

Itron, Inc.

TEST REPORT FOR

**Gas Endpoint
Model: 500GA**

Tested to The Following Standards:

FCC Part 15 Subpart C Section(s)

**15.247
(FHSS AND HYBRID 902-928 MHz)**

Report No.: 99315-30

Date of issue: December 24, 2018



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



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

Test Certificate # 803.02

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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: 163055

REPORT PREPARED BY:

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

Project Number: 99315

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

October 25, 2018
October 25-30, 2018 and December 4-5, 2018

Report Authorization

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



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

Test Facility Information



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

TEST LOCATION(S):
CKC Laboratories, Inc.
110 Olinda Place
Brea, CA 92823

Software Versions

CKC Laboratories Proprietary Software	Version
EMITest Emissions	5.03.11

Site Registration & Accreditation Information

Location	NIST CB #	TAIWAN	CANADA	FCC	JAPAN
Brea A, CA	US0060	SL2-IN-E-1146R	3082D-1	US1025	A-0147

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)/15.247(f)	Average Time of Occupancy	NA	NP
15.247(b)(2)	Output Power	NA	Pass
15.247(f)	Hybrid Systems	NA	Pass
15.247(f)	Power Spectral Density	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 Manufacturer Declaration in Average Time of Occupancy section.

ISO/IEC 17025 Decision Rule

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

Modifications During Testing

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

Summary of Conditions

No modifications were made during testing.

Modifications listed above must be incorporated into all production units.

Conditions During Testing

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

Summary of Conditions

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
Gas Endpoint	Itron, Inc.	500GA	99315-cond4

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.	PCB-TEMP-0007	NA

Configuration 2

Equipment Tested:

Device	Manufacturer	Model #	S/N
Gas Endpoint	Itron, Inc.	500GA	28 0100676314

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.	PCB-TEMP-0007	NA

General Product Information:

Product Information	Manufacturer-Provided Details
Equipment Type:	Stand-Alone Equipment
Type of Wideband System:	Proprietary FHSS
Operating Frequency Range:	902.3 to 926.9MHz (100kbps FSK power level 3) 902.4 to 927.6 MHz (300kbps power level 2-Hybrid) 902.4 to 927.6 MHz (300kbps power level 3)
Number of Hopping Channels:	83 (100kbps FSK power level 3) 64 (300kbps power level 2-Hybrid) 64 (300kbps power level 3)
Modulation Type(s):	100kbps FSK 300kbps GFSK 300kbps GFSK Hybrid
Maximum Duty Cycle:	100%
Number of TX Chains:	1
Antenna Gain:	0.6 dBi power level 2 1.7 dBi power level 3
Beamforming Type:	NA
Antenna Connection Type:	Integral (External connector provided to facilitate testing)
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):	12/5/2018
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 fresh battery 6.0Vdc. Frequency of measurement: 902.3 to 927.6MHz RBW=2kHz and 3.9kHz, VBW=6.2kHz and 12kHz		

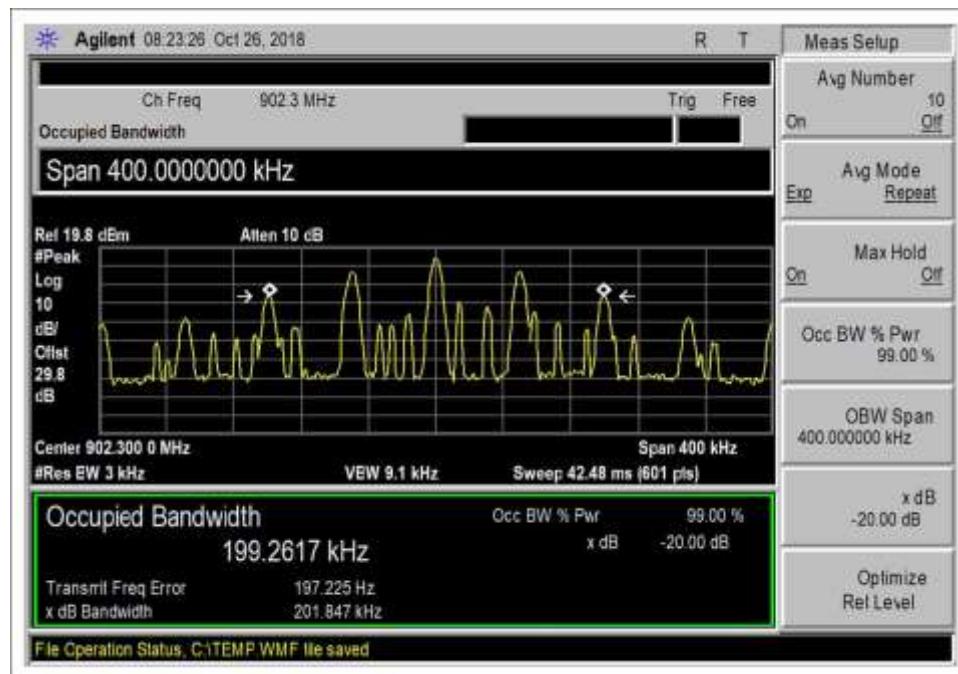
Environmental Conditions			
Temperature (°C)	21.5	Relative Humidity (%):	35.0

Test Equipment					
Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
02672	Spectrum Analyzer	Agilent	E4446A	3/2/2017	3/2/2019
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

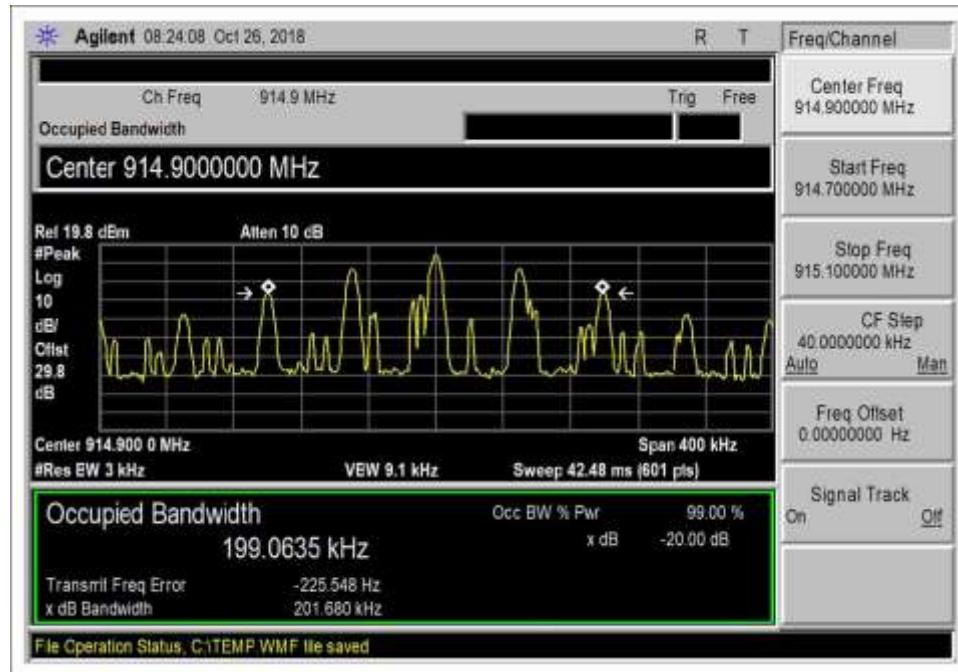
15.247(a)(1) 20 dB Bandwidth

Test Data Summary					
Frequency (MHz)	Antenna Port	Modulation	Measured (kHz)	Limit (kHz)	Results
902.3	1	100kbps FSK lv3	201.847	≤500	Pass
914.9	1	100kbps FSK lv3	201.680	≤500	Pass
926.9	1	100kbps FSK lv3	201.701	≤500	Pass
902.4	1	300kbps GFSK lv2	363.298	≤500	Pass
914.8	1	300kbps GFSK lv2	362.436	≤500	Pass
927.6	1	300kbps GFSK lv2	358.512	≤500	Pass
902.4	1	300kbps GFSK lv3	363.532	≤500	Pass
914.8	1	300kbps GFSK lv3	355.226	≤500	Pass
927.6	1	300kbps GFSK lv3	355.094	≤500	Pass

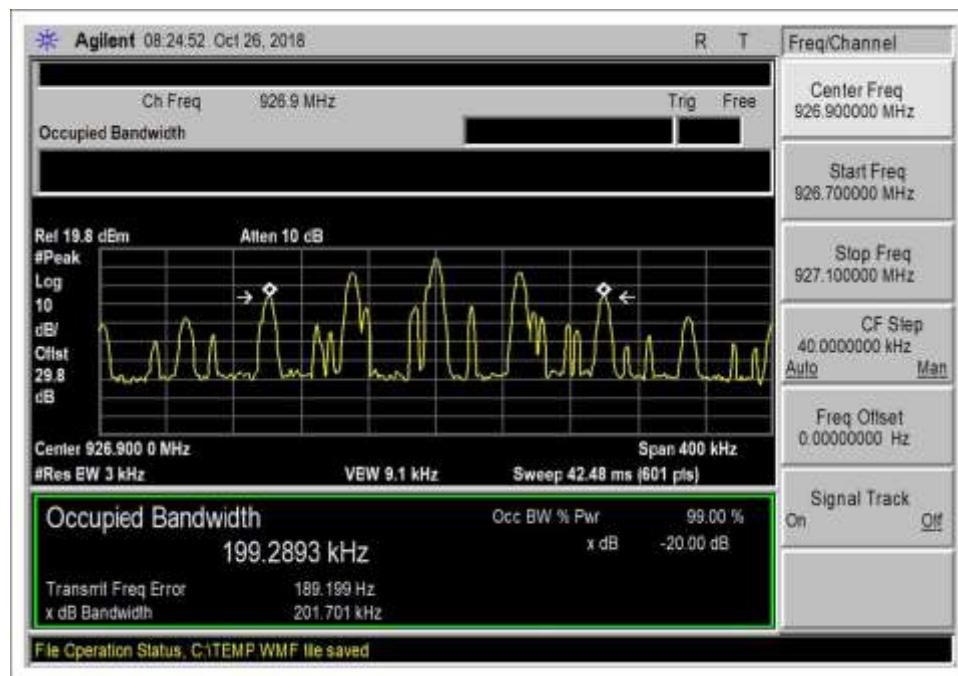
Plots



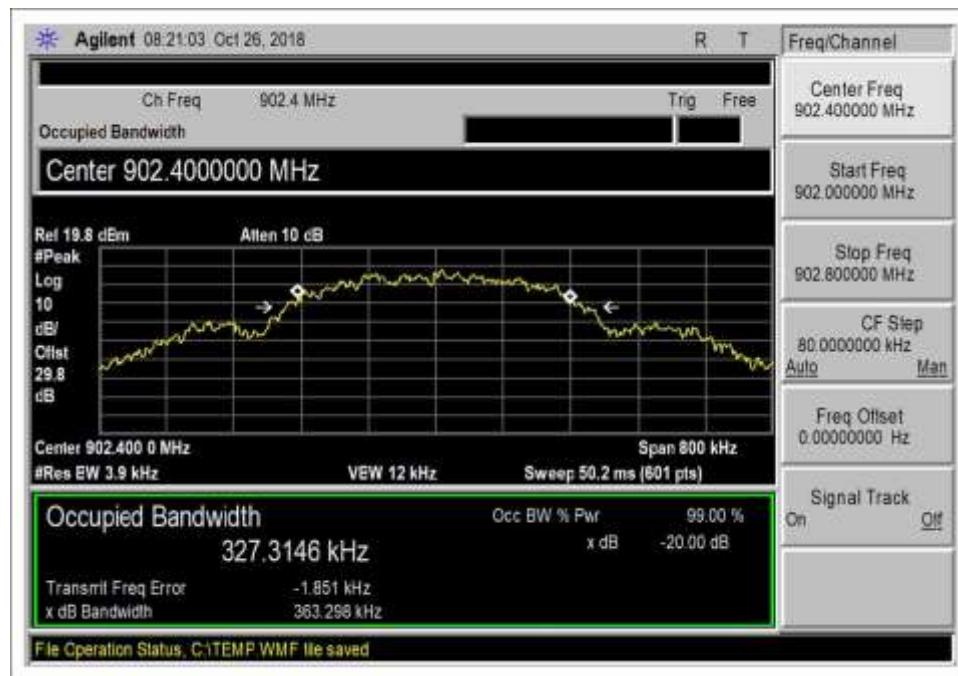
Low Channel, 100kbps, Power level 3



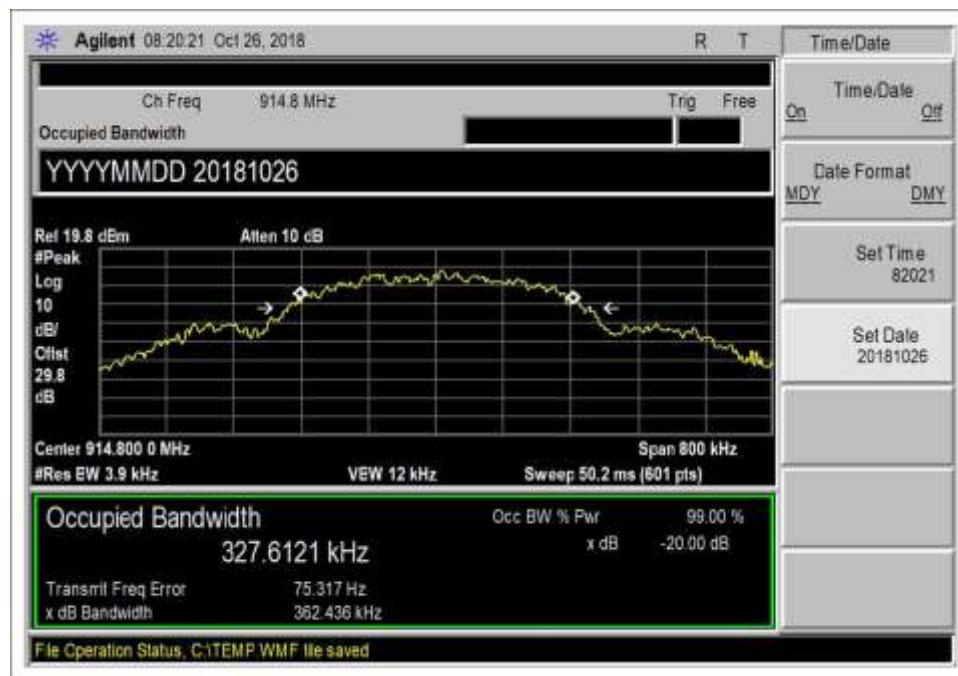
Middle Channel, 100kbps, Power level 3



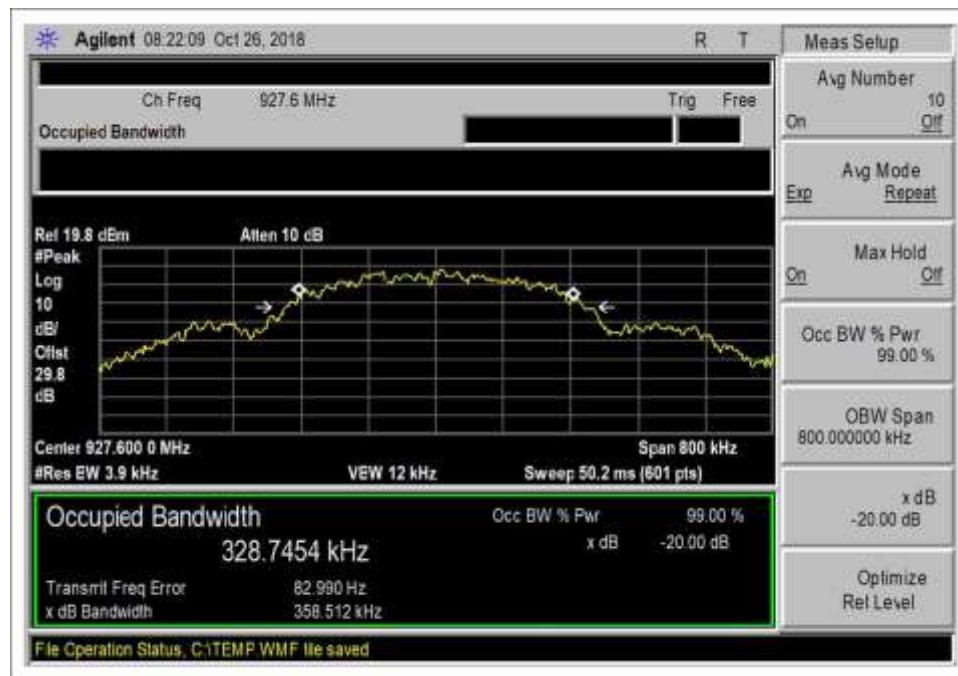
High Channel, 100kbps, Power level 3



Low Channel, 300kbps, Power level 2



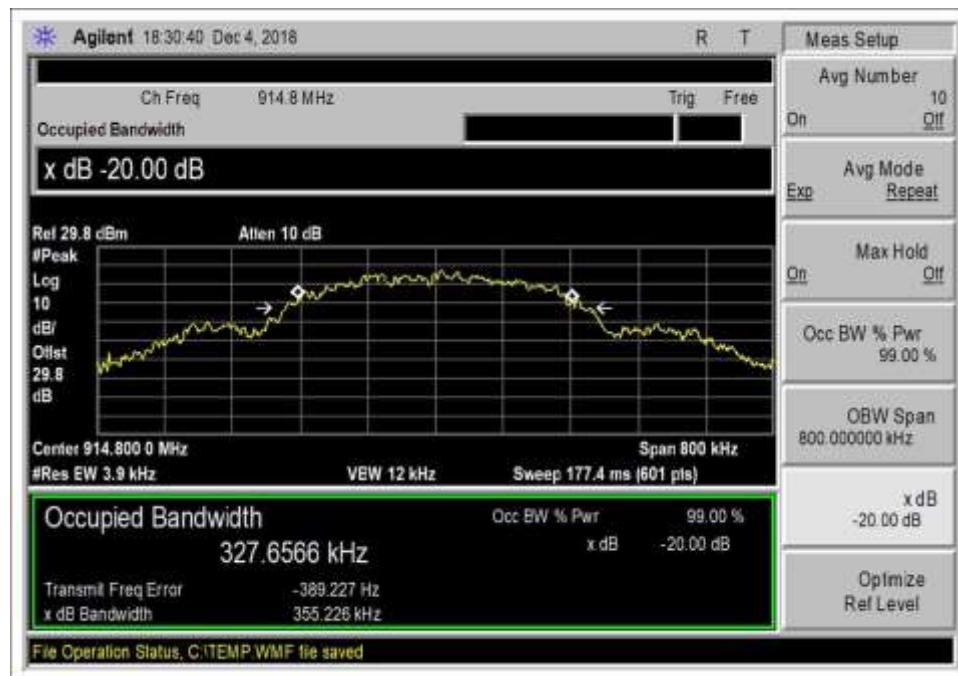
Middle Channel, 300kbps, Power level 2



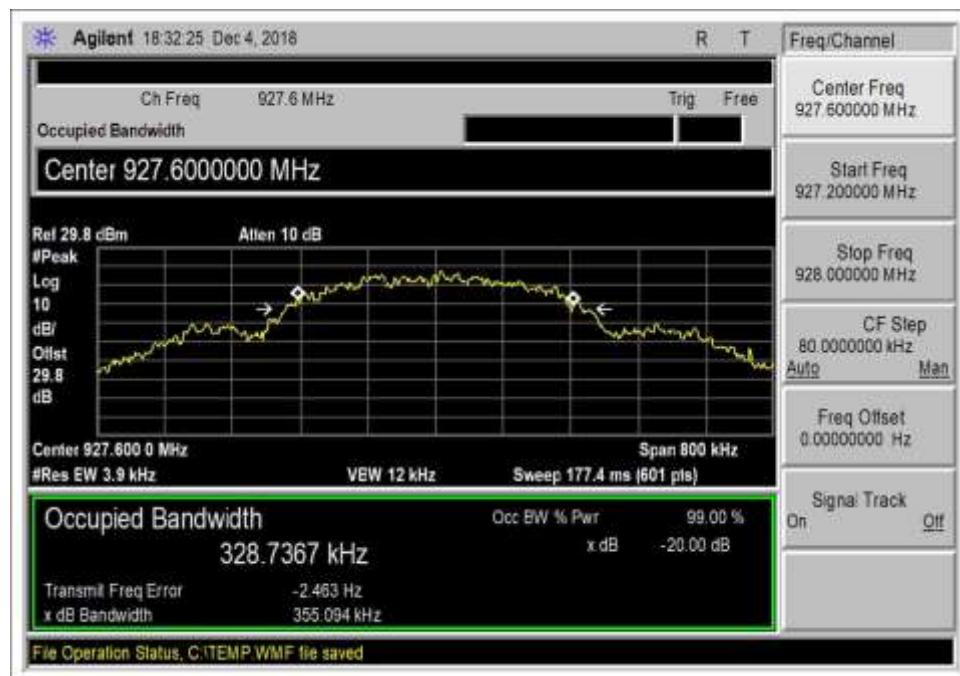
High Channel, 300kbps, Power level 2



Low Channel, 300kbps, Power level 3



Middle Channel, 300kbps, Power level 3



High Channel, 300kbps, Power level 3

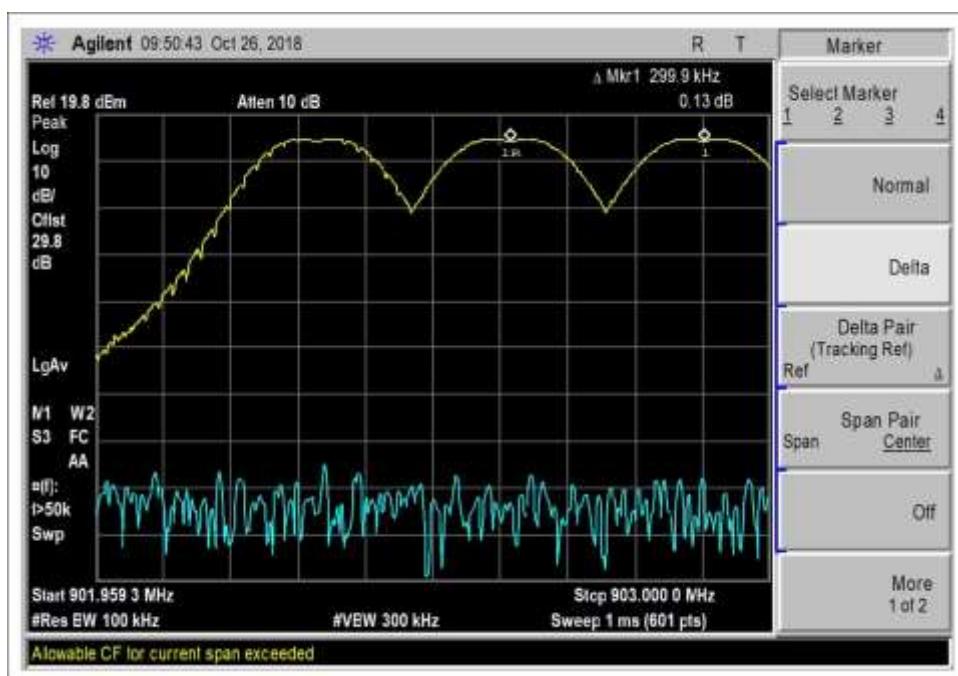
15.247(a)(1) Carrier Separation

Test Data Summary

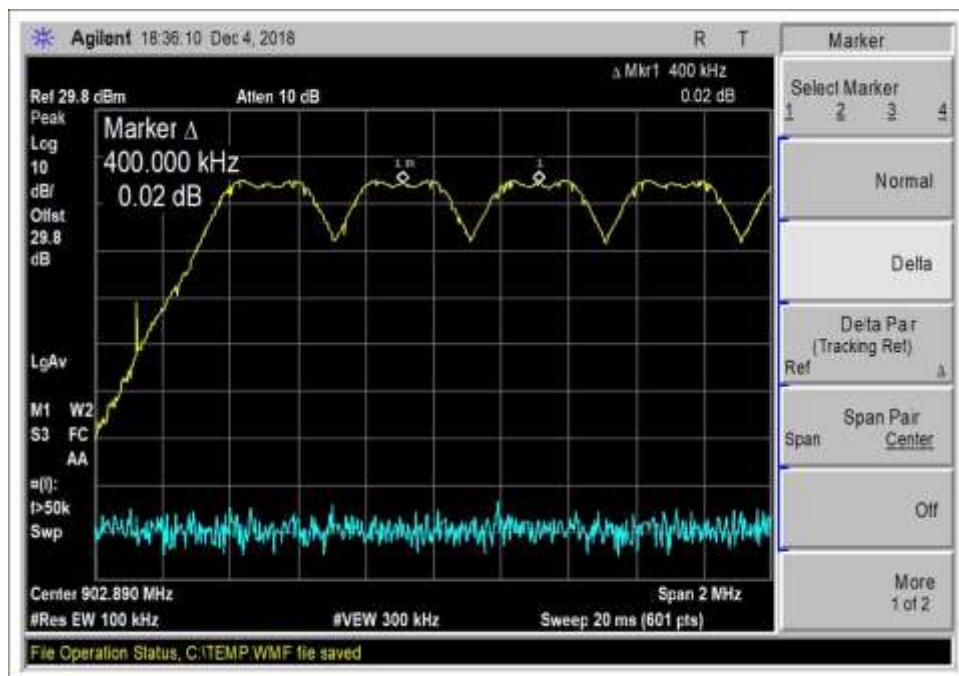
Limit applied: 20dB bandwidth of the hopping channel.

