

Itron, Inc.

REVISED TEST REPORT TO 105379-12

**Itron Cellular 500G Module
Model: 500GAC**

Tested to The Following Standards:

FCC Part 15 Subpart C Section(s)

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

Report No.: 105379-12A

Date of issue: August 18, 2021



Test Certificate # 803.01

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

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

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ADMINISTRATIVE INFORMATION

Test Report Information

REPORT PREPARED FOR:

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

Representative: Jay Holcomb
Customer Reference Number: 236177

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: 105379

May 11, 2021
May 11, 13, 18, and 25 – 27, 2021

Revision History

Original: Testing of the Itron Cellular 500G Module, Model: 500GAC to FCC Part 15 Subpart C Section(s) 15.247 (FHSS 902-928MHz).

Revision A: Added statement to the Conditions During Test table to clarify the orientation of the EUT during testing. Corrected the subsection references for Number of Hopping Channel, Average Time of Occupancy and Output Power.

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	5.03.19

Site Registration & Accreditation Information

Location	*NIST CB #	FCC	Canada	Japan
Canyon Park, Bothell, WA	US0103	US1024	3082C	A-0136
Brea, CA	US0103	US1024	3082D	A-0136
Fremont, CA	US0103	US1024	3082B	A-0136
Mariposa, CA	US0103	US1024	3082A	A-0136

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

SUMMARY OF RESULTS

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

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

NA = Not Applicable

NA1 = Not Applicable because the Manufacturer declares the EUT is battery powered.

NP = CKC Laboratories was not contracted to perform testing.

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

The manufacturer declares the equipment is only installed in one orientation and was tested in that orientation.

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
Itron Cellular 500G Module	Itron, Inc.	500GAC	CON1

Device	Manufacturer	Model #	S/N
USB to Serial Interface	Itron, Inc.	NA	NA
Laptop Computer	Dell	Latitude E6410	46TXXNI

Configuration 2

Equipment Tested:

Device	Manufacturer	Model #	S/N
Itron Cellular 500G Module	Itron, Inc.	500GAC	005

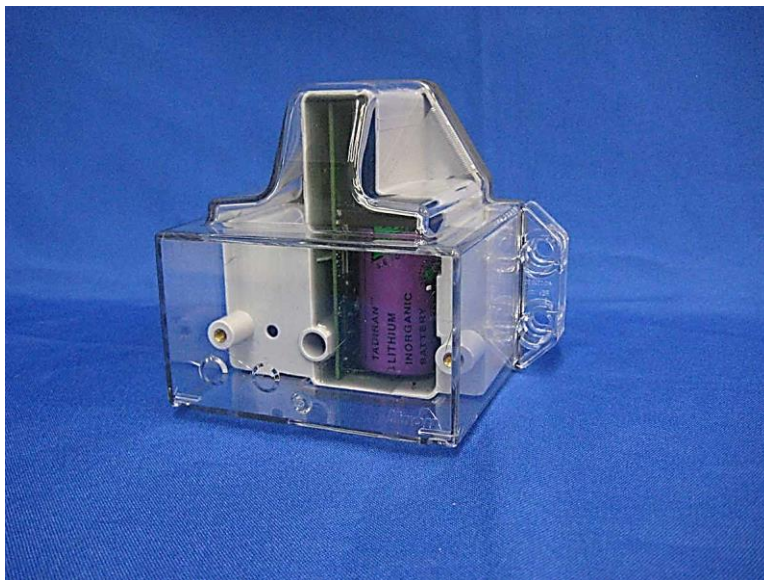
Support Equipment:

Device	Manufacturer	Model #	S/N
USB to Serial Interface	Itron, Inc.	NA	NA
Laptop Computer	Dell	Latitude E6410	46TXXNI

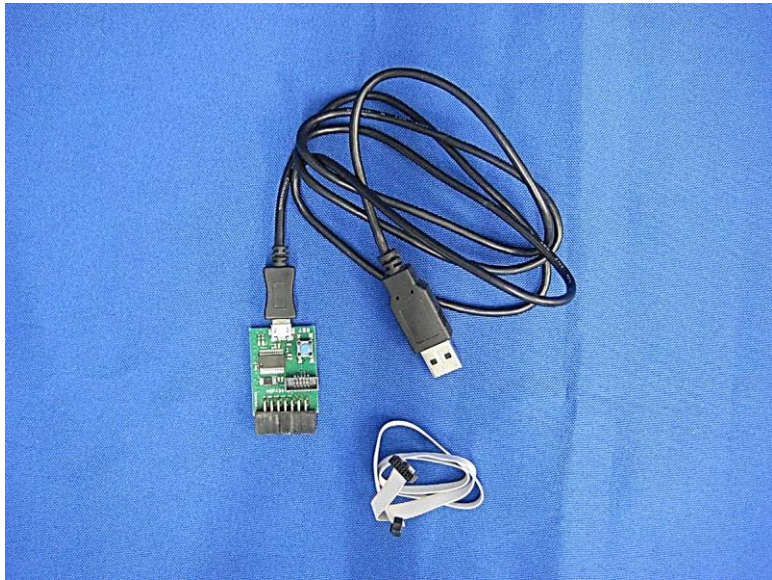
General Product Information:

Product Information	Manufacturer-Provided Details
Equipment Type:	Stand-Alone Equipment
Type of Wideband System:	Proprietary Low power and FHSS
Operating Frequency Range:	903.0MHz to 926.8MHz (OOK 16.384kbps PL3) 903.0MHz to 926.8MHz (OOK 16.384kbps PL1) 902.4MHz to 927.6MHz (300kbps GFSK PL2)
Number of Hopping Channels:	120 (OOK) 64 (GFSK)
Receiver Bandwidth and Synchronization:	The manufacturer declares the receiver input bandwidth matches the transmit channel bandwidth and shifts frequencies in synchronization with the transmitter.
Modulation Type(s):	OOK 16.384kbps GFSK 300kbps
Maximum Duty Cycle:	28.05% (OOK) 45% (GFSK)
Number of TX Chains:	1
Antenna Type(s) and Gain:	PCB Trace 0.9dBi
Beamforming Type:	NA
Antenna Connection Type:	Integral
Nominal Input Voltage:	3.6V Battery
Firmware / Software used for Test:	App Version: 0.0.33.0 CSL version: 8.1.17.0 Hardware Rev: 4

EUT Photo(s)



Support Equipment Photo(s)



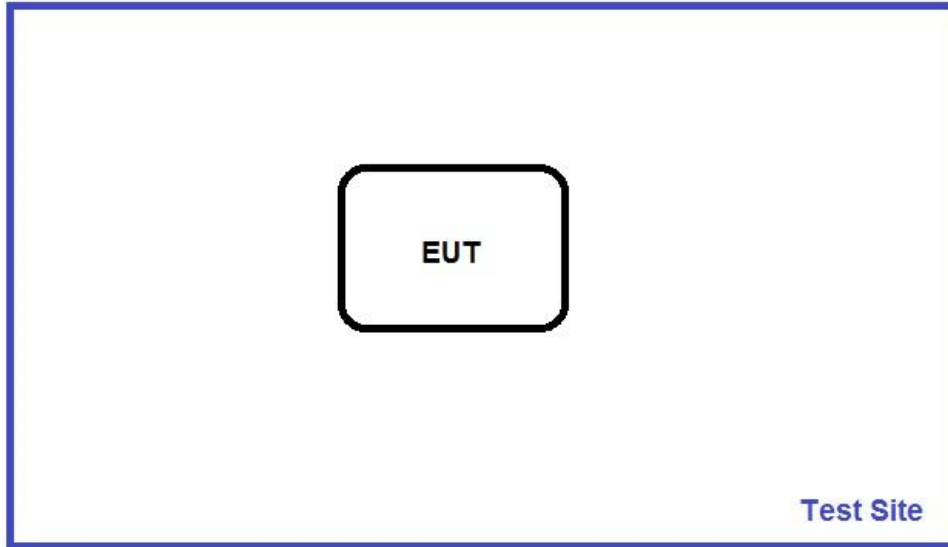
USB to Serial Interface



Laptop and Power Supply

Block Diagram of Test Setup(s)

Test Setup Block Diagram



FCC Part 15 Subpart C

15.247(a) Transmitter Characteristics

Test Setup/Conditions			
Test Location:	Brea Lab D	Test Engineer:	S. Yamamoto
Test Method:	ANSI C63.10 (2013)	Test Date(s):	5/11/2021
Configuration:	1		
Test Setup:	<p>The equipment under test (EUT) is connected to a laptop computer via USB to serial interface board. The laptop is running Command Line Interface (CLI) Tool. This software is used to run the scripts for setting the EUT parameters.</p> <p>The RF output has been configured to a coaxial cable output with sma connector. The output is connected to the spectrum analyzer using a coaxial cable and power attenuator.</p> <p>Frequency range of test: 902.0MHz to 928.0MHz.</p> <p>OOK 16.384kbps Power Level 1 and 3 Low channel 903.0MHz Middle channel 915.0MHz High channel 926.8MHz</p> <p>GFSK 300kbps Power Level 2 Low channel 902.4MHz Middle channel 915.2MHz High channel 927.6MHz</p> <p>Temperature: 21°C Relative Humidity: 50% Pressure: 99kPa</p> <p>Site D</p> <p>Reference 558074 D01 15.247 Meas Guidance v05r02 and ANSI C63.10-2013</p>		

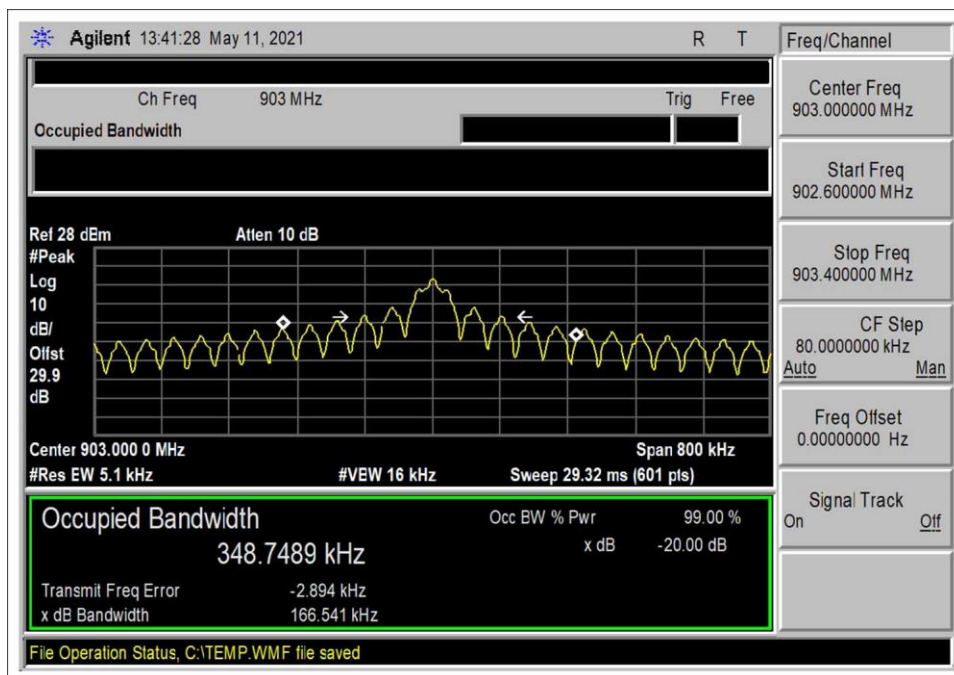
Environmental Conditions			
Temperature (°C)	21	Relative Humidity (%):	50

Test Equipment					
Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
02869	Spectrum Analyzer	Agilent	E4440A	8/3/2020	8/3/2021
03432	Attenuator	Aeroflex/Weinschel	90-30-34	10/22/2019	10/22/2021
P07656	Cable	Astrolab, Inc.	32022-29094K-29094K-24TC	7/30/2020	7/30/2022

