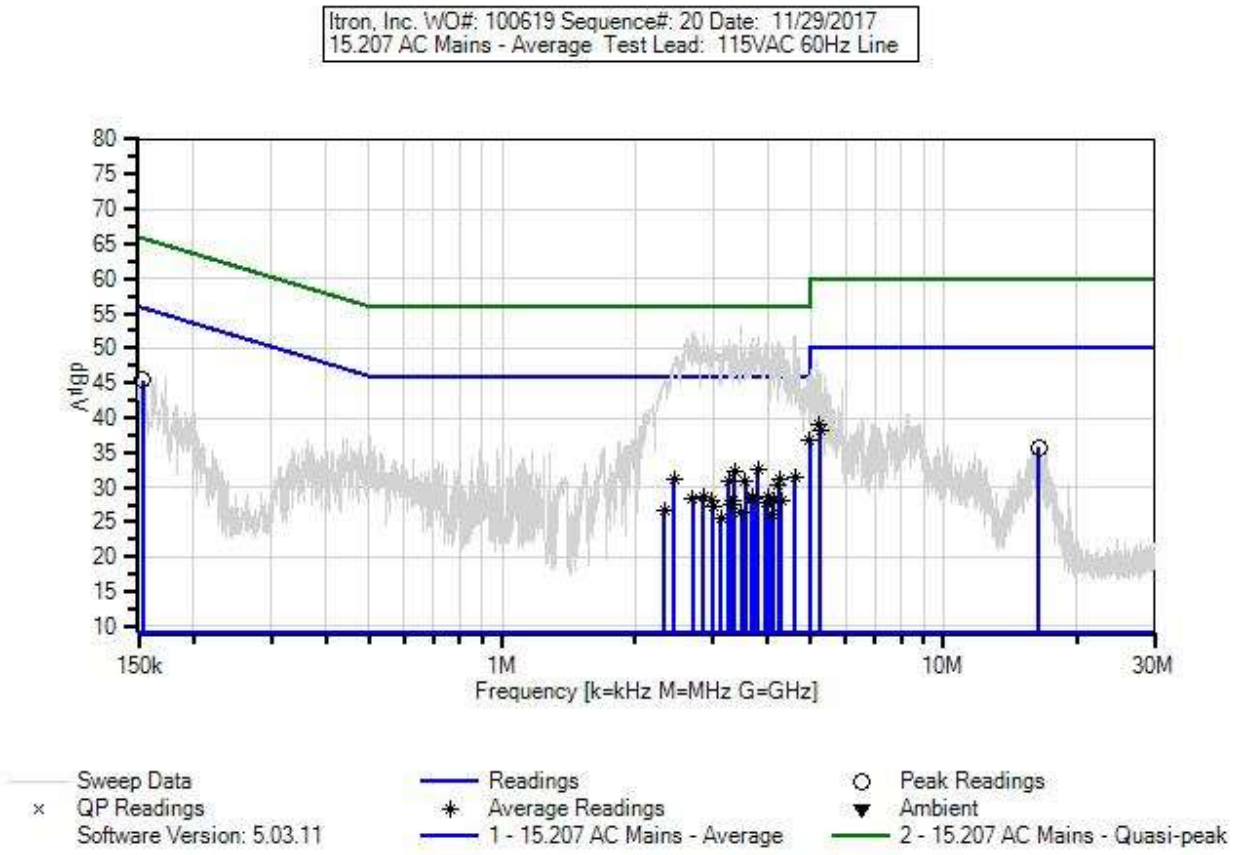
Test Conditions / Notes:

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 5.5 dBi

Duty Cycle: Tested at 100%

Setup: The EUT connected to AC mains through LISN. 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#: 100619 Sequence#: 20 Date: 11/29/2017
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
T1	AN02871	Spectrum Analyzer	E4440A	2/24/2017	2/24/2019
T2	AN02611	High Pass Filter	HE9615-150K-50-720B	2/18/2016	2/18/2018
T3	ANP06540	Cable	Heliax	10/30/2017	10/30/2019
T4	ANP06515	Cable	Heliax	1/21/2016	1/21/2018
T5	ANP06219	Attenuator	768-10	4/12/2016	4/12/2018
	AN01311	50uH LISN-Line1 (N)	3816/2	3/7/2016	3/7/2018
T6	AN01311	50uH LISN-Line2 (L)	3816/2	3/7/2016	3/7/2018

