

Ittron, Inc.

TEST REPORT FOR

**Gas Endpoint
Model: 500GR**

Tested to The Following Standards:

**FCC Part 15 Subpart C Section(s)
15.247
(FHSS AND HYBRID 902-928 MHz)**

Report No.: 99808-27

Date of issue: December 24, 2018



Test Certificate # 803.02

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:

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

Representative: Jay Holcomb
Customer Reference Number: 163070

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: 99808

October 26, 2018

October 26-30, 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.

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	5.03.11

Site Registration & Accreditation Information

Location	CB #	TAIWAN	CANADA	FCC	JAPAN
Brea A, CA	US0060	SL2-IN-E-1146R	3082D-1	US1025	A-0147
Brea D, CA	US0060	SL2-IN-E-1146R	3082D-2	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)(iii)/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 PCBA	Ittron, Inc.	500GR	99808-cond

Support Equipment:

Device	Manufacturer	Model #	S/N
Laptop AC/DC Adapter	Dell	LA65NS0-00	NA
Laptop	Dell	Latitude E6420	8P954R1
AC/DC Power Supply	Extech	382225	P99250026
USB to serial adapter card	Segger	J-Link	NA

Configuration 2

Equipment Tested:

Device	Manufacturer	Model #	S/N
Gas Endpoint	Ittron, Inc.	500GR	28 0100696379

Support Equipment:

Device	Manufacturer	Model #	S/N
Laptop	Dell	Latitude E6420	8P954R1
Laptop AC/DC Adapter	Dell	DA130PE1-00	CN-0JU012-48661-080-753M-A04
USB to serial adapter card	Segger	J-Link	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 Type(s) and Gain:	0.3dBi integral omni power level 2; 4.7 dBi integral omni 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:	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 and D	Test Engineer:	Don Nguyen
Test Method:	ANSI C63.10 (2013)	Test Date(s):	12/5/2018
Configuration:	1		
Test Setup:	The equipment under test (EUT) is placed on the table top. The EUT serial port is connected to a support laptop via serial to USB adapter. The laptop is running software Command Line Interface Tool to command the EUT to transmit and on specific frequencies. The EUT is powered from an ac/dc power supply providing nominal voltage to the EUT. Frequency of measurement: 902 MHz to 928MHz. RBW=3kHz/10kHz/100kHz, VBW=10kHz/30kHz/100kHz		

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

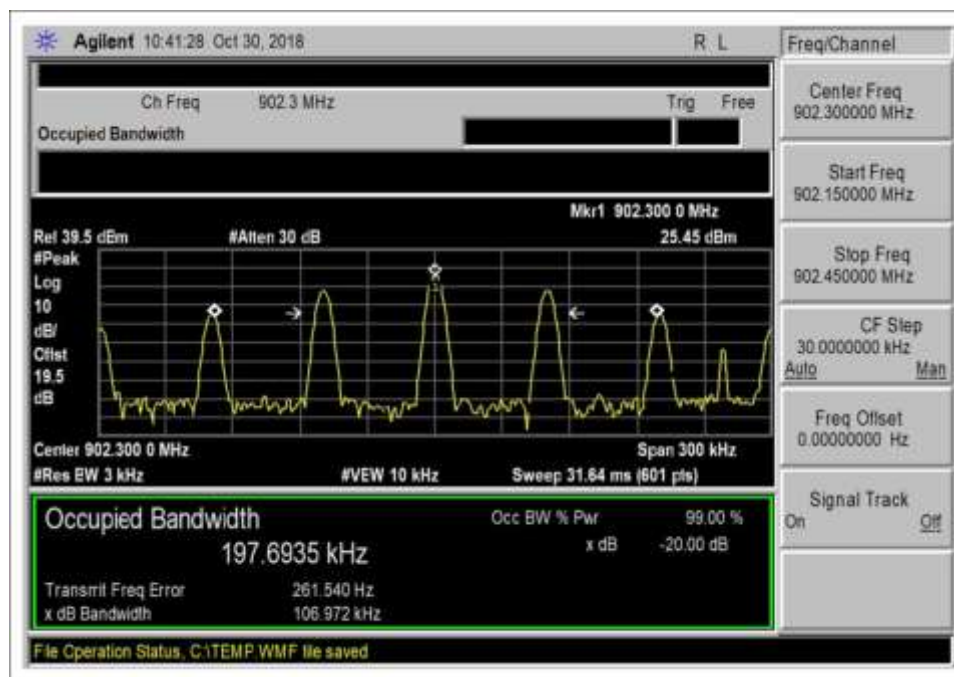
Test Equipment – Site A					
Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
02672	Spectrum Analyzer	Agilent	E4446A	3/2/2017	3/2/2019
03432	Attenuator	Aeroflex/Weinschel	90-30-34	10/27/2017	10/27/2019
P07244	Cable	H&S	32022-29094K-29094K-24TC	7/5/2018	7/5/2020

Test Equipment – Site D					
Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
02869	Spectrum Analyzer	Agilent	E4440A	8/10/2018	8/10/2019
03431	Attenuator	Aeroflex/Weinschel	89-20-21	12/19/2017	12/19/2019
P07247	Cable	H&S	32022-29094K-29094K-24TC	7/5/2018	7/5/2020

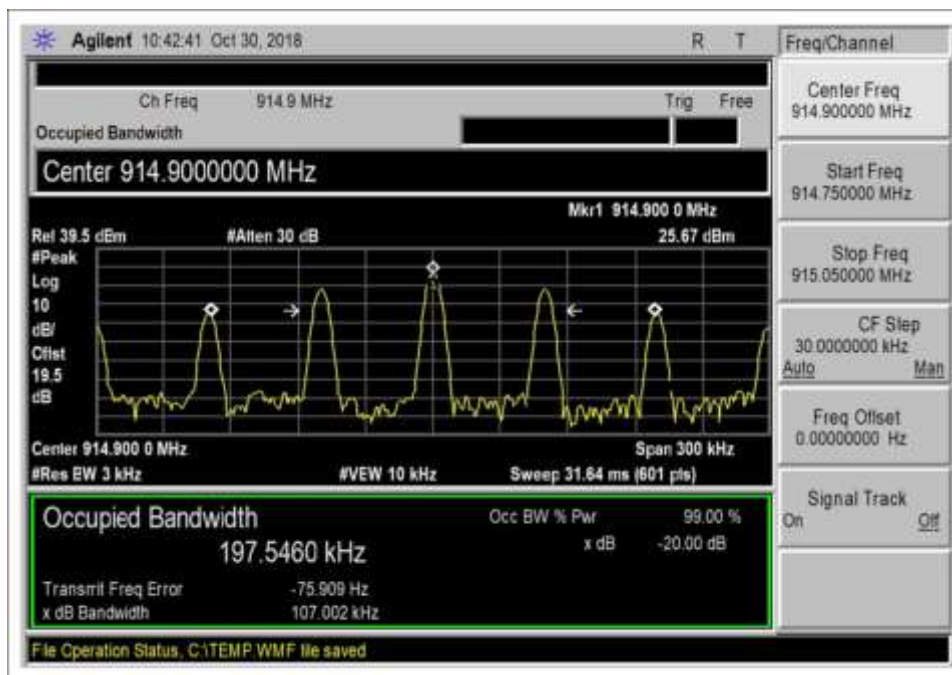
15.247(a)(1) 20 dB Bandwidth

Test Data Summary					
Frequency (MHz)	Antenna Port	Modulation	Measured (kHz)	Limit (kHz)	Results
902.3	1	100kbps FSK lv3	107	≤500	Pass
914.9	1	100kbps FSK lv3	107	≤500	Pass
926.9	1	100kbps FSK lv3	107	≤500	Pass
902.4	1	300kbps GFSK lv2	397.3	≤500	Pass
914.8	1	300kbps GFSK lv2	395.8	≤500	Pass
927.6	1	300kbps GFSK lv2	396.1	≤500	Pass
902.4	1	300kbps GFSK lv3	349.0	≤500	Pass
914.8	1	300kbps GFSK lv3	351.8	≤500	Pass
927.6	1	300kbps GFSK lv3	351.5	≤500	Pass

