

Ittron, Inc.

TEST REPORT FOR

MC4Max

Model: MC3C*

*(See Appendix A for Manufacturer's Declaration)

Tested to The Following Standards:

FCC Part 15 Subpart C Section(s)

15.247

(FHSS 902-928 MHz)

Report No.: 109570-10

Date of issue: April 30, 2024



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.

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Administrative Information

Test Report Information

REPORT PREPARED FOR:

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Liberty Lake, WA 99019

Representative: Jack McPeck
Customer Reference Number: 294642

REPORT PREPARED BY:

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Project Number: 109570

DATE OF EQUIPMENT RECEIPT:

March 29 2024

DATE(S) OF TESTING:

March 29, 2024, April 1, 2, and 14, 2024,
and June 17, 2024

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.

A handwritten signature in black ink that reads "Steve Behm".

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 SE, Suite A
Bothell, WA 98021

Software Versions

CKC Laboratories Proprietary Software	Version
EMITest Emissions	5.03.20

Site Registration & Accreditation Information

Location	*NIST CB #	FCC	Canada	Japan
Canyon Park, Bothell, WA	US0103	US1024	3082C	A-0136
Brea, CA	US0103	US1024	3082D	A-0136
Fremont, CA	US0103	US1024	3082B	A-0136
Mariposa, CA	US0103	US1024	3082A	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	Pass
15.247(b)(2)	Output Power	NA	Pass
15.247(d)	RF Conducted Emissions & Band Edge	NA	Pass
15.247(d)	Radiated Emissions & Band Edge	NA	Pass
15.207	AC Conducted Emissions	NA	NA1

NA = Not Applicable

NA1 = Not applicable because EUT is battery powered.

ISO/IEC 17025 Decision Rule

The equipment sample utilized for testing is selected by the manufacturer. The declaration of pass or fail herein is a binary statement for simple acceptance rule (ILAC G8) based upon assessment to the specification(s) listed above, without consideration 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

None

Equipment Under Test (EUT)

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

Configuration 1

Equipment Tested:

Device	Manufacturer	Model #	S/N
MC4Max	Itron, Inc.	MC3C	74008263

Support Equipment:

Device	Manufacturer	Model #	S/N
Laptop	Panasonic	CF-VEK33	T1126Z
Laptop PSU	Panasonic	CF-AA5713A M3	5713AM317811923D
EUT Power Source	RadioShack	Switching Power Supply	10A08

Configuration 2

Equipment Tested:

Device	Manufacturer	Model #	S/N
MC4Max	Itron, Inc.	MC3C	74008263

Support Equipment:

Device	Manufacturer	Model #	S/N
Laptop	Panasonic	CF-VEK33	T1126Z
Laptop PSU	Panasonic	CF-AA5713A M3	5713AM317811923D
EUT Power Source	RadioShack	Switching Power Supply	10A08
5dBi Antenna	PCTEL	Generic	NA
Receiver Antenna	PCTEL	SUB-0275-001/H	S15180005

Configuration 3

Equipment Tested:

Device	Manufacturer	Model #	S/N
MC4Max	Itron, Inc.	MC3C	74008263

Support Equipment:

Device	Manufacturer	Model #	S/N
Tablet	Panasonic	FZ-G1	IMEI: 990005071111034
Automobile Adapter (Tablet PSU)	Lind Electronics, inc.	PA1580-3262 FA	1331
Laptop Dock	Itron, Inc.	Laptop Dock	NA
EUT Power Source	RadioShack	Switching Power Supply	10A08
5dBi Antenna	PCTEL	Generic	NA
Receiver Antenna	PCTEL	SUB-0275-001/H	S15180005

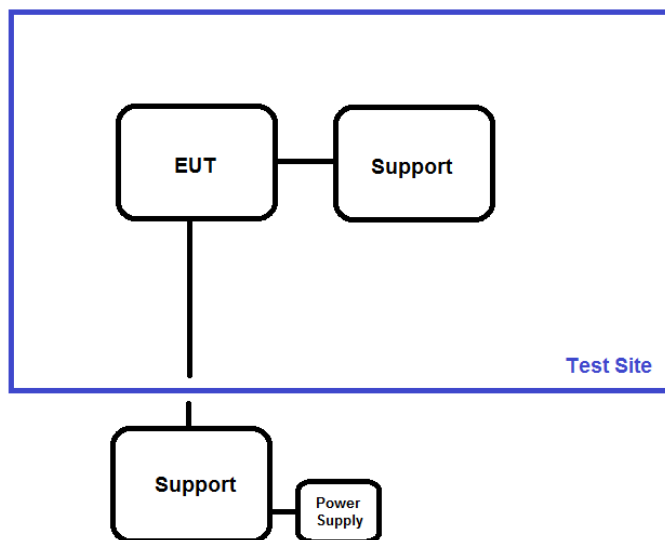
General Product Information:

Description of EUT	
Mobile Collection System	
Product Information	Manufacturer-Provided Details
Operating Frequencies Tested:	904.8-924.4 MHz
Equipment Type:	Stand-Alone Equipment
Type of Wideband System:	FHSS
Maximum Duty Cycle:	Tested at 100%
Modulation Type(s):	FSK 150kbps
Number of TX Chains:	1
Beamforming Type:	NA
Antenna Type(s) and Gain:	Omni / 5 dBi
Antenna Connection Type:	External Connector
Nominal Input Voltage:	Battery / 13.8VDC
Firmware / Software Version(s):	ARM version: 8.00.00.19 DSP version: 7.00.00.57 FPGA version: 3.08 TX version: 0.00 PSoC version: 0.00 MC3 SuperRaptor Test 4.2.0.0
Firmware / Software Description:	- Radio Firmware consists of 3 separate files - - ARM code for the ARM Cortex processor contained within the OMAP application processor. - DSP code for the Digital Signal Processor contained within the OMAP application processor. - FPGA code for the Field Programmable Gate Array - Software for testing the EUT consists of MC3Test running on a PC. MC3Test is used to set the transmitter power, frequency, modulation, and data rate during testing. This software is not available to the end user and the end user has no control over transmitter settings.
Firmware / Software Setting(s):	TXDAC: 10 PA: 29
Tune-up or Adjustment(s):	None
Receiver Bandwidth and Synchronization:	The manufacturer declares the receiver input bandwidth matches the transmit channel bandwidth and shifts frequencies in synchronization with the transmitter.
The validity of results is dependent on the stated product details, the accuracy of which the manufacturer assumes full responsibility.	

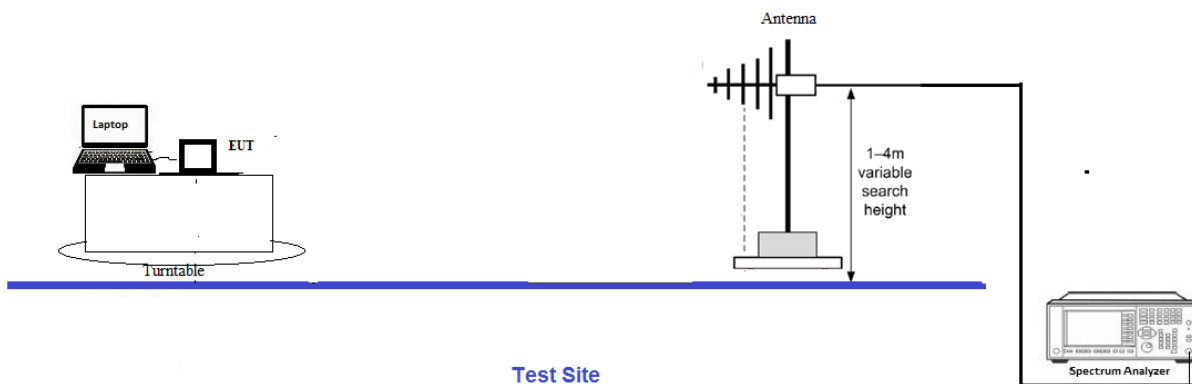
Block Diagram of Test Setup(s)

Config#	Setup Description of Block Diagram
1	EUT is setup for conducted measurements. The antenna port is directly connected to a spectrum analyzer via cable and attenuator.
2	EUT is setup for radiated measurements. Radio is connected to a laptop.
3	EUT is setup for radiated measurements. Radio is connected to a tablet.

Test Setup Block Diagram



Radiated test setup



FCC Part 15 Subpart C

15.247(a) Transmitter Characteristics

Test Setup/Conditions			
Test Location:	Bothell Lab C3	Test Engineer:	S. Pittsford
Test Method:	ANSI C63.10 (2020)	Test Date(s):	6/17/2024
Configuration:	1		
Test Setup:	EUT is setup for conducted measurements. The antenna port is directly connected to a spectrum analyzer via cable and attenuator.		

Environmental Conditions			
Temperature (°C)	21	Relative Humidity (%):	42

Test Equipment					
Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
03803	Spectrum Analyzer	Agilent	E4440A	2/12/2024	2/12/2026
P05748	Attenuator	Pasternack	PE7004-20	2/26/2024	2/26/2026
P06452	Cable	Andrews	Heliastax	2/8/2023	2/8/2025

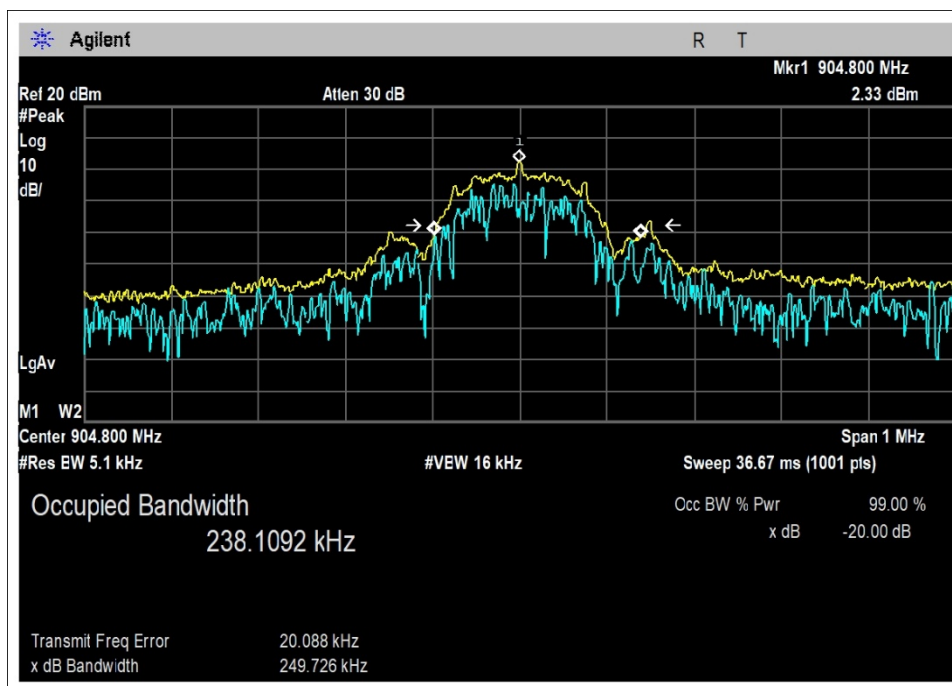
15.247(a)(1)(i) 20 dB Bandwidth

Test Data Summary					
Frequency (MHz)	Antenna Port	Modulation	Measured (kHz)	Limit (kHz)	Results
904.8	1	150kbps	249.7	≤500	Pass
914	1	150kbps	247.8	≤500	Pass
924.4	1	150kbps	253.5	≤500	Pass

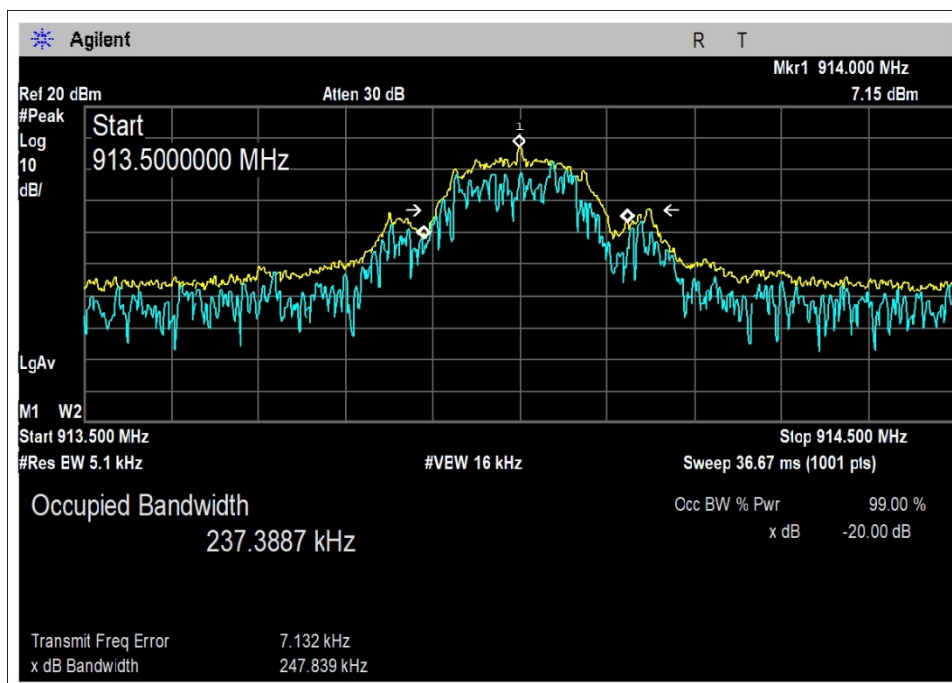
15.247(a)(1)(i) 99% Occupied Bandwidth

Test Data Summary					
Frequency (MHz)	Antenna Port	Modulation	Measured (kHz)	Limit (kHz)	Results
904.8	1	150kbps	238.1	None	N/A
914	1	150kbps	237.4		
924.4	1	150kbps	231.7		

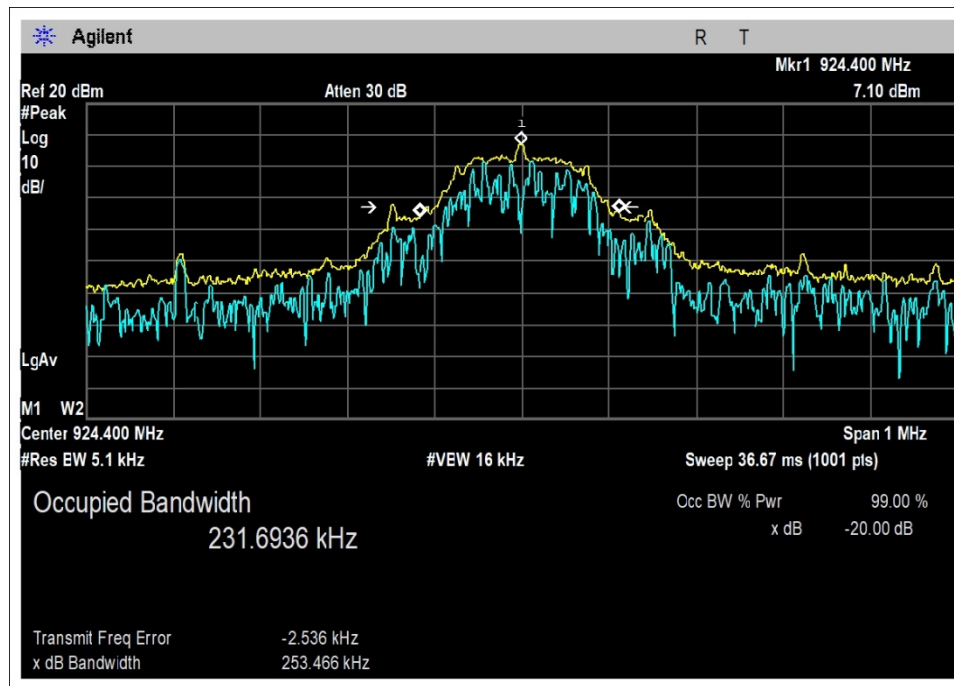
Plot(s)



Low Channel



Middle Channel



High Channel

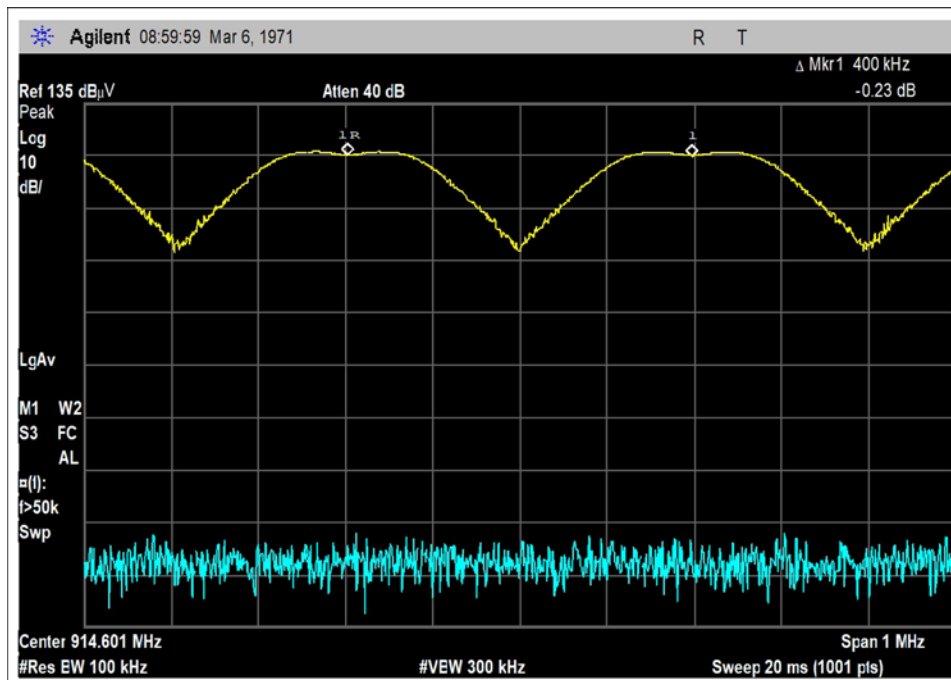
15.247(a)(1) Carrier Separation

Test Data Summary

Limit applied: 20dB bandwidth of the hopping channel.