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

#	Freq	Rdng	T1 T5	T2 T6	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV	dBµV	dB	Ant
1	4.968M	27.4	+0.0	+0.1	+0.0	+0.1	+0.0	36.8	46.0	-9.2	Line
Ave			+9.1	+0.1							
^	4.968M	36.3	+0.0	+0.1	+0.0	+0.1	+0.0	45.7	46.0	-0.3	Line
			+9.1	+0.1							
3	153.700k	35.5	+0.0	+0.7	+0.0	+0.0	+0.0	45.4	55.8	-10.4	Line
			+9.1	+0.1							
4	5.220M	29.5	+0.0	+0.1	+0.0	+0.1	+0.0	38.9	50.0	-11.1	Line
Ave			+9.1	+0.1							
^	5.220M	38.9	+0.0	+0.1	+0.0	+0.1	+0.0	48.3	50.0	-1.7	Line
			+9.1	+0.1							
6	5.252M	28.8	+0.0	+0.1	+0.0	+0.1	+0.0	38.2	50.0	-11.8	Line
Ave			+9.1	+0.1							
^	5.252M	35.9	+0.0	+0.1	+0.0	+0.1	+0.0	45.3	50.0	-4.7	Line
			+9.1	+0.1							
8	3.800M	23.2	+0.0	+0.1	+0.0	+0.1	+0.0	32.6	46.0	-13.4	Line
Ave			+9.1	+0.1							
^	3.800M	42.4	+0.0	+0.1	+0.0	+0.1	+0.0	51.8	46.0	+5.8	Line
			+9.1	+0.1							
10	3.369M	22.8	+0.0	+0.1	+0.0	+0.1	+0.0	32.2	46.0	-13.8	Line
Ave			+9.1	+0.1							
^	3.369M	41.0	+0.0	+0.1	+0.0	+0.1	+0.0	50.4	46.0	+4.4	Line
			+9.1	+0.1							
12	16.400M	26.2	+0.0	+0.1	+0.0	+0.3	+0.0	35.8	50.0	-14.2	Line
			+9.1	+0.1							
13	4.595M	22.1	+0.0	+0.1	+0.0	+0.1	+0.0	31.5	46.0	-14.5	Line
Ave			+9.1	+0.1							
^	4.595M	42.4	+0.0	+0.1	+0.0	+0.1	+0.0	51.8	46.0	+5.8	Line
			+9.1	+0.1							
15	4.240M	21.9	+0.0	+0.1	+0.0	+0.1	+0.0	31.3	46.0	-14.7	Line
Ave			+9.1	+0.1							
^	4.240M	41.6	+0.0	+0.1	+0.0	+0.1	+0.0	51.0	46.0	+5.0	Line
			+9.1	+0.1							
17	2.456M	21.8	+0.0	+0.1	+0.0	+0.1	+0.0	31.2	46.0	-14.8	Line
Ave			+9.1	+0.1							