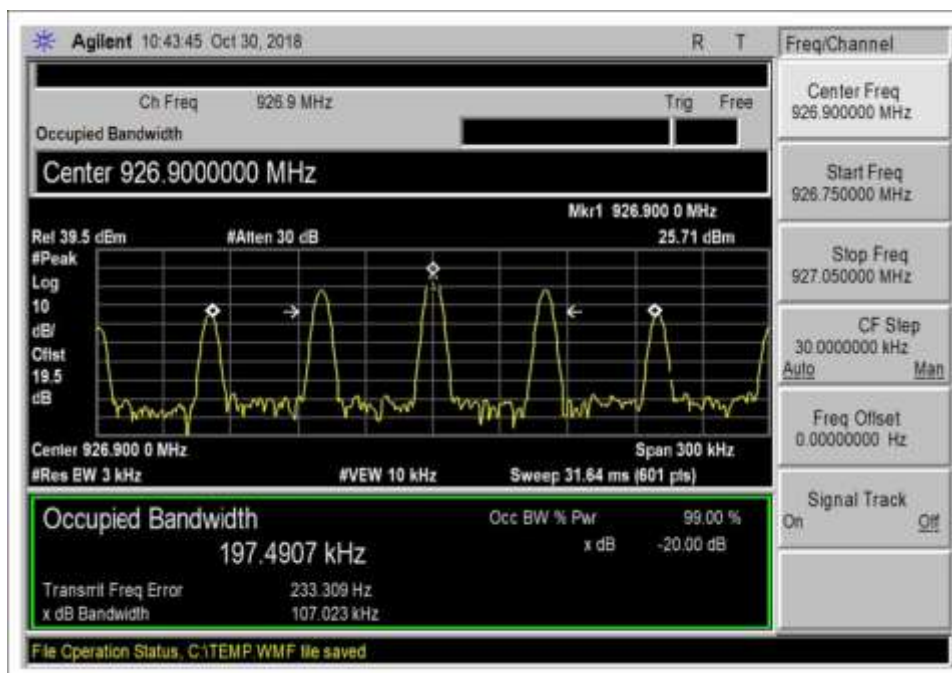
Plots



Low Channel, 100kbps, Power level 3



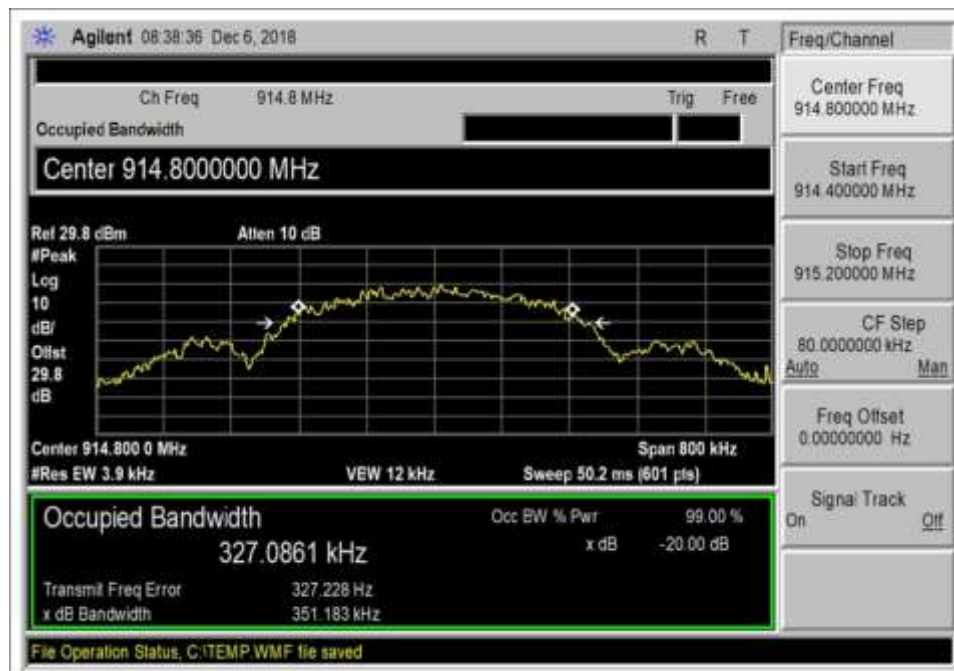
Middle Channel, 100kbps, Power level 3



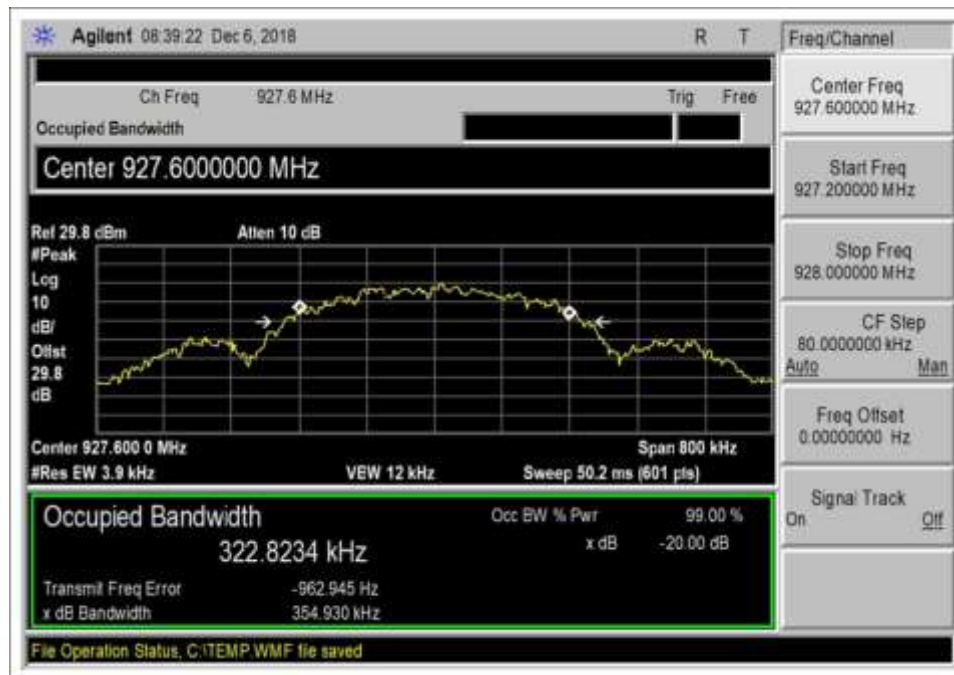
High Channel, 100kbps, Power level 3



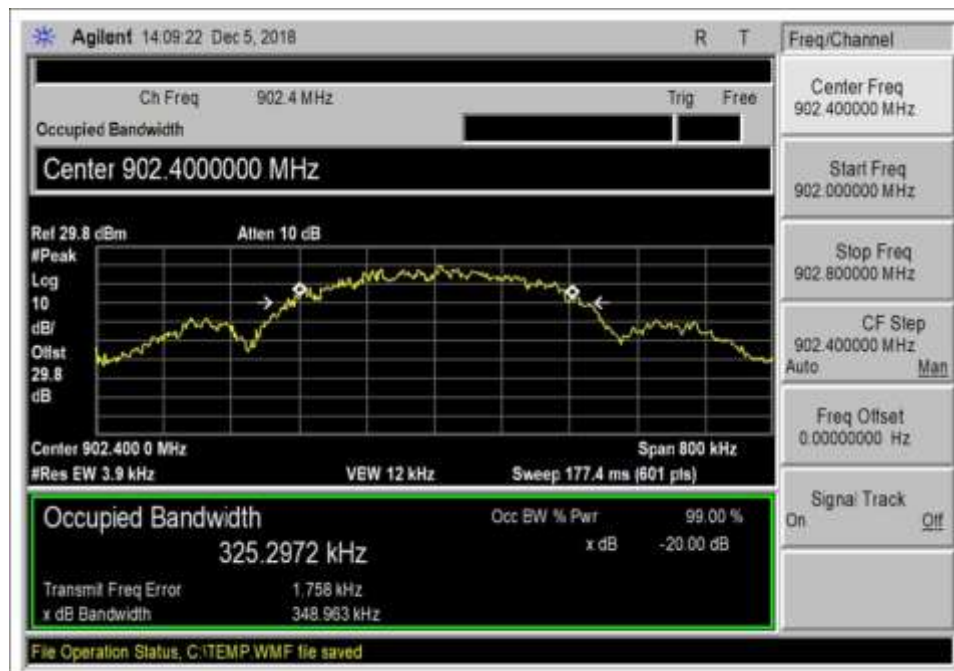
Low Channel, 300kbps, Power level 2



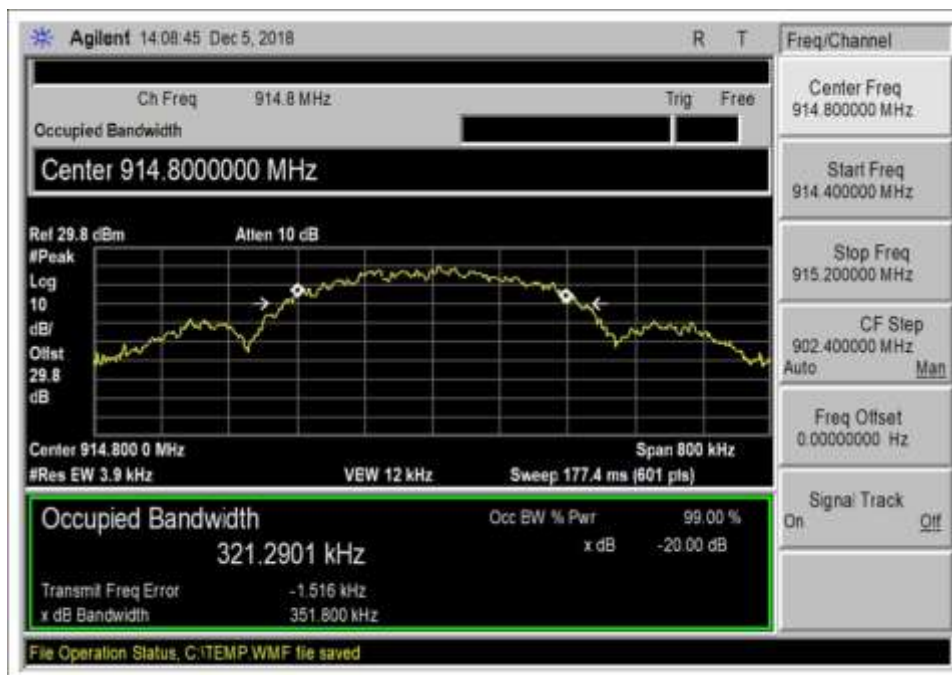
Middle Channel, 300kbps, Power level 2



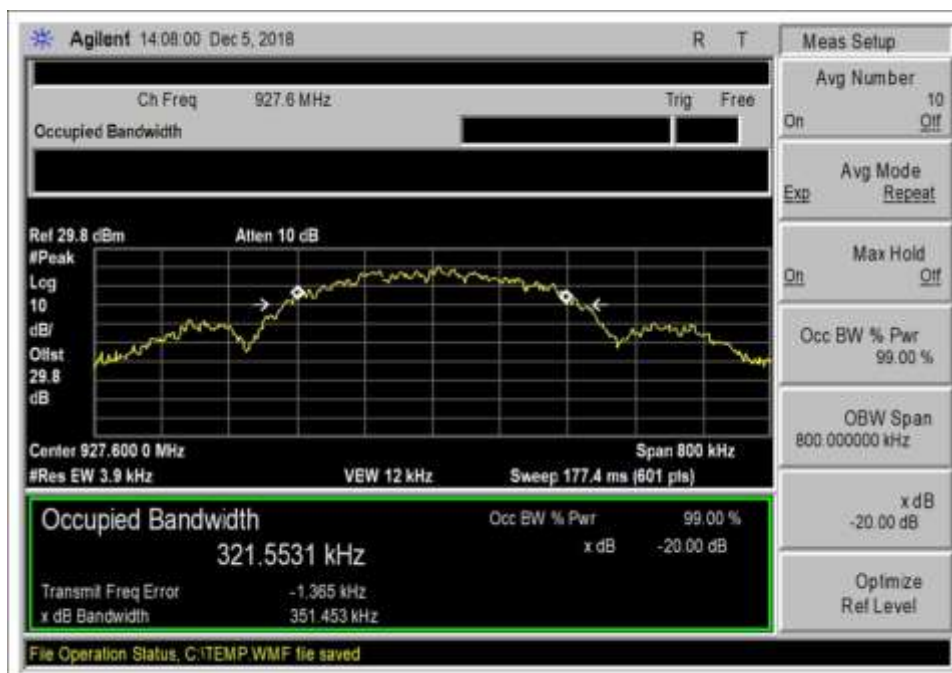
High Channel, 300kbps, Power level 2



Low Channel, 300kbps, Power level 3



Middle Channel, 300kbps, Power level 3

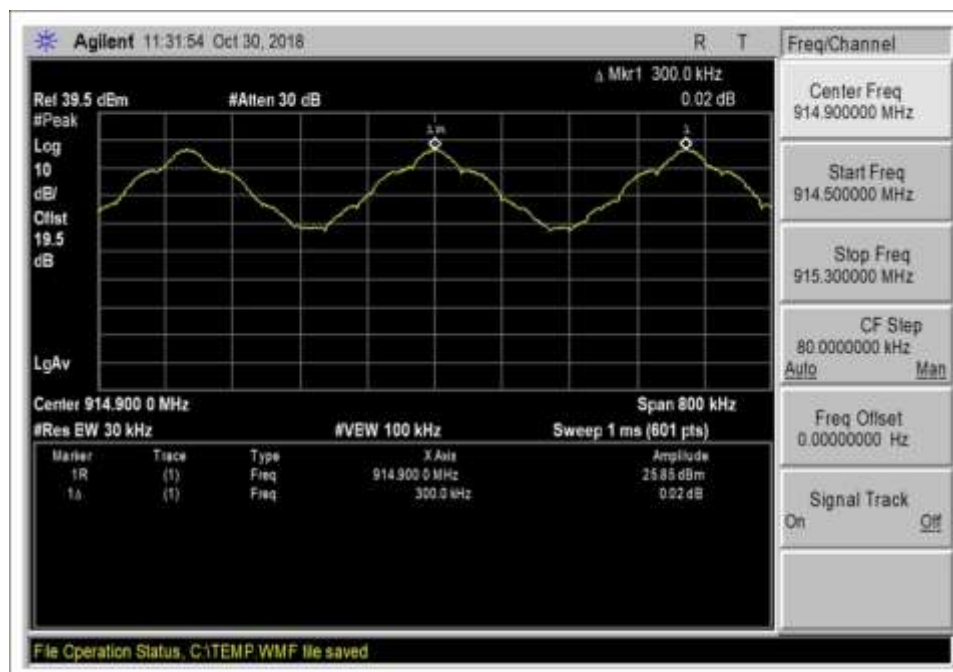


High Channel, 300kbps, Power level 3

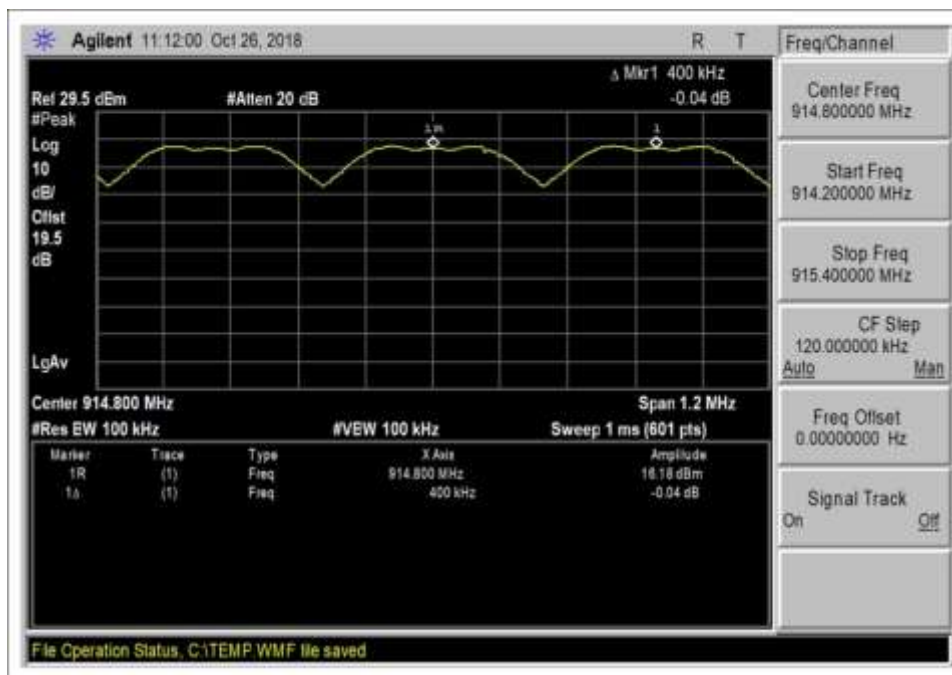
15.247(a)(1) Carrier Separation

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	> 107.0	Pass
1	300kbps GFSK lv2	400	> 397.0	Pass
1	300kbps GFSK lv3	400	> 351.8	Pass

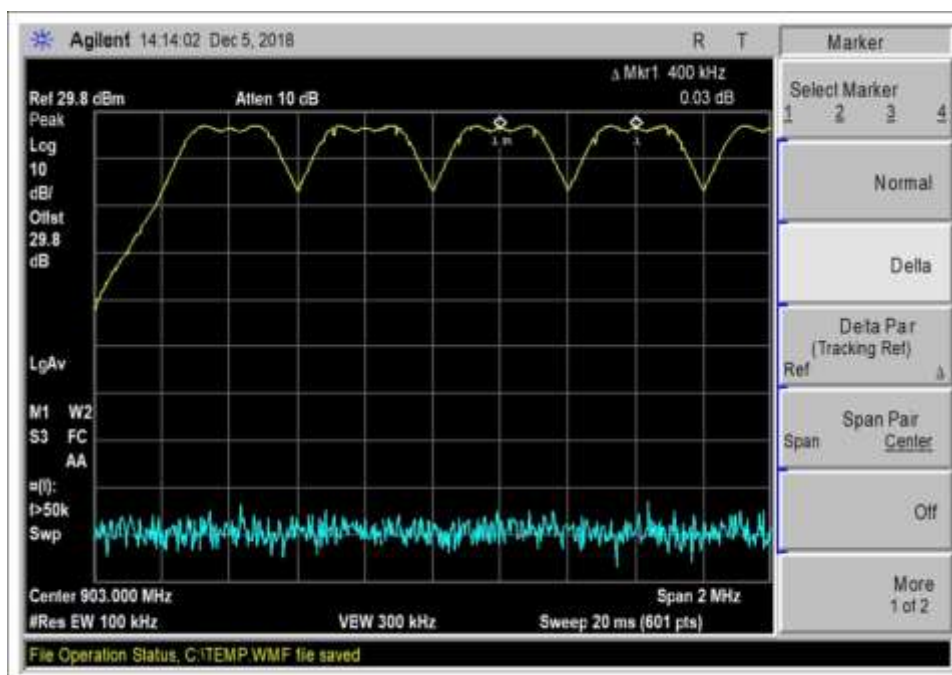
Plots



100kbps, Power level 3



300kbps, Power level 2

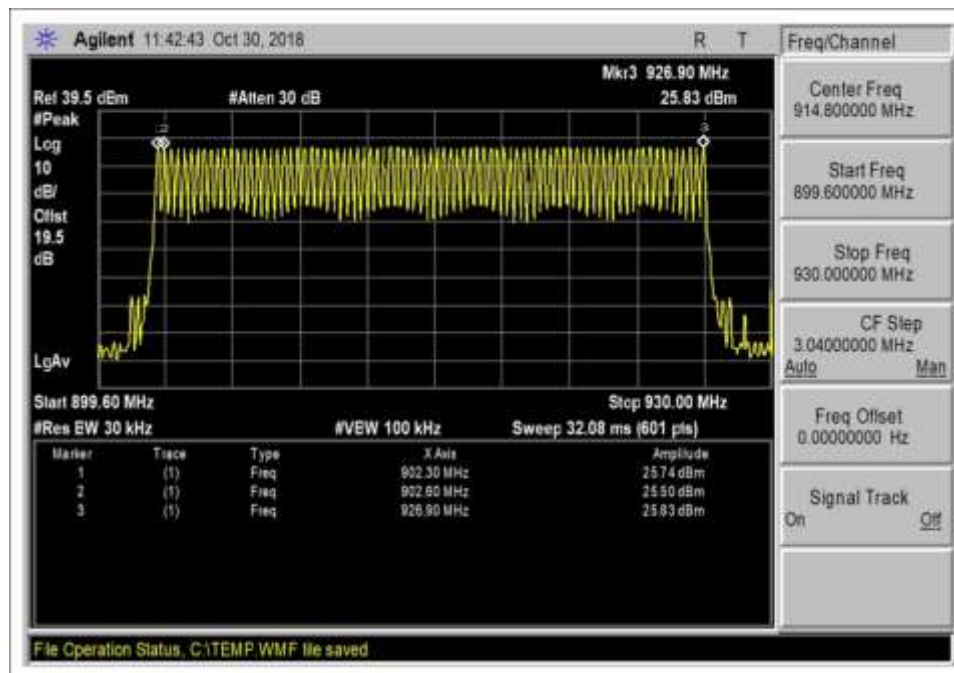


300kbps, Power level 3

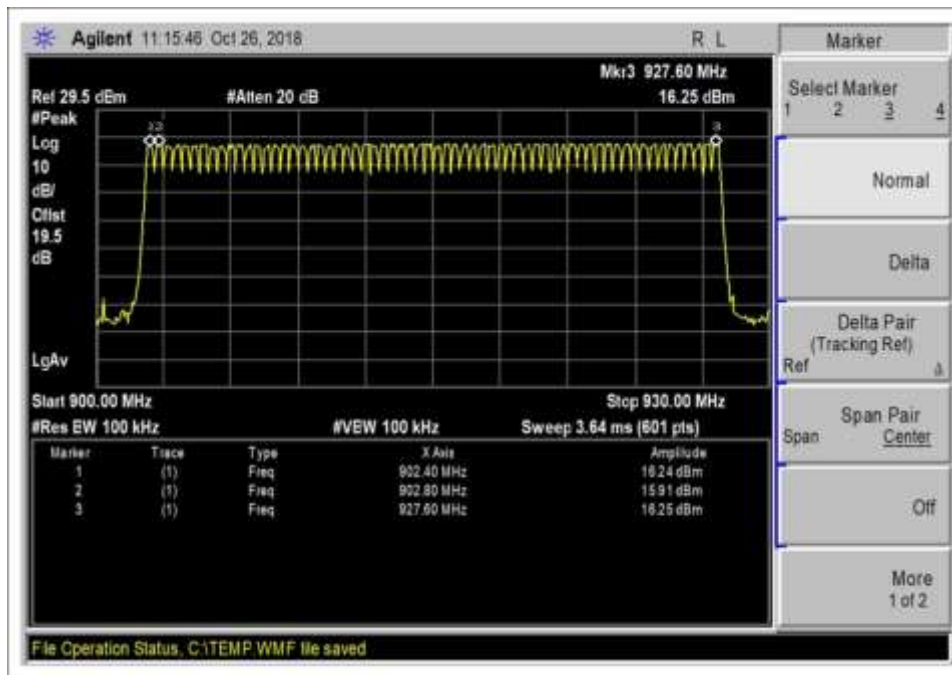
15.247(a)(1)(i) Number of Hopping Channels

Test Data Summary				
$\text{Limit} = \begin{cases} 50 \text{ Channels} & 20 \text{ dB BW} < 250 \text{ kHz} \\ 25 \text{ Channels} & 20 \text{ dB BW} \geq 250 \text{ kHz} \end{cases}$				
Antenna Port	Operational Mode	Measured (Channels)	Limit (Channels)	Results
1	100kbps FSK Iv3	83	≥ 50	Pass
1	300kbps GFSK Iv2	64	≥ 25	Pass
1	300kbps GFSK Iv3	64	≥ 25	Pass

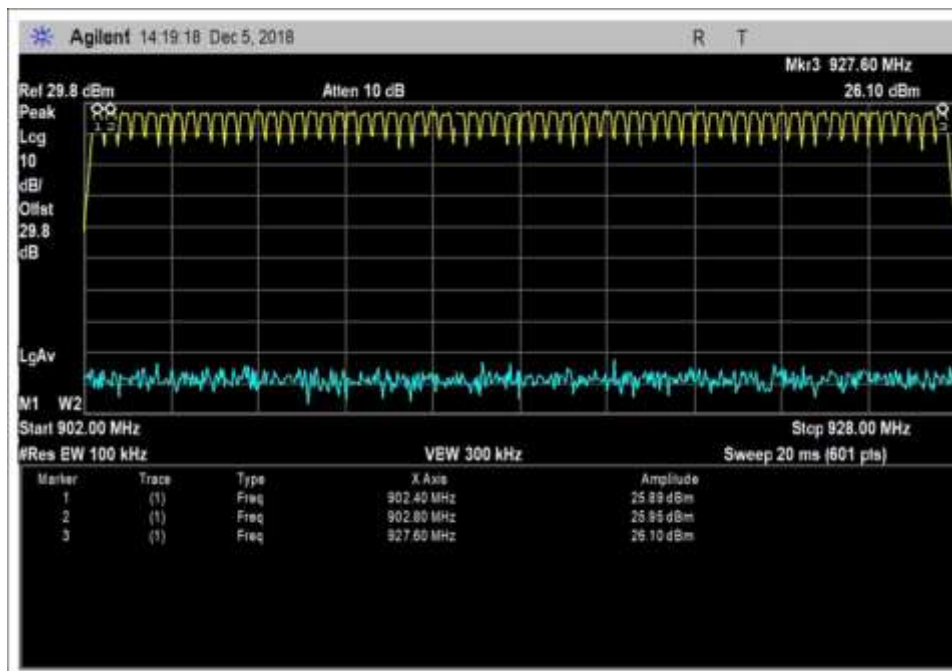
Plots



100kbps, Power level 3



300kbps, Power level 2



300kbps, Power level 3

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.

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.

Test Setup Photos



Site A



Site D

15.247(f) Hybrid Systems

Test Setup/Conditions			
Test Location:	Brea Lab D	Test Engineer:	S. Yamamoto
Test Method:	ANSI C63.10 (2013)	Test Date(s):	10/26/2018
Configuration:	1		
Test Setup:	The equipment under test (EUT) is placed on the table top. The EUT serial port is connected to a support laptop via serial to USB adapter. The laptop is running software Command Line Interface Tool to command the EUT to transmit and on specific frequencies. The EUT is powered from an ac/dc power supply providing nominal voltage to the EUT. Frequency of measurement: 902 MHz to 928MHz. RBW=3kHz/10kHz/100kHz, VBW=10kHz/30kHz/100kHz		

Environmental Conditions			
Temperature (°C)	23	Relative Humidity (%):	46

Test Equipment					
Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
02869	Spectrum Analyzer	Agilent	E4440A	8/10/2018	8/10/2019
03431	Attenuator	Aeroflex/Weinschel	89-20-21	12/19/2017	12/19/2019
P07247	Cable	H&S	32022-29094K-29094K-24TC	7/5/2018	7/5/2020

15.247 (f) Power Spectral Density

Power Spectral Density

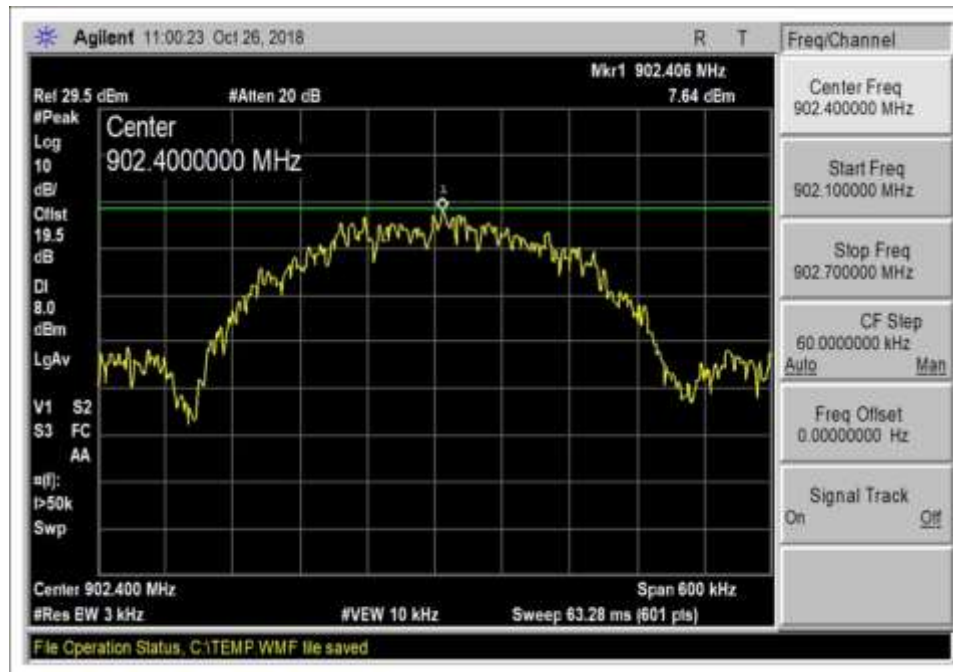
Test Data Summary - RF Conducted Measurement				
Measurement Method: PKPSD				
Frequency (MHz)	Modulation	Measured (dBm/3kHz)	Limit (dBm/3kHz)	Results
902.4	300kbps GFSK lv2 Hybrid	7.6	≤8	Pass
914.8	300kbps GFSK lv2 Hybrid	7.5	≤8	Pass
927.6	300kbps GFSK lv2 Hybrid	7.5	≤8	Pass

6dB Occupied Bandwidth (required for PSD measurement)