Antenna Port	Operational Mode	Measured (kHz)	Limit (kHz)	Results
1	Hopping	400	>253.5	Pass

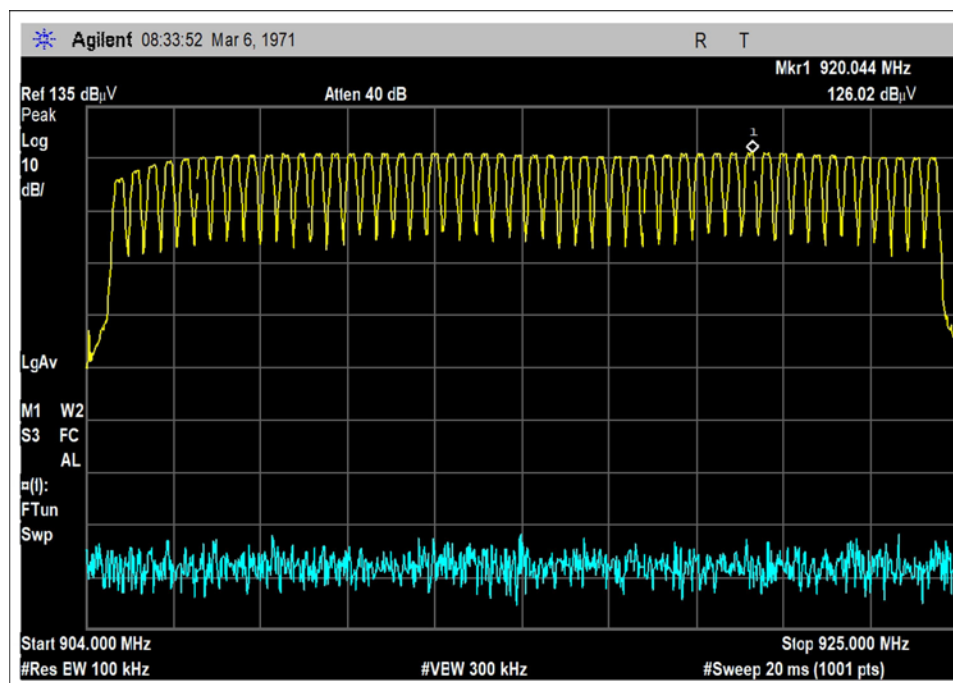
Plot(s)



15.247(a)(1)(i) Number of 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	Hopping	50	≥ 50	Pass

Plot(s)



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

Test Data Summary				
Observation Period, P_{obs} is derived from the following: $P_{obs} = \begin{cases} 20 \text{ Seconds} & 20 \text{ dB BW} < 250\text{kHz} \\ 10 \text{ Seconds} & 20 \text{ dB BW} \geq 250\text{kHz} \end{cases}$				
Antenna Port	Operational Mode	Measured (ms)	Limit (ms/ P_{obs})	Results
1	Hopping	99.8	≤ 400	Pass

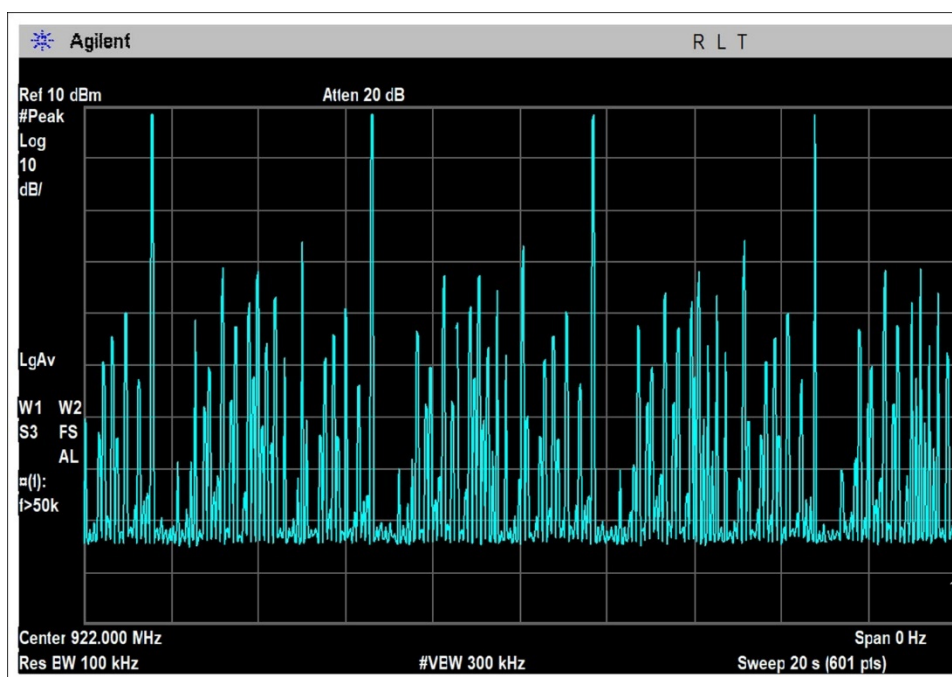
Measured results are calculated as follows:

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

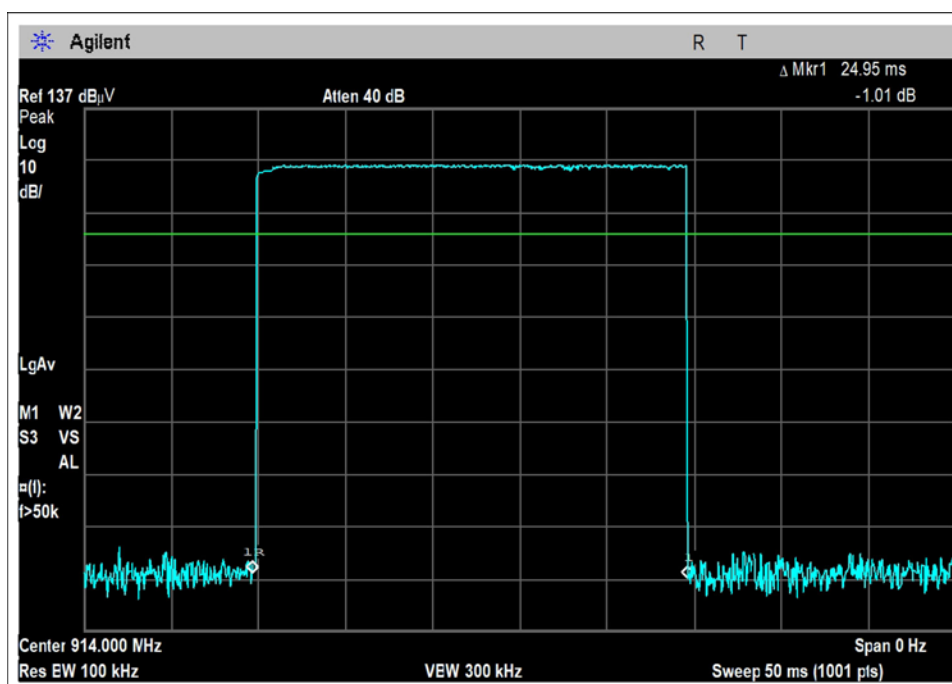
Actual Calculated Values:

Parameter	Value
Observation Period (P_{obs}):	20s
Number of RF Bursts / P_{obs} :	4
On time of RF Burst:	24.95ms
Number of Control or other signals / P_{obs} :	0
On time of Control or other Signals:	0
Total Measured On Time:	99.8ms

Plot(s)

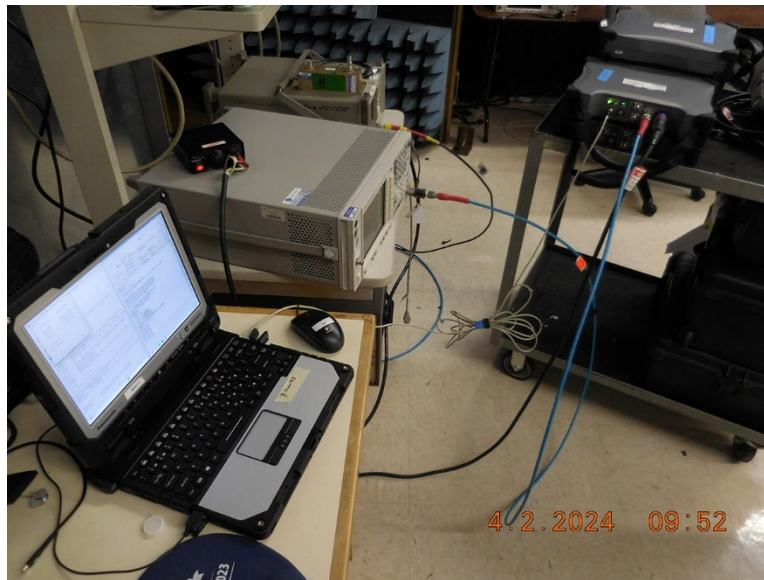


20s



Pulse

Test Setup Photo(s)



15.247(b)(2) Output Power

Test Setup/Conditions			
Test Location:	Bothell Lab C3	Test Engineer:	M. Harrison
Test Method:	ANSI C63.10 (2020)	Test Date(s):	3/29/2024
Configuration:	1		
Test Setup:	EUT is setup for conducted measurements. The antenna port is directly connected to a spectrum analyzer via cable and attenuator.		

Environmental Conditions			
Temperature (°C)	21	Relative Humidity (%):	42

Test Equipment					
Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
02673	PSA Series Spectrum Analyzer	Agilent	E4446A	3/8/2024	3/8/2026
P05503	Attenuator	Narda	766-10	4/28/2023	4/28/2025
P06009	Cable	Andrew	Helix	3/7/2024	3/7/2026

Test Data Summary - Voltage Variations

This equipment is battery powered. Power output tests were performed using an external power supply to simulate a fresh battery (13.8VDC).

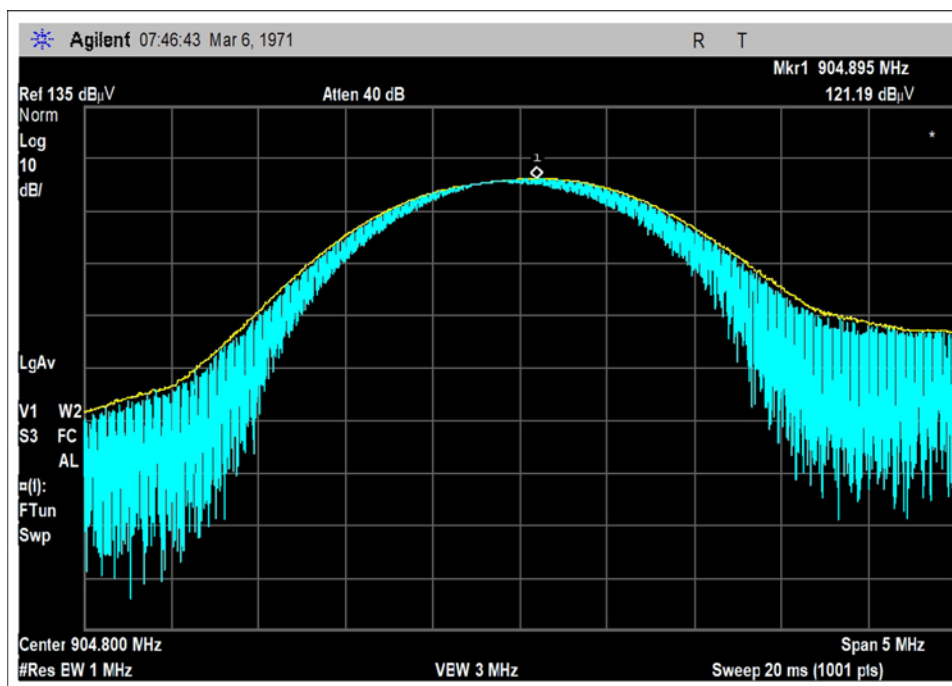
Test Data Summary - RF Conducted Measurement							
$\text{Limit} = \begin{cases} 30\text{dBm Conducted}/36\text{dBm EIRP} & \geq 50 \text{ Channels} \\ 24\text{dBm Conducted}/30\text{dBm EIRP} & < 50 \text{ Channels (min 25)} \end{cases}$							
Frequency (MHz)	Modulation	Ant. Type / Gain (dBi)	RF Conducted (dBm)		EIRP (dBm)		Results
			Measured	Limit	Calculated	Limit	
904.8	150kbps	Omni / 5 dBi	24.9	≤ 30	29.9	≤36	Pass
914	150kbps	Omni / 5 dBi	29.6	≤ 30	34.6	≤36	Pass
924.4	150kbps	Omni / 5 dBi	29.0	≤ 30	34.0	≤36	Pass

EIRP is calculated as RF conducted power (dBm) + antenna gain (dBi)