^	2.456M	38.5	+0.0 +9.1	+0.1 +0.1	+0.0	+0.1	+0.0	47.9	46.0	+1.9	Line
19	3.556M Ave	21.4	+0.0 +9.1	+0.1 +0.1	+0.0	+0.1	+0.0	30.8	46.0	-15.2	Line
^	3.556M	41.0	+0.0 +9.1	+0.1 +0.1	+0.0	+0.1	+0.0	50.4	46.0	+4.4	Line
21	3.255M Ave	21.4	+0.0 +9.1	+0.1 +0.1	+0.0	+0.1	+0.0	30.8	46.0	-15.2	Line
^	3.255M	41.7	+0.0 +9.1	+0.1 +0.1	+0.0	+0.1	+0.0	51.1	46.0	+5.1	Line
23	4.218M Ave	20.9	+0.0 +9.1	+0.1 +0.1	+0.0	+0.1	+0.0	30.3	46.0	-15.7	Line
^	4.218M	41.4	+0.0 +9.1	+0.1 +0.1	+0.0	+0.1	+0.0	50.8	46.0	+4.8	Line
25	3.994M Ave	19.3	+0.0 +9.1	+0.1 +0.1	+0.0	+0.1	+0.0	28.7	46.0	-17.3	Line
^	3.994M	41.1	+0.0 +9.1	+0.1 +0.1	+0.0	+0.1	+0.0	50.5	46.0	+4.5	Line
27	2.858M Ave	19.2	+0.0 +9.1	+0.1 +0.1	+0.0	+0.1	+0.0	28.6	46.0	-17.4	Line
^	2.858M	42.8	+0.0 +9.1	+0.1 +0.1	+0.0	+0.1	+0.0	52.2	46.0	+6.2	Line
29	3.676M Ave	19.2	+0.0 +9.1	+0.1 +0.1	+0.0	+0.1	+0.0	28.6	46.0	-17.4	Line
^	3.676M	42.1	+0.0 +9.1	+0.1 +0.1	+0.0	+0.1	+0.0	51.5	46.0	+5.5	Line
31	3.702M Ave	19.1	+0.0 +9.1	+0.1 +0.1	+0.0	+0.1	+0.0	28.5	46.0	-17.5	Line
^	3.702M	41.3	+0.0 +9.1	+0.1 +0.1	+0.0	+0.1	+0.0	50.7	46.0	+4.7	Line
33	2.702M Ave	19.0	+0.0 +9.1	+0.1 +0.1	+0.0	+0.1	+0.0	28.4	46.0	-17.6	Line
^	2.702M	42.9	+0.0 +9.1	+0.1 +0.1	+0.0	+0.1	+0.0	52.3	46.0	+6.3	Line
35	4.301M Ave	18.7	+0.0 +9.1	+0.1 +0.1	+0.0	+0.1	+0.0	28.1	46.0	-17.9	Line
^	4.301M	40.8	+0.0 +9.1	+0.1 +0.1	+0.0	+0.1	+0.0	50.2	46.0	+4.2	Line
37	2.992M Ave	18.6	+0.0 +9.1	+0.1 +0.1	+0.0	+0.1	+0.0	28.0	46.0	-18.0	Line
^	2.992M	40.0	+0.0 +9.1	+0.1 +0.1	+0.0	+0.1	+0.0	49.4	46.0	+3.4	Line
39	3.335M Ave	18.6	+0.0 +9.1	+0.1 +0.1	+0.0	+0.1	+0.0	28.0	46.0	-18.0	Line
^	3.335M	40.6	+0.0 +9.1	+0.1 +0.1	+0.0	+0.1	+0.0	50.0	46.0	+4.0	Line
41	3.347M Ave	18.6	+0.0 +9.1	+0.1 +0.1	+0.0	+0.1	+0.0	28.0	46.0	-18.0	Line
^	3.347M	41.2	+0.0 +9.1	+0.1 +0.1	+0.0	+0.1	+0.0	50.6	46.0	+4.6	Line
43	4.109M Ave	18.6	+0.0 +9.1	+0.1 +0.1	+0.0	+0.1	+0.0	28.0	46.0	-18.0	Line

