

Ittron, Inc.

TEST REPORT FOR

Water Endpoint Models: RIVAWA and RIVAWRA

Tested to The Following Standards:

FCC Part 15 Subpart C Section(s)

15.247
(FHSS 902-928 MHz)

Report No.: 102692-6

Date of issue: June 27, 2019



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:

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

Representative: Jay Holcomb
Customer Reference Number: : 181999

DATE OF EQUIPMENT RECEIPT:**DATE(S) OF TESTING:****REPORT PREPARED BY:**

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

Project Number: 102692-

June 3, 2019

June 3-10, 2019

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 positioned above 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.
110 Olinda Place
Brea, CA 92823

Software Versions

CKC Laboratories Proprietary Software	Version
EMITest Emissions	5.03.12

Site Registration & Accreditation Information

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

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

SUMMARY OF RESULTS

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

Test Procedure	Description	Modifications	Results
15.247(a)(1)(i)	Occupied Bandwidth	NA	Pass
15.247(a)(1)	Carrier Separation	NA	Pass
15.247(a)(1)(i)	Number of Hopping Channels	NA	Pass
15.247(a)(1)(i)	Average Time of Occupancy	NA	NP
15.247(b)(2)	Output Power	NA	Pass
15.247(d)	RF Conducted Emissions & Band Edge	NA	Pass
15.247(d)	Radiated Emissions & Band Edge	NA	Pass
15.207	AC Conducted Emissions	NA	NA1

NA = Not Applicable

NA1 = Not applicable because the EUT operates on battery power.

NP = CKC Laboratories was not contracted to perform test. See section for details.

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 Tested:

Device	Manufacturer	Model #	S/N
Water Endpoint	Itron, Inc.	RIVAWRA	102692-COND3

Support Equipment:

Device	Manufacturer	Model #	S/N
Laptop	Dell	Latitude E6410	NA
Laptop AC/DC Adapter	Dell	LA65NS0-00	NA
USB to Serial Adapter	Itron, Inc.	500W	NA

Configuration 2

Equipment Tested:

Device	Manufacturer	Model #	S/N
Water Endpoint	Itron, Inc.	RIVAWA	102692-REMOTE3

Support Equipment:

Device	Manufacturer	Model #	S/N
Laptop	Dell	Latitude E6410	NA
Laptop AC/DC Adapter	Dell	LA65NS0-00	NA
USB to Serial Adapter	Itron, Inc.	500W	NA

Configuration 3

Equipment Tested:

Device	Manufacturer	Model #	S/N
Water Endpoint	Itron, Inc.	RIVAWRA	102692-PIT3

Support Equipment:

Device	Manufacturer	Model #	S/N
Laptop	Dell	Latitude E6410	NA
Laptop AC/DC Adapter	Dell	LA65NS0-00	NA
USB to Serial Adapter	Itron, Inc.	500W	NA

Configuration 4

Equipment Tested:

Device	Manufacturer	Model #	S/N
Water Endpoint	Itron, Inc.	RIVAWRA	102692-PIT3

Support Equipment:

Device	Manufacturer	Model #	S/N
Laptop	Dell	Latitude E6410	NA
Laptop AC/DC Adapter	Dell	LA65NS0-00	NA
USB to Serial Adapter	Itron, Inc.	500W	NA
Antenna	Itron, Inc.	CFG-0900-003	18332108

Configuration 5

Equipment Tested:

Device	Manufacturer	Model #	S/N
Water Endpoint	Itron, Inc.	RIVAWRA	102692-PIT3

Support Equipment:

Device	Manufacturer	Model #	S/N
Ground Plane	NA	NA	NA
Laptop	Dell	Latitude E6410	NA
Laptop AC/DC Adapter	Dell	LA65NS0-00	NA
USB to Serial Adapter	Itron, Inc.	500W	NA
Antenna	Itron, Inc.	CFG-0900-003	18332108

General Product Information:

Product Information	Manufacturer-Provided Details
Equipment Type:	Stand-Alone Equipment
Type of Wideband System:	Proprietary FHSS
Operating Frequency Range:	902.4 to 927.6 MHz
Number of Hopping Channels:	64 (400kHz spacing)
Modulation Type(s):	50kbps GFSK lv3
Maximum Duty Cycle:	100%
Number of TX Chains:	1
Antenna Gain:	6.87 dBi Integral Omni Antenna 2.47 dBi External Omni Antenna
Beamforming Type:	NA
Antenna Connection Type:	Integral and External
Nominal Input Voltage:	6.0Vdc
Firmware / Software used for Test:	FW 4.1.6.0/ Command Line Interface (CLI) Tool 2.0.0.11

FCC Part 15 Subpart C

15.247(a) Transmitter Characteristics

Test Setup/Conditions			
Test Location:	Brea Lab A	Test Engineer:	Don Nguyen
Test Method:	ANSI C63.10 (2013)	Test Date(s):	6/10/2019
Configuration:	1		
Test Setup:	The EUT is placed on test bench. The serial port is connected to a support laptop via serial to USB adapter. The laptop is running software Command Line Interface Tool to turn on TX at 100% duty cycle. The EUT is powered from 6.0Vdc fresh batteries. Frequency of measurement: 902.4 to 927.6MHz RBW=1kHz and 3kHz		

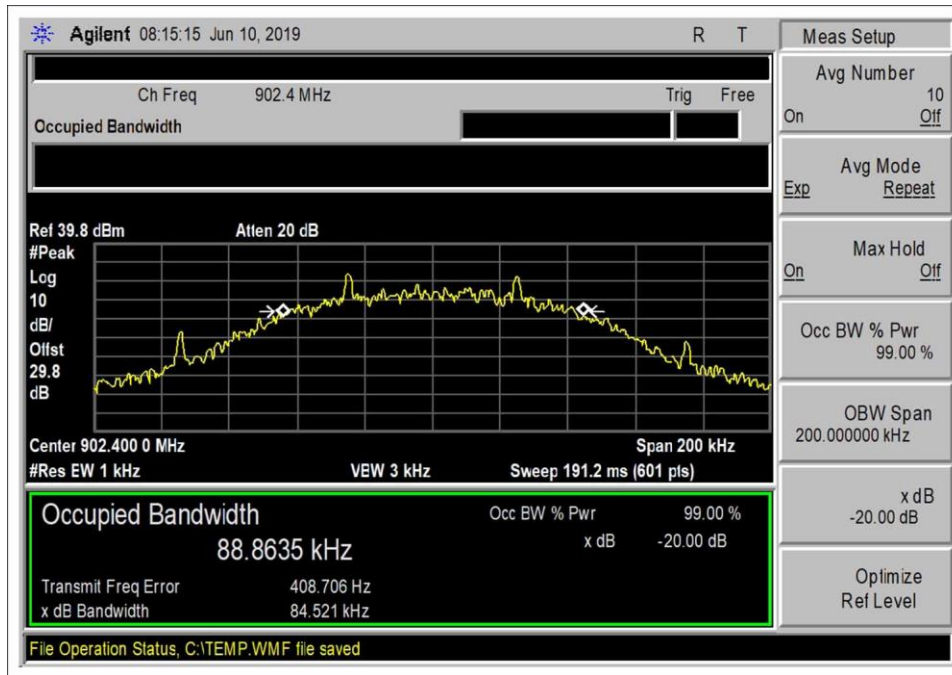
Environmental Conditions			
Temperature (°C)	20.9	Relative Humidity (%):	58.0

Test Equipment					
Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
02672	Spectrum Analyzer	Agilent	E4446A	3/13/2019	3/13/2021
03432	Attenuator	Aeroflex/Weinschel	90-30-34	10/27/2017	10/27/2019
P07244	Cable	H&S	32022-29094K-29094K-24TC	7/5/2018	7/5/2020

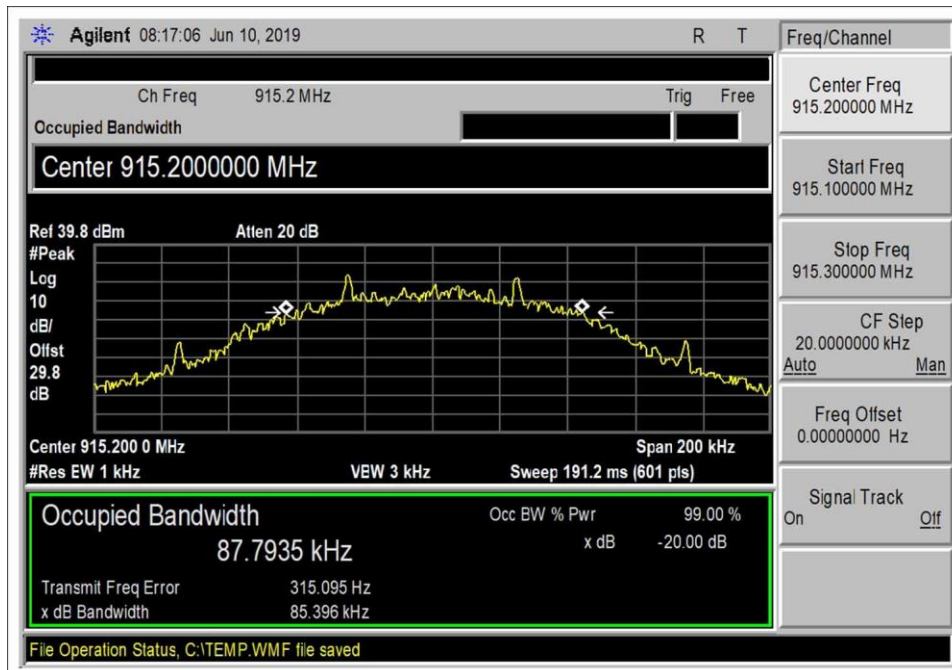
15.247(a)(1)(i) 20 dB Bandwidth

Test Data Summary					
Frequency (MHz)	Antenna Port	Modulation	Measured (kHz)	Limit (kHz)	Results
902.4	1	50kbps GFSK lv3	84.521	≤500	Pass
915.2	1	50kbps GFSK lv3	85.396	≤500	Pass
927.6	1	50kbps GFSK lv3	85.179	≤500	Pass

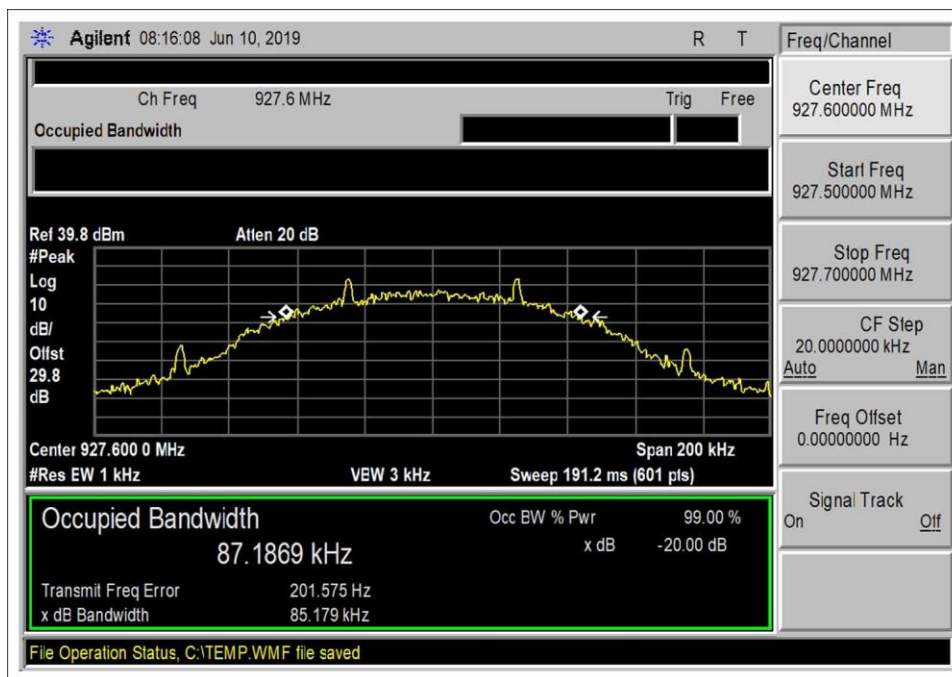
Plot(s)



Low Channel



Middle Channel

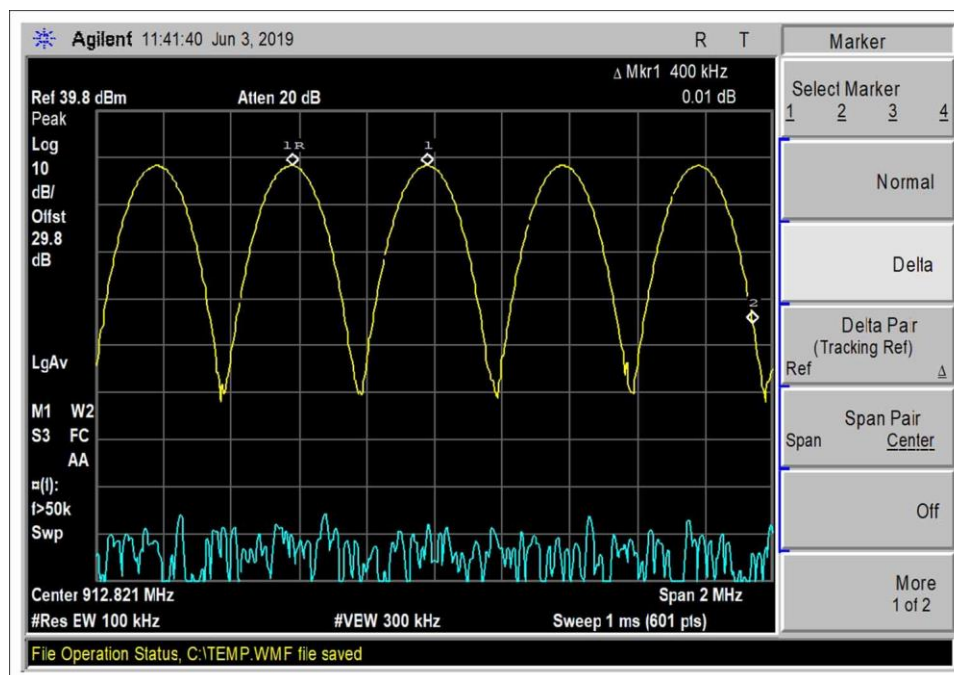


High Channel

15.247(a)(1) Carrier Separation

Test Data Summary				
Limit applied: 20dB bandwidth of the hopping channel.				
Antenna Port	Operational Mode	Measured (kHz)	Limit (kHz)	Results
1	50kbps GFSK lv3	400	> 85.396	Pass

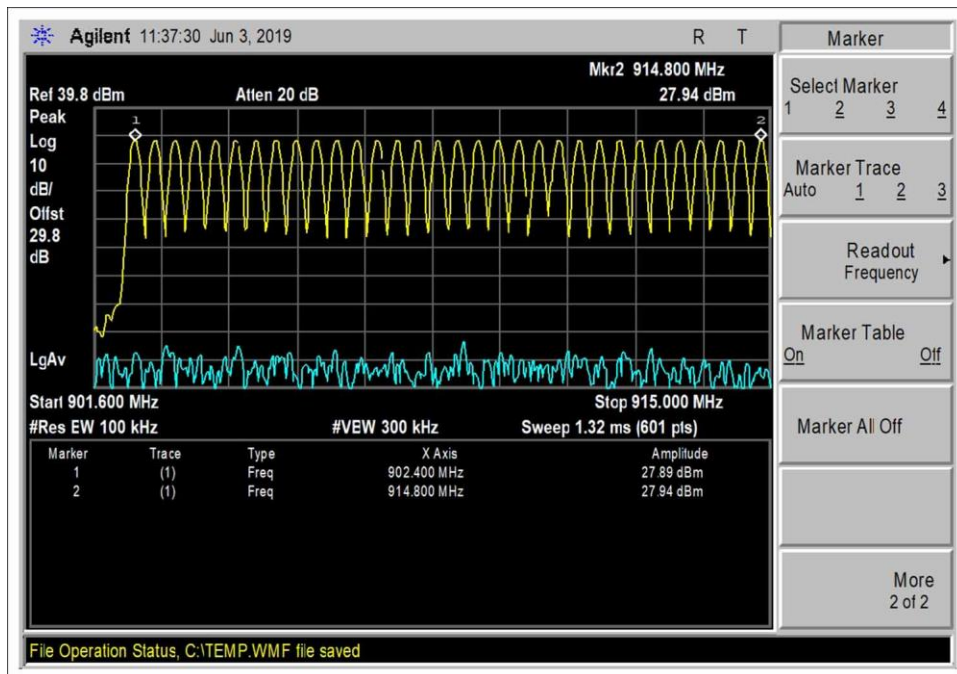
Plot(s)

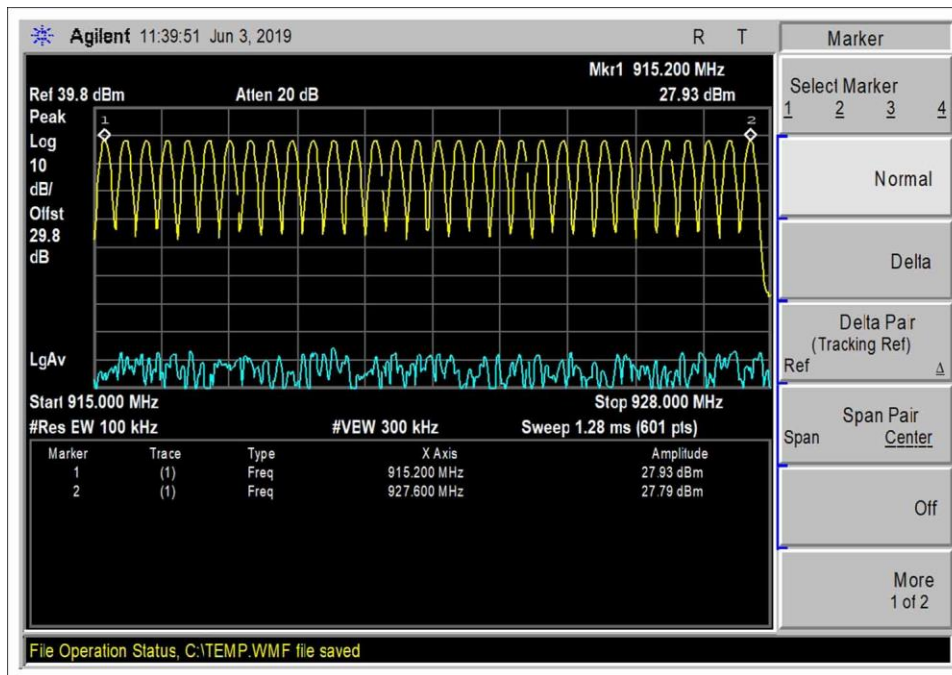


15.247(a)(1)(i) Number of Hopping Channels

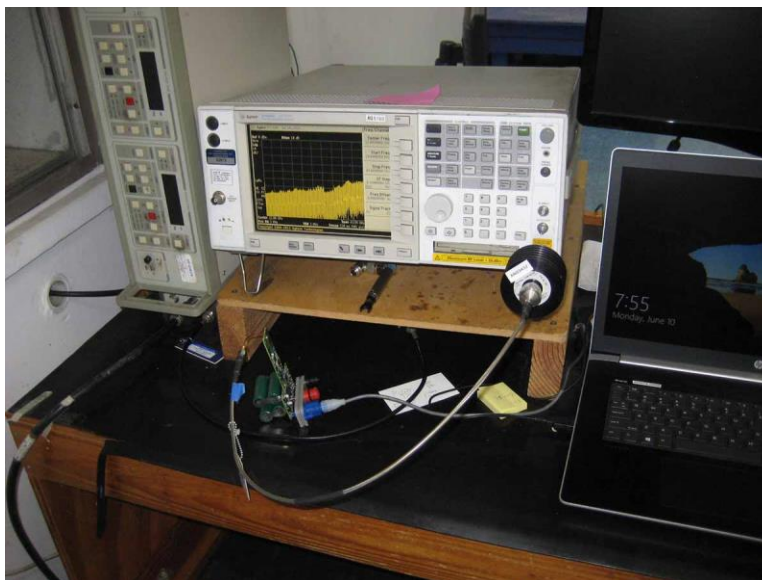
Test Data Summary				
$Limit = \begin{cases} 50 \text{ Channels} & 20 \text{ dB BW} < 250 \text{ kHz} \\ 25 \text{ Channels} & 20 \text{ dB BW} \geq 250 \text{ kHz} \end{cases}$				
Antenna Port	Operational Mode	Measured (Channels)	Limit (Channels)	Results
1	50kbps GFSK 1v3	64	≥ 50	Pass

Plot(s)





Test Setup Photo(s)



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

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

Therefore, the manufacturer declares the following:

With the multiple modulations, modes and hop tables, the mode with the worst-case Time of Occupancy to demonstrate 400mS compliance is 399.9 mS in 20 seconds, since this modulation is less than 250kHz Occupied Band Width. Each session of multiple short transmissions takes place on channels out of a minimum of 50 channels in a pseudorandom sequence. The algorithm that determines the pseudo-random hop sequence ensures all active channels are used equally on the average.

Ittron employs hopping patterns based on pseudo-random sequence generators or pseudo-random hop tables.

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

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

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

When the transmitter needs to send a continuous or long data stream, total time of the packet transmissions is monitored to comply with dwell time requirement of 400ms in the appropriate 10s or 20s window depending on the modulation/mode enabled.

This device does not employ any hopping avoidance techniques.