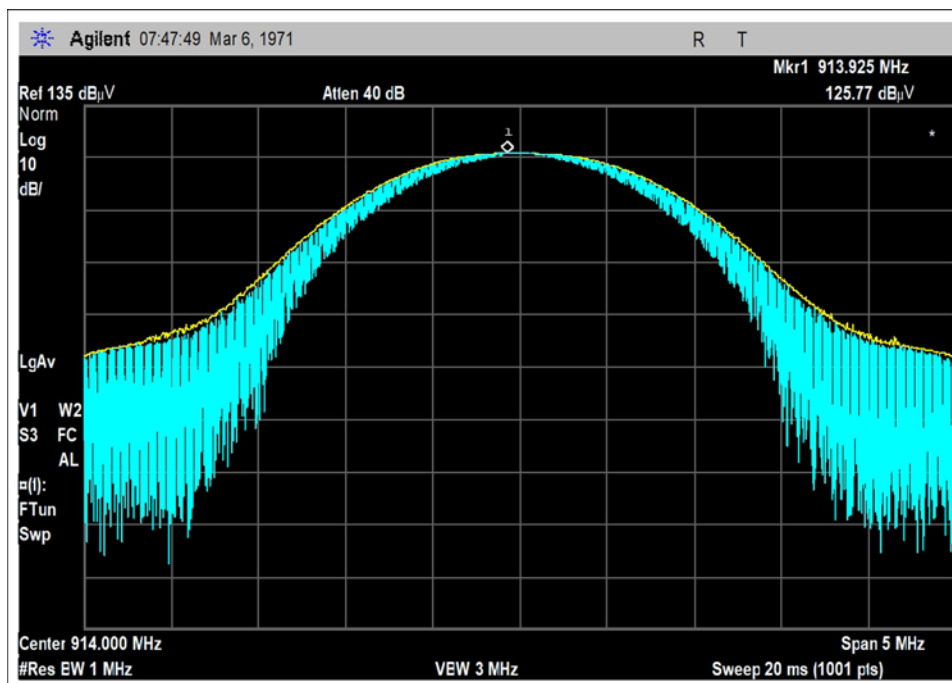
The RF conducted power limit is calculated according to the maximum allowed RF conducted power with a maximum of 6dBi gain antenna in accordance with 15.247(b):

$$\text{Limit} = 30 \text{ (or 24)} - \text{Roundup}(G - 6)$$

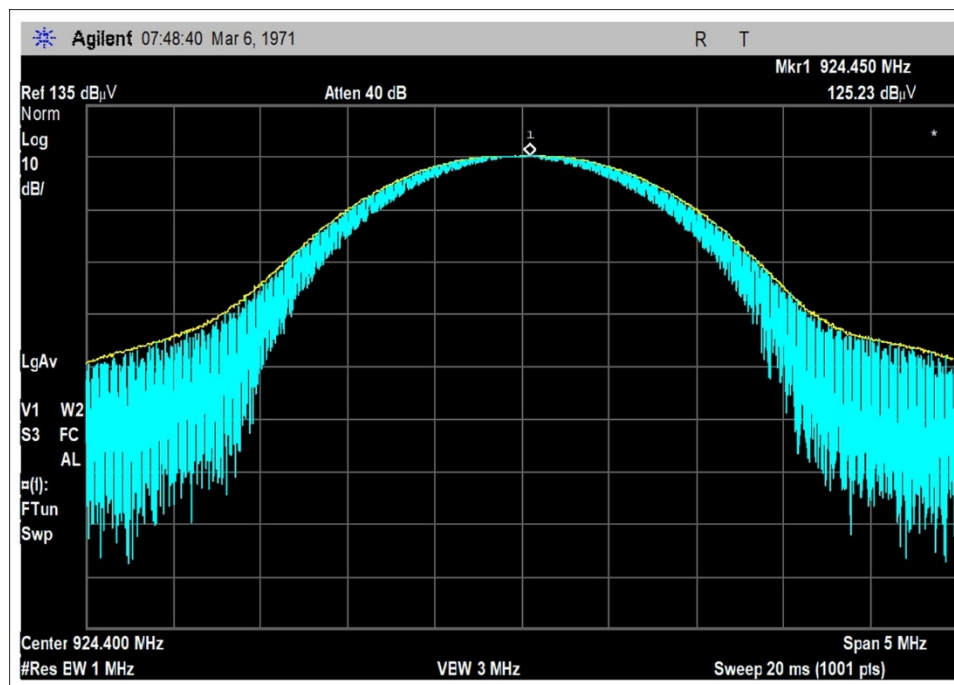
Plots



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 #: **109570** Date: 4/2/2024
 Test Type: **Conducted Emissions** Time: 10:17:24
 Tested By: Matt Harrison Sequence#: 1
 Software: EMITest 5.03.20 13.8VDC

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

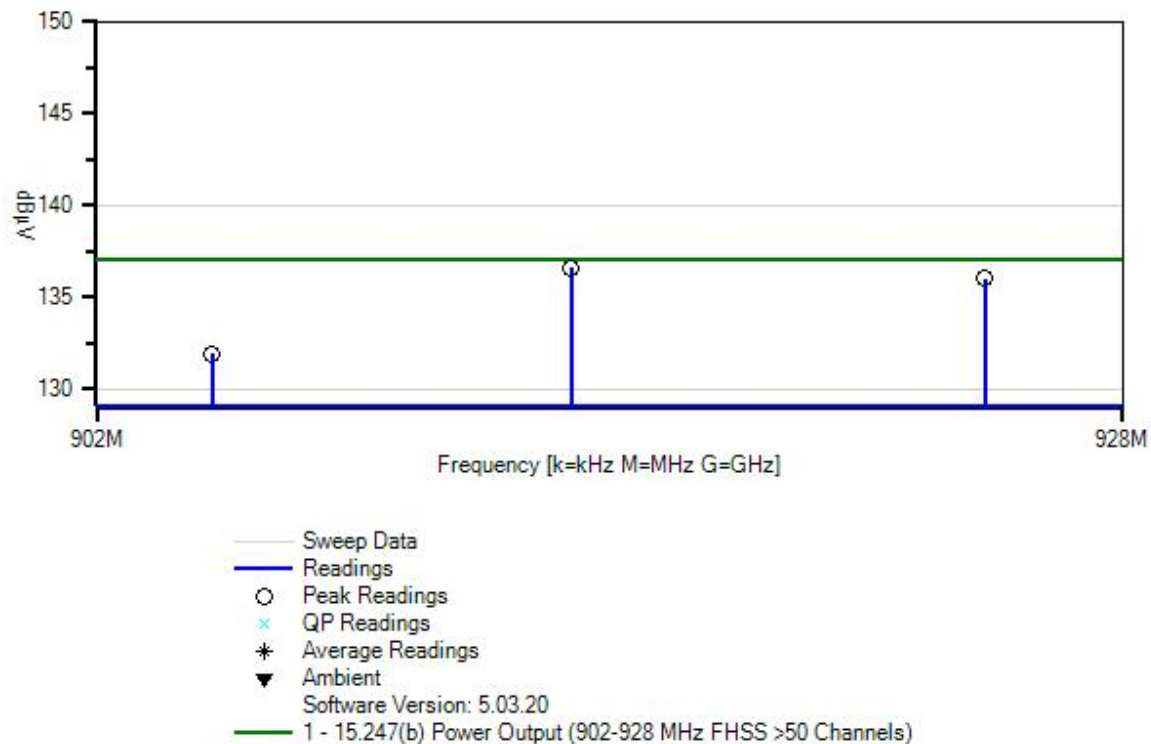
Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Test Environment Conditions: Temperature: 20°C Humidity: 42% Pressure: 100.3kPa Test Method: ANSI C63.10 Test Mode: Modulated Tx Test Setup: EUT is set up for conducted measurements. The antenna port is directly connected to a spectrum analyzer via cable and attenuator. Band of Operation: 902-928 MHz Frequency Tested: 904.8, 914, 924.4 MHz Firmware Power Setting: 06 01 30 Protocol /MCS/Modulation: FSK 150kbps Duty Cycle: 100% Antenna Type: External Omni Antenna Gain: 5 dBi. EUT Firmware: See Report Details Modifications: None
--

Ittron, Inc. WO#: 109570 Sequence#: 1 Date: 4/2/2024
15.247(b) Power Output (902-928 MHz FHSS >50 Channels) Test Lead: 13.8VDC RF Port



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP05503	Attenuator	766-10	4/28/2023	4/28/2025
T2	ANP06009	Cable	Heliac	3/7/2024	3/7/2026
	AN02673	Spectrum Analyzer	E4446A	3/8/2024	3/8/2026

Measurement Data:

Reading listed by margin.

Test Lead: RF Port

#	Freq MHz	Rdng dBμV	T1 dB	T2 dB	Dist dB	Table	Corr dBμV	Spec dBμV	Margin dB	Polar Ant
1	913.925M	125.8	+10.2	+0.6		+0.0	136.6	137.0	-0.4	RF Po
2	924.450M	125.2	+10.2	+0.6		+0.0	136.0	137.0	-1.0	RF Po
3	904.895M	121.2	+10.2	+0.5		+0.0	131.9	137.0	-5.1	RF Po

Test Setup Photo(s)



15.247(d) RF Conducted 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) Conducted Spurious Emissions**
 Work Order #: **109570** Date: 3/29/2024
 Test Type: **Conducted Emissions** Time: 12:36:35
 Tested By: Matt Harrison Sequence#: 3
 Software: EMITest 5.03.20 13.8VDC

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Test Environment Conditions:
 Temperature: 20°C
 Humidity: 42%
 Pressure: 100.3kPa

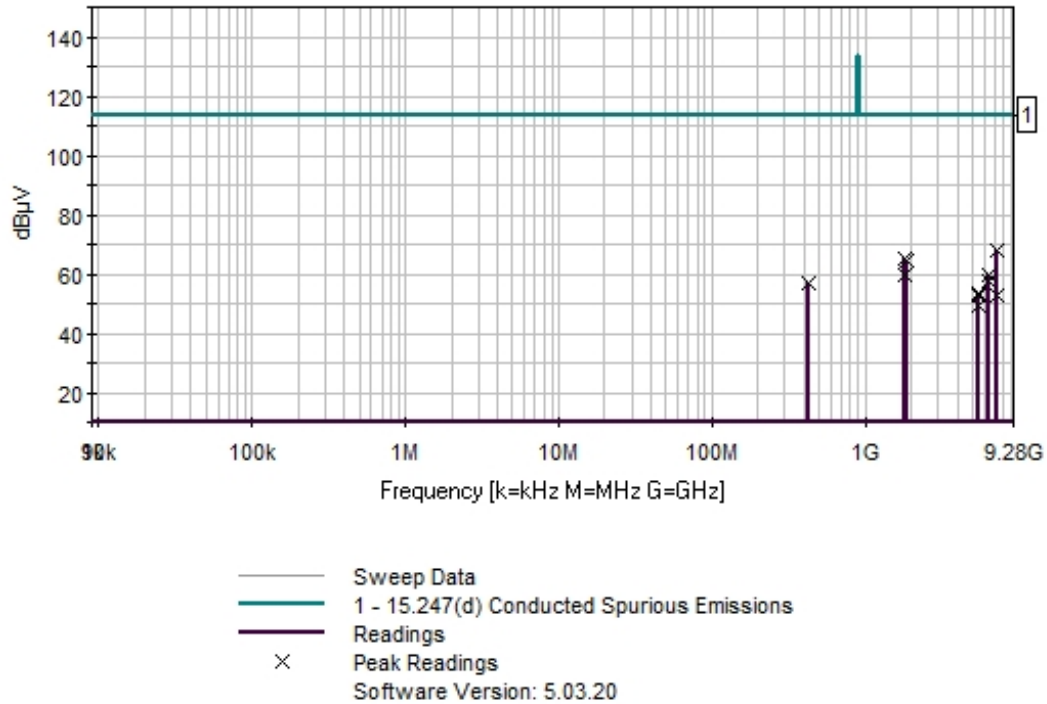
 Test Method: ANSI C63.10
 Test Mode: Modulated Tx
 Test Setup: EUT is set up for conducted measurements. The antenna port is directly connected to a spectrum analyzer via cable and attenuator.

 Frequency Range: 9k-10GHz

 Band of Operation: 902-928 MHz
 Frequency Tested: 904.8, 914, 924.4 MHz
 Firmware Power Setting: 06 01 30
 Protocol /MCS/Modulation: FSK 150kbps
 Duty Cycle: 100%

 Antenna Type: External Omni
 Antenna Gain: 5 dBi.
 EUT Firmware: See Report Details
 Modifications: None

Ittron, Inc. WO#: 109570 Sequence#: 3 Date: 3/29/2024
15.247(d) Conducted Spurious Emissions Test Lead: 13.8VDC RF Port



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP05503	Attenuator	766-10	4/28/2023	4/28/2025
T2	ANP06009	Cable	Heliac	3/7/2024	3/7/2026
	AN02673	Spectrum Analyzer	E4446A	3/8/2024	3/8/2026

Measurement Data:

Reading listed by margin.

Test Lead: RF Port

#	Freq MHz	Rdng dBμV	T1 dB	T2 dB			Dist Table	Corr dBμV	Spec dBμV	Margin dB	Polar Ant
1	7238.110M	65.8	+0.0	+2.3			+0.0	68.1	113.5	-45.4	RF Po
2	1827.910M	54.3	+10.2	+0.8			+0.0	65.3	113.5	-48.2	RF Po
3	1848.710M	53.6	+10.2	+0.8			+0.0	64.6	113.5	-48.9	RF Po
4	6333.860M	57.5	+0.0	+2.5			+0.0	60.0	113.5	-53.5	RF Po
5	6398.260M	57.2	+0.0	+2.5			+0.0	59.7	113.5	-53.8	RF Po
6	1809.540M	48.4	+10.2	+0.8			+0.0	59.4	113.5	-54.1	RF Po
7	6471.050M	55.1	+0.0	+2.6			+0.0	57.7	113.5	-55.8	RF Po
8	423.200M	46.5	+10.2	+0.4			+0.0	57.1	113.5	-56.4	RF Po
9	5546.185M	51.8	+0.0	+1.6			+0.0	53.4	113.5	-60.1	RF Po
10	5545.000M	51.1	+0.0	+1.6			+0.0	52.7	113.5	-60.8	RF Po
11	7312.410M	50.3	+0.0	+2.3			+0.0	52.6	113.5	-60.9	RF Po
12	5428.580M	48.0	+0.0	+1.6			+0.0	49.6	113.5	-63.9	RF Po

Band Edge

Band Edge Summary – Single Channel Mode

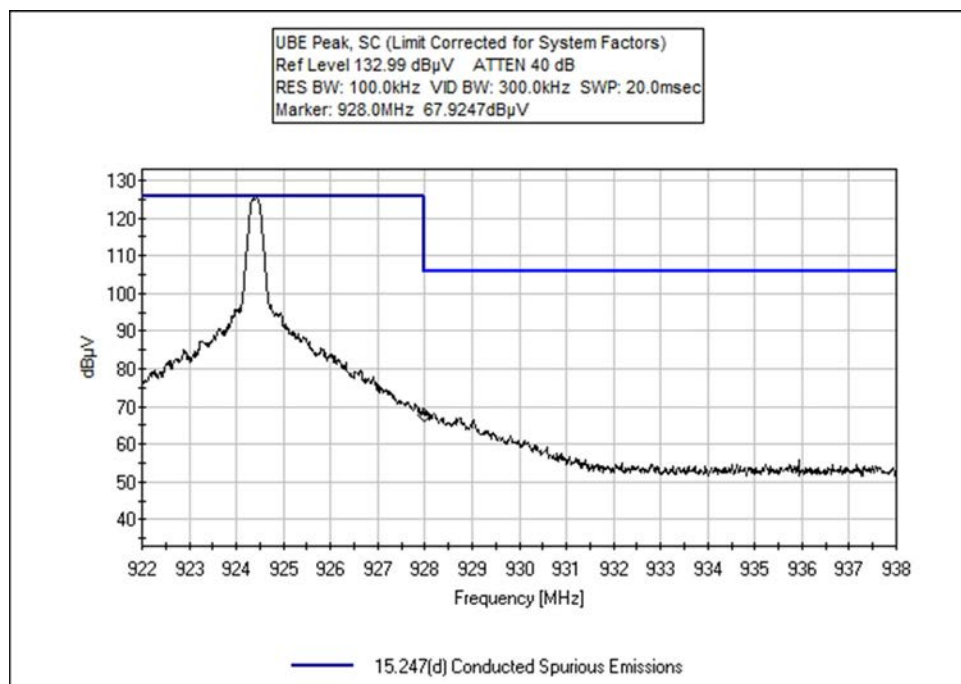
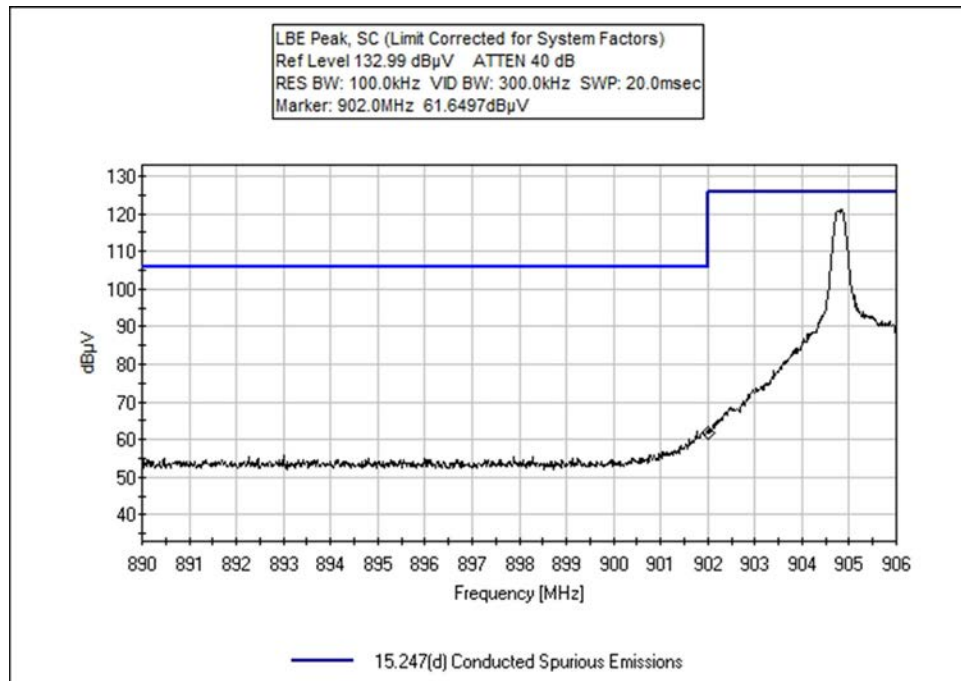
Frequency (MHz)	Modulation	Measured (dBμV)	Limit (dBμV)	Results
902	150kbps	72.4	< 116.6	Pass
928	150kbps	78.7	< 116.6	Pass