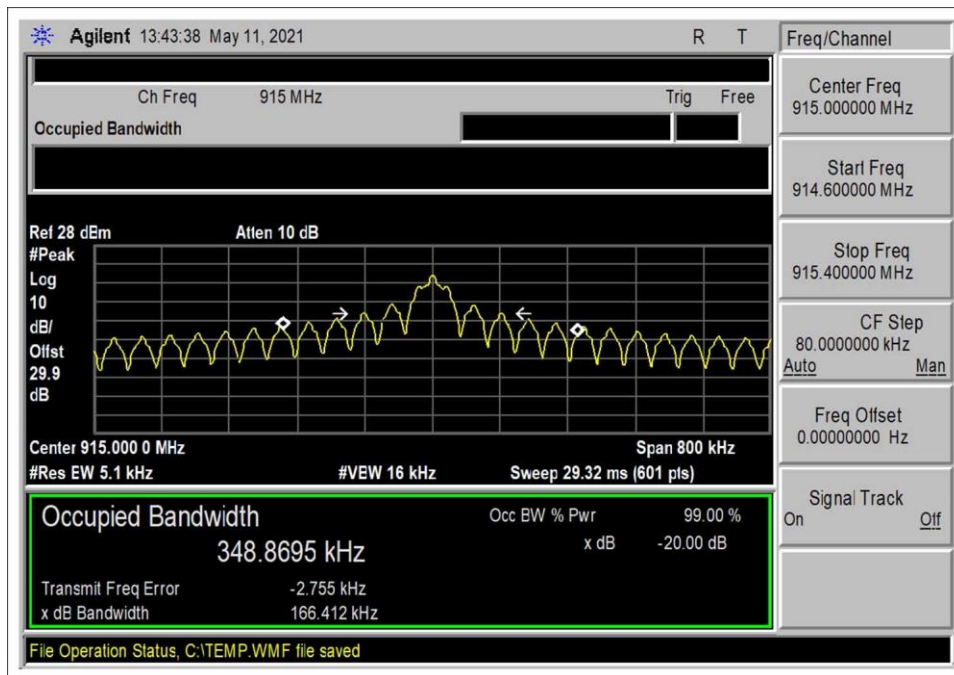
15.247(a)(1)(i) 20 dB Bandwidth

Test Data Summary					
Frequency (MHz)	Antenna Port	Modulation	Measured (kHz)	Limit (kHz)	Results
903.0	1	OOK 16.384kbps (PL3)	166.541	≤500	Pass
915.0	1	OOK 16.384kbps (PL3)	166.412	≤500	Pass
926.8	1	OOK 16.384kbps (PL3)	166.648	≤500	Pass
903.0	1	OOK 16.384kbps (PL1)	166.878	≤500	Pass
915.0	1	OOK 16.384kbps (PL1)	166.804	≤500	Pass
926.8	1	OOK 16.384kbps (PL1)	166.763	≤500	Pass
902.4	1	GFSK 300kbps (PL2)	363.028	≤500	Pass
915.2	1	GFSK 300kbps (PL2)	363.120	≤500	Pass
927.6	1	GFSK 300kbps (PL2)	363.301	≤500	Pass

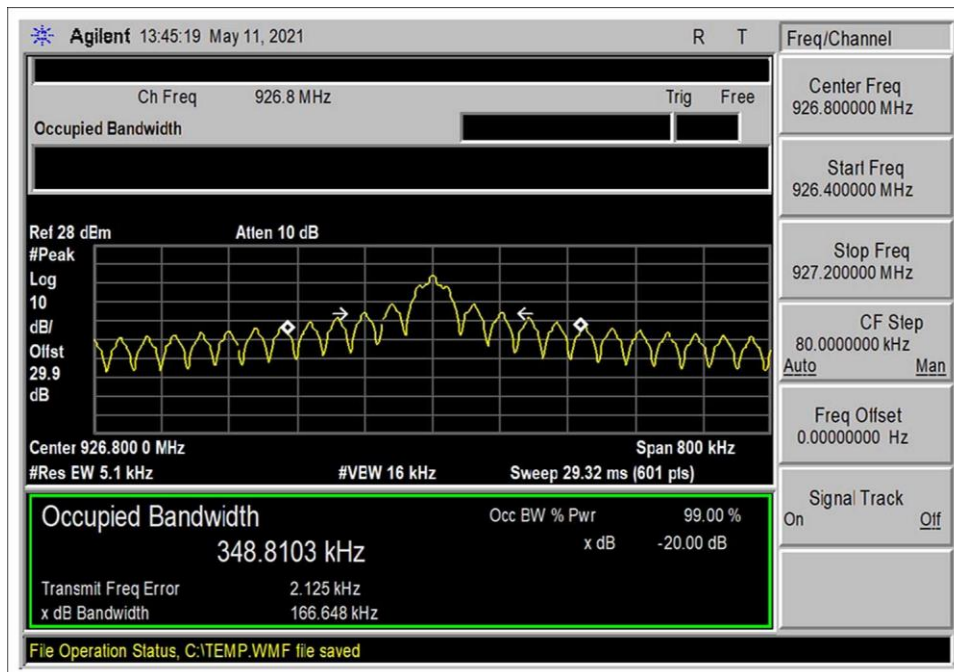
Plot(s)



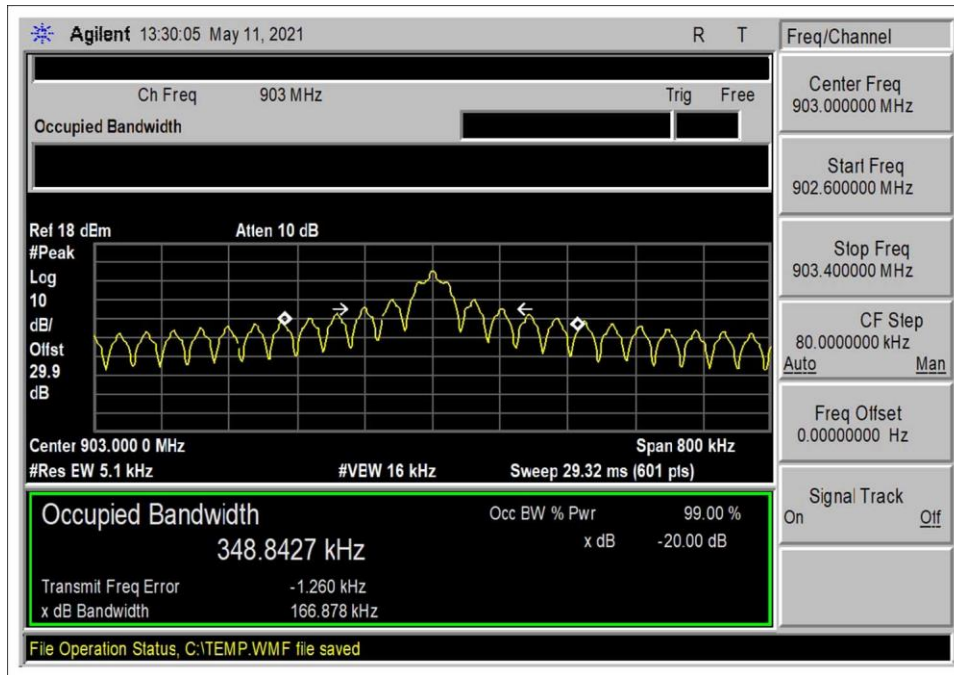
OOK, Low Channel (PL3)



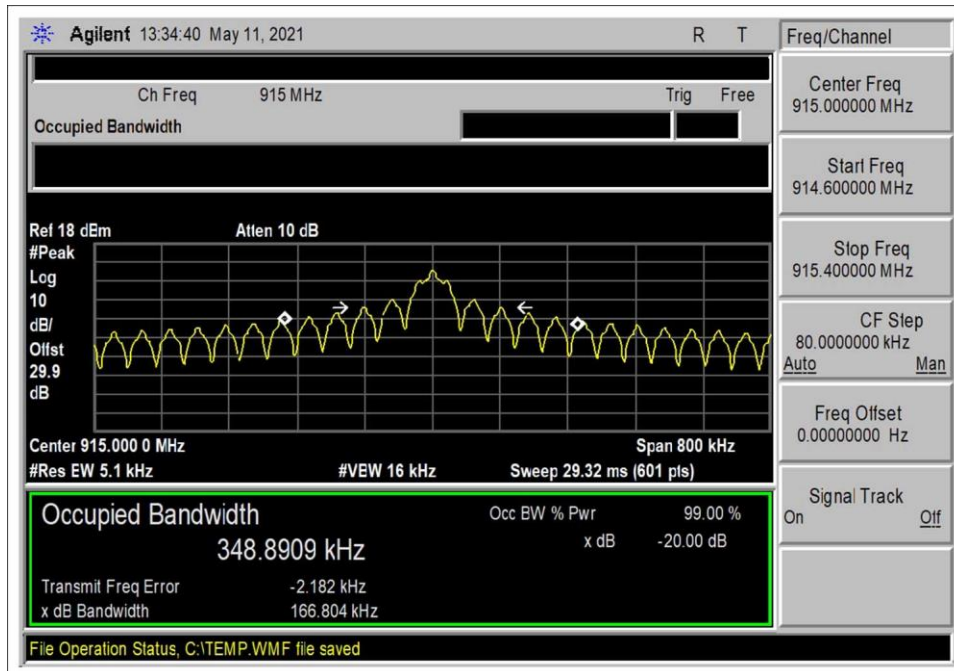
OOK, Middle Channel (PL3)



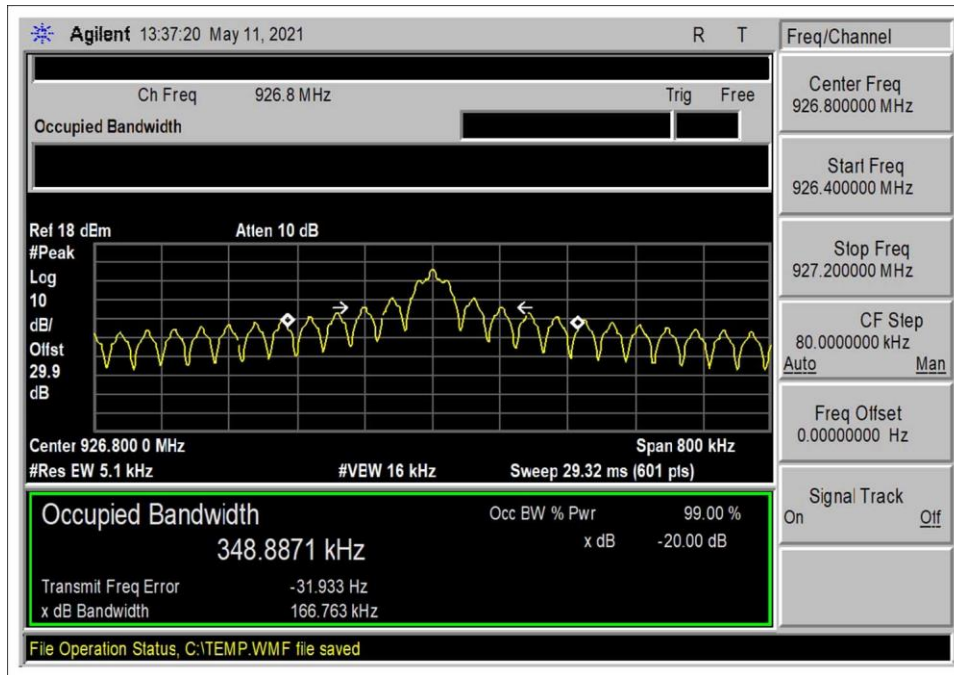
OOK High Channel (PL3)



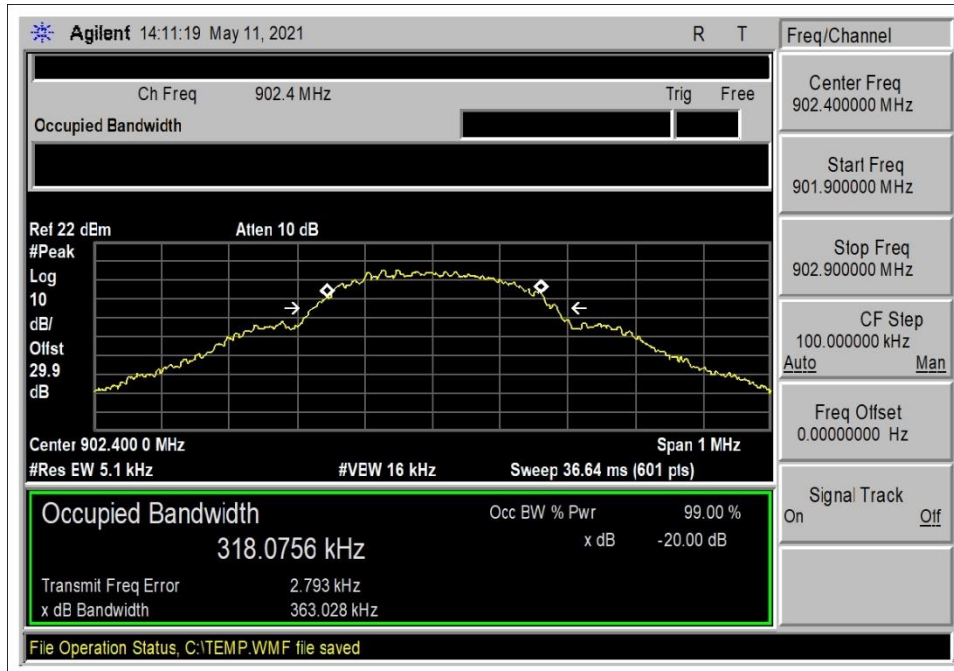
OOK Low Channel (PL1)



