

Ittron, Inc.

TEST REPORT FOR

CCU100

Models: CCU100C* and CCU100RC*

(*See Appendix A for Manufacturer Declaration)

Tested to The Following Standards:

FCC Part 15 Subpart C Section(s)

**15.207 & 15.247
(FHSS 902-928 MHz)**

Report No.: 103221-2

Date of issue: April 17, 2020



Test Certificate # 803.01

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

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

This report contains a total of 136 pages and may be reproduced in full only. Partial reproduction may only be done with the written consent of CKC Laboratories, Inc.

TABLE OF CONTENTS

Administrative Information	3
Test Report Information	3
Report Authorization	3
Test Facility Information	4
Software Versions	4
Site Registration & Accreditation Information	4
Summary of Results	5
Modifications During Testing.....	5
Conditions During Testing.....	5
Equipment Under Test.....	6
General Product Information.....	7
FCC Part 15 Subpart C	8
15.247(a) Transmitter Characteristics	8
15.247(a)(1)(i) 20 dB Bandwidth	9
15.247(a)(1) Carrier Separation.....	15
15.247(a)(1)(i) Number of Hopping Channels	17
15.247(b)(1) Output Power	20
15.35(c) Duty Cycle Correction Factor.....	26
15.247(d) RF Conducted Emissions & Band Edge	27
15.247(d) Radiated Emissions & Band Edge	53
15.207 AC Conducted Emissions.....	121
Appendix A: Manufacturer Declaration.....	134
Supplemental Information	135
Measurement Uncertainty	135
Emissions Test Details.....	135

ADMINISTRATIVE INFORMATION

Test Report Information

REPORT PREPARED FOR:

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

Representative: Jay Holcomb
Customer Reference Number: 193369

DATE OF EQUIPMENT RECEIPT:

DATE(S) OF TESTING:

REPORT PREPARED BY:

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

Project Number: 103221

December 13, 2019

December 13-18, 2019, January 21-25, 2020

April 15-16, 2020 and May 1, 2020

Report Authorization

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



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

Test Facility Information



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

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

Software Versions

CKC Laboratories Proprietary Software	Version
EMITest Emissions	5.03.12

Site Registration & Accreditation Information

Location	*NIST CB #	FCC	Japan
Canyon Park, Bothell, WA	US0081	US1022	A-0136
Brea, CA	US0060	US1025	A-0136
Fremont, CA	US0082	US1023	A-0136
Mariposa, CA	US0103	US1024	A-0136

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

SUMMARY OF RESULTS

Standard / Specification: FCC Part 15 Subpart C - 15.247 (FHSS 902-928MHz)

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

NA = Not Applicable

NP = CKC Laboratories was not contracted to perform test.

ISO/IEC 17025 Decision Rule

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

Modifications During Testing

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

Summary of Conditions

Modification #1: Added ferrite Laird Technologies – 28B0355-000 with no turns on battery cable.

Modification #2: Mounting plate ground was removed

Modifications listed above must be incorporated into all production units.

Conditions During Testing

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

Summary of Conditions

The models tested are the CCU100C and the CCU100RC.

The CCU100C becomes the CCU100RC with a different set of antennas installed. (The R is for remote, so for the remote set of antennas installed).

Models CCU100C and CCU100RC configurations were checked and worst-case provided for testing unless referenced differently in the test section.

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
CCU100	Itron, Inc.	CCU100C	74048330

Support Equipment:

Device	Manufacturer	Model #	S/N
Omnidirectional Antenna	PCTEL	BOA9025NM-ITR	NA
Omnidirectional Antenna	PCTEL	MHO3G4G02NM	NA

Configuration 2

Equipment Tested:

Device	Manufacturer	Model #	S/N
CCU100	Itron, Inc.	CCU100RC	74048330

Support Equipment:

Device	Manufacturer	Model #	S/N
Omnidirectional Antenna	PCTEL	BOA9028	NA
Omnidirectional Antenna	Taoglas	OMB.6912.03F21	NA
Attenuator 1dB (x2)	Mini Circuits	UNAT-1+	NA

Configuration 3

Equipment Tested:

Device	Manufacturer	Model #	S/N
CCU100	Itron, Inc.	CCU100C	74048333

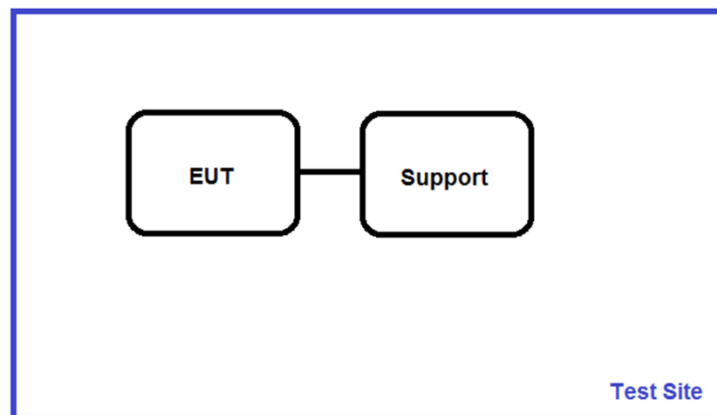
Support Equipment:

Device	Manufacturer	Model #	S/N
Omnidirectional Antenna	PCTEL	BOA9025NM-ITR	NA

General Product Information:

Product Information	Manufacturer-Provided Details
Equipment Type:	Stand-Alone Equipment
Type of Wideband System:	FHSS
Operating Frequency Range:	903-926.8 MHz (FSK 12.5k and FSK 37.5k) 908-923.8MHz (AM)
Number of Hopping Channels:	120 (FSK 12.5k and FSK 37.5k) 80 (AM)
Receiver Bandwidth and Synchronization:	The manufacturer declares the receiver input bandwidth matches the transmit channel bandwidth and shifts frequencies in synchronization with the transmitter.
Modulation Type(s):	37.5 kbit/sec FM (FSK) 12.5kbit/sec FM (FSK) 16.384kbit/sec AM (OOK)
Maximum Duty Cycle:	Tested 100% Modulated
Number of TX Chains:	1
Antenna Type(s) and Gain:	Omnidirectional, 5.5dBi Omnidirectional, 8.15dBi with 2dB attenuation
Beamforming Type:	NA
Antenna Connection Type:	External Connector
Nominal Input Voltage:	115VAC
Firmware / Software used for Test:	ARM = Version 2.27.0.0, DSP = Version 7.22.0.0 and FPGA = Version 4.14, SR Test 100 version 4.11.1.42

Test Setup Block Diagram



FCC Part 15 Subpart C

15.247(a) Transmitter Characteristics

Test Setup/Conditions			
Test Location:	Bothell Lab Bench	Test Engineer:	M. Harrison
Test Method:	ANSI C63.10 (2013)	Test Date(s):	4/16/2020
Configuration:	1		
Test Setup:	The equipment under test (EUT) is placed on the tabletop. The output of the EUT is connected to the spectrum analyzer using a coaxial cable and attenuator. The EUT is transmitting at its rated output power. Modification #1 and #2 were in place during testing.		

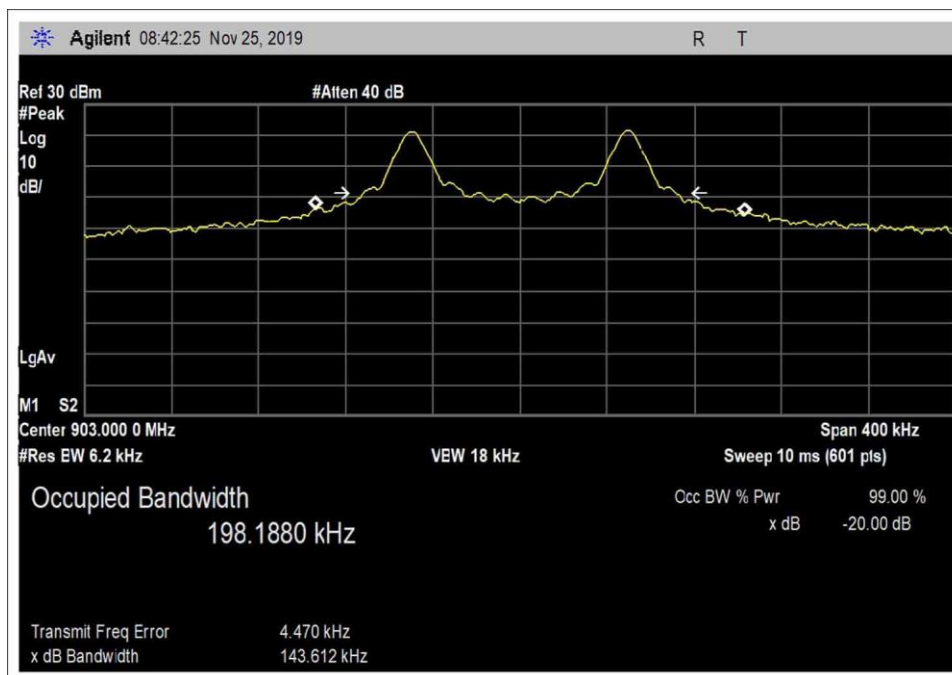
Environmental Conditions			
Temperature (°C)	22	Relative Humidity (%):	35

Test Equipment					
Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
02871	Spectrum Analyzer	Agilent	E4440A	10/15/2019	10/15/2021
P07227	Attenuator	Pasternack	PE7004-6	10/2/2019	10/2/2021

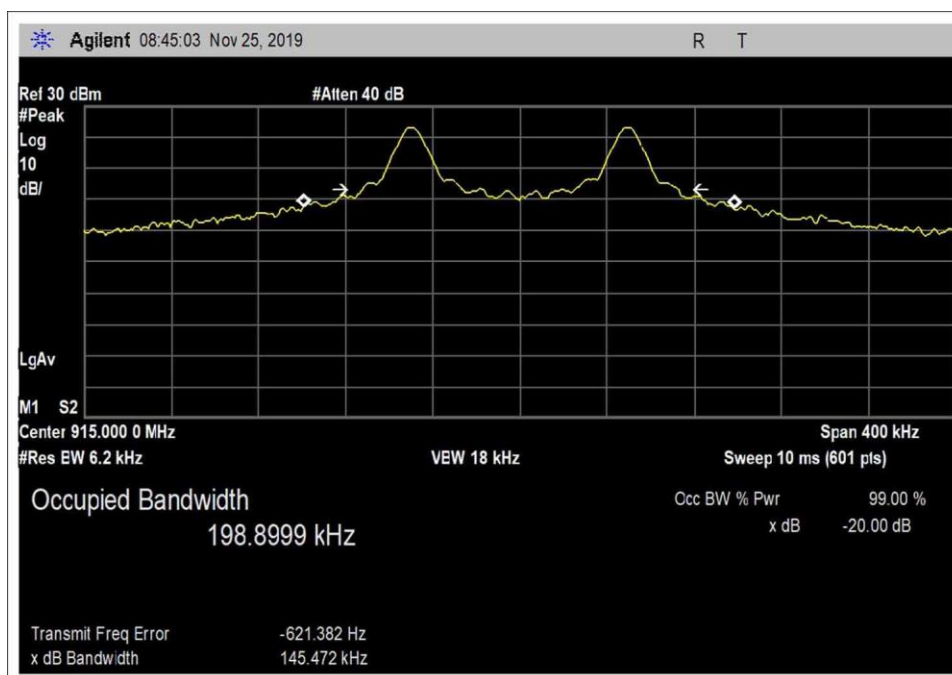
15.247(a)(1)(i) 20 dB Bandwidth

Test Data Summary					
Frequency (MHz)	Antenna Port	Modulation	Measured (kHz)	Limit (kHz)	Results
903	1	FM 12.5kbps	143.61	≤500	Pass
915	1	FM 12.5kbps	145.47	≤500	Pass
926.8	1	FM 12.5kbps	143.76	≤500	Pass
903	1	FM 37.5kbps	83.58	≤500	Pass
915	1	FM 37.5kbps	85.55	≤500	Pass
926.8	1	FM 37.5kbps	86.4	≤500	Pass
908	1	AM	297.54	≤500	Pass
915	1	AM	269.1	≤500	Pass
923.8	1	AM	313.45	≤500	Pass

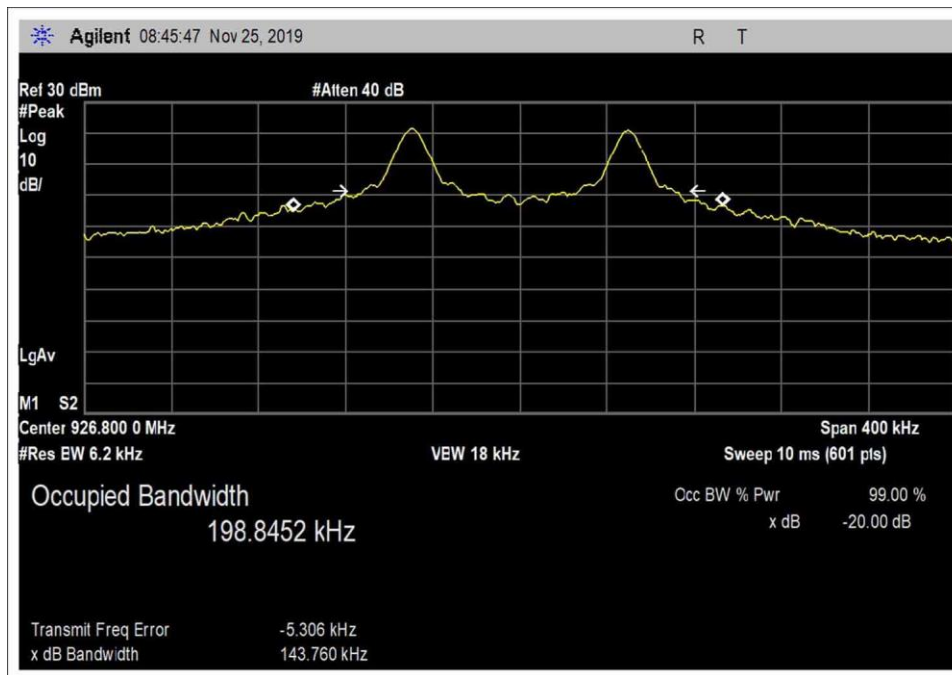
Plot(s)