Band Edge Summary – Hopping Mode

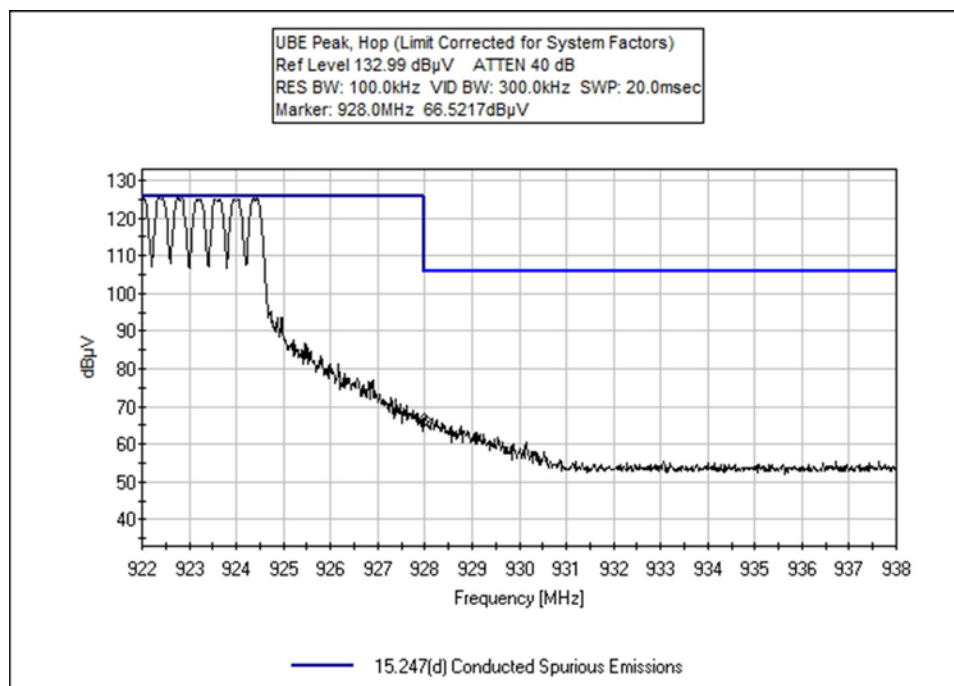
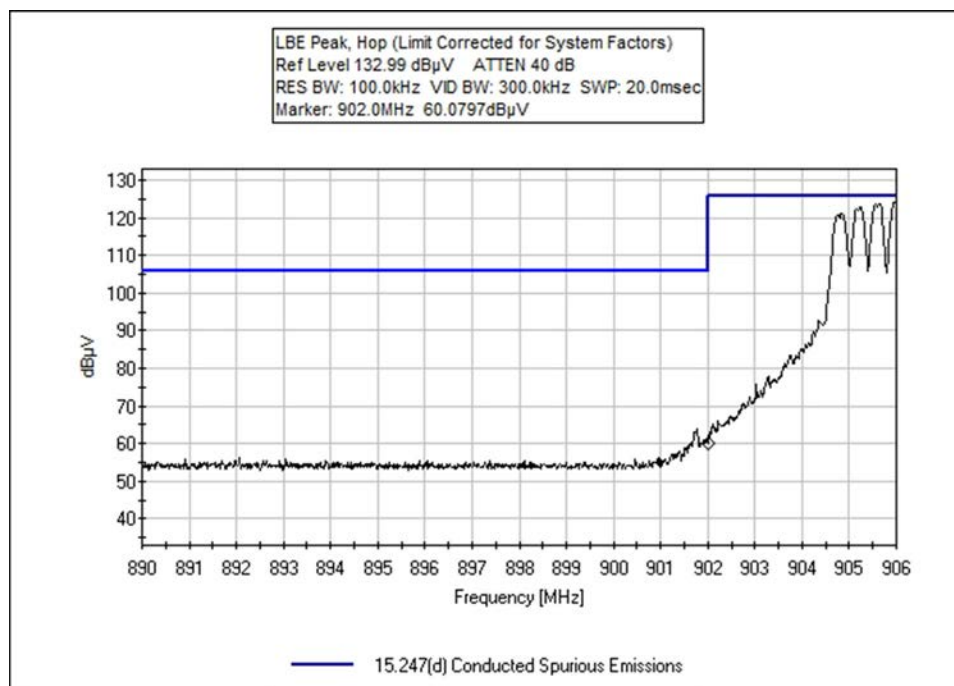
Frequency (MHz)	Modulation	Measured (dBμV)	Limit (dBμV)	Results
902	150kbps	70.8	< 116.6	Pass
928	150kbps	77.3	< 116.6	Pass

Band Edge Plots

Single Channel



Hopping



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 #: **109570** Date: 3/29/2024
 Test Type: **Conducted Emissions** Time: 12:24:09
 Tested By: Matt Harrison Sequence#: 2
 Software: EMITest 5.03.20 13.8VDC

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Test Environment Conditions:
 Temperature: 20°C
 Humidity: 42%
 Pressure: 100.3kPa

Test Method: ANSI C63.10
 Test Mode: Modulated Tx
 Test Setup: EUT is set up for conducted measurements. The antenna port is directly connected to a spectrum analyzer via cable and attenuator.

Frequency Range: Band Edge

Band of Operation: 902-928 MHz
 Frequency Tested: 904.8, 914, 924.4 MHz
 Firmware Power Setting: 06 01 30
 Protocol /MCS/Modulation: FSK 150kbps
 Duty Cycle: 100%

Antenna Type: External Omni
 Antenna Gain: 5 dBi.
 EUT Firmware: See Report Details
 Modifications: None

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP05503	Attenuator	766-10	4/28/2023	4/28/2025
T2	ANP06009	Cable	Heliac	3/7/2024	3/7/2026
T3	AN02673	Spectrum Analyzer	E4446A	3/8/2024	3/8/2026

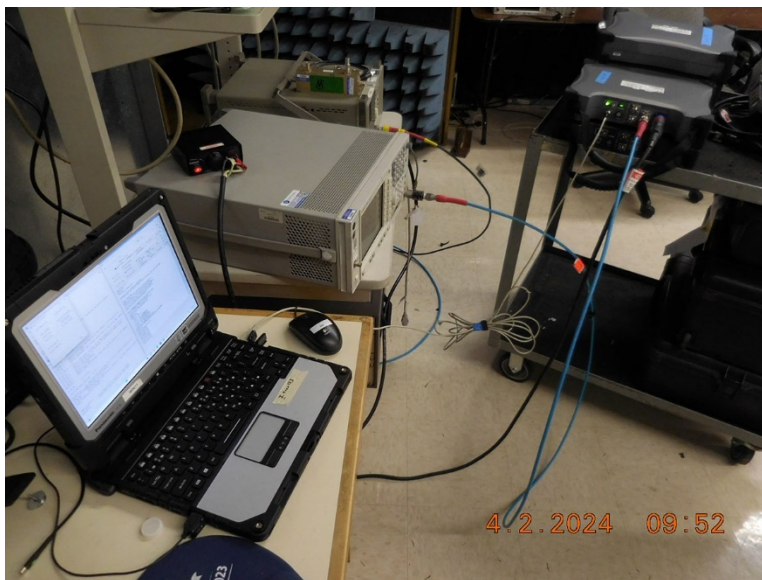
Measurement Data:

Reading listed by margin.

Test Lead: RF Port

#	Freq MHz	Rdng dBμV	T1 dB	T2 dB	T3 dB	Dist dB	Table	Corr dBμV	Spec dBμV	Margin dB	Polar Ant
1	928.000M	67.9	+10.2	+0.6	+0.0		+0.0	78.7	116.6 SC	-37.9	RF Po
2	928.000M	66.5	+10.2	+0.6	+0.0		+0.0	77.3	116.6 Hop	-39.3	RF Po
3	902.000M	61.7	+10.2	+0.5	+0.0		+0.0	72.4	116.6 SC	-44.2	RF Po
4	902.000M	60.1	+10.2	+0.5	+0.0		+0.0	70.8	116.6 Hop	-45.8	RF Po

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 #: **109570** Date: 4/1/2024
 Test Type: **Radiated Scan** Time: 12:01:06
 Tested By: Matt Harrison Sequence#: 5
 Software: EMITest 5.03.20

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

Test Conditions / Notes:

Test Environment Conditions:
 Temperature: 20°C
 Humidity: 42%
 Pressure: 100.3kPa

 Test Method: ANSI C63.10
 Test Mode: Modulated Tx
 Test Setup: EUT is set up in a tabletop configuration. It is connected to 2 RX antennas, 1Tx/GPS RX antenna, a laptop, and a power supply. X, Y, Z and both polarities were explored, worst-case data provided.

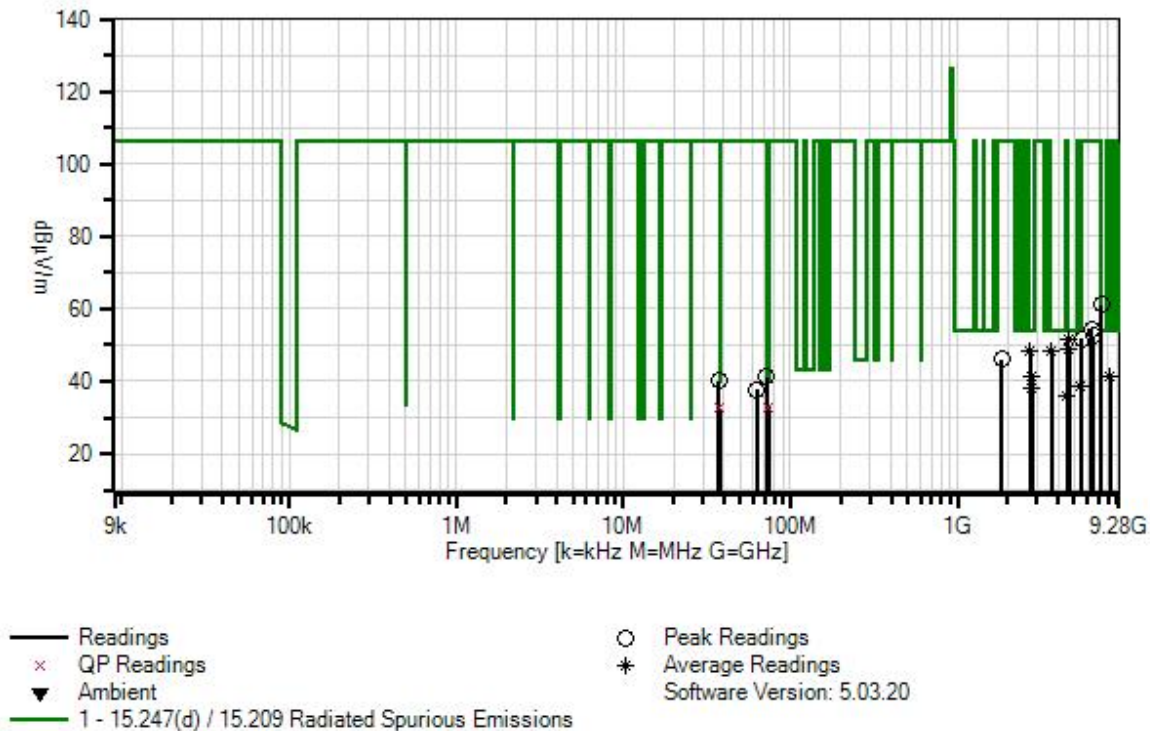
 Frequency Range: 9k-10GHz

 Band of Operation: 902-928 MHz
 Frequency Tested: 904.8, 914, 924.4 MHz
 Firmware Power Setting: 06 01 30
 Protocol /MCS/Modulation: FSK 150kbps
 Duty Cycle: 100%

 Antenna Type: External Omni
 Antenna Gain: 5 dBi.
 EUT Firmware: See Report Details
 Modifications: None

 Notes: No EUT emissions found within 20dB of the limit below 30MHz.

Itron, Inc. WO#: 109570 Sequence#: 5 Date: 4/1/2024
15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Vert



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP06011	Cable	Heliac	11/16/2023	11/16/2025
T2	ANP05333	Cable	Heliac	8/8/2023	8/8/2025
T3	ANP05360	Cable	RG214	8/8/2023	8/8/2025
	AN02673	Spectrum Analyzer	E4446A	3/8/2024	3/8/2026
T4	AN03824	Biconilog Antenna	3142E	5/9/2023	5/9/2025
T5	AN03540	Preamplifier	83017A	3/24/2023	3/24/2025
T6	AN02374ANSI	Horn Antenna	RGA-60	5/26/2023	5/26/2025
T7	ANP07746	Attenuator	PE7004-6	2/16/2023	2/16/2025
T8	ANP06515	Cable	Heliac	2/28/2024	2/28/2026
T9	ANP07504	Cable	CLU40-KMKM-02.00F	1/19/2024	1/19/2026
T10	AN03170	High Pass Filter	HM1155-11SS	9/27/2023	9/27/2025
T11	ANP08072	Band Reject Filter	BRC50722	10/3/2023	10/3/2025
	AN00052	Loop Antenna	6502	5/11/2022	5/11/2024
T12	AN02307	Preamplifier	8447D	8/9/2023	8/9/2025