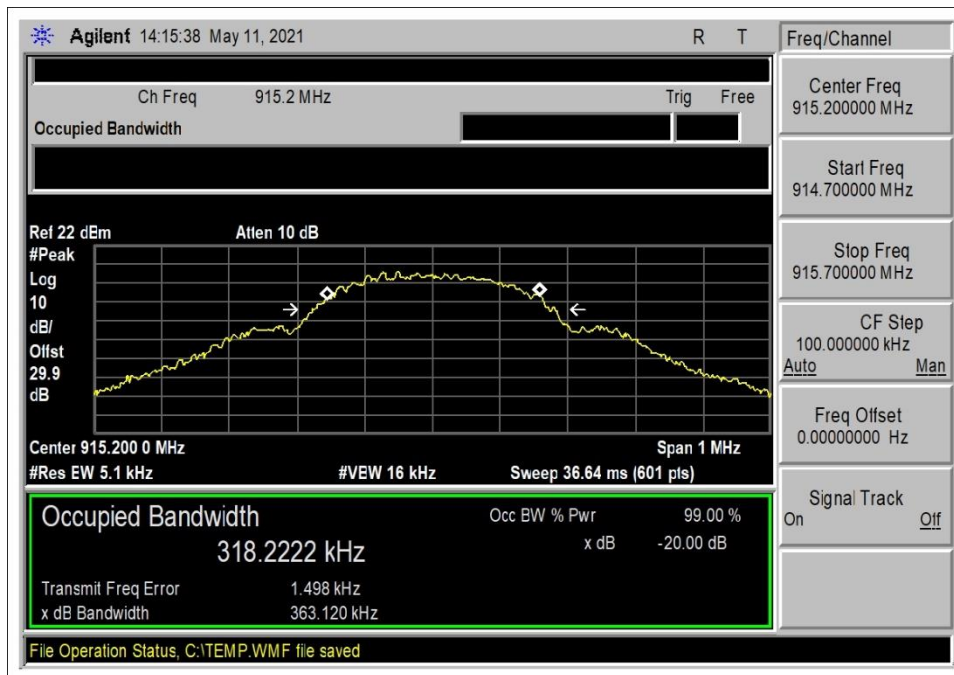
OOK Middle Channel (PL1)



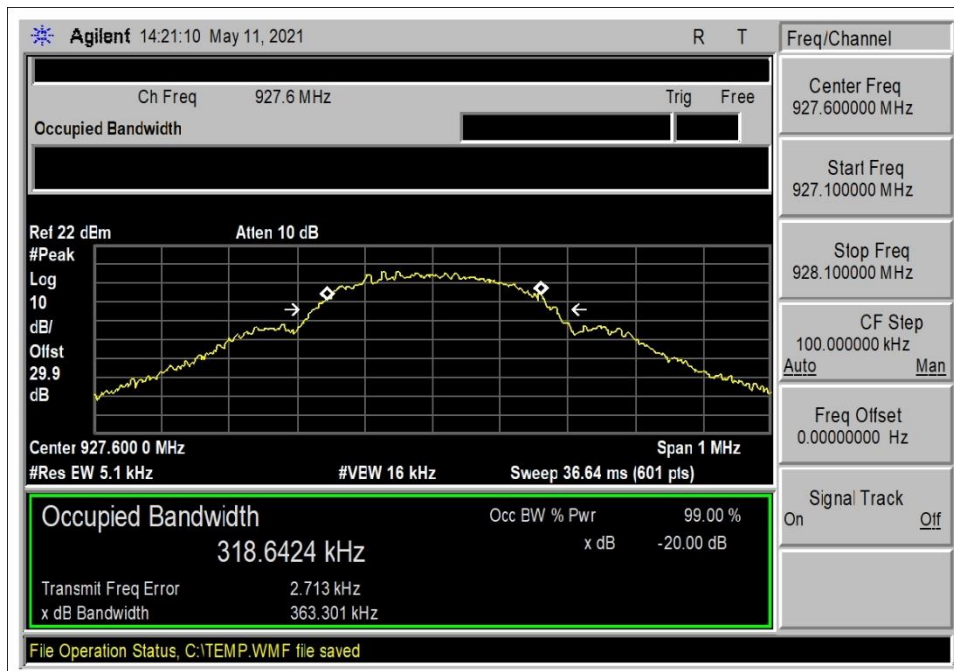
High Channel (PL1)



GFSK, Low Channel (PL2)



GFSK Middle Channel (PL2)

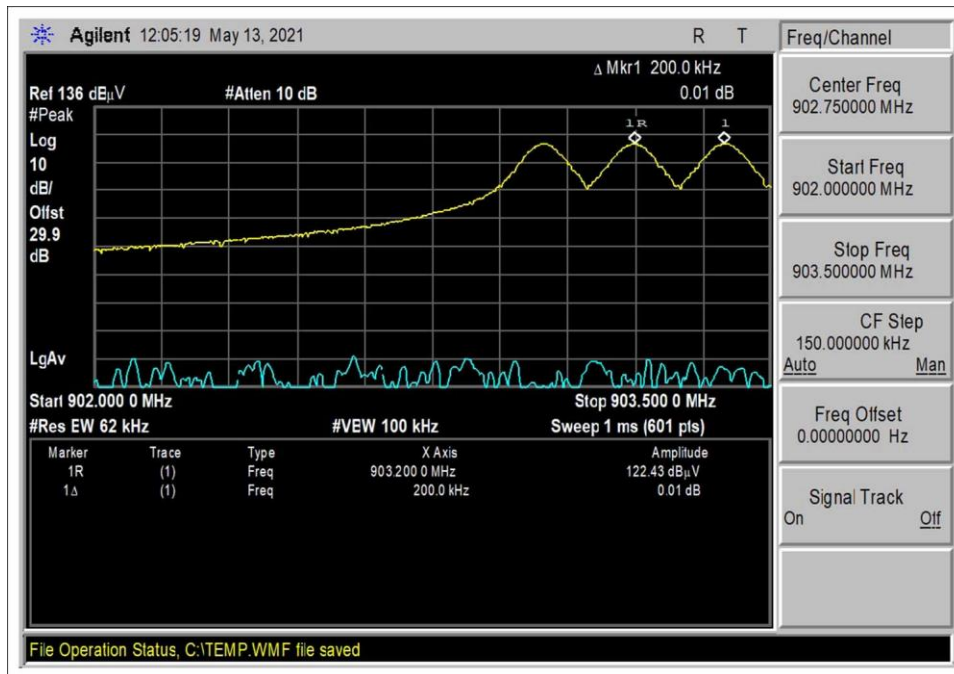


GFSK High Channel (PL2)

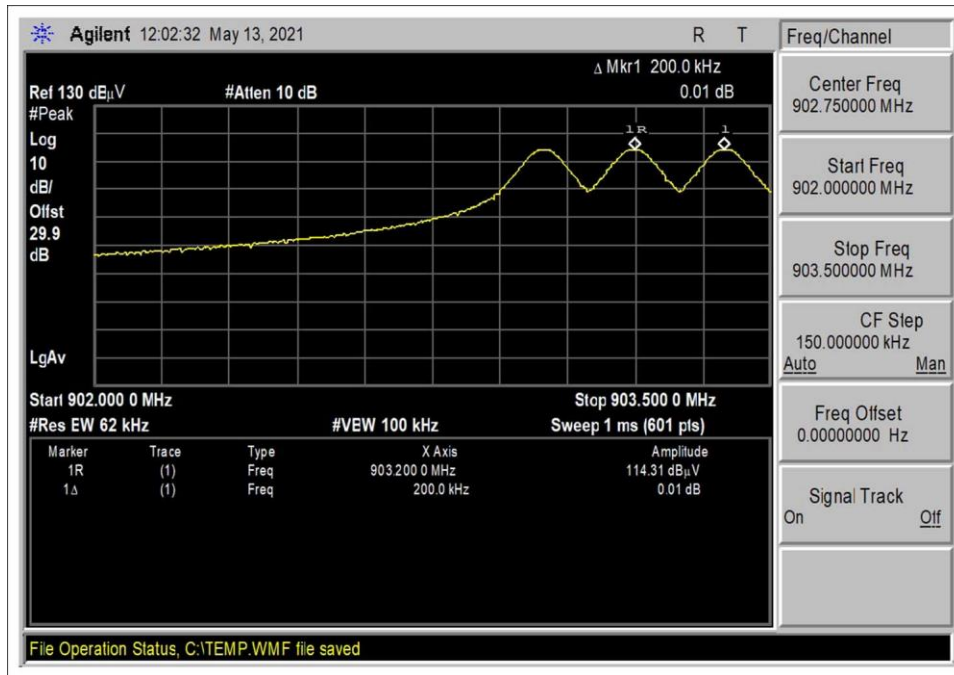
15.247(a)(1) Carrier Separation

Test Data Summary				
Limit applied: 20dB bandwidth of the hopping channel.				
Antenna Port	Operational Mode	Measured (kHz)	Limit (kHz)	Results
1	OOK 16.384kbps (PL3)	200	166.648	Pass
1	OOK 16.384kbps (PL1)	200	166.878	Pass
1	GFSK 300kbps (PL2)	400	363.301	Pass

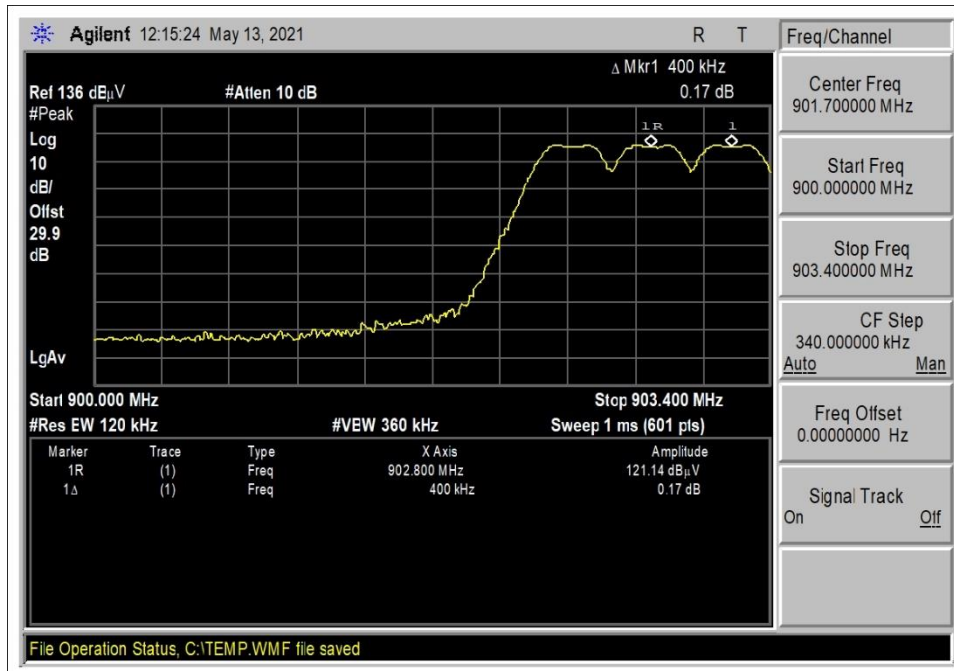
Plot(s)



OOK (PL3)



OOK (PL1)

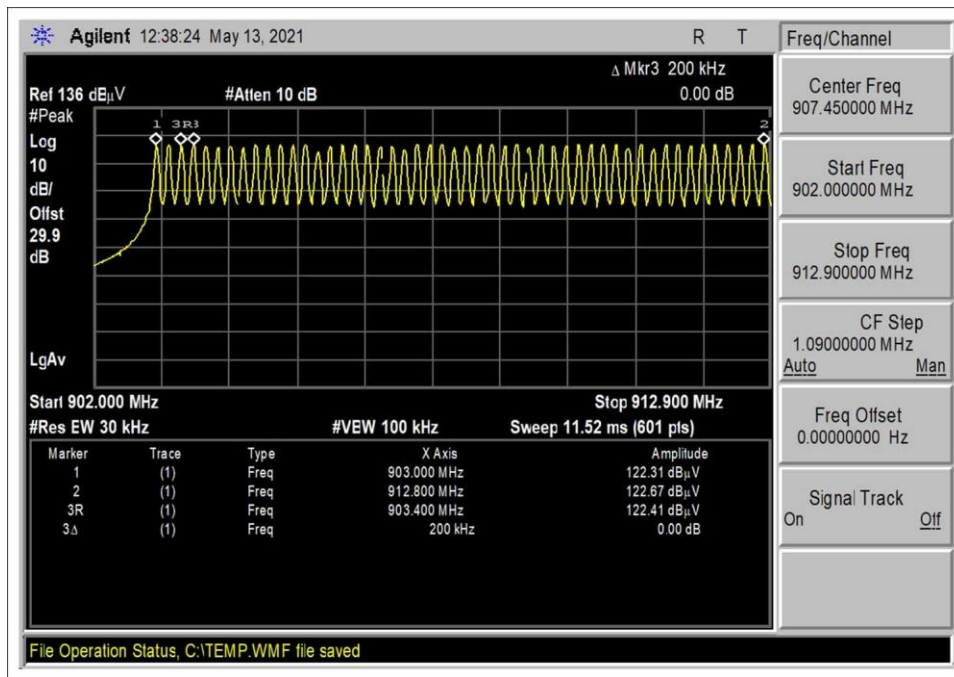


GFSK (PL2)