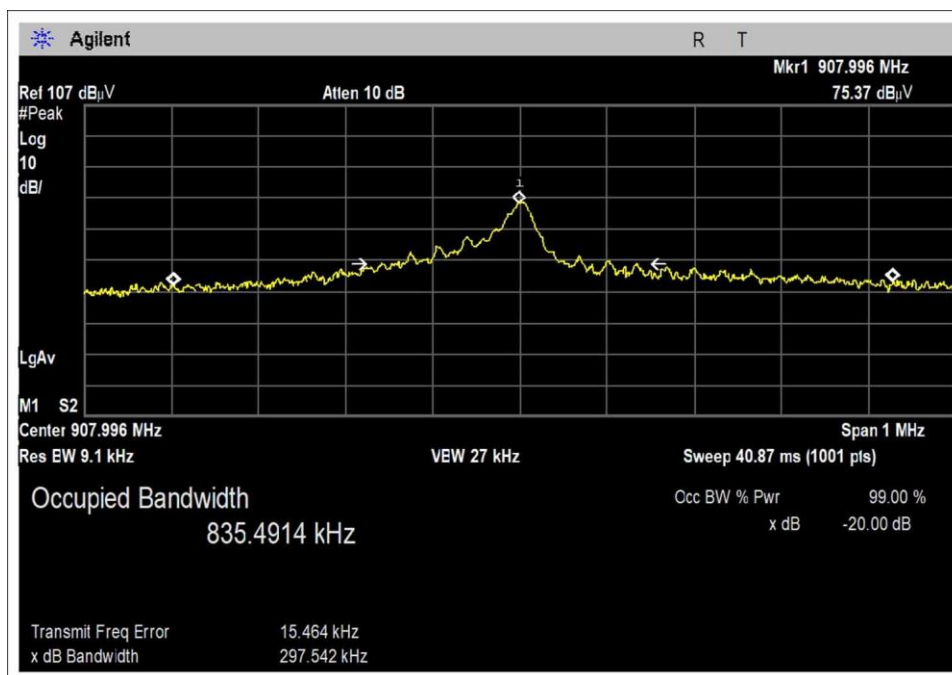
FSK Low Channel



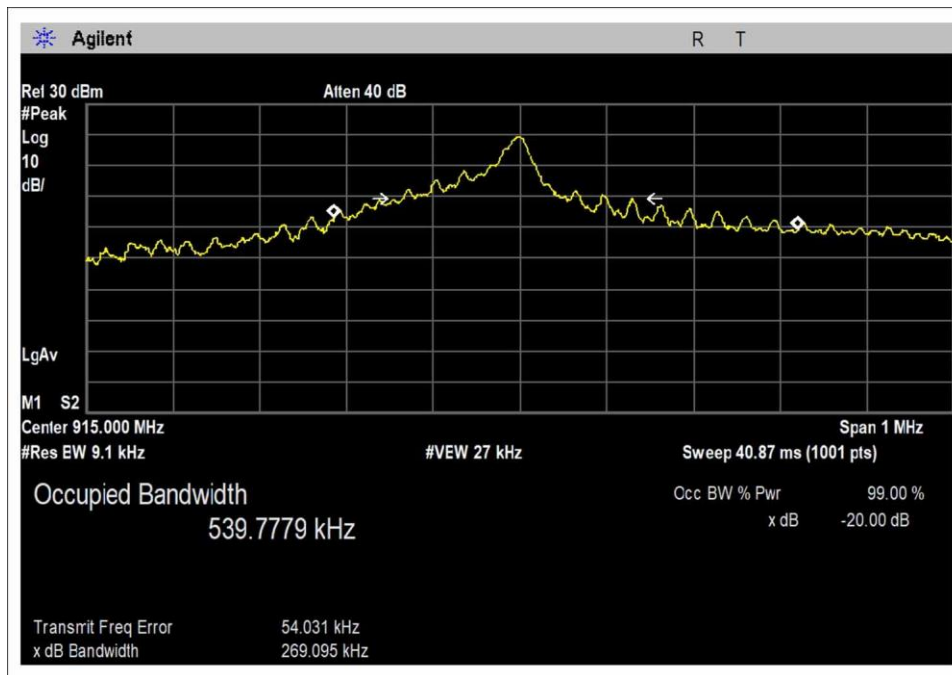
FSK Middle Channel



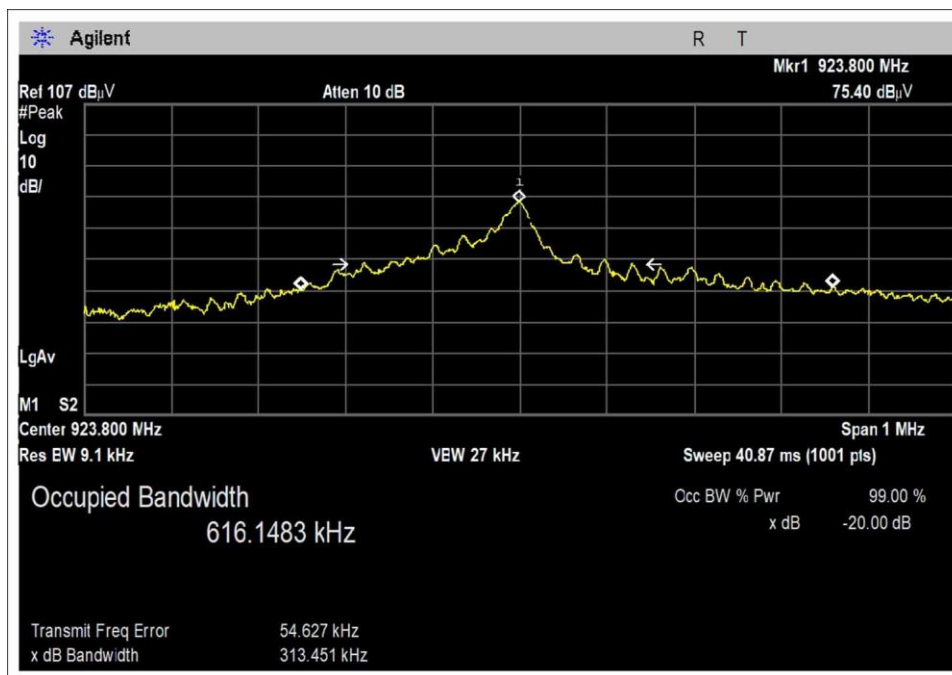
FSK High Channel



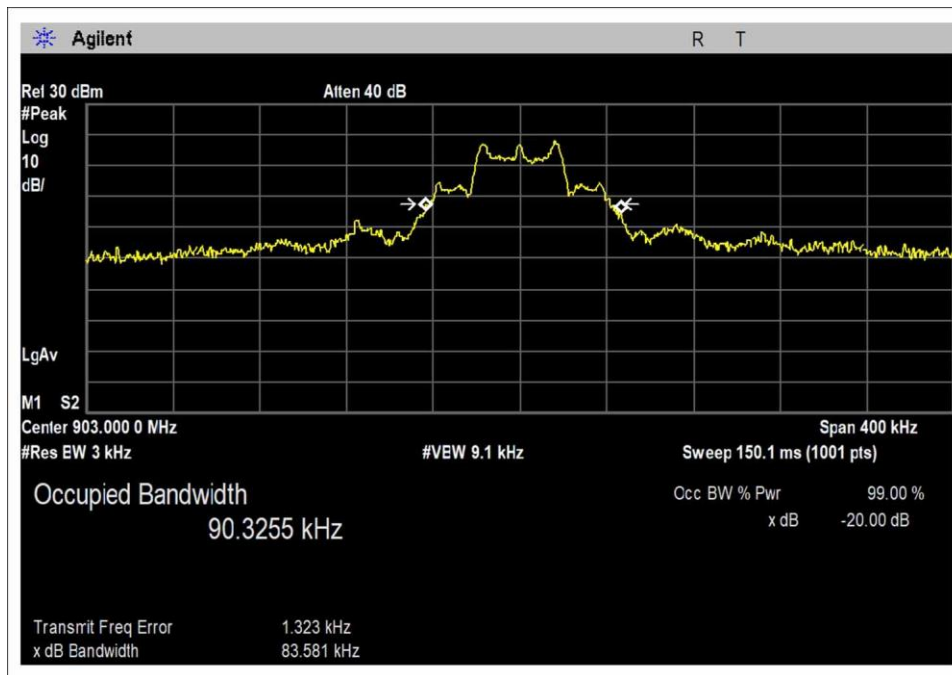
AM Low Channel



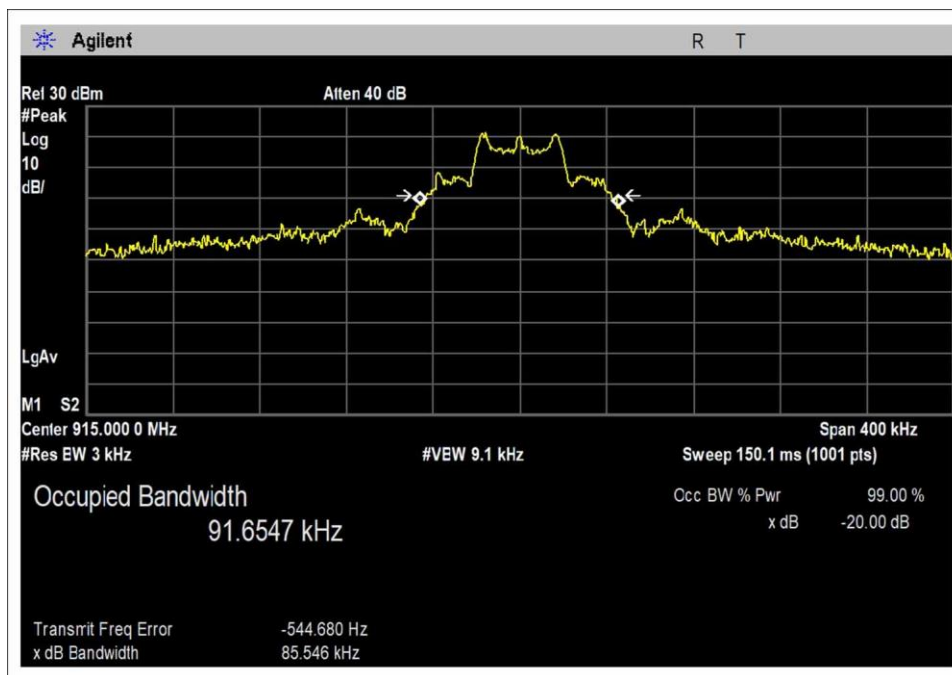
AM Middle Channel



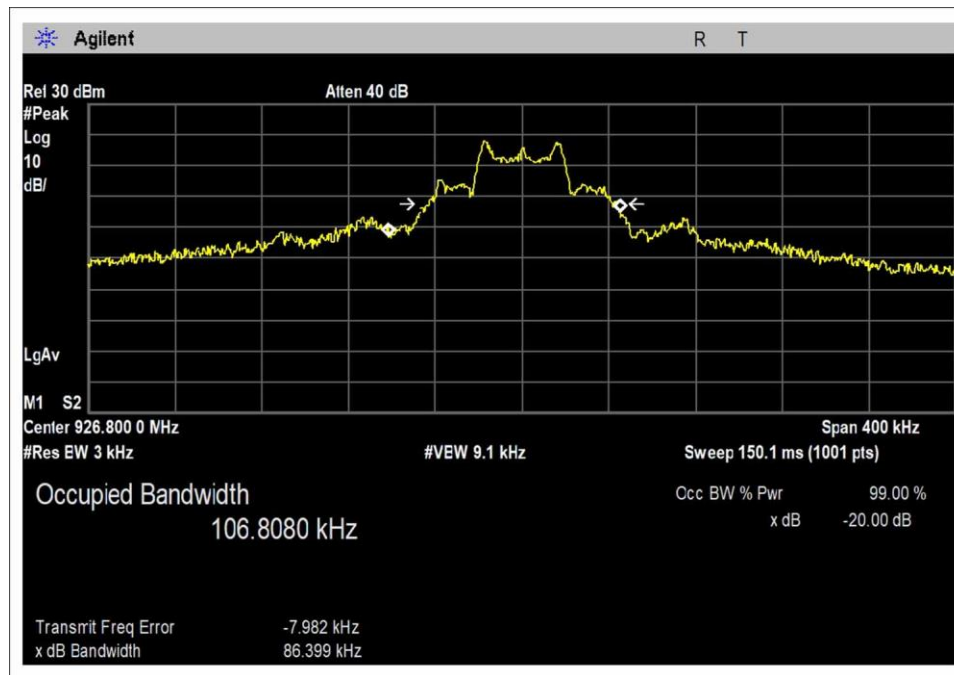
AM High Channel



FM 37.5kbps Low Channel



FM 37.5kbps Middle Channel

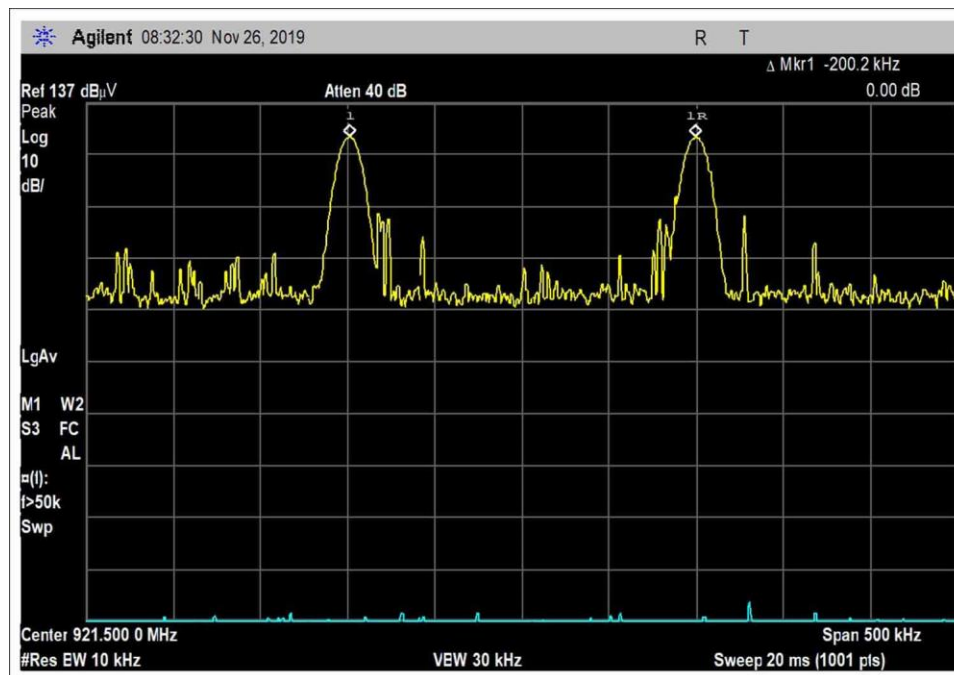


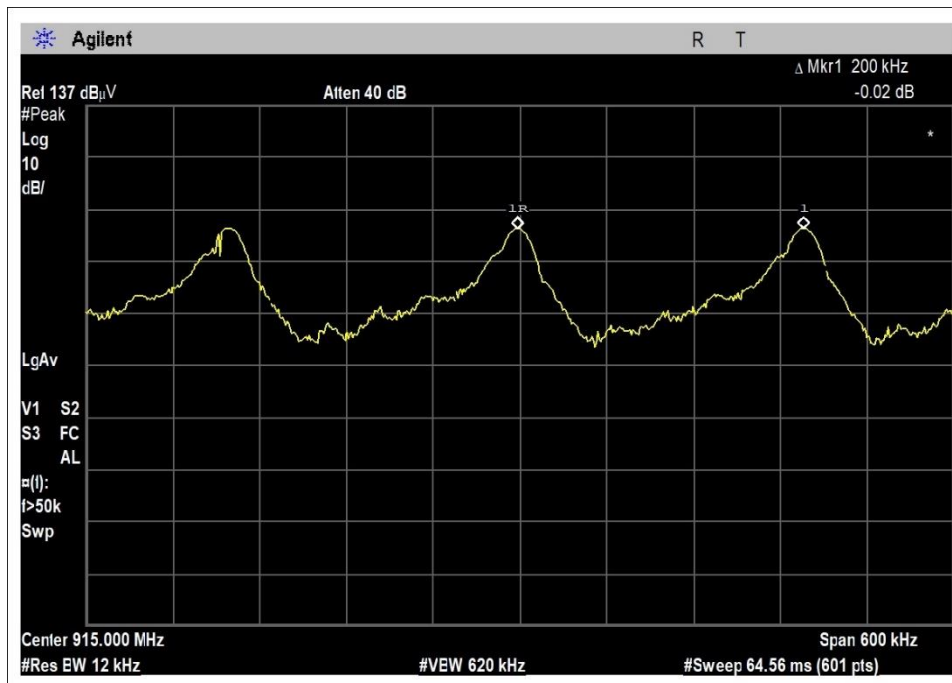
FM 37.5kbps High Channel

15.247(a)(1) Carrier Separation

Test Data Summary				
Limit applied: minimum 25kHz.				
Antenna Port	Operational Mode	Measured (kHz)	Limit (kHz)	Results
1	Transmitting, FSK Channel Plan	200.2	>25	Pass
1	Transmitting, AM Channel Plan	200.0	>25	Pass

Plot(s)

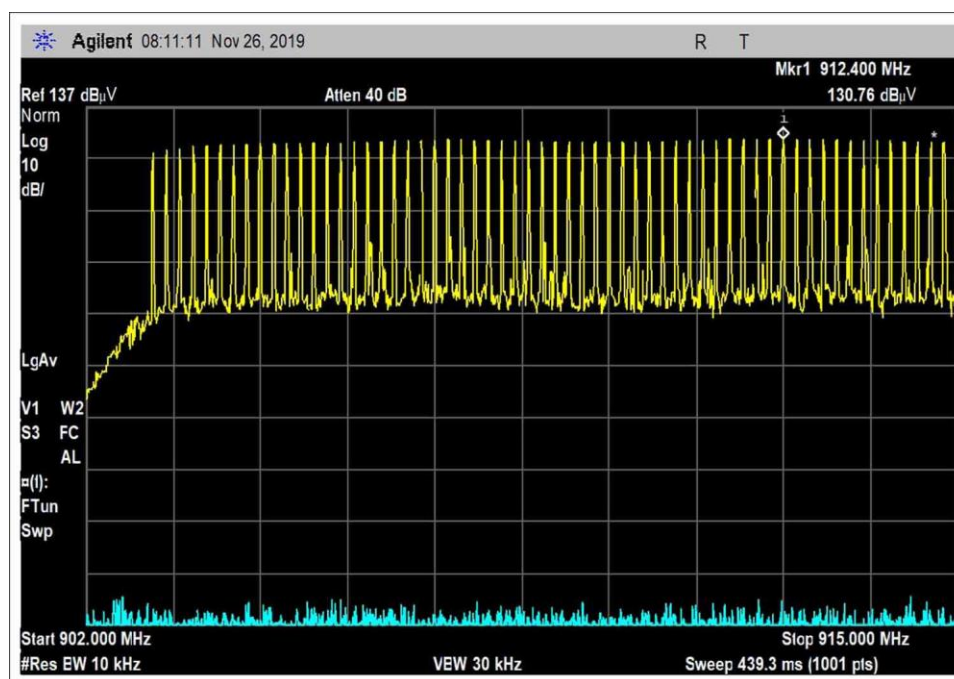


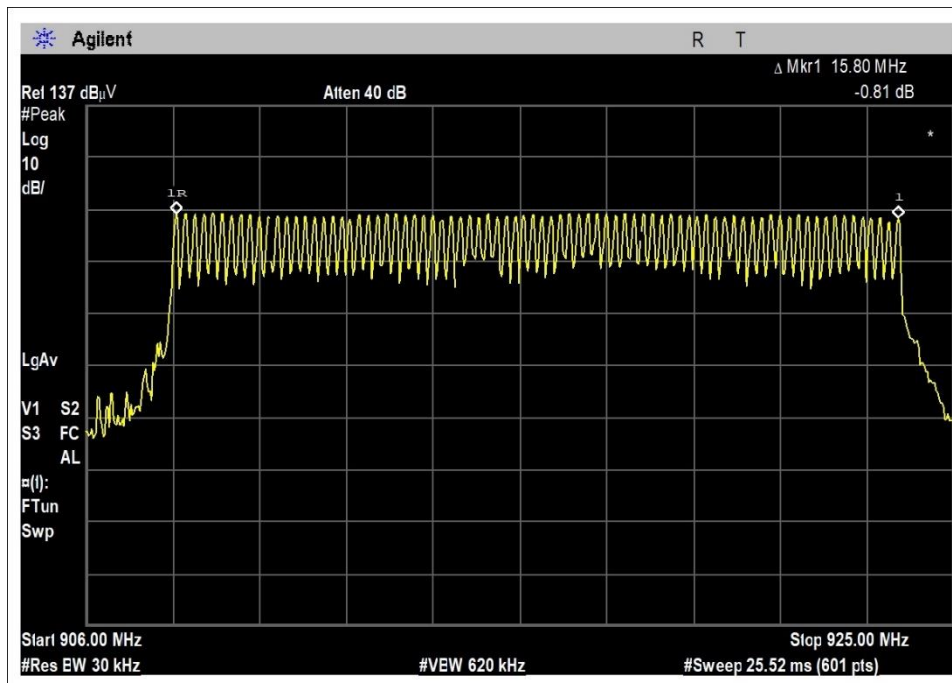
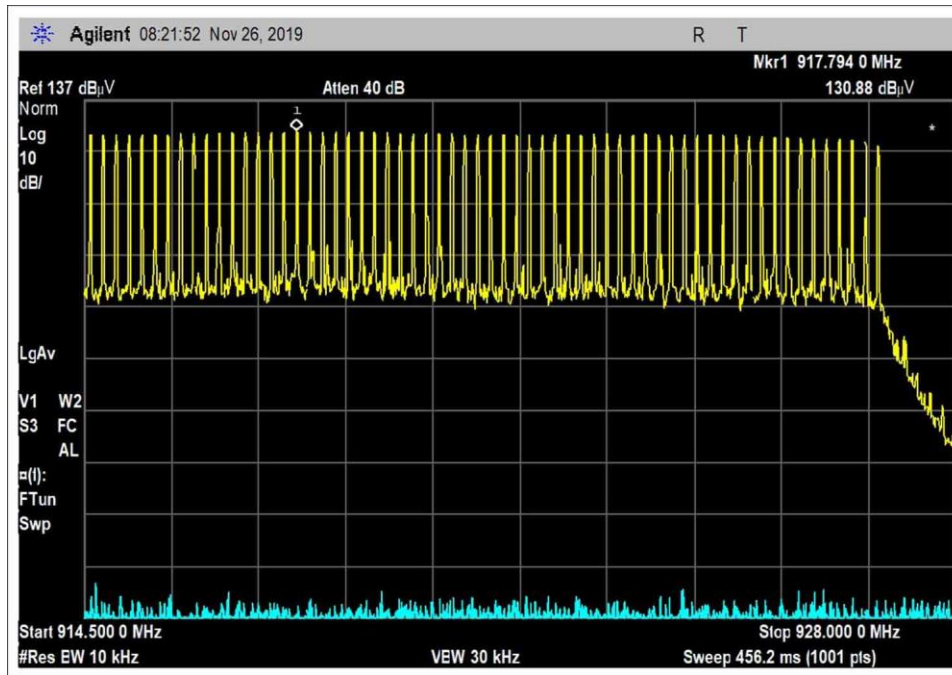


15.247(a)(1)(i) Number of Hopping Channels

Test Data Summary				
$\text{Limit} = \begin{cases} 50 \text{ Channels} & 20 \text{ dB BW} < 250 \text{ kHz} \\ 25 \text{ Channels} & 20 \text{ dB BW} \geq 250 \text{ kHz} \end{cases}$				
Antenna Port	Operational Mode	Measured (Channels)	Limit (Channels)	Results
1	Transmitting, FSK Channel Plan	120	≥ 25	Pass
1	Transmitting, AM Channel Plan	80	≥ 25	Pass

Plot(s)





Test Setup Photo(s)



15.247(b)(1) 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	FSK 12.5kbps (worst case)/ 1	28.1	28.3	28.2	0.2
915	FSK 12.5kbps (worst case)/ 1	29.7	29.7	29.7	0.0
926.8	FSK 12.5kbps (worst case)/ 1	28.0	27.9	28.0	0.1

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

Parameter Definitions:

Measurements performed at input voltage V_{Nominal} ± 15%.

