

Itron, Inc.

REVISED TEST REPORT FOR 107748-2

500W / RIVAWA
Model: ERW-1601-001*

500WR / RIVAWRA
Model: ERW-1601-010*

*(See Appendix A for Manufacturer's Declaration)

Tested to The Following Standards:

FCC Part 15 Subpart C Section(s)

15.247
(HYBRID 902-928MHz)

Report No.: 107748-2A

Date of issue: June 19, 2023



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:

ltron, Inc.
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Waseca, MN 56093

Representative: Dan Bomsta
Customer Reference Number: 271751

REPORT PREPARED BY:

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Project Number: 107748

DATE OF EQUIPMENT RECEIPT:

February 14, 2023

DATE(S) OF TESTING:

February 14, 15, 18, and 23, 2023
May 19, 26, 30, 2023 & June 2, 2023

Revision History

Original: Testing of 500W / RIVAWA, Model: ERW-1601-001 and 500WR / RIVAWA, Model: ERW-1601-010 to FCC Part 15 Subpart C Sections 15.247 (HYBRID 902-928MHz).

Revision A: Added Radiated Spurious Emissions & Band Edge data for External Antenna.

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, reading "Steve Behm", is written over a horizontal line.

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

Test Facility Information



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

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

Software Versions

CKC Laboratories Proprietary Software	Version
EMITest Emissions	5.03.20

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 (Hybrid 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	NA1
15.247(a)(1)(i)	Average Time of Occupancy	NA	NA1
15.247(b)(2)	Output Power	NA	Pass
15.247(d)	RF Conducted Emissions	NA	Pass
15.247(d)	Radiated Emissions & Band Edge	NA	Pass
15.247 (f)	Hybrid Systems Time of Occupancy	NA	NP
15.247 (f)	Hybrid Systems Power Spectral Density	NA	Pass
15.207	AC Conducted Emissions	NA	NA2

NA = Not Applicable

NA1 = This test is not applicable under Hybrid System requirements section 15.247 (f).

NA2 = The Manufacturer declares the EUT is battery powered.

NP = CKC Laboratories was not contracted to perform test.

ISO/IEC 17025 Decision Rule

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

Modifications During Testing

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

Summary of Conditions
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 Under Test:

Device	Manufacturer	Model #	S/N
500W / RIVAWA	ltron, Inc.	ERW-1601-001	01042023-cond

Support Equipment:

Device	Manufacturer	Model #	S/N
Laptop	HP	14-dq1033cl	5CD941CCWS
Laptop PSU	HP	TPN-CA14	WHGRE0AVKCR55T
Adapter Board	ltron, Inc.	None	None

Configuration 2

Equipment Under Test:

Device	Manufacturer	Model #	S/N
500W / RIVAWA	ltron, Inc.	ERW-1601-001	01042023-rivawa-rad

Support Equipment:

Device	Manufacturer	Model #	S/N
Laptop	HP	14-dq1033cl	5CD941CCWS
Laptop PSU	HP	TPN-CA14	WHGRE0AVKCR55T
Adapter Board	ltron, Inc.	None	None

Configuration 3

Equipment Under Test:

Device	Manufacturer	Model #	S/N
500WR / RIVAWRA	ltron, Inc.	ERW-1601-010	01042023-rivawra-rad

Support Equipment:

Device	Manufacturer	Model #	S/N
Laptop	HP	14-dq1033cl	5CD941CCWS
Laptop PSU	HP	TPN-CA14	WHGRE0AVKCR55T
Adapter Board	ltron, Inc.	None	None

Configuration 4 (External Antenna)

Equipment Under Test:

Device	Manufacturer	Model #	S/N
500W / RIVAWA	ltron, Inc.	ERW-1601-001	2803441-rivawa-rad-2

Support Equipment:

Device	Manufacturer	Model #	S/N
Antenna	ltron, Inc.	CFG-0900-003	12194430
Ground Plane	ltron, Inc.	4ft	NA
Openway Riva Gas Disconnect Flood Sensor 8'	ltron, Inc.	TEL-7103-008	54AADFWYRAW

General Product Information:

Product Information	Manufacturer-Provided Details
Equipment Type:	Stand-Alone Equipment
Type of Wideband System:	FHSS
Operating Frequency Range:	902.4-927.6
Number of Hopping Channels:	64
Modulation Type(s):	GFSK 150kbps
Maximum Duty Cycle:	Tested at 100%
Number of TX Chains:	1
Antenna Type(s) and Gain:	4.78dBi, Internal Meander Antenna 2.5 dBi, External Omni Antenna
Beamforming Type:	NA
Antenna Connection Type:	Integral (External connector provided to facilitate testing)
Nominal Input Voltage:	Battery (6VDC)
Firmware / Software used for Test:	CLI Tool V.8.02.0 CSL V.9.1.5.0

The validity of results is dependent on the stated product details, the accuracy of which the manufacturer assumes full responsibility.

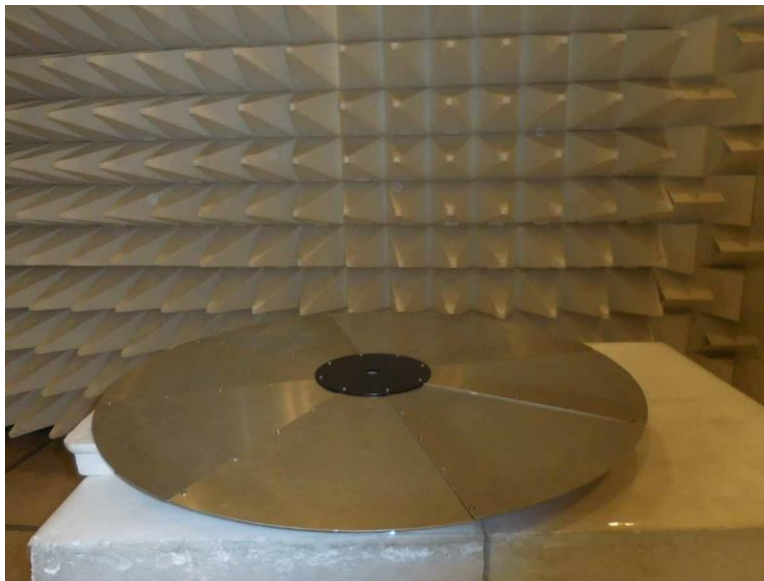
Support Equipment Photo(s)



Antenna



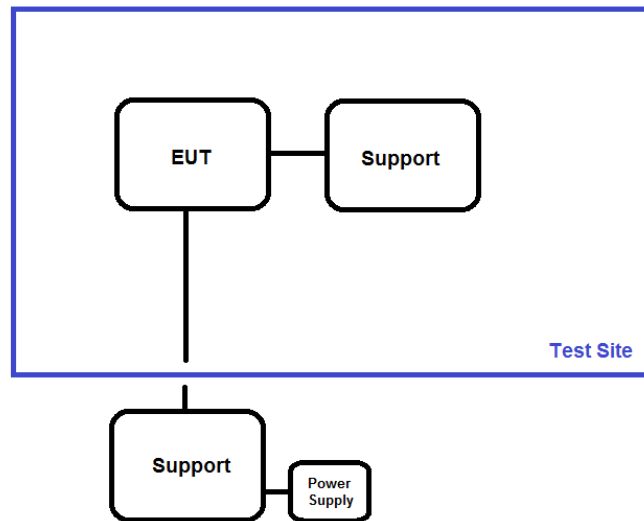
Flood Sensor



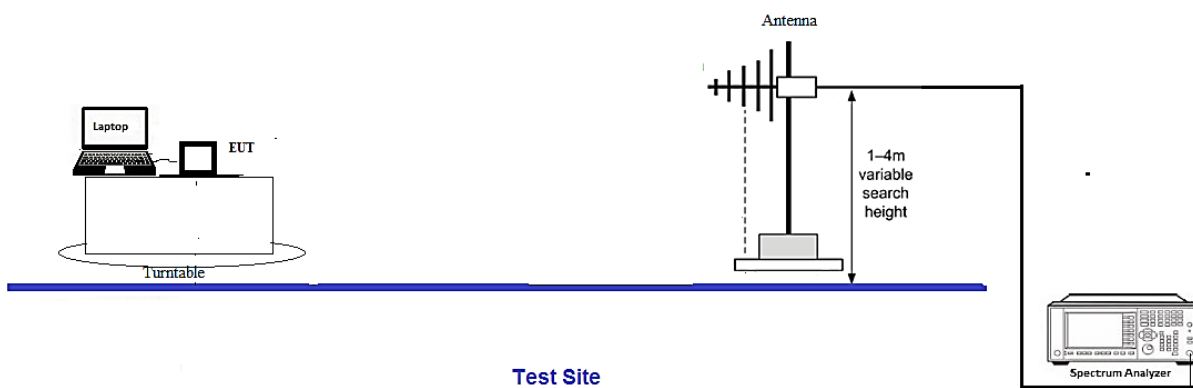
Ground Plane

Block Diagram of Test Setup(s)

Test Setup Block Diagram

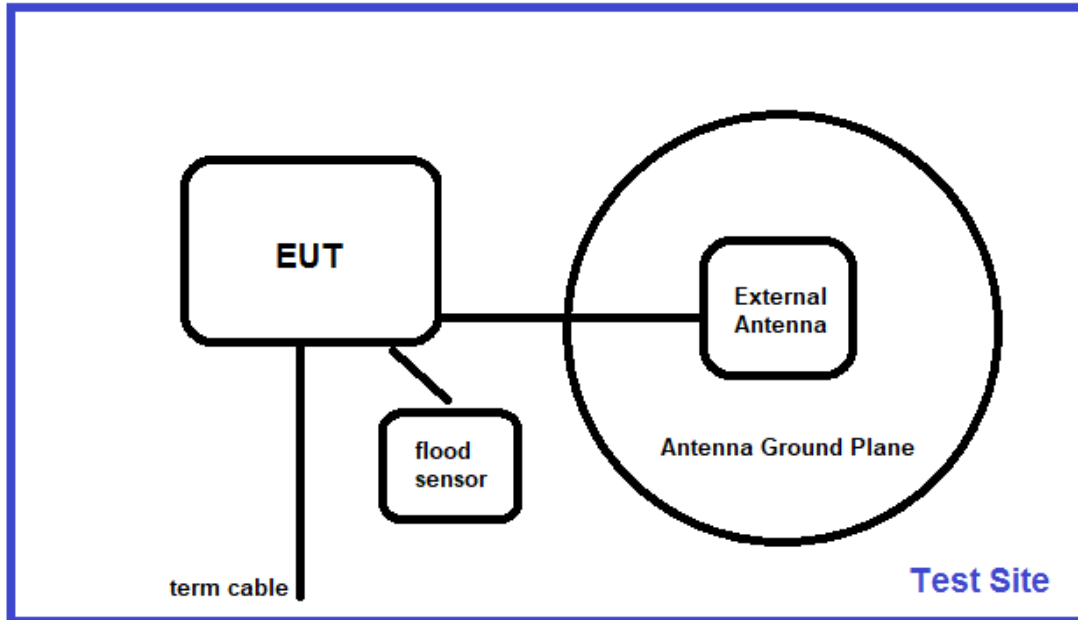


Radiated test setup



Test Setup Block Diagram

(External Antenna on Metal Lid Configurations)



FCC Part 15 Subpart C

15.247(a) Transmitter Characteristics

Test Setup/Conditions			
Test Location:	Bothell Lab C3	Test Engineer:	M. Harrison
Test Method:	ANSI C63.10 (2013)	Test Date(s):	2/14/2023
Configuration:	1		
Test Setup:	EUT is set up for conducted measurements. It is directly connected to the analyzer via cable and attenuator.		

Environmental Conditions			
Temperature (°C)	21	Relative Humidity (%):	38

Test Equipment					
Asset #	Description	Manufacturer	Model	Cal Date	Cal Due
P05503	Attenuator	Narda	766-10	6/8/2021	6/8/2023
P05353	Cable	Andrews	Heliac	2/23/2022	2/23/2024
03807	Spectrum Analyzer	Agilent	E4440A	10/6/2022	10/6/2024

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

20dB Occupied Bandwidth

Test Data Summary					
Frequency (MHz)	Antenna Port	Modulation	Measured (kHz)	Limit (kHz)	Results
902.4	1	GFSK	244.6	*See Note	NA
914.8	1	GFSK	175.5		
927.6	1	GFSK	205.2		

*For this Hybrid mode there is no requirement to meet the FHSS or DTS bandwidth limits. See Supplemental Section of data in 15.247 (f) Hybrid Systems.

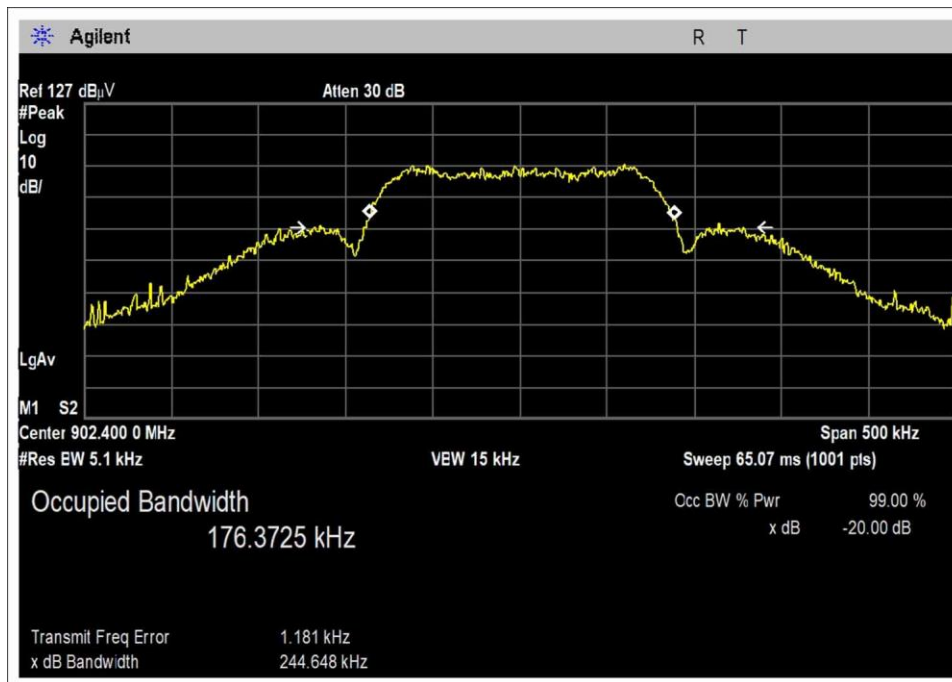
DTS Bandwidth

Test Data Summary					
Frequency (MHz)	Antenna Port	Modulation	Measured (kHz)	Limit (kHz)	Results
902.4	1	GFSK	254.4	*See Note	NA
914.8	1	GFSK	254.8		
927.6	1	GFSK	253.8		

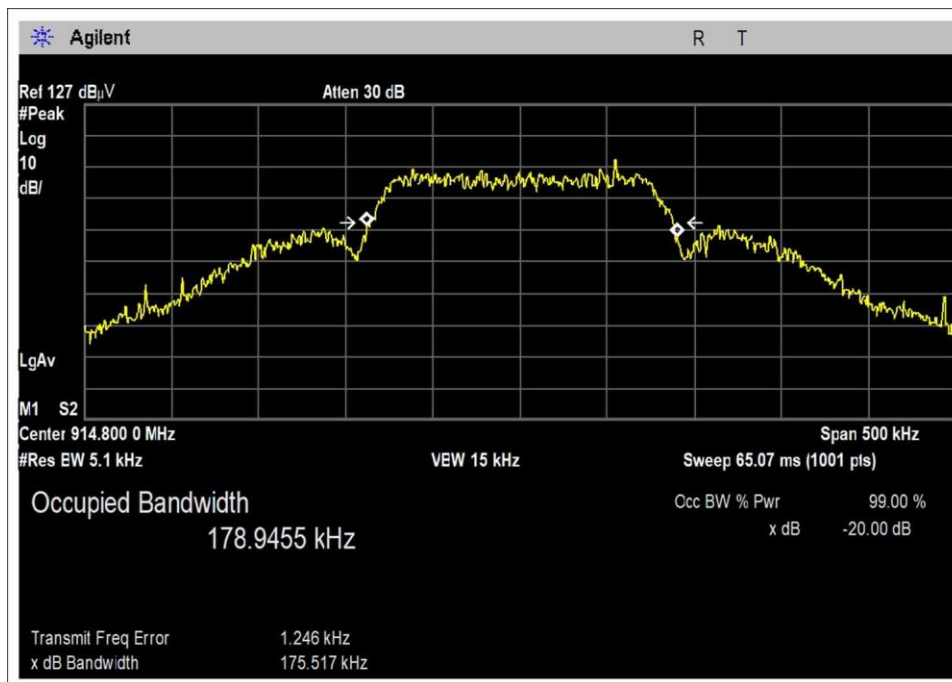
*For this Hybrid mode there is no requirement to meet the FHSS or DTS bandwidth limits. See Supplemental Section of data in 15.247 (f) Hybrid Systems.