15.247(b)(2) Output Power

Test Setup/Conditions			
Test Location:	Brea Lab A	Test Engineer:	Don Nguyen
Test Method:	ANSI C63.10 (2013)	Test Date(s):	6/3/2019
Configuration:	1		
Test Setup:	The EUT is placed on test bench. The serial port is connected to a support laptop via serial to USB adapter. The laptop is running software Command Line Interface Tool to turn on TX at 100% duty cycle. The EUT is powered from 6.0Vdc fresh batteries. Frequency of measurement: 902.4 to 927.6MHz RBW=2MHz, VBW=6MHz		

Environmental Conditions			
Temperature (°C)	22.4	Relative Humidity (%):	55.0

Test Equipment					
Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
02672	Spectrum Analyzer	Agilent	E4446A	3/13/2019	3/13/2021
03432	Attenuator	Aeroflex/Weinschel	90-30-34	10/27/2017	10/27/2019
P07244	Cable	H&S	32022-29094K-29094K-24TC	7/5/2018	7/5/2020

Test Data Summary - Voltage Variations

NA: This equipment is battery powered. Power output tests were performed using a power supply simulating fresh battery installed.

Parameter Definitions:

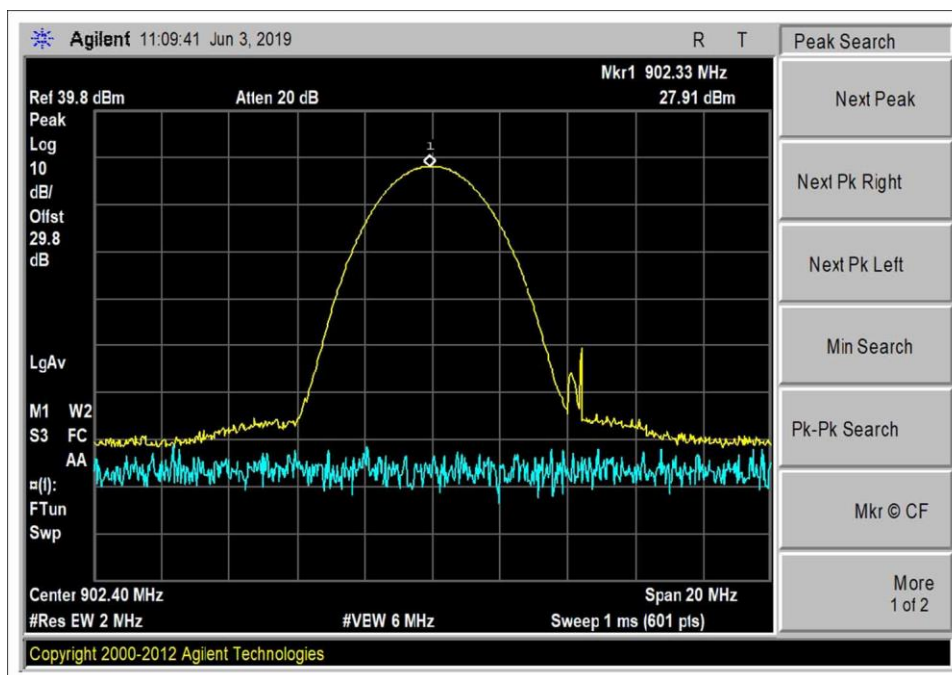
Measurements performed at input voltage according to manufacturer specification.

Parameter	Value
V _{Nominal} :	6.0Vdc
V _{Minimum} :	6.0Vdc
V _{Maximum} :	6.0Vdc

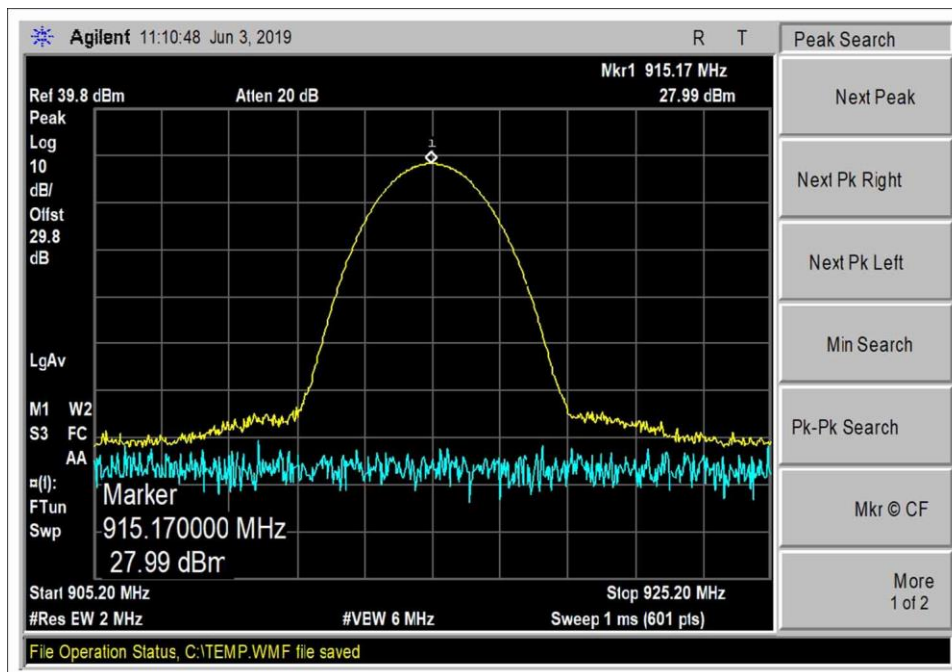
Test Data Summary - RF Conducted Measurement

$\text{Limit} = \begin{cases} 30\text{dBm Conducted}/36\text{dBm EIRP} & \geq 50 \text{ Channels} \\ 24\text{dBm Conducted}/30\text{dBm EIRP} & < 50 \text{ Channels (min 25)} \end{cases}$					
Frequency (MHz)	Modulation	Ant. Type / Gain (dBi)	Measured (dBm)	Limit (dBm)	Results
902.4	50kbps GFSK lv3	Integral Omni/6.87 External Omni/ 2.47	27.91	≤ 29.13	Pass
915.2	50kbps GFSK lv3	Integral Omni/6.87 External Omni/ 2.47	27.99	≤ 29.13	Pass
927.6	50kbps GFSK lv3	Integral Omni/6.87 External Omni/ 2.47	27.87	≤ 29.13	Pass

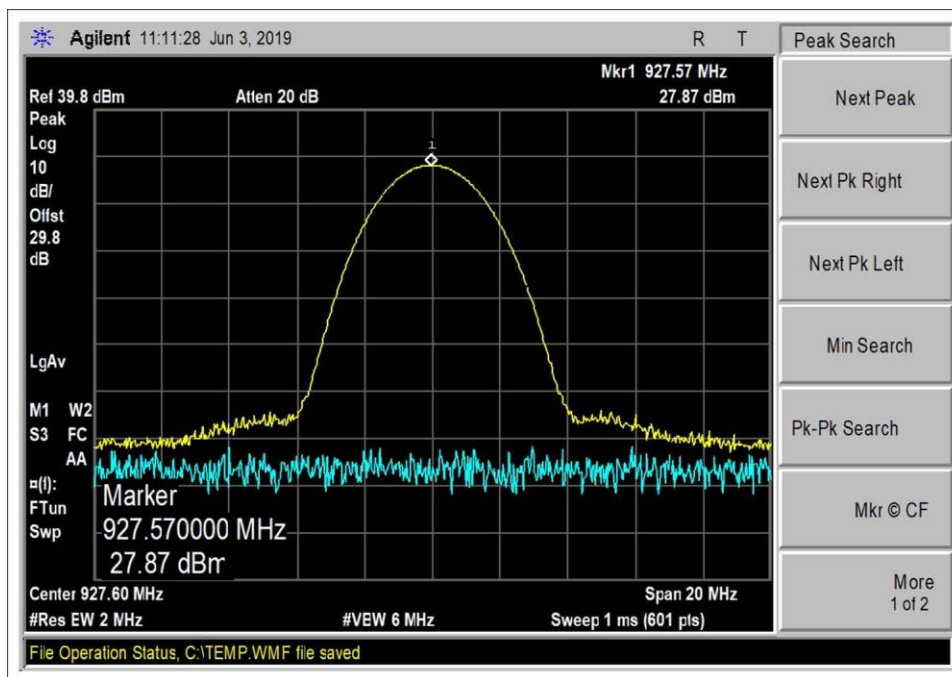
Plots



Low Channel

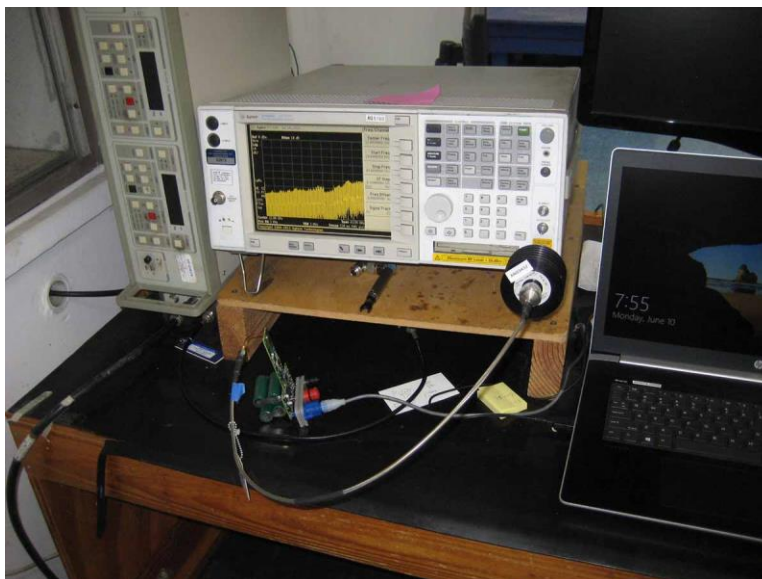


Middle Channel



High Channel

Test Setup Photo(s)



15.247(d) RF Conducted Emissions & Band Edge

Test Setup / Conditions / Data

Test Location: CKC Laboratories, Inc. • 110 N. Olinda Place • Brea, CA 92823 • 714-993-6112
 Customer: **Itron, Inc.**
 Specification: **15.247(d) Conducted Spurious Emissions**
 Work Order #: **102692** Date: 6/10/2019
 Test Type: **Conducted Emissions** Time: 09:07:40
 Tested By: Don Nguyen Sequence#: 0
 Software: EMITest 5.03.12 6.0Vdc

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

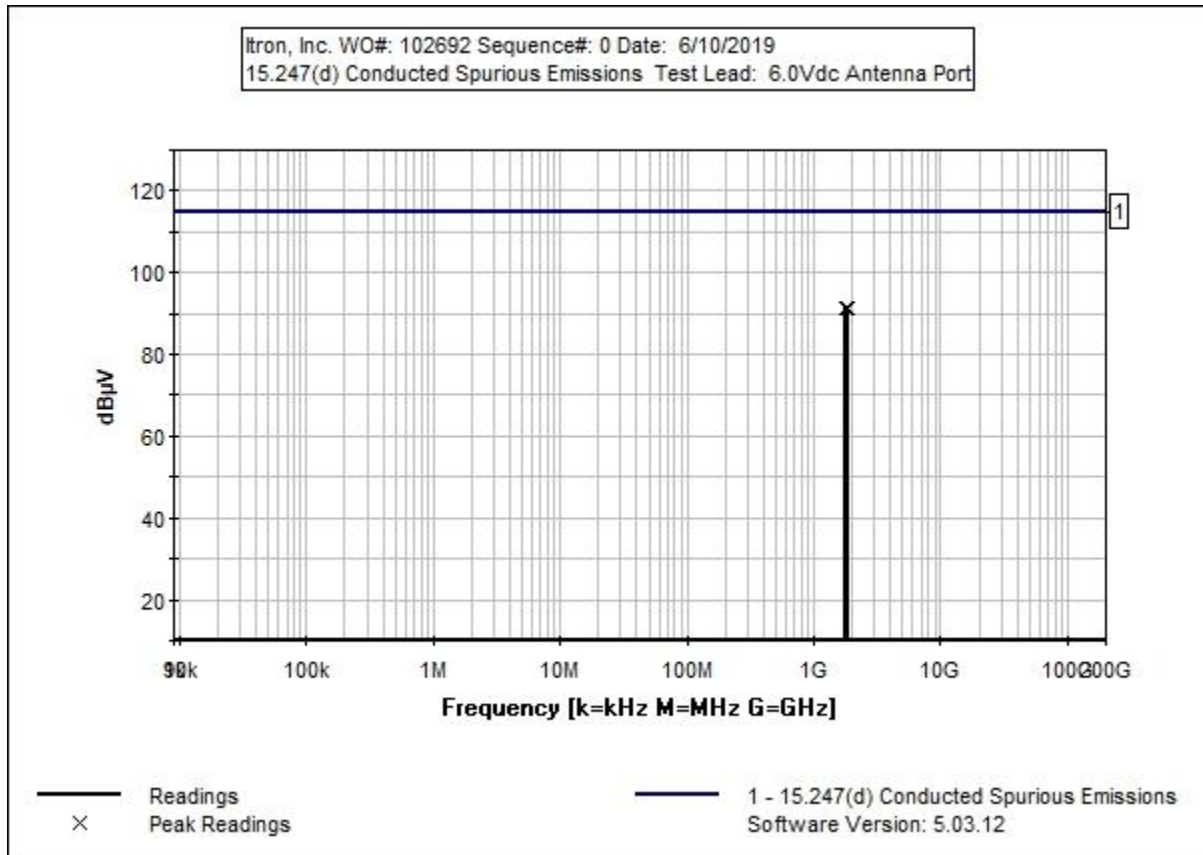
Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

The EUT is placed on test bench. The serial port is connected to a support laptop via serial to USB adapter. The laptop is running software Command Line Interface Tool to turn on TX. The EUT is powered from 6Vdc fresh batteries.
 Modulation: 50kbps GFSK
 Frequency of measurement: 9kHz-9280MHz
 RBW=100kHz, VBW=300kHz

 Data represent worst case emissions.

 Test Location: Brea Lab A
 Test Method: ANSI C63.10 (2013)
 Temperature (°C): 20.9
 Relative Humidity (%): 58.0



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN03432	Attenuator	90-30-34	10/27/2017	10/27/2019
T2	ANP07244	Cable	32022-29094K-29094K-24TC	7/5/2018	7/5/2020
	AN02672	Spectrum Analyzer	E4446A	3/13/2019	3/13/2021

Measurement Data:

Reading listed by margin.

Test Lead: Antenna Port

#	Freq MHz	Rdng dBμV	T1 dB	T2 dB	Dist dB	Table	Corr dBμV	Spec dBμV	Margin dB	Polar Ant
1	1830.354M	61.6	+29.7	+0.2		+0.0	91.5	115.0	-23.5	Anten
2	1855.156M	61.6	+29.7	+0.2		+0.0	91.5	115.0	-23.5	Anten
3	1804.847M	61.2	+29.7	+0.2		+0.0	91.1	115.0	-23.9	Anten

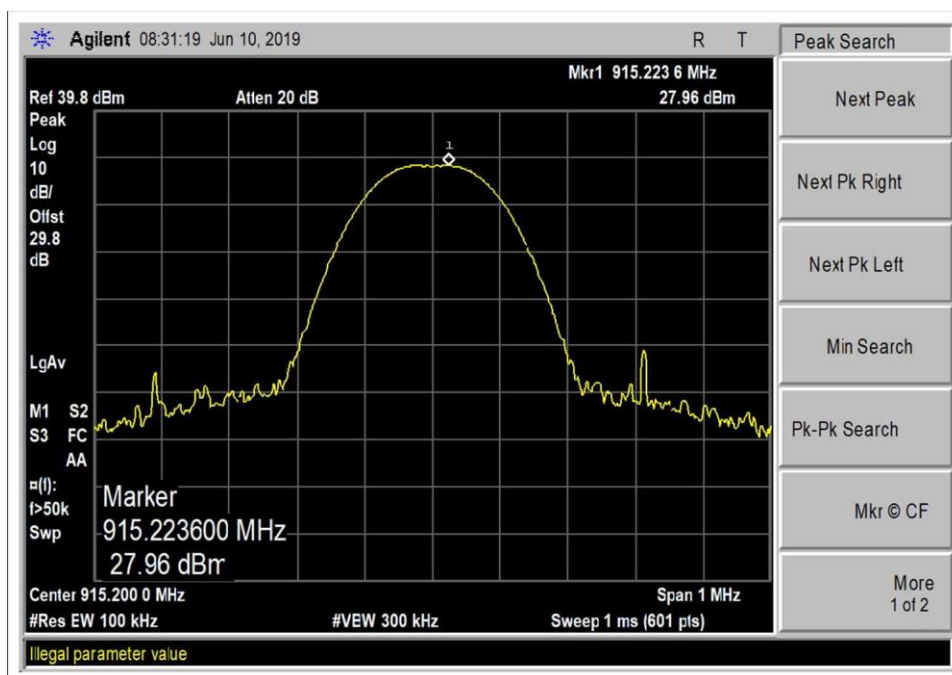
Band Edge

Band Edge Summary

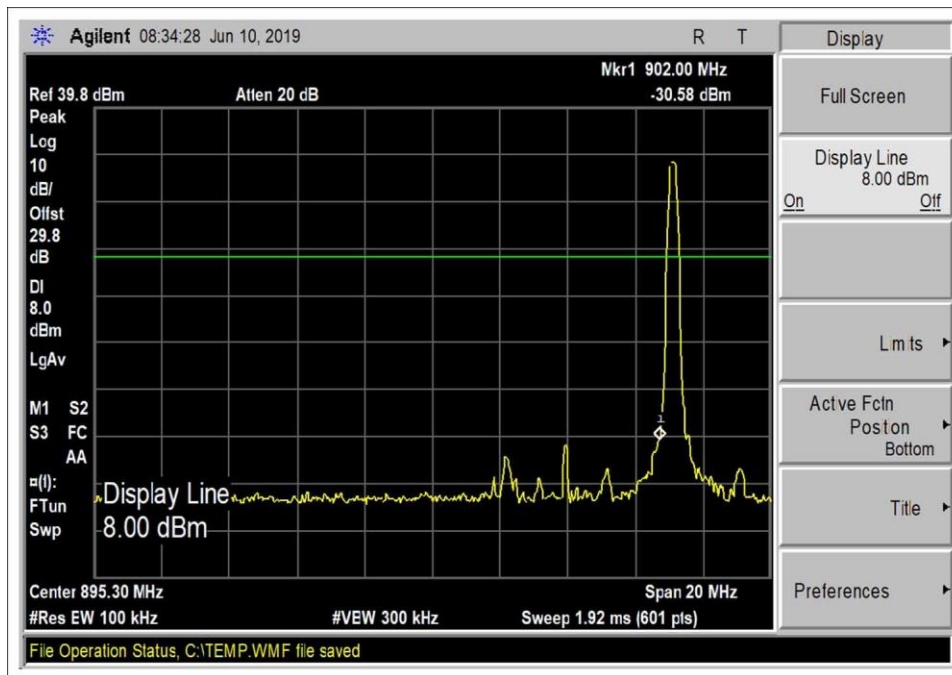
Limit applied: Max Power/100kHz - 20dB.