Parameter	Value
V _{Nominal} :	115
V _{Minimum} :	98
V _{Maximum} :	132

Test Data Summary - RF Conducted Measurement

Configuration 1

Limit = $\begin{cases} 30\text{dBm Conducted}/36\text{dBm EIRP} & | \geq 50 \text{ Channels} \\ 24\text{dBm Conducted}/30\text{dBm EIRP} & | < 50 \text{ Channels (min 25)} \end{cases}$

Frequency (MHz)	Modulation / Ant Port	Ant. Type / Gain (dBi)	Measured (dBm)	Limit (dBm)	Results
903	FSK 12.5kbps (worst case)/ 1	Omnidirectional/5.5	28.3	≤30	Pass
915	FSK 12.5kbps (worst case)/ 1	Omnidirectional/5.5	29.7	≤30	Pass
926.8	FSK 12.5kbps (worst case)/ 1	Omnidirectional/5.5	27.9	≤30	Pass

Test Data Summary - RF Conducted Measurement

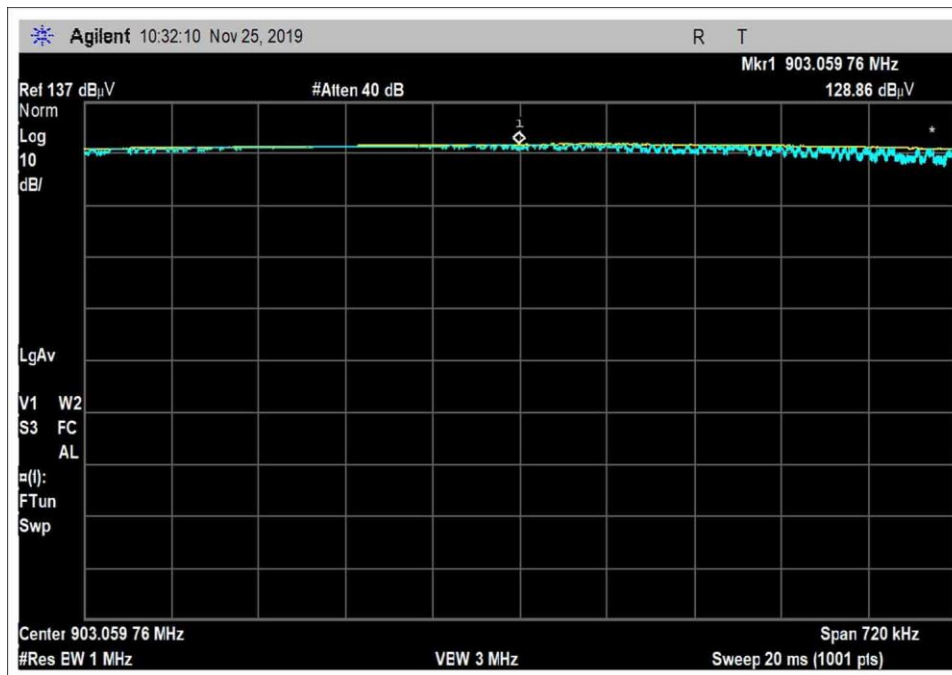
Configuration 2

Limit = $\begin{cases} 30\text{dBm Conducted}/36\text{dBm EIRP} & | \geq 50 \text{ Channels} \\ 24\text{dBm Conducted}/30\text{dBm EIRP} & | < 50 \text{ Channels (min 25)} \end{cases}$

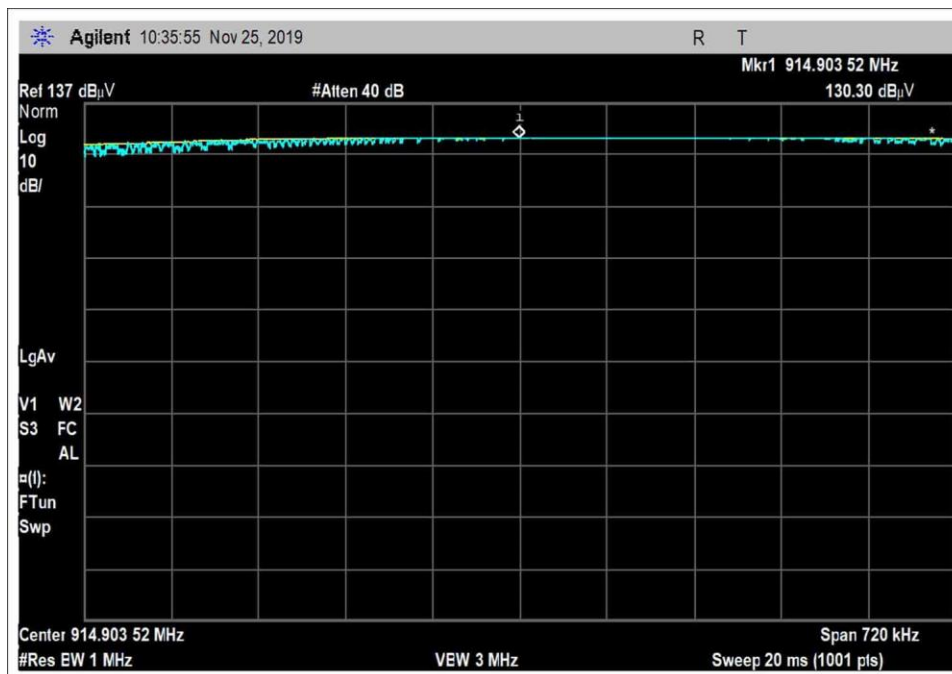
Frequency (MHz)	Modulation / Ant Port	Ant. Type / Gain (dBi)	Measured (dBm)	Limit (dBm)	Results
903	FSK 12.5kbps (worst case)/ 1	Omnidirectional/8.15*	28.3	≤30	Pass
915	FSK 12.5kbps (worst case)/ 1	Omnidirectional/8.15*	29.7	≤30	Pass
926.8	FSK 12.5kbps (worst case)/ 1	Omnidirectional/8.15*	27.9	≤30	Pass

*Manufacturer declares 2 dB of system loss via cable and attenuators to be attached before antenna

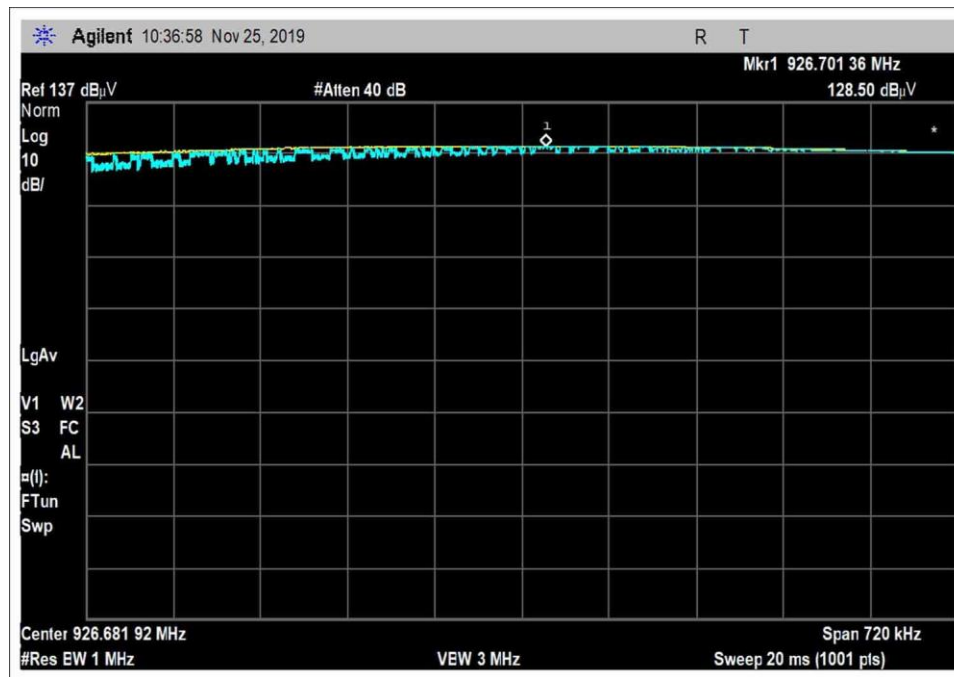
Plots



Low Channel



Middle Channel



High Channel

Test Setup / Conditions / Data

Test Location: CKC Laboratories, Inc. · 22116 23rd Dr SE · Bothell, WA 98021 · 800-500-4362
 Customer: **Itron, Inc.**
 Specification: **15.247(b) Power Output (902-928 MHz DTS)**
 Work Order #: **103221** Date: 11/25/2019
 Test Type: **Conducted Emissions** Time: 10:36:17
 Tested By: Matthew Harrison Sequence#: 19
 Software: EMITest 5.03.12 120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

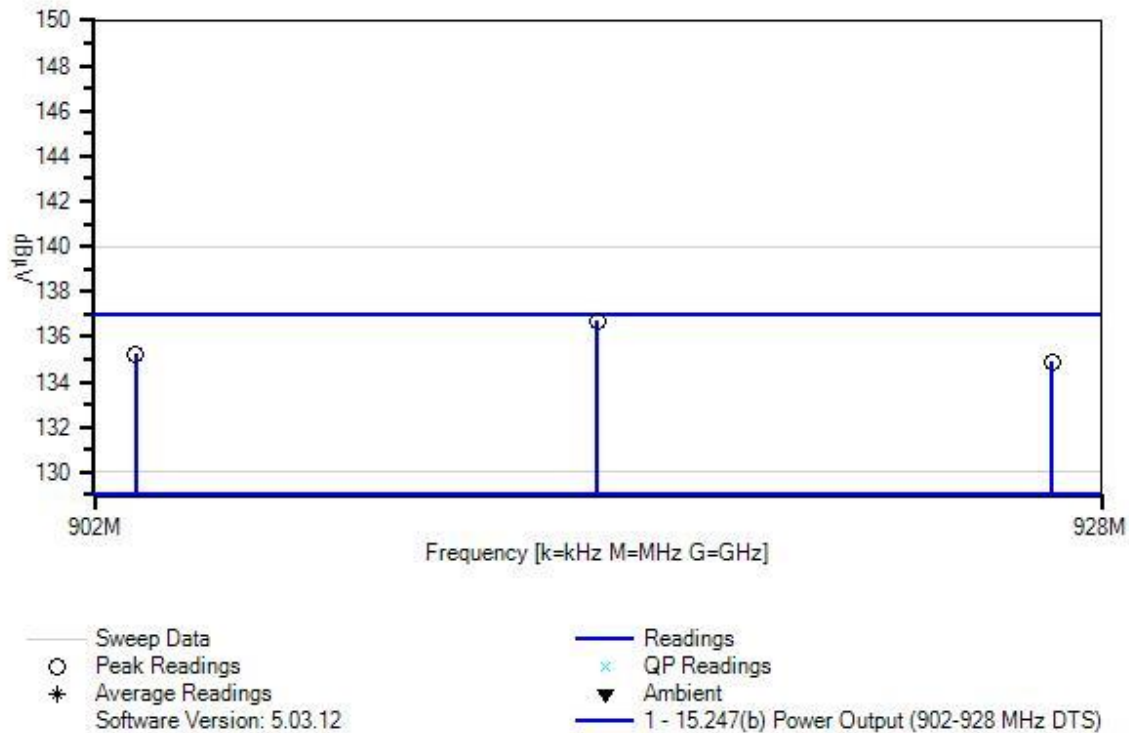
Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Temperature: 23° C Humidity: 39% Pressure: 101.1 kPa Frequency Range: 903-926.8MHz Frequency tested: 903, 915, 926.8 MHz Firmware power setting: Max Antenna type: Omnidirectional Antenna Gain: 5.5 dBi. Duty Cycle: 100% Modulated Test Method: ANSI C63.10: 2013 Test Mode: Transmitting The equipment under test (EUT) is placed on the tabletop. The output of the EUT is connected to the spectrum analyzer using a coaxial cable and attenuator. The EUT is transmitting at its rated output power. Modification #1 and #2 were in place during testing.

Itron, Inc. WO#: 103221 Sequence#: 19 Date: 11/25/2019
15.247(b) Power Output (902-928 MHz DTS) Test Lead: 120V 60Hz Antenna Port



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP07227	Attenuator	PE7004-6	10/2/2019	10/2/2021
T2	ANP05546	Cable	Helix	8/24/2018	8/24/2020
	AN02871	Spectrum Analyzer	E4440A	10/15/2019	10/15/2021

Measurement Data:

Reading listed by margin.

Test Lead: Antenna Port

#	Freq MHz	Rdng dBμV	T1 dB	T2 dB	dB	dB	Dist Table	Corr dBμV	Spec dBμV	Margin dB	Polar Ant
1	914.904M	130.3	+5.9	+0.5			+0.0	136.7	137.0	-0.3	Anten
2	903.060M	128.9	+5.9	+0.5			+0.0	135.3	137.0	-1.7	Anten
3	926.701M	128.5	+5.9	+0.5			+0.0	134.9	137.0	-2.1	Anten

Test Setup Photo(s)



15.35(c) Duty Cycle Correction Factor

Test Data Summary			
Antenna Port	Operational Mode	Declared On Time (mS / P _{obs})	Declared DCCF (dB)
1	Normal	23.8	12.5

15.247(d) RF Conducted Emissions & Band Edge

Test Setup / Conditions / Data

Test Location: CKC Laboratories, Inc. · 22116 23rd Dr SE · Bothell, WA 98021 · 800-500-4362
 Customer: **Itron, Inc.**
 Specification: **15.247(d) Conducted Spurious Emissions**
 Work Order #: **103221** Date: 11/25/2019
 Test Type: **Conducted Emissions** Time: 1:03:56 PM
 Tested By: Matthew Harrison Sequence#: 21
 Software: EMITest 5.03.12 120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

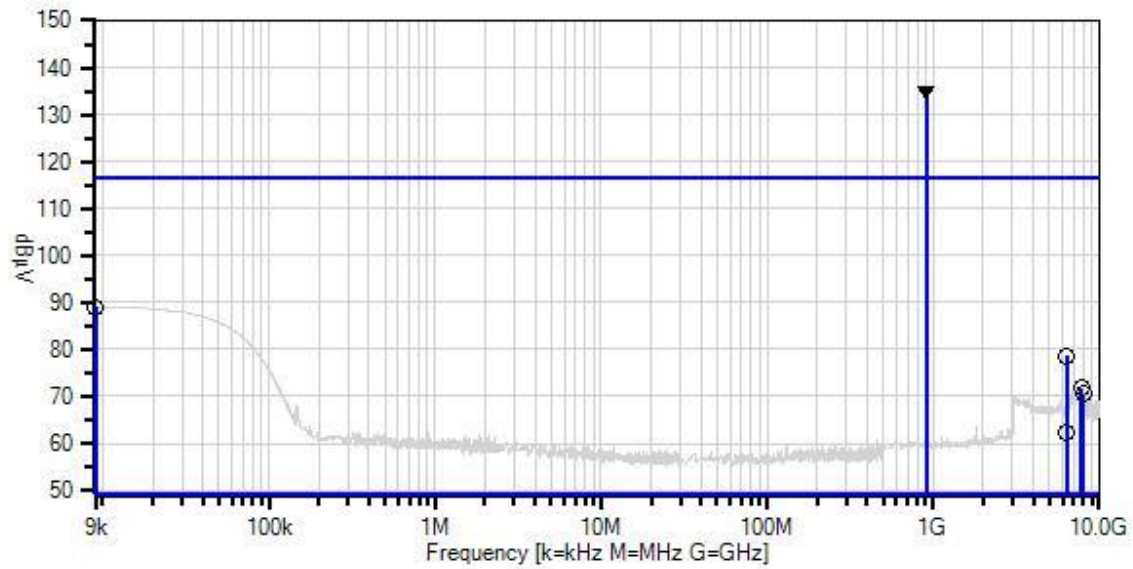
Temperature: 23° C
 Humidity: 39%
 Pressure: 101.1 kPa

Frequency Range: 9k-10GHz
 Frequency tested: Low
 Firmware power setting: Max
 Modulation: FSK 12.5, FSK 37.5, and AM investigated, overall worst case spur reported for each, otherwise FSK 12.5k is representative of worst case.

Duty Cycle: 100% Modulated

Test Method: ANSI C63.10: 2013
 Test Mode: Transmitting
 Test Setup: EUT is setup in for conducted measurements.
 Modifications #1 and #2 were in place during testing.

Itron, Inc. WD#: 103221 Sequence#: 21 Date: 11/25/2019
15.247(d) Conducted Spurious Emissions Test Lead: 120V 60Hz Antenna Port



— Sweep Data
○ Peak Readings
* Average Readings
— Readings
× QP Readings
▼ Ambient
— 1 - 15.247(d) Conducted Spurious Emissions
Software Version: 5.03.12

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP07227	Attenuator	PE7004-6	10/2/2019	10/2/2021
T2	ANP05546	Cable	Heliac	8/24/2018	8/24/2020
T3	AN02871	Spectrum Analyzer	E4440A	10/15/2019	10/15/2021

Measurement Data: Reading listed by margin.