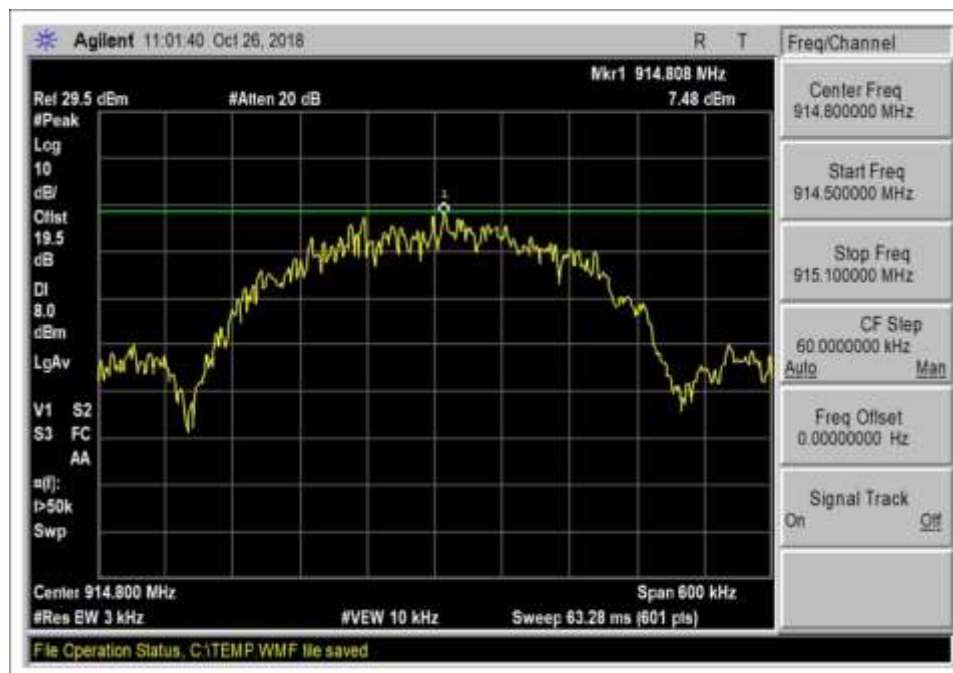
Test Data Summary					
Frequency (MHz)	Antenna Port	Modulation	Measured (kHz)	Limit (kHz)	Results
902.4	1	300kbps GFSK lv2 Hybrid	298.4	None	Pass
914.8	1	300kbps GFSK lv2 Hybrid	299.2		
927.6	1	300kbps GFSK lv2 Hybrid	295.6		

Plots

Power Spectral Density



Low Channel

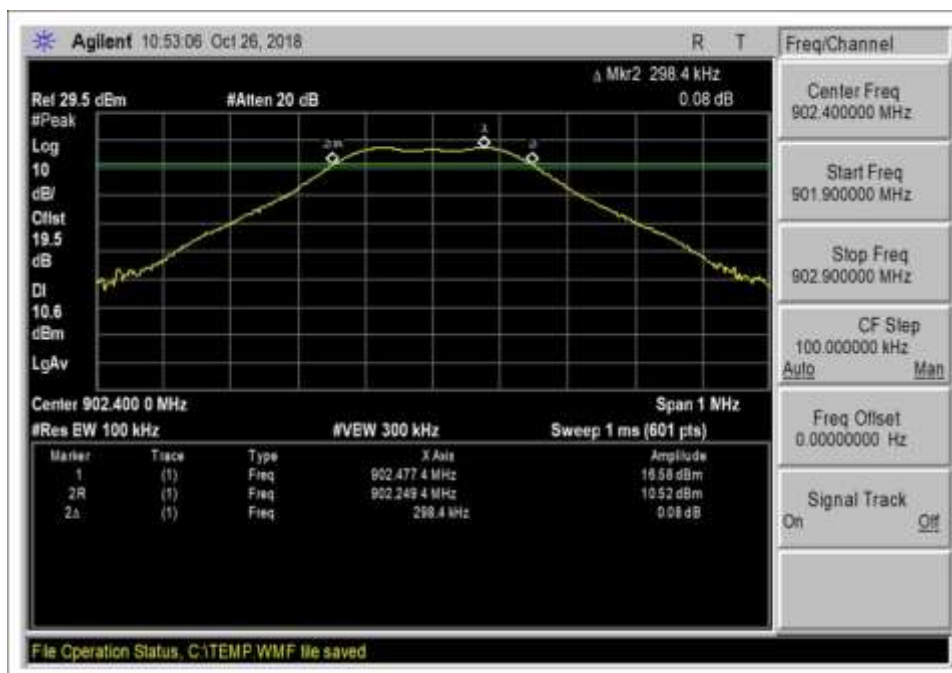


Middle Channel

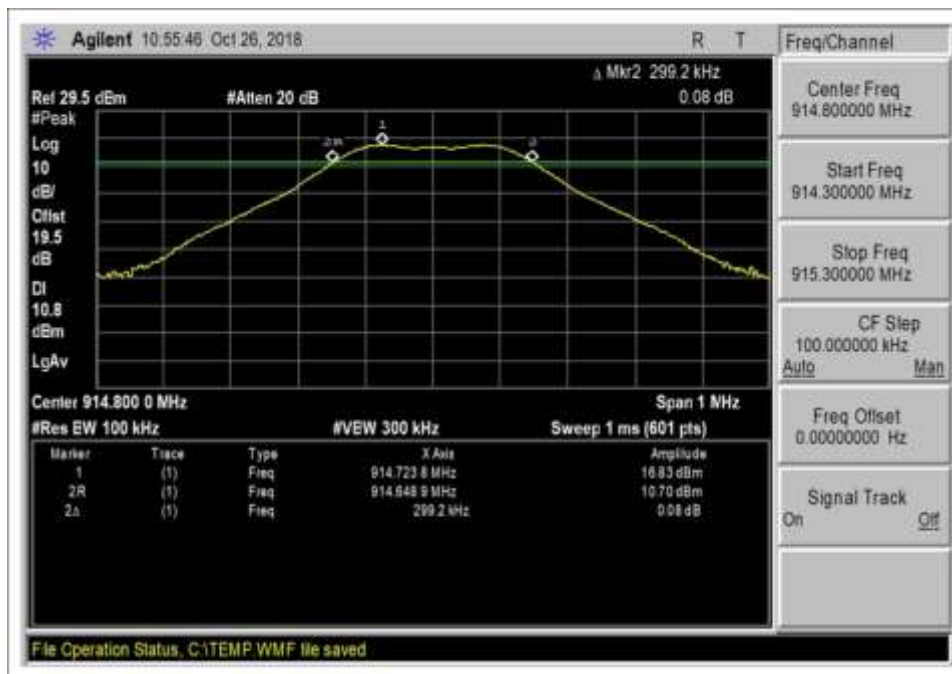


High Channel

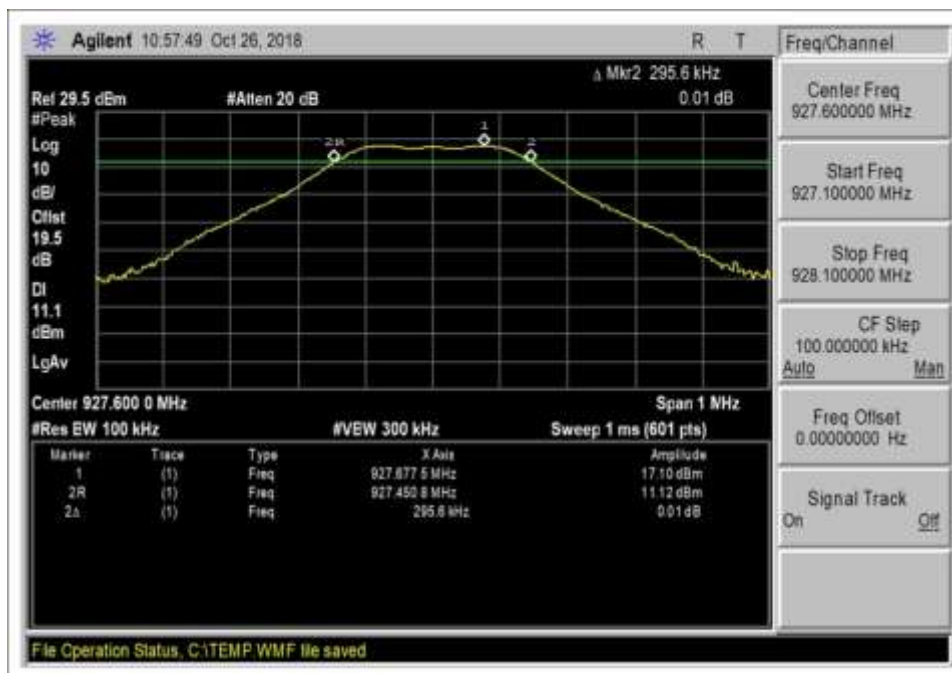
6dB Occupied Bandwidth



Low Channel



Middle Channel



High Channel

Test Setup Photo



15.247(b)(1) Output Power

Test Setup/Conditions			
Test Location:	Brea Lab A and D	Test Engineer:	S. Yamamoto/Don Nguyen
Test Method:	ANSI C63.10 (2013)	Test Date(s):	12/5/2018
Configuration:	1		
Test Setup:	The equipment under test (EUT) is placed on the table top. The EUT serial port is connected to a support laptop via serial to USB adapter. The laptop is running software Command Line Interface Tool to command the EUT to transmit and on specific frequencies. The EUT is powered from an ac/dc power supply providing nominal voltage to the EUT. Frequency of measurement: 902 MHz to 928MHz. RBW=120kHz/430kHz/2MHz, VBW=300kHz/1MHz/6MHz		

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

Test Equipment – Site A					
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 Equipment – Site D					
Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
02869	Spectrum Analyzer	Agilent	E4440A	8/10/2018	8/10/2019
03431	Attenuator	Aeroflex/Weinschel	89-20-21	12/19/2017	12/19/2019
P07247	Cable	H&S	32022-29094K-29094K-24TC	7/5/2018	7/5/2020

Test Data Summary - Voltage Variations

This equipment is battery powered and manufacturer declares the equipment cannot operate while charging. Power output tests were performed using a fresh battery.

Parameter Definitions:

Measurements performed at input voltage according to manufacturer specification.

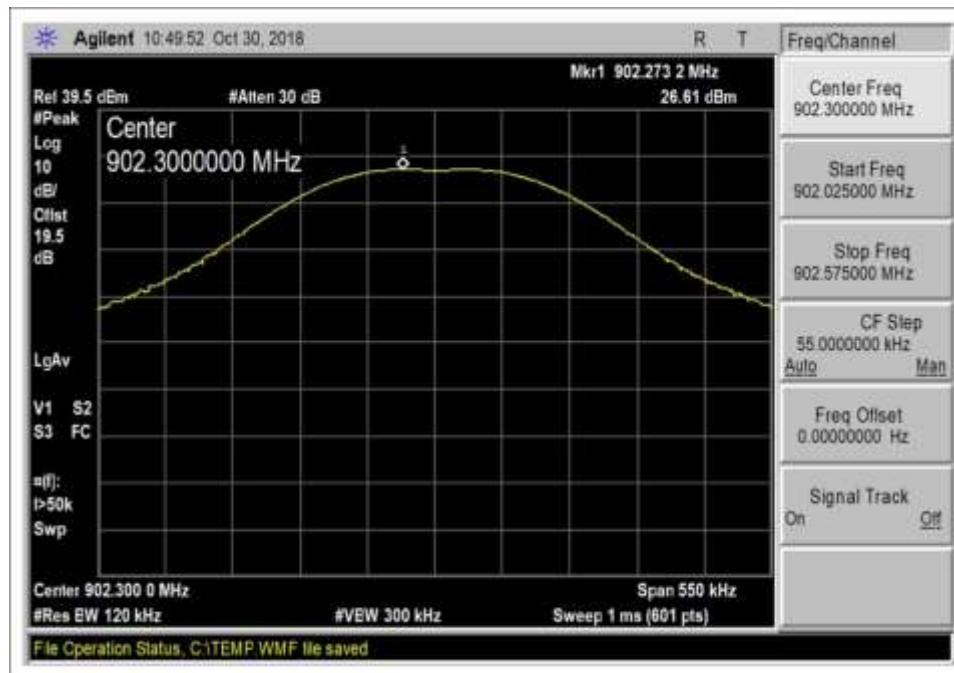
Parameter	Value
V _{Nominal} :	6.0Vdc
V _{Minimum} :	6.0Vdc
V _{Maximum} :	6.0Vdc

Test Data Summary - RF Conducted Measurement

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

Frequency (MHz)	Modulation	Ant. Type / Gain (dBi)	Measured (dBm)	Limit (dBm)	Results
902.3	100kbps FSK lv3	Integral / 4.7	26.6	≤30	Pass
914.9	100kbps FSK lv3	Integral / 4.7	26.8	≤30	Pass
926.9	100kbps FSK lv3	Integral / 4.7	26.8	≤30	Pass
902.4	300kbps GFSK lv2	Integral / 0.3	16.5	≤30	Pass
914.8	300kbps GFSK lv2	Integral / 0.3	16.8	≤30	Pass
927.6	300kbps GFSK lv2	Integral / 0.3	17.1	≤30	Pass
902.4	300kbps GFSK lv3	Integral / 4.7	26.78	≤30	Pass
914.8	300kbps GFSK lv3	Integral / 4.7	26.86	≤30	Pass
927.6	300kbps GFSK lv3	Integral / 4.7	26.80	≤30	Pass