Plot(s)

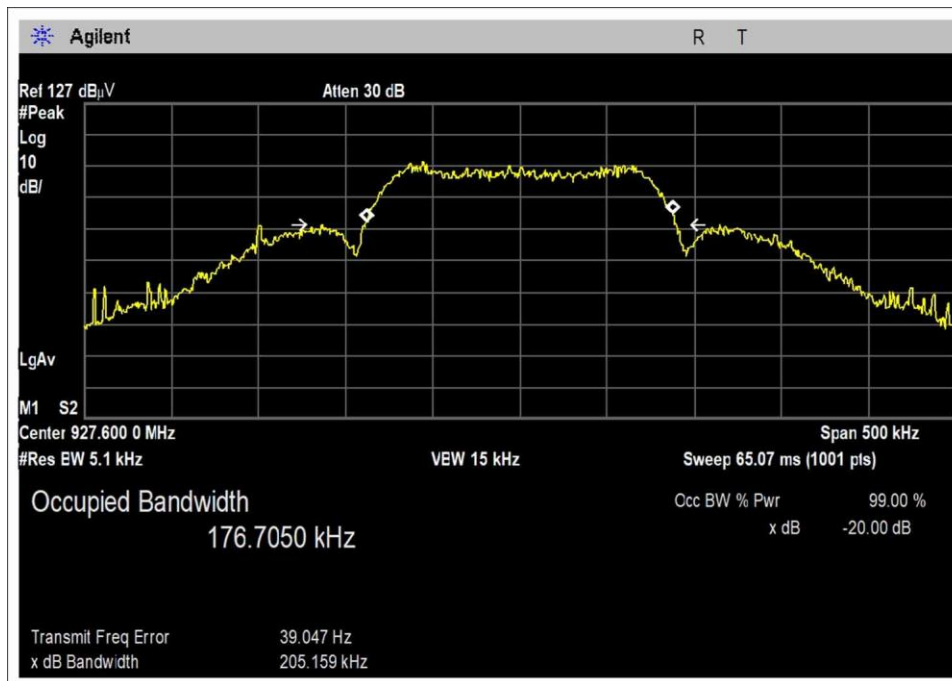
20dB Occupied Bandwidth



Low Channel

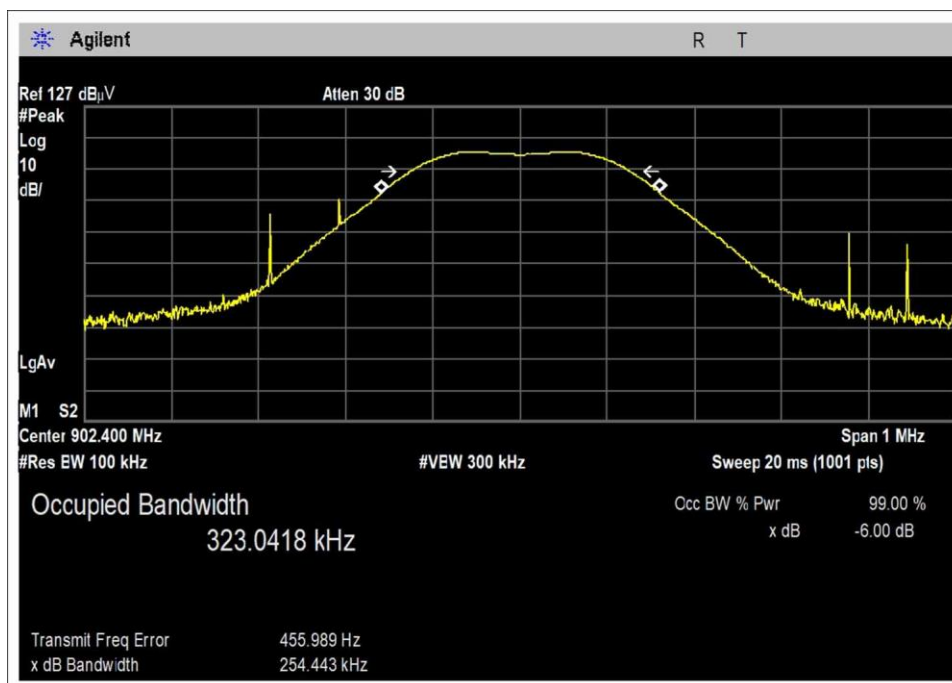


Middle Channel

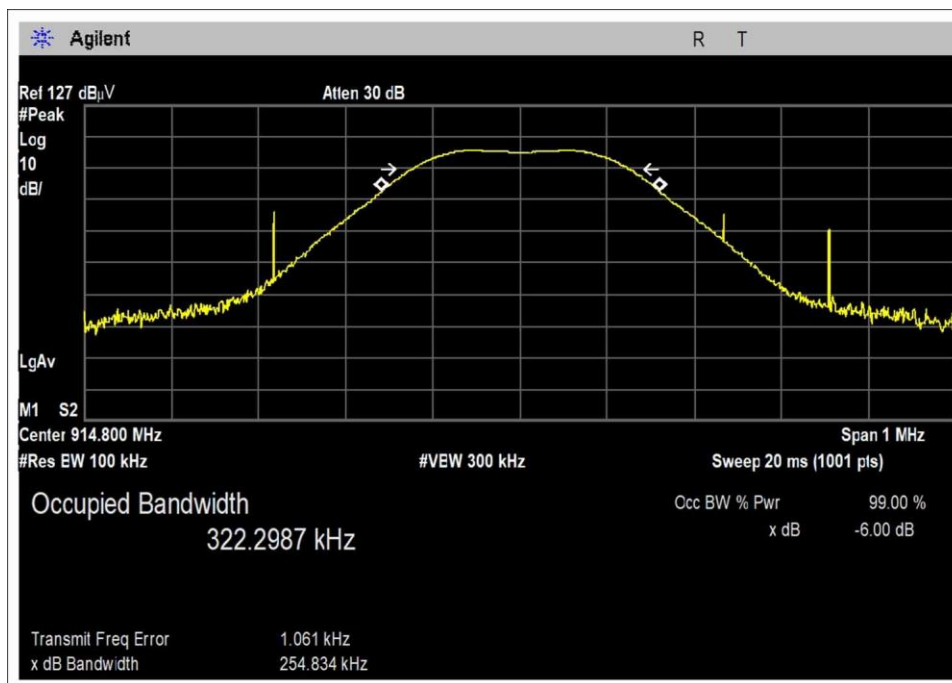


High Channel

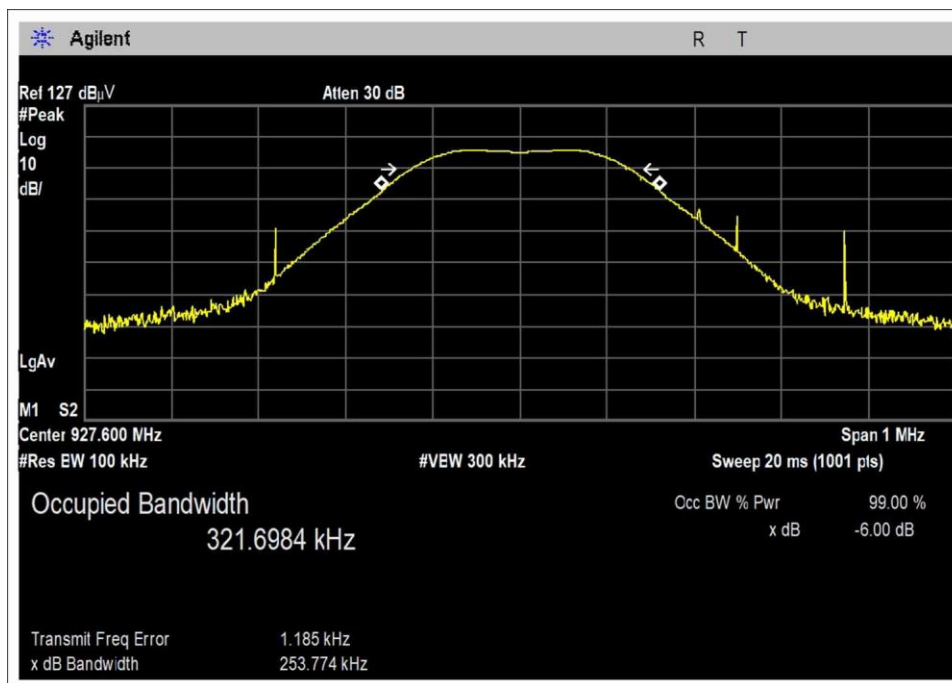
DTS Bandwidth



Low Channel



Middle Channel

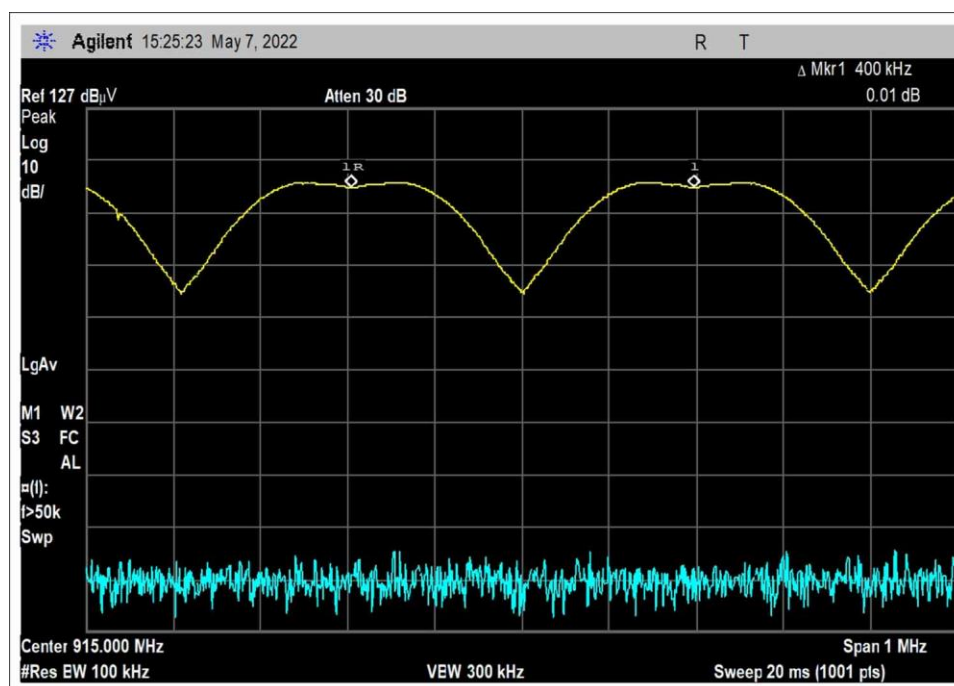


High Channel

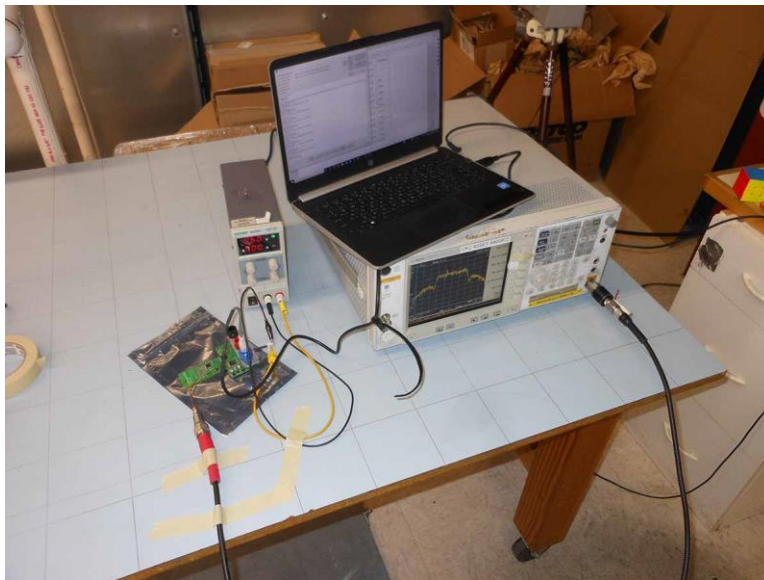
15.247(a)(1) Carrier Separation

Test Data Summary				
Limit applied: 20dB bandwidth of the hopping channel.				
Antenna Port	Operational Mode	Measured (kHz)	Limit (kHz)	Results
1	Hopping	400	>244.6	Pass

Plot(s)



Test Setup Photo(s)



15.247(b)(2) Output Power

Test Data Summary - Voltage Variations

This equipment is battery powered. Power output tests were performed using a fresh battery.

Test Data Summary - RF Conducted Measurement

Limit = 30dBm Conducted/36dBm EIRP

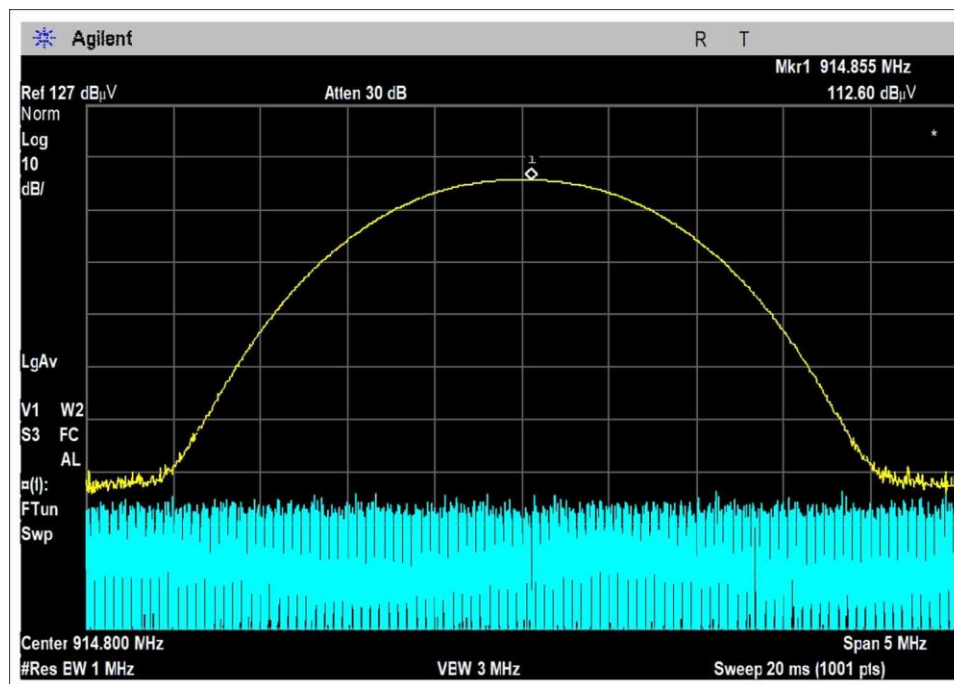
Frequency (MHz)	Modulation	Ant. Type / Gain (dBi)	Measured (dBm)	Limit (dBm)	Results
902.4	GFSK	Meander 4.78dBi	15.7	≤30	Pass
914.8	GFSK	Meander 4.78dBi	15.9	≤30	Pass
927.6	GFSK	Meander 4.78dBi	16.1	≤30	Pass

*For this Hybrid Mode there is no minimum number of hopping channels required for the 1 Watt (30dBm) limit.

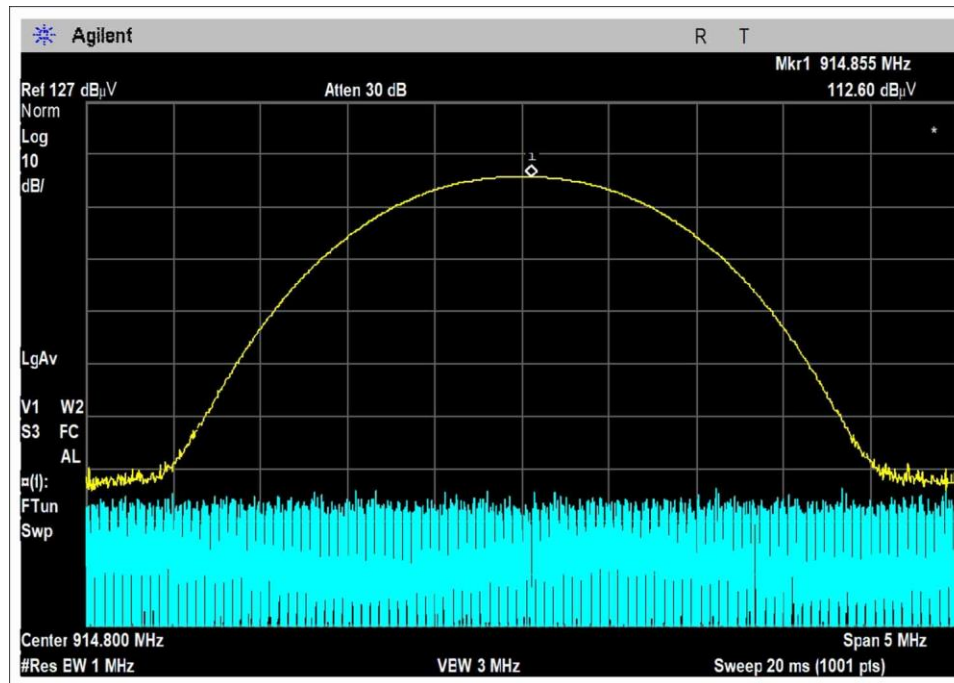
The limit is calculated according to a maximum of 1W (30 dBm) conducted power with a maximum of 6dBi gain antenna in accordance with 15.247(b)