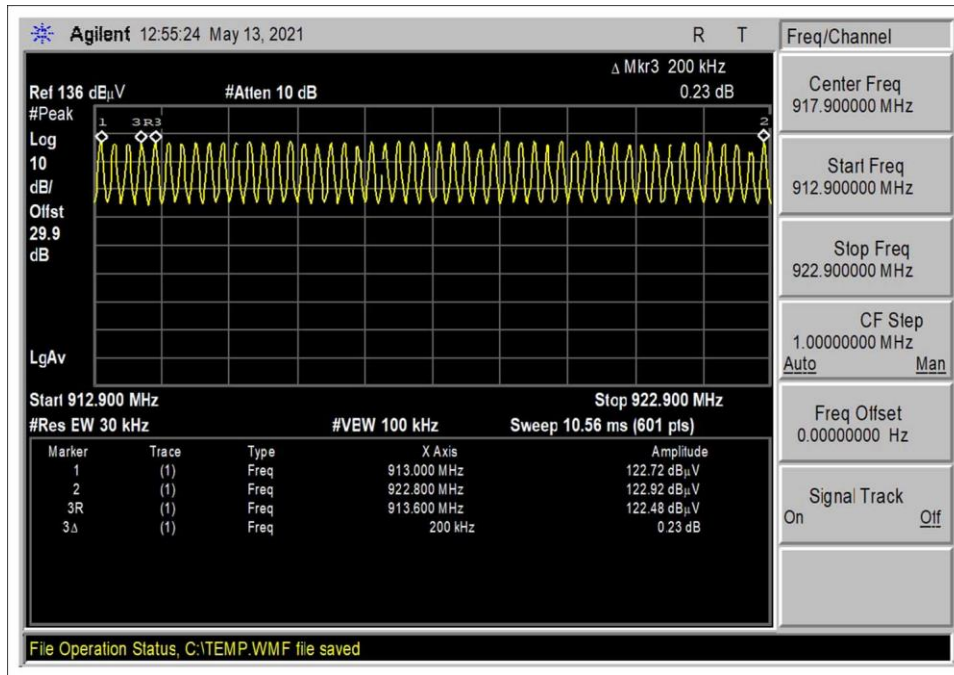
15.247(a)(1)(i) Number of Hopping Channels

Test Data Summary				
$Limit = \begin{cases} 50 \text{ Channels} & 20 \text{ dB BW} < 250 \text{ kHz} \\ 25 \text{ Channels} & 20 \text{ dB BW} \geq 250 \text{ kHz} \end{cases}$				
Antenna Port	Operational Mode	Measured (Channels)	Limit (Channels)	Results
1	OOK 16.384kbps	120	≥ 50	Pass
1	GFSK 300kbps	64	≥ 25	Pass

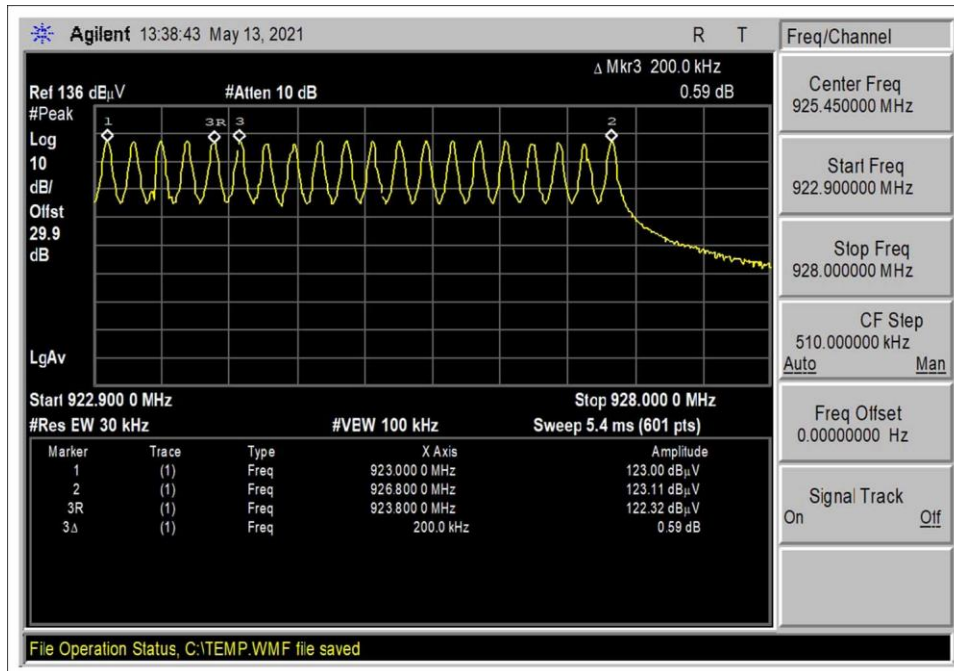
Plot(s)



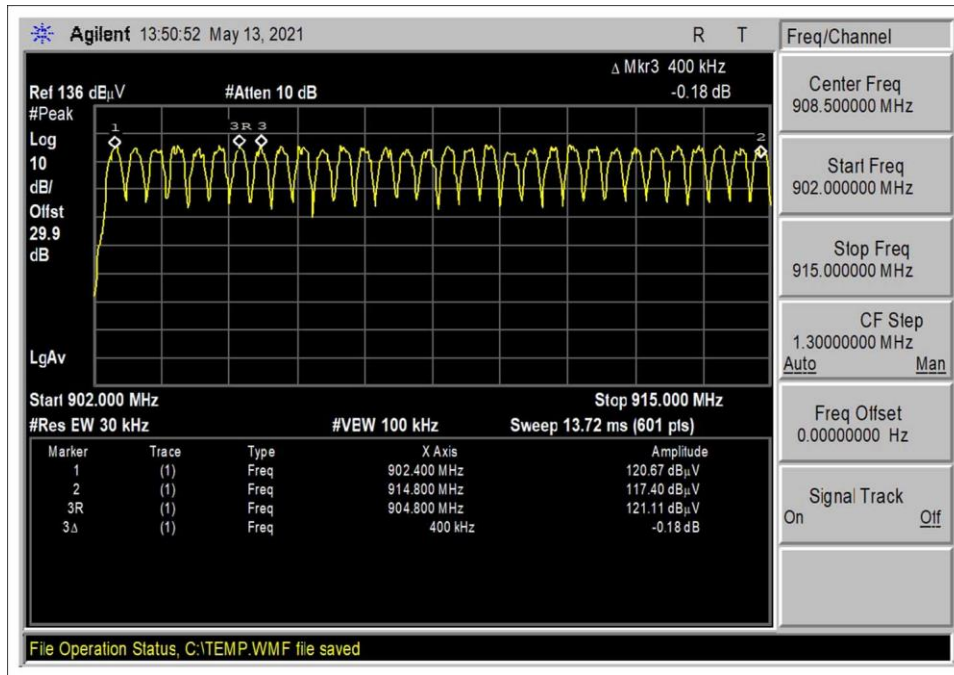
OOK, 903.0-912.9MHz



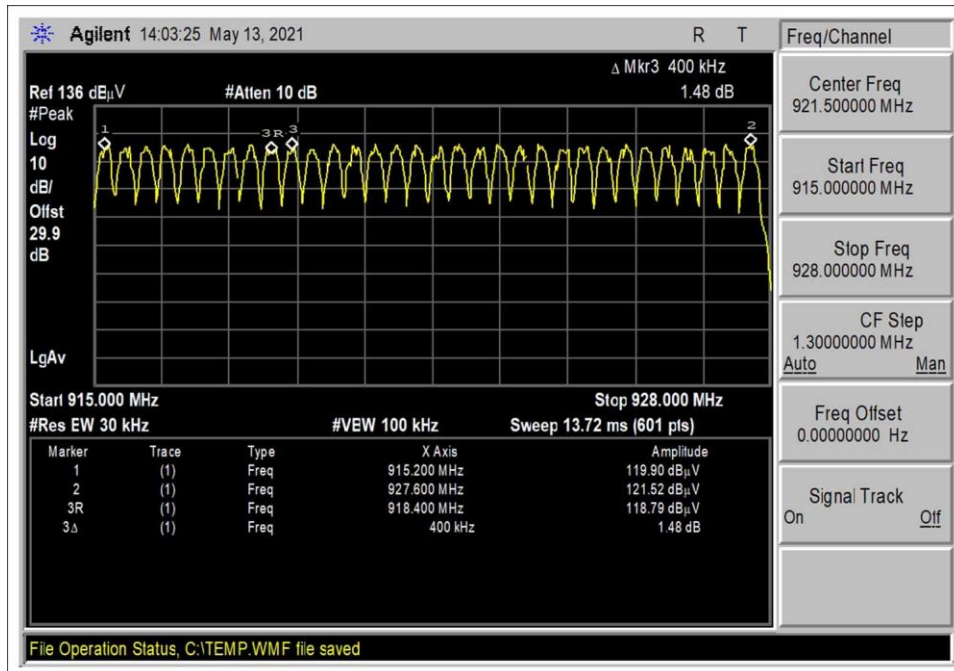
OOK, 912.9-922.9MHz



OOK, 922.9-926.8MHz



GFSK, 902-4-915.0



GFSK, 915.0-927.6MHz

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

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

Therefore, the manufacturer declares the following:

“With the multiple modulations, modes and hop tables, the mode with the worst-case Time of Occupancy to demonstrate 400mS compliance is 399mS 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.

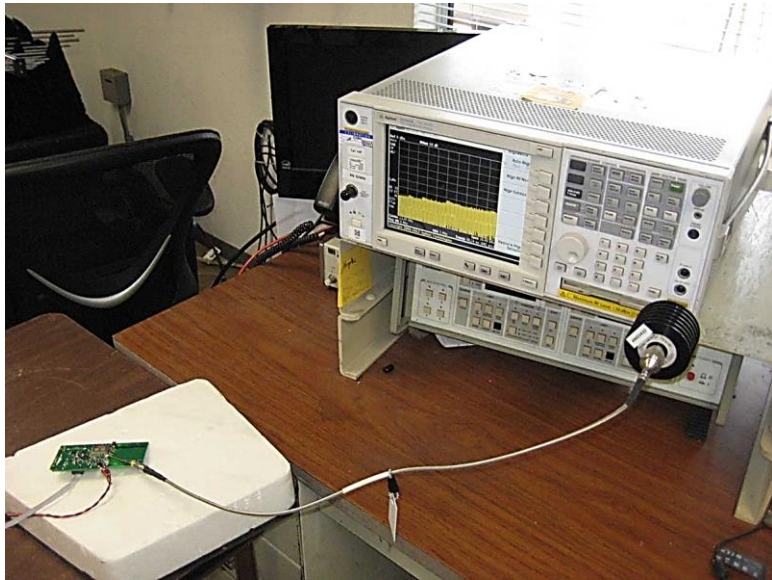
The system has receiver channel bandwidths that match the transmitter's modulation bandwidth that is enabled.

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(s)



15.247(b)(2) Output Power

Test Setup / Conditions / Data

Test Location: CKC Laboratories Inc. • 110 N Olinda Pl • Brea CA 92823 • 714-993-6112
 Customer: **Itron, Inc.**
 Specification: **15.247(b) Power Output (902-928 MHz FHSS >50 Channels)**
 Work Order #: **105379** Date: 5/11/2021
 Test Type: **Conducted Emissions** Time: 11:12:41
 Tested By: S. Yamamoto Sequence#: 1
 Software: EMITest 5.03.19 3.6Vdc

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 connected to a laptop computer via USB to serial interface board. The laptop is running Command Line Interface (CLI) Tool. This software is used to run the scripts for setting the EUT parameters.

The RF output has been configured to a coaxial cable output with sma connector. The output is connected to the spectrum analyzer using a coaxial cable and power attenuator.

Frequency range of test: 903.0MHz to 926.8MHz.