Frequency (MHz)	Modulation	Measured (dBm)	Limit (dBm)	Results
902	50kbps GFSK lv3	-30.58	< 8	Pass
928	50kbps GFSK lv3	-24.31	< 8	Pass
902	50kbps GFSK lv3 hopping	-33.08	< 8	Pass
928	50kbps GFSK lv3 hopping	-28.30	< 8	Pass

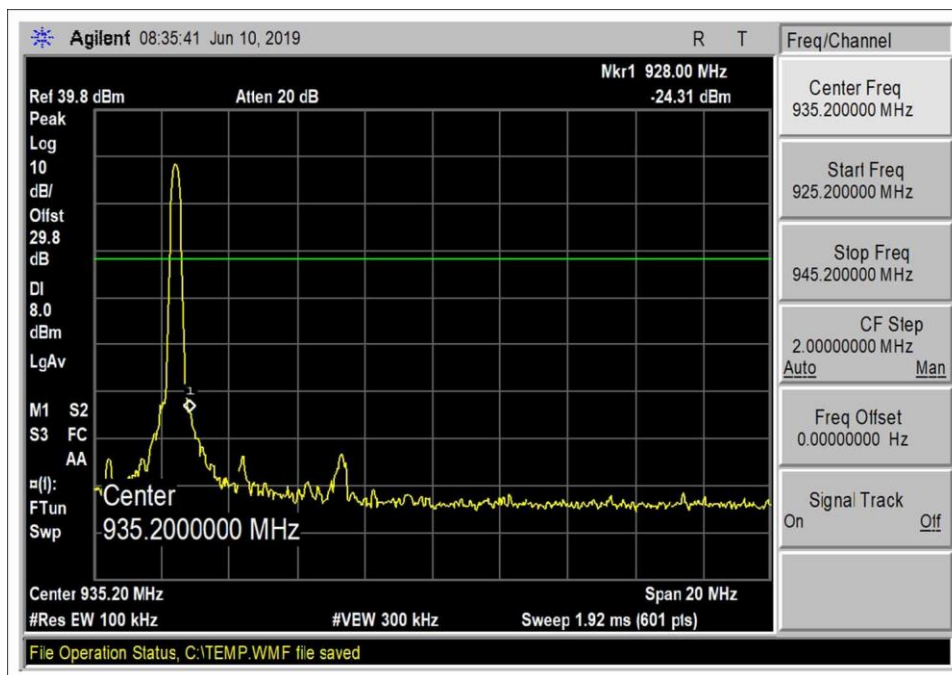
Band Edge Plots



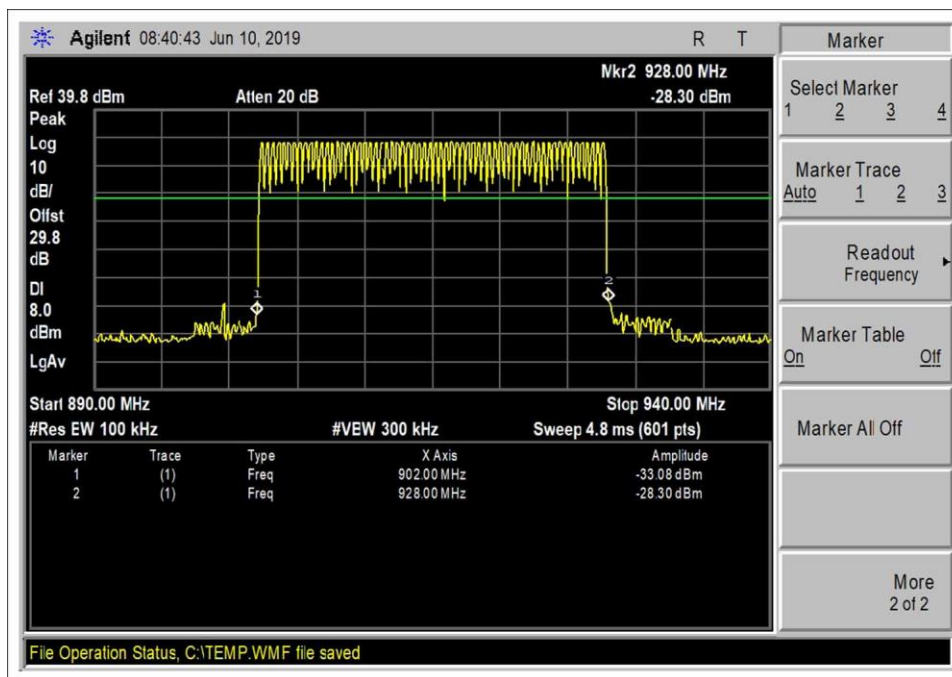
Peak



Low Channel

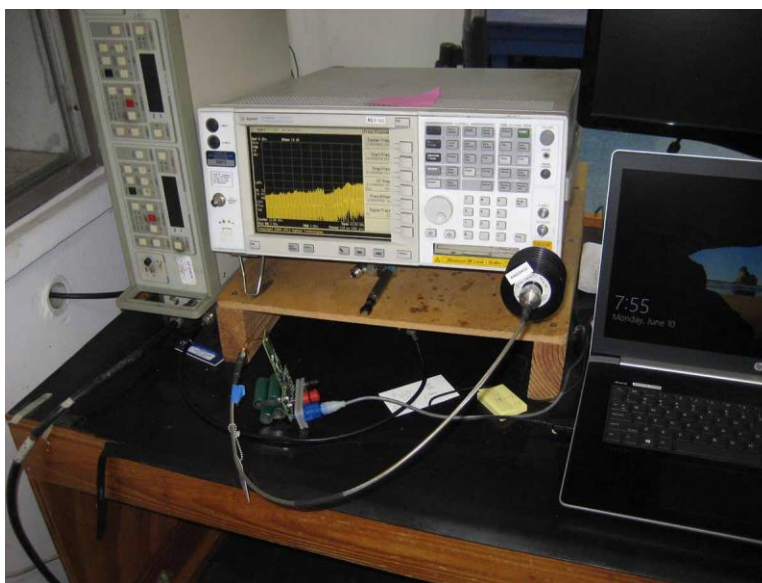


High Channel



Hopping

Test Setup Photo(s)



15.247(d) Radiated Emissions & Band Edge

Test Setup / Conditions / Data

Test Location: CKC Laboratories, Inc. • 110 N. Olinda Place • Brea, CA 92823 • 714-993-6112
 Customer: **Itron, Inc.**
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**
 Work Order #: **102692** Date: 6/12/2019
 Test Type: **Maximized Emissions** Time: 10:40:02
 Tested By: Don Nguyen Sequence#: 3
 Software: EMITest 5.03.12

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

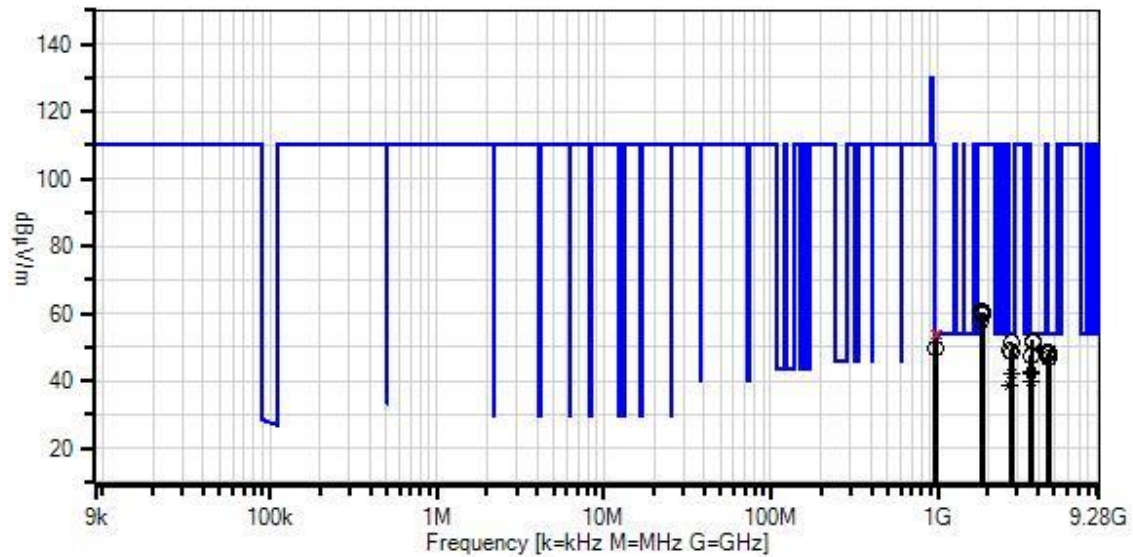
Test Conditions / Notes:

The EUT is placed on table top. The serial port is connected to a support laptop via serial to USB adapter. The laptop is running software Command Line Interface Tool to turn on TX. The EUT is powered from fresh battery 6.0Vdc.
 Modulation: 50kbps GFSK

Frequency of measurement: 9k-9280MHz
 9kHz -150 kHz;RBW=200 Hz,VBW=600 Hz;
 150 kHz-30 MHz;RBW=9 kHz,VBW=27 kHz;
 30 MHz-1000 MHz;RBW=120 kHz,VBW=360 kHz,
 1000 MHz-9280MHz;RBW=1 MHz,VBW=3 MHz.
 RBW=100kHz, VBW=300kHz (-20dbc limit)

Site A
 Test Method: ANSI C63.10 (2013)
 Temperature (°C): 23.9
 Relative Humidity (%): 62

Itron, Inc. WO#: 102692 Sequence#: 3 Date: 6/12/2019
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: 5.03.12

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN00309	Preamp	8447D	2/19/2018	2/19/2020
	AN00314	Loop Antenna	6502	5/13/2018	5/13/2020
	ANP05050	Cable	RG223/U	12/24/2018	12/24/2020
T1	AN01995	Biconilog Antenna	CBL6111C	4/23/2018	4/23/2020
T2	ANP05275	Attenuator	1W	4/5/2018	4/5/2020
T3	ANP05198	Cable-Amplitude +15C to +45C (dB)	8268	12/4/2018	12/4/2020
T4	AN02672	Spectrum Analyzer	E4446A	3/13/2019	3/13/2021
T5	AN00786	Preamp	83017A	5/12/2018	5/12/2020
T6	AN00849	Horn Antenna	3115	3/14/2018	3/14/2020
T7	ANP07139	Cable	ANDL1- PNMNM-48	3/4/2019	3/4/2021
T8	ANP07246	Cable	32022-29094K- 29094K-24TC	7/5/2018	7/5/2020
T9	AN03169	High Pass Filter	HM1155-11SS	5/8/2019	5/8/2021

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	967.200M QP	17.9	+23.8 +0.0 +0.0	+6.1 +0.0	+6.1 +0.0	+0.0 +0.0	+0.0	53.9	54.0	-0.1	Vert
^	967.200M	21.3	+23.8 +0.0 +0.0	+6.1 +0.0	+6.1 +0.0	+0.0 +0.0	+0.0	57.3	54.0	+3.3	Vert
3	993.195M QP	17.0	+24.2 +0.0 +0.0	+6.1 +0.0	+6.3 +0.0	+0.0 +0.0	+0.0	53.6	54.0	-0.4	Vert
^	993.195M	20.1	+24.2 +0.0 +0.0	+6.1 +0.0	+6.3 +0.0	+0.0 +0.0	+0.0	56.7	54.0	+2.7	Vert
5	3710.400M	53.8	+0.0 -38.3 +0.2	+0.0 +31.9	+0.0 +4.1	+0.0 +0.4	+0.0	52.1	54.0	-1.9	Horiz
6	3710.400M	53.3	+0.0 -38.3 +0.2	+0.0 +31.9	+0.0 +4.1	+0.0 +0.4	+0.0	51.6	54.0	-2.4	Vert
7	2782.800M	56.3	+0.0 -38.6 +0.2	+0.0 +29.5	+0.0 +3.5	+0.0 +0.3	+0.0	51.2	54.0	-2.8	Vert
8	2782.800M	56.3	+0.0 -38.6 +0.2	+0.0 +29.5	+0.0 +3.5	+0.0 +0.3	+0.0	51.2	54.0	-2.8	Horiz
9	967.195M	13.6	+23.8 +0.0 +0.0	+6.1 +0.0	+6.1 +0.0	+0.0 +0.0	+0.0	49.6	54.0	-4.4	Horiz

10	2707.200M	54.8	+0.0 -38.6 +0.2	+0.0 +29.1 +3.4	+0.0 +3.4 +0.3	+0.0 +0.0 +0.0	49.2	54.0	-4.8	Horiz
11	2745.600M	54.0	+0.0 -38.6 +0.2	+0.0 +29.4 +3.4	+0.0 +3.4 +0.3	+0.0 +0.0 +0.0	48.7	54.0	-5.3	Vert
12	4638.000M	48.1	+0.0 -37.7 +0.2	+0.0 +32.8 +4.7	+0.0 +4.7 +0.4	+0.0 +0.0 +0.0	48.5	54.0	-5.5	Horiz
13	4512.000M	47.9	+0.0 -37.8 +0.2	+0.0 +32.9 +4.5	+0.0 +0.5 +0.5	+0.0 +0.0 +0.0	48.2	54.0	-5.8	Horiz
14	4638.000M	47.7	+0.0 -37.7 +0.2	+0.0 +32.8 +4.7	+0.0 +4.7 +0.4	+0.0 +0.0 +0.0	48.1	54.0	-5.9	Vert
15	4512.000M	47.8	+0.0 -37.8 +0.2	+0.0 +32.9 +4.5	+0.0 +0.5 +0.5	+0.0 +0.0 +0.0	48.1	54.0	-5.9	Vert
16	3609.600M	49.9	+0.0 -38.4 +0.1	+0.0 +31.1 +4.1	+0.0 +0.5 +0.5	+0.0 +0.0 +0.0	47.3	54.0	-6.7	Horiz
17	4576.000M	46.0	+0.0 -37.8 +0.2	+0.0 +33.0 +4.6	+0.0 +0.5 +0.5	+0.0 +0.0 +0.0	46.5	54.0	-7.5	Vert
18	4576.000M	46.0	+0.0 -37.8 +0.2	+0.0 +33.0 +4.6	+0.0 +0.5 +0.5	+0.0 +0.0 +0.0	46.5	54.0	-7.5	Horiz
19	3660.800M Ave	44.7	+0.0 -38.3 +0.2	+0.0 +31.6 +4.1	+0.0 +0.4 +0.4	+0.0 +0.0 +0.0	42.7	54.0	-11.3	Horiz
^	3660.800M	53.4	+0.0 -38.3 +0.2	+0.0 +31.6 +4.1	+0.0 +0.4 +0.4	+0.0 +0.0 +0.0	51.4	54.0	-2.6	Horiz
21	2745.600M Ave	47.3	+0.0 -38.6 +0.2	+0.0 +29.4 +3.4	+0.0 +0.3 +0.3	+0.0 +0.0 +0.0	42.0	54.0	-12.0	Horiz
^	2745.600M	56.8	+0.0 -38.6 +0.2	+0.0 +29.4 +3.4	+0.0 +0.3 +0.3	+0.0 +0.0 +0.0	51.5	54.0	-2.5	Horiz
23	3660.800M Ave	43.8	+0.0 -38.3 +0.2	+0.0 +31.6 +4.1	+0.0 +0.4 +0.4	+0.0 +0.0 +0.0	41.8	54.0	-12.2	Vert
^	3660.800M	52.5	+0.0 -38.3 +0.2	+0.0 +31.6 +4.1	+0.0 +0.4 +0.4	+0.0 +0.0 +0.0	50.5	54.0	-3.5	Vert
25	3609.600M Ave	42.6	+0.0 -38.4 +0.1	+0.0 +31.1 +4.1	+0.0 +0.5 +0.5	+0.0 +0.0 +0.0	40.0	54.0	-14.0	Vert
^	3609.600M	51.5	+0.0 -38.4 +0.1	+0.0 +31.1 +4.1	+0.0 +0.5 +0.5	+0.0 +0.0 +0.0	48.9	54.0	-5.1	Vert

27	2707.200M Ave	44.3	+0.0 -38.6 +0.2	+0.0 +29.1	+0.0 +3.4	+0.0 +0.3	+0.0	38.7	54.0	-15.3	Vert
^	2707.200M	53.6	+0.0 -38.6 +0.2	+0.0 +29.1	+0.0 +3.4	+0.0 +0.3	+0.0	48.0	54.0	-6.0	Vert
29	1830.400M	69.4	+0.0 -38.9 +0.2	+0.0 +27.1	+0.0 +2.6	+0.0 +0.2	+0.0	60.6	110.1	-49.5	Vert
30	1855.200M	69.1	+0.0 -38.9 +0.2	+0.0 +27.3	+0.0 +2.7	+0.0 +0.2	+0.0	60.6	110.1	-49.5	Vert
31	1804.800M	69.4	+0.0 -38.9 +0.2	+0.0 +27.0	+0.0 +2.6	+0.0 +0.2	+0.0	60.5	110.1	-49.6	Vert
32	1855.200M	68.7	+0.0 -38.9 +0.2	+0.0 +27.3	+0.0 +2.7	+0.0 +0.2	+0.0	60.2	110.1	-49.9	Horiz
33	1830.400M	68.4	+0.0 -38.9 +0.2	+0.0 +27.1	+0.0 +2.6	+0.0 +0.2	+0.0	59.6	110.1	-50.5	Horiz
34	1804.800M	66.9	+0.0 -38.9 +0.2	+0.0 +27.0	+0.0 +2.6	+0.0 +0.2	+0.0	58.0	110.1	-52.1	Horiz

Test Location: CKC Laboratories, Inc. • 110 N. Olinda Place • Brea, CA 92823 • 714-993-6112
 Customer: **Itron, Inc.**
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**
 Work Order #: **102692** Date: 6/11/2019
 Test Type: **Maximized Emissions** Time: 14:31:51
 Tested By: Don Nguyen Sequence#: 3
 Software: EMITest 5.03.12

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 3			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 3			

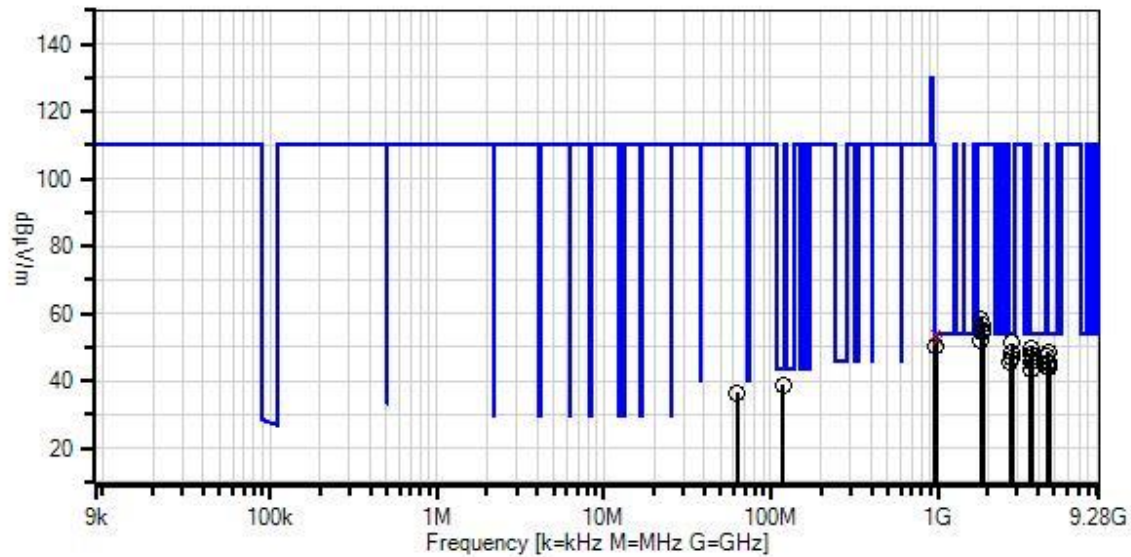
Test Conditions / Notes:

The EUT is placed on table top. The serial port is connected to a support laptop via serial to USB adapter. The laptop is running software Command Line Interface Tool to turn on TX. The EUT is powered from fresh battery 6.0Vdc.
 Modulation: 50kbps GFSK.

 Frequency of measurement: 9k-9280MHz
 9kHz -150 kHz;RBW=200 Hz,VBW=600 Hz;
 150 kHz-30 MHz;RBW=9 kHz,VBW=27 kHz;
 30 MHz-1000 MHz;RBW=120 kHz,VBW=360 kHz,
 1000 MHz-9280MHz;RBW=1 MHz,VBW=3 MHz.
 RBW=100kHz, VBW=300kHz (-20dbc limit)

 Site A
 Test Method: ANSI C63.10 (2013)
 Temperature (°C): 23.9
 Relative Humidity (%): 62

Itron, Inc. WO#: 102692 Sequence#: 3 Date: 6/11/2019
 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: 5.03.12

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN00314	Loop Antenna	6502	5/13/2018	5/13/2020
	AN00309	Preamp	8447D	2/19/2018	2/19/2020
	ANP05050	Cable	RG223/U	12/24/2018	12/24/2020
T1	AN01995	Biconilog Antenna	CBL6111C	4/23/2018	4/23/2020
T2	ANP05275	Attenuator	1W	4/5/2018	4/5/2020
T3	ANP05198	Cable-Amplitude +15C to +45C (dB)	8268	12/4/2018	12/4/2020
T4	AN02672	Spectrum Analyzer	E4446A	3/13/2019	3/13/2021
T5	AN00786	Preamp	83017A	5/12/2018	5/12/2020
T6	AN00849	Horn Antenna	3115	3/14/2018	3/14/2020
T7	ANP07139	Cable	ANDL1- PNMNM-48	3/4/2019	3/4/2021
T8	ANP07246	Cable	32022-29094K- 29094K-24TC	7/5/2018	7/5/2020
T9	AN03169	High Pass Filter	HM1155-11SS	5/8/2019	5/8/2021

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	967.205M QP	17.4	+23.8 +0.0 +0.0	+6.1 +0.0	+6.1 +0.0	+0.0 +0.0	+0.0	53.4	54.0	-0.6	Vert
^	967.205M	20.8	+23.8 +0.0 +0.0	+6.1 +0.0	+6.1 +0.0	+0.0 +0.0	+0.0	56.8	54.0	+2.8	Vert
3	993.200M QP	15.3	+24.2 +0.0 +0.0	+6.1 +0.0	+6.3 +0.0	+0.0 +0.0	+0.0	51.9	54.0	-2.1	Vert
^	993.200M	18.7	+24.2 +0.0 +0.0	+6.1 +0.0	+6.3 +0.0	+0.0 +0.0	+0.0	55.3	54.0	+1.3	Vert
5	2782.800M	56.2	+0.0 -38.6 +0.2	+0.0 +29.5	+0.0 +3.5	+0.0 +0.3	+0.0	51.1	54.0	-2.9	Vert
6	967.200M	14.4	+23.8 +0.0 +0.0	+6.1 +0.0	+6.1 +0.0	+0.0 +0.0	+0.0	50.4	54.0	-3.6	Horiz
7	3660.800M	51.7	+0.0 -38.3 +0.2	+0.0 +31.6	+0.0 +4.1	+0.0 +0.4	+0.0	49.7	54.0	-4.3	Horiz
8	117.600M	19.2	+11.5 +0.0 +0.0	+6.0 +0.0	+1.9 +0.0	+0.0 +0.0	+0.0	38.6	43.5	-4.9	Vert
9	4576.000M	48.0	+0.0 -37.8 +0.2	+0.0 +33.0	+0.0 +4.6	+0.0 +0.5	+0.0	48.5	54.0	-5.5	Horiz