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

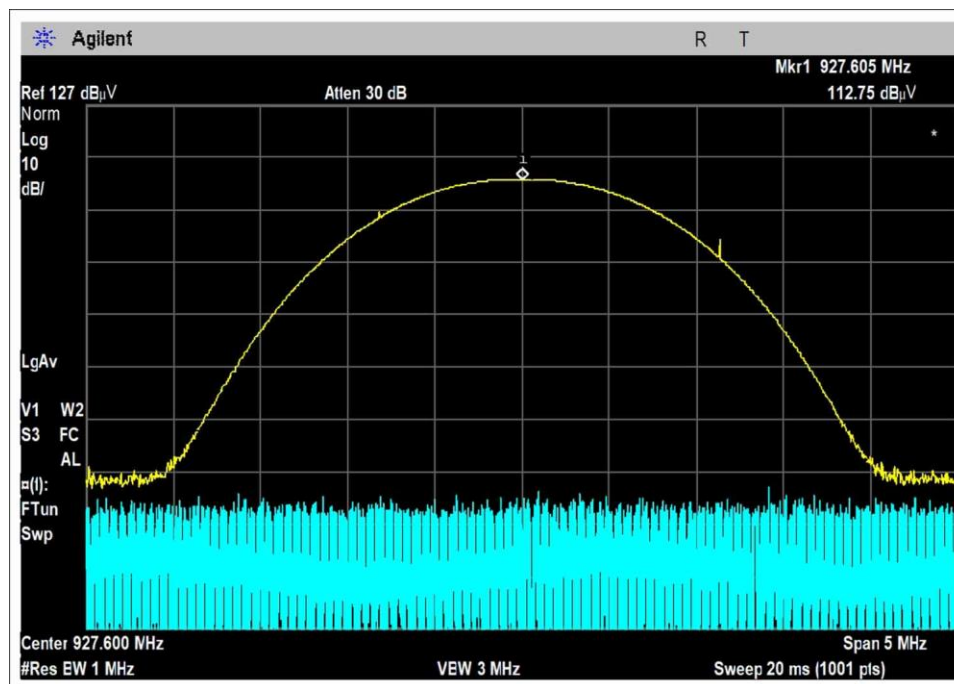
Plots



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 #: **107748** Date: 2/14/2023
 Test Type: **Conducted Emissions** Time: 07:38:43
 Tested By: Matt Harrison Sequence#: 2
 Software: EMITest 5.03.20 6VDC

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

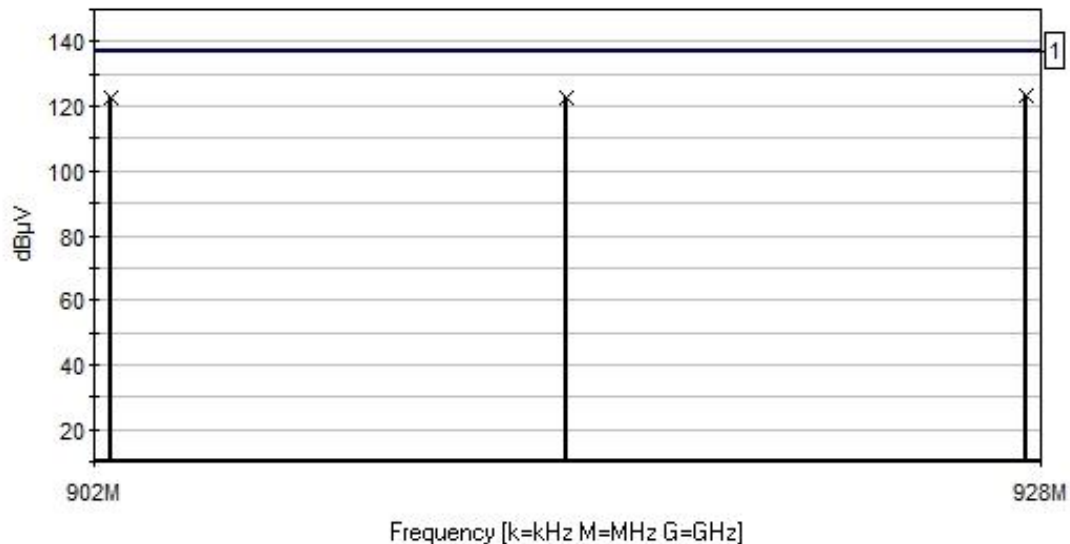
Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Test Environment Conditions: Temperature: 18.6°C Pressure: 100.9kPa Humidity: 40% Frequency Range: Fundamental Frequency Tested: 902.4, 914.8, 927.6 Firmware Power Setting: Level 2 EUT Firmware: Protocol /MCS/Modulation: GFSK 150kbps Test Method: ANSI C63.10 (2013) Test Mode: Transmitting Test Setup: EUT is set up for conducted measurement. It is directly connected to the Analyzer via cable and attenuator. Modifications Added: None

Iron, Inc. WO#: 107748 Sequence#: 2 Date: 2/14/2023
15.247(b) Power Output (902-928 MHz FHSS >50 Channels) Test Lead: 6VDC RF Port



— Readings
— 1 - 15.247(b) Power Output (902-928 MHz FHSS >50 Channels)
× Peak Readings
Software Version: 5.03.20

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP05503	Attenuator	766-10	6/8/2021	6/8/2023
T2	ANP05353	Cable	Heliac	2/23/2022	2/23/2024
	AN02872	Spectrum Analyzer	E4440A	11/29/2021	11/29/2023

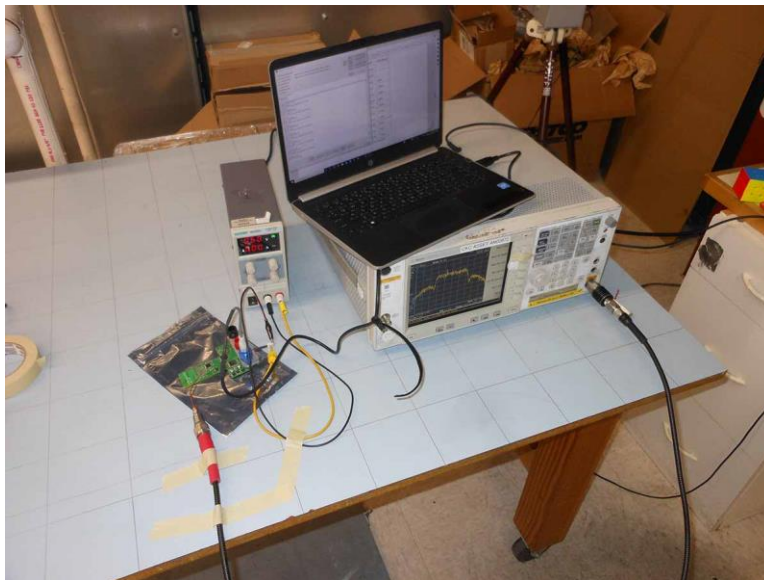
Measurement Data:

Reading listed by margin.

Test Lead: RF Port

#	Freq MHz	Rdng dBμV	T1 dB	T2 dB	dB	dB	Dist Table	Corr dBμV	Spec dBμV	Margin dB	Polar Ant
1	927.605M	112.8	+10.1	+0.2			+0.0	123.1	137.0	-13.9	RF Po
2	914.855M	112.6	+10.1	+0.2			+0.0	122.9	137.0	-14.1	RF Po
3	902.455M	112.4	+10.1	+0.2			+0.0	122.7	137.0	-14.3	RF Po

Test Setup Photo(s)



15.247(d) RF 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: **15.247(d) Conducted Spurious Emissions**
 Work Order #: **107748** Date: 2/14/2023
 Test Type: **Conducted Emissions** Time: 09:49:07
 Tested By: Matt Harrison Sequence#: 23
 Software: EMITest 5.03.20 6VDC

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

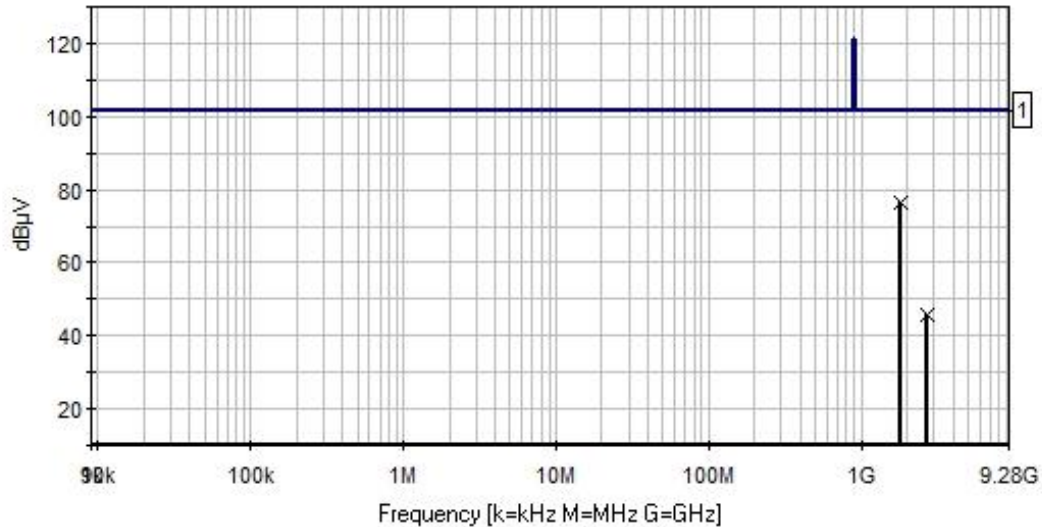
Test Conditions / Notes:

Test Environment Conditions:
 Temperature: 18.6°C
 Pressure: 100.9kPa
 Humidity: 40%

 Frequency Range: 30M-10GHz
 Frequency Tested: 914.8 (Low, Middle, and High channels were investigated, and worst case is represented)
 Firmware Power Setting: Level 2
 EUT Firmware:
 Protocol /MCS/Modulation: GFSK 150kbps

 Test Method: ANSI C63.10 (2013)
 Test Mode: Transmitting
 Test Setup: EUT is set up for conducted measurement. It is directly connected to the Analyzer via cable and attenuator.
 Modifications Added: None

Ittron, Inc. WO#: 107748 Sequence#: 23 Date: 2/14/2023
15.247(d) Conducted Spurious Emissions Test Lead: 6VDC RF Port



— Readings
— 1 - 15.247(d) Conducted Spurious Emissions
× Peak Readings
Software Version: 5.03.20

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP05503	Attenuator	766-10	6/8/2021	6/8/2023
T2	ANP05353	Cable	Heliac	2/23/2022	2/23/2024
	AN02872	Spectrum Analyzer	E4440A	11/29/2021	11/29/2023

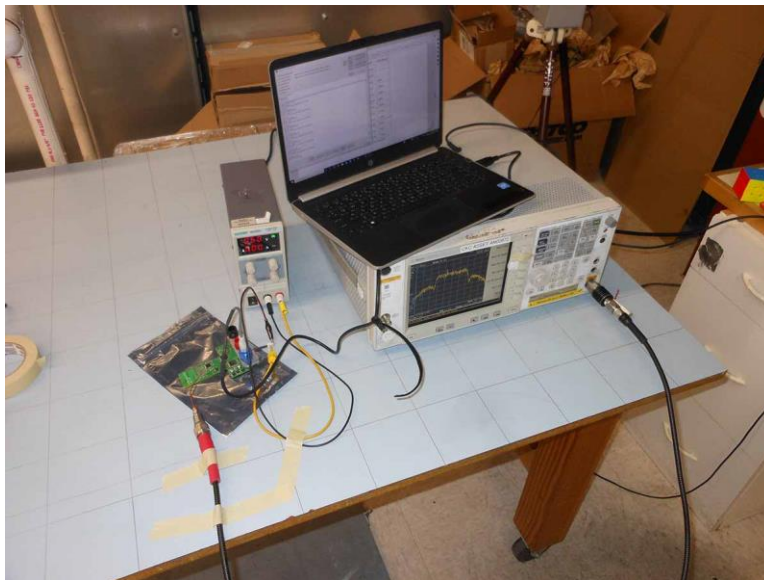
Measurement Data:

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	1829.714M	65.9	+10.2	+0.3			+0.0	76.4	101.3	-24.9 RF Po
2	2744.242M	35.1	+10.2	+0.4			+0.0	45.7	101.3	-55.6 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 #: **107748** Date: 2/18/2023
 Test Type: **Radiated Scan** Time: 06:55:55
 Tested By: Matt Harrison Sequence#: 22
 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:

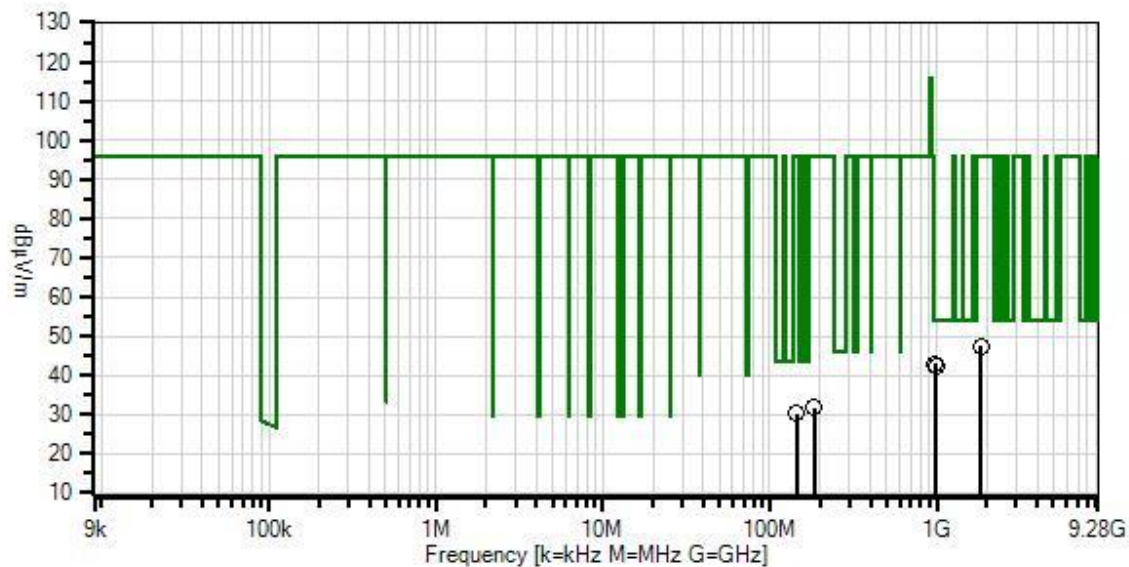
Test Environment Conditions:
 Temperature: 18.6°C
 Pressure: 100.9kPa
 Humidity: 40%

 Frequency Range: 9k-10GHz
 Frequency Tested: 914.8 (Low, Middle, and High channels were investigated, and worst case is represented)
 Firmware Power Setting: Level 2
 EUT Firmware:
 Protocol /MCS/Modulation: GFSK 150kbps

 Test Method: ANSI C63.10 (2013)
 Test Mode: Transmitting
 Test Setup: EUT is setup in a tabletop configuration. It is 80cm high for below 1GHz and 150cm above 1GHz, on a Styrofoam table.
 Modifications Added: None

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

Ittron, Inc. WO#: 107748 Sequence#: 22 Date: 2/18/2023
15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Vert



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

○ Peak Readings
* Average Readings
Software Version: 5.03.20

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN03628	Biconilog Antenna	3142E	6/3/2021	6/3/2023
T2	ANP05360	Cable	RG214	2/4/2022	2/4/2024
T3	ANP06540	Cable	Heliac	1/17/2022	1/17/2024
	AN02872	Spectrum Analyzer	E4440A	11/29/2021	11/29/2023
T4	ANP05333	Cable	Heliac	3/14/2022	3/14/2024
T5	AN02307	Preamp	8447D	1/6/2022	1/6/2024
	AN00052	Loop Antenna	6502	5/11/2022	5/11/2024
T6	AN02374ANSI	Horn Antenna	RGA-60	5/25/2021	5/25/2023
T7	AN03170	High Pass Filter	HM1155-11SS	9/16/2021	9/16/2023
T8	ANP06452	Cable	Heliac	1/17/2022	1/17/2024
T9	AN02660	Spectrum Analyzer	E4446A	12/6/2022	12/6/2024
	AN03155	Preamp	83017A	2/13/2023	2/13/2025

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq	Rdng	T1 T5 T9	T2 T6	T3 T7	T4 T8	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	976.960M	35.7	+30.2 -27.2 +0.0	+2.5 +0.0	+0.3 +0.0	+1.6 +0.0	+0.0	43.1	54.0	-10.9	Vert
2	992.860M	35.2	+29.9 -27.1 +0.0	+2.5 +0.0	+0.3 +0.0	+1.6 +0.0	+0.0	42.4	54.0	-11.6	Vert
3	1829.635M	49.8	+0.0 +0.0 -33.7	+0.0 +27.5	+0.0 +0.6	+2.3 +1.0	+0.0	47.5	95.7	-48.2	Horiz
4	183.900M	42.0	+15.6 -27.4 +0.0	+0.9 +0.0	+0.1 +0.0	+0.7 +0.0	+0.0	31.9	95.7	-63.8	Vert
5	144.000M	42.2	+14.0 -27.6 +0.0	+0.8 +0.0	+0.1 +0.0	+0.7 +0.0	+0.0	30.2	95.7	-65.5	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 #: **107748** Date: 2/23/2023
 Test Type: **Radiated Scan** Time: 07:33:27
 Tested By: Matt Harrison Sequence#: 18
 Software: EMITest 5.03.20

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

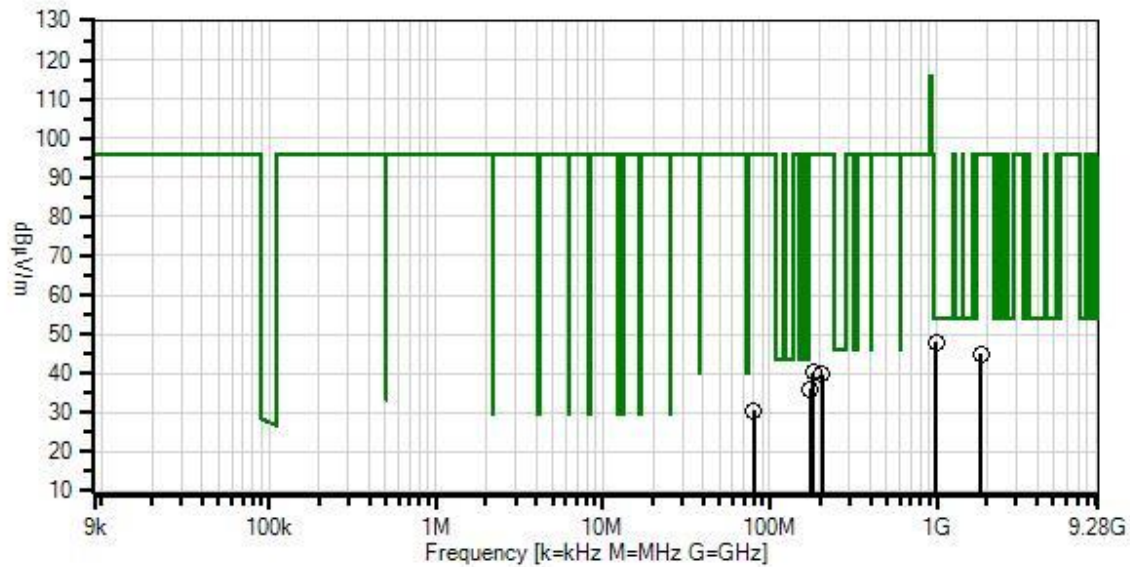
Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