Low channel 903.0MHz

Middle channel 915.0MHz

High channel 926.8MHz

RBW=300kHz, VBW=1MHz

Output level 3 OOK 16.384kbps

Test Environment Conditions:

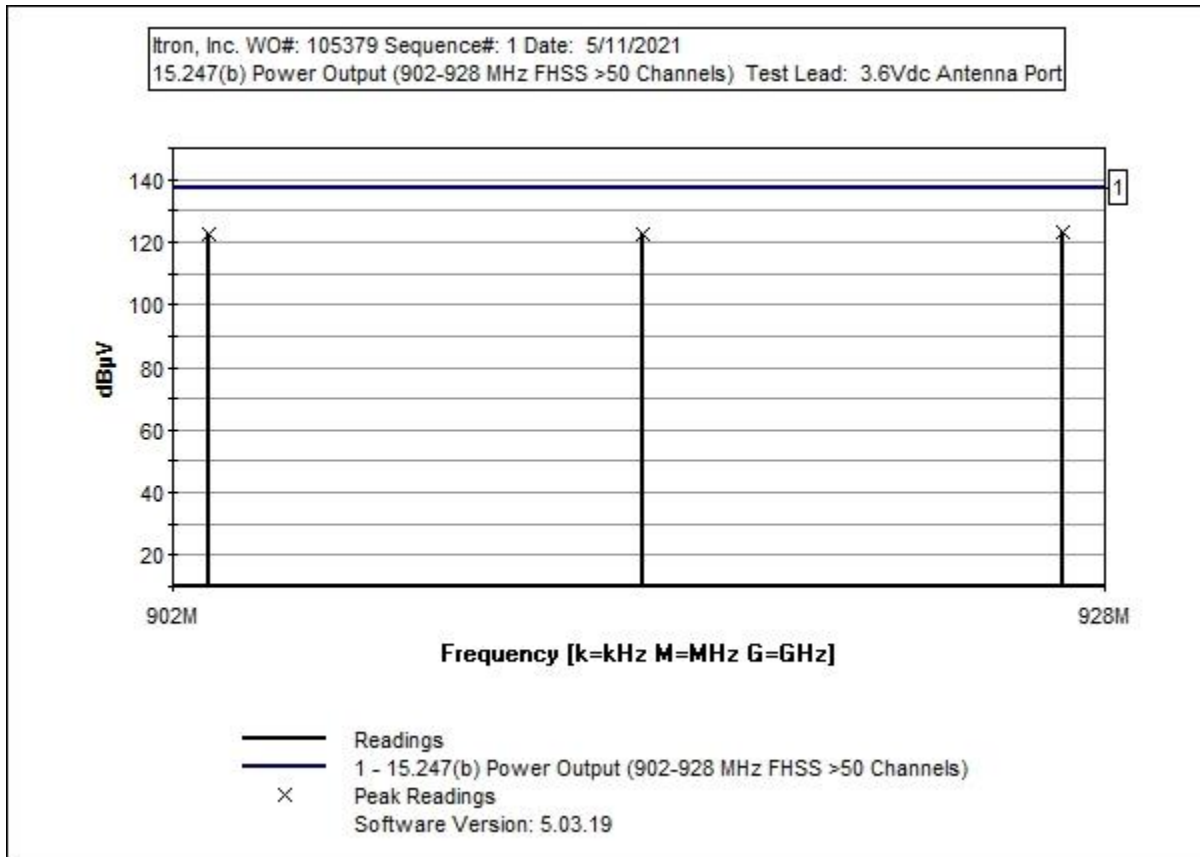
Temperature: 21°C

Relative Humidity: 50%

Pressure: 99kPa

Site D

Reference 558074 D01 15.247 Meas Guidance v05r02 and ANSI C63.10-2013



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02869	Spectrum Analyzer	E4440A	8/3/2020	8/3/2021
T2	AN03432	Attenuator	90-30-34	10/22/2019	10/22/2021
T3	ANP07656	Cable	32022-29094K- 29094K-24TC	7/30/2020	7/30/2022

Measurement Data:

Reading listed by margin.

Test Lead: Antenna Port

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	Dist dB	Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	926.800M	93.2	+0.0	+29.6	+0.3	+0.0		123.1	137.0	-13.9	Anten
2	915.000M	92.9	+0.0	+29.6	+0.3	+0.0		122.8	137.0	-14.2	Anten
3	903.000M	92.5	+0.0	+29.6	+0.3	+0.0		122.4	137.0	-14.6	Anten

Test Location: CKC Laboratories Inc. • 110 N Olinda Pl • Brea CA 92823 • 714-993-6112
 Customer: **Itron, Inc.**
 Specification: **15.247(b) Power Output (902-928 MHz FHSS >50 Channels)**
 Work Order #: **105379** Date: 5/11/2021
 Test Type: **Conducted Emissions** Time: 11:12:41
 Tested By: S. Yamamoto Sequence#: 2
 Software: EMITest 5.03.19 3.6Vdc

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 connected to a laptop computer via USB to serial interface board. The laptop is running Command Line Interface (CLI) Tool. This software is used to run the scripts for setting the EUT parameters.

The RF output has been configured to a coaxial cable output with sma connector. The output is connected to the spectrum analyzer using a coaxial cable and power attenuator.

Frequency range of test: 903.0MHz to 926.8MHz.
 Low channel 903.0MHz
 Middle channel 915.0MHz
 High channel 926.8MHz

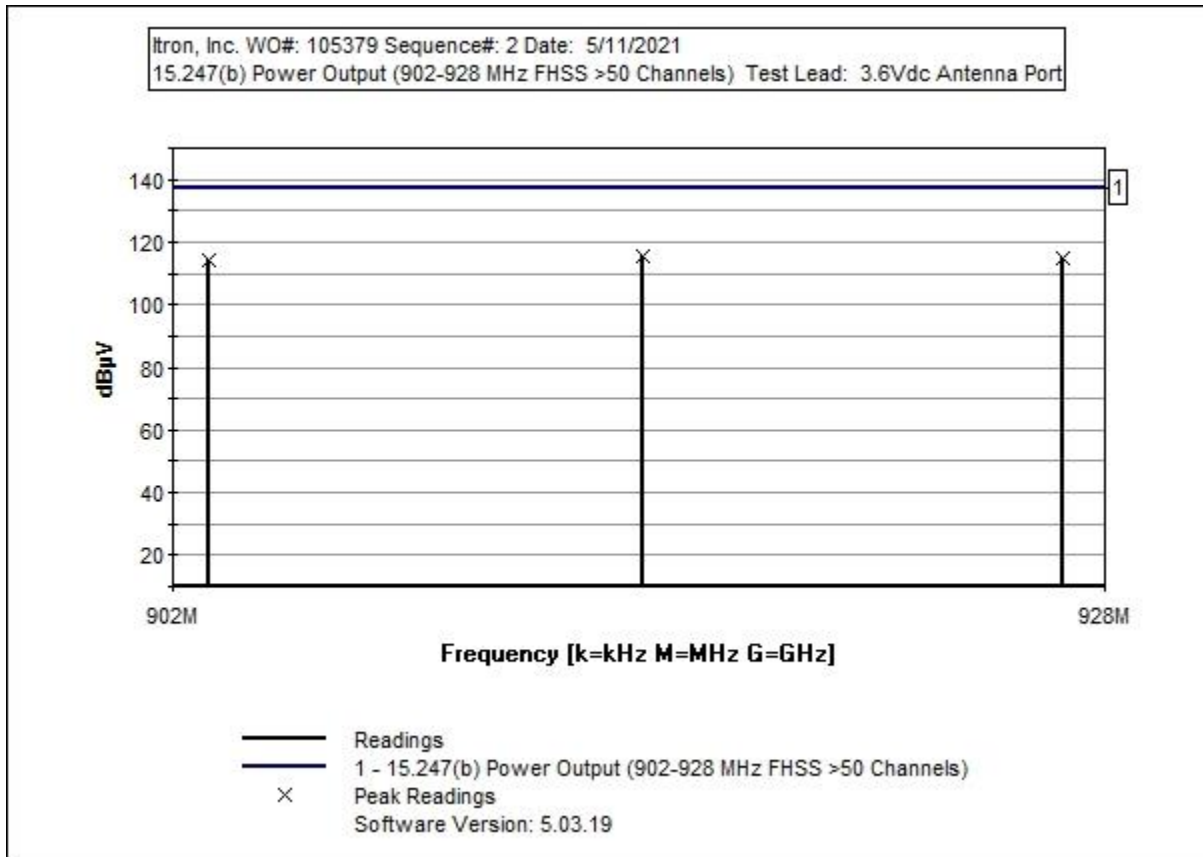
RBW=300kHz, VBW=1MHz

Output level 1 OOK 16.384kbps

Test Environment Conditions:
 Temperature: 21°C
 Relative Humidity: 50%
 Pressure: 99kPa

Site D

Reference 558074 D01 15.247 Meas Guidance v05r02 and ANSI C63.10-2013



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02869	Spectrum Analyzer	E4440A	8/3/2020	8/3/2021
T2	AN03432	Attenuator	90-30-34	10/22/2019	10/22/2021
T3	ANP07656	Cable	32022-29094K- 29094K-24TC	7/30/2020	7/30/2022

Measurement Data:

Reading listed by margin.

Test Lead: Antenna Port

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	Dist dB	Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	915.000M	85.4	+0.0	+29.6	+0.3	+0.0		115.3	137.0	-21.7	Anten
2	926.800M	85.1	+0.0	+29.6	+0.3	+0.0		115.0	137.0	-22.0	Anten
3	903.000M	84.4	+0.0	+29.6	+0.3	+0.0		114.3	137.0	-22.7	Anten

Test Location: CKC Laboratories Inc. • 110 N Olinda Pl • Brea CA 92823 • 714-993-6112
 Customer: **Itron, Inc.**
 Specification: **15.247(b) Power Output (902-928 MHz FHSS >50 Channels)**
 Work Order #: **105379** Date: 5/11/2021
 Test Type: **Conducted Emissions** Time: 11:46:59
 Tested By: S. Yamamoto Sequence#: 3
 Software: EMITest 5.03.19 3.6Vdc

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 connected to a laptop computer via USB to serial interface board. The laptop is running Command Line Interface (CLI) Tool. This software is used to run the scripts for setting the EUT parameters.

The RF output has been configured to a coaxial cable output with sma connector. The output is connected to the spectrum analyzer using a coaxial cable and power attenuator.

Frequency range of test: 902.4MHz to 927.6MHz.
 Low channel 902.4MHz
 Middle channel 915.2MHz
 High channel 927.6MHz

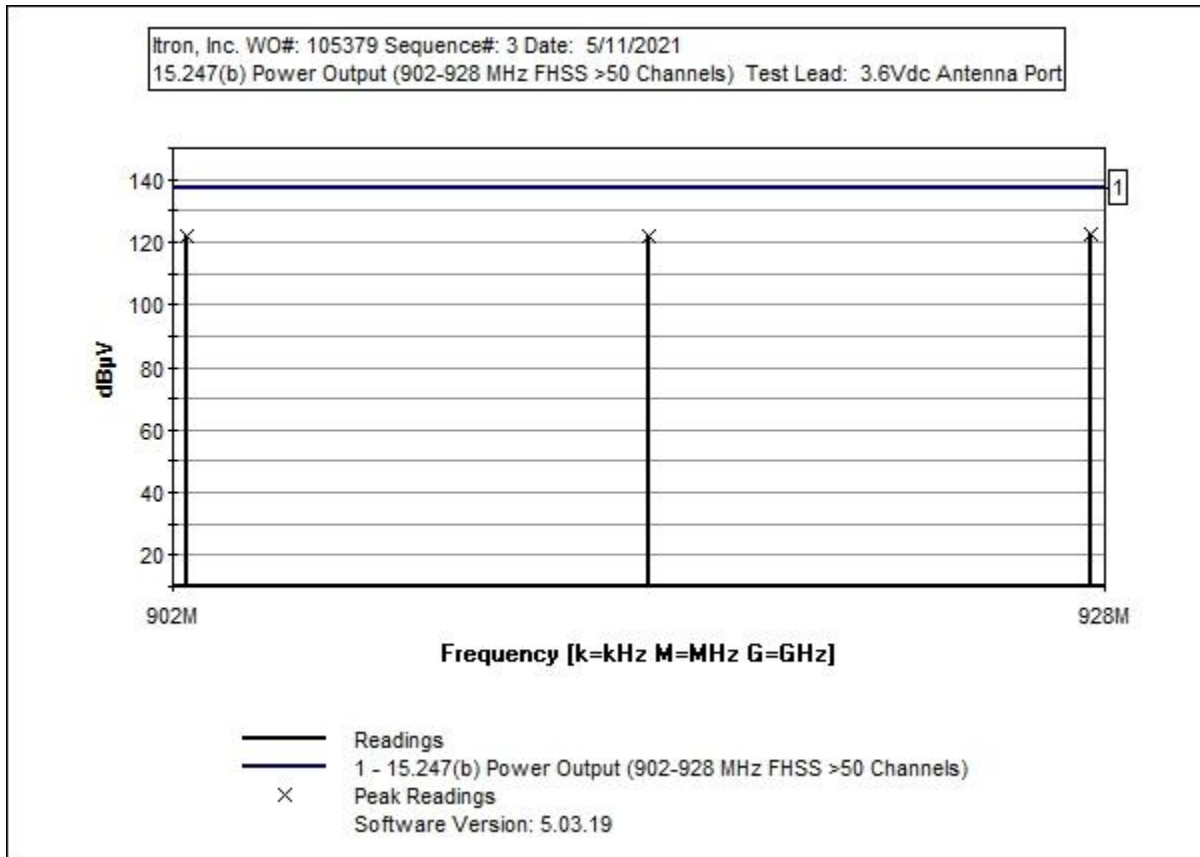
RBW=560kHz, VBW=1.6MHz

Output level 2 300kbps

Test Environment Conditions:
 Temperature: 21°C
 Relative Humidity: 50%
 Pressure: 99kPa

Site D

Reference 558074 D01 15.247 Meas Guidance v05r02 and ANSI C63.10-2013



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02869	Spectrum Analyzer	E4440A	8/3/2020	8/3/2021
T2	AN03432	Attenuator	90-30-34	10/22/2019	10/22/2021
T3	ANP07656	Cable	32022-29094K-29094K-24TC	7/30/2020	7/30/2022

Measurement Data:

Reading listed by margin.

