

# Itron, Inc.

## REVISED TEST REPORT TO 104265-2

### Smart Network Interface Card, Model: SNIC1 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.: 104265-2A

Date of issue: April 6, 2022



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

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

Test Certificate # 803.01

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## ADMINISTRATIVE INFORMATION

### Test Report Information

**REPORT PREPARED FOR:**

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

Representative: Jay Holcomb  
Customer Reference Number: 215017

**REPORT PREPARED BY:**

Darcy Thompson  
CKC Laboratories, Inc.  
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Mariposa, CA 95338

Project Number: 104265

**DATE OF EQUIPMENT RECEIPT:**  
**DATE(S) OF TESTING:**

July 1, 2020  
July 1-16, 2020

### Revision History

**Original:** Testing of the Smart Network Interface Card, Model: SNIC1, ORRNA, Model: RN-EGS to FCC Part 15 Subpart C Section(s) 15.207 & 15.247 (FHSS 902-928 MHz).

**Revision A:** To replace 15.207 AC Conducted Emissions data.

### 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	5.03.19

## 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	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 Manufacturer Declaration in Average Time of Occupancy section.

#### ISO/IEC 17025 Decision Rule

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

## Modifications During Testing

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

#### Summary of Conditions

No modifications were made during testing.

**Modifications listed above must be incorporated into all production units.**

## Conditions During Testing

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

#### Summary of Conditions

The permissive change testing performed in this report was for adding a new baudrate to an already approved modulation type in an already approved module. However, the testing on this new baudrate was performed on this specific host, therefore, for this permissive change to the module, it will only be valid for this specific host only. This module has already had Co-Location and RFX testing performed in this host, and the new baudrate added follows the same channel plan as a previously tested baudrate, so no new RFX or Co-Location was performed.

## 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
ORRNA	Itron, Inc.	RN-EGS	334915638 (HOST)
Smart Network Interface Card	Itron, Inc.	SNIC1	9230011615 (MODULE)

*Support Equipment:*

Device	Manufacturer	Model #	S/N
Laptop	HP	14-dq1033cl	5CD941CCWS
AC Adapter (for Laptop)	HP	L25296-002	NA
Antenna (used for different radio inside host)	PCTEL	BOA9025NM-ITR	NA

### Configuration 2

*Equipment Tested:*

Device	Manufacturer	Model #	S/N
ORRNA	Itron, Inc.	RN-EGS	334915638 (HOST)
Smart Network Interface Card	Itron, Inc.	SNIC1	9230011615 (MODULE)

*Support Equipment:*

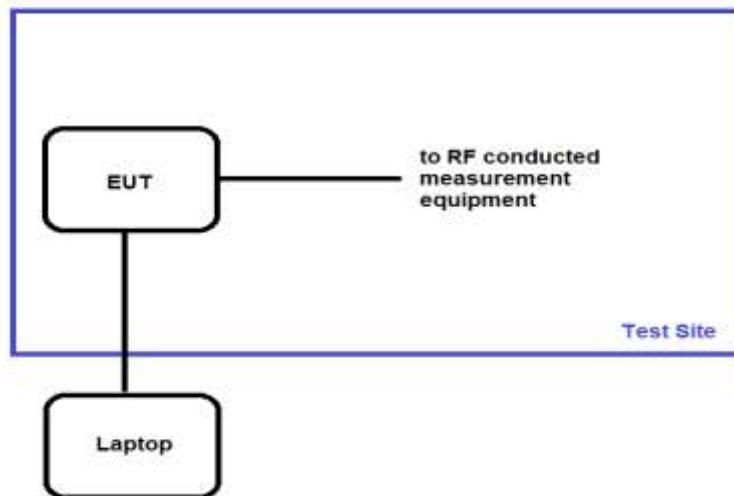
Device	Manufacturer	Model #	S/N
Laptop	HP	14-dq1033cl	5CD941CCWS
AC Adapter (for Laptop)	HP	L25296-002	NA
Antenna	PCTEL	BOA9022NM-ITR	NA
Antenna (used for different radio inside host)	PCTEL	BOA9025NM-ITR	NA

## General Product Information:

Product Information	Manufacturer-Provided Details
Equipment Type:	Host Specific Testing on Update to Integrated Module
Type of Wideband System:	Proprietary FHSS
Operating Frequency Range:	902.2 – 927.8MHz
Number of Hopping Channels:	513
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):	25kbps FSK
Maximum Duty Cycle:	Assume 100% as worst case
Number of TX Chains:	1
Antenna Type(s) and Gain:	Omnidirectional, 2.6dBi
Beamforming Type:	NA
Antenna Connection Type:	External Connector
Nominal Input Voltage:	85 to 265VAC (Host Device)
Firmware / Software used for Test:	RF_FW_NBFSK25_UART_f2ff12 (for the RF DSP) wifi_certificate_image_itron_secure Ver 1.5 build 24 rev. 632619 (for the Linux kernel) NGC_GUI_FSK_NB_0502 (Support Laptop Software)

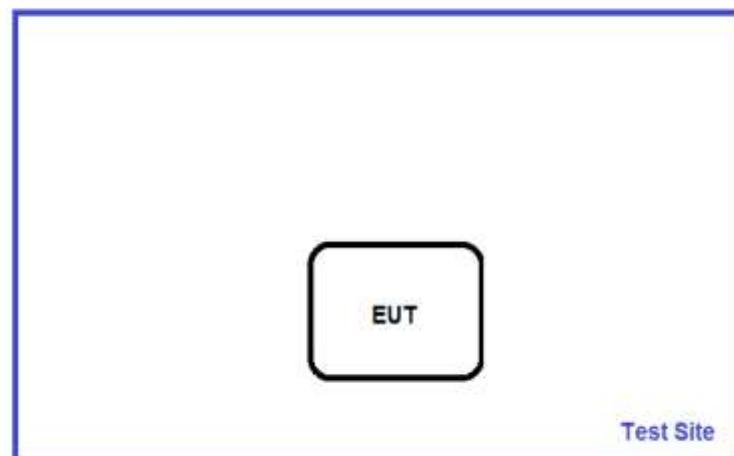
## Block Diagram of Test Setup(s)

### Test Setup Block Diagram



Configuration 1

### Test Setup Block Diagram



Configuration 2

## FCC Part 15 Subpart C

### 15.247(a) Transmitter Characteristics

Test Setup/Conditions			
Test Location:	Bothell Lab C3	Test Engineer:	M. Atkinson
Test Method:	ANSI C63.10 (2013)	Test Date(s):	7/1-2/2020
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.		

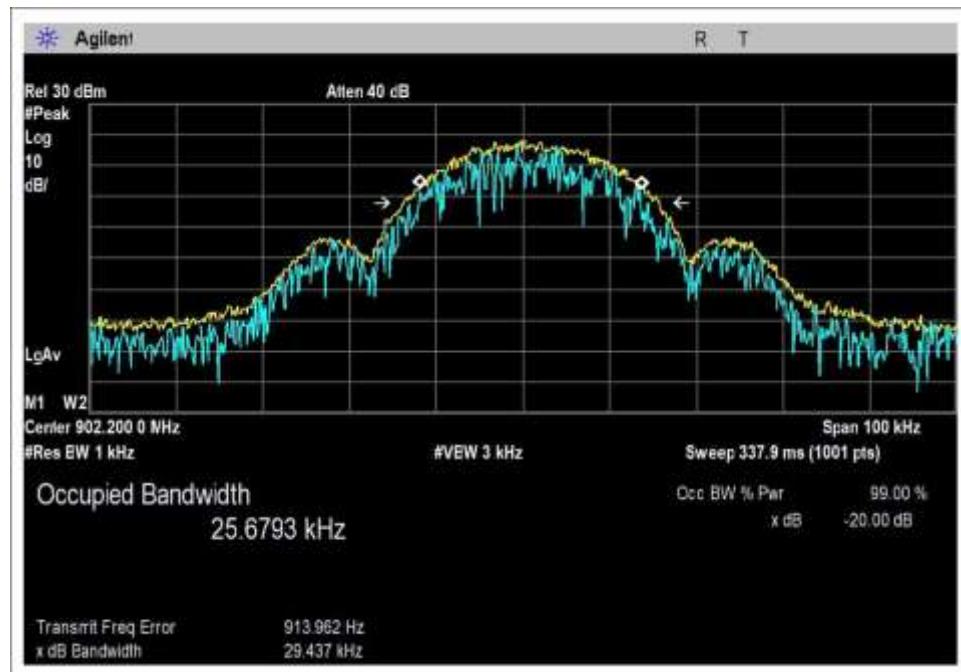
Environmental Conditions			
Temperature (°C)	22	Relative Humidity (%):	49

Test Equipment					
Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
02872	Spectrum Analyzer	Agilent	E4440A	11/18/2019	11/18/2021
P05959	Cable	Andrews	Heliax	1/20/2020	1/20/2022
P07227	Attenuator	Pasternack	PE7004-6	10/2/2019	10/2/2021

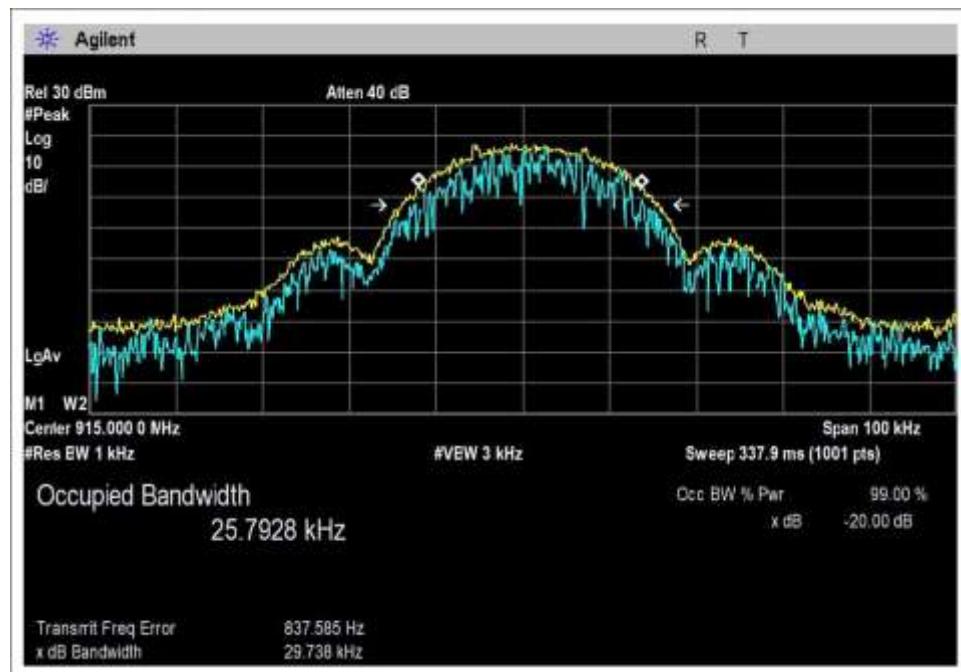
### 15.247(a)(1)(i) 20 dB Bandwidth

Test Data Summary					
Frequency (MHz)	Antenna Port	Modulation	Measured (kHz)	Limit (kHz)	Results
902.2	1	FSK 25kbps	29.437	≤500	Pass
915.0	1	FSK 25kbps	29.738	≤500	Pass
927.8	1	FSK 25kbps	29.279	≤500	Pass

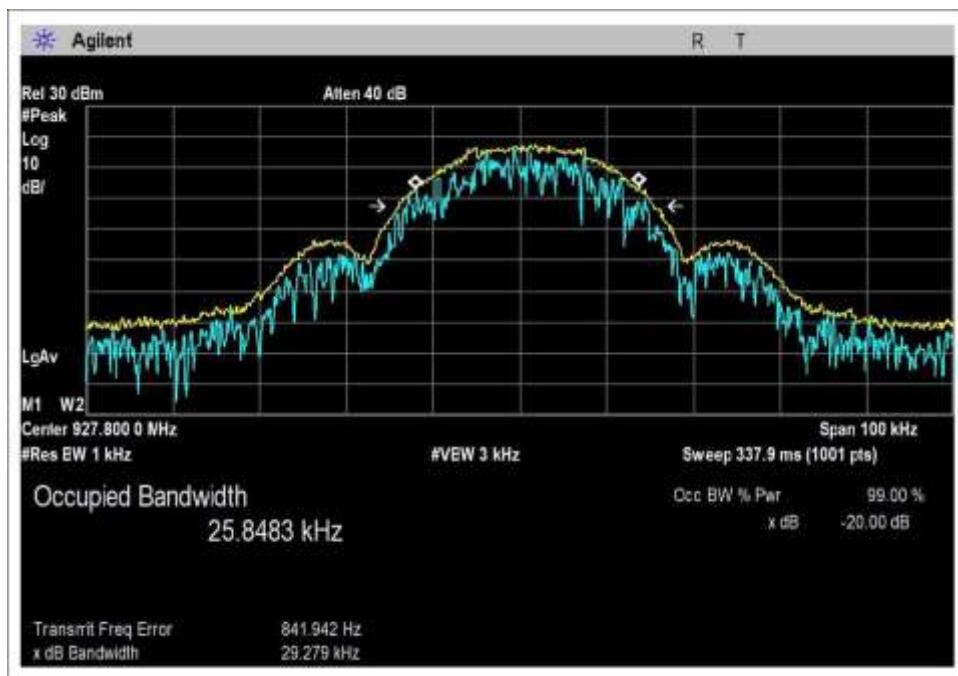
## Plot(s)



Low Channel



Middle Channel



High Channel

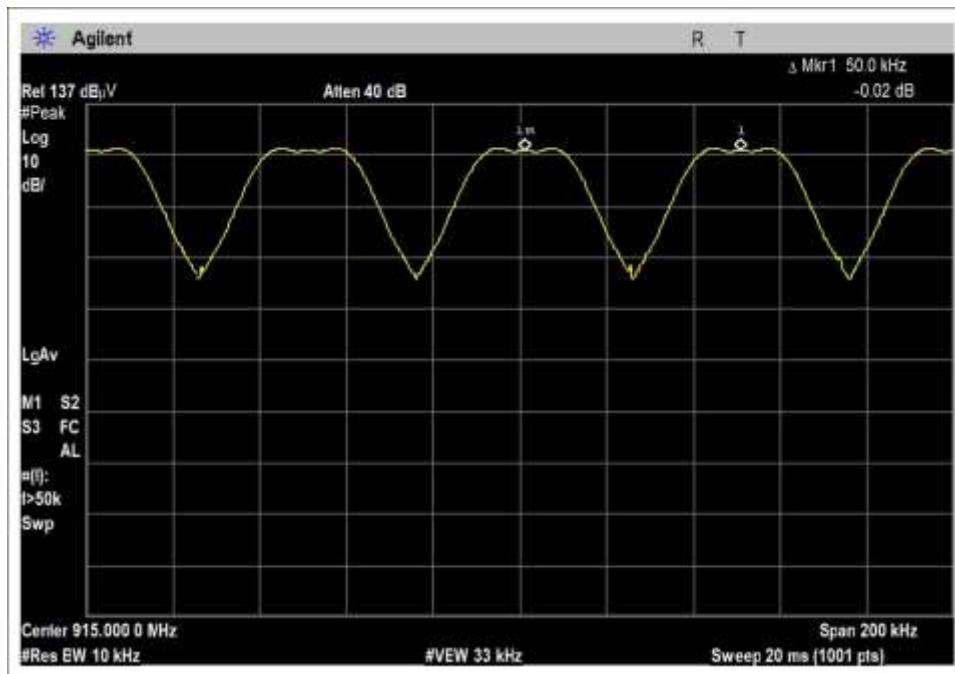
## 15.247(a)(1) Carrier Separation

### Test Data Summary

Limit applied: 20dB bandwidth of the hopping channel.