Test Conditions / Notes:

Test Environment Conditions: Temperature: 18.6°C Pressure: 100.9kPa Humidity: 40% Frequency Range: 9k-10GHz Frequency Tested: 902.4, 914.8, 927.6 Firmware Power Setting: Level 2 EUT Firmware: Protocol /MCS/Modulation: GFSK 150kbps Test Method: ANSI C63.10 (2013) Test Mode: Transmitting Test Setup: EUT is setup in a tabletop configuration. It is 80cm high for below 1GHz and 150cm above 1GHz, on a Styrofoam table. Modifications Added: None Notes: No emissions found within 20dB of the limit below 30MHz.
--

Itron, Inc. WO#: 107748 Sequence#: 18 Date: 2/23/2023
15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Horiz



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

○ Peak Readings
* Average Readings
Software Version: 5.03.20

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN03628	Biconilog Antenna	3142E	6/3/2021	6/3/2023
T2	ANP05360	Cable	RG214	2/4/2022	2/4/2024
T3	ANP06540	Cable	Heliac	1/17/2022	1/17/2024
	AN02872	Spectrum Analyzer	E4440A	11/29/2021	11/29/2023
T4	ANP05333	Cable	Heliac	3/14/2022	3/14/2024
T5	AN02307	Preamp	8447D	1/6/2022	1/6/2024
	AN00052	Loop Antenna	6502	5/11/2022	5/11/2024
T6	AN02374ANSI	Horn Antenna	RGA-60	5/25/2021	5/25/2023
T7	AN03170	High Pass Filter	HM1155-11SS	9/16/2021	9/16/2023
T8	ANP06452	Cable	Heliac	1/17/2022	1/17/2024
T9	AN03155	Preamp	83017A	2/13/2023	2/13/2025
	AN02660	Spectrum Analyzer	E4446A	12/6/2022	12/6/2024

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq	Rdng	T1 T5 T9	T2 T6	T3 T7	T4 T8	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	993.580M	40.7	+29.9 -27.1 +0.0	+2.5 +0.0	+0.3 +0.0	+1.6 +0.0	+0.0	47.9	54.0	-6.1	Vert
2	1830.000M	47.3	+0.0 +0.0 -33.7	+0.0 +27.5	+0.0 +0.6	+2.3 +1.0	+0.0	45.0	95.7	-50.7	Horiz
3	181.050M	50.1	+15.8 -27.4 +0.0	+0.9 +0.0	+0.1 +0.0	+0.7 +0.0	+0.0	40.2	95.7	-55.5	Vert
4	205.560M	48.7	+16.4 -27.2 +0.0	+0.9 +0.0	+0.1 +0.0	+0.8 +0.0	+0.0	39.7	95.7	-56.0	Vert
5	174.780M	46.1	+15.7 -27.4 +0.0	+0.9 +0.0	+0.1 +0.0	+0.7 +0.0	+0.0	36.1	95.7	-59.6	Vert
6	80.160M	44.5	+12.6 -27.8 +0.0	+0.6 +0.0	+0.1 +0.0	+0.5 +0.0	+0.0	30.5	95.7	-65.2	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 #: **107748** Date: 5/26/2023
 Test Type: **Maximized Emissions** Time: 20:20:29
 Tested By: Michael Atkinson Sequence#: 54
 Software: EMITest 5.03.20

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 4			

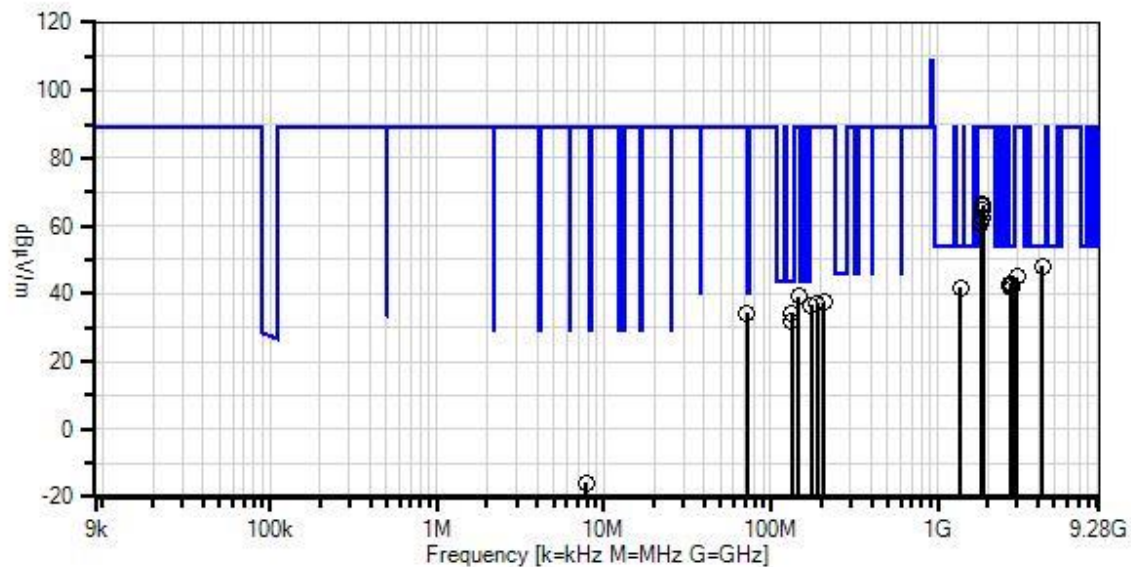
Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 4			

Test Conditions / Notes:

Test Environment Conditions: Temperature: 24° C Pressure: 100.9 kPa Humidity: 43% Frequency Range: 9kHz-10GHz Frequency tested: 902.4, 914.8, 927.6 Firmware power setting: Level 2 EUT Firmware: Protocol /MCS/Modulation: GFSK 150kbps Test Method: ANSI C63.10: 2013 Test Mode: Transmitting Test Setup: EUT is setup in a tabletop configuration. It is 80cm high for below 1GHz and 150cm above 1GHz, on a Styrofoam table. Modifications Added: None Horizontal and Vertical antenna polarities investigated above 30MHz, worst case reported. 3 orthogonal axes investigated below 30MHz, worst case reported.

Itron, Inc. WO#: 107748 Sequence#: 54 Date: 5/26/2023
15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Various



— Readings
× QP Readings
▼ Ambient
○ Peak Readings
* Average Readings
Software Version: 5.03.20
1 - 15.247(d) / 15.209 Radiated Spurious Emissions

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP05360	Cable	RG214	2/4/2022	2/4/2024
T2	ANP05333	Cable	Heliac	3/14/2022	3/14/2024
T3	ANP06454	Cable	Heliac	1/25/2022	1/25/2024
T4	AN02673	Spectrum Analyzer	E4446A	3/2/2023	3/2/2025
T5	AN03824	Biconilog Antenna	3142E	5/9/2023	5/9/2025
T6	AN00052	Loop Antenna	6502	5/11/2022	5/11/2024
T7	ANP06515	Cable	Heliac	3/1/2023	3/1/2025
T8	AN01467ANSI	Horn Antenna	3115	6/14/2021	6/14/2023
T9	AN03540	Preamplifier	83017A	3/24/2023	3/24/2025
T10	AN03170	High Pass Filter	HM1155-11SS	9/16/2021	9/16/2023
T11	ANP07504	Cable	CLU40-KMKM-02.00F	1/24/2023	1/24/2025
T12	ANP07929	Attenuator	PE7004-6	3/7/2022	3/7/2024

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	4250.000M	37.0	+0.0 +0.0 -33.9	+0.0 +0.0 +0.4	+1.6 +4.1 +1.3	+0.0 +31.7 +5.9	+0.0	48.1	54.0	-5.9	Vert
2	133.020M	18.6	+0.7 +13.9 +0.0	+0.7 +0.0 +0.0	+0.3 +0.0 +0.0	+0.0 +0.0 +0.0	+0.0	34.2	43.5	-9.3	Vert
3	2744.660M	38.5	+0.0 +0.0 -34.5	+0.0 +0.0 +0.3	+1.2 +3.0 +0.5	+0.0 +28.2 +5.8	+0.0	43.0	54.0 mid	-11.0	Vert
4	2782.830M	38.6	+0.0 +0.0 -34.5	+0.0 +0.0 +0.3	+1.2 +3.0 +0.5	+0.0 +28.0 +5.8	+0.0	42.9	54.0 high	-11.1	Vert
5	2707.180M	38.2	+0.0 +0.0 -34.5	+0.0 +0.0 +0.2	+1.2 +3.0 +0.5	+0.0 +28.3 +5.8	+0.0	42.7	54.0 low	-11.3	Horz
6	2782.700M	38.3	+0.0 +0.0 -34.5	+0.0 +0.0 +0.3	+1.2 +3.0 +0.5	+0.0 +28.0 +5.8	+0.0	42.6	54.0 high	-11.4	Horz
7	2707.300M	37.8	+0.0 +0.0 -34.5	+0.0 +0.0 +0.2	+1.2 +3.0 +0.5	+0.0 +28.3 +5.8	+0.0	42.3	54.0 low	-11.7	Vert
8	133.870M	16.0	+0.7 +13.9 +0.0	+0.7 +0.0 +0.0	+0.3 +0.0 +0.0	+0.0 +0.0 +0.0	+0.0	31.6	43.5	-11.9	Horiz
9	1365.000M	42.7	+0.0 +0.0 -35.9	+0.0 +0.0 +0.7	+0.9 +2.0 +0.4	+0.0 +25.3 +5.8	+0.0	41.9	54.0	-12.1	Vert
10	2744.220M	37.3	+0.0 +0.0 -34.5	+0.0 +0.0 +0.3	+1.2 +3.0 +0.5	+0.0 +28.2 +5.8	+0.0	41.8	54.0 mid	-12.2	Horz
11	1855.230M	65.2	+0.0 +0.0 -35.0	+0.0 +0.0 +0.6	+1.0 +2.3 +0.4	+0.0 +26.1 +5.8	+0.0	66.4	89.0 high	-22.6	Vert
12	1855.100M	64.7	+0.0 +0.0 -35.0	+0.0 +0.0 +0.6	+1.0 +2.3 +0.4	+0.0 +26.1 +5.8	+0.0	65.9	89.0 high	-23.1	Horz
13	1829.500M	63.6	+0.0 +0.0 -35.1	+0.0 +0.0 +0.6	+1.0 +2.3 +0.4	+0.0 +25.9 +5.8	+0.0	64.5	89.0 mid	-24.5	Vert
14	1829.420M	61.7	+0.0 +0.0 -35.1	+0.0 +0.0 +0.6	+1.0 +2.3 +0.4	+0.0 +25.9 +5.8	+0.0	62.6	89.0 mid	-26.4	Horz
15	1804.900M	60.8	+0.0 +0.0 -35.1	+0.0 +0.0 +0.6	+1.0 +2.2 +0.4	+0.0 +25.7 +5.8	+0.0	61.4	89.0 low	-27.6	Vert

16	1804.780M	59.8	+0.0	+0.0	+1.0	+0.0	+0.0	60.4	89.0	-28.6	Horz
			+0.0	+0.0	+2.2	+25.7			low		
			-35.1	+0.6	+0.4	+5.8					
17	2965.000M	39.2	+0.0	+0.0	+1.3	+0.0	+0.0	45.0	89.0	-44.0	Horz
			+0.0	+0.0	+3.2	+29.0					
			-34.4	+0.4	+0.5	+5.8					
18	145.940M	23.0	+0.8	+0.7	+0.3	+0.0	+0.0	39.1	89.0	-49.9	Vert
			+14.3	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
19	208.400M	18.9	+0.9	+0.8	+0.3	+0.0	+0.0	37.4	89.0	-51.6	Horiz
			+16.5	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
20	188.440M	19.5	+0.9	+0.8	+0.3	+0.0	+0.0	37.0	89.0	-52.0	Horiz
			+15.5	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
21	174.160M	19.2	+0.9	+0.7	+0.3	+0.0	+0.0	36.7	89.0	-52.3	Horiz
			+15.6	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
22	71.820M	20.2	+0.5	+0.5	+0.2	+0.0	+0.0	34.4	89.0	-54.6	Vert
			+13.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
23	7.840M	15.2	+0.0	+0.0	+0.0	+0.0	-40.0	-15.8	89.0	-104.8	Perp
			+0.0	+8.9	+0.1	+0.0					
			+0.0	+0.0	+0.0	+0.0					
24	28.440M	13.1	+0.0	+0.0	+0.1	+0.0	-40.0	-22.2	89.0	-111.2	Groun
			+0.0	+4.3	+0.3	+0.0					
			+0.0	+0.0	+0.0	+0.0					
25	22.083M	11.0	+0.0	+0.0	+0.1	+0.0	-40.0	-22.5	89.0	-111.5	Para
			+0.0	+6.2	+0.2	+0.0					
			+0.0	+0.0	+0.0	+0.0					

Band Edge

Band Edge Summary (Configuration 2)

Operating Mode: Single Channel (Low and High)

Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
614	GFSK	Meander 4.78dBi	39.9	<46.0	Pass
902	GFSK	Meander 4.78dBi	64.7	<95.7	Pass
928	GFSK	Meander 4.78dBi	63.9	<95.7	Pass
960	GFSK	Meander 4.78dBi	46.4	<54.0	Pass

Band Edge Summary (Configuration 2)

Operating Mode: Hopping

Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
614	GFSK	Meander 4.78dBi	40.0	<46.0	Pass
902	GFSK	Meander 4.78dBi	59.7	<95.7	Pass
928	GFSK	Meander 4.78dBi	60.1	<95.7	Pass
960	GFSK	Meander 4.78dBi	47.4	<54.0	Pass

Band Edge Summary (Configuration 3)

Operating Mode: Single Channel (Low and High)

Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
614	GFSK	Meander 4.78dBi	39.7	<46.0	Pass
902	GFSK	Meander 4.78dBi	61.6	<95.7	Pass
928	GFSK	Meander 4.78dBi	66.0	<95.7	Pass
960	GFSK	Meander 4.78dBi	47.6	<54.0	Pass

Band Edge Summary (Configuration 3)

Operating Mode: Hopping

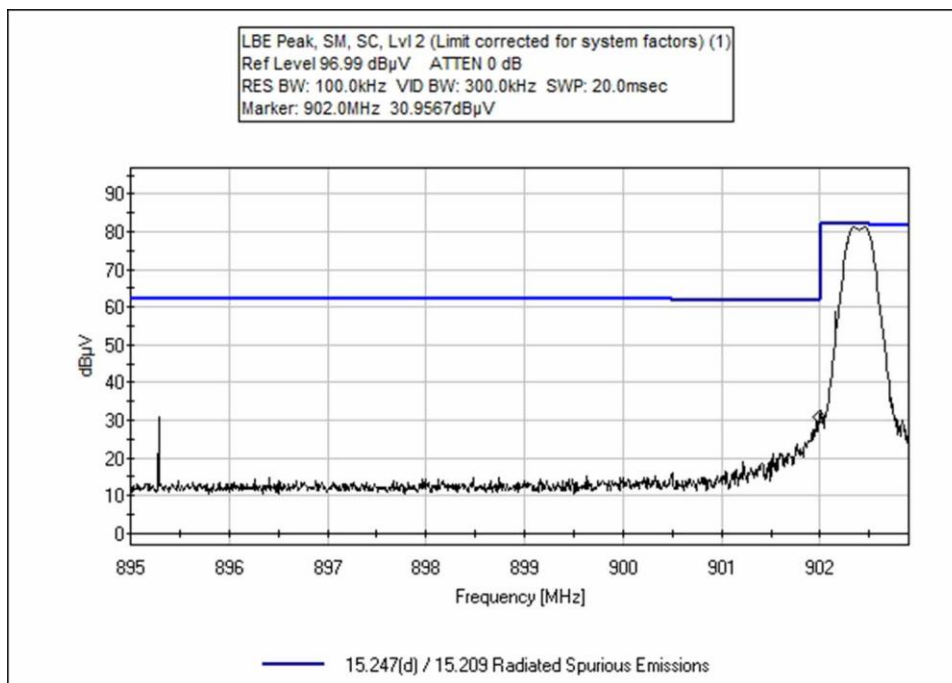
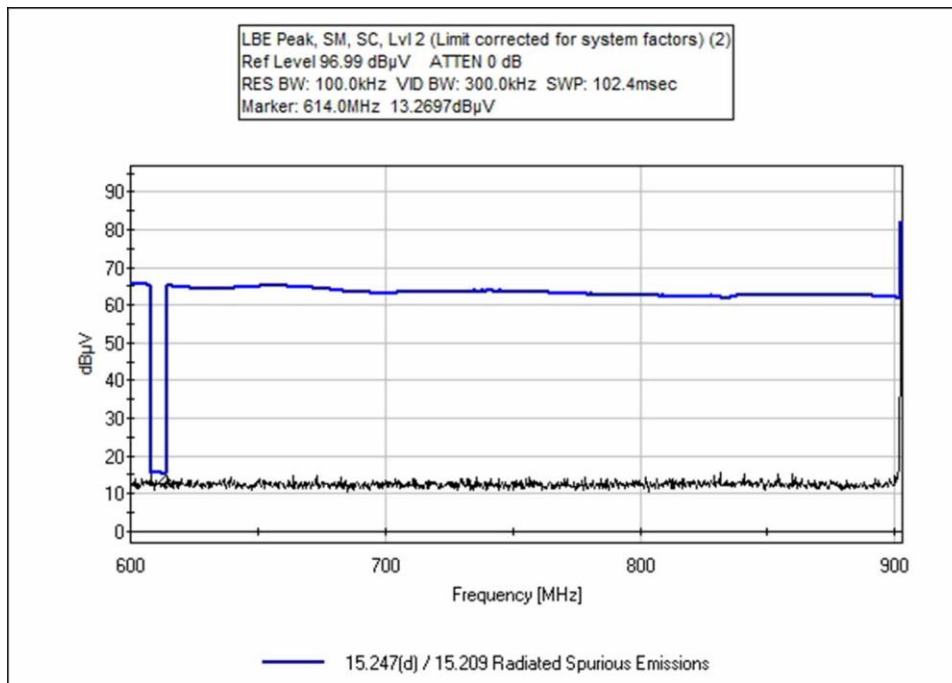
Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
614	GFSK	Meander 4.78dBi	43.0	<46.0	Pass
902	GFSK	Meander 4.78dBi	61.6	<95.7	Pass
928	GFSK	Meander 4.78dBi	66.9	<95.7	Pass
960	GFSK	Meander 4.78dBi	47.9	<54.0	Pass