Antenna Port	Operational Mode	Measured (kHz)	Limit (kHz)	Results
1	100kbps FSK lv3	300	> 201.847	Pass
1	300kbps GFSK lv2	400	> 363.298	Pass
1	300kbps GFSK lv3	400	> 363.532	Pass

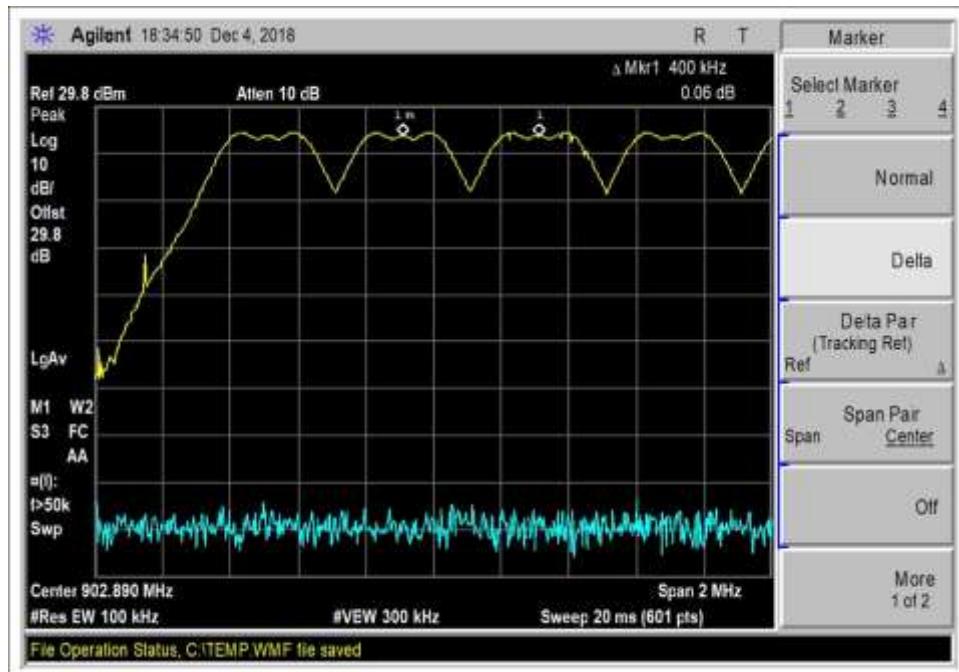
Plots



100kbps, Power level 3



300kbps, Power level 2

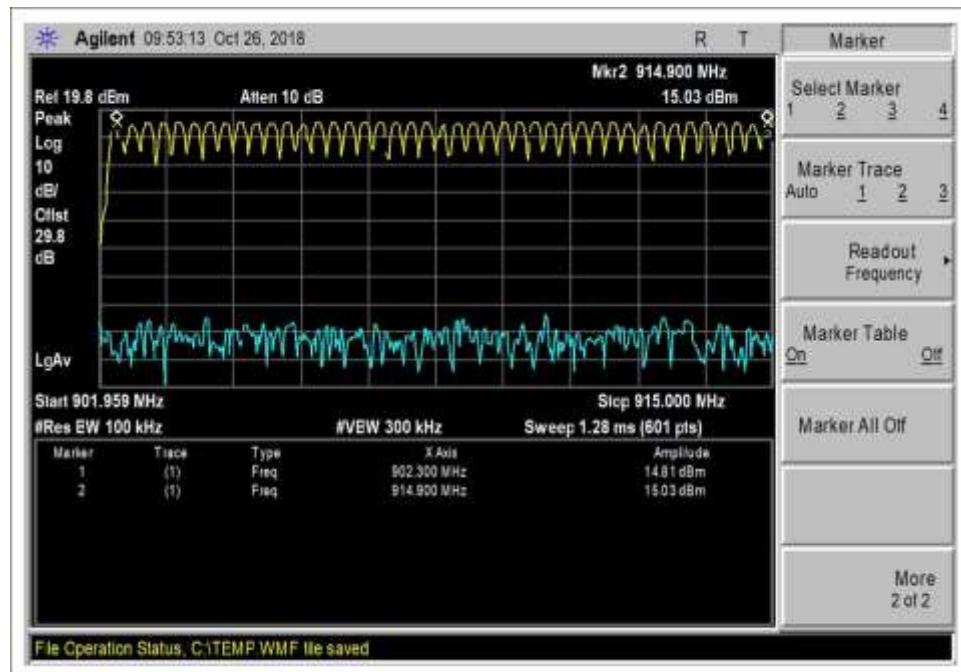


300kbps, Power level 3

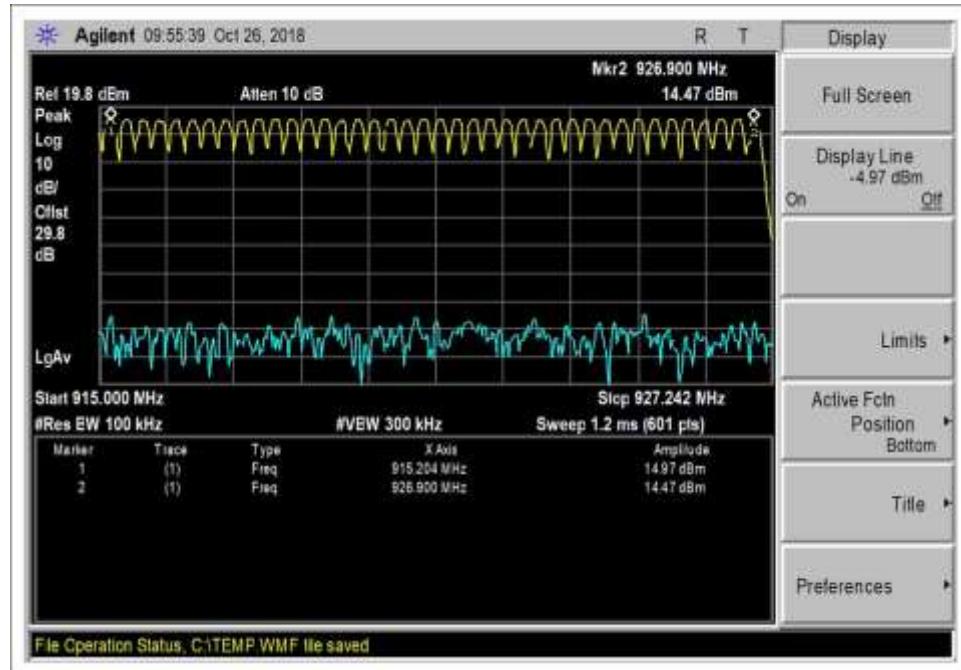
15.247(a)(1)(i) Number of Hopping Channels

Test Data Summary				
Antenna Port	Operational Mode	Measured (Channels)	Limit (Channels)	Results
1	100kbps FSK Iv3	83	≥ 50	Pass
1	300kbps GFSK Iv2	64	≥ 25	Pass
1	300kbps GFSK Iv3	64	≥ 25	Pass

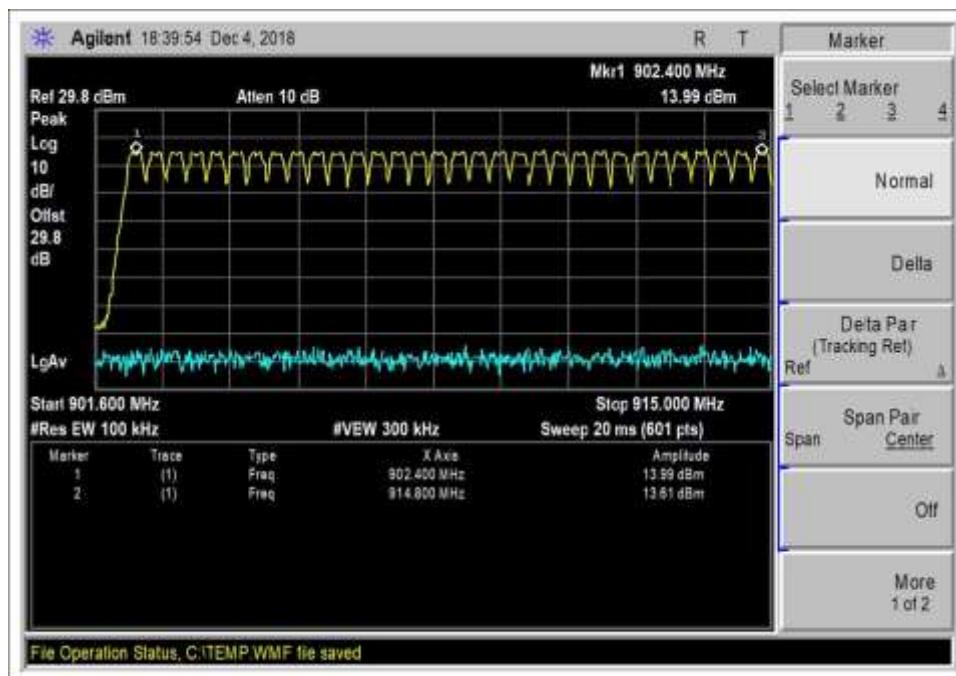
Plots



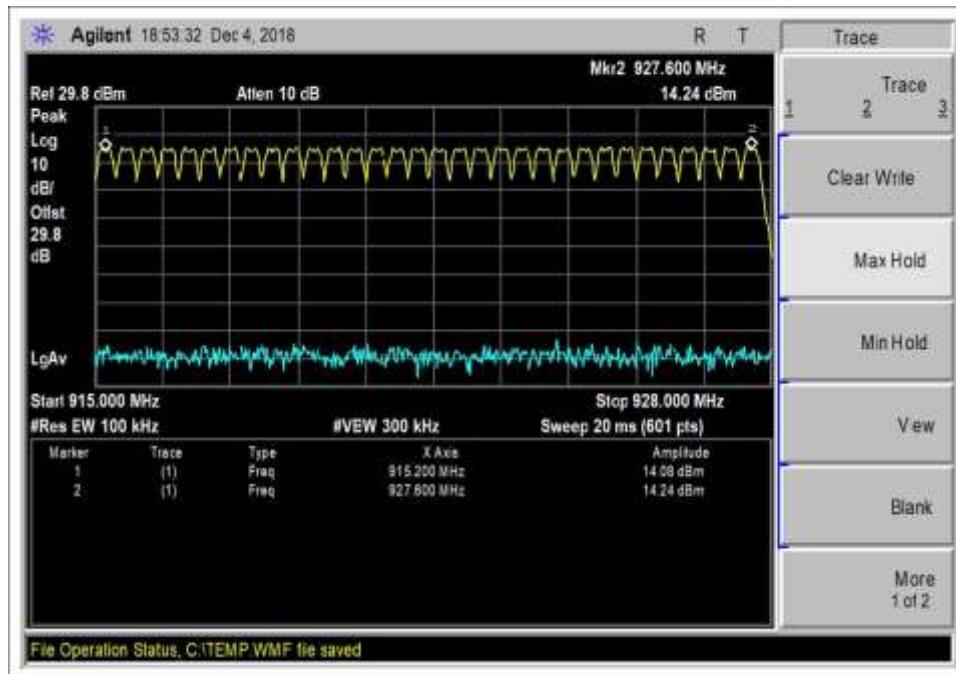
100kbps, Power level 3, #1



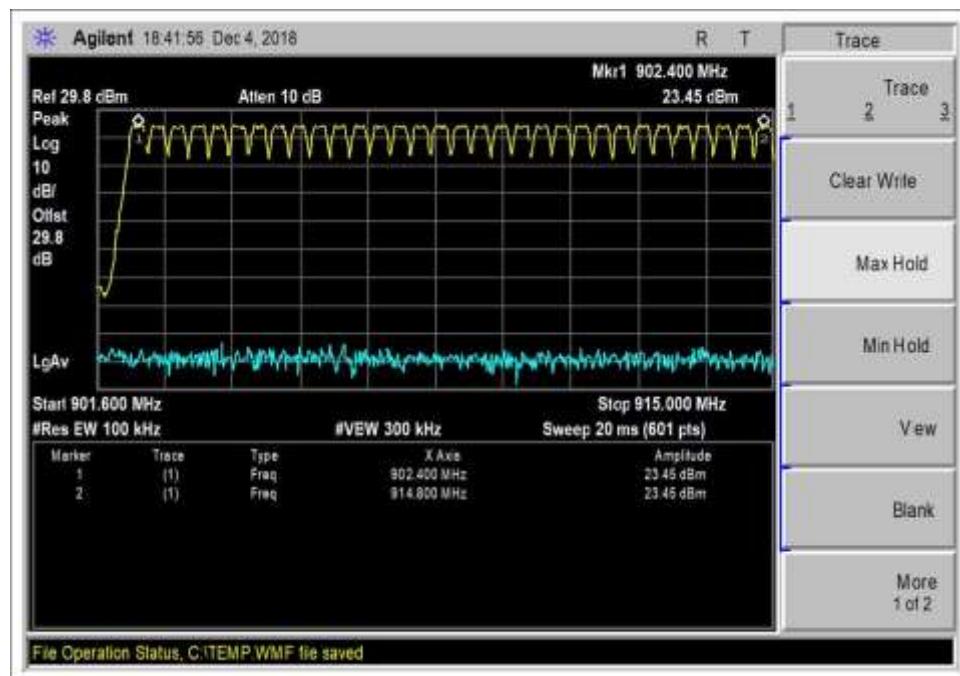
100kbps, Power level 3, #2



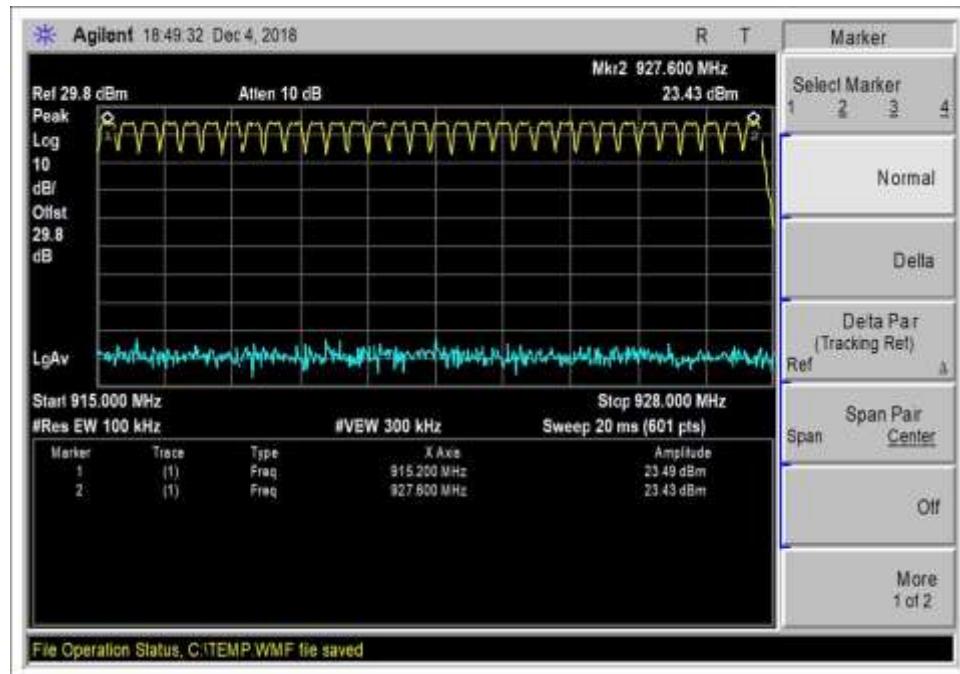
300kbps, Power level 2, #1



300kbps, Power level 2, #2



300kbps, Power level 3, #1



300kbps, Power level 3, #2

15.247(a)(1)(iii)/15.247(f) Average 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.

Itron 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.

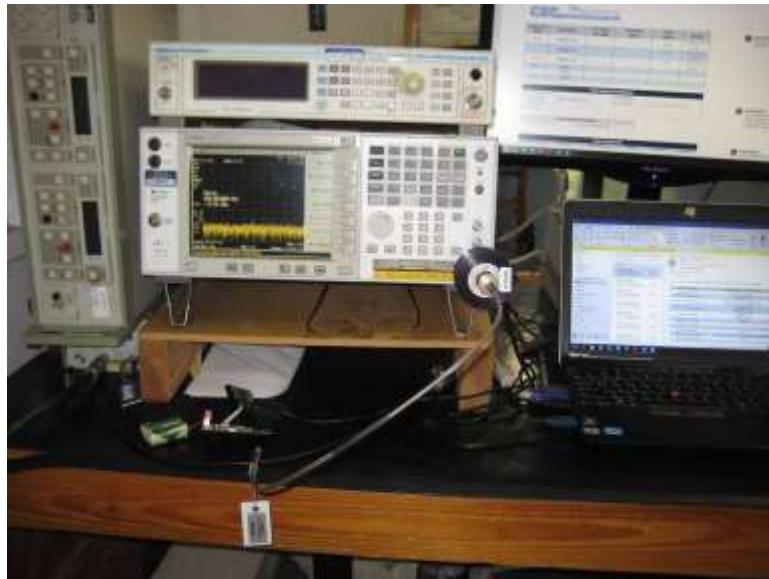
The system has receiver channel bandwidths that match the transmitter's modulation bandwidth that is enabled.

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.

Test Setup Photo



15.247(f) Hybrid Systems

Test Setup/Conditions			
Test Location:	Brea Lab A	Test Engineer:	Don Nguyen
Test Method:	ANSI C63.10 (2013)	Test Date(s):	10/25/2018
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 fresh battery 6.0Vdc. Frequency of measurement: 902.4 to 927.6MHz RBW=3kHz, VBW=9kHz		

Environmental Conditions			
Temperature (°C)	22.9	Relative Humidity (%):	54.4

Test Equipment					
Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
02672	Spectrum Analyzer	Agilent	E4446A	3/2/2017	3/2/2019
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 (f) 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	300kbps GFSK Lv2 Hybrid	5.95	≤8	Pass
914.8	300kbps GFSK Lv2 Hybrid	6.20	≤8	Pass
927.6	300kbps GFSK Lv2 Hybrid	6.26	≤8	Pass

6dB Occupied Bandwidth (required for PSD measurement)

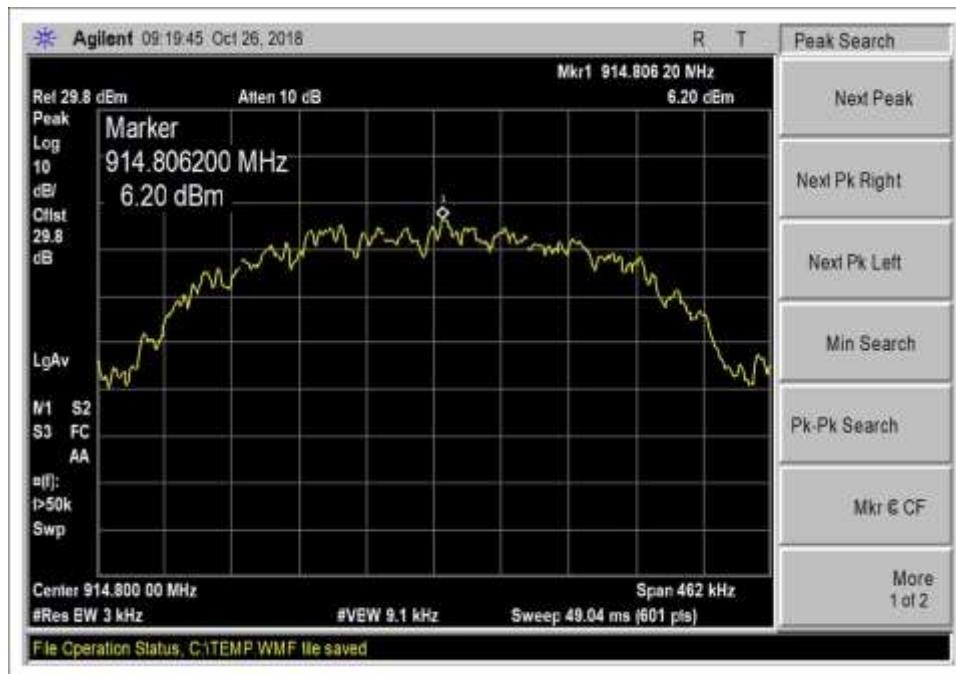
Test Data Summary					
Frequency (MHz)	Antenna Port	Modulation	Measured (kHz)	Limit (kHz)	Results
902.4	1	300kbps GFSK Lv2 Hybrid	307.545	None	Pass
914.8	1	300kbps GFSK Lv2 Hybrid	307.819		
927.6	1	300kbps GFSK Lv2 Hybrid	310.093		