^	4.109M	40.9	+0.0 +9.1	+0.1 +0.1	+0.0	+0.1	+0.0	50.3	46.0	+4.3	Line
45	3.951M Ave	18.3	+0.0 +9.1	+0.1 +0.1	+0.0	+0.1	+0.0	27.7	46.0	-18.3	Line
^	3.951M	41.4	+0.0 +9.1	+0.1 +0.1	+0.0	+0.1	+0.0	50.8	46.0	+4.8	Line
47	3.308M Ave	18.2	+0.0 +9.1	+0.1 +0.1	+0.0	+0.1	+0.0	27.6	46.0	-18.4	Line
^	3.308M	40.7	+0.0 +9.1	+0.1 +0.1	+0.0	+0.1	+0.0	50.1	46.0	+4.1	Line
49	3.008M Ave	17.8	+0.0 +9.1	+0.1 +0.1	+0.0	+0.1	+0.0	27.2	46.0	-18.8	Line
^	3.008M	42.1	+0.0 +9.1	+0.1 +0.1	+0.0	+0.1	+0.0	51.5	46.0	+5.5	Line
51	2.328M Ave	17.3	+0.0 +9.1	+0.1 +0.1	+0.0	+0.1	+0.0	26.7	46.0	-19.3	Line
^	2.328M	35.7	+0.0 +9.1	+0.1 +0.1	+0.0	+0.1	+0.0	45.1	46.0	-0.9	Line
53	3.486M Ave	17.0	+0.0 +9.1	+0.1 +0.1	+0.0	+0.1	+0.0	26.4	46.0	-19.6	Line
^	3.486M	43.9	+0.0 +9.1	+0.1 +0.1	+0.0	+0.1	+0.0	53.3	46.0	+7.3	Line
55	4.077M Ave	16.8	+0.0 +9.1	+0.1 +0.1	+0.0	+0.1	+0.0	26.2	46.0	-19.8	Line
^	4.077M	41.3	+0.0 +9.1	+0.1 +0.1	+0.0	+0.1	+0.0	50.7	46.0	+4.7	Line
57	3.128M Ave	16.1	+0.0 +9.1	+0.1 +0.1	+0.0	+0.1	+0.0	25.5	46.0	-20.5	Line
^	3.128M	42.4	+0.0 +9.1	+0.1 +0.1	+0.0	+0.1	+0.0	51.8	46.0	+5.8	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 #:	**100619**	Date:	11/29/2017
Test Type:	**Conducted Emissions**	Time:	10:01:40
Tested By:	Michael Atkinson	Sequence#:	19
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:

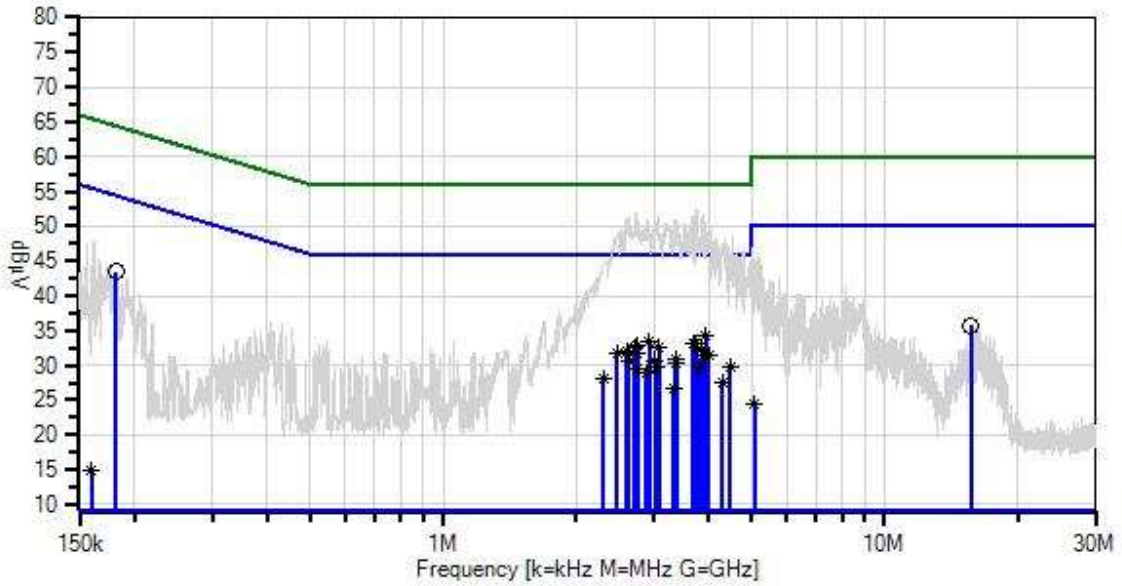
Frequency Range: 150kHz-30MHz
Frequency tested: 903, 915, 926.9MHz
Firmware power setting: Max
Firmware: ARM 1.0.0.0 DSP 1.0.0.0, FPGA 4.1, Test Software: SrTest100 v4.1.1.25
Modulation: 12.5 Kbit/sec FM (2GFSK), 37.5 Kbit/sec FM (2GFSK)