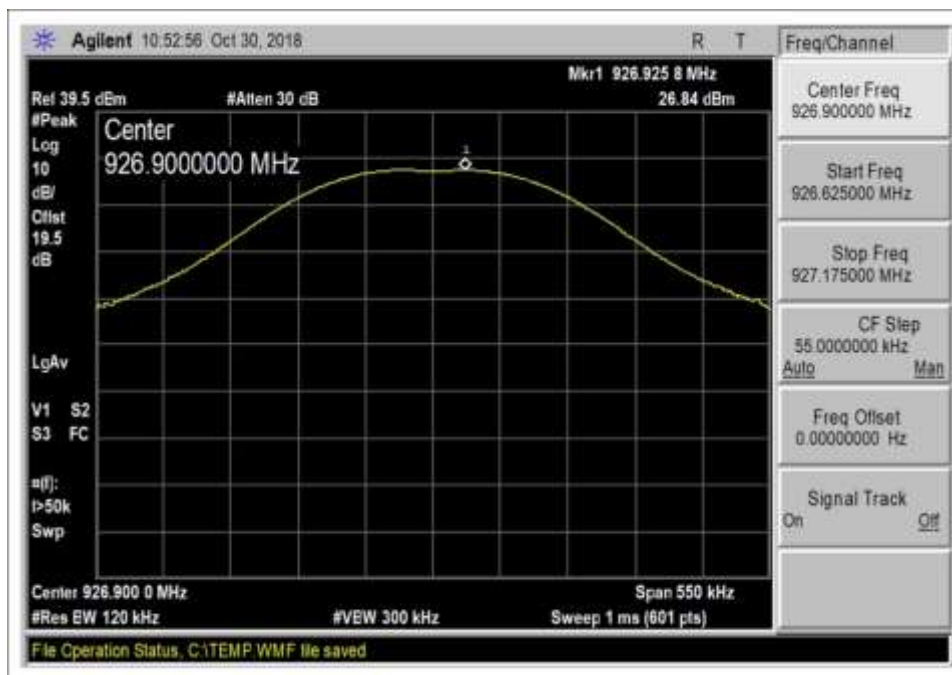
Plots



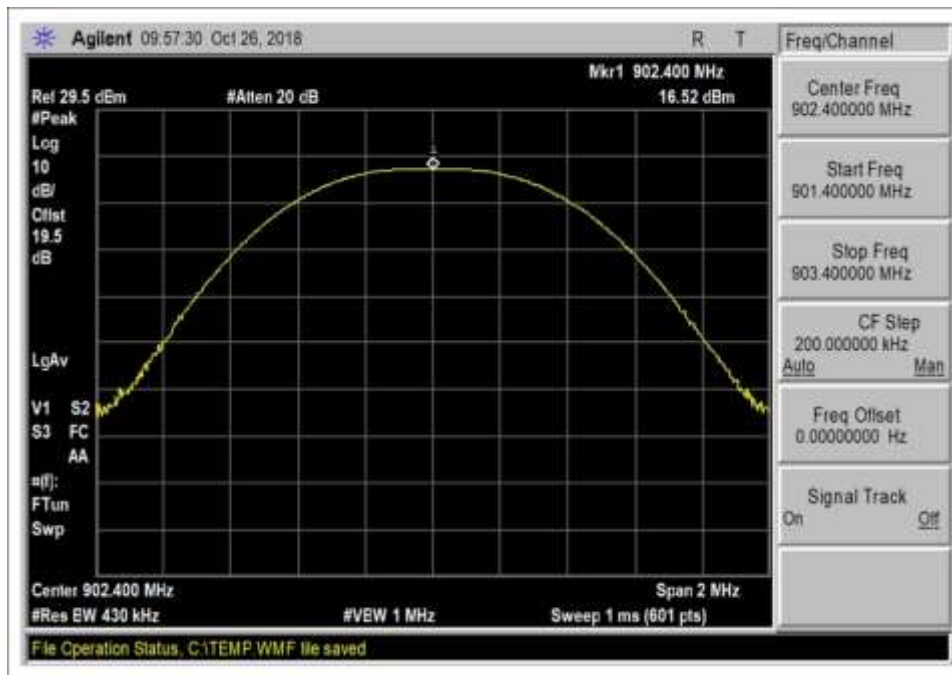
Low Channel, 100kbps, Power level 3



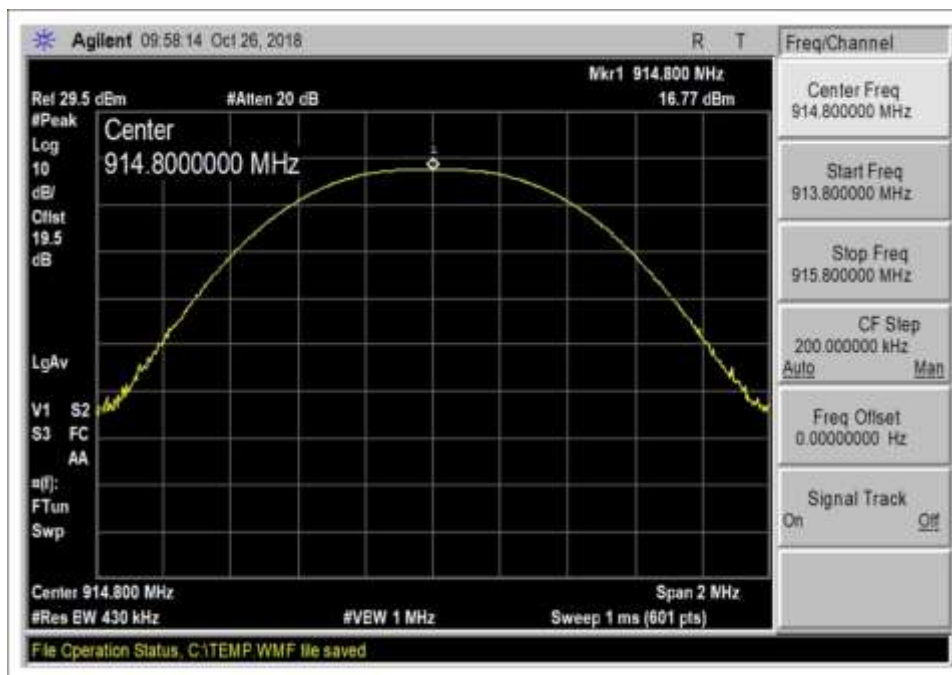
Middle Channel, 100kbps, Power level 3



High Channel, 100kbps, Power level 3



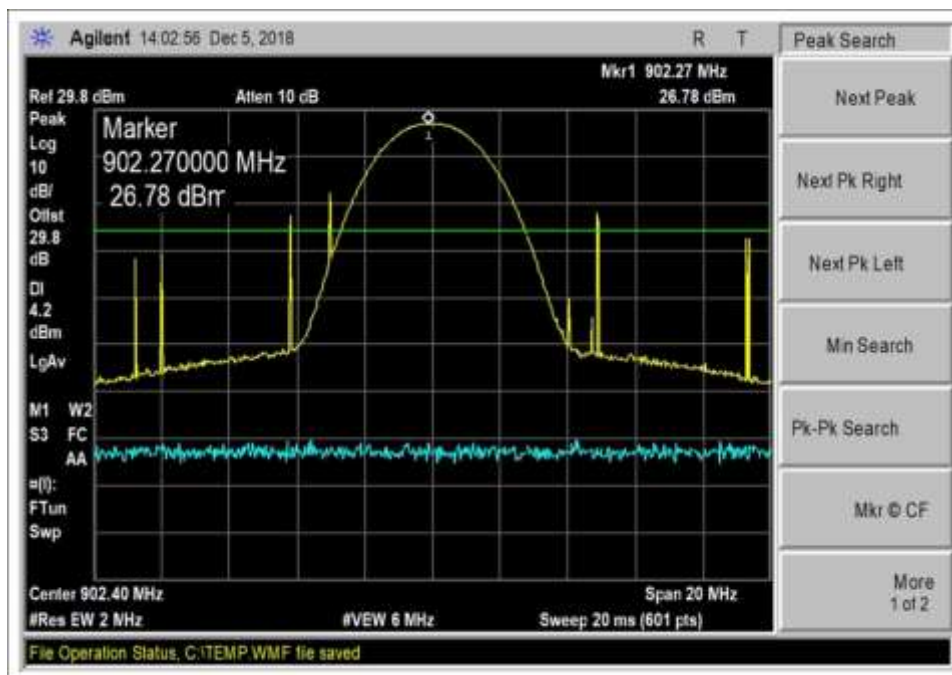
Low Channel, 300kbps, Power level 2



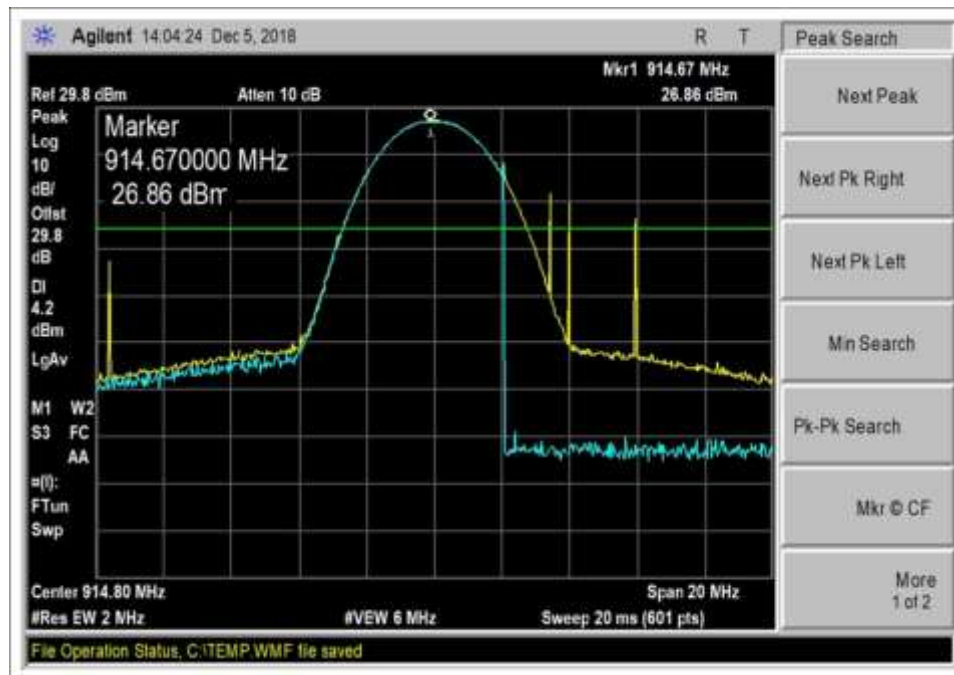
Middle Channel, 300kbps, Power level 2



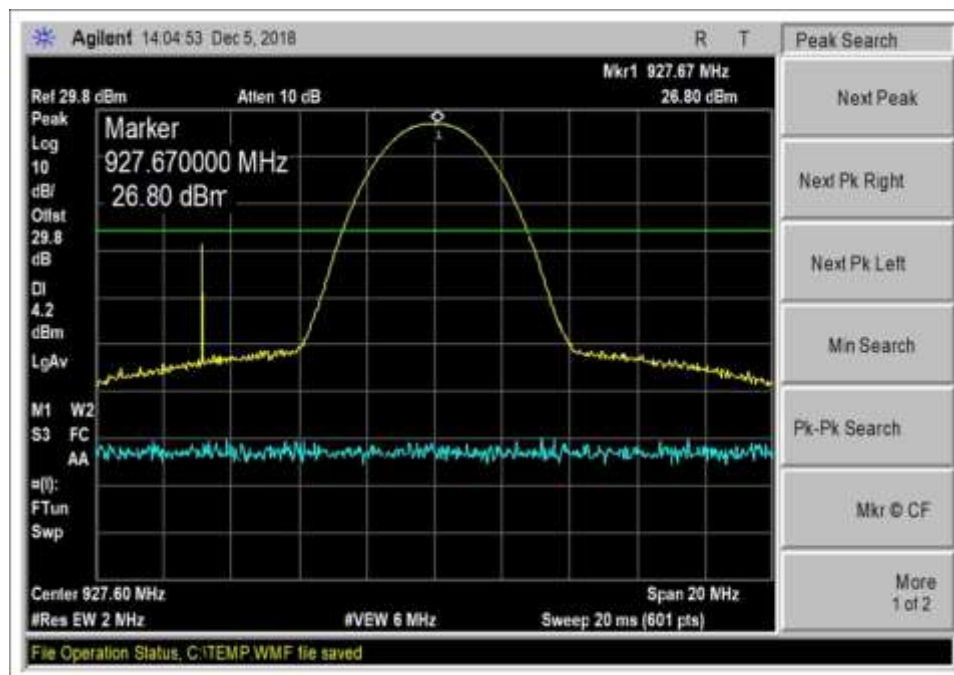
High Channel, 300kbps, Power level 2



Low Channel, 300kbps, Power level 3



Middle Channel, 300kbps, Power level 3



High Channel, 300kbps, Power level 3

Test Setup Photos



Site A



Site D

15.247(d) RF Conducted Emissions & Band Edge

Test Setup / Conditions / Data

Test Location: CKC Laboratories Inc. • 110 N Olinda Pl • Brea CA 92823 • 7149936112
 Customer: **Itron, Inc.**
 Specification: **15.247(d) Conducted Spurious Emissions**
 Work Order #: **99808** Date: 10/30/2018
 Test Type: **Conducted Emissions** Time: 12:26:06
 Tested By: S. Yamamoto Sequence#: 3
 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 equipment under test (EUT) is placed on the table top. The serial port is connected to a support laptop via serial to USB adapter. The laptop is running software Command Line Interface (CLI) Tool which is running script to command the EUT to specific channels and protocols at 100% duty cycle.

The EUT is powered from an ac/dc power supply providing nominal voltage to the EUT.

Low 902.3MHz, Middle 914.9MHz,

High 926.9MHz.

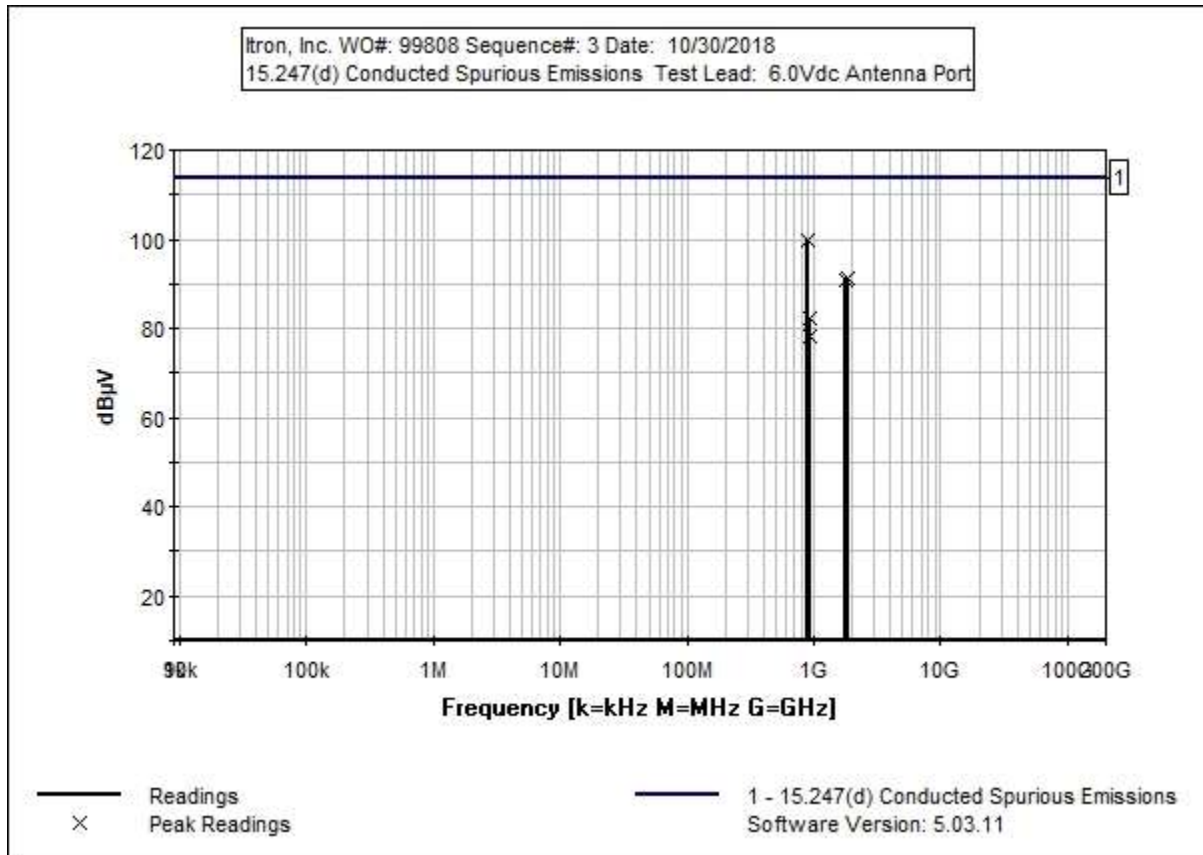
Site D.

Frequency range of data sheet 9kHz to 9.3GHz. RBW=100kHz, VBW=300kHz.

100kbps 83 channels 300kHz spacing FSK modulation. Power level 3.

Temperature: 22°C, Humidity: 52%, Pressure: 100kPa.

Test method ANSI C63.10 2013



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP07247	Cable	32022-29094K-29094K-24TC	7/5/2018	7/5/2020
	AN02869	Spectrum Analyzer	E4440A	8/10/2018	8/10/2019
T2	AN03431	Attenuator	89-20-21	12/19/2017	12/19/2019

Measurement Data:

Reading listed by margin.

Test Lead: Antenna Port

#	Freq MHz	Rdng dBμV	T1 dB	T2 dB	dB	dB	Dist Table	Corr dBμV	Spec dBμV	Margin dB	Polar Ant
1	902.000M	80.5	+0.2	+19.3			+0.0	100.0	113.8	-13.8	Anten
2	1829.770M	71.9	+0.2	+19.3			+0.0	91.4	113.8	-22.4	Anten
3	1853.767M	71.9	+0.2	+19.3			+0.0	91.4	113.8	-22.4	Anten
4	1804.550M	71.3	+0.2	+19.3			+0.0	90.8	113.8	-23.0	Anten
5	928.067M	62.8	+0.2	+19.3			+0.0	82.3	113.8	-31.5	Anten
6	928.000M	58.9	+0.2	+19.3			+0.0	78.4	113.8	-35.4	Anten

Test Location: CKC Laboratories Inc. • 110 N Olinda Pl • Brea CA 92823 • 1749936112
 Customer: **Itron, Inc.**
 Specification: **15.247(d) Conducted Spurious Emissions**
 Work Order #: **99808** Date: 10/26/2018
 Test Type: **Conducted Emissions** Time: 11:47:26
 Tested By: S. Yamamoto Sequence#: 2
 Software: EMITest 5.03.11 6.0Vdc

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

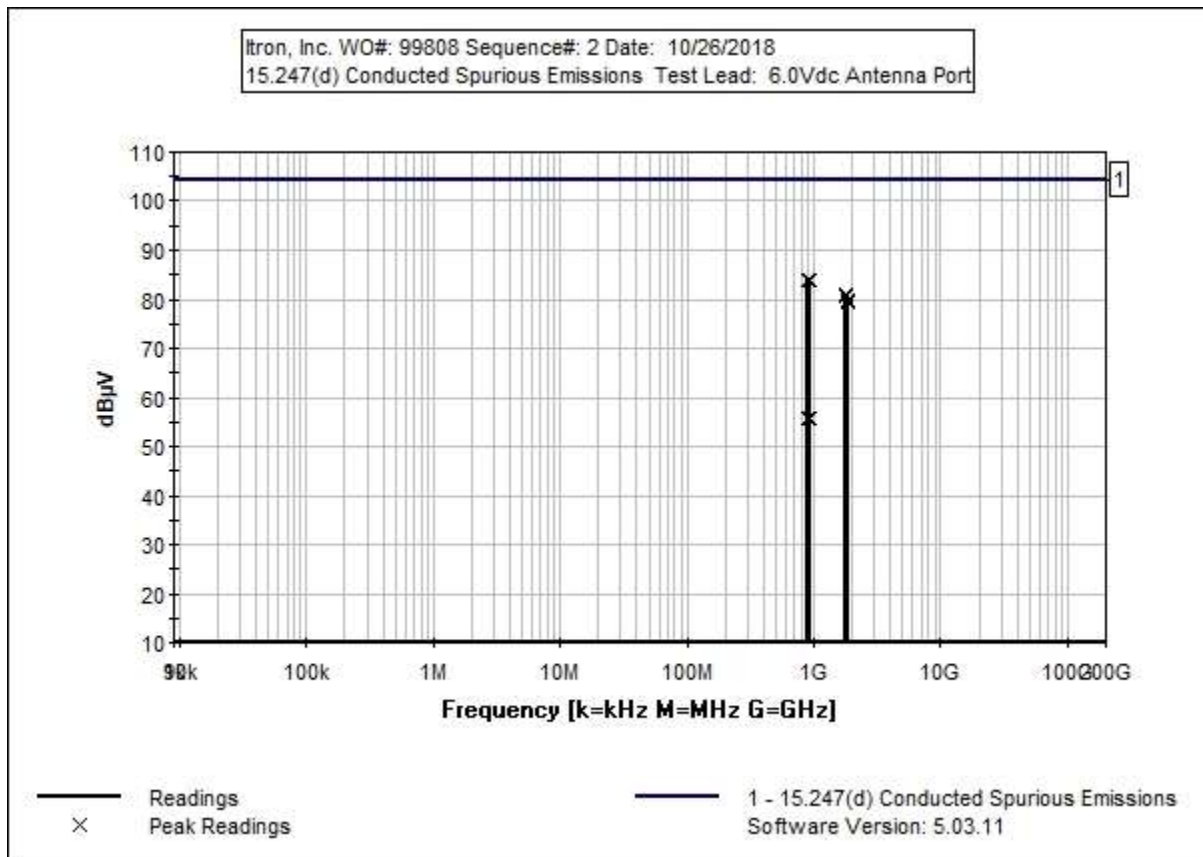
Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

The equipment under test (EUT) is placed on the table top. The serial port is connected to a support laptop via serial to USB adapter. The laptop is running software Command Line Interface (CLI) Tool which is running script to command the EUT to specific channels and protocols at 100% duty cycle.
 The EUT is powered from an ac/dc power supply providing nominal voltage to the EUT.
 Site D.

 Low 902.4MHz, Middle 914.8MHz,
 High 927.6MHz.
 Frequency range of data sheet 9kHz to 9.3GHz. RBW=100kHz, VBW=300kHz.
300kbps 64 channels 400kHz spacing Hybrid modulation. Power level 2.

 Temperature: 23°C, Humidity: 46%, Pressure: 100kPa.
 Test method ANSI C63.10 2013



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP07247	Cable	32022-29094K-29094K-24TC	7/5/2018	7/5/2020
	AN02869	Spectrum Analyzer	E4440A	8/10/2018	8/10/2019
T2	AN03431	Attenuator	89-20-21	12/19/2017	12/19/2019

Measurement Data:

Reading listed by margin.