Plots

Power Spectral Density



Low Channel

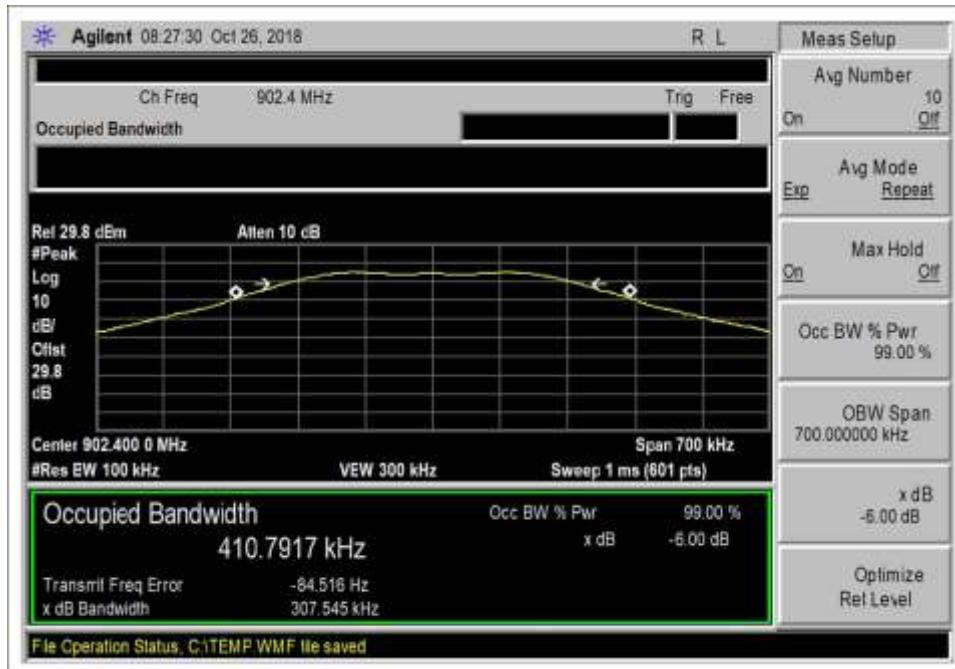


Middle Channel

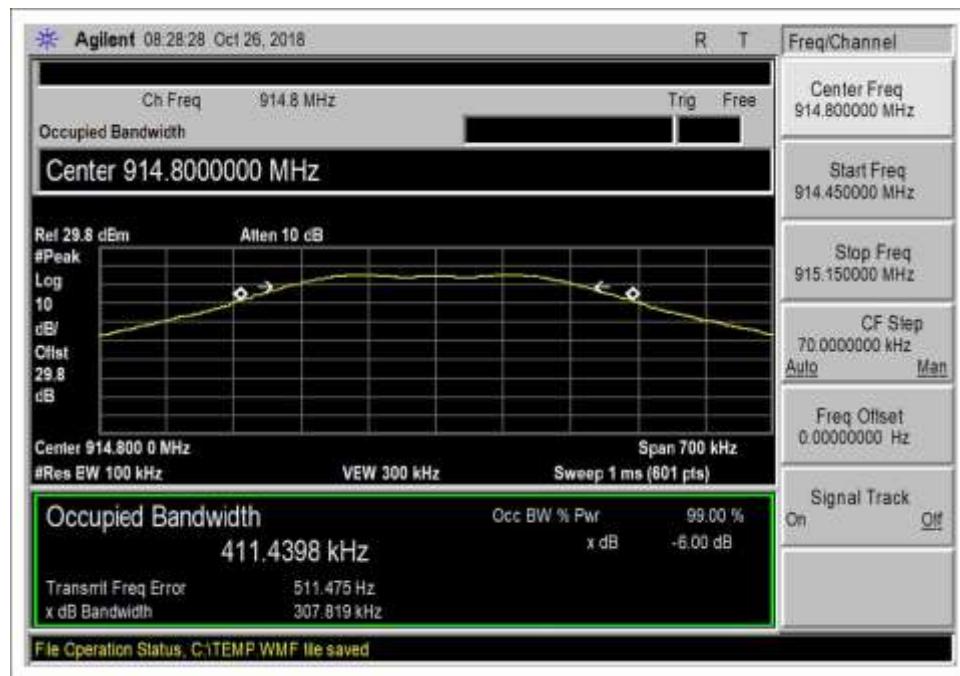


High Channel

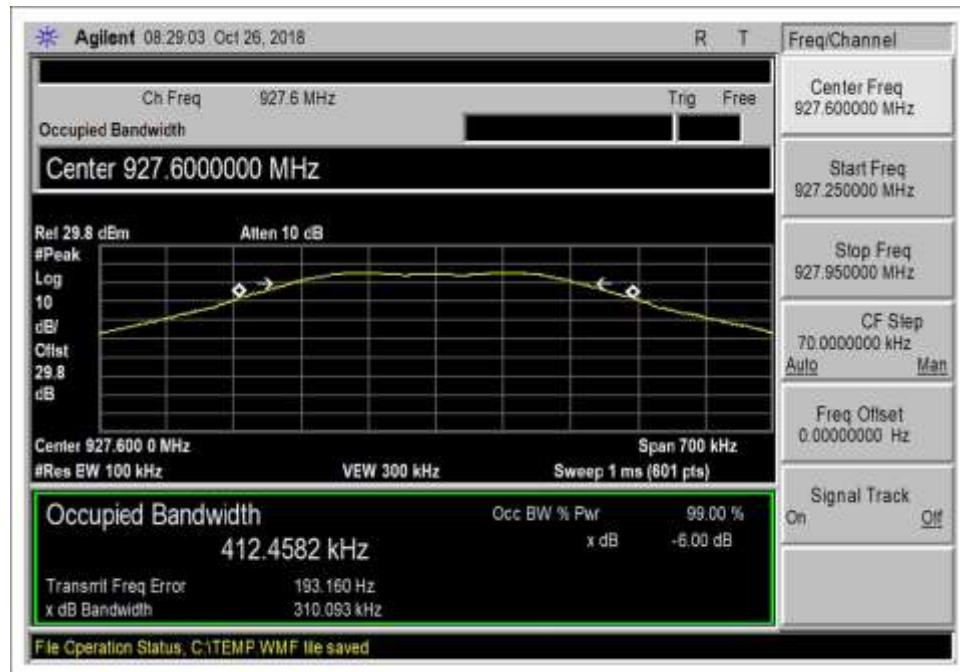
6dB Occupied Bandwidth



Low Channel

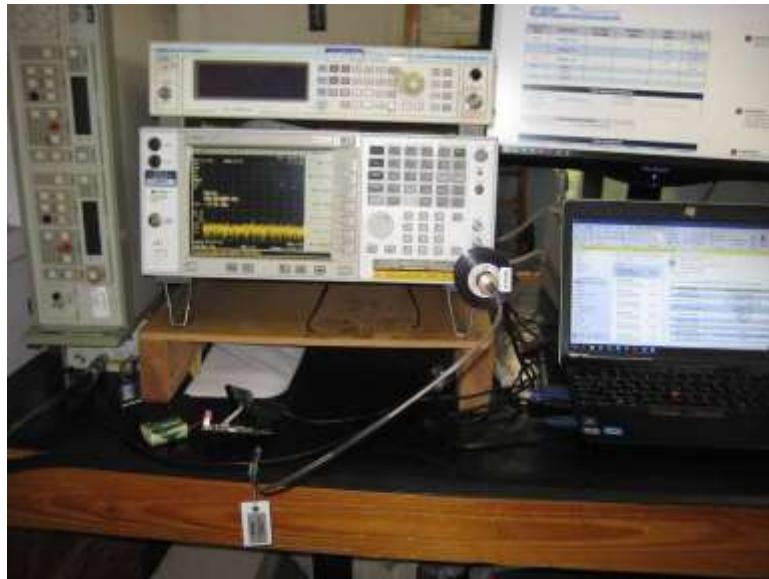


Middle Channel



High Channel

Test Setup Photo



15.247(b)(1) Output Power

Test Setup/Conditions			
Test Location:	Brea Lab A	Test Engineer:	Don Nguyen
Test Method:	ANSI C63.10 (2013)	Test Date(s):	12/5/2018
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 fresh battery 6.0Vdc. Frequency of measurement: 902.3 to 927.6MHz RBW=2MHz, VBW=6MHz		

Environmental Conditions			
Temperature (°C)	21.5	Relative Humidity (%):	35.0

Test Equipment					
Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
02672	Spectrum Analyzer	Agilent	E4446A	3/2/2017	3/2/2019
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

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

Parameter Definitions:

Measurements performed at input voltage according to manufacturer specification.

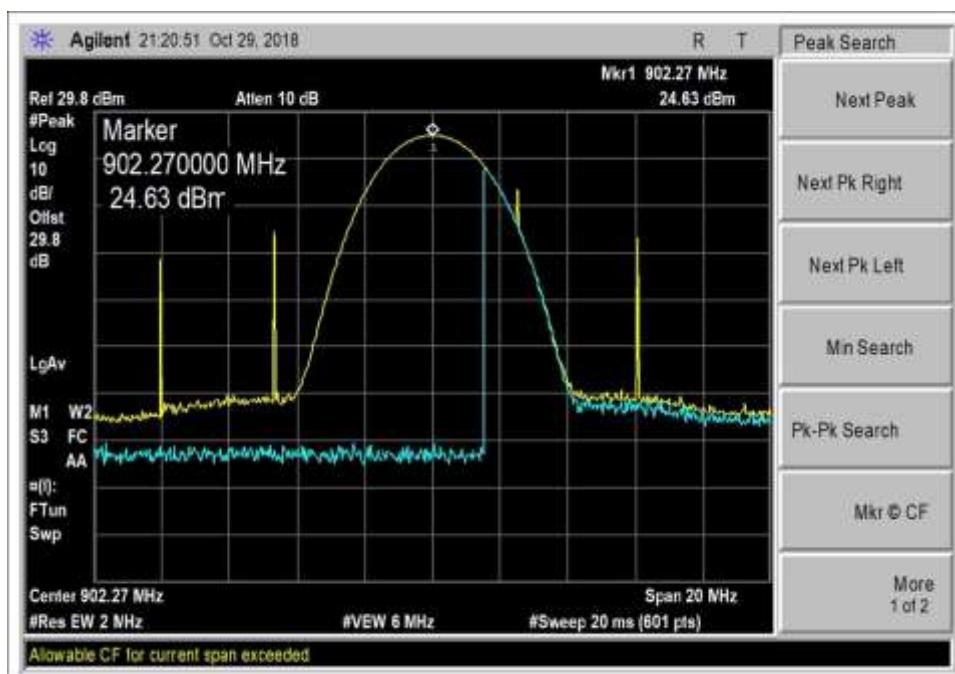
Parameter	Value
V _{Nominal} :	6.0Vdc
V _{Minimum} :	6.0Vdc
V _{Maximum} :	6.0Vdc

Test Data Summary - RF Conducted Measurement

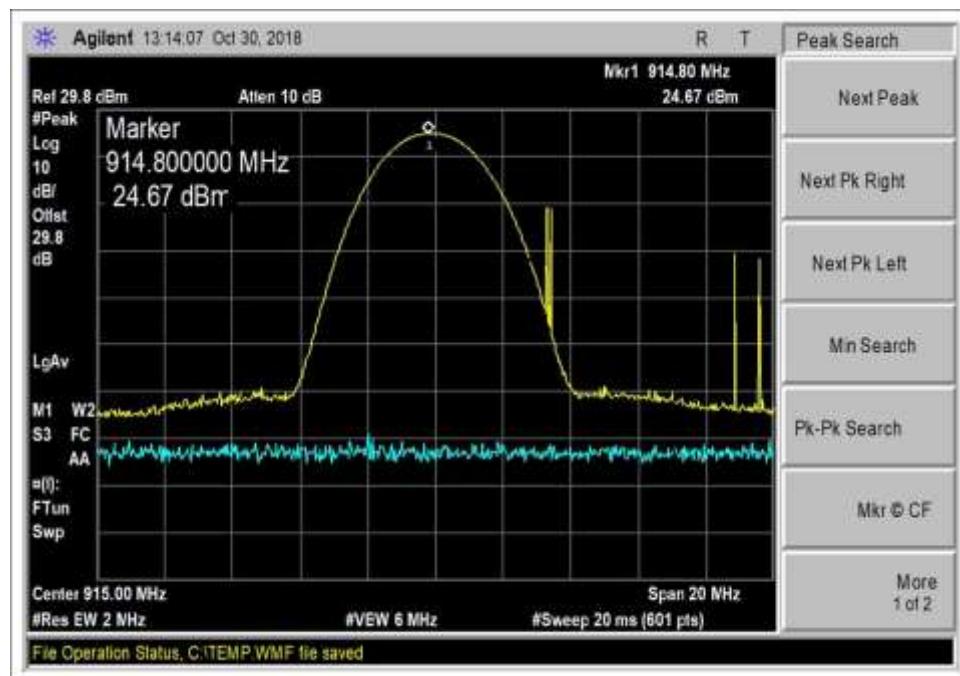
*Limit = {30dBm Conducted/36dBm EIRP | ≥ 50 Channels
 24dBm Conducted/30dBm EIRP | < 50 Channels (min 25)}*

Frequency (MHz)	Modulation	Ant. Type / Gain (dBi)	Measured (dBm)	Limit (dBm)	Results
902.3	100kbps FSK lv3	Integral/1.7	24.63	≤ 30	Pass
914.9	100kbps FSK lv3	Integral/1.7	24.67	≤ 30	Pass
926.9	100kbps FSK lv3	Integral/1.7	24.69	≤ 30	Pass
902.4	300kbps GFSK lv2	Integral/0.6	15.16	≤ 30	Pass
914.8	300kbps GFSK lv2	Integral/0.6	15.29	≤ 30	Pass
927.6	300kbps GFSK lv2	Integral/0.6	15.46	≤ 30	Pass
902.4	300kbps GFSK lv3	Integral/1.7	24.10	≤ 30	Pass
914.8	300kbps GFSK lv3	Integral/1.7	24.16	≤ 30	Pass
927.6	300kbps GFSK lv3	Integral/1.7	24.12	≤ 30	Pass