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

Duty Cycle: Tested at 100%

Setup: The EUT connected to AC mains through LISN. 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#: 100619 Sequence#: 19 Date: 11/29/2017
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
	AN02871	Spectrum Analyzer	E4440A	2/24/2017	2/24/2019
T1	AN02611	High Pass Filter	HE9615-150K-50-720B	2/18/2016	2/18/2018
T2	ANP06540	Cable	Heliax	10/30/2017	10/30/2019
T3	ANP06515	Cable	Heliax	1/21/2016	1/21/2018
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

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	dB	Table	dBµV	dBµV	dB	Ant
1	181.400k	34.1	+0.3 +0.0	+0.0	+0.0	+9.1	+0.0	43.5	54.4	-10.9	Retur
2	3.936M	24.9	+0.1	+0.0	+0.1	+9.1	+0.0	34.2	46.0	-11.8	Retur
	Ave		+0.0								
^	3.936M	41.4	+0.1 +0.0	+0.0	+0.1	+9.1	+0.0	50.7	46.0	+4.7	Retur
4	2.931M	24.1	+0.1	+0.0	+0.1	+9.1	+0.0	33.4	46.0	-12.6	Retur
	Ave		+0.0								
^	2.931M	41.4	+0.1 +0.0	+0.0	+0.1	+9.1	+0.0	50.7	46.0	+4.7	Retur
6	3.674M	23.9	+0.1	+0.0	+0.1	+9.1	+0.0	33.2	46.0	-12.8	Retur
	Ave		+0.0								
^	3.674M	42.1	+0.1 +0.0	+0.0	+0.1	+9.1	+0.0	51.4	46.0	+5.4	Retur
8	3.747M	23.9	+0.1	+0.0	+0.1	+9.1	+0.0	33.2	46.0	-12.8	Retur
	Ave		+0.0								
^	3.747M	43.2	+0.1 +0.0	+0.0	+0.1	+9.1	+0.0	52.5	46.0	+6.5	Retur
10	2.762M	23.6	+0.1	+0.0	+0.1	+9.1	+0.0	32.9	46.0	-13.1	Retur
	Ave		+0.0								
^	2.762M	41.5	+0.1 +0.0	+0.0	+0.1	+9.1	+0.0	50.8	46.0	+4.8	Retur
12	3.080M	23.2	+0.1	+0.0	+0.1	+9.1	+0.0	32.5	46.0	-13.5	Retur
	Ave		+0.0								
^	3.080M	42.2	+0.1 +0.0	+0.0	+0.1	+9.1	+0.0	51.5	46.0	+5.5	Retur
14	2.716M	23.2	+0.1	+0.0	+0.1	+9.1	+0.0	32.5	46.0	-13.5	Retur
	Ave		+0.0								
^	2.716M	42.8	+0.1 +0.0	+0.0	+0.1	+9.1	+0.0	52.1	46.0	+6.1	Retur
16	3.855M	23.1	+0.1	+0.0	+0.1	+9.1	+0.0	32.4	46.0	-13.6	Retur
	Ave		+0.0								
^	3.855M	41.9	+0.1 +0.0	+0.0	+0.1	+9.1	+0.0	51.2	46.0	+5.2	Retur