Test Lead: Antenna Port

#	Freq MHz	Rdng dBμV	T1 dB	T2 dB	T3 dB	Dist dB	Table	Corr dBμV	Spec dBμV	Margin dB	Polar Ant
1	905.936M	128.5	+5.9	+0.5	+0.0	+0.0		134.9	116.7	+18.2	Anten
	Ambient										
2	9.000k	83.2	+5.8	+0.0	+0.0	+0.0		89.0	116.7	-27.7	Anten
3	6318.773M	70.8	+6.1	+1.8	+0.0	+0.0		78.7	116.7	-38.0	Anten
									12k FSK		
4	6319.400M	70.7	+6.1	+1.8	+0.0	+0.0		78.6	116.7	-38.1	Anten
									37.5k FSK		
5	7742.040M	63.0	+6.3	+2.5	+0.0	+0.0		71.8	116.7	-44.9	Anten
									12k FSK		
6	8001.269M	61.8	+6.3	+2.5	+0.0	+0.0		70.6	116.7	-46.1	Anten
									12k FSK		
7	6356.010M	54.4	+6.1	+1.8	+0.0	+0.0		62.3	116.7	-54.4	Anten
									AM		

Test Location: CKC Laboratories, Inc. · 22116 23rd Dr SE · Bothell, WA 98021 · 800-500-4362
 Customer: **Itron, Inc.**
 Specification: **15.247(d) Conducted Spurious Emissions**
 Work Order #: **103221** Date: 11/25/2019
 Test Type: **Conducted Emissions** Time: 1:42:19 PM
 Tested By: Matthew Harrison Sequence#: 22
 Software: EMITest 5.03.12 120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

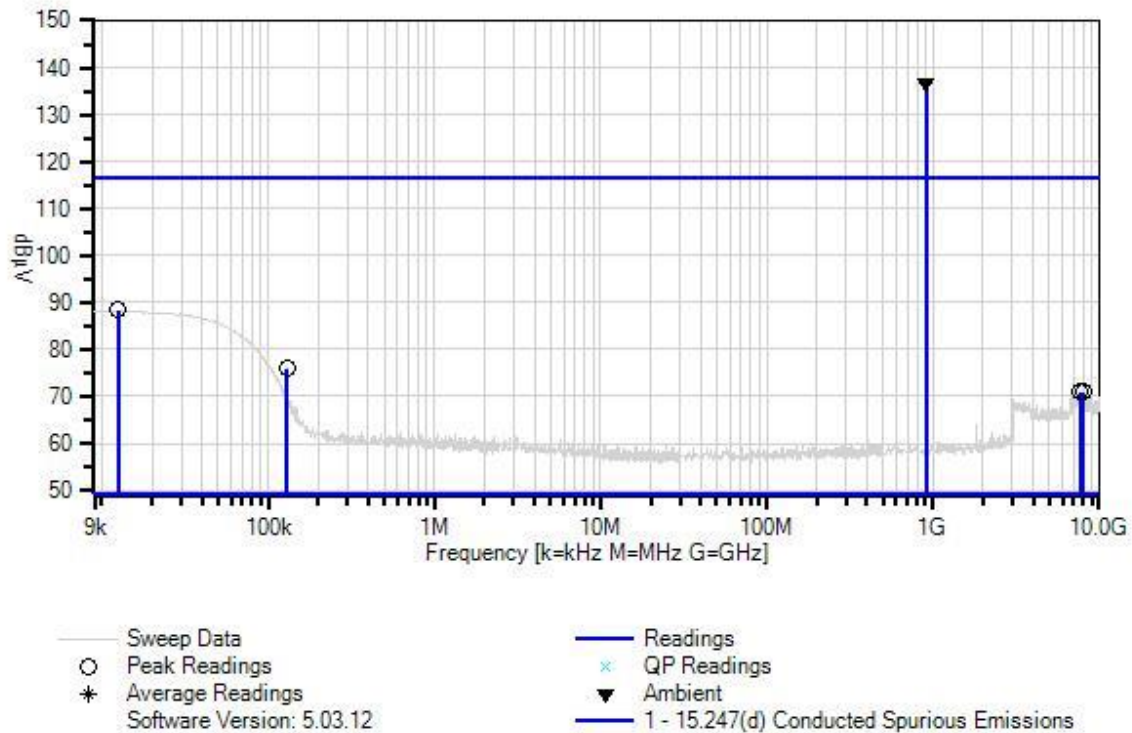
Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Temperature: 23° C Humidity: 39% Pressure: 101.1 kPa Frequency Range: 9kHz-10GHz Frequency tested: 915 MHz Firmware power setting: Max Antenna type: Omnidirectional Antenna Gain: 5.5 dBi. Duty Cycle: 100% Modulated Test Method: ANSI C63.10: 2013 Test Mode: Transmitting Test Setup: EUT is setup for conducted measurements. Modification #1 and #2 were in place during testing.

Itron, Inc. WD#: 103221 Sequence#: 22 Date: 11/25/2019
15.247(d) Conducted Spurious Emissions Test Lead: 120V 60Hz Antenna Port



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP07227	Attenuator	PE7004-6	10/2/2019	10/2/2021
T2	ANP05546	Cable	Helix	8/24/2018	8/24/2020
T3	AN02871	Spectrum Analyzer	E4440A	10/15/2019	10/15/2021

Measurement Data: Reading listed by margin.

Test Lead: Antenna Port

#	Freq MHz	Rdng dBμV	T1 dB	T2 dB	T3 dB	Dist dB	Table	Corr dBμV	Spec dBμV	Margin dB	Polar Ant
1	913.311M	130.3	+5.9	+0.5	+0.0	+0.0	136.7	116.7	+20.0	Anten	
	Ambient										
2	12.553k	82.5	+5.8	+0.0	+0.0	+0.0	88.3	116.7	-28.4	Anten	
3	130.370k	70.2	+5.8	+0.0	+0.0	+0.0	76.0	116.7	-40.7	Anten	

4	7653.547M				+0.0	+0.0	71.0	116.7	-45.7	Anten
		62.2	+6.3	+2.5						
5	7988.429M				+0.0	+0.0	71.0	116.7	-45.7	Anten
		62.2	+6.3	+2.5						

Test Location: CKC Laboratories, Inc. · 22116 23rd Dr SE · Bothell, WA 98021 · 800-500-4362
 Customer: **Itron, Inc.**
 Specification: **15.247(d) Conducted Spurious Emissions**
 Work Order #: **103221** Date: 11/25/2019
 Test Type: **Conducted Emissions** Time: 1:53:24 PM
 Tested By: Matthew Harrison Sequence#: 23
 Software: EMITest 5.03.12 120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

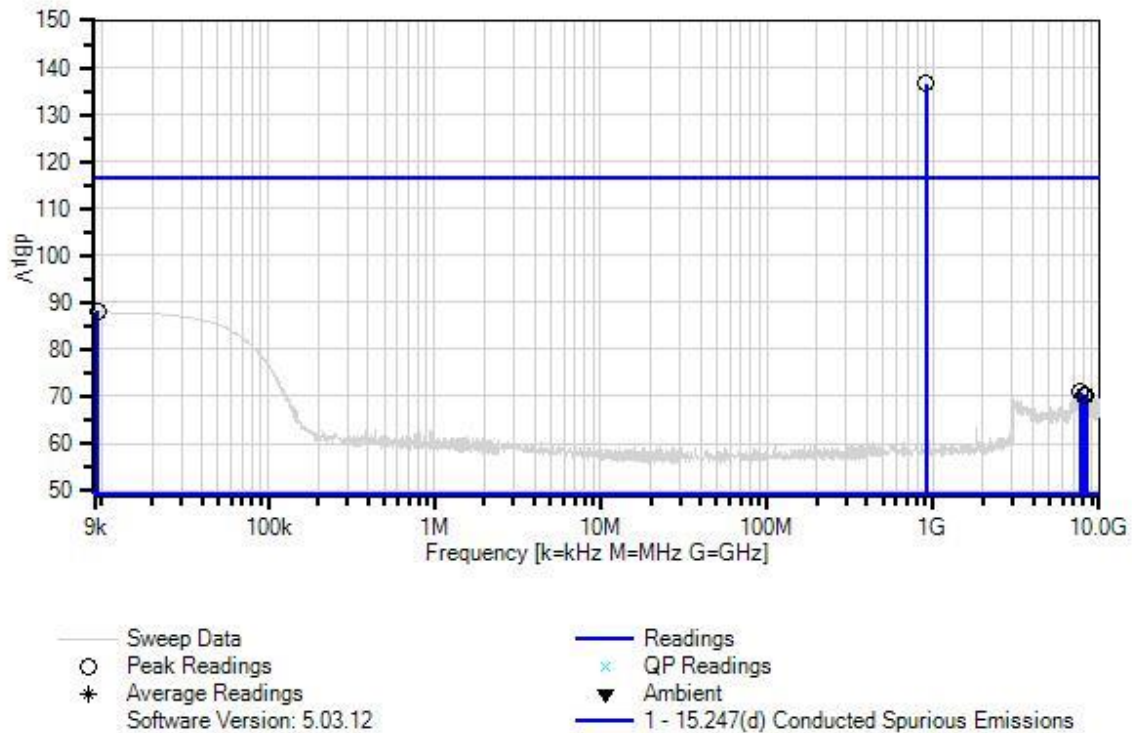
Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Temperature: 23° C Humidity: 39% Pressure: 101.1 kPa Frequency Range: 9kHz-10GHz Frequency tested: 926.8 MHz Firmware power setting: Max Antenna type: Omnidirectional Antenna Gain: 5.5 dBi. Duty Cycle: 100% Modulated Test Method: ANSI C63.10: 2013 Test Mode: Transmitting Test Setup: EUT is setup for conducted measurements. Modification #1 and #2 were in place during testing.

Itron, Inc. WD#: 103221 Sequence#: 23 Date: 11/25/2019
15.247(d) Conducted Spurious Emissions Test Lead: 120V 60Hz Antenna Port



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP07227	Attenuator	PE7004-6	10/2/2019	10/2/2021
T2	ANP05546	Cable	Helix	8/24/2018	8/24/2020
	AN02871	Spectrum Analyzer	E4440A	10/15/2019	10/15/2021

Measurement Data: Reading listed by margin.

Test Lead: Antenna Port

#	Freq MHz	Rdng dBμV	T1 dB	T2 dB	dB	dB	Dist Table	Corr dBμV	Spec dBμV	Margin dB	Polar Ant
1	913.311M	130.2	+5.9	+0.5			+0.0	136.6	116.7	+19.9	Anten
2	9.410k	82.3	+5.8	+0.0			+0.0	88.1	116.7	-28.6	Anten
3	7734.665M	62.2	+6.3	+2.5			+0.0	71.0	116.7	-45.7	Anten

4	8022.669M				+0.0	70.4	116.7	-46.3	Anten
		61.6	+6.3	+2.5					
5	8288.025M				+0.0	70.4	116.7	-46.3	Anten
		61.6	+6.3	+2.5					

Test Location: CKC Laboratories, Inc. · 22116 23rd Dr SE · Bothell, WA 98021 · 800-500-4362
 Customer: **Itron, Inc.**
 Specification: **15.247(d) Conducted Spurious Emissions**
 Work Order #: **103221** Date: 12/13/2019
 Test Type: **Conducted Emissions** Time: 09:47:11
 Tested By: Michael Atkinson Sequence#: 34
 Software: EMITest 5.03.12 120V 60Hz

Equipment Tested:

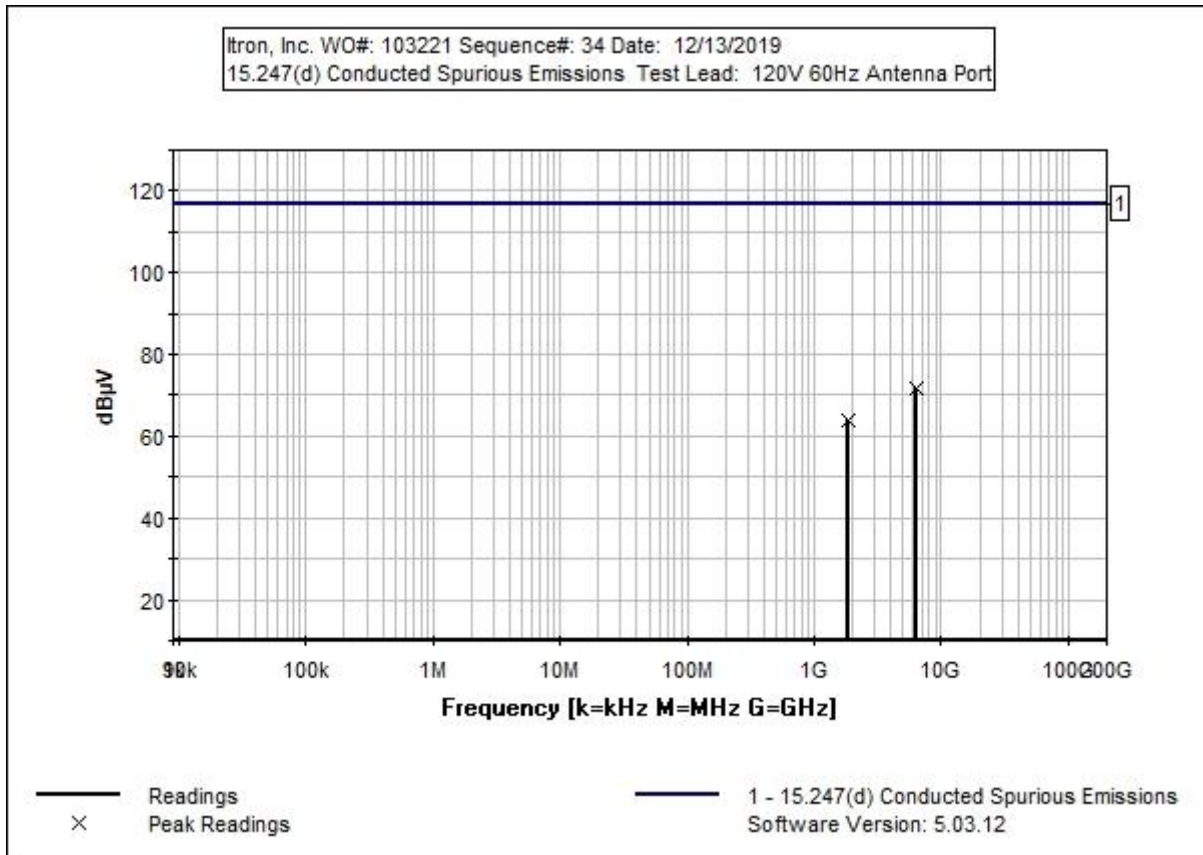
Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Temperature: 23° C Humidity: 39% Pressure: 101.1 kPa Frequency Range: 9kHz-10GHz Frequency tested: Hopping Firmware power setting: Max Duty Cycle: 100% Modulated Test Method: ANSI C63.10: 2013 Test Mode: Transmitting Test Setup: EUT is setup for conducted measurements. Modification #1 and #2 were in place during testing.
--



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP07227	Attenuator	PE7004-6	10/2/2019	10/2/2021
T2	ANP05546	Cable	Helix	8/24/2018	8/24/2020
	AN02871	Spectrum Analyzer	E4440A	10/15/2019	10/15/2021

Measurement Data: Reading listed by margin.

Test Lead: Antenna Port

#	Freq MHz	Rdng dBμV	T1 dB	T2 dB	Dist dB	Corr dB	Spec dBμV	Margin dB	Polar Ant
1	6341.410M	63.7	+6.1	+1.8	+0.0	71.6	116.7	-45.1	Anten
2	1836.190M	57.0	+5.9	+0.9	+0.0	63.8	116.7	-52.9	Anten

Band Edge

Band Edge Summary

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

Operating Mode: Single Channel (Low and High)

Frequency (MHz)	Modulation	Measured (dBm)	Limit (dBm)	Results
902	FM 12.5k	-8.8	<9.7	Pass
928	FM 12.5k	-22	<9.7	Pass
902	FM 37.5k	-12.3	<9.7	Pass
928	FM 37.5k	-25.2	<9.7	Pass
902	AM	-24	<9.7	Pass
928	AM	-26.6	<9.7	Pass

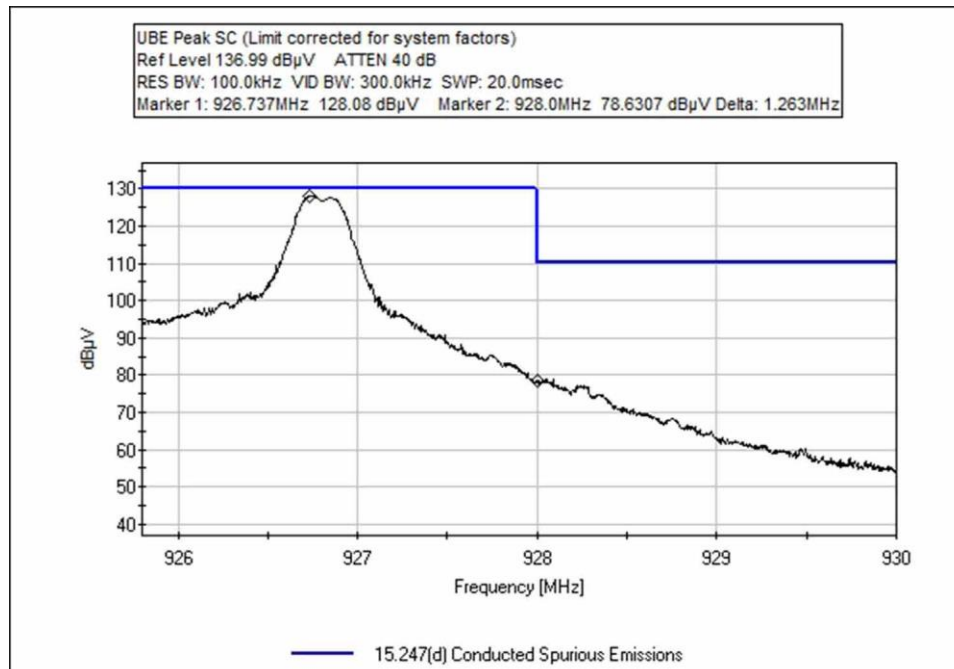
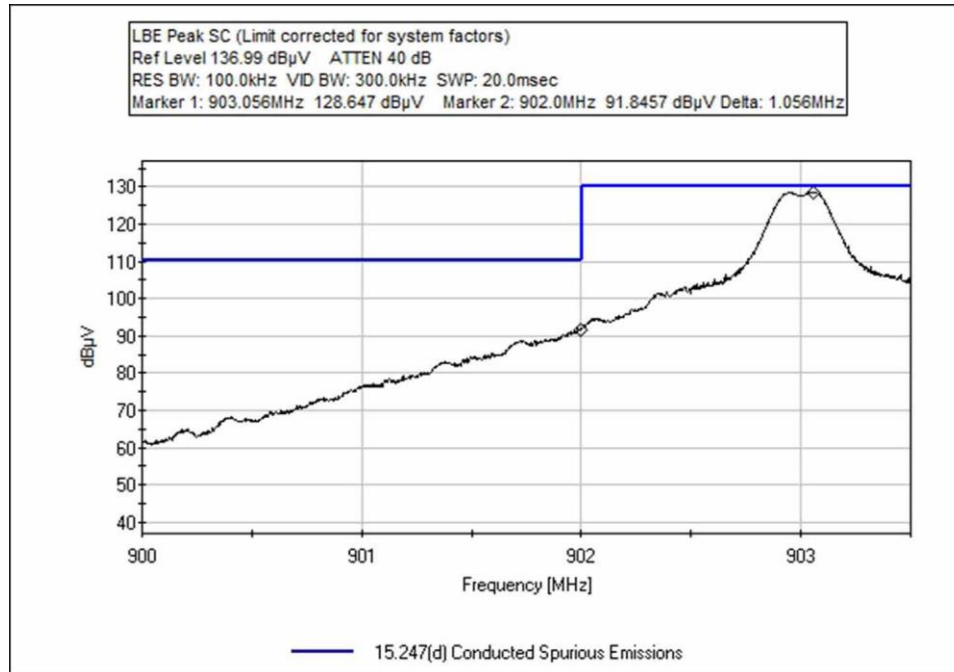
Band Edge Summary