Antenna Port	Operational Mode	Measured (kHz)	Limit (kHz)	Results
1	Hopping FSK 25kbps	50.0	>29.738	Pass

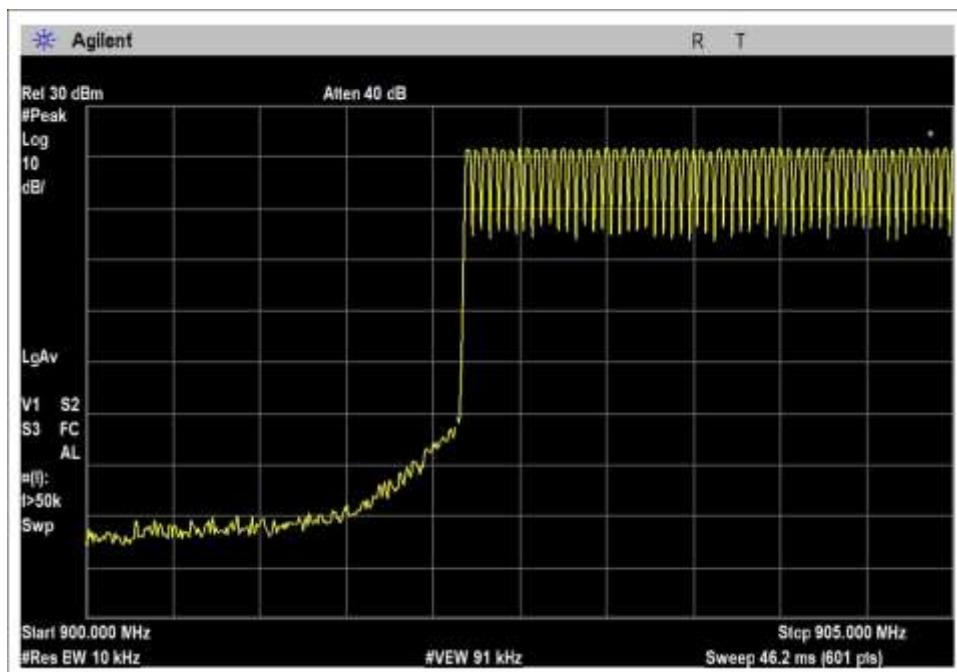
### Plot(s)



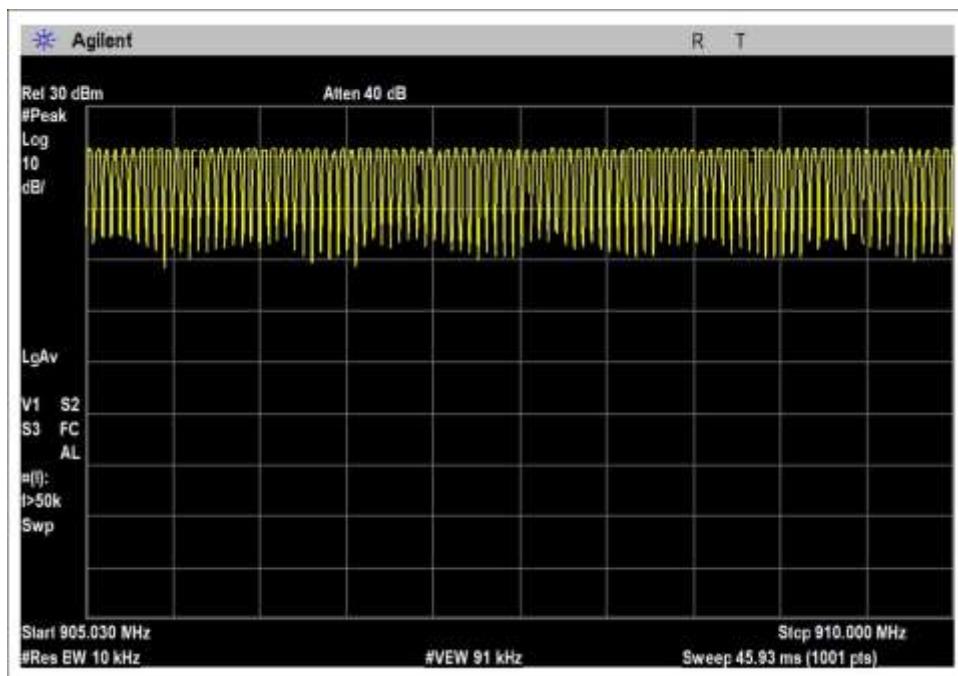
### 15.247(a)(1)(i) Number of Hopping Channels

Test Data Summary				
Antenna Port	Operational Mode	Measured (Channels)	Limit (Channels)	Results
1	Hopping FSK 25kbps	513	≥50	Pass

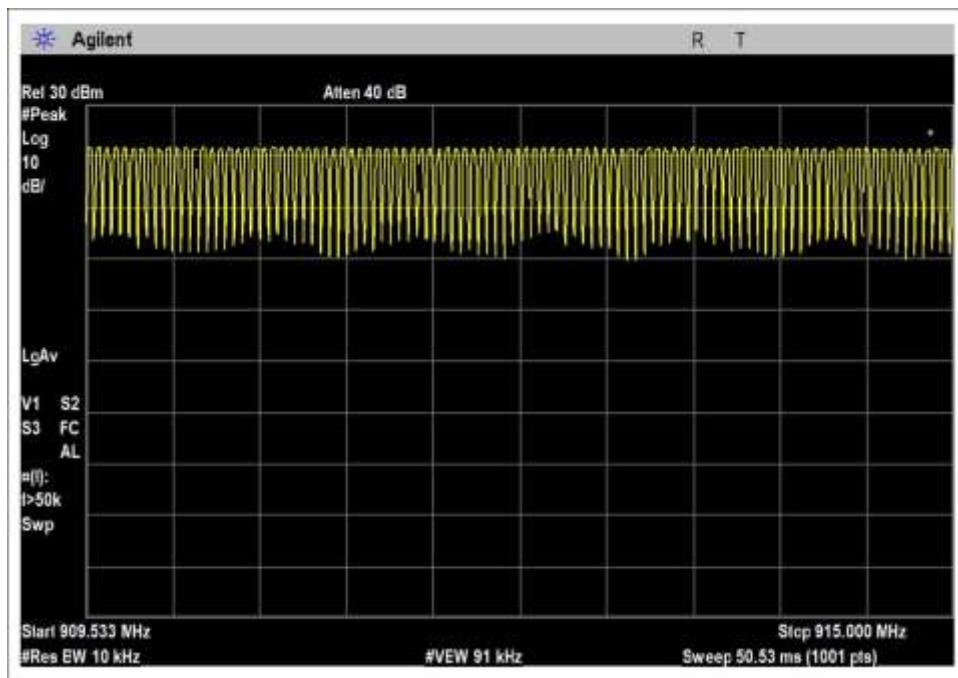
### Plot(s)



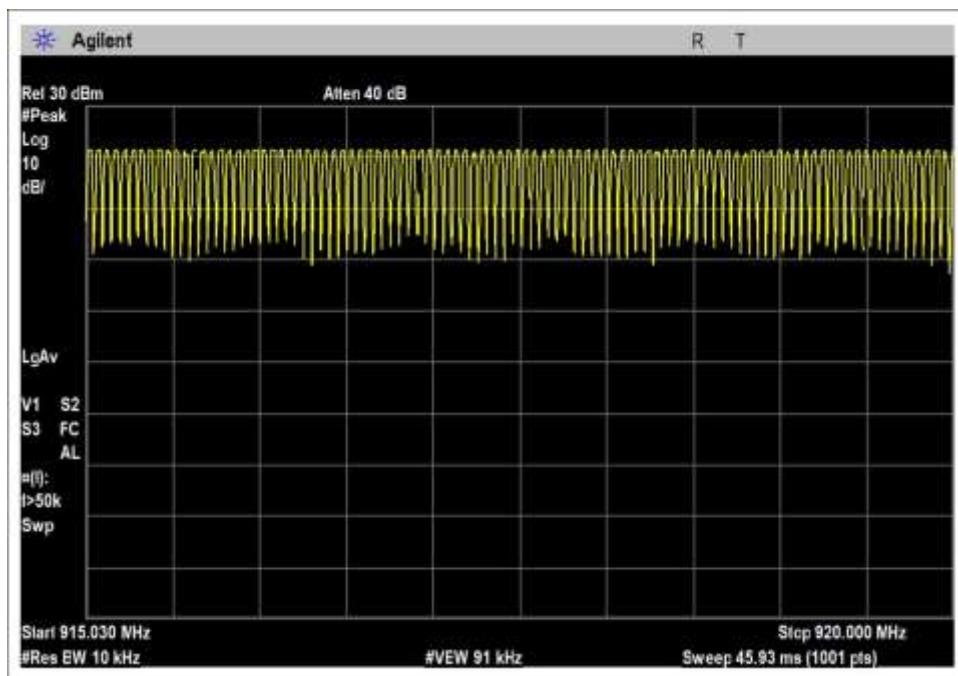
57 Channel



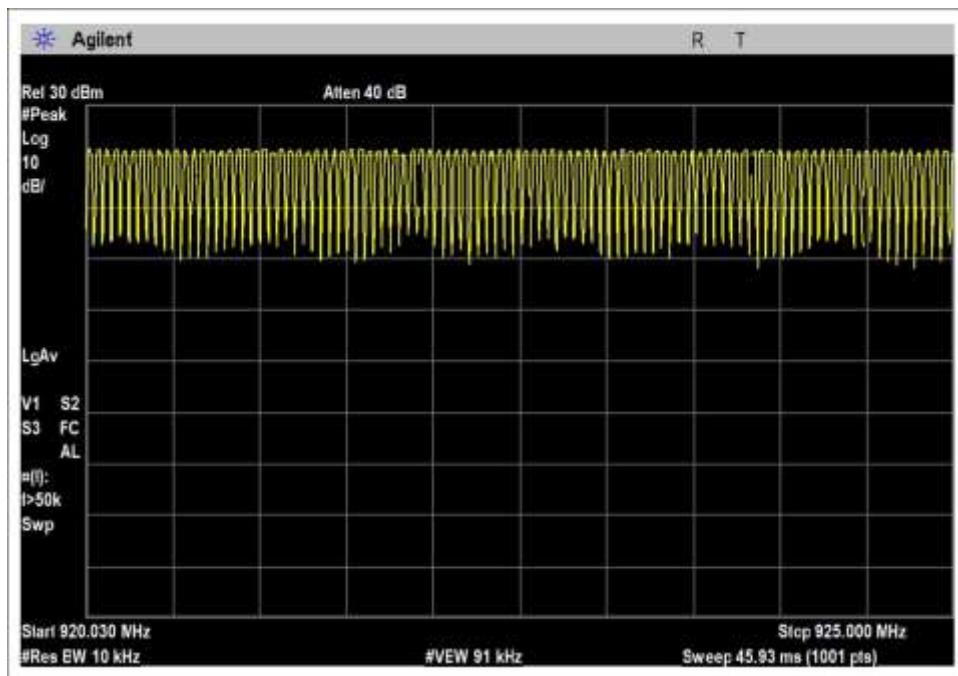
100 Channel



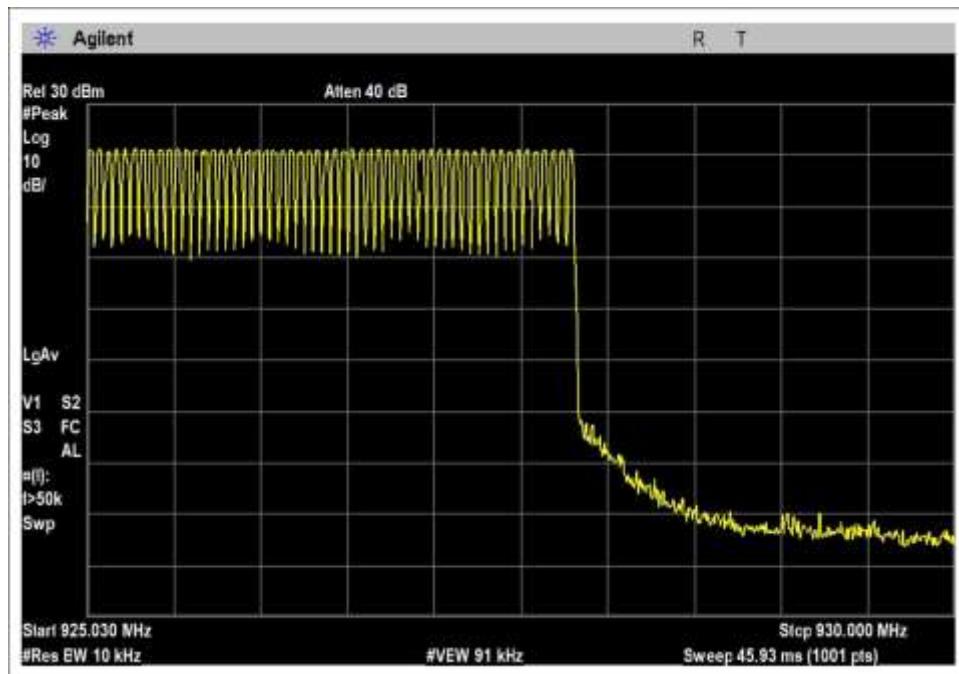
100 Channel



100 Channel

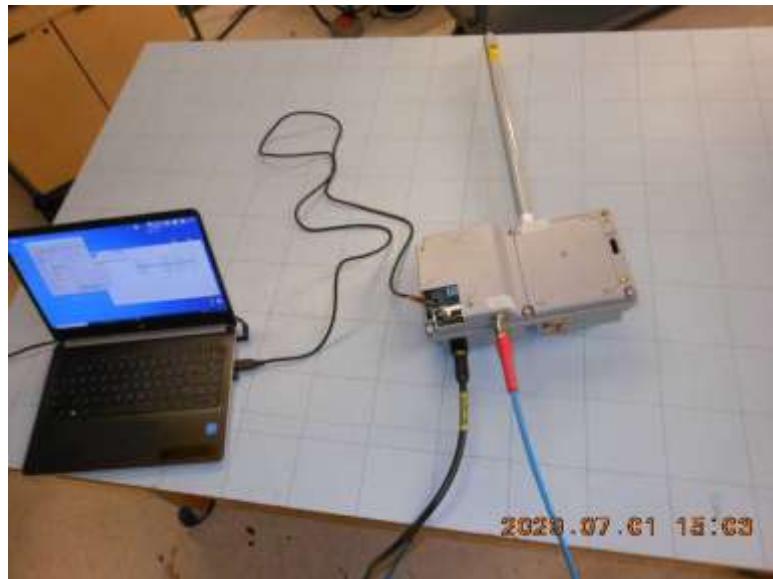


100 Channel



56 Channel

### Test Setup Photo(s)





## **15.247(a)(1)(i) Time of Occupancy**

CKC was not contracted to perform the testing due to the required equipment and firmware to exercise the EUT's multiple pseudo-random hopping sequences was not available and that the complexity of the different modulations and modes depend on the device to be in a fully operating network environment. Therefore, the manufacturer declares the following:

For this permissive change, the modulation/mode has a worst-case Time of Occupancy demonstrating 400mS compliance of 395.4mS in 20 seconds, with < 250kHz OBW. Each session of multiple short transmissions takes place on one of 513 different channels in a pseudorandom sequence. The algorithm that determines the pseudo-random hop sequence ensures all channels are used equally on the average.

Ittron Inc. (the manufacturer) employs hopping patterns based on a pseudo-random sequence generated by an algorithm. The algorithm can have multiple components generated, that each has its own pseudo-random sequence.

The firmware ensures the channels are used in the prescribed pseudo random order, therefore, it maintains equal channel usage.

The system has single channel receiver bandwidths that match the transmitter's modulation bandwidth that is enabled.

With the transmitter and receiver in synchronization within the network, transmitters switch frequencies in synchronization with the receiver.

When the transmitter needs to send a continuous or long data stream, total time of the packet transmissions is monitored to comply with dwell time requirement of 400ms in the appropriate 20s window if this modulation/mode is enabled.

This device does not employ any hopping avoidance techniques.