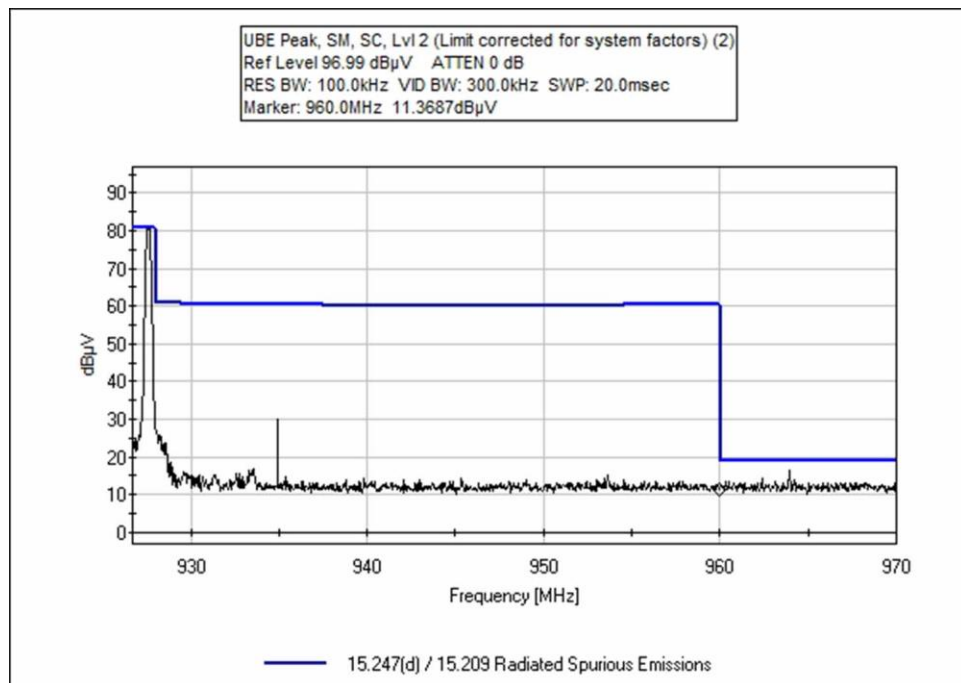
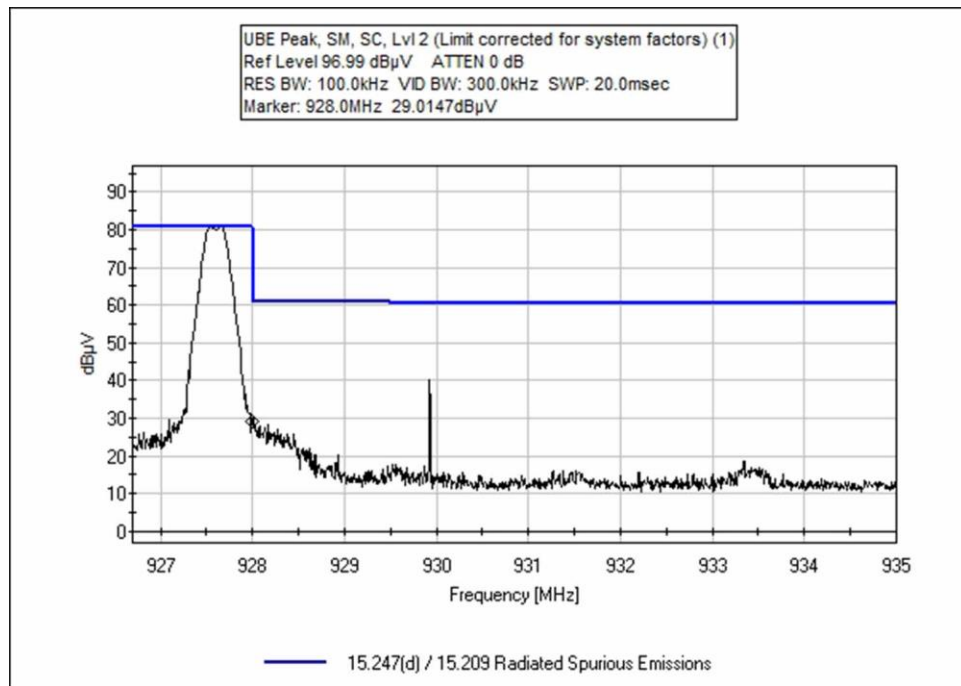
Band Edge Summary (Configuration 4)					
Operating Mode: Single Channel (Low and High)					
Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
614	GFSK	External Antenna – Pit on Metal Lid	40.5	<46.0	Pass
902	GFSK	External Antenna – Pit on Metal Lid	58.0	<89.0	Pass
928	GFSK	External Antenna – Pit on Metal Lid	58.9	<93.0	Pass
960	GFSK	External Antenna – Pit on Metal Lid	45.2	<54.0	Pass

Band Edge Summary (Configuration 4)					
Operating Mode: Hopping					
Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
614	GFSK	External Antenna – Pit on Metal Lid	40.6	<46.0	Pass
902	GFSK	External Antenna – Pit on Metal Lid	59.4	<89.0	Pass
928	GFSK	External Antenna – Pit on Metal Lid	60.8	<93.0	Pass
960	GFSK	External Antenna – Pit on Metal Lid	45.2	<54.0	Pass

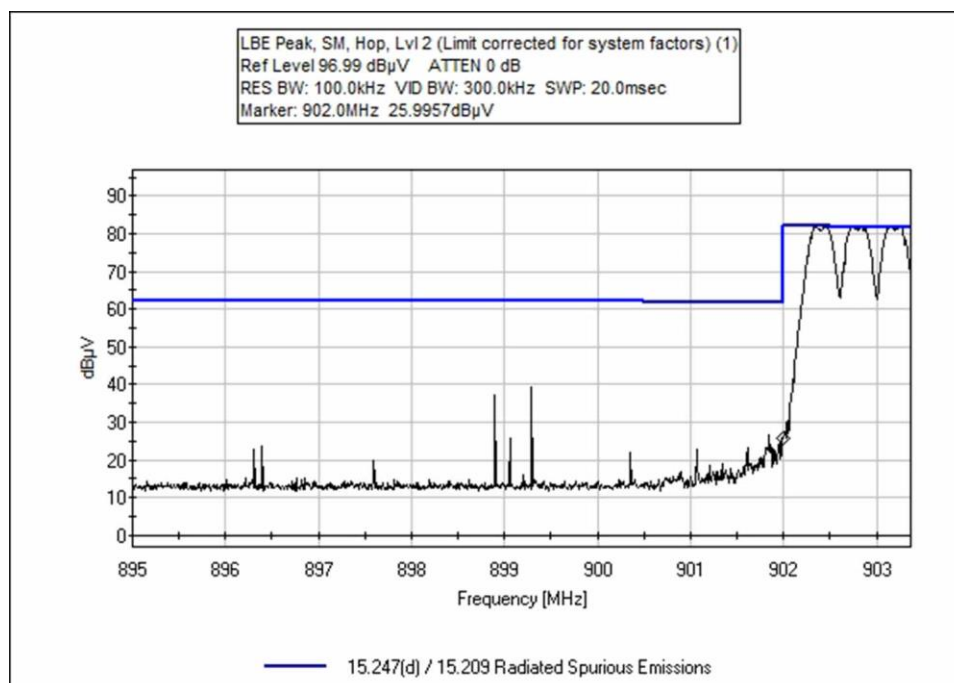
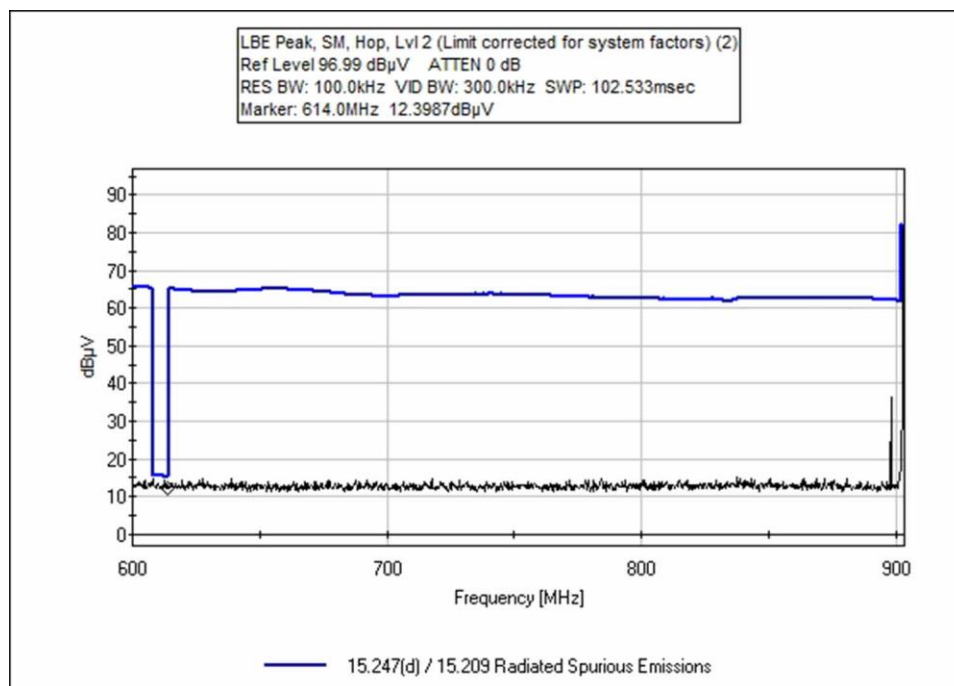
Band Edge Plots

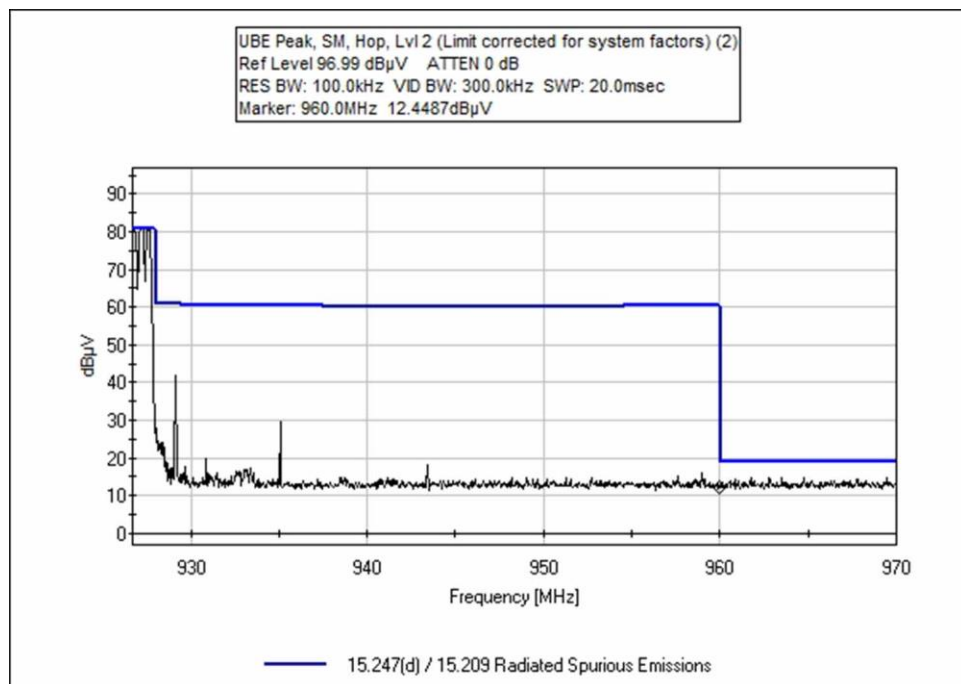
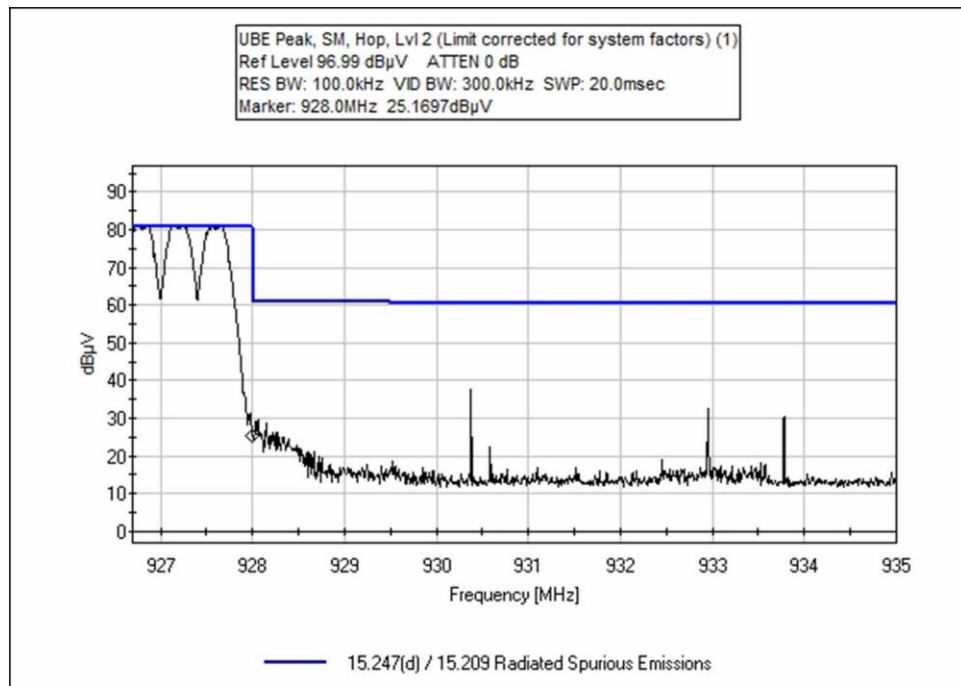
Configuration 2; Single Channel



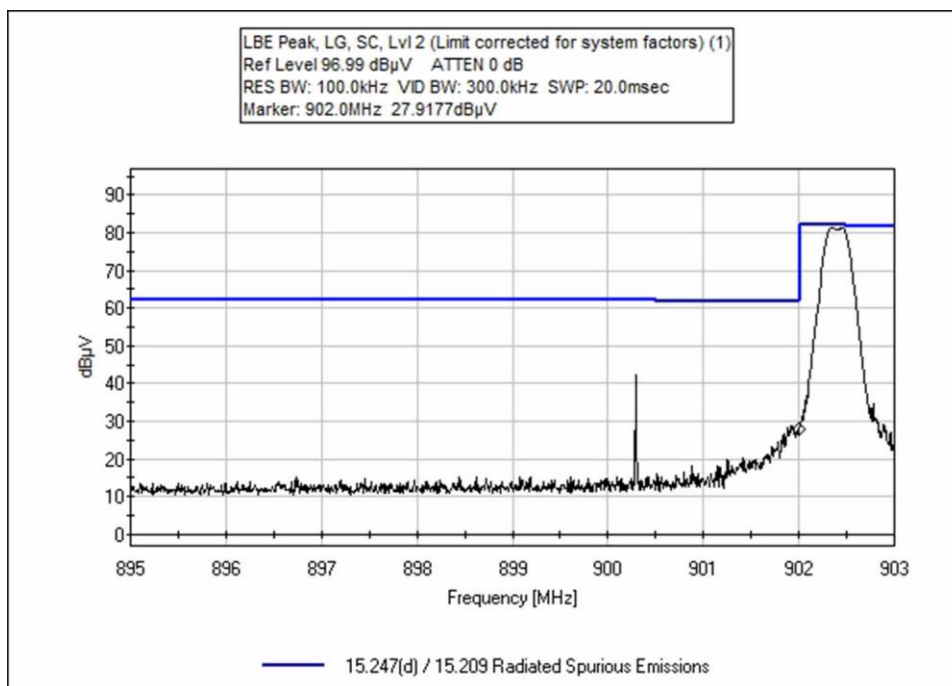
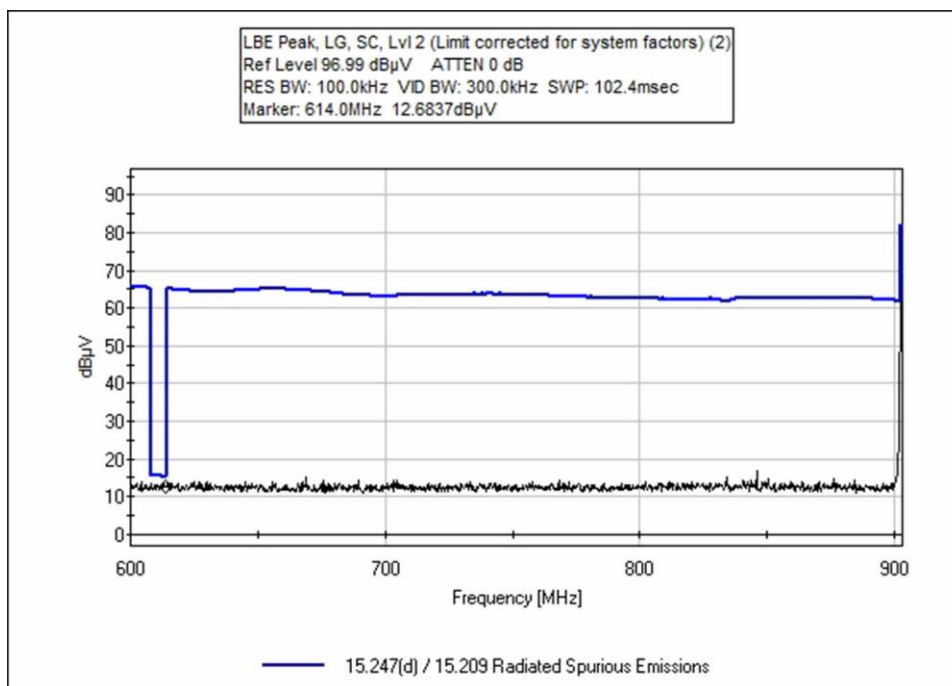