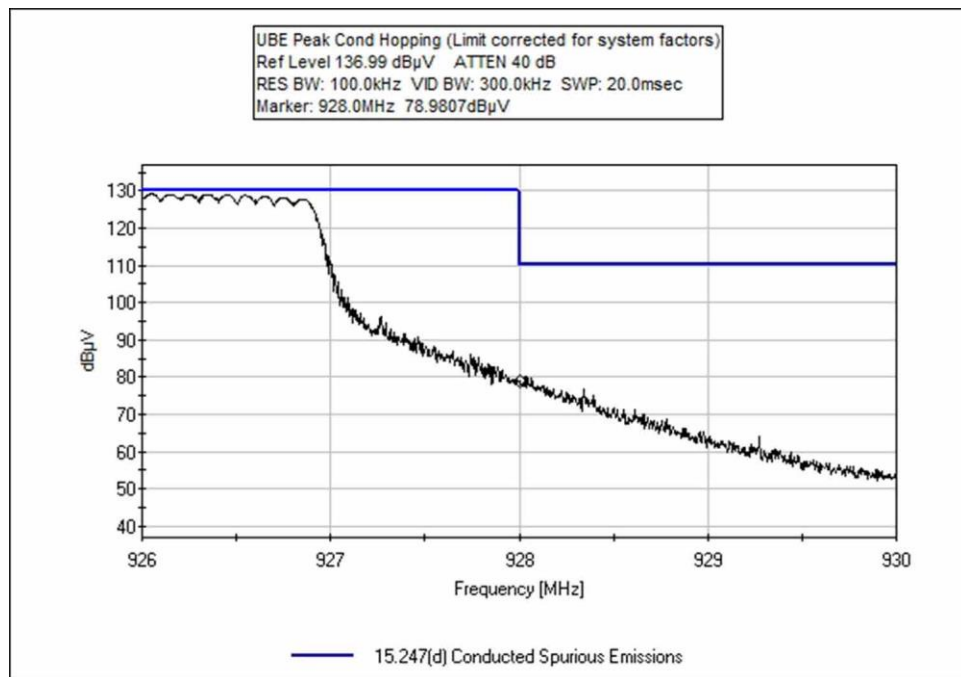
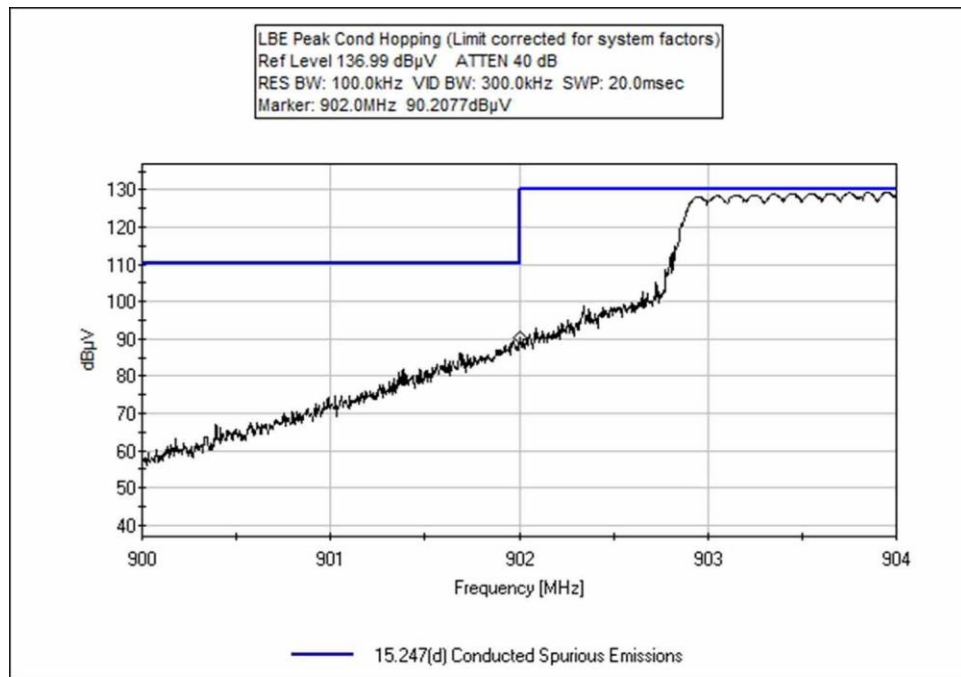
Limit applied: Max Power/100kHz - 20dB.

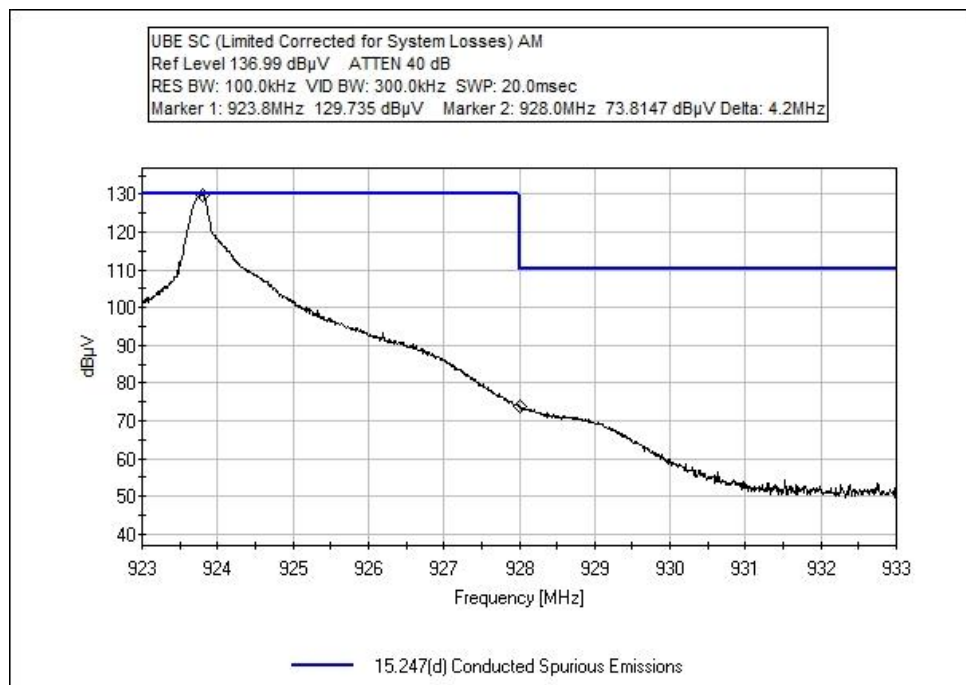
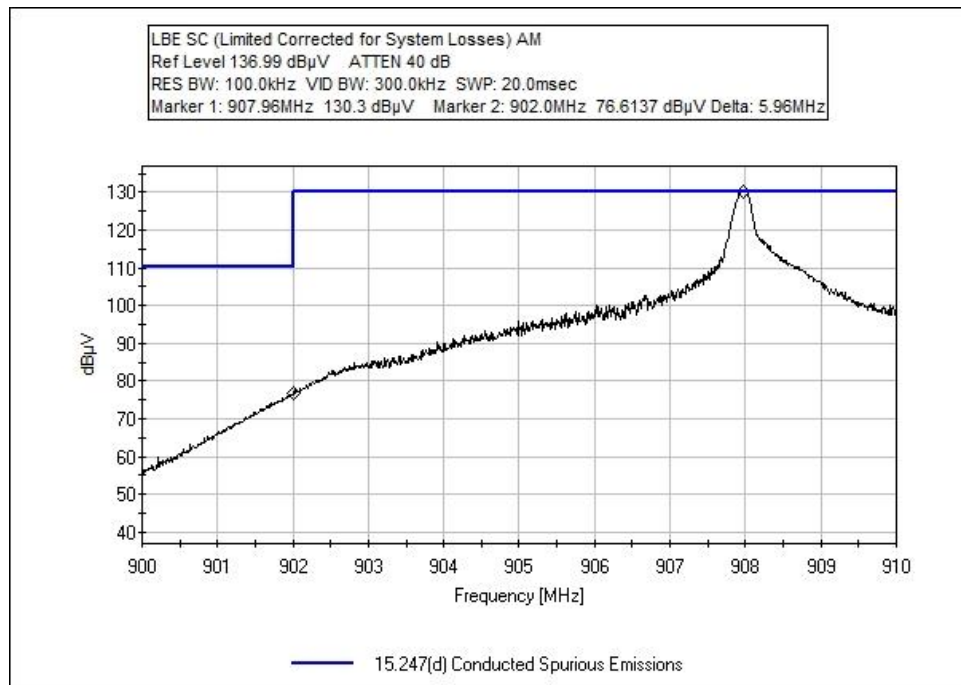
Operating Mode: Hopping

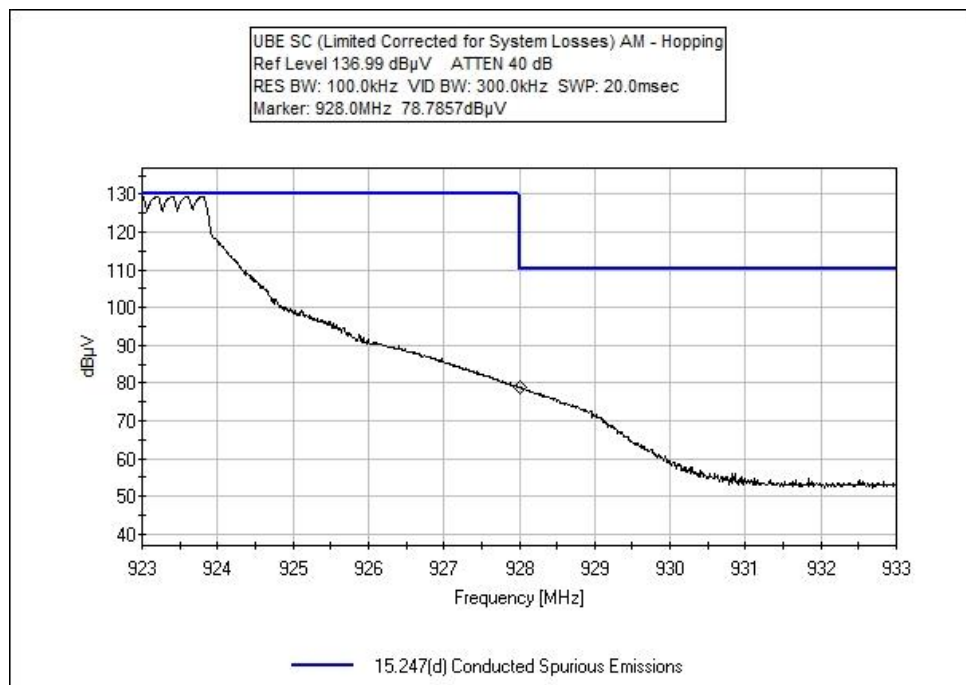
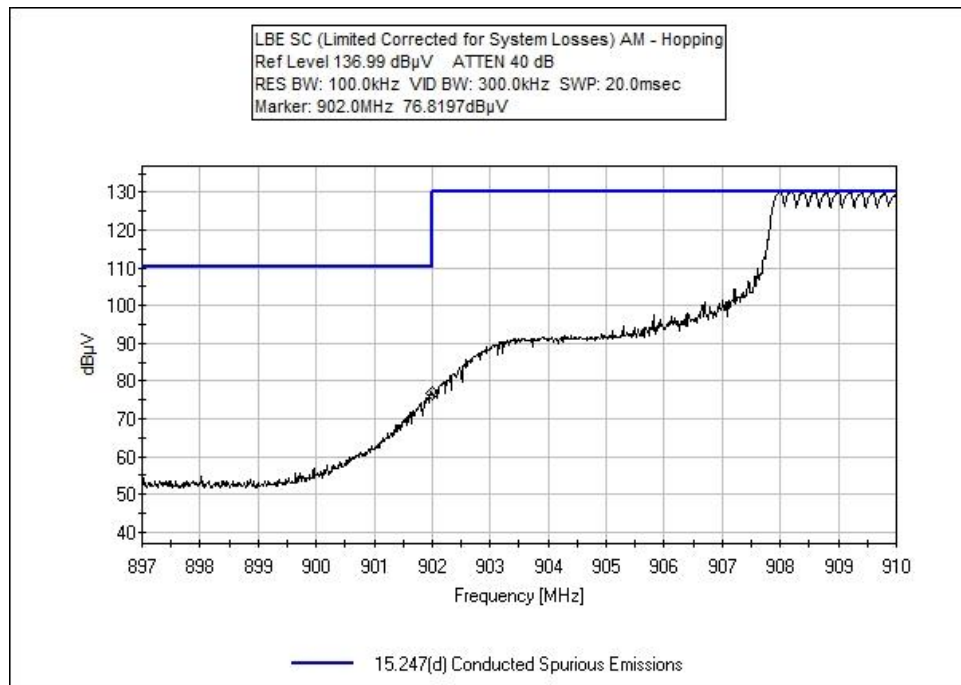
Frequency (MHz)	Modulation	Measured (dBm)	Limit (dBm)	Results
902	FM 12.5k	-10.4	<9.7	Pass
928	FM 12.5k	-21.6	<9.7	Pass
902	FM 37.5k	-13.9	<9.7	Pass
928	FM 37.5k	-26.4	<9.7	Pass
902	AM	-23.8	<9.7	Pass
928	AM	-21.8	<9.7	Pass

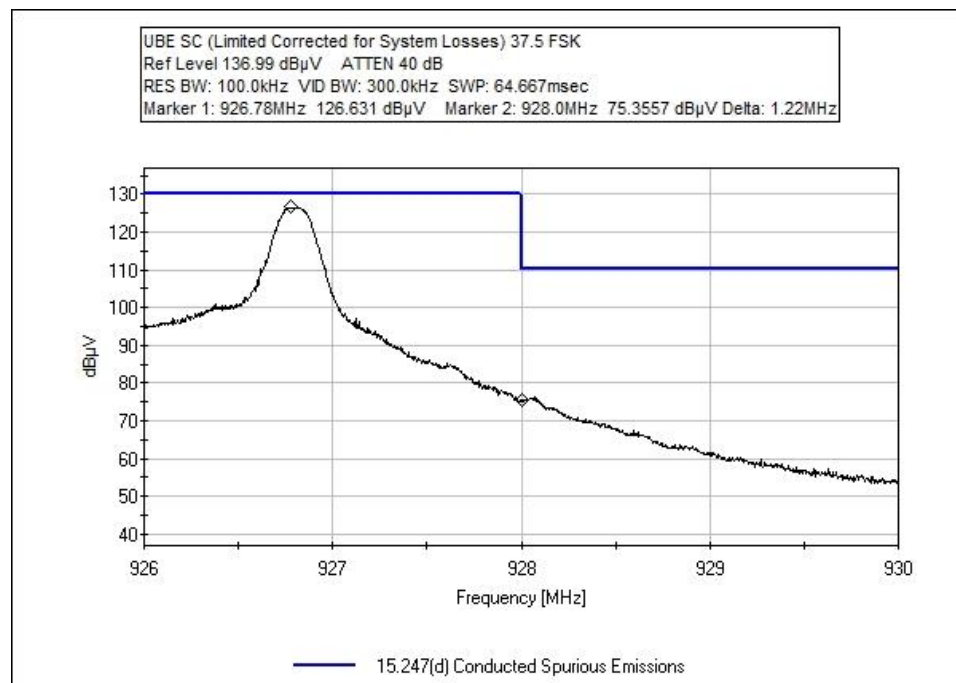
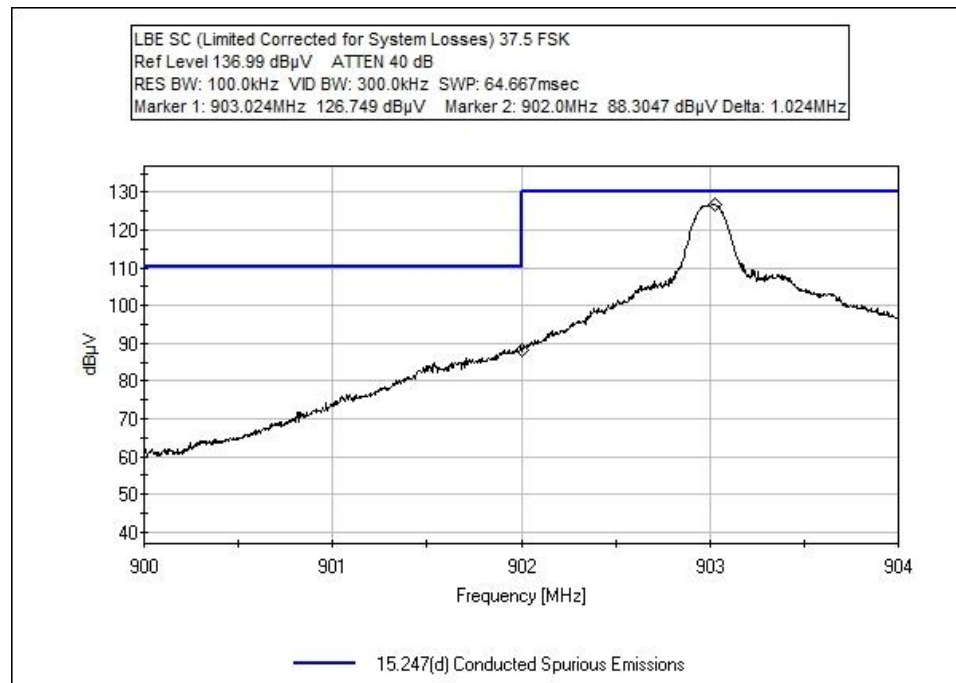
Band Edge Plots