## 15.247(b)(1) Output Power

### Test Equipment

Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
03514	Multimeter	Fluke	87	12/7/2018	12/7/2020
01505B	AC Power Supply	PPS	345AMXT-UPC32	5/28/2019	5/28/2021

### Test Data Summary - Voltage Variations

Frequency (MHz)	Modulation / Ant Port	V <sub>Minimum</sub> (dBm)	V <sub>Nominal</sub> (dBm)	V <sub>Maximum</sub> (dBm)	Max Deviation from V <sub>Nominal</sub> (dB)
902.2	FSK 25kbps	29.4	29.3	29.4	0.1
915.0	FSK 25kbps	29.4	29.3	29.3	0.1
927.8	FSK 25kbps	29.0	28.9	29.0	0.1

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

### Parameter Definitions:

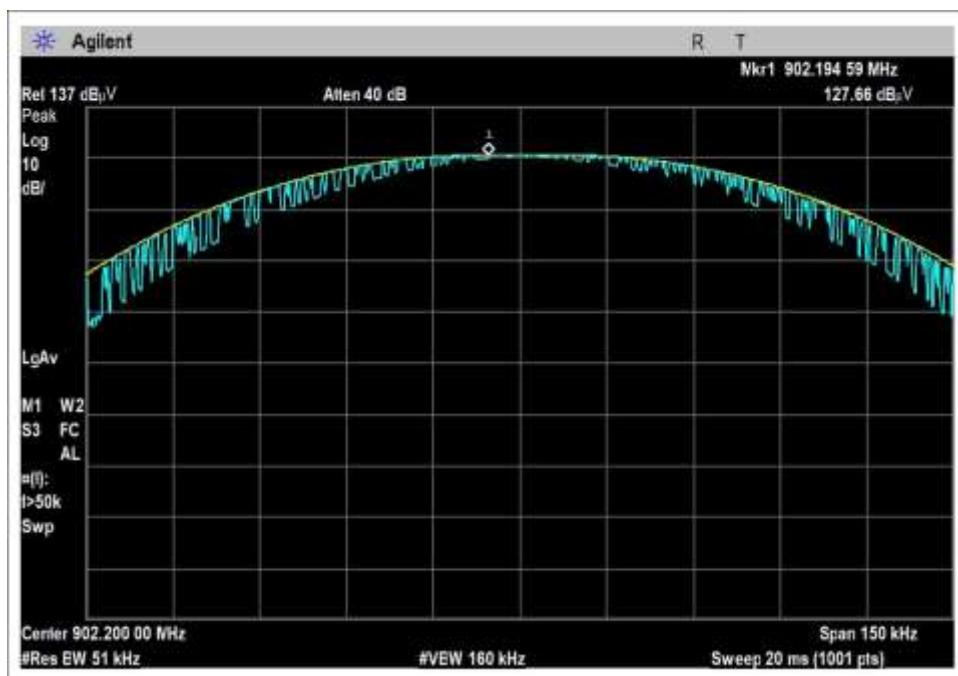
Measurements performed at input voltage according to manufacturer specification.

Parameter	Value
V <sub>Nominal</sub> :	120VAC
V <sub>Minimum</sub> :	85VAC
V <sub>Maximum</sub> :	265VAC

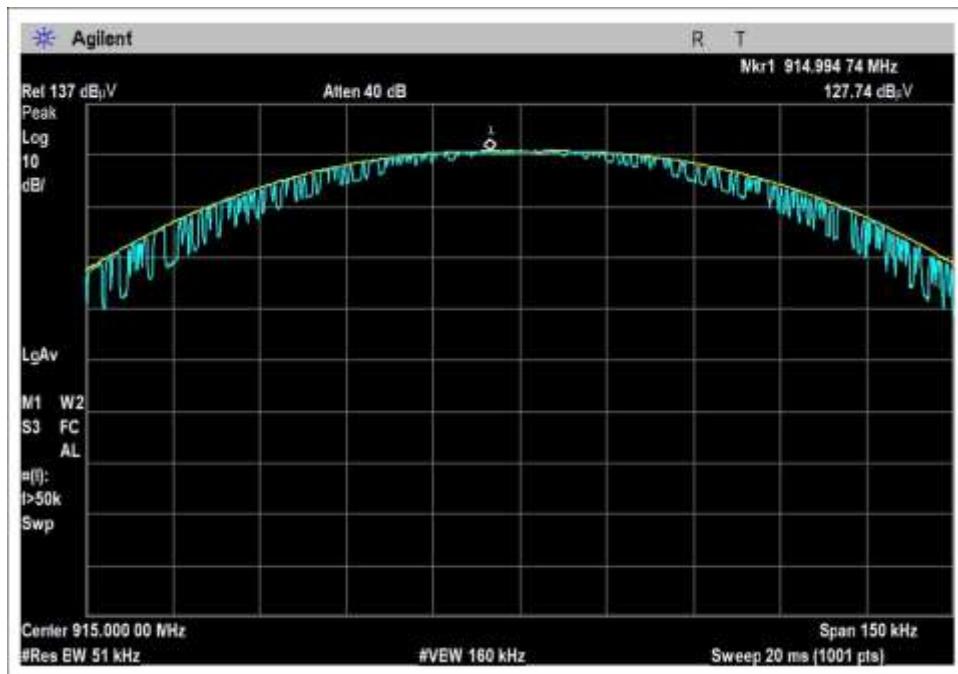
**Test Data Summary - RF Conducted Measurement**

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

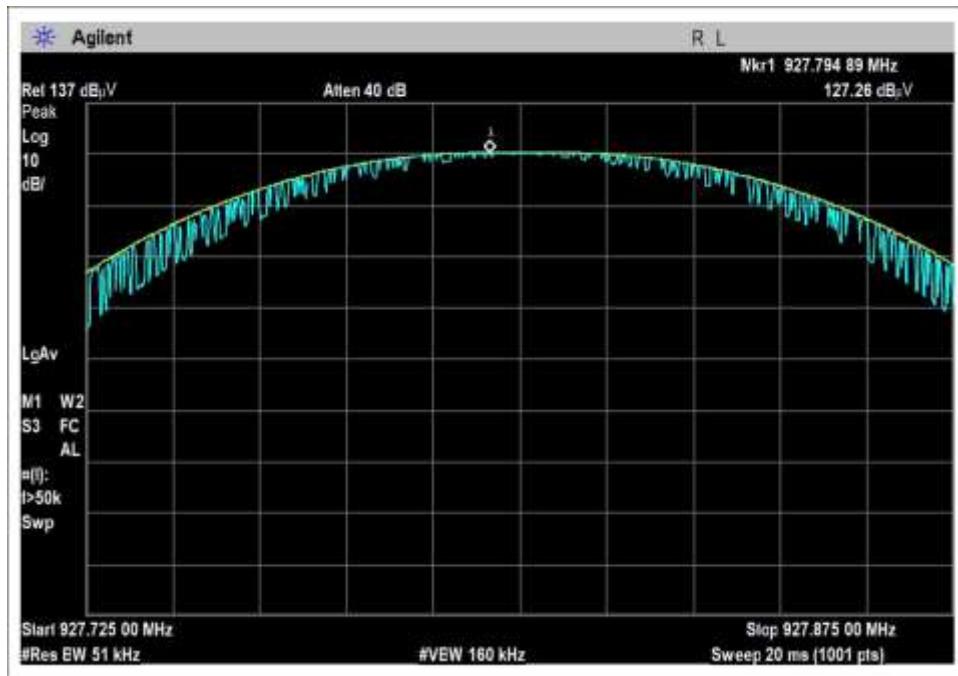
Frequency (MHz)	Modulation	Ant. Type / Gain (dBi)	Measured (dBm)	Limit (dBm)	Results
902.2	FSK 25kbps	Omnidirectional / 2.6dBi	29.3	$\leq 30$	Pass
915.0	FSK 25kbps	Omnidirectional / 2.6dBi	29.3	$\leq 30$	Pass
927.8	FSK 25kbps	Omnidirectional / 2.6dBi	28.9	$\leq 30$	Pass

**Plots**


Low Channel



Middle Channel



High Channel

## Test Setup / Conditions / Data

Test Location: CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)  
 Customer: **Itron, Inc.**  
 Specification: **15.247(b) Power Output (902-928 MHz FHSS >50 Channels)**  
 Work Order #: **104265** Date: 7/1/2020  
 Test Type: **Conducted Emissions** Time: 15:46:55  
 Tested By: Michael Atkinson Sequence#: 2  
 Software: EMITest 5.03.19 115VAC 60Hz

***Equipment Tested:***

Device	Manufacturer	Model #	S/N
Configuration 1			

***Support Equipment:***

Device	Manufacturer	Model #	S/N
Configuration 1			

***Test Conditions / Notes:***

Temperature: 22-24 °C

Humidity: 40-49 %

Pressure: 101.8kPa

Method: ANSI C63.10 (2013)

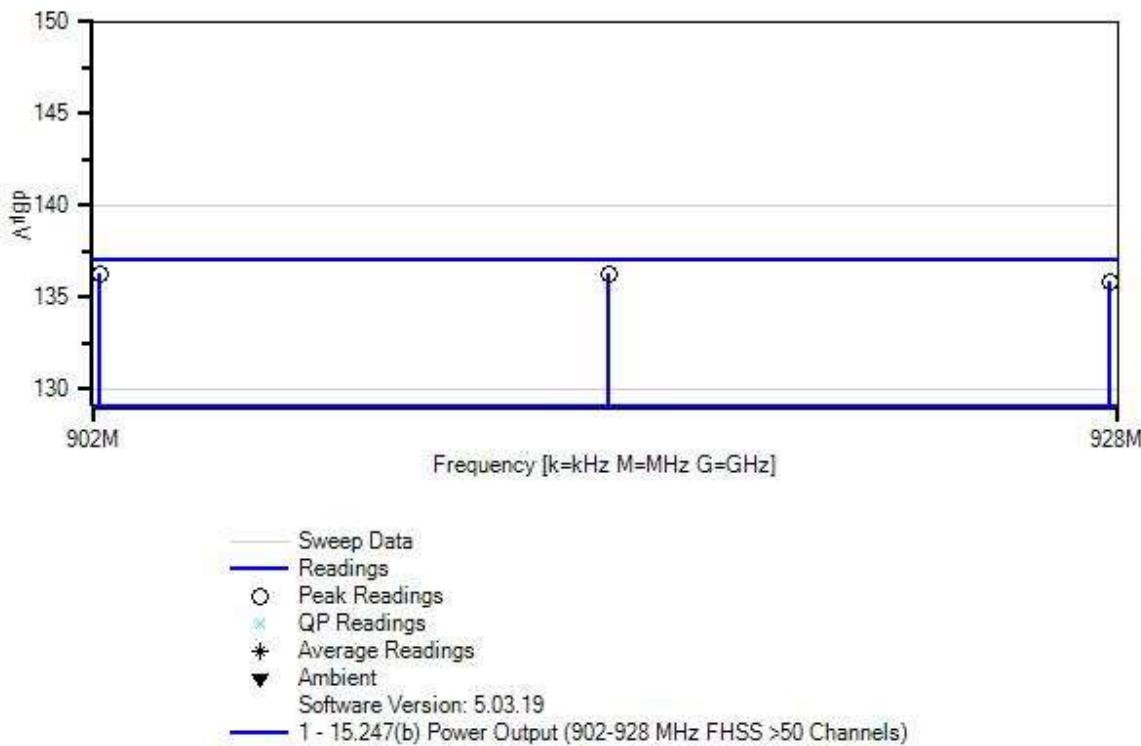
**Test Setup:**

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.

The internal insertion loss of the EUT's adapters to the internal module being tested are characterized under CKC asset C00157, this accounts for both the RF Switch Board (UFL to SMA) as well as the SMA to N type cable internal to the EUT. This is to calculate the output power at the module itself for this host specific module testing.

\*ANC00157 insertion loss factor not characterized until 7/10/2020. After this equipment was characterized, these factors were applied to the final measurement.

A support laptop is connected to the EUT via USB to Serial cable to configure the settings in the EUT.

Itron, Inc. WO#: 104265 Sequence#: 2 Date: 7/1/2020  
 15.247(b) Power Output (902-928 MHz FHSS >50 Channels) Test Lead: 115VAC 60Hz RF Port

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02872	Spectrum Analyzer	E4440A	11/18/2019	11/18/2021
T2	ANP07227	Attenuator	PE7004-6	10/2/2019	10/2/2021
T3	ANP05959	Cable	Heliax	1/20/2020	1/20/2022
T4	ANC00157*	Site Equipment		7/10/2020	7/10/2022

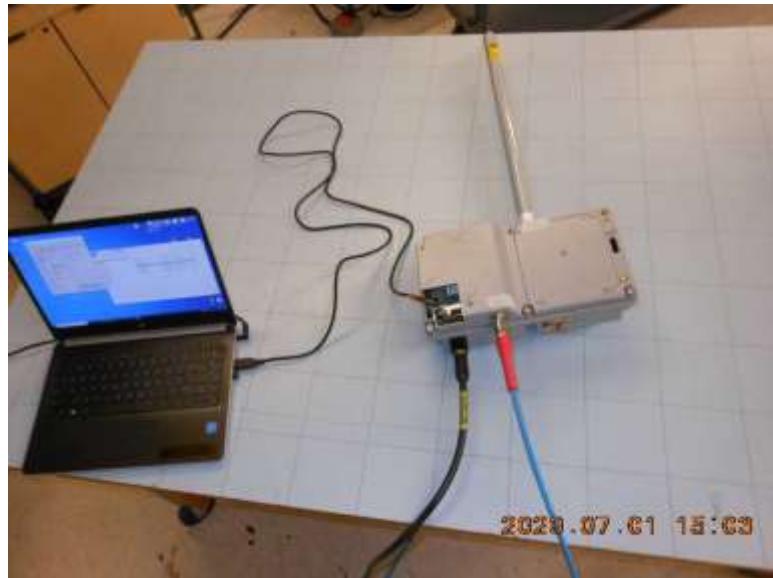
\* See Test Conditions Notes for details.

**Measurement Data:** Reading listed by margin.

Test Lead: RF Port

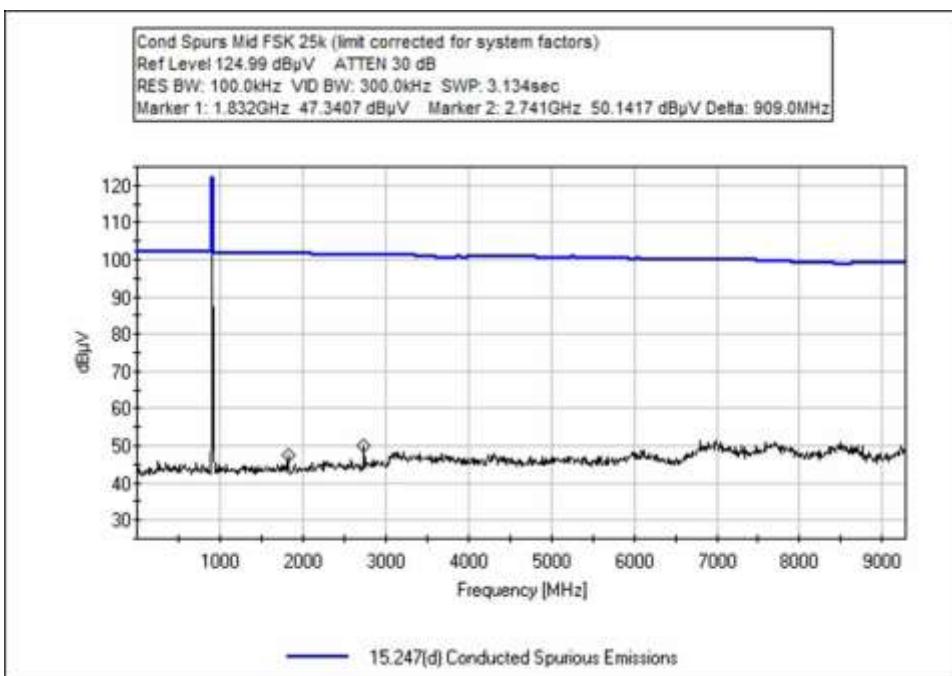
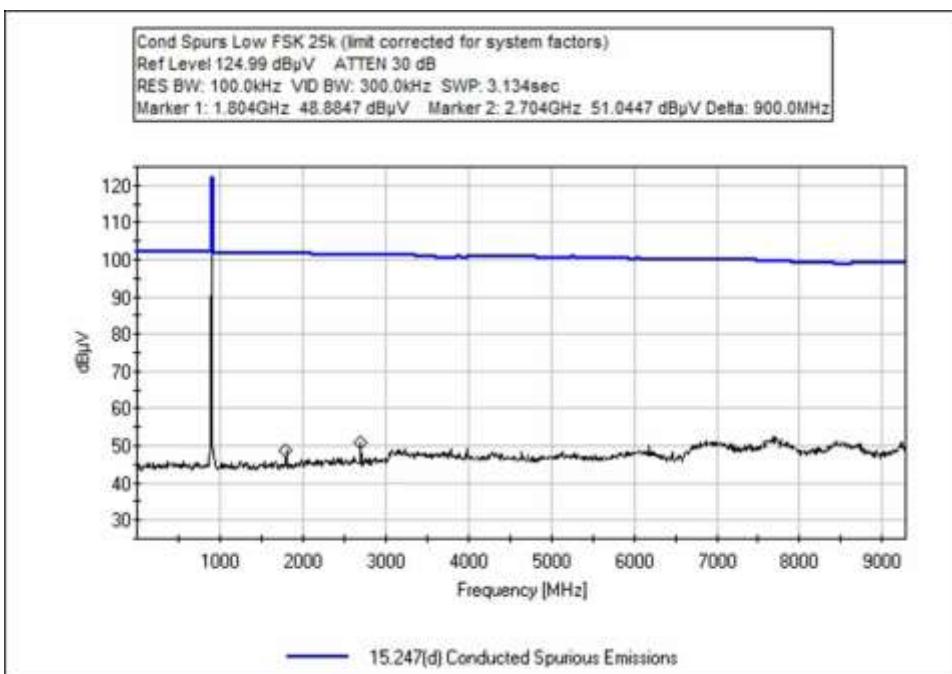
#	Freq MHz	Rdng dB $\mu$ V	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dB $\mu$ V	Spec dB $\mu$ V	Margin dB	Polar Ant
1	914.995M	127.7	+0.0	+5.9	+0.4	+2.3	+0.0	136.3	137.0	-0.7	RF Po
2	902.195M	127.7	+0.0	+5.9	+0.4	+2.3	+0.0	136.3	137.0	-0.7	RF Po
3	927.795M	127.3	+0.0	+5.9	+0.4	+2.3	+0.0	135.9	137.0	-1.1	RF Po