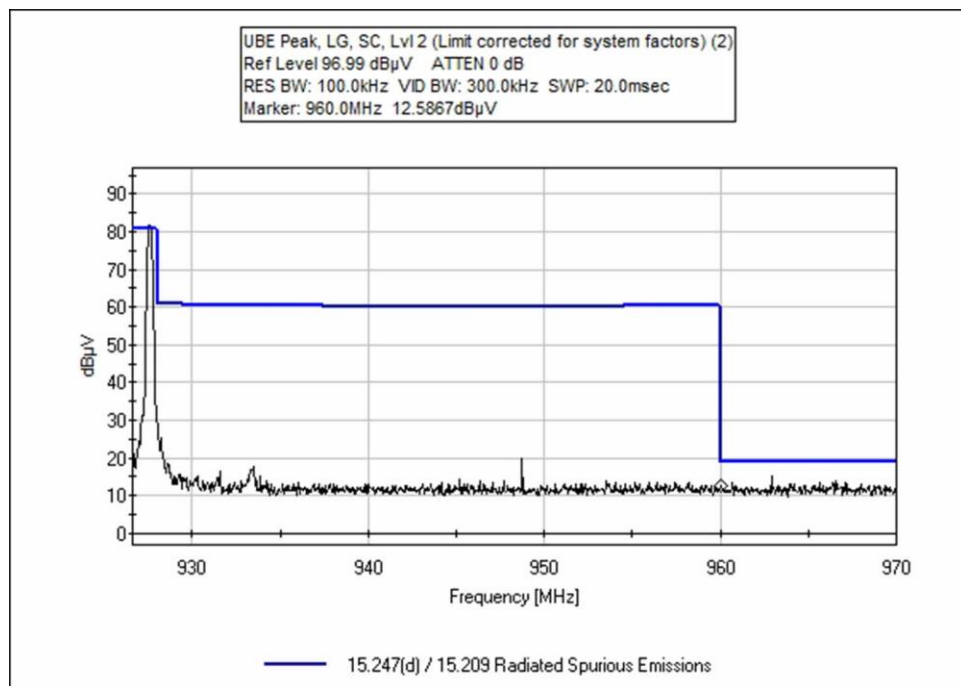
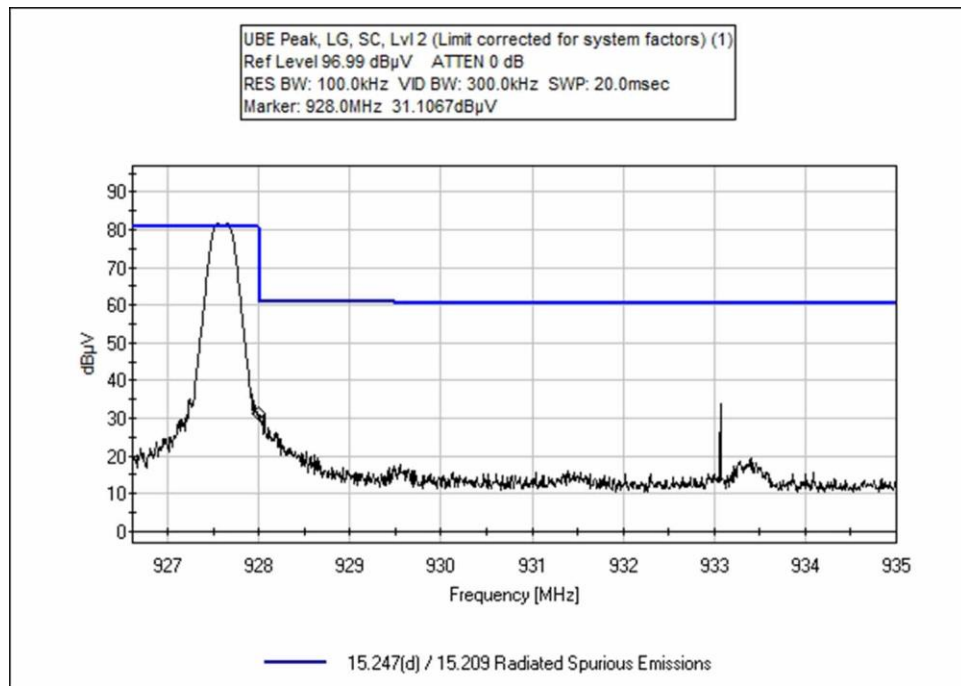
Configuration 2; Hopping



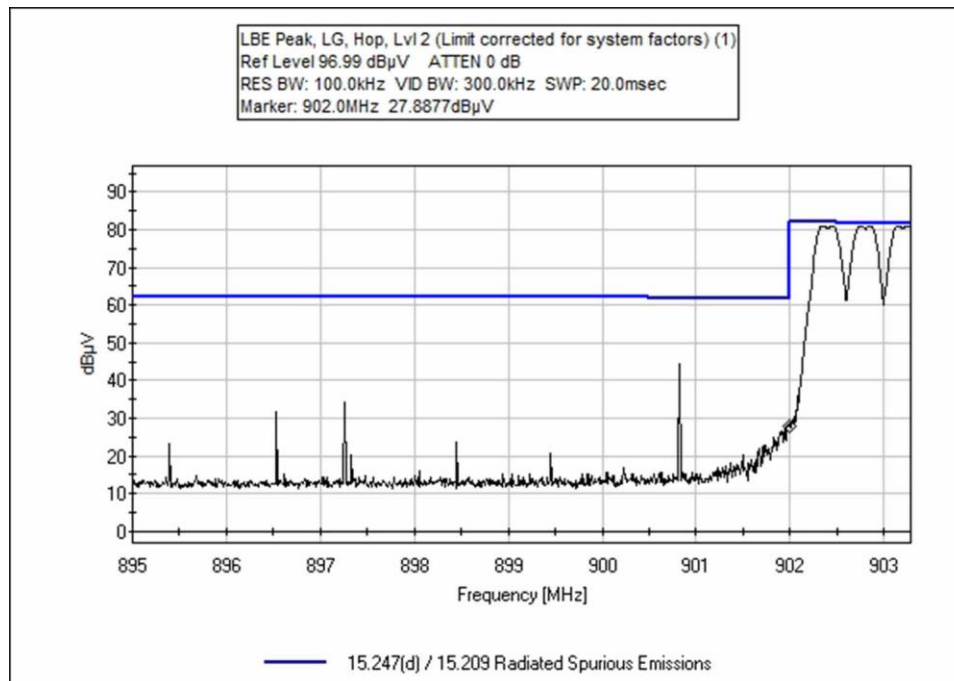
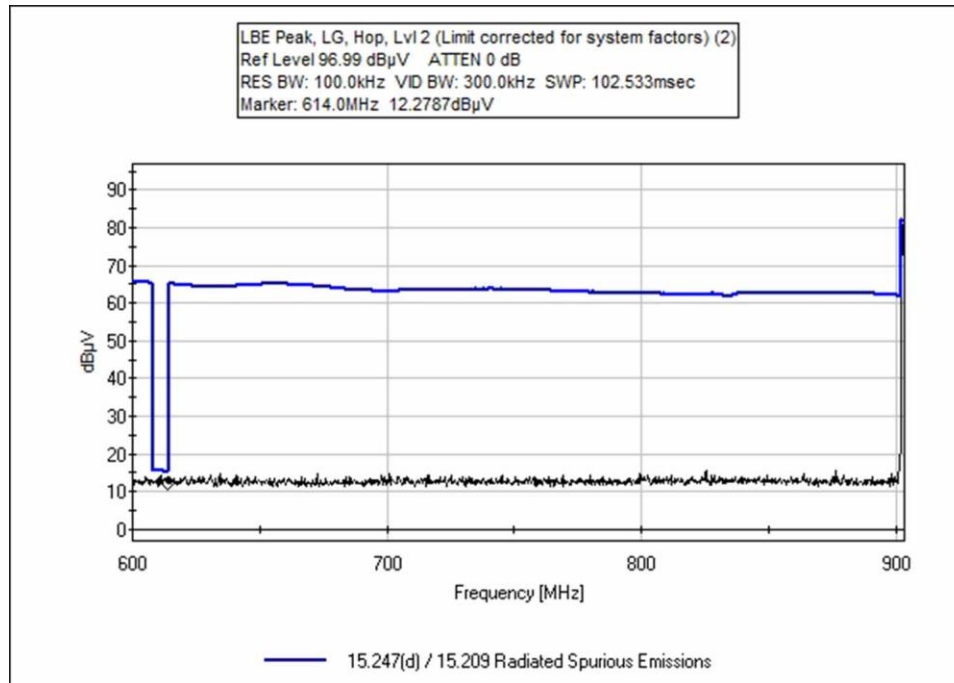


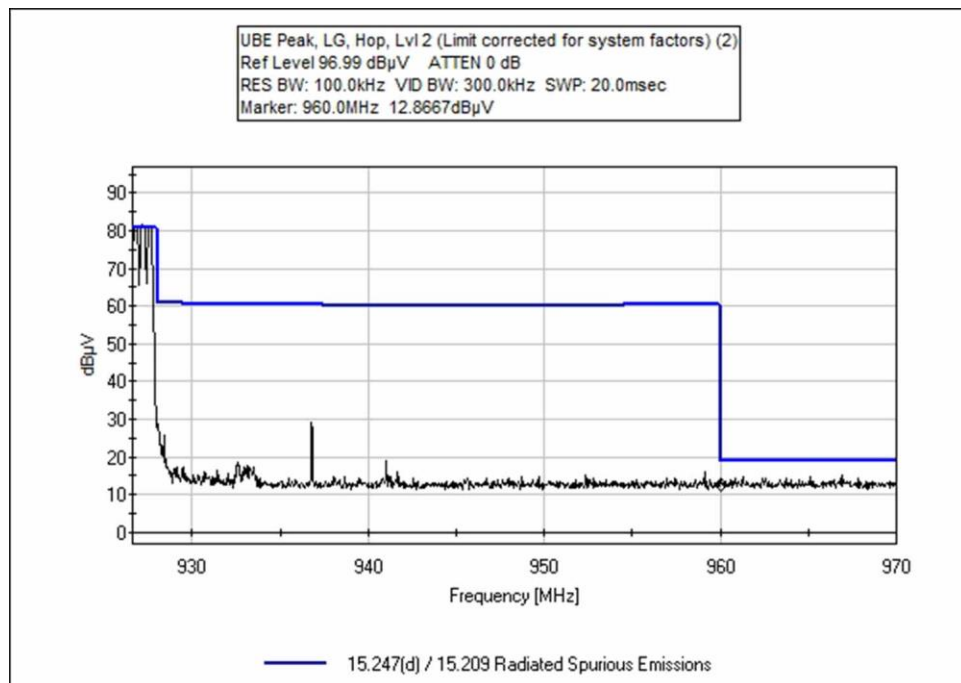
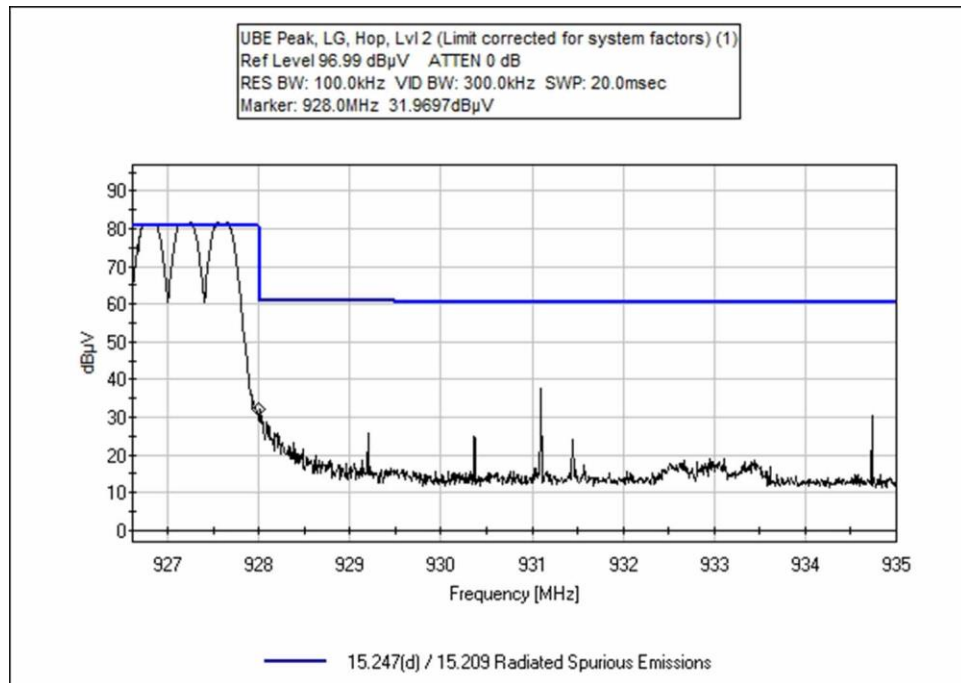
Configuration 3; Single Channel



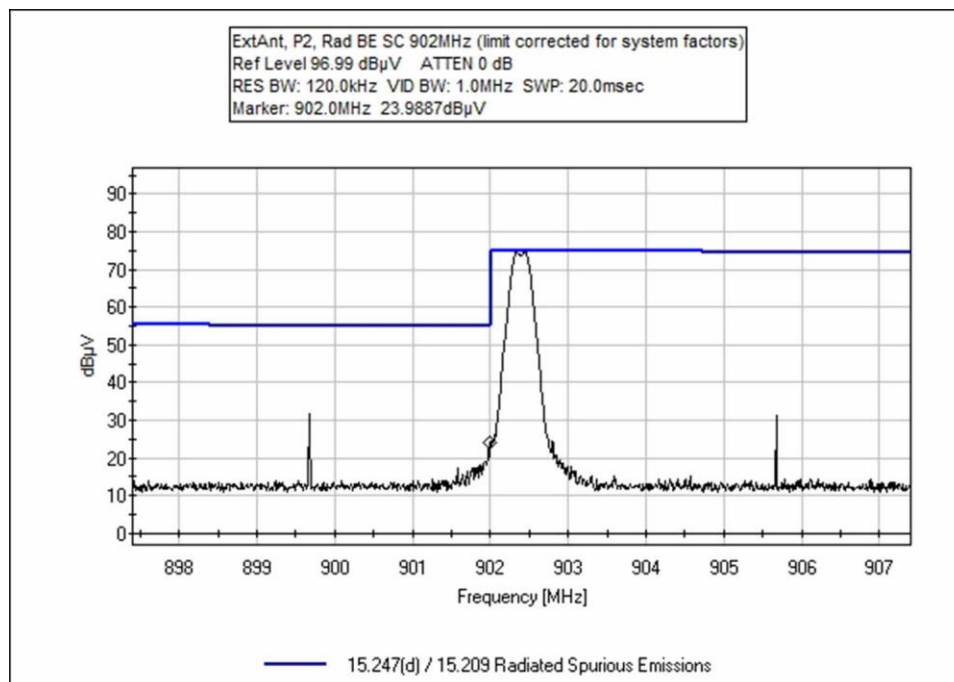
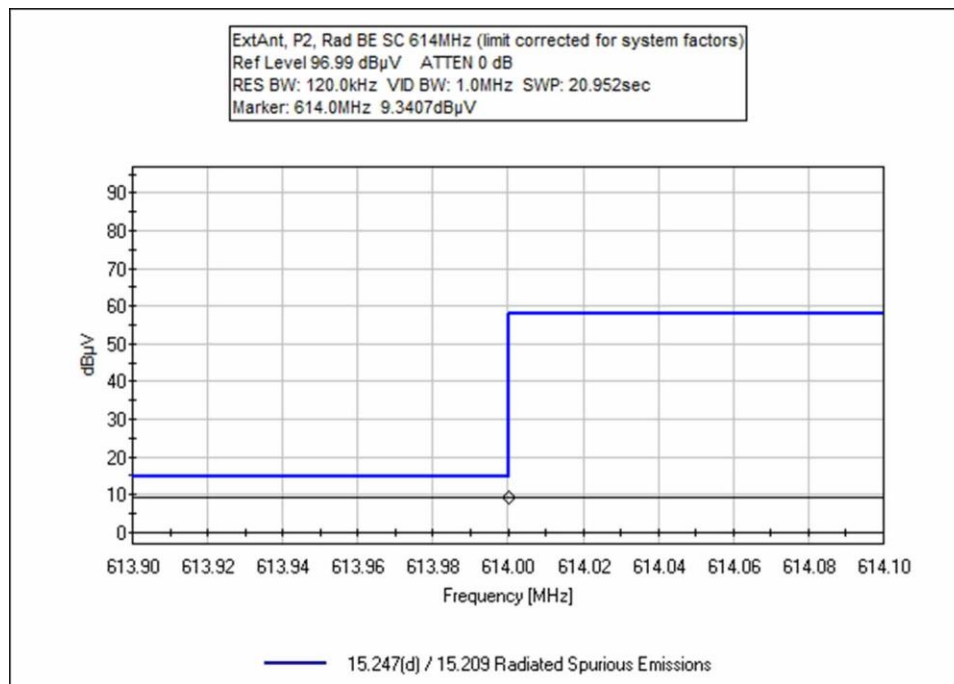