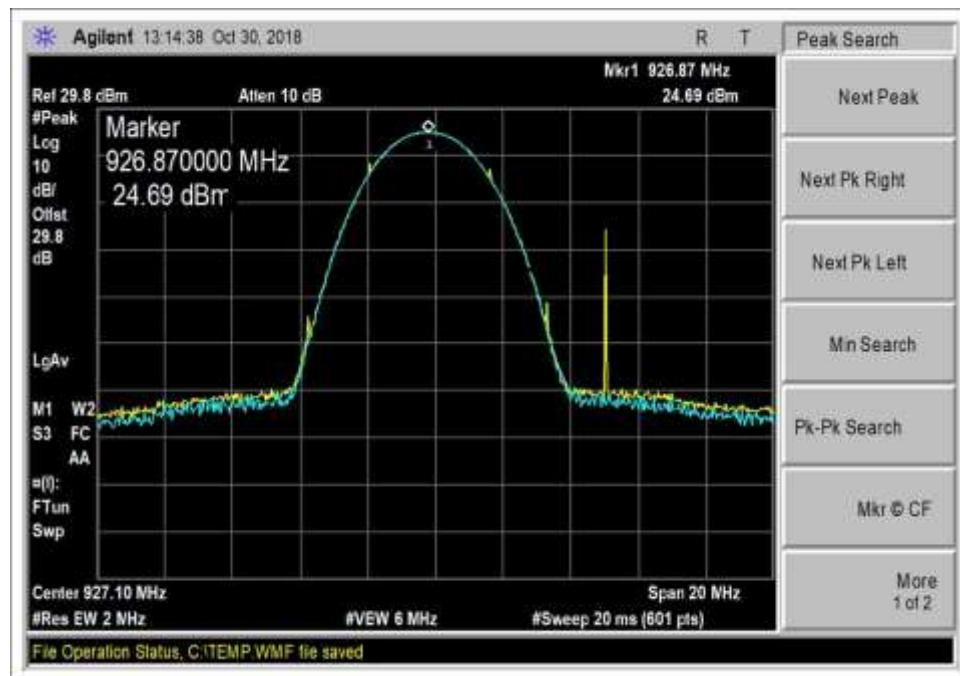
Plots



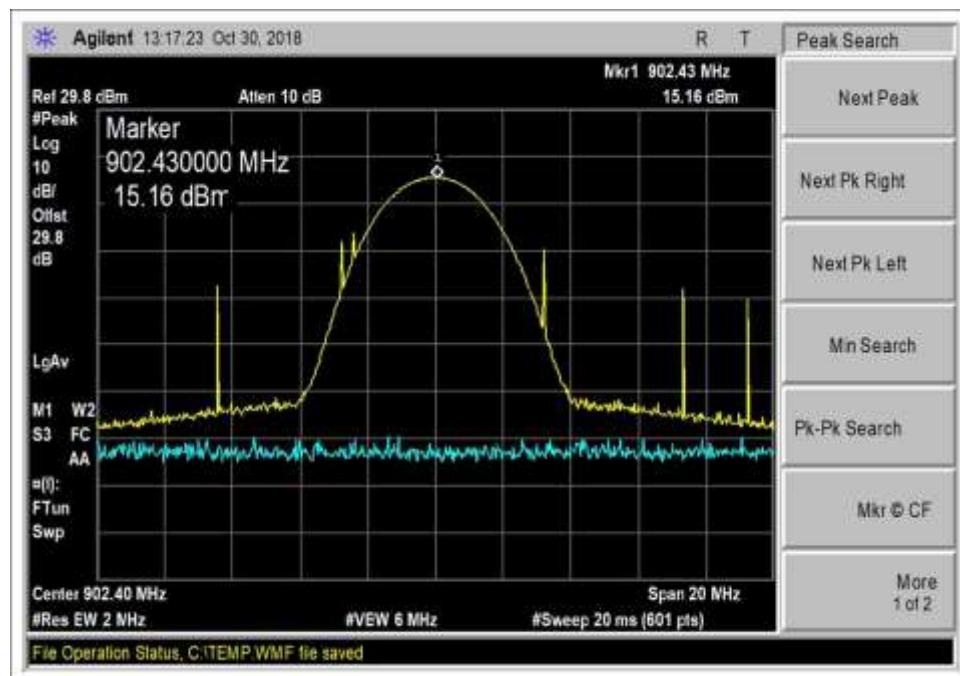
Low Channel, 100kbps, Power level 3



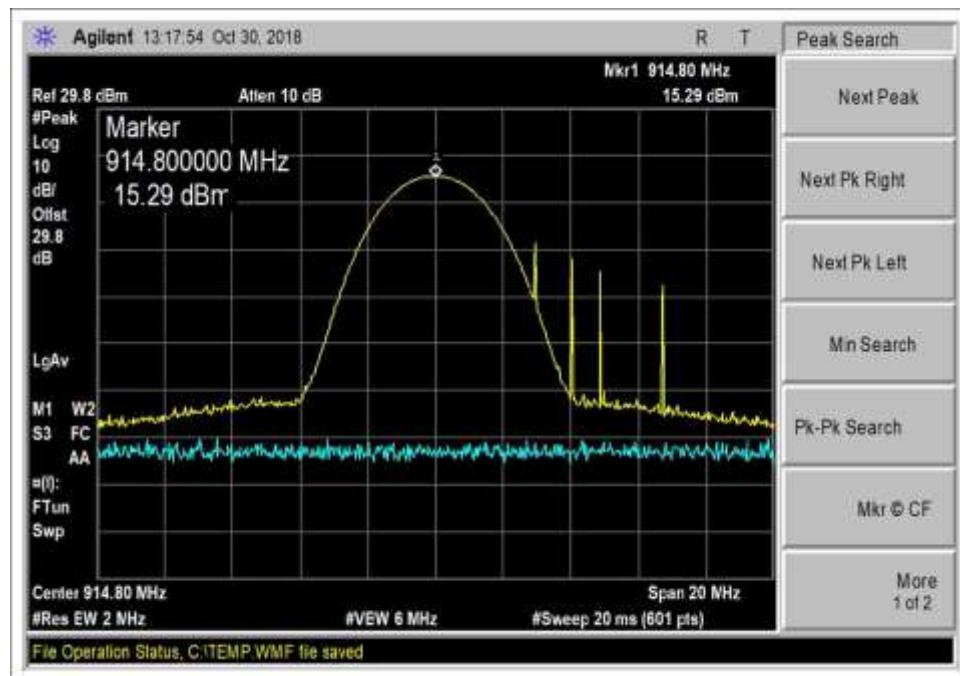
Middle Channel, 100kbps, Power level 3



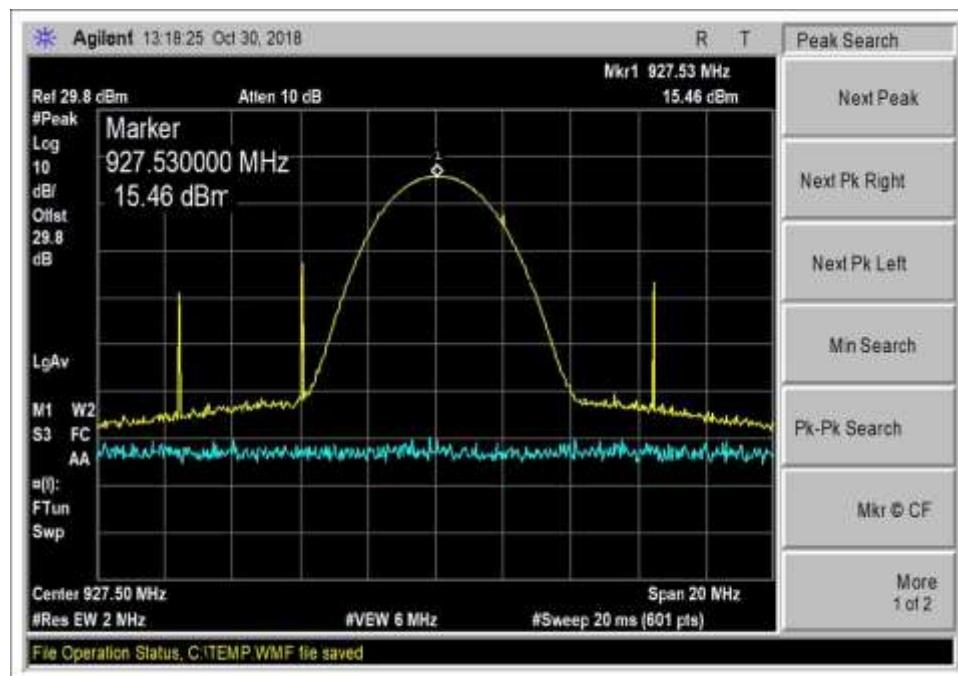
High Channel, 100kbps, Power level 3



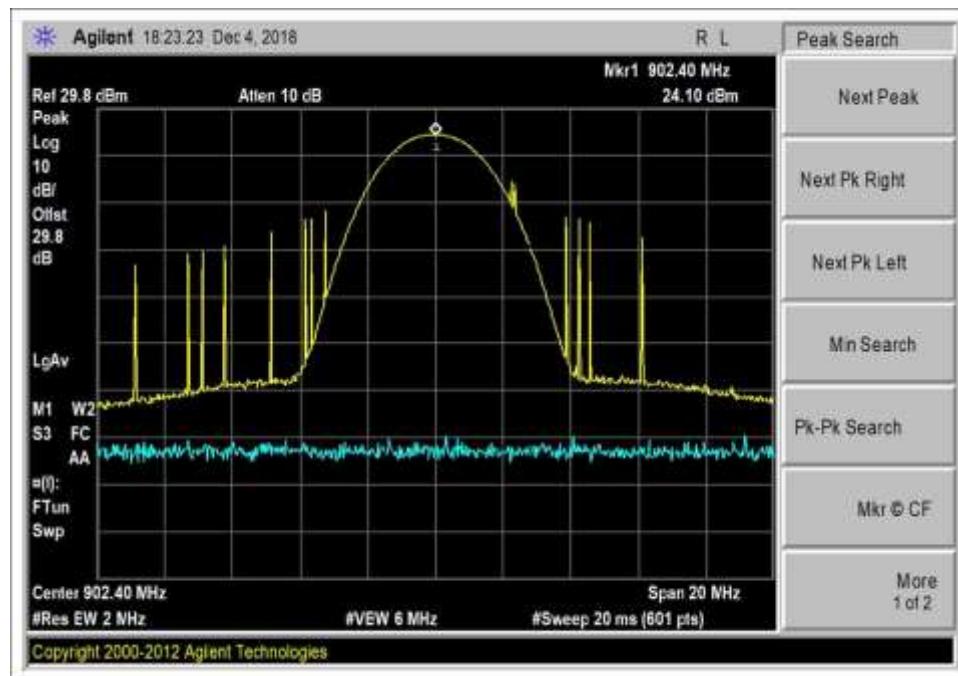
Low Channel, 300kbps, Power level 2



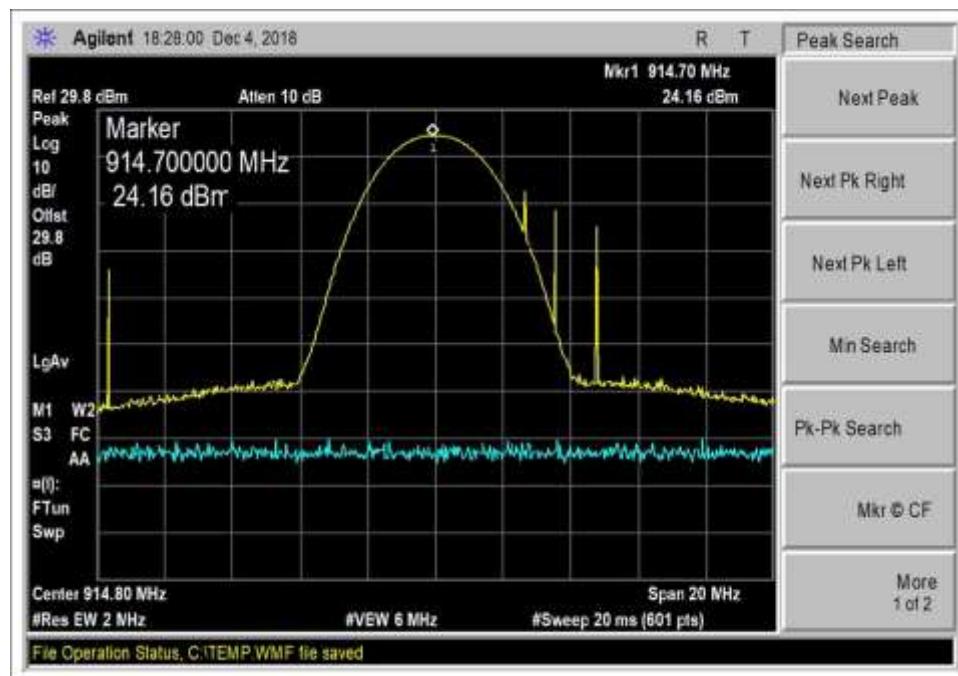
Middle Channel, 300kbps, Power level 2



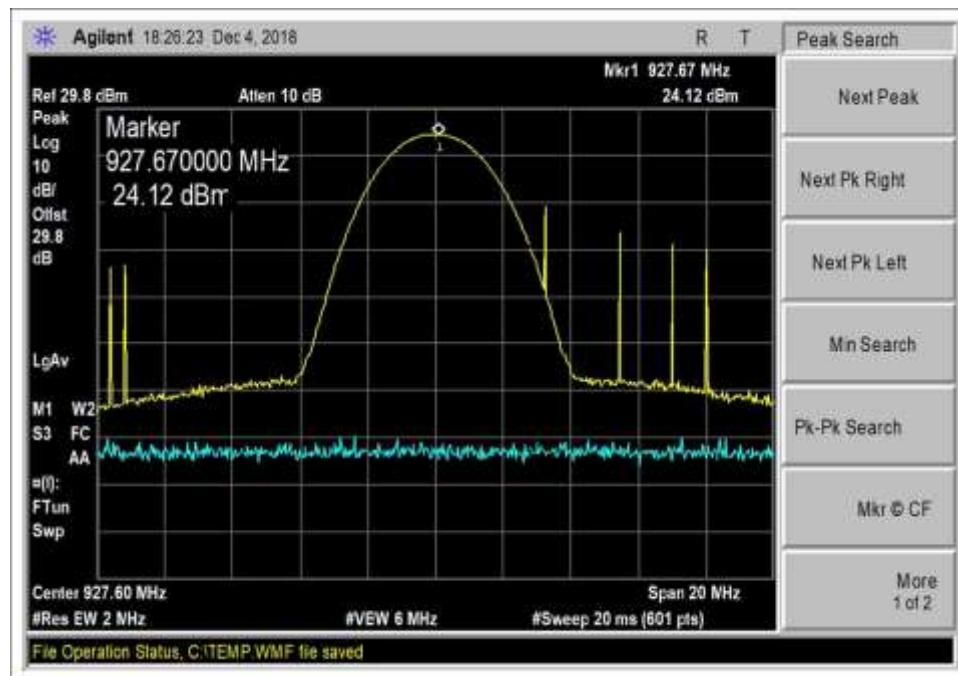
High Channel, 300kbps, Power level 2



Low Channel, 300kbps, Power level 3

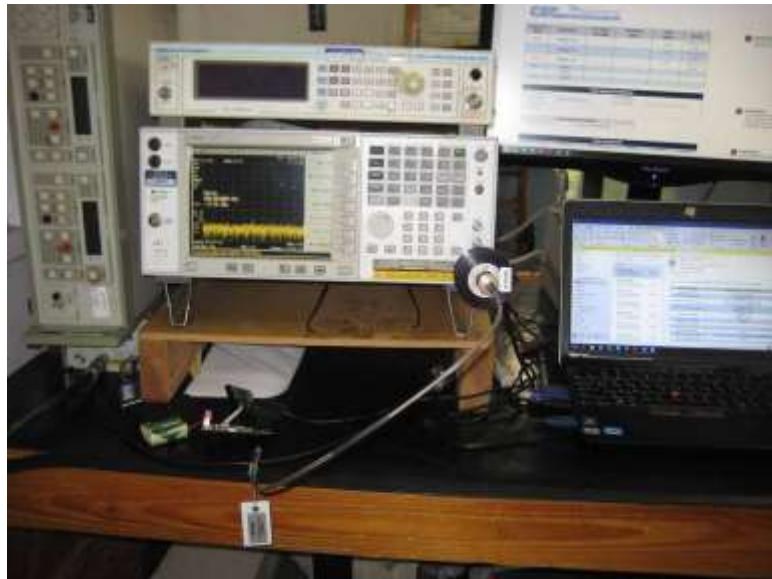


Middle Channel, 300kbps, Power level 3



High Channel, 300kbps, Power level 3

Test Setup Photo



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 #: **99315** Date: 12/5/2018
 Test Type: **Conducted Emissions** Time: 09:31:51
 Tested By: Don Nguyen Sequence#: 0
 Software: EMITest 5.03.11 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 at 100% duty cycle.
 The EUT is powered from fresh battery 6.0Vdc.

Modulation: 100kbps FSK, 300kbps GFSK power level 2, 300kbps GFSK power level 3

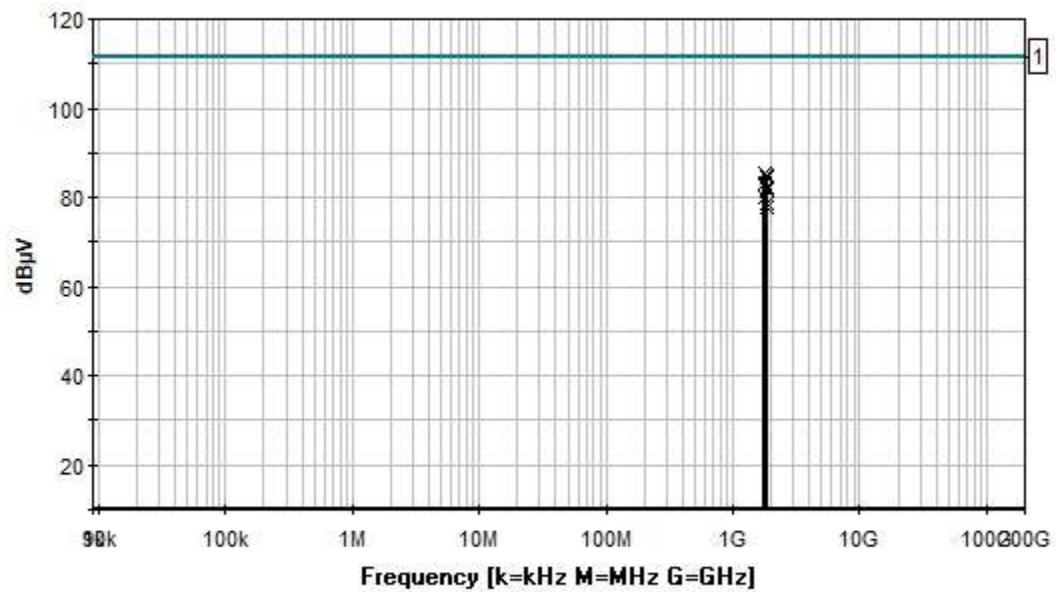
Frequency of measurement: 9kHz-9280MHz

RBW=100kHz, VBW=300kHz

Test Method: ANSI C63.10 (2013)

Data represent worst case emissions.

tron, Inc. WO#: 99315 Sequence#: 0 Date: 12/5/2018
15.247(d) Conducted Spurious Emissions Test Lead: 6V DC Antenna Port



— Readings
X Peak Readings

— 1 - 15.247(d) Conducted Spurious Emissions
Software Version: 5.03.11

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN03432	Attenuator	90-30-34	10/27/2017	10/27/2019
	AN02672	Spectrum Analyzer	E4446A	3/2/2017	3/2/2019
T2	ANP07244	Cable	32022-29094K-29094K-24TC	7/5/2018	7/5/2020

Measurement Data:

Reading listed by margin.

Test Lead: Antenna Port

#	Freq MHz	Rdng dB μ V	T1 dB	T2 dB	dB	Dist Table	Corr dB μ V	Spec dB μ V	Margin dB	Polar Ant
1	1804.647M	50.3	+29.7	+0.2		+0.0	80.2	102.0	-21.8	Anten GFSK 300k lv2
2	1829.450M	49.0	+29.7	+0.2		+0.0	78.9	102.0	-23.1	Anten GFSK 300k lv2
3	1855.050M	48.1	+29.7	+0.2		+0.0	78.0	102.0	-24.0	Anten GFSK 300k lv2
4	1804.644M	55.7	+29.7	+0.2		+0.0	85.6	111.4	-25.8	Anten GFSK 300k lv3
5	1829.453M	55.1	+29.7	+0.2		+0.0	85.0	111.4	-26.4	Anten GFSK 300k lv3
6	1855.043M	54.7	+29.7	+0.2		+0.0	84.6	111.4	-26.8	Anten GFSK 300k lv3
7	1804.805M	53.4	+29.7	+0.2		+0.0	83.3	111.4	-28.1	Anten FSK 100k lv3
8	1829.600M	52.5	+29.7	+0.2		+0.0	82.4	111.4	-29.0	Anten FSK 100k lv3
9	1855.200M	51.9	+29.7	+0.2		+0.0	81.8	111.4	-29.6	Anten FSK 100k lv3

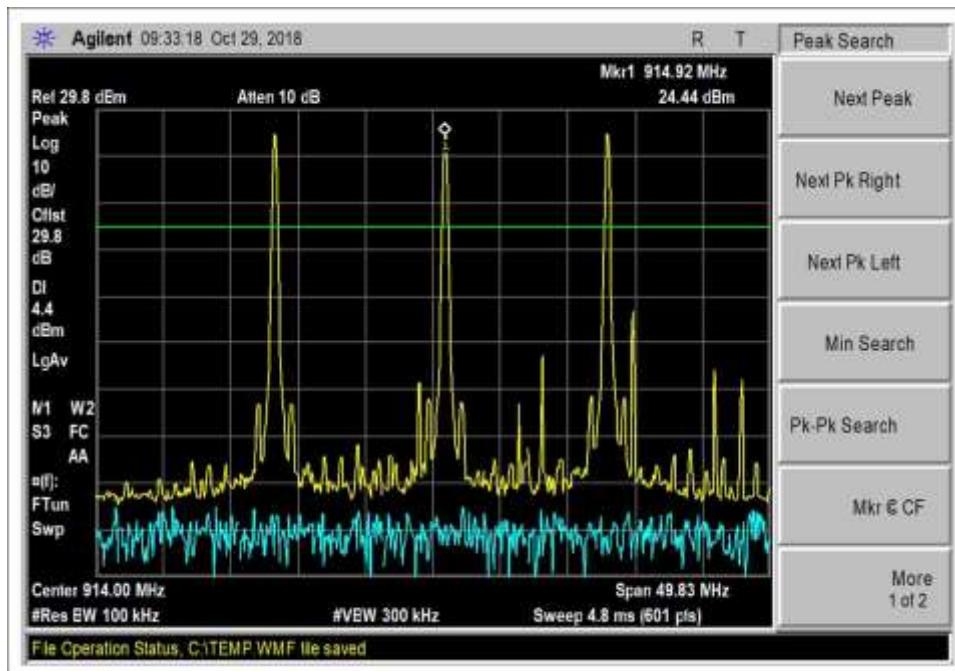
Band Edge

Band Edge Summary

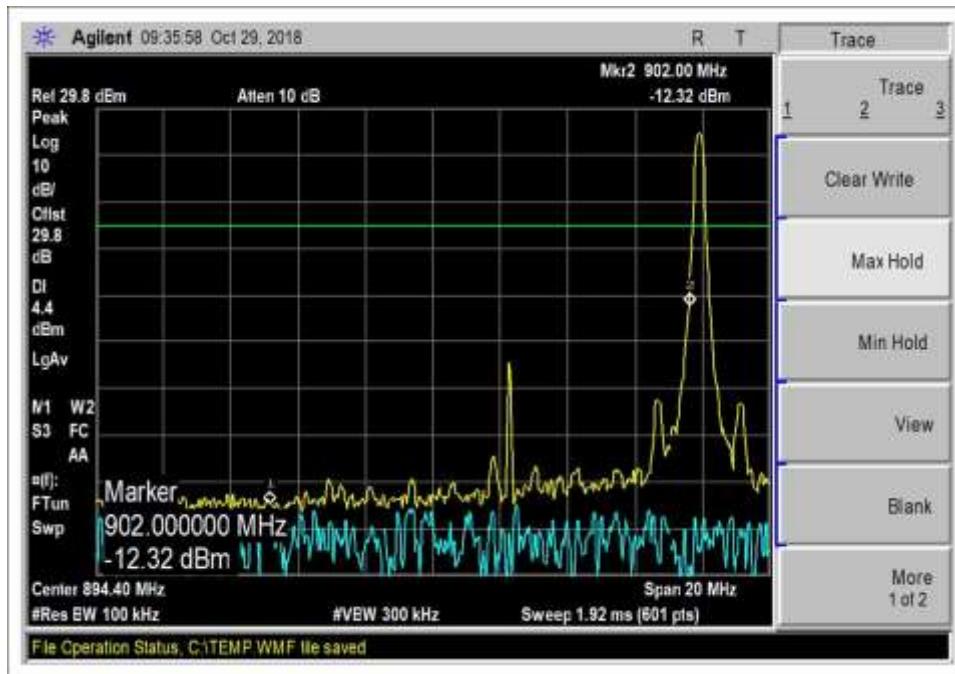
Limit applied: Max Power/100kHz - 20dB.

Frequency (MHz)	Modulation	Measured (dBm)	Limit (dBm)	Results
902	100kbps FSK lv3	-12.32	<4.4	Pass
928	100kbps FSK lv3	-36.75	<4.4	Pass
902	100kbps FSK lv3 hopping	-11.29	<4.4	Pass
928	100kbps FSK lv3 hopping	-36.26	<4.4	Pass
902	300kbps GFSK lv2	-22.08	<-5.0	Pass
928	300kbps GFSK lv2	-21.57	<-5.0	Pass
902	300kbps GFSK lv2 hopping	-20.43	<-5.0	Pass
928	300kbps GFSK lv2 hopping	-26.81	<-5.0	Pass
902	300kbps GFSK lv3	-9.47	<4.2	Pass
928	300kbps GFSK lv3	-11.01	<4.2	Pass
902	300kbps GFSK lv3 hopping	-10.82	<4.2	Pass
928	300kbps GFSK lv3 hopping	-9.76	<4.2	Pass

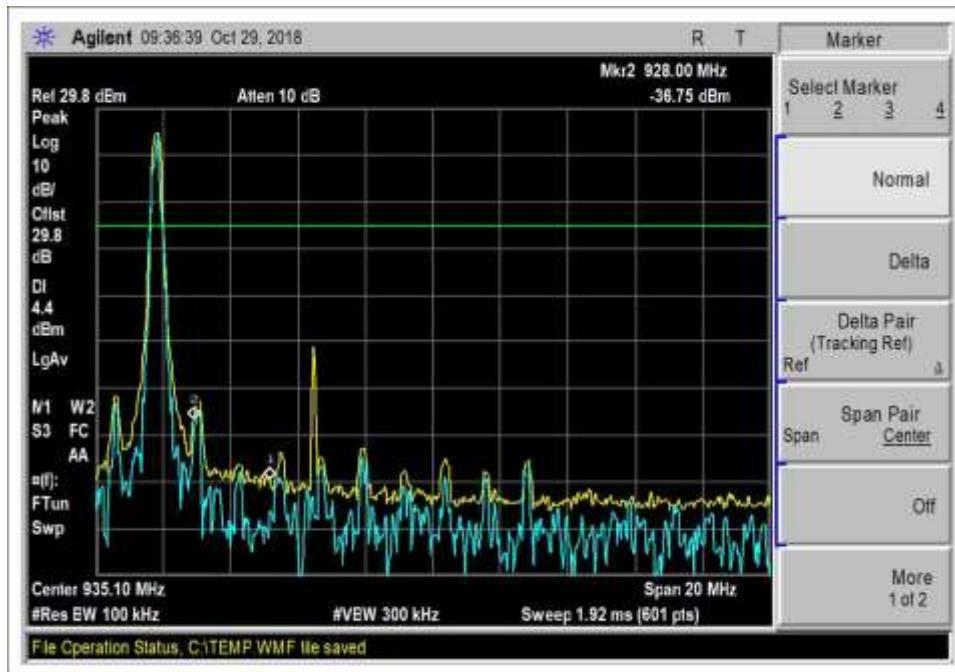
Band Edge Plots



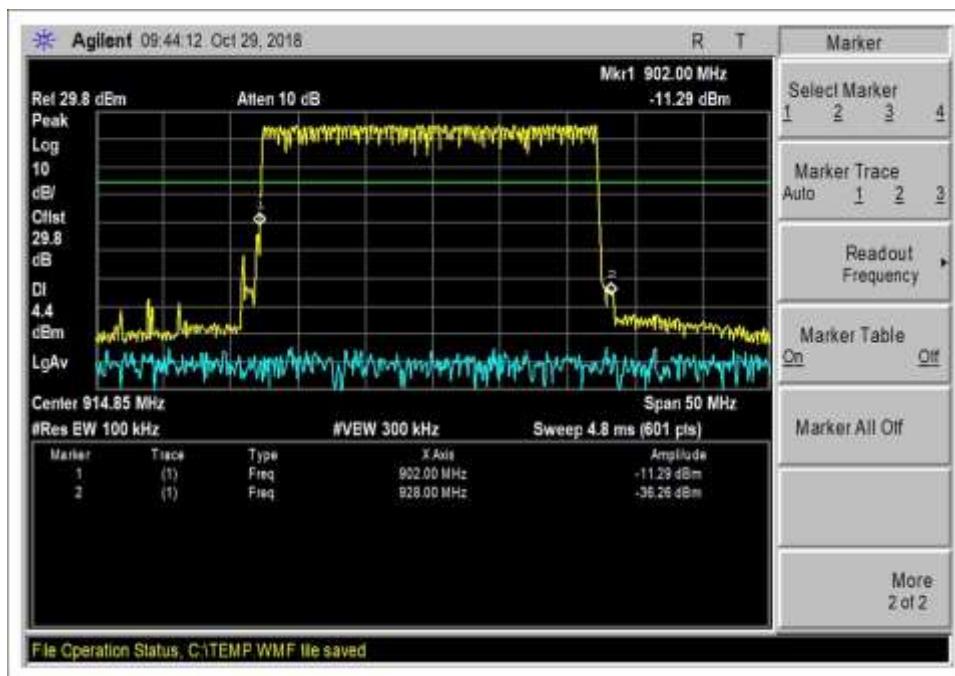
Peak, 100kbps, Power level 3



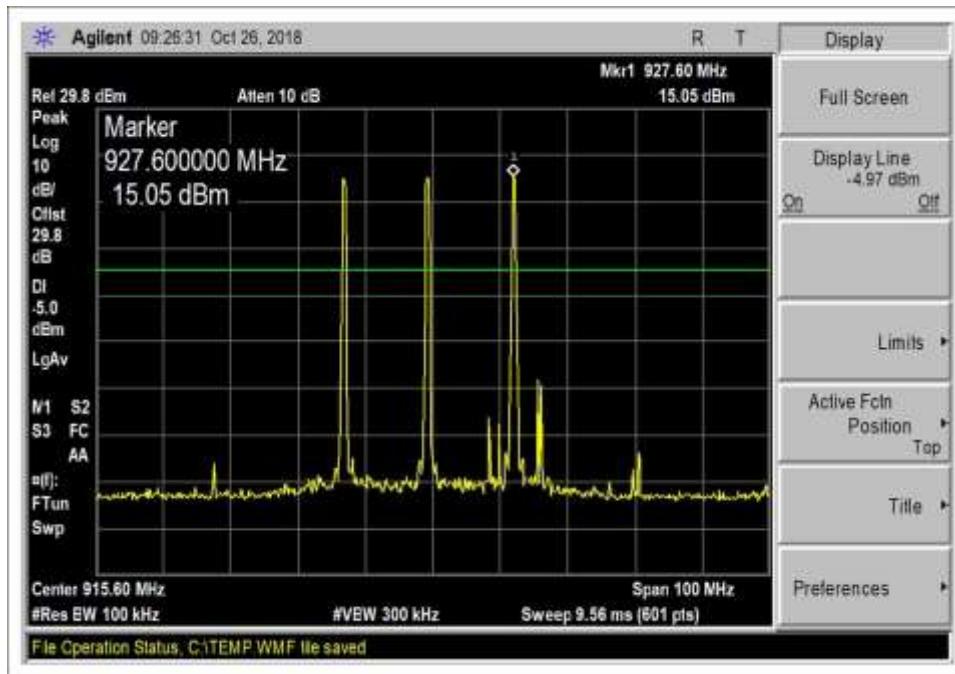
Low Channel, 100kbps, Power level 3



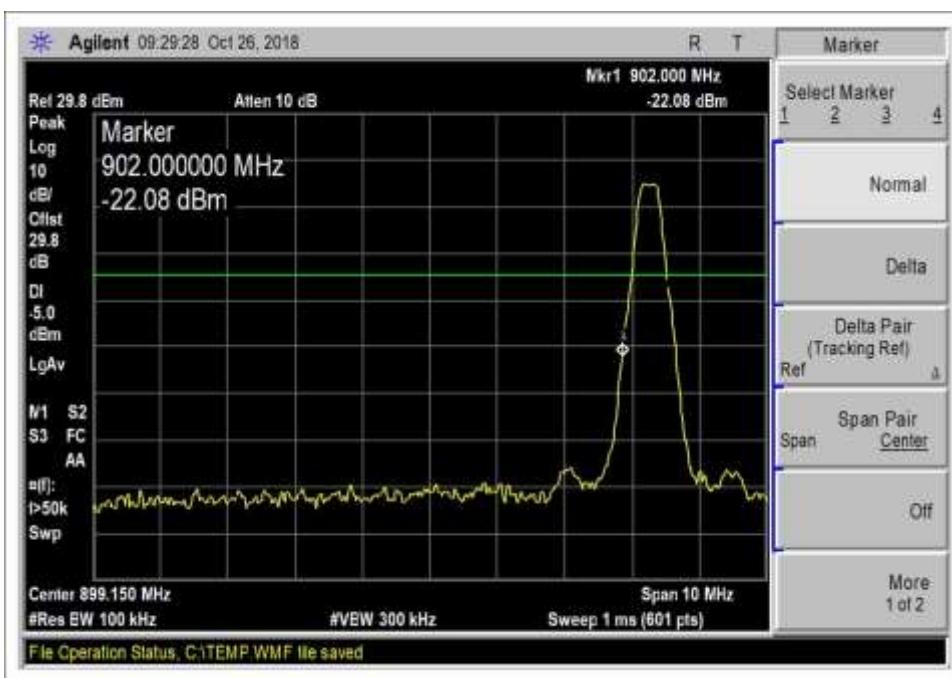
High Channel, 100kbps, Power level 3


Testing the Future
LABORATORIES, INC.