Test Lead: Antenna Port

#	Freq MHz	Rdng dBμV	T1 dB	T2 dB			Dist Table	Corr dBμV	Spec dBμV	Margin dB	Polar Ant
1	928.000M	64.4	+0.2	+19.3			+0.0	83.9	104.1	-20.2	Anten
2	902.000M	64.3	+0.2	+19.3			+0.0	83.8	104.1	-20.3	Anten
3	1804.647M	61.4	+0.2	+19.3			+0.0	80.9	104.1	-23.2	Anten
4	1804.953M	61.3	+0.2	+19.3			+0.0	80.8	104.1	-23.3	Anten
5	1829.756M	60.5	+0.2	+19.3			+0.0	80.0	104.1	-24.1	Anten
6	1829.443M	60.5	+0.2	+19.3			+0.0	80.0	104.1	-24.1	Anten
7	1855.346M	60.0	+0.2	+19.3			+0.0	79.5	104.1	-24.6	Anten
8	1855.052M	59.8	+0.2	+19.3			+0.0	79.3	104.1	-24.8	Anten
9	901.698M	36.4	+0.2	+19.3			+0.0	55.9	104.1	-48.2	Anten
10	928.327M	36.1	+0.2	+19.3			+0.0	55.6	104.1	-48.5	Anten

Test Location: CKC Laboratories Inc • 110 N Olinda Pl • Brea CA 92823 • 7149936112
 Customer: **Itron, Inc.**
 Specification: **15.247(d) Conducted Spurious Emissions**
 Work Order #: **99808** Date: 12/5/2018
 Test Type: **Conducted Emissions** Time: 14:39:33
 Tested By: Don Nguyen Sequence#: 4
 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			

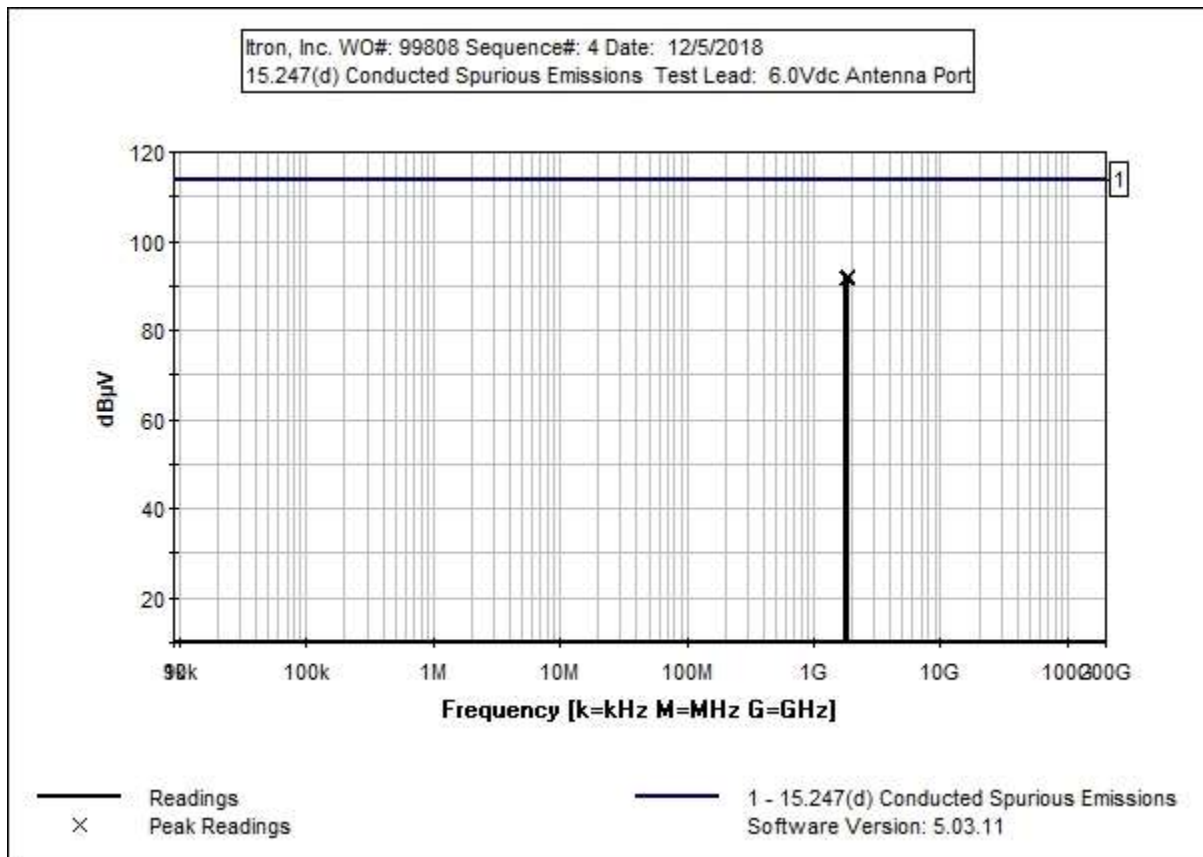
Test Conditions / Notes:

The equipment under test (EUT) is placed on the table top. The serial port is connected to a support laptop via serial to USB adapter. The laptop is running software Command Line Interface (CLI) Tool which is running script to command the EUT to specific channels and protocols at 100% duty cycle.
 The EUT is powered from an ac/dc power supply providing nominal voltage to the EUT.

300kbps GFSK modulation. Power level 3.

 Frequency range of data sheet 9kHz to 9.3GHz. RBW=100kHz, VBW=300kHz.

 Temperature: 24.9°C, Humidity: 30.3%, Pressure: 100kPa.
 Test method ANSI C63.10 2013
 Site A



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	3/2/2017	3/2/2019

Measurement Data:

Reading listed by margin.

Test Lead: Antenna Port

#	Freq MHz	Rdng dBμV	T1 dB	T2 dB		Dist Table	Corr dBμV	Spec dBμV	Margin dB	Polar Ant
1	1829.750M	62.2	+29.7	+0.2		+0.0	92.1	113.9	-21.8	Anten
2	1855.350M	61.8	+29.7	+0.2		+0.0	91.7	113.9	-22.2	Anten
3	1804.650M	61.8	+29.7	+0.2		+0.0	91.7	113.9	-22.2	Anten

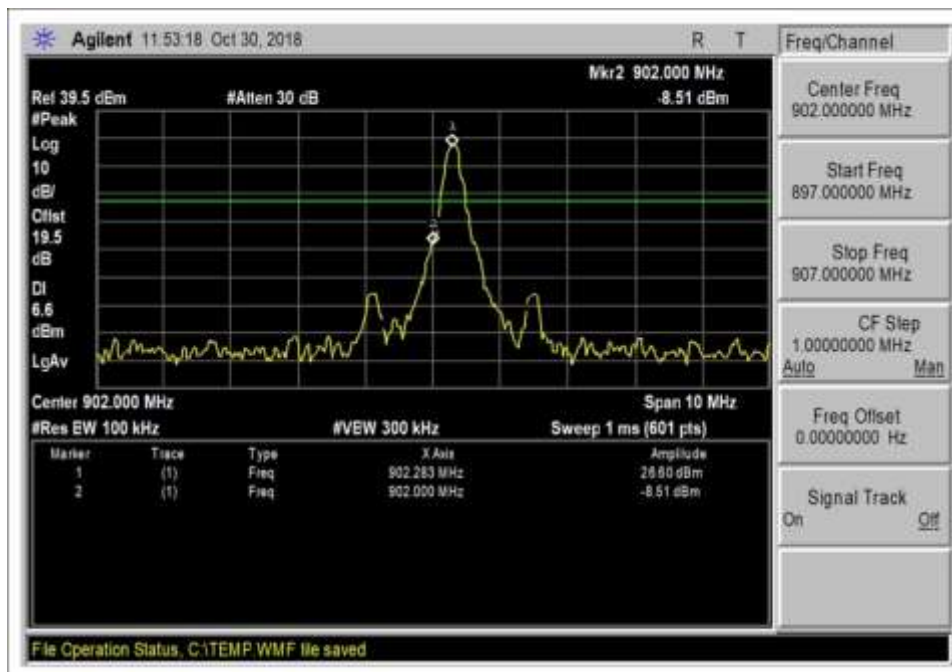
Band Edge

Band Edge Summary

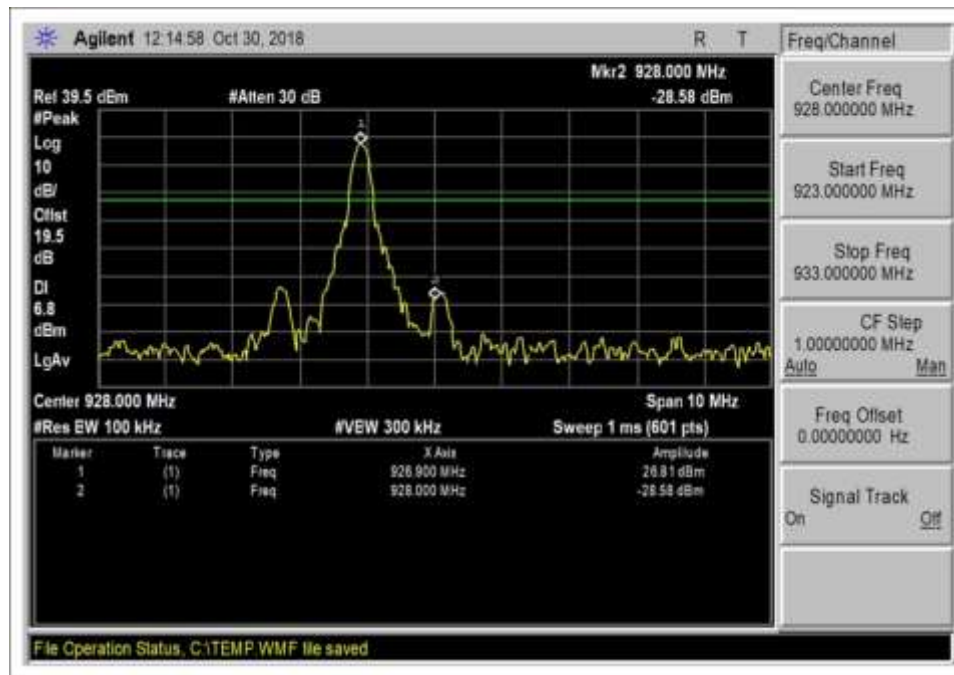
Limit applied: Max Power/100kHz - 20dB.

Frequency (MHz)	Modulation	Measured (dBm)	Limit (dBm)	Results
902	100kbps FSK lv3	-8.5	<6.6	Pass
928	100kbps FSK lv3	-28.6	<6.8	Pass
902	100kbps FSK lv3 hopping	-21.9	<-3.3	Pass
928	100kbps FSK lv3 hopping	-19.1	<-2.8	Pass
902	300kbps GFSK lv2	-8.4	<6.6	Pass
928	300kbps GFSK lv2	-29.7	<6.8	Pass
902	300kbps GFSK lv2 hopping	-22.3	<-3.3	Pass
928	300kbps GFSK lv2 hopping	-19.6	<-2.8	Pass
902	300kbps GFSK lv3	-11.32	<6.9	Pass
928	300kbps GFSK lv3	-9.42	<6.9	Pass
902	300kbps GFSK lv3 hopping	-13.08	<6.9	Pass
928	300kbps GFSK lv3 hopping	-10.25	<6.9	Pass

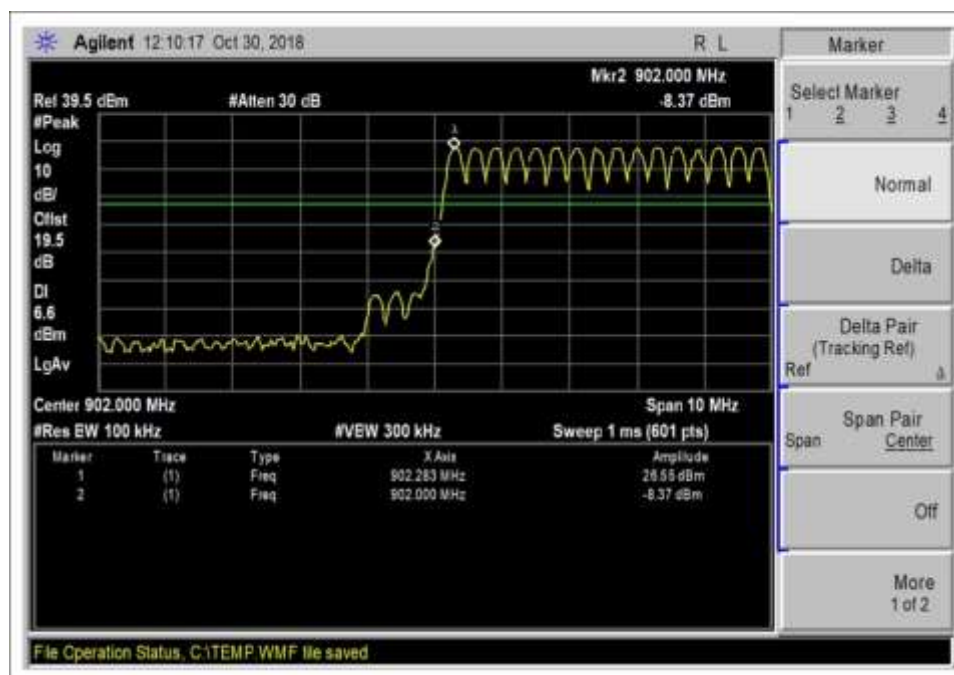
Band Edge Plots



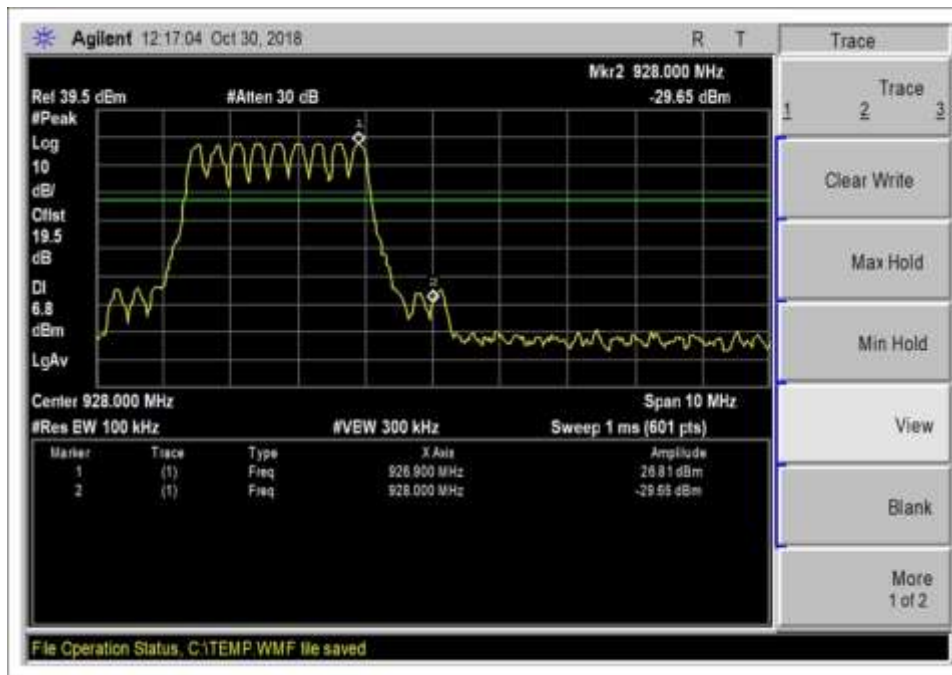
Low Channel, 100kbps, Power level 3



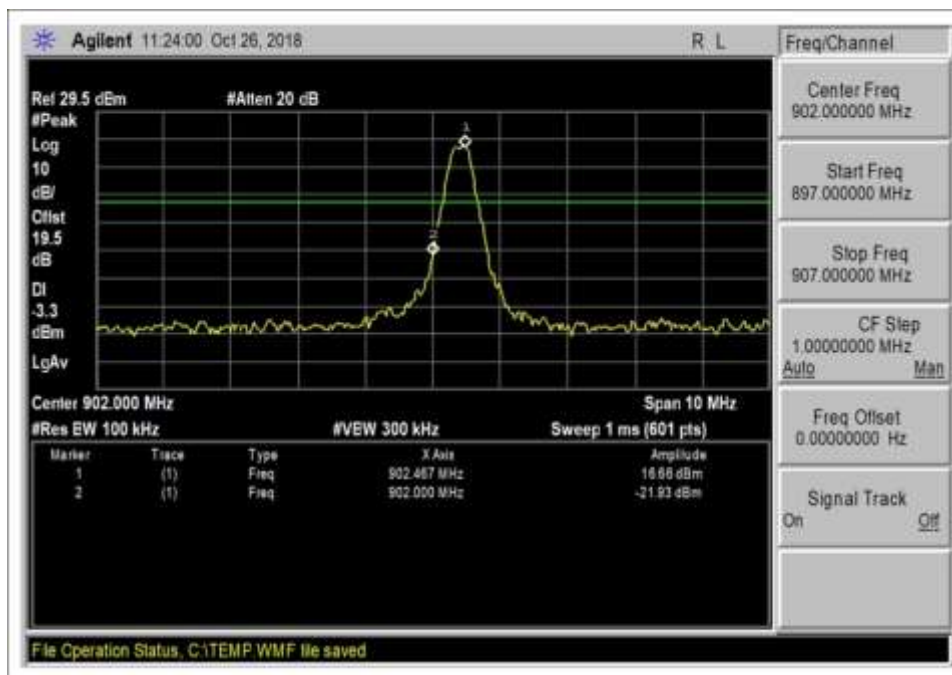
High Channel, 100kbps, Power level 3



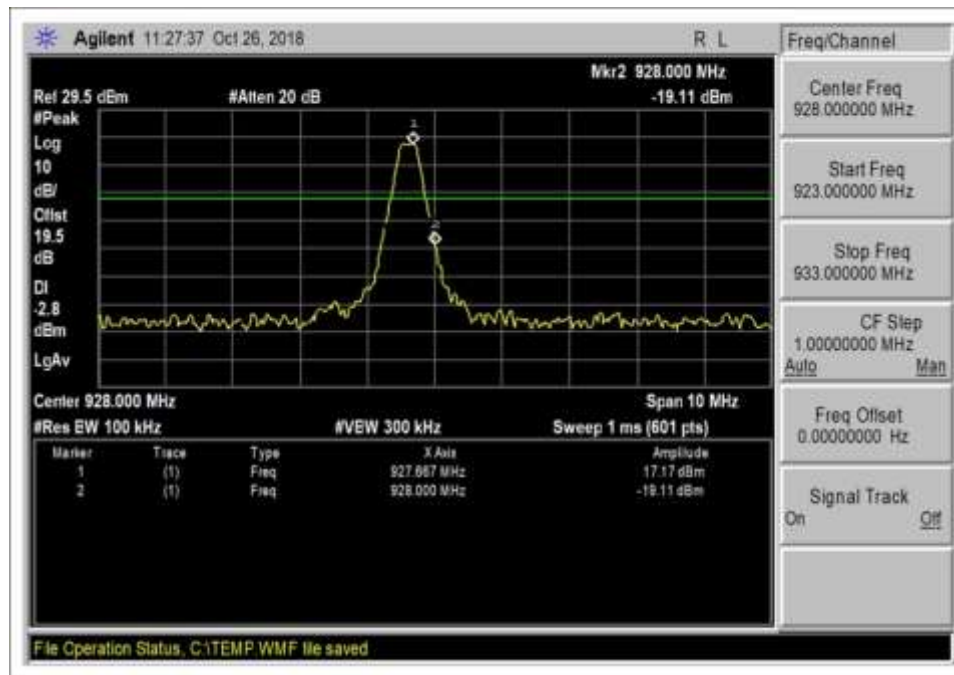
Low Channel, Hopping, 100kbps, Power level 3