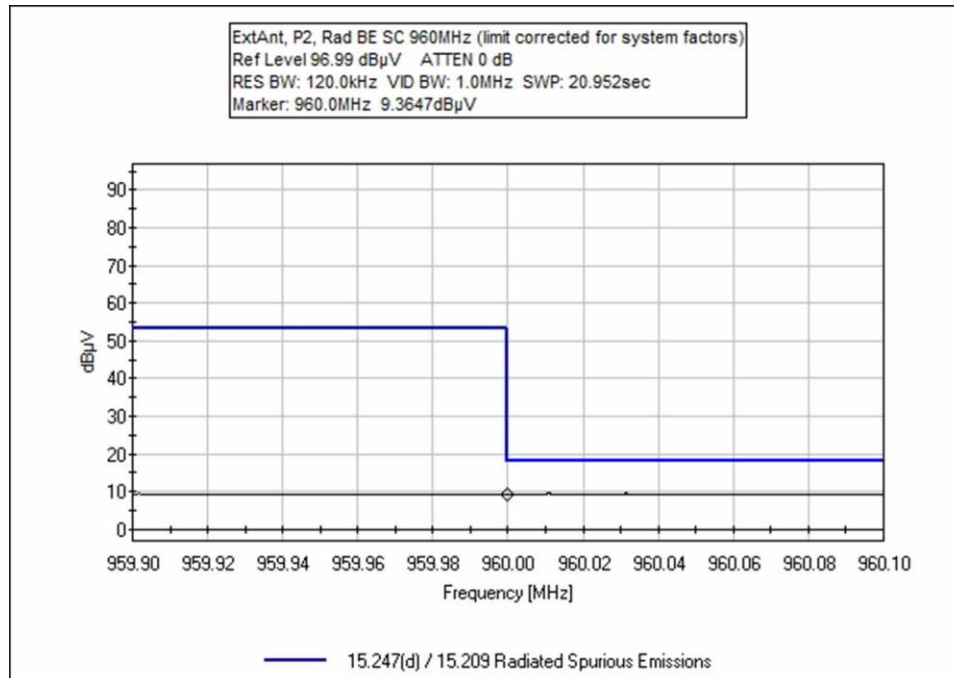
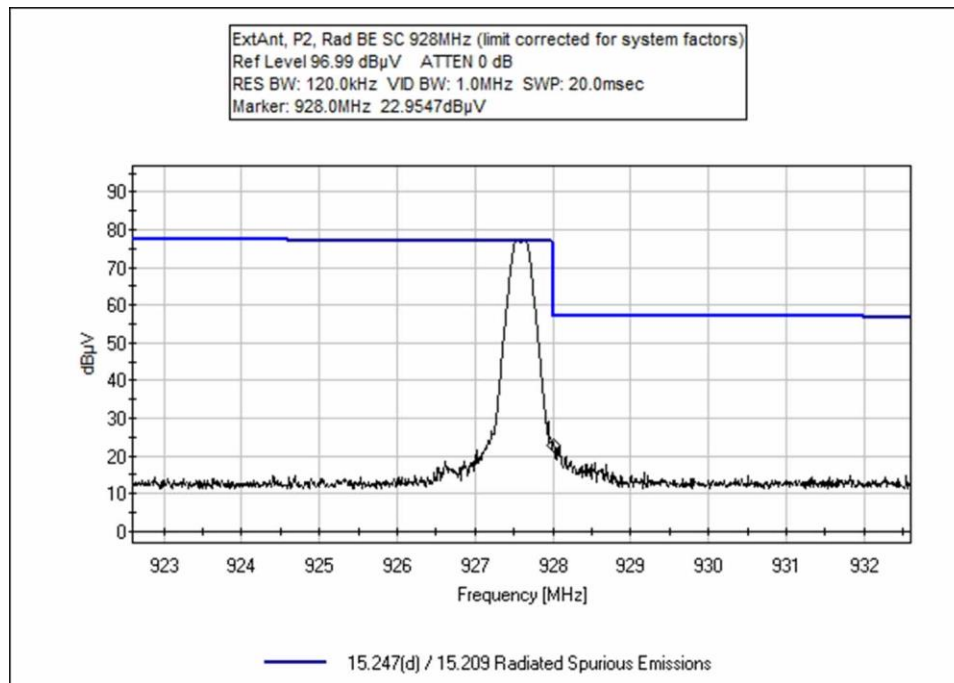
Configuration 3; Hopping



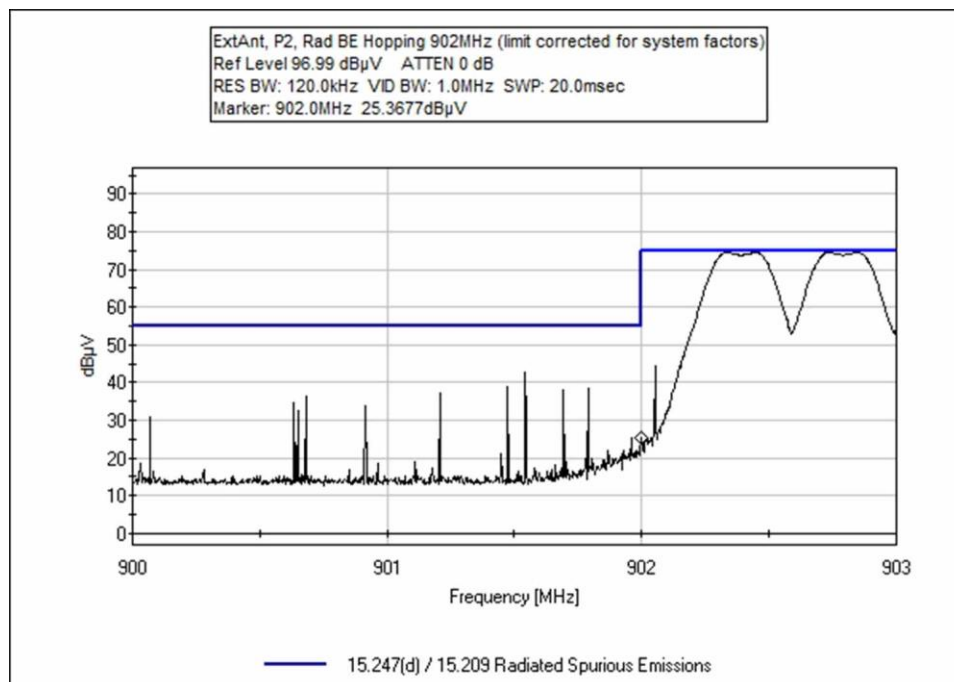
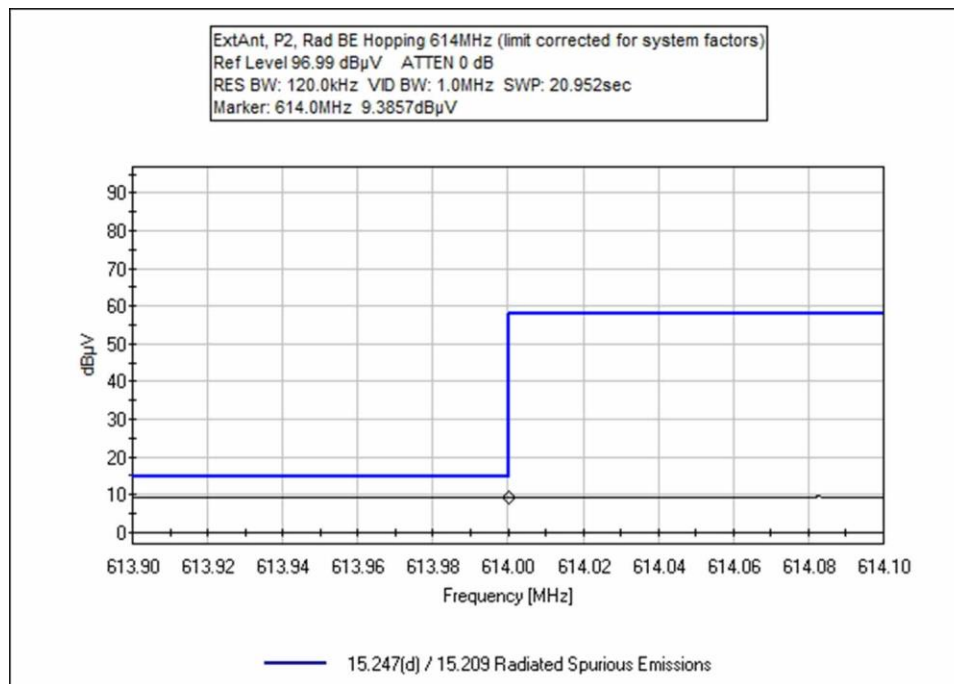


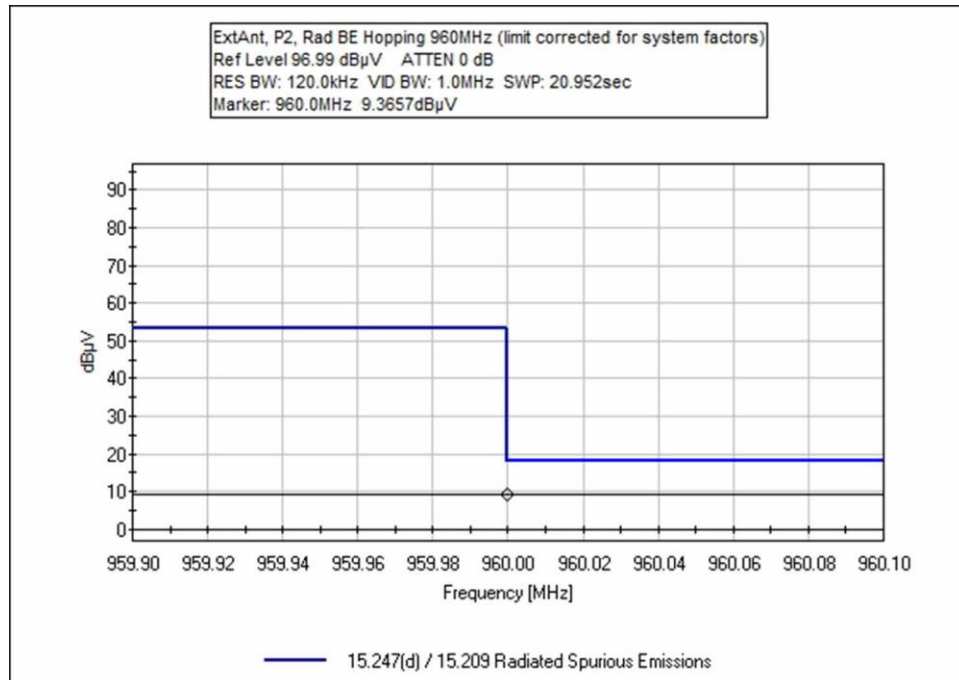
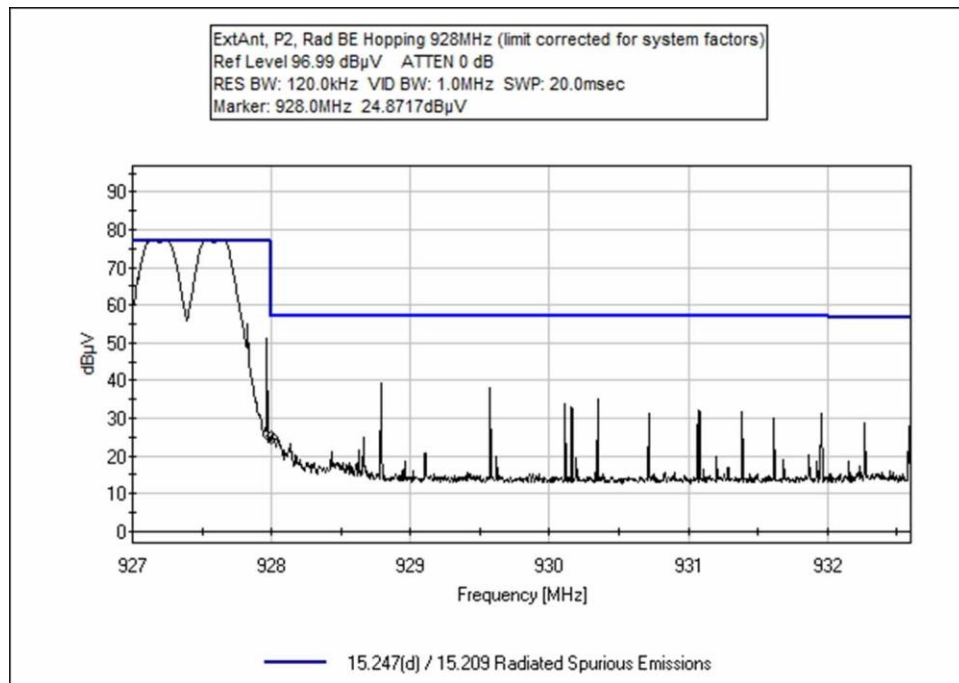
Configuration 4; Single Channel





Configuration 4; 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 #: **107748** Date: 2/14/2023
 Test Type: **Radiated Scan** Time: 13:52:51
 Tested By: Matt Harrison Sequence#: 7
 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: 18.6°C Pressure: 100.9kPa Humidity: 40% Frequency Range: 600-970 MHz Frequency Tested: 902.4, 927.6 Firmware Power Setting: Level 2 EUT Firmware: Protocol /MCS/Modulation: GFSK 150kbps Test Method: ANSI C63.10 (2013) Test Mode: Transmitting Test Setup: EUT is set up in a tabletop configuration. It is 80cm high on a Styrofoam table. Modifications Added: None

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN03628	Biconilog Antenna	3142E	6/3/2021	6/3/2023
T2	ANP05360	Cable	RG214	2/4/2022	2/4/2024
T3	ANP06540	Cable	Heliac	1/17/2022	1/17/2024
T4	AN02872	Spectrum Analyzer	E4440A	11/29/2021	11/29/2023
T5	ANP05333	Cable	Heliac	3/14/2022	3/14/2024

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBμV	dB	dB	dB	dB	Table	dBμV/m	dBμV/m	dB	Ant
1	614.000M QP	9.3	+27.2 +1.3	+1.9	+0.3	+0.0	+0.0	40.0	46.0 Hop	-6.0	Vert
2	614.000M QP	9.2	+27.2 +1.3	+1.9	+0.3	+0.0	+0.0	39.9	46.0 SC	-6.1	Vert
^	614.000M	13.3	+27.2 +1.3	+1.9	+0.3	+0.0	+0.0	44.0	46.0 SC	-2.0	Vert
^	614.000M	12.4	+27.2 +1.3	+1.9	+0.3	+0.0	+0.0	43.1	46.0 Hop	-2.9	Vert
5	960.000M	12.4	+30.7 +1.6	+2.4	+0.3	+0.0	+0.0	47.4	54.0 Hop	-6.6	Vert
6	960.000M	11.4	+30.7 +1.6	+2.4	+0.3	+0.0	+0.0	46.4	54.0 SC	-7.6	Vert
7	902.000M	31.0	+29.6 +1.5	+2.3	+0.3	+0.0	+0.0	64.7	95.7 SC	-31.0	Vert
8	928.000M	29.0	+30.6 +1.6	+2.4	+0.3	+0.0	+0.0	63.9	95.7 SC	-31.8	Vert
9	928.000M	25.2	+30.6 +1.6	+2.4	+0.3	+0.0	+0.0	60.1	95.7 Hop	-35.6	Vert
10	902.000M	26.0	+29.6 +1.5	+2.3	+0.3	+0.0	+0.0	59.7	95.7 Hop	-36.0	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 #: **107748** Date: 2/15/2023
 Test Type: **Radiated Scan** Time: 13:49:22
 Tested By: Matt Harrison Sequence#: 14
 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: 18.6°C Pressure: 100.9kPa Humidity: 40% Frequency Range: 600-970 MHz Frequency Tested: 902.4, 927.6 Firmware Power Setting: Level 2 EUT Firmware: Protocol /MCS/Modulation: GFSK 150kbps Test Method: ANSI C63.10 (2013) Test Mode: Transmitting Test Setup: EUT is set up in a tabletop configuration. It is 80cm high on a Styrofoam table. Modifications Added: None

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN03628	Biconilog Antenna	3142E	6/3/2021	6/3/2023
T2	ANP05360	Cable	RG214	2/4/2022	2/4/2024
T3	ANP06540	Cable	Heliastax	1/17/2022	1/17/2024
T4	AN02872	Spectrum Analyzer	E4440A	11/29/2021	11/29/2023
T5	ANP05333	Cable	Heliastax	3/14/2022	3/14/2024