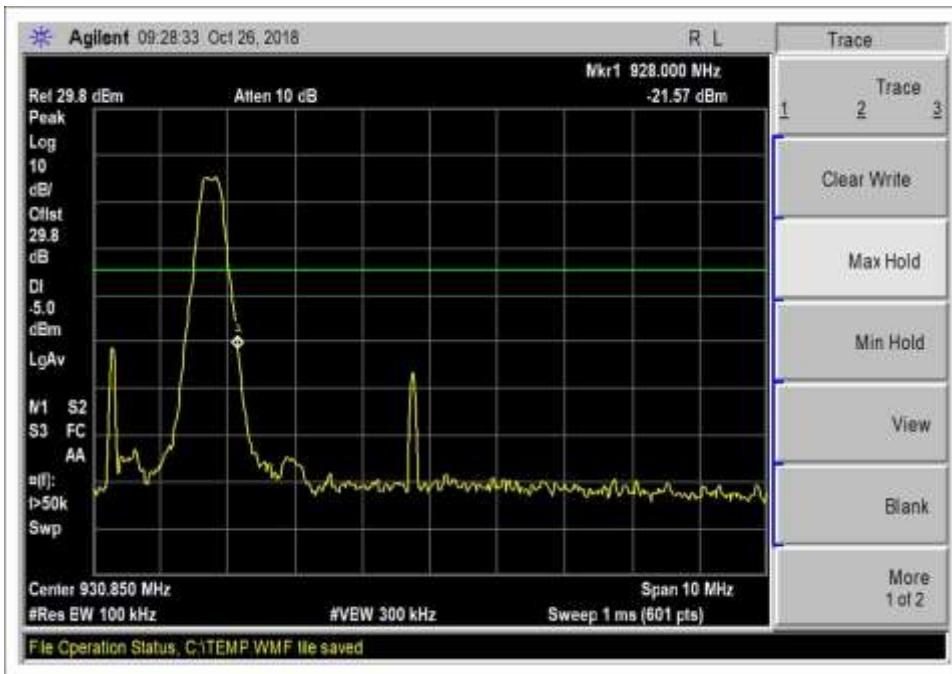
Hopping, 100kbps, Power level 3



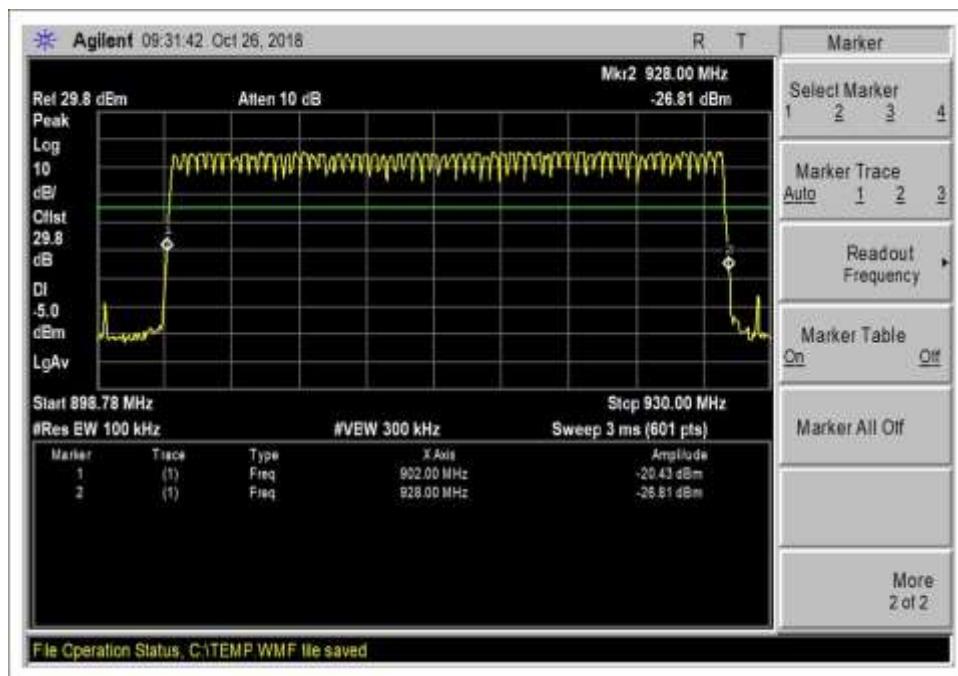
Peak, 300kbps, Power level 2



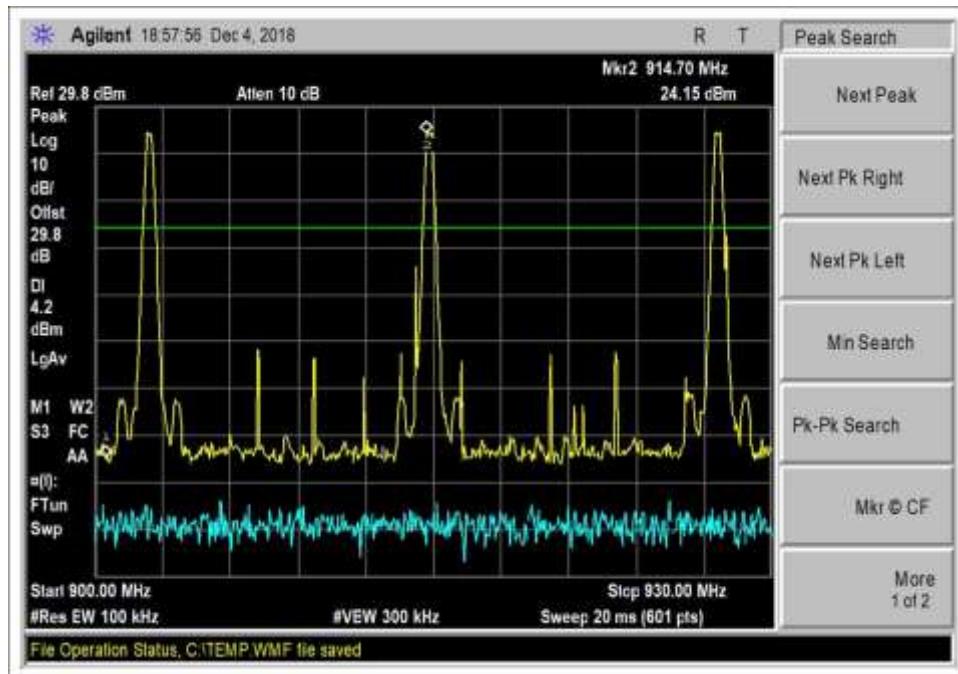
Low Channel, 300kbps, Power level 2



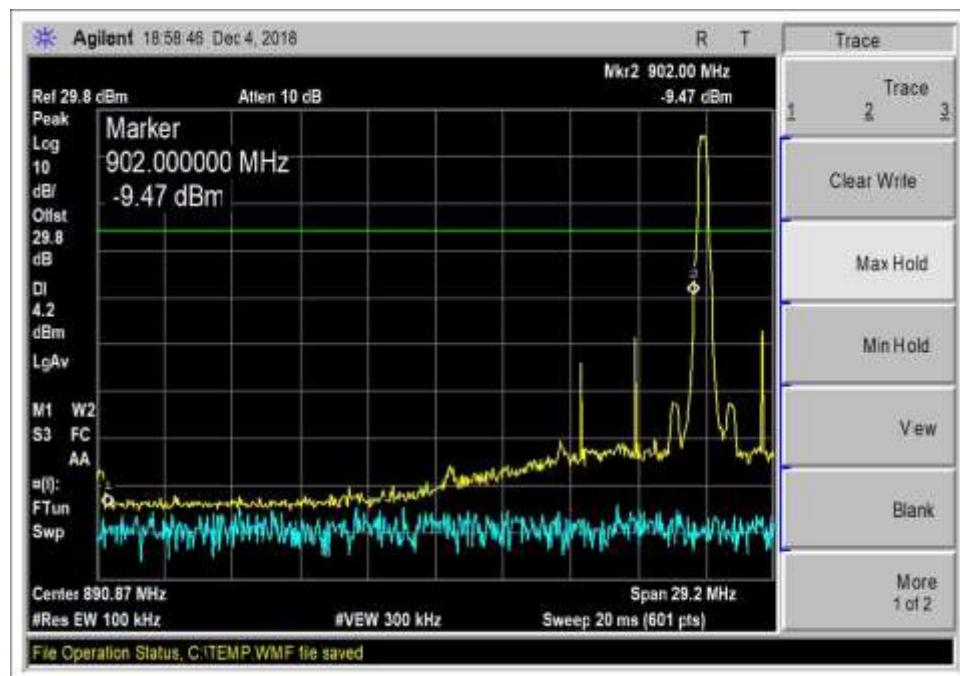
High Channel, 300kbps, Power level 2



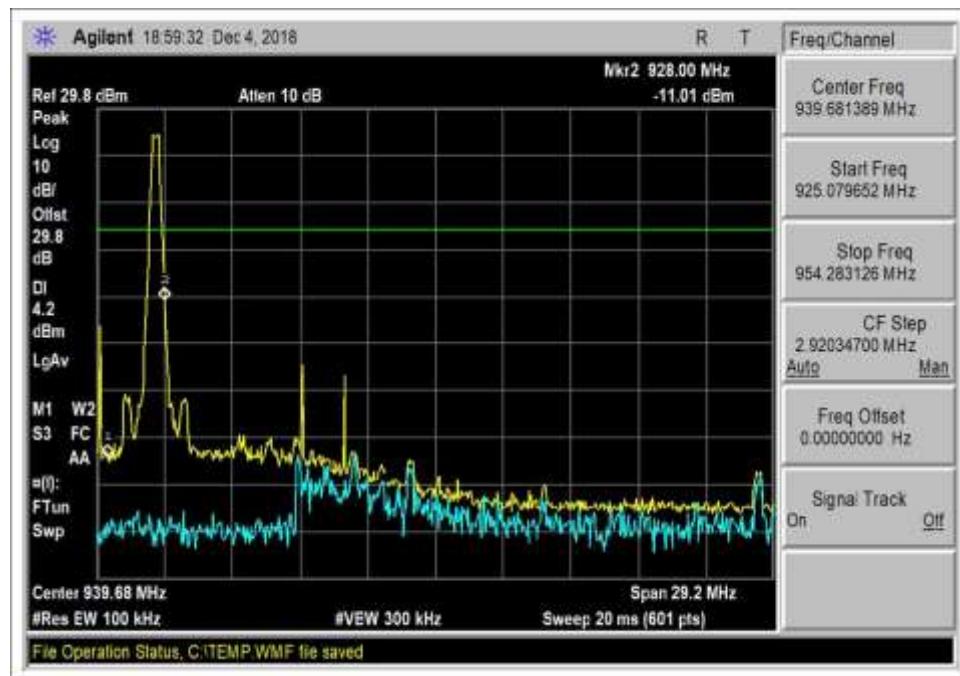
Hopping, 300kbps, Power level 2



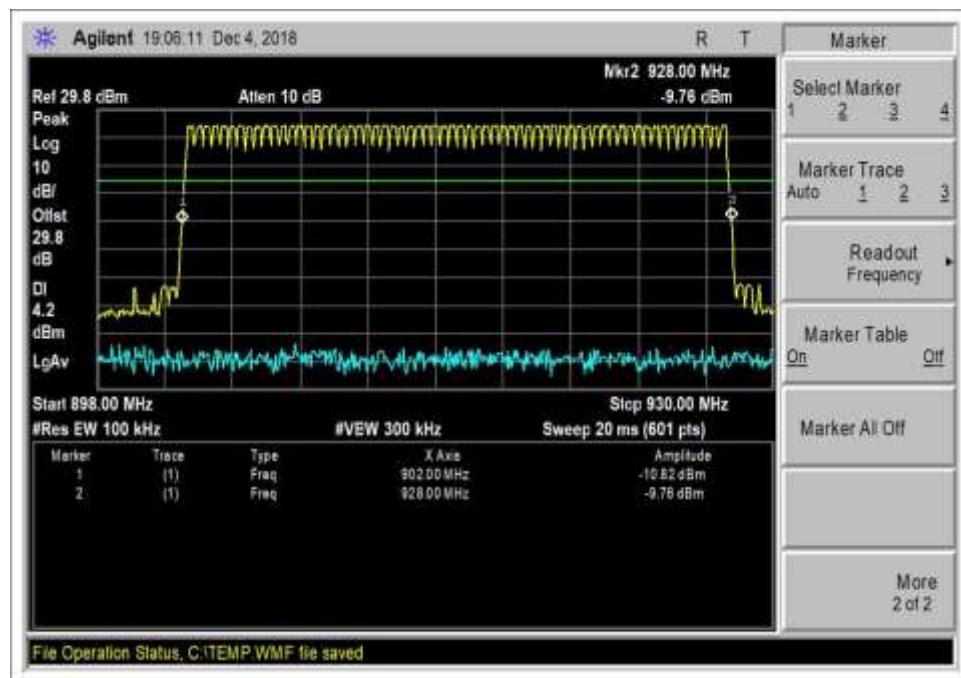
Peak, 300kbps, Power level 3



Low Channel, 300kbps, Power level 3

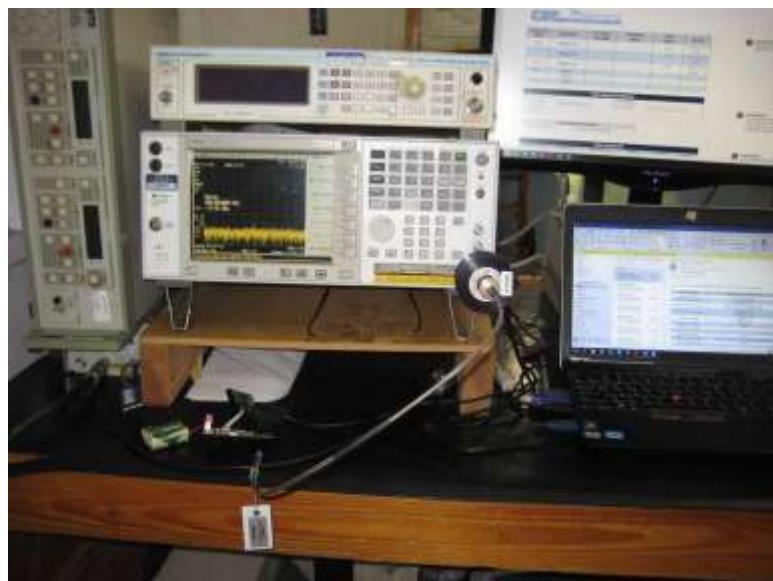


High Channel, 300kbps, Power level 3



Hopping, 300kbps, Power level 3

Test Setup Photo



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 #: **99315** Date: 10/30/2018
 Test Type: **Maximized Emissions** Time: 09:59:46
 Tested By: Don Nguyen Sequence#: 4
 Software: EMITest 5.03.11

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 at 100% duty cycle.
 The EUT is powered from fresh battery 6.0Vdc. Support equipment is removed during test.

Modulation: 100kbps FSK.

Frequency of measurement: 9k-9280MHz
 9 kHz -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)

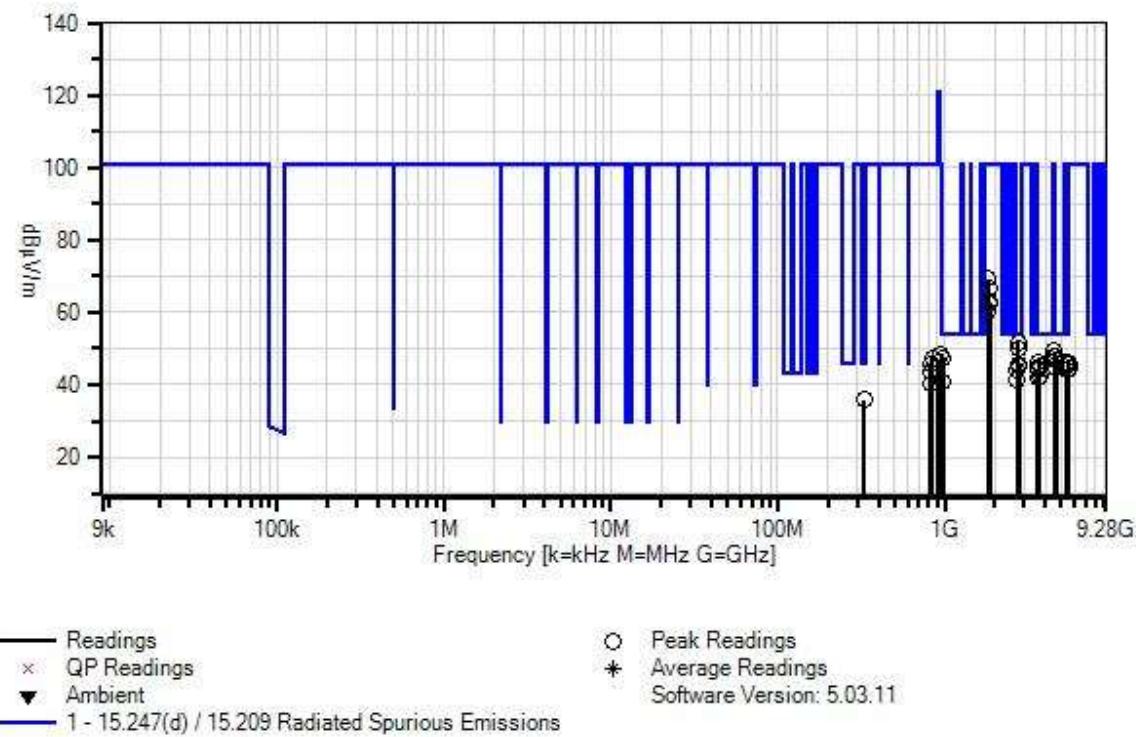
Test Method: ANSI C63.10 (2013)

Site A

Temperature: 22.4°C

Relative Humidity: 51.5%

Itron, Inc. WO#: 99315 Sequence#: 4 Date: 10/30/2018
15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Horiz



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN00314	Loop Antenna	6502	5/13/2018	5/13/2020
T1	AN01995	Biconilog Antenna	CBL6111C	4/23/2018	4/23/2020
T2	ANP05275	Attenuator	1W	4/5/2018	4/5/2020
T3	ANP05050	Cable	RG223/U	1/20/2017	1/20/2019
T4	ANP05198	Cable-Amplitude +15C to +45C (dB)	8268	12/7/2016	12/7/2018
T5	AN00309	Preamp	8447D	2/19/2018	2/19/2020
	AN02672	Spectrum Analyzer	E4446A	3/2/2017	3/2/2019
T6	AN00786	Preamp	83017A	5/12/2018	5/12/2020
T7	AN00849	Horn Antenna	3115	3/14/2018	3/14/2020
T8	ANP07139	Cable	ANDL1-PNMNM-48	3/1/2017	3/1/2019
T9	ANP07244	Cable	32022-29094K-29094K-24TC	7/5/2018	7/5/2020
T10	AN03169	High Pass Filter	HM1155-11SS	6/15/2017	6/15/2019

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dB μ V	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
			T5	T6	T7	T8	Table	dB μ V/m	dB μ V/m	dB	Ant
			T9	T10							
1	2744.700M	57.1	+0.0	+0.0	+0.0	+0.0	+0.0	51.7	54.0	-2.3	Horiz
			+0.0	-38.6	+29.4	+3.2					
			+0.4	+0.2							
2	2744.700M	55.6	+0.0	+0.0	+0.0	+0.0	+0.0	50.2	54.0	-3.8	Vert
			+0.0	-38.6	+29.4	+3.2					
			+0.4	+0.2							
3	4511.500M	49.4	+0.0	+0.0	+0.0	+0.0	+0.0	49.4	54.0	-4.6	Vert
			+0.0	-37.8	+32.9	+4.1					
			+0.7	+0.1							
4	4511.500M	48.0	+0.0	+0.0	+0.0	+0.0	+0.0	48.0	54.0	-6.0	Horiz
			+0.0	-37.8	+32.9	+4.1					
			+0.7	+0.1							
5	4634.500M	47.9	+0.0	+0.0	+0.0	+0.0	+0.0	48.0	54.0	-6.0	Vert
			+0.0	-37.7	+32.8	+4.2					
			+0.6	+0.2							
6	4574.500M	47.8	+0.0	+0.0	+0.0	+0.0	+0.0	47.8	54.0	-6.2	Horiz
			+0.0	-37.8	+32.9	+4.1					
			+0.7	+0.1							
7	978.930M	38.1	+24.0	+6.1	+0.5	+6.2	+0.0	47.5	54.0	-6.5	Vert
			-27.4	+0.0	+0.0	+0.0					
			+0.0	+0.0							
8	4634.500M	46.6	+0.0	+0.0	+0.0	+0.0	+0.0	46.7	54.0	-7.3	Horiz
			+0.0	-37.7	+32.8	+4.2					
			+0.6	+0.2							
9	3659.600M	48.5	+0.0	+0.0	+0.0	+0.0	+0.0	46.3	54.0	-7.7	Vert
			+0.0	-38.3	+31.6	+3.8					
			+0.5	+0.2							