10	2745.600M	53.5	+0.0 -38.6 +0.2	+0.0 +29.4 +3.4	+0.0 +3.4 +0.3	+0.0 +0.0 +0.0	+0.0 +0.0 +0.0	48.2	54.0	-5.8	Vert
11	3609.600M	50.3	+0.0 -38.4 +0.1	+0.0 +31.1 +4.1	+0.0 +4.1 +0.5	+0.0 +0.0 +0.0	+0.0 +0.0 +0.0	47.7	54.0	-6.3	Horiz
12	4512.000M	47.1	+0.0 -37.8 +0.2	+0.0 +32.9 +4.5	+0.0 +4.5 +0.5	+0.0 +0.0 +0.0	+0.0 +0.0 +0.0	47.4	54.0	-6.6	Horiz
13	3710.400M	49.0	+0.0 -38.3 +0.2	+0.0 +31.9 +4.1	+0.0 +4.1 +0.4	+0.0 +0.0 +0.0	+0.0 +0.0 +0.0	47.3	54.0	-6.7	Horiz
14	2745.600M	52.3	+0.0 -38.6 +0.2	+0.0 +29.4 +3.4	+0.0 +3.4 +0.3	+0.0 +0.0 +0.0	+0.0 +0.0 +0.0	47.0	54.0	-7.0	Horiz
15	2782.800M	51.8	+0.0 -38.6 +0.2	+0.0 +29.5 +3.5	+0.0 +3.5 +0.3	+0.0 +0.0 +0.0	+0.0 +0.0 +0.0	46.7	54.0	-7.3	Horiz
16	3710.400M	48.1	+0.0 -38.3 +0.2	+0.0 +31.9 +4.1	+0.0 +4.1 +0.4	+0.0 +0.0 +0.0	+0.0 +0.0 +0.0	46.4	54.0	-7.6	Vert
17	3660.800M	47.6	+0.0 -38.3 +0.2	+0.0 +31.6 +4.1	+0.0 +4.1 +0.4	+0.0 +0.0 +0.0	+0.0 +0.0 +0.0	45.6	54.0	-8.4	Vert
18	2707.200M	51.1	+0.0 -38.6 +0.2	+0.0 +29.1 +3.4	+0.0 +3.4 +0.3	+0.0 +0.0 +0.0	+0.0 +0.0 +0.0	45.5	54.0	-8.5	Vert
19	4576.000M	44.9	+0.0 -37.8 +0.2	+0.0 +33.0 +4.6	+0.0 +4.6 +0.5	+0.0 +0.0 +0.0	+0.0 +0.0 +0.0	45.4	54.0	-8.6	Vert
20	2707.200M	50.9	+0.0 -38.6 +0.2	+0.0 +29.1 +3.4	+0.0 +3.4 +0.3	+0.0 +0.0 +0.0	+0.0 +0.0 +0.0	45.3	54.0	-8.7	Horiz
21	4638.000M	44.7	+0.0 -37.7 +0.2	+0.0 +32.8 +4.7	+0.0 +4.7 +0.4	+0.0 +0.0 +0.0	+0.0 +0.0 +0.0	45.1	54.0	-8.9	Vert
22	4512.000M	44.1	+0.0 -37.8 +0.2	+0.0 +32.9 +4.5	+0.0 +4.5 +0.5	+0.0 +0.0 +0.0	+0.0 +0.0 +0.0	44.4	54.0	-9.6	Vert
23	4638.000M	43.5	+0.0 -37.7 +0.2	+0.0 +32.8 +4.7	+0.0 +4.7 +0.4	+0.0 +0.0 +0.0	+0.0 +0.0 +0.0	43.9	54.0	-10.1	Horiz
24	3609.600M	45.6	+0.0 -38.4 +0.1	+0.0 +31.1 +4.1	+0.0 +4.1 +0.5	+0.0 +0.0 +0.0	+0.0 +0.0 +0.0	43.0	54.0	-11.0	Vert
25	1804.800M	67.4	+0.0 -38.9 +0.2	+0.0 +27.0 +2.6	+0.0 +2.6 +0.2	+0.0 +0.0 +0.0	+0.0 +0.0 +0.0	58.5	110.1	-51.6	Vert
26	1830.400M	65.4	+0.0 -38.9 +0.2	+0.0 +27.1 +2.6	+0.0 +2.6 +0.2	+0.0 +0.0 +0.0	+0.0 +0.0 +0.0	56.6	110.1	-53.5	Vert

27	1855.200M	64.9	+0.0 -38.9 +0.2	+0.0 +27.3	+0.0 +2.7	+0.0 +0.2	+0.0	56.4	110.1	-53.7	Vert
28	1855.200M	63.3	+0.0 -38.9 +0.2	+0.0 +27.3	+0.0 +2.7	+0.0 +0.2	+0.0	54.8	110.1	-55.3	Horiz
29	1830.400M	62.8	+0.0 -38.9 +0.2	+0.0 +27.1	+0.0 +2.6	+0.0 +0.2	+0.0	54.0	110.1	-56.1	Horiz
30	1804.800M	61.1	+0.0 -38.9 +0.2	+0.0 +27.0	+0.0 +2.6	+0.0 +0.2	+0.0	52.2	110.1	-57.9	Horiz
31	62.600M	23.2	+5.8 +0.0 +0.0	+6.0 +0.0	+1.4 +0.0	+0.0 +0.0	+0.0	36.4	110.1	-73.7	Vert

Test Location: CKC Laboratories, Inc. • 110 N. Olinda Place • Brea, CA 92823 • 714-993-6112
 Customer: **Itron, Inc.**
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**
 Work Order #: **102692** Date: 6/11/2019
 Test Type: **Maximized Emissions** Time: 13:29:13
 Tested By: Don Nguyen Sequence#: 6
 Software: EMITest 5.03.12

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 4			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 4			

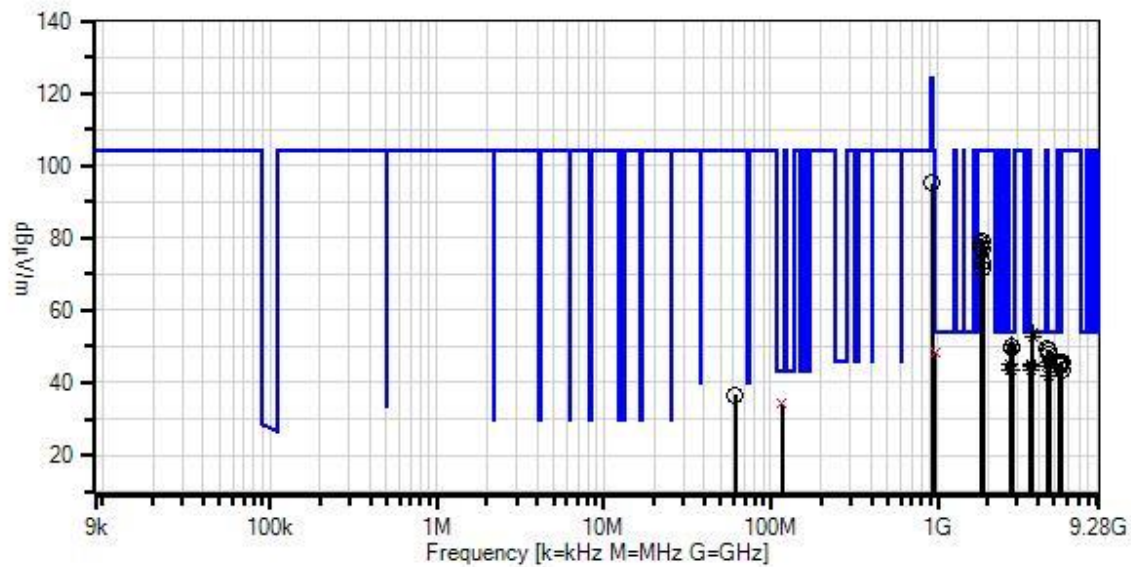
Test Conditions / Notes:

The EUT is placed on table top. The serial port is connected to a support laptop via serial to USB adapter. The laptop is running software Command Line Interface Tool to turn on TX. The EUT is powered from fresh battery 6.0Vdc.
 Modulation: 50kbps GFSK.

Frequency of measurement: 9k-9280MHz
 9kHz -150 kHz;RBW=200 Hz,VBW=600 Hz;
 150 kHz-30 MHz;RBW=9 kHz,VBW=27 kHz;
 30 MHz-1000 MHz;RBW=120 kHz,VBW=360 kHz,
 1000 MHz-9280MHz;RBW=1 MHz,VBW=3 MHz.
 RBW=100kHz, VBW=300kHz (-20dbc limit)

Site A
 Test Method: ANSI C63.10 (2013)
 Temperature (°C): 23.9
 Relative Humidity (%): 62

Itron, Inc. WO#: 102692 Sequence#: 6 Date: 6/11/2019
 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: 5.03.12

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN00314	Loop Antenna	6502	5/13/2018	5/13/2020
	AN00309	Preamp	8447D	2/19/2018	2/19/2020
	ANP05050	Cable	RG223/U	12/24/2018	12/24/2020
T1	AN01995	Biconilog Antenna	CBL6111C	4/23/2018	4/23/2020
T2	ANP05275	Attenuator	1W	4/5/2018	4/5/2020
T3	ANP05198	Cable-Amplitude +15C to +45C (dB)	8268	12/4/2018	12/4/2020
T4	AN02672	Spectrum Analyzer	E4446A	3/13/2019	3/13/2021
T5	AN00786	Preamp	83017A	5/12/2018	5/12/2020
T6	AN00849	Horn Antenna	3115	3/14/2018	3/14/2020
T7	ANP07139	Cable	ANDL1- PNMNM-48	3/4/2019	3/4/2021
T8	ANP07246	Cable	32022-29094K- 29094K-24TC	7/5/2018	7/5/2020
T9	AN03169	High Pass Filter	HM1155-11SS	5/8/2019	5/8/2021

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	3710.400M Ave	55.4	+0.0 -38.3 +0.2	+0.0 +31.9	+0.0 +4.1	+0.0 +0.4	+0.0	53.7	54.0	-0.3	Vert
^	3710.400M	64.7	+0.0 -38.3 +0.2	+0.0 +31.9	+0.0 +4.1	+0.0 +0.4	+0.0	63.0	54.0	+9.0	Vert
3	3710.400M Ave	54.1	+0.0 -38.3 +0.2	+0.0 +31.9	+0.0 +4.1	+0.0 +0.4	+0.0	52.4	54.0	-1.6	Horiz
^	3710.400M	63.0	+0.0 -38.3 +0.2	+0.0 +31.9	+0.0 +4.1	+0.0 +0.4	+0.0	61.3	54.0	+7.3	Horiz
5	2782.800M Ave	55.6	+0.0 -38.6 +0.2	+0.0 +29.5	+0.0 +3.5	+0.0 +0.3	+0.0	50.5	54.0	-3.5	Vert
^	2782.800M	64.1	+0.0 -38.6 +0.2	+0.0 +29.5	+0.0 +3.5	+0.0 +0.3	+0.0	59.0	54.0	+5.0	Vert
7	2745.600M	55.2	+0.0 -38.6 +0.2	+0.0 +29.4	+0.0 +3.4	+0.0 +0.3	+0.0	49.9	54.0	-4.1	Horiz
8	4512.000M	48.9	+0.0 -37.8 +0.2	+0.0 +32.9	+0.0 +4.5	+0.0 +0.5	+0.0	49.2	54.0	-4.8	Vert
9	2782.800M Ave	54.1	+0.0 -38.6 +0.2	+0.0 +29.5	+0.0 +3.5	+0.0 +0.3	+0.0	49.0	54.0	-5.0	Horiz

^	2782.800M	63.3	+0.0 -38.6 +0.2	+0.0 +29.5	+0.0 +3.5	+0.0 +0.3	+0.0	58.2	54.0	+4.2	Horiz
11	4638.000M	48.5	+0.0 -37.7 +0.2	+0.0 +32.8	+0.0 +4.7	+0.0 +0.4	+0.0	48.9	54.0	-5.1	Vert
12	967.200M QP	12.3	+23.8 +0.0 +0.0	+6.1 +0.0	+6.1 +0.0	+0.0 +0.0	+0.0	48.3	54.0	-5.7	Vert
^	967.200M	16.3	+23.8 +0.0 +0.0	+6.1 +0.0	+6.1 +0.0	+0.0 +0.0	+0.0	52.3	54.0	-1.7	Vert
14	4576.000M	47.3	+0.0 -37.8 +0.2	+0.0 +33.0	+0.0 +4.6	+0.0 +0.5	+0.0	47.8	54.0	-6.2	Vert
15	4638.000M Ave	45.2	+0.0 -37.7 +0.2	+0.0 +32.8	+0.0 +4.7	+0.0 +0.4	+0.0	45.6	54.0	-8.4	Horiz
^	4638.000M	54.1	+0.0 -37.7 +0.2	+0.0 +32.8	+0.0 +4.7	+0.0 +0.4	+0.0	54.5	54.0	+0.5	Horiz
17	5414.400M	43.5	+0.0 -37.5 +0.2	+0.0 +33.9	+0.0 +5.3	+0.0 +0.2	+0.0	45.6	54.0	-8.4	Horiz
18	3609.600M Ave	47.9	+0.0 -38.4 +0.1	+0.0 +31.1	+0.0 +4.1	+0.0 +0.5	+0.0	45.3	54.0	-8.7	Vert
^	3609.600M	56.6	+0.0 -38.4 +0.1	+0.0 +31.1	+0.0 +4.1	+0.0 +0.5	+0.0	54.0	54.0	+0.0	Vert
20	2707.200M Ave	50.7	+0.0 -38.6 +0.2	+0.0 +29.1	+0.0 +3.4	+0.0 +0.3	+0.0	45.1	54.0	-8.9	Vert
^	2707.200M	59.9	+0.0 -38.6 +0.2	+0.0 +29.1	+0.0 +3.4	+0.0 +0.3	+0.0	54.3	54.0	+0.3	Vert
22	3660.800M Ave	46.8	+0.0 -38.3 +0.2	+0.0 +31.6	+0.0 +4.1	+0.0 +0.4	+0.0	44.8	54.0	-9.2	Vert
^	3660.800M	55.0	+0.0 -38.3 +0.2	+0.0 +31.6	+0.0 +4.1	+0.0 +0.4	+0.0	53.0	54.0	-1.0	Vert
24	5414.400M	42.6	+0.0 -37.5 +0.2	+0.0 +33.9	+0.0 +5.3	+0.0 +0.2	+0.0	44.7	54.0	-9.3	Vert
25	3660.800M Ave	46.7	+0.0 -38.3 +0.2	+0.0 +31.6	+0.0 +4.1	+0.0 +0.4	+0.0	44.7	54.0	-9.3	Horiz
^	3660.800M	55.3	+0.0 -38.3 +0.2	+0.0 +31.6	+0.0 +4.1	+0.0 +0.4	+0.0	53.3	54.0	-0.7	Horiz

27	116.800M QP	14.7	+11.5 +0.0 +0.0	+6.0 +0.0	+1.9 +0.0	+0.0 +0.0	+0.0 +0.0	34.1	43.5	-9.4	Vert
^	116.800M	19.4	+11.5 +0.0 +0.0	+6.0 +0.0	+1.9 +0.0	+0.0 +0.0	+0.0 +0.0	38.8	43.5	-4.7	Vert
29	4512.000M Ave	44.3	+0.0 -37.8 +0.2	+0.0 +32.9	+0.0 +4.5	+0.0 +0.5	+0.0 +0.0	44.6	54.0	-9.4	Horiz
^	4512.000M	53.8	+0.0 -37.8 +0.2	+0.0 +32.9	+0.0 +4.5	+0.0 +0.5	+0.0 +0.0	54.1	54.0	+0.1	Horiz
31	3609.600M Ave	46.3	+0.0 -38.4 +0.1	+0.0 +31.1	+0.0 +4.1	+0.0 +0.5	+0.0 +0.0	43.7	54.0	-10.3	Horiz
^	3609.600M	55.2	+0.0 -38.4 +0.1	+0.0 +31.1	+0.0 +4.1	+0.0 +0.5	+0.0 +0.0	52.6	54.0	-1.4	Horiz
33	2707.200M Ave	49.2	+0.0 -38.6 +0.2	+0.0 +29.1	+0.0 +3.4	+0.0 +0.3	+0.0 +0.0	43.6	54.0	-10.4	Horiz
^	2707.200M	58.7	+0.0 -38.6 +0.2	+0.0 +29.1	+0.0 +3.4	+0.0 +0.3	+0.0 +0.0	53.1	54.0	-0.9	Horiz
35	2745.600M Ave	48.6	+0.0 -38.6 +0.2	+0.0 +29.4	+0.0 +3.4	+0.0 +0.3	+0.0 +0.0	43.3	54.0	-10.7	Vert
^	2745.600M	57.2	+0.0 -38.6 +0.2	+0.0 +29.4	+0.0 +3.4	+0.0 +0.3	+0.0 +0.0	51.9	54.0	-2.1	Vert
37	4576.000M Ave	41.2	+0.0 -37.8 +0.2	+0.0 +33.0	+0.0 +4.6	+0.0 +0.5	+0.0 +0.0	41.7	54.0	-12.3	Horiz
^	4576.000M	50.5	+0.0 -37.8 +0.2	+0.0 +33.0	+0.0 +4.6	+0.0 +0.5	+0.0 +0.0	51.0	54.0	-3.0	Horiz
39	1855.200M	87.6	+0.0 -38.9 +0.2	+0.0 +27.3	+0.0 +2.7	+0.0 +0.2	+0.0 +0.0	79.1	104.0	-24.9	Horiz
40	1804.800M	87.7	+0.0 -38.9 +0.2	+0.0 +27.0	+0.0 +2.6	+0.0 +0.2	+0.0 +0.0	78.8	104.0	-25.2	Horiz
41	1804.800M	86.6	+0.0 -38.9 +0.2	+0.0 +27.0	+0.0 +2.6	+0.0 +0.2	+0.0 +0.0	77.7	104.0	-26.3	Vert
42	1855.200M	85.5	+0.0 -38.9 +0.2	+0.0 +27.3	+0.0 +2.7	+0.0 +0.2	+0.0 +0.0	77.0	104.0	-27.0	Vert
43	927.600M	96.1	+0.0 -41.9 +38.9	+0.0 +0.0	+0.0 +1.8	+0.0 +0.1	+0.0 +0.0	95.0	124.0	-29.0	Vert

44	1830.400M	82.2	+0.0 -38.9 +0.2	+0.0 +27.1	+0.0 +2.6	+0.0 +0.2	+0.0	73.4	104.0	-30.6	Vert
45	1830.400M	80.3	+0.0 -38.9 +0.2	+0.0 +27.1	+0.0 +2.6	+0.0 +0.2	+0.0	71.5	104.0	-32.5	Horiz
46	5565.600M	43.2	+0.0 -37.4 +0.2	+0.0 +33.9	+0.0 +5.5	+0.0 +0.2	+0.0	45.6	104.0	-58.4	Vert
47	5491.200M	42.8	+0.0 -37.5 +0.2	+0.0 +34.1	+0.0 +5.5	+0.0 +0.2	+0.0	45.3	104.0	-58.7	Vert
48	5491.200M	42.7	+0.0 -37.5 +0.2	+0.0 +34.1	+0.0 +5.5	+0.0 +0.2	+0.0	45.2	104.0	-58.8	Horiz
49	5565.600M	41.2	+0.0 -37.4 +0.2	+0.0 +33.9	+0.0 +5.5	+0.0 +0.2	+0.0	43.6	104.0	-60.4	Horiz
50	61.550M	23.4	+5.8 +0.0 +0.0	+6.0 +0.0	+1.4 +0.0	+0.0 +0.0	+0.0	36.6	104.0	-67.4	Vert

Test Location: CKC Laboratories, Inc. • 110 N. Olinda Place • Brea, CA 92823 • 714-993-6112
 Customer: **Itron, Inc.**
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**
 Work Order #: **102692** Date: 6/11/2019
 Test Type: **Maximized Emissions** Time: 10:08:45
 Tested By: Don Nguyen Sequence#: 7
 Software: EMITest 5.03.12

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 5			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 5			

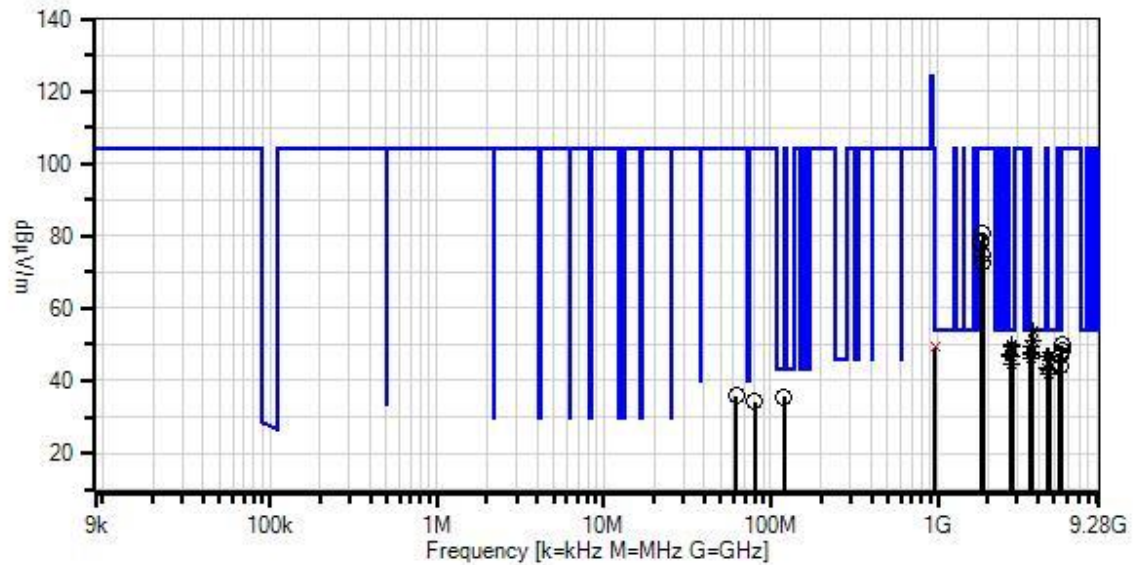
Test Conditions / Notes:

The EUT is placed on table top. The serial port is connected to a support laptop via serial to USB adapter. The laptop is running software Command Line Interface Tool to turn on TX. The EUT is powered from fresh battery 6.0Vdc.
 Modulation: 50kbps GFSK

 Frequency of measurement: 9k-9280MHz
 9kHz -150 kHz;RBW=200 Hz,VBW=600 Hz;
 150 kHz-30 MHz;RBW=9 kHz,VBW=27 kHz;
 30 MHz-1000 MHz;RBW=120 kHz,VBW=360 kHz,
 1000 MHz-9280MHz;RBW=1 MHz,VBW=3 MHz.
 RBW=100kHz, VBW=300kHz (-20dbc limit)

 Site A
 Test Method: ANSI C63.10 (2013)
 Temperature (°C): 23.9
 Relative Humidity (%): 62

Itron, Inc. WO#: 102692 Sequence#: 7 Date: 6/11/2019
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: 5.03.12