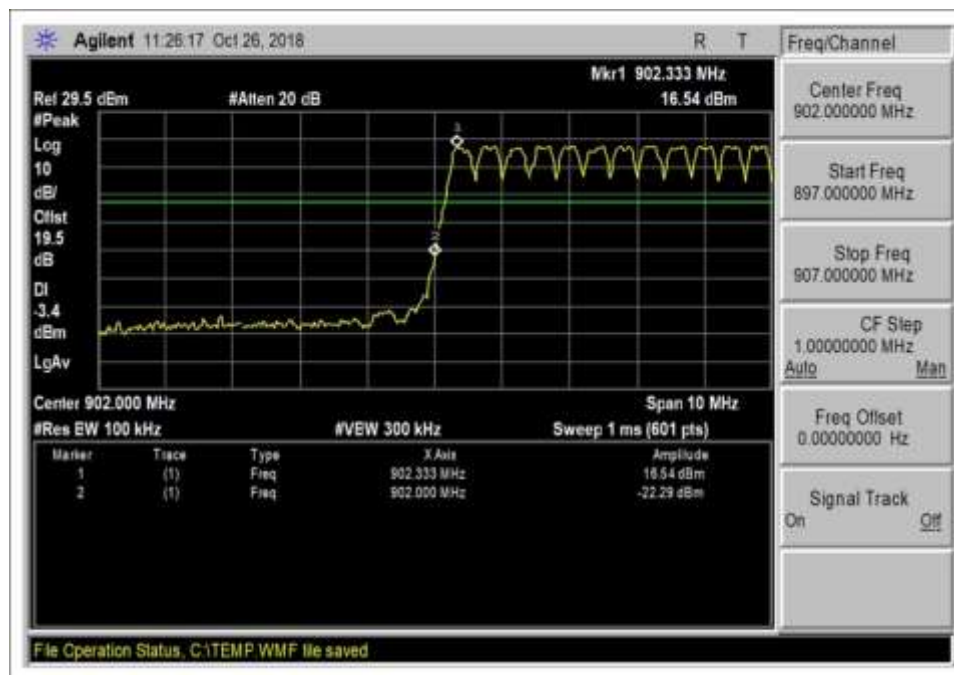
High Channel, Hopping, 100kbps, Power level 3



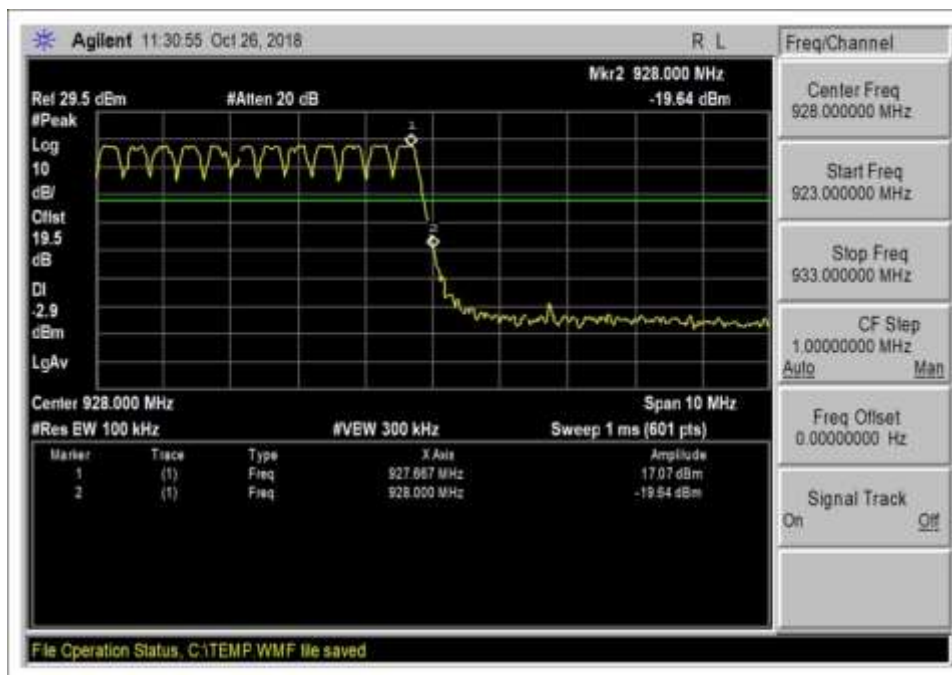
Low Channel, 300kbps, Power level 2



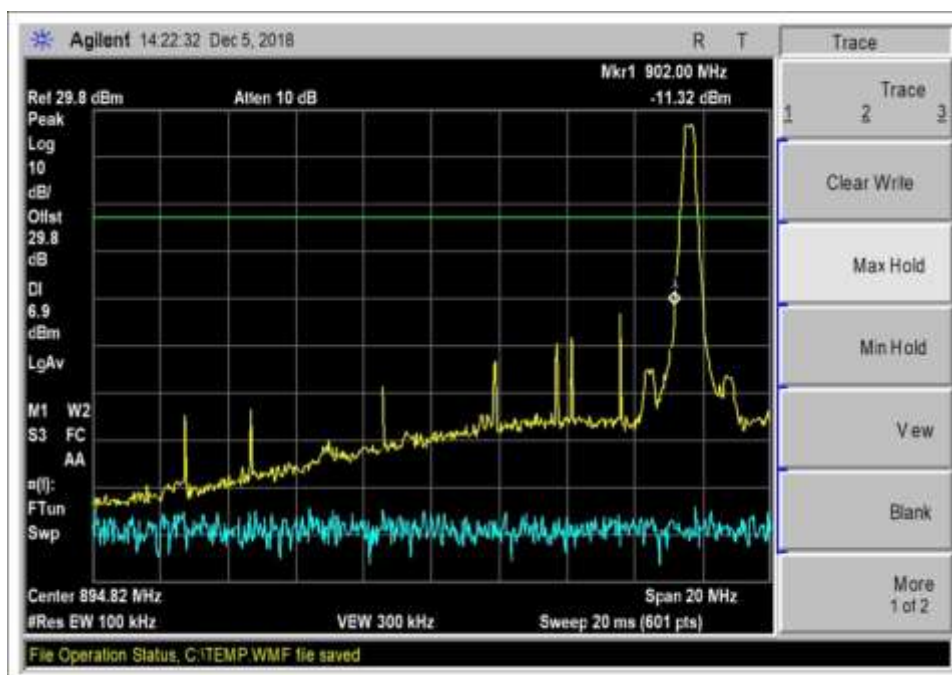
High Channel, 300kbps, Power level 2



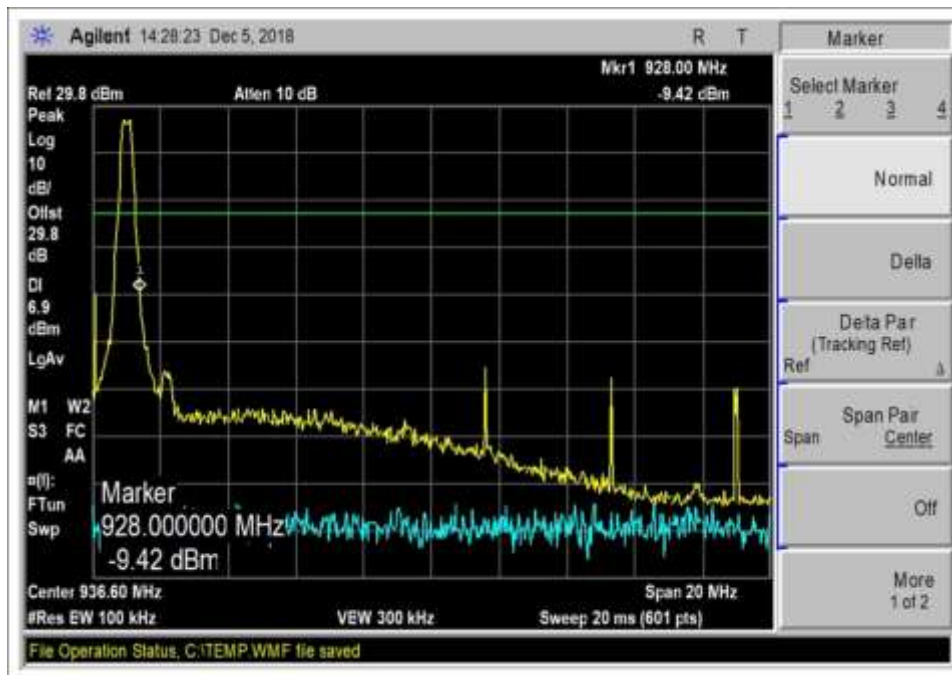
Low Channel, Hopping, 300kbps, Power level 2



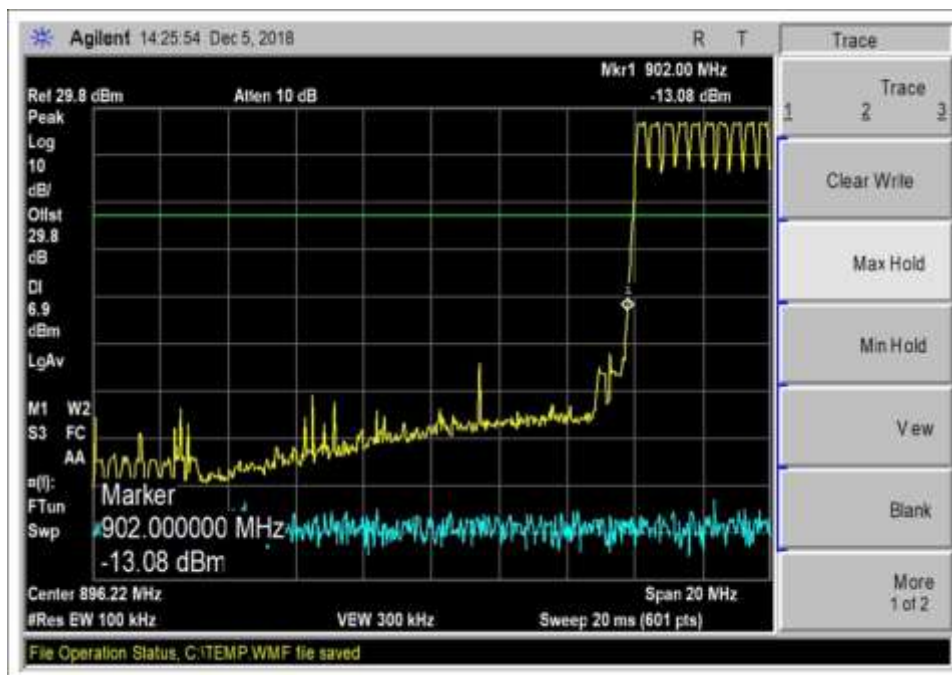
High Channel, Hopping, 300kbps, Power level 2



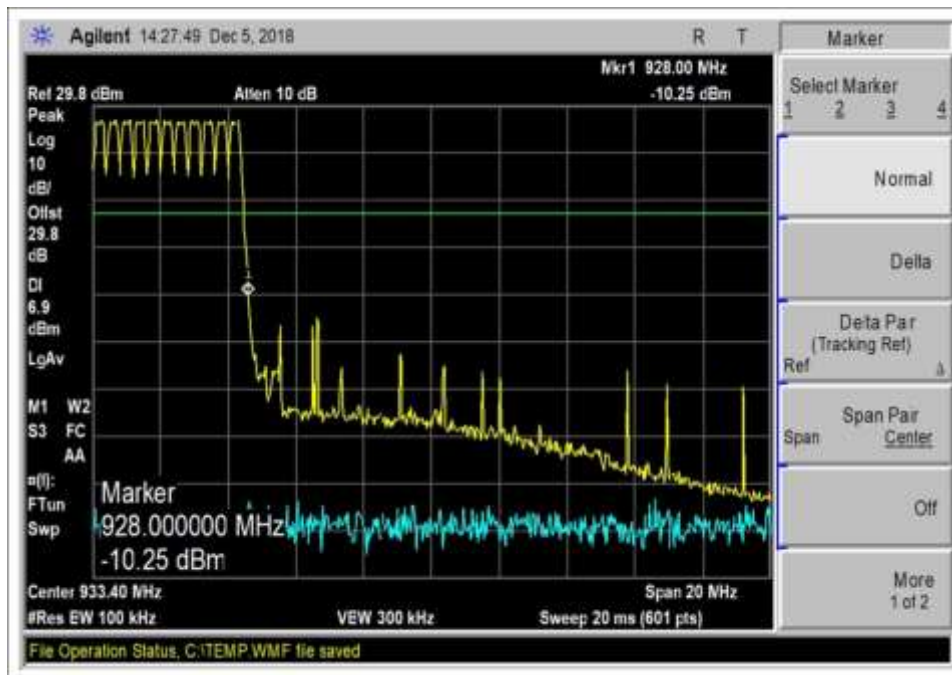
Low Channel, 300kbps, Power level 3



High Channel, 300kbps, Power level 3



Low Channel, Hopping, 300kbps, Power level 3



High Channel, Hopping, 300kbps, Power level 3

Test Setup Photos



Site A



Site D

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 #: **99808** Date: 10/29/2018
 Test Type: **Maximized Emissions** Time: 16:52:16
 Tested By: S. Yamamoto 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			

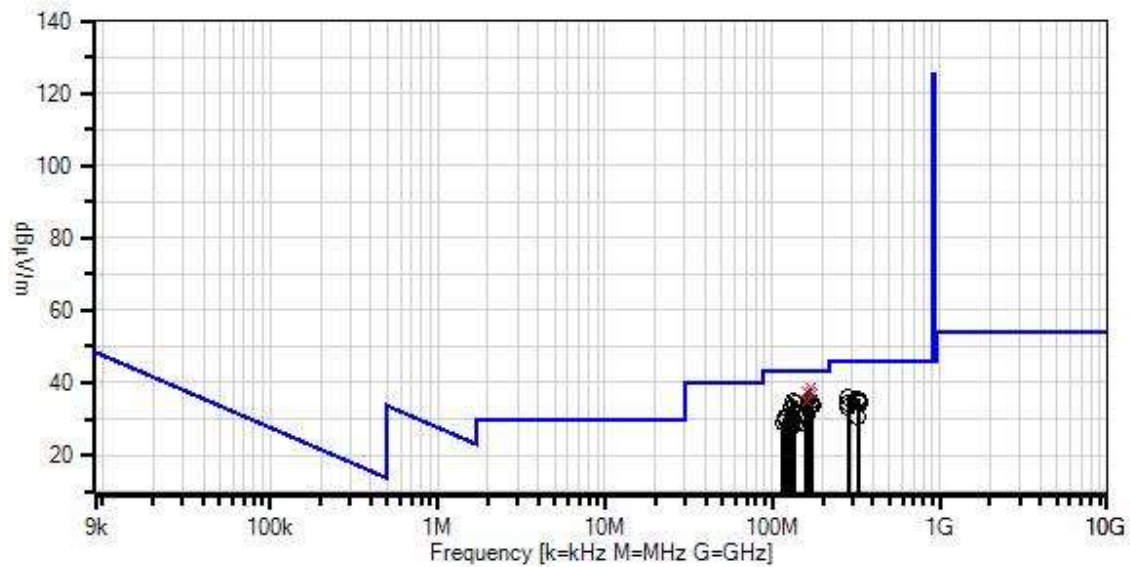
Test Conditions / Notes:

The equipment under test (EUT) is placed stand alone on a Styrofoam table top. Connected to the EUT is a laptop computer via USB to serial interface board. The EUT is turned on and set in transmitting mode.
 The EUT has fresh batteries installed. Nominal input voltage is 6.0Vdc.
 The EUT is tested in preferred orientation declared by the manufacturer.

Operating frequency: 902.3MHz, 914.9MHz, and 926.9MHz,
FSK modulation: power level 3.
 Operating frequency: 902.4MHz, 914.8MHz, and 927.6MHz,
Hybrid modulation. Firmware power: power level 2.

Frequency range of measurement = 9kHz to 1GHz. RBW=120kHz, VBW=300kHz for included data.
 Temperature: 21°C, Humidity: 56%, Pressure: 100kPa.
 Site D.
 Test Method: ANSI C63.10 (2013)

Itron, Inc. WO#: 99808 Sequence#: 3 Date: 10/29/2018
 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: 5.03.11

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN00010	Preamp	8447D	2/19/2018	2/19/2020
T2	ANP05569	Cable-Amplitude +15C to +45C (dB)	RG-214/U	12/7/2016	12/7/2018
T3	ANP05283	Attenuator	ATT-0218-06- NNN-02	4/5/2018	4/5/2020
T4	AN01994	Biconilog Antenna	CBL6111C	4/23/2018	4/23/2020
T5	ANP06978	Cable	Sucoflex 104A	3/31/2018	3/31/2020
T6	ANP04382	Cable	LDF-50	6/2/2018	6/2/2020
	AN02869	Spectrum Analyzer	E4440A	8/10/2018	8/10/2019

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq	Rdng	T1 T5	T2 T6	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	167.708M	46.8	-26.7	+1.3	+5.8	+9.9	+0.0	38.5	43.5	-5.0	Horiz
	QP		+0.1	+1.3							
^	167.708M	49.8	-26.7	+1.3	+5.8	+9.9	+0.0	41.5	43.5	-2.0	Horiz
			+0.1	+1.3							
3	162.803M	45.8	-26.7	+1.3	+5.8	+10.3	+0.0	37.8	43.5	-5.7	Horiz
	QP		+0.1	+1.2							
^	162.803M	48.8	-26.7	+1.3	+5.8	+10.3	+0.0	40.8	43.5	-2.7	Horiz
			+0.1	+1.2							
5	170.178M	46.1	-26.7	+1.3	+5.8	+9.7	+0.0	37.6	43.5	-5.9	Horiz
	QP		+0.1	+1.3							
^	170.178M	50.0	-26.7	+1.3	+5.8	+9.7	+0.0	41.5	43.5	-2.0	Horiz
			+0.1	+1.3							
7	165.258M	45.2	-26.7	+1.3	+5.8	+10.1	+0.0	37.0	43.5	-6.5	Horiz
	QP		+0.1	+1.2							
^	165.258M	48.9	-26.7	+1.3	+5.8	+10.1	+0.0	40.7	43.5	-2.8	Horiz
			+0.1	+1.2							
9	172.653M	45.5	-26.7	+1.3	+5.8	+9.5	+0.0	36.8	43.5	-6.7	Horiz
	QP		+0.1	+1.3							
^	172.653M	48.6	-26.7	+1.3	+5.8	+9.5	+0.0	39.9	43.5	-3.6	Horiz
			+0.1	+1.3							
11	160.328M	42.9	-26.8	+1.3	+5.8	+10.6	+0.0	35.1	43.5	-8.4	Horiz
	QP		+0.1	+1.2							
^	160.328M	46.6	-26.8	+1.3	+5.8	+10.6	+0.0	38.8	43.5	-4.7	Horiz
			+0.1	+1.2							
13	133.175M	42.0	-26.9	+1.2	+5.8	+11.5	+0.0	34.9	43.5	-8.6	Horiz
			+0.1	+1.2							
14	167.700M	43.0	-26.7	+1.3	+5.8	+9.9	+0.0	34.7	43.5	-8.8	Vert
			+0.1	+1.3							
15	135.650M	41.4	-26.9	+1.2	+5.8	+11.5	+0.0	34.3	43.5	-9.2	Horiz
			+0.1	+1.2							
16	172.640M	42.7	-26.7	+1.3	+5.8	+9.5	+0.0	34.0	43.5	-9.5	Vert
			+0.1	+1.3							
17	283.725M	40.3	-26.4	+1.7	+5.8	+13.0	+0.0	36.2	46.0	-9.8	Horiz
			+0.1	+1.7							