10	2780.700M	50.6	+0.0	+0.0	+0.0	+0.0	+0.0	45.4	54.0	-8.6	Horiz
			+0.0	-38.6	+29.5	+3.3					
			+0.4	+0.2							
11	2780.700M	50.4	+0.0	+0.0	+0.0	+0.0	+0.0	45.2	54.0	-8.8	Vert
			+0.0	-38.6	+29.5	+3.3					
			+0.4	+0.2							
12	3707.600M	46.8	+0.0	+0.0	+0.0	+0.0	+0.0	44.9	54.0	-9.1	Horiz
			+0.0	-38.3	+31.9	+3.8					
			+0.5	+0.2							
13	4574.500M	44.5	+0.0	+0.0	+0.0	+0.0	+0.0	44.5	54.0	-9.5	Vert
			+0.0	-37.8	+32.9	+4.1					
			+0.7	+0.1							
14	3609.200M	47.1	+0.0	+0.0	+0.0	+0.0	+0.0	44.4	54.0	-9.6	Horiz
			+0.0	-38.4	+31.1	+3.8					
			+0.6	+0.2							
15	5413.800M	42.6	+0.0	+0.0	+0.0	+0.0	+0.0	44.1	54.0	-9.9	Vert
			+0.0	-37.5	+33.9	+4.6					
			+0.4	+0.1							
16	3659.600M	46.2	+0.0	+0.0	+0.0	+0.0	+0.0	44.0	54.0	-10.0	Horiz
			+0.0	-38.3	+31.6	+3.8					
			+0.5	+0.2							
17	2706.900M	49.5	+0.0	+0.0	+0.0	+0.0	+0.0	43.8	54.0	-10.2	Horiz
			+0.0	-38.6	+29.1	+3.2					
			+0.4	+0.2							
18	329.400M	40.0	+14.1	+6.0	+0.2	+3.3	+0.0	35.7	46.0	-10.3	Horiz
			-27.9	+0.0	+0.0	+0.0					
			+0.0	+0.0							
19	3707.600M	44.2	+0.0	+0.0	+0.0	+0.0	+0.0	42.3	54.0	-11.7	Vert
			+0.0	-38.3	+31.9	+3.8					
			+0.5	+0.2							
20	3609.200M	44.7	+0.0	+0.0	+0.0	+0.0	+0.0	42.0	54.0	-12.0	Vert
			+0.0	-38.4	+31.1	+3.8					
			+0.6	+0.2							
21	2706.900M	47.1	+0.0	+0.0	+0.0	+0.0	+0.0	41.4	54.0	-12.6	Vert
			+0.0	-38.6	+29.1	+3.2					
			+0.4	+0.2							
22	978.900M	31.5	+24.0	+6.1	+0.5	+6.2	+0.0	40.9	54.0	-13.1	Horiz
			-27.4	+0.0	+0.0	+0.0					
			+0.0	+0.0							
23	1804.600M	78.2	+0.0	+0.0	+0.0	+0.0	+0.0	69.3	101.0	-31.7	Vert
			+0.0	-38.9	+27.0	+2.5					
			+0.2	+0.3							
24	1829.800M	75.4	+0.0	+0.0	+0.0	+0.0	+0.0	66.6	101.0	-34.4	Vert
			+0.0	-38.9	+27.1	+2.5					
			+0.2	+0.3							
25	1829.800M	71.8	+0.0	+0.0	+0.0	+0.0	+0.0	63.0	101.0	-38.0	Horiz
			+0.0	-38.9	+27.1	+2.5					
			+0.2	+0.3							
26	1853.800M	71.4	+0.0	+0.0	+0.0	+0.0	+0.0	62.8	101.0	-38.2	Horiz
			+0.0	-38.9	+27.2	+2.6					
			+0.2	+0.3							

27	1853.800M	70.9	+0.0	+0.0	+0.0	+0.0	+0.0	62.3	101.0	-38.7	Vert
			+0.0	-38.9	+27.2		+2.6				
			+0.2	+0.3							
28	1804.600M	69.3	+0.0	+0.0	+0.0	+0.0	+0.0	60.4	101.0	-40.6	Horiz
			+0.0	-38.9	+27.0		+2.5				
			+0.2	+0.3							
29	952.930M	39.6	+23.6	+6.1	+0.5	+6.1	+0.0	48.6	101.0	-52.4	Vert
			-27.3	+0.0	+0.0	+0.0					
			+0.0	+0.0							
30	838.830M	40.0	+22.3	+6.1	+0.4	+5.7	+0.0	47.3	101.0	-53.7	Vert
			-27.2	+0.0	+0.0	+0.0					
			+0.0	+0.0							
31	5489.400M	44.3	+0.0	+0.0	+0.0	+0.0	+0.0	46.0	101.0	-55.0	Vert
			+0.0	-37.5	+34.1		+4.6				
			+0.4	+0.1							
32	820.630M	39.0	+22.1	+6.0	+0.4	+5.6	+0.0	45.9	101.0	-55.1	Vert
			-27.2	+0.0	+0.0	+0.0					
			+0.0	+0.0							
33	5489.400M	43.9	+0.0	+0.0	+0.0	+0.0	+0.0	45.6	101.0	-55.4	Horiz
			+0.0	-37.5	+34.1		+4.6				
			+0.4	+0.1							
34	5561.400M	43.9	+0.0	+0.0	+0.0	+0.0	+0.0	45.5	101.0	-55.5	Horiz
			+0.0	-37.4	+33.9		+4.6				
			+0.4	+0.1							
35	5561.400M	43.1	+0.0	+0.0	+0.0	+0.0	+0.0	44.7	101.0	-56.3	Vert
			+0.0	-37.4	+33.9		+4.6				
			+0.4	+0.1							
36	900.830M	36.6	+22.8	+6.1	+0.5	+5.9	+0.0	44.7	101.0	-56.3	Vert
			-27.2	+0.0	+0.0	+0.0					
			+0.0	+0.0							
37	900.900M	36.6	+22.8	+6.1	+0.5	+5.9	+0.0	44.7	101.0	-56.3	Horiz
			-27.2	+0.0	+0.0	+0.0					
			+0.0	+0.0							
38	822.900M	36.5	+22.1	+6.0	+0.4	+5.6	+0.0	43.4	101.0	-57.6	Horiz
			-27.2	+0.0	+0.0	+0.0					
			+0.0	+0.0							
39	822.930M	33.6	+22.1	+6.0	+0.4	+5.6	+0.0	40.5	101.0	-60.5	Vert
			-27.2	+0.0	+0.0	+0.0					
			+0.0	+0.0							



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 #: **99315** Date: 10/30/2018
Test Type: **Maximized Emissions** Time: 12:55:34
Tested By: Don Nguyen Sequence#: 3
Software: EMITest 5.03.11

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 at 100% duty cycle.
The EUT is powered from fresh battery 6.0Vdc. Support equipment is removed during test.

Modulation: 300kbps Hybrid.

Frequency of measurement: 9k-9280MHz
9 kHz -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)

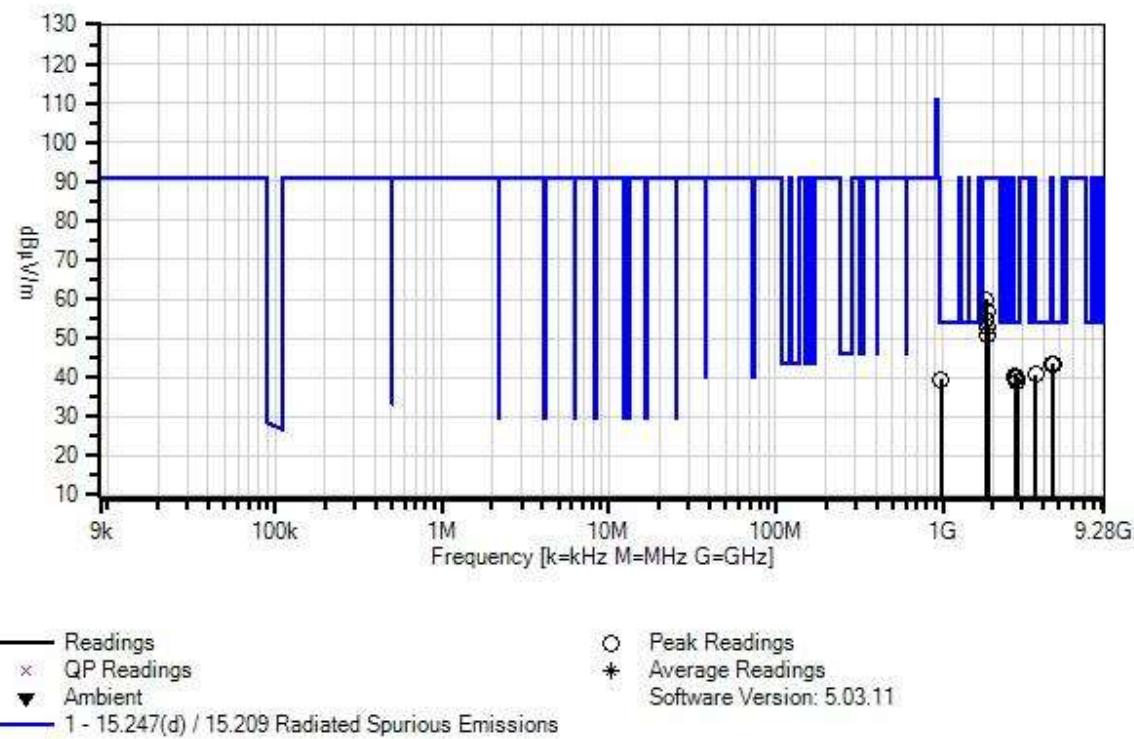
Test Method: ANSI C63.10 (2013)

Site A

Temperature: 26.1°C

Relative Humidity: 46.0%

Itron, Inc. WO#: 99315 Sequence#: 3 Date: 10/30/2018
15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Vert



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN00314	Loop Antenna	6502	5/13/2018	5/13/2020
T1	AN01995	Biconilog Antenna	CBL6111C	4/23/2018	4/23/2020
T2	ANP05275	Attenuator	1W	4/5/2018	4/5/2020
T3	ANP05050	Cable	RG223/U	1/20/2017	1/20/2019
T4	ANP05198	Cable-Amplitude +15C to +45C (dB)	8268	12/7/2016	12/7/2018
T5	AN00309	Preamp	8447D	2/19/2018	2/19/2020
	AN02672	Spectrum Analyzer	E4446A	3/2/2017	3/2/2019
T6	AN00786	Preamp	83017A	5/12/2018	5/12/2020
T7	AN00849	Horn Antenna	3115	3/14/2018	3/14/2020
T8	ANP07244	Cable	32022-29094K-29094K-24TC	7/5/2018	7/5/2020
T9	AN03169	High Pass Filter	HM1155-11SS	6/15/2017	6/15/2019
T10	ANP07139	Cable	ANDL1-PNMNM-48	3/1/2017	3/1/2019

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dB μ V	Margin				Dist Table	Corr dB μ V/m	Spec dB μ V/m	Margin dB	Polar Ant
			T1 +0.0	T2 -37.8	T3 +32.9	T4 +0.7					
			T5 +0.0	T6 -37.8	T7 +32.9	T8 +0.7					
1	4574.050M	43.6	+0.0	+0.0	+0.0	+0.0	+0.0	43.6	54.0	-10.4	Horiz
			+0.0	-37.8	+32.9	+0.7					
			+0.1	+4.1							
2	4512.000M	43.2	+0.0	+0.0	+0.0	+0.0	+0.0	43.2	54.0	-10.8	Vert
			+0.0	-37.8	+32.9	+0.7					
			+0.1	+4.1							
3	3609.600M	43.4	+0.0	+0.0	+0.0	+0.0	+0.0	40.7	54.0	-13.3	Horiz
			+0.0	-38.4	+31.1	+0.6					
			+0.2	+3.8							
4	2707.200M	46.3	+0.0	+0.0	+0.0	+0.0	+0.0	40.6	54.0	-13.4	Horiz
			+0.0	-38.6	+29.1	+0.4					
			+0.2	+3.2							
5	2782.800M	45.3	+0.0	+0.0	+0.0	+0.0	+0.0	40.1	54.0	-13.9	Vert
			+0.0	-38.6	+29.5	+0.4					
			+0.2	+3.3							
6	2744.400M	45.4	+0.0	+0.0	+0.0	+0.0	+0.0	40.0	54.0	-14.0	Vert
			+0.0	-38.6	+29.4	+0.4					
			+0.2	+3.2							
7	2744.450M	45.4	+0.0	+0.0	+0.0	+0.0	+0.0	40.0	54.0	-14.0	Horiz
			+0.0	-38.6	+29.4	+0.4					
			+0.2	+3.2							
8	2707.200M	45.4	+0.0	+0.0	+0.0	+0.0	+0.0	39.7	54.0	-14.3	Vert
			+0.0	-38.6	+29.1	+0.4					
			+0.2	+3.2							
9	980.400M	30.2	+24.0	+6.1	+0.5	+6.2	+0.0	39.6	54.0	-14.4	Vert
			-27.4	+0.0	+0.0	+0.0					
			+0.0	+0.0							

10	2782.800M	44.1	+0.0	+0.0	+0.0	+0.0	+0.0	38.9	54.0	-15.1	Horiz
			+0.0	-38.6	+29.5	+0.4					
			+0.2	+3.3							
11	1804.800M	68.8	+0.0	+0.0	+0.0	+0.0	+0.0	59.9	91.0	-31.1	Vert
			+0.0	-38.9	+27.0	+0.2					
			+0.3	+2.5							
12	1829.600M	65.6	+0.0	+0.0	+0.0	+0.0	+0.0	56.8	91.0	-34.2	Vert
			+0.0	-38.9	+27.1	+0.2					
			+0.3	+2.5							
13	1804.800M	63.8	+0.0	+0.0	+0.0	+0.0	+0.0	54.9	91.0	-36.1	Horiz
			+0.0	-38.9	+27.0	+0.2					
			+0.3	+2.5							
14	1855.200M	61.2	+0.0	+0.0	+0.0	+0.0	+0.0	52.7	91.0	-38.3	Vert
			+0.0	-38.9	+27.3	+0.2					
			+0.3	+2.6							
15	1829.600M	59.7	+0.0	+0.0	+0.0	+0.0	+0.0	50.9	91.0	-40.1	Horiz
			+0.0	-38.9	+27.1	+0.2					
			+0.3	+2.5							
16	1855.200M	59.2	+0.0	+0.0	+0.0	+0.0	+0.0	50.7	91.0	-40.3	Horiz
			+0.0	-38.9	+27.3	+0.2					
			+0.3	+2.6							



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 #: **99315** Date: 12/7/2018
Test Type: **Maximized Emissions** Time: 09:37:13
Tested By: Don Nguyen Sequence#: 5
Software: EMITest 5.03.11

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 at 100% duty cycle.
The EUT is powered from fresh battery 6.0Vdc. Support equipment is removed during test.

Modulation: 300kbps GFSK power level 3

Frequency of measurement: 9k-9280MHz
9 kHz -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)

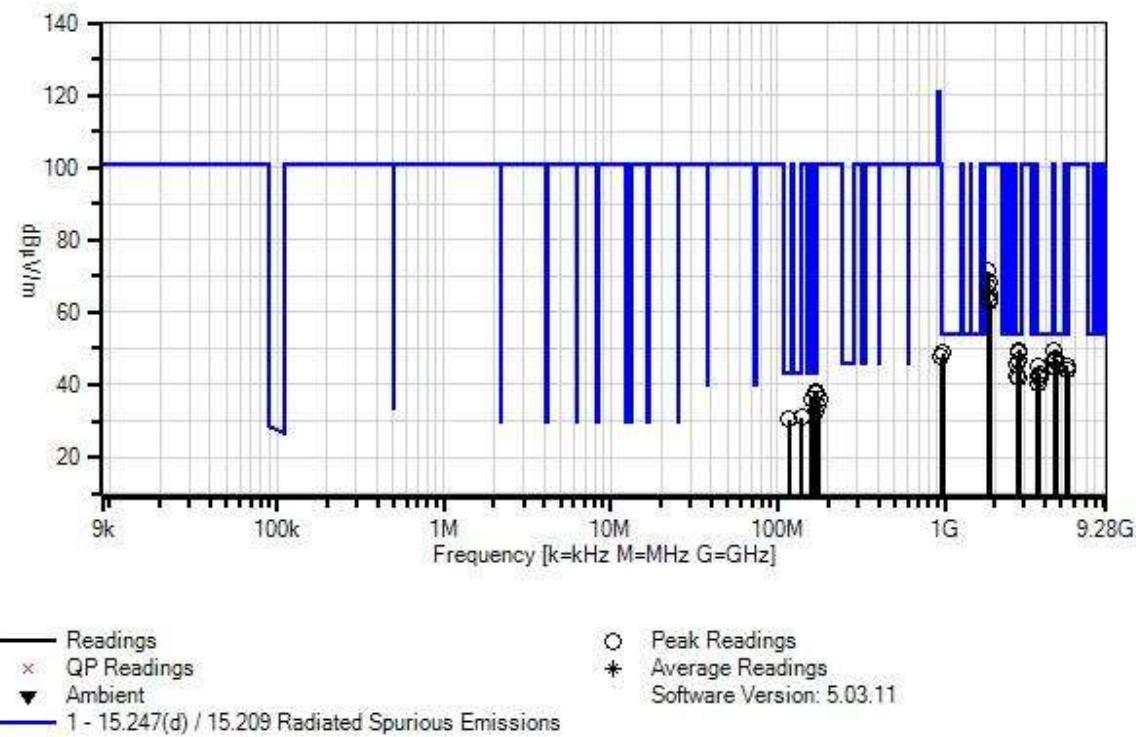
Test Method: ANSI C63.10 (2013)

Site A

Temperature: 26.1°C

Relative Humidity: 21.8%

Itron, Inc. WO#: 99315 Sequence#: 5 Date: 12/7/2018
15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Vert



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN00314	Loop Antenna	6502	5/13/2018	5/13/2020
T1	AN01995	Biconilog Antenna	CBL6111C	4/23/2018	4/23/2020
T2	ANP05275	Attenuator	1W	4/5/2018	4/5/2020
T3	ANP05050	Cable	RG223/U	1/20/2017	1/20/2019
T4	ANP05198	Cable-Amplitude +15C to +45C (dB)	8268	12/7/2016	12/7/2018
	AN00309	Preamp	8447D	2/19/2018	2/19/2020
T5	AN02672	Spectrum Analyzer	E4446A	3/2/2017	3/2/2019
T6	AN00786	Preamp	83017A	5/12/2018	5/12/2020
T7	AN00849	Horn Antenna	3115	3/14/2018	3/14/2020
T8	ANP07139	Cable	ANDL1-PNMMN-48	3/1/2017	3/1/2019
T9	ANP07244	Cable	32022-29094K-29094K-24TC	7/5/2018	7/5/2020
T10	AN03169	High Pass Filter	HM1155-11SS	6/15/2017	6/15/2019

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	Table	dB μ V/m	dB μ V/m	dB	Ant
1	4512.000M	49.7	+0.0 +0.0 +0.7	+0.0 -37.8 +0.1	+0.0 +32.9 +4.1	+0.0 +4.1	+0.0	49.7	54.0	-4.3	Vert
2	2782.800M	54.7	+0.0 +0.0 +0.4	+0.0 -38.6 +0.2	+0.0 +29.5 +3.3	+0.0 +3.3	+0.0	49.5	54.0	-4.5	Vert
3	2782.800M	54.3	+0.0 +0.0 +0.4	+0.0 -38.6 +0.2	+0.0 +29.5 +3.3	+0.0 +3.3	+0.0	49.1	54.0	-4.9	Horiz
4	979.530M	11.9	+24.0 +0.0 +0.0	+6.1 +0.0 +0.0	+0.5 +0.0 +0.0	+6.2 +0.0 +0.0	+0.0	48.7	54.0	-5.3	Vert
5	169.630M	19.3	+9.9 +0.0 +0.0	+6.0 +0.0 +0.0	+0.1 +0.0 +0.0	+2.2 +0.0 +0.0	+0.0	37.5	43.5	-6.0	Vert
6	4574.000M	47.4	+0.0 +0.0 +0.7	+0.0 -37.8 +0.1	+0.0 +32.9 +4.1	+0.0 +4.1	+0.0	47.4	54.0	-6.6	Vert
7	4638.000M	47.1	+0.0 +0.0 +0.6	+0.0 -37.7 +0.2	+0.0 +32.8 +4.2	+0.0 +4.2	+0.0	47.2	54.0	-6.8	Vert
8	4512.033M	47.0	+0.0 +0.0 +0.7	+0.0 -37.8 +0.1	+0.0 +32.9 +4.1	+0.0 +4.1	+0.0	47.0	54.0	-7.0	Horiz
9	2744.400M	52.3	+0.0 +0.0 +0.4	+0.0 -38.6 +0.2	+0.0 +29.4 +3.2	+0.0 +3.2	+0.0	46.9	54.0	-7.1	Horiz

10	4574.000M	46.5	+0.0	+0.0	+0.0	+0.0	+0.0	46.5	54.0	-7.5	Horiz
			+0.0	-37.8	+32.9		+4.1				
			+0.7	+0.1							
11	2707.233M	51.2	+0.0	+0.0	+0.0	+0.0	+0.0	45.5	54.0	-8.5	Horiz
			+0.0	-38.6	+29.1		+3.2				
			+0.4	+0.2							
12	5414.433M	43.7	+0.0	+0.0	+0.0	+0.0	+0.0	45.2	54.0	-8.8	Horiz
			+0.0	-37.5	+33.9		+4.6				
			+0.4	+0.1							
13	3609.633M	47.6	+0.0	+0.0	+0.0	+0.0	+0.0	44.9	54.0	-9.1	Horiz
			+0.0	-38.4	+31.1		+3.8				
			+0.6	+0.2							
14	172.100M	16.3	+9.7	+6.0	+0.1	+2.3	+0.0	34.4	43.5	-9.1	Horiz
			+0.0	+0.0	+0.0						
			+0.0	+0.0							
15	4638.000M	44.5	+0.0	+0.0	+0.0	+0.0	+0.0	44.6	54.0	-9.4	Horiz
			+0.0	-37.7	+32.8		+4.2				
			+0.6	+0.2							
16	170.850M	14.8	+9.8	+6.0	+0.1	+2.2	+0.0	32.9	43.5	-10.6	Horiz
			+0.0	+0.0	+0.0						
			+0.0	+0.0							
17	3710.400M	45.1	+0.0	+0.0	+0.0	+0.0	+0.0	43.2	54.0	-10.8	Vert
			+0.0	-38.3	+31.9		+3.8				
			+0.5	+0.2							
18	3659.200M	44.6	+0.0	+0.0	+0.0	+0.0	+0.0	42.4	54.0	-11.6	Horiz
			+0.0	-38.3	+31.6		+3.8				
			+0.5	+0.2							
19	2707.200M	48.0	+0.0	+0.0	+0.0	+0.0	+0.0	42.3	54.0	-11.7	Vert
			+0.0	-38.6	+29.1		+3.2				
			+0.4	+0.2							
20	3659.200M	44.4	+0.0	+0.0	+0.0	+0.0	+0.0	42.2	54.0	-11.8	Vert
			+0.0	-38.3	+31.6		+3.8				
			+0.5	+0.2							
21	2744.400M	47.5	+0.0	+0.0	+0.0	+0.0	+0.0	42.1	54.0	-11.9	Vert
			+0.0	-38.6	+29.4		+3.2				
			+0.4	+0.2							
22	3710.400M	43.9	+0.0	+0.0	+0.0	+0.0	+0.0	42.0	54.0	-12.0	Horiz
			+0.0	-38.3	+31.9		+3.8				
			+0.5	+0.2							
23	117.080M	11.0	+11.5	+6.0	+0.1	+1.8	+0.0	30.4	43.5	-13.1	Vert
			+0.0	+0.0	+0.0						
			+0.0	+0.0							
24	3609.600M	42.7	+0.0	+0.0	+0.0	+0.0	+0.0	40.0	54.0	-14.0	Vert
			+0.0	-38.4	+31.1		+3.8				
			+0.6	+0.2							
25	1804.800M	80.2	+0.0	+0.0	+0.0	+0.0	+0.0	71.3	101.0	-29.7	Vert
			+0.0	-38.9	+27.0		+2.5				
			+0.2	+0.3							
26	1829.600M	76.9	+0.0	+0.0	+0.0	+0.0	+0.0	68.1	101.0	-32.9	Vert
			+0.0	-38.9	+27.1		+2.5				
			+0.2	+0.3							