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN00314	Loop Antenna	6502	5/13/2018	5/13/2020
	AN00309	Preamp	8447D	2/19/2018	2/19/2020
	ANP05050	Cable	RG223/U	12/24/2018	12/24/2020
T1	AN01995	Biconilog Antenna	CBL6111C	4/23/2018	4/23/2020
T2	ANP05275	Attenuator	1W	4/5/2018	4/5/2020
T3	ANP05198	Cable-Amplitude +15C to +45C (dB)	8268	12/4/2018	12/4/2020
T4	AN02672	Spectrum Analyzer	E4446A	3/13/2019	3/13/2021
T5	AN00786	Preamp	83017A	5/12/2018	5/12/2020
T6	AN00849	Horn Antenna	3115	3/14/2018	3/14/2020
T7	ANP07139	Cable	ANDL1- PNMNM-48	3/4/2019	3/4/2021
T8	ANP07246	Cable	32022-29094K- 29094K-24TC	7/5/2018	7/5/2020
T9	AN03169	High Pass Filter	HM1155-11SS	5/8/2019	5/8/2021

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	3710.400M Ave	55.5	+0.0 -38.3 +0.2	+0.0 +31.9	+0.0 +4.1	+0.0 +0.4	+0.0	53.8	54.0	-0.2	Horiz
^	3710.400M	64.9	+0.0 -38.3 +0.2	+0.0 +31.9	+0.0 +4.1	+0.0 +0.4	+0.0	63.2	54.0	+9.2	Horiz
3	3710.400M Ave	52.7	+0.0 -38.3 +0.2	+0.0 +31.9	+0.0 +4.1	+0.0 +0.4	+0.0	51.0	54.0	-3.0	Vert
^	3710.400M	61.3	+0.0 -38.3 +0.2	+0.0 +31.9	+0.0 +4.1	+0.0 +0.4	+0.0	59.6	54.0	+5.6	Vert
5	2782.800M Ave	55.2	+0.0 -38.6 +0.2	+0.0 +29.5	+0.0 +3.5	+0.0 +0.3	+0.0	50.1	54.0	-3.9	Horiz
^	2782.800M	64.5	+0.0 -38.6 +0.2	+0.0 +29.5	+0.0 +3.5	+0.0 +0.3	+0.0	59.4	54.0	+5.4	Horiz
7	3660.800M Ave	51.7	+0.0 -38.3 +0.2	+0.0 +31.6	+0.0 +4.1	+0.0 +0.4	+0.0	49.7	54.0	-4.3	Horiz
^	3660.800M	61.2	+0.0 -38.3 +0.2	+0.0 +31.6	+0.0 +4.1	+0.0 +0.4	+0.0	59.2	54.0	+5.2	Horiz

9	2782.800M Ave	54.5	+0.0 -38.6 +0.2	+0.0 +29.5	+0.0 +3.5	+0.0 +0.3	+0.0	49.4	54.0	-4.6	Vert
^	2782.800M	64.0	+0.0 -38.6 +0.2	+0.0 +29.5	+0.0 +3.5	+0.0 +0.3	+0.0	58.9	54.0	+4.9	Vert
11	967.197M QP	13.2	+23.8 +0.0 +0.0	+6.1 +0.0	+6.1 +0.0	+0.0 +0.0	+0.0	49.2	54.0	-4.8	Vert
^	967.197M	16.6	+23.8 +0.0 +0.0	+6.1 +0.0	+6.1 +0.0	+0.0 +0.0	+0.0	52.6	54.0	-1.4	Vert
13	3660.800M Ave	49.7	+0.0 -38.3 +0.2	+0.0 +31.6	+0.0 +4.1	+0.0 +0.4	+0.0	47.7	54.0	-6.3	Vert
^	3660.800M	58.8	+0.0 -38.3 +0.2	+0.0 +31.6	+0.0 +4.1	+0.0 +0.4	+0.0	56.8	54.0	+2.8	Vert
15	5414.400M	45.3	+0.0 -37.5 +0.2	+0.0 +33.9	+0.0 +5.3	+0.0 +0.2	+0.0	47.4	54.0	-6.6	Horiz
16	3609.600M Ave	49.8	+0.0 -38.4 +0.1	+0.0 +31.1	+0.0 +4.1	+0.0 +0.5	+0.0	47.2	54.0	-6.8	Vert
^	3609.600M	59.1	+0.0 -38.4 +0.1	+0.0 +31.1	+0.0 +4.1	+0.0 +0.5	+0.0	56.5	54.0	+2.5	Vert
18	2707.200M Ave	52.7	+0.0 -38.6 +0.2	+0.0 +29.1	+0.0 +3.4	+0.0 +0.3	+0.0	47.1	54.0	-6.9	Horiz
^	2707.200M	61.1	+0.0 -38.6 +0.2	+0.0 +29.1	+0.0 +3.4	+0.0 +0.3	+0.0	55.5	54.0	+1.5	Horiz
20	4638.000M Ave	46.3	+0.0 -37.7 +0.2	+0.0 +32.8	+0.0 +4.7	+0.0 +0.4	+0.0	46.7	54.0	-7.3	Horiz
^	4638.000M	55.1	+0.0 -37.7 +0.2	+0.0 +32.8	+0.0 +4.7	+0.0 +0.4	+0.0	55.5	54.0	+1.5	Horiz
22	4576.000M Ave	46.2	+0.0 -37.8 +0.2	+0.0 +33.0	+0.0 +4.6	+0.0 +0.5	+0.0	46.7	54.0	-7.3	Horiz
^	4576.000M	55.4	+0.0 -37.8 +0.2	+0.0 +33.0	+0.0 +4.6	+0.0 +0.5	+0.0	55.9	54.0	+1.9	Horiz
24	2745.600M Ave	51.9	+0.0 -38.6 +0.2	+0.0 +29.4	+0.0 +3.4	+0.0 +0.3	+0.0	46.6	54.0	-7.4	Horiz
^	2745.600M	61.6	+0.0 -38.6 +0.2	+0.0 +29.4	+0.0 +3.4	+0.0 +0.3	+0.0	56.3	54.0	+2.3	Horiz

26	4512.000M Ave	46.3	+0.0 -37.8 +0.2	+0.0 +32.9	+0.0 +4.5	+0.0 +0.5	+0.0	46.6	54.0	-7.4	Horiz
^	4512.000M	55.8	+0.0 -37.8 +0.2	+0.0 +32.9	+0.0 +4.5	+0.0 +0.5	+0.0	56.1	54.0	+2.1	Horiz
28	2707.200M Ave	52.1	+0.0 -38.6 +0.2	+0.0 +29.1	+0.0 +3.4	+0.0 +0.3	+0.0	46.5	54.0	-7.5	Vert
^	2707.200M	61.1	+0.0 -38.6 +0.2	+0.0 +29.1	+0.0 +3.4	+0.0 +0.3	+0.0	55.5	54.0	+1.5	Vert
30	120.500M	16.0	+11.7 +0.0 +0.0	+6.0 +0.0	+1.9 +0.0	+0.0 +0.0	+0.0	35.6	43.5	-7.9	Vert
31	3609.600M Ave	48.6	+0.0 -38.4 +0.1	+0.0 +31.1	+0.0 +4.1	+0.0 +0.5	+0.0	46.0	54.0	-8.0	Horiz
^	3609.600M	57.5	+0.0 -38.4 +0.1	+0.0 +31.1	+0.0 +4.1	+0.0 +0.5	+0.0	54.9	54.0	+0.9	Horiz
33	2745.600M Ave	50.1	+0.0 -38.6 +0.2	+0.0 +29.4	+0.0 +3.4	+0.0 +0.3	+0.0	44.8	54.0	-9.2	Vert
^	2745.600M	58.9	+0.0 -38.6 +0.2	+0.0 +29.4	+0.0 +3.4	+0.0 +0.3	+0.0	53.6	54.0	-0.4	Vert
35	5414.400M	41.7	+0.0 -37.5 +0.2	+0.0 +33.9	+0.0 +5.3	+0.0 +0.2	+0.0	43.8	54.0	-10.2	Vert
36	4512.000M Ave	43.2	+0.0 -37.8 +0.2	+0.0 +32.9	+0.0 +4.5	+0.0 +0.5	+0.0	43.5	54.0	-10.5	Vert
^	4512.000M	51.3	+0.0 -37.8 +0.2	+0.0 +32.9	+0.0 +4.5	+0.0 +0.5	+0.0	51.6	54.0	-2.4	Vert
38	4638.000M Ave	42.7	+0.0 -37.7 +0.2	+0.0 +32.8	+0.0 +4.7	+0.0 +0.4	+0.0	43.1	54.0	-10.9	Vert
^	4638.000M	51.4	+0.0 -37.7 +0.2	+0.0 +32.8	+0.0 +4.7	+0.0 +0.4	+0.0	51.8	54.0	-2.2	Vert
40	4576.000M Ave	41.2	+0.0 -37.8 +0.2	+0.0 +33.0	+0.0 +4.6	+0.0 +0.5	+0.0	41.7	54.0	-12.3	Vert
^	4576.000M	49.7	+0.0 -37.8 +0.2	+0.0 +33.0	+0.0 +4.6	+0.0 +0.5	+0.0	50.2	54.0	-3.8	Vert
42	1855.200M	89.3	+0.0 -38.9 +0.2	+0.0 +27.3	+0.0 +2.7	+0.0 +0.2	+0.0	80.8	104.0	-23.2	Horiz

43	1855.200M	89.2	+0.0 -38.9 +0.2	+0.0 +27.3 +2.7	+0.0 +2.7 +0.2	+0.0 +0.0 +0.0	+0.0 +0.0 +0.0	80.7	104.0	-23.3	Vert
44	1804.800M	87.7	+0.0 -38.9 +0.2	+0.0 +27.0 +2.6	+0.0 +2.6 +0.2	+0.0 +0.0 +0.0	+0.0 +0.0 +0.0	78.8	104.0	-25.2	Horiz
45	1804.800M	87.1	+0.0 -38.9 +0.2	+0.0 +27.0 +2.6	+0.0 +2.6 +0.2	+0.0 +0.0 +0.0	+0.0 +0.0 +0.0	78.2	104.0	-25.8	Vert
46	1830.400M	83.5	+0.0 -38.9 +0.2	+0.0 +27.1 +2.6	+0.0 +2.6 +0.2	+0.0 +0.0 +0.0	+0.0 +0.0 +0.0	74.7	104.0	-29.3	Horiz
47	1830.400M	81.5	+0.0 -38.9 +0.2	+0.0 +27.1 +2.6	+0.0 +2.6 +0.2	+0.0 +0.0 +0.0	+0.0 +0.0 +0.0	72.7	104.0	-31.3	Vert
48	5565.600M	47.5	+0.0 -37.4 +0.2	+0.0 +33.9 +5.5	+0.0 +5.5 +0.2	+0.0 +0.0 +0.0	+0.0 +0.0 +0.0	49.9	104.0	-54.1	Horiz
49	5565.600M	46.0	+0.0 -37.4 +0.2	+0.0 +33.9 +5.5	+0.0 +5.5 +0.2	+0.0 +0.0 +0.0	+0.0 +0.0 +0.0	48.4	104.0	-55.6	Vert
50	5491.200M	44.6	+0.0 -37.5 +0.2	+0.0 +34.1 +5.5	+0.0 +5.5 +0.2	+0.0 +0.0 +0.0	+0.0 +0.0 +0.0	47.1	104.0	-56.9	Vert
51	5491.200M	44.4	+0.0 -37.5 +0.2	+0.0 +34.1 +5.5	+0.0 +5.5 +0.2	+0.0 +0.0 +0.0	+0.0 +0.0 +0.0	46.9	104.0	-57.1	Horiz
52	62.250M	22.5	+5.8 +0.0 +0.0	+6.0 +0.0 +0.0	+1.4 +0.0 +0.0	+0.0 +0.0 +0.0	+0.0 +0.0 +0.0	35.7	104.0	-68.3	Vert
53	80.500M	18.9	+7.8 +0.0 +0.0	+6.0 +0.0 +0.0	+1.6 +0.0 +0.0	+0.0 +0.0 +0.0	+0.0 +0.0 +0.0	34.3	104.0	-69.7	Vert

Band Edge

Band Edge Summary – Configuration 2 (Remote)

Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
614	50kbps GFSK lv3	Integral	42.0	<46	Pass
902	50kbps GFSK lv3	Integral	77.8	<110.1	Pass
928	50kbps GFSK lv3	Integral	78.4	<110.1	Pass
960	50kbps GFSK lv3	Integral	47.5	<54	Pass
902	50kbps GFSK lv3 Hopping	Integral	78.3	<110.1	Pass
928	50kbps GFSK lv3 Hopping	Integral	76.8	<110.1	Pass

Band Edge Summary-Configuration 3 (PIT)

Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
614	50kbps GFSK lv3	Integral	41.9	<46	Pass
902	50kbps GFSK lv3	Integral	74.0	<106.9	Pass
928	50kbps GFSK lv3	Integral	76.8	<106.9	Pass
960	50kbps GFSK lv3	Integral	48.7	<54	Pass
902	50kbps GFSK lv3 Hopping	Integral	74.4	<106.9	Pass
928	50kbps GFSK lv3 Hopping	Integral	73.7	<106.9	Pass

Band Edge Summary-Configuration 4 (PIT + antenna)

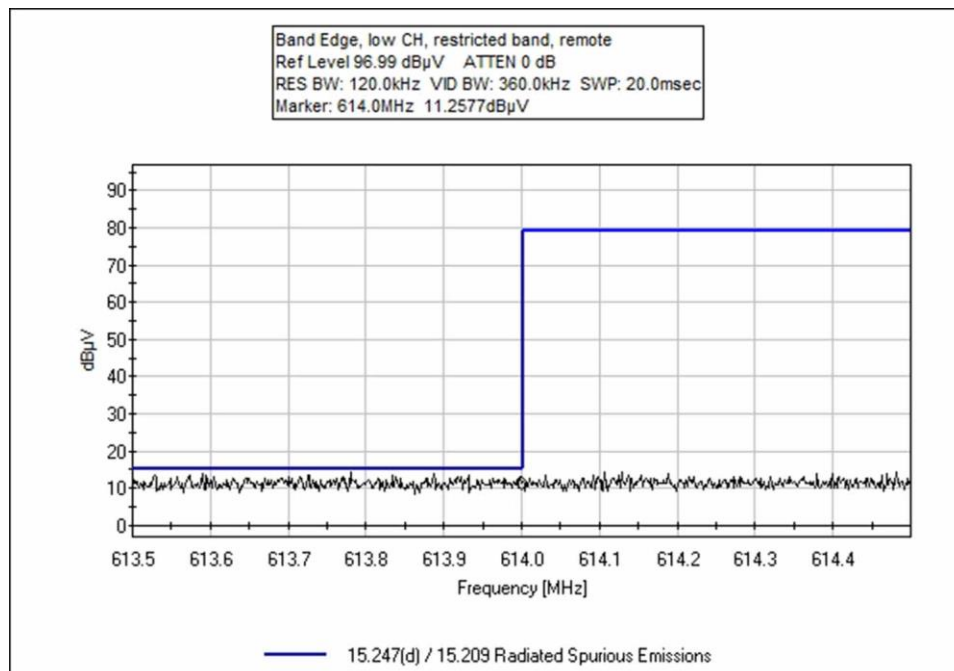
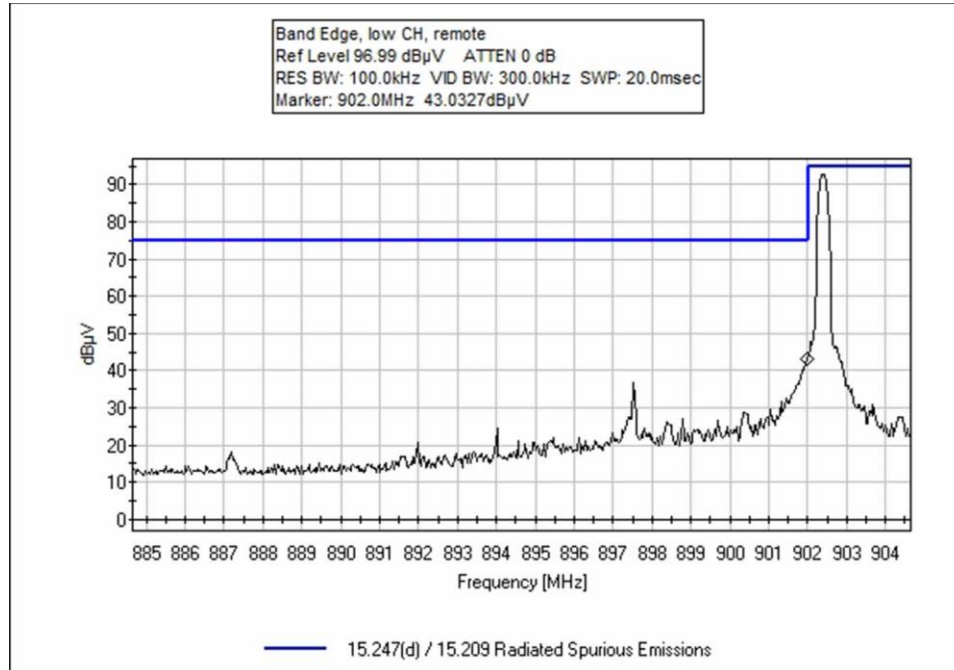
Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
614	50kbps GFSK lv3	External	40.6	<46	Pass
902	50kbps GFSK lv3	External	70.6	<104.0	Pass
928	50kbps GFSK lv3	External	70.8	<104.0	Pass
960	50kbps GFSK lv3	External	48.7	<54	Pass
902	50kbps GFSK lv3 Hopping	External	66.1	<104.0	Pass
928	50kbps GFSK lv3 Hopping	External	69.2	<104.0	Pass

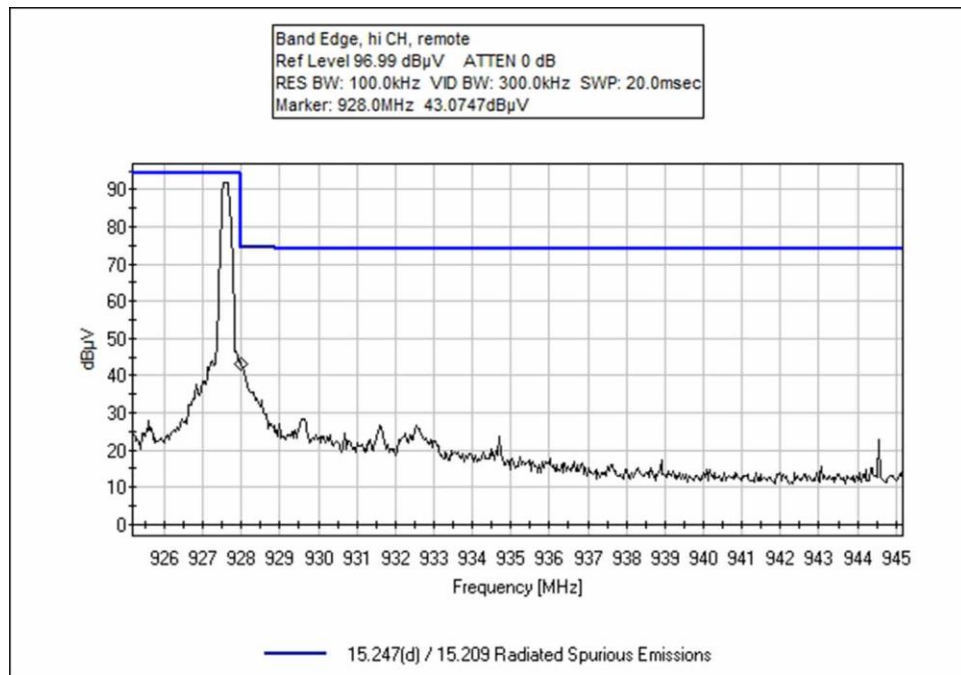
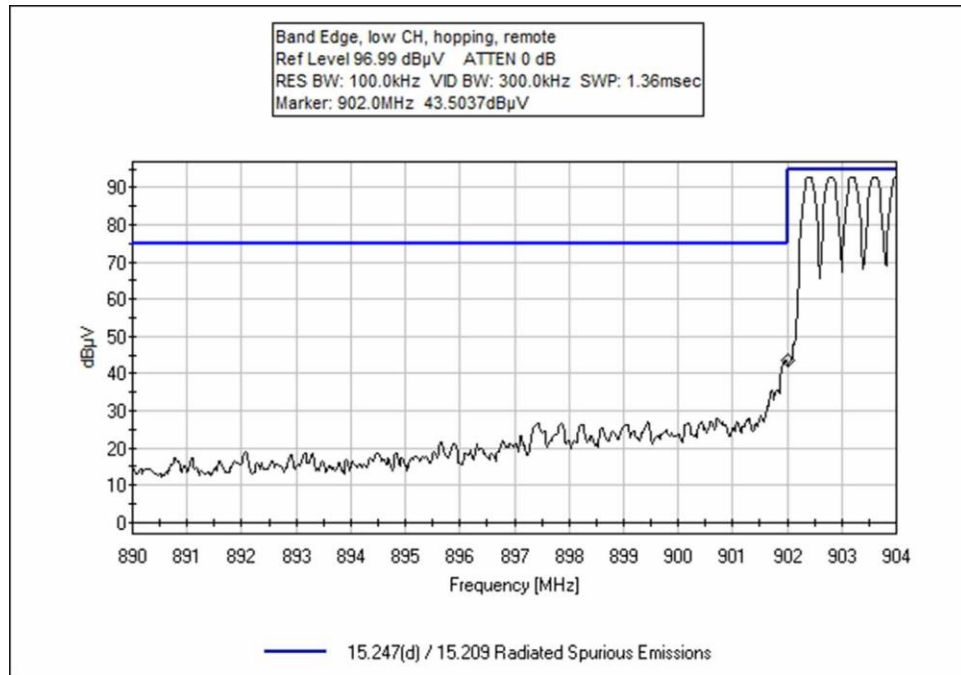
Band Edge Summary-Configuration 5 (PIT + antenna over ground plane)