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq	Rdng	T1 T5 T9	T2 T6 T10	T3 T7 T11	T4 T8 T12	Dist	Corr	Spec	Margin	Polar
	MHz	dBμV	dB	dB	dB	dB	Table	dBμV/m	dBμV/m	dB	Ant
1	4569.985M Ave	41.5	+1.1 -33.8 +0.6	+0.0 +32.2 +0.4	+0.0 +5.9 +0.0	+0.0 +3.9 +0.0	+0.0	51.8	54.0	-2.2	Vert
^	4569.985M	46.6	+1.1 -33.8 +0.6	+0.0 +32.2 +0.4	+0.0 +5.9 +0.0	+0.0 +3.9 +0.0	+0.0	56.9	54.0	+2.9	Vert
3	4622.000M Ave	38.3	+1.1 -33.8 +0.5	+0.0 +32.4 +0.5	+0.0 +5.9 +0.0	+0.0 +3.9 +0.0	+0.0	48.8	54.0	-5.2	Vert
^	4622.000M	44.3	+1.1 -33.8 +0.5	+0.0 +32.4 +0.5	+0.0 +5.9 +0.0	+0.0 +3.9 +0.0	+0.0	54.8	54.0	+0.8	Vert
5	2714.520M Ave	43.4	+0.8 -34.5 +0.5	+0.0 +29.3 +0.3	+0.0 +5.9 +0.0	+0.0 +2.8 +0.0	+0.0	48.5	54.0	-5.5	Vert
^	2714.520M	48.5	+0.8 -34.5 +0.5	+0.0 +29.3 +0.3	+0.0 +5.9 +0.0	+0.0 +2.8 +0.0	+0.0	53.6	54.0	-0.4	Vert
7	3656.000M Ave	40.2	+0.9 -34.0 +0.4	+0.0 +31.4 +0.3	+0.0 +5.9 +0.0	+0.0 +3.4 +0.0	+0.0	48.5	54.0	-5.5	Vert
^	3656.000M	45.9	+0.9 -34.0 +0.4	+0.0 +31.4 +0.3	+0.0 +5.9 +0.0	+0.0 +3.4 +0.0	+0.0	54.2	54.0	+0.2	Vert
9	73.479M QP	46.2	+0.1 +0.0 +0.0	+0.4 +0.0 +0.0	+0.6 +0.0 +0.1	+13.0 +0.0 -27.6	+0.0	32.8	40.0	-7.2	Vert
^	73.479M	51.1	+0.1 +0.0 +0.0	+0.4 +0.0 +0.0	+0.6 +0.0 +0.1	+13.0 +0.0 -27.6	+0.0	37.7	40.0	-2.3	Vert
11	37.634M QP	41.8	+0.0 +0.0 +0.0	+0.3 +0.0 +0.0	+0.4 +0.0 +0.1	+17.6 +0.0 -27.7	+0.0	32.5	40.0	-7.5	Vert
^	37.634M	46.2	+0.0 +0.0 +0.0	+0.3 +0.0 +0.0	+0.4 +0.0 +0.1	+17.6 +0.0 -27.7	+0.0	36.9	40.0	-3.1	Vert
13	2773.200M Ave	36.4	+0.8 -34.5 +0.5	+0.0 +29.3 +0.3	+0.0 +5.9 +0.0	+0.0 +2.8 +0.0	+0.0	41.5	54.0	-12.5	Vert
^	2773.200M	44.1	+0.8 -34.5 +0.5	+0.0 +29.3 +0.3	+0.0 +5.9 +0.0	+0.0 +2.8 +0.0	+0.0	49.2	54.0	-4.8	Vert

15	8143.280M Ave	23.6	+1.8 -35.4 +0.8	+0.0 +38.8 +0.5	+0.0 +6.0 +0.0	+0.0 +5.3 +0.0	+0.0	41.4	54.0	-12.6	Vert
^	8143.280M	39.0	+1.8 -35.4 +0.8	+0.0 +38.8 +0.5	+0.0 +6.0 +0.0	+0.0 +5.3 +0.0	+0.0	56.8	54.0	+2.8	Vert
17	5428.920M Ave	25.7	+1.2 -33.8 +0.5	+0.0 +34.4 +0.4	+0.0 +5.8 +0.0	+0.0 +4.2 +0.0	+0.0	38.4	54.0	-15.6	Vert
^	5428.920M	40.3	+1.2 -33.8 +0.5	+0.0 +34.4 +0.4	+0.0 +5.8 +0.0	+0.0 +4.2 +0.0	+0.0	53.0	54.0	-1.0	Vert
19	2742.000M Ave	33.2	+0.8 -34.5 +0.5	+0.0 +29.3 +0.3	+0.0 +5.9 +0.0	+0.0 +2.8 +0.0	+0.0	38.3	54.0	-15.7	Vert
^	2742.000M	43.7	+0.8 -34.5 +0.5	+0.0 +29.3 +0.3	+0.0 +5.9 +0.0	+0.0 +2.8 +0.0	+0.0	48.8	54.0	-5.2	Vert
21	4524.120M Ave	26.0	+1.0 -33.8 +0.7	+0.0 +32.1 +0.4	+0.0 +5.9 +0.0	+0.0 +3.8 +0.0	+0.0	36.1	54.0	-17.9	Vert
^	4524.120M	39.4	+1.0 -33.8 +0.7	+0.0 +32.1 +0.4	+0.0 +5.9 +0.0	+0.0 +3.8 +0.0	+0.0	49.5	54.0	-4.5	Vert
23	7238.720M	46.1	+1.4 -35.0 +0.5	+0.0 +36.9 +0.5	+0.0 +5.9 +0.0	+0.0 +4.9 +0.0	+0.0	61.2	106.4	-45.2	Vert
24	6333.600M	40.7	+1.2 -34.2 +0.6	+0.0 +34.7 +0.5	+0.0 +5.9 +0.0	+0.0 +5.0 +0.0	+0.0	54.4	106.4	-52.0	Vert
25	6471.530M	38.6	+1.3 -34.3 +0.5	+0.0 +34.7 +0.6	+0.0 +5.9 +0.0	+0.0 +5.2 +0.0	+0.0	52.5	106.4	-53.9	Vert
26	5546.030M	39.1	+1.2 -33.8 +0.4	+0.0 +34.4 +0.5	+0.0 +5.8 +0.0	+0.0 +4.2 +0.0	+0.0	51.8	106.4	-54.6	Vert
27	1828.010M	44.1	+0.6 -35.1 +0.4	+0.0 +27.5 +0.4	+0.0 +5.9 +0.0	+0.0 +2.3 +0.0	+0.0	46.1	106.4	-60.3	Vert
28	72.000M	54.6	+0.1 +0.0 +0.0	+0.4 +0.0 +0.0	+0.6 +0.0 +0.1	+13.0 +0.0 -27.6	+0.0	41.2	106.4	-65.2	Vert
29	37.000M	49.0	+0.0 +0.0 +0.0	+0.3 +0.0 +0.0	+0.4 +0.0 +0.1	+17.9 +0.0 -27.7	+0.0	40.0	106.4	-66.4	Vert
30	63.300M	51.3	+0.1 +0.0 +0.0	+0.4 +0.0 +0.0	+0.6 +0.0 +0.1	+12.8 +0.0 -27.6	+0.0	37.7	106.4	-68.7	Vert

Test Location: CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)
 Customer: **Itron, Inc.**
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**
 Work Order #: **109570** Date: 4/14/2024
 Test Type: **Radiated Scan** Time: 10:14:43
 Tested By: Matt Harrison Sequence#: 6
 Software: EMITest 5.03.20

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 3			

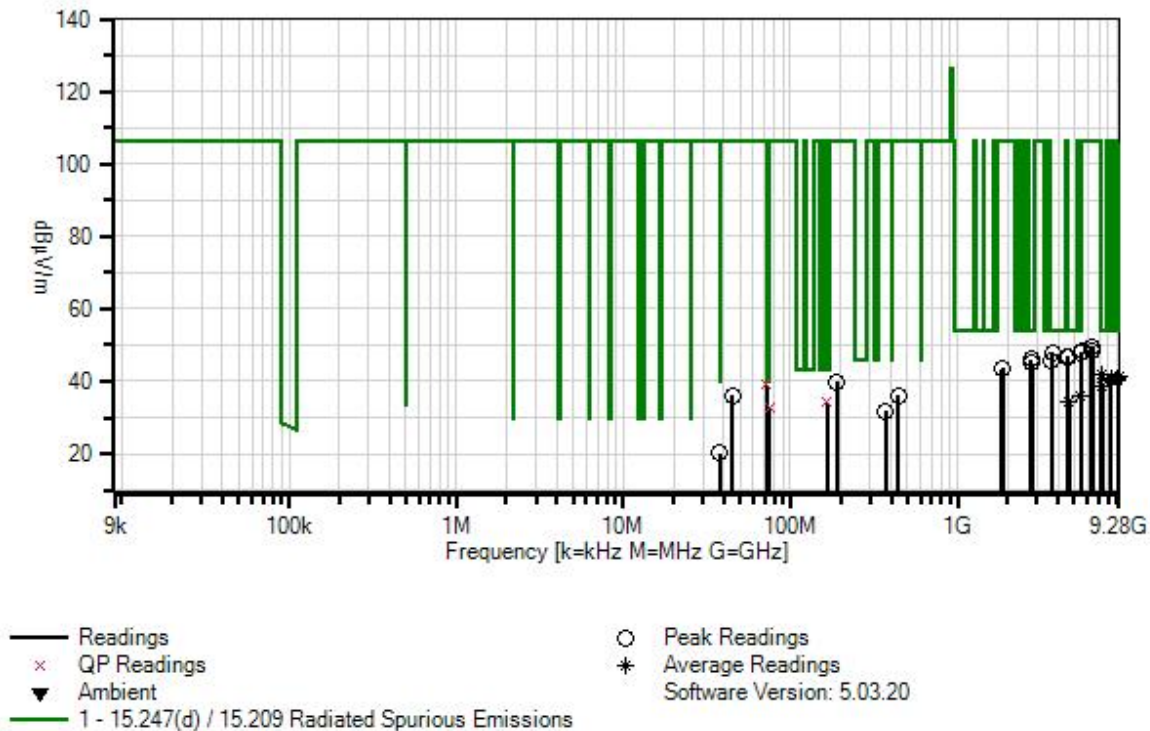
Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 3			

Test Conditions / Notes:

Test Environment Conditions: Temperature: 20°C Humidity: 42% Pressure: 100.3kPa Test Method: ANSI C63.10 Test Mode: Modulated Tx Test Setup: EUT is set up in a tabletop configuration. It is connected to 2 RX antennas, 1Tx/GPS RX antenna, a tablet, and a power supply. X, Y, Z and both polarities were explored, worst-case data provided. Frequency Range: 9k-10GHz Band of Operation: 902-928 MHz Frequency Tested: 904.8, 914, 924.4 MHz Firmware Power Setting: 06 01 30 Protocol /MCS/Modulation: FSK 150kbps Duty Cycle: 100% Antenna Type: External Omni Antenna Gain: 5 dBi. EUT Firmware: See Report Details Modifications: None Notes: No EUT emissions found within 20dB of the limit below 30MHz.

Ittron, Inc. WO#: 109570 Sequence#: 6 Date: 4/14/2024
15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Vert



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP06011	Cable	Heliac	11/16/2023	11/16/2025
T2	ANP05333	Cable	Heliac	8/8/2023	8/8/2025
T3	ANP05360	Cable	RG214	8/8/2023	8/8/2025
	AN02673	Spectrum Analyzer	E4446A	3/8/2024	3/8/2026
T4	AN03824	Biconilog Antenna	3142E	5/9/2023	5/9/2025
T5	AN03540	Preamp	83017A	3/24/2023	3/24/2025
T6	AN02374ANSI	Horn Antenna	RGA-60	5/26/2023	5/26/2025
T7	ANP07746	Attenuator	PE7004-6	2/16/2023	2/16/2025
T8	ANP06515	Cable	Heliac	2/28/2024	2/28/2026
T9	ANP07504	Cable	CLU40-KMKM-02.00F	1/19/2024	1/19/2026
T10	AN03170	High Pass Filter	HM1155-11SS	9/27/2023	9/27/2025
T11	ANP08072	Band Reject Filter	BRC50722	10/3/2023	10/3/2025
	AN00052	Loop Antenna	6502	5/11/2022	5/11/2024
T12	AN02307	Preamp	8447D	8/9/2023	8/9/2025

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq	Rdng	T1 T5 T9	T2 T6 T10	T3 T7 T11	T4 T8 T12	Dist	Corr	Spec	Margin	Polar
	MHz	dBμV	dB	dB	dB	dB	Table	dBμV/m	dBμV/m	dB	Ant
1	3695.150M	39.0	+0.9 -33.9 +0.5	+0.0 +31.6 +0.3	+0.0 +5.9 +0.0	+0.0 +3.4 +0.0	+0.0	47.7	54.0 924.4	-6.3	Vert 187
2	4570.385M	36.7	+1.1 -33.8 +0.6	+0.0 +32.2 +0.4	+0.0 +5.9 +0.0	+0.0 +3.9 +0.0	+0.0	47.0	54.0 914	-7.0	Vert 187
3	4524.230M	36.5	+1.0 -33.8 +0.7	+0.0 +32.1 +0.4	+0.0 +5.9 +0.0	+0.0 +3.8 +0.0	+0.0	46.6	54.0 904.8	-7.4	Vert 187
4	74.986M QP	46.0	+0.1 +0.0 +0.0	+0.4 +0.0 +0.0	+0.6 +0.0 +0.1	+12.9 +0.0 -27.6	+0.0	32.5	40.0	-7.5	Vert
^	75.010M	50.2	+0.1 +0.0 +0.0	+0.4 +0.0 +0.0	+0.6 +0.0 +0.1	+12.9 +0.0 -27.6	+0.0	36.7	40.0	-3.3	Vert
6	2743.115M	40.9	+0.8 -34.5 +0.5	+0.0 +29.3 +0.3	+0.0 +5.9 +0.0	+0.0 +2.8 +0.0	+0.0	46.0	54.0 914	-8.0	Vert 187
7	3654.035M	37.6	+0.9 -34.0 +0.4	+0.0 +31.4 +0.3	+0.0 +5.9 +0.0	+0.0 +3.4 +0.0	+0.0	45.9	54.0 914	-8.1	Vert 187
8	2772.930M	39.8	+0.8 -34.5 +0.5	+0.0 +29.3 +0.3	+0.0 +5.9 +0.0	+0.0 +2.8 +0.0	+0.0	44.9	54.0 924.4	-9.1	Vert 187
9	165.800M QP	44.4	+0.1 +0.0 +0.0	+0.6 +0.0 +0.0	+0.9 +0.0 +0.2	+15.2 +0.0 -27.2	+0.0	34.2	43.5	-9.3	Vert
^	165.800M	50.7	+0.1 +0.0 +0.0	+0.6 +0.0 +0.0	+0.9 +0.0 +0.2	+15.2 +0.0 -27.2	+0.0	40.5	43.5	-3.0	Vert
11	9192.780M Ave	22.9	+1.6 -34.7 +1.0	+0.0 +37.7 +0.8	+0.0 +5.9 +0.0	+0.0 +6.1 +0.0	+0.0	41.3	54.0 924.4	-12.7	Vert 187
^	9192.780M	35.5	+1.6 -34.7 +1.0	+0.0 +37.7 +0.8	+0.0 +5.9 +0.0	+0.0 +6.1 +0.0	+0.0	53.9	54.0 924.4	-0.1	Vert 187
13	9138.955M Ave	22.6	+1.6 -34.7 +0.9	+0.0 +37.7 +0.9	+0.0 +5.9 +0.0	+0.0 +6.1 +0.0	+0.0	41.0	54.0 914	-13.0	Vert 187
^	9138.955M	35.4	+1.6 -34.7 +0.9	+0.0 +37.7 +0.9	+0.0 +5.9 +0.0	+0.0 +6.1 +0.0	+0.0	53.8	54.0 914	-0.2	Vert 187