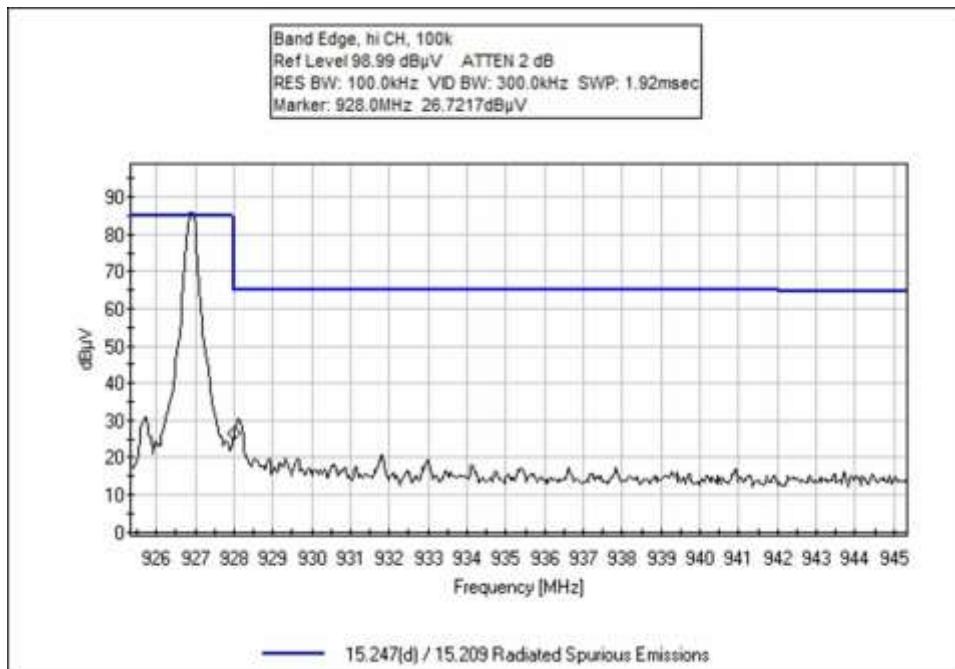
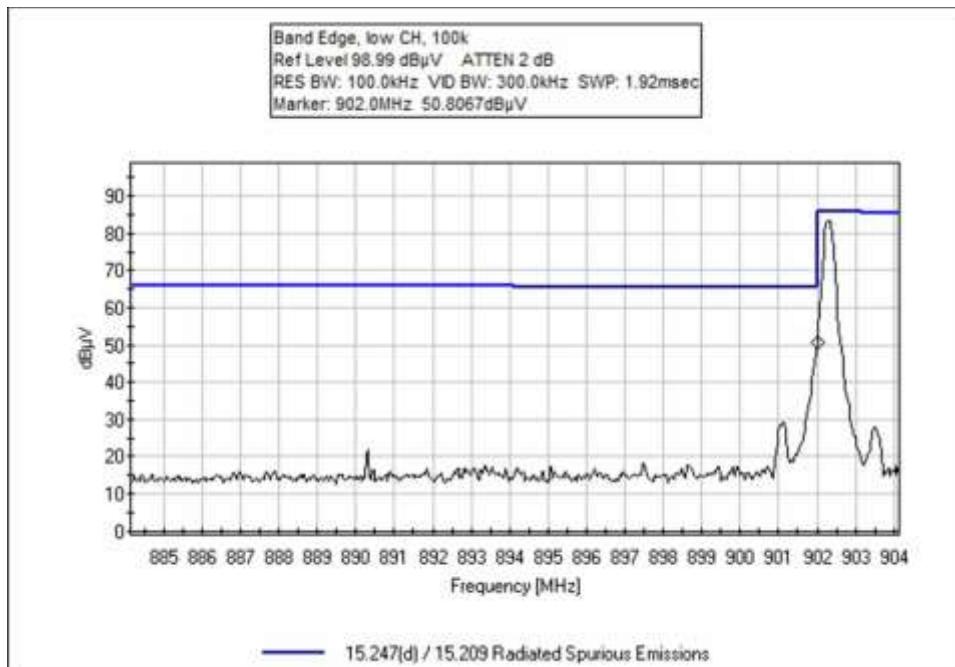
27	1804.833M	76.0	+0.0	+0.0	+0.0	+0.0	+0.0	67.1	101.0	-33.9	Horiz
			+0.0	-38.9	+27.0	+2.5					
			+0.2	+0.3							
28	1829.600M	73.7	+0.0	+0.0	+0.0	+0.0	+0.0	64.9	101.0	-36.1	Horiz
			+0.0	-38.9	+27.1	+2.5					
			+0.2	+0.3							
29	1855.200M	71.7	+0.0	+0.0	+0.0	+0.0	+0.0	63.2	101.0	-37.8	Horiz
			+0.0	-38.9	+27.3	+2.6					
			+0.2	+0.3							
30	1855.200M	71.4	+0.0	+0.0	+0.0	+0.0	+0.0	62.9	101.0	-38.1	Vert
			+0.0	-38.9	+27.3	+2.6					
			+0.2	+0.3							
31	953.633M	11.3	+23.6	+6.1	+0.5	+6.1	+0.0	47.6	101.0	-53.4	Vert
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0							
32	5488.800M	42.2	+0.0	+0.0	+0.0	+0.0	+0.0	43.9	101.0	-57.1	Vert
			+0.0	-37.5	+34.1	+4.6					
			+0.4	+0.1							
33	167.230M	19.9	+10.1	+6.0	+0.1	+2.2	+0.0	38.3	101.0	-62.7	Vert
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0							
34	176.950M	18.4	+9.3	+6.0	+0.1	+2.3	+0.0	36.1	101.0	-64.9	Horiz
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0							
35	159.983M	17.0	+10.7	+6.0	+0.1	+2.1	+0.0	35.9	101.0	-65.1	Vert
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0							
36	138.580M	11.1	+11.7	+6.0	+0.1	+2.0	+0.0	30.9	101.0	-70.1	Vert
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0							

Band Edge

Band Edge Summary

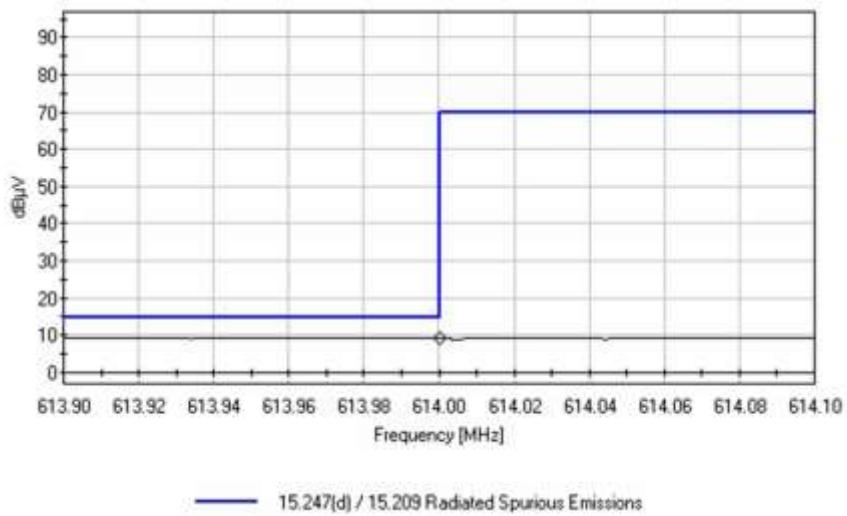
Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
614	100kbps FSK Lv3	Integral	40.3	<46	Pass
902	100kbps FSK Lv3	Integral	86.1	<101	Pass
928	100kbps FSK Lv3	Integral	62.5	<101	Pass
960	100kbps FSK Lv3	Integral	45.6	<54	Pass
902	100kbps FSK Lv3 Hopping	Integral	86.6	<101	Pass
928	100kbps FSK Lv3 Hopping	Integral	56.3	<101	Pass
614	300kbps GFSK Lv2	Integral	40.3	<46	Pass
902	300kbps GFSK Lv2	Integral	72.7	<91	Pass
928	300kbps GFSK Lv2	Integral	74.1	<91	Pass
960	300kbps GFSK Lv2	Integral	46.2	<54	Pass
902	300kbps GFSK Lv2 Hopping	Integral	69.8	<91	Pass
928	300kbps GFSK Lv2 Hopping	Integral	71.8	<91	Pass
614	300kbps GFSK Lv3	Integral	40.2	<46	Pass
902	300kbps GFSK Lv3	Integral	81.1	<101	Pass
928	300kbps GFSK Lv3	Integral	81.0	<101	Pass
960	300kbps GFSK Lv3	Integral	82.8	<54	Pass
902	300kbps GFSK Lv3 Hopping	Integral	81.3	<101	Pass
928	300kbps GFSK Lv3 Hopping	Integral	81.9	<101	Pass

Band Edge Plots

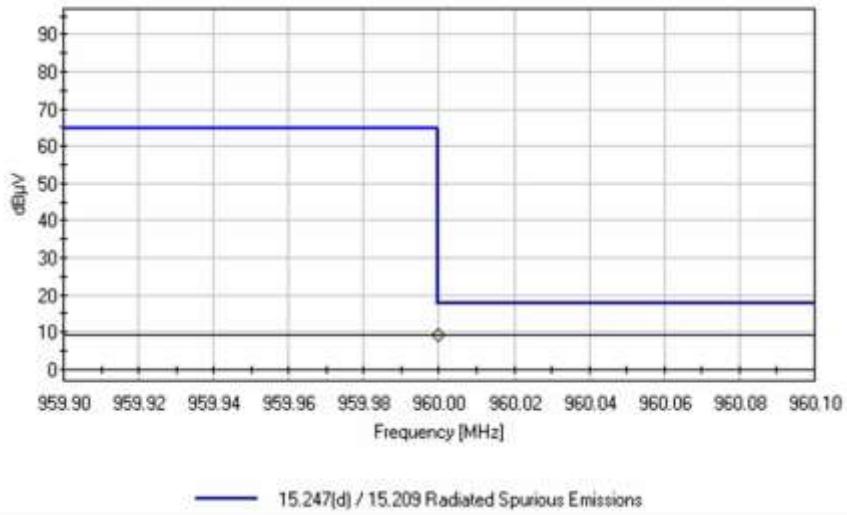


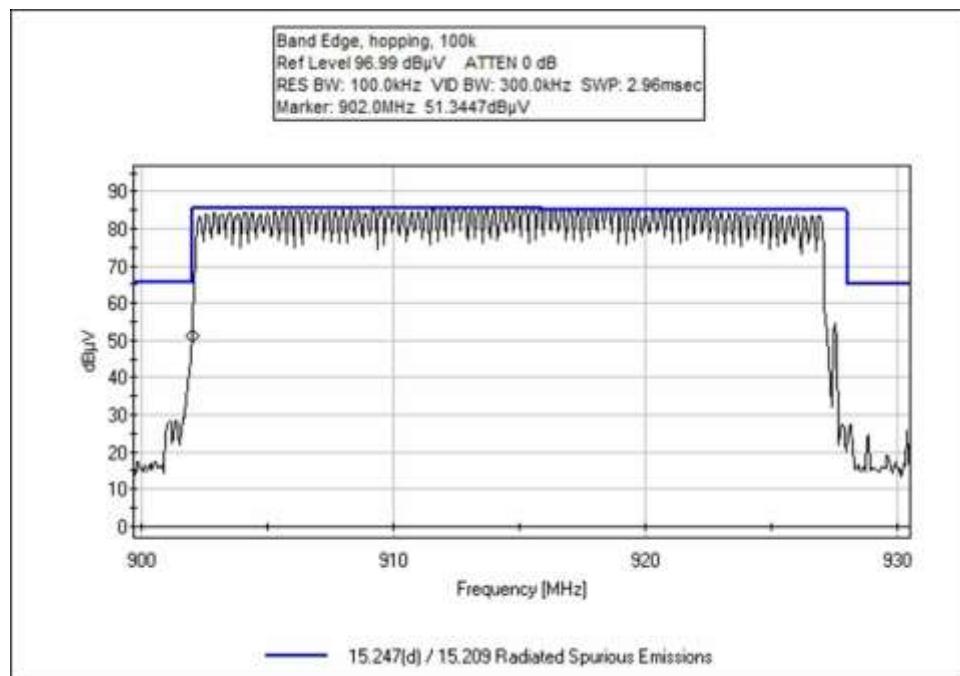


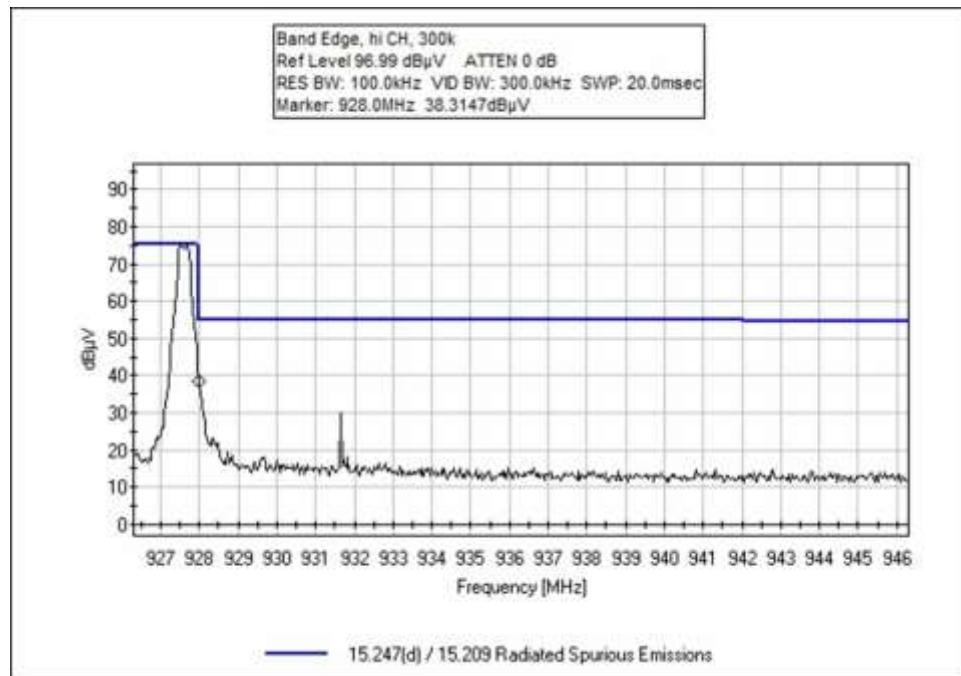
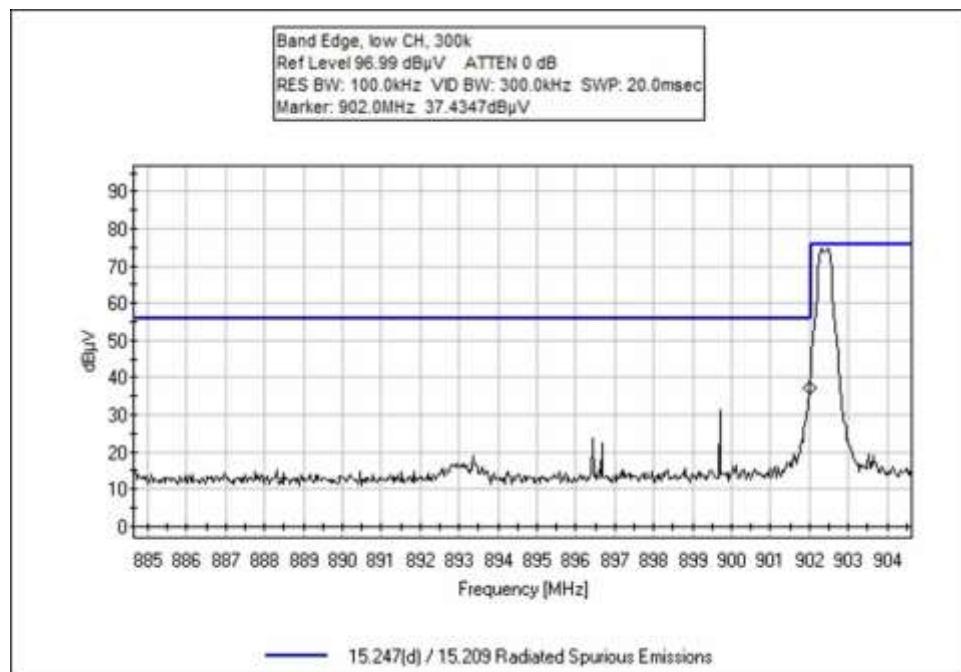
Band Edge, low CH, FSK 100k Hz, restricted band
Ref Level 96.99 dB μ V ATTEN 0 dB
RES BW: 120.0kHz VID BW: 360.0kHz SWP: 20.952sec
Marker: 614.0MHz 9.0977dB μ V

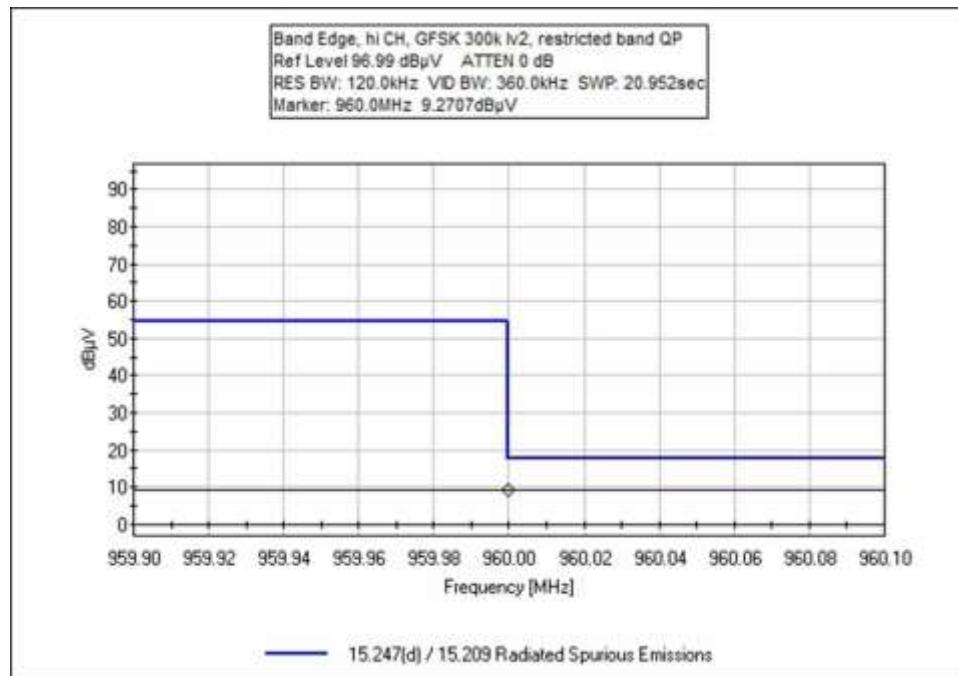
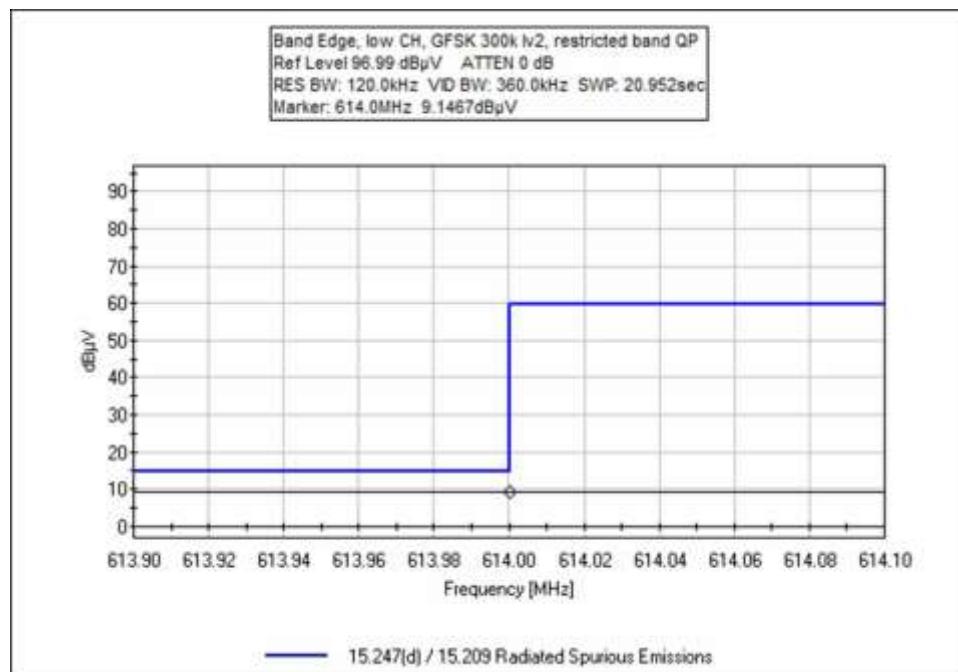