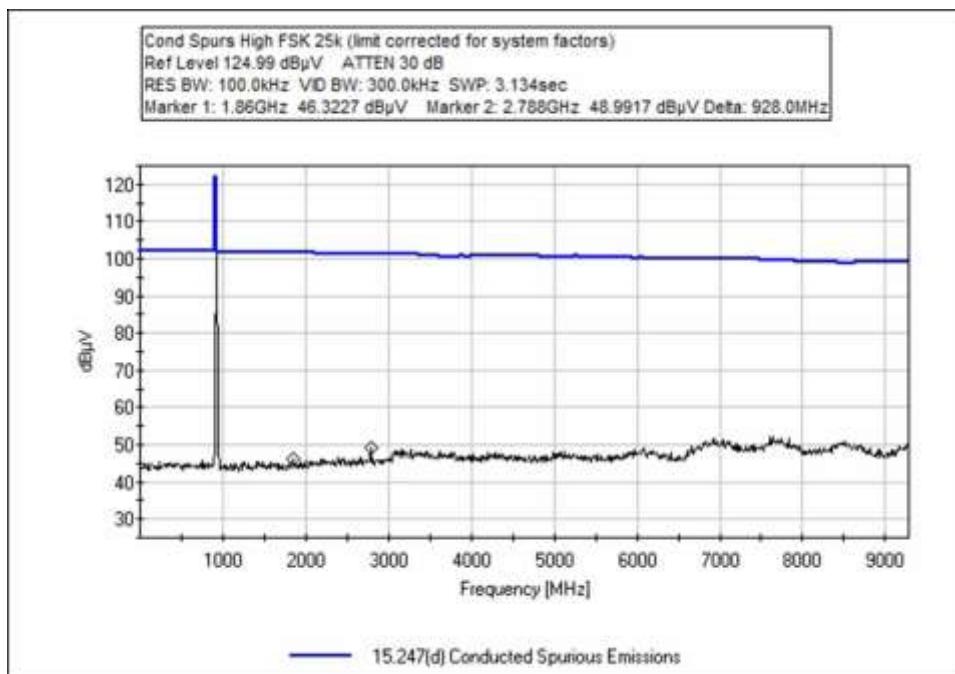
**Test Setup Photo(s)**



## 15.247(d) RF Conducted Emissions & Band Edge

### Plots





## 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 #: **104265** Date: 7/15/2020  
 Test Type: **Conducted Emissions** Time: 11:25:45  
 Tested By: Michael Atkinson Sequence#: 3  
 Software: EMITest 5.03.19 115VAC 60Hz

***Equipment Tested:***

Device	Manufacturer	Model #	S/N
Configuration 1			

***Support Equipment:***

Device	Manufacturer	Model #	S/N
Configuration 1			

***Test Conditions / Notes:***

Temperature: 24 °C

Humidity: 40 %

Pressure: 101.8 kPa

Method: ANSI C63.10 (2013)

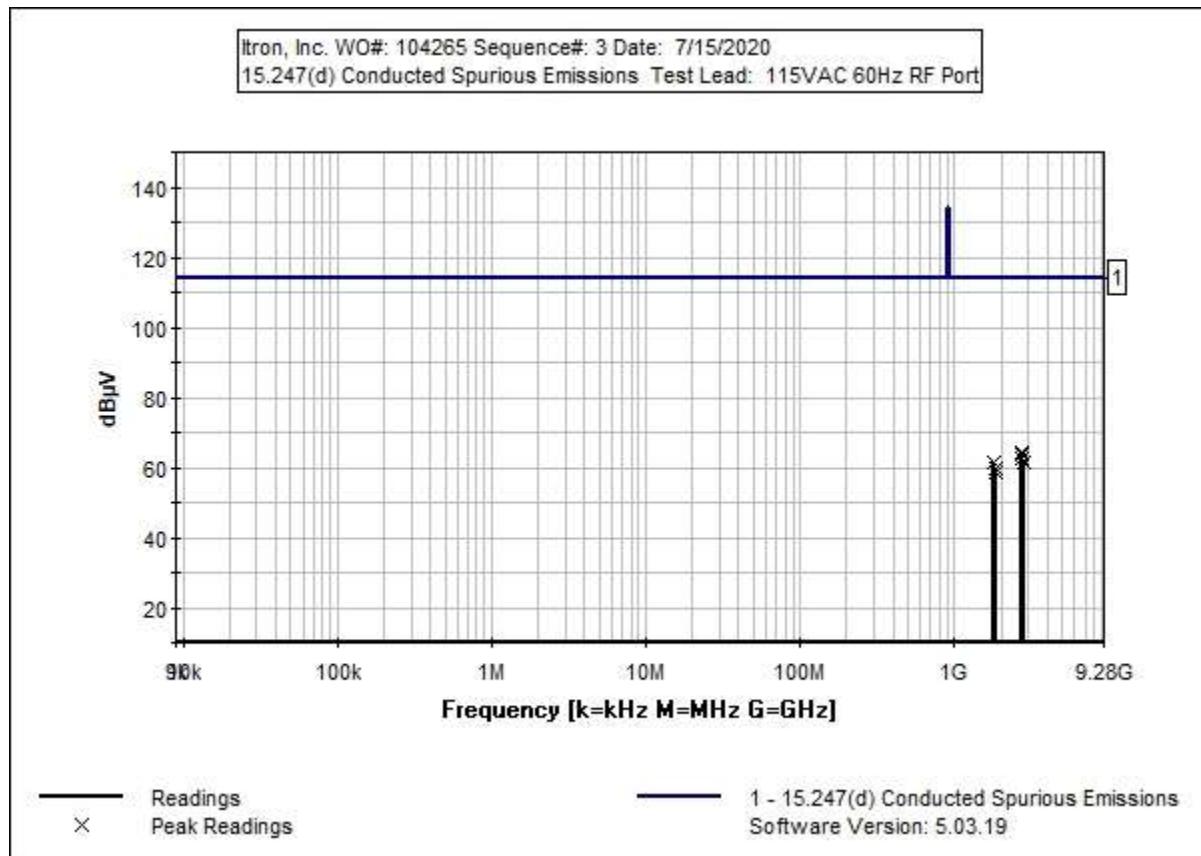
Frequency: 9kHz-9.28GHz

**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 continuously with modulation at its rated output power. Low, Mid, and High channels as well as hopping mode investigated, worst case reported.

For this specific host modular testing the Conducted Emissions are measured directly at the N port of the EUT, there is no additional correction for the loss to the internal module for Conducted Emissions or Band Edge. The limit based on the worst case 100kHz fundamental will also be measured directly at the N port of the EUT without any additional correction for the loss to the internal module.

A support laptop is connected to the EUT via USB to Serial cable to configure the settings in the EUT.


**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02872	Spectrum Analyzer	E4440A	11/18/2019	11/18/2021
T2	ANP07227	Attenuator	PE7004-6	10/2/2019	10/2/2021
T3	ANP05959	Cable	Heliax	1/20/2020	1/20/2022
T4	ANP06123	Attenuator	18N-6	4/5/2019	4/5/2021

<b>Measurement Data:</b>			Reading listed by margin.				Test Lead: RF Port				
#	Freq MHz	Rdng dB $\mu$ V	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dB $\mu$ V	Spec dB $\mu$ V	Margin dB	Polar Ant
1	2739.000M	51.4	+0.0	+5.9	+0.9	+5.9	+0.0	64.1	114.0	-49.9	RF Po
									worst case hopping		
2	2704.000M	51.0	+0.0	+5.9	+0.9	+5.9	+0.0	63.7	114.0	-50.3	RF Po
3	2741.000M	50.1	+0.0	+5.9	+0.9	+5.9	+0.0	62.8	114.0	-51.2	RF Po
4	2788.000M	49.0	+0.0	+5.9	+0.9	+5.9	+0.0	61.7	114.0	-52.3	RF Po
5	1812.000M	49.0	+0.0	+5.9	+0.7	+5.9	+0.0	61.5	114.0	-52.5	RF Po
									worst case hopping		
6	1804.000M	48.9	+0.0	+5.9	+0.7	+5.9	+0.0	61.4	114.0	-52.6	RF Po
7	1832.000M	47.3	+0.0	+5.9	+0.7	+5.9	+0.0	59.8	114.0	-54.2	RF Po
8	1860.000M	46.3	+0.0	+5.9	+0.7	+5.9	+0.0	58.8	114.0	-55.2	RF Po

## 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	FSK 25kbps	-16.0	< 7.0	Pass
928	FSK 25kbps	-14.8	< 7.0	Pass

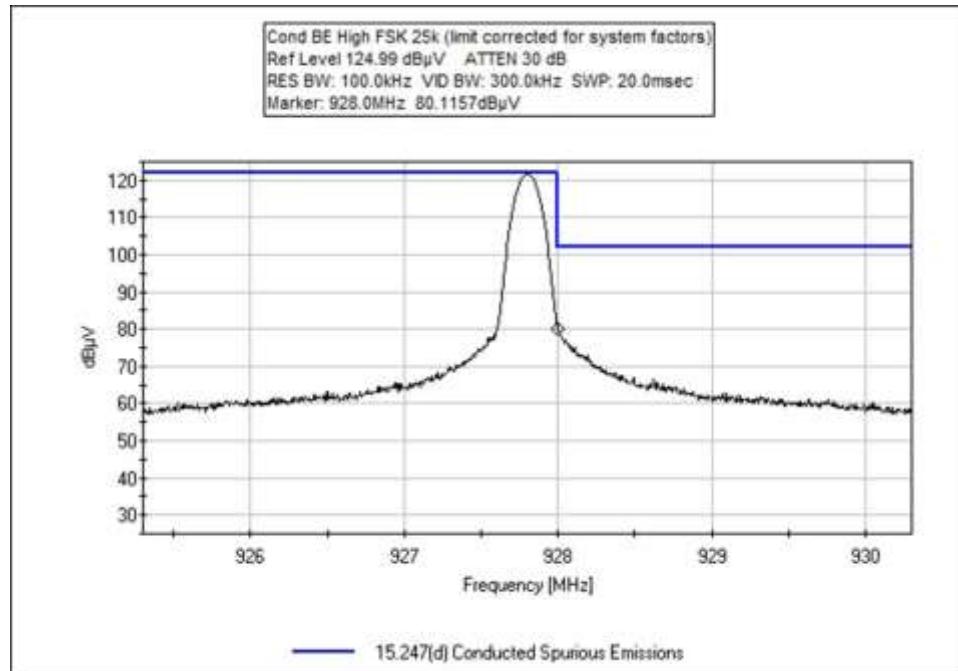
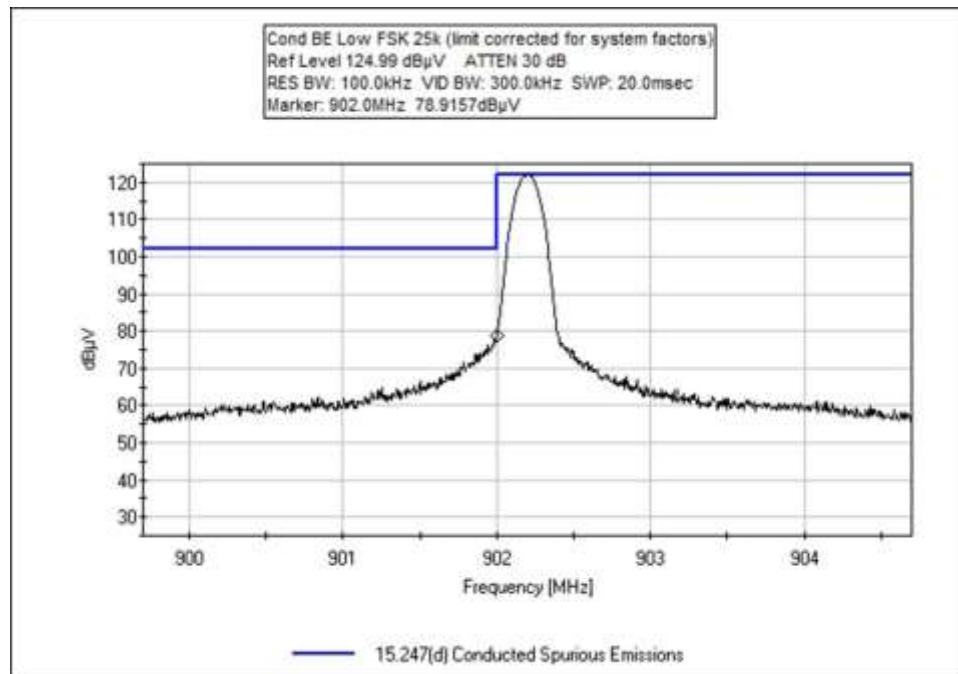
### Band Edge Summary

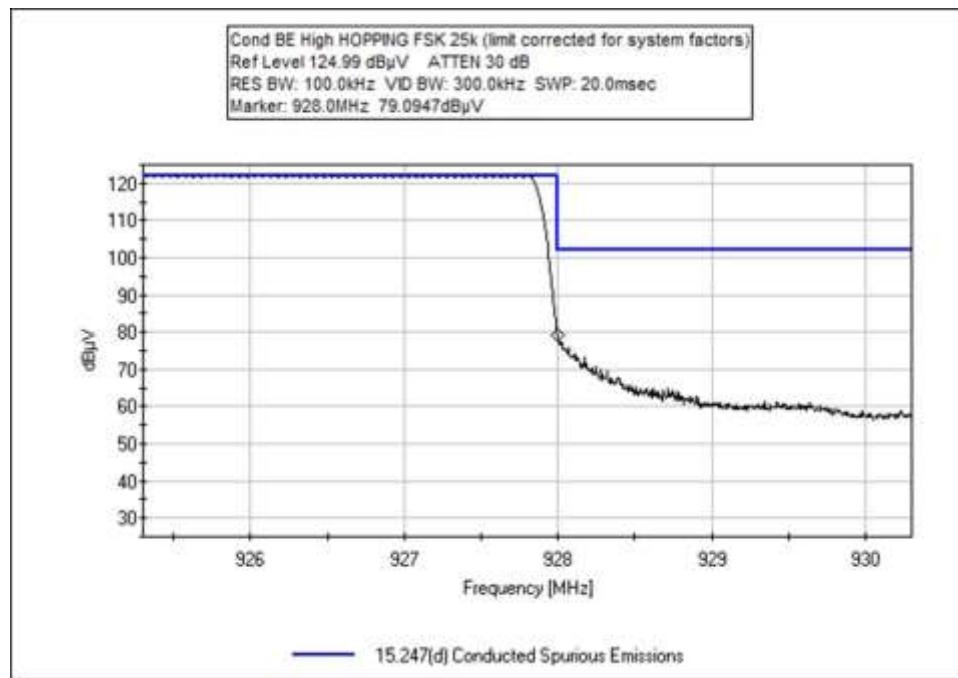
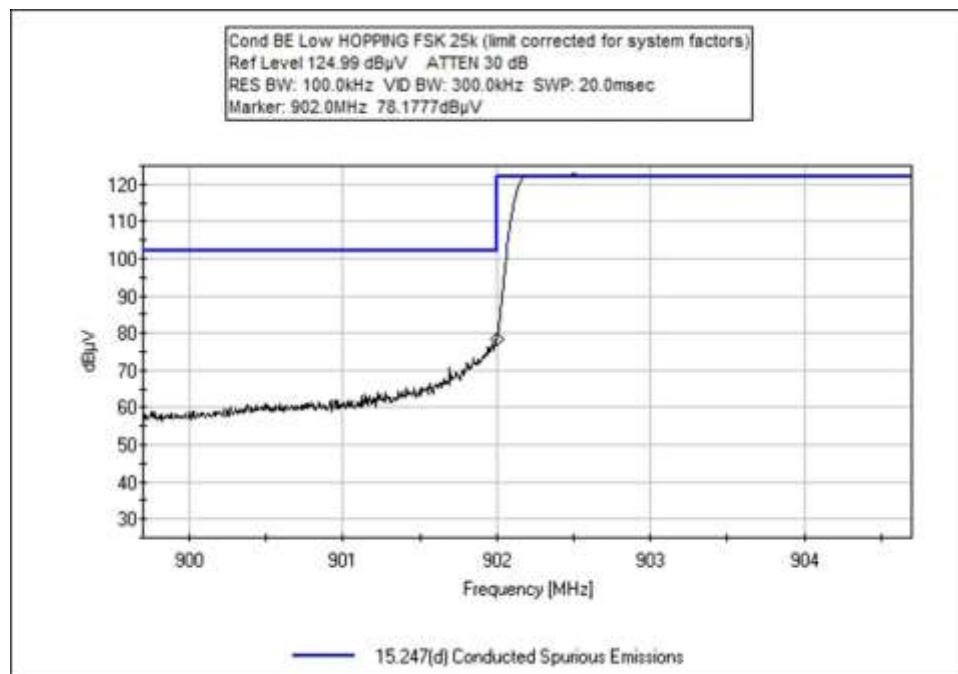
Limit applied: Max Power/100kHz - 20dB.