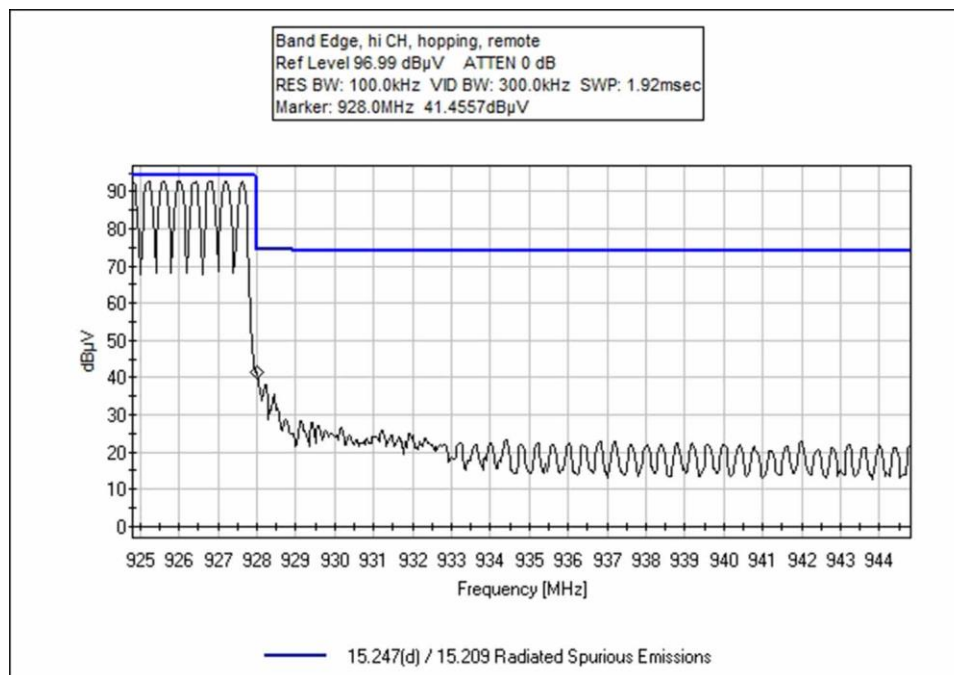
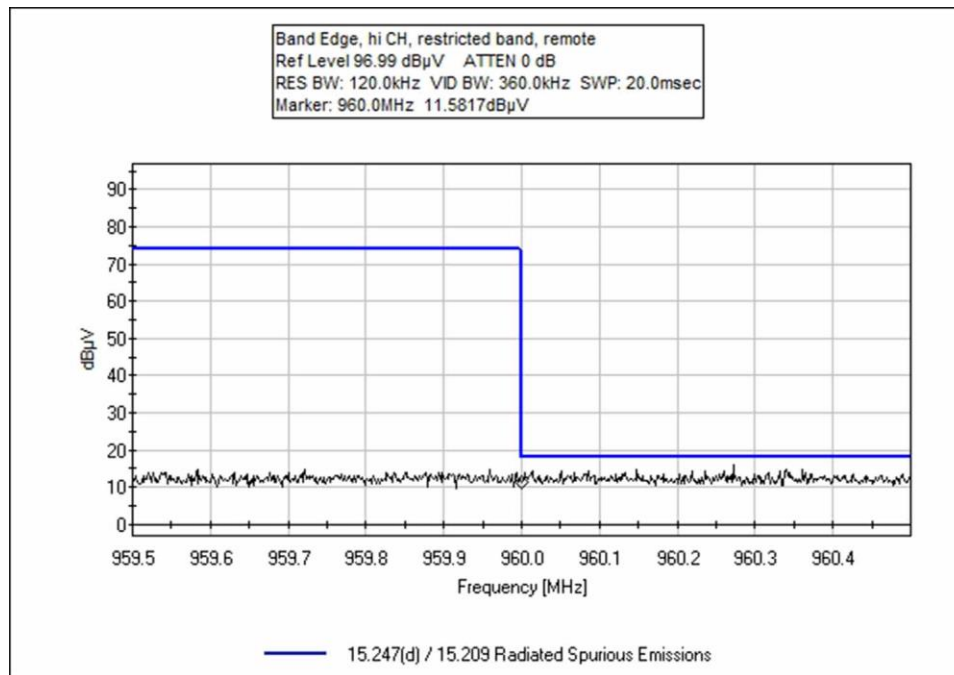
Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
614	50kbps GFSK lv3	External	42.4	<46	Pass
902	50kbps GFSK lv3	External	72.1	<105.7	Pass
928	50kbps GFSK lv3	External	73.1	<105.7	Pass
960	50kbps GFSK lv3	External	49.3	<54	Pass
902	50kbps GFSK lv3 Hopping	External	68.8	<105.7	Pass
928	50kbps GFSK lv3 Hopping	External	73.7	<105.7	Pass

Band Edge Plots

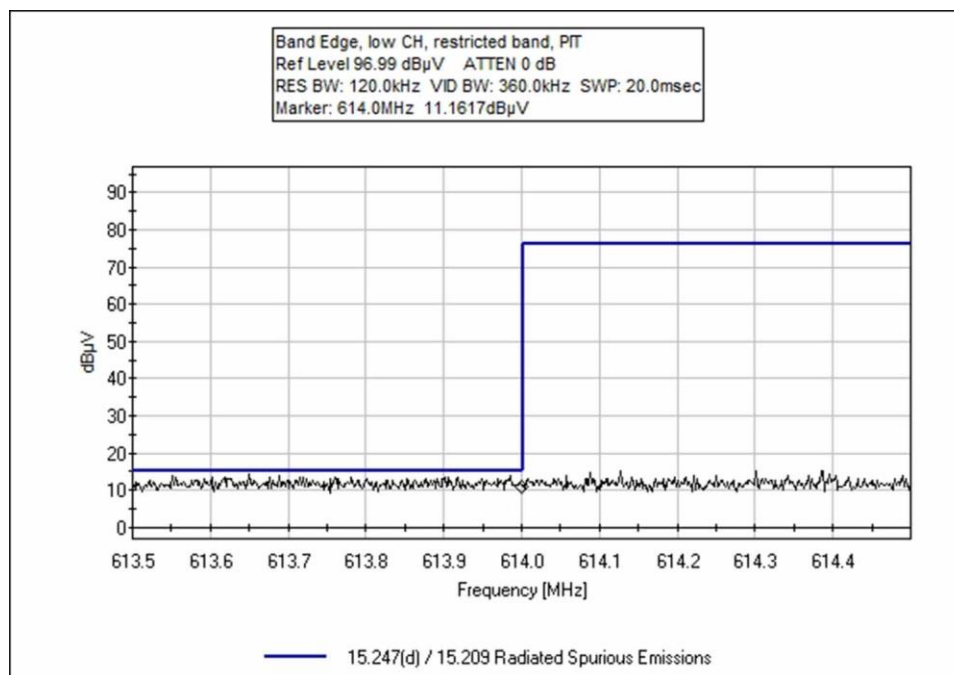
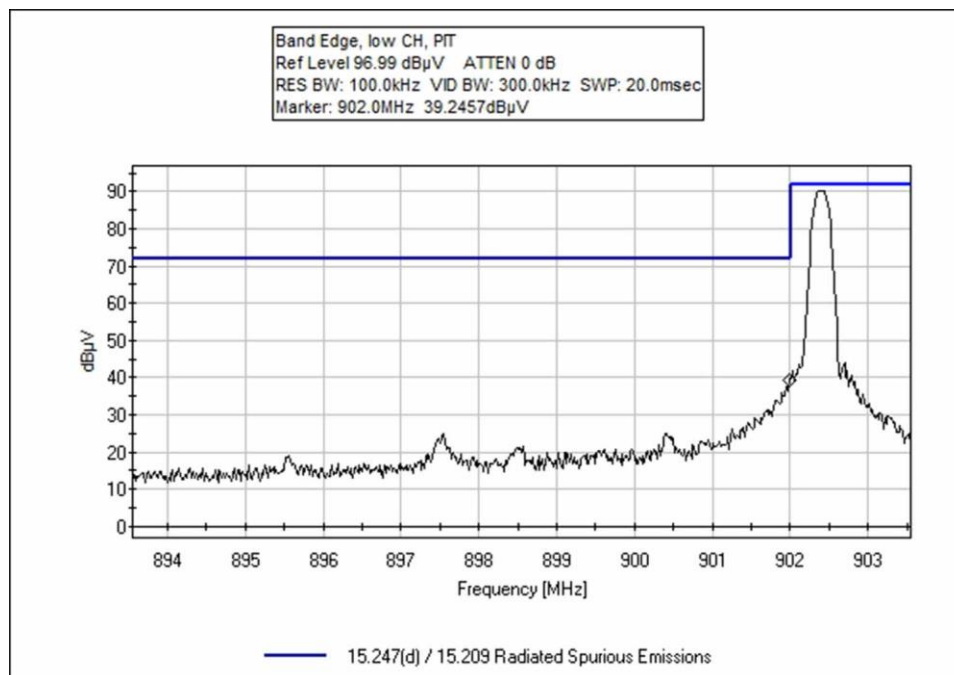
Configuration 2

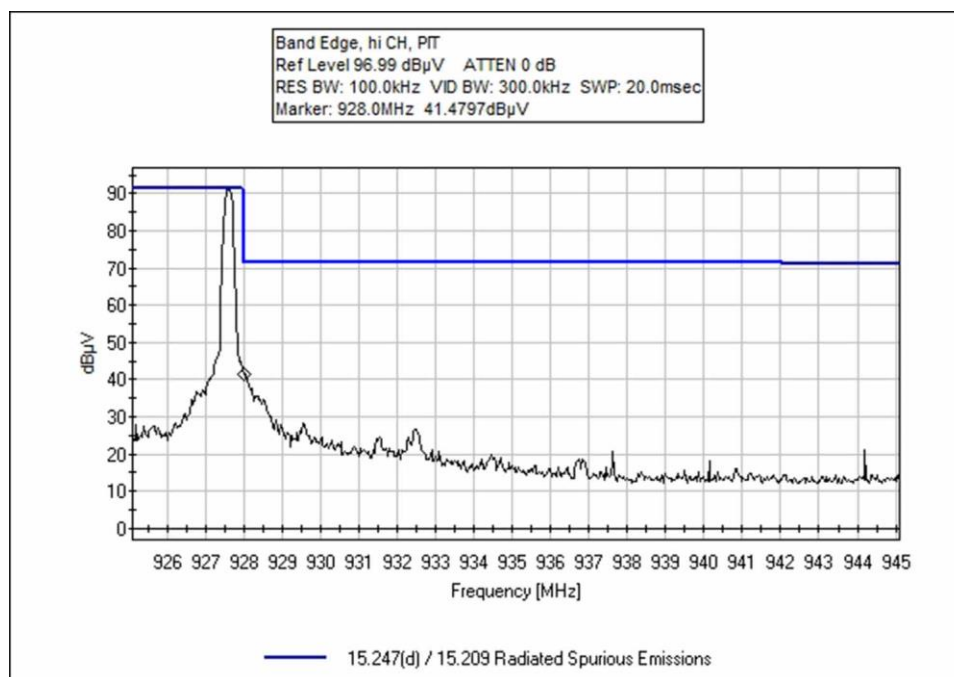
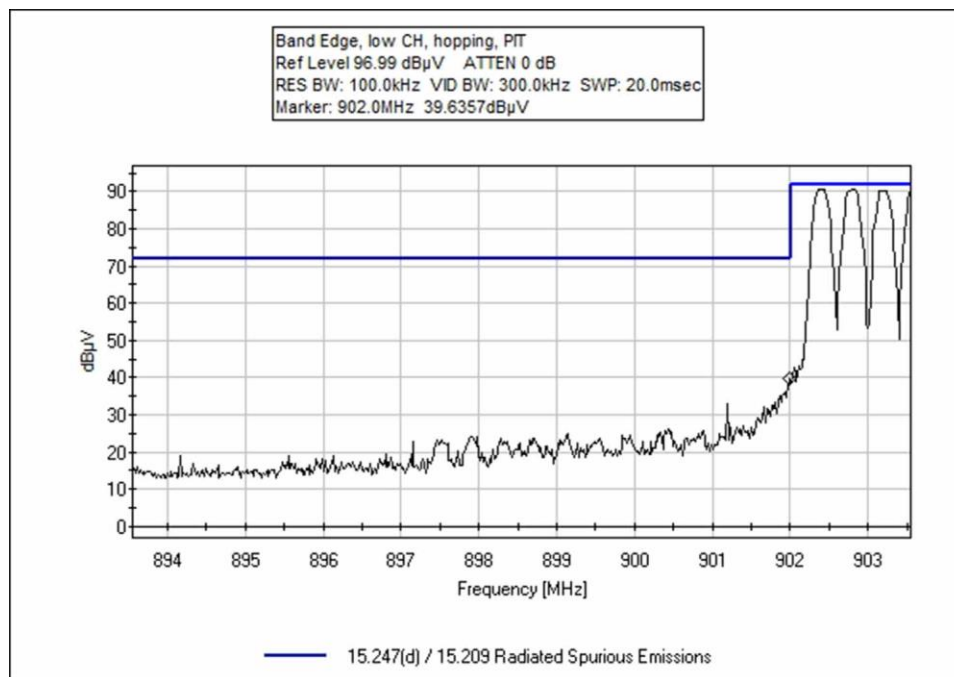


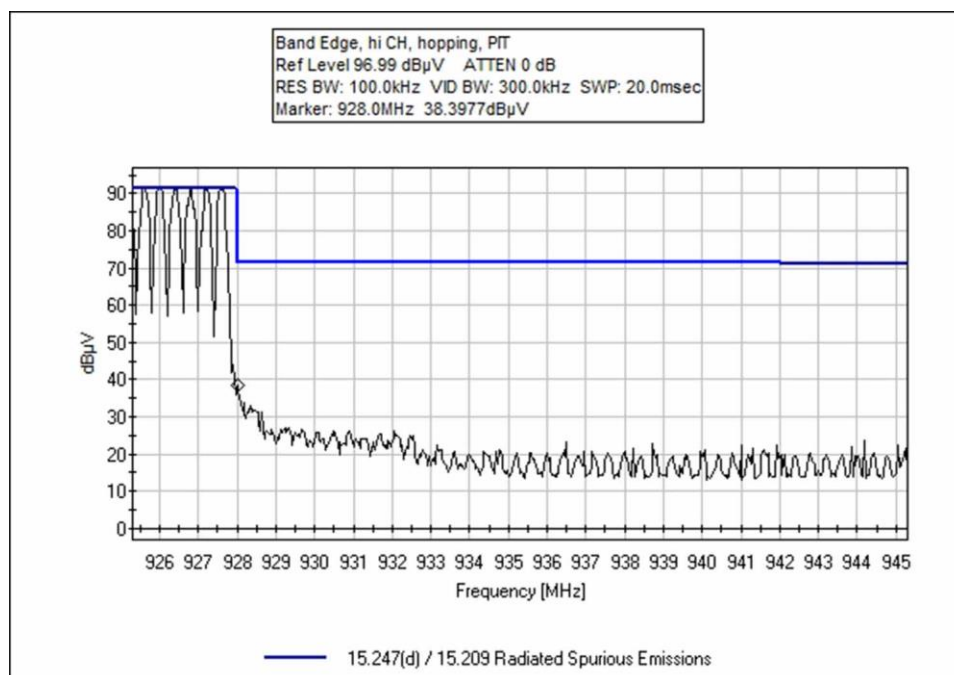
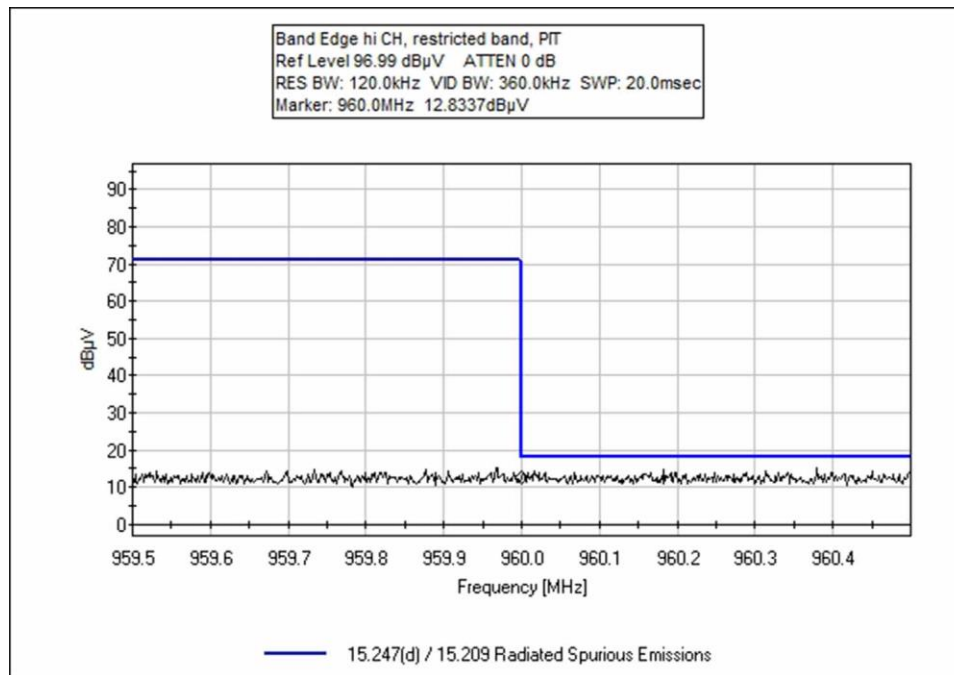




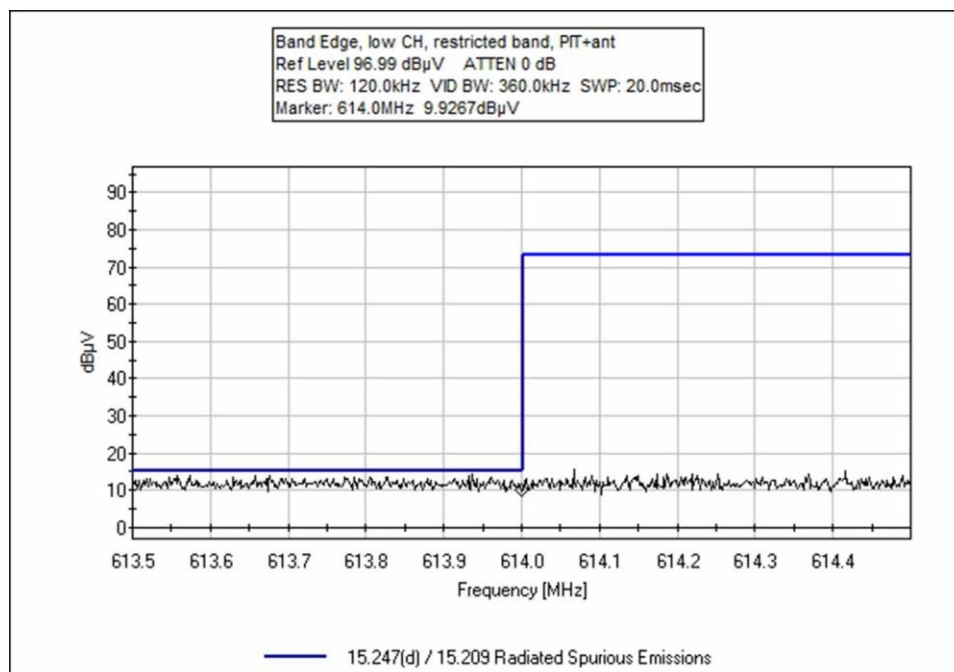
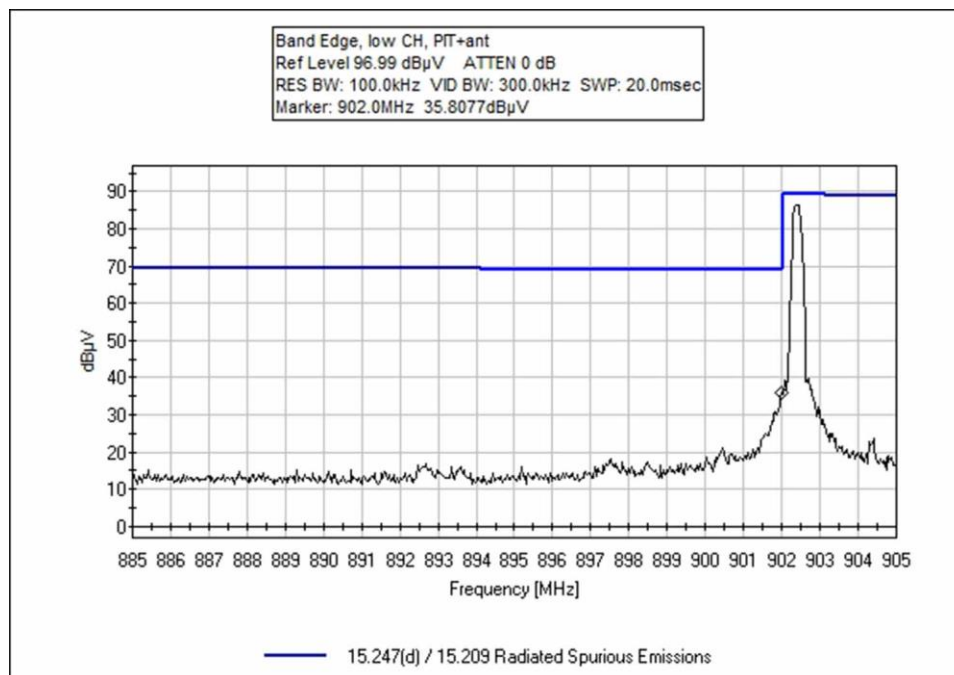
Configuration 3