15	8275.990M Ave	23.4	+1.8 -35.4 +0.9	+0.0 +38.3 +0.7	+0.0 +5.9 +0.0	+0.0 +5.3 +0.0	+0.0	40.9	54.0 924.4	-13.1	Vert 187
^	8275.990M	37.2	+1.8 -35.4 +0.9	+0.0 +38.3 +0.7	+0.0 +5.9 +0.0	+0.0 +5.3 +0.0	+0.0	54.7	54.0 924.4	+0.7	Vert 187
17	8228.058M Ave	23.0	+1.8 -35.4 +0.9	+0.0 +38.4 +0.5	+0.0 +5.9 +0.0	+0.0 +5.3 +0.0	+0.0	40.4	54.0 914	-13.6	Vert 187
^	8228.058M	35.3	+1.8 -35.4 +0.9	+0.0 +38.4 +0.5	+0.0 +5.9 +0.0	+0.0 +5.3 +0.0	+0.0	52.7	54.0 914	-1.3	Vert 187
19	9048.135M Ave	22.1	+1.7 -34.8 +0.8	+0.0 +37.9 +0.6	+0.0 +5.9 +0.0	+0.0 +6.0 +0.0	+0.0	40.2	54.0 904.8	-13.8	Vert 187
^	9048.135M	34.1	+1.7 -34.8 +0.8	+0.0 +37.9 +0.6	+0.0 +5.9 +0.0	+0.0 +6.0 +0.0	+0.0	52.2	54.0 904.8	-1.8	Vert 187
21	7312.235M Ave	23.2	+1.5 -35.0 +0.6	+0.0 +37.1 +0.5	+0.0 +5.9 +0.0	+0.0 +5.0 +0.0	+0.0	38.8	54.0 914	-15.2	Vert 187
^	7312.235M	35.6	+1.5 -35.0 +0.6	+0.0 +37.1 +0.5	+0.0 +5.9 +0.0	+0.0 +5.0 +0.0	+0.0	51.2	54.0 914	-2.8	Vert 187
23	7363.610M Ave	22.9	+1.5 -35.1 +0.6	+0.0 +37.3 +0.5	+0.0 +5.9 +0.0	+0.0 +5.0 +0.0	+0.0	38.6	54.0 924.4	-15.4	Vert 187
^	7363.610M	35.1	+1.5 -35.1 +0.6	+0.0 +37.3 +0.5	+0.0 +5.9 +0.0	+0.0 +5.0 +0.0	+0.0	50.8	54.0 924.4	-3.2	Vert 187
25	5428.960M Ave	23.0	+1.2 -33.8 +0.5	+0.0 +34.4 +0.4	+0.0 +5.8 +0.0	+0.0 +4.2 +0.0	+0.0	35.7	54.0 904.8	-18.3	Vert 187
^	5428.960M	35.9	+1.2 -33.8 +0.5	+0.0 +34.4 +0.4	+0.0 +5.8 +0.0	+0.0 +4.2 +0.0	+0.0	48.6	54.0 904.8	-5.4	Vert 187
27	4622.900M Ave	23.8	+1.1 -33.8 +0.5	+0.0 +32.4 +0.5	+0.0 +5.9 +0.0	+0.0 +3.9 +0.0	+0.0	34.3	54.0 924.4	-19.7	Vert 187
^	4622.900M	37.4	+1.1 -33.8 +0.5	+0.0 +32.4 +0.5	+0.0 +5.9 +0.0	+0.0 +3.9 +0.0	+0.0	47.9	54.0 924.4	-6.1	Vert 187
29	37.630M	29.5	+0.0 +0.0 +0.0	+0.3 +0.0 +0.0	+0.4 +0.0 +0.1	+17.6 +0.0 -27.7	+0.0	20.2	40.0	-19.8	Vert
30	6334.100M	36.0	+1.2 -34.2 +0.6	+0.0 +34.7 +0.5	+0.0 +5.9 +0.0	+0.0 +5.0 +0.0	+0.0	49.7	106.4 904.8	-56.7	Vert 187
31	6397.185M	35.6	+1.3 -34.2 +0.6	+0.0 +34.7 +0.5	+0.0 +5.9 +0.0	+0.0 +5.1 +0.0	+0.0	49.5	106.4 914	-56.9	Vert 187

32	5538.330M	35.6	+1.2 -33.8 +0.4	+0.0 +34.4 +0.5	+0.0 +5.8 +0.0	+0.0 +4.2 +0.0	+0.0	48.3	106.4 924.4	-58.1	Vert 187
33	6449.165M	34.4	+1.3 -34.3 +0.5	+0.0 +34.7 +0.6	+0.0 +5.9 +0.0	+0.0 +5.2 +0.0	+0.0	48.3	106.4 924.4	-58.1	Vert 187
34	5485.015M	35.2	+1.2 -33.8 +0.4	+0.0 +34.4 +0.5	+0.0 +5.8 +0.0	+0.0 +4.2 +0.0	+0.0	47.9	106.4 914	-58.5	Vert 187
35	1850.220M	41.4	+0.6 -35.0 +0.4	+0.0 +27.7 +0.4	+0.0 +5.9 +0.0	+0.0 +2.3 +0.0	+0.0	43.7	106.4 924.4	-62.7	Vert 187
36	1828.045M	41.4	+0.6 -35.1 +0.4	+0.0 +27.5 +0.4	+0.0 +5.9 +0.0	+0.0 +2.3 +0.0	+0.0	43.4	106.4 914	-63.0	Vert 187
37	7238.265M Ave	27.0	+1.4 -35.0 +0.5	+0.0 +36.9 +0.5	+0.0 +5.9 +0.0	+0.0 +4.9 +0.0	+0.0	42.1	106.4 904.8	-64.3	Vert 187
^	7238.265M	35.3	+1.4 -35.0 +0.5	+0.0 +36.9 +0.5	+0.0 +5.9 +0.0	+0.0 +4.9 +0.0	+0.0	50.4	106.4 904.8	-56.0	Vert 187
39	188.900M	49.5	+0.2 +0.0 +0.0	+0.7 +0.0 +0.0	+1.0 +0.0 +0.2	+15.4 +0.0 -27.1	+0.0	39.9	106.4	-66.5	Vert
40	72.024M QP	52.4	+0.1 +0.0 +0.0	+0.4 +0.0 +0.0	+0.6 +0.0 +0.1	+13.0 +0.0 -27.6	+0.0	39.0	106.4	-67.4	Vert
^	72.070M	56.6	+0.1 +0.0 +0.0	+0.4 +0.0 +0.0	+0.6 +0.0 +0.1	+13.0 +0.0 -27.6	+0.0	43.2	106.4	-63.2	Vert
42	442.300M	37.4	+0.3 +0.0 +0.0	+1.0 +0.0 +0.0	+1.7 +0.0 +0.2	+23.1 +0.0 -27.6	+0.0	36.1	106.4	-70.3	Vert
43	44.770M	49.0	+0.0 +0.0 +0.0	+0.3 +0.0 +0.0	+0.4 +0.0 +0.1	+14.0 +0.0 -27.7	+0.0	36.1	106.4	-70.3	Vert
44	369.500M	34.4	+0.3 +0.0 +0.0	+1.0 +0.0 +0.0	+1.4 +0.0 +0.2	+21.8 +0.0 -27.2	+0.0	31.9	106.4	-74.5	Vert

Band Edge

Band Edge Summary – Single Channel Mode (Configuration 2; Laptop)

Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
614	150kbps	Omni	40.4	<46	Pass
902			62.4	<109	Pass
928			73.4	< 109	Pass
960			48.8	<54	Pass

Band Edge Summary – Hopping Mode (Configuration 2; Laptop)

Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
614	150kbps	Omni	40.4	<46	Pass
902			64.8	<109	Pass
928			74.2	< 109	Pass
960			51.0	<54	Pass

Band Edge Summary – Single Channel Mode (Configuration 3; Tablet)

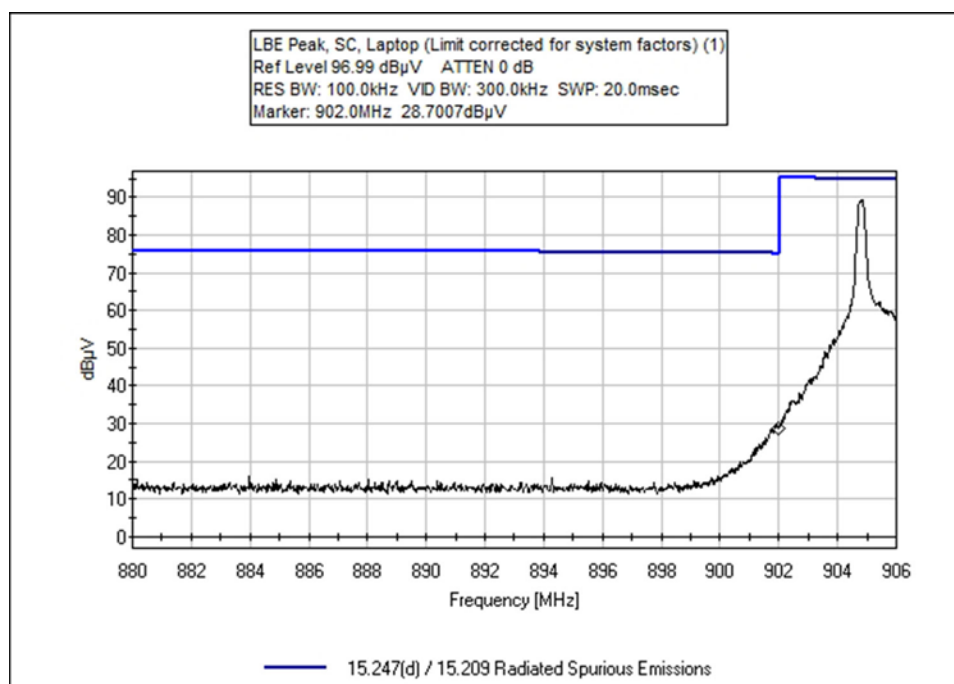
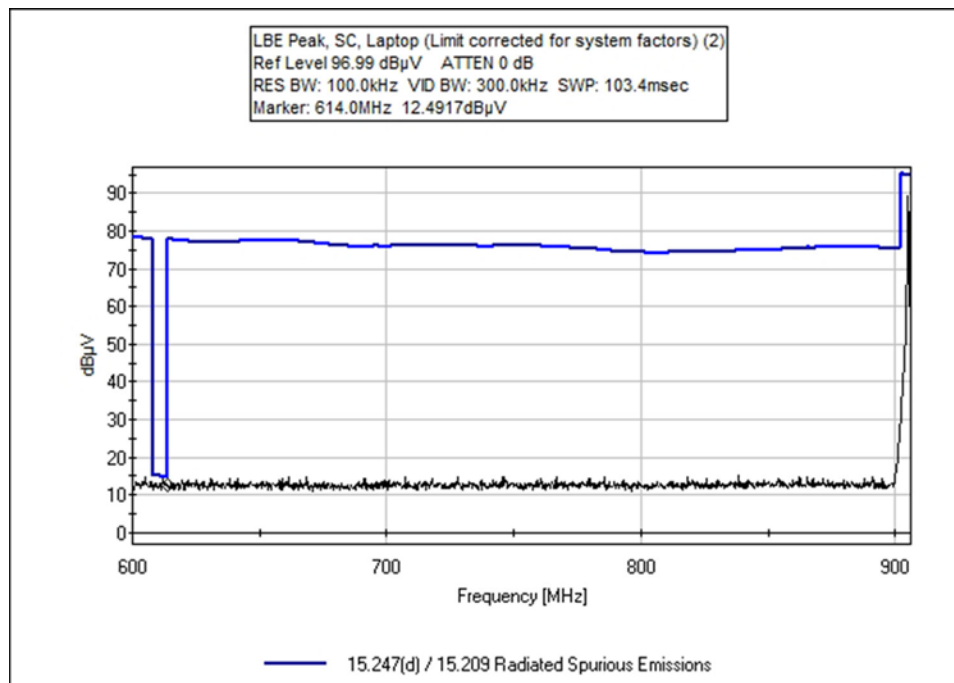
Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
614	150kbps	Omni	40.7	<46	Pass
902			62.5	<109	Pass
928			65.7	< 109	Pass
960			49.4	<54	Pass

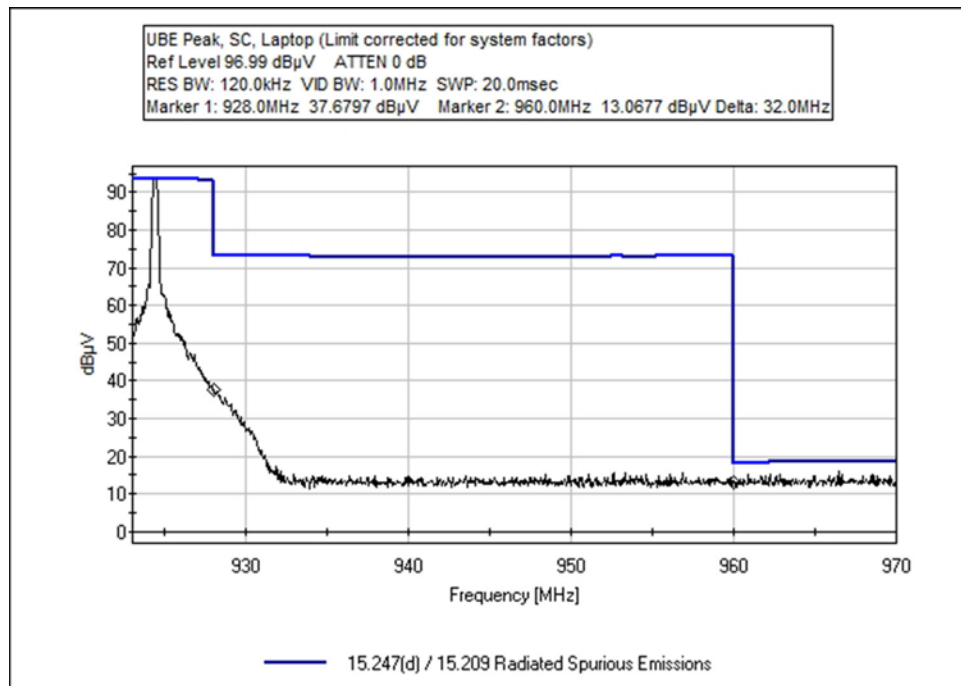
Band Edge Summary – Hopping Mode (Configuration 3; Tablet)

Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
614	150kbps	Omni	40.7	<46	Pass
902			61.0	<109	Pass
928			69.5	< 109	Pass
960			48.3	<54	Pass

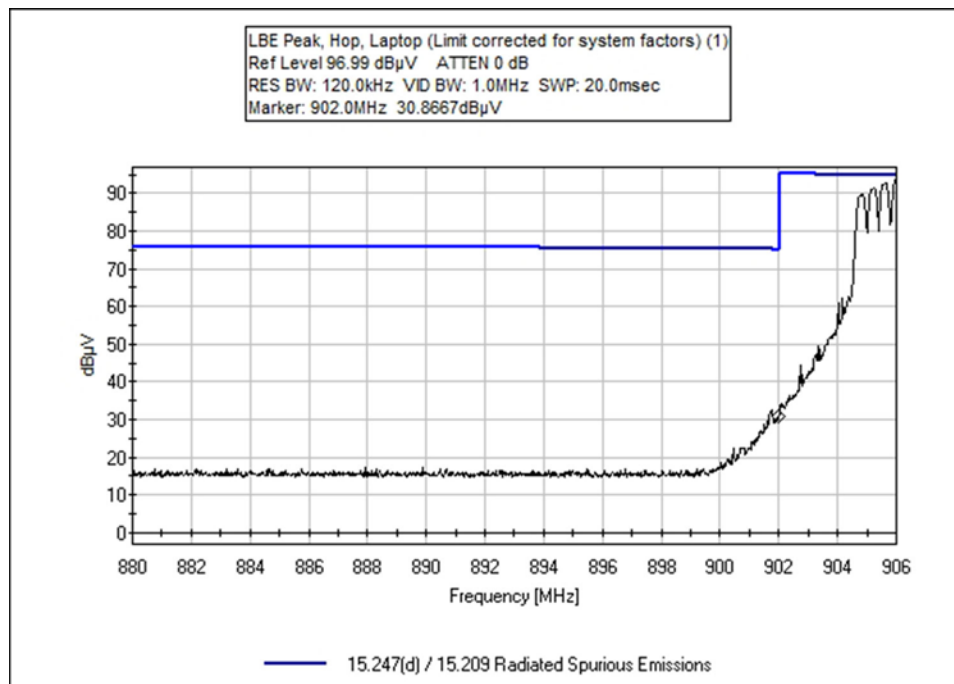
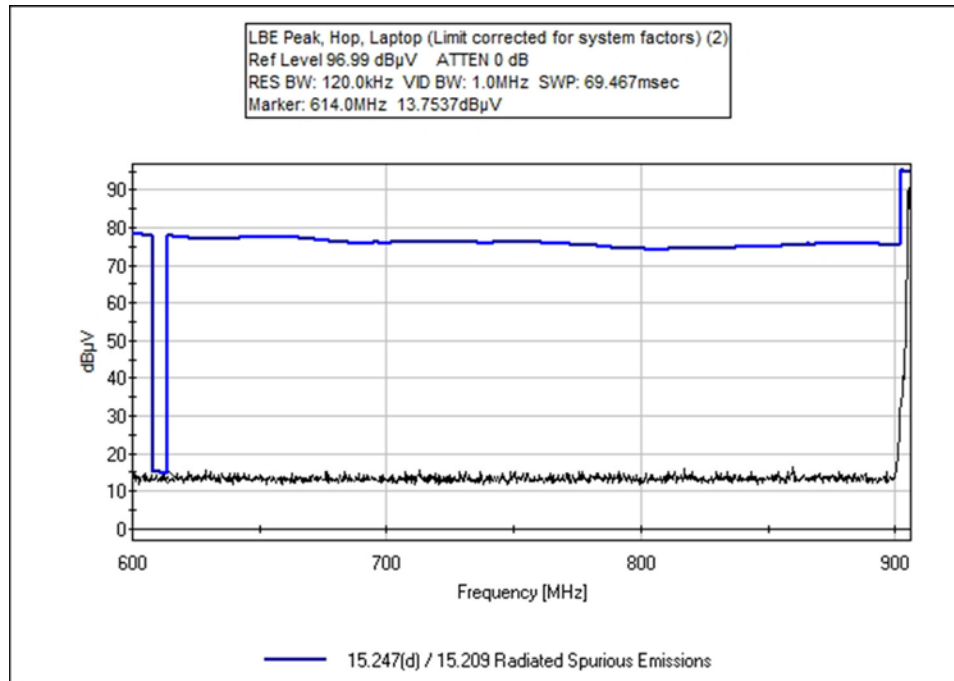
Band Edge Plots