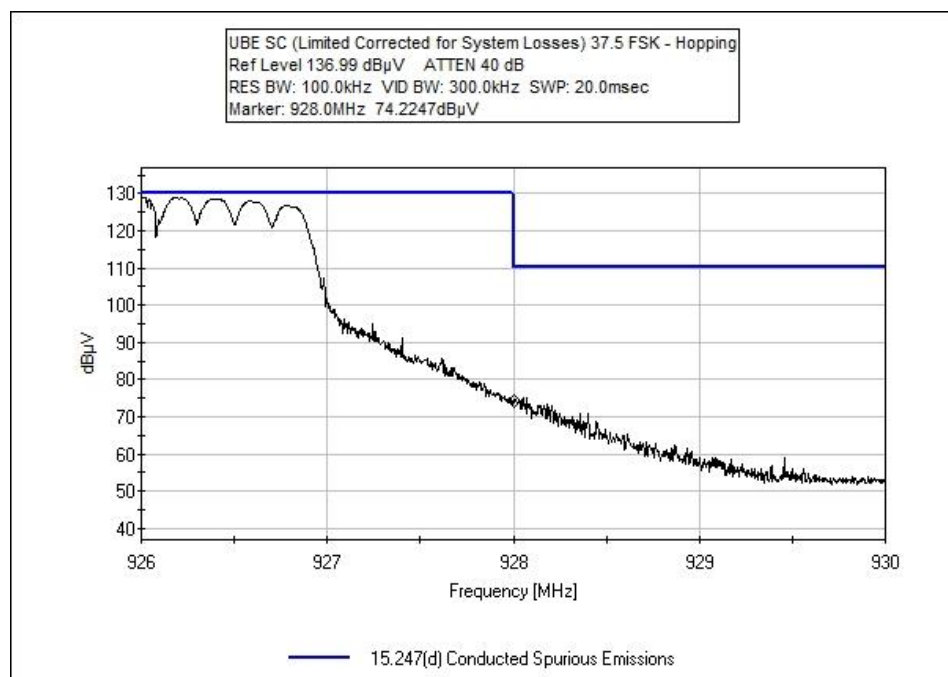
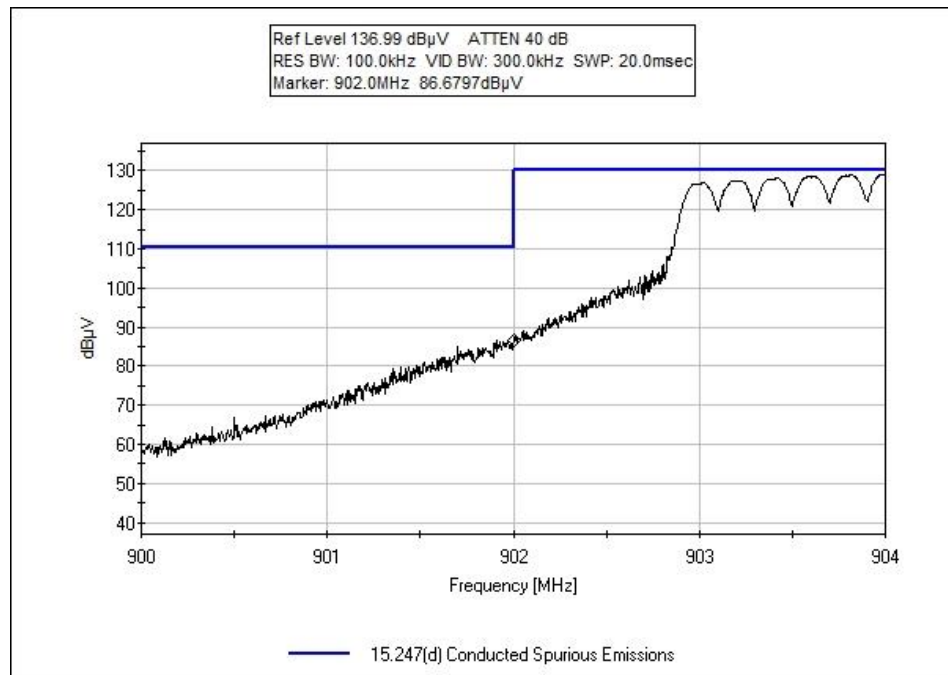












Test Setup / Conditions / Data

Test Location: CKC Laboratories, Inc. · 22116 23rd Dr SE · Bothell, WA 98021 · 800-500-4362
 Customer: **Itron, Inc.**
 Specification: **15.247(d) Conducted Spurious Emissions**
 Work Order #: **103221** Date: 12/13/2019
 Test Type: **Conducted Emissions** Time: 09:38:08
 Tested By: Michael Atkinson Sequence#: 24
 Software: EMITest 5.03.12 120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

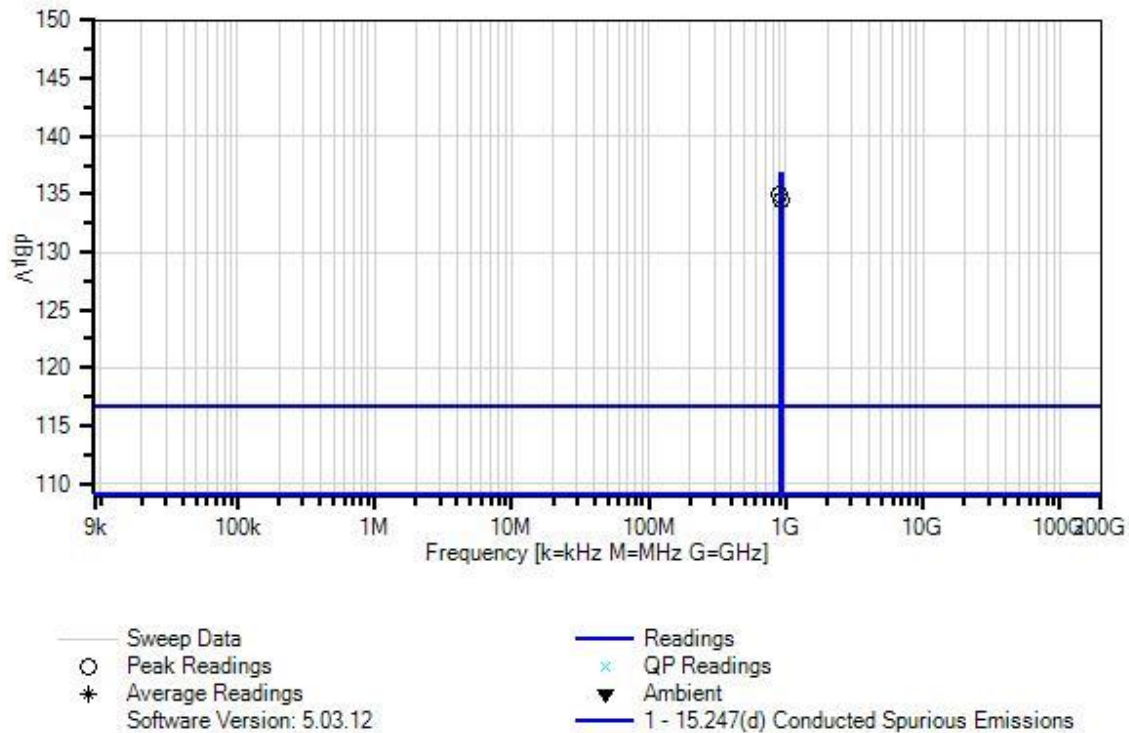
Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Temperature: 23° C Humidity: 39% Pressure: 101.1 kPa Frequency Range: 900-930MHz Frequency tested: 903, 926.8 MHz Firmware power setting: Max Modulation: FSK 12.5k Duty Cycle: 100% Modulated Test Method: ANSI C63.10: 2013 Test Mode: Transmitting Test Setup: EUT is setup in for conducted measurements. Modification #1 and #2 were in place during testing.

Itron, Inc. WD#: 103221 Sequence#: 24 Date: 12/13/2019
15.247(d) Conducted Spurious Emissions Test Lead: 120V 60Hz Antenna Port



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP07227	Attenuator	PE7004-6	10/2/2019	10/2/2021
T2	ANP05546	Cable	Helix	8/24/2018	8/24/2020
T3	AN02871	Spectrum Analyzer	E4440A	10/15/2019	10/15/2021

Measurement Data: Reading listed by margin.

Test Lead: Antenna Port

#	Freq MHz	Rdng dBμV	T1 dB	T2 dB	T3 dB	Dist dB	Table	Corr dBμV	Spec dBμV	Margin dB	Polar Anten
1	903.056M	128.6	+5.9	+0.5	+0.0	+0.0		135.0	136.7	-1.7	Anten
2	926.737M	128.1	+5.9	+0.5	+0.0	+0.0		134.5	136.7	-2.2	Anten
3	902.000M	91.8	+5.9	+0.5	+0.0	+0.0		98.2	116.7	-18.5	Anten

4	902.000M				+0.0	+0.0	96.6	116.7	-20.1	Anten
		90.2	+5.9	+0.5						
								Hopping		
5	928.000M				+0.0	+0.0	85.4	116.7	-31.3	Anten
		79.0	+5.9	+0.5						
								Hopping		
6	928.000M				+0.0	+0.0	85.0	116.7	-31.7	Anten
		78.6	+5.9	+0.5						

Test Location: CKC Laboratories, Inc. · 22116 23rd Dr SE · Bothell, WA 98021 · 800-500-4362
 Customer: **Itron, Inc.**
 Specification: **15.247(d) Conducted Spurious Emissions**
 Work Order #: **103221** Date: 4/29/2020
 Test Type: **Conducted Emissions** Time: 15:24:27
 Tested By: Michael Atkinson Sequence#: 24
 Software: EMITest 5.03.12 120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

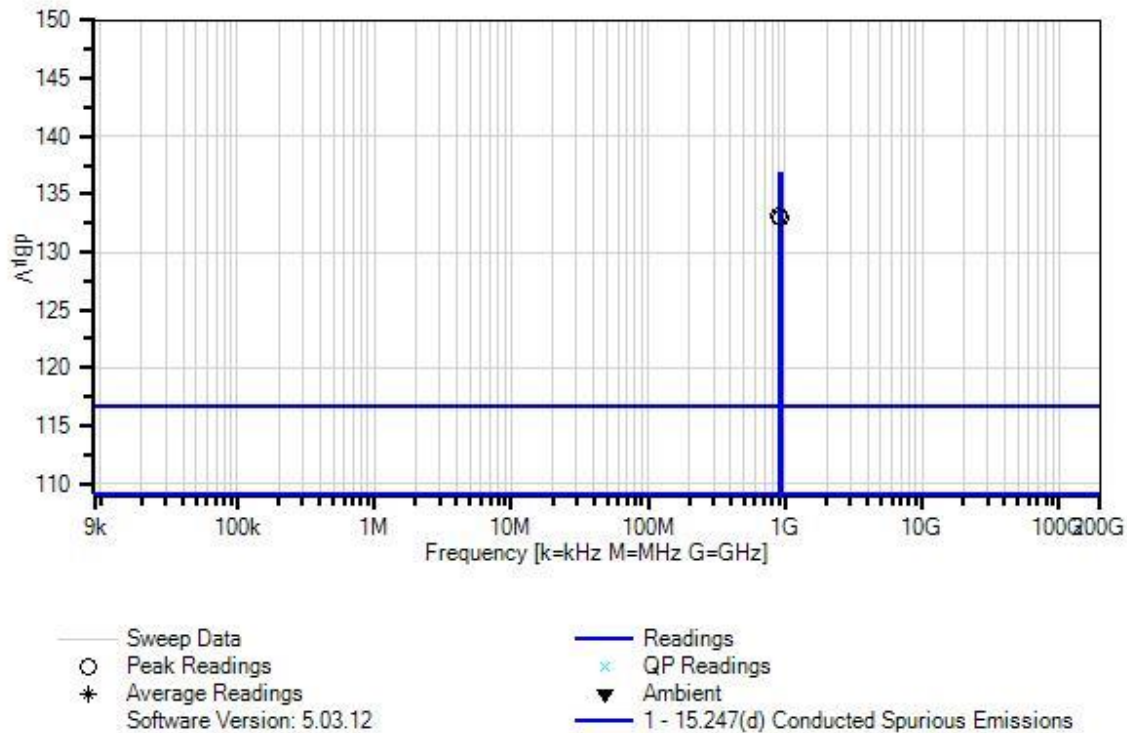
Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Temperature: 23° C Humidity: 39% Pressure: 101.1 kPa Frequency Range: 900-930MHz Frequency tested: 903, 926.8 MHz Firmware power setting: Max Modulation: FSK 37.5k Duty Cycle: 100% Modulated Test Method: ANSI C63.10: 2013 Test Mode: Transmitting Test Setup: EUT is setup in for conducted measurements. Modification #1 and #2 were in place during testing.

Itron, Inc. WD#: 103221 Sequence#: 24 Date: 4/29/2020
15.247(d) Conducted Spurious Emissions Test Lead: 120V 60Hz Antenna Port



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP07227	Attenuator	PE7004-6	10/2/2019	10/2/2021
T2	ANP05546	Cable	Helix	8/24/2018	8/24/2020
T3	AN02871	Spectrum Analyzer	E4440A	10/15/2019	10/15/2021

Measurement Data: Reading listed by margin.

Test Lead: Antenna Port

#	Freq MHz	Rdng dBμV	T1 dB	T2 dB	T3 dB	Dist dB	Table	Corr dBμV	Spec dBμV	Margin dB	Polar Ant
1	903.024M	126.7	+5.9	+0.5	+0.0	+0.0		133.1	136.7	-3.6	Anten
2	926.780M	126.6	+5.9	+0.5	+0.0	+0.0		133.0	136.7	-3.7	Anten
3	902.000M	88.3	+5.9	+0.5	+0.0	+0.0		94.7	116.7	-22.0	Anten

4	902.000M	86.7	+5.9	+0.5	+0.0	+0.0	93.1	116.7	-23.6	Anten
Hopping										
5	928.000M	75.4	+5.9	+0.5	+0.0	+0.0	81.8	116.7	-34.9	Anten
Hopping										
6	928.000M	74.2	+5.9	+0.5	+0.0	+0.0	80.6	116.7	-36.1	Anten
Hopping										

Test Location: CKC Laboratories, Inc. · 22116 23rd Dr SE · Bothell, WA 98021 · 800-500-4362

Customer: **Itron, Inc.**

Specification: **15.247(d) Conducted Spurious Emissions**

Work Order #: **103221**

Date: 4/29/2020

Test Type: **Conducted Emissions**

Time: 15:50:02

Tested By: Michael Atkinson

Sequence#: 25

Software: EMITest 5.03.12

120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Temperature: 23° C

Humidity: 39%

Pressure: 101.1 kPa

Frequency Range: 900-930MHz

Frequency tested: 908, 923.8 MHz

Firmware power setting: Max

Modulation: AM

Duty Cycle: 100% Modulated

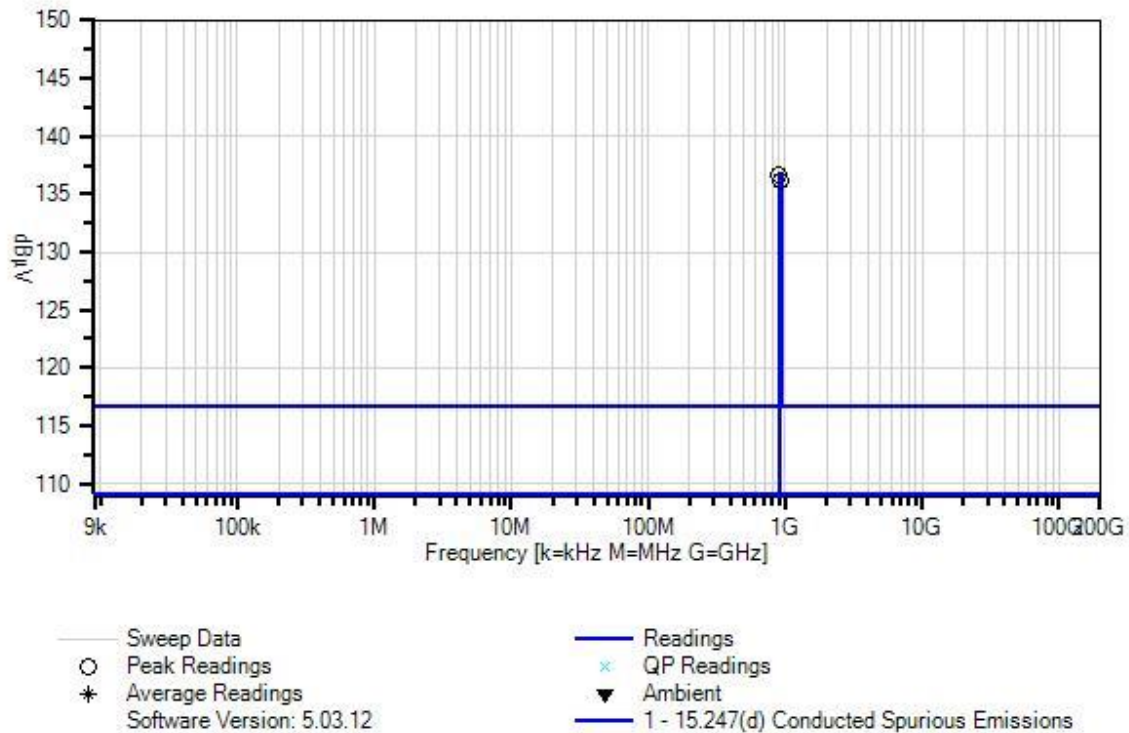
Test Method: ANSI C63.10: 2013

Test Mode: Transmitting

Test Setup: EUT is setup in for conducted measurements.

Modification #1 and #2 were in place during testing.

Itron, Inc. WD#: 103221 Sequence#: 25 Date: 4/29/2020
15.247(d) Conducted Spurious Emissions Test Lead: 120V 60Hz Antenna Port



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP07227	Attenuator	PE7004-6	10/2/2019	10/2/2021
T2	ANP05546	Cable	Helix	8/24/2018	8/24/2020
T3	AN02871	Spectrum Analyzer	E4440A	10/15/2019	10/15/2021

Measurement Data: Reading listed by margin.

Test Lead: Antenna Port

#	Freq MHz	Rdng dBμV	T1 dB	T2 dB	T3 dB	Dist dB	Table	Corr dBμV	Spec dBμV	Margin dB	Polar Ant
1	907.960M	130.3	+5.9	+0.5	+0.0	+0.0		136.7	136.7	+0.0	Anten
2	923.800M	129.7	+5.9	+0.5	+0.0	+0.0		136.1	136.7	-0.6	Anten
3	928.000M	78.8	+5.9	+0.5	+0.0	+0.0		85.2	116.7	-31.5	Anten
Hopping											

4	902.000M	76.8	+5.9	+0.5	+0.0	+0.0	83.2	116.7	-33.5	Anten
Hopping										
5	902.000M	76.6	+5.9	+0.5	+0.0	+0.0	83.0	116.7	-33.7	Anten
6	928.000M	74.0	+5.9	+0.5	+0.0	+0.0	80.4	116.7	-36.3	Anten

Test Setup Photo(s)



15.247(d) Radiated Emissions & Band Edge

Test Setup / Conditions / Data

Test Location: CKC Laboratories, Inc. · 22116 23rd Dr SE · Bothell, WA 98021 · 800-500-4362
 Customer: **Itron, Inc.**
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**
 Work Order #: **103221** Date: 4/29/2020
 Test Type: **Radiated Scan** Time: 16:17:40
 Tested By: Matthew Harrison Sequence#: 11
 Software: EMITest 5.03.12

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Temperature: 23° C
 Humidity: 39%
 Pressure: 101.1 kPa

Frequency Range: 9kHz-10GHz
 Frequency tested: Low, Mid High
 Firmware power setting: Max
 Modulation: FSK 12.5, FSK 37.5, and AM investigated, overall worst case reported. Worst case spur for each modulation type noted in table. This antenna configuration also worst produced worst case spurs compared to 8.15dBi configuration.