18	170.150M	42.1	-26.7 +0.1	+1.3 +1.3	+5.8	+9.7	+0.0	33.6	43.5	-9.9	Vert
19	130.700M	40.6	-26.9 +0.1	+1.2 +1.2	+5.8	+11.5	+0.0	33.5	43.5	-10.0	Horiz
20	284.700M	40.0	-26.4 +0.1	+1.7 +1.7	+5.8	+13.1	+0.0	36.0	46.0	-10.0	Horiz
21	165.370M	41.3	-26.7 +0.1	+1.3 +1.2	+5.8	+10.1	+0.0	33.1	43.5	-10.4	Vert
22	326.668M	38.1	-26.7 +0.2	+1.9 +1.9	+5.8	+14.2	+0.0	35.4	46.0	-10.6	Horiz
23	128.275M	40.0	-26.9 +0.1	+1.1 +1.1	+5.8	+11.6	+0.0	32.8	43.5	-10.7	Horiz
24	328.008M	37.8	-26.7 +0.2	+1.9 +1.9	+5.8	+14.2	+0.0	35.1	46.0	-10.9	Horiz
25	322.849M	37.8	-26.6 +0.2	+1.9 +1.8	+5.8	+14.1	+0.0	35.0	46.0	-11.0	Horiz
26	329.236M	37.1	-26.7 +0.2	+1.9 +1.9	+5.8	+14.2	+0.0	34.4	46.0	-11.6	Horiz
27	282.450M	38.2	-26.4 +0.1	+1.7 +1.7	+5.8	+13.0	+0.0	34.1	46.0	-11.9	Horiz
28	160.360M	39.0	-26.8 +0.1	+1.3 +1.2	+5.8	+10.6	+0.0	31.2	43.5	-12.3	Vert
29	285.000M	37.5	-26.4 +0.1	+1.7 +1.7	+5.8	+13.1	+0.0	33.5	46.0	-12.5	Vert
30	156.707M	38.3	-26.8 +0.1	+1.3 +1.2	+5.8	+10.8	+0.0	30.7	43.5	-12.8	Vert
31	120.850M	37.8	-26.9 +0.1	+1.1 +1.1	+5.8	+11.5	+0.0	30.5	43.5	-13.0	Horiz
32	118.375M	37.3	-26.9 +0.1	+1.1 +1.1	+5.8	+11.4	+0.0	29.9	43.5	-13.6	Horiz
33	130.650M	36.7	-26.9 +0.1	+1.2 +1.2	+5.8	+11.5	+0.0	29.6	43.5	-13.9	Vert
34	115.950M	36.6	-26.9 +0.1	+1.1 +1.1	+5.8	+11.2	+0.0	29.0	43.5	-14.5	Horiz
35	156.525M	36.5	-26.8 +0.1	+1.3 +1.2	+5.8	+10.8	+0.0	28.9	43.5	-14.6	Vert
36	135.650M	35.8	-26.9 +0.1	+1.2 +1.2	+5.8	+11.5	+0.0	28.7	43.5	-14.8	Vert
37	129.000M	35.7	-26.9 +0.1	+1.1 +1.1	+5.8	+11.5	+0.0	28.4	43.5	-15.1	Vert
38	323.005M	33.3	-26.6 +0.2	+1.9 +1.8	+5.8	+14.1	+0.0	30.5	46.0	-15.5	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 #: **99808** Date: 10/29/2018
Test Type: **Maximized Emissions** Time: 16:52:16
Tested By: S. Yamamoto 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:

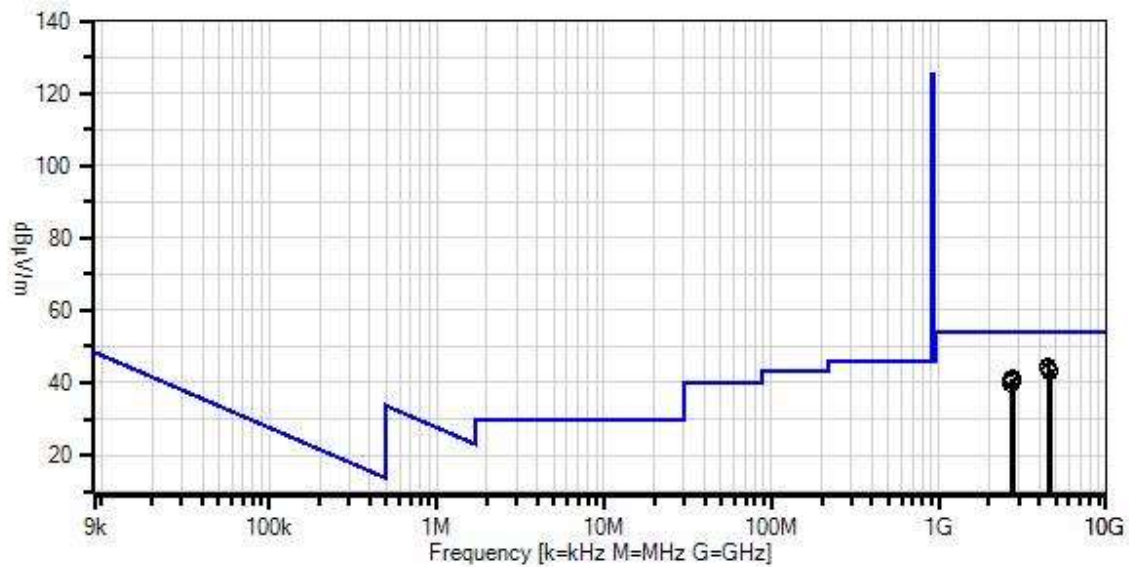
The equipment under test (EUT) is placed stand alone on a Styrofoam table top. Connected to the EUT is a laptop computer via USB to serial interface board.
The EUT is turned on and set in transmitting mode.
The EUT has fresh batteries installed. Nominal input voltage is 6.0Vdc.
The EUT is tested in preferred orientation declared by the manufacturer.

Operating frequency: 902.3MHz, 914.9MHz, and 926.9MHz.
FSK modulation. Firmware power: power level 3.

Frequency range of measurement = 1GHz to 9.3GHz. RBW=1MHz, VBW=3MHz for included data.

Temperature: 21°C, Humidity: 56%, Pressure: 100kPa.
Site D.
Test Method: ANSI C63.10 (2013).

Iron, Inc. WO#: 99808 Sequence#: 2 Date: 10/29/2018
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: 5.03.11

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP04382	Cable	LDF-50	6/2/2018	6/2/2020
T2	AN02869	Spectrum Analyzer	E4440A	8/10/2018	8/10/2019
T3	AN01646	Horn Antenna	3115	3/14/2018	3/14/2020
T4	AN03169	High Pass Filter	HM1155-11SS	6/15/2017	6/15/2019
T5	ANP07245	Cable	32022-29094K-29094K-24TC	7/5/2018	7/5/2020
T6	ANP07138	Cable	ANDL1-PNMNM-60	3/1/2017	3/1/2019
T7	AN00787	Preamp	83017A	6/9/2017	6/9/2019

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq	Rdng	T1 T5	T2 T6	T3 T7	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	4511.710M	37.9	+7.7 +0.8	+0.0 +5.6	+32.8 -40.2	+0.1	+0.0	44.7	54.0	-9.3	Vert
2	4511.180M	37.0	+7.7 +0.8	+0.0 +5.6	+32.8 -40.2	+0.1	+0.0	43.8	54.0	-10.2	Horiz
3	4634.642M	37.1	+7.8 +0.8	+0.0 +5.9	+32.6 -40.7	+0.2	+0.0	43.7	54.0	-10.3	Horiz
4	4574.535M	36.6	+7.7 +0.8	+0.0 +5.8	+32.8 -40.5	+0.1	+0.0	43.3	54.0	-10.7	Horiz
5	4574.250M	36.3	+7.7 +0.8	+0.0 +5.8	+32.8 -40.5	+0.1	+0.0	43.0	54.0	-11.0	Vert
6	4634.520M	36.3	+7.8 +0.8	+0.0 +5.9	+32.6 -40.7	+0.2	+0.0	42.9	54.0	-11.1	Vert
7	2780.790M	41.4	+5.8 +0.5	+0.0 +4.4	+29.1 -40.3	+0.2	+0.0	41.1	54.0	-12.9	Horiz
8	2780.851M	41.2	+5.8 +0.5	+0.0 +4.4	+29.1 -40.3	+0.2	+0.0	40.9	54.0	-13.1	Vert
9	2706.827M	41.6	+5.7 +0.5	+0.0 +4.3	+28.9 -40.3	+0.2	+0.0	40.9	54.0	-13.1	Horiz
10	2744.607M	41.4	+5.7 +0.5	+0.0 +4.3	+29.0 -40.3	+0.2	+0.0	40.8	54.0	-13.2	Vert
11	2744.480M	40.8	+5.7 +0.5	+0.0 +4.3	+29.0 -40.3	+0.2	+0.0	40.2	54.0	-13.8	Horiz
12	2706.625M	40.2	+5.7 +0.5	+0.0 +4.3	+28.9 -40.3	+0.2	+0.0	39.5	54.0	-14.5	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 #: **99808** Date: 12/4/2018
 Test Type: **Maximized Emissions** Time: 15:30:06
 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:

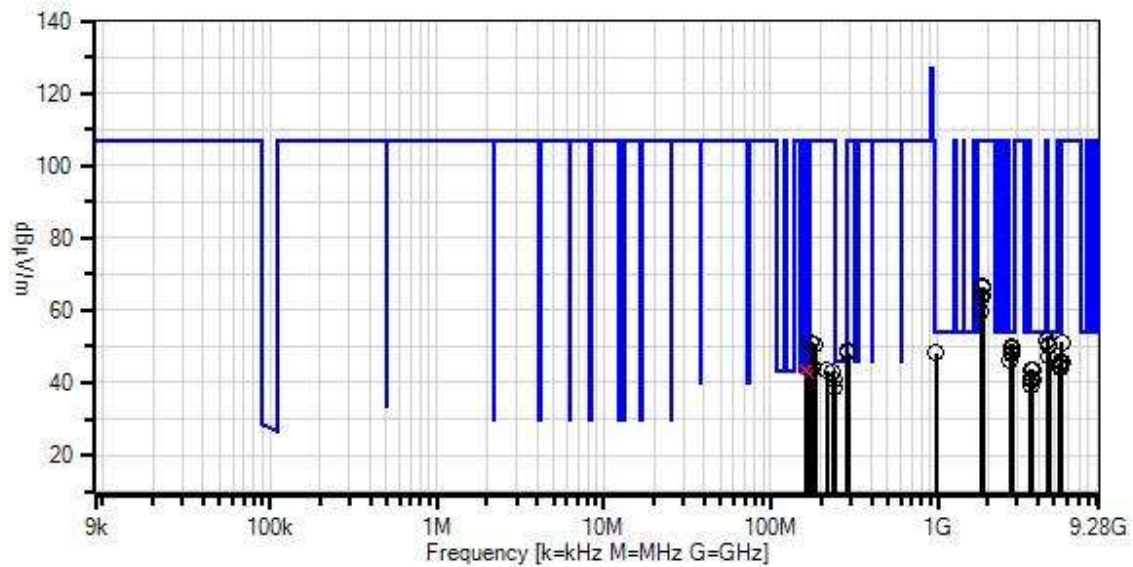
The equipment under test (EUT) is placed stand alone on a Styrofoam table top. Connected to the EUT is a laptop computer via USB to serial interface board.
 The EUT is turned on and set in transmitting mode.
 The EUT has fresh batteries installed. Nominal input voltage is 6.0Vdc.
 The EUT is tested in preferred orientation declared by the manufacturer.

GFSK 300kbps modulation. Firmware power: 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)

Temperature: 23.7°C, Humidity: 19.9%, Pressure: 100kPa.
 Site A.
 Test Method: ANSI C63.10 (2013). Site A

Itron, Inc. W/O#: 99808 Sequence#: 3 Date: 12/4/2018
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: 5.03.11

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN00314	Loop Antenna	6502	5/13/2018	5/13/2020
T1	ANP04382	Cable	LDF-50	6/2/2018	6/2/2020
T2	ANP05569	Cable-Amplitude +15C to +45C (dB)	RG-214/U	12/7/2016	12/7/2018
T3	ANP05283	Attenuator	ATT-0218-06- NNN-02	4/5/2018	4/5/2020
T4	AN01994	Biconilog Antenna	CBL6111C	4/23/2018	4/23/2020
T5	AN02869	Spectrum Analyzer	E4440A	8/10/2018	8/10/2019
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	Rdng	T1 T5 T9	T2 T6 T10	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	162.225M	24.7	+1.2 +0.0 +0.0	+1.3 +0.0 +0.0	+5.8 +0.0 +0.0	+10.4 +0.0 +0.0	+0.0	43.4	43.5	-0.1	Horiz
^	162.225M	27.1	+1.2 +0.0 +0.0	+1.3 +0.0 +0.0	+5.8 +0.0 +0.0	+10.4 +0.0 +0.0	+0.0	45.8	43.5	+2.3	Horiz
3	164.650M	24.8	+1.2 +0.0 +0.0	+1.3 +0.0 +0.0	+5.8 +0.0 +0.0	+10.2 +0.0 +0.0	+0.0	43.3	43.5	-0.2	Vert
^	164.650M	25.6	+1.2 +0.0 +0.0	+1.3 +0.0 +0.0	+5.8 +0.0 +0.0	+10.2 +0.0 +0.0	+0.0	44.1	43.5	+0.6	Vert
5	169.600M	24.3	+1.3 +0.0 +0.0	+1.3 +0.0 +0.0	+5.8 +0.0 +0.0	+9.8 +0.0 +0.0	+0.0	42.5	43.5	-1.0	Vert
^	169.600M	25.9	+1.3 +0.0 +0.0	+1.3 +0.0 +0.0	+5.8 +0.0 +0.0	+9.8 +0.0 +0.0	+0.0	44.1	43.5	+0.6	Vert
7	4512.000M	51.9	+0.0 +0.0 +0.7	+0.0 -37.8 +0.1	+0.0 +32.9	+0.0 +4.1	+0.0	51.9	54.0	-2.1	Horiz
8	4512.000M	51.6	+0.0 +0.0 +0.7	+0.0 -37.8 +0.1	+0.0 +32.9	+0.0 +4.1	+0.0	51.6	54.0	-2.4	Vert
9	4574.000M	50.5	+0.0 +0.0 +0.7	+0.0 -37.8 +0.1	+0.0 +32.9	+0.0 +4.1	+0.0	50.5	54.0	-3.5	Horiz

10	4574.000M	50.2	+0.0 +0.0 +0.7	+0.0 -37.8 +0.1	+0.0 +32.9	+0.0 +4.1	+0.0	50.2	54.0	-3.8	Vert
11	2782.800M	55.2	+0.0 +0.0 +0.4	+0.0 -38.6 +0.2	+0.0 +29.5	+0.0 +3.3	+0.0	50.0	54.0	-4.0	Vert
12	2744.400M	54.9	+0.0 +0.0 +0.4	+0.0 -38.6 +0.2	+0.0 +29.4	+0.0 +3.2	+0.0	49.5	54.0	-4.5	Horiz
13	240.250M	20.1	+1.6 +0.0 +0.0	+1.6 +0.0 +0.0	+5.8 +0.0	+11.6 +0.0	+0.0	40.7	46.0	-5.3	Vert
14	2744.400M	53.8	+0.0 +0.0 +0.4	+0.0 -38.6 +0.2	+0.0 +29.4	+0.0 +3.2	+0.0	48.4	54.0	-5.6	Vert
15	980.400M	10.9	+3.5 +0.0 +0.0	+3.7 +0.0 +0.0	+5.9 +0.0	+24.3 +0.0	+0.0	48.3	54.0	-5.7	Vert
16	2782.800M	53.2	+0.0 +0.0 +0.4	+0.0 -38.6 +0.2	+0.0 +29.5	+0.0 +3.3	+0.0	48.0	54.0	-6.0	Horiz
17	4638.000M	47.3	+0.0 +0.0 +0.6	+0.0 -37.7 +0.2	+0.0 +32.8	+0.0 +4.2	+0.0	47.4	54.0	-6.6	Horiz
18	4638.000M	47.1	+0.0 +0.0 +0.6	+0.0 -37.7 +0.2	+0.0 +32.8	+0.0 +4.2	+0.0	47.2	54.0	-6.8	Vert
19	241.450M	17.9	+1.6 +0.0 +0.0	+1.6 +0.0 +0.0	+5.8 +0.0	+11.7 +0.0	+0.0	38.6	46.0	-7.4	Vert
20	2707.200M	52.2	+0.0 +0.0 +0.4	+0.0 -38.6 +0.2	+0.0 +29.1	+0.0 +3.2	+0.0	46.5	54.0	-7.5	Vert
21	2707.200M	51.7	+0.0 +0.0 +0.4	+0.0 -38.6 +0.2	+0.0 +29.1	+0.0 +3.2	+0.0	46.0	54.0	-8.0	Horiz
22	5414.400M	44.0	+0.0 +0.0 +0.4	+0.0 -37.5 +0.1	+0.0 +33.9	+0.0 +4.6	+0.0	45.5	54.0	-8.5	Vert
23	5414.400M	43.2	+0.0 +0.0 +0.4	+0.0 -37.5 +0.1	+0.0 +33.9	+0.0 +4.6	+0.0	44.7	54.0	-9.3	Horiz
24	3659.200M	45.8	+0.0 +0.0 +0.5	+0.0 -38.3 +0.2	+0.0 +31.6	+0.0 +3.8	+0.0	43.6	54.0	-10.4	Horiz
25	3710.400M	45.4	+0.0 +0.0 +0.5	+0.0 -38.3 +0.2	+0.0 +31.9	+0.0 +3.8	+0.0	43.5	54.0	-10.5	Vert
26	3609.600M	44.3	+0.0 +0.0 +0.6	+0.0 -38.4 +0.2	+0.0 +31.1	+0.0 +3.8	+0.0	41.6	54.0	-12.4	Horiz