Operating Mode: Hopping

Frequency (MHz)	Modulation	Measured (dBm)	Limit (dBm)	Results
902	Hopping - FSK 25kbps	-16.7	< 7.0	Pass
928	Hopping - FSK 25kbps	-15.8	< 7.0	Pass

## Band Edge Plots





## 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 #: **104265** Date: 7/15/2020  
 Test Type: **Conducted Emissions** Time: 11:11:39  
 Tested By: Michael Atkinson Sequence#: 4  
 Software: EMITest 5.03.19 115VAC 60Hz

***Equipment Tested:***

Device	Manufacturer	Model #	S/N
Configuration 1			

***Support Equipment:***

Device	Manufacturer	Model #	S/N
Configuration 1			

***Test Conditions / Notes:***

Temperature: 24 °C  
 Humidity: 40 %  
 Pressure: 101.8 kPa

Method: ANSI C63.10 (2013)

Frequency: Band Edge

**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 continuously with modulation at its rated output power. Low and High channels investigated for Band Edge, as well as hopping mode.

For this specific host modular testing the Conducted Emissions are measured directly at the N port of the EUT, there is no additional correction for the loss to the internal module for Conducted Emissions or Band Edge. The limit based on the worst case 100kHz fundamental will also be measured directly at the N port of the EUT without any additional correction for the loss to the internal module.

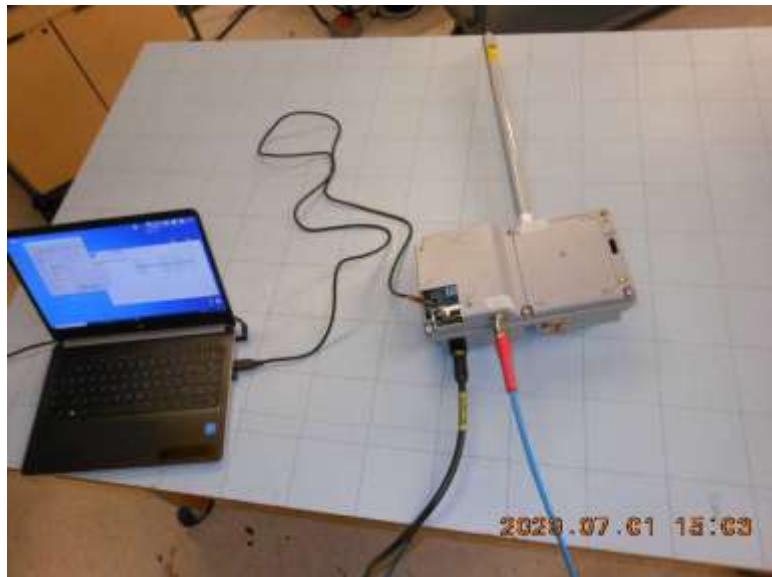
A support laptop is connected to the EUT via USB to Serial cable to configure the settings in the EUT.

***Test Equipment:***

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02872	Spectrum Analyzer	E4440A	11/18/2019	11/18/2021
T2	ANP07227	Attenuator	PE7004-6	10/2/2019	10/2/2021
T3	ANP05959	Cable	Heliax	1/20/2020	1/20/2022
T4	ANP06123	Attenuator	18N-6	4/5/2019	4/5/2021

<b>Measurement Data:</b>			Reading listed by margin.				Test Lead: RF Port				
#	Freq MHz	Rdng dB $\mu$ V	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dB $\mu$ V	Spec dB $\mu$ V	Margin dB	Polar Ant
1	928.000M	80.1	+0.0	+5.9	+0.4	+5.8	+0.0	92.2	114.0	-21.8	RF Po
2	928.000M	79.1	+0.0	+5.9	+0.4	+5.8	+0.0	91.2	114.0	-22.8	RF Po
3	902.000M	78.9	+0.0	+5.9	+0.4	+5.8	+0.0	91.0	114.0	-23.0	RF Po
4	902.000M	78.2	+0.0	+5.9	+0.4	+5.8	+0.0	90.3	114.0	-23.7	RF Po
											Hopping

### Test Setup Photo(s)



## 15.247(d) Radiated Emissions & Band Edge

### Test Setup / Conditions / Data

Test Location: CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)  
 Customer: **Itron, Inc.**  
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**  
 Work Order #: **104265** Date: 7/16/2020  
 Test Type: **Radiated Scan** Time: 13:05:39  
 Tested By: Michael Atkinson Sequence#: 6  
 Software: EMITest 5.03.19

***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: 41 %

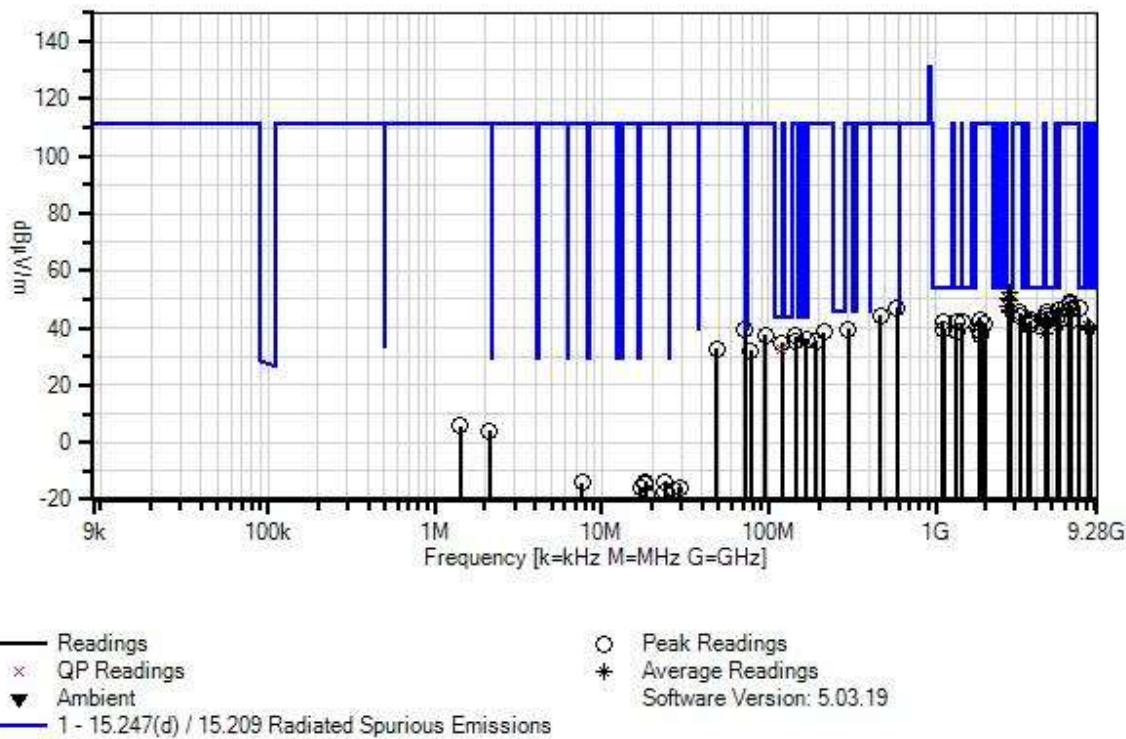
Pressure: 101.6 kPa

Method: ANSI C63.10 (2013)

Frequency: 9kHz-9.28GHz

**Test Setup:**

The equipment under test (EUT) is placed on the tabletop. A support laptop is connected to the EUT via USB to Serial cable to configure the settings in the EUT. The EUT host output port is connected to the externally attached antenna. The EUT is transmitting continuously with modulation at its rated output power. Low, Mid, High channels as well as hopping mode investigated, worst case reported. Horizontal and Vertical antenna polarities investigated above 30MHz, worst case reported. 3 x orthogonal axes investigated below 30MHz, worst case reported.

Itron, Inc. WO#: 104265 Sequence#: 6 Date: 7/16/2020  
 15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Ground Para

**Test Equipment:**

ID	Asset #	Description	Model	Cal Date	Cal Due Date
T1	AN02673	Spectrum Analyzer	E4446A	2/22/2019	2/22/2021
T2	ANP06540	Cable	Heliax	8/23/2019	8/23/2021
T3	ANP06515	Cable	Heliax	7/1/2020	7/1/2022
T4	ANP07504	Cable	CLU40-KMKM-02.00F	1/17/2019	1/17/2021
T5	AN01467	Horn Antenna-ANSI C63.5 Calibration	3115	7/5/2019	7/5/2021
T6	AN03540	Preamplifier	83017A	5/13/2019	5/13/2021
T7	AN03170	High Pass Filter	HM1155-11SS	10/23/2019	10/23/2021
T8	ANP05305	Cable	ETSI-50T	9/6/2019	9/6/2021
T9	ANP05360	Cable	RG214	2/3/2020	2/3/2022
T10	ANP06123	Attenuator	18N-6	4/5/2019	4/5/2021
T11	AN03628	Biconilog Antenna	3142E	6/11/2019	6/11/2021
T12	AN00052	Loop Antenna	6502	5/4/2020	5/4/2022

<b>Measurement Data:</b>			Reading listed by margin.			Test Distance: 3 Meters					
#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
			T5	T6	T7	T8					
	MHz	dB $\mu$ V	dB	dB	dB	dB	Table	dB $\mu$ V/m	dB $\mu$ V/m	dB	Ant
1	2783.400M	53.7	+0.0	+0.7	+2.9	+0.2	+0.0	52.3	54.0	-1.7	Vert
	Ave		+28.5	-34.1	+0.4	+0.0			High		
			+0.0	+0.0	+0.0	+0.0					
^	2783.410M	56.5	+0.0	+0.7	+2.9	+0.2	+0.0	55.1	54.0	+1.1	Vert
			+28.5	-34.1	+0.4	+0.0			High		
			+0.0	+0.0	+0.0	+0.0					
3	2706.620M	51.7	+0.0	+0.7	+2.9	+0.2	+0.0	50.1	54.0	-3.9	Vert
	Ave		+28.3	-34.1	+0.4	+0.0			Low		
			+0.0	+0.0	+0.0	+0.0					
^	2706.650M	53.2	+0.0	+0.7	+2.9	+0.2	+0.0	51.6	54.0	-2.4	Vert
			+28.3	-34.1	+0.4	+0.0			Low		
			+0.0	+0.0	+0.0	+0.0					
5	2745.025M	51.4	+0.0	+0.7	+2.9	+0.2	+0.0	49.9	54.0	-4.1	Vert
	Ave		+28.4	-34.1	+0.4	+0.0			Mid		
			+0.0	+0.0	+0.0	+0.0					
^	2745.060M	54.1	+0.0	+0.7	+2.9	+0.2	+0.0	52.6	54.0	-1.4	Vert
			+28.4	-34.1	+0.4	+0.0			Mid		
			+0.0	+0.0	+0.0	+0.0					
7	2706.620M	49.3	+0.0	+0.7	+2.9	+0.2	+0.0	47.7	54.0	-6.3	Horiz
	Ave		+28.3	-34.1	+0.4	+0.0			Low		
			+0.0	+0.0	+0.0	+0.0					
^	2706.590M	49.9	+0.0	+0.7	+2.9	+0.2	+0.0	48.3	54.0	-5.7	Horiz
			+28.3	-34.1	+0.4	+0.0			Low		
			+0.0	+0.0	+0.0	+0.0					
9	5413.250M	40.7	+0.0	+1.0	+4.3	+0.4	+0.0	46.5	54.0	-7.5	Horiz
	Ave		+33.4	-33.7	+0.4	+0.0			Low		
			+0.0	+0.0	+0.0	+0.0					
^	5413.240M	43.2	+0.0	+1.0	+4.3	+0.4	+0.0	49.0	54.0	-5.0	Horiz
			+33.4	-33.7	+0.4	+0.0			Low		
			+0.0	+0.0	+0.0	+0.0					
11	2783.430M	47.5	+0.0	+0.7	+2.9	+0.2	+0.0	46.1	54.0	-7.9	Horiz
	Ave		+28.5	-34.1	+0.4	+0.0			High		
			+0.0	+0.0	+0.0	+0.0					
^	2783.400M	49.5	+0.0	+0.7	+2.9	+0.2	+0.0	48.1	54.0	-5.9	Horiz
			+28.5	-34.1	+0.4	+0.0			High		
			+0.0	+0.0	+0.0	+0.0					
13	4575.000M	41.3	+0.0	+0.9	+3.8	+0.7	+0.0	45.5	54.0	-8.5	Vert
			+31.9	-33.7	+0.6	+0.0			Mid		
			+0.0	+0.0	+0.0	+0.0					
14	120.200M	19.9	+0.0	+0.1	+0.0	+0.0	+0.0	34.9	43.5	-8.6	Vert
			+0.0	+0.0	+0.0	+0.5					
			+0.6	+5.8	+8.0	+0.0					

15	2745.080M	46.8	+0.0	+0.7	+2.9	+0.2	+0.0	45.3	54.0	-8.7	Horiz
	Ave		+28.4	-34.1	+0.4	+0.0				Mid	
			+0.0	+0.0	+0.0	+0.0					
^	2745.030M	48.6	+0.0	+0.7	+2.9	+0.2	+0.0	47.1	54.0	-6.9	Horiz
			+28.4	-34.1	+0.4	+0.0				Mid	
			+0.0	+0.0	+0.0	+0.0					
17	4639.090M	40.1	+0.0	+0.9	+3.8	+0.6	+0.0	44.5	54.0	-9.5	Horiz
			+32.1	-33.6	+0.6	+0.0				High	
			+0.0	+0.0	+0.0	+0.0					
18	120.029M	17.9	+0.0	+0.1	+0.0	+0.0	+0.0	32.9	43.5	-10.6	Vert
	QP		+0.0	+0.0	+0.0	+0.5					
			+0.6	+5.8	+8.0	+0.0					
19	4639.008M	38.3	+0.0	+0.9	+3.8	+0.6	+0.0	42.7	54.0	-11.3	Vert
			+32.1	-33.6	+0.6	+0.0				High	
			+0.0	+0.0	+0.0	+0.0					
20	3711.032M	40.3	+0.0	+0.9	+3.5	+0.5	+0.0	42.6	54.0	-11.4	Vert
			+30.6	-33.7	+0.5	+0.0				High	
			+0.0	+0.0	+0.0	+0.0					
21	1104.000M	48.3	+0.0	+0.4	+1.8	+0.1	+0.0	42.2	54.0	-11.8	Horiz
			+24.7	-36.7	+3.6	+0.0					
			+0.0	+0.0	+0.0	+0.0					
22	3608.830M	40.2	+0.0	+0.8	+3.4	+0.6	+0.0	42.0	54.0	-12.0	Horiz
			+30.3	-33.8	+0.5	+0.0				Low	
			+0.0	+0.0	+0.0	+0.0					
23	1327.000M	49.3	+0.0	+0.4	+2.0	+0.1	+0.0	42.0	54.0	-12.0	Horiz
			+25.2	-35.8	+0.8	+0.0					
			+0.0	+0.0	+0.0	+0.0					
24	1442.000M	48.9	+0.0	+0.5	+2.1	+0.2	+0.0	42.0	54.0	-12.0	Vert
			+25.1	-35.5	+0.7	+0.0					
			+0.0	+0.0	+0.0	+0.0					
25	3711.150M	39.3	+0.0	+0.9	+3.5	+0.5	+0.0	41.6	54.0	-12.4	Horiz
			+30.6	-33.7	+0.5	+0.0				High	
			+0.0	+0.0	+0.0	+0.0					
26	4575.000M	37.3	+0.0	+0.9	+3.8	+0.7	+0.0	41.5	54.0	-12.5	Horiz
	Ave		+31.9	-33.7	+0.6	+0.0				Mid	
			+0.0	+0.0	+0.0	+0.0					
^	4574.975M	43.1	+0.0	+0.9	+3.8	+0.7	+0.0	47.3	54.0	-6.7	Horiz
			+31.9	-33.7	+0.6	+0.0				Mid	
			+0.0	+0.0	+0.0	+0.0					
28	3660.000M	38.8	+0.0	+0.9	+3.4	+0.5	+0.0	40.9	54.0	-13.1	Vert
			+30.5	-33.7	+0.5	+0.0				Mid	
			+0.0	+0.0	+0.0	+0.0					
29	8119.800M	30.9	+0.0	+1.3	+5.3	+0.6	+0.0	40.9	54.0	-13.1	Horiz
	Ave		+37.0	-35.0	+0.8	+0.0				Low	
			+0.0	+0.0	+0.0	+0.0					
^	8119.800M	40.0	+0.0	+1.3	+5.3	+0.6	+0.0	50.0	54.0	-4.0	Horiz
			+37.0	-35.0	+0.8	+0.0				Low	
			+0.0	+0.0	+0.0	+0.0					
31	3660.000M	38.5	+0.0	+0.9	+3.4	+0.5	+0.0	40.6	54.0	-13.4	Horiz
			+30.5	-33.7	+0.5	+0.0				Mid	
			+0.0	+0.0	+0.0	+0.0					