Test Lead: Antenna Port

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	Dist dB	Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	927.600M	92.4	+0.0	+29.6	+0.3	+0.0		122.3	137.0	-14.7	Anten
2	915.200M	92.1	+0.0	+29.6	+0.3	+0.0		122.0	137.0	-15.0	Anten
3	902.400M	91.7	+0.0	+29.6	+0.3	+0.0		121.6	137.0	-15.4	Anten

Parameter Definitions:

Measurements performed at input voltage according to manufacturer specification.

Parameter	Value
V _{Nominal} :	3.6Vdc
V _{Minimum} :	NA
V _{Maximum} :	NA

Test Data Summary - Voltage Variations

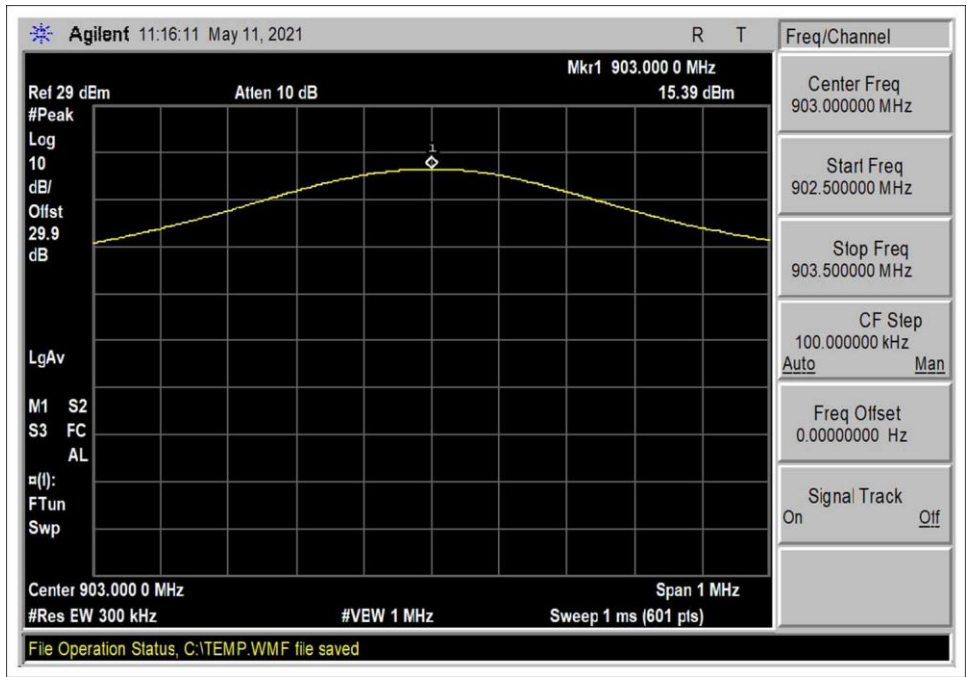
This equipment is battery powered. Power output tests were performed using a power supply simulating a brand new battery.

Test Data Summary - RF Conducted Measurement

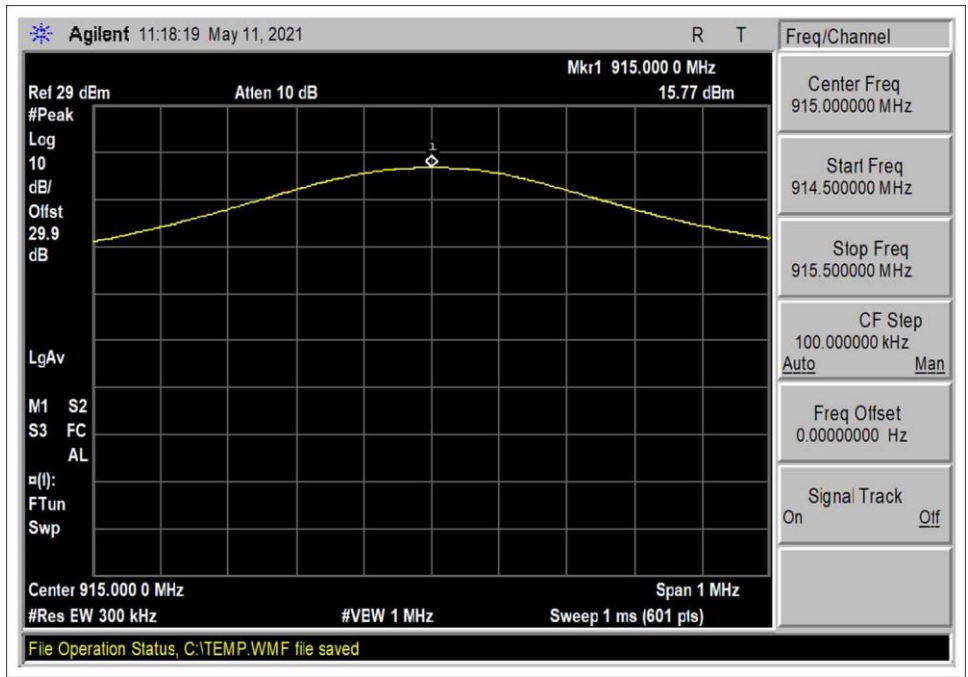
$$Limit = \begin{cases} 30dBm \text{ Conducted} / 36dBm \text{ EIRP} & | \geq 50 \text{ Channels} \\ 24dBm \text{ Conducted} / 30dBm \text{ EIRP} & | < 50 \text{ Channels (min 25)} \end{cases}$$

Frequency (MHz)	Modulation	Ant. Type / Gain (dBi)	Measured (dBm)	Limit (dBm)	Results
903.0	OOK 16.384kbps (PL3)	PCB Trace / 0.9	15.39	≤ 30	Pass
915.0	OOK 16.384kbps (PL3)	PCB Trace / 0.9	15.77	≤ 30	Pass
926.8	OOK 16.384kbps (PL3)	PCB Trace / 0.9	16.09	≤ 30	Pass
903.0	OOK 16.384kbps (PL1)	PCB Trace / 0.9	7.30	≤ 30	Pass
915.0	OOK 16.384kbps (PL1)	PCB Trace / 0.9	7.65	≤ 30	Pass
926.8	OOK 16.384kbps (PL1)	PCB Trace / 0.9	7.98	≤ 30	Pass
902.4	GFSK 300kbps (PL2)	PCB Trace / 0.9	14.57	≤ 30	Pass
915.2	GFSK 300kbps (PL2)	PCB Trace / 0.9	14.96	≤ 30	Pass
927.6	GFSK 300kbps (PL2)	PCB Trace / 0.9	15.30	≤ 30	Pass

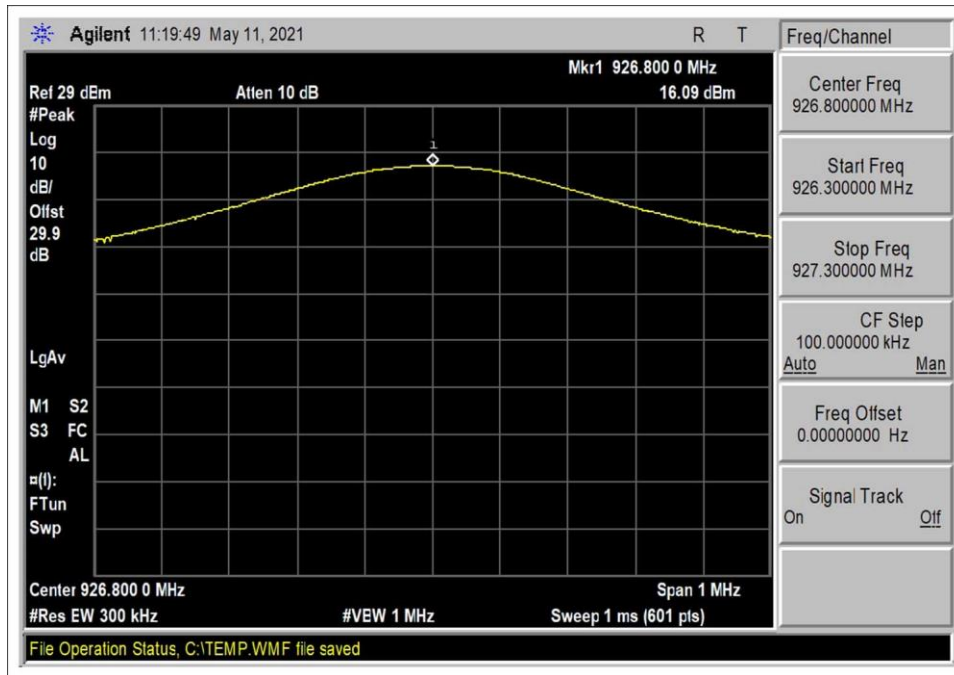
Plots



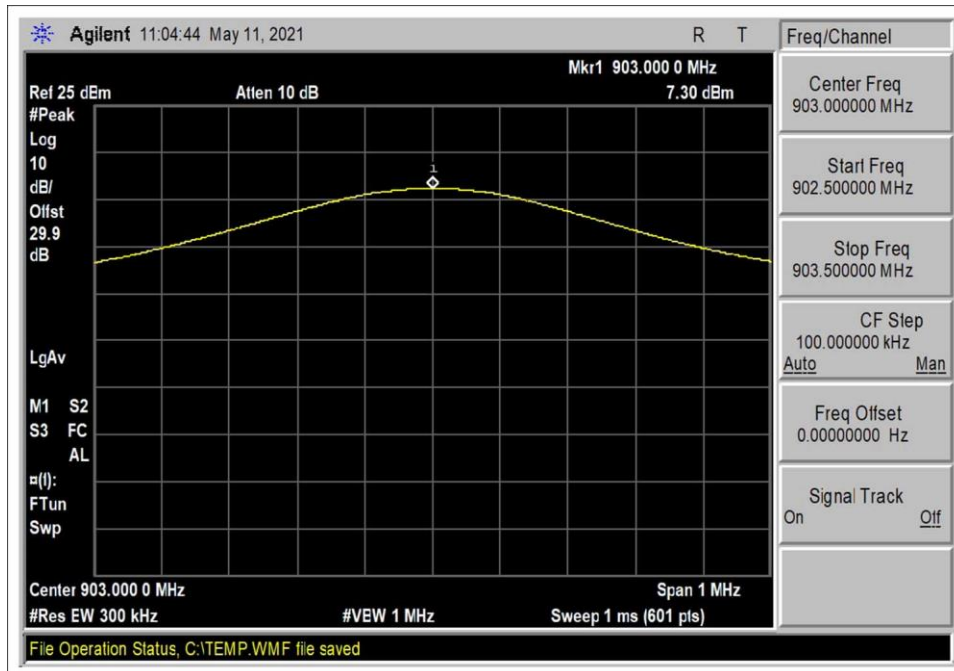
OOK, Low Channel (PL3)



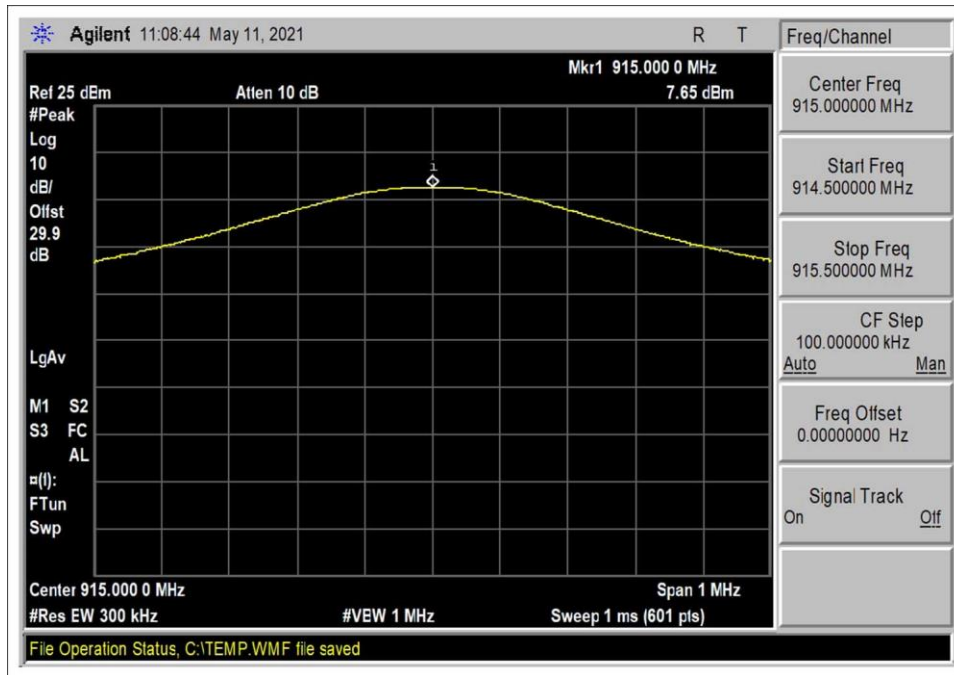
OOK Middle Channel (PL3)