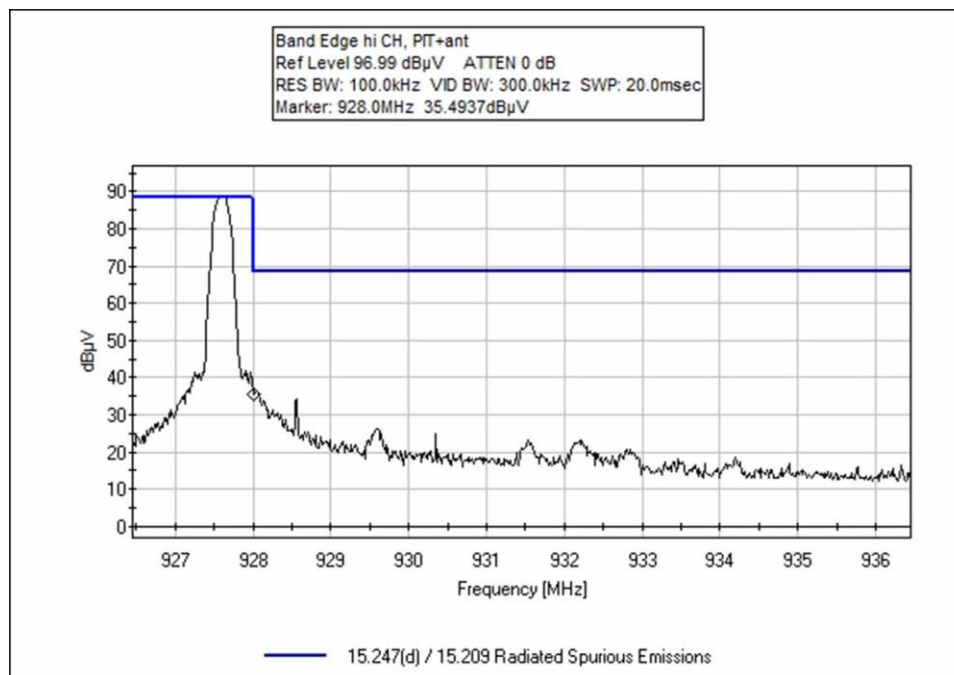
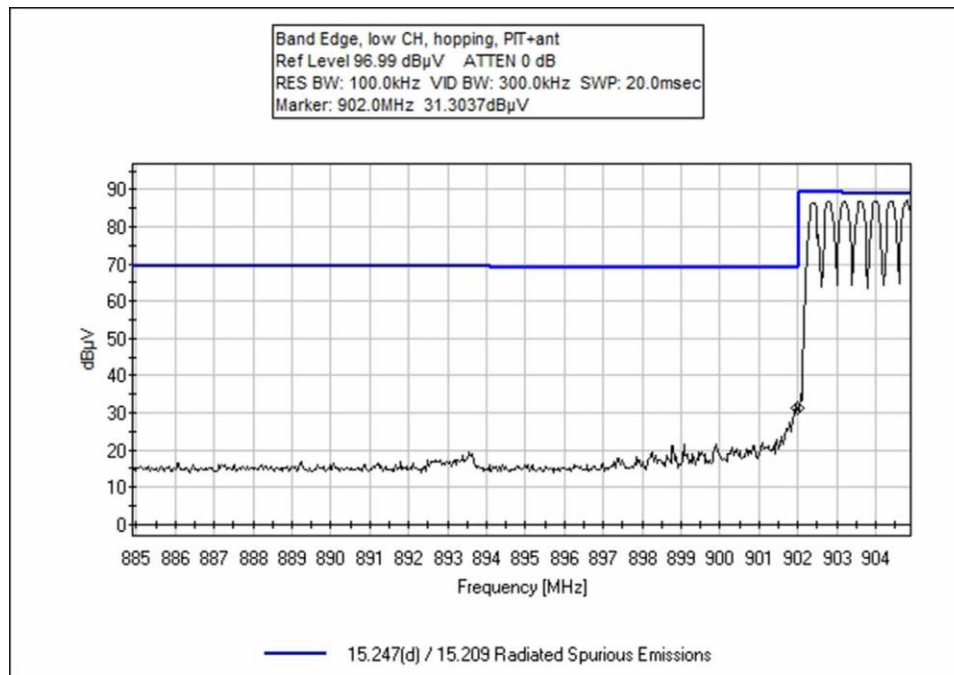


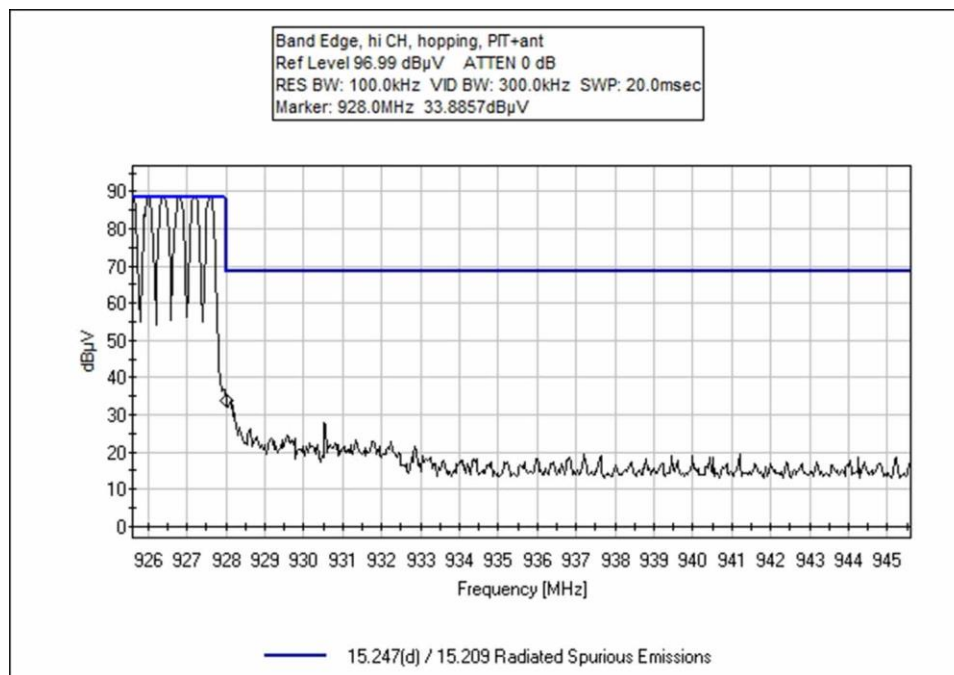
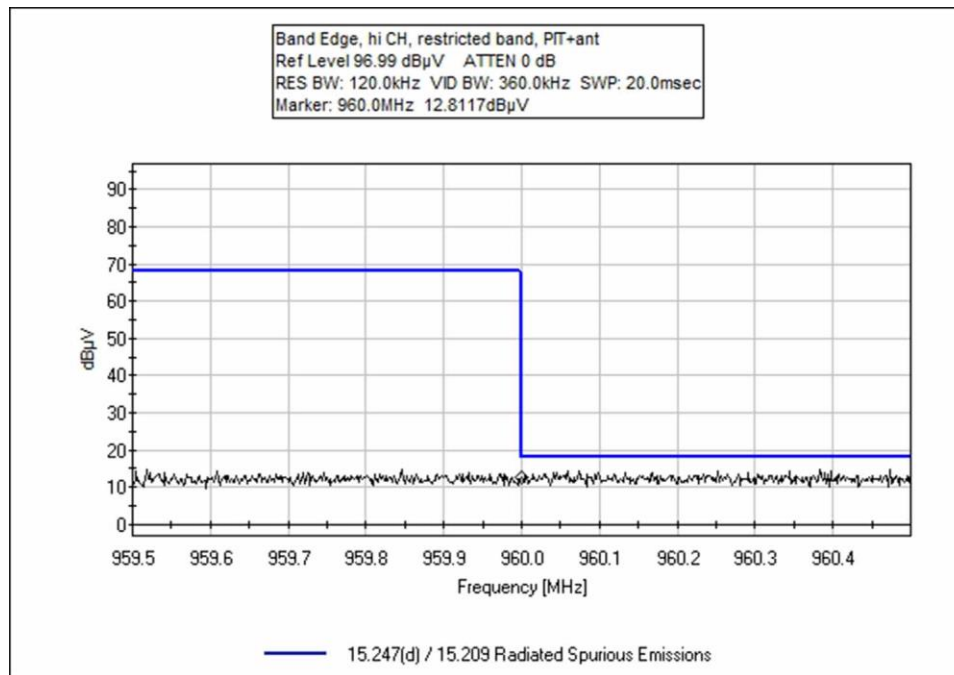




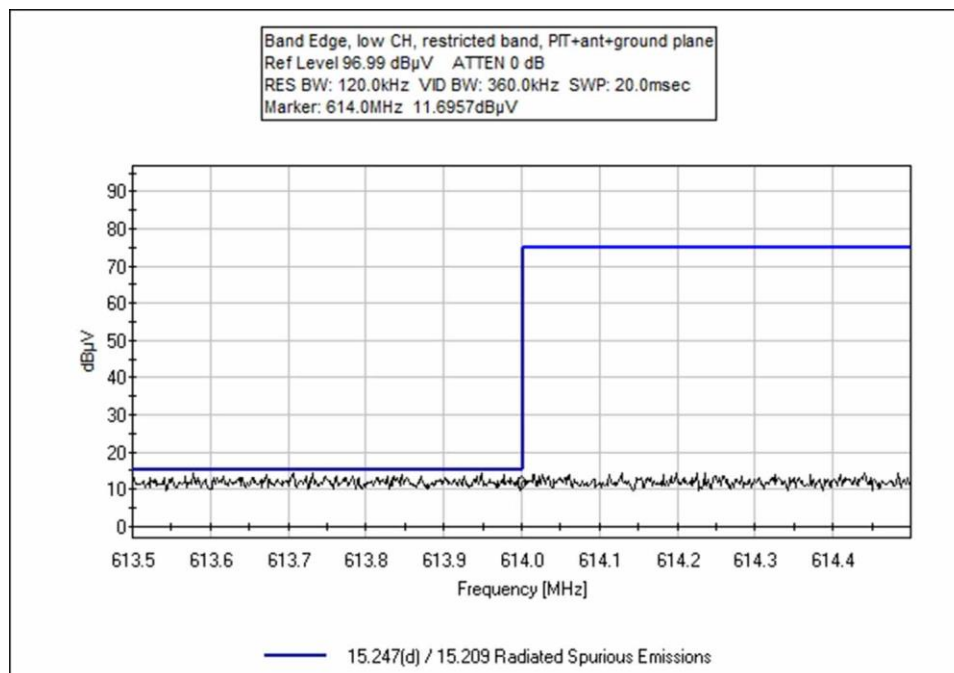
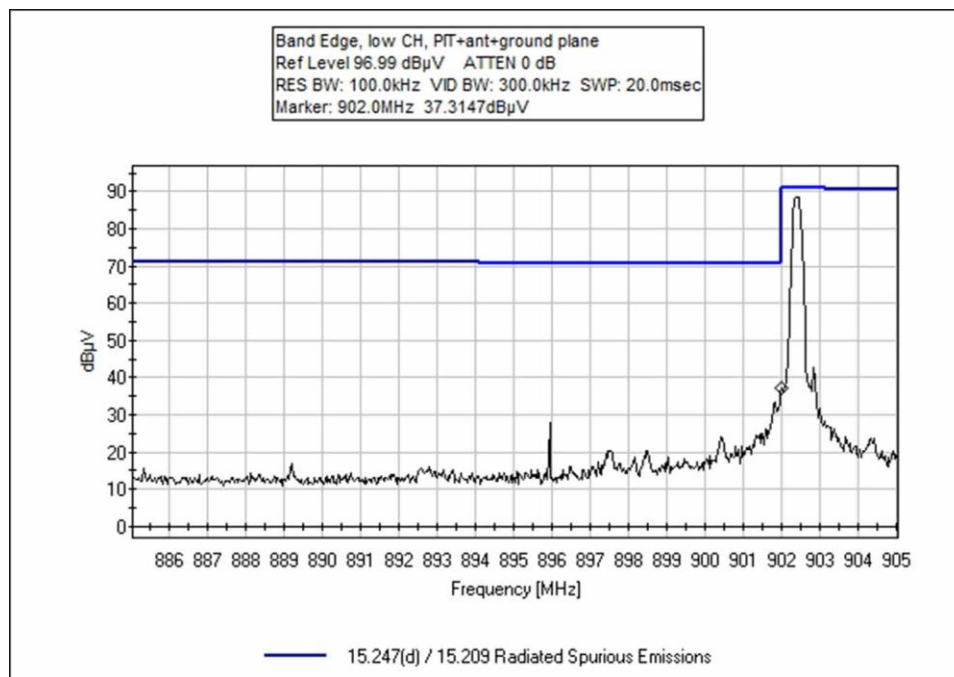
Configuration 4

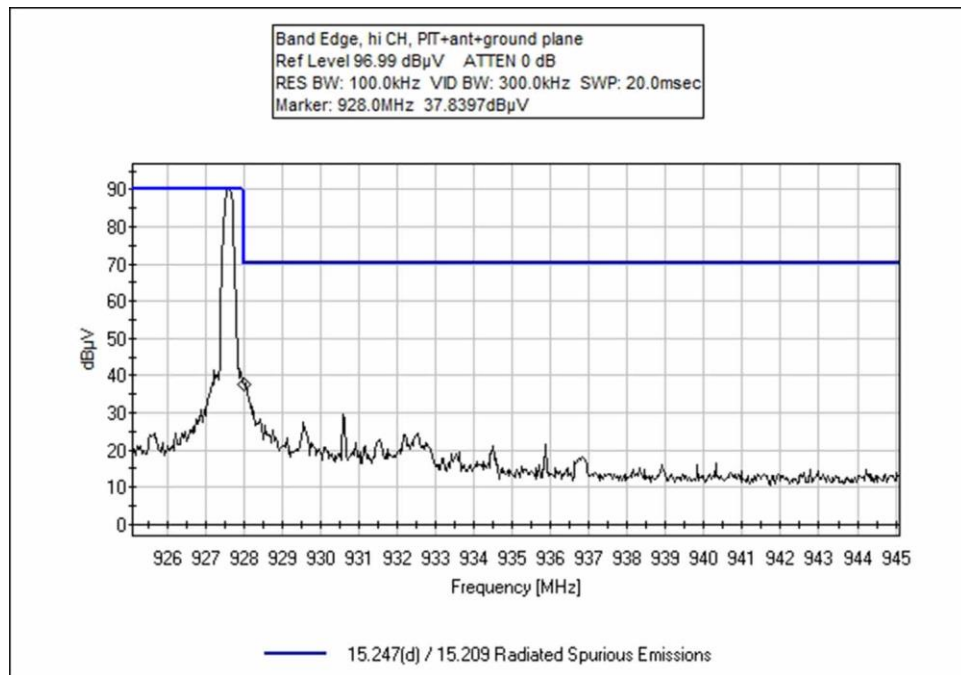
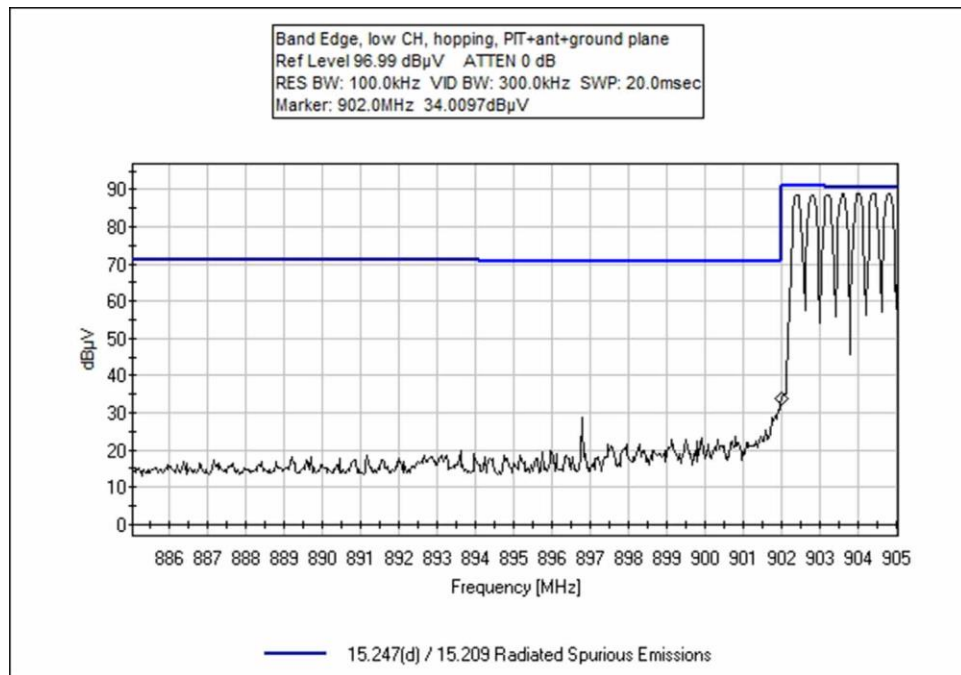


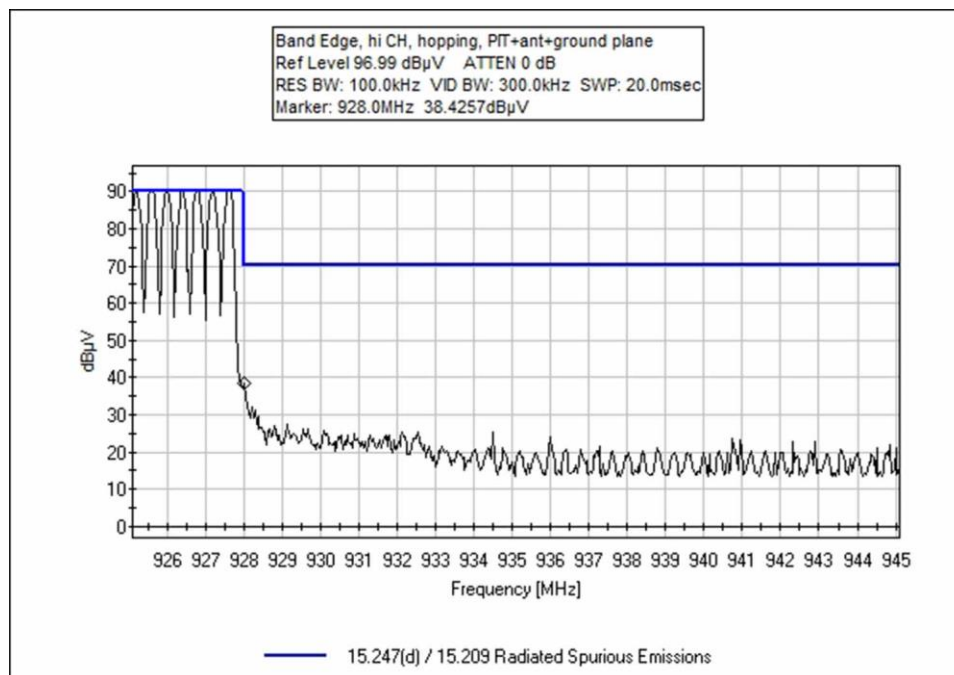
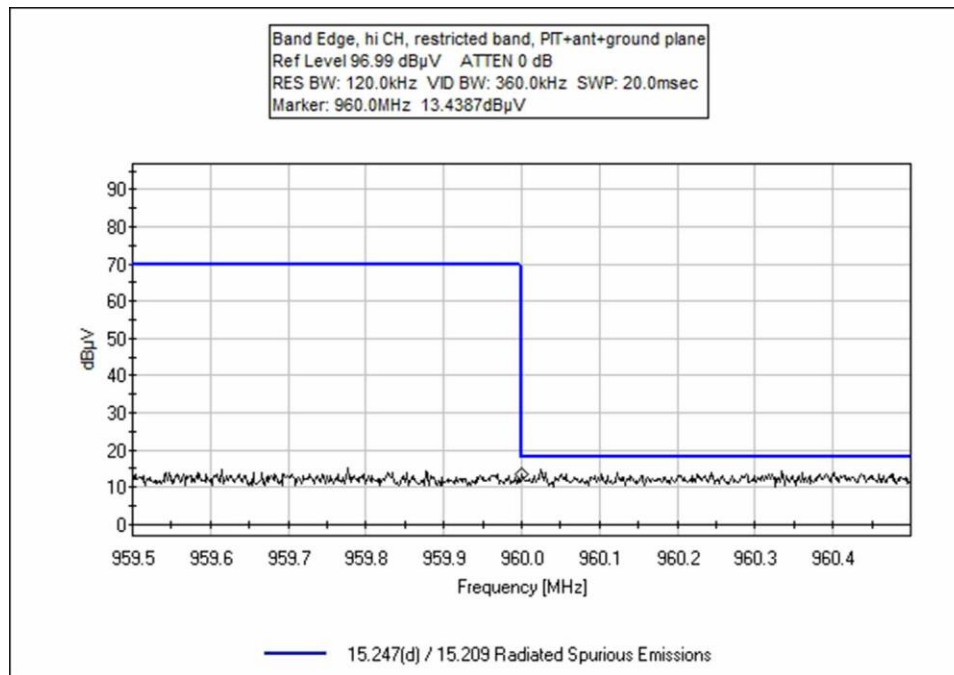




Configuration 5







Test Setup / Conditions / Data

Test Location: CKC Laboratories, Inc. • 110 N. Olinda Place • Brea, CA 92823 • 714-993-6112
 Customer: **Itron, Inc.**
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**
 Work Order #: **102692** Date: 6/10/2019
 Test Type: **Maximized Emissions** Time: 10:19:06
 Tested By: Don Nguyen Sequence#: 2
 Software: EMITest 5.03.12