32	5413.235M	34.7	+0.0	+1.0	+4.3	+0.4	+0.0	40.5	54.0	-13.5	Vert
	Ave		+33.4	-33.7	+0.4	+0.0			Low		
			+0.0	+0.0	+0.0	+0.0					
^	5413.235M	41.7	+0.0	+1.0	+4.3	+0.4	+0.0	47.5	54.0	-6.5	Vert
			+33.4	-33.7	+0.4	+0.0			Low		
			+0.0	+0.0	+0.0	+0.0					
34	8235.010M	29.8	+0.0	+1.7	+5.3	+0.5	+0.0	40.2	54.0	-13.8	Horiz
	Ave		+37.0	-35.0	+0.9	+0.0			Mid		
			+0.0	+0.0	+0.0	+0.0					
^	8234.965M	37.4	+0.0	+1.7	+5.3	+0.5	+0.0	47.8	54.0	-6.2	Horiz
			+37.0	-35.0	+0.9	+0.0			Mid		
			+0.0	+0.0	+0.0	+0.0					
36	8350.260M	29.2	+0.0	+1.7	+5.3	+0.5	+0.0	39.6	54.0	-14.4	Horiz
	Ave		+37.0	-34.9	+0.8	+0.0			High		
			+0.0	+0.0	+0.0	+0.0					
^	8350.290M	37.1	+0.0	+1.7	+5.3	+0.5	+0.0	47.5	54.0	-6.5	Horiz
			+37.0	-34.9	+0.8	+0.0			High		
			+0.0	+0.0	+0.0	+0.0					
38	1116.000M	46.9	+0.0	+0.4	+1.8	+0.1	+0.0	39.6	54.0	-14.4	Vert
			+24.7	-36.6	+2.3	+0.0					
			+0.0	+0.0	+0.0	+0.0					
39	1331.000M	46.1	+0.0	+0.4	+2.0	+0.1	+0.0	38.8	54.0	-15.2	Vert
			+25.2	-35.8	+0.8	+0.0					
			+0.0	+0.0	+0.0	+0.0					
40	4511.010M	34.2	+0.0	+0.9	+3.7	+0.7	+0.0	38.2	54.0	-15.8	Horiz
	Ave		+31.8	-33.7	+0.6	+0.0			Low		
			+0.0	+0.0	+0.0	+0.0					
^	4511.090M	42.3	+0.0	+0.9	+3.7	+0.7	+0.0	46.3	54.0	-7.7	Horiz
			+31.8	-33.7	+0.6	+0.0			Low		
			+0.0	+0.0	+0.0	+0.0					
42	4511.085M	34.0	+0.0	+0.9	+3.7	+0.7	+0.0	38.0	54.0	-16.0	Vert
	Ave		+31.8	-33.7	+0.6	+0.0			Low		
			+0.0	+0.0	+0.0	+0.0					
^	4511.040M	41.8	+0.0	+0.9	+3.7	+0.7	+0.0	45.8	54.0	-8.2	Vert
			+31.8	-33.7	+0.6	+0.0			Low		
			+0.0	+0.0	+0.0	+0.0					
44	6315.435M	41.1	+0.0	+1.0	+5.1	+0.5	+0.0	48.7	111.5	-62.8	Vert
			+34.6	-34.1	+0.5	+0.0			Low		
			+0.0	+0.0	+0.0	+0.0					
45	6405.060M	40.1	+0.0	+1.1	+5.3	+0.6	+0.0	48.0	111.5	-63.5	Vert
			+34.6	-34.2	+0.5	+0.0			Mid		
			+0.0	+0.0	+0.0	+0.0					
46	583.900M	17.5	+0.0	+0.3	+0.0	+0.0	+0.0	46.9	111.5	-64.6	Vert
			+0.0	+0.0	+0.0	+1.2					
			+1.6	+5.8	+20.5	+0.0					
47	6494.616M	38.7	+0.0	+1.2	+5.4	+0.6	+0.0	46.7	111.5	-64.8	Vert
			+34.5	-34.2	+0.5	+0.0			High		
			+0.0	+0.0	+0.0	+0.0					
48	7217.680M	37.5	+0.0	+1.1	+5.1	+0.5	+0.0	46.6	111.5	-64.9	Horiz
			+36.5	-34.5	+0.4	+0.0			Low		
			+0.0	+0.0	+0.0	+0.0					

49	6404.965M	38.5	+0.0	+1.1	+5.3	+0.6	+0.0	46.4	111.5	-65.1	Horiz
			+34.6	-34.2	+0.5	+0.0				Mid	
			+0.0	+0.0	+0.0	+0.0					
50	5490.140M	40.1	+0.0	+1.0	+4.4	+0.4	+0.0	46.1	111.5	-65.4	Vert
			+33.5	-33.7	+0.4	+0.0				Mid	
			+0.0	+0.0	+0.0	+0.0					
51	5490.000M	39.9	+0.0	+1.0	+4.4	+0.4	+0.0	45.9	111.5	-65.6	Horiz
			+33.5	-33.7	+0.4	+0.0				Mid	
			+0.0	+0.0	+0.0	+0.0					
52	3187.000M	44.9	+0.0	+0.8	+3.2	+0.5	+0.0	45.2	111.5	-66.3	Vert
			+29.5	-34.0	+0.3	+0.0					
			+0.0	+0.0	+0.0	+0.0					
53	464.600M	17.6	+0.0	+0.3	+0.0	+0.0	+0.0	44.4	111.5	-67.1	Horiz
			+0.0	+0.0	+0.0	+1.1					
			+1.4	+5.8	+18.2	+0.0					
54	3201.200M	44.1	+0.0	+0.8	+3.2	+0.5	+0.0	44.4	111.5	-67.1	Horiz
			+29.5	-34.0	+0.3	+0.0					
			+0.0	+0.0	+0.0	+0.0					
55	3186.640M	43.8	+0.0	+0.8	+3.2	+0.5	+0.0	44.1	111.5	-67.4	Vert
			+29.5	-34.0	+0.3	+0.0					
			+0.0	+0.0	+0.0	+0.0					
56	6494.690M	35.1	+0.0	+1.2	+5.4	+0.6	+0.0	43.1	111.5	-68.4	Horiz
			+34.5	-34.2	+0.5	+0.0				High	
			+0.0	+0.0	+0.0	+0.0					
57	5566.800M	36.7	+0.0	+1.0	+4.4	+0.4	+0.0	42.9	111.5	-68.6	Vert
			+33.7	-33.7	+0.4	+0.0				High	
			+0.0	+0.0	+0.0	+0.0					
58	1830.060M	47.9	+0.0	+0.5	+2.4	+0.2	+0.0	42.9	111.5	-68.6	Vert
			+26.3	-34.8	+0.4	+0.0				Mid	
			+0.0	+0.0	+0.0	+0.0					
59	5566.890M	36.6	+0.0	+1.0	+4.4	+0.4	+0.0	42.8	111.5	-68.7	Horiz
			+33.7	-33.7	+0.4	+0.0				High	
			+0.0	+0.0	+0.0	+0.0					
60	1855.675M	47.3	+0.0	+0.5	+2.4	+0.2	+0.0	42.7	111.5	-68.8	Vert
			+26.6	-34.7	+0.4	+0.0				High	
			+0.0	+0.0	+0.0	+0.0					
61	1959.000M	44.7	+0.0	+0.6	+2.5	+0.2	+0.0	41.3	111.5	-70.2	Horiz
			+27.5	-34.6	+0.4	+0.0				Low	
			+0.0	+0.0	+0.0	+0.0					
62	299.700M	18.5	+0.0	+0.2	+0.0	+0.0	+0.0	39.6	111.5	-71.9	Horiz
			+0.0	+0.0	+0.0	+0.9					
			+1.1	+5.8	+13.1	+0.0					
63	1804.490M	44.7	+0.0	+0.5	+2.3	+0.2	+0.0	39.5	111.5	-72.0	Horiz
			+26.1	-34.8	+0.5	+0.0				Low	
			+0.0	+0.0	+0.0	+0.0					
64	1804.435M	44.5	+0.0	+0.5	+2.3	+0.2	+0.0	39.3	111.5	-72.2	Vert
			+26.1	-34.8	+0.5	+0.0				Low	
			+0.0	+0.0	+0.0	+0.0					
65	71.700M	25.0	+0.0	+0.1	+0.0	+0.0	+0.0	39.1	111.5	-72.4	Vert
			+0.0	+0.0	+0.0	+0.4					
			+0.5	+5.8	+7.3	+0.0					

66	1830.050M	43.7	+0.0	+0.5	+2.4	+0.2	+0.0	38.7	111.5	-72.8	Horiz
			+26.3	-34.8	+0.4	+0.0					Mid
			+0.0	+0.0	+0.0	+0.0					
67	214.300M	20.5	+0.0	+0.2	+0.0	+0.0	+0.0	38.6	111.5	-72.9	Horiz
			+0.0	+0.0	+0.0	+0.7					
			+0.9	+5.8	+10.5	+0.0					
68	96.000M	22.8	+0.0	+0.1	+0.0	+0.0	+0.0	37.5	111.5	-74.0	Vert
			+0.0	+0.0	+0.0	+0.5					
			+0.6	+5.8	+7.7	+0.0					
69	1855.600M	41.8	+0.0	+0.5	+2.4	+0.2	+0.0	37.2	111.5	-74.3	Horiz
			+26.6	-34.7	+0.4	+0.0					High
			+0.0	+0.0	+0.0	+0.0					
70	144.500M	21.3	+0.0	+0.1	+0.0	+0.0	+0.0	37.1	111.5	-74.4	Vert
			+0.0	+0.0	+0.0	+0.5					
			+0.7	+5.8	+8.7	+0.0					
71	167.700M	19.0	+0.0	+0.2	+0.0	+0.0	+0.0	36.3	111.5	-75.2	Vert
			+0.0	+0.0	+0.0	+0.6					
			+0.8	+5.8	+9.9	+0.0					
72	167.700M	18.9	+0.0	+0.2	+0.0	+0.0	+0.0	36.2	111.5	-75.3	Horiz
			+0.0	+0.0	+0.0	+0.6					
			+0.8	+5.8	+9.9	+0.0					
73	192.000M	18.1	+0.0	+0.2	+0.0	+0.0	+0.0	35.5	111.5	-76.0	Vert
			+0.0	+0.0	+0.0	+0.7					
			+0.8	+5.8	+9.9	+0.0					
74	144.500M	19.2	+0.0	+0.1	+0.0	+0.0	+0.0	35.0	111.5	-76.5	Horiz
			+0.0	+0.0	+0.0	+0.5					
			+0.7	+5.8	+8.7	+0.0					
75	48.400M	18.1	+0.0	+0.1	+0.0	+0.0	+0.0	32.8	111.5	-78.7	Vert
			+0.0	+0.0	+0.0	+0.4					
			+0.4	+5.8	+8.0	+0.0					
76	77.500M	18.2	+0.0	+0.1	+0.0	+0.0	+0.0	31.9	111.5	-79.6	Horiz
			+0.0	+0.0	+0.0	+0.4					
			+0.5	+5.8	+6.9	+0.0					
77	1.419M	36.1	+0.0	+0.0	+0.0	+0.0	-40.0	5.7	111.5	-105.8	Para
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+9.6					
78	2.138M	34.5	+0.0	+0.0	+0.1	+0.0	-40.0	4.1	111.5	-107.4	Para
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+9.5					
79	24.002M	19.3	+0.0	+0.1	+0.3	+0.0	-40.0	-13.7	111.5	-125.2	Perp
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+6.6					
80	7.597M	16.7	+0.0	+0.0	+0.1	+0.0	-40.0	-14.0	111.5	-125.5	Para
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+9.2					
81	18.334M	17.7	+0.0	+0.1	+0.2	+0.0	-40.0	-14.1	111.5	-125.6	Perp
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+7.9					
82	18.274M	17.6	+0.0	+0.1	+0.2	+0.0	-40.0	-14.2	111.5	-125.7	Groun
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+7.9					

83	29.190M	19.5	+0.0	+0.1	+0.3	+0.0	-40.0	-15.6	111.5	-127.1	Perp
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+4.5					
84	17.014M	15.2	+0.0	+0.1	+0.2	+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	+8.4					
85	26.971M	17.8	+0.0	+0.1	+0.3	+0.0	-40.0	-16.3	111.5	-127.8	Para
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+5.5					
86	24.002M	15.8	+0.0	+0.1	+0.3	+0.0	-40.0	-17.2	111.5	-128.7	Para
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+6.6					
87	18.603M	14.3	+0.0	+0.1	+0.2	+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	+7.8					

## Band Edge

### Band Edge Summary

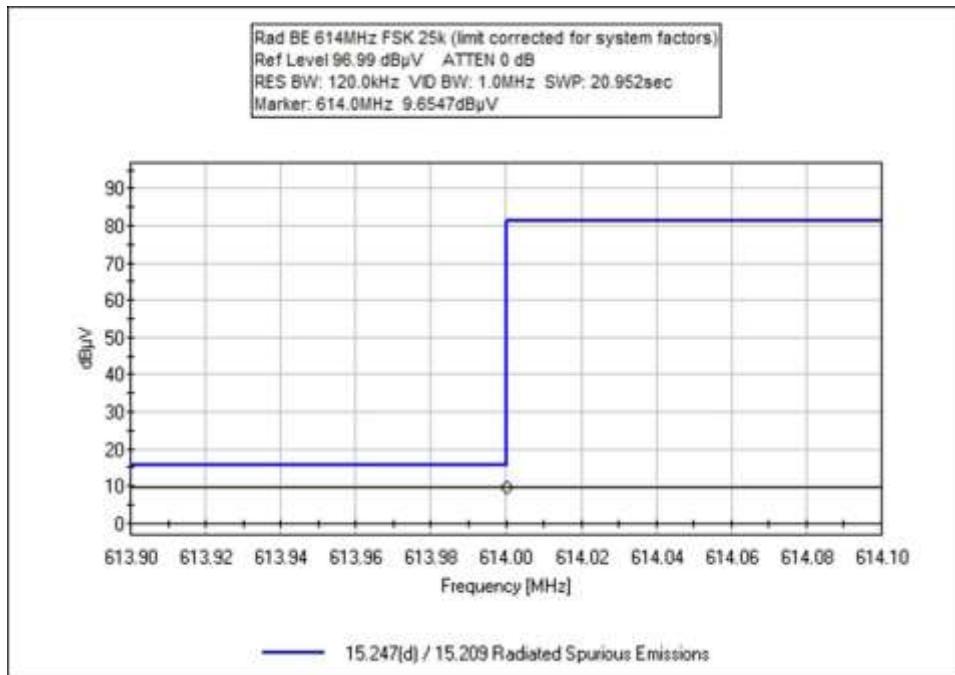
Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
614	FSK 25kbps	Omnidirectional / 2.6dBi	39.9	<46	Pass
902	FSK 25kbps	Omnidirectional / 2.6dBi	88.3	<111.5	Pass
928	FSK 25kbps	Omnidirectional / 2.6dBi	88.0	< 111.5	Pass
960	FSK 25kbps	Omnidirectional / 2.6dBi	47.2	<54	Pass