18	2.600M	22.7	+0.1	+0.0	+0.1	+9.1	+0.0	32.0	46.0	-14.0	Retur
	Ave		+0.0								
	^ 2.600M	41.8	+0.1	+0.0	+0.1	+9.1	+0.0	51.1	46.0	+5.1	Retur
			+0.0								
20	2.472M	22.5	+0.1	+0.0	+0.1	+9.1	+0.0	31.8	46.0	-14.2	Retur
	Ave		+0.0								
	^ 2.472M	39.7	+0.1	+0.0	+0.1	+9.1	+0.0	49.0	46.0	+3.0	Retur
			+0.0								
22	2.748M	22.5	+0.1	+0.0	+0.1	+9.1	+0.0	31.8	46.0	-14.2	Retur
	Ave		+0.0								
23	15.700M	26.2	+0.1	+0.0	+0.3	+9.1	+0.0	35.7	50.0	-14.3	Retur
			+0.0								
24	3.888M	22.2	+0.1	+0.0	+0.1	+9.1	+0.0	31.5	46.0	-14.5	Retur
	Ave		+0.0								
	^ 3.888M	42.4	+0.1	+0.0	+0.1	+9.1	+0.0	51.7	46.0	+5.7	Retur
			+0.0								
26	4.004M	22.1	+0.1	+0.0	+0.1	+9.1	+0.0	31.4	46.0	-14.6	Retur
	Ave		+0.0								
	^ 4.004M	40.6	+0.1	+0.0	+0.1	+9.1	+0.0	49.9	46.0	+3.9	Retur
			+0.0								
28	3.386M	21.7	+0.1	+0.0	+0.1	+9.1	+0.0	31.0	46.0	-15.0	Retur
	Ave		+0.0								
	^ 3.386M	41.2	+0.1	+0.0	+0.1	+9.1	+0.0	50.5	46.0	+4.5	Retur
			+0.0								
30	3.014M	21.4	+0.1	+0.0	+0.1	+9.1	+0.0	30.7	46.0	-15.3	Retur
	Ave		+0.0								
	^ 3.014M	43.1	+0.1	+0.0	+0.1	+9.1	+0.0	52.4	46.0	+6.4	Retur
			+0.0								
32	2.639M	21.2	+0.1	+0.0	+0.1	+9.1	+0.0	30.5	46.0	-15.5	Retur
	Ave		+0.0								
	^ 2.639M	42.1	+0.1	+0.0	+0.1	+9.1	+0.0	51.4	46.0	+5.4	Retur
			+0.0								
34	3.359M	21.0	+0.1	+0.0	+0.1	+9.1	+0.0	30.3	46.0	-15.7	Retur
	Ave		+0.0								
	^ 3.359M	41.5	+0.1	+0.0	+0.1	+9.1	+0.0	50.8	46.0	+4.8	Retur
			+0.0								
36	3.371M	20.9	+0.1	+0.0	+0.1	+9.1	+0.0	30.2	46.0	-15.8	Retur
	Ave		+0.0								
	^ 3.371M	41.4	+0.1	+0.0	+0.1	+9.1	+0.0	50.7	46.0	+4.7	Retur
			+0.0								
38	4.460M	20.5	+0.1	+0.0	+0.1	+9.1	+0.0	29.8	46.0	-16.2	Retur
	Ave		+0.0								
	^ 4.460M	36.7	+0.1	+0.0	+0.1	+9.1	+0.0	46.0	46.0	+0.0	Retur
			+0.0								
40	3.788M	20.5	+0.1	+0.0	+0.1	+9.1	+0.0	29.8	46.0	-16.2	Retur
	Ave		+0.0								
	^ 3.788M	42.3	+0.1	+0.0	+0.1	+9.1	+0.0	51.6	46.0	+5.6	Retur
			+0.0								
42	3.052M	20.5	+0.1	+0.0	+0.1	+9.1	+0.0	29.8	46.0	-16.2	Retur
	Ave		+0.0								
	^ 3.052M	41.3	+0.1	+0.0	+0.1	+9.1	+0.0	50.6	46.0	+4.6	Retur
			+0.0								