Antenna type: Omnidirectional
 Antenna Gain: 5.5 dBi.

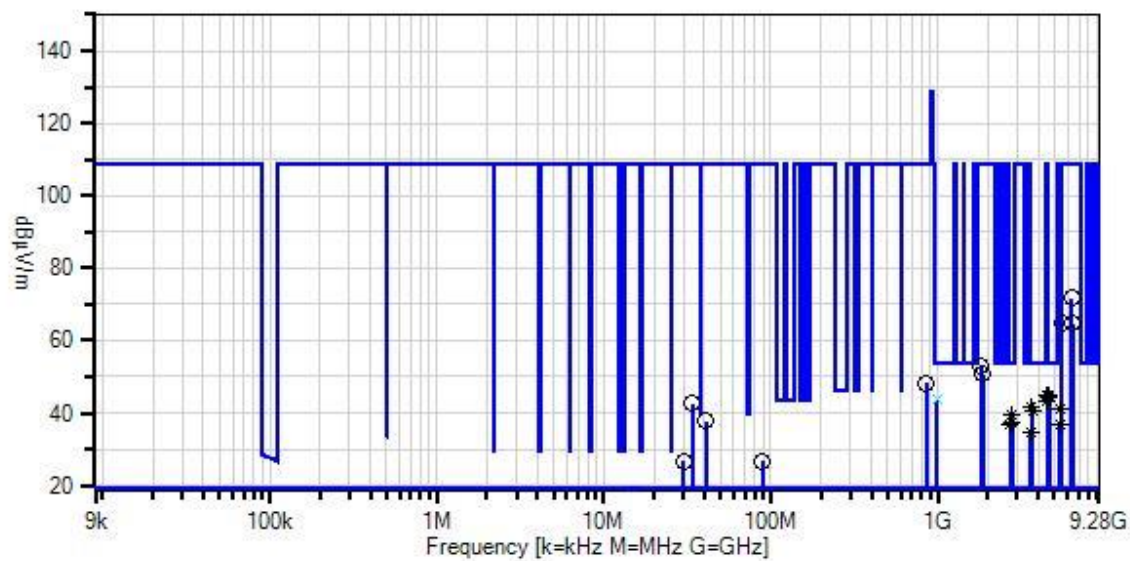
Duty Cycle: 100% Modulated

Test Method: ANSI C63.10: 2013
 Test Mode: Transmitting
 Test Setup: EUT is setup in a tabletop configuration on a Styrofoam table.
 Below 1GHz set 80cm high.
 Above 1GHz set 1.5m high

Co-Location testing was performed with Wi-Fi, Cell, and FHSS radios transmitting simultaneously in both CCU100C and CCU100RC configurations.

Modification #1 and #2 were in place during testing.

Itron, Inc. WO#: 103221 Sequence#: 11 Date: 4/29/2020
 15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Vert



— Sweep Data
 ○ Peak Readings
 * Average Readings
 Software Version: 5.03.12

— Readings
 × QP Readings
 ▼ Ambient
 — 1 - 15.247(d) / 15.209 Radiated Spurious Emissions

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02307	Preamp	8447D	1/15/2018	1/15/2020
T2	AN03628	Biconilog Antenna	3142E	6/11/2019	6/11/2021
T3	ANP06123	Attenuator	18N-6	4/5/2019	4/5/2021
T4	ANP05305	Cable	ETSI-50T	9/6/2019	9/6/2021
T5	ANP05360	Cable	RG214	1/31/2018	1/31/2020
T6	ANP06540	Cable	Heliac	8/23/2019	8/23/2021
T7	AN02673	Spectrum Analyzer	E4446A	2/22/2019	2/22/2021
T8	AN00052	Loop Antenna	6502	5/7/2018	5/7/2020
T9	ANP06515	Cable	Heliac	6/29/2018	6/29/2020
T10	AN03540	Preamp	83017A	5/13/2019	5/13/2021
T11	AN01467	Horn Antenna- ANSI C63.5 Calibration	3115	7/5/2019	7/5/2021
T12	ANP07504	Cable	CLU40-KMKM- 02.00F	1/17/2019	1/17/2021
T13	ANP06242	Attenuator	54A-10	3/13/2018	3/13/2020
T14	AN03170	High Pass Filter	HM1155-11SS	10/23/2019	10/23/2021
T15	ANDCCF	Duty Cycle Correction Factor	Multiple	10/1/2019	10/1/2021

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

#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
			T5	T6	T7	T8					
			T9	T10	T11	T12					
			T13	T14	T15						
	MHz	dBμV	dB	dB	dB	dB	Table	dBμV/m	dBμV/m	dB	Ant
1	4514.910M				+0.0	+0.0	+0.0	45.0	54.0	-9.0	Vert
		43.4	+0.0	+0.0	+0.0	+0.0					
	Ave		+0.0	+0.9	+31.8	+0.7			37.5k FSK		
			+3.9	-33.7	+12.5						
			+9.9	+0.6							
2	4575.000M				+0.0	+0.0	+0.0	44.8	54.0	-9.2	Vert
		43.0	+0.0	+0.0	+0.0	+0.0					
	Ave		+0.0	+0.9	+31.9	+0.7					
			+4.0	-33.7	+12.5						
			+9.9	+0.6							
^	4575.000M				+0.0	+0.0	+0.0	62.9	54.0	+8.9	Vert
		48.6	+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.9	+31.9	+0.7					
			+4.0	-33.7	+0.0						
			+9.9	+0.6							

4	4634.350M				+0.0	+0.0	+0.0	44.2	54.0	-9.8	Vert
		42.2	+0.0	+0.0	+0.0	+0.0					
	Ave		+0.0	+0.9	+32.1	+0.6					
			+4.0	-33.6	+12.5						
			+9.9	+0.6							
^	4634.350M				+0.0	+0.0	+0.0	64.3	54.0	+10.3	Vert
		49.8	+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.9	+32.1	+0.6					
			+4.0	-33.6	+0.0						
			+9.9	+0.6							
6	991.310M		-		+5.9	+1.5	+0.0	43.7	54.0	-10.3	Horiz
		35.8	27.0	+25.0	+0.0	+0.0					
	QP		+2.1	+0.4	+0.0	+0.0					
			+0.0	+0.0	+0.0						
			+0.0	+0.0							
^	991.310M		-		+5.9	+1.5	+0.0	49.1	54.0	-4.9	Horiz
		41.2	27.0	+25.0	+0.0	+0.0					
			+2.1	+0.4	+0.0	+0.0					
			+0.0	+0.0	+0.0						
			+0.0	+0.0							
8	4540.010M				+0.0	+0.0	+0.0	43.2	54.0	-10.8	Vert
		41.5	+0.0	+0.0	+0.0	+0.0					
	Ave		+0.0	+0.9	+31.9	+0.7		AM			
			+3.9	-33.7	+12.5						
			+9.9	+0.6							
9	4514.930M				+0.0	+0.0	+0.0	43.1	54.0	-10.9	Vert
		41.5	+0.0	+0.0	+0.0	+0.0					
	Ave		+0.0	+0.9	+31.8	+0.7		12.5 FSK			
			+3.9	-33.7	+12.5						
			+9.9	+0.6							
^	4514.910M				+0.0	+0.0	+0.0	63.9	54.0	+9.9	Vert
		49.8	+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.9	+31.8	+0.7					
			+3.9	-33.7	+0.0						
			+9.9	+0.6							
11	3660.020M				+0.0	+0.0	+0.0	41.5	54.0	-12.5	Vert
		41.9	+0.0	+0.0	+0.0	+0.0					
	Ave		+0.0	+0.9	+30.5	+0.5					
			+3.7	-33.7	+12.5						
			+9.7	+0.5							
^	3660.020M				+0.0	+0.0	+0.0	60.2	54.0	+6.2	Vert
		48.1	+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.9	+30.5	+0.5					
			+3.7	-33.7	+0.0						
			+9.7	+0.5							

13	3707.030M				+0.0	+0.0	+0.0	40.5	54.0	-13.5	Vert
		40.7	+0.0	+0.0	+0.0	+0.0					
	Ave		+0.0	+0.9	+30.6	+0.5					
			+3.8	-33.7	+12.5						
			+9.7	+0.5							
^	3707.030M				+0.0	+0.0	+0.0	60.7	54.0	+6.7	Vert
		48.4	+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.9	+30.6	+0.5					
			+3.8	-33.7	+0.0						
			+9.7	+0.5							
15	2780.520M				+0.0	+0.0	+0.0	39.7	54.0	-14.3	Vert
		44.0	+0.0	+0.0	+0.0	+0.0					
	Ave		+0.0	+0.7	+28.5	+0.2					
			+2.6	-34.1	+12.5						
			+9.9	+0.4							
^	2780.520M				+0.0	+0.0	+0.0	57.9	54.0	+3.9	Vert
		49.7	+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.7	+28.5	+0.2					
			+2.6	-34.1	+0.0						
			+9.9	+0.4							
17	2745.070M				+0.0	+0.0	+0.0	37.1	54.0	-16.9	Vert
		41.5	+0.0	+0.0	+0.0	+0.0					
	Ave		+0.0	+0.7	+28.4	+0.2					
			+2.6	-34.1	+12.5						
			+9.9	+0.4							
^	2745.070M				+0.0	+0.0	+0.0	56.2	54.0	+2.2	Vert
		48.1	+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.7	+28.4	+0.2					
			+2.6	-34.1	+0.0						
			+9.9	+0.4							
19	5417.610M				+0.0	+0.0	+0.0	36.9	54.0	-17.1	Vert
		33.6	+0.0	+0.0	+0.0	+0.0					
	Ave		+0.0	+1.0	+33.4	+0.4					
			+4.5	-33.7	+12.5						
			+9.8	+0.4							
^	5417.610M				+0.0	+0.0	+0.0	61.4	54.0	+7.4	Vert
		45.6	+0.0	+0.0	+0.0	+0.0					
			+0.0	+1.0	+33.4	+0.4					
			+4.5	-33.7	+0.0						
			+9.8	+0.4							
21	2709.110M				+0.0	+0.0	+0.0	36.6	54.0	-17.4	Vert
		41.1	+0.0	+0.0	+0.0	+0.0					
	Ave		+0.0	+0.7	+28.3	+0.2					
			+2.6	-34.1	+12.5						
			+9.9	+0.4							

^	2709.110M			+0.0	+0.0	+0.0	56.0	54.0	+2.0	Vert
		48.0	+0.0	+0.0	+0.0	+0.0				
			+0.0	+0.7	+28.3	+0.2				
			+2.6	-34.1	+0.0					
			+9.9	+0.4						
23	3611.770M			+0.0	+0.0	+0.0	34.8	54.0	-19.2	Vert
		35.6	+0.0	+0.0	+0.0	+0.0				
		Ave	+0.0	+0.8	+30.3	+0.6				
			+3.6	-33.8	+12.5					
			+9.7	+0.5						
^	3611.770M			+0.0	+0.0	+0.0	58.0	54.0	+4.0	Vert
		46.3	+0.0	+0.0	+0.0	+0.0				
			+0.0	+0.8	+30.3	+0.6				
			+3.6	-33.8	+0.0					
			+9.7	+0.5						
25	6319.940M			+0.0	+0.0	+0.0	71.7	108.8	-37.1	Horiz
		54.0	+0.0	+0.0	+0.0	+0.0				
			+0.0	+1.0	+34.6	+0.5				
			+5.2	-34.1	+0.0					
			+10.0	+0.5						
26	5560.480M			+0.0	+0.0	+0.0	64.9	108.8	-43.9	Vert
		48.8	+0.0	+0.0	+0.0	+0.0				
			+0.0	+1.0	+33.7	+0.4				
			+4.5	-33.7	+0.0					
			+9.8	+0.4						
27	6404.630M			+0.0	+0.0	+0.0	64.7	108.8	-44.1	Vert
		46.8	+0.0	+0.0	+0.0	+0.0				
			+0.0	+1.1	+34.6	+0.6				
			+5.4	-34.2	+0.0					
			+9.9	+0.5						
28	1806.180M			+0.0	+0.0	+0.0	52.8	108.8	-56.0	Vert
		48.2	+0.0	+0.0	+0.0	+0.0				
			+0.0	+0.5	+26.1	+0.2				
			+2.2	-34.8	+0.0					
			+9.9	+0.5						
29	1853.600M			+0.0	+0.0	+0.0	50.8	108.8	-58.0	Horiz
		45.7	+0.0	+0.0	+0.0	+0.0				
			+0.0	+0.5	+26.5	+0.2				
			+2.3	-34.7	+0.0					
			+9.9	+0.4						
30	1830.090M			+0.0	+0.0	+0.0	50.6	108.8	-58.2	Vert
		45.8	+0.0	+0.0	+0.0	+0.0				
			+0.0	+0.5	+26.3	+0.2				
			+2.3	-34.8	+0.0					
			+9.9	+0.4						

31	855.500M	-		+5.8	+1.4	+0.0	48.4	108.8	-60.4	Vert
		42.8	27.6	+23.8	+0.0	+0.0				
			+1.9	+0.3	+0.0	+0.0				
			+0.0	+0.0	+0.0					
			+0.0	+0.0						
32	33.900M	-		+5.8	+0.3	+0.0	42.5	108.8	-66.3	Vert
		49.2	28.0	+14.8	+0.0	+0.0				
			+0.3	+0.1	+0.0	+0.0				
			+0.0	+0.0	+0.0					
			+0.0	+0.0						
33	5489.780M			+0.0	+0.0	+0.0	40.9	108.8	-67.9	Vert
		37.5	+0.0	+0.0	+0.0	+0.0				
	Ave		+0.0	+1.0	+33.5	+0.4				
			+4.5	-33.7	+12.5					
			+9.8	+0.4						
^	5489.780M			+0.0	+0.0	+0.0	62.4	108.8	-46.4	Vert
		46.5	+0.0	+0.0	+0.0	+0.0				
			+0.0	+1.0	+33.5	+0.4				
			+4.5	-33.7	+0.0					
			+9.8	+0.4						
35	40.700M	-		+5.8	+0.3	+0.0	37.8	108.8	-71.0	Vert
		47.4	27.9	+11.8	+0.0	+0.0				
			+0.3	+0.1	+0.0	+0.0				
			+0.0	+0.0	+0.0					
			+0.0	+0.0						
36	89.200M	-		+5.8	+0.4	+0.0	26.6	108.8	-82.2	Horiz
		40.5	27.8	+7.1	+0.0	+0.0				
			+0.5	+0.1	+0.0	+0.0				
			+0.0	+0.0	+0.0					
			+0.0	+0.0						
37	30.000M			+0.0	+0.0	+0.0	26.6	108.8	-82.2	Para
		20.6	+0.0	+0.0	+0.0	+5.6				
			+0.0	+0.1	+0.0	+0.0				
			+0.3	+0.0	+0.0					
			+0.0	+0.0						
38	14.150M			+0.0	+0.0	-40.0	-9.5	108.8	-118.3	Perp
		21.2	+0.0	+0.0	+0.0	+9.1				
			+0.0	+0.0	+0.0	+0.0				
			+0.2	+0.0	+0.0					
			+0.0	+0.0						
39	15.165M			+0.0	+0.0	-40.0	-11.0	108.8	-119.8	Perp
		19.6	+0.0	+0.0	+0.0	+9.1				
			+0.0	+0.1	+0.0	+0.0				
			+0.2	+0.0	+0.0					
			+0.0	+0.0						

40	29.254M				+0.0	+0.0	-40.0	-14.2	108.8	-123.0	Perp
		19.6	+0.0	+0.0	+0.0	+5.8					
			+0.0	+0.1	+0.0	+0.0					
			+0.3	+0.0	+0.0						
			+0.0	+0.0							
41	29.343M				+0.0	+0.0	-40.0	-16.6	108.8	-125.4	Para
		17.2	+0.0	+0.0	+0.0	+5.8					
			+0.0	+0.1	+0.0	+0.0					
			+0.3	+0.0	+0.0						
			+0.0	+0.0							
42	13.935k				+0.0	+0.0	-80.0	-18.9	108.8	-127.7	Perp
		48.1	+0.0	+0.0	+0.0	+13.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0						
			+0.0	+0.0							
43	62.298k				+0.0	+0.0	-80.0	-30.1	108.8	-138.9	Para
		40.2	+0.0	+0.0	+0.0	+9.7					
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0						
			+0.0	+0.0							

Test Location: CKC Laboratories, Inc. · 22116 23rd Dr SE · Bothell, WA 98021 · 800-500-4362
 Customer: **Itron, Inc.**
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**
 Work Order #: **103221** Date: 11/23/2019
 Test Type: **Radiated Scan** Time: 10:51:05
 Tested By: Matthew Harrison Sequence#: 16
 Software: EMITest 5.03.12

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

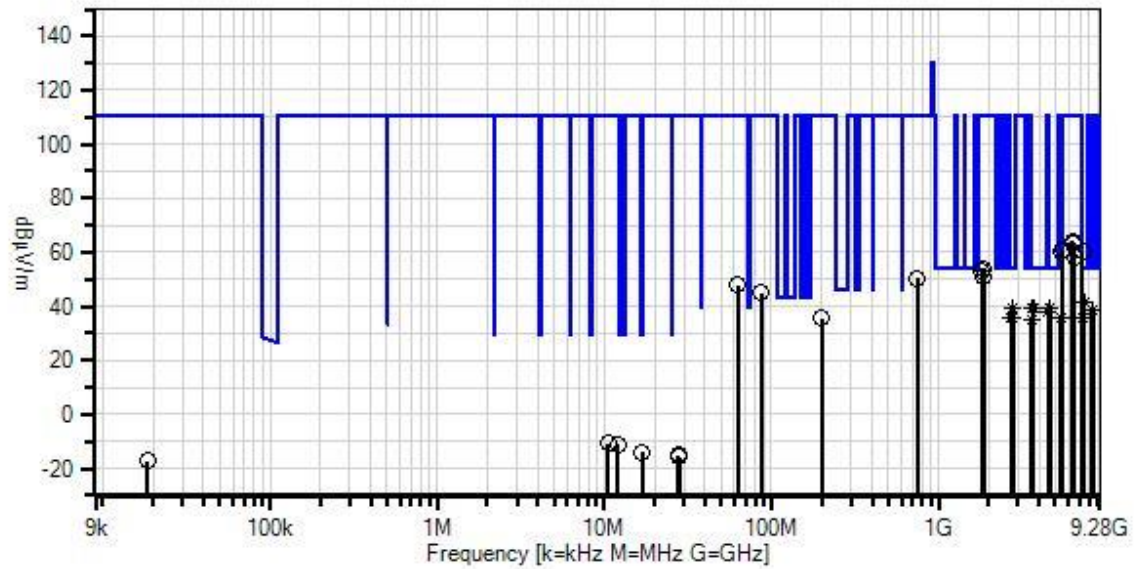
Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

Test Conditions / Notes:

Temperature: 23° C Humidity: 39% Pressure: 101.1 kPa Frequency Range: 9kHz-10GHz Frequency tested: Firmware power setting: Max Antenna type: Omnidirectional Antenna Gain: 8.15 dBi. Duty Cycle: 100% Modulated Test Method: ANSI C63.10: 2013 Test Mode: Transmitting Test Setup: EUT is setup in a tabletop configuration on a Styrofoam table: Below 1GHz set 80cm high. Above 1GHz set 1.5m high Co-Location testing was performed with Wi-Fi, Cell, and FHSS radios transmitting simultaneously in both CCU100C and CCU100RC configurations. Modification #1 and #2 were in place during testing.