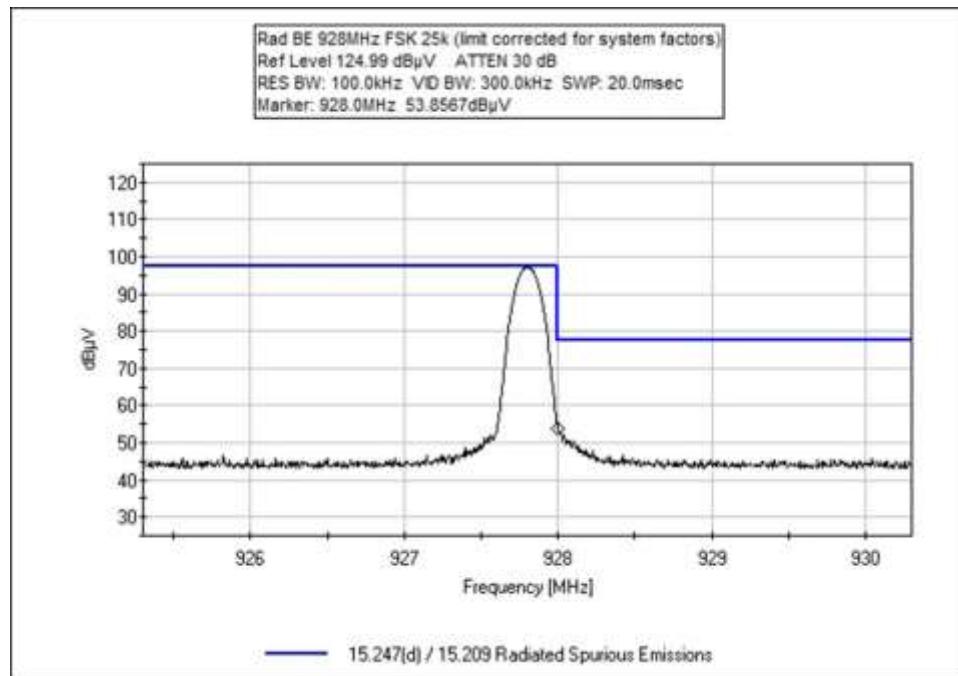
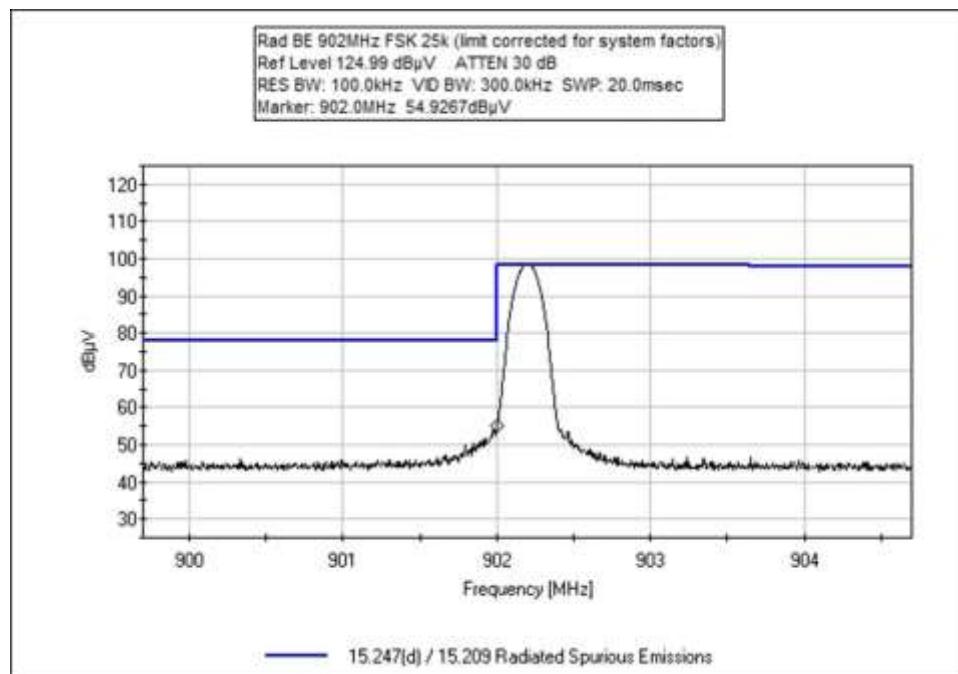
### Band Edge Summary

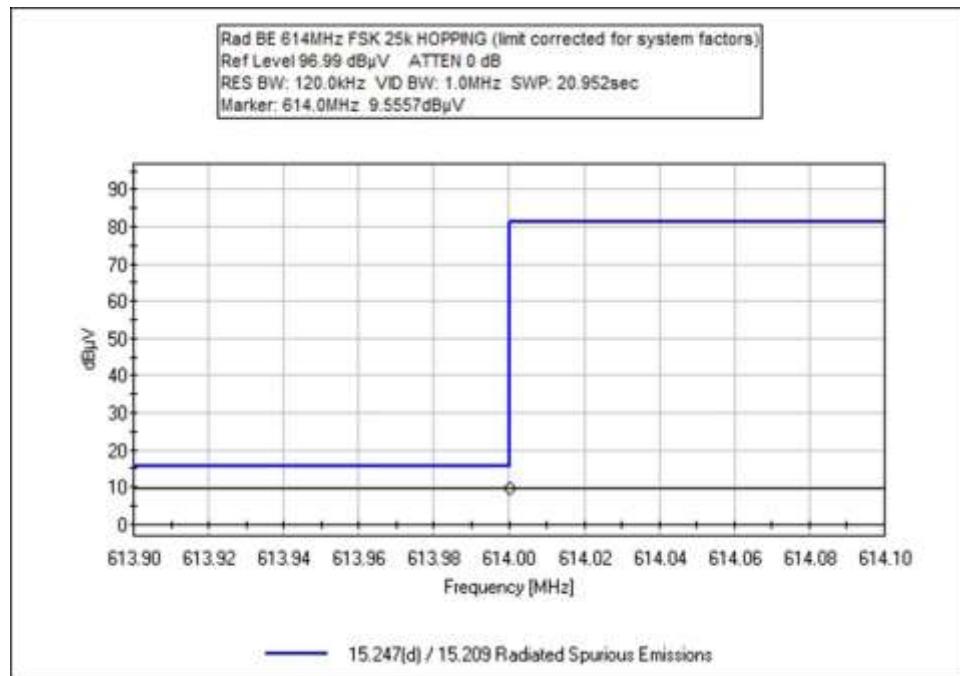
Operating Mode: Hopping

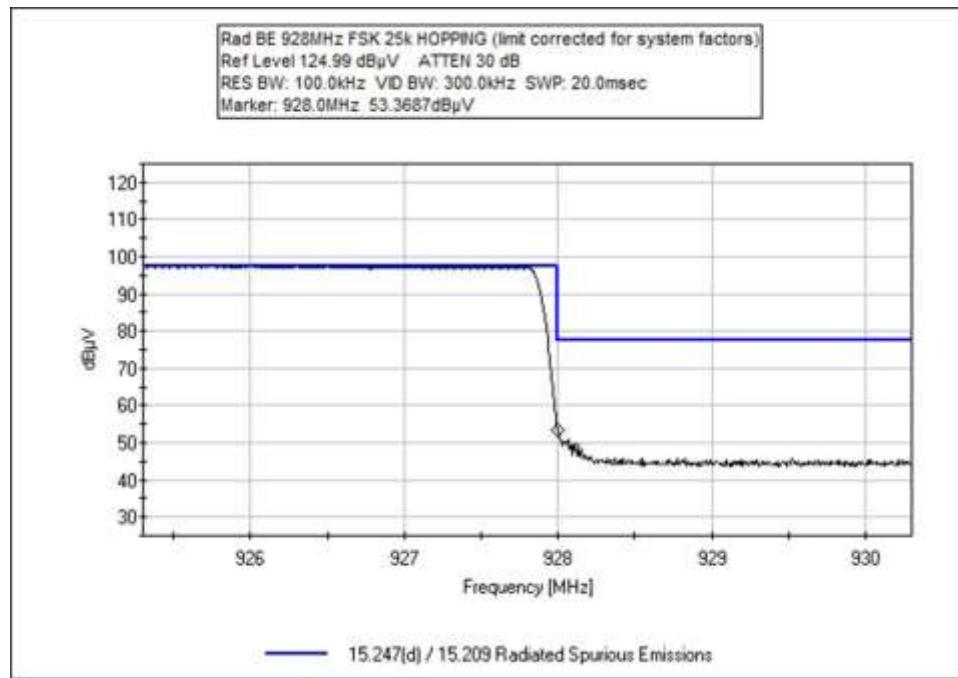
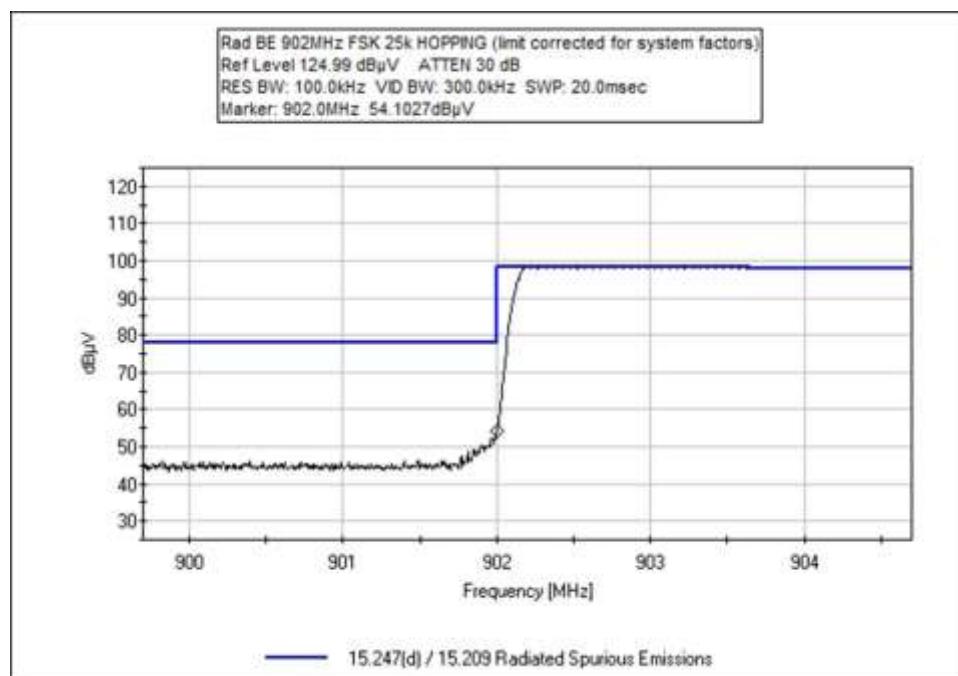
Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
614	Hopping, FSK 25kbps	Omnidirectional / 2.6dBi	39.8	<46	Pass
902	Hopping, FSK 25kbps	Omnidirectional / 2.6dBi	87.5	<111.5	Pass
928	Hopping, FSK 25kbps	Omnidirectional / 2.6dBi	87.5	< 111.5	Pass
960	Hopping, FSK 25kbps	Omnidirectional / 2.6dBi	45.0	<54	Pass

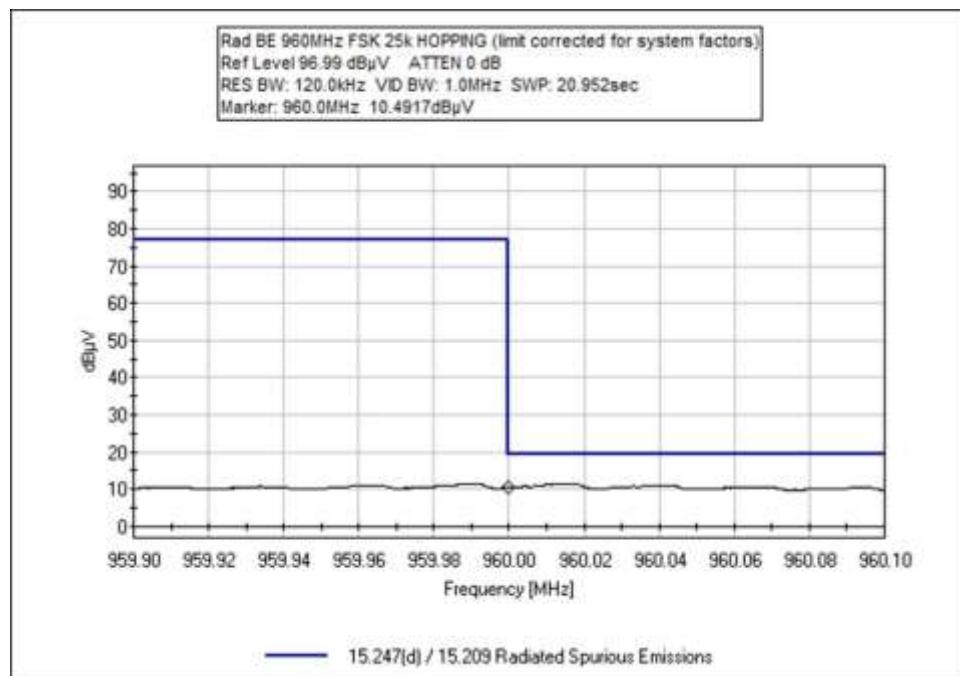
## Band Edge Plots











## 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 #: **104265** Date: 7/15/2020  
 Test Type: **Radiated Scan** Time: 15:02:58  
 Tested By: Michael Atkinson Sequence#: 5  
 Software: EMITest 5.03.19

***Equipment Tested:***

Device	Manufacturer	Model #	S/N
Configuration 2			

***Support Equipment:***

Device	Manufacturer	Model #	S/N
Configuration 2			

***Test Conditions / Notes:***

Temperature: 24 °C

Humidity: 40 %

Pressure: 101.8 kPa

Method: ANSI C63.10 (2013)

Frequency: Band Edge

**Test Setup:**

The equipment under test (EUT) is placed on the tabletop. A support laptop is connected to the EUT via USB to Serial cable to configure the settings in the EUT. The EUT host output port is connected to the externally attached antenna. The EUT is transmitting continuously with modulation at its rated output power. Low and High channels as well as hopping mode investigated, worst case reported. Horizontal and Vertical antenna polarities investigated, worst case reported.

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02673	Spectrum Analyzer	E4446A	2/22/2019	2/22/2021
T1	ANP06540	Cable	Heliax	8/23/2019	8/23/2021
T2	ANP05305	Cable	ETSI-50T	9/6/2019	9/6/2021
T3	ANP05360	Cable	RG214	2/3/2020	2/3/2022
T4	ANP06123	Attenuator	18N-6	4/5/2019	4/5/2021
T5	AN03628	Biconilog Antenna	3142E	6/11/2019	6/11/2021

**Measurement Data:**

Reading listed by margin.