44 Ave	2.739M	20.2	+0.1 +0.0	+0.0	+0.1	+9.1	+0.0	29.5	46.0	-16.5	Retur
^	2.739M	42.4	+0.1 +0.0	+0.0	+0.1	+9.1	+0.0	51.7	46.0	+5.7	Retur
^	2.748M	41.7	+0.1 +0.0	+0.0	+0.1	+9.1	+0.0	51.0	46.0	+5.0	Retur
47 Ave	2.889M	19.5	+0.1 +0.0	+0.0	+0.1	+9.1	+0.0	28.8	46.0	-17.2	Retur
^	2.889M	41.9	+0.1 +0.0	+0.0	+0.1	+9.1	+0.0	51.2	46.0	+5.2	Retur
49 Ave	2.308M	18.8	+0.1 +0.0	+0.0	+0.1	+9.1	+0.0	28.1	46.0	-17.9	Retur
^	2.308M	36.7	+0.1 +0.0	+0.0	+0.1	+9.1	+0.0	46.0	46.0	+0.0	Retur
51 Ave	4.288M	18.3	+0.1 +0.0	+0.0	+0.1	+9.1	+0.0	27.6	46.0	-18.4	Retur
^	4.288M	38.5	+0.1 +0.0	+0.0	+0.1	+9.1	+0.0	47.8	46.0	+1.8	Retur
53 Ave	3.325M	17.3	+0.1 +0.0	+0.0	+0.1	+9.1	+0.0	26.6	46.0	-19.4	Retur
^	3.325M	41.7	+0.1 +0.0	+0.0	+0.1	+9.1	+0.0	51.0	46.0	+5.0	Retur
55 Ave	5.076M	15.0	+0.1 +0.0	+0.0	+0.1	+9.1	+0.0	24.3	50.0	-25.7	Retur
^	5.076M	37.1	+0.1 +0.0	+0.0	+0.1	+9.1	+0.0	46.4	50.0	-3.6	Retur
57 Ave	159.800k	5.2	+0.6 +0.0	+0.0	+0.0	+9.1	+0.0	14.9	55.5	-40.6	Retur
^	159.800k	38.1	+0.6 +0.0	+0.0	+0.0	+9.1	+0.0	47.8	55.5	-7.7	Retur

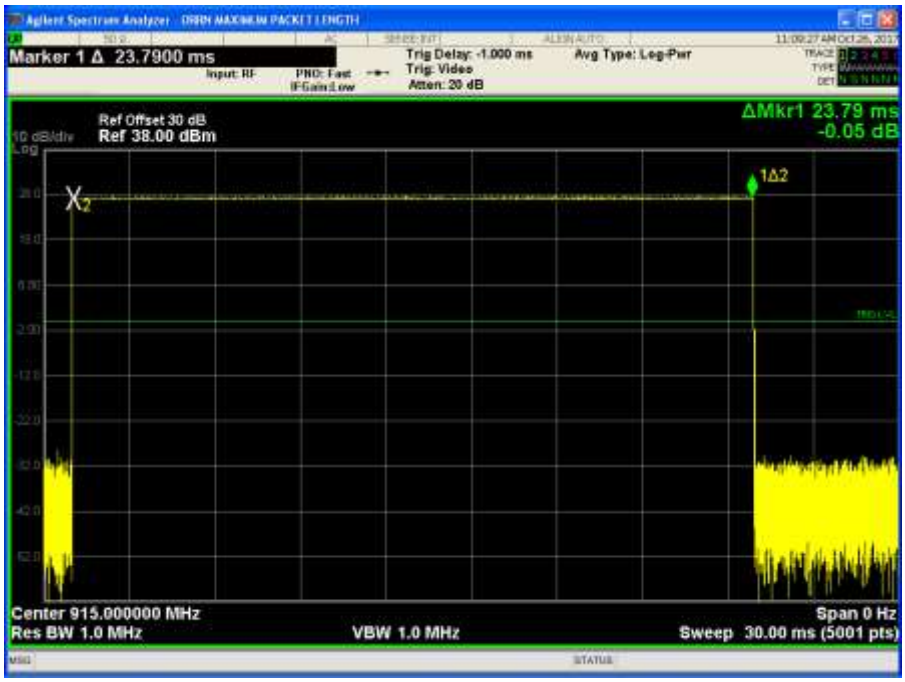
Test Setup Photo(s)

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 Plot

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.