Itron, Inc. WO#: 103221 Sequence#: 16 Date: 11/23/2019
15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Horiz



— Readings
× QP Readings
▼ Ambient
○ Peak Readings
* Average Readings
Software Version: 5.03.12
1 - 15.247(d) / 15.209 Radiated Spurious Emissions

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN03628	Biconilog Antenna	3142E	6/11/2019	6/11/2021
T2	ANP06123	Attenuator	18N-6	4/5/2019	4/5/2021
T3	ANP05305	Cable	ETSI-50T	9/6/2019	9/6/2021
T4	ANP05360	Cable	RG214	1/31/2018	1/31/2020
T5	ANP06540	Cable	Heliast	8/23/2019	8/23/2021
	AN02673	Spectrum Analyzer	E4446A	2/22/2019	2/22/2021
T6	AN00052	Loop Antenna	6502	5/7/2018	5/7/2020
T7	ANP06515	Cable	Heliast	6/29/2018	6/29/2020
T8	AN03540	Preamplifier	83017A	5/13/2019	5/13/2021
T9	AN01467	Horn Antenna-ANSI C63.5 Calibration	3115	7/5/2019	7/5/2021
T10	ANP07504	Cable	CLU40-KMKM-02.00F	1/17/2019	1/17/2021
T11	ANP06242	Attenuator	54A-10	3/13/2018	3/13/2020
T12	AN03170	High Pass Filter	HM1155-11SS	10/23/2019	10/23/2021
T13	ANDCCF	Duty Cycle Correction Factor	Multiple	10/1/2019	10/1/2021

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

#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
			T5	T6	T7	T8					
			T9	T10	T11	T12					
			T13								
	MHz	dBμV	dB	dB	dB	dB	Table	dBμV/m	dBμV/m	dB	Ant
1	7414.020M				+0.0	+0.0	+0.0	41.7	54.0	-12.3	Horiz
		33.9	+0.0	+0.0	+5.4	-34.6					
	Ave		+1.5	+0.0	+9.9	+0.6					
			+37.1	+0.4							
			+12.5								
^	7414.020M				+0.0	+0.0	+0.0	63.6	54.0	+9.6	Horiz
		43.3	+0.0	+0.0	+5.4	-34.6					
			+1.5	+0.0	+9.9	+0.6					
			+37.1	+0.4							
			+0.0								
3	4634.170M				+0.0	+0.0	+0.0	39.6	54.0	-14.4	Vert
		37.6	+0.0	+0.0	+4.0	-33.6					
	Ave		+0.9	+0.0	+9.9	+0.6					
			+32.1	+0.6							
			+12.5								
^	4634.170M				+0.0	+0.0	+0.0	59.5	54.0	+5.5	Vert
		45.0	+0.0	+0.0	+4.0	-33.6					
			+0.9	+0.0	+9.9	+0.6					
			+32.1	+0.6							
			+0.0								

5	2780.305M			+0.0	+0.0	+0.0	39.6	54.0	-14.4	Vert
		43.9	+0.0	+0.0	+2.6	-34.1				
	Ave		+0.7	+0.0	+9.9	+0.4				
			+28.5	+0.2						
			+12.5							
^	2780.305M			+0.0	+0.0	+0.0	56.8	54.0	+2.8	Vert
		48.6	+0.0	+0.0	+2.6	-34.1				
			+0.7	+0.0	+9.9	+0.4				
			+28.5	+0.2						
			+0.0							
7	3660.200M			+0.0	+0.0	+0.0	39.4	54.0	-14.6	Vert
		39.8	+0.0	+0.0	+3.7	-33.7				
	Ave		+0.9	+0.0	+9.7	+0.5				
			+30.5	+0.5						
			+12.5							
^	3660.200M			+0.0	+0.0	+0.0	58.6	54.0	+4.6	Vert
		46.5	+0.0	+0.0	+3.7	-33.7				
			+0.9	+0.0	+9.7	+0.5				
			+30.5	+0.5						
			+0.0							
9	3706.950M			+0.0	+0.0	+0.0	39.3	54.0	-14.7	Vert
		39.5	+0.0	+0.0	+3.8	-33.7				
	Ave		+0.9	+0.0	+9.7	+0.5				
			+30.6	+0.5						
			+12.5							
^	3706.950M			+0.0	+0.0	+0.0	58.9	54.0	+4.9	Vert
		46.6	+0.0	+0.0	+3.8	-33.7				
			+0.9	+0.0	+9.7	+0.5				
			+30.6	+0.5						
			+0.0							
11	4574.885M			+0.0	+0.0	+0.0	39.3	54.0	-14.7	Vert
		37.5	+0.0	+0.0	+4.0	-33.7				
	Ave		+0.9	+0.0	+9.9	+0.6				
			+31.9	+0.7						
			+12.5							
^	4574.885M			+0.0	+0.0	+0.0	59.0	54.0	+5.0	Vert
		44.7	+0.0	+0.0	+4.0	-33.7				
			+0.9	+0.0	+9.9	+0.6				
			+31.9	+0.7						
			+0.0							
13	8340.870M			+0.0	+0.0	+0.0	38.7	54.0	-15.3	Horiz
		30.4	+0.0	+0.0	+5.8	-34.9				
	Ave		+1.7	+0.0	+9.9	+0.8				
			+37.0	+0.5						
			+12.5							

^	8340.870M			+0.0	+0.0	+0.0	62.6	54.0	+8.6	Horiz
		41.8	+0.0	+0.0	+5.8	-34.9				
			+1.7	+0.0	+9.9	+0.8				
			+37.0	+0.5						
			+0.0							
15	8234.270M			+0.0	+0.0	+0.0	38.5	54.0	-15.5	Vert
		30.3	+0.0	+0.0	+5.7	-35.0				
		Ave	+1.7	+0.0	+9.9	+0.9				
			+37.0	+0.5						
			+12.5							
^	8234.270M			+0.0	+0.0	+0.0	63.4	54.0	+9.4	Vert
		42.7	+0.0	+0.0	+5.7	-35.0				
			+1.7	+0.0	+9.9	+0.9				
			+37.0	+0.5						
			+0.0							
17	4514.585M			+0.0	+0.0	+0.0	37.8	54.0	-16.2	Vert
		36.2	+0.0	+0.0	+3.9	-33.7				
		Ave	+0.9	+0.0	+9.9	+0.6				
			+31.8	+0.7						
			+12.5							
^	4514.585M			+0.0	+0.0	+0.0	59.5	54.0	+5.5	Vert
		45.4	+0.0	+0.0	+3.9	-33.7				
			+0.9	+0.0	+9.9	+0.6				
			+31.8	+0.7						
			+0.0							

19	5418.380M				+0.0	+0.0	+0.0	36.1	54.0	-17.9	Vert
		32.8	+0.0	+0.0	+4.5	-33.7					
	Ave		+1.0	+0.0	+9.8	+0.4					
			+33.4	+0.4							
			+12.5								
^	5418.380M				+0.0	+0.0	+0.0	59.5	54.0	+5.5	Vert
		43.7	+0.0	+0.0	+4.5	-33.7					
			+1.0	+0.0	+9.8	+0.4					
			+33.4	+0.4							
			+0.0								
21	2744.715M				+0.0	+0.0	+0.0	35.9	54.0	-18.1	Vert
		40.3	+0.0	+0.0	+2.6	-34.1					
	Ave		+0.7	+0.0	+9.9	+0.4					
			+28.4	+0.2							
			+12.5								
^	2744.715M				+0.0	+0.0	+0.0	55.9	54.0	+1.9	Vert
		47.8	+0.0	+0.0	+2.6	-34.1					
			+0.7	+0.0	+9.9	+0.4					
			+28.4	+0.2							
			+0.0								
23	2709.120M				+0.0	+0.0	+0.0	35.7	54.0	-18.3	Vert
		40.2	+0.0	+0.0	+2.6	-34.1					
	Ave		+0.7	+0.0	+9.9	+0.4					
			+28.3	+0.2							
			+12.5								
^	2709.120M				+0.0	+0.0	+0.0	54.8	54.0	+0.8	Vert
		46.8	+0.0	+0.0	+2.6	-34.1					
			+0.7	+0.0	+9.9	+0.4					
			+28.3	+0.2							
			+0.0								
25	7319.185M				+0.0	+0.0	+0.0	35.5	54.0	-18.5	Vert
		28.2	+0.0	+0.0	+5.4	-34.6					
	Ave		+1.3	+0.0	+9.9	+0.6					
			+36.8	+0.4							
			+12.5								
^	7319.185M				+0.0	+0.0	+0.0	61.9	54.0	+7.9	Vert
		42.1	+0.0	+0.0	+5.4	-34.6					
			+1.3	+0.0	+9.9	+0.6					
			+36.8	+0.4							
			+0.0								
27	3612.340M				+0.0	+0.0	+0.0	34.9	54.0	-19.1	Vert
		35.7	+0.0	+0.0	+3.6	-33.8					
	Ave		+0.8	+0.0	+9.7	+0.5					
			+30.3	+0.6							
			+12.5								

^	3612.340M			+0.0	+0.0	+0.0	57.0	54.0	+3.0	Vert
		45.3	+0.0	+0.0	+3.6	-33.8				
			+0.8	+0.0	+9.7	+0.5				
			+30.3	+0.6						
			+0.0							
29	6319.895M			+0.0	+0.0	+0.0	64.1	110.4	-46.3	Horiz
		46.4	+0.0	+0.0	+5.2	-34.1				
			+1.0	+0.0	+10.0	+0.5				
			+34.6	+0.5						
			+0.0							
30	6405.410M			+0.0	+0.0	+0.0	63.5	110.4	-46.9	Horiz
		45.6	+0.0	+0.0	+5.4	-34.2				
			+1.1	+0.0	+9.9	+0.5				
			+34.6	+0.6						
			+0.0							
31	5560.445M			+0.0	+0.0	+0.0	61.0	110.4	-49.4	Horiz
		44.9	+0.0	+0.0	+4.5	-33.7				
			+1.0	+0.0	+9.8	+0.4				
			+33.7	+0.4						
			+0.0							
32	5489.770M			+0.0	+0.0	+0.0	60.5	110.4	-49.9	Vert
		44.6	+0.0	+0.0	+4.5	-33.7				
			+1.0	+0.0	+9.8	+0.4				
			+33.5	+0.4						
			+0.0							
33	7224.790M			+0.0	+0.0	+0.0	60.1	110.4	-50.3	Horiz
		40.9	+0.0	+0.0	+5.3	-34.5				
			+1.1	+0.0	+9.9	+0.4				
			+36.5	+0.5						
			+0.0							
34	6487.975M			+0.0	+0.0	+0.0	58.0	110.4	-52.4	Horiz
		39.9	+0.0	+0.0	+5.6	-34.2				
			+1.2	+0.0	+9.9	+0.5				
			+34.5	+0.6						
			+0.0							
35	1853.665M			+0.0	+0.0	+0.0	53.5	110.4	-56.9	Vert
		48.4	+0.0	+0.0	+2.3	-34.7				
			+0.5	+0.0	+9.9	+0.4				
			+26.5	+0.2						
			+0.0							
36	1806.220M			+0.0	+0.0	+0.0	53.2	110.4	-57.2	Vert
		48.6	+0.0	+0.0	+2.2	-34.8				
			+0.5	+0.0	+9.9	+0.5				
			+26.1	+0.2						
			+0.0							

37	1829.650M				+0.0	+0.0	+0.0	51.0	110.4	-59.4	Horiz
		46.2	+0.0	+0.0	+2.3	-34.8					
			+0.5	+0.0	+9.9	+0.4					
			+26.3	+0.2							
			+0.0								
38	749.700M				+1.3	+1.7	+0.0	50.4	110.4	-60.0	Horiz
		18.1	+23.2	+5.8	+0.0	+0.0					
			+0.3	+0.0	+0.0	+0.0					
			+0.0	+0.0							
			+0.0								
39	63.000M				+0.4	+0.4	+0.0	48.0	110.4	-62.4	Vert
		33.7	+7.6	+5.8	+0.0	+0.0					
			+0.1	+0.0	+0.0	+0.0					
			+0.0	+0.0							
			+0.0								
40	86.300M				+0.4	+0.5	+0.0	44.9	110.4	-65.5	Vert
		31.1	+7.0	+5.8	+0.0	+0.0					
			+0.1	+0.0	+0.0	+0.0					
			+0.0	+0.0							
			+0.0								
41	198.800M				+0.7	+0.8	+0.0	35.7	110.4	-74.7	Vert
		18.4	+9.8	+5.8	+0.0	+0.0					
			+0.2	+0.0	+0.0	+0.0					
			+0.0	+0.0							
			+0.0								
42	10.568M				+0.0	+0.0	-40.0	-10.8	110.4	-121.2	Perp
		19.8	+0.0	+0.0	+0.2	+0.0					
			+0.0	+9.2	+0.0	+0.0					
			+0.0	+0.0							
			+0.0								
43	12.090M				+0.0	+0.0	-40.0	-10.9	110.4	-121.3	Perp
		19.7	+0.0	+0.0	+0.2	+0.0					
			+0.0	+9.2	+0.0	+0.0					
			+0.0	+0.0							
			+0.0								
44	16.896M				+0.0	+0.0	-40.0	-13.9	110.4	-124.3	Perp
		17.2	+0.0	+0.0	+0.2	+0.0					
			+0.1	+8.6	+0.0	+0.0					
			+0.0	+0.0							
			+0.0								
45	27.702M				+0.0	+0.0	-40.0	-14.9	110.4	-125.3	Para
		18.5	+0.0	+0.0	+0.3	+0.0					
			+0.1	+6.2	+0.0	+0.0					
			+0.0	+0.0							
			+0.0								

46	28.209M				+0.0	+0.0	-40.0	-15.6	110.4	-126.0	Perp
		17.9	+0.0	+0.0	+0.3	+0.0					
			+0.1	+6.1	+0.0	+0.0					
			+0.0	+0.0							
			+0.0								
47	18.588k				+0.0	+0.0	-80.0	-17.3	110.4	-127.7	Perp
		50.6	+0.0	+0.0	+0.0	+0.0					
			+0.0	+12.1	+0.0	+0.0					
			+0.0	+0.0							
			+0.0								
48	80.346k				+0.0	+0.0	-80.0	-30.4	110.4	-140.8	Para
		39.9	+0.0	+0.0	+0.0	+0.0					
			+0.0	+9.7	+0.0	+0.0					
			+0.0	+0.0							
			+0.0								

Band Edge

Band Edge Summary

Configuration 1

Operating Mode: Single Channel (Low and High)

Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
614	FM 12.5k	Omnidirectional	39.4	<46	Pass
902	FM 12.5k	Omnidirectional	92.3	<108.8	Pass
928	FM 12.5k	Omnidirectional	78.1	< 108.8	Pass
960	FM 12.5k	Omnidirectional	48.2	<54	Pass
614	FM 37.5k	Omnidirectional	43.2	<46	Pass
902	FM 37.5k	Omnidirectional	89.3	<108.8	Pass
928	FM 37.5k	Omnidirectional	85.1	< 108.8	Pass
960	FM 37.5k	Omnidirectional	49.3	<54	Pass
614	AM	Omnidirectional	38.2	<46	Pass
902	AM	Omnidirectional	76.0	<108.8	Pass
928	AM	Omnidirectional	73.3	< 108.8	Pass
960	AM	Omnidirectional	42.5	<54	Pass

Band Edge Summary

Configuration 1

Operating Mode: Hopping

Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
614	FM 12.5k	Omnidirectional	43.7	<46	Pass
902	FM 12.5k	Omnidirectional	87.7	<108.8	Pass
928	FM 12.5k	Omnidirectional	77.1	< 108.8	Pass
960	FM 12.5k	Omnidirectional	47.4	<54	Pass
614	FM 37.5k	Omnidirectional	25.1	<46	Pass
902	FM 37.5k	Omnidirectional	86.7	<108.8	Pass
928	FM 37.5k	Omnidirectional	83	< 108.8	Pass
960	FM 37.5k	Omnidirectional	50.4	<54	Pass
614	AM	Omnidirectional	38.3	<46	Pass
902	AM	Omnidirectional	73.3	<108.8	Pass
928	AM	Omnidirectional	76.0	< 108.8	Pass
960	AM	Omnidirectional	42.8	<54	Pass

Band Edge Summary

Configuration 2

Operating Mode: Single Channel (Low and High)

Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
614	FM 12.5k	Omnidirectional	39.3	<46	Pass
902	FM 12.5k	Omnidirectional	90.0	<110.4	Pass
928	FM 12.5k	Omnidirectional	77.7	< 110.4	Pass
960	FM 12.5k	Omnidirectional	46.1	<54	Pass
614	FM 37.5k	Omnidirectional	25.8	<46	Pass
902	FM 37.5k	Omnidirectional	88.8	<110.4	Pass
928	FM 37.5k	Omnidirectional	81.3	< 110.4	Pass
960	FM 37.5k	Omnidirectional	48.5	<54	Pass
614	AM	Omnidirectional	38.3	<46	Pass
902	AM	Omnidirectional	76.2	<110.4	Pass
928	AM	Omnidirectional	74.4	< 110.4	Pass
960	AM	Omnidirectional	42.5	<54	Pass

Band Edge Summary

Configuration 2

Operating Mode: Hopping

Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
614	FM 12.5k	Omnidirectional	44.7	<46	Pass
902	FM 12.5k	Omnidirectional	87.8	<110.4	Pass
928	FM 12.5k	Omnidirectional	77.1	< 110.4	Pass
960	FM 12.5k	Omnidirectional	48.6	<54	Pass
614	FM 37.5k	Omnidirectional	25.6	<46	Pass
902	FM 37.5k	Omnidirectional	84	<110.4	Pass
928	FM 37.5k	Omnidirectional	80.3	< 110.4	Pass
960	FM 37.5k	Omnidirectional	50.9	<54	Pass
614	AM	Omnidirectional	38.2	<46	Pass
902	AM	Omnidirectional	74.7	<110.4	Pass
928	AM	Omnidirectional	75.7	< 110.4	Pass
960	AM	Omnidirectional	42.5	<54	Pass

Band Edge Plots

Configuration 1 - FSK 12.5 kbps