27	3710.400M	42.7	+0.0 +0.0 +0.5	+0.0 -38.3 +0.2	+0.0 +31.9	+0.0 +3.8	+0.0	40.8	54.0	-13.2	Horiz
28	3659.200M	42.7	+0.0 +0.0 +0.5	+0.0 -38.3 +0.2	+0.0 +31.6	+0.0 +3.8	+0.0	40.5	54.0	-13.5	Vert
29	3609.600M	41.7	+0.0 +0.0 +0.6	+0.0 -38.4 +0.2	+0.0 +31.1	+0.0 +3.8	+0.0	39.0	54.0	-15.0	Vert
30	1855.200M	75.1	+0.0 +0.0 +0.2	+0.0 -38.9 +0.3	+0.0 +27.3	+0.0 +2.6	+0.0	66.6	106.7	-40.1	Vert
31	1829.600M	74.9	+0.0 +0.0 +0.2	+0.0 -38.9 +0.3	+0.0 +27.1	+0.0 +2.5	+0.0	66.1	106.7	-40.6	Vert
32	1829.600M	73.0	+0.0 +0.0 +0.2	+0.0 -38.9 +0.3	+0.0 +27.1	+0.0 +2.5	+0.0	64.2	106.7	-42.5	Horiz
33	1855.200M	72.4	+0.0 +0.0 +0.2	+0.0 -38.9 +0.3	+0.0 +27.3	+0.0 +2.6	+0.0	63.9	106.7	-42.8	Horiz
34	1804.800M	72.7	+0.0 +0.0 +0.2	+0.0 -38.9 +0.3	+0.0 +27.0	+0.0 +2.5	+0.0	63.8	106.7	-42.9	Vert
35	1804.800M	68.7	+0.0 +0.0 +0.2	+0.0 -38.9 +0.3	+0.0 +27.0	+0.0 +2.5	+0.0	59.8	106.7	-46.9	Horiz
36	5565.600M	49.6	+0.0 +0.0 +0.4	+0.0 -37.4 +0.1	+0.0 +33.9	+0.0 +4.6	+0.0	51.2	106.7	-55.5	Horiz
37	175.720M	33.5	+1.3 +0.0 +0.0	+1.3 +0.0 +0.0	+5.8 +0.0	+9.3 +0.0	+0.0	51.2	106.7	-55.5	Horiz
38	184.480M	33.3	+1.3 +0.0 +0.0	+1.3 +0.0 +0.0	+5.8 +0.0	+9.0 +0.0	+0.0	50.7	106.7	-56.0	Horiz
39	287.220M	26.6	+1.8 +0.0 +0.0	+1.8 +0.0 +0.0	+5.8 +0.0	+13.1 +0.0	+0.0	49.1	106.7	-57.6	Horiz
40	292.300M	25.5	+1.8 +0.0 +0.0	+1.8 +0.0 +0.0	+5.8 +0.0	+13.2 +0.0	+0.0	48.1	106.7	-58.6	Vert
41	5565.600M	44.1	+0.0 +0.0 +0.4	+0.0 -37.4 +0.1	+0.0 +33.9	+0.0 +4.6	+0.0	45.7	106.7	-61.0	Vert

42	5488.800M	44.0	+0.0	+0.0	+0.0	+0.0	+0.0	45.7	106.7	-61.0	Horiz
			+0.0	-37.5	+34.1	+4.6					
			+0.4	+0.1							
43	5488.800M	42.5	+0.0	+0.0	+0.0	+0.0	+0.0	44.2	106.7	-62.5	Vert
			+0.0	-37.5	+34.1	+4.6					
			+0.4	+0.1							
44	178.350M	26.7	+1.3	+1.3	+5.8	+9.1	+0.0	44.2	106.7	-62.5	Vert
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0							
45	216.720M	24.3	+1.5	+1.5	+5.8	+10.2	+0.0	43.3	106.7	-63.4	Horiz
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0							
46	234.050M	23.0	+1.5	+1.5	+5.8	+11.3	+0.0	43.1	106.7	-63.6	Vert
			+0.0	+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 #: **99808** Date: 10/29/2018
 Test Type: **Maximized Emissions** Time: 13:50:22
 Tested By: S. Yamamoto Sequence#: 1
 Software: EMITest 5.03.11

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

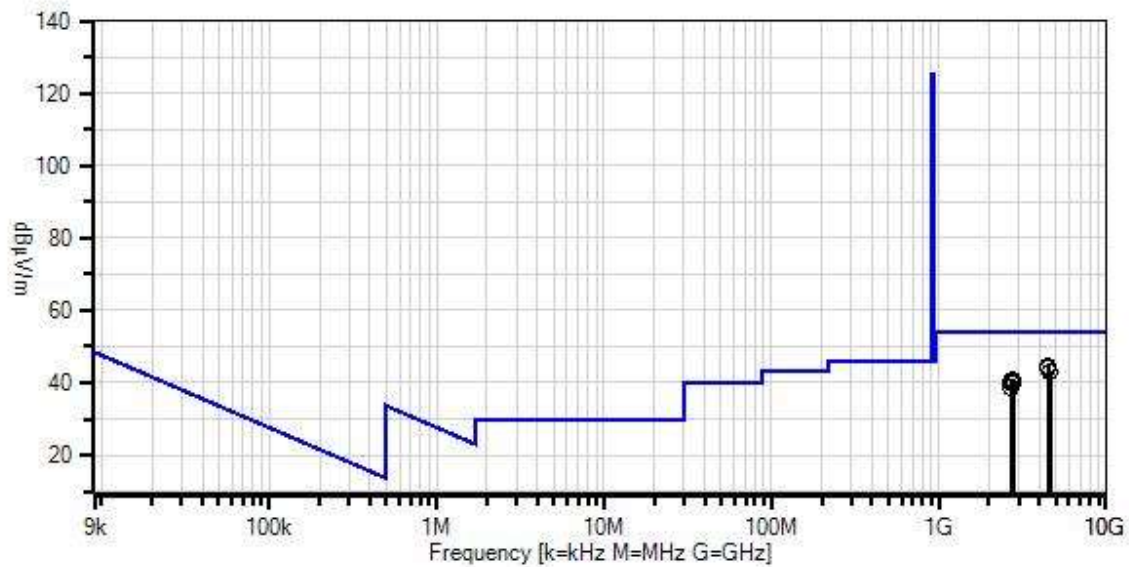
Test Conditions / Notes:

The equipment under test (EUT) is placed stand alone on a Styrofoam table top. Connected to the EUT is a laptop computer via USB to serial interface board.
 The EUT is turned on and set in transmitting mode.
 The EUT has fresh batteries installed.
 Nominal input voltage is 6.0Vdc.
 The EUT is tested in preferred orientation declared by the manufacturer.

 Operating frequency: 902.4MHz, 914.8MHz, and 927.6MHz.
Hybrid modulation. Firmware power: power level 2.
 Frequency range of measurement = 1GHz to 9.3GHz. RBW=1MHz, VBW=3MHz for included data.

 Temperature: 21°C, Humidity: 56%, Pressure: 100kPa.
 Site D.
 Test Method: ANSI C63.10 (2013)

Iron, Inc. WO#: 99808 Sequence#: 1 Date: 10/29/2018
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: 5.03.11

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP04382	Cable	LDF-50	6/2/2018	6/2/2020
	AN02869	Spectrum Analyzer	E4440A	8/10/2018	8/10/2019
T2	AN01646	Horn Antenna	3115	3/14/2018	3/14/2020
T3	AN03169	High Pass Filter	HM1155-11SS	6/15/2017	6/15/2019
T4	ANP07245	Cable	32022-29094K-29094K-24TC	7/5/2018	7/5/2020
T5	ANP07138	Cable	ANDL1-PNMNM-60	3/1/2017	3/1/2019
T6	AN00787	Preamp	83017A	6/9/2017	6/9/2019

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq	Rdng	T1 T5	T2 T6	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	4512.099M	37.9	+7.7 +5.6	+32.8 -40.2	+0.1	+0.8	+0.0	44.7	54.0	-9.3	Horiz
2	4511.659M	37.0	+7.7 +5.6	+32.8 -40.2	+0.1	+0.8	+0.0	43.8	54.0	-10.2	Vert
3	4573.750M	36.5	+7.7 +5.8	+32.8 -40.5	+0.1	+0.8	+0.0	43.2	54.0	-10.8	Vert
4	4574.500M	36.5	+7.7 +5.8	+32.8 -40.5	+0.1	+0.8	+0.0	43.2	54.0	-10.8	Horiz
5	4637.797M	36.5	+7.8 +5.9	+32.6 -40.7	+0.2	+0.8	+0.0	43.1	54.0	-10.9	Vert
6	4637.737M	36.1	+7.8 +5.9	+32.6 -40.7	+0.2	+0.8	+0.0	42.7	54.0	-11.3	Vert
7	2783.060M	41.3	+5.8 +4.4	+29.1 -40.3	+0.2	+0.5	+0.0	41.0	54.0	-13.0	Vert
8	2744.113M	41.1	+5.7 +4.3	+29.0 -40.3	+0.2	+0.5	+0.0	40.5	54.0	-13.5	Vert
9	2744.027M	40.8	+5.7 +4.3	+29.0 -40.3	+0.2	+0.5	+0.0	40.2	54.0	-13.8	Horiz
10	2707.102M	40.8	+5.7 +4.3	+28.9 -40.3	+0.2	+0.5	+0.0	40.1	54.0	-13.9	Horiz
11	2782.763M	40.1	+5.8 +4.4	+29.1 -40.3	+0.2	+0.5	+0.0	39.8	54.0	-14.2	Vert
12	2707.229M	39.4	+5.7 +4.3	+28.9 -40.3	+0.2	+0.5	+0.0	38.7	54.0	-15.3	Vert

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	40.7	<46	Pass
902	100kbps FSK lv3	Integral	85.9	<103.7	Pass
928	100kbps FSK lv3	Integral	65.5	<103.7	Pass
960	100kbps FSK lv3	Integral	46.4	<54	Pass
902	100kbps FSK lv3 Hopping	Integral	84.6	<103.7	Pass
928	100kbps FSK lv3 Hopping	Integral	64.7	<103.7	Pass
614	300kbps GFSK lv2	Integral	40.7	<46	Pass
902	300kbps GFSK lv2	Integral	75.9	<92	Pass
928	300kbps GFSK lv2	Integral	75.3	<92	Pass
960	300kbps GFSK lv2	Integral	46.3	<54	Pass
902	300kbps GFSK lv2 Hopping	Integral	76.2	<92	Pass
928	300kbps GFSK lv2 Hopping	Integral	74.8	< 92	Pass
614	300kbps GFSK lv3	Integral	40.8	<46	Pass
902	300kbps GFSK lv3	Integral	92.3	<106.7	Pass
928	300kbps GFSK lv3	Integral	92.1	<106.7	Pass
960	300kbps GFSK lv3	Integral	46.3	<54	Pass
902	300kbps GFSK lv3 Hopping	Integral	91.7	<106.7	Pass
928	300kbps GFSK lv3 Hopping	Integral	91.6	<106.7	Pass

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 #: **99808** Date: 12/4/2018
 Test Type: **Maximized Emissions** Time: 15:09:19
 Tested By: S. Yamamoto Sequence#: 1
 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 equipment under test (EUT) is placed stand alone on a Styrofoam table top. Connected to the EUT is a laptop computer via USB to serial interface board. The EUT is turned on and set in transmitting mode.
 The EUT has fresh batteries installed. Nominal input voltage is 6.0Vdc.
 The EUT is tested in preferred orientation declared by the manufacturer.

 Operating frequency: 902.3MHz, and 926.9MHz.
FSK modulation. Firmware power: power level 3.

 Frequency range of measurement = 614MHz to 960MHz
 RBW=100 kHz, VBW=300 kHz.

 Temperature: 25°C, Humidity: 46%, Pressure: 100kPa.
 Site D.
 Test Method: ANSI C63.10 (2013).

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02869	Spectrum Analyzer	E4440A	8/10/2018	8/10/2019
T2	ANP04382	Cable	LDF-50	6/2/2018	6/2/2020
T3	ANP05569	Cable-Amplitude +15C to +45C (dB)	RG-214/U	12/7/2016	12/7/2018
T4	ANP05283	Attenuator	ATT-0218-06- NNN-02	4/5/2018	4/5/2020
T5	AN01994	Biconilog Antenna	CBL6111C	4/23/2018	4/23/2020

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dB μ V	T1 T5 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 QP	9.2	+0.0 +20.4	+2.6	+2.7	+5.8	+0.0	40.7	46.0	-5.3	Vert
2	960.000M QP	9.4	+0.0 +24.1	+3.4	+3.6	+5.9	+0.0	46.4	54.0	-7.6	Vert
3	902.000M	49.9	+0.0 +23.4	+3.2	+3.5	+5.9	+0.0	85.9	103.7	-17.8	Vert
4	902.000M	48.6	+0.0 +23.4	+3.2	+3.5	+5.9	+0.0	84.6	103.7	-19.1	Vert
5	928.000M	29.0	+0.0 +23.7	+3.3	+3.6	+5.9	+0.0	65.5	103.7	-38.2	Vert
6	928.000M	28.2	+0.0 +23.7	+3.3	+3.6	+5.9	+0.0	64.7	103.7	-39.0	Vert

Test Location: CKC Laboratories Inc. • 110 N. Olinda Place • Brea, CA 92823 • 714-993-6112
 Customer: **Itron, Inc.**
 Specification: **RSS-247 5.5 / RSS-GEN 8.9 Radiated Spurious Emissions**
 Work Order #: **99808** Date: 12/4/2018
 Test Type: **Maximized Emissions** Time: 15:08:09
 Tested By: S. Yamamoto Sequence#: 1
 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 equipment under test (EUT) is placed stand alone on a Styrofoam table top. Connected to the EUT is a laptop computer via USB to serial interface board. T
 The EUT is turned on and set in transmitting mode.
 The EUT has fresh batteries installed.
 Nominal input voltage is 6.0Vdc.
 The EUT is tested in preferred orientation declared by the manufacturer.
 Operating frequency: 902.4MHz, and 927.6MHz.
Hybrid modulation. Firmware power: power level 2.

 Frequency range of measurement = 614MHz to 960MHz
 RBW=100 kHz, VBW=300 kHz.

 Temperature: 26°C, Humidity: 43%, Pressure: 100kPa.
 Site D.
 Test Method: ANSI C63.10 (2013).

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02869	Spectrum Analyzer	E4440A	8/10/2018	8/10/2019
T2	ANP04382	Cable	LDF-50	6/2/2018	6/2/2020
T3	ANP05569	Cable-Amplitude +15C to +45C (dB)	RG-214/U	12/7/2016	12/7/2018
T4	ANP05283	Attenuator	ATT-0218-06- NNN-02	4/5/2018	4/5/2020
T5	AN01994	Biconilog Antenna	CBL6111C	4/23/2018	4/23/2020

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 +20.4	+2.6	+2.7	+5.8	+0.0	40.7	46.0	-5.3	Vert
2	960.000M QP	9.3	+0.0 +24.1	+3.4	+3.6	+5.9	+0.0	46.3	54.0	-7.7	Vert
3	902.000M	40.1	+0.0 +23.4	+3.2	+3.5	+5.9	+0.0	76.1	92.0	-15.9	Vert
4	902.000M	39.9	+0.0 +23.4	+3.2	+3.5	+5.9	+0.0	75.9	92.0	-16.1	Vert
5	928.000M	38.8	+0.0 +23.7	+3.3	+3.6	+5.9	+0.0	75.3	92.0	-16.7	Vert
6	928.000M	38.3	+0.0 +23.7	+3.3	+3.6	+5.9	+0.0	74.8	92.0	-17.2	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 #: **99808** Date: 12/4/2018
 Test Type: **Maximized Emissions** Time: 15:10:01
 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 equipment under test (EUT) is placed stand alone on a Styrofoam table top. Connected to the EUT is a laptop computer via USB to serial interface board.
 The EUT is turned on and set in transmitting mode.
 The EUT has fresh batteries installed.
 Nominal input voltage is 6.0Vdc.
 The EUT is tested in preferred orientation declared by the manufacturer.

GFSK 300kbps modulation. Firmware power: power level 3.
 Frequency range of measurement = 614MHz to 960MHz
 RBW=100 kHz, VBW=300 kHz (-20dBc limit)
 RBW=120 kHz, VBW=360 kHz (restricted band)

 Temperature: 23.6°C, Humidity: 21.2%, Pressure: 100kPa.
 Site A.
 Test Method: ANSI C63.10 (2013).

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02869	Spectrum Analyzer	E4440A	8/10/2018	8/10/2019
T2	ANP04382	Cable	LDF-50	6/2/2018	6/2/2020
T3	ANP05569	Cable-Amplitude +15C to +45C (dB)	RG-214/U	12/7/2016	12/7/2018
T4	ANP05283	Attenuator	ATT-0218-06- NNN-02	4/5/2018	4/5/2020
T5	AN01994	Biconilog Antenna	CBL6111C	4/23/2018	4/23/2020

Measurement Data:

Reading listed by margin.

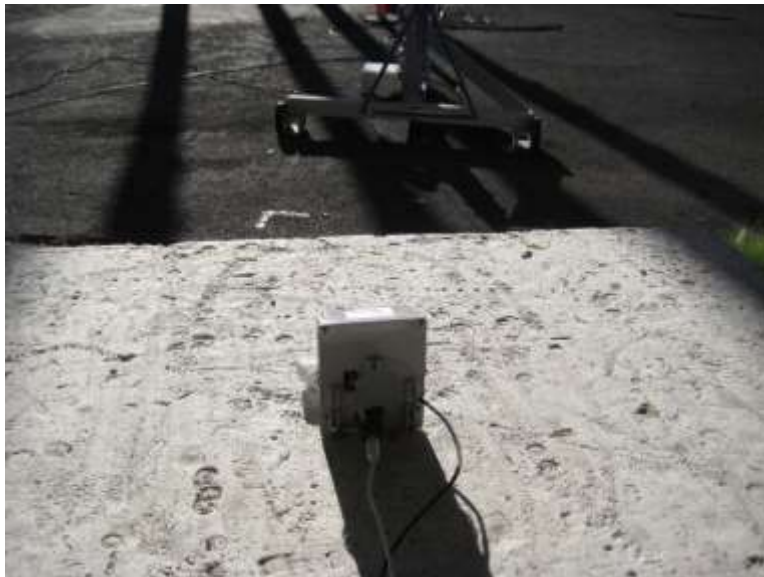
Test Distance: 3 Meters

#	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	9.3	+0.0 +20.4	+2.6	+2.7	+5.8	+0.0	40.8	46.0	-5.2	Vert
2	960.000M QP	9.3	+0.0 +24.1	+3.4	+3.6	+5.9	+0.0	46.3	54.0	-7.7	Vert
3	902.000M	56.3	+0.0 +23.4	+3.2	+3.5	+5.9	+0.0	92.3	106.7	-14.4	Vert
4	928.000M	55.6	+0.0 +23.7	+3.3	+3.6	+5.9	+0.0	92.1	106.7	-14.6	Vert
5	902.000M	55.7	+0.0 +23.4	+3.2	+3.5	+5.9	+0.0	91.7	106.7 hopping	-15.0	Vert
6	928.000M	55.1	+0.0 +23.7	+3.3	+3.6	+5.9	+0.0	91.6	106.7 hopping	-15.1	Vert

Test Setup Photos



Site A, Below 1GHz



Site A, Below 1GHz



Site A, Above 1GHz, Cone placement



Site D, Below 1GHz



Site D, Below 1GHz



Site D, 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.