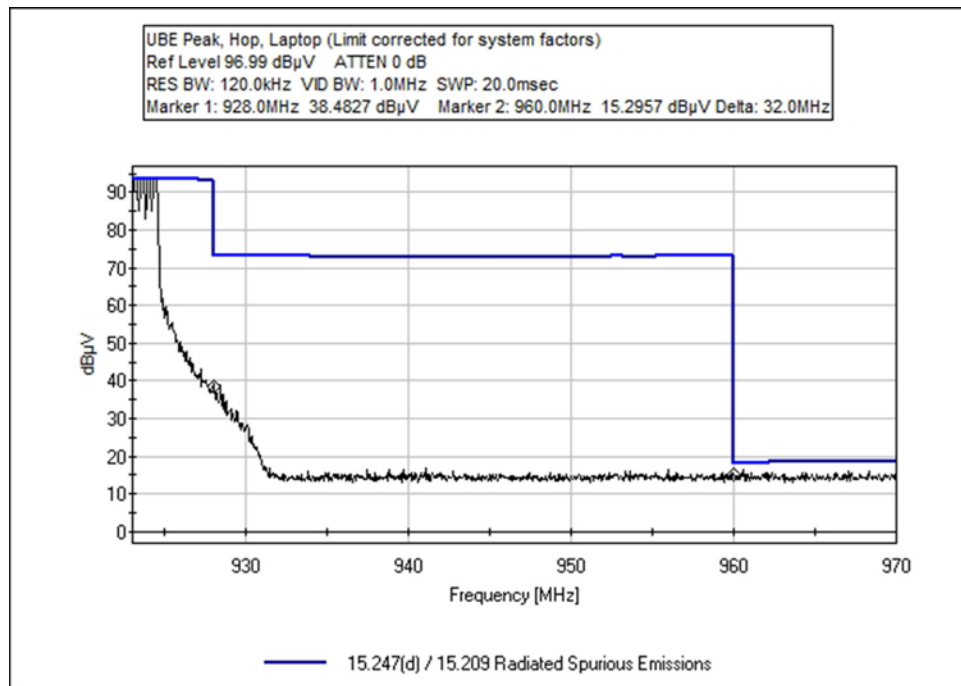
Configuration 2 Single Channel



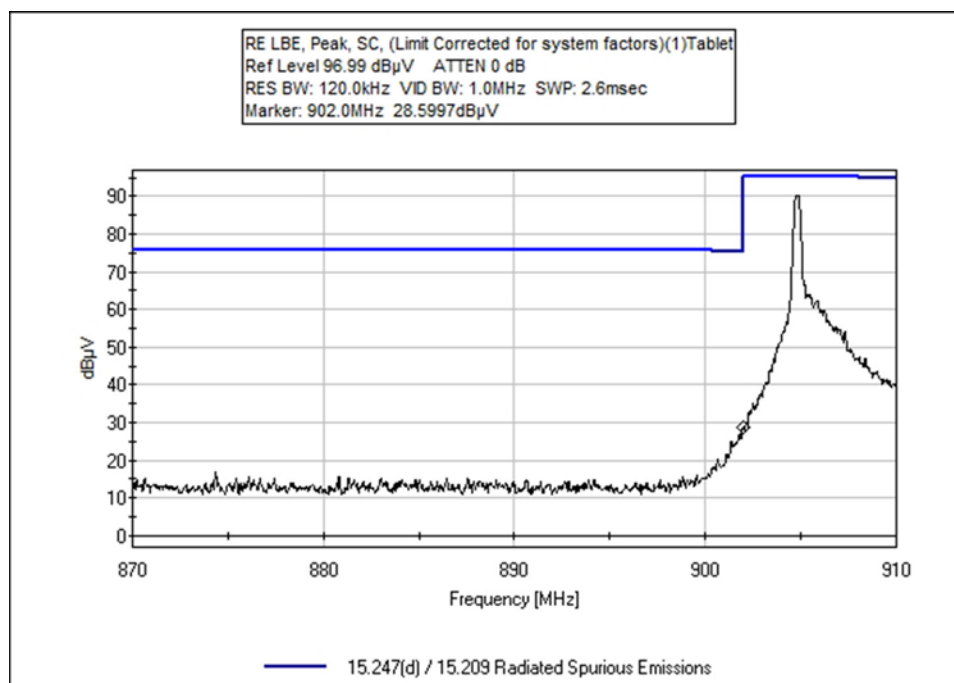
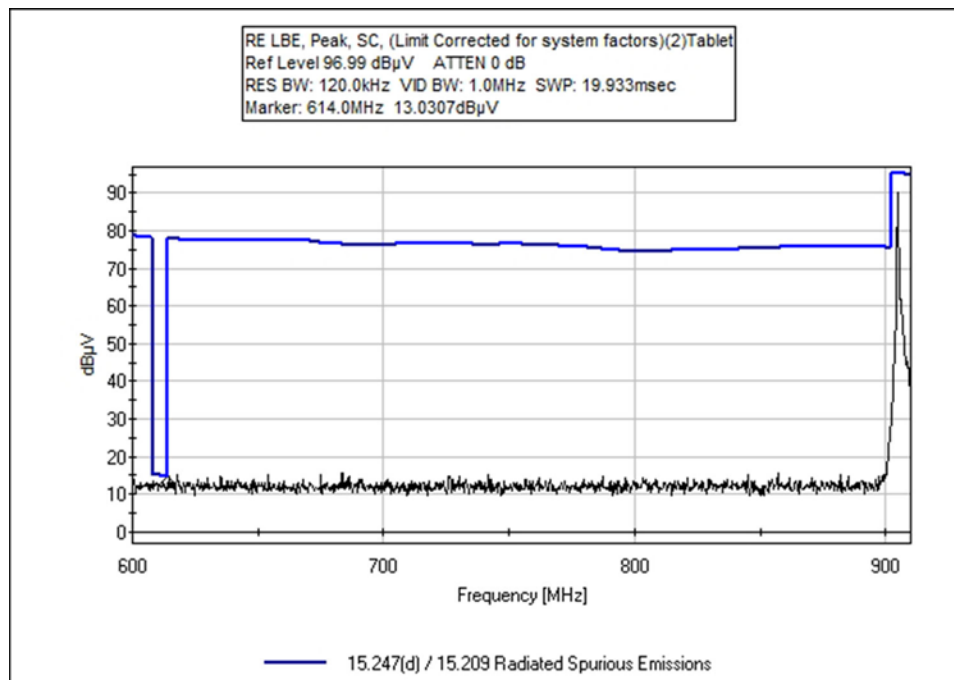


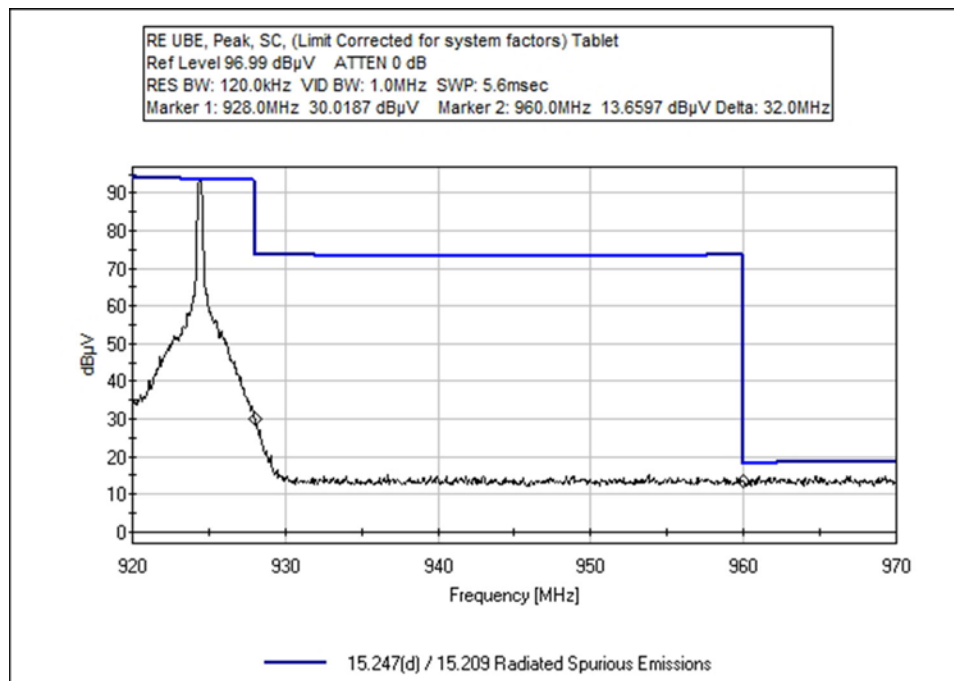
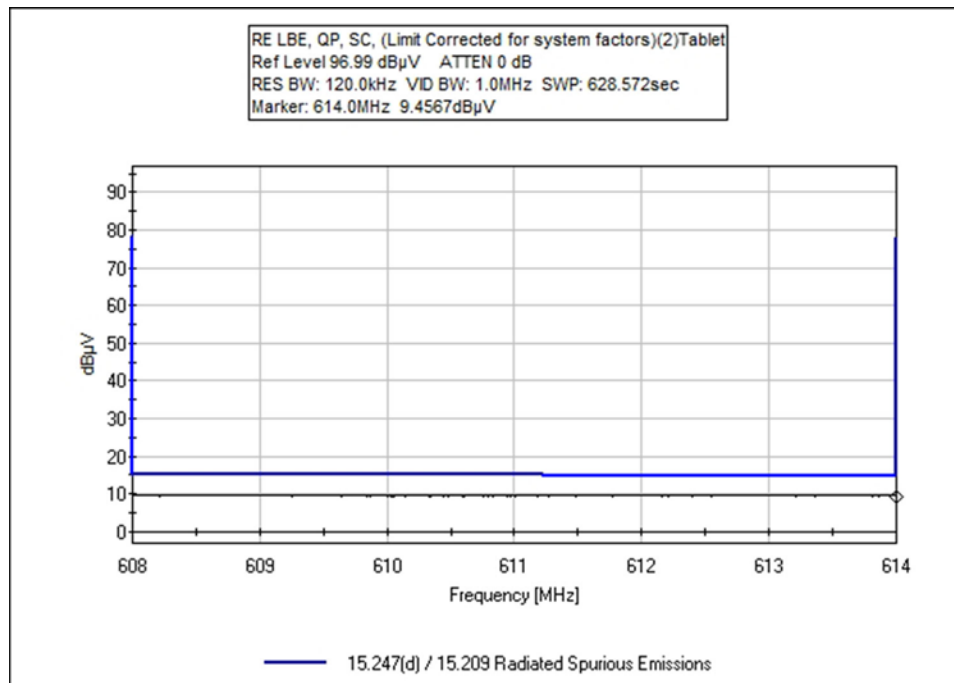
Hopping



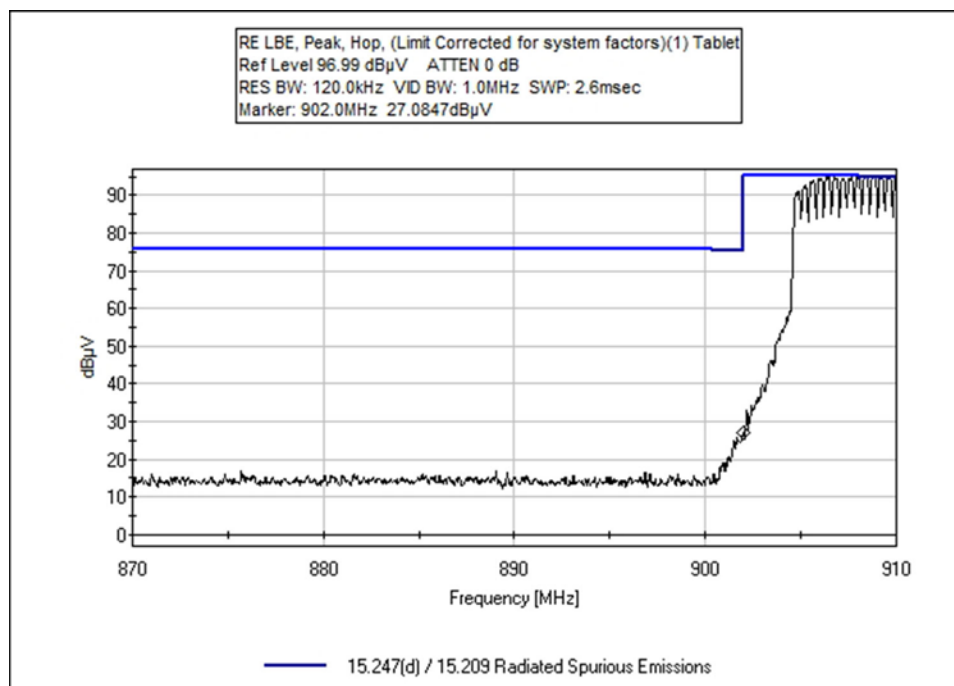
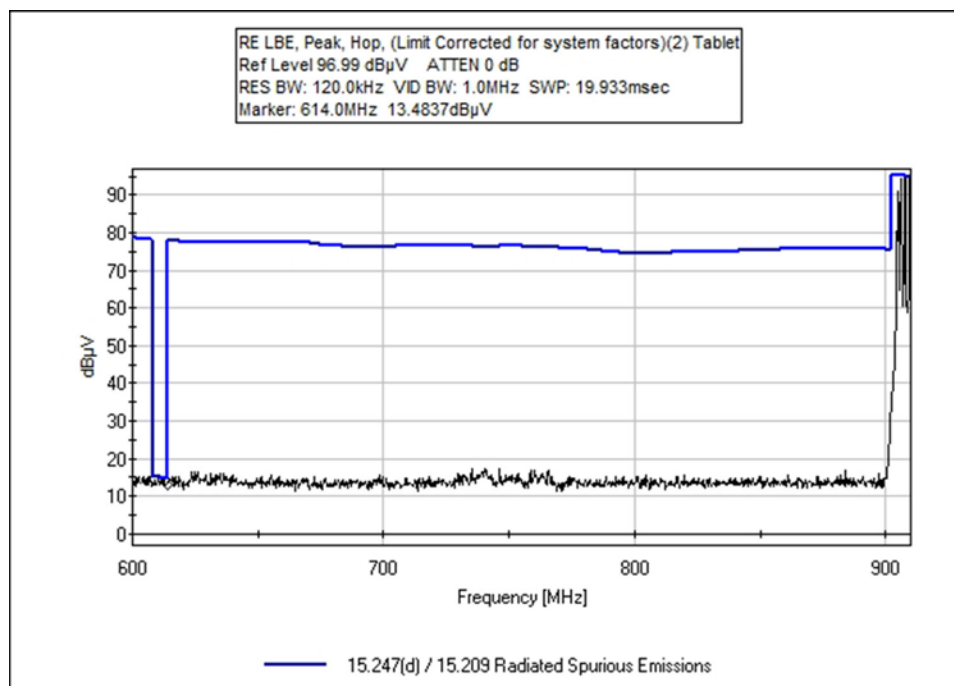