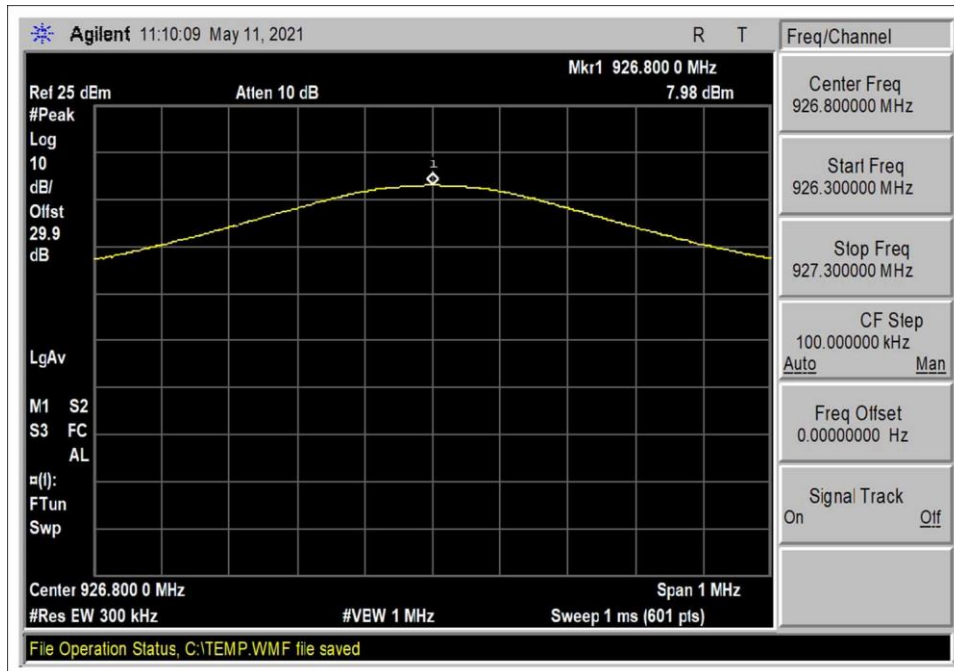
High Channel (PL3)



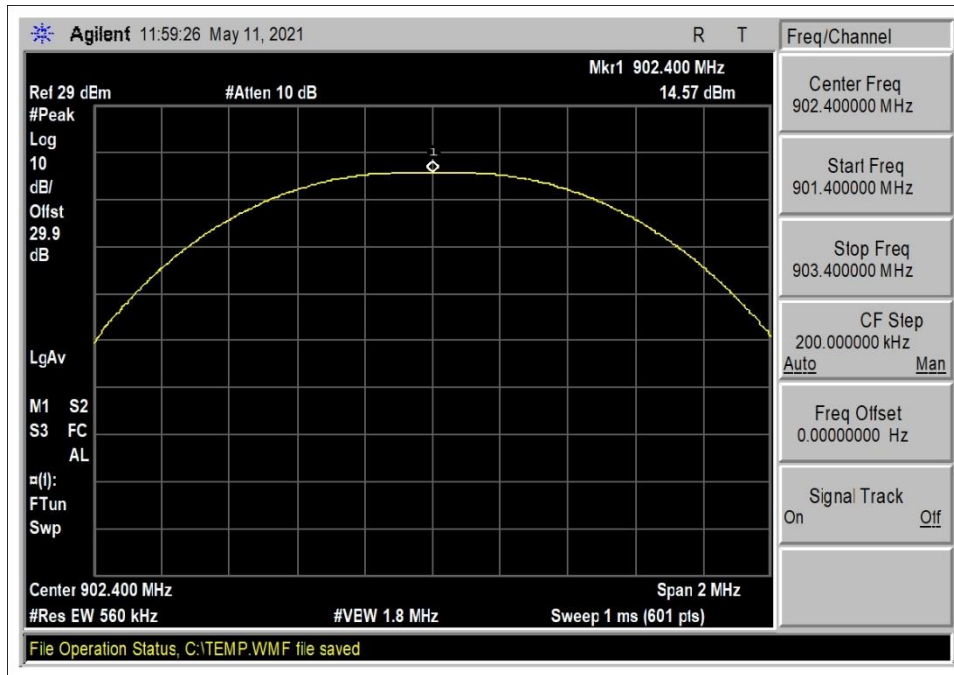
OOK Low Channel (PL1)



OOK Middle Channel (PL1)



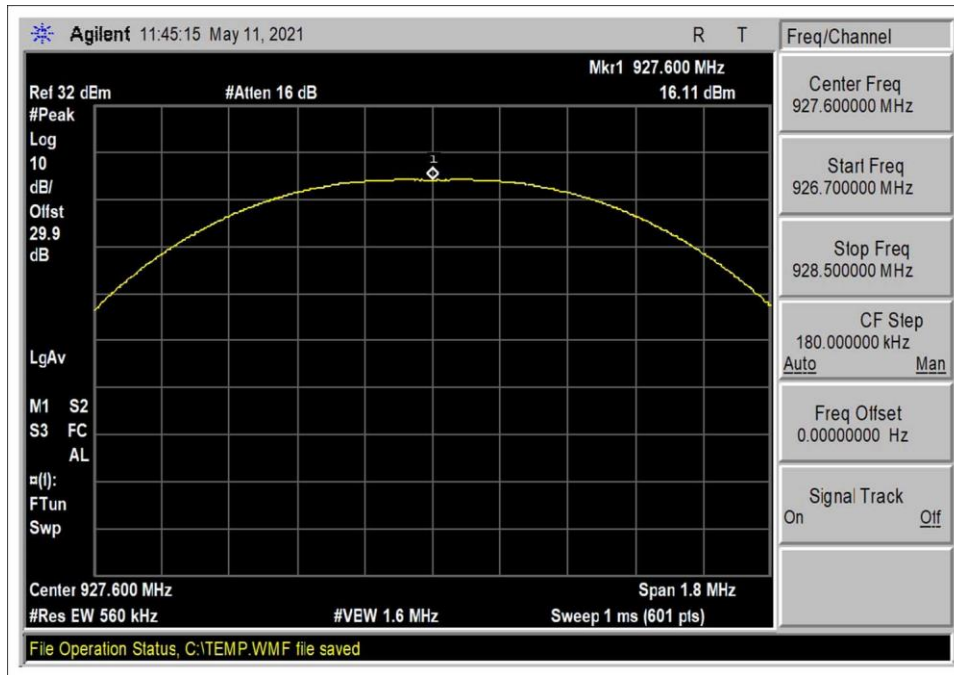
OOK High Channel (PL1)



GFSK Low Channel (PL2)

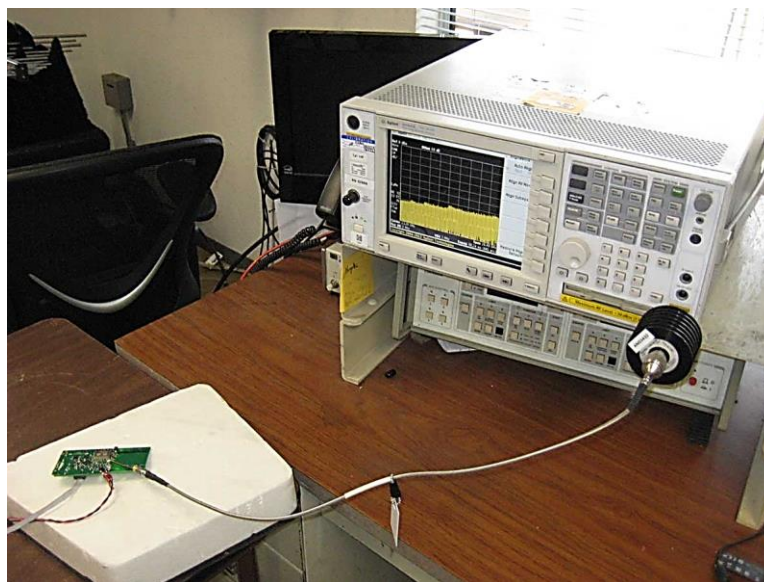


GFSK Middle Channel (PL2)



GFSK High Channel (PL2)

Test Setup Photo(s)



15.247(d) RF Conducted Emissions & Band Edge

Test Setup / Conditions / Data

Test Location: CKC Laboratories Inc. • 110 N Olinda Pl • Brea CA 92823 • 714-993-6112
 Customer: **Itron, Inc.**
 Specification: **15.247(d) Conducted Spurious Emissions**
 Work Order #: **105379** Date: 5/13/2021
 Test Type: **Conducted Emissions** Time: 15:29:11
 Tested By: S. Yamamoto Sequence#: 11
 Software: EMITest 5.03.19 3.6Vdc

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 connected to a laptop computer via USB to serial interface board. The laptop is running Command Line Interface (CLI) Tool. This software is used to run the scripts for setting the EUT parameters.

The RF output has been configured to a coaxial cable output with sma connector. The output is connected to the spectrum analyzer using a coaxial cable and power attenuator.

Frequency range of test: 9kHz to 9.28GHz.

Test Channels:
 Low Channel 903.0MHz
 Middle Channel 915.0MHz
 High Channel 926.8MHz

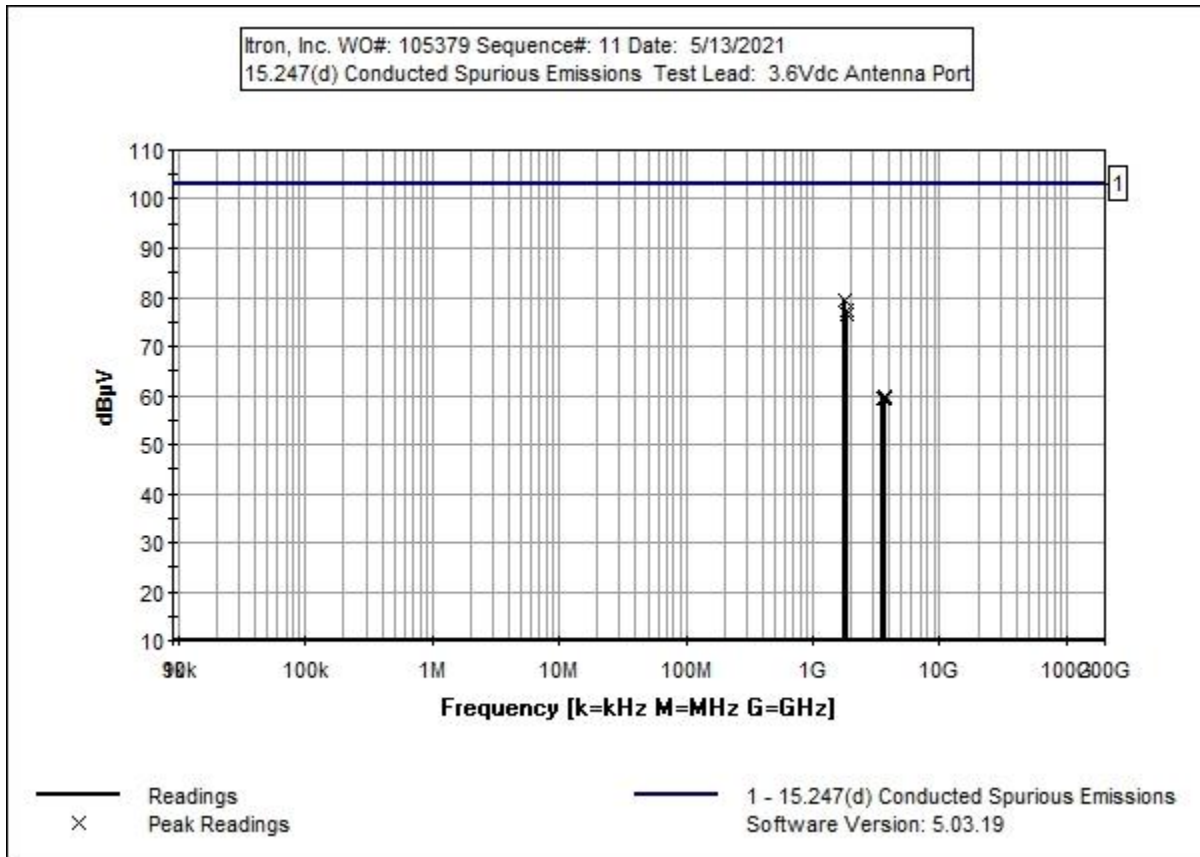
RBW=100kHz, VBW=300kHz

Output level 3 OOK 16.384kbps

Test Environment Conditions:
 Temperature: 22°C
 Relative Humidity: 52%
 Pressure: 99kPa

Site D

Reference 558074 D01 15.247 Meas Guidance v05r02 and ANSI C63.10-2013



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02869	Spectrum Analyzer	E4440A	8/3/2020	8/3/2021
T1	AN03432	Attenuator	90-30-34	10/22/2019	10/22/2021
T2	ANP07656	Cable	32022-29094K- 29094K-24TC	7/30/2020	7/30/2022

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	1806.000M	49.3	+29.6	+0.4			+0.0	79.3	103.1	-23.8	Anten
2	1830.003M	47.4	+29.6	+0.4			+0.0	77.4	103.1	-25.7	Anten
3	1853.598M	46.5	+29.6	+0.4			+0.0	76.5	103.1	-26.6	Anten
4	3660.000M	29.3	+29.8	+0.5			+0.0	59.6	103.1	-43.5	Anten
5	3612.003M	29.2	+29.7	+0.6			+0.0	59.5	103.1	-43.6	Anten
6	3707.199M	29.1	+29.8	+0.5			+0.0	59.4	103.1	-43.7	Anten

Test Location: CKC Laboratories Inc. • 110 N Olinda Pl • Brea CA 92823 • 714-993-6112
 Customer: **Itron, Inc.**
 Specification: **15.247(d) Conducted Spurious Emissions**
 Work Order #: **105379** Date: 5/13/2021
 Test Type: **Conducted Emissions** Time: 16:09:43
 Tested By: S. Yamamoto Sequence#: 12
 Software: EMITest 5.03.19 3.6Vdc

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 connected to a laptop computer via USB to serial interface board. The laptop is running Command Line Interface (CLI) Tool. This software is used to run the scripts for setting the EUT parameters.