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

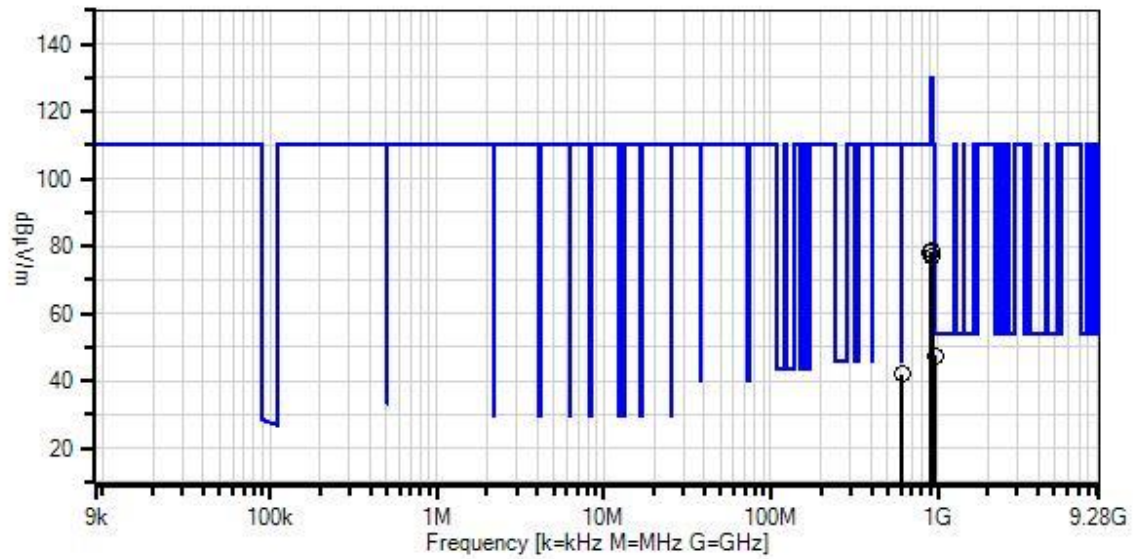
Test Conditions / Notes:

The EUT is placed on table top. The serial port is connected to a support laptop via serial to USB adapter. The laptop is running software Command Line Interface Tool to turn on TX. The EUT is powered from fresh battery 6.0Vdc.
 Modulation: 50kbps GFSK

 Frequency of measurement: 902-928MHz
 RBW=100kHz, VBW=300kHz (-20dBc limit)
 RBW=120kHz, VBW=360kHz (restricted band limit)

 Site A
 Test Method: ANSI C63.10 (2013)
 Temperature (°C): 23.9
 Relative Humidity (%): 62

Itron, Inc. WO#: 102692 Sequence#: 2 Date: 6/10/2019
 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: 5.03.12

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN01995	Biconilog Antenna	CBL6111C	4/23/2018	4/23/2020
T2	ANP05275	Attenuator	1W	4/5/2018	4/5/2020
T3	ANP05198	Cable-Amplitude +15C to +45C (dB)	8268	12/4/2018	12/4/2020
T4	AN02672	Spectrum Analyzer	E4446A	3/13/2019	3/13/2021

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dB μ V	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dB μ V/m	Spec dB μ V/m	Margin dB	Polar Ant
1	614.000M	11.3	+20.0	+6.0	+4.7	+0.0	+0.0	42.0	46.0	-4.0	Vert
2	960.000M	11.6	+23.7	+6.1	+6.1	+0.0	+0.0	47.5	54.0	-6.5	Vert
3	928.000M	43.1	+23.2	+6.1	+6.0	+0.0	+0.0	78.4	110.1	-31.7	Vert
4	902.000M	43.5	+22.8	+6.1	+5.9	+0.0	+0.0	78.3	110.1 hopping	-31.8	Vert
5	902.000M	43.0	+22.8	+6.1	+5.9	+0.0	+0.0	77.8	110.1	-32.3	Vert
6	928.000M	41.5	+23.2	+6.1	+6.0	+0.0	+0.0	76.8	110.1 hopping	-33.3	Vert

Test Location: CKC Laboratories, Inc. • 110 N. Olinda Place • Brea, CA 92823 • 714-993-6112
 Customer: **Itron, Inc.**
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**
 Work Order #: **102692** Date: 6/10/2019
 Test Type: **Maximized Emissions** Time: 11:38:31
 Tested By: Don Nguyen Sequence#: 4
 Software: EMITest 5.03.12

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 3			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 3			

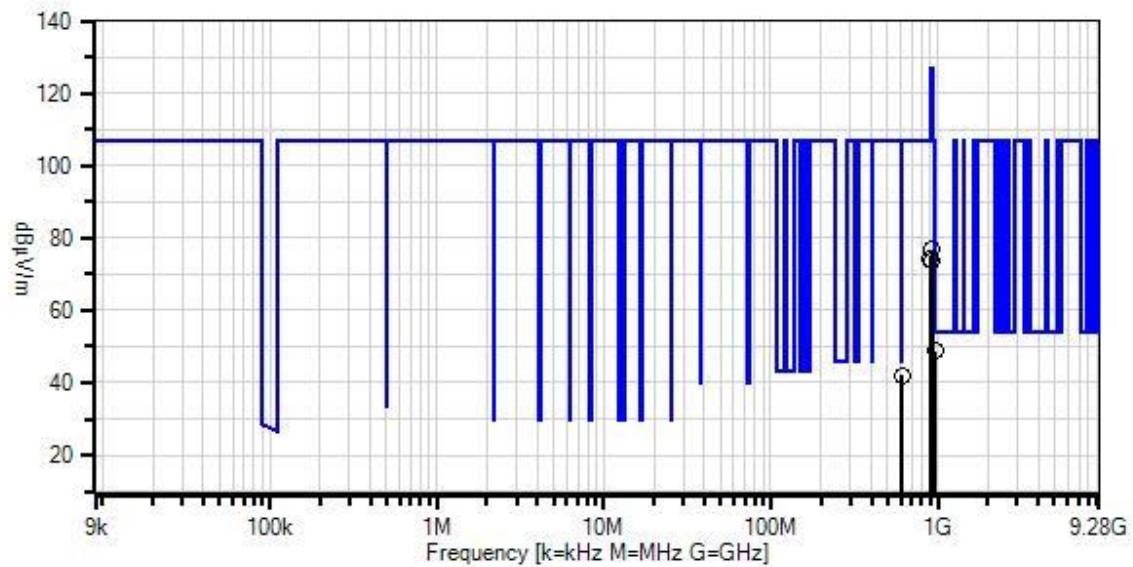
Test Conditions / Notes:

The EUT is placed on table top. The serial port is connected to a support laptop via serial to USB adapter. The laptop is running software Command Line Interface Tool to turn on TX. The EUT is powered from fresh battery 6.0Vdc.
 Modulation: 50kbps GFSK

 Frequency of measurement: 902-928MHz
 RBW=100kHz, VBW=300kHz (-20dBc limit)
 RBW=120kHz, VBW=360kHz (restricted band limit)

 Site A
 Test Method: ANSI C63.10 (2013)
 Temperature (°C): 23.9
 Relative Humidity (%): 62

Ittron, Inc. WO#: 102692 Sequence#: 4 Date: 6/10/2019
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: 5.03.12

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN01995	Biconilog Antenna	CBL6111C	4/23/2018	4/23/2020
T2	ANP05275	Attenuator	1W	4/5/2018	4/5/2020
T3	ANP05198	Cable-Amplitude +15C to +45C (dB)	8268	12/4/2018	12/4/2020
T4	AN02672	Spectrum Analyzer	E4446A	3/13/2019	3/13/2021

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dB μ V	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dB μ V/m	Spec dB μ V/m	Margin dB	Polar Ant
1	614.000M	11.2	+20.0	+6.0	+4.7	+0.0	+0.0	41.9	46.0	-4.1	Vert
2	960.000M	12.8	+23.7	+6.1	+6.1	+0.0	+0.0	48.7	54.0	-5.3	Vert
3	928.000M	41.5	+23.2	+6.1	+6.0	+0.0	+0.0	76.8	106.9	-30.1	Vert
4	902.000M	39.6	+22.8	+6.1	+5.9	+0.0	+0.0	74.4	106.9 hopping	-32.5	Vert
5	902.000M	39.2	+22.8	+6.1	+5.9	+0.0	+0.0	74.0	106.9	-32.9	Vert
6	928.000M	38.4	+23.2	+6.1	+6.0	+0.0	+0.0	73.7	106.9 hopping	-33.2	Vert

Test Location: CKC Laboratories, Inc. • 110 N. Olinda Place • Brea, CA 92823 • 714-993-6112
 Customer: **Itron, Inc.**
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**
 Work Order #: **102692** Date: 6/10/2019
 Test Type: **Maximized Emissions** Time: 13:45:52
 Tested By: Don Nguyen Sequence#: 5
 Software: EMITest 5.03.12

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 4			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 4			

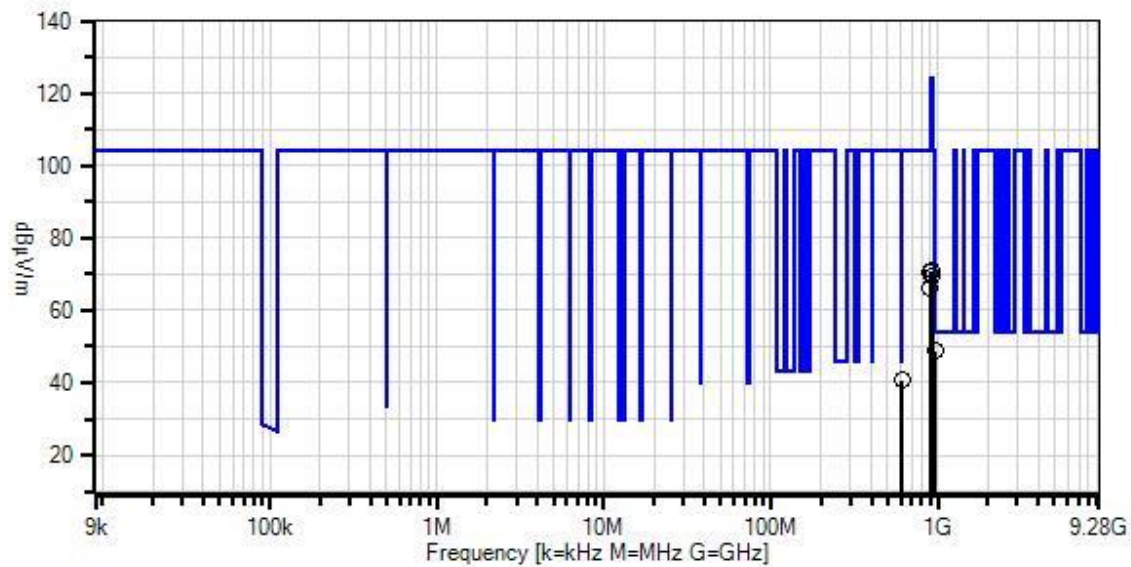
Test Conditions / Notes:

The EUT is placed on table top. The serial port is connected to a support laptop via serial to USB adapter. The laptop is running software Command Line Interface Tool to turn on TX. The EUT is powered from fresh battery 6.0Vdc.
 Modulation: 50kbps GFSK

 Frequency of measurement: 902-928MHz
 RBW=100kHz, VBW=300kHz (-20dBc limit)
 RBW=120kHz, VBW=360kHz (restricted band limit)

 Site A
 Test Method: ANSI C63.10 (2013)
 Temperature (°C): 23.9
 Relative Humidity (%): 62

Itron, Inc. WO#: 102692 Sequence#: 5 Date: 6/10/2019
 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: 5.03.12

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN01995	Biconilog Antenna	CBL6111C	4/23/2018	4/23/2020
T2	ANP05275	Attenuator	1W	4/5/2018	4/5/2020
T3	ANP05198	Cable-Amplitude +15C to +45C (dB)	8268	12/4/2018	12/4/2020
T4	AN02672	Spectrum Analyzer	E4446A	3/13/2019	3/13/2021

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dB μ V	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dB μ V/m	Spec dB μ V/m	Margin dB	Polar Ant
1	960.000M	12.8	+23.7	+6.1	+6.1	+0.0	+0.0	48.7	54.0	-5.3	Vert
2	614.000M	9.9	+20.0	+6.0	+4.7	+0.0	+0.0	40.6	46.0	-5.4	Vert
3	928.000M	35.5	+23.2	+6.1	+6.0	+0.0	+0.0	70.8	104.0	-33.2	Vert
4	902.000M	35.8	+22.8	+6.1	+5.9	+0.0	+0.0	70.6	104.0	-33.4	Vert
5	928.000M	33.9	+23.2	+6.1	+6.0	+0.0	+0.0	69.2	104.0 hopping	-34.8	Vert
6	902.000M	31.3	+22.8	+6.1	+5.9	+0.0	+0.0	66.1	104.0 hopping	-37.9	Vert

Test Location: CKC Laboratories, Inc. • 110 N. Olinda Place • Brea, CA 92823 • 714-993-6112
 Customer: **Itron, Inc.**
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**
 Work Order #: **102692** Date: 6/10/2019
 Test Type: **Maximized Emissions** Time: 14:54:36
 Tested By: Don Nguyen Sequence#: 6
 Software: EMITest 5.03.12

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 5			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 5			

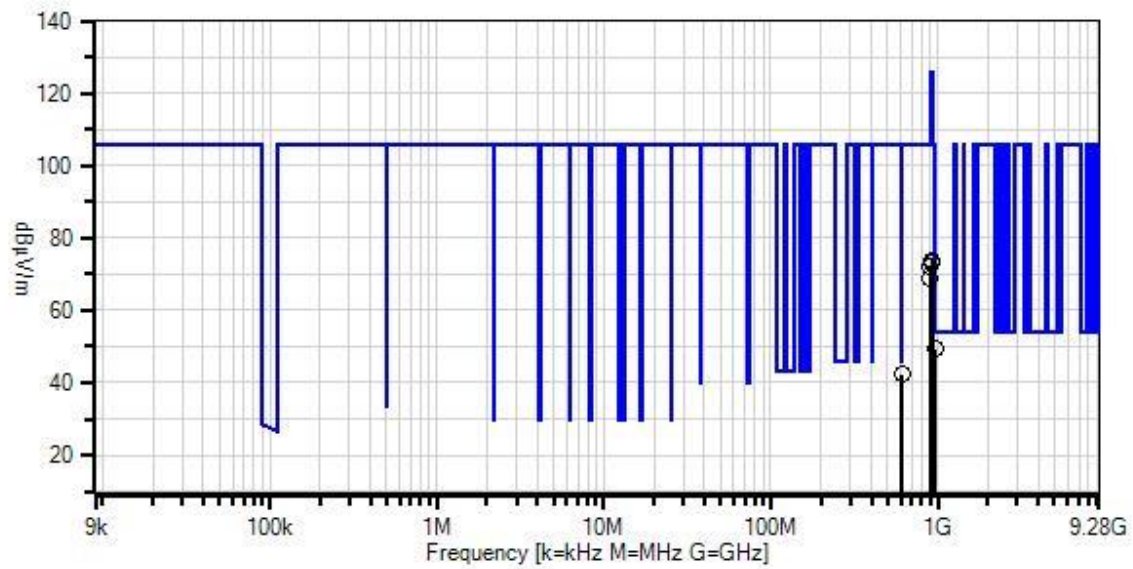
Test Conditions / Notes:

The EUT is placed on table top. The serial port is connected to a support laptop via serial to USB adapter. The laptop is running software Command Line Interface Tool to turn on TX. The EUT is powered from fresh battery 6.0Vdc.
 Modulation: 50kbps GFSK

 Frequency of measurement: 902-928MHz
 RBW=100kHz, VBW=300kHz (-20dBc limit)
 RBW=120kHz, VBW=360kHz (restricted band limit)

 Site A
 Test Method: ANSI C63.10 (2013)
 Temperature (°C): 23.9
 Relative Humidity (%): 62

Itron, Inc. WO#: 102692 Sequence#: 6 Date: 6/10/2019
 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: 5.03.12

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN01995	Biconilog Antenna	CBL6111C	4/23/2018	4/23/2020
T2	ANP05275	Attenuator	1W	4/5/2018	4/5/2020
T3	ANP05198	Cable-Amplitude +15C to +45C (dB)	8268	12/4/2018	12/4/2020
T4	AN02672	Spectrum Analyzer	E4446A	3/13/2019	3/13/2021

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

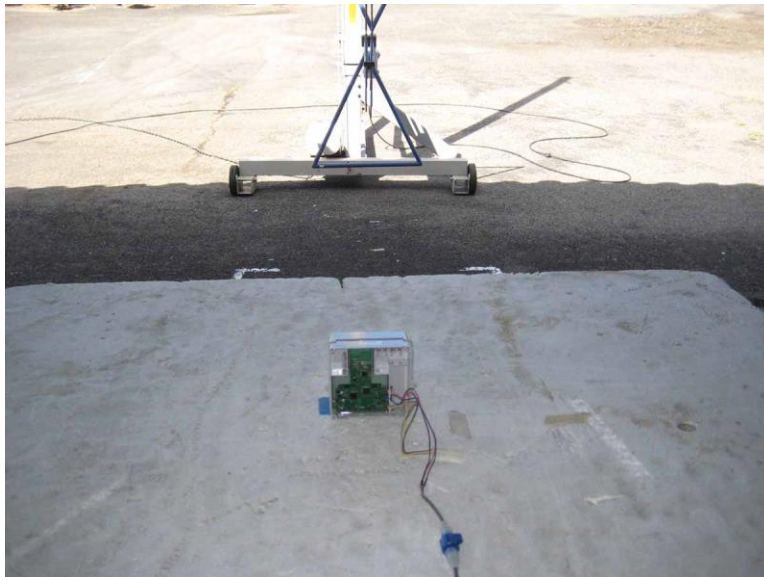
#	Freq MHz	Rdng dBμV	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBμV/m	Spec dBμV/m	Margin dB	Polar Ant
1	614.000M	11.7	+20.0	+6.0	+4.7	+0.0	+0.0	42.4	46.0	-3.6	Vert
2	960.000M	13.4	+23.7	+6.1	+6.1	+0.0	+0.0	49.3	54.0	-4.7	Vert
3	928.000M	38.4	+23.2	+6.1	+6.0	+0.0	+0.0	73.7	105.7 hopping	-32.0	Vert
4	928.000M	37.8	+23.2	+6.1	+6.0	+0.0	+0.0	73.1	105.7	-32.6	Vert
5	902.000M	37.3	+22.8	+6.1	+5.9	+0.0	+0.0	72.1	105.7	-33.6	Vert
6	902.000M	34.0	+22.8	+6.1	+5.9	+0.0	+0.0	68.8	105.7 hopping	-36.9	Vert

Test Setup Photo(s)

Configuration 2



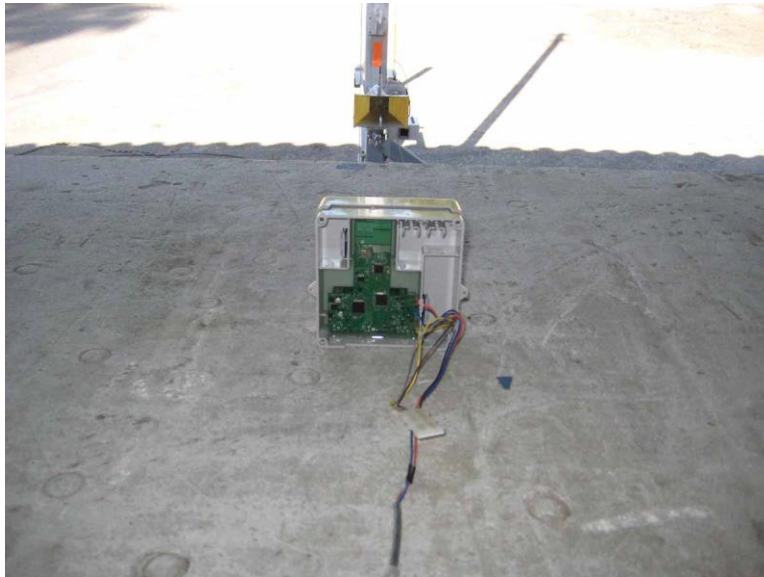
Below 1GHz



Below 1GHz



Above 1GHz

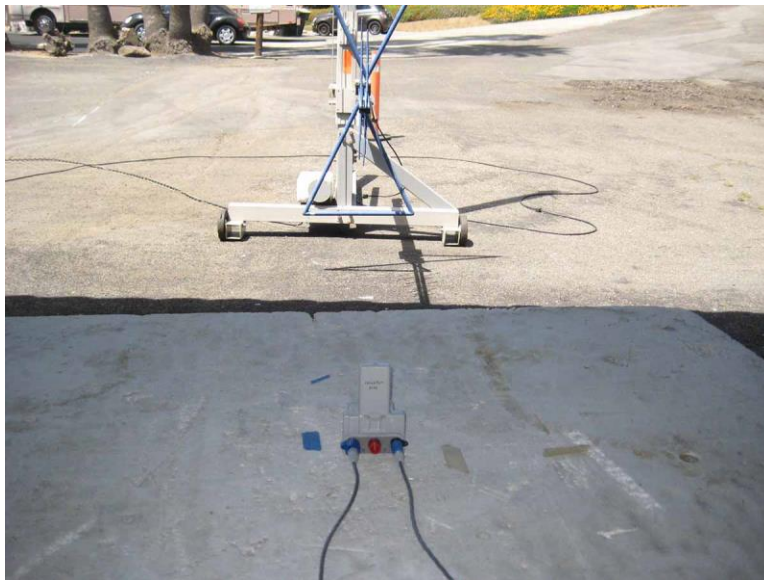


Below 1GHz

Configuration 3



Below 1GHz



Below 1GHz



Above 1GHz



Above 1GHz

Configuration 4



Below 1GHz



Below 1GHz



Above 1GHz



Above 1GHz

Configuration 5



Below 1GHz



Below 1GHz



Above 1GHz



Above 1GHz

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.