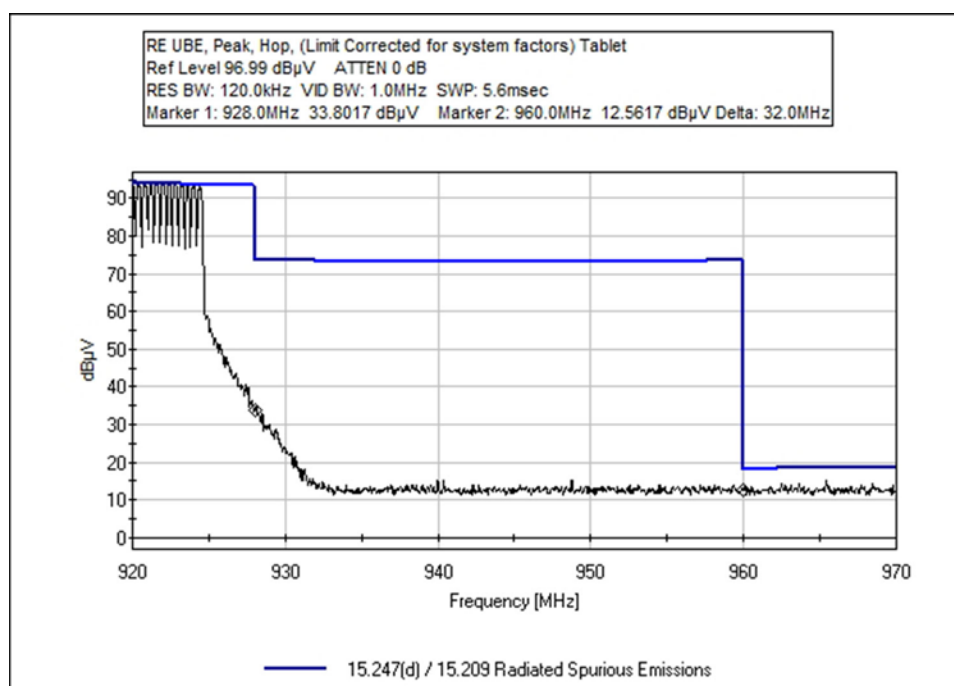
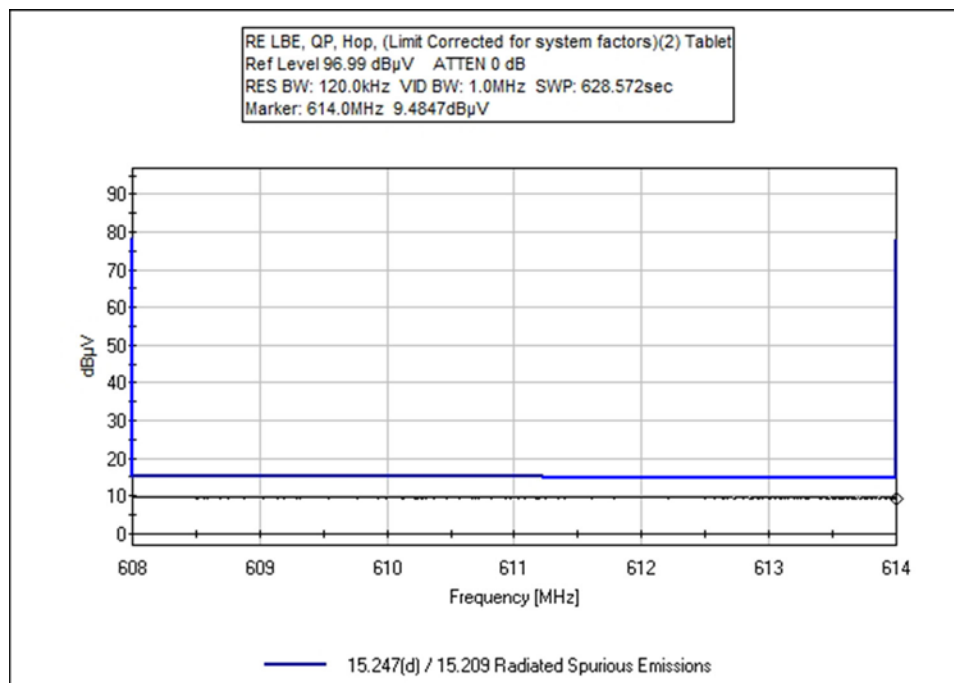
Configuration 3 **Single Channel**





Hopping





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 #: **109570** Date: 3/29/2024
 Test Type: **Radiated Scan** Time: 14:57:25
 Tested By: Matt Harrison Sequence#: 4
 Software: EMITest 5.03.20

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

Test Conditions / Notes:

Test Environment Conditions:
 Temperature: 20°C
 Humidity: 42%
 Pressure: 100.3kPa

 Test Method: ANSI C63.10
 Test Mode: Modulated Tx
 Test Setup: EUT is set up in a tabletop configuration. It is connected to 2 RX antennas, 1Tx/GPS RX antenna, a laptop, and a power supply. X, Y, Z and both polarities were explored, worst-case data provided.

 Frequency Range: 614-960 MHz

 Band of Operation: 902-928 MHz
 Frequency Tested: 904.8, 914, 924.4 MHz
 Firmware Power Setting: 06 01 30
 Protocol /MCS/Modulation: FSK 150kbps
 Duty Cycle: 100%

 Antenna Type: External Omni
 Antenna Gain: 5 dBi.
 EUT Firmware: See Report Details
 Modifications: None

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP06011	Cable	Heliac	11/16/2023	11/16/2025
T2	ANP05333	Cable	Heliac	8/8/2023	8/8/2025
T3	ANP05360	Cable	RG214	8/8/2023	8/8/2025
T4	AN02673	Spectrum Analyzer	E4446A	3/8/2024	3/8/2026
T5	AN03824	Biconilog Antenna	3142E	5/9/2023	5/9/2025

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dB μ V	dB	dB	dB	dB	Table	dB μ V/m	dB μ V/m	dB	Ant
1	913.964M	94.2	+0.4 +30.3	+1.5	+2.6	+0.0	+0.0 185	129.0	129.0 SC	+0.0	Vert 160
2	960.000M	15.3	+0.4 +31.1	+1.6	+2.6	+0.0	+0.0	51.0	54.0 Hop	-3.0	Vert
3	960.000M	13.1	+0.4 +31.1	+1.6	+2.6	+0.0	+0.0	48.8	54.0 SC	-5.2	Vert
4	614.000M QP	9.2	+0.3 +27.4	+1.2	+2.3	+0.0	+0.0	40.4	46.0 Hop	-5.6	Vert
5	614.000M QP	9.2	+0.3 +27.4	+1.2	+2.3	+0.0	+0.0	40.4	46.0 SC	-5.6	Vert
^	614.000M	13.8	+0.3 +27.4	+1.2	+2.3	+0.0	+0.0	45.0	46.0 Hop	-1.0	Vert
^	614.000M	12.5	+0.3 +27.4	+1.2	+2.3	+0.0	+0.0	43.7	46.0 SC	-2.3	Vert
8	928.000M	38.5	+0.4 +31.2	+1.5	+2.6	+0.0	+0.0	74.2	109.0 Hop	-34.8	Vert
9	928.000M	37.7	+0.4 +31.2	+1.5	+2.6	+0.0	+0.0	73.4	109.0 SC	-35.6	Vert
10	902.000M	30.9	+0.4 +29.5	+1.5	+2.5	+0.0	+0.0	64.8	109.0 Hop	-44.2	Vert
11	902.000M	28.5	+0.4 +29.5	+1.5	+2.5	+0.0	+0.0	62.4	109.0 SC	-46.6	Vert

Test Location: CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)
 Customer: **Itron, Inc.**
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**
 Work Order #: **109570** Date: 4/14/2024
 Test Type: **Radiated Scan** Time: 09:27:53
 Tested By: Steven Pittsford Sequence#: 5
 Software: EMITest 5.03.20

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 3			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 3			

Test Conditions / Notes:

Test Environment Conditions: Temperature: 19°C Humidity: 43% Pressure: 101kPa Test Method: ANSI C63.10 Test Mode: Modulated Tx Test Setup: EUT is set up in a tabletop configuration. It is connected to 2 RX antennas, 1Tx/GPS RX antenna, a tablet and a power supply. X, Y, Z and both polarities were explored, worst-case data provided. Frequency Range: 600-980MHz Band of Operation: 902-928 MHz Frequency Tested: 904.8, 914, 924.4 MHz Firmware Power Setting: 06 01 30 Protocol /MCS/Modulation: FSK 150kbps Duty Cycle: 100% Antenna Type: External Omni Antenna Gain: 5 dBi. EUT Firmware: See Report Details Modifications: None
--

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP06011	Cable	Heliac	11/16/2023	11/16/2025
T2	ANP05333	Cable	Heliac	8/8/2023	8/8/2025
T3	ANP05360	Cable	RG214	8/8/2023	8/8/2025
	AN02673	Spectrum Analyzer	E4446A	3/8/2024	3/8/2026
T4	AN03824	Biconilog Antenna	3142E	5/9/2023	5/9/2025

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dBμV	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBμV/m	Spec dBμV/m	Margin dB	Polar Ant
1	960.000M	13.7	+0.4	+1.6	+2.6	+31.1	+0.0	49.4	54.0 SC	-4.6	Vert
2	614.000M QP	9.5	+0.3	+1.2	+2.3	+27.4	+0.0	40.7	46.0 Hop	-5.3	Vert
3	614.000M QP	9.5	+0.3	+1.2	+2.3	+27.4	+0.0	40.7	46.0 SC	-5.3	Vert
^	614.000M	13.5	+0.3	+1.2	+2.3	+27.4	+0.0	44.7	46.0 Hop	-1.3	Vert
^	614.000M	13.0	+0.3	+1.2	+2.3	+27.4	+0.0	44.2	46.0 SC	-1.8	Vert
6	960.000M	12.6	+0.4	+1.6	+2.6	+31.1	+0.0	48.3	54.0 Hop	-5.7	Vert
7	928.000M	33.8	+0.4	+1.5	+2.6	+31.2	+0.0	69.5	109.3 Hop	-39.8	Vert
8	928.000M	30.0	+0.4	+1.5	+2.6	+31.2	+0.0	65.7	109.3 SC	-43.6	Vert
9	902.000M	28.6	+0.4	+1.5	+2.5	+29.5	+0.0	62.5	109.3 SC	-46.8	Vert
10	902.000M	27.1	+0.4	+1.5	+2.5	+29.5	+0.0	61.0	109.3 Hop	-48.3	Vert

Test Setup Photo(s)

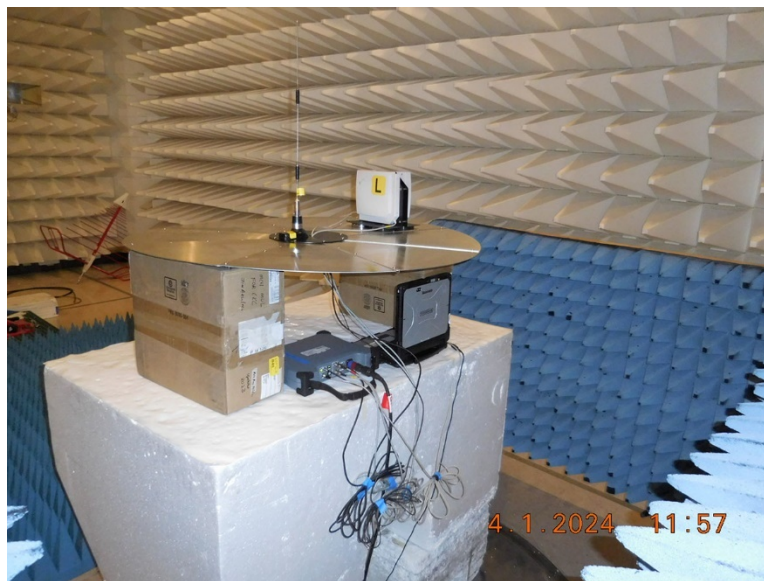
Configuration 2



Below 1GHz; View 1



Below 1GHz; View 2



Above 1GHz; View 1

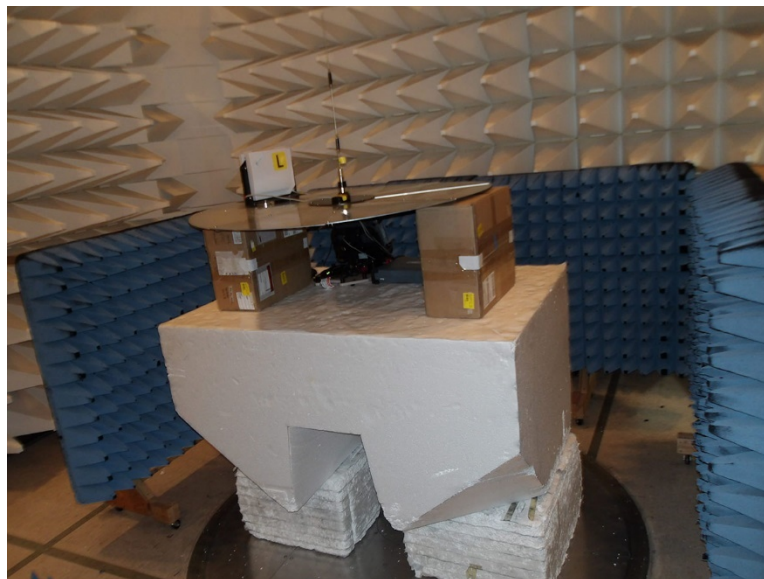


Above 1GHz; View 2

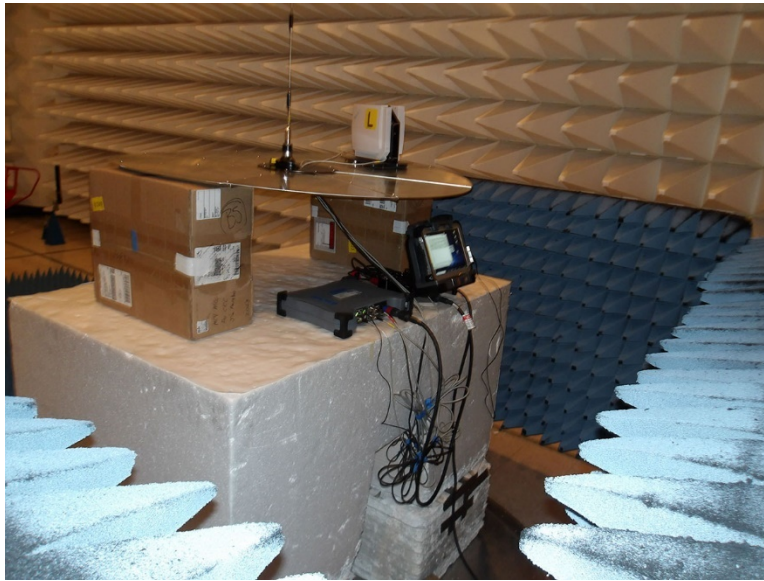
Configuration 3



Below 1GHz



Above 1GHz; View 1



Above 1GHz; View 2

Appendix A: Manufacturer Declaration

The manufacturer declares that the **MC3C** model applies to device names: **MC4Max** and **MC3**. These are identical hardware configurations and the only difference is in the name.

The manufacturer declares that the **MC4Max** model: **MC3C** tested is representative of the **MC3** model: **MC3C** and the **MC3Lite** model: **MC3C1**.

Supplemental Information

Measurement Uncertainty

Uncertainty Value	Parameter
5.77 dB	Radiated Emissions
0.673 dB	RF Conducted Measurements
5.77×10^{-10}	Frequency Deviation
0.00005 s	Time Deviation
3.18 dB	Mains Conducted Emissions

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 $\text{dB}\mu\text{V}/\text{m}$, the spectrum analyzer reading in $\text{dB}\mu\text{V}$ 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	($\text{dB}\mu\text{V}$)
+	Antenna Factor	(dB/m)
+	Cable Loss	(dB)
-	Distance Correction	(dB)
-	Preamplifier Gain	(dB)
=	Corrected Reading	($\text{dB}\mu\text{V}/\text{m}$)

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.

End of Report