The RF output has been configured to a coaxial cable output with sma connector. The output is connected to the spectrum analyzer using a coaxial cable and power attenuator.

Frequency range of test: 9kHz to 9.28GHz.

Test Channels:
 Low Channel 903.0MHz
 Middle Channel 915.0MHz
 High Channel 926.8MHz

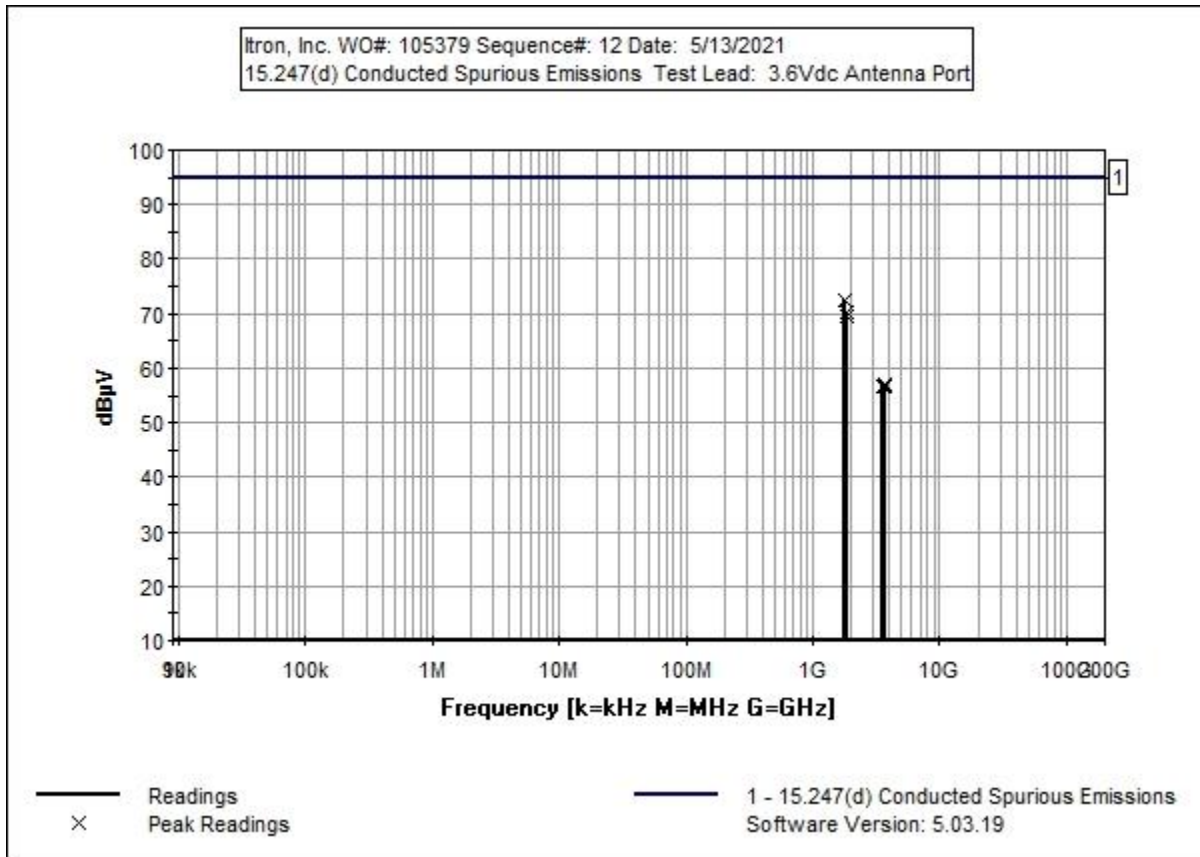
RBW=100kHz, VBW=300kHz

Output level 1 OOK 16.384kbps

Test Environment Conditions:
 Temperature: 22°C
 Relative Humidity: 52%
 Pressure: 99kPa

Site D

Reference 558074 D01 15.247 Meas Guidance v05r02 and ANSI C63.10-2013



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02869	Spectrum Analyzer	E4440A	8/3/2020	8/3/2021
T1	AN03432	Attenuator	90-30-34	10/22/2019	10/22/2021
T2	ANP07656	Cable	32022-29094K- 29094K-24TC	7/30/2020	7/30/2022

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	1806.008M	42.3	+29.6	+0.4			+0.0	72.3	95.0	-22.7	Anten
2	1830.002M	40.1	+29.6	+0.4			+0.0	70.1	95.0	-24.9	Anten
3	1853.593M	39.4	+29.6	+0.4			+0.0	69.4	95.0	-25.6	Anten
4	3707.239M	26.7	+29.8	+0.5			+0.0	57.0	95.0	-38.0	Anten
5	3660.017M	26.4	+29.8	+0.5			+0.0	56.7	95.0	-38.3	Anten
6	3611.958M	26.2	+29.7	+0.6			+0.0	56.5	95.0	-38.5	Anten

Test Location: CKC Laboratories Inc • 110 N Olinda Pl • Brea CA 92823 • 714-993-6112
 Customer: **Itron, Inc.**
 Specification: **15.247(d) Conducted Spurious Emissions**
 Work Order #: **105379** Date: 5/14/2021
 Test Type: **Conducted Emissions** Time: 08:16:07
 Tested By: S. Yamamoto Sequence#: 14
 Software: EMITest 5.03.19 3.6Vdc

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 connected to a laptop computer via USB to serial interface board. The laptop is running Command Line Interface (CLI) Tool. This software is used to run the scripts for setting the EUT parameters.

The RF output has been configured to a coaxial cable output with sma connector. The output is connected to the spectrum analyzer using a coaxial cable and power attenuator.

Frequency range of test: 9kHz to 9.28GHz.

Test Channels:
 Low channel 902.4MHz
 Middle channel 915.2MHz
 High channel 927.6MHz

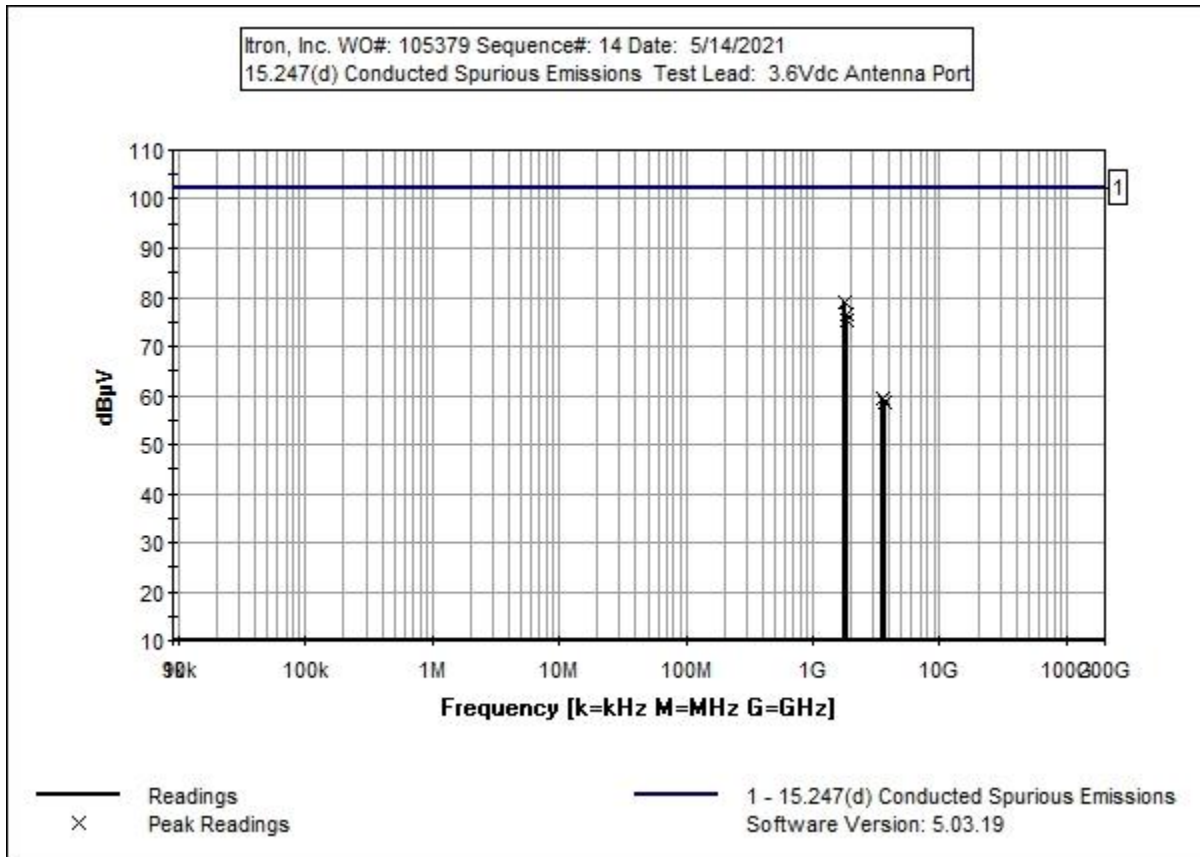
RBW=100kHz, VBW=300kHz

Output level 2 300kbps

Test Environment Conditions:
 Temperature: 20°C
 Relative Humidity: 53%
 Pressure: 99kPa

Site D

Reference 558074 D01 15.247 Meas Guidance v05r02 and ANSI C63.10-2013



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02869	Spectrum Analyzer	E4440A	8/3/2020	8/3/2021
T1	AN03432	Attenuator	90-30-34	10/22/2019	10/22/2021
T2	ANP07656	Cable	32022-29094K- 29094K-24TC	7/30/2020	7/30/2022

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	1804.640M	48.9	+29.6	+0.4			+0.0	78.9	102.4	-23.5	Anten
2	1830.253M	46.6	+29.6	+0.4			+0.0	76.6	102.4	-25.8	Anten
3	1855.052M	45.5	+29.6	+0.4			+0.0	75.5	102.4	-26.9	Anten
4	3609.317M	29.0	+29.7	+0.6			+0.0	59.3	102.4	-43.1	Anten
5	3710.710M	28.3	+29.8	+0.5			+0.0	58.6	102.4	-43.8	Anten
6	3661.093M	28.3	+29.8	+0.5			+0.0	58.6	102.4	-43.8	Anten

Band Edge

Band Edge Summary

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

Operating Mode: Single Channel (Low and High)

Frequency (MHz)	Modulation	Measured (dBm)	Limit (dBm)	Results
902	OOK 16.384kbps (PL3)	-17.21	< -3.91	Pass
928	OOK 16.384kbps (PL3)	-17.91	< -3.91	Pass
902	OOK 16.384kbps (PL1)	-25.42	< -12.02	Pass
928	OOK 16.384kbps (PL1)	-26.32	< -12.02	Pass
902	GFSK 300kbps (PL2)	-25.4	< -4.7	Pass
928	GFSK 300kbps (PL2)	-26.1	< -4.7	Pass

Band Edge Summary

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

Operating Mode: Hopping

Frequency (MHz)	Modulation	Measured (dBm)	Limit (dBm)	Results
902	OOK 16.384kbps (PL3)	-17.31	< -3.91	Pass
928	OOK 16.384kbps (PL3)	-17.71	< -3.91	Pass
902	OOK 16.384kbps (PL1)	-25.22	< -12.02	Pass
928	OOK 16.384kbps (PL1)	-26.32	< -12.02	Pass
902	GFSK 300kbps (PL2)	-26.7	< -4.7	Pass
928	GFSK 300kbps (PL2)	-28.9	< -4.7	Pass

Band Edge Plots