Test Distance: 3 Meters

#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
			T5				Table	dB $\mu$ V/m	dB $\mu$ V/m		
			MHz	dB $\mu$ V	dB	dB	dB				Ant
1	614.000M	9.7	+0.3	+1.2	+1.7	+5.8	+0.0	39.9	46.0	-6.1	Vert
	QP		+21.2								
2	614.000M	9.6	+0.3	+1.2	+1.7	+5.8	+0.0	39.8	46.0	-6.2	Vert
	QP		+21.2								Hopping
3	960.000M	12.7	+0.4	+1.5	+2.2	+5.8	+0.0	47.2	54.0	-6.8	Vert
	QP		+24.6								
4	960.000M	10.5	+0.4	+1.5	+2.2	+5.8	+0.0	45.0	54.0	-9.0	Vert
	QP		+24.6								Hopping
5	902.000M	54.9	+0.3	+1.4	+2.1	+5.8	+0.0	88.3	111.5	-23.2	Vert
			+23.8								
6	928.000M	53.9	+0.4	+1.5	+2.2	+5.8	+0.0	88.0	111.5	-23.5	Vert
			+24.2								
7	928.000M	53.4	+0.4	+1.5	+2.2	+5.8	+0.0	87.5	111.5	-24.0	Vert
			+24.2								Hopping
8	902.000M	54.1	+0.3	+1.4	+2.1	+5.8	+0.0	87.5	111.5	-24.0	Vert
			+23.8								Hopping

**Test Setup Photo(s)**



Below 1GHz



Above 1GHz

## 15.207 AC Conducted Emissions

### Test Setup / Conditions / Data

Test Location: CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)  
 Customer: **Itron, Inc.**  
 Specification: **15.207 AC Mains - Average**  
 Work Order #: **104265** Date: 7/16/2020  
 Test Type: **Conducted Emissions** Time: 14:43:28  
 Tested By: Michael Atkinson Sequence#: 7  
 Software: EMITest 5.03.19 115VAC 60Hz

***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: 41 %

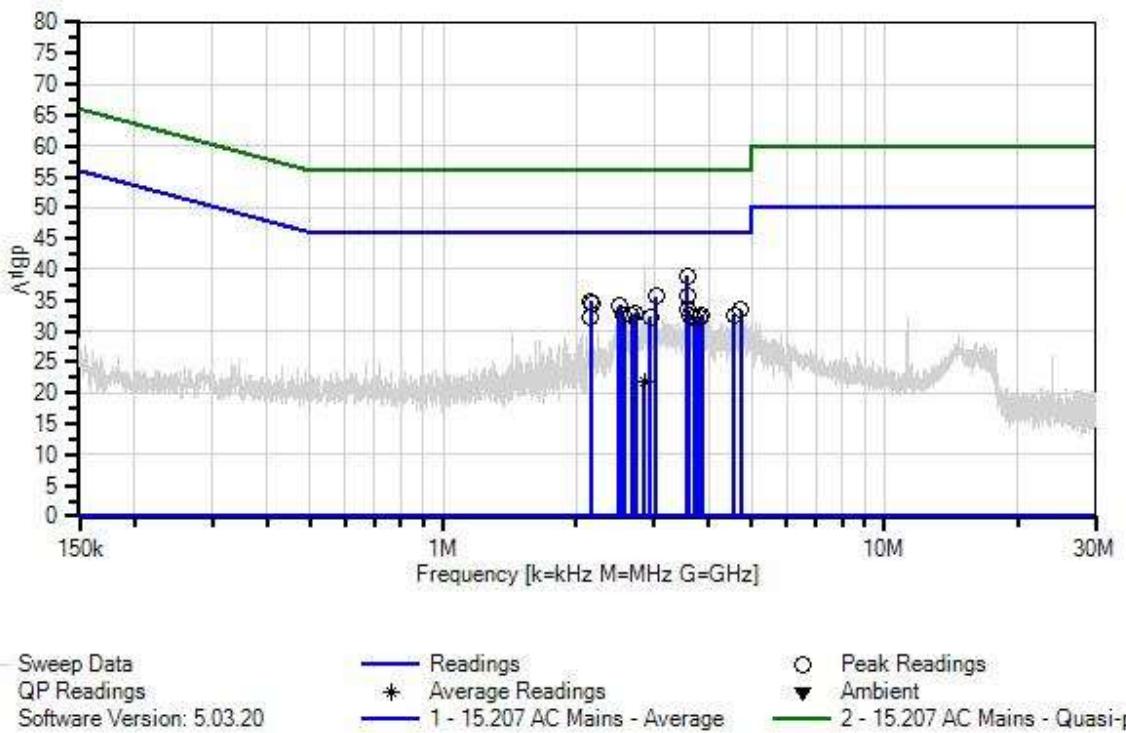
Pressure: 101.6 kPa

Method: ANSI C63.10 (2013)

Frequency: 0.15-30MHz

**Test Setup:**

The equipment under test (EUT) is placed on the tabletop. AC power for EUT is connected via measurement LISN. A support laptop is connected to the EUT via USB to Serial cable to configure the settings in the EUT. Support Laptop Power supply is connected to AC mains via LISN with termination. The EUT host output port is connected to the externally attached antenna. The EUT is transmitting continuously with modulation at its rated output power. Low, Mid, High channels as well as hopping mode investigated, worst case reported.

Itron, Inc. WO#: 104265 Sequence#: 7 Date: 7/16/2020  
 15.207 AC Mains - Average Test Lead: 115VAC 60Hz Line

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02673	Spectrum Analyzer	E4446A	2/22/2019	2/22/2021
T1	AN02611	High Pass Filter	HE9615-150K-50-720B	1/10/2020	1/10/2022
T2	ANP06540	Cable	Heliax	8/23/2019	8/23/2021
T3	ANP06515	Cable	Heliax	7/1/2020	7/1/2022
T4	ANP06219	Attenuator	768-10	4/7/2020	4/7/2022
T5	AN01311	50uH LISN-Line1 (L)	3816/2	2/24/2020	2/24/2022
	AN01311	50uH LISN-Line2 (N)	3816/2	2/24/2020	2/24/2022

<b>Measurement Data:</b>			Reading listed by margin.				Test Lead: Line					
#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar	
			MHz	dB $\mu$ V	dB	dB	dB	Table	dB $\mu$ V	dB $\mu$ V	dB	Ant
1	3.568M	29.4	+0.1 -0.3	+0.0	+0.1	+9.1	+0.0	39.0	46.0	-7.0	Line	
2	3.043M	26.1	+0.1 -0.3	+0.0	+0.1	+9.1	+0.0	35.7	46.0	-10.3	Line	
3	3.581M	26.0	+0.1 -0.3	+0.0	+0.1	+9.1	+0.0	35.6	46.0	-10.4	Line	
4	2.163M	25.1	+0.2 -0.3	+0.0	+0.1	+9.1	+0.0	34.8	46.0	-11.2	Line	
5	2.175M	24.7	+0.2 -0.3	+0.0	+0.1	+9.1	+0.0	34.4	46.0	-11.6	Line	
6	2.513M	24.7	+0.1 -0.3	+0.0	+0.1	+9.1	+0.0	34.3	46.0	-11.7	Line	
7	2.498M	24.4	+0.1 -0.3	+0.0	+0.1	+9.1	+0.0	34.0	46.0	-12.0	Line	
8	4.726M	23.8	+0.1 -0.4	+0.0	+0.1	+9.1	+0.0	33.5	46.0	-12.5	Line	
9	3.592M	23.9	+0.1 -0.3	+0.0	+0.1	+9.1	+0.0	33.5	46.0	-12.5	Line	
10	2.732M	23.3	+0.1 -0.3	+0.0	+0.1	+9.1	+0.0	32.9	46.0	-13.1	Line	
11	2.676M	23.1	+0.1 -0.3	+0.0	+0.1	+9.1	+0.0	32.7	46.0	-13.3	Line	
12	3.865M	23.1	+0.1 -0.3	+0.0	+0.1	+9.1	+0.0	32.7	46.0	-13.3	Line	
13	4.563M	22.9	+0.1 -0.4	+0.0	+0.1	+9.1	+0.0	32.6	46.0	-13.4	Line	
14	3.600M	23.0	+0.1 -0.3	+0.0	+0.1	+9.1	+0.0	32.6	46.0	-13.4	Line	
15	2.561M	22.9	+0.1 -0.3	+0.0	+0.1	+9.1	+0.0	32.5	46.0	-13.5	Line	
16	3.697M	22.8	+0.1 -0.3	+0.0	+0.1	+9.1	+0.0	32.4	46.0	-13.6	Line	
17	3.797M	22.8	+0.1 -0.3	+0.0	+0.1	+9.1	+0.0	32.4	46.0	-13.6	Line	
18	2.158M	22.6	+0.2 -0.3	+0.0	+0.1	+9.1	+0.0	32.3	46.0	-13.7	Line	
19	2.939M	22.7	+0.1 -0.3	+0.0	+0.1	+9.1	+0.0	32.3	46.0	-13.7	Line	
20	2.858M	12.3	+0.1 -0.3	+0.0	+0.1	+9.1	+0.0	21.9	46.0	-24.1	Line	
Ave												
^	2.858M	31.4	+0.1 -0.3	+0.0	+0.1	+9.1	+0.0	41.0	46.0	-5.0	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 #: **104265** Date: 7/16/2020  
Test Type: **Conducted Emissions** Time: 14:58:00  
Tested By: Michael Atkinson Sequence#: 8  
Software: EMITest 5.03.19 115VAC 60Hz

***Equipment Tested:***

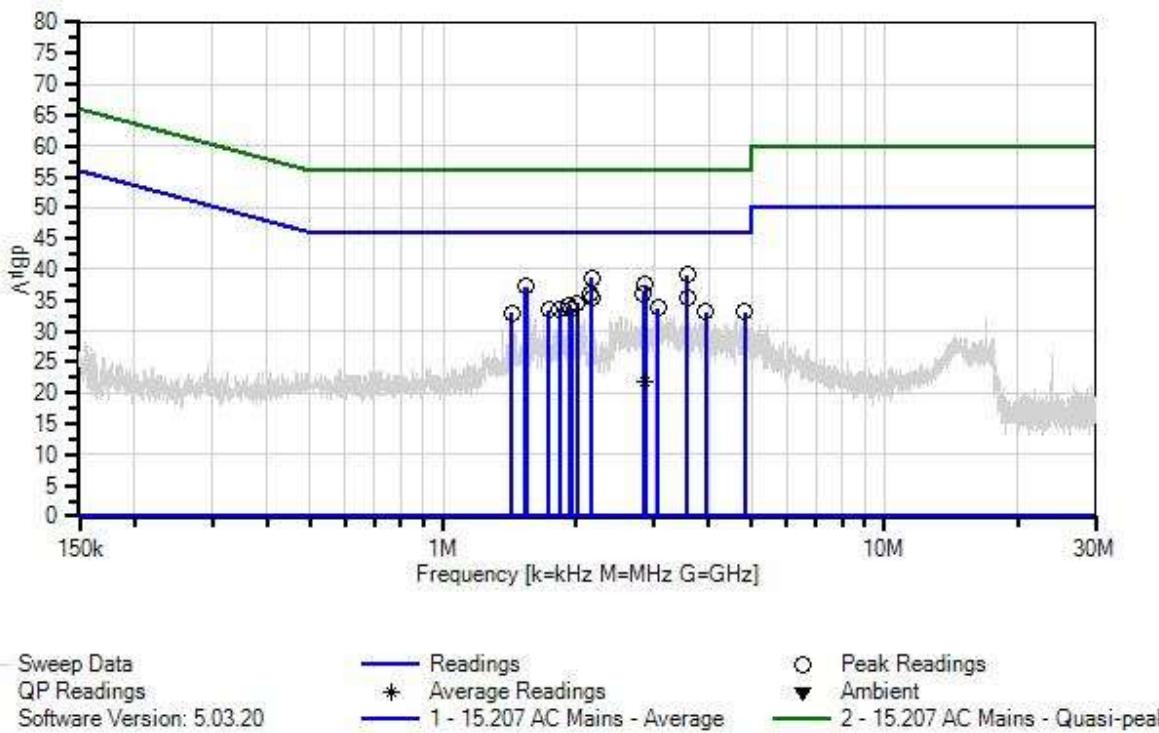
Device	Manufacturer	Model #	S/N
Configuration 2			

***Support Equipment:***

Device	Manufacturer	Model #	S/N
Configuration 2			

***Test Conditions / Notes:***

Temperature: 23 °C
Humidity: 41 %
Pressure: 101.6 kPa
Method: ANSI C63.10 (2013)
Frequency: 0.15-30MHz
<b>Test Setup:</b> The equipment under test (EUT) is placed on the tabletop. AC power for EUT is connected via measurement LISN. A support laptop is connected to the EUT via USB to Serial cable to configure the settings in the EUT. Support Laptop Power supply is connected to AC mains via LISN with termination. The EUT host output port is connected to the externally attached antenna. The EUT is transmitting continuously with modulation at its rated output power. Low, Mid, High channels as well as hopping mode investigated, worst case reported.

Itron, Inc. WO#: 104265 Sequence#: 8 Date: 7/16/2020  
 15.207 AC Mains - Average Test Lead: 115VAC 60Hz Neutral

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02673	Spectrum Analyzer	E4446A	2/22/2019	2/22/2021
T1	AN02611	High Pass Filter	HE9615-150K-50-720B	1/10/2020	1/10/2022
T2	ANP06540	Cable	Heliax	8/23/2019	8/23/2021
T3	ANP06515	Cable	Heliax	7/1/2020	7/1/2022
T4	ANP06219	Attenuator	768-10	4/7/2020	4/7/2022
	AN01311	50uH LISN-Line1 (L)	3816/2	2/24/2020	2/24/2022
T5	AN01311	50uH LISN-Line2 (N)	3816/2	2/24/2020	2/24/2022

<b>Measurement Data:</b>			Reading listed by margin.				Test Lead: Neutral					
#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar	
			MHz	dB $\mu$ V	dB	dB	dB	Table	dB $\mu$ V	dB $\mu$ V	dB	Ant
1	3.571M	29.5	+0.1 -0.3	+0.0	+0.1	+9.1	+0.0	39.1	46.0	-6.9	Neutr	
2	2.169M	29.0	+0.2 -0.3	+0.0	+0.1	+9.1	+0.0	38.7	46.0	-7.3	Neutr	
3	2.876M	28.0	+0.1 -0.3	+0.0	+0.1	+9.1	+0.0	37.6	46.0	-8.4	Neutr	
4	1.535M	27.5	+0.2 -0.3	+0.0	+0.1	+9.1	+0.0	37.2	46.0	-8.8	Neutr	
5	1.544M	27.5	+0.2 -0.3	+0.0	+0.1	+9.1	+0.0	37.2	46.0	-8.8	Neutr	
6	2.164M	26.5	+0.2 -0.3	+0.0	+0.1	+9.1	+0.0	36.2	46.0	-9.8	Neutr	
7	2.843M	26.5	+0.1 -0.3	+0.0	+0.1	+9.1	+0.0	36.1	46.0	-9.9	Neutr	
8	3.575M	25.9	+0.1 -0.3	+0.0	+0.1	+9.1	+0.0	35.5	46.0	-10.5	Neutr	
9	2.173M	25.8	+0.2 -0.3	+0.0	+0.1	+9.1	+0.0	35.5	46.0	-10.5	Neutr	
10	2.013M	24.8	+0.2 -0.3	+0.0	+0.1	+9.1	+0.0	34.5	46.0	-11.5	Neutr	
11	1.935M	24.6	+0.2 -0.3	+0.0	+0.1	+9.1	+0.0	34.3	46.0	-11.7	Neutr	
12	3.061M	24.2	+0.1 -0.3	+0.0	+0.1	+9.1	+0.0	33.8	46.0	-12.2	Neutr	
13	1.834M	23.9	+0.2 -0.3	+0.0	+0.1	+9.1	+0.0	33.6	46.0	-12.4	Neutr	
14	1.953M	23.8	+0.2 -0.3	+0.0	+0.1	+9.1	+0.0	33.5	46.0	-12.5	Neutr	
15	1.739M	23.7	+0.2 -0.3	+0.0	+0.1	+9.1	+0.0	33.4	46.0	-12.6	Neutr	
16	3.928M	23.5	+0.1 -0.4	+0.0	+0.1	+9.1	+0.0	33.2	46.0	-12.8	Neutr	
17	4.827M	23.5	+0.1 -0.4	+0.0	+0.1	+9.1	+0.0	33.2	46.0	-12.8	Neutr	
18	1.433M	23.4	+0.2 -0.3	+0.0	+0.0	+9.1	+0.0	33.0	46.0	-13.0	Neutr	
19	2.855M	12.1	+0.1 -0.3	+0.0	+0.1	+9.1	+0.0	21.7	46.0	-24.3	Neutr	
Ave												
^	2.855M	30.2	+0.1 -0.3	+0.0	+0.1	+9.1	+0.0	39.8	46.0	-6.2	Neutr	
^	2.859M	29.2	+0.1 -0.3	+0.0	+0.1	+9.1	+0.0	38.8	46.0	-7.2	Neutr	

**Test Setup Photo(s)**



## SUPPLEMENTAL INFORMATION

### Measurement Uncertainty

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

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

### Emissions Test Details

#### TESTING PARAMETERS

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

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

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

#### CORRECTION FACTORS

The basic spectrum analyzer reading was converted using correction factors as shown in the highest emissions readings in the tables. For radiated emissions in dB $\mu$ V/m, the spectrum analyzer reading in dB $\mu$ V 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	(dB $\mu$ V)
+ Antenna Factor	(dB/m)
+ Cable Loss	(dB)
- Distance Correction	(dB)
- Preamplifier Gain	(dB)
= Corrected Reading	(dB $\mu$ V/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.