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBμV	dB	dB	dB	dB	Table	dBμV/m	dBμV/m	dB	Ant
1	960.000M	12.9	+30.7 +1.6	+2.4	+0.3	+0.0	+0.0	47.9	54.0 Hop	-6.1	Vert
2	614.000M QP	9.0	+27.2 +1.3	+1.9	+0.3	+0.0	+0.0	39.7	46.0 Hop	-6.3	Vert
3	614.000M QP	9.0	+27.2 +1.3	+1.9	+0.3	+0.0	+0.0	39.7	46.0 SC	-6.3	Vert
^	614.000M	12.7	+27.2 +1.3	+1.9	+0.3	+0.0	+0.0	43.4	46.0 SC	-2.6	Vert
^	614.000M	12.3	+27.2 +1.3	+1.9	+0.3	+0.0	+0.0	43.0	46.0 Hop	-3.0	Vert
6	960.000M	12.6	+30.7 +1.6	+2.4	+0.3	+0.0	+0.0	47.6	54.0 SC	-6.4	Vert
7	928.000M	32.0	+30.6 +1.6	+2.4	+0.3	+0.0	+0.0	66.9	95.7 Hop	-28.8	Vert
8	928.000M	31.1	+30.6 +1.6	+2.4	+0.3	+0.0	+0.0	66.0	95.7 SC	-29.7	Vert
9	902.000M	27.9	+29.6 +1.5	+2.3	+0.3	+0.0	+0.0	61.6	95.7 SC	-34.1	Vert
10	902.000M	27.9	+29.6 +1.5	+2.3	+0.3	+0.0	+0.0	61.6	95.7 Hop	-34.1	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 #: **107748** Date: 5/26/2023
 Test Type: **Radiated Scan** Time: 15:59:58
 Tested By: Michael Atkinson Sequence#: 51
 Software: EMITest 5.03.20

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 4			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 4			

Test Conditions / Notes:

Test Environment Conditions: Temperature: 24° C Pressure: 100.9 kPa Humidity: 43% Frequency Range: 600-970 MHz Frequency tested: 902.4, 927.6 Firmware power setting: Level 2 EUT Firmware: Protocol /MCS/Modulation: GFSK 150kbps Test Method: ANSI C63.10: 2013 Test Mode: Transmitting Test Setup: EUT is setup for external antenna configuration, on 80cm high on a styrofoam table. Modifications Added: None Horizontal and Vertical antenna polarities investigated, worst case reported.
--

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP05360	Cable	RG214	2/4/2022	2/4/2024
T2	ANP05333	Cable	Heliac	3/14/2022	3/14/2024
T3	ANP06454	Cable	Heliac	1/25/2022	1/25/2024
	AN02673	Spectrum Analyzer	E4446A	3/2/2023	3/2/2025
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	614.000M QP	9.4	+1.9	+1.3	+0.6	+27.4	+0.0	40.6	46.0 Hopping	-5.4	Vert
2	614.000M QP	9.3	+1.9	+1.3	+0.6	+27.4	+0.0	40.5	46.0 SC	-5.5	Vert
3	960.000M QP	9.4	+2.4	+1.6	+0.7	+31.1	+0.0	45.2	54.0 SC	-8.8	Vert
4	960.000M QP	9.4	+2.4	+1.6	+0.7	+31.1	+0.0	45.2	54.0 Hopping	-8.8	Vert
5	902.000M	25.4	+2.3	+1.5	+0.7	+29.5	+0.0	59.4	89.0 Hopping	-29.6	Vert
6	902.000M	24.0	+2.3	+1.5	+0.7	+29.5	+0.0	58.0	89.0 SC	-31.0	Vert
7	928.000M	24.9	+2.4	+1.6	+0.7	+31.2	+0.0	60.8	93.0 Hopping	-32.2	Vert
8	928.000M	23.0	+2.4	+1.6	+0.7	+31.2	+0.0	58.9	93.0 SC	-34.1	Vert

Test Setup Photo(s)



Below 1GHz; Configuration 2



Below 1GHz; Configuration 3



Below 1GHz, Configuration 4



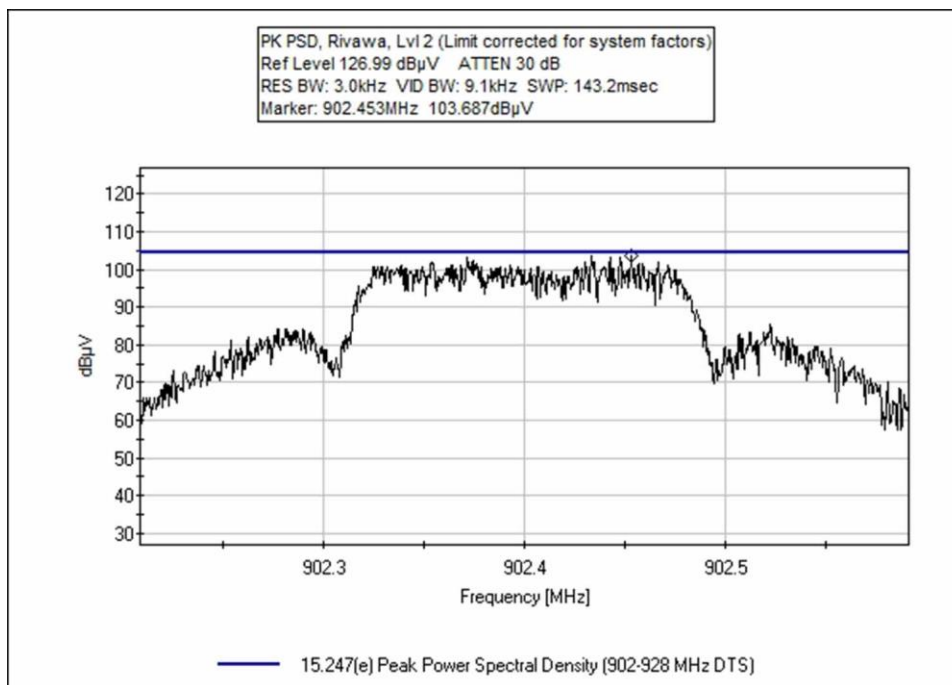
Above 1GHz, Configuration 4

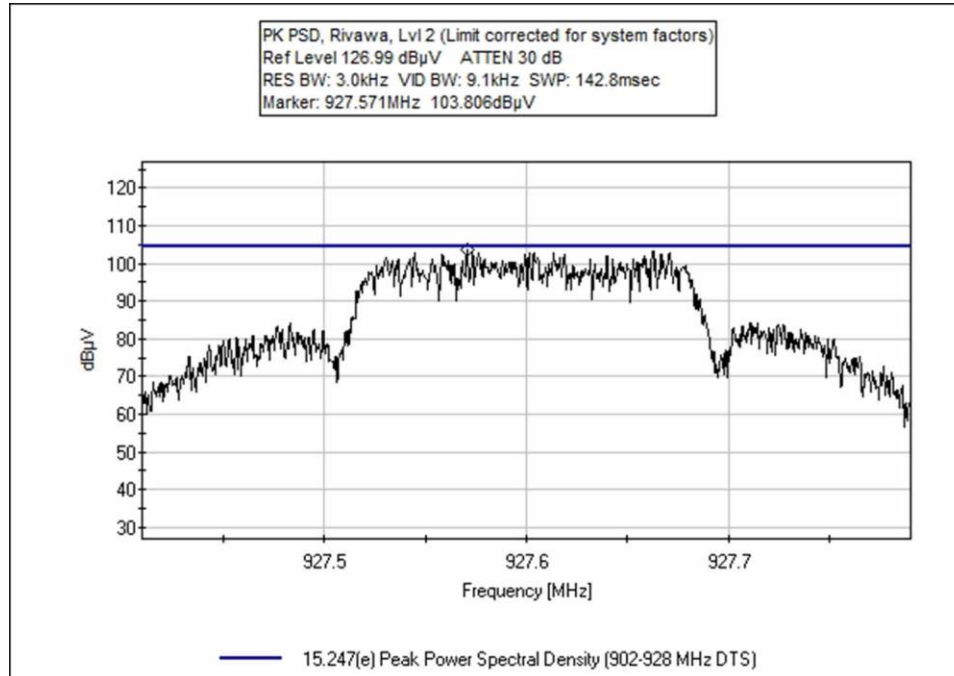
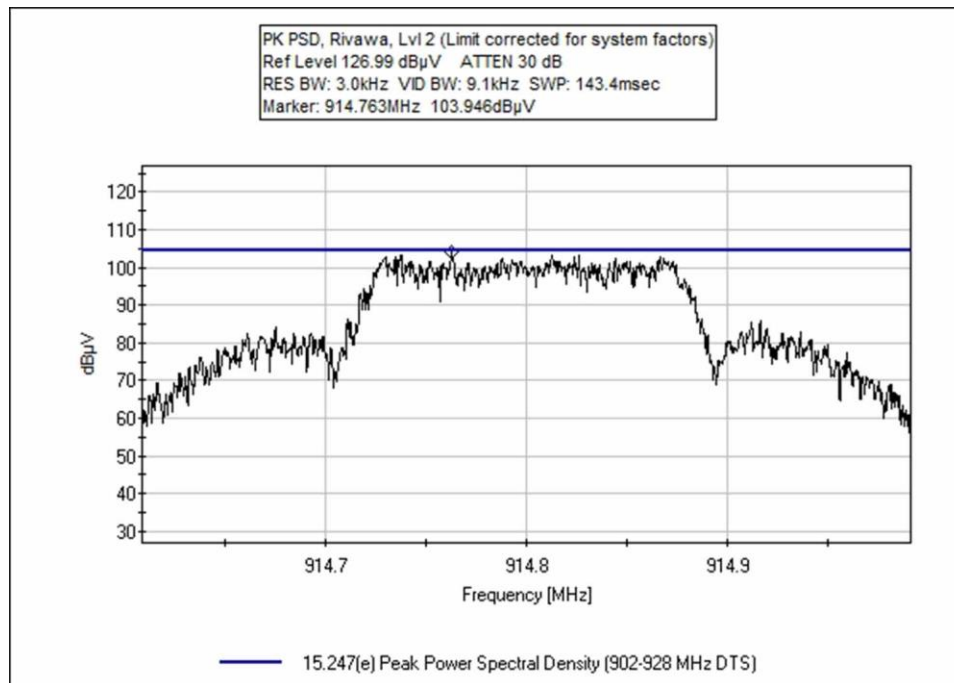
15.247 (f) Hybrid Systems Power Spectral Density

Power Spectral Density

Test Data Summary - RF Conducted Measurement				
Measurement Method: PKPSD				
Frequency (MHz)	Modulation	Measured (dBm/3kHz)	Limit (dBm/3kHz)	Results
902.4	GFSK	7.0	≤ 8	Pass
914.8	GFSK	7.2	≤ 8	Pass
927.6	GFSK	7.1	≤ 8	Pass

Plot(s)





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(e) Peak Power Spectral Density (902-928 MHz DTS)**
 Work Order #: **107748** Date: 2/14/2023
 Test Type: **Conducted Emissions** Time: 08:00:54
 Tested By: Matt Harrison Sequence#: 3
 Software: EMITest 5.03.20 6VDC

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

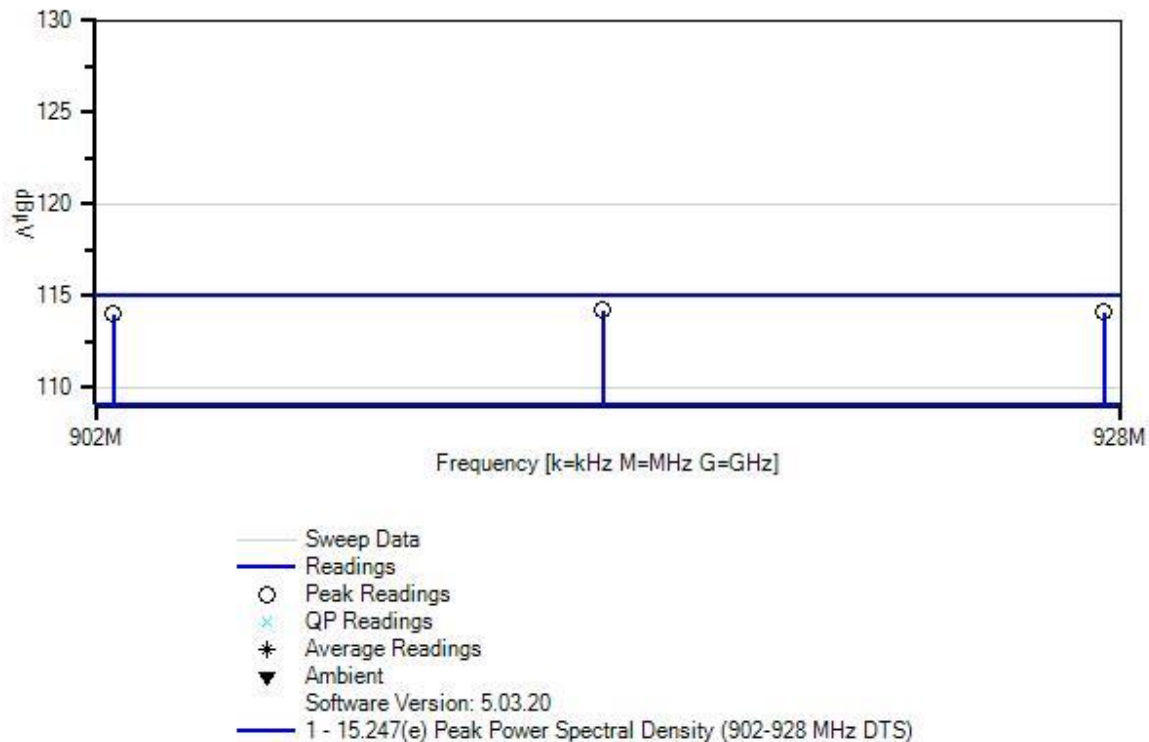
Test Conditions / Notes:

Test Environment Conditions:
 Temperature: 18.6°C
 Pressure: 100.9kPa
 Humidity: 40%

Frequency Range: Fundamental
 Frequency Tested: 902.4, 914.8, 927.6
 Firmware Power Setting: Level 2
 EUT Firmware:
 Protocol /MCS/Modulation: GFSK 150kbps

Test Method: ANSI C63.10 (2013)
 Test Mode: Transmitting
 Test Setup: EUT is set up for conducted measurement. It is directly connected to the Analyzer via cable and attenuator.
 Modifications Added: None

Ittron, Inc. W/O#: 107748 Sequence#: 3 Date: 2/14/2023
15.247(e) Peak Power Spectral Density (902-928 MHz DTS) Test Lead: 6VDC RF Port



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP05503	Attenuator	766-10	6/8/2021	6/8/2023
T2	ANP05353	Cable	Helix	2/23/2022	2/23/2024
	AN02872	Spectrum Analyzer	E4440A	11/29/2021	11/29/2023

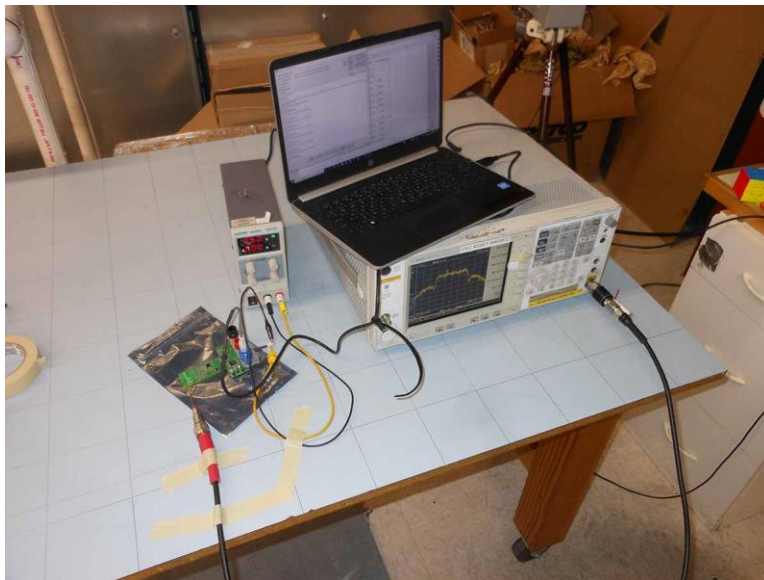
Measurement Data:

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	914.763M	103.9	+10.1	+0.2		+0.0	114.2	115.0	-0.8	RF Po
2	927.571M	103.8	+10.1	+0.2		+0.0	114.1	115.0	-0.9	RF Po
3	902.453M	103.7	+10.1	+0.2		+0.0	114.0	115.0	-1.0	RF Po

Test Setup Photo(s)



Appendix A: Manufacturer Declaration

The following Models have been tested by CKC Laboratories:

Models: ERW-1601-001 and ERW-1601-010

The manufacturer declares that the following additional models are identical electrically or any differences between them do not affect their EMC characteristics, and therefore meets the level of testing equivalent to the tested models.

Device	Manufacturer	Model #	S/N
500W / RIVAWA	ltron, Inc.	ERW-1601-002	NA
500W / RIVAWA	ltron, Inc.	ERW-1601-003	NA
500W / RIVAWA	ltron, Inc.	ERW-1601-004	NA
500W / RIVAWA	ltron, Inc.	ERW-1601-005	NA
500W / RIVAWA	ltron, Inc.	ERW-1601-006	NA
500W / RIVAWA	ltron, Inc.	ERW-1601-007	NA
500W / RIVAWA	ltron, Inc.	ERW-1601-008	NA

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 $\text{dB}\mu\text{V}/\text{m}$, 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.