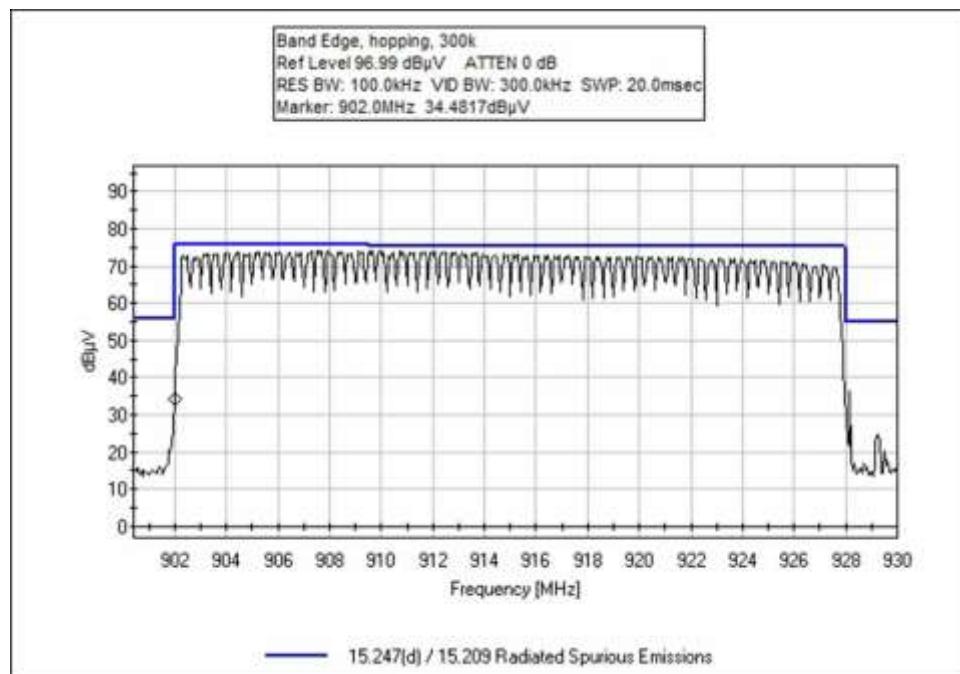
Band Edge, hi CH, FSK 100k Hz, restricted band QP
Ref Level 96.99 dB μ V ATTEN 0 dB
RES BW: 120.0kHz VID BW: 360.0kHz SWP: 20.952sec
Marker: 960.0MHz 9.1837dB μ V

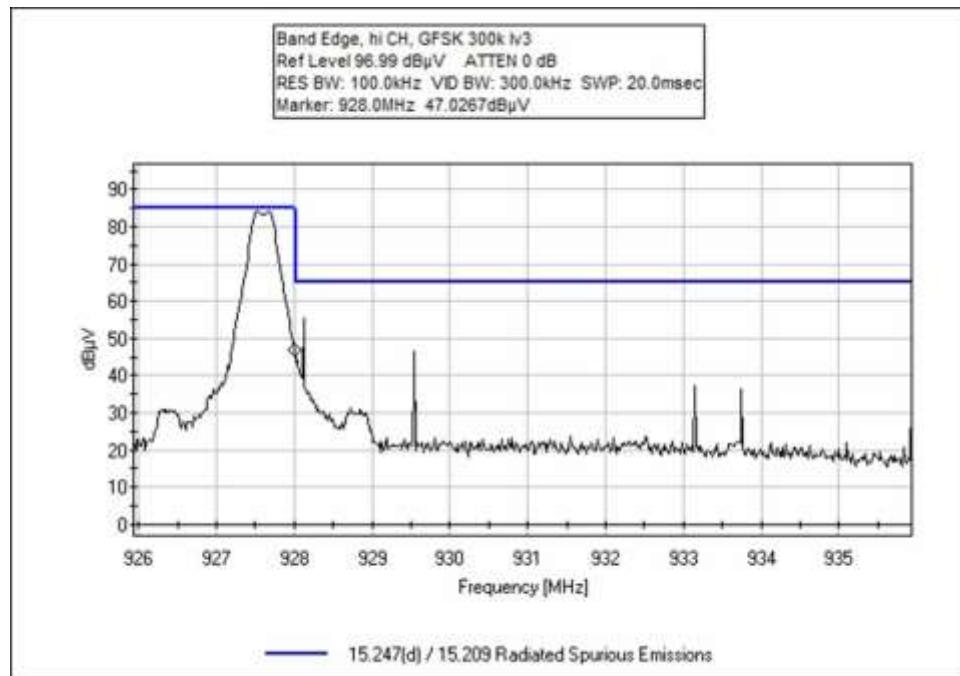
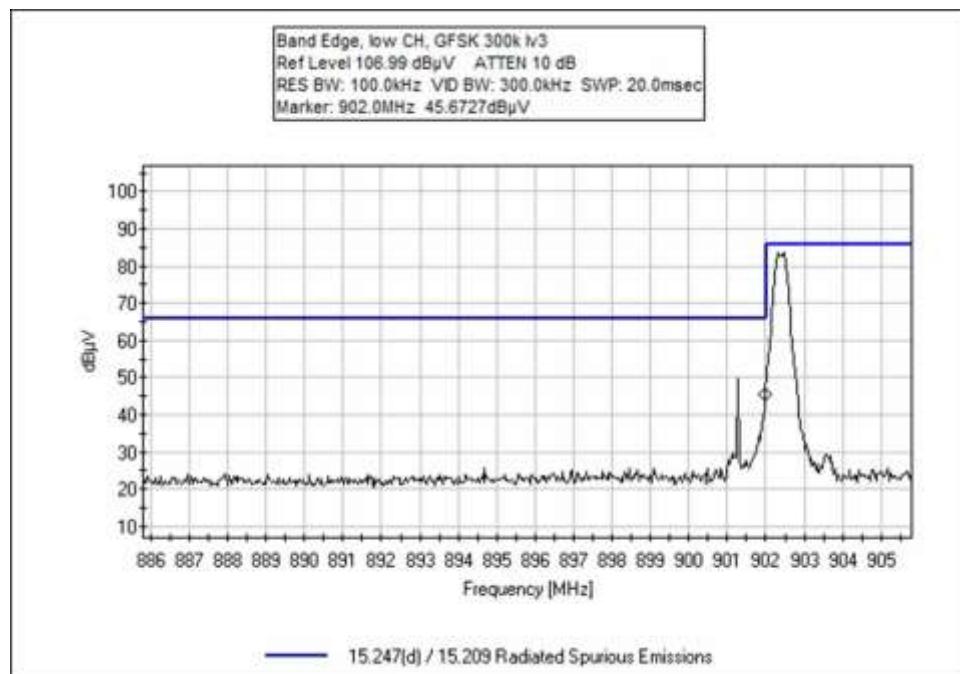


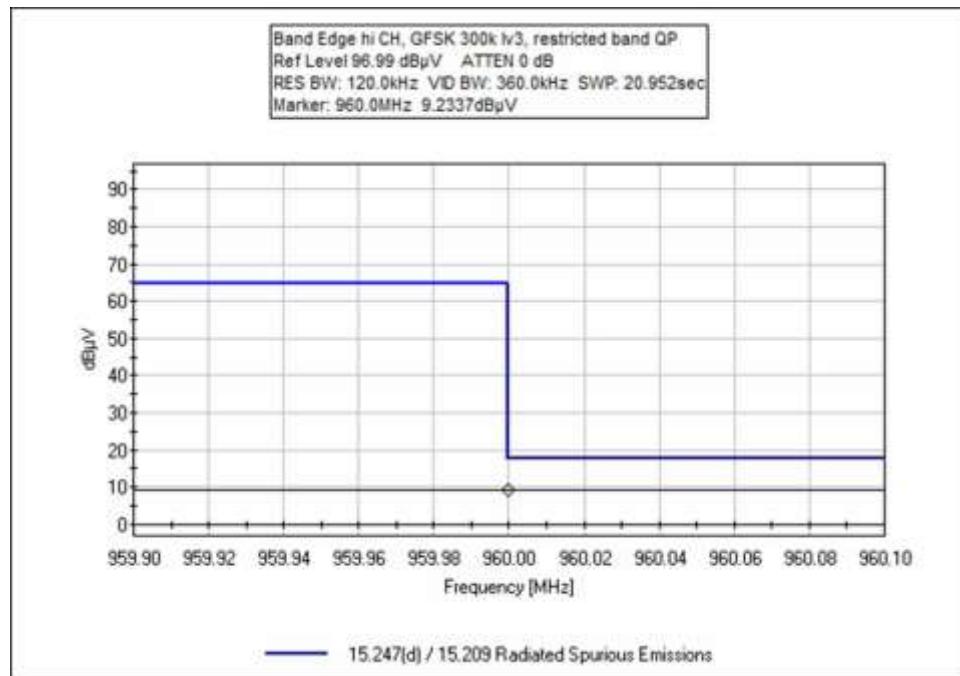
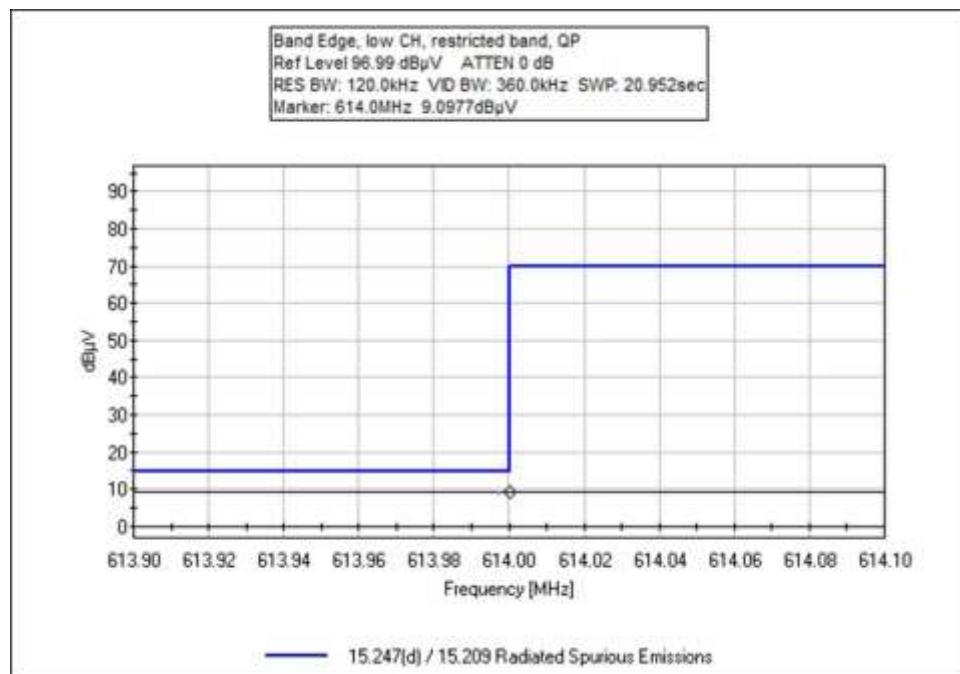


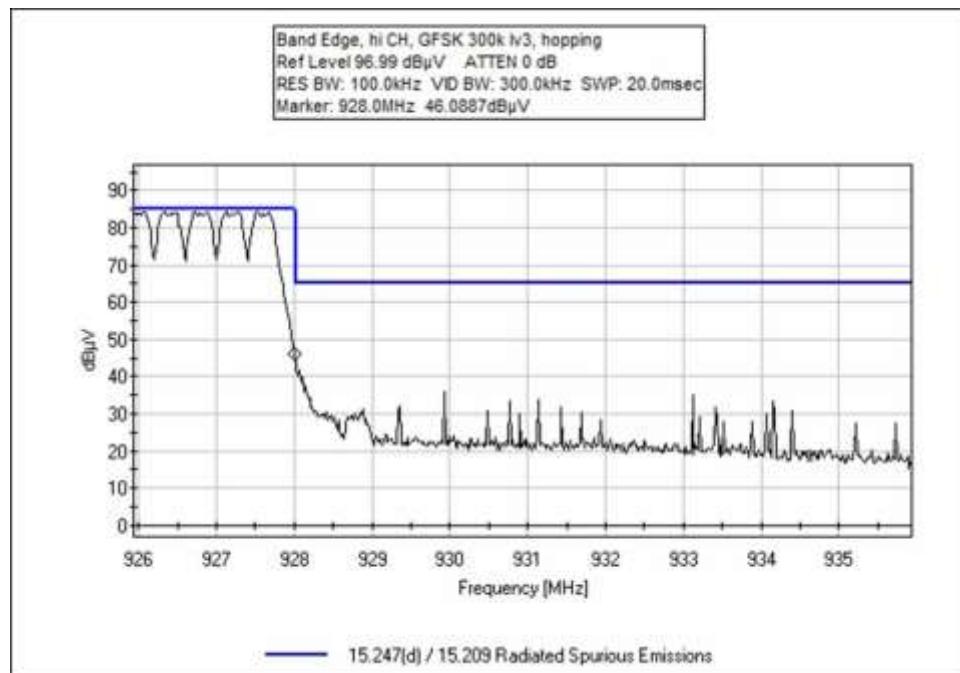
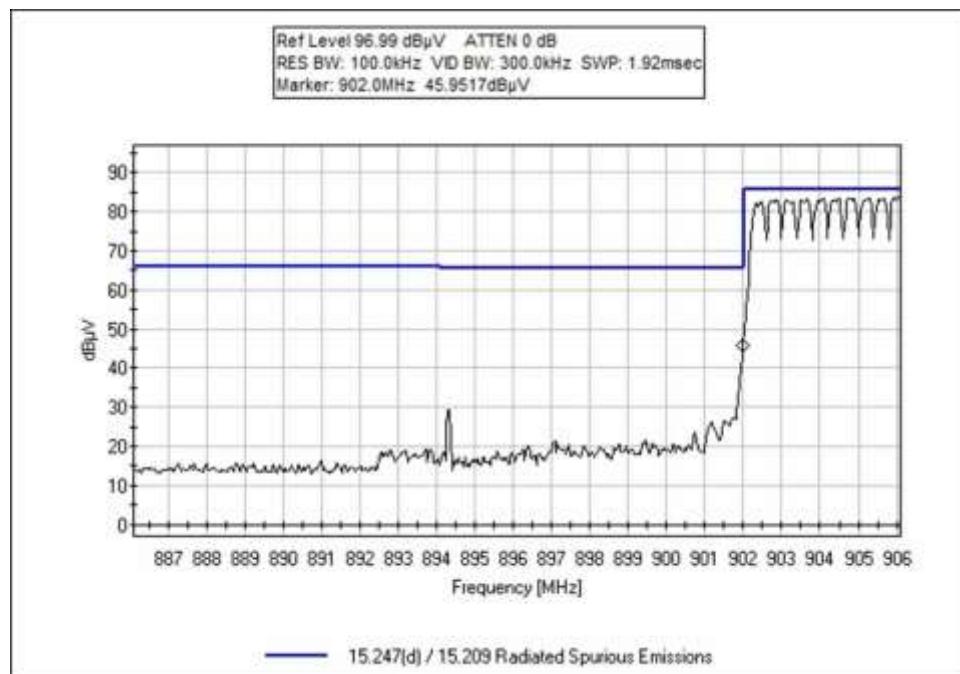












Test Setup / Conditions / Data

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 #: **99315** Date: 12/4/2018
 Test Type: **Maximized Emissions** Time: 09:15:12
 Tested By: Don Nguyen Sequence#: 3
 Software: EMITest 5.03.11

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 at 100% duty cycle.
 The EUT is powered from fresh battery 6.0Vdc. Support equipment is removed during test.

Modulation: 100kbps FSK power level 3.

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

Site A

Temperature: 22.1°C

Relative Humidity: 52.6%

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	ANP05050	Cable	RG223/U	1/20/2017	1/20/2019
T4	ANP05198	Cable-Amplitude +15C to +45C (dB)	8268	12/7/2016	12/7/2018
T5	AN02672	Spectrum Analyzer	E4446A	3/2/2017	3/2/2019

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

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dB μ V	dB	dB	dB	dB	Table	dB μ V/m	dB μ V/m	dB	Ant
1	614.000M QP	9.2 +0.0	+20.0 +6.0	+6.0	+0.4	+4.7	+0.0	40.3	46.0	-5.7	Vert
2	960.000M QP	9.2 +0.0	+23.7 +6.1	+6.1	+0.5	+6.1	+0.0	45.6	54.0	-8.4	Vert
3	902.000M	51.3 +0.0	+22.8 +6.1	+6.1	+0.5	+5.9	+0.0	86.6	101.0 Hopping	-14.4	Vert
4	902.000M	50.8 +0.0	+22.8 +6.1	+6.1	+0.5	+5.9	+0.0	86.1	101.0	-14.9	Vert
5	928.000M	26.7 +0.0	+23.2 +6.1	+6.1	+0.5	+6.0	+0.0	62.5	101.0	-38.5	Vert
6	928.000M	20.5 +0.0	+23.2 +6.1	+6.1	+0.5	+6.0	+0.0	56.3	101.0 Hopping	-44.7	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 #: **99315** Date: 10/26/2018
Test Type: **Maximized Emissions** Time: 14:16:35
Tested By: Don Nguyen Sequence#: 2
Software: EMITest 5.03.11

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 at 100% duty cycle.
The EUT is powered from fresh battery 6.0Vdc. Support equipment is removed during test.

Modulation: 300kbps GFSK power level 2.

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

Site A

Temperature: 26.1°C

Relative Humidity: 46.0%

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	ANP05050	Cable	RG223/U	1/20/2017	1/20/2019
T4	ANP05198	Cable-Amplitude +15C to +45C (dB)	8268	12/7/2016	12/7/2018
T5	AN02672	Spectrum Analyzer	E4446A	3/2/2017	3/2/2019

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

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dB μ V	dB	dB	dB	dB	Table	dB μ V/m	dB μ V/m	dB	Ant
1	614.000M QP	9.2 +0.0	+20.0 +6.0	+6.0	+0.4	+4.7	+0.0	40.3	46.0	-5.7	Vert
2	960.000M QP	9.8 +0.0	+23.7 +6.1	+6.1	+0.5	+6.1	+0.0	46.2	54.0	-7.8	Vert
3	928.000M	38.3 +0.0	+23.2 +6.1	+6.1	+0.5	+6.0	+0.0	74.1	91.0	-16.9	Vert
4	902.000M	37.4 +0.0	+22.8 +6.1	+6.1	+0.5	+5.9	+0.0	72.7	91.0	-18.3	Vert
5	928.000M	36.0 +0.0	+23.2 +6.1	+6.1	+0.5	+6.0	+0.0	71.8	91.0	-19.2	Vert
6	902.000M	34.5 +0.0	+22.8 +6.1	+6.1	+0.5	+5.9	+0.0	69.8	91.0	-21.2	Vert
											Hopping
											Hopping



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 #: **99315** Date: 12/4/2018
Test Type: **Maximized Emissions** Time: 09:45:41
Tested By: Don Nguyen Sequence#: 4
Software: EMITest 5.03.11

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 at 100% duty cycle.
The EUT is powered from fresh battery 6.0Vdc. Support equipment is removed during test.

Modulation: 300kbps GFSK power level3

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

Site A

Temperature: 23.7°C

Relative Humidity: 19.6%

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	ANP05050	Cable	RG223/U	1/20/2017	1/20/2019
T4	ANP05198	Cable-Amplitude +15C to +45C (dB)	8268	12/7/2016	12/7/2018
T5	AN02672	Spectrum Analyzer	E4446A	3/2/2017	3/2/2019

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

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dB μ V	dB	dB	dB	dB	Table	dB μ V/m	dB μ V/m	dB	Ant
1	614.000M QP	9.1 +0.0	+20.0 +6.0	+6.0	+0.4	+4.7	+0.0	40.2	46.0	-5.8	Vert
2	960.000M QP	9.3 +0.0	+23.7 +6.1	+6.1	+0.5	+6.1	+0.0	45.7	54.0	-8.3	Vert
3	928.000M	47.0 +0.0	+23.2 +6.1	+6.1	+0.5	+6.0	+0.0	82.8	101.0	-18.2	Vert
4	928.000M	46.1 +0.0	+23.2 +6.1	+6.1	+0.5	+6.0	+0.0	81.9	101.0	-19.1	Vert
5	902.000M	46.0 +0.0	+22.8 +6.1	+6.1	+0.5	+5.9	+0.0	81.3	101.0	-19.8	Vert
6	902.000M	45.7 +0.0	+22.8 +6.1	+6.1	+0.5	+5.9	+0.0	81.0	101.0	-20.0	Vert

Test Setup Photos



Below 1GHz



Below 1GHz



Above 1GHz, Cone placement



Above 1GHz, Cone placement

SUPPLEMENTAL INFORMATION

Measurement Uncertainty

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

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

Emissions Test Details

TESTING PARAMETERS

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

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

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

CORRECTION FACTORS

The basic spectrum analyzer reading was converted using correction factors as shown in the highest emissions readings in the tables. For radiated emissions in dB μ V/m, the spectrum analyzer reading in dB μ V was corrected by using the following formula. This reading was then compared to the applicable specification limit. Individual measurements were compared with the displayed limit value in the margin column. The margin was calculated based on subtracting the limit value from the corrected measurement value; a positive margin represents a measurement exceeding the limit, while a negative margin represents a measurement less than the limit.

SAMPLE CALCULATIONS	
Meter reading	(dB μ V)
+ Antenna Factor	(dB/m)
+ Cable Loss	(dB)
- Distance Correction	(dB)
- Preamplifier Gain	(dB)
= Corrected Reading	(dB μ V/m)

TEST INSTRUMENTATION AND ANALYZER SETTINGS

The test instrumentation and equipment listed were used to collect the emissions data. A spectrum analyzer or receiver was used for all measurements. Unless otherwise specified, the following table shows the measuring equipment bandwidth settings that were used in designated frequency bands. For testing emissions, an appropriate reference level and a vertical scale size of 10 dB per division were used.

MEASURING EQUIPMENT BANDWIDTH SETTINGS PER FREQUENCY RANGE			
TEST	BEGINNING FREQUENCY	ENDING FREQUENCY	BANDWIDTH SETTING
CONDUCTED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	9 kHz	150 kHz	200 Hz
RADIATED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	30 MHz	1000 MHz	120 kHz
RADIATED EMISSIONS	1000 MHz	>1 GHz	1 MHz

SPECTRUM ANALYZER/RECEIVER DETECTOR FUNCTIONS

The notes that accompany the measurements contained in the emissions tables indicate the type of detector function used to obtain the given readings. Unless otherwise noted, all readings were made in the "positive peak" detector mode. Whenever a "quasi-peak" or "average" reading was recorded, the measurement was annotated with a "QP" or an "Ave" on the appropriate rows of the data sheets. In cases where quasi-peak or average limits were employed and data exists for multiple measurement types for the same frequency then the peak measurement was retained in the report for reference, however the numbering for the affected row was removed and an arrow or caret ("^") was placed in the far left-hand column indicating that the row above takes precedence for comparison to the limit. The following paragraphs describe in more detail the detector functions and when they were used to obtain the emissions data.

Peak

In this mode, the spectrum analyzer or receiver recorded all emissions at their peak value as the frequency band selected was scanned. By combining this function with another feature called "peak hold," the measurement device had the ability to measure intermittent or low duty cycle transient emission peak levels. In this mode the measuring device made a slow scan across the frequency band selected and measured the peak emission value found at each frequency across the band.

Quasi-Peak

Quasi-peak measurements were taken using the quasi-peak detector when the true peak values exceeded or were within 2 dB of a quasi-peak specification limit. Additional QP measurements may have been taken at the discretion of the operator.

Average

Average measurements were taken using the average detector when the true peak values exceeded or were within 2 dB of an average specification limit. Additional average measurements may have been taken at the discretion of the operator. If the specification or test procedure requires trace averaging, then the averaging was performed using 100 samples or as required by the specification. All other average measurements are performed using video bandwidth averaging. To make these measurements, the test engineer reduces the video bandwidth on the measuring device until the modulation of the signal is filtered out. At this point, the measuring device is set into the linear mode and the scan time is reduced.